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

MOTOMAN INSTRUCTIONS

MOTOMAN INSTRUCTIONS
YRC1000 INSTRUCTIONS
YRC1000 OPERATOR’S MANUAL (GENERAL) (SUBJECT SPECIFIC)
YRC1000 MAINTENANCE MANUAL
YRC1000 ALARM CODES (MAJOR ALARMS) (MINOR ALARMS)

Please have the following information available when contacting Yaskawa Customer Support:

- System
- Primary Application
- Software Version (Located on Programming Pendant by selecting: (Main Menu) - (System Info) - (Version))
- Robot Serial Number (Located on robot data plate)
- Robot Sales Order Number (Located on controller data plate)

Part Number: 189249-1CD
Revision: 0
DANGER

• This manual describes the various components of the YRC1000 system and general operations. Read this manual carefully and be sure to understand its contents before handling the YRC1000. Any matter, including operation, usage, measures, and an item to use, not described in this manual must be regarded as “prohibited” or “improper”.

• General information related to safety are described in “Chapter 1. Safety” of the YRC1000 INSTRUCTIONS. To ensure correct and safe operation, carefully read “Chapter 1. Safety” of the YRC1000 INSTRUCTIONS.

CAUTION

• In some drawings in this manual, protective covers or shields are removed to show details. Make sure that all the covers or shields are installed in place before operating this product.

• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids the product warranty.

NOTICE

• 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.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the YRC1000.

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

**DANGER**
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Safety Signs identified by the signal word DANGER should be used sparingly and only for those situations presenting the most serious hazards.

**WARNING**
Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury. Hazards identified by the signal word WARNING present a lesser degree of risk of injury or death than those identified by the signal word DANGER.

**CAUTION**
Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to “NOTICE”.

**NOTICE**
NOTICE is the preferred signal word to address practices not related to personal injury. The safety alert symbol should not be used with this signal word. As an alternative to “NOTICE”, the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.

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 “DANGER”, “WARNING” and “CAUTION”.
DANGER

• Before operating the manipulator, make sure the servo power is turned OFF by performing the following operations. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.
  – Press the emergency stop buttons on the front door of the YRC1000, on the programming pendant, on the external control device, etc.
  – Disconnect the safety plug of the safety fence.
    (when in the play mode or in the remote mode)
If operation of the manipulator cannot be stopped in an emergency, personal injury and/or equipment damage may result.
Fig. : Emergency Stop Button

• Before releasing the emergency stop, make sure to remove the obstacle or error caused the emergency stop, if any, and then turn the servo power ON.
Failure to observe this instruction may cause unintended movement of the manipulator, which may result in personal injury.
Fig. : Release of Emergency Stop

• Observe the following precautions when performing a teaching operation within the manipulator's operating range:
  – Be sure to perform lockout by putting a lockout device on the safety fence when going into the area enclosed by the safety fence. In addition, the operator of the teaching operation must display the sign that the operation is being performed so that no other person closes the safety fence.
  – View the manipulator from the front whenever possible.
  – Always follow the predetermined operating procedure.
  – Always keep in mind emergency response measures against the manipulator’s unexpected movement toward a person.
  – Ensure a safe place to retreat in case of emergency.
Failure to observe this instruction may cause improper or unintended movement of the manipulator, which may result in personal injury.
• Confirm that no person is present in the manipulator's operating range and that the operator is in a safe location before:
  – Turning ON the YRC1000 power
  – Moving the manipulator by using the programming pendant
  – Running the system in the check mode
  – Performing automatic operations
Personal injury may result if a person enters the manipulator's operating range during operation. Immediately press an emergency stop button whenever there is a problem. The emergency stop buttons are located on the front panel of the YRC1000 and on the right of the programming pendant.
• Read and understand the Explanation of the Warning Labels before operating the manipulator.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.
The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and manipulator cables.

In this manual, the equipment is designated as follows.

<table>
<thead>
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<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRC1000 controller</td>
<td>YRC1000</td>
</tr>
<tr>
<td>YRC1000 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>

WARNING

- Perform the following inspection procedures prior to conducting manipulator teaching. If there is any problem, immediately take necessary steps to solve it, such as maintenance and repair.
  - Check for a problem in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the YRC1000 cabinet after use.

If the programming pendant is left unattended on the manipulator, on a fixture, or on the floor, etc., the Enable Switch may be activated due to surface irregularities of where it is left, and the servo power may be turned ON. In addition, in case the operation of the manipulator starts, the manipulator or the tool may hit the programming pendant left unattended, which may result in personal injury and/or equipment damage.
Descriptions of the programming pendant keys, buttons, and displays are shown as follows:

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<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td></td>
</tr>
<tr>
<td>Character Keys /Symbol Keys</td>
<td>The keys which have characters or symbols printed on them are denoted with [ ]. e.g. [ENTER]</td>
</tr>
<tr>
<td>Axis Keys /Numeric Keys</td>
<td>[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td>Keys pressed simultaneously</td>
<td>When two keys are to be pressed simultaneously, the keys are shown with a &quot;+&quot; sign between them, e.g. [SHIFT]+[COORD].</td>
</tr>
<tr>
<td>Mode Switch</td>
<td>Mode Switch can select three kinds of modes that are denoted as follows: REMOTE, PLAY or TEACH. (The switch names are denoted as symbols)</td>
</tr>
<tr>
<td>Button</td>
<td>The three buttons on the upper side of the programming pendant are denoted as follows: START, HOLD, or EMERGENCY STOP. (The button names are denoted as symbols)</td>
</tr>
<tr>
<td>Displays</td>
<td>The menu displayed in the programming pendant is denoted with { }. e.g. {JOB}</td>
</tr>
</tbody>
</table>

*The button/switch names are denoted as symbols.*
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 [SELECT] is pressed, or that the item is directly selected by touching the screen.

Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and TM are omitted.
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<td>S2C1450: Control Group Specified Gun No</td>
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</tbody>
</table>
1 Painting Application

1.1 Function Keys

The function keys for painting application are assigned to the [Numeric Key]s as described below.

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Registers a timer instruction “TIMER” in a job.</td>
</tr>
<tr>
<td>0</td>
<td>Registers a reference point “REFP” in a job or modifies an already-registered reference point. By pressing [REFP] + [FWD], the manipulator moves to the registered reference point.</td>
</tr>
<tr>
<td>5</td>
<td>&lt;Teach mode&gt; By pressing this key, the INHB PAINT signal (#51534) is turned OFF and the painting becomes enabled. By pressing this key again, the INHB PAINT signal (#51534) is turned ON and the painting becomes inhibited. &lt;Play mode&gt; By pressing this key when the painting is performed by the SPYON instruction, the painting becomes inhibited. By pressing this key again, the painting becomes enabled.</td>
</tr>
<tr>
<td>6</td>
<td>Displays the PAINT CONDITION window.</td>
</tr>
<tr>
<td>8</td>
<td>Registers the spray start instruction “SPYON” in a job.</td>
</tr>
<tr>
<td>9</td>
<td>Registers the spray end instruction “SPYOF” in a job.</td>
</tr>
</tbody>
</table>

NOTE
In a system configuration where more than one spray is connected, the operation of all sprays is controlled by the “PAINT ON/OFF” key.
1.2 Painting System Settings (PAINT SYSTEM CONFIG.)

Set the painting system.

The painting system setting window is displayed by selecting “PAINT” in the main menu → “PAINT SYSTEM CONFIG.” in management mode or higher. The settings can be edited only in teach mode.

* Target gun number (GUN1 to 32) can be switched by the [PAGE] key or the PAGE button at the bottom of the window.

**NAME**
Sets the name of each painting condition item.
Up to 14 alphanumeric and symbol characters can be used.
"/" cannot be used at the beginning.
In related windows, the set name is displayed as a name of painting condition item.

**UNIT**
Sets the unit name of each painting condition item.
Up to 16 alphanumeric and symbol characters can be used.
"/" cannot be used at the beginning.
In related windows, the set unit name is displayed as a unit of painting condition item.

**OUTPUT**
Sets each item's output (logical output) type of painting conditions.
- UNUSE : No destination for output
- I/O OUTPUT : Output to the user output signal
- I/O OUTPUT(Gr): Output to the user output signal (group output)
- REGISTER : Output to the register
CALIBRATION OUTPUT
Sets each item’s calibration output (logical output) type of painting conditions.
The followings can be selected from the selection dialog.
• UNUSE : No destination for output
• I/O OUTPUT : Output to the user output signal
• I/O OUTPUT(Gr) : Output to the user output signal (group output)
• REGISTER : Output to the register
• VOLTAGE(0-14V): Output voltage from an AEW circuit board (optional)

The “NAME” and “UNIT” of each painting condition item specified in the PAINT SYSTEM CONFIG. window are displayed as “NAME” and “UNIT” of painting condition items in the following windows. Keep that in mind when changing them.
• PAINT SPECIAL window
• PAINT CONDITION window
• CALIBRATION CONFIG. window
• TIME CHART CONFIG. window
• PAINT OUTPUT TEST window
• IO PAINT CONDITION OUTPUT CONFIG. window (optional)
1.3 Painting Device Characteristics (PAINT SPECIAL)

Sets the characteristics of the device for painting.

The painting device characteristics window is displayed by selecting "PAINT" in the main menu → "PAINT SPECIAL" in management mode or higher. The settings can be edited only in teach mode.

* Target gun number (GUN1 to 32) can be switched by the [PAGE] key or the PAGE button at the bottom of the window.

1. **SPY ON ADVANCE TIME**
   
   Sets an advance time or a delay time of the spray (work start instruction) signal to turn ON for the SPYON instruction execution timing.
   
   If a value larger than 0 is input, it is regarded as an advance time, and if a value smaller than 0 is input, it is regarded as a delay time.

2. **SPY OFF ADVANCE TIME**
   
   Sets an advance time or a delay time of the spray (work start instruction) signal to turn OFF for the SPYOF instruction execution timing.
   
   If a value larger than 0 is input, it is regarded as an advance time, and if a value smaller than 0 is input, it is regarded as a delay time.

3. **ATOM ON ADVANCE TIME**
   
   Sets an advance time or a delay time of the atomization ON signal to turn ON for the timing to turn ON the spray (work start instruction) signal.
   
   If a value larger than 0 is input, it is regarded as an advance time, and if a value smaller than 0 is input, it is regarded as a delay time.

4. **ATOM OFF DELAY TIME**
   
   Sets an advance time or a delay time of the atomization ON signal to turn OFF for the timing to turn OFF the spray (work start instruction) signal.
   
   If a value larger than 0 is input, it is regarded as an advance time, and if a value smaller than 0 is input, it is regarded as a delay time.
1 Painting Application
1.3 Painting Device Characteristics (PAINT SPECIAL)

If NWAIT is not added to the move instruction registered before SPYON or SPYOF instruction, the spray (work start instruction) signal and the atomization ON signal may not be output at the desired timing. Be sure to add NWAIT to the move instruction before the SPYON/SPYOF instruction.

## PAINT CONDITION NO
Sets the destination to output the paint condition number of when the PAINTSET PCF#(paint condition number) is operated.

Input range: OG#0 to 512, 0 to 8 bit

If OG#0 or 0 bit is specified, no signal is output. If other than OG#0 is specified, the paint condition number is output with the specified bit number to the specified user output group. If the paint condition number cannot be described with the specified bit number, all the specified bit number of the specified user output group turns ON.

The signal is output when executing the PAINTSET PCF#(paint condition number) and when executing the PAINTEND.

## OUTPUT/CALIBRATION OUTPUT Destination
Sets the output and the calibration output destination of each painting condition item.

The setting of the output and the calibration output destination is as shown below.

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<tr>
<th>Output selection of the painting system setting</th>
<th>Input range</th>
<th>Description</th>
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</thead>
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<td>Unused</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>I/O OUTPUT</td>
<td>OT#0 to 4096 0 to 16 bit</td>
<td>The specified user output signal number is regarded as the top (d0 bit), and the painting condition output value is output with the specified bit number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the output value of the painting condition cannot be described with the specified bit number, all the specified bit number of the specified user output group turns ON.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If OT#0 or 0 bit is specified, nothing is output.</td>
</tr>
<tr>
<td>I/O OUTPUT(Gr)</td>
<td>OG#0 to 512 0 to 16 bit</td>
<td>The specified user output group signal number is regarded as the top (d0 bit), and the painting condition output value is output with the specified bit number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the output value of the painting condition cannot be described with the specified bit number, all the specified bit number of the specified user output group turns ON.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If OG#0 or 0 bit is specified, nothing is output.</td>
</tr>
<tr>
<td>REGISTER</td>
<td>M000 to 599</td>
<td>The output value of the painting condition is output to the specified register number.</td>
</tr>
</tbody>
</table>
### Calibration output selection of the paint system setting

<table>
<thead>
<tr>
<th>Calibration</th>
<th>Input range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unused</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>I/O OUTPUT</td>
<td>OT#0 to 4096 0 to 16 bit</td>
<td>The specified user output signal number is regarded as the top (d0 bit), and the painting condition output value is output with the specified bit number. If the output value of the painting condition cannot be described with the specified bit number, all the specified bit number of the specified user output group turns ON. If OT#0 or 0 bit is specified, nothing is output.</td>
</tr>
<tr>
<td>I/O OUTPUT(Gr)</td>
<td>OG#0 to 512 0 to 16 bit</td>
<td>The specified user output group signal number is regarded as the top (d0 bit), and the painting condition output value is output with the specified bit number. If the output value of the painting condition cannot be described with the specified bit number, all the specified bit number of the specified user output group turns ON. If OG#0 or 0 bit is specified, nothing is output.</td>
</tr>
<tr>
<td>REGISTER</td>
<td>M000 to 599</td>
<td>The output value of the painting condition is output to the specified register number.</td>
</tr>
<tr>
<td>VOLTAGE(0-14V)</td>
<td>CH0 to 40</td>
<td>The output value of the painting condition is output to CH. If CH0 is specified, nothing is output.</td>
</tr>
</tbody>
</table>
1.4 Painting Conditions (PAINT CONDITION)

Sets painting conditions which are used for PAINTSET instruction.

The painting condition window is displayed by selecting “PAINT” in the main menu → “PAINT CONDITION” in operation mode or higher. The settings can be edited in edit mode or higher.

When the edit lock is not set, the settings can be edited even during playback operation.

* Condition number (1 to 255) can be switched by the [PAGE] key or the PAGE button at the bottom of the window.
* Target gun number (GUN1 to 32) can be switched by pressing the “GUN CHANGE” button at the bottom of the window.

1. **COMMENT**
   - Sets the comment of the painting condition. Up to 32 alphanumeric and symbol characters can be input.
   - At the beginning of the comment, “/” cannot be used.

2. **PAINT SPEED**
   - Sets the speed of manipulator motion of when operating painting.
   - Input range: 0.1 to 1500.0 mm/sec

3. **OUTPUT VALUE OF EACH ITEM**
   - Sets the output value of condition items 1 to 5.
   - Input range: 0 to 65535
1.5 Calibration Settings (CALIBRATION CONFIG.)

Sets the calibration for the output value of painting condition items to calculate the calibration output value, which is output to the external devices.

The calibration setting window is displayed by selecting “PAINT” in the main menu → “CALIBRATION CONFIG.” in operation mode or higher, and the settings can be edited in edit mode or higher.

When the edit lock is not set, the settings can be edited even during playback operation.

* Item number (1 to 5) can be switched by the [PAGE] key or the PAGE button at the bottom of the window.
* Target gun number (GUN1 to 32) can be switched by pressing the “GUN CHANGE” button at the bottom of the window.

① CALIBRATION SETTING data 1
The value of both OUTPUT and CALIBRATION OUTPUT are fixed to 0. The values cannot be changed.

② CALIBRATION SETTING data 2 to 10
Sets the calibration output value for the output value. The input range of both OUTPUT and CALIBRATION OUTPUT is 0 to 65535. However, as for an item that the calibration output is set to “VOLTAGE (0-14V)” in the PAINT SYSTEM CONFIG. window, its input range of the calibration output is 0.00 to 14.00 (unit: 0.01V).

③ CORRECT RATE (Input range: 0 to 200 (%) )
Corrects the calibration output value. If 100(%) is set, the calculated calibration value is output. If other than 100(%) is set, the value calculated with the following formula is output:

\[ \text{Calculated calibration value} \times \text{specified correction rate(\%)} \]
When editing ♂ and ☑ above, “EDITING” is displayed in the sub title, and “COMPLETE” button is displayed at the bottom of the window. When “EDITING” is displayed, the setting is not completed yet and it is not reflected as the calibration setting.

The calibration setting is completed by pressing [ENTER] or “COMPLETE” button after inputting the data of ♂ and ☑. However, if an output value of a data (its calibration output is not 0) is same as output value of other data (its calibration output is not 0), an error occurs and the setting is not completed.

When the setting is completed correctly, the set data is sorted in the following rules.

- The data whose calibration output is 0 is regarded as invalid, so it is placed at the end (data10~).
- The data whose calibration output is other than 0 is sorted in ascending order of output value (data1~).

Calibration output calculation is as follows.

(Example) When the calibration setting is as follows.

<table>
<thead>
<tr>
<th>OUTPUT</th>
<th>CALIBRATION OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data 1</td>
<td>0</td>
</tr>
<tr>
<td>Data 2</td>
<td>50</td>
</tr>
<tr>
<td>Data 3</td>
<td>100</td>
</tr>
<tr>
<td>Data 4</td>
<td>200</td>
</tr>
<tr>
<td>Data 5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Line up the setting values of each output and the calibration output.</td>
<td></td>
</tr>
</tbody>
</table>

The calibration output value for the output value between each setting value is calculated by the liner interpolation.

In this case, if the output is 150, the calibration output is 235.
1.6 Time Chart Settings (TIME CHART CONFIG.)

The function of the time chart operation is as follows. The time chart operation enables to output the specified ON/OFF state to the user output signals in two specified groups (consecutive user output signals: 16 points) for the specified time up to 40 times in succession.

When the time chart operation starts, the specified output value of the painting condition items is output. When the operation ends, all of the user output signals in the two specified groups are turned OFF and 0 is output to all of the painting condition items.

This function can be used for the gun cleaning, the valve opening/closing patterns for paint filling, etc.

In this setting, the signal number for time chart operations is set. The time chart setting window is displayed by selecting “PAINT” in the main menu → “TIME CHART CONFIG.” in management mode or higher. The settings can be edited only in teach mode.

* Target gun number (GUN1 to 32) can be switched by the [PAGE] key or the PAGE button at the bottom of the window.

① START SIGNAL
Sets the user input signal number for using as a start signal to start the time chart operation.

② RUNNING SIGNAL
Sets the user output signal number for using as a signal which output the operation running status.

③ COMPLETION SIGNAL
Sets the user output signal number for using as a signal which output the operation completion status.

④ ITEM OUTPUT GROUP
Sets the user output signal group number to control in the time chart operation.

In the time chart operation, set user output signal group and the next group are used. (Two groups are used.)

① to ④ can be set from TABLE 1 to TABLE 8 for each gun.
1.7 Time Chart (TIME CHART)

 Sets motion patterns for performing the time chart operation.

 The time chart window is displayed by selecting “PAINT” in the main menu → “TIME CHART” in operation mode or higher. The settings can be edited only in edit mode or higher.

 If the edit lock is not set nor the time chart is not operated, settings can be edited even during playback operation.

* The time chart patterns display (01 to 10, 11 to 20, 21 to 30, or 31 to 40) can be switched by the [PAGE] key or the PAGE button at the bottom of the window.
* Table number (1 to 8) can be switched by pressing TABLE button in the bottom of the window.
* Gun number (GUN1 to 32) can be switched by pressing “DISPLAY” in the pull-down menu → “GUN 1” to “GUN 32”.

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1 Painting Application
1.7 Time Chart (TIME CHART)

1. **COMMENT**
   Sets comment for each table. Up to 32 alphanumeric and symbol characters can be used. “/” cannot be used at the beginning.

2. **EACH ITEM OUTPUT VALUE**
   Sets the output value of painting condition items to be output when time chart operation is started.

3. **SIGNAL COMMENT**
   Sets comment for each 16 user output signal to be controlled by the time chart operation. Up to 16 alphanumeric and symbol characters can be used. “/” cannot be used at the beginning.

4. **SIGNAL STATUS SETTING**
   Sets the signal status to be output for each pattern.

5. **PATTERN OUTPUT TIME**
   Sets the signal output time of each pattern. If 0 is set, the pattern is excluded from the time chart operation.

The time chart operation is as shown below.

1. Time chart operation is started by turning ON the start signal, set on the TIME CHART CONFIG. window.
2. The running signal, set on the TIME CHART CONFIG. window, is turned ON.
3. The output value of the painting condition items, set on the TIME CHART window, is output.
4. The signal pattern of line 01, set on the TIME CHART window, is output for the specified time to the item output group, set on the TIME CHART CONFIG. window.
5. The signal pattern of line 02, set on the TIME CHART window, is output for the specified time to the item output group, set on the TIME CHART CONFIG. window.
6. The signal patterns of line 03 to 40, set on the TIME CHART window, are output for the specified time to the item output group, set on the TIME CHART CONFIG. window.
7. All the 16 signal of item output group, set on the TIME CHART CONFIG. window, are turned OFF.
8. The running signal, set on the TIME CHART CONFIG. window, is turned OFF, and the completion signal is turned ON.
9. All the output values in the PAINT CONDITION window become 0.

**NOTE**
When the start signal is turned OFF while time chart operation is running, all the 16 signals of the item output group are turned OFF, and all the output values in the PAINT CONDITION window become 0. At this time, the running signal is also turned OFF.

If the time chart operation is completed and the completion signal is ON, the completion signal is turned OFF by turning OFF the start signal.
1.8 Painting Data Settings (PAINT DATA CONFIG.)

Sets the painting data which can be used in general with jobs.

The painting data setting window is displayed by selecting “PAINT” in the main menu → “PAINT DATA CONFIG.” in operation mode or higher, and the settings can be edited in edit mode or higher.

When the edit lock is not set, the settings can be edited even during playback operation.

* Page number of the painting data (1 to 10) can be switched by the [PAGE] or the PAGE button at the bottom of the window.

① PAINTING DATA NUMBER
   The number of painting data. Press [SELECT] to search numbers.

② PAINTING DATA VALUE
   The value of the painting data.
   Input range: 0 to 65535

③ COMMENT
   Sets the comment of the painting data. Up to 32 alphanumeric and symbol characters can be used. “/” cannot be used at the beginning.

Followings are the access method of the painting data from.

When reading the painting data:
GETFILE D000 PDF#(1) 100  (Value of No. 100 on page 1 in the painting data is stored in D000.)
GETFILE D010 PDF#(10) 1  (Value of No.1 on page 10 in the painting data is stored in D010.)

When writing the painting data:
SETFILE PDF#(1) 100 D000  (Contents of D000 is set as No.100 on page 1 in the painting data.)
SETFILE PDF#(5) 10 D050  (Contents of D050 is set as No.10 on page 5 in the painting data.)
1.9 Painting Output Test (PAINT OUTPUT TEST)

The following is the window to execute the output test for the output signal used for the painting function.

The painting output test window is displayed by selecting “PAINT” in the main menu → “PAINT OUTPUT TEST” in management mode or higher. The settings can be edited only in teach mode.

**TEST**

Set to “VALID” when performing the output test. When it is valid, the specific output signal for paint output test (#51536) is turned ON.
### SPY ON/ATOM ON

Turn ON/OFF the spray ON and the atomization ON signal of the target gun. The following is the details.

<table>
<thead>
<tr>
<th>Name</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPY ON (GUN1)</td>
<td>#51530</td>
</tr>
<tr>
<td>ATOM ON (GUN1)</td>
<td>#51531</td>
</tr>
<tr>
<td>SPY ON (GUN2)</td>
<td>#51540</td>
</tr>
<tr>
<td>ATOM ON (GUN2)</td>
<td>#51541</td>
</tr>
<tr>
<td>SPY ON (GUN3)</td>
<td>#51550</td>
</tr>
<tr>
<td>ATOM ON (GUN3)</td>
<td>#51551</td>
</tr>
<tr>
<td>SPY ON (GUN4)</td>
<td>#51560</td>
</tr>
<tr>
<td>ATOM ON (GUN4)</td>
<td>#51561</td>
</tr>
<tr>
<td>SPY ON (GUN5)</td>
<td>#51570</td>
</tr>
<tr>
<td>ATOM ON (GUN5)</td>
<td>#51571</td>
</tr>
<tr>
<td>SPY ON (GUN6)</td>
<td>#51580</td>
</tr>
<tr>
<td>ATOM ON (GUN6)</td>
<td>#51581</td>
</tr>
<tr>
<td>SPY ON (GUN7)</td>
<td>#51590</td>
</tr>
<tr>
<td>ATOM ON (GUN7)</td>
<td>#51591</td>
</tr>
<tr>
<td>SPY ON (GUN8)</td>
<td>#51600</td>
</tr>
<tr>
<td>ATOM ON (GUN8)</td>
<td>#51601</td>
</tr>
<tr>
<td>SPY ON (GUN9)</td>
<td>#51610</td>
</tr>
<tr>
<td>ATOM ON (GUN9)</td>
<td>#51611</td>
</tr>
<tr>
<td>SPY ON (GUN10)</td>
<td>#51620</td>
</tr>
<tr>
<td>ATOM ON (GUN10)</td>
<td>#51621</td>
</tr>
<tr>
<td>SPY ON (GUN11)</td>
<td>#51630</td>
</tr>
<tr>
<td>ATOM ON (GUN11)</td>
<td>#51631</td>
</tr>
<tr>
<td>SPY ON (GUN12)</td>
<td>#51640</td>
</tr>
<tr>
<td>ATOM ON (GUN12)</td>
<td>#51641</td>
</tr>
<tr>
<td>SPY ON (GUN13)</td>
<td>#51650</td>
</tr>
<tr>
<td>ATOM ON (GUN13)</td>
<td>#51651</td>
</tr>
<tr>
<td>SPY ON (GUN14)</td>
<td>#51660</td>
</tr>
<tr>
<td>ATOM ON (GUN14)</td>
<td>#51661</td>
</tr>
<tr>
<td>SPY ON (GUN15)</td>
<td>#51670</td>
</tr>
<tr>
<td>ATOM ON (GUN15)</td>
<td>#51671</td>
</tr>
<tr>
<td>SPY ON (GUN16)</td>
<td>#51680</td>
</tr>
<tr>
<td>ATOM ON (GUN16)</td>
<td>#51681</td>
</tr>
<tr>
<td>SPY ON (GUN17)</td>
<td>#51690</td>
</tr>
<tr>
<td>ATOM ON (GUN17)</td>
<td>#51691</td>
</tr>
<tr>
<td>SPY ON (GUN18)</td>
<td>#51700</td>
</tr>
<tr>
<td>ATOM ON (GUN18)</td>
<td>#51701</td>
</tr>
<tr>
<td>SPY ON (GUN19)</td>
<td>#51710</td>
</tr>
<tr>
<td>ATOM ON (GUN19)</td>
<td>#51711</td>
</tr>
<tr>
<td>SPY ON (GUN20)</td>
<td>#51720</td>
</tr>
<tr>
<td>ATOM ON (GUN20)</td>
<td>#51721</td>
</tr>
<tr>
<td>SPY ON (GUN21)</td>
<td>#51730</td>
</tr>
<tr>
<td>ATOM ON (GUN21)</td>
<td>#51731</td>
</tr>
</tbody>
</table>
1 Painting Application
1.9 Painting Output Test (PAINT OUTPUT TEST)

<table>
<thead>
<tr>
<th>Name</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPY ON (GUN22)</td>
<td>#51740</td>
</tr>
<tr>
<td>ATOM ON (GUN22)</td>
<td>#51741</td>
</tr>
<tr>
<td>SPY ON (GUN23)</td>
<td>#51750</td>
</tr>
<tr>
<td>ATOM ON (GUN23)</td>
<td>#51751</td>
</tr>
<tr>
<td>SPY ON (GUN24)</td>
<td>#51760</td>
</tr>
<tr>
<td>ATOM ON (GUN24)</td>
<td>#51761</td>
</tr>
<tr>
<td>SPY ON (GUN25)</td>
<td>#51770</td>
</tr>
<tr>
<td>ATOM ON (GUN25)</td>
<td>#51771</td>
</tr>
<tr>
<td>SPY ON (GUN26)</td>
<td>#51780</td>
</tr>
<tr>
<td>ATOM ON (GUN26)</td>
<td>#51781</td>
</tr>
<tr>
<td>SPY ON (GUN27)</td>
<td>#51790</td>
</tr>
<tr>
<td>ATOM ON (GUN27)</td>
<td>#51791</td>
</tr>
<tr>
<td>SPY ON (GUN28)</td>
<td>#51800</td>
</tr>
<tr>
<td>ATOM ON (GUN28)</td>
<td>#51801</td>
</tr>
<tr>
<td>SPY ON (GUN29)</td>
<td>#51810</td>
</tr>
<tr>
<td>ATOM ON (GUN29)</td>
<td>#51811</td>
</tr>
<tr>
<td>SPY ON (GUN30)</td>
<td>#51820</td>
</tr>
<tr>
<td>ATOM ON (GUN30)</td>
<td>#51821</td>
</tr>
<tr>
<td>SPY ON (GUN31)</td>
<td>#51830</td>
</tr>
<tr>
<td>ATOM ON (GUN31)</td>
<td>#51831</td>
</tr>
<tr>
<td>SPY ON (GUN32)</td>
<td>#51840</td>
</tr>
<tr>
<td>ATOM ON (GUN32)</td>
<td>#51841</td>
</tr>
</tbody>
</table>

**PAINT COND OUTPUT GUN NO**
Select the gun number to output the set painting condition as a test.

**PAINT CONDITION OUTPUT**
If set to "ON", a voluntary set value is output.

*NOTE*
The output values in the PAINT CONDITION window become 0 when the following operations are performed.
- The paint condition output is turned OFF.
- The gun number is changed.
- TEST is turned to be invalid when the paint condition output is ON.
1 Painting Application

1.10 IO Painting Condition Output (IO PAINT CONDITION OUTPUT CONFIG.)

This function is for executing the calibration output of the output value set by the signal to the voluntary signal.

This function becomes available by setting the parameter S2C1029 to 1.

The IO painting condition output window is displayed by selecting “PAINT” in the main menu → “IO PAINT CONDITION OUTPUT CONFIG.” in management mode or higher. The settings can be edited only in teach mode.

1 COMMAND VALUE
Sets the input method of output value.
Can be selected by the user input signal or the register.

2 OUTPUT INSTRUCTION
Specifies the signal to execute the calibration output.
Specifies the user input signal.

3 CALIBRATION OUTPUT
Specifies the output destination of the calibration output.
Can be selected by the user output signal group or the register.

This function can be used by the following methods.

- Set an output value to the signal or to the register, specified to the command value.
- Turn ON an output instruction.
- Execute calibration output to the specified calibration output destination.

When the output instruction is ON, the command value is always output with calibration.
1.11 Mode Change Auto Reset of Spray ON/Atomization ON Signal

The spray ON signal and the atomization ON signal can be turned OFF automatically when changing mode (from play mode to teach mode, or from teach mode to play mode).

To use this function, set the following parameter.

S4C1040 (Specifies to turn OFF the spray and the atomization specific output signals when changing mode.)

The bits of the parameter value and the target signals are allocated as follows.

- d00: Work start instruction gun 1 (#51530)
- d01: Atomization ON gun 1 (#51531)
- d02: Work start instruction gun 2 (#51540)
- d03: Atomization ON gun 2 (#51541)
- d04: Work start instruction gun 3 (#51550)
- d05: Atomization ON gun 3 (#51551)
- d06: Work start instruction gun 4 (#51560)
- d07: Atomization ON gun 4 (#51561)
- d08: Work start instruction gun 5 (#51570)
- d09: Atomization ON gun 5 (#51571)
- d10: Work start instruction gun 6 (#51580)
- d11: Atomization ON gun 6 (#51581)
- d12: Work start instruction gun 7 (#51590)
- d13: Atomization ON gun 7 (#51591)
- d14: Work start instruction gun 8 (#51600)
- d15: Atomization ON gun 8 (#51601)

When changing mode while a bit is ON, the signal is turned OFF.

S4C1250 (Specifies to turn OFF the spray and the atomization specific output signals when changing mode.)

The bits of the parameter value and the target signals are allocated as follows.

- d00: Work start instruction gun 9 (#51610)
- d01: Atomization ON gun 9 (#51611)
- d02: Work start instruction gun 10 (#51620)
- d03: Atomization ON gun 10 (#51621)
- d04: Work start instruction gun 11 (#51630)
- d05: Atomization ON gun 11 (#51631)
- d06: Work start instruction gun 12 (#51640)
- d07: Atomization ON gun 12 (#51641)
- d08: Work start instruction gun 13 (#51650)
- d09: Atomization ON gun 13 (#51651)
1 Painting Application
1.11 Mode Change Auto Reset of Spray ON/Atomization ON Signal

When changing mode while a bit is ON, the signal is turned OFF.

S4C1251 (Specifies to turn OFF the spray and the atomization specific output signals when changing mode.)

The bits of the parameter value and the target signals are allocated as follows.

When changing mode while a bit is ON, the signal is turned OFF.
S4C1252 (Specifies to turn OFF the spray and the atomization specific output signals when changing mode.)

The bits of the parameter value and the target signals are allocated as follows.

- d00: Work start instruction gun 25 (#51770)
- d01: Atomization ON gun 25 (#51771)
- d02: Work start instruction gun 26 (#51780)
- d03: Atomization ON gun 26 (#51781)
- d04: Work start instruction gun 27 (#51790)
- d05: Atomization ON gun 27 (#51791)
- d06: Work start instruction gun 28 (#51800)
- d07: Atomization ON gun 28 (#51801)
- d08: Work start instruction gun 29 (#51810)
- d09: Atomization ON gun 29 (#51811)
- d10: Work start instruction gun 30 (#51820)
- d11: Atomization ON gun 30 (#51821)
- d12: Work start instruction gun 31 (#51830)
- d13: Atomization ON gun 31 (#51831)
- d14: Work start instruction gun 32 (#51840)
- d15: Atomization ON gun 32 (#51841)

When changing mode while a bit is ON, the signal is turned OFF.
1.12 Registering Work Instructions

1.12.1 SPYON

The SPYON instruction is used to start painting. The instruction turns ON the specific output signals (work start instruction and atomization ON) corresponding to the specified gun number.

Function key to register the spray start instruction “SPYON”

Select (DEVICE) in the instruction group list when registering SPYON instruction from [INFORM LIST].

Registering the SPYON Instruction

1. Select {JOB} under the main menu.
2. Select (JOB).
   - The JOB CONTENT window appears.

3. Move the cursor to the address area.
4. Press [INFORM LIST].

   - The instruction list dialog box appears.

5. Select (DEVICE).
6. Select (SPYON).

- "SPYON" instruction appears in the input buffer line.
7. Press [SELECT] and set each item in the DETAIL EDIT window.
   – The DETAIL EDIT window appears.

   – Move the cursor to the item to be set and press [SELECT].
1 Painting Application
1.12 Registering Work Instructions

- Use the [Numeric key]s to input the setting and press [ENTER].

- The setting appears in the buffer line.

8. Press [ENTER].

- When [ENTER] is pressed, the setting is registered in the job.

- To cancel the setting, press [CANCEL]. The window returns to the JOB CONTENT window.
Registering the SPYON Instruction by One-touch Operation

1. Press [8 / SPRAY ON].
   - “SPYON” appears in the input buffer line.

2. Press [ENTER] to register SPYON.
   - SPYON is registered to the job.
1 Painting Application
1.12 Registering Work Instructions

Syntax for the SPYON instruction

1. **Gun No. (Setting range: 1 to 32)**
   - The specific output signals (work start instruction and atomization ON) corresponding to the specified gun number is controlled.
   - If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

2. **Control group specified gun No.**
   - This is available to use only when the parameter S2C1450=1.
   - According to the contents set by the gun connecting robot specified parameter AxP80-83, 120-147, the gun number allocated to the control group No.1 to execute the instruction is defined as the control group specified as the gun No. 1 to 4 in the ascending order from the smaller number of the gun number.
   - The specific output signals (work start instruction and atomization ON) corresponding to the control group specified gun number is controlled.
   - The range of setting is 1 to 4. If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

3. **Execution timing (time) (Setting range: -327.68 to 327.67)**
   - An anticipation time (advance time, delay time) is set in units of seconds. If this setting is omitted, 0 is applied to the anticipation time.

4. **Execution timing (distance) (Setting range: -3276.8 to 3276.7)**
   - An anticipation distance (advance distance, delay distance) is set in units of mm.

For details of anticipation, refer to chapter 1.13 “Execution Timing Adjustment of Paint Start / End”.

---

**Diagram:**

```
SPYON

① GUNNO= Gun No.
② GGUNNO= Gun No.
③ ANT= Execution timing
④ ANTDIS= Execution timing

END
```
1.12.2 SPYOF

The SPYOF instruction is used to stop painting. This instruction turns OFF the specific output signals (work start instruction and atomization ON) corresponding to the specified gun number.

Function key to register the spray end instruction “SPYOF”

Select (DEVICE) in the instruction group list when registering SPYOF instruction from [INFORM LIST].

Registering the SPYOF Instruction

1. Select {JOB} under the main menu.
1 Painting Application
1.12 Registering Work Instructions

2. Select (JOB).  
   - The JOB CONTENT window appears.

3. Move the cursor to the address area.
4. Press [INFORM LIST].

   The instruction list dialog box appears.

5. Select [DEVICE].
6. Select (SPYOF).

- “SPYOF” instruction appears in the input buffer line.
7. Press [SELECT] and set each item in the DETAIL EDIT window.
   – The DETAIL EDIT window appears.

   – Move the cursor to the item to be set and press [SELECT].
1 Painting Application
1.12 Registering Work Instructions

– Use the [Numeric key]s to input the setting and press [ENTER].

8. Press [ENTER].
– When [ENTER] is pressed, the setting is registered in the job.

– To cancel the setting, press [CANCEL]. The window returns to the JOB CONTENT window.
1 Painting Application
1.12 Registering Work Instructions

Registering the SPYOF Instruction in a One-touch Operation

1. Press [9 / SPRAY OFF].
   – “SPYOF” appears in the input buffer line.

2. Press [ENTER] to register SPYOF.
   – SPYOF is registered to the job.
1 Painting Application
1.12 Registering Work Instructions

Syntax for the SPYOF instruction

① Gun No. (Setting range: 1 to 32)
The specific output signals (work start instruction and atomization ON) corresponding to the specified gun number is controlled. If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

② Control group specified gun No.
This is available to use only when the parameter S2C1450=1. According to the contents set by the gun connecting robot specified parameter AxP80-83, 120-147, the gun number allocated to the control group No.1 to execute the instruction is defined as the control group specified as the gun No. 1 to 4 in the ascending order from the smaller number of the gun number.
The specific output signals (work start instruction and atomization ON) corresponding to the control group specified gun number is controlled. The range of setting is 1 to 4. If the gun No. or the control group specified gun setting is omitted, 1 is applied for the gun number.

③ Execution timing (time) (Setting range: -327.68 to 327.67)
The anticipation time (advance time, delay time) is set in units of seconds. If this setting is omitted, 0 is applied to the anticipation time.

④ Execution timing (distance) (Setting range: -3276.8 to 3276.7)
The anticipation distance (advance distance, delay distance) is set in units of mm.

For details of anticipation, refer to chapter 1.13 “Execution Timing Adjustment of Paint Start / End”.
1.12.3 PAINTSET

The PAINTSET instruction is used to set the painting conditions for the paint control panel.

### Registering the PAINTSET Instruction

1. Select (JOB) under the main menu.

   ![Main Menu Screen](image)

   - The JOB CONTENT window appears.

2. Select (JOB).

   ![JOB CONTENT Screen](image)

   - The JOB CONTENT window appears.
3. Move the cursor to the address area.

4. Press [INFORM LIST].
   – The instruction list dialog box appears.
1 Painting Application
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5. Select (DEVICE).

6. Select (PAINTSET).
1 Painting Application

1.12 Registering Work Instructions

– “PAINTSET” instruction appears in the input buffer line.

1. Painting Application

1.12 Registering Work Instructions

7. Press [SELECT] and set each item in the DETAIL EDIT window.

– The DETAIL EDIT window appears.
1 Painting Application
1.12 Registering Work Instructions

– Move the cursor to the item to be set and press [SELECT].

– Use the [Numeric key]s to input the setting and press [ENTER].

– The setting appears in the buffer line.
8. Press [ENTER].

   – When [ENTER] is pressed, the setting is registered in the job.

   – To cancel the setting, press [CANCEL]. The window returns to the JOB CONTENT window.
1 Painting Application
1.12 Registering Work Instructions

Syntax for the PAINTSET instruction

1. **Gun No. (Setting range: 1 to 32)**
   - Set a gun number which outputs the painting condition.
   - If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

2. **Control group specified gun No.**
   - This is available to use only when the parameter S2C1450=1.
   - According to the contents set by the gun connecting robot specified parameter AxP80-83, 120-147, the gun number allocated to the control group No.1 to execute the instruction is defined as the control group specified as the gun No. 1 to 4 in the ascending order from the smaller number of the gun number.
   - Set a control group specified gun number which outputs the painting condition.
   - The range of setting is 1 to 4. If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

3. **Painting condition file No. (Setting range: 1 to 255)**
   - The painting condition of each item set in the painting condition file is output to the paint control panel.

4. **Output value (Setting range: 0 to 65535)**
   - The output value set to each item is set to the paint control panel.

5. **Operation speed (Setting range: 0.1 to 1500.0 [mm/sec])**
   - The operation speed of the manipulator when painting is set.
   - If operation speed of the move instruction in the PAINTSET section is not set, it is overridden by this setting.

---

**NOTE**

If the paint condition number and all the output values are omitted, the output condition doesn’t vary.

If use the paint condition number and the output values, the output which is set in the painting condition file is overwritten by this setting.
1.12.4 PAINTEND

The PAINTEND instruction is used to turn OFF the paint condition output for the paint control panel.

- Registering the PAINTEND Instruction

1. Select {JOB} under the main menu.

2. Select {JOB}.
   - The JOB CONTENT window appears.

   ![Image of JOB CONTENT window](image-url)
3. Move the cursor to the address area.

4. Press [INFORM LIST].
   - The instruction list dialog box appears.
5. Select (DEVICE).

6. Select (PAINTEND).
1 Painting Application
1.12 Registering Work Instructions

– “PAINTEND” instruction appears in the input buffer line.

7. Press [SELECT] and set each item in the DETAIL EDIT window.
– The DETAIL EDIT window appears.
– Move the cursor to the item to be set and press [SELECT].

– Use the [Numeric key]s to input the setting and press [ENTER].

– The setting appears in the buffer line.
8. Press [ENTER].
– When [ENTER] is pressed, the setting is registered in the job.

– To cancel the setting, press [CANCEL]. The window returns to the JOB CONTENT window.

Syntax for the PAINTEND instruction

1. **Gun No. (Setting range: 1 to 32)**
   Set a gun number which turns OFF the painting condition.
   If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

2. **Control group specified gun No.**
   This is available to use only when the parameter S2C1450=1.
   According to the contents set by the gun connecting robot specified parameter AxP80-83, 120-147, the gun number allocated to the control group No.1 to execute the instruction is defined as the control group specified as the gun No. 1 to 4 in the ascending order from the smaller number of the gun number.
   Set a control group specified gun number which turns off the painting condition output.
   The range of setting is 1 to 4. If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.
1.12.5 CALL

The CALL instruction is used to call a specified job.

This section describes an example where a job registration table (available when the parameter S2C443 is 1) is specified.

What Is the Job Registration Table?

In a job registration table, jobs that are read out by instructions such as the CALL instruction can be registered.

Three files are available for the registration table. Each job registration can hold 1024 jobs.

A job can be registered or edited in the job registration table even during play mode. The updated table becomes valid the next time when the job registration table is referred by instructions such as the CALL instruction.

1. TABLE NUMBER (Setting range: 1 to 3)
   The job registration table number.

2. NO.
   The job registration number.

3. JOB NAME
   Sets the job name.
   The selection dialog is shown by pressing [SELECT].
   Select “SETTING JOB” to open the job list window in which the job can be entered. The registration can be released by selecting “CANCEL JOB”.

4. CTRL GROUP
   The control group of the selected job is displayed.
How to Register the Job Registration Table

1. Select {JOB} under the main menu.

2. Select {JOB REGISTRATION}.
1 Painting Application
1.12 Registering Work Instructions

3. Move the cursor to "JOB NAME" and then press [SELECT].

4. Select "SETTING JOB".

– The JOB NAME window is shown.
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– Move the cursor to the job to be set and press [SELECT].

– The setting appears in the window.
How to Cancel the Job Registration Table

1. Select {JOB} under the main menu.

2. Select {JOB REGISTRATION}.

   - The JOB REGISTRATION window appears.
1. Painting Application
1.12 Registering Work Instructions

– The JOB REGISTRATION window appears.

3. Move the cursor to “JOB NAME” and then press [SELECT].
– The selection dialog is shown.

4. Select “CANCEL JOB”.
– The registered job is canceled.
1 Painting Application
1.12 Registering Work Instructions

- Registering the CALL Instruction (JET)

1. Select {JOB} under the main menu.

2. Select {JOB}.
   - The JOB CONTENT window appears.
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3. Move the cursor to the address area.

4. Press [INFORM LIST].
   – The instruction list dialog box appears.
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1.12 Registering Work Instructions

5. Select (CONTROL).

6. Select (CALL).
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1.12 Registering Work Instructions

– “CALL” instruction appears in the input buffer line.

7. Press [SELECT] and set each item in the DETAIL EDIT window.

– The DETAIL EDIT window appears.
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1.12 Registering Work Instructions

- Move the cursor to the item to be set and press [SELECT].
  (For the CALL destination, select {JET}).

- Use the [Numeric key]s to input the setting and press [ENTER].

- The setting appears in the buffer line.
8. Press [ENTER].

– When [ENTER] is pressed, the setting is registered in the job.

– To cancel the setting, press [CANCEL]. The window returns to the JOB CONTENT window.

Syntax for the CALL instruction

1. **Job registration table No. (Setting range: 1 to 3)**
   Sets the job registration table number.

2. **Job registration No. (Setting range: 1 to 1024)**
   Sets the registration number of the job that is registered in a specified job registration table.

Example of CALL Job

<table>
<thead>
<tr>
<th>Line</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>NOP</td>
<td></td>
</tr>
<tr>
<td>0001</td>
<td>WAIT IN#(1)=ON</td>
<td>Waits for a start signal to be input.</td>
</tr>
<tr>
<td>0002</td>
<td>DIN B000 IG#(2)</td>
<td>Enter the job registration number.</td>
</tr>
<tr>
<td>0003</td>
<td>CALL JET#(1) ENTRY=B000</td>
<td>Calls the job corresponding to the registration number that is entered in B000.</td>
</tr>
<tr>
<td>0004</td>
<td>PULSE OT#(1) T=1.00</td>
<td>Output the work end signal in pulses.</td>
</tr>
<tr>
<td>0005</td>
<td>END</td>
<td></td>
</tr>
</tbody>
</table>
1.12 Registering Work Instructions

The +SPYON instruction is used to start painting. The instruction turns ON the specific output signals (work start instruction and atomization ON) corresponding to the specified gun number. Used by adding to MOVJ, MOVL, MOVC, and IMOV.

**Registering the +SPYON Instruction**

1. Select (JOB) under the main menu.

2. Select (JOB).

   – The JOB CONTENT window appears.
1. Painting Application
1.12 Registering Work Instructions

3. Move the cursor to the address area.

! Image of a screen displaying a list of instructions.

4. Press [INFORM LIST].
   - The instruction list dialog appears.

! Image of a screen with the instruction list dialog open.
5. Select (MOTION).

6. Select (MOVJ).
1 Painting Application
1.12 Registering Work Instructions

– "MOVJ" instruction appears in the input buffer line.

7. Press [SELECT].

– The DETAIL EDIT window appears.

---

[Image of the input buffer and DETAIL EDIT window]
Move the cursor to “PAINT START” and press [SELECT].

Move the cursor to “*SPYON”.
8. Press [SELECT] and set each item in the DETAIL EDIT window.
   – The DETAIL EDIT window appears.

   ![Diagram of DETAIL EDIT window]

   – Move the cursor to the item to be set and press [SELECT].

   ![Diagram of DETAIL EDIT window with cursor set]
– Use the [Numeric key]s to input the setting and press [ENTER].

– The setting appears in the buffer line.

9. Press [ENTER].

– The DETAIL EDIT window appears.
10. Press [ENTER].

- When [ENTER] is pressed, the setting is registered in the job.

- To cancel the setting, press [CANCEL]. The window returns to the JOB CONTENT window.
1 Painting Application
1.12 Registering Work Instructions

Syntax for the +SPYON instruction

**1 Gun No. (Setting range: 1 to 32)**
The specific output signals (work start instruction and atomization ON) corresponding to the specified gun number is controlled.
If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

**2 Control group specified gun No.**
This is available to use only when the parameter S2C1450=1.
According to the contents set by the gun connecting robot specified parameter AxP80-83, 120-147, the gun number allocated to the control group No.1 to execute the instruction is defined as the control group specified as the gun No. 1 to 4 in the ascending order from the smaller number of the gun number.
The specific output signals (work start instruction and atomization ON) corresponding to the control group specified gun number is controlled. The range of setting is 1 to 4. If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

**3 Execution timing (distance) (Setting range: -3276.8 to 3276.7)**
An execution timing distance (advance distance, delay distance) is set in units of mm.

**4 Execution timing (time) (Setting range: -327.68 to 327.67)**
An execution timing time (advance time, delay time) is set in units of seconds. If this setting is omitted, 0 is applied to the execution timing time.
1.12 Registering Work Instructions

1.12.7 +SPYOF

The +SPYOF instruction is used to stop painting. The instruction turns OFF the specific output signals (work start instruction and atomization ON) corresponding to the specified gun number. Used by adding to MOVJ, MOVL, MOVC, and IMOV.

Registering the +SPYOF Instruction

1. Select {JOB} under the main menu.

2. Select (JOB).
   - The JOB CONTENT window appears.
1. Painting Application
1.12 Registering Work Instructions

3. Move the cursor to the address area.

4. Press [INFORM LIST].
   – The instruction list dialog appears.
5. Select {MOTION}.

6. Select {MOVJ}.
1. Painting Application
1.12 Registering Work Instructions

- "MOVJ" instruction appears in the input buffer line.

7. Press [SELECT].

- The DETAIL EDIT window appears.
1 Painting Application
1.12 Registering Work Instructions

– Move the cursor to “PAINT END”, and press [SELECT].

– Move the cursor to “+SPYOF”.
8. Press [SELECT] and set each item in the DETAIL EDIT window.
   - The DETAIL EDIT window appears.

   ![DETAIL EDIT Window]

   – Move the cursor to the item to be set and press [SELECT].

   ![DETAIL EDIT Window with selected items]
1 Painting Application
1.12 Registering Work Instructions

– Use the [Numeric key]s to input the setting and press [ENTER].

– The setting appears in the buffer line.

9. Press [ENTER].

– The DETAIL EDIT window appears.
10. Press [ENTER].

– When [ENTER] is pressed, the setting is registered in the job.

– To cancel the setting, press [CANCEL]. The window returns to the JOB CONTENT window.
1 Painting Application
1.12 Registering Work Instructions

Syntax for the +SPYOF instruction

① **Gun No. (Setting range: 1 to 32)**
   The specific output signals (work start instruction and atomization ON) corresponding to the specified gun number is controlled. If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

② **Control group specified gun No.**
   This is available to use only when the parameter S2C1450=1. According to the contents set by the gun connecting robot specified parameter AxP80-83, 120-147, the gun number allocated to the control group No.1 to execute the instruction is defined as the control group specified as the gun No. 1 to 4 in the ascending order from the smaller number of the gun number.

   The specific output signals (work start instruction and atomization ON) corresponding to the control group specified gun number is controlled. The range of setting is 1 to 4. If the gun No. or the control group specified gun No. setting is omitted, 1 is applied for the gun number.

③ **Execution timing (distance) (Setting range: -3276.8 to 3276.7)**
   An execution timing distance (advance distance, delay distance) is set in units of mm.

④ **Execution timing (time) (Setting range: -327.68 to 327.67)**
   An execution timing time (advance time, delay time) is set in units of seconds. If this setting is omitted, 0 is applied to the execution timing time.
1.13 Execution Timing Adjustment of Paint Start / End

Execution timing of the paint start / end instructions can be carried out earlier or later than the arrival timing of the step by specifying distance or time.

Use the following additional item to adjust the paint start / end instructions.

+SPYON/+SPYOF … "ADJT=" "ADJD="

To adjust the execution timing, set the time of the execution timing "ADJT=** (second)" or the distance "ADJD=** (mm)".

If set an execution timing with a negative value, the signal output is executed earlier.
If set an execution timing with a positive value, the signal output is executed later.

And, the execution timing can be adjusted by using the SPYON / SPYOF instructions.

SPYON/SPYOF … "ANT=" "ANTDIS="

To adjust the execution timing, set the time of the execution timing "ANT=** (second)" or the distance "ANTDIS=** (mm)".
1.13 Execution Timing Adjustment of Paint Start / End

1.13.1 Example

1.13.1.1 Start Painting

In the following example, painting starts 0.5 seconds before getting to the step \( n \) (while the manipulator is moving toward the step \( n \)).

In addition, the SPY ON advance time is set to 0.3 seconds and the ATOM ON advance time is set to 0.2 seconds in the painting device characteristics (PAINT SPECIAL) window.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-1</td>
<td>MOVL</td>
</tr>
<tr>
<td>n</td>
<td>MOVL +SPY ADJT=-0.5</td>
</tr>
<tr>
<td>n+1</td>
<td>MOVL</td>
</tr>
</tbody>
</table>

When the painting is started using the SPYON instruction as shown in the above figure, create the job as follows.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-1</td>
<td>MOVL NWAIT</td>
</tr>
<tr>
<td>n</td>
<td>MOVL +SPY ANT=-0.5</td>
</tr>
<tr>
<td>n+1</td>
<td>MOVL</td>
</tr>
</tbody>
</table>
The following restrictions are for the output timing to turn ON the work start signal and the atomization ON signal.

1. Among the work start signal (#51530) and the atomization ON signal (#51531), if a signal to be turned ON earlier is set to be turned ON before the previous step, the signal is turned ON when passing the previous step.

2. Among the work start signal (#51530) and the atomization ON signal (#51531), if a signal to be turned ON earlier is set to be turned ON after the next step, the signal is turned ON when passing the next step.

3. If a moving time from a step to the next step is longer than an ATOM ON advance time, the setting of the ATOM ON advance time is kept as it stands, and the time gap between the work start signal (#51530) and the atomization ON signal (#51531) to be turned ON is regarded as the ATOM ON advance time. This is also the same in case of 1 and 2.
1 Painting Application
1.13 Execution Timing Adjustment of Paint Start / End

1.13.1.2 End Painting

In the following example, painting ends 0.5 seconds after getting to the step n (while the manipulator is moving toward the step n+1).

In addition, the SPY OFF advance time is set to 0.3 seconds and the ATOM OFF delay time is set to 0.4 seconds in the painting device characteristics (PAINT SPECIAL) window.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-1</td>
<td>MOVL</td>
</tr>
<tr>
<td>n</td>
<td>MOVL +SPYOF ADJT=0.5</td>
</tr>
<tr>
<td>n+1</td>
<td>MOVL</td>
</tr>
</tbody>
</table>

When the painting is ended using the SPYOF instruction as shown in the above figure, create the job as follows.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-1</td>
<td>MOVL NWAIT</td>
</tr>
<tr>
<td>n</td>
<td>MOVL SPYOF ANT=0.5</td>
</tr>
<tr>
<td>n+1</td>
<td>MOVL</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following restrictions are for the output timing to turn OFF the work start signal and the atomization ON signal.

1. Among the work start signal (#51530) and the atomization ON signal (#51531), if a signal to be turned OFF earlier is set to be turned OFF before the previous step, the signal is turned OFF when passing the previous step.

2. Among the work start signal (#51530) and the atomization ON signal (#51531), if a signal to be turned OFF earlier is set to be turned OFF after the next step, the signal is turned OFF when passing the next step.

3. If a moving time from a step to the next step is longer than an ATOM OFF delay time, the setting of the ATOM OFF delay time is kept as it stands, and the time gap between the work start signal (#51530) and the atomization ON signal (#51531) to be turned OFF is regarded as the ATOM OFF delay time. This is also the same in case of 1 and 2.

If NWAIT is not set to the previous move instruction of the SPY ON/SPY OFF instructions, the execution timing of SPYON/SPYOFF instructions is the same as the normal DOUT instruction, and the anticipation cannot be executed.

In addition, as for the SPY ON advance time, the ATOM ON advance time, the SPY OFF advance time, and the ATOM OFF delay time, (those are set in the painting device characteristics (PAINT SPECIAL) window,) the anticipation output is invalid in this case.

When executing the anticipation output, be sure to set NWAIT to the previous move instruction of the SPYON/SPYOFF instruction.
When the execution timing distances "ADJD=" and "ANT-DIS=" are set to output a signal in a delayed timing, the signal cannot be output in an advanced timing whatever the setting in the painting device characteristics is.

When the signal is output in an advanced timing by painting device characteristics setting, it is output at starting the operation of the target step.

In the following example, the work start signal is turned OFF when the step n+1 starts.

In addition, the SPY OFF advance time is set to 0.6 seconds and the ATOM OFF delay time is set to 0.4 seconds in the painting device characteristics (PAINT SPECIAL) window.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-1</td>
<td>MOVL</td>
</tr>
<tr>
<td>n</td>
<td>MOVL +SPYOF ADJD=50.0</td>
</tr>
<tr>
<td>n+1</td>
<td>MOVL</td>
</tr>
</tbody>
</table>

NOTE

In case that signals are set to be output in advance by setting the painting device characteristics (PAINT SPECIAL),

The work start signal (#51530) turns OFF when the step n+1 is started, and the atomization ON signal (#51531) turns OFF after the ATOM OFF delay time has passed.
When the execution timing distances "ADJD=" and "ANT-DIS=" are set to output a signal in a delayed timing, do not register an instruction except for the following between steps. If an instruction except for the following is registered, the paint may not be able to start / end at the specified execution timing.

- DOUT
- PULSE
- TIMER
- SET
- " (comment)

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-1</td>
<td>MOVL</td>
</tr>
<tr>
<td>n</td>
<td>MOVL +SPYOF ADJD=100.0 DOUT</td>
</tr>
<tr>
<td>n+1</td>
<td>MOVL</td>
</tr>
</tbody>
</table>
1 Painting Application
1.13 Execution Timing Adjustment of Paint Start / End

1.13.2 Interruption

1.13.2.1 Start Painting

When a job is stopped when only a signal to be output earlier is ON, the signal which has been ON is turned OFF. When the job is restarted, the signal which had been turned OFF is turned ON immediately. And regardless of the passed time before the job is stopped, the signal to be output later is turned ON according to the set ATOM ON advance time.

In the following example, the atomization ON signal is turned OFF when HOLD signal is input. When restarted, the atomization ON signal is turned ON again. And the work start instruction is turned ON after the ATOM ON advance time has passed.

In addition, the ATOM ON advance time is set to 0.4 seconds in the painting device characteristics (PAINT SPECIAL) window.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-1</td>
<td>MOVL</td>
</tr>
<tr>
<td>n</td>
<td>MOVL +SPYON ADJT=1.0</td>
</tr>
<tr>
<td>n+1</td>
<td>MOVL</td>
</tr>
</tbody>
</table>

![Diagram showing the timing of signals](image-url)
When a job is stopped when only the signal to be output earlier is turned OFF, the signal to be output later is turned OFF according to the set ATOM OFF delay time. Until the signal to be output later is turned OFF, the job is regarded as running and the start lamp is not turned OFF.

In the following example, the atomization ON signal is not turned OFF even if HOLD signal is input, and the atomization ON signal is turned OFF after the ATOM OFF delay time has passed.

In addition, the ATOM OFF delay time is set to 0.5 seconds in the painting device characteristics (PAINT SPECIAL) window.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-1</td>
<td>MOVL</td>
</tr>
<tr>
<td>n</td>
<td>MOVL +SPYO ADJT=0.5</td>
</tr>
<tr>
<td>n+1</td>
<td>MOVL</td>
</tr>
</tbody>
</table>

When a job is stopped when only the signal to be output earlier is turned OFF, the signal to be output later is turned OFF according to the set ATOM OFF delay time. Until the signal to be output later is turned OFF, the job is regarded as running and the start lamp is not turned OFF.

In the following example, the atomization ON signal is not turned OFF even if HOLD signal is input, and the atomization ON signal is turned OFF after the ATOM OFF delay time has passed.

In addition, the ATOM OFF delay time is set to 0.5 seconds in the painting device characteristics (PAINT SPECIAL) window.
1.14 Parameter

1.14.0.1 AxP080: Specify the Robot With the Paint Gun 1
To specify the robot with the paint gun 1 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.2 AxP081: Specify the Robot With the Paint Gun 2
To specify the robot with the paint gun 2 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.3 AxP082: Specify the Robot With the Paint Gun 3
To specify the robot with the paint gun 3 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.4 AxP083: Specify the Robot With the Paint Gun 4
To specify the robot with the paint gun 4 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.5 AxP120: Specify the Robot With the Paint Gun 5
To specify the robot with the paint gun 5 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.6 AxP121: Specify the Robot With the Paint Gun 6
To specify the robot with the paint gun 6 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.7 AxP122: Specify the Robot With the Paint Gun 7
To specify the robot with the paint gun 7 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.8 AxP123: Specify the Robot With the Paint Gun 8
To specify the robot with the paint gun 8 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.9 AxP124: Specify the Robot With the Paint Gun 9
To specify the robot with the paint gun 9 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.10 AxP125: Specify the Robot With the Paint Gun 10
To specify the robot with the paint gun 10 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.11 AxP126: Specify the Robot With the Paint Gun 11
To specify the robot with the paint gun 11 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.12 AxP127: Specify the Robot With the Paint Gun 12
To specify the robot with the paint gun 12 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).
1.14 Parameter

1.14.0.13 AxP128: Specify the Robot With the Paint Gun 13
To specify the robot with the paint gun 13 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.14 AxP129: Specify the Robot With the Paint Gun 14
To specify the robot with the paint gun 14 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.15 AxP130: Specify the Robot With the Paint Gun 15
To specify the robot with the paint gun 15 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.16 AxP131: Specify the Robot With the Paint Gun 16
To specify the robot with the paint gun 16 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.17 AxP132: Specify the Robot With the Paint Gun 17
To specify the robot with the paint gun 17 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.18 AxP133: Specify the Robot With the Paint Gun 18
To specify the robot with the paint gun 18 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.19 AxP134: Specify the Robot With the Paint Gun 19
To specify the robot with the paint gun 19 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.20 AxP135: Specify the Robot With the Paint Gun 20
To specify the robot with the paint gun 20 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.21 AxP136: Specify the Robot With the Paint Gun 21
To specify the robot with the paint gun 21 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.22 AxP137: Specify the Robot With the Paint Gun 22
To specify the robot with the paint gun 22 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.23 AxP138: Specify the Robot With the Paint Gun 23
To specify the robot with the paint gun 23 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.24 AxP139: Specify the Robot With the Paint Gun 24
To specify the robot with the paint gun 24 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.25 AxP140: Specify the Robot With the Paint Gun 25
To specify the robot with the paint gun 25 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).
1.14.0.26 AxP141: Specify the Robot With the Paint Gun 26
To specify the robot with the paint gun 26 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.27 AxP142: Specify the Robot With the Paint Gun 27
To specify the robot with the paint gun 27 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.28 AxP143: Specify the Robot With the Paint Gun 28
To specify the robot with the paint gun 28 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.29 AxP144: Specify the Robot With the Paint Gun 29
To specify the robot with the paint gun 29 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.30 AxP145: Specify the Robot With the Paint Gun 30
To specify the robot with the paint gun 30 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.31 AxP146: Specify the Robot With the Paint Gun 31
To specify the robot with the paint gun 31 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.32 AxP147: Specify the Robot With the Paint Gun 32
To specify the robot with the paint gun 32 connected, the robot 1 to the robot 8 must be set as 0 to 7. The initial value is 0 (robot 1).

1.14.0.33 S2C1450: Control Group Specified Gun No.
To specify the use / unuse of the control group specified gun number tag (GGUNNO=) in the work instruction.
When using the control group specified gun number tag (GGUNNO=), 1 is set. When not using the tag, 0, the initial value, is set.
According to the contents set by the gun connecting robot specified parameter AxP80-83, 120-147, the control group No.1 to 4 is defined in the ascending order from the smaller number of the gun number allocated to each robot.
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