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

MOTOMAN INSTRUCTIONS

MOTOMAN--□□□ INSTRUCTIONS
DX200 INSTRUCTIONS
DX200 OPERATOR’S MANUAL
DX200 MAINTENANCE MANUAL

The DX200 Operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual.
MANDATORY

- This manual explains the arc sensor COMARC function of the DX200 system and general operations. Read this manual carefully and be sure to understand its contents before handling the DX200.
- General items related to safety are listed in Chapter 1: Safety of the DX200 Instructions. To ensure correct and safe operation, carefully read the DX200 Instructions 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 DX200.

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".
WARNING

• Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX200 and the programming pendant. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is 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.

Figure 1: 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.

Figure 2: Release of Emergency Stop

• Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
  – View the manipulator from the front whenever possible.
  – Always follow the predetermined operating procedure.
  – Keep in mind the emergency response measures against the manipulator’s unexpected motion toward you.
  – 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 person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  – Turning ON the power for the DX200.
  – Moving the manipulator with the programming pendant.
  – Running the system in the check mode.
  – Performing automatic operations.

• Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem. The emergency stop buttons are located on the right of front door of the DX200 and the programming pendant.
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 supply cables.

In this manual, the equipment is designated as follows.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX200 controller</td>
<td>DX200</td>
</tr>
<tr>
<td>DX200 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>

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 cabinet
  of the DX200 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 Warning Labels in the
  DX200 Instructions before operating the manipulator.
Descriptions of the programming pendant keys, buttons, and displays are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td>Character Keys /Symbol Keys</td>
</tr>
<tr>
<td></td>
<td>The keys which have characters or its symbol printed on them are denoted with [ ]. ex. [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, ex. [SHIFT]+[COORD]</td>
</tr>
<tr>
<td>Displays</td>
<td>The menu displayed in the programming pendant is denoted with { }. ex. (JOB)</td>
</tr>
</tbody>
</table>

**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, 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.
# Table of Contents

1 Installation ....................................................................................................................................... 1-1
1.1 Starting Point Detecting Unit ............................................................................................ .. 1-2
1.2 Current Detecting Unit ....................................................................................................... 1-3

2 DX200 Wiring .................................................................................................................................. 2-1
2.1 Connection Diagnosis ..................................................................................................... ... 2-4

3 Arc Sensor Function ....................................................................................................................... 3-1
3.1 Basic Understanding of the Arc Sensor ............................................................................. 3-1
3.1.1 Left and Right Path Correction ............................................................................. 3-1
3.1.2 Up and Down Path Correction.............................................................................. 3-2
3.1.3 Applicable Range of the Arc Sensor ..................................................................... 3-2
3.2 Main Operations for the Arc Sensor Function .................................................................... 3-3
3.2.1 Job Preparation for Welding and Adjustment of Welding Conditions ................... 3-3
3.2.1.1 Registration of Arc Sensing Instructions ................................................. 3-4
3.3 Arc Sensor Function and Weaving Condition .................................................................... 3-5
3.3.1 Path Correction Direction and Weaving Basis Coordinate System ...................... 3-5
3.3.2 Cases that Require the Registration of Reference Points .................................... 3-7

4 Registration of Instructions ............................................................................................................. 4-1
4.1 COMARCON (Sensing Start Instruction) ........................................................................... 4-1
4.2 COMARCOF (Sensing End Instruction) ............................................................................ 4-4
4.3 COMARCSET (Sensing Condition Change) ...................................................................... 4-5
4.4 REFP (Reference Point Registration) ................................................................................ 4-7

5 Phase Compensation Value ........................................................................................................... 5-1
5.1 Job Preparation for Measurement of Phase Compensation Value ................................... 5-1
5.2 Measurement and Registration of a Phase Compensation Value .................................. 5-3

6 Measurement and Registration of Sensing Conditions ............................................................. 6-1
6.1 Job for Measuring Sensing Conditions .............................................................................. 6-1
6.2 Measurement of Sensing Conditions ................................................................................. 6-3
6.3 Registration of Sensing Conditions .................................................................................... 6-4
6.4 Adjustment of Sensing Conditions ..................................................................................... 6-5
6.5 Results of Arc Sensing ...................................................................................................... 6-6
# Table of Contents

7  COMARC Condition File ................................................................. 7-1
   7.1  COMARC Condition File ....................................................... 7-1
   7.2  File Operation ......................................................................... 7-3
       7.2.1  Display of a File ............................................................... 7-3
       7.2.2  Editing of a File ............................................................... 7-3
           7.2.2.1  Editing of “CORRECTION SELECT” and “CONDITION” ........ 7-3
           7.2.2.2  Editing of Other Items ........................................... 7-3
       7.2.3  Initialization of the File .................................................. 7-4

8  Modification of the Settings in COMARC Function ..................... 8-1

9  Instruction List .............................................................................. 9-1

10 Parameter List ............................................................................ 10-1

11 Alarm Message List ................................................................. 11-1
1 Installation

WARNING

- Since detected voltage (200 V), welding current, and welding voltage are applied to the starting point detecting unit, install the unit securely so that it does not fall.

Failure to observe this warning may result in an electric shock or damage to the unit.

For installation methods of a starting point detecting unit and a current detecting unit, refer to Fig.1-1 Installation of Starting Point Detecting Unit and Fig.1-2 Installation of Current Detecting Unit.

The starting point detecting unit should be installed outside of the manipulator interference area.
1. **Starting Point Detecting Unit**

The starting point detecting unit should be installed on the side of the welder.

When installing the unit on a welder or other devices, use a fixture to fix the unit with the mounting holes located on both sides of the unit in order to prevent the unit from falling.

*Fig. 1-1: Installation of Starting Point Detecting Unit*
1.2 Current Detecting Unit

Fig. 1-2: Installation of Current Detecting Unit

Front View

Side View

Units: mm
WARNING

- Before connecting the inter-unit cables and the welding cables, be sure to turn OFF the power supply to the DX200 and the welder.

Failure to observe this warning may result in an electric shock.

- Special attention should be paid during starting point detection, since 200 VDC is applied across the wire and the workpiece (welding jig).

Failure to observe this warning may result in an electric shock.

- Do not place any object directly on the cable of the starting point detecting unit.

Failure to observe this warning may result in an injury or damage caused by the disconnection of the cable.

- Attach the cable of the starting point detecting unit for the wire feeder with the wire stand, to protect it from robot movement. If interference between the cable and the peripheral devices cannot be avoided, cover the cable with a rubber plate or spiral tube, etc.

Failure to observe this warning may result in an electric shock caused by damage to the cable, or an injury or damage caused by malfunction.

- Do not lay the cable of the starting point detecting unit directly on the floor, but install them in a pit or duct, or attach the cable with a protective cover.

Failure to observe this warning may result in an injury or damage to the cable.

- Since a high current flows through the welding cable, separate it from the cables of the control circuit system. If the cables cannot be separated, take preventative measures such as using metallic ducts or tubes on the cables of the control circuit system.
Wire the unit in the following manner, referring to Fig. 2-1 Configuration Diagram of Starting Point Detecting Unit and Fig. 2-2 Configuration Diagram of Current Detecting Unit.

**Starting Point Detecting Unit**

1. Connect the starting point detecting unit to the DX200.
2. Connect the plus terminal of the starting point detecting unit to the plus terminal of the welder.
3. Connect the minus terminal of the starting point detecting unit to the torch power supply unit on the wire feeder.
4. Connect the front terminal of the stand of the starting point detecting unit to the welding voltage detecting terminal on the wire feeder in the case of a floor-standing type, and to the terminal stand in the welder in the case of a welder-side hung type, respectively.

---

**CAUTION**

- Insert the inter-unit cable on the starting point detecting unit side, firmly to the connector, and fix it securely by tightening the coupling nut.
- Fix the other cables connected to the terminal stand securely by tightening the terminal screws.

Failure to observe these cautions may result in an electric shock, an injury, or damage caused by malfunctioning.

- After connected, be sure to reinstall the terminal covers of starting point detecting unit and welder.

Failure to observe this caution may result in an electric shock.

---

Fig. 2-1: Configuration Diagram of Starting Point Detecting Unit

**Diagram Description:**

- **DX200**
- **Welder**
- **Welding cable**
- **Starting point detecting unit**
- **Inter-unit cable**
- **YCP02 board**
- **1CN**
- **SE1**
- **SE2**
- **To the workpiece**
- **To the wire feeder**
- **Ground cable**
- **Cable for welding voltage detection**
- **To the torch**
- **To the welder**
Current Detecting Unit

1. Connect the connection cable of current detecting unit to the DX200.
2. Connect the plus cable of the current detecting unit to the + terminal of the welder.
   Connect the other cable to the welding cable from the torch power supply unit on the wire feeder, and tape it with an insulating tape.

Fig. 2-2: Configuration Diagram of Current Detecting Unit
2.1 Connection Diagnosis

To confirm a connection, perform a diagnosis of the input status to the YCP02 board. (The YCP02 board is a board for the COMARC.)

Use the following procedure to call the YCP02 I/O status display.

1. Select {IN/OUT} from the main menu.
2. Select {YCP02 I/O}.
   - The YCP02 I/O STATUS window appears.

   ![YCP02 I/O STATUS window]

   - In this display, confirm the values read-by the YCP02 board’s A/D converter and the general I/O status.
   - Eight channels are provided for the A/D converter.
   - Four points for input and output respectively are provided for general I/O.
   - Use the YCP02 I/O STATUS window for the following purposes;
     • Check whether the A/D converter is correctly operating.
     • Check whether the cables for the current detecting unit are correctly connected.

     For an incorrect connection
     When welding is performed, the A/D data shows a negative value (-).
     For normal status
     When welding is performed by executing the normal ARCON/ARCOF, the A/D data show a positive value (+).
     (Execute a job without using COMARCON/COMARCOF.)

• The YCP02 I/O STATUS window can be called only in "MANAGEMENT MODE".
• When the icon {YCP02 I/O} does not appear, switch the security mode to "MANAGEMENT MODE".
3 Arc Sensor Function

3.1 Basic Understanding of the Arc Sensor

For welding with a power supply that has constant voltage characteristics, the welding current fluctuates as the distance L changes as shown below. Distance L is the distance between the tip and the base metal. The arc sensor function uses these characteristics.

3.1.1 Left and Right Path Correction

During welding with the torch weaving from side to side, an equal amount welding current flows on points ① and ② if the distance L is the same on both sides (points ① and ②) due to the aforementioned characteristics.

![Diagram showing path correction](image)

If the distances L are different at points ① and ②, different currents flow at these two points as shown below.

The arc sensor checks the welding currents at points ① and ② and corrects the path to equalize the values.
3.1.2 Up and Down Path Correction

During welding with the torch moving up and down, the arc sensor checks the welding currents at any 2 points, an upper point and a lower point, and corrects the path to equalize the values.

3.1.3 Applicable Range of the Arc Sensor

The applicable metal thickness and joint are as follows.

- Metal thickness: 3.2 mm or more
- Joint: T joint, Lap joint
- Speed: 1 m/min or less

The arc sensor function can be used except that the droplet transfer status is a spray transfer.

- The droplet transfer means that the welded tip of wire (droplet) transfers to the base metal.
- For the status of droplet transfer, there are dip transfer, spray transfer, and etc.
3.2 Main Operations for the Arc Sensor Function

3.2.1 Job Preparation for Welding and Adjustment of Welding Conditions

Prepare a job for welding and adjust the welding conditions.
3.2 Main Operations for the Arc Sensor Function

3.2.1.1 Registration of Arc Sensing Instructions

Register a COMARCON/COMARCOF instructions in the section where arc sensing is to be performed.

Set the UP/DOWN correction condition (U/D) to the same values as the value of the current setting in the ARCON instruction.
Set the LEFT/RIGHT correction condition to "0".

When adjustment of the targeted position is required after seeing the results of the welding done with the arc sensor, adjust the UP/DOWN correction conditions (U/D) or the LEFT/RIGHT correction conditions (L/R).

For details on how to adjust the UP/DOWN and LEFT/RIGHT correction conditions, refer to Section 6.4 “Adjustment of Sensing Conditions” on page 6-5.

Depending on the welding current range to be used, the current value set with ARCON instruction may differ from the current value actually output from the welder.

In this case, measure the sensing conditions when registering the COMARCON instruction.

For details on how to measure a sensing condition, refer to Chapter 6 "Measurement and Registration of Sensing Conditions" on page 6-1.

When an actual workpiece cannot be used to measure a sensing condition, use a test piece.
Then, for the UP/DOWN and LEFT/RIGHT correction conditions (U/D and L/R) for the COMARCON instruction in the actual work job, enter the values based on those measurements using the numeric keys.
3.3 Arc Sensor Function and Weaving Condition

3.3.1 Path Correction Direction and Weaving Basis Coordinate System

As described in Section 3.1 “Basic Understanding of the Arc Sensor” on page 3-1, the path correcting direction and weaving action are closely related. Weaving is performed based on the following coordinate system. This coordinate system is generated automatically when weaving is executed.

Wall Direction: Z direction of the robot axis
Horizontal Direction: The direction of approach point from the wall
Advance Direction: The direction that the torch moves from the weaving start point to the end point

The approach point is a point indicated by a step immediately before the step where weaving starts.

Depending on the mouthing and shape of the workpiece, a definition of the above coordinate system may not be sufficient to generate a weaving pattern. In that case, register the reference point REFP 1 or REFP 2.

For details, refer to Section 3.3.2 “Cases that Require the Registration of Reference Points” on page 3-7.
3.3 Arc Sensor Function and Weaving Condition

The weaving coordination and the path correcting direction are as follows.

Left and Right path correction is same as the amplitude direction of a weaving, and Up and Down path correction is same as perpendicular direction against the amplitude of a weaving.
3.3.2 Cases that Require the Registration of Reference Points

The registration of the reference point REFP1 or REFP2 is not usually required. They are required only with a special workpiece condition, etc.

The REFP1, that defines the wall direction, is a point on the wall surface or its expansion plane. The REFP2, which defines the horizontal direction, is a point on the right or left side of the wall.

**Example 1**

REFP1 is registered because the wall direction is not parallel to the Z direction of the robot axis.

Also, register REFP1 when a robot is hanging from the ceiling. In such case, the Z direction of the robot axis differs from wall direction.

For information on registering REFP, refer to Section 4.4 "REFP (Reference Point Registration)" on page 4-7.
<Example 2>
REFP2 is registered because the approach point is on another side of the wall.

<table>
<thead>
<tr>
<th>Example</th>
<th>MOVJ VJ=25.00</th>
<th>MOVL V=120</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REFP 2</td>
<td>WVON WEV#(1)</td>
</tr>
<tr>
<td></td>
<td>MOVL V=50</td>
<td>WVOF</td>
</tr>
</tbody>
</table>
4 Registration of Instructions

4.1 COMARCON (Sensing Start Instruction)

The COMARCON instruction starts the arc sensing and weaving. Correction conditions (UP/DOWN correction condition, RIGHT/LEFT correction condition), and the COMARC condition file No. specifications. < > indicates numerical or alphabetical data.

<table>
<thead>
<tr>
<th>COMARCON</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Starts arc sensing and weaving.</td>
</tr>
</tbody>
</table>

### Instruction items

<table>
<thead>
<tr>
<th>Settings</th>
<th>Data input range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaving conditions 1)</td>
<td>AMP: 0.1 to 99.9</td>
<td>0.1 mm</td>
</tr>
<tr>
<td></td>
<td>FREQ: 0.1 to 5.0</td>
<td>0.1 Hz</td>
</tr>
<tr>
<td></td>
<td>ANGL: 0.0 to 180.0</td>
<td>0.1 deg.</td>
</tr>
<tr>
<td></td>
<td>WEV#: 1 to 255</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>DIR: 0 or 1</td>
<td>-</td>
</tr>
</tbody>
</table>

| Correction conditions | U/D: 1 to 999 | 1 A |
| | L/R: -255.0 to 255.0 | 0.1 A |

| COMARC condition file No. CAF#: | 1 to 128 | - |

#### Examples

- COMARCON AMP=2.0 FREQ=3.0 U/D=200 L/R=0.0
- COMARCON WEV#(1) U/D=200 L/R=0.0
- COMARCON AMP=2.0 FREQ=3.0 U/D=200 L/R=0.0 CAF#(1)
- COMARCON WEV#(1) U/D=200 L/R=0.0 CAF#(1)

---

1 Two setting methods are available: setting by AMP and FREQ or setting by WEV#. When weaving conditions are set by AMP and FREQ, the weaving mode is "single oscillation". When ANGL is set to UNUSED, weaving angle is set to 45 deg. Do not use DIR normally. DIR specifies the weaving direction changing. DIR=0 equals to UNUSED.
4. Registration of Instructions

4.1 COMARCON (Sensing Start Instruction)

- Be sure to register the COMARCON instruction after the ARCON instruction.
  Register the COMARCON/COMARCOF instruction and the ARCON/ARCOF instruction in the same job.

- For setting and adjusting sensor correction conditions, refer to Chapter 6 "Measurement and Registration of Sensing Conditions" on page 6-1.

- When a COMARC condition file is not specified for the COMARCON instruction, perform sensing under the following conditions in the COMARC condition file display.
  - "CORRECTION SELECT" (direction of path correction): U/D & L/R (all directions)
  - "CONDITION" (operation after pass-over): NOT MONITOR

For details on the COMARC condition file, refer to Chapter 7 "COMARC Condition File" on page 7-1.

1. Move the cursor to the address area.
2. Press [INFORM LIST].
3. Select "SENSOR".
4. Select "COMARCON".
   - The instruction appears with the previously registered additional items in the input buffer line.

5. Press [SELECT], and set the conditions in the detail edit window.
   (1) Move the cursor to the item to be set, and press [SELECT].
   (2) Enter each condition using the numeric keys, and then press [ENTER].
4 Registration of Instructions

4.1 COMARCON (Sensing Start Instruction)

- The following two methods are available to set weaving conditions.
  - When a weaving condition is set by additional items

![Diagram of COMARCON settings]

- When a weaving condition is specified by the file

![Diagram of file-based setting]


- Press [ENTER] in the detail edit window to display the setting details in the input buffer line.
  Press [ENTER] again to register the setting details in the job.
4.2 COMARCOF (Sensing End Instruction)

The COMARCOF instruction ends arc sensing and weaving.

<table>
<thead>
<tr>
<th>COMARCOF</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction Item</td>
<td>Ends arc sensing and weaving.</td>
</tr>
<tr>
<td>Example</td>
<td>COMARCOF</td>
</tr>
</tbody>
</table>

**Note:**

Be sure to register the COMARCOF instruction before the ARCOF instruction.

Register the COMARCON/COMARCOF instruction and the ARCON/ARCOF instruction in the same job.

1. Move the cursor to the address area.
2. Press [INFORM LIST].
3. Select “SENSOR”.
4. Select “COMARCOF”.
   - The instruction appears in the input buffer line.

5. Press [ENTER].
4.3 COMARCSET (Sensing Condition Change)

The COMARCSET instruction changes the arc sensing conditions and the weaving conditions.

There are three types of settings for the COMARCSET instruction: weaving conditions (weaving amplitude, weaving angle), sensor correction conditions (UP/DOWN correction condition, RIGHT/LEFT correction direction), and the COMARC condition file No. specifications.

<> indicates numerical or alphabetical data.

<table>
<thead>
<tr>
<th>Function</th>
<th>Changes the sensing conditions and the weaving condition.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction Items</td>
<td>Settings</td>
</tr>
<tr>
<td>Weaving conditions</td>
<td>AMP = &lt;Weaving amplitude&gt;</td>
</tr>
<tr>
<td></td>
<td>ANGL=&lt;Weaving angle&gt;</td>
</tr>
<tr>
<td>Correction conditions</td>
<td>U/D = &lt;correcting the up and down path&gt;</td>
</tr>
<tr>
<td></td>
<td>L/R = &lt;correcting the left and right path&gt;</td>
</tr>
<tr>
<td>COMARC condition file No.</td>
<td>CAF# (&lt;COMARC condition file No.&gt;)</td>
</tr>
</tbody>
</table>

Examples:
- COMARCSET AMP=2.5 U/D=210 L/R=0.0 CAF#(2)
- COMARCSET AMP=2.5
- COMARCSET U/D=210
- COMARCSET L/R=1.0
- COMARCSET CAF#(2)

1. For the COMARCSET instruction, only the items to be changed can be set.

- The conditions registered with the COMARCSET instruction are validated when executing the move instruction after the COMARCSET instruction.
- For setting and adjusting sensor correction conditions, refer to Chapter 6 "Measurement and Registration of Sensing Conditions" on page 6-1.
- For details on the COMARC condition file, refer to Chapter 7 "COMARC Condition File" on page 7-1.
1. Move the cursor to the address area.
2. Press [INFORM LIST].
3. Select "SENSOR".
4. Select "COMARCSET".
   - The instruction appears with the previously registered additional items in the input buffer line.
5. Press [SELECT], and set the conditions in the detail edit window.
   (1) Move the cursor to the item to be set, and press [SELECT].
   (2) Enter each condition using the numeric keys, and then press [ENTER].
4.4 REFP (Reference Point Registration)

Reference point instructions (REFP) set an auxiliary point such as a wall point for weaving.

Reference points No.1 to 8 are assigned for each application. Follow the procedure below to register reference point instructions.

1. Select {JOB} under the main menu.
2. Select {JOB}.
3. Move the cursor.
   - Move the cursor to the line immediately before the position where the reference point to be registered.
4. Squeeze the Enable switch.
   - The servo power is turned ON.
5. Press the axis key.
   - Use the axis key to move the manipulator to the position to be registered as a reference point.
6. Press [REFP].
   - The reference point instruction is displayed in the input buffer line.
7. Change the reference point number.
   - Move the cursor to the reference point number, and press [SHIFT] + the cursor key to change the reference point number.
   - If you use the numeric keys to input the reference point number, press [SELECT] when the cursor is on the reference point number ("Ref-point_no.").
     The data input line is displayed. Input number and press [ENTER].
8. Press [INSERT].
   - The [INSERT] key lamp lights.
   - When registering before the END instruction, [INSERT] is not needed.
9. Press [ENTER].
   - The REFP instruction is registered.
5 Phase Compensation Value

As explained in Section 3.1 “Basic Understanding of the Arc Sensor” on page 3-1, the arc sensing corrects the manipulator path by measuring the welding current values at the peak and bottom of the waves of weaving motion.

However, in the actual welding, a discrepancy between the weaving cycle and the peak value of the current variation cycle is generated as shown in the following figure.

The phase compensation value compensates for this discrepancy.

Since the phase compensation value differs depending on the welding circumstances, measure and register a value for each welder.

![Diagram showing discrepancy between weaving motion and welding current peak value]

A discrepancy between the weaving motion and the welding current peak value is generated.

5.1 Job Preparation for Measurement of Phase Compensation Value

Prepare a job to measure a phase compensation value.

Refer to the following job example to prepare a job for measurement of a phase compensation value.

<table>
<thead>
<tr>
<th>Table 5-1: Job Example for Measurement of Phase Compensation Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOP</td>
</tr>
<tr>
<td>MOVJ  VJ=50.00</td>
</tr>
<tr>
<td>MOVJ  VJ=50.00</td>
</tr>
<tr>
<td>ARCON  AC=200  AVP=100</td>
</tr>
<tr>
<td>COMARCON  AMP=2.0  FREQ=3.0  U/D=200  L/R=0.0</td>
</tr>
<tr>
<td>MOVL  V=80</td>
</tr>
<tr>
<td>COMARCOF</td>
</tr>
<tr>
<td>ARCOF</td>
</tr>
<tr>
<td>MOVL  V=800</td>
</tr>
<tr>
<td>MOVJ  VJ=50.00</td>
</tr>
<tr>
<td>END</td>
</tr>
</tbody>
</table>
5 Phase Compensation Value
5.1 Job Preparation for Measurement of Phase Compensation Value

- Execute a job for measurement of phase compensation value under the same welding condition (current value, voltage value, torch positions) as a job with an actual workpiece.

- For the weaving conditions, measure the phase compensation values for all the weaving frequencies used in the actual welding.

- For measurement of a phase compensation value, teach the torch positions as if there is a top plate. (Steps 2 and 3).

**NOTE**
5.2 Measurement and Registration of a Phase Compensation Value

- Measuring and registering a phase compensation value is only possible in “MANAGEMENT MODE”. Change the security mode to “MANAGEMENT MODE”.

- The phase compensation value is registered in the parameter SxE. To measure and register phase compensation value, set the parameter SxE197 to “1” first, then proceed the following operations.

- After the registration of phase compensation value, be sure to reset the parameter SxE197 to “0”.

1. Select the job for measurement of a phase compensation value.
2. Select {UTILITY} in the JOB CONTENT window in play mode.
3. Select {SETUP SPECIAL RUN} from the selection dialog box.
   - The SPECIAL PLAY window appears.
4. Set the "COMARC MEASURE MODE" to "VALID".
   (1) Move the cursor to "COMARC MEASURE MODE", and press [SELECT] to set the mode to "VALID".
   (2) The message "COMARC MEASURE MODE" appears in the message line.
5. Execute the job.
6. Select {UTILITY} in the teach mode.
5.2 Measurement and Registration of a Phase Compensation Value

7. Select {COMARC COND. MODIFY}.
   - The COMARC PHASE COMP window appears.

8. Select (PARAMETER) from the main menu.
9. Select (SxE).
10. Display the parameter No. to be changed.
11. Register the measured value.
   - Register the phase compensation value confirmed in the COMARC PHASE COMP window appears.

   • After measuring the phase compensation value, be sure to reset the "COMARC MEASURE MODE" to "INVALID".
   • When the shielding gas is changed, measure and register the phase compensation value.
     If the type of shielding gas is different, the parameter No. is different.

   Measure and register phase compensation values for all the frequencies used in the actual welding.
   Depending on the frequency for which a phase compensation value is measured, the values may be registered in the same parameter No. In this case, register the average value of several measured phase compensation values.

   **Example**
   The phase compensation values for the weaving frequencies 4.0 Hz and 5.0 Hz are registered in SxE060.
   In this case, the average value of the phase compensation values for the weaving frequencies 4.0 Hz and 5.0 Hz is registered in SxE060.
6 Measurement and Registration of Sensing Conditions

6.1 Job for Measuring Sensing Conditions

Play back the measuring job in the sensing condition measurement mode to automatically measure the data of the sensing conditions (correction conditions in the up/down/left/right directions).

The following shows an example of a measuring job.

<Example>
Job for measuring sensing conditions

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>NOP</td>
</tr>
<tr>
<td>0001</td>
<td>MOVJ $V_J=50.00$</td>
</tr>
<tr>
<td>0002</td>
<td>MOVJ $V_J=50.00$</td>
</tr>
<tr>
<td>0003</td>
<td>MOVJ $V_J=30.00$</td>
</tr>
<tr>
<td>0004</td>
<td>ARCON $AC=200$ $AVP=100$</td>
</tr>
<tr>
<td>0005</td>
<td>COMARCON $AMP=2.0$ $FREQ=3.0$ $U/D=200$ $L/R=0.0$</td>
</tr>
<tr>
<td>0006</td>
<td>MOVL $V=80$</td>
</tr>
<tr>
<td>0007</td>
<td>COMARCOF</td>
</tr>
<tr>
<td>0008</td>
<td>ARCOF</td>
</tr>
<tr>
<td>0009</td>
<td>MOVJ $V_J=30.00$</td>
</tr>
<tr>
<td>0010</td>
<td>MOVJ $V_J=50.00$</td>
</tr>
<tr>
<td>0011</td>
<td>END</td>
</tr>
</tbody>
</table>

1 to 6: Taught steps

1. Stand-by position
2. Welding start position
3. Sensing starts (measures a condition)
4. Welding end position
5. Sensing completed
6. Stand-by position
Before measuring a condition, make sure that the workpiece is not dislocated.

If the workpiece is dislocated, correct the dislocation or correct the taught position for the measuring job.

Measure the sensing conditions in a single section within the same job.

Do not set more than one sensing section in the same job.

**<Wrong Setting Example>**

MOVJ VJ=30.00
ARCON AC=200 AVP=100
COMARCON AMP=2.0 FREQ=3.0 U/D=200 L/R=0.0
MOVL V=80
COMARCOF
COMARCON AMP=2.0 FREQ=3.0 U/D=200 L/R=0.0
MOVL V=80
COMARCOF
ARCOF
MOVJ VJ=30.00
6.2 Measurement of Sensing Conditions

1. Select {UTILITY} in the JOB CONTENT window in the play mode.
2. Select {SPECIAL PLAY} from the selection dialog box.
   - The SPECIAL PLAY window appears.
3. Set "COMARC MEASURE MODE" to "VALID".
   (1) Move the cursor to "COMARC MEASURE MODE", and press [SELECT] to set the mode to "VALID".
   (2) "COMARC MEASURE MODE" appears in the message line.
4. Execute the job.

**NOTE**
Be sure to reset the "COMARC MEASURE MODE" to "INVALID" after measuring the sensing conditions.
6.3 Registration of Sensing Conditions

1. Select {UTILITY} in the JOB CONTENT window in the teach mode.
2. Select {COMARC COND. MODIFY}.
   - The COMARC COND. MODIFY window appears.
3. Select "MODIFY COMARC COND" from the {DATA} selection box.
   - The sensing conditions are registered in the job.
   - When registration is complete, the JOB CONTENT window reappears.
6.4 Adjustment of Sensing Conditions

1. Move the cursor to the instruction area of the COMARCON instruction or the COMARCSET instruction.
3. Select either "UP/DOWN" or "LEFT/RIGHT" in the DETAIL EDIT window.
   - Enter a value using the numeric keys.

The following is the relation between the settings of the correction conditions and the correction direction.

To define the direction along the wall and horizontally, refer to Section 3.3 "Arc Sensor Function and Weaving Condition" on page 3-5.

- To lengthen a wire extension, decrease the UP/DOWN (U/D) correction condition in units of 10 A.
- To shorten a wire extension, increase the UP/DOWN (U/D) correction condition in units of 10 A.
- To move the targeted position toward the wall, decrease the LEFT/RIGHT (L/R) correction condition in units of 5 A.
- To move the targeted position toward the horizontal direction, increase the LEFT/RIGHT (L/R) correction condition in units of 5 A.
6.5 Results of Arc Sensing

After arc sensing has been performed, the history of the correction amount in each step can be viewed.

1. Select {ARC WELDING} from the main menu.
2. Select {COMARC CORRECT}.

– The correction amount in each step appears.

The CORRECTING LIST window only appears when sensing has been performed. Therefore, the icon “COMARC CORRECT” does not appear when turning the power ON or before performing sensing.
7 COMARC Condition File

Set the following two items in the COMARC condition files.

- Direction of path correction by sensing
- Pass-over monitoring condition

### 7.1 COMARC Condition File

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COND NO. (1 to 128)</strong></td>
<td>Displays the file No.</td>
</tr>
<tr>
<td><strong>CORRECTION SELECT</strong></td>
<td>Specifies the direction to be corrected. When “NO CORRECTION” is selected, a correction by sensing is not performed.</td>
</tr>
<tr>
<td><strong>U/D &amp; L/R</strong></td>
<td>Corrects the path in the up, down, left, and right directions.</td>
</tr>
<tr>
<td><strong>L/R</strong></td>
<td>Corrects the path in the left and right directions (the up and down directions are not corrected).</td>
</tr>
<tr>
<td><strong>U/D</strong></td>
<td>Corrects the path in the up and down directions (the left and right directions are not corrected).</td>
</tr>
<tr>
<td><strong>CONDITION</strong></td>
<td>Specifies the operation to be done when a pass-over occurs.</td>
</tr>
<tr>
<td><strong>ALARM</strong></td>
<td>An alarm occurs, and the manipulator stops.</td>
</tr>
</tbody>
</table>

#### U/D & L/R

**U/D & L/R**
- Corrects the path in the up, down, left, and right directions.

**L/R**
- Corrects the path in the left and right directions (the up and down directions are not corrected).

**U/D**
- Corrects the path in the up and down directions (the left and right directions are not corrected).

#### CONDITION

**CONDITION** (operation after pass-over) (ALARM, TEACHING POSITION, CORRECTION RETAIN, NOT MONITOR)
- Specifies the operation to be done when a pass-over occurs.

#### ALARM

**ALARM**
- An alarm occurs, and the manipulator stops.

[Diagram of pass-over condition]

Pass-over occurred, and the manipulator stops.

Actual welding line

Taught line

: Taught position
### COMARC Condition File

#### 7.1 COMARC Condition File

<table>
<thead>
<tr>
<th>TEACHING POSITION</th>
<th>Sensing stops, and the manipulator returns to the taught position and continues welding.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image_url" alt="Diagram" /> Pass-over occurred Restarts sensing from the taught position</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CORRECTION RETAIN</th>
<th>The taught position just after the occurrence of pass-over. The manipulator restarts welding from a position adjusted for the amount of shift from the taught position just before the occurrence of the pass-over.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image_url" alt="Diagram" /> Pass-over occurred Sensing restarts at a new, adjusted position. The distance between this new position and the taught position is equal to the amount of shift from the taught position just before the pass-over.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOT MONITOR</th>
<th>The pass-over is not monitored.</th>
</tr>
</thead>
</table>

- **VERTICAL MONITOR** (the pass-over monitor value in the up and down directions) (0.0 to 25.5 mm)
  - Sets the pass-over monitor value in the up and down directions.
  - When set to 0.0, the up and down directions are not monitored.
- **HORIZONTAL MONITOR** (the pass-over monitor value in the left and right directions) (0.0 to 25.5 mm)
  - Sets the pass-over monitor value in the left and right directions.
  - When set to 0.0, the left and right directions are not monitored.
- **NO. (the number of pass-overs) (1 to 10)**
  - When the number of pass-over exceeds this set value, the manipulator moves as described in ③.

The pass-over monitor function monitors whether the manipulator is in the rectangular range specified by the vertical monitor value and horizontal monitor value with the taught path as its center line.

When the manipulator moves out of the specified range more than the set number of times, the manipulator moves as described in ③.
7.2 File Operation

7.2.1 Display of a File

1. Select {ARC WELDING} from the main menu.
2. Select {COMARC COND}.
3. Display a desired file No.
   – Press the [PAGE] to call the next file No.
   – Press [SHIFT] + [PAGE] to call back the previous file No.

7.2.2 Editing of a File

7.2.2.1 Editing of “CORRECTION SELECT” and “CONDITION”

1. Move the cursor to "CORRECTION SELECT" or "CONDITION", and press [SELECT].
2. Select the item to be set from the selection dialog box.

7.2.2.2 Editing of Other Items

1. Move the cursor to the item to be set, and press [SELECT].
2. Enter a value to be set using the numerical keys.
3. Press [ENTER].
7.2.3 Initialization of the File

The COMARC condition file can be initialized in the maintenance mode.

To initialize the COMARC condition file, set the security mode to "MANAGEMENT MODE".
(When the security mode is set to “OPERATION MODE” or “EDITING MODE”, a file cannot be initialized.)

1. While pressing [MAIN MENU], turn ON the power.
2. Change the security mode ("SECURITY") to “MANAGEMENT MODE”.
3. Select {FILE} from the main menu.
4. Select {INITIALIZE}.
5. Select "FILE/GENERAL DATA".
   – The selection window of condition file/general data appears.

6. Select "COMARC COND FILE".
   – A star "★" appears on the left of the "COMARC COND FILE".

7. Press [ENTER].
   – The confirmation dialog box appears.
8. Select "YES".
   - The COMARC condition file is initialized.

9. Turn ON the power again.
Modification of the Settings in COMARC Function

To validate the COMARC function, mount the JANCD-YCP02 board in the CPU rack (JZNC-YRK21) with the power OFF.

To invalidate the COMARC function, remove the JANCD-YCP02 board from the CPU rack (JZNC-YRK21) with the power OFF.

The COMARC function has been set before shipment.

• Do not change the settings for the COMARC function unless it is required to invalidate the COMARC function.

• To validate/invalidate the COMARC function, change the security mode to “MANAGEMENT MODE”.

• When the security mode is set to “OPERATION MODE” or “EDITING MODE”, the setting status can be only referenced.

1. While pressing [MAIN MENU], turn ON the power.
2. Change the security mode ("SECURITY") to "MANAGEMENT MODE".
3. Select {SYSTEM} from the main menu.
4. Select {SETUP}.
   – The SETUP window appears.
5. Select {OPTION BOARD}.
   
   (1) The setting status appears.
   
   – When the YCP02 board is mounted, the following window appears.

   **Fig. 8-1: When the YCP02 board is Mounted**

   (2) Press [SELECT], and the YCP02 window appears.

   (3) Set the “YCP02” to “USED”.

   (4) To change the ROBOT SENSOR OPTION, Select “DETAIL” of “ROBOT SENSOR OPTION”.

   **Fig. 8-1: When the YCP02 board is Mounted**

   ![Diagram of YCP02 setup](image)
– When the YCP02 board is not mounted, the following window appears.

**Fig. 8-2: When the YCP02 board is not Mounted**

6. Press [ENTER].

– The confirmation dialog box appears.

7. Select "YES".

8. Turn ON the power again.
# 9 Instruction List

< > indicates numerical or alphabetical data.

## COMARCON Function
Starts arc sensing and weaving.

<table>
<thead>
<tr>
<th>Instruction Item</th>
<th>Settings</th>
<th>Data input range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaving conditions</td>
<td>AMP = &lt;Weaving amplitude&gt;</td>
<td>AMP: 0.1 to 99.9</td>
<td>0.1 mm</td>
</tr>
<tr>
<td></td>
<td>FREQ = &lt;Weaving frequency&gt;</td>
<td>FREQ: 0.1 to 5.0</td>
<td>0.1 Hz</td>
</tr>
<tr>
<td></td>
<td>ANGL = &lt;Weaving angle&gt;</td>
<td>ANGLE: 0.0 to 180.0</td>
<td>0.1 deg.</td>
</tr>
<tr>
<td></td>
<td>WEV# = &lt;Weaving file No.&gt;</td>
<td>1 to 255</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>DIR = &lt;Weaving direction&gt;</td>
<td>0 or 1</td>
<td>-</td>
</tr>
<tr>
<td>Correction conditions</td>
<td>U/D = &lt;Correcting the up and down path&gt;</td>
<td>U/D: 1 to 999</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>L/R = &lt;Correcting the left and right path&gt;</td>
<td>L/R: -255.0 to 255.0</td>
<td>0.1A</td>
</tr>
<tr>
<td>COMARC condition file No.</td>
<td>CAF# = &lt;COMARC condition file No.&gt;</td>
<td>1 to 128</td>
<td>-</td>
</tr>
</tbody>
</table>

**Examples**

- COMARCON AMP=2.0 FREQ=3.0 U/D=200 L/R=0.0
- COMARCON AMP=2.0 FREQ=3.0 U/D=200 L/R=0.0 CAF#(1)
- COMARCON AMP=2.0 FREQ=3.0 U/D=200 L/R=0.0 CAF#(1)

## COMARCOF Function
Ends arc sensing and weaving.

<table>
<thead>
<tr>
<th>Instruction Item</th>
<th>-</th>
</tr>
</thead>
</table>

**Example**

- COMARCOF

## COMARCSET Function
Changes sensing condition and weaving condition.

<table>
<thead>
<tr>
<th>Instruction Item</th>
<th>Settings</th>
<th>Data input range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaving condition</td>
<td>AMP = &lt;Weaving amplitude&gt;</td>
<td>AMP: 0.1 to 99.9</td>
<td>0.1 mm</td>
</tr>
<tr>
<td></td>
<td>ANGL = &lt;Weaving angle&gt;</td>
<td>ANGLE: 0.0 to 180.0</td>
<td>0.1 deg.</td>
</tr>
<tr>
<td>Correction condition</td>
<td>U/D = &lt;Correcting the up and down path&gt;</td>
<td>U/D: 1 to 999</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>L/R = &lt;Correcting the left and right path&gt;</td>
<td>L/R: -255.0 to 255.0</td>
<td>0.1A</td>
</tr>
<tr>
<td>COMARC condition file No.</td>
<td>CAF# = &lt;COMARC condition file No.&gt;</td>
<td>1 to 128</td>
<td>-</td>
</tr>
</tbody>
</table>

**Example**

- COMARCSET AMP=2.5 U/D=210 L/R=5.0 CAF#(2)
- COMARCSET AMP=2.5
- COMARCSET U/D=210
- COMARCSET L/R=5.0
- COMARCSET CAF#(2)

---

1. Two setting methods are available: setting by AMP and FREQ, or setting by WEV#.
   When weaving conditions are set by AMP and FREQ, the weaving mode is "single oscillation".
   When ANGL is set to UNUSED, weaving angle is set to 45 deg.
   Do not use DIR normally. DIR specifies the weaving direction changing.
   DIR=0 equals to UNUSED; the weaving directions are identical.
2. For the COMARCSET instruction, only the items to be changed can be set.
The data in < > can be set by using constants or user variables.

To use user variables, pay attention to the unit of set data.

<Example>
COMARCSET AMP=B000

The unit for the weaving amplitude settings is “0.1 mm”. To set 2.5 mm as the amplitude, set the B000 to “25”.
### 10 Parameter List

**Table 10-1: SxE Parameters**

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Contents</th>
<th>Unit</th>
<th>Initial Value</th>
<th>Setting Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Application designation</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1 to 19</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>Analog signal input channel</td>
<td>-</td>
<td>SL1: 1</td>
<td>1 to 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SL2: 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SL3: 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SL4: 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SL5: 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SL6: 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SL7: 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SL8: 8</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Compensation value for conversion of an AD value</td>
<td>[%]</td>
<td>100</td>
<td>0 to 100</td>
</tr>
<tr>
<td></td>
<td>to a current value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Number of times that correction was prohibited at</td>
<td>-</td>
<td>4</td>
<td>0 to 10000</td>
</tr>
<tr>
<td></td>
<td>COMARCON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Number of times that correction was prohibited at</td>
<td>-</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>MIN: correction prohibited current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Correction prohibited minimum current</td>
<td>[0.1A]</td>
<td>500</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>25</td>
<td>Correction prohibited maximum current</td>
<td>[0.1A]</td>
<td>10000</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>26</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>27</td>
<td>Dead zone U/D</td>
<td>[0.1A]</td>
<td>50</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>28</td>
<td>Dead zone L/R</td>
<td>[0.1A]</td>
<td>50</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>29</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>30</td>
<td>Correction amount Y+</td>
<td>[μm]</td>
<td>150</td>
<td>0 to 10000</td>
</tr>
<tr>
<td></td>
<td>(Weaving frequency less than 2.0 [Hz])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Correction amount Y-</td>
<td>[μm]</td>
<td>150</td>
<td>0 to 10000</td>
</tr>
<tr>
<td></td>
<td>(Weaving frequency less than 2.0 [Hz])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Correction amount Z+</td>
<td>[μm]</td>
<td>150</td>
<td>0 to 10000</td>
</tr>
<tr>
<td></td>
<td>(Weaving frequency less than 2.0 [Hz])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Correction amount Z-</td>
<td>[μm]</td>
<td>150</td>
<td>0 to 10000</td>
</tr>
<tr>
<td></td>
<td>(Weaving frequency less than 2.0 [Hz])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Correction amount Y+</td>
<td>[μm]</td>
<td>150</td>
<td>0 to 10000</td>
</tr>
<tr>
<td></td>
<td>(Weaving frequency 2.0 [Hz] or more, less than 3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[Hz])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Correction amount Y-</td>
<td>[μm]</td>
<td>150</td>
<td>0 to 10000</td>
</tr>
<tr>
<td></td>
<td>(Weaving frequency 2.0 [Hz] or more, less than 3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[Hz])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Correction amount Z+</td>
<td>[μm]</td>
<td>150</td>
<td>0 to 10000</td>
</tr>
<tr>
<td></td>
<td>(Weaving frequency 2.0 [Hz] or more, less than 3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[Hz])</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 10-1: SxE Parameters

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Contents</th>
<th>Unit</th>
<th>Initial Value</th>
<th>Setting Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Correction amount Z- (Weaving frequency 2.0 [Hz] or more, less than 3.0 [Hz])</td>
<td>[µm]</td>
<td>150</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>38</td>
<td>Correction amount Y+ (Weaving frequency 3.0 [Hz] or more, less than 4.0 [Hz])</td>
<td>[µm]</td>
<td>100</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>39</td>
<td>Correction amount Y- (Weaving frequency 3.0 [Hz] or more, less than 4.0 [Hz])</td>
<td>[µm]</td>
<td>100</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>40</td>
<td>Correction amount Z+ (Weaving frequency 3.0 [Hz] or more, less than 4.0 [Hz])</td>
<td>[µm]</td>
<td>100</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>41</td>
<td>Correction amount Z- (Weaving frequency 3.0 [Hz] or more, less than 4.0 [Hz])</td>
<td>[µm]</td>
<td>100</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>42</td>
<td>Correction amount Y+ (Weaving frequency 4.0 [Hz] or more)</td>
<td>[µm]</td>
<td>100</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>43</td>
<td>Correction amount Y- (Weaving frequency 4.0 [Hz] or more)</td>
<td>[µm]</td>
<td>100</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>44</td>
<td>Correction amount Z+ (Weaving frequency 4.0 [Hz] or more)</td>
<td>[µm]</td>
<td>100</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>45</td>
<td>Correction amount Z- (Weaving frequency 4.0 [Hz] or more)</td>
<td>[µm]</td>
<td>100</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>46 to 49</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>50</td>
<td>Sampling interval</td>
<td>[msec]</td>
<td>2</td>
<td>1 to 10</td>
</tr>
<tr>
<td>51 to 59</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>60 to 179</td>
<td>Phase compensation value</td>
<td>[msec]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>180 to 196</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>197</td>
<td>Measurement mode (1: Phase compensation value measurement)</td>
<td>-</td>
<td>0</td>
<td>0,1</td>
</tr>
<tr>
<td>198,199</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
### 11 Alarm Message List

<table>
<thead>
<tr>
<th>Alarm Number</th>
<th>Message</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>4410</td>
<td>TWO STEPS SAME POSITION (WEAV)</td>
<td>The weaving base point was the same as the wall point.</td>
<td>Reset the alarm. Reteach the 3 different points.</td>
</tr>
<tr>
<td>4486</td>
<td>PASS OVER [Decimal data]</td>
<td>The path went outside the designated pass-over monitoring area.</td>
<td>Remove the cause of the pass-over. Set the pass-over radius inside the permitted range.</td>
</tr>
<tr>
<td>4494</td>
<td>DEFECTIVE TAUGHT POINT (WEAV) [Decimal data]</td>
<td>1: Weaving start point and end point were the same. If not using hover weaving, the weaving start point and end point will be the same point, or the weaving start point and the reference point will be the same point. If using hover weaving, the weaving start point and the reference point will be the same point. 2: Weaving targeted point outer product error</td>
<td>Check the start point, the end point, and the reference point. Teach again.</td>
</tr>
<tr>
<td>1003</td>
<td>ROM ERROR (YCP02)</td>
<td>Checksum error in the ROM (memory) of the sensor program.</td>
<td>Replace the YCP02 board.</td>
</tr>
<tr>
<td>5010</td>
<td>ANALOG INPUT ERROR (YCP02) [Decimal data]</td>
<td>The analog input value of YCP02 board cannot be read properly. The decimal data indicates the channel where an input fault occurs.</td>
<td>Check the cable connection. Replace the YCP02 board.</td>
</tr>
<tr>
<td>5012</td>
<td>SYSTEM ERROR (COMARC) [Decimal data]</td>
<td>An error occurs in the system of the sensor in the COMARC function. The decimal data indicates the contents of error.</td>
<td>Needs investigation. Contact your Yaskawa representative. State any observations, the alarm No. and data displayed.</td>
</tr>
<tr>
<td>5013</td>
<td>COMARC ERROR [Decimal data]</td>
<td>An error occurs when processing the sensor in the COMARC function. The decimal data indicates the contents of error.</td>
<td>Needs investigation. Contact your Yaskawa representative. State any observations, the alarm No. and data displayed.</td>
</tr>
</tbody>
</table>