YRC1000
ARC WELDING
OPERATOR’S MANUAL

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

MOTOMAN INSTRUCTIONS

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

The YRC1000 operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual. The YRC1000 operator’s manual above consists of “GENERAL” and “SUBJECT SPECIFIC”. The YRC1000 alarm codes above consists of “MAJOR ALARMS” and “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: 178646-1CD
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>
<tr>
<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.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td></td>
</tr>
<tr>
<td>Character Keys</td>
<td>The keys which have characters or its symbols printed on them are denoted with [.].</td>
</tr>
<tr>
<td>Symbol Keys</td>
<td>ex. [ENTER]</td>
</tr>
<tr>
<td>Axis Keys</td>
<td>[Axis Keys] and [Numeric Keys] are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td>Numeric Keys</td>
<td></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.</td>
</tr>
<tr>
<td>ex. [SHIFT]+[COORD]</td>
<td></td>
</tr>
<tr>
<td>Displays</td>
<td>The menu displayed in the programming pendant is denoted with { }.</td>
</tr>
<tr>
<td>ex. {JOB}</td>
<td></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 [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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1 Arc Welding Application

1.1 System Structure Example of Arc Welding System

*Fig. 1-1: System Structure of Welding Robot*

- Manipulator
- Power Source (MOTOWELD)
- Programming Pendant
- Internal User I/O
- Wiring Harness (Base Side)
- Gas Hose
- Conduit Cable
- Cable Feeder
- Torch
- Positioner (MOTOPOS)
- Power Cable (+)
- Power Cable (-)
- Voltage Detecting Cable (-)
- Manipulator Cable
- Soft CPU
- Off
- ON
- OFF
- OFF
- On/Off
- 120/380V
- 91200m/min
- 350A YWE-RL350-A
- YRC1000
- LAN cable
1.2 General Descriptions of Instructions and Functions

1.2.1 Setup

Connect peripheral devices.
- Wire inching function (See chapter 1.3 “Function Keys”).
- Gas flow control function (See chapter 1.3 “Function Keys”).

Setup the Power Source.
See chapter 1.4 “Power Source Condition File”.

1.2.2 Teaching Operation

Teach a weld line.

Register work instructions.
- ARCON chapter 1.5.1 “ARCON”
- ARCOF chapter 1.5.2 “ARCOF”
- ARCSET chapter 1.5.3 “ARCSET”
Set welding conditions.

- Arc welding start condition chapter 1.5.1 “ARCON”
- Arc welding end condition chapter 1.5.2 “ARCOF”

```
000 NOP
001 MOVJ VJ=10.00
002 MOVJ VJ=80.00
003 MOVL V=800
004 ARCON ASF#(1)
005 MOVL V=50
006 ARCSET AC=200 AVP=100
007 MOVL V=50
008 ARCOF AEF#(1)
009 MOVL V=800
010 MOVJ VJ=50.00
011 END
```

Set other welding functions.

- Weaving chapter 1.12 “Weaving Operation”
- Arc retry function chapter 1.6 “Arc Retry Function”
- Arc restart function chapter 1.7 “Arc Restart Function”
- Wire-stick check function chapter 1.9 “Wire-Stick Check Function”
- Automatic wire-stick release function chapter 1.8 “Automatic Wire-Stick Release Function”
- Slope up/down function chapter 1.10 “Slope Up/Down Function”
- Welding path shift function chapter 1.17 “Welding Path Shift Function”
1.2 General Descriptions of Instructions and Functions

Check the operation.
- Test operations (See “YRC1000 GENERAL OPERATOR’S MANUAL (RE-CSO-A051) 3.8 Test Operations”).
- Welding execution function during teach mode
  chapter 1.5.9 “Welding Execution Function during Teach Mode”

1.2.3 Playback

Fine-control the welding conditions.
- Changing welding conditions during playback chapter 1.13 “Changing Welding Conditions during Playback”
- Arc monitor function chapter 1.16 “Arc Monitor Function”

1.2.4 Production (Automatic Operation)

Control the arc welding operation.
- Check for welding errors chapter 1.14 “Displaying Welding Alarm History”
- Arc welding management and maintenance chapter 1.15 “Arc Welding Management and Maintenance”
- Welding condition check chapter 1.16 “Arc Monitor Function”
1.3 Function Keys

Each function used for arc welding is allocated on the [Numeric Keys] of the programming pendant.

- **Registers a timer instruction “TIMER” in a job.**

- **Registers a reference point “REFP” in a job, or modifies the registered reference point.**
  
  \[\text{REFP} + \text{FWD}\]  
  Moves the manipulator to the registered reference point.

- **Registers a welding start instruction “ARCON”.**
  
  \[\text{INTERLOCK} + \text{ARCON}\]  
  Switches welding path shift ON/OFF.

- **Registers a welding end instruction “ARCOFF”.**

- **Use this key to control the gas flow.**
  Gas is fed only while [GAS] is pressed.
  (Refer to chapter 1.3.2 “Gas Flow Control Function”.)
1 Arc Welding Application

1.3 Function Keys

**Used for wire inching. Press [FEED] to feed the wire, and press [RETRACT] to retract the wire. While these keys are pressed, the wire feed motor operates.**

Three speed levels are available for wire feeding:

- [FEED]: Slow
- [FEED] + [FAST]: Medium
- [FEED] + [HIGH SPEED]: Fast

Two speed levels are available for wire retraction:

- [RETRACT]: Slow
- [RETRACT] + [HIGH SPEED]: Fast

(Refer to chapter 1.3.1 “Wire Inching Function”.)

**Modifies the welding current/voltage while welding during the play mode.**

Press [3/CUR/VOL] to increase the current/voltage value, and press [-/CUR/VOL] to decrease the current/voltage value.

(Refer to chapter 1.13 “Changing Welding Conditions during Playback”.)

When the security mode is the management mode, press this key to light the LED and welding can be performed during the test run.

Use this key for welding check during teaching.

* When [WELD ON/OFF] is pressed and the LED is lit, a beep is sounded.

- Wire retraction, high-speed inching, or high-speed retraction cannot be performed depending on the Power Source.
- The function key is not available if the window (subject of key operation) is active while Arc Start Cond. or Arc End Cond. window is displayed.
1.3 Function Keys

1.3.1 Wire Inching Function

Wire Inching

The term wire inching refers to gradually feeding or retracting the welding wire through the torch. [FEED] and [RETRACT] are used to perform wire inching. The wire inching simply feeds or retracts the wire, it has nothing to do with the job procedure being taught. The wire inching is performed only in the teach mode when the arc does not occur.

Wire Feeding

The wire is fed only while [FEED] is pressed.
Three speed levels are available for wire feeding:
• [FEED] : Slow
• [FEED] + [FAST] : Medium
• [FEED] + [HIGH SPEED] : Fast

Wire Retraction

The wire is retracted only while [RETRACT] is pressed.
Two speed levels are available for wire retraction:
• [RETRACT] : Slow
• [RETRACT] + [HIGH SPEED]: Fast

SUPPLEMENT

Wire retraction, high-speed inching, or high-speed retraction cannot be performed depending on the Power Source.

1.3.2 Gas Flow Control Function

Gas Flow Control

The Gas Flow Control function is used to adjust the flow amount of shielding gas by opening or closing the solenoid valve.
The solenoid valve can be opened or closed by pressing [GAS].
This function simply opens or closes the solenoid valve for shielding gas. Therefore, the operation does not cause any changes in the job contents.
The Gas Flow Control function is enabled in the teach mode only.
1.4 Power Source Condition File

1.4.1 About Power Source Condition File

This is the file where the Power Source characteristics: voltage characteristic, etc., is registered. This file contains the information for Power Source control.

For precise control of the welding current and voltage, the control signals sent from the controller to the Power Source must be properly adjusted.

The voltage of the current control signal is called the welding current reference value; the voltage of the voltage control signal is called the welding voltage reference value. A reference value is in the range between 0 and 14V (or between 0 and -14 depending on Power Sources).

How the output of the welding current or voltage changes with the reference value depends on the Power Source model, and this relationship between the reference value and output value is called an output characteristics. Each Power Source condition data file contains the output values (measured values) associated with several reference values. The figure below is an example of the welding current output characteristic curve.

Fig. 1-2: Welding Current Output Characteristics (Example)

Note that the data points (points of measurement) are automatically connected by straight lines, which define the output values of any points off these data points.

The inclination between the last two data points is extended as a straight line beyond the last point until it reaches the end of the measuring range.

If the intended welding current or voltage is not output due to a fluctuation in the Power Source’s power supply voltage, adjust the output by specifying a correction value. The figure (Fig. 1-2 “Welding Current Output Characteristics (Example)”) shows how a correction value works.
1. Arc Welding Application

1.4 Power Source Condition File

The following are the three types of the Power Source condition files. Each file consists of two windows.

Fig. 1-3: Power Source Condition Files

- The execution file is used to set the condition file of the Power Source being used.
- The user registered file is used by the user to save the Power Source condition files, and the data for 64 models can be registered.
- YASKAWA also offers initial value files which contain common Power Source characteristics. Data for 24 models have already been registered.

A Power Source condition file can be set only by reading from either the user registered file or initial value file to the execution file.

When it is necessary to make adjustments to the data, refer to chapter 1.4.4 “Editing the Power Source Condition File”.

1.4.2 Specifying Welding Voltage When Synergic Power Supply Is Used

When a synergic power supply is used, the YRC1000 requests the user to specify the welding voltage by a ratio against the proper output value (not by the output value as conventionally done).

For that, the voltage characteristics associated with a certain welding current output value must be determined by measurement, and the results should be stored in the Power Source condition data file as representative values.

The welding current output value for the measurement should be a value that is assumed relatively often in actual situations.

Each of the provided Power Source condition data files already contains the representative values for the associated Power Source model.

<Example>

An example is shown with the ARCON instruction.

If the welding current output is 250 A, the welding voltage can be specified as follows:

<table>
<thead>
<tr>
<th>ARCON</th>
<th>AC=250</th>
<th>AVP=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding</td>
<td></td>
<td>100% of proper output, assuming the use of synergic power supply.</td>
</tr>
<tr>
<td>current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With the voltage characteristics with the following Figure A, the above instruction causes the output of 7.5 V control signal to the Power Source
If the welding current output value is changed to 220 A, a minor correction to the ARCON instruction causes the output of the control signal associated with 100% of the proper output value at 220A. (Fig.B)

ARCON  AC=220  AVP=100 ······100% output

Also note that a minor adjustment of the welding voltage can be instructed easily. (Fig. C)

e.g. The control signal is output 110% of the proper output value at 220 A.

ARCON  AC=220  AVP=110 ······110% output

or

e.g. The control signal is output 94% of the proper output value at 220 A.

ARCON  AC=220  AVP=94 ······94% output

This setting method enables easy adjustment without calculating the voltage output.

This method can be also applied to condition data files and instructions other than ARCON.

Another advantage is that a single welding job can be used with more than one Power Source with a synergic power supply by changing the welder condition data file.

If welding current output is significantly different from the voltage characteristics measurement used, voltage output may vary. Write the welding current value used for the voltage characteristics measurement as a comment for reference.
1.4.3 POWER SOURCE CONDITION File

A Power Source condition data file has the following two windows:

- POWER SOURCE CONDITION Window
- POWER SOURCE CONDITION Window (for current/voltage output)

1.4.3.1 POWER SOURCE CONDITION Window

A. POWER SOURCE NO. (1 to 8)
Displays a Power Source number between 1 and 8 (for each welder).

B. SETTING
If this file is modified, the status automatically changes to “NONE”, indicating that the modification is not saved yet. To save the modification to the file, move the cursor to “SETTING” and press [SELECT]. Then the status changes to “DONE”.

C. POWER SOURCE NAME
Displays a Power Source name of 16 characters or less.

D. COMM. (COMMENT)
Displays a comment of 32 characters or less.

E. POWER SUPPLY (A/V, A/%)
- When “A/%” is displayed: Measured values of voltage can be input by the unit of “%” for “D. MEASURE” in the POWER SOURCE CONDITION window for current/voltage output shown in the next page.

- When “A/V” is displayed: Measured values of voltage can be input by the unit of “V” for “D. MEASURE” in the POWER SOURCE CONDITION window for current/voltage output shown in the next page.

*To switch between “A/%” and “A/V” in the POWER SOURCE CONDITION window, select [DATA] -> [READING] to read the initial value file (maker offer) or user registered file once again.

*This function is available for the standard software version NS4.00.00A or later.

F. SHIELDING GAS (CO2,MAG)
Specifies the shielding gas type.

G. WIRE DIA. (0 to 9.9 mm dia.)
Specifies the wire diameter.
1.4 Power Source Condition File

H. **WIRE STICKOUT (0 to 99 mm)**
   Specifies the length of the welding wire protruding from the torch tip.

I. **WIRE ANTI-STICKING (0 to 9.9 seconds)**
   Specifies the duration of the wire anti-stick process at the end of welding.

J. **ARC FAILURE STOP (0 to 2.55 seconds)**
   Specifies the time between the detection of arc failure and the stopping of the manipulator movement.

1.4.3.2 POWER SOURCE CONDITION Window for Current/Voltage Output

A. **RANGE**
   Indicates the polarity of the reference value for the welding current and voltage. If the range is positive(+), the reference value is in the range between 0 and 14.00V. If the range is negative(-), the reference value is in the range between 0 and -14.00 V.

B. **ADJUST (0.80 to 1.20)**
   A correction value to adjust the welding current/voltage output.

C. **REF. (V) (0 to 14.00 V)**
   Welding current/voltage reference values.

D. **MEASURE (0 to 999 A, 0 to 50.0 V, or 50 to 150%)**
   The welding current/voltage output values measured at the reference values as given under C.
1.4.4 Editing the Power Source Condition File

1.4.4.1 Displaying the Power Source Condition File

1. Select {ARC WELDING} under the main menu.
2. Select {POWER SOURCE CONDITION}.
   – The POWER SOURCE CONDITION window appears.

1.4.4.2 Reading the Power Source Condition File

1. Select {DATA} from the menu.
2. Select {READING}.

**NOTE**

When the Power Source condition file is modified or the file is read in, the SETTING status in the POWER SOURCE CONDITION window changes from “DONE” to “NONE”. After editing, move the cursor to SETTING then press [SELECT] to save the modification. Then the SETTING status changes from “NONE” to “DONE”.

---

**POWER SOURCE CONDITION**

- POWER SOURCE NO.: 1/1
- SETTING: DONE
- POWER SOURCE NAME: MOTOWELD-E350
- COMM.: STC CONTROL NONE
- POWER SUPPLY: CO2
- SHIELDING GAS: CO2
- WIRE DIA.: 0.8 mm
- WIRE STICKOUT: 15 mm
- WIRE ANTI-STICKING: 0.1 sec
- ARC FAILURE STOP: 1.50 sec
- CURRENT OUTPUT CHAR.: 50
- WELDING VOLTAGE OUTPUT CHAR.: 0.0030
- RANGE: ±0.0001
- ADJUST: 1.00 1.00
- NO. REF.(V) MEASURE (A) REF.(V) MEASURE (%)
  01 10.00 10.00 10.00 10.00
3. Select the Power Source condition file number of the data to be read.
   – Each time [PAGE] is pressed, the window alternates between MAKER INITIAL VALUE window and USER INITIAL VALUE window.
   – On the MAKER INITIAL VALUE window, the registered initial value file list (1 to 24) appears.

   ![MAKER INITIAL VALUE Table]

   – On the USER INITIAL VALUE window, the registered user registration file list (1 to 64) appears.

   ![USER INITIAL VALUE Table]

4. Select “YES”.
   – The confirmation dialog box appears. Select “NO” to return to the POWER SOURCE CONDITION window without the read-in.

   ![Confirmation Dialog Box]
1.4.4.3 Editing the Power Source Condition File

- Editing the “WELDER NAME” or “COMMENT”

1. Select “POWER SOURCE NAME” or “COMMENT”.
2. Input characters.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Power Source Name</th>
<th>Comment</th>
<th>Power Supply</th>
<th>Shielding Gas</th>
<th>Wire Dia</th>
<th>Wire Stickout</th>
<th>Anti-Sticking</th>
<th>Arc Failure Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MOTOWELD-E350</td>
<td>STC Control None</td>
<td>CO2</td>
<td>0.1 mm</td>
<td>15 mm</td>
<td>0.1 sec</td>
<td>1.50 sec</td>
<td></td>
</tr>
</tbody>
</table>

1.4.4.4 Editing the Power Source Condition File for Current/Voltage Output

- Editing the “RANGE”

1. Select “RANGE”.
   - Each time [SELECT] is pressed, the indication alternates between “+” (positive) and “−” (negative).
1. Arc Welding Application
2. Power Source Condition File

### Editing “ADJ”, “REF”, or “MEASURE”

1. Select “ADJ”, “REF”, or “MEASURE”.
2. Input the number using [Numeric Key].
   - When some data is modified, the SETTING status is changed to "NONE".

<table>
<thead>
<tr>
<th>NO.</th>
<th>REF.(V)</th>
<th>MEASURE (A)</th>
<th>REF. (%)</th>
<th>MEASURE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>0.00</td>
<td>30</td>
<td>0.00</td>
<td>50</td>
</tr>
<tr>
<td>02</td>
<td>1.00</td>
<td>60</td>
<td>1.00</td>
<td>20</td>
</tr>
<tr>
<td>03</td>
<td>2.00</td>
<td>40</td>
<td>2.00</td>
<td>100</td>
</tr>
<tr>
<td>04</td>
<td>3.00</td>
<td>80</td>
<td>3.00</td>
<td>100</td>
</tr>
</tbody>
</table>

3. After the modification, move the cursor to “SETTING” and press [SELECT].
   - The setting is completed.

### Notes on Power Source Data Condition File Modification:

When changing “POWER SUPPLY” in Power Source condition file, the welding condition files (Arc Welding Start Condition File, Arc Welding End Condition File, and Arc Auxiliary Condition File) are formatted.
1.4.4.5 Registering the Power Source Condition File Data

Other than the 24 types of initial value data that YASKAWA has provided, 4 types of Power Source condition files can be registered. The data partially modified using the initial value file can also be registered.

1. Select (ARC WELDING) under the main menu.

2. Select (POWER SOURCE COND.).

3. Select (WRITING) from (DATA) in the menu.
   - The user registered file list appears.

   ![User Registered File List]

- Setting up the initial value file:

   ![Setting up the Initial Value File]
4. Select the Power Source condition file number of the data to be written.
   – The confirmation dialog box appears.

5. Select “YES”.
   – Select “YES” to register the Power Source condition file data. Select “NO” to return to the POWER SOURCE CONDITION window.
1.5 Basic Functions

1.5.1 ARCON

1.5.1.1 Function

This instruction outputs an arc start command. The arc start signal to the Power Source is turned ON to start welding by this instruction.

The function key [ARCON] can be used for registration.

To register the ARCON instruction using [INFORM LIST], select “DEVICE” from the instruction group list.

1.5.1.2 Syntax

```
WELDn [1]
```

Choose one of the following tags. These tags are enabled only when multiple applications are in use and two or more applications are set as arc welding application.

When there is only one application, these tags are not displayed.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELDn</td>
<td>Selects the Power Source</td>
<td>1 to 8.</td>
</tr>
</tbody>
</table>
### ASF# (Arc welding start condition file number) [2] /AC = Current output value [3]

Be sure to choose either of the following.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
| ASF# (Arc welding start condition file number) | Specifies the arc welding start condition file number. Conditions to start welding are registered in the arc welding start condition file. | No. 1 to 1000  
The number can be specified by B/I/D/LB/LI/LD variable. |
| AC = Current output value | Specifies the output value of welding current. | Current value: 1 to 999 A  
The current output value can be specified by B/I/D/LB/LI/LD/LB[ ]/LI[ ]/LD[ ] variable. |

### AV = Voltage output value /AVP [4] = Percentage against the proper voltage output value [5]

Only when “AC = Current output value” is selected in the above “ASF# (Arc welding start condition file number) [2] /AC = Current output value [3]”, be sure to choose either of the following.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
| AV = Voltage output value | Specifies the output value of welding voltage. The output value of welding voltage is specified when the power supply is independent. | Voltage value: 0.1 to 50.0 V  
The voltage output value can be specified by B/I/D/LB/LI/LD/LB[ ]/LI[ ]/LD[ ] variable. (Unit: 0.1 V) |
| AVP = Percentage against the proper voltage output value | Specifies the percentage against the proper output value of welding voltage. The percentage against the proper voltage output value is specified when the power supply is synergic. | Percentage: 50 to 150%  
The voltage output value can be specified by B/I/D/LB/LI/LD/LB[ ]/LI[ ]/LD[ ] variable. |

### T = Time [6]

This tag is added or omitted only when “AC = Current output value” is selected in the above “ASF# (Arc welding start condition file number) [2] /AC = Current output value [3]”.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
| T = Time | Specifies the timer value at the start of welding. | Unit: seconds  
The time can be specified by I/LI[ ]/LI[ ] variable. (Unit: 0.01 sec.) |
1.5 Basic Functions

### V = Welding speed

This tag is added or omitted only when "AC = Current output value" is selected in the aforementioned "ASF# (Arc welding start condition file number) [2] /AC = Current output value [3]".

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>V = Welding speed</td>
<td>Specifies the welding speed. Speed: 0.1 to 1500.0 mm/sec. The unit displayed can be changed by the setting of the parameter (S2C101). The speed can be specified by B/B[ ]LB/LB[ ]I/I[ ]LI/LI[ ]D/D[ ]LD/LD[ ] variable. (Unit: 0.1 mm/sec.)</td>
<td></td>
</tr>
</tbody>
</table>

### RETRY

This tag is added or omitted only when "AC = Current output value" is selected in the aforementioned "ASF# (Arc welding start condition file number) [2] /AC = Current output value [3]".

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>RETRY</td>
<td>Specifies the retry function. The retry function works to prevent the interruption of operation when an arc start failure occurs.</td>
<td>Refer to chapter 1.6 “Arc Retry Function”.</td>
</tr>
</tbody>
</table>

### REPLAY

Only when RETRY is added in the above "RETRY [8]", be sure to add this tag.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>REPLAY</td>
<td>Specifies the replay mode. The replay mode is one of the modes to repeat the ARCON process when the retry function is enabled.</td>
<td>Refer to chapter 1.6 “Arc Retry Function”.</td>
</tr>
</tbody>
</table>

1.5.1.4 Registering the ARCON Instruction

1. Press [ARCON].
2. Press [ENTER].

ARCON instruction cannot be modified after it is registered to the job.

(Refer to “YRC1000 GENERAL OPERATOR’S MANUAL (RE-CSO-A051) 3.6.4 Modifying Instructions").

If the ARCON instruction needs to be modified, delete it and then, add the necessary instruction.
1.5.1.5 Setting Welding Start Conditions

The ARCON instruction can be registered in any of the following three ways:

- With additional items to specify conditions
  ARCON AC=200   AVP=100   T=0.50   V=60   RETRY

- With an arc welding start condition file
  ARCON ASF# (1)
  In this case, the welding condition is set using the arc welding start condition file. (Refer to chapter 1.5.4 “Arc Start Condition File”.)

- Without additional items
  ARCON
  In this case, the welding condition must be set using the welding condition set instruction (ARCSET) before the ARCON instruction is executed. (Refer to chapter 1.5.3 “ARCSET”.)

- With Additional Items to Specify Conditions

  1. Select the ARCON instruction in the instruction area.
     - The ARCON instruction appears in the input buffer line.

     ![Image of ARCON instruction in input buffer line]

  2. Press [SELECT].
     - The DETAIL EDIT window appears.

  3. Select “UNUSED”.

     ![Image of DETAIL EDIT window with ARCON instruction]
4. Press [SELECT] and select "AC=" from the selection dialog.

5. Place the cursor on "ASF#( )" and press [SELECT], then select "AC=" from the selection dialog.

– If the arc welding start condition file has already been set in the ARCON instruction additional items, the DETAIL EDIT window appears.
6. Input the welding condition.
   - Set each welding condition.

   ![Data Edit Display Utility](image1)

   **ARCON**
   - WELDING CURR: AC=180
   - WELDING VOLT: AVP=100
   - TIMER: T=0.30
   - SPEED: V=80
   - RETRY: RETRY
   - MODE: REPLAY

   ![Job Edit Display Utility](image2)

   **ARCON**
   - WELDING CURR: AC=200
   - WELDING VOLT: AVP=100
   - TIMER: T=0.30
   - SPEED: V=80
   - RETRY: RETRY
   - REPLAY: FLY:T=0.23
   - SCR:L=3.1

7. Press [ENTER].
   - The set contents are displayed in the input buffer line.

   ![Input Buffer Line](image3)
1. Arc Welding Application

1.5 Basic Functions

8. Press [ENTER].

– The set contents are registered in the job.

```plaintext
STEP NO: 0003
CONTROL GROUP: R1

0000 NOP
0001 MOVL Vi=80.00
0002 MOVL Vi=800
0003 ARCON AC=200 AVP=100 V=80 RETRY REPLAY
0004 MOVL Vi=50
0005 MOVL Vi=50
0006 MOVL Vi=50
0007 ARCON
0008 MOVL Vi=800
0009 MOVL VJ=80.00
0010 END

ARCON AC=200 AVP=100 V=80 RETRY REPLAY
```

– Press [CANCEL] to return to the JOB CONTENT window if the set contents are not to be registered.

```plaintext
STEP NO: 0003
CONTROL GROUP: R1

0000 NOP
0001 MOVL Vi=80.00
0002 MOVL Vi=800
0003 ARCON
0004 MOVL Vi=50
0005 MOVL Vi=50
0006 MOVL Vi=50
0007 ARCON
0008 MOVL Vi=800
0009 MOVL VJ=80.00
0010 END

ARCON
```

With an Arc Welding Start Condition File

1. Select the ARCON instruction in the instruction area.

– The ARCON instruction appears in the input buffer line.

```plaintext
STEP NO: 0003
CONTROL GROUP: R1

0000 NOP
0001 MOVL Vi=80.00
0002 MOVL Vi=800
0003 ARCON
0004 MOVL Vi=50
0005 MOVL Vi=50
0006 MOVL Vi=50
0007 ARCON
0008 MOVL Vi=800
0009 MOVL VJ=80.00
0010 END

ARCON
```
1. Arc Welding Application
1.5 Basic Functions

2. Press [SELECT].
   – The DETAIL EDIT window appears.

3. Place the cursor on "UNUSED".

4. Press [SELECT] and select "ASF#()" from the selection dialog.

   – If the welding conditions have already been set in the ARCON instruction additional items, the DETAIL EDIT window appears.
5. Place the cursor on "AC=" and press [SELECT], then select "ASF#()" from the selection dialog.

6. Set the file number.
   – Specify the file number (1 to 1000).
   (1) Move the cursor to the file number and press [SELECT].

7. Press [ENTER].
   – The set contents are displayed in the input buffer line.
8. Press [ENTER].

– The set contents are registered in the job.

<table>
<thead>
<tr>
<th>JOB CONTENT</th>
<th>STEP NO: 0003</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB NAME: WORK A</td>
<td>CONTROL GROUP: R1</td>
</tr>
<tr>
<td>0000 NOP</td>
<td>TOOL: 00</td>
</tr>
<tr>
<td>0001 MOVJ VJ=80.00</td>
<td>0002 MOVL VI=800</td>
</tr>
<tr>
<td>0003 ARCON ASF# (10)</td>
<td>0004 MOVL VI=50</td>
</tr>
<tr>
<td>0005 MOVL VI=50</td>
<td>0006 MOVL VI=50</td>
</tr>
<tr>
<td>0007 ARCOF</td>
<td>0008 MOVL VI=800</td>
</tr>
<tr>
<td>0009 MOVL VI=800.00</td>
<td>0010 END</td>
</tr>
</tbody>
</table>

– Press [CANCEL] to return to the JOB CONTENT window if the set contents are not to be registered.

<table>
<thead>
<tr>
<th>JOB CONTENT</th>
<th>STEP NO: 0003</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB NAME: WORK A</td>
<td>CONTROL GROUP: R1</td>
</tr>
<tr>
<td>0000 NOP</td>
<td>TOOL: 00</td>
</tr>
<tr>
<td>0001 MOVJ VJ=80.00</td>
<td>0002 MOVL VI=800</td>
</tr>
<tr>
<td>0003 ARCON</td>
<td>0004 MOVL VI=50</td>
</tr>
<tr>
<td>0005 MOVL VI=50</td>
<td>0006 MOVL VI=50</td>
</tr>
<tr>
<td>0007 ARCOF</td>
<td>0008 MOVL VI=800</td>
</tr>
<tr>
<td>0009 MOVL VI=800.00</td>
<td>0010 END</td>
</tr>
</tbody>
</table>
Without Additional Items

When an additional item is not provided for the ARCON instruction, set the welding conditions in advance with the welding condition setting instruction (ARCSET) before executing the ARCON instruction.
(Refer to chapter 1.5.3 “ARCSET”.)

1. Select the ARCON instruction in the instruction area.
   – The ARCON instruction appears in the input buffer line.

<table>
<thead>
<tr>
<th>JOB</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB CONTENT</td>
<td>JOB NAME: WORK A</td>
<td>CONTROL GROUP: RY</td>
<td>TOOL: 06</td>
</tr>
<tr>
<td>0003</td>
<td>NOP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0001</td>
<td>MOVJ VJ=80.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0002</td>
<td>MOVJ V=800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0003</td>
<td>ARCON ASF#(10) T=0.30 RETRY REPLAY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0004</td>
<td>MOVJ V=80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0005</td>
<td>MOVJ V=80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0006</td>
<td>MOVJ V=80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0007</td>
<td>ARCOF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0008</td>
<td>MOVJ V=800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0009</td>
<td>MOVJ V=80.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0010</td>
<td>END</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Press [SELECT].
   – The DETAIL EDIT window appears.

3. Place the cursor on “ASF#( )” or “AC=”.​

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DETAIL EDIT ARCON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SET METHOD</td>
<td>ASF#(10) T=0.30 RETRY REPLAY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DETAIL EDIT ARCON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELDING CURR</td>
<td>180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELDING VOLT</td>
<td>AVP= 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIMER</td>
<td>T= 0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPEED</td>
<td>V= 80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RETRY</td>
<td></td>
<td>RETRY</td>
<td></td>
</tr>
<tr>
<td>REPLAY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCR= 3.1 SCR</td>
<td>3.1 SCR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ARCON ASF#(10) T=0.30 RETRY REPLAY
1 Arc Welding Application
1.5 Basic Functions

4. Press [SELECT] and select "UNUSED" from the selection dialog.

5. Press [ENTER].
   – The set contents are displayed in the input buffer line.

6. Press [ENTER].
   – The set contents are registered in the job.
   – Press [CANCEL] to return to the JOB CONTENT window if the set contents are not to be registered.
1.5.2 ARCOF

1.5.2.1 Function

This instruction outputs an arc end command.

The arc start signal to the Power Source is turned OFF to end welding by this instruction.

The function key [ARCOF] can be used for registration.

To register the ARCOF instruction using [INFORM LIST], select “DEVICE” from the instruction group list.

1.5.2.2 Syntax

1.5.2.3 Explanation

- **WELDn [1]**
  
  Choose one of the following tags.
  
  These tags are enabled only when multiple applications are in use and two or more applications are set as arc welding application.
  
  When there is only one application, these tags are not displayed.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELDn</td>
<td>Selects the Power Source 1 to 8.</td>
<td></td>
</tr>
</tbody>
</table>
### Arc Welding Application

#### 1.5 Basic Functions

- **AEF# (Arc welding end condition file number)** [2] / **AC = Current output value** [3]
  
  Be sure to choose either of the following.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
  | AEF# (Arc welding end condition file number) | Specifies the arc welding end condition file number. Conditions to end welding are registered in the arc welding end condition file. | No. 1 to 1000  
The number can be specified by B/I/D/LB/LI/LD variable. |
  | AC = Current output value                 | Specifies the output value of welding current.                                                       | Current value: 1 to 999 A  

- **AV = Voltage output value** / **AVP** [4] = **Percentage against the proper voltage output value** [5]
  
  Only when “AC = Current output value” is selected in the above “AEF# (Arc welding end condition file number) [2] / AC = Current output value [3]”, be sure to choose either of the following.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
  | AV = Voltage output value                 | Specifies the output value of welding voltage.                                                       | Voltage value: 0.1 to 50.0 V  
The voltage output value can be specified by B/I/D/B[I]/I[D]/LB/LI/LD/LB[B]/L[LI]/LD[L] variable. (Unit: 0.1 V) |
  | AVP = Percentage against the proper voltage output value | Specifies the percentage against the proper output value of welding voltage. The percentage against the proper voltage output value is specified when the power supply is synergic. | Percentage: 50 to 150%  

- **T = Time** [6]
  
  This tag is added or omitted only when “AC = Current output value” is selected in the above “AEF# (Arc welding end condition file number) [2] / AC = Current output value [3]”.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
  | T = Time | Specifies the timer value at the end of welding. | Unit: seconds  
The time can be specified by I/LI/I[L] variable. (Unit: 0.01 sec.) |
### ANTSTK [7]
This tag is added or omitted only when "AC = Current output value" is selected in the aforementioned "AEF# (Arc welding end condition file number) [2] /AC = Current output value [3]".

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTSTK</td>
<td>Specifies the automatic wire-stick release function. When the automatic wire-stick release function is used, the manipulator does not immediately output the wire sticking signal upon detecting a wire stick, but automatically attempts to release the sticking by applying a certain voltage.</td>
<td>Refer to chapter 1.8 &quot;Automatic Wire-Stick Release Function&quot;.</td>
</tr>
</tbody>
</table>
1.5.2.4 Registering the ARCOF Instruction

1. Press [ARCOF].

2. Press [ENTER].

ARCOF instruction cannot be modified after it is registered to the job. (Refer to “YRC1000 GENERAL OPERATOR’S MANUAL (RE-CSO-A051) 3.6.4 Modifying Instructions”.)

If the ARCOF instruction needs to be modified, delete it and then, add the necessary instruction.
1.5.5 Setting Arc Welding End Conditions (Crater Processing)

The ARCOF instruction can be registered in any of the following four ways:

- **With additional items to specify conditions**
  
  ARCOF AC=160  AVP=70  T=0.50  ANTSTK

- **With an arc welding end condition file**
  
  ARCOF AEF#(1)
  
  In this case, the welding condition is set using the arc welding end condition file. (Refer to **chapter 1.5.5 “Arc End Condition File”**.)

- **Without additional items**
  
  ARCOF
  
  When the crater process is performed by changing the welding condition when welding is completed, before the ARCOF instruction is executed, the welding condition needs to be set using the welding condition setting instruction. (Refer to **chapter 1.5.3 “ARCSET”**.)

### With Additional Items to Specify Conditions

1. Select the ARCOF instruction in the instruction area.

   - The ARCOF instruction appears in the input buffer line.

2. Press [SELECT].

   - The DETAIL EDIT window appears.

3. Place the cursor on “UNUSED”.

```plaintext
JOB EDIT DISPLAY UTILITY
Main Menu ! Turn on servo power
JOB CONTENT
JOB NAME: WORK A
0000   NOP
0001   MOVJ VJ=80.00
0002   MOVL V=800
0003   ARCON
0004   MOVL V=50
0005   MOVL V=50
0006   MOVL V=50
0007   END
```
4. Press [SELECT] and select “AC=” from the selection dialog.

– If the arc welding end condition file has already been set in the ARCOF instruction additional items, the DETAIL EDIT window appears.

5. Place the cursor on “AEF#( )” and press [SELECT], then select “AC=” from the selection dialog.

6. Input the welding condition.

– Set each welding condition.

7. Press [ENTER].

– The set contents are displayed in the input buffer line.
8. Press [ENTER].

– The set contents are registered in the job.

```
JOB CONTENT
JOB NAME: WORK A
CONTROL GROUP: R1
STEP NO: 0003
0000 NOP
0001 MOVJ VJ=80.00
0002 MOVL V=800
0003 ARCON
0004 MOVL V=50
0005 MOVL V=50
0006 MOVL V=50
0007 ARCOF AC=200 AVP=100 T=0.30 ANTSTK
0008 MOVL V=800
0009 MOVL V=800
0010 END
```

– Press [CANCEL] to return to the JOB CONTENT window if the set contents are not to be registered.

```
JOB CONTENT
JOB NAME: WORK A
CONTROL GROUP: R1
STEP NO: 0003
0000 NOP
0001 MOVJ VJ=80.00
0002 MOVL V=800
0003 ARCON
0004 MOVL V=50
0005 MOVL V=50
0006 MOVL V=50
0007 ARCOF
0008 MOVL V=800
0009 MOVL V=800
0010 END
```
1. Select the ARCOF instruction in the instruction area.
   - The ARCOF instruction appears in the input buffer line.

2. Press [SELECT].
   - The DETAIL EDIT window appears.

3. Place the cursor on "UNUSED".
4. Press [SELECT] and select "AEF#( )" from the selection dialog.

   – If the welding conditions have already been set in the ARCOF instruction additional items, the DETAIL EDIT window appears.

5. Place the cursor on "AC=" and press [SELECT], then select "AEF#()" from the selection dialog.

6. Set the file number.

   – Specify the file number (1 to 1000).

   (1) Move the cursor to the file number and press [SELECT].

   (2) Type the file number using [Numeric Key] and press [ENTER].

7. Press [ENTER].

   – The set contents are displayed in the input buffer line.
8. Press [ENTER].

- The set contents are registered in the job.

```plaintext
<table>
<thead>
<tr>
<th>JOB CONTENT</th>
<th>STEP NO: 0003</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB NAME:</td>
<td>WORK A</td>
</tr>
<tr>
<td>CONTROL</td>
<td>GROUP: R1</td>
</tr>
<tr>
<td>TOOL: 00</td>
<td></td>
</tr>
<tr>
<td>STEP NO: 0003</td>
<td></td>
</tr>
<tr>
<td>FUNCTION:</td>
<td></td>
</tr>
<tr>
<td>0000: NOP</td>
<td></td>
</tr>
<tr>
<td>0001: MOVJ</td>
<td>VJ=80.00</td>
</tr>
<tr>
<td>0002: MOVL</td>
<td>V=800</td>
</tr>
<tr>
<td>0003: ARCON</td>
<td></td>
</tr>
<tr>
<td>0004: MOVL</td>
<td>V=50</td>
</tr>
<tr>
<td>0005: MOVL</td>
<td>V=50</td>
</tr>
<tr>
<td>0006: MOVL</td>
<td>V=50</td>
</tr>
<tr>
<td>0007: ARCOF</td>
<td>AEF# (10)</td>
</tr>
<tr>
<td>0008: MOVL</td>
<td>V=800</td>
</tr>
<tr>
<td>0009: MOVJ</td>
<td>VJ=80.00</td>
</tr>
<tr>
<td>0010: END</td>
<td></td>
</tr>
</tbody>
</table>
```

- Press [CANCEL] to return to the JOB CONTENT window if the set contents are not to be registered.

```plaintext
<table>
<thead>
<tr>
<th>JOB CONTENT</th>
<th>STEP NO: 0003</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB NAME:</td>
<td>WORK A</td>
</tr>
<tr>
<td>CONTROL</td>
<td>GROUP: R1</td>
</tr>
<tr>
<td>TOOL: 00</td>
<td></td>
</tr>
<tr>
<td>STEP NO: 0003</td>
<td></td>
</tr>
<tr>
<td>FUNCTION:</td>
<td></td>
</tr>
<tr>
<td>0000: NOP</td>
<td></td>
</tr>
<tr>
<td>0001: MOVJ</td>
<td>VJ=80.00</td>
</tr>
<tr>
<td>0002: MOVL</td>
<td>V=800</td>
</tr>
<tr>
<td>0003: ARCON</td>
<td></td>
</tr>
<tr>
<td>0004: MOVL</td>
<td>V=50</td>
</tr>
<tr>
<td>0005: MOVL</td>
<td>V=50</td>
</tr>
<tr>
<td>0006: MOVL</td>
<td>V=50</td>
</tr>
<tr>
<td>0007: ARCOF</td>
<td></td>
</tr>
<tr>
<td>0008: MOVL</td>
<td>V=800</td>
</tr>
<tr>
<td>0009: MOVJ</td>
<td>VJ=80.00</td>
</tr>
<tr>
<td>0010: END</td>
<td></td>
</tr>
</tbody>
</table>
```
Without Additional Items

1. Select the ARCOF instruction in the instruction area.
   – The ARCOF instruction appears in the input buffer line.

2. Press [SELECT].
   – The DETAIL EDIT window appears.
3. Place the cursor on “AEF#()” or “AC=“.
4. Press [SELECT] and select “UNUSED” from the selection dialog.
5. Press [SELECT].
   – The set contents are displayed in the input buffer line.
6. Press [ENTER].

– The set contents are registered in the job.

![Job Content Display]

– Press [CANCEL] to return to the JOB CONTENT window if the set contents are not to be registered.

![Job Content Display with ARCOF Command]
1.5.3 ARCSET

1.5.3.1 Function

This is the instruction to set the welding conditions (current, voltage, etc.) individually.

The ARCSET instruction can be registered in any of the following two ways:

- With additional items to specify conditions
  ARCSET AC=200  AVP=100
- With an arc welding start condition file
  ARCSET ASF# (1)

In this case, the welding condition is set using the arc start condition file.
ACOND=0: Set by “start condition”
ACOND=1: Set by “main condition”
(Refer to chapter 1.5.4 “Arc Start Condition File”.)

1.5.3.2 Syntax

1.5.3.3 Explanation

- **WELDn [1]**

  Choose one of the following tags.

  These tags are enabled only when multiple applications are in use and two or more applications are set as arc welding application.

  When there is only one application, these tags are not displayed.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELDn</td>
<td>Selects the Power Source 1 to 8.</td>
<td></td>
</tr>
</tbody>
</table>
1.5 Basic Functions

- **AC = Current output value [2]/ASF# (Arc welding start condition file number) [3]**
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC = Current output value</td>
<td>Specifies the output value of welding current.</td>
<td>Current value: 1 to 999 A The current output value can be specified by B/I/D/B/I/D/LB/LD/LB/L/L/LD/LD variable.</td>
</tr>
<tr>
<td>ASF# (Arc welding start condition file number)</td>
<td>Specifies the arc welding start condition file number. Conditions to start welding are registered in the arc welding start condition file.</td>
<td>No. 1 to 1000 The number can be specified by B/I/D/LB/LI/LD variable.</td>
</tr>
</tbody>
</table>

- **AV = Voltage output value /AVP [4]= Percentage against the proper voltage output value [5]**
  Be sure to choose either of the following.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV = Voltage output value</td>
<td>Specifies the output value of welding voltage. The output value of welding voltage is specified when the power supply is independent.</td>
<td>Voltage value: 0.1 to 50.0 V The voltage output value can be specified by B/I/D/B/I/D/LB/LI/LD/LB/L/L/LI/LD/LD variable. (Unit: 0.1 V)</td>
</tr>
<tr>
<td>AVP = Percentage against the proper voltage output value</td>
<td>Specifies the percentage against the proper output value of welding voltage. The percentage against the proper voltage output value is specified when the power supply is synergic.</td>
<td>Percentage: 50 to 150% The voltage output value can be specified by B/I/D/B/I/D/LB/LI/LD/LB/L/L/LI/LD/LD variable.</td>
</tr>
</tbody>
</table>

- **V = Welding speed [6]**
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>V = Welding speed</td>
<td>Specifies the welding speed.</td>
<td>Speed: 0.1 to 1500.0 mm/sec. The unit displayed can be changed by the setting of the parameter (S2C101). The speed can be specified by B/B/LB/LB/I/I/LI/LD/LD variable. (Unit: 0.1 mm/sec.)</td>
</tr>
</tbody>
</table>
## 1 Arc Welding Application
1.5 Basic Functions

- **AN3 = Voltage target value [7]**
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
| AN3 = Voltage target value | Specifies the voltage target value for the analog output 3.                | Target value: -14.00 to +14.00 V  
The voltage target value can be specified by I/LI/I[]/LI[] variable.  
(Unit: 0.01 V) |

- **AN4 = Voltage target value [8]**
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
| AN4 = Voltage target value | Specifies the voltage target value for the analog output 4.                | Target value: -14.00 to +14.00 V  
The voltage target value can be specified by I/LI/I[]/LI[] variable.  
(Unit: 0.01 V) |
1.5.3.4 Registering the ARCSET Instruction

- **With Additional Items to Specify Conditions**

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

2. Select the ARCSET instruction.
   - The ARCSET instruction appears in the input buffer line.

3. Press [SELECT] and set the welding condition on the DETAIL EDIT window.
   - The DETAIL EDIT window appears.
1 Arc Welding Application
1.5 Basic Functions

(1) Move the cursor to the item to be set, and press [SELECT].

(2) Type the welding conditions using [Numeric Key], and press [ENTER].

(3) To add the additional items, place the cursor on the item with the “UNUSED” status and press [SELECT], then the selection dialog appears.

(4) To delete the additional items, line up the cursor with the additional items and press [SELECT] to select “UNUSED”.

4. Press [ENTER].
   – The set contents are displayed in the input buffer line.
5. Press [ENTER].

   – The set contents are registered in the job.

   ![Job Content 1](image1.png)

   – Press [CANCEL] to return to the JOB CONTENT window if the set contents are not to be registered.

   ![Job Content 2](image2.png)
1. Arc Welding Application
1.5 Basic Functions

### With an Arc Start Condition File

1. Select the ARCSET instruction in the instruction area.
   - The ARCSET instruction appears in the input buffer line.

2. Press [SELECT].
   - The DETAIL EDIT window appears.
   1. Place the cursor on “UNUSED”.
   2. Press [SELECT] and select “ASF#()” from the selection dialog.

3. Set the file number.
   - Specify the file number (1 to 396).
   1. Move the cursor to the file number and press [SELECT].
1 Arc Welding Application
1.5 Basic Functions

(2) Type the file number using [Numeric Key] and press [ENTER].

4. Specify the condition set.
   • When the welding condition file is the enhanced type
     – Specify the number for the condition set (0 or 1).

   (1) Move the cursor to the ACOND number at the condition set, and press [SELECT].

   (2) Type the file number using [Numeric Key] and press [ENTER].
     – By selecting the condition set number, either one of the “start condition” or “main condition” in the condition file can be specified.
     – ACOND=0: Sets the welding current and voltage which are specified in the “start condition”.
     – ACOND=1: Sets the welding current and voltage which are specified in the “main condition”.

5. Press [ENTER].
   – The set contents are displayed in the input buffer line.
6. Press [ENTER]. The set contents are registered in the job.

- Press [ENTER]. The set contents are registered in the job.

- Press [CANCEL] to return to the JOB CONTENT window if the set contents are not to be registered.
1.5.4 Arc Start Condition File

1.5.4.1 Displayed File Numbers

Two types of file numbers are displayed: The sequential serial number of all welding files and the file number allocated for each power source. Either number can be entered.

When specifying the condition file number for the ARCON or the ARCSET command of a job, set the number shown in the sequential serial number field.

1.5.4.2 Tabs

Conditions of the arc start condition file are divided into the tabs: “PREFLOW”, “START”, “MAIN COND.”, and “OTHER”.

To switch tabs, use the cursor (left and right).

“Main Condition” Tab Window

1. START COND. ON
   Check this box to enable the start condition.

2. CURRENT (30 to 500 A)
   Welding current output value.

3. VOLTAGE (12.0 to 45.0 V, 50 to 150%)
   Welding voltage output value.

4. ANALOG OUTPUT 3 (-14.00 to 14.00)
   Displayed when the enhanced welding condition file function is enabled. This is the reference value to the Power Source through the analog output 3. To use this, AEW01 circuit board, etc. with analog output ports must be added.

5. ANALOG OUTPUT 4 (-14.00 to 14.00)
   Displayed when the enhanced welding condition file function is enabled. This is the reference value to the Power Source through the analog output 4. To use this, AEW01 circuit board, etc. with analog output ports must be added.

6. ROBOT PAUSE TIME (0 to 10.00 seconds)
   The length of time when the manipulator pauses at the beginning of welding.
   If the start condition is enabled, the robot pause time is specified in the “START” tab and is not displayed in the “MAIN COND.” tab.
1. Arc Welding Application
1.5 Basic Functions

7. ROBOT SPEED (1 to 600 cm/min)
Set the travel speed of the torch tip during welding.
However, if the move instruction specifies a particular speed in the welding section, this particular speed is given priority.

■ “START” Tab Window

Check the box of “SLOPE ON” to specify whether the conditions set in “START” tab should be changed stepwise or gradually to the conditions set in “MAIN COND.” tab when starting welding.

The setting window switches as shown in the following.

*Fig. 1-4: With “SLOPE ON” Checked*

*Fig. 1-5: With “SLOPE ON” Unchecked*

1. The values of CURRENT, VOLTAGE, ANALOG OUTPUT 3, and ANALOG OUTPUT 4 of the start condition at the beginning of welding
Check the box of “START COND. ON” in the “MAIN COND.” tab to set the values.
To use the analog output 3 and 4, AEW01 circuit board, etc. with analog output ports must be added.

2. ROBOT PAUSE TIME (0 to 10.00 seconds)
The length of time when the manipulator pauses at the beginning of welding.

1-53
3. ROBOT MOVE DIST (DISTANCE)
   Displayed only when the slope function is OFF.
   The distance which the manipulator moves along the welding line with
   the conditions set in "START" tab.
   The manipulator moves at the speed specified in the "MAIN COND."

4. ROBOT SPEED (1 to 600 cm/min)
   Displayed only when the slope function is ON.
   Specifies the initial velocity when the manipulator starts moving after the
   robot pause time (specified in B. above).
   Then, the speed gradually increases to the speed specified in the "MAIN
   COND."

5. SLOPE DIST: Distance Specification
   Displayed only when the slope function is ON.
   The interval where the conditions are gradually changed from the ones
   set in the "START" tab to the ones set in the "MAIN COND." tab can be
   specified by millimeter.

“PREFLOW” Tab Window
   Specifies the process before the beginning of welding.

A. GAS: PREFLOW TIME
   When the manipulator moves to the welding start point, feeding of the
   shielding gas can be started before the manipulator reaches the welding
   start point.
   When to start feeding the shielding gas before the manipulator reaches
   the welding start point can be specified by seconds.

NOTE
If the manipulator’s traveling time from the preceding step to
the welding start point step becomes shorter than the gas
preflow time due to the job teaching, the shielding gas is fed
when the manipulator starts traveling to the welding start
point, thus the preflow time becomes shorter than the time
specified.
1. RETRY ON
Specifies whether the retry function is ON or OFF. Check this box to turn the retry function ON. At this time, the retry function is turned ON with following the setting of “RETRY FUNCTION SET” of “Arc Auxiliary Condition File”.

2. ARC FAILURE RESTART
ARC AUX. COND: If select “ARC AUX. COND”, the arc failure restart setting turns ON according to the settings of the Arc Auxiliary Condition File.
NO RESTART : If select “NO RESTART”, arc failure restart setting becomes invalid.

3. PZ: POSITION SET ZONE
Specifies the distance from the actual position of the manipulator (the position fed back from the encoder of each axis of the manipulator) to the welding start point, where the manipulator is regarded to have reached the welding start point.
When the position set zone is set to 0, the welding start signal is output to the power source after the manipulator completely reaches the welding start point and stops.

4. WELDER PATH COORD SHIFT
Check this box to enable welding path shift. For the details, refer to chapter 1.17 “Welding Path Shift Function”.

5. UB: UPPER BOARD (-5.0 to 5.0 mm)
Shifting amount to the upper board direction.

6. UB: LOWER BOARD (-5.0 to 5.0 mm)
Shifting amount to the lower board direction.
1.5.4.3 Comment

Comment can be added to every ARC START COND. file number. It is input or displayed with the Arc Start Cond. window.

1. **COMMENT**

   The comment added to each file number is displayed in this box. Up to 32 characters can be input for the comment.

- **Inputting Comment**
  1. Move the cursor to the comment displaying box.
  2. Press [ENTER].
     - The software keypad window appears.
3. Input the comment and press [ENTER].

- The window returns to the Arc Start Cond. window and the input comment is displayed.
1.5.5 Arc End Condition File

1.5.5.1 Displayed File Numbers

Two types of file numbers are displayed: The serial number of all welding files (Serial No) and the file number allocated for each welder. Either number can be entered.

When specifying the condition file number for the ARCOF instruction of a job, set the number shown in the “Serial No” field.

1.5.5.2 Tabs

Conditions of the arc end condition file are divided into the tabs: “CRATER COND. 1”, “CRATER COND. 2”, and “OTHER”.

To switch tabs, use the cursor (left and right).

■ “CRATER COND. 1” Tab Window

Check the box of “SLOPE ON” to specify whether the welding conditions should be gradually changed to the crater condition before the manipulator reaches to the welding end point, or should be changed to the crater condition immediately after the manipulator reaches the welding end point.

The setting window switches as shown in the following.

Fig. 1-6: With “SLOPE ON” Checked
1. The values of CURRENT, VOLTAGE, ANALOG OUTPUT 3, and ANALOG OUTPUT 4 of the crater condition 1 at the beginning of welding
The analog output 3 and 4 are displayed when the enhanced welding condition file function is enabled.
To use the analog output 3 and 4, AEW01 circuit board, etc. with analog output ports must be added.

2. ROBOT SPEED (1 to 600 cm/min)
Displayed only when the slope function is ON.
This is the manipulator’s travel speed at the welding end point.
The manipulator’s travel speed changes from the speed specified with the move instruction of a job or the speed specified by the welding start condition file to the speed specified above.

3. ROBOT PAUSE TIME (0 to 10.00 seconds)
The length of time when the manipulator continues welding while the manipulator is stopped at the welding end point.

4. SLOPE DIST: Distance Specification
Displayed only when the slope function is ON.
The interval where the conditions are gradually changed from the ones set in the “MAIN COND.” tab to the ones set in the “CRATER COND. 1” tab can be specified by millimeter.
1 Arc Welding Application
1.5 Basic Functions

“CRATER COND. 2” Tab Window
Check the box of “CRATER2 ON” to set the condition to either of the following:

- Check “CRATER2 ON” to change the crater condition stepwise after the manipulator reaches the welding end point.
- Uncheck “CRATER2 ON” to continue welding with the crater condition 1.

The setting window switches as shown in the following.

Fig. 1-8: With “CRATER2 ON” Checked

Fig. 1-9: With “CRATER2 ON” Unchecked

1. The values of CURRENT, VOLTAGE, ANALOG OUTPUT 3, and ANALOG OUTPUT 4 of the start condition at the beginning of welding
Check the box of “CRATER2 ON” to set the value.
The analog output 3 and 4 are displayed when the enhanced welding condition file function is enabled.
To use the analog output 3 and 4, AEW01 circuit board, etc. with analog output ports must be added.

2. ROBOT PAUSE TIME (0 to 10.00 seconds)
The length of time when the manipulator continues welding while the manipulator is stopped at the welding end point.
1 Arc Welding Application
1.5 Basic Functions

“OTHER” Tab Window

Fig. 1-10: With "AST: ANTI-STICK ON" Checked

Fig. 1-11: With "AST: ANTI-STICK ON" Unchecked

Fig. 1-12: Timing of Each Process Time of Arc End Process

Manipulator Operating Time
Welding Condition Output Time
Wire Anti-Stick Process Time
Wire-Stick Check Time
Gas Afterflow Time
1. **PZ: POSITION SET ZONE**

Specifies the distance from the actual position of the manipulator (the position fed back from the encoder of each axis of the manipulator) to the welding end point, where the manipulator is regarded to have reached the welding end point.

When the position set zone is set to 1, the condition switches to the crater condition after the manipulator completely reaches the welding end point and stops.

![Crater at the end of the weld bead](image)

If the timings of the manipulator’s stop and the switch of the crater condition are not right, there may be rare occasions when the crater part becomes longer as shown below.

In this case, it is effective to set the position set zone to 0 in order to synchronize precisely the timings of the manipulator’s stop and the switch of the crater condition.

When the position set zone is set to 1, the cycle time extends by 0.1 to 0.2 seconds, because the judgment that the manipulator has reached the welding end point is delayed, compared with when the position set zone is set to other than 0.

Set the appropriate position set zone depending on the shape of crater.

2. **MTS: MONITORING TIME**

Wire stick monitoring time at the end of welding.

3. **AST: ANTI-STICK ON**

Check this box so that the process of automatic wire-stick release will be performed if wire-stick is detected at the end of welding.

When the anti-stick function is ON, the cycle time becomes longer than when it is OFF.

- When the anti-stick is ON:
  After the wire stick monitoring of the step 2 above, the manipulator starts to move.

- When the anti-stick is OFF:
  Simultaneously with the start of the wire stick monitoring of the step 2 above, the manipulator starts to move.

4. **GAS: AFTERFLOW TIME**

Specifies with the length of time to feed the shielding gas while the manipulator is moving from the end of welding to the next step.
1.5.5.3 Comment

Comment can be added to every ARC END COND. file number. It is input or displayed with the Arc Start Cond. window.

1. COMMENT

The comment added to each file number is displayed in this box. Up to 32 characters can be input for the comment.

- **Inputting Comment**
  1. Move the cursor to the comment displaying box.
  2. Press [ENTER].
     - The software keypad window appears.
1 Arc Welding Application
1.5 Basic Functions

3. Input the comment and press [ENTER].

4. The window returns to the Arc End Cond. window and the input comment is displayed.
1.5.6 Condition File Edit Function (Copying of the Welding Conditions)

- **Outline**
  Contents of the welding conditions set in ARC START COND. or ARC END COND. files can be batch copied into other ARC START COND. or ARC END COND. files.

- **Copying Procedures**

  ![Diagram of copying procedures]

  **NOTICE**

  Perform copying under the following status.
  - Security mode: Edit mode or higher
  - Teach mode
  - No alarm is occurred

  Note 1: Copying cannot be executed during playback operation.
  Note 2: Copying cannot be executed between different welding devices.
1. Procedure

1. Display {WELD COND COPY}.

   - Display either ARC START COND. or ARC END COND. file, and then select {DATA}.

   - Move the cursor to the row of the “No.” (① in the figure below), and then press [SELECT]. Specification of the file number is enabled and the cursor jumps to the relevant file.

   - The cursor can be moved or the window can be scrolled by pressing [↑], [↓], or [SHIFT] + [↑] or [↓].

   - When moving the cursor to the row of the “Src No.” (② in the figure below), and then press [SELECT]. “●” is marked on the relevant file and a file to be copied becomes in a selected status.

2. Select a file to be copied.

   - Move the cursor to the row of the “No.” (① in the figure below), and then press [SELECT]. Specification of the file number is enabled and the cursor jumps to the relevant file.

   - The cursor can be moved or the window can be scrolled by pressing [↑], [↓], or [SHIFT] + [↑] or [↓].

   - When moving the cursor to the row of the “Src No.” (② in the figure below), and then press [SELECT]. “●” is marked on the relevant file and a file to be copied becomes in a selected status.
3. Select a copy destination file.

- Move the cursor to the row of the “No.” (① in the figure below), and then press [SELECT]. Specification of the file number is enabled and the cursor jumps to the relevant file.

- The cursor can be moved or the window can be scrolled by pressing [↑], [↓], or [SHIFT] + [↑] or [↓].

- When moving the cursor to the row of the “Src No.” (② in the figure below), and then press [SELECT]. “●” is marked on the relevant file and a copy destination file becomes in a selected status.

Note: Selecting more than one copy destination files.

- The copy destination file can be selected by moving the cursor to the row of the “DestNo.” (③ in the figure below), and then press [SELECT].

- When selecting more than two destination files, press [SHIFT]+[SELECT] first, then move the cursor to other files. “●” is marked on each file and those copy destination file becomes in a selected status.

4. Execute copying

- When pressing [EXECUTE] (④ in the figure below), a confirmation dialog box appears

- Select [YES] to execute copying.

- Select [NO] to cancel copying.
Other Operations

5 Jumps to {TOP LINE}.
Jumps to the top line of the available file at a welding robot for editing.

6 Jumps to {ENDLINE}.
Jumps to the last line of the available file at a welding robot for editing.

7 Jumps to {DESIGNATED LINE}.
Jumps to the designated line of the available file at a welding robot for editing.

8 Jumps to {SOURCE LINE}.
Jumps to the source line for copying.

9 Jumps to {SELECT ALL (COPYING)}.
All the lines are selectable.

10 Jumps to {CANCEL ALL (COPYING)}.
Cancels all the lines selected as destinations for copying.
1.5.7 Welding Speed Specifications

The welding speed is determined by one of the following:

- Welding speed specified by the play speed of the move instruction
- Welding speed specified by the ARCON instruction or the arc start condition file

*When the move instruction does not specify a speed*
Welding is performed at the welding speed of the ARCON instruction.

*When the move instruction and ARCON instruction specify different speeds*
Priority is given to one according to the parameter values described below. To switch the priorities, change the parameter setting.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Contents</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AxP005</td>
<td>Move instruction speed is priority</td>
<td>0</td>
</tr>
<tr>
<td>x: Application number</td>
<td>ARCON instruction speed is priority : 1</td>
<td></td>
</tr>
</tbody>
</table>

1.5.8 Welding Condition Batch Change Function

This function changes all the welding conditions in the job collectively. This change varies in the following ways.

- Changes specified jobs collectively
- Changes jobs within the specified range collectively.

Welding conditions changeable are as follows.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Changeable to</th>
<th>Input range</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Changes the AC (welding current value) specified by the welding instruction to the value input in {VALUE}.</td>
<td>1 to 999</td>
</tr>
<tr>
<td>AV</td>
<td>Changes the AV (welding voltage value) specified by the welding instruction to the value input in {VALUE}.</td>
<td>0.1 to 50.0</td>
</tr>
<tr>
<td>AVP</td>
<td>Changes the APV (proportion to appropriate voltage) specified by the welding instruction to the value input in {VALUE}.</td>
<td>50?150</td>
</tr>
<tr>
<td>Relative: AC</td>
<td>Changes the AC (welding current value) specified by the welding instruction to the proportion of the value input in {VALUE}.</td>
<td>1 to 200</td>
</tr>
<tr>
<td>Relative: AV</td>
<td>Changes the AV (welding voltage value) specified by the welding instruction to the proportion of the value input in {VALUE}.</td>
<td>1 to 200</td>
</tr>
<tr>
<td>Relative: AVP</td>
<td>Changes the APV (proportion to appropriate voltage) specified by the welding instruction to the proportion of the value input in {VALUE}.</td>
<td>1 to 200</td>
</tr>
<tr>
<td>Relative</td>
<td>Changes the value of either AC, AV, or APV specified by the welding instruction to the proportion of the value input in {VALUE}.</td>
<td>1 to 200</td>
</tr>
</tbody>
</table>

*SUPPLEMENT*
When “RELATIVE:**” or “RELATIVE” is set to {CONDITION TYPE} and change of the welding condition is executed, the maximum value is set to the welding condition in case the changed value exceeds the upper limit of the input range.
1.5.8.1 Batch Change of Welding Conditions in Specified Job

Welding conditions of a whole job can be changed collectively.

1. Display a job in which the welding conditions are to be changed.
2. Move the cursor to the instruction area.
3. Select (EDIT) → (CHANGE WELD. COND.) under the main menu.
   – (WELDING CONDITION CHANGE) window appears.
4. Set “NO CONFIRM” to (CHANGE METHOD)
5. Specify (CONFIRM) to (CHANGE METHOD).

6. Input a value to (VALUE).

7. Select (EXECUTE) or press [ENTER].
   - Welding condition in the selected job.
1.5.8.2 Batch Change of Welding Conditions in Specified Job after Confirmed Individually

Welding conditions of a whole job can be changed after confirmed by instructions.

1. Display a job in which the welding conditions are to be changed.
2. Move the cursor to the instruction area.
3. Select [EDIT] → [CHANGE WELD. COND.] under the main menu.
   - (WELDING CONDITION CHANGE) window appears.
4. Set "NO CONFIRM" to [CHANGE METHOD]
1 Arc Welding Application
1.5 Basic Functions

5. Specify \{CONFIRM\} to \{CHANGE METHOD\}.

6. Input a value to \{VALUE\}.

7. Select \{EXECUTE\} or press [ENTER].
   – The message "Changing welding condition." appears.
   – The cursor moves to the instruction in which the specified welding condition is included.
8. Press [ENTER].
   - The welding condition to which the cursor is moved is changed.
   - The cursor moves to the next instruction.

9. Press [↑] or [↓].
   - The cursor moves to the upper or lower instruction that includes the specified welding condition.

10. The instruction at the last line of the welding condition job is changed or press [CANCEL].
    - Change of the welding condition operation is completed.
    - The message “Changing welding condition.” disappears.
1.5.8.3 Batch Change of Welding Conditions within Specified Range

Welding conditions in a specified range can be changed.

1. Display a job in which the welding conditions are to be changed.
2. Move the cursor to the welding condition change start line, and then press [→] to move it to the instruction area.

3. Press [SHIFT] + [SELECT].
   - A line in the window becomes in a selectable status.

4. Press [↓] or [↑] to select the range in which the welding conditions are to be changed.
   - Two or more lines are selected.
5. Select {EDIT} → {CHANGE WELD. COND.} under the main menu.

- The WELDING CONDITION CHANGE window appears.
- START LINE NO.: Start line No. of the selected range is displayed.
- END LINE NO.: End line No. of the selected range is displayed.

6. Set “NO CONFIRM” to “CHANGE METHOD”.

7. To “CONDITION TYPE”, specify a condition to be changed.
8. Input a value to “VALUE”.

![Image of welding condition change window]

9. Select [EXECUTE] or press [ENTER].
   - The welding conditions within the selected range are changed.

![Image of job content window]

Instructions with no welding conditions specified by “CONDITION TYPE” would not be changed even if they are within the selected range.
1.5.8.4 Batch Change of Welding Conditions in Specified Range after Confirmed Individually

Welding conditions within the specified range can be changed after confirmed by instructions.

1. Display a job in which the welding conditions are to be changed.

2. Move the cursor to the welding condition change start line, and then press [→] to move it to the instruction area.

3. Press [SHIFT] + [SELECT].
   – A line in the window becomes in a selectable status.

4. Press [↓] or [↑] to select the range in which the welding conditions are to be changed.
   – Two or more lines are selected.
5. Select (EDIT) → (CHANGE WELD. COND.) under the main menu.

- The WELDING CONDITION CHANGE window appears.
- START LINE NO.: Start line No. of the selected range is displayed.
- END LINE NO.: End line No. of the selected range is displayed.

6. Set “CONFIRM” to “CHANGE METHOD”.

7. To “CONDITION TYPE”, specify a condition to be changed.
8. Input a value to “VALUE”.

9. Select {EXECUTE} or press [ENTER].
   - The message “Changing welding condition.” appears.
   - The cursor moves to the instruction in which the specified welding condition is included.

10. Press [ENTER].
    - The welding condition to which the cursor is moved is converted.
    - The cursor moves to the next instruction.
11. Press [↑] or [↓].
   – The cursor moves to the upper or lower instruction that includes the specified welding condition.

12. The instruction at the last line of the welding condition job is changed or press [CANCEL].
   – Change of the welding condition operation is completed.
1.5.9 Welding Execution Function during Teach Mode

When the [WELD ON/OFF] is pressed, the LED is lit with a beep sound, turning ON the system output signal “#50065: PERMISSIBLE WORK IN TEST RUN”.

When pressing this key once again, the LED goes out and the beep sound stops, then the system output signal “#50065: PERMISSIBLE WORK IN TEST RUN” turns OFF.

The standard ladder program of arc welding application supports the function that welding can be performed during the teach mode by the signal “#50065: PERMISSIBLE WORK IN TEST RUN”.

*Welding can be performed during a test run only when the security mode is the management mode.

*Welding cannot be performed during a test run even while the LED is lit unless the security mode is the management mode.

During a test run of the teach mode, the manipulator may not move at the actual welding speed due to the speed limit in some cases. (e.g. at a welding position/point where the manipulator significantly changes its posture during a coordinated motion with a station)

In these cases, weld bead may be thicker compared with the bead that is formed during the playback operation, or burn through may occur as the speed of the welding is different from the speed that is appropriate for the welding conditions (current and voltage).

1.5.10 Test Run Operation Mode

In a test run, the manipulator is moved through taught steps in a continuous motion by pressing [INTERLOCK] and [TEST START] simultaneously.

 Normally the manipulator moves only while [TEST START] is pressed after the above-mentioned keys are pressed simultaneously. However, by setting the following parameter, the manipulator becomes to be moved only while [INTERLOCK] is pressed.

* Test run operation mode (S2C308 d1 bit)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Contents and setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2C308</td>
<td>Continue test run by pressing [TEST START] : 1</td>
</tr>
<tr>
<td></td>
<td>Continue test run by pressing [INTERLOCK] : 3</td>
</tr>
<tr>
<td></td>
<td>(Pressing [TEST START] is also available to continue test run.)</td>
</tr>
</tbody>
</table>
1.5.11 Notes on Arc Welding

1.5.11.1 Notes on Restarting

If the manipulator stops during welding, the arc is automatically turned OFF. When restarted, the arc is automatically turned ON, and the manipulator starts welding towards the step where the cursor is located on the screen. The welding current and voltage when arc is turned ON again are the same as those before stopping.

Bang text diagram:

If the manipulator is moved from the stopped position using [Axis Key], return the manipulator to the stopped position before restarting for safe operation.

It is possible to move the manipulator to the stopped position automatically at restarting and start welding again by the parameter setting (S2C422, S2C423).

[FWD] or [BWD] can be used for moving to the stopped position.

- S2C422: Restart Operation after E-Stop (Set 2).
- S2C423: Restart Operation after Jog Operation (Set 2).

Refer to “YRC1000 GENERAL OPERATOR’S MANUAL (RE-CSO-A051) 8 Parameter”.

Danger text diagram:
1.6 Arc Retry Function

An attachment to the welding start position of a non-conductive material, such as rust, soot, and oil, may cause an arc start failure during arc start. An arc start failure stops the manipulator and interrupts work. This is prevented by using the arc retry function.

When an arc start failure occurs and this arc retry function is performed, the ARCON process is repeated according to the retry condition defined in the Arc Auxiliary Condition File. The manipulator repeats the ARCON procedure as it slightly shifts its position near the arc starting point. After that, the manipulator returns to the starting point when an arc starts and continues working.

*Fig. 1-13: Retry Function Example*

1. Arc Start Failure
2. The Retry Procedure
   - Returns toward the previous step and performs a retract inching, then returns to the teaching starting point and repeats the ARCON procedure.
3. After a successful arc start, the manipulator continues to weld.
1.6 Arc Retry Function Setting

1. NO. (0 to 9 times)
   Maximum repetition count for the arc retry process.

2. RETRACT TIME (0 to 2.50 seconds)
   Wire retracting time in the arc retry process.

3. REPLAY DISTANCE (0 to 99.9 mm)
   Manipulator moving distance for an arc retry process at the replay mode.

4. SPEED (1 to 600 cm/min)
   Speed of the manipulator when it returns to the welding start point at arc retry.
   When the welding start condition file (ASF#()) is specified to ARCON instruction or “REPLAY” is specified in the retry mode, the retry operation is executed not at the speed in the arc auxiliary condition file, but at the speed specified in the move instruction before ARCON instruction.

5. CURRENT (1 to 999A)
   Welding current output when the manipulator returns to the welding start point at arc retry.
   When the welding start condition file (ASF#()) is specified to ARCON instruction or “REPLAY” is specified in the retry mode, not the current value in the arc auxiliary condition file, but the value in the welding start condition file or the value specified in the AC tag of ARCON instruction is output.

6. VOLTAGE (0 to 50.0V, 50 to 150%)
   Welding voltage output when the manipulator returns to the welding start point at arc retry.
   When the welding start condition file (ASF#()) is specified to ARCON instruction or “REPLAY” is specified in the retry mode, not the voltage value in the arc auxiliary condition file, but the value in the welding start condition file or the value specified in the AV/AVP tag of ARCON instruction is output.

When the twin synchronous function, etc. is used, the arc retry function cannot be used.
1.7 Arc Restart Function

When the manipulator stops because of an arc failure, a simple start would leave a break in the welding line. This is prevented by using the arc restart function. When the arc restart function is executed, the manipulator is restarted using the method specified in the Arc Auxiliary Condition File*1.

There are three methods to restart the manipulator after an arc failure:

- With the arc OFF the controller outputs an error signal and the message “RESTARTING FOR ARC”, but continues manipulator’s movement. After exiting the arc section, the controller outputs the message “END OF ARC RESTARTING”, and continues the operation.

- With the arc ON trial, the manipulator automatically returns for the specified overlap length*2, and then continues welding.

- The manipulator stops and waits for a manual intervention. After intervention (A), the operator should return the manipulator to the original stop position (B). And then press [START] again. The manipulator returns for the specified overlap length*2 (C) and continues the work.

*1 The arc auxiliary condition file defines the following: current, voltage and speed at restart; method of restart after a gas shortage or wire shortage.

*2 The overlap length (the length of the section where welding is repeated after a restart) can be set as desired (0 to 99.9mm).
NOTE

A cursor operation resets the "restarting" status. Therefore, the arc restart function cannot be executed after the cursor operation.
1.7 Arc Restart Function

1.7.1 Arc Auxiliary Condition File

1.7.1.1 Arc Restart Function Setting

1. NO. (0 to 9 times)
   Maximum repetition count for the arc restart process regarding the same welding section.

2. LAP DISTANCE (0 to 99.9 mm)
   Overlapped welding distance in a restart process.

3. SPEED (1 to 600 cm/min)
   Speed of the manipulator as it moves backward in an arc restart process.

4. CURRENT (1 to 999 A)
   Welding current output when the manipulator moves backward in an arc restart process.

5. VOLTAGE (0 to 50.0 V, 50 to 150%)
   Welding voltage output when the manipulator moves backward in an arc restart process.

6. RESTART MODE
   1. ARC FAILURE
      (1) NO RESTART:
         – Arc restart function is not used. The manipulator stops with the arc failure alarm.
      (2) ARCOF CONTINUE:
         – With the arc OFF, the controller outputs the “Restarting for Arc” message and the manipulator keeps moving.
         – After moving through the arc section, the controller outputs the “End of Arc Restarting” message and resumes a normal welding operation.
         – The message is reset when OT #4093 is turned ON and OFF.
      (3) AUTO RESTART:
         – The manipulator automatically restarts.
      (4) SEMI-AUTO RESTART:
         – The manipulator stops and waits for manual intervention.
         – The manipulator restarts as the operator presses [START] again.
         – The restart status is reset when OT #4094 is turned ON and OFF.
2. GAS FAILURE

(1) NO RESTART:
- Arc restart function is not used. The manipulator moves with the gas shortage alarm.

(2) ALARM AT ARC END:
- The manipulator continues the welding operation until it reaches the welding end point, where it stops with an alarm.

(3) SEMI-AUTO RESTART:
- The manipulator stops and waits for manual intervention.
- The manipulator restarts as the operator presses [START] again.
- The restart status is reset when OT #4094 is turned ON and OFF.

3. WIRE FAILURE

(1) NO RESTART:
- Arc restart function is not used. The manipulator moves with the wire shortage alarm.

(2) ALARM AT ARC END:
- The manipulator continues the welding operation until it reaches the welding end point, where it stops with an alarm.

(3) SEMI-AUTO RESTART:
- The manipulator stops and waits for manual intervention.
- The manipulator restarts as the operator presses [START] again.
- The restart status is reset when OT #4094 is turned ON and OFF.

SUPPLEMENT

• When the complete synchronization of the twin synchronous function is used, the arc restart function cannot be used.

• The signal to reset the message “End of Arc Restarting” differs depending on the power source:
OT#4093 (power source 1), OT#4085 (power source 2),
OT#4077 (power source 3), OT#4069 (power source 4),
OT#4061 (power source 5), OT#4053 (power source 6),
OT#4045 (power source 7), OT#4037 (power source 8)

• The signal to reset the restart status differs depending on the power source:
OT#4094 (power source 1), OT#4086 (power source 2),
OT#4078 (power source 3), OT#4070 (power source 4),
OT#4062 (power source 5), OT#4054 (power source 6),
OT#4046 (power source 7), OT#4038 (power source 8)
1.8 Automatic Wire-Stick Release Function

- Automatic Wire-Stick Release Function
  The automatic wire-stick release function can be used if wire stick is detected in spite of the anti-stick process.

  When this function is used, the manipulator does not immediately output the wire sticking signal upon detecting a wire stick, but automatically attempts to release the sticking by applying a certain voltage.

  Only when the stick release process has failed for a specified number of times, the manipulator stops and outputs the wire stick signal.

  This function is specified in the arc end condition file or the ARCOF instruction's additional items. When it is used, the voltage and number of attempts are set in the arc auxiliary condition file.

- Manipulator Stopped by Wire Stick
  If a wire stick occurs at the end of welding, the manipulator immediately stops in the hold status. While the manipulator remains in the hold status, the [HOLD] lamp lights and the external system output signal “Wire Sticking” is output.
1.8.1 Arc Auxiliary Condition File

1.8.1.1 Automatic Wire Anti-Stick Function Setting

1. NO. (0 to 9 times)
   Maximum repetition count for the wire-sticking release process.

2. CURRENT (1 to 999 A)
   The welding current output in the wire-sticking release process.

3. VOLTAGE (0 to 50.0 V, 50 to 150%)
   The welding voltage output in the wire-sticking release process.

4. CLOCK (0 to 2.00 seconds)
   Sticking release process duration.
1.9 Wire-Stick Check Function

- **Anti-Stick Function**
  
The wire may stick to the workpiece after welding is completed (1).

  As an anti-stick process, the Power Source temporarily increases the voltage at the end of welding (2).

  After the anti-stick process, a wire stick check is performed (3).

  If the anti-stick process failed and a wire stick is detected, the manipulator enters a hold status or performs the automatic sticking release process, depending on the anti-stick condition specified.

  Time required for the anti-stick process differs depending on the Power Sources.

  The anti-stick process times for different Power Sources is registered in the Power Source characteristic file.

  The wire check is performed after the anti-stick process time has elapsed.

  **Supplement**

  "Wire stick" refers to the contact of the wire to the workpiece as observed after the arc-OFF.

1. Welding End (Wire Stick Occurrence)

![Wire stick to workpiece]

2. Anti-stick Process

![Voltage increased temporarily as anti-stick process]

3. Wire Stick Check

  - Wire stick check is performed after elapsing of the anti-stick process time defined in the Power Source characteristic file.

![Wire stick to workpiece]


1.10  **Slope Up/Down Function**

The slope up/down function is used during welding to gradually change the welding condition.

This function is extremely effective in conducting heat for such operations on workpieces such as the one shown below.

During the welding of a workpiece as shown below, especially during the period before the end of welding, the tearing or dropping of metal can occur quite frequently due to heat conduction.

However, even in this example, if the welding condition is gradually decreased before the end of welding, tearing and dropping of metal can be prevented.

![Image of welding process](image)

Welding start point (P1) and welding end point (Pn) must be the same.

<table>
<thead>
<tr>
<th>Reference Job</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NOP</td>
<td></td>
</tr>
<tr>
<td>MOVL V=500</td>
<td></td>
</tr>
<tr>
<td>ARCON AC=210 AVP=100</td>
<td></td>
</tr>
<tr>
<td>MOV C V=80</td>
<td></td>
</tr>
<tr>
<td>MOV C V=80</td>
<td></td>
</tr>
<tr>
<td>MOV C V=80</td>
<td></td>
</tr>
<tr>
<td>ARCC TE AC=180 AVP=100 DIS=20.0</td>
<td></td>
</tr>
<tr>
<td>MOV C V=80</td>
<td></td>
</tr>
<tr>
<td>ARCOF AC=160 AVP=80 T=0.30</td>
<td></td>
</tr>
<tr>
<td>END</td>
<td></td>
</tr>
</tbody>
</table>

Moves to welding start point P1.
Arc starts.

Moves to taught point Pn-1.
Gradually decreases the current from the point 20mm short of the welding end point.
Moves to welding end point Pn.
Arc ends.

![Diagram of welding process](image)
1.10.1 ARCCCTS

1.10.1.1 Function

The ARCCCTS instruction is used with a move instruction to gradually change the welding current and voltage during welding.

A gradual change in the current or voltage is specified by an aimed value and the length of the slope up/down section. The length of the slope up/down section is set from the move start point (DIS).

If no length is specified, the entire section of the move instruction is used.

1.10.1.2 Syntax
# Arc Welding Application

## 1.10 Slope Up/Down Function

### 1.10.1.3 Explanation

- **WELDn/WELD2/WELD3/WELD4/WELD5/WELD6/WELD7/WELD8 [1]**
  
  Choose one of the following tags.

  These tags are enabled only when multiple applications are in use and two or more applications are set as arc welding application.

  When there is only one application, these tags are not displayed.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELDn</td>
<td>Selects the Power Source 1 to 8.</td>
<td></td>
</tr>
</tbody>
</table>

- **AC = Current output value [2]**
  
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
| AC = Current output value | Specifies the target value of welding current. | Current value: 1 to 999 A  

- **AV = Voltage output value /AVP [3] = Percentage against the proper voltage output value [4]**
  
  Be sure to choose either of the following.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
| AV = Voltage output value | Specifies the target value of welding voltage. | Voltage value: 0.1 to 50.0 V  
The voltage output value can be specified by B/I/D/B[I]/I/D/LB/LI/LD/LB[I]/LI[L]/LD[L] variable. (Unit: 0.1 V) |
| AVP = Percentage against the proper voltage output value | Specifies the target value of welding voltage by the percentage against the proper output value of welding voltage. | Percentage: 50 to 150%  

- **AN3 = Voltage target value [5]**
  
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
| AN3 = Voltage target value | Specifies the voltage target value for the analog output 3. | Target value: -14.00 to +14.00 V  
The voltage target value can be specified by I/LI[I]/LI[L] variable. (Unit: 0.01 V) |
1 Arc Welding Application
1.10 Slope Up/Down Function

- **AN4 = Voltage target value [6]**
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN4 = Voltage target</td>
<td>Specifies the voltage target value for the analog output 4.</td>
<td>Target value: -14.00 to +14.00 V. The voltage target value can be specified by I/L/I[]/I[] variable. (Unit: 0.01 V)</td>
</tr>
<tr>
<td>target value</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **DIS = Slope up/down section length [9]**
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIS = Slope up/down</td>
<td>Specifies the slope up/down section length where the current and voltage are gradually changed. The length is set as the distance from the move start point. If no length is specified, the entire section of the move instruction is used.</td>
<td>Length: 0.1 to 6553.5 mm. The slope up/down section length can be specified by B/I/D/[ ]/I/[ ]/D/[ ]/B/L/L/I/LD/ LB/[ ]/LI/[ ]/LD[ ] variable. (Unit: 0.1 mm)</td>
</tr>
<tr>
<td>section length</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<Example>

The current and voltage are gradually changed as the manipulator moves toward the move end point specified by the move instruction. The aimed current and voltage values are 150A and 16.0V respectively. The slope up/down section length is 100mm from the move start point.

```
ARCCTS      AC=150
AV=16.0
DIS=100.0
MOVL      V=80
```

Target value of welding current
Target value of welding voltage
Slope up/down section length (distance from move start point)
1.10 Slope Up/Down Function

Gradually Decreasing Current or Voltage

Gradually Increasing Current or Voltage

NOTE

• The ARCCTS or ARCCTE instruction is valid for only one step.

• If the move section specified by the move instruction is shorter than the distance specified by the slope up/down section length (DIS=XXX), the change is performed equally in the entire section of the move instruction.

• If the ARCCTS or ARCCTE instruction specifies the distance as zero (DIS=0.00), the change is performed equally in the entire section of the move instruction.

• A pair of ARCCTS and ARCCTE instructions can be used on one move instruction. In this case, the ARCCTS instruction is executed first, then the ARCCTE instruction is executed in the remaining part of the move section. If the remaining part of the move section is 0mm, the value instantly changes to the value specified in the ARCCTE instruction.
1.10 Slope Up/Down Function

1.10.4 Registering the ARCCTS Instruction

1. Press [INFORM LIST].

   – The instruction list dialog box appears.

2. Select the ARCCTS instruction.

   – The ARCCTS instruction appears in the input buffer line.

3. Press [SELECT] and set the welding condition in the DETAIL EDIT window.

   – The DETAIL EDIT window appears.

(1) Move the cursor to the item to be set and press [SELECT].
1 Arc Welding Application
1.10 Slope Up/Down Function

(2) Type the welding conditions using [Numeric Key] and press [ENTER].

(3) To add the additional items, place the cursor on the item with the “UNUSED” condition and press [SELECT]. The selection dialog box appears.
To delete the additional items, line up the cursor with the additional items and select “UNUSED”.

4. Press [ENTER].
– The set contents are displayed in the input buffer line.
5. Press [ENTER].

– The set contents are registered in the job.

– Press [CANCEL] to return to the JOB CONTENT window when the set contents are not to be registered.
1.10.2 ARCCTE

1.10.2.1 Function

The ARCCTE instruction is used with a move instruction to gradually change the welding current and voltage during welding. A gradual change in the current or voltage is specified by an aimed value and the length of the slope up/down section. The length of the slope up/down section is measured from the move end point (DIS). If no length is specified, the entire section of the move instruction is used.

1.10.2.2 Syntax
1.10 Slope Up/Down Function

1.10.3 Explanation

- **WELDn [1]**
  Choose one of the following tags.

  These tags are enabled only when multiple applications are in use and two or more applications are set as arc welding application.

  When there is only one application, these tags are not displayed.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELDn</td>
<td>Selects the Power Source 1 to 8.</td>
<td></td>
</tr>
</tbody>
</table>

- **AC = Current output value [2]**
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
  | AC = Current output value | Specifies the target value of welding current. | Current value: 1 to 999 A 
The current output value can be specified by B/I/D/B/[ ]/I/[ ]/D/[ ]/LB/LI/LD/LB/[ ]/L[ ]/LD[ ] variable. |

- **AV = Voltage output value /AVP [3] = Percentage against the proper voltage output value [4]**
  Be sure to choose either of the following.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
  | AV = Voltage output value | Specifies the target value of welding voltage. | Voltage value: 0.1 to 50.0 V 
The voltage output value can be specified by B/I/D/B/[ ]/I/[ ]/D/[ ]/LB/LI/LD/LB/[ ]/L[ ]/LD[ ] variable. (Unit: 0.1 V) |
  | AVP = Percentage against the proper voltage output value | Specifies the target value of welding voltage by the percentage against the proper output value of welding voltage. | Percentage: 50 to 150% 
The voltage output value can be specified by B/I/D/B/[ ]/I/[ ]/D/[ ]/LB/LI/LD/LB/[ ]/L[ ]/LD[ ] variable. |

- **AN3 = Voltage target value [5]**
  This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
  | AN3 = Voltage target value | Specifies the voltage target value for the analog output 3. | Target value: -14.00 to +14.00 V 
The voltage target value can be specified by I/L/I/[ ]/L[ ] variable. (Unit: 0.01 V) |
### 1.10 Slope Up/Down Function

This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
</table>
| AN4 = Voltage target value | Specifies the voltage target value for the analog output 4.                                                                                                                                                  | Target value: -14.00 to +14.00 V  
The voltage target value can be specified by I/LI/I[I]/LI[]. (Unit: 0.01 V)                                                                                           |

| DIS = Slope up/down section length | Specifies the slope up/down section length where the current and voltage are gradually changed. The length is set as the distance from the move start point. If no length is specified, the entire section of the move instruction is used. | Length: 0.1 to 6553.5 mm  
The slope up/down section length can be specified by B/I/D/LB/LI/LD/LB[]. (Unit: 0.1 mm)                                                                 |

| AEF# (Arc welding end condition file number) | Specifies the arc welding end condition file number. Conditions to end welding are registered in the arc welding end condition file. | No. 1 to 1000  
The number can be specified by B/I/D/LB/LI/LD variable.                                                                                                           |

**<Example>**

The current and voltage are gradually changed as the manipulator moves toward the move end point specified by the move instruction. The aimed current and voltage values are 150A and 16.0V respectively. The slope up/down section length is 100mm from the move end point.

```
ARCCTE AC=150 AV=16.0 DIS=100.0
```

MOVL V=80

---

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Gradually Decreasing Current or Voltage

Gradually Increasing Current or Voltage

• The ARCCTS or ARCCTE instruction is valid for only one step.

• If the move section specified by the move instruction is shorter than the distance specified by the slope up/down section length (DIS=XXX), the change is performed equally in the entire section of the move instruction.

• If the ARCCTS or ARCCTE instruction specifies the distance as zero (DIS=0.00), the change is performed equally in the entire section of the move instruction.

• A pair of ARCCTS and ARCCTE instructions can be used on one move instruction. In this case, the ARCCTS instruction is executed first, then the ARCCTE instruction is executed in the remaining part of the move section. If the remaining part of the move section is 0mm, the value instantly changes to the value specified in the ARCCTE instruction.
1.10.2.4 Registering the ARCCTE Instruction

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

2. Select the ARCCTE instruction.
   - The ARCCTE instruction appears in the input buffer line.

3. Press [SELECT] and set the welding condition in the DETAIL EDIT window.
   - The DETAIL EDIT window appears.
1 Arc Welding Application
1.10 Slope Up/Down Function

(1) Move the cursor to the item to be set and press [SELECT].
(2) Type the welding conditions using [Numeric Key] and press [ENTER].
(3) To add the additional items, place the cursor on the item with the "UNUSED" condition and press [SELECT]. The selection dialog box appears.
To delete the additional items, line up the cursor with the additional items and select "UNUSED".

4. Press [ENTER].
   - The set contents are displayed in the input buffer line.
5. Press [ENTER].

– The set contents are registered in the job.

![JOB CONTENT](image1)

– Press [CANCEL] to return to the JOB CONTENT window when the set contents are not to be registered.

![JOB CONTENT](image2)
1.11 Enhanced Welding Condition File Function

The enhanced welding condition file function improves the method of setting the welding condition file. This function can be used as follows:

- Analog output to the Power Source increases by 2 channels. Therefore, Power Sources with polarity ratio control can be used.

When the type of the file changes, the welding start/end condition file is initialized.

To load a welding condition file that has been saved on an external memory device, files that are different type from those being used cannot be loaded. Load files of the same type.

1.11.1 Function Setting

To change the type of the welding condition file, set as described below.

Change the setting of the welding condition files in the management mode. In the operation mode or editing mode, the setting status can only be referred to.

1. While pressing {Main Menu}, turn ON the power. Then change the security mode to the management mode.
2. Select {SYSTEM} from the main menu and select {SETUP}.

![Setup Window]

The SETUP window appears.
3. Select “OPTION FUNCTION”.
   
   – The OPTION FUNCTION window appears.

4. Select “ARC WELDING”, then select either “STANDARD” or “ENHANCED”.
   
   – The selection dialog box appears.

   – The confirmation dialog box appears. Selecting “YES” changes the file type and initializes the related files (welding start/end condition files).
– Selecting “NO” does not change the file type or initialize the related files.

5. Turn ON the power supply again.
1.12 Weaving Operation

1.12.1 Weaving Basic Coordinate System

Weaving is performed based on the following coordinate system. This coordinate system is automatically generated when weaving is executed.

- **Wall Direction**: Z-direction of the robot axis
- **Horizontal Direction**: The direction to the approach point from the wall
- **Direction of Travel**: The direction in which the manipulator 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 mounting status and shape of the workpiece, a definition of the above coordinate system may not be sufficient to generate a weaving pattern. In this case, register the reference point REFP 1, REFP 2, or REFP 3 (MODE: ELLIPSE).

If the “MODE” is set to “ELLIPSE”, the reference point REFP 1 will not be referred to.

For details, see chapter 1.12.4.2 “Editing the Condition Data.”
1.12.1.1 Cases that Require the Registration of Reference Points

The registration of the reference point REFP 1, REFP 2, or REFP 3 is not usually required. They are required only with a special workpiece condition, etc.

The REFP 1, that defines the wall direction, is a point on the wall surface or its expansion plane. The REFP 2, which defines the horizontal direction, is a point at the right or left side of the wall.

If the “MODE” is set to “ELLIPSE”, REFP 3 is the reference point which defines the direction of travel.

For information on registering REFP, refer to “YRC1000 GENERAL OPERATOR’S MANUAL (RE-CSO-A051) 3.2.3.2 Registering Reference Point Instructions”.

< Example 1 >
REFP 1 is registered because the wall direction is not parallel to the Z-axis of the robot coordinates.
<Example 2>
REFP 2 is registered because the approach point is at another side of the wall.

If the weaving start step (immediately before WVON) and the previous step (approach point) are same, the weaving start point and the approach point become same, and the horizontal direction become undefined.
In this case, register the reference point REFP 2.
1.12.2 WVON

1.12.2.1 Function

This is the weaving start operation.

1.12.2.2 Syntax

The tag to be used varies according to the control group of job.

```
WVON
```

```
1 RBl
```

```
2 WEV#
```

```
( Weaving condition file number
```

```
3 AMP=
```

```
Weaving half-amplitude (mm)
```

```
4 FREQ=
```

```
Weaving frequency
```

```
5 ANGL=
```

```
Weaving angle (degree)
```

```
6 DIR=
```

```
Starting direction of weaving
```

Table 1-1: Job Type and Control Group

<table>
<thead>
<tr>
<th>Type</th>
<th>Control Group of Job</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent</td>
<td>Job with one manipulator (Standard)</td>
<td></td>
</tr>
<tr>
<td>Coordinated</td>
<td>Job with two manipulators</td>
<td>Option</td>
</tr>
</tbody>
</table>

Table 1-2: Tag Usage Limitation

<table>
<thead>
<tr>
<th>Tag</th>
<th>Control Group of Job</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>RB1</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB2</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB3</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB4</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB5</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB6</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB7</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB8</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>WEV#()</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>AMP=</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>FREQ=</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>ANGL=</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>DIR=</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

O: Available
X: Not available
1.12.3 Explanation

- **RBn [1]**
  Be sure to choose one of the following tags.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBn</td>
<td>Specifies the weaving motion of robot 1 to 8.</td>
<td></td>
</tr>
</tbody>
</table>

- **WEV# (Weaving condition file number)/AMP [2] = Weaving half-amplitude [3]**
  Be sure to choose one of the following tags.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEV# (Weaving condition file number)</td>
<td>Specifies the weaving condition file number. Conditions for the weaving motion are registered in the weaving condition file.</td>
<td>No. 1 to 16 The number can be specified by B/I/D/LB/LI/LD variable.</td>
</tr>
<tr>
<td>AMP = Weaving half-amplitude</td>
<td>Specifies the half-amplitude of weaving.</td>
<td>Half-amplitude: 0.1 to 99.9 mm The half-amplitude can be specified by B/I/D/LB/LI/LD variable. (Unit: 0.1 mm)</td>
</tr>
</tbody>
</table>

- **FREQ = Weaving frequency [4]**
  Only when “AMP = Weaving half-amplitude” is selected in the above “WEV# (Weaving condition file number)/AMP [2] = Weaving half-amplitude [3]”, be sure to add the following tag.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQ = Weaving frequency</td>
<td>Specifies the weaving frequency.</td>
<td>Frequency: 0.1 to 5.0 Hz The frequency can be specified by B/I/D/LB/LI/LD variable. (Unit: 0.1 Hz)</td>
</tr>
</tbody>
</table>

- **ANGL = Weaving angle [5]**
  Only when “AMP = Weaving half-amplitude” is selected in the above “WEV# (Weaving condition file number)/AMP [2] = Weaving half-amplitude [3]”, this tag is added or omitted after “FREQ = Weaving frequency [4]”

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANGL = Weaving angle</td>
<td>Specifies the weaving angle.</td>
<td>Angle: 0.0 to 180.0 degree The degree can be specified by B/I/D/LB/LI/LD variable. (Unit: 0.1)</td>
</tr>
</tbody>
</table>
### DIR = Starting direction of weaving [6]

This tag can be added or omitted.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIR = Starting direction of weaving</td>
<td>Specifies the starting direction of weaving.</td>
<td>Direction: 0 to 1 0: Forward 1: Backward The direction can be specified by B/I/D/B]/I]/D]/LB/LI/LD/LB]/LI]/LD]/ variable.</td>
</tr>
</tbody>
</table>
Setting conditions for weaving

• Weaving half-amplitude
  Specify the amplitude size of weaving motion.

• Weaving angle
  Specify the angle of weaving motion.

• Starting direction of weaving
  Specify the starting direction of weaving motion.

MODE: TRIANGLE, L-TYPE

- SINGLE
- TRIANGLE
- L-TYPE
- ELLIPSE
1.12.2.4 Registering the WVON Instruction

This is the instruction to start the weaving operation.

1. Move the cursor to the address area.
2. Press [INFORM LIST].
   – The instruction list dialog box appears.
3. Select "DEVICE".
4. Select the WVON instruction.
   – The "WVON" instruction appears in the input buffer line.
1. Arc Welding Application

1.12 Weaving Operation

5. Press [SELECT], and set the file number in the DETAIL EDIT window.
   – Select the file number (1 to 255).
   (1) Move the cursor to the file number and press [SELECT].
   (2) Input the file number using [Numeric Key] and press [ENTER].

6. Press [ENTER].
   – The set contents are displayed in the input buffer line.

   – The set contents are registered in the job.

   When the set contents are not to be registered, press [CANCEL] to return to the JOB CONTENT window.
1.12.3 WVOF Instruction

1.12.3.1 Function

This is the weaving end instruction.

1.12.3.2 Syntax

The control group of job limits the tag usage.

![Diagram](image)

**Table 1-3: Job Type and Control Group**

<table>
<thead>
<tr>
<th>Type</th>
<th>Control Group of Job</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent</td>
<td>Job with one manipulator (Standard)</td>
<td></td>
</tr>
<tr>
<td>Coordinated</td>
<td>Job with two manipulators</td>
<td>Option</td>
</tr>
</tbody>
</table>

**Table 1-4: Tag Usage Limitation**

<table>
<thead>
<tr>
<th>Tag</th>
<th>Control Group of Job</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB1</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB2</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB3</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB4</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB5</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB6</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB7</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB8</td>
<td>X</td>
<td>O</td>
</tr>
</tbody>
</table>

| O: Available |
| X: Not available |

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1.12 Weaving Operation

1.12.3.3 Explanation

**RB1/RB2/RB3/RB4/RB5/RB6/RB7/RB8 [1]**

Be sure to choose one of the following tags.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBn</td>
<td>Specifies the weaving motion of robot 1 to 8.</td>
<td></td>
</tr>
</tbody>
</table>

**Example**

NOP

MOVJ VJ=50.00 · · · Step 1
MOVL V=220  · · · Step 2
MOVL V=200  · · · Step 3
WVON WEV#(2) · · · Weaving start
ARCON AC=220 AVP=100 T=0.50 · · · Welding start
MOVL V=138  · · · Step 4
ARCOF AC=160 AVP=90 T=0.50 · · · Welding end
WVOF  · · · Weaving end
MOVL V=200  · · · Step 5
MOVJ VJ=50.00 · · · Step 6
END  · · ·
1.12.3.4 Registering the WVOF Instruction

This is the instruction to end the weaving operation.

1. Move the cursor to the address area.
2. Press [INFORM LIST].
   – The instruction list dialog box appears.
3. Select “DEVICE”.
4. Select the “WVOF” instruction.
5. Press [ENTER].
   – The set contents are registered in the job.
### 1.12.4 WEAVING CONDITION Window

A. **COND NO. (1 to 255)**  
The weaving condition file number between 1 and 255 is shown.

B. **MODE, C. SMOOTH**  
Set the weaving mode to SINGLE, TRIANGLE, L-TYPE, or ELLIPSE. For the SINGLE, TRIANGLE, or L-TYPE mode, ON/OFF of SMOOTH can be set.

![Weaving Modes]

D. **SPEED TYPE (FREQUENCY, MOVING TIME)**  
Specify the setting type of the weaving motion speed. Two types are available: setting by frequency and setting by the moving time in each weaving section.
E. FREQUENCY
Specify the weaving frequency if "SPEED TYPE" is set to "FREQUENCY". Note that when the mode is set to "SINGLE" and the speed type is set to "FREQUENCY", the maximum frequency is determined by the amplitude as illustrated in the graph below. Specify a frequency within the allowable range.

F. AMPLITUDE TYPE (SAME, EACH)
Specify the amplitude type of weaving, SAME or EACH.
When the amplitude type is set to EACH, the right-left amplitude for SINGLE or the lateral-longitudinal amplitude for ELLIPSE (V: semi-minor axis, H: semi-major axis) can be specified.

When set to SAME in the SINGLE, TRIANGLE, or L-TYPE mode

When set to EACH in the SINGLE, TRIANGLE, or L-TYPE mode

The definitions of "right" and "left" differ depending on the wall direction, and the wall side is defined as "left".
1 Arc Welding Application
1.12 Weaving Operation

When set to SAME in the ELLIPSE mode

When set to EACH in the ELLIPSE mode

G. PATTERN

- AMPLITUDE
  Specify the amplitude size at weaving when MODE is set to SINGLE or ELLIPSE.

When AMPLITUDE TYPE is set to EACH in the above step F, specify the amplitude size individually for the right-left amplitude for SINGLE or the lateral-longitudinal amplitude for ELLIPSE (V: semi-minor axis, H: semi-major axis).
**1 Arc Welding Application**

**1.12 Weaving Operation**

- **VERTICAL, HORIZONTAL**
  If MODE is set to TRIANGLE or L-TYPE, the data for the triangle must be set to define the weaving pattern.

- **ANGLE**
  Specifies the angle of weaving motion.

**MODE: SINGLE**

**MODE: TRIANGLE, L-TYPE**

**MODE: ELLIPSE**
• TRAVEL ANGLE
  Specifies the travel angle of weaving motion.

[Diagram showing travel angles and directions]

MODE: ELLIPSE
1 Arc Welding Application
1.12 Weaving Operation

H. TIMER (MODE)
As shown below, a single weaving cycle is divided into three or four sections. The timer mode can be specified for each section.

Set one of the following timer modes:
WEAV STOP: Weaving stops but manipulator moves.
ROBOT STOP: Manipulator stops.

I. MOVING TIME
If “SPEED TYPE” is set to “MOVING TIME”, the moving time specified here determines the moving speed in each of the weaving sections (explained in “TIMER (MODE)” above).

J. STOP TIMER
Specifies the timer to determine weaving stop or manipulator stop for each section (explained in “TIMER (MODE)” above).

NOTE
If the corner radius (CR) is specified in the move instruction, weaving operations cannot be performed.

When MODE is set to ELLIPSE, weaving operations can be performed only in MOVL, MOVC, SMOVL, SMOVC, or IMOV.

NOTE
ELLIPSE cannot be used when the teaching such as the following is performed in the two-manipulator coordinated system.

- The travel distance of the master-side manipulator is longer than that of the slave-side manipulator.
K. HOVER WEAVING COND. (option)

- **SET (ON/OFF)**
  Specifies whether hover weaving is used or not.

- **TIMER**
  Finishes hover weaving when the time specified here ends.

- **INPUT SIGNAL**
  Finishes hover weaving when the input signal specified here is input.

### Reference Job

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOP</td>
<td></td>
</tr>
<tr>
<td>MOVJ VJ=10.00</td>
<td></td>
</tr>
<tr>
<td>MOVJ VJ=25.00</td>
<td></td>
</tr>
<tr>
<td>REFP 3</td>
<td></td>
</tr>
<tr>
<td>ARCON ASF#(1)</td>
<td>Welding start point.</td>
</tr>
<tr>
<td>WVON WEV#(1)</td>
<td>Reference point for defining the direction of travel.</td>
</tr>
<tr>
<td>MOVL V=60</td>
<td>*Teaching by interpolation instruction, not by joint interpolation. The same point with the welding start point.</td>
</tr>
<tr>
<td>WVOF</td>
<td></td>
</tr>
<tr>
<td>ARCOF</td>
<td></td>
</tr>
<tr>
<td>MOVJ VJ=25.00</td>
<td></td>
</tr>
<tr>
<td>MOVJ VJ=25.00</td>
<td></td>
</tr>
<tr>
<td>END</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

In hover weaving, the start and end points are the same. Therefore, the weaving direction cannot be determined. For this reason, the user needs to register a reference point (REFP 3) to define the direction of travel.
1.12.4.1 Displaying the Weaving File

1. Select {ARC WELDING} under the main menu.

2. Select {WEAVING}.

3. Display the desired file number.
   (1) The desired file can be called up by using [PAGE].
   (2) Press [PAGE] to call the next file.
   (3) Press [SHIFT]+[PAGE] to call the previous file.
1.2.4.2 Editing the Condition Data

1. Select the item to be edited.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Smooth</th>
<th>Speed Type</th>
<th>Frequency</th>
<th>Pattern</th>
<th>Amplitude</th>
<th>Vertical</th>
<th>Horizontal</th>
<th>Angle</th>
<th>Travel Angle</th>
<th>Timer Mode</th>
<th>Point 1</th>
<th>Point 2</th>
<th>Point 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE</td>
<td>OFF</td>
<td>FREQUENCY</td>
<td>3.5 Hz</td>
<td></td>
<td>2.000 mm</td>
<td>10.000 mm</td>
<td>10.000 mm</td>
<td>45.00 deg.</td>
<td>5.00 deg.</td>
<td>WEAV STOP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Input the value using [Numeric Key].

<table>
<thead>
<tr>
<th>Mode</th>
<th>Smooth</th>
<th>Speed Type</th>
<th>Frequency</th>
<th>Pattern</th>
<th>Amplitude</th>
<th>Vertical</th>
<th>Horizontal</th>
<th>Angle</th>
<th>Travel Angle</th>
<th>Timer Mode</th>
<th>Point 1</th>
<th>Point 2</th>
<th>Point 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE</td>
<td>OFF</td>
<td>FREQUENCY</td>
<td>5.0 Hz</td>
<td></td>
<td>2.000 mm</td>
<td>10.000 mm</td>
<td>10.000 mm</td>
<td>45.00 deg.</td>
<td>5.00 deg.</td>
<td>WEAV STOP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.12.5 Prohibiting Weaving

If the weaving instruction is registered during the “CHECK” operation in the play mode or “TEST RUN” or [FWD] operation in the teach mode, weaving is performed as well as other move instructions.

However, in the cases when weaving should not be performed because the manipulator collides with a workpiece, etc., follow the procedure below to prohibit weaving.

1.12.5.1 Method to Prohibit Weaving during a “CHECK” Operation

2. Select {UTILITY}.
3. Select {SETUP SPECIAL RUN}.
   – The SPECIAL PLAY window appears.
4. Select “WEAV PROHIBIT IN CHK-RUN”.
   – Each time [SELECT] is pressed, “VALID” and “INVALID” alternate.
1.12.5.2 Method to Prohibit Weaving during a "TEST RUN" or FWD Operation

1. Press [AREA] on the JOB CONTENT window in the TEACH mode.
2. Select {UTILITY}.

3. Select (SETUP SPECIAL RUN).
   - The SPECIAL TEACH window appears.

4. Select "WEAV PROHIBIT IN TEST RUN/NEXT".

1.12.5.3 Method to Prohibit Weaving by Means of a System Input Signal

The system input signal 40047 is used.
1.13 Changing Welding Conditions during Playback

1.13.1 ARC COND ADJUSTMENT Window

While the ARC COND ADJUSTMENT window is displayed in the play mode, the welding current and voltage can be changed using the function keys.

The arc welding performance during playback changes with the welding current and voltage. The adjusted data of the current and voltage values can be reflected in the associated instructions or welding condition files.

A. CURR (A)/VOLT (%)
   The welding current value and welding voltage value are displayed.

B. DATA (Change data or No change data)
   Specifies whether or not to rewrite the data of condition file or additional item.
   The data are rewritten when the execution of the instruction which includes the changed condition data ends.

C. INST
   The last instruction that sets the welding current or voltage is displayed.
   The instruction includes the following:
   • ARCON
   • ARCSET

NOTE
Changing the welding conditions during playback is enabled only when the command condition is analog type.
1. Arc Welding Application
1.13 Changing Welding Conditions during Playback

1.13.1 Displaying the ARC COND ADJUSTMENT Window
2. Select {UTILITY}.
3. Select {WELD COND. ADJUST}.

■ Changing the Welding Conditions

1. Line up the cursor with the current or voltage condition to be adjusted.
   – The current and voltage can be independently changed.

2. Select {WELD COND. ADJUST}.
   – Press [CUR/VOL] to increase the welding current and the welding voltage.
   – Press [CUR/VOL] to decrease the welding current and the welding voltage.
   – Each time the key is pressed, the current value changes in increments of 1 A, and the voltage value changes in increments of 1% or 0.1 V.
1. Select “DATA”.

- Each time [SELECT] is pressed, the setting alternates between “No change data” and “Change data”.

**NOTE**
Even if control jumps from one job to another job, rewriting of the arc condition for the former job is performed.
1.13.2 Notes on Modification of Welding Conditions

1.13.2.1 When Condition Data Cannot Be Modified

In the following cases, the window returns to the previous window of the ARC COND ADJUSTMENT window. Even if the function keys are pressed, current and voltage cannot be modified.

- When the mode is switched (to the teach mode, etc).
- When the emergency stop is activated.

**NOTE**

The maximum current and voltage values are determined according to the voltage and current characteristics of the Power Source.

*Example*

When using a Power Source with the current characteristics as shown in the following table:

When the data points are interpolated on the graph, it can be observed that the maximum reference value (14.00 V) is reached when the welding current specified by the ARCON instruction is 395 A. This becomes the maximum value.

![Fig. 1-14: Welding Current Output Characteristics](image-url)
1.13 Changing Welding Conditions during Playback

1.13.2 ARCON Instruction

The ARCON instruction without an additional item is not subject to arc condition rewriting.

- **ARCON ASF#(1)**: Current and voltage values can be rewritten.
- **ARCON AC=220 AVP=100**: Current and voltage values can be rewritten.
- **ARCON**: Conditions cannot be rewritten.

1.13.2.3 ARCOF Instruction

The conditions of the ARCOF instruction cannot be rewritten.

1.13.2.4 ARCCTS and ARCCTE Instructions

The arc condition adjustment operation is invalid while the slope up/down instruction ARCCTS or ARCCTE is executed.

Even if “Change data” is set on the ARC COND ADJUSTMENT window, rewriting cannot be done after the ARCCTS or ARCCTE instruction.

No Rewriting

![Diagram](image)

Refer to chapter 1.8.1 “Arc Auxiliary Condition File” for details regarding the ARCCTS and ARCCTE instructions.
1.14 Displaying Welding Alarm History

The historical records of welding-related alarms can be viewed on the user alarm (system section) window.

To view the detailed information about alarm occurrence, use the alarm detailed window.

1.14.1 Alarm History Windows

There are 5 types of alarm history windows:

- MAJOR ALARM
- MINOR ALARM
- USER ALARM (SYSTEM)
- USER ALARM (USER)
- OFF-LINE ALARM

In each window, the alarm code, occurrence date, time, and detailed information are displayed.

1. Select {SYSTEM INFO} under the main menu.
   - The sub-menu for the system information appears.

2. Select {ALARM HISTORY}.
   - The alarm history window appears.
3. Using [PAGE] to change the window.
   - Each time [PAGE] is pressed, the window alternates between
     “MAJOR ALARM”, “MINOR ALARM”, “USER ALARM (SYSTEM)”,
     “USER ALARM (USER)”, and “OFF-LINE ALARM”.

![User Alarm History Display]
1.15 Arc Welding Management and Maintenance

1.15.1 ARC WELD DIAGNOSIS Window

An optimum arc welding requires timely contact-tip replacement and nozzle cleaning.

It is also recommended that the user check how often such functions as arc retry, arc restart, and automatic anti-stick have been used and adjust the operating environment and work conditions accordingly.

The usage of the above-mentioned functions can be controlled or confirmed on the ARC WELD DIAGNOSIS window.

For example, contact-tip replacement is initially set at 180 minutes. When the welding time reaches 180 minutes, an external output signal (system output) is output. The operator can then replace the tip or adjust as necessary.

A. WORK CONTINUE (CONT, STOP)

When the manipulator is restarted after it stops in the middle of a work section, the manipulator either performs welding over the remaining part of the section or moves without performing welding.

B. TIP REPLACE, NOZZLE CLEAN (0 to 999 minutes)

In the “SETTING” fields, specify the optimum timings for contact-tip replacement and nozzle cleaning. The initial values are 180 minutes for contact-tip replacement; 30 minutes for nozzle cleaning. The “ACCUM.” fields display an accumulated service duration.

C. RETRY, RESTART (ARC), ANTI-STICK

In each of the “SETTING” fields, specify a reference value for the number of times each function is used. As an initial setting, 10 is specified for each function. Each of the “ACCUM.” fields displays the accumulated count, showing how many times the function has been used.

ARC RETRY, ARC RESTART, and ANTI-STICK counts:

These counts are different from the maximum repetition counts specified in the arc auxiliary condition file. These counts show how many times these functions have actually been used.
1.15.2 Editing the ARC WELD DIAGNOSIS Window

1. Select {ARC WELDING} under the main menu.

2. Select {ARC WELD DIAG.}.

3. Line up the cursor with each set item and press [SELECT] to edit it.

4. Set the work continue specification.
   - Each time [SELECT] is pressed, the setting alternates between “CONT” and “STOP”.

![Diagram of ARC WELD DIAGNOSIS window with editing options]

![Diagram of ARC WELD DIAGNOSIS window with work continue settings]
5. Set the control value.
   – Move the cursor to the setting value to be changed and press [SELECT].

6. Input the desired value using [Numeric Key] and press [ENTER].

The accumulated value can be cleared by either of the following:
• ARC WELD DIAGNOSIS window
• External input signal (system input signal)
1.16 Arc Monitor Function

The arc monitor function is used to monitor, analyze and control the welding conditions (welding current and welding voltage) of the specified welding section.

- Samples the welding conditions and show them on the display.
- Calculates the average and deviation and detects the error.
- Saves the results of measurement and analysis in the file.

```
000 NOP
001 MOVJ VJ=10.00
002 MOVJ VJ=80.00
003 MOVL V=800
004 ARCON AEFI(1)  Welding start
005 ARMONON AMF#(1) Arc monitor start
006 MOVL V=50
007 ARMONOF Arc monitor end
008 ARCOF AEFI(1)  Welding end
009 MOVL V=800
010 MOVJ VJ=50.00
011 END
```
1.16 Arc Monitor Function

1.16.1 Hardware Specification

For the arc monitor function, the following circuit board is needed.

- Welding I/F circuit board: JANCD-AEW01

### 1.16.1.1 Signal Specifications of JANCD-AEW01 Circuit Board (Analog Input/Output)

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Number/Channel</td>
<td>Output: 2ch (1ch: Voltage, 2ch: Current)</td>
</tr>
<tr>
<td>(Analog Input/Output)</td>
<td>Input: 2ch (1ch: Voltage, 2ch: Current)</td>
</tr>
</tbody>
</table>
| Analog Voltage              | Output: -14.00 to 14.00  
|                             | Input: 0 to +5 V                   |
| Voltage/Current Converted   | 10.0 V/V, 100 A/V          
| Value                       | (can be modified by the parameter) |
| Monitor Minimum Unit        | Voltage: 0.1 V, Current: 1 A      |

### 1.16.2 Connection

<table>
<thead>
<tr>
<th>Signal</th>
<th>Connection Channel</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding Voltage Input</td>
<td>Analog Input (CH1)</td>
<td>CN322-11 (Voltage Input)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CN322-12 (GND)</td>
</tr>
<tr>
<td>Welding Current Input</td>
<td>Analog Input (CH2)</td>
<td>CN322-8 (Current Input)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CN322-28 (GND)</td>
</tr>
</tbody>
</table>

### 1.16.2 Arc Monitor (Sampling) Window

The following data is always displayed whether or not welding is being done.

- Welding Current Reference Value
- Welding Voltage Value
- Welding Current Measured Value
- Welding Voltage Measured Value

**NOTE**

- Due to the variation, etc. in the electric resistance of welding power cable and the detectors, the values displayed in the sampling window may be different from the actual welding current value and welding voltage value.

- In order to monitor the exact value, measure the actual welding current value and welding voltage value with calibrated measuring instruments and adjust the magnification and offset. (See chapter 1.16.7 “Parameter”.)
1.16.3 ARCMONON

1.16.3.1 Function

This is the instruction to start sampling the welding condition data.

1.16.3.2 Syntax

```
ARCMONON
```

Choose one of the following tags.

These tags are enabled only when multiple applications are in use and two or more applications are set as arc welding application.

When there is only one application, these tags are not displayed.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD1</td>
<td>Selects the Power Source 1.</td>
<td></td>
</tr>
<tr>
<td>WELD2</td>
<td>Selects the Power Source 2.</td>
<td></td>
</tr>
<tr>
<td>WELD3</td>
<td>Selects the Power Source 3.</td>
<td></td>
</tr>
<tr>
<td>WELD4</td>
<td>Selects the Power Source 4.</td>
<td></td>
</tr>
<tr>
<td>WELD5</td>
<td>Selects the Power Source 5.</td>
<td></td>
</tr>
<tr>
<td>WELD6</td>
<td>Selects the Power Source 6.</td>
<td></td>
</tr>
<tr>
<td>WELD7</td>
<td>Selects the Power Source 7.</td>
<td></td>
</tr>
<tr>
<td>WELD8</td>
<td>Selects the Power Source 8.</td>
<td></td>
</tr>
</tbody>
</table>

- **AMF# (Arc monitor file number) [9]**

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMF# (Arc monitor file number)</td>
<td>Specifies the arc monitor file number. The sampling results and statistical data are recorded in the arc monitor file.</td>
<td>No.: 1 to 100 The number can be specified by B/I/D/LB/LI/LD variable.</td>
</tr>
</tbody>
</table>
1.16.4 ARCMONOF

1.16.4.1 Function

This is the instruction to end sampling the welding condition data.

1.16.4.2 Syntax

```
ARCMONOF
```

Choose one of the following tags.

These tags are enabled only when multiple applications are in use and two or more applications are set as arc welding application.

When there is only one application, these tags are not displayed.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD1</td>
<td>Selects the Power Source 1.</td>
<td></td>
</tr>
<tr>
<td>WELD2</td>
<td>Selects the Power Source 2.</td>
<td></td>
</tr>
<tr>
<td>WELD3</td>
<td>Selects the Power Source 3.</td>
<td></td>
</tr>
<tr>
<td>WELD4</td>
<td>Selects the Power Source 4.</td>
<td></td>
</tr>
<tr>
<td>WELD5</td>
<td>Selects the Power Source 5.</td>
<td></td>
</tr>
<tr>
<td>WELD6</td>
<td>Selects the Power Source 6.</td>
<td></td>
</tr>
<tr>
<td>WELD7</td>
<td>Selects the Power Source 7.</td>
<td></td>
</tr>
<tr>
<td>WELD8</td>
<td>Selects the Power Source 8.</td>
<td></td>
</tr>
</tbody>
</table>
1.16.5 GETFILE

1.16.5.1 Function

Retrieves the data of arc monitor file into the variable (D variable).

1.16.5.2 Syntax

GETFILE<DATA 1> Condition file specification (element number)

```
GETFILE  [1]  D/LD/ D[[L][D]]  Variable number
          |             | Application quantity correcting condition file number
          |             | Application quantity correcting condition file number
          |             | Weaving condition file number
          |             | Arc monitor file number
```

END
### D Variable Number/LD Variable Number/D [Element Number]/LD [Element Number] [1]

Be sure to add the following tag.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Variable Number/ LD Variable Number/ D [Element Number]/ LD [Element Number]</td>
<td>Specifies the double-precision integer type variable in which the retrieved data is stored.</td>
<td>&lt;DATA 1&gt;</td>
</tr>
</tbody>
</table>

### SPR# (Application quantity correcting condition file number) [2]/ UDC# (Application quantity correcting condition file number) [3]/ WEV# (Weaving condition file number) [4]/ AMF# (Arc monitor file number) [5]

Be sure to choose one of the following tags.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPR# (Application quantity correcting condition file number)</td>
<td>Specifies the application quantity correcting condition file number (spray).</td>
<td>No.: 1 The number can be specified by B/I/D/LB/LI/ LD variable. Only available with the servo sealer gun function (optional).</td>
</tr>
<tr>
<td>UDC# (Application quantity correcting condition file number)</td>
<td>Specifies the application quantity correcting condition file number (undercoating).</td>
<td>No.: 1 The number can be specified by B/I/D/LB/LI/ LD variable. Only available with the undercoating function (optional).</td>
</tr>
<tr>
<td>WEV# (Weaving condition file number)</td>
<td>Specifies the weaving condition file number.</td>
<td>No.: 1 to 255 The number can be specified by B/I/D/LB/LI/ LD variable.</td>
</tr>
<tr>
<td>AMF# (Arc monitor file number)</td>
<td>Specifies the arc monitor file number.</td>
<td>No.: 1 to 100 The number can be specified by B/I/D/LB/LI/ LD variable. Only available with the arc monitor function (optional).</td>
</tr>
</tbody>
</table>

### (Element number) [6]

Be sure to add the following tag.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Element number)</td>
<td>Specifies the element of the condition file from which the data are retrieved.</td>
<td>Element No.: 1 to 255 The number can be specified by B/LB variable.</td>
</tr>
</tbody>
</table>
1. Move the cursor to the address area.
2. Press [INFORM LIST].
3. Select {ARITH}.
4. Select the GETFILE instruction.
   - The instruction is displayed on the input buffer line with the same additional items as registered previously.
5. Press [ENTER].
   - The set contents are registered in the job.
1.16.5.5 File Data and Element Number

The relation between the element numbers of GETFILE instruction and the arc monitor file is shown as follows.

The numbers below denote the element numbers.

1. STATUS
2. CURRENT
3. VOLTAGE
4. CURRENT AVERAGE
5. CURRENT AVERAGE
6. CURRENT DEVIATION
7. VOLTAGE DEVIATION
8. NUMBER OF DATA (NORMAL)
9. NUMBER OF DATA (ERROR)
1.16.6 Arc Monitor File

1.16.6.1 Function

One hundred files for the arc monitor function are prepared. The arc monitor file can be saved in an external memory device. (Cannot be loaded.)

1.16.6.2 Arc Monitor File

A. FILE NUMBER (1 to 100)
   Shows the file number.

B. CURRENT
   Shows the average value of current data between the last-performed ARCMONON and ARCMONOF.

C. VOLTAGE
   Shows the average value of voltage data between the last-performed ARCMONON and ARCMONOF.

D. STATUS
   Shows the result (normal/error) of the last-performed arc monitor.

E. CURRENT AVERAGE/DEVIATION
   Shows the average/standard deviation of the retrieved average current value.

F. VOLTAGE AVERAGE/DEVIATION
   Shows the average/standard deviation of the retrieved average current value.

G. NUMBER OF DATA
   Shows the number of retrieved data (normal/error).
1.16.6.3 Displaying the File

- **Procedure 1**
  1. Place the cursor on the ARCMONON instruction.
  2. Press [DIRECT OPEN].
     - The arc monitor file window is displayed.
     - Press [PAGE] to call the next file number.
     - Press [SHIFT] + [PAGE] to call the previous file number.

- **Procedure 2**
  1. Select (ARC WELDING) under the main menu.
  2. Select (ARC MONITOR) under the sub menu.
     - The arc monitor file window is displayed.
     - Press [PAGE] to call the next file number.
     - Press [SHIFT] + [PAGE] to call the previous file number.

**NOTE**
The data of arc monitor file cannot be edited.
File Initialization

All the files become ‘0’ after file initialization.

1. Display the arc monitor file window.
2. Select {CLEAR DATA} from the pull-down menu (DATA).
   - Select {CLEAR DATA} and the confirmation dialog box appears.
   - {CLEAR DATA} from the arc monitor file window initializes only the displayed file number.
   - To initialize all the files, perform the initialization in the maintenance mode.
### 1.16.7 Parameter

Table 1-5: Parameter

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Description</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2C453</td>
<td>Current Conversion Ratio (Power Source 1)</td>
<td>200</td>
</tr>
<tr>
<td>S2C454</td>
<td>Current Conversion Offset (Power Source 1)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 1 A</td>
<td></td>
</tr>
<tr>
<td>S2C455</td>
<td>Voltage Conversion Ratio (Power Source 1)</td>
<td>200</td>
</tr>
<tr>
<td>S2C456</td>
<td>Voltage Conversion Offset (Power Source 1)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 0.1 V</td>
<td></td>
</tr>
<tr>
<td>S2C457</td>
<td>Current Conversion Ratio (Power Source 2)</td>
<td>200</td>
</tr>
<tr>
<td>S2C458</td>
<td>Current Conversion Offset (Power Source 2)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 1 A</td>
<td></td>
</tr>
<tr>
<td>S2C459</td>
<td>Voltage Conversion Ratio (Power Source 2)</td>
<td>200</td>
</tr>
<tr>
<td>S2C460</td>
<td>Voltage Conversion Offset (Power Source 2)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 0.1 V</td>
<td></td>
</tr>
<tr>
<td>S2C461</td>
<td>Current Conversion Ratio (Power Source 3)</td>
<td>200</td>
</tr>
<tr>
<td>S2C462</td>
<td>Current Conversion Offset (Power Source 3)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 1 A</td>
<td></td>
</tr>
<tr>
<td>S2C463</td>
<td>Voltage Conversion Ratio (Power Source 3)</td>
<td>200</td>
</tr>
<tr>
<td>S2C464</td>
<td>Voltage Conversion Offset (Power Source 3)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 0.1 V</td>
<td></td>
</tr>
<tr>
<td>S2C465</td>
<td>Current Conversion Ratio (Power Source 4)</td>
<td>200</td>
</tr>
<tr>
<td>S2C466</td>
<td>Current Conversion Offset (Power Source 4)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 1 A</td>
<td></td>
</tr>
<tr>
<td>S2C467</td>
<td>Voltage Conversion Ratio (Power Source 4)</td>
<td>200</td>
</tr>
<tr>
<td>S2C468</td>
<td>Voltage Conversion Offset (Power Source 4)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 0.1 V</td>
<td></td>
</tr>
<tr>
<td>S2C469</td>
<td>Current Conversion Ratio (Power Source 5)</td>
<td>200</td>
</tr>
<tr>
<td>S2C470</td>
<td>Current Conversion Offset (Power Source 5)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 1 A</td>
<td></td>
</tr>
<tr>
<td>S2C471</td>
<td>Voltage Conversion Ratio (Power Source 5)</td>
<td>200</td>
</tr>
<tr>
<td>S2C472</td>
<td>Voltage Conversion Offset (Power Source 5)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 0.1 V</td>
<td></td>
</tr>
<tr>
<td>S2C473</td>
<td>Current Conversion Ratio (Power Source 6)</td>
<td>200</td>
</tr>
<tr>
<td>S2C474</td>
<td>Current Conversion Offset (Power Source 6)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 1 A</td>
<td></td>
</tr>
<tr>
<td>S2C475</td>
<td>Voltage Conversion Ratio (Power Source 6)</td>
<td>200</td>
</tr>
<tr>
<td>S2C476</td>
<td>Voltage Conversion Offset (Power Source 6)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 0.1 V</td>
<td></td>
</tr>
<tr>
<td>S2C477</td>
<td>Current Conversion Ratio (Power Source 7)</td>
<td>200</td>
</tr>
<tr>
<td>S2C478</td>
<td>Current Conversion Offset (Power Source 7)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 1 A</td>
<td></td>
</tr>
<tr>
<td>S2C479</td>
<td>Voltage Conversion Ratio (Power Source 7)</td>
<td>200</td>
</tr>
<tr>
<td>S2C480</td>
<td>Voltage Conversion Offset (Power Source 7)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 0.1 V</td>
<td></td>
</tr>
<tr>
<td>S2C481</td>
<td>Current Conversion Ratio (Power Source 8)</td>
<td>200</td>
</tr>
</tbody>
</table>
The conversion parameter (for conversion ratio and offset) to calculate the current value and voltage value using the analog input value is available.

The input voltage is converted to the current value and voltage value according to the following charts.

### Table 1-5: Parameter

<table>
<thead>
<tr>
<th>Parameter No.</th>
<th>Description</th>
<th>Initial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2C482</td>
<td>Current Conversion Offset (Power Source 8)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 1 A</td>
<td></td>
</tr>
<tr>
<td>S2C483</td>
<td>Voltage Conversion Ratio (Power Source 8)</td>
<td>200</td>
</tr>
<tr>
<td>S2C484</td>
<td>Voltage Conversion Offset (Power Source 8)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unit: 0.1 V</td>
<td></td>
</tr>
</tbody>
</table>

Conversion ratio: 200, Offset: 50 A
Conversion ratio: 200, Offset: 0 A
Conversion ratio: 190, Offset: 0 A

Conversion ratio: 200, Offset: 50.0 V
Conversion ratio: 200, Offset: 0.0 V
Conversion ratio: 190, Offset: 0.0 V
1.17 Welding Path Shift Function

The welding path shift function shifts the welding path to upper board direction/lower board direction.

- The shifting path is from the welding start (ARCON) step to the welding end (ARCOFF) step.
- The shifting direction is to upper board direction and lower board direction.
- The shifting amount is to be set to Arc Start Condition File and the setting range is between -5.0 to 5.0 mm.

Usually, the welding path is taught when it is deviated slightly from the joint of boards. This function can perform welding the deviating path by teaching the joint of boards and set deviating amount as the shifting amount to Arc Start Condition File

This function has the following effects.

- The welding path is high accuracy, because it is easy to teach the joint of boards than the deviating path from it.
- The welding path can be managed with Arc Start Condition File, and it is easy to modify.

When correcting the workpieces position or welding many workpieces of the same shape, use the Parallel Shift Function. For the details of this function “YRC1000 GENERAL OPERATOR’S MANUAL (RE-CSO-A051) 6.2 Parallel Shift Function”.

- The shifting direction of the welding path shift function

<table>
<thead>
<tr>
<th>Upper board direction</th>
<th>Z-axis direction on the base coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower board direction</td>
<td>The direction that turned 90 degrees Z-axis of base coordinates to Z-axis of tool coordinates.</td>
</tr>
</tbody>
</table>

![Fig. 1-15: Shifting Direction of the Welding Path Shift Function]
1.17.1 Setting the Shifting Amount of Welding Path

The shifting amount of the welding path is set with the procedures described in """"OTHER"" Tab Window" at chapter 1.5.4.2 "Tabs".

1.17.2 Cancel the Welding Path Shift

Welding path shift is canceled with the following operations.

- Function keys.
- Menu on JOB CONTENT window.
- Editing the move instruction.

**Function keys**

By the simultaneous pressing of [INTERLOCK] + [8 ARCON], the welding path shift is canceled and it is enabled when pressing those keys again.

**Menu on JOB CONTENT window**

1. Select {JOB} under the main menu.
2. Select {JOB CONTENT}.
   - Contents of the job appear.
3. Select {UTILITY} under the pull down menu.
4. Select (ARC SHIFT CANCEL).

- A dialog box confirming the cancel of welding path shift
  Select “YES” to cancel it and the window returns to the JOB CONTENT window.

Note: Select “NO” to keep it and the window returns to the JOB CONTENT window.

- Editing the move instruction
  The welding path shift is canceled, when the present position is selected in inserting or modifying the move instruction. For the details, please refer to chapter 1.17.3 “Teaching Move Instruction during Welding Path Shift”.
1.17.3 Teaching Move Instruction during Welding Path Shift

When inserting or modifying the move instruction while welding path shift, the teaching position can be selected from the following two positions.

The welding path shift is canceled when the present position is selected.

- **Present position**
  Select this mode in teaching the joint of boards.
  In playback, the manipulator moves to the position where the shifting amount is added to the teaching position.

- **Position where the shifting amount is subtracted from present position**
  In playback, the manipulator moves to the present position.

1. Insert or modify the moving instruction.

   - A dialog box which confirms teaching the position where the shifting amount is subtracted from present position is displayed.
   Select “YES” to teach the position where the shifting amount is subtracted from present position. And the window returns to the JOB CONTENT window.
   Select “NO” to teach the present position. And the window returns to the JOB CONTENT window.
1.17.4 Restriction

Followings are the restrictions to this function:

1. Register ARCON or ARCOF instruction to the job to which the welding section (move instruction) is registered. If ARCON instruction is executed in the CALL destination job, the welding path shift would not be operated in the welding section at the CALL source job.

2. In case modifying the shifting amount, set ARCSET with Arc Start Condition File that the next shifting amount is registered. Do not set ARCON instruction.

3. The welding path shift cannot be canceled in the welding section. Set “0” to the shifting amount in arc Arc Start Condition File.

4. This function cannot be used in the external reference point motion.

5. Do not register IMOV instruction in the welding section where the welding path shift is available. The manipulator moves to the position where the shifting amount is doubled.

6. The welding path shift will be limited if teaching is performed in the following conditions.

<table>
<thead>
<tr>
<th>Condition of welding section</th>
<th>Restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-axis of tool coordinates is parallel to Z-axis direction on the base coordinates.</td>
<td>ALARM 4987 WELD LINE CORD SHIFT MOV DISABLE</td>
</tr>
<tr>
<td>-Same point</td>
<td>1st step</td>
</tr>
<tr>
<td>-Short distance</td>
<td>2nd step</td>
</tr>
<tr>
<td>-Traveling direction is same as Z-axis direction on the base coordinates</td>
<td>Execute shifting operation to the upper/lower board direction of the previous step</td>
</tr>
</tbody>
</table>
1.18 Weld Line Table

By using this Weld Line Table, information on the welding section can be shown on the programming pendant, and the welding condition, speed, etc. can be easily checked and modified.

Contents of the job and the welding condition file can be modified on the "Weld line table" window.

Only the steps relating to welding are shown, thus even for a job with many welding points, information on the welding section can easily be edited.

The effective values and the welding length can also be monitored.

**Modification of the welding condition**

The welding condition can be modified on the Weld line table window. When the welding condition is modified on the Weld line table window, contents of the job and the arc start condition file are modified.

The following items of the welding condition can be modified on the Weld line table window:

- File No.
- Current
- Voltage
- User file No.
- Velocity

**Checking of the effective value**

During welding, the effective values (current and voltage) and the welding length are shown on the Weld line table window.
• In the Weld line table, information on the move instructions of the welding section from the ARCON instruction to the ARCOF instruction is shown for each step. If a TIMER instruction is taught in the welding section, the TIMER instruction is also shown in the Weld line table.

• The welding condition can be modified under the following conditions:
  • Security mode: edit mode or higher
  • Teach mode

• While the Weld line table is being shown, the manipulator does not operate by a test run or FWD/BWD operation.
1.18.1 Weld Line Table Window

1. **Job name, line No., step No.**
   The name of the job shown in the Weld line table is displayed. The line number and the step number where the cursor is located in the job are displayed.

2. **Welding point**
   The number of the ARCON sections in the job is shown.

3. **Total length, total time**
   During welding, the length of the weld line and the welding time are shown.

4. **Estimate length, estimate time**
   The total length of the weld line and the total welding time of the ARCON sections in the job are shown.
   The estimate length and time are not the actually-measured values, but are used for making an estimate of the total length of the weld line and the total welding time prior to the actual welding. Press (CALC) to see the estimated total length and the estimated total time.

5. **Weld line No., Line No.**
   The weld line number is shown. This weld line number is a number allocated to each welding section. In the column of the line number, the line numbers within the ARCON sections of the job are shown.
   The location of the cursor in the Weld line table is the same as the location of the cursor in the job. However, if the cursor of the job is located out of the ARCON sections, the cursor in the Weld line table appears on the last line number of the ARCON sections.

6. **File No.**
   When the arc start condition file (ASF#) is specified in the ARCON instruction, the following item is shown. The following item can be edited on the Weld line table window.
   - The number of the specified arc start condition file
1 Arc Welding Application
1.18 Weld Line Table

7 Current (welding condition), voltage (welding condition)
When the arc start condition file (ASF#) is specified in the ARCON instruction, the following items are shown. The following items can be edited on the Weld line table window.
• The current value and the voltage value on the "MAIN COND." tab of the specified arc start condition file

When the current output value (AC=), the voltage output value (AV=), or the percentage against the proper voltage output value (AVP=) is specified in the ARCON instruction, the following item is shown. The following item can be edited on the Weld line table window.
• The current output value (AC=), the voltage output value (AV=), or the percentage against the proper voltage output value (AVP=)

8 Velocity
When the arc start condition file (ASF#) is specified in the ARCON instruction, the following item is shown. The following item can be edited on the Weld line table window.
• Speed of the job’s move instruction is shown if “AxP005: welding speed priority specification” is set to “0: Move instruction speed is priority”.

• Speed of the manipulator on the “MAIN COND.” tab of the specified arc start condition file is shown if “AxP005: welding speed priority specification” is set to “1: ARCON instruction speed is priority”.

When the welding speed (V=) is specified in the ARCON instruction, the following item is shown. The following item can be edited on the Weld line table window.
• Speed of the job’s move instruction is shown if “AxP005: welding speed priority specification” is set to “0: Move instruction speed is priority”.

• Welding speed of the ARCON instruction is shown if “AxP005: welding speed priority specification” is set to “1: ARCON instruction speed is priority”.

9 User file No., Weld type No.
When a digital welding power source is used and the arc start condition file (ASF#) is specified in the ARCON instruction, the following items are shown. The user file number can be edited on the Weld line table window, but the weld type number cannot.
• The user file number and the weld type number of the specified arc start condition file

10 Current (effective value), voltage (effective value), length
During welding, the effective values and the weld line length are shown. As the effective values (current and voltage), the real-time value of the line in the currently-executed step is shown, and after the execution of the step is completed, the average value during the step is shown.
• The effective values of up to 10,000 lines can be shown in the Weld line table. If data of the effective values exceed 10,000 lines, older effective values cannot be shown. Also, the effective values of up to 1,000 jobs can be shown in the Weld line table. If the number of jobs exceeds 1,000, the effective values of the job after that cannot be shown.

• When the file number, current, voltage, velocity, or the user file number is edited in the Weld line table, the job cannot be continuously started at the next execution of the job.

• In the Weld line table, an item which is the same as the item in the above row is denoted by “ “. An item in the job specified by an variable is denoted by “VAL”.

• While the Weld line table is displayed, even if the CALL instruction or the JUMP instruction is executed and the job is switched to another job, the job shown in the Weld line table stays unswitched. In this case, the name of the job whose Weld line table was opened is shown as the job name, and “****” is shown as the line number and the step number. As the total length and the total time, the values excluding the weld line length and the welding time of the CALL or JUMP destinations are shown.

• The estimate length and the estimate time may differ from the actual total length and the actual total time. Cases such as the following cause differences:
  · Amount of inward turning during welding is large.
Cases such as the following cause the difference only between the estimate time and the total time:
  · Slope up/down function is used for the welding condition.
  · Welding speed is fast and acceleration and deceleration occur during welding.

• {CALC} cannot be pressed during playback.

• If the CALL instruction or the JUMP instruction is taught in the job, the ARCON sections in the CALL destination or the JUMP destination will not be included in the estimate length and the estimate time.

• Depending on the contents taught in the job, the estimate length or the estimate time may not be calculated. If the teaching is performed as in the following cases, the estimate length and the estimate time cannot be calculated and “INVALID” is shown:
  · The tag of the instruction such as the welding condition file and TIMER is specified by a variable.
  · An alarm such as a pulse-limit alarm occurs in the job.
The displayed units of the weld line length (the total length, the estimate length, and the effective value of the length) in the Weld line table can be switched by modifying the following parameter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description and setting value</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2C1324</td>
<td>Unit of the length in the Weld line table (total length, estimate length, effective value of the length)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0: mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: M (meter)</td>
<td></td>
</tr>
</tbody>
</table>
1.18.2 Operating the Weld Line Table

■ Opening the Weld line table

The Weld line table appears by selecting it from the pull-down menu in the JOB CONTENT window, or by pressing [SHIFT] + [AUX].

1. Select {JOB} under the main menu.
2. Select {JOB CONTENT}.
   – The JOB CONTENT window appears.
3. Select {DISPLAY} in the menu area.
   – The pull-down menu appears.
4. Select {WELD LINE TABLE}.
   – The Weld line table appears.

The Weld line table can be opened only from the job which includes a manipulator for arc welding application in the control group.
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- Closing the Weld line table
  The Weld line table is closed by pressing {CLOSE}, or by pressing [SHIFT] + [AUX].

- Closing the Weld line table after jumping to a specified line number
  By selecting a line number and closing the Weld line table, the window returns to the JOB window, and the cursor moves to the selected line number.
  
  If the Weld line table is closed without selecting any line number, the cursor in the job returns to where it was located when the Weld line table was opened.

  1. Move the cursor to the line to jump to. Press [↑], [↓], or [SHIFT] + [↑]/[↓] to move the cursor.

![Weld Line Table Screenshot]
1. **Arc Welding Application**

1.18 **Weld Line Table**

2. Press [SELECT] on the line to jump to.

   - A confirmation dialog box appears.

3. Select “OK” in the confirmation dialog box.

   - The JOB CONTENT window appears, and the cursor moves to the selected line number.

![Weld line table image]

NOTE

The cursor can move to the selected line number only in the teach mode.

In the same way as when the cursor is moved in the job, the job cannot be continuously started after the cursor moves to the selected line number.
## Editing in the Weld line table

The welding condition can be modified on the Weld line table window.

When the welding condition is modified on the Weld line table window, contents of the job and the arc start condition file are modified.

1. Move the cursor to an item to be modified.

2. Press [SELECT] and modify the value.

3. Press [ENTER] to confirm.
4. Modified contents are reflected in the file.

When the editing is unsuccessful, one of the following messages appears:

<table>
<thead>
<tr>
<th>Message</th>
<th>Cause</th>
</tr>
</thead>
</table>
| Can’t be edited on current status. | Editing was attempted under one of the following conditions:  
  • While an error occurs  
  • While an alarm occurs  
  • In the mode other than the teach mode  
  • When the edit-lock system input signal is turned ON |
| Currently, this job can’t be edited. | Editing was attempted when the job in the Weld line table and the job in the JOB CONTENT window are not the same.  
  (By the CALL instruction or the JUMP instruction, a job different from the job in the Weld line table is being executed.) |
| This job can’t be edited. | Editing of an edit-lock job was attempted. |
| This line can’t be edited. | Editing of a job in an edit-lock line was attempted. |
1. **Arc Welding Application**

1.18 **Weld Line Table**

- **Displaying the estimate values**
  Press (CALC) in the Weld line table to see the estimate length and the estimate time.

1. Press (CALC).

2. The estimate length and the estimate time are shown.
1.18.3 Clearing the Effective Value

Press the (RESET) button to clear the displayed effective values.

1.18.4 Saving the Weld Line Table

Press the (SAVE) button to save the contents of the Weld line table as a CSV file in an external memory device.

<table>
<thead>
<tr>
<th>Save destination</th>
<th>The file is stored in the folder “ARCDIAG\CSV” in the specified external memory device (SD or USB). If no folder exists, an folder is automatically created.</th>
</tr>
</thead>
<tbody>
<tr>
<td>File name</td>
<td>A name representing the date and time, in the order of year, month, day, hour, minute, and second, is automatically added as the file name (not a user-defined name). i.e., “YYYYMMDD-HHmmss.csv”</td>
</tr>
<tr>
<td></td>
<td>Example: When the file is created at 17:30:10 on April 1, 2016, the file name will be “20160401-173010.csv”.</td>
</tr>
</tbody>
</table>

If the saving is unsuccessful, one of the following messages appears.

<table>
<thead>
<tr>
<th>Message</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert the media.</td>
<td>CSV file saving was attempted without inserting the media for saving.</td>
</tr>
<tr>
<td>Failed in saving CSV file. [0x0003]</td>
<td>Not enough space in the media for saving.</td>
</tr>
<tr>
<td>Failed in saving CSV file. [0x000f]</td>
<td>The media for saving was removed during CSV file saving.</td>
</tr>
</tbody>
</table>

The Weld line table cannot be saved during playback.

When “USB1: controller” is specified as the external memory device, the file will be saved in “USB: pendant”.

NOTE
1.19 Appendix 1

1.19.1 Table of Work Instructions

- `< >` indicates alpha-numerical data.
- If multiple items are shown in one additional item section, select one.

Table 1-6: Arc Welding Instructions (Sheet 1 of 3)

<table>
<thead>
<tr>
<th>ARCON Function</th>
<th>Outputs arc start conditions and an arc start instruction for the Power Source.</th>
<th>Additional Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD1, WELD2, WELD3, WELD4 WELD5, WELD6, WELD7, WELD8</td>
<td>Displayed only when using multiple power sources.</td>
<td>AC = &lt;welding current &gt; ASF#(&lt;arc start condition file number&gt;) AC: 1 to 999 A ASF#: 1 to 1000</td>
</tr>
<tr>
<td>AV = &lt;welding voltage &gt; AVP = &lt;percentage against proper welding voltage&gt;</td>
<td>AV: independent 0.1 to 50.0 V AVP: synergic 50 to 150%</td>
<td>T = &lt;manipulator stopping time&gt; 0.01 to 655.35 sec</td>
</tr>
<tr>
<td>V = &lt;manipulator moving speed&gt;</td>
<td>0.1 to 1500.0 mm/sec 1 to 9000 cm/min</td>
<td>RETRY Specifies use of arc retry function.</td>
</tr>
</tbody>
</table>

Example

ARCON AC=200 AVP=100 T=0.30 RETRY
ARCON AC=200 AV=22.0 T=0.30
ARCON ASF#(1)

<table>
<thead>
<tr>
<th>ARCON Function</th>
<th>Outputs arc end conditions and an arc end instruction for the Power Source.</th>
<th>Additional Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD1, WELD2, WELD3, WELD4 WELD5, WELD6, WELD7, WELD8</td>
<td>Displayed only when using multiple power sources.</td>
<td>AC = &lt;welding current &gt; AEF#(&lt;arc end condition file number&gt;) AC: 1 to 999 A AEF#: 1 to 1000</td>
</tr>
<tr>
<td>AV = &lt;welding voltage &gt; AVP = &lt;percentage against proper welding voltage&gt;</td>
<td>AV: independent 0.1 to 50.0 V AVP: synergic 50 to 150%</td>
<td>T = &lt;manipulator stopping time&gt; 0.01 to 655.35 sec</td>
</tr>
<tr>
<td>V = &lt;manipulator moving speed&gt;</td>
<td>0.1 to 1500.0 mm/sec 1 to 9000 cm/min</td>
<td>ANTSTK Specifies use of wire anti-stick function.</td>
</tr>
</tbody>
</table>

Example

ARCOF AC=180 AVP=80 T=0.30 ANTSTK
ARCOF AC=180 AV20.0 T=0.30
ARCOF AEF#(1)
### ARCSET Function
Changes the welding conditions individually.

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD1, WELD2, WELD3, WELD4, WELD5, WELD6, WELD7, WELD8</td>
<td>Displayed only when using multiple power sources.</td>
</tr>
<tr>
<td>AC = &lt;welding current&gt;</td>
<td>1 to 999 A</td>
</tr>
<tr>
<td>ASF#(&lt;arc start condition file number&gt;)</td>
<td>1 to 1000</td>
</tr>
<tr>
<td>AV = &lt;welding voltage&gt;</td>
<td>AV: independent 0.1 to 50.0 V</td>
</tr>
<tr>
<td>AVP = &lt;percentage against proper welding voltage&gt;</td>
<td>AVP: synergic 50 to 150%</td>
</tr>
<tr>
<td>V = &lt;manipulator moving speed&gt;</td>
<td>0.1 to 1500.0 mm/sec 1 to 9000 cm/min</td>
</tr>
<tr>
<td>AN3 = &lt;analog output 3&gt;</td>
<td>-14.00 to 14.00 V</td>
</tr>
<tr>
<td>AN4 = &lt;analog output 4&gt;</td>
<td>-14.00 to 14.00 V</td>
</tr>
</tbody>
</table>

**Example**
ARCSET AC=200
ARCSET AV=20.0
ARCSET AVP=95
ARCSET V=80
ARCSET AN3=10.00

### ARCCCTS Function
Changes the welding conditions gradually during execution of welding.

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD1, WELD2, WELD3, WELD4, WELD5, WELD6, WELD7, WELD8</td>
<td>Displayed only when using multiple power sources.</td>
</tr>
<tr>
<td>AC = &lt;welding current&gt;</td>
<td>1 to 999 A</td>
</tr>
<tr>
<td>AV = &lt;welding voltage&gt;</td>
<td>AV: independent 0.1 to 50.0 V</td>
</tr>
<tr>
<td>AVP = &lt;percentage against proper welding voltage&gt;</td>
<td>AVP: synergic 50 to 150%</td>
</tr>
<tr>
<td>AN3 = &lt;analog output 3&gt;</td>
<td>-14.00 to 14.00 V</td>
</tr>
<tr>
<td>AN4 = &lt;analog output 4&gt;</td>
<td>-14.00 to 14.00 V</td>
</tr>
<tr>
<td>DIS = &lt;distance from the movement’s start position&gt;</td>
<td>0.00 to 6553.5 mm</td>
</tr>
</tbody>
</table>

**Example**
ARCCCTS AC=200 AVP=100 DIS=100.0
ARCCCTS AC=200 AV=22.0 AN3=10.0 DIS=5.0

### ARCCCTE Function
Changes the welding conditions gradually during execution of welding.

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD1, WELD2, WELD3, WELD4, WELD5, WELD6, WELD7, WELD8</td>
<td>Displayed only when using multiple power sources.</td>
</tr>
<tr>
<td>AC = &lt;welding current&gt;</td>
<td>1 to 999 A</td>
</tr>
<tr>
<td>AV = &lt;welding voltage&gt;</td>
<td>AV: independent 0.1 to 50.0 V</td>
</tr>
<tr>
<td>AVP = &lt;percentage against proper welding voltage&gt;</td>
<td>AVP: synergic 50 to 150%</td>
</tr>
<tr>
<td>AN3 = &lt;analog output 3&gt;</td>
<td>-14.00 to 14.00 V</td>
</tr>
<tr>
<td>AN4 = &lt;analog output 4&gt;</td>
<td>-14.00 to 14.00 V</td>
</tr>
<tr>
<td>DIS = &lt;distance from the movement’s end position&gt;</td>
<td>0.00 to 6553.5 mm</td>
</tr>
</tbody>
</table>

**Example**
ARCCCTE AC=200 AVP=100 DIS=100.0
ARCCCTE AC=200 AV=22.0 AN3=10.0 DIS=5.0

### AWELD Function
Specifies welding current by current reference value.

<table>
<thead>
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<th>Additional Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD1, WELD2, WELD3, WELD4, WELD5, WELD6, WELD7, WELD8</td>
<td>Displayed only when using multiple power sources.</td>
</tr>
<tr>
<td>&lt;Current reference value&gt;</td>
<td>-14.00 to 14.00 V</td>
</tr>
</tbody>
</table>

**Example**
AWELD 12
### VWELD Function
Specifies welding voltage by voltage value.

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD1, WELD2, WELD3, WELD4, WELD5, WELD6, WELD7, WELD8</td>
<td>Displayed only when using multiple power sources.</td>
<td>VWELD 2.5</td>
</tr>
<tr>
<td>&lt;voltage value&gt;</td>
<td>-14.00 to 14.00 V</td>
<td></td>
</tr>
</tbody>
</table>

### WVON Function
Starts weaving.

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB1, RB2, RB3, RB4, RB5, RB6, RB7, RB8</td>
<td>Displayed only when using multiple manipulators.</td>
<td>WVON WEV#(1)</td>
</tr>
<tr>
<td>WEV#(&lt;weaving condition file number&gt;)</td>
<td>1 to 255</td>
<td></td>
</tr>
</tbody>
</table>

### WVOF Function
Ends weaving.

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB1, RB2, RB3, RB4, RB5, RB6, RB7, RB8</td>
<td>Displayed only when using multiple manipulators.</td>
<td>None</td>
</tr>
<tr>
<td>None</td>
<td></td>
<td>WVOF</td>
</tr>
</tbody>
</table>
1.20 Appendix 2

1.20.1 Power Source Condition File Initial Value

The initial value data for 24 Power Sources are prepared as follows.

*Table 1-7: Welder Condition Data File*

<table>
<thead>
<tr>
<th>Power Source No.</th>
<th>Power Source Name</th>
<th>Power Supply</th>
<th>Shielding Gas</th>
<th>Wire Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MOTOWELD-E series 350A class</td>
<td>Synergic</td>
<td>MAG (or CO2)</td>
<td>1.2 (or any)</td>
</tr>
<tr>
<td>2</td>
<td>MOTOWELD-E series 350A class</td>
<td>Independent</td>
<td>MAG (or CO2)</td>
<td>1.2 (or any)</td>
</tr>
<tr>
<td>3</td>
<td>MOTOWELD-E series 500A class</td>
<td>Synergic</td>
<td>MAG (or CO2)</td>
<td>1.2 (or any)</td>
</tr>
<tr>
<td>4</td>
<td>MOTOWELD-E series 500A class</td>
<td>Independent</td>
<td>MAG (or CO2)</td>
<td>1.2 (or any)</td>
</tr>
<tr>
<td>5</td>
<td>MOTOWELD-S350-AJ2/3 (without STC)</td>
<td>Synergic</td>
<td>CO2</td>
<td>1.2</td>
</tr>
<tr>
<td>6</td>
<td>MOTOWELD-S350-AJ2/3 (without STC)</td>
<td>Synergic</td>
<td>MAG</td>
<td>1.2</td>
</tr>
<tr>
<td>7</td>
<td>MOTOWELD-S350-AJ2/3 (without STC)</td>
<td>Independent</td>
<td>CO2</td>
<td>1.2</td>
</tr>
<tr>
<td>8</td>
<td>MOTOWELD-S350-AJ2/3 (without STC)</td>
<td>Independent</td>
<td>MAG</td>
<td>1.2</td>
</tr>
<tr>
<td>9</td>
<td>MOTOWELD-S350-AJ2/3 (without STC)</td>
<td>Synergic</td>
<td>CO2</td>
<td>0.9 (or 1.0)</td>
</tr>
<tr>
<td>10</td>
<td>MOTOWELD-S350-AJ2/3 (without STC)</td>
<td>Synergic</td>
<td>MAG</td>
<td>0.9 (or 1.0)</td>
</tr>
<tr>
<td>11</td>
<td>MOTOWELD-S350-AJ2/3 (without STC)</td>
<td>Independent</td>
<td>CO2</td>
<td>0.9 (or 1.0)</td>
</tr>
<tr>
<td>12</td>
<td>MOTOWELD-S350-AJ2/3 (without STC)</td>
<td>Independent</td>
<td>MAG</td>
<td>0.9 (or 1.0)</td>
</tr>
<tr>
<td>13</td>
<td>MOTOWELD-S350-AJ2/3 (with STC)</td>
<td>Synergic</td>
<td>CO2</td>
<td>1.2</td>
</tr>
<tr>
<td>14</td>
<td>MOTOWELD-S350-AJ2/3 (with STC)</td>
<td>Synergic</td>
<td>MAG</td>
<td>1.2</td>
</tr>
<tr>
<td>15</td>
<td>MOTOWELD-S350-AJ2/3 (with STC)</td>
<td>Independent</td>
<td>CO2</td>
<td>1.2</td>
</tr>
<tr>
<td>16</td>
<td>MOTOWELD-S350-AJ2/3 (with STC)</td>
<td>Independent</td>
<td>MAG</td>
<td>1.2</td>
</tr>
<tr>
<td>17</td>
<td>MOTOWELD-S350-AJ2/3 (with STC)</td>
<td>Synergic</td>
<td>CO2</td>
<td>0.9 (or 1.0)</td>
</tr>
<tr>
<td>18</td>
<td>MOTOWELD-S350-AJ2/3 (with STC)</td>
<td>Synergic</td>
<td>MAG</td>
<td>0.9 (or 1.0)</td>
</tr>
<tr>
<td>19</td>
<td>MOTOWELD-S350-AJ2/3 (with STC)</td>
<td>Independent</td>
<td>CO2</td>
<td>0.9 (or 1.0)</td>
</tr>
<tr>
<td>20</td>
<td>MOTOWELD-S350-AJ2/3 (with STC)</td>
<td>Independent</td>
<td>MAG</td>
<td>0.9 (or 1.0)</td>
</tr>
<tr>
<td>21</td>
<td>SHINKO ES 350</td>
<td>Synergic</td>
<td>CO2</td>
<td>1.2</td>
</tr>
<tr>
<td>22</td>
<td>DAIHEN CPV 350</td>
<td>Synergic</td>
<td>CO2</td>
<td>1.2</td>
</tr>
<tr>
<td>23</td>
<td>MOTOWELD-S500 (without STC)</td>
<td>Synergic</td>
<td>CO2</td>
<td>1.2</td>
</tr>
<tr>
<td>24</td>
<td>MOTOWELD-S500 (without STC)</td>
<td>Synergic</td>
<td>MAG</td>
<td>1.2</td>
</tr>
</tbody>
</table>
### Contents of 24 Welder Condition Files

The following tables give the original contents of the provided Power Source condition files, that are associated with the Power Source numbers 1 through 24:

<table>
<thead>
<tr>
<th>POWER SOURCE NO.:</th>
<th>POWER SOURCE NAME:</th>
<th>POWER SOURCE NO.:</th>
<th>POWER SOURCE NAME:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MOTOWELD-E series 350A class</td>
<td>2</td>
<td>MOTOWELD-E series 350A class</td>
</tr>
<tr>
<td>3</td>
<td>MOTOWELD-E series 500A class</td>
<td>4</td>
<td>MOTOWELD-E series 500A class</td>
</tr>
</tbody>
</table>

#### POWER SOURCE NO.: 1

- **POWER SOURCE NAME:** MOTOWELD-E series 350A class
- **COMMENT:** COMBINATION GAS AND WIRE
- **POWER SUPPLY:** A (synergic)
- **SHIELDING GAS:** MAG
- **WIRE DIA.:** 1.2 mm
- **WIRE STICKOUT:** 15 mm
- **WIRE ANTI-STICKING:** 0.1 sec
- **ARC FAILURE STOP:** 0.6 sec

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RANGE: positive</td>
<td>RANGE: positive</td>
</tr>
<tr>
<td>ADJ.: 1.00</td>
<td>ADJ.: 1.00</td>
</tr>
<tr>
<td>REF. (V)</td>
<td>MEA. (A)</td>
</tr>
<tr>
<td>0.00</td>
<td>30</td>
</tr>
<tr>
<td>1.35</td>
<td>62</td>
</tr>
<tr>
<td>2.70</td>
<td>94</td>
</tr>
<tr>
<td>10.80</td>
<td>286</td>
</tr>
<tr>
<td>12.15</td>
<td>318</td>
</tr>
<tr>
<td>13.50</td>
<td>350</td>
</tr>
<tr>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

#### POWER SOURCE NO.: 2

- **POWER SOURCE NAME:** MOTOWELD-E series 350A class
- **COMMENT:** COMBINATION GAS AND WIRE
- **POWER SUPPLY:** independent
- **SHIELDING GAS:** MAG
- **WIRE DIA.:** 1.2 mm
- **WIRE STICKOUT:** 15 mm
- **WIRE ANTI-STICKING:** 0.1 sec
- **ARC FAILURE STOP:** 0.6 sec

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RANGE: positive</td>
<td>RANGE: positive</td>
</tr>
<tr>
<td>ADJ.: 1.00</td>
<td>ADJ.: 1.00</td>
</tr>
<tr>
<td>REF. (V)</td>
<td>MEA. (A)</td>
</tr>
<tr>
<td>0.00</td>
<td>30</td>
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<td>1.35</td>
<td>62</td>
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<td>2.70</td>
<td>94</td>
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<td>318</td>
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<tr>
<td>13.50</td>
<td>350</td>
</tr>
<tr>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>0.00</td>
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</tr>
</tbody>
</table>

#### POWER SOURCE NO.: 3

- **POWER SOURCE NAME:** MOTOWELD-E series 500A class
- **COMMENT:** COMBINATION GAS AND WIRE
- **POWER SUPPLY:** A (synergic)
- **SHIELDING GAS:** MAG
- **WIRE DIA.:** 1.2 mm
- **WIRE STICKOUT:** 15 mm
- **WIRE ANTI-STICKING:** 0.1 sec
- **ARC FAILURE STOP:** 0.6 sec

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RANGE: positive</td>
<td>RANGE: positive</td>
</tr>
<tr>
<td>ADJ.: 1.00</td>
<td>ADJ.: 1.00</td>
</tr>
<tr>
<td>REF. (V)</td>
<td>MEA. (A)</td>
</tr>
<tr>
<td>0.00</td>
<td>30</td>
</tr>
<tr>
<td>1.35</td>
<td>77</td>
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<tr>
<td>2.70</td>
<td>124</td>
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<tr>
<td>0.00</td>
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</tr>
</tbody>
</table>

#### POWER SOURCE NO.: 4

- **POWER SOURCE NAME:** MOTOWELD-E series 500A class
- **COMMENT:** COMBINATION GAS AND WIRE
- **POWER SUPPLY:** independent
- **SHIELDING GAS:** MAG
- **WIRE DIA.:** 1.2 mm
- **WIRE STICKOUT:** 15 mm
- **WIRE ANTI-STICKING:** 0.1 sec
- **ARC FAILURE STOP:** 0.6 sec

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RANGE: positive</td>
<td>RANGE: positive</td>
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<td>ADJ.: 1.00</td>
<td>ADJ.: 1.00</td>
</tr>
<tr>
<td>REF. (V)</td>
<td>MEA. (A)</td>
</tr>
<tr>
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<td>30</td>
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<tr>
<td>1.35</td>
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<tr>
<td>2.70</td>
<td>124</td>
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<td>10.80</td>
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<tr>
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<td>453</td>
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<td>500</td>
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<tr>
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</tbody>
</table>
### POWER SOURCE NO.: 5
- **POWER SOURCE NAME:** MOTOWELD-S350-AJ2/3
- **COMMENT:** STC NO-CONTROL
- **POWER SUPPLY:** A (synergic)
- **SHIELDING GAS:** CO₂
- **WIRE DIA.:** 1.2 mm
- **WIRE STICKOUT:** 15 mm
- **WIRE ANTI-STICKING:** 0.3 sec
- **ARC FAILURE STOP:** 0.6 sec

### POWER SOURCE NO.: 6
- **POWER SOURCE NAME:** MOTOWELD-S350-AJ2/3
- **COMMENT:** STC NO-CONTROL
- **POWER SUPPLY:** A (synergic)
- **SHIELDING GAS:** MAG
- **WIRE DIA.:** 1.2 mm
- **WIRE STICKOUT:** 15 mm
- **WIRE ANTI-STICKING:** 0.3 sec
- **ARC FAILURE STOP:** 0.6 sec

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>REF. (V)</td>
<td>MEA. (%)</td>
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<tr>
<td>1.00</td>
<td>100</td>
</tr>
<tr>
<td>2.00</td>
<td>145</td>
</tr>
<tr>
<td>3.50</td>
<td>185</td>
</tr>
<tr>
<td>5.00</td>
<td>230</td>
</tr>
<tr>
<td>7.00</td>
<td>270</td>
</tr>
<tr>
<td>10.00</td>
<td>350</td>
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### POWER SOURCE NO.: 7
- **POWER SOURCE NAME:** MOTOWELD-S350-AJ2/3
- **COMMENT:** STC NO-CONTROL
- **POWER SUPPLY:** independent
- **SHIELDING GAS:** CO₂
- **WIRE DIA.:** 1.2 mm
- **WIRE STICKOUT:** 15 mm
- **WIRE ANTI-STICKING:** 0.3 sec
- **ARC FAILURE STOP:** 0.6 sec

### POWER SOURCE NO.: 8
- **POWER SOURCE NAME:** MOTOWELD-S350-AJ2/3
- **COMMENT:** STC NO-CONTROL
- **POWER SUPPLY:** independent
- **SHIELDING GAS:** MAG
- **WIRE DIA.:** 1.2 mm
- **WIRE STICKOUT:** 15 mm
- **WIRE ANTI-STICKING:** 0.3 sec
- **ARC FAILURE STOP:** 0.6 sec

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>VOLTAGE</th>
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</thead>
<tbody>
<tr>
<td>REF. (V)</td>
<td>MEA. (%)</td>
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1-180
### Arc Welding Application

#### Appendix 2

<table>
<thead>
<tr>
<th>POWER SOURCE NO.: 9</th>
<th>POWER SOURCE NO.: 10</th>
</tr>
</thead>
<tbody>
<tr>
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<td>MOTOWELD-S350-AJ2/3</td>
</tr>
<tr>
<td>MOTOWELD-S350-AJ2/3</td>
<td>COMMENT: STC NO-CONTROL</td>
</tr>
<tr>
<td>COMMENT: STC NO-CONTROL</td>
<td>POWER SUPPLY: A (synergic)</td>
</tr>
<tr>
<td>POWER SUPPLY: A (synergic)</td>
<td>SHIELDING GAS: CO2</td>
</tr>
<tr>
<td>SHIELDING GAS: CO2</td>
<td>WIRE DIA.: 0.9 mm</td>
</tr>
<tr>
<td>WIRE DIA.: 0.9 mm</td>
<td>WIRE STICKOUT: 10 mm</td>
</tr>
<tr>
<td>WIRE STICKOUT: 10 mm</td>
<td>WIRE ANTI-STICKING: 0.3 sec</td>
</tr>
<tr>
<td>WIRE ANTI-STICKING: 0.3 sec</td>
<td>ARC FAILURE STOP: 0.6 sec</td>
</tr>
<tr>
<td>ARC FAILURE STOP: 0.6 sec</td>
<td></td>
</tr>
</tbody>
</table>

#### POWER SOURCE NO.: 11

<table>
<thead>
<tr>
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<th>VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
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<td>RANGE: positive</td>
</tr>
<tr>
<td>ADJ: 1.00</td>
<td>ADJ: 1.00</td>
</tr>
<tr>
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<td>MEA. (A)</td>
</tr>
<tr>
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<tr>
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#### POWER SOURCE NO.: 12

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<tbody>
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### Arc Welding Application

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### Notes
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- COMMENT: STC CONTROL
- POWER SUPPLY: A (synergic)
- SHIELDING GAS: CO2
- WIRE DIA.: 1.2 mm
- WIRE STICKOUT: 15 mm
- WIRE ANTI-STICKING: 0.3 sec
- ARC FAILURE STOP: 0.6 sec
- POWER SOURCE NO.: 14
- POWER SOURCE NAME: MOTOWELD-S350-AJ2/3
- COMMENT: STC CONTROL
- POWER SUPPLY: A (synergic)
- SHIELDING GAS: MAG
- WIRE DIA.: 1.2 mm
- WIRE STICKOUT: 15 mm
- WIRE ANTI-STICKING: 0.3 sec
- ARC FAILURE STOP: 0.6 sec
- POWER SOURCE NO.: 15
- POWER SOURCE NAME: MOTOWELD-S350-AJ2/3
- COMMENT: STC CONTROL
- POWER SUPPLY: independent
- SHIELDING GAS: CO2
- WIRE DIA.: 1.2 mm
- WIRE STICKOUT: 15 mm
- WIRE ANTI-STICKING: 0.3 sec
- ARC FAILURE STOP: 0.6 sec
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- POWER SOURCE NAME: MOTOWELD-S350-AJ2/3
- COMMENT: STC CONTROL
- POWER SUPPLY: independent
- SHIELDING GAS: MAG
- WIRE DIA.: 1.2 mm
- WIRE STICKOUT: 15 mm
- WIRE ANTI-STICKING: 0.3 sec
- ARC FAILURE STOP: 0.6 sec
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POWER SOURCE NAME: MOTOWELD-S350-AJ2/3
COMMENT: STC CONTROL
POWER SUPPLY: A (synergic)
SHIELDING GAS: CO2
WIRE DIA.: 0.9 mm
WIRE STICKOUT: 10 mm
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ARC FAILURE STOP: 0.6 sec

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ARC FAILURE STOP: 0.6 sec

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COMMENT: STC CONTROL
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YRC1000
ARC WELDING
OPERATOR’S MANUAL

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

YASKAWA
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