YRC1000
ARC WELDING
LINCOLN ARCLINK/XT
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”.

Part Number: 182777-1CD
Revision: 0
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www.motoman.com
Arc Welding Lincoln Arclink/XT

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.
We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: (734) 994-6088
FAX: (734) 994-3338
www.roboticsonline.com

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

We recommend approved Yaskawa training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
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.

NOTICE
To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “DANGER”, “WARNING” and “CAUTION”
Notes for Safe Operation

**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 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>
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Descriptions of the programming pendant keys, buttons, and displays are shown as follows.

<table>
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<th>Manual Designation</th>
</tr>
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<tr>
<td>Programming</td>
<td></td>
</tr>
<tr>
<td>Pendant</td>
<td></td>
</tr>
<tr>
<td>Character Keys</td>
<td>The keys which have characters or its</td>
</tr>
<tr>
<td>Symbol Keys</td>
<td>symbols printed on them are denoted with [.]. ex. [ENTER]</td>
</tr>
<tr>
<td>Axis Keys</td>
<td>[Axis Keys] and [Numeric Keys] are generic</td>
</tr>
<tr>
<td>Numeric Keys</td>
<td>names for the keys for axis operation and</td>
</tr>
<tr>
<td></td>
<td>number input.</td>
</tr>
<tr>
<td>Keys pressed simultaneously</td>
<td>When two keys are to be pressed simultaneously, the keys are shown with a</td>
</tr>
<tr>
<td></td>
<td>“+” sign between them. ex. [SHIFT]^[COORD]</td>
</tr>
<tr>
<td>Displays</td>
<td>The menu displayed in the programming</td>
</tr>
<tr>
<td></td>
<td>pendant is denoted with { }. ex. [JOB]</td>
</tr>
</tbody>
</table>

**Description of the Operation Procedure**

In the explanation of the operation procedure, the expression “Select • • • ” means that the cursor is moved to the object item and [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.

**Safeguarding Tips**

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this equipment, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this equipment.

- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.

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

- In accordance with ANSI/RIA R15.06-2012, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).
Mechanical Safety Devices

The safe operation of this equipment is ultimately the users responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06-2012 safety standards, and other local codes that may pertain to the installation and use of this equipment.

Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety equipment is provided as standard:

- Safety barriers
- Door interlocks
- Emergency stop palm buttons located on operator station

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.
Programming, Operation, and Maintenance Safety

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this equipment should be permitted to program, or maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the equipment to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.

- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.

- Check the E-Stop button on the operator station for proper operation before programming. The equipment must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.

- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.

- Any modifications to the controller unit can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to the controller unit. Making any changes without the written permission from Yaskawa will void the warranty.

- Some operations require a standard passwords and some require special passwords.

- The equipment allows modifications of the software for maximum performance. Care must be taken when making these modifications. All modifications made to the software will change the way the equipment operates and can cause severe personal injury or death, as well as damage parts of the system. Double check all modifications under every mode of operation to ensure that the changes have not created hazards or dangerous situations.

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

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

- Use proper replacement parts.

- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.
Maintenance Safety

Turn the power OFF and disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

Perform only the maintenance described in this manual. Maintenance other than specified in this manual should be performed only by Yaskawa-trained, qualified personnel.

Summary of Warning Information

This manual is provided to help users establish safe conditions for operating the equipment. Specific considerations and precautions are also described in the manual, but appear in the form of Dangers, Warnings, Cautions, and Notes.

It is important that users operate the equipment in accordance with this instruction manual and any additional information which may be provided by Yaskawa. Address any questions regarding the safe and proper operation of the equipment to Yaskawa Customer Support.
Customer Support Information

If you need assistance with any aspect of your Arc Welding Lincoln Arclink/XT system, please contact Yaskawa Customer Support at the following 24-hour telephone number:

(937) 847-3200

For routine technical inquiries, you can also contact Yaskawa Customer Support at the following e-mail address:

techsupport@motoman.com

When using e-mail to contact Yaskawa Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

NOTICE

Please use e-mail for routine inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact Yaskawa Customer Support at the telephone number shown above.

Please have the following information ready before you call Customer Support:

• System Arc Welding Lincoln Arclink/XT
• Primary Application
• Controller YRC1000
• Software Version Access this information on the Programming Pendant’s LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION}
• Robot Serial Number Located on the robot data plate
• Robot Sales Order Number Located on the YRC1000 controller data plate
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Appendix A | Table of Work Instructions | A-1
1 Arc Welding Application

1.1 System Structure Example of Arc Welding System

Fig. 1-1: System Structure of Welding Robot
1.2 General Descriptions of Instructions and Functions

1.2.1 Setup

Connect the welder, robot, wirefeeder, and gas lines as shown in the connection diagram provided with your system.

1.2.1.1 Setup the Power Source

Connect a shielded CAT5 (or greater) Ethernet cable from the power source to the robot controller. If using more than one power source (or connecting a PC for remote monitoring) use a standard Ethernet switch to connect all devices.

1.2.1.2 Welder Network Addressing

Each welder in the robot cell must be mapped to a particular welder index. For example: a Lincoln power source with an IP address of 192.168.255.66 may be referred to as “Welder 1” in the Motoman controller. Up to four welders can be mapped per a single controller.

Open the Lincoln Setup screen. From the pendant main menu, touch [Arc Welding] > [Lincoln Setup].

The network will automatically be scanned when opening this screen. By touching the [Refresh Scan...] button, you can manually re-scan the network for any new welders.

Simply touch the welder you want from the list of Available Welders. Upon selecting a particular welder in the list, the LED’s on the front of the power source should begin to rapidly blink, as a visual indication of which welder has been selected. Then, touch the [Assign Rx] button to assign the selected welder to a particular index in the Motoman controller.

You must also specify what type of wire feeder is connected to this welder. Use the [Change Feeder] drop down menu to select the correct feeder.
### 1.2.2 Teaching Operation

#### 1.2.2.1 Teach a weld line.

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<th>Action</th>
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</thead>
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<td>NOP</td>
<td></td>
</tr>
<tr>
<td>001</td>
<td>MOVJ VJ=10.00</td>
<td>Standby position</td>
</tr>
<tr>
<td>002</td>
<td>MOVJ VJ=80.00</td>
<td>Approach position</td>
</tr>
<tr>
<td>003</td>
<td>MOVL V=800</td>
<td>Welding start point</td>
</tr>
<tr>
<td>004</td>
<td>MOVL V=50</td>
<td></td>
</tr>
<tr>
<td>005</td>
<td>MOVL V=50</td>
<td>Welding end point</td>
</tr>
<tr>
<td>006</td>
<td>MOVL V=800</td>
<td>Retract position</td>
</tr>
<tr>
<td>007</td>
<td>MOVJ VJ=50.00</td>
<td></td>
</tr>
<tr>
<td>008</td>
<td>END</td>
<td>Standby position</td>
</tr>
</tbody>
</table>

![Diagram showing steps and movements during welding process]
1.2.2.2 Register work instructions.

- **ARCON section 1.5.1 “ARCON”**
- **ARCOF section 1.5.2 “ARCOF”**
- **ARCSET section 1.5.3 “ARCSET”**

```
000 NOP
001 MOVJ VJ=10.00  Standby position
002 MOVJ VJ=80.00 Approach position
003 MOVL V=800    Welding start point
004 ARCON ASF#(1) Welding start
005 MOVL V=50     Welding condition change
006 ARCSET ASF#(2) Welding end point
007 MOVL V=50     Welding end
008 ARCOF AEF#(1) Retract end
009 MOVL V=800    Retract
010 MOVJ VJ=50.00 Standby position
011 END
```

1.2.2.3 Set welding conditions.

- **Arc welding start condition section 1.5.1 “ARCON”**
- **Arc welding end condition section 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 ASF#(2)
007 MOVL V=50
008 ARCOF AEF#(1)
009 MOVL V=800
010 MOVJ VJ=50.00
011 END
```
1.2.2.4 Set other welding functions.

- Weaving section 1.13 "Weaving Operation"
- Arc retry function section 1.7 "Arc Retry Function"
- Arc restart function section 1.8 "Arc Restart Function"
- Wire-stick check function section 1.10 "Wire-Stick Check Function"
- Automatic wire-stick release function section 1.9 "Automatic Wire-Stick Release Function"
- Slope up/down function section 1.11 "Slope Up/Down Function"
- Welding path shift function see Appendix A

1.2.2.5 Check the operation.

- Test operations (See YRC1000 GENERAL OPERATOR’S MANUAL (178645-1CD) section 3.8 "Test Operations").
- Welding execution function during teach mode section 1.5.8 "Welding Execution Function during Teach Mode"

1.2.3 Playback

1.2.3.1 Fine-control the welding conditions.

- Changing welding conditions during playback section 1.14 "Changing Welding Conditions during Playback"
- Arc monitor function section 1.17 "Production Monitoring"
1.2.4 Production (Automatic Operation)

1.2.4.1 Control the arc welding operation.

- Check for welding errors section 1.15 "Displaying Welding Alarm History"
- Arc welding management and maintenance section 1.16 "Arc Welding Management and Maintenance"
- Welding condition check section 1.17 "Production Monitoring"
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.**
  
  \[[REFP] + [FWD]\]
  
  Moves the manipulator to the registered reference point.

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

- **Registers a welding end instruction “ARCOFF”.**
1.3 Function Keys

### 1.3.1 Wire Inching Function

#### 1.3.1.1 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.

By default the wire feed speed will gradually increase as the key is held. But if a specific wire feed speed is desired, enter the specific value (inches / min) into the following M register(s):

- R1 - M330
- R2 - M363
- R3 - M396
- R4 - M429

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

### 1.3.2 Gas Flow Control Function

Use this key to control the gas flow. Gas is fed only while [GAS] is pressed.

(Refer to section 1.3.2 “Gas Flow Control Function”.)

### Wire Feeding

The wire is fed only while [FEED] is pressed.
1.3.1.3 **Wire Retraction**

The wire is retracted only while [RETRACT] is pressed.

1.3.2 **Gas Flow Control Function**

The gas 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

CAUTION

The Power Source Condition File contains fixed values for the Lincoln ArcLinkXT interface. This must not be modified.
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.

NOTICE

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

1.5.1.2 Syntax

WELDn [1]

This tag is 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, this tag is 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 4.</td>
<td></td>
</tr>
</tbody>
</table>

ASF# (Arc welding start condition file number) [2]

<table>
<thead>
<tr>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<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 999 The number can be specified by B/I/D/LB/LI/LD variable.</td>
</tr>
</tbody>
</table>
1.5.4 Registering the ARCON Instruction

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

1.5.5 Setting Welding Start Conditions

The ARCON instruction can be registered in either of the following two ways:

- 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 section 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 section 1.5.3 “ARCSET”.)

**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.
2. Press [SELECT].
   –The DETAIL EDIT window appears.
3. Place the cursor on “UNUSED”.

   ![Screenshot of DETAIL EDIT window showing SET METHOD: UNUSED]

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

   ![Screenshot of DETAIL EDIT window showing SET METHOD: ASF#()]

5. Set the file number.
   –Specify the file number (1 to 999).
   (1) Move the cursor to the file number and press [SELECT].

   ![Screenshot of DETAIL EDIT window showing file number set to 1]
(2) Type the file number using [Numeric Key] and press [ENTER].

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

7. 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.
### Without Additional Items

**NOTICE**

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 section 1.5.3 “ARCSET”.)

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

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

3. Place the cursor on “ASF#( )”.

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.

   ![Screenshot of JOB CONTENT window]

   –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.

**NOTICE**

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]**
  This tag is 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, this tag is 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 4.</td>
<td></td>
</tr>
</tbody>
</table>

- **AEF# (Arc welding end condition file number) [2]**

<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 999
  |                                          |                                                                             | The number can be specified by B/I/D/LB/LI/LD variable.              |
1.5.2.4 Registering the ARCOF Instruction

1. Press [ARCOF].

2. Press [ENTER].

1.5.2.5 Setting Arc Welding End Conditions (Crater Processing)

The ARCOF instruction can be registered in either of the following two ways:

- 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 section 1.5.5 “Arc End Condition File”.)

- Without additional items
  - ARCOF
    This will end the weld without performing any specific crater conditions or wire stick checking. (Refer to section 1.5.3 “ARCSET”.)
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.
5. Set the file number.
   –Specify the file number (1 to 999).
   (1) Move the cursor to the file number and press [SELECT].
(2) Type the file number using [Numeric Key] and press [ENTER].

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

7. 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. **Without Additional Items**

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

   ![JOB CONTENT](image)

2. Press [ENTER].
   - The ARCOF instruction is registered in the job.
1.5.3 ARCSET

1.5.3.1 Function

The ARCSET instruction must be registered with an arc welding start condition file:

- ARCSET ASF# (1)
  ACOND=0: Use the weld settings from the “start condition”
  ACOND=1: Use the weld settings from the “main condition”
  (Refer to section 1.5.4 “Arc Start Condition File”.)

1.5.3.2 Syntax

1.5.3.3 Explanation

- **WELDn [1]**
  This tag is 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, this tag is 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 4.</td>
<td></td>
</tr>
</tbody>
</table>

- **ASF# (Arc welding start condition file number) [2]**

<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 999
  |                                           |                                                   | The number can be specified by B/I/D/LB/LI/LD variable. |
1.5.3.4 Registering the ARCSET Instruction

- **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 999).

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

   (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].
Arc Welding Lincoln Arclink/XT

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

–ACOND=0: Sets the weld settings which are specified in the “start condition”.

–ACOND=1: Sets the weld settings which are specified in the “main condition”.

5. Press [ENTER].

–The set contents are displayed in the input buffer line.

6. Press [ENTER].

–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

Up to 999 Arc Start Condition files can be defined. Each of these files is related to a specifically defined welder (1-4) based on the mapping created in the Lincoln Setup screen. Refer to section 1.2.1.2 “Welder Network Addressing” on page 1-2 for details.

A welding procedure is made up of seven components: process, material type, wire diameter, program, wire feed speed, voltage or arc length trim, and wave control. Selecting a welding mode determines the output characteristics of the power source.

The standard process modes shipped with the system encompass a wide range of common processes and will meet most needs.

**NOTICE**

Many fields in the Arc Start Condition file editor are disabled based on the active security level of the pendant.

Users with Operator level security access are not able to modify any of the settings.

Users with Editing level access are only be able to modify the Weld Control Parameters of files that have already been configured, but cannot change the selected mode or modify fields that affect robot motion during the weld.

Users with Management level access are able to modify and create new files.

1.5.4.1 Arc Start Condition File Editor

The Arc Start condition file editor can be opened from the Main Menu or by clicking on the direct open key while highlighting an ARCON command in a job file.

1.5.4.2 Tabs

Conditions of the arc start condition file are divided into the tabs: “Process,” “Preflow,” “Start Condition,” “Main Condition,” and “Other.”

To switch between tabs, use the cursor key (left and right) or simply touch the desired tab on the pendant screen.
“Process” Tab Window

The Process tab helps determine the output characteristics of the power source. The Search field allows you to view the available process modes by process type, wire type, and wire size. Selecting a setting for one component narrows your choice of available mode numbers in the table. If the process mode number is known, it can be entered directly into the field next to the [Set Process] button.

Process mode selection directly impacts what values and parameters are available in each subsequent tab and how they determine the output characteristics of the power source.

A. Process Type:
Select the welding process. Multiple selections are available including; SMAW, SSFCAW, GTAW, Gouge, PAW, and SAW.

B. Wire Type
Select from the wire material types available. Multiple selections are available including; Aluminum, Copper, Stainless, Metal Core, and many others.

C. Wire Size
Select from the wire diameters available.

D. Process Selection
Once the available modes have been narrowed down using the Search fields, select a specific process mode from the listed programs available for the selected process, wire type, and wire size. A specific process must be selected before clicking the [Set Process] button.

E. Set Process
Click the [Set Process] button to select the desired process mode. If any settings are outside accepted values, they will be highlighted in red and must be corrected before the process is set.
1.5 Basic Functions

“Preflow” Tab Window

Allows shielding-gas output prior to the beginning of welding.

A. Gas: Preflow Time

After the manipulator moves to the welding start point, the shielding gas can be started before the manipulator begins welding. The manipulator is stationary during Preflow.

Use the check box to enable / disable Preflow. Then, enter a length of time (in seconds) to hold with the gas on.

“Start Condition” Tab Window

A “Start Condition” allows for a brief period of different weld parameters at the start of the weld. This is often used to deposit extra material at the start of the weld or to ramp from a low setting to a higher setting. Check the “Enable Starting Condition” and “Enable Slope” boxes to specify whether the conditions set in “Start Condition” tab step or gradually ramp to the conditions set in “Main Condition” tab when starting welding.

The available parameters change based on what options are enabled, as shown in the following:

Fig. 1-2: With “Enable Starting Condition” Unchecked
1.5 Basic Functions

A. Strike Wirefeed Speed
The wirefeed speed from the time of ArcOn until the wire contacts the part and an arc is detected.

B. Delay After Strike
The length of time when the manipulator pauses between detecting the arc and beginning motion.

C. Enable Starting Condition
Allows different weld settings at the beginning of the weld before applying the Main Condition settings.

D. Robot Move Distance
Specifies the travel distance over which the Starting conditions are applied before switching to the Main condition.

E. Weld Control Parameters
The process mode selection directly impacts what values and parameters appear in the weld control parameters area. These control parameters vary depending on the process mode selection. Some of the more common parameters include:

- **WFS (Wire Feed Speed)**
  In synergic welding modes (synergic CV, pulse GMAW) WFS is the dominant control parameter, controlling all other variables. The user adjusts WFS according to factors such as weld size, penetration requirements, heat input, etc. The WFS setting is used to adjust output characteristics (output voltage, output current) according to pre-programmed settings.
  In non-synergic modes, the WFS control behaves more like a conventional CV power source where WFS and voltage are independent adjustments. Therefore, to maintain the arc characteristics, voltage must be adjusted to compensate for any changes made to the WFS.
1.5 Basic Functions

- **Voltage**
  Welding voltage output value. In constant voltage modes (synergic CV, standard CV) this control adjusts the welding voltage. In pulse synergic welding modes (pulse GMAW only) the user can change the Trim setting to adjust the arc length. It is adjustable from 0.50 to 1.50. A Trim setting of 1.00 is a good starting point for most conditions.

Refer to the Lincoln power source documentation included with your system for more information regarding these weld control parameters.

**F. Enable Slope**

Allows a gradual transition between the conditions set in “Start Condition” tab and those specified in the “Main Condition” tab. Stepping causes the weld parameters to immediately transition to the Main condition. Sloping causes the weld parameters to gradually ramp up/down to the Main condition.

**G. Slope Distance**

Displayed only when the Enable Slope box is checked. The robot travel distance where the conditions are gradually changed from the ones set in the “Start Condition” tab to the ones set in the “Main Condition” tab.

**H. Robot Speed**

Displayed only when the Enable Slope box is checked. The speed which the manipulator moves along the welding line as it transitions between the conditions set in “Start Condition” tab and those specified in the “Main Condition.” This value can be overridden by the speed value specified in the INFORM job. The speed value that is given precedence is controlled by robot parameter AxP005. See section 1.5.7 “Welding Speed Specifications” on page 1-46.
Arc Welding Application
1.5 Basic Functions

“Main Condition” Tab Window

Fig. 1-5: Main Condition Tab

A. Robot Speed

Travel speed of the robot until an ARCOF command is reached or a new speed is requested. This value can be overridden by the speed value specified in the INFORM job. The speed value that is given precedence is controlled by robot parameter AxP005. See section 1.5.7 “Welding Speed Specifications” on page 1-46.

B. Weld Control Parameters

Process mode selection directly impacts what values and parameters appear in the weld control parameters area. These control parameters vary depending on the process mode selection. Some of the more common parameters include:

- WFS (Wire Feed Speed)
  In synergic welding modes (synergic CV, pulse GMAW) WFS is the dominant control parameter, controlling all other variables. The user adjusts WFS according to factors such as weld size, penetration requirements, heat input, etc. The WFS setting is used to adjust output characteristics (output voltage, output current) according to pre-programmed settings.
  In non-synergic modes, the WFS control behaves more like a conventional CV power source where WFS and voltage are independent adjustments. Therefore, to maintain the arc characteristics, voltage must be adjusted to compensate for any changes made to the WFS.

- Voltage
  Welding voltage output value. In constant voltage modes (synergic CV, standard CV) this control adjusts the welding voltage. In pulse synergic welding modes (pulse GMAW only) the user can change the Trim setting to adjust the arc length. It is adjustable from 0.50 to 1.50. A Trim setting of 1.00 is a good starting point for most conditions.

Refer to the Lincoln power source documentation included with your system for more information regarding these and other weld control parameters.
1 Arc Welding Application
1.5 Basic Functions

“Other” Tab Window
The Other tab provides settings for Position Set Zone, Arc Retry, and others.

Fig. 1-6: Other Tab

A. 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 “Unused", the welding start signal is output to the Power Source immediately after the move instruction to the welding start point is output.

When the position set zone is set to 1, the welding start signal is output to the Power Source after the manipulator completely reaches the welding start point and stops.

When a bigger number is selected (2, 3, or 4), the timing of the output of the welding start signal becomes earlier, i.e., the time from the output of the welding start signal to the welding start point becomes longer.

B. Enable Retry
Turns retry function ON or OFF. This allows the robot to retry an ARCON command if the arc fails to start at the beginning of the weld.

Check this box to turn the retry function ON. See section 1.7 “Arc Retry Function” on page 1-50 for information about the Arc Retry Function.

C. Arc Failure Restart
Specifies whether the Arc Restart function is used. If this function is used, the settings are specified in both the Global tab and the Arc Auxiliary file. See section 1.8.1 “Arc Auxiliary Condition File” on page 1-54 for more information.

D. Production Monitoring Profile Number
Specifies the profile (1-200) that will be used to record statistics for this weld. See section 1.17 “Production Monitoring” on page 1-95.
**E. Burnback**

When the weld is stopped without using an Arc End File (such as HOLD, EStop, or ARCOF command without AEF tag), it is common for the wire to end stuck to the workpiece. By checking this option, an automatic burnback can be applied at the end of the weld by stopping the wire-drive for the specified amount of time. The weld controller stays on during this time, with the currently active weld parameters, to melt the wire back toward the contact tip.

**F. Disable Last-Weld data collection on robot**

At the end of each arc, the welder automatically calculates statistics about the weld. Normally, the robot will retrieve this data and save it to global variables for use by the robot programmer or a connected PLC. By checking this option, the robot controller will not retrieve the data from the welder. This can help improve cycle time when performing rapid, short welds with minimal time between arcs. This option does not disable the statistics within the welder. So any production monitoring applications run from a PC or central server will not be affected.

**G. Copy**

Allows the user to copy all settings from another Arc Start file. The active file number is the destination of the copy. Input the file number of the source file and touch the [Copy From] button.

**H. Display Units**

This determines whether the weld control parameters are displayed with metric or imperial units. This setting does not apply to any Robot Speed fields. The unit for Robot Speed is based on the speed used for programming robot jobs. This can be changed from the main menu under Setup → Operate Condition.
1.5.5 Arc End Condition File

Up to 999 Arc End Condition files can be defined. Each of these files is related to a specifically defined welder (1-4) based on the mapping created in the Lincoln Setup screen. Refer to section 1.2.1.2 “Welder Network Addressing” on page 1-2.

A welding procedure is made up of seven components: process, material type, wire diameter, program, wire feed speed, voltage or arc length trim, and wave control. Selecting a welding mode determines the output characteristics of the power source.

The standard process modes shipped with the system encompass a wide range of common processes and will meet most needs.

NOTICE

Many fields in the Arc End Condition file editor are disabled based on the active security level of the pendant.

Users with Operator level security access are not able to modify any of the settings.

Users with Editing level access are only be able to modify the Weld Control Parameters of files that have already been configured, but cannot change the selected mode or modify fields that affect robot motion during the weld.

Users with Management level access are able to modify and create new files.

1.5.5.1 Arc End Condition File Editor

The Arc End condition file editor can be opened from the main menu or by clicking on the direct open key while highlighting an ARCOF command in a job file.

1.5.5.2 Tabs

Conditions of the arc end condition file are divided into the tabs: “Process,” “Crater,” “Burnback,” “Postflow,” and “Misc.”

To switch between tabs, use the cursor key (left and right) or simply touch the desired tab on the pendant screen.
“Process” Tab Window

The Process tab helps determine the output characteristics of the power source. The Search field allows you to view the available process modes by process type, wire type, and wire size. Selecting a setting for one component narrows your choice of available mode numbers in the table. If the process mode number is known, it can be entered directly into the window next to the [Set Process] button.

Process mode selection directly impacts what values and parameters are available in each subsequent tab and how they determine the output characteristics of the power source.

Fig. 1-7: Process Tab

A. Process Type:
Select the welding process. Multiple selections are available including; SMAW, SSFCAW, GTAW, Gouge, PAW, and SAW.

B. Wire Type
Select from the wire material types available for the selected process. Multiple selections are available including; Aluminum, Copper, Stainless, Metal Core, and many others.

C. Wire Size
Select from the wire diameters available for the selected process and material type.

D. Process Selection
Once the selection has been narrowed down using the Search field, select a specific process mode from the listed programs available for the selected process, wire type, and wire size. Only once a process has been selected and highlighted can the [Set Process] button be pressed.

E. Set Process
Click the [Set Process] button to select the desired process mode. If any settings are outside accepted values, they will be highlighted in red and must be corrected before the process is set.
“Crater” Tab Window

The Crater condition is used to fill in the end of the weld. This can be used to create a "puddle" for a smooth and consistent finish or to taper up/down from a main weld condition resulting in a narrower or wider weld approaching the end of the weld.

**Fig. 1-8: Crater Tab**

A. Slope down from Main Condition

Allows a gradual transition between the conditions set in the “Main Condition” tab of the Arc Start condition file and those specified in the “Crater” tab. If this is not selected, the weld control parameters immediately switch to those specified in the “Crater” tab.

B. Robot Speed

Displayed only when the “Slope down” box is checked.

The speed which the manipulator moves along the welding line as it transitions between the conditions set in “Main Condition” tab and those specified in the “Crater” tab. This value can be overridden by the speed value specified in the INFORM job. The speed value that is given precedence is controlled by robot parameter AxP005. See section 1.5.7 “Welding Speed Specifications” on page 1-46.

C. Slope Distance

Displayed only when the Enable Slope box is checked.

The robot’s travel distance over which the conditions are gradually changed from the ones set in the “Start Condition” tab to the ones set in the “Main Condition” tab.

D. Crater Duration

The amount of time the Crater setting are applied.

**NOTICE**

The Crater condition is always used when an Arc End file is used. If the crater condition is not wanted but an Arc End file must be used, the duration can be set to “0.0” or the weld control parameters can be set to be the same as the Main condition.
E. Weld Control Parameters

Process mode selection directly impacts what values and parameters appear in the weld control parameters area. These control parameters vary depending on the process mode selection. Some of the more common parameters include:

- **WFS (Wire Feed Speed)**
  In synergic welding modes (synergic CV, pulse GMAW) WFS is the dominant control parameter, controlling all other variables. The user adjusts WFS according to factors such as weld size, penetration requirements, heat input, etc. The WFS setting is used to adjust output characteristics (output voltage, output current) according to pre-programmed settings.
  In non-synergic modes, the WFS control behaves more like a conventional CV power source where WFS and voltage are independent adjustments. Therefore, to maintain the arc characteristics, voltage must be adjusted to compensate for any changes made to the WFS.

- **Voltage**
  Welding voltage output value. In constant voltage modes (synergic CV, standard CV) this control adjusts the welding voltage. In pulse synergic welding modes (pulse GMAW only) the user can change the Trim setting to adjust the arc length. It is adjustable from 0.50 to 1.50. A Trim setting of 1.00 is a good starting point for most conditions.

Refer to the Lincoln power source documentation included with your system for more information regarding these and other weld control parameters.

■ “Burnback” Tab Window

The burnback function is setup to use a wire feed speed of zero while maintaining power to the weld controller. This will allow the wire to melt back toward the contact tip. This ensures the wire is cleared from the workpiece at the end of the weld.

**NOTICE**

Although WFS is a parameter for the burnback procedure, the wire feeder is disabled. For synergic weld modes, the WFS is used to determine the voltage of the weld.
1.5 Basic Functions

Arc Welding Lincoln Arclink/XT

Fig. 1-9: Burnback Tab

A. Burnback Duration
The amount of time the burnback setting are applied.

B. Weld Control Parameters
Process mode selection directly impacts what values and parameters appear in the weld control parameters area. These control parameters vary depending on the process mode selection. Some of the more common parameters include:

- WFS (Wire Feed Speed)
The wire feeder is always disabled during the burnback process. However, in synergic welding modes (synergic CV, pulse GMAW) WFS is the dominant control parameter, controlling all other variables. The user adjusts WFS according to factors such as weld size, penetration requirements, heat input, etc. The WFS setting is used to adjust output characteristics (output voltage, output current) according to pre-programmed settings.

- Voltage
Welding voltage output value. In constant voltage modes (synergic CV, standard CV) this control adjusts the welding voltage. In pulse synergic welding modes (pulse GMAW only) the user can change the Trim setting to adjust the arc length. It is adjustable from 0.50 to 1.50. A Trim setting of 1.00 is a good starting point for most conditions.

Refer to the Lincoln power source documentation included with your system for more information regarding these and other weld control parameters.
“Postflow” Tab Window
Enables postflow of shielding gas as the manipulator holds over the end of the weld.

Fig. 1-10: Postflow Tab

A. Postflow Time
Specifications with the length of time to feed the shielding gas while the manipulator remains stationary at the end of the weld.
### “Misc” Tab Window

**Fig. 1-11: Miscellaneous Tab**

#### A. 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 “Unused”, the welding end signal is output to the Power Source immediately after the move instruction to the welding end point is output.

When the position set zone is set to 1, the welding end signal is output to the Power Source after the manipulator completely reaches the ARCOF command and stops.

When a bigger number is selected (2, 3, or 4), the timing of the output of the welding end signal becomes earlier, i.e., the time from the output of the welding end signal to the welding end point becomes longer.

![Diagram of Position Set Zone](image)

#### Crater at the end of the weld bead

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

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

**NOTICE**

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.

B. Enable Stick Check

Specifies whether the stick check function is ON or OFF. When enabled, the robot will perform a touchsense routine to determine if the weld wire is fused to the workpiece. This allows the robot to ensure that the wire is free from the workpiece prior to moving to the next programmed point. These settings override those in the Arc Auxiliary Condition file.

C. Automatically Clear Stuck Wire

If wire stick is detected the power source re-energizes with the settings from the burnback tab in an attempt to clear the stuck wire. Refer to section 1.10 “Wire-Stick Check Function” on page 1-57.

D. Check Duration

Amount of time that the wire stick check is performed. The robot determines if the wire is stuck at the end of this time period.

E. Clear Attempts

Determines the number of times to repeat the auto clear process. If the wire is still stuck after this number of repeated attempts, an alarm appears instructing you to manually cut the wire and reset the alarm.

F. Copy

Allows the user to copy all settings from another Arc End file. The active file number is the destination of the copy. Input the file number of the source file and touch the [Copy From] button.

G. Display Units

Determines if the weld control parameters are displayed in metric or imperial units. This setting does not apply to any Robot Speed fields. The unit for Robot Speed is based on the speed used for programming robot jobs. This can be changed from the main menu under Setup -> Operate Condition.
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**

  ![Flowchart]

  1. Start
  2. Display {WELD COND COPY}.
  3. Select a file to be copied. (Select 1 file.)
  4. Select a copy destination file. (Select 1 or more files.)
  5. Start copying.
  6. End

---

**NOTICE**

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

Note: Copying cannot be executed during playback operation.
## 1.5 Basic Functions

### 1. Display {WELD COND COPY}.

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

#### Procedure

1. Display {WELD COND COPY}.

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

   ![Image of Display {WELD COND COPY}]

   - 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.

   ![Image of Selecting a File to Copy]
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.

**NOTICE**

If selecting more than one copy of the destination files:

– Select the copy destination file by moving the cursor to the row of the "DestNo." (③ in the figure below) and pressing [SELECT].

– When selecting more than two destination files, press [SHIFT]+[SELECT] first, then move the cursor to the other files. Each selected "DestNo." file displays "●" indicating files to copy.
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 is specified by the arc start condition file in the ARCON instruction

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 in accordance to the parameter values below. To switch 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></td>
<td>ARCON instruction speed is priority</td>
<td>1</td>
</tr>
</tbody>
</table>

### NOTICE

During a test run in teach mode, the manipulator may not move at the actual welding speed due to speed limits 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, the weld bead may be thicker compared with a bead that is formed during playback operation, or may burn through can occur as speed of the welding is different from the speed that is appropriate for the welding conditions (current and voltage).

1.5.8 **Welding Execution Function during Teach Mode**

When pressing the [WELD ON/OFF], the LED lights and beep sounds, turning ON the system output signal "#50065: PERMISSIBLE WORK IN TEST RUN".

Pressing [WELD ON/OFF] again, LED goes out and beep stops, then the system output signal "#50065: PERMISSIBLE WORK IN TEST RUN" turns OFF.

The standard ladder program for the arc welding application supports the function so welding can be performed in 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.

1.5.9 **Test Run Operation Mode**

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

Normally the manipulator only moves by pressing [TEST START] after pressing the keys mentioned above simultaneously. However, setting the following parameter, the manipulator only moves when pressing [INTERLOCK].
1.5.10 Notes on Arc Welding

1.5.10.1 Notes on Restarting

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

**NOTICE**

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 (178645-1CD) chapter 8 “Parameter”.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Contents and setting value</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2C308</td>
<td>Continue test run by pressing [TEST START] : 1 Continue test run by pressing [INTERLOCK] : 3  (Pressing [TEST START] is also available to continue test run.)</td>
<td>1</td>
</tr>
</tbody>
</table>
1.6 Global Weld Settings

The Lincoln Setup screen contains an option for Global Weld Settings. These settings apply to every weld that is made, regardless of arc start condition file specified.

![Lincoln Arclink XT Setup](image)

1.6.1 Arc Restart Settings:

See section 1.8 “Arc Restart Function” on page 1-52 for information about the Arc Restart Function.

- **Arc Loss Timeout**
  
  After an arc is lost during the middle of a weld, the robot will continue operating for brief amount of time without any errors. This allows the welder time to re-establish the arc. If the arc does not re-establish within Arc Loss Timeout window, then the Arc Restart routine will be triggered.
  
  Note that this value is ignored if the Arc Restart Function is disabled in the Arc Start Condition File or in the Arc Auxiliary Condition File.

- **Restart Arc At __ % of Main Condition**
  
  During the Arc Restart routine, the robot will move backward to overlap the previous weld. This helps ensure that there are no gaps in the weld joint. In order to prevent excessive weld buildup, the welder can use a lower wire feed speed during the overlap. This is done by scaling the settings in the Main Condition by a fixed percentage.
1.6.2 Advanced Options:

- **Work point in Amps and Time in Volts**
  The Lincoln welder has many dynamic control parameters that can vary based on which process mode is selected. Some users prefer to specify only Amps and Volts. Checking these boxes will convert all modes in the welder to use Amps and Volts.

  NOTICE

  Internally in the welder, the specified Amps and Volts are converted back to the normal dynamic parameters using a fixed lookup table. This table requires a consistent wire stickout length for all welds being performed. This table may need to be customized for a specific application. Contact Lincoln Electric support team for help with the lookup table.

- **Automatic stick-check if not using AEF**
  Normally, a stick-check is only performed if it is enabled in the arc end condition file. However, this setting allows a stick-check to be performed any time the weld ends without an arc end condition file. This includes if the weld ends by enabling the HOLD signal.

  The stick-check is performed by enabling a touchsense routine. This will slightly increase cycle time.

  This routine will only check to see if the wire is stuck. It will not attempt to automatically clear a stuck wire.
1.7 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. 1-12: 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.
1.7 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
   This option is not used for the Lincoln ArcLink/XT interface. The weld settings stored in the arc start file are used when retrying.

6. VOLTAGE
   This option is not used for the Lincoln ArcLink/XT interface. The weld settings stored in the arc start file are used when retrying.

   When the twin synchronous function, etc. is used, the arc retry function cannot be used.
1.8 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).
NOTICE

Moving the job cursor position resets the “restarting” status. Therefore, the arc restart function cannot be executed after the cursor operation.
1.8.1 Arc Auxiliary Condition File

1.8.1.1 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
   Not applicable for ArcLink XT systems. Refer to section 1.6 “Global Weld Settings” on page 1-48. The weld settings stored in the arc start file are used when restarting. The settings are scaled by the value specified in the Global Settings.

5. VOLTAGE
   Not applicable for ArcLink XT systems. Refer to section 1.6 “Global Weld Settings” on page 1-48. The weld settings stored in the arc start file are used when restarting. The settings are scaled by the value specified in the Global Settings.

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.
1.8 Arc Restart Function

(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.

NOTICE

• 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)
• 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)
1.9 Automatic Wire-Stick Release Function

- **Automatic Wire-Stick Release Function**
  The automatic wire-stick release function can be used if a wire stick is detected at the end of the weld.

  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.

---

**WARNING**

Once the wire has been cut and the [Reset] button pressed, the power source applies a 50V touch sense signal to confirm that the wire has been cleared.

---

**Manipulator Stopped by Wire Stick**

- **Automatic Wire-stick Release**
  Even if a single attempt has failed, the process is repeated up to the specified maximum repetition count.

---

**1.9.1 Arc Auxiliary Condition File**

**1.9.1.1 Automatic Wire Anti-Stick Function Setting**

The Arc Auxiliary File is not used for anti-stick with the Lincoln ArcLink XT interface. Refer to the “Misc Tab Window” on page 1-40 for correct settings for anti-stick.
### 1.10 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 activates a burnback at the end of welding (2).

---

**WARNING**

Once the wire has been cut and the [Reset] button pressed, the power source applies a 50V touch sense signal to confirm that the wire has been cleared.

---

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.

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

---

**NOTICE**

**Wire stick**

“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 to workpiece
1.11 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.

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

**Reference Job**

<table>
<thead>
<tr>
<th>NOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOVL V=500</td>
</tr>
<tr>
<td>ARCON ASF#(1)</td>
</tr>
<tr>
<td>MOVC V=80</td>
</tr>
<tr>
<td>MOVC V=80</td>
</tr>
<tr>
<td>MOVC V=80</td>
</tr>
<tr>
<td>MOVC V=80</td>
</tr>
<tr>
<td>ARCCTE AEF#(2)</td>
</tr>
<tr>
<td>MOVC V=80</td>
</tr>
<tr>
<td>ARCOF AEF#(1)</td>
</tr>
<tr>
<td>END</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](attachment:diagram.png)

Current

<table>
<thead>
<tr>
<th>P1</th>
<th>P2</th>
<th>Pn-1</th>
<th>Pn</th>
</tr>
</thead>
<tbody>
<tr>
<td>210</td>
<td>180</td>
<td>160</td>
<td>20mm</td>
</tr>
</tbody>
</table>

Main condition

Welding condition gradually decreases. (Slope Up/Down Func.)

End condition

Manipulator stop (0.3s)
1.11.1 ARCCTS

1.11.1.1 Function

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

1.11.1.2 Syntax

1.11.1.3 Explanation

- **WELD1/WELD2/WELD3/WELD4[1]**

  This tag is 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, this tag is 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 4.</td>
</tr>
<tr>
<td></td>
<td>Value immediately before execution of move instruction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ARCCTS target value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ARCCTS executed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Move section specified by move instruction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Welding continues</td>
<td></td>
</tr>
</tbody>
</table>

**Gradually Decreasing Current or Voltage**

**Gradually Increasing Current or Voltage**
1.11 Slope Up/Down Function

**NOTICE**

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

### 1.11.2 ARCCTE

#### 1.11.2.1 Function

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

#### 1.11.2.2 Syntax

```
ARCCTE
```

#### 1.11.2.3 Explanation

- **WELDn [1]**
  - This tag is 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, this tag is 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 4.</td>
<td></td>
</tr>
</tbody>
</table>

Gradually Decreasing Current or Voltage
Arc Welding Application

1.11 Slope Up/Down Function

Gradually Increasing Current or Voltage

Value immediately before execution of move instruction

ARCCTE executed

Move section specified by move instruction

ARCCTE target value

Welding continues

NOTICE

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

• 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.
1.12 Enhanced Welding Condition File Function

The Lincoln ArcLink XT interface requires the Enhanced Welding Condition File function be enabled.

**NOTICE**

Weld files used with non-Lincoln ArcLink XT welders can not be loaded and used with a Lincoln welder. ArcStart and ArcEnd files are specific to ArcLink XT interfaced welders.

1.12.1 Function Setting

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

**NOTICE**

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}.

![Main Menu with System and Setup options]
1.12 Enhanced Welding Condition File Function

3. Select “OPTION FUNCTION”.

4. Select “ARC WELDING”, then select “ENHANCED”.

--The SETUP window appears.

--The OPTION FUNCTION window appears.

--The selection dialog box appears.
1.12 Enhanced Welding Condition File Function

–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.
1.13 Weaving Operation

1.13.1 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

NOTICE

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

1.13.1.1 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.
Arc Welding Lincoln Arclink/XT

1 Arc Welding Application
1.13 Weaving Operation

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

---

**NOTICE**

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 section 1.13.4.2 “Editing the Condition Data”.

---

For information on registering REFP, refer to the YRC1000 GENERAL OPERATOR’S MANUAL (178645-1CD) section 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.

Wall direction

Example

```
0003 MOVL V=120
0004 WVON WEV#(1)
0005 REFP 1
0006 MOVL V=50
0007 WVOF
```

< Example 2 >
REFP 2 is registered because the approach point is at another side of the wall.

Example

```
0009 MOVJ VJ=25.00
0010 MOVL V=120
0011 WVON WEV#(1)
0012 REFP 2
0013 MOVL V=50
0014 WVOF
```

NOTICE

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.
1.13.2 WVON

1.13.2.1 Function
This is the weaving start operation.

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

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>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
1.13.2.3 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.</td>
<td>No. 1 to 16</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</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</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</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>
1.13 Weaving Operation

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
1.3.2.4 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.
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.
1.13.3 **WVOF Instruction**

1.13.3.1 **Function**

This is the weaving end instruction.

1.13.3.2 **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>RB1</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>RB2</td>
<td>X</td>
<td>O</td>
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<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
1.13.3.3 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  · · ·  

![Diagram of weaving operation steps](image-url)
1.13.3.4 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.
1.13.4 **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.

**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.

![Graph showing maximum frequencies for different amplitudes]

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

![Diagram showing weaving conditions with same amplitude]

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

![Diagram showing weaving conditions with different amplitudes]

The definitions of “right” and “left” differ depending on the wall direction, and the wall side is defined as “left”.

Wall direction
- SINGLE
  - Half amplitude: left
  - Half amplitude: right

Wall direction
- Horizontal direction
1.13 Weaving Operation

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).
• 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.

MODE: ELLIPSE
1.3 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 pauses.

**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).

**NOTICE**
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.

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.
1.13 Weaving Operation

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.

<table>
<thead>
<tr>
<th>Reference Job</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOP</td>
</tr>
<tr>
<td>MOVJ VJ=10.00</td>
</tr>
<tr>
<td>MOVJ VJ=25.00</td>
</tr>
<tr>
<td>REFP 3</td>
</tr>
<tr>
<td>ARCON ASF#(1)</td>
</tr>
<tr>
<td>WVON WEV#(1)</td>
</tr>
<tr>
<td>MOVL V=60</td>
</tr>
<tr>
<td>WVOF</td>
</tr>
<tr>
<td>ARCOF</td>
</tr>
<tr>
<td>MOVJ VJ=25.00</td>
</tr>
<tr>
<td>MOVJ VJ=25.00</td>
</tr>
<tr>
<td>END</td>
</tr>
</tbody>
</table>

Welding start point.
Reference point for defining the direction of travel.

*Teaching by interpolation instruction, not by joint interpolation.
The same point with the welding start point.

NOTICE

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.

Wall Direction: Robot axis Z+ direction
Horizontal Direction: Direction from the wall to approach point
Direction of Travel: Direction from weaving start point to REFP 3

NOTICE

In hover weaving, the start and end points are the same. Therefore, the arc retry function and arc restart function are not available.
1.13.4.1 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.
1.13.4.2 Editing the Condition Data

1. Select the item to be edited.

   1. Weaving Operation
   2. Input the value using [Numeric Key].

   DATA | EDIT | DISPLAY | UTILITY

   WEAVING CONDITION
   COND NO. 1/255

   Mode: SINGLE
   Smooth: ON
   Speed Type: FREQUENCY
   Frequency: 5.0 Hz
   <Pattern>
   Amplitude: 2.000 mm
   Vertical: 10.000 mm
   Horizontal: 10.000 mm
   Angle: 45.00 deg.
   Travel Angle: 5.00 deg.
   <Timer Mode>
   Point1: WEAV STOP
   Point2: WEAV STOP
   Point3: WEAV STOP

   Main Menu | Simple Menu | Run on servo power

   WEAVING CONDITION
   COND NO. 1/255

   Mode: SINGLE
   Smooth: ON
   Speed Type: FREQUENCY
   Frequency: 5.0 Hz
   <Pattern>
   Amplitude: 2.000 mm
   Vertical: 10.000 mm
   Horizontal: 10.000 mm
   Angle: 45.00 deg.
   Travel Angle: 5.00 deg.
   <Timer Mode>
   Point1: WEAV STOP
   Point2: WEAV STOP
   Point3: WEAV STOP

   Main Menu | Simple Menu | Run on servo power
1.13.5 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.

1.13.5.1 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.
1.13.5.2 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”.

1.13.5.3 Method to Prohibit Weaving by Means of a System Input Signal
The system input signal 40047 is used.
1.14 Changing Welding Conditions during Playback

The Arc Condition Adjustment function should not be used with the Lincoln ArcLink XT interface. The numbers and units displayed in this function window are not accurate and will result in undefined weld behavior.
1.15 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.

1.15.1 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”.

![Data Display Utility](image)
1.16 Arc Welding Management and Maintenance

1.16.1 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.
1.16.2 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”.

   - WORK CONTINUE
     - CONT
     - STOP
   - TIP REPLACE
     - 72 min
     - 5 times
   - NOZZLE CLEAN
     - 12 min
     - 10 times
   - RETRY
     - 5 min
     - 10 times
   - RESTART (ARC)
     - 2 min
     - 10 times
   - ANTI-STICK
     - 10 min
     - 100 times
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].

```
<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
</table>

ARC WELD DIAGNOSIS
NO.: 1/1

WORK CONTINUE
  <ACCUM.> > <SETTING>
  CONT

TIP REPLACE
  10 min
  10 min
  10 times

NOZZLE CLEAN
  10 min
  10 min
  10 times

RETRY
  1 time
  2 times
  0 times

RESTART (ARC)
  1 time
  1 time
  1 time

ANTI-STICK
  1 time
  1 time
  1 time

<ACCUM.>               <SETTING>
  180  min
  30  min
  10  times
  10  times
  10  times

:  CONT
:    72  min
:    12  min
:      5  times
:      2  times
:       0  times

Simple Menu
```

**NOTICE**

The accumulated value can be cleared by either of the following:

- ARC WELD DIAGNOSIS window
- External input signal (system input signal)
1.17 Production Monitoring

The Yaskawa ArcLink XT interface supports integration with the Lincoln Production Monitoring software. Full feature support and setup must be performed using the Powerwave Manager PC software (available as a free download from www.powerwavesoftware.com). However, the ArcLink XT pendant interface provides a convenient portal for performing setup changes and monitoring.

The Lincoln Production Monitoring software enables the following:

- Monitoring of weld data during weld
- Gathering of weld statistics and averages for previous welds
- Setting empirical limits to determine if a weld is "good"
- Control of robot/welder actions for "bad" welds
- User notification when welder needs attention/service

1.17.1 Setup/Installation

Full setup and configuration of all available settings must be performed using the Powerwave Manager PC software provided by Lincoln Electric. Refer to the Lincoln documentation for additional information.

This data can also be uploaded to the a cloud server database called CheckPoint. See section 1.17.4 “CheckPoint Cloud Integration” on page 1-104 for details on CheckPoint integration.
1.17.2 Operation

When using the Production Monitoring Feature software, weld data for each weld is gathered into one of 200 profiles. Averages and statistics are calculated for all welds in a particular profile. It is common practice to “categorize” welds and select different profiles for each of the different welds on a part.

Each Arc Start Condition file is associated with a particular production monitoring profile number. This is set under the “Other” tab of the Arc Start file. See section 1.5.4 “Arc Start Condition File” on page 1-26 for additional information.

Fig. 1-13: Production Monitoring Profile Number

1.17.2.1 Startup

The Production Monitoring Features application can be started from the Main Menu. Press the {Arc Welding} button and select {Production Monitor} from the drop-down list.

Fig. 1-14: Production Monitor

NOTICE
You must be in MANAGEMENT security level to modify Production Monitoring settings.
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**“Control” Tab Window**

**NOTICE**

All data and settings are loaded/saved from the welder number selected at the top of the application. If a particular welder does not appear in the drop-down list, check that it is powered ON and properly connected to the YRC1000. You may need to close and restart the application after connecting a welder.

The Control tab allows you to select settings that apply to all profiles in the welder.

*Fig. 1-15: Control Tab*

**A. Out of Limit Actions**

Production Monitoring allows you to set upper and lower limits for the attributes of a particular weld (See Profile Config tab). If a particular attribute goes outside of the pre-programmed limit, you can determine what response action is performed.

Press the (Edit) button to modify these actions. Then press [Save] to accept the changes.

**NOTICE**

Limits must be set for each individual profile number. However, these actions are global to all profiles.

- No Action: Even if limits for this attribute are enabled, no action is taken when the weld goes out of limit.

- Log Event: The event is logged into the Production Monitoring database. The pass/fail signal indicates that the weld failed. The weld is not interrupted and no alarm occurs.

- Fault System: The event is logged into the Production Monitoring database. The pass/fail signal indicates that the weld failed. The weld stops immediately. The robot displays a PM Limit alarm that must be reset before continuing to weld.
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- **Alarm Latch:** The event is logged into the Production Monitoring database. The pass/fail signal indicates that the weld failed. The weld continues to finish. At the end of the weld, the robot controller displays a PM Limit alarm that must be reset before the next weld. A latch event can also be reset from this screen. Please note that the main weld condition does finish.

**NOTICE**

The main weld condition will finish normally. However, an Arc End Condition is not executed. This includes Crater, Burnback, Postflow, and Wire-stick-check routines.

**B. Reset Alarm Latch**

In the event of an Alarm Latch action, the latch must be cleared before you can weld again. Resetting the robot alarm will clear the latch. You can also use this button to clear the latch.

**C. Enter Custom Weight**

When using a custom or partial wire spool, it is generally not desirable to use the [Reset Wire Weight] button. This button will allow you to manually type in a custom weight for the new spool. After typing in the desired weight, you must touch the button again to save your value.

**D. Reset Wire Weight**

The weight of the wire spool is estimated by the Lincoln power source. When replacing an empty spool, you must reset the weight to notify the welder there is a new spool. Click this button to reset the weight back to the initial weight of a new spool (touch a second time to confirm). The initial weight is set using Lincoln's Powerwave Manager.

**E. Wire Weight Warning**

The power source notifies the user when the wire spool gets below a certain limit. To change this limit, click the textbox, and type the new value into the textbox and click [Save].

When the warning weight level is reached, a message is displayed on the bottom of the pendant as a reminder that the wire is low. This message is cleared after touching [Reset Wire Weight]. Additionally, you can configure the power source to send an email notification when the wire is low. Please see Lincoln Powerwave Manager for more details.
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“Profile Config” Tab Window

Each of the profiles can be configured to ensure individual weld attributes remain within certain upper and lower bounds. These bounds are “trained” using the Powerwave Manager. However, the Profile Config tab allows you to manually enter the limits and/or tweak the values that have been trained.

Fig. 1-16: Profile Config Tab

Press {Edit} to modify the values for the selected profile. If the Enable check box is not checked for a particular attribute, the limits will not be monitored during the weld.

NOTICE

With the 455m/655m power source, you cannot enable/disable individual attributes. Plus, Weld Score is not available.

A. Start Delay (seconds)

Set the time from the start of the arc before beginning to monitor the limits. This is useful when ramping the weld settings at the start of a weld.

B. Duration Limits (seconds)

Sets the limits for the time length of the weld.

C. Current Limits (Amps)

Sets the limits for the amperage of the weld.

D. Voltage Limits (Volts)

Sets the limits for the voltage of the weld.

E. Wirefeed Speed Limits (inches per minute)

Sets the limits for the WFS of the weld.

F. Discard welds shorter than...

If the length of a weld is shorter than the Start Delay plus the End Delay, it can be excluded from the Production Monitoring history.

G. End Delay (seconds)

When an out-of-limit event occurs, the power source will wait for this amount of time before taking action. If the weld ends prior to this action, it will be ignored.
“Last Weld Data” Tab Window

The Last Weld Data tab provides statistics for the last weld performed by the selected welder number.

*Fig. 1-17: Last Weld Data*

**A. Weld Profile Totals**

This displays the totals for the profile number used in the last weld. This may be different than the selected profile for the next weld.

**B. Last Weld...**

This displays various statistics about the weld attributes for the last weld.

**C. Overall Pass/Fail**

This indicates if the weld stayed within the programmed limits of the profile. This will indicate failure in the event of a Log Event, Fault Event, or Alarm Latch. If No Action was selected on the Control tab, then this will indicate “Pass” even if the weld went outside the programmed limits.
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**“Last PM Alarm” Tab Window**
In the event of a failed weld, this tab displays the attribute(s) that were out of limit. If a Fault Event or Alarm Latch occurs, the alarm is displayed on the programming pendant. However, the alarm does not contain specific information on what failed. Use this tab for more detail.

*Fig. 1-18: Last PM Alarm*

```
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Under Limit</th>
<th>Over Limit</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current (A)</td>
<td></td>
<td></td>
<td>Fail</td>
</tr>
<tr>
<td>Voltage (V)</td>
<td></td>
<td></td>
<td>Pass</td>
</tr>
<tr>
<td>WFS (W)</td>
<td></td>
<td></td>
<td>Pass</td>
</tr>
<tr>
<td>Time (T)</td>
<td></td>
<td></td>
<td>Pass</td>
</tr>
<tr>
<td>Score (S)</td>
<td></td>
<td></td>
<td>Pass</td>
</tr>
</tbody>
</table>
```

**“Live Monitor” Tab Window**
The Live Monitor tab monitors weld data in real time. It can be used as a handy reference to monitor the weld. The display shows a 10 second scrolling window into the weld.

*Fig. 1-19: Live Monitor*
1.17.3 Accessing Data

The Production Monitoring data collected by the YRC1000 is stored in user variables for easy reference by external devices. Using an HMI or PLC, this data can be stored, displayed, or used for other calculations. The following table shows the user variables where the data is stored.

Table 1-5: Production Monitoring Data User Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Welder 1</th>
<th>Welder 2</th>
<th>Welder 3</th>
<th>Welder 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last Weld Profile #</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
</tr>
<tr>
<td>Last Weld Limit Code **</td>
<td>101</td>
<td>151</td>
<td>201</td>
<td>251</td>
</tr>
<tr>
<td>Last Weld Max Amps</td>
<td>102</td>
<td>152</td>
<td>202</td>
<td>252</td>
</tr>
<tr>
<td>Last Weld Avg Amps</td>
<td>103</td>
<td>153</td>
<td>203</td>
<td>253</td>
</tr>
<tr>
<td>Last Weld Min Amps</td>
<td>104</td>
<td>154</td>
<td>204</td>
<td>254</td>
</tr>
<tr>
<td>Last Weld Max Volts</td>
<td>105</td>
<td>155</td>
<td>205</td>
<td>255</td>
</tr>
<tr>
<td>Last Weld Avg Volts</td>
<td>106</td>
<td>156</td>
<td>206</td>
<td>256</td>
</tr>
<tr>
<td>Last Weld Min Volts</td>
<td>107</td>
<td>157</td>
<td>207</td>
<td>257</td>
</tr>
<tr>
<td>Last Weld Max WFS</td>
<td>108</td>
<td>158</td>
<td>208</td>
<td>258</td>
</tr>
<tr>
<td>Last Weld Avg WFS</td>
<td>109</td>
<td>159</td>
<td>209</td>
<td>259</td>
</tr>
<tr>
<td>Last Weld Min WFS</td>
<td>110</td>
<td>160</td>
<td>210</td>
<td>260</td>
</tr>
<tr>
<td>Last Weld Max WeldScore</td>
<td>111</td>
<td>161</td>
<td>211</td>
<td>261</td>
</tr>
<tr>
<td>Last Weld Avg WeldScore</td>
<td>112</td>
<td>162</td>
<td>212</td>
<td>262</td>
</tr>
<tr>
<td>Last Weld Min WeldScore</td>
<td>113</td>
<td>163</td>
<td>213</td>
<td>263</td>
</tr>
<tr>
<td>Profile Weld Count</td>
<td>117</td>
<td>167</td>
<td>217</td>
<td>267</td>
</tr>
<tr>
<td>Profile Current Limit Count</td>
<td>118</td>
<td>168</td>
<td>218</td>
<td>268</td>
</tr>
<tr>
<td>Profile Voltage Limit Count</td>
<td>119</td>
<td>169</td>
<td>219</td>
<td>269</td>
</tr>
<tr>
<td>Profile WFS Limit Count</td>
<td>120</td>
<td>170</td>
<td>220</td>
<td>270</td>
</tr>
<tr>
<td>Profile Time Limit Count</td>
<td>121</td>
<td>171</td>
<td>221</td>
<td>271</td>
</tr>
<tr>
<td>Profile Score Limit Count</td>
<td>122</td>
<td>172</td>
<td>222</td>
<td>272</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D Variables</th>
<th>Welder 1</th>
<th>Welder 2</th>
<th>Welder 3</th>
<th>Welder 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part ID#</td>
<td>100</td>
<td>110</td>
<td>120</td>
<td>130</td>
</tr>
<tr>
<td>Expected Weld Count</td>
<td>101</td>
<td>111</td>
<td>121</td>
<td>131</td>
</tr>
<tr>
<td>Timestamp - End of Last Weld</td>
<td>102</td>
<td>112</td>
<td>122</td>
<td>132</td>
</tr>
<tr>
<td>Timestamp - Start of Last Weld</td>
<td>103</td>
<td>113</td>
<td>123</td>
<td>133</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R Variables</th>
<th>Welder 1</th>
<th>Welder 2</th>
<th>Welder 3</th>
<th>Welder 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last Weld - True Energy</td>
<td>100</td>
<td>110</td>
<td>120</td>
<td>130</td>
</tr>
<tr>
<td>Last Weld - Wire Used</td>
<td>101</td>
<td>111</td>
<td>121</td>
<td>131</td>
</tr>
<tr>
<td>Last Weld - Wire Remaining</td>
<td>102</td>
<td>112</td>
<td>122</td>
<td>132</td>
</tr>
</tbody>
</table>
### Arc Welding Application

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<table>
<thead>
<tr>
<th>S Variables</th>
<th>Welder 1</th>
<th>Welder 2</th>
<th>Welder 3</th>
<th>Welder 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator Serial</td>
<td>100</td>
<td>110</td>
<td>120</td>
<td>130</td>
</tr>
<tr>
<td>Consumable Serial</td>
<td>101</td>
<td>111</td>
<td>121</td>
<td>131</td>
</tr>
<tr>
<td>Assembly Name</td>
<td>102</td>
<td>112</td>
<td>122</td>
<td>132</td>
</tr>
<tr>
<td>Part Serial</td>
<td>103</td>
<td>113</td>
<td>123</td>
<td>133</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M Registers</th>
<th>Welder 1</th>
<th>Welder 2</th>
<th>Welder 3</th>
<th>Welder 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Feedback</td>
<td>304</td>
<td>337</td>
<td>370</td>
<td>403</td>
</tr>
<tr>
<td>Current Feedback</td>
<td>305</td>
<td>338</td>
<td>371</td>
<td>404</td>
</tr>
<tr>
<td>WFS Feedback</td>
<td>306</td>
<td>339</td>
<td>372</td>
<td>405</td>
</tr>
<tr>
<td>Motor Current Feedback</td>
<td>307</td>
<td>340</td>
<td>373</td>
<td>406</td>
</tr>
</tbody>
</table>

**Limit code is a binary encoded field**

<table>
<thead>
<tr>
<th>Bit 15</th>
<th>Bit 14</th>
<th>Bit 13</th>
<th>Bit 12</th>
<th>Bit 11</th>
<th>Bit 10</th>
<th>Bit 9</th>
<th>Bit 8</th>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time high</td>
<td>Time low</td>
<td>Score high</td>
<td>Score low</td>
<td>WFS high</td>
<td>WFS low</td>
<td>Volts high</td>
<td>Volts low</td>
<td>Current high</td>
<td>Current low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.17 Production Monitoring

1.17.4 CheckPoint Cloud Integration

CheckPoint is an online cloud database service offered by Lincoln Electric. All of the production monitoring data collected by the welder can be uploaded to this cloud portal for easy access. See www.lincolncheckpoint.com for details on CheckPoint setup.

The robot's weld interface contains macro jobs to help organize the data which gets uploaded to the cloud server.

1.17.4.1 Macro Jobs:

- **LINC-STRT-PART**

  The LINC-STRT-PART macro is used to signal the start of a new collection of welds to assemble a part. This macro should be called before the first ARCON command for a particular part.

  - **WELDER #**: This is the welder number (1 - 4). If multiple welders will be working on the same part, then this macro should be called multiple times (one for each welder).

  - **EXPCTD # OF WLDS**: This is the expected number of welds (0 - 9999) that it should take to finish the part. This will later be compared to the actual number of welds that occurred. It is a useful metric to monitor for errors or issues during production.

  - **PART SN**: This is the index of a global S (string) variable (0 - 99). This S variable should contain a unique serial number for this part. This serial number will be used to organize the weld collections on the CheckPoint cloud server.

  - **ASSEMBLY NAME**: This is the index of a global S (string) variable (0 - 99). This S variable should contain a name for the type of part that is being assembled. (eg: "Car_Subframe_A") This will be used to organize the weld collections on the CheckPoint cloud server.

  - **OPERATOR ID**: This is the index of a global S (string) variable (0 - 99). This S variable should contain a name or ID for the welder operator. This will be used to organize the weld collections on the CheckPoint cloud server.
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**CONSUMABLE LOT:** This is the index of a global S (string) variable (0 - 99). This S variable should contain an ID for the wire being used during welding. This will be used to organize the weld collections on the CheckPoint cloud server.

- **LINC-END-PART**
  The LINC-END-PART macro is used to signal the end of a collection of welds used to assemble a part. This macro should be after the last ARCOF command for a particular part.

- **WELDER #:** This is the welder number (1 - 4). If multiple welders performed work on the same part, then this macro should be called multiple times (one for each welder).
LINC-ABORT-PART
The LINC-ABORT-PART macro is used to signal the end of a collection of welds in an error state. This should be called if a part was not completed due to some error condition.

- **WELDER #**: This is the welder number (1 - 4). If multiple welders performed work on the same part, then this macro should be called multiple times (one for each welder).
Appendix A

A.1 Table of Work Instructions

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

<table>
<thead>
<tr>
<th>Function</th>
<th>Additional Item</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCON</td>
<td>WELD1, WELD2, WELD3, WELD4</td>
<td>ARCON ASF#(1)</td>
</tr>
<tr>
<td></td>
<td>ASF#(&lt;arc start condition file number&gt;)</td>
<td></td>
</tr>
<tr>
<td>ARCOF</td>
<td>WELD1, WELD2, WELD3, WELD4</td>
<td>ARCON</td>
</tr>
<tr>
<td></td>
<td>AEF#(&lt;arc end condition file number&gt;)</td>
<td>AEF#(): 1 to 999</td>
</tr>
<tr>
<td>ARCOF</td>
<td>AEF#(&lt;arc end condition file number&gt;)</td>
<td>AEF#(): 1 to 999</td>
</tr>
<tr>
<td>ARCSET</td>
<td>WELD1, WELD2, WELD3, WELD4</td>
<td>ARCSET ASF#(3)</td>
</tr>
<tr>
<td></td>
<td>ASF#(&lt;arc start condition file number&gt;)</td>
<td>ASF#(): 1 to 999</td>
</tr>
<tr>
<td>ARCCTS</td>
<td>WELD1, WELD2, WELD3, WELD4</td>
<td>ARCCTS ASF#(1)</td>
</tr>
<tr>
<td></td>
<td>AEF#(&lt;arc end condition file number&gt;)</td>
<td>AEF#(): 1 to 999</td>
</tr>
<tr>
<td>ARCCTE</td>
<td>WELD1, WELD2, WELD3, WELD4</td>
<td>ARCCTE AEF#(1)</td>
</tr>
<tr>
<td></td>
<td>AEF#(&lt;arc end condition file number&gt;)</td>
<td>AEF#(): 1 to 999</td>
</tr>
<tr>
<td>WVON</td>
<td>RB1, RB2, RB3, RB4, RB5, RB6, RB7, RB8</td>
<td>WVON WEV#(1)</td>
</tr>
<tr>
<td></td>
<td>WEV#(&lt;weaving condition file number&gt;)</td>
<td>1 to 255</td>
</tr>
<tr>
<td>WVOF</td>
<td>RB1, RB2, RB3, RB4, RB5, RB6, RB7, RB8</td>
<td>WVOF</td>
</tr>
</tbody>
</table>

Table A-1: Arc Welding Instructions