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

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

• This manual explains the graphical arc monitoring function of the DX200 system. Read this manual carefully and be sure to understand its contents before handling the DX200.

• General items related to safety are listed in the Chapter 1: Safety of the DX200 Instructions. To ensure correct and safe operation, carefully read the DX200 Instructions before reading this manual.

CAUTION

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

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

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

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

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

Read this manual carefully before installation, operation, maintenance, or inspection of the DX200.

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

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

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

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

- **PROHIBITED**
  Must never be performed.

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

**NOTE**
To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “CAUTION” and “WARNING”.
WARNING

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

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

*Figure 1: Emergency Stop Button*

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

Injury may result from unintentional or unexpected manipulator motion.

*Figure 2: Release of Emergency Stop*

• Observe the following precautions when performing teaching operations within the P-point MAX envelope of the manipulator:
  – View the manipulator from the front whenever possible.
  – Always follow the predetermined operating procedure.
  – Keep in mind the emergency response measures against the manipulator’s unexpected motion toward you.
  – Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

• Confirm that no person is present in the P-point MAX envelope of the manipulator and that you are in a safe location before:
  – Turning ON the DX200 power
  – Moving the manipulator with the programming pendant
  – Running the system in the check mode
  – Performing automatic operations

Injury may result if anyone enters the P-point MAX envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem. The emergency stop buttons are located on the right of the front door of the DX200 and the programming pendant.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.
The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and the 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>DX200 Controller</td>
<td>DX200</td>
</tr>
<tr>
<td>DX200 Programming Pendant</td>
<td>Programming Pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>
Descriptions of the programming pendant keys, buttons, and displays are shown as follows:

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

**Description of the Operation Procedure**

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

**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.
# Graphical Arc Monitoring

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1 Outline of Graphical Arc Monitoring Function

This function samples the arc-welding related data and shows it on the programming pendant as a graph and numeric values. This function can also set the sampling data as a trigger and start displaying the data, and save the memory data of the definite period of time continuously in the external memory unit in the order of time scales.

And also this function can save the sampling data of the welding condition and others in the external memory unit automatically apart from the arc monitor graph window.

The graphical arc monitoring function consists of the following functions.

- **Monitoring function**
  This function samples the arc-welding related data and shows it on the programming pendant. The data includes the welding condition, the welding stopping factor (e.g. alarm, hold, emergency stop), the job data, the manipulator operation data, the state of IO signal, etc. Also this function can save the monitoring data in the external memory unit such as USB memory sticks or Compact Flashes.

- **Logging function**
  This function samples the data of the fixed time of the arc-welding (logging execution), and saves the data in the external memory unit such as USB memory sticks or Compact Flashes at the timing when instructed by the IO signal (logging backup). The data can be saved in the chronological order.
The graphical arc monitor with logging function needs to be ordered separately.

The graphical arc monitoring function has two types.

1. The graphical arc monitoring function
2. The graphical arc monitoring function (with logging function)

When order (2)(with logging function), both monitoring function and the logging function are available.
2 Operation Outline

2.1 Operation Process of Monitoring Function

- Displaying/Non-displaying Monitoring Function Window

From the main menu, select submenu (ARC WELDING) and then {ARC MONITOR(GRAPH)}. Then the main window of the graphical arc monitor (the picture shown below) appears.

To close the window, press “CLOSE” button.

Even if the monitoring display is closed by pressing the “CLOSE” button, the data measurement (data sampling) continues. To stop measuring, press the “STOP” button which appears during the measurement. Once press the “START” button and the measurement starts, the “START” button changes to the “STOP” button.

When the ARC MONITOR(GRAPH) window is being activated, the test operation and the next/back operation are invalid.
2.1 Operation Process of Monitoring Function

Preparation for Monitoring

Before start monitoring, set the item to be monitored as shown in the flowchart below.

1. Start monitoring
2. Use existing setting
3. Load monitoring advanced setting file
4. Select data to be monitored
5. Set monitor display
6. Set sampling condition
7. Set trigger condition
8. Save settings
9. Save to monitoring advanced setting file
10. Preparation for monitoring is completed.
2. Operation Outline

2.1 Operation Process of Monitoring Function

- **Starting / Finishing Monitoring**

When the preparation for monitoring is ready, press the “START” button on the monitoring window. Then the state of trigger becomes “waiting for trigger” (when the trigger is available).

As shown in the flowchart below, when the sampling is executed and the trigger signal turns ON under the state of waiting for trigger, in Single mode: the monitoring ends.

in Normal mode: the measurement continues and waits for the next trigger.
2 Operation Outline
2.1 Operation Process of Monitoring Function

- Saving Monitoring Data

When press “SAVE” button on the main menu of the graphical arc monitor (shown on the picture below), the data displayed on the monitoring window is saved in the external memory unit which is selected at "DEVICE" in “EX. MEMORY”.
2.2 Operation Process of Logging Function

- Setting of Logging Function

To display the logging function setting window, select the submenu {arc welding} from the main menu and then select {arc monitoring (chart)}. After the main window of the monitoring function is displayed, press “SETTING” button. Then set details as shown in the flowchart below.

- The monitoring function and the logging function can be set in the same setting file, while each section and the sampling cycle need to be set separately. (Their setting files are not common.)

- The monitoring advanced setting file doesn’t need to be loaded when use the setting which is being displayed at the time.
### 2.2 Operation Process of Logging Function

#### Preparation for Logging Section

The section which retrieves the sampling data and records the data of the fixed time is called the logging section.

The logging section can be specified by the welding start instruction or by the IO signal.

There are several ways to set the section as shown in the following flowchart.

- To execute logging in the welding start instruction (ARCON) section
- To execute logging while the universal IO is ON
- To execute logging while the special input signal is ON

![Logging Section Flowchart](image-url)
2 Operation Outline
2.2 Operation Process of Logging Function

- **Logging Backup**

  Logging backup makes backups of the data which is recorded for a certain time in the logging section and saves the data in the external memory unit. The logging backup can be executed by the following ways.

  • To execute the logging backup when the universal IO turns ON
  • To execute the logging backup when the specific input signal turns ON

  The logging backup can be executed every logging section, or after storing several data of the logging section.

  e.g.) If the logging section is short, the logging backup function can be used after executing the logging several times.
The “LOAD” button is invalid at this time.
3.1 Starting /Stopping Measurement

- **Starting Measurement**

  When press {START} button (①) after the monitor setting, the sampling starts. When the sampling is started, the {START} button changes to the {STOP} button.

- **Stopping Measurement**

  During the measurement, when the {STOP} button is selected, the measurement stops.
### Stopping Indication of Measurement

When specify the factor as “ARC Stop” (not “Sampling data”) in the trigger setting, the stopping factor is indicated as shown in the picture below when the welding is stopped.

The trigger caused by “ARC Stop” of this function occurs when any of the following condition below is formed.

- An alarm occurred.
- An emergency stop happened. (servo OFF)
- The state became HOLD.
- The operation prohibited signal turned ON.
- The operation mode switched from PLAY mode to TEACH mode.

Even when the arc welding is not executed, when the state becomes any of the condition above, the “ARC Stop” trigger occurs and the measurement stops after measuring data for the set time.

When {START} button is shown, the measurement is not in process. To start measuring again, select the {START} button. When the measurement is in process, {STOP} button is shown.
3.2 Setting of Monitoring Function and Logging Function

If press “SETTING” button (②), the advanced setting window appears. In the window the monitoring function and the logging function can be set.

For the detail of the advanced setting window, refer to Chapter 4 Advanced Setting Window.

During the measurement, cannot select the “SETTING” button. To select the “SETTING” button, need to stop measuring. Even if the setting is changed in the advanced setting window during the logging, the content to be logged is not changed. The new setting is reflected from the next time of logging.
3.3 Saving Monitoring Data

The monitoring data can be saved as a file by pressing the {SAVE} button (③).

- **Monitor Data File**
  - **Saving destination**: The data file is stored in the “RT_ARCMON\CSV” file of the specified device (CF or USB) in the “EX. MEMORY”. When no folder is in the device, a new folder is made automatically.
  - **File Name**: The file name which describes the current time sequence is named automatically. (Not an arbitrary name)
    - 
      - [welder number / year / month / day / time]
      - “T-YYYYMMDD-HHMMSS.csv”
      - (e.g.) welder 5, 2013, May 10th, 15:08:04 → 5-20130510-150804.csv
  - **File Type**: CSV type text file
    - For the detail of the form, refer to Chapter 6 Concurrent I/O Ladder.

**NOTE**

If there is no measured data (measurement has not been executed or not in measurement at the time), the “SAVE” button cannot be selected.
3.4 Display of Monitor Main Window

Display of [Waiting for trigger]

When the trigger is set and waiting to be executed, the message [Waiting for trigger] is displayed on the window.

(When the trigger is set as Single mode)
When the trigger signal is turned ON, the message [Triggered] is displayed. And when the measurement time is passed, the measurement finishes and the message [Triggered] disappears.

(When the trigger is set as Normal mode)
When the trigger signal is turned ON, the message [Triggered] is displayed. And when the measurement time is passed, the message [Waiting for trigger] is displayed again and turns into the state of waiting for trigger. At this time the waveform stops in the state that the measuring time passed after the previous trigger signal has turned ON.

(For the detail, refer to “Setting of Trigger Mode” of Section 4.2 “Setting of Monitoring” on page 4-10.)

When it is in the Normal mode, press the “STOP” button to finish the measurement.
Display of Job Information

The information of the job which is executed during the measurement is displayed.

After the measurement stopped, the job information of the time when the measurement was stopped is displayed.

The job information includes "job name", "line number", and "step number".

NOTE: The job information may be shown later than the actual measurement execution state.
4 Advanced Setting Window

4.1 Selecting Data

Select the data to be monitored in the following tabs: “MEASURE” (effective value), “REF” (command value), “POS ANGLE” (posture angle) and “OPTION” (option).

- Selecting Effective Value Data (MEASURE)

In this window (MEASURE tab), select the data to be monitored, which is inputted from the external manipulator controller, such as actual welding current, welding voltage, and wire feeding speed, etc.

1. Names
Enter names to specify each channel name. The name is used as the data name of values on the monitoring window.

2. Graph display specification
If checked, a graph of the data is displayed on the monitoring window.

3. Bold line (B) specification
If checked, the graph is displayed in bold line.

4. Numeric value display specification
If checked, numeric value of the data is displayed on the monitoring window.

5. Display range (MAX, MIN) specification
The MAX and MIN values specified in this window are reflected to the graph.

6. Units
The unit name entered here is used as the unit of the numeric value.
4. Advanced Setting Window

4.1 Selecting Data

There are two columns. When the welding function is enhanced, the number of columns becomes four. The number of columns corresponds to the number of the analog input channel which is able to set for each one use of the arc.

The channel number on the left side is automatically assigned for the data which is selected to be monitored by checking the check box of the graph or the value. The MAX number of channels for monitoring is 16.

The waveform might be displayed with some gaps. However, when the measurement is stopped, all waveforms are displayed.

### NOTE

- There are two columns. When the welding function is enhanced, the number of columns becomes four. The number of columns corresponds to the number of the analog input channel which is able to set for each one use of the arc.
- The channel number on the left side is automatically assigned for the data which is selected to be monitored by checking the check box of the graph or the value. The MAX number of channels for monitoring is 16.
- The waveform might be displayed with some gaps. However, when the measurement is stopped, all waveforms are displayed.
4. Advanced Setting Window

4.1 Selecting Data

ON Delay time, OFF Delay time

As for the effective value, the average value of the welding section is displayed after finishing the measurement. The analog data of the welding current and the welding voltage, which is inputted from the welding power source to the manipulator controller, is unstable and easy to change largely when the welding starts and finishes because of the welding effect like the short circuit. So the starting section and the finishing section can be set not to be included to calculate the average value. Specify the exclusion time.

The welding section written here is the time when the ARCON signal is ON.

Only with the data of the interval here, the average value is calculated.

The average value of the welding section is displayed after finishing the measurement. During the measurement, the current effective value is displayed.
4. Advanced Setting Window
4.1 Selecting Data

- Select Command Value Data (REF)

In this window (REF tab), select the data to be monitored, which is inputted from the external manipulator controller, such as actual welding current, welding voltage, and wire feeding speed, etc.

1. Names
   Enter names to specify each channel name. The name is used as the data name of values on the monitoring window.

2. Graph display specification
   If checked, a graph of the data is displayed on the monitoring window.

3. Bold line (B) specification
   If checked, the graph is displayed in bold line.

4. Numeric value display specification
   If checked, numeric value of the data is displayed on the monitoring window.

5. Display range (MAX, MIN) specification
   The MAX and MIN values specified in this window are reflected to the graph.

6. Units
   The unit name entered here is used as the unit of the numeric value.
Graphical Arc Monitoring

4  Advanced Setting Window
4.1 Selecting Data

In this window (POS ANGLE tab), select the data to be monitored, such as the torch angle when a manipulator is welding, and the downward angle of the welding line which is taught to the welding target work. There are three columns: "TOUCH ANGLE", "TRAVEL ANGLE", and "DOWNWARD ANGLE".

1. Posture angle names
   The name cannot be changed. The name is used as the data name of values on the monitoring window.

- There are two columns. When the welding function is enhanced, the number of columns becomes 4. The number of columns corresponds to the number of the analog input channel which is able to set for each one use of the arc.

- The channel number on the left side is automatically assigned for the data which is selected to be monitored by checking the graph or the value. The MAX number of the channel for monitoring is 16.

- The waveform might be displayed with some gaps. However, when the measurement is stopped, all waveforms are displayed.

### Selecting Posture Angle Data (POS ANGLE)

In this window (POS ANGLE tab), select the data to be monitored, such as the torch angle when a manipulator is welding, and the downward angle of the welding line which is taught to the welding target work. There are three columns: "TOUCH ANGLE", "TRAVEL ANGLE", and "DOWNWARD ANGLE".

1. Posture angle names
   The name cannot be changed. The name is used as the data name of values on the monitoring window.
Graphical Arc Monitoring

4 Advanced Setting Window

4.1 Selecting Data

② Graph display specification
If checked, a graph of the data is displayed on the monitoring window.

③ Bold line (B) specification
If checked, the graph is displayed in bold line.

④ Numeric value display specification
If checked, numeric value of the data is displayed on the monitoring window.

⑤ Display range (MAX, MIN) specification
The MAX and MIN values specified in this window are reflected to the graph.

⑥ Units
The unit name entered here is used as the unit of the numeric value.

<table>
<thead>
<tr>
<th>ARC MONITOR GRAPH</th>
<th>LINE #</th>
<th>STEP UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLTAGE (V)</td>
<td>CURRENT (A)</td>
<td></td>
</tr>
<tr>
<td>REF.</td>
<td>10.1</td>
<td>216.0</td>
</tr>
<tr>
<td>AVG.</td>
<td>10.1</td>
<td>216.0</td>
</tr>
</tbody>
</table>

**SUPPLEMENT**
For the definition of the posture angle, refer to Section 2.3.8 “Teaching Line Coordinates” in the DX200 Instructions.

**NOTE**
The posture angle doesn’t have any teaching lines because there are not more than two teaching points in the job, so the posture angle may not be calculated. (The posture angle is invalid. In that case the value is displayed as “---.-” and the graph displays the past (latest) valid value.)
4 Advanced Setting Window
4.1 Selecting Data

Selecting Optional Data (OPTION)

In this window (OPTION tab), select the data which is related to the welding operation other than the above-mentioned effective value, the command value, and the posture angle.

① Types
The following welding related data can be selected.

{SPD}
The speed of welding. The unit is the one specified in the controller setting.

{LEN}
The length between the welding start point and the welding finish point. The unit is “mm”.

{IO}
The ON/OFF state of the IO signal used in the concurrent IO ladder can be monitored. It is specified by a logical number. Just after selected, a universal input signal #00010 is specified as an initial value.
In the item of the numeric value display, the IO name which is set in the I/O menu is displayed. The state of ON is described as ●, and OFF is described as ○.
When the state is ON, the line of the graph moves upward for 1 div.

{REG}
The registered value used in the concurrent IO ladder can be monitored. Just after selected, M000 is specified as an initial value. Specify the registered number to be monitored.
In the name item of the value display, the registered name which is set in the I/O menu is displayed.
4. Advanced Setting Window

4.1 Selecting Data

{FIL}
Numbers of the welding start condition file and the welding end condition file, which are specified at the welding instructions (ARCON, ARCSET, ARCOFF) executed during the welding, can be monitored.

{STEP}
The step number of the job can be monitored.

② Names
The name cannot be changed.
If the data type is IO, the IO name set in the I/O menu is displayed, and if the data type is REG, the registered name set in the I/O menu is displayed. The name is used as the data name of numeric value on the monitoring window.

⑤ Number specification
Only when the data type is IO or REG.
If checked, the data is displayed on the monitoring window.

④ Graph display specification
If checked, a graph of the data is displayed on the monitoring window.

⑧ Bold line (B) specification
If checked, the graph is displayed in bold line.

⑥ Numeric value display specification
If checked, the data is displayed on the monitoring window.

⑦ Display range (MAX, MIN) specification
The MAX and MIN values specified in this window are reflected to the graph display.

⑧ Units
The unit name is used to display values.

On the display of the numeric value "FIL", when ARCON or ARCSET is executed, the welding start condition file number is displayed as ASF, and when ARCON is executed, the welding end condition number is displayed as AEF. On display of the waveform, there is not any difference of ASF and AEF.
If the advanced setting is closed with “CLOSE” button without checking in check boxes of neither the graph display specification nor the numeric value display specification, the contents of the item is deleted.
4.2 Setting of Monitoring

In the “MONITOR” tab, various setting related to the function can be set.

![Graphical Arc Monitoring 4 Advanced Setting Window](Image)

** Sampling time **

The sampling cycle can be selected from four patterns.

The number of the data which can be displayed on the monitor is 300, and the monitoring time depends on the sampling cycle setting.

- **{4msec}**... monitorable time: 1.2 seconds
  
  It is possible to execute the sampling by synchronizing with the processing cycle of the concurrent ladder of the manipulator controller. This cycle is adequate for monitoring the behavior of the arc-related IO signals of the time when the arc runs out, occurs, or finishes.

- **{0.1sec}**... monitorable time: 30 seconds
  
  This cycle is adequate in case of welding 30-60 cm long welding line.

- **{1sec}**... monitorable time: 5 minutes
  
  This cycle is adequate to monitor multi welding lines (about 30-60 cm long) at the same time.

- **{10sec}**... monitorable time: 50 minutes
  
  This cycle is adequate to monitor for a long time. (multi-layer welding, etc.)

The waveform might be displayed with some gaps. However when the measurement is stopped, all waveforms are displayed.
Graphical Arc Monitoring

4 Advanced Setting Window
4.2 Setting of Monitoring

**Trigger Mode**
Select the timing to start monitoring.
Select one of the following three modes.

**(OFF)**
Once the “START” button on the monitoring window is pressed, the monitoring is started soon.
The monitoring continues until the “STOP” button is pressed.
The latest data of the monitorable time is displayed all the time and the waveform moves toward left from right. (roll mode display)
(e.g. When the sampling cycle is set as 0.1 sec, the data of the latest 30 minutes is displayed.)

**(Single)**
When the “START” button is pressed, the state becomes the condition of waiting for trigger, and the latest data is kept monitoring all the time like the (OFF) mode.
When the trigger condition is established, the measurement stops after monitoring for the sampling time (sampling cycle x 300). If a pre-trigger time is set, the monitoring time (after the trigger signal turns ON) changes. (For the detail, refer to the “Selection item Pre-trigger setting”.)
Once the “STOP” button is pressed, the roll display of the waveform of the time stops.

**(Normal)**
Like the (Single) mode, when the “START” button is pressed, the state becomes the waiting for trigger and the latest data is kept monitoring all the time.
When the trigger condition is established, dislike the (Single) mode, the measurement doesn’t stop and becomes the state of the waiting for trigger after monitoring for the sampling time (sampling cycle x 300).
The data is displayed in the roll mode for the first time of waiting for trigger. Although, under the state of waiting for trigger from the second time, the monitoring data after establishing trigger condition last time is displayed. (The waveform data is not displayed in roll mode so it doesn’t move.) Every time the trigger signal turns ON, a waveform is renewed with the latest data.
4 Advanced Setting Window
4.2 Setting of Monitoring

① Trigger
Select one of the following two modes.

{Sampling data}
In this mode, the data which is selected in the monitor setting tabs (MEASURE, REF, POS ANGLE, and OPTION) are specified as a trigger.

{ARC Stop}
In this mode, the time when the welding stopped is specified as a trigger.
ARC Stop is determined by the following conditions.

Table 4-1: Determination Condition of ARC Stop

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm occurred and the manipulator stopped.</td>
</tr>
<tr>
<td>Emergency stop signal turned ON (Servo OFF) and the manipulator stopped.</td>
</tr>
<tr>
<td>HOLD signal turned ON and the manipulator stopped.</td>
</tr>
<tr>
<td>Operation prohibit signal turned ON and the welding stopped.</td>
</tr>
<tr>
<td>PLAY mode was switched into TEACH mode.</td>
</tr>
</tbody>
</table>

② Sampling data setting
Set this item when the “Sampling data” is selected in the Trigger (①).

{CH}
When the monitoring data of “MEASURE”, “REF”, “POS ANGLE”, or “OPTION” is selected, select the channel number of the sampling data which is displayed on the left side of each setting window.

{Level}
Set a threshold value to judge that the trigger condition is established.
Graphical Arc Monitoring

4 Advanced Setting Window

4.2 Setting of Monitoring

{Up / Down / UpDown}

“Up” is judged when the sampling data becomes bigger than the above-mentioned threshold value.

“Down” is judged when the sampling data becomes smaller than the above-mentioned threshold value.

“UpDown” is judged when the sampling data becomes bigger or smaller than the above-mentioned threshold value.

When the specified “CH” type is “IO”, the setting of “LEVEL” is not referred.

Up is judged when the specified IO signal is turned ON, Down is judged when the specified IO signal is turned OFF, and UpDown is judged when specified IO signal is turned ON or OFF.

When the specified “CH” type is “SPD” (unit: except for mm/sec), “LEN”, “REG”, “FIL” or “STEP”, the value after the decimal point cannot be set. Even if input the value after the decimal point, the setting is invalid. (When open the monitor advanced setting window next time, the value after the decimal point becomes “0”.)
4-14

4. Advanced Setting Window
4.2 Setting of Monitoring

Setting of pre-trigger

If a pre-trigger is set, the data before the trigger condition is established can be monitored.

The pre-trigger is specified by the unit of div (scale) of the graph time base. The time base is divided into ten parts by the scale. Therefore the data of the monitoring time can be monitored before the trigger condition is established.

By setting the most monitoring time as a pre-trigger time, the monitoring function can be used for the factor determination.

For example by setting “ARC Stop” for the trigger factor and 9[div] for the pre-trigger, the arc-related data just before the arc was stopped is monitored, so the reason of the arc stop can be examined with it.

Trigger monitoring is started after pre-trigger time is exceeded.

Even if the trigger condition is established before exceeding the pre-trigger time, the trigger monitoring is not started.
Offset

By the setting of Offset, the waveform on the monitoring window which is specified on the monitor data setting tabs can be shifted.

By using the Offset, the waveform of each channel can be displayed separately without lapping a waveform on the other waveform.

The unit of the Offset is div (scale) and the range of the Offset can be set within (-10div) - (+10div).

Name

The name of the loaded monitor advanced setting is displayed.

<Description about CH1 by the setting mentioned above>

1div becomes 20[V/div].

\[ \text{MAX} \div \text{MIN} = \frac{300[V]}{100[V]} = 3 \div 1 = 20[V/div] \]

When Offset is 4.0 div, \(20[V/div] \times 4.0[\text{div}] = 80[V] \). (80[V] is offset.)

\[ \Rightarrow \text{MAX}300[V] \rightarrow 220[V], \text{MIN}100[V] \rightarrow 20[V] \]
4.3 Setting of Logging Condition

In the "LOGGING" tab, various settings related to the logging can be set.

Even if a setting is changed in the advanced setting window, the new setting is not reflected when the logging is executed. From the next execution of logging, the new setting becomes valid.
<Setting of sampling cycle>

At the “Sampling Time” (①), the sampling cycle can be selected from four patterns.

In the logging function, the data is logged by the different cycle from the monitoring function.

However, the data for sampling is same as the one of the monitoring function.

The number of the data which can be logged is 8000, and the logging time depends on the sampling cycle setting.

- **{0.1sec}.... logable time: 800 seconds**
- **{1sec}... logable time: 8000 seconds (about 2 hours and 10 minutes)**
  - 0.1sec and 1sec cycles are adequate to log multi welding lines (about 30-60 cm long).
- **{10sec}... logable time: 80000 seconds (about 16 hours)**
  - This cycle is adequate for a long time logging such as multi-layer welding, etc.
- **{60sec}.... logable time: about 128 hours**
  - This cycle is adequate for a long time logging such as multi-layer welding, etc.

**NOTE**

As the number of use increases, the logable time changes. In case the use is for ARC and ARC, the logable time becomes half.
4.3 Setting of Logging Condition

<② Setting of logging section>

Specify the section to log data. There are two ways to specify the section: specifying in the welding start condition file and specifying by the logging execution signal. The logging starts by either of these two instructions.

{Specify welding start condition file}

Check “LOGGING ON” in the “OTHER” tab of the welding start condition (ARC START COND.) file.

If an ARCON instruction is executed by the welding start condition file which is specified to valid the logging, the logging starts, and if the ARCOF instruction is executed, the logging finishes.

Example:

In case the logging section is specified by the welding start condition file (number 10)

(The welding condition file (number 12) is set as the logging is not valid.)

```
JOB
ARCON ASF#(10) ①
MOVL
ARCOF
MOVJ
ARCON ASF#(12) ②
MOVJ
ARCOF
MOVJ
ARCON ASF#(10) ③
MOVL
ARCOF
```
The logging data of each logging section is named as INDEX1, INDEX2 ..., and they are saved into the external memory unit when a backup is executed.

{Logging execution signal}
The logging is executed when the specific input signal “Logging execution signal” or the universal output signal is ON.

<Specific input signal>
- Use when starting the logging with the concurrent IO ladder such as a signal from PLC or an external signal. (A concurrent IO ladder circuit for the logging execution control can be made.)
- For the detail of the specific input signal, refer to Chapter 6 “Concurrent I/O Ladder”.

<Universal output signal>
- Use when instructing the logging execution from the robot job.
- If specify "0000", the universal output number specification becomes invalid.
4.3 Setting of Logging Condition

<③ Setting of logging data backup signal>

The logging data is saved to the external memory unit when the specific input signal “Logging backup signal” or the universal output signal turns ON.

<Specific input signal>

• Use when instructing the logging data backup with the concurrent IO ladder such as a signal from PLC or an external signal. (A concurrent IO ladder circuit for the logging data backup control can be made.)

• For the detail of the specific input signal, refer to Chapter 6 Concurrent I/O Ladder.

<Universal output signal>

• Use when instructing the logging execution from the robot job.

• If specify “0000”, the universal output number specification becomes invalid.

Save the logging data into the external memory unit by turning ON the logging data backup signal, before the number of logable data becomes more than 8000. If the logging is executed while the number of data is more than 8000, old data is deleted automatically.

When the backup is done properly, the logging data is cleared. (The same logging data is not saved when the next backup is executed.)

Although the logging data is usually deleted after its backup, it is not the same when the logging is executed while the backup.

When the control power supply is disconnected, the data which is not saved in the external memory unit is deleted, and also the data of the following time is deleted: from the last save in the external memory unit after receiving the logging data backup signal last, to when the control power supply is disconnected.
4  Advanced Setting Window
4.3  Setting of Logging Condition

<③ Setting of logging data backup destination>

The destination for logging data backup is selected from a USB or a CF card. By setting a pass, a folder in a media can be selected.

The following setting cannot be selected as a destination for logging data backup.

• In case the length of the pass is more than 16 bytes.
• A folder of the upper hierarchy than the selected media
• A folder of CF when a USB is selected
• A folder of USB when a CF is selected
4.4 Logging Backup Retry

The saving in the external memory unit can be failed depending on the timing.

If a backup is failed, a retry is carried out every retry period selected as beforehand.

The retry period is decided depending on the parameter. For the detail of parameter, refer to Chapter 7 Parameter.

The following message is indicated for five seconds when a backup or a retry is failed.

Backup of the logging data went wrong.

When failing in retry for the number of specified times, the following message is indicated and the specific output signal “Arc monitor logging backup failed (#51013)” in the concurrent ladder turns ON.

After a retry is executed properly, the message below disappears and the specific output signal turns OFF.

Backup of the logging data went wrong again.

When the logging data is empty (the logging has not executed since the last logging backup), the following message is indicated for five seconds and the backup is not executed.

The logging data which backs up does not exist.

In case the logging is executed during the backup, the backup continues and also the logging is executed at the same time. However, the logging may start late.

Under the condition of that a backup retry is not executed and stops as a fail, the message “Backup of the logging data went wrong.” is indicated and the specific output signal “Arc monitor logging backup failed (#51013)” turns ON.
Graphical Arc Monitoring

4 Advanced Setting Window
4.4 Logging Backup Retry

A logging backup cannot be executed in the following cases.

<table>
<thead>
<tr>
<th>Logging backup invalid condition</th>
<th>Retry</th>
</tr>
</thead>
<tbody>
<tr>
<td>No logging data (logging has not executed since the last logging backup)</td>
<td>Not executed</td>
</tr>
<tr>
<td>Cannot write into the specified external memory unit.</td>
<td>Not executed</td>
</tr>
<tr>
<td>Overloaded</td>
<td></td>
</tr>
<tr>
<td>No external memory unit</td>
<td></td>
</tr>
<tr>
<td>No specified pass</td>
<td></td>
</tr>
<tr>
<td>A logging backup signal turns ON while executing logging.</td>
<td>In case the logging ended within a retry time, the backup is made by the retry.</td>
</tr>
</tbody>
</table>

NOTE

Under the condition of that a backup retry is not executed and stops as a fail, the specific output signal “Arc monitor logging backup failed (#51013)” turns ON.

NOTE

In case the logging is executed during the backup, the backup continues and also the logging is executed at the same time. However, the logging may start late.

NOTE

When a backup is failed because the data is overloaded and cannot be written into the external memory unit, the data may be written in the memory unit halfway through. When the data backup is done properly, “ARC_LOGDATAEND” is indicated in the end of logging data.
4.5 Forced Clearance of Logging Data

To delete the retrieved logging data and retrieve a new logging data, use the specific input signal "Arc monitor logging backup clear".

By turning this signal ON, the logging data is cleared.

To use this signal, make a new circuit to control the arc monitor logging clearance signal, and add the signal to the concurrent IO ladder.

For the detail of the specific input signal, refer to Chapter 6 Concurrent I/O Ladder.

NOTE: The forced clearance cannot be executed while executing the logging or the logging backup.
4.6 Loading and Saving Monitor Advanced Setting

However, setting details take time as there are a lot of setting items. The setting contents provided by the maker can be used, and the contents setting can be saved to continue later.

LOAD

Details can be set by choosing (loading) an advanced setting file of either “Maker setting” or “User setting”.

LOAD

SAVE

Maker setting [LOAD]

No. Name

01 500A glass std. (Stop trigger)
02 500A glass std. (With posture)
03 I/O monitor (Arc start)
04 I/O monitor (Arc end)
05 500A glass std. (Stop trigger)
06 500A glass std. (With posture)
07 I/O monitor (Arc start)
08 I/O monitor (Arc end)
09 500A glass std. (Stop trigger)
10 500A glass std. (With posture)
The current maker initial setting file has 4 types. (From 05 is the same.)

“01 350A class std. (Stop trigger)” and “02 350A class std. (With posture)” are for standard use such as checking the arc welding condition and the investigation at the time of an alarm occurred.

“03 I/O monitor (Arc start)” is for checking the state of when arc welding starts in detail, and “04 I/O monitor (Arc end)” is for checking the state of when arc welding finishes in detail.
After setting detail contents, the settings can be saved to the manipulator controller as a file. The number of savable files is 20.

SAVE

**Graphical Arc Monitoring**

**4 Advanced Setting Window**

**4.6 Loading and Saving Monitor Advanced Setting**

(SAVE)

After setting detail contents, the settings can be saved to the manipulator controller as a file. The number of savable files is 20.
4.7 Finishing Monitor Advanced Setting

{OK}
Fix the setting change and back to the monitoring window.

{CANCEL}
Delete the setting change and back to the monitoring window.
5 Saving Format of Monitoring/Logging Data

The saving format of the monitoring data and the logging data to an external memory unit is same.

---

**Saving Format of Logging Data**

---

```
//ARC_LOGDATA

//WELD1
//DATE :2013/05/24 18:40:35
//JOB :ARC_TEST
//SAMPLING 0.1sec
//SAMPLNUM 25
//PRETRIG 0

//invalid
CHANNEL ATTRIBUTE NAME NO. GRAPH NUMBER UNIT MIN MAX OFFSET BOLD LINE
---
CH1 AIN1 VOLTAGE 0 0 1 V 100 300 4 0
CH2 AIN2 CURRENT 0 0 1 A 0 50 -3 0
CH3 AOT1 VOLTAGE 0 0 1 V -3276.7 3276.7 0 0
CH4 AOT2 CURRENT 0 0 1 A -3276.7 3276.7 0 0
CH5 ANG1 TOUCH ANGLE 0 0 1 deg. -3276.7 3276.7 0 0
CH6 ANG2 TRAVEL ANGLE 0 0 1 deg. -3276.7 3276.7 0 0
CH7 ANG3 DOWNWARD ANG 0 0 1 deg. -3276.7 3276.7 0 0
CH8 STEP STEP NO. 0 0 1 0 100 0 0
CH9 SPD WELD SPEED 0 1 1 cm/min 0 500.3 0 0

//DATA
---
CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8 CH9
---
1 2 3 4 5 6 7 8 9
---
100 200 300 400 500 600 700 800 900

//INDEX2
//DATE :2013/05/24 18:40:59
//JOB :ARC_TEST
//SAMPLING 0.1sec
//SAMPLNUM 10
//PRETRIG 0

//invalid
CHANNEL ATTRIBUTE NAME NO. GRAPH NUMBER UNIT MIN MAX OFFSET BOLD LINE
---
CH1 AIN1 VOLTAGE 0 0 1 V 100 300 4 0
CH2 AIN2 CURRENT 0 0 1 A 0 50 -3 0
CH3 AOT1 VOLTAGE 0 0 1 V -3276.7 3276.7 0 0
CH4 AOT2 CURRENT 0 0 1 A -3276.7 3276.7 0 0
CH5 ANG1 TOUCH ANGLE 0 0 1 deg. -3276.7 3276.7 0 0
CH6 ANG2 TRAVEL ANGLE 0 0 1 deg. -3276.7 3276.7 0 0
CH7 ANG3 DOWNWARD ANG 0 0 1 deg. -3276.7 3276.7 0 0
CH8 STEP STEP NO. 0 0 1 0 100 0 0
CH9 SPD WELD SPEED 0 1 1 cm/min 0 500.3 0 0

//DATA
---
CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8 CH9
---
1 2 3 4 5 6 7 8 9
---
100 200 300 400 500 600 700 800 900

//ARC_LOGDATAEND
```
5 Saving Format of Monitoring/Logging Data

1) ARC_LOGDATA
   Function : Shows the type of log data.
   Notation : ARC_LOGDATA/ARC_MONDATA
   Description : Logging data: ARC_LOGDATA is shown. Monitoring data: ARC_MONDATA is shown.

2) WELD1
   Function : Shows the welder number.
   Notation : WELD1/WELD2/WELD3/WELD4/WELD5/WELD6/WELD7/WELD8

3) INDEX1
   Function : Shows the logging section number.
   Notation : INDEX1/INDEX2...
   Description : From the oldest logging section, numbers are allocated as INDEX1/INDEX2/... When it is monitoring data: INDEX1 only.

4) DATE
   Function : Shows the start date of the log data.
   Notation : DATE : 2012/08/06 09:00
   Description : Logging data: logging start date is shown. Monitoring data: measurement start date is shown.

5) JOB
   Function : Shows the JOB name of when the logging was started.
   Notation : JOB : ARC_TEST
   Description : Logging data: JOB name at the time of logging is started is shown. Monitoring data: JOB name of when the measurement was started is shown. When JOB is not executed, "*****************************************" is shown.

6) SAMPLING
   Function : Shows the sampling time.
   Notation : SAMPLING 4MSEC/0.1SEC/1SEC/10SEC/60SEC
   Description : Logging data: the sampling time which is set in the logging of the ARC MONITOR(GRAPH) advanced setting window is shown. Select from 0.1SEC/1SEC/10SEC/60SEC Monitoring data: the sampling time which is set in the ARC MONITOR(GRAPH) advanced setting window is shown. Select from 4MSEC/0.1SEC/1SEC/10SEC

7) SAMPLNUM
   Function : Shows the number of samples.
   Notation : SAMPLNUM 300
   Description : The number of samples is shown. (logging data, monitoring data)

8) PRETRIG
   Function : Shows the number of pre-trigger samples.
   Notation : PRETRIG 0.1
   Description : Monitoring data: the value which is set in the pre-trigger in the ARC MONITOR(GRAPH) advanced setting window is shown. Logging data: "0" is shown.
9) INVALID
Function : Shows the stopping factor.
Notation : ARC_STOP[alarm number]/ESP_STOP/HOLD_STOP/SIGNAL_STOP/
           MODE_STOP/NON_STOP/INVALID
Description : When the trigger is set to ARC Stop in the monitoring data,
              the factor is shown.
              When the trigger is not set to ARC Stop in the monitoring data or
              when it is logging data, "INVALID" is shown.

10) CHANNEL
Function : Shows the channel number.
Notation : CH1/CH2/CH3/CH4/CH5/CH6/CH7/CH8/CH9/
           CH10/CH11/CH12/CH13/CH14/CH15/CH16
Description : The valid channel in the ARC MONITOR(GRAPH) advanced setting window
              (the channel ticked either in the checkbox of "GRAPH" or "NUMBER") is shown.

11) ATTRIBUTE
Function : Shows the attribution of the item which is set to the type in the ARC
           MONITOR (GRAPH) advanced setting window.
           ANG1/ANG2/ANG3/SPD/LEN/IO/REG/FILE/STEP
Description : The attribution of the item which is set to the type in the ARC MONITOR
              (GRAPH) advanced setting window is shown.
              AIN1/AIN2/AIN3/AIN4/AIN5/AIN6 ... effective value (1-6 CH)
              AOT1/AOT2/AOT3/AOT4/AOT5/AOT6 ... command value (1-6 CH)
              ANG1 ... Touch angle
              ANG2 ... Travel angle
              ANG3 ... Downward angle
              SPD ... Welding speed
              LEN ... Welding length
              IO ... Signal
              REG ... Register
              FILE ... Welding start condition file number/Welding end condition file number
              STEP ... Step number of the JOB
To distinguish the welding start condition file between the welding end condition file of the FILE data, the welding end con-
dition file number starts from 1001.
e.g.) - FILE data number “1” = the welding start condition file “1”
     - FILE data number “1001” = the welding end condition file “1”

12) NAME
Function : Shows the name of the item which is set to the type in the ARC
           MONITOR(GRAPH) advanced setting window.
Notation : Setting name/Touch angle/Travel angle/Downward angle/Welding speed
           /Welding length/Signal name/ Register name/Welding condition file number
           /Step number
Description : The name which is displayed in the ARC MONITOR(GRAPH) advanced setting
              window is shown.
13) NO.
   Function: Shows the number of the item which is set to the type in the ARC MONITOR (GRAPH) advanced setting window.
   Notation: IO: (signal number) Register: (register number)
   Description: IO: set signal number is shown.
               Register: set register number is shown.
               Neither IO nor register: “0” is shown.

14) GRAPH
   Function: Shows the status of “GRAPH” in the ARC MONITOR (GRAPH) advanced setting window.
   Notation: 0/1
   Description: “1” is shown if the checkbox of “GRAPH” is ticked in the ARC MONITOR (GRAPH) advanced setting window.

15) NUMBER
   Function: Shows the status of “NUMBER” in the ARC MONITOR (GRAPH) advanced setting window.
   Notation: 0/1
   Description: “1” is shown if the checkbox of “NUMBER” is ticked in the ARC MONITOR (GRAPH) advanced setting window.

16) UNIT
   Function: Shows the unit of the item which is set to the type in the ARC MONITOR (GRAPH) advanced setting window.
   Notation: V/A/deg./(set value)
   Description: The unit displayed in the ARC MONITOR (GRAPH) advanced setting window.
               There are two patterns of units: one is specified according to its attribution, the other is set by the user optionally.

17) MIN
   Function: Shows the MIN value of the item which is set to the type in the ARC MONITOR (GRAPH) advanced setting window.
   Notation: (set value)
   Description: The MIN value of the item which is set to the type in the ARC MONITOR (GRAPH) advanced setting window.

18) MAX
   Function: Shows the MAX value of the item which is set to the type in the ARC MONITOR (GRAPH) advanced setting window.
   Notation: (set value)
   Description: The MAX value of the item which is set to the type in the ARC MONITOR (GRAPH) advanced setting window.

19) OFFSET
   Function: Shows the offset of the item which is set to the type in the ARC MONITOR (GRAPH) advanced setting window.
   Notation: (set value)
   Description: The offset of the item which is set to the type in the ARC MONITOR (GRAPH) advanced setting window.
5. Saving Format of Monitoring/Logging Data

20) BOLD LINE
   Function : Shows the status of “B” in the ARC MONITOR(GRAPH) advanced setting window.
   Notation : 0/1
   Description : “1” is shown if the checkbox of “B” is ticked in the ARC MONITOR (GRAPH) advanced setting window.

21) DATA
   Function : Shows the data which is sampled in the logging data or the monitoring data.
   Description : The data which is sampled in the logging data or the monitoring data is shown.

22) ARC_LOGDATAEND
   Function : Shows that all data is written in the logging data or in the monitoring data.
   Notation : ARC_LOGDATAEND/ARC_MONDATAEND
   Description : Shown when all data is written in the logging data or in the monitoring data. Not shown when writing data was failed.

---

Save the logging data into the external memory unit by turning ON the logging data backup signal, before the number of logable data becomes more than 8000. If the logging is executed while the number of data is more than 8000, old data is deleted automatically. If the number of samples (the number of “(7)SAMPLNUM”) and the number of sampling data (the number of “(20)DATA”) is different, that means the old data is deleted.

e.g.) In case the actual number of samples: 8200
   SAMPLE_NUM shows 8200.
   The number of DATA is 8000.
   200 old data were automatically deleted.
As for the logging section number, the existence of data in the logging section is judged by the logging section number when multiple logging sections exist, the number of the logging data is over 8000, and all the data of old logging sections are deleted and doesn’t exist.

e.g.)
The number of data in the 1st logging section: 5000
   ➔ All data are not backed up.
The number of data in the 2nd logging section: 5000
   ➔ Latest 3000 data are backed up.
The number of data in the 3rd logging section: 5000
   ➔ All data are backed up.

INDEX1  Not described in the logging data.
INDEX2  SAMPLE_NUM: 5000 (the number of DATA: 3000)
INDEX3  SAMPLE_NUM: 5000 (the number of DATA: 5000)
The first logging section is not backed up, so displayed from INDEX2.

In case of the example above, the log data start date of the second logging section is the actual date (time) when the logging was started. (Not the date (time) of the first data of the latest 3000 data.)

When a backup is failed because the data is overloaded and cannot be written into the external memory unit, the data may be written in the memory unit halfway through. When the data backup is done properly, “ARC_LOGDATAEND” is shown in the end of logging data.
### 6 Concurrent I/O Ladder

I/O signals for the graphical arc monitoring function are as follows.

#### 6.1 Specific Input Signal

<table>
<thead>
<tr>
<th>I/O Signal</th>
<th>Description</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>41172</td>
<td>ARCMONITOR LOGGING EXECUTION</td>
<td></td>
</tr>
<tr>
<td>41171</td>
<td>ARCMONITOR EFFECTIVE VALUE</td>
<td></td>
</tr>
<tr>
<td>41170</td>
<td>ARCMONITOR MEASUREMENT</td>
<td></td>
</tr>
</tbody>
</table>

For welder 1

<table>
<thead>
<tr>
<th>I/O Signal</th>
<th>Description</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>41232</td>
<td>ARCMONITOR LOGGING EXECUTION</td>
<td></td>
</tr>
<tr>
<td>41231</td>
<td>ARCMONITOR EFFECTIVE VALUE</td>
<td></td>
</tr>
<tr>
<td>41230</td>
<td>ARCMONITOR MEASUREMENT</td>
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</tr>
</tbody>
</table>

For welder 2

<table>
<thead>
<tr>
<th>I/O Signal</th>
<th>Description</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>41292</td>
<td>ARCMONITOR LOGGING EXECUTION</td>
<td></td>
</tr>
<tr>
<td>41291</td>
<td>ARCMONITOR EFFECTIVE VALUE</td>
<td></td>
</tr>
<tr>
<td>41290</td>
<td>ARCMONITOR MEASUREMENT</td>
<td></td>
</tr>
</tbody>
</table>

For welder 3

<table>
<thead>
<tr>
<th>I/O Signal</th>
<th>Description</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>41352</td>
<td>ARCMONITOR LOGGING EXECUTION</td>
<td></td>
</tr>
<tr>
<td>41351</td>
<td>ARCMONITOR EFFECTIVE VALUE</td>
<td></td>
</tr>
<tr>
<td>41350</td>
<td>ARCMONITOR MEASUREMENT</td>
<td></td>
</tr>
</tbody>
</table>

For welder 4

<table>
<thead>
<tr>
<th>I/O Signal</th>
<th>Description</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>41412</td>
<td>ARCMONITOR LOGGING EXECUTION</td>
<td></td>
</tr>
<tr>
<td>41411</td>
<td>ARCMONITOR EFFECTIVE VALUE</td>
<td></td>
</tr>
<tr>
<td>41410</td>
<td>ARCMONITOR MEASUREMENT</td>
<td></td>
</tr>
</tbody>
</table>

For welder 5

<table>
<thead>
<tr>
<th>I/O Signal</th>
<th>Description</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>41472</td>
<td>ARCMONITOR LOGGING EXECUTION</td>
<td></td>
</tr>
<tr>
<td>41471</td>
<td>ARCMONITOR EFFECTIVE VALUE</td>
<td></td>
</tr>
<tr>
<td>41470</td>
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For welder 6

<table>
<thead>
<tr>
<th>I/O Signal</th>
<th>Description</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>41532</td>
<td>ARCMONITOR LOGGING EXECUTION</td>
<td></td>
</tr>
<tr>
<td>41531</td>
<td>ARCMONITOR EFFECTIVE VALUE</td>
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<tr>
<td>41530</td>
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</table>

For welder 7

<table>
<thead>
<tr>
<th>I/O Signal</th>
<th>Description</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>41592</td>
<td>ARCMONITOR LOGGING EXECUTION</td>
<td></td>
</tr>
<tr>
<td>41591</td>
<td>ARCMONITOR EFFECTIVE VALUE</td>
<td></td>
</tr>
<tr>
<td>41590</td>
<td>ARCMONITOR MEASUREMENT</td>
<td></td>
</tr>
</tbody>
</table>

For welder 8

<table>
<thead>
<tr>
<th>I/O Signal</th>
<th>Description</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>40604</td>
<td>ARCMONITOR LOGGING BACKUP</td>
<td></td>
</tr>
<tr>
<td>40603</td>
<td>CLEAR</td>
<td></td>
</tr>
</tbody>
</table>
6 Concurrent I/O Ladder
6.1 Specific Input Signal

**“ARCMONITOR MEASUREMENT START”**

- With this signal, the measurement starts automatically without selecting the measurement start button.
- This signal does the same operation as the time when the “START” button and the “STOP” button is pressed.
- Turning ON the specific input signal = Pressing “START” button
- Turning OFF the specific input signal = Pressing “STOP” button
(e.g.)
- Add a new circuit which is turned ON by the “CONTROL POWER ON COMPLETED (NORMALITY ON)” to the IO concurrent ladder.
- When the controller is activated, the measurement starts automatically. By pressing “STOP” button, the measurement stops.

**“ARCMONITOR LOGGING EXECUTION SIGNAL”**

- Use when instruct to start logging in the IO concurrent ladder such as the signal from PLC and the external signal. (A concurrent IO ladder for logging execution control can be made.)

**“ARCMONITOR LOGGING BACKUP SIGNAL”**

- Use when instruct to backup the logging data into the external memory unit in the IO concurrent ladder such as the signal from PLC and the external signal. (A concurrent IO ladder for logging execution control can be made.)

**“ARCMONITOR LOGGING BACKUP CLEAR”**

- Use when delete the retrieved data and retrieve a logging data newly. By turning ON this signal, the logging data is cleared.
- (Make a circuit which controls the arc monitor logging clearance signal in the concurrent IO ladder, and use this signal.)

**“ARCMONITOR EFFECTIVE VALUE CALCULATION”**

- The analog data of the welding current and the welding voltage, which is inputted from the welding power source to the manipulator controller, is unstable and easy to change largely because of the welding effect like the short circuit. Even if the sampling data at the real time is displayed, the data value is difficult to understand. So the effective value is calculated and its average value of the welding section is displayed.
- This signal is used for instruction to calculate the effective value by synchronizing with the welding section.
- As the initial value of the concurrent IO ladder for arc welding, there is a circuit which turns ON this signal by the ARCON signal. (For detail of the circuit, refer to Section 6.3 “Related Circuits” on page 6-4)
### 6.2 Specific Output Signal

<table>
<thead>
<tr>
<th>Time</th>
<th>Signal Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>51570</td>
<td>For welder 1 ARCMONITOR MEASURING</td>
</tr>
<tr>
<td>51630</td>
<td>For welder 2 ARCMONITOR MEASURING</td>
</tr>
<tr>
<td>51690</td>
<td>For welder 3 ARCMONITOR MEASURING</td>
</tr>
<tr>
<td>51750</td>
<td>For welder 4 ARCMONITOR MEASURING</td>
</tr>
<tr>
<td>51810</td>
<td>For welder 5 ARCMONITOR MEASURING</td>
</tr>
<tr>
<td>51870</td>
<td>For welder 6 ARCMONITOR MEASURING</td>
</tr>
<tr>
<td>51930</td>
<td>For welder 7 ARCMONITOR MEASURING</td>
</tr>
<tr>
<td>51990</td>
<td>For welder 8 ARCMONITOR MEASURING</td>
</tr>
<tr>
<td>51013</td>
<td>ARCMONITOR LOGGING BACKUP FAILED</td>
</tr>
</tbody>
</table>

- **“ARCMONITOR MEASURING”**
  - Turns ON during the measurement of the monitoring data.

- **“ARCMONITOR LOGGING BACKUP FAILED”**
  - Turns ON when the logging backup retry upper limit has been reached and the retry is failed.
  - Turns OFF when the logging backup is instructed again and the data is saved properly.
6.3 Related Circuits

In the default circuits of the ladder related to the arc-welding, the specific input signal "ARC MONITOR average value calculation" is allocated to the ARCON signal. With this circuit, it synchronizes with the ARCON signal and calculates the average value of the current and the voltage which are inputted from the welding power source to the manipulator controller.

The following circuits of the welders(1~8) have been added to the original ladder according to the number of the welder.

```
#70143  ARCON signal: welder 1  ARC MONITOR average value calculation: welder 1
#70343  ARCON signal: welder 2  ARC MONITOR average value calculation: welder 2
#70543  ARCON signal: welder 3  ARC MONITOR average value calculation: welder 3
#70743  ARCON signal: welder 4  ARC MONITOR average value calculation: welder 4
#70943  ARCON signal: welder 5  ARC MONITOR average value calculation: welder 5
#71143  ARCON signal: welder 6  ARC MONITOR average value calculation: welder 6
#71343  ARCON signal: welder 7  ARC MONITOR average value calculation: welder 7
#71543  ARCON signal: welder 8  ARC MONITOR average value calculation: welder 8
```
7 Parameter

7.1 SC Parameter

Table 7-1: Parameter List

<table>
<thead>
<tr>
<th>Number</th>
<th>Content</th>
<th>Initial Value</th>
<th>Setting Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2C1320</td>
<td>Effective value low-pass filter cutoff frequency [unit: 0.1 Hz]</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>S4C1010</td>
<td>Logging backup retry time [unit: second]</td>
<td>60</td>
<td>10~3600 (1 hour)</td>
</tr>
<tr>
<td>S4C1011</td>
<td>Logging backup retry count</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

- **Effective Value Low-pass Filter Cutoff Frequency**

  The analog data of the welding current and the welding voltage, which is inputted from the welding power source to the manipulator controller, shows a higher frequency wave pattern than normal used sampling section (0.1 sec) because of the welding effect like the short circuit or the current characteristic of pulse waveform from welding power source. So removes the high frequency component with the digital filter (low-pass filter). Specify the frequency of waveform which is able to pass the filter in this parameter. The waveform which frequency is higher than the specified frequency is removed.

- **Logging Backup Retry Time**

  Specify the section to retry logging data backup.

- **Logging Backup Retry Count**

  Specify the upper limit of retry count of logging data backup.
## 8  Alarm / Error / Inform

### 8.1 Error Dialogue List

<table>
<thead>
<tr>
<th>Message</th>
<th>Factor</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Error.[0x0100]</td>
<td>Failed to secure the memory for graph. Cannot make graph.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Critical Error.[0x0101]</td>
<td>Error in end process.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Critical Error.[0x0102]</td>
<td>Error in start drawing process.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Critical Error.[0x0103]</td>
<td>Failed in receiving sampling data from manipulator controller to programming pendant.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Critical Error.[0x0104]</td>
<td>Forcefully closed because drawing process did not end in time.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Critical Error.[0x0105]</td>
<td>Forcefully closed because of error in drawing process.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Critical Error.[0x0106]</td>
<td>Forcefully closed because of failure in receiving sampling data from manipulator controller to programming pendant.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Critical Error.[0x0108]</td>
<td>Failed to welder switching process.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Critical Error.[0x0109]</td>
<td>Failed to start CSV saving process.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Data receive error. ERROR CODE: 0x0016</td>
<td>Data quantity exceeded the MAX.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Data receive error. ERROR CODE: 0x0017</td>
<td>Received channel bit is different from required channel bit.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Data receive error. ERROR CODE: 0x0018</td>
<td>Received data quantity exceeded the MAX.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Data receive error. ERROR CODE: 0x0020</td>
<td>Total measurement data quantity is smaller than last time.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Data receive error. ERROR CODE: 0x0021</td>
<td>Wrong welder number is specified.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Data receive error. ERROR CODE: 0x0022</td>
<td>Error in real type sampling process.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Can’t start the measuring. ERROR CODE: 0x0001</td>
<td>Error in welder number specification.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Can’t start the measuring. ERROR CODE: 0x0004</td>
<td>Error in CH setting.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Can’t start the measuring. ERROR CODE: 0x0008</td>
<td>Error in MAX/MIN value.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Can’t start the measuring. ERROR CODE: 0x0010</td>
<td>Error in trigger condition.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Can’t start the measuring. ERROR CODE: 0x0020</td>
<td>Error in trigger condition.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>Can’t start the measuring. ERROR CODE: 0x0040</td>
<td>There is a CH which cannot be measured. Even though enhanced function is not set, there are 3CH and 4CH (effective value and command value).</td>
<td>Enable the enhanced function.</td>
</tr>
</tbody>
</table>
### Error Dialogue List

<table>
<thead>
<tr>
<th>Message</th>
<th>Factor</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load failed. (Welder No.n)</td>
<td>Failed to load welder setting.</td>
<td>Close the graphical arc monitor and reset it.</td>
</tr>
<tr>
<td>Save failed. (Welder No.n)</td>
<td>Failed to write welder setting.</td>
<td>Close the graphical arc monitor and reset it.</td>
</tr>
<tr>
<td>Load failed. (User setting No.n)</td>
<td>Failed to load initial setting.</td>
<td>Close the graphical arc monitor and reload it.</td>
</tr>
<tr>
<td>Load failed. (Maker setting No.n)</td>
<td>Failed to load initial setting.</td>
<td>Close the graphical arc monitor and reload it.</td>
</tr>
<tr>
<td>Save failed. (User setting No.n)</td>
<td>Failed to write initial setting.</td>
<td>Close the graphical arc monitor and rewrite it.</td>
</tr>
<tr>
<td>An input value is out of range. Set the correct value. (MIN~MAX)</td>
<td>Set value (MIN/MAX) is invalid.</td>
<td>Check the range and reset.</td>
</tr>
<tr>
<td>The number of CH n is out of range. Set the correct value. (MIN~MAX)</td>
<td>Set value (MIN/MAX) is invalid.</td>
<td>Check the range and reset.</td>
</tr>
<tr>
<td>The value of ON Delay is out of range. Set the correct value. (0~1000).</td>
<td>Set On Delay value is invalid.</td>
<td>Check the range and reset.</td>
</tr>
<tr>
<td>The value of OFF Delay is out of range. Set the correct value. (0~1000).</td>
<td>Set Off Delay value is invalid.</td>
<td>Check the range and reset.</td>
</tr>
<tr>
<td>Language file does not exist.</td>
<td>Failed to load language file.</td>
<td>Close the graphical arc monitor and rewrite it. To reproduce, the programming pendant needs to be installed again.</td>
</tr>
<tr>
<td>The term which selected to trigger does not exist.</td>
<td>Trigger setting is invalid.</td>
<td>Check the trigger setting and reset.</td>
</tr>
<tr>
<td>CompactFlash is not inserted.</td>
<td>CF is not inserted.</td>
<td>Insert the CF / Take out and insert the CF / Use another CF.</td>
</tr>
<tr>
<td>USB media is not inserted.</td>
<td>USB is not inserted.</td>
<td>Insert the CF / Take out and insert the CF / Use another CF.</td>
</tr>
<tr>
<td>CSV file save failed. ERROR CODE: 0x0001</td>
<td>Failed to open the file or to make a folder.</td>
<td>Check the folder &quot;RT_ARCMON&quot; of the CF or the USB.</td>
</tr>
<tr>
<td>CSV file save failed. ERROR CODE: 0x0002</td>
<td>Failed to find memory.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>CSV file save failed. ERROR CODE: 0x0003</td>
<td>Disk is full.</td>
<td>Try again after extending capacity of the CF or the USB.</td>
</tr>
<tr>
<td>CSV file save failed. ERROR CODE: 0x0004</td>
<td>File is not opened yet.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>CSV file save failed. ERROR CODE: 0x0005</td>
<td>Error in writing in file.</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
<tr>
<td>CSV file save failed. ERROR CODE: 0x0009</td>
<td>External media is not found.</td>
<td>Do not remove the CF or the USB while saving data.</td>
</tr>
<tr>
<td>CSV file save failed. ERROR CODE: 0xFFFF</td>
<td>Other error</td>
<td>Close the graphical arc monitor and display it again.</td>
</tr>
</tbody>
</table>
DX200 OPTIONS
INSTRUCTIONS
FOR GRAPHICAL ARC MONITORING FUNCTION

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