MITSUBISHI ELECTRIC

Mitsubishi Programmable Controller

MELSEC iQ-R series

MELSEC iQ-R Analog-Digital Converter Module User's Manual (Application)

-R60AD4
-R60ADV8
-R60ADI8

SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using MELSEC iQ-R series programmable controllers, please read the manuals for the product and the relevant manuals introduced in those manuals carefully, and pay full attention to safety to handle the product correctly.

In this manual, the safety precautions are classified into two levels: "⚠WARNING" and "⚠CAUTION".

⚠ **WARNING**	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ **CAUTION**	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

⚠WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
  (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
  (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
    - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
    - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
  (3) All outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.
  (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to manuals relevant to the network. Incorrect output or malfunction due to a communication failure may result in an accident.

[Design Precautions]

⚠WARNING

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.
- If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Failure to do so may result in an accident due to an incorrect output or malfunction.
- To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.

[Design Precautions]

⚠CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.
- Do not power off the programmable controller or reset the CPU module while the settings are being written. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so also may cause malfunction or failure of the module.
- When changing the operating status of the CPU module from external devices (such as the remote RUN/STOP functions), select "Do Not OPEN in Program" for "Open Method Setting" in the module parameters. If "OPEN in Program" is selected, an execution of the remote STOP function causes the communication line to close. Consequently, the CPU module cannot reopen the line, and external devices cannot execute the remote RUN function.

[Installation Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

⚠CAUTION

- Use the programmable controller in an environment that meets the general specifications in the Safety Guidelines included with the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect interconnection may cause malfunction, failure, or drop of the module.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause malfunction.
- When using an SD memory card, fully insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
- Securely insert an extended SRAM cassette into the cassette connector of the CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
- Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, or connector. Doing so can cause malfunction or failure of the module.

[Wiring Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.
- After installation and wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
- Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module. Poor contact may cause malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact. Do not clamp the extension cables with the jacket stripped.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
- Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in the user's manual for the module used. If not, normal data transmission is not guaranteed.

[Startup and Maintenance Precautions]

⚠WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so will cause the battery to produce heat, explode, ignite, or leak, resulting in injury and fire.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock.

[Startup and Maintenance Precautions]

⚠CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit may cause malfunction.
- After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
- Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure of the module.
- Do not touch the integrated circuits on the circuit board of an extended SRAM cassette. Doing so may cause malfunction or failure of the module.
- Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.
- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.

[Operating Precautions]

⚠CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
- Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so can cause malfunction or failure of the module.

[Disposal Precautions]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.
- When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.

[Transportation Precautions]

⚠CAUTION

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

CONDITIONS OF USE FOR THE PRODUCT

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;

i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and

ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

Thank you for purchasing the Mitsubishi MELSEC iQ-R series programmable controllers.
This manual describes the functions, parameter settings, and troubleshooting of the relevant products listed below.
Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-R series programmable controller to handle the product correctly.
When applying the program examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.
Please make sure that the end users read this manual.

Point

Unless otherwise specified, this manual provides program examples in which the I/O numbers of X/Y0 to X/YF are assigned to the A/D converter module. Assign I/O numbers when applying the program examples to an actual system. For I/O number assignment, refer to the following.
MELSEC iQ-R Module Configuration Manual

Relevant products

R60AD4, R60ADV8, R60ADI8

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RELEVANT MANUALS

Manual name [manual number]	Description	Available form
MELSEC iQ-R Analog-Digital Converter Module User's Manual (Application) [SH-081233ENG] (this manual)	Functions, parameter settings, troubleshooting, I/O signals, and buffer memory of the A/D converter module	Print book
		e-Manual PDF
MELSEC iQ-R Analog-Digital Converter Module User's Manual (Startup) [SH-081232ENG]	Performance specifications, procedures before operation, wiring, programming, and offset/gain setting of the A/D converter module	Print book
		e-Manual PDF
MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks) [SH-081266ENG]	Instructions for the CPU module, dedicated instructions for the intelligent function modules, and standard functions/ function blocks	e-Manual PDF

Point

e-Manual refers to the Mitsubishi FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
A/D converter module	The abbreviation for the MELSEC iQ-R series analog-digital converter module
GX Works3	The product name of the software package for the MELSEC programmable controllers
Watchdog timer error	An error that occurs if the internal processing of the A/D converter module is abnormal. Watchdog timer enables the module to monitor its own internal processing.
Engineering tool	Another term for GX Works3
Factory default setting	A generic term for analog input ranges of 0 to 10V, 0 to 5V, 1 to 5V, -10 to 10V, 0 to 20mA, and 4 to 20mA
Normal mode	Setting items of the operation mode setting
Offset/gain setting mode	
Buffer memory	A memory in an intelligent module for storing data (such as setting values and monitored values) to be transferred to the CPU module
User range	An analog input range where any value can be set. This range can be set in the offset/gain setting.
R mode	A mode in which the module operates with the buffer memory map that has been newly laid out in the MELSEC iQ-R series
Q series-compatible mode	A mode in which the module operates with the buffer memory map converted to the equivalent one of the MELSEC Q series
Global label	A label that is valid for all the program data when multiple program data are created in the project. The global label has two types: a module specific label (module label), which is generated automatically by GX Works3, and an optional label, which can be created for any specified device.
Module Label	A label that represents one of memory areas (I/O signals and buffer memory areas) specific to each module in a given character string. For the module used, GX Works3 automatically generates this label, which can be used as a global label.
Remote head module	The abbreviation for the RJ72GF15-T2 CC-Link IE Field Network remote head module

1 FUNCTIONS

This chapter describes the functions of the A/D converter module and the setting procedures for those functions.
For details on the I/O signals and the buffer memory, refer to the following.

☞ Page 98 I/O Signals
☞ Page 107 Buffer Memory Areas

Point

- This chapter describes buffer memory addresses for CH1. For details on the buffer memory addresses after CH2, refer to the following.

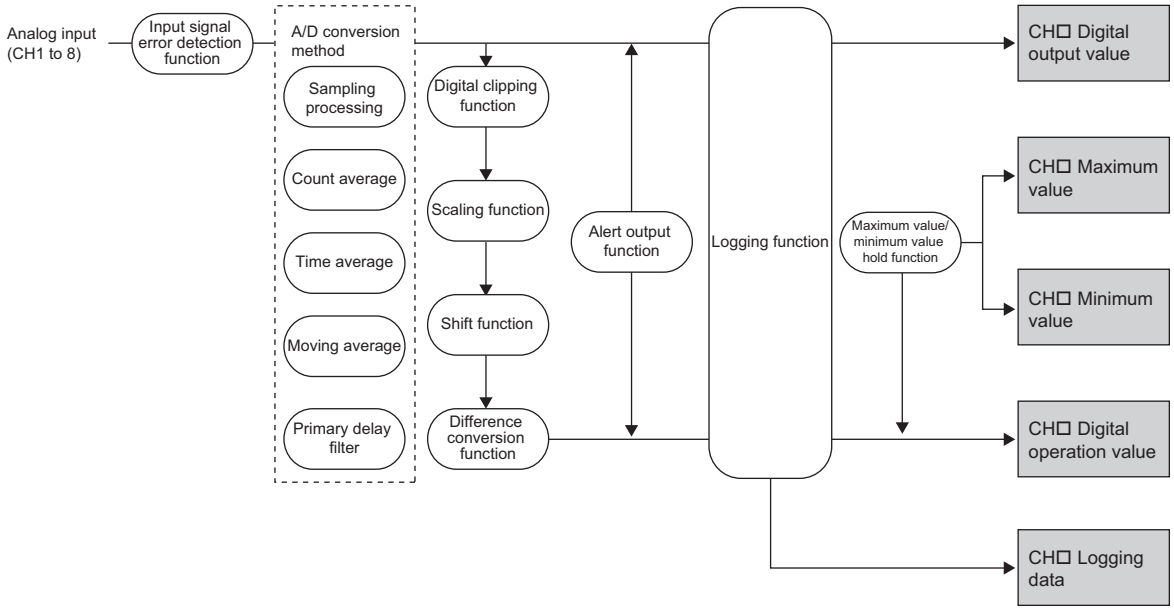
☞ Page 107 List of buffer memory addresses

- Numerical values corresponding to the channel where an error has occurred and the error description fit in the □ and △ of an error code and alarm code described in this chapter. For details on the numerical values, refer to the following.

☞ Page 91 List of Error Codes
☞ Page 95 List of Alarm Codes

1.1 Processing of Each Function

The functions are processed in the order shown below. If multiple functions are enabled, the output of the first processed function is used as the input of the next function.



Digital output value

These values are the digital values after the sampling processing, each averaging processing, or primary delay filter has been performed.

Digital operation value

These values are obtained by operating a digital output value using the digital clipping function, scaling function, shift function, or difference conversion function. When each function is not used, the same value as the digital output value is stored.

Maximum and minimum value

The maximum and minimum values of the digital operation values are stored.

Logging data

When the logging function is used, digital output values or digital operation values are collected.

1.2 Range Switching Function

This function allows switching the input range of an analog input for each channel.
Switching the range makes it possible to change the input signal characteristics.

Setting procedure

Set the input range to be used in the "Input range setting".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter]⇨ [Basic setting] ⇨ [Range switching function]

Input range setting	Digital output value		
	R60AD4	R60ADV8	R60ADI8
4 to 20mA	0 to 32000	—	0 to 32000
0 to 20mA			
1 to 5V	0 to 32000	0 to 32000	—
0 to 5V			
-10 to 10V	-32000 to 32000	-32000 to 32000	—
0 to 10V	0 to 32000	0 to 32000	
4 to 20mA (extended mode)	-8000 to 32000	—	-8000 to 32000
1 to 5V (extended mode)	-8000 to 32000	-8000 to 32000	—
User range setting	-32000 to 32000	-32000 to 32000	-32000 to 32000

After the data is written, the range is switched when the programmable controller power supply is turned off and on or when the CPU module is reset.

Point

With the following buffer memory areas, the range switching and range setting can be monitored.
'CH1 Range setting' (Un\G598)
'CH1 Range setting monitor' (Un\G430)
For details on the buffer memory addresses, refer to the following.
☞ Page 160 CH1 Range setting
☞ Page 134 CH1 Range setting monitor

1.3 A/D Conversion Enable/Disable Setting Function

This function controls whether to enable or disable the A/D conversion for each channel.
Disabling the A/D conversion for unused channels reduces the A/D conversion cycles.

Setting procedure

Set "A/D conversion enable/disable setting" to "A/D conversion enable" or "A/D conversion disable".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting] ⇨ [A/D conversion enable/disable setting function]

1.4 A/D Conversion Method

An A/D conversion method can be set for each channel.

Sampling processing

The A/D converter module executes the A/D conversion of the analog input value sequentially and stores the digital output value to the buffer memory area.

Point

The sampling cycle is "Conversion speed (80μs) × number of conversion enabled channels".
Whether to enable or disable the A/D conversion can be set for each channel. Disabling the A/D conversion for unused channels reduces the A/D conversion cycles.
Conversion cycle that applies when the three channels get A/D conversion enabled
• 80 × 3 = 240 (μs)
The conversion cycle is 240 (μs).

Averaging processing

The A/D converter module performs the averaging processing on digital output values for each channel and stores the mean values to the buffer memory.
The following three types of averaging processing are provided.

- Time average
- Count average
- Moving average

■Time average

The A/D converter module executes A/D conversion for a set time, and calculates the average of the total value excluding the maximum and the minimum values to store it in the buffer memory area.
The number of processing times within the set time changes depending on the number of channels where the A/D conversion is enabled.

$$\text{Number of processing times} = \frac{\text{Setting time}}{(\text{Number of conversion enabled channels} \times \text{Conversion speed})}$$

Ex.

The following table shows the processing times with the setting below.

Item	Setting
Number of channels where the A/D conversion is enabled	Four channels (CH1 to CH4)
Setting time	2ms

$$\frac{2}{(4 \times 0.08)} = 6.25^{*1}$$

*1 Values after the decimal point are omitted.

Conversion is processed 6 times and the mean value is output.

Point

The valid lower limit setting value for the time average is calculated by the formula "Minimum processing times (4 times) × Conversion speed × Number of channels used". Therefore, when the number of channels used is seven or eight and 3ms or less is set as the setting time, the digital output value is 0.

■Count average

The A/D converter module executes the A/D conversion for a set number of times, and stores the average of the total value excluding the maximum and the minimum values to the buffer memory area.

The time taken for the mean value calculated through the average processing to be stored in the buffer memory changes depending on the number of channels where the A/D conversion is enabled.

Processing time = Set number of times × (Number of conversion enabled channels × Conversion speed)

Ex.

The following table shows the processing time with the setting below.

Item	Setting
Number of channels where the A/D conversion is enabled	Four channels (CH1 to CH4)
Set number of times	Five times

5 (times) × (4 (CH)) × 80 (μs)) = 1600 (μs) = 1.6 (ms)

A mean value is output every 1.6ms.

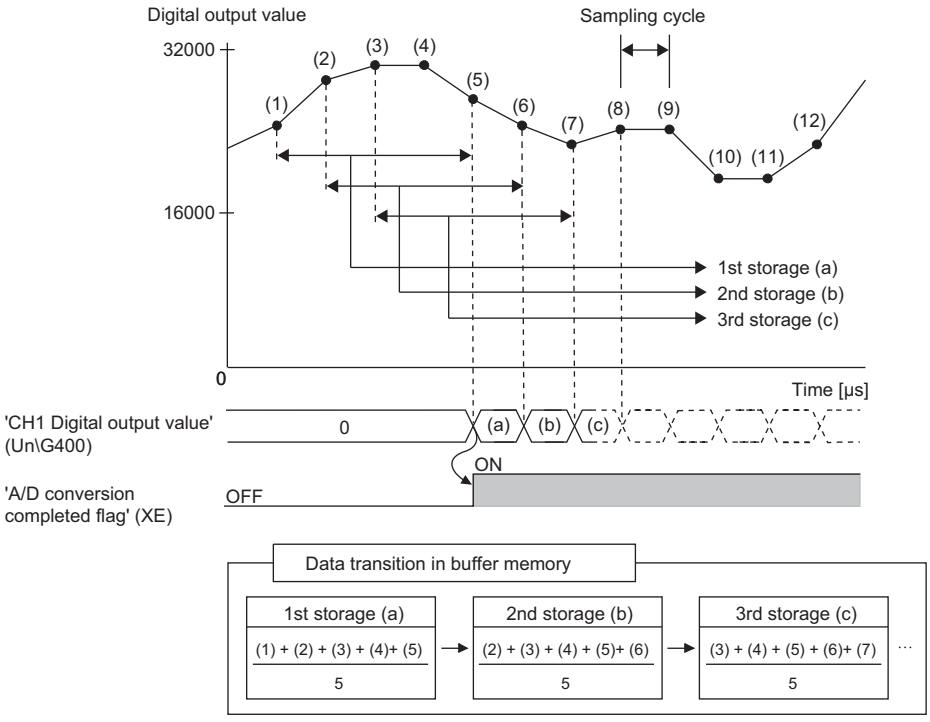
Point

Because the count average requires a sum of at least two counts excluding the maximum and minimum values, the set number of times should be four or more.

■Moving average

The A/D converter module averages digital output values taken at every sampling cycle for a specified number of times, and stores the mean value in the buffer memory area. Since the averaging processing is performed on a moving set of sampling processing, the latest digital output values can be obtained.

The following figure shows the moving average processing of when the set number of times is five.



Primary delay filter

Depending on the set time constant, transient noise of analog input is smoothed and stored in the buffer memory area.
The degree of smoothing changes depending on the setting of a time constant (unit: s).
Time constant is the time taken for the digital output value to reach 63.2% of the steady-state value.
The following shows the relational expressions of time constants and digital output values.
When n = 1[*1]

$Y_n = 0$

When n = 2

$$Y_n = X_{n-1} + \frac{\Delta t}{\Delta t + TA} (X_n - X_{n-1})$$

When $n \geq 3$

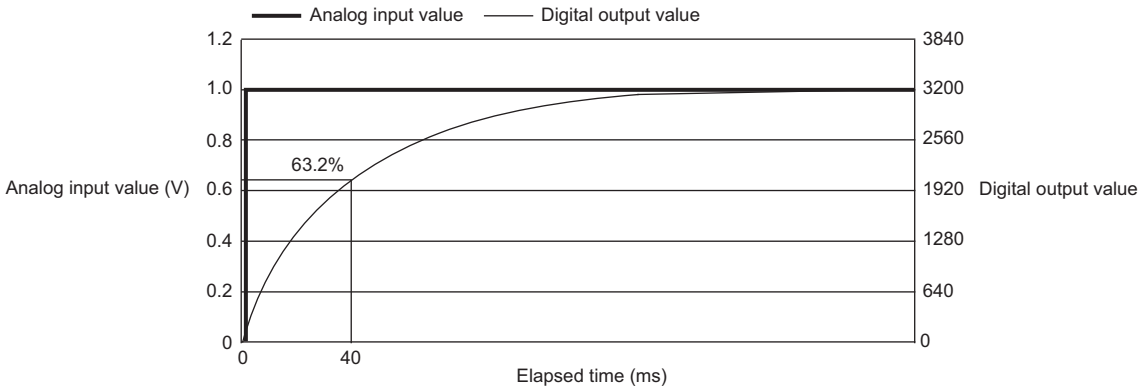
$$Y_n = Y_{n-1} + \frac{\Delta t}{\Delta t + TA} (X_n - Y_{n-1})$$

Y_n : Present digital output value
Y_{n-1} : Last digital output value
n : Number of sampling
X_n : Digital output value before smoothing
X_{n-1} : Last digital output value before smoothing
ΔT : Conversion time
TA : Time constant

*1 A/D conversion completed flag turns on when $n \geq 2$.

Ex.

Digital output value when an analog input value is changed from 0 to 1V
The following figure shows the change of the digital output value with the input range of 0 to 10V and time constant (Conversion cycle × Primary delay filter) of 40ms.
After 40ms from the analog input value becomes 1V, the digital output value reaches 63.2% of the digital output value of when the sampling processing is selected.



Setting procedure

■Sampling processing

Set "Averaging process specification" to "Sampling processing".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting] ⇨ [A/D conversion method]

■Averaging processing and primary delay filter

1. Set "Averaging process specification" to "Time average", "Count average", "Moving average", or "Primary delay filter".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting] ⇨ [A/D conversion method]

2. Set a value for "Time average/Count average/Moving average/Primary delay filter constant setting".

Item	Setting range
Time average	2 to 5000 (ms)*1
Count average	4 to 62500 (times)
Moving average	2 to 1000 (times)
Primary delay filter	1 to 500 (times)

*1 When the number of channels used is seven or eight, set 3ms or longer for the time (for averaging). When a time shorter than 3ms is set for the time (for averaging), the digital output value is 0.

1.5 Scaling Function

This function performs the scale conversion on digital output values. The values are converted within a specified range between a scaling upper limit value and scaling lower limit value.
The converted values are stored in 'CH1 Digital operation value' (Un\G402).

Concept of scaling setting

Ex.
When the input range is set to -10 to 10V:
For the scaling lower limit value, set a value corresponding to the lower limit value of the input range (-32000).
For the scaling upper limit value, set a value corresponding to the upper limit value of the input range (32000).

Calculating the scaling value

The scale conversion is based on the following formula. (In scale conversion, values are rounded to the nearest whole number.)
Current: 0 to 20mA, 4 to 20mA, 4 to 20mA (extended mode)*1, user range setting (current)
Voltage: 0 to 10V, 0 to 5V, 1 to 5V, 1 to 5V (extended mode)*1, user range setting (voltage)

$$D_Y = \frac{D_X \times (S_H - S_L)}{D_{Max}} + S_L$$

Voltage: -10 to 10V

$$D_Y = \frac{D_X \times (S_H - S_L)}{D_{Max} - D_{Min}} + \frac{(S_H + S_L)}{2}$$

D_X : Digital output value
D_Y : Scaling value (Digital operation value)
D_{Max} : Maximum digital output value of the input range in use
D_{Min} : Minimum digital output value of the input range in use
S_H : Scaling upper limit value
S_L : Scaling lower limit value

*1 Although the range of the digital output value in the extended mode is -8000 to 32000, this function performs the scale conversion for digital output values within the range of 0 to 32000.

Setting procedure

1. Set "Scaling enable/disable setting" to "Enable".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting] ⇨ [Scaling setting]

2. Set values for "Scaling upper limit value" and "Scaling lower limit value".

Item	Setting range
Scaling upper limit value	32000
Scaling lower limit value	-32000

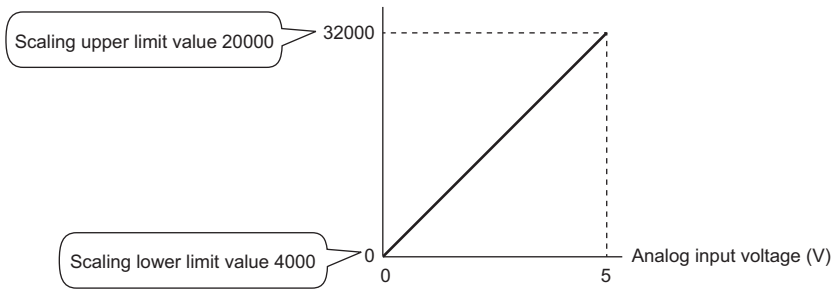
Point

- Even when the scaling upper limit value and the scaling lower limit value are set so that the change is greater than the resolution, the resolution will not increase.
- If the relation between the values is A/D conversion scaling lower limit value > A/D conversion scaling upper limit value, the scale conversion can be performed according to a negative slope.
- Set the scaling with the condition "Scaling upper limit value ≠ Scaling lower limit value".

Setting example

Ex.

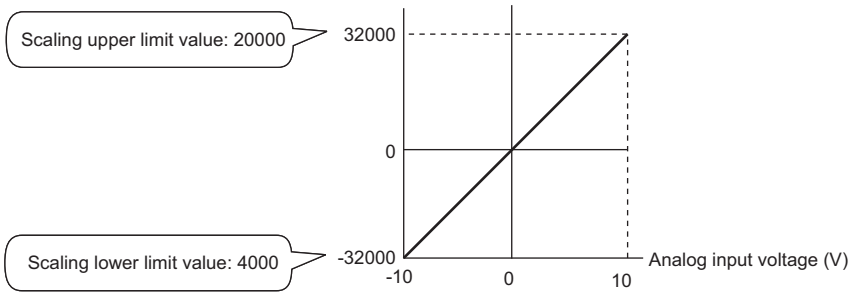
When 20000 is set to the scaling upper limit value and 4000 is set to the scaling lower limit value for the module with the input range of 0 to 5V



Voltage input (V)	Digital output value	Digital operation value (scaling value)
0	0	4000
1	6400	7200
2	12800	10400
3	19200	13600
4	25600	16800
5	32000	20000

Ex.

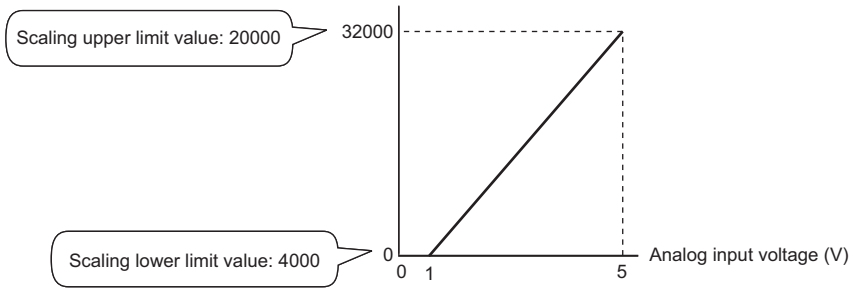
When 20000 is set to the scaling upper limit value and 4000 is set to the scaling lower limit value for the module with the input range of -10 to 10V



Voltage input (V)	Digital output value	Digital operation value (scaling value)
-10	-32000	4000
-5	-16000	8000
0	0	12000
5	16000	16000
10	32000	20000

Ex.

When 20000 is set to the scaling upper limit value and 4000 is set to the scaling lower limit value for the module with the input range of 1 to 5V (extended mode)



Voltage input (V)	Digital output value	Digital operation value (scaling value)
0	-8000	0
1	0	4000
2	8000	8000
3	16000	12000
4	24000	16000
5	32000	20000
5.096	32767	20384

Point

When the scaling function is used with the digital clipping function, the scale conversion is performed on the digital operation values after digital clipping.

1.6 Shift Function

This function adds (shifts) a set conversion value shift amount to a digital output value and stores the result in the buffer memory area. The digital operation value reflects the change in the conversion value shift amount on a realtime basis. Therefore, fine adjustment can be easily performed when the system starts.

Operation

A set conversion value shift amount is added to the digital operation value. The digital operation value with shift addition is stored in 'CH1 Digital operation value' (Un\G402). The conversion value shift amount is added in every sampling cycle for sampling processing and is added in every averaging process cycle for averaging processing. After that, the added values are stored in 'CH1 Digital operation value' (Un\G402). If a value is set to the conversion value shift amount, the conversion value shift amount is added regardless of turning on and off 'Operating condition setting request' (Y9).

Setting procedure

Set a value for "Conversion value shift".

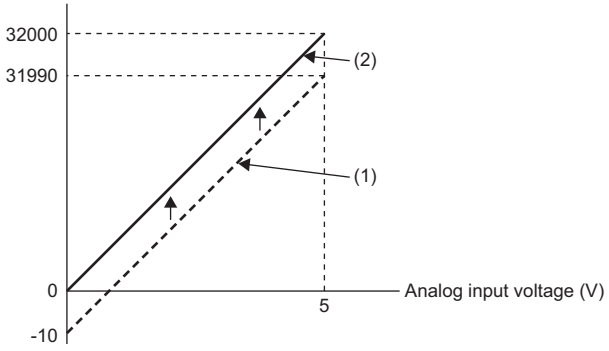
[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting] ⇨ [Conversion value shift]

Item	Setting range
Conversion value shift	-32768 to 32767

Setting example

Ex.

When the I/O characteristics is adjusted in a channel where the input range of 0 to 5V is set by the shift function

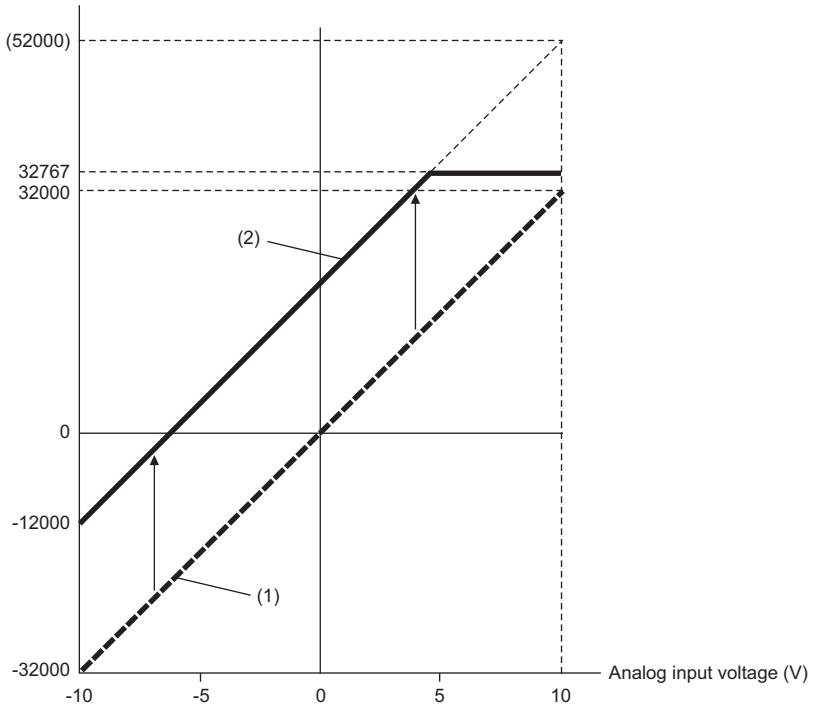


(1) 'CH1 Digital output value' (Un\G400)
+
'CH1 Conversion value shift amount' (Un\G472) "+10"
↓
(2) 'CH1 Digital operation value' (Un\G402)

Voltage input	Digital output value	Digital operation value
0	-10	0
5	31990	32000

Ex.

When the I/O characteristics is adjusted in a channel where the input range of -10 to 10V is set by the shift function



(1) 'CH1 Digital output value' (Un\G400)
+
'CH1 Conversion value shift amount' (Un\G472)
"+20000"
↓
(2) 'CH1 Digital operation value' (Un\G402)

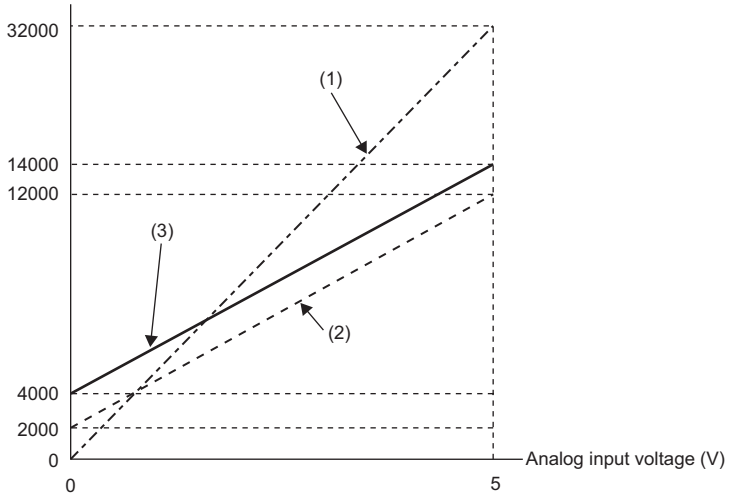
Voltage input	Digital output value	Digital operation value
-10	-32000	-12000
-5	-16000	4000
0	0	20000
5	16000	32767*1
10	32000	32767*1

*1 Because the value exceeds the range of -32768 to 32767, the value is fixed to 32767 (the upper limit value).

Ex.

When the following values are used for the A/D converter module with the input range of 0 to 5V

- CH1 Scaling enable/disable setting: Enable (0)
- CH1 Scaling upper limit value: 12000
- CH1 Scaling lower limit value: 2000
- CH1 Conversion value shift amount: 2000



(1) 'CH1 Digital output value' (Un\G400)
Scaling
0 to 32000
↓
2000 to 12000

(2) Value after scaling
'CH1 Conversion value shift amount' (Un\G472) "+2000"
↓

(3) 'CH1 Digital operation value' (Un\G402)

Voltage input	Digital output value	Value after scaling	Digital operation value
0	0	2000	4000
1	6400	4000	6000
2	12800	6000	8000
3	19200	8000	10000
4	25600	10000	12000
5	32000	12000	14000

Point

When the shift function is used with the digital clipping function and scaling function, shift-and-add is performed on the value obtained after digital clipping and scale conversion. Therefore, the range of the digital operation value is determined as -32768 to 32767.

For a setting example of when the digital clipping function, scaling function, and shift function are used together, refer to the following.

☞ Page 27 Setting example

1.7 Digital Clipping Function

This function fixes the range of the digital operation value with the maximum digital output value and the minimum digital output value when the corresponding current or voltage exceeds the input range.

List of output ranges

The following table lists the output ranges of the digital operation values when the digital clipping function is enabled with each range.

■R60AD4

Input range	Output range of digital operation values	
	Digital clipping function is enabled	Digital clipping function is disabled
4 to 20mA	0 to 32000	-768 to 32767
0 to 20mA		
1 to 5V		
0 to 5V		
0 to 10V		
-10 to 10V	-32000 to 32000	-32768 to 32767
User range setting		
4 to 20mA (extended mode)	-8000 to 32000	-8768 to 32767
1 to 5V (extended mode)		

■R60ADV8

Input range	Output range of digital operation values	
	Digital clipping function is enabled	Digital clipping function is disabled
1 to 5V	0 to 32000	-768 to 32767
0 to 5V		
0 to 10V		
-10 to 10V	-32000 to 32000	-32768 to 32767
User range setting		
1 to 5V (extended mode)	-8000 to 32000	-8768 to 32767

■R60ADI8

Input range	Output range of digital operation values	
	Digital clipping function is enabled	Digital clipping function is disabled
4 to 20mA	0 to 32000	-768 to 32767
0 to 20mA		
User range setting	-32000 to 32000	-32768 to 32767
4 to 20mA (extended mode)	-8000 to 32000	-8768 to 32767

Setting procedure

Set "Digital clipping enable/disable setting" to "Enable".

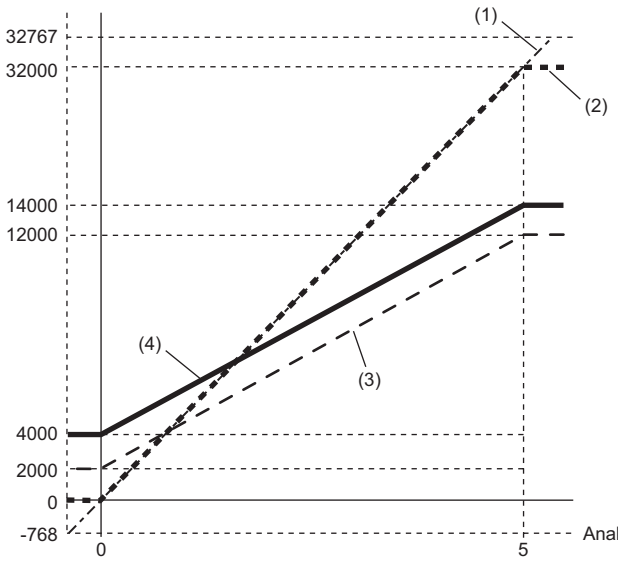
[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting] ⇨ [Digital clipping function]

Setting example

Ex.

When the following values are used for the A/D converter module with the input range of 0 to 5V

- CH1 Scaling enable/disable setting: Enable (0)
- CH1 Scaling upper limit value: 12000
- CH1 Scaling lower limit value: 2000
- CH1 Conversion value shift amount: 2000
- CH1 Digital clipping enable/disable setting: Enable (0)



(1) 'CH1 Digital output value' (Un\G400)
Digital clipping
-768 to 32767
↓
0 to 32000

(2) Value after digital clipping
Scaling
0 to 32000
↓
2000 to 12000

(3) Value after scaling
'CH1 Conversion value shift amount' (Un\G472) "+2000"
↓
4000 to 14000

(4) 'CH1 Digital operation value' (Un\G402)

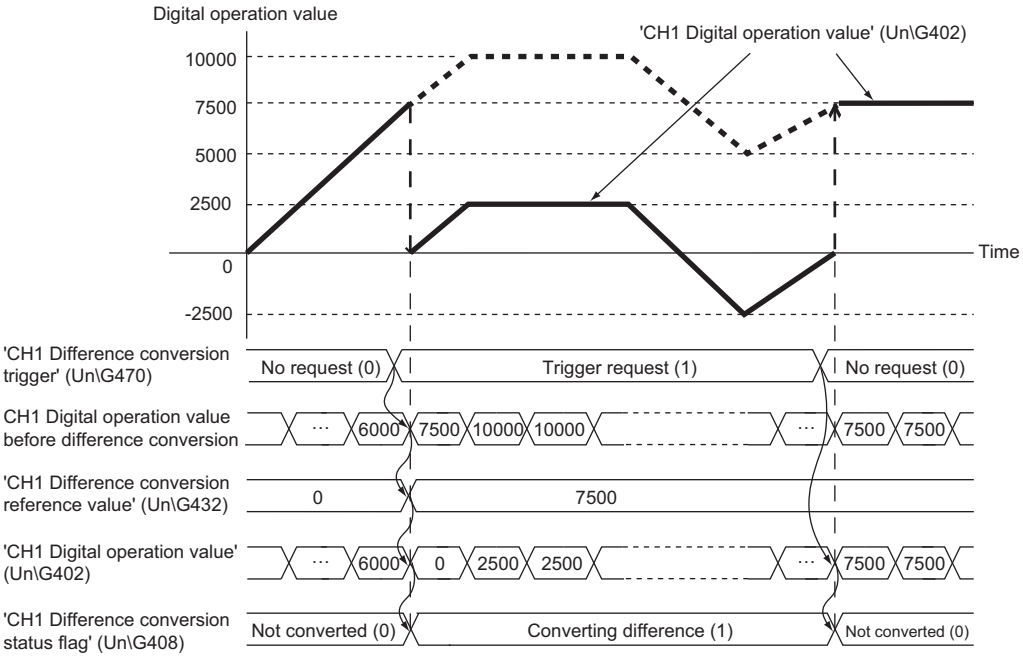
Input voltage (V)	Digital output value	Digital operation value
-0.12	-768	4000
0	0	4000
1	6400	6000
2	12800	8000
3	19200	10000
4	25600	12000
5	32000	14000
5.096	32767	14000

Point

When the digital clipping function is used with the scaling function, shift function, and difference conversion function, scale conversion, shift-and-add, and difference conversion are performed on the value obtained after digital clipping.

1.8 Difference Conversion Function

The digital operation value at the start of this function is treated as 0 (reference value). Thereafter, values that increased or decreased from the reference value are stored in the buffer memory.



Operation

The digital operation value at the start of the difference conversion (the data stored inside the A/D converter module before the difference conversion starts) is determined as a difference conversion reference value. The value acquired by subtracting the difference conversion reference value from the digital operation value is stored in 'CH1 Digital operation value' (Un\G402). At the start of this function, the digital operation value is 0 (because the digital operation value and the difference conversion reference value have the same value at the start).

- Digital operation value after difference conversion = Digital operation value - Difference conversion reference value

■Starting the difference conversion

1. Change 'CH1 Difference conversion trigger' (Un\G470) from No request (0) to Trigger request (1).

The rise of No request (0) → Trigger request (1) is detected as a trigger. When the trigger is detected, the digital operation value at the start is output to the difference conversion reference value. The value acquired by subtracting the difference conversion reference value from the digital operation value is stored in 'CH1 Digital operation value' (Un\G402). After the value is stored, 'CH1 Difference conversion status flag' (Un\G408) turns to Converting difference (1).

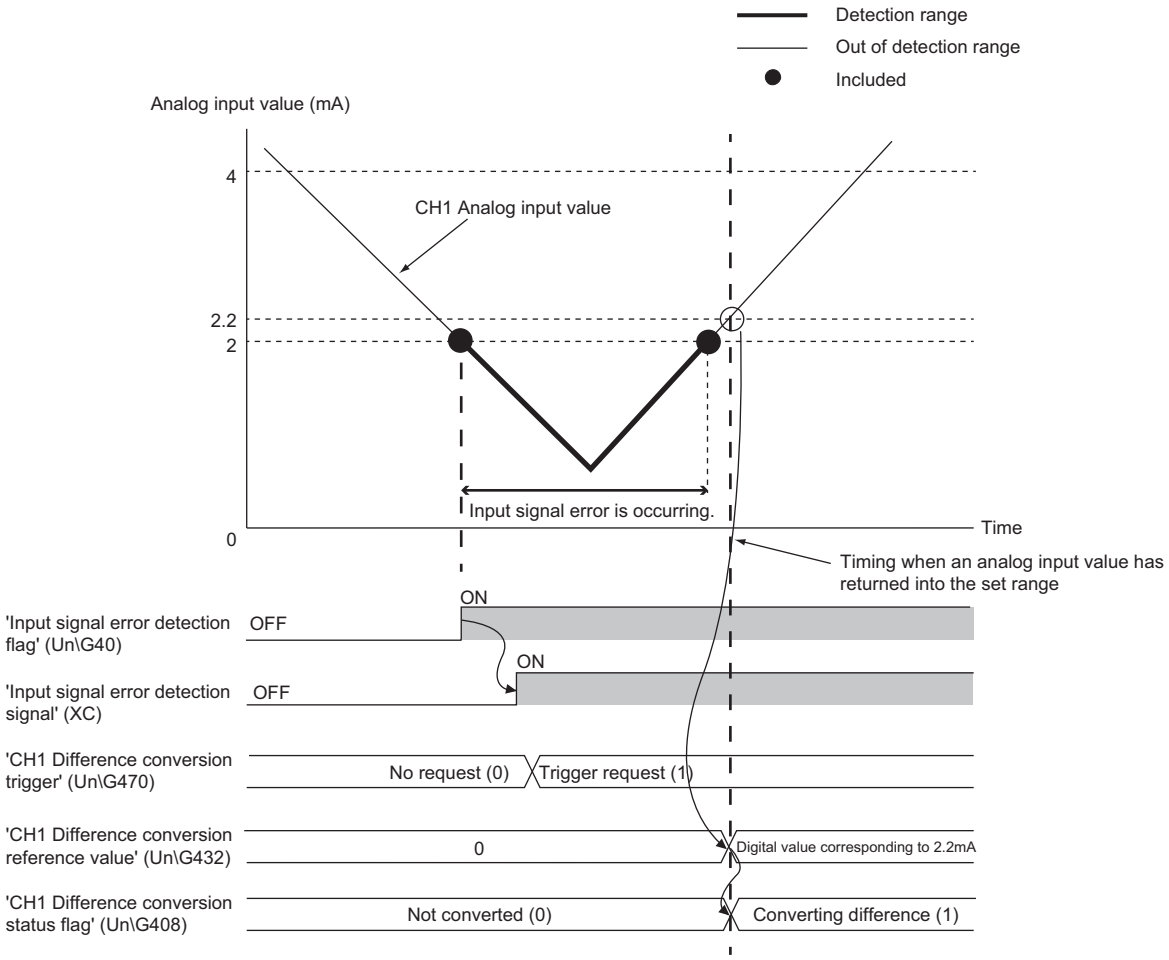
■Stopping the difference conversion

1. Change 'CH1 Difference conversion trigger' (Un\G470) from Trigger request (1) to No request (0).

The fall of Trigger request (1)→ No request (0) is detected as a trigger. When the trigger is detected, the difference conversion stops, and 'CH1 Difference conversion status flag' (Un\G408) turns to Not converted (0). Thereafter, the digital operation value is stored as it is in 'CH1 Digital operation value' (Un\G402).

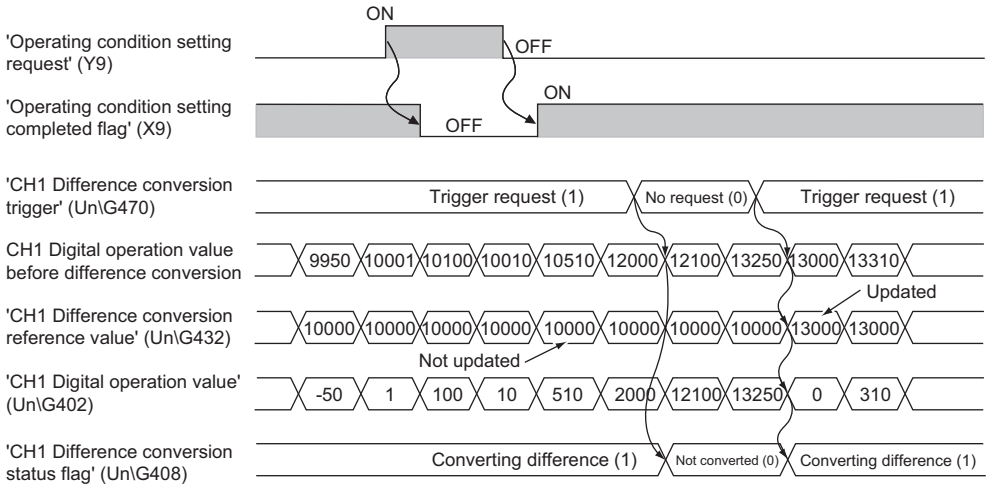
■Operations of when an input signal error occurs

When an input signal error occurs, even if 'CH1 Difference conversion trigger' (Un\G470) changes from No request (0) to Trigger request (1), the difference conversion does not start. After the input signal error returns to the normal value, change 'CH1 Difference conversion trigger' (Un\G470) from No request (0) to Trigger request (1) again. If an input signal error occurs in the status of Trigger request (1), the difference conversion starts at the timing when the input signal error returns to the normal value, treating the digital operation value as the difference conversion reference value.



■Operations of when Operating condition setting request (Y9) is turned on and off

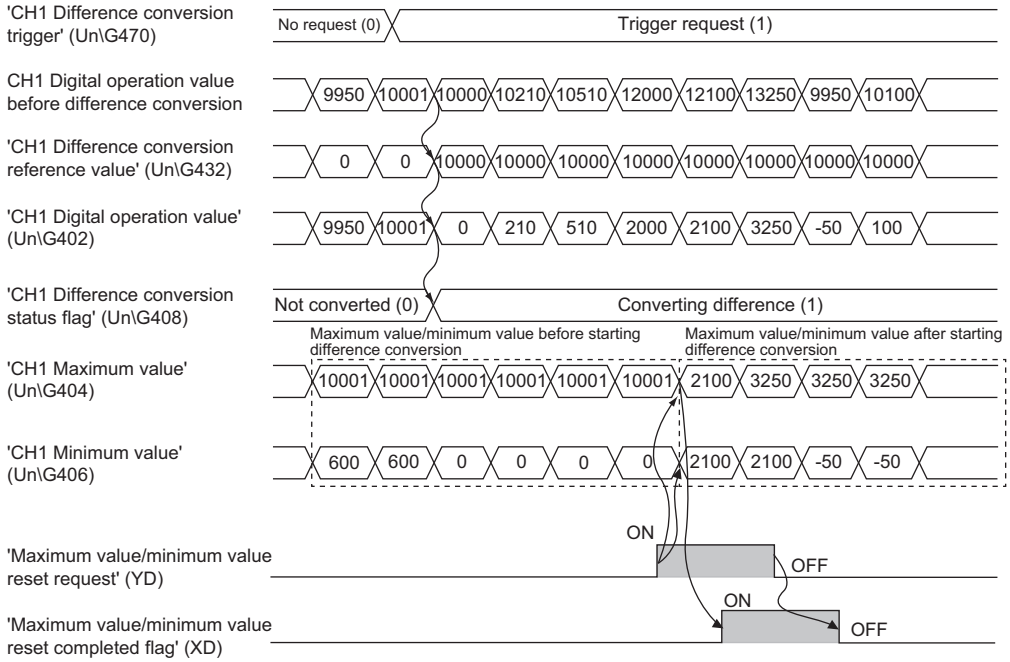
- During the difference conversion, even when Operating condition setting request (Y9) is turned on and off, the difference conversion continues without updating the difference conversion reference value. To updating the difference conversion reference value, restart the difference conversion by changing CH1 Difference conversion trigger (Un\G470) from Trigger request (1) to No request (0), and Trigger request (1) again.
- CH1 Difference conversion trigger (Un\G470) does not become valid even when the trigger changes from No request (0) to Trigger request (1) when Operating condition setting request (Y9) is turned off and on. After turning on and off Operating condition setting request (Y9), change CH1 Difference conversion trigger (Un\G470) from No request (0) to Trigger request (1) again.



■Operations of CH1 Maximum value (Un\G404) and CH1 Minimum value (Un\G406)

When the difference conversion starts, the maximum value and the minimum value of the values acquired by the difference conversion are stored in 'CH1 Maximum value' (Un\G404) and 'CH1 Minimum value' (Un\G406). By turning on 'Maximum value/minimum value reset request' (YD), the maximum value and the minimum value after the start of the difference conversion can be checked.

When 'Maximum value/minimum value reset request' (YD) is not turned on, the maximum values and minimum values before and after difference conversion are mixed.



■Operation of when the averaging processing is set

If the difference conversion starts after the averaging processing is set, the digital operation value at the completion of the averaging processing is determined as 'CH1 Difference conversion reference value' (Un\G432). 'CH1 Difference conversion status flag' (Un\G408) turns to Converting difference (1).

Point

- The difference conversion function can be started at any timing.
- When the difference conversion function is used with the digital clipping function, scaling function, and shift function, each digital operation value is determined as a difference conversion reference value and used for the difference conversion.
- Even though the digital clipping function, scaling function, and shift function are enabled during the difference conversion, the value in 'CH1 Difference conversion reference value' (Un\G432) is not updated. To update the value in 'CH1 Difference conversion reference value' (Un\G432), stop the difference conversion and restart it again.

1.9 Maximum Value/Minimum Value Hold Function

This function stores the maximum and minimum values of digital operation values for each channel to the buffer memory area. Time average and count average are processed on the averaging process cycle. The values of the sampling processing, moving average, and primary delay filter are updated on the sampling cycle.

Resetting the maximum value and the minimum value

Turn on and off 'Maximum value/minimum value reset request' (YD) or 'Operating condition setting request' (Y9) to update the maximum value and minimum value with the current value.
Turning on and off 'Maximum value/minimum value reset request' (YD) turns on 'Maximum value/minimum value reset completed flag' (XD).

Values to be the maximum value and the minimum value

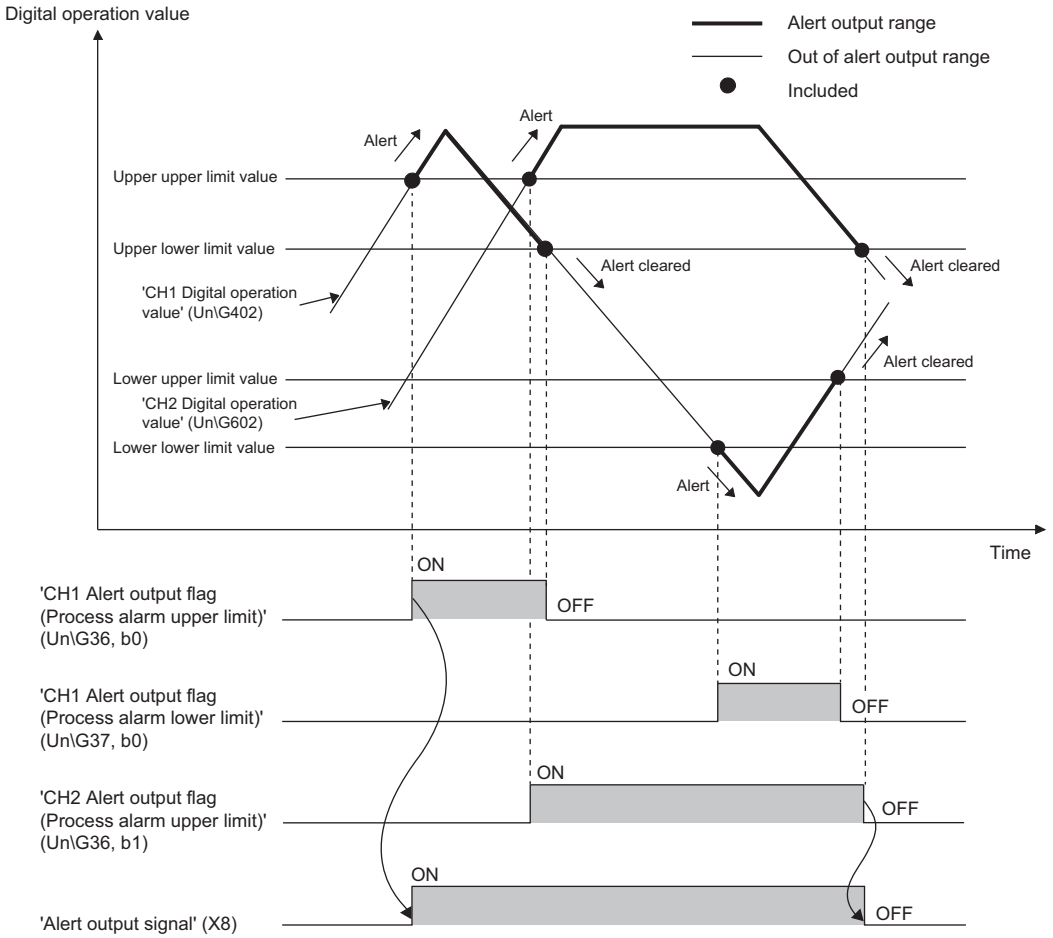
The maximum and minimum values of digital operation values are stored in the buffer memory.
When the digital clipping function, scaling function, shift function, or difference conversion function is used, the maximum value and minimum value of each function are stored.

1.10 Alert Output Function

This section describes process alarms and rate alarms used for the alert output function.

Process alarm

This function outputs an alert when a digital operation value enters the preset alert output range.



Operation

■Operation performed when an alert is output

When a digital operation value is equal to or greater than the process alarm upper upper limit value, or the value is equal to or smaller than the process alarm lower lower limit value and the value enters the alarm output range, an alert is output as follows.

- Alarm ON (1) is stored in 'Alert output flag (Process alarm upper limit)' (Un\G36) or 'Alert output flag (Process alarm lower limit)' (Un\G37).
- 'Alert output signal' (X8) turns on.
- The ALM LED turns on.

In addition, an alarm code is stored in 'Latest alarm code' (Un\G2).

For details on the alarm codes, refer to the following.

☞ Page 95 List of Alarm Codes

Point

The A/D conversion on a channel where an alert was output continues.

■Operation after an alert was output

After an alert was output, if the digital operation value does not satisfy the alert output condition due to being smaller than the process alarm upper lower limit value or being greater than the process alarm lower upper limit value, Normal (0) is stored in a bit position corresponding to the channel number of 'Alert output flag (Process alarm upper limit)' (Un\G36) or 'Alert output flag (Process alarm lower limit)' (Un\G37).

In addition, when all the bits of 'Alert output flag (Process alarm upper limit)' (Un\G36) and 'Alert output flag (Process alarm lower limit)' (Un\G37) return to Normal (0), 'Alert output signal' (X8) turns off and the ALM LED turns off. However, the alarm code stored in 'Latest alarm code' (Un\G2) is not cleared. To clear the alarm code, turn on and off 'Error clear request (YF)' after all the bits of 'Alert output flag (Process alarm upper limit)' (Un\G36) and 'Alert output flag (Process alarm lower limit)' (Un\G37) return to Normal (0).

Detection cycle

When time average is specified, the function works at every interval of the time (for averaging). When count average is specified, the function works at every count (for averaging).

When the sampling processing, moving average, and primary delay filter is specified, this function works at every sampling cycle.

Detection target for outputting an alert

When the digital clipping function, scaling function, shift function, or difference conversion function is used, the digital operation value to which digital clipping, scale conversion, shift-and-add, or difference conversion is performed is the detection target for outputting an alert. Set values for CH1 Process alarm upper upper limit value (Un\G514), CH1 Process alarm upper lower limit value (Un\G516), CH1 Process alarm lower upper limit value (Un\G518), and CH1 Process alarm lower lower limit value (Un\G520) while considering the digital clipping, scale conversion, shift-and-add, and difference conversion.

Setting procedure

1. Set "Alert output setting (Process alarm)" to "Enable".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting] ⇨ [Alert output function (Process alarm)]

2. Set values for "Process alarm upper upper limit value", "Process alarm upper lower limit value", "Process alarm lower upper limit value", and "Process alarm lower lower limit value".

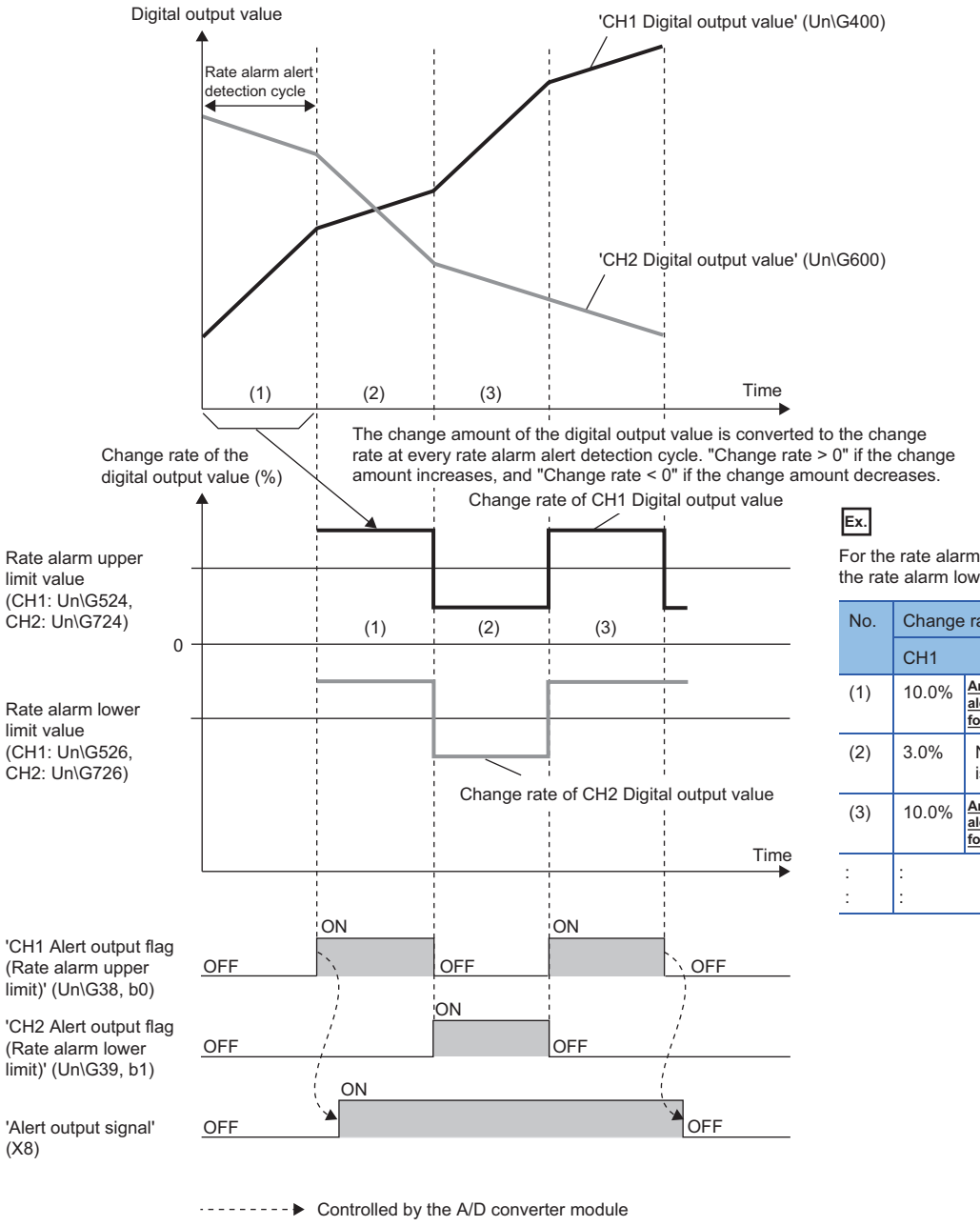
Item	Setting range
Process alarm upper upper limit value	-32768 to 32767
Process alarm upper lower limit value	
Process alarm lower upper limit value	
Process alarm lower lower limit value	

Point

Set values within the range satisfying the condition "Process alarm upper upper limit value ≥ Process alarm upper lower limit value ≥ Process alarm lower upper limit value ≥ Process alarm lower lower limit value". If a value out of the range is set, a process alarm upper lower limit value setting range error (error code: 1B△□H) occurs.

Rate alarm

This function outputs an alert when the change rate of a digital output value is equal to or more than the rate alarm upper limit value, or the rate is equal to or less than the rate alarm lower limit value.



Ex.

For the rate alarm upper limit value: 5.0%, and the rate alarm lower limit value: -5.0%

No.	Change rate of the digital output value			
	CH1		CH2	
(1)	10.0%	**An upper limit alert issued for CH1**	-3.0%	No alert issued
(2)	3.0%	No alert issued	-10.0%	**A lower limit alert issued for CH2**
(3)	10.0%	**An upper limit alert issued for CH1**	-3.0%	No alert issued
:	:		:	
:	:		:	

Operation

■Operation performed when an alert is output

Digital output values are monitored on the rate alarm alert detection cycle. When a change rate of a digital output value (from a previous value) is equal to or more than the rate alarm upper limit value, or the rate is equal to or less than the rate alarm lower limit value, an alert is output as follows.

- Alarm ON (1) is stored in 'Alert output flag (Rate alarm upper limit)' (Un\G38) or 'Alert output flag (Rate alarm lower limit)' (Un\G39).
- 'Alert output signal' (X8) turns on.
- The ALM LED turns on.

In addition, an alarm code is stored in 'Latest alarm code' (Un\G2).

For details on the alarm codes, refer to the following.

☞ Page 95 List of Alarm Codes

Point

The A/D conversion on a channel where an alert was output continues.

■Operation after an alert was output

After an alert was output, if the change rate of a digital output value does not satisfy the alert output conditions due to being smaller than the rate alarm upper limit value or being greater than the rate alarm lower limit value, Normal (0) is stored in a bit position corresponding to the channel number of 'Alert output flag (Rate alarm upper limit)' (Un\G38) or 'Alert output flag (Rate alarm lower limit)' (Un\G39).

In addition, when all 'Alert output flag (Rate alarm upper limit)' (Un\G38) and 'Alert output flag (Rate alarm lower limit)' (Un\G39) return to Normal (0), 'Alert output signal' (X8) turns off and the ALM LED turns off. However, the alarm code stored in 'Latest alarm code' (Un\G2) is not cleared. To clear the alarm code, turn on and off 'Error clear request (YF)' after all the bits of 'Alert output flag (Rate alarm upper limit)' (Un\G38) and 'Alert output flag (Rate alarm lower limit)' (Un\G39) return to Normal (0).

Detection cycle

Set the rate alarm alert detection cycle in 'CH1 Rate alarm alert detection cycle setting' (Un\G522).

The rate alarm alert detection cycle is the value calculated by multiplying the set value by the conversion cycle.

Ex.

The rate alarm alert detection cycle under the following conditions

- A/D conversion-enabled channels: CH1 to CH3
- 'CH1 Rate alarm alert detection cycle setting' (Un\G522): 5 (times)

The rate alarm detection cycle is 1200μs (80μs × 3 (CH) × 5 (times)).

Digital output values are compared in 1200μs intervals to check the change rate.

Judgment of rate alarm

A change rate is judged with 'CH1 Rate alarm upper limit value' (Un\G524) and 'CH1 Rate alarm lower limit value' (Un\G526) converted to digital values per rate alarm alert detection cycle.

The following shows the conversion formula of judgment values used for the rate alarm detection.

$$\text{Value used for judgement at each Rate alarm alert detection cycle [digit]} = \left(\frac{R_H \text{ or } R_L}{1000} \right) \times D_{Max}$$

Item	Description
R_H	Rate alarm upper limit value (Unit: 0.1%)
R_L	Rate alarm lower limit value (Unit: 0.1%)
D_{Max}	Maximum digital output value of the input range: 32000

Point

Values after the decimal point are omitted.

Ex.

The judgment value under the following conditions

- A/D conversion-enabled channel: CH1
- CH1 Averaging process specification: Sampling processing (0)
- CH1 Rate alarm alert detection cycle setting: 5 (times)
- CH1 Rate alarm upper limit value: 250 (25.0%)
- CH1 Rate alarm lower limit value: 50 (5.0%)

250 × 0.001 × 32000 = 8000 (digits)

50 × 0.001 × 32000 = 1600 (digits)

The present value is compared to the previous value in a rate alarm alert detection cycle of 400μs (conversion cycle 80μs × 5). A digital value is judged if it increases 8000 digits (25.0%) or more, or if the increase is 1600 digits (5.0%) or less from the previous value (when the maximum digital output value is 32000).

Use the following formula to calculate a change rate to be set based on the change amount of voltage and current to detect an alert.

$$\text{Change rate to be set (0.1\%)} = \left(\frac{\text{Change amount of the voltage (current) to detect an alert (V(mA))}}{\text{Gain voltage (current) (V(mA))} - \text{Offset voltage (current) (V(mA))}} \times 1000 \right)^{*1}$$

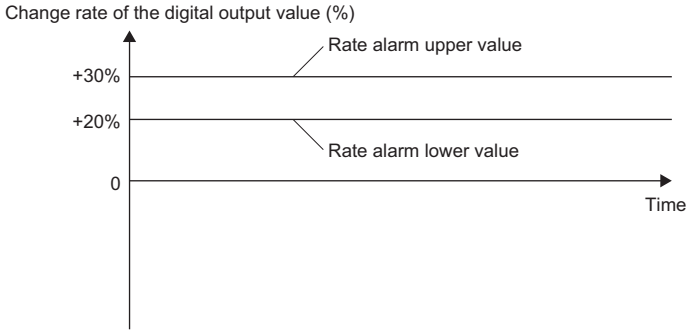
*1 Values after the decimal point are omitted.

Application examples of rate alarms

A rate alarm serves to monitor that the variation rate of a digital output value lies in a limited range as shown below:

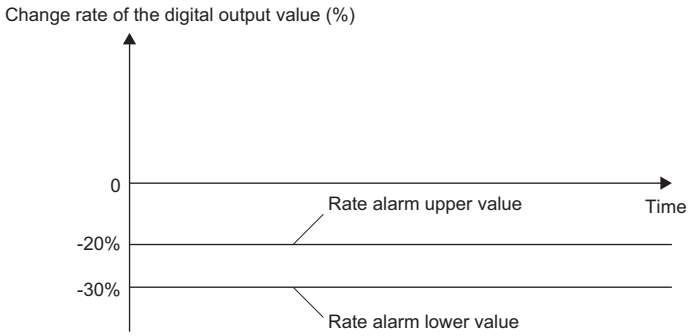
Ex.

To monitor that a rising rate of a digital output value is within the specified range



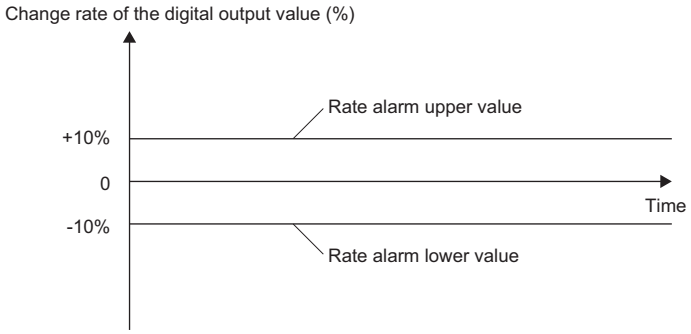
Ex.

To monitor that a drop rate of a digital output value is within the specified range



Ex.

To monitor that a change rate of a digital output value is within the specified range



Setting procedure

1. Set "Alert output setting (Rate alarm)" to "Enable".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting] ⇨ [Alert output function (Rate alarm)]

2. Set an alert detection cycle of rate alarms.

Set the cycle in "Rate alarm alert detection cycle setting".

Item	Setting range
Rate alarm alert detection cycle setting	1 to 32000 (times)

Point

In the channel where a value out of the range is set, a rate alarm alert detection cycle setting range error (error code: 1B9☐H) occurs.

3. Set values for "Rate alarm upper limit value" and "Rate alarm lower limit value".

Set a value for the maximum value (32000) of the digital output value in increments of 0.1%.

Item	Setting range
Rate alarm upper limit value	-3276.8 to 3276.7 (%)
Rate alarm lower limit value	

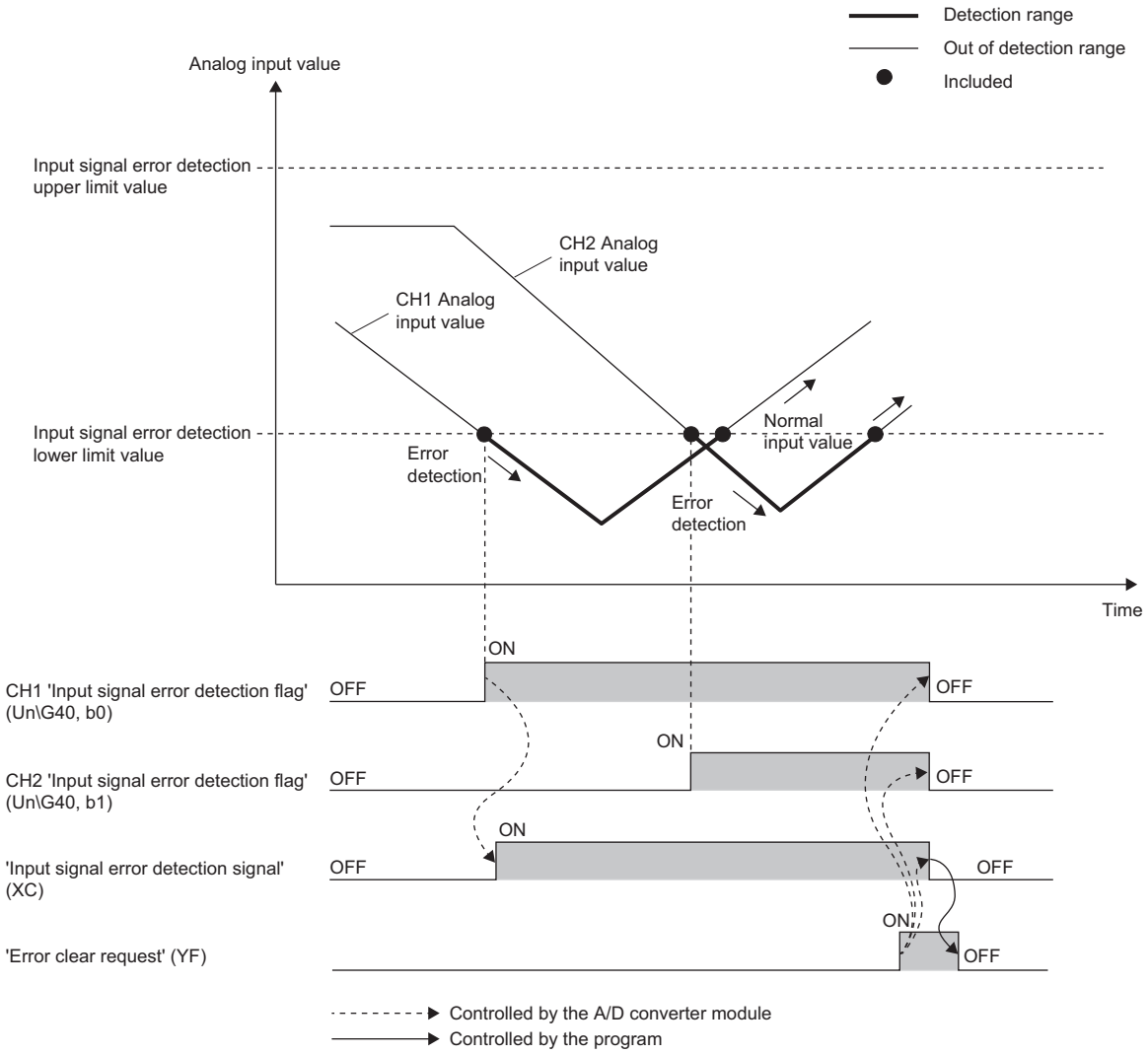
Point

Set values within the range satisfying the condition "Rate alarm upper limit value > Rate alarm lower limit value".

If a value out of the range is set, a rate alarm upper/lower limit setting value inversion error (error code: 1BA☐H) occurs.

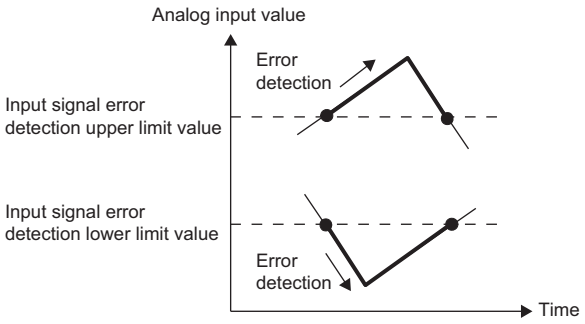
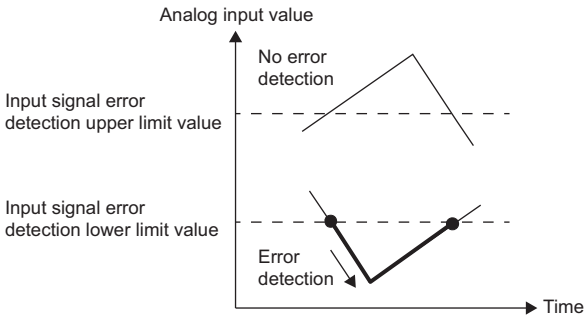
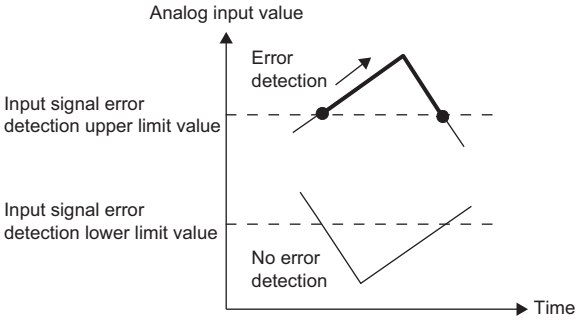
1.11 Input Signal Error Detection Function

This function detects an analog input value that is equal to or greater/smaller than the setting range.



Detection method

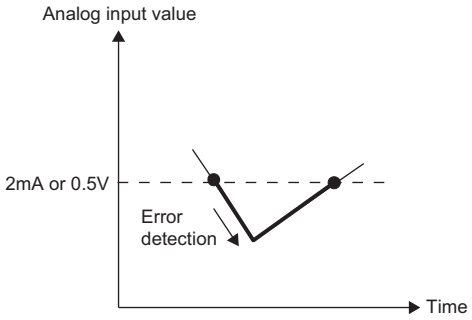
One of the following detection methods can be selected.

Detection method	Detection condition	
0: Disable	Input signal errors are not detected.	—
1: Upper and lower limit detection	An input signal error is detected when the analog input value is equal to or greater than the input signal error detection upper limit value, or when the analog input value is equal to or smaller than the input signal error detection lower limit value.	
2: Lower limit detection	An input signal error is detected when the analog input value is equal to or smaller than the input signal error detection lower limit value.	
3: Upper limit detection	An input signal error is detected when the analog input value is equal to or greater than the input signal error detection upper limit value.	
4: Simple disconnection detection	Simple disconnection detection is performed. For details, refer to the following. ☞ Page 42 Simple disconnection detection	

■Simple disconnection detection

By combining this function with the extended mode in the input range setting, simple disconnection detection is enabled.
When an analog input value satisfies either of the following conditions, a disconnection occurs and 'Input signal error detection flag' (Un\G40) turns on.

Input range	Disconnection detection signal
4 to 20mA (extended mode)	Analog input value ≤ 2mA
1 to 5V (extended mode)	Analog input value ≤ 0.5V



The setting for 'CH1 Input signal error detection setting value' (Un\G529) is ignored.

Notification

When an input signal error is detected, an error is notified as follows.

- Input signal error (1) is stored in 'Input signal error detection flag' (Un\G40).
- 'Input signal error detection signal' (XC) turns on.
- The ALM LED flashes.

In addition, an alarm code is stored in 'Latest alarm code' (Un\G2). Alarm codes are stored whenever the analog input satisfies the condition for the input signal error detection.
For details on the alarm codes, refer to the following.
☞ Page 95 List of Alarm Codes

Operation

On the channel where an error is detected, the last digital output value and digital operation value just before the error was detected are stored.
When the analog input does not satisfy the condition of the input signal error detection, the A/D conversion resumes regardless of the reset on 'Input signal error detection flag' (Un\G40) and 'Input signal error detection signal' (XC). (The ALM LED remains flashing.)

Point

- When an input signal error occurs, the digital output value and digital operation value are not updated.
- The A/D conversion continues on the channel where no Input signal error is detected.
- Whether an input signal error occurred is judged with the value when the first A/D conversion is completed. Thus, A/D conversion completed flag turns on even when an input signal error is detected.

Detection cycle

This function works at every sampling cycle.

Clearing input signal errors

After the analog input value returns within the set range, turn on and off 'Error clear request' (YF).
The A/D converter module arranges the following status when an input signal error is cleared.

- 'Input signal error detection flag' (Un\G40) is cleared.
- 'Input signal error detection signal' (XC) turns off.
- The ALM LED turns off.
- 'Latest alarm code' (Un\G2) is cleared.

How to set an input signal error detection setting value

Set the input signal error detection upper limit value and input signal error detection lower limit value by 1 (0.1%) based on the input signal error detection setting value.
Both the input signal error detection upper limit value and the input signal error detection lower limit value reflect the input signal error detection setting value.

■Input signal error detection upper limit value

This value is calculated by adding "Analog input range width (Gain value - Offset value) × Input signal error detection setting value (%)" to the gain value. Only a value which is equal to or greater than the gain value can be set.
To calculate the input signal error detection setting value based on the input signal error detection upper limit value, use the following formula.

$$\text{Input signal error detection setting value} = \frac{\text{Input signal error detection upper limit value - Gain value of each range}}{\text{Gain value of each range - Offset value of each range}} \times 1000$$

■Input signal error detection lower limit value

This value is calculated by subtracting "Analog input range width (Gain value - Offset value) × Input signal error detection setting value" from the lower limit value of each range. Only the value which is equal to or smaller than the lower limit value of the range can be set.
To calculate the input signal error detection setting value based on the input signal error detection lower limit value, use the following formula.

$$\text{Input signal error detection setting value} = \frac{\text{Lower limit value of each range - Input signal error detection lower limit value}}{\text{Gain value of each range - Offset value of each range}} \times 1000$$

The following table lists the lower limit value, offset value, and gain value for each range.

Input range		Lower limit value	Offset value	Gain value
Voltage	0 to 10V	0V		10V
	0 to 5V	0V		5V
	1 to 5V	1V		5V
	1 to 5V (extended mode)	1V		5V
	-10 to 10V	-10V	0V	10V
	User range setting	Analog input value equivalent to the digital output value of -32000	Analog input value set as an offset value	Analog input value set as a gain value
Current	0 to 20mA	0mA		20mA
	4 to 20mA	4mA		20mA
	4 to 20mA (extended mode)	4mA		20mA
	User range setting	Analog input value equivalent to the digital output value of -32000	Analog input value set as an offset value	Analog input value set as a gain value

Setting procedure

1. Select a detection method in "Input signal error detection setting".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting] ⇨ [Input signal error detection function]

2. Set a value for "Input signal error detection setting value".

Item	Setting range
Input signal error detection setting value	0.0 to 25.0 (%)

Point

In the channel where a value out of the range is set, an input signal error detection setting value range error (error code: 1C1□H) occurs.

■Setting example of the input signal error detection

To detect an error on a channel where the analog input range of 4 to 20mA is set when the analog input value is 2.4mA or lower, make the following substitutions in the formula based on the input signal error lower limit value.

- Input signal error detection lower limit value: 2.4mA
- Offset value: 4.0mA
- Gain value: 20.0mA

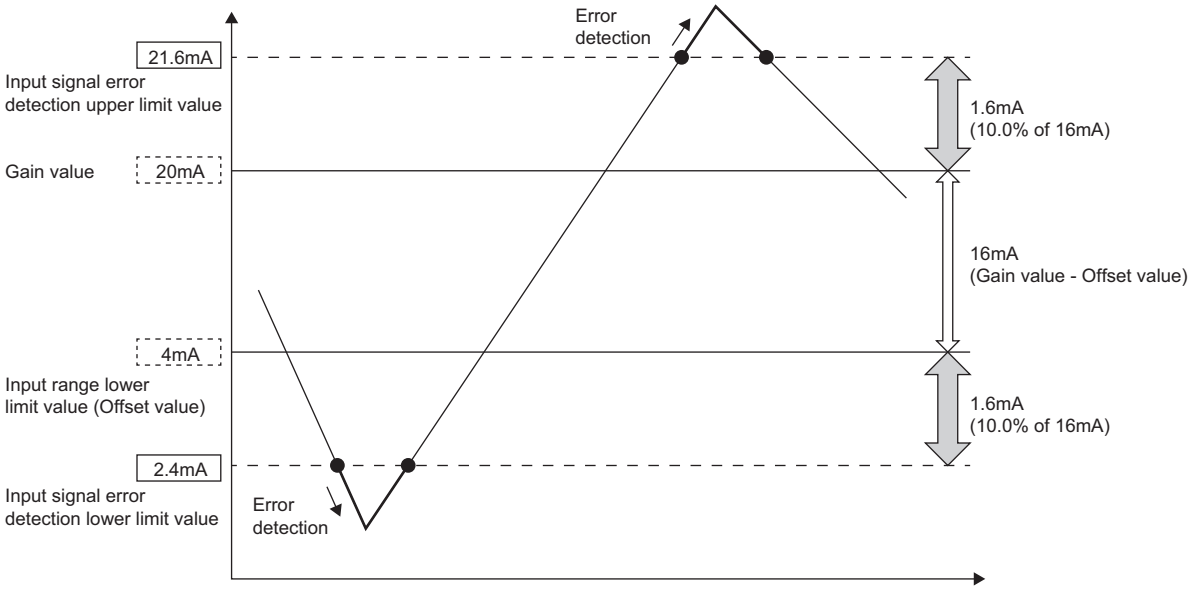
$$\text{Input signal error detection setting value} = \frac{4.0 - 2.4}{20.0 - 4.0} \times 1000$$

$$= 100\ (10.0\%)$$

Thus, set 'CH1 Input signal error detection setting value' (Un\G529) to 100 (10.0%).

When CH1 Input signal error detection setting (Un\G528) is set to Upper and lower limit detection (1), the input signal error detection setting value works as shown below.

Since the setting value is 100 (10.0%), an error is detected not only at 2.4mA (lower limit) but also at 21.6mA (upper limit).



1.12 Logging Function

This function stores 10000 points of digital output values or digital operation values per channel in the buffer memory area. In addition, the data collection can be stopped by using the status change of the data as a trigger. This function also helps the error analysis since the data before and after the occurrence of an error is held.
Using function blocks (FBs) enables saving the data stored in the buffer memory as a CSV file.

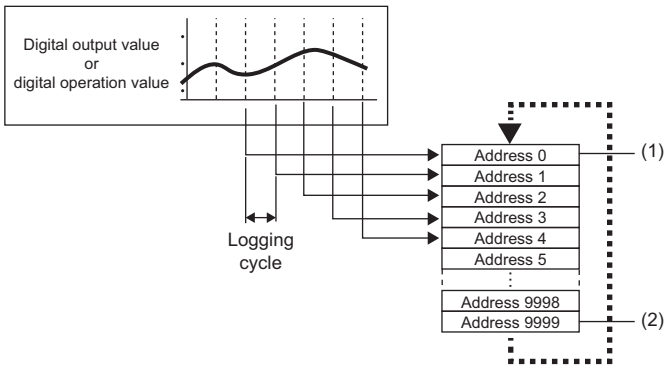
Logging function

■Collecting logging data

Logging data is collected as follows.

- 10000 points of the latest digital output values or digital operation values can be always collected for each channel.
- The data can be collected at intervals of 80μs at a minimum and of 3600s at a maximum.

An address where the latest/oldest data is stored can be checked with the latest/head pointer.



(1) Head pointer
The address of the oldest data in logging data can be checked.

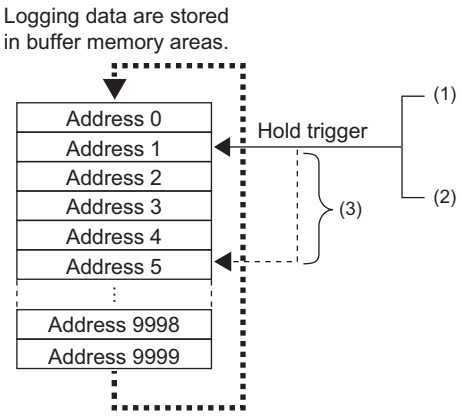
(2) Latest pointer
The address of the latest data in logging data can be checked.

Logging data are stored in the buffer memory area. When the number of stored data points is 10001 or greater, data is sequentially overwritten from address 0 with new data.

■Stopping the logging operation

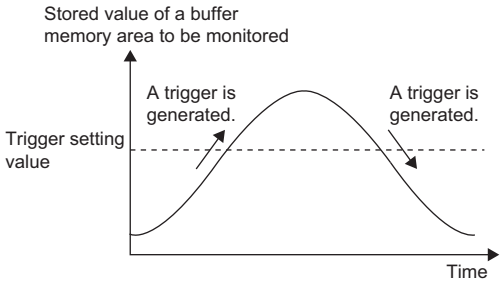
The logging data is refreshed at high speed during logging. Stop logging when the logging data needs to be referred without paying attention to the refreshing cycle.
Logging can be stopped by the hold trigger.

- A hold trigger allows two options: Logging hold request or Level trigger.
- The number of data points to be collected after a hold trigger occurs can be set.



(1) Logging hold request
A hold trigger is generated from a program at any timing.

(2) Level trigger
A hold trigger is generated when a stored value in a buffer memory area is monitored and the set condition is satisfied as follows.
Example: When the stored value exceeds or falls below the set value, a hold trigger is generated.



(3) Post-trigger logging points
When the set points of data is collected after a hold trigger is generated, the logging operation is stopped.

■Saving logging data into a CSV file

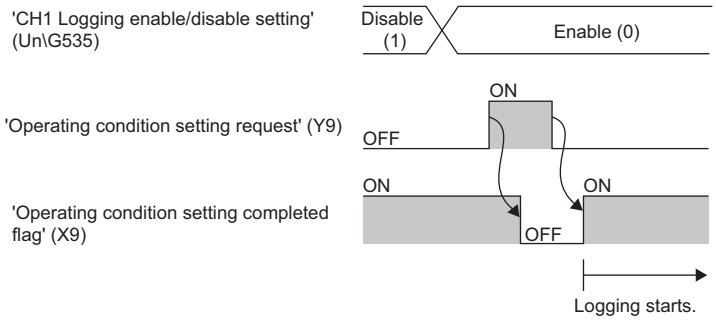
The data in CH1 Logging data (Un\G10000 to Un\G19999) disappears when the module is powered off. However, the data can be saved in a CSV file by using function blocks (FBs).

Operation of logging

■Starting logging data collection

Logging data collection starts when 'CH1 Logging enable/disable setting' (Un\G535) is set to Enable (0) and 'Operating condition setting request' (Y9) is turned on and off.

The data in 'CH1 Digital output value' (Un\G400) or 'CH1 Digital operation value' (Un\G402) is stored in CH1 Logging data (Un\G10000 to Un\G19999) on the set logging cycle.



■Logging data

Logging data are stored in the following buffer memory areas.

When the number of stored data points is 10001 or greater, the data is overwritten with new data from the head of the storage area of the corresponding channel.

Channel	Storage area for logging data
CH1	Un\G10000 to Un\G19999
CH2	Un\G20000 to Un\G29999
CH3	Un\G30000 to Un\G39999
CH4	Un\G40000 to Un\G49999
CH5*1	Un\G50000 to Un\G59999
CH6*1	Un\G60000 to Un\G69999
CH7*1	Un\G70000 to Un\G79999
CH8*1	Un\G80000 to Un\G89999

*1 Only R60ADV8 and R60ADI8 use this channel.

If logging has been performed even once, all the logging data above are cleared to 0 at the timing when 'Operating condition setting request' (Y9) is turned off and on.

Logging data setting

Select a data type to be collected with 'CH1 Logging data setting' (Un\G536).

- Digital output value (0)
- Digital operation value (1)

Logging cycle

■Logging cycle setting

Set the logging cycle with 'CH1 Logging cycle setting value' (Un\G537) and 'CH1 Logging cycle unit setting' (Un\G538).
The following table lists the setting range for each cycle.

Setting value of CH1 Logging cycle unit setting	Setting range of CH1 Logging cycle setting value
μs (0)	80 to 32767
ms (1)	1 to 32767
s (2)	1 to 3600

The logging cycle must be an integral multiple of the conversion cycle. Even if the setting is not an integral multiple, the actual logging cycle is adjusted to the integral multiple of the conversion cycle within a limit of the set logging cycle.
The following table lists the conversion cycle for each A/D conversion method.

Conversion method	Conversion cycle
Sampling processing	Number of conversion enabled channels × Conversion speed
Time average	$\left(\frac{\text{Time set in Time average/Count average/Moving average/Primary delay filter constant setting}}{\text{Number of conversion enabled channels} \times \text{Conversion speed}}\right)^{*1} \times$ Number of conversion enabled channels × Conversion speed
Count average	(The count set to CH1 Time average/Count average/Moving average/Primary delay filter constant setting (Un\G502)) × (Number of conversion enabled channels × Conversion speed)
Moving average	Number of conversion enabled channels × Conversion speed
Primary delay filter	Number of conversion enabled channels × Conversion speed

*1 Values after the decimal point are omitted.

Ex.
With the following settings, the conversion cycle is 320μs and the actual logging cycle is performed every 6720μs (integral multiple of 320μs).

- Number of conversion enabled channels: CH1 to CH4
- Conversion process specification: Sampling processing
- Logging cycle setting value: 7000
- Logging cycle unit setting: μs

The following values are stored in 'CH1 Logging cycle monitor value' (Un\G441 to Un\G443).

Address	Item		Stored value
441	CH1 Logging cycle monitor value (Un\G441 to Un\G443)	s	0
442		ms	6
443		μs	720

■When the logging function becomes disabled

The logging is not performed when even one of the following errors occurs after the logging function is enabled and 'Operating condition setting request' (Y9) is turned on and off.

- Error code (192□H to 195□H): Setting errors of 'CH1 Time average/Count average/Moving average/Primary delay filter constant setting' (Un\G502)
- Error code (1D0□H to 1D6□H): Setting errors of the logging function
- Error code (1D8□H to 1D9□H): Setting errors of the logging read function

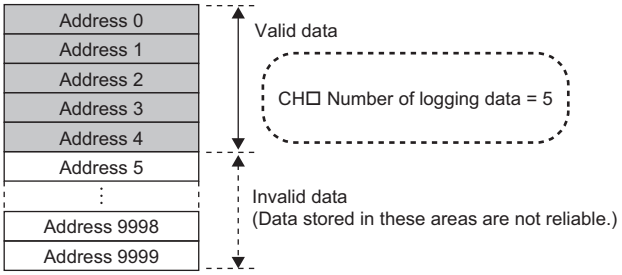
Point

When 'Operating condition setting request' (Y9) is turned on and off on the condition that the logging cycle determined by 'CH1 Logging cycle setting value' (Un\G537) and 'CH1 Logging cycle unit setting' (Un\G538) is shorter than the conversion cycle, an error occurs and logging does not start. A logging cycle setting disable error (error code: 1D2□H) is stored in 'Latest error code' (Un\G0) to turn on 'Error flag' (XF) and the ERR LED.

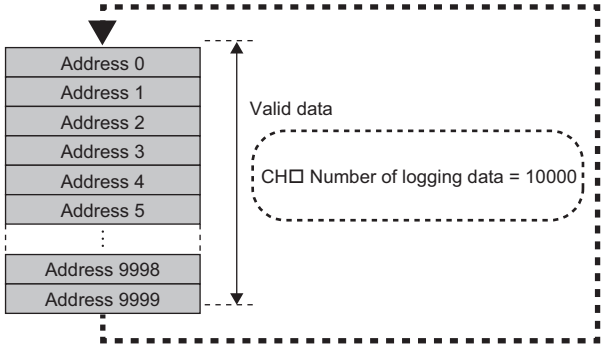
■Number of logging data

With 'CH1 Number of logging data' (Un\G436), the number of valid data in 'CH1 Logging data' (Un\G10000 to Un\G19999) can be checked.

When the number of collected data points is less than 10000



When the number of collected data points is 10001 or greater



The number of logging data increases by one each time new data is stored.

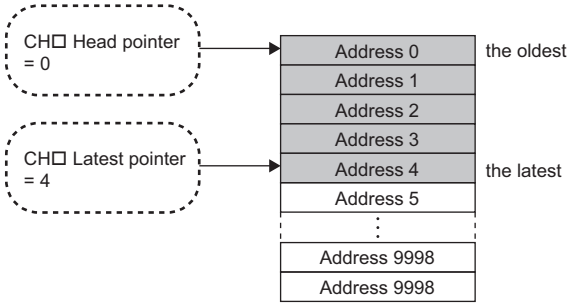
When CH1 Logging data (Un\G10000 to Un\G19999) becomes full (Number of logging data = 10000), the next data is stored in the head address of CH1 Logging data (Un\G10000 to Un\G19999), and the logging operation continues overwriting the existing data. In this case, the number of logging data is fixed to 10000.

■Head pointer and latest pointer

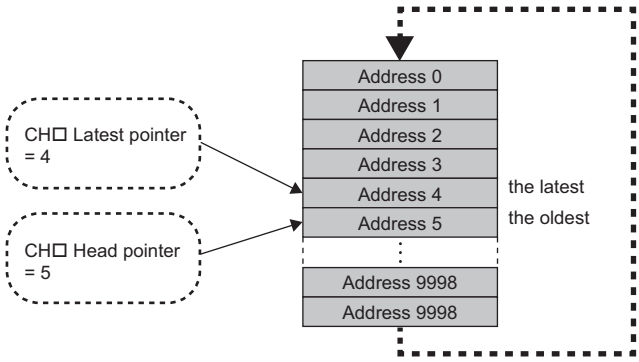
The storage location of the oldest data and the latest data in CH1 Logging data (Un\G10000 to Un\G19999) can be checked with the following buffer memory areas.

Buffer memory area	Description
CH1 Head pointer (Un\G434)	The buffer memory address of the oldest data in CH1 Logging data (Un\G10000 to Un\G19999) can be checked with this buffer memory area. The offset value (0 to 9999) counted from the start address of CH1 Logging data (Un\G10000 to Un\G19999) is stored.
CH1 Latest pointer (Un\G435)	The buffer memory address of the latest data in CH1 Logging data (Un\G10000 to Un\G19999) can be checked with this buffer memory area. The offset value (0 to 9999) counted from the start address of CH1 Logging data (Un\G10000 to Un\G19999) is stored.

When the number of collected data points is less than 10000



When the number of collected data points is 10001 or greater



The head pointer does not change (fixed to 0) until CH1 Logging data (Un\G10000 to Un\G19999) becomes full after the logging start.

The head pointer moves by one point when CH1 Logging data (Un\G10000 to Un\G19999) becomes full and overwriting the data starts from the head address.

■Checking logging data without stopping the logging operation

Logging data can be checked during the logging operation with 'CH1 Head pointer' (Un\G434), 'CH1 Latest pointer' (Un\G435), and 'CH1 Number of logging data' (Un\G436).

To check logging data during logging operation, follow the precautions below because logging data may be refreshed while data is being read out.

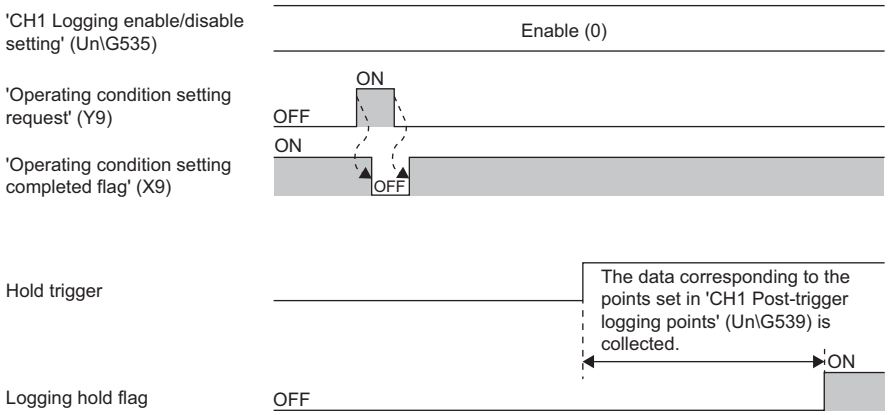
- Set the cycle to 'CH1 Logging cycle setting value' (Un\G537) so that data checking and reading surely complete before logging data is refreshed. If the logging cycle is short, logging data may be refreshed during data checking and reading.
- After obtaining the logging data which needs to be checked, monitor the variation of the head pointer and the number of logging data, and obtain logging data just after the stored value has changed.
- If the data refreshed and the data being checked do not synchronize due to the relationship between the logging cycle and the scan time of the CPU module, adjust the logging cycle.

Stop the logging operation when the logging data needs to be checked without paying attention to the logging cycle.

(☞ Page 50 Stopping the logging operation)

Stopping the logging operation

Logging operation stops (holds) when the preset trigger condition is satisfied and the set points of the data are collected.
A trigger that is generated when the condition is satisfied is called a hold trigger.
To generate a hold trigger, the following two methods are available.
☞ Page 53 Logging hold request
☞ Page 54 Level trigger
When a hold trigger is detected during data collection, the logging operation stops after the points of the data set in 'CH1 Post-trigger logging points' (Un\G539) are collected.



Post-trigger logging points

Set the number of data collected in the period from the detection of a hold trigger to logging operation stop to 'CH1 Post-trigger logging points' (Un\G539).

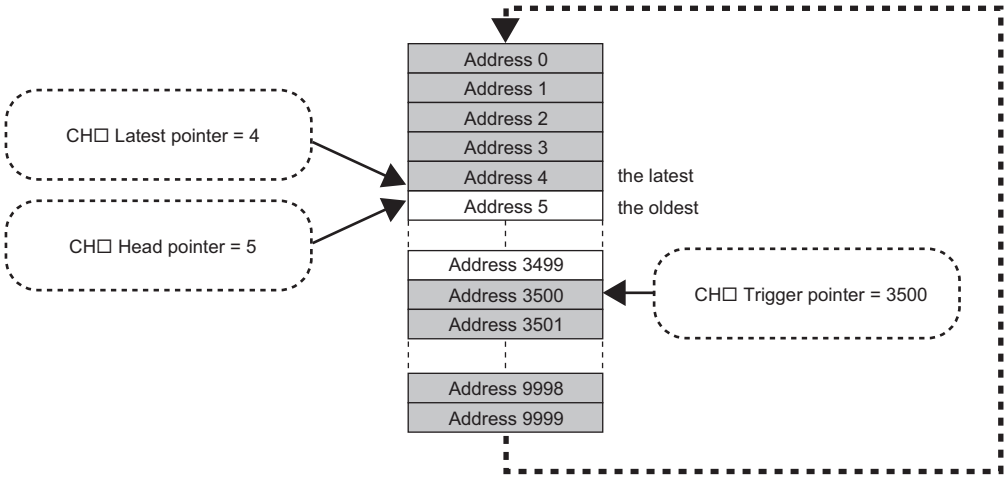
Checking that the logging has stopped

Check that 'CH1 Logging hold flag' (Un\G409) is ON (1).

Checking data when a hold trigger has occurred

The storage location of the data when a hold trigger has occurred can be checked with 'CH1 Trigger pointer' (Un\G437). The offset value counted from the start address of CH1 Logging data (Un\G10000 to Un\G19999) is stored in 'CH1 Trigger pointer' (Un\G437).

Ex.
The value stored in Trigger pointer when the logging operation stops under the following conditions
- 'CH1 Post-trigger logging points' (Un\G539): 6505 points
- The data location where a hold trigger has occurred: 3500th data



■Checking the trigger generation time

The trigger generation time can be checked with 'CH1 Trigger generation time' (Un\G444 to Un\G448).

Even when the logging cycle is set to a period less than 1 millisecond (Example: 80μs), the minimum time unit recorded in 'CH1 Trigger generation time' (Un\G444 to Un\G448) is millisecond. Use the trigger generation time as an indication to refer to the logging data.

Ex.

When 'CH1 Trigger generation time' (Un\G444 to Un\G448) is monitored

	b15 to b8	b7 to b0
'CH1 Trigger generation time (First/Last two digits of the year)' (Un\G444)	First two digits of the year	Last two digits of the year
'CH1 Trigger generation time (Month/Day)' (Un\G445)	Month	Day
'CH1 Trigger generation time (Hour/Minute)' (Un\G446)	Hour	Minute
'CH1 Trigger generation time (Second/Day of the week)' (Un\G447)	Second	Day of the week
'CH1 Trigger generation time (Millisecond)' (Un\G448)	Millisecond (higher-order digits)	Millisecond (lower-order digits)

- First two digits of the year, last two digits of the year, month, day, hour, minute, second, and millisecond are all stored in the BCD code.
- In the day of the week segment, one of the following values in the BCD code indicating the corresponding day is stored.

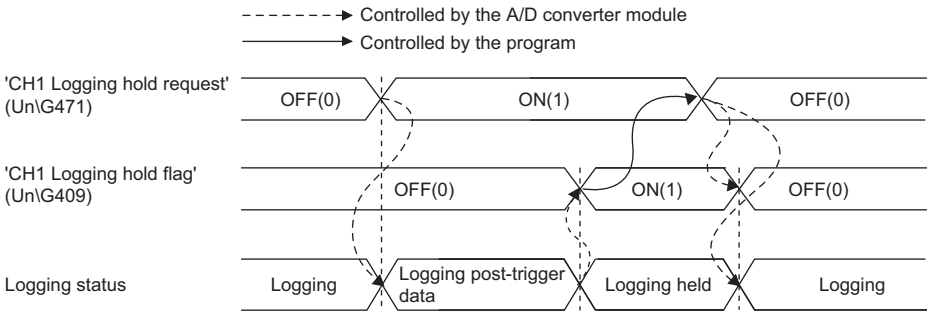
Sunday: 00H, Monday: 01H, Tuesday: 02H, Wednesday: 03H, Thursday: 04H, Friday: 05H, Saturday: 06H

Resuming the logging

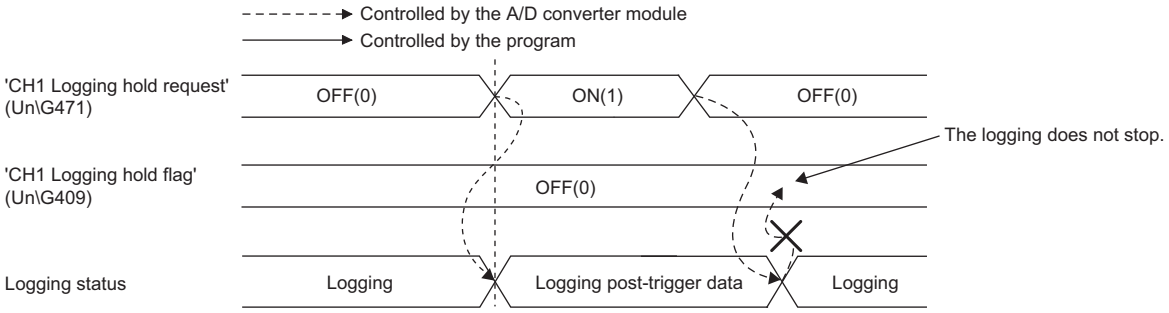
It may take time until ON (1) is stored in 'CH1 Logging hold flag' (Un\G409) after 'CH1 Logging hold request' (Un\G471) is changed from off to on.

To resume logging, check that ON (1) is stored in 'CH1 Logging hold flag' (Un\G409) and 'CH1 Logging hold request' (Un\G471) is changed from on to off. After logging resumes, the value is stored from the head buffer memory area of CH1 Logging data (Un\G10000 to Un\G19999).

In addition, OFF (0) is stored in 'CH1 Logging hold flag' (Un\G409).



Logging does not stop when 'CH1 Logging hold request' (Un\G471) is changed from on to off before ON (1) is stored in 'CH1 Logging hold flag' (Un\G409).



■Buffer memory area status when logging resumes

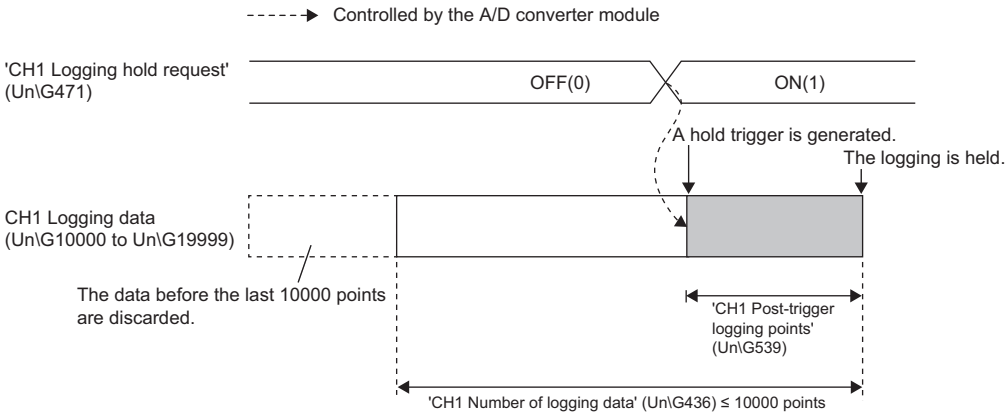
The following table shows the buffer memory area status when logging resumes.

Buffer memory area	Value status
CH1 Head pointer (Un\G434)	Values are initialized.
CH1 Latest pointer (Un\G435)	
CH1 Number of logging data (Un\G436)	
CH1 Trigger pointer (Un\G437)	
CH1 Trigger generation time (Un\G444 to Un\G448)	
CH1 Logging data (Un\G10000 to Un\G19999)	The values before logging resumes are not initialized. After logging resumes, values are stored from the start address of CH1 Logging data (Un\G10000 to Un\G19999). To refer to the logging data, check which area has valid data with CH1 Number of logging data (Un\G436).

Logging hold request

A hold trigger is generated from a program at any timing.

Logging starts when ON (1) is set to 'CH1 Logging hold request' (Un\G471) and stops after a preset number of the data is collected.



Point

- The following delay time occurs until the A/D converter module receives a hold trigger after the value in 'CH1 Logging hold request' (Un\G471) is changed from OFF (0) to ON (1).

Trigger delay = Logging cycle (Cycle at which logging is actually performed) + Scan time of the CPU module

- When 'CH1 Logging hold request' (Un\G471) is changed from ON (1) to OFF (0) before 'CH1 Logging hold flag' (Un\G409) turns to ON (1), the data set in 'CH1 Post-trigger logging points' (Un\G539) is not held after logging, and logging resumes soon.
- If a value other than OFF (0) and ON (1) is set to 'CH1 Logging hold request' (Un\G471), an error occurs. A logging hold request range error (error code: 1D7□H) is stored in 'Latest error code' (Un\G0) to turn on 'Error flag' (XF) and the ERR LED.

Checking that the logging has stopped

Check that 'CH1 Logging hold flag' (Un\G409) is ON (1).

Level trigger

When a value in the monitored buffer memory area of the A/D converter module satisfies a preset condition, a hold trigger is generated.

A level trigger is monitored on the refreshing cycle of the digital output value or the digital operation value.

Initial setting of a level trigger

■Setting a target to be monitored

As a condition to generate a hold trigger, set the buffer memory address to be monitored to 'CH1 Trigger data' (Un\G541).

Item	Setting range
CH1 Trigger data (Un\G541)	0 to 9999

To monitor a device value of a module other than the A/D converter module such as a device of the CPU module, set as follows.

- Set a value between 90 and 99 (Level data☐ (Un\G90 to Un\G99)) to 'CH1 Trigger data' (Un\G541).
- Write a value of the monitored device to Level data☐ (Un\G90 to Un\G99) by using the MOV instruction.

Item	Setting range
Level data☐ (Un\G90 to Un\G99)	-32768 to 32767

Ex.

Application example of Level data☐ (Un\G90 to Un\G99)

To monitor the data register D100 in the CPU module and operate the level trigger in CH1, create a program as follows.

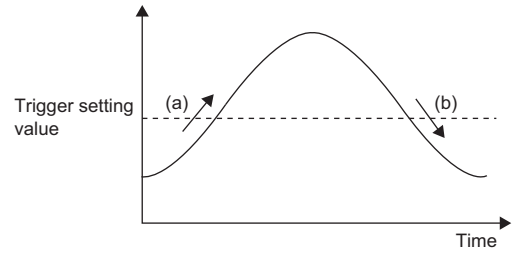
1. Set 91 (buffer memory address of Level data 1) to 'CH1 Trigger data' (Un\G541) (when Level data 1 is used).
2. Store the storage data of D100 in 'Level data 1' (Un\G91) by the program continuously.

Point

Specify an appropriate data such as 'CH1 Digital output value' (Un\G400), 'CH1 Digital operation value' (Un\G402), or Level data☐ (Un\G90 to Un\G99) to 'CH1 Trigger data' (Un\G541). When a setting area or a system area is specified, the normal operation is not guaranteed.

■Setting the monitoring condition

Set a condition to generate a hold trigger in 'CH1 Level trigger condition setting' (Un\G540).

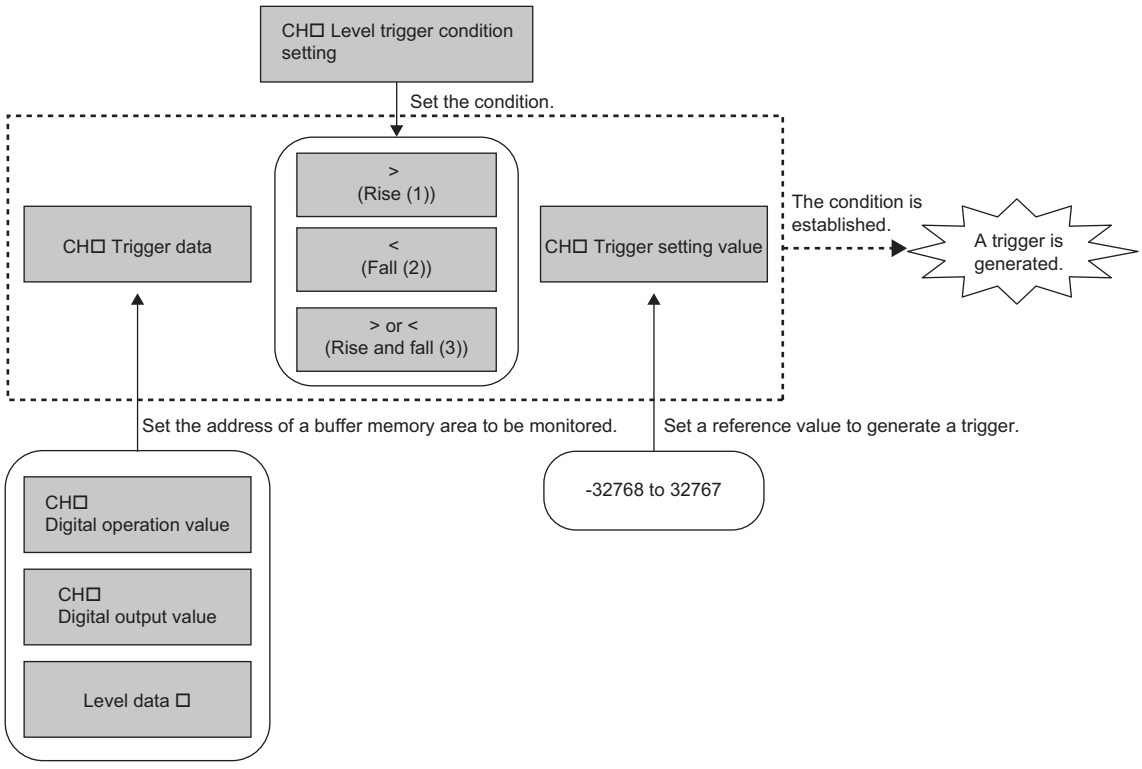
Setting value	Description	
Rise (1)	Stored value of a buffer memory area to be monitored  (a) A hold trigger is generated when the relation between the values changes from "Stored value of a buffer memory area to be monitored ≤ Trigger setting value" to "Stored value of a buffer memory area to be monitored > Trigger setting value". (b) A hold trigger is generated when the relation between the values changes from "Stored value of a buffer memory area to be monitored ≥ Trigger setting value" to "Stored value of a buffer memory area to be monitored < Trigger setting value".	A hold trigger is generated under the condition (a).
Fall (2)		A hold trigger is generated under the condition (b).
Rise and fall (3)		A hold trigger is generated under the condition (a) or (b).

- Set a value where a hold trigger is generated to 'CH1 Trigger setting value' (Un\G542).

Item	Setting range
CH1 Trigger setting value (Un\G542)	-32768 to 32767

Point

The following figure shows the relation between setting items to be configured for the initial setting of a level trigger.

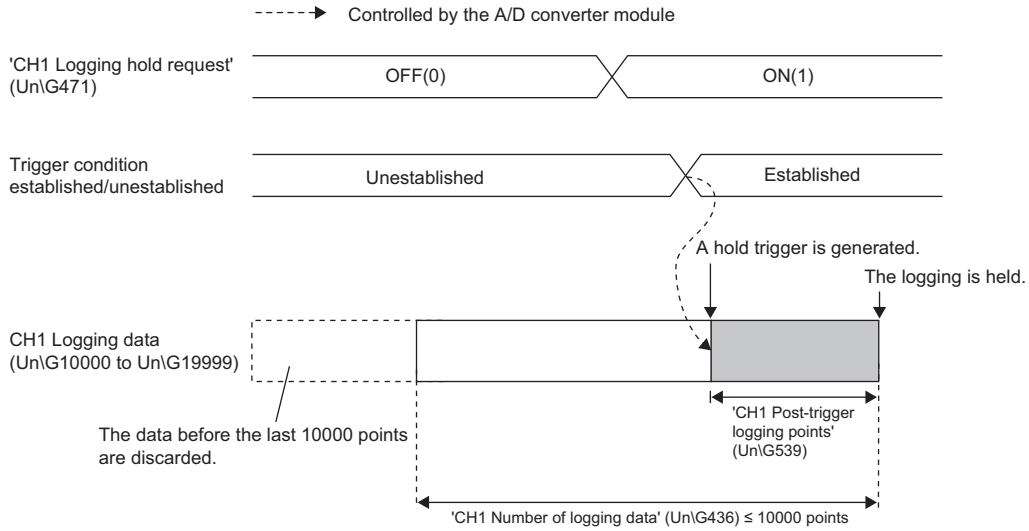


To generate a hold trigger when a value in CH1 Digital output value (Un\G400) is greater than 10000, set as follows.

- 'CH1 Level trigger condition setting' (Un\G540): Rise (1)
- 'CH1 Trigger data' (Un\G541): 400
- 'CH1 Trigger setting value' (Un\G542): 10000

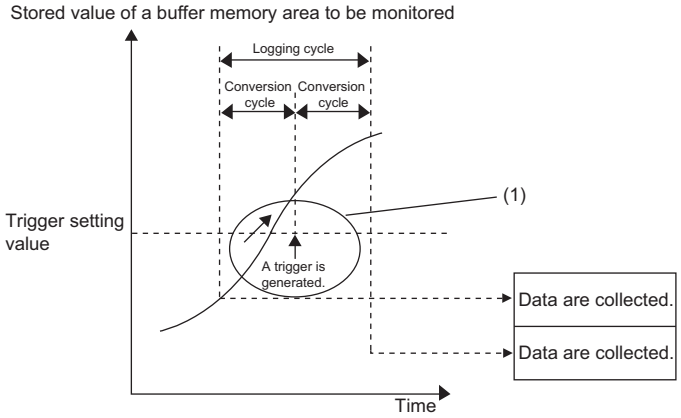
Operation of a level trigger

To use a level trigger, set ON (1) to 'CH1 Logging hold request' (Un\G471) in advance. At the point where ON (1) has been set to 'CH1 Logging hold request' (Un\G471), the module becomes the trigger condition wait status.
Data collection starts when the trigger condition has been satisfied, and stops when the set points of the data have been collected.



Point

A level trigger is detected on the refreshing cycle of the digital output value or the digital operation value. Therefore, the data when a hold trigger is generated may not be stored in CH1 Logging data (Un\G10000 to Un\G19999) depending on the setting of the logging cycle. To store the data at the timing when a hold trigger is generated in CH1 Logging data (Un\G10000 to Un\G19999), arrange related settings so that the conversion cycle of the monitoring target value (a trigger data) and the logging cycle (actual logging cycle) have the same time period.



(1) The data at the timing when a trigger is generated is not stored in the buffer memory area.

■Checking that the logging has stopped

Check that 'CH1 Logging hold flag' (Un\G409) is ON (1).

Initial settings of the logging function

The following describes the initial setting procedure to use the logging function.

Setting procedure

1. Set "A/D conversion enable/disable setting" to "A/D conversion enable".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting] ⇨ [A/D conversion enable/disable setting function]

2. Set "Logging enable/disable setting" to "Enable".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting] ⇨ [Logging function]

3. Set the target data to be logged in "Logging data setting". Set which of "Digital output value" or "Digital operation value" for each channel.
4. Set the cycle to store the logging data to "Logging cycle setting value".
5. Select a unit of the logging cycle setting value in "Logging cycle unit setting".
6. Set a condition to generate a hold trigger in "Level trigger condition setting". To use 'CH1 Logging hold request' (Un\G471), set "Disable". To use the level trigger, set either of "Level trigger (condition: Rise)", "Level trigger (condition: Fall)", or "Level trigger (condition: Rise and fall)".
7. Set a number of the data points to be collected for the time period from the occurrence of a hold trigger to logging stop in "Post-trigger logging points".
8. Set a buffer memory address to be monitored with a level trigger to "Trigger data".
9. Set whether to enable or disable the logging read function in "Read interrupt enable/disable setting"
10. Set a level where a level trigger operates for "Trigger setting value".

Logging read function

More than 10000 points of logging data can be stored by transferring the device data to the file register of the CPU module without stopping logging. This function reduces the takt time in a test demanding high-speed conversion.

Overview of the logging read function

After logging starts, an interrupt request is sent to the CPU module and an interrupt program is executed every time the preset number of data to be read is logged.

The A/D converter module has 16 points of the interrupt factor (SI) corresponding to the logging reading of each channel.

For the setting of interrupt pointers, refer to the following.

☞ Page 58 Setting interrupt pointers

Setting interrupt pointers

Assign the interrupt factors (SI) of the A/D converter module and interrupt pointers of the CPU module using the interrupt pointer setting of the engineering tool.

The interrupt function must be set when the logging read function is used.

Starting the logging read function

To use the logging read function, set 'CH1 Loading interrupt enable/disable setting' (Un\G544) to Enable (0) and set a number of logging points to generate an interrupt in 'CH1 Logging read points setting value' (Un\G545). This function starts when 'Operating condition setting request' (Y9) is turned on and off.

■The number of logging read points

Set a value whose integral multiple is 10000 in 'CH1 Logging read points setting value' (Un\G545). The setting range is from 10 to 10000.

When a value whose integral multiple is not 10000 is set, the number of the actual logging read points is forced to become a maximum value whose integral multiple is 10000 within the set value. The value of the number of logging read points is stored in 'CH1 Logging read points monitor value' (Un\G440).

The number of logging read points	Logging read points monitor value
100	100
90	80
110	100
650	625
4000	2500

Data checking method

■Current logging read pointer

- The head pointer read from CH1 Logging data (Un\G10000 to Un\G19999) with the interrupt processing is stored in 'CH1 Current logging read pointer' (Un\G438).
- The default value of 'CH1 Current logging read pointer' (Un\G438) is -1.
- Every time the same number of data as the value stored in CH1 Logging read points monitor value (Un\G440) is logged, a value calculated by the following formula is stored in 'CH1 Current logging read pointer' (Un\G438).

CH1 Current logging read pointer = CH1 Latest pointer - CH1 Logging read points monitor value + 1

■Previous logging read pointer

- 'CH1 Current logging read pointer' (Un\G438) at the timing when the previous read pointer detection interrupt occurs is stored in 'CH1 Previous logging read pointer' (Un\G439).
- The default value of 'CH1 Previous logging read pointer' (Un\G439) is -1.
- 'CH1 Previous logging read pointer' (Un\G439) is used to detect the overlap of the logging read pointer detection interrupt processing.

Ex.

The values to be stored in each pointer at every detection interrupt when the logging read detection starts with 'CH1 Logging read points setting value' (Un\G545) being set to 1000

Occurrence of read pointer detection interrupts	Previous logging read pointer	Current logging read pointer	Latest pointer	Relative address	Buffer memory area
Default value	-1	-1	0	0	1st data
First time	-1	0	999	⋮	⋮
Second time	0	1000	1999	999	1000th data
Third time	1000	2000	2999	1000	1001st data
⋮	⋮	⋮	⋮	⋮	⋮
				1999	2000th data
10th time	8000	9000	9999	2000	2001st data
11th time	9000	0	999	⋮	⋮
12th time	0	1000	1999	9999	10000th data

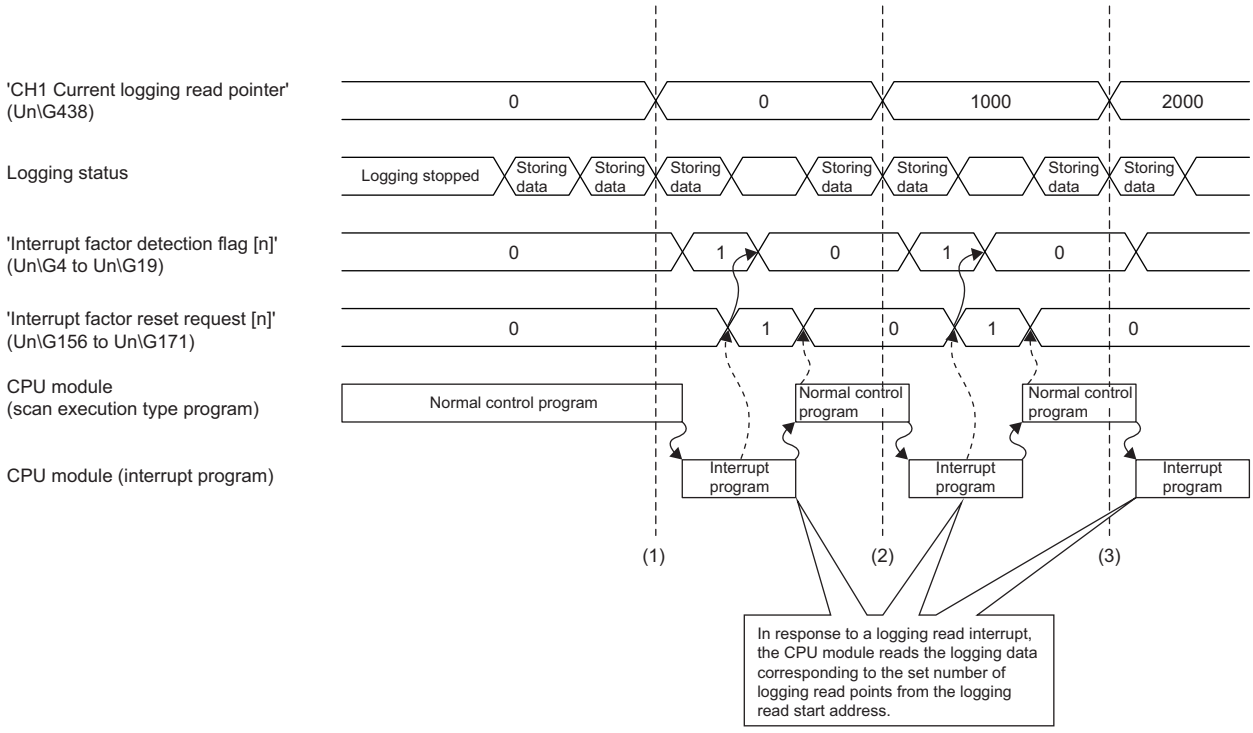
Operation

The logging read function starts by setting interrupt pointers and turning on and off 'Operating condition setting request' (Y9). This function repeats its operation every time the same number of data as the logging read points monitor value is logged.

Ex.

The following figure shows the operation when the logging read function is used under the following conditions.

- A/D conversion-enabled channel: 1CH
- Logging read points setting value: 1000 points



(1) The timing that the first interrupt processing occurs

(2) The timing that the second interrupt processing occurs

(3) The timing that the third interrupt processing occurs

Setting procedure

To use the logging read function, both the logging read function and the interrupt setting must be set.

1. Set "Condition target setting" to "Logging read".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Interrupt setting]

2. Set "A/D conversion enable/disable setting" to "A/D conversion enable".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting] ⇨ [A/D conversion enable/disable setting]

3. Set "Logging enable/disable setting" to "Enable".

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting] ⇨ [Logging function]

4. Set the target data to be logged in "Logging data setting".
5. Set the cycle to store the logging data to "Logging cycle setting value".
6. Set "Read interrupt enable/disable setting" to "Enable".
7. Set the number of logging points that generate a read interrupt in "Logging read points setting value".

Setting example

Ex.

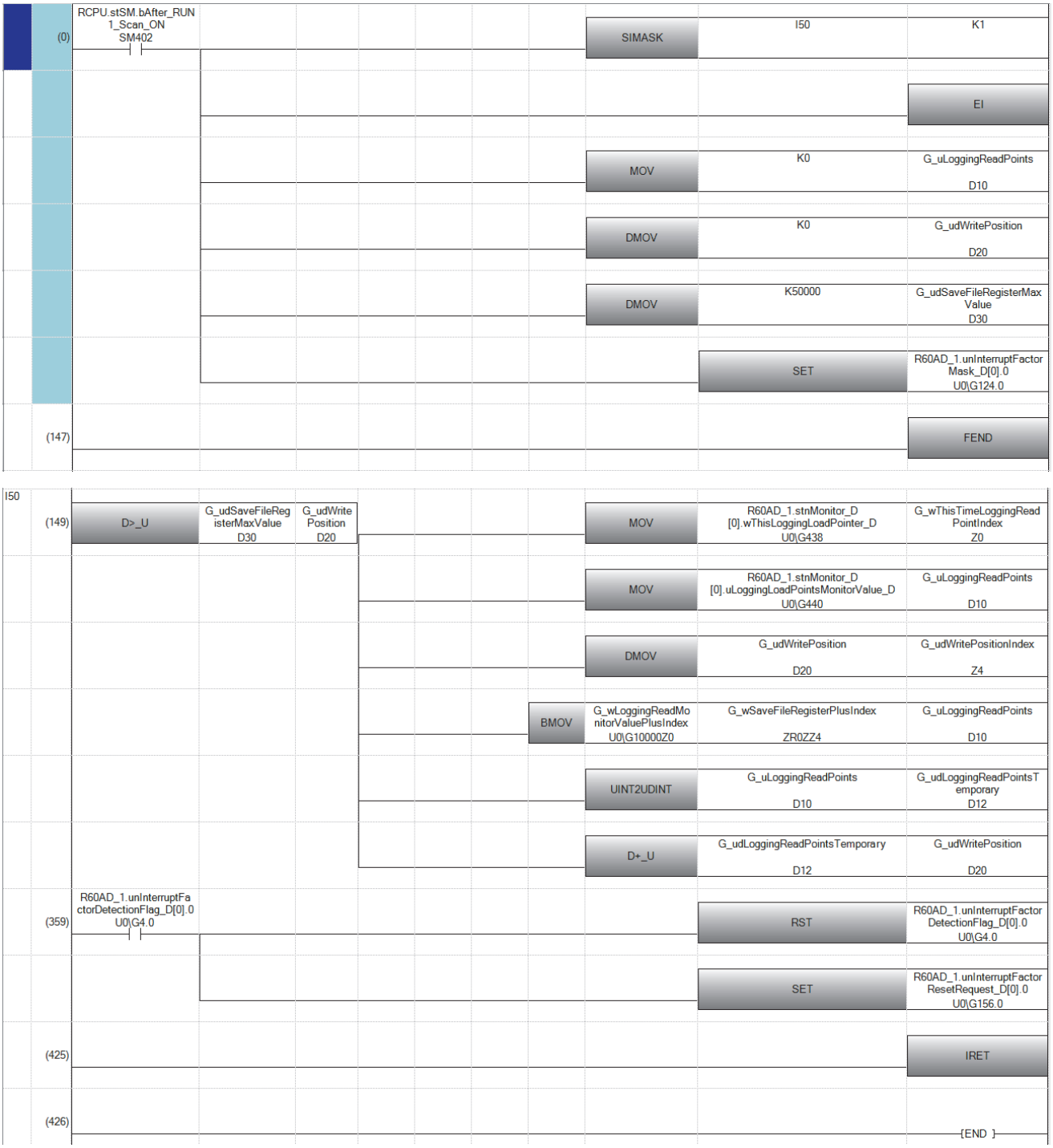
When an interrupt program that is executed when the data of CH1 Logging read points monitor value is logged is assigned to the interrupt pointer I50

• Label settings

Classification	Label name	Description	Device
Module Label	RCPU.stSM.bAfter_RUN1_Scan_ON	ON for one scan after RUN	SM402
	R60AD_1.unInterruptFactorMask_D[0].0	Interrupt factor mask	U0¥G124
	R60AD_1.unInterruptFactotDetectionFlag_D[0].0	Interrupt factor detection flag?	U0¥G4
	R60AD_1.unInterruptFactorResetRequest_D[0].0	Interrupt factor reset request	U0¥G156
	R60AD_1.stnMonitor_D[0].wThisLoggingLoadPointer_D	CH1 Current logging read pointer	U0\G438
	R60AD_1.stnMonitor_D[0].uLoggingLoadPointsMonitorValue_D	CH1 Logging read points monitor value	U0\G440
Labels to be defined	Define global labels as shown below:		

	Label Name	Data Type		Class	Assign
1	G_uLoggingReadPoints	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D10
2	G_udLoggingReadPointsTemporary	Double Word [Unsigned]/Bit String [32-bit]	...	VAR_GLOBAL	D12
3	G_udWritePosition	Double Word [Unsigned]/Bit String [32-bit]	...	VAR_GLOBAL	D20
4	G_udSaveFileRegisterMaxValue	Double Word [Unsigned]/Bit String [32-bit]	...	VAR_GLOBAL	D30
5	G_wThisTimeLoggingReadPointIndex	Word [Signed]	...	VAR_GLOBAL	Z0
6	G_udWritePositionIndex	Double Word [Unsigned]/Bit String [32-bit]	...	VAR_GLOBAL	Z4
7	G_wLoggingReadMonitorValuePlusIndex	Word [Signed]	...	VAR_GLOBAL	U0\G10000Z0
8	G_wSaveFileRegisterPlusIndex	Word [Signed]	...	VAR_GLOBAL	ZR0ZZ4

• Program example



(0) Enable only the interrupt pointer I50.
Initialize CH1 Logging read points monitor value and the write position of the save destination file register.
Set the maximum number of stored save destination file registers.
Clear Interrupt factor mask [0].

(149) Store CH1 Current logging read pointer in the index register.
Store CH1 Logging read points monitor value in the register.
Store the write position of the save destination file register in the index register.
Store CH1 Logging data for the logging read points monitor value in the save destination file register.
Add the points of the logging read points monitor value to the write position of the save destination file register and store the obtained value as the write position for the next logging.

(359) Turn off Interrupt factor mask [0] when Interrupt factor detection flag turns on.
Turn on Interrupt factor reset request [0].

Saving to a CSV file

The logging data stored in the buffer memory areas can be saved to a CSV file by using function blocks (FBs). The save data is sorted in a time series, where the logging data can be easily checked.
However, function blocks (FBs) can be executed only when the logging operation is stopped. During the logging operation, the execution of function blocks (FBs) is disabled.

Saving a CSV file

To save a CSV file, an SD memory card is required.
CSV files are saved in an SD memory card installed in the CPU module. CSV files cannot be saved in the built-in memory of the CPU module.

Saving procedure

1. Check that ON (1) is stored in 'CH1 Logging hold flag' (Un\G409).
2. Execute the function block (FB).

Point

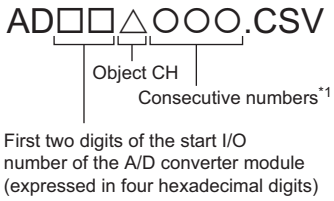
If the execution state of the function block (FB) is maintained, logging data can be saved in the CSV file every time logging stops.

Data to be saved in a CSV file

The logging data stored in the buffer memory areas is saved.
For how to check the logging data, refer to the following.
☞ Page 50 Checking data when a hold trigger has occurred

CSV file name

CSV files saved with the function block (FB) are named as follows.



*1 The maximum number of the consecutive numbers can be set with the input label i_Max_Number (maximum number of saving files) of the function block (FB).

Ex.

The file name under the following condition is AD453006.CSV.

- Start I/O number of the A/D converter module: 0450H
- Target channel: 3
- Saving to a CSV file: 6th time.

Displaying logging data

The CSV file output with the logging function can be displayed graphically by reading the file through GX LogViewer.
For how to display the logging data with GX LogViewer, refer to the following.
GX LogViewer Version 1 Operating Manual

1.13 Interrupt Function

This function executes an interrupt program of the CPU module when an interrupt factor such as an input signal error or alert output is detected.
For the A/D converter module, the maximum number of interrupt pointers available is 16 per module.

Operation

■Detecting an interrupt factor

When an interrupt factor occurs, an interrupt request is sent to the CPU module at the same time as 'Interrupt factor detection flag [n]' (Un\G4 to Un\G19) is turned to Interrupt factor (1).

■How to reset an interrupt factor

When Reset request (1) is set to 'Interrupt factor reset request [n]' (Un\G156 to Un\G171) corresponding to the interrupt factor, the specified interrupt factor is reset and 'Interrupt factor detection flag [n]' (Un\G4 to Un\G19) changes to No interrupt factor (0).

Setting procedure

To use the interrupt function, set "Condition target setting", "Condition target channel setting", "Interrupt factor transaction setting", and "Interrupt pointer" in the engineering tool. After completing the settings, write the project to enable the settings.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Interrupt setting]

The following table shows the setting items on the interrupt setting window.

Item	Description
Condition target setting	Select a factor of the target for the interrupt detection.
Condition target channel setting	Select a target channel when the condition target setting for the interrupt detection is channel specification.
Interrupt factor transaction setting	Set an interrupt request for when the same interrupt factor occurs during the interrupt factor detection.
Interrupt pointer	Specify the number of an interrupt pointer that is initiated at the detection of an interrupt factor.

■Condition target setting

Select a factor of the condition target setting for the interrupt detection.
For details on the factors to be detected, refer to the following.
☞ Page 129 Condition target setting [n]

■Condition target channel setting

Select a target channel when the condition target setting for the interrupt detection is channel specification.

Item	Setting value								
Condition target channel setting	0: All channels	1: CH1	2: CH2	3: CH3	4: CH4	5: CH5	6: CH6	7: CH7	8: CH8

■Interrupt factor transaction setting

Set an interrupt request for when the same interrupt factor occurs during the interrupt factor detection.

- With "Interrupt reissue requests (0)", if the same interrupt factor occurs during the interrupt factor detection, an interrupt request is sent to the CPU module again.
- With "No interrupt reissue request (1)", if the same interrupt factor occurs during the interrupt factor detection, an interrupt request is not sent to the CPU module.

■Interrupt pointer

Specify the number of an interrupt pointer that is initiated at the detection of an interrupt factor. For details on the interrupt pointers, refer to the following.
MELSEC iQ-R CPU Module User's Manual (Application)

Point

- If 'Condition target setting [n]' (Un\G232 to Un\G247) is Disable (0), an interrupt request is not sent to the CPU module.
- To reset the interrupt factor, set Reset request (1) until 'Interrupt factor detection flag [n]' (Un\G4 to Un\G19) changes to No interrupt factor (0).
- Resetting interrupt factors is executed only when 'Interrupt factor reset request [n]' (Un\G156 to Un\G171) changes from No reset request (0) to Reset request (1).
- Multiple interrupt pointers can also share the same setting of 'Condition target setting [n]' (Un\G232 to Un\G247). When interrupts with the same settings occur in 'Condition target setting [n]' (Un\G232 to Un\G247), the interrupt program is executed in order of the priority of the interrupt pointers. For the priority of the interrupt pointers, refer to the following.

MELSEC iQ-R CPU Module User's Manual (Application)

- When All channels (0) is set for 'Condition target channel setting [n]' (Un\G264 to Un\G279) and an interrupt detection target is set for each channel of 'Condition target setting [n]' (Un\G232 to Un\G247), the interrupt requests that have the same interrupt factor are sent to the CPU module if alerts are issued in multiple channels. In this case, the CPU module executes multiple interrupt programs and judges that the program cannot be normally finished due to the scan monitoring function, and a CPU module error may occur. When a CPU error occurs, refer to the following.

MELSEC iQ-R CPU Module User's Manual (Application)

Setting example

Ex.

If the interrupt program (I51) is executed when an error occurs in any channel

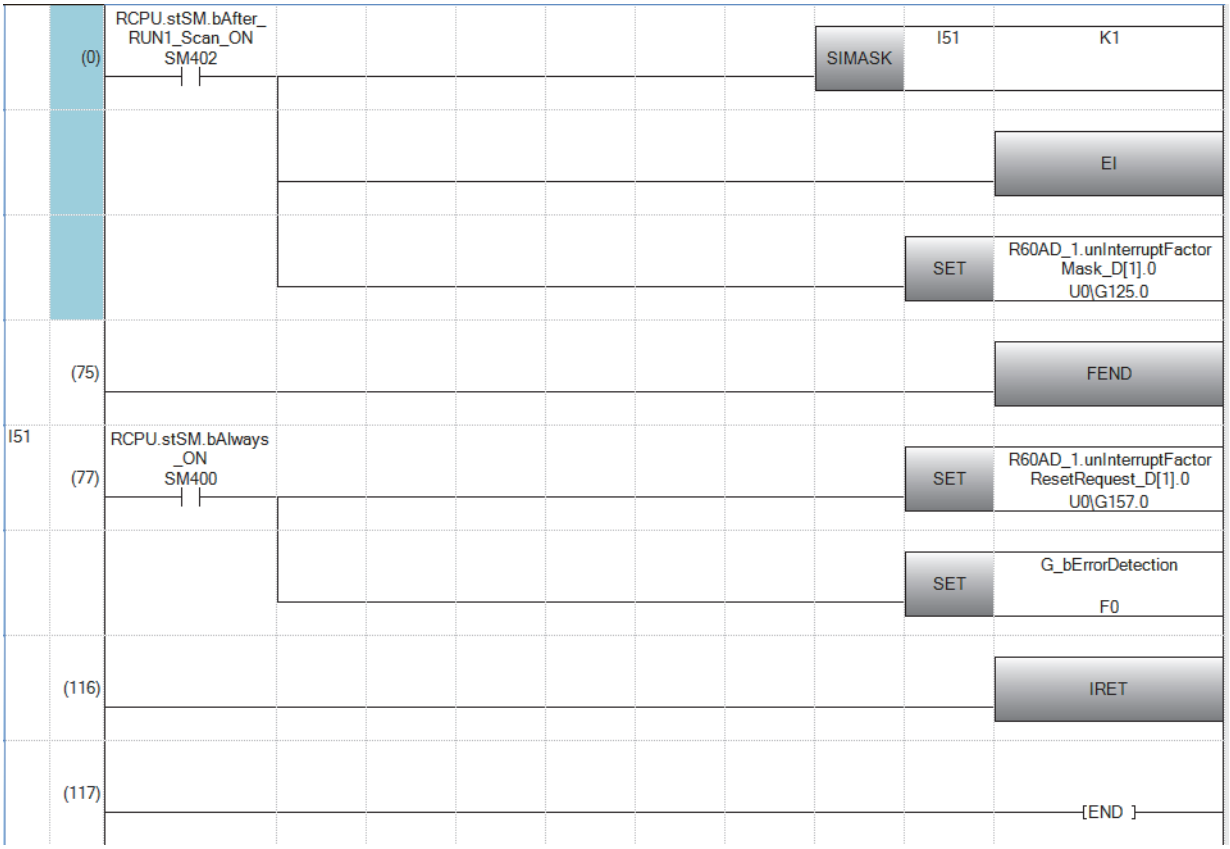
- Parameter setting

Set "Interrupt setting" of [Module Parameter] as follows.

No.	Condition target setting	Condition target channel setting	Interrupt pointer
2	Error flag	All channels	I51

- Label settings

Classification	Label name	Description	Device
Module Label	RCPU.stSM.bAlways_ON	Always ON	SM400
	RCPU.stSM.bAfter_RUN1_Scan_ON	ON for one scan after RUN	SM402
	R60AD_1.unInterruptFactorMask_D[1].0	Interrupt factor mask	U0\G125.0
	R60AD_1.unInterruptFactorResetRequest_D[1].0	Interrupt factor reset request	U0\G157.0
Labels to be defined	Define global labels as shown below: Label Name: G_bErrorDetection, Data Type: Bit, Class: VAR_GLOBAL, Assign (Device/Label): F0		



(0) Enable only the interrupt pointer I51.

(77) Turn on 'Interrupt factor reset request [1]' (U0\G157).
Performs the processing of when an error is detected.

1.14 Inter-Module Synchronization Function

This function allows the A/D conversion values to be held simultaneously among multiple modules in which the inter-module synchronization function is active.
The storage timing of the digital output values of each module is determined by the inter-module synchronization cycle set with the system parameter.

Setting procedure

■Setting the system parameter

For the setting of the system parameter, refer to the following.
📖 MELSEC iQ-R Inter-Module Synchronization Function Reference Manual

■Setting the module parameter

Select "Normal mode (A/D conversion process)" in the operation mode setting.

■Reading synchronization latch digital operation values

When the inter-module synchronization function is used, the A/D conversion values acquired according to the inter-module synchronization cycle are stored in 'CH1 Synchronization latch digital operation value' (Un\G9500). Read 'CH1 Synchronization latch digital operation value' (Un\G9500) with an interrupt program.
For the setting of interrupt programs, refer to the following.
📖 MELSEC iQ-R CPU Module User's Manual (Application)

■Setting the inter-module synchronization cycle

Set the inter-module synchronization cycle that establishes the following relation.
(Inter-module synchronization cycle) > (Run time of the inter-module synchronous interrupt program + Sampling cycle)

Ex.
When CH1 to CH3 are enabled and CH4 is disabled
Sampling cycle = 80μs × 3CH = 240μs
In the condition that the above relation is not established, any of the following settings cause an inter-module synchronous cycle time setting enable lower limit shorter error (error code: 1EA0H), where the inter-module synchronization function does not operate.

- Changing the STOP state to the RUN state of the CPU module (A/D conversion enable/disable setting set in the module parameters is to be reflected.)
- Turning on and off 'Operating condition setting request' (Y9)

Point

The A/D converter module always executes A/D conversion according to the cycle of Number of channels where A/D conversion is enabled × 80μs. By setting the inter-module synchronization cycle to an integral multiple of Number of channels where A/D conversion is enabled × 80μs, 'CH1 Synchronization latch digital operation value' (Un\G9500) is stored at a fixed timing in A/D conversion process.

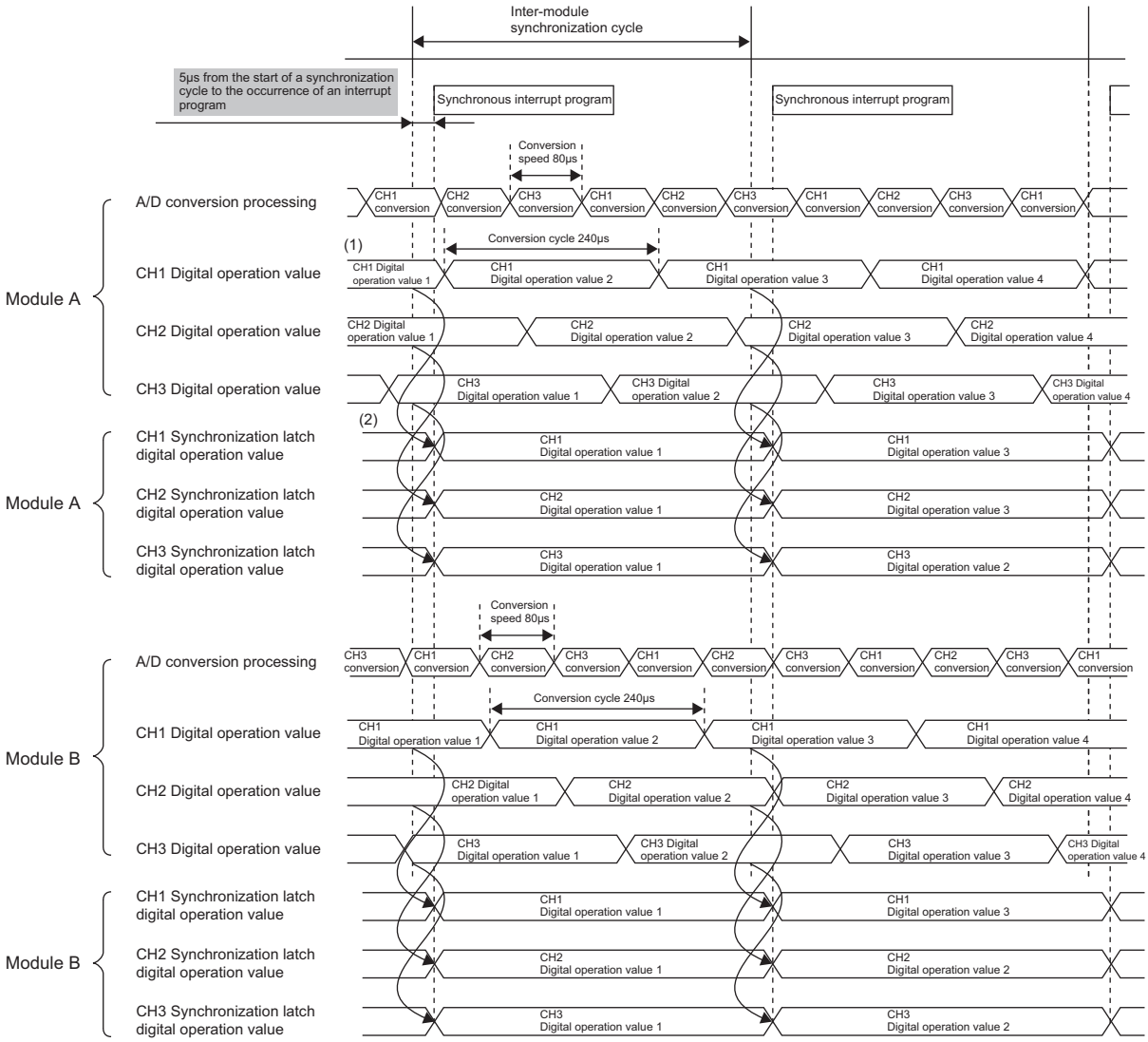
Operation

■Inter-module synchronization processing for the A/D converter module

When the inter-module synchronization function is enabled, the latest A/D conversion value is stored in 'CH1 Synchronization latch digital operation value' (Un\G9500) in 5μs where an inter-module synchronization cycle and the inter-module synchronous interrupt program are executed. The stored 'CH1 Synchronization latch digital operation value' (Un\G9500) is kept during the cycle.

Ex.

Inter-module synchronous processing on two A/D converter modules (module A and module B)



(1) CH□ Digital operation value is stored in the A/D converter module according to the conversion speed.

(2) CH□ Digital operation value acquired in (1) is stored in CH□ Synchronization latch digital operation value according to the inter-module synchronization cycle.

■Abnormal operation during synchronization

The phenomenon that the A/D converter module cannot receive inter-module synchronization signals at a normal cycle is called "synchronization deviation". When a synchronization deviation occurs, an inter-module synchronization signal error (error code: 2610H) occurs. When this error occurs, the synchronization operation of the A/D converter module stops and the previous stored value is stored in 'CH1 Synchronization latch digital operation value' (Un\G9500).

■Monitor function

When the inter-module synchronization function is used, the inter-module synchronization status can be monitored.

For details, refer to the following.

☞ Page 169 Synchronization status monitor

Precautions

- When the offset/gain setting mode is set in the operation mode setting, an inter-module synchronization selection offset/gain setting error (error code: 1EA1H) occurs and the module does not operate.
- When a mode switching setting value is set for 'Mode switching setting' (Un\G296, Un\G297) and 'Operating condition setting request (Y9)' is turned on, an inter-module synchronization mode switching request error (alarm code: 0D00H) occurs and the ALM LED turns on. In this case, the mode is not switched and the synchronization processing continues. Turn on and off 'Error clear request' (YF) to clear the alarm that occurred.
- When performing the offset/gain setting, set the module as a synchronization non-target, and switch to normal mode to shift offset/gain setting mode.
- Dedicated instructions cannot be used.

The following shows the operation when a dedicated instruction is executed.

When the G(P).OFFGAN instruction is executed, an inter-module synchronization mode switching request error (alarm code: 0D00H) occurs.

The G(P).OGLOAD instruction is disabled.

When the G(P).OGSTOR instruction is executed, a G(P).OGSTOR instruction execution error in offset/gain setting mode (error code: 1860H) is stored in the dedicated instruction completion status.

For details on the dedicated instructions, refer to the following.

MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks)

1.15 Error History Function

This function stores up to the latest 16 errors and alarms that occurred in the A/D converter module to the buffer memory area.

Operation

When an error occurs, the error code and the error time are stored from Error history 1 (Un\G3600 to Un\G3609) in order.
When an alarm occurs, the alarm code and the alarm time are stored from Alarm history 1 (Un\G3760 to Un\G3769) in order.

- Detail of the error code assignment

	b15 to b8	b7 to b0
Un\G3600	Error code	
Un\G3601	First two digits of the year	Last two digits of the year
Un\G3602	Month	Day
Un\G3603	Hour	Minute
Un\G3604	Second	Day of the week
Un\G3605	Millisecond (higher-order digits)	Millisecond (lower-order digits)
Un\G3606	System area	
⋮		
Un\G3609		

- Detail of the alarm code assignment

	b15 to b8	b7 to b0
Un\G3760	Alarm code	
Un\G3761	First two digits of the year	Last two digits of the year
Un\G3762	Month	Day
Un\G3763	Hour	Minute
Un\G3764	Second	Day of the week
Un\G3765	Millisecond (higher-order digits)	Millisecond (lower-order digits)
Un\G3766	System area	
⋮		
Un\G3769		

Ex.

Storing example of error history and alarm history

Item	Storage contents	Storage example*1
First two digits of the year/Last two digits of the year	Stored in BCD code.	2014H
Month/Day		630H
Hour/Minute		1234H
Second		56H
Day of the week	One of the following values is stored in BCD code. Sunday: 0, Monday: 1, Tuesday: 2, Wednesday: 3 Thursday: 4, Friday: 5, Saturday: 6	1H
Millisecond (upper)	Stored in BCD code.	7H
Millisecond (lower)		89H

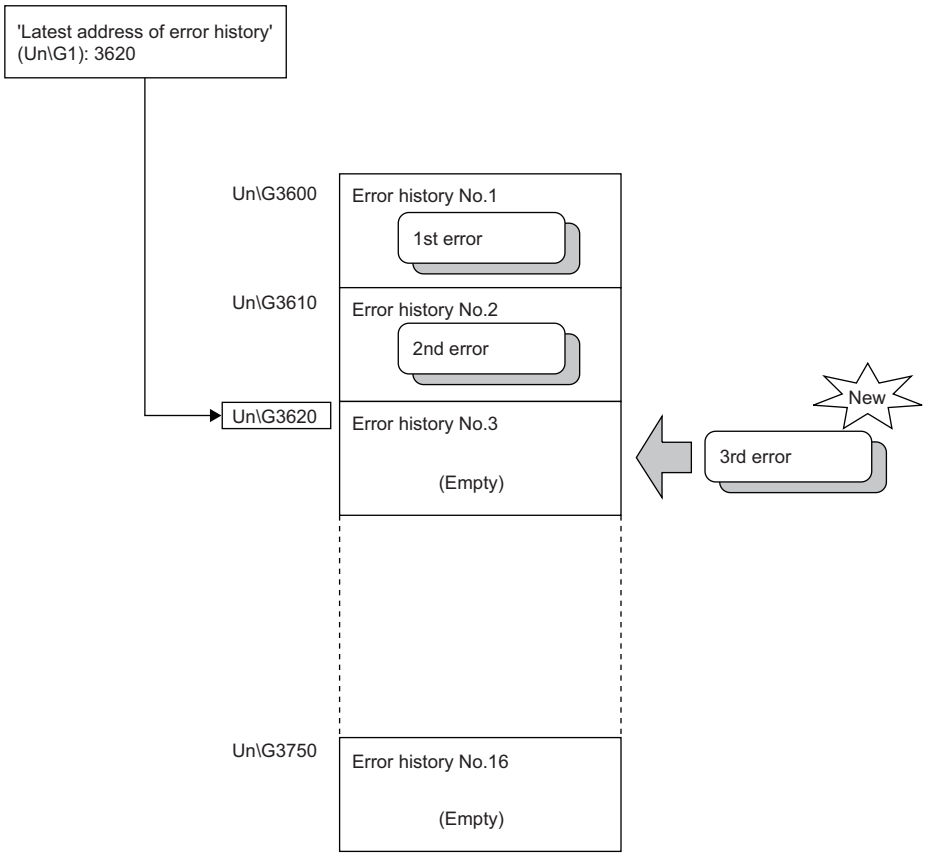
*1 Values stored when an error occurs at 12:34:56.789 on Monday, June 30th, 2014.

The start address of Error history where the latest error is stored can be checked in 'Latest address of error history' (Un\G1).
The start address of Alarm history where the latest alarm is stored can be checked in 'Latest address of alarm history' (Un\G3).

Ex.

When the third error occurs:

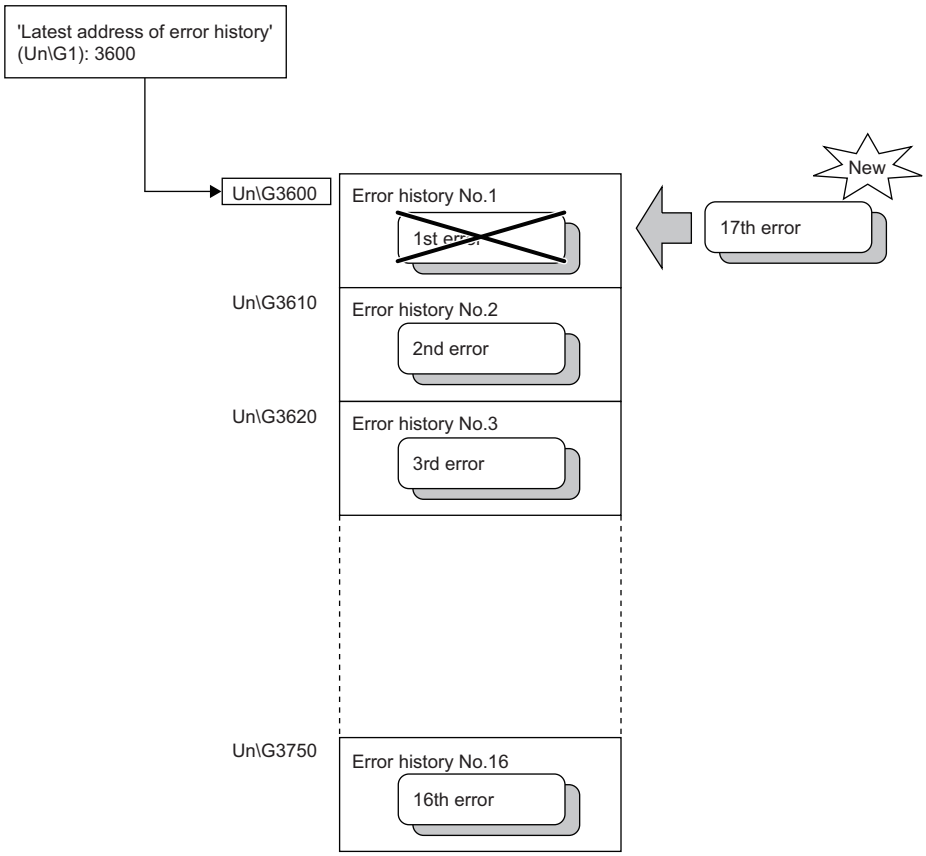
The third error is stored in Error history 3, and the value 3620 (start address of Error history 3) is stored to Latest address of error history.



Ex.

When the 17th error occurs:

The 17th error is stored in Error history 1, and the value 3600 (start address of Error history 1) is stored to Latest address of error history.



Point

- Once the error history storage area becomes full, subsequent error information will overwrite the existing data, starting from Error history 1 (Un\G3600 to Un\G3609), and continues sequentially thereafter. The overwritten history is deleted.
- The same processing is performed for Alarm history when an alarm occurs.
- The stored error history is cleared when the A/D converter module is powered off, or when the CPU module is reset.

1.16 Event History Function

This function collects generated errors, alarms or executed operations in the A/D converter module as event information in the CPU module.

The CPU module collects the event information occurred in the A/D converter module and keeps them in the data memory inside of the CPU module.

The event information collected by the CPU module can be displayed on an engineering tool to check the occurrence history in a time series.

Event type	Classification	Description
System	Error	An error detected by the self diagnostics in each module.
	Warning	A warning (alarm) detected in each module.
	Information	The operation by the normal detection of the system that is not classified as Error or Warning, or the operation performed automatically by the system.
Security	Warning	Operation that is judged as an unauthorized access to each module.
	Information	Operation that is hard to be judged as the success of unlocking passwords or an unauthorized access.
Operation	Warning	Deleting (data clear) operations that may change the action. (These operations are not judged as errors by the self diagnostics.)
	Information	Operations performed by users to change the system operation or configuration in the offset/gain setting.

Setting procedure

The event history function can be set from the event history setting window of the engineering tool. For the setting method, refer to the following.

MELSEC iQ-R CPU Module User's Manual (Application)

Displaying event history

Access to the menu window of the engineering tool. For details on the operating procedure and how to view the contents, refer to the following.

GX Works3 Operating Manual

List of event history data

The following table lists the events that would occur in the A/D converter module when the event type is set to "Operation"

Event code	Event class	Event name	Event detail	Additional information
20010	Information	Offset/gain setting execution	In the user range setting, offset/gain values has been set.	Total number of writes
20100	Information	Error clear	Error clear request has been issued.	I/O number

1.17 Backing up, Saving, and Restoring Offset/Gain Values

The A/D converter module is capable of backing up, saving, and restoring offset/gain values of the user range.

- Backup: Creates a module-specific backup parameter and saves offset/gain values.
- Save: Saves the offset/gain information, registered in this module by making the offset/gain setting, in the CPU module.
- Restoration: Writes the information backed up and saved in the CPU module to this module.

In the event that the A/D converter module fails and needs to be replaced, the offset/gain values of the failed A/D converter module can be restored onto the replaced A/D converter module.

In addition, if multiple A/D converter modules are connected on a system, the offset/gain settings in one of the A/D converter modules can be applied to the other systems.

However, if the offset/gain values are saved and restored, the accuracy after the restoration decreases by approximately three times compared to that before the restoration. Reconfigure the offset/gain setting when required.

Only when the model where the offset/gain values are to be saved and the model where the offset/gain values are to be restored are the same, the offset/gain values can be saved and restored.

Each procedure differs depending on whether a module-specific backup parameter is used or not.

When a module-specific backup parameters is used

At the time of replacement by means of online module change, the offset/gain values are automatically restored.

For details on the online module change, refer to the following.

MELSEC iQ-R Online Module Change Manual

Details of the module-specific backup parameter

A module-specific backup parameter is a file created in an SD memory card or the data memory of the control CPU.

The contents of the parameter are the offset/gain values of the user range stored in the flash memory of the A/D converter module.

The file name of a module-specific backup parameter is determined as follows based on the start I/O number of the A/D converter module.

UBPmmmnn.BPR

- mmm indicates a value calculated by dividing the module I/O No. by 10H (3 digits in hexadecimal).
- nn indicates a consecutive number of the module-specific backup parameters for each module and fixed to 00.

Creating and updating a module-specific backup parameter

A module-specific backup parameter is created or updated when the offset/gain values stored in the flash memory of the A/D converter module are updated.

Timing when backup data is created or updated	Description
When the offset/gain setting is completed with "Offset/gain setting" of the engineering tool	A module-specific backup parameter is created or updated when the offset/gain setting is completed with "Offset/gain setting" of the engineering tool.
When 'User range write request' (YA) is turned on in the offset/gain setting mode	A module-specific backup parameter is created or updated when the offset/gain values of the user range are changed in the offset/gain setting mode.
When 'User range write request' (YA) is turned on in the normal mode	When 'User range write request' (YA) is turned on in the normal mode, the offset/gain values of the user range are restored based on the settings of the buffer memory areas (Save data type, CH1 Factory default setting offset value (L) to CH8 User range setting gain value (H)). At this timing, module-specific backup parameters are updated.
When the G(P).OGSTOR instruction is executed in the normal mode	When the G(P).OGSTOR instruction is executed in the normal mode, the offset/gain values of the user range are restored. At this timing, module-specific backup parameters are updated.
When a new module is recognized after the online module change	When a new module is mounted and recognized after the online module change, the offset/gain values of the user range are restored. At this timing, module-specific backup parameters are updated.

When no module-specific backup parameter exists in the data memory of the control CPU and a module-specific backup parameter needs to be created with the current setting, change the mode of the A/D converter module to the offset/gain setting mode and turn on 'User range write request' (YA). A module-specific backup parameter is created with the current setting of the flash memory.

■Precautions

If the creation of a module-specific backup parameter fails because the data memory of the control CPU does not have sufficient free space or the module-specific backup parameter is being used, a module-specific backup parameter creation error (error code: 17E1H) occurs.

Reading of module-specific backup parameters

To read a module-specific backup parameter and restore offset/gain values, set "Auto restore of Offset/gain setting with the module change" of the module parameter to "Enable" in advance.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting] ⇨ [Online module change]

■Reading timing

Module-specific backup parameters are read when a new module is mounted and recognized after the online module change. If the module is replaced with the programmable controller powered off, module-specific backup parameters are not read.

■Precautions

When the module-specific backup parameter for the target slot does not exist in an SD memory card or the data memory of the control CPU, the subsequent restoration of the offset/gain values is not performed. If the offset/gain values cannot be restored even though the module-specific backup parameter exists, a module-specific backup parameter restore error (error code: 17E0H) occurs.

Restoration of the offset/gain values of the user range

Upon the successful completion of reading module-specific backup parameters, the values are converted (restored) into the offset/gain values of the user range for the new module, and stored in the flash memory. At the same time, the module-specific backup parameter in the data memory of the control CPU is updated with the setting of the new module.

Restrictions on the module-specific backup parameter

The back up and restoration by means of module-specific backup parameters fails in the following cases.

- When the control CPU is not the process CPU
- When replacing the A/D converter module with the programmable controller powered off
- When "Auto restore of Offset/gain setting with the module change" of the module parameter is set to "Disable"

In any of the cases above, back up or restore offset/gain values by the following method.

☞ Page 76 When the module-specific backup parameter is not used

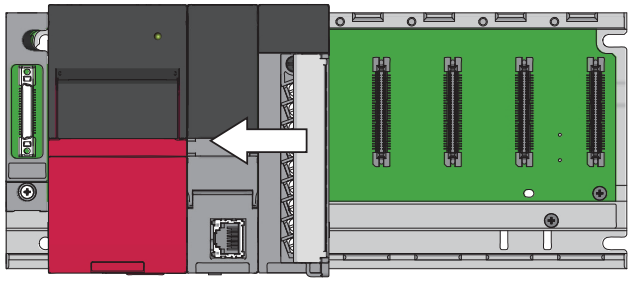
When the module-specific backup parameter is not used

Back up or restore offset/gain values by one of the following methods.

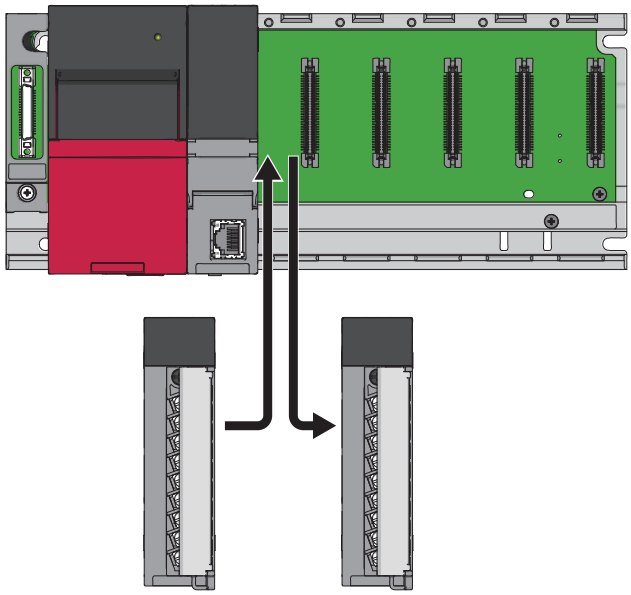
- Saving and restoring by dedicated instructions
- Saving and restoring by reading from and writing to the buffer memory

With the method above, offset/gain values can be restored to a new module, or the offset/gain values set in one module can be applied to the other modules in the same system.

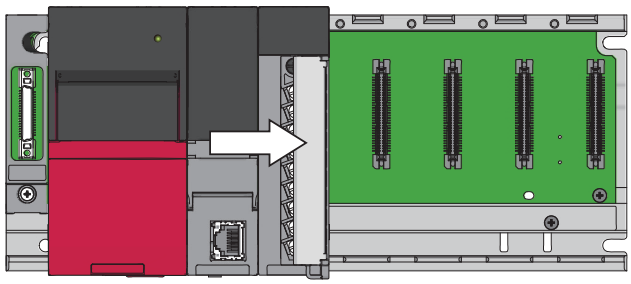
- To restore offset/gain values onto a new replaced module:



1. Save the offset/gain values.



2. Replace the A/D converter module.

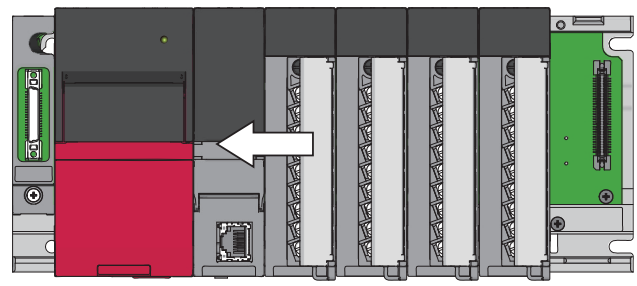


3. Restore the offset/gain values.

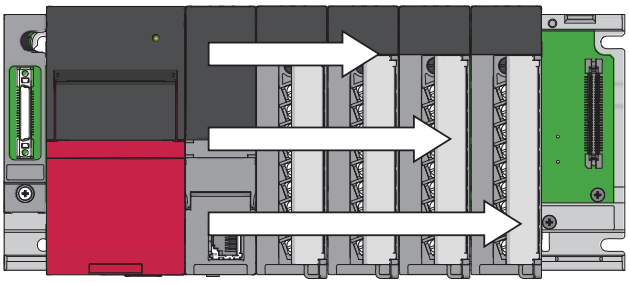
• To apply the offset/gain values set in one module to the other modules in the same system:

Ex.

When the offset/gain values in module No.1 are applied to modules No.2 to No.4



1. Save the offset/gain values of module No.1.



2. Apply the offset/gain values to modules No.2 to No.4.

Methods for saving and restoring offset/gain values

The offset/gain values can be saved and restored by the following two types of operations.

• Saving and restoring by dedicated instructions

• Saving and restoring by reading from and writing to the buffer memory

■Saving and restoring by dedicated instructions

Use the dedicated instruction G(P).OGLOAD to temporarily save the offset/gain values of the source A/D converter module to the internal device of the CPU, then use G(P).OGSTOR to write the values to the destination A/D converter module.

Prevent the saved offset/gain setting data from being deleted, by one of the following methods before replacing the modules:

• Use latch settings for the internal device of the destination module.

• Save the data onto an SD memory card. (To write data: use the SP.FWRITE instruction. To read data: use the SP.FREAD instruction.)

• Store the saved data.

For use of dedicated instructions, refer to the following.

MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks)

■Saving and restoring by reading from and writing to the buffer memory

Use Save data type setting, CH1 Factory default setting offset value (L) to CH8 User range setting gain value (H), and 'User range write request' (YA) to read the offset/gain values from the source A/D converter module. Use the buffer memory again to write the values to the destination A/D converter module.

The following describes the procedure for using the buffer memory.

• To restore offset/gain values onto a new replaced module:

When restoring offset/gain values onto the source A/D converter module	❶ Set Save data type setting. ❷ Turn on and off 'Operating condition setting request' (Y9). ❸ Save the stored values of Save data type setting and CH1 Factory default setting offset value (L) to CH8 User range setting gain value (H).
When the power of the module is off	❹ Replace the A/D converter module.
When restoring offset/gain values onto the destination A/D converter module	❺ Write the data saved in Save data type setting and CH1 Factory default setting offset value (L) to CH8 User range setting gain value (H). ❻ Turn on 'User range write request' (YA). ❼ Check that 'Offset/gain setting mode status flag' (XA) is on. ❽ Turn on and off 'User range write request (YA)'. ❾ Check whether the destination A/D converter module operates with the offset/gain values that are restored.

Point

When replacing modules, prevent the saved offset/gain setting data from being deleted, by one of the following methods before powering off the module.

- Use latch settings for the internal device of the destination module.
- Save the data onto an SD memory card. (To write data: use the SP.FWRITE instruction. To read data: use the SP.FREAD instruction.)
- Store the saved data.

• To apply the offset/gain values set in one module to the other modules in the same system:

When restoring offset/gain values onto the source A/D converter module	❶ Set Save data type setting. ❷ Turn on and off 'Operating condition setting request' (Y9). ❸ Save the stored values of Save data type setting and CH1 Factory default setting offset value (L) to CH8 User range setting gain value (H).
When restoring offset/gain values onto the destination A/D converter module	❹ Write the data saved in Save data type setting and CH1 Factory default setting offset value (L) to CH8 User range setting gain value (H). ❺ Turn on 'User range write request' (YA). ❻ Check that 'Offset/gain setting mode status flag' (XA) is on. ❼ Turn on and off 'User range write request (YA)'. ❽ Check whether the destination A/D converter module operates with the offset/gain values that are restored.

Range reference table

The following describes the range reference tables used for saving and restoring offset/gain values.

■Factory default setting

The following describes the buffer memory addresses of the factory default setting.

R60AD4: CH1 Factory default setting offset value (L) (Un\G4004) to CH4 Factory default setting gain value (H) (Un\G4019)

R60ADV8, R60ADI8: CH1 Factory default setting offset value (L) (Un\G4004) to CH8 Factory default setting gain value (H) (Un\G4035)

• For R60AD4

Address (decimal)				Description	Save data type setting*1	Analog value	Reference value (hexadecimal)
CH1	CH2	CH3	CH4				
4004 4005	4008 4009	4012 4013	4016 4017	Factory default setting offset value	Voltage specification	0V	800000H
					Current specification	0mA	800000H
4006 4007	4010 4011	4014 4015	4018 4019	Factory default setting gain value	Voltage specification	10V	B33333H
					Current specification	20mA	999999H

*1 The reference values differ depending on the setting of Save data type setting (Un\G4002) (voltage or current).

• For R60ADV8

Address (decimal)								Description	Analog value	Reference value (hexadecimal)
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8			
4004 4005	4008 4009	4012 4013	4016 4017	4020 4021	4024 4025	4028 4029	4032 4033	Factory default setting offset value	0V	800000H
4006 4007	4010 4011	4014 4015	4018 4019	4022 4023	4026 4027	4030 4031	4034 4035	Factory default setting gain value	10V	B33333H

• For R60ADI8

Address (decimal)								Description	Analog value	Reference value (hexadecimal)
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8			
4004 4005	4008 4009	4012 4013	4016 4017	4020 4021	4024 4025	4028 4029	4032 4033	Factory default setting offset value	0mA	800000H
4006 4007	4010 4011	4014 4015	4018 4019	4022 4023	4026 4027	4030 4031	4034 4035	Factory default setting gain value	20mA	999999H

■User range setting

The following describes the buffer memory addresses of the user range setting.

R60AD4: CH1 User range setting offset value (L) (Un\G4020) to CH4 User range setting gain value (H) (Un\G4035)

R60ADV8, R60ADI8: CH1 User range setting offset value (L) (Un\G4036) to CH8 User range setting gain value (H) (Un\G4067)

Offset/gain value		Reference value (hexadecimal)
Voltage	0V[*1]	800000H
	1V	851EB8H
	5V	999999H
	10V[*2]	B33333H
Current	0mA	800000H
	4mA[*3]	851EB8H
	20mA[*4]	999999H

*1 This value is stored in User range setting offset value by default of the R60ADV8.

*2 This value is stored in User range setting gain value by default of the R60ADV8.

*3 This value is stored in User range setting offset value by default of the R60AD4 or R60ADI8.

*4 This value is stored in User range setting gain value by default of the R60AD4 or R60ADI8.

1.18 Q Compatible Mode Function

This function controls an operation state with the buffer memory layout of the A/D converter module converted to equivalent one of the addresses of the compatible modules of the MELSEC-Q series.
This compatibility makes it possible to reuse sequence programs that have exhibited high performance on the A/D converter module of the MELSEC-Q series.
The following table lists the compatible modules of the MELSEC-Q series.

A/D converter module of the MELSEC iQ-R series	Compatible A/D converter module
R60AD4	Q64AD
R60ADV8	Q68ADV
R60ADI8	Q68ADI

Operation

Only the buffer memory assignment is changed in the Q compatible mode.

- The I/O signal assignment is the same as that of the R mode. Temperature drift correction flag (X1) of the MELSEC-Q series is deleted and High resolution mode status flag (X8) is changed to 'Alert output signal' (X8). However, the signals that change the module operation maintain the compatibility. Therefore, when the MELSEC-Q series program is diverted, a significant modification is not required.

Point

- When the MELSEC-Q series program is diverted, check digital output values and the operation timing and modify the program if necessary because the specifications such as the resolution and update timing are changed.
- When the MELSEC-Q series program is diverted and an error code is set as the operating condition or interlock condition, the program does not operate normally.
- When the Q compatible mode function is enabled, a program that uses FB or labels cannot be created. When FB or labels is used, create a program in the R mode.

Setting procedure

1. When adding a new module, select the module whose module name has "(Q)" at the end.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Right-click ⇨ [Add New Module]

2. Configure the same parameter setting as the one of when the R mode is used.

3. Restart the CPU module after the module parameter is written.

Point

- During the module operation, the mode cannot be switched between the R mode and Q compatible mode.
- The project of the compatible A/D converter module created by GX Works2 can be read with the other format read function of GX Works3. The read project keeps various settings of the compatible A/D converter module as the settings of the A/D converter module of the MELSEC iQ-R series. The settings to be kept are the switch setting, parameter setting, auto refresh setting, and I/O assignment.

2 PARAMETER SETTINGS

Set the parameters of each channel.
Setting parameters here eliminates the need to program them.

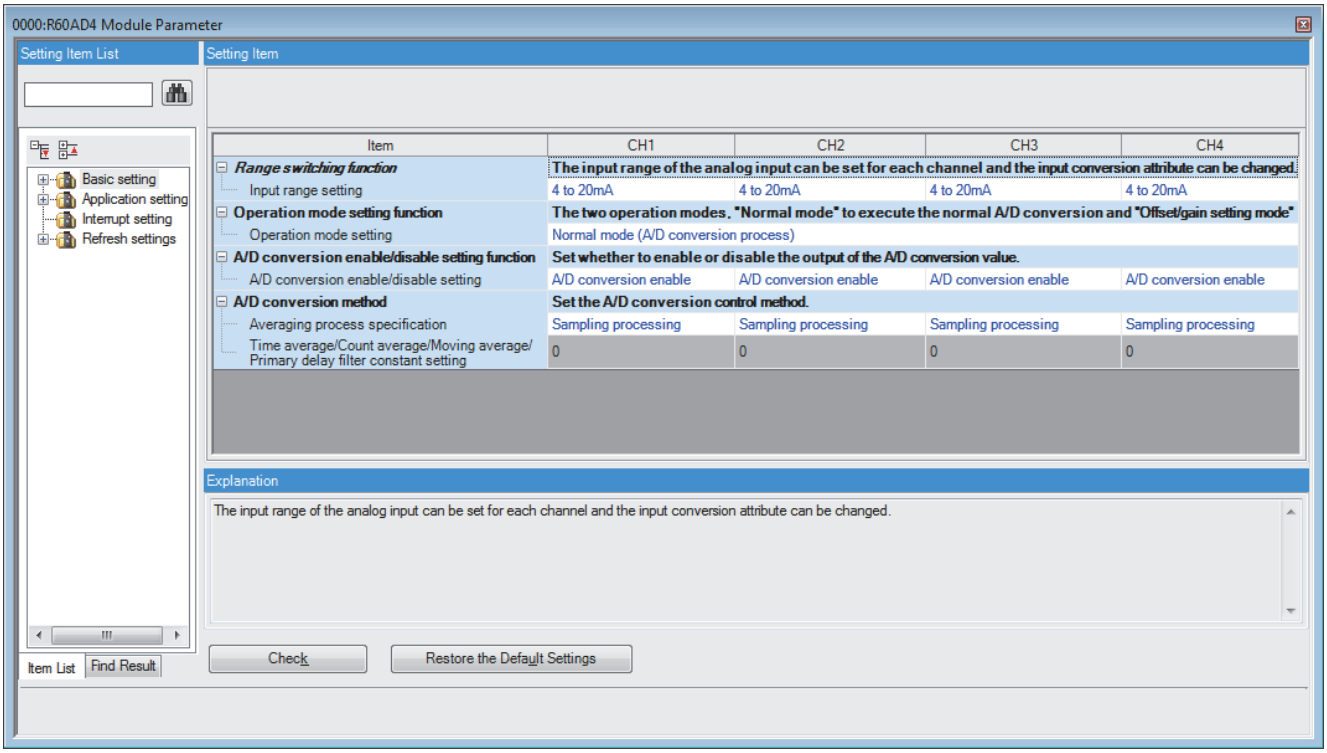
2.1 Basic Setting

Setting procedure

Open "Basic setting" of the engineering tool.

1. Start Module parameter.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Basic setting]



2. Click the item to be changed to enter the setting value.

• Item where a value is selected from the pull-down list

Click [▼] button of the item to be set, and from the pull-down list that appears, select the value.

• Item where a value is entered into the text box

Double-click the item to be set to enter the numeric value.

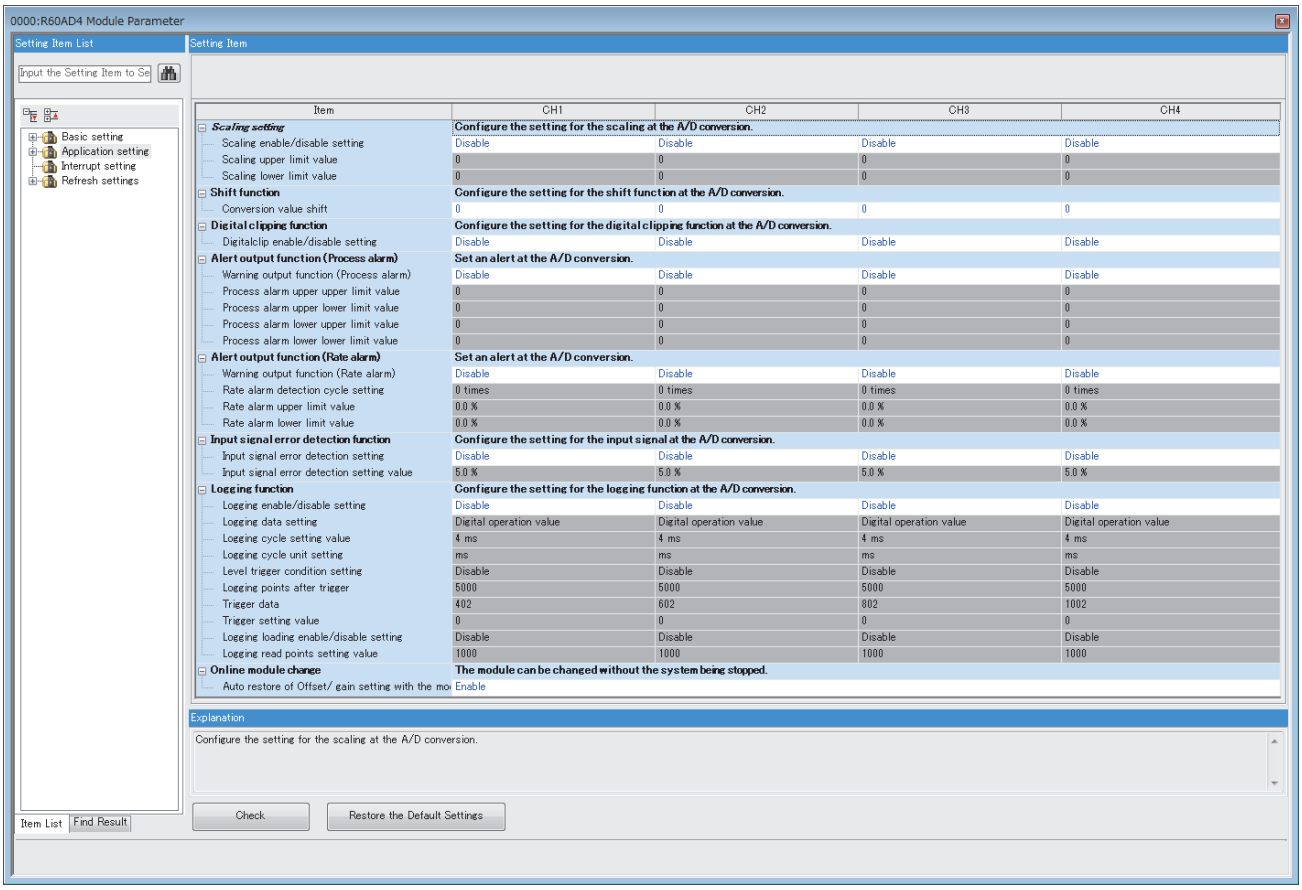
2.2 Application Setting

Setting procedure

Open "Application setting" of the engineering tool.

1. Start Module parameter.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Application setting]



2. Click the item to be changed to enter the setting value.

- Item where a value is selected from the pull-down list

Click [▼] button of the item to be set, and from the pull-down list that appears, select the value.

- Item where a value is entered into the text box

Double-click the item to be set to enter the numeric value.

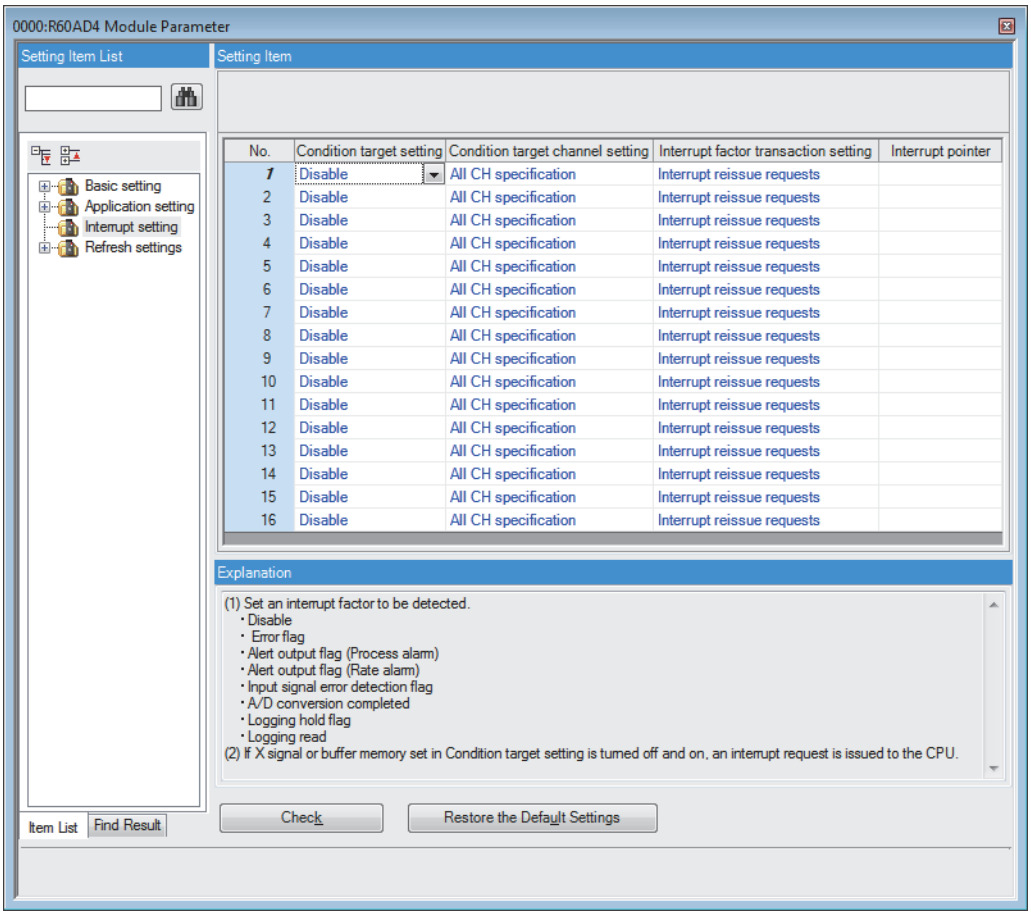
2.3 Interrupt Setting

Setting procedure

Open "Interrupt setting" of the engineering tool.

1. Start Module parameter.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Interrupt setting]



2. Click the interrupt setting number (No.1 to 16) to be changed to enter the setting value.

• Item where a value is selected from the pull-down list

Click [▼] button of the item to be set, and from the pull-down list that appears, select the value.

• Item where a value is entered into the text box

Double-click the item to be set to enter the numeric value.

2.4 Refresh Setting

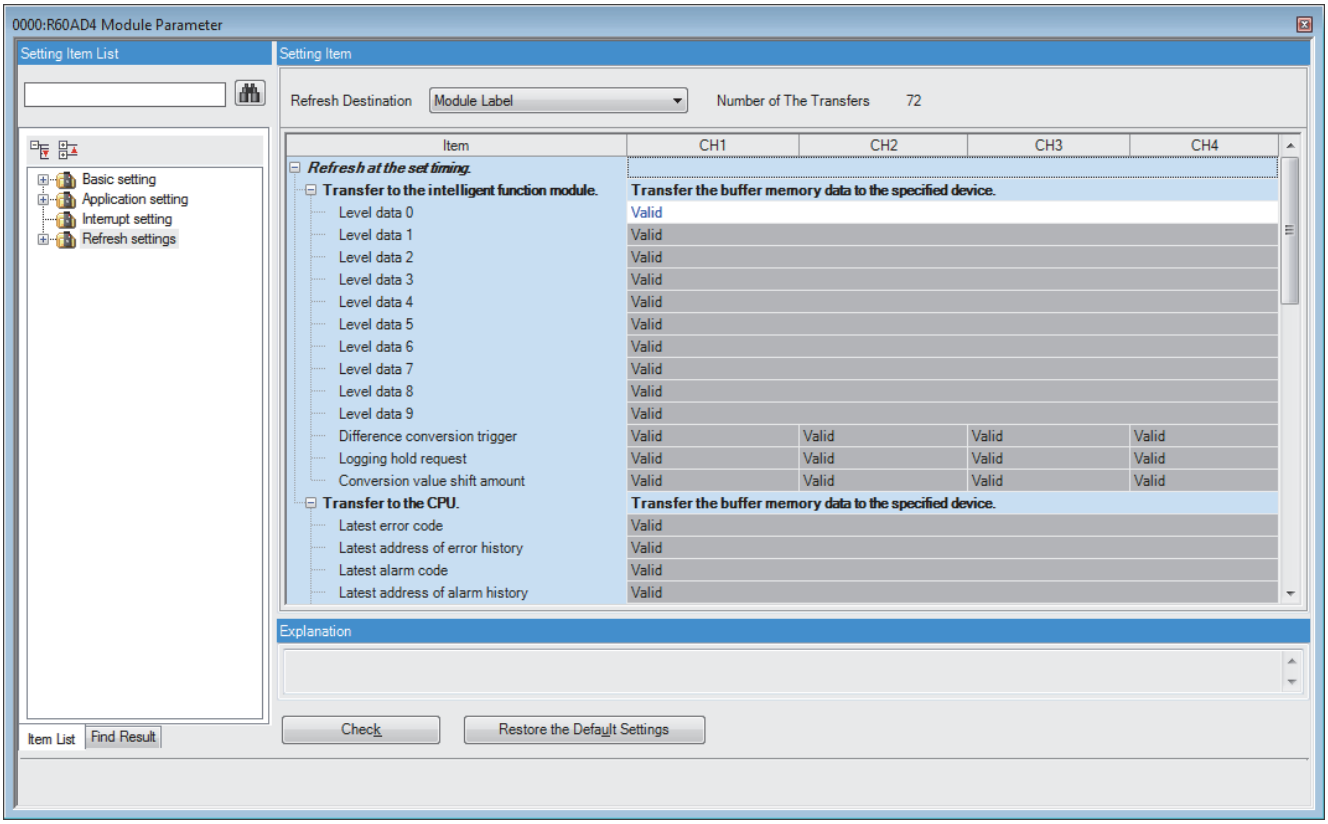
Setting procedure

Set the buffer memory area of the A/D converter module to be refreshed.

This refresh setting eliminates the need for reading/writing data by programming.

1. Start Module parameter.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter] ⇨ [Refresh setting]



2. Click "Target", and set the auto refresh destination.

• When "Refresh Destination" is "Module Label"

Set whether to enable or disable the refresh by setting "Level data 0" to Valid or Invalid.

• When "Refresh Destination" is "Refresh Data Register (RD)"

The transfer destinations of all items are automatically set by setting the start device to "Top Device Name".

• When "Refresh Destination" is "Specified Device"

Double-click the item to be set to enter the refresh destination device.

3. Click "Refresh Group" to set the timing to refresh.

Set "Refresh Group" to "At the Execution Time of END Instruction" or "At the Execution Time of Specified Program".

When "At the Execution Time of Specified Program" is set, double-click "Group [n] (n: 1-64)" and set a value of 1 to 64.

Point

- When the inter-module synchronization function is used and the refresh target is set to "Specified Device", the auto refresh destination device must be written into "Inter-module synchronous interrupt function".
- With refresh enabled, the value of the refresh destination takes effect at the timing of refresh which is set up by the engineering tool. As this happens, the buffer memory is overwritten with the value of the refresh destination. To change the value of a buffer memory area to be refreshed, change the value of module label or device at the refresh destination in the program.

Refresh processing time

A refresh processing time [μs] is a constituent of the scan time of the CPU module. For details on the scan time, refer to the following.

MELSEC iQ-R CPU Module User's Manual (Application)

The refresh processing time [μs], which is taken for refresh, is given by:

- Refresh processing time [μs] = Refresh read time (time for transferring refresh data to the CPU module) + Refresh write time (time for transferring refresh data to the intelligent function module)

The refresh read time and refresh write time vary depending on the settings of "Target".

With the inter-module synchronization function used, the refresh read time and refresh write time are also added to the execution time of an inter-module synchronous interrupt program.

When "Target" is "Module Label" or "Refresh Data Register (RD)"

The following table shows the refresh read time and refresh write time with an R□CPU used.

Model	Classification	When using the refresh settings	When using the inter-module synchronization function
R60AD4	Refresh read time	20.65μs	14.01μs
	Refresh write time	12.22μs	0μs
R60ADV8, R60ADI8	Refresh read time	26.57μs	14.41μs
	Refresh write time	14.66μs	0μs
R60AD4 (Q compatible mode)	Refresh read time	23.02μs	14.01μs
	Refresh write time	11.64μs	0μs
R60ADV8, R60ADI8 (Q compatible mode)	Refresh read time	24.02μs	14.41μs
	Refresh write time	11.76μs	0μs

When "Target" is "Device"

Calculate the refresh read time and refresh write time according to the number of items and the number of their transfer data (in units of word) that are set to be refreshed. For the calculation method, refer to the following.

MELSEC iQ-R CPU Module User's Manual (Application)

3 TROUBLESHOOTING

This chapter describes errors that may occur in the use of the A/D converter module and those troubleshooting.

3.1 Troubleshooting with the LEDs

Check the state of the LEDs to narrow down the possible causes of the trouble. This step is the first diagnostics before using the engineering tool.

A state of the A/D converter module can be checked with the RUN LED, ERR LED, and ALM LED. The following table shows the correspondence of these LEDs and a state of the A/D converter module.

Name	Description
RUN LED	Indicates the operating status of the module. On: Normal operation Flashing (1s cycles): In offset/gain setting mode Flashing (400ms cycles): Selected as a module for the online module change Off: 5V power supply interrupted, watchdog timer error occurred, or exchanging the module is allowed in the process of the online module change.
ERR LED	Indicates the error status of the module.*1 On: Error occurred Off: Normal operation
ALM LED	Indicates the alarm status of the module.*2 On: Alert (process alarm or rate alarm) issued Flashing: Input signal error detected Off: Normal operation

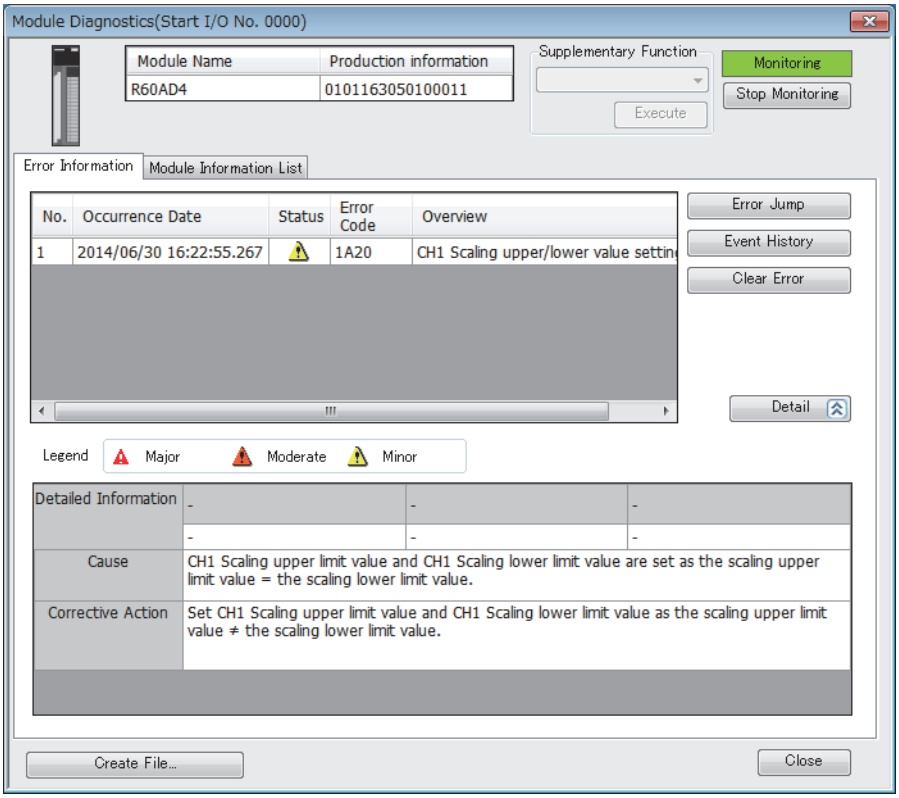
*1 For details, refer to the following.
☞ Page 91 List of Error Codes

*2 For details, refer to the following.
☞ Page 95 List of Alarm Codes

3.2 Checking the State of the Module

Open the module diagnostics window of the engineering tool to check the error codes (alarm codes) and error history of the A/D converter module.

[Diagnostics] ⇨ [System Monitor] ⇨ Right-click the module to be checked. ⇨ "Module Diagnostics"


Module Diagnostics(Start I/O No. 0000)
Module Name
Production information
R60AD4
0101163050100011
Supplementary Function
Execute
Monitoring
Stop Monitoring
Error Information
Module Information List
No.
Occurrence Date
Status
Error Code
Overview
1
2014/06/30 16:22:55.267
1A20
CH1 Scaling upper/lower value settin
Error Jump
Event History
Clear Error
Detail
Legend
Major
Moderate
Minor
Detailed Information
Cause
CH1 Scaling upper limit value and CH1 Scaling lower limit value are set as the scaling upper limit value = the scaling lower limit value.
Corrective Action
Set CH1 Scaling upper limit value and CH1 Scaling lower limit value as the scaling upper limit value ≠ the scaling lower limit value.
Create File...
Close

3.3 Troubleshooting by Symptom

When the RUN LED flashes or turns off

When flashing

Check item	Cause	Action
Check whether the module is in offset/gain setting mode.	In the module parameter setting of the engineering tool, the programmable controller power supply has been turned off and on, or the CPU has been reset when the operation mode is offset/gain setting mode.	In the module parameter setting of the engineering tool, set the operation mode to normal mode and turn off and on the programmable controller power supply, or reset the CPU.
	The G(P).OFFGAN instruction has been executed with the mode switched to offset/gain setting mode.	Review the program that uses the G(P).OFFGAN instruction to check whether the mode has been switched erroneously.
	The value in the mode switching setting has been changed and the mode has been switched to offset/gain setting mode.	Review the program that uses the mode switching setting to check whether the mode has been switched erroneously.

When turning off

Check item	Action
Check whether the power is supplied.	Check that the supply voltage of the power supply module is within the rated range.
Check whether the capacity of the power supply module is enough.	Calculate the current consumption of mounted modules, such as the CPU module, I/O modules, and intelligent function modules to check that the power capacity is enough.
Check whether the module is mounted properly.	Check the mounting state of the module.
Cases other than the above	Reset the programmable controller CPU, and check if the RUN LED turns on. If the RUN LED still remains off, the possible cause is a failure of the module. Please consult your local Mitsubishi representative.

When the ERR LED turns on

When turning on

Check item	Action
Check whether any error has occurred.	Check Latest error code and take actions described in the list of error codes. ☞ Page 91 List of Error Codes

When the ALM LED turns on or flashes

When turning on

Check item	Action
Check whether any alert has been issued.	Check Alert output flag (Process alarm upper limit), Alert output flag (Process alarm lower limit), Alert output flag (Rate alarm upper limit), and Alert output flag (Rate alarm lower limit). Take actions described in the list of alarm codes. ☞ Page 95 List of Alarm Codes

When flashing

Check item	Action
Check whether any input signal error has occurred.	Check Input signal error detection signal (XC) or Input signal error detection flag. Take actions described in the list of alarm codes. ☞ Page 95 List of Alarm Codes

When a digital output value cannot be read

Check item	Action
Check whether there is any problem with the wiring, such as looseness or disconnection of analog signal lines.	Identify the faulty area of signal lines by a visual check and continuity check.
Check whether the CPU module is in the STOP state.	Change the state of the CPU module to RUN.
Check whether the offset/gain setting is correct.	If the input range setting is the user range setting, turn on and off Operating condition setting request (Y9), check CH☐ User range setting offset value and CH☐ User range setting gain value comparing with the range reference table. If the stored values are not desired offset/gain values, perform the offset/gain setting again. For the range reference table, refer to the following. ☞ Page 78 Range reference table
Check whether the input range setting is correct.	Check CH☐ Range setting monitor using the engineering tool. If the input range is incorrect, correctly set the input range setting of the engineering tool and/or CH☐ Range setting.
Check whether A/D conversion disable is set in A/D conversion enable/disable setting of the channel where a value is to be input.	Check CH☐ A/D conversion enable/disable setting and set to A/D conversion enable using a sequence program or the engineering tool.
Check whether Operating condition setting request (Y9) has been executed.	Turn on and off Operating condition setting request (Y9)*1 and check that a digital output value is stored in CH☐ Digital output value. If the stored value is correct, further check the sequence program to verify the description of Operating condition setting request (Y9).
Check whether the terminals (V+) and (I+) are connected at the current input. (R60AD4 only)	For the current input of the R60AD4, be sure to connect the terminals (V+) and (I+) by referring to the external wiring example. 📖 MELSEC iQ-R Analog-Digital Converter Module User's Manual (Startup)
Check whether the setting value of the time average is correct when the time average is selected in Averaging process specification.	When the time average is selected for processing, set the time average value in CH☐ Time average/Count average/Moving average/Primary delay filter constant setting so that the value satisfies the following condition: Time average value ≥ 4 (times) × 80μs × The number of conversion enabled channels If the condition above is not satisfied, the digital output value results in 0.
Check whether there is any potential difference between the AG terminal and the external device GND.	A potential difference may occur between the AG terminal and the external device GND by a cause such as a long wiring distance, resulting in an incorrect A/D conversion. Connect the AG terminal and the external device GND to eliminate the potential difference.
Check whether external devices to be connected at each channel share the same GND.	If the external device GND is shared across channels, noise can sneak in between channels, which may cause some error in A/D conversion. Connect the AG terminal and the external device GND to eliminate the errors.
Check whether the program for reading digital output values has an error.	Check CH☐ Digital output value using the engineering tool. If the digital output value is stored without being converted from the analog input value, review and correct the read program.
Check whether the refresh setting is correct.	If the refresh is set so that the value in CH☐ Digital output value is transferred to the device of the CPU module, review and correct the auto refresh setting.
Check whether any input signal error has occurred.	The digital output value and digital operation value are not updated during the occurrence of an input signal error. If Input signal error detection flag indicates an input signal error, check the values in CH☐ Input signal error detection setting and CH☐ Input signal error detection setting value to examine the validity of the input signal error detection upper limit value and the input signal error detection lower limit value. ☞ Page 40 Input Signal Error Detection Function If the values are valid, change the analog input value so that an input signal error does not occur.

*1 If Operating condition setting request (Y9) is in an on state, A/D conversion does not start. In such a case, turn off and on it to check the off state of Operating condition setting completed flag (X9), and then be sure to turn on and off it.

Point

If digital output values cannot be read even after the above actions are taken, the possible cause is a failure of the module. Please consult your local Mitsubishi representative.

When the digital output value does not fall within the range of accuracy

Check item	Action
Check whether any measures have been taken to reduce noise.	To reduce noise, take measures such as the use of shielded cables for connection.

When the synchronization latch digital operation value does not change

Check item		Action
Checking the system parameter settings of GX Works3	Check whether the module is selected as the target module to be synchronized.	Check the synchronization status monitor. If the monitor status is "0: No Synchronous Target between Modules", the module is not selected as the target module to be synchronized. Set the module as the target to be synchronized in the system parameter settings of GX Works3.
Checking the module parameter settings of GX Works3	Check whether the operation mode setting is correct.	Check that Offset/gain setting mode flag (XA) is off, and the operation mode setting is normal mode. If the operation mode setting is not normal mode (A/D conversion processing), set to normal mode in the module parameter setting of GX Works3.
Checking the operating status of the CPU module	Check whether the operation switch indicates the STOP state or stop error.	Set the operation switch to RUN. For the stop error, take actions described in the list of error codes. ☞ Page 91 List of Error Codes
Checking the program	Check whether A/D conversion disable is set in CH□ A/D conversion enable/disable setting of the channel where a value is to be input.	Check CH□ A/D conversion enable/disable setting to set to A/D conversion enable.
	Check whether Operating condition setting request (Y9) has been executed.	Turn on and off Operating condition setting request (Y9) to enable the parameter setting of the functions.
	Check whether the inter-module synchronous interrupt program (I44) is prepared.	When obtaining the synchronization latch digital operation value, run the inter-module synchronous interrupt program to refresh the value.
	Check whether the EI instruction has been executed.	To run the inter-module synchronous interrupt program, execute the EI instruction in the program.

3.4 List of Error Codes

If an error occurs during operation, the A/D converter module stores the error code into Latest error code of the buffer memory. In addition, Error flag (XF) turns on. Turning on Error clear request (YF) allows clearing of the error code of Latest error code, where Error flag (XF) turns off.

Error codes of the A/D converter module are classified in minor errors or moderate errors.

- Minor error: This error is caused by the setting failure of programs and parameters. The A/D conversion continues with the parameter setting before the change. (1000H to 1FFFH)
- Moderate error: Hardware failures and errors at the execution of the inter-module synchronization function are included. The A/D conversion do not continue. (2000H to 2FFFH, 3000H to 3FFFH)

The following table lists the error codes that may be stored.

□: This symbol indicates the number of the channel where an error has occurred. A numerical value of 0 to 7 is used to correspond to CH1 to 8.

(CH1: 0, CH2: 1, CH3: 2, CH4: 3, CH5: 4, CH6: 5, CH7: 6, CH8: 7)

△: For what this symbol indicates, refer to Description and cause of error.

Error code	Error name	Description and cause	Action
0000H	—	There is no error.	—
1080H	Number of writes to offset/gain settings reach limit error	The number of the offset/gain settings has exceeded the guaranteed maximum number.	Any further setting of offset/gain values may not be reflected correctly.
17E0H	Module-specific backup parameter restore error	Offset/gain values cannot be restored with the module-specific backup parameter.	The module-specific backup parameter file may be damaged. Readjust the user range.
17E1H	Module-specific backup parameter creation error	The module-specific backup parameter has not been created.	Check the free space on the data memory of the control CPU and the SD memory card, and recreate a module-specific backup parameter. For how to create module-specific backup parameters, refer to the following. ☞ Page 74 Backing up, Saving, and Restoring Offset/Gain Values
180△H	Interrupt factor generation setting range error	A value other than 0 to 1 is set in Interrupt factor generation setting [n]. △ indicates the interrupt setting related in the error as below: 0: Setting 1 to F: Setting 16	Set Interrupt factor generation setting [n] to 0 or 1.
181△H	Condition target setting range error	A value other than 0 to 7 is set in Condition target setting [n]. △ indicates the interrupt setting related in the error as below: 0: Setting 1 to F: Setting 16	Set Condition target setting [n] to 0 to 7.
182△H	Condition target channel setting range error	A value other than 0 to 8 is set in Condition target channel setting [n] (for R60AD4, a value other than 0 to 4). △ indicates the interrupt setting related in the error as below: 0: Setting 1 to F: Setting 16	Set Condition target channel setting [n] to 0 to 8 (for R60AD4, 0 to 4).
1860H	G(P).OGSTOR instruction execution error in offset/gain setting mode	The G(P).OGSTOR instruction has been executed in offset/gain setting mode.	Do not execute the G(P).OGSTOR instruction in the offset/gain setting mode.
1861H	Offset/gain setting continuous write occurrence error	The G(P).OGSTOR instruction has been executed continuously or a setting value has been continuously written to the flash memory 26 times or more in the offset/gain setting.	For the G(P).OGSTOR instruction, execute it only once per module. For the offset/gain setting, write the setting value only once per setting.
1862H	Model mismatch error at the execution of OGSTOR	The G(P).OGSTOR instruction has been executed on a module different from the one on which the G(P).OGLOAD instruction was executed. The G(P).OGSTOR instruction has been executed ahead of the G(P).OGLOAD instruction.	Execute the G(P).OGLOAD and G(P).OGSTOR instructions on the same module. As the other way, execute the G(P).OGLOAD instruction on the module whose data is to be restored, and then execute the G(P).OGSTOR instruction on the module to which the data is to be restored.

Error code	Error name	Description and cause	Action
190□H	Range setting range error	A value out of the range is set in CH□ Range setting.	Set CH□ Range setting to the following values: R60AD4: 0 to 5, A, B, F (hexadecimal) R60ADV8: 0, 2 to 5, B, F (hexadecimal) R60ADI8: 0, 1, A, F (hexadecimal)
191□H	Averaging process specification setting range error	A value other than 0 to 4 is set in CH□ Averaging process specification.	Set CH□ Averaging process specification to 0 to 4.
192□H	Time average setting range error	When the time average is selected in CH□ Averaging process specification, CH□ Time average/Count average/Moving average/Primary delay filter constant setting is set to the following value: When the number of channels used is 1 to 6: any value other than 2 to 5000 When the number of channels used is 7 to 8: any value other than 3 to 5000	Set CH□ Time average/Count average/Moving average/Primary delay filter constant setting to the following value: When the number of channels used is 1 to 6: 2 to 5000 When the number of channels used is 7 to 8: 3 to 5000
193□H	Count average setting range error	When the count average is selected in CH□ Averaging process specification, a value other than 4 to 62500 is set in CH□ Time average/Count average/Moving average/Primary delay filter constant setting.	Set CH□ Time average/Count average/Moving average/Primary delay filter constant setting to 4 to 62500.
194□H	Moving average setting range error	When the moving average is selected in CH□ Averaging process specification, a value other than 2 to 1000 is set in CH□ Time average/Count average/Moving average/Primary delay filter constant setting.	Set CH□ Time average/Count average/Moving average/Primary delay filter constant setting to 2 to 1000.
195□H	Primary delay filter constant setting range error	When the primary delay filter is selected in CH□ Averaging process specification, a value other than 1 to 500 is set in CH□ Time average/Count average/ Moving average/Primary delay filter constant setting.	Set CH□ Time average/Count average/Moving average/Primary delay filter constant setting to 1 to 500.
1A0□H	Scaling enable/disable setting range error	A value other than 0 and 1 is set in CH□ Scaling enable/disable setting.	Set CH□ Scaling enable/disable setting to 0 or 1.
1A1□H	Scaling setting range error	A value other than -32000 to 32000 is set in CH□ Scaling lower limit value and/or CH□ Scaling upper limit value.	Set CH□ Scaling lower limit value and CH□ Scaling upper limit value to -32000 to 32000.
1A2□H	Scaling upper/lower limit value setting error	CH□ Scaling upper limit value and CH□ Scaling lower limit value are set as the scaling upper limit value = the scaling lower limit value.	Set CH□ Scaling upper limit value and CH□ Scaling lower limit value as the scaling upper limit value ≠ the scaling lower limit value.
1A5□H	Digital clipping enable/ disable setting range error	A value other than 0 and 1 is set in CH□ Digital clipping enable/disable setting.	Set CH□ Digital clipping enable/disable setting to 0 or 1.
1A7□H	Difference conversion trigger setting range error	A value other than 0 and 1 is set in CH□ Difference conversion trigger.	Set CH□ Difference conversion trigger to 0 or 1.
1B0□H	Alert output setting (Process alarm) range error	A value other than 0 and 1 is set in CH□ Alert output setting (Process alarm).	Set CH□ Alert output setting (Process alarm) to 0 or 1.
1B△□H	Process alarm upper lower limit value setting range error	The values set in CH□ Process alarm upper upper limit value to CH□ Process alarm lower lower limit value do not satisfy the following condition: Upper upper limit value ≥ Upper lower limit value ≥ Lower upper limit value ≥ Lower lower limit value △ indicates that the set values are as follows: 1: Process alarm lower lower limit value > Process alarm lower upper limit value 2: Process alarm lower upper limit value > Process alarm upper lower limit value 3: Process alarm upper lower limit value > Process alarm upper upper limit value	Set CH□ Process alarm upper upper limit value to CH□ Process alarm lower lower limit value so that the values satisfy the following condition: Upper upper limit value ≥ Upper lower limit value ≥ Lower upper limit value ≥ Lower lower limit value
1B8□H	Alert output setting (Rate alarm range error)	A value other than 0 and 1 is set in CH□ Alert output setting (Rate alarm).	Set CH□ Alert output setting (Rate alarm) to 0 or 1.
1B9□H	Rate alarm alert detection cycle setting range error	A value other than 1 to 32000 is set in CH□ Rate alarm alert detection cycle setting.	Set CH□ Rate alarm alert detection cycle setting to 1 to 32000.
1BA□H	Rate alarm upper/lower limit setting value inversion error	CH□ Rate alarm upper limit value and CH□ Rate alarm lower limit value are set as Lower limit value ≥ Upper limit value.	Set CH□ Rate alarm upper limit value and CH□ Rate alarm lower limit value as Lower limit value < Upper limit value.
1C0□H	Input signal error detection setting range error	A value other than 0 to 4 is set in CH□ Input signal error detection setting.	Set CH□ Input signal error detection setting value to 0 to 4.

Error code	Error name	Description and cause	Action
1C1☐H	Input signal error detection setting value range error	A value other than 0 to 250 is set in CH☐ Input signal error detection setting.	Set CH☐ Input signal error detection setting value to 0 to 250.
1C6☐H	Disconnection detection enabled range setting range error	Simple disconnection detection is set in CH☐ Input signal error detection setting, and the value set in CH☐ Input range setting is other than the following: • 4 to 20mA (extended mode) • 1 to 5V (extended mode)	For channels for simple disconnection detection using the input signal error detection function, set CH☐ Input range setting to either of the following: • 4 to 20mA (extended mode) • 1 to 5V (extended mode)
1D0☐H	Logging enable/disable setting range error	A value other than 0 and 1 is set in CH☐ Logging enable/disable setting.	Set CH☐ Logging enable/disable setting to 0 or 1.
1D1☐H	Logging cycle setting value range error	A value out of the range is set in CH☐ Logging cycle setting value and/or CH☐ Logging cycle unit setting.	Set one or both of CH☐ Logging cycle setting value and CH☐ Logging cycle unit setting to the values within the range.
1D2☐H	Logging cycle setting disable error	CH☐ Logging cycle setting value and CH☐ Logging cycle unit setting are set so that the set logging cycle falls below the conversion cycle.	Set CH☐ Logging cycle setting value and CH☐ Logging cycle unit setting so that the logging cycle is not less than the conversion cycle of the object to be logged.
1D3☐H	Logging data setting range error	A value other than 0 and 1 is set in CH☐ Logging data setting.	Set CH☐ Logging data setting to 0 or 1.
1D4☐H	Post-trigger logging points setting range error	A value other than 1 to 10000 is set in CH☐ Post-trigger logging points.	Set CH☐ Post-trigger logging points to 1 to 10000.
1D5☐H	Level trigger condition setting range error	A value other than 0 to 3 is set in CH☐ Level trigger condition setting.	Set CH☐ Level trigger condition setting to 0 to 3.
1D6☐H	Trigger data setting range error	A value other than 0 to 9999 is set in CH☐ Trigger data.	Set CH☐ Trigger data to 0 to 9999.
1D7☐H	Logging hold request range error	A value other than 0 and 1 is set in CH☐ Logging hold request.	Set CH☐ Logging hold request to 0 or 1.
1D8☐H	Loading interrupt enable/ disable setting range error	A value other than 0 and 1 is set in CH☐ Loading interrupt enable/disable setting.	Set CH☐ Loading interrupt enable/disable setting to 0 or 1.
1D9☐H	Logging read points setting value range error	A value other than 10 to 10000 is set in CH☐ Logging read points setting value.	Set CH☐ Logging read points setting value to 10 to 10000.
1E50H	Offset/gain setting channel specification error	In the offset/gain setting, "1: Setting channel" is set for both CH☐ Offset/gain setting mode (offset specification) and CH☐ Offset/gain setting mode (gain specification), or "0: Disable" is set.	Correctly set CH☐ Offset/gain setting mode (offset specification) and CH☐ Offset/gain setting mode (gain specification).
1E51H	User range data invalid (CH identification disabled)	An invalid value is set in the offset/gain setting. The number of the channel in which this error occurs cannot be identified.	Perform the offset/gain setting again for all channels where the user range is set. If the error occurs again, the possible cause is a failure of the module. Please consult your local Mitsubishi representative.
1E6☐H	User range data invalid (CH identification enabled, the range setting of the CH where the error occurred is User range)	An invalid value is set in CH☐ Offset/gain setting.	Perform the offset/gain setting again for the channels where the error has occurred. If the error occurs again, the possible cause is a failure of the module. Please consult your local Mitsubishi representative.
1E7☐H	Offset/gain value inversion error	The offset value and gain value to be saved in the flash memory are as follows: Offset value ≥ Gain value	Perform the offset/gain setting again so that the following condition is satisfied: Offset value < Gain value
1E8☐H	Offset/gain setting channel range error	A value other than 0 and 1 is set in CH☐ Offset/gain setting mode (offset specification) and CH☐ Offset/ gain setting mode (gain specification).	Set CH☐ Offset/gain setting mode (offset specification) and CH☐ Offset/gain setting mode (gain specification) to 0 or 1.
1EA0H	Synchronous cycle time setting enable lower limit shorter error	The sampling cycle is longer than the value in the inter-module synchronization cycle setting in the system parameters.	Set a long cycle for the inter-module synchronization cycle setting in the system parameters, and/or disable the conversion of the A/D conversion enabled channels that are not used so that the following condition is satisfied: Inter-module synchronization cycle setting > Run time of the inter-module synchronous interrupt program + Sampling cycle

Error code	Error name	Description and cause	Action
1EA1H	Inter-module synchronization selection offset/gain setting error	Synchronization output mode is set and offset/gain setting mode is set for the operation mode setting. As the other cause, a mode switching program has been executed during synchronization output mode	When using synchronization output mode, select normal mode (A/D conversion processing) for the operation mode setting. When performing the offset/gain setting, set the module as a synchronization non-target in the system parameters. In addition, do not execute a mode switching program during synchronization output mode.
1F00H	Hardware failure (minor)	A hardware failure (minor) has occurred in the module.	The module may be affected by noise. Review and adjust the cable wiring and the installation environment of the programmable controllers. After the adjustment, turn on and off Error clear request (YF) to eliminate this error and resume the conversion. If the error occurs again, the possible cause is a failure of the module. Please consult your local Mitsubishi representative.
2610H	Inter-module synchronization signal error	Synchronization loss is detected with the inter-module synchronization function operating.	The module may be affected by noise. Review and adjust the cable wiring and the installation environment of the programmable controllers, and restart the system. If the error reoccurs even after the adjustment, the possible cause is a failure of the module. Please consult your local Mitsubishi representative.
3001H	Hardware failure (moderate)	A hardware failure (moderate) has occurred in the module.	Power off and on the module. If the error occurs again, the possible cause is a failure of the module. Please consult your local Mitsubishi representative.
3030H	Flash memory error	The data in the flash memory is abnormal.	Check the digital output values. If the values are abnormal, please consult your local Mitsubishi representative.

3.5 List of Alarm Codes

If an alarm occurs during operation, the A/D converter module stores the alarm code into Latest alarm code of the buffer memory. Turning on Error clear request (YF) allows clearing of the alarm code of Latest alarm code.
The following table lists the alarm codes that may be stored.
☐: This symbol indicates the number of the channel where an alarm has occurred (0: CH1, 1: CH2, 2: CH3, 3: CH4, 4: CH5, 5: CH6, 6: CH7, 7: CH8).

Alarm code	Alarm name	Description and cause	Action
080☐H	Process alarm (upper limit)	The process alarm (upper limit) has occurred in CH☐.	Adjust CH☐ Digital operation value to fall within the range. As a result, the corresponding bit of CH☐ Alert output flag (Process alarm upper limit) and/or CH☐ Alert output flag (Process alarm lower limit), and Alert output signal (X8) turn off automatically.
081☐H	Process alarm (lower limit)	The process alarm (lower limit) has occurred in CH☐.	
082☐H	Rate alarm (upper limit)	The rate alarm (upper limit) has occurred in CH☐.	Adjust the change rate in CH☐ Digital output value to fall within the range. As a result, the corresponding bit of CH☐ Alert output flag (Rate alarm upper limit) or CH☐ Alert output flag (Rate alarm lower limit), and Alert output signal (X8) turn off automatically.
083☐H	Rate alarm (lower limit)	The rate alarm (lower limit) has occurred in CH☐.	
090☐H	Input signal error detection (upper limit)	An input signal error (upper limit) has been detected in CH☐.	Adjust the analog input value to fall within the range, and then turn on and off Error clear request (YF). As a result, the corresponding bit of CH ☐ Input signal error detection flag and Input signal error detection signal (XC) turn off.
091☐H	Input signal error detection (lower limit)	An input signal error (lower limit) has been detected in CH☐.	
0A0☐H	Input signal error detection (disconnection)	An input signal error (disconnection) has been detected in CH☐.	
0D00H	Inter-module synchronization mode switching request error	A mode switching request has been issued for a target module to be synchronized.	Target modules to be synchronized cannot shift to offset/gain setting mode. When performing the offset/gain setting, set the module as a synchronization non-target in the system parameters, and switch to normal mode (A/D conversion processing) to shift offset/gain setting mode. Turn on and off Error clear request (YF) to clear the alarm.

APPENDICES

Appendix 1 Module Label

The functions of the A/D converter module can be set by using module labels.

Module labels of I/O signals

The module label name of an I/O signal is defined with the following structure:
"Module name"_"Module number".b"Label name" or "Module name"_"Module number".b"Label name"_D

Ex.
R60AD_1.bModuleREADY_D

■Module name
The character string of a module model name is given.

■Module number
A number starting from 1 is added to identify modules that have the same module name.

■Label name
The label identifier unique to a module is given.

■_D
This string indicates that the module label is for the direct access input (DX) or direct access output (DY). A module label without the string is for the input (X) or output (Y) of the refresh processing.

Module labels of buffer memory areas

The module label name of a buffer memory area is defined with the following structure:
"Module name"_"Module number"."Data type"_D["(Channel)"]."Data format""Label name"_D

Ex.
R60AD_1.stnMonitor_D[0].wDigitalOutputValue_D

■Module name
The character string of a module model name is given.

■Module number
A number starting from 1 is added to identify modules that have the same module name.

■Data type
The data type to sort a buffer memory area is given. Each data type is as follows:

Data type	Description
stnMonitor	Monitor
stnControl	Control
stnSetting	Setting
stnSynchronous	Synchronization

■Channel
The channel number corresponding to a module label is given. A numerical value of 0 to 7 is used to correspond to CH1 to 8.
(CH1: 0, CH2: 1, CH3: 2, CH4: 3, CH5: 4, CH6: 5, CH7: 6, CH8: 7)

■Data format

The string that represents the data size of a buffer memory area is given. Each data format is as follows:

Data format	Description
u	Word [Unsigned]/Bit string [16-bit]
w	Word [Signed]

■Label name

The label identifier unique to a module is given.

■_D

This string indicates that the module label is for the direct access. A module label without the string is for the auto refresh. The following table shows the differences between the auto refresh and direct access.

Type	Description	Access timing	Example
Auto refresh	Values that are read from or written to the module label are reflected in the module collectively at the auto refresh. The run time of the program can be reduced. To use the auto refresh, set "Target" to "Module Label" in "Refresh settings" of "Module Parameter".	At auto refresh	R60AD_1.stnMonitor[0].wDigitalOutputValue
Direct access	Values that are read from or written to the module label is reflected in the module instantly. Compared with the auto refresh, the run time of the program becomes longer. However, the responsiveness is high.	At reading/writing from/to the module label	R60AD_1.stnMonitor_D[0].wDigitalOutputValue_D

Appendix 2 I/O Signals

List of I/O signals

The following table lists the I/O signals of the A/D converter module.
For details on the I/O signals, refer to the following.
☞ Page 99 Details of input signals
☞ Page 105 Details of output signals

Point

- The I/O number (X/Y) described below shows the case that the start I/O number of the A/D converter module is set to "0".
- Do not use the "Use prohibited" signals shown below because the system uses them. If users use (turn off and on) the signals, the functions of the A/D converter module cannot be guaranteed.

Input signal

Device number	Signal name
X0	Module READY
X1 to X7	Use prohibited
X8	Alert output signal
X9	Operating condition setting completed flag
XA	Offset/gain setting mode status flag
XB	Channel change completed flag
XC	Input signal error detection signal
XD	Maximum value/minimum value reset completed flag
XE	A/D conversion completed flag
XF	Error flag

Output signal

Device number	Signal name
Y0 to Y8	Use prohibited
Y9	Operating condition setting request
YA	User range write request
YB	Channel change request
YC	Use prohibited
YD	Maximum value/minimum value reset request
YE	Use prohibited
YF	Error clear request

Details of input signals

The following describes the details of the input signals for the A/D converter module which are assigned to the CPU module. The I/O numbers (X/Y) described in Appendix 2 are for the case when the start I/O number of the A/D converter module is set to 0.

Point

This section describes buffer memory addresses for CH1.
For details on the buffer memory addresses after CH2, refer to the following.
☞ Page 107 List of buffer memory addresses

Module READY

Module READY (X0) turns on to indicate the preparation for the A/D conversion is completed after the power-on or after the reset operation of the CPU module, and the A/D conversion is performed.
In the following cases, 'Module READY' (X0) turns off.

- In the offset/gain setting mode (In this case, the A/D conversion is performed.)
- When a watchdog timer error occurs in the A/D converter module (In this case, the A/D conversion is not performed.)

■Device number

The following shows the device number of this input signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Module READY	X0							

Alert output signal

'Alert output signal' (X8) turns on when the process alarm or rate alarm has been detected. When the alert output function is disabled for all channels, 'Alert output signal' (X8) always turns off.

■Device number

The following shows the device number of this input signal.

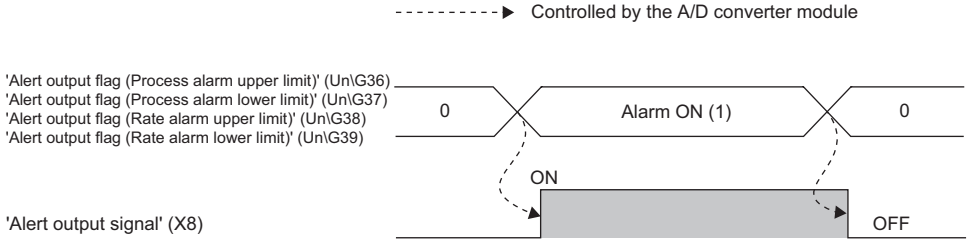
Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Alert output signal	X8							

■Process alarm

- Alert output signal (X8) turns on when digital operation values of the A/D conversion enabled channels exceed the ranges set for 'CH1 Process alarm upper upper limit value' (Un\G514) to 'CH1 Process alarm lower lower limit value' (Un\G520) after the alert output setting (process alarm) is enabled. The ALM LED also turns on along with the on of the signal.
- Alert output signal (X8) turns off when the digital operation values fall within the setting range for all the A/D conversion enabled channels. The ALM LED also turns off along with the off of the signal.

■Rate alarm

- Alert output signal (X8) turns on when the change rate of digital output values of the A/D conversion enabled channels exceed the ranges set for 'CH1 Rate alarm upper limit value' (Un\G524) to 'CH1 Rate alarm lower limit value' (Un\G526) after the alert output setting (rate alarm) is enabled. The ALM LED also turns on along with the on of the signal.
- Alert output signal (X8) turns off when the change rate of the digital output values falls within the setting range for all the A/D conversion enabled channels. The ALM LED also turns off along with the off of the signal.



Operating condition setting completed flag

■Device number

The following shows the device number of this input signal.

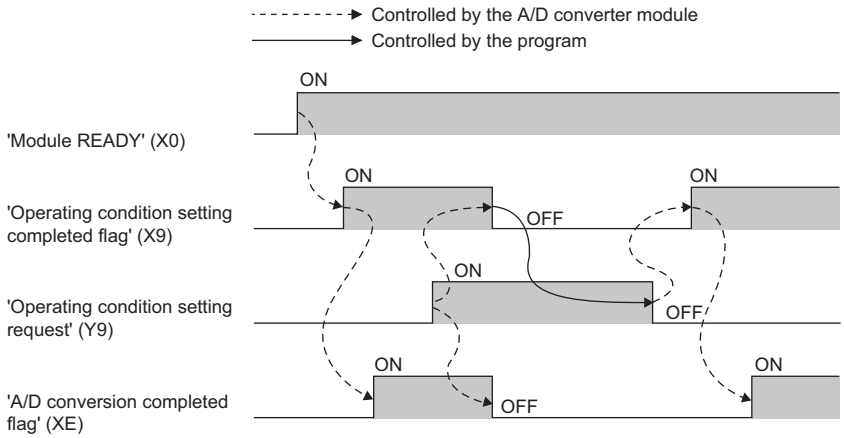
Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Operating condition setting completed flag	X9							

When changing values of the buffer memory, use Operating condition setting completed flag (X9) as an interlock condition to turn on and off 'Operating condition setting request' (Y9). For the buffer memory addresses which require turning on and off of 'Operating condition setting request' (Y9) to enable the changed values, refer to the following.

☞ Page 107 List of buffer memory addresses

When 'Operating condition setting completed flag' (X9) is off, the A/D conversion is not performed.

When 'Operating condition setting request' (Y9) is on, 'Operating condition setting completed flag' (X9) turns off.



Offset/gain setting mode status flag

■Device number

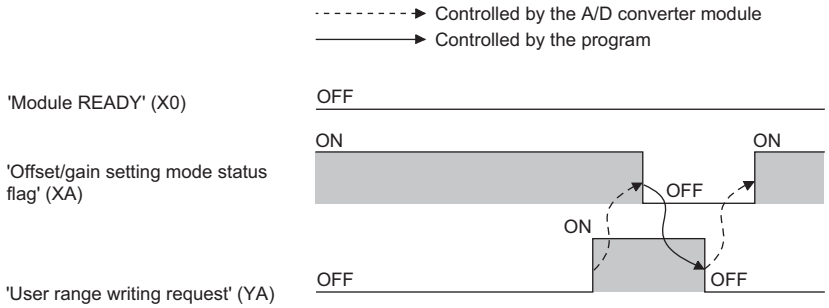
The following shows the device number of this input signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Offset/gain setting mode status flag	XA							

■In the offset/gain setting mode

When registering the value, which has been adjusted with the offset/gain setting, use Offset/gain setting mode status flag (XA) as an interlock condition to turn on and off 'User range write request' (YA). For the offset/gain setting, refer to the following.

MELSEC iQ-R Analog-Digital Converter Module User's Manual (Startup)

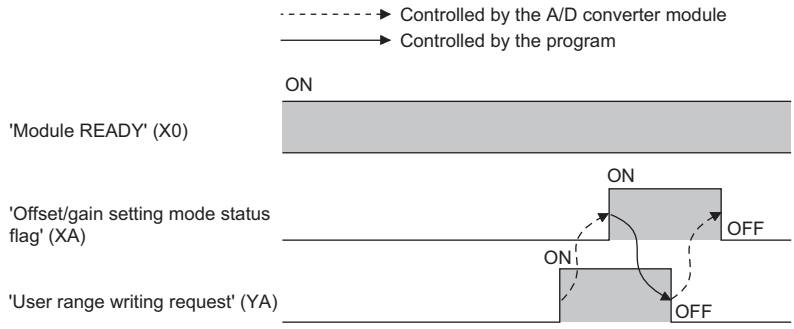


■In the normal mode

In the user range setting restoration, use Offset/gain setting mode status flag (XA) as an interlock condition to turn on and off 'User range write request' (YA).

For user range setting restoration, refer to the following.

☞ Page 74 Backing up, Saving, and Restoring Offset/Gain Values



A

Channel change completed flag

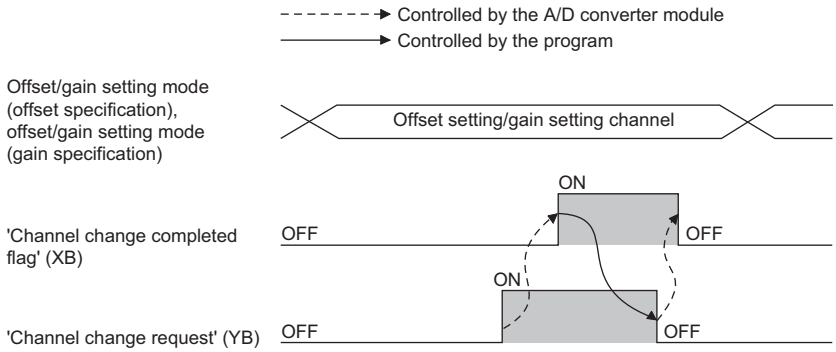
When changing a channel to perform the offset/gain setting, use Channel change completed flag (XB) as an interlock condition to turn on and off 'Channel change request' (YB).

When the offset/gain setting is configured from the offset/gain setting window of an engineering tool, the setting is performed properly on the window. Therefore, a program is not required to perform the setting.

To configure the offset/gain setting creating a program, use this flag.

For details, refer to the following.

Analog-Digital Converter Module User's Manual



■Device number

The following shows the device number of this input signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Channel change completed flag	XB							

Input signal error detection signal

■Device number

The following shows the device number of this input signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Input signal error detection signal	XC							

■Turning on Input signal error detection signal (XC)

Input signal error detection signal (XC) turns on when an analog input value exceeds the range set with 'CH1 Input signal error detection setting value' (Un\G529) in any channel which has been A/D conversion-enabled, after the detection condition is set in 'CH1 Input signal error detection setting' (Un\G528). When the simple disconnection detection is set, the signal ignores the setting for 'CH1 Input signal error detection setting value' (Un\G529) is ignored and turns on at the disconnection detection.

When Input signal error detection signal (XC) turns on, the following operations are performed.

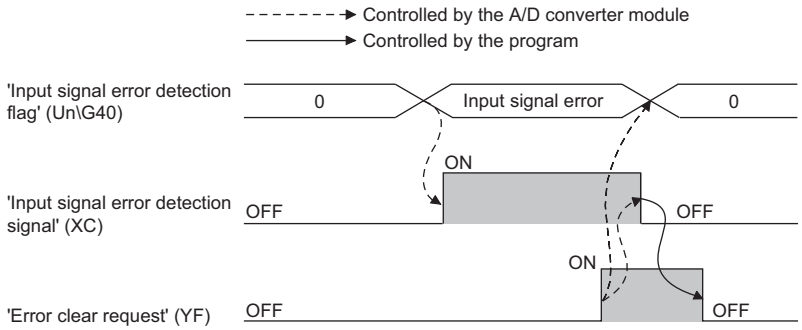
- 'CH1 Digital output value' (Un\G400) and 'CH1 Digital operation value' (Un\G402) hold the digital value just before the error was detected.
- The ALM LED flashes.

■Turning off Input signal error detection signal (XC)

'Input signal error detection signal' (XC) turns off by turning on and off 'Error clear request' (YF) after the analog input value returns to the setting range.

When 'Input signal error detection signal' (XC) turns off, the following operations are performed.

- The ALM LED turns off.
- 'Latest alarm code' (Un\G2) is cleared.



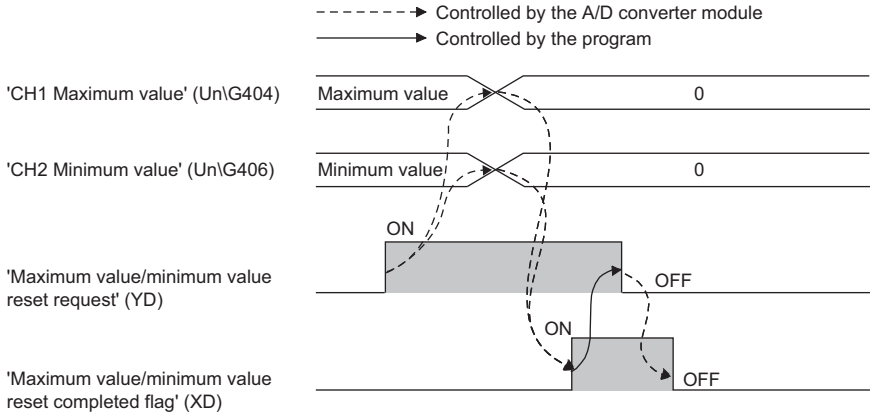
Point

- Averaging processing starts over after the A/D conversion resumes.
- 'Input signal error detection signal' (XC) operates only when the input signal error detection function is enabled. When the input signal error detection function is disabled, 'Input signal error detection signal' (XC) always turns off.

A

Maximum value/minimum value reset completed flag

Maximum value/minimum value reset completed flag (XD) turns on after the maximum and minimum values stored in 'CH1 Maximum value' (Un\G404) and 'CH1 Minimum value' (Un\G406) are reset by turning on and off 'Maximum value/minimum value reset request' (YD).



■Device number

The following shows the device number of this input signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Maximum value/minimum value reset completed flag	XD							

A/D conversion completed flag

A/D conversion completed flag (XE) turns on when all conversion enabled channels are converted.

■Device number

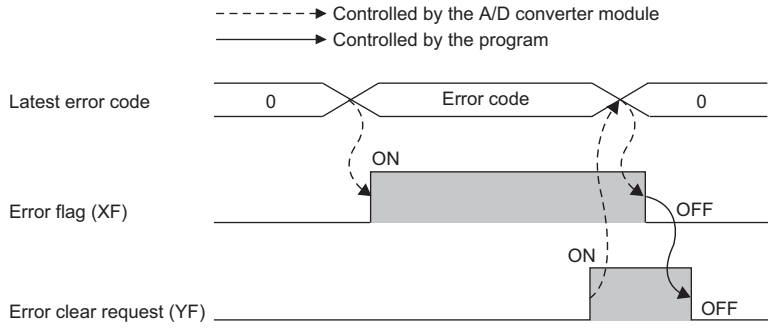
The following shows the device number of this input signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
A/D conversion completed flag	XE							

Error flag

'Error flag' (XF) turns on when an error occurs.

Turn on and off 'Error clear request' (YF) to clear 'Latest error code' (Un\G0) and 'Latest alarm code' (Un\G2).



■Device number

The following shows the device number of this input signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Error flag	XF							

Details of output signals

The following describes the details of the output signals for the A/D converter module which are assigned to the CPU module. The I/O numbers (X/Y) described in Appendix 2 are for the case when the start I/O number of the A/D converter module is set to 0.

Point

This section describes buffer memory addresses for CH1.
For details on the buffer memory addresses after CH2, refer to the following.
☞ Page 107 List of buffer memory addresses

Operating condition setting request

Turn on and off Operating condition setting request (Y9) to enable the setting of the A/D converter module.
For the timing of turning the signal on and off, refer to the following.
☞ Page 100 Operating condition setting completed flag
For details on the buffer memory areas to be enabled, refer to the following.
☞ Page 107 List of buffer memory addresses

■Device number

The following shows the device number of this output signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Operating condition setting request	Y9							

User range write request

■Device number

The following shows the device number of this output signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
User range write request	YA							

■In the offset/gain setting mode

Turn on and off User range write request (YA) to register values adjusted with the offset/gain setting in the A/D converter module. The data is written to the flash memory when this signal is turned off and on.
For the timing of turning the signal on and off, refer to the following.
☞ Page 101 In the offset/gain setting mode

■In the normal mode

Turn on and off User range write request (YA) to restore the user range.
For the timing of turning the signal on and off, refer to the following.
☞ Page 101 In the normal mode

Channel change request

Turn on and off Channel change request (YB) to change a channel to perform the offset/gain setting.
For the timing of turning the signal on and off, refer to the following.
☞ Page 102 Channel change completed flag

■Device number

The following shows the device number of this output signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Channel change request	YB							

Maximum value/minimum value reset request

Turn on and off 'Maximum value/minimum value reset request' (YD) to clear the maximum and minimum values stored in 'CH1 Maximum value' (Un\G404) and 'CH1 Minimum value' (Un\G406).

For the timing of turning the signal on and off, refer to the following.

☞ Page 104 Maximum value/minimum value reset completed flag

■Device number

The following shows the device number of this output signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Maximum value/minimum value reset request	YD							

Error clear request

Turn on and off Error clear request (YF) to clear 'Error flag' (XF), 'Input signal error detection signal' (XC), 'Latest error code' (Un\G0), and 'Latest alarm code' (Un\G2). For the timing of turning the signal on and off, refer to the following.

☞ Page 103 Input signal error detection signal

☞ Page 104 Error flag

■Device number

The following shows the device number of this output signal.

Signal name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Error clear request	YF							

Appendix 3 Buffer Memory Areas

List of buffer memory addresses

The following table lists the buffer memory addresses of the A/D converter module. For details on the buffer memory addresses, refer to the following.

☞ Page 121 Details of buffer memory addresses

Point

Do not write data to the system areas and areas whose data types are monitor in the buffer memory. Writing data into these areas can cause the malfunction of the module.

In R mode

■Un\G0 to Un\G399

Address (decimal)	Address (hexadecimal)	Name	Default value	Data type	Auto refresh	Enabled by Y9*1
0	0H	Latest error code	0	Monitor	○	—
1	1H	Latest address of error history	0	Monitor	○	—
2	2H	Latest alarm code	0	Monitor	○	—
3	3H	Latest address of alarm history	0	Monitor	○	—
4 to 19	4H to 13H	Interrupt factor detection flag [n]*2	0	Monitor	○	—
20 to 35	14H to 23H	System area	—	—	—	—
36	24H	Alert output flag (Process alarm upper limit)	0000H	Monitor	○	—
37	25H	Alert output flag (Process alarm lower limit)	0000H	Monitor	○	—
38	26H	Alert output flag (Rate alarm upper limit)	0000H	Monitor	○	—
39	27H	Alert output flag (Rate alarm lower limit)	0000H	Monitor	○	—
40	28H	Input signal error detection flag	0000H	Monitor	○	—
41	29H	System area	0000H	—	—	—
42	2AH	A/D conversion completed flag	0000H	Monitor	○	—
43 to 89	2BH to 59H	System area	—	—	—	—
90	5AH	Level data 0	0	Control	○	—
91	5BH	Level data 1	0	Control	○	—
92	5CH	Level data 2	0	Control	○	—
93	5DH	Level data 3	0	Control	○	—
94	5EH	Level data 4	0	Control	○	—
95	5FH	Level data 5	0	Control	○	—
96	60H	Level data 6	0	Control	○	—
97	61H	Level data 7	0	Control	○	—
98	62H	Level data 8	0	Control	○	—
99	63H	Level data 9	0	Control	○	—
100 to 123	64H to 7BH	System area	—	—	—	—
124 to 139	7CH to 8BH	Interrupt factor mask [n]*2	0	Control	×	—
140 to 155	8CH to 9BH	System area	—	—	—	—
156 to 171	9CH to ABH	Interrupt factor reset request [n]*2	0	Control	×	—
172 to 199	ACH to C7H	System area	—	—	—	—
200 to 215	C8H to D7H	Interrupt factor generation setting [n]*2	0	Setting	×	○
216 to 231	D8H to E7H	System area	—	—	—	—
232 to 247	E8H to F7H	Condition target setting [n]*2	0	Setting	×	○
248 to 263	F8H to 107H	System area	—	—	—	—
264 to 279	108H to 117H	Condition target channel setting [n]*2	0	Setting	×	○
280 to 295	118H to 127H	System area	—	—	—	—
296, 297	128H, 129H	Mode switching setting	0	Setting	×	○
298 to 399	130H to 18FH	System area	—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)
*2 [n] in the table indicates an interrupt setting number. (n = 1 to 16)

■Un\G400 to Un\G3599

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9[*1]
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
400 (190H)	600 (258H)	800 (320H)	1000 (3E8H)	1200 (4B0H)	1400 (578H)	1600 (640H)	1800 (708H)	CH□ Digital output value	0	Monitor	○	—
401 (191H)	601 (259H)	801 (321H)	1001 (3E9H)	1201 (4B1H)	1401 (579H)	1601 (641H)	1801 (709H)	System area	—	—	—	—
402 (192H)	602 (25AH)	802 (322H)	1002 (3EAH)	1202 (4B2H)	1402 (57AH)	1602 (642H)	1802 (70AH)	CH□ Digital operation value	0	Monitor	○	—
403 (193H)	603 (25BH)	803 (323H)	1003 (3EBH)	1203 (4B3H)	1403 (57BH)	1603 (643H)	1803 (70BH)	System area	—	—	—	—
404 (194H)	604 (25CH)	804 (324H)	1004 (3ECH)	1204 (4B4H)	1404 (57CH)	1604 (644H)	1804 (70CH)	CH□ Maximum value	0	Monitor	○	—
405 (195H)	605 (25DH)	805 (325H)	1005 (3EDH)	1205 (4B5H)	1405 (57DH)	1605 (645H)	1805 (70DH)	System area	—	—	—	—
406 (196H)	606 (25EH)	806 (326H)	1006 (3EEH)	1206 (4B6H)	1406 (57EH)	1606 (646H)	1806 (70EH)	CH□ Minimum value	0	Monitor	○	—
407 (197H)	607 (25FH)	807 (327H)	1007 (3EFH)	1207 (4B7H)	1407 (57FH)	1607 (647H)	1807 (70FH)	System area	—	—	—	—
408 (198H)	608 (260H)	808 (328H)	1008 (3F0H)	1208 (4B8H)	1408 (580H)	1608 (648H)	1808 (710H)	CH□ Difference conversion status flag	0	Monitor	○	—
409 (199H)	609 (261H)	809 (329H)	1009 (3F1H)	1209 (4B9H)	1409 (581H)	1609 (649H)	1809 (711H)	CH□ Logging hold flag	0	Monitor	○	—
410 to 429 (19AH to 1ADH)	610 to 629 (262H to 275H)	810 to 829 (32AH to 33DH)	1010 to 1029 (3F2H to 405H)	1210 to 1229 (4BAH to 4CDH)	1410 to 1429 (582H to 595H)	1610 to 1629 (64AH to 65DH)	1810 to 1829 (712H to 725H)	System area	—	—	—	—
430 (1AEH)	630 (276H)	830 (33EH)	1030 (406H)	1230 (4CEH)	1430 (596H)	1630 (65EH)	1830 (726H)	CH□ Range setting monitor	0000H[*2] 0005H	Monitor	×	—
431 (1AFH)	631 (277H)	831 (33FH)	1031 (407H)	1231 (4CFH)	1431 (597H)	1631 (65FH)	1831 (727H)	System area	—	—	—	—
432 (1B0H)	632 (278H)	832 (340H)	1032 (408H)	1232 (4D0H)	1432 (598H)	1632 (660H)	1832 (728H)	CH□ Difference conversion reference value	0000H	Monitor	×	—
433 (1B1H)	633 (279H)	833 (341H)	1033 (409H)	1233 (4D1H)	1433 (599H)	1633 (661H)	1833 (729H)	System area	—	—	—	—
434 (1B2H)	634 (27AH)	834 (342H)	1034 (40AH)	1234 (4D2H)	1434 (59AH)	1634 (662H)	1834 (72AH)	CH□ Head pointer	0	Monitor	×	—
435 (1B3H)	635 (27BH)	835 (343H)	1035 (40BH)	1235 (4D3H)	1435 (59BH)	1635 (663H)	1835 (72BH)	CH□ Latest pointer	0	Monitor	×	—
436 (1B4H)	636 (27CH)	836 (344H)	1036 (40CH)	1236 (4D4H)	1436 (59CH)	1636 (664H)	1836 (72CH)	CH□ Number of logging data	0	Monitor	×	—
437 (1B5H)	637 (27DH)	837 (345H)	1037 (40DH)	1237 (4D5H)	1437 (59DH)	1637 (665H)	1837 (72DH)	CH□ Trigger pointer	0	Monitor	×	—
438 (1B6H)	638 (27EH)	838 (346H)	1038 (40EH)	1238 (4D6H)	1438 (59EH)	1638 (666H)	1838 (72EH)	CH□ Current logging read pointer	-1	Monitor	×	—
439 (1B7H)	639 (27FH)	839 (347H)	1039 (40FH)	1239 (4D7H)	1439 (59FH)	1639 (667H)	1839 (72FH)	CH□ Previous logging read pointer	-1	Monitor	×	—
440 (1B8H)	640 (280H)	840 (348H)	1040 (410H)	1240 (4D8H)	1440 (5A0H)	1640 (668H)	1840 (730H)	CH□ Logging read points monitor value	0	Monitor	×	—
441 (1B9H)	641 (281H)	841 (349H)	1041 (411H)	1241 (4D9H)	1441 (5A1H)	1641 (669H)	1841 (731H)	CH□ Logging cycle monitor value (s)	0	Monitor	×	—
442 (1BAH)	642 (282H)	842 (34AH)	1042 (412H)	1242 (4DAH)	1442 (5A2H)	1642 (66AH)	1842 (732H)	CH□ Logging cycle monitor value (ms)	0	Monitor	×	—
443 (1BBH)	643 (283H)	843 (34BH)	1043 (413H)	1243 (4DBH)	1443 (5A3H)	1643 (66BH)	1843 (733H)	CH□ Logging cycle monitor value (μs)	0	Monitor	×	—
444 (1BCH)	644 (284H)	844 (34CH)	1044 (414H)	1244 (4DCH)	1444 (5A4H)	1644 (66CH)	1844 (734H)	CH□ Trigger generation time (First/Last two digits of the year)	0	Monitor	×	—

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9[*1]
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
445 (1BDH)	645 (285H)	845 (34DH)	1045 (415H)	1245 (4DDH)	1445 (5A5H)	1645 (66DH)	1845 (735H)	CH□ Trigger generation time (Month/Day)	0	Monitor	×	—
446 (1BEH)	646 (286H)	846 (34EH)	1046 (416H)	1246 (4DEH)	1446 (5A6H)	1646 (66EH)	1846 (736H)	CH□ Trigger generation time (Hour/Minute)	0	Monitor	×	—
447 (1BFH)	647 (287H)	847 (34FH)	1047 (417H)	1247 (4DFH)	1447 (5A7H)	1647 (66FH)	1847 (737H)	CH□ Trigger generation time (Second/Day of the week)	0	Monitor	×	—
448 (1C0H)	648 (288H)	848 (350H)	1048 (418H)	1248 (4E0H)	1448 (5A8H)	1648 (670H)	1848 (738H)	CH□ Trigger generation time (Millisecond)	0	Monitor	×	—
449 to 469 (1C1H to 1D5H)	649 to 669 (289H to 29DH)	849 to 869 (351H to 365H)	1049 to 1069 (419H to 42DH)	1249 to 1269 (4E1H to 4F5H)	1449 to 1469 (5A9H to 5BDH)	1649 to 1669 (671H to 685H)	1849 to 1869 (739H to 74DH)	System area	—	—	—	—
470 (1D6H)	670 (29EH)	870 (366H)	1070 (42EH)	1270 (4F6H)	1470 (5BEH)	1670 (686H)	1870 (74EH)	CH□ Difference conversion trigger	0	Control	○	—
471 (1D7H)	671 (29FH)	871 (367H)	1071 (42FH)	1271 (4F7H)	1471 (5BFH)	1671 (687H)	1871 (74FH)	CH□ Logging hold request	0	Control	○	—
472 (1D8H)	672 (2A0H)	872 (368H)	1072 (430H)	1272 (4F8H)	1472 (5C0H)	1672 (688H)	1872 (750H)	CH□ Conversion value shift amount	0	Control	○	—
473 to 499 (1D9H to 1F3H)	673 to 699 (2A1H to 2BBH)	873 to 899 (369H to 383H)	1073 to 1099 (431H to 44BH)	1273 to 1299 (4F9H to 513H)	1473 to 1499 (5C1H to 5DBH)	1673 to 1699 (689H to 6A3H)	1873 to 1899 (751H to 76BH)	System area	—	—	—	—
500 (1F4H)	700 (2BCH)	900 (384H)	1100 (44CH)	1300 (514H)	1500 (5DCH)	1700 (6A4H)	1900 (76CH)	CH□ A/D conversion enable/disable setting	0	Setting	×	○
501 (1F5H)	701 (2BDH)	901 (385H)	1101 (44DH)	1301 (515H)	1501 (5DDH)	1701 (6A5H)	1901 (76DH)	CH□ Averaging process specification	0	Setting	×	○
502 (1F6H)	702 (2BEH)	902 (386H)	1102 (44EH)	1302 (516H)	1502 (5DEH)	1702 (6A6H)	1902 (76EH)	CH□ Time average/Count average/Moving average/ Primary delay filter constant setting	0	Setting	×	○
503 (1F7H)	703 (2BFH)	903 (387H)	1103 (44FH)	1303 (517H)	1503 (5DFH)	1703 (6A7H)	1903 (76FH)	System area	—	—	—	—
504 (1F8H)	704 (2C0H)	904 (388H)	1104 (450H)	1304 (518H)	1504 (5E0H)	1704 (6A8H)	1904 (770H)	CH□ Scaling enable/ disable setting	1	Setting	×	○
505 (1F9H)	705 (2C1H)	905 (389H)	1105 (451H)	1305 (519H)	1505 (5E1H)	1705 (6A9H)	1905 (771H)	System area	—	—	—	—
506 (1FAH)	706 (2C2H)	906 (38AH)	1106 (452H)	1306 (51AH)	1506 (5E2H)	1706 (6AAH)	1906 (772H)	CH□ Scaling upper limit value	0	Setting	×	○
507 (1FBH)	707 (2C3H)	907 (38BH)	1107 (453H)	1307 (51BH)	1507 (5E3H)	1707 (6ABH)	1907 (773H)	System area	—	—	—	—
508 (1FCH)	708 (2C4H)	908 (38CH)	1108 (454H)	1308 (51CH)	1508 (5E4H)	1708 (6ACH)	1908 (774H)	CH□ Scaling lower limit value	0	Setting	×	○
509 (1FDH)	709 (2C5H)	909 (38DH)	1109 (455H)	1309 (51DH)	1509 (5E5H)	1709 (6ADH)	1909 (775H)	System area	—	—	—	—
510 (1FEH)	710 (2C6H)	910 (38EH)	1110 (456H)	1310 (51EH)	1510 (5E6H)	1710 (6AEH)	1910 (776H)	CH□ Digital clipping enable/disable setting	1	Setting	×	○
511 (1FFH)	711 (2C7H)	911 (38FH)	1111 (457H)	1311 (51FH)	1511 (5E7H)	1711 (6AFH)	1911 (777H)	System area	—	—	—	—
512 (200H)	712 (2C8H)	912 (390H)	1112 (458H)	1312 (520H)	1512 (5E8H)	1712 (6B0H)	1912 (778H)	CH□ Alert output setting (Process alarm)	1	Setting	×	○
513 (201H)	713 (2C9H)	913 (391H)	1113 (459H)	1313 (521H)	1513 (5E9H)	1713 (6B1H)	1913 (779H)	CH□ Alert output setting (Rate alarm)	1	Setting	×	○
514 (202H)	714 (2CAH)	914 (392H)	1114 (45AH)	1314 (522H)	1514 (5EAH)	1714 (6B2H)	1914 (77AH)	CH□ Process alarm upper upper limit value	0	Setting	×	○
515 (203H)	715 (2CBH)	915 (393H)	1115 (45BH)	1315 (523H)	1515 (5EBH)	1715 (6B3H)	1915 (77BH)	System area	—	—	—	—

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9[*1]
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
516 (204H)	716 (2CCH)	916 (394H)	1116 (45CH)	1316 (524H)	1516 (5ECH)	1716 (6B4H)	1916 (77CH)	CH□ Process alarm upper lower limit value	0	Setting	×	○
517 (205H)	717 (2CDH)	917 (395H)	1117 (45DH)	1317 (525H)	1517 (5EDH)	1717 (6B5H)	1917 (77DH)	System area	—	—	—	—
518 (206H)	718 (2CEH)	918 (396H)	1118 (45EH)	1318 (526H)	1518 (5EEH)	1718 (6B6H)	1918 (77EH)	CH□ Process alarm lower upper limit value	0	Setting	×	○
519 (207H)	719 (2CFH)	919 (397H)	1119 (45FH)	1319 (527H)	1519 (5EFH)	1719 (6B7H)	1919 (77FH)	System area	—	—	—	—
520 (208H)	720 (2D0H)	920 (398H)	1120 (460H)	1320 (528H)	1520 (5F0H)	1720 (6B8H)	1920 (780H)	CH□ Process alarm lower lower limit value	0	Setting	×	○
521 (209H)	721 (2D1H)	921 (399H)	1121 (461H)	1321 (529H)	1521 (5F1H)	1721 (6B9H)	1921 (781H)	System area	—	—	—	—
522 (20AH)	722 (2D2H)	922 (39AH)	1122 (462H)	1322 (52AH)	1522 (5F2H)	1722 (6BAH)	1922 (782H)	CH□ Rate alarm alert detection cycle setting	0	Setting	×	○
523 (20BH)	723 (2D3H)	923 (39BH)	1123 (463H)	1323 (52BH)	1523 (5F3H)	1723 (6BBH)	1923 (783H)	System area	—	—	—	—
524 (20CH)	724 (2D4H)	924 (39CH)	1124 (464H)	1324 (52CH)	1524 (5F4H)	1724 (6BCH)	1924 (784H)	CH□ Rate alarm upper limit value	0	Setting	×	○
525 (20DH)	725 (2D5H)	925 (39DH)	1125 (465H)	1325 (52DH)	1525 (5F5H)	1725 (6BDH)	1925 (785H)	System area	—	—	—	—
526 (20EH)	726 (2D6H)	926 (39EH)	1126 (466H)	1326 (52EH)	1526 (5F6H)	1726 (6BEH)	1926 (786H)	CH□ Rate alarm lower limit value	0	Setting	×	○
527 (20FH)	727 (2D7H)	927 (39FH)	1127 (467H)	1327 (52FH)	1527 (5F7H)	1727 (6BFH)	1927 (787H)	System area	—	—	—	—
528 (210H)	728 (2D8H)	928 (3A0H)	1128 (468H)	1328 (530H)	1528 (5F8H)	1728 (6C0H)	1928 (788H)	CH□ Input signal error detection setting	0	Setting	×	○
529 (211H)	729 (2D9H)	929 (3A1H)	1129 (469H)	1329 (531H)	1529 (5F9H)	1729 (6C1H)	1929 (789H)	CH□ Input signal error detection setting value	50	Setting	×	○
530 to 534 (212H to 216H)	730 to 734 (2DAH to 2DEH)	930 to 934 (3A2H to 3A6H)	1130 to 1134 (46AH to 46EH)	1330 to 1334 (532H to 536H)	1530 to 1534 (5FAH to 5FEH)	1730 to 1734 (6C2H to 6C6H)	1930 to 1934 (78AH to 78EH)	System area	—	—	—	—
535 (217H)	735 (2DFH)	935 (3A7H)	1135 (46FH)	1335 (537H)	1535 (5FFH)	1735 (6C7H)	1935 (78FH)	CH□ Logging enable/ disable setting	1	Setting	×	○
536 (218H)	736 (2E0H)	936 (3A8H)	1136 (470H)	1336 (538H)	1536 (600H)	1736 (6C8H)	1936 (790H)	CH□ Logging data setting	1	Setting	×	○
537 (219H)	737 (2E1H)	937 (3A9H)	1137 (471H)	1337 (539H)	1537 (601H)	1737 (6C9H)	1937 (791H)	CH□ Logging cycle setting value	4	Setting	×	○
538 (21AH)	738 (2E2H)	938 (3AAH)	1138 (472H)	1338 (53AH)	1538 (602H)	1738 (6CAH)	1938 (792H)	CH□ Logging cycle unit setting	1	Setting	×	○
539 (21BH)	739 (2E3H)	939 (3ABH)	1139 (473H)	1339 (53BH)	1539 (603H)	1739 (6CBH)	1939 (793H)	CH□ Post-trigger logging points	5000	Setting	×	○
540 (21CH)	740 (2E4H)	940 (3ACH)	1140 (474H)	1340 (53CH)	1540 (604H)	1740 (6CCH)	1940 (794H)	CH□ Level trigger condition setting	0	Setting	×	○
541 (21DH)	741 (2E5H)	941 (3ADH)	1141 (475H)	1341 (53DH)	1541 (605H)	1741 (6CDH)	1941 (795H)	CH□ Trigger data	[*3]	Setting	×	○
542 (21EH)	742 (2E6H)	942 (3AEH)	1142 (476H)	1342 (53EH)	1542 (606H)	1742 (6CEH)	1942 (796H)	CH□ Trigger setting value	0	Setting	×	○
543 (21FH)	743 (2E7H)	943 (3AFH)	1143 (477H)	1343 (53FH)	1543 (607H)	1743 (6CFH)	1943 (797H)	System area	—	—	—	—
544 (220H)	744 (2E8H)	944 (3B0H)	1144 (478H)	1344 (540H)	1544 (608H)	1744 (6D0H)	1944 (798H)	CH□ Loading interrupt enable/disable setting	1	Setting	×	○
545 (221H)	745 (2E9H)	945 (3B1H)	1145 (479H)	1345 (541H)	1545 (609H)	1745 (6D1H)	1945 (799H)	CH□ Logging read points setting value	1000	Setting	×	○

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9*1
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
546 to 597 (222H to 255H)	746 to 797 (2EAH to 31DH)	946 to 997 (3B2H to 3E5H)	1146 to 1197 (47AH to 4ADH)	1346 to 1397 (542H to 575H)	1546 to 1597 (60AH to 63DH)	1746 to 1797 (6D2 to 705H)	1946 to 1997 (79AH to 7CDH)	System area	—	—	—	—
598 (256H)	798 (31EH)	998 (3E6H)	1198 (4AEH)	1398 (576H)	1598 (63EH)	1798 (706H)	1998 (7CEH)	CH□ Range setting	0	Setting	×	○
599 (257H)	799 (31FH)	999 (3E7H)	1199 (4AFH)	1399 (577H)	1599 (63FH)	1799 (707H)	1999 (7CFH)	System area	—	—	—	—
2000 to 3599 (7D0H to E0FH)												

*1 Item enabled by turning on and off Operating condition setting request (Y9)

*2 The following shows the default values.
R60AD4 and R60ADI8: 0000H
R60ADV8: 0005H

*3 The following shows the default values.
CH1: 402, CH2: 602, CH3: 802, CH4: 1002, CH5: 1202, CH6: 1402, CH7: 1602, CH8: 1802

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■Error history (Un\G3600 to Un\G3759)

Address (decimal)	Address (hexadecimal)	Name				Default value	Data type	Auto refresh	Enabled by Y9*1
3600	E10H	Error history 1	Error code			0	Monitor	×	—
3601	E11H		Error time	First two digits of the year	Last two digits of the year				
3602	E12H			Month	Day				
3603	E13H			Hour	Minute				
3604	E14H			Second	Day of the week				
3605	E15H			Millisecond					
3606 to 3609	E16H to E19H	System area				—	—	—	—
3610 to 3615	E1AH to E1FH	Error history 2	Same as error history 1			0	Monitor	×	—
3616 to 3619	E20H to E23H	System area				—	—	—	—
3620 to 3625	E24H to E29H	Error history 3	Same as error history 1			0	Monitor	×	—
3626 to 3629	E2AH to E2DH	System area				—	—	—	—
3630 to 3635	E2EH to E33H	Error history 4	Same as error history 1			0	Monitor	×	—
3636 to 3639	E34H to E37H	System area				—	—	—	—
3640 to 3645	E38H to E3DH	Error history 5	Same as error history 1			0	Monitor	×	—
3646 to 3649	E3EH to E41H	System area				—	—	—	—
3650 to 3655	E42H to E47H	Error history 6	Same as error history 1			0	Monitor	×	—
3656 to 3659	E48H to E4BH	System area				—	—	—	—
3660 to 3665	E4CH to E51H	Error history 7	Same as error history 1			0	Monitor	×	—
3666 to 3669	E52H to E55H	System area				—	—	—	—
3670 to 3675	E56H to E5BH	Error history 8	Same as error history 1			0	Monitor	×	—
3676 to 3679	E5CH to E5FH	System area				—	—	—	—
3680 to 3685	E60H to E65H	Error history 9	Same as error history 1			0	Monitor	×	—
3686 to 3689	E66H to E69H	System area				—	—	—	—
3690 to 3695	E6AH to E6FH	Error history 10	Same as error history 1			0	Monitor	×	—
3696 to 3699	E70H to E73H	System area				—	—	—	—
3700 to 3705	E74H to E79H	Error history 11	Same as error history 1			0	Monitor	×	—
3706 to 3709	E7AH to E7DH	System area				—	—	—	—
3710 to 3715	E7EH to E83H	Error history 12	Same as error history 1			0	Monitor	×	—
3716 to 3719	E84H to E87H	System area				—	—	—	—
3720 to 3725	E88H to E8DH	Error history 13	Same as error history 1			0	Monitor	×	—
3726 to 3729	E8EH to E91H	System area				—	—	—	—
3730 to 3735	E92H to E97H	Error history 14	Same as error history 1			0	Monitor	×	—
3736 to 3739	E98H to E9BH	System area				—	—	—	—
3740 to 3745	E9CH to EA1H	Error history 15	Same as error history 1			0	Monitor	×	—
3746 to 3749	EA2H to EA5H	System area				—	—	—	—
3750 to 3755	EA6H to EABH	Error history 16	Same as error history 1			0	Monitor	×	—
3756 to 3759	EACH to EAFH	System area				—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

■Alarm history (Un\G3760 to Un\G3999)

Address (decimal)	Address (hexadecimal)	Name				Default value	Data type	Auto refresh	Enabled by Y9*1
3760	EB0H	Alarm history 1	Alarm code			0	Monitor	×	—
3761	EB1H		Alarm time	First two digits of the year	Last two digits of the year				
3762	EB2H			Month	Day				
3763	EB3H			Hour	Minute				
3764	EB4H			Second	Day of the week				
3765	EB5H			Millisecond					
3766 to 3769	EB6H to EB9H	System area				—	—	—	—
3770 to 3775	EBAH to EBFH	Alarm history 2	Same as alarm history 1			0	Monitor	×	—
3776 to 3779	EC1H to EC3H	System area				—	—	—	—
3780 to 3785	EC4H to EC9H	Alarm history 3	Same as alarm history 1			0	Monitor	×	—
3786 to 3789	ECAH to ECDH	System area				—	—	—	—
3790 to 3795	ECEH to ED3H	Alarm history 4	Same as alarm history 1			0	Monitor	×	—
3796 to 3799	ED4H to ED7H	System area				—	—	—	—
3800 to 3805	ED8H to EDDH	Alarm history 5	Same as alarm history 1			0	Monitor	×	—
3806 to 3809	EDEH to EE1H	System area				—	—	—	—
3810 to 3815	EE2H to EE7H	Alarm history 6	Same as alarm history 1			0	Monitor	×	—
3816 to 3819	EE8H to EEBH	System area				—	—	—	—
3820 to 3825	EECH to EF1H	Alarm history 7	Same as alarm history 1			0	Monitor	×	—
3826 to 3829	EF2H to EF5H	System area				—	—	—	—
3830 to 3835	EF6H to EFBH	Alarm history 8	Same as alarm history 1			0	Monitor	×	—
3836 to 3839	EFCH to EFFH	System area				—	—	—	—
3840 to 3845	F00H to F05H	Alarm history 9	Same as alarm history 1			0	Monitor	×	—
3846 to 3849	F06H to F09H	System area				—	—	—	—
3850 to 3855	F0AH to F0FH	Alarm history 10	Same as alarm history 1			0	Monitor	×	—
3856 to 3859	F10H to F13H	System area				—	—	—	—
3860 to 3865	F14H to F19H	Alarm history 11	Same as alarm history 1			0	Monitor	×	—
3866 to 3869	F1AH to F1DH	System area				—	—	—	—
3870 to 3875	F1EH to F23H	Alarm history 12	Same as alarm history 1			0	Monitor	×	—
3876 to 3879	F24H to F27H	System area				—	—	—	—
3880 to 3885	F28H to F2DH	Alarm history 13	Same as alarm history 1			0	Monitor	×	—
3886 to 3889	F2EH to F31H	System area				—	—	—	—
3890 to 3895	F32H to F37H	Alarm history 14	Same as alarm history 1			0	Monitor	×	—
3896 to 3899	F38H to F3BH	System area				—	—	—	—
3900 to 3905	F3CH to F41H	Alarm history 15	Same as alarm history 1			0	Monitor	×	—
3906 to 3909	F42H to F45H	System area				—	—	—	—
3910 to 3915	F46H to F4BH	Alarm history 16	Same as alarm history 1			0	Monitor	×	—
3916 to 3999	F4CH to F9FH	System area				—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

■Offset/gain setting (for R60AD4) (Un\G4000 to Un\G4131)

Address Decimal (hexadecimal)				Name	Default value	Data type	Auto refresh	Enabled by Y9[*1]
CH1	CH2	CH3	CH4					
4000 to 4001 (FA0H to FA1H)				System area	—	—	—	—
4002 (FA2H)				Save data type setting	0000H	Setting	×	○
4003 (FA3H)				System area	—	—	—	—
4004 (FA4H)	4008 (FA8H)	4012 (FACH)	4016 (FB0H)	CH□ Factory default setting offset value (L)	0	Setting	×	—
4005 (FA5H)	4009 (FA9H)	4013 (FADH)	4017 (FB1H)	CH□ Factory default setting offset value (H)	0	Setting	×	—
4006 (FA6H)	4010 (FAAH)	4014 (FAEH)	4018 (FB2H)	CH□ Factory default setting gain value (L)	0	Setting	×	—
4007 (FA7H)	4011 (FABH)	4015 (FAFH)	4019 (FB3H)	CH□ Factory default setting gain value (H)	0	Setting	×	—
4020 (FB4H)	4024 (FB8H)	4028 (FBCH)	4032 (FC0H)	CH□ User range setting offset value (L)	0	Setting	×	—
4021 (FB5H)	4025 (FB9H)	4029 (FBDH)	4033 (FC1H)	CH□ User range setting offset value (H)	0	Setting	×	—
4022 (FB6H)	4026 (FBAH)	4030 (FBEH)	4034 (FC2H)	CH□ User range setting gain value (L)	0	Setting	×	—
4023 (FB7H)	4027 (FBBH)	4031 (FBFH)	4035 (FC3H)	CH□ User range setting gain value (H)	0	Setting	×	—
4036 to 4131 (FC4H to 1023H)				System area	—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

■Offset/gain setting (for R60ADV8 and R60ADI8) (Un\G4000 to Un\G4131)

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9[*1]
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
4000 to 4003 (FA0H to FA3H)								System area	—	—	—	—
4004 (FA4H)	4008 (FA8H)	4012 (FACH)	4016 (FB0H)	4020 (FB4H)	4024 (FB8H)	4028 (FBCH)	4032 (FC0H)	CH□ Factory default setting offset value (L)	0	Setting	×	—
4005 (FA5H)	4009 (FA9H)	4013 (FADH)	4017 (FB1H)	4021 (FB5H)	4025 (FB9H)	4029 (FBDH)	4033 (FC1H)	CH□ Factory default setting offset value (H)	0	Setting	×	—
4006 (FA6H)	4010 (FAAH)	4014 (FAEH)	4018 (FB2H)	4022 (FB6H)	4026 (FBAH)	4030 (FBEH)	4034 (FC2H)	CH□ Factory default setting gain value (L)	0	Setting	×	—
4007 (FA7H)	4011 (FABH)	4015 (FAFH)	4019 (FB3H)	4023 (FB7H)	4027 (FBBH)	4031 (FBFH)	4035 (FC3H)	CH□ Factory default setting gain value (H)	0	Setting	×	—
4036 (FC4H)	4040 (FC8H)	4044 (FCCH)	4048 (FD0H)	4052 (FD4H)	4056 (FD8H)	4060 (FDCH)	4064 (FE0H)	CH□ User range setting offset value (L)	0	Setting	×	—
4037 (FC5H)	4041 (FC9H)	4045 (FCDH)	4049 (FD1H)	4053 (FD5H)	4057 (FD9H)	4061 (FDDH)	4065 (FE1H)	CH□ User range setting offset value (H)	0	Setting	×	—
4038 (FC6H)	4042 (FCAH)	4046 (FCEH)	4050 (FD2H)	4054 (FD6H)	4058 (FDAH)	4062 (FDEH)	4066 (FE2H)	CH□ User range setting gain value (L)	0	Setting	×	—
4039 (FC7H)	4043 (FCBH)	4047 (FCFH)	4051 (FD3H)	4055 (FD7H)	4059 (FDBH)	4063 (FDFH)	4067 (FE3H)	CH□ User range setting gain value (H)	0	Setting	×	—
4068 to 4131 (FE4H to 1023H)								System area	—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

■Un\G4132 to Un\G9499

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9[*1]
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
4132 (1024H)	4134 (1026H)	4136 (1028H)	4138 (102AH)	4140 (102CH)	4142 (102EH)	4144 (1030H)	4146 (1032H)	CH□ Offset/gain setting mode (offset specification)	0	Setting	×	—
4133 (1025H)	4135 (1027H)	4137 (1029H)	4139 (102BH)	4141 (102DH)	4143 (102FH)	4145 (1031H)	4147 (1033H)	CH□ Offset/gain setting mode (gain specification)	0	Setting	×	—
4148 to 4163 (1034H to 1043H)								System area	—	—	—	—
4164 (1044H)	4165 (1045H)	4166 (1046H)	4167 (1047H)	—	—	—	—	CH□ Offset/gain setting mode (range specification)[*2]	0	Setting	×	—
4168 to 9499(1048H to 251BH)								System area	—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)
*2 When the R60ADV8 or R60ADI8 is used, these areas are used as system areas.

■Un\G9500 to Un\G9999

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9*1
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
9500 (251CH)	9502 (251EH)	9504 (2520H)	9506 (2522H)	9508 (2524H)	9510 (2526H)	9512 (2528H)	9514 (252AH)	CH□ Synchronization latch digital operation value	0	Monitor	○	—
9501 (251DH)	9503 (251FH)	9505 (2521H)	9507 (2523H)	9509 (2525H)	9511 (2527H)	9513 (2529H)	9515 (252BH)	System area	—	—	—	—
9516 to 9599 (252CH to 257FH)												
9600 (2580H)								Synchronization status monitor	0	Monitor	○	—
9601 to 9999 (2581H to 270FH)								System area	—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

■Logging data (Un\G10000 to Un\G89999)

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9*1
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
10000 to 19999 (2710H to 4E1FH)	20000 to 29999 (4E20H to 752FH)	30000 to 39999 (7530H to 9C3FH)	40000 to 49999 (9C40H to C34FH)	50000 to 59999 (C350H to EA5FH)	60000 to 69999 (EA60H to 1116FH)	70000 to 79999 (11170H to 1387FH)	80000 to 89999 (13880H to 15F8FH)	CH□ Logging data	0	Monitor	×	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

In Q compatible mode

■Un\G0 to Un\G199

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9*1
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
0 (0H)								A/D conversion enable/ disable setting	00FFH	Setting	×	○
1 (1H)	2 (2H)	3 (3H)	4 (4H)	5 (5H)	6 (6H)	7 (7H)	8 (8H)	CH□ Time Average/ Count Average setting	0	Setting	×	○
9 (9H)								Averaging process specification (for Q series)	0	Setting	×	○
10 (AH)								A/D conversion completed flag	0	Monitor	○	—
11 (BH)	12 (CH)	13 (DH)	14 (EH)	15 (FH)	16 (10H)	17 (11H)	18 (12H)	CH□ Digital output value	0	Monitor	○	—
19 (13H)								Latest error code	0	Monitor	○	—
20 (14H)				21 (15H)				Range setting monitor	*2	Monitor	×	—
22 (16H)								Offset/gain setting mode (offset specification)	0	Setting	×	—
23 (17H)								Offset/gain setting mode (gain specification)	0	Setting	×	—
24 (18H)				25 (19H)				Averaging process setting	0	Setting	×	○
26 (1AH)								Offset/gain setting mode (range specification)	0	Setting	×	—
27 (1BH)				28 (1CH)				Input signal error detection setting	0	Setting	×	○
29 (1DH)								Digital clipping enable/ disable setting	00FFH	Setting	×	○

Address Decimal (hexadecimal)								Name	Default value	Data type	Auto refresh	Enabled by Y9*1
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
30 (1EH)	32 (20H)	34 (22H)	36 (24H)	38 (26H)	40 (28H)	42 (2AH)	44 (2CH)	CH□ Maximum value	0	Monitor	○	—
31 (1FH)	33 (21H)	35 (23H)	37 (25H)	39 (27H)	41 (29H)	43 (2BH)	45 (2DH)	CH□ Minimum value	0	Monitor	○	—
46, 47 (2EH, 2FH)								System area	—	—	—	—
48 (30H) (b15 to b8: Rate alarm/b7 to b0: Process alarm)								Alert output setting (Process alarm) Alert output setting (Rate alarm)	FFFFH	Setting	×	○
49 (31H)								Input signal error detection flag	0	Monitor	○	—
50 (32H)								Alert output flag (Process alarm)	0	Monitor	○	—
51 (33H)								Alert output flag (Rate alarm)	0	Monitor	○	—
52 (34H)								System area	—	—	—	—
53 (35H)								Scaling enable/disable setting	00FFH	Setting	×	○
54 (36H)	55 (37H)	56 (38H)	57 (39H)	58 (3AH)	59 (3BH)	60 (3CH)	61 (3DH)	CH□ Digital operation value	0	Monitor	○	—
62 (3EH)	64 (40H)	66 (42H)	68 (44H)	70 (46H)	72 (48H)	74 (4AH)	76 (4CH)	CH□ Scaling lower limit value	0	Setting	×	○
63 (3FH)	65 (41H)	67 (43H)	69 (45H)	71 (47H)	73 (49H)	75 (4BH)	77 (4DH)	CH□ Scaling upper limit value	0	Setting	×	○
78 to 85 (4EH to 55H)								System area	—	—	—	—
86 (56H)	90 (5AH)	94 (5EH)	98 (62H)	102 (66H)	106 (6AH)	110 (6EH)	114 (72H)	CH□ Process alarm lower lower limit value	0	Setting	×	○
87 (57H)	91 (5BH)	95 (5FH)	99 (63H)	103 (67H)	107 (6BH)	111 (6FH)	115 (73H)	CH□ Process alarm lower upper limit value	0	Setting	×	○
88 (58H)	92 (5CH)	96 (60H)	100 (64H)	104 (68H)	108 (6CH)	112 (70H)	116 (74H)	CH□ Process alarm upper lower limit value	0	Setting	×	○
89 (59H)	93 (5DH)	97 (61H)	101 (65H)	105 (69H)	109 (6DH)	113 (71H)	117 (75H)	CH□ Process alarm upper upper limit value	0	Setting	×	○
118 (76H)	119 (77H)	120 (78H)	121 (79H)	122 (7AH)	123 (7BH)	124 (7CH)	125 (7DH)	CH□ Rate alarm alert detection cycle setting	0	Setting	×	○
126 (7EH)	128 (80H)	130 (82H)	132 (84H)	134 (86H)	136 (88H)	138 (8AH)	140 (8CH)	CH□ Rate alarm upper limit value	0	Setting	×	○
127 (7FH)	129 (81H)	131 (83H)	133 (85H)	135 (87H)	137 (89H)	139 (8BH)	141 (8DH)	CH□ Rate alarm lower limit value	0	Setting	×	○
142 (8EH)	143 (8FH)	144 (90H)	145 (91H)	146 (92H)	147 (93H)	148 (94H)	149 (95H)	CH□ Input signal error detection setting value	50	Setting	×	○
150 (96H)	151 (97H)	152 (98H)	153 (99H)	154 (9AH)	155 (9BH)	156 (9CH)	157 (9DH)	CH□ Conversion value shift amount	0	Control	○	—
158, 159 (9EH, 9FH)								Mode switching setting	0	Setting	×	○
160 to 171 (A0H to ABH)								System area	—	—	—	—
172 (ACH)	173 (ADH)	174 (AEH)	175 (AFH)	176 (B0H)	177 (B1H)	178 (B2H)	179 (B3H)	CH□ Difference conversion trigger	0	Control	○	—
180 (B4H)	181 (B5H)	182 (B6H)	183 (B7H)	184 (B8H)	185 (B9H)	186 (BAH)	187 (BBH)	CH□ Difference conversion reference value	0	Monitor	×	—
188, 189 (BCH, BDH)								System area	—	—	—	—
190 (BEH)	191 (BFH)	192 (C0H)	193 (C1H)	194 (C2H)	195 (C3H)	196 (C4H)	197 (C5H)	CH□ Difference conversion status flag	0	Monitor	○	—
198, 199 (C6H, C7H)								System area	—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

*2 The following shows the default values.
R60AD4 and R60ADI8: 0000H
R60ADV8: 5555H

■Offset/gain setting (for R60AD4) (Un\G200 to Un\G399)

Address Decimal				Name	Default value	Data type	Auto refresh	Enabled by Y9*1
CH1	CH2	CH3	CH4					
200 (C8H)				Save data type setting	0	Setting	×	○
201 (C9H)				System area	—	—	—	—
202 (CAH)	206 (CEH)	210 (D2H)	214 (D6H)	CH□ Factory default setting offset value (L)	0	Setting	×	—
203 (CBH)	207 (CFH)	211 (D3H)	215 (D7H)	CH□ Factory default setting offset value (H)	0	Setting	×	—
204 (CCH)	208 (D0H)	212 (D4H)	216 (D8H)	CH□ Factory default setting gain value (L)	0	Setting	×	—
205 (CDH)	209 (D1H)	213 (D5H)	217 (D9H)	CH□ Factory default setting gain value (H)	0	Setting	×	—
218 (DAH)	222 (DEH)	226 (E2H)	230 (E6H)	CH□ User range setting offset value (L)	0	Setting	×	—
219 (DBH)	223 (DFH)	227 (E3H)	231 (E7H)	CH□ User range setting offset value (H)	0	Setting	×	—
220 (DCH)	224 (E0H)	228 (E4H)	232 (E8H)	CH□ User range setting gain value (L)	0	Setting	×	—
221 (DDH)	225 (E1H)	229 (E5H)	233 (E9H)	CH□ User range setting gain value (H)	0	Setting	×	—
234 to 399 (EAH to 18FH)				System area	—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

■Offset/gain setting (for R60ADV8 and R60ADI8) (Un\G200 to Un\G399)

Address Decimal								Name	Default value	Data type	Auto refresh	Enabled by Y9*1
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
200 (C8H)								Save data type setting	0	Setting	×	—
201 (C9H)								System area	—	—	—	—
202 (CAH)	206 (CEH)	210 (D2H)	214 (D6H)	218 (DAH)	222 (DEH)	226 (E2H)	230 (E6H)	CH□ Factory default setting offset value (L)	0	Setting	×	—
203 (CBH)	207 (CFH)	211 (D3H)	215 (D7H)	219 (DBH)	223 (DFH)	227 (E3H)	231 (E7H)	CH□ Factory default setting offset value (H)	0	Setting	×	—
204 (CCH)	208 (D0H)	212 (D4H)	216 (D8H)	220 (DCH)	224 (E0H)	228 (E4H)	232 (E8H)	CH□ Factory default setting gain value (L)	0	Setting	×	—
205 (CDH)	209 (D1H)	213 (D5H)	217 (D9H)	221 (DDH)	225 (E1H)	229 (E5H)	233 (E9H)	CH□ Factory default setting gain value (H)	0	Setting	×	—
234 (EAH)	238 (EEH)	242 (F2H)	246 (F6H)	250 (FAH)	254 (FEH)	258 (102H)	262 (106H)	CH□ User range setting offset value (L)	0	Setting	×	—
235 (EBH)	239 (EFH)	243 (F3H)	247 (F7H)	251 (FBH)	255 (FFH)	259 (103H)	263 (107H)	CH□ User range setting offset value (H)	0	Setting	×	—
236 (ECH)	240 (F0H)	244 (F4H)	248 (F8H)	252 (FCH)	256 (100H)	260 (104H)	264 (108H)	CH□ User range setting gain value (L)	0	Setting	×	—
237 (EDH)	241 (F1H)	245 (F5H)	249 (F9H)	253 (FDH)	257 (101H)	261 (105H)	265 (109H)	CH□ User range setting gain value (H)	0	Setting	×	—
266 to 399 (10AH to 18FH)								System area	—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

A

■Un\G400 to Un\G4999

Address Decimal								Name	Default value	Data type	Auto refresh	Enabled by Y9[*1]
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
400, 401 (190H, 191H)								System area	—	—	—	—
402 (192H)				403 (193H)				Range setting	0	Setting	×	○
404 to 999 (194H to 3E7H)								System area	—	—	—	—
1000 (3E8H)	1001 (3E9H)	1002 (3EAH)	1003 (3EBH)	1004 (3ECH)	1005 (3EDH)	1006 (3EEH)	1007 (3EFH)	CH□ Logging enable/ disable setting	1	Setting	×	○
1008 (3F0H)	1009 (3F1H)	1010 (3F2H)	1011 (3F3H)	1012 (3F4H)	1013 (3F5H)	1014 (3F6H)	1015 (3F7H)	CH□ Logging hold request	0	Control	○	—
1016 (3F8H)	1017 (3F9H)	1018 (3FAH)	1019 (3FBH)	1020 (3FCH)	1021 (3FDH)	1022 (3FEH)	1023 (3FFH)	CH□ Logging hold flag	0	Monitor	○	—
1024 (400H)	1025 (401H)	1026 (402H)	1027 (403H)	1028 (404H)	1029 (405H)	1030 (406H)	1031 (407H)	CH□ Logging data setting	1	Setting	×	○
1032 (408H)	1033 (409H)	1034 (40AH)	1035 (40BH)	1036 (40CH)	1037 (40DH)	1038 (40EH)	1039 (40FH)	CH□ Logging cycle setting value	4	Setting	×	○
1040 (410H)	1041 (411H)	1042 (412H)	1043 (413H)	1044 (414H)	1045 (415H)	1046 (416H)	1047 (417H)	CH□ Logging cycle unit setting	1	Setting	×	○
1048 (418H)	1049 (419H)	1050 (41AH)	1051 (41BH)	1052 (41CH)	1053 (41DH)	1054 (41EH)	1055 (41FH)	CH□ Post-trigger logging points	5000	Setting	×	○
1056 (420H)	1057 (421H)	1058 (422H)	1059 (423H)	1060 (424H)	1061 (425H)	1062 (426H)	1063 (427H)	CH□ Level trigger condition setting	0	Setting	×	○
1064 (428H)	1065 (429H)	1066 (42AH)	1067 (42BH)	1068 (42CH)	1069 (42DH)	1070 (42EH)	1071 (42FH)	CH□ Trigger data	[*2]	Setting	×	○
1072 to 1081 (430H to 439H)								Level data 0 to 9	0	Control	○	—
1082 (43AH)	1083 (43BH)	1084 (43CH)	1085 (43DH)	1086 (43EH)	1087 (43FH)	1088 (440H)	1089 (441H)	CH□ Trigger setting value	0	Setting	×	○
1090 (442H)	1091 (443H)	1092 (444H)	1093 (445H)	1094 (446H)	1095 (447H)	1096 (448H)	1097 (449H)	CH□ Head pointer	0	Monitor	×	—
1098 (44AH)	1099 (44BH)	1100 (44CH)	1101 (44DH)	1102 (44EH)	1103 (44FH)	1104 (450H)	1105 (451H)	CH□ Latest pointer	0	Monitor	×	—
1106 (452H)	1107 (453H)	1108 (454H)	1109 (455H)	1110 (456H)	1111 (457H)	1112 (458H)	1113 (459H)	CH□ Number of logging data	0	Monitor	×	—
1114 (45AH)	1115 (45BH)	1116 (45CH)	1117 (45DH)	1118 (45EH)	1119 (45FH)	1120 (460H)	1121 (461H)	CH□ Trigger pointer	0	Monitor	×	—
1122 (462H)	1125 (465H)	1128 (468H)	1131 (46BH)	1134 (46EH)	1137 (471H)	1140 (474H)	1143 (477H)	CH□ Logging cycle monitor value (s)	0	Monitor	×	—
1123 (463H)	1126 (466H)	1129 (469H)	1132 (46CH)	1135 (46FH)	1138 (472H)	1141 (475H)	1144 (478H)	CH□ Logging cycle monitor value (ms)	0	Monitor	×	—
1124 (464H)	1127 (467H)	1130 (46AH)	1133 (46DH)	1136 (470H)	1139 (473H)	1142 (476H)	1145 (479H)	CH□ Logging cycle monitor value (μs)	0	Monitor	×	—
1146 to 1153 (47AH to 481H)								System area	—	—	—	—
1154 (482H)	1158 (486H)	1162 (48AH)	1166 (48EH)	1170 (492H)	1174 (496H)	1178 (49AH)	1182 (49EH)	CH□ Trigger generation time (First/Last two digits of the year)	0	Monitor	×	—
1155 (483H)	1159 (487H)	1163 (48BH)	1167 (48FH)	1171 (493H)	1175 (497H)	1179 (49BH)	1183 (49FH)	CH□ Trigger generation time (Month/Day)	0	Monitor	×	—
1156 (484H)	1160 (488H)	1164 (48CH)	1168 (490H)	1172 (494H)	1176 (498H)	1180 (49CH)	1184 (4A0H)	CH□ Trigger generation time (Hour/Minute)	0	Monitor	×	—
1157 (485H)	1161 (489H)	1165 (48DH)	1169 (491H)	1173 (495H)	1177 (499H)	1181 (49DH)	1185 (4A1H)	CH□ Trigger generation time (Second/Day of the week)	0	Monitor	×	—
1186 (4A2H)	1187 (4A3H)	1188 (4A4H)	1189 (4A5H)	1190 (4A6H)	1191 (4A7H)	1192 (4A8H)	1193 (4A9H)	CH□ Trigger generation time (Millisecond)	0	Monitor	×	—
1194 to 1199 (4AAH to 4AFH)								System area	—	—	—	—
1200 (4B0H)	1201 (4B1H)	1202 (4B2H)	1203 (4B3H)	1204 (4B4H)	1205 (4B5H)	1206 (4B6H)	1207 (4B7H)	CH□ Loading interrupt enable/disable setting	1	Setting	×	○
1208 (4B8H)	1209 (4B9H)	1210 (4BAH)	1211 (4BBH)	1212 (4BCH)	1213 (4BDH)	1214 (4BEH)	1215 (4BFH)	CH□ Logging read points setting value	1000	Setting	×	○

Address Decimal								Name	Default value	Data type	Auto refresh	Enabled by Y9[*1]
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8					
1216 (4C0H)	1217 (4C1H)	1218 (4C2H)	1219 (4C3H)	1220 (4C4H)	1221 (4C5H)	1222 (4C6H)	1223 (4C7H)	CH□ Current logging read pointer	-1	Setting	×	○
1224 (4C8H)	1225 (4C9H)	1226 (4CAH)	1227 (4CBH)	1228 (4CCH)	1229 (4CDH)	1230 (4CEH)	1231 (4CFH)	CH□ Previous logging read pointer	-1	Setting	×	○
1232 (4D0H)	1233 (4D1H)	1234 (4D2H)	1235 (4D3H)	1236 (4D4H)	1237 (4D5H)	1238 (4D6H)	1239 (4D7H)	CH□ Logging read points monitor value	0	Monitor	×	—
1240 to 1799 (4D8H to 707H)								System area	—	—	—	—
1800 (708H)								Latest address of error history	0	Monitor	○	—
1801 to 1809 (709H to 711H)								System area	—	—	×	—
1810 to 1969 (712H to 7B1H)								Error history 1 to 16	0	Monitor	×	—
1970 to 1999 (7B2H to 7CFH)								System area	—	—	—	—
2000 (7D0H)	2002 (7D2H)	2004 (7D4H)	2006 (7D6H)	2008 (7D8H)	2010 (7DAH)	2012 (7DCH)	2014 (7DEH)	CH□ Synchronization latch digital operation value	0	Monitor	○	—
2015 to 2099 (7DFH to 833H)								System area	—	—	—	—
2100 (834H)								Synchronization status monitor	0	Monitor	○	
2101 to 3749 (835H to EA5H)								System area	—	—	—	—
3750 (EA6H)								Latest alarm code	0	Monitor	○	—
3751 (EA7H)								Latest address of alarm history	0	Monitor	○	—
3752 to 3759 (EA8H to EAFH)								System area	—	—	—	—
3760 to 3919 (EB0H to F4FH)								Alarm history 1 to 16	0	Monitor	×	—
3920 to 3999 (F50H to F9FH)								System area	—	—	—	—
4000 to 4015 (FA0H to FAFH)								Interrupt factor detection flag [n][*3]	0	Monitor	○	—
4016 to 4031 (FB0H to FBFH)								System area	—	—	—	—
4032 to 4047 (FC0H to FCFH)								Interrupt factor mask [n][*3]	0	Control	×	—
4048 to 4063 (FD0H to FDFH)								System area	—	—	—	—
4064 to 4079 (FE0H to FEFH)								Interrupt factor reset request [n][*3]	0	Control	×	—
4080 to 4095 (FF0H to FFFH)								System area	—	—	—	—
4096 to 4111 (1000H to 100FH)								Interrupt factor generation setting [n][*3]	0	Setting	×	○
4112 to 4127 (1010H to 101FH)								System area	—	—	—	—
4128 to 4143 (1020H to 102FH)								Condition target setting [n][*3]	0	Setting	×	○
4144 to 4159 (1030H to 103FH)								System area	—	—	—	—
4160 to 4175 (1040H to 104FH)								Condition target channel setting [n][*3]	0	Setting	×	○
4176 to 4999 (1050H to 1387H)								System area	—	—	—	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

*2 The following shows the default values.
CH1: 54, CH2: 55, CH3: 56, CH4: 57, CH5: 58, CH6: 59, CH7: 60, CH8: 61

*3 [n] in the table indicates an interrupt setting number. (n = 1 to 16)

■Logging data (Un\G5000 to Un\G84999)

Address Decimal	Name	Default value	Data type	Auto refresh	Enabled by Y9*1
5000 to 14999 (1388H to 3A97H)	CH1 Logging data	0	Monitor	×	—
15000 to 24999 (3A98H to 61A7H)	CH2 Logging data	0	Monitor	×	—
25000 to 34999 (61A8H to 88B7H)	CH3 Logging data	0	Monitor	×	—
35000 to 44999 (88B8H to AFC7H)	CH4 Logging data	0	Monitor	×	—
45000 to 54999 (AFC8H to D6D7H)	CH5 Logging data	0	Monitor	×	—
55000 to 64999 (D6D8H to FDE7H)	CH6 Logging data	0	Monitor	×	—
65000 to 74999 (FDE8H to 124F7H)	CH7 Logging data	0	Monitor	×	—
75000 to 84999 (124F8H to 14C07H)	CH8 Logging data	0	Monitor	×	—

*1 Item enabled by turning on and off Operating condition setting request (Y9)

Details of buffer memory addresses

The following describes the details of the buffer memory addresses of the A/D converter module.

Point

This section describes buffer memory addresses for CH1.

Latest error code

The latest error code detected in the A/D converter module is stored. For details, refer to the following.

☞ Page 91 List of Error Codes

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Latest error code	0							
Latest error code (in Q compatible mode)	19							

■Clearing an error

Turn on and off 'Error clear request' (YF).

Latest address of error history

Among Error history □ (Un\G3600 to Un\G3759), a buffer memory address which stores the latest error code is stored.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Latest address of error history	1							
Latest address of error history (in Q compatible mode)	1800							

Latest alarm code

The latest alarm code detected in the A/D converter module is stored. For details, refer to the following.

☞ Page 95 List of Alarm Codes

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Latest alarm code	2							
Latest alarm code (in Q compatible mode)	3750							

■Clearing an alarm

Turn on and off Error clear request (YF).

Latest address of alarm history

Among Alarm history □ (Un\G3760 to Un\G3999), a buffer memory address which stores the latest alarm code is stored.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Latest address of alarm history	3							
Latest address of alarm history (in Q compatible mode)	3751							

Interrupt factor detection flag [n]

The detection status of the interrupt factor is stored.

Monitor value	Description
0	No interrupt factor
1	Interrupt factor

When an interrupt factor occurs, an interrupt request is sent to the CPU module at the same time as 'Interrupt factor detection flag [n]' (Un\G4 to Un\G19) is turned to Interrupt factor (1).
"n" indicates an interrupt setting number. (n = 1 to 16)

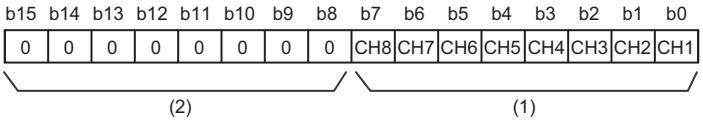
■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Interrupt factor detection flag [n]	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Interrupt factor detection flag [n] (in Q compatible mode)	4000	4001	4002	4003	4004	4005	4006	4007	4008	4009	4010	4011	4012	4013	4014	4015

Alert output flag (Process alarm upper limit)

The upper limit alarm of the process alarm can be checked for each channel.



(1) 0: Normal, 1: Alarm ON

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Alert output flag (Process alarm upper limit)	36							

■Alert output flag status

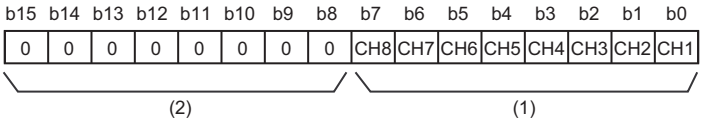
- When the value is out of the range specified in the process alarm upper upper limit value, Alarm ON (1) is stored in 'Alert output flag (Process alarm upper limit)' (Un\G36) corresponding to each channel.
- When an alert is detected in any channel where the A/D conversion and the alert output setting (Process alarm) are enabled, 'Alert output signal' (X8) also turns on.

■Cleaning Alert output flag

- When the digital operation value returns within the setting range, the flag is automatically cleared.
- When 'Operating condition setting request' (Y9) is turned on and off, the flag is cleared.

Alert output flag (Process alarm lower limit)

The lower limit alarm of the process alarm can be checked for each channel.



(1) 0: Normal, 1: Alarm ON

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Alert output flag (Process alarm lower limit)	37							

■Alert output flag status

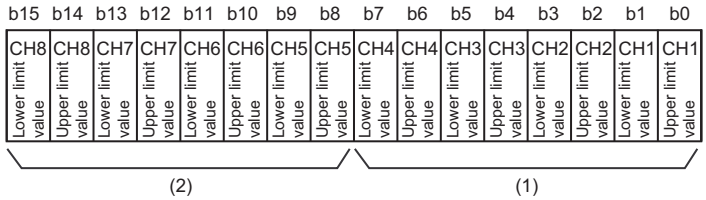
- When the value is out of the range specified in the process alarm lower lower limit value, Alarm ON (1) is stored in 'Alert output flag (Process alarm lower limit)' (Un\G37) corresponding to each channel.
- When an alert is detected in any channel where the A/D conversion and the alert output setting (Process alarm) are enabled, 'Alert output signal' (X8) also turns on.

■Cleaning Alert output flag

- When the digital operation value returns within the setting range, the flag is automatically cleared.
- When 'Operating condition setting request' (Y9) is turned on and off, the flag is cleared.

Alert output flag (Process alarm) [Q compatible mode]

When the Q compatible mode function is used, the upper/lower limit alarm of the process alarm can be checked.



(1) 0: Normal, 1: Alarm ON

(2) b8 to b15 of the R60AD4 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Alert output flag (Process alarm) (in Q compatible mode)	50							

■Alert output flag status

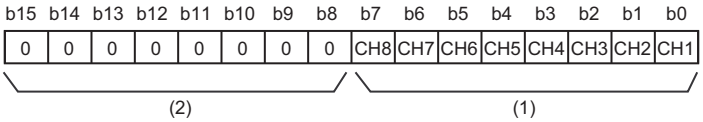
- When the value is out of the range specified in the process alarm upper upper limit value or process alarm lower lower limit value, Alarm ON (1) is stored in Alert output flag (Process alarm) corresponding to each channel.
- When an alert is detected in any channel where the A/D conversion and the alert output setting (Process alarm) are enabled, 'Alert output signal' (X8) also turns on.

■Cleaning Alert output flag

- When the digital operation value returns within the setting range, the flag is automatically cleared.
- When 'Operating condition setting request' (Y9) is turned on and off, the flag is cleared.

Alert output flag (Rate alarm upper limit)

The upper limit alarm of the rate alarm can be checked for each channel.



(1) 0: Normal, 1: Alarm ON

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Alert output flag (Rate alarm upper limit)	38							

■Alert output flag status

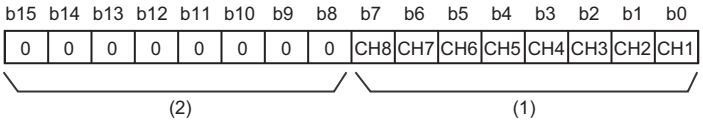
- When the value is out of the range specified in the rate alarm upper limit value, Alarm ON (1) is stored in 'Alert output flag (Rate alarm upper limit)' (Un\G38) corresponding to each channel.
- When an alert is detected in any channel where the A/D conversion and the alert output setting (Rate alarm) are enabled, 'Alert output signal' (X8) also turns on.

■Cleaning Alert output flag

- When the change rate of the digital output value returns within the setting range, the flag is automatically cleared.
- When 'Operating condition setting request' (Y9) is turned on and off, the flag is cleared.

Alert output flag (Rate alarm lower limit)

The lower limit alarm of the rate alarm can be checked for each channel.



(1) 0: Normal, 1: Alarm ON

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Alert output flag (Rate alarm lower limit)	39							

■Alert output flag status

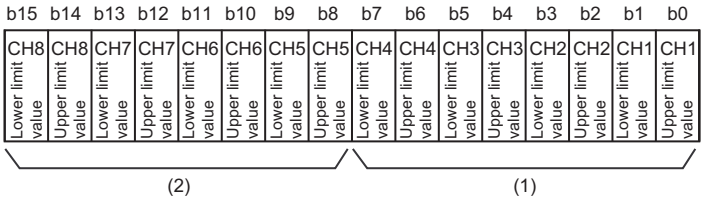
- When the value is out of the range specified in the rate alarm lower limit value, Alarm ON (1) is stored in 'Alert output flag (Rate alarm lower limit)' (Un\G39) corresponding to each channel.
- When an alert is detected in any channel where the A/D conversion and the alert output setting (Rate alarm) are enabled, 'Alert output signal' (X8) also turns on.

■Cleaning Alert output flag

- When the change rate of the digital output value returns within the setting range, the flag is automatically cleared.
- When 'Operating condition setting request' (Y9) is turned on and off, the flag is cleared.

Alert output flag (Rate alarm) [Q compatible mode]

When the Q compatible mode function is used, the upper/lower limit alarm of the rate alarm can be checked.



(1) 0: Normal, 1: Alarm ON

(2) b8 to b15 of the R60AD4 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Alert output flag (Rate alarm) (in Q compatible mode)	51							

■Alert output flag status

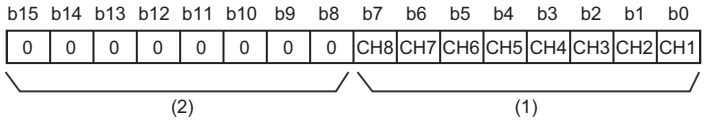
- When the value is out of the range specified in the rate alarm upper limit value or rate alarm lower limit value, Alarm ON (1) is stored in Alert output flag (Rate alarm) corresponding to each channel.
- When an alert is detected in any channel where the A/D conversion and the alert output setting (Rate alarm) are enabled, 'Alert output signal' (X8) also turns on.

■Cleaning Alert output flag

- When the change rate of the digital output value returns within the setting range, the flag is automatically cleared.
- When 'Operating condition setting request' (Y9) is turned on and off, the flag is cleared.

Input signal error detection flag

The status of an input signal can be checked for each channel.



(1) 0: Normal, 1: Input signal error

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Input signal error detection flag	40							
Input signal error detection flag (in Q compatible mode)	49							

■Input signal error detection flag status

- When an analog input value out of the setting range for 'CH1 Input signal error detection setting value' (Un\G528) is detected, Input signal error (1) is stored in 'Input signal error detection flag' (Un\G40) corresponding to each channel.
- When an error is detected in any channel where the A/D conversion and the input signal error detection are enabled, 'Input signal error detection signal' (XC) turns on.

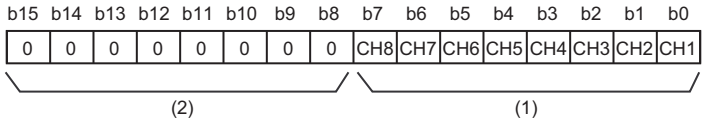
■Clearing Input signal error detection flag

Input signal error detection flag is turned off by turning on and off 'Error clear request' (YF) after the analog input value returns within the setting range.

When 'Operating condition setting request' (Y9) is turned on and off, Input signal error detection flag is cleared.

A/D conversion completed flag

The A/D conversion status can be checked.



(1) 0: During A/D conversion or unused, 1: A/D conversion completed

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
A/D conversion completed flag	42							
A/D conversion completed flag (in Q compatible mode)	10							

■A/D conversion completed flag status

When the first A/D conversion is completed in the channel where the A/D conversion is enabled, the flag turns to A/D conversion completed (1). 'A/D conversion completed flag' (XE) turns on when the conversion of all the channels where the A/D conversion is enabled is completed.

■Cleaning A/D conversion completed flag

Turning on and off 'Operating condition setting request' (Y9) turns the flag back to the default (During A/D conversion or unused (0)), and when the first A/D conversion has completed, the flag turns to A/D conversion completed (1) again.

Level data 0 to 9

This area stores data to be monitored when a level trigger of the logging function is used. Ten types of data are available: 'Level data 0' (Un\G90) to 'Level data 9' (Un\G99). Use the area to generate triggers while monitoring the values of devices other than the A/D converter module.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	0	1	2	3	4	5	6	7	8	9
Level data☐	90	91	92	93	94	95	96	97	98	99
Level data☐ (in Q compatible mode)	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081

■Setting range

The setting range is from -32768 to 32767.

■Default value

The default value is 0 for all channels.

Interrupt factor mask [n]

Set Interrupt factor mask to be used.

Setting value	Setting content
0	Mask (Interrupt unused)
1	Mask clear (Interrupt used)

When 'Interrupt factor mask [n]' (Un\G124 to Un\G139) is changed to Mask clear (Interrupt used) (1) and an interrupt factor occurs, an interrupt request is sent to the CPU module. When the set value is two or larger, the setting is regarded as Mask clear (Interrupt used) (1).

"n" indicates an interrupt setting number. (n = 1 to 16)

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Interrupt factor mask [n]	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
Interrupt factor mask [n] (in Q compatible mode)	4032	4033	4034	4035	4036	4037	4038	4039	4040	4041	4042	4043	4044	4045	4046	4047

■Default value

The default value is set to Mask (Interrupt unused) (0) for all channels.

Interrupt factor reset request [n]

An interrupt factor reset request is sent.

Setting value	Setting content
0	No reset request
1	Reset request

When Reset request (1) is set to 'Interrupt factor reset request [n]' (Un\G156 to Un\G171) corresponding to the interrupt factor, the interrupt factor corresponding to the specified interrupt is reset. After that, 'Interrupt factor reset request [n]' (Un\G156 to Un\G171) turns to No reset request (0). When the set value is two or larger, the setting is regarded as Reset request (1).
Interrupt factors can be reset by turning on and off 'Operating condition setting request' (Y9).
"n" indicates an interrupt setting number. (n = 1 to 16)

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Interrupt factor reset request [n]	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171
Interrupt factor reset request [n] (in Q compatible mode)	4064	4065	4066	4067	4068	4069	4070	4071	4072	4073	4074	4075	4076	4077	4078	4079

■Default value

The default value is 0 for all channels.

Interrupt factor generation setting [n]

Set an interrupt request for when the same interrupt factor occurs during the interrupt factor detection.

Setting value	Setting content
0	Interrupt resend request
1	No interrupt resend request

- When 'Interrupt factor generation setting [n]' (Un\G200 to Un\G215) is Interrupt resend request (0) and the same interrupt factor occurs during the interrupt factor detection, an interrupt request is sent to the CPU module again.
- When 'Interrupt factor generation setting [n]' (Un\G200 to Un\G215) is No interrupt resend request (1) and the same interrupt factor occurs during the interrupt factor detection, an interrupt request is not sent to the CPU module.

If a value other than the above is set, an interrupt factor generation setting error (error code: 180△H) occurs.
"n" indicates an interrupt setting number. (n = 1 to 16)

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Interrupt factor generation setting [n]	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215
Interrupt factor generation setting [n] (in Q compatible mode)	4096	4097	4098	4099	4100	4101	4102	4103	4104	4105	4106	4107	4108	4109	4110	4111

■Enabling the setting

Turn on and off Operating condition setting request (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

Condition target setting [n]

Set an interrupt factor to be detected.

Setting value	Setting content
0	Disable
1	Error flag (XF)
2	Alert output flag (Process alarm)
3	Alert output flag (Rate alarm)
4	Input signal error detection flag
5	A/D conversion completed
6	Logging hold flag
7	Logging read

If a value other than the above is set, a condition target setting range error (error code: 181△H) occurs.

When an input signal (X) or a buffer memory area set to 'Condition target setting [n]' (Un\G232 to Un\G247) turns off and on, an interrupt request is sent to the CPU module.

"n" indicates an interrupt setting number. (n = 1 to 16)

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Condition target setting [n]	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247
Condition target setting [n] (in Q compatible mode)	4128	4129	4130	4131	4132	4133	4134	4135	4136	4137	4138	4139	4140	4141	4142	4143

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

A

Condition target channel setting [n]

Set a channel where an interrupt is detected.

Setting value	Setting content
0	All channels
1	CH1
2	CH2
3	CH3
4	CH4
5	CH5
6	CH6
7	CH7
8	CH8

When a factor for the channel specification is set to 'Condition target setting [n]' (Un\G232 to Un\G247), an interrupt factor in the channel set by this area is monitored. When a factor of the input signal (X) is set, the setting in this area is ignored.

If a value other than the above is set, a condition target setting range error (error code: 182△H) occurs.

"n" indicates an interrupt setting number. (n = 1 to 16)

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Condition target channel setting [n]	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279
Condition target channel setting [n] (in Q compatible mode)	4160	4161	4162	4163	4164	4165	4166	4167	4168	4169	4170	4171	4172	4173	4174	4175

■Setting range

For R60AD4, the setting range is from 0 to 4.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

Mode switching setting

Set a setting value for the mode to be switched.

Switching mode	Setting value	
Buffer memory address	**296**	**297**
Normal mode	5260H	4144H
Offset/gain setting mode	4144H	5260H

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Mode switching setting	296, 297							
Mode switching setting (in Q compatible mode)	158, 159							

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■After the mode is switched

When the mode is switched, this area is cleared to 0 and 'Operating condition setting completed flag' (X9) turns off.

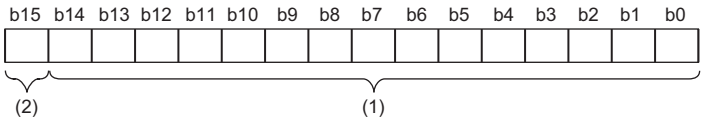
After checking that 'Operating condition setting completed flag' (X9) is off, turn off 'Operating condition setting request' (Y9).

Point

When a value out of the above is written and 'Operating condition setting request' (Y9) is turned on and off, the mode setting is not performed and only the operating condition is changed.

CH1 Digital output value

The A/D-converted digital output value is stored in 16-bit signed binary value.



(1) Data section

(2) Sign bit 0: Positive, 1: Negative

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Digital output value	400	600	800	1000	1200	1400	1600	1800
CH☐ Digital output value (in Q compatible mode)	11	12	13	14	15	16	17	18

■Refreshing cycle

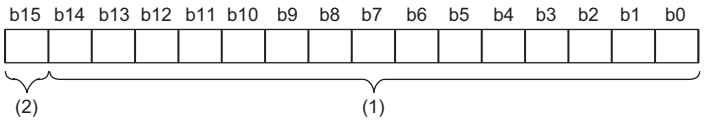
If averaging processing is performed, values are updated at every averaging process cycle, but if not performed, values are updated at every sampling cycle.

Point

The initial value of 'CH1 Digital output value' (Un\G400) is 0. However, since 'CH1 A/D conversion enable/disable setting' (Un\G500) is A/D conversion enable (0), a digital output value is stored right after the module startup.

CH1 Digital operation value

A digital operation value obtained by the scaling function, shift function, digital clipping function, or difference conversion function is stored in 16-bit signed binary value.



(1) Data section

(2) Sign bit 0: Positive, 1: Negative

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Digital operation value	402	602	802	1002	1202	1402	1602	1802
CH☐ Digital operation value (in Q compatible mode)	54	55	56	57	58	59	60	61

Point

When the scaling function, shift function, digital clipping function, or difference conversion function is not used, a value which is the same as the one in 'CH1 Digital output value' (Un\G400) is stored.

CH1 Maximum value

The maximum value of the digital operation value is stored in 16-bit signed binary value.

In the following cases, 'CH1 Maximum value' (Un\G404) is updated with the current value.

- When 'Operating condition setting request' (Y9) is turned on and off and the setting is changed
- When 'Maximum value/minimum value reset request' (YD) is turned on and off

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Maximum value	404	604	804	1004	1204	1404	1604	1804
CH☐ Maximum value (in Q compatible mode)	30	32	34	36	38	40	42	44

CH1 Minimum value

The minimum value of the digital operation value is stored in 16-bit signed binary value.

In the following cases, 'CH1 Minimum value' (Un\G406) is updated with the current value.

- When 'Operating condition setting request' (Y9) is turned on and off and the setting is changed
- When 'Maximum value/minimum value reset request' (YD) is turned on and off

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Minimum value	406	606	806	1006	1206	1406	1606	1806
CH☐ Minimum value (in Q compatible mode)	31	33	35	37	39	41	43	45

Point

- For the channel to which the averaging processing is specified, the maximum and minimum values are stored at every averaging processing time.
- When the scaling function, shift function, digital clipping function, or difference conversion function is used, values calculated by each function are stored in Maximum value and Minimum value.

CH1 Difference conversion status flag

The difference conversion status can be checked.

Monitor value	Description
0	Not converted
1	Converting difference

When the difference conversion starts after 'CH1 Difference conversion trigger' (Un\G470) is changed from No request (0) to Trigger request (1), 'CH1 Difference conversion status flag' (Un\G408) corresponding to the channel turns to Converting difference (1).
When 'CH1 Difference conversion trigger' (Un\G470) is changed from Trigger request (1) to No request (0), 'CH1 Difference conversion status flag' (Un\G408) is changed from Converting difference (1) to Not converted (0).
'CH1 Difference conversion status flag' (Un\G408) is Converting difference (1) during the difference conversion; Not converted (0) if not during the difference conversion.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Difference conversion status flag	408	608	808	1008	1208	1408	1608	1808
CH☐ Difference conversion status flag (in Q compatible mode)	190	191	192	193	194	195	196	197

CH1 Logging hold flag

The logging holding status can be checked.
For details on the logging function, refer to the following.
☞ Page 45 Logging Function

Monitor value	Description
0	OFF
1	ON

When a state that data is collected in 'CH1 Logging data' (Un\G10000 to Un\G19999) changes to the stop state, 'CH1 Logging hold flag' (Un\G409) is turned to ON (1).
When logging restarts by changing 'CH1 Logging hold request' (Un\G471) from ON (1) to OFF (0), 'CH1 Logging hold flag' (Un\G409) is turned to OFF (0).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Logging hold flag	409	609	809	1009	1209	1409	1609	1809
CH☐ Logging hold flag (in Q compatible mode)	1016	1017	1018	1019	1020	1021	1022	1023

CH1 Range setting monitor

The input range value set to the input range setting or 'CH1 Range setting' (Un\G598) can be checked.

Monitor value	Description
0H	4 to 20mA
1H	0 to 20mA
2H	1 to 5V
3H	0 to 5V
4H	-10 to 10V
5H	0 to 10V
AH	4 to 20mA (extended mode)
BH	1 to 5V (extended mode)
FH	User range setting

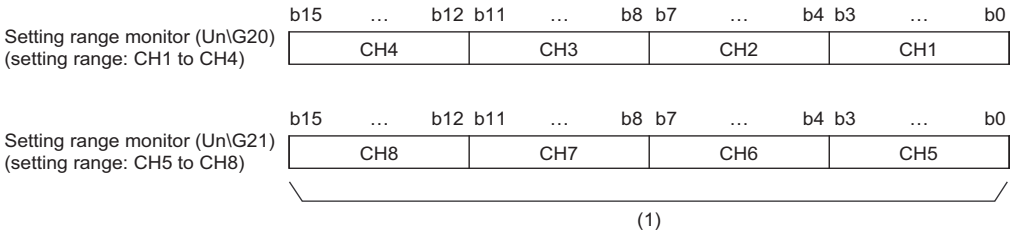
■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Range setting monitor	430	630	830	1030	1230	1430	1630	1830

Range setting monitor [Q compatible mode]

When the Q compatible mode function is used, the input range value set in the input range setting can be checked.



(1) The buffer memory address 21 of R60AD4 is fixed to 0.

Monitor value	Description
0H	4 to 20mA
1H	0 to 20mA
2H	1 to 5V
3H	0 to 5V
4H	-10 to 10V
5H	0 to 10V
AH	4 to 20mA (extended mode)
BH	1 to 5V (extended mode)
FH	User range setting

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Range setting monitor	20				21			

CH1 Difference conversion reference value

This area stores 'CH1 Digital operation value' (Un\G402) at the start of the difference conversion as the difference conversion reference value.

The difference conversion reference value is updated when 'CH1 Difference conversion trigger' (Un\G470) is turned from No request (0) to Trigger request (1).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Difference conversion reference value	432	632	832	1032	1232	1432	1632	1832
CH☐ Difference conversion reference value (in Q compatible mode)	180	181	182	183	184	185	186	187

■Setting range

The setting range is from -32768 to 32767.

Point

Even if 'CH1 Difference conversion status flag' (Un\G408) is turned from Converting difference (1) to Not converted (0), 'CH1 Difference conversion reference value' (Un\G432) is not cleared.

CH1 Head pointer

The buffer memory address of the oldest data in CH1 Logging data (Un\G10000 to Un\G19999) can be checked with this buffer memory area.

The offset value counted from the start address of CH1 Logging data (Un\G10000 to Un\G19999) is stored.

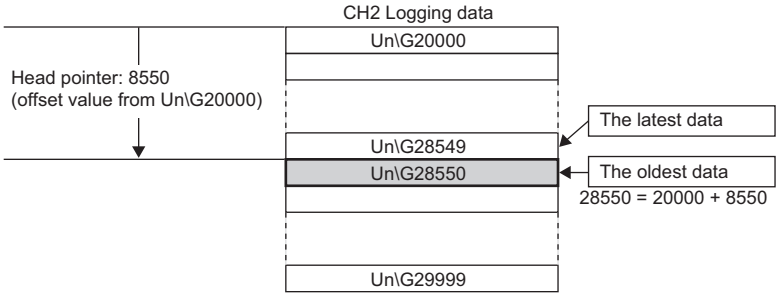
■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Head pointer	434	634	834	1034	1234	1434	1634	1834
CH☐ Head pointer (in Q compatible mode)	1090	1091	1092	1093	1094	1095	1096	1097

Ex.

When the value of 'CH2 Head pointer' (Un\G634) is 8550



■Default value

The default value is 0 for all channels.

Point

- The value in 'CH1 Head pointer' (Un\G434) is fixed to 0 since the oldest data is stored in the start address of CH1 Logging data (Un\G10000 to Un\G19999) while the data of the first 10000 points is being logged from beginning of the logging. On and after the 10001st data, 'CH1 Head pointer' (Un\G434) increases one by one each time data is stored.
- When 'CH1 Logging hold request' (Un\G471) is turned on and off, 'CH1 Head pointer' (Un\G434) is cleared to 0.

CH1 Latest pointer

The buffer memory address of the latest data in CH1 Logging data (Un\G10000 to Un\G19999) can be checked with this buffer memory area.

The offset value counted from the start address of CH1 Logging data (Un\G10000 to Un\G19999) is stored.

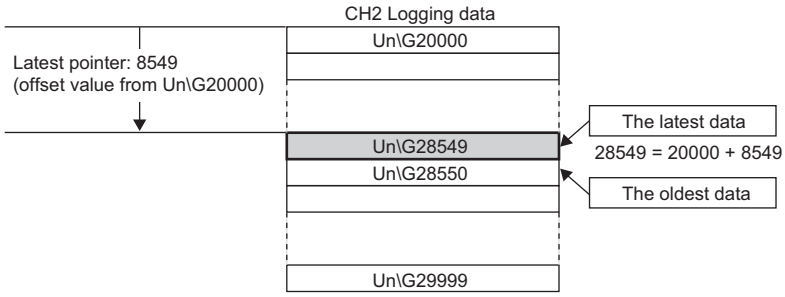
■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Latest pointer	435	635	835	1035	1235	1435	1635	1835
CH☐ Latest pointer (in Q compatible mode)	1098	1099	1100	1101	1102	1103	1104	1105

Ex.

When the value of CH2 Latest pointer (Un\G635) is 8549



■Default value

The default value is 0 for all channels.

Point

- 'CH1 Latest pointer' (Un\G435) increases one by one each time data is stored from beginning of the logging.
- When 'CH1 Logging hold request' (Un\G471) is turned on and off, 'CH1 Latest pointer' (Un\G435) is cleared to 0.

CH1 Number of logging data

The number of data stored in the logging data storage area can be checked during the logging.

'CH1 Number of logging data' (Un\G436) increases one by one each time data is stored from beginning of the logging.

When the value in the logging data storage area reaches 10000, 'CH1 Number of logging data' (Un\G436) is fixed to 10000 since the value is overwritten from the head again.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Number of logging data	436	636	836	1036	1236	1436	1636	1836
CH☐ Number of logging data (in Q compatible mode)	1106	1107	1108	1109	1110	1111	1112	1113

Point

When 'CH1 Logging hold request' (Un\G471) is turned on and off, 'CH1 Number of logging data' (Un\G436) is cleared to 0.

CH1 Trigger pointer

The buffer memory address of the data of when a hold trigger is executed in CH1 Logging data (Un\G10000 to Un\G19999) can be checked with this buffer memory area.

The difference between the address of buffer memory which stores the data of when a hold trigger is executed and the start address in CH1 Logging data (Un\G10000 to Un\G19999) is stored.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Trigger pointer	437	637	837	1037	1237	1437	1637	1837
CH☐ Trigger pointer (in Q compatible mode)	1114	1115	1116	1117	1118	1119	1120	1121

■Default value

The default value is 0 for all channels.

Point

When 'CH1 Logging hold request' (Un\G471) is turned on and off, 'CH1 Trigger pointer' (Un\G437) is cleared to 0.

CH1 Current logging read pointer

Each time an amount equivalent to the logging read points monitor value is logged, a value calculated by the following formula is stored.

CH1 Current logging read pointer = CH1 Latest pointer - CH1 Logging read points monitor value + 1

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Current logging read pointer	438	638	838	1038	1238	1438	1638	1838
CH☐ Current logging read pointer (in Q compatible mode)	1216	1217	1218	1219	1220	1221	1222	1223

■Default value

The default value is -1 for all channels.

CH1 Previous logging read pointer

A before-update current logging read pointer is stored just before an interrupt to the CPU module causes the update.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Previous logging read pointer	439	639	839	1039	1239	1439	1639	1839
CH☐ Previous logging read pointer (in Q compatible mode)	1224	1225	1226	1227	1228	1229	1230	1231

■Default value

The default value is -1 for all channels.

CH1 Logging read points monitor value

The number of the actual logging read points is stored.

When 'Operating condition setting request' (Y9) is turned on and off, a value is not stored in the channel where the logging read function is disabled.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Logging read points monitor value	440	640	840	1040	1240	1440	1640	1840
CH☐ Logging read points monitor value (in Q compatible mode)	1232	1233	1234	1235	1236	1237	1238	1239

CH1 Logging cycle monitor value

This area stores the actual logging cycle which is calculated from the refreshing cycle of data to be logged.

When 'Operating condition setting request' (Y9) is turned on and off, the actual logging cycle is stored in Logging cycle monitor value in the corresponding channel where the logging function is enabled.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

The following values are stored in 'CH1 Logging cycle monitor value' (Un\G441 to Un\G443).

	b15 to b0
'CH1 Logging cycle monitor value (s)' (Un\G441)	s
'CH1 Logging cycle monitor value (ms)' (Un\G442)	ms
'CH1 Logging cycle monitor value (μs)' (Un\G443)	μs

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Logging cycle monitor value (s)	441	641	841	1041	1241	1441	1641	1841
CH☐ Logging cycle monitor value (ms)	442	642	842	1042	1242	1442	1642	1842
CH☐ Logging cycle monitor value (μs)	443	643	843	1043	1243	1443	1643	1843
CH☐ Logging cycle monitor value (s) (in Q compatible mode)	1122	1125	1128	1131	1134	1137	1140	1143
CH☐ Logging cycle monitor value (ms) (in Q compatible mode)	1123	1126	1129	1132	1135	1138	1141	1144
CH☐ Logging cycle monitor value (μs) (in Q compatible mode)	1124	1127	1130	1133	1136	1139	1142	1145

CH1 Trigger generation time

The time when a trigger is generated is recorded.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

	b15 to b8	b7 to b0
'CH1 Trigger generation time (First/Last two digits of the year)' (Un\G444)	First two digits of the year	Last two digits of the year
'CH1 Trigger generation time (Month/Day)' (Un\G445)	Month	Day
'CH1 Trigger generation time (Hour/Minute)' (Un\G446)	Hour	Minute
'CH1 Trigger generation time (Second/Day of the week)' (Un\G447)	Second	Day of the week
'CH1 Trigger generation time (Millisecond)' (Un\G448)	Millisecond (higher-order digits)	Millisecond (lower-order digits)

Item	Storage contents	Storage example*1
First two digits of the year/Last two digits of the year	Stored in BCD code.	2014H
Month/Day		630H
Hour/Minute		1234H
Second		56H
Day of the week	One of the following values is stored in BCD code. Sunday: 0, Monday: 1, Tuesday: 2, Wednesday: 3 Thursday: 4, Friday: 5, Saturday: 6	1H
Millisecond (upper)	Stored in BCD code.	7H
Millisecond (lower)		89H

*1 Values stored when an error occurs at 12:34:56.789 on Monday, June 30th, 2014.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Trigger generation time (First/Last two digits of the year)	444	644	844	1044	1244	1444	1644	1844
CH☐ Trigger generation time (Month/Day)	445	645	845	1045	1245	1445	1645	1845
CH☐ Trigger generation time (Hour/Minute)	446	646	846	1046	1246	1446	1646	1846
CH☐ Trigger generation time (Second/Day of the week)	447	647	847	1047	1247	1447	1647	1847
CH☐ Trigger generation time (Millisecond)	448	648	848	1048	1248	1448	1648	1848
CH☐ Trigger generation time (First/Last two digits of the year) (in Q compatible mode)	1154	1158	1162	1166	1170	1174	1178	1182
CH☐ Trigger generation time (Month/Day) (in Q compatible mode)	1155	1159	1163	1167	1171	1175	1179	1183
CH☐ Trigger generation time (Hour/Minute) (in Q compatible mode)	1156	1160	1164	1168	1172	1176	1180	1184
CH☐ Trigger generation time (Second/Day of the week) (in Q compatible mode)	1157	1161	1165	1169	1173	1177	1181	1185
CH☐ Trigger generation time (Millisecond) (in Q compatible mode)	1186	1187	1188	1189	1190	1191	1192	1193

Point

- Time units shorter than one millisecond are not recorded.
- When 'CH1 Logging hold request' (Un\G471) is turned on and off, 'CH1 Trigger generation time' (Un\G444 to Un\G448) is cleared to 0.

CH1 Difference conversion trigger

Use this buffer memory area as a trigger to start or stop the difference conversion.

For details on the difference conversion function, refer to the following.

☞ Page 28 Difference Conversion Function

Setting value	Setting content
0	No request
1	Trigger request

If a value other than the above is set, a difference conversion trigger setting range error (error code: 1A7□H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Difference conversion trigger	470	670	870	1070	1270	1470	1670	1870
CH□ Difference conversion trigger (in Q compatible mode)	172	173	174	175	176	177	178	179

■Starting and stopping the difference conversion

- When the setting value is turned from No request (0) to Trigger request (1), the difference conversion starts.
- When the setting value is turned from Trigger request (1) to No request (0), the difference conversion stops.

■Default value

The default value is No request (0) for all channels.

CH1 Logging hold request

Use this buffer memory area as a trigger to hold (stop) logging at any timing during the logging.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

Logging hold request	Setting value
OFF	0
ON	1

If a value other than the above is set, a logging hold request range error (error code: 1D7□H) occurs.

When 'CH1 Logging enable/disable setting' (Un\G535) is set to Disable (1), the setting for 'CH1 Logging hold request' (Un\G471) is ignored.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Logging hold request	471	671	871	1071	1271	1471	1671	1871
CH□ Logging hold request (in Q compatible mode)	1008	1009	1010	1011	1012	1013	1014	1015

■Operation of the logging hold processing

- When Disable (0) is set to 'CH1 Level trigger condition setting' (Un\G540), the logging hold processing starts by turning off and on 'CH1 Logging hold request' (Un\G471).
- When a value other than Disable (0) is set to 'CH1 Hold trigger condition setting' (Un\G540), the logging hold processing starts after 'CH1 Logging hold request' (Un\G471) is turned off and on and the set trigger condition is satisfied. When the level trigger is enabled, use this buffer memory area as an interlock condition to operate the level trigger.
- If 'CH1 Logging hold request' (Un\G471) is turned on and off during the logging hold processing, the hold (stop) status is cleared and the logging restarts.

■Default value

The default value is OFF (0) for all channels.

Point

The stop status of the logging can be checked with 'CH1 Logging hold flag' (Un\G409).

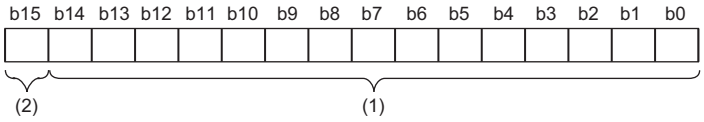
CH1 Conversion value shift amount

Set 'CH1 Conversion value shift amount' (Un\G472) used for the shift function.

The digital operation value to which the conversion value shift amount is applied is stored in 'CH1 Digital operation value' (Un\G402).

For details on the shift function, refer to the following.

☞ Page 23 Shift Function



(1) Data section

(2) Sign bit 0: Positive, 1: Negative

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Conversion value shift amount	472	672	872	1072	1272	1472	1672	1872
CH☐ Conversion value shift amount (in Q compatible mode)	150	151	152	153	154	155	156	157

■Setting range

The setting range is from -32768 to 32767.

■Enabling the setting

Regardless of turning on and off 'Operating condition setting request' (Y9), the set conversion value shift amount takes effect.

■Default value

The default value is 0 for all channels.

CH1 A/D conversion enable/disable setting

Set whether to enable or disable the A/D conversion.

For details on the A/D conversion enable/disable setting function, refer to the following.

☞ Page 15 A/D Conversion Enable/Disable Setting Function

Setting value	Setting content
0	A/D conversion enable
1	A/D conversion disable

When a value other than the ones above is set, CH1 A/D conversion enable/disable setting (Un\G500) is turned to A/D conversion disable (1).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ A/D conversion enable/disable setting	500	700	900	1100	1300	1500	1700	1900

■Enabling the setting

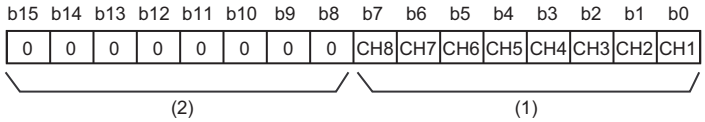
Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is A/D conversion enable (0) for all channels.

A/D conversion enable/disable setting [Q compatible mode]

When the Q compatible mode function is used, set whether to enable or disable the A/D conversion.



(1) 0: A/D conversion enabled, 1: A/D conversion disabled

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
A/D conversion enable/disable setting (in Q compatible mode)	0							

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is A/D conversion enable (0) for all channels.

CH1 Averaging process specification

Select processing to be performed among the sampling processing, averaging processing, and filter processing.

Averaging processing consists of time average, count average, and moving average.

Setting value	Setting content
0	Sampling processing
1	Time average
2	Count average
3	Moving average
4	Primary delay filter

If a value other than the above is set, an averaging process specification setting range error (error code: 191□H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Averaging process specification	501	701	901	1101	1301	1501	1701	1901

■Enabling the setting

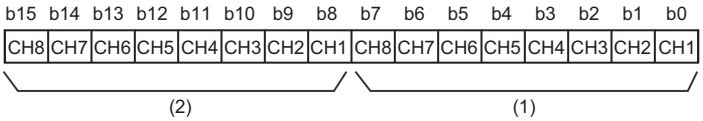
Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Sampling processing (0) for all channels.

Averaging process specification (for Q series) [Q compatible mode]

For Q compatible mode, to use default sequence programs of the Q64AD, Q68ADV, and Q68ADI, set which processing to use, sampling processing or averaging processing.



(1) Time or count specification: "0: Count average" or "1: Time average"

(2) Channel specification for averaging processing: "0: Sampling processing" or "1: Averaging processing"

b4 to b7 and b12 to b15 of the R60AD4 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

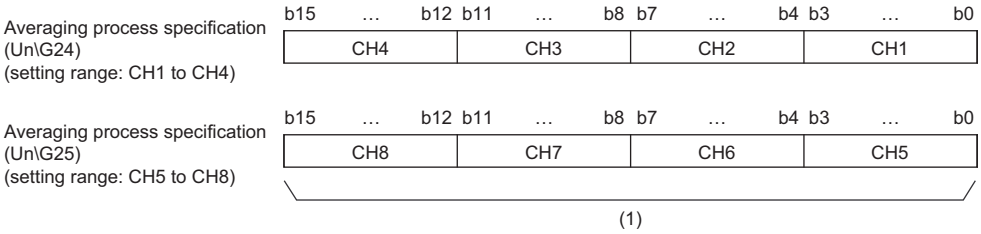
Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Averaging process specification (for Q series)	9							

■Enabling the setting

Set Averaging process specification (Un\G24 and Un\G25) to 0 and turn on and off 'Operating condition setting request' (Y9) to enable the setting.

Averaging process specification [Q compatible mode]

For Q compatible mode, set which processing to use, sampling processing, averaging processing, or filter processing.



(1) The buffer memory address 25 of R60AD4 is fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Averaging process setting	24				25			

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

Point

When using the averaging process specification (for Q series) by utilizing a sequence program from the Q64AD, Q68ADV, and Q68ADI, this setting is ignored.

A

CH1 Time average/Count average/Moving average/Primary delay filter constant setting

Configure the time (for averaging), count (for averaging), moving average count, and primary delay filter constant for each channel where the averaging processing is specified.

The following table lists the setting ranges.

Setting value	Setting content
2 to 5000 (ms)*1	Time average
4 to 62500 (times)*2	Count average
2 to 1000 (times)	Moving average
1 to 500 (times)	Primary delay filter constant

*1 When the number of channels used is seven or eight, set 3ms or longer for the time (for averaging). A time shorter than 3ms results in a digital output value of 0.

*2 To set a value of 32768 to 62500 (times) by using a program, the value must be in hexadecimal. For example, set F424H for 62500 (times).

If a value other than the above is set, any of a time average setting range error (error code: 192☐H), count average setting range error (error code: 193☐H), moving average setting range error (error code: 194☐H), or primary delay filter constant setting range error (error code: 195☐H) occurs, and the A/D conversion process is performed with the setting before the occurrence of the error.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Time average/Count average/Moving average/Primary delay filter constant setting	502	702	902	1102	1302	1502	1702	1902
CH☐ Time average/Count average/Moving average/Primary delay filter constant setting (in Q compatible mode)	1	2	3	4	5	6	7	8

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

Point

- Set a primary delay filter constant for the primary delay filter. The value of the time constant (ms) is the product of the primary delay filter constant and the sampling cycle.
- Since the default value is 0, change the setting value according to the processing method.
- The setting for this area is ignored in the channel where Sampling processing (0) is set to 'CH1 Averaging process specification' (Un\G501).

CH1 Scaling enable/disable setting

Set whether to enable or disable the scaling.

For details on the scaling function, refer to the following.

☞ Page 20 Scaling Function

Setting value	Setting content
0	Enable
1	Disable

If a value other than the above is set, a scaling enable/disable setting range error (error code: 1A0☐H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Scaling enable/disable setting	504	704	904	1104	1304	1504	1704	1904

■Enabling the setting

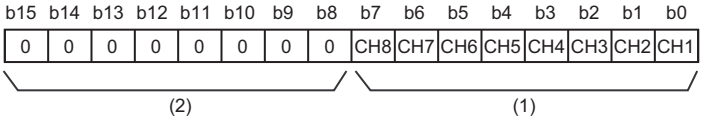
Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

Scaling enable/disable setting [Q compatible mode]

When the Q compatible mode function is used, set whether to enable or disable the scaling.



(1) 0: Scaling enabled, 1: Scaling disabled

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Scaling enable/disable setting (in Q compatible mode)	53							

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

CH1 Scaling upper limit value

Set an upper limit value for the range of the scale conversion.

For details on the scaling function, refer to the following.

☞ Page 20 Scaling Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Scaling upper limit value	506	706	906	1106	1306	1506	1706	1906
CH☐ Scaling upper limit value (in Q compatible mode)	63	65	67	69	71	73	75	77

■Setting range

The setting range is from -32000 to 32000.

In the channel where a value out of the range is set, a scaling setting range error (error code: 1A1☐H) occurs.

In the channel where a set value does not satisfy the condition "the scaling upper limit value ≠ the scaling lower limit value", a scaling upper/lower limit value setting error (error code: 1A2☐H) occurs.

When 'CH1 Scaling enable/disable setting' (Un\G504) is set to Disable (1), the setting for 'CH1 Scaling upper limit value' (Un\G506) is ignored.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

CH1 Scaling lower limit value

Set a lower limit value for the range of the scale conversion.

For details on the scaling function, refer to the following.

☞ Page 20 Scaling Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Scaling lower limit value	508	708	908	1108	1308	1508	1708	1908
CH□ Scaling lower limit value (in Q compatible mode)	62	64	66	68	70	72	74	76

■Setting range

The setting range is from -32000 to 32000.

In the channel where a value out of the range is set, a scaling setting range error (error code: 1A1□H) occurs.

In the channel where a set value does not satisfy the condition "the scaling upper limit value ≠ the scaling lower limit value", a scaling upper/lower limit value setting error (error code: 1A2□H) occurs.

When 'CH1 Scaling enable/disable setting' (Un\G504) is set to Disable (1), the setting for 'CH1 Scaling lower limit value' (Un\G508) is ignored.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

CH1 Digital clipping enable/disable setting

Set whether to enable or disable the digital clipping function.

For details on the digital clipping function, refer to the following.

☞ Page 26 Digital Clipping Function

Setting value	Setting content
0	Enable
1	Disable

If a value other than the above is set, a digital clipping enable/disable setting range error (error code: 1A5□H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Digital clipping enable/disable setting	510	710	910	1110	1310	1510	1710	1910

■Enabling the setting

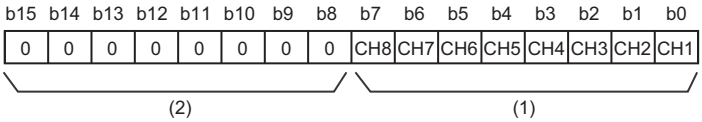
Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

Digital clipping enable/disable setting [Q compatible mode]

When the Q compatible mode function is used, set whether to enable or disable the digital clipping function.



(1) 0: Digital clipping enabled, 1: Digital clipping disabled

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Digital clipping enable/disable setting (in Q compatible mode)	29							

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

CH1 Alert output setting (Process alarm)

Set whether to enable or disable the alert output of the process alarm.

For details on the alert output function, refer to the following.

☞ Page 33 Alert Output Function

Setting value	Setting content
0	Enable
1	Disable

If a value other than the above is set, an alert output setting (Process alarm) range error (error code: 1B0□H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Alert output setting (Process alarm)	512	712	912	1112	1312	1512	1712	1912

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

CH1 Alert output setting (Rate alarm)

Set whether to enable or disable the alert output of the rate alarm.

For details on the alert output function, refer to the following.

☞ Page 33 Alert Output Function

Setting value	Setting content
0	Enable
1	Disable

If a value other than the above is set, an alert output setting (Rate alarm) range error (error code: 1B8□H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Alert output setting (Rate alarm)	513	713	913	1113	1313	1513	1713	1913

■Enabling the setting

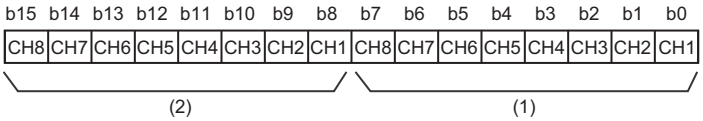
Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

Alert output setting [Q compatible mode]

When the Q compatible mode function is used, set whether to enable or disable the alert output of process alarms and rate alarms.



(1) 0: Process alarm enabled, 1: Process alarm disabled

(2) 0: Rate alarm enabled, 1: Rate alarm disabled

b4 to b7 and b12 to b15 of the R60AD4 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Alert output setting (Process alarm)/Alert output setting (Rate alarm)	48							

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

CH1 Process alarm upper upper limit value

Set an upper upper limit value of the alert output function (Process alarm).

For details on the alert output function, refer to the following.

☞ Page 33 Alert Output Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Process alarm upper upper limit value	514	714	914	1114	1314	1514	1714	1914
CH☐ Process alarm upper upper limit value (in Q compatible mode)	89	93	97	101	105	109	113	117

■Setting range

The setting range is from -32768 to 32767.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

CH1 Process alarm upper lower limit value

Set an upper lower limit value of the alert output function (Process alarm).

For details on the alert output function, refer to the following.

☞ Page 33 Alert Output Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Process alarm upper lower limit value	516	716	916	1116	1316	1516	1716	1916
CH☐ Process alarm upper lower limit value (in Q compatible mode)	88	92	96	100	104	108	112	116

■Setting range

The setting range is from -32768 to 32767.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

CH1 Process alarm lower upper limit value

Set a lower upper limit value of the alert output function (Process alarm).

For details on the alert output function, refer to the following.

☞ Page 33 Alert Output Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Process alarm lower upper limit value	518	718	918	1118	1318	1518	1718	1918
CH□ Process alarm lower upper limit value (in Q compatible mode)	87	91	95	99	103	107	111	115

■Setting range

The setting range is from -32768 to 32767.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

CH1 Process alarm lower lower limit value

Set a lower lower limit value of the alert output function (Process alarm).

For details on the alert output function, refer to the following.

☞ Page 33 Alert Output Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Process alarm lower lower limit value	520	720	920	1120	1320	1520	1720	1920
CH□ Process alarm lower lower limit value (in Q compatible mode)	86	90	94	98	102	106	110	114

■Setting range

The setting range is from -32768 to 32767.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

Point

- When using the process alarm, configure the 4-step settings for the process alarm upper upper limit value, upper lower limit value, lower upper limit value, and lower lower value.
- In the channel where a set value does not satisfy the condition "the upper upper limit value ≥ the upper lower limit value ≥ the lower upper limit value ≥ the lower lower limit value", a process alarm upper lower limit value setting range error (error code: 1B△□H) occurs.
- Since the default value is 0, change the setting value.
- When the scaling function, shift function, digital clipping function, or difference conversion function is used, alert targets are digital operation values to which the operation of each function is reflected. Be sure to consider operation results of each function to set values.

CH1 Rate alarm alert detection cycle setting

Set the cycle to check the change rate of digital output values.

The value of the cycle to detect a rate alarm alert is the product of the value in 'CH1 Rate alarm alert detection cycle setting' (Un\G522) and the conversion cycle.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Rate alarm alert detection cycle setting	522	722	922	1122	1322	1522	1722	1922
CH☐ Rate alarm alert detection cycle setting (in Q compatible mode)	118	119	120	121	122	123	124	125

■Setting range

The setting range is from 1 to 32000 (times).

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

Point

- In the channel where a value out of the range is set, a rate alarm detection cycle setting range error (error code: 1B9☐H) occurs.
- Since the default value is 0, change the setting value when setting the rate alarm function.

CH1 Rate alarm upper limit value

Set an upper limit value of the change rate of digital output values to detect a rate alarm.

For details on the alert output function, refer to the following.

☞ Page 33 Alert Output Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Rate alarm upper limit value	524	724	924	1124	1324	1524	1724	1924
CH☐ Rate alarm upper limit value (in Q compatible mode)	126	128	130	132	134	136	138	140

■Setting range

The setting range is from -32768 to 32767 (-3276.8 to 3276.7%). (Set it in a unit of 0.1%.)

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

CH1 Rate alarm lower limit value

Set a lower limit value of the change rate of digital output values to detect a rate alarm.

For details on the alert output function, refer to the following.

☞ Page 33 Alert Output Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Rate alarm lower limit value	526	726	926	1126	1326	1526	1726	1926
CH☐ Rate alarm lower limit value (in Q compatible mode)	127	129	131	133	135	137	139	141

■Setting range

The setting range is from -32768 to 32767 (-3276.8 to 3276.7%). (Set it in a unit of 0.1%.)

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

Point

- When using the rate alarm, configure the 2-step settings for the rate alarm upper limit value and lower limit value.
- In the channel where a set value does not satisfy the condition "the rate alarm lower limit value ≥ the rate alarm upper limit value", a rate alarm upper/lower limit setting value inversion error (error code: 1BA☐H) occurs.
- Since the default value is 0, change the setting value.

CH1 Input signal error detection setting

Set a condition for detecting an input signal error.

For details on the input signal error detection function, refer to the following.

☞ Page 40 Input Signal Error Detection Function

Setting value	Setting content
0	Disable
1	Upper and lower limit detection
2	Lower limit detection
3	Upper limit detection
4	Simple disconnection detection

If a value other than the above is set, an input signal error detection setting range error (error code: 1C0☐H) occurs.

If Simple disconnection detection (4) is selected for the channel where the input range setting is other than the extended mode, a disconnection detection enabled range setting range error (error code: 1C6☐H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Input signal error detection setting	528	728	928	1128	1328	1528	1728	1928

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

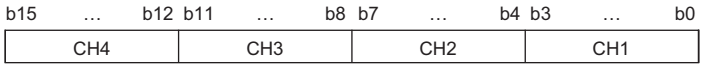
■Default value

The default value is Disable (0) for all channels.

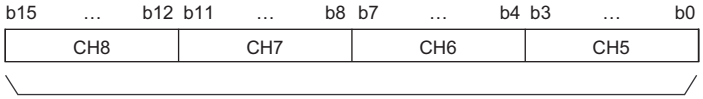
Input signal error detection setting [Q compatible mode]

When the Q compatible mode function is used, set a condition for detecting an input signal error.

Input signal error detection setting (Un\G27) (setting range: CH1 to CH4)



Input signal error detection setting (Un\G28) (setting range: CH5 to CH8)



(1) The buffer memory address 28 of R60AD4 is fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Input signal error detection setting (in Q compatible mode)	27				28			

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

A

CH1 Input signal error detection setting value

Set a value to detect an error for the input analog value.

For details on the input signal error detection function, refer to the following.

☞ Page 40 Input Signal Error Detection Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Input signal error detection setting value	529	729	929	1129	1329	1529	1729	1929
CH□ Input signal error detection setting value (in Q compatible mode)	142	143	144	145	146	147	148	149

■Setting range

The setting range is from 0 to 250 (0 to 25.0%). Set it in a unit of 1 (0.1%).

In the channel where a value out of the range is set, an input signal error detection setting value range error (error code: 1C1□H) occurs.

The input signal error detection upper limit value and input signal error detection lower limit value are calculated based on the input signal error detection setting value as follows. The calculated values vary depending on the input range used.

Detection conditions vary depending on 'CH1 Input signal error detection setting' (Un\G528).

Input signal error detection upper limit value = Gain value of each range + (gain value of each range - offset value of each range) × (input signal error detection setting value/1000)

Input signal error detection lower limit value = Lower limit value of each range - (gain value of each range - offset value of each range) × (input signal error detection setting value/1000)

Ex.

When the input signal error detection setting value is set to 100 (10%)

Range used: 4 to 20mA

The input signal error detection upper limit value and input signal error detection lower limit value are as follows:

$$\text{Input signal error detectionupper limit value} = 20 + (20 - 4) \times \frac{100}{1000} = 21.6\text{mA}$$

$$\text{Input signal error detection lower limit value} = 4 - (20 - 4) \times \frac{100}{1000} = 2.4\text{mA}$$

Detection conditions vary depending on 'Input signal error detection setting' (Un\G528) as follows:

- When Input signal error detection setting is set to Upper and lower limit detection (1), the detection is performed with both the input signal error detection upper limit value and input signal error detection lower limit value.
- When Input signal error detection setting is set to Lower limit detection (2), the detection is performed only with the input signal error detection lower limit value.
- When Input signal error detection setting is set to Upper limit detection (3), the detection is performed only with the input signal error detection upper limit value.
- When Input signal error detection setting is set to Simple disconnection detection (4), the value set in this area is ignored.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 50 for all channels.

CH1 Logging enable/disable setting

Set whether to enable or disable the logging function.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

Setting value	Setting content
0	Enable
1	Disable

If a value other than the above is set, a logging enable/disable setting range error (error code: 1D0□H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Logging enable/disable setting	535	735	935	1135	1335	1535	1735	1935
CH□ Logging enable/disable setting (in Q compatible mode)	1000	1001	1002	1003	1004	1005	1006	1007

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

CH1 Logging data setting

Determine the target to be collected: digital output value or digital operation value.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

Setting value	Setting content
0	Digital output value
1	Digital operation value

If a value other than the above is set, a logging data setting range error (error code: 1D3□H) occurs.

When 'CH1 Logging enable/disable setting' (Un\G535) is set to Disable (1), the setting for 'CH1 Logging data setting' (Un\G536) is ignored.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Logging data setting	536	736	936	1136	1336	1536	1736	1936
CH□ Logging data setting (in Q compatible mode)	1024	1025	1026	1027	1028	1029	1030	1031

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Digital operation value (1) for all channels.

CH1 Logging cycle setting value

Set a cycle for storing the logging data.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Logging cycle setting value	537	737	937	1137	1337	1537	1737	1937
CH☐ Logging cycle setting value (in Q compatible mode)	1032	1033	1034	1035	1036	1037	1038	1039

■Setting range

The setting range varies depending on the setting in 'CH1 Logging cycle unit setting' (Un\G538).

CH1 Logging cycle unit setting (Un\G538)	Setting range
μs (0)	80 to 32767
ms (1)	1 to 32767
s (2)	1 to 3600

- If a value out of the range is set, a logging cycle setting value range error (error code: 1D1☐H) occurs. Logging cannot be performed.
- If the set logging cycle is below the update cycle of data to be logged, a logging cycle setting disable error (error code: 1D2☐H) occurs. Logging cannot be performed.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 4 for all channels.

CH1 Logging cycle unit setting

Set a cycle unit for storing the logging data.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

Setting value	Setting content
0	μs
1	ms
2	s

- If a value out of the range is set, a logging cycle setting value range error (error code: 1D1☐H) occurs. Logging cannot be performed.
- If the set logging cycle is below the update cycle of data to be logged, a logging cycle setting disable error (error code: 1D2☐H) occurs. Logging cannot be performed.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Logging cycle unit setting	538	738	938	1138	1338	1538	1738	1938
CH☐ Logging cycle unit setting (in Q compatible mode)	1040	1041	1042	1043	1044	1045	1046	1047

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default is ms (1) for all channels.

CH1 Post-trigger logging points

Set a number of data points collected for the time period from the occurrence of a hold trigger to the logging stop.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Post-trigger logging points	539	739	939	1139	1339	1539	1739	1939
CH☐ Post-trigger logging points (in Q compatible mode)	1048	1049	1050	1051	1052	1053	1054	1055

■Setting range

The setting range is from 1 to 10000.

If a value out of the range is set, a post-trigger logging points setting range error (error code: 1D4☐H) occurs. Logging cannot be performed.

When 'CH1 Logging enable/disable setting' (Un\G535) is set to Disable (1), the setting for 'CH1 Post-trigger logging points' (Un\G539) is ignored.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 5000 for all channels.

CH1 Level trigger condition setting

Set the condition for the occurrence of a hold trigger when using the level trigger in the logging function.

To use the level trigger, set Level trigger condition setting to either level of Level trigger (condition: Rise) (1), Level trigger (condition: Fall) (2), or Level trigger (condition: Rise and fall) (3).

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

Setting value	Setting content
0	Disable
1	Level trigger (condition: Rise)
2	Level trigger (condition: Fall)
3	Level trigger (condition: Rise and fall)

If a value other than the above is set, a level trigger condition setting range error (error code: 1D5☐H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Level trigger condition setting	540	740	940	1140	1340	1540	1740	1940
CH☐ Level trigger condition setting (in Q compatible mode)	1056	1057	1058	1059	1060	1061	1062	1063

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (0) for all channels.

CH1 Trigger data

Set a buffer memory address to be monitored using a level trigger.

Set the buffer memory address where the target data for monitoring is stored.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Trigger data	541	741	941	1141	1341	1541	1741	1941
CH☐ Trigger data (in Q compatible mode)	1064	1065	1066	1067	1068	1069	1070	1071

■Setting range

The setting range is from 0 to 9999.

If a value out of the range is set, a trigger data setting range error (error code: 1D6☐H) occurs. Logging cannot be performed.

When 'CH1 Logging enable/disable setting' (Un\G535) is set to Disable (1), the setting for 'CH1 Post-trigger logging points' (Un\G539) is ignored.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default values are set as shown below.

Channel	Default value	Buffer memory area to be monitored
CH1	402	CH1 Digital operation value (Un\G402)
CH2	602	CH2 Digital operation value (Un\G602)
CH3	802	CH3 Digital operation value (Un\G802)
CH4	1002	CH4 Digital operation value (Un\G1002)
CH5	1202	CH5 Digital operation value (Un\G1202)
CH6	1402	CH6 Digital operation value (Un\G1402)
CH7	1602	CH7 Digital operation value (Un\G1602)
CH8	1802	CH8 Digital operation value (Un\G1802)

CH1 Trigger setting value

Set a level to generate a level trigger.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Trigger setting value	542	742	942	1142	1342	1542	1742	1942
CH☐ Trigger setting value (in Q compatible mode)	1082	1083	1084	1085	1086	1087	1088	1089

■Setting range

The setting range is from -32768 to 32767.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 0 for all channels.

CH1 Loading interrupt enable/disable setting

Set whether to enable or disable the logging read function.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

Setting value	Setting content
0	Enable
1	Disable

- If a value other than the above is set, a read interrupt enable/disable setting error (error code: 1D8☐H) occurs. Logging cannot be performed.
- When CH1 Logging read enable/disable setting (Un\G544) is set to Enable (0), an interrupt is generated and sent to the CPU module by setting a read pointer each time an amount equivalent to the logging read points setting value is logged.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Loading interrupt enable/disable setting	544	744	944	1144	1344	1544	1744	1944
CH☐ Loading interrupt enable/disable setting (in Q compatible mode)	1200	1201	1202	1203	1204	1205	1206	1207

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is Disable (1) for all channels.

Point

The interrupt pointer to be used is preset but can be changed. To change the interrupt pointer, set the corresponding interrupt pointer with the engineering tool.

CH1 Logging read points setting value

An interrupt is generated to the CPU module each time the number of data equal to the set points is logged.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Logging read points setting value	545	745	945	1145	1345	1545	1745	1945
CH☐ Logging read points setting value (in Q compatible mode)	1208	1209	1210	1211	1212	1213	1214	1215

■Setting range

The setting range is from 10 to 10000.

If a value out of the range is set, a logging read points setting value range error (error code: 1D9☐H) occurs. Logging cannot be performed.

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

■Default value

The default value is 1000 for all channels.

CH1 Range setting

This area is for setting an input range.

Input range	Setting value		
	R60AD4	R60ADV8	R60ADI8
4 to 20mA	0H	—	0H
0 to 20mA	1H	—	1H
1 to 5V	2H	2H	—
0 to 5V	3H	3H	—
-10 to 10V	4H	4H	—
0 to 10V	5H	0H, 5H	—
4 to 20mA (extended mode)	AH	—	AH
1 to 5V (extended mode)	BH	BH	—
User range setting	FH	FH	FH

If a value other than the above is set, a range setting range error (error code: 190□H) occurs.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH□ Range setting	598	798	998	1198	1398	1598	1798	1998

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

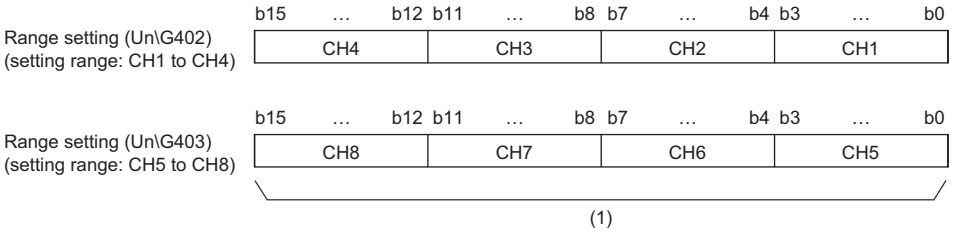
■Default value

The default value is 0H for all channels.

When the range is set in the parameter setting, the default value is the set value.

Range setting [Q compatible mode]

When the Q compatible mode function is used, this area is for setting an input range.



(1) The buffer memory address 403 of R60AD4 is fixed to 0.

Input range	Setting value		
	R60AD4	R60ADV8	R60ADI8
4 to 20mA	0H	—	0H
0 to 20mA	1H	—	1H
1 to 5V	2H	2H	—
0 to 5V	3H	3H	—
-10 to 10V	4H	4H	—
0 to 10V	5H	0H, 5H	—
4 to 20mA (extended mode)	AH	—	AH
1 to 5V (extended mode)	BH	BH	—
User range setting	FH	FH	FH

■Buffer memory address

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Range setting (in Q compatible mode)	402				403			

■Enabling the setting

Turn on and off 'Operating condition setting request' (Y9) to enable the setting.

A

Error history

Up to 16 errors that occurred in the module are recorded.

	b15 to b8	b7 to b0
Un\G3600	Error code	
Un\G3601	First two digits of the year	Last two digits of the year
Un\G3602	Month	Day
Un\G3603	Hour	Minute
Un\G3604	Second	Day of the week
Un\G3605	Millisecond (higher-order digits)	Millisecond (lower-order digits)
Un\G3606 ⋮ Un\G3609	System area	

Item	Storage contents	Storage example*1
First two digits of the year/Last two digits of the year	Stored in BCD code.	2014H
Month/Day		630H
Hour/Minute		1234H
Second		56H
Day of the week	One of the following values is stored in BCD code. Sunday: 0, Monday: 1, Tuesday: 2, Wednesday: 3 Thursday: 4, Friday: 5, Saturday: 6	1H
Millisecond (upper)	Stored in BCD code.	7H
Millisecond (lower)		89H

*1 Values stored when an error occurs at 12:34:56.789 on Monday, June 30th, 2014.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	No.1 to No.16
Error history	3600 to 3759
Error history (in Q compatible mode)	1810 to 1969

Alarm history

Up to 16 alarms that occurred in the module are recorded.

	b15 to b8	b7 to b0
Un\G3760	Alarm code	
Un\G3761	First two digits of the year	Last two digits of the year
Un\G3762	Month	Day
Un\G3763	Hour	Minute
Un\G3764	Second	Day of the week
Un\G3765	Millisecond (higher-order digits)	Millisecond (lower-order digits)
Un\G3766 to Un\G3769	System area	

Item	Storage contents	Storage example*1
First two digits of the year/Last two digits of the year	Stored in BCD code.	2014H
Month/Day		630H
Hour/Minute		1234H
Second		56H
Day of the week	One of the following values is stored in BCD code. Sunday: 0, Monday: 1, Tuesday: 2, Wednesday: 3 Thursday: 4, Friday: 5, Saturday: 6	1H
Millisecond (upper)	Stored in BCD code.	7H
Millisecond (lower)		89H

*1 Values stored when an alarm occurs at 12:34:56.789 on Monday, June 30th, 2014.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	No.1 to No.16
Alarm history	3760 to 3919
Alarm history (in Q compatible mode)	3760 to 3919

Save data type setting

This area saves and restores the offset/gain setting value in user range setting.

Specify the data type of the offset/gain value to be saved and restored: voltage or current.

Only the R60AD4 can use this area.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	0	0	0	0	0	0	0	0	CH4	CH3	CH2	CH1
(2)												(1)			

(1) 0: Voltage 1: Current

(2) Fixed to 0

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Save data type setting	4002							
Save data type setting (in Q compatible mode)	200							

■Default value

The default value is 0 for all channels.

CH1 Factory default setting

This area restores the offset/gain setting value in user range setting. For details, refer to the following.

☞ Page 164 CH1 User range setting

CH1 User range setting

This area restores the offset/gain setting value in user range setting.

■Buffer memory address

The following shows the buffer memory address of this area.

- For R60AD4

Buffer memory name	CH1	CH2	CH3	CH4
CH☐ Factory default setting offset value (L)	4004	4008	4012	4016
CH☐ Factory default setting offset value (H)	4005	4009	4013	4017
CH☐ Factory default setting gain value (L)	4006	4010	4014	4018
CH☐ Factory default setting gain value (H)	4007	4011	4015	4019
CH☐ User range setting offset value (L)	4020	4024	4028	4032
CH☐ User range setting offset value (H)	4021	4025	4029	4033
CH☐ User range setting gain value (L)	4022	4026	4030	4034
CH☐ User range setting gain value (H)	4023	4027	4031	4035
CH☐ Factory default setting offset value (L) (in Q compatible mode)	202	206	210	214
CH☐ Factory default setting offset value (H) (in Q compatible mode)	203	207	211	215
CH☐ Factory default setting gain value (L) (in Q compatible mode)	204	208	212	216
CH☐ Factory default setting gain value (H) (in Q compatible mode)	205	209	210	217
CH☐ User range setting offset value (L) (in Q compatible mode)	218	222	226	230
CH☐ User range setting offset value (H) (in Q compatible mode)	219	223	227	231
CH☐ User range setting gain value (L) (in Q compatible mode)	220	224	228	232
CH☐ User range setting gain value (H) (in Q compatible mode)	221	225	229	233

• For R60ADV8 and R60ADI8

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Factory default setting offset value (L)	4004	4008	4012	4016	4020	4024	4028	4032
CH☐ Factory default setting offset value (H)	4005	4009	4013	4017	4021	4025	4029	4033
CH☐ Factory default setting gain value (L)	4006	4010	4014	4018	4022	4026	4030	4034
CH☐ Factory default setting gain value (H)	4007	4011	4015	4019	4023	4027	4031	4035
CH☐ User range setting offset value (L)	4036	4040	4044	4048	4052	4056	4060	4064
CH☐ User range setting offset value (H)	4037	4041	4045	4049	4053	4057	4061	4065
CH☐ User range setting gain value (L)	4038	4042	4046	4050	4054	4058	4062	4066
CH☐ User range setting gain value (H)	4039	4043	4047	4051	4055	4059	4063	4067
CH☐ Factory default setting offset value (L) (in Q compatible mode)	202	206	210	214	218	222	226	230
CH☐ Factory default setting offset value (H) (in Q compatible mode)	203	207	211	215	219	223	227	231
CH☐ Factory default setting gain value (L) (in Q compatible mode)	204	208	212	216	220	224	228	232
CH☐ Factory default setting gain value (H) (in Q compatible mode)	205	209	213	217	221	225	229	233
CH☐ User range setting offset value (L) (in Q compatible mode)	234	238	242	246	250	254	258	262
CH☐ User range setting offset value (H) (in Q compatible mode)	235	239	243	247	251	255	259	263
CH☐ User range setting gain value (L) (in Q compatible mode)	236	240	244	248	252	256	260	264
CH☐ User range setting gain value (H) (in Q compatible mode)	237	241	245	249	253	257	261	265

When the following operations are performed, the data to be used is stored (saved).

- Writing the initial setting by engineering tool
- Turning off and on 'Operating condition setting request' (Y9) (Data is not saved when a setting value is written in the mode switching setting.)
- Turning off and on 'Operating condition setting request' (Y9) (Data is not saved when the mode is switched from the normal mode to the offset/gain setting mode by the mode switching setting.)
- Writing an offset/gain value in the offset/gain setting mode (When 'User range write request' (YA) is turned off and on)

When restoring the offset/gain setting value in user range setting, set the same data as the saved data in this area to the corresponding area of the A/D converter module that is the restoration destination.

■Default value

The default value is 0 for all channels.

CH1 Offset/gain setting mode

Specify the channel where the offset/gain setting is adjusted.

- Offset/gain setting mode (offset specification): Channel to adjust the offset
- Offset/gain setting mode (gain specification): Channel to adjust the gain

Setting	Setting content
0	Disable
1	Setting channel

Set one of the offset specification or gain specification to the Setting channel (1), and the other to Disable (0). When a value other than 0 and 1 is set, an offset/gain setting channel range error (error code: 1E8☐H) occurs.

Multiple channels can be set at the same time. In that case, set the offset specification and gain specification separately. The offset specification and gain specification cannot be set at the same time.

In the following cases, an offset/gain setting channel specification error (error code: 1E50H) occurs.

- When both the offset specification and gain specification of the same channel are set to Setting channel (1)
- When Disable (0) is set for all channels
- When both the offset specification and gain specification of multiple channels are set to Setting channel (1) at the same time

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Offset/gain setting mode (offset specification)	4132	4134	4136	4138	4140	4142	4144	4146
CH☐ Offset/gain setting mode (gain specification)	4133	4135	4137	4139	4141	4143	4145	4147

■Enabling the setting

Turn off and on 'Channel change request' (YB).

■Default value

The default value is Disable (0) for all channels.

CH1 Offset/gain setting mode (range specification)

In the offset/gain setting, specify the current input or voltage input for each channel.

Only the R60AD4 can use this area.

Setting value	Setting content
0	Voltage
1	Current

When a value other than 0 or 1 is set, an offset/gain setting range error (error code: 1E9☐H) occurs.

- When an offset/gain value is written in the offset/gain setting mode (When 'User range write request' (YA) is turned off and on), this setting is written to a flash memory.
- This setting is saved in the module-specific backup parameter at the online module change. After the module replacement, the factory default setting to be referred to is determined according to this setting when the offset/gain setting is restored.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4
CH☐ Offset/gain setting mode (range specification)	4164	4165	4166	4167

■Default value

The default value is Voltage (0) for all channels.

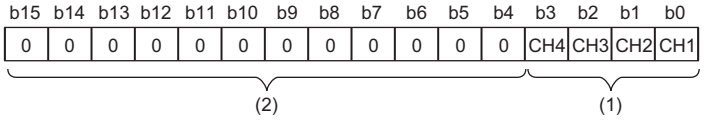
At the following timings, the value saved in the flash memory is set.

- When 'Operating condition setting request' (Y9) is turned off and on
- When the operation mode is switched to the offset/gain setting mode

Offset/gain setting mode (range specification) [Q compatible mode]

In the offset/gain setting of the Q compatible mode, specify the current input or voltage input for each channel.

Only the R60AD4 can use this area.



(1) 0: Voltage, 1: Current

(2) b4 to b15 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

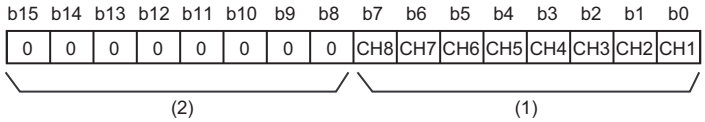
Buffer memory name	CH1	CH2	CH3	CH4
CH☐ Offset/gain setting mode (range specification) (in Q compatible mode)	26			

■Default value

The default value is Voltage (0) for all channels.

Offset/gain setting mode [Q compatible mode]

When the Q compatible mode function is used, specify the channel where the offset/gain setting is adjusted.



(1) 0: Disable, 1: Setting channel

(2) b4 to b15 of the R60AD4 and b8 to b15 of the R60ADV8/R60ADI8 are fixed to 0.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Offset/gain setting mode (offset specification) (in Q compatible mode)	22							
Offset/gain setting mode (gain specification) (in Q compatible mode)	23							

■Enabling the setting

Turn off and on 'Channel change request' (YB).

■Default value

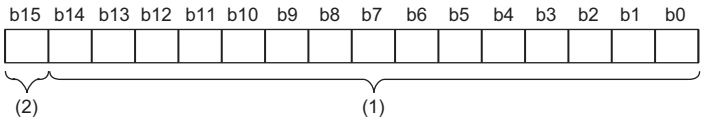
The default value is Disable (0) for all channels.

Point

When the offset/gain setting is configured from the offset/gain setting window of an engineering tool, the setting is performed properly on the window. Therefore, a program is not required to perform the setting.
To configure the offset/gain setting from a program, set the offset/gain setting mode (offset specification) and offset/gain setting mode (gain specification). For details, refer to the following.
Analog-Digital Converter Module User's Manual

CH1 Synchronization latch digital operation value

When the inter-module synchronization function is enabled, 'CH1 Digital operation value' (Un\G402) is stored in this area at the timing of the inter-module synchronization cycle.



(1) Data section

(2) Sign bit 0: Positive, 1: Negative

The digital operation value is stored in 16-bit signed binary.

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Synchronization latch digital operation value	9500	9502	9504	9506	9508	9510	9512	9514
CH☐ Synchronization latch digital operation value (in Q compatible mode)	2000	2002	2004	2006	2008	2010	2012	2014

When the inter-module synchronization processing is asynchronous, this area is fixed to 0.

■Default value

The default value is 0 for all channels.

Synchronization status monitor

The status of the inter-module synchronization and whether the currently checked module is the target of the inter-module synchronization function can be checked.

Monitor value	Description
0	Not the inter-module synchronization target
1	Inter-module synchronization target (synchronization suspended)
2	Inter-module synchronization target (during synchronization)

If the currently checked module is not the inter-module synchronization target, the monitor value is Inter-module synchronization non-target (0).

If the currently checked module is the inter-module synchronization target and the inter-module synchronization is being executed, the monitor value is Inter-module synchronization target (during synchronization) (2). When an error occurs in the CPU module or A/D converter module, the monitor value is Inter-module synchronization target (synchronization suspended) (1).

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Synchronization status monitor	9600							
Synchronization status monitor (in Q compatible mode)	2100							

■Default value

The default value is Inter-module synchronization non-target (0) for all channels.

CH1 Logging data

This area stores the data logged by the logging function.

Up to 10000 points of data can be stored per channel. When the number of stored data points is 10001 or greater, data is continuously collected overwriting the data from the head.

For details on the logging function, refer to the following.

☞ Page 45 Logging Function

■Buffer memory address

The following shows the buffer memory address of this area.

Buffer memory name	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH☐ Logging data	10000 to 19999	20000 to 29999	30000 to 39999	40000 to 49999	50000 to 59999	60000 to 69999	70000 to 79999	80000 to 89999
CH☐ Logging data (in Q compatible mode)	5000 to 14999	15000 to 24999	25000 to 34999	35000 to 44999	45000 to 54999	55000 to 64999	65000 to 74999	75000 to 84999

Point

- When 'Operating condition setting request' (Y9) is turned off and on, the logging data in all the channels are cleared.
- When Logging hold request is turned on and off while the logging hold flag is on, data logging resumes. In this case, the logged data is not cleared.

Appendix 4 Dedicated Instructions

Instruction list

The following table lists the dedicated instructions that can be used in the A/D converter module.

Instruction	Description
G(P).OFFGAN	Switches normal mode to offset/gain setting mode. Switches offset/gain setting mode to normal mode.
G(P).OGLOAD	Reads out the offset/gain setting value in the user range setting to write it into the CPU module.
G(P).OGSTOR	Restores the offset/gain setting value in the user range setting stored in the CPU module into the A/D converter module.

For details on the dedicated instructions, refer to the following.

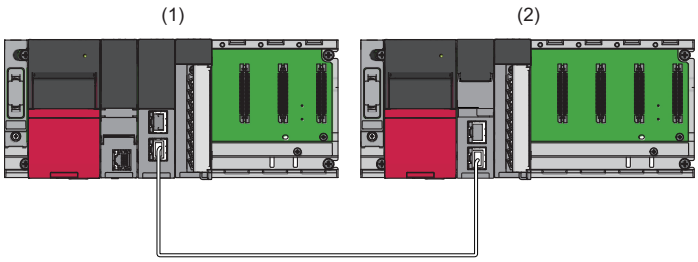
MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks)

Appendix 5 Operation Examples of When the Remote Head Module Is Mounted

This section describes operation examples of when the remote head module is mounted

System configuration example

The following system configuration is used to explain an example of operation.



(1) Master station (Network number 1, station number 0)

- Power supply module: R61P
- CPU module: R04CPU
- Master/local module: RJ71GF11-T2 (Start I/O number: 0000H to 001FH)
- Input module: RX10 (Start I/O number: 0020H to 002FH)

(2) Intelligent device station (Network number 1, station number 1)

- Power supply module: R61P
- Remote head module: RJ72GF15-T2
- A/D converter module: R60AD4 (Start I/O number: 0000H to 000FH*1)

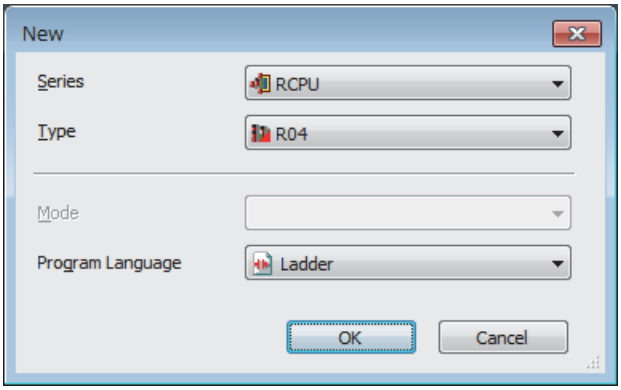
*1 In the RX/RY setting of the master station, set 1000H to 100FH as the start I/O number of the A/D converter module.

Setting in the master station

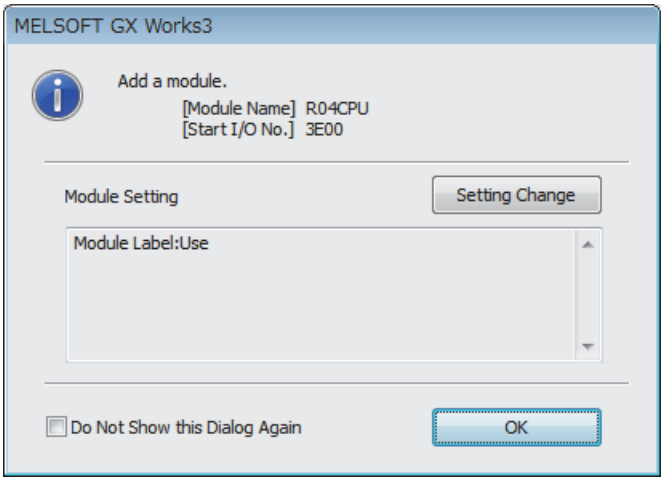
Connect the engineering tool to the CPU module of the master station and set parameters.

1. Create the project with the following settings.

[Project] ⇨ [New]

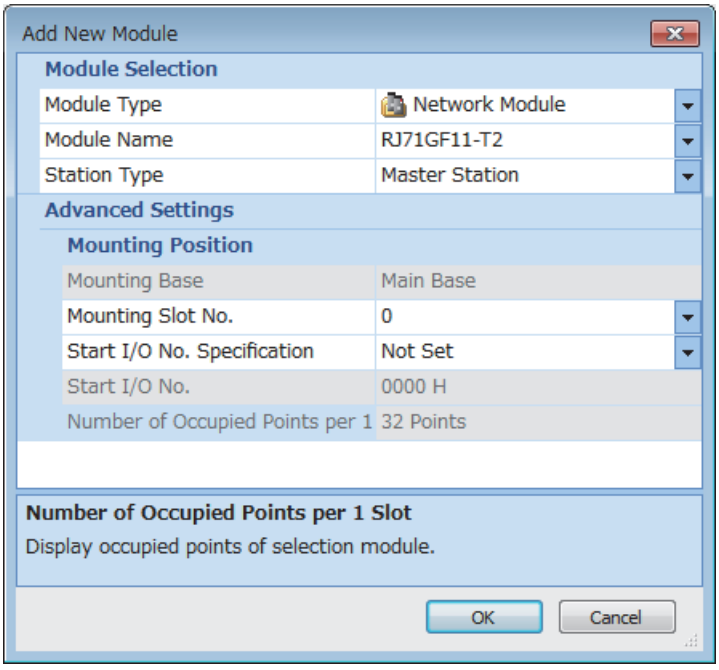


2. Configure the setting to use the module labels and add the module labels of the CPU module.



3. Add the master/local module with the following settings.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Right-click ⇨ [Add New Module]



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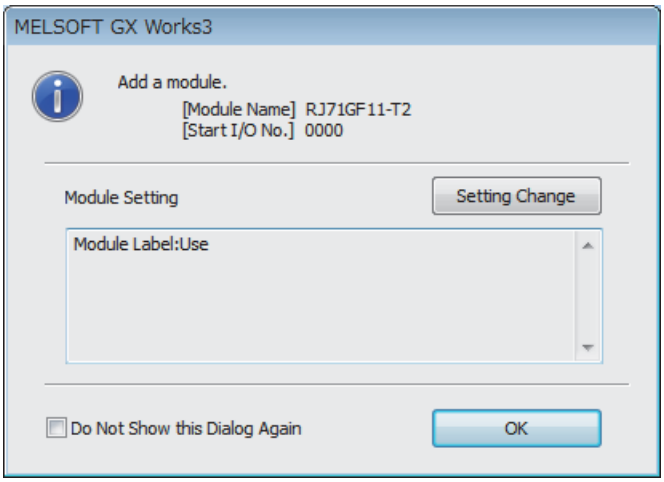
4. Configure the setting to use the module labels and add the module labels of the master/local module.



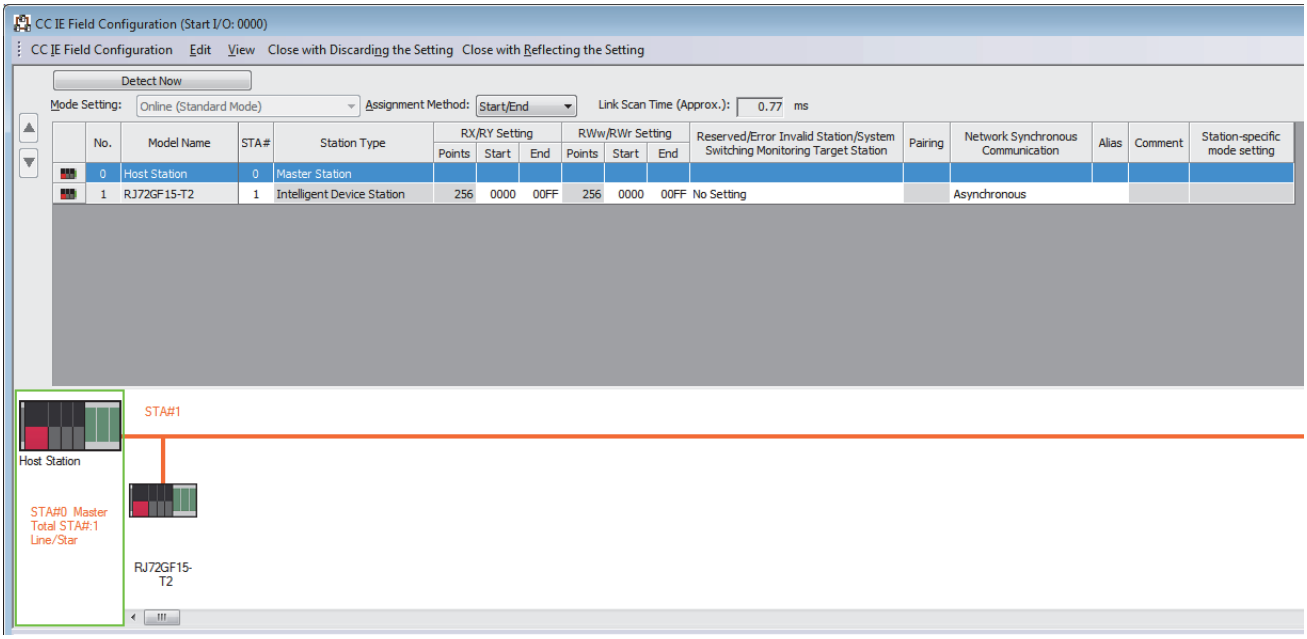
5. Set "Required Settings" of "Module Parameter" of the master/local module as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [RJ71GF11-T2] ⇨ [Module Parameter] ⇨ [Required Settings]

Item	Setting
Station Type	
Station Type	Master Station
Network Number	
Network Number	1
Station Number	
Setting Method	Parameter Editor
Station No.	0
Parameter Setting Method	
Setting Method of Basic/Application Settings	Parameter Editor

6. Set "Network Configuration Settings" of "Module Parameter" of the master/local module as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [RJ71GF11-T2] ⇨ [Module Parameter] ⇨ [Basic Settings] ⇨ [Network Configuration Settings]



7. Set "Refresh Setting" of "Module Parameter" of the master/local module as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [RJ71GF11-T2] ⇨ [Module Parameter] ⇨ [Basic Settings] ⇨ [Refresh Setting]

No.	Link Side					CPU Side				
	Device Name	Points	Start	End		Target	Device Name	Points	Start	End
-	SB	512	00000	001FF		Module Label				
-	SW	512	00000	001FF		Module Label				
1	RX	256	00000	000FF		Specify Device	X	256	01000	010FF
2	RY	256	00000	000FF		Specify Device	Y	256	01000	010FF
3	RWw	256	00000	000FF		Specify Device	W	256	00000	000FF
4	RWr	256	00000	000FF		Specify Device	W	256	01000	010FF
5										

8. Write the set parameters to the CPU module on the master station. Then reset the CPU module or power off and on the system.

[Online] ⇨ [Write to PLC]

Point

For parameters of the master/local module which are not described in this procedure, set default values. For details on parameters of the master/local module, refer to the following.

MELSEC iQ-R CC-Link IE Field Network User's Manual (Application)

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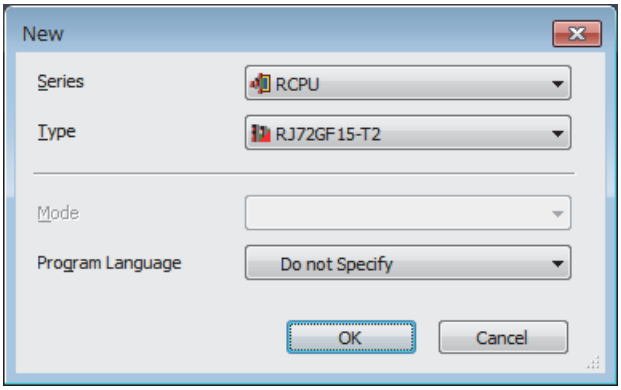
Setting in the intelligent device station

Connect the engineering tool to the remote head module of the intelligent device station and set parameters.

1. Create the project with the following settings.

[Project] ⇨ [New]



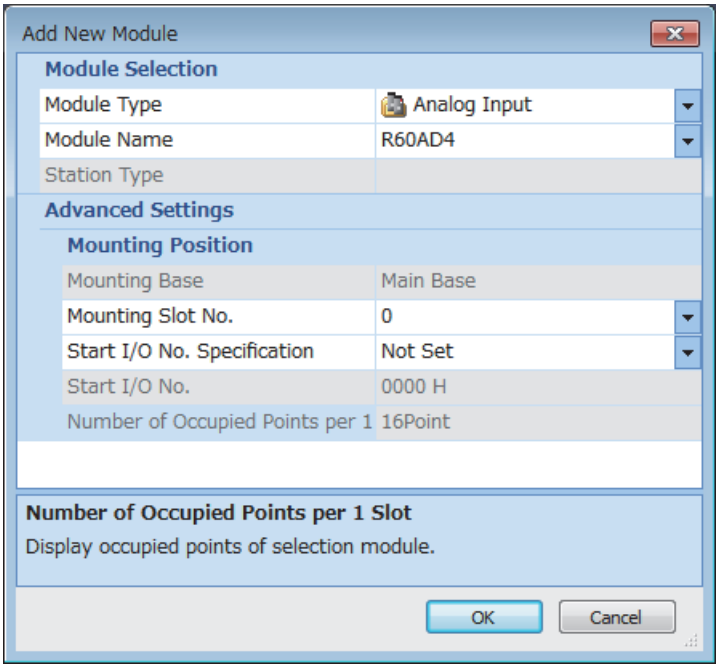
2. Set "Network Required Setting" of "CPU Parameter" of the remote head module as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [RJ72GF15-T2] ⇨ [CPU Parameter] ⇨ [Network Required Setting]

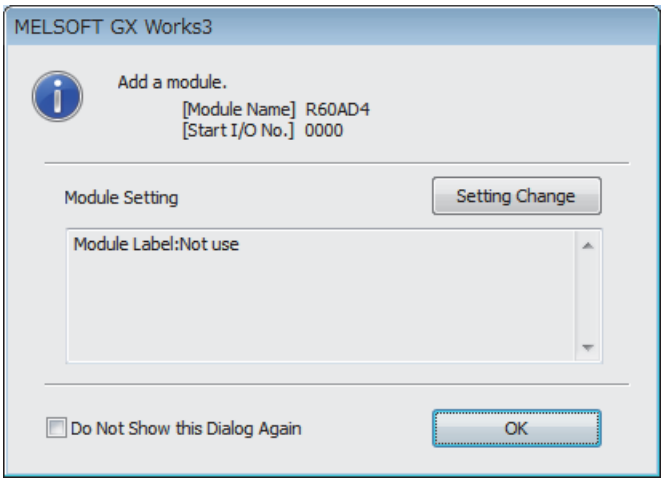
Item	Setting
Network Number	
Network Number	1
Station Number	
Station No.	1

3. Add the A/D converter module with the following settings.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Right-click ⇨ [Add New Module]



4. Configure the setting not to use the module labels.



5. Set "Basic setting" of "Module Parameter" of the A/D converter module as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60AD4] ⇨ [Module Parameter] ⇨ [Basic setting]

Item	CH1	CH2	CH3	CH4
Range switching function	**The input range of the analog input can be set for each channel and the input conversion attribute ca**			
Input range setting	0 to 10V	0 to 10V	0 to 20mA	4 to 20mA
Operation mode setting function	**The two operation modes, "Normal mode" to execute the normal A/D conversion and "Offset/gain**			
Operation mode setting	Normal mode (A/D conversion process)			
A/D conversion enable/disable setting function	**Set whether to enable or disable the output of the A/D conversion value.**			
A/D conversion enable/disable setting	A/D conversion enable	A/D conversion enable	A/D conversion enable	A/D conversion enable
A/D conversion method	**Set the A/D conversion control method.**			
Average processing setting	Sampling processing	Count average	Moving average	Sampling processing
Time average/Count average/Moving average/ Primary delay filter constant setting	0	50 ms	10 ms	0

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6. Set "Application setting" of "Module Parameter" of the A/D converter module as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60AD4] ⇨ [Module Parameter] ⇨ [Application setting]

Item	CH1	CH2	CH3	CH4
Scaling setting	**Configure the setting for the scaling at the A/D conversion.**			
Scaling enable/disable setting	Disable	Disable	Enable	Disable
Scaling upper limit value	0	0	16000	0
Scaling lower limit value	0	0	2000	0
Shift function	**Configure the setting for the shift function at the A/D conversion.**			
Conversion value shift	0	0	2000	0
Digital clipping function	**Configure the setting for the digital clipping function at the A/D conversion.**			
Digitalclip enable/disable setting	Disable	Disable	Enable	Disable
Alert output function (Process alarm)	**Set an alert at the A/D conversion.**			
Warning output function (Process alarm)	Disable	Enable	Disable	Disable
Process alarm upper upper limit value	0	32000	0	0
Process alarm upper lower limit value	0	28000	0	0
Process alarm lower upper limit value	0	4000	0	0
Process alarm lower lower limit value	0	0	0	0
Alert output function (Rate alarm)	**Set an alert at the A/D conversion.**			
Warning output function (Rate alarm)	Enable	Disable	Disable	Disable
Rate alarm detection cycle setting	5 times	0 times	0 times	0 times
Rate alarm upper limit value	25.0 %	0.0 %	0.0 %	0.0 %
Rate alarm lower limit value	-5.0 %	0.0 %	0.0 %	0.0 %
Input signal error detection function	**Configure the setting for the input signal at the A/D conversion.**			
Input signal error detection setting	Upper limit detection	Disable	Disable	Disable
Input signal error detection setting value	10.0 %	5.0 %	5.0 %	5.0 %
Logging function	**Configure the setting for the logging function at the A/D conversion.**			
Logging enable/disable setting	Disable	Disable	Disable	Disable
Logging data setting	Digital operation value	Digital operation value	Digital operation value	Digital operation value
Logging cycle setting value	4 ms	4 ms	4 ms	4 ms
Logging cycle unit setting	ms	ms	ms	ms
Level trigger condition setting	Disable	Disable	Disable	Disable
Logging points after trigger	5000	5000	5000	5000
Trigger data	402	602	802	1002
Trigger setting value	0	0	0	0
Logging loading enable/disable setting	Disable	Disable	Disable	Disable
Logging read points setting value	1000	1000	1000	1000
Online module change	**The module can be changed without the system being stopped.**			
Auto restore of Offset/ gain setting with the module change	Enable			

7. Set "Refresh settings" of "Module Parameter" of the A/D converter module as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60AD4] ⇨ [Module Parameter] ⇨ [Refresh settings]

Item	CH1	CH2	CH3	CH4
Refresh at the set timing.				
Transfer to the intelligent function module.	Transfer the buffer memory data to the specified device.			
Transfer to the CPU.	Transfer the buffer memory data to the specified device.			
Latest error code	W1020			
Latest address of error history				
Latest alarm code				
Latest address of alarm history				
Interrupt factor detection flag 1				
Interrupt factor detection flag 2				
Interrupt factor detection flag 3				
Interrupt factor detection flag 4				
Interrupt factor detection flag 5				
Interrupt factor detection flag 6				
Interrupt factor detection flag 7				
Interrupt factor detection flag 8				
Interrupt factor detection flag 9				
Interrupt factor detection flag 10				
Interrupt factor detection flag 11				
Interrupt factor detection flag 12				
Interrupt factor detection flag 13				
Interrupt factor detection flag 14				
Interrupt factor detection flag 15				
Interrupt factor detection flag 16				
Warning output flag (Process alarm upper limit)	W1010			
Warning output flag (Process alarm lower limit)	W1011			
Warning output flag (Rate alarm upper limit)	W1012			
Warning output flag (Rate alarm lower limit)	W1013			
Input signal error detection flag	W1014			
A/D conversion completed flag	W1000			
Digital output value	W1001	W1002		W1004
Digital operation value			W1003	
Maximum value			W1005	
Minimum value			W1006	
Difference conversion state flag				
Logging hold flag				

8. Write the set parameters to the remote head module on the intelligent device station. Then reset the remote head module or power off and on the system.

[Online] ⇨ [Write to PLC]

Point

For parameters of the remote head module which are not described in this procedure, set default values. For details on parameters of the remote head module, refer to the following.

• MELSEC iQ-R CC-Link IE Field Network Remote Head Module User's Manual (Application)

Checking the network status

After setting parameters to the master station and the intelligent device station, check whether data link is normally performed between the master station and the intelligent device station. Check the network status using the CC-Link IE Field Network diagnostics of the engineering tool.

For how to perform the CC-Link IE Field Network diagnostics from the master station, refer to the following.

MELSEC iQ-R CC-Link IE Field Network User's Manual (Application)

Program examples

For the program examples, the module labels of the master/local module are used.

Write the programs to the CPU module on the master station.

Classification	Label name	Description	Device
Module label	GF11_1.bSts_DataLinkError	Data link error status of own station	SB0049
	GF11_1.bnSts_DataLinkError_Station[1]	Data link status of each station (station number 1)	SW00B0.0
Label to be defined	Define global labels as shown below:		

Label Name	Data Type		Class	Assign (Device/Label)
CH1_DigOutValTempArea	Word [Signed]	...	VAR_GLOBAL	D11
CH2_DigOutValTempArea	Word [Signed]	...	VAR_GLOBAL	D12
CH3_DigCalcValTempArea	Word [Signed]	...	VAR_GLOBAL	D13
CH4_DigOutValTempArea	Word [Signed]	...	VAR_GLOBAL	D14
CH3_DigMaxValTempArea	Word [Signed]	...	VAR_GLOBAL	D15
CH3_DigMinValTempArea	Word [Signed]	...	VAR_GLOBAL	D16
CH2_ProcAlmUpLimit	Bit	...	VAR_GLOBAL	F0
CH2_ProcAlmLowLimit	Bit	...	VAR_GLOBAL	F1
CH1_RateAlmUpLimit	Bit	...	VAR_GLOBAL	F2
CH1_RateAlmLowLimit	Bit	...	VAR_GLOBAL	F3
CH1_InputSigErr	Bit	...	VAR_GLOBAL	F4
Connect_FormationFlg_St1	Bit	...	VAR_GLOBAL	M0
CH1_AD_conversionCompletedFlag	Bit	...	VAR_GLOBAL	W1000.0
CH2_AD_conversionCompletedFlag	Bit	...	VAR_GLOBAL	W1000.1
CH3_AD_conversionCompletedFlag	Bit	...	VAR_GLOBAL	W1000.2
CH4_AD_conversionCompletedFlag	Bit	...	VAR_GLOBAL	W1000.3
CH1_DigOutVal	Word [Signed]	...	VAR_GLOBAL	W1001
CH2_DigOutVal	Word [Signed]	...	VAR_GLOBAL	W1002
CH3_DigCalcVal	Word [Signed]	...	VAR_GLOBAL	W1003
CH4_DigOutVal	Word [Signed]	...	VAR_GLOBAL	W1004
CH3_DigMaxVal	Word [Signed]	...	VAR_GLOBAL	W1005
CH3_DigMinVal	Word [Signed]	...	VAR_GLOBAL	W1006
CH2_WarningOutputFlagProcessAlarmUpperLimit	Bit	...	VAR_GLOBAL	W1010.1
CH2_WarningOutputFlagProcessAlarmLowerLimit	Bit	...	VAR_GLOBAL	W1011.1
CH1_WarningOutputFlagRateAlarmUpperLimit	Bit	...	VAR_GLOBAL	W1012.0
CH1_WarningOutputFlagRateAlarmLowerLimit	Bit	...	VAR_GLOBAL	W1013.0
CH1_InputSignalErrorDetectionFlag	Bit	...	VAR_GLOBAL	W1014.0
DigitOutValSig	Bit	...	VAR_GLOBAL	X20
MaxMinReadSig	Bit	...	VAR_GLOBAL	X21
MaxMinResetSig	Bit	...	VAR_GLOBAL	X22
ErrResetSig	Bit	...	VAR_GLOBAL	X23
ModuleREADY	Bit	...	VAR_GLOBAL	X1000
InputSignalErrorDetectionSignal	Bit	...	VAR_GLOBAL	X100C
MaxValueMinValueResetCompletedFlag	Bit	...	VAR_GLOBAL	X100D
A_D_conversionCompletedFlag	Bit	...	VAR_GLOBAL	X100E
ErrorFlag	Bit	...	VAR_GLOBAL	X100F
OperatingConditionSettingRequest	Bit	...	VAR_GLOBAL	Y1009
MaxValueMinValueResetRequest	Bit	...	VAR_GLOBAL	Y100D
ErrorClearRequest	Bit	...	VAR_GLOBAL	Y100F

Common program

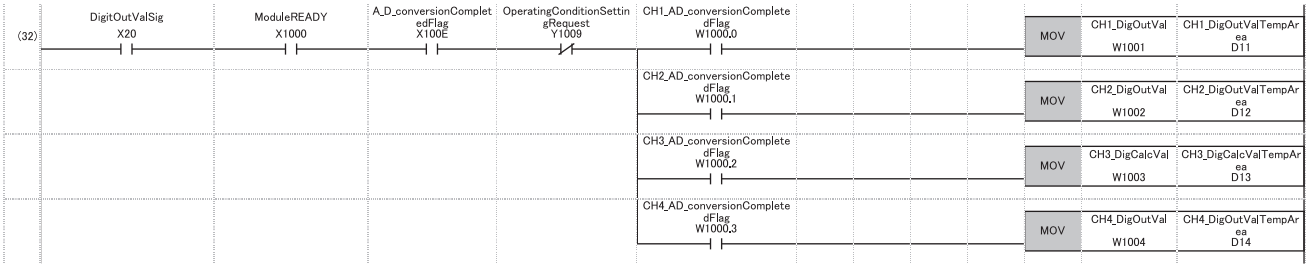
The following figure shows an example of the program to check the data link status of the remote head module (station number 1).

(0) Checks the data link status of the remote head module (station number 1).

Add the MCR instruction shown below to the last of the program.

Program example 1

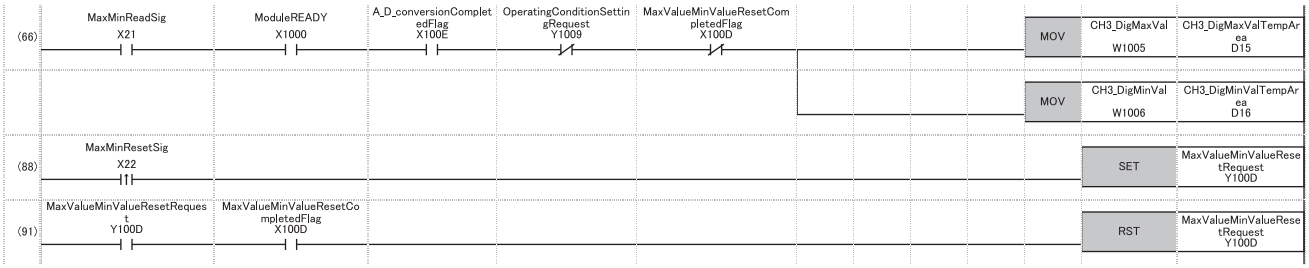
The following figure shows an example of the program to read digital output values of CH1, CH2, and CH4 and digital operation values of CH3 and save them.



(32) Reads values of CH1 Digital output value, CH2 Digital output value, CH3 Digital operation value, and CH4 Digital output value.

Program example 2

The following figure shows an example of the program to read a maximum value and a minimum value of CH3 and reset them.



(66) Reads values of CH3 Maximum value and CH3 Minimum value.

(88) Turns on 'Maximum value/minimum value reset request' (Y100D).

(91) Turns off 'Maximum value/minimum value reset request' (Y100D).

Program example 3

The following figure shows an example of the program to perform operations reacting to an alert if an alert (process alarm upper/lower limit) occurs in CH2.

(94) Performs a processing of when an alert (process alarm upper limit) has occurred in CH2.

(113) Performs a processing of when an alert (process alarm lower limit) has occurred in CH2.

Program example 4

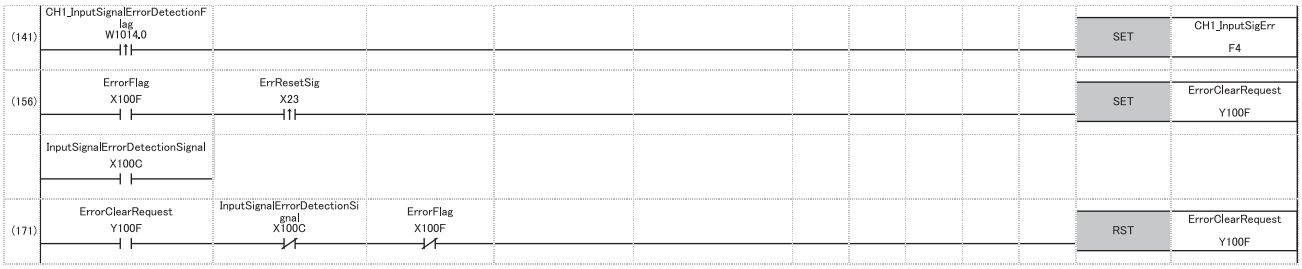
The following figure shows an example of the program to perform operations reacting to an alert if an alert (rate alarm upper/lower limit) occurs in CH1.

(118) Performs a processing of when an alert (rate alarm upper limit) has occurred in CH1.

(136) Performs a processing of when an alert (rate alarm lower limit) has occurred in CH1.

Program example 5

The following figure shows an example of the program to clear Input signal error detection flag, Error flag, and Latest error code if an input signal error is detected in CH1 or an error occurs in any of the channels.



(141) Performs a processing of when an input signal error was detected in CH1.

(156) Turns on 'Error clear request' (Y100F).

(171) Turns off 'Error clear request' (Y100F).

Appendix 6 Added or Changed Functions

This section describes the functions added to or changed for the A/D converter module.

Added or changed contents	Firmware version	Reference
Online module change	"02" or later	MELSEC iQ-R Online Module Change Manual
Backing up offset/gain values	"02" or later	Page 183 Backing up offset/gain values

Backing up offset/gain values

A module-specific backup parameter is created and offset/gain values are saved.

■When an unsupported version of A/D converter modules is used

A module-specific backup parameter is not created.

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REVISIONS

*The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
June 2014	SH(NA)-081233ENG-A	First edition
January 2015	SH(NA)-081233ENG-B	■Added function Online module change ■Added or modified parts RELEVANT MANUALS, Section 1.4, 1.15, 1.17, 3.1, 3.4, Appendix 3, 5
May 2016	SH(NA)-081233ENG-C	■Added or modified parts RELEVANT MANUALS, TERMS, Chapter 1, Section 1.1 to 1.3, 1.5 to 1.7, 1.10 to 1.13, 1.15 to 1.18, 2.1 to 2.4, Appendix 3, 5

Japanese manual number: SH-081231-C

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MODEL CODE: 13JX12

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