

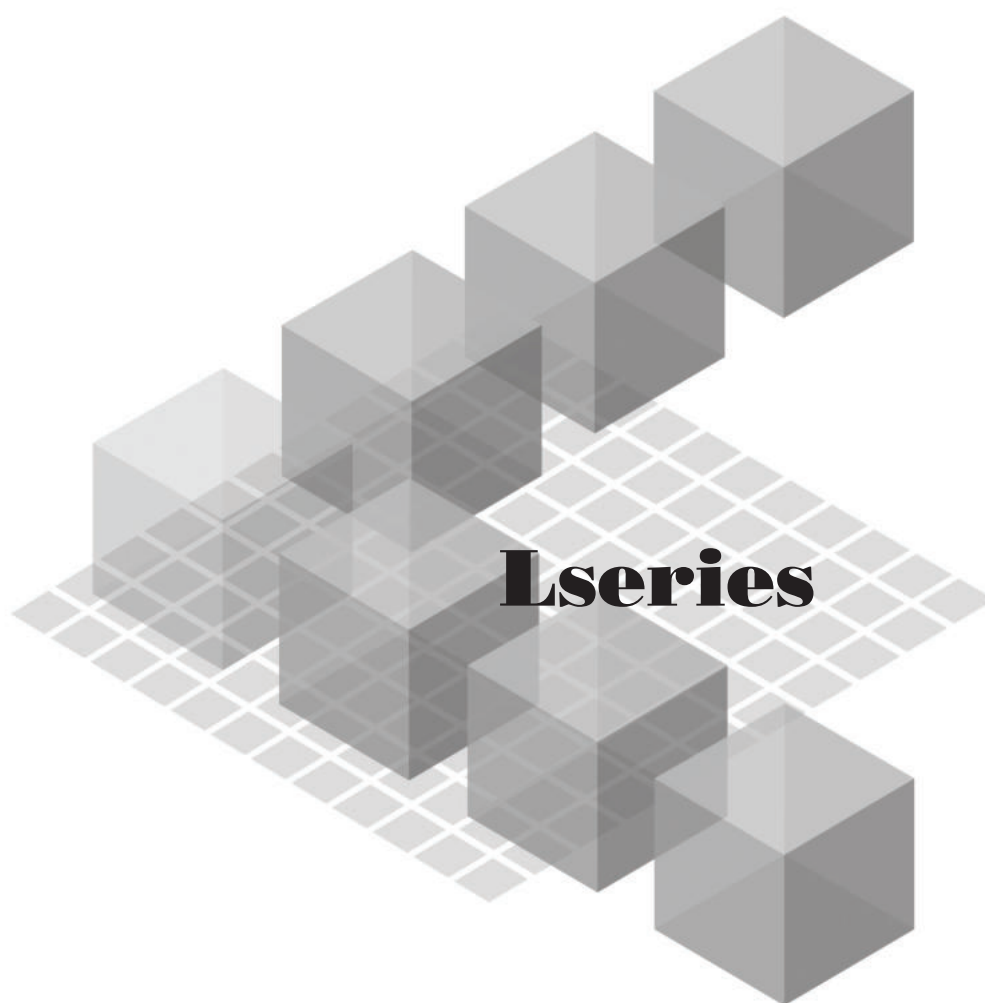
# mitsubishi

Mitsubishi Programmable Controller

MELSEC *L*<sub>series</sub>

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## MELSEC-L Analog-Digital Converter Module User's Manual



-L60AD4



# ● SAFETY PRECAUTIONS ●

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the user's manual for the CPU module used.

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

- Do not write any data to the "system area" and "write-protect area" (R) of the buffer memory in the intelligent function module.  
Also, do not use any "use prohibited" signals as an output signal from the programmable controller CPU to the intelligent function module.  
Doing so may cause malfunction of the programmable controller system.

## [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.

## [Installation Precautions]

### **WARNING**

- Shut off the external power supply for the system in all phases before connecting or removing a 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 manual "Safety Guidelines", the manual supplied with the CPU module or head module. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To interconnect modules, engage the respective connectors and securely lock the module joint levers. Incorrect interconnection may cause malfunction, failure, or drop of the module.
- Tighten the screw 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.
- Do not directly touch any conductive parts and electronic components of the module. Doing so can cause malfunction or failure of the module.

## [Wiring Precautions]

### **WARNING**

- 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**

- Ground the FG terminal to the protective ground conductor dedicated to the programmable controller. Failure to do so may result in electric shock or malfunction.
- Tighten the terminal block screw within the specified torque range. Undertightening can cause short circuit, fire, or malfunction.  
Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- 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.

## [Wiring Precautions]

### CAUTION

- Mitsubishi 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 methods, refer to the MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection).

## [Startup and Maintenance Precautions]

### WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Shut off the external power supply for the system in all phases before cleaning the module or retightening the terminal block screw. Failure to do so may result in electric shock.

## [Startup and Maintenance Precautions]

### CAUTION

- Do not disassemble or modify the module. Doing so may cause failure, malfunction, injury, or a fire.
- Shut off the external power supply for the system in all phases before connecting or removing a module. Failure to do so may cause the module to fail or malfunction.
- Tighten the terminal block screw 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 (module, display unit, and terminal block), the number of connections/disconnections is limited to 50 times (in accordance with IEC 61131-2). Exceeding the limit may cause malfunction.
- 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.

## [Disposal Precautions]

### CAUTION

- When disposing of this product, treat it as industrial waste.

# ●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-L series programmable controllers.

This manual describes the functions and programming of an analog-digital converter module (hereafter abbreviated as A/D converter module).

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC-L series programmable controller to handle the product correctly.


When applying the program examples introduced in this manual to the actual system, ensure the applicability and confirm that it will not cause system control problems.

■Relevant module: L60AD4


## Remark

Unless otherwise specified, this manual describes the program examples in which the I/O numbers of X/Y00 to X/Y0F are assigned for an A/D converter module.

For I/O number assignment, refer to the following.

 MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

Operating procedures are explained using GX Works2. When using GX Developer or GX Configurator-AD, refer to the following.

- When using GX Developer or GX Configurator-AD ( Page 226, Appendix 9)

# COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

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## **(1) Method of ensuring compliance**

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to the Safety Guidelines Please refer to the manual included with the CPU module or head module.

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

## **(2) Additional measures**

No additional measures are necessary for the compliance of this product with the EMC and Low Voltage Directives.



# RELEVANT MANUALS

## (1) CPU module user's manual

| Manual name<br><manual number (model code)>   | Description   |
|---|---|
| MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)<br><SH-080890ENG, 13JZ36> | Specifications of the CPU modules, power supply modules, display unit, branch module, extension module, SD memory cards, and batteries, information on how to establish a system, maintenance and inspection, and troubleshooting |
| MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)<br><SH-080889ENG, 13JZ35>  | Functions and devices of the CPU module, and programming  |

## (2) Head module user's manual

| Manual name<br><manual number (model code)>   | Description   |
|---|---|
| MELSEC-L CC-Link IE Field Network Head Module User's Manual<br><SH-080919ENG, 13JZ48> | Specifications for a head module, procedures before operation, system configuration, installation and wiring, settings, and troubleshooting |

## (3) Operating manual

| Manual name<br><manual number (model code)>                             | Description  |
|---|--|
| GX Works2 Version 1 Operating Manual (Common)<br><SH-080779ENG, 13JU63> | System configuration, parameter settings, and online operations (common to Simple project and Structured project) of GX Works2 |
| GX Developer Version 8 Operating Manual<br><SH-080373E, 13JU41>         | Operating methods of GX Developer, such as programming, printing, monitoring, and debugging                                    |

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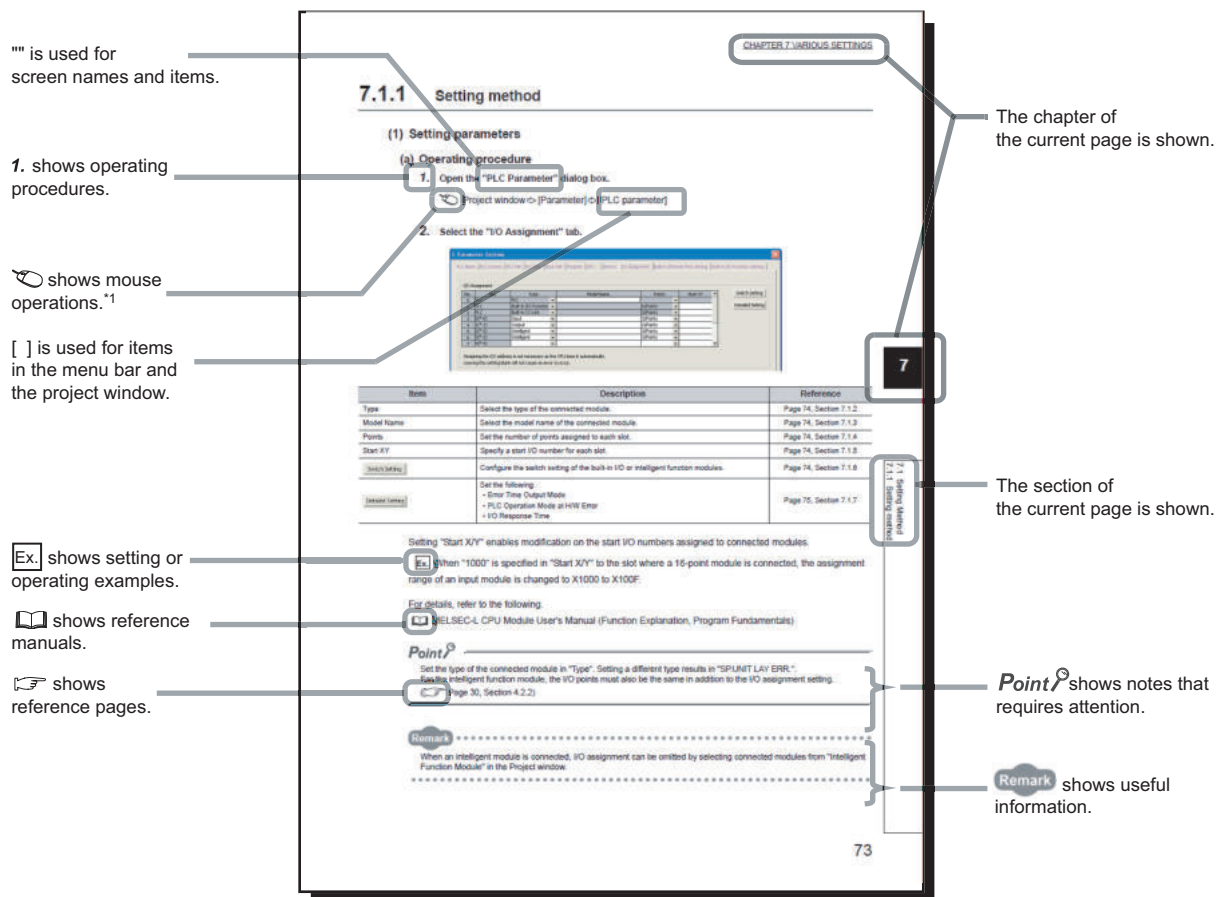
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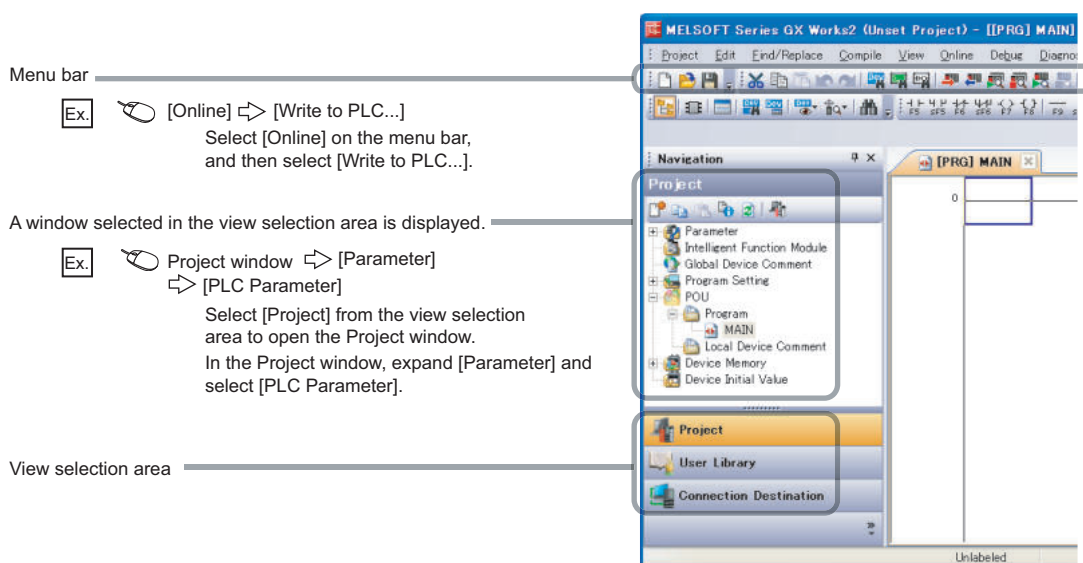
# MANUAL PAGE ORGANIZATION

In this manual, pages are organized and the symbols are used as shown below.

The following illustration is for explanation purpose only, and should not be referred to as an actual documentation.







\*1 The mouse operation example is provided below. (For GX Works2)



The following illustration is for explanation purpose only, and should not be referred to as an actual documentation.




- Instructions can be executed under the following conditions.

| Execution condition | Any time  | During on   | On the rising edge   | During off  | On the falling edge   |
|---------------------|-----------|---|--|---|---|
| Symbol              | No symbol |  |  |  |  |

- The following devices can be used.

| Setting data                    | Internal device (system, user)                 |                                | File register | Link direct device J□□ |      | Intelligent function module device U□\G□ | Index register Zn | Constant <sup>*3</sup> | Others <sup>*3</sup>                    |
|---------------------------------|--|--------------------------------|---------------|------------------------|------|--|-------------------|------------------------|---|
|                                 | Bit  | Word                           |               | Bit                    | Word |  |                   |                        |   |
| Applicable device <sup>*1</sup> | X, Y, M, L, SM, F, B, SB, FX, FY <sup>*2</sup> | T, ST, C, D, W, SD, SW, FD, @□ | R, ZR         | -                      |      | U□\G□                                    | Z                 | K, H, E, \$            | P, I, J, U, D, X, DY, N, BL, TR, BL\, V |

<sup>\*1</sup> For details on each device, refer to the following.

 MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

<sup>\*2</sup> FX and FY can be used for bit data only, and FD for word data only.

<sup>\*3</sup> In the "Constant" and "Others" columns, a device(s) that can be set for each instruction is shown.

- The following data types can be used.

| Data type        | Description  |
|------------------|--|
| Bit              | Bit data or the start number of bit data                     |
| BIN 16-bit       | 16-bit binary data or the start number of word device        |
| BIN 32-bit       | 32-bit binary data or the start number of double-word device |
| BCD 4-digit      | Four-digit binary-coded decimal data                         |
| BCD 8-digit      | Eight-digit binary-coded decimal data                        |
| Real number      | Floating-point data  |
| Character string | Character string data  |
| Device name      | Device name data   |

# TERMS

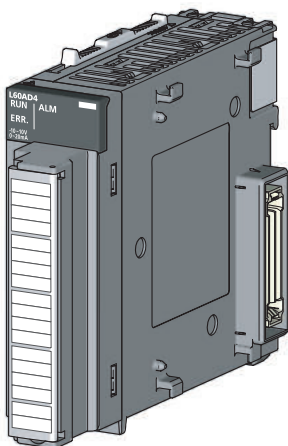
Unless otherwise specified, this manual uses the following terms.

| Term                    | Description  |
|-------------------------|--|
| A/D converter module    | Another term for the MELSEC-L series analog-digital converter module   |
| Head module             | Abbreviation for the LJ72GF15-T2 CC-Link IE Field Network head module  |
| Display unit            | A liquid crystal display to be attached to the CPU module  |
| Programming tool        | Generic term for GX Works2 and GX Developer  |
| Factory default setting | 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   |
| GX Works2               | Product name of the software package for the MELSEC programmable controllers   |
| GX Developer            |  |
| GX Configurator-AD      | A setting and monitoring tool added in GX Developer (for A/D converter modules)  |
| Buffer memory           | The memory of an intelligent function module used to store data (such as setting values and monitored values) for communication with a CPU module. |

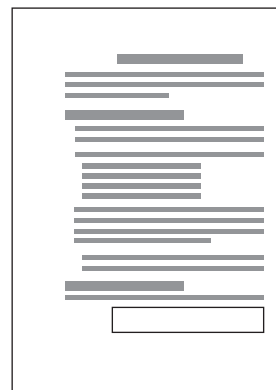
# PACKING LIST

The following items are included in the package of this product. Before use, check that all the items are included.

## L60AD4



L60AD4



Before Using the Product



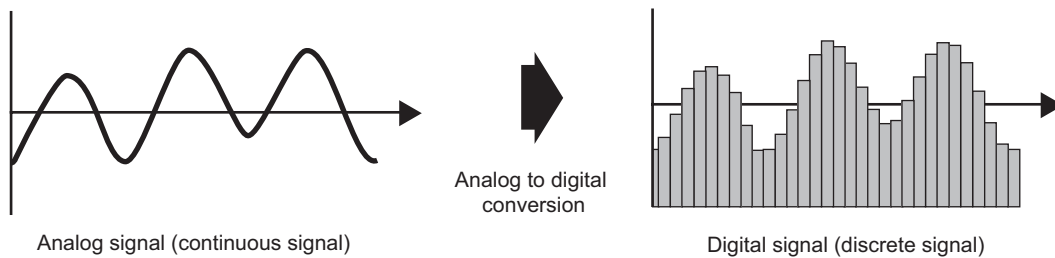
# CHAPTER 1 A/D CONVERTER MODULE

1

This chapter describes the applications and features of the A/D converter module.

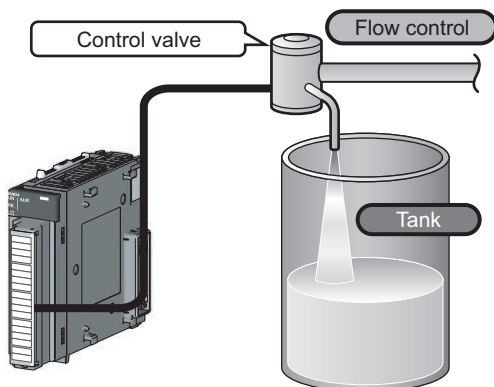
## 1.1 Application

This module converts the analog value input from external devices to the digital output value, and inputs the converted data to the CPU module. By converting the data, which has been processed through the A/D converter module, to a digital data, the input information can be sent to the CPU module.

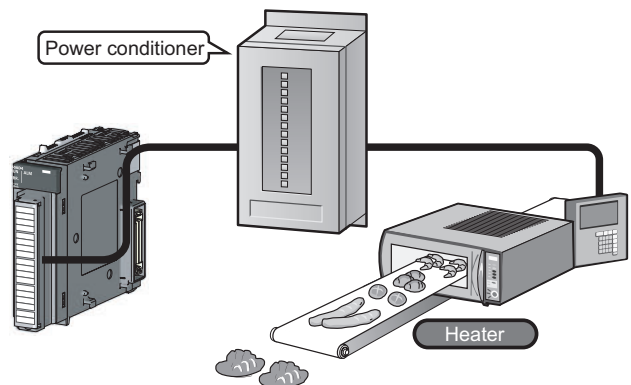


The A/D converter module enables works as follows.

Connect the module to the control valve to measure the flow



Connect the module to the power conditioning equipment to measure the heating temperature of the heater or others



## 1.2 Features

---

### **(1) Response by high-speed conversion**

The high-speed conversion of 20 $\mu$ s/channel is achieved.

### **(2) Detailed control by high resolution**

In all analog input ranges, the high resolution of 1/20000 is achieved.

### **(3) Reliability by high accuracy**

The accuracy for the maximum value of the digital output value is  $\pm 0.1\%$  ( $25\pm 5^{\circ}\text{C}$ ),  $\pm 0.2\%$  (0 to  $55^{\circ}\text{C}$ ).

### **(4) Operation of digital output value by each function**

The scaling function, shift function, digital clipping function and difference conversion function can represent the digital output value in a numeric value easy to understand according to the use environment.

### **(5) Comparing/monitoring the measurement target**

By using the input signal error detection function, input range extended mode function, or alarm output function (process alarm), the statuses of connected devices can be monitored easily.

### **(6) Logging function**

An analysis of data collected by logging function increases maintainability of used system.

### **(7) Flow amount integration function**

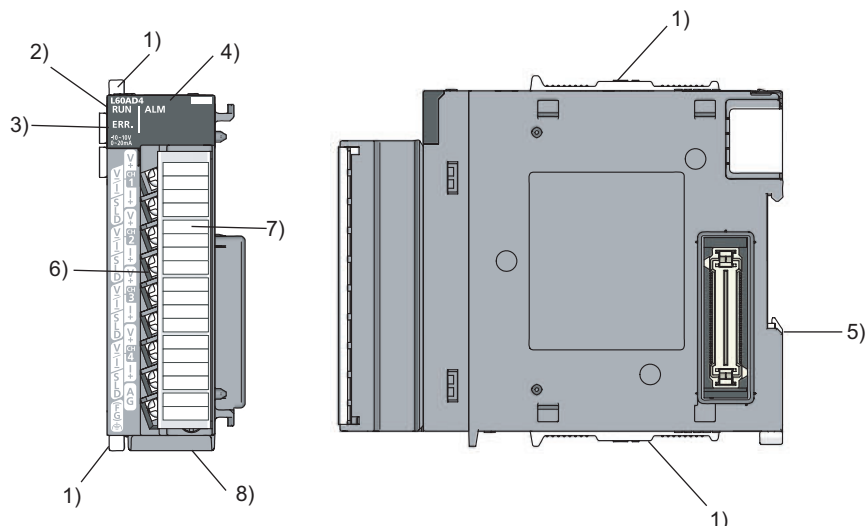
The flow amount integration function executes the integral processing of input (instantaneous flow amount) from a flow meter and easily calculates the flow amount in a certain period. By registering/outputting the calculated flow amount, system operation can be improved and man-hours for programming can be reduced.

### **(8) Easy setting with GX Works2**

Programming is reduced since the initial setting or auto refresh setting can be configured on the screen. In addition, setting status and operation status of modules can be checked easily.

## CHAPTER 2 PART NAMES

The following table shows part names of the A/D converter module.



| Number | Name                  | Description  |
|--------|-----------------------|--|
| 1)     | Module joint levers   | Levers for connecting modules  |
| 2)     | RUN LED (green)       | Displays the operating status of the A/D converter module.<br>On: The module is operating normally.<br>Flashing: In the offset/gain setting mode<br>Off: The 5V power off or watchdog timer error has occurred.                      |
| 3)     | ERR. LED (red)        | Displays the errors and status of the A/D converter module.<br>On: an error has occurred except for error code: 112* <sup>1</sup><br>Flashing: Error code: 112 has occurred.* <sup>1</sup><br>Off: The module is operating normally. |
| 4)     | ALM LED (red)         | Displays the alarm status of the A/D converter module.<br>On: Alarm (process alarm) is occurring* <sup>2</sup><br>Flashing: Input signal error detection is occurring<br>Off: The module is operating normally.* <sup>2</sup>        |
| 5)     | DIN rail hook         | A hook used to mount the module to a DIN rail  |
| 6)     | Terminal block        | 18-pin screw terminal block for connecting input signal lines of such as external devices  |
| 7)     | Terminal block cover  | Covers for preventing electric shock while the power is on   |
| 8)     | Serial number display | Displays the serial number printed on the rating plate.  |

\*1 Error Code List (☞ Page 159, Section 11.4)

\*2 Alarm Code List (☞ Page 163, Section 11.5)

## Memo

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# CHAPTER 3 SPECIFICATIONS


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This chapter describes general specifications, performance specifications, function list, list of I/O signals and list of buffer memory address.

## 3.1 General Specifications

---

For the general specifications of the A/D converter module, refer to the following.

 The manual "Safety Guidelines", the manual supplied with the a CPU module or head module

## 3.2 Performance Specifications

The following table shows the performance specifications of the A/D converter module.

| Item                                |         | Model  |                               |  |            |  |
|-------------------------------------|---------|--|-------------------------------|--|------------|--|
|                                     |         | L60AD4   |                               |  |            |  |
| Number of analog input points       |         | 4 points (4 channels)  |                               |  |            |  |
| Analog input                        | Voltage | -10 to 10 VDC (input resistance 1M Ω)  |                               |  |            |  |
|                                     | Current | 0 to 20mADC (input resistance 250 Ω)   |                               |  |            |  |
| Digital output                      |         | -20480 to 20479  |                               |  |            |  |
|                                     |         | When using the scaling function  | -32768 to 32767               |  |            |  |
| I/O characteristics, resolution*1   |         | Analog input range   |                               | Digital output value   | Resolution |  |
|                                     |         | Voltage  | 0 to 10V                      | 0 to 20000   | 500μV      |  |
|                                     |         |  | 0 to 5V                       |  | 250μV      |  |
|                                     |         |  | 1 to 5V                       |  | 200μV      |  |
|                                     |         |  | -10 to 10V                    | -20000 to 20000  | 500μV      |  |
|                                     |         |  | 1 to 5V (Extended mode)       | -5000 to 22500   | 200μV      |  |
|                                     |         |  | User range setting            | -20000 to 20000  | 307μV*2    |  |
|                                     |         | Current  | 0 to 20mA                     | 0 to 20000   | 1000nA     |  |
|                                     |         |  | 4 to 20mA                     |  | 800nA      |  |
|                                     |         |  | 4 to 20mA (Extended mode)     | -5000 to 22500   | 800nA      |  |
|                                     |         |  | User range setting            | -20000 to 20000  | 1230nA*2   |  |
|                                     |         | Accuracy (accuracy for the maximum value of the digital output value)*3  | Ambient temperature 25±5°C    | Within ±0.1% (±20digit)  |            |  |
|                                     |         |  | Ambient temperature 0 to 55°C | Within ±0.2% (±40digit)  |            |  |
|                                     |         | Conversion speed*4*5*6   |                               | High-speed: 20μs/channel<br>Medium speed: 80μs/channel<br>Low speed: 1ms/channel |            |  |
| Absolute maximum input              |         | Voltage: ±15V, Current: 30mA*7   |                               |  |            |  |
| Offset/gain setting count*8         |         | Up to 50000 counts   |                               |  |            |  |
| Isolation method                    |         | Between I/O terminals and programmable controller power supply: photocoupler isolation<br>Between input channels: no isolation |                               |  |            |  |
| Dielectric withstand voltage        |         | Between I/O terminals and programmable controller power supply: 500VACrms for 1 minute   |                               |  |            |  |
| Insulation resistance               |         | Between I/O terminals and programmable controller power supply: 500VDC 10MΩ or higher  |                               |  |            |  |
| Number of occupied I/O points       |         | 16 points (I/O assignment: Intelligent 16 points)  |                               |  |            |  |
| Connected terminal                  |         | 18-point terminal block  |                               |  |            |  |
| Applicable wire size                |         | 0.3 to 0.75mm <sup>2</sup>   |                               |  |            |  |
| Applicable solderless terminal      |         | R1.25-3 (solderless terminals with sleeve are not usable)  |                               |  |            |  |
| Internal current consumption (5VDC) |         | 0.52A  |                               |  |            |  |
| Weight                              |         | 0.19kg   |                               |  |            |  |

\*1 For details on the I/O conversion characteristics, refer to the following.

I/O conversion characteristic of A/D conversion (👉 Page 203, Appendix 3)


\*2 Maximum resolution in the user range setting.


- \*3 Except when receiving noise influence.
- \*4 The default value is 80 $\mu$ s/channel.
- \*5 The logging function can be used only in the middle speed (80 $\mu$ s/channel) or low speed (1ms/channel).
- \*6 The flow amount integration function can be used only in the low speed (1ms/channel).
- \*7 This is a momentary current value which does not cause damage to internal resistors of the module. The maximum input current value for constant application is 24mA.
- \*8 If the number of offset/gain settings exceeds 50000 times, an error occurs.

## 3.2.1 Number of parameter settings

Set the initial setting of A/D converter module and the parameter setting of auto refresh setting so that the number of parameters, including these of other intelligent function modules, does not exceed the number of parameters that can be set in the CPU module or the head module.

For the maximum number of parameters that can be set in the CPU module or the head module (maximum number of parameter settings), refer to the following.

 MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

 MELSEC-L CC-Link IE Field Network Head Module User's Manual


### (1) Number of A/D converter module parameters

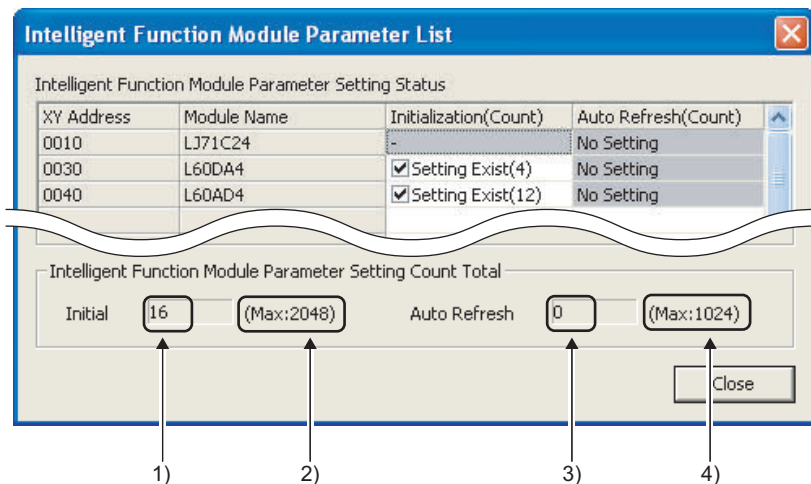
For A/D converter modules, the following number of parameters can be set per module.

| Target module | Initial setting | Auto refresh setting            |
|---------------|-----------------|---------------------------------|
| L60AD4        | 12              | 75 (maximum number of settings) |

### (2) Checking method

The maximum number of parameter settings and the number of parameter settings set for the intelligent function module can be checked with the following operation.

-  Project window ⇒ [Intelligent Function Module] ⇒ Right-click  
⇒ [Intelligent Function Module Parameter List]



| No. | Description  |
|-----|--|
| 1)  | The total number of parameters in the initial settings selected on the dialog box      |
| 2)  | The maximum number of parameter settings in the initial settings                       |
| 3)  | The total number of parameters in the auto refresh settings selected on the dialog box |
| 4)  | The maximum number of parameter settings in the auto refresh settings                  |



## 3.3 Function List

The following is the function list of the A/D converter module.

| Item  |                      |                | Description   | Reference                   |
|---|----------------------|----------------|---|-----------------------------|
| A/D conversion enable/disable function          |                      |                | Sets whether to enable or disable A/D conversion for each channel. Disabling the A/D conversion for unused channels reduces the conversion cycles.  | Page 63, Section 8.2        |
| A/D conversion method                           | 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.   | Page 63, Section 8.3 (1)    |
|   | Averaging processing | Time average   | The A/D converter module executes the A/D conversion for set time, and stores the average of the total value excluding the maximum and the minimum values to the buffer memory. The number of processing time within the setting time changes depending on the number of channels used (the number of channels set to A/D conversion enabled).          | Page 64, Section 8.3 (2)(a) |
|   |                      | Count average  | The A/D converter module executes the A/D conversion for set time, and stores the average of the total value excluding the maximum and the minimum values to the buffer memory. Time for the count average value stored in the buffer memory changes depending on the used channel numbers (the number of channels specified to A/D conversion enable). | Page 64, Section 8.3 (2)(b) |
|   |                      | Moving average | The A/D converter module averages digital output values of set number of times which are measured every sampling cycle, and stores them in the buffer memory.   | Page 65, Section 8.3 (2)(c) |
| Range switching function                        |                      |                | The input range to use can be selected from the following ranges:<br>• Factory default range (4 to 20mA, 0 to 20mA, 1 to 5V, 0 to 5V, -10 to 10V, 0 to 10V)<br>• User range (User range setting)<br>Extended mode range (4 to 20mA (Extended mode), 1 to 5V (Extended mode))  | Page 49, Section 7.2        |
| Offset/gain setting function                    |                      |                | This function compensates for errors in digital output values.  | Page 54, Section 7.5        |
| Conversion speed switch function                |                      |                | The conversion speed can be selected from 20μs, 80μs or 1ms.  | Page 68, Section 8.5        |
| Input range extended mode function              |                      |                | The input range can be extended. By combining this function with the input signal error detection function, simple disconnection detection can be executed.   | Page 67, Section 8.4        |
| Maximum value/minimum value hold function       |                      |                | The A/D converter module stores the maximum and minimum values of the scaling values (digital operation values) for each channel to the buffer memory.  | Page 68, Section 8.6        |
| Input signal error detection function           |                      |                | This function detects the analog input value which exceeds the setting range.   | Page 69, Section 8.7        |
| Input signal error detection extension function |                      |                | The detection method of the input signal error detection function can be extended. Use this function to detect the input signal error only in the lower limit or upper limit, or to execute the disconnection detection.  | Page 74, Section 8.8        |
| Warning output function (process alarm)         |                      |                | This function outputs alarm when a digital output value is in the range set in advance.   | Page 77, Section 8.9        |
| Scaling function                                |                      |                | The A/D converter module scale-converts the output digital value to the set range of the scaling upper limit value and scaling lower limit value. This omits the programming of the scale conversion.   | Page 80, Section 8.10       |

| Item                                    | Description   | Reference                 |
|---|---|---------------------------|
| Shift function                          | The A/D converter module adds the set shifting amount to conversion value to the scaling value (digital operation value) and stores in the buffer memory. Fine adjustment can be performed easily when the system starts. | Page 86,<br>Section 8.11  |
| Digital clipping function               | When the input voltage or current exceeds the input range, the maximum value of the scaling value (digital operation value) can be set to 20000, and the minimum value can be set to 0 or -20000.                         | Page 90,<br>Section 8.12  |
| Difference conversion function          | This function subtracts the difference conversion reference value from the scaling value (digital operation value) and stores the acquired value in the buffer memory.  | Page 94,<br>Section 8.13  |
| Logging function                        | This function logs the digital output value or scaling value (digital operation value). The data of 10000 points can be logged for each channel.  | Page 98,<br>Section 8.14  |
| Flow amount integration function        | This function performs the A/D conversion of analog input value (voltage or current) from a source such as a flow meter and integrates the digital output value.  | Page 110,<br>Section 8.15 |
| Error log function                      | The function stores up to latest 16 recodes of errors and alarms occurred in the A/D converter module to the buffer memory.   | Page 119,<br>Section 8.16 |
| Module error collection function        | This function collects errors and alarms occurred in the A/D converter module and stores to the CPU module or the head module.  | Page 122,<br>Section 8.17 |
| Error clear function                    | Clearing the error from the system monitor at error occurrence is possible.   | Page 123,<br>Section 8.18 |
| Saving and restoring offset/gain values | The offset/gain value of the user range setting can be saved or restored.   | Page 124,<br>Section 8.19 |

## 3.4 I/O Signal List

The following shows the list of the A/D converter module I/O signals.  
For the details of I/O signals, refer to the followings.

- Details of I/O signals (☞ Page 167, Appendix 1)

| Input signal  |  | Output signal |                     |
|---------------|--|---------------|---------------------|
| Device number | Signal name                                      | Device number | Signal name         |
| X0            | Module READY                                     | Y0            | Use prohibited      |
| X1            | Use prohibited                                   | Y1            |                     |
| X2            |  | Y2            |                     |
| X3            |  | Y3            |                     |
| X4            |  | Y4            |                     |
| X5            |  | Y5            |                     |
| X6            |  | Y6            |                     |
| X7            |  | Y7            |                     |
| X8            | Warning output signal                            | Y8            | Use prohibited      |
| X9            | Operating condition setting completed flag       | Y9            |                     |
| XA            | Offset/gain setting mode flag                    | YA            |                     |
| XB            | Channel change completed flag                    | YB            |                     |
| XC            | Input signal error detection signal              | YC            |                     |
| XD            | Maximum value/minimum value reset completed flag | YD            |                     |
| XE            | A/D conversion completed flag                    | YE            |                     |
| XF            | Error flag                                       | YF            | Error clear request |

### Point

The I/O number (X/Y) described above shows the case that the start I/O number of the A/D converter module is set to "0".

## 3.5 List of Buffer Memory Addresses

The following shows the list of the A/D converter module buffer memory.

For details of buffer memory addresses, refer to the following.

- Details of buffer memory addresses (👉 Page 174, Appendix 2)

### Point

Do not write data to the system area and the area where the data cannot be written from the program in the buffer memory. Writing data to these areas may lead the module to malfunction.

#### (1) Un\G0 to Un\G1799

| Address<br>(decimal) | Address<br>(hexadecimal)                | Name  | Default<br>*1     | Read/Write<br>*2 |
|----------------------|---|---|-------------------|------------------|
| 0                    | 0 <sub>H</sub>                          | A/D conversion enable/disable setting             | 0000 <sub>H</sub> | R/W              |
| 1                    | 1 <sub>H</sub>                          | CH1 Time Average/ Count Average/Moving Average    | 0                 | R/W              |
| 2                    | 2 <sub>H</sub>                          | CH2 Time Average/ Count Average/Moving Average    | 0                 | R/W              |
| 3                    | 3 <sub>H</sub>                          | CH3 Time Average/ Count Average/Moving Average    | 0                 | R/W              |
| 4                    | 4 <sub>H</sub>                          | CH4 Time Average/ Count Average/Moving Average    | 0                 | R/W              |
| 5<br>to<br>8         | 5 <sub>H</sub><br>to<br>8 <sub>H</sub>  | System area                                       | —                 | —                |
| 9                    | 9 <sub>H</sub>                          | Averaging process setting (used to replace Q64AD) | 0000 <sub>H</sub> | R/W              |
| 10                   | A <sub>H</sub>                          | A/D conversion completed flag                     | 0000 <sub>H</sub> | R                |
| 11                   | B <sub>H</sub>                          | CH1 Digital output value                          | 0                 | R                |
| 12                   | C <sub>H</sub>                          | CH2 Digital output value                          | 0                 | R                |
| 13                   | D <sub>H</sub>                          | CH3 Digital output value                          | 0                 | R                |
| 14                   | E <sub>H</sub>                          | CH4 Digital output value                          | 0                 | R                |
| 15<br>to<br>18       | F <sub>H</sub><br>to<br>12 <sub>H</sub> | System area                                       | —                 | —                |
| 19                   | 13 <sub>H</sub>                         | Latest error code                                 | 0                 | R                |
| 20                   | 14 <sub>H</sub>                         | Setting range                                     | 0000 <sub>H</sub> | R                |
| 21                   | 15 <sub>H</sub>                         | System area                                       | -                 | -                |
| 22                   | 16 <sub>H</sub>                         | Offset/gain setting mode Offset specification     | 0000 <sub>H</sub> | R/W              |
| 23                   | 17 <sub>H</sub>                         | Offset/gain setting mode Gain specification       | 0000 <sub>H</sub> | R/W              |
| 24                   | 18 <sub>H</sub>                         | Averaging process setting                         | 0000 <sub>H</sub> | R/W              |
| 25                   | 19 <sub>H</sub>                         | System area                                       | —                 | —                |
| 26                   | 1A <sub>H</sub>                         | Conversion speed setting                          | 0001 <sub>H</sub> | R/W              |
| 27                   | 1B <sub>H</sub>                         | Input signal error detection extension setting    | 0000 <sub>H</sub> | R/W              |
| 28                   | 1C <sub>H</sub>                         | System area                                       | —                 | —                |
| 29                   | 1D <sub>H</sub>                         | Digital clipping enable/disable setting           | 000F <sub>H</sub> | R/W              |
| 30                   | 1E <sub>H</sub>                         | CH1 Maximum value                                 | 0                 | R                |
| 31                   | 1F <sub>H</sub>                         | CH1 Minimum value                                 | 0                 | R                |

| Address<br>(decimal) | Address<br>(hexadecimal)                 | Name  | Default<br>*1     | Read/Write<br>*2 |
|----------------------|--|---|-------------------|------------------|
| 32                   | 20 <sub>H</sub>                          | CH2 Maximum value                           | 0                 | R                |
| 33                   | 21 <sub>H</sub>                          | CH2 Minimum value                           | 0                 | R                |
| 34                   | 22 <sub>H</sub>                          | CH3 Maximum value                           | 0                 | R                |
| 35                   | 23 <sub>H</sub>                          | CH3 Minimum value                           | 0                 | R                |
| 36                   | 24 <sub>H</sub>                          | CH4 Maximum value                           | 0                 | R                |
| 37                   | 25 <sub>H</sub>                          | CH4 Minimum value                           | 0                 | R                |
| 38<br>to<br>46       | 26 <sub>H</sub><br>to<br>2E <sub>H</sub> | System area                                 | —                 | —                |
| 47                   | 2F <sub>H</sub>                          | Input signal error detection setting        | 000F <sub>H</sub> | R/W              |
| 48                   | 30 <sub>H</sub>                          | Warning output setting                      | 000F <sub>H</sub> | R/W              |
| 49                   | 31 <sub>H</sub>                          | Input signal error detection flag           | 0000 <sub>H</sub> | R                |
| 50                   | 32 <sub>H</sub>                          | Warning output flag (Process alarm)         | 0000 <sub>H</sub> | R                |
| 51<br>52             | 33 <sub>H</sub><br>34 <sub>H</sub>       | System area                                 | —                 | —                |
| 53                   | 35 <sub>H</sub>                          | Scaling enable/disable setting              | 000F <sub>H</sub> | R/W              |
| 54                   | 36 <sub>H</sub>                          | CH1 Scaling value (digital operation value) | 0                 | R                |
| 55                   | 37 <sub>H</sub>                          | CH2 Scaling value (digital operation value) | 0                 | R                |
| 56                   | 38 <sub>H</sub>                          | CH3 Scaling value (digital operation value) | 0                 | R                |
| 57                   | 39 <sub>H</sub>                          | CH4 Scaling value (digital operation value) | 0                 | R                |
| 58<br>to<br>61       | 3A <sub>H</sub><br>to<br>3D <sub>H</sub> | System area                                 | —                 | —                |
| 62                   | 3E <sub>H</sub>                          | CH1 Scaling lower limit value               | 0                 | R/W              |
| 63                   | 3F <sub>H</sub>                          | CH1 Scaling upper limit value               | 0                 | R/W              |
| 64                   | 40 <sub>H</sub>                          | CH2 Scaling lower limit value               | 0                 | R/W              |
| 65                   | 41 <sub>H</sub>                          | CH2 Scaling upper limit value               | 0                 | R/W              |
| 66                   | 42 <sub>H</sub>                          | CH3 Scaling lower limit value               | 0                 | R/W              |
| 67                   | 43 <sub>H</sub>                          | CH3 Scaling upper limit value               | 0                 | R/W              |
| 68                   | 44 <sub>H</sub>                          | CH4 Scaling lower limit value               | 0                 | R/W              |
| 69                   | 45 <sub>H</sub>                          | CH4 Scaling upper limit value               | 0                 | R/W              |
| 70<br>to<br>85       | 46 <sub>H</sub><br>to<br>55 <sub>H</sub> | System area                                 | —                 | —                |
| 86                   | 56 <sub>H</sub>                          | CH1 Process alarm lower lower limit value   | 0                 | R/W              |
| 87                   | 57 <sub>H</sub>                          | CH1 Process alarm lower upper limit value   | 0                 | R/W              |
| 88                   | 58 <sub>H</sub>                          | CH1 Process alarm upper lower limit value   | 0                 | R/W              |
| 89                   | 59 <sub>H</sub>                          | CH1 Process alarm upper upper limit value   | 0                 | R/W              |
| 90                   | 5A <sub>H</sub>                          | CH2 Process alarm lower lower limit value   | 0                 | R/W              |
| 91                   | 5B <sub>H</sub>                          | CH2 Process alarm lower upper limit value   | 0                 | R/W              |
| 92                   | 5C <sub>H</sub>                          | CH2 Process alarm upper lower limit value   | 0                 | R/W              |
| 93                   | 5D <sub>H</sub>                          | CH2 Process alarm upper upper limit value   | 0                 | R/W              |

| Address<br>(decimal) | Address<br>(hexadecimal)                 | Name   | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|--|---------------|------------------|
| 94                   | 5E <sub>H</sub>                          | CH3 Process alarm lower lower limit value      | 0             | R/W              |
| 95                   | 5F <sub>H</sub>                          | CH3 Process alarm lower upper limit value      | 0             | R/W              |
| 96                   | 60 <sub>H</sub>                          | CH3 Process alarm upper lower limit value      | 0             | R/W              |
| 97                   | 61 <sub>H</sub>                          | CH3 Process alarm upper upper limit value      | 0             | R/W              |
| 98                   | 62 <sub>H</sub>                          | CH4 Process alarm lower lower limit value      | 0             | R/W              |
| 99                   | 63 <sub>H</sub>                          | CH4 Process alarm lower upper limit value      | 0             | R/W              |
| 100                  | 64 <sub>H</sub>                          | CH4 Process alarm upper lower limit value      | 0             | R/W              |
| 101                  | 65 <sub>H</sub>                          | CH4 Process alarm upper upper limit value      | 0             | R/W              |
| 102<br>to<br>141     | 66 <sub>H</sub><br>to<br>8D <sub>H</sub> | System area                                    | —             | —                |
| 142                  | 8E <sub>H</sub>                          | CH1 Input signal error detection setting value | 50            | R/W              |
| 143                  | 8F <sub>H</sub>                          | CH2 Input signal error detection setting value | 50            | R/W              |
| 144                  | 90 <sub>H</sub>                          | CH3 Input signal error detection setting value | 50            | R/W              |
| 145                  | 91 <sub>H</sub>                          | CH4 Input signal error detection setting value | 50            | R/W              |
| 146<br>to<br>149     | 92 <sub>H</sub><br>to<br>95 <sub>H</sub> | System area                                    | —             | —                |
| 150                  | 96 <sub>H</sub>                          | CH1 Shifting amount to conversion value        | 0             | R/W              |
| 151                  | 97 <sub>H</sub>                          | CH2 Shifting amount to conversion value        | 0             | R/W              |
| 152                  | 98 <sub>H</sub>                          | CH3 Shifting amount to conversion value        | 0             | R/W              |
| 153                  | 99 <sub>H</sub>                          | CH4 Shifting amount to conversion value        | 0             | R/W              |
| 154<br>to<br>157     | 9A <sub>H</sub><br>to<br>9D <sub>H</sub> | System area                                    | —             | —                |
| 158                  | 9E <sub>H</sub>                          | Mode switching setting                         | 0             | R/W              |
| 159                  | 9F <sub>H</sub>                          |  |               |                  |
| 160<br>to<br>171     | A0 <sub>H</sub><br>to<br>AB <sub>H</sub> | System area                                    | —             | —                |
| 172                  | AC <sub>H</sub>                          | CH1 Difference conversion trigger              | 0             | R/W              |
| 173                  | AD <sub>H</sub>                          | CH2 Difference conversion trigger              | 0             | R/W              |
| 174                  | AE <sub>H</sub>                          | CH3 Difference conversion trigger              | 0             | R/W              |
| 175                  | AF <sub>H</sub>                          | CH4 Difference conversion trigger              | 0             | R/W              |
| 176<br>to<br>179     | B0 <sub>H</sub><br>to<br>B3 <sub>H</sub> | System area                                    | —             | —                |
| 180                  | B4 <sub>H</sub>                          | CH1 Difference conversion reference value      | 0             | R                |
| 181                  | B5 <sub>H</sub>                          | CH2 Difference conversion reference value      | 0             | R                |
| 182                  | B6 <sub>H</sub>                          | CH3 Difference conversion reference value      | 0             | R                |
| 183                  | B7 <sub>H</sub>                          | CH4 Difference conversion reference value      | 0             | R                |

| Address<br>(decimal) | Address<br>(hexadecimal)                 | Name  | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|---|---------------|------------------|
| 184<br>to<br>189     | B8 <sub>H</sub><br>to<br>BD <sub>H</sub> | System area                                       | —             | —                |
| 190                  | BE <sub>H</sub>                          | CH1 Difference conversion status flag             | 0             | R                |
| 191                  | BF <sub>H</sub>                          | CH2 Difference conversion status flag             | 0             | R                |
| 192                  | C0 <sub>H</sub>                          | CH3 Difference conversion status flag             | 0             | R                |
| 193                  | C1 <sub>H</sub>                          | CH4 Difference conversion status flag             | 0             | R                |
| 194<br>to<br>199     | C2 <sub>H</sub><br>to<br>C7 <sub>H</sub> | System area                                       | —             | —                |
| 200                  | C8 <sub>H</sub>                          | Pass data classification setting                  | 0             | R/W              |
| 201                  | C9 <sub>H</sub>                          | System area                                       | —             | —                |
| 202                  | CA <sub>H</sub>                          | CH1 Industrial shipment settings offset value (L) | 0             | R/W              |
| 203                  | CB <sub>H</sub>                          | CH1 Industrial shipment settings offset value (H) | 0             | R/W              |
| 204                  | CC <sub>H</sub>                          | CH1 Industrial shipment settings gain value (L)   | 0             | R/W              |
| 205                  | CD <sub>H</sub>                          | CH1 Industrial shipment settings gain value (H)   | 0             | R/W              |
| 206                  | CE <sub>H</sub>                          | CH2 Industrial shipment settings offset value (L) | 0             | R/W              |
| 207                  | CF <sub>H</sub>                          | CH2 Industrial shipment settings offset value (H) | 0             | R/W              |
| 208                  | D0 <sub>H</sub>                          | CH2 Industrial shipment settings gain value (L)   | 0             | R/W              |
| 209                  | D1 <sub>H</sub>                          | CH2 Industrial shipment settings gain value (H)   | 0             | R/W              |
| 210                  | D2 <sub>H</sub>                          | CH3 Industrial shipment settings offset value (L) | 0             | R/W              |
| 211                  | D3 <sub>H</sub>                          | CH3 Industrial shipment settings offset value (H) | 0             | R/W              |
| 212                  | D4 <sub>H</sub>                          | CH3 Industrial shipment settings gain value (L)   | 0             | R/W              |
| 213                  | D5 <sub>H</sub>                          | CH3 Industrial shipment settings gain value (H)   | 0             | R/W              |
| 214                  | D6 <sub>H</sub>                          | CH4 Industrial shipment settings offset value (L) | 0             | R/W              |
| 215                  | D7 <sub>H</sub>                          | CH4 Industrial shipment settings offset value (H) | 0             | R/W              |
| 216                  | D8 <sub>H</sub>                          | CH4 Industrial shipment settings gain value (L)   | 0             | R/W              |
| 217                  | D9 <sub>H</sub>                          | CH4 Industrial shipment settings gain value (H)   | 0             | R/W              |
| 218                  | DA <sub>H</sub>                          | CH1 User range settings offset value (L)          | 0             | R/W              |
| 219                  | DB <sub>H</sub>                          | CH1 User range settings offset value (H)          | 0             | R/W              |
| 220                  | DC <sub>H</sub>                          | CH1 User range settings gain value (L)            | 0             | R/W              |
| 221                  | DD <sub>H</sub>                          | CH1 User range settings gain value (H)            | 0             | R/W              |
| 222                  | DE <sub>H</sub>                          | CH2 User range settings offset value (L)          | 0             | R/W              |
| 223                  | DF <sub>H</sub>                          | CH2 User range settings offset value (H)          | 0             | R/W              |
| 224                  | E0 <sub>H</sub>                          | CH2 User range settings gain value (L)            | 0             | R/W              |
| 225                  | E1 <sub>H</sub>                          | CH2 User range settings gain value (H)            | 0             | R/W              |
| 226                  | E2 <sub>H</sub>                          | CH3 User range settings offset value (L)          | 0             | R/W              |
| 227                  | E3 <sub>H</sub>                          | CH3 User range settings offset value (H)          | 0             | R/W              |
| 228                  | E4 <sub>H</sub>                          | CH3 User range settings gain value (L)            | 0             | R/W              |
| 229                  | E5 <sub>H</sub>                          | CH3 User range settings gain value (H)            | 0             | R/W              |
| 230                  | E6 <sub>H</sub>                          | CH4 User range settings offset value (L)          | 0             | R/W              |
| 231                  | E7 <sub>H</sub>                          | CH4 User range settings offset value (H)          | 0             | R/W              |

| Address<br>(decimal) | Address<br>(hexadecimal)                   | Name                                   | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|--|---------------|------------------|
| 232                  | E8 <sub>H</sub>                            | CH4 User range settings gain value (L) | 0             | R/W              |
| 233                  | E9 <sub>H</sub>                            | CH4 User range settings gain value (H) | 0             | R/W              |
| 234<br>to<br>999     | EA <sub>H</sub><br>to<br>3E7 <sub>H</sub>  | System area                            | —             | —                |
| 1000                 | 3E8 <sub>H</sub>                           | CH1 Logging enable/disable setting     | 1             | R/W              |
| 1001                 | 3E9 <sub>H</sub>                           | CH2 Logging enable/disable setting     | 1             | R/W              |
| 1002                 | 3EA <sub>H</sub>                           | CH3 Logging enable/disable setting     | 1             | R/W              |
| 1003                 | 3EB <sub>H</sub>                           | CH4 Logging enable/disable setting     | 1             | R/W              |
| 1004<br>to<br>1007   | 3EC <sub>H</sub><br>to<br>3EF <sub>H</sub> | System area                            | —             | —                |
| 1008                 | 3F0 <sub>H</sub>                           | CH1 Logging hold request               | 0             | R/W              |
| 1009                 | 3F1 <sub>H</sub>                           | CH2 Logging hold request               | 0             | R/W              |
| 1010                 | 3F2 <sub>H</sub>                           | CH3 Logging hold request               | 0             | R/W              |
| 1011                 | 3F3 <sub>H</sub>                           | CH4 Logging hold request               | 0             | R/W              |
| 1012<br>to<br>1015   | 3F4 <sub>H</sub><br>to<br>3F7 <sub>H</sub> | System area                            | —             | —                |
| 1016                 | 3F8 <sub>H</sub>                           | CH1 Logging hold flag                  | 0             | R                |
| 1017                 | 3F9 <sub>H</sub>                           | CH2 Logging hold flag                  | 0             | R                |
| 1018                 | 3FA <sub>H</sub>                           | CH3 Logging hold flag                  | 0             | R                |
| 1019                 | 3FB <sub>H</sub>                           | CH4 Logging hold flag                  | 0             | R                |
| 1020<br>to<br>1023   | 3FC <sub>H</sub><br>to<br>3FF <sub>H</sub> | System area                            | —             | —                |
| 1024                 | 400 <sub>H</sub>                           | CH1 Logging data setting               | 1             | R/W              |
| 1025                 | 401 <sub>H</sub>                           | CH2 Logging data setting               | 1             | R/W              |
| 1026                 | 402 <sub>H</sub>                           | CH3 Logging data setting               | 1             | R/W              |
| 1027                 | 403 <sub>H</sub>                           | CH4 Logging data setting               | 1             | R/W              |
| 1028<br>to<br>1031   | 404 <sub>H</sub><br>to<br>407 <sub>H</sub> | System area                            | —             | —                |
| 1032                 | 408 <sub>H</sub>                           | CH1 Logging cycle setting value        | 4             | R/W              |
| 1033                 | 409 <sub>H</sub>                           | CH2 Logging cycle setting value        | 4             | R/W              |
| 1034                 | 40A <sub>H</sub>                           | CH3 Logging cycle setting value        | 4             | R/W              |
| 1035                 | 40B <sub>H</sub>                           | CH4 Logging cycle setting value        | 4             | R/W              |
| 1036<br>to<br>1039   | 40C <sub>H</sub><br>to<br>40F <sub>H</sub> | System area                            | —             | —                |
| 1040                 | 410 <sub>H</sub>                           | CH1 Logging cycle unit setting         | 1             | R/W              |
| 1041                 | 411 <sub>H</sub>                           | CH2 Logging cycle unit setting         | 1             | R/W              |



| Address<br>(decimal) | Address<br>(hexadecimal)                   | Name                                | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|-------------------------------------|---------------|------------------|
| 1042                 | 412 <sub>H</sub>                           | CH3 Logging cycle unit setting      | 1             | R/W              |
| 1043                 | 413 <sub>H</sub>                           | CH4 Logging cycle unit setting      | 1             | R/W              |
| 1044<br>to<br>1047   | 414 <sub>H</sub><br>to<br>417 <sub>H</sub> | System area                         | —             | —                |
| 1048                 | 418 <sub>H</sub>                           | CH1 Logging points after trigger    | 5000          | R/W              |
| 1049                 | 419 <sub>H</sub>                           | CH2 Logging points after trigger    | 5000          | R/W              |
| 1050                 | 41A <sub>H</sub>                           | CH3 Logging points after trigger    | 5000          | R/W              |
| 1051                 | 41B <sub>H</sub>                           | CH4 Logging points after trigger    | 5000          | R/W              |
| 1052<br>to<br>1055   | 41C <sub>H</sub><br>to<br>41F <sub>H</sub> | System area                         | —             | —                |
| 1056                 | 420 <sub>H</sub>                           | CH1 Level trigger condition setting | 0             | R/W              |
| 1057                 | 421 <sub>H</sub>                           | CH2 Level trigger condition setting | 0             | R/W              |
| 1058                 | 422 <sub>H</sub>                           | CH3 Level trigger condition setting | 0             | R/W              |
| 1059                 | 423 <sub>H</sub>                           | CH4 Level trigger condition setting | 0             | R/W              |
| 1060<br>to<br>1063   | 424 <sub>H</sub><br>to<br>427 <sub>H</sub> | System area                         | —             | —                |
| 1064                 | 428 <sub>H</sub>                           | CH1 Trigger data                    | 54            | R/W              |
| 1065                 | 429 <sub>H</sub>                           | CH2 Trigger data                    | 55            | R/W              |
| 1066                 | 42A <sub>H</sub>                           | CH3 Trigger data                    | 56            | R/W              |
| 1067                 | 42B <sub>H</sub>                           | CH4 Trigger data                    | 57            | R/W              |
| 1068<br>to<br>1071   | 42C <sub>H</sub><br>to<br>42F <sub>H</sub> | System area                         | —             | —                |
| 1072                 | 430 <sub>H</sub>                           | Level data 0                        | 0             | R/W              |
| 1073                 | 431 <sub>H</sub>                           | Level data 1                        | 0             | R/W              |
| 1074                 | 432 <sub>H</sub>                           | Level data 2                        | 0             | R/W              |
| 1075                 | 433 <sub>H</sub>                           | Level data 3                        | 0             | R/W              |
| 1076                 | 434 <sub>H</sub>                           | Level data 4                        | 0             | R/W              |
| 1077                 | 435 <sub>H</sub>                           | Level data 5                        | 0             | R/W              |
| 1078                 | 436 <sub>H</sub>                           | Level data 6                        | 0             | R/W              |
| 1079                 | 437 <sub>H</sub>                           | Level data 7                        | 0             | R/W              |
| 1080                 | 438 <sub>H</sub>                           | Level data 8                        | 0             | R/W              |
| 1081                 | 439 <sub>H</sub>                           | Level data 9                        | 0             | R/W              |
| 1082                 | 43A <sub>H</sub>                           | CH1 Trigger setting value           | 0             | R/W              |
| 1083                 | 43B <sub>H</sub>                           | CH2 Trigger setting value           | 0             | R/W              |
| 1084                 | 43C <sub>H</sub>                           | CH3 Trigger setting value           | 0             | R/W              |
| 1085                 | 43D <sub>H</sub>                           | CH4 Trigger setting value           | 0             | R/W              |

| Address<br>(decimal) | Address<br>(hexadecimal)                   | Name                            |      | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|---------------------------------|------|---------------|------------------|
| 1086<br>to<br>1089   | 43E <sub>H</sub><br>to<br>441 <sub>H</sub> | System area                     |      | —             | —                |
| 1090                 | 442 <sub>H</sub>                           | CH1 Head pointer                |      | 0             | R                |
| 1091                 | 443 <sub>H</sub>                           | CH2 Head pointer                |      | 0             | R                |
| 1092                 | 444 <sub>H</sub>                           | CH3 Head pointer                |      | 0             | R                |
| 1093                 | 445 <sub>H</sub>                           | CH4 Head pointer                |      | 0             | R                |
| 1094<br>to<br>1097   | 446 <sub>H</sub><br>to<br>449 <sub>H</sub> | System area                     |      | —             | —                |
| 1098                 | 44A <sub>H</sub>                           | CH1 Latest pointer              |      | 0             | R                |
| 1099                 | 44B <sub>H</sub>                           | CH2 Latest pointer              |      | 0             | R                |
| 1100                 | 44C <sub>H</sub>                           | CH3 Latest pointer              |      | 0             | R                |
| 1101                 | 44D <sub>H</sub>                           | CH4 Latest pointer              |      | 0             | R                |
| 1102<br>to<br>1105   | 44E <sub>H</sub><br>to<br>451 <sub>H</sub> | System area                     |      | —             | —                |
| 1106                 | 452 <sub>H</sub>                           | CH1 Number of logging data      |      | 0             | R                |
| 1107                 | 453 <sub>H</sub>                           | CH2 Number of logging data      |      | 0             | R                |
| 1108                 | 454 <sub>H</sub>                           | CH3 Number of logging data      |      | 0             | R                |
| 1109                 | 455 <sub>H</sub>                           | CH4 Number of logging data      |      | 0             | R                |
| 1110<br>to<br>1113   | 456 <sub>H</sub><br>to<br>459 <sub>H</sub> | System area                     |      | —             | —                |
| 1114                 | 45A <sub>H</sub>                           | CH1 Trigger pointer             |      | 0             | R                |
| 1115                 | 45B <sub>H</sub>                           | CH2 Trigger pointer             |      | 0             | R                |
| 1116                 | 45C <sub>H</sub>                           | CH3 Trigger pointer             |      | 0             | R                |
| 1117                 | 45D <sub>H</sub>                           | CH4 Trigger pointer             |      | 0             | R                |
| 1118<br>to<br>1121   | 45E <sub>H</sub><br>to<br>461 <sub>H</sub> | System area                     |      | —             | —                |
| 1122                 | 462 <sub>H</sub>                           | CH1 Logging cycle monitor value | (s)  | 0             | R                |
| 1123                 | 463 <sub>H</sub>                           |                                 | (ms) | 0             | R                |
| 1124                 | 464 <sub>H</sub>                           |                                 | (μs) | 0             | R                |
| 1125                 | 465 <sub>H</sub>                           | CH2 Logging cycle monitor value | (s)  | 0             | R                |
| 1126                 | 466 <sub>H</sub>                           |                                 | (ms) | 0             | R                |
| 1127                 | 467 <sub>H</sub>                           |                                 | (μs) | 0             | R                |
| 1128                 | 468 <sub>H</sub>                           | CH3 Logging cycle monitor value | (s)  | 0             | R                |
| 1129                 | 469 <sub>H</sub>                           |                                 | (ms) | 0             | R                |
| 1130                 | 46A <sub>H</sub>                           |                                 | (μs) | 0             | R                |

| Address<br>(decimal) | Address<br>(hexadecimal)                   | Name   |                                 |                                   | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|--|---------------------------------|-----------------------------------|---------------|------------------|
| 1131                 | 46B <sub>H</sub>                           | CH4 Logging cycle monitor value                    | (s)                             |                                   | 0             | R                |
| 1132                 | 46C <sub>H</sub>                           |  | (ms)                            |                                   | 0             | R                |
| 1133                 | 46D <sub>H</sub>                           |  | (μs)                            |                                   | 0             | R                |
| 1134<br>to<br>1153   | 46E <sub>H</sub><br>to<br>481 <sub>H</sub> | System area  |                                 |                                   | —             | —                |
| 1154                 | 482 <sub>H</sub>                           | CH1 Trigger<br>detection time                      | First two digits<br>of the year | Last two<br>digits of the<br>year | 0             | R                |
| 1155                 | 483 <sub>H</sub>                           |  | Month                           | Day                               | 0             | R                |
| 1156                 | 484 <sub>H</sub>                           |  | Hour                            | Minute                            | 0             | R                |
| 1157                 | 485 <sub>H</sub>                           |  | Second                          | Day of the<br>week                | 0             | R                |
| 1158                 | 486 <sub>H</sub>                           | CH2 Trigger<br>detection time                      | First two digits<br>of the year | Last two<br>digits of the<br>year | 0             | R                |
| 1159                 | 487 <sub>H</sub>                           |  | Month                           | Day                               | 0             | R                |
| 1160                 | 488 <sub>H</sub>                           |  | Hour                            | Minute                            | 0             | R                |
| 1161                 | 489 <sub>H</sub>                           |  | Second                          | Day of the<br>week                | 0             | R                |
| 1162                 | 48A <sub>H</sub>                           | CH3 Trigger<br>detection time                      | First two digits<br>of the year | Last two<br>digits of the<br>year | 0             | R                |
| 1163                 | 48B <sub>H</sub>                           |  | Month                           | Day                               | 0             | R                |
| 1164                 | 48C <sub>H</sub>                           |  | Hour                            | Minute                            | 0             | R                |
| 1165                 | 48D <sub>H</sub>                           |  | Second                          | Day of the<br>week                | 0             | R                |
| 1166                 | 48E <sub>H</sub>                           | CH4 Trigger<br>detection time                      | First two digits<br>of the year | Last two<br>digits of the<br>year | 0             | R                |
| 1167                 | 48F <sub>H</sub>                           |  | Month                           | Day                               | 0             | R                |
| 1168                 | 490 <sub>H</sub>                           |  | Hour                            | Minute                            | 0             | R                |
| 1169                 | 491 <sub>H</sub>                           |  | Second                          | Day of the<br>week                | 0             | R                |
| 1170<br>to<br>1299   | 492 <sub>H</sub><br>to<br>513 <sub>H</sub> | System area  |                                 |                                   | —             | —                |
| 1300                 | 514 <sub>H</sub>                           | CH1 Flow amount integration enable/disable setting |                                 |                                   | 1             | R/W              |
| 1301                 | 515 <sub>H</sub>                           | CH2 Flow amount integration enable/disable setting |                                 |                                   | 1             | R/W              |
| 1302                 | 516 <sub>H</sub>                           | CH3 Flow amount integration enable/disable setting |                                 |                                   | 1             | R/W              |
| 1303                 | 517 <sub>H</sub>                           | CH4 Flow amount integration enable/disable setting |                                 |                                   | 1             | R/W              |
| 1304<br>to<br>1307   | 518 <sub>H</sub><br>to<br>51B <sub>H</sub> | System area  |                                 |                                   | —             | —                |
| 1308                 | 51C <sub>H</sub>                           | CH1 Integration cycle setting                      |                                 |                                   | 4             | R/W              |
| 1309                 | 51D <sub>H</sub>                           | CH2 Integration cycle setting                      |                                 |                                   | 4             | R/W              |

| Address<br>(decimal) | Address<br>(hexadecimal)                   | Name   | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|--|---------------|------------------|
| 1310                 | 51E <sub>H</sub>                           | CH3 Integration cycle setting                      | 4             | R/W              |
| 1311                 | 51F <sub>H</sub>                           | CH4 Integration cycle setting                      | 4             | R/W              |
| 1312<br>to<br>1315   | 520 <sub>H</sub><br>to<br>523 <sub>H</sub> | System area  | —             | —                |
| 1316                 | 524 <sub>H</sub>                           | CH1 Flow amount time unit setting                  | 0             | R/W              |
| 1317                 | 525 <sub>H</sub>                           | CH2 Flow amount time unit setting                  | 0             | R/W              |
| 1318                 | 526 <sub>H</sub>                           | CH3 Flow amount time unit setting                  | 0             | R/W              |
| 1319                 | 527 <sub>H</sub>                           | CH4 Flow amount time unit setting                  | 0             | R/W              |
| 1320<br>to<br>1323   | 528 <sub>H</sub><br>to<br>52B <sub>H</sub> | System area  | —             | —                |
| 1324                 | 52C <sub>H</sub>                           | CH1 Unit scaling setting                           | 0             | R/W              |
| 1325                 | 52D <sub>H</sub>                           | CH2 Unit scaling setting                           | 0             | R/W              |
| 1326                 | 52E <sub>H</sub>                           | CH3 Unit scaling setting                           | 0             | R/W              |
| 1327                 | 52F <sub>H</sub>                           | CH4 Unit scaling setting                           | 0             | R/W              |
| 1328<br>to<br>1331   | 530 <sub>H</sub><br>to<br>533 <sub>H</sub> | System area  | —             | —                |
| 1332                 | 534 <sub>H</sub>                           | CH1 Integrated flow amount (L)                     | 0             | R                |
| 1333                 | 535 <sub>H</sub>                           | CH1 Integrated flow amount (H)                     | 0             | R                |
| 1334                 | 536 <sub>H</sub>                           | CH2 Integrated flow amount (L)                     | 0             | R                |
| 1335                 | 537 <sub>H</sub>                           | CH2 Integrated flow amount (H)                     | 0             | R                |
| 1336                 | 538 <sub>H</sub>                           | CH3 Integrated flow amount (L)                     | 0             | R                |
| 1337                 | 539 <sub>H</sub>                           | CH3 Integrated flow amount (H)                     | 0             | R                |
| 1338                 | 53A <sub>H</sub>                           | CH4 Integrated flow amount (L)                     | 0             | R                |
| 1339                 | 53B <sub>H</sub>                           | CH4 Integrated flow amount (H)                     | 0             | R                |
| 1340<br>to<br>1347   | 53C <sub>H</sub><br>to<br>543 <sub>H</sub> | System area  | —             | —                |
| 1348                 | 544 <sub>H</sub>                           | CH1 Integration cycle monitor value                | 0             | R                |
| 1349                 | 545 <sub>H</sub>                           | CH2 Integration cycle monitor value                | 0             | R                |
| 1350                 | 546 <sub>H</sub>                           | CH3 Integration cycle monitor value                | 0             | R                |
| 1351                 | 547 <sub>H</sub>                           | CH4 Integration cycle monitor value                | 0             | R                |
| 1352<br>to<br>1355   | 548 <sub>H</sub><br>to<br>54B <sub>H</sub> | System area  | —             | —                |
| 1356                 | 54C <sub>H</sub>                           | CH1 Flow amount integration temporary stop request | 0             | R/W              |
| 1357                 | 54D <sub>H</sub>                           | CH2 Flow amount integration temporary stop request | 0             | R/W              |
| 1358                 | 54E <sub>H</sub>                           | CH3 Flow amount integration temporary stop request | 0             | R/W              |
| 1359                 | 54F <sub>H</sub>                           | CH4 Flow amount integration temporary stop request | 0             | R/W              |

| Address<br>(decimal) | Address<br>(hexadecimal)                   | Name  | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|---|---------------|------------------|
| 1360<br>to<br>1363   | 550 <sub>H</sub><br>to<br>553 <sub>H</sub> | System area                                     | —             | —                |
| 1364                 | 554 <sub>H</sub>                           | CH1 Flow amount integration temporary stop flag | 0             | R                |
| 1365                 | 555 <sub>H</sub>                           | CH2 Flow amount integration temporary stop flag | 0             | R                |
| 1366                 | 556 <sub>H</sub>                           | CH3 Flow amount integration temporary stop flag | 0             | R                |
| 1367                 | 557 <sub>H</sub>                           | CH4 Flow amount integration temporary stop flag | 0             | R                |
| 1368<br>to<br>1371   | 558 <sub>H</sub><br>to<br>55B <sub>H</sub> | System area                                     | —             | —                |
| 1372                 | 55C <sub>H</sub>                           | CH1 Integrated flow amount clear request        | 0             | R/W              |
| 1373                 | 55D <sub>H</sub>                           | CH2 Integrated flow amount clear request        | 0             | R/W              |
| 1374                 | 55E <sub>H</sub>                           | CH3 Integrated flow amount clear request        | 0             | R/W              |
| 1375                 | 55F <sub>H</sub>                           | CH4 Integrated flow amount clear request        | 0             | R/W              |
| 1376<br>to<br>1379   | 560 <sub>H</sub><br>to<br>563 <sub>H</sub> | System area                                     | —             | —                |
| 1380                 | 564 <sub>H</sub>                           | CH1 Integrated flow amount clear flag           | 0             | R                |
| 1381                 | 565 <sub>H</sub>                           | CH2 Integrated flow amount clear flag           | 0             | R                |
| 1382                 | 566 <sub>H</sub>                           | CH3 Integrated flow amount clear flag           | 0             | R                |
| 1383                 | 567 <sub>H</sub>                           | CH4 Integrated flow amount clear flag           | 0             | R                |
| 1384<br>to<br>1799   | 568 <sub>H</sub><br>to<br>707 <sub>H</sub> | System area                                     | —             | —                |

\*1 The default value is a value set after power-on or after resetting the CPU module.

\*2 This shows whether read or write from programs is possible.  
R: Readable  
W: Writable

## (2) Error history (Un\G1800 to Un\G4999)

| Address<br>(decimal) | Address<br>(hexadecimal)                   | Name                            |               |                                    | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|---------------------------------|---------------|------------------------------------|---------------|------------------|
| 1800                 | 708 <sub>H</sub>                           | Latest address of error history |               |                                    | 0             | R                |
| 1801<br>to<br>1809   | 709 <sub>H</sub><br>to<br>711 <sub>H</sub> | System area                     |               |                                    | —             | —                |
| 1810                 | 712 <sub>H</sub>                           | No.1                            | Error code    |                                    | 0             | R                |
| 1811                 | 713 <sub>H</sub>                           |                                 | Error time    | First two<br>digits of the<br>year | 0             | R                |
| 1812                 | 714 <sub>H</sub>                           |                                 |               | Month                              | 0             | R                |
| 1813                 | 715 <sub>H</sub>                           |                                 |               | Hour                               | 0             | R                |
| 1814                 | 716 <sub>H</sub>                           |                                 |               | Second                             | 0             | R                |
| 1815<br>to<br>1819   | 717 <sub>H</sub><br>to<br>71B <sub>H</sub> |                                 | System area   |                                    | —             | —                |
| 1820<br>to<br>1829   | 71C <sub>H</sub><br>to<br>725 <sub>H</sub> | No.2                            | Same as No. 1 |                                    |               |                  |
| 1830<br>to<br>1839   | 726 <sub>H</sub><br>to<br>72F <sub>H</sub> | No.3                            | Same as No. 1 |                                    |               |                  |
| 1840<br>to<br>1849   | 730 <sub>H</sub><br>to<br>739 <sub>H</sub> | No.4                            | Same as No. 1 |                                    |               |                  |
| 1850<br>to<br>1859   | 73A <sub>H</sub><br>to<br>743 <sub>H</sub> | No.5                            | Same as No. 1 |                                    |               |                  |
| 1860<br>to<br>1869   | 744 <sub>H</sub><br>to<br>74D <sub>H</sub> | No.6                            | Same as No. 1 |                                    |               |                  |
| 1870<br>to<br>1879   | 74E <sub>H</sub><br>to<br>757 <sub>H</sub> | No.7                            | Same as No. 1 |                                    |               |                  |
| 1880<br>to<br>1889   | 758 <sub>H</sub><br>to<br>761 <sub>H</sub> | No.8                            | Same as No. 1 |                                    |               |                  |
| 1890<br>to<br>1899   | 762 <sub>H</sub><br>to<br>76B <sub>H</sub> | No.9                            | Same as No. 1 |                                    |               |                  |

| Address<br>(decimal) | Address<br>(hexadecimal)                    | Name        |               | Default<br>*1 | Read/Write<br>*2 |
|----------------------|---|-------------|---------------|---------------|------------------|
| 1900<br>to<br>1909   | 76C <sub>H</sub><br>to<br>775 <sub>H</sub>  | No.10       | Same as No. 1 |               |                  |
| 1910<br>to<br>1919   | 776 <sub>H</sub><br>to<br>77F <sub>H</sub>  | No.11       | Same as No. 1 |               |                  |
| 1920<br>to<br>1929   | 780 <sub>H</sub><br>to<br>789 <sub>H</sub>  | No.12       | Same as No. 1 |               |                  |
| 1930<br>to<br>1939   | 78A <sub>H</sub><br>to<br>793 <sub>H</sub>  | No.13       | Same as No. 1 |               |                  |
| 1940<br>to<br>1949   | 794 <sub>H</sub><br>to<br>79D <sub>H</sub>  | No.14       | Same as No. 1 |               |                  |
| 1950<br>to<br>1959   | 79E <sub>H</sub><br>to<br>7A7 <sub>H</sub>  | No.15       | Same as No. 1 |               |                  |
| 1960<br>to<br>1969   | 7A8 <sub>H</sub><br>to<br>7B1 <sub>H</sub>  | No.16       | Same as No. 1 |               |                  |
| 1970<br>to<br>4999   | 7B2 <sub>H</sub><br>to<br>1387 <sub>H</sub> | System area |               | —             | —                |

\*1 The default value is a value set after power-on or after resetting the CPU module.

\*2 This shows whether read or write from programs is possible.

R: Readable

W: Writable

### (3) Logging section (Un\G5000 to Un\G49999)

| Address<br>(decimal) | Address<br>(hexadecimal)                     | Name             | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|------------------|---------------|------------------|
| 5000<br>to<br>14999  | 1388 <sub>H</sub><br>to<br>3A97 <sub>H</sub> | CH1 Logging data | 0             | R                |
| 15000<br>to<br>24999 | 3A98 <sub>H</sub><br>to<br>61A7 <sub>H</sub> | CH2 Logging data | 0             | R                |
| 25000<br>to<br>34999 | 61A8 <sub>H</sub><br>to<br>88B7 <sub>H</sub> | CH3 Logging data | 0             | R                |
| 35000<br>to<br>44999 | 88B8 <sub>H</sub><br>to<br>AFC7 <sub>H</sub> | CH4 Logging data | 0             | R                |

| Address<br>(decimal) | Address<br>(hexadecimal)                     | Name        | Default<br>*1 | Read/Write<br>*2 |
|----------------------|--|-------------|---------------|------------------|
| 45000<br>to<br>49999 | AFC8 <sub>H</sub><br>to<br>C34F <sub>H</sub> | System area | —             | —                |

\*1 The default value is a value set after power-on or after resetting the CPU module.

\*2 This shows whether read or write from programs is possible.

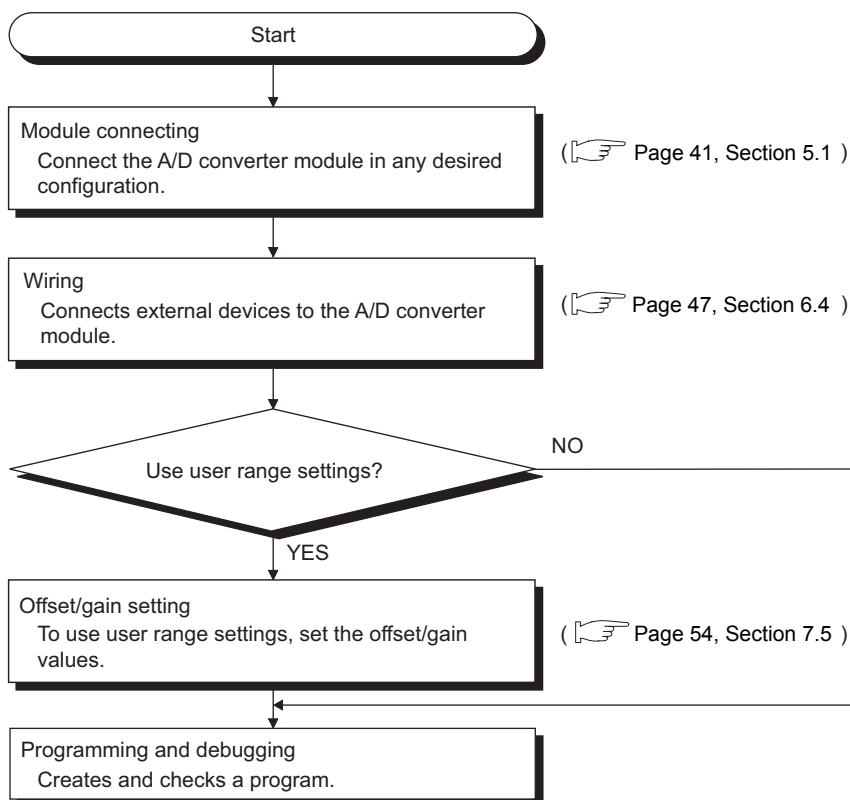
R: Readable

W: Writable



# CHAPTER 4 PROCEDURES BEFORE STARTING THE OPERATION

This chapter describes the procedures before starting the operation.



## Memo

---

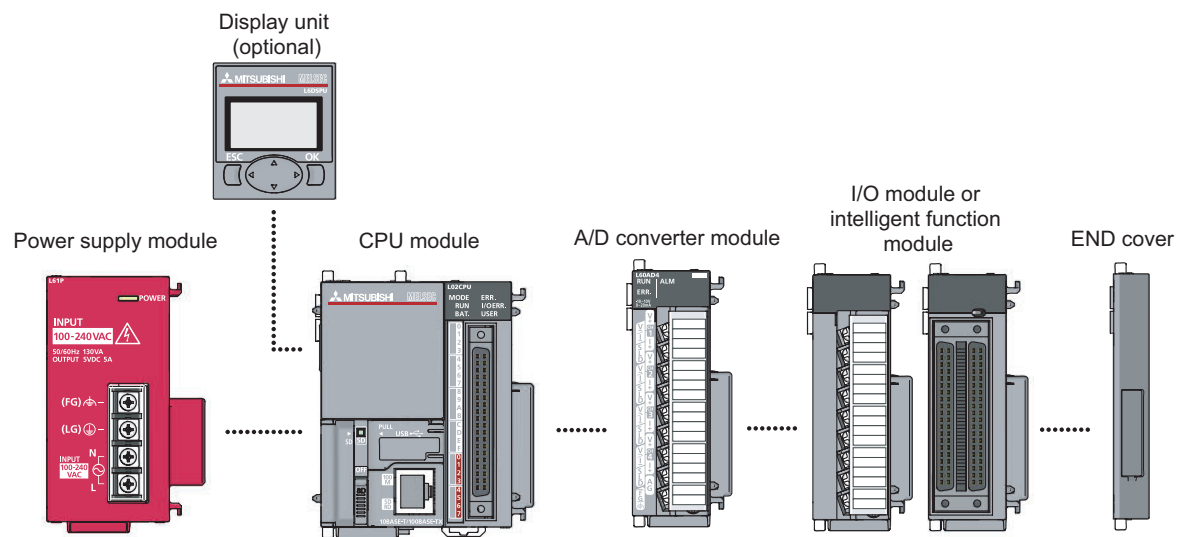
# CHAPTER 5 SYSTEM CONFIGURATION

This chapter describes the overall configuration, number of connectable modules, and compatible software version of the A/D converter module.

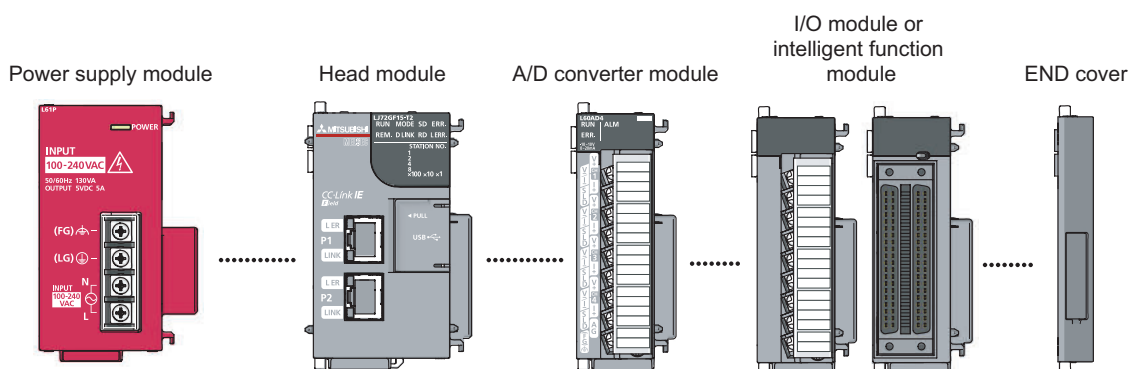
## 5.1 Overall System Configuration

The following shows a system configuration example for using the A/D converter module.

### (1) When connected to a CPU module



### (2) When connected to a head module





## 5.2 Applicable System

---



### (1) Number of connectable modules

For the number of connectable modules, refer to the following.

-  MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)
-  MELSEC-L CC-Link IE Field Network Head Module User's Manual

### (2) Compatible software version

For the compatible software versions, refer to the following.

-  MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)
-  MELSEC-L CC-Link IE Field Network Head Module User's Manual

## 5.3 Restrictions When A/D Converter Module is Connected to Head Module

---

The following describes the restriction when the A/D converter module is connected to a head module.

- Dedicated instruction cannot be used.

# CHAPTER 6 INSTALLATION AND WIRING



---

This chapter describes the installation and wiring of the A/D converter module.

## 6.1 Installation Environment and Installation Position

---

For precautions for installation environment and installation position, refer to the following.

-  MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)
-  MELSEC-L CC-Link IE Field Network Head Module User's Manual

## 6.2 Terminal Block

### (1) Precautions

Tighten the terminal block screws within the following specified torque range.

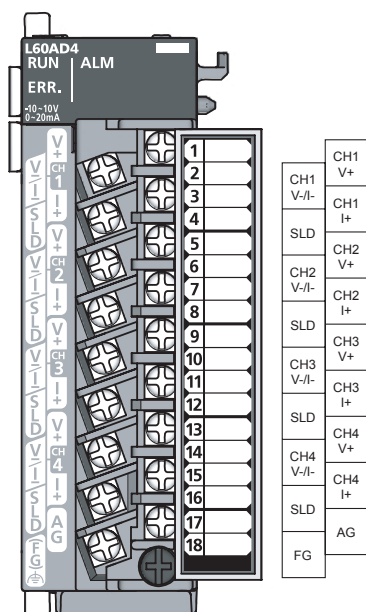
| Screw type                                 | Tightening torque range |
|--|-------------------------|
| Terminal screw (M3 screw)                  | 0.42 to 0.58N • m       |
| Terminal block mounting screw (M3.5 screw) | 0.66 to 0.89N • m       |

The table below shows applicable solderless terminals connected to the terminal block. When wiring, use applicable wires and an appropriate tightening torque. Use UL-approved solderless terminals and, for processing, use a tool recommended by their manufacturer. Also, sleeved solderless terminals cannot be used.

| Solderless terminal |                   | Wire             |          |          |                    |
|---------------------|-------------------|------------------|----------|----------|--------------------|
| Model               | Tightening torque | Diameter         | Type     | Material | Temperature rating |
| R1.25-3             | 0.42 to 0.58N • m | AWG 22 to AWG 18 | Stranded | Copper   | 75°C or more       |

### (2) Signal names of the terminal block

The following shows signal names of the terminal block.

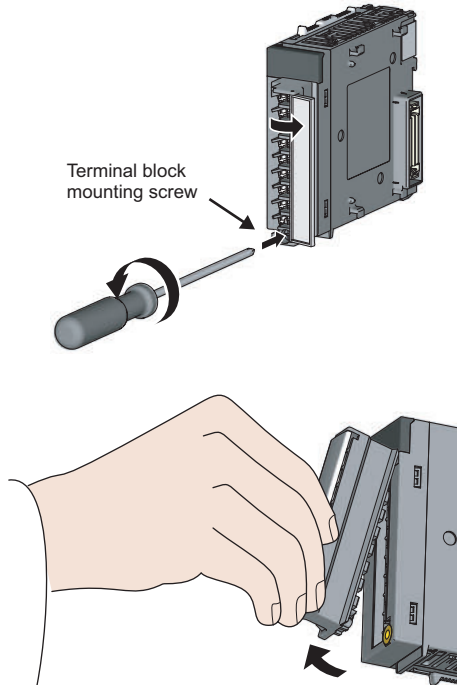


| Pin number | Signal name |       |
|------------|-------------|-------|
| 1          | CH1         | V+    |
| 2          |             | V-/I- |
| 3          |             | I+    |
| 4          |             | SLD   |
| 5          | CH2         | V+    |
| 6          |             | V-/I- |
| 7          |             | I+    |
| 8          |             | SLD   |
| 9          | CH3         | V+    |
| 10         |             | V-/I- |
| 11         |             | I+    |
| 12         |             | SLD   |
| 13         | CH4         | V+    |
| 14         |             | V-/I- |
| 15         |             | I+    |
| 16         |             | SLD   |
| 17         | AG          |       |
| 18         | FG          |       |

### (3) Removal and installation of the terminal block

The following shows how to remove and install the terminal block.

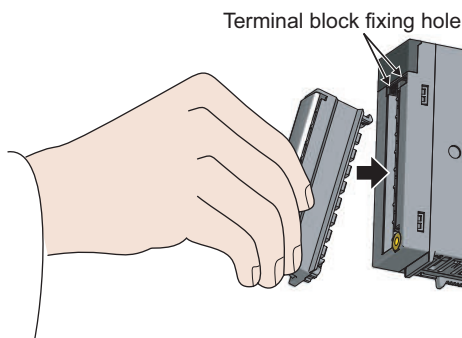
#### (a) Removal procedure



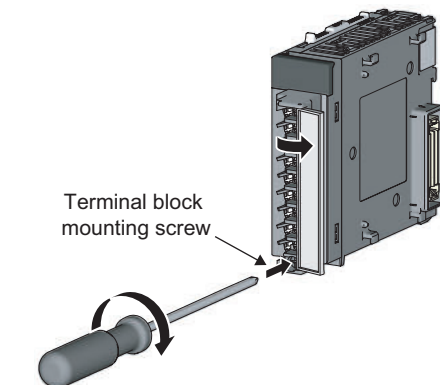
1. Open the terminal cover and loosen the terminal block mounting screw.

2. Using the terminal block fixing holes as a fulcrum, remove the terminal block.

#### (b) Installation procedure



1. Fully insert the projections on the top of the terminal block into the terminal block fixing holes and press the terminal block until it snaps into place.



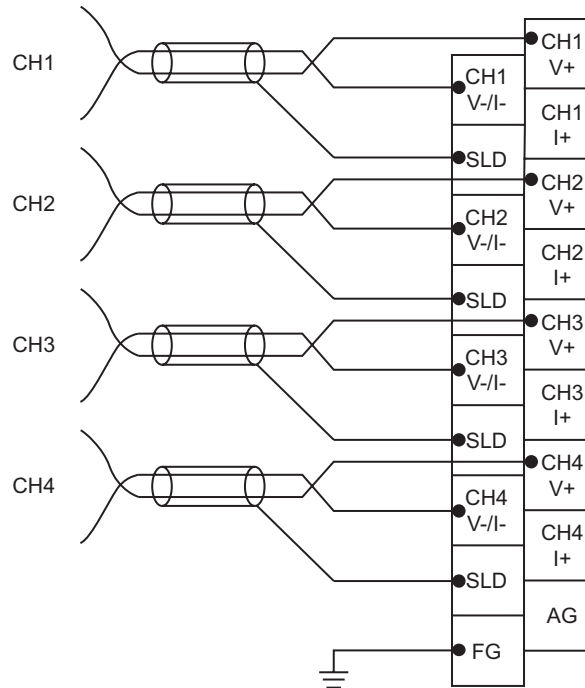
2. Open the terminal cover and tighten the terminal block mounting screw.

## 6.3 Wiring

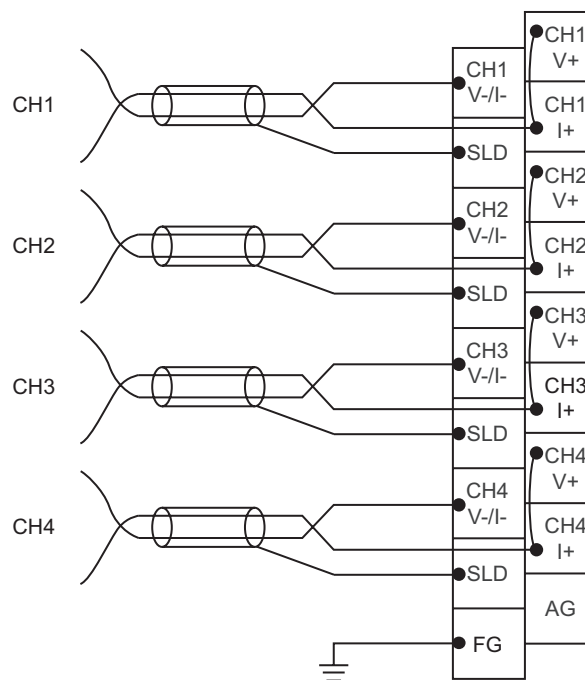
### (1) Wiring to a terminal block

The following shows wirings to a terminal block.

#### (a) For the voltage input



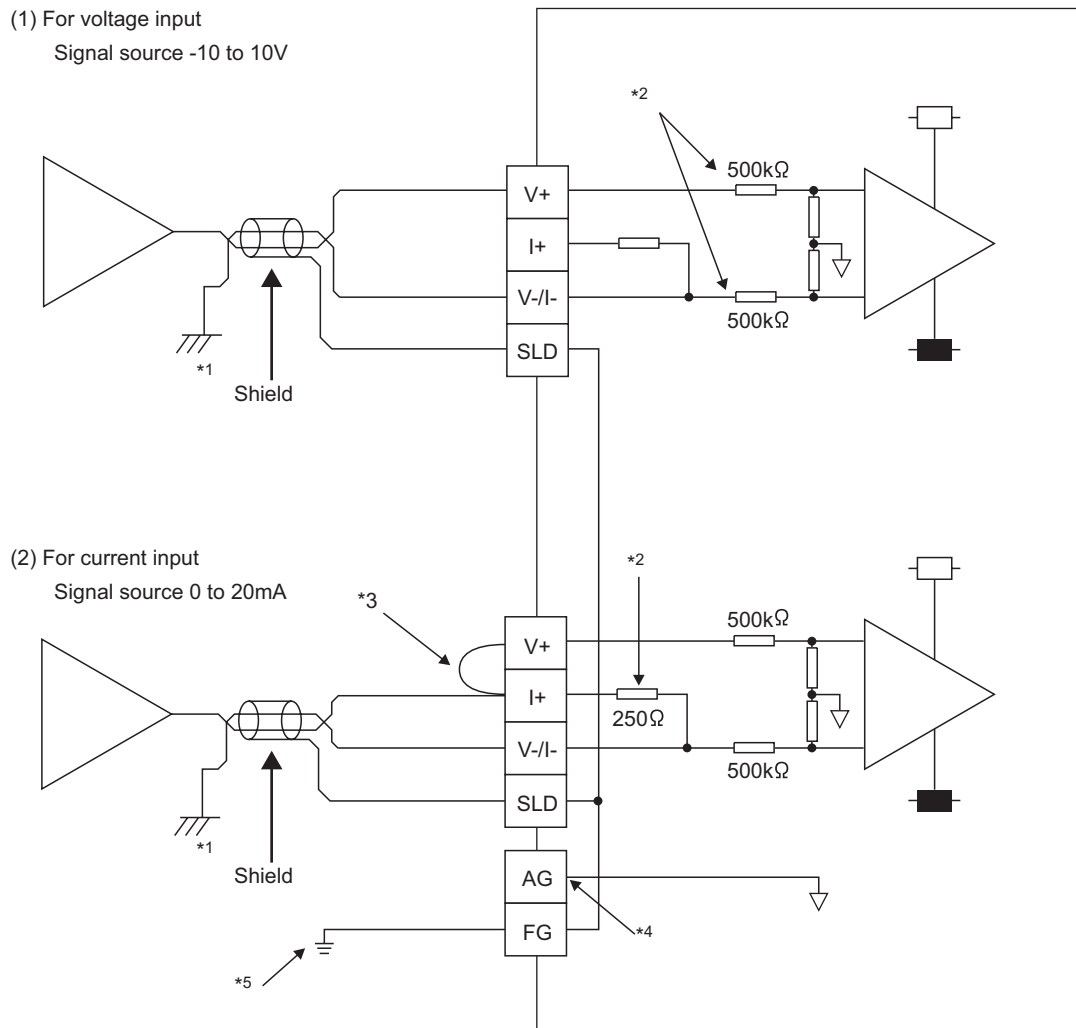
#### (b) For the current input





## 6.4 External Wiring

The following describes the external wiring.



- \*1 For the wire, use the shielded twisted pair cable.
- \*2 This indicates the input resistance of the A/D converter module.
- \*3 For the current input, always connect the terminals (V+) and (I+).
- \*4 If there are potential differences between the AG terminal and GND of the external device, connect the AG terminal to the GND of the external device.
- \*5 Always connect the shielded wire for each channel to the shield terminal and ground the FG terminal.  
In addition, ground the FG terminal of the power supply module.

### Point

In unused channels, if the circuit between two terminals is kept open, an undefined digital value may be output. To prevent this phenomenon, perform any of the following measures.

- Set the A/D conversion enable/disable setting in the unused channel to disable.  
Note that changing the A/D conversion enable/disable setting from A/D conversion enable to A/D conversion disable reduces the conversion cycle.
- Short-circuit the input terminal (V+) and (V-) of the unused channel.

# CHAPTER 7    VARIOUS SETTINGS

This chapter describes the setting procedures of the A/D converter module.

**Point**


After writing the contents of new module, switch settings, parameter settings and auto refresh settings into the CPU module, reset the CPU module, switch STOP → RUN → STOP → RUN, or switch ON the power supply, to validate the setting contents.

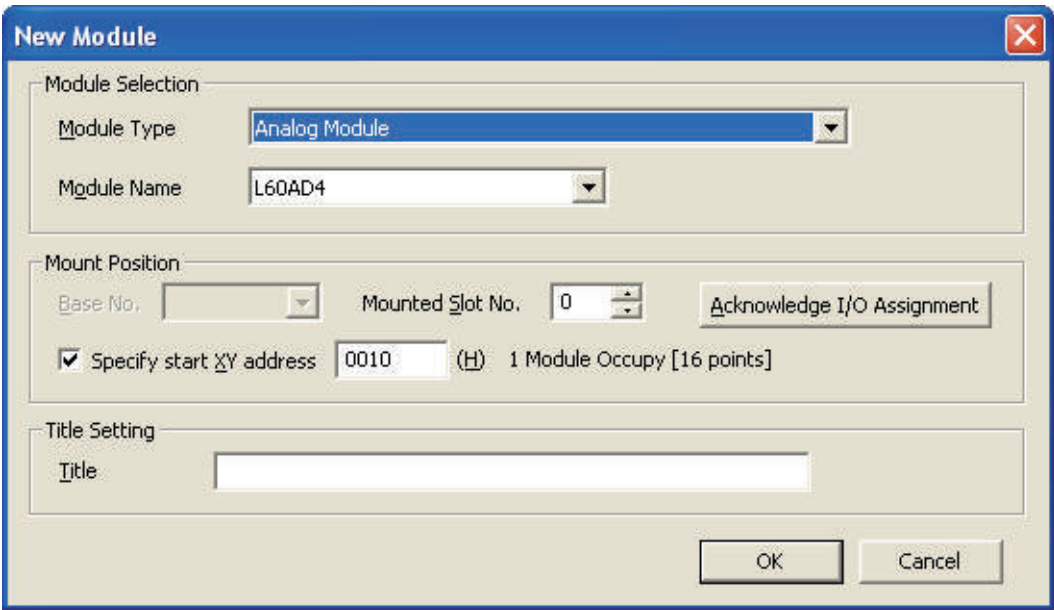
## 7.1    Addition of Modules

Add the model name of A/D converter modules to use on the project.

**(1) Addition procedure**

Open the "New Module" dialog box.

 Project window ⇨ [Intelligent Function Module] ⇨ Right-click ⇨ [New Module]




| Item             |                           | Description  |
|------------------|---------------------------|--|
| Module Selection | Module Type               | Set "Analog Module".   |
|                  | Module Name               | Select the name of the module to connect.  |
| Mount Position   | Mounted Slot No.          | Set the slot No. where the module is connected.  |
|                  | Specify start X/Y address | The start I/O number (hexadecimal) of the target module is set, according to the slot No. Setting any start I/O number is also possible. |
| Title Setting    | Title                     | Set any title.   |

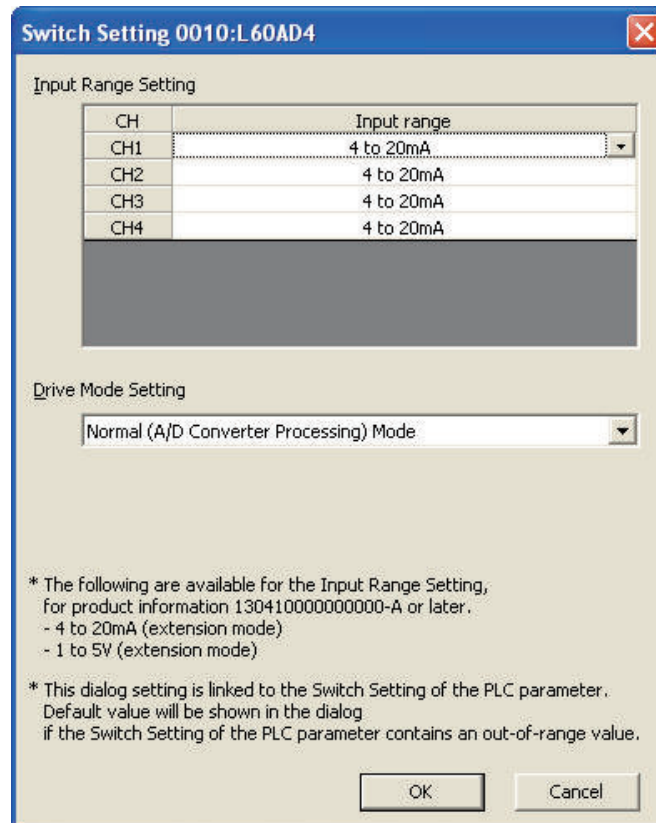
## 7.2 Switch Setting

Set the operation mode and the input range used in each CH.

### (1) Setting procedure

Open the "Switch Setting" dialog box.

 Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Switch Setting]



| Item                | Description   | Setting value  |
|---------------------|---|--|
| Input Range Setting | Set the input range used in each CH.                | <ul style="list-style-type: none"> <li>• 4 to 20mA (default value)</li> <li>• 0 to 20mA</li> <li>• 1 to 5V</li> <li>• 0 to 5V</li> <li>• -10 to 10V</li> <li>• 0 to 10V</li> <li>• 4 to 20mA (Extended mode)</li> <li>• 1 to 5V (Extended mode)</li> <li>• User range setting</li> </ul> |
| Drive Mode Setting  | Set the operation mode of the A/D converter module. | <ul style="list-style-type: none"> <li>• Normal (A/D conversion processing) mode (default value)</li> <li>• Offset/gain setting mode</li> </ul>  |

## 7.3 Parameter Setting

Set the parameters of each CH.

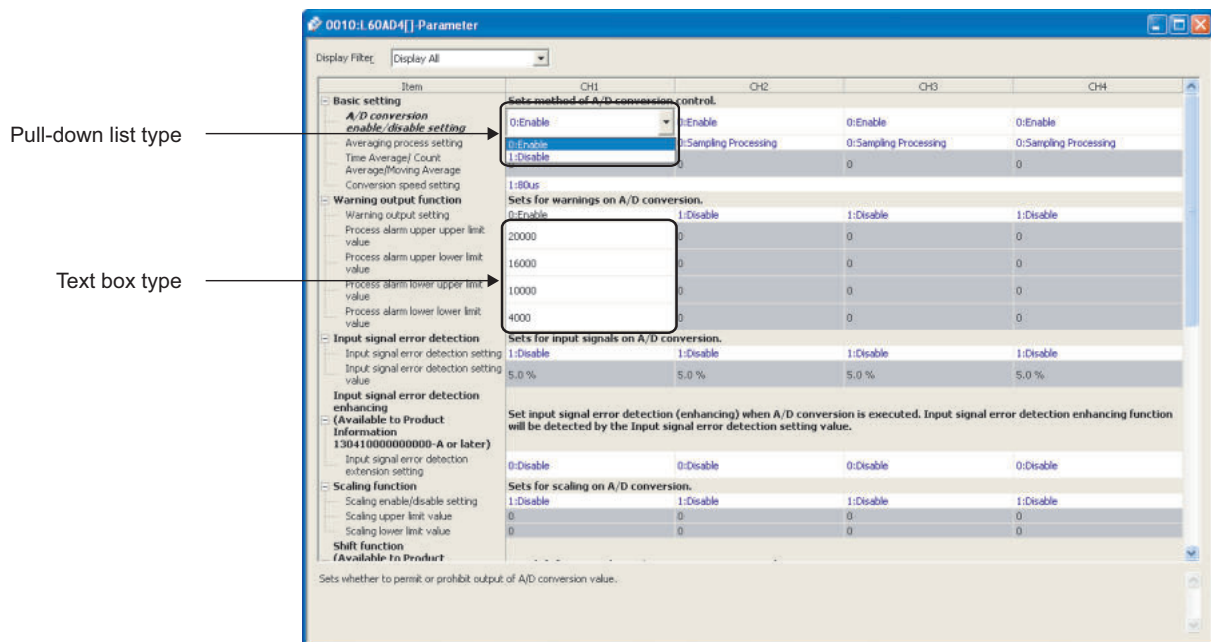
By setting the parameters, the setting by programming is unnecessary.

### (1) Setting procedure

Open the "Parameter" dialog box.

#### 1. Start "Parameter"

Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ "Parameter"



#### 2. Double-click the item to change the setting, and input the setting value.

- Items to input from the pull-down list  
Double-click the item to set, to display the pull-down list. Select the item.
- Items to input from the text box  
Double-click the item to set, and input the setting value.

#### 3. For setting CH2 to CH4, follow the operation of step2.

| Item                                   |  | Setting value  |   | Reference                |
|--|--|--|---|--------------------------|
| Basic setting                          | A/D conversion enable/disable setting            | 0: Enable (default value)<br>1: Disable  |   | Page 63,<br>Section 8.2  |
|  | Averaging process setting                        | 0: Sampling Processing (default value)<br>1: Time Average<br>2: Count Average<br>3: Moving Average                                   |   | Page 63,<br>Section 8.3  |
|  | Time Average/ Count Average/<br>Moving Average   | Time Average   | 20μs: 2 to 1500ms (default value: 0)<br>80μs, 1ms: 2 to 5000ms (default value: 0) |                          |
|  |  | Count Average  | 4 to 62500 times (default value: 0)   |                          |
|  |  | Moving Average   | 2 to 1000 times (default value: 0)  |                          |
|  | Conversion speed setting                         | 0: 20μs<br>1: 80μs (default value)<br>2: 1ms   |   | Page 68,<br>Section 8.5  |
| Warning output function                | Warning output setting                           | 0: Enable<br>1: Disable (default value)  |   | Page 77,<br>Section 8.9  |
|  | Process alarm upper upper limit value            | -32768 to 32767 (default value: 0)   |   |                          |
|  | Process alarm upper lower limit value            | -32768 to 32767 (default value: 0)   |   |                          |
|  | Process alarm lower upper limit value            | -32768 to 32767 (default value: 0)   |   |                          |
|  | Process alarm lower lower limit value            | -32768 to 32767 (default value: 0)   |   |                          |
| Input signal error detection           | Input signal error detection setting             | 0: Enable<br>1: Disable (default value)  |   | Page 69,<br>Section 8.7  |
|  | Input signal error detection setting value       | 0 to 25.0% (default value: 5.0%)   |   |                          |
| Input signal error detection extension | Input signal error detection extension setting   | 0: Disable (default value)<br>1: Upper and Lower Detection<br>2: Lower Detection<br>3: Upper Detection<br>4: Disconnection Detection |   | Page 74,<br>Section 8.8  |
| Scaling function                       | Scaling enable/disable setting                   | 0: Enable<br>1: Disable (default value)  |   | Page 80,<br>Section 8.10 |
|  | Scaling upper limit value                        | -32000 to 32000 (default value: 0)   |   |                          |
|  | Scaling lower limit value                        | -32000 to 32000 (default value: 0)   |   |                          |
| Shift function                         | Shifting amount to conversion value              | -32768 to 32767 (default value: 0)   |   | Page 86,<br>Section 8.11 |
| Digital clipping function              | Digital clipping function enable/disable setting | 0: Enable<br>1: Disable (default value)  |   | Page 90,<br>Section 8.12 |

| Item                             |  | Setting value  | Reference                 |
|----------------------------------|--|--|---------------------------|
| Logging function                 | Logging enable/disable setting                 | 0: Enable<br>1: Disable (default value)  | Page 98,<br>Section 8.14  |
|                                  | Logging data setting                           | 0: Digital Output Value<br>1: Scaling Value (Digital Operation Value) (default value)                              |                           |
|                                  | Logging cycle setting value                    | μs: 80 to 32767 (default value: 4)<br>ms: 1 to 32767 (default value: 4)<br>s: 1 to 3600 (default value: 4)         |                           |
|                                  | Logging cycle unit setting                     | 0: μs<br>1: ms (default value)<br>2: s   |                           |
|                                  | Logging points after trigger                   | 1 to 10000 (default value: 5000)   |                           |
|                                  | Level trigger condition setting                | 0: Disable (default value)<br>1: Above<br>2: Below<br>3: Pass Through  |                           |
|                                  | Trigger data                                   | 0 to 4999 (CH1 default value: 54)<br>(CH2 default value: 55)<br>(CH3 default value: 56)<br>(CH4 default value: 57) |                           |
|                                  | Trigger setting value                          | -32768 to 32767 (default value: 0)   |                           |
| Flow amount integration function | Flow amount integration enable/disable setting | 0: Enabled<br>1: Disabled (default value)  | Page 110,<br>Section 8.15 |
|                                  | Integration cycle setting                      | 1 to 5000ms (default value: 4ms)   |                           |
|                                  | Flow amount time unit setting                  | 0: /s (default value)<br>1: /min<br>2: /h  |                           |
|                                  | Unit scaling setting                           | 0: × 1 (default value)<br>1: × 10<br>2: × 100<br>3: × 1000<br>4: × 10000   |                           |


## 7.4 Auto Refresh

This function transfers data in the buffer memory to specified devices.  
By the auto refresh setting, reading/writing data by programming is unnecessary.

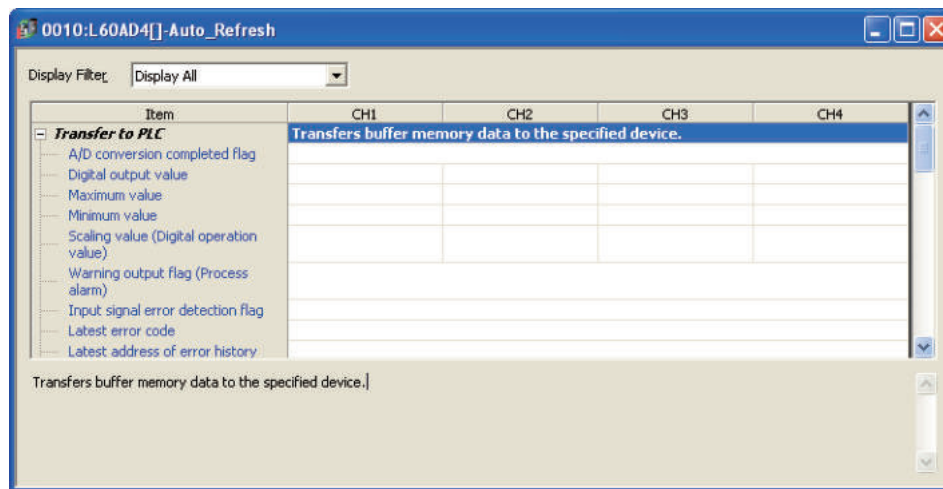
### (1) Setting procedure

Open the "Auto\_Refresh" dialog box.

#### 1. Start "Auto\_Refresh".

 Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Auto\_Refresh]

#### 2. Click the item to setup, and input the auto refresh target device.



### Point

Available devices are X, Y, M, L, B, T, C, ST, D, W, R, and ZR.  
When a bit device X, Y, M, L, or B is used, set the number that is divisible by 16 points (example: X10, Y120, M16). Data in the buffer memory are stored in 16 points of devices from the set device No. (Example: When X10 is set, the data are stored in X10 to X1F.)

## 7.5 Offset/Gain Setting

When using the user range setting, configure the offset/gain setting with the following operations.

When using factory default settings, the offset/gain is not required.


The offset/gain setting can be configured from the following two types of operations.


- Setting from "Offset/Gain Setting" of GX Works2.
- Setting from a program

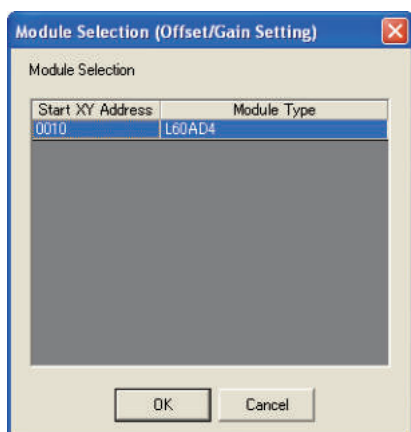
### 7.5.1 Setting from GX Works2 "Offset/Gain Setting"

#### (1) Setting procedure

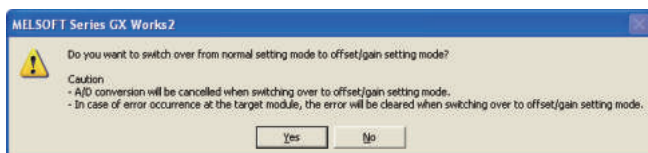
Open the "Offset/Gain Setting" dialog box.

 [Tool] ⇒ [Intelligent Function Module Tool] ⇒ [Analog Module] ⇒ [Offset/gain Setting...]

1. Select the module to configure the offset/gain setting, and click the  button.

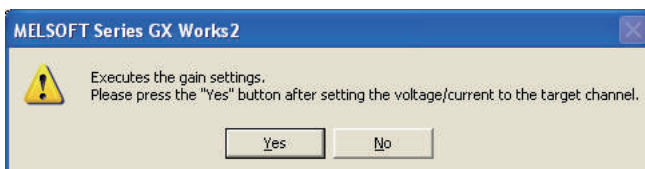
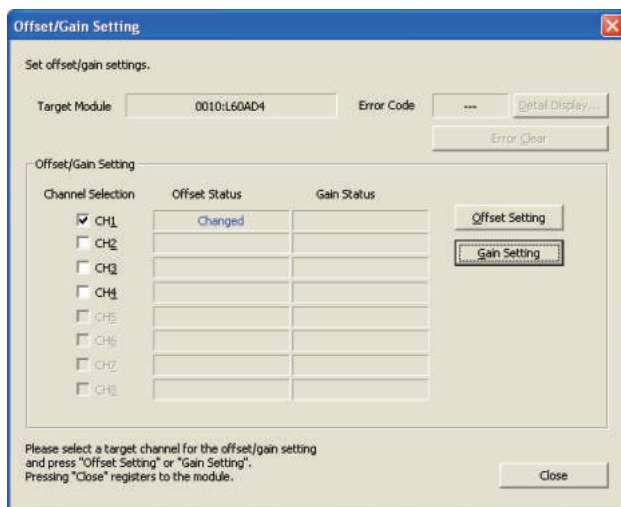
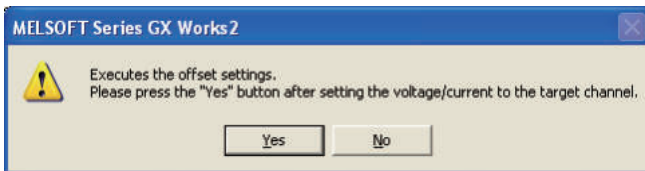
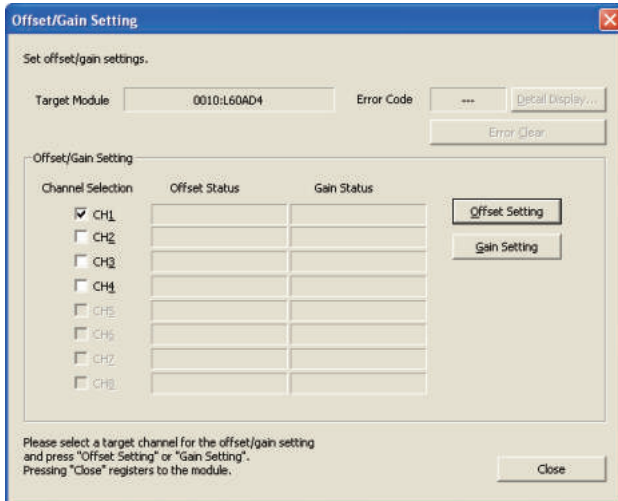


2. Click the  button.





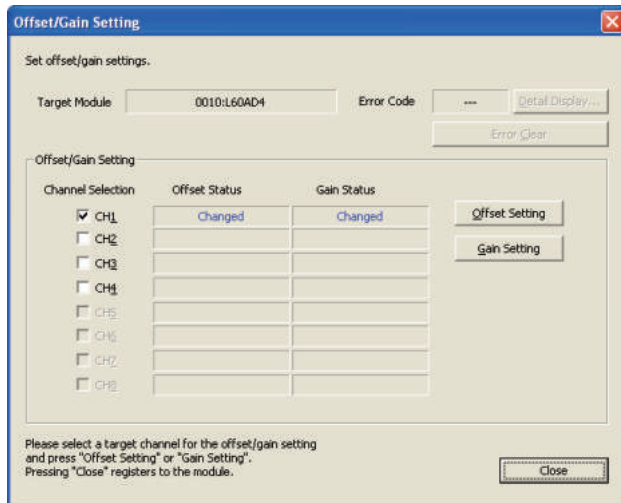
3. Select the channel to use the offset/gain setting, and click the **Offset Setting** button.




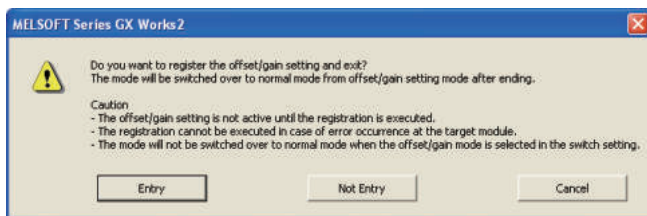
4. Input the offset value voltage or current in the target channel terminal, and click the **Yes** button.


5. Check if "Offset Status" is changed to "Changed", and click the **Gain Setting** button.

6. Input the gain value voltage or current in the target channel terminal, and click the **Yes** button.



7. Check if "Gain Status" is changed to "Changed", and click the  button.



8. Click the  button.

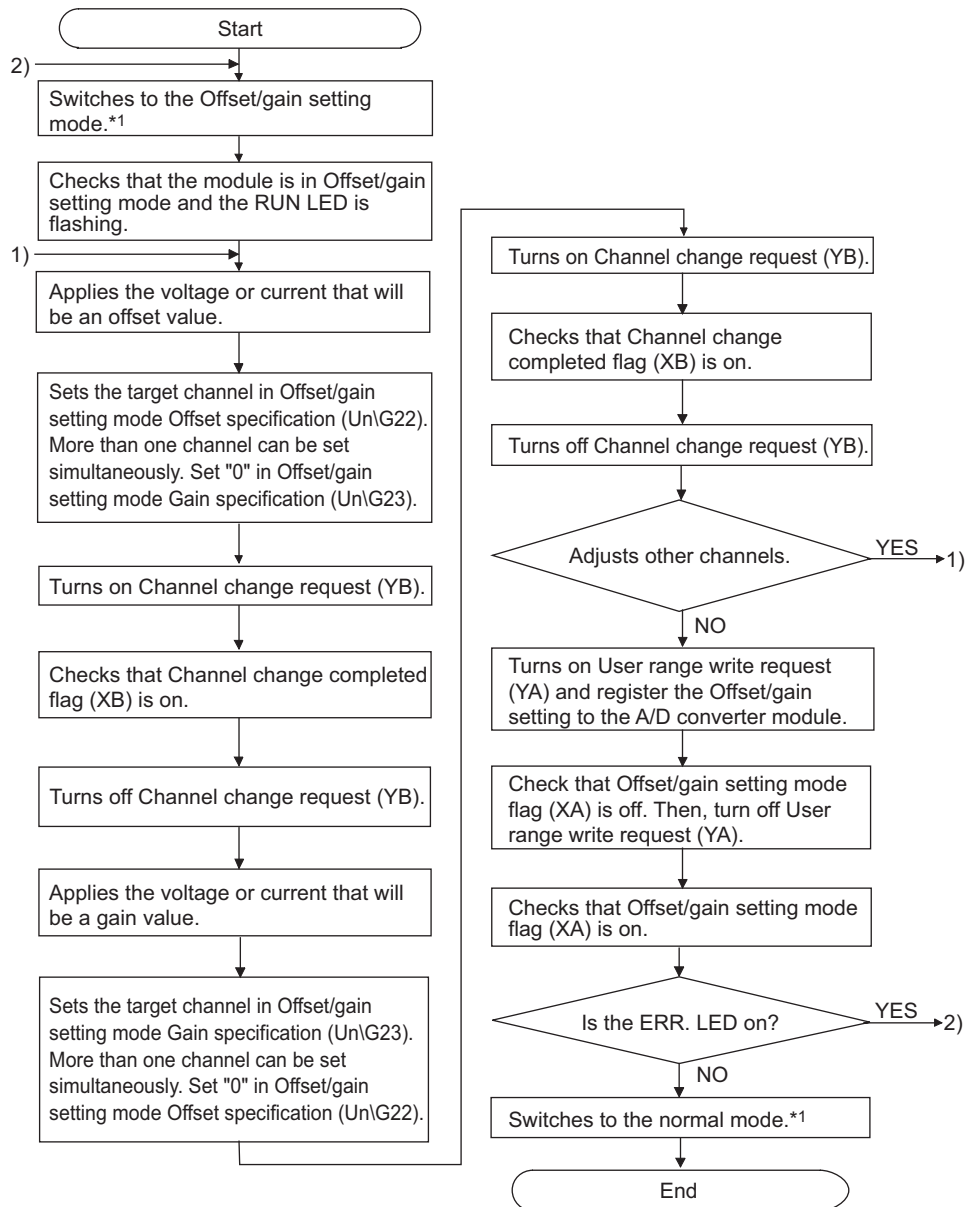


End

## 7.5.2 Setting from a program

### (1) Setting procedure

The following describes the procedures when setting the offset/gain from a program.



- \*1 The following shows the procedure for switching the mode (normal mode → offset/gain setting mode → normal mode).  
 Dedicated instruction (G(P).OFFGAN) (👉 Page 210, Appendix 5.2)  
 • Setting for Mode switching setting (Un\G158, Un\G159) and OFF → ON → OFF of Operating condition setting request (Y9) (👉 Page 185, Appendix 2(24))  
 • Intelligent function module switch setting (👉 Page 49, Section 7.2 (1))

- Configure the offset/gain setting in accordance with the actual use situation.
- Offset and gain values are recorded in the flash memory in the A/D converter module by turning OFF → ON → OFF User range write request (YA). Once recorded, the values are not deleted even after turning the power off.  
When the values are written 26 times in succession, an error occurs and the error code is stored in Latest error code (Un\G19) to prevent an improper write to flash memory.
- Configure the offset/gain setting in the range satisfying the following condition.  
When the setting value out of the range is configured, the resolution and accuracy of the module may not fall within the range shown in the following performance specifications.
  - I/O conversion characteristic of A/D conversion (Page 203, Appendix 3)
- Offset/gain setting can be configured for multiple channels at the same time, however, the setting must be configured for offset and gain channels separately.  
When configuring the setting for offset and gain channels at the same time, an error occurs and ERR. LED turns on.
- When turning ON User range write request (YA), the integrity between the offset values and gain values is checked.  
When error occurs even in one channel, offset/gain value is not written to the module.  
Check the value in Latest error code (Un\G19) and perform the following procedures to reconfigure the offset/gain setting from the beginning.
  - Error code list (Page 159, Section 11.4)
- When the mode is switched from the offset/gain setting mode to the normal mode by the setting of the dedicated instruction (G(P).OFFGAN) or Mode switching setting (Un\G158, Un\G159), Module READY (X0) turns from OFF to ON.  
Note the initial setting process is executed at the switching of the mode if the sequence program executes the initial setting at Module READY (X0) ON.
- To validate the intelligent function module switch setting after writing the setting to the CPU module, reset the CPU module or turn the power supply from OFF to ON.

## (2) Program example

### (a) Device

**Ex.** I/O number of the A/D converter module is X/Y30 to 3F (when the L26CPU-BT is used).

The following shows the devices used in the program example.

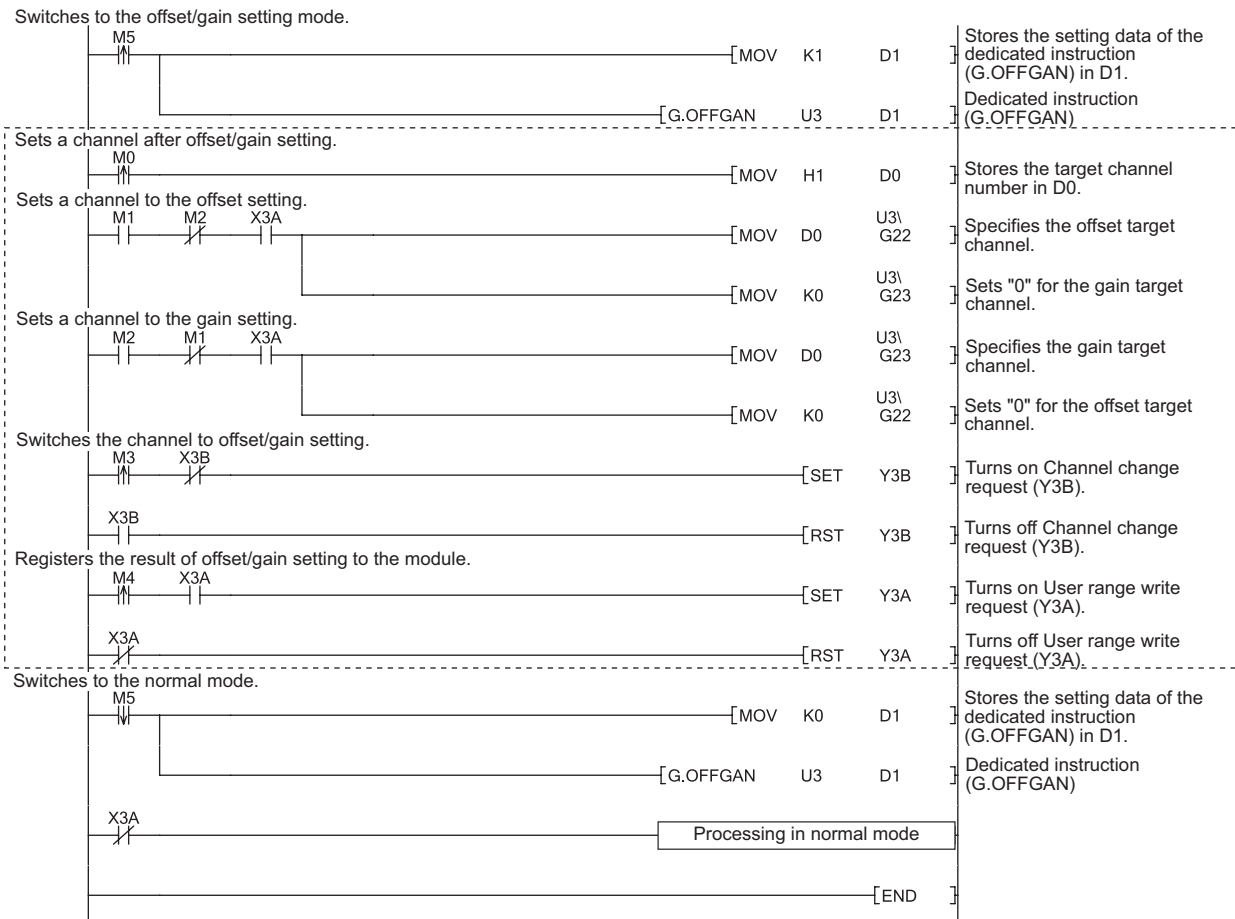
| Device | Functions   |
|--------|---|
| M0     | Channel selection   |
| M1     | Offset setting  |
| M2     | Gain setting  |
| M3     | Channel change command  |
| M4     | Write command to module of offset/gain setting value                            |
| M5     | Mode switching  |
| D0     | Channel-specified storage device  |
| D1     | Storage device for the setting value of the dedicated instruction (G(P).OFFGAN) |

When using the L02CPU, set the I/O assignments of the A/D converter module to X/Y30 to 3F so that the I/O assignments be the same as that of the system configuration above.

## (b) Switching the mode by the dedicated instruction (G(P).OFFGAN)

This program performs the followings:

- first, switches the mode to the offset/gain setting mode by the dedicated instruction (G(P).OFFGAN),
- second, switches the channels for which the offset/gain settings is configured,
- third, writes the offset/gain value to the A/D converter module,
- finally, switches the mode back to the normal modes.

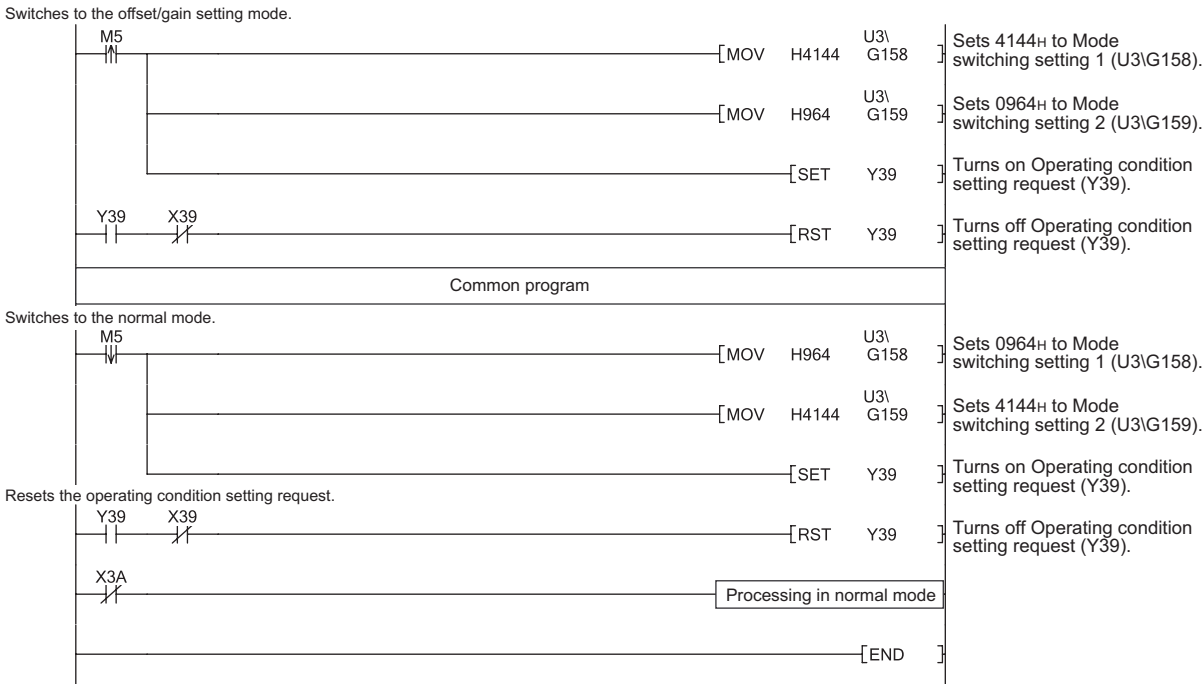


### Point

The program enclosed by the dotted line is the common programs among the following three programs.

- Switching the mode by the dedicated instruction (G(P).OFFGAN)
- Switching the mode by setting Mode switching setting (Un\G158, Un\G159) and by Operating condition setting request (Y9)
- Switching the mode by the intelligent function module switch setting

**(c) Switching the mode by Mode switching setting (Un\G158, Un\G159) and Operating condition setting request (Y9)**



**(d) Switching the mode by the intelligent function module switch setting**  
 The programs other than the common program is not necessary.

# CHAPTER 8 FUNCTIONS

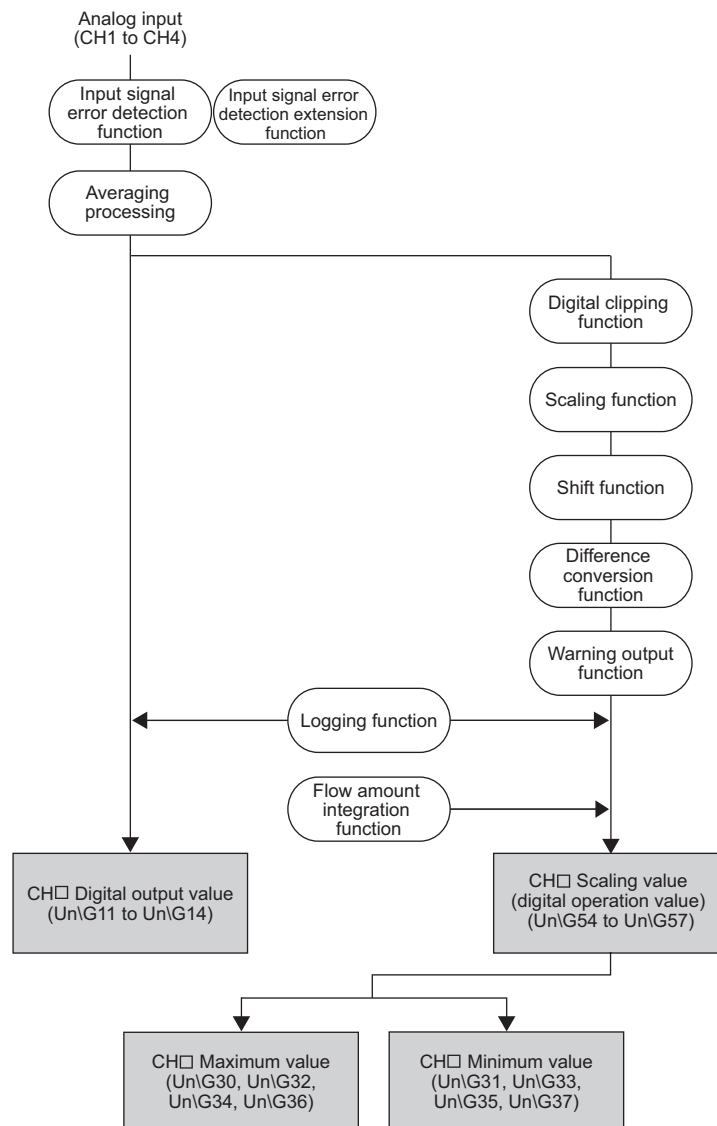
This chapter describes the details of the functions available in the A/D converter module, and the setting procedures for those functions.

For details on I/O signals and buffer memory, refer to the following.

- Details of I/O signals (☞ Page 167, Appendix 1)
- Details of buffer memory addresses (☞ Page 174, Appendix 2)

## 8.1 Processing 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.



### (1) Digital output values

These are digital values after sampling processing or averaging processing has been performed.

## (2) Scaling values (digital operation values)

These are values obtained by operating the digital output value using the digital clipping function, scaling function, shift function, or difference conversion function.

## (3) Maximum and minimum values

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

### **Point**

---

If averaging processing (time average/count average) is performed, the digital values are stored per averaging process cycle.

---



## 8.2 A/D Conversion Enable/Disable Function

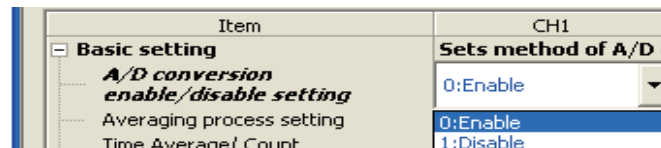
Sets whether to enable or disable A/D conversion for each channel.

By disabling A/D conversion for the channels you are not using, the conversion cycle can be reduced.

### (1) Setting procedure

Set "A/D conversion enable/disable setting" to "0: Enable".

 Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]



## 8.3 A/D Conversion Method

Sets whether to perform sampling processing or averaging processing for each channel.

### (1) Sampling processing

Sequentially performs A/D conversion on the analog input values and stores the digital output values to the buffer memory.

#### Point

The conversion cycle is calculated by "Conversion speed × Number of used channels".  
Conversion can be enabled or disabled per channel, allowing you to reduce the conversion cycle by disabling A/D conversion for the channels that are not used.


**Ex.** Conversion cycle in the following settings

- Number of used channels (where A/D conversion is enabled): CH1 to CH3 (three channels in total)
- Conversion speed: 80μs (middle speed)

$$80 \times 3 = 240 (\mu s)$$

The conversion cycle is calculated to be 240(μs).

For details on conversion speed setting, refer to the following.

- Conversion Speed Setting ( Page 68, Section 8.5)

### (2) Averaging processing

Performs averaging processing on the digital output values for each channel, and stores the average values to the buffer memory.

There are three processes in averaging processing, as follows:

- Time average
- Count average
- Moving average

### (a) Time average

Performs A/D conversion for a set time, averages the total without the maximum and minimum values, and stores the average value to the buffer memory.

The processing count within the setting time varies depending on the number of channels used (number of channels for which A/D conversion is enabled).

$$\text{Number of processing times} = \frac{\text{Set period of time}}{(\text{Number of channels used} \times \text{Conversion speed})}$$

**Ex.** The processing count for the following settings is calculated below:

| Item   | Setting                 |
|--|-------------------------|
| Number of channels used (number of channels for which A/D conversion is enabled) | 4 channels (CH1 to CH4) |
| Conversion speed   | 20 $\mu$ s              |
| Set period of time   | 15 ms                   |

$$\frac{15}{(4 \times 0.02)} = 187.5 \text{ (times)} \cdot \cdot \cdot \text{Drop the fractional part}$$

→ Time is measured 187 times and the averaged value is output.

### Point

The valid lower limit setting value for the time average is calculated by "(minimum processing count of 4)  $\times$  (conversion speed)  $\times$  (number of channels used)".

**Ex.** If a maximum of 4 channels are used (conversion speed: low speed):

$$4 \times 1.0 \times 4 = 16 \text{ ms}$$

If the processing count becomes less than 4 due to the setting time, an error occurs (error code: 20□), and a digital output value comes out to 0 (zero).

### (b) Count average

Performs A/D conversion a set number of times, averages the total without the maximum and minimum values, and stores the average value to the buffer memory.

The time it takes for the count average value to be stored to the buffer memory varies depending on the number of channels used (number of channels for which A/D conversion is enabled).

$$\text{Processing time} = \text{Set number of times} \times (\text{Number of channels used} \times \text{Conversion speed})$$

**Ex.** The processing time for the following settings is calculated below:

| Item   | Setting                 |
|--|-------------------------|
| Number of channels used (number of channels for which A/D conversion is enabled) | 4 channels (CH1 to CH4) |
| Conversion speed   | 80 $\mu$ s              |
| Set number of times  | 20 times                |

$$20 \times (4 \times 0.08) = 6.4 \text{ (ms)} \rightarrow \text{An average value is output every 6.4 ms.}$$

## Point

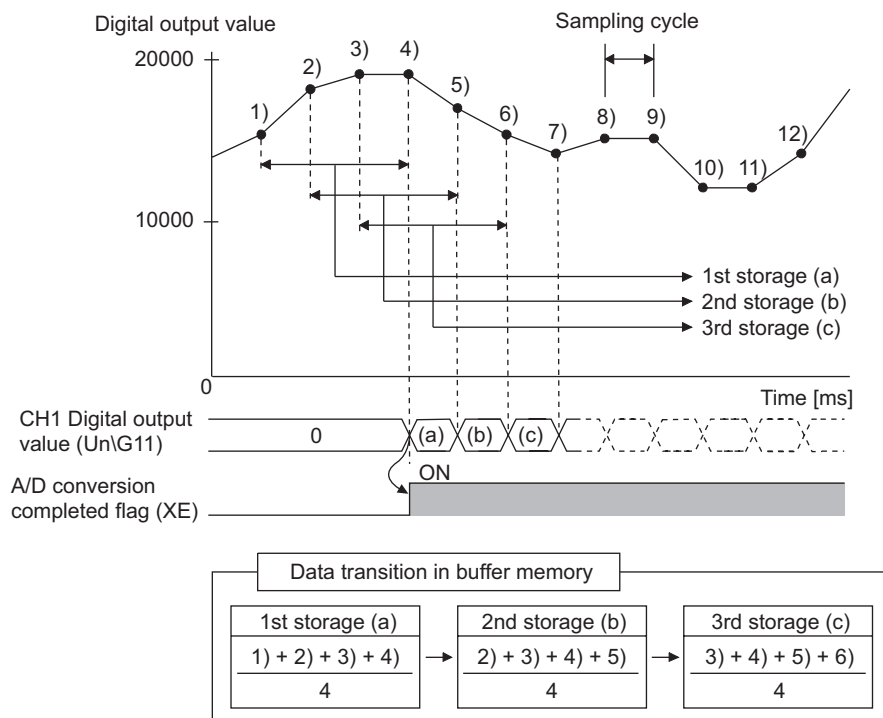
Because the count average requires a sum of at least two counts, not counting the maximum and minimum values, the set number of times should be set to 4 or more.

### (c) Moving average

Takes the average of digital output values sampled over a set number of sampling cycles, and stores it to the buffer memory.

Since the averaging processing is performed on a moving set of sampling processing, the most current digital output values can be obtained.

The moving average processing for a set number of times of 4 is shown below:

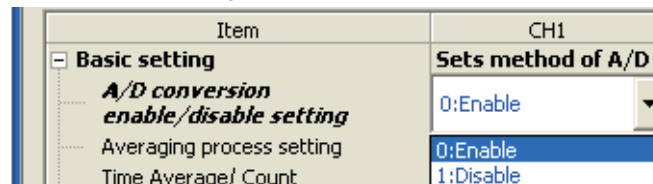


## (3) Setting procedure

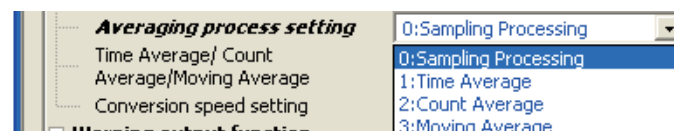
### (a) Sampling processing

1. Set "A/D conversion enable/disable setting" to "0: Enable".

Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]




2. For "Averaging process setting", select "0: Sampling Processing".

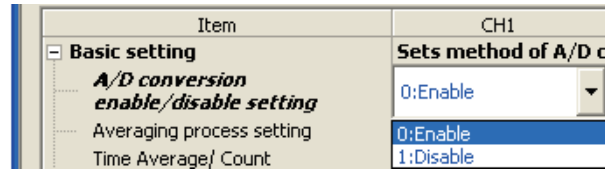


## (b) Averaging processing

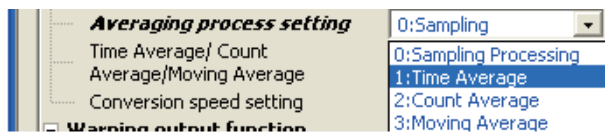
**Ex.** To select "1: Time Average" for "Averaging process setting":

### 1. Set "A/D conversion enable/disable setting" to "0: Enable".

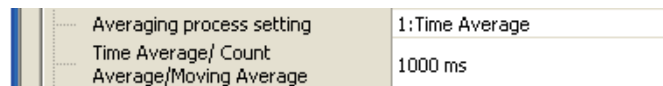
 Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]



### 2. For "Averaging process setting", select "1: Time Average".



### 3. For "Time Average/ CountAverage/Moving Average", enter the following:



| Setting item   | Conversion speed   | Setting range    |
|----------------|--------------------|------------------|
| Time Average   | 20 μs              | 2 to 1500 ms     |
|                | 80 μs, 1 ms        | 2 to 5000 ms     |
| Count Average  | 20 μs, 80 μs, 1 ms | 4 to 62500 times |
| Moving Average | 20 μs, 80 μs, 1 ms | 2 to 1000 times  |

## Point

The following table shows the conversion cycle of each A/D conversion.

| A/D conversion method | Conversion cycle  |
|-----------------------|---|
| Sampling processing   | Conversion speed × Number of used channels  |
| Time average          | $\left( \frac{\text{Time set in "Time Average/Count Average/Moving Average"}}{\text{Conversion speed} \times \text{Number of used channels}} \right)^{*1} \times \text{Conversion speed} \times \text{Number of used channels}$ |
| Count average         | Number of times set in "Time Average/Count Average/Moving Average" × Conversion speed × Number of used channels   |
| Moving average        | Conversion speed × Number of used channels  |

\*1 The value after the decimal point is rounded off.

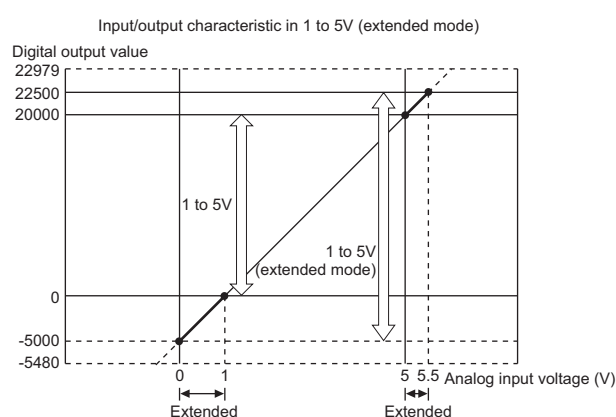
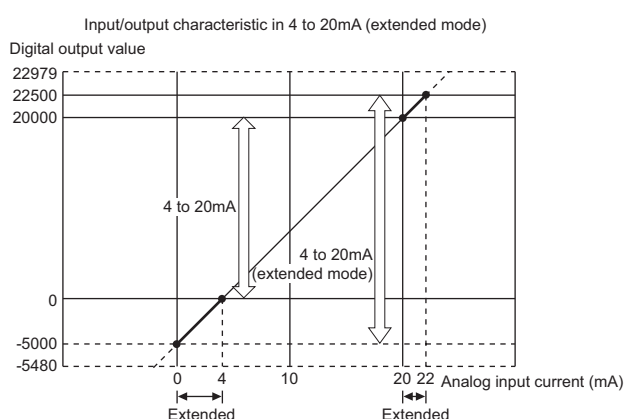
## 8.4 Input Range Extended Mode Function

Using this function, the available input range in 4 to 20mA and 1 to 5V can be extended.

| Normal mode         |             |                      | Extended mode             |               |                      |
|---------------------|-------------|----------------------|---------------------------|---------------|----------------------|
| Input range setting | Input range | Digital output value | Input range setting       | Input range   | Digital output value |
| 4 to 20mA           | 4 to 20mA   | 0 to 20000           | 4 to 20mA (Extended mode) | 0.0 to 22.0mA | -5000 to 22500       |
| 1 to 5V             | 1 to 5V     |                      | 1 to 5V (Extended mode)   | 0.0 to 5.5V   |                      |

### (1) Overview

- The analog input value can be monitored in the extended mode even if errors vary depending on sensors and the analog input value is less than 4mA or 1V in the input range of 4 to 20mA and 1 to 5V.
- The slope of Input/output characteristic of the extended mode is the same as that of the normal mode. However, the upper limit value and the lower limit value of the input range and the digital output value are extended.
- The resolution is the same between the extended input range and the input range of 4 to 20mA and 1 to 5V. This enables the A/D conversion with higher resolution compared to the use of the input range of 0 to 20mA and 0 to 5V.



For details on the current input characteristic and voltage input characteristic, refer to the following.

- I/O conversion characteristic of A/D conversion (Page 203, Appendix 3)

### (2) Setting procedure

Set the input range into the extended mode in the input range setting of the switch setting.

#### Point

If the input range extended mode function, scaling function, shift function, and difference conversion function are simultaneously used, the digital output value may exceed the range of -32768 to 32767. In this case, a value fixed at the upper limit value (32767) or at the lower limit value (-32768) is stored as a scaling value (digital operation value).

- Processing each function (Page 61, Section 8.1)

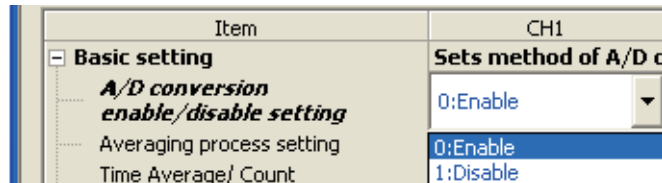
## 8.5 Conversion Speed Switch Function

You can select from three conversion speeds:

- High speed: 20  $\mu$ s/channel
- Medium speed: 80  $\mu$ s/channel
- Low speed: 1 ms/channel

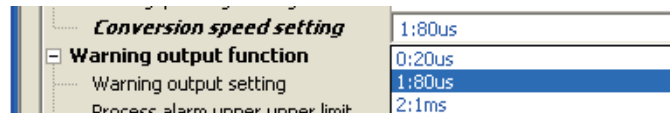
### (1) Setting procedure

1. Set "A/D conversion enable/disable setting" to "0: Enable".



Project window  $\Rightarrow$  [Intelligent Function Module]  $\Rightarrow$  module name  $\Rightarrow$  [Parameter]

2. For "Conversion speed setting", select the appropriate conversion speed.



## 8.6 Maximum and Minimum Values Hold Function

Using this function, the maximum and minimum scaling values (digital operation values) can be stored to the buffer memory for each channel.

If averaging processing is specified, the values are updated per averaging process cycle. Otherwise they are updated per sampling cycle.

For a list of buffer memory addresses to which the values are stored, refer to the following.

- List of Buffer Memory Addresses (Page 26, Section 3.5)

### (1) Resetting maximum and minimum values

Switching Maximum value/minimum value reset request (YD) or Operating condition setting request (Y9) from OFF  $\rightarrow$  ON  $\rightarrow$  OFF updates the maximum and minimum values with the current values.

### (2) Targets of the maximum and minimum values

The maximum and minimum scaling values (digital operation values) are stored to the buffer memory.

For details, refer to the following.

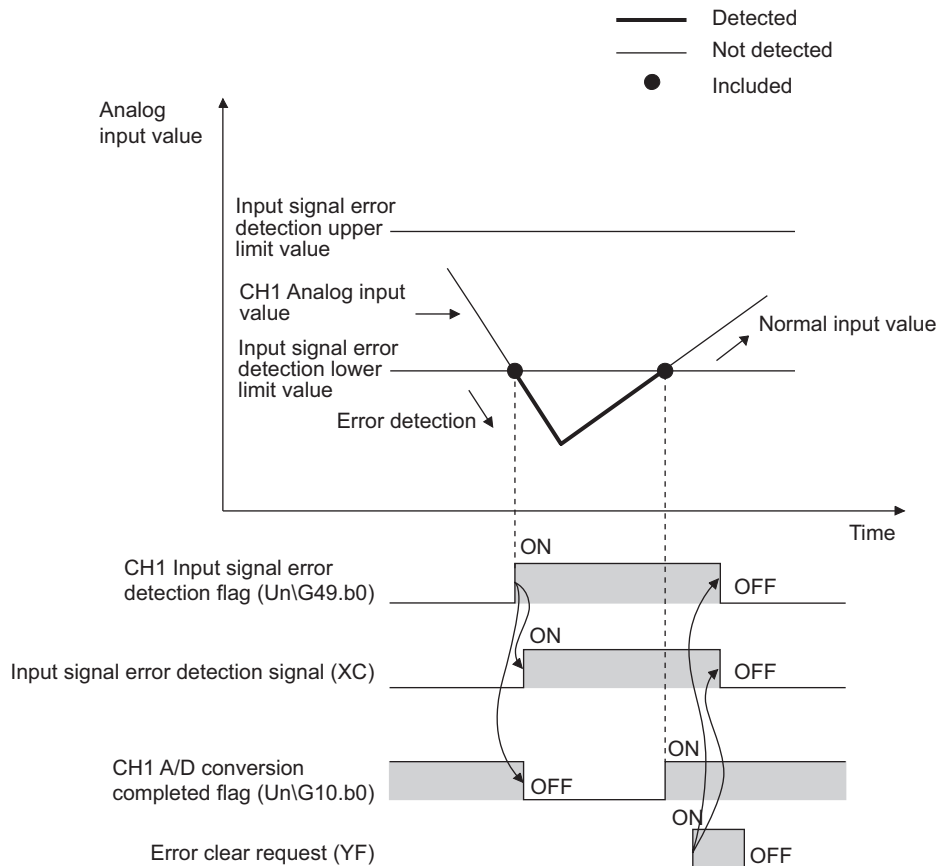
- Processing each function (Page 61, Section 8.1)

## 8.7 Input Signal Error Detection Function

Detects any analog input value that is outside the setting range. By using the input signal error detection extension function, the upper limit detection, lower limit detection, or disconnection detection can be set.

For details on the input signal error detection extension function, refer to the following.

Input signal error detection extension function (☞ Page 74, Section 8.8)



### (1) Notification of input signal error

If the analog input value is above the input signal error detection upper limit value, or below the input signal error detection lower limit value, the error is notified by Input signal error detection flag (Un\G49), Input signal error detection signal (XC), and the flashing ALM LED.

In addition, alarm code 110□ gets stored in Latest error code (Un\G19).

The alarm code that is stored is shown below:

110□  
 Fixed ↑  
 Input signal error channel number

For details on alarm codes, refer to the following.

- Alarm code list (☞ Page 163, Section 11.5)

## (2) Operation of the input signal error detection function

The digital output value on the channel on which the error was detected is held at the value just before the error was detected, and A/D conversion completed flag (Un\G10) and A/D conversion completed flag (XE) are turned OFF.

In addition, once the analog input value returns within the setting range, A/D conversion resumes regardless of the reset of Input signal error detection flag (Un\G49) and Input signal error detection signal (XC). After the first update, A/D conversion completed flag (Un\G10) for this channel turns back ON. (ALM LED remains flashing.)

## (3) Detection cycle

This function is executed per sampling cycle.

## (4) Clearing the input signal error detection

After the analog input value returns within the setting range, turn Error clear request (YF) OFF → ON → OFF.

When the input signal error is cleared, the A/D converter module results in the following state:

- Input signal error detection flag (Un\G49) is cleared.
- Input signal error detection signal (XC) turns OFF.
- The ALM LED turns off.
- The alarm code 110□, which is stored in Latest error code (Un\G19), is cleared.

## (5) Setting the input signal error detection upper and lower limit values

Set the input signal error detection upper and lower limit values based on the input signal error detection setting value. (Set the values in increments of 1 (0.1%).)

Input signal error detection setting value is reflected in both the input signal error detection upper and lower limit values.

### (a) Input signal error detection upper limit value

Add the gain value to "Input range width (gain value – offset value) multiplied by input signal error detection setting value". The input signal error detection setting value is calculated by the following formula:

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

### (b) Subtract the gain value from Input signal error detection lower limit value

"Input range width (gain value – offset value) multiplied by input signal error detection setting value". The input signal error detection setting value is calculated by the following formula:

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



**Remark**

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

| Analog 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   |
|                    | -10 to 10V                | -10V   | 0V   | 10V  |
|                    | 1 to 5V (Extended mode)   | 1V   |  | 5V   |
|                    | User range setting        | Analog input value when the digital output value is -20000 | Analog input value set as a offset value by the user | Analog input value set as a gain value by the user |
| Current            | 0 to 20mA                 | 0mA  |  | 20mA   |
|                    | 4 to 20mA                 | 4mA  |  | 20mA   |
|                    | 4 to 20mA (Extended mode) | 4mA  |  | 20mA   |
|                    | User range setting        | Analog input value when the digital output value is -20000 | Analog input value set as a offset value by the user | Analog input value set as a gain value by the user |

## (6) Example of input signal error detection

**Ex.** To detect an error when the analog input value becomes lower than 2.4mA for a channel with an input range of 4mA to 20mA:

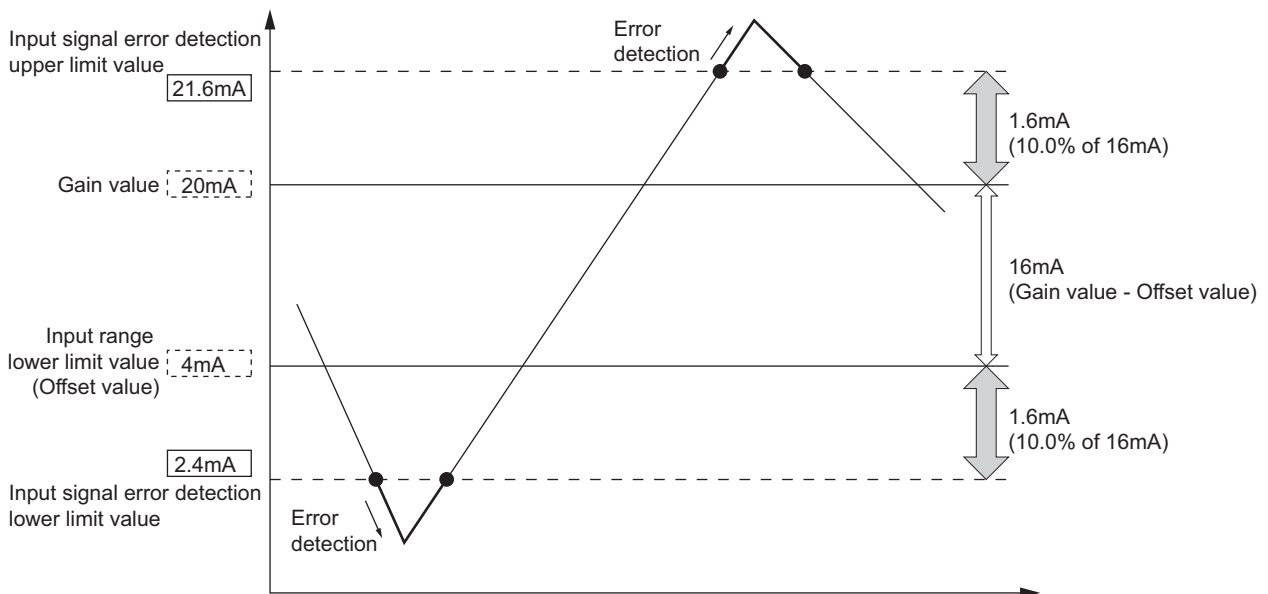
Substitute the following values into the input signal error detection lower limit value.

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

$$\begin{aligned}\text{Input signal error detection setting value} &= \frac{4.0 - 2.4}{20.0 - 4.0} \times 1000 \\ &= 100(10.0\%)\end{aligned}$$

Therefore, set the input signal error detection setting value to 100 (10.0%).

In this case, the input signal error detection value behaves as follows. (With the 100 (10%) setting, an error is detected when the value is not only 2.4mA, but also 21.6mA.)



## (7) Setting procedure

To enable the input signal error detection function, the input signal error detection extension function should be disabled. When the input signal error detection extension function is enabled, the setting of input signal error detection function is ignored.

### 1. Set "A/D conversion enable/disable setting" to "0: Enable".

Project window ⇒ [Intelligent Function Module] ⇒ module name ⇒ [Parameter]

| Item   | CH1                         |
|--|-----------------------------|
| <b>Basic setting</b>                         | <b>Sets method of A/D c</b> |
| <i>A/D conversion enable/disable setting</i> | 0:Enable                    |
| Averaging process setting                    | 0:Enable                    |
| Time Average/ Count                          | 1:Disable                   |

### 2. Set "Input signal error detection setting" to "0: Enable".

| Item                                 | CH1                                  |
|--------------------------------------|--------------------------------------|
| <b>Input signal error detection</b>  | <b>Sets for input signals on A/I</b> |
| <i>Input signal error detection</i>  | 0:Enable                             |
| Input signal error detection setting | 0:Enable                             |
| value                                | 1:Disable                            |

### 3. Set a value for "Input signal error detection setting value".

| Item                                       | CH1                           |
|--|-------------------------------|
| <b>Input signal error detection</b>        | <b>Sets for input signals</b> |
| Input signal error detection setting       | 0:Enable                      |
| Input signal error detection setting value | 10.0 %                        |

### 4. Set "Input signal error detection extension setting" to "0: Disable".

| Item  | CH1                         |
|---|-----------------------------|
| <i>Input signal error detection extension setting</i> | 0:Disable                   |
| <b>Scaling function</b>                               | 0:Disable                   |
| Scaling enable/disable setting                        | 1:Upper and Lower Detection |
| Scaling upper limit value                             | 2:Lower Detection           |
| Scaling lower limit value                             | 3:Upper Detection           |
|   | 4:Disconnection Detection   |

| Item                                       | Setting range |
|--|---------------|
| Input signal error detection setting value | 0 to 25.0%    |

## 8.8 Input Signal Error Detection Extension Function

Using this function, the detection method of the input signal error detection function can be extended. Use this function to detect an input signal error only at the lower or upper limit, or to execute the disconnection detection. To enable this function, the input signal error detection function does not need to be enabled.

### (1) Detection method

As well as the input signal error detection function, an error can be detected with input signal error detection upper limit value and input signal error detection lower limit value.

For details on the setting procedure of input signal error detection upper limit value and input signal error detection lower limit value, refer to the following.

- Input signal error detection function (☞ Page 69, Section 8.7)

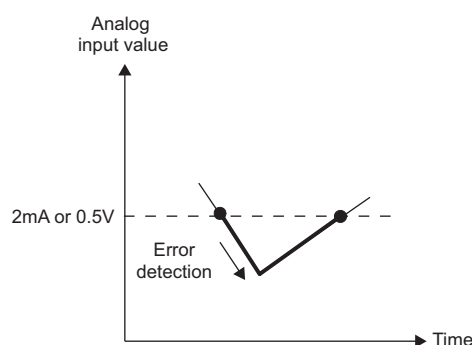
The detection method can be selected from the following list:

| Detection method            | Detection condition  |  |
|-----------------------------|--|--|
| Lower upper limit detection | An error is detected above the input signal error detection upper limit value or below the input signal error detection lower limit value.   | <p>Analog input value</p> <p>Error detection</p> <p>Input signal error detection upper limit value</p> <p>Input signal error detection lower limit value</p> <p>Error detection</p> <p>Time</p>    |
| Lower limit detection       | An error is detected below the input signal error detection lower limit value.   | <p>Analog input value</p> <p>No error detection</p> <p>Input signal error detection upper limit value</p> <p>Input signal error detection lower limit value</p> <p>Error detection</p> <p>Time</p> |
| Upper limit detection       | An error is detected above the input signal error detection upper limit value.   | <p>Analog input value</p> <p>Error detection</p> <p>Input signal error detection upper limit value</p> <p>Input signal error detection lower limit value</p> <p>No error detection</p> <p>Time</p> |
| Disconnection detection     | Disconnection detection is performed. For details, refer to the following. <ul style="list-style-type: none"> <li>• Disconnection detection (☞ Page 75, Section 8.8 (1)(a))</li> </ul> |  |

### (a) Disconnection detection

By combining this detection method with the input range extended mode function, simple disconnection detection can be performed. When either of following conditions is satisfied, Input signal error detection flag (Un\G49) turns on and a disconnection occurs.

| Input range               | Disconnection detection condition     |
|---------------------------|---------------------------------------|
| 4 to 20mA (Extended mode) | Input analog value $\leq 2\text{mA}$  |
| 1 to 5V (Extended mode)   | Input analog value $\leq 0.5\text{V}$ |

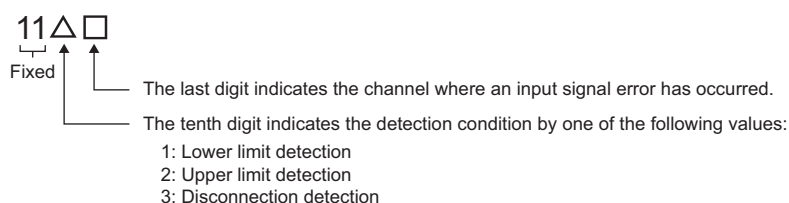


The setting for CH□ Input signal error detection setting value (Un\G142 to Un\G145) is ignored.

### (2) Notification of input signal error

If the analog input value satisfies the detection condition of the set detection method, the error is notified by Input signal error detection flag (Un\G49), Input signal error detection signal (XC), and the flashing ALM LED. In addition, alarm code 11△□ gets stored in Latest error code (Un\G19). The value of the alarm code to be stored varies depending on the condition (upper limit, lower limit, or disconnection detection) under which an error of the analog input value is detected.

The following shows the alarm code to be stored.



For details on alarm codes, refer to the following.

- Alarm code list (☞ Page 163, Section 11.5)

### (3) Operation of the input signal error detection extension function

The operation is the same as that of the input signal error detection function.

For details, refer to the following.

- Input signal error detection function (☞ Page 69, Section 8.7)

### (4) Detection cycle

This function is executed per sampling cycle.

## (5) Clearing the input signal error detection

As in the input signal error detection function, turn Error clear request (YF) OFF → ON → OFF after the analog input value returns within the setting range. When the disconnection detection is set, after the analog input value exceeds 2.0mA or 0.5V, turn Error clear request (YF) OFF → ON → OFF.

For details, refer to the following.

- Input signal error detection function (👉 Page 69, Section 8.7)

## (6) Specifying the input signal error detection upper and lower limit values

As well as the input signal error detection function, set them based on the input signal error detection setting value.

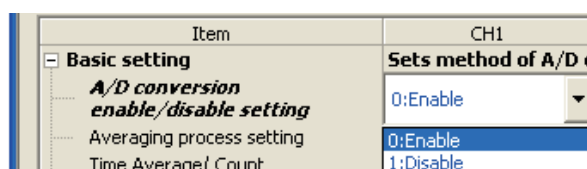
For details, refer to the following.

- Input signal error detection function (👉 Page 69, Section 8.7)

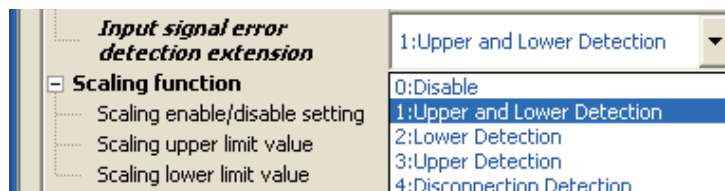
## (7) Setting procedure

### 1. Set "A/D conversion enable/disable setting" to "0: Enable".

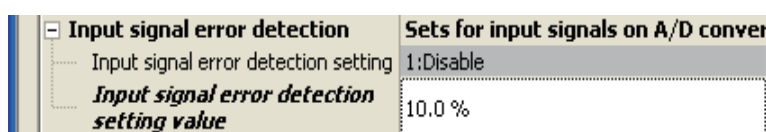
🔍 Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]



### 2. Set the detection method in "Input signal error detection extension setting"



### 3. Set a value for "Input signal error detection setting value".



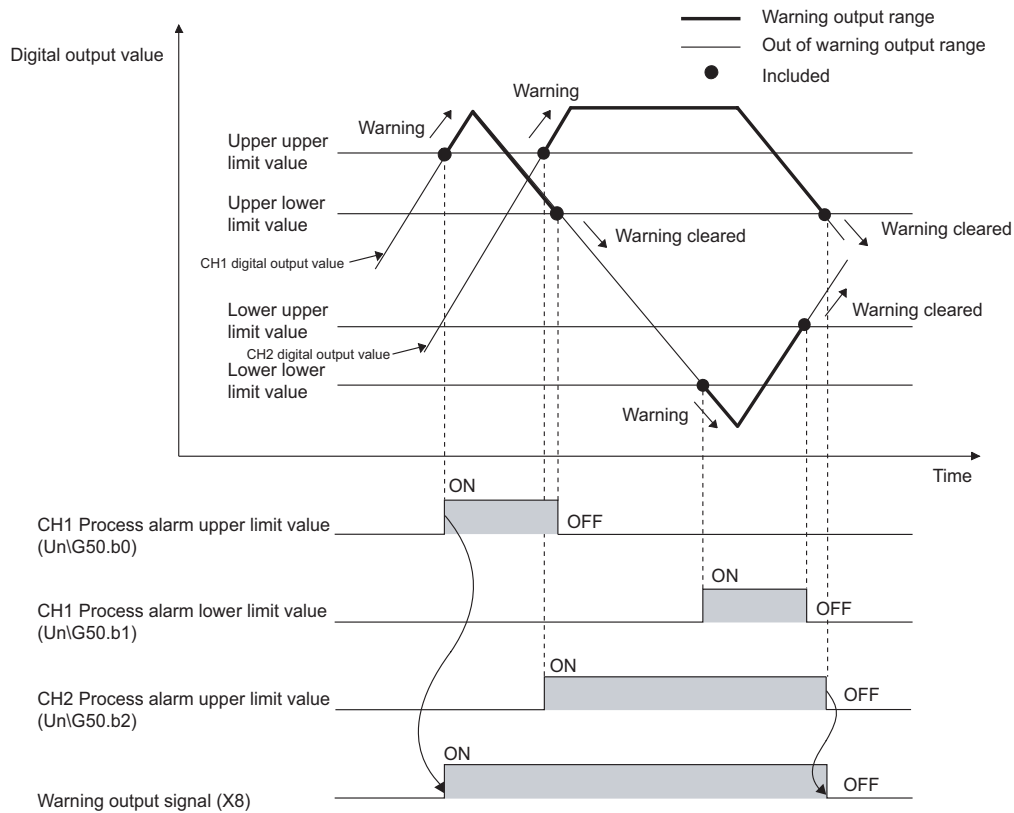
| Item                                       | Setting range |
|--|---------------|
| Input signal error detection setting value | 0 to 25.0%    |

### Point

- If "4: Disconnection Detection" is set to a channel whose input range is not 4 to 20mA (Extended mode) or 1 to 5V (Extended mode), an error occurs.
- The setting in "Input signal error detection setting" is ignored when "Input signal error detection extension setting" is set to other than "0: Disable". An input signal error is detected according to the setting of "Input signal error detection extension setting".

## 8.9 Warning Output Function (Process Alarm)

Outputs an alarm when the digital output value enters a preset range.

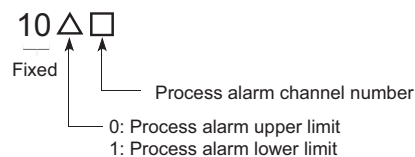


### (1) Process alarm notification

When the digital output value moves above the process alarm upper upper limit value, or below the process alarm lower lower limit value, thus entering the alarm output range, alarm notifications are made by Warning output flag (Process alarm) (Un\G50), Warning output signal (X8) and the ALM LED turning ON.

In addition, alarm code  $10\triangle\square$  gets stored in Latest error code (Un\G19).

The alarm code that is stored is shown below:



### (2) Operation of the Warning output function (Process alarm)

After the alarm is output, once the digital output value returns within the setting range, below the process alarm upper upper limit value and above the process alarm lower upper limit value, a "0" (zero) is stored in the bit position corresponding to the channel number for Warning output flag (Process alarm) (Un\G50).

Once all channels are within the setting range, Warning output signal (X8) and the ALM LED turn OFF.

### (3) Detection cycle

When time average is specified, the function is executed per set time (for averaging). When count average is specified, the function is executed per set count (for averaging).

In addition, when sampling processing and moving average are specified, the function is executed per sampling cycle.

### (4) Clearing the alarm code

After the digital output value returns within the setting range, turn Error clear request (YF) OFF → ON → OFF.

This clears the alarm code 10△□, which was stored in Latest error code (Un\G19).

### (5) Alarm output target

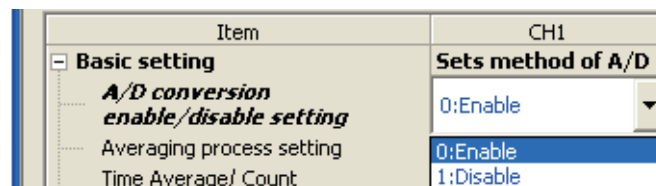
Alarm output target is CH□ Scaling value (digital operation value) (Un\G54 to Un\G57).

For CH1 Process alarm lower lower limit value (Un\86) through CH4 Process alarm upper upper limit value (Un\G101), set values considering digital clipping, scale conversion, shift conversion, and difference conversion.

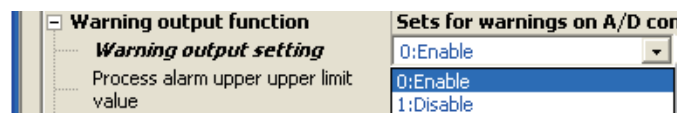
### (6) Setting procedure

1. Set "A/D conversion enable/disable setting" to "0: Enable".

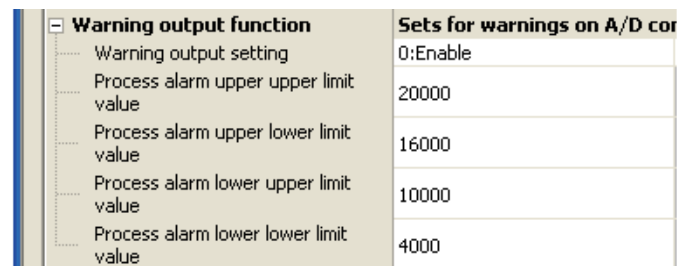
 Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]



2. Set "Warning output setting" to "0: Enable".



3. Specify the 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

Process alarm output settings must meet the following condition:

Process alarm upper upper limit value  $\geq$  Process alarm upper lower limit value  $\geq$  Process alarm lower upper limit value  $\geq$   
Process alarm lower lower limit value

## 8.10 Scaling Function

Performs scale conversion on the digital values that are output. The values are converted in the range between the scaling upper limit value and the scaling lower limit value.

The converted values are stored to CH□ Scaling value (digital operation value) (Un\G54 to Un\G57).

### (1) Concept of scaling setting

**Ex.** If the input range is set to -10 to 10V:

For the scaling lower limit value, set it to a value corresponding to the lower limit of the input range (-20000), and for the scaling upper limit value, set it to a value corresponding to the upper limit of the input range (20000).

### (2) Calculation of the scaling value (digital operation value)

For A/D conversion, use the values produced by the following formulas.

(Values after the decimal point are rounded off during scale conversion.)

- When the voltage and current are as follows:

Voltage: 0 to 10V, 0 to 5V, 1 to 5V, 1 to 5V (Extended mode)<sup>\*1</sup>, user range setting

Current: 0 to 20mA, 4 to 20mA, 4 to 20mA (Extended mode)<sup>\*1</sup>, user range setting

$$\text{Scaling value (digital operation value)} = \frac{Dx \times (SH - SL)}{D_{Max}} + SL$$

- When voltage is -10 to 10V

$$\text{Scaling value (digital operation value)} = \frac{Dx \times (SH - SL)}{D_{Max} - D_{Min}} + \frac{(SH + SL)}{2}$$

| Item | Description  |
|------|--|
| Dx   | Digital output value                                 |
| DMax | Maximum digital output value of the input range used |
| DMin | Minimum digital output value of the input range used |
| SH   | Scaling upper limit value                            |
| SL   | Scaling lower limit value                            |

<sup>\*1</sup> Although the digital output value range in the extended mode is -5000 to 22500, this function scales digital output values that are within the range of 0 to 20000. For the setting example of scaling using the extended mode, refer to the following.

- Example of scaling setting (👉 Page 82, Section 8.10 (4))

### (3) Setting procedure

1. Set "A/D conversion enable/disable setting" to "0: Enable".

 Project window ⇒ [Intelligent Function Module] ⇒ module name ⇒ [Parameter]

| Item   | CH1                         |
|--|-----------------------------|
| <b>Basic setting</b>                         | <b>Sets method of A/D c</b> |
| <i>A/D conversion enable/disable setting</i> | 0:Enable                    |
| Averaging process setting                    | 0:Enable                    |
| Time Average/ Count                          | 1:Disable                   |

2. Set "Scaling enable/disable setting" to "0: Enable".

|                               |                                    |
|-------------------------------|------------------------------------|
| <b>Scaling function</b>       | <b>Sets for scaling on A/D con</b> |
| <i>Scaling enable/disable</i> | 0:Enable                           |
| Scaling upper limit value     | 0:Enable                           |
| Scaling lower limit value     | 1:Disable                          |

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

|                                |                                    |
|--------------------------------|------------------------------------|
| <b>Scaling function</b>        | <b>Sets for scaling on A/D con</b> |
| Scaling enable/disable setting | 0:Enable                           |
| Scaling upper limit value      | 16000                              |
| Scaling lower limit value      | 4000                               |

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

#### Point

- Even if you set the scaling upper limit value and the scaling lower limit value in such a way that the change is larger than the resolution, the resolution will not increase.
- Your scaling settings must meet the following condition:  
Scaling upper limit value > Scaling lower limit value

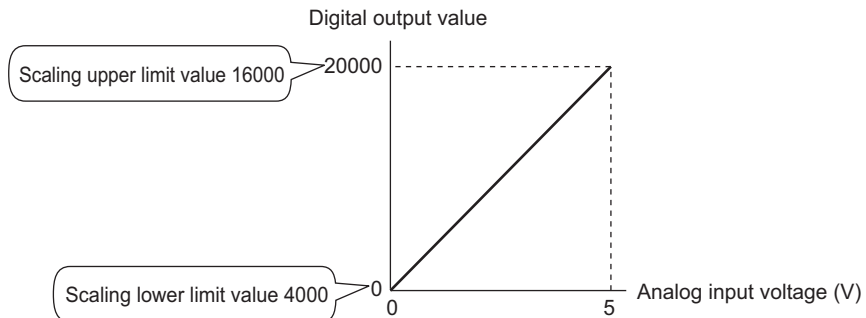
#### (4) Example of scaling setting

**Ex.** 1. When values are set for a channel with input range of 0 to 5V as follows:

- "Scaling upper limit value": 16000
- "Scaling lower limit value": 4000

| Scaling function               |  | Sets for scaling on A/D con |
|--------------------------------|--|-----------------------------|
| Scaling enable/disable setting |  | 0:Enable                    |
| Scaling upper limit value      |  | 16000                       |
| Scaling lower limit value      |  | 4000                        |

The digital output values and scaling values (digital operation values) are as follows:



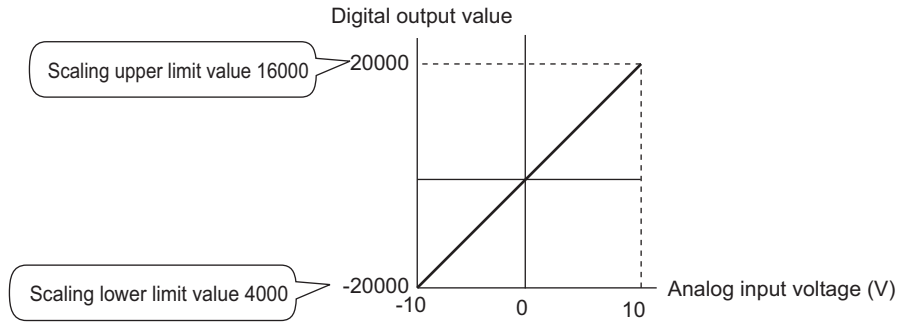
| Analog input voltage (V) | Digital output value | Scaling value<br>(digital operation value) |
|--------------------------|----------------------|--|
| 0                        | 0                    | 4000                                       |
| 1                        | 4000                 | 6400                                       |
| 2                        | 8000                 | 8800                                       |
| 3                        | 12000                | 11200                                      |
| 4                        | 16000                | 13600                                      |
| 5                        | 20000                | 16000                                      |

**Ex.** 2. When values are set for a channel with input range of -10 to 10V as follows:

- "Scaling upper limit value": 16000
- "Scaling lower limit value": 4000

| Scaling function               | Sets for scaling on A/D con |
|--------------------------------|-----------------------------|
| Scaling enable/disable setting | 0:Enable                    |
| Scaling upper limit value      | 16000                       |
| Scaling lower limit value      | 4000                        |

The digital output values and scaling values (digital operation values) are as follows:



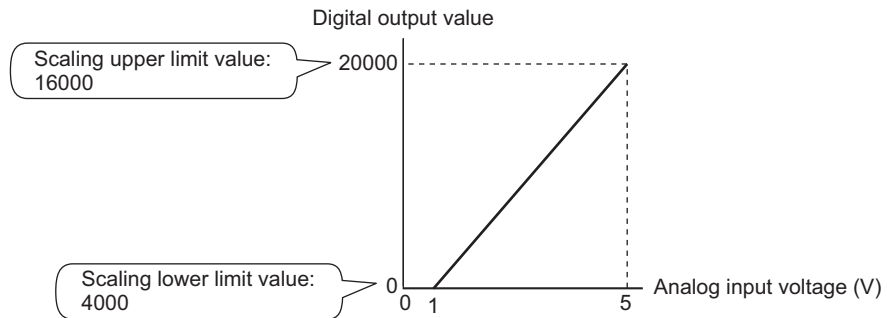
| Analog input voltage (V) | Digital output value | Scaling value<br>(digital operation value) |
|--------------------------|----------------------|--|
| -10                      | -20000               | 4000                                       |
| -5                       | -10000               | 7000                                       |
| 0                        | 0                    | 10000                                      |
| 5                        | 10000                | 13000                                      |
| 10                       | 20000                | 16000                                      |

**Ex.** 3: When values are set for a channel with input range of 1 to 5V (Extended mode) as follows:

- "Scaling upper limit value": 16000
- "Scaling lower limit value": 4000

| Scaling function               |  | Sets for scaling on A/D converter |
|--------------------------------|--|-----------------------------------|
| Scaling enable/disable setting |  | 0:Enable                          |
| Scaling upper limit value      |  | 16000                             |
| Scaling lower limit value      |  | 4000                              |

The digital output values and scaling values (digital operation values) are as follows:



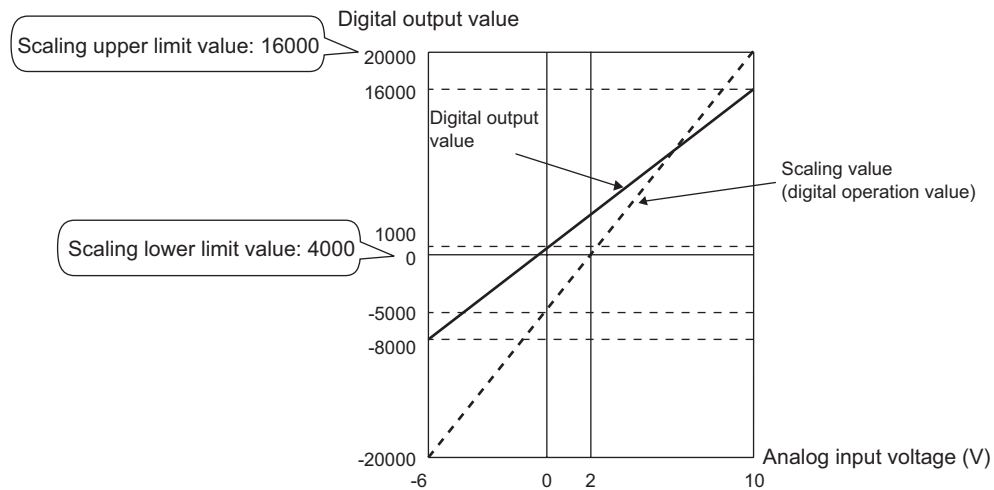
| Analog input voltage (V) | Digital output value | Scaling value<br>(digital operation value) |
|--------------------------|----------------------|--|
| 0                        | -5000                | 1000                                       |
| 1                        | 0                    | 4000                                       |
| 2                        | 5000                 | 7000                                       |
| 3                        | 10000                | 10000                                      |
| 4                        | 15000                | 13000                                      |
| 5                        | 20000                | 16000                                      |
| 5.5                      | 22500                | 17500                                      |

**Ex.** 4: When values are set for a channel with user range of 2 to 10V as follows:

- "Scaling upper limit value": 16000
- "Scaling lower limit value": 4000

| Scaling function               | Sets for scaling on A/D con |
|--------------------------------|-----------------------------|
| Scaling enable/disable setting | 0:Enable                    |
| Scaling upper limit value      | 16000                       |
| Scaling lower limit value      | 4000                        |

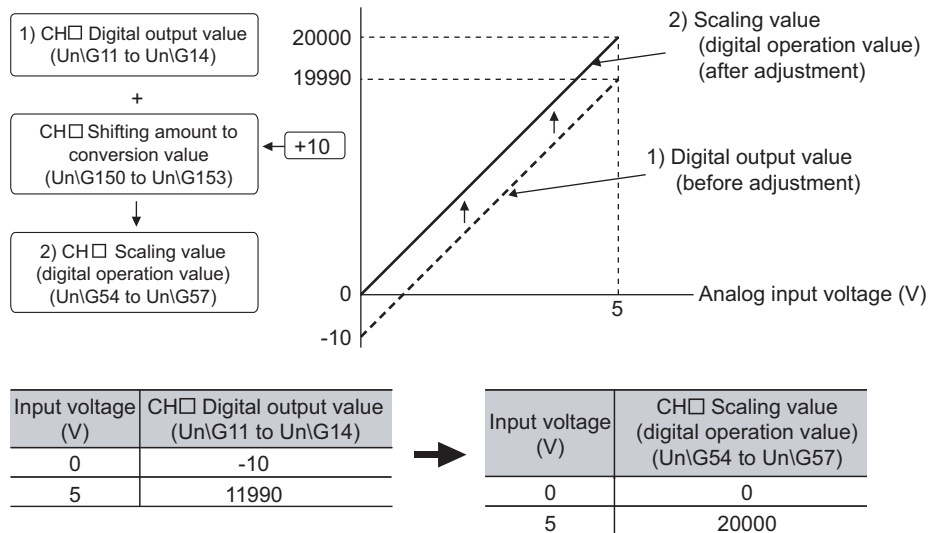
The digital output values and scaling values (digital operation values) are as follows:



| Analog input voltage (V) | Digital output value | Scaling value<br>(digital operation value) |
|--------------------------|----------------------|--|
| -6                       | -20000               | -8000                                      |
| -4                       | -15000               | -5000                                      |
| -2                       | -10000               | -2000                                      |
| 0                        | -5000                | 1000                                       |
| 2                        | 0                    | 4000                                       |
| 4                        | 5000                 | 7000                                       |
| 6                        | 10000                | 10000                                      |
| 8                        | 15000                | 13000                                      |
| 10                       | 20000                | 16000                                      |

## 8.11 Shift Function

Using this function, the set shifting amount to conversion value can be added (shifted) to the digital output value and it can be stored in the buffer memory. When the shifting amount to conversion value is changed, it is reflected to the scaling value (digital operation value) in real time. Therefore, fine adjustment can be easily performed when the system starts.



### (1) Operation of the shift function

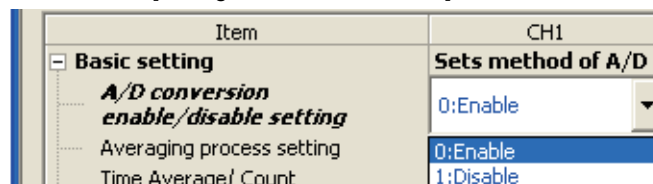
The set shifting amount to conversion value is added to the scaling value (digital operation value). The scaling value (digital operation value) with shift addition is stored in CH□ Scaling value (digital operation value) (Un\G54 to Un\G57). The shift amount is added in every sampling cycle for sampling processing, while it is added in every averaging process cycle for averaging processing. Then, those added values are stored in CH□ Scaling value (digital operation value) (Un\G54 to Un\G57).

If some value is set to the shifting amount to conversion value, the shifting amount to conversion value is added regardless of the status change (OFF → ON → OFF) of Operating condition setting request (Y9).

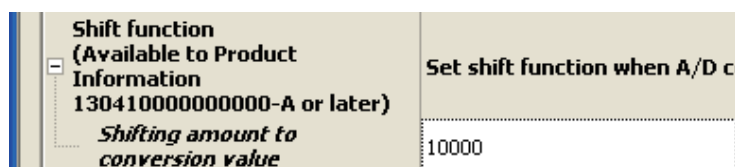
### (2) Setting procedure

#### 1. Set "A/D conversion enable/disable setting" to "0: Enable".

Project window ⇒ [Intelligent Function Module] ⇒ module name ⇒ [Parameter]



#### 2. Set a value to "Shifting amount to conversion value".





The initial value of the shifting amount to conversion value is 0.

| Item                                | Setting range   |
|-------------------------------------|-----------------|
| Shifting amount to conversion value | -32768 to 32767 |

### Point

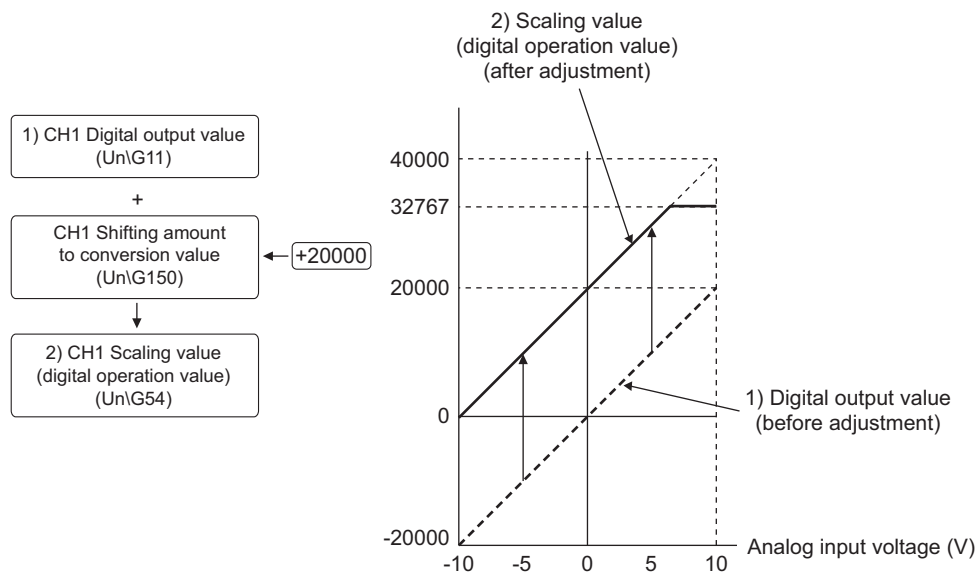
If the digital output value exceeds the range of -32768 to 32767 as a result of shift addition, the digital output value is fixed to the lower limit value (-32768) or the upper limit value (32767).

## (3) Setting example

**Ex.** When the following settings are used for a channel with input range of -10 to 10V:

- "Shifting amount to conversion value": 20000

The following figure and table show CH1 Digital output value (Un\G11) and CH1 Scaling value (digital operation value) (Un\G54).



| Input voltage (V) | CH1 Digital output value (Un\G11) | CH1 Scaling value (digital operation value) (Un\G54) |
|-------------------|-----------------------------------|--|
| -10               | -20000                            | 0  |
| -5                | -10000                            | 10000  |
| 0                 | 0                                 | 20000  |
| 5                 | 10000                             | 30000  |
| 10                | 20000                             | 32767 <sup>*1</sup>                                  |


<sup>\*1</sup> Since the value exceeds the range of -32768 to 32767, it is fixed to 32767 (the upper limit value).

#### (4) Setting example of when both the scaling function and shift function is used

**Ex.** When the following settings are used for the A/D converter module with input range of 0 to 5V:

- "Scaling upper limit value": 12000
- "Scaling lower limit value": 2000
- "Shifting amount to conversion value": 2000

##### 1. Set "A/D conversion enable/disable setting" to "0: Enable".

 Project window ⇒ [Intelligent Function Module] ⇒ module name ⇒ [Parameter]

| Item   | CH1                         |
|--|-----------------------------|
| <b>Basic setting</b>                         | <b>Sets method of A/D c</b> |
| <i>A/D conversion enable/disable setting</i> | 0:Enable                    |
| Averaging process setting                    | 0:Enable                    |
| Time Average/ Count                          | 1:Disable                   |

##### 2. Set "Scaling enable/disable setting" to "0: Enable".

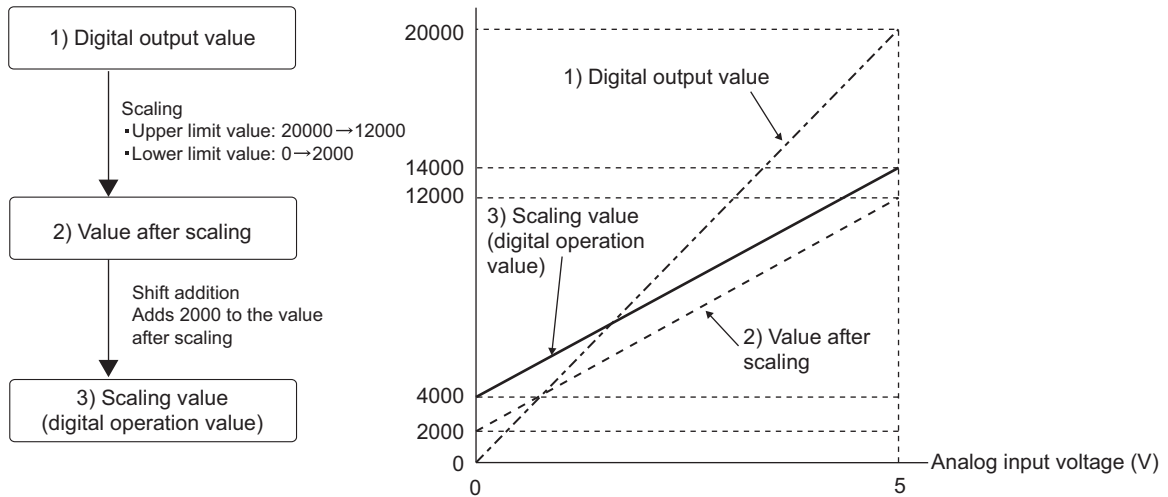
|                               |                                    |
|-------------------------------|------------------------------------|
| <b>Scaling function</b>       | <b>Sets for scaling on A/D con</b> |
| <i>Scaling enable/disable</i> | 0:Enable                           |
| Scaling upper limit value     | 0:Enable                           |
| Scaling lower limit value     | 1:Disable                          |

##### 3. Set values for "Scaling upper limit value" and "Scaling lower limit value".

|                                |   |
|--------------------------------|---|
| <b>Scaling function</b>        | <b>Sets for scaling on A/D conversi</b> |
| Scaling enable/disable setting | 0:Enable                                |
| Scaling upper limit value      | 12000                                   |
| Scaling lower limit value      | 2000                                    |

##### 4. Set a value to "Shifting amount to conversion value".

|  |                                      |
|--|--------------------------------------|
| <b>Shift function</b><br>(Available to Product Information<br>13041000000000-A or later) | <b>Set shift function when A/D c</b> |
| <i>Shifting amount to conversion value</i>   | 2000                                 |



| Input voltage (V) | Digital output value | Value after scaling | Scaling value (digital operation value) |
|-------------------|----------------------|---------------------|---|
| 0                 | 0                    | 2000                | 4000                                    |
| 1                 | 4000                 | 4000                | 6000                                    |
| 2                 | 8000                 | 6000                | 8000                                    |
| 3                 | 12000                | 8000                | 10000                                   |
| 4                 | 16000                | 10000               | 12000                                   |
| 5                 | 20000                | 12000               | 14000                                   |

### Point

When the shift function is used with the digital clipping function and scaling function, shift addition is executed on the value after digital clipping and scale conversion.  
Therefore, the range of the scaling value (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.

- Setting example of when the digital clipping function, scaling function, and shift function are used together (Page 92, Section 8.12 (4))

## 8.12 Digital Clipping Function

The range of the scaling value (digital operation value) for voltage or current over the input range is fixed between the maximum digital output value and the minimum digital output value.

### (1) Concept of digital clipping setting

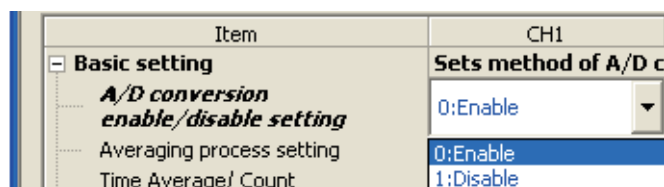
The following table lists the output range of the scaling value (digital operation value) when the digital clipping function is enabled for each range.

| Input range               | Output range of the scaling value (digital operation value) |                                    |
|---------------------------|---|------------------------------------|
|                           | Digital clipping function enabled                           | Digital clipping function disabled |
| 4 to 20mA                 | 0 to 20000  | -480 to 20479                      |
| 0 to 20mA                 |   |                                    |
| 1 to 5V                   |   |                                    |
| 0 to 5V                   |   |                                    |
| 0 to 10V                  |   |                                    |
| -10 to 10V                | -20000 to 20000   | -20480 to 20479                    |
| User range setting        |   |                                    |
| 4 to 20mA (Extended mode) | -5000 to 22500  | -5480 to 22979                     |
| 1 to 5V (Extended mode)   |   |                                    |

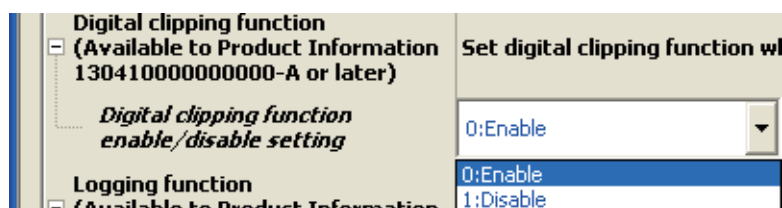
### (2) Setting procedure

1. Set "A/D conversion enable/disable setting" to "0: Enable".

 Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]



2. Set "Digital clipping function enable/disable setting" to "0: Enable" .



### (3) Setting example of when both the digital clipping function and scaling function are used

**Ex.** When setting as follows for the A/D converter module with input range of 0 to 5V:

- "Scaling upper limit value": 32000
- "Scaling lower limit value": 0
- "Digital clipping function enable/disable setting": "0: Enable"

#### 1. Set "A/D conversion enable/disable setting" to "0: Enable".

Project window ⇒ [Intelligent Function Module] ⇒ module name ⇒ [Parameter]

| Item   | CH1                                  |
|--|--------------------------------------|
| <b>Basic setting</b>                         | <b>Sets method of A/D conversion</b> |
| <i>A/D conversion enable/disable setting</i> | 0:Enable                             |
| Averaging process setting                    | 0:Enable                             |
| Time Average/ Count                          | 1:Disable                            |

#### 2. Set "Scaling enable/disable setting" to "0: Enable".

| Item                          | Sets for scaling on A/D conversion |
|-------------------------------|------------------------------------|
| <b>Scaling function</b>       |                                    |
| <i>Scaling enable/disable</i> | 0:Enable                           |
| Scaling upper limit value     | 0:Enable                           |
| Scaling lower limit value     | 1:Disable                          |

#### 3. Set values for "Scaling upper limit value" and "Scaling lower limit value".

| Item                           | Sets for scaling on A/D conversion |
|--------------------------------|------------------------------------|
| <b>Scaling function</b>        |                                    |
| Scaling enable/disable setting | 0:Enable                           |
| Scaling upper limit value      | 32000                              |
| Scaling lower limit value      | 0                                  |

#### 4. Set "Digital clipping function enable/disable setting" to "0: Enable".

| Item   | Set digital clipping function with |
|--|------------------------------------|
| <b>Digital clipping function</b><br>(Available to Product Information 13041000000000-A or later) |                                    |
| <i>Digital clipping function enable/disable setting</i>  | 0:Enable                           |
| Logging function   | 0:Enable                           |
| (Available to Product Information 13041000000000-A or later)                                     | 1:Disable                          |


In this case, scale conversion is performed on the digital-clipped scaling value (digital operation value). Therefore, the digital output range of the scaling value (digital operation value) is determined as 0 to 32000.

#### (4) Setting example of when the digital clipping function, scaling function, and shift function are used together

**Ex.** When setting as follows for the A/D converter module with input range of 0 to 5V:

- "Scaling upper limit value": 12000
- "Scaling lower limit value": 2000
- "Shifting amount to conversion value": 2000
- "Digital clipping function enable/disable setting": "0: Enable"

##### 1. Set "A/D conversion enable/disable setting" to "0: Enable".

 Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]

| Item   | CH1                         |
|--|-----------------------------|
| <b>Basic setting</b>                         | <b>Sets method of A/D c</b> |
| <i>A/D conversion enable/disable setting</i> | 0:Enable                    |
| Averaging process setting                    | 0:Enable                    |
| Time Average/ Count                          | 1:Disable                   |

##### 2. Set "Scaling enable/disable setting" to "0: Enable".

|                               |                                    |
|-------------------------------|------------------------------------|
| <b>Scaling function</b>       | <b>Sets for scaling on A/D con</b> |
| <i>Scaling enable/disable</i> | 0:Enable                           |
| Scaling upper limit value     | 0:Enable                           |
| Scaling lower limit value     | 1:Disable                          |

##### 3. Set values for "Scaling upper limit value" and "Scaling lower limit value".

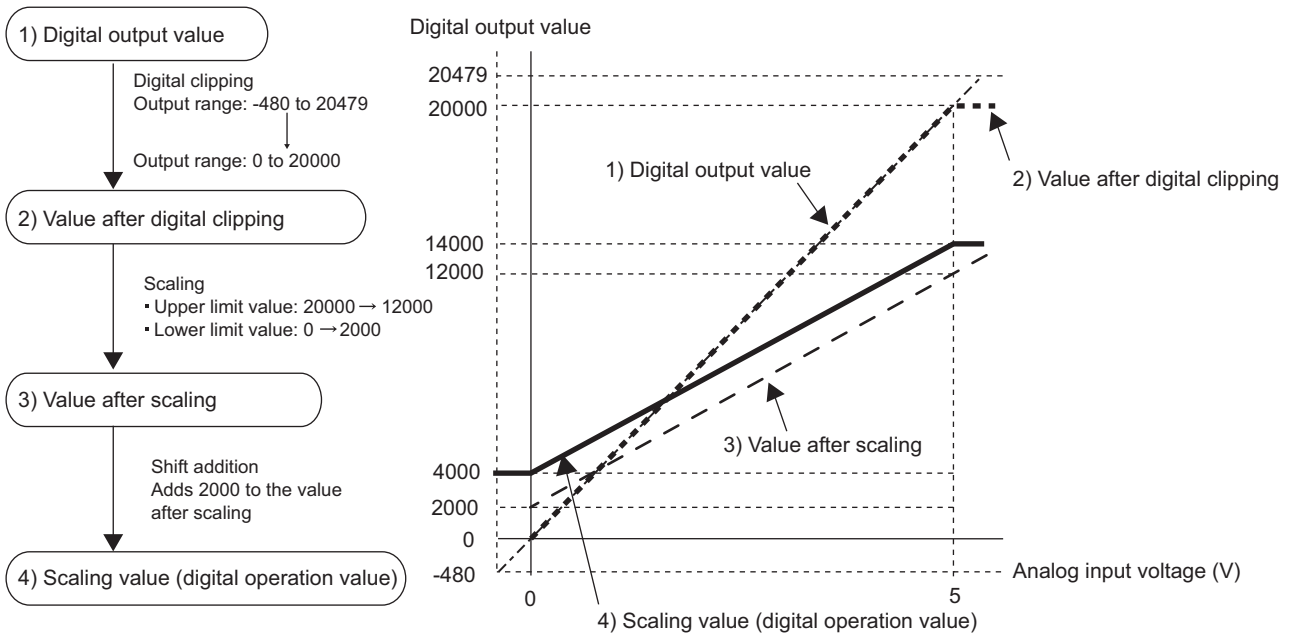
|                                |   |
|--------------------------------|---|
| <b>Scaling function</b>        | <b>Sets for scaling on A/D conversi</b> |
| Scaling enable/disable setting | 0:Enable                                |
| Scaling upper limit value      | 12000                                   |
| Scaling lower limit value      | 2000                                    |

##### 4. Set a value to "Shifting amount to conversion value".

|  |      |
|--|------|
| <b>Shift function</b>  |      |
| (Available to Product Information 13041000000000-A or later) |      |
| <i>Shifting amount to conversion value</i>                   | 2000 |

##### 5. Set "Digital clipping function enable/disable setting" to "0: Enable".

|  |   |
|--|---|
| <b>Digital clipping function</b>                             | <b>Set digital clipping function wl</b> |
| (Available to Product Information 13041000000000-A or later) |   |
| <i>Digital clipping function enable/disable setting</i>      | 0:Enable                                |
| Logging function   | 0:Enable                                |
| (Available to Product Information                            | 1:Disable                               |



| Input voltage (V) | Digital output value | Scaling value (digital operation value) |
|-------------------|----------------------|---|
| -0.12             | -480                 | 4000                                    |
| 0                 | 0                    | 4000                                    |
| 1                 | 4000                 | 6000                                    |
| 2                 | 8000                 | 8000                                    |
| 3                 | 12000                | 10000                                   |
| 4                 | 16000                | 12000                                   |
| 5                 | 20000                | 14000                                   |
| 5.12              | 20479                | 14000                                   |

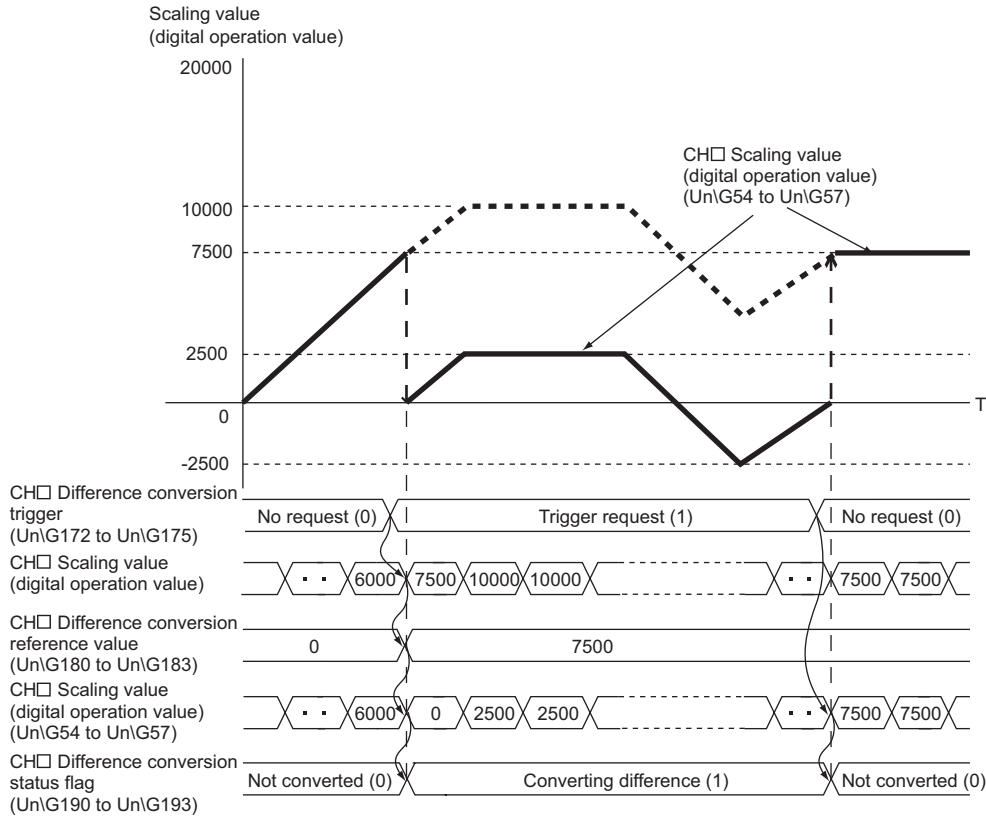
### Point

When the digital clipping function is used with the scaling function, shift function, and difference conversion function, the scale conversion, shift addition, and difference conversion are executed on the value after digital clipping. For details, refer to the following.

- Processing each function (☞ Page 61, Section 8.1)

## 8.13 Difference Conversion Function

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



### (1) Operation of the difference conversion function

When the difference conversion starts, the scaling value (digital operation value) at that time (the data stored inside the A/D converter module before difference conversion) is determined as the difference conversion reference value. The value acquired by subtracting the difference conversion reference value from the scaling value (digital operation value) is stored in CH□ Scaling value (digital operation value) (UnG54 to UnG57). Therefore, CH□ Scaling value (digital operation value) (UnG54 to UnG57) at the start of this function is 0. (since the scaling value (digital operation value) equals to the difference conversion reference value at the start)

$$\text{Scaling value (digital operation value) after difference conversion} = \text{Scaling value (digital operation value)} - \text{Difference conversion reference value}$$

### (2) How to use difference conversion

#### (a) Starting difference conversion

##### 1. Change CH□ Difference conversion trigger (UnG172 to UnG175) 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 scaling value (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 scaling value (digital operation value) is stored in CH□ Scaling value (digital operation value) (UnG54 to UnG57). After the value is stored, CH□ Difference conversion status flag (UnG190 to UnG193) changes to Converting difference (1).



## (b) Stopping difference conversion

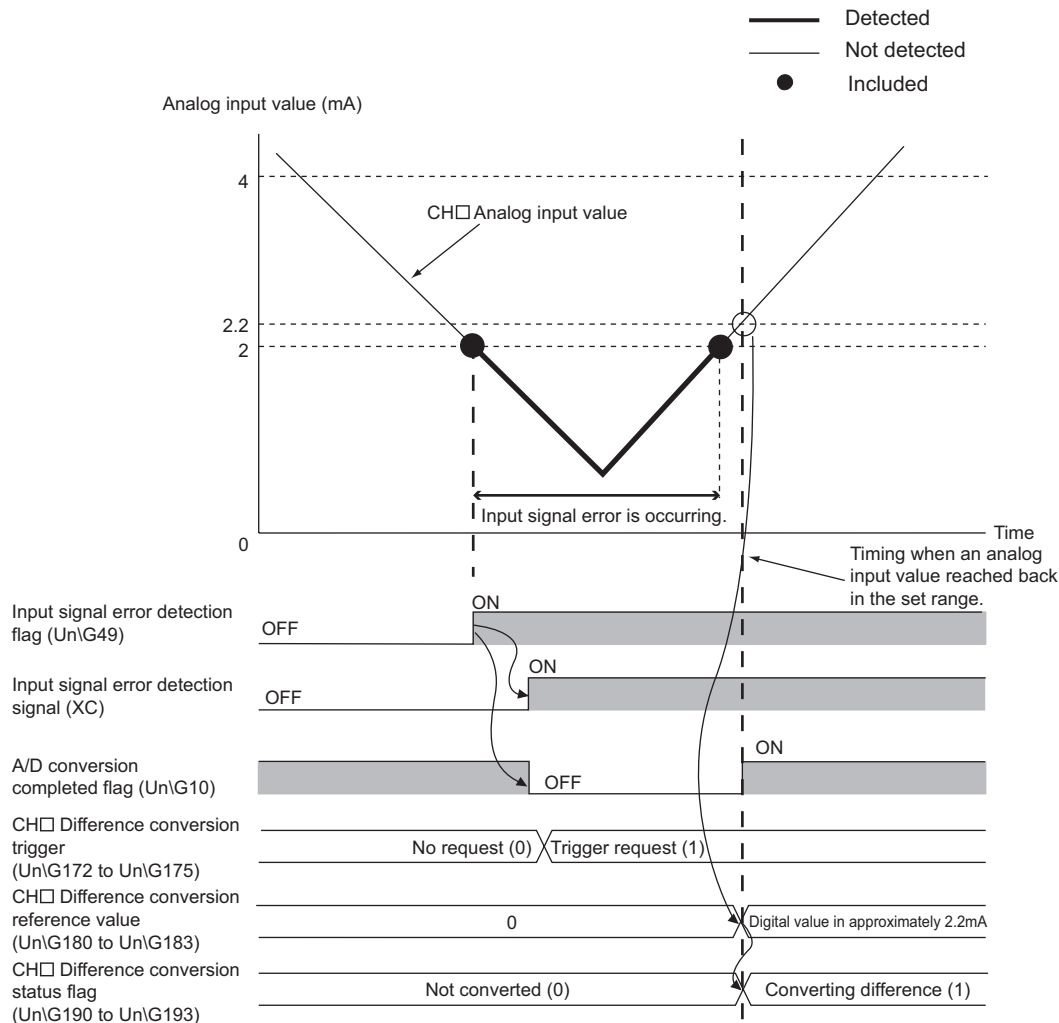
### 1. Change CH□ Difference conversion trigger (Un\G172 to Un\G175) from Trigger request (1) to No request (0).

The fall of Trigger request (1) → No request (0) is detected as a trigger. When the trigger is detected, the difference conversion stops, and CH□ Difference conversion status flag (Un\G190 to Un\G193) changes to Not converted (0). After that, the scaling value (digital operation value) is stored as it is in CH□ Scaling value (digital operation value) (Un\G54 to Un\G57).

## (3) Points for the use of the difference conversion function

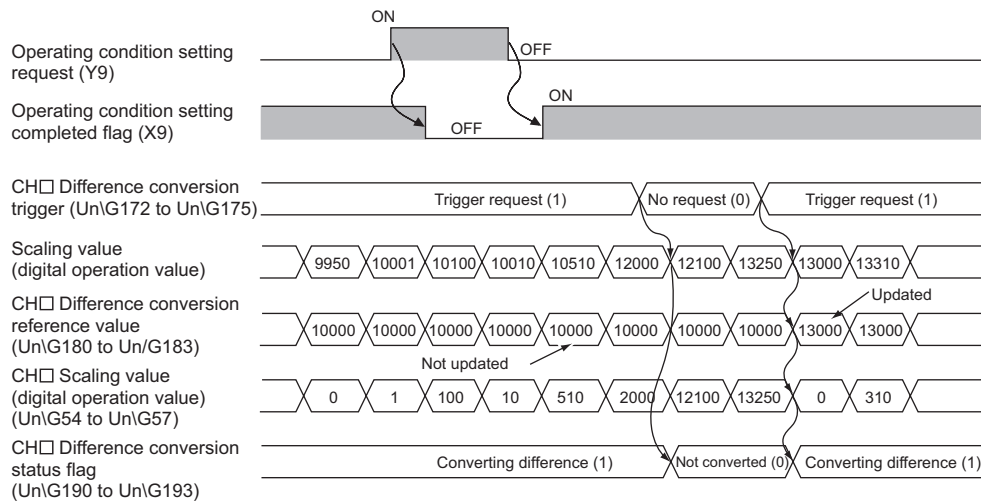
### (a) Operation of when an input signal error occurs

While an input signal error is occurring, even if Difference conversion trigger (Un\G172 to Un\G175) changes No request (0) → Trigger request (1), the difference conversion does not start. After the analog input value returns within the setting range, change Difference conversion trigger (Un\G172 to Un\G175) 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 just when the analog input value returns within the setting value, treating the scaling value (digital operation value) as the difference conversion reference value.



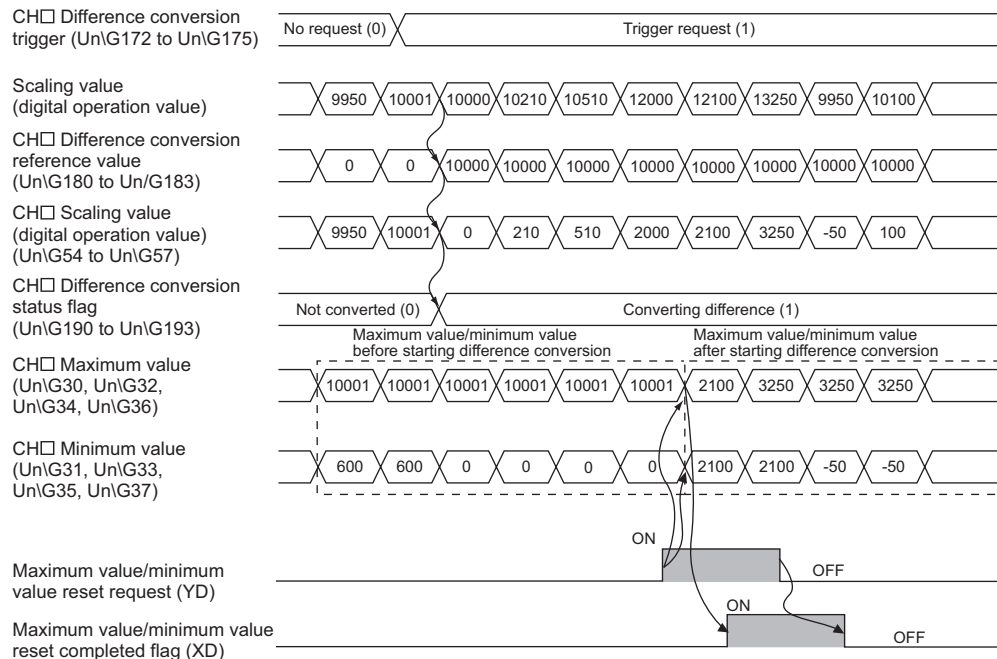
## (b) Operation of when Operating condition setting request (Y9) is turned OFF → ON → OFF during difference conversion

During the difference conversion, even if Operating condition setting request (Y9) is turned OFF → ON → OFF, the difference conversion before Operating condition setting request (Y9) continues and the difference conversion reference value is not updated. To update the difference conversion reference value, restart the difference conversion by changing Difference conversion trigger Trigger request (1) → No request (0) → Trigger request (1) again.



## (c) Operation of the maximum value and the minimum value

When the difference conversion starts, the maximum value and the minimum value of the values acquired by the difference conversion are stored in CH□ Maximum value and CH□ Minimum value. 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.



#### (d) Operation of when the averaging processing is set

If the difference conversion starts while the averaging processing is set, the scaling value (digital operation value) at the completion of the averaging processing is determined as the difference conversion reference value. In addition, CH□ Difference conversion status flag (Un\G190 to Un\G193) changes 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 scaling value (digital operation value) is determined as a difference conversion reference value.
- If other than No request (0) or Trigger request (1) is set in CH□ Difference conversion trigger (Un\G172 to Un\G175) during the difference conversion, an error occurs. Though the difference conversion continues.
- Even if the digital clipping function, scaling function, and shift function are set valid, the difference conversion reference value is not updated. To update the difference conversion reference value, stop the difference conversion and restart it.

## 8.14 Logging Function

Using this function, data can be consecutively collected at a set cycle and they can be stored in the buffer memory. Using the data stored in the buffer memory, debugging can be performed and the data variation can be checked periodically.

In addition, the time-series data imported as logs can be easily checked.

### (1) Logging function

#### (a) Collectable data

The following two kinds of data can be collected.

- Digital output value
- Scaling value (digital operation value)

#### (b) Collectable points

Up to 10000 points logging data can be stored for each channel.

#### (c) Collection cycle

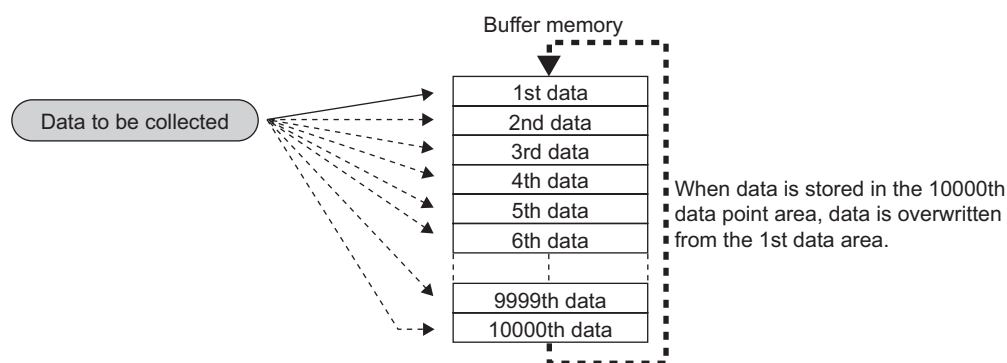
The data can be collected at intervals of 80 $\mu$ s at the minimum and of 3600s at the maximum.

For details of the collection cycle, refer to the following.

- Setting procedure (☞ Page 100, Section 8.14 (3))

#### (d) Storing the collected data

Logging data are stored orderly in the logging data storage area of the buffer memory, starting from the head of the area.



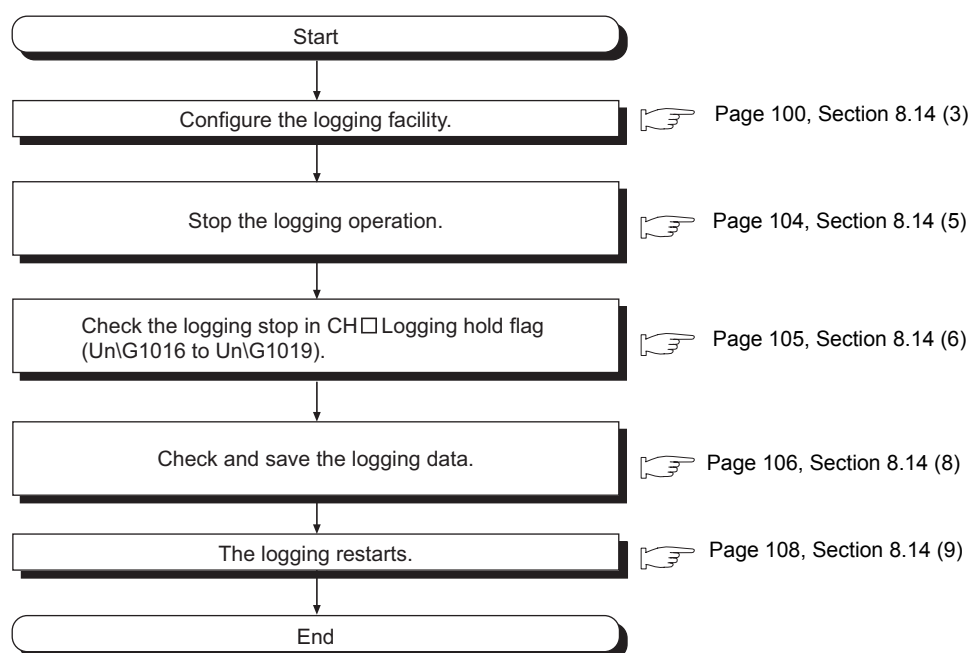
## (2) Logging procedure

### (a) Use conditions of the logging function

To use the logging function, set as follows.

| Item  | Setting            |
|---|--------------------|
| Conversion speed                                | 80 $\mu$ s, or 1ms |
| Input signal error detection function           | Disable            |
| Input signal error detection extension function | Disable            |

### (b) Starting logging and checking procedure of logging data



#### Point

Logging data can also be checked without stopping logging. For details, refer to the following.

- When checking logging data without stopping logging ( Page 109, Section 8.14 (10))

### (3) Setting procedure

1. Set "A/D conversion enable/disable setting" to "0: Enable".

 Project window ⇨ [Intelligent Function Module] ⇨ module name ⇨ [Parameter]

| Item   | CH1                         |
|--|-----------------------------|
| <b>Basic setting</b>                         | <b>Sets method of A/D c</b> |
| <b>A/D conversion enable/disable setting</b> | 0:Enable                    |
| Averaging process setting                    | 0:Enable                    |
| Time Average/ Count                          | 1:Disable                   |

2. Set "Logging enable/disable setting" to "0: Enable".

|                               |           |
|-------------------------------|-----------|
| <b>Logging enable/disable</b> | 0:Enable  |
| Logging data setting          | 0:Enable  |
| Logging cycle setting value   | 1:Disable |

3. Set the logging target in "Logging data setting".

|                                  |   |
|----------------------------------|---|
| Logging enable/disable setting   | 0:Enable                                  |
| <b>Logging data setting</b>      | 1:Scaling Value (Digital Operation Value) |
| Logging cycle setting value      | 0:Digital Output Value                    |
| Logging cycle unit specification | 1:Scaling Value (Digital Operation Value) |

4. Set the cycle of storing logging data in "Logging cycle setting value".

|                                  |         |
|----------------------------------|---------|
| <b>Logging cycle setting</b>     | 1000 ms |
| Logging cycle unit specification | 1:ms    |

5. Set the unit of the "Logging cycle setting value" in "Logging cycle unit specification".

|                                 |      |
|---------------------------------|------|
| <b>Logging cycle unit</b>       | 1:ms |
| Logging points after trigger    | 0:us |
| Level trigger condition setting | 1:ms |
| Trigger data                    | 2:s  |

The following table lists the setting ranges.

| "Logging cycle unit specification" | Setting range of "Logging cycle setting value" |
|------------------------------------|--|
| 0: $\mu$ s                         | 80 to 32767                                    |
| 1: ms                              | 1 to 32767                                     |
| 2: s                               | 1 to 3600                                      |

The actual logging cycle is "an integral multiple of the conversion cycle of each A/D conversion method".

The following table lists the conversion cycle of each A/D conversion method.

| A/D conversion method | The conversion cycle  |
|-----------------------|---|
| Sampling processing   | Conversion speed × Number of used channels  |
| Time average          | $\left( \frac{\text{Time set in "Time Average/Count Average/Moving Average"}}{\text{Conversion speed} \times \text{Number of used channels}} \right)^{*1} \times \text{Conversion speed} \times \text{Number of used channels}$ |
| Count average         | Number of times set in "Time Average/ Count Average/Moving Average" × Conversion speed × Number of used channels  |
| Moving average        | Conversion speed × Number of used channels  |

\*1 The value after the decimal point is rounded off.

If the set logging cycle is not an integral multiple of the conversion cycle shown above, the logging function operates in the maximum cycle of an integral multiple within the setting range.

**Ex.** When setting as follows in CH1 to CH3:

- "Averaging process setting": "0: Sampling Processing"
- "Conversion speed setting": "1: 80μs"
- "Logging data setting": "0: Digital Output Value"
- "Logging cycle setting value": 7000
- "Logging cycle unit specification": "0: μs"

$$80 \times 3 = 240\mu\text{s}$$

The actual logging cycle is 6960μs (an integral multiple of 240μs).

The actual logging cycle can be checked at CH□ Logging cycle monitor value (Un\G1122 to Un\G1133)

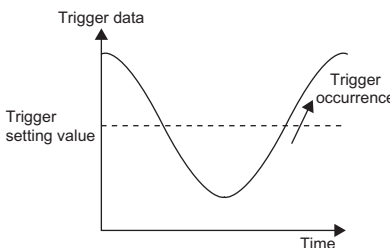
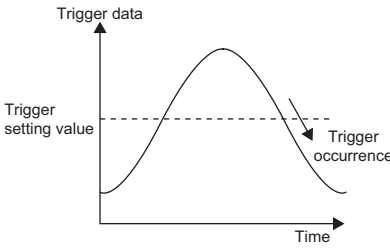
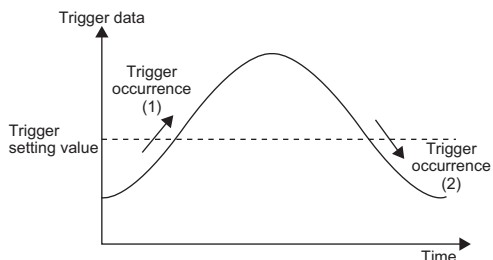
## 6. In "Logging points after trigger", set the data points to be collected from stop request (hold trigger) for logging occurs until logging stops.



The following table lists the setting range of the "Logging points after trigger".

| Item                         | Setting range |
|------------------------------|---------------|
| Logging points after trigger | 1 to 10000    |

**7. In "Level trigger condition setting", select any of the following.**

| Setting value   | Description  |   |              |    |    |    |    |    |    |    |     |     |
|-----------------|--|---|--------------|----|----|----|----|----|----|----|-----|-----|
| 0: Disable      | Select when a stop condition of logging is not set. (Logging can be stopped at any timing.)  |   |              |    |    |    |    |    |    |    |     |     |
| 1: Above        | Select a value to set a stop condition of logging.<br>(Logging stops when the value in the buffer memory satisfies the set condition.)   | Logging stops when the status of "Trigger data < Trigger setting value" turns to that of "Trigger data > Trigger setting value"<br> <div><div>Example</div><div>When the trigger setting value is 70</div><table><tr><th>Trigger data</th></tr><tr><td>64</td></tr><tr><td>66</td></tr><tr><td>67</td></tr><tr><td>69</td></tr><tr><td>70</td></tr><tr><td>71</td></tr><tr><td>72</td></tr><tr><td>74</td></tr><tr><td>...</td></tr></table><div>← Trigger occurs at this point</div></div> | Trigger data | 64 | 66 | 67 | 69 | 70 | 71 | 72 | 74  | ... |
| Trigger data    |  |   |              |    |    |    |    |    |    |    |     |     |
| 64              |  |   |              |    |    |    |    |    |    |    |     |     |
| 66              |  |   |              |    |    |    |    |    |    |    |     |     |
| 67              |  |   |              |    |    |    |    |    |    |    |     |     |
| 69              |  |   |              |    |    |    |    |    |    |    |     |     |
| 70              |  |   |              |    |    |    |    |    |    |    |     |     |
| 71              |  |   |              |    |    |    |    |    |    |    |     |     |
| 72              |  |   |              |    |    |    |    |    |    |    |     |     |
| 74              |  |   |              |    |    |    |    |    |    |    |     |     |
| ...             |  |   |              |    |    |    |    |    |    |    |     |     |
| 2: Below        | Logging stops when the status of "Trigger data > Trigger setting value" turns to that of "Trigger data < Trigger setting value"<br> <div><div>Example</div><div>When the trigger setting value is 70</div><table><tr><th>Trigger data</th></tr><tr><td>74</td></tr><tr><td>72</td></tr><tr><td>71</td></tr><tr><td>70</td></tr><tr><td>69</td></tr><tr><td>67</td></tr><tr><td>66</td></tr><tr><td>64</td></tr><tr><td>...</td></tr></table><div>← Trigger occurs at this point</div></div> | Trigger data  | 74           | 72 | 71 | 70 | 69 | 67 | 66 | 64 | ... |     |
| Trigger data    |  |   |              |    |    |    |    |    |    |    |     |     |
| 74              |  |   |              |    |    |    |    |    |    |    |     |     |
| 72              |  |   |              |    |    |    |    |    |    |    |     |     |
| 71              |  |   |              |    |    |    |    |    |    |    |     |     |
| 70              |  |   |              |    |    |    |    |    |    |    |     |     |
| 69              |  |   |              |    |    |    |    |    |    |    |     |     |
| 67              |  |   |              |    |    |    |    |    |    |    |     |     |
| 66              |  |   |              |    |    |    |    |    |    |    |     |     |
| 64              |  |   |              |    |    |    |    |    |    |    |     |     |
| ...             |  |   |              |    |    |    |    |    |    |    |     |     |
| 3: Pass Through | Logging stops when the trigger data passes the trigger setting value. (Either of the following (1) or (2))<br>(1) When the status of "Trigger data < Trigger setting value" turns to that of "Trigger data > Trigger setting value"<br>(2) When the status of "Trigger data > Trigger setting value" turns to that of "Trigger data < Trigger setting value"<br>   |   |              |    |    |    |    |    |    |    |     |     |



**8. When other than "0: Disable" in "Level trigger condition setting" is selected, set the stop condition of logging with "Trigger data" and "Trigger setting value".**

| Item                  | Description  |
|-----------------------|--|
| Trigger data          | Set the buffer memory address monitored as a occurrence condition to stop logging.*1 |
| Trigger setting value | Set the value of the buffer memory to stop logging.                                  |

\*1 By setting Level data ☐ (Un\G1072 to Un\G1081) as a monitoring target, a device value of a CPU module can be set as a trigger data.

For details on the Level data, refer to the following.

- Level data (👉 Page 194, Appendix 2(38))

**Point** 🔍

- While "Conversion speed" is set as 20μs (0), setting CH ☐ Logging enable/disable setting (Un\G1000 to Un\G1003) to 0: Enable causes an error.
- When the input signal error detection function and the input signal error detection extension function are set, setting CH ☐ Logging enable/disable setting (Un\G1000 to Un\G1003) to Enable (0) causes an error.
- If the logging cycle setting value and the logging cycle set in the logging cycle input setting are below the digital output value and the cycle of updating the scaling value (digital operation value), an error occurs and logging cannot be performed.
- When the logging function turns disabled  
The logging function turns disabled when any of the following error occurs after the logging function is enabled and Operating condition setting request (Y9) is turned OFF → ON → OFF.
  - Error code (20□): Setting error of CH ☐ Time Average/ Count Average/Moving Average (Un\G1 to Un\G4)
  - Error code (30□): Setting error of CH ☐ Time Average/ Count Average/Moving Average (Un\G1 to Un\G4)
  - Error code (31□): Setting error of CH ☐ Time Average/ Count Average/Moving Average (Un\G1 to Un\G4)
  - Error code (360): Setting error of Conversion speed setting (Un\G26)
  - Error code (200□ to 208□): Setting error of a parameter setting item of the logging function

#### (4) Starting logging

Turn Operating condition setting request (Y9) OFF → ON → OFF. Data is logged at every set logging cycle.

#### (5) Stopping logging

Use a hold trigger to stop logging. After the hold trigger is detected, the A/D converter module stops collecting data after logging for points that is previously set.

Logging stopping method are as follows.

##### 1. Turn CH□ Logging hold request (Un\G1008 to Un\G1011) from No request (0) to Requested (1).

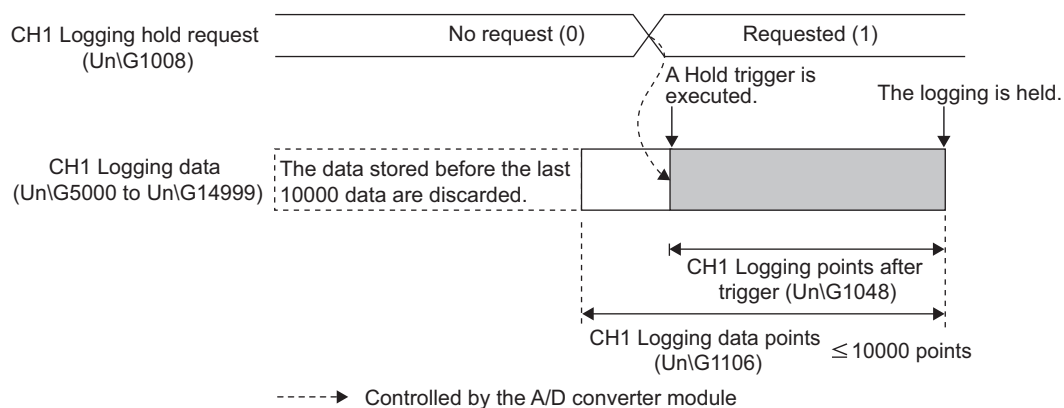
When "Level trigger condition setting" is set to "0: Disable", the data corresponding to the set points are collected and logging stops.

When "Level trigger condition setting" is set to other than "0: Disable", data corresponding to set points are collected after the conditions of "Trigger data" and "Trigger setting value" are satisfied, and logging stops.

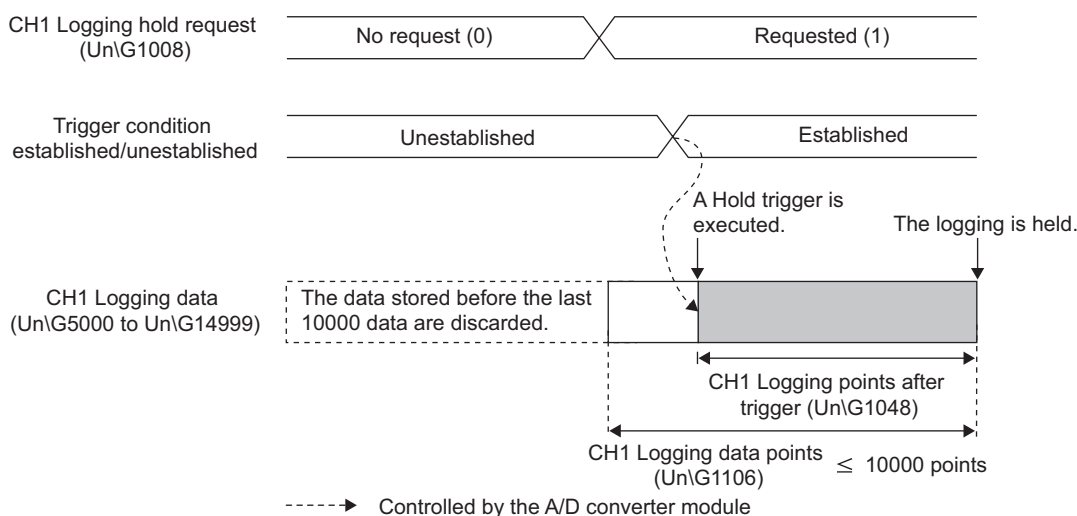
#### Point

- When Operating condition setting request (Y9) is turned on, logging stops regardless of ON or OFF of the hold trigger. All the logging data stored before turning on Operating condition setting request (Y9) are cleared.
- Turn CH□ Logging hold request (Un\G1008 to Un\G1011) Requested (1) → No request (0) after confirming CH□ Logging hold flag (Un\G1016 to Un\G1019) turns Logging held (1). If CH□ Logging hold request (Un\G1008 to Un\G1011) is turned Requested (1) → No request (0) before holding, logging does not stop.
- The following delay occurs at the maximum until the A/D converter module receives a hold trigger after CH□ Logging hold request (Un\G1008 to Un\G1011) is turned No request (0) → Requested (1).  
Trigger delay = Logging cycle (Cycle at which logging is actually performed) + Scan time of CPU module

**Ex.** When "Level trigger condition setting" is set to "0: Disable" and CH1 Scaling value (digital operation value) (Un\G54) is logged



**Ex.** When "Level trigger condition setting" is set to other than "0: Disable" and CH1 Scaling value (digital operation value) (Un\G54) is logged



## (6) Confirming stop of logging

Confirm that CH□ Logging hold flag (Un\G1016 to Un\G1019) turns Logging held (1).

## (7) Checking trigger detection time

The time that the hold trigger is detected can be checked in the buffer memory.

Even when the logging cycle is set as less than 1s, the minimum time unit recorded in the Trigger detection time (Un\G1154 to Un\G1157) is second. Use trigger detection time as an indication to refer to the logging data.

For the buffer memory areas in which trigger detection time is recorded, refer to the following.

| Channel | Address for trigger detection time                |
|---------|---|
| CH1     | CH1 Trigger detection time (Un\G1154 to Un\G1157) |
| CH2     | CH2 Trigger detection time (Un\G1158 to Un\G1161) |
| CH3     | CH3 Trigger detection time (Un\G1162 to Un\G1165) |
| CH4     | CH4 Trigger detection time (Un\G1166 to Un\G1169) |

**Ex.** For CH1 Trigger detection time (Un\G1154 to Un\G1157)

|          |                              |    |       |                             |    |
|----------|------------------------------|----|-------|-----------------------------|----|
|          | b15                          | to | b8 b7 | to                          | b0 |
| Un\G1154 | First two digits of the year |    |       | Last two digits of the year |    |
| Un\G1155 | Month                        |    |       | Day                         |    |
| Un\G1156 | Hour                         |    |       | Minute                      |    |
| Un\G1157 | Second                       |    |       | Day of the week             |    |

| Item   | Storage contents  | Storage example* <sup>1</sup> |
|--|---|-------------------------------|
| First two digits of the year/<br>Last two digits of the year | Stored in BCD code.   | 2011 <sub>H</sub>             |
| Month/Day  |   | 329 <sub>H</sub>              |
| Hour/Minute  |   | 1035 <sub>H</sub>             |
| Second   |   | 40 <sub>H</sub>               |
| Day of the week  | One of the following value is stored for each day of the week in BCD code.<br>• Sunday: 0                      • Monday: 1<br>• Tuesday: 2                    • Wednesday: 3<br>• Thursday: 4                  • Friday: 5<br>• Saturday: 6 | 2 <sub>H</sub>                |

\*1 Those are values when a hold trigger is detected at 10:35:40 on Tuesday, March 29th, 2011.

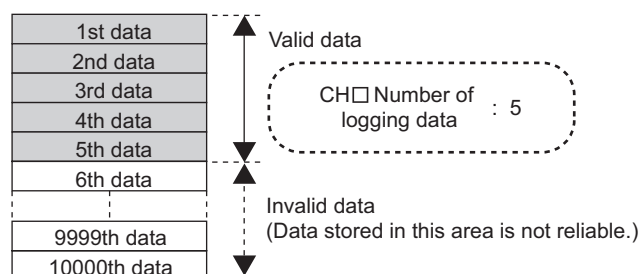
## (8) Checking logging data

Logging data are stored in the following buffer memory areas.

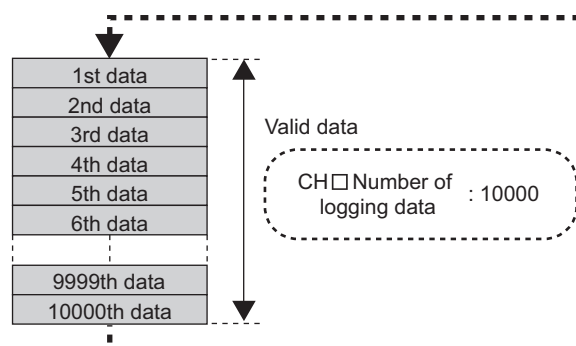
| Channel | Collectable data                            |                       | Storing destination of logging data |                        |
|---------|---|-----------------------|-------------------------------------|------------------------|
|         | Buffer memory name                          | Buffer memory address | Buffer memory name                  | Buffer memory address  |
| CH1     | CH□ Digital output value                    | Un\G11                | CH□ Logging data                    | Un\G5000 to Un\G14999  |
| CH2     |   | Un\G12                |                                     | Un\G15000 to Un\G24999 |
| CH3     |   | Un\G13                |                                     | Un\G25000 to Un\G34999 |
| CH4     |   | Un\G14                |                                     | Un\G35000 to Un\G44999 |
| CH1     | CH□ Scaling value (digital operation value) | Un\G54                |                                     | Un\G5000 to Un\G14999  |
| CH2     |   | Un\G55                |                                     | Un\G15000 to Un\G24999 |
| CH3     |   | Un\G56                |                                     | Un\G25000 to Un\G34999 |
| CH4     |   | Un\G57                |                                     | Un\G35000 to Un\G44999 |

### 1. Check the number of valid logging data in CH□ Number of logging data (Un\G1106 to Un\G1109).

When data is collected 10000 times or less



When data is collected 10001 times or more

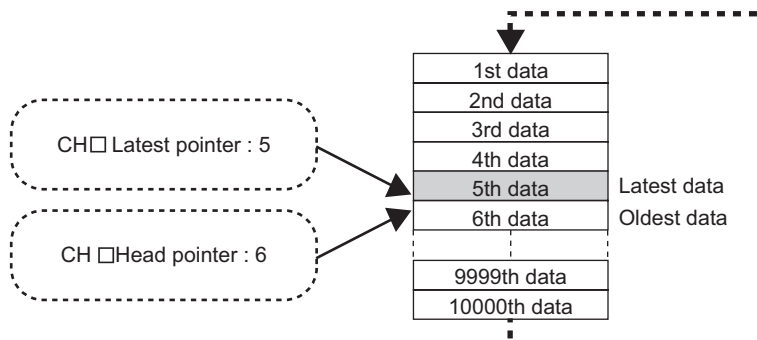


## 2. Check the places where the latest data and the oldest data are stored.

Those places can be checked in the following buffer memory areas.

- CH□ Head pointer (Un\G1090 to Un\G1093) (☞ Page 195, Appendix 2(40))
- CH□ Latest pointer (Un\G1098 to Un\G1101) (☞ Page 195, Appendix 2(41))

**Ex.** When data is collected 10001 times or more

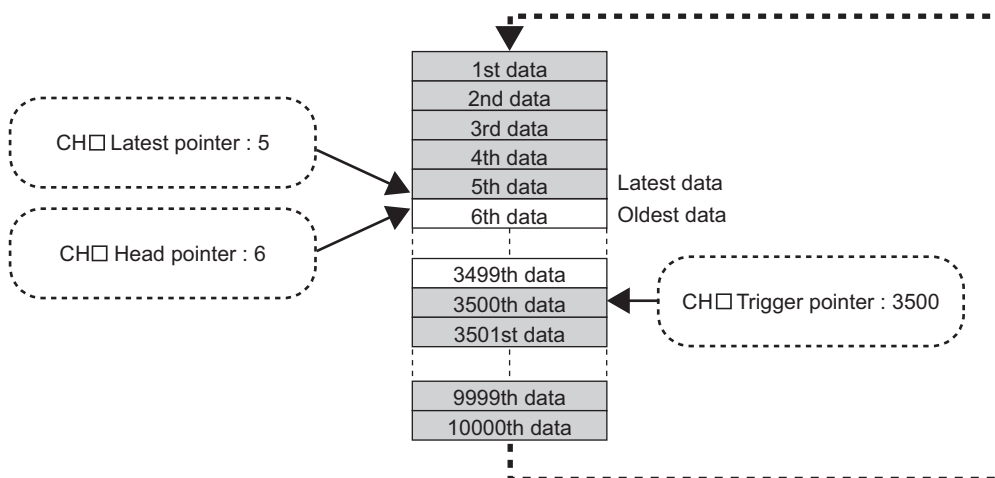


## 3. Check the storage location when logging stops with CH□ Trigger pointer (Un\G1114 to Un\G1117).

**Ex.** When logging stops under the following conditions

- CH□ Logging points after trigger (Un\G1048 to Un\G1051): 6505 points
- Logging hold request: Performed at 3500th

(Because of the above condition, the hold location is determined as 5th.)



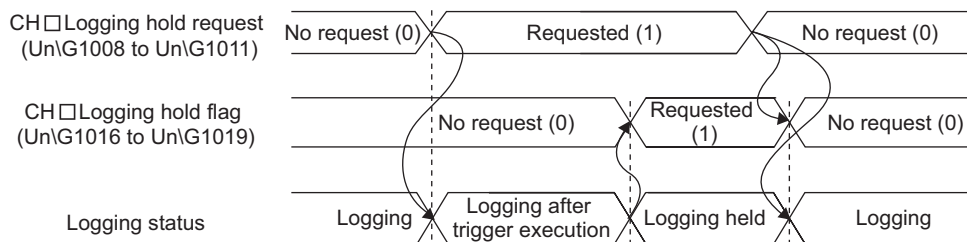
## (9) Restarting logging

To restart logging, turn CH□ Logging hold request (Un\G1008 to Un\G1011) ON → OFF. Logging is restarted from the head of the logging data storage area.

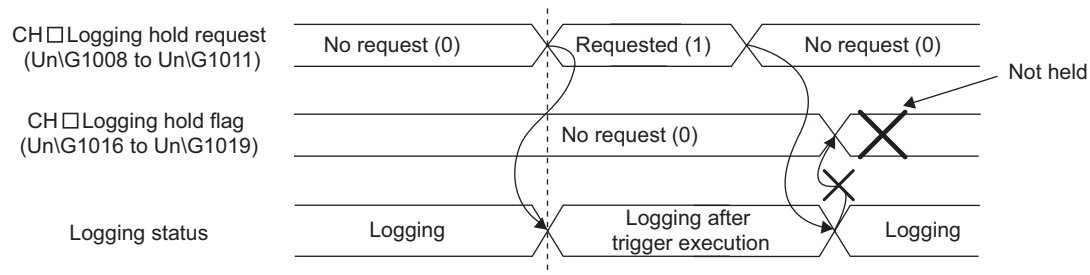
At this time, head pointer, trigger pointer, and the number of logging data are cleared, and CH□ Logging hold flag (Un\G1016 to Un\G1019) turns off.

### (a) Precautions

- It may take time for CH□ Logging hold flag (Un\G1016 to Un\G1019) to turn on after CH□ Logging hold request (Un\G1008 to Un\G1011) is turned OFF → ON. To restart logging, turn CH□ Logging hold request (Un\G1008 to Un\G1011) ON → OFF after confirming CH□ Logging hold flag (Un\G1016 to Un\G1019) turns on.



- If CH□ Logging hold request (Un\G1008 to Un\G1011) is turned ON → OFF before CH□ Logging hold flag (Un\G1016 to Un\G1019) turns on, logging does not stop.



### (b) Each buffer memory when logging is restarted

When logging resumes, the value in each buffer memory area below is as follows.

| Buffer memory                                     | Value status   |
|---|--|
| CH□ Head pointer (Un\G1090 to Un\G1093)           | Values are initialized. (Initial value: 0)                         |
| CH□ Latest pointer (Un\G1098 to Un\G1101)         |  |
| CH□ Number of logging data (Un\G1106 to Un\G1109) |  |
| CH□ Trigger pointer (Un\G1114 to Un\G1117)        |  |
| CH□ Logging data (Un\G5000 to Un\G44999)          | The value before logging is restarted is maintained. <sup>*1</sup> |

<sup>\*1</sup> After logging is restarted, values are stored starting from the head buffer memory of the logging data storage area. Since the value before logging is restarted is stored in CH□ Logging data (Un\G5000 to Un\G44999), check the valid data with CH□ Number of logging data (Un\G1106 to Un\G1109) to refer to the logging data.

## (10)When checking logging data without stopping logging

Logging data can be checked during logging. Logging data can be easily checked on a display device just by monitoring the buffer memory without stopping logging on the display device.

To check the logging data, adjust the logging cycle to prevent the logging data from being updated during read.

### (a) Checking method

Read the logging data monitoring the storage locations of the latest data and of the oldest data in the following buffer memory areas.

| Buffer memory                                     | Description  | Reference                |
|---|--|--------------------------|
| CH□ Head pointer (Un\G1090 to Un\G1093)           | The buffer memory where the oldest data is stored can be checked by number starting from the start address in the logging data storage area. | Page 195, Appendix 2(40) |
| CH□ Latest pointer (Un\G1098 to Un\G1101)         | The buffer memory where the latest data is stored can be checked by number starting from the start address in the logging data storage area. | Page 195, Appendix 2(41) |
| CH□ Number of logging data (Un\G1106 to Un\G1109) | The number of data stored in the logging data storage area can be checked.   | Page 196, Appendix 2(42) |

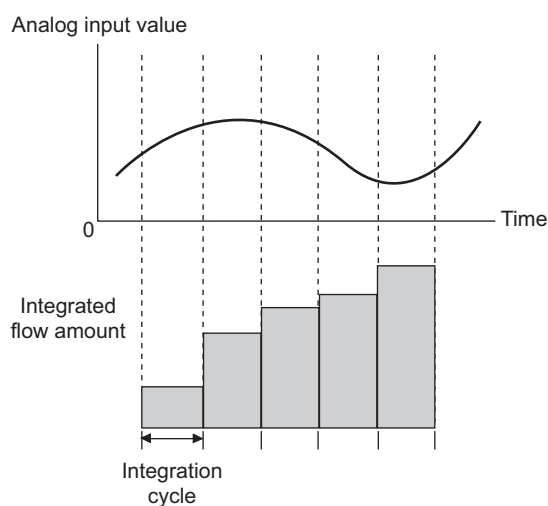
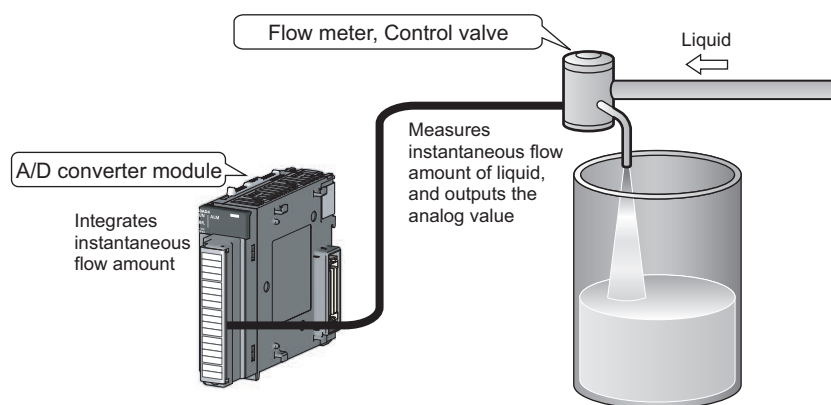
### (b) Precautions

- Set CH□ Logging cycle setting value (Un\G1032 to Un\G1035) to the cycle that confirmation and read of data surely complete before logging data is updated. If the logging cycle is short, logging data may be updated while confirming and reading data.
- After acquiring the logging data which need to be checked, monitor the variation of the head pointer and the number of logging data. Acquire logging data after the stored value changes.
- If the update of the data 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.
- To check the data without paying attention to logging cycle, use the logging hold.

## 8.15 Flow Amount Integration Function

This function performs the A/D conversion of analog input value (voltage or current) from a flow meter and others, and integrates the digital output value by every integration cycle. In this function, integral processing is performed regarding the scaling value (digital operation value) as the instantaneous flow amount.

In the flow amount integration function, the conversion speed can be set in 1ms.





## (1) Concept of integral processing

With this function, integral processing is performed using the following formula.

$$\text{Integrated flow amount} = (\text{Instantaneous flow amount} \times \frac{\Delta T}{T} \times \text{Unit scaling}) + \text{Previous amount}$$

| Item   | Description   |  |   |        |    |   |      |      |     |       |      |   |         |
|--|---|--|---|--------|----|---|------|------|-----|-------|------|---|---------|
| Integrated flow amount   | This is a result of the integral processing. The integrated flow amount is stored in CH□ Integrated flow amount (Un\G1332 to Un\G1339) in the range of 0 to 2147483647.   |  |   |        |    |   |      |      |     |       |      |   |         |
| Instantaneous flow amount  | This is an instantaneous flow amount value output in analog from the flow meter. In this function, the value stored in CH□ Scaling value (digital operation value) (Un\G54 to Un\G57) as the instantaneous flow amount.   |  |   |        |    |   |      |      |     |       |      |   |         |
| $\Delta T$   | <p>This is an integration cycle (ms) set in CH□ Integration cycle setting (Un\G1308 to Un\G1311). Set this cycle according to the output cycle of the flow meter connected to the A/D converter module.</p> <p><b>Ex.</b> When the flow meter outputs instantaneous flow amount in analog at intervals of 500ms, set 500.</p>   |  |   |        |    |   |      |      |     |       |      |   |         |
| T  | <p>This is a conversion value to convert the time unit of instantaneous flow amount to ms. Set this value in CH□ Flow amount time unit setting (Un\G1316 to Un\G1319). Set this cycle according to the range of the flow meter connected to the A/D converter module.</p> <p>The following table lists the values of T for CH□ Flow amount time unit setting (Un\G1316 to Un\G1319).</p> <table><tr><th>Range of flow meter</th><th>Setting value of CH□ Flow amount time unit setting (Un\G1316 to Un\G1319)</th><th>T (ms)</th></tr><tr><td>/s</td><td>0</td><td>1000</td></tr><tr><td>/min</td><td>1</td><td>60000</td></tr><tr><td>/h</td><td>2</td><td>3600000</td></tr></table> <p><b>Ex.</b> When the range of the flow meter is cm<sup>3</sup>/s, set /s (0).</p>   | Range of flow meter  | Setting value of CH□ Flow amount time unit setting (Un\G1316 to Un\G1319) | T (ms) | /s | 0 | 1000 | /min | 1   | 60000 | /h   | 2 | 3600000 |
| Range of flow meter  | Setting value of CH□ Flow amount time unit setting (Un\G1316 to Un\G1319)   | T (ms)   |   |        |    |   |      |      |     |       |      |   |         |
| /s   | 0   | 1000   |   |        |    |   |      |      |     |       |      |   |         |
| /min   | 1   | 60000  |   |        |    |   |      |      |     |       |      |   |         |
| /h   | 2   | 3600000  |   |        |    |   |      |      |     |       |      |   |         |
| Unit scaling   | <p>This is unit scaling of the integrated flow amount. Set this value in CH□ Unit scaling setting (Un\G1324 to Un\G1327). This is used when the value of instantaneous flow amount × <math>\Delta T/T</math> is 0 to 1.</p> <p>The following table lists the values of unit scaling for CH□ Unit scaling setting (Un\G1324 to Un\G1327).</p> <table><tr><th>Setting value of CH□ Unit scaling setting (Un\G1324 to Un\G1327)</th><th>Unit scaling</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>10</td></tr><tr><td>2</td><td>100</td></tr><tr><td>3</td><td>1000</td></tr><tr><td>4</td><td>10000</td></tr></table> <p><b>Ex.</b> When the value of <math>\Delta T/T</math> is 0.0083...(<math>\Delta T=500(\text{ms})</math>, <math>T=60000(\text{ms})</math>)<br/>Set × 1000 (3) or × 10000 (4).</p> | Setting value of CH□ Unit scaling setting (Un\G1324 to Un\G1327) | Unit scaling  | 0      | 1  | 1 | 10   | 2    | 100 | 3     | 1000 | 4 | 10000   |
| Setting value of CH□ Unit scaling setting (Un\G1324 to Un\G1327) | Unit scaling  |  |   |        |    |   |      |      |     |       |      |   |         |
| 0  | 1   |  |   |        |    |   |      |      |     |       |      |   |         |
| 1  | 10  |  |   |        |    |   |      |      |     |       |      |   |         |
| 2  | 100   |  |   |        |    |   |      |      |     |       |      |   |         |
| 3  | 1000  |  |   |        |    |   |      |      |     |       |      |   |         |
| 4  | 10000   |  |   |        |    |   |      |      |     |       |      |   |         |
| Previous amount  | This is a value stored in CH□ Integrated flow amount (Un\G1332 to Un\G1339) before integral processing.   |  |   |        |    |   |      |      |     |       |      |   |         |

### Point

- If the instantaneous flow amount is less than 0, integral processing is not performed.
- The value acquired by rounding off the part after the decimal point is stored in CH□ Integrated flow amount (Un\G1332 to Un\G1339). (Inside the A/D converter module, calculation is performed including the value after the decimal point in integral processing.)
- The value within the range of 0 to 2147483647 is stored in CH□ Integrated flow amount (Un\G1332 to Un\G1339). If the value exceeds the upper limit (2147483647), the excessive part is stored in CH□ Integrated flow amount (Un\G1332 to Un\G1339).

**Ex.** When the previous amount is 2147483000 and the present amount (Instantaneous flow amount  $\times$  Unit scaling  $\times \Delta T/T$ ) is 5000,  
(2147483000 + 5000) - 2147483647 = 4353 is stored in CH□ Integrated flow amount (Un\G1332 to Un\G1339).

## (2) Concept of integration cycle

Set the integration cycle according to the analog output cycle of the flow meter connected to the A/D converter module. In addition, set this cycle as an integral multiple of the updating cycle of CH□ Scaling value (digital operation value) (Un\G54 to Un\G57).

The updating cycle of CH□ Scaling value (digital operation value) (Un\G54 to Un\G57) equals to the conversion cycle of the specified A/D conversion method. The following table lists the conversion cycle of each A/D conversion method.

| A/D conversion method     | Conversion cycle   |
|---------------------------|--|
| Sampling processing       | Conversion speed <sup>*1</sup> × Number of used channels (ms)  |
| Count average processing  | $\left( \frac{\text{Time set in "Time Average/Count Average/Moving Average"}}{\text{Number of used channels}} \right)^{*2} \times \text{Conversion speed}^{*1} \times \text{Number of used channels (ms)}$ |
| Time average processing   | Number of times set in "Time Average/ Count Average/Moving Average" × Conversion speed <sup>*1</sup> × Number of used channels (ms)  |
| Moving average processing | Conversion speed <sup>*1</sup> × Number of used channels (ms)  |

\*1 In the flow amount integration function, the conversion speed can be set in 1ms. Therefore, the conversion speed is 1ms.

\*2 The value after the decimal point is rounded off.

If the setting value of CH□ Integration cycle setting (Un\G1308 to Un\G1311) is not an integral multiple of the updating cycle of CH□ Scaling value (digital operation value) (Un\G54 to Un\G57), the maximum value of an integral multiple less than the value set in CH□ Integration cycle setting (Un\G1308 to Un\G1311) is calculated as the integration cycle.

Check the calculated integration cycle, which is stored in CH□ Integration cycle monitor value (Un\G1348 to Un\G1351).

**Ex.** When the integration cycle is calculated with the following settings

- A/D conversion enable in CH1 to CH3
- "Averaging process setting" is "0: Sampling processing"
- "Integration cycle setting" is 5000

Since the updating cycle of CH□ Scaling value (digital operation value) (Un\G54 to Un\G57) is 3ms, the integration cycle is determined as 4998ms (the maximum cycle of an integral multiple of 3ms).

### **Point**

If CH□ Integration cycle setting (Un\G1308 to Un\G1311) is less than the updating cycle of CH□ Scaling value (digital operation value) (Un\G54 to Un\G57), the flow amount integration function turns disabled and an error (error code: 212□) occurs.

### (3) Concept of unit scaling

Unit scaling adjusts the number of digits of the integrated flow amount by multiplying "instantaneous flow amount  $\times \Delta T/T$ " by a multiple of 10.

Set the unit scaling to store the value after the decimal point of "instantaneous flow amount  $\times \Delta T/T$ " in CH□ Integrated flow amount (Un\G1332 to Un\G1339).

**Ex.** When the value of "instantaneous flow amount  $\times \Delta T/T$ " is 123.45

By setting 100 as a unit scaling, the value of "instantaneous flow amount  $\times \Delta T/T$ " turns 12345 and the value after the decimal point can be stored in CH□ Integrated flow amount (Un\G1332 to Un\G1339).

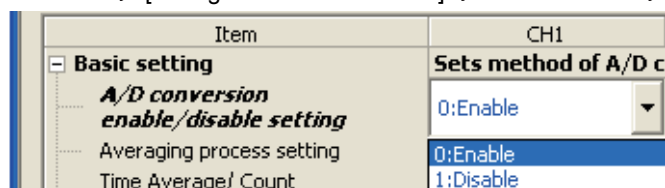
The following table lists the indications of the calculated value of  $\Delta T/T$  acquired by the combination of CH□ Flow amount time unit setting (Un\G1316 to Un\G1319) (T) and CH□ Integration cycle setting (Un\G1308 to Un\G1311) ( $\Delta T$ ) and the value set in CH□ Unit scaling setting (Un\G1324 to Un\G1327).

| Setting value of CH□ Flow amount time unit setting (Un\G1316 to Un\G1319) (T) | Setting value of CH□ Integration cycle setting (Un\G1308 to Un\G1311) ( $\Delta T$ ) | $\Delta T/T$ | Indication of unit scaling |
|---|--|--------------|----------------------------|
| 0<br>(T = 1000)   | 1  | 0.001        | $\times 1000$              |
|   | 500  | 0.5          | $\times 10$                |
|   | 1000   | 1            | $\times 1$                 |
|   | 5000   | 5            | $\times 1$                 |
| 1<br>(T = 60000)  | 1  | 0.000016666  | $\times 10000$             |
|   | 500  | 0.008333333  | $\times 10000$             |
|   | 1000   | 0.016666666  | $\times 1000$              |
|   | 5000   | 0.083333333  | $\times 1000$              |
| 2<br>(T = 3600000)  | 1  | 0.000000277  | $\times 10000$             |
|   | 500  | 0.000138888  | $\times 10000$             |
|   | 1000   | 0.000277777  | $\times 10000$             |
|   | 5000   | 0.001388888  | $\times 10000$             |

#### (4) Setting procedure

1. Set "A/D conversion enable/disable setting" to "0: Enable".

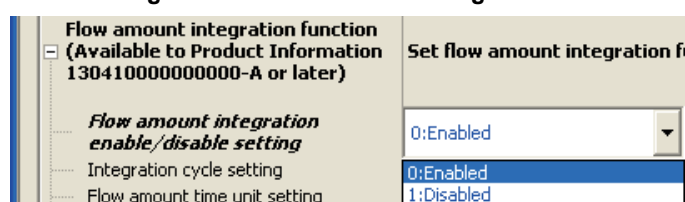
Project window ⇒ [Intelligent Function Module] ⇒ module name ⇒ [Parameter]



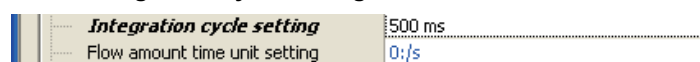
2. Set "Conversion speed setting" to "2: 1ms".



3. Set "Flow amount integration enable/disable setting" to "0: Enabled".



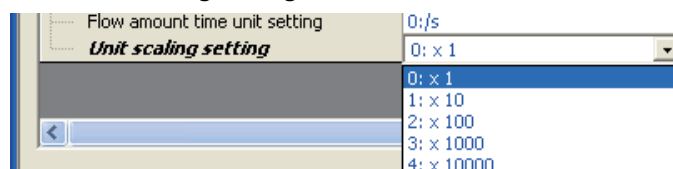
4. Set a value for "Integration cycle setting".



5. Set a value for "Flow amount time unit setting"



6. Set a value for "Unit scaling setting"



| Item                      | Setting range |
|---------------------------|---------------|
| Integration cycle setting | 1 to 5000ms   |

**Ex.** When the flow meter connected to the A/D converter module output the instantaneous flow amount (range: cm<sup>3</sup>/min) in analog at intervals of 500ms

- "Integration cycle setting": 500ms
- "Flow amount time unit setting": "1: /min"
- "Unit scaling setting": "2: × 100"
- Value in CH□ Scaling value (digital operation value) (Un\G54 to Un\G57) when integral processing is performed: 5000
- Previous amount: 11000 (Maintained amount inside the A/D converter module: 11000.127)

The following formulation shows the integrated flow amount with the above settings.

| Flow amount integration function<br>(Available to Product Information<br>13041000000000-A or later) |           |
|---|-----------|
| Flow amount integration<br>enable/disable setting   | 0:Enabled |
| Integration cycle setting   | 500 ms    |
| Flow amount time unit setting   | 1:/min    |
| Unit scaling setting  | 2: × 100  |

$$\begin{aligned}
 \text{Integrated flow amount} &= (\text{Instantaneous flow amount} \times \frac{\Delta T}{T} \times \text{Unit scaling}) + \text{Previous amount} \\
 &= (5000 \times \frac{500}{60000} \times 100) + 11000.127 \\
 &= 4166.666 \dots + 11000.127 \\
 &= 15166.7936 \dots
 \end{aligned}$$

"15166" acquired by rounding off the value after the decimal point is stored in CH□ Integrated flow amount (Un\G1332 to Un\G1339).

8

## (5) Flow amount integration temporary stop

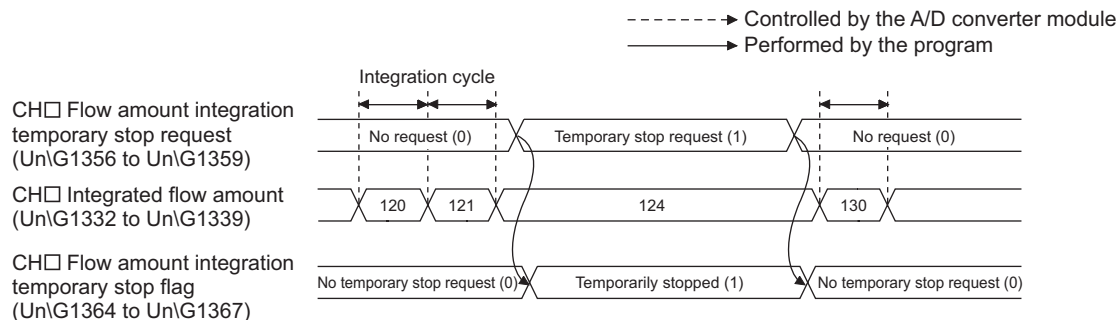
The flow amount integration can be stopped temporarily through a program. Flow amount integration function can be temporarily stopped by changing the value of CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359) during its operation. CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359) operates only when the flow amount integration function is enabled.

### (a) Operation procedure to stop the flow amount integration temporarily

1. While the flow amount integration function is operating, change the CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359) of the channel to be stopped temporarily No request (0) → Temporary stop request (1).
2. When the rise of No request (0) → Temporary stop request (1) is detected, the flow amount integration function is temporarily stopped, and CH□ Flow amount integration temporary stop flag (Un\G1364 to Un\G1367) of the corresponding channel turns Temporarily stopped (1).

### (b) Operation procedure to restart the flow amount integration (to cancel temporary stop)

1. While the flow amount integration function is temporarily stopped, change the CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359) of the stopped channel Temporary stop request (1) → No request (0).
2. When the fall of Temporary stop request (1) → No request (0) is detected, the flow amount integration function is restarted, and CH□ Flow amount integration temporary stop flag (Un\G1364 to Un\G1367) of the corresponding channel turns No temporary stop request (0).

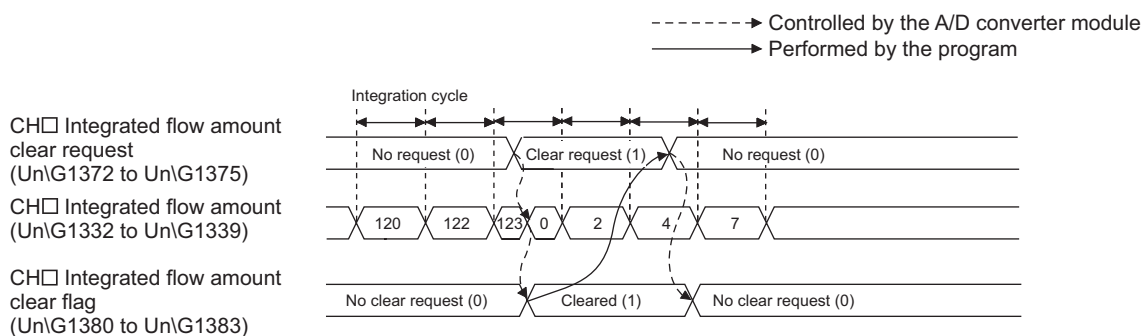


## (6) Clearing the integrated flow amount

The integrated flow amount can be cleared in a program. The integrated flow amount can be cleared by changing the value of CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375) while the flow amount integration function is operating. CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375) operates only when the flow amount integration function is enabled.

### (a) Operation procedure to clear the integrated flow amount

1. While the flow amount integration function is operating, change the CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375) of the channel to be cleared No request (0) → Clear request (1).
2. When the rise of No request (0) → Clear request (1) is detected, the value of CH□ Integrated flow amount (Un\G1332 to Un\G1339) of the corresponding channel is cleared to zero.
3. After it is cleared, CH□ Integrated flow amount clear flag (Un\G1380 to Un\G1383) of the cleared channel turns Cleared (1)
4. Confirm CH□ Integrated flow amount clear flag (Un\G1380 to Un\G1383) is Cleared (1) and change CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375) Clear request (1) → No request (0).
5. When the fall of Clear request (1) → No request (0) is detected, CH□ Integrated flow amount clear flag (Un\G1380 to Un\G1383) turns No request (0).

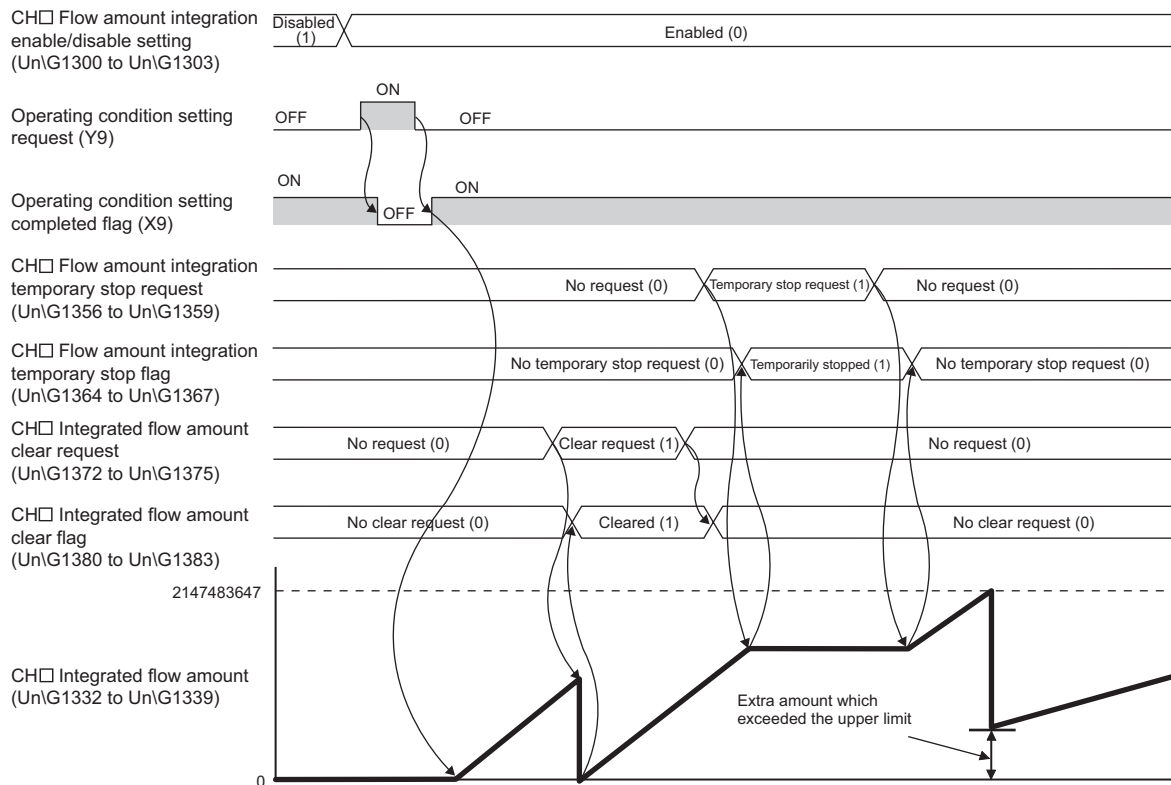


### Point

- CH□ Integrated flow amount (Un\G1332 to Un\G1339) is also cleared to zero in the following case.
  - Set CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303) to Enable (0) and turn Operating condition setting request (Y9) OFF → ON → OFF.

## (7) Change of the integrated flow amount

The following timing chart shows the timings that the integrated flow amount changes.



## (8) Operation when an input signal error occurs

The integral processing cannot be performed while an input signal error is occurring. When the analog input value returns within the setting range and the A/D conversion is restarted, the integral processing is performed.

## (9) Operation when Operating condition setting request (Y9) is turned OFF → ON → OFF

The following processing is performed by changing the settings in the following buffer memory areas and turning Operating condition setting request (Y9) OFF → ON → OFF. The flow amount integration function is performed with the changed settings.

| Buffer memory   | Processing after changing setting  |
|---|--|
| A/D conversion enable/disable setting (Un\G0)                   | <ul style="list-style-type: none"> <li>Integration cycles of all channels are changed just by changing 1 channel.</li> <li>The integral processing stops in the channel in which A/D conversion enable/disable setting (Un\G0) changes from Enable (0) to Disable (0). CH□ Integrated flow amount (Un\G1332 to Un\G1339) maintains the value before changing.</li> <li>CH□ Integrated flow amount (Un\G1332 to Un\G1339) of the unchanged channel is cleared to zero. After it is cleared, restart the integral processing with the setting before turning on Operating condition setting request (Y9).</li> </ul> |
| CH□ Time Average/ Count Average/Moving Average (Un\G1 to Un\G4) | <ul style="list-style-type: none"> <li>The integration cycle changes in only the changed channel.</li> <li>CH□ Integrated flow amount (Un\G1332 to Un\G1339) of the changed channel is cleared to zero.</li> <li>CH□ Integrated flow amount (Un\G1332 to Un\G1339) of the unchanged channel is not cleared. The integral processing is continued with the setting before turning on Operating condition setting request (Y9).</li> </ul>   |
| Averaging process setting (used to replace Q64AD) (Un\G9)       |  |
| Averaging process setting (Un\G24)                              |  |
| CH□ Integration cycle setting (Un\G1308 to Un\G1311)            | <ul style="list-style-type: none"> <li>Only in the changed channel, values to be stored in CH□ Integrated flow amount (Un\G1332 to Un\G1339) are changed according to the changed setting of the buffer memory.</li> <li>CH□ Integrated flow amount (Un\G1332 to Un\G1339) of the changed channel is cleared to zero.</li> <li>CH□ Integrated flow amount (Un\G1332 to Un\G1339) of the unchanged channel is not cleared. The integral processing is continued with the setting before turning on Operating condition setting request (Y9).</li> </ul>   |
| CH□ Flow amount time unit setting (Un\G1316 to Un\G1319)        |  |
| CH□ Unit scaling setting (Un\G1324 to Un\G1327)                 |  |

### Point

If Operating condition setting request (Y9) is turned OFF → ON → OFF and one of the following error occurs, the flow amount integration function turns disabled.

- Setting error of CH□ Time Average/ Count Average/Moving Average (Un\G1 to Un\G4) (error code: 20□, error code: 30□, error code: 31□)
- Setting error of Conversion speed setting (Un\G26) (error code: 360□, error code: 210□)
- Setting error of CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303) (error code: 210□)
- Setting error of CH□ Integration cycle setting (Un\G1308 to Un\G1311) (error code: 211□, error code 212□)
- Setting error of CH□ Flow amount time unit setting (Un\G1316 to Un\G1319) (error code: 213□)
- Setting error of CH□ Unit scaling setting (Un\G1324 to Un\G1327) (error code: 214□)

For details on the error contents, refer to the following.

- Error code list (📖 Page 159, Section 11.4)



## 8.16 Error Log Function

Stores a history of errors and alarms that occurred in the A/D converter module to the buffer memory (Un\G1810 to Un\G1969).

A maximum of 16 errors and alarms can be stored.

### (1) Process of the error log function

The error code and the time of error occurrence are stored in the buffer memory address, starting from error history No.1 (start address Un\G1810) and sequentially thereafter. Error occurrence time is stored as follows:

**Ex.** For error history No. 1

|          |                              |    |    |                             |    |    |
|----------|------------------------------|----|----|-----------------------------|----|----|
|          | b15                          | to | b8 | b7                          | to | b0 |
| Un\G1810 | Error code                   |    |    |                             |    |    |
| Un\G1811 | First two digits of the year |    |    | Last two digits of the year |    |    |
| Un\G1812 | Month                        |    |    | Day                         |    |    |
| Un\G1813 | Hour                         |    |    | Minute                      |    |    |
| Un\G1814 | Second                       |    |    | Day of the week             |    |    |
| Un\G1815 | System area                  |    |    |                             |    |    |
| to       |                              |    |    |                             |    |    |
| Un\G1819 |                              |    |    |                             |    |    |

| Item   | Storage contents   | Storage example <sup>*1</sup> |
|--|--|-------------------------------|
| First two digits of the year/<br>Last two digits of the year | Stored in BCD code.  | 2011 <sub>H</sub>             |
| Month/Day  |  | 329 <sub>H</sub>              |
| Hour/Minute  |  | 1035 <sub>H</sub>             |
| Second   |  | 40 <sub>H</sub>               |
| Day of the week  | One of the following values is stored for each day of the week in BCD code.<br><ul style="list-style-type: none"> <li>• Sunday: 0</li> <li>• Tuesday: 2</li> <li>• Thursday: 4</li> <li>• Saturday: 6</li> <li>• Monday: 1</li> <li>• Wednesday: 3</li> <li>• Friday: 5</li> </ul> | 2 <sub>H</sub>                |

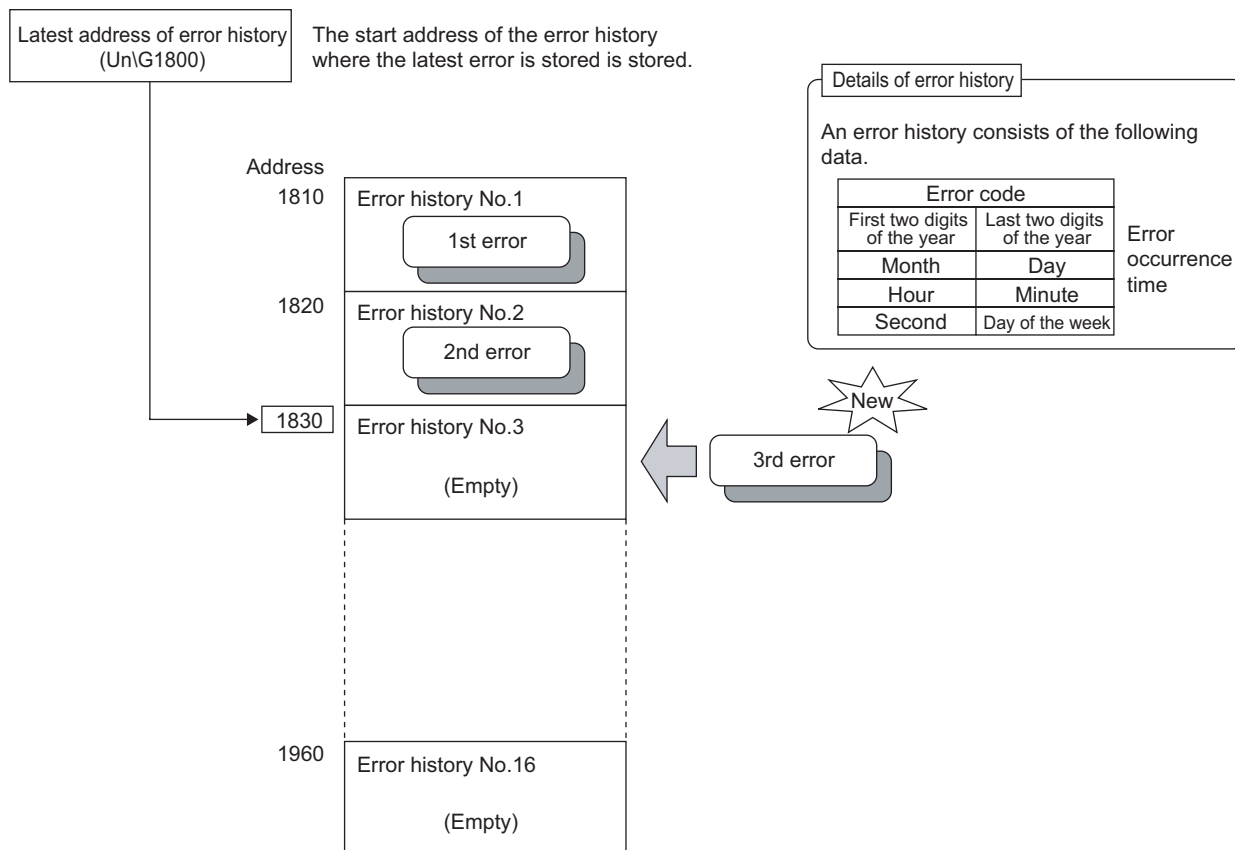
<sup>\*1</sup> Those are values when an error occurs at 10:35:40 on Tuesday, March 29th, 2011.

## (2) Checking error history

You can check the start address of the latest stored error at Latest address of error history (Un\G1800)

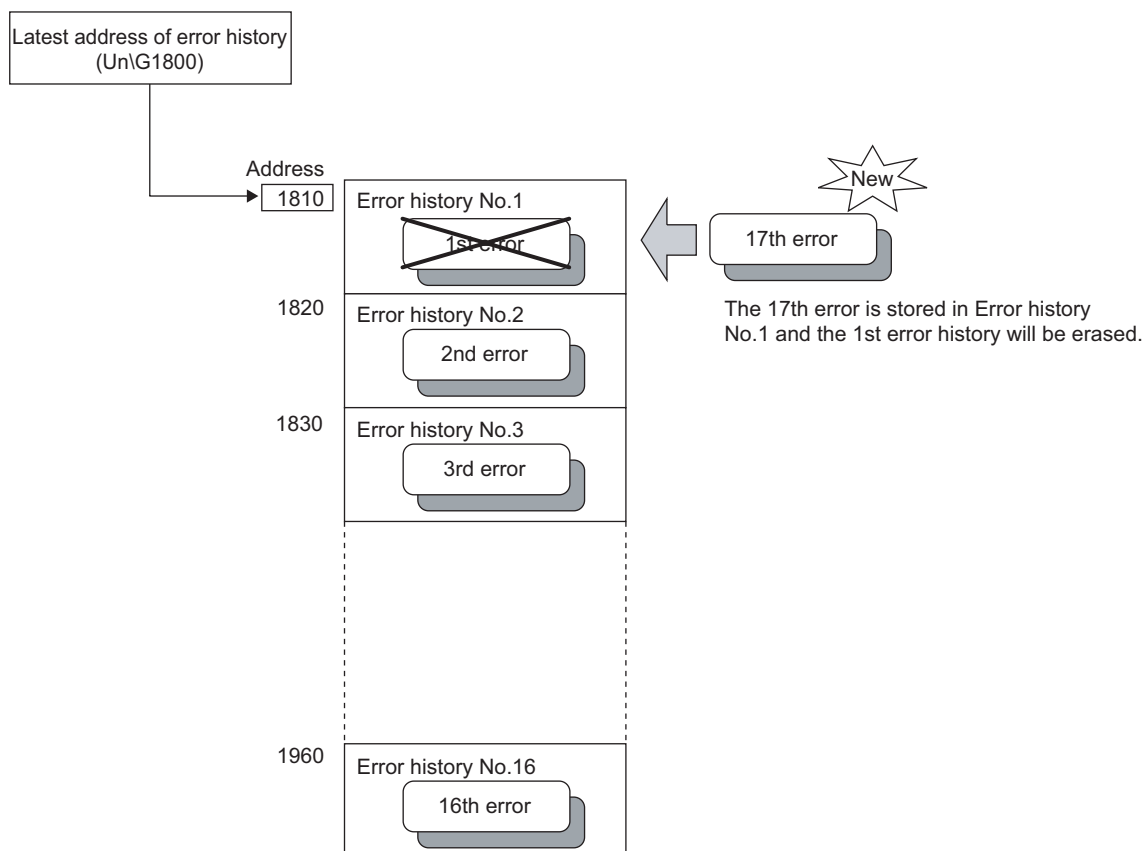
**Ex.** 1. When the third error occurs:

The third error is stored in error history No.3, and the value "1830" (start address of error history No.3) is stored to Latest address of error history (Un\G1800).



**Ex.** 2. When a 17th error occurs:

The 17th error is stored in error history No.1, and the value "1810" (start address of error history No.1) gets stored to Latest address of error history (Un\G1800).

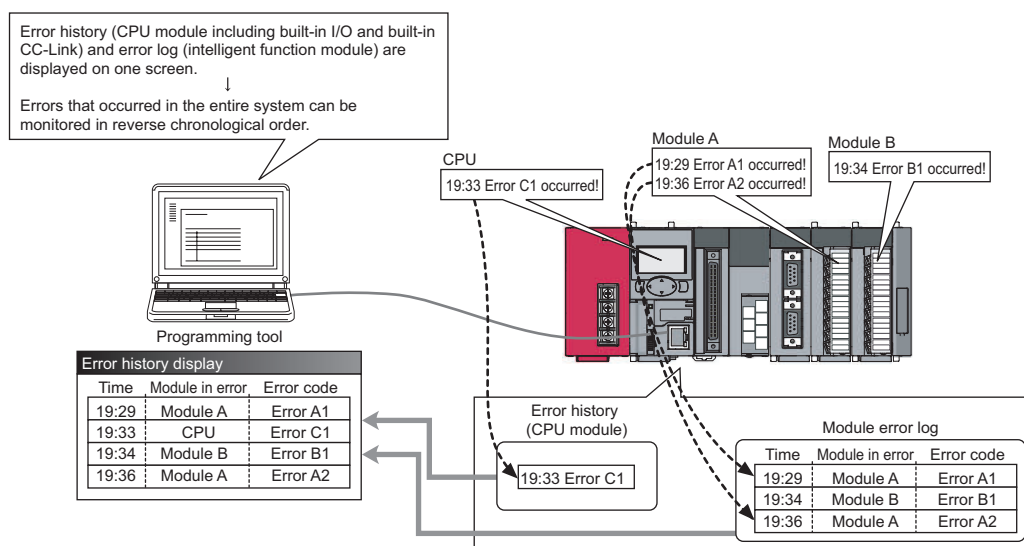


### Point

- The same process for errors is used when an alarm occurs.
- Once the error history storage area becomes full, subsequent errors will overwrite the previous errors, starting from error history No.1, and continues sequentially thereafter (Un\G1810 to Un\G1819). (The overwritten history is deleted.)
- The stored error history is cleared when power supply is turned OFF, or when the CPU module is reset.

## 8.17 Module Error Collection Function

Collects the errors and alarms that occurred in the A/D converter module, into the CPU module or the head module. By holding the module errors in a memory that can hold data in the event of power failure, the errors can be held even after powering off or resetting the CPU module or the head module.



[Example of screen display]

| No.   | Error Code | Date and Time       | Model Name | Start I/O |
|-------|------------|---------------------|------------|-----------|
| 00125 | 0070       | 2009/12/10 17:02:37 | L60AD4     | 0030      |
| 00124 | 0070       | 2009/12/10 17:00:05 | L60AD4     | 0030      |
| 00123 | 0CE4       | 2009/12/10 17:00:04 | L26CPU-BT  | ----      |
| 00122 | 05DC       | 2009/12/10 16:15:50 | L26CPU-BT  | ----      |
| 00121 | 0070       | 2009/12/10 15:59:30 | L60DA4     | 0030      |
| 00120 | 0070       | 2009/12/10 15:45:02 | L60DA4     | 0010      |
| 00119 | 05DC       | 2009/12/10 14:14:38 | L26CPU-BT  | ----      |
| 00118 | 0070       | 2009/12/10 14:12:03 | L60DA4     | 0010      |
| 00117 | 0CE4       | 2009/12/10 13:59:54 | L26CPU-BT  | ----      |
| 00116 | 0CE4       | 2009/12/10 13:35:11 | L26CPU-BT  | ----      |
| 00115 | 05DC       | 2009/12/10 11:11:45 | L26CPU-BT  | ----      |
| 00114 | 0070       | 2009/12/10 11:07:05 | L60AD4     | 0010      |
| 00113 | 0CE4       | 2009/12/10 11:07:04 | L26CPU-BT  | ----      |
| 00112 | 0070       | 2009/12/10 11:03:49 | L60AD4     | 0010      |
| 00111 | 0CE4       | 2009/12/10 11:03:48 | L26CPU-BT  | ----      |
| 00110 | 05DC       | 2009/12/09 16:30:58 | L26CPU-BT  | ----      |
| 00109 | 0070       | 2009/12/09 16:29:33 | L60DA4     | 0010      |
| 00108 | 0070       | 2009/12/09 16:29:12 | L60DA4     | 0010      |
| 00107 | 083B       | 2009/12/09 16:29:11 | L26CPU-BT  | ----      |



For details on the module error collection function, refer to the following.

MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

## 8.18 Error Clear Function

When an error occurs, you can clear the error from the system monitor.

By clicking the **Error Clear** button in the system monitor, the latest error code stored in Latest error code (Un\G19) is cleared and the ERR. LED is also turned off. The operation is the same as Error clear request (YF) as well as executing error clear from the display unit.

However, error history cannot be cleared.

For instructions on Error clear request (YF) and executing error clear from the display unit, refer to the following.

- Error clear request (YF) (☞ Page 167, Appendix 1)
- Checking/Clearing an Error (☞ Page 138, Section 9.4)

☞ [Diagnostics] ⇒ [System Monitor...] ⇒ Error Module

**Module's Detailed Information**

**Monitor Status**  
Monitoring

**Module**  
Model Name: L60AD4  
I/O Address: 0010  
Mount Position: Main block 0th slot  
Product Information: 13041000000000-A  
Production Number: ---

**Module Information**  
Module Access: Possible  
Status of External Power Supply: ---  
Fuse Blown Status: ---  
Status of I/O Address Verify: Agree  
I/O Clear / Hold Setting: ---  
Noise Filter Setting: ---  
Input Type: ---  
Remote Password Setting Status: ---

**Error Information**  
Latest Error Code: 360  
Update Error History  
Clear Error History  
Error Clear  
Display Format: ☐ HEX ☒ DEC  
The error history is sequentially displayed from an old error. The latest error is displayed at the bottom line.

**Error and Solution**  
Contents:  
Solution:

Stop Monitor Close

## 8.19 Saving and Restoring Offset/Gain Values

With the A/D converter module, you can save and restore offset/gain values in the user range setting.

In the event that the A/D converter module fails and need to be replaced, you can restore the offset/gain values of the failed A/D converter module onto a replacement A/D converter module.

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

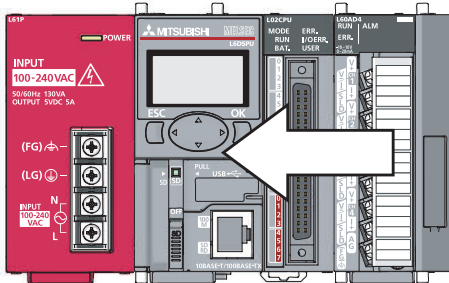
However, if you save and restore the offset/gain values, the accuracy after the restoration decreases by approximately three times compared to that before the restoration.

Reconfigure the offset/gain as necessary.

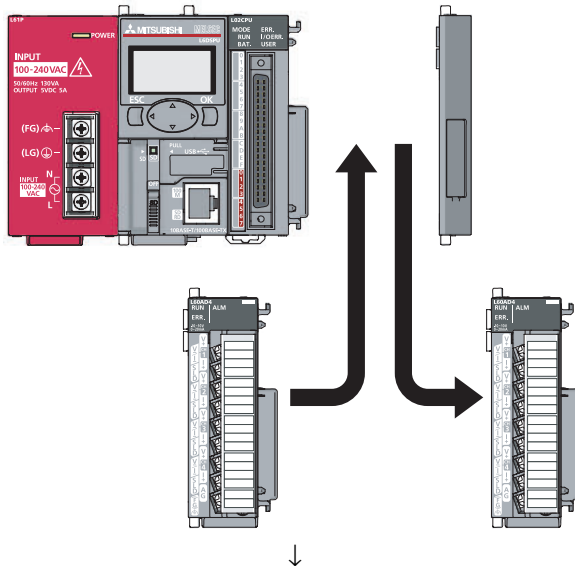
### (1) Procedure for saving and restoring offset/gain values

#### (a) To restore offset/gain values onto a new replacement module:

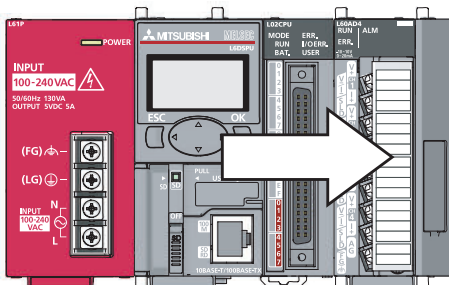
##### 1. Save the offset/gain values.



##### 2. Replace A/D converter unit.

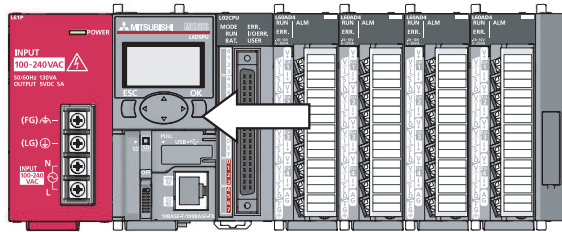


##### 3. Restore the offset/gain values.

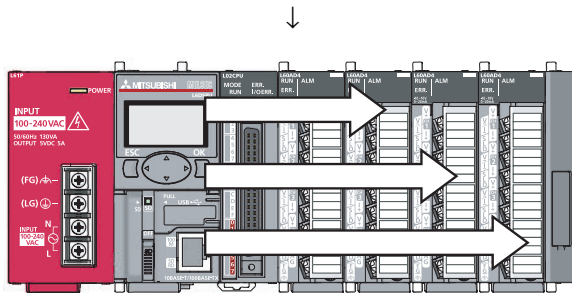


(b) To apply the offset/gain values of one module to the other modules in the same system:

**Ex.** Here, the offset/gain setting of module No.1 is 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.**

## (2) Methods for saving and restoring offset/gain values

There are two methods for saving and restoring offset/gain values.

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

### (a) Saving and restoring by a dedicated instruction

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

You can prevent the saved offset/gain value data from getting deleted, by doing one of the following 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 SP.FWRITE instruction  
To read data: use SP.FREAD instruction
- Store the saved data

For use of dedicated instructions, refer to the following.

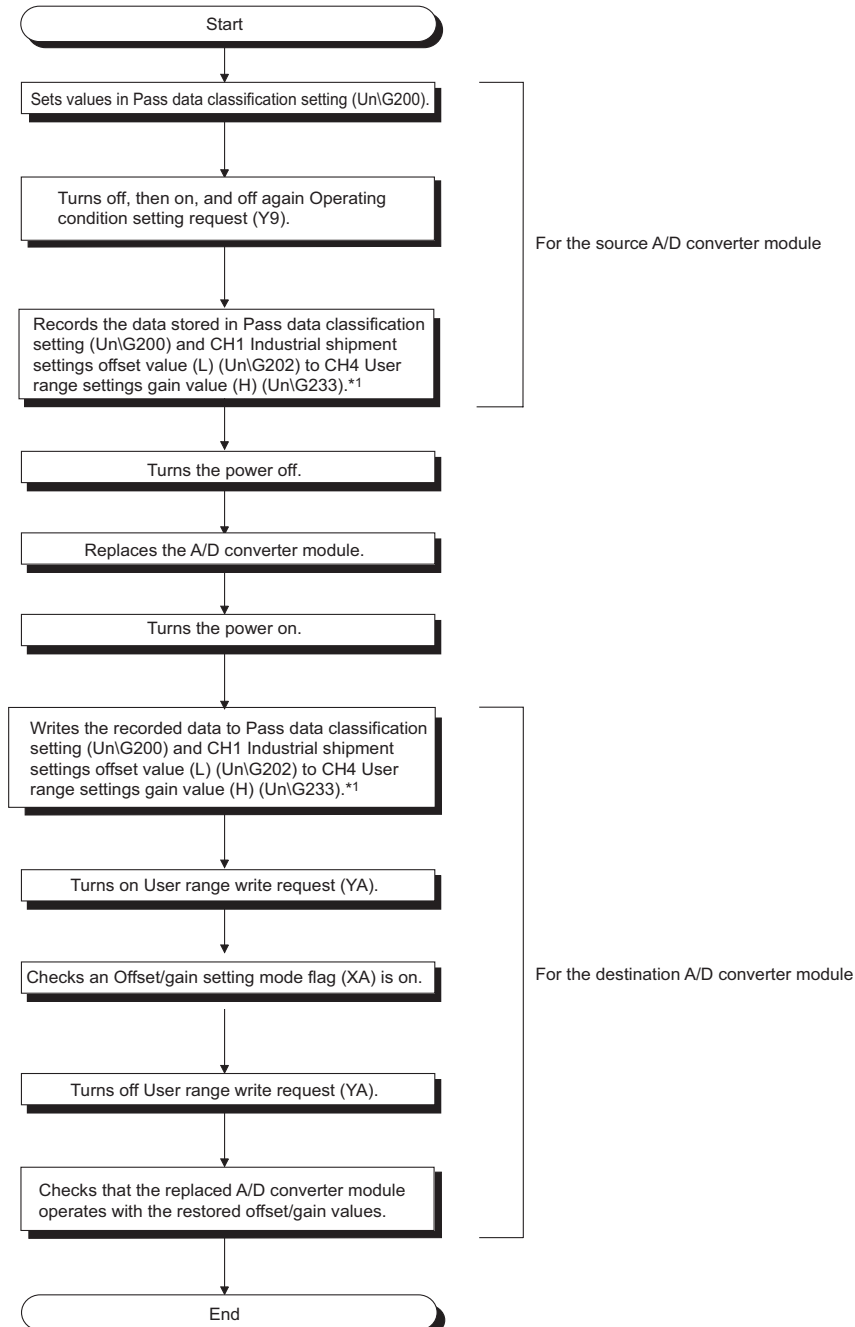
- Dedicated Instructions (☞ Page 209, Appendix 5)

## (b) Saving and restoring by reading from and writing to the buffer memory

In the buffer memory, use Pass data classification setting (Un\G200), CH1 Industrial shipment settings offset value (L)(Un\G202) to CH4 User range settings gain value (H)(Un\G233), and User range write request (YA) to read the offset/gain values from the source A/D converter module, then use the buffer memory again to write to the destination A/D converter module.

The procedure for using the buffer memory is described below.

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

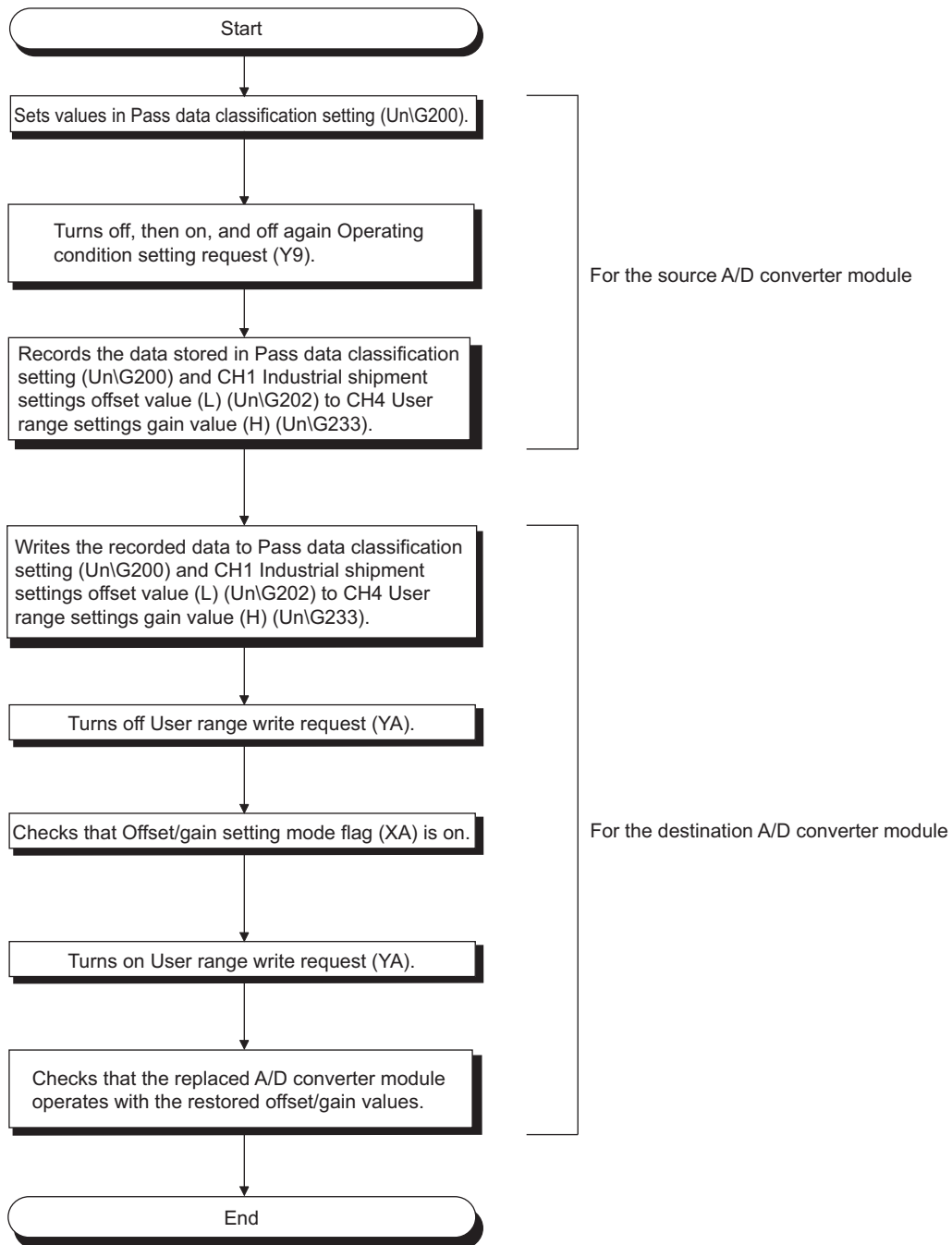


\*1 When replacing modules, you can prevent the saved offset/gain value data from getting deleted, by doing one of the following before turning the power off:

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



- To apply the offset/gain values of one module to the other modules:



### (3) Range reference tables

Below are reference ranges to be used for saving and restoring offset/gain values.

#### (a) Reference table for CH1 Industrial shipment settings offset value (L)(Un\G202) to CH4 Industrial shipment settings gain value (H)(Un\G217)

The reference values will vary depending on Pass data classification setting (Un\G200) (voltage or current).

| Address (decimal) |          |          |          | Description                               | Pass data classification setting | Reference value (hexadecimal) |
|-------------------|----------|----------|----------|---|----------------------------------|-------------------------------|
| CH1               | CH2      | CH3      | CH4      |   |                                  |                               |
| 202, 203          | 206, 207 | 210, 211 | 214, 215 | Industrial shipment settings offset value | Voltage                          | Approx. 00000007 <sub>H</sub> |
|                   |          |          |          |   | Current                          | Approx. 0000000E <sub>H</sub> |
| 204, 205          | 208, 209 | 212, 213 | 216, 217 | Industrial shipment settings gain value   | Voltage                          | Approx. 00008011 <sub>H</sub> |
|                   |          |          |          |   | Current                          | Approx. 00008018 <sub>H</sub> |

#### (b) Reference table for CH1 User range settings offset value (L)(Un\G218) to CH4 User range settings gain value (H)(Un\G233)


| Offset/gain value |                    | Reference value (hexadecimal) |
|-------------------|--------------------|-------------------------------|
| Voltage           | 0V                 | Approx. 00000007 <sub>H</sub> |
|                   | 1V                 | Approx. 00000CD4 <sub>H</sub> |
|                   | 5V                 | Approx. 0000400C <sub>H</sub> |
|                   | 10V                | Approx. 00008011 <sub>H</sub> |
| Current           | 0mA                | Approx. 00000007 <sub>H</sub> |
|                   | 4mA* <sup>1</sup>  | Approx. 00000CD4 <sub>H</sub> |
|                   | 20mA* <sup>2</sup> | Approx. 0000400C <sub>H</sub> |

\*1 This is the value that is stored in user range offset value at the time of shipping.

\*2 This is the value that is stored in user range gain value at the time of shipping.

# CHAPTER 9 DISPLAY UNIT

This chapter describes the functions of the display unit that can be used with the A/D converter module. For instruction on operating the display unit, or for details on the functions and menu configuration, refer to the following.


 MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)

## 9.1 Display Unit

The display unit is an LCD to be attached to the CPU module. By attaching it to the CPU module, you can check the status of the system and change system settings without the software package.

In addition, in the event a problem occurs, you can identify the cause of the problem by displaying the error information.

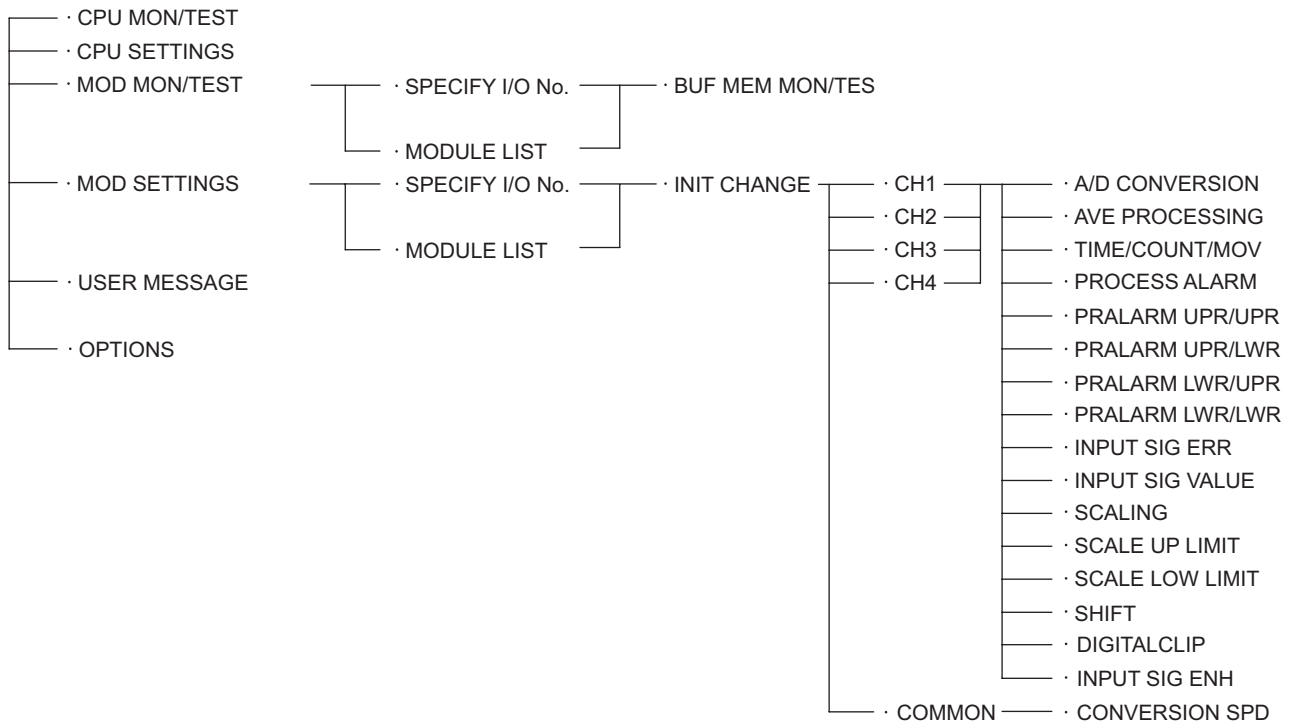
For details on how to check and clear an error from the display unit, refer to the following.

- Checking/Clearing an Error ( Page 138, Section 9.4)

## 9.2 Menu Transition

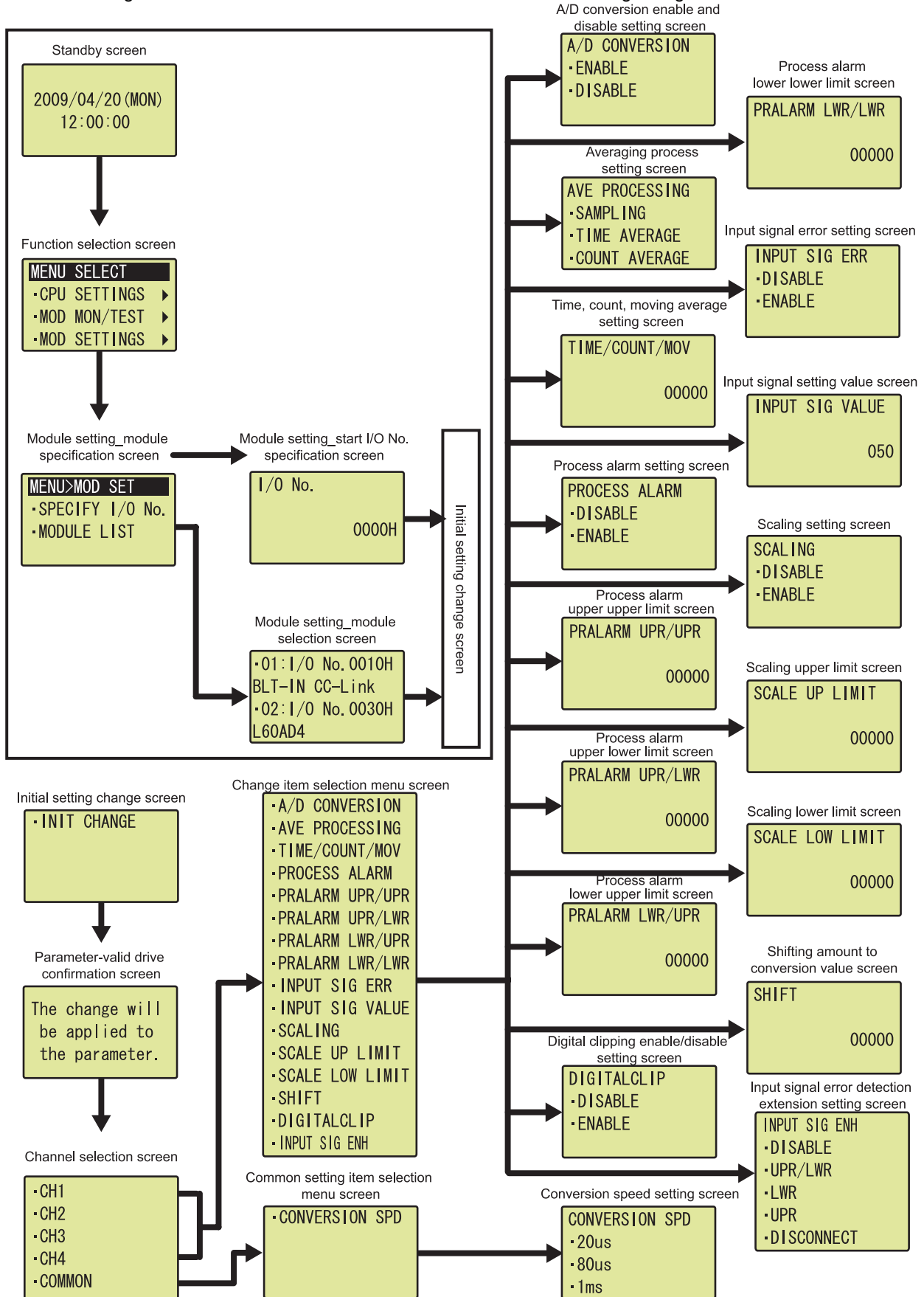
### (1) Organization

The diagram below shows how the "MOD MON/TEST" and "MOD SETTINGS" menus are organized.



## (2) Screen transitions up to the initial setting change screen

The diagram below shows how the screens transition to the initial setting change screen.



## 9.3 List of Setting Value Change Screens

The following is a list of setting value change screens.

### (1) Displayed in English:

| Name   |                 | Screen format | Input limits |             |
|--|-----------------|---------------|--------------|-------------|
| Setting item   | Screen display  |               | Upper limit  | Lower limit |
| A/D conversion enable/disable setting                | A/D CONVERSION  | Selection     | —            | —           |
| Averaging process setting                            | AVE PROCESSING  | Selection     | —            | —           |
| Time Average/ Count Average/Moving Average           | TIME/COUNT/MOV  | Numeric       | 62500        | 2           |
| Warning output setting                               | PROCESS ALARM   | Selection     | —            | —           |
| Process alarm upper upper limit value                | PRALARM UPR/UPR | Numeric       | 32767        | -32768      |
| Process alarm upper lower limit value                | PRALARM UPR/LWR | Numeric       | 32767        | -32768      |
| Process alarm lower upper limit value                | PRALARM LWR/UPR | Numeric       | 32767        | -32768      |
| Process alarm lower lower limit value                | PRALARM LWR/LWR | Numeric       | 32767        | -32768      |
| Input signal error detection setting                 | INPUT SIG ERR   | Selection     | —            | —           |
| Input signal error detection setting value           | INPUT SIG VALUE | Numeric       | 250          | 0           |
| Scaling function                                     | SCALING         | Selection     | —            | —           |
| Scaling upper limit value                            | SCALE UP LIMIT  | Numeric       | 32000        | -32000      |
| Scaling lower limit value                            | SCALE LOW LIMIT | Numeric       | 32000        | -32000      |
| Shifting amount to conversion value                  | SHIFT           | Numeric       | 32767        | -32768      |
| Digital clipping function                            | DIGITALCLIP     | Selection     | —            | —           |
| Input signal error detection enhancing setting value | INPUT SIG ENH   | Selection     | —            | —           |
| Conversion speed setting                             | CONVERSION SPD  | Selection     | —            | —           |

## (2) A/D conversion enable/disable setting

Select "ENABLE" or "DISABLE" in the "A/D CONVERSION" screen.

"A/D CONVERSION" screen

|                         |                                       |
|-------------------------|---------------------------------------|
| A/D変換許可禁止<br>・許可<br>・禁止 | A/D CONVERSION<br>・ENABLE<br>・DISABLE |
|-------------------------|---------------------------------------|

1. Use the ▲ and ▼ buttons to select "ENABLE" or "DISABLE", and then confirm with the  button.

## (3) Averaging process setting

In the "AVE PROCESSING" screen, select whether to perform sampling processing or averaging processing (time average, count average, moving average).

"AVE PROCESSING" screen

|                                       |  |
|---------------------------------------|--|
| 平均処理指定<br>・サンプリング処理<br>・時間平均<br>・回数平均 | AVE PROCESSING<br>・SAMPLING<br>・TIME AVERAGE<br>・COUNT AVERAGE |
|---------------------------------------|--|



"TIME/COUNT/MOV" screen

|   |   |
|---|---|
| 時間/回数/移動<br><br><div style="text-align: right;">00000</div> | TIME/COUNT/MOV<br><br><div style="text-align: right;">00000</div> |
|---|---|



1. Use the ▲ and ▼ buttons to select "SAMPLING", "TIME AVERAGE", "COUNT AVERAGE", or "MOVING AVERAGE", and then confirm with the . (If you selected any item other than "SAMPLING", proceed to step 2.)
2. Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the  button.

Table of input items

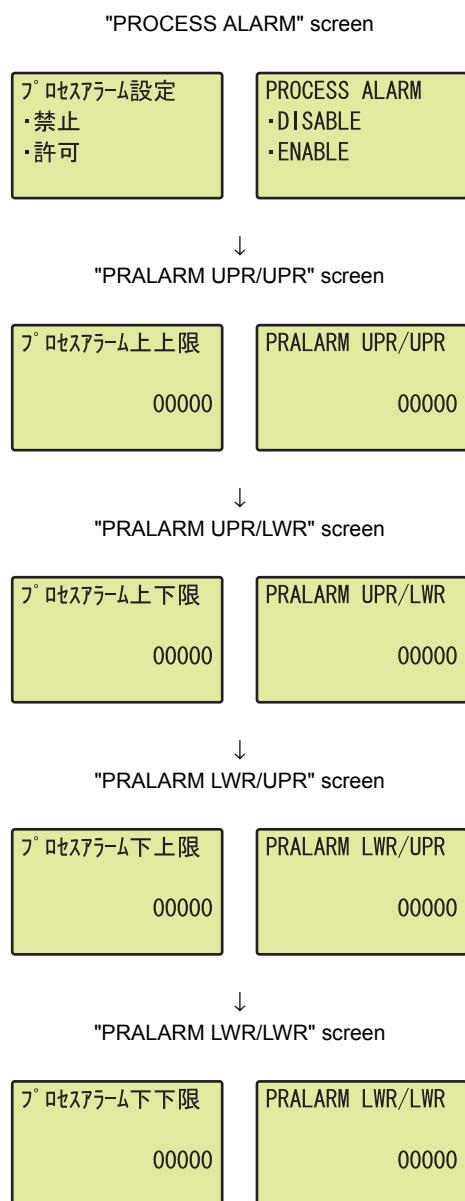
| Input item | Conversion speed | Input range       |                   |
|------------|------------------|-------------------|-------------------|
|            |                  | Input upper limit | Input lower limit |
| TIME       | 20μs             | 1500              | 2                 |
|            | 80μs/1ms         | 5000              | 2                 |
| COUNT      | 20μs/80μs/1ms    | 62500             | 4                 |
| MOV        | 20μs/80μs/1ms    | 1000              | 2                 |

### Point

The display unit allows you to input between 2 to 62500 for any type of averaging processing, however, if the value is outside the setting range of the averaging processing that you selected, an error will occur on the A/D converter module side.

#### (4) Warning output setting

Select "DISABLE" or "ENABLE" in the "PROCESS ALARM" screen.



1. Use the ▲ and ▼ buttons to select "DISABLE" or "ENABLE", and then confirm with the **OK** button. (If you selected "ENABLE", follow the rest of the procedure.)
2. Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the **OK** button.
3. Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the **OK** button.
4. Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the **OK** button.
5. Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the **OK** button.

Table of input items

| Input item      | Input range       |                   |
|-----------------|-------------------|-------------------|
|                 | Input upper limit | Input lower limit |
| PRALARM UPR/UPR | 32767             | -32768            |
| PRALARM UPR/LWR |                   |                   |
| PRALARM LWR/UPR |                   |                   |
| PRALARM LWR/LWR |                   |                   |

### (5) Input signal error detection setting

Select "DISABLE" or "ENABLE" in the "INPUT SIG ERR" screen.


"INPUT SIG ERR" screen

|                      |                                      |
|----------------------|--------------------------------------|
| 入力信号異常<br>・禁止<br>・許可 | INPUT SIG ERR<br>・DISABLE<br>・ENABLE |
|----------------------|--------------------------------------|



"INPUT SIG VALUE" screen

|                |                        |
|----------------|------------------------|
| 入力信号設定値<br>050 | INPUT SIG VALUE<br>050 |
|----------------|------------------------|

**1.** Use the ▲ and ▼ buttons to select "DISABLE" or "ENABLE", and then confirm with the  button. (If you selected "ENABLE", proceed to step 2.)


**2.** Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the  button.

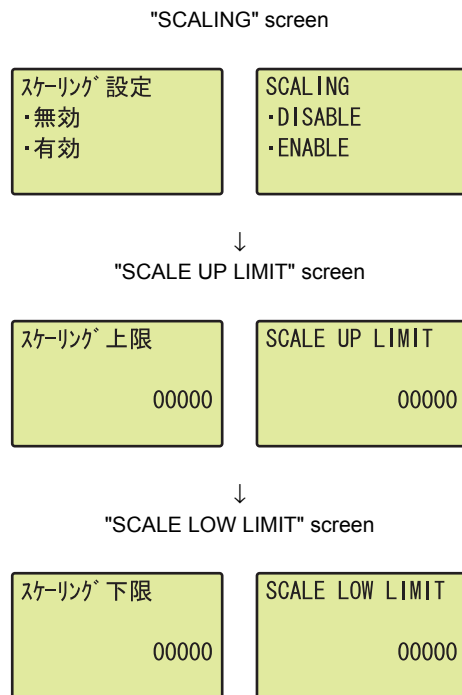
Table of input items

| Input item      | Input range       |                   |
|-----------------|-------------------|-------------------|
|                 | Input upper limit | Input lower limit |
| INPUT SIG VALUE | 250               | 0                 |



## (6) Scaling setting

Select "DISABLE" or "ENABLE" in the "SCALING" screen.



1. Use the ▲ and ▼ buttons to select "DISABLE" or "ENABLE", and then confirm with the **OK** button. (If you selected "ENABLE", follow the rest of the procedure.)
2. Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the **OK** button.
3. Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the **OK** button.

Table of input items


| Input item      | Input range       |                   |
|-----------------|-------------------|-------------------|
|                 | Input upper limit | Input lower limit |
| SCALE UP LIMIT  | 32000             | -32000            |
| SCALE LOW LIMIT |                   |                   |

## (7) Shifting amount to conversion value

Set the shifting amount to conversion value in the "SHIFT" screen.

"SHIFT" screen

|                  |                |
|------------------|----------------|
| 変換値シフト量<br>00000 | SHIFT<br>00000 |
|------------------|----------------|

1. Move the cursor using the ◀ and ▶ buttons, then increment or decrement the value at the cursor, using the ▲ and ▼ buttons, respectively. Confirm with the  button.

Input item lists

| Input item | Input range       |                   |
|------------|-------------------|-------------------|
|            | Input upper limit | Input lower limit |
| SHIFT      | 32767             | -32768            |

### Point


The "Shifting amount to conversion value" is reflected to the scaling value regardless of turning Operating condition setting request (Y9) OFF → ON → OFF. However, when the "Shifting amount to conversion value" is set in a display unit, it is not reflected just after setting. As well as other functions of display unit, turn the CPU module STOP → RUN → STOP → RUN to reflect the setting value.

## (8) Digital clipping enable/disable setting

Select "DISABLE" or "ENABLE" in the "DIGITALCLIP" screen.

"DIGITALCLIP" screen

|                        |                                    |
|------------------------|------------------------------------|
| デジタルクリップ<br>・無効<br>・有効 | DIGITALCLIP<br>・DISABLE<br>・ENABLE |
|------------------------|------------------------------------|


1. Use the ▲ and ▼ buttons to select "DISABLE" or "ENABLE", and then confirm with the  button.

## (9) Input signal error detection extension setting

Select a detection method in the "INPUT SIG ENH" screen.

"INPUT SIG ENH" screen

|                                  |   |
|----------------------------------|---|
| 入力信号拡張<br>・無効<br>・上下限検出<br>・下限検出 | INPUT SIG ENH<br>・DISABLE<br>・UPR/LWR<br>・LWR |
|----------------------------------|---|

1. Use the ▲ and ▼ buttons to select "DISABLE" or "ENABLE" from the following detection methods, and then confirm with the  button.
  - DISABLE
  - UPR/LWR
  - LWR
  - UPR
  - DISCONNECT

### Point


When "INPUT SIG ENH" is set to other than "DISABLE", setting "INPUT SIG ERR" to "ENABLE" is not necessary. The setting of "INPUT SIG ERR" will be ignored.

## (10) Conversion speed setting

In the "CONVERSION SPD" screen, specify the conversion speed of the A/D conversion processing.

"CONVERSION SPD" screen

|             |                |
|-------------|----------------|
| 変換速度設定      | CONVERSION SPD |
| ・20 $\mu$ s | ・20us          |
| ・80 $\mu$ s | ・80us          |
| ・1ms        | ・1ms           |

1. Use the ▲ and ▼ buttons to select the conversion speed, and then confirm with the  button.

## 9.4 Checking and Clearing Errors

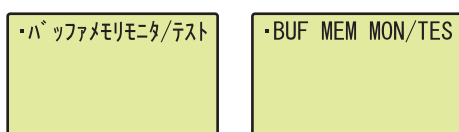
You can check the errors that occurred in the A/D converter module, from the display unit. In addition, you can also clear an error during its occurrence.

### (1) Checking the error

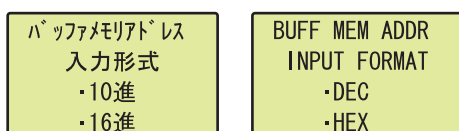
You can check the error that occurred in the A/D converter module, by specifying Latest error code (Un\G19) from "buffer memory monitor/test".

**Ex.** When an error occurs in the A/D converter module with a start I/O number of 1

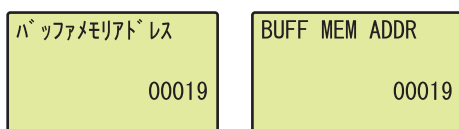
"Buffer memory monitor/test" screen



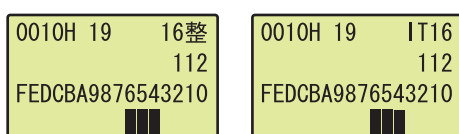
"Buffer memory address input format selection" screen



"Buffer memory address setting" screen



"Buffer memory monitor" screen



**1.** Press the **OK** button.

**2.** Use the **▲** and **▼** buttons to select "DEC" for the input format of the buffer memory address, and then confirm with the **OK** button.

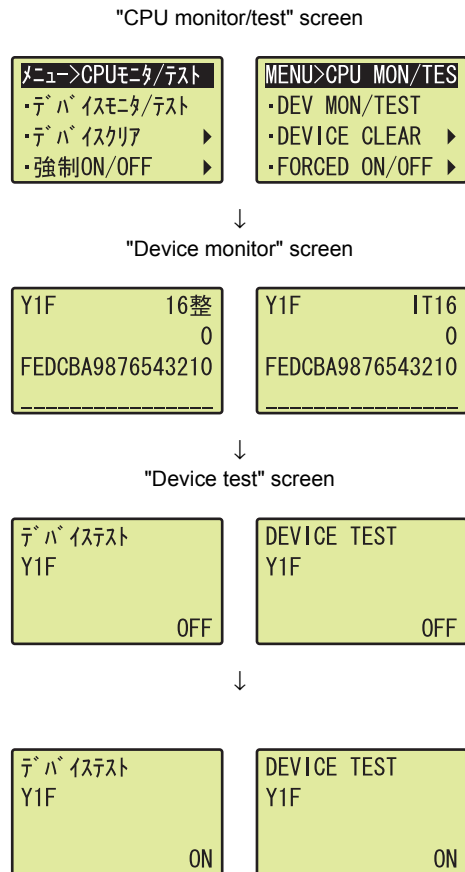
**3.** Move the cursor using the **◀** and **▶** buttons, then increment or decrement the value at the cursor, using the **▲** and **▼** buttons, and set the value to 19. Confirm with the **OK** button.

**4.** You can check the error that occurred, in the "Buffer memory monitor" screen.

## (2) Clearing errors

You can clear an error by eliminating the cause of the error, and turning Error clear request (YF) OFF → ON → OFF from "Device Monitor/Test".

**Ex.** When an error occurs in the A/D converter module with a start I/O number of 1



**1.** Use the ▲ and ▼ buttons to select "DEV MON/TEST", and then confirm with the **[OK]** button.

**2.** Set the device to Y and press the **[OK]** button.

**3.** Use the ▲ and ▼ buttons to set the device to Y1F, and then confirm with the **[OK]** button.

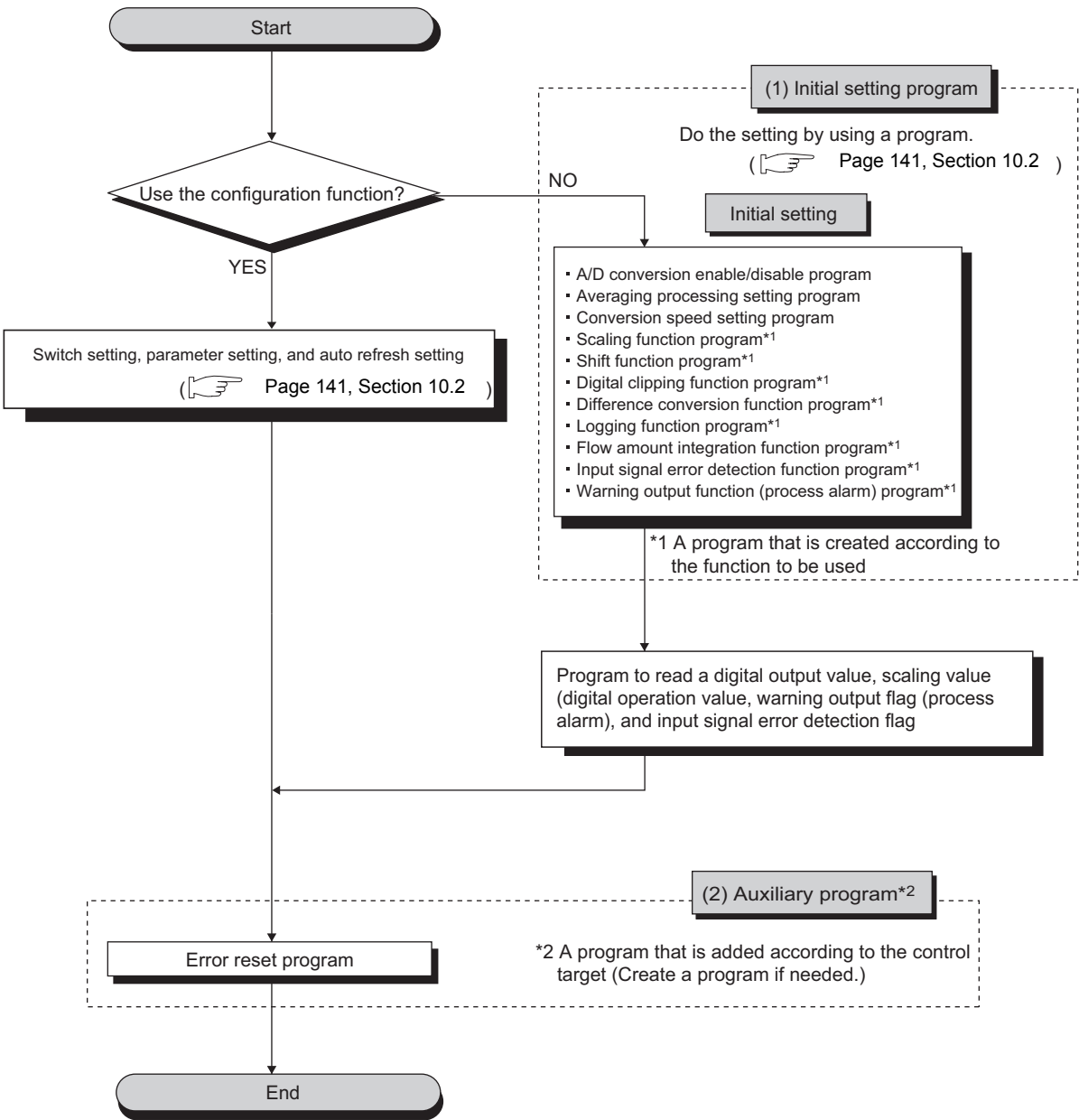
**4.** Use the ▲ and ▼ buttons to switch ON/OFF. Press the **[OK]** button to set the value at the device test setting.

# CHAPTER 10 PROGRAMMING

This chapter describes the procedure for programming and the basic program of the A/D converter module.

## 10.1 Procedure for Programming

Create a program to execute A/D conversion, according to the following procedure.



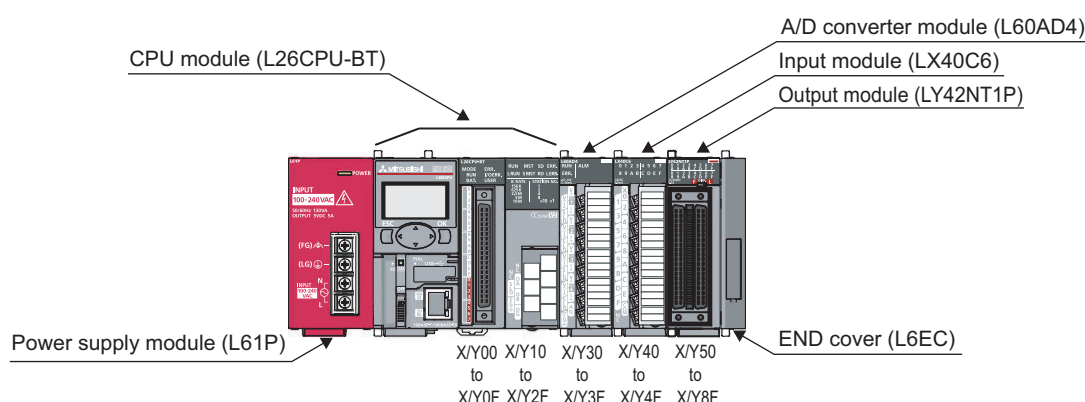
## 10.2 When Using the Module in a Standard System Configuration

10

The following shows program examples for the system configuration and usage conditions of the A/D converter module.

### (1) System configuration

The following shows an example of the system configuration when using the module in a standard system configuration.



### Point

For configuring the same I/O assignment as the system above, when using the L02CPU, set the I/O assignment of the A/D converter module within X/Y30 to 3F. Also, set the I/O assignment of the LX40C6 within X/Y40 to 4F, and the same of the LY42NT1P, within X/Y50 to 8F.


### (2) Programming condition

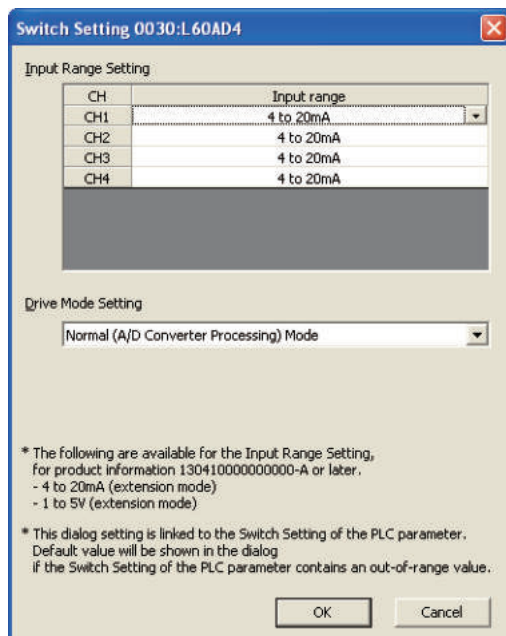
This program reads digital output values enabled for A/D conversion at CH1 to CH3 in the A/D converter module.

CH1 executes sampling processing, CH2 executes averaging processing every 50 times and CH3 executes A/D conversion every 10 moving averages. If an error occurs in the module, an error code is displayed in BCD notation.

### (3) Switch setting

Set the input range and the operation mode.

 Project window ⇒ [Intelligent Function Module] ⇒ [L60AD4] ⇒ [Switch Setting]



The dialog box is titled "Switch Setting 0030:L60AD4". It contains two main sections: "Input Range Setting" and "Drive Mode Setting".

**Input Range Setting:** This section contains a table with four rows, each representing a channel (CH1 to CH4). Each row has two columns: "CH" and "Input range". All four channels are currently set to "4 to 20mA".

| CH  | Input range |
|-----|-------------|
| CH1 | 4 to 20mA   |
| CH2 | 4 to 20mA   |
| CH3 | 4 to 20mA   |
| CH4 | 4 to 20mA   |

**Drive Mode Setting:** This section contains a single dropdown menu labeled "Normal (A/D Converter Processing) Mode".

**Footnote:** At the bottom, there are two asterisked notes. The first note states that the following input ranges are available for the Input Range Setting for product information 13041000000000-A or later: - 4 to 20mA (extension mode) and - 1 to 5V (extension mode). The second note states that the dialog setting is linked to the Switch Setting of the PLC parameter, and the default value will be shown in the dialog if the Switch Setting of the PLC parameter contains an out-of-range value.

**Buttons:** At the bottom right, there are two buttons: "OK" and "Cancel".



## (4) Initial setting description

### (a) Channel setting

| Item   | Description         |               |                |                     |
|--|---------------------|---------------|----------------|---------------------|
|  | CH1                 | CH2           | CH3            | CH4                 |
| A/D conversion enable/disable setting            | Enable              | Enable        | Enable         | Disable             |
| Averaging process setting                        | Sampling processing | Count average | Moving average | Sampling processing |
| Time Average/ Count Average/ Moving Average      | 0                   | 50 times      | 10 times       | 0                   |
| Conversion speed setting                         | 20μs                |               |                |                     |
| Warning output setting                           | Disable             | Enable        | Disable        | Disable             |
| Process alarm upper upper limit value            | 0                   | 20000         | 0              | 0                   |
| Process alarm upper lower limit value            | 0                   | 18000         | 0              | 0                   |
| Process alarm lower upper limit value            | 0                   | 3000          | 0              | 0                   |
| Process alarm lower lower limit value            | 0                   | 0             | 0              | 0                   |
| Input signal error detection setting             | Enable              | Disable       | Disable        | Disable             |
| Input signal error detection setting value       | 10.0%               | 5.0%          | 5.0%           | 5.0%                |
| Input signal error detection extension setting   | Disable             | Disable       | Disable        | Disable             |
| Scaling enable/disable setting                   | Disable             | Disable       | Enable         | Disable             |
| Scaling upper limit value                        | 0                   | 0             | 32000          | 0                   |
| Scaling lower limit value                        | 0                   | 0             | 0              | 0                   |
| Shifting amount to conversion value              | 0                   | 0             | 10000          | 0                   |
| Digital clipping function enable/disable setting | Disable             | Disable       | Enable         | Disable             |

### (b) Device for user

| Device    | Description                                    |                      |
|-----------|--|----------------------|
| D1(D11)   | CH1 Digital output value                       |                      |
| D2(D12)   | CH2 Digital output value                       |                      |
| D8        | Input signal error detection flag              |                      |
| D10       | Error code                                     |                      |
| D18       | Warning output flag                            |                      |
| D28(D13)  | CH3 Scaling value (digital operation value)    |                      |
| M0        | CH1 A/D conversion completed flag              |                      |
| M1        | CH2 A/D conversion completed flag              |                      |
| M2        | CH3 A/D conversion completed flag              |                      |
| M20 to 27 | Warning output flag                            |                      |
| M50 to 53 | Input signal error detection flag              |                      |
| M100      | Module READY checking flag                     |                      |
| X40       | Digital output value read command input signal | LX40C6 (X40 to 4F)   |
| X43       | Input signal error detection reset signal      |                      |
| X44       | Error reset signal                             |                      |
| Y50 to 5F | Error code notation (BCD 3 digits)             | LY42NT1P (Y50 to 5F) |

## (5) Program example when using the parameter of intelligent function module

### (a) Parameter setting

Set the contents of initial settings in the parameter.

Project window ⇒ [Intelligent Function Module] ⇒ [L60AD4] ⇒ [Parameter]

0030:L60AD4[]-Parameter

Display Filter: Display All

| Item  | CH1   | CH2             | CH3              | CH4                   |
|---|---|-----------------|------------------|-----------------------|
| <b>Basic setting</b>  | <b>Sets method of A/D conversion control.</b>   |                 |                  |                       |
| A/D conversion enable/disable setting   | 0:Enable  | 0:Enable        | 0:Enable         | 1:Disable             |
| Averaging process setting   | 0:Sampling Processing   | 2:Count Average | 3:Moving Average | 0:Sampling Processing |
| Time Average/ Count Average/Moving Average  | 0   | 50 Times        | 10 Times         | 0                     |
| Conversion speed setting  | 0:20us  |                 |                  |                       |
| <b>Warning output function</b>  | <b>Sets for warnings on A/D conversion.</b>   |                 |                  |                       |
| Warning output setting  | 1:Disable   | 0:Enable        | 1:Disable        | 1:Disable             |
| Process alarm upper upper limit value   | 0   | 20000           | 0                | 0                     |
| Process alarm upper lower limit value   | 0   | 18000           | 0                | 0                     |
| Process alarm lower upper limit value   | 0   | 3000            | 0                | 0                     |
| Process alarm lower lower limit value   | 0   | 0               | 0                | 0                     |
| <b>Input signal error detection</b>   | <b>Sets for input signals on A/D conversion.</b>  |                 |                  |                       |
| Input signal error detection setting  | 0:Enable  | 1:Disable       | 1:Disable        | 1:Disable             |
| Input signal error detection setting value  | 10.0 %  | 5.0 %           | 5.0 %            | 5.0 %                 |
| <b>Input signal error detection enhancing</b><br>(Available to Product Information 13041000000000-A or later) | Set input signal error detection (enhancing) when A/D conversion is executed. Input signal error detection enhancing function will be detected by the Input signal error detection setting value. |                 |                  |                       |
| Input signal error detection extension setting  | 0:Disable   | 0:Disable       | 0:Disable        | 0:Disable             |
| <b>Scaling function</b>   | <b>Sets for scaling on A/D conversion.</b>  |                 |                  |                       |
| Scaling enable/disable setting  | 1:Disable   | 1:Disable       | 0:Enable         | 1:Disable             |
| Scaling upper limit value   | 0   | 0               | 32000            | 0                     |
| Scaling lower limit value   | 0   | 0               | 0                | 0                     |
| <b>Shift function</b><br>(Available to Product Information 13041000000000-A or later)                         | Set shift function when A/D conversion is executed.   |                 |                  |                       |
| Shifting amount to conversion value   | 0   | 0               | 10000            | 0                     |
| <b>Digital clipping function</b><br>(Available to Product Information 13041000000000-A or later)              | Set digital clipping function when A/D conversion is executed.  |                 |                  |                       |
| Digital clipping function enable/disable setting  | 1:Disable   | 1:Disable       | 0:Enable         | 1:Disable             |

Sets method of A/D conversion control.

### (b) Auto refresh setting

Project window ⇒ [Intelligent Function Module] ⇒ [L60AD4] ⇒ [Auto\_Refresh]

0030:L60AD4[]-Auto\_Refresh


Display Filter: Display All

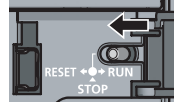
| Item  | CH1  | CH2 | CH3 | CH4 |
|---|--|-----|-----|-----|
| <b>Transfer to PLC</b>  | <b>Transfers buffer memory data to the specified device.</b> |     |     |     |
| A/D conversion completed flag   | D1   | D2  |     |     |
| Digital output value  |  |     |     |     |
| Maximum value   |  |     |     |     |
| Minimum value   |  |     |     |     |
| Scaling value (Digital operation value)   |  |     | D28 |     |
| Warning output flag (Process alarm)   | D18  |     |     |     |
| Input signal error detection flag   | D8   |     |     |     |
| Latest error code   | D10  |     |     |     |
| Latest address of error history   |  |     |     |     |
| Difference conversion reference value<br>(Available to Product Information 13041000000000-A or later) |  |     |     |     |
| Difference conversion status flag<br>(Available to Product Information 13041000000000-A or later)     |  |     |     |     |

Transfers buffer memory data to the specified device.

### (c) Writing parameter of intelligent function module

Write the set parameter to the CPU module and reset the CPU module, or then off and then on the programmable controller power supply.

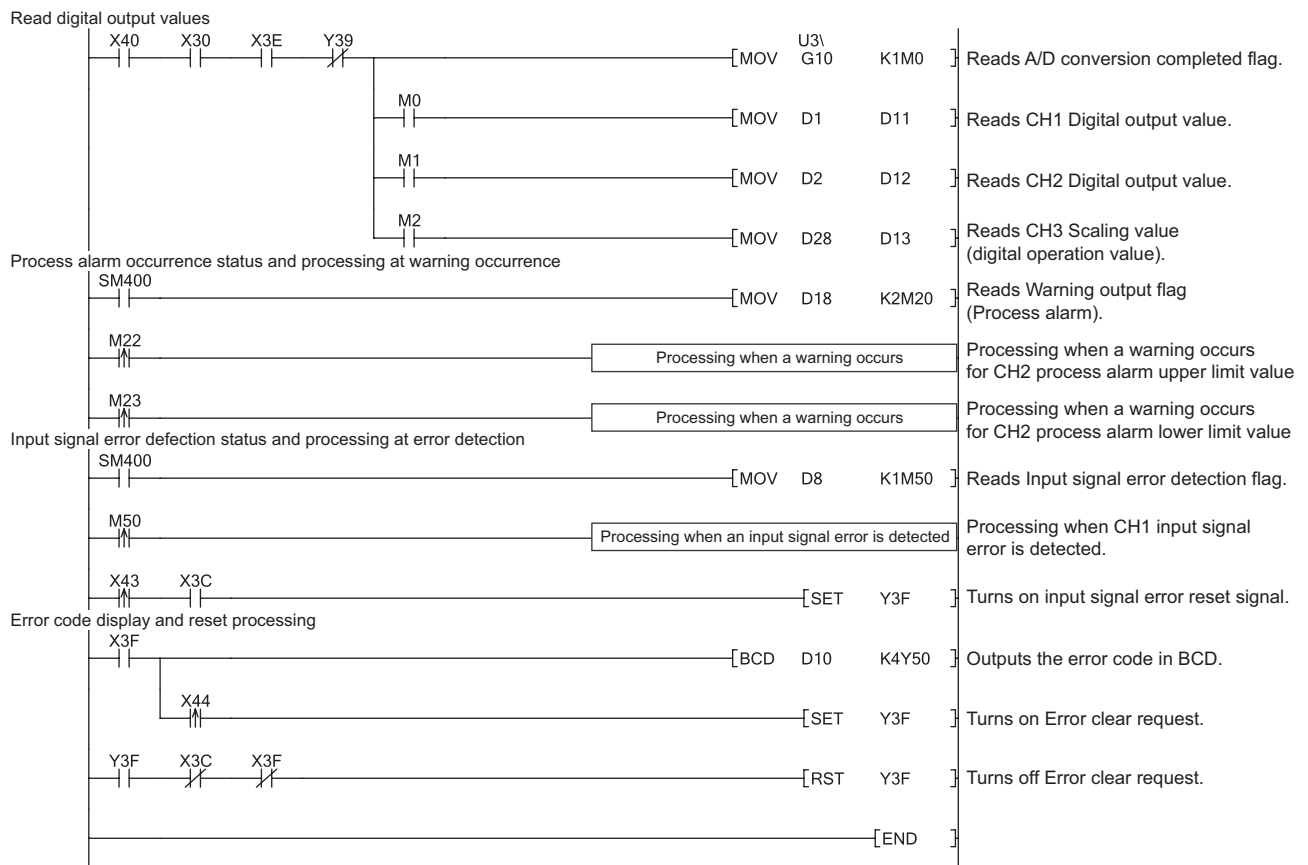
 [Online] ⇨ [Write to PLC...]



or Power OFF → ON

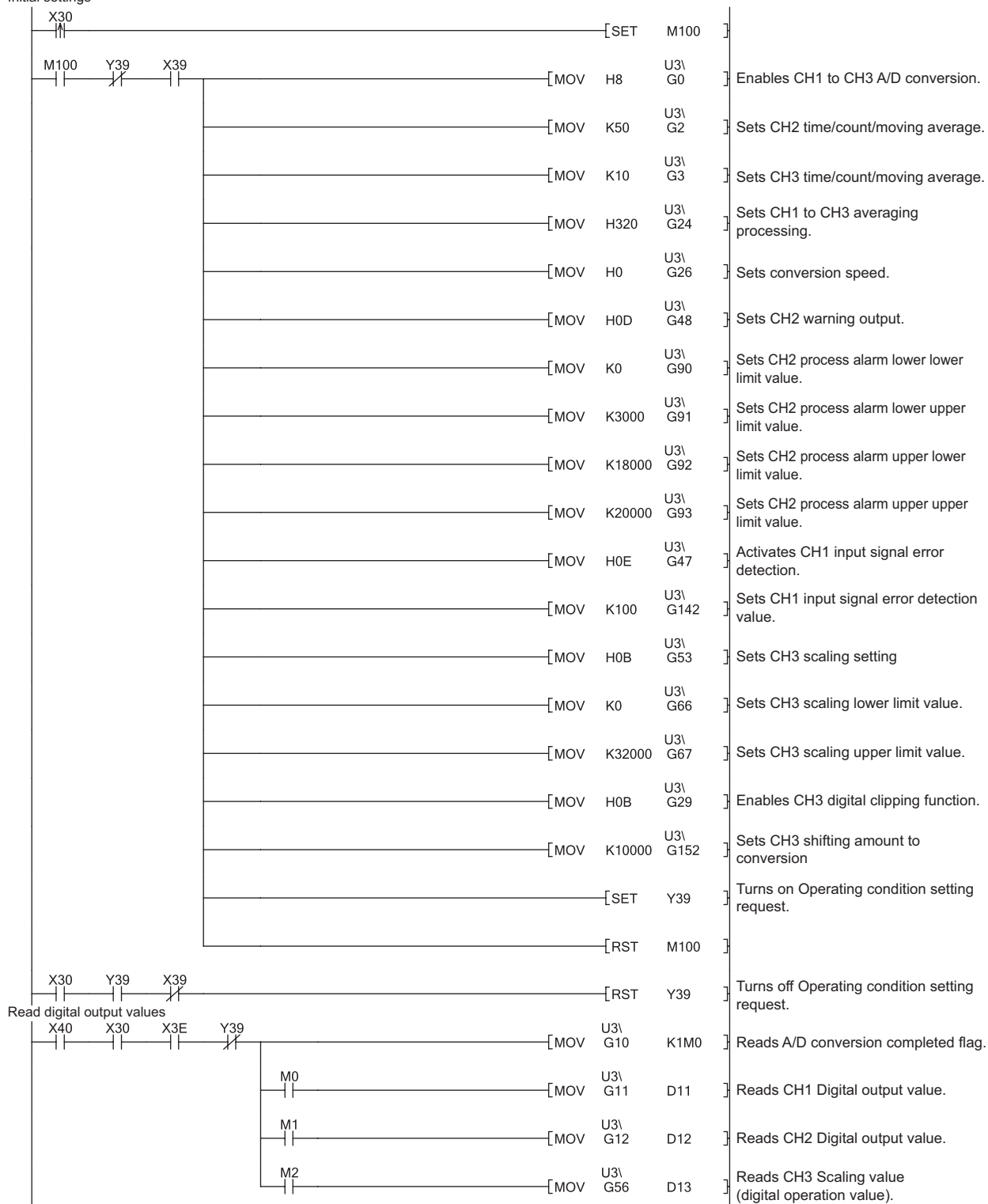
10

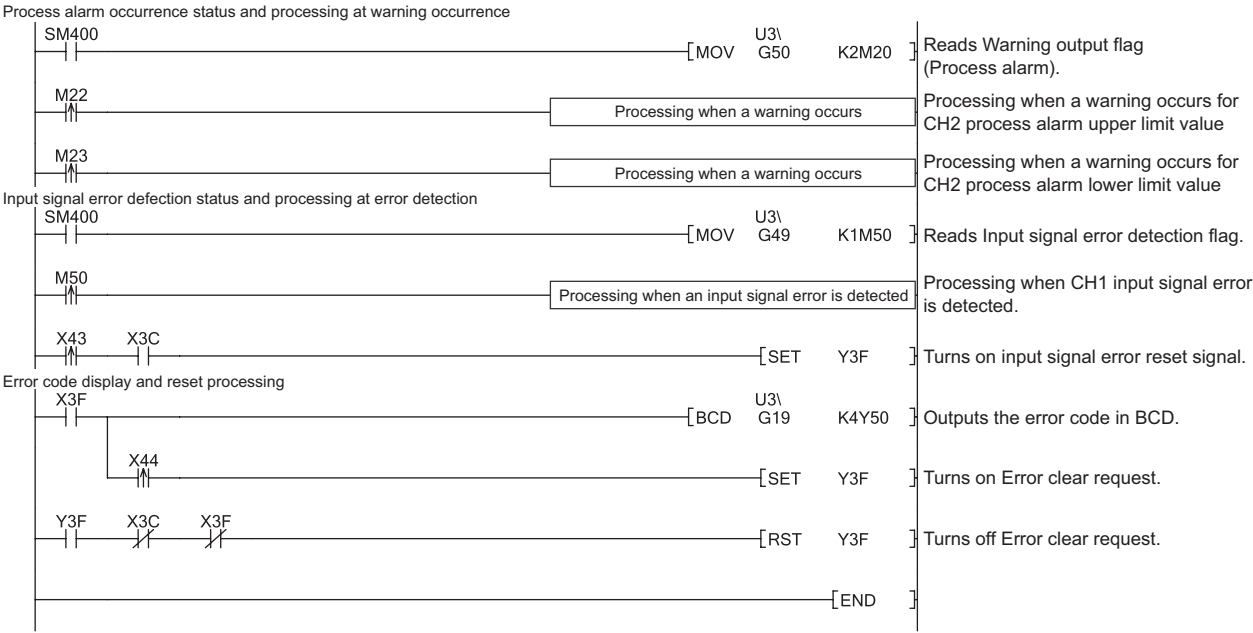
### (d) Program example



## (6) Program example when not using the parameter of intelligent function module

Initial settings



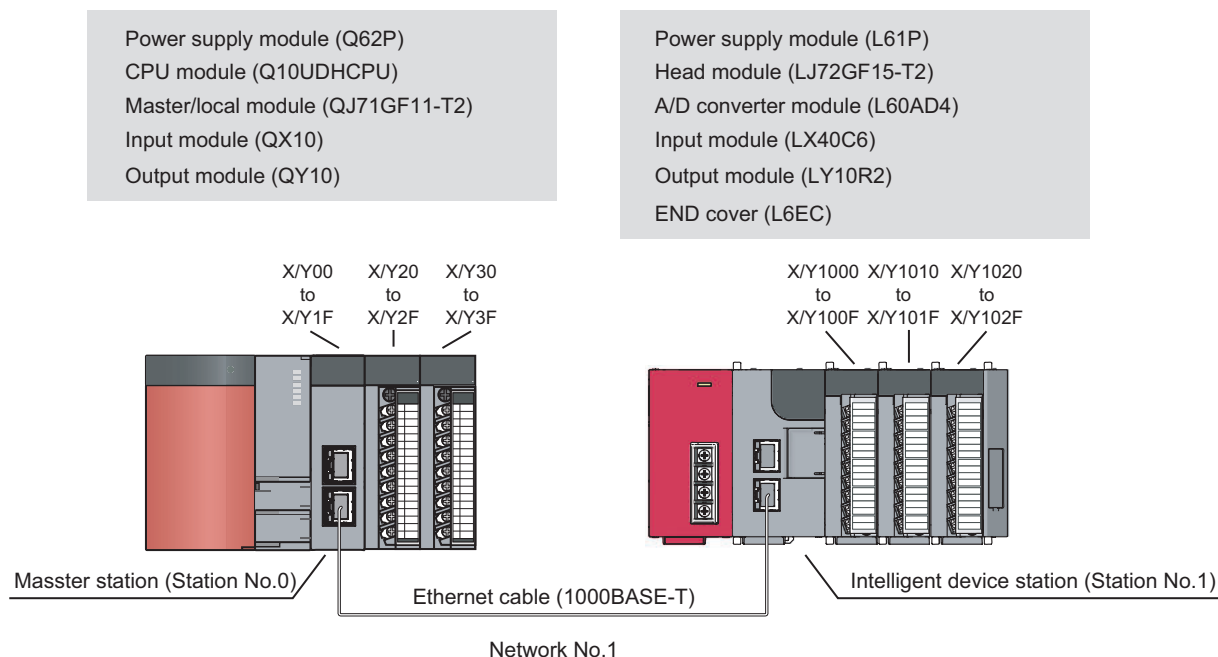


## 10.3 When A/D Converter Module is Connected to Head Module

This section describes the system configuration of A/D converter module and a program example of operation condition.

### (1) System configuration

The following describes the system configuration examples when the A/D converter module is mounted to a head module.



### (2) Programming conditions

This program reads digital output values enabled for A/D conversion at CH1 to CH3 in the A/D converter module. CH1 executes sampling processing, CH2 executes averaging processing every 50 times and CH3 executes A/D conversion every 10 moving averages. If an error occurs in the module, an error code is displayed in BCD notation.

### (3) Description of initial settings

| Item   | Description         |               |                |                     |
|--|---------------------|---------------|----------------|---------------------|
|  | CH1                 | CH2           | CH3            | CH4                 |
| A/D conversion enable/disable setting            | Enable              | Enable        | Enable         | Disable             |
| Averaging process setting                        | Sampling processing | Count average | Moving average | Sampling processing |
| Time Average/Count Average/Moving Average        | 0                   | 50 times      | 10 times       | 0                   |
| Conversion speed setting                         | 20μs                |               |                |                     |
| Warning output setting                           | Disable             | Enable        | Disable        | Disable             |
| Process alarm upper upper limit value            | 0                   | 20000         | 0              | 0                   |
| Process alarm upper lower limit value            | 0                   | 18000         | 0              | 0                   |
| Process alarm lower upper limit value            | 0                   | 3000          | 0              | 0                   |
| Process alarm lower lower limit value            | 0                   | 0             | 0              | 0                   |
| Input signal error detection setting             | Enable              | Disable       | Disable        | Disable             |
| Input signal error detection setting value       | 10.0%               | 5.0%          | 5.0%           | 5.0%                |
| Input signal error detection extension setting   | Disable             | Disable       | Disable        | Disable             |
| Scaling enable/disable setting                   | Disable             | Disable       | Enable         | Disable             |
| Scaling upper limit value                        | 0                   | 0             | 32000          | 0                   |
| Scaling lower limit value                        | 0                   | 0             | 0              | 0                   |
| Shifting amount to conversion value              | 0                   | 0             | 10000          | 0                   |
| Digital clipping function enable/disable setting | Disable             | Disable       | Enable         | Disable             |

### (4) Devices used by a user

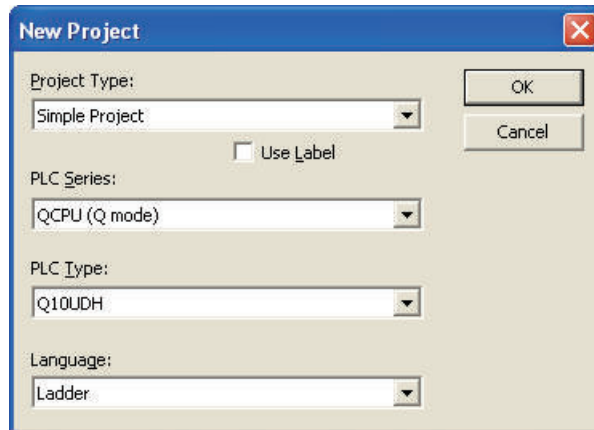
| Device     | Description   |                   |
|------------|---|-------------------|
| W1000      | A/D conversion completed flag                                   |                   |
| W1001      | CH1 Digital output value  |                   |
| W1002      | CH2 Digital output value  |                   |
| W1008      | Input signal error detection flag                               |                   |
| W1010      | Latest error code   |                   |
| W1018      | Warning output flag (Process alarm)                             |                   |
| W1028      | CH3 Scaling value (digital operation value)                     |                   |
| M0         | CH1 A/D conversion completed flag                               |                   |
| M1         | CH2 A/D conversion completed flag                               |                   |
| M2         | CH3 A/D conversion completed flag                               |                   |
| M20 to M27 | Warning output flag (Process alarm)                             |                   |
| M50 to M53 | Input signal error detection flag                               |                   |
| X20        | Digital output value read command input signal                  | QX10 (X20 to X2F) |
| X23        | Input signal error detection reset signal                       |                   |
| X24        | Error reset signal  |                   |
| Y30 to Y3F | Error code display (BCD 4 digits)                               | QY10 (Y30 to Y3F) |
| SB49       | Data link status (own station)                                  |                   |
| SWB0.0     | Data link status (each station) (station number 1)              |                   |
| N0         | Nesting (station number 1)                                      |                   |
| M100       | Flag for meeting the communication condition (station number 1) |                   |

## (5) Setting on master station

### 1. Create a project on GX Works2.

Select "QCPU (Q mode)" for "PLC Series" and select "Q10UDH" for "PLC Type."


 [Project] ⇒ [New...]

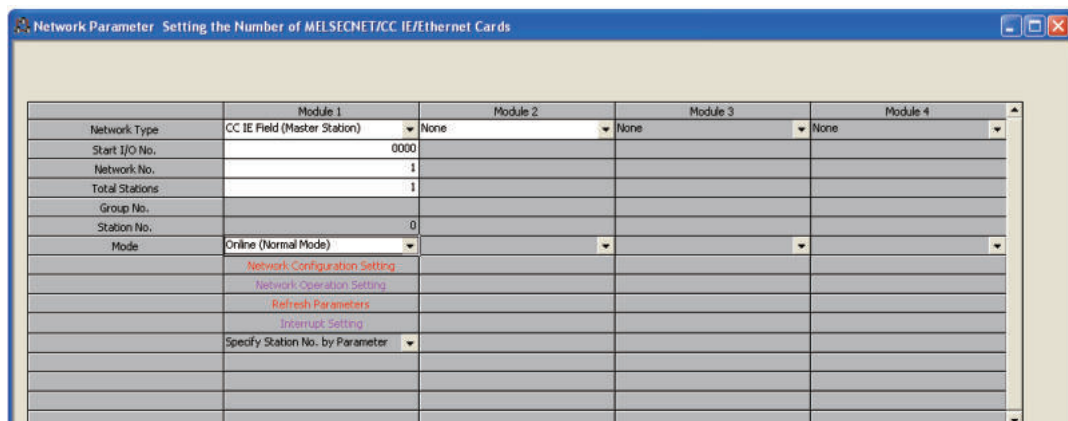


The "New Project" dialog box in GX Works2. It contains the following fields and options:

- Project Type:** Simple Project (dropdown menu)
- ☐ Use Label
- PLC Series:** QCPU (Q mode) (dropdown menu)
- PLC Type:** Q10UDH (dropdown menu)
- Language:** Ladder (dropdown menu)
- Buttons:** OK, Cancel

### 2. Display the network parameter setting screen and configure the setting as follows.

 Project window ⇒ [Parameter] ⇒ [Network Parameter] ⇒ [Ethernet/CC IE/MELSECNET]




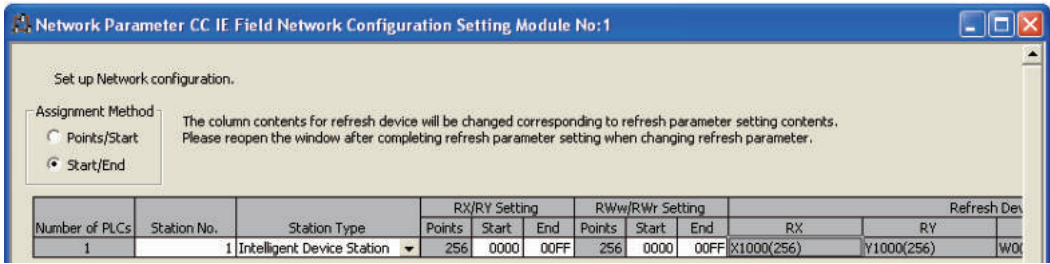
The "Network Parameter" setting screen in GX Works2, titled "Setting the Number of MELSECNET/CC IE/Ethernet Cards". It displays a table for configuring network parameters across four modules.

|                                  | Module 1                     | Module 2 | Module 3 | Module 4 |
|----------------------------------|------------------------------|----------|----------|----------|
| Network Type                     | CC IE Field (Master Station) | None     | None     | None     |
| Start I/O No.                    | 0000                         |          |          |          |
| Network No.                      | 1                            |          |          |          |
| Total Stations                   | 1                            |          |          |          |
| Group No.                        |                              |          |          |          |
| Station No.                      | 0                            |          |          |          |
| Mode                             | Online (Normal Mode)         |          |          |          |
| Network Configuration Setting    |                              |          |          |          |
| Network Operation Setting        |                              |          |          |          |
| Refresh Parameters               |                              |          |          |          |
| Interrupt Setting                |                              |          |          |          |
| Specify Station No. by Parameter |                              |          |          |          |
|                                  |                              |          |          |          |
|                                  |                              |          |          |          |
|                                  |                              |          |          |          |
|                                  |                              |          |          |          |




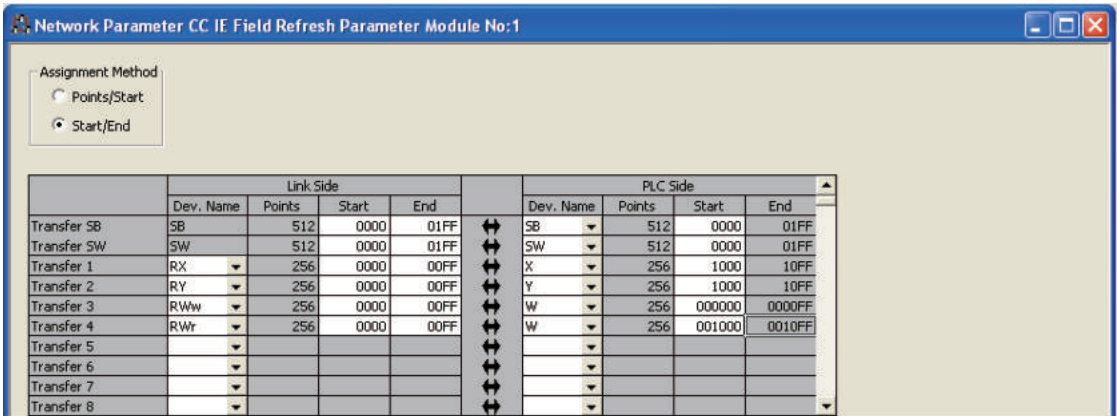
3. Display the Network Configuration Setting screen and configure the setting as follows.

Project window ⇒ [Parameter] ⇒ [Network Parameter] ⇒ [Ethernet/CC IE/MELSECNET] ⇒  button



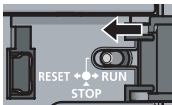
4. Display the Auto Refresh setting screen for the A/D converter module (L60AD4) and configure the setting as follows.

Project window ⇒ [Parameter] ⇒ [Network Parameter] ⇒ [Ethernet/CC IE/MELSECNET] ⇒  button



5. Write the set parameter to the CPU module of the master station and reset the CPU module, or turn off and then on the programmable controller power supply.

[Online] ⇒ [Write to PLC...]




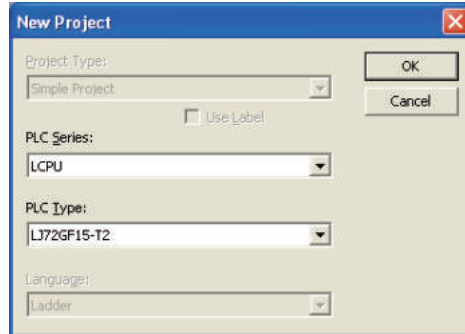
or Power OFF → ON

## (6) Setting by intelligent device station

### 1. Create a project for GX Works2.

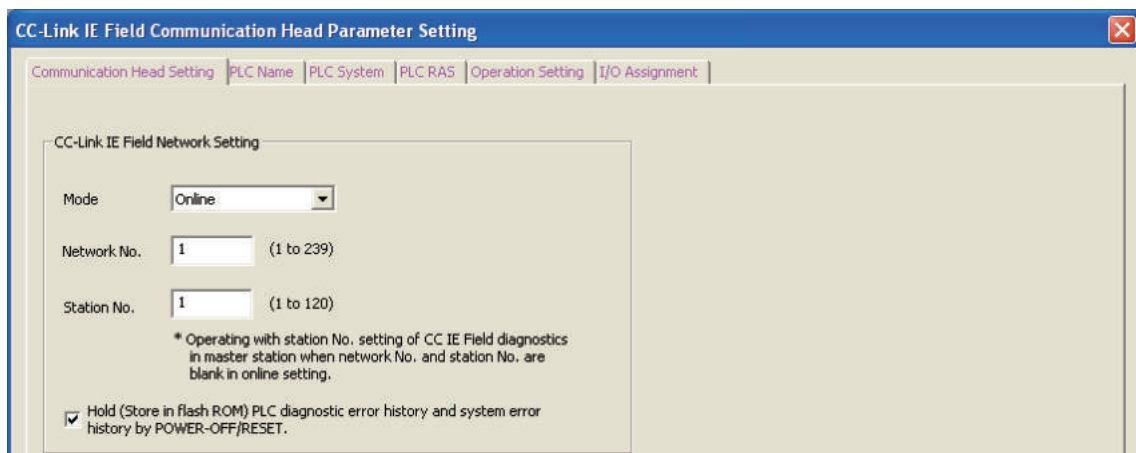
Select "LCPU" for "PLC Series" and select "LJ72GF15-T2" for "PLC Type."

 [Project] ⇒ [New...]



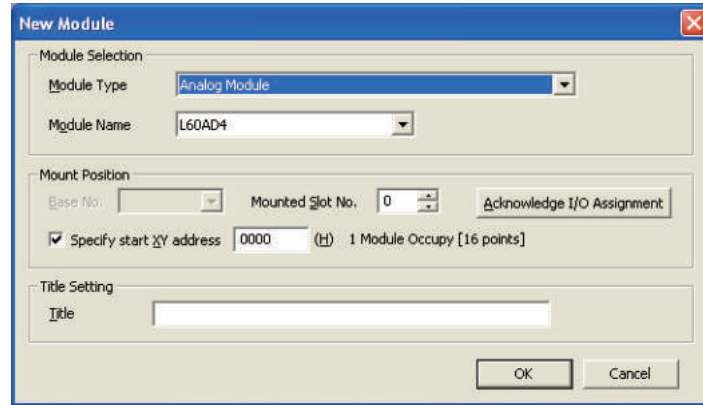
### 2. Display the PLC Parameter setting screen and configure the setting as follows.

 Project window ⇒ [Parameter] ⇒ [PLC Parameter] ⇒ "Communication Head Setting"



### 3. Add the A/D converter module (L60AD4) to the GX Works2 project.

Project window ⇒ [Intelligent Function Module] ⇒ Right-click ⇒ [New Module]



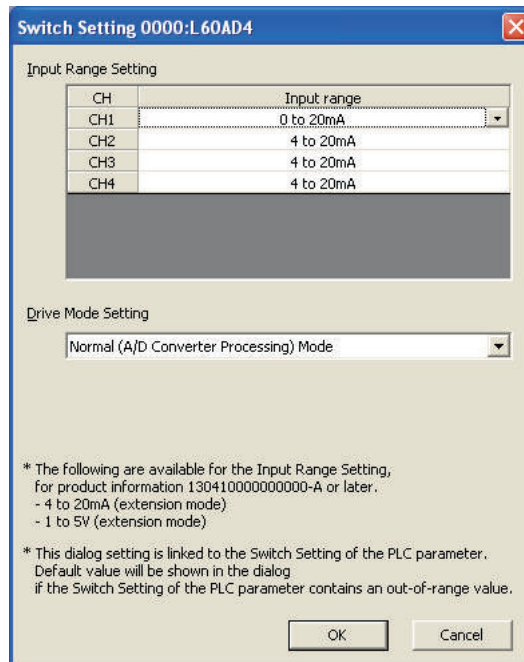
The 'New Module' dialog box is shown with the following settings:

- Module Selection:**
  - Module Type: Analog Module
  - Module Name: L60AD4
- Mount Position:**
  - Base No.: (empty)
  - Mounted Slot No.: 0
  - Acknowledge I/O Assignment: (checked)
  - ☒ Specify start address: 0000 (H) 1 Module Occupy [16 points]
- Title Setting:**
  - Title: (empty)

Buttons: OK, Cancel

### 4. Display the Switch Setting screen for the A/D converter module (L60AD4) and configure the setting as follows.

Project window ⇒ [Intelligent Function Module] ⇒ [L60AD4] ⇒ [Switch Setting]



The 'Switch Setting 0000:L60AD4' dialog box is shown with the following settings:

- Input Range Setting:**

| CH  | Input range |
|-----|-------------|
| CH1 | 0 to 20mA   |
| CH2 | 4 to 20mA   |
| CH3 | 4 to 20mA   |
| CH4 | 4 to 20mA   |
- Drive Mode Setting:**
  - Normal (A/D Converter Processing) Mode

Buttons: OK, Cancel

\* The following are available for the Input Range Setting, for product information 13041000000000-A or later.  
 - 4 to 20mA (extension mode)  
 - 1 to 5V (extension mode)

\* This dialog setting is linked to the Switch Setting of the PLC parameter. Default value will be shown in the dialog if the Switch Setting of the PLC parameter contains an out-of-range value.

5. Display the initial setting screen for the A/D converter module (L60AD4) and configure the setting as follows.

Project window ⇒ [Intelligent Function Module] ⇒ [L60AD4] ⇒ [Parameter]

The screenshot shows the '0000:L60AD4[]-Parameter' window. The 'Display Filter' is set to 'Display All'. The window is divided into a left sidebar with a tree view and a main table area.

**Left Sidebar Tree View:**

- Basic setting
  - A/D conversion enable/disable setting
  - Averaging process setting
  - Time Average/ Count Average/Moving Average
  - Conversion speed setting
- Warning output function
  - Warning output setting
  - Process alarm upper upper limit value
  - Process alarm upper lower limit value
  - Process alarm lower upper limit value
  - Process alarm lower lower limit value
- Input signal error detection
  - Input signal error detection setting
  - Input signal error detection setting value
- Input signal error detection enhancing (Available to Product Information 130410000000000-A or later)
  - Input signal error detection extension setting
- Scaling function
  - Scaling enable/disable setting
  - Scaling upper limit value
  - Scaling lower limit value
- Shift function (Available to Product Information 130410000000000-A or later)
  - Shifting amount to conversion value
- Digital clipping function (Available to Product Information 130410000000000-A or later)
  - Digital clipping function enable/disable setting

**Main Table:**

| Item  | CH1                   | CH2             | CH3              | CH4                   |
|---|-----------------------|-----------------|------------------|-----------------------|
| <b>Sets method of A/D conversion control.</b>   |                       |                 |                  |                       |
| A/D conversion enable/disable setting   | 0:Enable              | 0:Enable        | 0:Enable         | 1:Disable             |
| Averaging process setting   | 0:Sampling Processing | 2:Count Average | 3:Moving Average | 0:Sampling Processing |
| Time Average/ Count Average/Moving Average  | 0                     | 50 Times        | 5 Times          | 0                     |
| Conversion speed setting  | 0:20us                |                 |                  |                       |
| <b>Sets for warnings on A/D conversion.</b>   |                       |                 |                  |                       |
| Warning output setting  | 1:Disable             | 0:Enable        | 1:Disable        | 1:Disable             |
| Process alarm upper upper limit value   | 0                     | 20000           | 0                | 0                     |
| Process alarm upper lower limit value   | 0                     | 18000           | 0                | 0                     |
| Process alarm lower upper limit value   | 0                     | 3000            | 0                | 0                     |
| Process alarm lower lower limit value   | 0                     | 0               | 0                | 0                     |
| <b>Sets for input signals on A/D conversion.</b>  |                       |                 |                  |                       |
| Input signal error detection setting  | 0:Enable              | 1:Disable       | 1:Disable        | 1:Disable             |
| Input signal error detection setting value  | 10.0 %                | 5.0 %           | 5.0 %            | 5.0 %                 |
| Set input signal error detection (enhancing) when A/D conversion is executed. Input signal error detection enhancing function will be detected by the Input signal error detection setting value. |                       |                 |                  |                       |
| Input signal error detection extension setting  | 0:Disable             | 0:Disable       | 0:Disable        | 0:Disable             |
| <b>Sets for scaling on A/D conversion.</b>  |                       |                 |                  |                       |
| Scaling enable/disable setting  | 1:Disable             | 1:Disable       | 0:Enable         | 1:Disable             |
| Scaling upper limit value   | 0                     | 0               | 32000            | 0                     |
| Scaling lower limit value   | 0                     | 0               | 0                | 0                     |
| <b>Set shift function when A/D conversion is executed.</b>  |                       |                 |                  |                       |
| Shifting amount to conversion value   | 0                     | 0               | 10000            | 0                     |
| <b>Set digital clipping function when A/D conversion is executed.</b>   |                       |                 |                  |                       |
| Digital clipping function enable/disable setting  | 1:Disable             | 1:Disable       | 0:Enable         | 1:Disable             |

At the bottom of the window, it says: 'Sets method of A/D conversion control.'

6. Display the Auto Refresh setting screen for the A/D converter module (L60AD4) and configure the setting as follows.

Project window ⇒ [Intelligent Function Module] ⇒ [L60AD4] ⇒ [Auto\_Refresh]

The screenshot shows the '0000:L60AD4[] Auto\_Refresh' window. The 'Display Filter' is set to 'Display All'. The window is divided into a left sidebar with a tree view and a main table area.

**Left Sidebar Tree View:**


- Transfer to PLC
  - A/D conversion completed flag
  - Digital output value
  - Maximum value
  - Minimum value
  - Scaling value (Digital operation value)
  - Warning output flag (Process alarm)
  - Input signal error detection flag
  - Latest error code
  - Latest address of error history
  - Difference conversion reference value (Available to Product Information 130410000000000-A or later)
  - Difference conversion status flag (Available to Product Information 130410000000000-A or later)
  - Logging hold flag

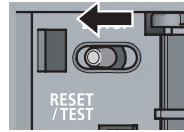
**Main Table:**

| Item  | CH1   | CH2   | CH3   | CH4 |
|---|-------|-------|-------|-----|
| <b>Transfers buffer memory data to the specified device.</b>  |       |       |       |     |
| A/D conversion completed flag   | W1000 |       |       |     |
| Digital output value  | W1001 | W1002 |       |     |
| Maximum value   |       |       |       |     |
| Minimum value   |       |       |       |     |
| Scaling value (Digital operation value)   |       |       | W1028 |     |
| Warning output flag (Process alarm)   | W1018 |       |       |     |
| Input signal error detection flag   | W1008 |       |       |     |
| Latest error code   | W1010 |       |       |     |
| Latest address of error history   |       |       |       |     |
| Difference conversion reference value (Available to Product Information 130410000000000-A or later) |       |       |       |     |
| Difference conversion status flag (Available to Product Information 130410000000000-A or later)     |       |       |       |     |
| Logging hold flag   |       |       |       |     |

At the bottom of the window, it says: 'Transfers buffer memory data to the specified device.'

## 7. Write the set parameter to the head module and reset the head module, or turn off and then on the programmable controller power supply.

 [Online] ⇨ [Write to PLC...]

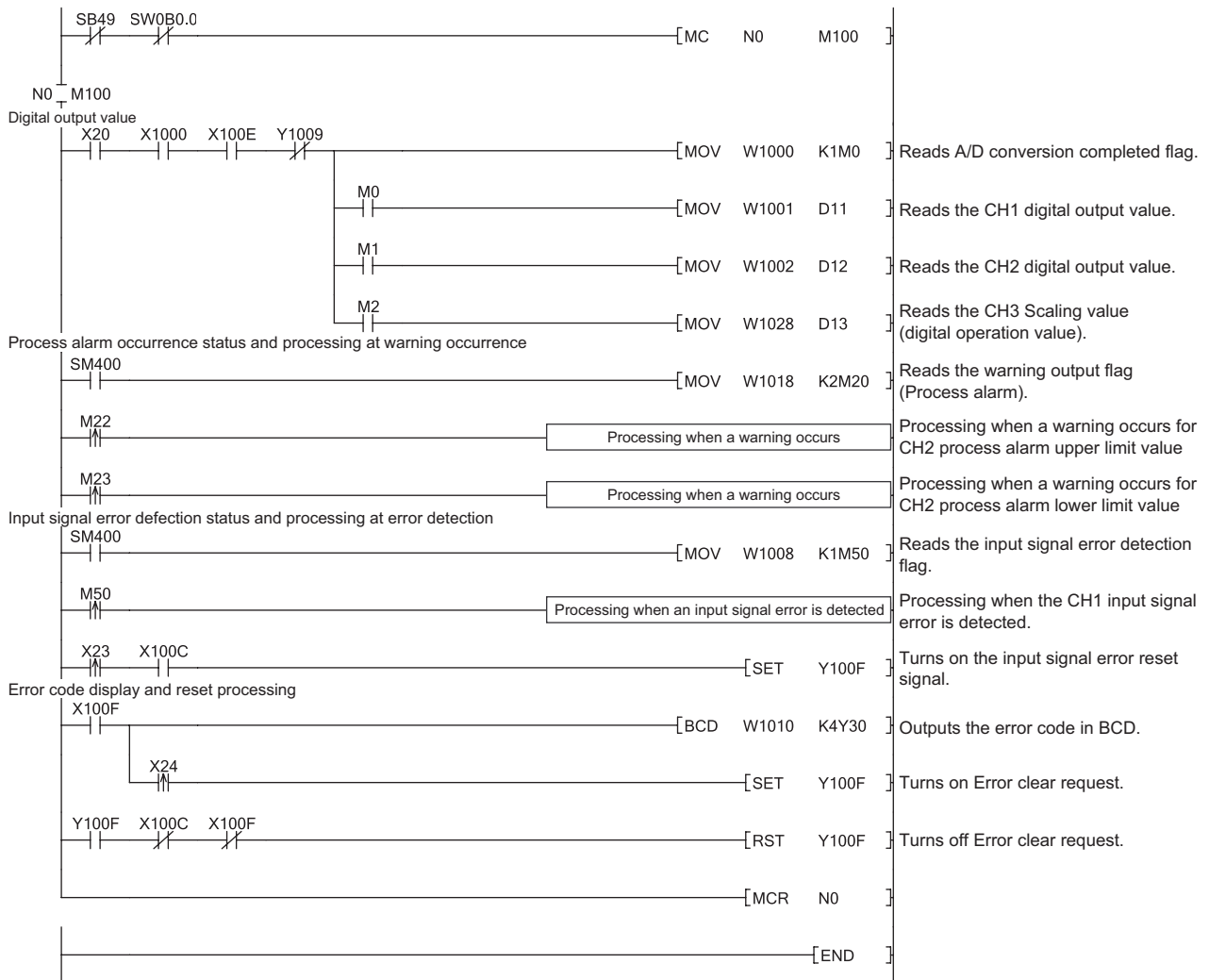


or Power OFF → ON

10

### (7) Program example

The following shows a program example. The program can be written to the CPU module of the master station.



10.3 When A/D Converter Module is Connected to Head Module

# CHAPTER 11 TROUBLESHOOTING

---

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

## (1) Checking for the error codes and the alarm codes

Errors and alarms occurred in the A/D converter module can be checked by any of the following methods:

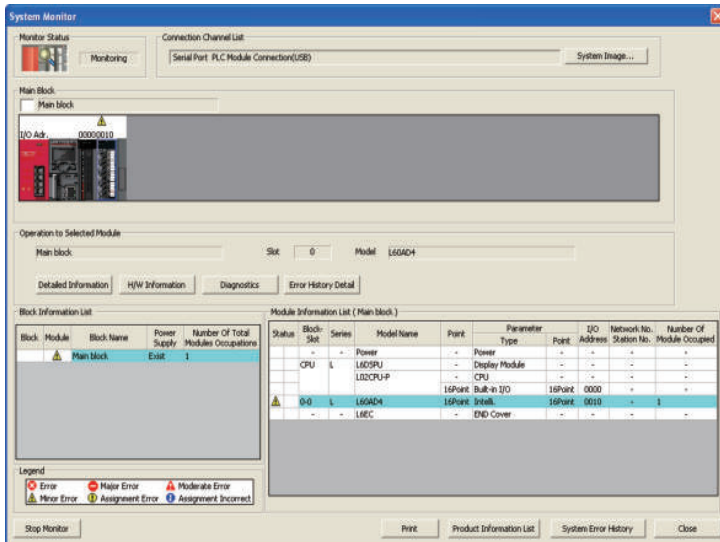
- Checking on the module detailed Information (☞ Page 157, Section 11.1)
- Checking by Latest Error Code (Un\G19) (☞ Page 158, Section 11.2)
- Checking on the module error collection function (☞ Page 158, Section 11.3)
- Checking by a display unit (☞ Page 138, Section 9.4)

Choose the checking methods for the purpose and application.

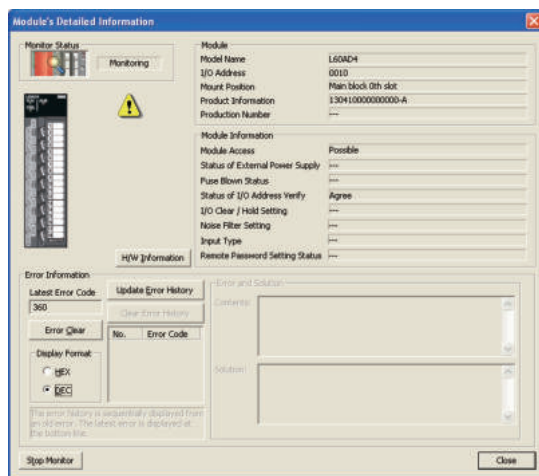
## 11.1 Checking on the Module Detailed Information

The following describes how to check the errors on the module detailed information.

 [Diagnostics] ➡ [System Monitor...]



↓



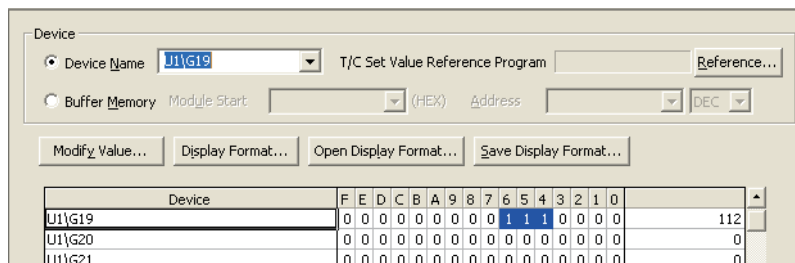
- 1. Select the A/D converter module in "Main Block" and click the  button.**

- 2. "Module's Detailed Information" of the A/D converter module is displayed.**

## 11.2 Checking by Latest Error Code (Un\G19)

The following describes how to check the error codes and alarm codes in Latest error code (Un\G19).

 [Online] ⇒ [Monitor] ⇒ [Device/Buffer Memory Batch]




| Device | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |     |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-----|
| U1\G19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 112 |
| U1\G20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |
| U1\G21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0   |

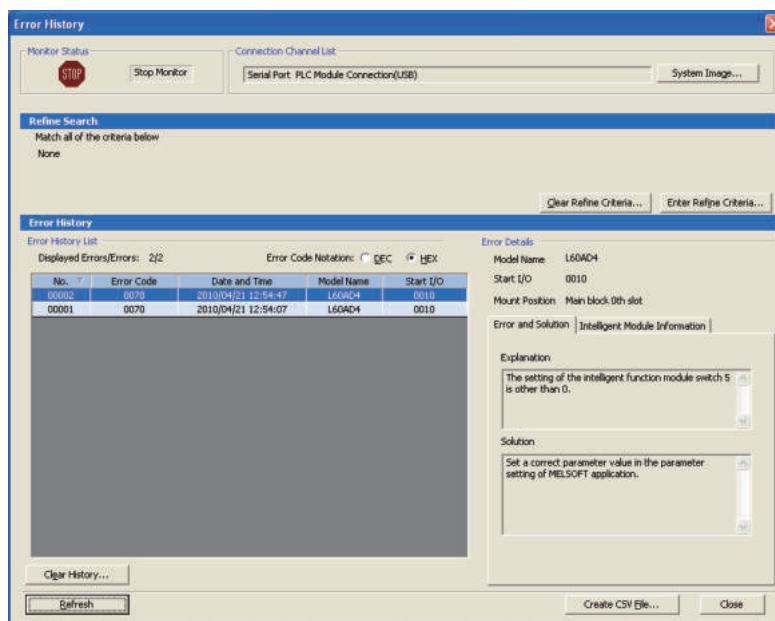
## 11.3 Checking on the Module Error Collection Function

Using the module error collection function stores the errors occurred in the A/D converter module to the CPU module or the head module. Once being stored, the errors remain even after powering off or resetting the CPU module or the head module.

### (1) How to check the errors by the module error collection function

To check the errors of the A/D converter module collected by the CPU module, open the "Error History" dialog box.

 [Diagnostics] ⇒ [System Monitor...] ⇒ click the **Error History Detail** button





| No.  | Error Code | Date and Time       | Model Name | Start I/O |
|------|------------|---------------------|------------|-----------|
| 0000 | 0000       | 2010/04/21 12:54:47 | L604CH     | 0010      |
| 0001 | 0070       | 2010/04/21 12:54:07 | L604CH     | 0010      |

**Error Details**  
Model Name: L604CH  
Start I/O: 0010  
Mount Position: Main block 0th slot  
Error and Solution: Intelligent Module Information  
Explanation: The setting of the intelligent function module switch 5 is other than 0.  
Solution: Set a correct parameter value in the parameter setting of MELSOFT application.

### (2) Errors to be collected

The A/D converter module reports the following contents to the CPU module:

- Error code list ( Page 159, Section 11.4)
- Alarm code list ( Page 163, Section 11.5)



## 11.4 Error Code List

If the following errors occur on the A/D converter module while data is written to or read from the CPU module, the corresponding error code below is stored in Latest error code (Un\G19).

The error is reported to the CPU module also.

| Error code (decimal) | Description and cause of error   | Action  |
|----------------------|--|---|
| 10□                  | The input range is set with a value outside the setting range for Switch 1 of the intelligent function module switch setting.<br>The channel with the invalid setting fits in □.   | Set a valid value on the intelligent function module switch setting in the parameter setting.   |
| 111                  | A hardware failure has occurred on the module.   | Power off and on the module.<br>If the error occurs again, a failure might have occurred on the module. Please consult a local Mitsubishi representative.   |
| 112                  | A value other than 0 is set to Switch 5 on the intelligent function module switch setting.   | Set 0 to Switch 5 on the intelligent function module switch setting in the parameter setting.   |
| 113*1                | The data in the flash memory has a problem.  | Check the digital output value.<br>If there is a problem of the digital output value, please consult a local Mitsubishi representative.   |
| 120*1                | An invalid value is set to the offset/gain setting.<br>The channel where the error has occurred cannot be identified.  | Start over the offset/gain setting of all channels where the user range setting is used.<br>If the error occurs again, a failure might have occurred on the module. Please consult a local Mitsubishi representative.   |
| 12□*1                | An invalid value is set to the offset/gain setting.<br>The channel where the error has occurred fits in □.   | Start over the offset/gain setting of the channel where the error has occurred.<br>If the error occurs again, a failure might have occurred on the module. Please consult a local Mitsubishi representative.  |
| 161*1*2              | The G(P).OGSTOR instruction was executed in the offset/gain setting mode.  | Do not execute the G(P).OGSTOR instruction in the offset/gain setting mode.   |
| 162*1                | <ul style="list-style-type: none"> <li>The G(P).OGSTOR instruction has been consecutively executed.</li> <li>For the offset/gain setting, a setting value has been consecutively written to the flash memory more than 25 times.</li> </ul>  | <ul style="list-style-type: none"> <li>Execute the G(P).OGSTOR instruction only once per module.</li> <li>Write the setting value into the flash memory only once for each offset/gain setting.</li> </ul>  |
| 163*1                | <ul style="list-style-type: none"> <li>The G(P).OGSTOR instruction has been executed on a module different from the one on which the G(P).OGLOAD instruction was executed.</li> <li>The G(P).OGSTOR instruction has been executed ahead of the G(P).OGLOAD instruction.</li> </ul> | <ul style="list-style-type: none"> <li>Execute the G(P).OGLOAD and G(P).OGSTOR instructions to the same module.</li> <li>After executing the G(P).OGLOAD instruction on the module from where data is restored, execute the G(P).OGSTOR instruction on the module to where the data is restored.</li> </ul> |
| 170*1                | The offset/gain setting was configured exceeding the maximum number of times.  | No more offset/gain setting is reflected on the operation successfully.   |

| Error code (decimal) | Description and cause of error  | Action  |
|----------------------|---|---|
| 20□*1                | <ul style="list-style-type: none"> <li>Although the conversion speed has been set to 20μs, the averaging time value set in CH□ Time Average/Count Average/Moving Average (Un\G1 to Un\G4) is outside the range of 2 to 1500ms.</li> <li>Although the conversion speed has been set to 80μs or 1ms, the averaging time value set in CH□ Time Average/Count Average/Moving Average (Un\G1 to Un\G4) is outside the range of 2 to 5000ms.</li> <li>The averaging time value set in CH□ Time Average/Count Average/Moving Average (Un\G1 to Un\G4) is less than "4 × Number of used channels × Conversion speed" (ms).</li> </ul> The channel where the error has occurred fits in □. | <ul style="list-style-type: none"> <li>When the conversion speed is 20μs, set the averaging time to a value in the range of 2 to 1500ms.</li> <li>When the conversion speed is 80μs or 1ms, set the averaging time to a value in the range of 2 to 5000ms.</li> <li>Set the averaging time to a value equal to or more than "4 × Number of used channels × Conversion speed" (ms).</li> </ul> |
| 30□*1                | The averaging count value set in CH□ Time Average/Count Average/Moving Average (Un\G1 to Un\G4) is outside the range of 4 to 62500.<br>The channel where the error has occurred fits in □.  | Set the averaging count to a value in the range of 4 to 62500.  |
| 31□*1                | The moving average count value set in CH□ Time Average/Count Average/Moving Average (Un\G1 to Un\G4) is outside the range of 2 to 1000.<br>The channel where the error has occurred fits in □.  | Set the moving average count to a value in the range of 2 to 1000.  |
| 360*1                | The value set in Conversion speed setting (Un\G26) is outside the range of 0 to 2.  | Set one of the following values in Conversion speed setting (Un\G26). <ul style="list-style-type: none"> <li>20μs (0)</li> <li>80μs (1)</li> <li>1ms (2)</li> </ul>   |
| 37□*1                | The value set in CH□ Difference conversion trigger (Un\G172 to Un\G175) is other than 0 and 1.<br>The channel where the error has occurred fits in □.   | Set the value in CH□ Difference conversion trigger (Un\G172 to Un\G175) to No request (0) or Trigger request (1).   |
| 40□*1                | When the user range is set or restored, values are as follows: Offset value ≥ Gain value<br>The channel where the error has occurred fits in □.   | Set values so that they meet the following condition: Offset value < Gain value   |
| 500*1                | When the offset/gain setting is configured, channels or 0s are set simultaneously in both Offset/gain setting mode Offset specification (Un\G22) and Offset/gain setting mode Gain specification (Un\G23).  | Correct the setting in Offset/gain setting mode Offset specification (Un\G22) and/or the Offset/gain setting mode Gain specification (Un\G23).  |
| 6△□*1                | The settings in CH1 Process alarm lower lower limit value (Un\G86) to CH4 Process alarm upper upper limit value (Un\G101) are invalid.<br>The channel with the invalid setting fits in □.<br>A value fits in △ indicates that the alarm status is as follows:<br>2: Process alarm lower lower limit value > Process alarm lower upper limit value<br>3: Process alarm lower upper limit value > Process alarm upper lower limit value<br>4: Process alarm upper lower limit value > Process alarm upper upper limit value   | Correct the settings in CH1 Process alarm lower lower limit value (Un\G86) to CH4 Process alarm upper upper limit value (Un\G101).  |
| 80□*1                | The value set in CH□ Input signal error detection setting value (Un\G142 to Un\G145) is outside the range of 0 to 250.<br>The channel where the error has occurred fits in □.   | Set a value within the range of 0 to 250 in CH□ Input signal error detection setting value (Un\G142 to Un\G145).  |

| Error code<br>(decimal) | Description and cause of error  | Action   |
|-------------------------|---|--|
| 81□*1                   | The value set in Input signal error detection extension setting (Un\G27) is outside the range of 0 to 4.<br>The channel where the error has occurred fits in □.   | Set one of the following values in Input signal error detection extension setting (Un\G27) for the channel where the error has occurred.<br>• Disable (0)<br>• Upper/lower limit detection (1)<br>• Lower limit detection (2)<br>• Upper limit detection (3)<br>• Disconnection detection (4)  |
| 82□*1                   | A value set in Input signal error detection extension setting (Un\G27) is Disconnection detection (4), besides the set input range for the same channel is other than the following.<br>• 4 to 20mA (Extended mode)<br>• 1 to 5V (Extended mode)<br>The channel where the error has occurred fits in □. | • To perform disconnection detection using the input signal error detection extension function, set the input range of the corresponding channel to 4 to 20mA (Extended mode) or 1 to 5V (Extended mode).<br>• Not to perform disconnection detection using the input signal error detection extension function, set Input signal error detection extension setting (Un\G27) of the corresponding channel to the value other than Disconnection detection (4). |
| 90□*1                   | The values set in CH1 Scaling lower limit value (Un\G62) to CH4 Scaling upper limit value (Un\G69) are outside the range of -32000 to 32000.<br>The channel where the error has occurred fits in □.   | Set a value within the range of -32000 to 32000 in CH1 Scaling lower limit value (Un\G62) to CH4 Scaling upper limit value (Un\G69).   |
| 91□*1                   | The values set in CH1 Scaling lower limit value (Un\G62) to CH4 Scaling upper limit value (Un\G69) are as follows: Scaling lower limit value ≥ Scaling upper limit value.<br>The channel where the error has occurred fits in □.  | Set the values in CH1 Scaling lower limit value (Un\G62) to CH4 Scaling upper limit value (Un\G69) so that they meet the following condition:<br>Scaling upper limit value > Scaling lower limit value   |
| 99□*1*3                 | For some channels, user range setting is used and besides the scaling function is enabled.<br>The channel with the invalid setting fits in □.   | Disable the scaling function of the channel where a user range setting is used.  |
| 200□*1                  | CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to a value other than 0 and 1.<br>The channel where the error has occurred fits in □.  | Set Enable (0) or Disable (1) in CH□ Logging enable/disable setting (Un\G1000 to Un\G1003).  |
|                         | Conversion speed is set to 20μs, and besides CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Enable (0).<br>The channel where the error has occurred fits in □.   | To use the logging function, set the conversion speed to 80μs or 1ms.  |
| 201□*1                  | A value outside the setting range is set in one or both of CH□ Logging cycle setting value (Un\G1032 to Un\G1035) or/and CH□ Logging cycle unit setting (Un\G1040 to Un\G1043).<br>The channel where the error has occurred fits in □.  | Set a value within the setting range in one or both of CH□ Logging cycle setting value (Un\G1032 to Un\G1035) or/and CH□ Logging cycle unit setting (Un\G1040 to Un\G1043).<br>For the setting method of the logging cycle, refer to the following.<br>• Logging function (👉 Page 98, Section 8.14)  |
| 202□*1                  | The set logging cycle is shorter than the update cycle of the logged value (digital output value or scaling value (digital operation value)).<br>The channel where the error has occurred fits in □.  | Set CH□ Logging cycle setting value (Un\G1032 to Un\G1035) and CH□ Logging cycle unit setting (Un\G1040 to Un\G1043) so that the logging cycle is equal to or longer than the update cycle of the logged value.<br>For the setting method of the logging cycle, refer to the following.<br>Logging function (👉 Page 98, Section 8.14)  |
| 203□*1                  | CH□ Logging data setting (Un\G1024 to Un\G1027) is set to a value other than 0 and 1.<br>The channel where the error has occurred fits in □.  | Set Digital output value (0) or Scaling value (digital operation value) (1) in CH□ Logging data setting (Un\G1024 to Un\G1027).  |

| Error code<br>(decimal) | Description and cause of error  | Action   |
|-------------------------|---|--|
| 204□*1                  | CH□ Logging points after trigger (Un\G1048 to Un\G1051) is set to a value outside the range of 1 to 10000.<br>The channel where the error has occurred fits in □.   | Set a value within the range of 1 to 10000 in CH□ Logging points after trigger (Un\G1048 to Un\G1051).   |
| 205□*1                  | CH□ Level trigger condition setting (Un\G1056 to Un\G1059) is set to a value outside the range of 0 to 3.<br>The channel where the error has occurred fits in □.  | Set one of the following values in CH□ Level trigger condition setting (Un\G1056 to Un\G1059).<br>• Disable (0)<br>• Above (1)<br>• Below (2)<br>• Pass through (3)  |
| 206□*1                  | CH□ Trigger data (Un\G1064 to Un\G1067) is set to a value outside the range of 0 to 4999.<br>The channel where the error has occurred fits in □.  | Set a value within the range of 0 to 4999 in CH□ Trigger data (Un\G1064 to Un\G1067).  |
| 207□*1                  | CH□ Logging hold request (Un\G1008 to Un\G1011) is set to a value other than 0 and 1.<br>The channel where the error has occurred fits in □.  | Set OFF (0) or ON (1) in CH□ Logging hold request (Un\G1008 to Un\G1011).  |
| 208□*1                  | CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Enable (0), and besides the input signal error detection function or the input signal error detection extension function is enabled.<br>The channel where the error has occurred fits in □. | To use the logging function, set the following buffer memory areas as below.<br>• Set Disable (0) in Input signal error detection extension setting (Un\G27)<br>• Set Disable (1) in Input signal error detection setting (Un\G47).  |
| 210□*1                  | CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303) is set to a value other than 0 and 1.<br>The channel where the error has occurred fits in □.  | Set Enable (0) or Disable (1) in CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303).  |
|                         | Conversion speed is set to 20μs or 80μs, and besides CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303) is set to Enable (0).<br>The channel where the error has occurred fits in □.   | To use the flow amount integration function, set the conversion speed to 1ms.  |
| 211□*1                  | CH□ Integration cycle setting (Un\G1308 to Un\G1311) is set to a value outside the range of 1 to 5000.<br>The channel where the error has occurred fits in □.   | Set a value within the range of 1 to 5000 in CH□ Integration cycle setting (Un\G1308 to Un\G1311).   |
| 212□*1                  | The set value in CH□ Integration cycle setting (Un\G1308 to Un\G1311) is shorter than the update cycle of CH□ Scaling value (digital operation value) (Un\G54 to Un\G57).<br>The channel where the error has occurred fits in □.                                | Set CH□ Integration cycle setting (Un\G1308 to Un\G1311) so that the integration cycle is equal to or longer than the update cycle of CH□ Scaling value (digital operation value) (Un\G54 to Un\G57).<br>For the setting method of the integration cycle, refer to the following.<br>Flow amount integration function (👉 Page 110, Section 8.15) |
| 213□*1                  | CH□ Flow amount time unit setting (Un\G1316 to Un\G1319) is set to a value outside the range of 0 to 2.<br>The channel where the error has occurred fits in □.  | Set one of the following values in CH□ Flow amount time unit setting (Un\G1316 to Un\G1319).<br>• /s (0)<br>• /min (1)<br>• /h (2)   |
| 214□*1                  | CH□ Unit scaling setting (Un\G1324 to Un\G1327) is set to a value outside the range of 0 to 4.<br>The channel where the error has occurred fits in □.   | Set one of the following values in CH□ Unit scaling setting (Un\G1324 to Un\G1327).<br>• × 1 (0)<br>• × 10 (1)<br>• × 100 (2)<br>• × 1000 (3)<br>• × 10000 (4)   |
| 215□*1                  | CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359) is set to a value other than 0 and 1.<br>The channel where the error has occurred fits in □.  | Set No request (0) or Temporary stop request (1) in CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359).   |

| Error code (decimal) | Description and cause of error   | Action  |
|----------------------|--|---|
| 216□*1               | CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375) is set to a value other than 0 and 1.<br>The channel where the error has occurred fits in □. | Set No request (0) or Clear request (1) in CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375). |

- \*1 This error code can be cleared by turning off, on, and then off Error clear request (YF).  
 \*2 An error code is not stored in Latest error code (Un\G19) but in the completion status of the G(P). OGSTOR instruction (Ⓢ + 1).  
 \*3 For A/D converter modules whose serial number (first five digits) is 13041 or later, the scaling function can be used on the channel where a user range setting is used; therefore, an error does not occur.

## 11.5 Alarm Code List

The following shows an alarm code list.

| Alarm code (decimal) | Description and cause of alarm   | Action  |
|----------------------|--|---|
| 10△□                 | A process alarm is occurring.<br>The channel where the process alarm has occurred fits in □.<br>A value fits in △ indicates that the alarm status is as follows:<br>0: Upper limit of a process alarm<br>1: Lower limit of a process alarm   | When the scaling value (digital operation value) returns to the one within the setting range, the corresponding bit of Warning output flag (Process alarm) (Un\G50) and Warning output signal (X8) turn off.<br>The alarm code can be cleared by turning off, on, and off Error clear request (YF) after the scaling value (digital operation value) returns to the one within the setting range. |
| 110□                 | An input signal error is occurring.<br>The channel where the input signal error has occurred fits in □.<br>This alarm code is stored when an input signal error is detected according to the setting of the input signal error detection function.   | The corresponding bit of Input signal error detection flag (Un\G49) and Input signal error detection signal (XC) turn off by turning off, on, and off Error clear request (YF) after the analog input value returns to the one within the setting range.  |
| 11△□                 | An input signal error is occurring.<br>The channel where the input signal error has occurred fits in □.<br>A value fits in △ indicates that the detection status is as follows:<br>1: Upper limit detection<br>2: Lower limit detection<br>3: Disconnection detection<br>This alarm code is stored when an input signal error is detected according to the setting of the input signal error detection extension function. |   |

## 11.6 Troubleshooting

### (1) When the RUN LED flashes or turns off

#### (a) When flashing


| Check item   | Action  |
|--|---|
| Is the operation mode setting in the offset/gain setting mode? | Take the either of the following actions: <ul style="list-style-type: none"><li>• switch the operation mode setting in the intelligent function module switch setting to the normal mode, or</li><li>• correct Switch4 in the intelligent function module switch setting to switch the operation mode setting to the normal mode.</li></ul> |

#### (b) When turning off

| Check item                                     | Action   |
|--|--|
| Is the power supplied?                         | Check that the supply voltage of power supply module is within the rated range.  |
| Is the capacity of power supply module enough? | Make sure that the power capacity is enough by calculating the current consumption such as a connected CPU module, an I/O module, and an intelligent function modules. |
| Is there any watchdog timer error?             | Reset the CPU module, and check if the RUN LED turns on. If the RUN LED remains off, the module may be failed. Please consult a local Mitsubishi representative.       |
| Is the module connected properly?              | Check the module connection.   |

### (2) When the ERR. LED turns on or flashes

#### (a) When turning on

| Check item            | Action  |
|-----------------------|---|
| Does any error occur? | Check the error code, and take the action described in the error code list. <ul style="list-style-type: none"><li>• Error Code List ( Page 159, Section 11.4)</li></ul> |

#### (b) When flashing

| Check item  | Action  |
|---|---|
| Is the value other than 0 set for Switch 5 of the intelligent function module switch setting? | With the parameter setting, set 0 for Switch 5 in the intelligent function module switch setting. |

### (3) When the ALM LED turns on or flashes

#### (a) When turning on

| Check item                 | Action  |
|----------------------------|---|
| Is there any alarm output? | Check Warning output flag (Process alarm) (Un\G50). |

#### (b) When flashing

| Check item                       | Action   |
|----------------------------------|--|
| Is there any input signal error? | Check Input signal error detection flag (Un\G49) |

#### (4) When digital output value cannot be read

| Check item  | Action   |
|---|--|
| Is there any problem with wiring, such as off or disconnection of analog signal lines?  | Check the faulty area by checking signal line visually or conductively.  |
| Is the CPU module in the STOP status?   | Change the status of the CPU module to RUN.  |
| Is the offset/gain setting correct?   | Check if the offset/gain setting is correct.<br>When the user range setting is selected, change the input range to the factory default setting. Then check if the A/D conversion executes.<br>If the A/D conversion is properly executed, configure the offset/gain setting again. |
| Is input range setting correct?   | Check Setting range (Un\G20). When the setting range is wrong, perform the intelligent function module switch setting again.   |
| Of the channels to input the analog value, is there any channel, whose A/D conversion enable/disable setting (Un\G0) set to the A/D conversion disable? | Check A/D conversion enable/disable setting (Un\G0). Then, set the A/D conversion enable for Un\G0 with the program or the parameter of the intelligent function module.   |
| Is Operating condition setting request (Y9) performed?  | Check if the digital output value is stored in the CH□ Digital output value (Un\G11 to Un\G14) after turning Operating condition setting request (Y9) from OFF to ON, then to OFF.<br>When the problem has been solved, check the program again.                                   |
| Are the (V+) and (I+) terminals connected if the input source is current?   | Make sure to connect the (V+) and (I+) terminals while inputting current as shown in the external wiring.  |
| Are the setting values correct when the average processing is specified?  | When selecting the time average processing, set the values satisfy the following condition.<br>• Setting value $\geq$ "4 (times) $\times$ conversion speed $\times$ Number of used channels"<br>If the condition above is not met, digital output values remain 0.                 |
| Is there any potential difference between the AG terminal and the external device GND?  | Connect the AG terminal and the external device GND  |

#### Point

If digital output value cannot be read even after taking the above actions, the A/D converter module may be failed.  
Please consult a local Mitsubishi representative.

#### (5) When an A/D conversion completed flag does not turn on in the normal mode

| Check item                          | Action   |
|-------------------------------------|--|
| Isn't there any input signal error? | Check Input signal error detection flag (Un\G49) |

# 11.7 Checking the Status of the A/D Converter Module by the System Monitor

To check the LED status or the setting status of the intelligent function module switch setting, select the H/W information of the A/D converter module on the system monitor of GX Works2.

## (1) Hardware LED information

LED status is displayed.

| No. | LED name | Status  |
|-----|----------|---|
| 1)  | RUN LED  | 0000 <sub>H</sub> : Indicates the LED off.<br>0001 <sub>H</sub> : Indicates the LED on.   |
| 2)  | ERR. LED | Alternating indication between 0000 <sub>H</sub> and 0001 <sub>H</sub> : Indicates the LED flashing.  |
| 3)  | ALM LED  | (GX Works2 displays the communication status with the A/D converter module, so that the displaying intervals of 0000 <sub>H</sub> and 0001 <sub>H</sub> are not always even.) |

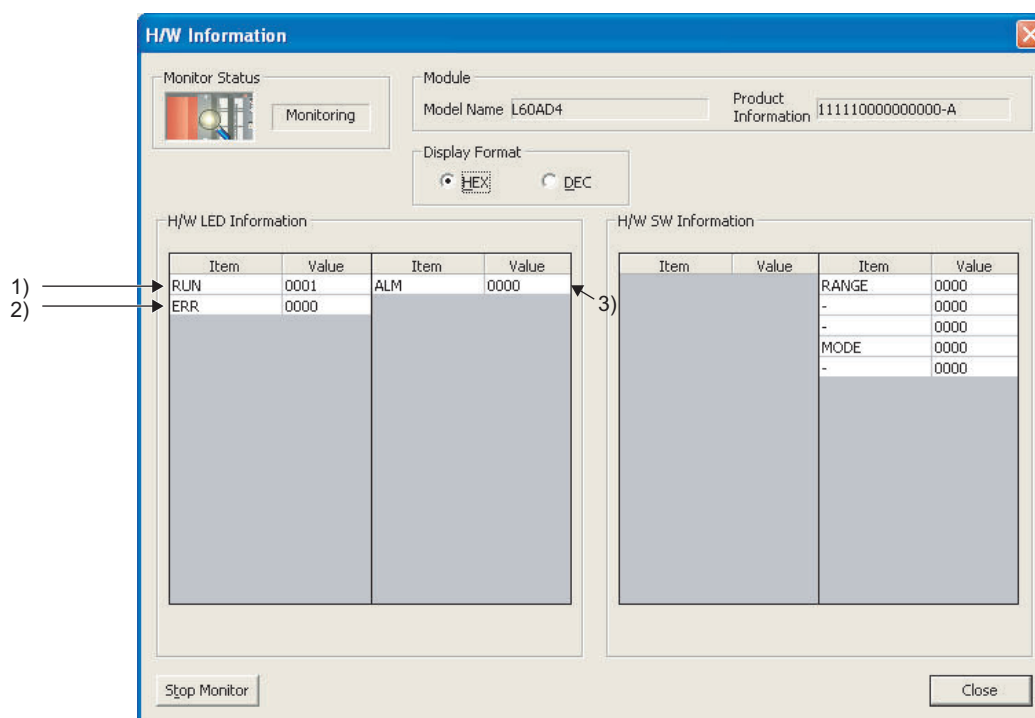
## (2) Hardware switch information

The setting status of the intelligent function module switch setting is displayed.

For details on the setting status, refer to the following.

- Intelligent function module switch setting (☞ Page 227, Appendix 9.1(2))

| Item  | Intelligent function module switch |
|-------|------------------------------------|
| RANGE | Switch1                            |
| —     | Switch2                            |
| —     | Switch3                            |
| MODE  | Switch4                            |
| —     | Switch5                            |





# APPENDICES

## Appendix 1 Details of I/O Signals

The following describes the details of the A/D converter module I/O signals assigned to the CPU module.

The I/O numbers (X/Y) described in Appendix 1 are for the case when the start I/O number of the A/D converter module is set to 0.

### Appendix 1.1 Input signal

A

#### (1) Module READY (X0)

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 then the A/D conversion is proceeded.

In the following cases, Module READY (X0) turns off.

- In the offset/gain setting mode (In this case, the A/D conversion processing is executed)
- When a watch dog timer error occurs to the A/D converter module (In this case, the A/D conversion processing is not executed)

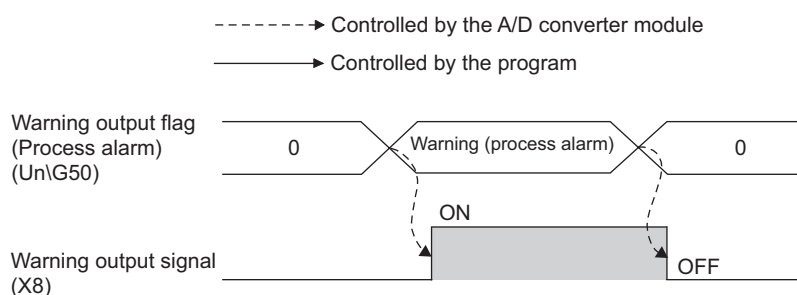
#### (2) Warning output signal (X8)

Warning output signal (X8) turns ON when the process alarm has been detected.

##### (a) Process alarm

- Warning output signal (X8) turns ON when digital output values of the A/D conversion enabled channels exceed the ranges set for CH1 Process alarm lower limit value (Un\G86) to CH4 Process alarm upper limit value (Un\G101) after validating the alarm output setting (process alarm).  
The ALM LED also turns on along with the on of the signal.
- Warning output signal (X8) turns OFF when the digital output 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.



### (3) Operating condition setting completed flag (X9)

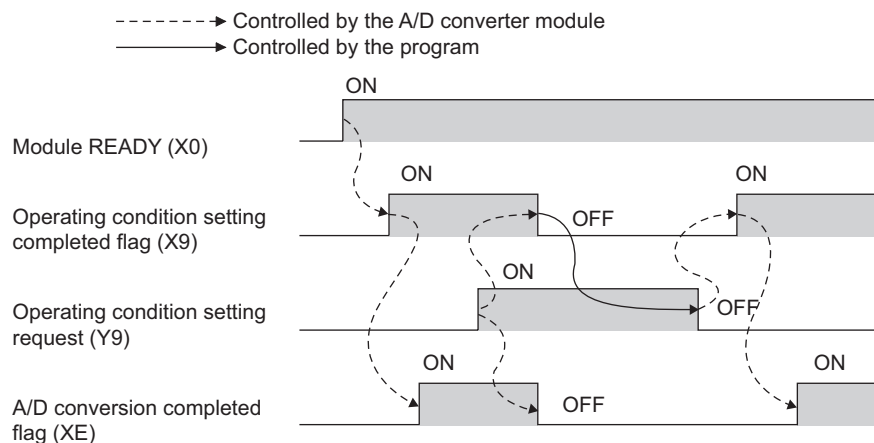
When changing the following settings, use Operating condition setting completed flag (X9) as an interlock condition to turn Operating condition setting request (Y9) OFF → ON → OFF.

- A/D conversion enable/disable setting (Un\G0)
- CH□ Time Average/ Count Average/Moving Average (Un\G1 to Un\G4)
- Averaging process setting (used to replace Q64AD) (Un\G9)
- Averaging process setting (Un\G24)
- Conversion speed setting (Un\G26)
- Input signal error detection extension setting (Un\G27)
- Digital clipping enable/disable setting (Un\G29)
- Input signal error detection setting (Un\G47)
- Warning output setting (Un\G48)
- Scaling enable/disable setting (Un\G53)
- CH□ Scaling lower limit value (Un\G62, Un\G64, Un\G66, Un\G68)
- CH□ Scaling upper limit value (Un\G63, Un\G65, Un\G67, Un\G69)
- CH□ Process alarm lower lower limit value (Un\G86, Un\G90, Un\G94, Un\G98)
- CH□ Process alarm lower upper limit value (Un\G87, Un\G91, Un\G95, Un\G99)
- CH□ Process alarm upper lower limit value (Un\G88, Un\G92, Un\G96, Un\G100)
- CH□ Process alarm upper upper limit value (Un\G89, Un\G93, Un\G97, Un\G101)
- CH□ Input signal error detection setting value (Un\G142 to Un\G145)
- CH□ Logging enable/disable setting (Un\G1000 to Un\G1003)
- CH□ Logging data setting (Un\G1024 to Un\G1027)
- CH□ Logging cycle setting value (Un\G1032 to Un\G1035)
- CH□ Logging cycle unit setting (Un\G1040 to Un\G1043)
- CH□ Logging points after trigger (Un\G1048 to Un\G1051)
- CH□ Level trigger condition setting (Un\G1056 to Un\G1059)
- CH□ Trigger data (Un\G1064 to Un\G1067)
- CH□ Trigger setting value (Un\G1082 to Un\G1085)
- CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303)
- CH□ Integration cycle setting (Un\G1308 to Un\G1311)
- CH□ Flow amount time unit setting (Un\G1316 to Un\G1319)
- CH□ Unit scaling setting (Un\G1324 to Un\G1327)

When Operating condition setting completed flag (X9) is OFF, the A/D conversion processing is not executed.

In the case of the following status, Operating condition setting completed flag (X9) turns OFF.

- When Operating condition setting request (Y9) is ON



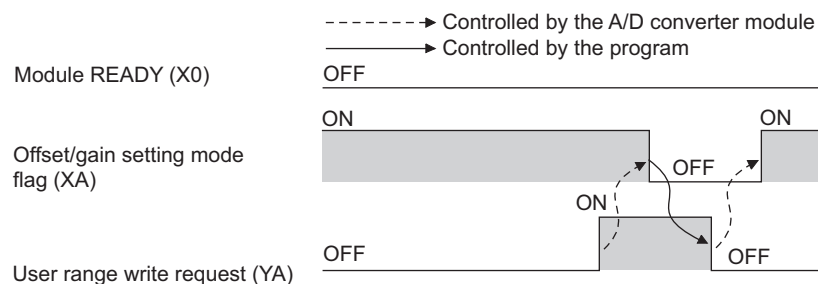
## (4) Offset/gain setting mode flag (XA)

### (a) Offset/gain setting mode

When registering the value, which was adjusted with the offset/gain setting, to the module, use Offset/gain setting mode flag (XA) as an interlock condition to turn User range write request (YA) OFF → ON → OFF.

For the offset/gain setting, refer to the following.

- Offset/gain setting (☞ Page 54, Section 7.5)

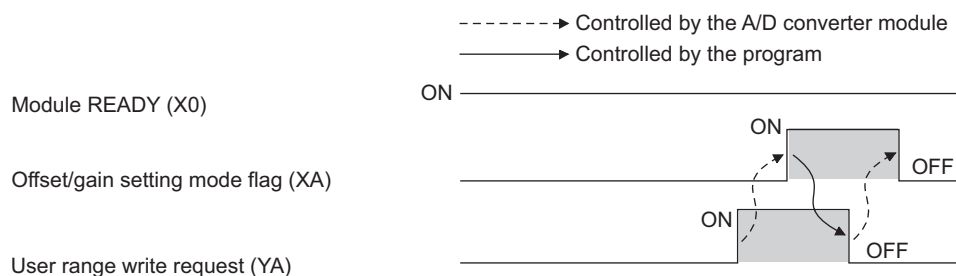


### (b) Normal mode

In the user range restoration, use Offset/gain setting mode flag (XA) as an interlock condition to turn User range write request (YA) OFF → ON → OFF.

For user range restoration, refer to the following.

- Save/restoration of offset/gain value (☞ Page 124, Section 8.19)

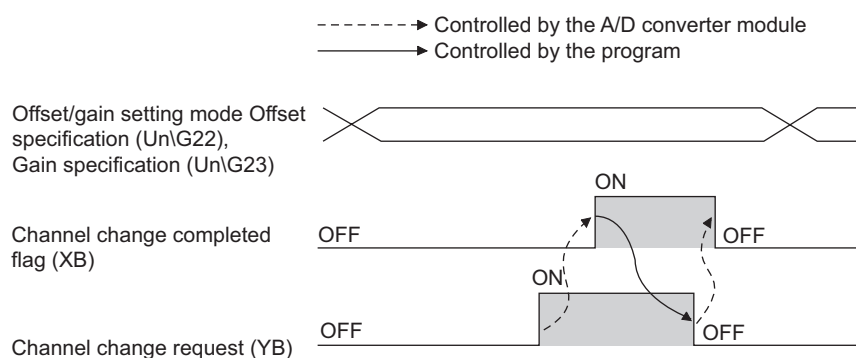


## (5) Channel change completed flag (XB)

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

For the offset/gain setting, refer to the following.

- Offset/gain setting (☞ Page 54, Section 7.5)



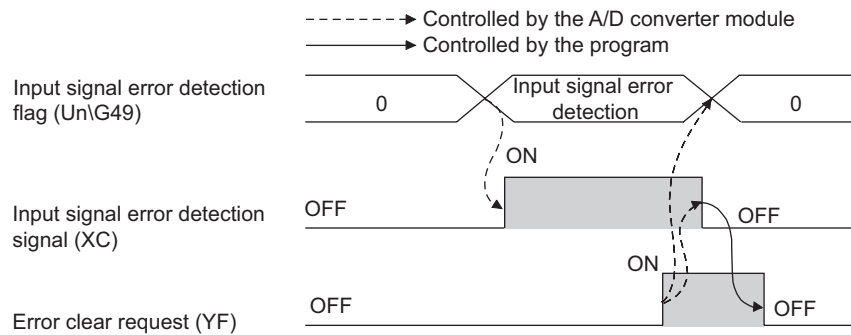
## (6) Input signal error detection signal (XC)

### (a) Turning Input signal error detection signal (XC) ON

- Input signal error detection signal (XC) turns to ON when an analog input value exceeds the range set with CH□ Input signal error detection setting value (Un\G142 to Un\G145) in any channel which has been A/D conversion-enabled, after validating Input signal error detection setting (Un\G47).
- Input signal error detection signal (XC) turns to ON when an analog input value exceeds the range set with CH□ Input signal error detection setting value (Un\G142 to Un\G145) in any channel which has been A/D conversion-enabled, after setting the detection condition in Input signal error detection extension setting (Un\G27). When the disconnection detection is set, the signal ignores the setting for CH□ Input signal error detection setting value (Un\G142 to Un\G145), and turns to ON at the disconnection detection.

### (b) Turning Input signal error detection signal (XC) OFF

After setting the analog input value within the range set, turn Error clear request (YF) OFF → ON → OFF to turn OFF Input signal error detection signal (XC).



### (c) When Input signal error detection signal (XC) turns ON

- A/D conversion completed flag (Un\G10) for the corresponding channels turns OFF.
- For the error detected channel, the digital output value immediately before the error detection is held in the buffer memory.
- ALM LED flashes.

### (d) When Input signal error detection signal (XC) turns OFF

- ALM LED turns off.
- Latest error code (Un\G19) is cleared.

### Point

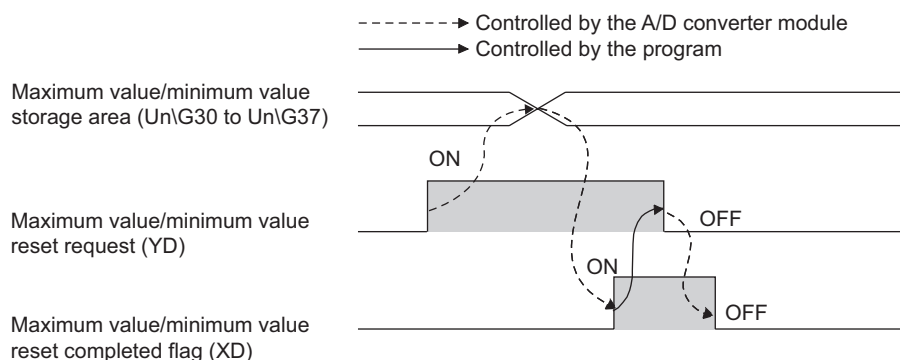
When the analog input value falls within the range set, A/D conversion resumes regardless of Input signal error detection signal (XC) reset.

When the first A/D conversion after the resumption is completed, A/D conversion completed flag (Un\G10) is turned to A/D conversion completion (1).

Averaging processing starts over after the A/D conversion resumed.

## (7) Maximum value/minimum value reset completed flag (XD)

Maximum value/minimum value reset completed flag (XD) turns ON after resetting the maximum or minimum values stored in CH□ Maximum value (Un\G30, Un\G32, Un\G34, Un\G36) and CH□ Minimum value (Un\G31, Un\G33, Un\G35, Un\G37) by turning Maximum value/minimum value reset request (YD) OFF → ON → OFF.

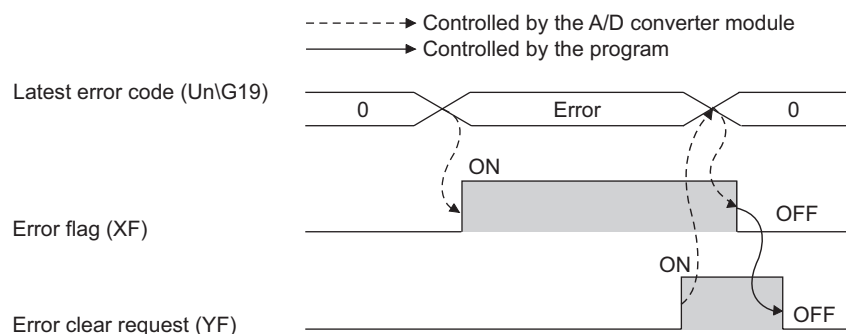


## (8) A/D conversion completed flag (XE)

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

## (9) Error flag (XF)

Error flag (XF) turns ON when an error occurs.



### (a) Clearing the latest error code and Error flag (XF)

Turn Error clear request (YF) OFF → ON → OFF.

## Appendix 1.2 Output signal

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### (1) Operating condition setting request (Y9)

To validate the following settings, turn Operating condition setting request (Y9) OFF → ON → OFF.

- A/D conversion enable/disable setting (Un\G0)
- CH□ Time Average/ Count Average/Moving Average (Un\G1 to Un\G4)
- Averaging process setting (used to replace Q64AD) (Un\G9)
- Averaging process setting (Un\G24)
- Conversion speed setting (Un\G26)
- Input signal error detection extension setting (Un\G27)
- Digital clipping enable/disable setting (Un\G29)
- Input signal error detection setting (Un\G47)
- Warning output setting (Un\G48)
- Scaling enable/disable setting (Un\G53)
- CH□ Scaling lower limit value (Un\G62, Un\G64, Un\G66, Un\G68)
- CH□ Scaling upper limit value (Un\G63, Un\G65, Un\G67, Un\G69)
- CH□ Process alarm lower lower limit value (Un\G86, Un\G90, Un\G94, Un\G98)
- CH□ Process alarm lower upper limit value (Un\G87, Un\G91, Un\G95, Un\G99)
- CH□ Process alarm upper lower limit value (Un\G88, Un\G92, Un\G96, Un\G100)
- CH□ Process alarm upper upper limit value (Un\G89, Un\G93, Un\G97, Un\G101)
- CH□ Input signal error detection setting value (Un\G142 to Un\G145)
- CH□ Logging enable/disable setting (Un\G1000 to Un\G1003)
- CH□ Logging data setting (Un\G1024 to Un\G1027)
- CH□ Logging cycle setting value (Un\G1032 to Un\G1035)
- CH□ Logging cycle unit setting (Un\G1040 to Un\G1043)
- CH□ Logging points after trigger (Un\G1048 to Un\G1051)
- CH□ Level trigger condition setting (Un\G1056 to Un\G1059)
- CH□ Trigger data (Un\G1064 to Un\G1067)
- CH□ Trigger setting value (Un\G1082 to Un\G1085)
- CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303)
- CH□ Integration cycle setting (Un\G1308 to Un\G1311)
- CH□ Flow amount time unit setting (Un\G1316 to Un\G1319)
- CH□ Unit scaling setting (Un\G1324 to Un\G1327)

For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Operating condition setting completed flag (X9) (👉 Page 167, Appendix 1.1)

### (2) User range write request (YA)

#### (a) Offset/gain setting mode

Turn User range write request (YA) OFF → ON → OFF to register the adjusted offset/gain setting values in the A/D converter module.

The data is written to the flash memory at the timing when this signal is turned on from off.

For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Offset/gain setting mode flag (XA) (👉 Page 167, Appendix 1.1)

#### (b) Normal mode

Turn User range write request (YA) OFF → ON → OFF to perform the user range restoration.

For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Offset/gain setting mode flag (XA) (👉 Page 167, Appendix 1.1)

### (3) Channel change request (YB)

Turn Channel change request (YB) OFF → ON → OFF to change a channel to perform the offset/gain setting.  
For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Channel change completed flag (XB) (👉 Page 167, Appendix 1.1)

### (4) Maximum value/minimum value reset request (YD)

Turn Maximum value/minimum value reset request (YD) OFF → ON → OFF to clear the maximum or minimum values stored in CH□ Maximum value (Un\G30, Un\G32, Un\G34, Un\G36) and CH□ Minimum value (Un\G31, Un\G33, Un\G35, Un\G37).

For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Maximum value/minimum value reset completed flag (XD) (👉 Page 167, Appendix 1.1)

### (5) Error clear request (YF)

To clear Error flag (XF), Input signal error detection signal (XC), and Latest error code (Un\G19), turn Error clear request (YF) OFF → ON → OFF.

For the timing of turning the signal OFF → ON → OFF, refer to the following.

- Input signal error detection signal (XC) (👉 Page 167, Appendix 1.1)
- Error flag (XF) (👉 Page 167, Appendix 1.1)

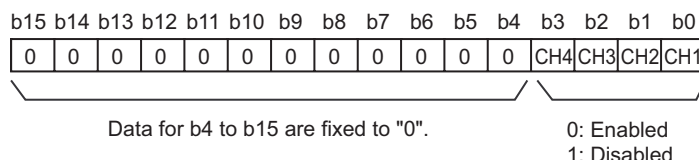
A

## Appendix 2 Details of Buffer Memory Addresses

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

### (1) A/D conversion enable/disable setting (Un\G0)

Set if the A/D conversion is enabled or disabled for each channel.



#### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (b) Default value

All channels are set to A/D conversion enable (0) as the default value.

### (2) CH□ Time Average/ Count Average/Moving Average (Un\G1 to Un\G4)

Configure the time/count/moving average setting for each channel to which the averaging processing is specified. The following shows the setting range.

| Processing method | Conversion speed setting | Setting range                    |
|-------------------|--------------------------|----------------------------------|
| Time average      | 20μs                     | 2 to 1500 (ms)                   |
|                   | 80μs, 1ms                | 2 to 5000 (ms)                   |
| Count average     | 20μs, 80μs, 1ms          | 4 to 62500 (times) <sup>*1</sup> |
| Moving average    | 20μs, 80μs, 1ms          | 2 to 1000 (times)                |

<sup>\*1</sup> When specifying a setting between 32768 and 62500 (times) in the program, configure the setting in hexadecimal.

**Ex.** When specifying a setting of 62500 (times), set F424<sub>H</sub>.

#### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (b) Default value

All channels are set to Disable (0).

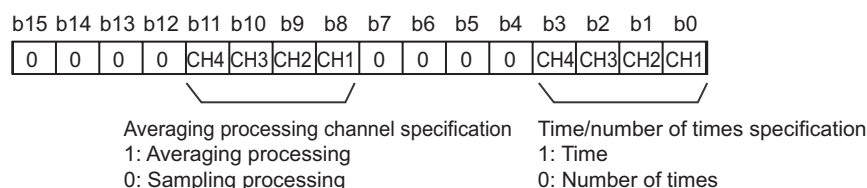
#### Point

- When the value out of the setting range above is written, an error occurs in the channel to which the value is written, the error code is stored in Latest error code (Un\G19) and Error flag (XF) is turned ON. The A/D conversion is processed in the setting configured before the error occurrence.
- 0 is set as default value, so change the value according to the processing method.
- When the sampling is set to the channel to which the setting value has been set, the setting value is ignored.



### (3) Averaging process setting (used to replace Q64AD) (Un\G9)

Write the setting for averaging processing when using the sequence program for initial setting of the Q64AD.



#### (a) Enabling the setting

To enable the setting, turn OFF → ON → OFF Operating condition setting request (Y9) after setting Averaging process setting (Un\G24) to sampling processing (0).

#### Point

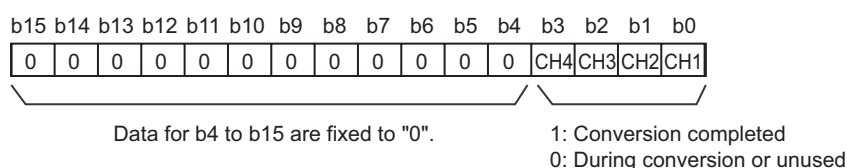
When selecting the moving average, it is necessary to write 0 to (Un\G9), and write the moving average to Averaging process setting (Un\G24).

#### (b) Default value

All channels are set to sampling (0) as the default value.

### (4) A/D conversion completed flag (Un\G10)

A/D conversion status can be checked with this flag.



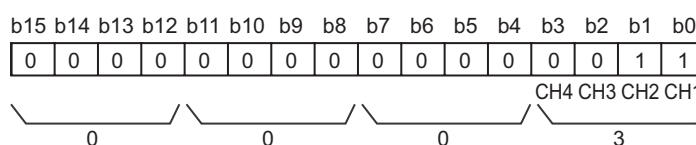
#### (a) A/D conversion completion

When the first A/D conversion is completed in the channel where the A/D conversion is enabled, the flag is turned to A/D conversion completion (1).

A/D conversion completed flag (XE) is turned to ON when the conversion of all the channels where the A/D conversion is enabled are completed.

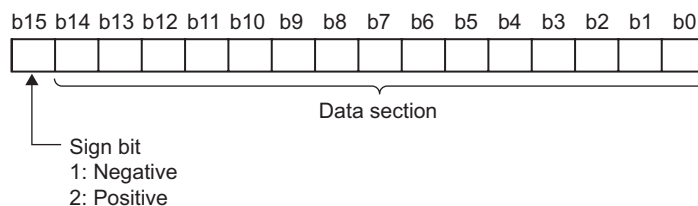
Turning OFF → ON → OFF Operating condition setting request (Y9) turns the flag to 0 (default value), and the flag is turned to A/D conversion completion (1) when the first A/D conversion is completed.

**Ex.** When A/D conversion enable is set to CH1 and CH2 and all the A/D conversions in CH1 and CH2 are completed, 0003<sub>H</sub>(3) is stored in A/D conversion completed flag (Un\G10), as shown below.



## (5) CH□ Digital output value (Un\G11 to Un\G14)

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



### (a) Updating cycle

When performing the average processing, the value is updated in each specified averaging processing cycle.

When the average processing is not performed, the value is updated in each sampling cycle.

## (6) Latest error code (Un\G19)

Error codes or alarm codes detected in the A/D converter module are stored.

For details on error code and alarm code, refer to the following.

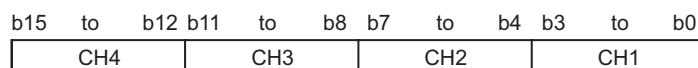
- Error code list (📖 Page 159, Section 11.4)
- Alarm code list (📖 Page 163, Section 11.5)

### (a) Clearing an error

Turn OFF → ON → OFF Error clear request (YF).

## (7) Setting range (Un\G20)

The setting content for input range can be checked.



| Input range               | Setting value  |
|---------------------------|----------------|
| 4 to 20mA                 | 0 <sub>H</sub> |
| 0 to 20mA                 | 1 <sub>H</sub> |
| 1 to 5V                   | 2 <sub>H</sub> |
| 0 to 5V                   | 3 <sub>H</sub> |
| -10 to 10V                | 4 <sub>H</sub> |
| 0 to 10V                  | 5 <sub>H</sub> |
| 4 to 20mA (Extended mode) | A <sub>H</sub> |
| 1 to 5V (Extended mode)   | B <sub>H</sub> |
| User range setting        | F <sub>H</sub> |

### Point

Input range cannot be changed in Setting range (Un\G20).  
For changing the setting, refer to the following.

- Switch setting (📖 Page 49, Section 7.2)

## (8) Offset/gain setting mode Offset specification (Un\G22), Offset/gain setting mode Gain specification (Un\G23)

Specify the channel to perform the offset/gain setting adjustment.

Offset/gain setting mode Offset specification (Un\G22): channel to adjust the offset

Offset/gain setting mode Gain specification (Un\G23): channel to adjust the gain

|  | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3  | b2  | b1  | b0  |
|--|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|-----|-----|-----|-----|
| Offset/gain setting mode Offset specification (Un\G22) | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0  | 0  | CH4 | CH3 | CH2 | CH1 |
| Offset/gain setting mode Gain specification (Un\G23)   | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0  | 0  | CH4 | CH3 | CH2 | CH1 |

Data for b4 to b15 are fixed to "0".

1: Setting-target channel  
0: Invalid

### Point

- The settings for multiple channels can be configured at the same time. However, set either of Offset/gain setting mode Offset specification (Un\G22) or Offset/gain setting mode Gain specification (Un\G23) to be disabled (0).  
When the settings for both of them are configured at the same time, a gain setting mode error (error code: 500) occurs.
- For details on offset/gain setting, refer to the following.
  - Offset/gain setting (Page 54, Section 7.5)

## (9) Averaging process setting (Un\G24)

Configure the setting when selecting sampling or averaging processing for each channel.

Averaging processing includes time average, count average and moving average.

| b15 | to | b12 | b11 | to  | b8 | b7  | to | b4 | b3 | to | b0 |
|-----|----|-----|-----|-----|----|-----|----|----|----|----|----|
| CH4 |    | CH3 |     | CH2 |    | CH1 |    |    |    |    |    |

| Processing method   | Setting value  |
|---------------------|----------------|
| Sampling processing | 0 <sub>H</sub> |
| Time average        | 1 <sub>H</sub> |
| Count average       | 2 <sub>H</sub> |
| Moving average      | 3 <sub>H</sub> |

### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

### (b) Default value

All channels are set to sampling (0) as the default value.

### Point

- When using Averaging process setting (used to replace Q64AD) (Un\G9), the value set in Averaging process setting (Un\G24) is ignored. (The operation is performed in the averaging process setting in Averaging process setting (used to replace Q64AD) (Un\G9).)
- The channel to which a value out of the above setting range is written performs the operation in the sampling processing.

## (10) Conversion speed setting (Un\G26)

Set the conversion speed for all channels.

When the value of 0003<sub>H</sub> to FFFF<sub>H</sub> is set, an error occurs and the operation is performed in the previous setting.

| Conversion speed | Setting value  |
|------------------|----------------|
| 20μs             | 0 <sub>H</sub> |
| 80μs             | 1 <sub>H</sub> |
| 1ms              | 2 <sub>H</sub> |

### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

### (b) Default value

80μs (1) is set as the default value.

## (11) Input signal error detection extension setting (Un\G27)

In the input signal error detection extension function, set the error detection method for each channel. When Input signal error detection extension setting (Un\G27) is set to other than Disable (0), the input signal error detection extension function turns enabled.

For details on the input signal error detection extension function, refer to the following.

- Input signal error detection extension function (👉 Page 74, Section 8.8)

|            |           |          |          |
|------------|-----------|----------|----------|
| b15 to b12 | b11 to b8 | b7 to b4 | b3 to b0 |
| CH4        | CH3       | CH2      | CH1      |

| Detection method            | Setting value  |
|-----------------------------|----------------|
| Disable                     | 0 <sub>H</sub> |
| Lower upper limit detection | 1 <sub>H</sub> |
| Lower limit detection       | 2 <sub>H</sub> |
| Upper limit detection       | 3 <sub>H</sub> |
| Disconnection detection     | 4 <sub>H</sub> |

### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

### (b) Default value

All channels are set to Disable (0).

### Point

- When a value out of the setting range above is set to a channel, an error occurs in the channel, an error code is stored in Latest error code (Un\G19) and Error flag (XF) is turned to ON. The operation is performed in the setting configured before the error occurrence.
- Disconnection detection (4) is valid only when the input range is set as 4 to 20mA (extended mode) or 1 to 5V (extended mode). When the channel with another range is set to Disconnection detection (4), an error occurs.
- When Input signal error detection extension setting (Un\G27) is set to Lower upper limit detection (1), Upper limit detection (2), Lower limit detection (3), or Disconnection detection (4), the setting of Input signal error detection setting (Un\G47) is ignored.

## (12) Digital clipping enable/disable setting (Un\G29)

Set whether the digital clipping function is enabled or disabled, for each channel.

For details on the digital clipping function, refer to the following.

- Digital Clipping Function (🔍 Page 90, Section 8.12)

| 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 |

Data for b4 to b15 are fixed to "0".

0: Enabled  
1: Disabled

### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

### (b) Default value

All channels are set to Disable (1).

## (13) CH□ Maximum value (Un\G30, Un\G32, Un\G34, Un\G36), CH□ Minimum value (Un\G31, Un\G33, Un\G35, Un\G37)

The maximum and minimum values of converted digital output value are stored as signed 16-bit binary.

In the following cases, CH□ Maximum value (Un\G30, Un\G32, Un\G34, Un\G36) and CH□ Minimum value (Un\G31, Un\G33, Un\G35, Un\G37) are updated with the current value.

- When turning OFF → ON → OFF Operating condition setting request (Y9) changes the setting
- When Maximum value/minimum value reset request (YD) is turned OFF → ON → OFF

### Point

- For the channel to which the averaging processing is specified, the maximum and minimum values are stored at averaging processing time intervals.
- In CH□ Maximum value (Un\G30, Un\G32, Un\G34, Un\G36) and CH□ Minimum value (Un\G31, Un\G33, Un\G35, Un\G37), the values calculated by each function is stored using the following functions:
  - Digital clipping function
  - Scaling function
  - Shift function
  - Difference conversion function

## (14) Input signal error detection setting (Un\G47)

Set whether the alarm output of input signal error detection is enabled or disabled for each channel. Only the lower upper limit detection can be used as the detection method of an input signal error in this area.

- Input Signal Error Detection Function (🔍 Page 69, Section 8.7)

| 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 |

Data for b4 to b15 are fixed to "0".

0: Enabled  
1: Disabled

### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

### (b) Default value

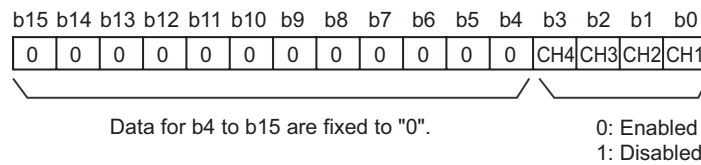
All channels are set to disable (1) as the default value.

### Point

When Input signal error detection extension setting (Un\G27) is set to other than Disable (0), the setting in this area is ignored.

## (15)Warning output setting (Un\G48)

Set whether the alarm output of process alarm is enabled or disabled for each channel.



### (a) Enabling the setting

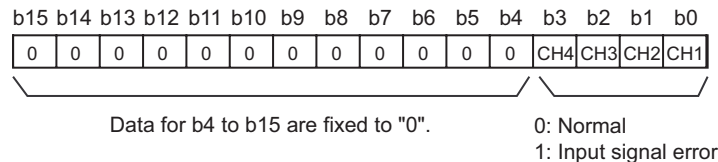
Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

### (b) Default value

All channels are set to disable (1) as the default value.

## (16)Input signal error detection flag (Un\G49)

Input signal status can be checked with this flag.



### (a) Input signal error detection flag (Un\G49) status

- When setting the detection method in Input signal error detection extension setting (Un\G27)  
When the analog input value out of the setting range for CH□ Input signal error detection setting value (Un\G142 to Un\G145) is detected according to the set condition of detection method, Input signal error detection flag (Un\G49) corresponding to each channel is turned to input signal error (1).
- When setting Input signal error detection setting (Un\G47) to Enable (0) and Input signal error detection extension setting (Un\G27) to Disable (0)  
When the analog input value out of the setting range for CH□ Input signal error detection setting value (Un\G142 to Un\G145) is detected, Input signal error detection flag (Un\G49) corresponding to each channel is turned to input signal error (1).
- When an error is detected in any A/D conversion enable or input signal error detection enable channels, Input signal error detection signal (XC) is turned to ON.

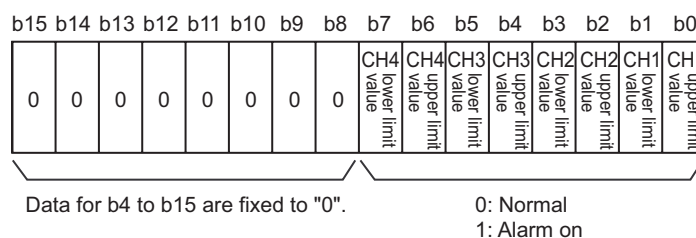
### (b) Clearing Input signal error detection flag (Un\G49)

Input signal error detection flag (Un\G49) can be cleared in the following two procedures.

- Turn OFF → ON → OFF Operating condition setting request (Y9)
- Turn OFF → ON → OFF Error clear request (YF)

## (17)Warning output flag (Process alarm) (Un\G50)

Alarms can be checked if the alarm is the upper limit alarm or lower limit alarm, for each channel.



### (a) Warning output flag (Process alarm) (Un\G50) status

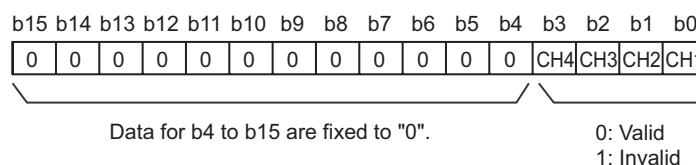
- When the value is out of the range specified in CH1 Process alarm lower lower limit value (Un\G86) to CH4 Process alarm upper upper limit value (Un\G101), Warning output flag (Process alarm) (Un\G50) corresponding to each channel is turned to alarm ON (1).
- When an error is detected in any A/D conversion enable or alarm output enable channels, Warning output signal (X8) is also turned to ON.

### (b) Clearing Warning output flag (Process alarm) (Un\G50)

- When the digital output value returns within the setting range, the flag is automatically cleared.
- When Operating condition setting request (Y9) is turned OFF → ON → OFF, it is cleared.

## (18)Scaling enable/disable setting (Un\G53)

Set whether the scaling is enabled or disabled, for each channel.



### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

### (b) Default value

All channels are set to disable (1) as the default value.

## (19)CH□ Scaling value (digital operation value) (Un\G54 to Un\G57)

The scaling value (digital operation value) which is obtained by the scaling function, shift function, digital clipping function, and difference conversion function is stored as signed 16-bit binary.



### Point

When the digital clipping function, scaling function, shifting function, or difference conversion function is not used, the same value as the one in CH□ Digital output value (Un\G11 to Un\G14) is stored.

## (20)CH□ Scaling lower limit value (Un\G62, Un\G64, Un\G66, Un\G68), CH□ Scaling upper limit value (Un\G63, Un\G65, Un\G67, Un\G69)

Set the range of scale conversion for each channel.

For details on scaling function, refer to the following.

- Scaling Function (Page 80, Section 8.10)

### (a) Setting range

Setting range: -32000 to 32000 (scaling upper limit value > scaling lower limit value)

### (b) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

### (c) Default value

All channels are set to 0.

### Point

- When a value set to a channel is out of the setting range above or a value does not satisfy "scaling upper limit value > scaling lower limit value", an error occurs to the channel.  
Then, an error code is stored in Latest error code (Un\G19), Error flag (XF) is turned ON and the operation is performed in the setting configured before the error occurrence.
- Change the setting value, since 0 is set as the default value.
- When Scaling enable/disable setting (Un\G53) is set to Disable (1), the setting for CH□ Scaling lower limit value (Un\G62, Un\G64, Un\G66, Un\G68) and CH□ Scaling upper limit value (Un\G63, Un\G65, Un\G67, Un\G69) are ignored.



- (21)CH□ Process alarm lower lower limit value (Un\G86, Un\G90, Un\G94, Un\G98),  
 CH□ Process alarm lower upper limit value (Un\G87, Un\G91, Un\G95, Un\G99),  
 CH□ Process alarm upper lower limit value (Un\G88, Un\G92, Un\G96, Un\G100),  
 CH□ Process alarm upper upper limit value (Un\G89, Un\G93, Un\G97, Un\G101)

Set the digital output value range for each channel.

For details on warning output function (process alarm), refer to the following.

- Warning Output Function (Process Alarm) (👉 Page 77, Section 8.9)

#### (a) Setting range

- Setting range is -32768 to 32767.
- Configure the 4-step setting of 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.

#### (b) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (c) Default value

0 is set as the default value.

### Point

- When a value out of the setting range above or a value which does not satisfy the formula of process alarm upper upper limit value  $\geq$  process alarm upper lower limit value  $\geq$  process alarm lower upper limit value  $\geq$  process alarm lower lower limit value is set to a channel, an error occurs in the channel. The error code is stored in Latest error code (Un\G19), and Error flag (XF) is turned to ON. The operation is performed in the setting configured before the error occurrence.
- Change the setting value, since 0 is set as the default value.
- When the following functions are used, warning targets are scaling values that reflect the operations of each function. Set values considering operation results of each function.
  - Digital clipping function
  - Scaling function
  - Shift function
  - Difference conversion function

## (22)CH□ Input signal error detection setting value (Un\G142 to Un\G145)

Set the setting value to detect an input analog value error for each channel.

For details on the input signal error detection function and input signal error detection extension function, refer to the following.

- Input signal error detection function (☞ Page 69, Section 8.7)
- Input signal error detection extension function (☞ Page 74, Section 8.8)

### (a) Setting procedure

- Setting range is 0 to 250 (0 to 25.0%). Set in increments of 1 (0.1%).
- The input signal error detection upper and lower limit values are calculated as follows based on the input signal error detection setting value. The calculating input signal error detection upper and lower limit values will be different depending on the input range to be used.

[Input signal error detection upper limit value]

$$= \text{Gain value of each range} + \left( \text{Gain value of each range} - \text{Offset value of each range} \right) \times \frac{\text{Input signal error detection setting value}}{1000}$$

[Input signal error detection lower limit value]

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

**Ex.** When the input signal error detection setting value is set to 100 (10%)

Range to be used: 4 to 20mA

The upper and lower limit values of input signal error detection are as follows:

$$\text{Input signal error detection upper limit value} = 20 + (20 - 4) \times \frac{100}{1000} = 21.6\text{mA}$$

$$\text{Input signal error detection lower limit value} = -4 - (20 - 4) \times \frac{100}{1000} = -2.4\text{mA}$$

- Conditions vary as follows depending on the setting in Input signal error detection extension setting (Un\G27).

| Input signal error detection extension setting (Un\G27) | Detection condition   |
|---|---|
| Lower upper limit detection (1)                         | At the input signal error detection upper limit value or the input signal error detection lower limit value   |
| Lower limit detection (2)                               | At the input signal error detection lower limit value   |
| Upper limit detection (3)                               | At the input signal error detection upper limit value   |
| Disconnection detection (4)                             | <ul style="list-style-type: none"> <li>• In 2mA or less, or 0.5V or less</li> <li>• The setting for CH□ Input signal error detection setting value (Un\G142 to Un\G145) is ignored.</li> <li>• Input range other than 4 to 20mA (extended mode) or 1 to 5V (extended mode) cannot be used.</li> </ul> |

### (b) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

### (c) Default value

All channels are set to 5% (50).

## Point

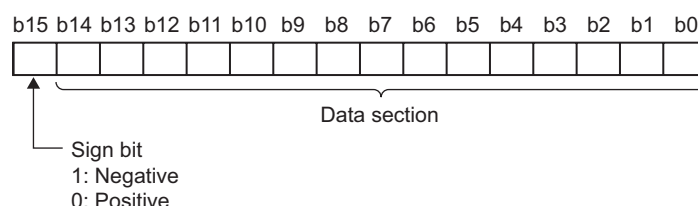
When a value out of the setting range above is set to a channel, an error occurs in the channel, an error code is stored in Latest error code (Un\G19) and Error flag (XF) is turned to ON. The operation is performed in the setting configured before the error occurrence.

### (23)CH□ Shifting amount to conversion value (Un\G150 to Un\G153)

Set the shifting amount to conversion value that is to be used for the shift function.

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

- Shift function (Page 86, Section 8.11)



#### (a) Setting range

Setting range is -32768 to 32767.

#### (b) Enabling the setting

- When the value is set, set shifting amount to conversion value turns valid regardless of turning Operating condition setting request (Y9) OFF → ON → OFF.

#### (c) Default value

All channels are set to Disable (0).

### (24)Mode switching setting (Un\G158, Un\G159)

Set the setting value for the mode to be switched to.

| Mode switching to        | Setting value     |                   |
|--------------------------|-------------------|-------------------|
|                          | Un\G158           | Un\G159           |
| Normal mode              | 0964 <sub>H</sub> | 4144 <sub>H</sub> |
| Offset/gain setting mode | 4144 <sub>H</sub> | 0964 <sub>H</sub> |

#### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (b) After the mode is switched

When the mode is switched, this area is cleared to zero and Operating condition setting completed flag (X9) is turned to OFF.

After checking that the operating condition setting complete/completion flag is OFF, turn Operating condition setting request (Y9) to OFF

## Point

When a value out of the setting range above is written, the mode is not switched and only the operating condition is changed.

## (25)CH□ Difference conversion trigger (Un\G172 to Un\G175)

Use this buffer memory as a trigger to start/stop the difference conversion.

For details on the difference conversion function, refer to the following.

- Difference Conversion Function (👉 Page 94, Section 8.13)

| Difference conversion trigger | Setting value |
|-------------------------------|---------------|
| No request                    | 0             |
| Trigger request               | 1             |

### (a) Starting/Stopping the difference conversion

- When the setting value is turned No request (0) → Trigger request (1), the difference conversion starts.
- When the setting value is turned Trigger request (0) → No request (1), the difference conversion stops.

### (b) Default value

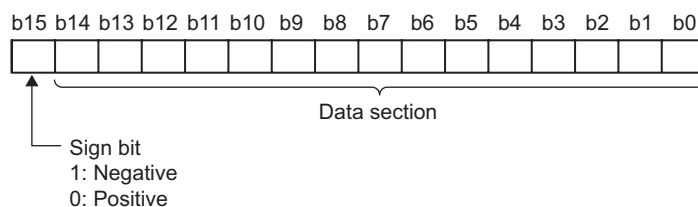
All channels are set to No request (0).

### Point🔍

In the channel where a setting value other than the above is set, an error occurs. The error code is stored in Latest error code (Un\G19) and Error flag (XF) turns on. However, the difference conversion continues.

## (26)CH□ Difference conversion reference value (Un\G180 to Un\G183)

This is the area for storing the scaling value (digital operation value) at the start of the difference conversion as the difference conversion reference value.



### (a) Setting range

Setting range is -32768 to 32767.

### Point🔍

- The difference conversion reference value is updated when CH□ Difference conversion trigger (Un\G172 to Un\G175) is turned No request (0) → Trigger request (1).
- Even if CH□ Difference conversion status flag (Un\G190 to Un\G193) is turned Converting difference (1) → Not converted (0), CH□ Difference conversion reference value (Un\G180 to Un\G183) is not cleared.

## (27)CH□ Difference conversion status flag (Un\G190 to Un\G193)

Difference conversion status can be checked with this flag.

| Difference conversion status | CH□ Difference conversion status flag<br>(Un\G190 to Un\G193) |
|------------------------------|---|
| Not converted                | 0   |
| Converting difference        | 1   |

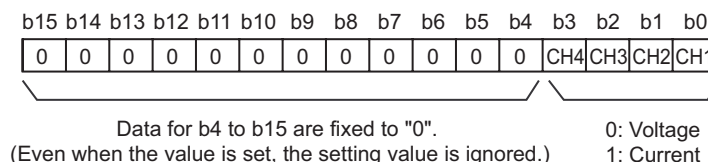
- When CH□ Difference conversion trigger (Un\G172 to Un\G175) is turned No request (0) → Requested (1), CH□ Difference conversion status flag (Un\G190 to Un\G193) is turned to Converting difference (1).
- When CH□ Difference conversion trigger (Un\G172 to Un\G175) is turned Requested (1) → No request (0), CH□ Difference conversion status flag (Un\G190 to Un\G193) is turned Converting difference (1) → Not converted (0).

A

## (28)Pass data classification setting (Un\G200)

This is the area for saving and restoring the offset/gain setting value in user range setting.

Specify if the offset/gain setting value to be saved or restored is either voltage or current.



## (29)CH1 Industrial shipment settings offset value (L) (Un\G202) to CH4 User range settings gain value (H) (Un\G233)

This is the area for restoring the offset/gain setting value in user range setting.

When the offset/gain setting of the user range setting is restored, the data to be used is stored with the following operation.

- Writing the initial setting by utility
- Turning OFF → ON Operating condition setting request (Y9) \*1
- Turning OFF → ON User range write request (YA) (in offset/gain setting mode)

\*1 The data is not saved when the setting value is written to Mode switching setting (Un\G158, Un\G159).

When restoring the offset/gain setting value in user range setting, set the data saved in this area to the same area in the A/D converter module where the data is restored.

For the setting procedure of offset/gain values or saving and restoring offset/gain values, refer to the following.

- Offset/gain setting (Page 54, Section 7.5)
- Saving and restoring offset/gain values (Page 124, Section 8.19)

### (30)CH□ Logging enable/disable setting (Un\G1000 to Un\G1003)

Set whether the logging is enabled or disabled.

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

- Logging function (👉 Page 98, Section 8.14)

| Logging enable/disable setting | Setting value |
|--------------------------------|---------------|
| Enable                         | 0             |
| Disable                        | 1             |

#### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (b) Default value

All channels are set to Disable (1).

### Point🔍

- Enabling the setting starts the logging.
- In the channel where the following conditions are set, an error occurs. Then, the error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON and logging cannot be performed.
  - When a value other than the above setting values is set
  - When Conversion speed setting (Un\G26) is set to 20μs (0) and CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Enable (0)
  - When Input signal error detection setting (Un\G47) is set to Enable (0) and CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Enable (0)
  - When Input signal error detection extension setting (Un\G27) is set to other than Disable (0) and CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Enable (0)

### (31)CH□ Logging hold request (Un\G1008 to Un\G1011)

Use Logging hold request (Un\G1008 to Un\G1011) as a trigger to hold (stop) the logging at any timing during the logging.

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

- Logging function (👉 Page 98, Section 8.14)

| Logging hold request | Setting value |
|----------------------|---------------|
| OFF                  | 0             |
| ON                   | 1             |

#### (a) Operation of the logging hold processing

- In the case that CH□ Level trigger condition setting (Un\G1056 to Un\G1059) is set to Disable (0), when CH□ Logging hold request (Un\G1008 to Un\G1011) changes from OFF (0) to ON (1), the logging hold processing starts.
- In the case that CH□ Level trigger condition setting (Un\G1056 to Un\G1059) is set to other than Disable (0), when the trigger condition is satisfied after CH□ Logging hold request (Un\G1008 to Un\G1011) changes from OFF (0) to ON (1), the logging hold processing starts.  
When the level trigger is enabled, use Logging hold request (Un\G1008 to Un\G1011) as an interlock to operate the level trigger.
- If CH□ Logging hold request (Un\G1008 to Un\G1011) is turned to ON (1) → OFF (1), the hold status (stop) is cleared and the logging restarts.

#### (b) Default value

All channels are set to OFF (0).

#### Point🔍

- In the channel where a value other than the above setting values is set, an error occurs. Then, the error code is stored in Latest error code (Un\G19) and Error flag (XF) is turned to ON. However, the logging continues.
- When CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Disable (1), the setting for CH□ Logging hold request (Un\G1008 to Un\G1011) is ignored.

### (32)CH□ Logging hold flag (Un\G1016 to Un\G1019)

Hold status of logging can be checked with this flag.

| Hold status of logging | Stored value |
|------------------------|--------------|
| OFF                    | 0            |
| ON                     | 1            |

- Logging hold flag (Un\G1016 to Un\G1019) is turned to ON (1) when the status of logging changes to the hold (stop) from the status where the logging is recording data in the logging data storage area.

### (33)CH□ Logging data setting (Un\G1024 to Un\G1027)

When the logging function is used, set whether the logging data type is Digital output value or Scaling value (digital operation value).

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

- Logging function (👉 Page 98, Section 8.14)

| Target of logging                       | Setting value |
|---|---------------|
| Digital output value                    | 0             |
| Scaling value (digital operation value) | 1             |

#### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (b) Default value

All channels are set to Scaling value (digital operation value) (1).

#### **Point**🔑

- In the channel where a value other than the above setting values is set, an error occurs. Then, the error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON and the logging cannot be performed.
- When CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Disable (1), the setting for CH□ Logging data setting (Un\G1024 to Un\G1027) is ignored.



### (34)CH□ Logging cycle setting value (Un\G1032 to Un\G1035), CH□ Logging cycle unit setting (Un\G1040 to Un\G1043)

Set the cycle of storing the logging data.

Set a value for 1 cycle in CH□ Logging cycle setting value (Un\G1032 to Un\G1035).

Set a unit of cycle in CH□ Logging cycle unit setting (Un\G1040 to Un\G1043).

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

- Logging function (👉 Page 98, Section 8.14)

#### (a) Setting range

The available setting range of CH□ Logging cycle setting value (Un\G1032 to Un\G1035) depends on the setting for CH□ Logging cycle unit setting (Un\G1040 to Un\G1043).

| Logging cycle unit | Setting value of CH□ Logging cycle unit setting (Un\G1040 to Un\G1043) | Available setting range of CH□ Logging cycle setting value (Un\G1032 to Un\G1035) |
|--------------------|--|---|
| μs                 | 0  | 80 to 32767   |
| ms                 | 1  | 1 to 32767  |
| s                  | 2  | 1 to 3600   |

#### (b) Actual logging cycle

The actual logging cycle is an integral multiple of the conversion cycle of digital output value or scaling value (digital operation value).

**Ex.** When the conversion cycle is set to 80μs and the A/D conversion is performed for CH1 to CH3 with the sampling processing

→ The actual logging cycle is an integral multiple of 240μs (80μs × 3) with the value set in CH□ Logging cycle setting value (Un\G1032 to Un\G1035) and CH□ Logging cycle unit setting (Un\G1040 to Un\G1043) as the upper limit value.

#### (c) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (d) Default value

- For CH□ Logging cycle setting value (Un\G1032 to Un\G1035), all channels are set to 4.
- For CH□ Logging cycle unit setting (Un\G1040 to Un\G1043), all channels are set to ms (1).

#### Point

- In the channel where the following conditions are set, an error occurs. Then, the error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON and logging cannot be performed.
  - When a value out of the above setting range is set in either of CH□ Logging cycle setting value (Un\G1032 to Un\G1035) or CH□ Logging cycle unit setting (Un\G1040 to Un\G1043)
  - When the set logging cycle is below the update cycle of data to be logged
- When CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Disable (1), the setting for CH□ Logging cycle setting value (Un\G1032 to Un\G1035) and CH□ Logging cycle unit setting (Un\G1040 to Un\G1043) are ignored.

### (35)CH□ Logging points after trigger (Un\G1048 to Un\G1051)

When the logging function is used, set the data points recorded from hold trigger occurs until logging holds (stops).

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

- Logging function (🔍 Page 98, Section 8.14)

#### (a) Setting range

Setting range is 1 to 10000.

#### (b) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (c) Default value

All channels are set to 5000.

### Point🔍

- In the channel where a value out of the above range is set, an error occurs. Then, the error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON and logging cannot be performed.
- When CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Disable (1), the setting for CH□ Logging points after trigger (Un\G1048 to Un\G1051) is ignored.

### (36)CH□ Level trigger condition setting (Un\G1056 to Un\G1059)

When the level trigger is used with the logging function, set the occurrence condition of the hold trigger.

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

- Logging function (🔍 Page 98, Section 8.14)

| Setting      | Setting value |
|--------------|---------------|
| Disable      | 0             |
| Above        | 1             |
| Below        | 2             |
| Pass through | 3             |

#### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (b) Default value

All channels are set to Disable (0).

### Point🔍

- In the channel where a value other than the above setting values is set, an error occurs. Then, the error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON and logging cannot be performed.
- When CH□ Logging enable/disable setting (Un\G1000 to Un\G1003) is set to Disable (1), the setting for CH□ Level trigger condition setting (Un\G1056 to Un\G1059) is ignored.

### (37)CH□ Trigger data (Un\G1064 to Un\G1067)

When the logging function is used, set the buffer memory address monitored for the occurrence condition of level trigger.

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

- Logging function (☞ Page 98, Section 8.14)

#### (a) Setting range

Setting range is 0 to 4999.

#### (b) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

#### (c) Default value

| Channel | Default value | Buffer memory to be monitored                        |
|---------|---------------|--|
| CH1     | 54            | CH1 Scaling value (digital operation value) (Un\G54) |
| CH2     | 55            | CH2 Scaling value (digital operation value) (Un\G55) |
| CH3     | 56            | CH3 Scaling value (digital operation value) (Un\G56) |
| CH4     | 57            | CH4 Scaling value (digital operation value) (Un\G57) |

#### Point

- In the channel where a value out of the above setting range is set, an error occurs. Then, the error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON and logging cannot be performed.
- Set CH□ Digital output value (Un\G11 to Un\G14), CH□ Scaling value (digital operation value) (Un\G54 to Un\G57), Level data □ (Un\G1072 to Un\G1081), or a buffer memory address with "R" in List of Buffer Memory Addresses to the trigger data.

**Ex.** Buffer memory address, system area, etc. with "R/W" or "W" in List of Buffer Memory Addresses

For details on the buffer memory address, refer to the following.

- List of buffer memory addresses (☞ Page 26, Section 3.5)

### (38)Level data □ (Un\G1072 to Un\G1081)

This is the area for storing the data to be monitored when the level trigger of the logging function is used. 10 types of data are available: Level data 0 (Un\G1072) to Level data 9 (Un\G1081)

Use Level data □ (Un\G1072 to Un\G1081) to monitor device values in other than the A/D converter module and generate triggers.

- Logging function (👉 Page 98, Section 8.14)

#### (a) Application example

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

1. Set 1073 (Level data 1) for CH1 Trigger data (Un\G1064). (When Level data 1 is used)
2. Store the storage data which is D100 in the program in Level data 1 (Un\G1073) as needed. (The start I/O number is set to 10<sub>H</sub> in the following program example.)



#### (b) Setting range

Setting range is -32768 to 32767.

#### (c) Default value

All are set to 0.

### (39)CH□ Trigger setting value (Un\G1082 to Un\G1085)

When the logging function is used, set a level where a level trigger is generated.

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

- Logging function (👉 Page 98, Section 8.14)

#### (a) Setting range

Setting range is -32768 to 32767.

#### (b) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

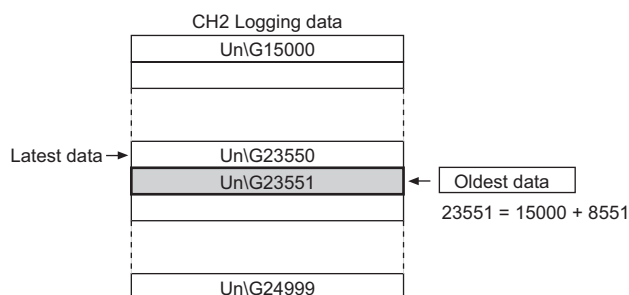
#### (c) Default value

All channels are set to 0.

#### (40)CH□ Head pointer (Un\G1090 to Un\G1093)

The buffer memory address where the oldest data is stored can be checked in CH□ Logging data (Un\G5000 to Un\G44999). The difference between the buffer memory address where the oldest data is stored and the start address in CH□ Logging data (Un\G5000 to Un\G44999) is stored.

**Ex.** When the value of CH2 Head pointer (Un\G1091) is 8551



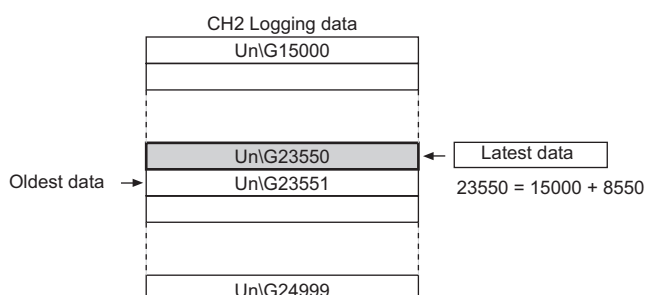
#### Point

- The value in CH□ Head pointer (Un\G1090 to Un\G1093) is fixed to 0 since the oldest data is stored in the start address of CH□ Logging data (Un\G5000 to Un\G44999) while the data of first 10000 points is logged from the logging is stated. After the 10001st data, the place of CH□ Latest pointer (Un\G1090 to Un\G1093) increases one by one.
- When CH□ Logging hold request (Un\G1008 to Un\G1011) is turned ON (1) → OFF (0), CH□ Head pointer (Un\G1090 to Un\G1093) is cleared to zero.

#### (41)CH□ Latest pointer (Un\G1098 to Un\G1101)

The buffer memory address where the latest data is stored can be checked in CH□ Logging data (Un\G5000 to Un\G44999). The difference between the buffer memory address where the latest data is stored and the start address in CH□ Logging data (Un\G5000 to Un\G44999) is stored.

**Ex.** When the value of CH2 Latest pointer (Un\G1099) is 8550



#### Point

- CH□ Latest pointer (Un\G1098 to Un\G1101) increases one by one each time data is stored from the logging starts.
- When CH□ Logging hold request (Un\G1008 to Un\G1011) is turned ON (1) → OFF (0), CH□ Latest pointer (Un\G1098 to Un\G1101) is cleared to zero.

## (42)CH□ Number of logging data (Un\G1106 to Un\G1109)

The number of data stored in the logging data storage area can be checked during the logging.

### Point

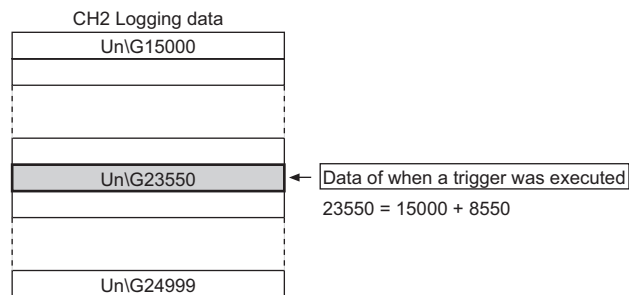
- The number of logging data increases one by one each time data is stored from the logging starts.
- When the value in the logging data storage area reaches 10000, CH□ Number of logging data (Un\G1106 to Un\G1109) is fixed to 10000 since the value is overwritten from the head again.
- When CH□ Logging hold request (Un\G1008 to Un\G1011) is turned ON (1) → OFF (0), CH□ Number of logging data (Un\G1106 to Un\G1109) is cleared to zero.

## (43)CH□ Trigger pointer (Un\G1114 to Un\G1117)

The address of buffer memory which stores the data of when a hold trigger was executed can be checked in CH□ Logging data (Un\G5000 to Un\G44999).

The difference between the address of buffer memory which stores the data of when a hold trigger was executed and the start address in CH□ Logging data (Un\G5000 to Un\G44999) is stored.

**Ex.** When the value of CH2 Trigger pointer (Un\G1115) is 8550



### Point

- When CH□ Logging hold request (Un\G1008 to Un\G1011) is turned ON (1) → OFF (0), CH□ Trigger pointer (Un\G1114 to Un\G1117) is cleared to zero.

#### (44)CH□ Logging cycle monitor value (Un\G1122 to Un\G1133)

This is the area for storing the actual logging cycle which is calculated from the update cycle of data to be logged. When Operating condition setting request (Y9) is turned OFF → ON → OFF, the logging cycle is stored in CH□ Logging cycle monitor value (Un\G1122 to Un\G1133) in the corresponding channel where the logging function is enabled.

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

- Logging function (👉 Page 98, Section 8.14)

|          | b15 | to | b0 |
|----------|-----|----|----|
| Un\G1122 |     | s  |    |
| Un\G1123 |     | ms |    |
| Un\G1124 |     | μs |    |

**Ex.** When the calculated value of logging cycle in CH1 is 6960μs

| Buffer memory address | Stored value |
|-----------------------|--------------|
| Un\G1122              | 0 (s)        |
| Un\G1123              | 6 (ms)       |
| Un\G1124              | 960 (μs)     |

#### (45)CH□ Trigger detection time (Un\G1154 to Un\G1169)

The time that the hold trigger occurred is recorded.

|          | b15 | to                           | b8 | b7 | to                          | b0 |
|----------|-----|------------------------------|----|----|-----------------------------|----|
| Un\G1154 |     | First two digits of the year |    |    | Last two digits of the year |    |
| Un\G1155 |     | Month                        |    |    | Day                         |    |
| Un\G1156 |     | Hour                         |    |    | Minute                      |    |
| Un\G1157 |     | Second                       |    |    | Day of the week             |    |

| Item   | Storage contents   | Storage example *1 |
|--|--|--------------------|
| First two digits of the year/<br>Last two digits of the year | Stored in BCD code.  | 2011 <sub>H</sub>  |
| Month/Day  |  | 329 <sub>H</sub>   |
| Hour/Minute  |  | 1035 <sub>H</sub>  |
| Second   |  | 40 <sub>H</sub>    |
| Day of the week  | One of the following values is stored for each day of the week in BCD code.<br><ul style="list-style-type: none"> <li>• Sunday: 0</li> <li>• Tuesday: 2</li> <li>• Thursday: 4</li> <li>• Saturday: 6</li> <li>• Monday: 1</li> <li>• Wednesday: 3</li> <li>• Friday: 5</li> </ul> | 2 <sub>H</sub>     |

\*1 Those are values when a hold trigger is detected at 10:35:40 on Tuesday, March 29th, 2011.

#### Point🔑

- Time units shorter than one second are not recorded.
- When CH□ Logging hold request (Un\G1008 to Un\G1011) is turned ON (1) → OFF (0), CH□ Trigger detection time (Un\G1154 to Un\G1169) is cleared to zero.

#### (46)CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303)

Set whether the flow amount integration function is enabled or disabled.

For details on the flow amount integration function, refer to the following.

- Flow amount integration function (☞ Page 110, Section 8.15)

| Flow amount integration enable/disable setting | Setting value |
|--|---------------|
| Enable   | 0             |
| Disable  | 1             |

##### (a) Enabling the setting

Turn OFF → ON → OFF Operating condition setting request (Y9) to enable the setting.

##### (b) Default value

All channels are set to Disable (1).

#### **Point**

- In the channel where a setting value other than the above is set, an error occurs. The error code is stored in Latest error code (Un\G19) and Error flag (XF) is turned to ON.
- In the channel where the conversion speed is set to 20μs or 80μs and CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303) is Enabled (0), an error occurs. The error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON, and the flow amount integration function is not enabled.

#### (47)CH□ Integration cycle setting (Un\G1308 to Un\G1311)

Set the integration cycle of flow amount integration in each channel.

For details on the flow amount integration function, refer to the following.

- Flow amount integration function (☞ Page 110, Section 8.15)

##### (a) Setting range

Setting range is 1 to 5000 (ms).

##### (b) Default value

All channels are set to 4 (ms).

#### **Point**

- In the channel where the following conditions are set, an error occurs. Then, the error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON and the flow amount integration function cannot be performed.
- When a value other than the above is set
  - When the calculated integration cycle is below the data updated cycle of CH□ Scaling value (digital operation value) (Un\G54 to Un\G57)



## (48)CH□ Flow amount time unit setting (Un\G1316 to Un\G1319)

Set a conversion value to convert the time unit of instantaneous flow amount to ms.

Set CH□ Flow amount time unit setting (Un\G1316 to Un\G1319) to the range of the flow meter connected to the A/D converter module.

For details on the flow amount integration function, refer to the following.

- Flow amount integration function (☞ Page 110, Section 8.15)

| Flow amount time unit | Setting value |
|-----------------------|---------------|
| /s                    | 0             |
| /min                  | 1             |
| /h                    | 2             |

**Ex.** When the range of the flow meter is "cm<sup>3</sup>/s", set / (0).

### (a) Default value

All channels are set to /s (0).

#### **Point**

In the channel where a setting value other than the above is set, an error occurs. The error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON, and the flow amount integration function is not enabled.

## (49)CH□ Unit scaling setting (Un\G1324 to Un\G1327)

Set the unit scaling that is used for the flow amount integration function.

For details on the flow amount integration function, refer to the following.

- Flow amount integration function (☞ Page 110, Section 8.15)

| Unit scaling | Setting value |
|--------------|---------------|
| × 1          | 0             |
| × 10         | 1             |
| × 100        | 2             |
| × 1000       | 3             |
| × 10000      | 4             |

### (a) Default value

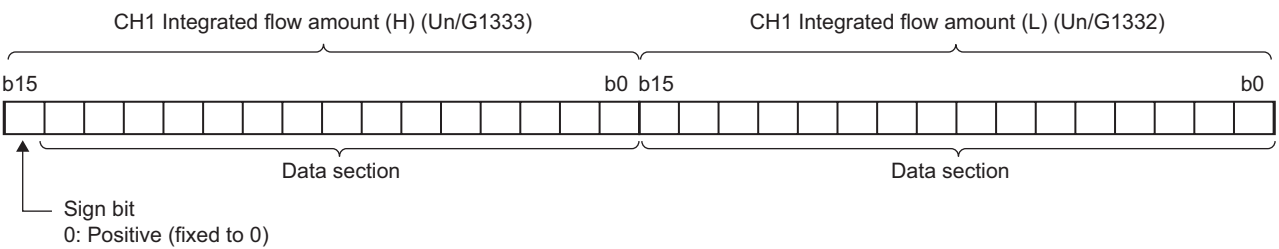
All channels are set to × 1 (0).

#### **Point**

In the channel where a setting value other than the above is set, an error occurs. The error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON, and the flow amount integration function is not enabled.

**(50)CH□ Integrated flow amount (Un\G1332 to Un\G1339)**

This is the area for storing the result of the integral processing performed by the flow amount integration function. The integrated flow amount is stored with 32-bit signed binary.



**(a) Storage range**

The value is stored within the range of 0 to 2147483647.

**(51)CH□ Integration cycle monitor value (Un\G1348 to Un\G1351)**

This is the area for storing the integration cycle which is calculated from the update cycle of CH□ Scaling value (digital operation value) (Un\G54 to Un\G57).

For details on the flow amount integration function, refer to the following.

- Flow amount integration function (📖 Page 110, Section 8.15)

**(a) Storage range**

When CH□ Flow amount integration enable/disable setting (Un\G1300 to Un\G1303) is Enable (0), the value is stored within the range of 1 to 5000. When it is Disable (1), the value is fixed to 0.

**(52)CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359)**

Stops the integral processing temporarily while the flow amount integration function is operating.

For details on the flow amount integration function, refer to the following.

- Flow amount integration function (📖 Page 110, Section 8.15)

| Flow amount integration temporary stop request | Setting value |
|--|---------------|
| No request                                     | 0             |
| Temporary stop request                         | 1             |

- When CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359) is turned No request (0) → Temporary stop request (1) while the flow amount integration function is operating, the flow amount integration function temporarily stops.
- When CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359) is turned Temporary stop request (1) → No request (0) while the flow amount integration function temporarily stops, the flow amount integration function restarts.

**(a) Default value**

All channels are set to No request (0).

**Point**

In the channel where a setting value other than the above is set, an error occurs. The error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON, and the setting is ignored.

### (53)CH□ Flow amount integration temporary stop flag (Un\G1364 to Un\G1367)

Flow amount integration temporary stop request status can be checked with this flag.

| Flow amount integration temporary stop request status | Stored value |
|---|--------------|
| No temporary stop request                             | 0            |
| Temporary stopping                                    | 1            |

- While the flow amount integration function temporarily stops by CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359) being turned No request (0) → Temporary stop request (1), CH□ Flow amount integration temporary stop flag (Un\G1364 to Un\G1367) is turned to Temporary stop request (1).
- When the flow amount integration function restarts by CH□ Flow amount integration temporary stop request (Un\G1356 to Un\G1359) being turned Temporary stop request (1) → No request (0), CH□ Flow amount integration temporary stop flag (Un\G1364 to Un\G1367) is turned to No temporary stop request (0).

### (54)CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375)

When the flow amount integration function is enabled, the value of CH□ Integrated flow amount (Un\G1332 to Un\G1339) can be cleared to zero.

For details on the flow amount integration function, refer to the following.

- Flow amount integration function (☞ Page 110, Section 8.15)

| Integrated flow amount clear request | Setting value |
|--------------------------------------|---------------|
| No request                           | 0             |
| Clear request                        | 1             |

When CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375) is turned to No request (0) → Clear request (1) while the flow amount integration function is operating, the value of CH□ Integrated flow amount (Un\G1332 to Un\G1339) in the corresponding channel is cleared to zero.

#### (a) Default value

All channels are set to No request (0).

#### Point

In the channel where a setting value other than the above is set, an error occurs. The error code is stored in Latest error code (Un\G19), Error flag (XF) is turned to ON, and the value of CH□ Integrated flow amount (Un\G1332 to Un\G1339) is not cleared.

### (55)CH□ Integrated flow amount clear flag (Un\G1380 to Un\G1383)

Integrated flow amount clear request status can be checked with this flag.

| Integrated flow amount clear flag | Setting value |
|-----------------------------------|---------------|
| No clear request                  | 0             |
| Cleared                           | 1             |

- When CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375) is turned No request (0) → Clear request (1) and the value of CH□ Integrated flow amount (Un\G1332 to Un\G1339) is cleared, CH□ Integrated flow amount clear flag (Un\G1380 to Un\G1383) is turned to Cleared (1).
- When CH□ Integrated flow amount clear request (Un\G1372 to Un\G1375) is turned to Clear request (1) → No request (0), CH□ Integrated flow amount clear flag (Un\G1380 to Un\G1383) is turned to No clear request (0).

## (56) Latest error code address (Un\G1800)

The latest address of error log is stored.

## (57) Error history No.□ (Un\G1810 to Un\G1969)

Up to 16 errors occurred in the module are recorded.

|                            |                              |    |    |                             |    |    |
|----------------------------|------------------------------|----|----|-----------------------------|----|----|
|                            | b15                          | to | b8 | b7                          | to | b0 |
| Un\G1810                   | Error code                   |    |    |                             |    |    |
| Un\G1811                   | First two digits of the year |    |    | Last two digits of the year |    |    |
| Un\G1812                   | Month                        |    |    | Day                         |    |    |
| Un\G1813                   | Hour                         |    |    | Minute                      |    |    |
| Un\G1814                   | Second                       |    |    | Day of the week             |    |    |
| Un\G1815<br>to<br>Un\G1819 | System area                  |    |    |                             |    |    |

| Item   | Storage contents   | Storage example <sup>*1</sup> |
|--|--|-------------------------------|
| First two digits of the year/<br>Last two digits of the year | Stored in BCD code.  | 2011 <sub>H</sub>             |
| Month/Day  |  | 329 <sub>H</sub>              |
| Hour/Minute  |  | 1035 <sub>H</sub>             |
| Second   |  | 40 <sub>H</sub>               |
| Day of the week  | One of the following values is stored for each day of the week in BCD code.<br>• Sunday: 0<br>• Tuesday: 2<br>• Thursday: 4<br>• Saturday: 6<br>• Monday: 1<br>• Wednesday: 3<br>• Friday: 5 | 2 <sub>H</sub>                |

\*1 Those are values when an error occurs at 10:35:40 on Tuesday, March 29th, 2011.

## (58) CH□ Logging data (Un\G5000 to Un\G44999)

This is an area for storing the logged data. Up to 10000 data can be stored per channel. After the 10001st data for CH□ Logging data (Un\G5000 to Un\G44999) for each channel, the logging is continued overwriting the data from the head.

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

- Logging function (👉 Page 98, Section 8.14)

### Point

- When Operating condition setting request (Y9) is turned OFF → ON → OFF, the logging data in all the channels are cleared.
- Even if CH□ Logging hold request (Un\G1008 to Un\G1011) is turned ON (1) → OFF (0) and the logging restarts, the logged data is not cleared to zero.

## Appendix 3 I/O Conversion Characteristic of A/D Conversion

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I/O conversion characteristic of A/D conversion means the slope of the line connected between the offset value and gain value when converting the analog signal (voltage or current input) from outside of programmable controller to digital value.

### (1) Offset value

This is the analog input value (voltage or current) when the digital output value becomes 0.

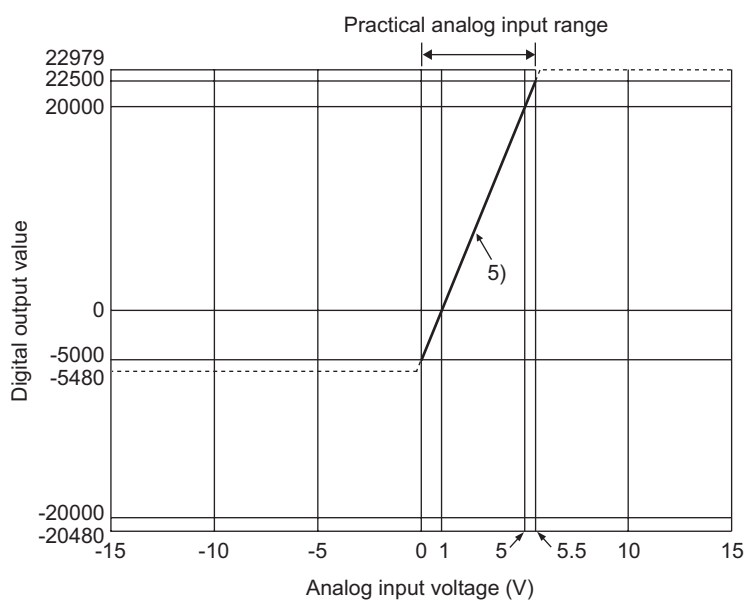
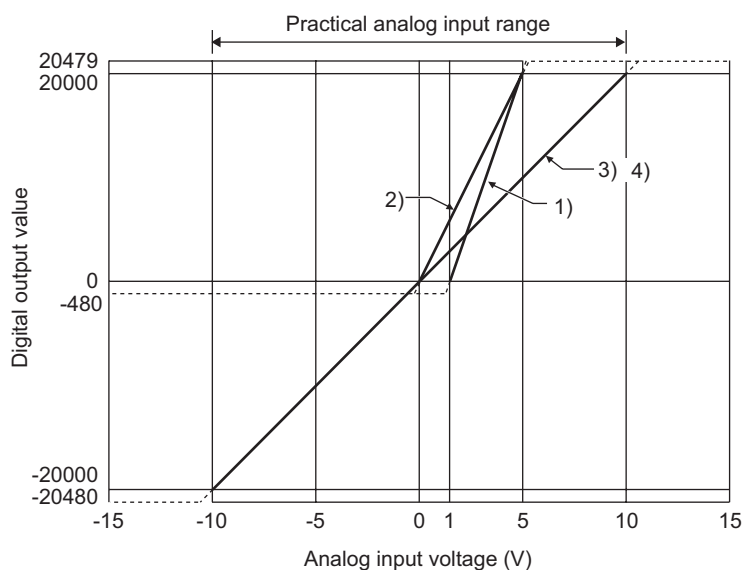
### (2) Gain value

This is the analog input value (voltage or current) when the digital output value becomes 20000.

**A**

### (3) Voltage input characteristic

The following graph shows the voltage input characteristic.



| No. | Input range setting     | Offset value | Gain value | Digital output value <sup>*2</sup> | Resolution                |
|-----|-------------------------|--------------|------------|------------------------------------|---------------------------|
| 1)  | 1 to 5V                 | 1V           | 5V         | 0 to 20000                         | 200 $\mu$ V               |
| 2)  | 0 to 5V                 | 0V           | 5V         |                                    | 250 $\mu$ V               |
| 3)  | -10 to 10V              | 0V           | 10V        | -20000 to 20000                    | 500 $\mu$ V               |
| 4)  | 0 to 10V                | 0V           | 10V        | 0 to 20000                         |                           |
| 5)  | 1 to 5V (Extended mode) | 1V           | 5V         | -5000 to 22500                     | 200 $\mu$ V               |
| —   | User range setting      | *1           | *1         | -20000 to 20000                    | 307 $\mu$ V <sup>*3</sup> |

- \*1 Set the offset value and gain value in user range setting within the range satisfying the following conditions.  
If the following conditions are not satisfied, A/D conversion may not be properly performed.
- Setting range for offset value and gain value: -10 to 10V
  - $((\text{gain value}) - (\text{offset value})) \geq 4.0\text{V}$
- \*2 When analog input is performed exceeding the range of digital output value, the digital output value is fixed to the maximum or minimum.

| Input range setting     | Digital output value |         |
|-------------------------|----------------------|---------|
|                         | Minimum              | Maximum |
| 1 to 5V                 | -480                 | 20479   |
| 0 to 5V                 |                      |         |
| -10 to 10V              |                      |         |
| 0 to 10V                | -480                 | 22976   |
| 1 to 5V (Extended mode) | -5480                |         |
| User range setting      | -20480               |         |

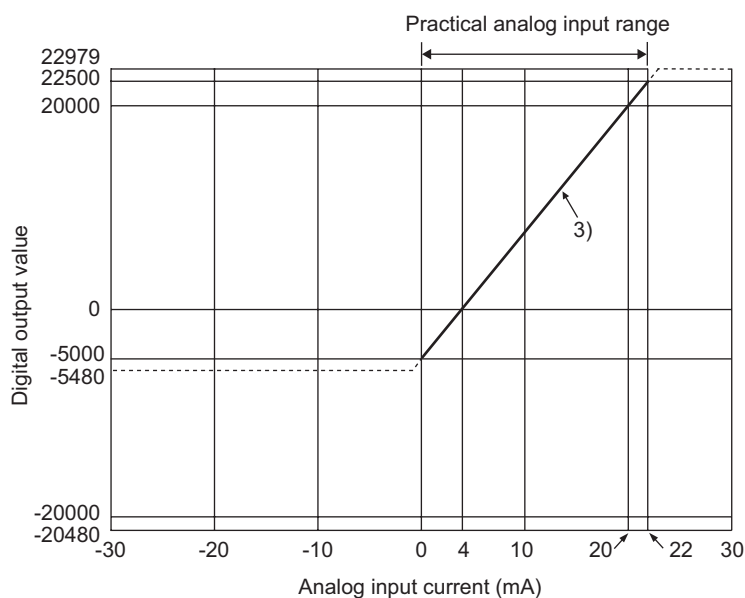
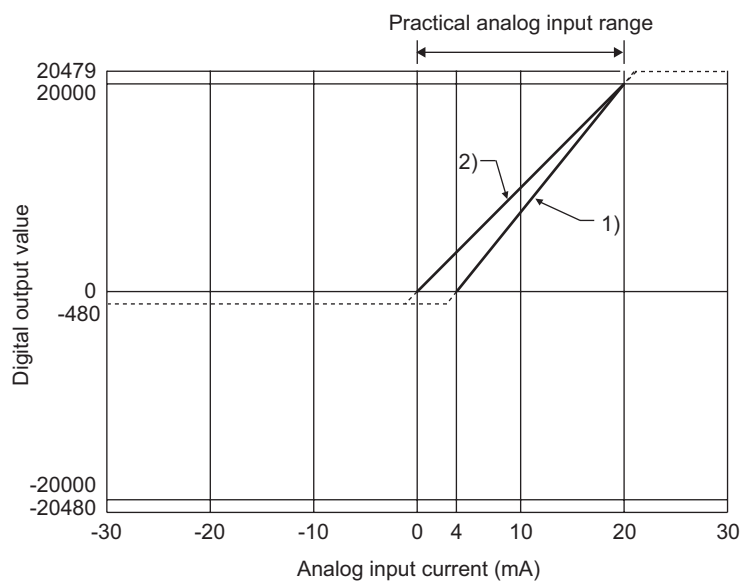
- \*3 This is the maximum resolution in user range setting.

### Point

- Use the value within the practical analog input range and practical digital output range. If a value is out of the range, the resolution and accuracy may not fall within the range of performance specifications. (Do not use the value in the dotted line region in the graph of voltage input characteristic.)
- Do not input a value of  $\pm 15\text{V}$  or more. This may damage the elements.

#### (4) Current input characteristic

The following graph shows the current input characteristic.



| No. | Input range setting       | Offset value | Gain value | Digital output value *2 | Resolution |
|-----|---------------------------|--------------|------------|-------------------------|------------|
| 1)  | 4 to 20mA                 | 4mA          | 20mA       | 0 to 20000              | 800nA      |
| 2)  | 0 to 20mA                 | 0mA          | 20mA       |                         | 1000nA     |
| 3)  | 4 to 20mA (Extended mode) | 4mA          | 20mA       | -5000 to 22500          | 800nA      |
| —   | User range setting        | *1           | *1         | -20000 to 20000         | 1230nA *3  |



- \*1 Set the offset value and gain value in the user range setting within the range satisfying the following conditions.  
If the following conditions are not satisfied, A/D conversion may not be properly performed.
- gain value  $\leq 20\text{mA}$ , offset value  $\geq 0\text{mA}$
  - $((\text{gain value}) - (\text{offset value})) \geq 16.0\text{mA}$
- \*2 When analog input is performed exceeding the range of digital output value, the digital output value is fixed to the maximum or minimum.

| Input range setting       | Digital output value |         |
|---------------------------|----------------------|---------|
|                           | Minimum              | Maximum |
| 4 to 20mA                 | -480                 | 20479   |
| 0 to 20mA                 |                      |         |
| 4 to 20mA (Extended mode) | -5480                | 22979   |
| User range setting        | -20480               | 20479   |

- \*3 This is the maximum resolution in user range setting.

### Point

- Use the value within the practical analog input range and practical digital output range. If a value is out of the range, the resolution and accuracy may not fall within the range of performance specifications. (Do not use the value in the dotted line region in the graph of current input characteristic.)
- Do not input a value of  $\pm 30\text{mA}$  or more. This may damage the elements.

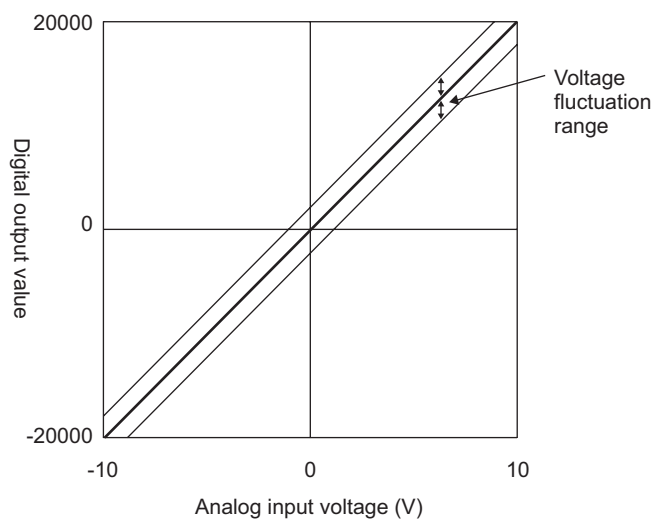
## Appendix 4 A/D Conversion Accuracy

The A/D conversion accuracy is the accuracy for the maximum value of digital output value.

Even when changing the offset/gain setting and input range to change the input characteristics, the accuracy does not change and is kept within the range of described performance specifications.

The following graph shows the fluctuation range of accuracy when the range of -10 to 10V is selected.

The accuracy is  $\pm 0.1\%$  ( $\pm 20$ digit) when the ambient temperature is  $25 \pm 5^\circ\text{C}$  and  $\pm 0.2\%$  ( $\pm 40$ digit) when the ambient temperature is 0 to  $55^\circ\text{C}$ . (Excluding the case under noise effect.)



## Appendix 5 Dedicated Instruction

This chapter describes the dedicated instructions that can be used in A/D converter module.

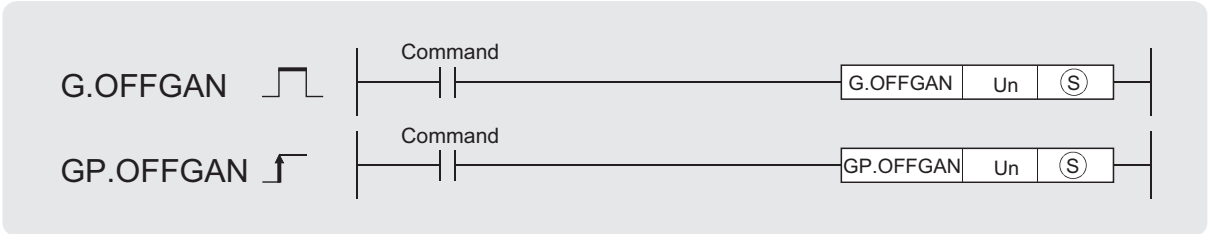
### Appendix 5.1 Instruction list

The following shows the dedicated instructions that can be used in the A/D converter module.

| Instruction | Description   |
|-------------|---|
| G(P).OFFGAN | <ul style="list-style-type: none"> <li>The operation mode is changed to the offset/gain setting mode.</li> <li>The operation mode is changed to the normal mode.</li> </ul> |
| G(P).OGLOAD | The offset/gain set value in the user range setting is read out to the CPU module.  |
| G(P).OGSTOR | The offset/gain set value in the user range setting stored in the CPU module is restored to the A/D converter module.   |

A

# Appendix 5.2 G(P).OFFGAN



| Setting data | Internal device |      | R, ZR | J□□ |      | U□\G□ | Zn | Constant<br>K, H, \$ | Others |
|--------------|-----------------|------|-------|-----|------|-------|----|----------------------|--------|
|              | Bit             | Word |       | Bit | Word |       |    |                      |        |
| Ⓢ            | —               | ○    |       |     |      | —     |    |                      |        |

## (1) Setting data

| Device | Description  | Setting range        | Data type   |
|--------|--|----------------------|-------------|
| Un     | Start I/O number of module   | 0 to FE <sub>H</sub> | BIN 16 bits |
| Ⓢ      | Mode change<br>0: changed to the normal mode<br>1: changed to the offset/gain setting mode<br>When a value other than above is set, the mode is changed to the offset/gain setting mode. | 0, 1                 | BIN 16 bits |

## (2) Functions

This instruction switches the operation mode of the A/D converter module.

- Normal mode → offset/gain setting mode (Offset/gain setting mode flag (XA) is ON)
- Offset/gain setting mode → normal mode (Offset/gain setting mode flag (XA) is OFF)

### Point

- When the mode is switched from the offset/gain setting mode to the normal mode, Module READY (X0) turns from OFF to ON.  
Note that if a program includes the initial settings to be executed at ON of Module READY (X0), this instruction performs the initial setting process.
- When the mode is switched from the offset/gain setting mode to the normal mode, the A/D converter module operates under the previous operating condition.

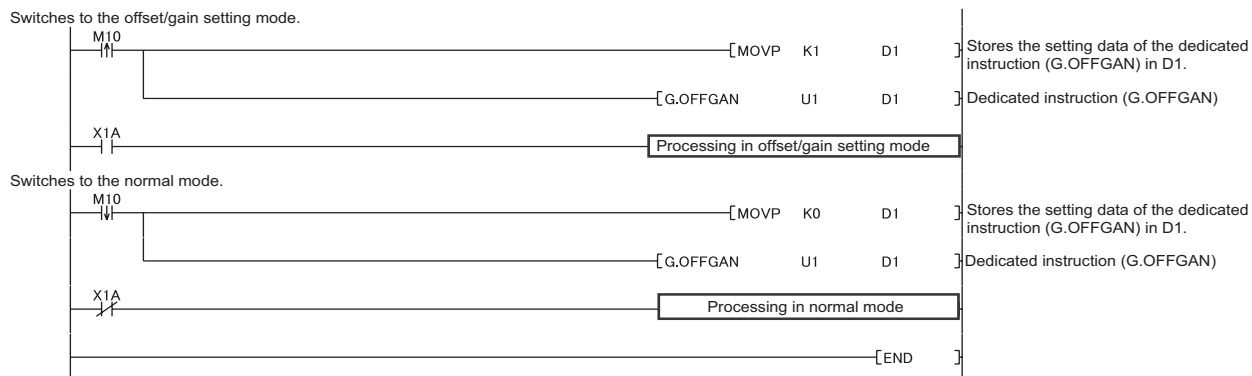
## (3) Errors

The instruction has no errors.

#### (4) Program example

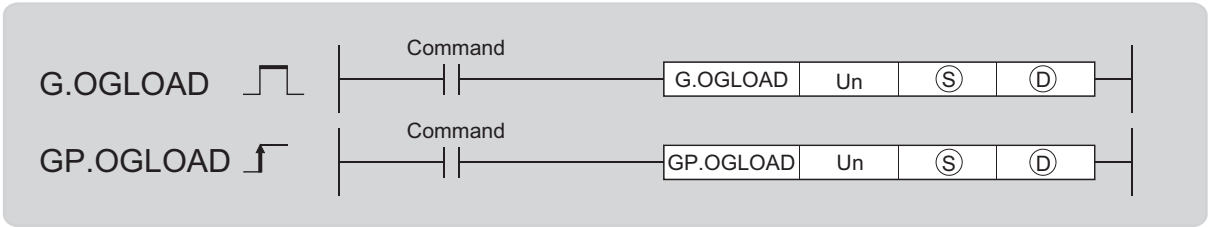
The following shows the program of the A/D converter module, installed in I/O number X/Y10 to X/Y1F, with the following conditions:

- turning ON M10 switches the operation mode to the offset/gain setting mode, and
- turning OFF M10 restores the operation mode to the normal mode.



A

# Appendix 5.3 G(P).OGLOAD



| Setting data | Internal device |      | R, ZR | J□\□ |      | U□\G□ | Zn | Constant<br>K, H, \$ | Others |
|--------------|-----------------|------|-------|------|------|-------|----|----------------------|--------|
|              | Bit             | Word |       | Bit  | Word |       |    |                      |        |
| (S)          | —               | ○    |       |      |      | —     |    |                      |        |
| (D)          |                 | ○    |       |      |      | —     |    |                      |        |

## (1) Setting data

| Device | Description  | Setting range                        | Data type   |
|--------|--|--------------------------------------|-------------|
| Un     | Start I/O number of module   | 0 to FE <sub>H</sub>                 | BIN 16 bits |
| (S)    | Start number of device where the control data is stored  | Within the range of specified device | Device name |
| (D)    | Device which turns ON for one scan at the processing completion of the dedicated instruction.<br>In error completion, (D) + 1 also turns ON. | within the range of specified device | Bit         |

## (2) Control data \*1

| Device | Item  | Setting data  | Setting range                          | Set by |
|--------|---|---|--|--------|
| ⑤      | System area                                       | —   | —                                      | —      |
| ⑤+1    | Completion status                                 | The status on instruction completion is stored.<br>0 : normal completion<br>Other than 0: error completion (error code)   | —                                      | System |
| ⑤+2    | Pass data classification setting                  | Specify the type of offset/gain setting value to read out.<br>0: voltage<br>1: current<br><div> <div>b15</div> <div>b8</div> <div>b7</div> <div>b6</div> <div>b5</div> <div>b4</div> <div>b3</div> <div>b2</div> <div>b1</div> <div>b0</div> <div>0</div> <div>~</div> <div>~</div> <div>~</div> <div>~</div> <div>0</div> <div>CH4</div> <div>CH3</div> <div>CH2</div> <div>CH1</div> </div> | 0000 <sub>H</sub> to 000F <sub>H</sub> | User   |
| ⑤+3    | System area                                       | —   | —                                      | —      |
| ⑤+4    | CH1 Industrial shipment settings offset value (L) | —   | —                                      | System |
| ⑤+5    | CH1 Industrial shipment settings offset value (H) | —   | —                                      | System |
| ⑤+6    | CH1 Industrial shipment settings gain value (L)   | —   | —                                      | System |
| ⑤+7    | CH1 Industrial shipment settings gain value (H)   | —   | —                                      | System |
| ⑤+8    | CH2 Industrial shipment settings offset value (L) | —   | —                                      | System |
| ⑤+9    | CH2 Industrial shipment settings offset value (H) | —   | —                                      | System |
| ⑤+10   | CH2 Industrial shipment settings gain value (L)   | —   | —                                      | System |
| ⑤+11   | CH2 Industrial shipment settings gain value (H)   | —   | —                                      | System |
| ⑤+12   | CH3 Industrial shipment settings offset value (L) | —   | —                                      | System |
| ⑤+13   | CH3 Industrial shipment settings offset value (H) | —   | —                                      | System |
| ⑤+14   | CH3 Industrial shipment settings gain value (L)   | —   | —                                      | System |
| ⑤+15   | CH3 Industrial shipment settings gain value (H)   | —   | —                                      | System |
| ⑤+16   | CH4 Industrial shipment settings offset value (L) | —   | —                                      | System |
| ⑤+17   | CH4 Industrial shipment settings offset value (H) | —   | —                                      | System |
| ⑤+18   | CH4 Industrial shipment settings gain value (L)   | —   | —                                      | System |
| ⑤+19   | CH4 Industrial shipment settings gain value (H)   | —   | —                                      | System |
| ⑤+20   | CH1 User range settings offset value (L)          | —   | —                                      | System |
| ⑤+21   | CH1 User range settings offset value (H)          | —   | —                                      | System |
| ⑤+22   | CH1 User range settings gain value (L)            | —   | —                                      | System |
| ⑤+23   | CH1 User range settings gain value (H)            | —   | —                                      | System |
| ⑤+24   | CH2 User range settings offset value (L)          | —   | —                                      | System |
| ⑤+25   | CH2 User range settings offset value (H)          | —   | —                                      | System |
| ⑤+26   | CH2 User range settings gain value (L)            | —   | —                                      | System |
| ⑤+27   | CH2 User range settings gain value (H)            | —   | —                                      | System |
| ⑤+28   | CH3 User range settings offset value (L)          | —   | —                                      | System |
| ⑤+29   | CH3 User range settings offset value (H)          | —   | —                                      | System |

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| Device | Item                                     | Setting data | Setting range | Set by |
|--------|--|--------------|---------------|--------|
| Ⓢ+30   | CH3 User range settings gain value (L)   | —            | —             | System |
| Ⓢ+31   | CH3 User range settings gain value (H)   | —            | —             | System |
| Ⓢ+32   | CH4 User range settings offset value (L) | —            | —             | System |
| Ⓢ+33   | CH4 User range settings offset value (H) | —            | —             | System |
| Ⓢ+34   | CH4 User range settings gain value (L)   | —            | —             | System |
| Ⓢ+35   | CH4 User range settings gain value (H)   | —            | —             | System |

\*1 Configure the setting of Pass data classification setting Ⓢ +2 only.  
When the data is written to the area to be set by system, offset/gain setting value is not correctly read out.

### (3) Functions

- This instruction reads out the offset/gain set value in the user range setting of the A/D converter module to the CPU module.
- The interlock signal of G(P).OGLOAD includes a completion device ⓓ and a completion status indication device ⓓ+1.

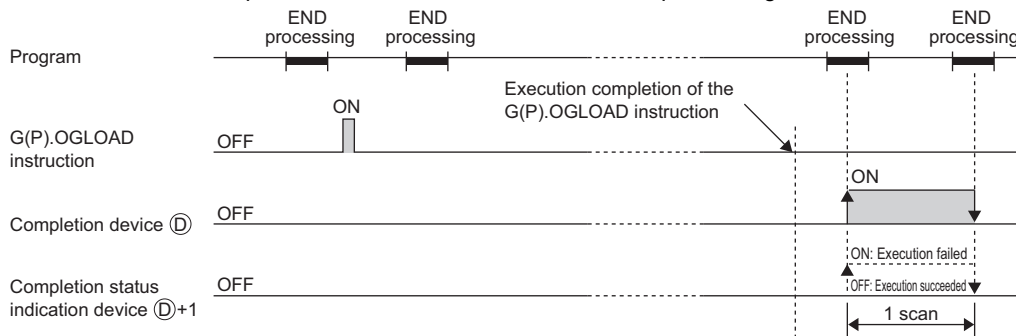
#### (a) Completion device

The device turns ON at the END processing for the scan where the G(P).OGLOAD instruction is completed, and turns OFF at the next END processing.

#### (b) Completion status indication device

This device turns OFF → ON → OFF depending on the status of the G(P).OGLOAD instruction completion.

- Normal completion: the device is kept to be OFF.
- Error completion: the device turns ON at the END processing for the scan where the G(P).OGLOAD instruction is completed, and turns OFF at the next END processing.



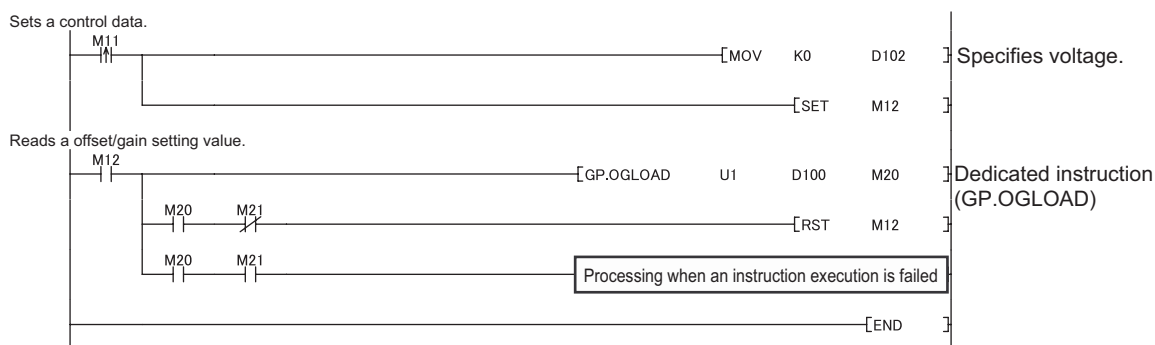
### (4) Errors

The instruction has no errors.



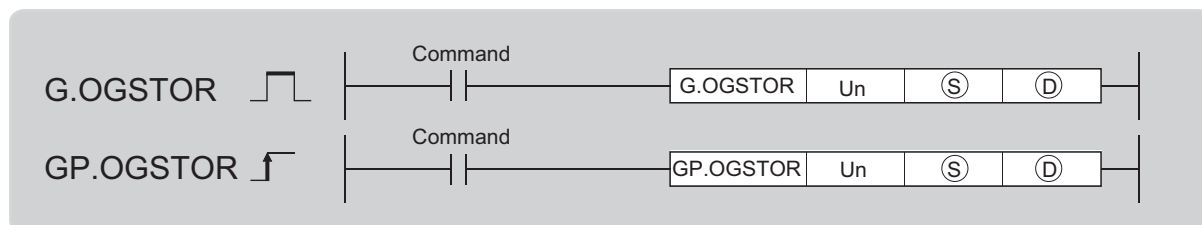
## (5) Program example

The following shows the program to read out the offset/gain setting value of the A/D converter module, installed in I/O number X/Y10 to X/Y1F, by turning ON M11.



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## Appendix 5.4 G(P).OGSTOR



| Setting data | Internal device |      | R, ZR | J□□ |      | U□\G□ | Zn | Constant<br>K, H, \$ | Others |
|--------------|-----------------|------|-------|-----|------|-------|----|----------------------|--------|
|              | Bit             | Word |       | Bit | Word |       |    |                      |        |
| Ⓢ            | —               | ○    |       |     |      | —     |    |                      |        |
| Ⓓ            |                 | ○    |       |     |      | —     |    |                      |        |

### (1) Setting data

| Device | Description  | Setting range                        | Data type   |
|--------|--|--------------------------------------|-------------|
| Un     | Start I/O number of module   | 0 to FE <sub>H</sub>                 | BIN 16 bits |
| Ⓢ*1    | Start number of device where the control data is stored  | Within the range of specified device | Device name |
| Ⓓ      | Device which turns ON for one scan at the processing completion of the dedicated instruction.<br>In error completion, Ⓓ+1 also turns ON. | Within the range of specified device | Bit         |

- \*1 Specify the device specified to Ⓢ on execution of the G(P).OGLOAD instruction.  
Do not change the data which is read out by the G(P).OGLOAD instruction. If the data is changed, the normal operation may not be ensured.

## (2) Control data

| Device | Item  | Setting data  | Setting range                          | Set by |
|--------|---|---|--|--------|
| ⑤      | System area                                       | —   | —                                      | —      |
| ⑤+1    | Completion status                                 | The status on instruction completion is stored.<br>0 : normal completion<br>Other than 0: error completion (error code)   | —                                      | System |
| ⑤+2    | Pass data classification setting                  | The value which is set for Pass data classification setting ⑤ +2 by G(P).OGLOAD instruction is stored.<br>0: voltage<br>1: current<br><div> <div>b15</div> <div>b8</div> <div>b7</div> <div>b6</div> <div>b5</div> <div>b4</div> <div>b3</div> <div>b2</div> <div>b1</div> <div>b0</div> </div> <div> <div>0</div> <div>~</div> <div>~</div> <div>~</div> <div>~</div> <div>~</div> <div>0</div> <div>CH4</div> <div>CH3</div> <div>CH2</div> <div>CH1</div> </div> | 0000 <sub>H</sub> to 000F <sub>H</sub> | System |
| ⑤+3    | System area                                       | —   | —                                      | —      |
| ⑤+4    | CH1 Industrial shipment settings offset value (L) | —   | —                                      | System |
| ⑤+5    | CH1 Industrial shipment settings offset value (H) | —   | —                                      | System |
| ⑤+6    | CH1 Industrial shipment settings gain value (L)   | —   | —                                      | System |
| ⑤+7    | CH1 Industrial shipment settings gain value (H)   | —   | —                                      | System |
| ⑤+8    | CH2 Industrial shipment settings offset value (L) | —   | —                                      | System |
| ⑤+9    | CH2 Industrial shipment settings offset value (H) | —   | —                                      | System |
| ⑤+10   | CH2 Industrial shipment settings gain value (L)   | —   | —                                      | System |
| ⑤+11   | CH2 Industrial shipment settings gain value (H)   | —   | —                                      | System |
| ⑤+12   | CH3 Industrial shipment settings offset value (L) | —   | —                                      | System |
| ⑤+13   | CH3 Industrial shipment settings offset value (H) | —   | —                                      | System |
| ⑤+14   | CH3 Industrial shipment settings gain value (L)   | —   | —                                      | System |
| ⑤+15   | CH3 Industrial shipment settings gain value (H)   | —   | —                                      | System |
| ⑤+16   | CH4 Industrial shipment settings offset value (L) | —   | —                                      | System |
| ⑤+17   | CH4 Industrial shipment settings offset value (H) | —   | —                                      | System |
| ⑤+18   | CH4 Industrial shipment settings gain value (L)   | —   | —                                      | System |
| ⑤+19   | CH4 Industrial shipment settings gain value (H)   | —   | —                                      | System |
| ⑤+20   | CH1 User range settings offset value (L)          | —   | —                                      | System |
| ⑤+21   | CH1 User range settings offset value (H)          | —   | —                                      | System |
| ⑤+22   | CH1 User range settings gain value (L)            | —   | —                                      | System |
| ⑤+23   | CH1 User range settings gain value (H)            | —   | —                                      | System |
| ⑤+24   | CH2 User range settings offset value (L)          | —   | —                                      | System |
| ⑤+25   | CH2 User range settings offset value (H)          | —   | —                                      | System |
| ⑤+26   | CH2 User range settings gain value (L)            | —   | —                                      | System |
| ⑤+27   | CH2 User range settings gain value (H)            | —   | —                                      | System |
| ⑤+28   | CH3 User range settings offset value (L)          | —   | —                                      | System |

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Appendix 5 Dedicated Instruction  
Appendix 5.4 G(P).OGSTOR

| Device | Item                                     | Setting data | Setting range | Set by |
|--------|--|--------------|---------------|--------|
| Ⓔ+29   | CH3 User range settings offset value (H) | —            | —             | System |
| Ⓔ+30   | CH3 User range settings gain value (L)   | —            | —             | System |
| Ⓔ+31   | CH3 User range settings gain value (H)   | —            | —             | System |
| Ⓔ+32   | CH4 User range settings offset value (L) | —            | —             | System |
| Ⓔ+33   | CH4 User range settings offset value (H) | —            | —             | System |
| Ⓔ+34   | CH4 User range settings gain value (L)   | —            | —             | System |
| Ⓔ+35   | CH4 User range settings gain value (H)   | —            | —             | System |

### (3) Functions

- The offset/gain set value in user range setting stored in CPU module is restored to A/D converter module.
- There are two interlock signals of G(P).OGSTOR: a completion device Ⓔ and a completion status indication device Ⓔ+1.
- The reference accuracy on restoration of offset/gain setting value is lowered three times or less of that of before the restoration.

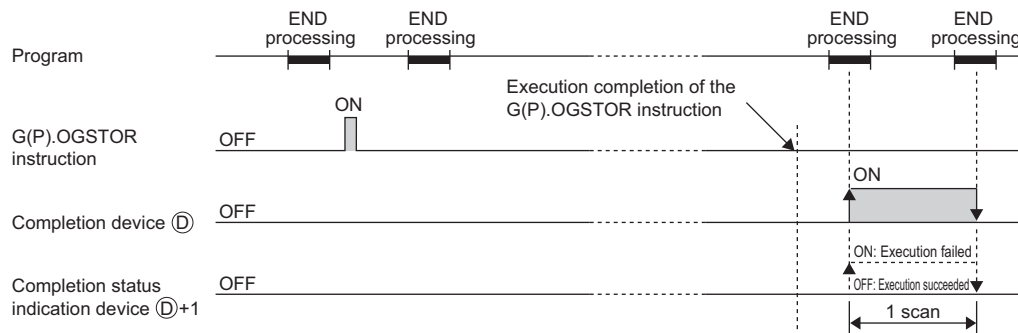
#### (a) Completion device

The device turns ON at the END processing for the scan where the G(P).OGSTOR instruction is completed, and turns OFF at the next END processing.

#### (b) Completion status indication device

This device turns OFF → ON → OFF depending on the status of the G(P).OGSTOR instruction completion.

- Normal completion: the device is kept to be OFF.
- Error completion: the device turns ON at the END processing for the scan where the G(P).OGSTOR instruction is completed, and turns OFF at the next END processing.



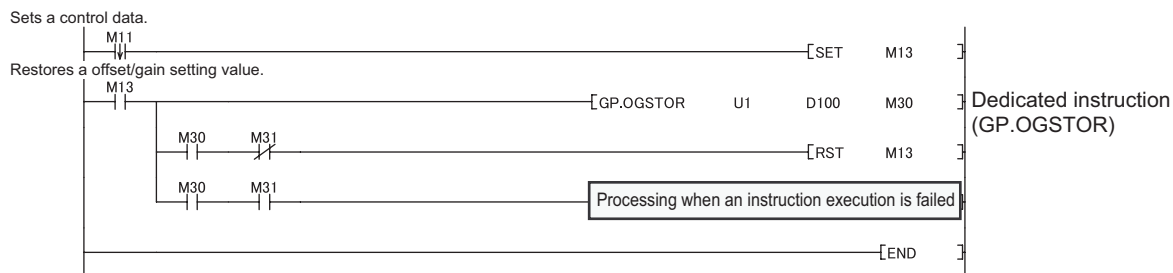
### (4) Errors

In the following cases, an error occurs and error code is stored in completion status area Ⓔ +1.

| Error code | Description of operation error  |
|------------|---|
| 161        | G(P).OGSTOR instruction is executed in offset/gain setting mode.  |
| 162        | G(P).OGSTOR instruction is continuously executed.   |
| 163        | <ul style="list-style-type: none"> <li>• G(P).OGSTOR instruction is executed to the different model from the one to which G(P).OGLOAD instruction is executed.</li> <li>• G(P).OGSTOR instruction has been executed before the execution of G(P).OGLOAD instruction.</li> </ul> |

## (5) Program example


The following shows the programs to write the offset/gain setting value to A/D converter module, installed in I/O number X/Y10 to X/Y1F, by turning OFF M11.



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## Appendix 6 Checking Serial Number and Function Version

For details on how to check the serial number and function version, refer to the following.

 MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

 MELSEC-L CC-Link IE Field Network Head Module User's Manual

## Appendix 7 Addition and Change of Functions

### Appendix 7.1 Addition of functions

The following table lists functions added to the A/D converter module and GX Works2, and product information of compatible A/D converter module and software version of GX Works2.

| Added contents                                  |                      | Upper 5 digits of product information compatible with the A/D converter module | Compatible version of GX Works2 | Reference                 |
|---|----------------------|--|---------------------------------|---------------------------|
| Input range extended mode function              |                      | 13041 or later   | 1.62Q or later                  | Page 67, Section 8.4      |
| Input signal error detection extension function |                      |  |                                 | Page 74, Section 8.8      |
| Shift function                                  |                      |  |                                 | Page 86, Section 8.11     |
| Digital clipping function                       |                      |  |                                 | Page 90, Section 8.12     |
| Difference conversion function                  |                      |  |                                 | Page 94, Section 8.13     |
| Logging function                                |                      |  |                                 | Page 98, Section 8.14     |
| Flow amount integration function                |                      |  |                                 | Page 110, Section 8.15    |
| Display unit                                    | SHIFT screen         |  |                                 | Page 136, Section 9.3 (7) |
|   | DIGITALCLIP screen   |  |                                 | Page 136, Section 9.3 (8) |
|   | INPUT SIG ENH screen |  |                                 | Page 136, Section 9.3 (9) |

### Appendix 7.2 Change of functions

The following table lists functions changed in A/D converter module and GX Works2, and product information of compatible A/D converter module and software version of GX Works2.

| Changed contents   | Upper 5 digits of product information compatible with the A/D converter module | Compatible version of GX Works2 | Reference                 |
|--|--|---------------------------------|---------------------------|
| CH□ Scaling value (digital operation value) (Un\G54 to Un\G57) | 13041 or later   | 1.62Q or later                  | Page 221, Appendix 7.2(1) |
| Maximum value/minimum value hold function                      |  |                                 | Page 221, Appendix 7.2(2) |
| Input signal error detection function                          |  |                                 | Page 221, Appendix 7.2(3) |
| Warning output function (Process alarm)                        |  |                                 | Page 221, Appendix 7.2(4) |
| Scaling function   |  |                                 | Page 222, Appendix 7.2(5) |

## (1) CH□ Scaling value (digital operation value) (Un\G54 to Un\G57)

When the digital clipping function, scaling function, shift function, or difference conversion function is not used, the same value as the one in CH□ Digital output value (Un\G11 to Un\G14) is stored.

### (a) When the non-compatible version of A/D converter module is used

When the scaling function is not used, the value is not stored in CH□ Scaling value (digital operation value) (Un\G54 to Un\G57).

## (2) Maximum value/minimum value hold function

The scaling value (digital operation value) is stored in CH□ Maximum value (Un\G30, Un\G32, Un\G34, Un\G36) and CH□ Minimum value (Un\G31, Un\G33, Un\G35, Un\G37).

For details on the function, refer to the following.

- Maximum value/minimum value hold function (☞ Page 68, Section 8.6)

### (a) When the non-compatible version of A/D converter module is used

When the scaling function is not used, the digital output value is stored in CH□ Maximum value (Un\G30, Un\G32, Un\G34, Un\G36) and CH□ Minimum value (Un\G31, Un\G33, Un\G35, Un\G37). When the scaling function is used, the scaling value (digital operation value) is stored in CH□ Maximum value (Un\G30, Un\G32, Un\G34, Un\G36) and CH□ Minimum value (Un\G31, Un\G33, Un\G35, Un\G37).

## (3) Input signal error detection function

The detection cycle is changed to the sampling cycle.

For details on the function, refer to the following.

- Input signal error detection function (☞ Page 69, Section 8.7)

### (a) When the non-compatible version of A/D converter module is used

The detection cycle is detected per sampling cycle or averaging process cycle depending on the specified A/D conversion method.

## (4) Warning output function (Process alarm)

The alarm output function monitors CH□ Scaling value (digital operation value) (Un\G54 to Un\G57) for alarm output and does not monitor CH□ Digital output value (Un\G11 to Un\G14) for alarm output.

For details on the function, refer to the following.

- Warning output function (Process alarm) (☞ Page 77, Section 8.9)

### (a) When the non-compatible version of A/D converter module is used

When the scaling function is not used, the alarm output function monitors CH□ Digital output value (Un\G11 to Un\G14) for alarm output. When the scaling function is used, the alarm output function monitors CH□ Scaling value (digital operation value) (Un\G54 to Un\G57) for alarm output.

## **(5) Scaling function**

The scaling function can be used in a channel in which the user range setting is used.

For details on the function, refer to the following.

- Scaling function (  Page 77, Section 8.9)

### **(a) When the non-compatible version of A/D converter module is used**

For the A/D converter module of non-compatible version, when the scaling function is set to be enabled in a channel in which the user range setting is used, an error occurs (error code: 99□). After the error occurrence, the error code is stored in Latest error code (Un\G19) and Error flag (XF) is turned to ON. The scaling function performs in the setting before the error.

For details on how to resolve the error, refer to the following.

- Error code list (  Page 159, Section 11.4)



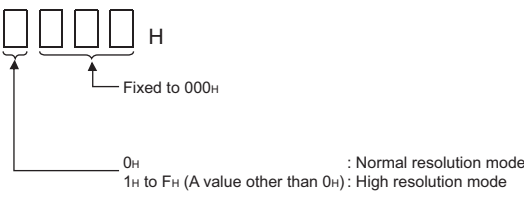
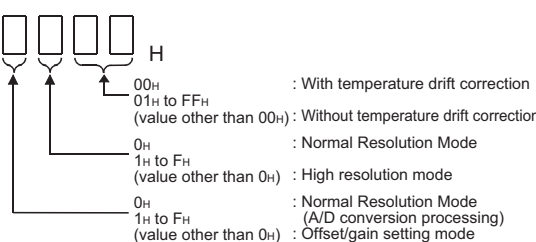
## Appendix 8 Differences with Q Series

The following describes the differences between L series and Q series, and the precautions for configuring the L-series system using the Q-series program.

The description in this chapter is in the case of Q64AD.

### (1) Specification comparison

The following table shows a comparison of the specifications between the L60AD4 and Q64AD.

| Difference                                 | L60AD4  | Q64AD   |
|--|---|---|
| Resolution change function                 | 1 type; 1/20000 (resolution change function is not installed)   | 2 types; normal resolution (1/4000) and high resolution (1/12000 or 1/16000)  |
| Average time                               | 20μs: 2 to 1500ms<br>80μs, 1ms: 2 to 5000ms   | 2 to 5000ms   |
| Averaging process specification            | Averaging process setting (used to replace Q64AD) (Un\G9)<br>Averaging process setting (Un\G24)                     | Averaging process setting (used to replace Q64AD) (Un\G9)   |
| Intelligent function module switch setting |                                   |    |
| Digital output value, scaling value        | When Operating condition setting request (Y9) is turned from OFF to ON, digital values and scaling values are held. | When Operating condition setting request (Y9) is turned from OFF to ON, digital values are cleared. (Q64AD has no scaling value.) |

## Appendix 8.1 Precautions for Applying Q Series Sequence Program

The initial setting program of a Q-series A/D converter module is applicable to the program of the L60AD4 for the input signals and the buffer memory assignment of the L60AD4 are compatible between the L60AD4 and Q64AD. The resolution is also applicable with the use of the module scaling function.

### (1) Input signals and assignment of buffer memory

Refer to the following table to change the program.

Note the precautions for averaging process specification of channel isolated A/D converter modules (Q64AD-GH, Q68AD-G, Q66AD-DG).

The following shows the applicable module list.

| Module                 |            | Averaging process specification   | Description of application  |
|------------------------|------------|---|---|
| Applied from           | Applied to | Applied from  |   |
| Q64AD                  | L60AD4     | Sampling<br>Averaging process<br>Count average<br>(Setting: Un\G9)  | Applicable without making any change.<br>• Precaution<br>Apply the sequence program with the conversion speed setting of 80μs.  |
| Q68ADV/Q68ADI          |            | Sampling<br>Averaging process<br>Count average<br>(Setting: Un\G9)  | Applicable without making any change.<br>• Precaution<br>Apply the sequence program with the conversion speed setting of 80μs.  |
| Q62AD-DGH<br>/Q64AD-GH |            | Sampling<br>Averaging process<br>Count average<br>Moving average<br>First-order delay filter<br>(Setting: Un\G9)  | Partial changes in the sequence program are required.<br>Set the data in the buffer memory address (Un\G9) in the applying sequence program to the buffer memory address (Un\G24) of the applied sequence program.<br>(If the first-order delay filter is set in the buffer memory address (Un\G9), set the other averaging processing to the buffer memory address (Un\G24).)<br>• Precaution<br>Set 0 to the buffer memory address (Un\G9) of the module. |
| Q68AD-G                |            | Sampling<br>Averaging process<br>Count average<br>Moving average<br>First-order delay filter<br>(Setting: Un\G24) | Applicable without making any change.<br>(If the first-order delay filter is set in the buffer memory address (Un\G9), set the other averaging processing to the buffer memory address (Un\G24).)<br>• Precaution<br>Set 0 to the buffer memory address (Un\G9) of the module.  |
| Q66AD-DG               |            | Sampling<br>Averaging process<br>Count average<br>Moving average<br>First-order delay filter<br>(Setting: Un\G24) | Applicable without making any change.<br>(If the first-order delay filter is set in the buffer memory address (Un\G9), set the other averaging processing to the buffer memory address (Un\G24).)<br>• Precaution<br>Set 0 to the buffer memory address (Un\G9) of the module.  |

### Point

- For details on the averaging process specification of the L-series A/D converter module, refer to the following.  
Detail of buffer memory (☞ Page 174, Appendix 2)
- For details on averaging process specification of Q-series A/D converter modules, refer to the user's manual for each module.

## (2) Resolution

Since the module has 1/20000 resolution, the program can be applied from Q-series A/D converter modules just by using the scaling function.

Note that it is the prior condition of the sequence program, applied from a channel isolated A/D converter module (Q68AD-G or Q66AD-DG), does not have the scaling function program.

When applying the sequence program, having the scaling function, from a channel isolated A/D converter module (Q68AD-G or Q66AD-DG), set the scaling upper and lower limit value corresponding to the setting in the sequence program applied from.

The following shows the scaling function setting when applying the sequence program from a Q-series A/D converter module.

| Resolution of applied module | Resolution                                       |               |  |                 |  |                 |                                   |                      |
|------------------------------|--|---------------|--|-----------------|--|-----------------|-----------------------------------|----------------------|
|                              | 1/4000   |               | 1/12000  |                 | 1/16000  |                 | 1/32000                           |                      |
|                              | Digital output value                             |               | Digital output value                             |                 | Digital output value                             |                 | Digital output value              |                      |
|                              | 0 to 4000  | -4000 to 4000 | 0 to 12000                                       | -12000 to 12000 | 0 to 16000                                       | -16000 to 16000 | 0 to 32000                        | -32000 to 32000      |
| Scaling upper limit value    | 4000   | 4000          | 12000  | 12000           | 16000  | 16000           | 32000                             | 32000                |
| Scaling lower limit value    | 0  | -4000         | 0  | -12000          | 0  | -16000          | 0                                 | -32000               |
| Target module                | Q64AD<br>Q68ADV<br>Q68ADI<br>Q68AD-G<br>Q66AD-DG |               | Q64AD<br>Q68ADV<br>Q68ADI<br>Q68AD-G<br>Q66AD-DG |                 | Q64AD<br>Q68ADV<br>Q68ADI<br>Q68AD-G<br>Q66AD-DG |                 | Q64AD-GH<br>Q62AD-DGH<br>(16 bit) | Q64AD-GH<br>(16 bit) |

Applying the sequence program of the Q64AD-GH or Q62AD-DGH with 1/64000 resolution by using the scaling function is not available.

Change the digital output value ranges in the program.


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# Appendix 9 When Using GX Developer or GX Configurator-AD

Appendix 9 describes the operating procedure when using GX Developer and GX Configurator-AD.

## (1) Compatible software version

For compatible software version, refer to the following.

 MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

## Appendix 9.1 Operation of GX Developer

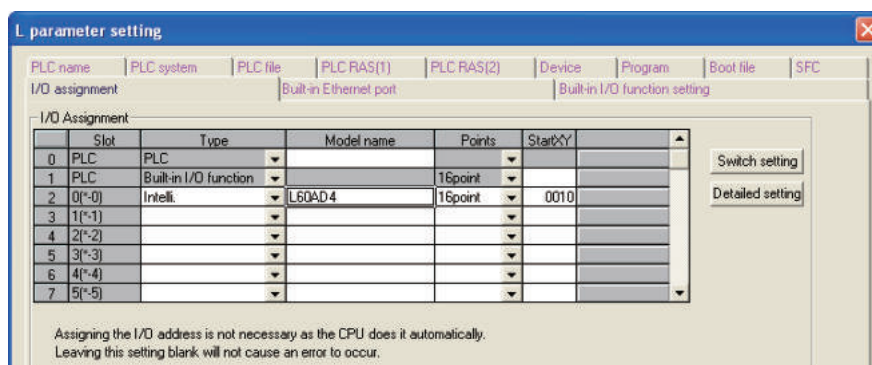
Configure the setting on the following screen when using GX Developer.

| Screen name         | Application  | Reference                 |
|---------------------|--|---------------------------|
| I/O assignment      | Set the type of module to be installed and the range of I/O signal.          | Page 226, Appendix 9.1(1) |
| Switch setting      | Configure the switch setting of an intelligent function module.              | Page 227, Appendix 9.1(2) |
| Offset/gain setting | Configure the setting when using the user range setting for the input range. | Page 57, Section 7.5.2    |

## (1) I/O assignment

Configure the setting from "I/O assignment" in "PLC parameter".

 Parameter ⇨ [PLC parameter] ⇨ [I/O assignment]



| Slot | Type     | Model name | Points  | StartXY |
|------|----------|------------|---------|---------|
| 0    | PLC      |            |         |         |
| 1    | PLC      |            | 16point |         |
| 2    | Intelli. | L60AD4     | 16point | 0010    |
| 3    |          |            |         |         |
| 4    |          |            |         |         |
| 5    |          |            |         |         |
| 6    |          |            |         |         |
| 7    |          |            |         |         |

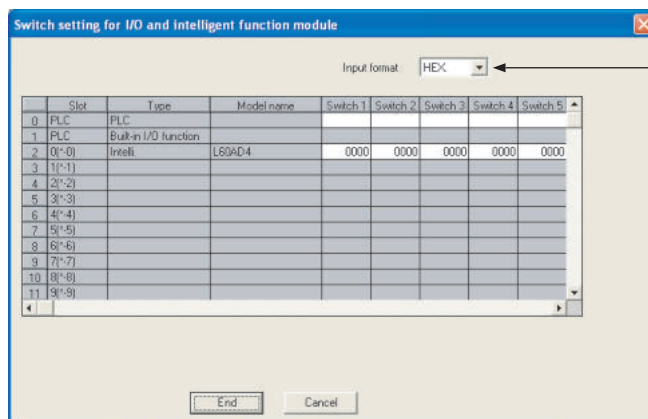
Assigning the I/O address is not necessary as the CPU does it automatically.  
Leaving this setting blank will not cause an error to occur.

| Item       | Description   |
|------------|---|
| Type       | Select "Intelli.".  |
| Model name | Enter the model name of the A/D converter module.             |
| Points     | Select "16 point".  |
| Start XY   | Enter a desired start I/O number of the A/D converter module. |


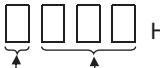
## (2) Intelligent function module switch setting

Configure the setting from "Switch setting" in "PLC parameter".

Parameter ⇒ [PLC parameter] ⇒ [I/O assignment] ⇒ Click the **Switch setting** button.



Select "HEX.".

| Item     | Setting item   |                           |                     |
|----------|--|---------------------------|---------------------|
| Switch 1 | Input range setting<br>(CH1 to CH4)<br><br>CH4 CH3 CH2 CH1  | Analog input range        | Input range setting |
|          |  | 4 to 20mA                 | 0 <sub>H</sub>      |
|          |  | 0 to 20mA                 | 1 <sub>H</sub>      |
|          |  | 1 to 5V                   | 2 <sub>H</sub>      |
|          |  | 0 to 5V                   | 3 <sub>H</sub>      |
|          |  | -10 to 10V                | 4 <sub>H</sub>      |
|          |  | 0 to 10V                  | 5 <sub>H</sub>      |
|          |  | 4 to 20mA (Extended mode) | A <sub>H</sub>      |
|          |  | 1 to 5V (Extended mode)   | B <sub>H</sub>      |
|          |  | User range setting        | F <sub>H</sub>      |
| Switch 2 | 0: Fixed (blank)   |                           |                     |
| Switch 3 | 0: Fixed (blank)   |                           |                     |
| Switch 4 | <br>Fixed to 000 <sub>H</sub><br>0 <sub>H</sub> : Normal (A/D converter processing) mode<br>1 <sub>H</sub> to F <sub>H</sub> (A value other than 0 <sub>H</sub> ) *1 : Offset/gain setting mode |                           |                     |
| Switch 5 | 0: Fixed (blank)   |                           |                     |

\*1 The operation is the same when any value within the setting range is set.


## Appendix 9.2 Operation of GX Configurator-AD

---

When setting the A/D converter module parameter using GX Configurator-AD, the display method such as a setting screen differs from that of GX Works2.

This section describes the screen display method of GX Configurator-AD.

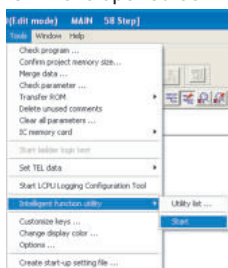
Setting of contents added to the A/D conversion module cannot be configured when the upper 5 digits of product information are 13041 or later. Set by programming. Other setting contents are the same as those of GX Works2.

( Page 48, CHAPTER 7)

When using GX Configurator-AD, configure the settings on the following screens.

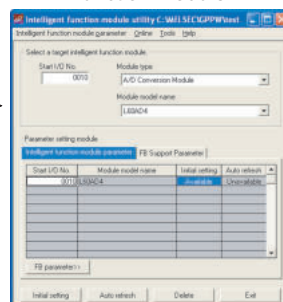
| Screen name          | Application  |
|----------------------|--|
| Initial setting      | This setting configures the settings such as A/D conversion enable/disable setting.  |
| Auto refresh setting | This setting transfers data in the buffer memory to specified devices.   |
| Monitor/test         | This function enables the user to monitor/test the buffer memory and I/O signals, and configure the operating condition setting and offset/gain setting. |
| FB conversion        | This function generates FB automatically from the intelligent function module parameter (initial setting/auto refresh).                                  |

GX Developer screen



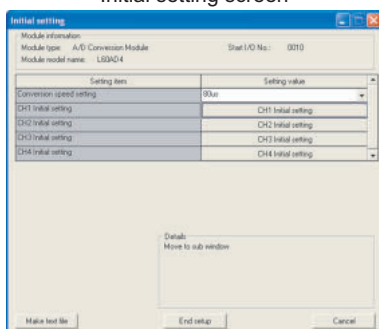
[Tools] - [Intelligent function utility]  
- [Start]

Screen for selecting a target intelligent function module



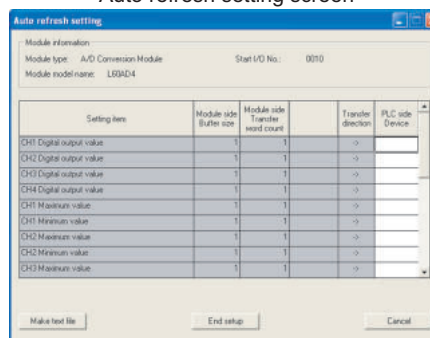
Initial setting

Initial setting screen



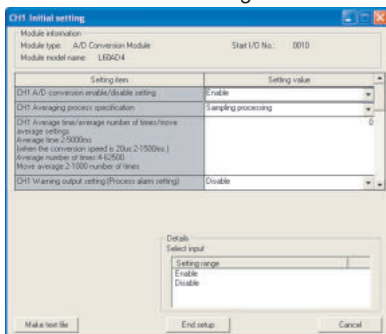
Auto refresh

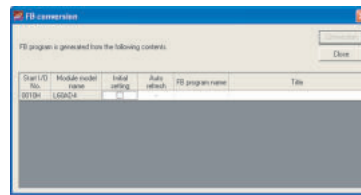
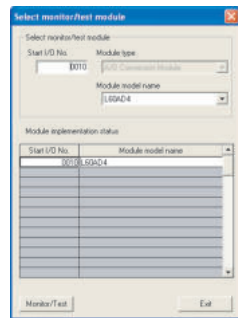
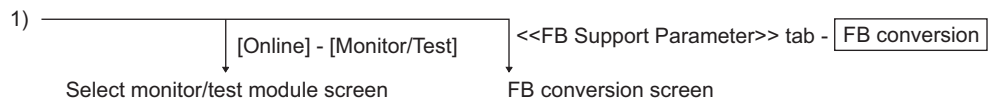
Auto refresh setting screen



CH1 Initial setting

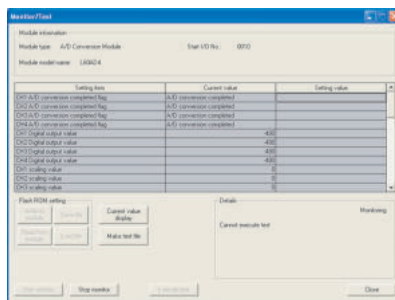
CH1 Initial setting screen





Select a module to be monitored/tested.

Monitor/Test screen

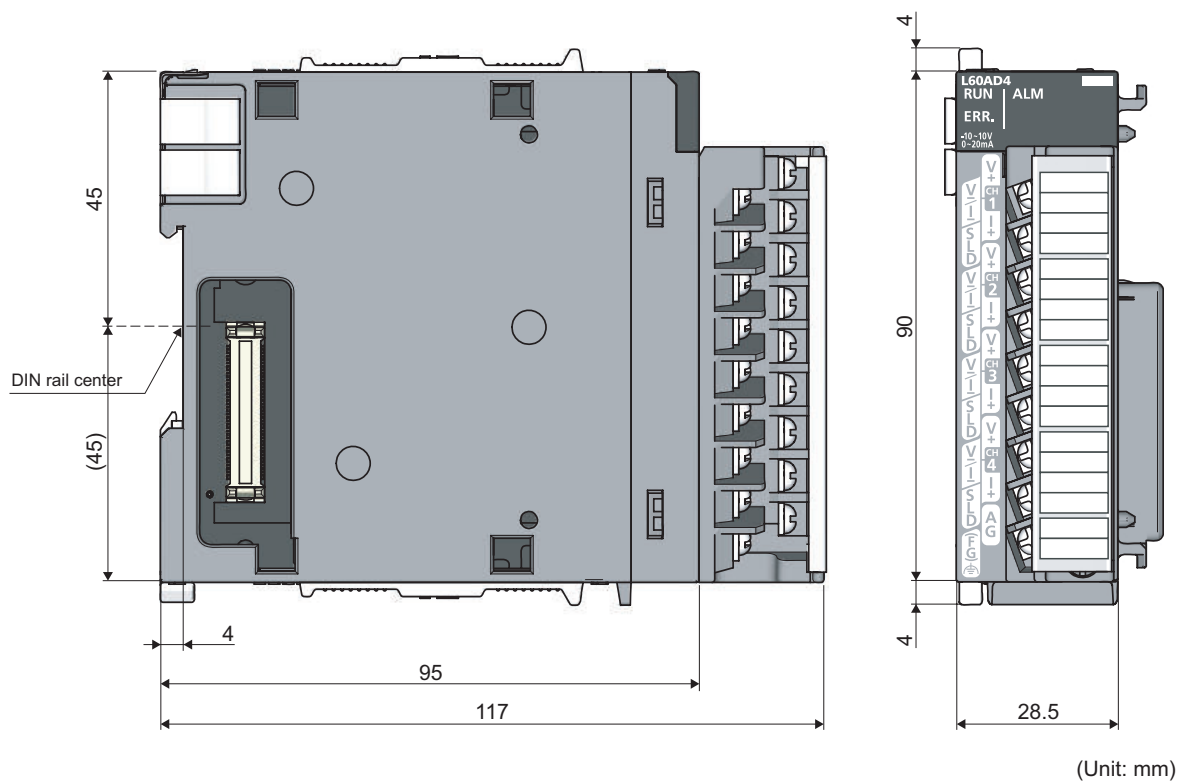




# Appendix 10 External Dimensions

The following shows the external dimensions of A/D converter module.

## (1) L60AD4



A



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# REVISIONS

\*The manual number is given on the bottom left of the back cover.

| Print date   | *Manual number     | Revision  |
|--------------|--------------------|---|
| January 2010 | SH(NA)-080899ENG-A | First edition   |
| April 2010   | SH(NA)-080899ENG-B | <p><b>Partial correction</b></p> <p>SAFETY PRECAUTIONS, COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES, RELEVANT MANUALS, TERMS, CHAPTER 3, Section 3.1, 3.2.1, 3.3, 3.5, CHAPTER 4, Section 5.1, 5.2, Section 6.1, 6.4, Section 7.1, 7.2, 7.3, 7.4, 7.5, 7.5.1, Section 8.3, 8.4, 8.5, 8.6, 8.8, Section 9.3, 9.4, Section 10.2, CHAPTER 11, Section 11.4, 11.6, APPENDICES 2</p> <p><b>Additions</b></p> <p>Section 5.3, Section 7.5.1, Section 10.3</p> <p><b>Modification</b></p> <p>APPENDICES 8.1 → Section 7.5.2</p> |
| October 2011 | SH(NA)-080899ENG-C | <p><b>Partial correction</b></p> <p>COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES, MANUAL PAGE ORGANIZATION, Section 1.2, Section 3.2, 3.2.1, 3.3, 3.5, Section 7.1, 7.2, 7.3, 7.4, 7.5, Section 8.1, 8.3, 8.6, 8.7, 8.9, 8.10, 8.16, 8.18, 8.19, Section 9.2, 9.3, Section 10.1, 10.2, 10.3, Section 11.1, 11.4, 11.5, 11.6, Appendix 1, 1.1, 1.2, Appendix 2, Appendix 3, Appendix 9.1, 9.2</p> <p><b>Additions</b></p> <p>Section 8.4, 8.8, 8.11, 8.12, 8.13, 8.14, 8.15, Appendix 7</p>                                    |
|              |                    |   |

Japanese manual version SH-080877-C

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# MELSEC-L Analog-Digital Converter Module User's Manual

|                             |           |
|-----------------------------|-----------|
| MODEL                       | L-A/D-U-E |
| MODEL<br>CODE               | 13JZ42    |
| SH(NA)-080899ENG-C(1110)MEE |           |



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