5 FUNCTIONS

5.1 Function List

TSN: CC-Link IE TSN, Field: CC-Link IE Field Network, Basic: CC-Link IE Field Network Basic, MOD: MODBUS/TCP

○: Available, △: Some restrictions, ─: Not available

Common functions

Item	Description	TSN	Field	Basic	SLMP	MOD	Reference
Error history function	The error history held in the network interface module can be checked.	○	○	△[*1][*2]	△[*1][*3]	△[*1][*3]	☞ Page 97 Error history function
Network diagnostics	Communication status monitor or remote reset is performed from the master station.	○	○	○	△[*4]	△[*5]	☞ Page 100 Network diagnostics
Unit test	Run a unit test to check if there is any abnormality in the hardware of network interface module.	○	○	○	○	○	☞ Page 293 Unit Test
Operation history recording function (FA3-TH)	The on/off history for 100 points every I/O signal is stored and the data is output in CSV format.	○	─	△[*2]	△[*3]	─	☞ Page 105 Operation history recording function (FA3-TH)
Logging function (FA3-AT)	Digital input/output values or digital operation values for 8000 points (all channels shared) are recorded and can be output in CSV format.	○	─	△[*2]	△[*3]	─	☞ Page 106 Logging function (FA3-AT)
Maintenance information recording function	Operating start date, operating time, and relay ON count are recorded.	○	○	△[*2]	△[*3]	△[*3]	☞ Page 109 Maintenance information recording function
Maintenance alarm function	An alarm is output when operating time or relay ON count exceeds the specified threshold.	○	○	△[*2]	△[*3]	△[*3]	☞ Page 110 Maintenance alarm function
Parameter area initialization	The target parameters in remote buffer memory areas are initialized to the default values.	○	○	○	○	○	☞ Page 111 Parameter area initialization function
Command execution of slave station	Execute a command to a slave station using an engineering tool.	○	○	─	─	─	☞ Page 112 Command execution of slave station

*1 The error history can be checked using the remote buffer memory. The error history cannot be checked from the engineering tool.
*2 Only when cyclic communication is performed one time or more and clock data is sent, the error occurrence time is recorded. (0 is always stored in the element of millisecond.)
*3 Only when clock data is sent, the error occurrence time is recorded. (0 is always stored in the element of millisecond.)
*4 The communication status monitoring function is used. (☞ Page 240 Communication status monitoring function)
*5 The alive check function and the split reception monitoring function are used. (☞ Page 267 Alive check function, Page 269 Split reception monitoring function)

Functions of the FA3-TH1T16XC and FA3-TH1M16XC

Item	Description	TSN	Field	Basic	SLMP	MOD	Reference
Input response time setting function	Prevents an incorrect input due to noise by setting the response time required for the module to recognize an actual input as the input signal.	○	○	○	○	○	☞ Page 114 Input response time setting function

Functions of the FA3-TH1T16Y, FA3-TH1T16YE, FA3-TH1M16Y, and FA3-TH1M16YE

Item	Description	TSN	Field	Basic	SLMP	MOD	Reference
Output HOLD/CLEAR setting function	When the network interface module is disconnected from data link, when the CPU module operating status is STOP or RESET, or when the CPU module operation is suspended by an error, whether to hold or clear the last output value can be set by this function.	○	○	△*1	△*1	△*1	☞ Page 115 Output HOLD/CLEAR setting function
Output on/off information hold function	Checks whether the output has been turned on or off.	○	○	○	○	○	☞ Page 116 Output on/off information hold function

*1 The HOLD/CLEAR settings for each operating status of the CPU module are not supported.

Functions of the FA3-AT1T8X and FA3-AT1M8X

Item			Description	TSN	Field	Basic	SLMP	MOD	Reference
A/D conversion enable/disable function			Sets whether to enable or disable A/D conversion for each channel.	○	○	○	○	○	☞ Page 119 A/D conversion enable/disable function
A/D conversion method	Sampling processing		Performs A/D conversion on analog input values sequentially, storing the converted values into the remote register.	○	○	○	○	○	☞ Page 119 Sampling processing
	Averaging processing	Time average	Performs A/D conversion for a set period of time and averages the total value excluding the maximum and the minimum values, storing the averaged value into the remote register.	○	○	○	○	○	☞ Page 120 Averaging processing
		Count average	Performs A/D conversion a set number of times and averages the total value excluding the maximum and the minimum values, storing the averaged value into the remote register.						
		Moving average	Digital output values are retrieved from each sampling cycle a specified number of times, and the values are averaged. The average value is stored in the remote register.						
Input signal error detection function			An input signal error is detected when the analog input value enters the error detection range.	○	○	○	○	○	☞ Page 122 Input signal error detection function
Warning output function (process alarm)			A warning is output if the digital operation value enters the predefined warning output range.	○	○	○	○	○	☞ Page 124 Warning output function (process alarm)
Digital clipping function			Used to fix the digital operation value to the maximum digital output value or the minimum digital output value if the input voltage exceeds the input range.	○	○	○	○	○	☞ Page 126 Digital clipping function
Scaling function			Performs scale conversion on a digital output value to the set range of the scaling upper limit value and the scaling lower limit value.	○	○	○	○	○	☞ Page 127 Scaling function
Shift function			Adds the conversion value shift amount specified to a digital output value and stores it into the remote register.	○	○	○	○	○	☞ Page 129 Shift function
Maximum value/minimum value hold function			For each channel, stores the maximum and minimum values of digital operation values into the remote buffer memory.	○	○	○	○	○	☞ Page 132 Maximum value/minimum value hold function

5

Functions of the FA3-AT1T8Y and FA3-AT1M8Y

Item	Description	TSN	Field	Basic	SLMP	MOD	Reference
D/A conversion enable/disable function	Sets whether to enable or disable D/A conversion for each channel.	○	○	○	○	○	☞ Page 134 D/A conversion enable/disable function
D/A output enable/disable function	Sets whether to output the D/A conversion value or the offset value for each channel.	○	○	○	○	○	☞ Page 134 D/A output enable/disable function
Analog output HOLD/CLEAR function	Set whether to hold or clear the last analog output value in any of the following cases: when the network interface module is disconnected from data link, when the CPU module operating status is STOP or RESET, or when the CPU module operation is suspended by an error.	○	○	△[*1]	△[*1]	△[*1]	☞ Page 135 Analog output HOLD/CLEAR setting function
Warning output function	A warning is output if the digital input value enters the predefined warning output range.	○	○	○	○	○	☞ Page 136 Warning output function
Scaling function	Performs scale conversion on a digital input value to the set range of the scaling upper limit value and the scaling lower limit value.	○	○	○	○	○	☞ Page 138 Scaling function

*1 The HOLD/CLEAR settings for each operating status of the CPU module are not supported.

5.2 Common Functions

Error history function

The error history held in the network interface module can be checked.

Operation

- The error history records a maximum of 16 errors in reverse chronological order of occurrence. If 17 or more errors occur, errors are deleted from the oldest.
- If the same error occurs continuously, only the initial occurrence is stored to the error history.
- Even when the module is powered off, the error history before power-off can be checked using the remote buffer memory.
- "Occurrence Date" information in the error history is recorded after clock information is distributed from the master station.
- When an error occurs before clock information is distributed from the master station, occurrence date is not recorded properly.

Checking method

The error history can be checked using an engineering tool or remote buffer memory.
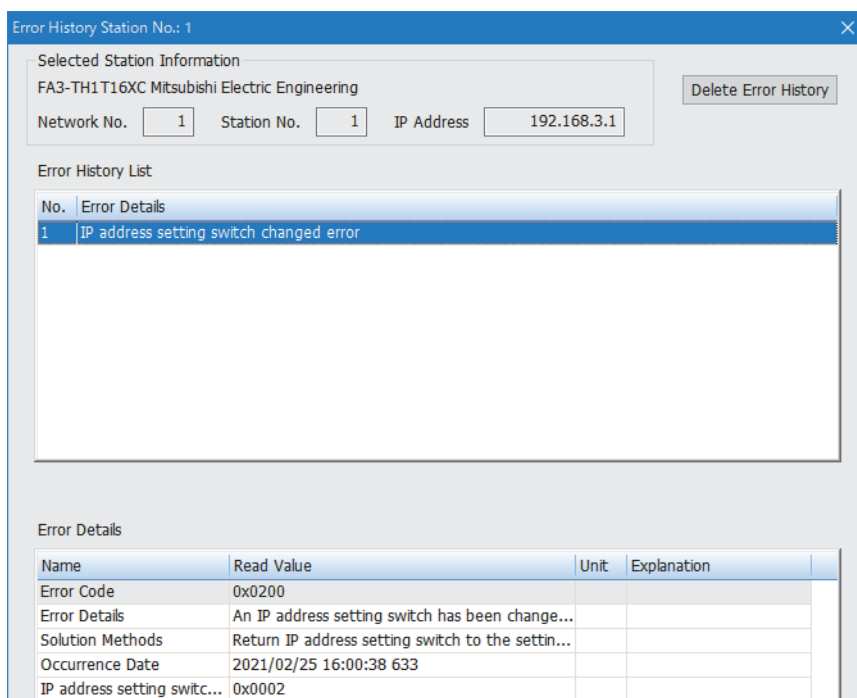
■Checking using an engineering tool (network diagnostics)

CC-Link IE TSN and CC-Link IE Field Network are supported.

Ex.

Use the CC-Link IE TSN/CC-Link IE Field diagnostics to check the error history.

🖝 [Diagnostics] ⇨ [CC-Link IE TSN/CC-Link IE Field Diagnostics] ⇨ Select and right-click the network interface module to be diagnosed. ⇨ Select "Error History".

Error History Station No.: 1	✕

Selected Station Information
FA3-TH1 T16XC Mitsubishi Electric Engineering

| Network No. | 1 | Station No. | 1 | IP Address | 192.168.3.1 | Delete Error History |

Error History List

No.	Error Details
1	IP address setting switch changed error

Error Details

Name	Read Value	Unit	Explanation
Error Code	0x0200		
Error Details	An IP address setting switch has been change...		
Solution Methods	Return IP address setting switch to the settin...		
Occurrence Date	2021/02/25 16:00:38 633		
IP address setting switc...	0x0002		

Point

In the CC-Link IE TSN system, the error history can be cleared by clicking the [Delete Error History] button in the window above.

The error history 1 to 16 (3BA2H to 3BB3H, ..., 3CB0H to 3CC1H) cannot be cleared even when the error history is cleared by clicking the [Delete Error History] button

To clear the error history 1 to 16 (3BA2H to 3BB3H, ..., 3CB0H to 3CC1H), select "Error history clear request" in the "Command Execution of Slave Station" window. (🖝 Page 112 Command execution of slave station)

■Checking using an engineering tool (command execution of slave station)

Execute "Read error history data". (⮕ Page 112 Command execution of slave station)

■Checking using a remote buffer memory

Errors are stored in error history 1 to 16 (remote buffer memory 3BA2H to 3BB3H, ..., 3CB0H to 3CC1H). Errors are stored in order of occurrence. The first error is stored in Error history 1, and the second error is stored in Error history 2. And then, the 17th error is stored in Error history 1 again and the following errors are stored in order of occurrence.

To find the latest error in error history 1 to 16, check Latest error history pointer (remote buffer memory: 3BA0H).

In the CC-Link IE Field Network system, the latest error is always stored in Error history 1, and the one before the latest is stored in Error history 2 subsequently. If any error history exists, the value of Latest error history pointer is always 0000H.

Ex.

When reading the latest error stored in Error history 16 (remote buffer memory: 3CB0H to 3CC1H) to D1000 using a program (When 15 is stored in Latest error history pointer (remote buffer memory: 3BA0H))

Data format of error history

The following table shows data format of the error history 1 to 16 (remote buffer memory 3BA2H to 3BB3H, ..., 3CB0H to 3CC1H).

Element		Size	Content for network interface module
Error code		2 bytes	An error code or alarm code for the error that has occurred in the network interface module is stored.
Occurrence date[*1]	Year	2 bytes	1970 to 2105
	Month	1 byte	01 to 12
	Day	1 byte	01 to 31
	Hour	1 byte	00 to 23
	Minute	1 byte	00 to 59
	Second	1 byte	00 to 59
	Day of week	1 byte	00 (Sunday) to 06 (Saturday)
	Millisecond	2 bytes	0000 to 0999 (fixed to 0000 in a system other than CC-Link IE TSN and CC-Link IE Field Network)
Number of detailed information		2 bytes	The number of detailed information (1 to 2) for the error code or alarm code is stored.
Detailed information		20 bytes	Detailed information for the error code or alarm code is stored. ⮕ Page 301 List of Error Codes ⮕ Page 308 List of Alarm Codes

*1 The value obtained by converting the Unix time is stored. (BCD system)

How to clear errors

The following descriptions show how to clear the error history. When the error history is cleared by the following method, error history 1 to 16 (remote buffer memory: 3BA2H to 3BB3H, ..., 3CB0H to 3CC1H) are also cleared.

- CC-Link IE TSN, CC-Link IE Field Network: Select "Error history clear request" in the "Command Execution of Slave Station" window. (☞ Page 112 Command execution of slave station)
- CC-Link IE Field Network Basic, SLMP: Error history cannot be cleared since the command execution of slave station is not supported.
- MODBUS/TCP: Send the function code (44H: Error history clear).

5

Network diagnostics

Communication status monitor or remote reset is performed from the master station.

CC-Link IE TSN/CC-Link IE Field Network diagnostics

Communication status monitor or remote reset is performed using an engineering tool.

👌 [Diagnostics] ⇨ [CC-Link IE TSN/CC-Link IE Field Diagnostics]

For details, refer to the user's manual for the master module used.

■Selected station communication status monitor (CC-Link IE TSN)

When the network interface module is selected in the "CC-Link IE TSN/CC-Link IE Field diagnostics" window, the LED status is shown as shown in the following table. (☞ Page 75 Part Names)
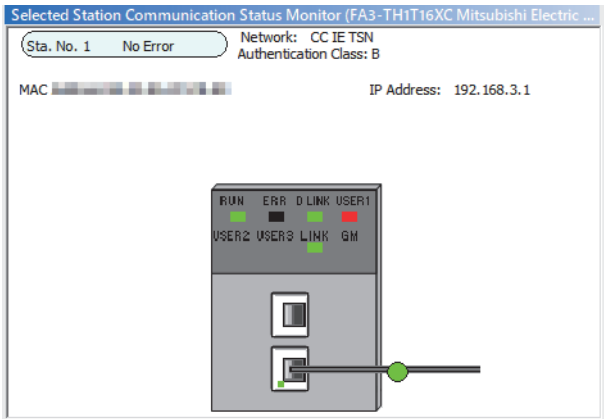
Contents displayed on "Selected Station Communication Status Monitor"	Description
RUN	RUN LED status is shown.
ERR	RUN LED status is shown.
D LINK	D LINK LED status is shown.
USER1	ALM LED status is shown.
USER2	Not used.
USER3	Not used.
LINK	LINK LED of P1 or P2 is lit.
GM	Not used.

Precautions

When an Ethernet cable is connected to P1, the "Selected Station Communication Status Monitor" will display it as if the cable is connected to P2. When an Ethernet cable is connected to P2, the "Selected Station Communication Status Monitor" will display it as if the cable is connected to P1. (☞ Page 75 Part Names)

■Selected station communication status monitor (CC-Link IE Field)

When the network interface module is selected in the "CC-Link IE TSN/CC-Link IE Field diagnostics" window, the LED status or processing status is shown as shown in the following table. (Page 75 Part Names)
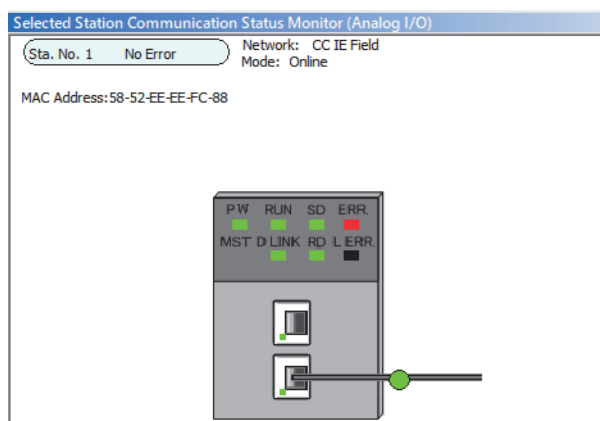
Contents displayed on "Selected Station Communication Status Monitor"	Description
PW	PW LED status is shown.
RUN	RUN LED status is shown.
SD	Data is being transmitted.
ERR.	ERR. LED status is shown.
MST	Not used.
D LINK	D LINK LED status is shown.
RD	Data is being received.
L ERR.	Not used.

ALM LED status is not shown.

■Remote reset

The network interface module is remotely reset by the following operation.

Selecting "Remote operation" in "Network Configuration Setting" of "Basic Setting" can also perform remote reset.

Operating procedure

1. Select the network interface module to be remotely reset in the "CC-Link IE TSN/CC-Link IE Field diagnostics" window.

2. Click the [Remote operation] button in the "CC-Link IE TSN/CC-Link IE Field diagnostics" window.

3. Follow the on-screen instructions and click the [Yes] button.

*4.* Follow the on-screen instructions and click the [OK] button.

CC-Link IE Field Network Basic diagnostics

The network status is monitored and diagnosed by using an engineering tool. For details, refer to the following.

📖CC-Link IE Field Network Basic Reference Manual

■Diagnostic information list

The following table lists the diagnostic information of slave station that can be checked in the special register (SD) or buffer memory of master station.

Name		SM/SD/Buffer memory			Description
		MELSEC iQ-R, MELSEC iQ-L	MELSEC iQ-F	MELSEC-Q, MELSEC-L	
Diagnostic information 2	Manufacturer code	Un\G1068	SD11144	SD1758	0208H (fixed) is stored.
	Model code (lower)	Un\G1070	SD11146	SD1760	☞ Page 102 Model code
	Model code (upper)	Un\G1071	SD11147	SD1761	
	Device version	Un\G1072	SD11148	SD1762	0001H is stored.
	Module information	Un\G1074	SD11150	SD1764	☞ Page 102 Module information
	Error code	Un\G1075	SD11151	SD1765	☞ Page 301 List of Error Codes
	Detailed module information (lower)	Un\G1076	SD11152	SD1766	Use prohibited
	Detailed module information (upper)	Un\G1077	SD11153	SD1767	☞ Page 103 Detailed module information (digital input) ☞ Page 103 Detailed module information (digital output) ☞ Page 103 Detailed module information (analog output)

For diagnostics information other than the above, refer to the manual for the master station used.

■Model code

The following model codes will be stored.

Model	Model code (upper)	Model code (lower)
FA3-TH1T16XC	0000H	000EH
FA3-TH1T16Y	0000H	000FH
FA3-TH1T16YE	0000H	0010H
FA3-AT1T8X	0000H	0011H
FA3-AT1T8Y	0000H	0012H
FA3-TH1M16XC	0000H	0013H
FA3-TH1M16Y	0000H	0014H
FA3-TH1M16YE	0000H	0015H
FA3-AT1M8X	0000H	0016H
FA3-AT1M8Y	0000H	0017H

■Module information

The following module information will be stored.

Module information	Description
b0	The I/O control status of network interface module is stored. 0: A moderate or major error has occurred, and I/O processing is stopped. 1: No error or minor error has occurred, and I/O processing is under operation.
b1 to b15	Use prohibited

■Detailed module information (digital input)

The following data will be stored in the detailed module information (upper) of the FA3-TH1T16XC and FA3-TH1M16XC.

Detailed module information	Description
b0 to b2	The input response time setting status at power-on is stored.
b3 to b15	Use prohibited

Stored value			Input response time
b2	b1	b0	
0	0	0	1ms
0	0	1	0ms
0	1	0	0.2ms
0	1	1	1.5ms
1	0	0	5ms
1	0	1	10ms
1	1	0	20ms
1	1	1	70ms

Even if parameters are changed during operation, the stored values are not updated.

For details on the input response time setting, refer to the following.

■Detailed module information (digital output)

The following data will be stored in the detailed module information (upper) of the FA3-TH1T16Y, FA3-TH1T16YE, FA3-TH1M16Y, and FA3-TH1M16YE.

Detailed module information	Description
b0 to b2	Use prohibited

b3	The output HOLD/CLEAR setting status at power-on is stored.
	    0: CLEAR
	    1: HOLD

b4 to b15	Use prohibited

Even if parameters are changed during operation, the stored values are not updated.

For details on the output HOLD/CLEAR setting, refer to the following.

■Detailed module information (analog output)

The following data will be stored in the detailed module information (upper) of the FA3-AT1T8Y and FA3-AT1M8Y.

Detailed module information	Description	
b0 to b2	Use prohibited	

b3	CH1	The analog output HOLD/CLEAR setting status at power-on is stored.
		    0: CLEAR
		    1: HOLD

b4	CH2	
b5	CH3	
b6	CH4	
b7	CH5	
b8	CH6	
b9	CH7	
b10	CH8	
b11 to b15	Use prohibited	

Even if parameters are changed during operation, the stored values are not updated.

For details on the analog output HOLD/CLEAR setting, refer to the following.

Communication status monitoring function for SLMP

Request messages are received periodically from external devices by setting the request message monitoring interval, resulting in monitoring the communication status. (☞ Page 240 Communication status monitoring function)

Alive check function and split reception monitoring function for MODBUS/TCP

- The network interface module periodically sends alive check messages to the MODBUS/TCP master device and confirms whether the response messages can be received. (☞ Page 267 Alive check function)
- When the network interface module receives a split request message, the module monitors whether the last part can be received within the specified period of time from when the first part is received. (☞ Page 269 Split reception monitoring function)

Operation history recording function (FA3-TH)

The on/off history for 100 points every I/O signal is stored and the data is output in CSV format.
The function block (FB) for the operation history storage is used. (☞ Page 73 Function Block (FB))
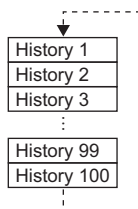
Operation

Operating procedure

1. Set off (Enable) for the bit of the relevant I/O signal in the Operation history recording enable/disable setting (RWw6) to start collecting the operation history.

- FA3-TH1T16XC, FA3-TH1M16XC ☞ Page 40 Operation history recording enable/disable setting (RWw6)
- FA3-TH1T16Y, FA3-TH1T16YE, FA3-TH1M16Y, FA3-TH1M16YE ☞ Page 44 Operation history recording enable/disable setting (RWw6)

2. The operation history is stored in the internal memory of network interface module when the I/O signal is turned off or on.

> **Point**
>
> • When the operation history for 100 points are stored, the oldest data is updated.
>
> | History 1 |
> | History 2 |
> | History 3 |
> | ⋮ |
> | History 99 |
> | History 100 |
>
> • The execution status of the operation history recording function can be checked by Operation history recording status (RWr6).

3. Set on (Disable) for the bit of the relevant I/O signal in the Operation history recording enable/disable setting (RWw6) to stop collecting the operation history.

4. Insert the SD memory card in the CPU module as a master station.

5. Execute the function block (FB) to record the operation history in the SD memory card in CSV format.

6. By turning off the power supply of the network interface module, the operation history stored in the internal memory is cleared.

Precautions

- The function block (FB) can be executed only when the operation history recording processing is stopped. If the FB is executed without the operation history recording processing stopped, the FB processing failed.
- CSV files are saved to the SD memory card in the CPU module. (CSV files cannot be saved to the built-in memory of the CPU module.)
- The operation history is recorded when the time information is not received from the master station, the occurrence time is not recorded properly.

Logging function (FA3-AT)

Digital input/output values or digital operation values for 8000 points (all channels shared) are recorded and output in CSV format.

The function block (FB) for the logging data storage is used. (☞ Page 73 Function Block (FB))

Overview

To collect the logging data, set the target channel in Logging execution flag (RWwC) to off (Enable). (The default value is off (Enable).)

■FA3-AT1T8X, FA3-AT1M8X

- Digital output value or scaling value (digital operation value) for 8000 points (all channels shared) are collected.
- Data can be collected at a minimum interval of 1ms or a maximum interval of 3600s.
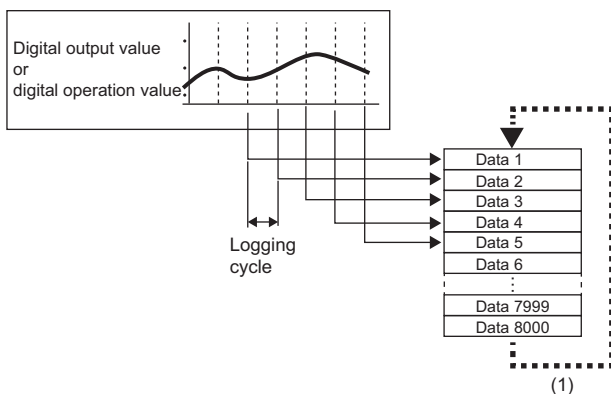
(1) After the number of stored data reaches 8000 (number of collectable data), the data is overwritten in order from the data 1.

Point

The digital output value and scaling value (digital operation value) are the following values.
- Digital output value: Value before scaling or shift operation
- Scaling value (Digital operation value): Value after scaling or shift operation

■FA3-AT1T8Y, FA3-AT1M8Y

- Digital input value or scaling value (digital operation value) for 8000 points (all channels shared) are collected.
- Data is collected when the digital input value changes.

Point

The digital input value and scaling value (digital operation value) are the following values.
- Digital input value: Digital value that is inputted in CH□ Digital value (RWw2 to RWw9)
- Scaling value (Digital operation value): Digital value to be used for D/A conversion after scaling operation

Logging cycle

Set the logging cycle of the FA3-AT1T8X and FA3-AT1M8X as follows.
- CH□ Logging cycle unit setting (remote buffer memory: 4110H to 4117H): Set the unit of cycle of collecting data
- CH□ Logging cycle setting (remote buffer memory: 4108H to 410FH): Set the cycle of collecting data.

The following table lists the setting range for each cycle unit.

CH□ Logging cycle unit setting	CH□ Logging cycle setting range
ms (0)	1 to 32767
s (1)	1 to 3600

Set the logging cycle to an integral multiple of the conversion cycle.

If not so, the actual logging cycle will be an integral multiple of the conversion cycle, and the set logging cycle is the maximum value.

The following table shows the conversion cycles for each A/D conversion method.

A/D conversion method	Conversion cycle
Sampling processing	Conversion speed × Number of A/D conversion enabled channels
Time average	$$\left(\frac{\text{Time set in Time average/Count average/Moving average setting}}{\text{Number of conversion enabled channels} \times \text{Conversion speed}} \right)^{*1} \times \text{Number of conversion enabled channels} \times \text{Conversion speed}$$ *1 Values after the decimal point are rounded down.
Count average	Time/Count/Moving average × Conversion speed × Number of A/D conversion enabled channels
Moving average	Conversion speed × Number of A/D conversion enabled channels

> **Point**
>
> For details on each A/D conversion method, refer to the following.
> ☞ Page 119 A/D conversion method
> For the FA3-AT1T8Y and FA3-AT1M8Y, the logs are recorded when the digital input value changes, not using the logging cycle settings.

Setting method (FA3-AT1T8X, FA3-AT1M8X)

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", select "Enable" for "CH□ A/D conversion enable/disable setting".

A/D conversion enable/disable setting				
CH1 A/D conversion enable/disable setting	Enable			Enable

2. In the same window, select the unit for "CH□ Logging cycle unit setting" and input the value for "CH□ Logging cycle setting".

Logging cycle setting				
CH1 Logging cycle unit setting	ms			
CH1 Logging cycle setting	1			
CH2 Logging cycle unit setting	ms			ms
CH2 Logging cycle setting	1			s
CH3 Logging cycle unit setting	ms			ms

3. In the same window, select the data type for "CH□ Logging data setting".

Logging data setting				
CH1 Logging data setting	Digital output value			
CH2 Logging data setting	Digital output value			Digital output value
CH3 Logging data setting	Digital output value			Scaling value
CH4 Logging data setting	Digital output value			
CH5 Logging data setting	Digital output value			

■Setting using the program

1. Set the relevant channel in CH☐ A/D conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

↪ Page 66 CH☐ A/D conversion enable/disable setting (0102H)

2. Set the unit and the value in the relevant channels in CH☐ Logging cycle unit setting (remote buffer memory: 4110H to 4117H) and CH☐ Logging cycle setting (remote buffer memory: 4108H to 410FH).

↪ Page 68 CH☐ Logging cycle unit setting (4110H to 4117H),Page 68 CH☐ Logging cycle setting (4108H to 410FH)

3. Set the data type in the relevant channel in CH☐ Logging data setting (4100H to 4107H).

↪ Page 68 CH☐ Logging data setting (4100H to 4107H)

Setting method (FA3-AT1T8Y, FA3-AT1M8Y)

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", select "Enable" for "CH☐ D/A conversion enable/disable setting".

⊟ D/A conversion enable/disable setting					
┈ CH1 D/A conversion enable/disable setting	Disable				Enable

2. In the same window, select the data type for "CH☐ Logging data setting".

⊟ Logging data setting				
┈ CH1 Logging data setting	Digital input value			▽
┈ CH2 Logging data setting	Digital input value			
┈ CH3 Logging data setting	Digital input value		Digital input value	
┈ CH4 Logging data setting	Digital input value		Scaling value	
┈ CH5 Logging data setting	Digital input value		Digital input value	

■Setting using the program

1. Set the relevant channel in CH☐ D/A conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

↪ Page 71 CH☐ D/A conversion enable/disable setting (0102H)

2. Set the data type in the relevant channel in CH☐ Logging data setting (4100H to 4107H).

↪ Page 72 CH☐ Logging data setting (4100H to 4107H)

Operation

Operating procedure

1. To start logging, set the bit of the channel that collects the logging data in Logging execution flag (RWwC) of the remote register to off (Enable).

2. The logging data is stored in the internal memory of the network interface module.

> *Point*
>
> The execution status of the logging function can be checked using Logging execution status (RWrC).

3. To stop logging, set the bits in Logging execution flag (RWwC) of all channels to on (Disable).

4. Insert the SD memory card in the CPU module as a master station.

5. Execute the function block (FB) to record the logging data in the SD memory card in CSV format.

6. By turning off the power supply of the network interface module, the logging data stored in the internal memory is cleared.

Precautions

• The FB can be executed only when logging is stopped. If the FB is executed without logging stopped, the FB processing failed.

• CSV files are saved to the SD memory card in the CPU module. (CSV files cannot be saved to the built-in memory of the CPU module.)

• The logging data is recorded in a CSV file when the time information is not received from the master station, "---" is stored in the occurrence time.

Maintenance information recording function

Operating start date, operating time, and relay ON count are recorded.

Operation start date

Date is recorded in Operation start date (remote buffer memory: 3B82H to 3B86H). The default value is 0.

Element		Size	Content for network interface module
Occurrence time[*1]	Year	2 bytes	1970 to 2105
	Month	1 byte	01 to 12
	Day	1 byte	01 to 31
	Hour	1 byte	00 to 23
	Minute	1 byte	00 to 59
	Second	1 byte	00 to 59
	Day of week	1 byte	00 (Sunday) to 06 (Saturday)
	Millisecond	2 bytes	0000 to 0999 (fixed to 0000 in a system other than CC-Link IE TSN and CC-Link IE Field Network)

*1   The value obtained by converting the Unix time is stored. (BCD system)

■Reset using an engineering tool

Execute "Operation start date reset flag". (☞ Page 112 Command execution of slave station)

■Reset using the program

By setting Operation start date reset flag (remote buffer memory: 4125H) to 1, operation start date is set from the present date in the master module. (☞ Page 57 Operation start date reset flag (4125H))

Elapsed operation time

The total of the time when the power is supplied to the network interface module is recorded in Elapsed operation time (remote buffer memory: 3B80H to 3B81H). (Data can be recorded for 0 to 4294967295 hours.)

■Checking and reset using an engineering tool

Execute "Elapsed operation time" to check the elapsed operation time. (☞ Page 112 Command execution of slave station)
Execute "Elapsed operation time reset flag" to reset the elapsed operation time. (☞ Page 112 Command execution of slave station)

■Reset using the program

Set Elapsed operation time reset flag (remote buffer memory: 4124H) to 1 to reset the elapsed operation time (remote buffer memory: 3B80H to 3B81H). (☞ Page 57 Elapsed operation time reset flag (4124H))

Relay ON count (FA3-TH)

The number of times that a relay is turned on is counted for each I/O signal and is recorded in X/Y□ relay ON count (remote buffer memory: 3B60H to 3B61H, ..., 3B7EH to 3B7FH). (Data can be recorded for 0 to 4294967295 times. After the count reaches 4294967295, it is no longer increased.)

■Checking and reset using an engineering tool

Execute "Relay ON count" to check the relay ON count. (☞ Page 112 Command execution of slave station)
Execute "Relay ON count reset flag" to reset the relay ON count. (☞ Page 112 Command execution of slave station)

■Reset using the program

Turn on the relevant I/O signal in Relay ON count reset flag (remote buffer memory: 4121H) to reset the relay ON count for each I/O signal. (☞ Page 57 Relay ON count reset flag (4121H))

Maintenance alarm function

An alarm is output when operating time or relay ON count exceeds the specified threshold.

Elapsed operation time threshold

Set a value within 0 to 4294967295 for Elapsed operation time threshold setting (remote buffer memory: 4122H, 4123H) to output an alarm when the elapsed operation time exceeds the threshold.

Operating procedure

■Setting using an engineering tool

1. Set the value for "Elapsed operation time threshold setting" in the "Parameter Processing of Slave Station" window from the network configuration setting.

Operation elapsed time threshold setting	0	h		h	87600

■Setting using the program

1. Set a value within 0 to 4294967295 for Elapsed operation time threshold setting (remote buffer memory: 4122H, 4123H).

Relay ON count threshold (FA3-TH)

Set a value within 0 to 4294967295 in Relay ON count threshold setting (remote buffer memory: 4100H to 4101H, ..., 411EH to 411FH) to output an alarm when the relay ON count exceeds the threshold.
For details on the threshold, refer to the manual for the digital signal converter used.

■Setting using an engineering tool

1. Set the values for "X☐ Relay ON count threshold valid/invalid setting" and "X☐ Relay ON count threshold setting" in the "Parameter Processing of Slave Station" window from the network configuration setting.

Relay ON count function					
X0 relay ON count threshold valid / invalid setting	Disable				Enable
X0 relay ON count threshold setting	0	Count		Count	20000000

■Setting using the program

1. Set the relevant I/O signal in Relay ON count threshold valid/invalid setting (remote buffer memory: 4120H) to on (Valid).
- FA3-TH1T16XC, FA3-TH1M16XC ☞ Page 57 Relay ON count threshold valid/invalid setting (4120H)
- FA3-TH1T16Y, FA3-TH1T16YE, FA3-TH1M16Y, FA3-TH1M16YE ☞ Page 57 Relay ON count threshold valid/invalid setting (4120H)

2. Set a value within 0 to 4294967295 in Relay ON count threshold setting (remote buffer memory: 4100H to 4101H, ..., 411EH to 411FH).
- FA3-TH1T16XC, FA3-TH1M16XC ☞ Page 57 X☐ relay ON count threshold setting (4100H to 4101H, ..., 411EH to 411FH)
- FA3-TH1T16Y, FA3-TH1T16YE, FA3-TH1M16Y, FA3-TH1M16YE ☞ Page 60 Y☐ relay ON count threshold setting (4100H to 4101H, ..., 411EH to 411FH)

Parameter area initialization function

The target parameters in remote buffer memory areas are initialized to the default values.

The remote input (RX) signal and remote register that indicate an error/alarm status are not cleared.

Target parameter

The following table lists the parameter to be initialized.

Model	Type	Target parameter	Reference
FA3-TH1T16XC FA3-TH1M16XC	Module-based parameter data	All	☞ Page 53 FA3-TH1T16XC, FA3-TH1M16XC
FA3-TH1T16Y FA3-TH1T16YE FA3-TH1M16Y FA3-TH1M16YE			☞ Page 58 FA3-TH1T16Y, FA3-TH1T16YE, FA3-TH1M16Y, FA3-TH1M16YE
FA3-AT1T8X FA3-AT1M8X	Module-based parameter data	All	☞ Page 61 FA3-AT1T8X, FA3-AT1M8X
	Module-based control data	• CH□ Logging data setting[1] • CH□ Logging cycle setting[1] • CH□ Logging cycle unit setting[1]	
FA3-AT1T8Y FA3-AT1M8Y	Module-based parameter data	All	☞ Page 69 FA3-AT1T8Y, FA3-AT1M8Y
	Module-based control data	CH□ Logging data setting[1]	

[1] □= 1 to 8. All channels are targeted.

Setting and operation

### ■Initialization using an engineering tool

1. Execute "Parameter area initialization command". (☞ Page 112 Command execution of slave station)

■Initialization using the program

1. Set Parameter area initialization command (remote buffer memory: 4002H.b0) to on (Commanded). (☞ Page 56 Parameter area initialization command (4002H))[1]

[1] When the FA3-AT is used, turn on and off Initial data setting request flag (RY9) after setting.

2. The target parameters in remote buffer memory areas are initialized to the default values.

3. Parameter area initialization completed (remote buffer memory: 4003H.b0) will be on (Completed).

---------▶ Controlled by the network interface module.
————▶ Controlled by the program.
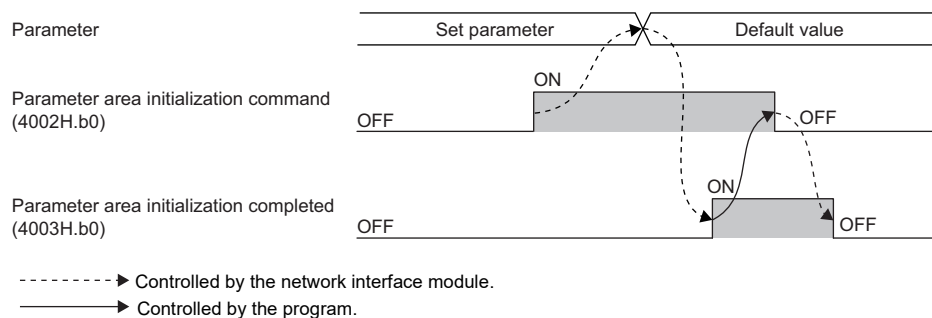
> **Point** 🖉
>
> After the execution of Parameter area initialization command, powering off and on the module enables the module to operate normally.
>
> In the CC-Link IE TSN system, the parameters used for operation of the network interface module after the module is powered off and on vary depending on whether the slave station parameter automatic setting is set or not. (☞ Page 142 Slave station parameter automatic setting)
>
> • When the slave station parameter automatic setting is set: The module operates with the parameters written to the CPU module of the master station.
> • When the slave station parameter automatic setting is not set: The module operates with the initialized parameters in remote buffer memory areas.

Command execution of slave station

Execute a command to a slave station using an engineering tool of the master station.

Operating procedure

1. Select the network interface module from the station list on the "CC-Link IE TSN Configuration" or "CC IE Field Configuration" window.

2. Open the "Command Execution of Slave Station" window.

✎ [Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Model ⇨ [Basic Settings] ⇨ [Network Configuration Settings]. Double-click "Detail Setting".
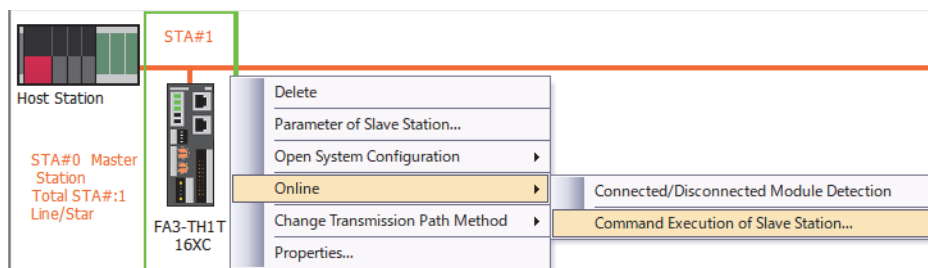
3. Select "Method selection" and set "Command setting".
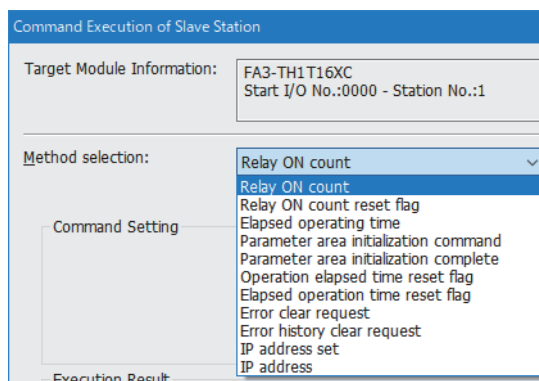
4. Click the [Execute] button to execute the command to the network interface module.

Command common to all models

The following commands can be executed to all the network interface modules.

Method selection	Description	Reference
Elapsed operation time	Check the elapsed operation time of the maintenance information recording function.	☞ Page 109 Elapsed operation time
Parameter area initialization command	Initialize the parameter area of the remote buffer memory to the default status.	☞ Page 111 Parameter area initialization function
Parameter area initialization completed	Check the initialization completed status for the parameter area of the remote buffer memory.	
Elapsed operation time reset flag	Clear the elapsed operation time of the maintenance information recording function to 0.	☞ Page 109 Elapsed operation time
Operation start date reset flag	Set the operation start date of the maintenance information recording function to the present date.	☞ Page 109 Operation start date
Read error history data	Check the error history 1 to 16. (CC-Link IE Field Network only)	☞ Page 97 Error history function
Error clear request	Clear the error.	☞ Page 301 List of Error Codes
Error history clear request	Clear the error history.	☞ Page 97 Error history function
IP address at next startup setting	Set the IP address at next startup. (CC-Link IE TSN only)	☞ Page 55 IP address at next startup setting (0000H, 0001H)
IP address at next startup	Check the IP address at next startup setting status. (CC-Link IE TSN only)	

Network interface module (digital input) dedicated command

The following commands can be executed to the FA3-TH1T16XC and FA3-TH1M16XC.

Method selection	Description	Reference
Relay ON count	Check the X0 to XF relay ON count of the maintenance information recording function.	☞ Page 109 Relay ON count (FA3-TH)
Relay ON count reset flag	Clear the X0 to XF relay ON count of the maintenance information recording function to 0.	

Network interface module (digital output) dedicated command

The following commands can be executed to the FA3-TH1T16Y, FA3-TH1M16Y, FA3-TH1T16YE, and FA3-TH1M16YE.

Method selection	Description	Reference
Relay ON count	Check the Y0 to YF relay ON count of the maintenance information recording function.	☞ Page 109 Relay ON count (FA3-TH)
Relay ON count reset flag	Clear the Y0 to YF relay ON count of the maintenance information recording function to 0.	

Network interface module (analog input) dedicated command

The following commands can be executed to the FA3-AT1T8X and FA3-AT1M8X.

Method selection	Description	Reference
CH_Maximum value/minimum value	Check the maximum and minimum values of digital operation values for each channel.	☞ Page 132 Maximum value/minimum value hold function
Parameter automatic setting status monitor	Check the parameter automatic setting status. (CC-Link IE TSN only)	☞ Page 142 Slave station parameter automatic setting

Network interface module (analog output) dedicated command

The following commands can be executed to the FA3-AT1T8Y and FA3-AT1M8Y.

Method selection	Description	Reference
Parameter automatic setting status monitor	Check the parameter automatic setting status. (CC-Link IE TSN only)	☞ Page 142 Slave station parameter automatic setting

5.3 Functions of the FA3-TH1T16XC and FA3-TH1M16XC

Input response time setting function

This function prevents an incorrect input due to noise by setting the response time required for the module to recognize an actual input as the input signal.

Setting method

■Setting using an engineering tool

1. Set the value for "Input response time setting" in the "Parameter Processing of Slave Station" window from the network configuration setting.

■Setting using the program

1. Set a value in Input response time setting (remote buffer memory: 0100H).

Precautions

Noise may be taken in as an input depending on the input response time setting.

The pulse width which is taken in as an input varies depending on the input response time.

To set the input response time, consider fully the operating environment.

The following table shows the minimum values of the pulse widths which may be taken in as an input. The pulse widths lower than the values shown below can be filtered as noise.

Input response time setting	0ms	0.2ms	1.0ms	1.5ms	5ms	10ms	20ms	70ms
The minimum value of the pulse width which may be taken in as an input (the maximum pulse widths which can be filtered as noise)	—	0.003ms	0.05ms	0.3ms	2ms	4ms	9ms	36ms

5.4 Functions of the FA3-TH1T16Y, FA3-TH1T16YE, FA3-TH1M16Y, and FA3-TH1M16YE

Output HOLD/CLEAR setting function

When the network interface module is disconnected from data link, when the CPU module operating status is STOP or RESET, or when the CPU module operation is suspended by an error, whether to hold or clear the last output value can be set by this function.

Output HOLD/CLEAR setting and its operation

When HOLD or CLEAR is set for an output, the output is turned on or off as follows.

Operating status		Output HOLD/CLEAR setting HOLD		Output HOLD/CLEAR setting CLEAR	
		Last output status OFF	Last output status ON	Last output status OFF	Last output status ON
Data link in operation	CPU module in RUN	Off	On	Off	On
	CPU module in STOP	Off	On	Off	Off
	CPU module in PAUSE	Off	On	Off	On
	CPU module in RESET	Off	On	Off	Off
	CPU module suspended by error	Off	On	Off	Off
During disconnection/cyclic transmission stop		Off	On	Off	Off
When a minor error occurs		Off	On	Off	On
When a major/moderate error occurs		Off	Off	Off	Off

Setting method

■Setting using an engineering tool

1. Set the value for "Output HOLD/CLEAR setting" in the "Parameter Processing of Slave Station" window from the network configuration setting.

Output HOLD / CLEAR setting					
Output HOLD / CLEAR setting	CLEAR				
Relay ON count function					
Y0 relay ON count threshold valid / invalid setting	Disable			CLEAR	
Y0 relay ON count threshold setting	0	Count		Count HOLD	

■Setting using the program

1. Set a value in Output HOLD/CLEAR setting (remote buffer memory: 0101H).

☞ Page 60 Output HOLD/CLEAR setting (0101H)

> **Point**
>
> If "Y" is used for the remote output (RY) signal refresh device of the auto refresh parameter, the output value may not be held regardless of HOLD setting.
> Use "M" or "B" for the remote output (RY) signal refresh device when HOLD is set.
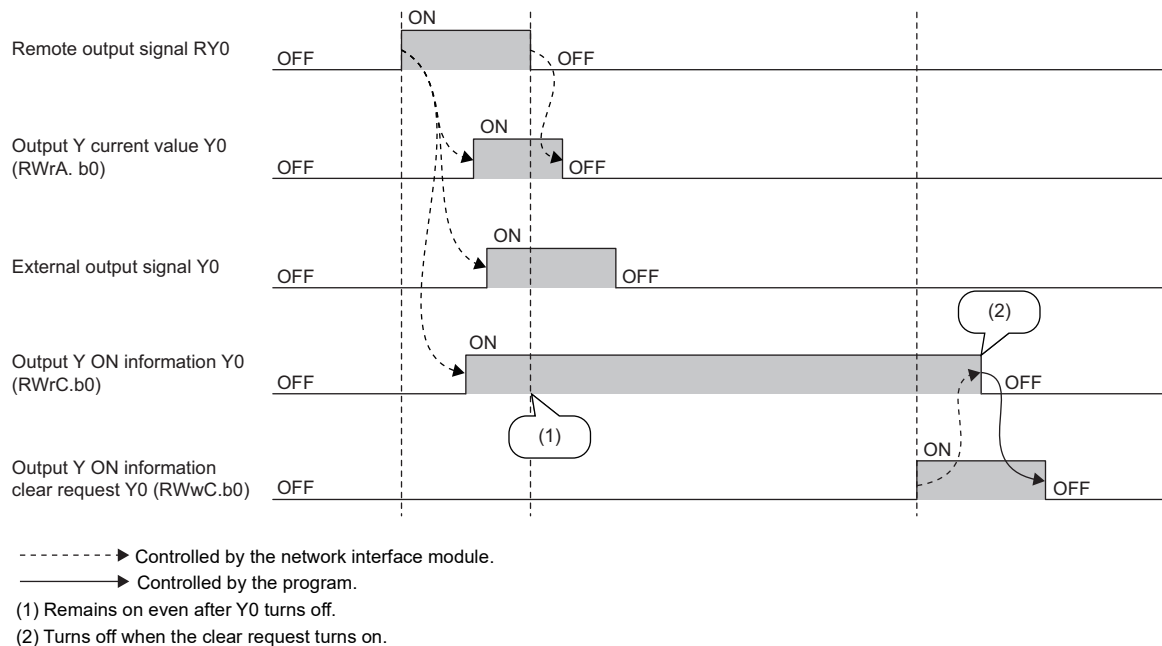
Output on/off information hold function

Whether the output has been turned on or off can be checked.

Output ON information

Output ON information is stored in Output Y ON information Y0 to YF (RWrC).

Output Y ON information Y0 to YF (RWrC) can be cleared using Output Y ON information clear request Y0 to YF (RWwC).

The amount of time delay from when Output Y ON information Y0 to YF (RWrC) changes until the external output accordingly changes is no more than the maximum output response time.

- - - - - - - ► Controlled by the network interface module.

―――――► Controlled by the program.

(1) Remains on even after Y0 turns off.

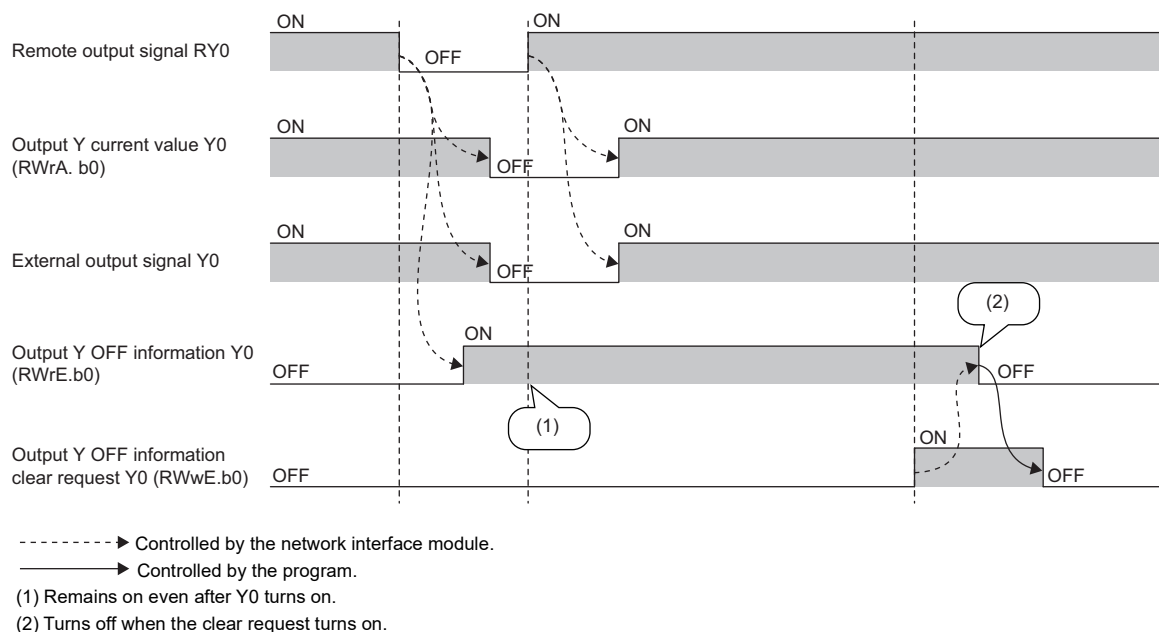(2) Turns off when the clear request turns on.

Point

While Output Y ON information clear request Y0 to YF (RWwC) is turned on, regardless of the remote output (RY) signal status, Output Y ON information Y0 to YF (RWrC) continues to be cleared.

Output OFF information

Output OFF information is stored in Output Y OFF information Y0 to YF (RWrE).

Output Y OFF information Y Y0 to YF (RWrE) can be cleared using Output Y OFF information clear request Y0 to YF (RWwE).

The amount of time delay from when Output Y OFF information Y0 to YF (RWrE) changes until the external output accordingly changes is no more than the maximum output response time.

- - - - - - - ▶ Controlled by the network interface module.
——————▶ Controlled by the program.
(1) Remains on even after Y0 turns on.
(2) Turns off when the clear request turns on.

> **Point**
>
> While Output Y OFF information clear request Y0 to YF (RWwE) is on, regardless of the remote output (RY) signal status, Output Y OFF information Y0 to YF (RWrE) continues to be cleared.

5.5 Functions of the FA3-AT1T8X and FA3-AT1M8X

Each Function in the Sequence

Functions are processed in the following order.

If multiple functions are enabled, the output of the first-processed function is used as the input of the next function.
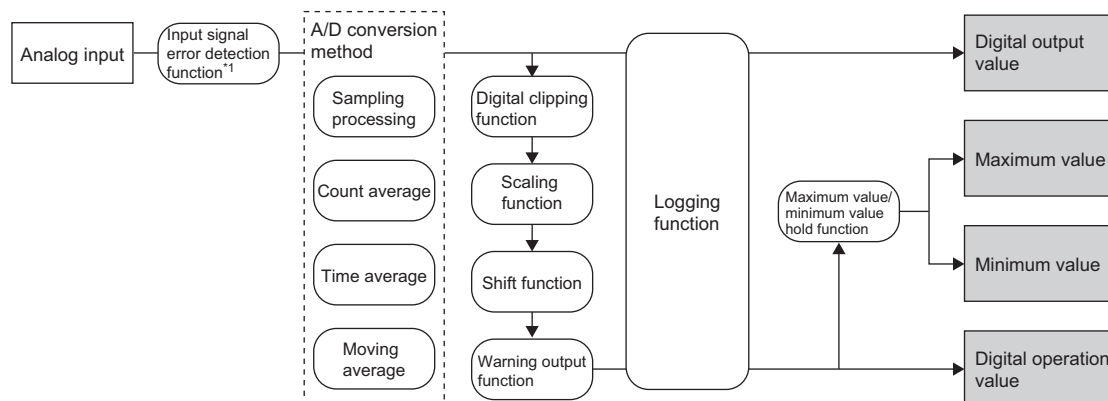
*1 When an error is detected using the input signal error detection function, no processing after the input signal error detection function is executed.

■Digital output value

A digital output value is a value after sampling processing or averaging processing have been performed.

The logging function collects data as digital output values. (☞ Page 106 Logging function (FA3-AT))

■Digital operation value

A digital operation value is a value calculated by using the digital clip function, scaling function, or shift function.

The value is stored in CH□ Digital operation value (RWr2 to RWr9).

When functions are not used, the same value as the digital output value is stored.

The logging function collects data as scaling values (digital operation values). (☞ Page 106 Logging function (FA3-AT))

■Maximum value and minimum value

The maximum value and minimum value of the digital operation values.

The values are stored in CH□ Maximum value/Minimum value (remote buffer memory: 0600H to 060FH).

> **Point**
>
> Parameters of the FA3-AT are enabled by turning on Initial data setting request flag (RY9) after writing the parameters to the remote buffer memory.

A/D conversion enable/disable function

This function allows A/D conversion to be enabled or disabled for each channel.

Disabling the A/D conversion for unused channels reduces the conversion cycles.

Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ A/D conversion enable/disable setting" to "Enable".

A/D conversion enable/disable setting					
CH1 A/D conversion enable/disable setting	Enable				Enable

■Setting using the program

1. Set the relevant channel in CH□ A/D conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).
☞ Page 66 CH□ A/D conversion enable/disable setting (0102H)

A/D conversion method

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

Sampling processing

Analog input values are sequentially converted and the converted values are stored in the remote register (CH□ Digital operation value (RWr2 to RWr9)).

■Sampling cycle

Time taken to store the digital output value where Sampling processing is performed in the remote resister is called sampling cycle.

This sampling cycle varies depending on the number of A/D conversion enabled channels.

• Sampling cycle [ms] = Number of A/D conversion enabled channels × Conversion speed (1ms)

Ex.

Sampling cycle time when A/D conversion is enabled for 3 channels

$3 \times 1 = 3$ms

Point

By disabling A/D conversion for the channels that are not used, the sampling cycle can be shortened.

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ A/D conversion enable/disable setting" to "Enable".

A/D conversion enable/disable setting					
CH1 A/D conversion enable/disable setting	Enable				Enable

2. In the same window, set "CH□ Averaging process setting" to "Sampling processing".

Averaging process setting				
CH1 Averaging process setting	Sampling process			Sampling process

■Setting using the program

1. Set the relevant channel in CH□ A/D conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).
☞ Page 66 CH□ A/D conversion enable/disable setting (0102H)

2. Set the relevant channel in CH□ Averaging processing setting (remote buffer memory: 0105H, 0106H) to 0H (Sampling processing).
☞ Page 66 CH□ Averaging processing setting (0105H, 0106H)

Averaging processing

Digital output values are averaged for each channel and stored in the remote register (CH□ Digital operation value (RWr2 to RWr9)).

There are three types of averaging processing as follows:

- Time average
- Count average
- Moving average

■Time average

A/D conversion is executed for a specified time, and the total value excluding the maximum and minimum values is averaged and stored in the remote register (CH□ Digital operation value (RWr2 to RWr9)).

- The setting time can be set within 2 to 10000ms. (Default: 0)
- The processing times within the setting time vary depending on the number of conversion enabled channels.

Processing times = Setting time ÷ Number of A/D conversion enabled channels × Conversion speed for 1 channel (1ms)

Point

The decimal part of the number of processing times is rounded down.

When the processing is performed less than twice, the same processing as Sampling processing is performed.

When the processing is performed twice, the two values are averaged regardless of the maximum and minimum values.

Ex.

The number of processing times assuming the following settings is as follows.

- Number of conversion enabled channels: 2 channels
- Setting time: 1000ms

$1000 \div 2 \times 1 = 500$ times

■Count average

A/D conversion is executed for a specified number of times, and the total value excluding the maximum and minimum values is averaged and stored in the remote register (CH□ Digital operation value (RWr2 to RWr9)).

- The set number of times can be set within 4 to 65000. (Default: 0)
- Time taken to store the average value by Count average in the remote register varies depending on the number of A/D conversion enabled channels.

Processing time = Set number of times × Number of A/D conversion enabled channels × Conversion speed for 1 channel (1ms)

Ex.

The processing time assuming the following settings is as follows.

- Number of conversion enabled channels: 2 channels
- Set number of times: 1000

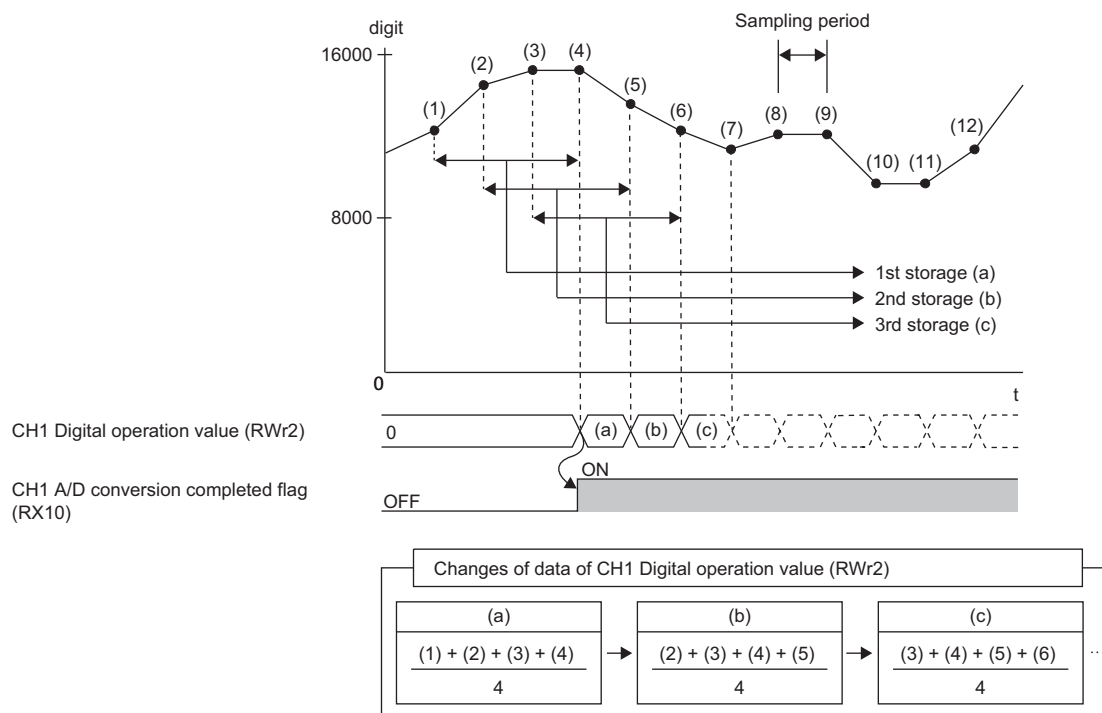$1000 \times 2 \times 1 = 2000$ms

■Moving average

The acquired digital output values for the specified number of times are averaged for each sampling cycle and stored in the remote register (CH□ Digital operation value (RWr2 to RWr9)).

Because Averaging processing is executed on a moving set of Sampling processing, the latest digital operation values can be obtained.

The set number of times can be set within 2 to 128. (Default: 0)

Ex.

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

Changes of data of CH1 Digital operation value (RWr2)

(a)	(b)	(c)
$\dfrac{(1)+(2)+(3)+(4)}{4}$	$\dfrac{(2)+(3)+(4)+(5)}{4}$	$\dfrac{(3)+(4)+(5)+(6)}{4}$ ...

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ A/D conversion enable/disable setting" to "Enable".

A/D conversion enable/disable setting						
CH1 A/D conversion enable/disable setting	Enable					Enable

2. In the same window, specify the type of averaging processing for "CH□ Averaging process setting" and set the value of averaging processing in "CH□ Time average/Count average/Moving average".

Averaging process setting						
CH1 Averaging process setting	Sampling process					Time average
CH1 Time average/Count average/Moving average	0					1000

■Setting using the program

1. Set the relevant channel in CH□ A/D conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

☞ Page 66 CH□ A/D conversion enable/disable setting (0102H)

2. Set the Averaging processing method for the relevant channel in CH□ Averaging processing setting (remote buffer memory: 0105H, 0106H).

☞ Page 66 CH□ Averaging processing setting (0105H, 0106H)

3. Set the value of Averaging processing for the relevant channel in CH□ Time average/Count average/Moving average (remote buffer memory: 0107H to 010EH).

☞ Page 66 CH□ Time average/Count average/Moving average (0107H to 010EH)

Input signal error detection function

An input signal error is detected when the analog input value enters the error detection range.
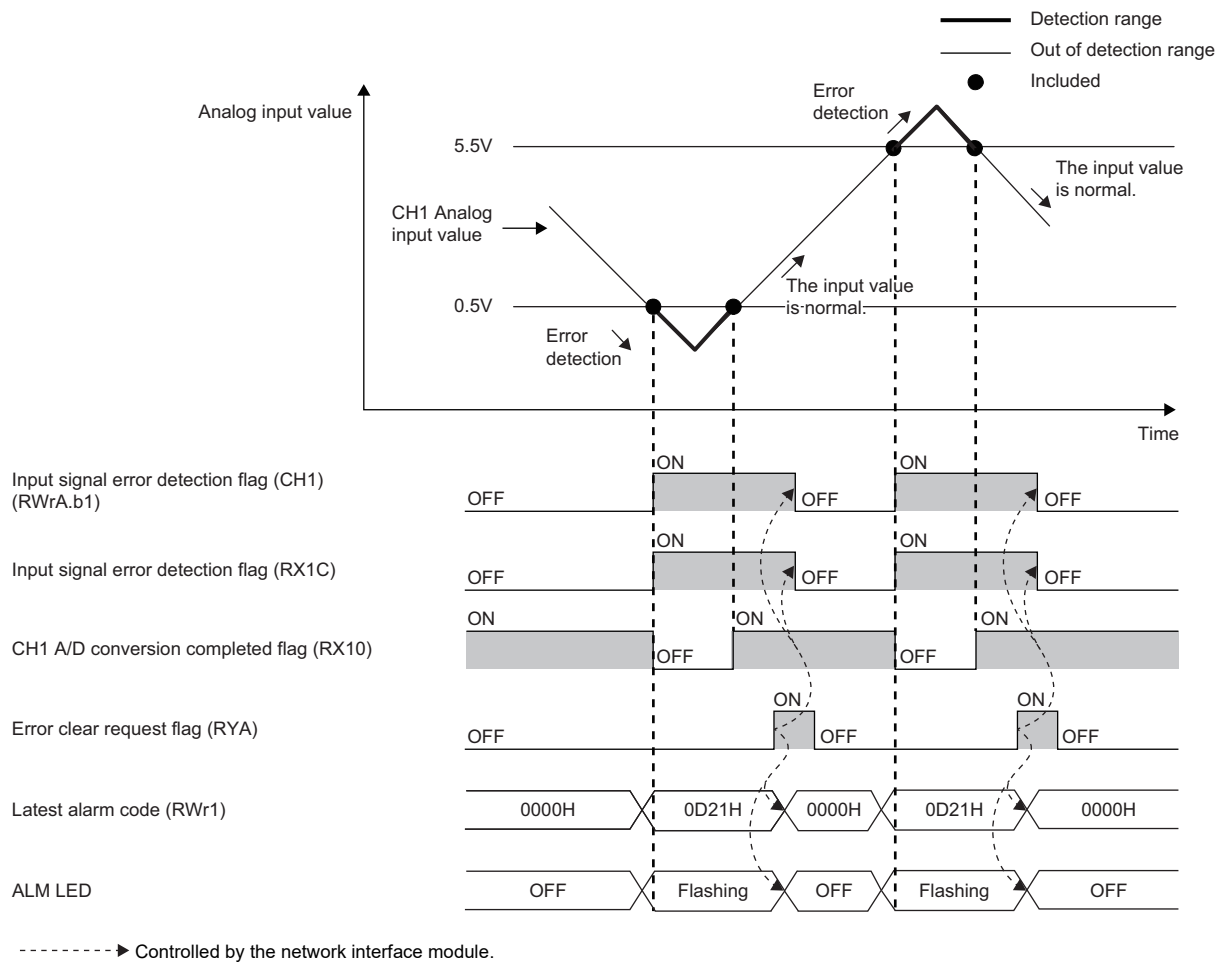
Error detection range

- Analog input value ≤ 0.5V
- Analog input value ≥ 5.5V

■Detection cycle

This function is executed per sampling cycle. (☞ Page 119 Sampling cycle)

Notification

When an input signal error is detected, the module results in the following state.

- Input signal error detection flag (RWrA): Bit of the corresponding channel turns on.
- Input signal error detection signal (RX1C): On (This signal turns on when an error is detected in any of the channels where the input signal error detection function is used.)
- ALM LED: Flashing
- Latest alarm code (RWr1): Alarm code (0D2□H) is stored.

Precautions

When detection of an input signal error and a remote buffer memory access error (minor error) occur at the same time, the ALM LED may be turned off. Even while the input signal error continues, the ALM LED starts flashing again when the remote buffer memory access error is cleared by taking corrective actions corresponding to the error code (1020H).

Operation

The digital output value of the channel in which an input signal error is detected is held at the value just before the detection, and CH□ A/D conversion completion flag (RX10 to RX17) of the corresponding channel turns off.

■When the value returns to within the normal range

After the error detection, once the analog input value returns to a value within the normal range, A/D conversion resumes regardless of the reset of CH□ Input signal error detection flag (RWrA) and CH□ Input signal error detection signal (RX1C). After the next update, CH□ A/D conversion completion flag (RX10 to RX17) of the corresponding channel turns on again. (The ALM LED remains flashing.)

> **Point**
> - The digital output value is not updated while the input signal error is being detected.
> - The input signal error is detected in the channels to which CH□ A/D conversion enable/disable setting (remote buffer memory: 0102H) is set to off (Enable).
> - When a signal conversion module from RTD to voltage or a signal conversion module from thermocouple temperature to voltage is used and a disconnection is detected, an analog value rises above 5.5V and an input signal error occurs.

Clear

The input signal error is cleared by any of the following method after all channels return to within the normal range.
- Turning on and off Error clear request flag (RYA)
- Turning on and off Initial data setting request flag (RY9)

When the input signal error is cleared, the network interface module results in the following state:
- Input signal error detection flag (RWrA): Cleared
- Input signal error detection signal (RX1C): Off
- ALM LED: Off
- Latest alarm code (RWr1): Cleared

## Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ A/D conversion enable/disable setting" to "Enable".

A/D conversion enable/disable setting						
CH1 A/D conversion enable/disable setting	Enable					Enable

***2.*** In the same window, set "CH□ Input signal error detection setting" to "Input signal error detection".

Input signal error detection function						
CH1 Input signal error detection setting	Disable					Input signal error detection

■Setting using the program

1. Set the relevant channel in CH□ A/D conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

☞ Page 66 CH□ A/D conversion enable/disable setting (0102H)

2. Set the relevant channel in Input signal error detection setting (remote buffer memory: 010FH to 0110H) to 4H (Input signal error detection).

☞ Page 66 Input signal error detection setting (010FH to 0110H)

Warning output function (process alarm)

A warning is output if the digital operation value enters the predefined warning output range.

(1) CH1 Digital operation value
(2) CH2 Digital operation value
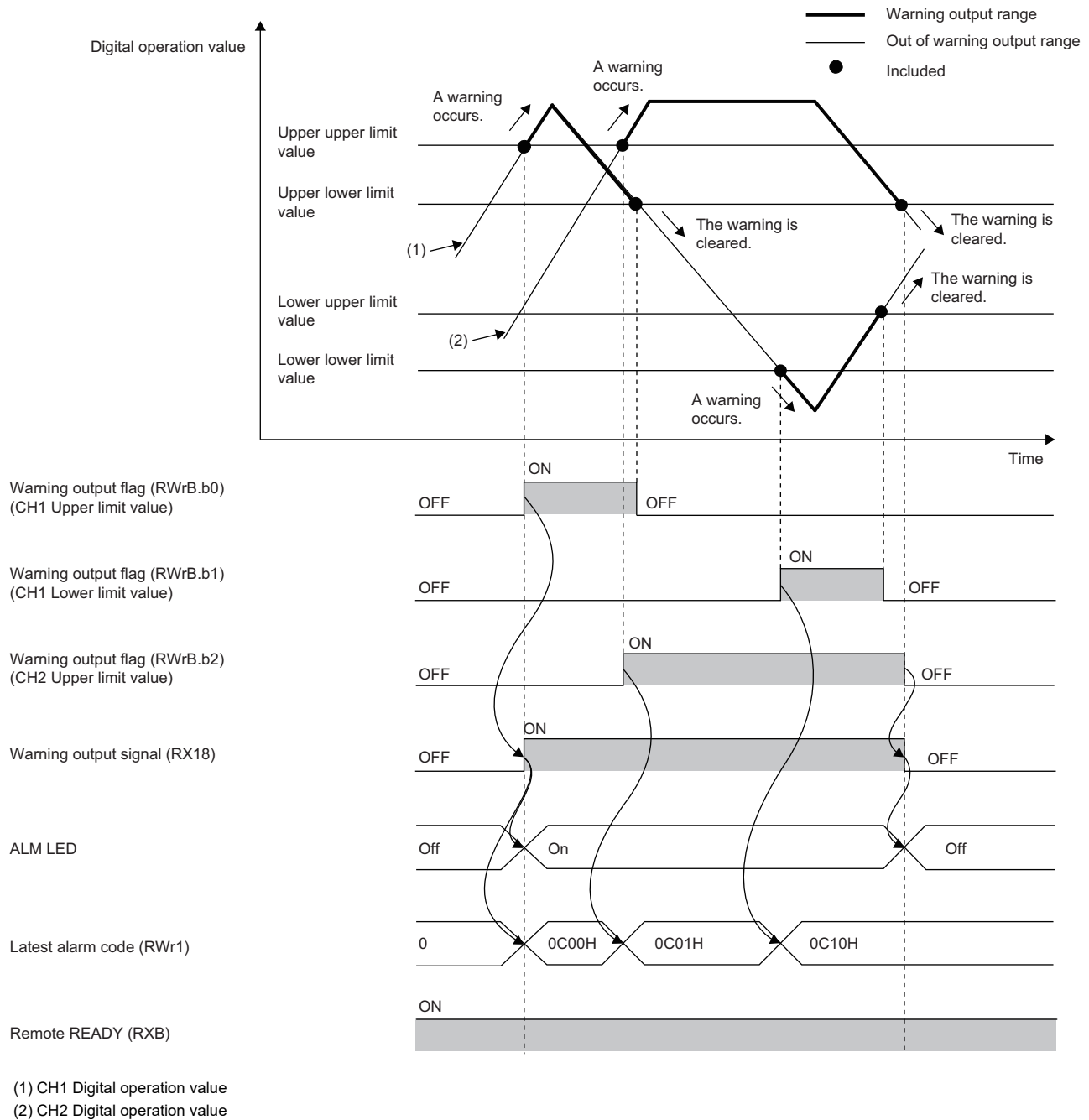
Warning output range

- Digital operation value ≥ process alarm upper upper limit value
- Digital operation value ≤ process alarm lower lower limit value

■Detection cycle

Detection is executed for the set time when time average is specified, or for the set count when count average is specified.

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

■Output target

The warning output target is CH□ Digital operation value (RWr2 to RWr9). (☞ Page 118 Each Function in the Sequence)

Notification

When the digital operation value enters the warning output range, the module results in the following state.
- Warning output flag (RWrB): Bit of the corresponding channel turns on.
- Warning output signal (RX18): On (This signal turns on when a warning is detected in any of the channels where the warning output function is used.)
- ALM LED: On
- Latest alarm code (RWr1): Alarm code (0C0□H or 0C1□H) is stored.

Operation

The digital operation value returns to within the normal range in the following conditions.
- Digital operation value < process alarm upper lower limit value
- Digital operation value > process alarm lower upper limit value

■When the value returns to within the normal range

After the warning output, when the digital operation value returns to a value within the normal range, the module results in the following state.
- Warning output flag (RWrB): Bit of the corresponding channel turns off (normal).

When all channels return to within the normal range, the module results in the following state.
- Warning output signal (RX18): Off
- ALM LED: Off

The alarm code stored in Latest alarm code (RWr1) is not cleared.

Clear

The alarm code is cleared by any of the following method after all channels return to within the normal range.
- Turning on and off Error clear request flag (RYA)
- Turning on and off Initial data setting request flag (RY9)

Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ A/D conversion enable/disable setting" to "Enable".

A/D conversion enable/disable setting					
CH1 A/D conversion enable/disable setting	Enable				Enable

2. In the same window, set "CH□ Warning output setting" to "Enable", and specify the values for "CH□ Process alarm upper upper limit value", "CH□ Process alarm upper lower limit value", "CH□ Process alarm lower upper limit value", and "CH□ Process alarm lower lower limit value".

Warning output function					
CH1 Warning output setting	Disable				Enable
CH1 Process alarm upper upper limit value	0				16000
CH1 Process alarm upper lower limit value	0				10000
CH1 Process alarm lower upper limit value	0				3000
CH1 Process alarm lower lower limit value	0				0

■Setting using the program

1. Set the relevant channel in CH□ A/D conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

⊏⧛ Page 66 CH□ A/D conversion enable/disable setting (0102H)

2. Set the relevant channel in Warning output setting (remote buffer memory: 0111H) to off (Enable).

⊏⧛ Page 67 Warning output setting (0111H)

3. Set a value in CH□ Process alarm upper/lower limit value (remote buffer memory: 0112H to 0131H).

⊏⧛ Page 67 CH□ Process alarm upper limit value/lower limit value (0112H to 0131H)

> *Point*
>
> Be sure to consider the scale conversion and shift-and-add operations when setting the process alarm upper/lower limit value (remote buffer memory 0112H to 0131H).

Digital clipping function

The digital operation value is fixed to the maximum digital output value or the minimum digital output value if the input voltage exceeds the input range.

When the digital clipping function is used, perform the scaling and shift processing for the value after Digital clipping processing.

How to interpret the digital clip function

The following shows the output range of a digital operation value when the digital clipping function is enabled.

- Disable: -384 to 16383
- Enable: 0 to 16000

Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ A/D conversion enable/disable setting" to "Enable".

A/D conversion enable/disable setting					
CH1 A/D conversion enable/disable setting	Enable				Enable

2. Set "CH□ Digital clipping enable/disable setting" to "Enable".

Digital clip function					
CH1 digital clip enable / disable setting	Disable				Enable

■Setting using the program

1. Set the relevant channel in CH□ A/D conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

⊏⧛ Page 66 CH□ A/D conversion enable/disable setting (0102H)

2. Set Digital clipping enable/disable setting (remote buffer memory: 0132H) to on (Enable).

⊏⧛ Page 67 Digital clipping enable/disable setting (0132H)

Scaling function

A digital value is scale-converted to the range of the scaling upper limit value and the scaling lower limit value. The function reduces the time and effort to create a program of the scale conversion.

A scale-converted output value is stored in CH□ Digital operation value (RWr2 to RWr9).

How to interpret the scaling setting

Set a value corresponding to the upper limit value (16000) of the digital output value for the scaling upper limit value.

Set a value corresponding to the lower limit value (0) of the digital output value for the scaling lower limit value.

> **Point**
>
> Even if the scaling upper limit value and the scaling lower limit value are set, so that the range becomes larger, the resolution will not increase.

Calculation of the digital operation value

The value is calculated using the following formulas. (Values after the decimal point are rounded off during scale conversion.)

$$D_Y = \frac{D_X \times (S_H - S_L)}{16000} + S_L$$

Item	Description
D_Y	Digital operation value
D_X	Digital output value
S_H	Scaling upper limit value
S_L	Scaling lower limit value

## Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ A/D conversion enable/disable setting" to "Enable".

⊟ A/D conversion enable/disable setting				
⋯ CH1 A/D conversion enable/disable setting	Enable			Enable

2. In the same window, set "CH□ Scaling enable/disable setting" to "Enable", and set values in "CH□ Scaling upper limit value" and "CH□ Scaling lower limit value".

⊟ Scaling function				
⋯ CH1 Scaling enable/disable setting	Disable			Enable
⋯ CH1 Scaling upper limit value	0			16000
⋯ CH1 Scaling lower limit value	0			4000

■Setting using the program

1. Set the relevant channel in CH□ A/D conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

☞ Page 66 CH□ A/D conversion enable/disable setting (0102H)

2. Set the relevant channel in Digital clipping enable/disable setting (remote buffer memory: 0133H) to off (Enable).

☞ Page 67 Scaling enable/disable setting (0133H)

3. Set a value in CH□ Scaling upper/lower limit value (remote buffer memory: 0134H to 0143H).

☞ Page 68 CH□ Scaling upper limit value/lower limit value (0134H to 0143H)

Example of the scaling setting

Ex.

When the following settings are made for channel 1 with the input range 1 to 5V
- Scaling enable/disable setting (remote buffer memory: 0133H.b0): Off (Enable)
- CH1 Scaling lower limit value (remote buffer memory: 0134H): 4000
- CH1 Scaling upper limit value (remote buffer memory: 0135H): 12000

After setting, turn on and off Initial data setting request flag (RY9).
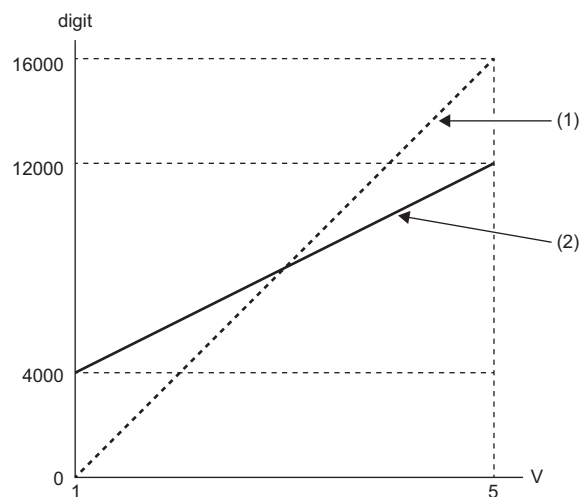
digit: Digital output value
V: Analog input voltage (V)
(1) Digital output value
(2) CH1 Digital operation value (RWr2)

Analog input voltage (V)	Digital output value	CH1 Digital operation value (RWr2)
1	0	4000
2	4000	6000
3	8000	8000
4	12000	10000
5	16000	12000

Shift function

Adds the conversion value shift amount specified to a digital output value and stores it into the remote register.

Changes to the conversion value shift amount are applied to the digital operation value in real time, allowing fine adjustment to be easily performed when the system starts.

Operation

The conversion value shift amount is added to the digital output value and stored in CH□ Digital operation value (RWr2 to RWr9).

When sampling processing is executed, the conversion value shift amount is added in each sampling cycle. When averaging processing is executed, the conversion value shift amount is added in each conversion cycle.

■When other functions are used together

When the digital clipping function or scaling function is used with the shift function, the conversion value shift amount is added to the value obtained after the digital-clipping or scale-conversion. (☞ Page 118 Each Function in the Sequence)

Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ A/D conversion enable/disable setting" to "Enable".

A/D conversion enable/disable setting					
CH1 A/D conversion enable/disable setting	Enable				Enable

2. Set a value to add in CH□ Shifting amount to conversion value (RWw2 to RWw9) using the program.

■Setting using the program

1. Set the relevant channel in CH□ A/D conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

☞ Page 66 CH□ A/D conversion enable/disable setting (0102H)

2. Set a value to add in CH□ Shifting amount to conversion value (RWw2 to RWw9).

☞ Page 47 CH□ Shifting amount to conversion value (RWw2 to RWw9)

Setting example

Ex.

For channel 1 with the input range 1 to 5V, when a conversion value shift amount of 10 is added to a network interface module with the following I/O characteristics
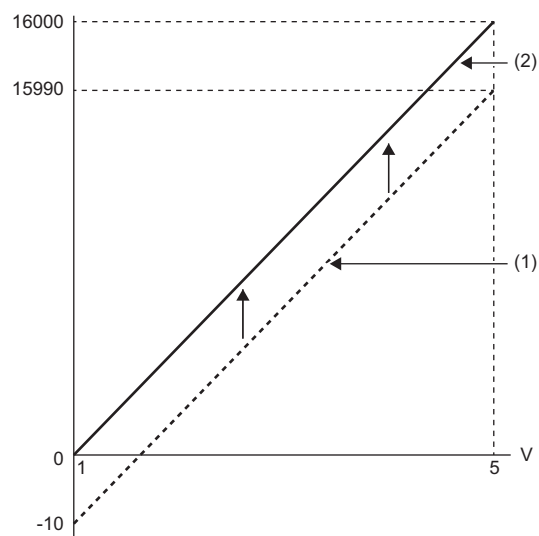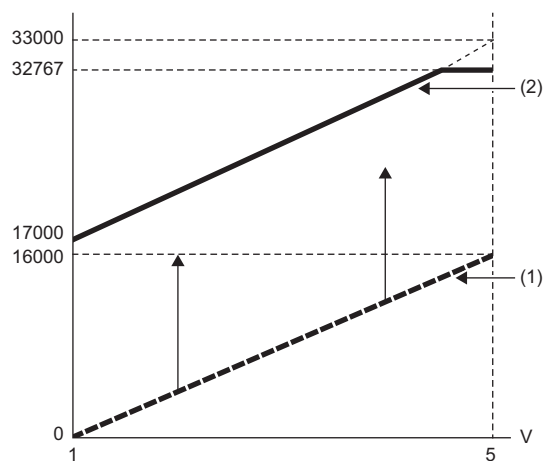
V: Analog input voltage (V)
(1) CH1 Digital output value
(2) CH1 Digital operation value

Analog input voltage (V)	Digital output value	CH1 Digital operation value (RWr2)
1	-10	0
5	15990	16000

Ex.

When the conversion value shift amount of 17000 is added to channel 1 with the input range of 1 to 5V

V: Analog input voltage (V)
(1) CH1 Digital output value
(2) CH1 Digital operation value (RWr2)

Analog input voltage (V)	Digital output value	CH1 Digital operation value (RWr2)
1	0	17000
5	16000	32767[*1]

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

Example of combined use of scaling function and shift function

Ex.

When the following settings are made for channel 1 with the input range 1 to 5V
- Scaling enable/disable setting (remote buffer memory: 0133H.b0): Off (Enable)
- CH1 Scaling lower limit value (remote buffer memory: 0134H): 2000
- CH1 Scaling upper limit value (remote buffer memory: 0135H): 10000
- CH1 Shifting amount to conversion value (RWw2): 2000

Turn on and off Initial data setting request flag (RY9).
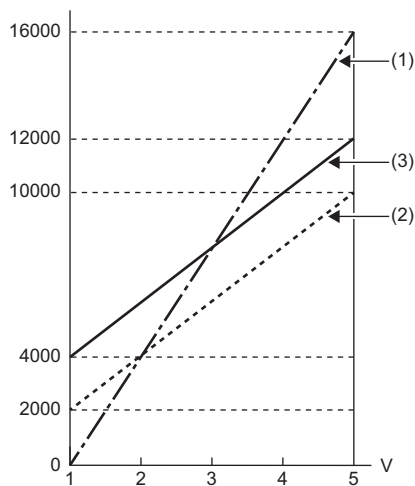
V: Analog input voltage (V)
(1) CH1 Digital output value
(2) Value after scaling processing
(3) CH1 Digital operation value (RWr2)

Analog input voltage (V)	Digital output value	Value after scaling	CH1 Digital operation value (RWr2)
1	0	2000	4000
2	4000	4000	6000
3	8000	6000	8000
4	12000	8000	10000
5	16000	10000	12000

Maximum value/minimum value hold function

For each channel, the maximum and minimum values of digital operation values are stored into the remote buffer memory. If averaging processing is specified, the values are updated per averaging process cycle. Otherwise they are updated per sampling cycle.

Target of maximum value/minimum value

When the digital clipping function, scaling function, or shift function is used, the digital operation value after digital-clipping, scale-conversion, or shift-and-add is stored in CH☐ Maximum value/Minimum value (remote buffer memory: 0600H to 060FH).
For the order of the operations, refer to the following.
☞ Page 118 Each Function in the Sequence

■Checking using an engineering tool
Execute "CH_Maximum value/minimum value". (☞ Page 112 Command execution of slave station)

Resetting maximum and minimum values

Turning on and off Maximum value/minimum value reset request (RY1D) updates the maximum and minimum values to the present values.
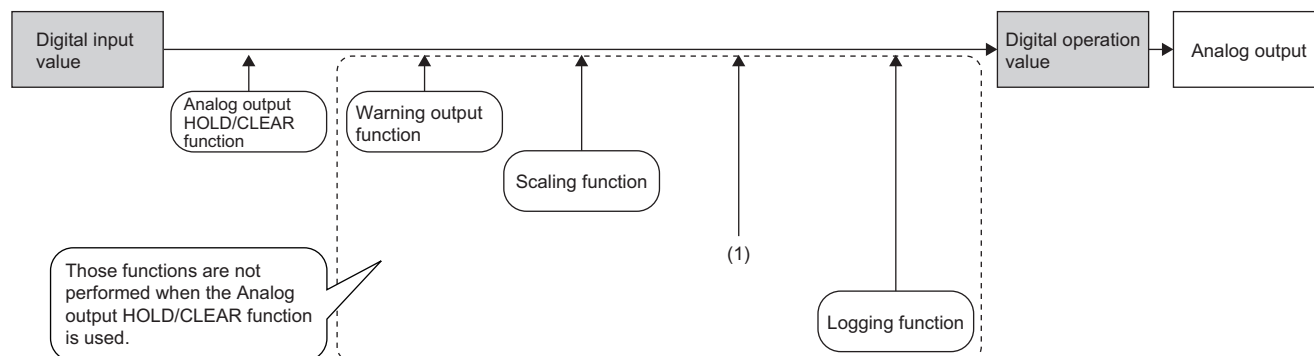The maximum and minimum values are cleared to 0 by turning on and off Initial data setting request flag (RY9).

5.6 Functions of the FA3-AT1T8Y and FA3-AT1M8Y

Each Function in the Sequence

Functions are processed in the following order.

If multiple functions are enabled, the output of the first-processed function is used as the input of the next function.

(1) When the network interface module is disconnected from data link, when the CPU module operating status is STOP or RESET, or when the CPU module operation is suspended by an error, functions after analog output HOLD/CLEAR function are not processed.
(2) The digital value is checked. (☞ Page 49 CH□ Set value check code (RWr2 to RWr9))

■Digital input value

The digital value is output from the CPU module and used for D/A conversion.

The value is stored in CH□ Digital value (RWw2 to RWw9).

The logging function collects data as digital input values. (☞ Page 106 Logging function (FA3-AT))

■Digital operation value

A digital operation value is a value obtained by calculating a digital input value using scaling function.

The logging function collects data as scaling values (digital operation values). (☞ Page 106 Logging function (FA3-AT))

> **Point**
>
> Parameters of the FA3-AT are enabled by turning on Initial data setting request flag (RY9) after writing the parameters to the remote buffer memory.

D/A conversion enable/disable function

This function allows D/A conversion to be enabled or disabled for each channel.

Disabling the D/A conversion for unused channels reduces the conversion cycles.

Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ D/A conversion enable/disable setting" to "Enable".

D/A conversion enable/disable setting					
CH1 D/A conversion enable/disable setting	Disable				Enable

■Setting using the program

1. Set the relevant channel in CH□ D/A conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

☞ Page 71 CH□ D/A conversion enable/disable setting (0102H)

D/A output enable/disable function

This function sets whether to output the D/A conversion value or the offset value for each channel.

Setting method

1. Set the relevant channel in CH□ D/A conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

☞ Page 71 CH□ D/A conversion enable/disable setting (0102H)

2. Turn on and off Initial data setting request flag (RY9).

☞ Page 37 Initial data setting request flag (RY9)

3. Set the relevant channel in CH□ Output enable/disable flag (RY10 to RY17) to off (Offset value).

☞ Page 37 CH□ Output enable/disable flag (RY10 to RY17)

Analog output HOLD/CLEAR setting function

Set whether to hold or clear the last analog output value in any of the following cases: when the network interface module is disconnected from data link, when the CPU module operating status is STOP or RESET, or when the CPU module operation is suspended by an error.

Combination of analog output status

The following table shows how the analog output status changes, depending on the combination of settings for CH☐ D/A conversion enable/disable setting (remote buffer memory: 0102H), CH☐ Output enable/disable flag (RY10 to RY17), and Analog output HOLD/CLEAR setting flag (remote buffer memory: 0105H, 0106H).

Execution status	CH☐ D/A conversion enable/ disable setting (Remote buffer memory: 0102H)	Enable				Disable
	CH☐ Output enable/disable flag (RY10 to RY17)	Enable			Disable	Enable or disable
	Analog output HOLD/CLEAR setting (remote buffer memory: 0105H, 0106H)	HOLD		CLEAR	HOLD or CLEAR	HOLD or CLEAR
Data link in operation	CPU module in RUN	Analog value D/A-converted from the digital value			1V	0V
	CPU module in STOP	The latest analog value is held.	1V	1V	1V	0V
	CPU module in PAUSE	Analog value D/A-converted from the digital value			1V	0V
	CPU module in RESET	The latest analog value is held.	1V	1V	1V	0V
	CPU module suspended by error	The latest analog value is held.	1V	1V	1V	0V
During disconnection/cyclic transmission stop		The latest analog value is held.	1V	1V	1V	0V
When a minor/moderate error occurs		Analog value D/A-converted from the digital value			1V	0V
When a major error occurs		0V		0V	0V	0V

Point

If Y is used for the remote output (RY) refresh device of the auto refresh parameter, the analog value may not be held regardless of HOLD setting.

Use M or B for the remote output (RY) refresh device when HOLD is set.

## Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH☐ D/A conversion enable/disable setting" to "Enable".

2. In the same window, set "CH☐ Analog output HOLD/CLEAR setting".

### ■Setting using the program

1. Set the relevant channel in CH☐ D/A conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

☞ Page 71 CH☐ D/A conversion enable/disable setting (0102H)

2. Set Analog output HOLD/CLEAR setting (remote buffer memory: 0105H, 0106H).

☞ Page 71 Analog output HOLD/CLEAR setting (0105H, 0106H)

Warning output function

A warning is output if the digital input value enters the predefined warning output range.
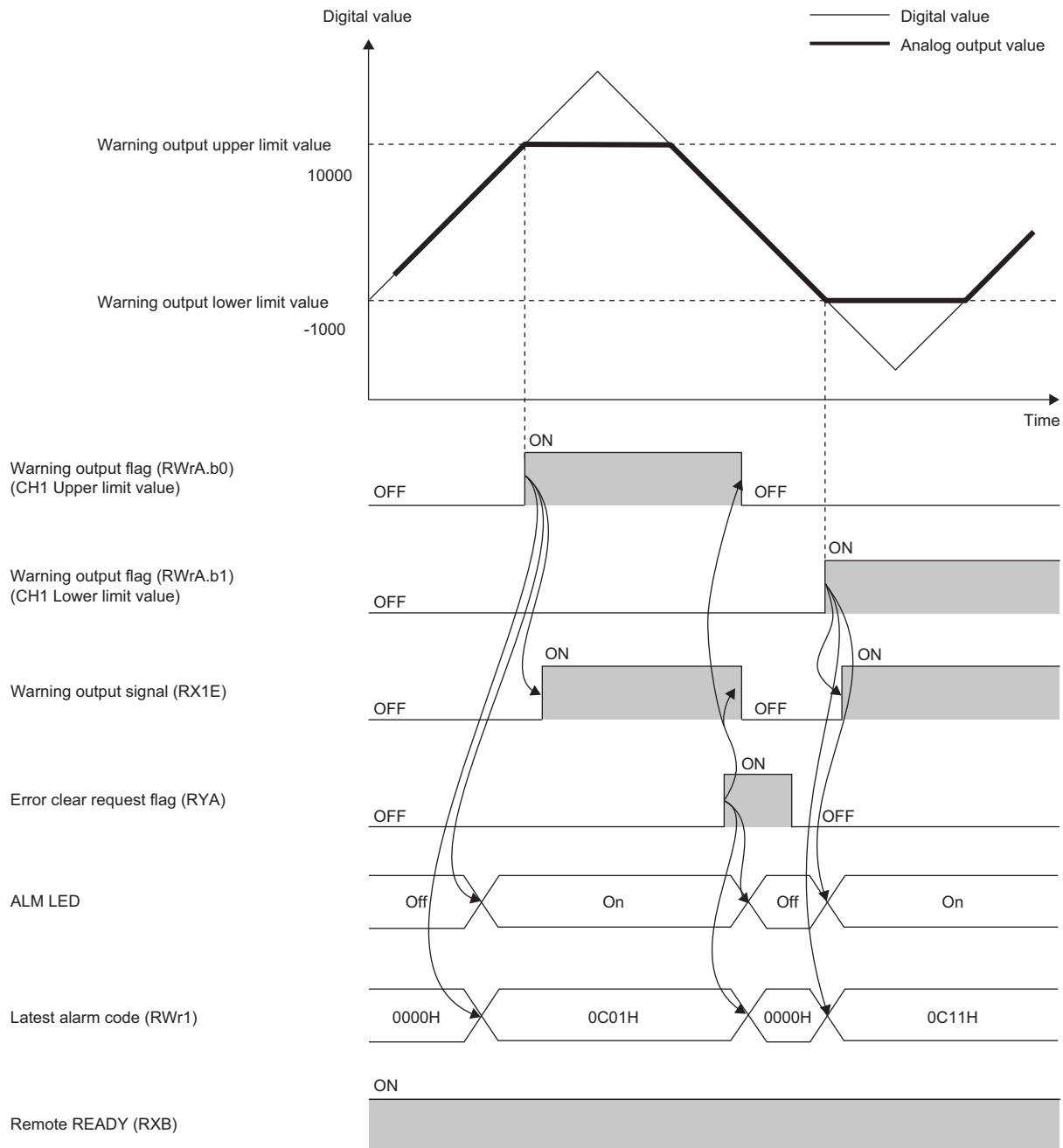
Warning output range

- Digital input value > Warning output upper limit value
- Digital input value < Warning output lower limit value

Notification

When the digital input value enters the warning output range, the module results in the following state.
- Warning output flag (RWrA): Bit of the corresponding channel turns on.
- Warning output signal (RX1E): On (This signal turns on when a warning is detected in any of the channels where the warning output function is used.)
- ALM LED: On
- Latest alarm code (RWr1): Alarm code (0C0□H or 0C1□H) is stored.

Operation

The analog output value of the channel in which a warning is output is as follows.
- When the digital input value exceeds the warning output upper limit value: An analog output value converted from the digital input value of the warning output upper limit value
- When the digital input value is below the warning output upper limit value: An analog output value converted from the digital input value of the warning output lower limit value

■When the value returns to within the normal range

After a warning is output, the analog output value returns to the normal value when the digital input value returns to a value within the normal range. However, Warning output flag (RWrA) and Warning output signal (RX1E) are not cleared. (ALM LED remains turned on.)

Clear

The warning is cleared by any of the following method after all channels return to within the normal range.
- Turning on and off Error clear request flag (RYA)
- Turning on and off Initial data setting request flag (RY9)

When the warning output is cleared, the network interface module results in the following state:
- Warning output flag (RWrA): OFF
- Warning output signal (RX1E): Off
- ALM LED: Off
- Latest alarm code (RWr1): Cleared

When the scaling function is enabled

When the bit corresponding to the relevant channel in Scaling enable/disable setting (remote buffer memory: 0118H) is set to off (Enable), the scale-converted digital input value is the target for warning detection.
Be sure to consider the scale conversion operations when setting CH□ Warning output upper/lower limit value (remote buffer memory: 0108H to 0117H).

Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ D/A conversion enable/disable setting" to "Enable".

☐ D/A conversion enable/disable setting					
┈ CH1 D/A conversion enable/disable setting	Disable				Enable

2. In the same window, set "CH□ Warning output setting" to "Enable", and set values in "CH□ Warning output upper limit value" and "CH□ Warning output lower limit value".

☐ Warning output function					
┈ CH1 Warning output setting	Disable				Enable
┈ CH1 Warning output upper limit value	0				16000
┈ CH1 Warning output lower limit value	0				4000

■Setting using the program

1. Set the relevant channel in CH□ D/A conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).
☞ Page 71 CH□ D/A conversion enable/disable setting (0102H)

2. Set the relevant channel in Warning output setting (remote buffer memory: 0107H) to off (Enable).
☞ Page 71 Warning output setting (0107H)

3. Set values in CH□ Warning output upper/lower limit value (remote buffer memory: 0108H to 0117H).
☞ Page 72 CH□ Warning output upper/lower limit value (0108H to 0117H)

Scaling function

This function performs scale conversion on a digital input value to the set range of the scaling upper limit value and the scaling lower limit value. The function reduces the time and effort to create a program of the scale conversion.

How to interpret the scaling setting

Set a value corresponding to the upper limit value (5V) of the analog output value for the scaling upper limit value.
Set a value corresponding to the lower limit value (1V) of the analog output value for the scaling lower limit value.

> **Point**
>
> Even if the scaling upper limit value and the scaling lower limit value are set, so that the range becomes larger, the resolution will not increase.

Calculation of the scaling value

The value is calculated using the following formulas. (Values after the decimal point are rounded down during scale conversion.)

$$D_Y = \frac{16000}{S_H - S_L} \times (D_X - S_L)$$

Item	Description
D_Y	Digital operation value
D_X	Digital input value
S_H	Scaling upper limit value
S_L	Scaling lower limit value

Setting method

■Setting using an engineering tool

1. In the "Parameter Processing of Slave Station" window from "Network configuration setting", set "CH□ D/A conversion enable/disable setting" to "Enable".

D/A conversion enable/disable setting					
CH1 D/A conversion enable/disable setting	Disable				Enable

2. In the same window, set "CH□ Scaling enable/disable setting" to "Enable", and set values in "CH□ Scaling upper limit value" and "CH□ Scaling lower limit value".

Scaling function					
CH1 Scaling enable/disable setting	Disable				Enable
CH1 Scaling upper limit value	0				10000
CH1 Scaling lower limit value	0				4000

■Setting using the program

1. Set the relevant channel in CH□ D/A conversion enable/disable setting (remote buffer memory: 0102H) to off (Enable).

2. Set the relevant channel in Digital clipping enable/disable setting (remote buffer memory: 0118H) to off (Enable).

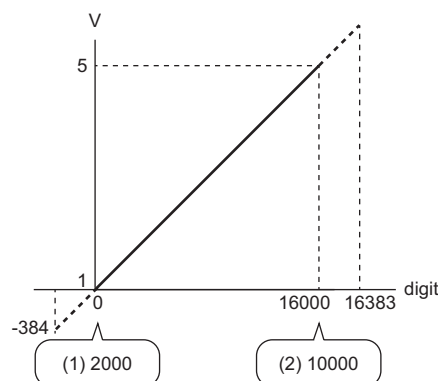*3.* Set a value in CH□ Scaling upper/lower limit value (remote buffer memory: 0119H to 0128H).

Example of use the scaling function

Ex.

When the following settings are made for channel 1 with the output range 1 to 5V
- Scaling enable/disable setting (remote buffer memory: 0118H.b0): Off (Enable)
- CH1 Scaling lower limit value (remote buffer memory: 0119H): 2000
- CH1 Scaling upper limit value (remote buffer memory: 011AH): 10000

After setting, turn on and off Initial data setting request flag (RY9).

digit: Digital input value
V: Analog output voltage (V)
(1) Scaling lower limit value
(2) Scaling upper limit value

Digital input value	Digital value after scaling	Analog output voltage (V)
2000	0	1
4000	4000	2
6000	8000	3
8000	12000	4
10000	16000	5

Point

- When the scaling function is used, the digital input value before scaling can be set to a value out of the range of the scaling upper and lower limit values (dotted line area in the I/O characteristics). However, use the scaling function within the range of the analog output practical range (solid line area in the I/O characteristics). If the value is out of the analog output practical range, the maximum resolution and accuracy may not fall within the range of performance specifications.
- Set the digital input value within the scaling range as shown in the I/O characteristics of the example. The error code (190□H) is stored in Latest error code (RWr0) if CH□ Output enable/disable flag (RY10 to RY17) is turned on with a value exceeding the scaling range. Therefore, confirm that an appropriate digital input value within the scaling range is set before turning on CH□ Output enable/disable flag (RY10 to RY17).