MELSEC ST Series

Programmable Logic Controllers

User's Manual (CC-Link)

Platinum RTD Input Module ST1RD2

●SAFETY PRECAUTIONS●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.

The precautions given in this manual are concerned with this product only. Refer to the user's manual of the network system to use for a description of the network system safety precautions.

These SAFETY PRECAUTIONS classify the safety precautions into two categories: "DANGER" and "CAUTION".

◇ DANGER	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 medium or slight personal injury or physical damage.

Depending on circumstances, procedures indicated by ⚠ CAUTION may also be linked to serious results.
In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[DESIGN PRECAUTIONS]

◇ DANGER

● Create an interlock circuit on the program so that the system will operate safely based on the communication status information. Failure to do so may cause an accident due to an erroneous output or malfunction.

When an error occurs, all outputs are turned off in the MELSEC-ST system. (At default)

However, I/O operations of the head module and respective slice modules can be selected for the following errors:

(1) Communication error (☞ MELSEC-ST CC-Link Head Module User's Manual "4.3.1 Output status setting for module error")

(2) Slice module error

The output status for the case of an error can be set to Clear, Hold, or Preset with a command parameter of each slice module. (For the setting availability, refer to each slice module manual.)

Since the parameter is defaulted to Clear, outputs will be turned off when an error occurs.

This parameter setting can be changed to Hold or Preset when the system safety is more ensured by holding or presetting the output.

[DESIGN PRECAUTIONS]

◇ DANGER

● Create an external failsafe circuit so that the MELSEC-ST system will operate safely, even when the external power supply or the system fails.

Failure to do so may cause an accident due to an erroneous output or malfunction.

(1) The status of output changes depending on the setting of various functions that control the output. Take sufficient caution when setting those functions.

(2) Outputs may be kept ON or OFF due to malfunctions of output elements or the internal circuits. For signals that may cause a serious accident, configure an external monitoring circuit.

[DESIGN PRECAUTIONS]

⚠ CAUTION

● Make sure to initialize the network system after changing parameters of the MELSEC-ST system or the network system. If unchanged data remain in the network system, this may cause malfunctions.

● Do not install the control wires or communication cables together with the main circuit or power wires. Keep a distance of 100 mm (3.94 inch) or more between them. Not doing so could result in malfunctions due to noise.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

● Use the MELSEC-ST system in the general environment specified in the MELSEC-ST system users manual. Using this MELSEC-ST system in an environment outside the range of the general specifications could result in electric shock, fire, erroneous operation, and damage to or deterioration of the product.

● Mount the head module and base module on the DIN rail securely (one rail for one module) referring to the MELSEC-ST System User's Manual and then fix them with stoppers. Incorrect mounting may result in a fall of the module, short circuits or malfunctions.

● Secure the module with several stoppers when using it in an environment of frequent vibration. Tighten the screws of the stoppers within the specified torque range. Undertightening can cause a drop, short circuit or malfunction. Overtightening can cause a drop, short circuit or malfunction due to damage to the screw or module.

● Make sure to externally shut off all phases of the power supply for the whole system before mounting or removing a module. Failure to do so may damage the module.

(1) Online replacement of the power distribution module and/or the base module is not available. When replacing either of the modules, shut off all phases of the external power supply. Failure to do so may result in damage to all devices of the MELSEC-ST system.

(2) I/O modules and intelligent function modules can be replaced online. Since online replacement procedures differ depending on the module type, be sure to make replacement as instructed. For details, refer to the chapter of online module change in this manual.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Do not directly touch the module's conductive parts or electronic components. Doing so may cause malfunctions or failure of the module.
- Make sure to securely connect each cable connector. Failure to do so may cause malfunctions due to poor contact.
- DIN rail must be conductive; make sure to ground it prior to use. Failure to do so may cause electric shocks or malfunctions. Undertightening can cause a drop, short circuit or malfunction. Overtightening can cause a drop, short circuit or malfunction due to damage to the screw or module.

[WIRING PRECAUTIONS]

◇ DANGER

- Completely turn off the external power supply when installing or placing wiring. Not completely turning off all power could result in electric shock or damage to the product.
- Place the platinum RTD signal cables at least 100mm away from the main circuit lines or AC control lines. Especially, ensure a sufficient distance from high-voltage cables or any harmonic circuit such as an inverter load circuit. Failure to do so will make the module more susceptible to noise, surge and induction.

⚠ CAUTION

- Make sure to ground the control panel where the MELSEC-ST system is installed in the manner specified for the MELSEC-ST system. Failure to do so may cause electric shocks or malfunctions.
- Use applicable solderless terminals and tighten them with the specified torque.
  A solderless spade terminal may be dropped off if the terminal screw is loosened, causing a failure.
- Check the rated voltage and the terminal layout and wire the system correctly. Connecting an inappropriate power supply or incorrect wiring could result in fire or damage.
- Tighten the terminal screws within the specified torque. If the terminal screws are loose, it could result in short circuits, fire, or erroneous operation. Overtightening may cause damages to the screws and/or the module, resulting in short circuits or malfunction.
- Prevent foreign matter such as chips or wiring debris from entering the module. Failure to do so may cause fires, damage, or erroneous operation.
- When connecting the communication and power supply cables to the module, always run them in conduits or clamp them. Not doing so can damage the module and cables by pulling a dangling cable accidentally or can cause a malfunction due to a cable connection fault.
- When disconnecting the communication and power supply cables from the module, do not hold and pull the cable part. Pulling the cables connected to the module can damage the module and cables or can cause a malfunction due to a cable connection fault.

[STARTUP AND MAINTENANCE PRECAUTIONS]

◇ **DANGER**

● Do not touch the terminals while power is on.
  Doing so could cause shock or erroneous operation.
● Make sure to shut off all phases of the external power supply for the system before cleaning the module or tightening screws.
  Not doing so can cause the module to fail or malfunction.

[STARTUP AND MAINTENANCE PRECAUTIONS]

⚠ **CAUTION**

● Do not disassemble or modify the modules.
  Doing so could cause failure, erroneous operation, injury, or fire.
● Do not drop or give a strong impact to the module since its case is made of resin. Doing so can damage the module.
● Make sure to shut off all phases of the external power supply for the system before mounting/ removing the module onto/from the control panel. Not doing so can cause the module to fail or malfunction.
● Before handling the module, touch a grounded metal object to discharge the static electricity from the human body.
  Failure to do so may cause a failure or malfunctions of the module.
● When using any radio communication device such as a cellular phone, keep a distance of at least 25cm (9.85 inch) away from the MELSEC-ST system in all directions.
  Not doing so can cause a malfunction.

[DISPOSAL PRECAUTIONS]

⚠ **CAUTION**
● When disposing of this product, treat it as industrial waste.

REVISIONS

Print Date	*Manual Number	Revision
Sep., 2008	SH(NA)-080758ENG-A	First edition

INTRODUCTION

Thank you for choosing the ST1RD2 MELSEC-ST platinum RTD input module.
Before using the module, please read this manual carefully to fully understand the functions and performance of the ST1RD2 MELSEC-ST platinum RTD input module and use it correctly.

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<u>About Manuals</u>

The following manuals are related to this product.
Referring to this list, please request the necessary manuals.

| Relevant Manuals |

Manual Name	Manual Number (Model Code)
MELSEC-ST System User's Manual Explains the system configurations of the MELSEC-ST system and the performance specifications, functions, handling, wiring and troubleshooting of the power distribution modules, base modules and I/O modules. (Sold separately)	SH-080456ENG (13JR72)
MELSEC-ST CC-Link Head Module User's Manual Explains the system configurations, specifications, functions, handling, wiring and troubleshooting of the ST1H-BT head module. (Sold separately)	SH-080754ENG (13JR68)
GX Configurator-ST Version 1 Operating Manual Explains how to operate GX Configurator-ST, how to set the intelligent function module parameters, and how to monitor the MELSEC-ST system. (Sold separately)	SH-080439ENG (13JU47)
CC-Link System Master/Local Module User's Manual Describes the system configurations, performance specifications, functions, handling, wiring and troubleshooting of the QJ61BT11N master/local Module. (Sold separately)	SH080394E (13JR64)

<u>Compliance with the EMC and Low Voltage Directives</u>

(1) For MELSEC-ST system
To configure a system meeting the requirements of the EMC and Low Voltage Directives when incorporating the Mitsubishi MELSEC system (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to Chapter 11 "EMC AND LOW VOLTAGE DIRECTIVES" of the MELSEC-ST System User's Manual.
The CE mark, indicating compliance with the EMC and Low Voltage Directives, is printed on the rating plate of the MELSEC-ST system.

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

How to Read Manual

This manual explains each area for the CC-Link remote I/O. remote registers, and message transmission using $\boxed{Br}$, $\boxed{Wr}$, $\boxed{Cr}$, $\boxed{Bw}$, $\boxed{Ww}$, and $\boxed{Cw}$.

(1) Data symbol

<Example of $\boxed{Cr}$ Command result area>

Cr.0 (7-0)
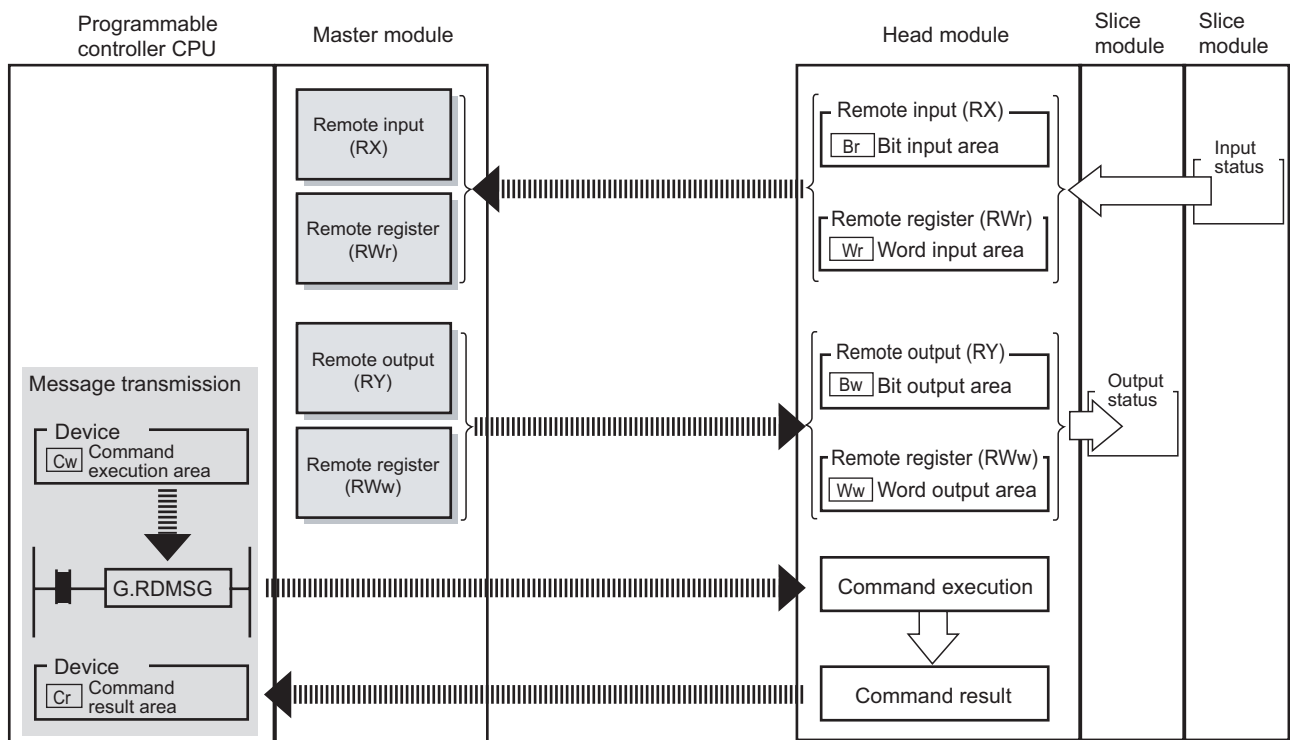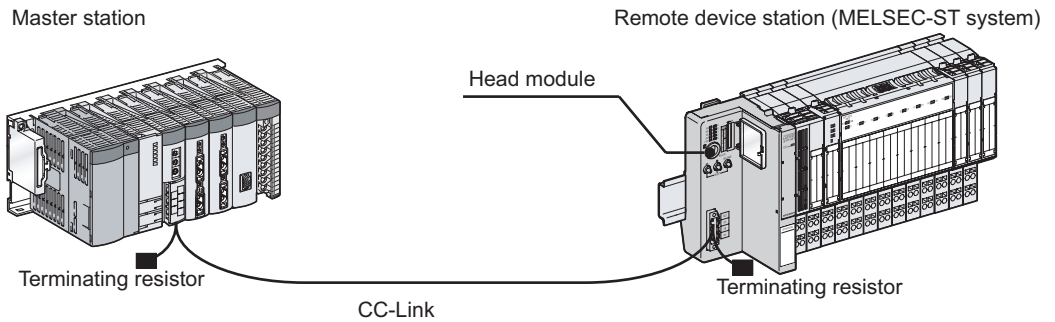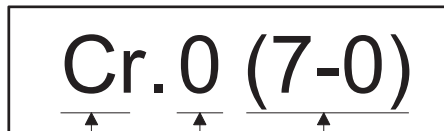
Range
When the unit of data is one word (16 bits),
the corresponding bits are indicated.
(0) : Bit 0
(7-0): Range of bit 0 to bit 7

Detail data No.

Abbreviated data symbol

(☞ (2) Head module → Master station, (3) Master station → Head module)

(2) Head module → Master station

(a) Remote input (RX)

Data symbol		Area	Unit	Detail data No. notation
Br	Br.00 to Br.n	Bit Input Area	1 bit/symbol	Hexadecimal

(b) Remote register (RWr)

Data symbol		Area	Unit	Detail data No. notation
Wr	Wr.00 to Wr.n	Word Input Area	1 word/symbol	Hexadecimal

(c) Message transmission

Data symbol		Area	Unit	Detail data No. notation
Cr	Cr.0 to Cr.n	Command Result Area	1 word/symbol	Decimal

(3) Master station → Head module

(a) Remote output (RY)

Data symbol		Area	Unit	Detail data No. notation
Bw	Bw.00 to Bw.n	Bit Output Area	1 bit/symbol	Hexadecimal

(b) Remote register (RWw)

Data symbol		Area	Unit	Detail data No. notation
Ww	Ww.00 to Ww.n	Word Output Area	1 word/symbol	Hexadecimal

(c) Message transmission

Data symbol		Area	Unit	Detail data No. notation
Cw	Cw.0 to Cw.n	Command Execution Area	1 word/symbol	Decimal

This manual uses the following generic terms and abbreviations to describe the ST1AD, unless otherwise specified.

Generic Term/ Abbreviation	Description
ST1RD2	Abbreviation for the ST1RD2 MELSEC-ST platinum RTD input module.
Head module	ST1H-BT, MELSEC-ST CC-Link head module.
Bus refreshing module	Module that distributes external system power and auxiliary power to the head module and slice modules.
Power feeding module	Module that distributes external auxiliary power to slice modules.
Power distribution module	Generic term for bus refreshing module and power feeding module.
Base module	Module that transfers data/connects between the head module and slice modules, and between slice modules and external devices.
Input module	Module that handles input data in bit units.
Output module	Module that handles output data in bit units.
Intelligent function module	Module that handles input/output data in word units.
I/O module	Input module and output module.
Slice module	Module that can be mounted to the base module: power distribution module, I/O module and intelligent function module.
MELSEC-ST system	System that consists of head module, slice modules, end plates and end brackets.
GX Configurator-ST	Configuration software dedicated to the MELSEC-ST system. The general name of SWnD5C-STPB-E type products. (n=1 or later)
CC-Link	Abbreviation for Control and Communication Link system.
Master module	Abbreviation for the QJ61BT11N when it is used as a master station.
RDMSG	Abbreviation for dedicated instruction of master station.

The following explains the meanings and definitions of the terms used in this manual.

Term	Definition
Cyclic transmission	A communication method by which remote I/O data and remote register data are transferred periodically.
Message transmission	A transmission method for writing parameters from the master station to a remote device station and reading the remote device station status.
Master station	This station controls the entire data link system. One master station is required for one system.
Remote I/O station	A remote station that can only use bit data. (Input from or output to external devices) (AJ65BTB1-16D, AJ65SBTB1-16D, etc.)
Remote device station	A remote station that can use both bit and word data. (Input from or output to external devices, or analog data conversion) (ST1H-BT, AJ65BT-64AD, AJ65BT-64DAV, AJ65BT-64DAI, etc.)
SB	Link special relay (for CC-Link). Bit data that indicate the module operating status and data link status of the master/local station.
SW	Link special register (for CC-Link) Data in units of 16 bits, which indicate the module operating status and data link status of the master/local station.
RX	Remote input (for CC-Link). Bit data that are input from remote stations to the master station.
RY	Remote output (for CC-Link) Bit data that are output from the master station to remote stations.
RWr	Remote register. (CC-Link data read area) 16-bit word data that are input from remote device stations to the master station.
RWw	Remote register. (CC-Link data write area) 16-bit word data that are output from the master station to remote device stations.
Remote net Ver.1 mode	Select this mode when extended cyclic setting is not needed or when the QJ65BT11 is replaced with the QJ65BT11N.
Remote net Ver.2 mode	Select this mode when creating a new system with extended cyclic setting.
I/O data	Data that are sent/received between the head module and the master station. Generic term for RX, RY, RWr, and RWw.
Br.n bit input area	Bit input data of each module. Input data are sent from the head module to the master station through the remote input (RX).
Bw.n bit output area	Bit output data of each module. Output data are sent from the master station and received to the head module through the remote output (RY).
Wr.n word input area	Word (16-bit) input data of an intelligent function module. Input data are sent from the head module to the master station through the remote register (RWr).
Ww.n word output area	Word (16-bit) output data of an intelligent function module. Output data are sent from the master station and received to the head module through the remote register (RWw).
Cr.n command result area	An area for the information that indicates a command result. This information is stored in Setting data ((D1)+1 and after) of the RDMSG instruction of the master station.
Cw.n command execution area	An area for the information for executing a command. This information is stored in Setting data ((S2)+1 and after) of the RDMSG instruction of the master station.

Term	Definition
Number of occupied I/O points	The area, that is equivalent to the occupied I/O points, is occupied in $\boxed{Br}$ bit input area/$\boxed{Bw}$ bit output area.
Slice No.	The number assigned to every 2 occupied I/O points of each module. The numbers are assigned in ascending order, starting from "0" of the head module. (The maximum value is 127). This is used for specifying a command execution target.
Slice position No.	The number that shows where the slice module is physically installed. The numbers are assigned in ascending order, starting from "0" of the head module. (The maximum value is 63.) This is used for specifying a command execution target.
Start slice No.	The start slice No. assigned to the head module and slice modules.
Command	Generic term for requests that are executed by the master station for reading each module's operation status, setting intelligent function module command parameters or various controls.
Command parameter	Generic term for parameters set in commands or GX Configurator-ST. All of the parameters set for the head module and slice modules are command parameters.

Packing list

The following is included.

Model name	Product name	Quantity
ST1RD2	ST1RD2 MELSEC-ST platinum RTD input module	1

Memo

CHAPTER1 OVERVIEW

This User's Manual explains the specifications, handling instructions and programming for the ST1RD2 platinum RTD input module (hereinafter referred to as the ST1RD2), and describes the ST1RD2 only.
For information on the MELSEC-ST system, refer to the MELSEC-ST System User's Manual.

The ST1RD2 converts platinum RTD values that are input from the outside into 16-bit signed binary temperature values.
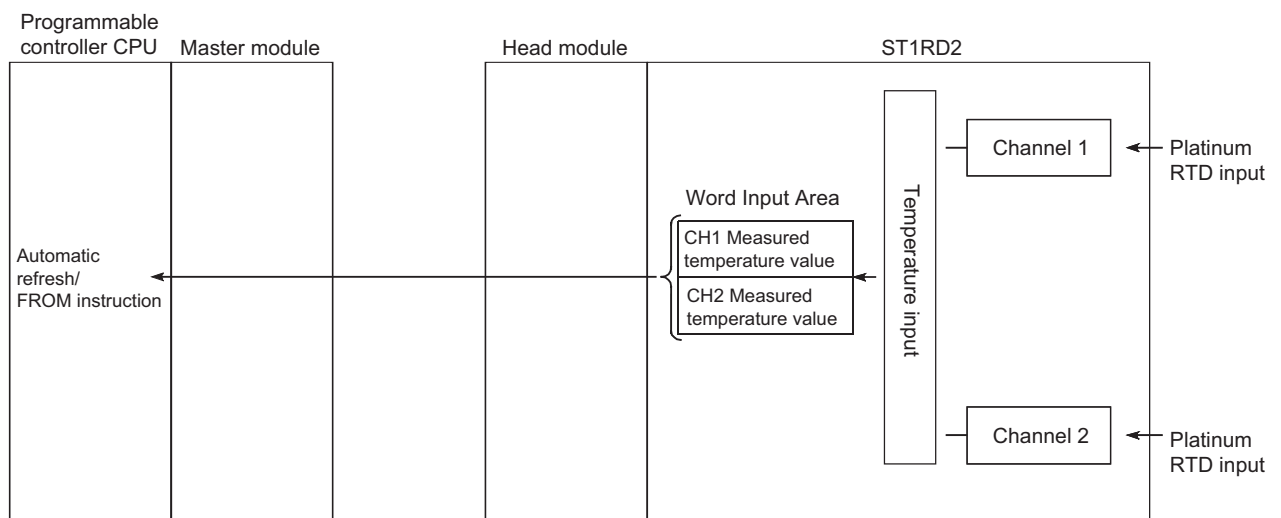
Figure 1.1 Overview of the ST1RD2

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1.1　Features

(1) One ST1RD2 is capable of 2-channel temperature measurement.
A single ST1RD2 can measure temperatures of two channels.

(2) Up to 26 modules can be mounted.
For one head module, up to 26 ST1RD2 modules (52 channels) can be mounted.

(3) Platinum RTDs, Pt100 and Pt1000 are applicable.
Platinum RTDs, Pt100 and Pt100 can be used.
Using GX Configurator-ST or a command, a platinum RTD type can be selected for each channel.

(4) Three-wire type platinum RTDs are connectable.
A 3-wire type platinum RTD can be connected to each channel.
By short-circuiting terminals, 2-wire type platinum RTDs can be also used.
(☞ Section 3.1.1 Specifications for platinum RTD connection)

(5) Disconnection is detectable.
Disconnection of a platinum RTD or cable can be detected for each channel and for each wire (wire A, B or b).

(6) Type of the values stored at disconnection detection is selectable.
For values to be stored in the CH □ measured temperature value area in the case of disconnection detection, you can select "Value immediately before disconnection", "Up scale (each measurement range's upper limit value + 5%)", "Down scale (each measurement range's lower limit value - 5%)" and "Given value".

(7) Optimal conversion processing is selectable.
From Sampling processing, Time averaging, Count averaging, Moving average and Primary delay filter options, a desired conversion method can be selected for each channel.

(8) Measurement range is selectable for each channel.
Three different measurement ranges are available for each of Pt100 and Pt1000 RTDs, and any of these can be selected for each channel.

(9) One-point compensation using the sensor compensation function
The sensor compensation function allows 1-point compensation for each channel.
When an error is identified between "an actual temperature" and "a measured temperature", it can be compensated easily by setting a sensor compensation value.

(10)Two-point compensation using the offset/gain setting
The offset/gain setting allows 2-point compensation for each channel.
User range setting (user-defined setting) or Factory default setting (default setting of the module) can be selected for offset/gain values.

(11) Alarm output

An alarm can be output for each channel when a temperature outside the preset measurement range is detected.

(12) Online module change

A module can be replaced without stopping the system.

(13) Easy setting using GX Configurator-ST

A software package (GX Configurator-ST) is separately available.
GX Configurator-ST is not necessarily required for the system.
However, using GX Configurator-ST enables onscreen parameter setting and offset/gain setting, which can reduce programming steps of master station and makes the setting/operating status check easier.

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CHAPTER2   SYSTEM CONFIGURATION

This chapter describes the system configuration for use of the ST1RD2.

2.1   Overall Configuration

An overall configuration for use of the ST1RD2 is shown below.
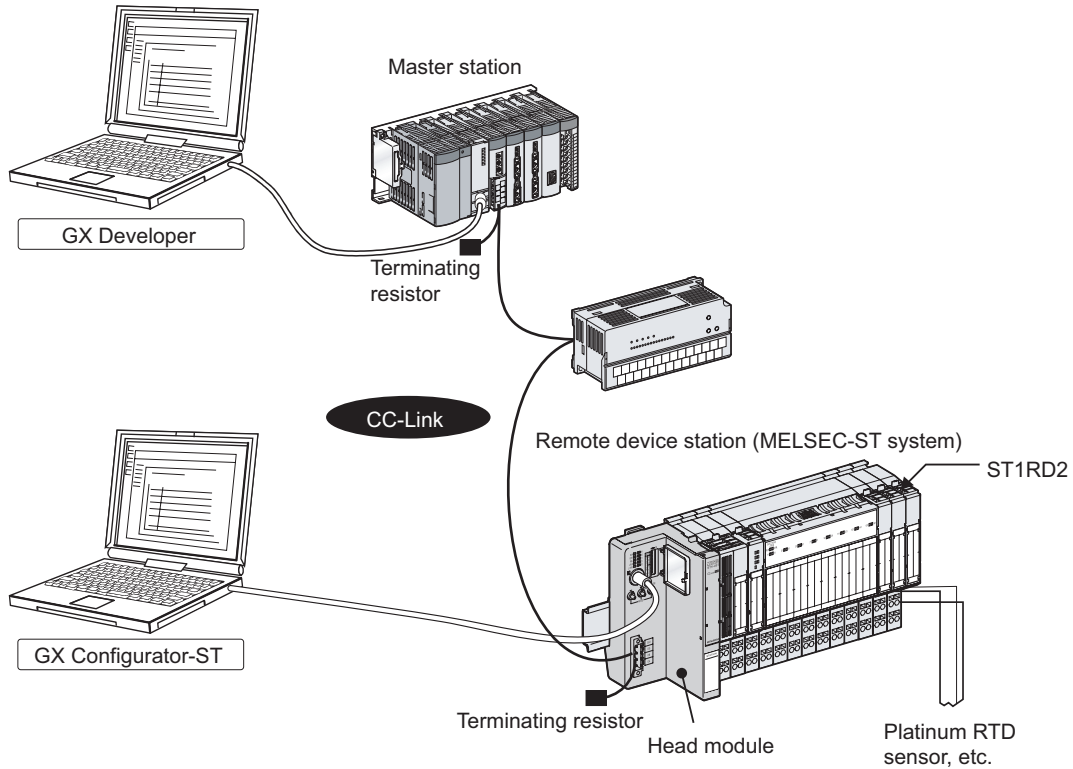
Figure 2.1 Overall system configuration

2.2 Applicable System

This section explains the applicable system.

2.2.1 Applicable head module

The head module applicable to the ST1RD2 is indicated below.

Table 2.1 Applicable head module

Product name	Model name
MELSECT-ST CC-Link Head Module	ST1H-BT

2.2.2 Applicable base module

The base modules applicable to the ST1RD2 are indicated below.

Table 2.2 Applicable base modules

Type	Model name
Spring Clamp Type	ST1B-S4IR2
Screw Clamp Type	ST1B-E4IR2

2.2.3 Applicable coding element

The coding element applicable for the ST1RD2 is indicated below.
The coding element is fitted before shipment.
It is also available separately in case it is lost.

Table 2.3 Applicable coding element

Product name	Model name
ST1RD2 coding element	ST1A-CKY-15

2.2.4 Applicable software package

The software package applicable to the ST1RD2 is indicated below.

Table 2.4 Applicable software package

Product name	Model name	Version
GX Configurator-ST [1]	SW1D5C-STPB-E	1.06G or later

* 1 GX Configurator-ST is optional.

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2.3 Precautions for System Configuration

For precautions for ST1RD2 system configuration, refer to the following.

☞ MELSEC-ST System User's Manual, "3.4 Precautions for System Configuration"

CHAPTER3   SPECIFICATIONS

This chapter provides the specifications of the ST1RD2.

For the general specifications of the ST1RD2, refer to the following.

↳ MELSEC-ST System User's Manual

3.1   Performance Specifications

The following indicates the performance specifications of the ST1RD2

(1) Performance specifications list

Table 3.1 Performance specifications list

Item			Specifications			
Number of analog input points			2 channels/1 module			
Output [1]			16-bit signed binary (-2000 to 8500: Value to the first decimal place 10 × times)			
Applicable platinum RTD			Pt100 (JIS C1604-1997, IEC751 1983), Pt1000[2]			
Output current for temperature detection			0.25mA or less			
Measured temperature range			-200 to 850 ℃			
Resolution			0.1 ℃			
Accuracy			Based on calculation expression marked *3			
Conversion accuracy	-200 to 850 ℃	Pt100	±0.7 ℃ (25±5 ℃), ±2.4 ℃ (0 to 55 ℃)			
		Pt1000				
	-20 to 120 ℃	Pt100	±0.3 ℃ (25±5 ℃), ±1.1 ℃ (0 to 55 ℃)			
		Pt1000				
	0 to 200 ℃	Pt100	±0.4 ℃ (25±5 ℃), ±1.2 ℃ (0 to 55 ℃)			
		Pt1000				
Conversion speed			80ms/1 channel			
Conversion method			Δ Σ method			
Disconnection detection			Detectable [4](Each channel independent [5])			
ROM write count			ROM write count by user range write or parameter setting: Up to 10,000 times			
Number of occupied I/O points			4 points for each of input and output			
Number of occupied slices			2			
Information amount	Input data		Br.n : Number of occupancy 4, Wr.n : Number of occupancy 2			
	Output data		Bw.n : Number of occupancy 4, Ww.n : Number of occupancy 0			
Isolation			Specific isolated area	Isolation method	Dielectric withstand	Insulation resistance
			Between platinum RTD input channels and internal bus	Photo coupler insulation	560V AC rms/3 cycles (elevation 2000m)	500V DC 10MΩ or more
			Between platinum RTD input channels	No insulation	-	-

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Table 3.1 Performance specifications list (Continued)

Item	Specifications
Applicable base module	Spring clamp type: ST1B-S4IR2 Screw clamp type: ST1B-E4IR2
Applicable coding element	ST1A-CKY-15(dusty gray)
External AUX. power supply	24V DC (+20/-15%, ripple ratio within 5%)
	24V DC current: 0.030A
5V DC internal current consumption	0.080A
External dimensions	77.6mm(H) × 12.6mm(W) × 55.4mm(D)
	77.6 (3.06in.) (H) × 12.6 (0.50in.) (W) × 55.4 (2.18in.) (D) [mm]
Weight	0.04kg

* 1 If a measured temperature value outside each range is input, it will be treated as a maximum or minimum value of the range.
* 2 The reference resistance of Pt1000 can be obtained by multiplying that of Pt100 by 10.
* 3 The accuracy can be calculated by the following.
   (Accuracy) = (Conversion accuracy) + (Platinum RTD tolerance)

Table 3.2 Platinum RTD tolerance

Class	Platinum RTD tolerance
A	$\pm(0.15 + 0.002|t|)$ ℃
B	$\pm(0.3 + 0.005|t|)$ ℃

(|t| denotes an absolute measured temperature value.)

Example) Under the condition: Platinum RTD: Class A, Operating ambient temperature: 40 ℃, Measured temperature: 800 ℃, the accuracy is

$(\pm 2.4$ ℃$) + \{\pm(0.15$ ℃ $+ 0.002$ ℃ $\times 800$ ℃$)\} = \pm 4.15$ ℃ .

* 4 For output in the case of disconnection detection, select any of "Value immediately before disconnection", "Up scale (each measurement range's upper limit value + 5%)", "Down scale (each measurement range's lower limit value - 5%)" or "Given value".(☞ Section 3.2.5 Conversion setting for disconnection detection)
* 5 Disconnection is detectable for each wire (Wire A, B and b).

3.1.1   Specifications for platinum RTD connection

This section explains the specifications for connection of the ST1RD2 and platinum RTD.

(1) For 3-wire type

The conductor resistance of 1)+3)+4) or 2)+3)+4) must be 2kΩ or less.

Also, the difference between the conductor resistance values 1) and 2) must be 10Ω or less.
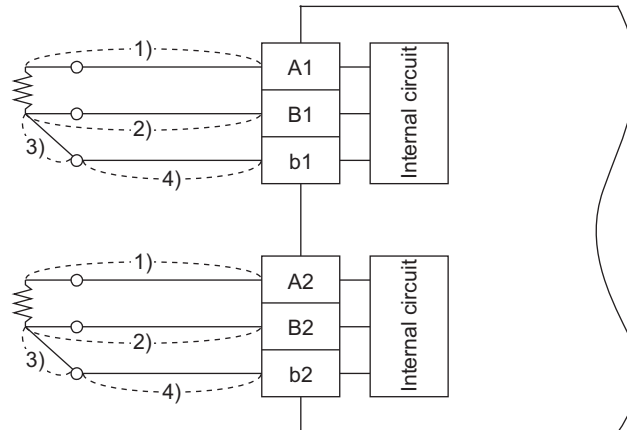
Figure 3.1 3-wire type

(2) For 2-wire type

The conductor resistance of 1)+3)+4) or 2)+4) must be 2kΩ or less.

Also, the difference between the conductor resistance values 1)+3) and 2) must be 10Ω or less.

Figure 3.2 2-wire type

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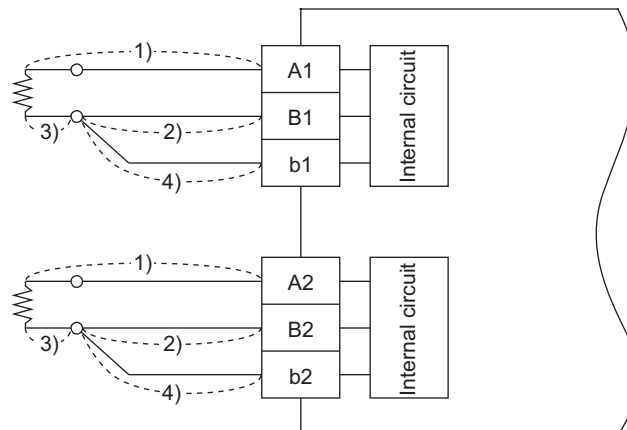
3.1.2   Conversion speed

The conversion speed of the ST1RD2 is 80ms/1 channel.

3.1.3   Intelligent function module processing time

The ST1RD2 intelligent function module processing time is (CH1 conversion speed) + (CH2 conversion speed).

For the input transmission delay time, refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual

3.2 Functions

This section explains the functions of the ST1RD2.

3.2.1 Function list

Table 3.3 lists the functions of the ST1RD2.

Table 3.3 ST1RD2 function list

Item	Description	Reference section
Temperature conversion function	(1) This function allows conversion of a "temperature input value" input from a platinum RTD into a temperature data. (2) Temperature data are 16-bit signed binary (-2000 to 8500) and stored into $\boxed{Wr}$ word input area.	Section 3.2.2
Conversion enable/ disable function	(1) This function specifies whether temperature conversion is enabled or disabled on each channel. (2) Processing time can be reduced by enabling or disabling the temperature conversion. (3) By default, conversion is enabled for all channels. [Setting method] •GX Configurator-ST(☞ Section 5.3 Parameter Setting) •Dedicated instruction (RDMSG) from the master station ☞ Section 8.5.1 Conversion enable/disable setting write (Command No.: A400H/ 2400H)	-

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Table 3.3 ST1RD2 function list(Continued)

Item	Description	Reference section
Temperature conversion system	(1) Sampling processing 　Input temperature values are successively converted into digital values and stored as measured temperature values. (2) Averaging processing 　• Time averaging 　　Temperature values collected from each channel in the specified period of time are averaged and the average value is stored. 　• Count averaging 　　Temperature values collected from each channel for the specified number of times are averaged and the average value is stored. 　• Moving average 　　Temperature values measured for the specified number of times are averaged for each sampling cycle. (3) Primary delay filter 　By a preset time constant, measured temperature values are smoothed. (4) Averaging process specification and time/count/moving average/time constant setting can be set for each channel. (5) Averaging processing specification is preset to sampling processing for all channels. (6) The time/count/moving average/time constant setting is set to 0 by default. [Averaging processing specification method] •GX Configurator-ST (☞ Section 5.3 Parameter Setting) •Dedicated instruction (RDMSG) from the master station ☞ Section 8.5.2 Operating condition setting write (Command No.: A402H/2402H) [Time/count/moving average/time constant setting method] •GX Configurator-ST (☞ Section 5.3 Parameter Setting) •Dedicated instruction (RDMSG) from the master station ☞ Section 8.5.3 CH[] time/count/moving average/time constant setting write (Command No.: A404H/2404H)	Section 3.2.3
Disconnection detection function	(1) By this function, disconnection of a platinum RTD or a cable connected to each channel can be detected. 　Also, disconnection is detectable for each wire (Wire A, B and b). (2) Disconnection can be detected on only the conversion-enabled channels.	Section 3.2.4
Conversion setting for disconnection detection	(1) For values to be stored in [Wr.n] , [Wr.n+1] CH□ measured temperature value area in the case of disconnection detection, you can select "Value immediately before disconnection", "Up scale (each measurement range's upper limit value + 5%)", "Down scale (each measurement range's lower limit value - 5%)" or "Given value". [Conversion setting for disconnection detection] •GX Configurator-ST (☞ Section 5.3 Parameter Setting) •Dedicated instruction (RDMSG) from the master station ☞ Section 8.5.2 Operating condition setting write (Command No.: A402H/2402H) [Conversion setting value for disconnection detection] •GX Configurator-ST (☞ Section 5.3 Parameter Setting) •Dedicated instruction (RDMSG) from the master station ☞ Section 8.5.3 CH[] time/count/moving average/time constant setting write (Command No.: A404H/2404H)	Section 3.2.5

Table 3.3 ST1RD2 function list(Continued)

Item	Description	Reference section
Measurement range selection function	(1) This function allows setting of the measurement range per channel. (2) The measurement range is selectable from the following. | **Measurement range**	
---	---
Pt100	- 200 to 850 ℃ (default)
	- 20 to 120 ℃
	0 to 200 ℃
Pt1000	- 200 to 850 ℃
	- 20 to 120 ℃
	0 to 200 ℃ | [Setting method] •GX Configurator-ST (☞ Section 5.3 Parameter Setting) •Dedicated instruction (RDMSG) from the master station ☞ Section 8.3.1 Initial data batch write request (Command No.: 8106H) ☞ Section 8.3.2 Initial data individual write request (Command No.: 8107H/0107H)	-
Alarm output function	(1) This function allows alarm output when the temperature exceeds the range specified by the user. Setting is available for each channel. (2) Alarm output setting default is No alarm output for all channels. (3) Set the 4 limit values of alarm output: upper upper limit value, upper lower limit value, lower upper limit value and lower lower limit value. These are set to 0 by default. [Alarm output setting method] •GX Configurator-ST (☞ Section 5.3 Parameter Setting) Dedicated instruction (RDMSG) from the master station ☞ Section 8.5.2 Operating condition setting write (Command No.: A402H/2402H) [Upper upper limit value, upper lower limit value, lower upper limit value and lower lower limit value setting method] •GX Configurator-ST (☞ Section 5.3 Parameter Setting) •Dedicated instruction (RDMSG) from the master station ☞ Section 8.5.4 CH[] upper upper limit/upper lower limit setting write (Command No.: A408H, A40AH/2408H, 240AH) ☞ Section 8.5.5 CH[] lower upper limit/lower lower limit setting write (Command No.: A409H, A40BH/2409H, 240BH)	Section 3.2.6
Command	(1) By using commands, command parameters can be set, and the parameter settings can be written from RAM to ROM and read from ROM to RAM.	CHAPTER 8

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Table 3.3 ST1RD2 Function List (Continued)

Item	Description	Reference section
Compensation of measured temperature value	(1) The ST1RD2 is capable of correcting the error between "actual temperature" and "measured temperature", which may occur due to variation in platinum RTD accuracy and/or a specific wiring or grounding condition. To compensate the error, the 1-point compensation using the sensor compensation function and the 2-point compensation using the offset/gain setting can be used. •Sensor compensation function When the measurement range width is less than 60 ℃, use the sensor compensation function. The compensation value can be easily obtained in 1-point temperature measurement only. •Offset/gain setting function When the measurement range width is 60 ℃ or more, use the offset/gain setting function. Wide-range compensation is available. (2) For the sensor compensation or the offset/gain setting, prepare a thermometer to measure the temperature of the object. Compensation is performed based on the difference between the temperature measured by the thermometer and the one measured by the ST1RD2.	-
Sensor compensation function	(1) The measured temperature value is compensated based on the set sensor compensation value. The compensation is available for each channel. [Sensor compensation method] GX Configurator-ST Dedicated instruction (RDMSG) from the master station ☞ Section 8.5.6 Sensor compensation value write (Command No.: A41A$_H$/241A$_H$)	Section 3.2.7
Offset/gain setting function	(1) Linear compensation is available by individually compensating any given 2 points (offset/gain value) within the effective range. The offset/gain setting can be made for each channel. (2) To use the user range setting, the offset/gain value selection must be made in advance. The offset/gain value selection is available for each channel. Default is set to "factory default". [Offset/gain setting method] •GX Configurator-ST •Dedicated instruction (RDMSG) from the master station ☞ Section 8.6.3 Operation mode setting (Command No.: B402$_H$/3402$_H$) ☞ Section 8.6.4 Offset channel specification (Command No.: B403$_H$/3403$_H$) ☞ Section 8.6.5 Gain channel specification (Command No.: B404$_H$/3404$_H$) ☞ Section 8.6.6 User range write (Command No.: B405$_H$/3405$_H$) [Offset/gain value selection method] •GX Configurator-ST (☞ Section 5.3 Parameter Setting) •Dedicated instruction (RDMSG) from the master station ☞ Section 8.3.1 Initial data batch write request (Command No.: 8106$_H$) ☞ Section 8.3.2 Initial data individual write request (Command No.: 8107$_H$/0107$_H$)	Section 4.5
Online module change	(1) A module can be replaced without the system being stopped. [Execution procedure] •GX Configurator-ST •Button operation on the head module	CHAPTER 7

3.2.2 Temperature conversion function

(1) A "temperature value" input from a platinum RTD is converted into a temperature data, and thereby the temperature can be detected.

(2) The measured temperature value to the first decimal place is multiplied by 10 and the result is stored into $\boxed{Wr.n}$, $\boxed{Wr.n+1}$ CH measured temperature value in 16-bit signed binary. (The value is rounded down to the nearest tenth.)

[Example 1] For a measured temperature value of 123.45 ℃, 1234 is stored.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	0	1	0	0	1	1	0	1	0	0	1	0

Figure 3.3 For a measured temperature value of 123.45 ℃

(3) A negative measured temperature value is represented as a two's complement.

[Example 2] For a measured temperature value of -123.45 ℃, -1234 is stored.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
1	1	1	1	1	0	1	1	0	0	1	0	1	1	1	0

Table 3.4 For a measured temperature value of -123.45 ℃

(4) All channels are set to 0 when the MELSEC-ST system is powered up, when the head module is reset or when the $\boxed{Bw.n+1}$ convert setting request is OFF (0).

(5) Processing time can be reduced by disabling conversion of unused channels.
It also prevents unnecessary disconnection detection of unused channels.

**(6) The temperature range varies with each measurement range.
If any out-of-range temperature is input, the measured temperature
value will be fixed to the maximum or minimum of the selected
measurement range.**
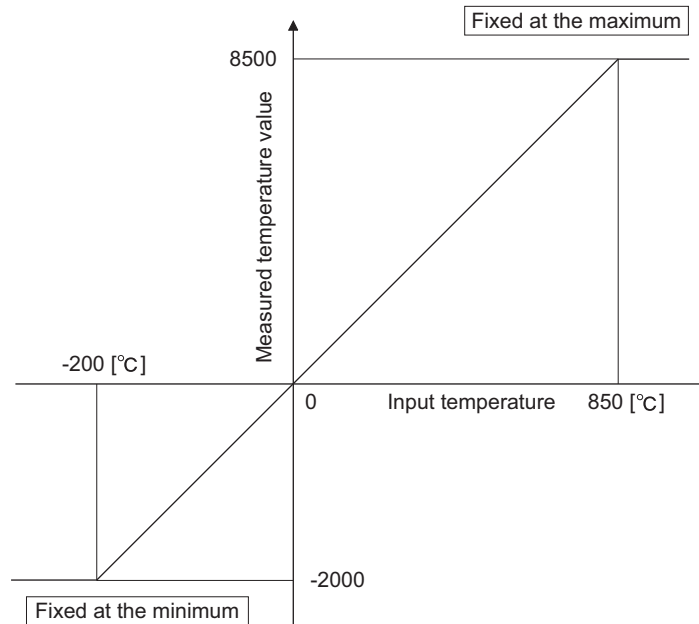
Figure 3.4 Conversion characteristics of -200 to 850 ℃ range

3.2.3 Temperature conversion system

There are the following temperature conversion methods: sampling, averaging (time averaging, count averaging and moving average) and primary delay filter.

(1) Sampling processing

Input temperature values are converted one by one, and each time a measured temperature value is stored into $\boxed{\text{Wr.n}}$, $\boxed{\text{Wr.n+1}}$ CH□ measured temperature value area.

(Processing time) = (Number of used channels) $\times$ (80ms)

[Example] If channels 1 and 2 are set conversion-enabled, the sampling time is 160ms.

$2 \times 80\text{ms} = 160\text{ms}$

(2) Averaging processing

The setting ranges for time, count, or moving average are shown below.
Setting any value outside the setting range will light up the ERR.LED.
- Time averaging: 640 to 5000ms
- Count averaging: 4 to 500 times
- Moving average: 4 to 60 times

(a) Time averaging

Conversion is performed for the specified channel for the preset period of time. Then, the sum of the values excluding the maximum and minimum is averaged and the result is stored in $\boxed{\text{Wr.n}}$, $\boxed{\text{Wr.n+1}}$ CH□ measured temperature value area.

The number of processings conducted within the preset time varies depending on the number of used channels (number of conversion-enabled channels).

$$(\text{Processing count}) = \frac{(\text{Preset time})}{(\text{Number of used channels}) \times (80\text{ms})}$$

Figure 3.5 Processing count within the preset time

[Example] If conversion of channels 1 and 2 is enabled with the preset time of 840ms, the measurement will be taken 5 times and an average value will be output.

$\dfrac{840}{2 \times 80} = 5.25$ (times) $\cdots$ Truncate the fractional part.

Figure 3.6 Example of processing count calculation

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(b) Count averaging

Conversion is performed for the specified channel for the preset number of times. Then, the sum of the values excluding the maximum and minimum is averaged and the result is stored into ⌷Wr.n⌷ , ⌷Wr.n+1⌷ CH□ measured temperature value area.

The time taken for storing the averaged value(s) into ⌷Wr.n⌷ , ⌷Wr.n+1⌷ CH□ measured temperature value area varies depending on the number of used channels (number of conversion-enabled channels).

(Processing time) = (Preset number of times) × (Number of used channels) × (80ms)

[Example] If conversion of channels 1 and 2 is enabled with the preset count of 500, an average value will be output every 80000ms.

$500 \times 2 \times 80 = 80000ms$

(c) Moving average

From the conversion values obtained at sampling intervals for the specified number of times, the maximum and minimum values are eliminated and the others are averaged.

The averaged value is stored in ⌷Wr.n⌷ , ⌷Wr.n+1⌷ CH□ measured temperature value area.
Since the calculation is done for each sampling period, the latest measured temperature value can be obtained.

Moving average processing for setting of 4 times
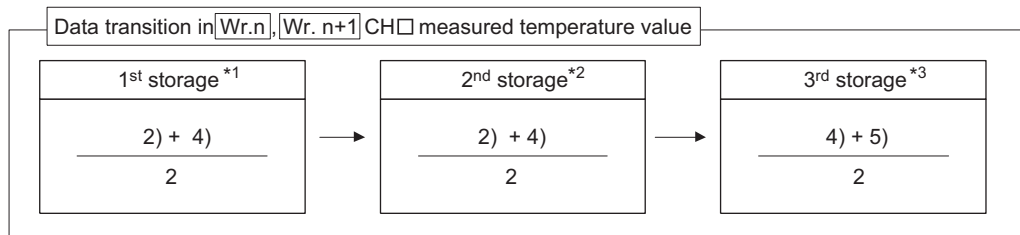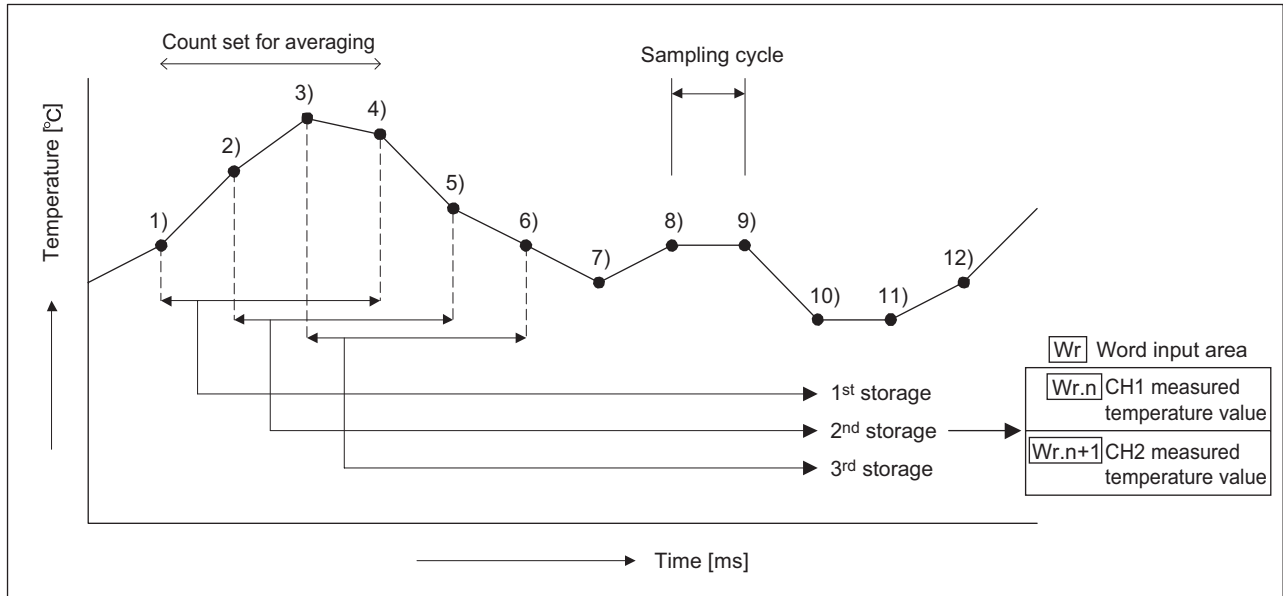
Figure 3.7 Moving average processing for setting of 4 times

* 1 Values except the maximum 3) and minimum 1) values are averaged.
* 2 Values except the maximum 3) and minimum 5) values are averaged.
* 3 Values except the maximum 3) and minimum 6) values are averaged.

(3) Primary delay filter

By setting a time constant, excessive noise is eliminated and a smoothed temperature value can be output. Depending the time constant, the degree of smoothness is changed.

The setting range is from 80 to 5000ms.

If an out-of range value is set, the ERR. LED will turn on.

The relational expression between the time constant and measured temperature value is shown below.

[In the case of n=1]

$Y_n = 0$

[In the case of n=2]

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

Figure 3.8 In the case of n=2

[In the case of n≧3]

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

Figure 3.9 In the case of n≧3

Y_n : **Current measured temperature value**

n : **Sampling count**

Y_{n-1} : **Preceding measured temperature value**

$\triangle$: **Conversion time (0.08s)**

TA : **Time constant (s)**

X_n : **Measured temperature value before smoothing**

• $\boxed{\text{Br.n+2}}$ Conversion completed flag is on when n≧2.

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[Example] When the temperature input value is changed from 25.0 ℃ to 26.0 ℃

In the time constant setting of 1000ms (1s), the measured temperature value is changed as shown below.

In 1000ms (1s) at the input temperature of 26.0 ℃, the measured temperature value reaches 63.2% of the value that will be output if sampling processing is selected.
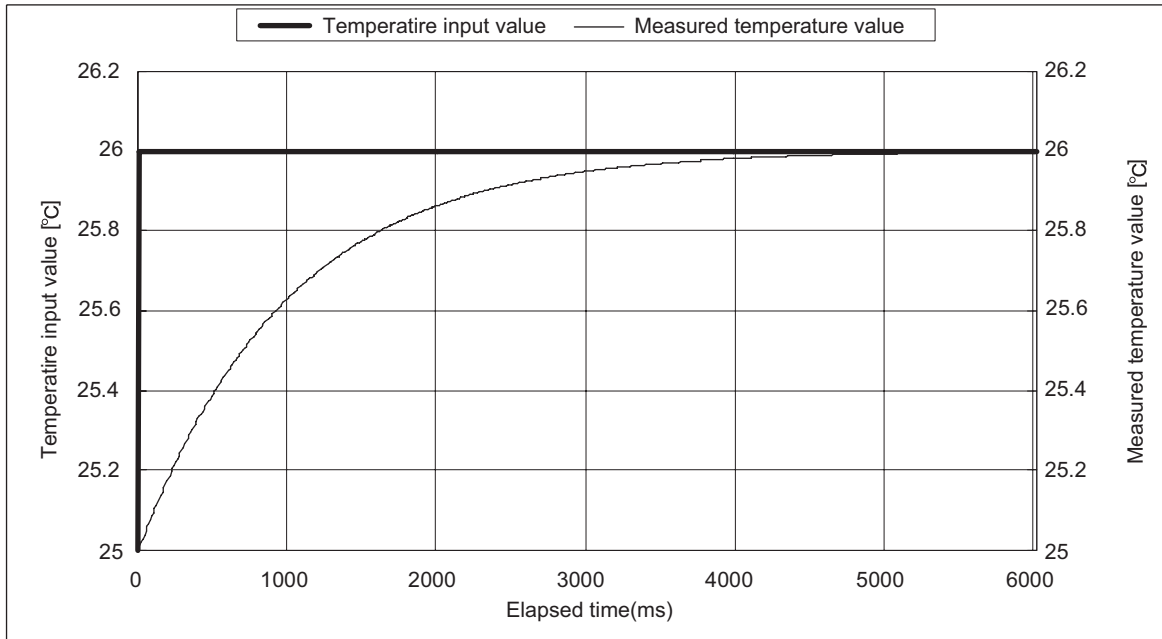
Figure 3.10 When the temperature input value is changed from 25.0 to 26.0 ℃

3.2.4　Disconnection detection function

(1)　If disconnection of a platinum RTD or cable is detected, the ERR. LED turns on, Error status (RXnA) is set to ON, and then an error code is stored.

When Error status (RXnA) is ON, the error module can be identified by executing the Error module information read request command (command No.: 0103H). In order to obtain the error code, execute the Error code read request command (command No.: 8101H/0101H) to the identified error module.

To take actions to correct the error, refer to the following:

☞ Section 9.1 Error Code List

Error status (RXnA) is a remote input of the head module.

For details of the Error status (RXnA), refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual
"3.4 Remote I/O, Remote Registers"

(2)　Disconnection can be detected only on channels, whose conversion is enabled.

(3)　Disconnection can be detected on every channel.

Disconnection is also detectable for every wire (Wire A, B and b).

Disconnected channels and wires can be identified by reading the error code.
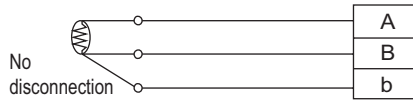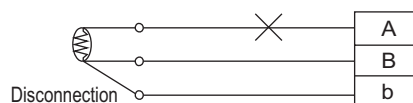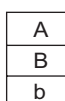
(☞ Section 9.1 Error Code List)

(4)　You can set which value should be stored when a disconnection is detected. This settings are available: "Value immediately before disconnection", "Up scale (each measurement range's upper limit value + 5%)", "Down scale (each measurement range's lower limit value - 5%)" or "Given value".

(☞ Section 3.2.5 Conversion setting for disconnection detection)

(5)　The relationships between disconnection detection and the conversion enable/disable setting are indicated below.

Table 3.5 Relation between disconnection detection and conversion enable/disable setting

Connection Status		Conversion Enable/ Disable Setting	Disconnection Detection
No disconnection	A / B / b	Enable	OFF
		Disable	
Disconnection	A / B / b	Enable	ON
		Disable	OFF
No connection	A / B / b	Enable	ON
		Disable	OFF

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☒**POINT**

- Channels with no platinum RTD connected must be set to "conversion disable". Otherwise "disconnection detected" will always be reported. If conversion of such channel is enabled, disconnection is detected.
- Please use the module within the allowed input range, which is set in "measurement range setting". Otherwise "disconnection detected" will be reported.

Remark ●

- For wiring, refer to the following.
  ☞ Section 4.4 Wiring
- For troubleshooting on disconnection detection, refer to the following.
  ☞ Section 9.2.3 When disconnection is detected

● ●

3.2.5 Conversion setting for disconnection detection

(1) You can set which value should be stored in the $\boxed{\text{Wr.n}}$ **,** $\boxed{\text{Wr.n+1}}$ **CH**□ **measured temperature value when a disconnection is detected. This settings are available: "Value immediately before disconnection", "Up scale (each measurement range's upper limit value + 5%)", "Down scale (each measurement range's lower limit value - 5%)" or "Given value".**
Setting is available for each channel.

(2) This function is available only on channels, whose conversion is enabled.

(3) When Up scale or Down scale is set, an Up scale value (each measurement range's upper limit value + 5%) or a Down scale value (each measurement range's lower limit value - 5%) of the individual range is stored respectively.

Table 3.6 Up scale and Down scale

Measurement range		Up scale	Down scale
Pt100 Pt1000	-200 to 850 ℃	902.5 ℃	-252.5 ℃
	-20 to 120 ℃	127 ℃	-27 ℃
	0 to 200 ℃	210 ℃	-10 ℃

(4) When "Given value" is selected, specify a value for CH☞ conversion setting value for disconnection detection (command parameter).

The value set in the area is stored in ⌐Wr.n⌐ , ⌐Wr.n+1⌐ CH☐ measured temperature value when disconnection is detected.

[Example] When disconnection occurs under the following settings: CH1: Value immediately before disconnection, CH2: Up scale
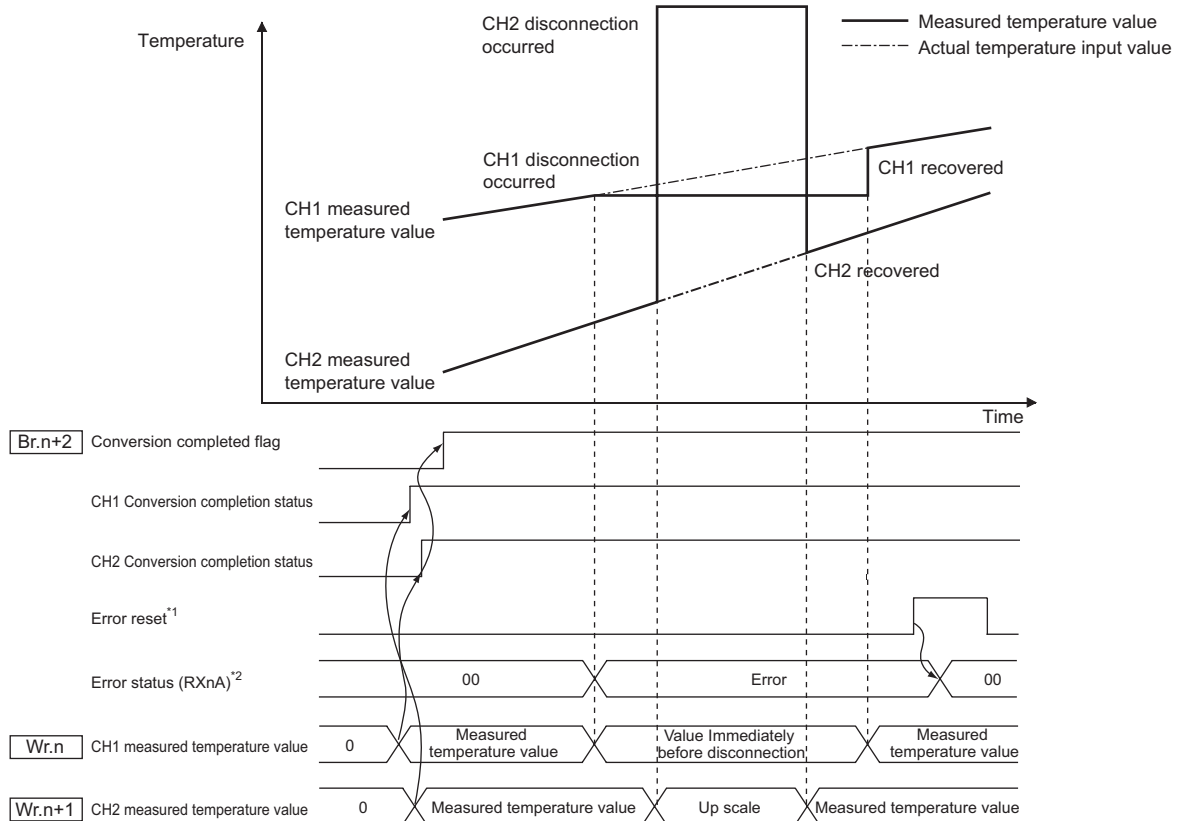
Figure 3.11 Operation when disconnection is detected

* 1 Errors can be reset by Error clear request command (command No.: 8104H/0104H) or Error reset request (RYnA).
  For details, refer to the following.
  ☞ MELSEC-ST CC-Link Head Module User's Manual

* 2 Error status (RXnA) is a remote input of the head module.
  When Error status (RXnA) is ON, the error module can be identified by executing the Error module information read request command (command No.: 0103H).
  In order to obtain the error code, execute the Error code read request command (command No.: 8101H/0101H) to the identified error module.
  ☞ MELSEC-ST CC-Link Head Module User's Manual "3.4 Remote I/O, Remote Registers"

3.2.6　Alarm output function
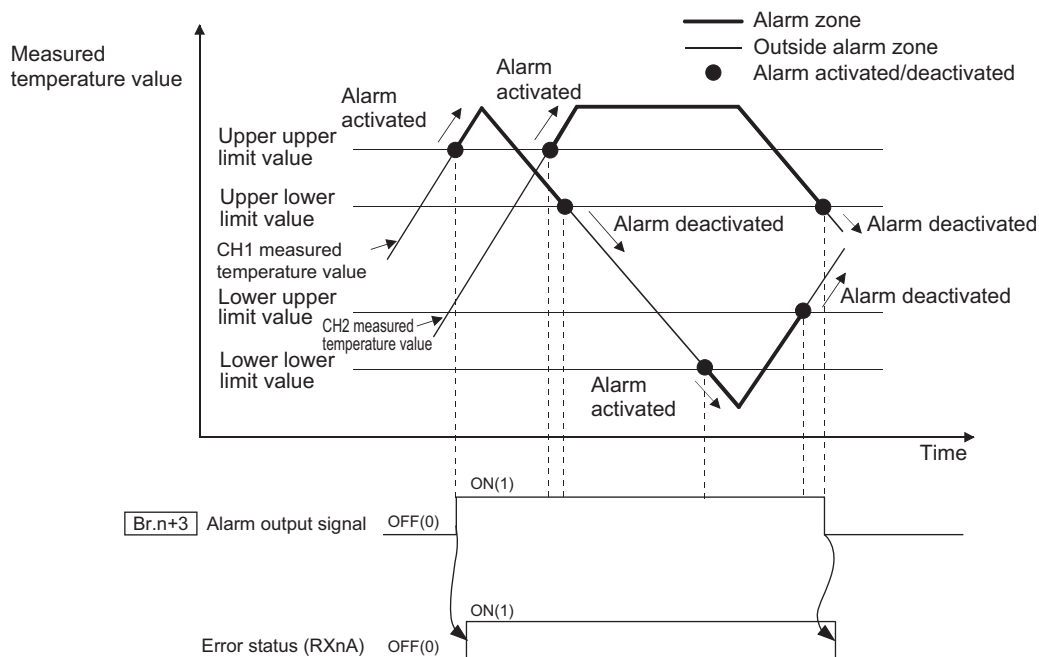
Figure 3.12 Alarm output function overview

(1) When the detected value
   - rises to or above the upper upper limit or
   - falls to or below the lower lower limit, and so enters the alarm output area, then Br.n+3 alarm output signal is set to on (1), and Error status (RXnA) is afterwards also set to on (1).
   Error status (RXnA) is a remote input of the head module.
   When Error status (RXnA) is ON, the error module can be identified by executing the Error module information read request command (command No.: 0103H).
   For details of the Error status (RXnA), refer to the following.
   ☞MELSEC-ST CC-Link Head Module User's Manual "3.4 Remote I/O, Remote Registers"

(2) After alarm is activated, when all channel values return within the setting range, Br.n+3 alarm output signal is set to off (0) automatically.
   Error status (RXnA) is also set to OFF automatically. [*1]

   * 1 If another error has occurred in the ST1RD2, head module or any slice module other than the ST1RD2, Error status (RXnA) will not set to OFF.

(3) Alarm output processing can be applied to each channel.
   Alarm processing is set to "disabled" by default.

(4) Set the 4 limit values for the alarm output: upper upper limit value, upper lower limit value, lower upper limit value and lower lower limit value.

If a channel setting does not meet the conditions shown in (a) and (b), it is considered as an error and the ERR. LED will light up.

(a) The setting range for each measurement range is shown below.

Values must be set in units of 0.1 ℃.

[Example] To set to 0.3 ℃, enter "3".

Table 3.7 Setting range for each measurement range

Measurement range		Setting range
Pt100 Pt1000	-200 ~ 850 ℃	-2000 to 8500
	-20 ~ 120 ℃	-200 to 1200
	0 ~ 200 ℃	0 to 2000

(b) The following conditional expression must be satisfied by the value settings.

Lower lower limit value $\leqq$ lower upper limit value $\leqq$ upper lower limit value $\leqq$ upper upper limit value

(5) Alarm output is available only on channels, whose conversion is enabled.

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3.2.7 Sensor compensation function

(1) This function is used to correct the error between "actual temperature" and "measured temperature", which may occur due to variation in platinum RTD accuracy and/or a wiring or grounding condition.
The measured temperature value is compensated based on the set sensor compensation value.
The compensation is available for each channel.

(2) The setting range is -200 to 200.
Set a value in units of 0.1 ℃.

Example) When the measured temperature (501.5 ℃) is higher than the actual temperature (500.0 ℃) by 1.5 ℃, set -15 as the sensor compensation value.
500.0(℃)-501.5(℃) = -1.5(℃)
-1.5(℃) × 10 = -15
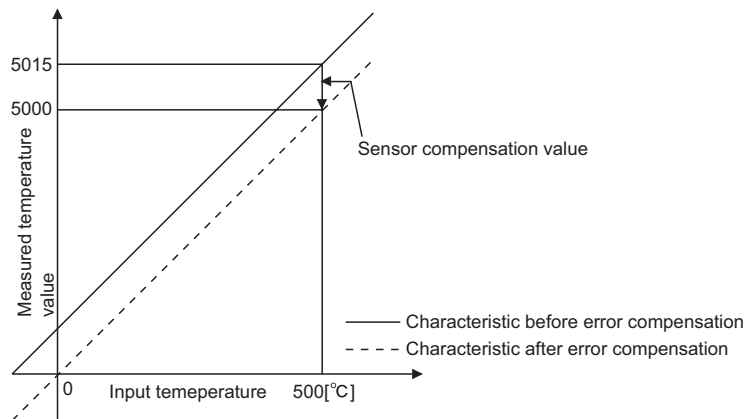
Figure 3.13 Sensor compensation function

3.3 I/O Data

The ST1RD2 has the areas for data exchange with the head module as indicated below. This section explains the composition of each area.

Table 3.1 I/O data list

Transfer direction	Item	Number of Occupancy	Default value	Reference section
ST1RD2 → Head module (Input Data)	Br Bit Input Area	4	0	Section 3.3.1
	Wr Word Input Area	2	0	Section 3.3.2
Head module → ST1RD2 (Output Data)	Bw Bit Output Area	4	0	Section 3.3.3
	Ww Word Output Area	0	0	-

3.3.1   Bit input area

This section explains the $\boxed{\text{Br}}$ bit input area.

(1) "Br.n" Module ready

(a) This turns on (1) when conversion is ready after the MELSEC-ST system (ST1RD2) is powered on or the head module is reset.

(b) When the $\boxed{\text{Br.n}}$ Module ready signal is off (0), conversion processing is not performed.

$\boxed{\text{Br.n}}$ Module ready turns off (0) in the following situations:
- In offset/gain setting mode
- When watchdog timer error occured
- During online module change
  ($\Rightarrow$ CHAPTER 7 ONLINE MODULE CHANGE)

(2) "Br.n+1" Convert setting completed flag

(a) After $\boxed{\text{Bw.n+1}}$ convert setting request has turned on (1), this turns on (1) when command parameter setting check is completed. (Turns on (1) if a setting error is detected.)

[When parameter setting is normal]
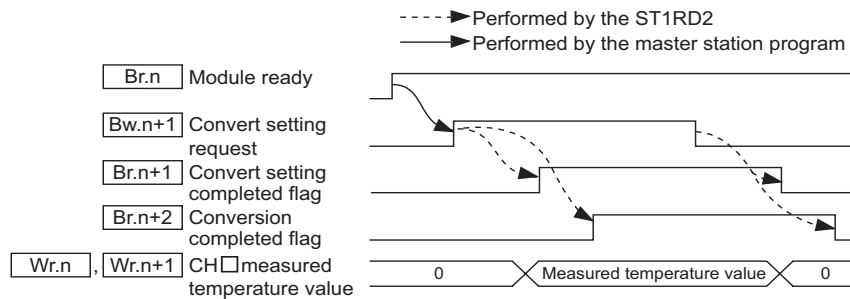
Figure 3.1 When parameter setting is normal

[When parameter setting is not normal]
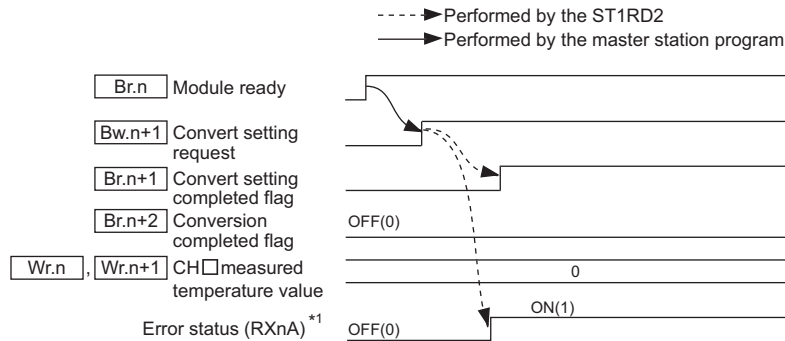
Figure 3.2 When parameter setting is not normal

* 1 Error status (RXnA) is a remote input of the head module.
  When Error status (RXnA) is ON, the error module can be identified by executing the Error module information read request command (command No.: 0103H).
  In order to obtain the error code, execute the Error code read request command ((command No.: 8101H/0101H) to the identified error module.
  Take corrective actions to correct the error, refer to the following:

  ☞ Section 9.1 Error Code List

  For details of Error status (RXnA) refer to the following.

  ☞ MELSEC-ST CC-Link Head Module User's Manual,
  "3.4 Remote I/O, Remote Registers"

(3) "Br.n+2" Conversion completed flag

(a) After ⌑Bw.n+1⌑ convert setting request has turned on (1), ⌑Br.n+2⌑ conversion completed flag turns on (1) when conversion is completed on all conversion-enabled channels.

(b) The ⌑Br.n+2⌑ conversion completed flag status is changed once only when the ⌑Bw.n+1⌑ convert setting request status is changed.

1) When ⌑Bw.n+1⌑ convert setting request is turned from off (0) to on (1)

When a measured temperature value is stored into ⌑Wr.n⌑ or ⌑Wr.n+1⌑ CH⌑ measured temperature value, ⌑Br.n+2⌑ conversion completed flag turns on (1).

Specifying averaging process will cause a delay in turning ⌑Br.n+2⌑ conversion completed flag on (1) by the processing time.

2) When ⌑Bw.n+1⌑ convert setting request is turned from on (1) to off (0) ⌑Br.n+2⌑ conversion completed flag turns off (0).

(4) "Br.n+3" Alarm output signal

(a) This signal turns on (1) when the measured temperature value falls outside the setting range specified with the CH□ upper upper limit value/upper lower limit value and CH□ lower upper limit value/lower lower limit value on any alarm-output-enabled and conversion-enabled channel.

(b) This signal turns off (0) automatically when measured temperature values have returned to within the setting range on all conversion-enabled channels.

- - - - ► Performed by the ST1RD2
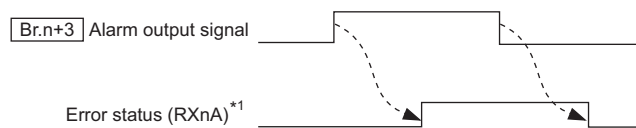
Figure 3.3 Alarm output signal

* 1 Error status (RXnA) is a remote input of the head module.
   When Error status (RXnA) is ON, the error module can be identified by executing the Error module information read request command (command No.: 0103H).
   In order to obtain the error code, execute the Error code read request command ((command No.: 8101H/0101H) to the identified error module.
   Take corrective actions to correct the error, refer to the following:

   ☞ Section 9.1 Error Code List

   For details of Error status (RXnA) refer to the following.

   ☞ MELSEC-ST CC-Link Head Module User's Manual,
   "3.4 Remote I/O, Remote Registers"

3.3.2 Word input area

This section explains the $\boxed{Wr}$ word input area.

(1) "Wr.n" CH1 measured temperature value, "Wr.n+1" CH2 measured temperature value

   (a) A converted measured temperature value is stored into $\boxed{Wr.n}$ or $\boxed{Wr.n+1}$ CH□ measured temperature value for each channel.

   (b) A measured temperature value rounded off to one decimal place is multiplied by ten and stored in 16-bit signed binary format. (The value is rounded down to the nearest tenth.)

3.3.3 Bit output area

This section explains the $\boxed{Bw}$ bit output area.

(1) "Bw.n" System area

   Use of $\boxed{Bw.n}$ System area is prohibited. (Fixed to 0)

(2) "Bw.n+1" Convert setting request

   (a) Turn this on (1) to start conversion of the channel for which conversion is enabled. Setting this to off (0) stops the conversion.
      • OFF (0): Conversion stop (Default)
      • ON (1): Conversion start

   (b) Turn this off (0) and then on (1) to enable the command parameter settings.

      1) When writing a command parameter, set $\boxed{Bw.n+1}$ convert setting request to off (0) to stop conversion. Data cannot be written when it is on (1).

   (c) For the ON (1)/OFF (0) timing, refer to the following.

(3) "Bw.n+2" System area, "Bw.n+3" System area

   Use of $\boxed{Bw.n+2}$ and $\boxed{Bw.n+3}$ system areas is prohibited. (Fixed to 0.)

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3.4   Memory and Parameters

This section explains the memory and parameters of the ST1RD2.

3.4.1   Memory

RAM and ROM can be used to store the parameter of ST1RD2.

(1) RAM

(a) The ST1RD2 operates based on the parameter settings stored in the RAM.

(b) The parameter settings stored in the RAM become valid when the ⬚ Bw.n+1 ⬚ convert setting request turns from OFF to ON.

(2) ROM

(a) The parameters stored in the ROM are not erased even if the power is turned off.

(b) The parameters stored in the ROM are transferred to the RAM when:
- The MELSEC-ST system (ST1RD2) is powered off, then on.
- The head module is reset.
- Parameter setting read from ROM (command No.: B400H/3400H) is executed.

3.4.2 Parameters

The setting items required for operation of the ST1RD2 are called command parameters.

(1) Setting command parameters

Use either of the following methods to set command parameters.

(a) GX Configurator-ST

GX Configurator-ST allows easy on-screen setup, reducing programming steps on the master station.

If the set values should be used every time when the MELSEC-ST system starts up, they must be written to the ROM. (Writing the set values to the RAM is used only for temporary testing.)

(b) Command

1) Using the dedicated instruction (RDMSG) of the master station to execute a command, setting values can be written to RAM of the ST1RD2.

2) Then, using command "Parameter setting write to ROM" (command No.: B401H/3401H), the setting value stored in RAM can be written to the ROM.

3) Writing command parameters to ROM in advance can reduce programming steps on the master station.

(2) Command parameter list

Command parameters and corresponding command numbers, which are used when using the dedicated instruction, are listed below.

These command parameters can be also set in GX Configurator-ST.

Table 3.2 List of available command parameters

Setting item	Command
Measurement range setting, offset/gain value selection setting	8106H
	8107H/0107H
Conversion enable/disable setting	A400H/2400H
Averaging processing specification, alarm output setting, conversion setting for disconnection detection setting	A402H/2402H
Time averaging/Count averaging/Moving average/Time constant setting	A404H/2404H
Upper upper/upper lower limit setting	A408H/2408H
	A40AH/240AH
Lower upper/lower lower limit setting	A409H/2409H
	A40BH/240BH
Sensor compensation value setting	A41AH/241AH
Conversion setting value for disconnection detection	A41EH/241EH

⊠**POINT**

For commands with the number 8000H and greater, determine the head module and slice modules with their slice position number.

And for commands with the number 7FFFH and lower, determine them with their start slice number.

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CHAPTER4   SETUP AND PROCEDURES BEFORE OPERATION

4.1   Handling Precautions

(1) Do not drop the module or give it hard impact since its case is made of resin.
Doing so can damage the module.

(2) Do not disassemble or modify the modules.
Doing so could cause a failure, malfunction, injury or fire.

(3) Be careful not to let foreign particles such as swarf or wire chips enter the module. They may cause a fire, mechanical failure or malfunction.

4.2 Setup and Procedure before Operation
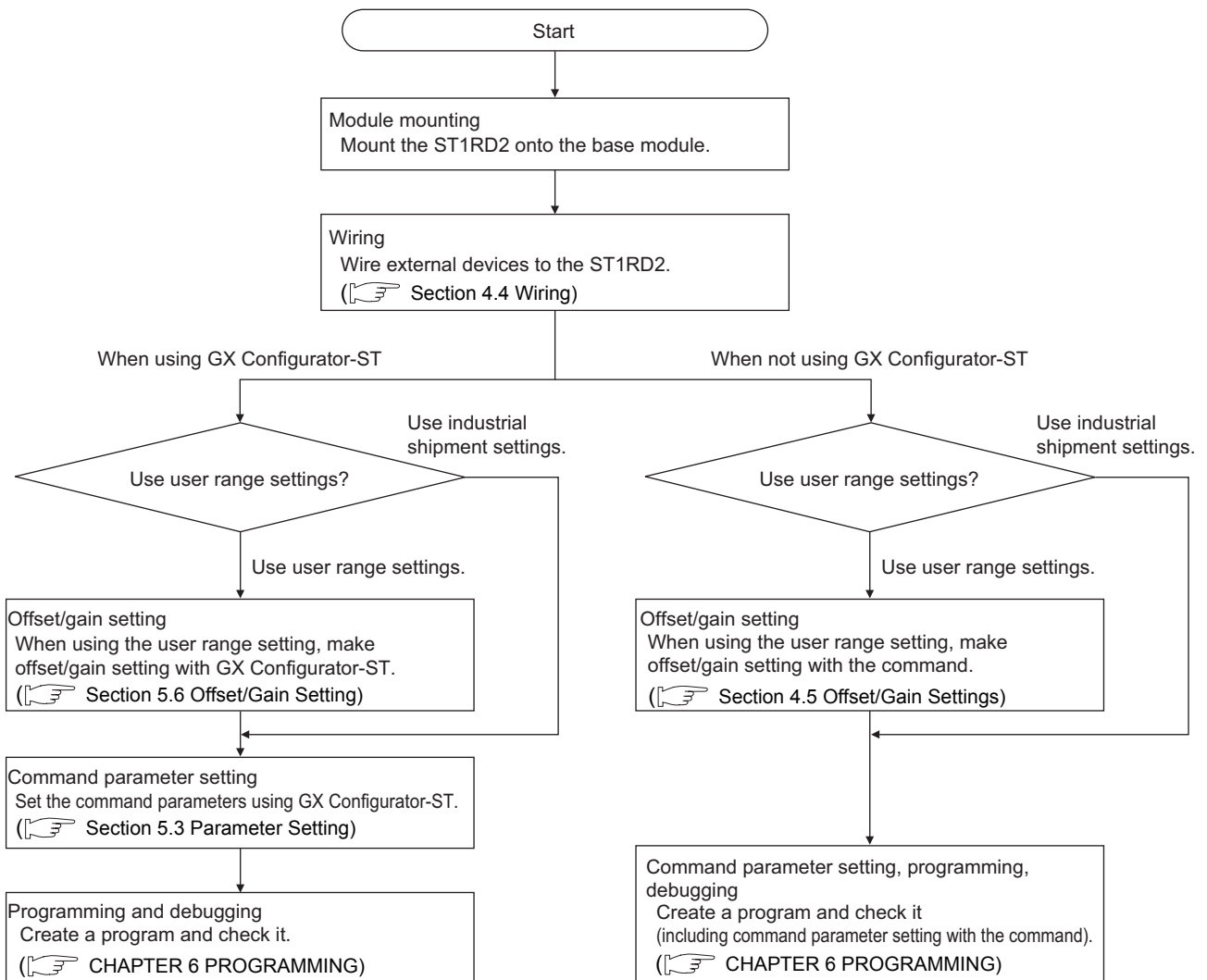
Figure 4.1 Setup and procedures before operation

4.3 Part Names

The name of each part in the ST1RD2 is listed below.
The following shows the ST1RD2 mounted on the spring clamp type base module.

[Rear view of the ST1RD2]
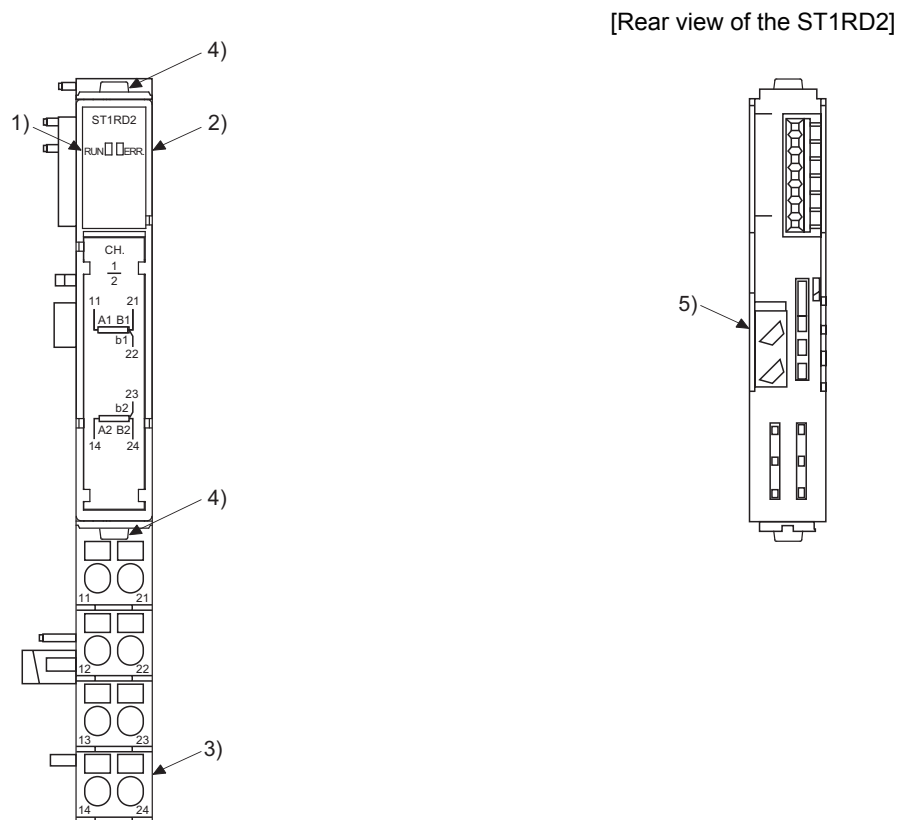
Figure 4.2 Part names

Table 4.1 Part names and functions

No.	Name and appearance	Description
1)	RUN LED	The RUN and ERR. LEDs (on/flashing/off) indicate various states of the ST1RD2
2)	ERR. LED	(☞ Section 4.3.1 Status confirmation by LEDs).
3)	Terminal block	The input signal lines of the ST1RD2 are wired to the terminal block of the base module. [Applicable base modules] Spring clamp type: ST1B-S4IR2 Screw clamp type: ST1B-E4IR2
4)	Slice module fixing hooks (at both ends)	Used for mounting/dismounting the ST1RD2 to/from the base module. While pressing the hooks at both ends, mount/dismount the ST1RD2.
5)	Coding element	Prevents the module from being mounted incorrectly. The coding element consists of two pieces, and its shape changes depending on the model name. When the ST1RD2 is mounted on the base module and then dismounted, one piece of the coding element remains on the base module, and the other remains on the ST1RD2. The ST1RD2 can be mounted onto the base module that matches the ST1RD2 coding element. [Applicable coding element] ST1A-CKY-15

⊠**POINT**

In order to ensure safety, make sure to attach the coding element to the base module and ST1RD2.

Table 4.2 Terminal number assignments

Terminal No.	Signal		Terminal No.	Signal	
11	CH1	A1	21	CH1	B1
12	Empty		22		b1
13	Empty		23	CH2	b2
14	CH2	A2	24		B2

4.3.1 Status confirmation by LEDs

The following table shows LED indications.

Table 4.3 LED indications

LED indication		Operating status
RUN LED	**ERR.LED**	
On	Off	Normal
	On	System error
Flashing (1s interval)	Off	Data communication stop or parameter error between master station and head module, another slice module fault, or internal bus error.
	On	System error occurred during data communication stop or a parameter error between master station and head module, or another slice module fault or internal bus error.
Flashing (0.5s interval)	Off	Module is in offset/gain setting mode
	On	System error occurred in offset/gain setting mode
Flashing (0.25s interval)	Off	Module is selected as the target of online module change
	On	System error occurred when module is selected as the target of online module change
Off	Off	Power is off or online module change is in execution.
	On	System error occurred during online module change

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4.4 Wiring

The wiring precautions and examples of module connection are provided below.

4.4.1 Wiring precautions

In order to optimize the functions of the ST1RD2 and ensure system reliability, external wiring, that is protected from noise, is required.
Please observe the following precautions for external wiring:

(1) **Use separate cables for the AC control circuit and the external input signals of the ST1RD2 to avoid the influence of the AC side surges and inductions.**

(2) **Do not bring/install the cables closer to/together with the main circuit line, a high-voltage cable or a load cable from other than the MELSEC-ST system. This may increase the effects of noise, surges and induction.**

(3) **Always place the platinum RTD signal cable at least 100mm (3.94inch) away from the main circuit cables and AC control lines.**
   Fully keep it away from high-voltage cables and circuits which include harmonics, such as an inverter's load circuit.
   Failure to do so will make the module more susceptible to noises, surges and inductions.

4.4.2   External wiring

Wire the cables to the base module (sold separately).
For the specifications for platinum RTD connection, refer to the following.

☞ Section 3.1.1 Specifications for platinum RTD connection

(1) For 3-wire type
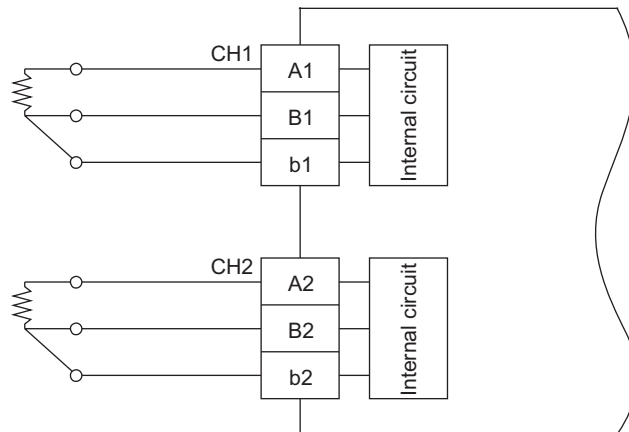
Figure 4.3 Wiring diagram (3-wire type)

When using a
cable clamp

When using a
terminal block

Connect to the
control panel
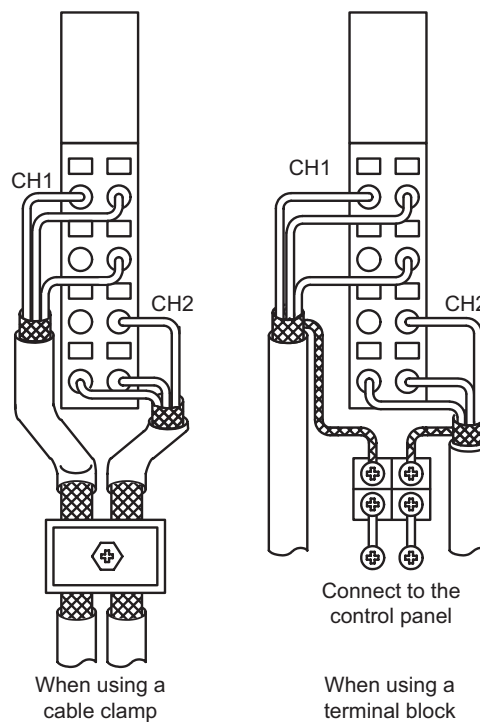
Figure 4.4 External wiring diagram (3-wire type)

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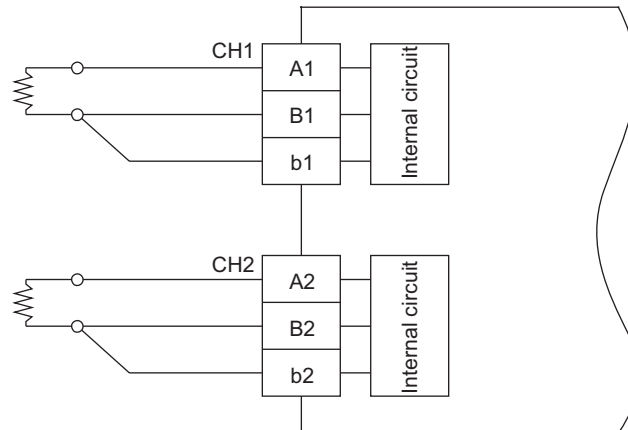
(2) For 2-wire type

Figure 4.5 Wiring diagram (2-wire type)

When using a
cable clamp

Connect to the
control panel

When using a
terminal block
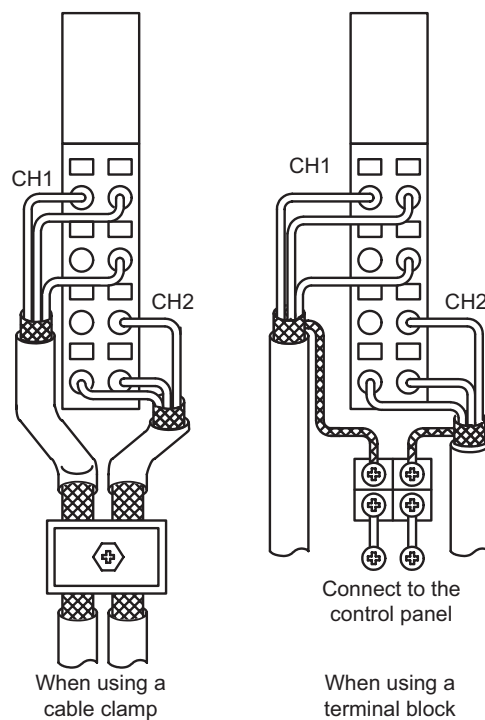
Figure 4.6 External wiring diagram (2-wire type)

⊠POINT

Any channel where no platinum RTD is connected must be set to "conversion disable".
If conversion of such channel is set to enable, disconnection is detected.

4.5 Offset/Gain Settings

This section explains the offset/gain setting.

(1) Offset/gain setting function
The offset/gain setting is a function that corrects values at any two points within the operating range (with offset and gain values) when a proper temperature value is not obtained at system startup or when the measurement range is changed.

(2) Relation between measured temperature values and offset and gain values for input temperature
The following shows the relation between measured temperature values and offset and gain values for input temperature.
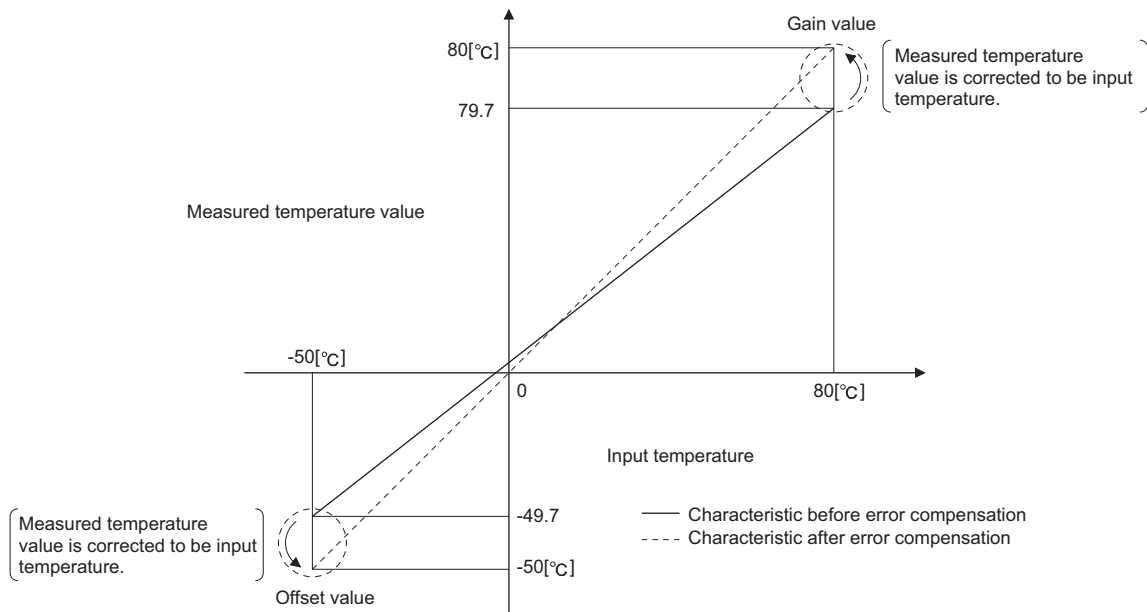
Figure 4.7 Relation between measured temperature values and offset and gain values for input temperature

(3) Precautions

(a) Measured temperature range for the offset/gain setting
Set offset/gain values within the temperature range of each measurement range.
(☞ Section 3.1 Performance Specifications)
If the setting exceeds the allowable range, resolution and accuracy may not meet the performance specifications.

(b) Condition for the offset/gain setting
Set the offset and gain values according to the real application situation.
Also, after completion of the offset/gain setting, check for correct offset/gain values in the real application situation.

(c) Offset/gain value memory
Offset/gain values are stored in the ROM, and thereby they are not erased by power-off.

(d) Number of writes to ROM
After the offset/gain setting, write the data to the ROM with the User range write command (command No.: B405H/3405H).
The maximum number of writes to ROM is 10,000.
To prevent inadvertent writing to the ROM, the number of writes to ROM is counted from the time of power-on.

(e) When an error occurs
When an error occurs during offset/gain setting, the offset and gain values are not written to the ST1RD2.
Set correct offset and gain values again.

(f) For higher accuracy
* Offset/gain values of higher accuracy can be obtained by correcting errors with the minimum and maximum values within the operating range.
* Higher accuracy can be obtained if offset and gain values are set after 30-minute warm-up.

(g) Offset/gain value range
Set offset and gain values within the range satisfying the following conditions.
If an invalid value is set, an error will occur.
Condition 1: Within the allowable input range
Condition 2: Offset value < Gain value
Condition 3: (Gain value) - (Offset value) $\geqq 0.2$ [℃]

(h) Error correction
Errors can be corrected by using a standard resistor instead of direct temperature input to a platinum RTD.

| Power value of standard DC voltage generator | = | Resistance value of platinum RTD |

Figure 4.8 Error correction

4.5.1　Offset/gain setting procedure

For the user range setting, configure the offset/gain settings.
To utilize the factory default setting, the offset/gain settings are not required.
Either of the following methods is available for the offset/gain setting.

(1) Setting offset/gain values with GX Configurator-ST
Configure offset/gain setting in GX Configurator-ST.
☞ Section 5.6 Offset/Gain Setting

(2) Setting offset/gain values using commands
Set offset/gain values as shown in Figure 4.7

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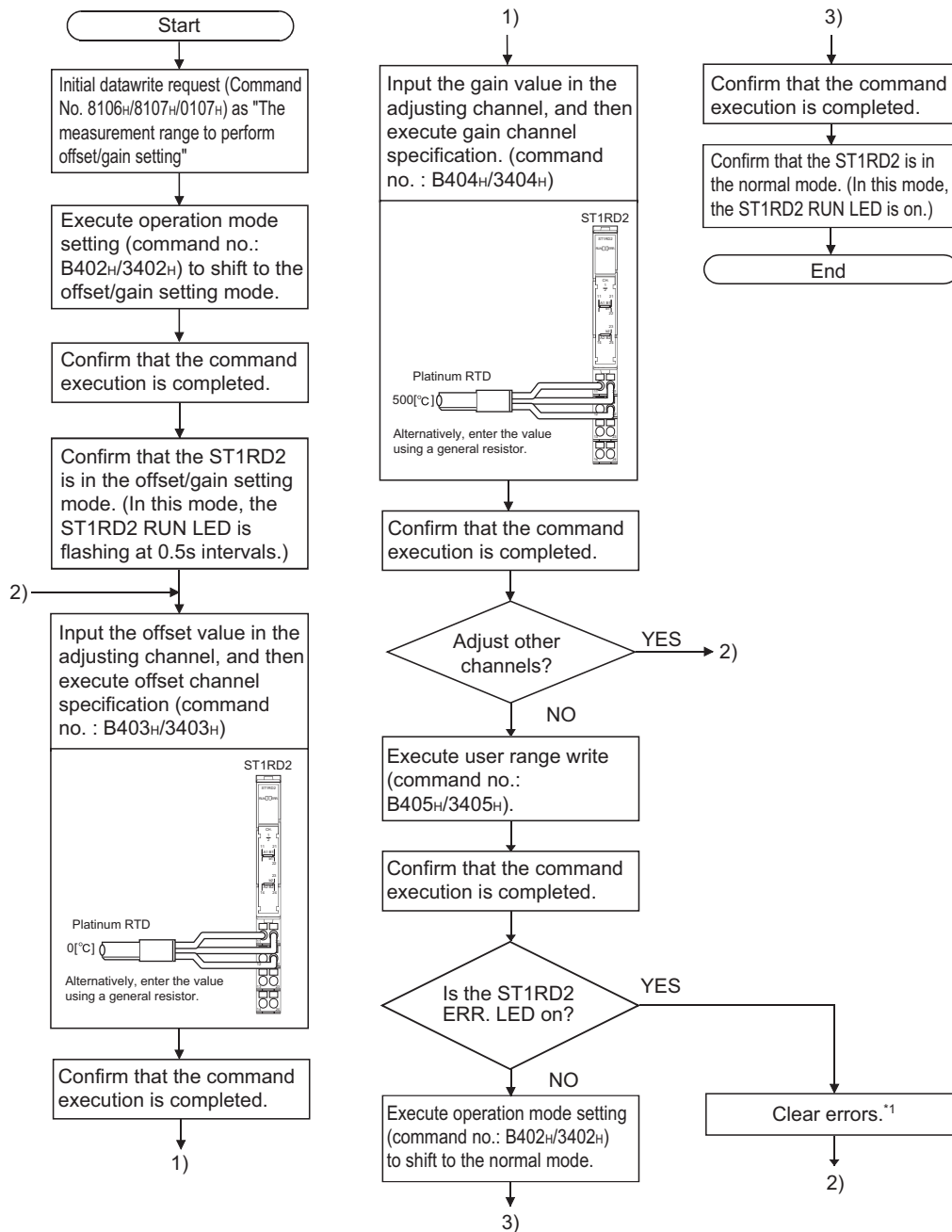
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Figure 4.9 Offset/gain setting procedure

* 1 An error can be cleared by either of the following.
　* Error clear request (command No.: 8104H/0104H)
　* Error reset request (RYnA)
　For details of the above, refer to the following.

　☞ MELSEC-ST CC-Link Head Module User's Manual "8.2.5 Error clear request (Command No.: 8104H/0104H)"

　☞ MELSEC-ST CC-Link Head Module User's Manual "3.4 Remote I/O, Remote Registers"

(3) Programming

The program example given here contains mode switching (between normal mode and offset/gain setting mode), specification of the offset/gain setting channel, offset/gain value adjustment, and offset/gain value writing to the ST1RD2.

(a) Devices assigned to the program example

For devices used in common with other program examples, refer to the following.

☞ Section 6.4 Program Examples

1) Devices assigned to the program example

Table 4.4 Device assignments in program example

Device	Application	Device	Application
M1000	Other station data link status (Station No.1)	M4000	Offset/gain setting mode switching flag
M1001	Other station data link status (Station No.2)	M4001	Offset channel specification flag
M1002	Data link status of ST1H-BT (Station No.3)	M4002	Gain channel specification flag
M2000	Completion device (Initial data write command)	M4003	User range write flag
M2001	Completion status indicator device (Initial data write command)	M4004	Normal mode switching flag
M2010	Completion device (ST1RD2 control command)	M5000	Error reset request flag
M2011	Completion status indicator device (ST1RD2 control command)	D1000 to D1004	Control data
M3000	Initial data individual write flag	D1100 to D1104	Send data of ST1RD2 control command (execution data of the command)
		D1300 to D1304	Receive data of ST1RD2 control command (result data of the command)
		D1500 to D1506	Send data of initial data write command (execution data of the command)
		D1700 to D1705	Receive data of initial data write command (result data of the command)
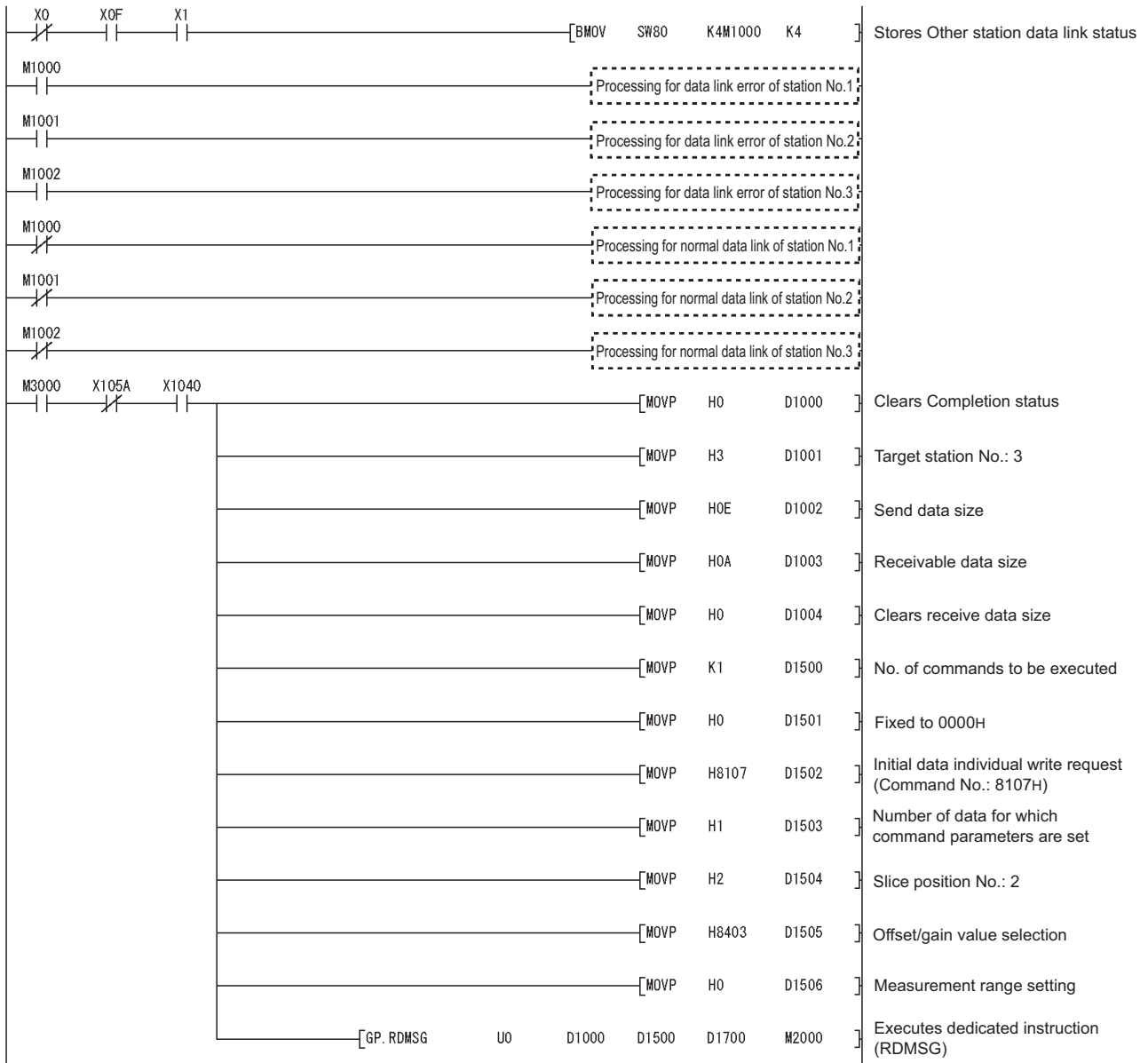
2) Program example

Figure 4.10 Offset/gain setting program example

4.5 Offset/Gain Settings
4.5.1 Offset/gain setting procedure

Figure 4.10 Offset/gain setting program example (continued)

```
M4002  X105A
 ┤├────┤/├──────────────────────────────────[MOVP    K1      D1100 ]  No. of commands to be
                                                                       executed

                                            ─[MOVP    H2      D1101 ]  Slice position No.: 2

                                            ─[MOVP    H0B404  D1102 ]  Gain channel specification
                                                                       (command No.: B404H)

                                            ─[MOVP    H1      D1103 ]  CH1: Channel setting
                                                                       CH2: Disable

                                            ─[MOVP    K5000   D1104 ]  Temperature setting value

                    ─[G.RDMSG U0   D1000   D1100   D1300   M2010 ]  Executes dedicated
                                                                    instruction (RDMSG)

M4003  X105A
 ┤├────┤/├──────────────────────────────────[MOVP    K1      D1100 ]  No. of commands to
                                                                       be executed

                                            ─[MOVP    H2      D1101 ]  Slice position No.: 2

                                            ─[MOVP    H0B405  D1102 ]  User range write
                                                                       (command No.: B405H)

                                            ─[MOVP    H0      D1103 ]  Fixed to 0000H

                                            ─[MOVP    H0      D1104 ]  Fixed to 0000H

                    ─[G.RDMSG U0   D1000   D1100   D1300   M2010 ]  Executes dedicated
                                                                    instruction (RDMSG)

M5000  X105A
 ┤├────┤├────────────────────────────────────────────────(Y105A )  Error reset request flag ON

Y105A  X105A
 ┤├────┤/├────────────────────────────────────────────[RST   M5000 ]  Error reset request flag OFF

M4004  X105A
 ┤├────┤/├──────────────────────────────────[MOVP    K1      D1100 ]  No. of commands to be
                                                                       executed

                                            ─[MOVP    H2      D1101 ]  Slice position No.: 2

                                            ─[MOVP    H0B402  D1102 ]  Operation mode setting
                                                                       (command No.: B402H)

                                            ─[MOVP    H0      D1103 ]  Normal mode

                                            ─[MOVP    H0      D1104 ]  Fixed to 0000H

                    ─[G.RDMSG U0   D1000   D1100   D1300   M2010 ]  Executes dedicated
                                                                    instruction (RDMSG)
```

Figure 4.10 Offset/gain setting program example (continued)
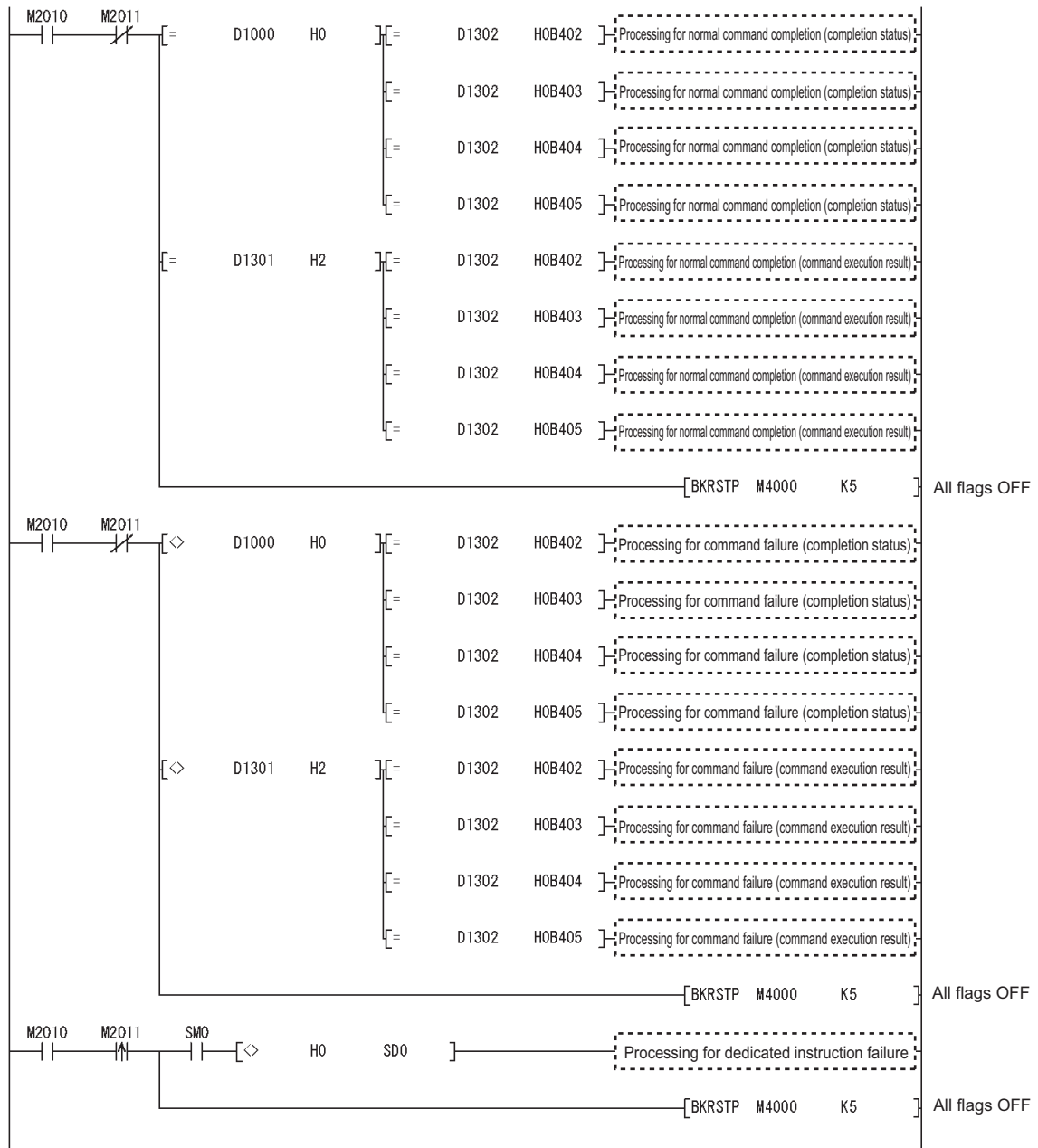
Figure 4.10 Offset/gain setting program example (continued)

CHAPTER5   GX Configurator-ST

This chapter explains the functions of GX Configurator-ST used with the ST1RD2.
For details of GX Configurator-ST, refer to the following.
☞ GX Configurator-ST Operating Manual

5.1   GX Configurator-ST Functions

Table 5.1 lists the GX Configurator-ST functions used with the ST1RD2.

Table 5.1 List of GX Configurator-ST functions used with ST1RD2

Item	Description	Reference section
Parameter Setting	(1) The following parameters can be set in GX Configurator-ST. 　•CH□ measurement range setting 　•CH□ offset/gain value selection 　•CH□ conversion enable/disable setting 　•CH□ averaging processing specification 　•CH□ alarm output setting 　•CH□ conversion setting for disconnection detection 　•CH□ time/count/moving average/time constant setting 　•CH□ upper upper limit value/upper lower limit value/lower upper limit value/lower lower limit value 　•CH□ sensor compensation value setting 　•CH□ conversion setting value for disconnection detection (2) Specify the area (RAM or ROM) where parameter setting will be registered. (3) Using GX Configurator-ST, parameters can be set while online module change is performed.	Section 5.3
Input/output monitor	(1) The I/O data of the ST1RD2 can be monitored.	Section 5.4
Forced output test	(1) Test can be conducted with the values set in the Bw bit output area of the ST1RD2.	Section 5.5
Offset/gain setting	(1) The offset and gain values of the user range can be easily set on-screen. (2) Using GX Configurator-ST, gain/offset values can be set while online module change is performed.	Section 5.6
Online module change	(1) A module can be replaced without stopping the system.	CHAPTER 7

5.2 Creating a Project

(1) Creating a project

A new project can be created by reading the real MELSEC-ST system from the communication port. It can be also created offline if there is no MELSEC-ST system. For details, refer to the following.

☞ GX Configurator-ST Operating Manual

(2) Selecting a head module

To create a new project offline, select "CC-Link (ST1H-BT)" and click the [Next] button.

(3) Display/setting screen
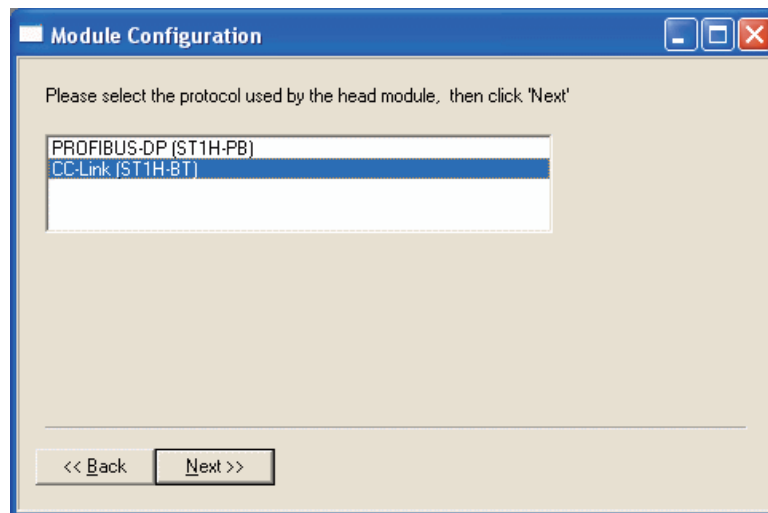
Figure 5.1 Selecting a head module

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5.3   Parameter Setting

This section explains how to set the parameters.
Setting parameters by GX Configurator-ST eliminates programs for which the parameters must be set.
The set values used for MELSEC-ST system startup must be written to the ROM for saving. (Writing to the RAM is used temporarily for testing.)

(1) Mode changing

The mode needs to be changed.
Setting is available in either the edit and diagnosis modes.

(2) "Parameter Setting" screen display

(a) Select ST1RD2 on the "Module Configuration" or "System Monitor" screen.

(b) Click [Edit] → [Parameter Setting].

(3) Display/setting screen
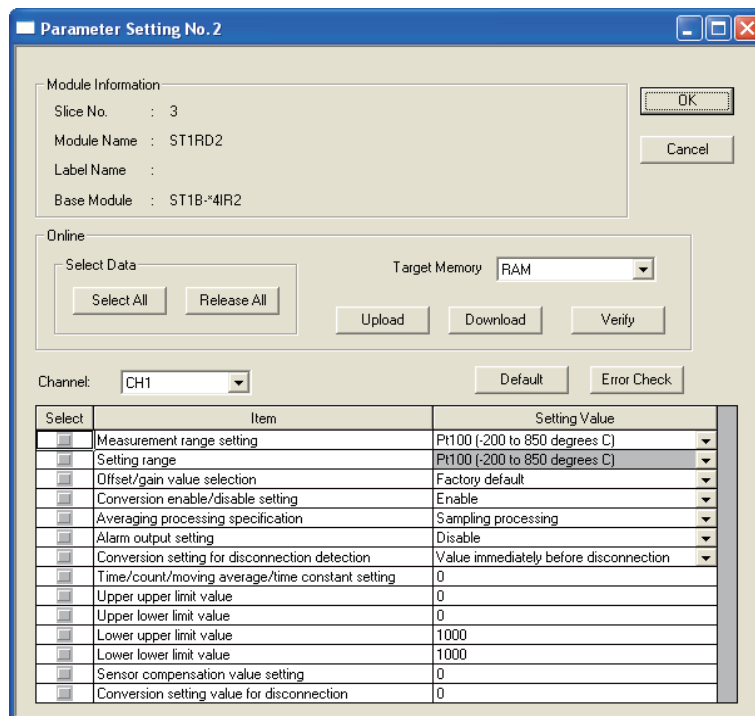
Figure 5.2 Parameter setting screen

(4) Display/setting details

When the parameters need to be set for multiple channels, set them separately for each channel.

Table 5.2 Input range

Model	Input range
ST1AD2-V	-10 to 10V
	0 to 10V
	0 to 5V
	1 to 5V
	User range setting
ST1AD2-I	4 to 20mA
	0 to 20mA
	User range setting

(a) Measurement range setting

Set the measurement range.

Select a measurement range from the following.

Table 5.3 Measurement range setting

Measurement range	
Pt100	-200 to 850 ℃
	-20 to 120 ℃
	0 to 200 ℃
Pt1000	-200 to 850 ℃
	-20 to 120 ℃
	0 to 200 ℃

(b) Setting range

The actual measurement range setting used in the ST1RD2 is shown here, and cannot be changed here.

(c) Offset/gain value selection

Select Factory default or User range setting.

(d) Conversion enable/disable setting

Conversion can be enabled or disabled.

Disable : Conversion disabled

Enable : Conversion enabled

(e) Averaging processing specification

Specify Sampling processing, Time or Count averaging, Moving average or Primary delay filter.

(f) Alarm output setting

Alarm output can be enabled or disabled.

Disable : No alarm output

Enable : Alarm output performed

(g) Conversion setting for disconnection detection

Specify the conversion setting that is applied when disconnection is detected.

Value immediately before disconnection

Up scale

Down scale

Given value

(h) Time/count/moving average/time constant setting

Set a value for Time, Count, Moving average or Time constant.

The setting ranges are shown below.

Average time : 640 to 5000ms

Average number of times : 4 to 500 times

Moving average : 4 to 60 times

Time constant : 80 to 5000ms

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(i) Upper upper limit value/Upper lower limit value/Lower upper limit value/Lower lower limit value

Set the upper value of upper limit, lower value of upper limit, upper value of lower limit and lower value of lower limit for alarm output.

Setting range on each measurement range is shown below.

Set the value in units of 0.1 ℃.

[Example] To set to 0.3 ..... Enter "3".

Table 5.4 Setting range for each measurement range

Measurement range		Setting range
Pt100 Pt1000	-200 to 850 ℃	-2000 to 8500
	-20 to 120 ℃	-200 to 1200
	0 to 200 ℃	0 to 2000

(j) Sensor compensation value setting

Set a sensor compensation value.

The setting range for the sensor compensation value is -200 to 200.

Set the value in units of 0.1 ℃.

[Example] To set to 0.3 ..... Enter "3".

(k) Conversion setting value for disconnection

Specify a conversion setting value applied when disconnection is detected.

The setting range of the conversion setting value for disconnection detection is -32768 to 32767.

Set the value in units of 0.1 ℃.

[Example] To set to 0.3 ..... Enter "3".

(5) Parameter writing operation

1) In Input/Output Monitor of GX Configurator-ST, check that ⬚Bw.n+1⬚ convert setting request is OFF (0).(☞ Section 5.4 Input/Output Monitor)

2) From the "Channel:" pull-down menu, select a channel for parameter setting.

3) Select parameter items to be written to the ST1RD2 by checking the corresponding "Select" check boxes.

4) Set values in the "Setting Value" fields.

5) Select the target memory (RAM or ROM) from the pull-down menu of "Target Memory".

6) Click the ⬚Download⬚ button.

When writing the parameters of multiple channels to the ST1RD2, perform the steps 2) to 6) for each channel.

⊠POINT

Before writing parameters, make sure that ⬚Bw.n+1⬚ convert setting request is OFF (0).

If ⬚Bw.n+1⬚ convert setting request is ON (1), parameters cannot be written.

5.4 Input/Output Monitor

This section explains how to monitor the I/O data of the ST1RD2.

(1) Mode changing
Click [Mode] → [Diagnosis]

(2) "Input/Output Monitor" screen display
1) Select ST1RD2 on the "System Monitor" screen.

2) Click the | Input/Output Monitor | button.
Monitoring starts as soon as the "Input/Output Monitor" screen is displayed.

(3) Display/setting screen
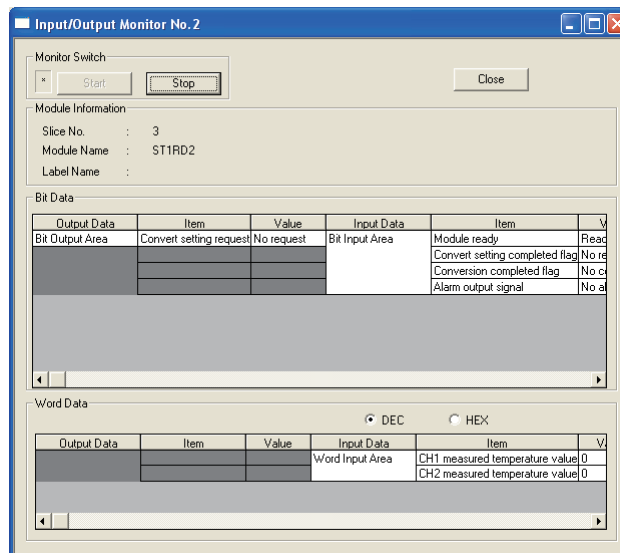
Figure 5.3 Input/Output Monitor screen

(4) Display/setting details

(a) Bit Data

Table 5.5 Bit Data list

Input/Output Data	Item	Description
Bit Output Area	Convert setting request	The status of	Bw.n+1	convert setting request is displayed.
Bit Input Area	Module ready	The status of	Br.n	module ready is displayed.
	Convert setting completed flag	The status of	Br.n+1	convert setting completed flag is displayed.
	Conversion completed flag	The status of	Br.n+2	Conversion completed flag is displayed.
	Alarm output signal	The status of	Br.n+3	alarm output signal is displayed.

(b) Word Data

The display format (decimal/hexadecimal) can be changed.

Table 5.6 Word Data list

Input/Output Data	Item	Description
Word Input Area	CH□ measured temperature value	The values of ⌐Wr.n⌐ and ⌐Wr.n+1⌐ CH□ measured temperature values are displayed.

5.5 Forced Output Test

This section explains a forced output test.
Conduct the test after setting values to the bit output area of the ST1RD2.

(1) Mode changing

Click [Mode] → [Diagnosis]

(2) "Forced Output Test" screen display

1) Select ST1RD2 on the "System Monitor" screen.

2) Click the [Forced Output Test] button.

(3) Display/setting screen
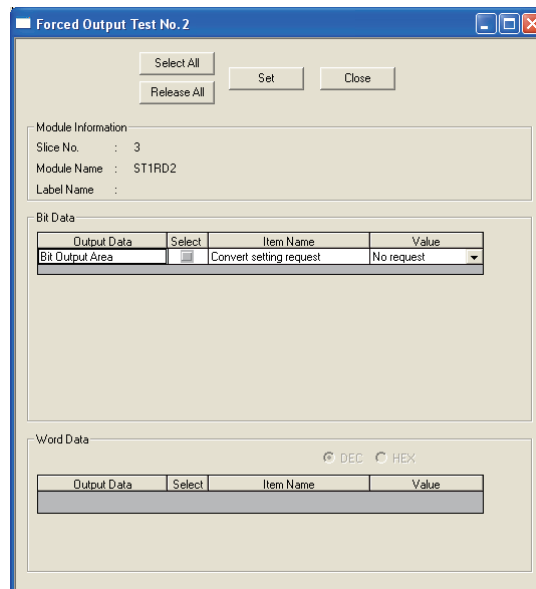
Figure 5.4 Forced output test screen

(4) Display/setting details

(a) Bit Data

Table 5.7 Bit Data list

Output Data	Item	Description
Bit Output Area	Convert setting request	The setting of [Bw.n+1] convert setting request can be changed.

(b) Word Data

Unavailable for the ST1RD2.

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(5) Test operation

(a) Select the test item by checking the corresponding "Select" check box.

(b) Make setting in the "Value" filed.

(c) Click the [Set] button.[*1]

Clicking the [Set] button executes the test.

* 1 When the module is not in the forced output test mode, a screen appears asking whether to switch
to the forced output test mode.Click the [OK] button to switch to the forced output test mode.
When the forced output test mode is activated, the RUN LED of the head module flashes.

▧**POINT** ─────────────────────────────

When having exited the forced output test mode, make sure that the RUN LED of
the head module is on.

──

5.6 Offset/Gain Setting

This section explains how to make offset/gain setting.

(1) Measurement range setting

Set the measurement range for the offset/gain setting on the parameter setting screen.

For the parameter setting, refer to the following.

☞ Section 5.3 Parameter Setting

(2) Mode changing

Click [Mode] → [Diagnosis]

(3) "Offset/Gain Setting" screen display

1) Select ST1RD2 on the "System Monitor" screen.

2) Click the ⌐ Offset/Gain Setting ⌐ button.[1]

  * 1 When the module is not in the forced output test mode, a screen appears asking whether to switch to the forced output test mode. Click the ⌐OK⌐ button to switch to the forced output test mode. When the forced output test mode is activated, the RUN LED of the head module flashes.

3) As a screen appears asking whether to switch to the offset/gain setting mode, click the ⌐OK⌐ button to switch to the offset/gain setting mode.

   After being switched to the offset/gain setting mode, the RUN LED of ST1RD2 flashes (0.5s interval) and the ST1AD stops.

(4) Display/setting screen
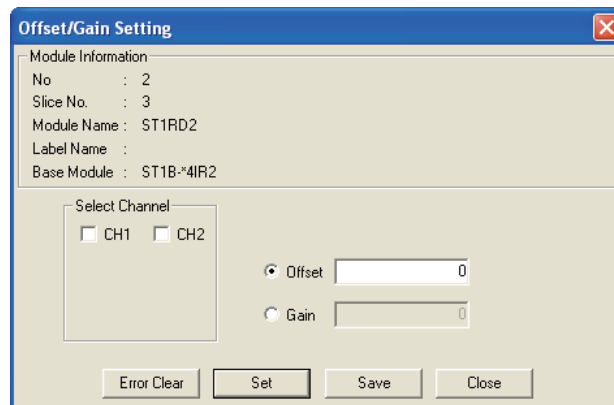
Figure 5.5 Offset/gain setting screen

(5) Offset/gain setting operation

When setting different offset and gain values for different channels, perform the operations in (a), (b) for each channel.

Perform the operation in (c) only once at the end since it writes the offset/gain settings of all channels to the ST1AD.

(a) Offset value setting operation

1) Select a channel by checking the corresponding "Select channel" check box. By checking multiple check boxes, values can be set to multiple channels at the same time.

2) Specify "Offset".

3) Apply an offset value input to the channel to be adjusted to display a temperature value equivalent to the input, and click the ⎡ Set ⎤ button. The setting is performed in units of 0.1 ℃.

[Example] To set to 0.3 ℃ ..... Set "3".
Setting range on each measurement range is shown below.

Table 5.8 Setting range for each measurement range

Measurement range		Setting range
Pt100 Pt1000	-200 to 850 ℃	−2000 to 8500
	-20 to 120 ℃	−200 to 1200
	0 to 200 ℃	0 to 2000

(b) Gain value setting operation

1) Select a channel by checking the corresponding "Select channel" check box. By checking multiple check boxes, values can be set to multiple channels at the same time.

2) Specify "Gain".

3) Apply a gain value input to the channel to be adjusted to display a temperature value equivalent to the input, and click the ⎡ Set ⎤ button. The setting is performed in units of 0.1 ℃.

[Example] To set to 0.3 ℃.....Set "3".
Setting range on each measurement range is shown below.

Table 5.9 Setting range for each measurement range

Measurement range		Setting range
Pt100 Pt1000	-200 to 850 ℃	−2000 to 8500
	-20 to 120 ℃	−200 to 1200
	0 to 200 ℃	0 to 2000

(c) Offset/gain setting writing operation

Click the ⎡ Save ⎤ button.

The offset/gain settings of all channels are written to the ST1RD2.

✕POINT

(1) An error occurs if the ⬚Save⬚ button is clicked in either of the following conditions. (☞ Section 9.1 Error Code List)
- Offset value ≧ Gain value (Error code: 400☐ H)
- (Gain value) - (Offset value) ☞ 0.2 [℃] (Error code: 410☐ H)

  If an error occurred, click the ⬚Error Clear⬚ button to clear the error, and set it again.

(2) When the offset/gain setting screen is closed, the screen displays a message that asks if you are sure to change to the normal mode. Click the ⬚OK⬚ button to change to the normal mode.
  When the module enters the normal mode, the RUN LED of the ST1RD2 turns on.

(3) When having exited the forced output test mode, make sure that the RUN LED of the head module is on.

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CHAPTER6   PROGRAMMING

This chapter describes example programs available when the QJ61BT11N is used as a master station.

6.1   Programming Procedure

According to the following procedure, create a program for executing temperature conversion of the ST1RD2.
When applying any of the program examples introduced in this chapter to the actual system, verify the applicability and confirm that no problems will occur in the system control.
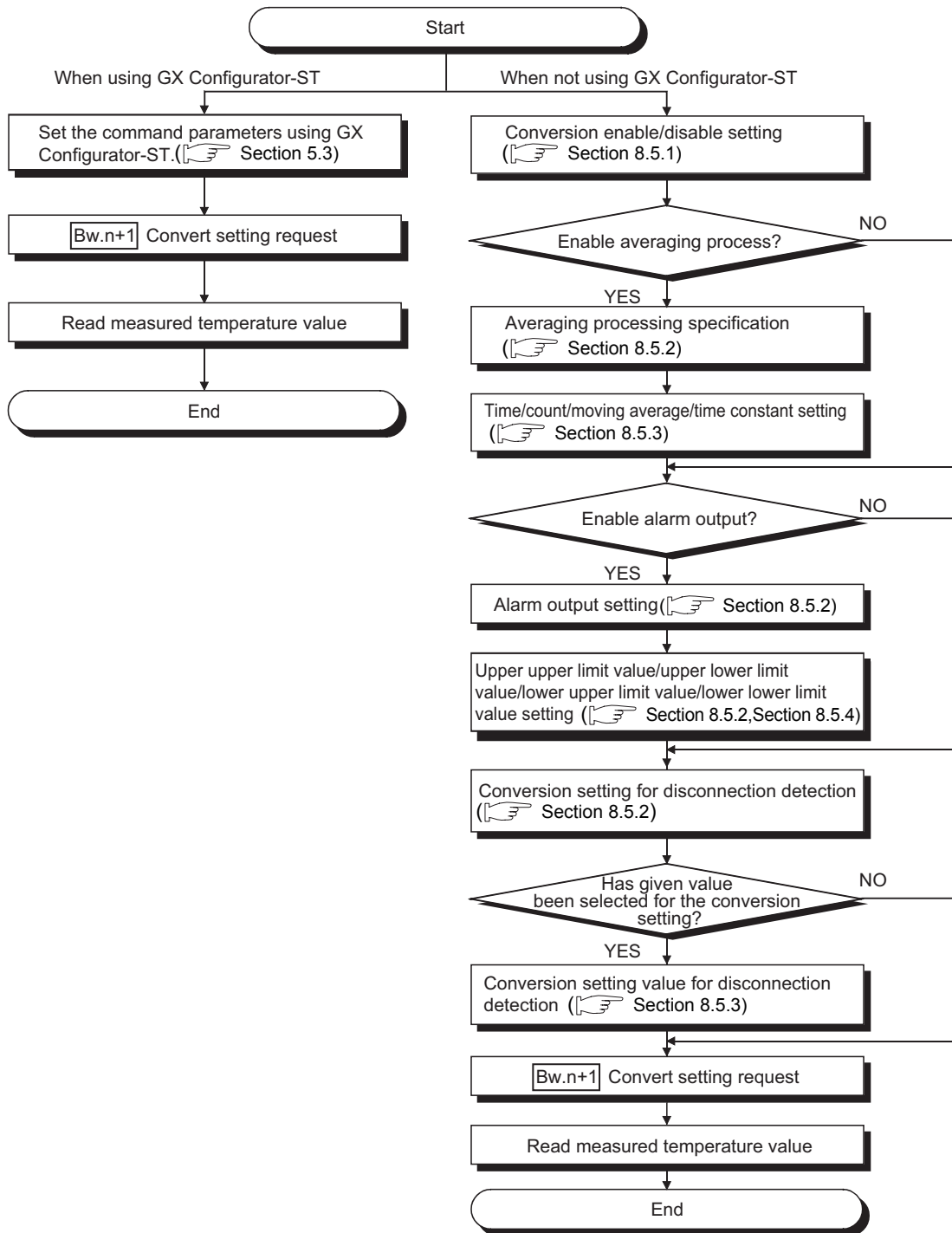
Figure 6.1 Programming procedure

⊠**POINT**

(1) With one dedicated instruction (RDMSG), up to eight commands can be simultaneously executed.
   However, the following commands cannot be executed with any other command at the same time.
   Initial data batch write request (command No.: 8106H)
   Initial data individual write request (command No.: 8107H/0107H)
   If executed simultaneously, an error will occur.

(2) The sizes of $\boxed{\text{Cw}}$ Command execution area and $\boxed{\text{Cr}}$ Command result area vary depending on the command.

(3) In the following cases, commands cannot be executed. Therefore, execute the command after following cases finished.
   • The head module is executing the self-diagnostics function.
   • A slice module is being replaced online.
   • Another command is in execution. (The dedicated instruction (RDMSG) is not completed.)

(4) For online module change, advance preparation may be required depending on the operating conditions. For details, refer to the following.
   ☞ Section 7.2 Preparations for Online Module Change

6.2 System Configuration Example

The following system example is used for the programs described in this chapter.

Remote net Ver.2 mode
Master station Station No.0
Configuration of
Q25HCPU
QJ61BT11N
and QX41

Ver.1 remote I/O station
(16-point input module)
Station No.1, 1 station
occupied

Ver.1 remote I/O station
(16-point output module)
Station No.2, 1 station
occupied

Ver.1 remote device station
(single setting) Station
No.3, 1 station occupied

·ST1H-BT
·ST1PSD
·ST1RD2

Terminating resistor

CC-Link

Terminating resistor

Figure 6.2 System configuration example

(1) System configuration of master station

Table 6.1 System configuration of master station

Module	Input signal	Output signal
Q25HCPU	-	-
QJ61BT11N	X00 to X1F	Y00 to 1F
QX41	X20 to X3F	-

(2) MELSEC-ST system configuration

Table 6.2 I/O points sheet

Slice position No.	Start slice No. (No. of occupied slices)	Module name	Br.n	Bw.n	Wr.n	Ww.n	5V DC internal current consumption (Total)	24V DC current (Total)	Slot width (Total)
	0(2)	ST1H-BT	0	0	0	0	0.410A(0.410A)	0A(0A)	-
	2(1)	ST1PSD	0	0	0	0	-	-	25.2mm (25.2mm)
	3(2)	ST1RD2	4	4	2	0	0.080A(0.490A)	*1	12.6mm (37.8mm)
Total			4 (252 bits or less)*2	4 (252 bits or less)*2	2 (52 words or less)	0 (52 words or less)	-	-	37.8mm (850mm or more)

* 1 The 24V DC current varies depending on the external device connected to each slice module. Check the current consumption of external devices connected to slice modules, and calculate the total value. (☞ MELSEC-ST System User's Manual)

* 2 The number of available points reduces by two points for each additional power distribution module.

6.3 Settings and Communication Data

After determining the system configuration, set parameters to the programmable controller CPU of the master station.

(1) Setting PLC parameters (I/O assignment)

Connect GX Developer to the programmable controller CPU of the master station, and set PLC parameters as shown below.
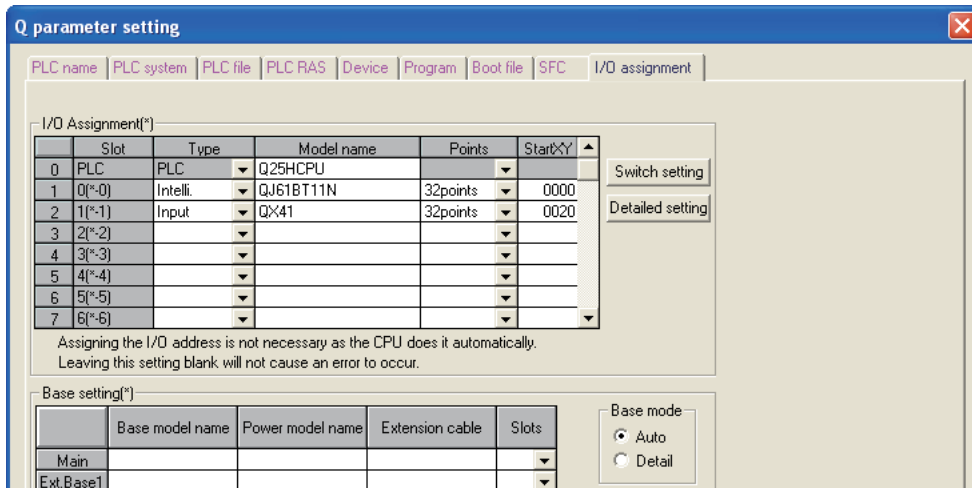
Figure 6.3 I/O assignment

(2) Network parameters

Connect GX Developer to the programmable controller CPU of the master station, and set network parameters as shown below.
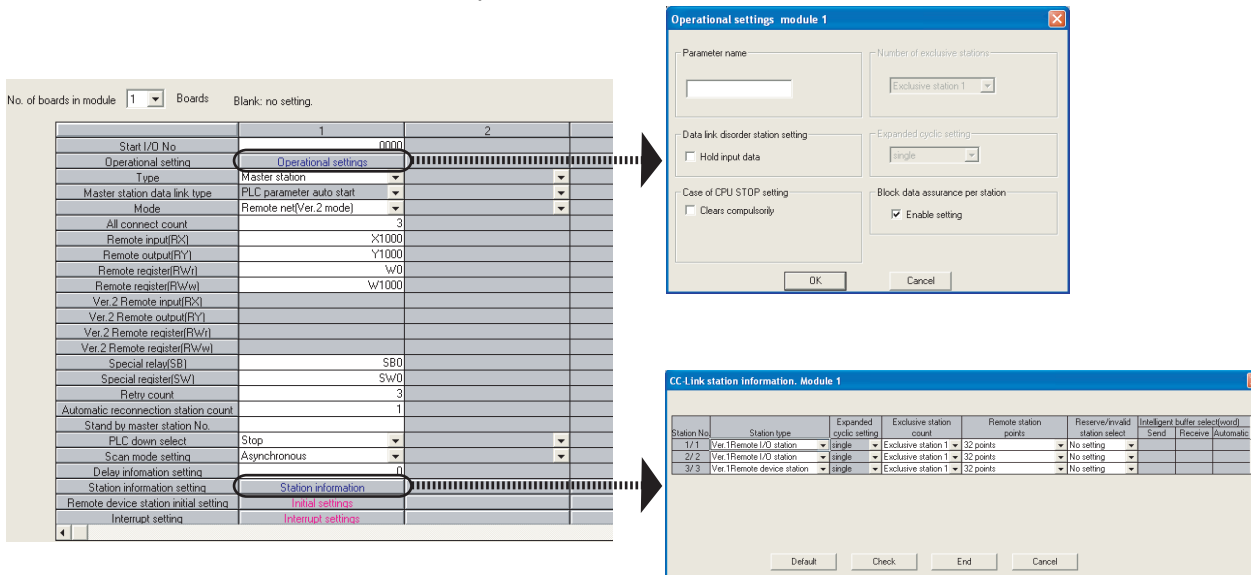
Figure 6.4 Setting network parameters

(3) I/O data assignment

The following are I/O data assignment results for the system configuration example in this chapter.

The I/O points sheet is useful for I/O data assignment.

For details of the I/O data assignment sheet, refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual, "Appendix 3.2 Input data assignment sheet, Appendix 3.3 Output data assignment sheet"

(a) "Br" Bit input area (Remote input (RX))
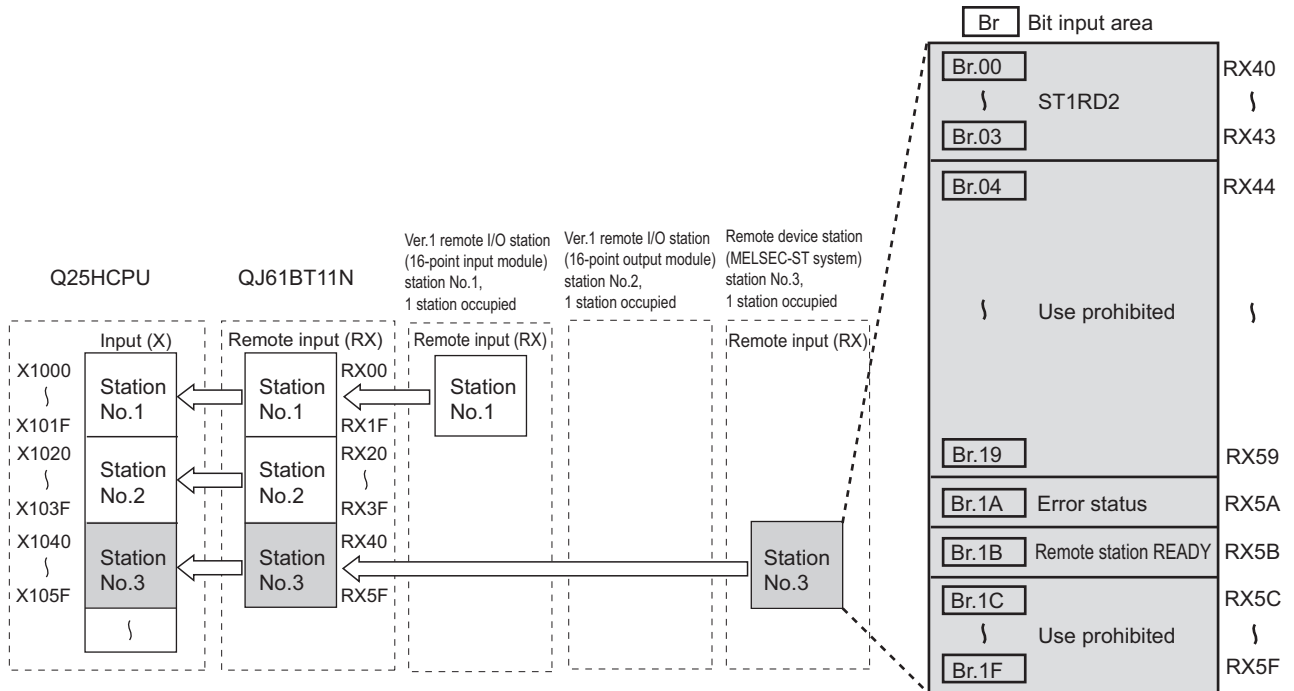
Figure 6.5 "Br" Bit input area (remote input (RX))

Table 6.3 "Br" Bit input area assignment sheet

Master station		Remote device station (MELSEC-ST system)			
Device	Remote input (RX)	Slice position No.	Module name	Br.n	Data name
X1040	RX40			Br.00	Module READY
X1041	RX41			Br.01	Convert setting completion flag
X1042	RX42	2	ST1RD2	Br.02	Conversion complete flag
X1043	RX43			Br.03	Alarm output signal
X1044	RX44	-	-	Br.04	Use prohibited
to			to		
X1059	RX59	-	-	Br.19	Use prohibited
X105A	RX5A	-	-	Br.1A	Error status [1]
X105B	RX5B	-	-	Br.1B	Remote station READY [1]
X105C	RX5C	-	-	Br.1C	Use prohibited
to			to		
X105F	RX5F	-	-	Br.1F	Use prohibited

* 1 Error status (RXnA) and Remote station READY (RXnB) are remote input areas of the head module. For details of remote input, refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual, "3.4 Remote I/O, Remote Registers"

(b) "Bw" Bit output area (Remote output (RY))
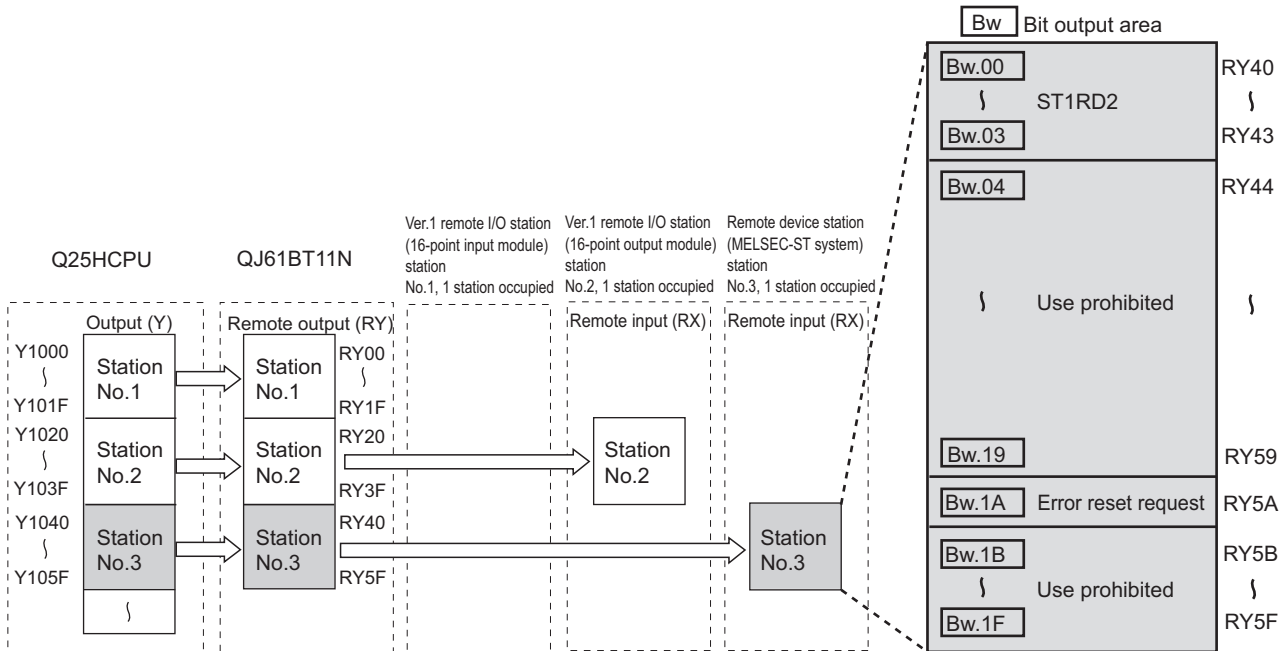
Figure 6.6 "Bw" Bit output area (Remote output (RY))

Table 6.4 "Bw" Bit output area assignment sheet

Master station		Remote device station (MELSEC-ST system)			
Device	Remote output (RY)	Slice position No.	Module name	Bw.n	Data name
Y1040	RY40	2	ST1RD2	Bw.00	Use prohibited
Y1041	RY41			Bw.01	Convert setting request
Y1042	RY42			Bw.02	Use prohibited
Y1043	RY43			Bw.03	Use prohibited
Y1044	RY44	-	-	Bw.04	Use prohibited
to			to		
Y1059	RY59	-	-	Bw.19	Use prohibited
Y105A	RY5A	-	-	Bw.1A	Error reset request [1]
Y105B	RY5B	-	-	Bw.1B	Use prohibited
to			to		
Y105F	RY5F	-	-	Bw.1F	Use prohibited

* 1 Error reset request (RYnA) is a remote output area of the head module.
For details of Error reset request (RYnA), refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual, "3.4 Remote I/O, Remote Registers"

(c) "Wr" Word input area (remote input (RWr))
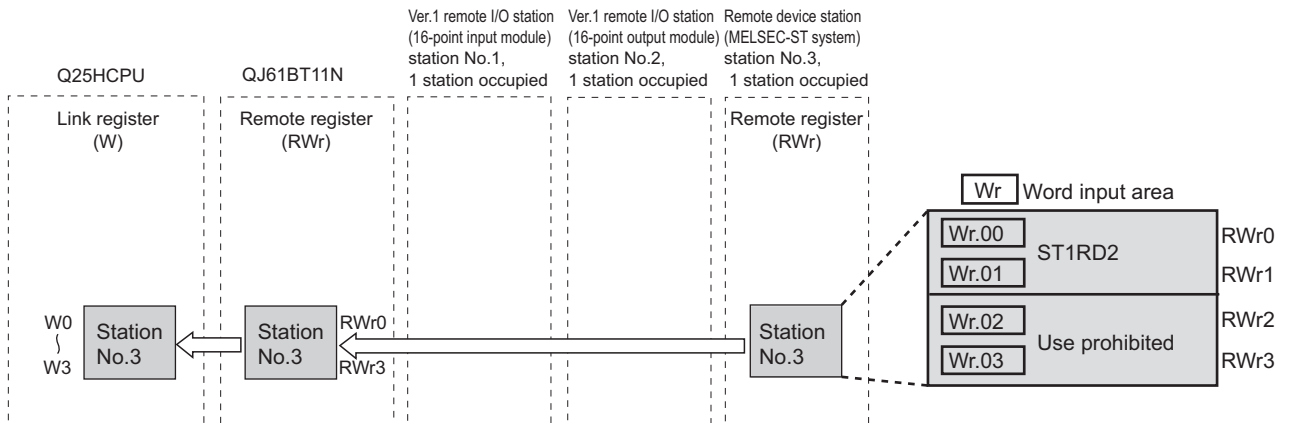
Figure 6.7 "Wr" Word input area (remote input (RWr))

Table 6.5 "Wr" Word input area assignment sheet

Master station		Remote device station (MELSEC-ST system)			
Device	Remote register (RWr)	Slice position No.	Module name	Wr.n	Data name
W0	RWr0	2	ST1RD2	Wr.00	CH1 measured temperature value
W1	RWr1			Wr.01	CH2 measured temperature value
W2	RWr2	-	-	Wr.02	Use prohibited
W3	RWr3			Wr.03	Use prohibited

6.4   Program Examples

A program example is shown below.
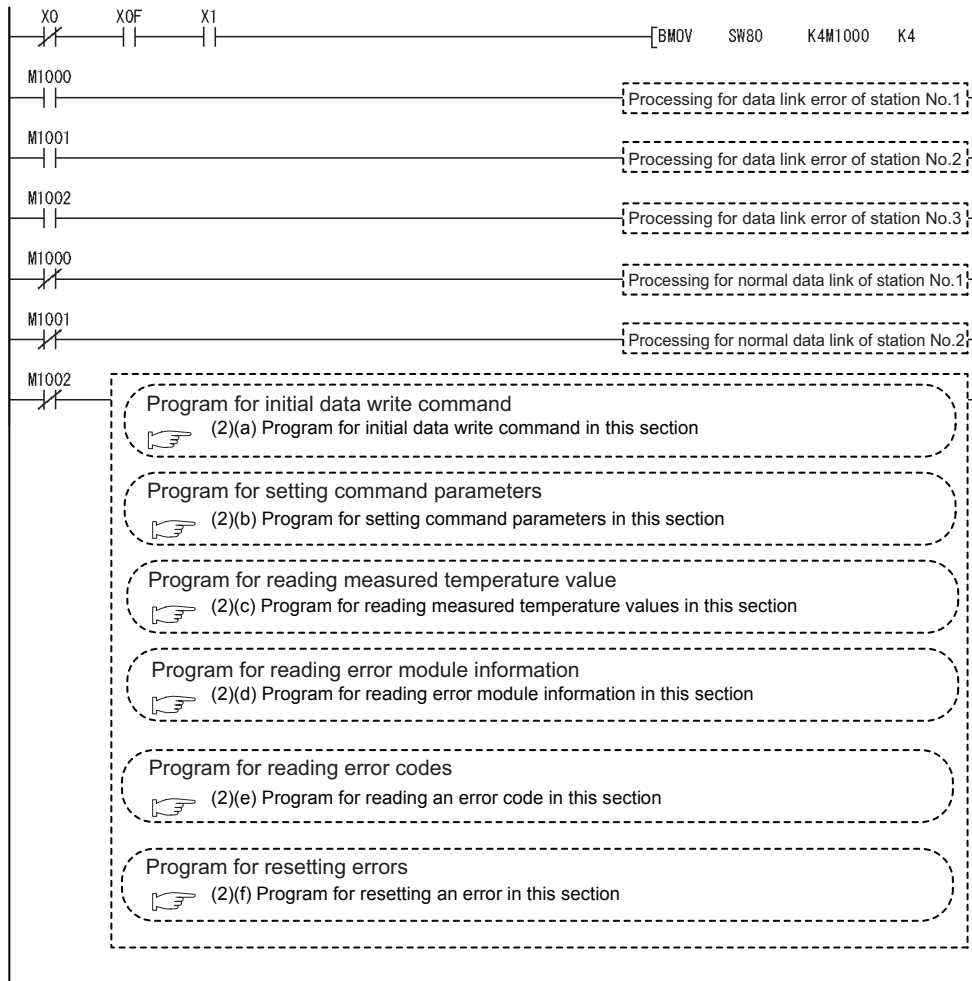
Figure 6.8 Program example

(1) Device assignments in program examples

The devices used common to the program examples (2) in this section and later are shown below.

For devices used for each program example, refer to the following.

☞ (2) Program examples in this section

(a) Special relay (SM) and special register (SD)

Table 6.6 Special relay (SM) and special register (SD)

Device	Application	Device	Application
SM0	Diagnostic error	SD0	Diagnostic error

(b) Devices used by the QJ61BT11N (master station)

Table 6.7 Devices used by the QJ61BT11N (master station)

Device	Application	Device	Application
X00	Module error		-
X01	Own data link status		
X0F	Module READY		
SB0 to SB1FF	Link special relay (SB) of the QJ61BT11N	SW0 to SW1FF	Link special register (SW) of the QJ61BT11N

(c) Devices used by the user

Table 6.8 Devices for checking Other station data link status

Device	Application	Device	Application
M1000	Other station data link status (station No.1)	M1002	Data link status of the ST1H-BT (station No.3)
M1001	Other station data link status (station No.2)		-

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(2) Program examples

(a) Program for initial data write command
Execute Initial data individual write request (command No.: 8107H) with the dedicated instruction (RDMSG) of the master station to set command parameters.

1) Setting details of command parameters
In this program, the following parameters are set.

Table 6.9 Setting details of command parameters

Item		Setting	Reference section
ST1RD2	CH1 Offset/gain value selection	Factory default	Section 8.3.2
	CH2 Offset/gain value selection	Factory default	
	CH1 Measurement range setting	Pt100 (-200 to 850 ℃)	
	CH2 Measurement range setting	Pt100 (-200 to 850 ℃)	

2) Device assignments in the program example

Table 6.10 Device assignments in the program example

Device	Application	Device	Application
M2020	Completion device	D1000 to D1004	Control data
M2021	Completion status indicator device	D1500 to D1506	Send data (execution data of the command)
M3000	Initial data individual write flag	D1700 to D1704	Receive data (result data of the command)

3) Program example

	MOVP	H0	D1000		Clears Completion status
	MOVP	H3	D1001		Target station No.: 3
	MOVP	H0E	D1002		Send data size
	MOVP	H0A	D1003		Receivable data size
	MOVP	H0	D1004		Clears receive data size
	MOVP	K1	D1500		No. of commands to be executed
	MOVP	H0	D1501		Fixed to 0000H
	MOVP	H8107	D1502		Initial data individual write request (Command No.: 8107H)
	MOVP	H1	D1503		Number of data for which command parameters are set
	MOVP	H2	D1504		Slice position No.: 2
	MOVP	H8400	D1505		Module-specific No. Offset/gain value selection
	MOVP	H0	D1506		Measurement range setting CH1,CH2 : Pt100 (-200 to 850℃)
	GP. RDMSG	U0 D1000 D1500 D1700 M2020			Executes dedicated instruction (RDMSG)

Figure 6.9 Program for initial data write command

(b) Program for setting command parameters
Execute a command of the ST1RD2 with the dedicated instruction (RDMSG) of the master station to set command parameters.

1) Setting details of command parameters
In this program, the following command parameters are set.

Table 6.11 Setting details of command parameters

	Item	Setting	Reference section
ST1AD2-V	CH1 Conversion enable/disable setting	Conversion enabled	Section 8.5.1
	CH2 Conversion enable/disable setting	Conversion enabled	
	CH1 Averaging processing specification	Count averaging	Section 8.5.2
	CH2 Averaging processing specification	Sampling processing	
	CH1 Time/count/moving average/time constant setting	50 times	Section 8.5.3
	CH2 Time/count/moving average/time constant setting	No setting	
	CH1 Alarm output setting	Alarm output enabled	Section 8.5.2
	CH2 Alarm output setting	No alarm output	
	CH1 Conversion setting for disconnection detection	Given value	
	CH2 Conversion setting for disconnection detection	Value immediately before disconnection	
	CH1 Upper upper limit value, Upper lower limit value	Upper upper limit value: 300 ℃	Section 8.5.4
		Upper lower limit value: 300 ℃	
	CH2 Upper upper limit value, Upper lower limit value	No setting	
	CH1 Lower upper limit value, Lower lower limit value	Lower upper limit value: 10 ℃	Section 8.5.5
		Lower lower limit value: 10 ℃	
	CH2 Lower upper limit value, Lower lower limit value	No setting	
	CH1 Sensor compensation value setting	0.2 ℃	Section 8.5.6
	CH2 Sensor compensation value setting	No setting	
	CH1 Conversion setting value for disconnection	5000	Section 8.5.7
	CH2 Conversion setting value for disconnection	No setting	

2) Device assignments in the program example

Table 6.12 Device assignments in the program example

Device	Application	Device	Application
M2030	Completion device (for simultaneous execution of multiple commands)	D1000 to D1004	Control data
M2031	Completion status indicator device (for simultaneous execution of multiple commands)	D1100 to D1104	Send data (execution data for each command execution)
M2040	Completion device (for separate execution of each command)	D1300 to D1304	Receive data (execution data for each command execution)
M2041	Completion status indicator device (for separate execution of each command)	D2000 to D2028	Send data (for simultaneous execution of multiple commands)
M4000	Conversion enable/disable setting write flag	D3000 to D3028	Receive data (for simultaneous execution of multiple commands)
M4001	Operation condition specification value write flag		
M4002	Time/number of times/moving average/time constant setting write flag		
M4003	CH1 upper upper limit value/upper lower limit value setting write flag		
M4004	CH1 lower upper limit value/lower lower limit value setting write flag	-	-
M4005	Sensor compensation value write flag		
M4006	Conversion setting value (for disconnection detection) write flag		
M4007	Command parameter write flag (for simultaneous execution of multiple commands)		

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3) Program example (when multiple commands are simultaneously executed)
The following is a program example for simultaneous execution of multiple commands.

M4007 X105A X1040	[MOVP H0 D1000]	Clears Completion status
	[MOVP H3 D1001]	Target station No.: 3
	[MOVP H3A D1002]	Send data size
	[MOVP H3A D1003]	Receivable data size
	[MOVP H0 D1004]	Clears receive data size
	[MOVP K7 D2000]	No. of commands to be executed
	[MOVP H2 D2001]	Slice position No.: 2
	[MOVP H0A400 D2002]	Conversion enable/disable setting write (Command No.: A400H)
	[MOVP H0 D2003]	CH1: Conversion enable CH2: Conversion enable
	[MOVP H0 D2004]	Fixed to 0000H
	[MOVP H2 D2005]	Slice position No.: 2
	[MOVP H0A402 D2006]	Operation condition set value write (Command No.: A402H)
	[MOVP H2 D2007]	CH1: Count averaging CH2: Sampling processing
	[MOVP H301 D2008]	CH1: Alarm output processing performed CH2: No setting CH1: Given value CH2: Value Immediately before disconnection
	[MOVP H2 D2009]	Slice position No.: 2
	[MOVP H0A404 D2010]	CH □ time/count/moving average/time constant setting value write (Command No.: A404H)
	[MOVP K50 D2011]	Set value: 50 times
	[MOVP K0 D2012]	No setting

Figure 6.10 Program for setting command parameters (when multiple commands are simultaneously executed)

```
  M4007    X105A    X1040
   │ ├──────┤/├──────┤ ├──────────────────────────────[MOVP    H2        D2013 ]  Slice position No.: 2

                                                       [MOVP    H0A408    D2014 ]  CH1 upper upper/upper
                                                                                    lower limit set value write
                                                                                    (Command No.: A408H)

                                                       [MOVP    K3000     D2015 ]  CH1 Upper upper limit
                                                                                    value setting: 300℃

                                                       [MOVP    K3000     D2016 ]  CH1 Upper lower limit
                                                                                    value setting: 300℃

                                                       [MOVP    H2        D2017 ]  Slice position No.: 2

                                                       [MOVP    H0A409    D2018 ]  CH1 lower upper/ lower
                                                                                    lower limit set value write
                                                                                    (Command No.: A409H)

                                                       [MOVP    K100      D2019 ]  CH1 Lower upper limit
                                                                                    value setting: 10℃

                                                       [MOVP    K100      D2020 ]  CH1 Lower lower limit
                                                                                    value setting: 10℃

                                                       [MOVP    H2        D2021 ]  Slice position No.: 2

                                                       [MOVP    H0A41A    D2022 ]  Sensor compensation
                                                                                    value write
                                                                                    (Command No.: A41AH)

                                                       [MOVP    H2        D2023 ]  CH1 Sensor compensation
                                                                                    value: 0.2℃

                                                       [MOVP    H0        D2024 ]  CH2 Sensor compensation
                                                                                    value: No setting

                                                       [MOVP    H2        D2025 ]  Slice position No.: 2

                                                       [MOVP    H0A41E    D2026 ]  Conversion setting value
                                                                                    (for disconnection detection) write
                                                                                    (Command No.: A41EH)

                                                       [MOVP    K5000     D2027 ]  CH1 Conversion setting
                                                                                    value for disconnection
                                                                                    detection

                                                       [MOVP    H0        D2028 ]  CH2 Conversion setting
                                                                                    value for disconnection
                                                                                    detection

                     [GP. RDMSG    U0    D1000    D2000    D3000    M2030 ]  Executes dedicated
                                                                              instruction (RDMSG)
```
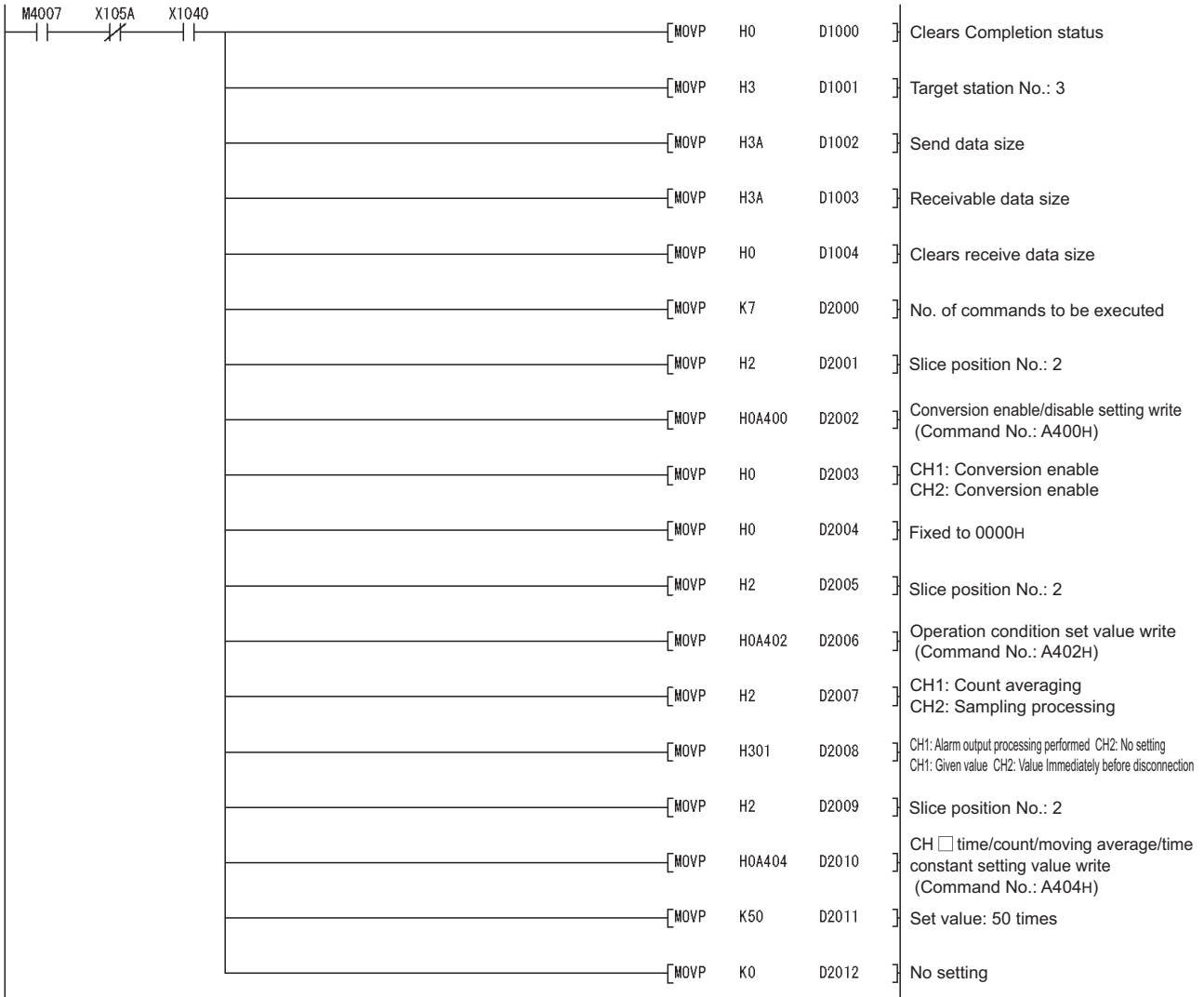
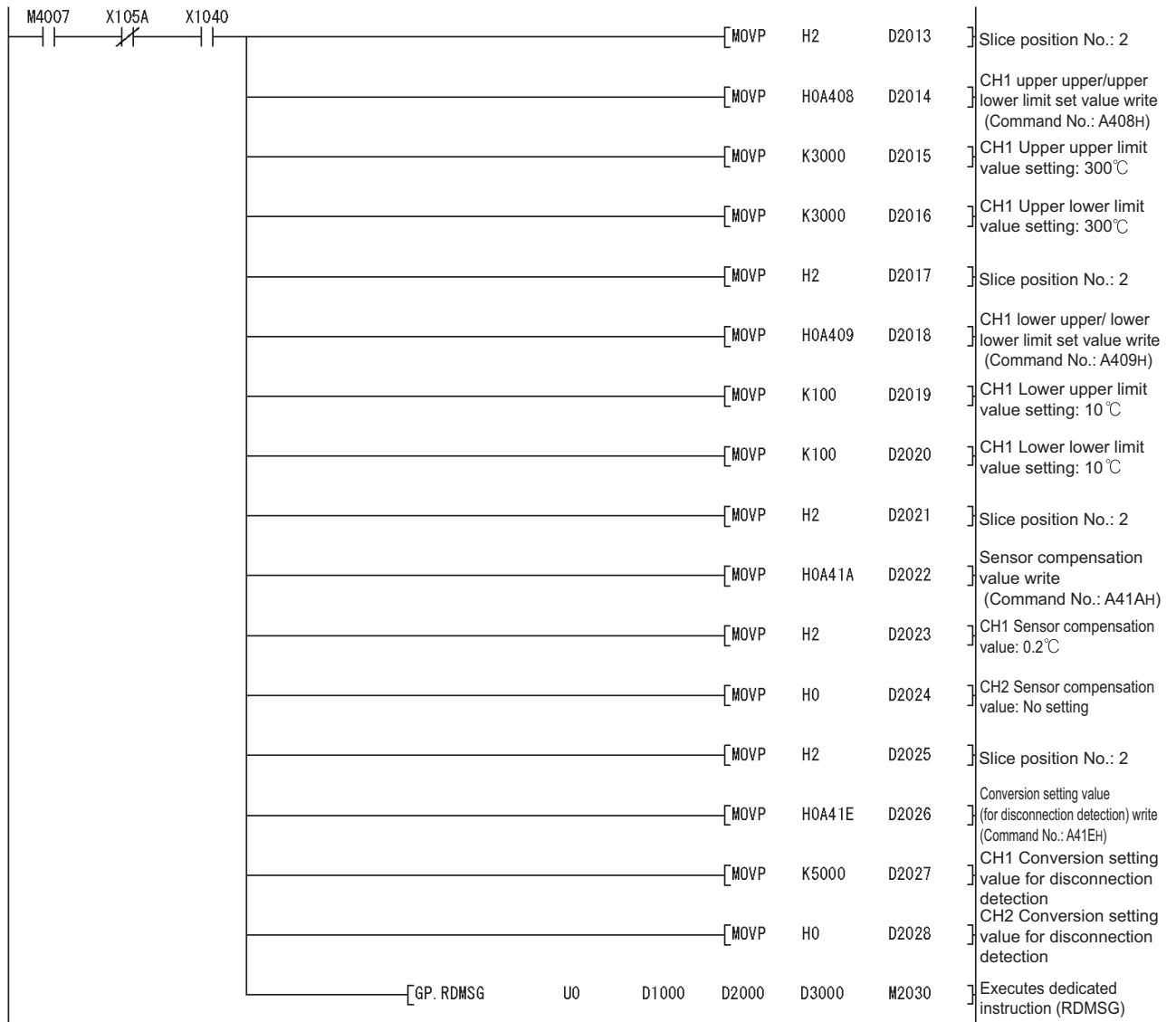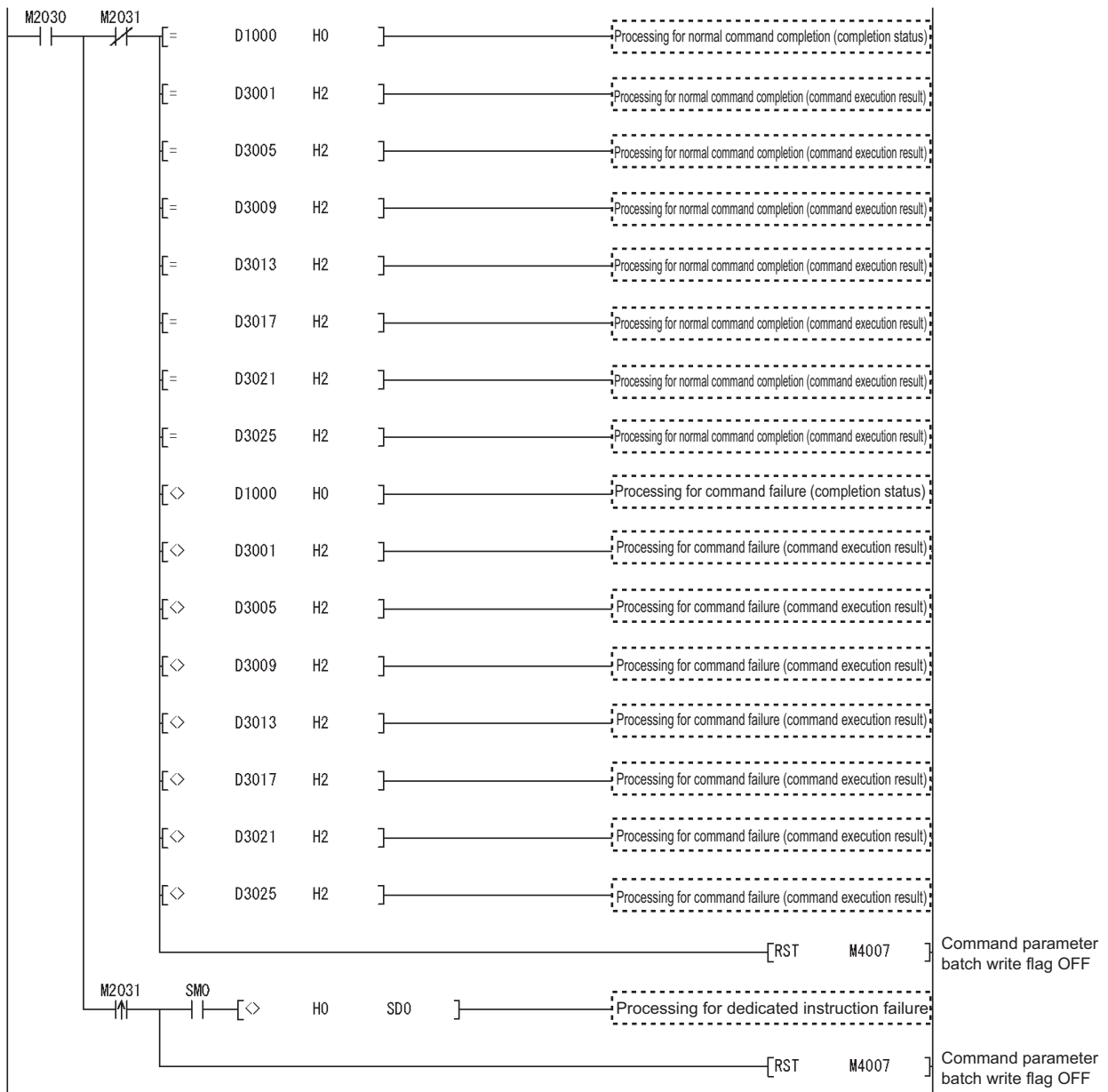**Figure 6.10 Program for setting command parameters (when multiple commands are simultaneously executed) (continued)**

[=	D1000	H0	]	Processing for normal command completion (completion status)
[=	D3001	H2	]	Processing for normal command completion (command execution result)
[=	D3005	H2	]	Processing for normal command completion (command execution result)
[=	D3009	H2	]	Processing for normal command completion (command execution result)
[=	D3013	H2	]	Processing for normal command completion (command execution result)
[=	D3017	H2	]	Processing for normal command completion (command execution result)
[=	D3021	H2	]	Processing for normal command completion (command execution result)
[=	D3025	H2	]	Processing for normal command completion (command execution result)
[<>	D1000	H0	]	Processing for command failure (completion status)
[<>	D3001	H2	]	Processing for command failure (command execution result)
[<>	D3005	H2	]	Processing for command failure (command execution result)
[<>	D3009	H2	]	Processing for command failure (command execution result)
[<>	D3013	H2	]	Processing for command failure (command execution result)
[<>	D3017	H2	]	Processing for command failure (command execution result)
[<>	D3021	H2	]	Processing for command failure (command execution result)
[<>	D3025	H2	]	Processing for command failure (command execution result)

[RST M4007] Command parameter batch write flag OFF

M2031 SM0 [<> H0 SD0] Processing for dedicated instruction failure

[RST M4007] Command parameter batch write flag OFF

Figure 6.10 Program for setting command parameters (when multiple commands are simultaneously executed) (continued)

4) Program example (when one command is executed at a time)

The following is a program example for executing a command at a time.
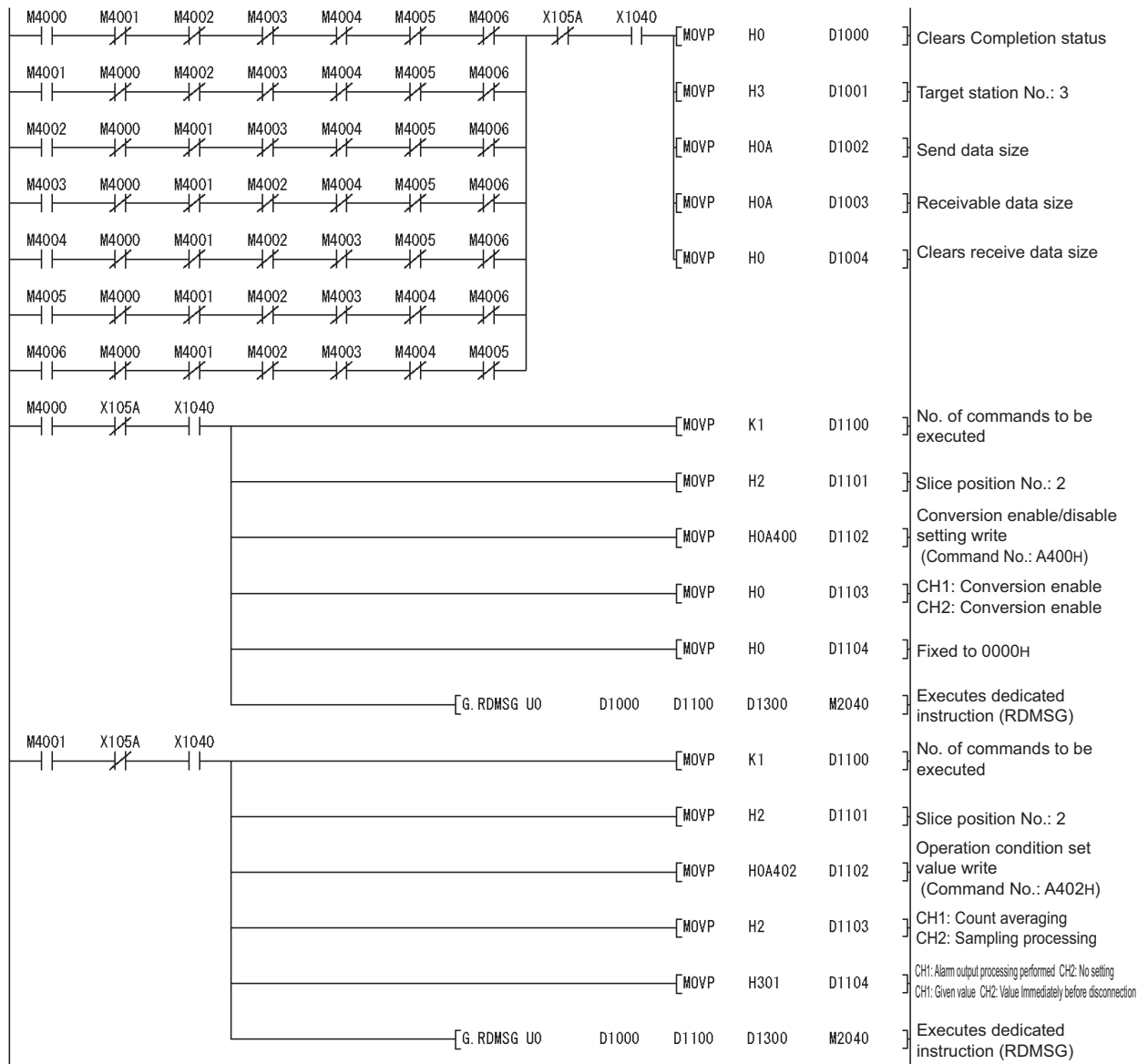
Figure 6.11 Program for setting command parameters (when one command is executed at a time)

```
M4002   X105A   X1040
──┤├─────┤/├─────┤├──────────────────────────[MOVP   K1       D1100 ]   No. of commands to be executed

                                              [MOVP   H2       D1101 ]   Slice position No.: 2

                                              [MOVP   H0A404   D1102 ]   CH☐ time/count/moving average/time
                                                                        constant setting value write
                                                                         (Command No.: A404H)

                                              [MOVP   K50      D1103 ]   Set value: 50 times

                                              [MOVP   H0       D1104 ]   No setting

                            [G.RDMSG U0   D1000   D1100   D1300   M2040 ]   Executes dedicated instruction
                                                                            (RDMSG)

M4003   X105A   X1040
──┤├─────┤/├─────┤├──────────────────────────[MOVP   K1       D1100 ]   No. of commands to be executed

                                              [MOVP   H2       D1101 ]   Slice position No.: 2

                                              [MOVP   H0A408   D1102 ]   CH1 upper upper/upper lower
                                                                        limit set value write
                                                                         (Command No.: A408H)

                                              [MOVP   K3000    D1103 ]   CH1 Upper upper limit value
                                                                        setting: 300℃

                                              [MOVP   K3000    D1104 ]   CH1 Upper lower limit value
                                                                        setting: 300℃

                            [G.RDMSG U0   D1000   D1100   D1300   M2040 ]   Executes dedicated instruction
                                                                            (RDMSG)

M4004   X105A   X1040
──┤├─────┤/├─────┤├──────────────────────────[MOVP   K1       D1100 ]   No. of commands to be executed

                                              [MOVP   H2       D1101 ]   Slice position No.: 2

                                              [MOVP   H0A409   D1102 ]   CH1 lower upper/ lower lower limit
                                                                        set value write
                                                                         (Command No.: A409H)

                                              [MOVP   K100     D1103 ]   CH1 Lower upper limit value
                                                                        setting: 10℃

                                              [MOVP   K100     D1104 ]   CH1 Lower lower limit value
                                                                        setting: 10℃

                            [G.RDMSG U0   D1000   D1100   D1300   M2040 ]   Executes dedicated instruction
                                                                            (RDMSG)

M4005   X105A   X1040
──┤├─────┤/├─────┤├──────────────────────────[MOVP   K1       D1100 ]   No. of commands to be executed

                                              [MOVP   H2       D1101 ]   Slice position No.: 2

                                              [MOVP   H0A41A   D1102 ]   Sensor compensation value write
                                                                         (Command No.: A41AH)

                                              [MOVP   H2       D1103 ]   CH1 Sensor compensation
                                                                        value: 0.2℃

                                              [MOVP   H0       D1104 ]   CH2 Sensor compensation value:
                                                                        No setting

                            [G.RDMSG U0   D1000   D1100   D1300   M2040 ]   Executes dedicated instruction
                                                                            (RDMSG)
```

Figure 6.11 Program for setting command parameters (when one command is executed at a time) (continued)

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Figure 6.11 Figure Program for setting command parameters (when one command is executed at a time) (continued)
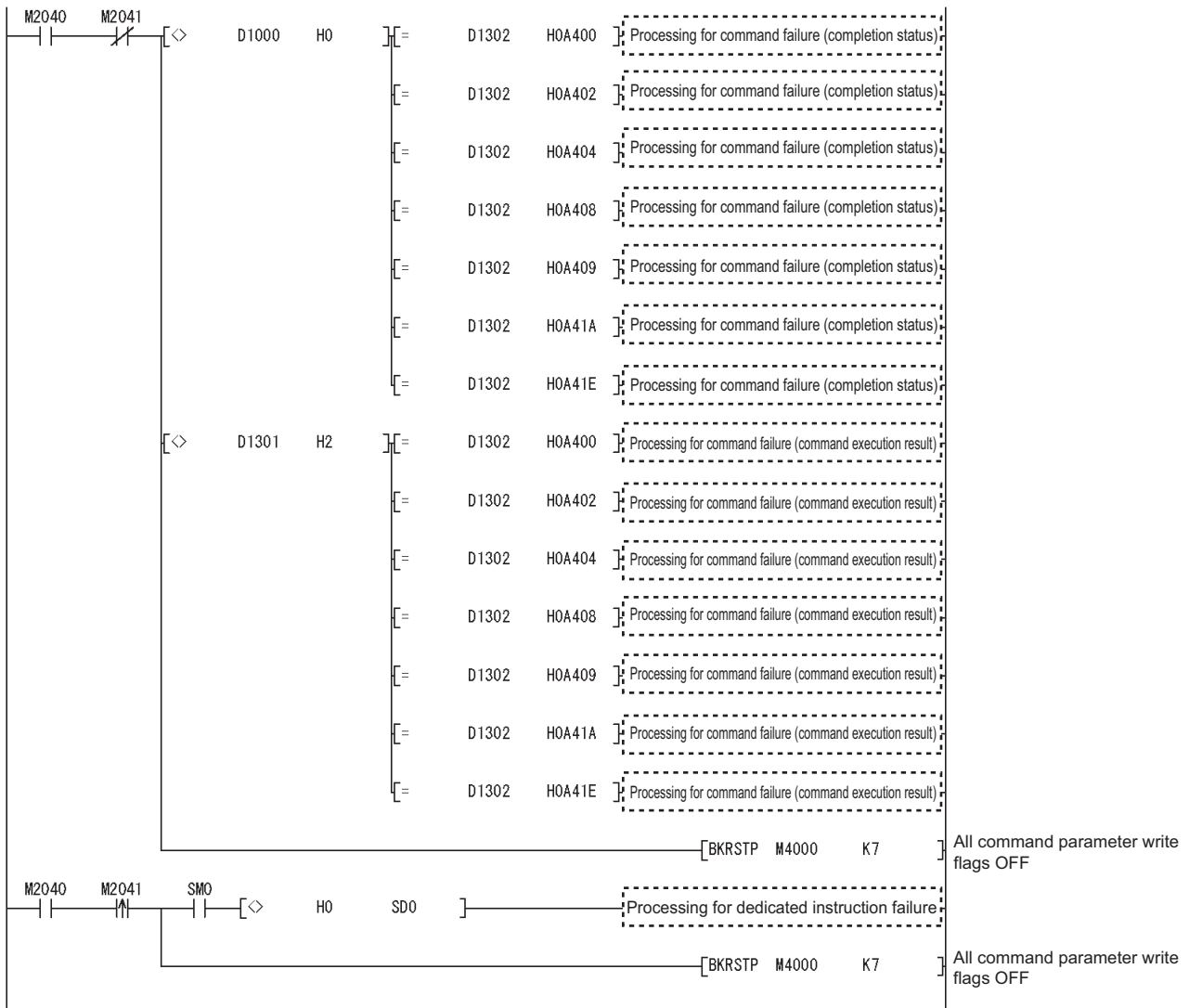
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Figure 6.11 Program for setting command parameters (when one command is executed at a time) (continued)

(c) Program for reading measured temperature values

$\boxed{\text{Br.n+2}}$ Measured temperature values are read out.

1) Device assignment in the program example

Table 6.13 Device assignment in the program example

Device	Application	Device	Application
M4100	Conversion enable/disable setting write flag		-

2) Program example
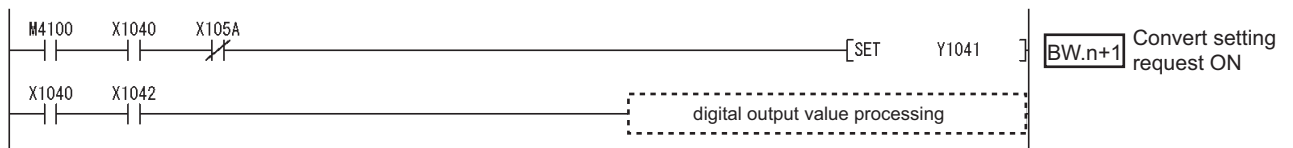
Figure 6.12 Program for reading measured temperature values

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(d) Program for reading error module information
   Execute Error module information read request (command No.: 0103H) with the dedicated instruction (RDMSG) of the master station to read the error module information.
   Error module information read request is a command of the head module. For details of the command, refer to the following.
   ☞ MELSEC-ST CC-Link Head Module User's Manual, "8.2.4 Error module information read request"

1) Device assignments in the program example

Table 6.14 Device assignments in the program example

Device	Application	Device	Application
M2050	Completion device	D1000 to D1004	Control data
M2051	Completion status indicator device	D1100 to D1104	Send data (execution data of the command)
M6000	Error module information storage enabled	D1300 to D1318	Receive data (result data of the command)
-	-	D4000	Error module information read target

2) Program example
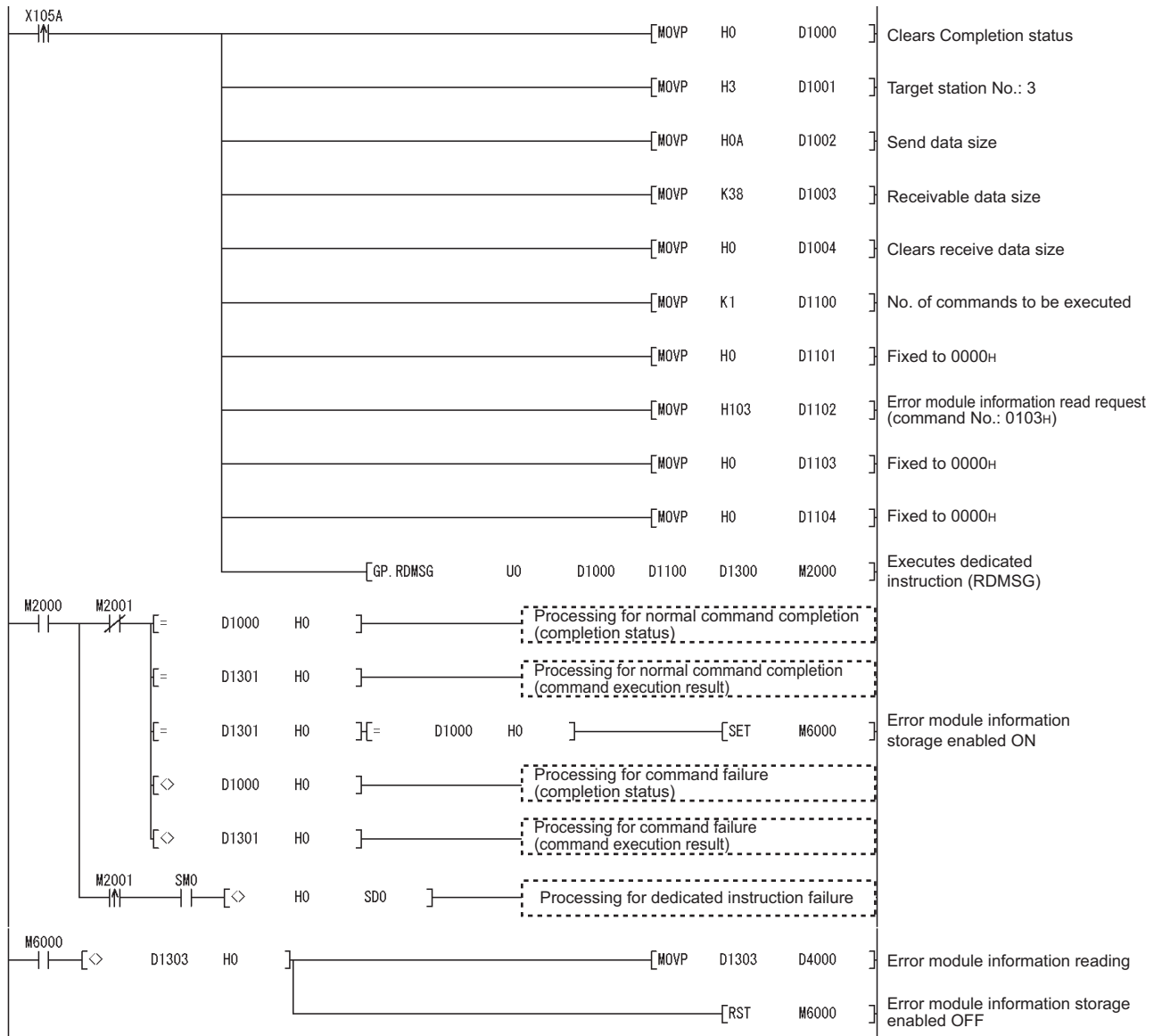
Figure 6.13 Program for reading error module information

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(e) Program for reading an error code
Execute Error code read request (command No.: 8101H/0101H) with the dedicated instruction (RDMSG) of the master station to read an error code.

1) Device assignments in the program example

Table 6.15 Device assignments in the program example

Device	Application	Device	Application
M2000	Completion device	D1000 to D1004	Control data
M2001	Completion status indicator device	D1100 to D1104	Send data (execution data of the command)
M5002	Error handling flag	D1300 to D1304	Receive data (result data of the command)
M6001	Error code storage enabled	D4000	Error module information read target ☞ (2)(d) Program for reading error module information in this section
-	-	D4001	Error code read target

2) Program example
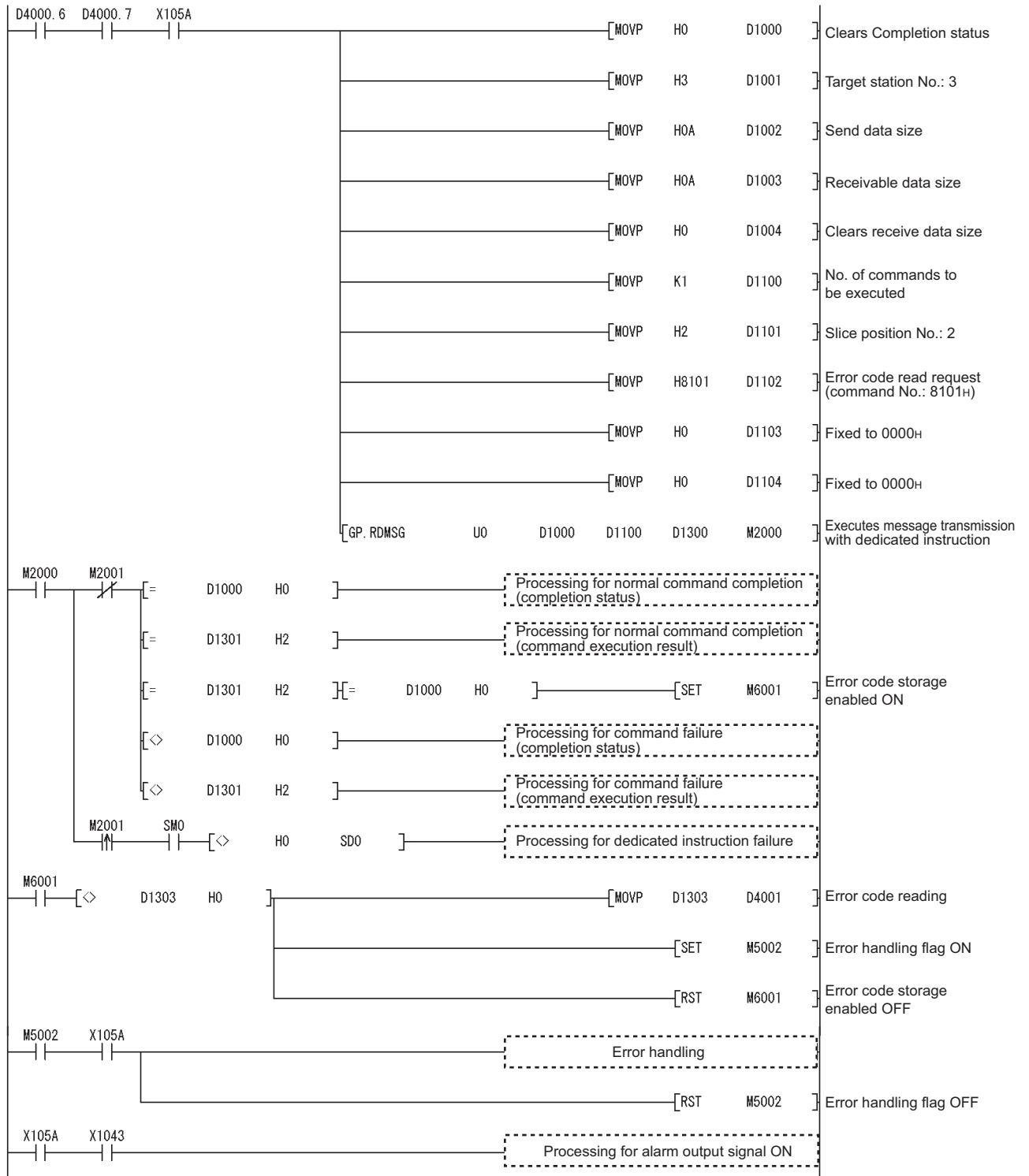
Figure 6.14 Program for reading an error code

(f) Program for resetting an error

Execute Error clear request (command No.: 8104H/0104H) with the dedicated instruction (RDMSG) of the master station to reset an error.

Error clear request is a command of the head module.

For details of the command, refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual, "8.2.5 Error clear request"

1) Device assignments in the program example

Table 6.16 Device assignments in the program example

Device	Application	Device	Application
M2070	Completion device	D1000 to D1004	Control data
M2071	Completion status indicator device	D1100 to D1106	Send data (execution data of the command)
M5003	Error reset request flag	D1300 to D1304	Receive data (result data of the command)

2) Program example

M5003 X105A	MOVP	H0	D1000	Clears Completion status
	MOVP	H3	D1001	Target station No.: 3
	MOVP	H0E	D1002	Send data size
	MOVP	H0A	D1003	Receivable data size
	MOVP	H0	D1004	Clears receive data size
	MOVP	K1	D1100	No. of commands to be executed
	MOVP	H0	D1101	Fixed to 0000H
	MOVP	H8104	D1102	Error clear request (command No.: 8104H)
	MOVP	H4	D1103	Slice position No.: 2
	MOVP	H0	D1104	Argument 2
	MOVP	H0	D1105	Argument 3
	MOVP	H0	D1106	Argument 4
	GP.RDMSG U0 D1000 D1100 D1300 M2000			Executes dedicated instruction (RDMSG)

Figure 6.15 Program for resetting an error

CHAPTER7   ONLINE MODULE CHANGE

Before performing online module change, always read through the following.

☞ MELSEC-ST CC-Link Head Module User's Manual, "4.6 Online Module Change Function"

This chapter describes the specifications of online module change.

(1) Perform online module change with the buttons of the head module or using GX Configurator-ST.

(2) Existing command parameters and offset/gain setting values in the user range setting are automatically loaded into the new module.

(3) Using GX Configurator-ST allows offset/gain setting during online module change.
When higher accuracy is required, perform offset/gain setting during online module change using GX Configurator-ST.

7.1   Precautions for Online Module Change

Take the following precautions for an online module change.

(1) System configuration in which online module change is executable
To perform the online module change, the system configuration must be appropriate for execution of the online module change.
For details, refer to the following.
☞ MELSEC-ST System User's Manual, "3.4 Precautions for System Configuration"
Executing the online module change in an inappropriate system configuration may result in a malfunction or failure.
If the system configuration is not appropriate for online module change, shut off all phases of the external power supply for the MELSEC-ST system to replace a slice module.

(2) Online module change procedure
When performing online module change, take the steps described in the following.
☞ Section 7.4.1 When setting is performed using GX Configurator-ST during online module change
☞ MELSEC-ST CC-Link Head Module User's Manual, "4.6 Online Module Change Function"
Failure to do so can cause a malfunction or failure.

(3) Precaution for external devices during online module change
Before starting online module change, confirm that the external device connected with the slice module to be removed will not malfunction.

(4) Replaceable slice module

Only the slice modules of the same model name can be replaced online. Replacing a slice module with a different slice module model and adding a new slice module are not allowed.

(5) Number of replaceable slice modules

Only one slice module can be replaced in a single online module change.
To replace multiple slice modules, perform a separate online module change for each module.

(6) Command execution during online module change

While an online module change is being executed (while the REL. LED of the head module is on), no command can be executed to the slice module being replaced online.
An attempt to execute a command in such a case will cause an error.

(7) Parameter change during online module change

To change a command parameter of the slice module, which is being changed online (the head module's REL. LED is on), from the master station, wait until the online module change is completed.

(8) The ERR. LED of the head module in online module change status

The ERR. LED of the head module in online module change status will turn on only when an error related to the online module change occurs.
It will not turn on or flash when any other error occurs.

(9) I/O data during online module change

While online module change is being executed for a slice module (while the REL. LED of the head module is on), all the Br.n Bit input area and Wr.n Word input area data of the slice module turn to 0 (OFF).

(10) User setting range accuracy after online module change

After online module change, the accuracy of the user range setting is about three times lower than that before the online module change.
When the user range setting is used, set the offset and gain values again as necessary.

(11) Mode for online module change

Perform online module change in the normal mode.

(12) Forced output test during online module change

The forced output test of GX Configurator-ST cannot be used for the module being changed online.
After completion of online module change, perform the forced output test.

7.2 Preparations for Online Module Change

Have GX Configurator-ST ready to use when replacing the ST1RD2 online.
Depending on the module failure status, the command parameters and offset/gain setting values in the user range setting may not be saved into the head module.
For the procedure for setting parameters and offset/gain values during online module change, refer to the following.

☞ Section 7.4.1 When setting is performed using GX Configurator-ST during online module change

When GX Configurator-ST is unavailable, make the preparations described below.
Failure to do so may cause the values such as offset/gain setting values in the user range setting not be imported to the new module, if they cannot be saved to the head module.

(1) Command parameters

When GX Configurator-ST is unavailable, the command parameters must be set by the commands after completion of online module change.
Provide a command parameter setting program in the master station program.
For the command parameter setting program, refer to the following.

☞ Section 6.4 Program Examples

(2) Offset/gain setting values

When the user range setting is used and GX Configurator-ST is unavailable, offset/gain values must be set by commands after completion of online module change.
Provide an offset/gain setting program in the master station program.
For the offset/gain setting program, refer to the following.

☞ Section 4.5 Offset/Gain Settings

⊠**POINT**

When GX Configurator-ST is unavailable, set the command parameters and offset/gain setting values after the module has operated once by default.

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7.3 Disconnecting/Connecting the External Device for Online Module Change

Disconnect the external device from the ST1RD2 and connect it after online module change according to the following procedure.

(1) Disconnection
Power off the external device.

(2) Connection
Power on the external device.

7.4 Online Module Change Procedure

This section explains how to set the command parameters or offset/gain values set in the user range setting during online module change when they could not be saved in the head module or when higher accuracy is required with the user range setting used.
For other online module change procedures, refer to the following.
☞ MELSEC-ST CC-Link Head Module User's Manual, "4.6 Online Module Change Function"

7.4.1 When setting is performed using GX Configurator-ST during online module change

This section describes the procedures for parameter setting or offset/gain setting using GX Configurator-ST during online module change.

> ⊠**POINT**
> If a slice module different from the target one is selected by mistake, restart the operation by any of the following.
> (1) On the screen shown in (c)
>   Click the [Cancel] button on screen (c) to terminate online module change.
> (2) On the screen shown in (d)
>   Do not change the slice module, click the [Next] button, and perform the operations in steps (g), (l), and (m) to complete the online module change once.
> (3) During operation (g)
>   Mount the removed slice module again, click the [Next] button, and perform the operations (l) and (m) to complete the online module change once.

7.3 Disconnecting/Connecting the External Device for Online Module Change
7.4.1 When setting is performed using GX Configurator-ST during online module change

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[Preparation for replacing ST1RD2]

(a) Select the ST1RD2 to be replaced online on the "System Monitor" screen.
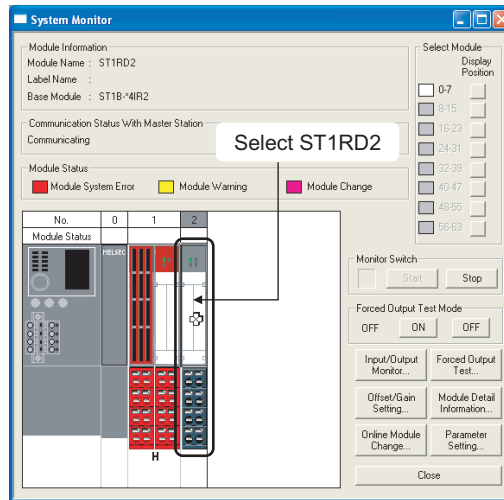
Figure 7.1 System Monitor screen

(b) Click the [Online Module Change] button on the "System Monitor" screen. Then, confirm that the RUN LED of the selected ST1RD2 is flashing at 0.25s intervals.
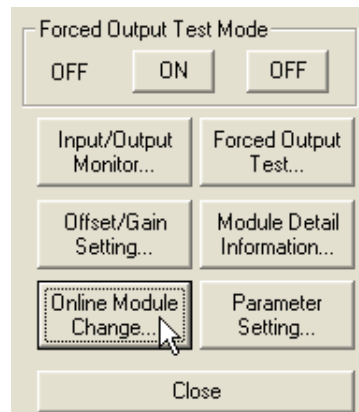
Figure 7.2 Online Module Change button

Remark ●

In addition to the above, the following operations are also available.

- Select [Diagnostics] → [Online Module Change].
- Right-click the ST1RD2 selected in (a), and click [Online Module Change] on the menu.

● ●

7.4 Online Module Change Procedure
7.4.1 When setting is performed using GX Configurator-ST during online module change

(c) Confirm that the ST1RD2 displayed as "Target Module" is the ST1RD2 to be replaced and click the ‾Next‾ button.
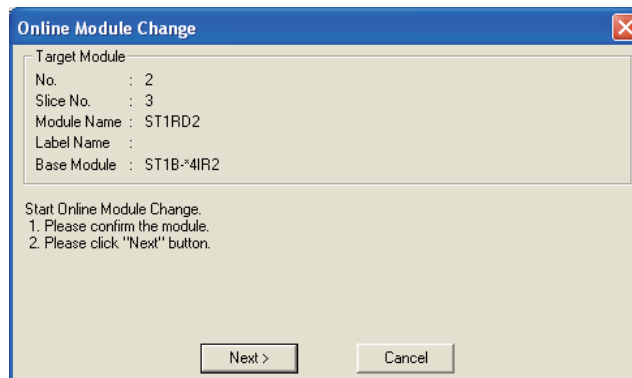
Figure 7.3 Online Module Change screen

1) Clicking the ‾Next‾ button validates the settings and the following will be performed.
- The head module is placed into the online module change mode.
- The command parameters and user range setting's offset/gain setting values of the ST1RD2 to be changed are saved into the head module.

Clicking the ‾Cancel‾ button stops online module change.

Clicking the ‾Exit‾ button returns the screen back to the status before performing (b).

2) After clicking the ‾Next‾ button, confirm the following module states.
- The REL. LED of the head module is on.
- The RUN LED of the target ST1RD2 is off.
- The "Module Status" indicator of the target ST1RD2 has turned purple on the "System Monitor" screen.

3) If the command parameters and user range setting's offset/gain setting values could not be read from the ST1RD2, the REL. and ERR. LEDs of the head module turn on and an error message is displayed on the screen by the operation in step (g).

Confirm the error message and resolve the error.(☞ Section 9.1 Error Code List)

For details of the error codes of the head module, refer to the following.

(☞ MELSEC-ST CC-Link Head Module User's Manual, "9.7 Error Codes")

To set parameters and offset/gain values for a new ST1RD2, perform the operations described in (d) and later.

7.4 Online Module Change Procedure
7.4.1 When setting is performed using GX Configurator-ST during online module change

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[Disconnection from external device]

(d) As the following screen appears, power off the external device connected to the ST1RD2 to be removed.

```
Online Module Change                              [X]
┌ Target Module ─────────────────────────────────┐
│ No.          : 2                                 │
│ Slice No.    : 3                                 │
│ Module Name : ST1RD2                             │
│ Label Name   :                                   │
│ Base Module  : ST1B-*4IR2                        │
│                                                  │
│ Execute Online Module Change.                    │
│ 1. Please exchange the module.                   │
│ 2. Please click "Next" button.                   │
│                                                  │
│          [ Next > ]      [ Cancel ]              │
└──────────────────────────────────────────────────┘
```
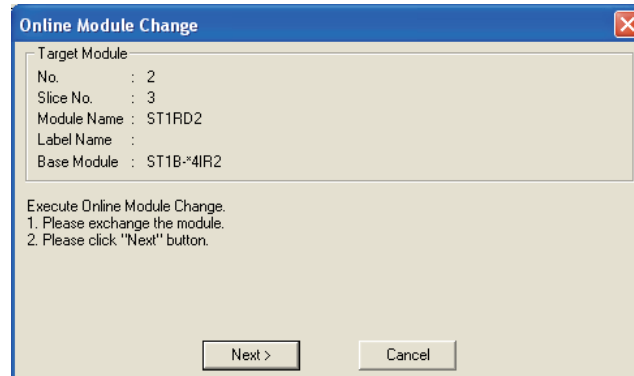
Figure 7.4 Disconnection from the exernal device

☒POINT

If the external device cannot be powered off, shut off all phases of the external power for the MELSEC-ST system and replace the ST1RD2.

[Replacing ST1RD2]

(e) Remove the ST1RD2 and replace it with a new one.
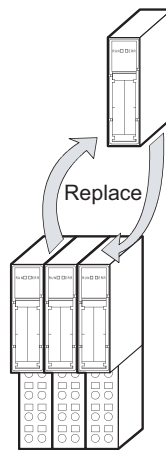
Figure 7.5 ST1RD2 replacement

[Connection to external device after replacement]

(f) Mount a new ST1RD2. And then, power on the external device.

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7.4 Online Module Change Procedure
7.4.1 When setting is performed using GX Configurator-ST during online module change

[Operations after external device connection]

(g) After connecting to the external device, click the ⌐Next¬ button on the screen in (d).

1) Clicking the ⌐Next¬ button performs the following.
   • Checking whether the model name of the newly mounted slice module is the same as that of the removed one.
   • Writing the command parameters and user range setting's offset/gain setting values, which were saved in the head module in (c), to the mounted ST1RD2.

   Clicking the ⌐Cancel¬ button stops online module change.

   Terminate the online module change by the following procedure.
   • On the restarted screen shown in (a), select the same slice module. If a different module is selected, an error occurs.
   • Perform the operation (b) to display the screen in (k), and click the ⌐Next¬ button to terminate the online module change.

2) After clicking the ⌐Next¬ button, confirm the following module statuses.
   • The REL. LED of the head module is flashing.
   • The RUN LED of the newly mounted ST1RD2 is flashing (at 0.25s intervals).

If the parameter settings or user range setting's offset/gain setting values could not be written to the ST1RD2, the REL. and ERR. LEDs of the head module turn on and the following screen appears.

```
Online Module Change                                    [x]
┌─Target Module────────────────────────────────────────┐
│ No.          : 2                                       │
│ Slice No.    : 3                                       │
│ Module Name : ST1RD2                                   │
│ Label Name   :                                         │
│ Base Module  : ST1B-*4IR2                              │
└────────────────────────────────────────────────────────┘

Failed to write the parameter.

Please click "Next" button to operate with default parameters.

In case of changing the parameter settings, please close with "Cancel" button, write parameters
with "Parameter Setting" and after that execute "Online Module Change" again.

              [ Next > ]        [ Cancel ]
```

Figure 7.6 Error screen

Confirm the error and take corrective actions. (☞ Section 9.1 Error Code List)

For details of the error codes of the head module, refer to the following.

(☞ MELSEC-ST CC-Link Head Module User's Manual, "9.7 Error Codes")

7.4 Online Module Change Procedure
7.4.1 When setting is performed using GX Configurator-ST during online module change

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[Parameter setting/offset/gain setting]

(h) Click the ⌈Cancel⌋ button to stop the online module change.

Online Module Change

Target Module
No. : 2
Slice No. : 3
Module Name : ST1RD2
Label Name :
Base Module : ST1B-*4IR2

Please click "Next" button to start the changed module operations.

Online Module Change can be cancelled by "Cancel" button.

[Next >]   [Cancel]
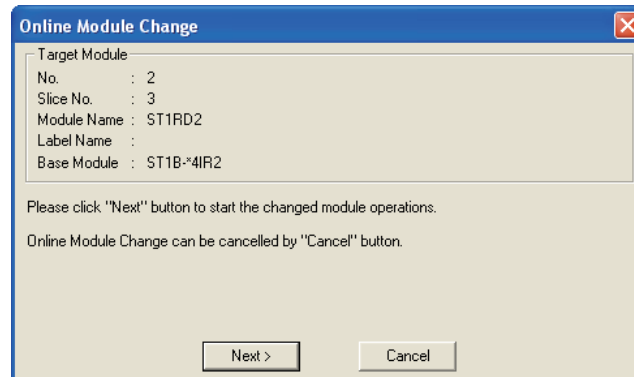
Figure 7.7 Stop of online module change

(i) Click the ⌈OK⌋ button.

MELSOFT GX Configurator-ST

Online Module Change was stopped.
This module does not operate.
Please execute "Online Module Change" again.

[OK]
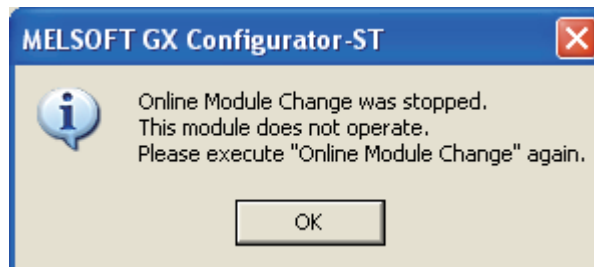
Figure 7.8 Confirmation dialog

(j) Set parameters or offset/gain values.
Take the procedures described in the following.
☞ Section 5.3 Parameter Setting
☞ Section 5.6 Offset/Gain Setting
The following describes the notes on the parameter setting and offset/gain setting during online module change.

⊠POINT

(1) As the system is already in the diagnostic mode, the mode need not be changed.

(2) When setting parameters during online module change, write them to both the RAM and ROM.
After the control resumes, the module will operate with the settings written on the RAM.

(3) If the parameter settings and user range setting's offset/gain setting values could not be read from the old ST1RD2, command parameters might have been written during operation (g).
Using GX Configurator-ST, check whether the command parameters have been written.

(4) When offset/gain values have been set during online module change, the RUN LED of the ST1RD2 flashes at 0.25s intervals even in the offset/gain setting mode.

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7.4 Online Module Change Procedure
7.4.1 When setting is performed using GX Configurator-ST during online module change

[Processing after parameter setting or offset/gain setting]

(k) After parameter setting or offset/gain setting, execute the operations (a) and (b) to resume the online module change.

* Select the same ST1RD2 as the one selected before the online module change stop. If the selected ST1RD2 is different, an error will occur.
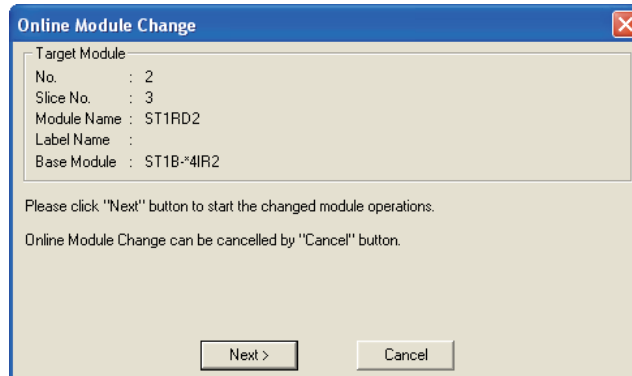
Figure 7.9 Online Module Change window

(l) Clicking the [Next] button releases the head module from the online module change mode.

1) Clicking the [Next] button performs the following.
   - The head module exits the online module change mode.
   - I/O data refresh is restarted.

   Clicking the [Cancel] button stops online module change.

   When stopped, the screen in (a) is displayed.

   Terminate the online module change by the following procedure.
   - On the restarted screen shown in (a), select the same slice module. If a different module is selected, an error occurs.
   - Follow the instructions in (b) to display the screen in (c), and click the [Cancel] button.

2) After clicking the [Next] button, confirm the following module statuses.
   - The REL. LED of the head module is off.
   - The RUN LED of the newly mounted ST1RD2 is on.
   - The "Module Status" indicator of the target ST1RD2 has turned white on the "System Monitor" screen.

3) If the head module cannot exit the online module change mode, both the REL. and ERR. LEDs of the head module turn on.

   Confirm the error and take corrective actions. (☞ MELSEC-ST CC-Link Head Module User's Manual, "9.7.2 Error code list")

7.4 Online Module Change Procedure
7.4.1 When setting is performed using GX Configurator-ST during online module change

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[Completion]

(m) The following screen appears showing that online module change has been completed.

Click the [Finish] button.
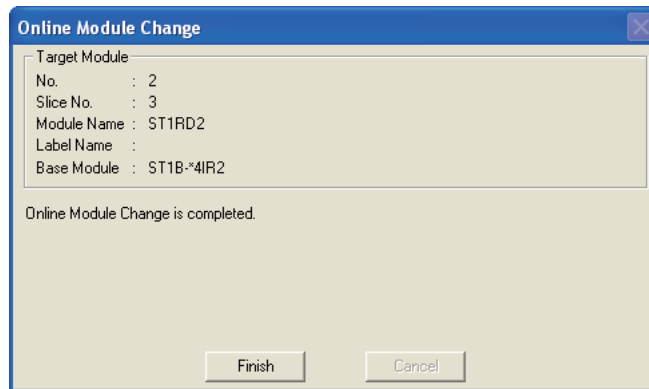
Figure 7.10 Completion of online module change

7.4 Online Module Change Procedure
7.4.1 When setting is performed using GX Configurator-ST during online module change

CHAPTER8   COMMANDS

This chapter explains the commands.

8.1   Command List

(1) About commands
A command is executed by transmitting a message to the MELSEC-ST system with a dedicated instruction (RDMSG) of the master station.
For the command execution procedure, refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual, "8.1 Command execution method and procedures"

(2) When two command numbers are assigned to one command
Use command number 8000H or higher.
Commands, with the number 7FFFH and smaller, are used for importing existing sequence programs from the ST1H-PB (MELSEC-ST PROFIBUS-DP head module) to ST1H-BT (MELSEC-ST CC-Link head module).

(3) Command list
The list of commands that are executable in the ST1RD2 and conditions for respective command executions are shown in Table 8.1.

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COMMANDS

Table 8.1 Command list (1/2)

Command type	Command No.	Command name	Description	Execution condition	Reference section
Common command	8100H 0100H	Operating status read request	Reads the operating status of the ST1RD2.	-	Section 8.2.1
	8101H 0101H	Error code read request	Reads an error code and alarm information of the ST1RD2.	-	Section 8.2.2
Initial data write command	8106H	Initial data batch write request	Writes command parameters to multiple ST1RD2s all at once.	Condition 1	Section 8.3.1
	8107H 0107H	Initial data individual write request	Writes command parameters to a single ST1RD2.	Condition 1	Section 8.3.2
ST1RD2 parameter setting read command	9400H 1400H	Conversion enable/disable setting read	Reads the conversion enable/disable setting from RAM of the ST1RD2.	-	Section 8.4.1
	9401H 1401H	Conversion channel read	Reads current conversion enable/disable setting and conversion completion status.	-	Section 8.4.2
	9402H 1402H	Operation condition setting read	Reads averaging process setting, alarm output setting, and conversion setting for disconnection detection from RAM of the ST1RD2.	-	Section 8.4.3
	9404H 1404H	CH □ time/count/moving average/time constant setting read	Reads time or number of times set for averaging processing, number of times set for moving average, or a time constant from RAM of the ST1RD2.	-	Section 8.4.4
	9408H 1408H	CH1 upper upper limit/upper lower limit setting read		-	Section 8.4.5
	9409H 1409H	CH1 lower upper limit/lower lower limit setting read	Reads the upper value of upper limit, lower value of upper limit, upper value of lower limit, or lower value of lower limit of alarm output.	-	Section 8.4.6
	940AH 140AH	CH2 upper upper limit/upper lower limit setting read		-	Section 8.4.5
	940BH 140BH	CH2 lower upper limit/lower lower limit setting read		-	Section 8.4.6
	9418H 1418H	Initial data setting read	Reads measurement range and offset/gain value settings from RAM of the ST1RD2.	-	Section 8.4.7
	941AH 141AH	Sensor compensation value read	Reads compensation values for errors between "actual temperature" and "measured temperature" from RAM of the ST1RD2.	-	Section 8.4.8
	941EH 141EH	Conversion setting value (for disconnection detection) read	Reads conversion setting values for disconnection detection from RAM of the ST1RD2.	-	Section 8.4.9

8 COMMANDS

Table 8.1 Command list (2/2)

Command type	Command No.	Command name	Description	Execution condition	Reference section
ST1RD2 parameter setting write command	A400H 2400H	Conversion enable/disable setting write	Writes the conversion enable/disable setting to RAM of the ST1RD2.	Condition 1	Section 8.5.1
	A402H 2402H	Operation condition setting write	Writes averaging processing specification, alarm output setting, and conversion setting for disconnection detection to RAM of the ST1RD2.	Condition 1	Section 8.5.2
	A404H 2404H	CH □ time/count/moving average/time constant setting write	Writes time or number of times for averaging processing, number of times set for moving average, or a time constant to RAM of the ST1RD2.	Condition 1	Section 8.5.3
	A408H 2408H	CH1 upper upper limit/upper lower limit setting write	Writes the upper value of upper limit, lower value of upper limit, upper value of lower limit, or lower value of lower limit of alarm output.	Condition 1	Section 8.5.4
	A409H 2409H	CH1 lower upper limit/lower lower limit setting write			Section 8.5.5
	A40AH 240AH	CH2 upper upper limit/upper lower limit setting write			Section 8.5.4
	A40BH 240BH	CH2 lower upper limit/lower lower limit setting write			Section 8.5.5
	A41AH 241AH	Sensor compensation value write	Writes compensation values for errors between "actual temperature" and "measured temperature" to RAM of the ST1RD2.	Condition 1	Section 8.5.6
	A41EH 241EH	Conversion setting value (for disconnection detection) write	Writes conversion setting values for disconnection detection to RAM of the ST1RD2.	Condition 1	Section 8.5.7
ST1RD2 control command	B400H 3400H	Parameter setting read from ROM	Reads parameters from ROM to RAM in the ST1RD2.	Condition 1	Section 8.6.1
	B401H 3401H	Parameter setting write to ROM	Writes parameters from RAM to ROM in the ST1RD2.	Condition 1	Section 8.6.2
	B402H 3402H	Operation mode setting	Switches the mode of the ST1RD2.	Condition 2	Section 8.6.3
	B403H 3403H	Offset channel specification	Specifies an offset channel of offset/gain setting and adjusts the offset value.	Condition 3	Section 8.6.4
	B404H 3404H	Gain channel specification	Specifies a gain channel of offset/gain setting and adjusts the gain value.	Condition 3	Section 8.6.5
	B405H 3405H	User range write	Writes adjusted offset/gain settings to ROM of the ST1RD2.	Condition 3	Section 8.6.6

Table 8.2 Conditions for execution

Condition	Description
-	Commands are always executable.
Condition 1	Commands are executable in normal mode and when $\boxed{\text{Bw.n+1}}$ Convert setting request is OFF (0).
Condition 2	Commands are only executable in normal mode and when $\boxed{\text{Bw.n+1}}$ Convert setting request is OFF (0), or in offset/gain setting mode.
Condition 3	Commands are executable only in offset/gain setting mode.

⊠**POINT**

If a command execution is attempted while the required condition is not met, it will fail and "06H" or "13H" will be stored in $\boxed{\text{Cr.n(15-8)}}$ Command execution result.

8.2 Common Commands

8.2.1 Operating status read request (Command No.: 8100H/0100H)

	Data size
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads the operating status of the ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.3 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.8100H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.0100H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (8100H/0100H). (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.4 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.8100H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.0100H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (8100H/0100H) is stored. (Hexadecimal)

Table 8.4 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.2	The operating status of the ST1RD2 is stored. `0 0 0 □`H Fixed to 000H. → 0H: Normal mode / 1H: System error
Cr.3	The current operation mode of the ST1RD2 is stored. `0 0 0 □`H Fixed to 000H. → 1H: Normal mode / 2H: Offset/gain setting mode

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.5 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.8100H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) For execution of command No.0100H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (8100H/0100H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in `Cr.0(15-8)` Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in `Cr.0(7-0)` Start slice No. or Slice position No.

8.2.2 Error code read request (Command No.: 8101H/0101H)

	Data size
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads an error code of the ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.6 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.8101H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.0101H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (8101H/0101H). (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.7 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.8101H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ～ b8 b7 ～ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.0101H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ～ b8 b7 ～ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (8101H/0101H) is stored. (Hexadecimal)

Table 8.7 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.2	The error code of the error that is currently occurring in the ST1RD2 is stored. (Hexadecimal) For details of error codes, refer to the following. ☞ Section 9.1 Error Code List When no error is detected, 0000H is stored.
Cr.3	Alarm information is stored for each channel.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.8 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.8101H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. [For execution of command No.0101H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below.
Cr.1	The executed command No. (8101H/0101H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Start slice No. or Slice position No.

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8.3 Initial Data Write Command

8.3.1 Initial data batch write request (Command No.: 8106H)

Data size	
Cw	6 to 20 words (12 to 40 bytes)
Cr	6 words (12 bytes)

This command batch-writes command parameters to the following modules of the same type.
- Head module
- Input module
- Output module
- Intelligent function module

The measurement range and offset/gain settings are written to RAMs of multiple ST1RD2s all at once.

(1) Values set to "Cw" Command execution area

Table 8.9 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	Fixed to 0000H.
Cw.1	Set a command No. to be executed (8106H). (Hexadecimal)
Cw.2	Set command parameters of the head module. (Hexadecimal)[1]
Cw.3	Set command parameters of input modules. (Hexadecimal)[1]
Cw.4	Set command parameters of output modules. (Hexadecimal)[1]
Cw.5	Set the number of the command parameter settings for intelligent function modules in Cw.6 to Cw.19 (number of module types: 0 to 7).
Cw.6	Set a number specific to the ST1RD2 module and and offset/gain setting. (Hexadecimal) This setting is required only when one or more value is set in Cw.5 .

Table 8.9 Values set to "Cw" Command execution area (Continued)

Cw Command execution area	Setting value
Cw.7	Set command parameters of the ST1RD2. (Hexadecimal) This setting is required only when one or more value is set in Cw.5 . `0 0 □ □ H` Fixed to 00H. → CH1 Measurement range setting 0H : Pt100 (-200 to 850 ℃) 1H : Pt100 (-20 to 120 ℃) 2H : Pt100 (0 to 200 ℃) 4H : Pt1000 (-200 to 850 ℃) 5H : Pt1000 (-20 to 120 ℃) 6H : Pt1000 (0 to 200 ℃) → CH2 Measurement range setting 0H : Pt100 (-200 to 850 ℃) 1H : Pt100 (-20 to 120 ℃) 2H : Pt100 (0 to 200 ℃) 4H : Pt1000 (-200 to 850 ℃) 5H : Pt1000 (-20 to 120 ℃) 6H : Pt1000 (0 to 200 ℃)
Cw.8 to Cw.19	In the same way as in Cw.6 or Cw.7 , set command parameters for other ST1RD2s and intelligent function modules. (Two words each)[2]

* 1 For settings of each module, refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual, "8.2.7 Initial data batch write request (Command No.: 8106H)"

* 2 For settings of intelligent function modules other than the ST1RD2, refer to the following.

☞ Intelligent Function Module User's Manual, "Initial data batch write request (Command No.: 8106H)"

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the data (normal completion or failure) in Cr.0 .

(a) When completed normally ("Cr.0" is 0000H.)

Table 8.10 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	Error code (0000H when completed normally)
Cr.1	The executed command No. (8106H) is stored. (Hexadecimal)
Cr.2 Cr.3 Cr.4 Cr.5	The command parameter setting status after writing is stored for each slice module. |	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cr.2	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	← Each bit indicates each slice position No.
Cr.3	31	30	29	28	28	26	25	24	23	22	21	20	19	18	17	16	
Cr.4	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	
Cr.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48		 0: Parameter not set 1: Parameter set

(b) When failed ("Cr.0" is other than 0000H.)

Table 8.11 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	An error code is stored. (Hexadecimal)[1]
Cr.1	The executed command No. (8106H) is stored. (Hexadecimal)
Cr.2 Cr.3 Cr.4 Cr.5	The command parameter setting status after writing is stored for each slice module.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	
Cr.2	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	← Each bit indicates each slice position No.
Cr.3	31	30	29	28	28	26	25	24	23	22	21	20	19	18	17	16	
Cr.4	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	
Cr.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	

0: Parameter not set
1: Parameter set

* 1 For details of error codes, refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual, "9.7.2 Error code list"

☒POINT

(1) In Cw.6 to Cw.19, intelligent function module's command parameter settings exceeding the quantity set in Cw.5 are not executed.

(2) Initial data batch write request (Command No.: 8106H) cannot be executed with another command at the same time.
Doing so will cause an error.

8.3.2 Initial data individual write request (Command No.: 8107H/0107H)

Data size	
Cw	6 to 99 words (12 to 198 bytes)
Cr	4 to 35 words (8 to 70 bytes)

This command writes command parameters of the following modules to RAM for each module.

- Head module
- Input module
- Output module
- Intelligent function module

The measurement range and offset/gain settings are written to RAM of a single ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.12 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	Fixed to 0000H.
Cw.1	Set a command No. to be executed (8107H/0107H). (Hexadecimal)
Cw.2	Set the number of the command parameter settings for slice modules (number of the modules: 1 to 32). (Hexadecimal)
Cw.3	[For execution of command No.8107H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.0107H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.4	Set a number specific to the ST1RD2 module and offset/gain setting. (Hexadecimal) $\boxed{8}\boxed{4}\boxed{0}\boxed{}$ H b3 b2 b1 b0 Module-specific No. Fixed to 00. CH1 Offset/gain value selection 0: Factory default 1: User range setting CH2 Offset/gain value selection 0: Factory default 1: User range setting

Table 8.12 Values set to "Cw" Command execution area (Continued)

Cw Command execution area	Setting value
Cw.5	Set respective command parameters for the ST1RD2. (Hexadecimal) 0 0 □ □ H Fixed to 00H. CH1 Measurement range setting 0H : Pt100 (-200 to 850 ℃) 1H : Pt100 (-20 to 120 ℃) 2H : Pt100 (0 to 200 ℃) 4H : Pt1000 (-200 to 850 ℃) 5H : Pt1000 (-20 to 120 ℃) 6H : Pt1000 (0 to 200 ℃) CH2 Measurement range setting 0H : Pt100 (-200 to 850 ℃) 1H : Pt100 (-20 to 120 ℃) 2H : Pt100 (0 to 200 ℃) 4H : Pt1000 (-200 to 850 ℃) 5H : Pt1000 (-20 to 120 ℃) 6H : Pt1000 (0 to 200 ℃)
Cw.6 to Cw.98	In the same way as in Cw.3 to Cw.5 , set command parameters for each module.[1] (Three words each)

* 1 For settings of the head module and I/O modules, refer to the following.

☞ MELSEC-ST CC-Link Head Module User's Manual, "8.2.8 Initial data individual write request (Command No.: 8107H/0107H)"

For settings of intelligent function modules other than the ST1RD2, refer to the following.

☞ Intelligent Function Module User's Manual, "Initial data individual write request (Command No.: 8107H/0107H)"

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the data (normal completion or failure) in Cr.0 .

(a) When completed normally ("Cr.0" is 0000H.)

Table 8.13 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	Error code (0000H when completed normally)
Cr.1	The executed command No. (8107H/0107H) is stored. (Hexadecimal)
Cr.2	The number of command parameter settings of the intelligent function module is stored.

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Table 8.13 Values stored in "Cr" Command result area (When completed normally)(Continued)

`Cr` Command result area	Result details
`Cr.3`	[For execution of command No.8107H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 `Cr.3(15-8)` Command execution result `Cr.3(7-0)` Slice position No. → 00H: Normal completion [For execution of command No.0107H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below b15 ~ b8 b7 ~ b0 `Cr.3(15-8)` Command execution result `Cr.3(7-0)` Start slice No. → 00H: Normal completion
`Cr.4` to `Cr.34`	Detailed results for the intelligent function modules set in `Cr.2` are stored in the same way as in `Cr.3`. (One word each)

(b) When failed ("Cr.0" is other than 0000H.)

Table 8.14 Values stored in "Cr" Command result area (When failed)

`Cr` Command result area	Result details
`Cr.0`	An error code is stored. (Hexadecimal)[*1]
`Cr.1`	The executed command No. (8107H/0107H) is stored. (Hexadecimal)
`Cr.2`	The number of command parameter settings of the intelligent function module is stored.
`Cr.3`	[For execution of command No.8107H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 `Cr.3(15-8)` Command execution result `Cr.3(7-0)` Slice position No.[*2] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.0107H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 `Cr.3(15-8)` Command execution result `Cr.3(7-0)` Start slice No.[*2] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
`Cr.4` to `Cr.34`	Detailed results for the intelligent function modules set in `Cr.2` are stored in the same way as in `Cr.3`. (One word each)

* 1 For details of error codes, refer to the following.

     ☞ MELSEC-ST CC-Link Head Module User's Manual, "9.7.2 Error code list"

* 2 When 0FH is stored in `Cr.0(15-8)` Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in `Cr.0(7-0)` Slice position No. or start slice No.

⊠**POINT**

(1) $\boxed{\text{Cw.3}}$ to $\boxed{\text{Cw.98}}$, intelligent function module's command parameter settings exceeding the quantity set in $\boxed{\text{Cw.2}}$ are not executed.

(2) Initial data individual write request (Command No.: 8107H/0107H) cannot be executed with another command at the same time.
Doing so will cause an error.

(3) When the slice position No. or start slice No. is duplicated, the module with the duplicate setting is detected as an error module.

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8.4 ST1RD2 Parameter Setting Read Commands

8.4.1 Conversion enable/disable setting read (Command No.: 9400H/1400H)

	Data size
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads the conversion enable/disable setting from RAM of the ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.15 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.9400H] Set a slice position No. of the target ST1RD2. (Hexadecimal)
	[For execution of command No.1400H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (9400H/1400H). (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.16 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.9400H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below
	b15 ~ b8 b7 ~ b0
	Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No.
	→ 00H: Normal completion
	[For execution of command No.1400H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below.
	b15 ~ b8 b7 ~ b0
	Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No.
	→ 00H: Normal completion
Cr.1	The executed command No. (9400H/1400H) is stored. (Hexadecimal)

Table 8.16 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.2	The conversion enable/disable setting in RAM is stored for each channel. 0 0 0 □ H Fixed to 0. b3 b2 b1 b0 0 0 Fixed to 0. CH1: Conversion enable/disable setting 0: Conversion enable 1: Conversion disable CH2: Conversion enable/disable setting 0: Conversion enable 1: Conversion disable
Cr.3	0000H is stored.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

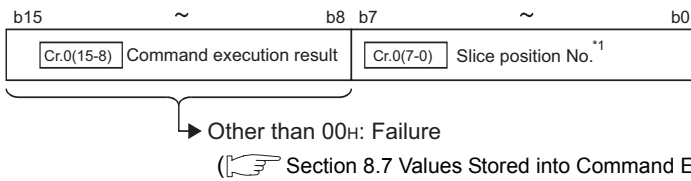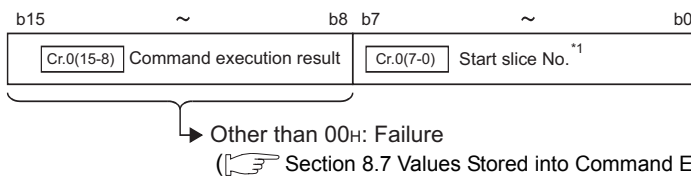**Table 8.17 Values stored in "Cr" Command result area (When failed)**

Cr Command result area	Result details
Cr.0	[For execution of command No.9400H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No.[*1] Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.1400H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No.[*1] Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (9400H/1400H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

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8.4.2 Conversion channel read (Command No.: 9401H/1401H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads the current conversion enable/disable setting and conversion completion status.

(1) Values set to "Cw" Command execution area

Table 8.18 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.9401H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.1401H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (9401H/1401H). (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.19 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Setting value
Cr.0	For execution of command No.9401H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.1401H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (9401H/1401H) is stored. (Hexadecimal)

Table 8.19 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Setting value
Cr.2	The current conversion enable/disable setting is stored for each channel. 0 0 0 ☐ H Fixed to 0. b3 b2 b1 b0 0 0 ☐ ☐ Fixed to 0. CH1: Conversion enable/disable setting 0: Conversion enable 1: Conversion disable CH2: Conversion enable/disable setting 0: Conversion enable 1: Conversion disable
Cr.3	The conversion completion status is stored for each channel. 0 0 0 ☐ H Fixed to 0. b3 b2 b1 b0 0 0 ☐ ☐ Fixed to 0. CH1 Conversion completed status 0: Conversion being executed or not used 1: Conversion completed CH2 Conversion completed status 0: Conversion being executed or not used 1: Conversion completed

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.

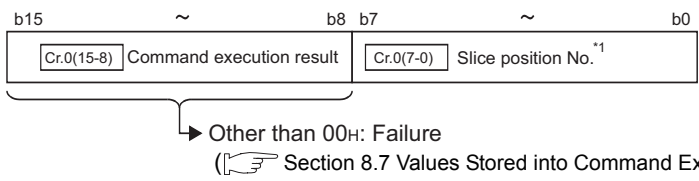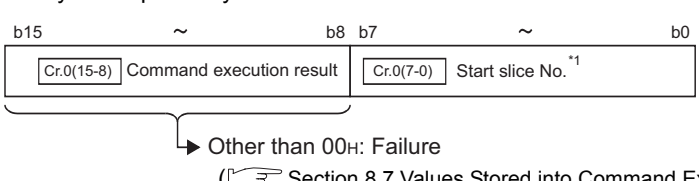**Table 8.20 Values stored in "Cr" Command result area (When failed)**

Cr Command result area	Result details
Cr.0	[For execution of command No.9401H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result [For execution of command No.1401H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result
Cr.1	The executed command No. (9401H/1401H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1   When 0FH is stored in   Cr.0(15-8)   Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in   Cr.0(7-0)   Slice position No. or start slice No.

8.4.3 Operation condition setting read (Command No.: 9402H/1402H)

	Data size
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads averaging process setting, alarm output setting, and conversion setting for disconnection detection from RAM of the ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.21 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.9402H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.1402H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (9402H/1402H). (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.22 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.9402H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result / Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.1402H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result / Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (9402H/1402H) is stored. (Hexadecimal)

Table 8.22 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.2	The averaging process setting is stored for each channel. `0 0 □ □` Fixed to 00H. CH1 Averaging processing specification 0H : Sampling processing 1H : Time averaging 2H : Count averaging 3H : Moving average 4H : Primary delay filter CH2 Averaging processing specification 0H : Sampling processing 1H : Time averaging 2H : Count averaging 3H : Moving average 4H : Primary delay filter

Cr.3	The alarm output setting and conversion setting for disconnection detection are stored for each channel.
	
	Fixed to 0. Fixed to 0.
	
	`0 □ 0 □ H`
	
	b3 b2 b1 b0
	`0 0 □ □`
	Fixed to 0.
	
	CH1 Alarm output setting
	0: Alarm output not performed
	1: Alarm output performed
	
	CH2 Alarm output setting
	0: Alarm output not performed
	1: Alarm output performed
	
	b11 b10 b9 b8
	`□ □ □ □`
	
	CH1 Conversion setting for disconnection detection
	00: Value immediately before disconnection
	01: Up scale
	10: Down scale
	11: Given value
	
	CH2 Conversion setting for disconnection detection
	00: Value immediately before disconnection
	01: Up scale
	10: Down scale
	11: Given value

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.23 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.9402H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.1402H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (9402H/1402H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1   When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.4.4 CH[] time/count/moving average/time constant setting read (Command No.: 9404H/1404H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads the number of times or the period of time set for averaging process, or moving average or time constant setting, from RAM of the ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.24 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.9404H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.1404H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (9404H/1404H). (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.25 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.9404H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.1404H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (9404H/1404H) is stored. (Hexadecimal)

8.4 ST1RD2 Parameter Setting Read Commands
8.4.4 CH[] time/count/moving average/time constant setting read (Command No.: 9404H/1404H)

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Table 8.25 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.2	The number of times or the period of time set for averaging process of channel 1 is stored. The value ranges are as follows: Count averaging: 4 to 62500 (times) Time averaging: 2 to 5000 (ms)
Cr.3	The number of times or the period of time set for averaging process of channel 2 is stored. The value ranges are the same as Cr.2 response data 1.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.26 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.9404H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (Section 8.7 Values Stored into Command Execution Result) [For execution of command No.1404H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (9404H/1404H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

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8.4 ST1RD2 Parameter Setting Read Commands
8.4.4 CH[] time/count/moving average/time constant setting read (Command No.: 9404H/1404H)

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8.4.5 CH[] upper upper limit/upper lower limit setting read (Command No.: 9408H, 940AH/1408H, 140AH)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

From RAM of the ST1RD2, this command reads the upper value of upper limit or lower value of upper limit set for alarm output.

(1) Values set to "Cw" Command execution area

Table 8.27 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.9408H, 940AH] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.1408H, 140AH] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed. (Hexadecimal) CH1 upper upper limit/upper lower limit setting read: 9408H, 1408H CH2 upper upper limit/upper lower limit setting read: 940AH, 140AH
Cw.2 Cw.3	Fixed to 0000H. (Any other value is treated as 0000H.)

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.28 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.9408H, 940AH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.1408H, 140AH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (9408H/1408H, 940AH/140AH) is stored. (Hexadecimal)

8.4 ST1RD2 Parameter Setting Read Commands
8.4.5 CH[] upper upper limit/upper lower limit setting read (Command No.: 9408H, 940AH/1408H, 140AH)

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Table 8.28 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.2	CH □ upper upper limit value is stored. (16-bit signed binary) The stored value range is -32768 to 32767.
Cr.3	CH □ upper lower limit value is stored. (16-bit signed binary) The stored value range is the same as Cr.2 Response data.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.29 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.9408H, 940AH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (⮫ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.1408H, 140AH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (⮫ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (9408H/1408H, 940AH/140AH) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

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8.4 ST1RD2 Parameter Setting Read Commands
8.4.5 CH[] upper upper limit/upper lower limit setting read (Command No.: 9408H, 940AH/1408H, 140AH)

8.4.6 CH[] lower upper limit/lower lower limit setting read (Command No.: 9409H, 940BH/1409H, 140BH)

	Data size
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

From RAM of the ST1RD2, this command reads the upper value of lower limit or lower value of lower limit set for alarm output.

(1) Values set to "Cw" Command execution area

Table 8.30 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.9409H, 940BH] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.1409H, 140BH] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed. (Hexadecimal) CH1 lower upper limit/lower lower limit setting read: 9409H, 1409H CH2 lower upper limit/lower lower limit setting read: 940BH, 140BH
Cw.2 Cw.3	Fixed to 0000H. (Any other value is treated as 0000H.)

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.31 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.9409H, 940BH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.1409H, 140BH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (9409H/1409H, 940BH/140BH) is stored. (Hexadecimal)

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Table 8.31 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.2	CH □ lower upper limit value is stored. (16-bit signed binary) The stored value range is -32768 to 32767.
Cr.3	CH □ lower lower limit value is stored. (16-bit signed binary) The stored value range is the same as Cr.2 Response data.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.32 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.9409H, 940BH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.1409H, 140BH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (9409H/1409H, 940BH/140BH) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

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8.4 ST1RD2 Parameter Setting Read Commands
8.4.6 CH[] lower upper limit/lower lower limit setting read (Command No.: 9409H, 940BH/1409H, 140BH)

8.4.7 Initial data setting read (Command No.: 9418H/1418H)

	Data size
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads the measurement range setting and offset/gain value section from the RAM of the ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.33 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.9418H] Set a slice position No. of the target ST1RD2. (Hexadecimal)
	[For execution of command No.1418H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. (9418H/1418H) to be executed. (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

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(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in $\boxed{\text{Cr.0(15-8)}}$ Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.34 Values stored in "Cr" Command result area (When completed normally)

$\boxed{\text{Cr}}$ Command result area	Result details
$\boxed{\text{Cr.0}}$	[For execution of command No.9418H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ～ b8 b7 ～ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result $\boxed{\text{Cr.0(7-0)}}$ Slice position No. → 00H: Normal completion [For execution of command No.1418H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ～ b8 b7 ～ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result $\boxed{\text{Cr.0(7-0)}}$ Start slice No. → 00H: Normal completion
$\boxed{\text{Cr.1}}$	The executed command No. (9418H/1418H) is stored. (Hexadecimal)
$\boxed{\text{Cr.2}}$ *1	The measurement range and offset/gain settings in the RAM are stored for each channel. Fixed to 0H. CH1 Measurement range setting 0H : Pt100 (-200 to 850℃) 1H : Pt100 (-20 to 120℃) 2H : Pt100 (0 to 200℃) 4H : Pt1000 (-200 to 850℃) 5H : Pt1000 (-20 to 120℃) 6H : Pt1000 (0 to 200℃) b11 b10 b9 b8 Fixed to 00. CH1 Offset/gain value selection 0 : Factory default 1 : User range setting CH2 Offset/gain value selection 0 : Factory default 1 : User range setting CH2 Measurement range setting 0H : Pt100 (-200 to 850℃) 1H : Pt100 (-20 to 120℃) 2H : Pt100 (0 to 200℃) 4H : Pt1000 (-200 to 850℃) 5H : Pt1000 (-20 to 120℃) 6H : Pt1000 (0 to 200℃)
$\boxed{\text{Cr.3}}$ *1	The currently valid measurement range and offset/gain settings are stored for each channel. The stored values are the same as those of $\boxed{\text{Cr.2}}$ Response data 1.

* 1 If the stored values differ between $\boxed{\text{Cr.2}}$ and $\boxed{\text{Cr.3}}$, it means that the parameters written to the RAM have not taken effect in the module.

Set $\boxed{\text{Br.n+1}}$ $\boxed{\text{Bw.n+1}}$ Convert setting request to on (1) to make the parameters effective.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.35 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.9418H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.1418H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (9418H/1418H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.4.8 Sensor compensation value read (Command No.: 941AH/141AH)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads out compensation values for errors between "actual temperature" and "measured temperature" from RAM of the ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.36 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.941AH] Set a slice position No. of the target ST1RD2. (Hexadecimal)
	[For execution of command No.141AH] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. (941AH/141AH) to be executed. (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.37 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.941AH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.141AH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (941AH/141AH) is stored. (Hexadecimal)
Cr.2	CH1 sensor compensation value is stored. The stored value range is -200 to 200.
Cr.3	CH2 sensor compensation value is stored. The stored value range is the same as that of Cr.2 Response data 1.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.38 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.941AH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.141AH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (941AH/141AH) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.4.9 Conversion setting value (for disconnection detection) read (Command No.: 941EH/141EH)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads out conversion setting values for disconnection detection from RAM of the ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.39 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.941EH] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.141EH] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. (941EH/141EH) to be executed. (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.40 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.941EH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.141EH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (941EH/141EH) is stored. (Hexadecimal)
Cr.2	CH1 conversion setting value for disconnection detection is stored. The stored value range is -32768 to 32767.
Cr.3	CH1 conversion setting value for disconnection detection is stored. The stored value range is the same as that of Cr.2 Response data 1.

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8.4 ST1RD2 Parameter Setting Read Commands
8.4.9 Conversion setting value (for disconnection detection) read (Command No.: 941EH/141EH)

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.41 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.941EH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ～ b8 b7 ～ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.141EH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ～ b8 b7 ～ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (941EH/141EH) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.4 ST1RD2 Parameter Setting Read Commands
8.4.9 Conversion setting value (for disconnection detection) read (Command No.: 941EH/141EH)

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8.5 ST1RD2 Parameter Setting Write Commands

8.5.1 Conversion enable/disable setting write (Command No.: A400H/ 2400H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command writes the conversion enable/disable setting to RAM of the ST1RD2, and can be executed only in normal mode and when $\boxed{\text{Bw.n+1}}$ Convert setting request is off (0).

(1) Values set to "Cw" Command execution area

Table 8.42 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.A400H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.2400H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (A400H/2400H). (Hexadecimal)
Cw.2	Set a conversion enable/disable setting for each channel.
Cw.3	Fixed to 0000H. (Any other value is treated as 0000H.)

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in $\boxed{\text{Cr.0(15-8)}}$ Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.43 Values stored in "Cr" Command result area (When completed normally)

$\boxed{\text{Cr}}$ **Command result area**	**Result details**
$\boxed{\text{Cr.0}}$	[For execution of command No.A400H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result | $\boxed{\text{Cr.0(7-0)}}$ Slice position No. ↳ 00H: Normal completion [For execution of command No.2400H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result | $\boxed{\text{Cr.0(7-0)}}$ Start slice No. ↳ 00H: Normal completion
$\boxed{\text{Cr.1}}$	The executed command No. (A400H/2400H) is stored. (Hexadecimal)
$\boxed{\text{Cr.2}}$	$\boxed{\text{Cw.2}}$ Argument 1 at command execution is stored.
$\boxed{\text{Cr.3}}$	0000H is stored.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.44 Values stored in "Cr" Command result area (When failed)

$\boxed{\text{Cr}}$ **Command result area**	**Result details**
$\boxed{\text{Cr.0}}$	[For execution of command No.A400H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result | $\boxed{\text{Cr.0(7-0)}}$ Slice position No.[1] ↳ Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.2400H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result | $\boxed{\text{Cr.0(7-0)}}$ Start slice No.[1] ↳ Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)

8.5 ST1RD2 Parameter Setting Write Commands
8.5.1 Conversion enable/disable setting write (Command No.: A400H/2400H)

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Table 8.44 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.1	The executed command No. (A400H/2400H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

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8.5 ST1RD2 Parameter Setting Write Commands
8.5.1 Conversion enable/disable setting write (Command No.: A400H/2400H)

8.5.2 Operating condition setting write (Command No.: A402H/2402H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command writes the averaging process setting, alarm output setting, and convert setting for disconnection detection to RAM of the ST1RD2, and can be executed only in normal mode and when $\boxed{Bw.n+1}$ Convert setting request is OFF (0).

(1) Values set to "Cw" Command execution area

Table 8.45 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.A402H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.2402H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (A402H/2402H). (Hexadecimal)
Cw.2	Specify averaging process for each channel. 0 0 ▯ ▯ Fixed to 00H. CH1 Averaging processing specification 0H : Sampling processing 1H : Time averaging 2H : Count averaging 3H : Moving average 4H : Primary delay filter CH2 Averaging processing specification 0H : Sampling processing 1H : Time averaging 2H : Count averaging 3H : Moving average 4H : Primary delay filter

Table 8.45 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.3	Enable or disable the alarm output and specify the conversion setting for disconnection detection for each channel. Fixed to 0. Fixed to 0. 0 0 ☐ H b3 b2 b1 b0 0 0 ☐ ☐ Fixed to 0. CH1 Alarm output setting 0: Alarm output not performed 1: Alarm output performed CH2 Alarm output setting 0: Alarm output not performed 1: Alarm output performed b11 b10 b9 b8 ☐ ☐ ☐ ☐ CH1 Conversion setting for disconnection detection 00: Value immediately before disconnection 01: Up scale 10: Down scale 11: Given value CH2 Conversion setting for disconnection detection 00: Value immediately before disconnection 01: Up scale 10: Down scale 11: Given value

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.46 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.A402H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.2402H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (A402H/2402H) is stored. (Hexadecimal)
Cr.2	0000H is stored.
Cr.3	

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.47 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.A402H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Slice position No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.2402H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result │ Cr.0(7-0) Start slice No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (A402H/2402H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.5.3 CH[] time/count/moving average/time constant setting write (Command No.: A404H/2404H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command writes the number of times or period of time set for averaging process or moving average or time constant setting to RAM of the ST1RD2, and can be executed only in normal mode and when Bw.n+1 Convert setting request is OFF (0).

(1) Values set to "Cw" Command execution area

Table 8.48 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.A404H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.2404H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (A404H/2404H). (Hexadecimal)
Cw.2	Set the number of times or the period of time for averaging process, moving average, or time constant for channel 1. The setting ranges are as follows: Time averaging: 640 to 5000 (ms) Count averaging: 4 to 500 (times) Moving average: 4 to 60 (times) Time constant: 80 to 5000 (ms) If an out-of-range value is set, an error occurs when Bw.n+1 Convert setting request is set to on although it does not occur at the time of command execution.
Cw.3	Set the number of times or the period of time for averaging process, moving average, or time constant for channel 2. The setting ranges are the same as those of Cw.2 Argument 1.

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8.5 ST1RD2 Parameter Setting Write Commands
8.5.3 CH[] time/count/moving average/time constant setting write (Command No.: A404H/2404H)

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in $\boxed{\text{Cr.0(15-8)}}$ Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.49 Values stored in "Cr" Command result area (When completed normally)

$\boxed{\text{Cr}}$ Command result area	Result details
$\boxed{\text{Cr.0}}$	[For execution of command No.A404H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result $\boxed{\text{Cr.0(7-0)}}$ Slice position No. → 00H: Normal completion [For execution of command No.2404H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result $\boxed{\text{Cr.0(7-0)}}$ Start slice No. → 00H: Normal completion
$\boxed{\text{Cr.1}}$	The executed command No. (A404H/2404H) is stored. (Hexadecimal)
$\boxed{\text{Cr.2}}$ $\boxed{\text{Cr.3}}$	0000H is stored.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.50 Values stored in "Cr" Command result area (When failed)

$\boxed{\text{Cr}}$ Command result area	Result details
$\boxed{\text{Cr.0}}$	[For execution of command No.A404H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result $\boxed{\text{Cr.0(7-0)}}$ Slice position No.[*1] → Other than 00H: Failure (Section 8.7 Values Stored into Command Execution Result) [For execution of command No.2404H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result $\boxed{\text{Cr.0(7-0)}}$ Start slice No.[*1] → Other than 00H: Failure (Section 8.7 Values Stored into Command Execution Result)

8.5 ST1RD2 Parameter Setting Write Commands
8.5.3 CH[] time/count/moving average/time constant setting write (Command No.: A404H/2404H)

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Table 8.50 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.1	The executed command No. (A404H/2404H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

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8.5 ST1RD2 Parameter Setting Write Commands
8.5.3 CH[] time/count/moving average/time constant setting write (Command No.: A404H/2404H)

8.5.4 CH[] upper upper limit/upper lower limit setting write (Command No.: A408H, A40AH/2408H, 240AH)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command writes the upper value of upper limit or the lower value of upper limit to RAM of the ST1RD2, and can be executed only in normal mode and when $\boxed{\text{Bw.n+1}}$ Convert setting request is OFF (0).

(1) Values set to "Cw" Command execution area

Table 8.51 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.A408H, A40AH] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.2408H, 240AH] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed. (Hexadecimal) CH1 upper upper limit/upper lower limit setting write: A408H, 2408H CH2 upper upper limit/upper lower limit setting write: A40AH, 240AH
Cw.2	Set an upper upper limit value for alarm output. The setting range for each measurement range is shown below. Values must be set in units of 0.1 ℃. [Example] For the case of 0.3 ℃, set "3". **Measurement range / Setting range table:** <table><tr><th colspan="2">Measurement range</th><th>Setting range</th></tr><tr><td rowspan="3">Pt100 Pt1000</td><td>-200 to 850 ℃</td><td>-2000 to 8500</td></tr><tr><td>-20 to 120 ℃</td><td>-200 to 1200</td></tr><tr><td>0 to 200 ℃</td><td>0 to 2000</td></tr></table> The condition, Upper upper limit value ≥ Upper lower limit value ≥ Lower upper limit value ≥ Lower lower limit value, must be met. If an out-of-range value is set, an error occurs when Bw.n+1 Convert setting request is set to on although it does not occur at the time of command execution.
Cw.3	Set an upper lower limit value for alarm output. The setting ranges are the same as those of Cw.2 Argument 1.

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(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in $\boxed{\text{Cr.0(15-8)}}$ Command execution result.
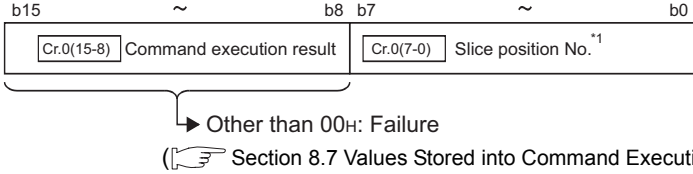
(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.52 Values stored in "Cr" Command result area (When completed normally)

$\boxed{\text{Cr}}$ Command result area	Result details
$\boxed{\text{Cr.0}}$	[For execution of command No.A408H, A40AH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result $\boxed{\text{Cr.0(7-0)}}$ Slice position No. → 00H: Normal completion [For execution of command No.2408H, 240AH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result $\boxed{\text{Cr.0(7-0)}}$ Start slice No. → 00H: Normal completion
$\boxed{\text{Cr.1}}$	The executed command No. (A408H/2408H, A40AH/240AH) is stored. (Hexadecimal)
$\boxed{\text{Cr.2}}$ $\boxed{\text{Cr.3}}$	0000H is stored.

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8.5 ST1RD2 Parameter Setting Write Commands
8.5.4 CH[] upper upper limit/upper lower limit setting write (Command No.: A408H, A40AH/2408H, 240AH)

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.53 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.A408H, A40AH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 [Cr.0(15-8) Command execution result] [Cr.0(7-0) Slice position No.[*1]] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.2408H, 240AH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 [Cr.0(15-8) Command execution result] [Cr.0(7-0) Start slice No.[*1]] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (A408H/2408H, A40AH/240AH) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.5 ST1RD2 Parameter Setting Write Commands
8.5.4 CH[] upper upper limit/upper lower limit setting write (Command No.: A408H, A40AH/2408H, 240AH)

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8.5.5 CH[] lower upper limit/lower lower limit setting write (Command No.: A409H, A40BH/2409H, 240BH)

	Data size
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command writes the upper value of lower limit or the lower value of lower limit to RAM of the ST1RD2, and can be executed only in normal mode and when $\boxed{Bw.n+1}$ Convert setting request is OFF (0).

(1) Values set to "Cw" Command execution area

Table 8.54 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.A409H, A40BH] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.2409H, 240BH] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed. (Hexadecimal) CH1 lower upper limit/lower lower limit setting write: A409H, 2409H CH2 lower upper limit/lower lower limit setting write: A40BH, 240BH
Cw.2	Set a lower upper limit value for alarm output. The setting ranges are as follows: The setting range for each measurement range is shown below. Values must be set in units of 0.1 ℃. [Example] For the case of 0.3 ℃, set "3".

Measurement range		Setting range
Pt100 Pt1000	-200 to 850 ℃	-2000 to 8500
	-20 to 120 ℃	-200 to 1200
	0 to 200 ℃	0 to 2000

The condition, Upper upper limit value $\geqq$ Upper lower limit value $\geqq$ Lower upper limit value $\geqq$ Lower lower limit value, must be met.

If an out-of-range value is set, an error occurs when Bw.n+1 Convert setting request is set to on although it does not occur at the time of command execution.

| Cw.3 | Set an upper lower limit value for alarm output.
The setting range is the same as $\boxed{Cw.2}$ Argument 1. |

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8.5 ST1RD2 Parameter Setting Write Commands
8.5.5 CH[] lower upper limit/lower lower limit setting write (Command No.: A409H, A40BH/2409H, 240BH)

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.55 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.A409H, A40BH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.2409H, 240BH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (A409H/2409H, A40BH/240BH) is stored. (Hexadecimal)
Cr.2 Cr.3	0000H is stored.

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(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.56 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.A409H, A40BH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.2409H, 240BH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (A409H/2409H, A40BH/240BH) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

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8.5 ST1RD2 Parameter Setting Write Commands
8.5.5 CH[] lower upper limit/lower lower limit setting write (Command No.: A409H, A40BH/2409H, 240BH)

8.5.6 Sensor compensation value write (Command No.: A41AH/241AH)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command writes compensation values for errors between "actual temperature" and "measured temperature" to RAM of the ST1RD2.

(1) Values set to "Cw" Command execution area

Table 8.57 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.A41AH] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.241AH] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (A41AH/241AH). (Hexadecimal)
Cw.2	Set a CH1 sensor compensation value. The setting range is -200 to 200. Values must be set in units of 0.1 °C. [Example] For the case of 0.3 °C, set "3".
Cw.3	Set a CH2 sensor compensation value. The setting range is the same as that of Cw.2 Argument 1.

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(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in $\boxed{\text{Cr.0(15-8)}}$ Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.58 Values stored in "Cr" Command result area (When completed normally)

$\boxed{\text{Cr}}$ Command result area	Result details
$\boxed{\text{Cr.0}}$	[For execution of command No.A41AH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result — $\boxed{\text{Cr.0(7-0)}}$ Slice position No. → 00H: Normal completion [For execution of command No.241AH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 $\boxed{\text{Cr.0(15-8)}}$ Command execution result — $\boxed{\text{Cr.0(7-0)}}$ Start slice No. → 00H: Normal completion
$\boxed{\text{Cr.1}}$	The executed command No. (A41AH/241AH) is stored. (Hexadecimal)
$\boxed{\text{Cr.2}}$ $\boxed{\text{Cr.3}}$	0000H is stored.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.59 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.A41AH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.241AH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (A41AH/241AH) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.5.7 Conversion setting value (for disconnection detection) write (Command No.: A41EH/241EH)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command writes conversion setting values for disconnection detection to RAM of the ST1RD2, and can be executed only in normal mode and when [Bw.n+1] Convert setting request is OFF (0).

(1) Values set to "Cw" Command execution area

Table 8.60 Values set to "Cw" Command execution area

[Cw] Command execution area	Setting value
Cw.0	[For execution of command No.A41EH] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.241EH] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (A41EH/241EH). (Hexadecimal)
Cw.2	Set a CH1 conversion value for disconnection detection. The setting range is -32768 to 32767.
Cw.3	Set a CH2 conversion value for disconnection detection. The setting range is the same as that of [Cw.2] Argument 1.

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.61 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.A41EH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result — Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.241EH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result — Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (A41EH/241EH) is stored. (Hexadecimal)
Cr.2	0000H is stored.
Cr.3	

8.5 ST1RD2 Parameter Setting Write Commands
8.5.7 Conversion setting value (for disconnection detection) write (Command No.: A41EH/241EH)

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(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.62 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.A41EH] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.241EH] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (A41EH/241EH) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 1 at command execution is stored.

* 1   When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

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8.5 ST1RD2 Parameter Setting Write Commands
8.5.7 Conversion setting value (for disconnection detection) write (Command No.: A41EH/241EH)

8.6 ST1RD2 Control Commands

8.6.1 Parameter setting read from ROM (Command No.: B400H/3400H)

	Data size
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command reads parameters from ROM to RAM in the ST1RD2, and can be executed only in normal mode and when Bw.n+1 Convert setting request is OFF (0).

(1) Values set to "Cw" Command execution area

Table 8.63 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.B400H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.3400H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (B400H/3400H). (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.64 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.B400H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No. └► 00H: Normal completion [For execution of command No.3400H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No. └► 00H: Normal completion

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Table 8.64 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.1	The executed command No. (B400H/3400H) is stored. (Hexadecimal)
Cr.2	0000H is stored.
Cr.3	

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.65 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.B400H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below.. b15 ～ b8 b7 ～ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No.[1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.3400H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ～ b8 b7 ～ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No.[1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (B400H/3400H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

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8.6.2 Parameter setting write to ROM (Command No.: B401H/3401H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command writes parameters from RAM to ROM in the ST1RD2, and can be executed only in normal mode and when Bw.n+1 Convert setting request is OFF (0).

(1) Values set to "Cw" Command execution area

Table 8.66 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.B401H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.3401H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (B401H/3401H). (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.67 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.B401H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.3401H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (B401H/3401H) is stored. (Hexadecimal)

Table 8.67 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.2	0000H is stored.
Cr.3	

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.68 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.B401H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.3401H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No.*1 → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (B401H/3401H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

⊠**POINT**

Check that the module operates normally with the set values written to RAM, before executing Parameter setting write to ROM (command No.: B401H/3401H).

8.6.3 Operation mode setting (Command No.: B402H/3402H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

The mode of the ST1RD2 can be changed. (From normal mode to offset/gain setting mode, or from offset/gain setting mode to normal mode)

This command can be executed in normal mode and when [Bw.n+1] Convert setting request is off (0), or in offset/gain setting mode.

(1) Values set to "Cw" Command execution area

Table 8.69 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.B402H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.3402H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (B402H/3402H). (Hexadecimal)
Cw.2	Set an operation mode. (Hexadecimal) 0000H: Normal mode 0001H: Offset/gain setting mode
Cw.3	Fixed to 0000H. (Any other value is treated as 0000H.)

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in [Cr.0(15-8)] Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.70 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.B402H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 [Cr.0(15-8) Command execution result] [Cr.0(7-0) Slice position No.] → 00H: Normal completion [For execution of command No.3402H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 [Cr.0(15-8) Command execution result] [Cr.0(7-0) Start slice No.] → 00H: Normal completion

Table 8.70 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.1	The executed command No. (B402H/3402H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	0000H is stored.

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.71 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.B402H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.3402H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (B402H/3402H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.6.4 Offset channel specification (Command No.: B403H/3403H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command specifies a channel and adjusts the offset value for the channel.
When this command is executed, the value being applied to the ST1RD2 is written to RAM as an offset value.
This command can be executed only in offset/gain setting mode.

(1) Values set to "Cw" Command execution area

Table 8.72 Values set to "Cw" Command execution area
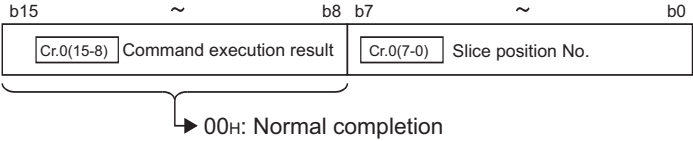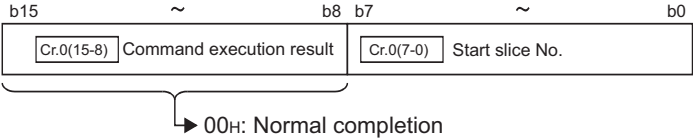
Cw Command execution area	Setting value
Cw.0	[For execution of command No.B403H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.3403H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (B403H/3403H). (Hexadecimal)
Cw.2	Specify a channel for which values are adjusted by the offset value set in the offset/gain setting. Multiple channels can be set at the same time. 0 0 0 □ H — Fixed to 0. b3 b2 b1 b0 — 0 0 □ □ — Fixed to 0. CH1 Offset channel specification 0: Invalid 1: Channel to be set CH2 Offset channel specification 0: Invalid 1: Channel to be set
Cw.3	Set a temperature value equivalent to the input. Values must be set in units of 0.1 ℃. [Example] For the case of 0.3 ℃, set "3".

	Measurement range	Setting range
Pt100 Pt1000	-200 to 850 ℃	-2000 to 8500
	-20 to 120 ℃	-200 to 1200
	0 to 200 ℃	0 to 2000

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(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.73 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.B403H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ～ b8 b7 ～ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.3403H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ～ b8 b7 ～ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (B403H/3403H) is stored. (Hexadecimal)
Cr.2	0000H is stored.
Cr.3	

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.74 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.B403H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 | Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No.*1 | ↳ Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.3403H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 | Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No.*1 | ↳ Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (B403H/3403H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.6.5 Gain channel specification (Command No.: B404H/3404H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command specifies a channel and adjusts the gain value for the channel.
When this command is executed, the value being applied to the ST1RD2 is written to RAM as a gain value.
This command can be executed only in offset/gain setting mode.

(1) Values set to "Cw" Command execution area

Table 8.75 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.B404H] Set a slice position No. of the target ST1RD2. (Hexadecimal) [For execution of command No.3404H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (B404H/3404H). (Hexadecimal)
Cw.2	Specify a channel for which values are adjusted by the gain value set in the offset/gain setting. Multiple channels can be set at the same time. 0 0 0 ☐ H Fixed to 0. b3 b2 b1 b0 0 0 ☐ ☐ Fixed to 0. CH1 Gain channel specification 0: Invalid 1: Channel to be set CH2 Gain channel specification 0: Invalid 1: Channel to be set
Cw.3	Set a temperature value equivalent to the input. Values must be set in units of 0.1 °C. [Example] For the case of 0.3 °C, set "3". Measurement range / Setting range table below

	Measurement range	Setting range
Pt100 Pt1000	-200 to 850 °C	-2000 to 8500
	-20 to 120 °C	-200 to 1200
	0 to 200 °C	0 to 2000

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.76 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.B404H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.3404H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (B404H/3404H) is stored. (Hexadecimal)
Cr.2	0000H is stored.
Cr.3	

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.77 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.B404H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result　Cr.0(7-0) Slice position No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.3404H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result　Cr.0(7-0) Start slice No.[*1] → Other than 00H: Failure (☞ Section 8.7 Values Stored into Command Execution Result)
Cr.1	he executed command No. (B404H/3404H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.6.6 User range write (Command No.: B405H/3405H)

Data size	
Cw	4 words (8 bytes)
Cr	4 words (8 bytes)

This command writes adjusted offset/gain setting values to ROM of the ST1RD2, and can be executed only in offset/gain setting mode.

(1) Values set to "Cw" Command execution area

Table 8.78 Values set to "Cw" Command execution area

Cw Command execution area	Setting value
Cw.0	[For execution of command No.B405H] Set a slice position No. of the target ST1RD2. (Hexadecimal)
	[For execution of command No.3405H] Set a start slice No. of the target ST1RD2. (Hexadecimal)
Cw.1	Set a command No. to be executed (B405H/3405H). (Hexadecimal)
Cw.2	Fixed to 0000H. (Any other value is treated as 0000H.)
Cw.3	

(2) Values stored in "Cr" Command result area

The command execution result data vary depending on the result data (normal completion or failure) in Cr.0(15-8) Command execution result.

(a) When completed normally ("Cr.0(15-8)" Command execution result is 00H.)

Table 8.79 Values stored in "Cr" Command result area (When completed normally)

Cr Command result area	Result details
Cr.0	[For execution of command No.B405H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Slice position No. → 00H: Normal completion [For execution of command No.3405H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result | Cr.0(7-0) Start slice No. → 00H: Normal completion
Cr.1	The executed command No. (B405H/3405H) is stored. (Hexadecimal)

Table 8.79 Values stored in "Cr" Command result area (When completed normally) (Continued)

Cr Command result area	Result details
Cr.2	0000H is stored.
Cr.3	

(b) When failed ("Cr.0(15-8)" Command execution result is other than 00H.)

Table 8.80 Values stored in "Cr" Command result area (When failed)

Cr Command result area	Result details
Cr.0	[For execution of command No.B405H] The command execution result and slice position No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Slice position No.*1 → Other than 00H: Failure (⮕ Section 8.7 Values Stored into Command Execution Result) [For execution of command No.3405H] The command execution result and start slice No. in hexadecimal are stored in the high and low bytes respectively as shown below. b15 ~ b8 b7 ~ b0 Cr.0(15-8) Command execution result Cr.0(7-0) Start slice No.*1 → Other than 00H: Failure (⮕ Section 8.7 Values Stored into Command Execution Result)
Cr.1	The executed command No. (B405H/3405H) is stored. (Hexadecimal)
Cr.2	Cw.2 Argument 1 at command execution is stored.
Cr.3	Cw.3 Argument 2 at command execution is stored.

* 1 When 0FH is stored in Cr.0(15-8) Command execution result, 00H (slice position No. or start slice No. of the head module) is stored in Cr.0(7-0) Slice position No. or start slice No.

8.7 Values Stored into Command Execution Result

The following table indicates the values stored in $\boxed{Cr.n(15-8)}$ Command execution result in $\boxed{Cr}$ Command result area.

Table 8.81 Command execution results and actions

Command execution result	Description	Action
00H	Normal completion	-
01H	The requested command is not available for the specified module.	Check Table 8.1 to see if the requested command No. is applicable for the ST1RD2 or not. Check if the specified $\boxed{Cw.0}$ Slice position No. or start slice No. matches $\boxed{Cw.0}$ Slice position No. or start slice No. of the ST1RD2.
02H	The value is out of range.	Check if the values set in $\boxed{Cw.2}$ and subsequent area in the command execution area are within the range available for the requested command No.
03H	The specified target start slice position No. or start slice No. is incorrect.	Check if the ST1RD2 is mounted in the position of the specified $\boxed{Cw.0}$ slice position No. or start slice No. Check if the specified $\boxed{Cw.0}$ slice position No. or start slice No. matches start slice No. of the ST1RD2.
04H	There is no response from the specified module.	Check Table 8.1 to see if the requested command No. can be used for the ST1RD2 or not. If the requested command No. is applicable, the ST1AD may be faulty. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.
05H	No communication is available with the specified module.	The ST1RD2 may be faulty. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.
06H	The requested command is not executable in the current operation mode of the module.	Confirm the error code and take corrective actions. (☞ Section 9.1 Error Code List) If no error code is stored, see Table 8.1 to check whether the requested command was executed in an appropriate mode.
07H	The module has already been in the specified mode.	Continue the processing since the operation mode of the ST1RD2 specified by $\boxed{Cw.0}$ slice position No. or start slice No.is already the requested mode.
08H	The mode of the module cannot be changed to the specified mode.	Set $\boxed{Bw.n+1}$ Convert setting request to OFF (0), and then execute the command.
09H	The specified module is in the online module change status.	Execute the command after completion of the online module change.
0AH	The specified module No. is different, or does not exist.	Check if the command parameter setting of the intelligent function module is appropriate to the specified module No.
0FH	The value of $\boxed{Cw.0}$ slice position No. or start slice No. is out of range.	Check if the value set for $\boxed{Cw.0}$ slice position No. or start slice No. is within the range or not.

Table 8.81 Command execution results and actions (Continued)

Command execution result	Description	Action
10H	Data cannot be read from the specified module.	Execute the command again. If the problem on the left occurs again, the ST1RD2 may be faulty. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.
11H	Data cannot be written to the specified module.	
13H	The specified module is not in the status available for command parameter writing.	Set [Bw.n+1] Convert setting request to OFF (0), and then execute the command.

CHAPTER9   TROUBLESHOOTING

This chapter lists the errors that may occur when the ST1RD2 is used, and explains how to troubleshoot them.

9.1   Error Code List

When an error has occurred in the ST1RD2 due to data writing to the master module, by executing the Error code read request command (command No.: 8101H/0101H), an error code can be stored into $\boxed{\text{Cr}}$ Command result area of the head module.

Table 9.1 Error code list

Error code (Hexadecimal)	Error level	Error name	Description	Corrective action
1100H	System error	ROM error	ROM fault.	Power the ST1RD2 off and then on, or reset the head module. If the error code given on the left is still stored, the possible cause is a ST1RD2 failure. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.
1200H	System error	ROM write count error	Parameter setting write to ROM (command No.: B401H/3401H) or User range write (command No.: B405H/3405H) was executed more than 25 times after power-on.	After power-on, execute the command for a single module, or write offset/gain settings to the ROM using GX Configurator-ST, within 25 times.
			Offset/gain settings were written to the ROM using GX Configurator-ST more than 25 times after power-on.	
1300H	System error	Converter error	A converter error has occurred.	Turn the convert setting request off to clear the error. Then, turn the convert setting request on again.
200□H	System error	Measurement range setting error	The value set to measurement range setting is outside the valid range. □ indicates the channel number causing the error.	Set a value that is within the valid range.
210□H	System error	Average setting error	The average time setting is outside the range 640 to 5000ms. □ indicates the channel number causing the error.	Set a value that is within the valid range.
220□H	System error	Average setting error	The average number of times setting is outside the range of 4 to 500 times. □ indicates the channel number causing the error.	Set a value that is within the valid range.
230□H	System error	Average setting error	The set value for moving average is outside the range of 4 to 60 times. □ indicates the channel number causing the error.	Set a value that is within the valid range.
240□H	System error	Average setting error	The set time constant is other than 80 to 5000ms. □ indicates the channel number causing the error.	Set a value that is within the valid range.

Table 9.1 Error code list (continued)

Error code (Hexadecimal)	Error level	Error name	Description	Corrective action
300□H	System error	Alarm setting error	The value set to the upper upper limit value/upper lower limit value/lower upper limit value/lower lower limit value of the alarm output is outside the valid range. The setting range for each measurement range is shown below. Measurement range / Setting range: Pt100 Pt1000 — -200 to 850 ℃ : -2000 to 8500 Pt100 Pt1000 — -20 to 120℃ : -200 to 1200 Pt100 Pt1000 — 0 to 200℃ : 0 to 2000 □ indicates the channel number causing the error.	Set a value that is within the valid range.
312 □H	System error	Alarm setting error	In the lower upper limit value/lower lower limit value of the alarm output, the lower upper limit value is less than the lower lower limit value. □ indicates the channel number causing the error.	Re-set the limit values so that the condition of upper upper limit value ≥ upper lower limit value ≥ lower upper limit value ≥ lower lower limit value is satisfied.
313□H	System error	Alarm setting error	In the upper lower limit value/lower upper limit value of the alarm output, the upper lower limit value is less than the lower upper limit value. □ indicates the channel number causing the error.	
314□H	System error	Alarm setting error	In the upper upper limit value/upper lower limit value of the alarm output, the upper upper limit value is less than the upper lower limit value. value. □ indicates the channel number causing the error.	
400□H	System error	User range setting error	In User range setting, offset value is equal to or greater than gain value. □ indicates the channel number causing the error.	Reset the range so that offset value is smaller than gain value.
410□H	System error	User range setting error	In User range setting, the gain value minus offset value is less than 0.2 [℃]. □ indicates the channel number causing the error.	Correct the setting so that the gain value minus offset value is equal to or greater than 0.2 [℃].

Table 9.1 Error code list (continued)

Error code (Hexadecimal)	Error level	Error name	Description	Corrective action
500□H	System error	Disconnection detection error	Disconnection of line A has been detected. □ indicates the channel number causing the error.	Identify a faulty part by a visual check or continuity check of the signal lines.
510□H	System error	Disconnection detection error	Disconnection of line B has been detected. □ indicates the channel number causing the error.	
520□H	System error	Disconnection detection error	Disconnection of line b has been detected. □ indicates the channel number causing the error.	
B10□H to FFFF	-	(Error detected by head module)	-	Refer to the following and take corrective actions. ☞ MELSEC-ST CC-Link Head Module User's Manual, "9.7.2 Error code list"

⊠**POINT**

(1) The error can be cleared by either of the following methods:
   • Error clear request (command No.: 8104H/0104H)
   • Error reset request (RYnA)
   For details of the above methods, refer to the following.
   ☞ MELSEC-ST CC-Link Head Module User's Manual, "8.2.5 Error clear request (Command No.: 8104H/0104H)
   ☞ MELSEC-ST CC-Link Head Module User's Manual, "3.4 Remote I/O, Remote Registers"

(2) If multiple errors of the same level have occurred, the error first detected by the ST1RD2 is stored.

9.2 Troubleshooting

9.2.1 When the RUN LED is flashing or turned off

(1) When flashing at 0.5s intervals

Table 9.2 When flashing at 0.5s intervals

Check item	Corrective action
Is the mode set to the offset/gain setting mode?	Execute Operation mode setting (command No.: B102H/3202H) to select the normal mode. ☞ Section 8.6.3 Operation mode setting (Command No.: B402H/3402H)

(2) When flashing at 0.25s intervals

Table 9.3 When flashing at 0.25s intervals

Check item	Corrective action
Is the module selected as the target of online module change?	Refer to the following and take corrective action. ☞ CHAPTER 7 ONLINE MODULE CHANGE

(3) When flashing at 1s intervals

Table 9.4 When flashing at 1s intervals

Check item	Corrective action
Has cyclic transmission been stopped between the master station and head module?	Refer to the following and take corrective action. ☞ MELSEC-ST System User's Manual
Has a parameter communication error occurred between the master station and head module?	
Has an error occurred in another slice module?	
Has an internal bus error occurred?	

(4) When turned off

Table 9.5 When turned off

Check item	Corrective action
Is a module change enabled during an online module change?	Refer to the following and take corrective action. ☞ CHAPTER 7 ONLINE MODULE CHANGE
Is External SYS. power supply being supplied?	Check whether the supply voltage of the bus refreshing module is within the rated range.
Is the capacity of the bus refreshing module adequate?	Calculate the current consumption of the mounted module, and check that the power supply capacity is sufficient.
Is the ST1RD2 correctly mounted on the base module?	Check the mounting condition of the ST1RD2.
Has a watchdog timer error occurred?	Power the ST1RD2 off and then on, or reset the head module, and check whether the LED turns on. If the LED still does not turn on, the possible cause is a ST1RD2 failure. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

9.2.2 When the RUN and ERR. LEDs is turned on

Table 9.6 When the RUN and ERR. LEDs turned on

Check item	Corrective action
Has an error occurred	Confirm the error code and take corrective action described in the error code list. ☞ Section 9.1 Error Code List

9.2.3 When disconnection is detected

Table 9.7 When disconnection is detected

Check item	Corrective action
Check for incomplete platinum RTD connection.	Connect the platinum RTD securely.
Check whether the terminal screws are tightened enough when a screw clamp type base module is used.	Retighten the terminal screws within the specified torque range. For the specified torque range of the terminal screws, refer to the MELSEC-ST System User's Manual.
Check the connected platinum RTD for wire disconnection.	Perform continuity check on the platinum RTD, and replace it if it is broken.
Check whether conversion is enabled for the channel where no platinum RTD is connected.	Check the conversion-enabled channels and the channels where platinum RTDs are connected, and correct the conversion settings.

9.2.4 When measured temperature values cannot be read

Table 9.8 When measured temperature values cannot be read

Check item	Corrective action
Is external AUX. power supply being supplied?	Check whether the power distribution modules is supplied with 24V DC voltage.
Is there any fault with the analog signal lines such as broken or disconnected line?	Check for any abnormality on the signal lines by doing a visual check and performing a continuity check.
Are the offset/gain settings correct?	Check if the offset/gain settings are correct. •Checking by GX Configurator-ST ☞ Section 5.6 Offset/Gain Setting •Checking by commands ☞ Section 4.5 Offset/Gain Settings When the user range setting is used, switch it to the factory default setting and check whether conversion is performed correctly or not. If it is correctly performed, redo the offset/gain setting.
Is the measurement range setting correct?	Execute the Initial data setting read command (command No.: 9418H/1418H) and confirm the measurement range setting. ☞ Section 8.4.7 Initial data setting read (Command No.: 9418H/1418H) If the measurement range setting is wrong, reset the measurement range setting in GX Configurator-ST, or modify the program for setting command parameters.
Is the conversion enable/disable setting for the channel, where data was input, set to Disable?	Execute the Conversion enable/disable setting read (command No.: 9400H/1400H) to confirm the conversion enable/disable setting. ☞ Section 8.4.1 Conversion enable/disable setting read (Command No.: 9400H/1400H) If conversion is disabled, enable it by GX Configurator-ST or by executing the Conversion enable/disable setting write command (command no.: A400H/2400H). ☞ Section 5.3 Parameter Setting ☞ Section 8.5.1 Conversion enable/disable setting write (Command No.: A400H/2400H)

Table 9.8 When measured temperature values cannot be read (Continued)

Check item	Corrective action
Are ⬚ Bw.n+1 ⬚ convert setting request and ⬚ Br.n+1 ⬚ convert setting completed flag on?	Check whether ⬚ Bw.n+1 ⬚ convert setting request and ⬚ Br.n+1 ⬚ convert setting completed flag are on or off using the program of the master station or the I/O monitor of GX Configurator-ST. ☞ Section 5.4 Input/Output Monitor If ⬚ Bw.n+1 ⬚ convert setting request and ⬚ Br.n+1 ⬚ convert setting completed flag are off, reexamine the program of the master station. ☞ Section 3.4.1 Memory ☞ Section 3.3.2 Word input area

9.2.5 When a measured temperature value is abnormal

Table 9.9 When a measured temperature value is abnormal

Check item	Corrective action
Check whether the connected platinum RTD does not match the setting.	Set a measurement range appropriate to the connected platinum RTD.
Check the platinum RTD for reverse connection.	Connect the platinum RTD correctly.
Check for noise in the platinum RTD input.	Check influence from the ground and adjacent devices, and take action to prevent noise.
Check whether a platinum RTD was changed after the offset/gain value setting.	Set offset/gain values again for the currently used platinum RTD.

⊠**POINT**

The module may be faulty if correct measured temperature values cannot be read even after implementation of the above. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

APPENDIXES

Appendix 1 Accessories

This section explains the accessories related to the ST1RD2.

(1) Wiring marker
For how to use the wiring marker, refer to the following.

☞ MELSEC-ST System User's Manual, "10.2 Mounting the Modules"

Table App.1 Wiring marker list

Model name	Description	Color
ST1A-WMK-BK	Terminal marker (Signal wire)	Black

(2) Coding element
The coding element is fitted before shipment.

It is also available as an option in case it is lost.

Table App.2 Coding element list

Model name	Description	Shape [1]		Color
		Base module side	Slice module side	
ST1A-CKY-15	Coding element for ST1RD2			Dusty gray

* 1 Indicates the position of the projection or hole when the coding element is viewed from above.

◁ : Projection ◀ : Hole

Appendix 2   External Dimensions

(1) ST1RD2
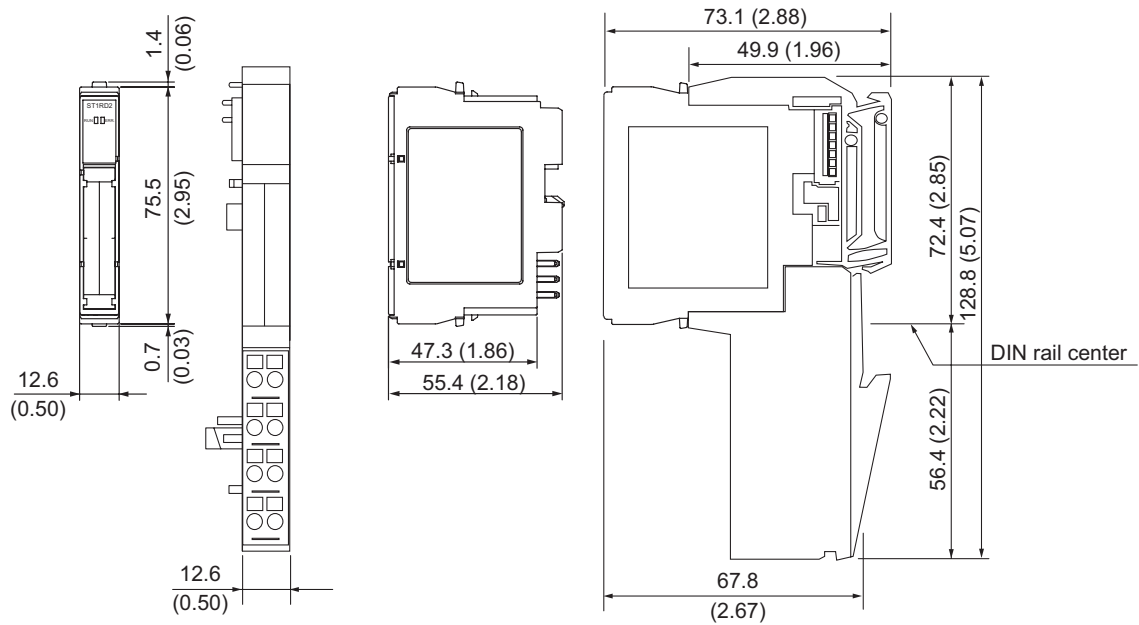
Unit:mm(inch)

Figure App.1 External dimensions

Unit: mm (inch)

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Warranty

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued.
Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not , compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

(1) In using the Mitsubishi MELSEC programmable controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.

(2) The Mitsubishi programmable controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or Public service purposes shall be excluded from the programmable controller applications.

In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable controller range of applications.

However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the users discretion.

MELSEC-ST Platinum RTD
Input Module

User's Manual (CC-Link)

MODEL	ST1RD-BT-U-SY-E
MODEL CODE	13JZ15
SH(NA)-080758ENG-A(0809)KWIX	

MITSUBISHI ELECTRIC CORPORATION

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