MELSEC-ST
SSI Absolute Encoder Input Module

User's Manual

MITSUBISHI


MELSEC-ST

ST1SS1

# ● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using this product, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the product properly.
The precautions given in this manual are concerned with this product only. Refer to the user's manual of the network system for safety precautions of the network system.
In this manual, safety precautions are classified 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 minor or moderate injury or property damage. |

Depending on circumstances, failure to observe ⚠ CAUTION level precautions may also lead to serious results.
Be sure to observe the instructions of both levels to ensure the safety.

Store this manual in a safe place for future reference and also pass it on to the end user.

## [DESIGN PRECAUTIONS]

### ⚠ DANGER

● If a communication error occurs in the network, the error station (MELSEC-ST system) shows the following behavior:
All outputs turn OFF. (In the MELSEC-ST system, the output status at the time of error can be set to clear/hold/preset by user parameters of each slice module. As "clear" is set by default, the outputs turn OFF when an error occurs. In the case where the system operates safely with the output set to "hold" or "preset", change the parameter settings.)
Create an interlock circuit on the program so that the system operates safely based on the communication status information. Failure to do so may cause an accident due to faulty output or malfunction.

● Create an external fail safe circuit that will ensure the MELSEC-ST system operates safely, even when the external power supply or the system fails.
Accident may occur due to output error or malfunction.
(1) The status of output changes depending on the setting of various functions that control the output. Take sufficient caution when setting for those functions.
(2) Normal output may not be obtained due to malfunctions of output elements or the internal circuits. Configure a circuit to monitor signals whose operations may lead to a serious accident.


A - 1

## [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(s) on the DIN rail securely (one by one) referring to the MELSEC-ST system users 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) The I/O modules and the 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.

- 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.

## [INSTALLATION PRECAUTIONS]

### ⚠ CAUTION

- 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 short circuit or malfunction. Overtightening can cause a short circuit due to damage to the screw.

## [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.

- Always place the SSI absolute encoder 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.
  Not doing so will make the module more susceptible to noises, surges and inductions.

### ⚠ 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.

- 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 range. If the terminal screws are loose, it could result in short circuits 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. Disconnect the cables after loosening the screws in the portions connected to the module. Pulling the cables connected to the module can damage the module and cables or can cause a malfunction due to a cable connection fault.


A - 3

## [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.

### ⚠ 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, make sure to 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.
  Not doing so can cause a malfunction.

## [DISPOSAL PRECAUTIONS]

### ⚠ CAUTION

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

REVISIONS

* The manual number is given on the bottom left of the back cover.

| Print Date | * Manual Number | Revision |
|---|---|---|
| Aug., 2006 | SH(NA)-080630ENG-A | First edition |

Japanese Manual Version SH-080629-A

INTRODUCTION

Thank you for choosing the ST1SS1 type MELSEC-ST SSI absolute encoder input module.
Before using the module, please read this manual carefully to fully understand the functions and performance of the ST1SS1 type MELSEC-ST SSI absolute encoder input module and use it correctly.

CONTENTS

About Manuals

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<br>Explains the system configuration 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 PRFIBUS-DP Head Module User's Manual<br>Explains the system configuration, specifications, functions, handling, wiring and troubleshooting of the ST1H-PB. (Sold separately) | SH-080436ENG (13JR68) |
| GX Configurator-ST Version 1 Operating Manual<br>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) |

Compliance with the EMC Directive and the Low Voltage Directive

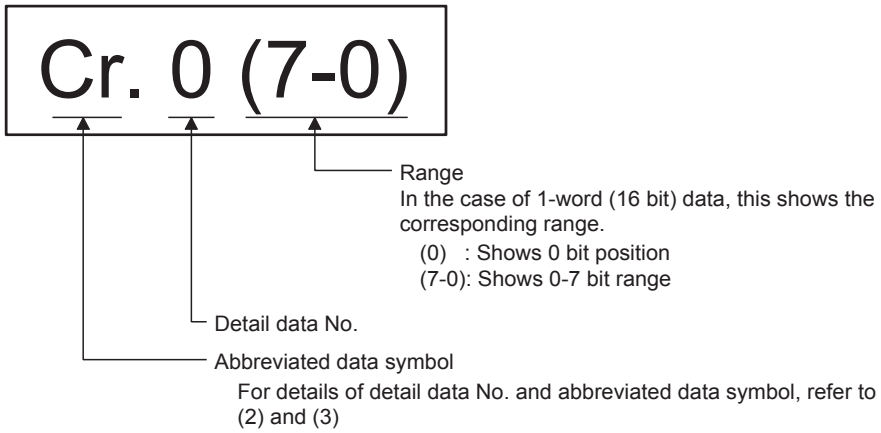
When incorporating the Mitsubishi MELSEC-ST system that is compliant with the EMC directive and the low voltage directive into other machine or equipment and making it comply with the EMC directive and the low voltage directive, refer to "EMC Directive and Low Voltage Directive" of the MELSEC-ST System User's Manual.
The CE logo is printed on the rating plate of the EMC Directive and the Low Voltage Directive.
By making this product conform to the EMC directive and low voltage instruction, it is not necessary to make those steps individually.


A - 9

This manual explains each area for input data and output data using the following symbols.

## (1) Data symbol

<Example: Cr Command result area>




## (2) Input data

| Data symbol | | Area | Unit | Detail data No. notation |
|---|---|---|---|---|
| Br | Br.00 to Br.FF | Bit Input Area | 1 bit/1 symbol | Hexadecimal |
| Er | Er.00 to Er.FF | Error Information Area | 1 bit/1 symbol | Hexadecimal |
| Mr | Mr.0 to Mr.127 | Module Status Area | 1 bit/1 symbol | Decimal |
| Cr | ＊1 | Command Result Area | 1 word/1 symbol | Decimal |
| Wr | Wr.00 to Wr.33 | Word Input Area | 1 word/1 symbol | Hexadecimal |

＊1: The following shows the data symbols and the corresponding detail areas within the command result area.

| Data symbol | | Area |
|---|---|---|
| Cr.0 | Cr.0 (15-8) | Command Execution Area |
| | Cr.0 (7-0) | Start Slice No. of Execution Target |
| Cr.1 | | Executed Command No. |
| Cr.2 | | Response Data 1 |
| Cr.3 | | Response Data 2 |


A - 10

### (3) Output data

| Data symbol | | Area | Unit | Detail data No. notation |
|---|---|---|---|---|
| Bw | Bw.00 to Bw.FF | Bit Output Area | 1 bit/1 symbol | Hexadecimal |
| Ew | Ew.00 to Ew.FF | Error Clear Area | 1 bit/1 symbol | Hexadecimal |
| Sw | Sw.0 to Sw.7 | System Area | 1 word/1 symbol | Decimal |
| Cw | ＊1 | Command Execution Area | 1 word/1 symbol | Decimal |
| Ww | Ww.00 to Ww.33 | Word Output Area | 1 word/1 symbol | Hexadecimal |

＊1: The following shows the data symbols and the corresponding detail areas within the command execution area.

| Data symbol | Area |
|---|---|
| Cw.0 | Start Slice No. of Execution Target |
| Cw.1 | Command No. to be Executed |
| Cw.2 | Argument 1 |
| Cw.3 | Argument 2 |


A - 11

About the Generic Terms and Abbreviations

This manual uses the following generic terms and abbreviations to describe the ST1SS1, unless otherwise specified.

| Generic Term/Abbreviation | Description |
|---|---|
| ST1SS1 | Abbreviation for ST1SS1 type MELSEC-ST SSI absolute encoder input module. |
| Head module | ST1H-PB, MELSEC-ST PROFIBUS-DP compatible head module. |
| PROFIBUS-DP | PROFIBUS-DP network. |
| Bus refreshing module | Module that distributes the external SYS. power supply and external AUX. power supply among the head module and slice modules. |
| Power feeding module | Module that distributes external AUX. power supply among 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 | Generic term for 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 | SWnD5C-STPB-E type products. (n: 1 or later) |
| Configuration software | Software used to set slave parameters for head module and slice modules.(e.g., GX Configurator-DP) |
| User parameter | Generic term for setting items (SSI baud rate setting, SSI direction reversal setting, SSI code setting, SSI code length setting, SSI parity setting) set by the configuration software of the master station. |
| Command parameter | Generic term for setting items (SSI trailing bits setting, SSI monoflop time setting, Latch mode setting, Coincidence detection flag setting, Coincidence detection value) set by commands. They can also be set by GX Configurator-ST. |
| Parameter | Generic term for user parameters and command parameters. |

Term definition

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

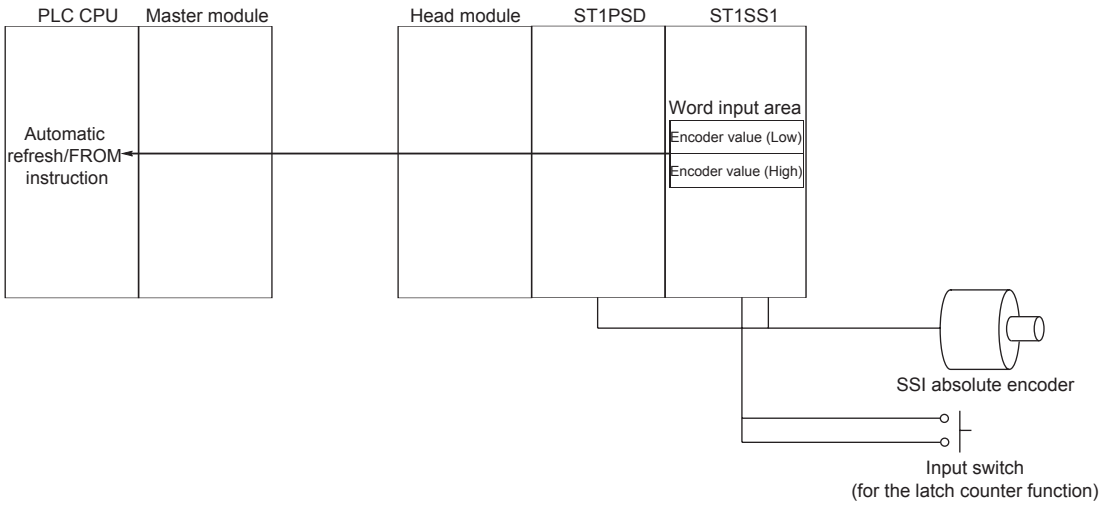
| Term | Definition |
|---|---|
| Master station | Class 1 master station that communicates I/O data with slave stations. |
| Slave station | Device that communicates I/O data with the master station. |
| Repeater | Device that connects PROFIBUS-DP segments. |
| Bus terminator | Terminator that is connected to both ends of each PROFIBUS-DP segment |
| FDL address | Address assigned to the master station or slave station. |
| GSD file | The electronic file that includes description of the slave station parameters.<br>The file is used to set parameters at the master station. |
| Input data | Data sent from the head module to the master station.<br>The data consists of the following areas.<br>・[Br] Bit Input Area<br>・Information Area<br>[Er] Error Information Area<br>[Mr] Module Status Area<br>[Cr] Command Result Area<br>・[Wr] Word Input Area |
| Output data | Data that the head module receives from the master station.<br>The data consists of the following areas.<br>・[Bw] Bit Output Area<br>・Request Area<br>[Ew] Error Clear Area<br>[Sw] System Area<br>[Cw] Command Execution Area<br>・[Ww] Word Output Area |
| I/O data | Data (input data, output data) transferred between the head module and the master station. |
| [Br.n] bit input | Bit input data of each module. |
| [Bw.n] bit output | Bit output data of each module. |
| [Wr.n] word input | Word (16-bit) input data of an intelligent function module.<br>In the case of analog input module, a digital output data value is stored. |
| [Ww.n] word output | Word (16-bit) output data of an intelligent function module.<br>In the case of analog output module, a digital setting data value is stored. |
| Information area | Bit/Word input data for checking each module status and command execution results. |
| Request area | Bit/Word output data for requesting each module to clear errors/to execute commands. |
| Number of occupied I/O points | The area, that is equivalent to the occupied I/O points, is occupied in [Br] bit input area/[Bw] bit output area. |
| Slice No. | No. assigned to every 2 occupied I/O points of each module. This numbering starts by assigning "0" to the head module and then proceeds in ascending order. (The maximum is 127).<br>The No. is used for specifying the execution target. |
| Command | Generic term for requests made by the master station in order to read each module's operating status and to set and control intelligent function module operation. |

# 1 OVERVIEW



This User's Manual provides the specifications, handling instructions, programming methods, etc. for the MELSEC-ST SSI absolute encoder input module ST1SS1 (hereinafter referred to as the ST1SS1).
SSI is an abbreviation for the Synchronous Serial Interface.
This manual includes descriptions of the ST1SS1 only.
For information on the MELSEC-ST system, refer to the MELSEC-ST System User's Manual.

The ST1SS1 is designed to be connected to an absolute encoder that has the SSI communication function (hereinafter referred to as the SSI absolute encoder), and thereby it can load positioning data sent from the encoder.




## 1.1 Features

### (1) Connectable with SSI absolute encoder

The ST1SS1 can be connected to an SSI absolute encoder, especially, the one having trailing bits (signals indicating the status of the encoder) since the number of trailing bits can be set.

### (2) Selection of gray or binary code is available.

The SSI code for the ST1SS1 can be selected from two options (Gray code and Binary code) so that it is suitable for the SSI absolute encoder to be connected. The ST1SS1 always outputs binary data to a head module. (When Gray code is selected, the ST1SS1 converts values to binary data.)

### (3) SSI baud rate is selectable

The SSI baud rate for communication with the SSI absolute encoder is selectable from 125kHz, 250kHz, 500kHz, 1MHz, and 2MHz. Since the SSI baud rate can be selected from 125kHz, 250kHz, 500kHz, 1MHz and 2MHz, the ST1SS1 is applicable to a variety of systems.

### (4) SSI code length setting suitable for resolution of SSI absolute encoder

The ST1SS1 is compatible with SSI absolute encoders of 2- to 31-bit resolution, and the SSI code length can be set within the range from 2 to 31 bits.

### (5) Digitally input encoder value can be latched. (Latch count function)

With 1-point digital input for the latch function, the ST1SS1 can latch the encoder value when a signal is input by the input switch, etc.

### (6) Rotational direction of SSI absolute encoder is detectable.

The ST1SS1 has two LEDs that indicate rotational directions of the SSI absolute encoder, so that its incrementing or decrementing count can be confirmed with the LEDs.

### (7) Count direction can be reversed.

Incrementing or decrementing count relative to the rotational direction of the SSI absolute encoder can be reversed.

| SSI direction reversal setting | SSI absolute encoder output | ST1SS1<br>Wr.n Encoder value (Low),<br>Wr.n+1 Encoder value (High) | INC. LED | DEC. LED |
|---|---|---|---|---|
| No reversal | Increment | Increment | ON | OFF |
| | Decrement | Decrement | OFF | ON |
| Reversal | Increment | Decrement | OFF | ON |
| | Decrement | Increment | ON | OFF |

### (8) Coincidence detection is available.

The ST1SS1 compares the present value with the coincidence detection value set in advance and, if these values are matched, it outputs a bit output signal.

### (9) Failure in DATA signal line is detectable.

Failure occurred in a DATA signal line connected between the ST1SS1 and a SSI absolute encoder (e.g. cable disconnection, short circuit, incorrect wiring) can be detected.

### (10) Online module change

The module can be replaced without stopping the system.

### (11) Easy setup using GX Configurator-ST

An optional software package (GX Configurator-ST) is separately available. GX Configurator-ST is not necessarily required for system configuration. However, use of GX Configurator-ST is recommended because parameter setting and automatic refresh setting can be made on-screen, resulting in reduction of programming steps, and the setting/operating status can be easily checked.

# 2 SYSTEM CONFIGURATION

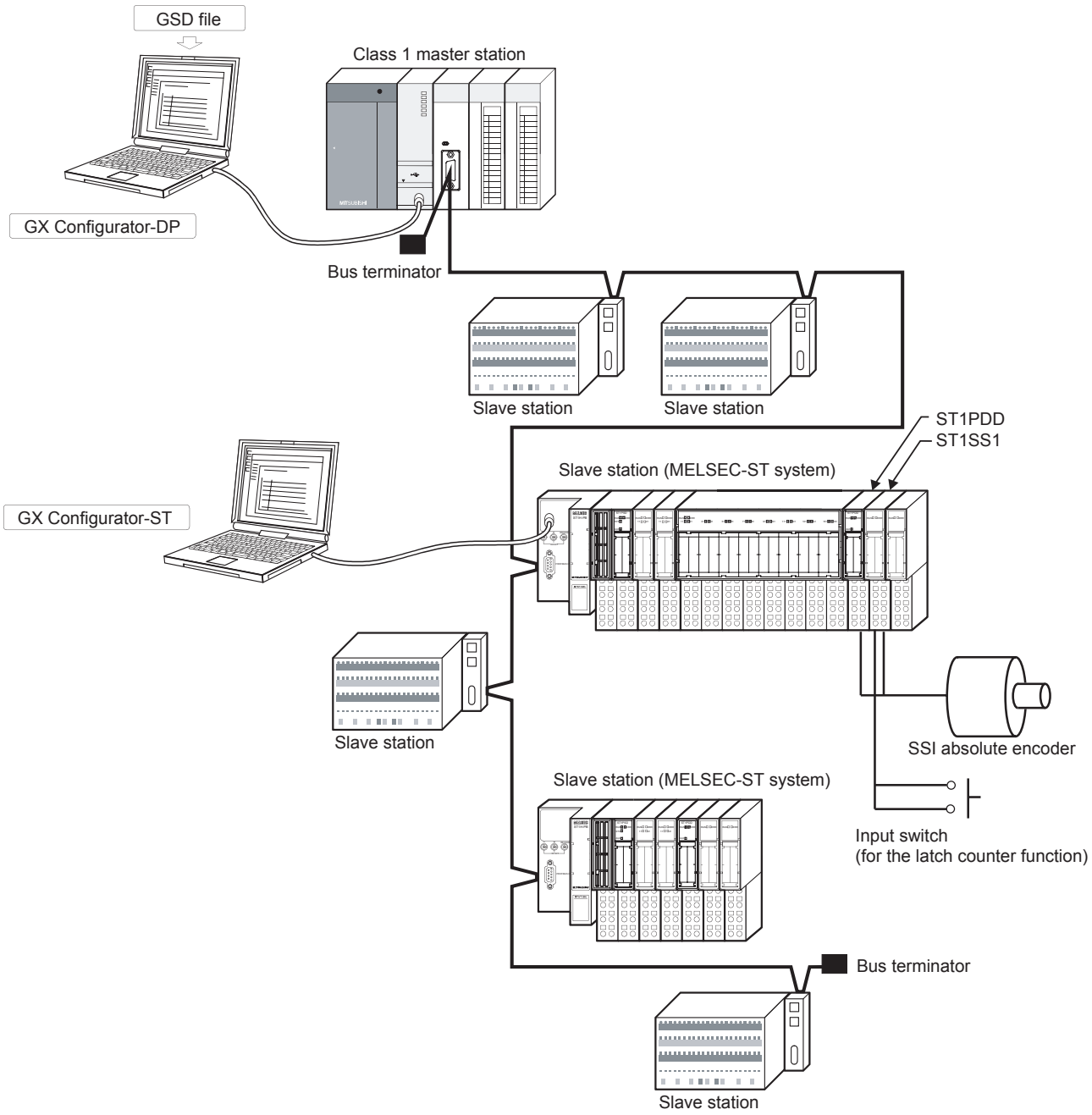
This chapter describes the system configuration for use of the ST1SS1.

## 2.1 Overall Configuration



The overall configuration for use of the ST1SS1 is shown below.

<The system using MELSEC-Q series>





2 - 1

## 2.2 Applicable System

This section explains the applicable system.

### 2.2.1 Applicable head module

The head module applicable to the ST1SS1 is indicated below.

| Product name | Model name |
|---|---|
| MELSECT-ST PROFIBUS-DP Head Module | ST1H-PB |

### 2.2.2 Applicable base module

The base modules applicable to the ST1SS1 are indicated below.

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

### 2.2.3 Applicable coding element

The coding elements applicable to the ST1SS1 are indicated below.
The coding element is fitted before shipment.
It is also available separately in case it is lost.

| Description | Model name |
|---|---|
| ST1SS1 coding element | ST1A-CKY-18 |

### 2.2.4 Applicable software package

The software package applicable to the ST1SS1 is indicated below.

| Model name | Product name | Compatible software version |
|---|---|---|
| SW1D5C-STPB-E | GX Configurator-ST | Version 1.05F or later |

### 2.2.5 Applicable GSD file

The GSD file applicable to the ST1SS1 is indicated below.

| Description | Compatible version* |
|---|---|
| GSD file applicable to ST1SS1 | rel. 1.04 or later |

* The GSD file name and version are displayed in the GSD file registration list of the configuration software on the master station.
Check that the version is rel. 1.04 or later.

### 2.2.6 Number of mountable ST1SS1s per head module

The following shows the number of mountable ST1SS1s per head module.

| No. of mountable ST1SS1s | Remarks |
|---|---|
| Up to 20 *1<br>(When the head module is in 128-point mode) | Placing the ST1PSD (or ST1PDD) on the immediately left, mount it between the SSI absolute encoder and the ST1PSD (or ST1PDD). |

*1: When the maximum I/O points of the head module are set as 128-point mode:
(Bit data of head module: 4 bits)
+ (Bit data of ST1SS1: 4 bits × 20)
+ (Bit data of ST1PSD or ST1PDD: 2 bits × 20)
= 124 bits < 128 bits (No. of bits in 128-point mode)

The maximum number of mountable modules changes depending on the maximum input/output points setting of the head module. For details, refer to the MELSEC-ST PROFIBUS-DP Head Module User's Manual.

## 2.3 Precautions for System Configuration

When using the ST1SS1 in the MELSEC-ST system, pay attention to the following:

1) Mount the power distribution module on the immediate left of the ST1SS1. (Refer to Section 4.4.2.)
2) When using multiple ST1SS1s, mount one power distribution module per ST1SS1.
3) When installing the ST1SS1 together with another intelligent function module in the same power supply section, mount the ST1SS1 in the leftmost position of the power supply section.

For other precautions on the system configuration, refer to the MELSEC-ST System User's Manual, Section 3.4 "Precautions for System Configuration".

# 3 SPECIFICATIONS

This chapter provides the specifications of the ST1SS1.
For the general specifications of the ST1SS1, refer to the MELSEC-ST System User's Manual.

## 3.1 Performance Specifications

This section indicates the performance specifications of the ST1SS1.

### (1) Performance specifications list



| Item | | Specifications |
|---|---|---|
| Number of input points | | 1 channel / 1 module |
| Output data format | | Binary of up to 31 bits (0 to 2147483647) |
| Applicable absolute encoder | | Absolute encoder with SSI (Synchronous Serial Interface) |
| Power voltage available for SSI absolute encoder | | 20.4V to 26.4V DC<br>(Supplied through AUX. terminal of power distribution module.*1) |
| Counting range | | 31-bit binary (0 to 2147483647) |
| Resolution | | 2 to 31 bits (Can be set in 1-bit units) |
| SSI baud rate | | 125kHz |
| | | 250kHz |
| | | 500kHz |
| | | 1MHz |
| | | 2MHz |
| Transmission path*2 | | EIA standard RS-485 |
| Detection of input line error | | Yes |
| External input | | 1 point<br>Rated input voltage : 24V DC (+20 / -15%, Ripple ratio: within 5%)<br>Rated input current : Approx. 12mA |
| ROM write count | | ROM write count by parameter setteing: 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, Er.n : Number of occupancy 4, Mr.n : Number of occupancy 2, Wr.n : Number of occupancy 2 |
| | Output data | Bw.n : Number of occupancy 4, Ew.n : Number of occupancy 4,Ww.n : Number of occupancy 2 |
| Isolation | | Specific isolated area: Channels and internal bus<br>Isolation method: Photocoupler<br>Dielectric withstand: 510Vrms AC /1ms (elevation 2000m)<br>Insulation resistance: 500V DC 10MΩ or more |
| Applicable base module | | Spring clamp type: ST1B-S4IR2 Screw clamp type: ST1B-E4IR2 |
| Applicable coding element | | ST1A-CKY-18(dark green) |
| External AUX. power supply | | 24V DC (+20/-15%, ripple ratio within 5%) |
| | | 24V DC current: 0.030A |
| 5V DC internal current consumption | | 0.080 A |
| External dimensions | | 77.6 (3.06in.) (H) × 12.6 (0.50in.) (w) × 55.4 (2.18in.) (D) [mm] |
| Weight | | 0.04 kg |

*1: For the rated current of the AUX. terminal of the power distribution module, refer to the MELSEC-ST System User's Manual.

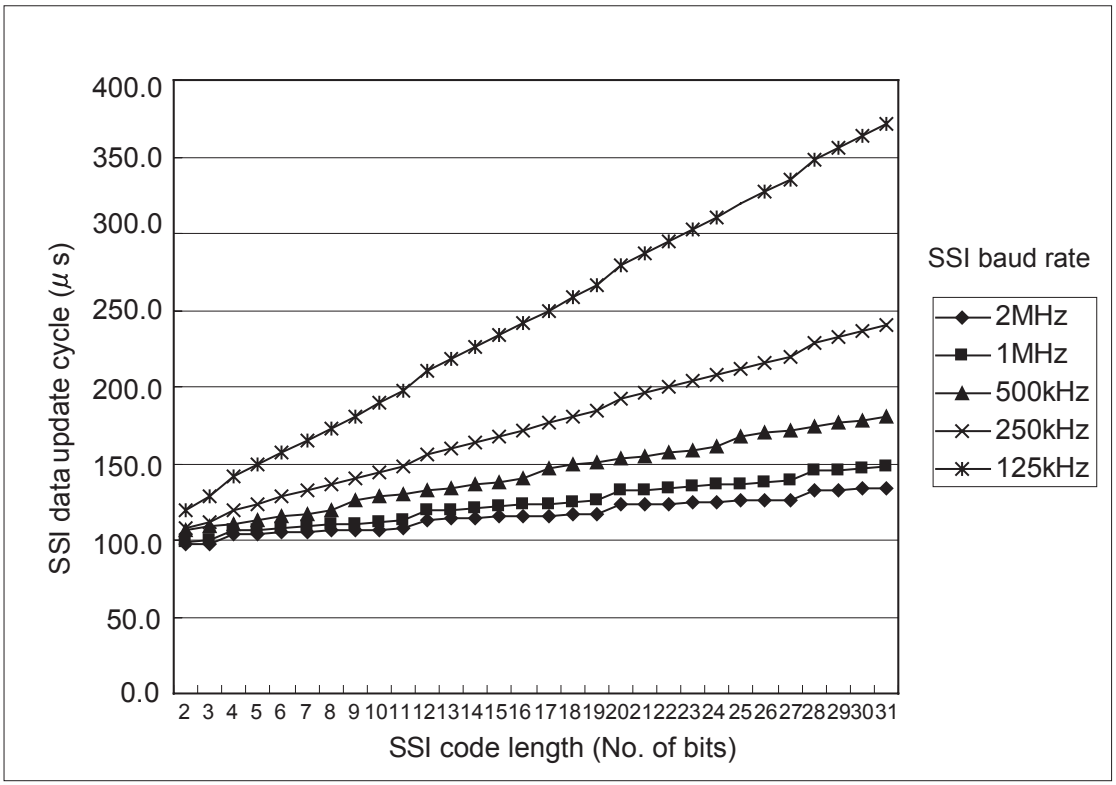
*2: This is the case where the ST1SS1 is connected to an RS-485 type encoder (communication with the one equivalent to TI's SN75176 has been confirmed.) If any other type of encoder is connected, communication may be restricted. Be sure to check the specifications of the encoder to be connected.

### 3.1.1 Data refresh cycle of the ST1SS1

When the ST1SS1 sends a clock to a SSI absolute encoder, the encoder sends a positioning data back to the STSS1 in synchronization with the clock.
Data in ST1SS1's Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) areas are refreshed regularly by communications with the SSI absolute encoder.

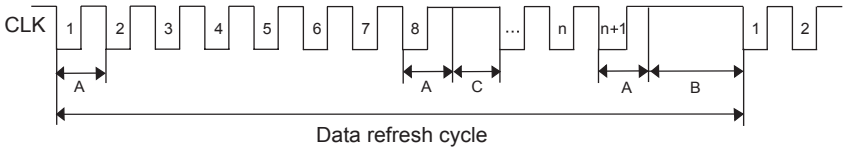
#### (1) Data refresh cycle of the ST1SS1

The ST1SS1 data update cycle varies depending on the SSI code length.
Shown below is a graph of the ST1SS1 data update cycle for the monoflop time of 96μs.



The refresh cycle of Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) can be obtained from the formula shown below.
The formula varies depending on the SSI baud rate.

(a) When the SSI baud rate is 250kHz/1MHz/2MHz

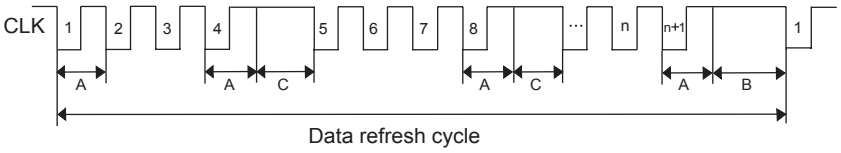



Data refresh cycle = A × (n+1) + B + (C × n/8)

A: Inverse of SSI baud rate f (1/f )
n: SSI code length (Refer to Section 3.2.1)
B: SSI monoflop time (Refer to Section 3.2.3)
C: Clock delay*
250kHz: 4μs
1MHz: 5μs
2MHz: 5.5μs

Example) Calculation for the following case: SSI baud rate: 250kHz, SSI code length: 25 bits, and SSI monoflop time: 96μs
4 × (25+1) + 96 + (4×25/8) = 212.5μs

(b) When the SSI baud rate is 125kHz/500kHz




Data refresh cycle = A × (n+1) + B + (C × n/4)

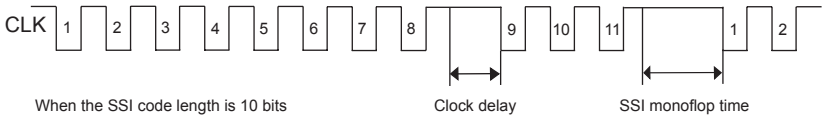
A: Inverse of SSI baud rate f (1/f )
n: SSI code length (Refer to Section 3.2.1)
B: SSI monoflop time (Refer to Section 3.2.3)
C: Clock delay*
125kHz/500kHz: 5μs

Example) Calculation for the following case: SSI baud rate: 125kHz, SSI code length: 25 bits, and SSI monoflop time: 96μs
8 × (25+1) + 96 + (5×25/4) = 335.25μs

∗Clock delay is the time of delay that occurs in communication with the SSI absolute encoder.
The clock delay varies depending on the SSI baud rate.

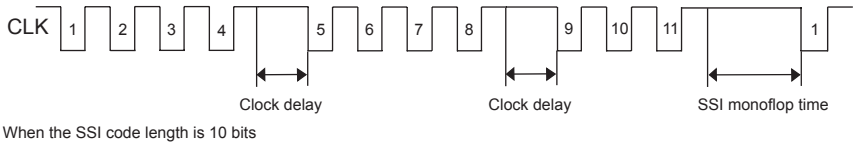
1) When the SSI baud rate is 250kHz/1MHz/2MHz

The following clock delay occurs every 8 bits.
SSI baud rate 250kHz : 4μs
SSI baud rate 1MHz: 5μs
SSI baud rate 2MHz: 5.5μs




2) When the SSI baud rate is 125kHz/500kHz

Clock delay of 5μs occurs every 4 bits.




### 3.1.2 Intelligent function module processing time

The ST1SS1 intelligent function module processing time is Data refresh cycle.
For the input transmission delay time, refer to your head module user's manual.

## 3.2 Functions

This section explains functions of the ST1SS1.

### 3.2.1 Function list

Table 3.1 lists functions of the ST1SS1.

Table 3.1 ST1SS1 Function List (1/3)

<table>
<tr><th>Item</th><th>Description</th><th>Reference section</th></tr>
<tr><td>Counter function</td><td>(1) The output data of the SSI absolute encoder are stored in the Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) areas.<br>(2) Counting is available within the range from 0 to 2147483647 (31-bit binary).<br>(3) Counting is repeated within the range between the lower and upper limit values.</td><td>Section 3.2.2</td></tr>
<tr><td>SSI code setting function (Gray code/Binary code selection)</td><td>(1) Select either "Gray code" or "Binary code" as the SSI code of the ST1SS1, in accordance with the SSI absolute encoder to be connected.<br>(2) The ST1SS1 always outputs binary data to a head module. (When "Gray code" is selected, it converts values into binary data and stores them in the Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) areas.)<br>(3) The default is "Gray code".<br>[Setting tool]<br>• Master station's configuration software<br>• GX Configurator-ST (Refer to Section 5.3.)</td><td>—</td></tr>
<tr><td>SSI baud rate selection function</td><td>(1) Set the SSI baud rate applied to communication with the SSI absolute encoder.<br>(2) Select the SSI baud rate from 125kHz, 250kHz, 500kHz, 1MHz, and 2MHz.<br>(3) The maximum wiring length is determined by the SSI baud rate.
<table>
<tr><th>SSI baud rate</th><th>Maximum wiring length</th></tr>
<tr><td>125kHz</td><td>320m</td></tr>
<tr><td>250kHz</td><td>160m</td></tr>
<tr><td>500kHz</td><td>60m</td></tr>
<tr><td>1MHz</td><td>20m</td></tr>
<tr><td>2MHz</td><td>8m</td></tr>
</table>
(4) Default is "125kHz".<br>[Setting tool]<br>• Master station's configuration software<br>• GX Configurator-ST (Refer to Section 5.3.)</td><td>—</td></tr>
<tr><td>SSI code length setting function (Encoder resolution setting function)</td><td>(1) Set the SSI code length that matches resolution of the SSI absolute encoder to be connected.<br>The ST1SS1 supports SSI absolute encoders with resolution of 2 to 31 bits.<br>(2) The setting range is 2 to 31 bits.<br>(3) The default is "25 bits".<br>[Setting tool]<br>• Master station's configuration software<br>• GX Configurator-ST (Refer to Section 5.3.)</td><td>—</td></tr>
</table>

Table 3.1 ST1SS1 Function List (2/3)

<table>
<tr><th>Item</th><th>Description</th><th>Reference section</th></tr>
<tr><td>SSI parity setting function</td><td>(1) Make the parity check setting (None, Even, or Odd) appropriate for the SSI absolute encoder to be connected.<br>(2) Select any of "None", "Even", and "Odd".<br>(3) When a parity error is detected, the ERR. LED turns on and a system error data is stored in Er.n+1 and Er.n Error information while Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) are retained.<br>(4) The default is "None".<br>[Setting tool]<br>• Master station's configuration software<br>• GX Configurator-ST (Refer to Section 5.3.)</td><td>—</td></tr>
<tr><td>SSI monoflop time setting function</td><td>(1) Set the time to be reserved for synchronization with the data refresh cycles of the SSI absolute encoder (SSI monoflop time).<br>(2) Select one from 48μs, 64μs, 80μs and 96μs.<br>(3) The default is "96μs".<br>[Setting tool]<br>• SSI monoflop time setting value write (Command No.: 2502H, Refer to Section 8.4.2.)<br>• GX Configurator-ST (Refer to Section 5.3.)</td><td>Section 3.2.3</td></tr>
<tr><td>Latch counter function</td><td>(1) The ST1SS1 has 1-point digital input for the latch function and, if a signal is input from the input switch, it latches the values stored in Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) and turns ON (1) Br.n+2 Latch detection flag.<br>(2) Select a desired option from "No latch", "Rising edge", "Falling edge", and "Rising + falling edge".<br>(3) To clear Br.n+2 Latch detection flag, turn ON (1) Bw.n+2 Latch detection clear request.<br>(4) The default is "No latch".<br>[Setting tool]<br>• Latch mode setting value write (Command No.: 2503H, Refer to Section 8.4.3)<br>• GX Configurator-ST (Refer to Section 5.3.)</td><td>Section 3.2.4</td></tr>
<tr><td>Detection of rotational direction</td><td>(1) The ST1SS1 has two LEDs that indicate rotational directions of the SSI absolute encoder, so that its incrementing or decrementing count can be confirmed with the LEDs.</td><td>—</td></tr>
<tr><td>SSI direction reversal setting</td><td>(1) Incrementing or decrementing count relative to the rotational direction of the SSI absolute encoder can be reversed.<br>(2) Select either "No reversal" or "Reversal".<br><table><tr><th>SSI direction reversal setting</th><th>SSI absolute encoder output</th><th>ST1SS1<br>Wr.n Encoder value (Low)<br>Wr.n+1 Encoder value (High)</th><th>INC.LED</th><th>DEC.LED</th></tr><tr><td rowspan="2">No reversal</td><td>Increment</td><td>Increment</td><td>ON</td><td>OFF</td></tr><tr><td>Decrement</td><td>Decrement</td><td>OFF</td><td>ON</td></tr><tr><td rowspan="2">Reversal</td><td>Increment</td><td>Decrement</td><td>OFF</td><td>ON</td></tr><tr><td>Decrement</td><td>Increment</td><td>ON</td><td>OFF</td></tr></table>(3) The default is "No reversal".<br>[Setting tool]<br>• Master station's configuration software<br>• GX Configurator-ST (Refer to Section 5.3.)</td><td>—</td></tr>
</table>


3 - 6

Table 3.1 ST1SS1 Function List (3/3)

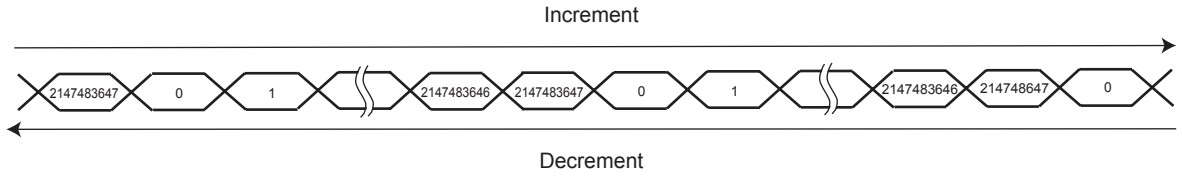
| Item | Description | Reference section |
|---|---|---|
| Coincidence detection function | (1) The preset coincidence detection value (command parameter) is compared with Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High). If these values are matched, Br.n+3 Coincidence detection flag turns ON (1).<br>(2) In the coincidence detection flag setting, select a desired option from "No comparator", "Upward", "Downward" or "Upward + downward".<br>The default is "No comparator".<br>(3) The coincidence detection setting value can be set within the range from 0 to 2147483647 in 1-point units.<br>The default is "0".<br>(4) To clear Br.n+3 Coincidence detection flag, turn ON (1) Bw.n+3 Comparator clear request.<br>[Coincidence detection flag setting method]<br>• Coincidence detection flag setting write (Command No.: 2504H, Refer to Section 8.4.4.)<br>• GX Configurator-ST (Refer to Section 5.3.)<br>[Coincidence detection value setting method]<br>• Coincidence detection value write (Command No.: 2505H, Refer to Section 8.4.5.)<br>• GX Configurator-ST (Refer to Section 5.3.) | Section 3.2.5 |
| SSI trailing bits setting function | (1) Set the number of trailing bits if the SSI absolute encoder connected has trailing bits.<br>(2) The setting range is 0 to 15 bits.<br>(3) The default is "0" bits.<br>[Setting tool]<br>• SSI trailing bits setting value write (Command No.: 2501H, Refer to Section 8.4.1.)<br>• GX Configurator-ST (Refer to Section 5.3.) | — |
| DATA signal line error detection function | (1) Failure occurred in a DATA signal line connected between the ST1SS1 and a SSI absolute encoder (e.g. cable disconnection, short circuit, incorrect wiring) can be detected.<br>(2) When a DATA signal line error is detected, the ERR. LED turns on and a system error data is stored in Er.n+1 and Er.n Error information while Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) are retained. | — |
| 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 |
| Online module change | (1) A module change is made without the system being stopped.<br>[Execution procedure]<br>• Button operation on the head module<br>• GX Configurator-ST | Chapter 7 |

### 3.2.2 Counter function

(1) The output data of the SSI absolute encoder are stored in the Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) areas.

(2) Counting is available within the range from 0 to 2147483647 (31-bit binary).

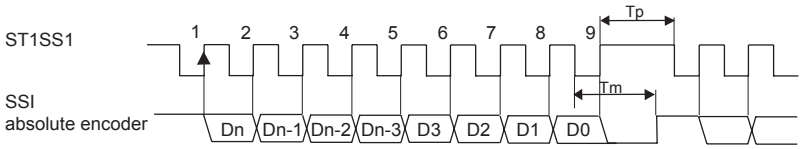
(3) Counting is repeated within the range between the lower limit(0) and upper (different depending on the SSI code length setting) limit values.




(4) At power-up of the MELSEC-ST system, at reset of the head module, or when Bw.n+1 Convert setting request turns OFF (0), 0 is stored.

## 3.2.3 SSI monoflop time setting function

(1) The SSI monoflop time (Tp) is a time to be secured for synchronization with the data refresh cycles of an SSI absolute encoder.
To communicate with the SSI absolute encoder, set the SSI monoflop time (Tp) to allow time for data transmission of the encoder to be reset (Tm) under condition of Tp>Tm.




(2) Select one from 48μs, 64μs, 80μs and 96μs.
When the SSI baud rate is 125kHz or 250kHz, the SSI monoflop time setting is restricted depending.
For the case of 500kHz, 1MHz, or 2MHz, there are no restrictions.

| SSI baud rate | SSI monoflop time setting | | | |
|---|---|---|---|---|
| | 48μs | 64μs | 80μs | 96μs |
| 125kHz | × | | ○ | |
| 250kHz | × | | ○ | |
| 500kHz | ○ | | | |
| 1MHz | ○ | | | |
| 2MHz | ○ | | | |

○: Can be set ×: Can not be set

(3) Default value is 96μs.

### 3.2.4 Latch counter function

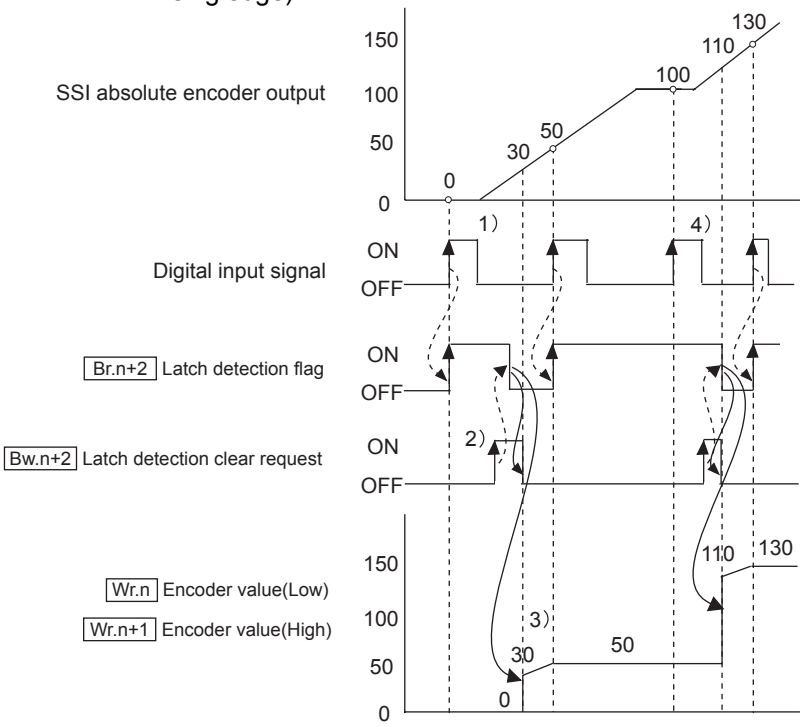
(1) The ST1SS1 has 1-point digital input for the latch function and, if a signal is input from the input switch, it latches the values stored in Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) and turns ON (1) Br.n+2 Latch detection flag.

(2) Select a desired option from "No latch", "Rising edge", "Falling edge", and "Rising + falling edge".

(3) To clear Br.n+2 Latch detection flag, turn ON (1) Bw.n+2 Latch detection clear request.

(4) While Br.n+2 Latch detection flag is OFF (0), Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) are constantly updated to the latest values.

(5) The figure below shows the relation between the SSI absolute encoder output, the digital input signal, and Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) in the latch counter function (Latch mode setting: Rising edge).




1) Br.n+2 Latch detection flag turns ON (1) at the rise of the digital input signal, and Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) are latched.
2) When Bw.n+2 Latch detection clear request turns ON (1), Br.n+2 Latch detection flag turns OFF (0).
3) While Br.n+2 Latch detection flag is OFF (0), Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) are constantly updated to the latest values.
4) If the digital input signal rises with Br.n+2 Latch detection flag turned ON (1), Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) are not updated.


3 - 11

## 3.2.5 Coincidence detection function

(1) The preset coincidence detection value (command parameter) is compared with Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High). If these values are matched, Br.n+3 Coincidence detection flag turns ON (1).

(2) In the coincidence detection flag setting, select a desired option from "No comparator", "Upward", "Downward" or "Upward + downward". Conditions for detection on each setting are given in the table below.

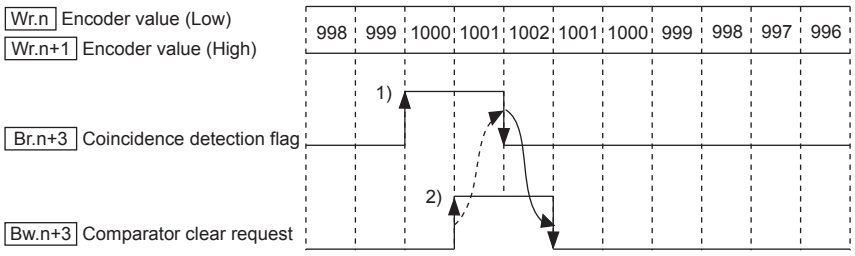
| Coincidence detection flag setting | Conditions for detection |
|---|---|
| Upward | Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) match the Coincidence detection value while they are incremented. |
| Downward | Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) match the Coincidence detection value while they are decremented. |
| Upward + downward | Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) match the Coincidence detection value regardless of whether they are incremented or decremented. |

(3) The coincidence detection setting value can be set within the range from 0 to 2147483647 in 1-point units.

(4) To clear Br.n+3 Coincidence detection flag, turn ON (1) Bw.n+3 Comparator clear request.

(5) The following diagram shows the relationship between Wr.n Encoder value (Low), Wr.n+1 Encoder value (High) and Br.n+3 Coincidence detection flag in the coincidence detection function.

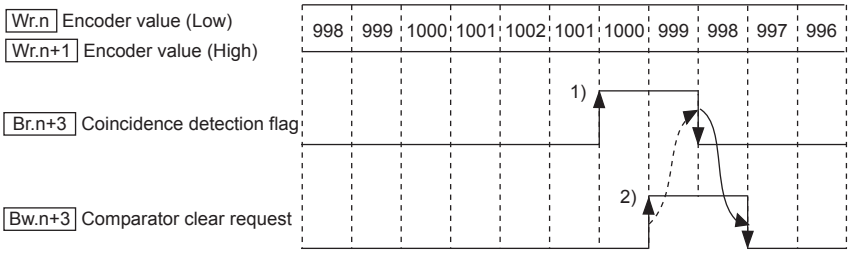
Example 1) Coincidence detection flag setting: Upward, Coincidence detection value: 1000




1) When Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) match the Coincidence detection value while they are incremented, Br.n+3 Coincidence detection flag turns ON (1).

2) Turning ON (1) Bw.n+3 Comparator clear request turns OFF (0) Br.n+3 Coincidence detection flag.

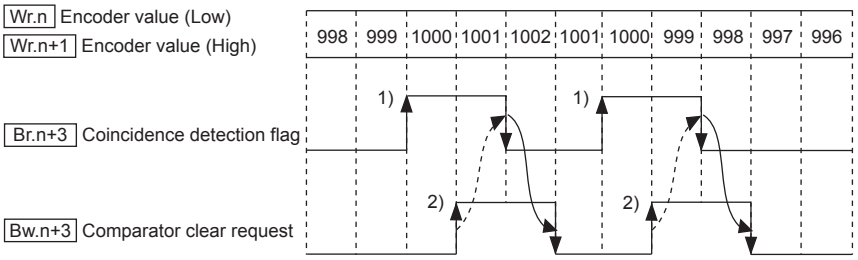
Example 2) Coincidence detection flag setting: Downward, Coincidence detection value: 1000




1) When Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) match the Coincidence detection value while they are decremented, Br.n+3 Coincidence detection flag turns ON (1).

2) Turning ON (1) Bw.n+3 Comparator clear request turns OFF (0) Br.n+3 Coincidence detection flag.

Example 3) Coincidence detection flag setting: Upward + downward, Coincidence detection value: 1000

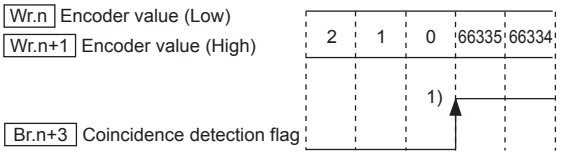



1) When Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) match the Coincidence detection value regardless of whether they are incremented or decremented, Br.n+3 Coincidence detection flag turns ON (1).

2) Turning ON (1) Bw.n+3 Comparator clear request turns OFF (0) Br.n+3 Coincidence detection flag.

(6) The coincidence detection function compares the present values of Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) with the previous ones.
When the encoder value changes from the upper to the lower limit or from the lower to the upper limit, the Coincidence detection flag turns ON (1) even if the direction of value change is opposite to the setting.

Example) Coincidence detection flag setting: Upward, Coincidence detection value: 1000, SSI code length setting: 16 bits




1) When the value is changed from the lower limit (0) to the upper limit (65535) in the decrement setting, the ST1SS1 identifies the increase from 0 to 65535 and turns ON (1) the Coincidence detection flag.

## 3.3 I/O Data

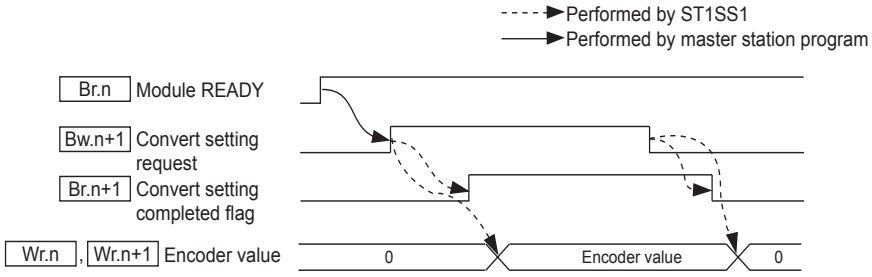
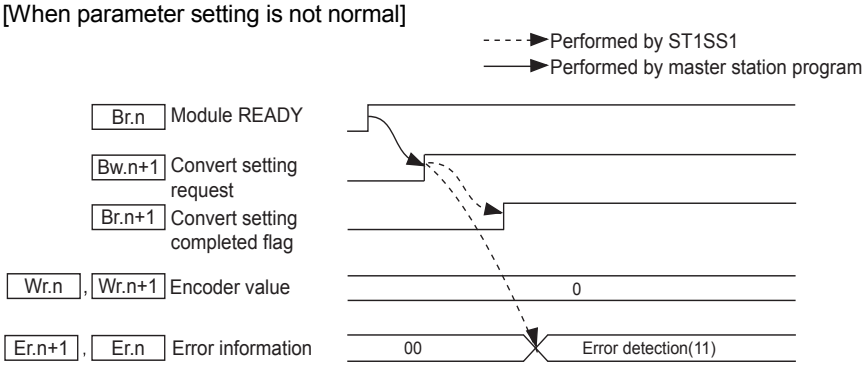
The ST1SS1 has the areas for data transfer with the head module as indicated in Table 3.2.
This section explains the composition of each area.

Table 3.2 I/O Data List

| Transfer direction | Item | | Number of Occupancy | Default value | Reference section |
|---|---|---|---|---|---|
| ST1SS1→ Head module (Input Data) | Br Bit Input Area | | 4 | 0 | Section 3.3.1 |
| | Information Area | Er Error Information Area | 4 | 0 | Section 3.3.2 |
| | | Mr Module Status Area | 2 | 0 | Section 3.3.3 |
| | Wr Word Input Area | | 2 | 0 | Section 3.3.4 |
| Head module → ST1SS1 (Output Data) | Bw Bit Output Area | | 4 | 0 | Section 3.3.5 |
| | Request Area | Ew Error Clear Area | 4 | 0 | Section 3.3.6 |
| | Ww Word Output Area | | 2 | 0 | Section 3.3.7 |

## 3.3.1 Bit input area

This section explains the Br Bit input area.

| Bit input | Item | Description |
|---|---|---|
| Br.n | Module READY | (1) Turns ON (1) when the MELSEC-ST system (ST1SS1) is powered up or when the head module is reset.<br>(2) While Br.n Module READY is OFF (0), counting is not performed.<br>Br.n Module READY turns OFF (0) when:<br>• The ST1SS1 has a watchdog timer error.<br>• The system is in module-replaceable status during online module change. (Refer to Chapter 7.) |
| Br.n+1 | Convert setting completed flag | (1) Turns ON (1) upon completion of setting check of user and command parameters after Bw.n+1 Convert setting request has turned ON (1). (Also turns ON (1) when a setting error is detected.)<br>[When parameter setting is normal]<br>  <br><br>[When parameter setting is not normal]<br>  <br> |
| Br.n+2 | Latch detection flag | (1) Turns ON (1) when values stored in Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) are latched after a signal is input by the digital input for latch. |
| Br.n+3 | Coincidence detection flag | (1) Compares Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) with the preset coincidence detection value (command parameter), and if they match each other, this flag turns ON (1). |

### 3.3.2 Error information area

This section explains the Er error information area.

<table>
<tr><th colspan="2">Error information</th><th>Item</th><th>Description</th></tr>
<tr><td>Er.n+1</td><td>Er.n</td><td>Error information</td><td>(1) Stores the error information when an error occurs.<br>(2) The stored error information can be cleared by turning on (1) the Ew.n error clear request. (Refer to Section 3.3.6)
<table>
<tr><th>Er.n+1</th><th>Er.n</th><th>Information</th></tr>
<tr><td>0</td><td>0</td><td>Normal</td></tr>
<tr><td>1</td><td>1</td><td>System error has occurred</td></tr>
</table></td></tr>
</table>

### 3.3.3 Module status area

This section explains the Mr module status area.

<table>
<tr><th colspan="2">Module status</th><th>Item</th><th>Description</th></tr>
<tr><td>Mr.n+1</td><td>Mr.n</td><td>Module status</td><td>(1) The operating status of the ST1SS1 is stored.
<table>
<tr><th>Mr.n+1</th><th>Mr.n</th><th>Information</th></tr>
<tr><td>0</td><td>0</td><td>Online module change in progress or internal bus error occurred</td></tr>
<tr><td>1</td><td>1</td><td>Normal</td></tr>
</table></td></tr>
</table>

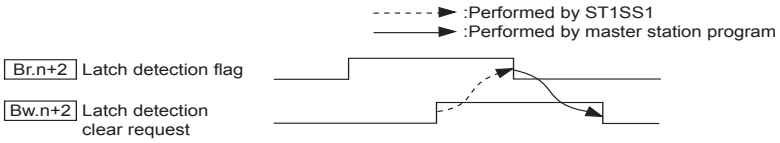
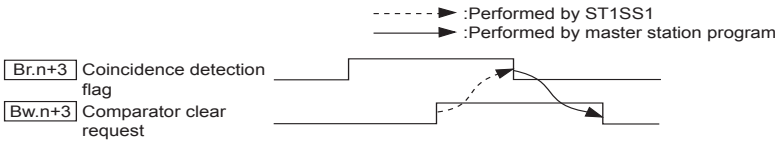
### 3.3.4 Word input area

This section explains the Wr word input area.

| Word input | Item | Description |
|---|---|---|
| Wr.n | Encoder value (Low) | (1) Stores the low order word of the encode data (bit 0 to 15). |
| Wr.n+1 | Encoder value (High) | (1) Stores the high order word of the encode data (bit 16 to 31). |

## 3.3.5 Bit output area

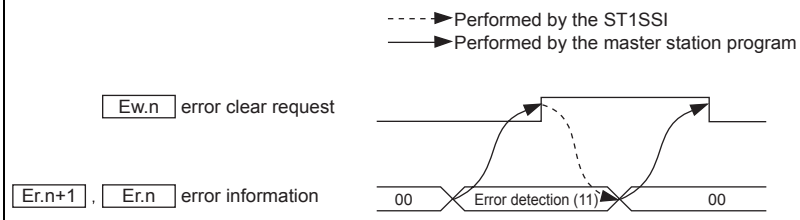
This section explains the Bw bit output area.

| Bit output | Item | Description |
|---|---|---|
| Bw.n | System area | Use prohibited (Fixed to 0) |
| Bw.n+1 | Convert setting request | (1) Turn this from OFF (0) to ON (1) to enable the settings of the user and command parameters.<br>(a) When writing a command parameter, turn Bw.n+1 Convert setting request OFF (0) to stop the count.<br>With the status ON (1), the command parameter cannot be written.<br>(b) Regardless of whether Bw.n+1 Convert setting request is ON (1) or OFF (0), user parameters are written but not enabled. (Turn Bw.n+1 Convert setting request from OFF (0) to ON (1).)<br>(2) Turn this ON (1) to start communication with the SSI absolute encoder.<br>If it turns OFF (0), communication will stop.<br>(3) For the ON (1)/OFF (0) timing, refer to the description of Br.n+1 in Section 3.3.1.<br><br>OFF(0): Conversion stop (Default)<br>ON(1) : Conversion start |
| Bw.n+2 | Latch detection clear request | (1) Turn this OFF (0) and then ON (1) to turn OFF (0) Br.n+2 Latch detection flag.<br>(2) After confirming Br.n+2 Latch detection flag has turned OFF (0), turn OFF (0) Bw.n+2 Latch detection clear request.<br><br>OFF(0): No latch detection clear request (Default)<br>ON(1) : Latch detection clear requested<br>  |
| Bw.n+3 | Comparator clear request | (1) Turn this OFF (0) and then ON (1) to turn OFF (0) Br.n+3 Coincidence detection flag.<br>(2) After confirming Br.n+3 Coincidence detection flag has turned OFF (0), turn OFF Bw.n+3 Comparator clear request.<br><br>OFF(0): No coincidence detection clear request (Default)<br>ON(1) : Coincidence detection clear requested<br>  |


3 - 17

### 3.3.6 Error clear area

This section explains the Ew error clear area.

| Error clear area | Item | Description |
|---|---|---|
| Ew.n | Error clear request | (1) Turn this request on (1) to clear the Er.n+1 , Er.n error information.<br>(2) After confirming that the Er.n+1 , Er.n error information has been cleared, turn off (0) the Ew.n error clear request.<br>OFF (0): No error clear requested (Default)<br>ON (1) : Error clear requested<br>  |
| Ew.n+1<br>Ew.n+2<br>Ew.n+3 | System area | Use prohibited (fixed to 0) |

### 3.3.7 Word output area

The ST1SS1 does not use the Ww word output area since it is operational without reserving the area.
To make effective use of the Ww word output area, select "ST1SS1 (without Ww)" using the configuration software of the master station or GX Configurator-ST. The number of occupancy of the Ww word output area in the ST1SS1 is 0.


3 - 18

## 3.4 Memory and Parameters

This section explains the memory and parameters of the ST1SS1.

### 3.4.1 Memory

RAM and ROM are available as the parameter storage memory of the ST1SS1.

(1) RAM

(a) The ST1SS1 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 ROM stores the parameters. The stored parameters are not erased at power-off.

(b) The parameters stored in the ROM are transferred to the RAM when:

- The MELSEC-ST system (ST1SS1) is powered off, then on.
- The head module is reset.
- Parameter setting ROM read (command number: $3500_H$) is executed.

### 3.4.2 Parameters

The ST1SS1 has user parameters and command parameters.

(1) User parameters

(a) Setting item

- SSI baud rate setting
- SSI direction reversal setting
- SSI code setting
- SSI code length setting
- SSI parity setting

(b) Setting method

Set the parameters using the configuration software of the master station. When the MELSEC-ST system is tested alone, set the parameters using GX Configurator-ST.

(2) Command parameters

(a) Setting item

- SSI trailing bits setting
- SSI monoflop time setting
- Latch mode setting
- Coincidence detection flag setting
- Coincidence detection value

(b) Setting method

1) Command

Execute a command from the master station to write the settings to the RAM of the ST1SS1.
When the command parameters are written in advance using Parameter setting ROM write (command number: 3501H), master station program steps can be reduced.

2) GX Configurator-ST

Use of GX Configurator-ST allows the parameters to be easily set on-screen, reducing master station program steps.
Write and save the settings, which are used for a MELSEC-ST system startup, to the ROM. (Use write to RAM when conducting a test temporarily.)

# 4 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.

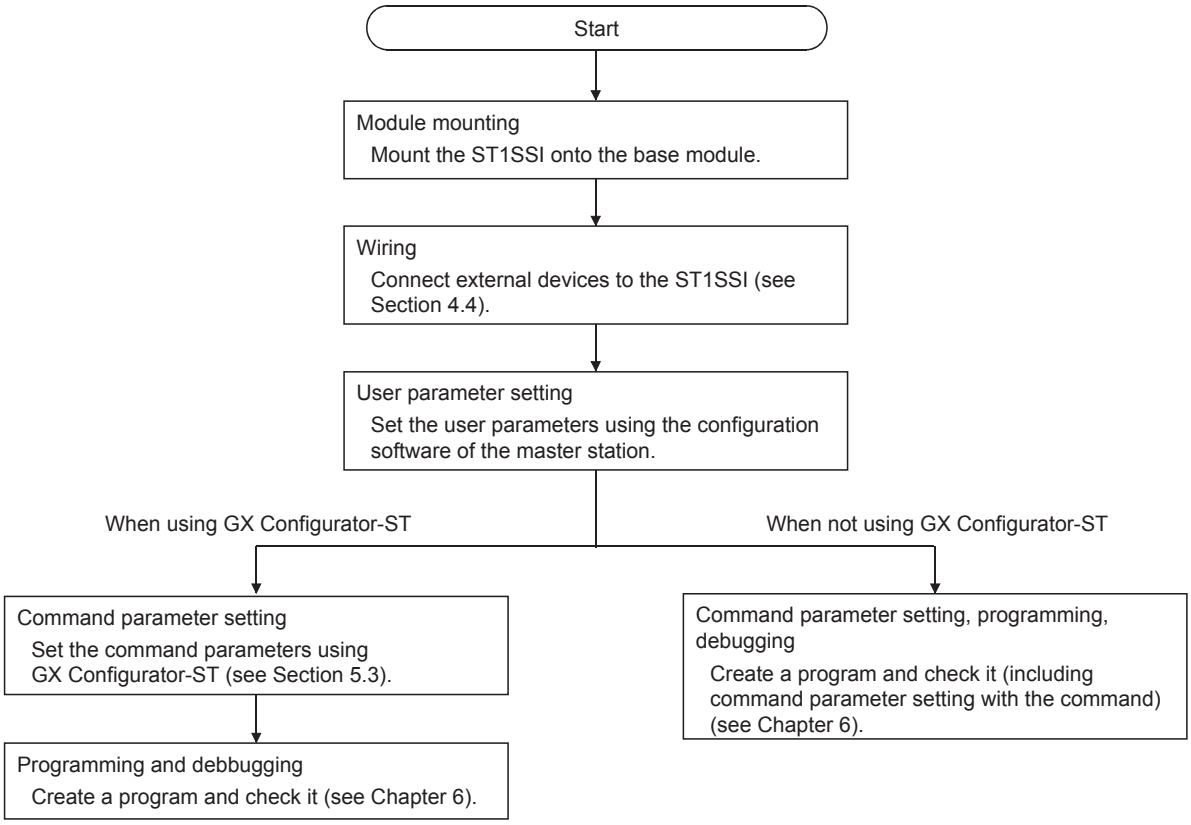
(2) Do not disassemble or modify the modules.
Doing so could cause failure, malfunction, injury or fire.

(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 - 1

## 4.2 Setup and Procedure before Operation

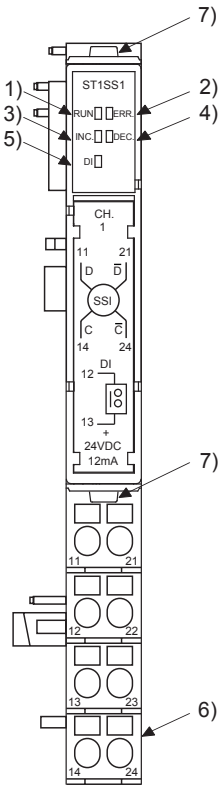



**POINT**

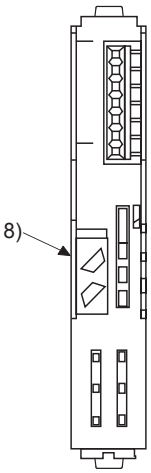
Refer to Section 3.4 for details of the user parameter and command parameter.

## 4.3 Part Names

The name of each part in the ST1SS1 is listed below.
The following shows the ST1SS1 mounted on the spring clamp type base module.




[Rear view of ST1SS1]





4 - 3

| No. | Name and appearance | Description |
|---|---|---|
| 1) | RUN LED | RUN LED and ERR. LED (on/flashing/off) indicate various statuses of the ST1SS1 (Refer to Section 4.3.1 (1)). |
| 2) | ERR. LED | |
| 3) | INC. LED | The lighting status of the INC. and DEC. LEDs indicates the rotational direction of the SSI absolute encoder. (Refer to Section 4.3.1 (2)). |
| 4) | DEC. LED | |
| 5) | DI LED | Indicates the status of digital input that is used for the latch counter function.<br>ON : Digital input ON<br>OFF: Digital input OFF |
| 6) | Terminal block | Wires are connected between the ST1SS1 and the terminal block of the base module for the ST1SS1/ST1PSD/ST1PDD.<br>For base modules applicable to the ST1PSD/ST1PDD, refer to the MELSEC-ST System User's Manual.<br>[Applicable base modules]<br>Spring Clamp Type : ST1B-S4IR2<br>Screw Clamp Type : ST1B-E4IR2 |
| 7) | Slice module fixing hooks (at both ends) | Used for mounting/dismounting the ST1SS1 to/from the base module. While pressing the hooks at both ends, mount/dismount the ST1SS1. |
| 8) | Coding element | Prevents the module from being mounted incorrectly.<br>The coding element consists of two pieces, and its shape varies depending on the model name.<br>When the ST1SS1 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 ST1SS1.<br>The ST1SS1 can be mounted onto the base module only when the two pieces of the coding elements are matched.<br>[Applicable coding element]<br>ST1SS1 : ST1A-CKY-18 |

**POINT**

In order to ensure safety, make sure to attach the coding element to the base module and ST1SS1.

[Terminal block assignment of the ST1SS1]

| Terminal No. | Signal name | Terminal No. | Signal name |
|---|---|---|---|
| 11 | DATA | 21 | $\overline{\text{DATA}}$ |
| 12 | DI | 22 | DI |
| 13 | +24V | 23 | +24V |
| 14 | CLK | 24 | $\overline{\text{CLK}}$ |

## 4.3.1 Status confirmation by LED

The LED indications are described here.

### (1) Indications of RUN and ERR. LEDs

Indications of the RUN and ERR. LEDs are shown below.

| LED indication | | Operating status |
|---|---|---|
| RUN LED | ERR.LED | |
| On | Off | Normal |
| | On | System error is occurring. |
| Flashing (1s interval) | Off | The data communication has stopped or the parameter communication is faulty between the master module and head module, other slice module is faulty or an internal bus error is occurring. |
| | On | System error is occurring when the data communication has stopped or the parameter communication is faulty between the master module and head module, other slice module is faulty or an internal bus error has occurred. |
| Flashing (0.25s interval) | Off | Module is selected as the target of online module change. |
| | On | System error is occurring when module is selected as the target of online module change. |
| Off | Off | Power is off or online module change is being made. |
| | On | System error is occurring during online module change. |

### (2) Indications of INC. and DEC. LEDs

Indications of the INC. and DEC. LEDs are shown below.

| LED indication | | Operating status |
|---|---|---|
| INC. LED | DEC..LED | |
| Off | Off | The SSI absolute encoder output is not changing. |
| On | Off | The SSI absolute encoder output is being incremented.<br>(When the Direction reversal setting (command parameter) is set to "Reversal", the SSI absolute encoder output is being decremented.) |
| Off | On | The SSI absolute encoder output is being decremented.<br>(When the Direction reversal setting (command parameter) is set to "Reversal", the SSI absolute encoder output is being incremented.) |

**POINT**

When the encoder value is changed from the upper limit to the lower limit or from the lower limit to the upper limit, the INC. or DEC. LED showing direction opposite to the SSI absolute encoder rotation turns on instantaneously.

## 4.4 Wiring

The wiring precautions and examples of module connection are provided in this section.

### 4.4.1 Wiring precautions

In order to optimize the functions of the ST1SS1 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 ST1SS1 to avoid the influence of the AC side surges and inductions.

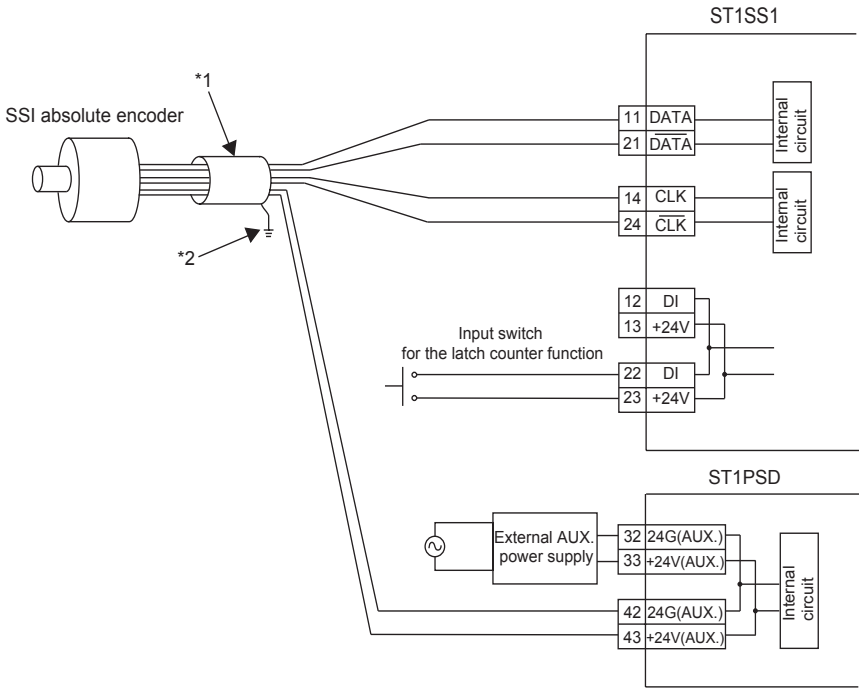
(2) Do not bring/install the cables closer to/together with the main circuit line, a high-voltage cable or a load cable from other than the MELSEC-ST system. Doing so may increase the effects of noise, surges and induction.

(3) Always place the SSI absolute encoder 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.
Not doing so will make the module more susceptible to noises, surges and inductions.

## 4.4.2 External wiring

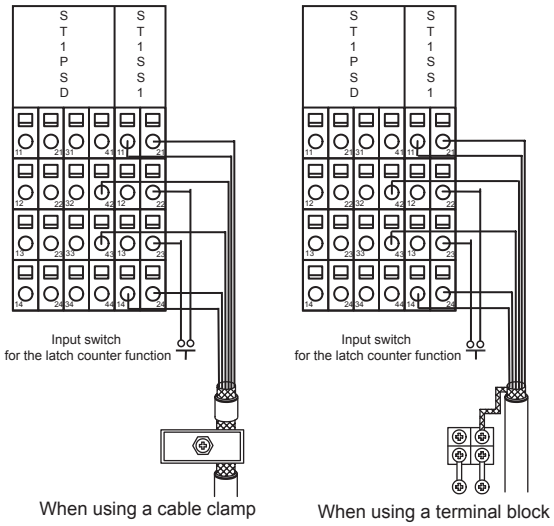
Connect the SSI absolute encoder to the ST1SS1 and ST1PSD/ST1PDD with cables.
Mount the ST1PSD/ST1PDD on the immediate left of the ST1SS1.
Connect the cables to the base module (sold separately).
For wiring details on the ST1PSD/ST1PDD, refer to the MELSEC-ST System User's Manual.

### (1) When the ST1PSD is placed on the left




∗1 Be sure to use a shielded twisted pair cable.
Also, use the shielded wire as short as possible.

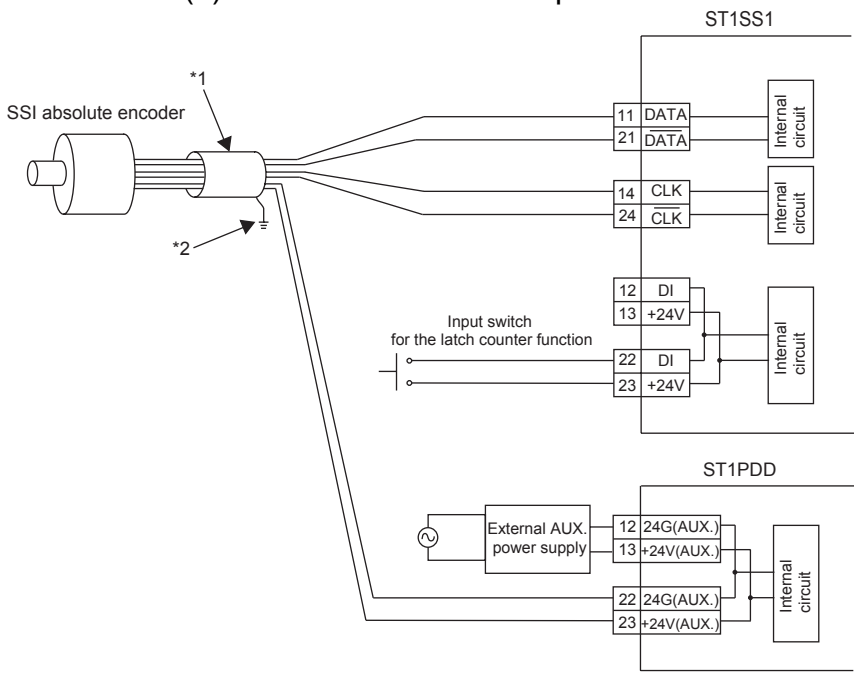
∗2 Ground the shield through the cable clamp or terminal block.
Depending on noise conditions, however, it is recommended to ground the shield on the external device side.



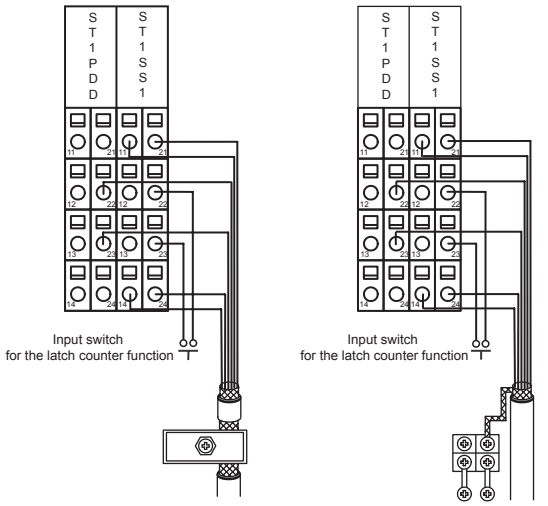


4 - 7

## (3) When the ST1PDD is placed on the left




* 1 Be sure to use a shielded twisted pair cable.
  Also, use the shielded wire as short as possible.
* 2 Ground the shield through the cable clamp or terminal block.
  Depending on noise conditions, however, it is recommended to ground the shield on the external device side.




When using a cable clamp When using a terminal block

### 4.4.3 Cable connected between ST1SS1 and absolute encoder

Connect the ST1SS1 to the absolute encoder with a shielded twisted pair cable whose cross section is 0.2mm$^2$ or more (AWG24 or thicker).
However, always confirm the specifications of the absolute encoder.

Relation between the baud rate and the maximum cable length (reference values)

| Baud rate | 125kHz | 250kHz | 500kHz | 1MHz | 2MHz |
|---|---|---|---|---|---|
| Max. cable length | 320m | 160m | 60m | 20m | 8m |

The maximum cable lengths shown in the above table have been ensured for the absolute encoder, CEV-58-M SSI (manufactured by TR ELECTRONIC GmbH). The shown values are not guaranteed because they may change depending on the connected absolute encoder. Treat them as reference values.

**POINT**

If the maximum cable length is exceeded, one of the following will occur.
(1) The encoder value is fixed to an erroneous value, and no error is detected. *1
(2) The encoder value fluctuates erratically, and an error is detected.
(3) The encoder value cannot be read, and an error is detected.
*1: Using the parity check or CRC check will raise the error detection rate.

# MEMO


4 - 10

# 5 GX Configurator-ST

This chapter explains the functions of GX Configurator-ST used with the ST1SS1.
For details of GX Configurator-ST, refer to the GX Configurator-ST Operating Manual.

## 5.1 GX Configurator-ST Functions

Table 5.1 lists the GX Configurator-ST functions used with the ST1SS1.

Table 5.1 List of GX Configurator-ST Functions Used with ST1SS1

| Item | Description | Reference section |
|---|---|---|
| Parameter Setting | (1) The following parameter items can be set on GX Configurator-ST.<br>• SSI baud rate setting<br>• SSI direction reversal setting<br>• SSI code setting<br>• SSI code length setting<br>• SSI parity setting<br>• SSI trailing bits setting<br>• SSI monoflop time setting<br>• Latch mode setting<br>• Coincidence detection flag setting<br>• Coincidence detection value setting<br>(2) Specify the area (RAM or ROM) where parameter setting will be registered.<br>(3) Using GX Configurator-ST, parameter setting can be made while online module change is performed. | Section 5.3 |
| Input/output monitor | (1) The I/O data of the ST1SS1 can be monitored. | Section 5.4 |
| Forced output test | (1) Test can be conducted with the values set in the Bw bit output area or Ew error clear area of the ST1SS1. | Section 5.5 |
| Offset/gain setting | (1) The offset and gain values of the user range can be easily set on-screen.<br>(2) Using GX Configurator-ST, gain/offset setting can be made while online module change is performed. | Section 5.6 |
| Online module change | (1) A module can be replaced without the system being stopped. | Chapter 7 |




5 - 1

## 5.2 Project Creation

When the MELSEC-ST system can be connected to a personal computer with GX Configurator-ST preinstalled, select [get system] to create a project.
Even if there is no MELSEC-ST system, a project can be created.
For project creation and get system, refer to the GX Configurator-ST Operating Manual.




5 - 2

## 5.3 Parameter Setting

This section explains how to set the parameters.

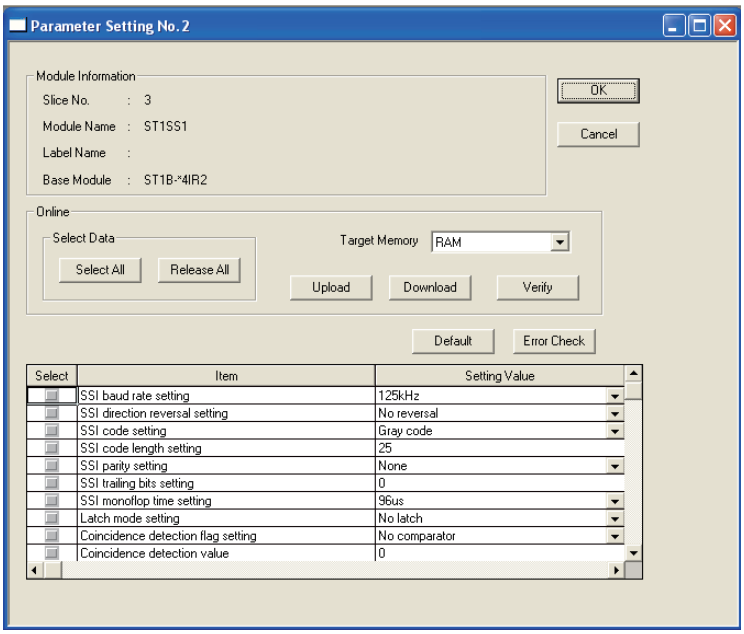
### (1) Mode changing

The mode need not be changed.
Either the edit mode or diagnosis mode can be used for the setting.

### (2) Displaying "Parameter Setting" screen

1) Select ST1SS1 on the "Module Information List" screen or "System Monitor" screen.
2) Click [Edit] → [Parameter Setting].

### (3) Display/Setting Screen



(4) Display/setting details

When setting the parameters of multiple channels, make the following setting for each channel.

(a) User parameters

Set the user parameters using the configuration software of the master station.

When the MELSEC-ST system is tested alone, set the parameters using GX Configurator-ST.

1) SSI baud rate setting

Set a SSI baud rate.

Select an option from 125kHz, 250kHz, 500kHz, 1MHz and 2MHz.

2) SSI direction reversal setting

Set whether the rotation direction can be reversed or not.

No reversal: Rotation is not reversed.

Reversal : Rotation can be reversed.

3) SSI code setting

Set the SSI code. (Gray code, Binary code)

4) SSI code length setting

Set the SSI code length.

The setting range is 2 to 31 bits.

5) SSI parity setting

Set the SSI parity.

None : No parity check

Even : Even parity check

Odd : Odd parity check

(b) Command parameters

By setting the command parameters using GX Configurator-ST, master station program steps can be reduced.

Write and save the settings, which are used for a MELSEC-ST system startup, to the ROM. (Use RAM when conducting a test temporarily.)

1) SSI trailing bits setting

Set the number of SSI trailing bits.

The setting range is from 0 to 15 bits.

2) SSI monoflop time setting

SSI monoflop time setting

Set the SSI monoflop time.

Select an option from 48μs, 64μs, 80μs, and 96μs.

3) Latch mode setting

Specify the latch mode setting. (No latch, Rising edge, Falling edge or Rising + falling edge)

4) Coincidence detection flag setting

Set the condition for the coincidence detection.

No comparato : No coincidence detection
Upward : Detect at the set value or higher
Downward : Detect at the set value or lower
Upward + Downward: Detect at the set value or higher + or lower

5) Coincidence detection value

Set a value for coincidence detection.
The setting range is from 0 to 2147483647 bits.

(5) Parameter writing

1) From the "Channel:" pull-down menu, select the channel where the parameters will be set.
2) Select the parameter items to be written to the ST1SS1 by checking the corresponding "select" check box.
3) Make setting in the "Setting Value" field.
4) Select the target memory (RAM or ROM) from the pull-down menu of "Target Memory".
5) Click the Download button.

When writing the parameters of multiple channels to the ST1SS1, perform the operations in steps 1) to 5) for each channel.

## 5.4 Input/Output Monitor

This section explains how to monitor the I/O data of the ST1SS1.

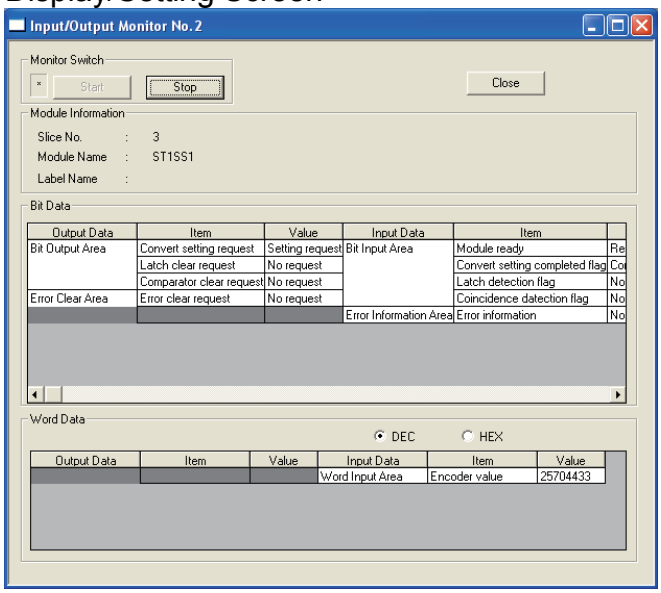
### (1) Mode changing

Click [Mode] → [Diagnosis].

### (2) Displaying "Input/Output Monitor" screen

1) Select ST1SS1 on the "System Monitor" screen.
2) Click the Input/Output Monitor button.
   Monitor starts as soon as the "Input/Output Monitor" screen is displayed.

### (3) Display/Setting Screen




### (4) Display/setting details

#### (a) Bit Data

| Input/Output Data | Item | Description |
|---|---|---|
| Bit Output Area | Convert setting request | The status of Bw.n+1 Convert setting request is displayed. |
| | Latch clear request | The status of BW.n+2 Latch detection clear request is displayed. |
| | Comparator clear request | The status of BW.n+3 Comparator clear request is displayed. |
| Error Clear Area | Error clear request | The status of Ew.n Error clear 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. |
| | Latch detection flag | The status of Br.n+2 Latch detection flag is displayed. |
| | Coincidence detection flag | The status of Br.n+3 Coincidence detection flag is displated. |
| Error Information Area | Error information | The status of Er.n+1 to Er.n Error information is displayed. |

(b) Word Data

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

| | | |
|---|---|---|
| Word Input Area | Encoder value | Wr.n Encoder value (Low) and Wr.n+1 Encoder value (High) is displayed. |

## 5.5 Forced Output Test

This section explains a forced output test.
Conduct the test after setting values to the bit output area or error clear area of the ST1SS1.

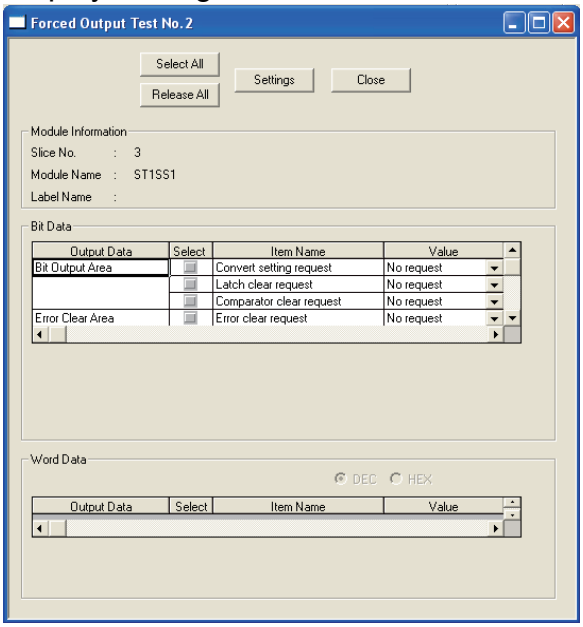
### (1) Mode changing

Click [Mode] → [Diagnosis].

### (2) Displaying "Forced Output Test" screen

1) Select ST1SS1 on the "System Monitor" screen.
2) Click the Forced Output Test button.

### (3) Display/Setting Screen




### (4) Display/setting details

#### (a) Bit Data

| Output Data | Item | Description |
|---|---|---|
| Bit Output Area | Convert setting request | The setting of Bw.n+1 Convert setting request can be changed. |
| | Latch clear request | The setting in Bw.n+2 Latch detection clear request can be changed. |
| | Comparator clear request | The setting in Bw.n+3 Comparator clear request can be changed. |
| Error Clear Area | Error clear request | The setting of Ew.n Error clear request can be changed. |

#### (b) Word Data

Unavailable for the ST1SS1.

(5) Test operation

1) Select the test item by checking the corresponding "Select" check box.
2) Make setting in the "Value" field.
3) Click the Settings button. *
   Clicking the Settings button executes the test.
   *: When the module is not in the forced output test mode, a screen asking whether to switch to the forced output test mode. Click the OK button to switch to the forced output test mode.
   When the module is switched to the forced output test mode, the RUN LED of the head module flashes.

| POINT |
| --- |
| When the forced output test mode has been cancelled, make sure that the RUN LED of the head module is on. |


5 - 9

# 6 PROGRAMMING

This chapter explains program examples available when the QJ71PB92V/QJ71PB92D and AJ71PB92D/A1SJ71PB92D are used as the master station.

REMARK

Refer to the following manuals for details of the QJ71PB92V/QJ71PB92D and AJ71PB92D/A1SJ71PB92D.

<QJ71PB92V>
- PROFIBUS-DP Master Module User's Manual
- SH-080572ENG (13JR84)

<QJ71PB92D>
- PROFIBUS-DP Interface Module User's Manual
- SH-080127 (13JR22)

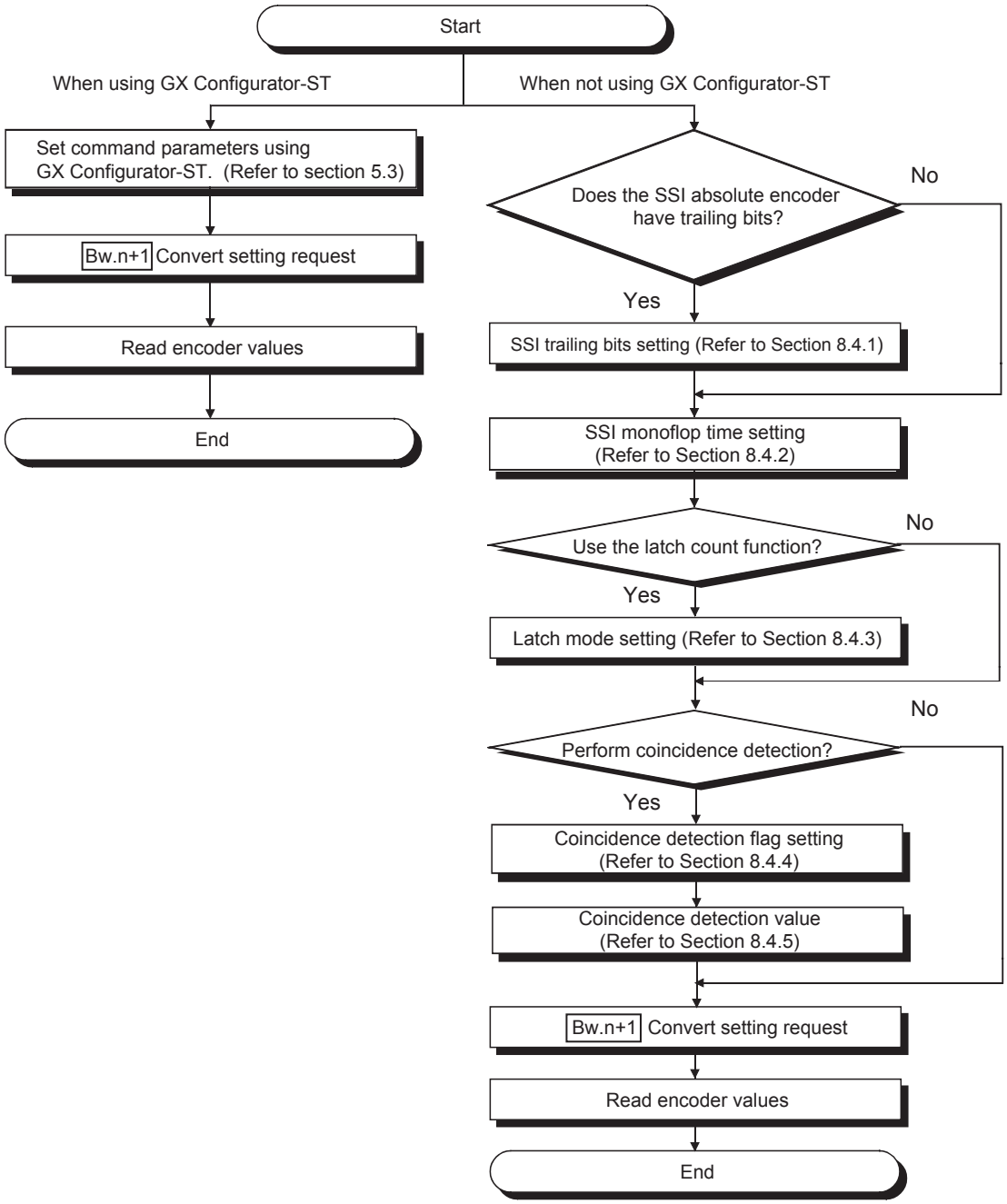
<AJ71PB92D/A1SJ71PB92D>
- PROFIBUS-DP Interface Module type AJ71PB92D/A1SJ71PB92D User's Manual
- IB-66773 (13JL20)




6 - 1

## 6.1 Programming Procedure

Follow the steps shown below and create a program for executing the count operation of the ST1SS1.
When utilizing the program example introduced in this chapter for an actual system, fully verify that there are no problems in controllability in the target system.





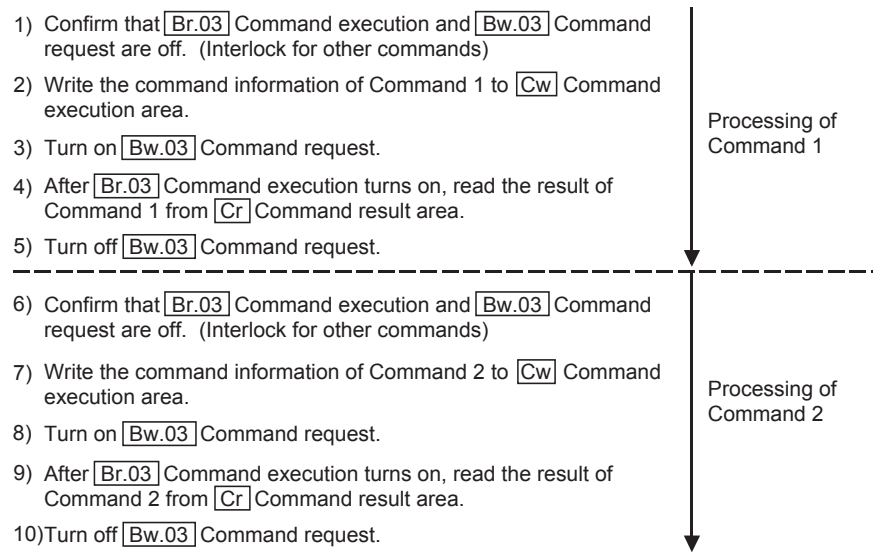


6 - 2

POINT

(1) While a command is being executed, other command is not executable.
Also, a command can be executed for only one module.
When executing the same command for multiple modules or executing several kinds of commands, provide an interlock in the program using [Br.03] Command execution and [Bw.03] Command request as shown below.

<Example>
Executing 2 commands (Commands 1 and 2) consecutively




If a command is executed without any interlock, the following status will be generated.

1) When turning off [Bw.03] Command request before completion of the command:
   • [Br.03] Command execution does not turn on.
   • The command result is not stored in [Cr] Command result area.
   • The command requested once may be executed.
2) When executing a command inadvertently during execution of other command:
   The command is executed based on the information written in [Cw] Command execution area at the time that [Bw.03] Command request turns on.

(2) Performing online module change may require a previous arrangement, depending on the use condition.
For details, refer to Section 7.2.

## 6.2 When QJ71PB92V/QJ71PB92D is Used as Master Station

This section explains program examples available when the QJ71PB92V/QJ71PB92D is used as the master station.
The following table shows the setting differences in the program examples between the QJ71PB92V and QJ71PB92D.
Except for the given differences, both models have identical settings.

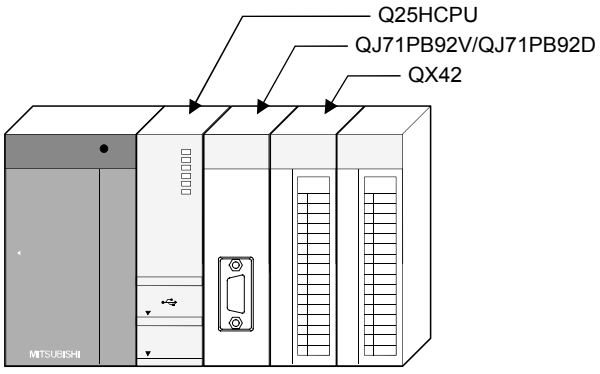
| Item | | Difference | Reference section |
|---|---|---|---|
| Master station settings | | "Operation mode" and "I/O data area assignment" are different. | Section 6.2 (1)(b) |
| I/O data assignment | Input data | Buffer memory assignment is different between QJ71PB92V and QJ71PB92D. | Section 6.2 (3) |
| | Output data | | |
| Program example | | Because of the differences in buffer memory assignment, the intelligent function module device numbers in the programs are different. | Section 6.2.1 (2) |

Section 6.2.1 uses the following system configuration example for explanation.

### (1) System configuration of master station (QJ71PB92V/QJ71PB92D)

The system configuration of the master station (QJ71PB92V/QJ71PB92D) used in this section is shown below.

#### (a) System configuration of master station (QJ71PB92V/QJ71PB92D)



(b) Settings of master station (QJ71PB92V/QJ71PB92D)

1) QJ71PB92V

| Item | | Description |
|---|---|---|
| I/O signals | | X/Y000 to X/Y01F |
| Operation mode | | Communication mode (mode3) |
| I/O data area (buffer memory) for FDL address 1 (MELSEC-ST system) | Input data | 6144(1800H) to 6154(180AH) |
| | Output data | 14336(3800H) to 14346(380AH) |
| Data consistency function | | Prevents data separation caused by automatic refresh |

2) QJ71PB92D

| Item | | Description |
|---|---|---|
| I/O signals | | X/Y000 to X/Y01F |
| Operation mode | | Extended service mode (MODE E) |
| I/O data area (buffer memory) for FDL address 1 (MELSEC-ST system) | Input data | 0(0H) to 10(0AH) |
| | Output data | 960(3C0H) to 970(3CAH) |
| Data consistency function | | Prevents data separation caused by automatic refresh |

REMARK

In the MELSEC-ST system, the I/O data size varies depending on the maximum I/O point setting and the number of intelligent function modules mounted.
Therefore, the master station is set to the following modes where the data size is variable.

- For the QJ71PB92V: Communication mode (mode 3)
- For the QJ71PB92D: Extended service mode (MODE E)

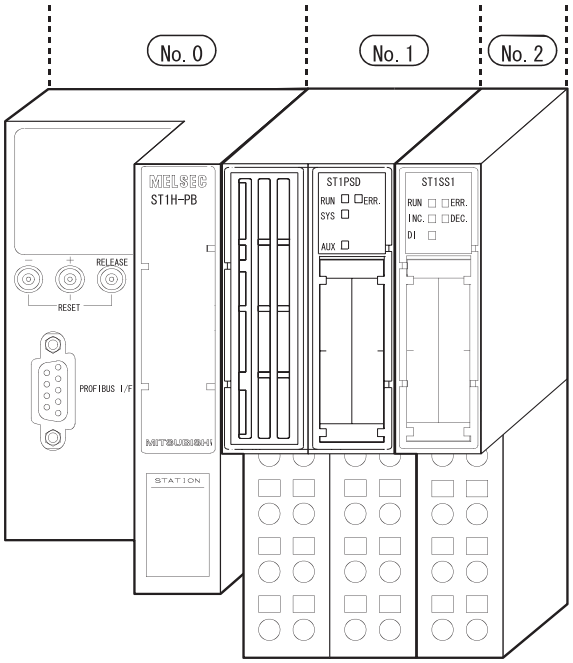
(2) System configuration of MELSEC-ST system

The following system configuration is used as the MELSEC-ST system for explanation.

(a) System configuration of slave station (MELSEC-ST system)

1) FDL address: 1

2) Maximum I/O point setting: 32-point mode



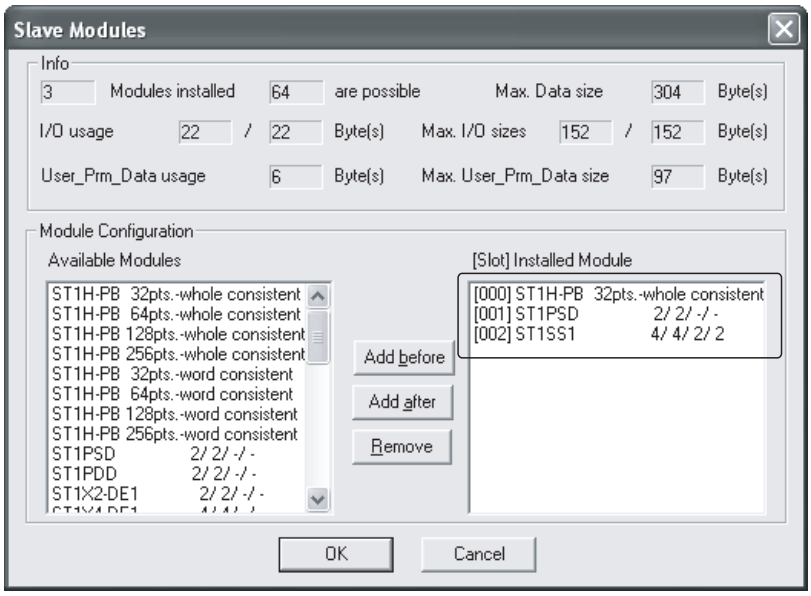

The following table uses the maximum input/output points setting sheet given in the Head Module User's Manual.

| No. | Module Name | Number of Occupied I/O Points | Start Slice No. (Number of occupied slices) | Wr.n | Ww.n | 5V DC Internal Current Consumption (Total) | 24V DC Current (Total) | System Length (Total) |
|---|---|---|---|---|---|---|---|---|
| 0 | ST1H-PB | 4 | 0(2) | — | — | 0.530A(0.530A) | 0A(0A) | — |
| 1 | ST1PSD | 2 | 2(1) | — | — | — | — | 25.2mm(25.2mm) |
| 2 | ST1SS1 | 4 | 3(2) | 2 | 2 | 0.080(0.610A) | ＊1 | 12.6mm(37.8mm) |
| Total | | 10 | — | 2 | 2 | — | — | — |

＊1: The 24V DC current changes depending on the external device connected to each slice module.
Confirm the current consumption of the external device connected to each slice module, and calculate the total value.
Refer to the MELSEC-ST System User's Manual for details of current consumption calculation.

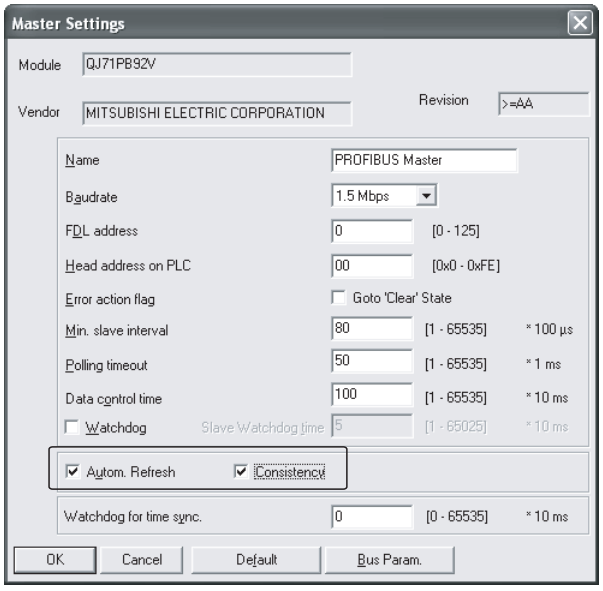
(b) GX Configurator-DP setting

1) Selecting modules




2) Setting the master station

To prevent data from being separated due to automatic refresh, check "Autom. Refresh" and "Consistency".



(c) ST1SS1 setting

| Item | Description |
|---|---|
| SSI baud rate setting* | 125kHz |
| SSI direction reversal setting* | No reversal |
| SSI code setting* | Gray code |
| SSI code length setting* | 25-bit |
| SSI parity setting* | None |
| SSI trailing bits setting | 8-bit |
| SSI monoflop time setting | 96μs |
| Latch mode setting | Rising edge |
| Coincidence detection flag setting | Downward |
| Coincidence detection value | 100000 |

* GX Configurator-DP is used for these settings.

### (3) I/O data assignment

The following shows the I/O data assignment result in the system configuration example given in (2) in this section.

#### (a) Input data

##### 1) QJ71PB92V

Buffer memory address Decimal (Hexadecimal)

| | b15 | | | | | | | b8 | b7 | | | | | | | b0 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6144(1800H) | Br.0F | Br.0E | Br.0D | Br.0C | Br.0B | Br.0A | Br.09 | Br.08 | Br.07 | Br.06 | Br.05 | Br.04 | Br.03 | Br.02 | Br.01 | Br.00 | Br Bit input area |
| | 0 | | | | | | No.2 | | | | No.1 | | No.0 | | | | |
| 6145(1801H) | Br.1F | Br.1E | Br.1D | Br.1C | Br.1B | Br.1A | Br.19 | Br.18 | Br.17 | Br.16 | Br.15 | Br.14 | Br.13 | Br.12 | Br.11 | Br.10 | |
| | 0 | | | | | | | | | | | | | | | | |
| 6146(1802H) | Er.0F | Er.0E | Er.0D | Er.0C | Er.0B | Er.0A | Er.09 | Er.08 | Er.07 | Er.06 | Er.05 | Er.04 | Er.03 | Er.02 | Er.01 | Er.00 | Er Error information area |
| | 0 | | | | | | No.2 | | | | No.1 | | No.0 | | | | |
| 6147(1803H) | Er.1F | Er.1E | Er.1D | Er.1C | Er.1B | Er.1A | Er.19 | Er.18 | Er.17 | Er.16 | Er.15 | Er.14 | Er.13 | Er.12 | Er.11 | Er.10 | |
| | 0 | | | | | | | | | | | | | | | | |
| 6148(1804H) | Mr.15 | Mr.14 | Mr.13 | Mr.12 | Mr.11 | Mr.10 | Mr.9 | Mr.8 | Mr.7 | Mr.6 | Mr.5 | Mr.4 | Mr.3 | Mr.2 | Mr.1 | Mr.0 | Mr Module status area |
| | 0 | | | | | | | | | | | No.2 | | No.1 | | No.0 | |
| 6149(1805H) | Cr.0(15-8) Command execution result | | | | | | | | Cr.0(7-0) Start slice No. of execution target | | | | | | | | Cr Command result area |
| 6150(1806H) | Cr.1 Executed command No. | | | | | | | | | | | | | | | | |
| 6151(1807H) | Cr.2 Response data 1 | | | | | | | | | | | | | | | | |
| 6152(1808H) | Cr.3 Response data 2 | | | | | | | | | | | | | | | | |
| 6153(1809H) | Wr.00 Encoder value (Low) (Wr.n) | | | | | | | | | | | | | | | | Wr Word input area |
| 6154(180AH) | Wr.01 Encoder value (High) (Wr.n+1) | | | | | | | | | | | | | | | | |

No. 0: Head module (ST1H-PB)
No. 1: Bus refreshing module (ST1PSD)
No. 2: Intelligent Function Module (ST1SS1)


6 - 9

## 2) QJ71PB92D

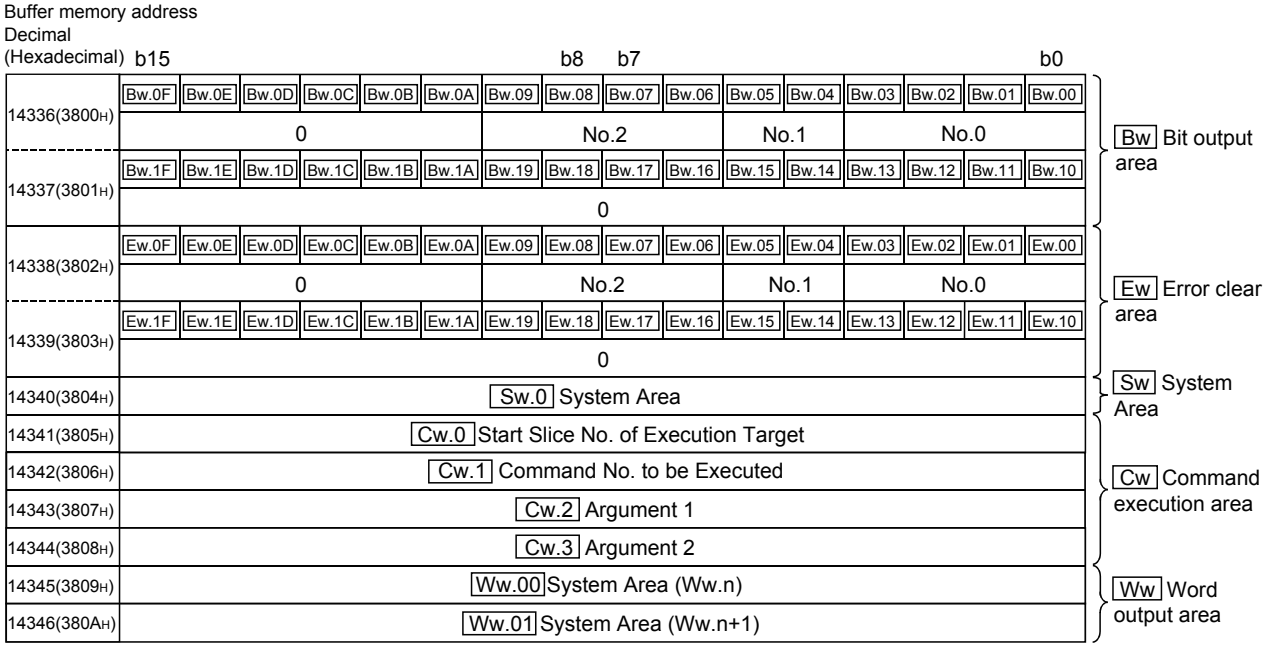
| Buffer memory address Decimal (Hexadecimal) | b15 | | | | | | | b8 | b7 | | | | | | | b0 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 (0H) | Br.0F | Br.0E | Br.0D | Br.0C | Br.0B | Br.0A | Br.09 | Br.08 | Br.07 | Br.06 | Br.05 | Br.04 | Br.03 | Br.02 | Br.01 | Br.00 | Br Bit input area |
| | 0 | | | | | | No.2 | | | | No.1 | | No.0 | | | | |
| 1 (1H) | Br.1F | Br.1E | Br.1D | Br.1C | Br.1B | Br.1A | Br.19 | Br.18 | Br.17 | Br.16 | Br.15 | Br.14 | Br.13 | Br.12 | Br.11 | Br.10 | |
| | 0 | | | | | | | | | | | | | | | | |
| 2 (2H) | Er.0F | Er.0E | Er.0D | Er.0C | Er.0B | Er.0A | Er.09 | Er.08 | Er.07 | Er.06 | Er.05 | Er.04 | Er.03 | Er.02 | Er.01 | Er.00 | Er Error information area |
| | 0 | | | | | | No.2 | | | | No.1 | | No.0 | | | | |
| 3 (3H) | Er.1F | Er.1E | Er.1D | Er.1C | Er.1B | Er.1A | Er.19 | Er.18 | Er.17 | Er.16 | Er.15 | Er.14 | Er.13 | Er.12 | Er.11 | Er.10 | |
| | 0 | | | | | | | | | | | | | | | | |
| 4 (4H) | Mr.15 | Mr.14 | Mr.13 | Mr.12 | Mr.11 | Mr.10 | Mr.9 | Mr.8 | Mr.7 | Mr.6 | Mr.5 | Mr.4 | Mr.3 | Mr.2 | Mr.1 | Mr.0 | Mr Module status area |
| | 0 | | | | | | | | | | | No.2 | | No.1 | | No.0 | |
| 5 (5H) | Cr.0(15-8) Command execution result | | | | | | | | Cr.0(7-0) Start slice No. of execution target | | | | | | | | Cr Command result area |
| 6 (6H) | Cr.1 Executed command No. | | | | | | | | | | | | | | | | |
| 7 (7H) | Cr.2 Response data 1 | | | | | | | | | | | | | | | | |
| 8 (8H) | Cr.3 Response data 2 | | | | | | | | | | | | | | | | |
| 9 (9H) | Wr.00 Encoder value (Low) (Wr.n) | | | | | | | | | | | | | | | | Wr Word input area |
| 10 (AH) | Wr.01 Encoder value (High) (Wr.n+1) | | | | | | | | | | | | | | | | |

No. 0: Head module (ST1H-PB)
No. 1: Bus refreshing module (ST1PSD)
No. 2: Intelligent Function Module (ST1SS1)


6 - 10

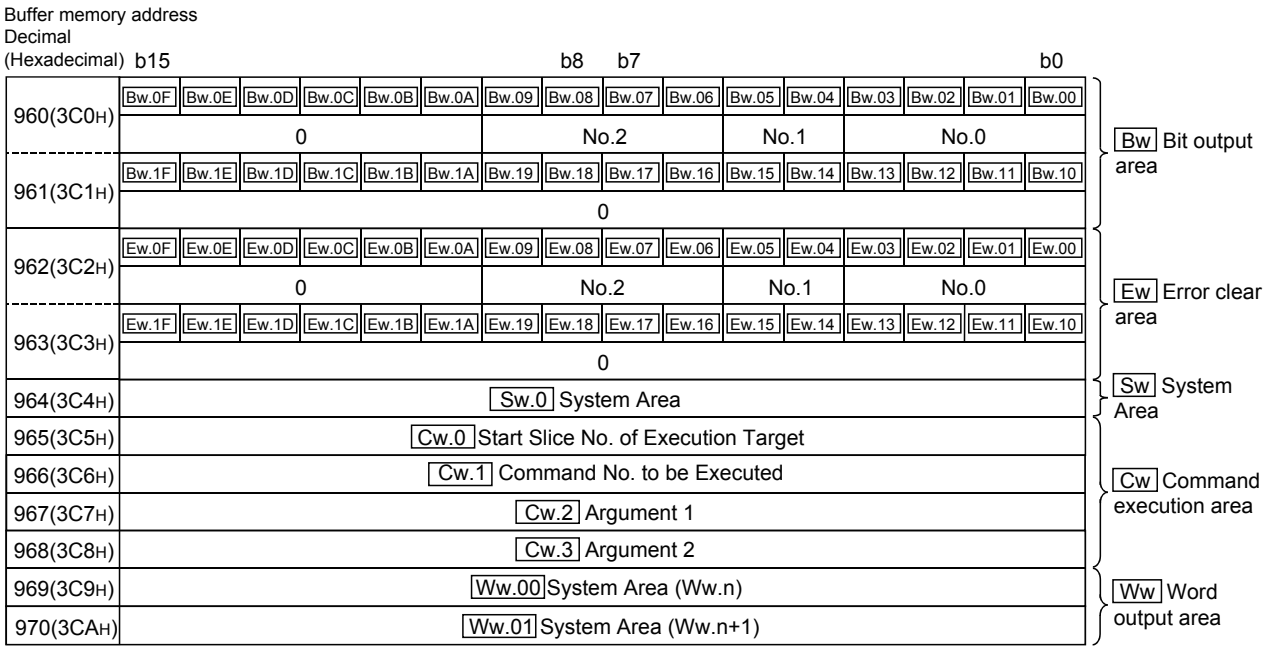
### (b) Output data

#### 1) QJ71PB92V




No.0: Head module (ST1H-PB)
No.1: Bus refreshing module (ST1PSD)
No.2: Intelligent Function Module (ST1SS1)

#### 2) QJ71PB92D




No.0: Head module (ST1H-PB)
No.1: Bus refreshing module (ST1PSD)
No.2: Intelligent Function Module (ST1SS1)


6 - 11

### (4) Device assignment in program examples

The program example in this section uses the following device assignment.

#### (a) Devices used by QJ71PB92V/QJ71PB92D

| Device | Application | Device | Application |
|---|---|---|---|
| X0 | Exchange start end signal | Y0 | Exchange start request signal |
| X1B | Communication READY signal | | |
| X1D | Module READY signal | — | |
| X1F | Watchdog timer error signal | | |

#### (b) Devices used by user

| Device | Application | Device | Application |
|---|---|---|---|
| X20 | PROFIBUS-DP exchange start command | M0 | Refresh start request |
| X30 | ST1SS1 error code read request | M100 | Command execution signal |
| X31 | ST1SS1 error clear request | M200 | SSI trailing bits setting value write signal |
| X32 | Encoder value read command | M201 | SSI monoflop time setting value write signal |
| D500 | Encoder value (Low) read destination | M202 | Latch mode setting value write signal |
| D501 | Encoder value (High) read destination | M203 | Coincidence detection flag setting write signal |
| D600 | ST1SS1 error code read destination | M204 | Coincidence detection value write signal |
| — | | M210 | Conversion start signal |
| | | M230 | ST1SS1 error clear request signal |

#### (c) Devices used in I/O data

##### 1) Br Bit input area

| Br.n Bit input | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Br.00 | Module READY | D1000.0 | 0 | ST1H-PB |
| Br.01 | Forced output test mode | D1000.1 | | |
| Br.02 | Module being changed online | D1000.2 | 1 | |
| Br.03 | Command execution | D1000.3 | | |
| Br.04 | External power supply status | D1000.4 | 2 | ST1PSD |
| Br.05 | | D1000.5 | | |
| Br.06 | Module READY | D1000.6 | 3 | ST1SS1 |
| Br.07 | Convert setting completed flag | D1000.7 | | |
| Br.08 | Latch detection flag | D1000.8 | 4 | |
| Br.09 | Coincidence detection flag | D1000.9 | | |
| Br.0A | — | D1000.A | — | — |
| to | | | | |
| Br.1F | — | D1001.F | — | — |

### 2) Er Error information area

| Er.n Error information | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Er.00 | Head module error information | D1002.0 | 0 | ST1H-PB |
| Er.01 | | D1002.1 | | |
| Er.02 | | D1002.2 | 1 | |
| Er.03 | | D1002.3 | | |
| Er.04 | Bus refreshing module error information | D1002.4 | 2 | ST1PSD |
| Er.05 | | D1002.5 | | |
| Er.06 | Error information | D1002.6 | 3 | ST1SS1 |
| Er.07 | | D1002.7 | | |
| Er.08 | _ | D1002.8 | 4 | |
| Er.09 | | D1002.9 | | |
| Er.0A | _ | D1002.A | _ | _ |
| to | | | | |
| Er.1F | _ | D1003.F | _ | _ |

### 3) Mr Module status area

| Mr.n Module status | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Mr. 0 | Head module existence information | D1004.0 | 0 | ST1H-PB |
| Mr. 1 | | D1004.1 | 1 | |
| Mr.2 | Bus refreshing module existence information | D1004.2 | 2 | ST1PSD |
| Mr.3 | Module status | D1004.3 | 3 | ST1SS1 |
| Mr.4 | | D1004.4 | 4 | |
| Mr.5 | _ | D1004.5 | _ | _ |
| to | | | | |
| Mr.15 | _ | D1004.F | _ | _ |

### 4) Cr Command result area

| Cr Command result area | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Cr.0 | Cr.0(15-8) Command Execution Result, Cr.0(7-0) Start Slice No. of Execution Target | D1005 | _ | _ |
| Cr.1 | Executed Command No. | D1006 | | |
| Cr.2 | Response Data 1 | D1007 | | |
| Cr.3 | Response Data 2 | D1008 | | |

### 5) Wr Word input area

| Wr.n Word input | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Wr.00 | Encoder value (Low) (Wr.n) | D1009 | 3 | ST1SS1 |
| Wr.01 | Encoder value (High) (Wr.n+1) | D1010 | | |

### 6) Bw Bit output area

| Bw.n Bit output | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Bw.00 | System area (0 fixed) | D2000.0 | 0 | ST1H-PB |
| Bw.01 | System area (0 fixed) | D2000.1 | | |
| Bw.02 | System area (0 fixed) | D2000.2 | 1 | |
| Bw.03 | Command request | D2000.3 | | |
| Bw.04 | System area (0 fixed) | D2000.4 | 2 | ST1PSD |
| Bw.05 | System area (0 fixed) | D2000.5 | | |
| Bw.06 | System area (0 fixed) | D2000.6 | 3 | ST1SS1 |
| Bw.07 | Convert setting request | D2000.7 | | |
| Bw.08 | Latch detection clear request | D2000.8 | 4 | |
| Bw.09 | Comparator clear request | D2000.9 | | |
| Bw.0A | _ | D2000.A | _ | _ |
| to | | | | |
| Bw.1F | _ | D2001.F | _ | _ |

### 7) Ew Error clear area

| Ew.n Error clear | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Ew.00 | Error clear request | D2002.0 | 0 | ST1H-PB |
| Ew.01 | System area (0 fixed) | D2002.1 | | |
| Ew.02 | System area (0 fixed) | D2002.2 | 1 | |
| Ew.03 | System area (0 fixed) | D2002.3 | | |
| Ew.04 | Error clear request | D2002.4 | 2 | ST1PSD |
| Ew.05 | System area (0 fixed) | D2002.5 | | |
| Ew.06 | Error clear request | D2002.6 | 3 | ST1SS1 |
| Ew.07 | System area (0 fixed) | D2002.7 | | |
| Ew.08 | System area (0 fixed) | D2002.8 | 4 | |
| Ew.09 | System area (0 fixed) | D2002.9 | | |
| Ew.0A | _ | D2002.A | _ | _ |
| to | | | | |
| Ew.1F | _ | D2003.F | _ | _ |


6 - 14

### 8) Sw System area

| Sw System area | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Sw.0 | System area (0 fixed) | D2004 | — | — |

### 9) Cw Command execution area

| Cw Command execution area | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Cw.0 | Start Slice No. of Execution Target | D2005 | — | — |
| Cw.1 | Command No. to be Executed | D2006 | | |
| Cw.2 | Argument 1 | D2007 | | |
| Cw.3 | Argument 2 | D2008 | | |

### 10) Ww Word output area

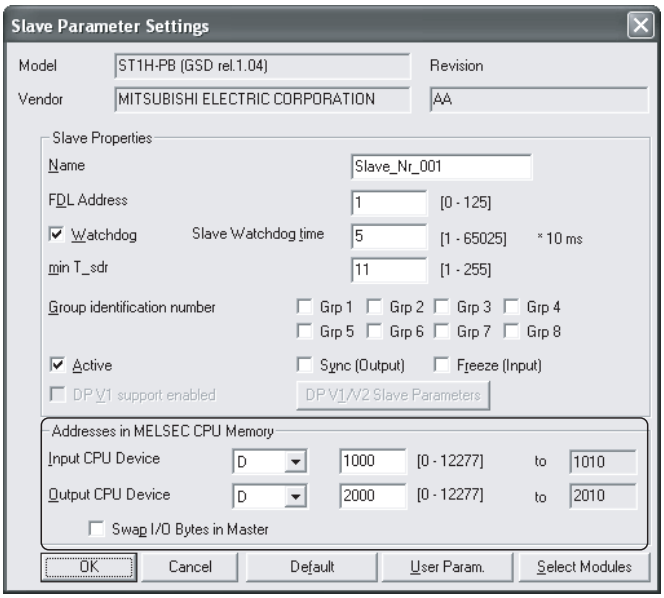
| Ww Word output | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Ww.00 | System area (0 fixed) (Ww.n) | D2009 | 3 | ST1SS1 |
| Ww.01 | System area (0 fixed) (Ww.n+1) | D2010 | | |

## 6.2.1 Program example available when using auto refresh in QJ71PB92V/QJ71PB92D

This section explains a program example available when auto refresh is used in the QJ71PB92V/QJ71PB92D to communicate with the MELSEC-ST system.
The program example in this section is based on the system configuration in Section 6.2.

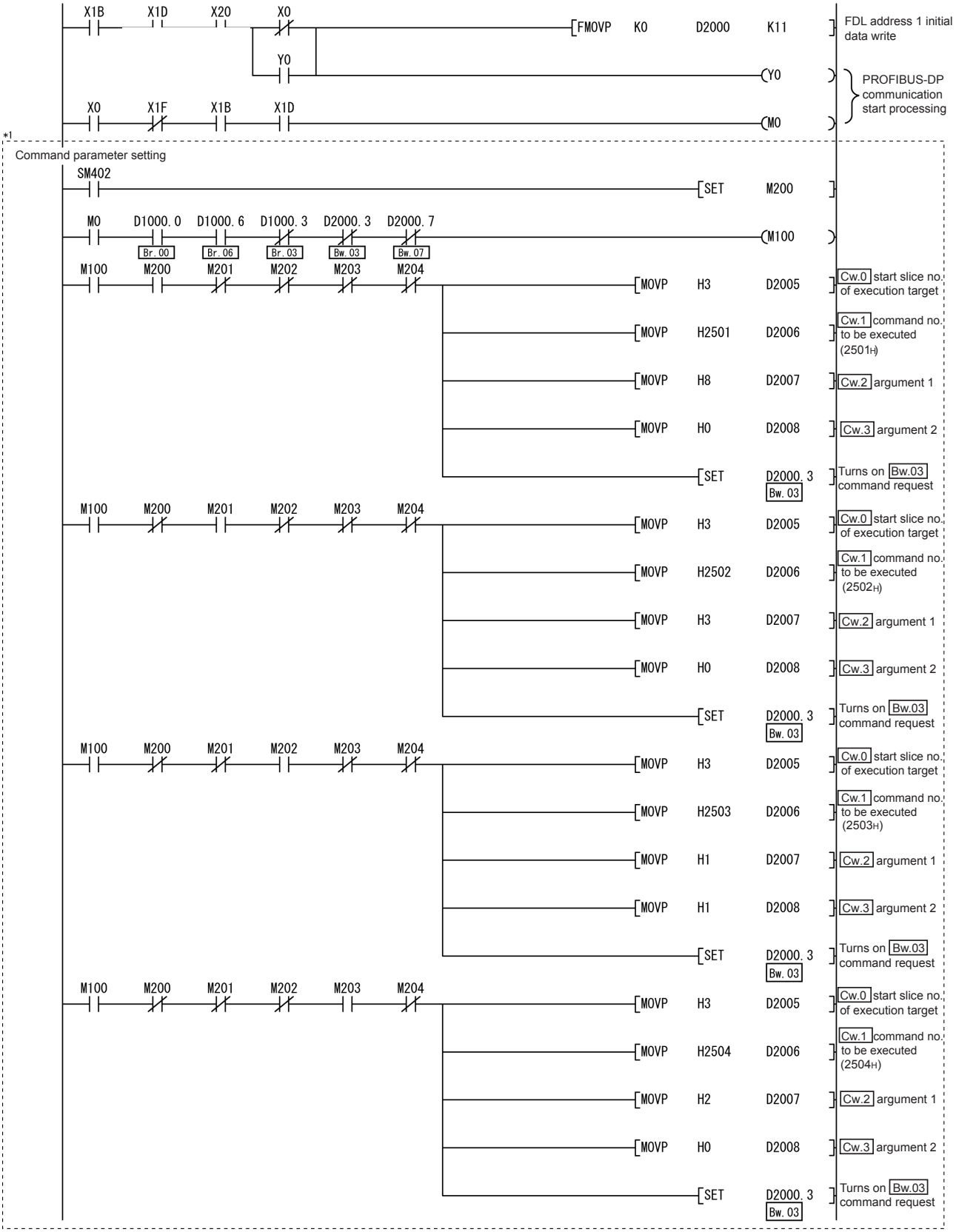
### (1) Auto refresh setting

To use auto refresh, setting must be made on GX Configurator-DP.
Refer to the GX Configurator-DP Manual for details.

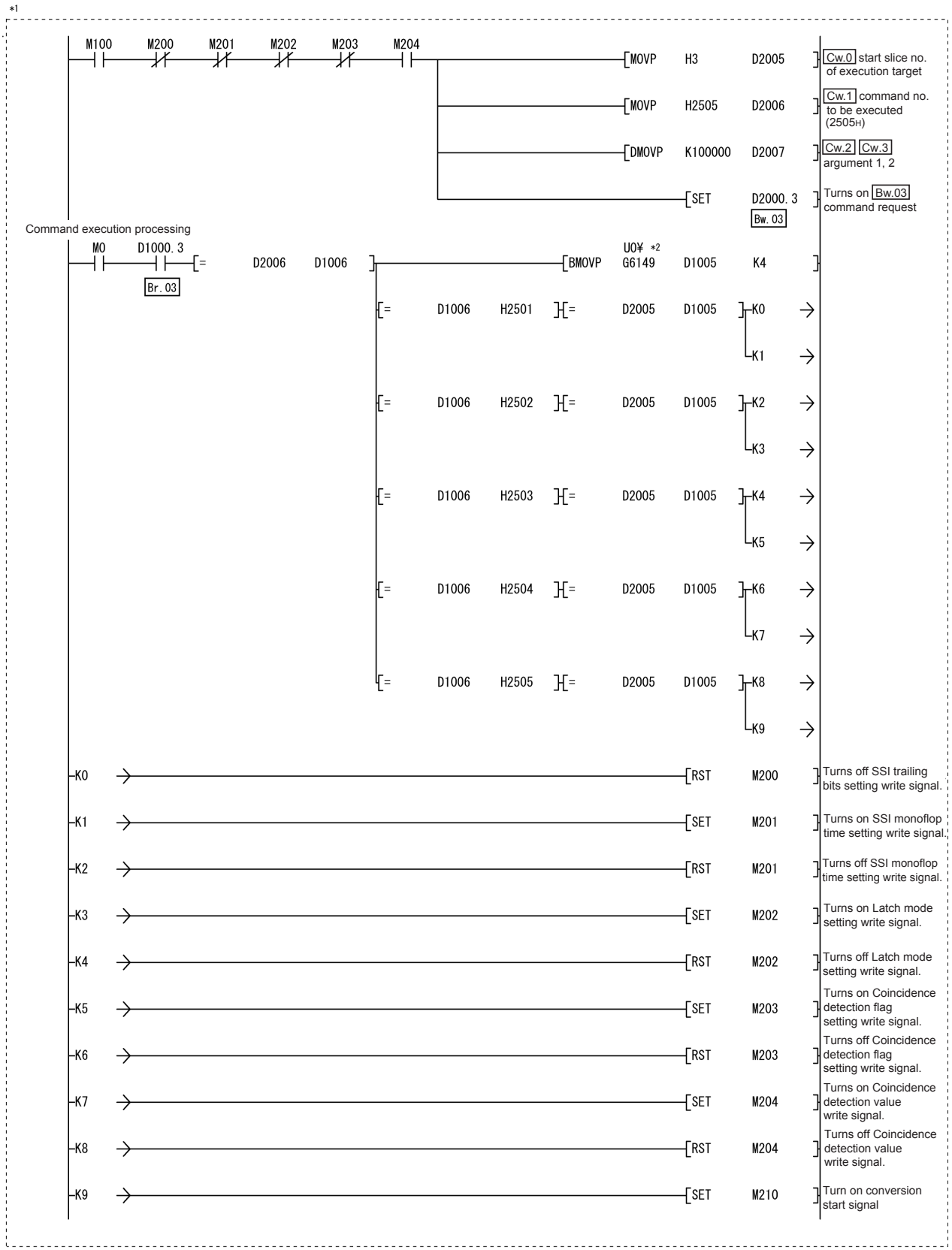


### (2) Program example

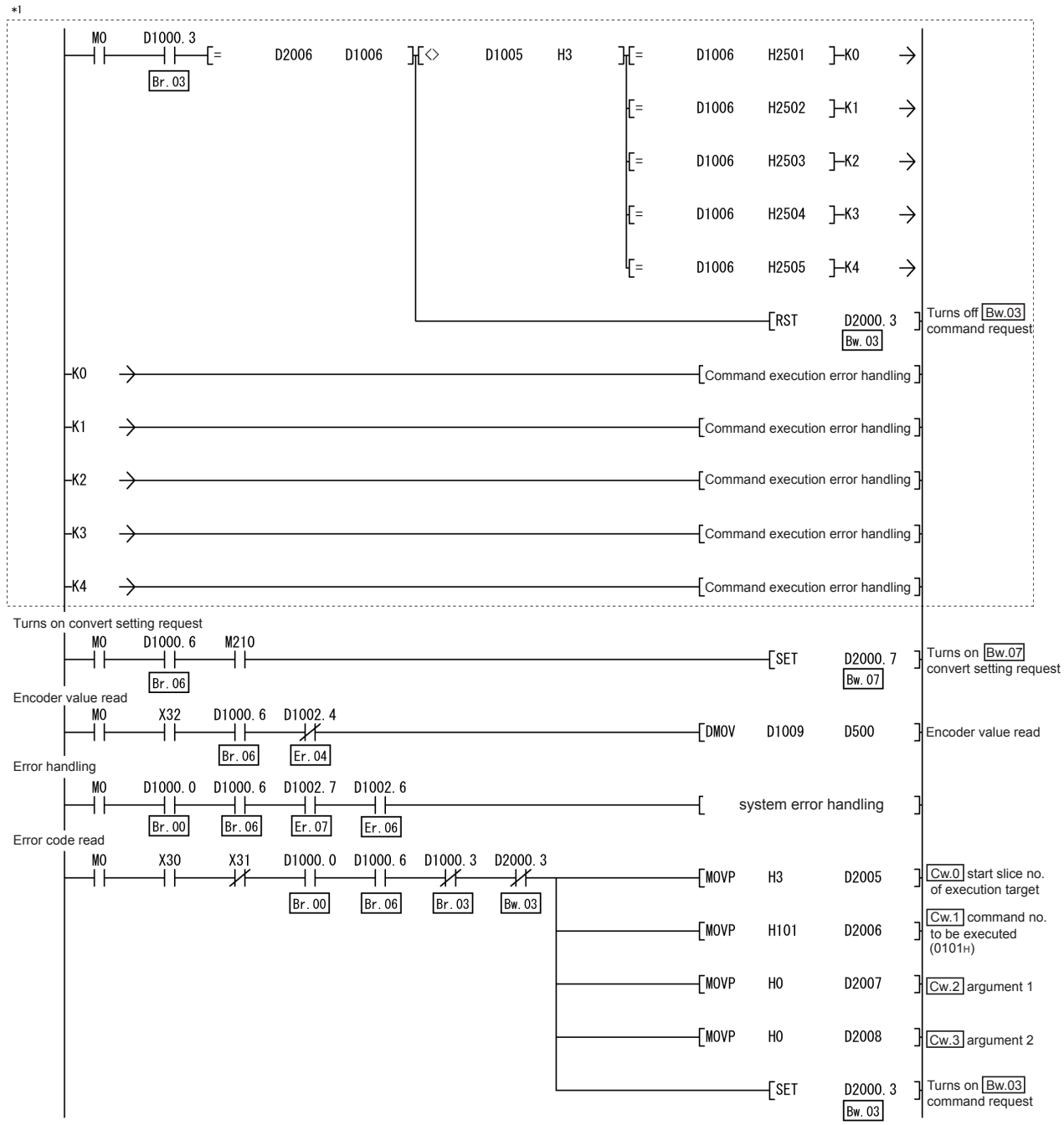
This is a program example for the QJ71PB92V.




*1 The program area enclosed by the dotted line is not required when GX Configurator-ST is used to set the command parameters.

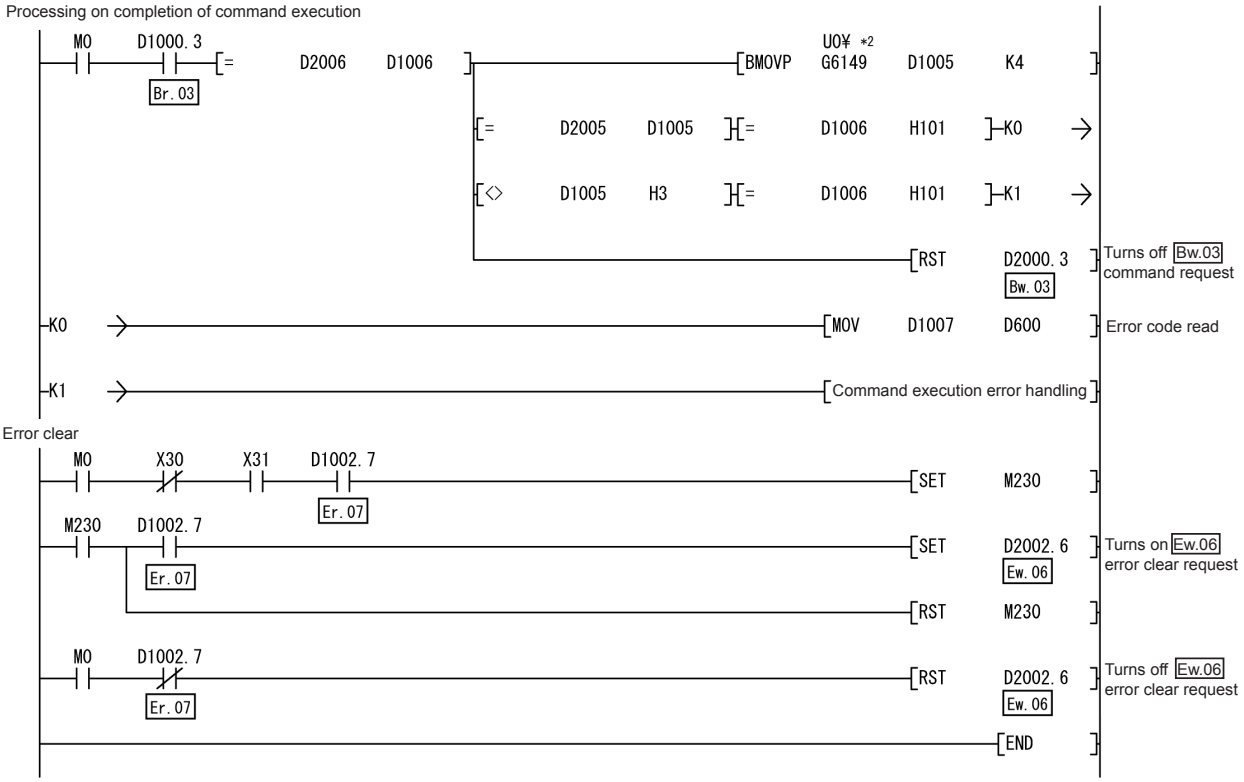



*1 The program area enclosed by the dotted line is not required when GX Configurator-ST is used to set the command parameters.
*2 When the master station is the QJ71PB92D, it is "U0\G5".




*1 The program area enclosed by the dotted line is not required when GX Configurator-ST is used to set the command parameters.


6 - 19




*2 When the master station is the QJ71PB92D, it is "U0\G5".

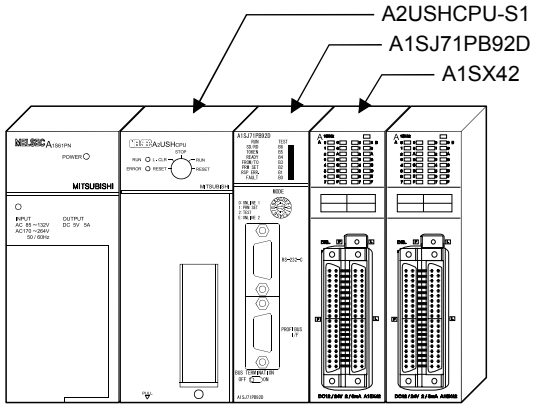
## 6.3 When Using AJ71PB92D/A1SJ71PB92D as Master Station

This section explains a program example available when the AJ71PB92D/A1SJ71PB92D is used as the master station.
The program example shown here is the case where the A1SJ71PB92D is used as the master station.

### (1) System configuration of master station (A1SJ71PB92D)

The system configuration of the master station (A1SJ71PB92D) used in this section is shown below.

#### (a) System configuration of master station (A1SJ71PB92D)




#### (b) Settings of master station (A1SJ71PB92D)

| Item | | Setting |
|---|---|---|
| I/O signals | | X/Y000 to X/Y01F |
| Operation mode | | Extended service mode (MODE E) |
| I/O data area (buffer memory) for FDL address 1 (MELSEC-ST system) | Input data | 0($0_H$) to 10($0A_H$) |
| | Output data | 960($3C0_H$) to 970($3CA_H$) |
| Data consistency function | | Prevents data separation caused by FROM/TO instruction (Cannot prevent data separation caused by automatic refresh or any dedicated instruction.) |

REMARK

The MELSEC-ST system changes in I/O data size depending on the maximum input/output point setting and the number of mounted intelligent function modules. Hence, the master station operation mode is set to the extended service mode (MODE E) where the data size is variable.

### (2) System configuration of MELSEC-ST system

The MELSEC-ST system has the system configuration as described in Section 6.2 (2).

### (3) I/O data assignment

The I/O data assignment results are the same as those shown in section 6.2 (3) (a) 2) and (b) 2).

### (4) Device assignment in program examples

The program example in this section uses the following device assignment.

#### (a) Devices used by A1SJ71PB92D

| Device | Application | Device | Application |
|---|---|---|---|
| X0 | Exchange start end signal | Y0 | Exchange start request signal |
| X0D | Watchdog timer error signal | _ | |
| X1B | Communication READY signal | | |
| X1D | Module READY signal | | |

#### (b) Devices used by user

| Device | Application | Device | Application |
|---|---|---|---|
| X20 | PROFIBUS-DP exchange start command | M0 | Refresh start request |
| X30 | ST1SS1 error code read request | M100 | Command execution signal |
| X31 | ST1SS1 error clear request | M200 | SSI trailing bits setting value write signal |
| X32 | Encoder value read command | M201 | SSI monoflop time setting value write signal |
| D500 | Encoder value (Low) read destination | M202 | Latch mode setting value write signal |
| D501 | Encoder value (High) read destination | M203 | Coincidence detection flag setting write signal |
| D600 | ST1SS1 error code read destination | M204 | Coincidence detection value write signal |
| _ | | M210 | Conversion start signal |
| | | M230 | ST1SS1 error clear request signal |

#### (c) Devices used in I/O data

##### 1) Br Bit input area

| Br.n Bit input | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Br.00 | Module READY | B0 | 0 | ST1H-PB |
| Br.01 | Forced output test mode | B1 | | |
| Br.02 | Module being changed online | B2 | 1 | |
| Br.03 | Command execution | B3 | | |
| Br.04 | External power supply status | B4 | 2 | ST1PSD |
| Br.05 | | B5 | | |
| Br.06 | Module READY | B6 | 3 | ST1SS1 |
| Br.07 | Convert setting completed flag | B7 | | |
| Br.08 | Latch detection flag | B8 | 4 | |
| Br.09 | Coincidence detection flag | B9 | | |
| Br.0A | _ | BA | _ | _ |
| to | | | | |
| Br.1F | _ | B1F | _ | _ |

### 2) Er Error information area

| Er.n Error information | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Er.00 | Head module error information | B20 | 0 | ST1H-PB |
| Er.01 | | B21 | | |
| Er.02 | | B22 | 1 | |
| Er.03 | | B23 | | |
| Er.04 | Bus refreshing module error information | B24 | 2 | ST1PSD |
| Er.05 | | B25 | | |
| Er.06 | Error information | B26 | 3 | ST1SS1 |
| Er.07 | | B27 | | |
| Er.08 | _ | B28 | 4 | |
| Er.09 | | B29 | | |
| Er.0A | _ | B2A | _ | _ |
| to | | | | |
| Er.1F | _ | B3F | _ | _ |

### 3) Mr Module status area

| Mr.n Module status | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Mr. 0 | Head module existence information | B40 | 0 | ST1H-PB |
| Mr. 1 | | B41 | 1 | |
| Mr.2 | Bus refreshing module existence information | B42 | 2 | ST1PSD |
| Mr.3 | Module status | B43 | 3 | ST1SS1 |
| Mr.4 | | B44 | 4 | |
| Mr.5 | _ | B45 | _ | _ |
| to | | | | |
| Mr.15 | _ | B4F | _ | _ |

### 4) Cr Command result area

| Cr Command result area | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Cr.0 | Cr.0(15-8) Command Execution Result, Cr.0(7-0) Start Slice No. of Execution Target | W0 | _ | _ |
| Cr.1 | Executed Command No. | W1 | | |
| Cr.2 | Response Data 1 | W2 | | |
| Cr.3 | Response Data 2 | W3 | | |


6 - 23

### 5) Wr Word input area

| Wr.n Word input | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Wr.00 | Encoder value (Low) (Wr.n) | W4 | 3 | ST1SS1 |
| Wr.01 | Encoder value (High) (Wr.n+1) | W5 | | |

### 6) Bw Bit output area

| Bw.n Bit output | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Bw.00 | System area (0 fixed) | B1000 | 0 | ST1H-PB |
| Bw.01 | System area (0 fixed) | B1001 | | |
| Bw.02 | System area (0 fixed) | B1002 | 1 | |
| Bw.03 | Command request | B1003 | | |
| Bw.04 | System area (0 fixed) | B1004 | 2 | ST1PSD |
| Bw.05 | System area (0 fixed) | B1005 | | |
| Bw.06 | System area (0 fixed) | B1006 | 3 | ST1SS1 |
| Bw.07 | Convert setting request | B1007 | | |
| Bw.08 | Latch detection clear request | B1008 | 4 | |
| Bw.09 | Comparator clear request | B1009 | | |
| Bw.0A | _ | B100A | _ | _ |
| to | | | | |
| Bw.1F | _ | B101F | _ | _ |

### 7) Ew Error clear area

| Ew.n Error clear | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Ew.00 | Error clear request | B1020 | 0 | ST1H-PB |
| Ew.01 | System area (0 fixed) | B1021 | | |
| Ew.02 | System area (0 fixed) | B1022 | 1 | |
| Ew.03 | System area (0 fixed) | B1023 | | |
| Ew.04 | Error clear request | B1024 | 2 | ST1PSD |
| Ew.05 | System area (0 fixed) | B1025 | | |
| Ew.06 | Error clear request | B1026 | 3 | ST1SS1 |
| Ew.07 | System area (0 fixed) | B1027 | | |
| Ew.08 | System area (0 fixed) | B1028 | 4 | |
| Ew.09 | System area (0 fixed) | B1029 | | |
| Ew.0A | _ | B102A | _ | _ |
| to | | | | |
| Ew.1F | _ | B103F | _ | _ |

### 8) Sw System area

| Sw System area | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Sw.0 | System area (0 fixed) | B1040 to B104F | — | — |

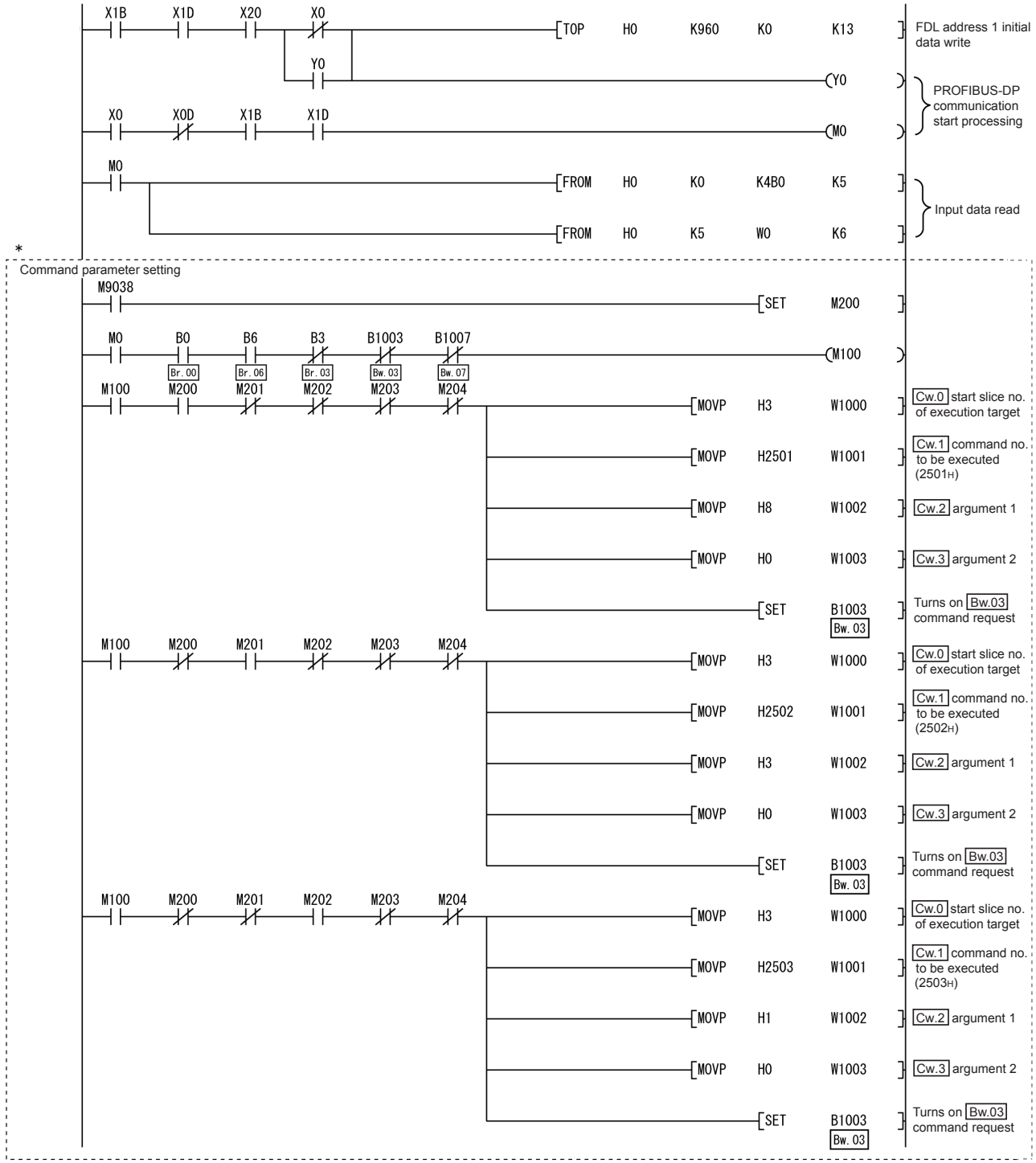
### 9) Cw Command execution area

| Cw Command execution area | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Cw.0 | Start Slice No. of Execution Target | W1000 | — | — |
| Cw.1 | Command No. to be Executed | W1001 | | |
| Cw.2 | Argument 1 | W1002 | | |
| Cw.3 | Argument 2 | W1003 | | |

### 10) Ww Word output area

| Ww Word output | Information | Master station side device | Slice No. | Module name |
|---|---|---|---|---|
| Ww.00 | System area (0 fixed) (Ww.n) | W1004 | 3 | ST1SS1 |
| Ww.01 | System area (0 fixed) (Ww.n+1) | W1005 | | |

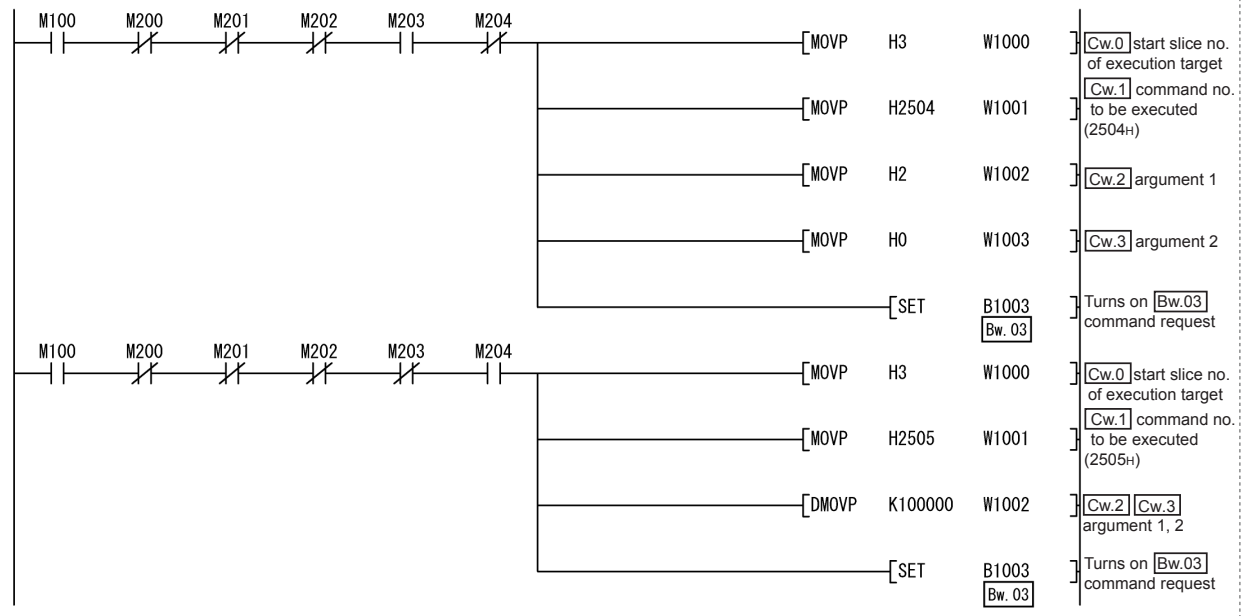
## (5) Program example




* The program area enclosed by the dotted line is not required when GX Configurator-ST is used to set the command parameters.


6 - 26

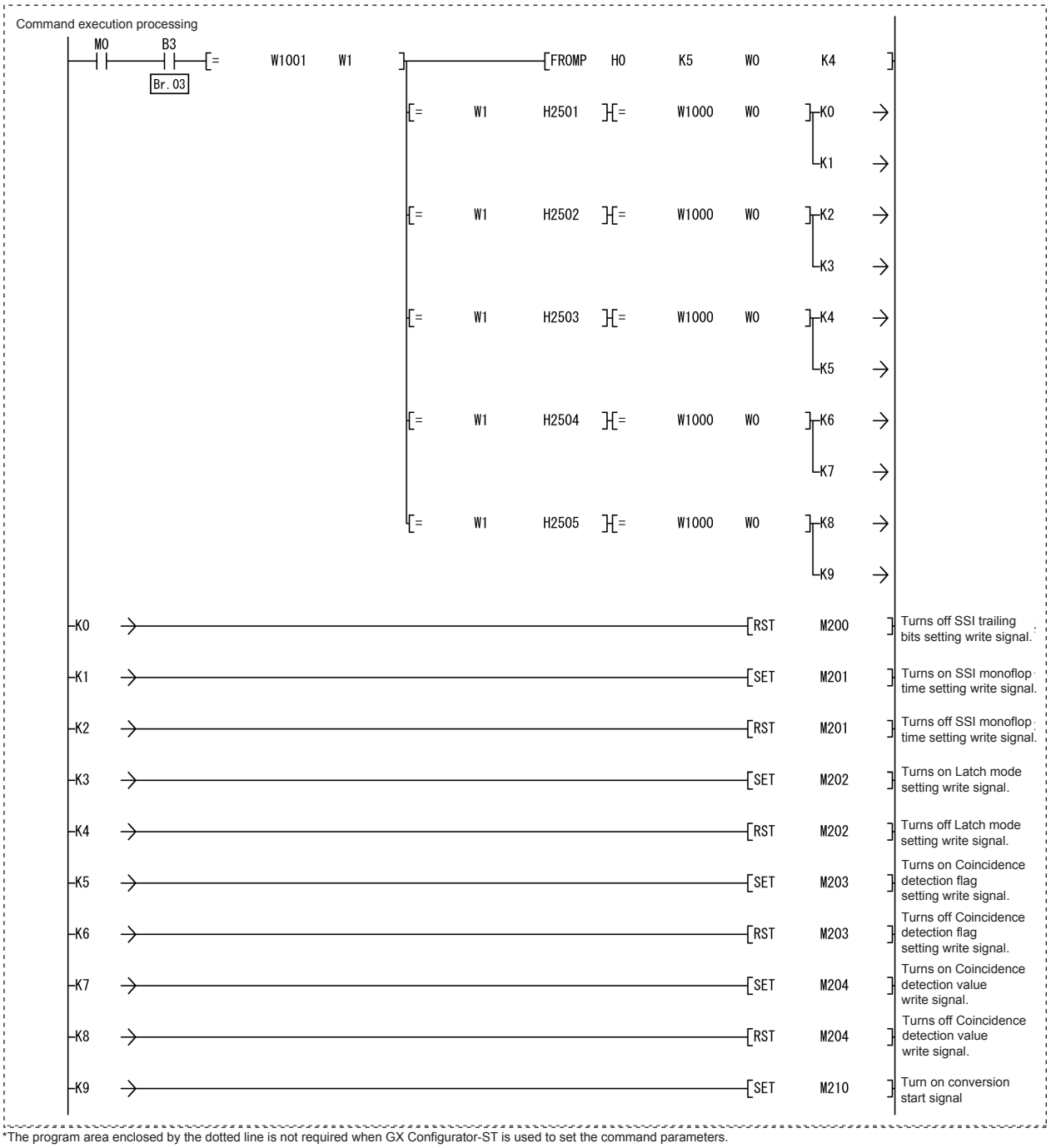
*




*The program area enclosed by the dotted line is not required when GX Configurator-ST is used to set the command parameters.

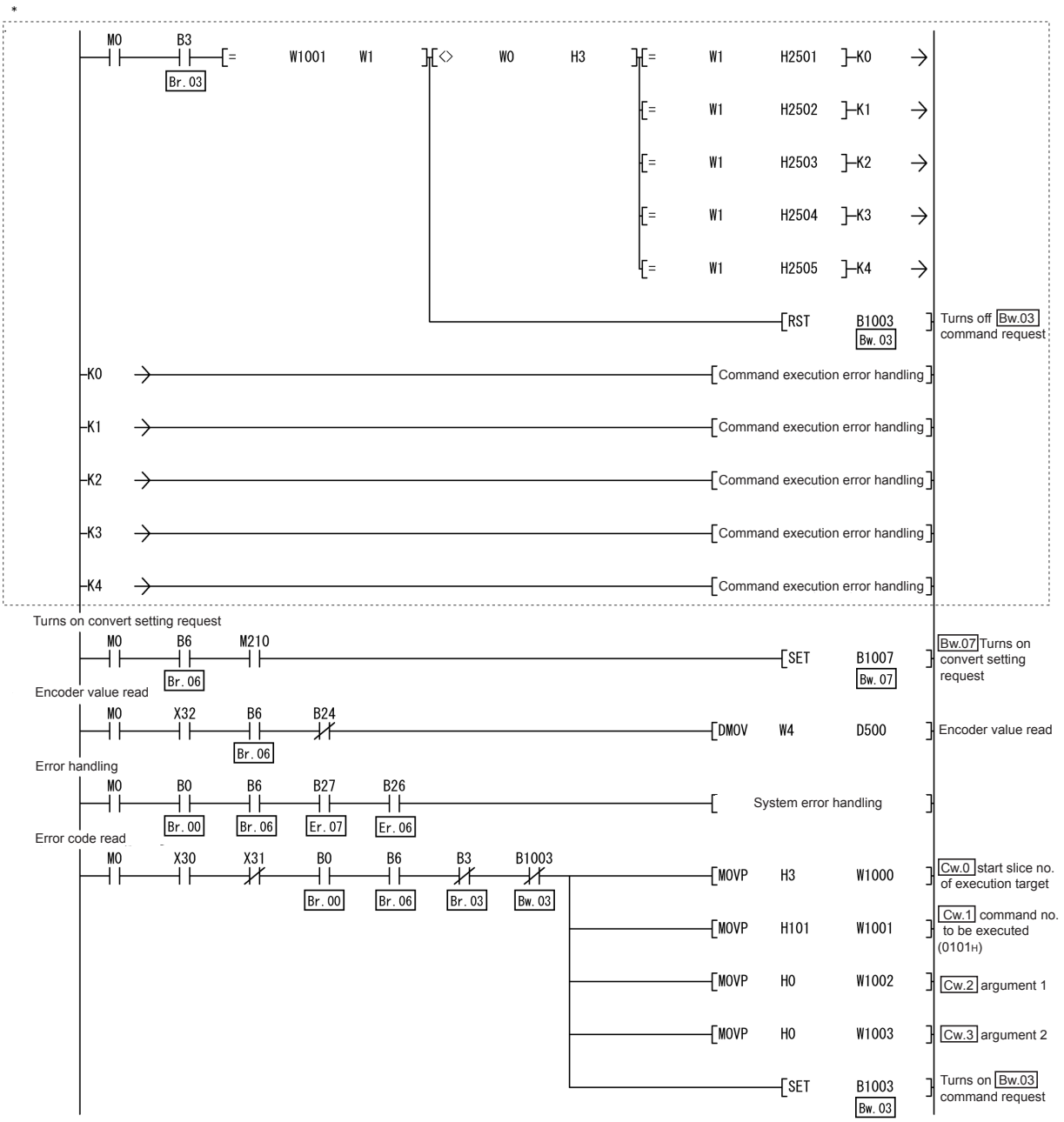

6 - 27

*



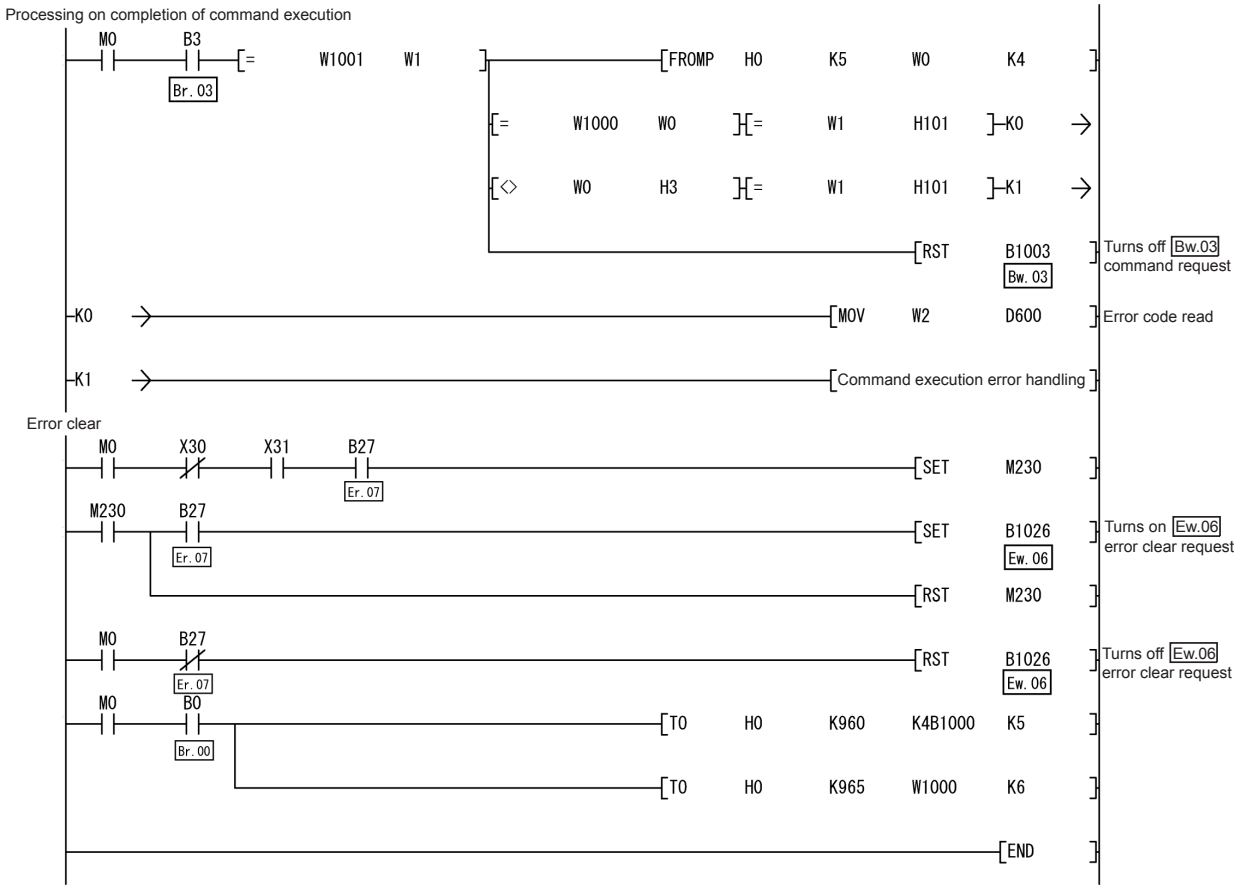

*The program area enclosed by the dotted line is not required when GX Configurator-ST is used to set the command parameters.


6 - 28




* The program area enclosed by the dotted line is not required when GX Configurator-ST is used to set the command parameters.


6 - 29


Processing on completion of command execution
M0
B3
Br.03
[=
W1001
W1
FROMP
H0
K5
W0
K4
[=
W1000
W0
][=
W1
H101
]K0
[<>
W0
H3
][=
W1
H101
]K1
RST
B1003
Bw.03
Turns off Bw.03 command request
K0
MOV
W2
D600
Error code read
K1
Command execution error handling
Error clear
M0
X30
X31
B27
Er.07
SET
M230
M230
B27
Er.07
SET
B1026
Ew.06
Turns on Ew.06 error clear request
RST
M230
M0
B27
Er.07
RST
B1026
Ew.06
Turns off Ew.06 error clear request
M0
B0
Br.00
T0
H0
K960
K4B1000
K5
T0
H0
K965
W1000
K6
END

# 7 ONLINE MODULE CHANGE

When performing online module change, make sure to read through Section 4.4 "Online module change" in the head module user's manual.
This chapter describes the specifications of an online module change.

(1) Perform an online module change by operating the head module buttons or using GX Configurator-ST.

(2) The user parameter and command parameter are automatically handed down to the new module.

## 7.1 Precautions for Online Module Change

The following are the precautions for online module change.

(1) To perform the online module change, the system configuration must be appropriate for execution of the online module change.
For details, refer to the 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 malfunction or failure.
In such a system configuration, shut off all phases of the external power supply for the MELSEC-ST system to replace a slice module.

(2) Be sure to perform an online module change in the "online module change procedure" in the user's manual of the used head module and in the procedure given in Section 7.4.1 of this manual.
Failure to do so can cause a malfunction or failure.

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

(4) Only the slice modules of the same model name can be replaced online. It is not possible to replace with/add the slice module of different model name.

(5) Only one slice module can be replaced in a single online module change process. To replace multiple slice modules, perform an online module change for each module.

(6) While an online module change is being executed (while the REL. LED of the head module is on), no command can be executed from the master station to the slice module being replaced online.
To do so will cause an error.

(7) When changing the user parameter of the slice module from the master station during online module change (while the head module's REL. LED is on), change it after the online module change is completed.
If the user parameter setting is changed from the master station during the online module change, the new setting is not validated since the new user parameter values are overwritten by the user parameter saved in the head module when the online module change is finished.

(8) During an online module change, the ERR. LED of the head module turns on only when an error related to the online module change occurs.
It will not turn on or flicker when any other error occurs.

(9) While an online module change is being executed (while the REL. LED of the head module is on), the following data of the slice module being replaced online all turn to 0 (OFF).
- Br.n Bit input
- Er.n Error information
- Mr.n Module status
- Wr.n Word input

(10) Make sure to perform online module change in the normal mode.

(11) Except the error clear request, the forced output test of GX Configurator-ST cannot be used for the module being changed online.
If it is used, the module will not operate. It will not display an error, either.

## 7.2 Preparations for Online Module Change

Prepare GX Configurator-ST when changing the ST1SS1 online.
Depending on the module failure status, the user parameter and command parameter may not be saved into the head module.
Refer to Section 7.4.1 for the procedure used in the parameter setting an online module change.
When GX Configurator-ST is unavailable, make the following preparations.
Failure to do so may not import the command parameter and others to the new module, if these settings cannot be saved into the head module.

### (1) Command parameter

When GX Configurator-ST is unavailable, the command parameter must be set by commands after an online module change is finished. Include a command parameter setting program in the master station program.
Refer to Section 6.2.1 and Section 6.3 for the command parameter setting program.

**POINT**

When GX Configurator-ST is unavailable, set the command parameter after the module has operated once by default.

**REMARK**

The preparations for the user parameter are not specially required since the values set by the configuration software of the master station are written from the head module.

## 7.3 Disconnecting/Connecting the External Device for Online Module Change

When replacing the module online, perform the following to cut off the connection between the ST1SS1 and an external device (SSI absolute encoder) and reconnect them.
Since power is supplied to the external device (SSI absolute encoder) from the power distribution module (ST1PSD/ST1PDD), disconnect and reconnect the power supply part by the switch or any other means.

### (1) Disconnection

Disconnect the following part between the power distribution module and the external device (SSI absolute encoder).
Signal name + 24V (Terminal that supplies power to the SSI absolute encoder)

### (2) Connection

Connect the following part between the power distribution module and the external device (SSI absolute encoder).
Signal name + 24V (Terminal that supplies power to the SSI absolute encoder)

## 7.4 Online Module Change Procedure

This section explains how to make the parameter setting an online module change when the user parameter and command parameter could not be saved in the head module or when the user range setting is used and high accuracy is required.
For the other online module change procedure, refer to the user's manual of the head module.

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

**POINT**

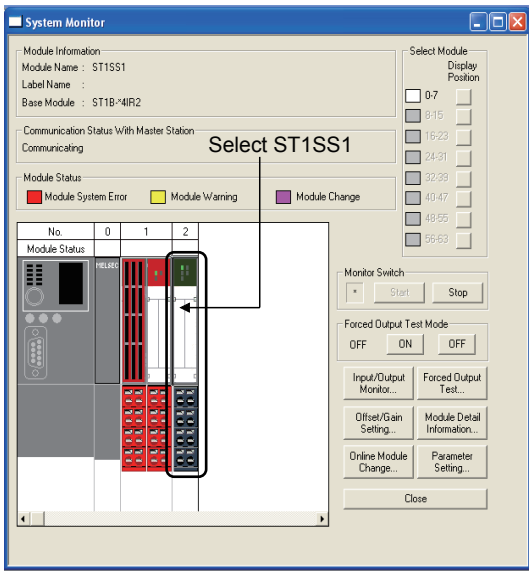
If a slice module different from the target one is selected by mistake, restart the operation as instructed below.

(1) To restart the operation at step 3)
Click the Cancel button on the screen to terminate online module change.

(2) When you noticed on the screen in step 4)
Do not change the slice module, click the Next button, and perform the operations in steps 7), 12), 13) to complete the online module change once.

(3) To restart the operation at step 7)
Mount the removed slice module again, click the Next button, and perform the operations in steps 12), 13) to complete the online module change once.

## Preparation for replacing ST1SS1

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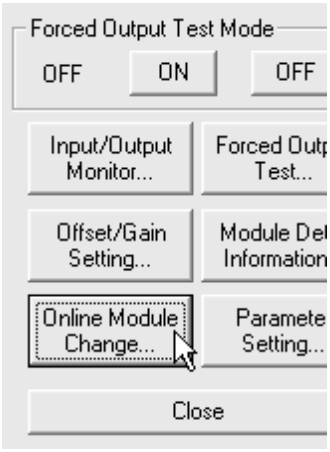


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1) Select the ST1SS1 to be replaced online on the "System Monitor" screen.

2) Click the Online Module Change button on the "System Monitor" screen.
Then, confirm that the RUN LED of the selected ST1SS1 is flashing at 0.25s intervals.

REMARK

Instead of the above, the following operations are also available.

- Select [Diagnostics] → [Online Module Change].
- Right-click the ST1SS1 selected at step 1), and click [Online Module Change] on the menu.

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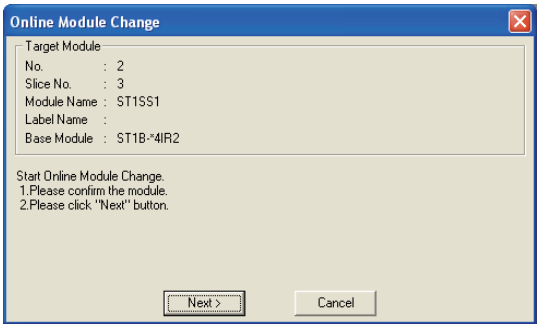


3) Confirm that the ST1SS1 displayed as "Target Module" is the ST1SS1 to be replaced and click the Next button.

(a) Clicking the Next button validates the settings and the following will be performed.
- Puts the head module into the online module change mode.
- Save the user parameter and command parameter of the ST1SS1 to be changed into the head module.

(b) After clicking the Next button, confirm the following module statuses.
- The REL. LED of the head module is on.
- The RUN LED of the target ST1SS1 is off. (If any other LED has been on, it is off.)
- The "Module Status" indicator of the target module has turned purple. This applies only when monitoring from the "System Monitor" screen.

(c) If the user parameter and command parameter could not be read from the ST1SS1, the REL. LED and ERR. LED of the head module turn on and the corresponding error message is displayed on the screen by the operation in step 7).
Confirm the error definition.
For details of the error code reading operation and error code of the head module, refer to the user's manual of the used head module.
When making parameter setting to the new ST1SS1, perform the operations in step 4, and later.

When not executing online module change, click the Cancel button.

(a) Clicking the Cancel button causes the screen to show that online module change is cancelled.

Clicking the Exit button returns to the step 1).

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7 - 7

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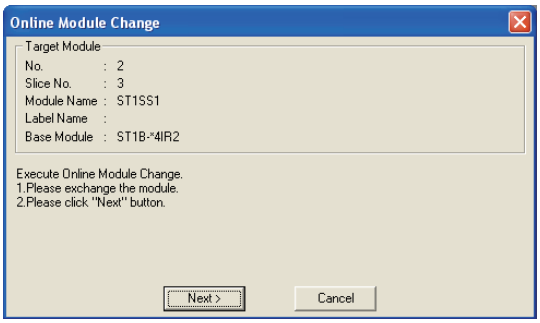
Disconnection from external device

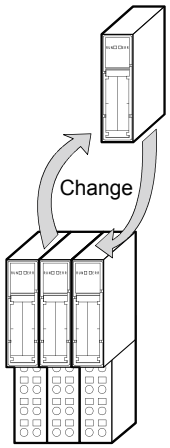



4) When the left screen appears, replace the module online. Cut off the power between the power distribution module on the immediate left of the ST1SS1 and the external device (SSI absolute encoder).

| 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 ST1SS1. |

↓

Replacing ST1SS1




5) Remove the ST1SS1 and replace with new one.

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Connection to external device after replacement

6) After installing a new ST1SS1, connect the power cable between the power distribution module and the external device (SSI absolute encoder).

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Operations after external device connection

7) After connecting to the external device, click the Next button on the screen at step 4).

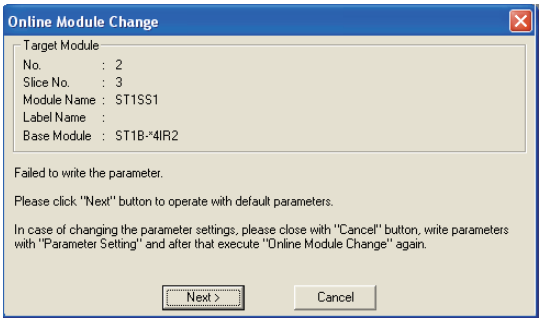
(a) Clicking the Next button performs the following.

- Checks whether the module name of the newly mounted slice module is the same as that of the removed one.
- Write the user parameter and command parameter which were saved in the head module in step 3), to the mounted ST1SS1.

(b) 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 ST1SS1 is flashing (at 0.25s intervals).

Clicking the Cancel button, i.e., interrupting online module change returns to step 1) In this case, select the same slice module as selected before, and complete online module change. Note that selecting different one causes an error.




If the parameter setting could not be written to the ST1SS1, the REL. LED and ERR. LED of the head module turn on and the screen shown on the left appears.
Confirm the error definition.
For details of the error code reading operation and error code of the head module, refer to the user's manual of the used head module.

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7 - 9

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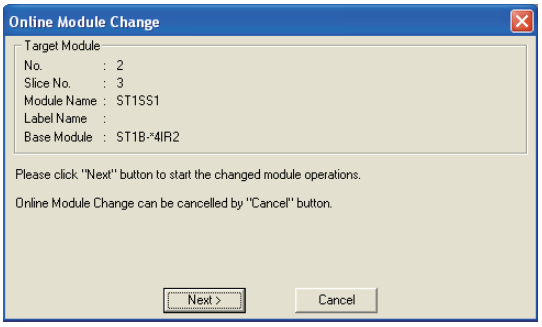
Parameter setting




8) Click the Cancel button to stop the online module change.

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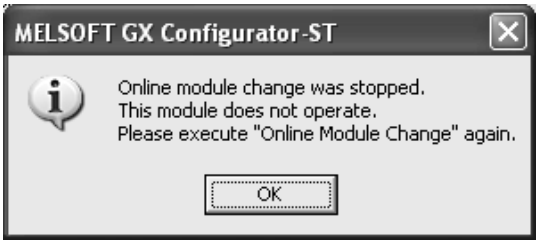


9) Click the OK button.

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10) Make parameter setting.
Follow the procedure in Section 5.3 for the parameter setting.
The following describes the POINT of parameter setting the online module change.

**POINT**

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

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

(3) If the parameter setting could not be read from the old ST1SS1, the user parameter have been written when the operation in step 7, was performed.
Using GX Configurator-ST, check whether the user parameter have been written.

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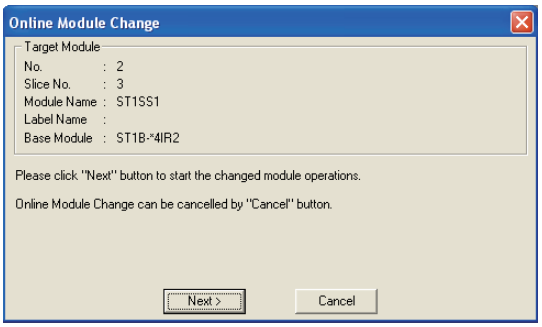
Processing after parameter setting

11) After parameter setting, execute the operations in steps 1), 2) to resume the online module change.
* Select the same ST1SS1 as before the online module change was stopped.
If the selected ST1SS1 is different, an error will occur.




12) Clicking the Next button releases the head module from the online module change mode.
(a) Clicking the Next button performs the following.
- Releases the head module from the online module change mode.
- Restarts refreshing the I/O data, etc.

(b) 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 ST1SS1 is on.
- The "Module Status" indicator of the target ST1SS1 has turned white. This applies only when monitoring from the "System Monitor" screen.

(c) If the head module cannot be released from the online module change mode, both REL. LED and ERR. LED of the head module turn on.
Confirm the error definition.
For details of the error code reading operation and error code of the head module, refer to the user's manual of the used head module.

When interrupting online module exchange, click the Cancel button.
(a) Clicking the Cancel button, i.e., interrupting online module change returns to step 1). In this case, select the same slice module as selected before, and complete online module change.
Note that selecting different one causes an error.

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7 - 11

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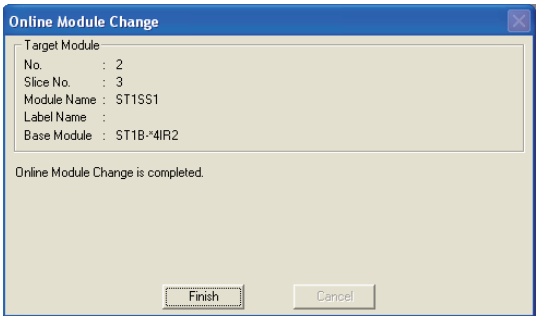


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(Completed)

13) The left screen appears showing that online module change has been completed.
Click the Finish button.


7 - 12

# 8 COMMANDS

This chapter explains the commands.

## 8.1 Command List

The ST1SS1 supports the command execution method that uses the Cw Command execution area/ Cr Command result area of the head module.
For the command execution procedure, refer to the User's Manual of your head module.
Table 8.1 lists the commands that can be executed by the ST1SS1.

Table 8.1 Command List

| COMMANDS | | | Description | Executability* | | Reference section |
|---|---|---|---|---|---|---|
| Command type | Command No. | Command name | | 1) | 2) | |
| Common command | 0100H | Operating status read request | Reads the operating status of the ST1SS1. | ○ | ○ | Section 8.2.1 |
| | 0101H | Error code read request | Reads the error code of the ST1SS1. | ○ | ○ | Section 8.2.2 |
| ST1SS1 parameter setting read command | 1500H | User parameter set value read | Reads the user parameter from the RAM of the ST1SS1. | ○ | ○ | Section 8.3.1 |
| | 1501H | SSI trailing bits set value read | Reads the SSI trailing bits setting from the RAM of the ST1SS1. | ○ | ○ | Section 8.3.2 |
| | 1502H | SSI monoflop time set value read | Reads the SSI monoflop time setting from the RAM of the ST1SS1. | ○ | ○ | Section 8.3.3 |
| | 1503H | Latch mode set value read | Reads the latch mode setting from the RAM of the ST1SS1. | ○ | ○ | Section 8.3.4 |
| | 1504H | Coincidence detection flag setting read | Reads the coincidence detection flag setting from the RAM of the ST1SS1. | ○ | ○ | Section 8.3.5 |
| | 1505H | Coincidence detection value read | Reads the coincidence detection value from the RAM of the ST1SS1. | ○ | ○ | Section 8.3.6 |
| ST1SS1 parameter setting write command | 2501H | SSI trailing bits set value write | Writes the SSI trailing bits setting to the RAM of the ST1SS1. | ○ | × | Section 8.4.1 |
| | 2502H | SSI monoflop time set value write | Writes the SSI monoflop time setting to the RAM of the ST1SS1. | ○ | × | Section 8.4.2 |
| | 2503H | Latch mode set value write | Writes the latch mode setting to the RAM of the ST1SS1. | ○ | × | Section 8.4.3 |
| | 2504H | Coincidence detection flag setting write | Writes the coincidence detection flag setting to the RAM of the ST1SS1. | ○ | × | Section 8.4.4 |
| | 2505H | Coincidence detection value write | Writes the coincidence detection value to the RAM of the ST1SS1. | ○ | × | Section 8.4.5 |
| ST1SS1 control command | 3500H | Parameter setting ROM read | Reads parameters from the ROM to RAM in the ST1SS1. | ○ | × | Section 8.5.1 |
| | 3501H | Parameter setting ROM write | Writes parameters from the RAM to RAM in the ST1SS1. | ○ | × | Section 8.5.2 |

○: Executable ×: Not executable

1) When Bw.n+1 convert setting request is OFF (0)
2) When Bw.n+1 convert setting request is ON (1)
* If a command is executed when it is not executable, it fails and "06H " or "13H " is stored into the Cr.0(15-8) Command execution result.

## 8.2 Common Command

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

Reads the operating status of the ST1SS1.

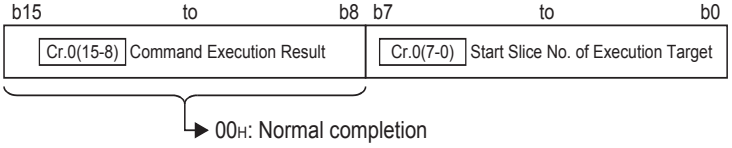
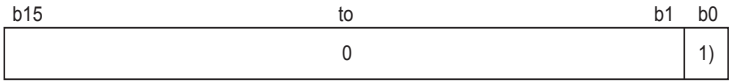
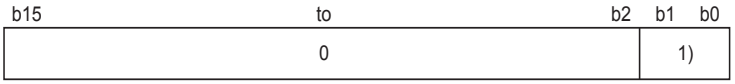
#### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 0100H |
| Cw.2 | Fixed to 0000H (Any value other than 0000H is ignored.) |
| Cw.3 | |

#### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

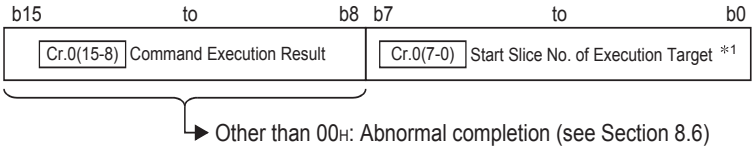
##### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | The operating status of the ST1SS1 is stored.<br>  <br>1) 0: Normal<br>1: System error |
| Cr.3 | The current operation mode of the ST1SS1 is stored.<br>  <br>1) 01: Normal mode |




8 - 2

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

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

Reads the error code of the ST1SS1.

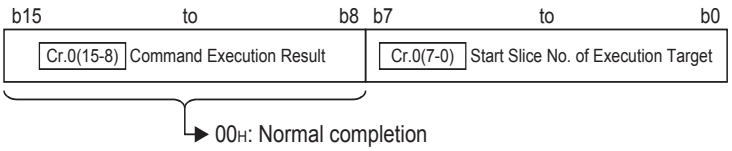
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 0101H |
| Cw.2 | Fixed to 0000H (Any value other than 0000H is ignored.) |
| Cw.3 | |

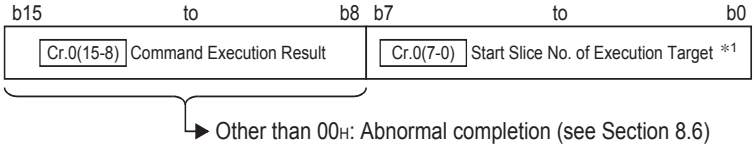
### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | The error code currently occurring in the ST1SS1 is stored. (Hexadecimal)<br>Refer to Section 9.1 for details of the error code. |
| Cr.3 | 0000 H |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.3 ST1SS1 Parameter Setting Read Command

### 8.3.1 User parameter set value read (Command No.: 1500H)

This command reads the SSI code setting, SSI code length setting ,SSI parity setting, SSI baud rate setting and SSI direction reversal setting from the RAM of the ST1SS1.

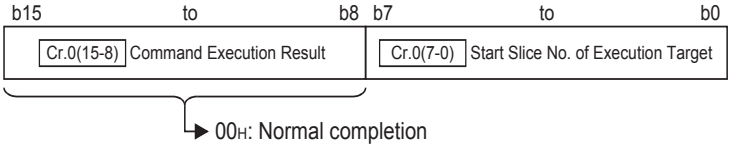
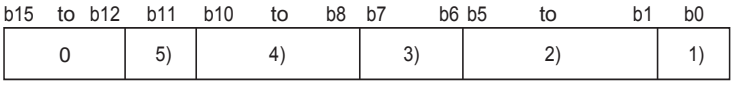
(1) Values set to [Cw] Command execution area

| [Cw] Command execution area | Setting value |
|---|---|
| [Cw.0] | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| [Cw.1] | 1500H |
| [Cw.2] | Fixed to 0000H (Any value other than 0000H is ignored.) |
| [Cw.3] | |

### (2) Execution result in Cr Command result area

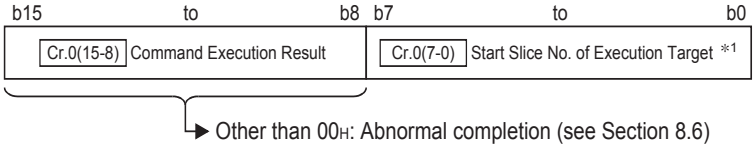
The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2* | This area stores the SSI code setting, SSI code length setting, SSI parity setting, SSI baud rate setting and SSI direction reversal setting that were written to the RAM.<br>  <br>1) SSI code setting (b0)<br>0: Gray code<br>1: Binary code<br>2) SSI code length setting (b1 to b5)<br>2 to 31 (bit)<br>3) SSI parity setting (b6 to b7)<br>00: None<br>01: Even<br>10: Odd<br>4) SSI baud rate setting (b8 to b10)<br>000: 125kHz<br>001: 250kHz<br>010: 500kHz<br>011: 1MHz<br>100: 2MHz<br>5) SSI direction reversal setting (b11)<br>0: No reversal<br>1: Reversal |
| Cr.3* | This area stores the SSI code setting, SSI code length setting, SSI parity setting, SSI baud rate setting and SSI direction reversal setting that are currently valid.<br>The stored values are the same as those of Cr.2 Response data 1. |

* If the stored values differ between Cr.2 Response data 1 and Cr.3 Response data 2, refer to Section 3.4 and take corrective actions.

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.3.2 SSI trailing bits set value read (Command No.: 1501H)

Reads the SSI trailing bits setting from the RAM of the ST1SS1.

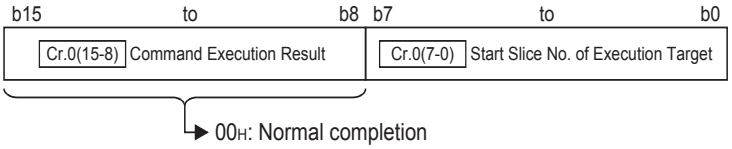
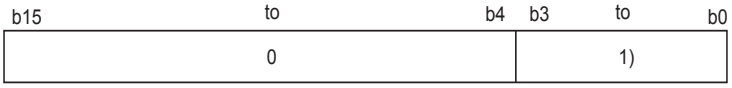
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 1501H |
| Cw.2 | Fixed to 0000H (Any value other than 0000H is ignored.) |
| Cw.3 | |

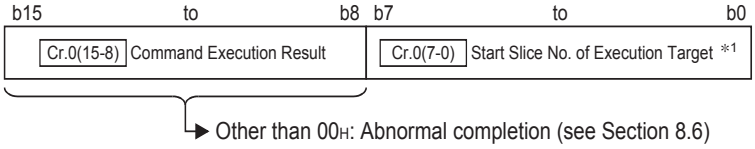
### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | The SSI trailing bits setting is stored.<br>  <br>1) SSI trailing bits setting (b0 to b3)<br>The range for stored data is from 0 to 15 (bit). |
| Cr.3 | 0000H |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.3.3 SSI monoflop time set value read (Command No.: 1502H)

Reads the SSI monoflop time setting from the RAM of the ST1SS1.

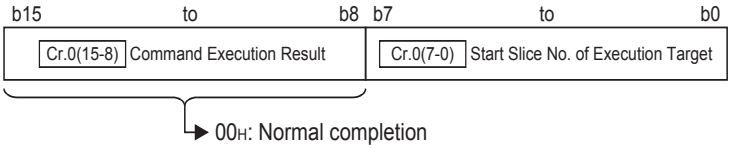
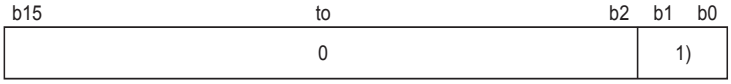
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 1502H |
| Cw.2 | Fixed to 0000H (Any value other than 0000H is ignored.) |
| Cw.3 | |

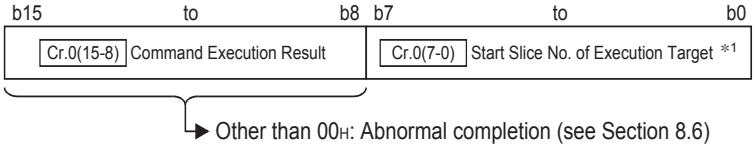
### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | The SSI monoflop time setting is stored.<br>  <br>1) SSI monoflop time setting (b0 to b1)<br>00: 48µs<br>01: 64µs<br>10: 80µs<br>11: 96µs |
| Cr.3 | 0000H |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.3.4 Latch mode set value read (Command No.: 1503H)

Reads the latch mode setting from the RAM of the ST1SS1.

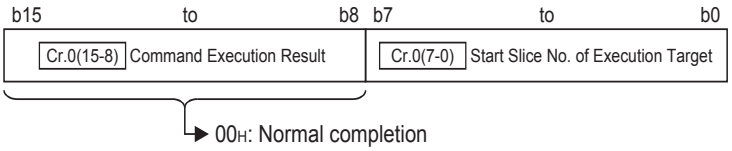
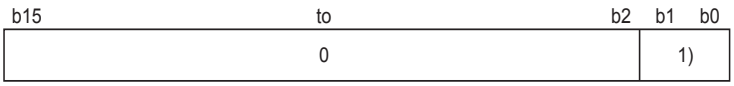
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 1503H |
| Cw.2 | Fixed to 0000H (Any value other than 0000H is ignored.) |
| Cw.3 | |

### (2) Execution result in Cr Command result area

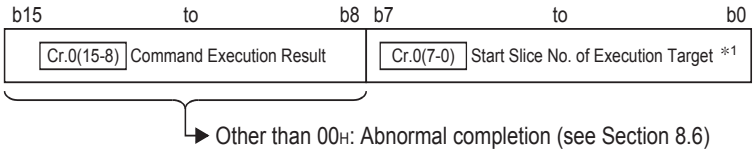
The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | The latch mode setting is stored.<br>  <br>1) Latch mode setting (b0 to b1)<br>00: No latch<br>01: Rising edge<br>10: Falling edge<br>11: Rising + falling edge |
| Cr.3 | 0000H |


8 - 13

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.3.5 Coincidence detection flag setting read (Command No.: 1504H)

Reads the coincidence detection flag setting from the RAM of the ST1SS1.

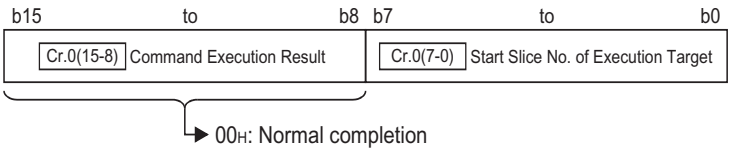
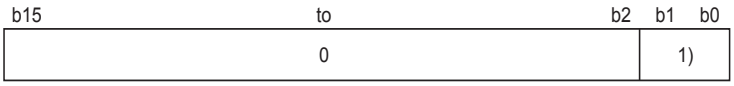
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 1504H |
| Cw.2 | Fixed to 0000H (Any value other than 0000H is ignored.) |
| Cw.3 | |

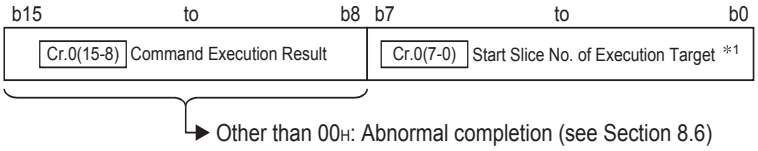
### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | The coincidence detection flag setting is stored.<br>  <br>1) Coincidence detection flag setting (b0 to b1)<br>00: No comparator<br>01: Upward<br>10: Downward<br>11: Upward + downward |
| Cr.3 | 0000H |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.3.6 Coincidence detection value read (Command No.: 1505H)

Reads the coincidence detection value from the RAM of the ST1SS1.

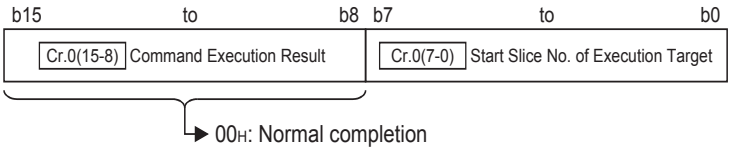
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 1505H |
| Cw.2 | Fixed to 0000H (Any value other than 0000H is ignored.) |
| Cw.3 | |

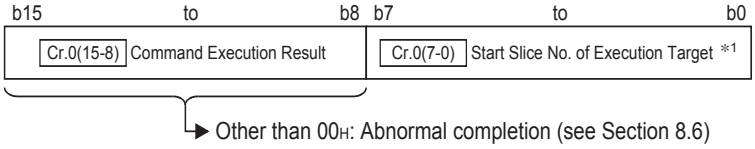
### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | The low word (b0 to b15) of the coincidence detection value is stored. |
| Cr.3 | The high word (b16 to b31) of the coincidence detection value is stored. |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.4 ST1SS1 Parameter Setting Write Command

### 8.4.1 SSI trailing bits set value write (Command No.: 2501H)

Writes the SSI trailing bits setting to the RAM of the ST1SS1.
This command can be executed only when Bw.n+1 convert setting request is off (0).

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

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 2501H |
| Cw.2 | Set the SSI trailing bits setting.<br>b15 to b4 b3 to b0<br>0 \| 1)<br>1) SSI trailing bits setting (b0 to b3)<br>The setting range is 0 to 15 (bit). |
| Cw.3 | Fixed to 0000H (Any value other than 0000H is ignored.) |

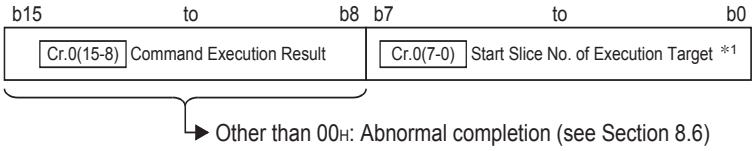
#### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

##### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>b15 to b8 b7 to b0<br>Cr.0(15-8) Command Execution Result \| Cr.0(7-0) Start Slice No. of Execution Target<br>00H: Normal completion |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | 0000H |
| Cr.3 | |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.4.2 SSI monoflop time set value write (Command No.: 2502H)

Writes the SSI monoflop time setting to the RAM of the ST1SS1.
This command can be executed only when Bw.n+1 convert setting request is off (0).

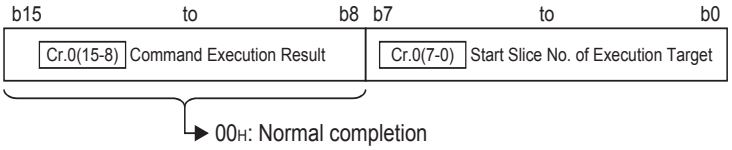
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 2502H |
| Cw.2 | Set the SSI monoflop time setting.<br>b15 to b2 b1 b0<br>0 \| 1)<br>1) SSI monoflop time setting (b0 to b1)<br>00: 48μs<br>01: 64μs<br>10: 80μs<br>11: 96μs |
| Cw.3 | Fixed to 0000H (Any value other than 0000H is ignored.) |

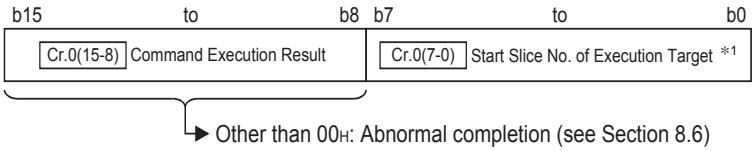
### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | 0000H |
| Cr.3 | |

#### (b) Abnormal completion (When Cr.0(15-8) Command execution result is other than 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.4.3 Latch mode set value write (Command No.: 2503H)

Writes the latch mode setting to the RAM of the ST1SS1.
This command can be executed only when Bw.n+1 convert setting request is off (0).

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

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 2503H |
| Cw.2 | Set the latch mode setting.<br>b15 to b2 b1 b0<br>0 \| 1)<br>1) Latch mode setting (b0 to b1)<br>00: No latch<br>01: Rising edge<br>10: Falling edge<br>11: Rising + falling edge |
| Cw.3 | Fixed to 0000H (Any value other than 0000H is ignored.) |

### (2) Execution result in Cr Command result area

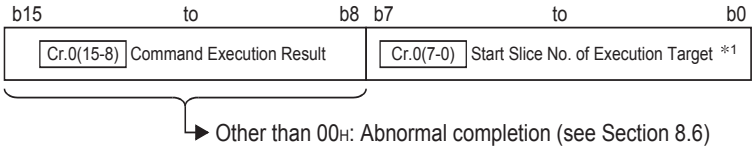
The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>b15 to b8 b7 to b0<br>Cr.0(15-8) Command Execution Result \| Cr.0(7-0) Start Slice No. of Execution Target<br>00H: Normal completion |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | 0000H |
| Cr.3 | |


8 - 23

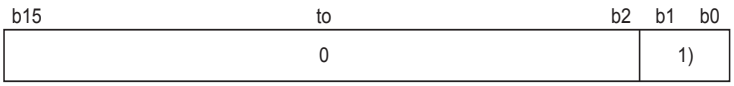
(b) Abnormal completion (When Cr.0(15-8) Command execution result is other than 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.4.4 Coincidence detection flag setting write (Command No.: 2504H)

Writes the coincidence detection flag setting to the RAM of the ST1SS1.
This command can be executed only when Bw.n+1 convert setting request is off (0).

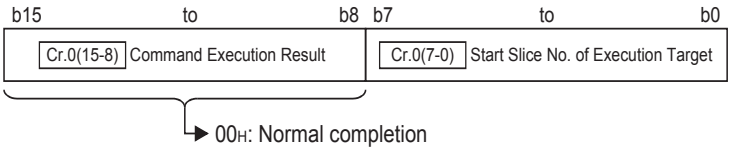
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 2504H |
| Cw.2 | Set the coincidence detection flag setting.<br>  <br>1) Coincidence detection flag setting (b0 to b1)<br>00: No comparator<br>01: Upward<br>10: Downward<br>11: Upward + downward |
| Cw.3 | Fixed to 0000H (Any value other than 0000H is ignored.) |

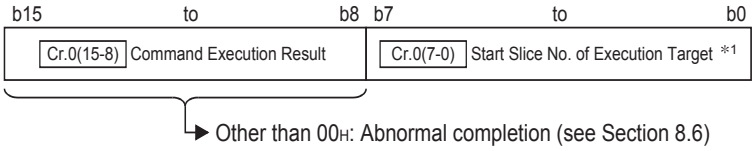
### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | 0000H |
| Cr.3 | |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.4.5 Coincidence detection value write (Command No.: 2505H)

Writes the coincidence detection value to the RAM of the ST1SS1.
This command can be executed only when Bw.n+1 convert setting request is off (0).

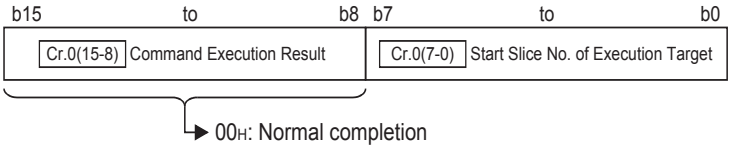
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 2505H |
| Cw.2 | Set the low word (b0 to b15) of the coincidence detection value.<br>[Example] For 10000000 (989680H), set 9680H for Cw.2 and 0098H for Cw.3. |
| Cw.3 | Set the high word (b16 to b31) of the coincidence detection value. |

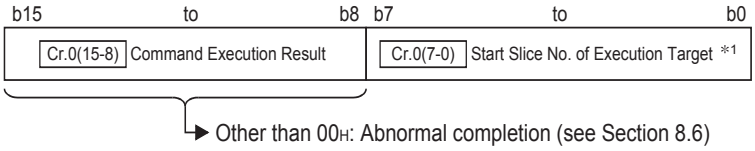
### (2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | 0000H |
| Cr.3 | |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.5 ST1SS1 Control Command

### 8.5.1 Parameter setting ROM read (Command No.: 3500H)

Reads the parameters from the ROM of the ST1SS1 to the RAM.
This command can be executed only when Bw.n+1 convert setting request is off (0).

(1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 3500H |
| Cw.2 | Fixed to 0000H (Any value other than 0000H is ignored.) |
| Cw.3 | |

(2) Execution result in Cr Command result area

The execution result of the command changes depending on the result (normal completion or abnormal completion) in Cr.0(15-8) Command execution result.

(a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>b15 to b8 b7 to b0<br>Cr.0(15-8) Command Execution Result \| Cr.0(7-0) Start Slice No. of Execution Target<br>00H: Normal completion |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | 0000H |
| Cr.3 | |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>b15 to b8 b7 to b0<br>Cr.0(15-8) Command Execution Result \| Cr.0(7-0) Start Slice No. of Execution Target *1<br>Other than 00H: Abnormal completion (see Section 8.6)<br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

## 8.5.2 Parameter setting ROM write (Command No.: 3501H)

Writes the parameters from the RAM of the ST1SS1 to the ROM.
This command can be executed only when Bw.n+1 convert setting request is off (0).

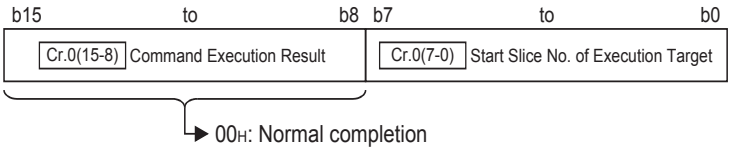
### (1) Values set to Cw Command execution area

| Cw Command execution area | Setting value |
|---|---|
| Cw.0 | Set the start slice no. of the ST1SS1 where the command will be executed. (Hexadecimal) |
| Cw.1 | 3501H |
| Cw.2 | Fixed to 0000H (Any value other than 0000H is ignored.) |
| Cw.3 | |

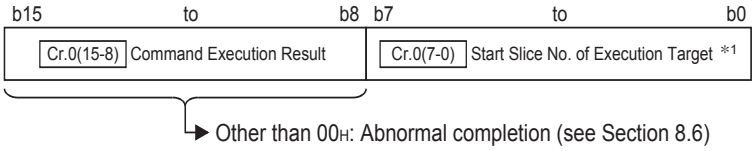
### (2) Execution result in Cr Command result area

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

#### (a) Normal completion (When Cr.0(15-8) Command execution result is 00H)

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  |
| Cr.1 | The executed command no. is stored. (Hexadecimal) |
| Cr.2 | 0000H |
| Cr.3 | |

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

| Cr Command result area | Result details |
|---|---|
| Cr.0 | The command execution result is stored into the higher byte, and the start slice No. of execution target into the lower byte in hexadecimal as shown below.<br>  <br><br>*1: When 0FH is stored into the Cr.0(15-8) Command Execution Result, 00H (start slice No. of head module) is stored into the Cr.0(7-0) Start Slice No. of Execution Target. |
| Cr.1 | The executed command no. 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. |

**POINT**

Execute Parameter setting ROM write (command number: 3501H) after confirming that normal operation is performed with the settings written to the RAM.

## 8.6 Values Stored into Command Execution Result

The following table indicates the values stored into Cr.0(15-8) Command execution result in Cr Command result area.

| Cr.0 (15-8) Command execution result | Description | Corrective action |
|---|---|---|
| 00H | Normal completion | — |
| 01H | The requested command is not available for the specified module. | Check Table 8.1 in section 8.1 to see if the requested command no. can be used for the ST1SS1. |
| | | Check whether the specified start slice No. of execution target is the start slice No. of the ST1SS1. |
| 02H | The value set in Cw.2 Argument 1 or Cw.3 Argument 2 is outside the allowable range. | Check whether the value set to Cw.2 Argument 1 or Cw.3 Argument 2 in the command execution area is within the range usable for the requested command no. |
| 03H | The start slice No. of the execution target is wrong. | Check whether the ST1SS1 is mounted to the specified start slice No. of execution target. |
| | | Check whether the specified start slice No. of execution target is the start slice No. of the ST1SS1. |
| 04H | There is no response from the specified module. | Check Table 8.1 in section 8.1 to see if the requested command no. can be used for the ST1SS1.<br>When the requested command no. can be used, the possible cause is a ST1SS1 failure.<br>Please consult your local distributor or branch office, explaining a description of the problem. |
| 05H | No communication is available with the specified module. | The possible cause is a ST1SS1 failure.<br>Please consult your local distributor or branch office, explaining a description of the problem. |
| 06H | The requested command is not executable in the current operating status (operation mode) of the module. | Check the error code and take corrective actions. (Refer to section 9.1.) If no error code is stored, refer to Table 8.1 in section 8.1 and check whether the requested command no. is executable in the operation mode or not. |
| 07H | The module has already been in the specified mode. | Continue the processing since the operation mode of the ST1SS1 specified by the start slice No. of execution target is the mode already requested. |
| 08H | The module cannot be changed into the specified mode. | Execute the command after turning Bw.n+1 convert setting request to OFF (0). |
| 09H | The specified module is in the online module change status. | Execute the command after online module change is completed. |
| 10H | Data cannot be read from the specified module. | Execute the command again.<br>If the problem on the left persists, the possible cause is a ST1SS1 failure.<br>Please consult your local distributor or branch office, explaining a description of the problem. |
| 11H | Data cannot be written to the specified module. | |

| Cr.0 (15-8) Command execution result | Description | Corrective action |
|---|---|---|
| $13_H$ | The specified module is not in the status available for parameter writing. | Execute the command after turning Bw.n+1 convert setting request to OFF (0). |
| $0F_H$ | The value of Cw.0 Start Slice No. of Execution Target is outside the applicable range. | Check whether the value set at Cw.0 Start Slice No. of Execution Target is not more than $7F_H$. |


8 - 33

# 9 TROUBLESHOOTING

This chapter explains the errors that may occur during operation of the ST1SS1, and how to troubleshoot them.

## 9.1 Error Code List

When an error occurs due to data writing to the master module, the ST1SS1 can execute the error code read request (command no.: 0101H) and thereby an error code is stored into Cr Command result area of the head module.

Table 9.1 Error code list (1/2)

| Error code (Hexadecimal) | Error level | Error name | Description | Corrective action |
|---|---|---|---|---|
| 1100H | System error | ROM error | ROM is faulty. | Power off the ST1SS1 and then on, or reset the head module. If the error code on the left is stored again, the ST1SS1 may be faulty. Please consult your local Mitsubishi representative, explaining a detailed description of the problem. |
| 1200H | System error | Number of writes to ROM exceeded | Parameter setting ROM write (command no.: 3501H) was executed more than 25 times after power-on. | Commands or writes to ROM by GX Configurator-ST must not be executed more than 25 times per module after power-ON. |
| | | | Data were written to ROM by GX Configurator-ST more than 25 times. | |
| 2001H | System error | SSI trailing bits error | Number of SSI trailing bits is greater than the SSI code length. | Set a value so that the SSI code length is greater than or equal to the number of trailing bits. |
| 2101H | System error | SSI code length error | Any other than 2 to 31 bits is set for the SSI code length. | Set a value that is within the valid range. |
| 2201H | System error | SSI parity error | The SSI parity setting is out of range. | Set a value that is within the valid range. |
| 2301H | System error | SSI baud rate error | The SSI baud rate setting is out of range. | Set a value that is within the valid range. |
| 2401H | System error | SSI monoflop time error | The SSI monoflop time setting is out of range. | Set a value that is within the valid range. |
| 3001H | System error | Coincidence detection value error | The coincidence detection value is out of range. | Set a value that is within the valid range. |
| 5001H | System error | DATA signal line reversal error | The DATA signal line is connected reversely. | Reverse the connection between DATA and $\overline{\text{DATA}}$. |




9 - 1

Table 9.1 Error code list (2/2)

| Error code (Hexadecimal) | Error level | Error name | Description | Corrective action |
|---|---|---|---|---|
| 5101H | System error | Start error | The data signal line is not high before SSI transmission. | Check cabling, shielding, SSI baud rate, cable length and SSI code length.<br>If the error persists after the check, hardware failure of the SSI absolute encoder or the ST1SS1, or the influence of noise is a probable cause.<br>Replace the SSI absolute encoder, or consult your local Mitsubishi representative, explaining a detailed description of the problem. |
| 5201H | System error | End error | The data signal line is not low after SSI transmission. | Check cabling, shielding, SSI baud rate, cable length and SSI code length.<br>If the error persists after the check, hardware failure of the SSI absolute encoder or the ST1SS1, or the influence of noise is a probable cause.<br>Replace the SSI absolute encoder, or consult your local Mitsubishi representative, explaining a detailed description of the problem. |
| 5301H | System error | Parity error | The parity bit is different between the ST1SS1 and the SSI absolute encoder. | Check the cable wiring and shielding.<br>Make the SSI parity setting suitable for the SSI absolute encoder to be used. |

POINT

(1) When multiple errors in the same level has occurred, a code of the first error found by the ST1SS1 is stored.
(2) Errors can be cleared by turning on (1) Ew.n Error clear request.




9 - 2

## 9.2 Troubleshooting

### 9.2.1 When the RUN LED is flashing or turned off

#### (1) When flashing at 0.25s intervals

| Check item | Corrective action |
|---|---|
| Is the module selected as the target of online module change? | Refer to Chapter 7 and take corrective action. |

#### (2) When flashing at 1s intervals

| Check item | Corrective action |
|---|---|
| Has data communication been stopped between the master station and head module? | Refer to the MELSEC-ST System User's Manual and take corrective action. |
| 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? | |

#### (3) When off

| Check item | Corrective action |
|---|---|
| Is a module change enabled during an online module change? | Refer to Chapter 7 and take corrective action. |
| 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 modules, and check that the power supply capacity is sufficient. |
| Is the ST1SS1 correctly mounted on the base module? | Check the mounting condition of the ST1RSS1. |
| Has a watchdog timer error occurred? | Power the ST1SS1 off and then on, or reset the head module, and check whether the LED turns on.<br>If the LED still does not turn on, the possible cause is a ST1SS1 failure. Please consult your local Mitsubishi representative, explaining a detailed description of the problem. |

### 9.2.2 When the RUN LED and the ERR. LED turned on

| Check item | Corrective action |
|---|---|
| Is a system error being generated? | Confirm the error code and take corrective action described in Section 9.1. |

### 9.2.3 When counting is not performed

| Check item | Corrective action |
|---|---|
| Is external AUX. power being supplied? | Check whether a 24V DC voltage is supplied to the power distribution module. |
| Is the external wiring normally connected? | Check the external wiring. (Refer to Section 4.4.) |
| Is the digital input for latch OFF? | Turn OFF the digital input for latch. |

### 9.2.4 When encoder values are not correct

| Check item | Corrective action |
|---|---|
| Is the SSI code setting correct? | Select Gray code or Binary code in accordance with the SSI absolute encoder to be connected. |
| Does the cable length fall within the range of the maximum cable length? | Check the cable length or cable thickness. (Refer to Section 4.4.3.)<br>Or, reduce the SSI baud rate. |
| Is the SSI code length setting correct? | Set a SSI code length in accordance with the resolution of the SSI absolute encoder to be connected. |
| Are shielded twisted pair cables used? | Use shielded twisted pair cables. |
| Does any noise affect the system? | Take preventive actions such as attaching a surge suppressor to magnet switches. |
| Is a sufficient distance is ensured between heavy electric equipment and signal lines? | Connect signal lines independently, and keep a distance of at least 100mm from the power cables. |

**POINT**

If a normal encoder value cannot be read after performing the above actions, the possible cause is failure of the module.
Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

# APPENDIX

## Appendix 1 Accessories

This section explains the accessories related to the ST1SS1.

### (1) Wiring maker

For how to use the wiring marker, refer to the MELSEC-ST System User's Manual.

| Model name | Description | Color |
|---|---|---|
| ST1A-WMK-BK | Terminal marker (Signal wire) | Black |
| ST1A-WMK-RD | Terminal marker (24V DC) | Red |

### (2) Coding element

The coding element is fitted before shipment.
It is also available as an option in case it is lost.

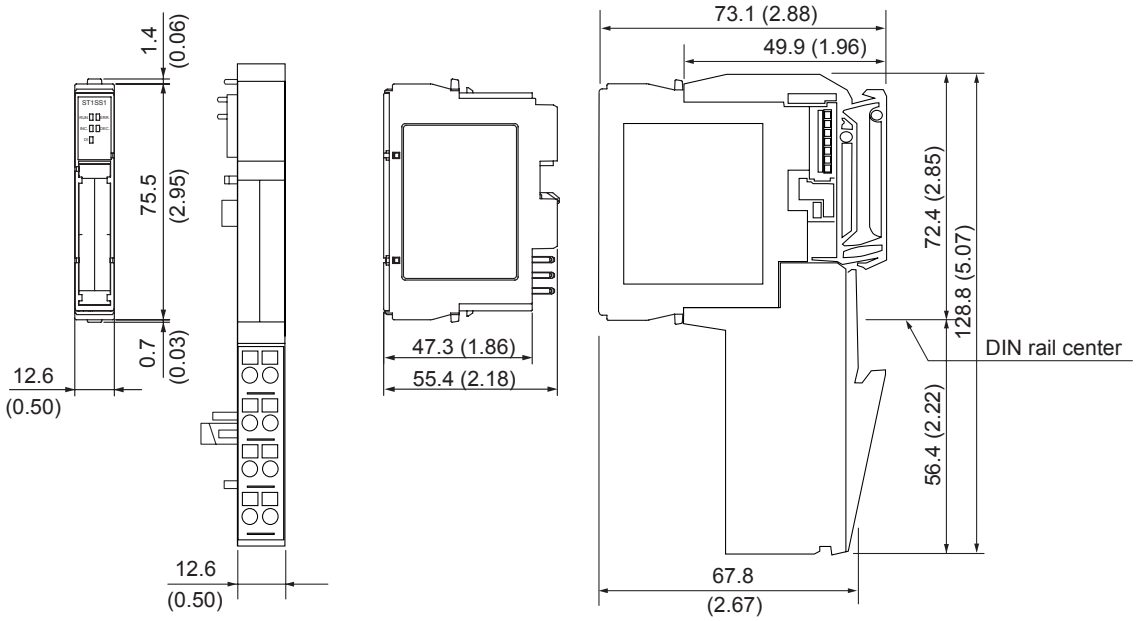
| Model name | Description | Shape* | | Color |
|---|---|---|---|---|
| | | Base module side | Slice module side | |
| ST1A-CKY-18 | Coding element for ST1SS1 |  |  | Dark green |

*Indicates the position of the projection or hole when the coding element is viewed from above.
: Projection : Hole

App


App - 1

## Appendix 2 External Dimensions




Unit: mm (inch)

App


App - 2

# MEMO


App - 3

# INDEX





Index - 1

Index - 2

# 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 logic 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 logic 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 logic 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 logic 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 logic 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
# SSI Absolute Encoder Input Module
## User's Manual

| | |
|---|---|
| MODEL | ST1SS-U-SY-E |
| MODEL CODE | 13JR94 |
| SH(NA)-080630ENG-A(0608)MEE | |

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS : 1-14 , YADA-MINAMI 5-CHOME , HIGASHI-KU, NAGOYA , JAPAN