RFID Interface Module

Model

EQ-V680D1
EQ-V680D2

User's Manual

EQ-V680D1
EQ-V680D2

MELSEC Recognized

● SAFETY PRECAUTIONS ●

(Always read these precautions prior to use.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to ensure that the product is used correctly.
The precautions presented in this manual are concerned with this product only. For programmable controller system safety precautions, refer to the user's manual of the CPU module used.
In this manual, the safety precautions are ranked as "WARNING" and "CAUTION."

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

Note that failure to observe the ⚠CAUTION level instructions may lead to a serious consequence according to the circumstances. Always follow the precautions of both levels because they are important to personal safety.
Please keep this manual in an easy-to-access location for future reference, and be sure to deliver the manual to the end user.

[DESIGN PRECAUTIONS]

⚠ CAUTION

- Provide a safety circuit outside the programmable controller to ensure that the overall system operates safely in the event of an error in the external power supply or failure of the programmable controller itself. Failure to do so results in the risk of erroneous output and malfunction, resulting in module failure.
- Configure the circuitry so that the external power supply is activated after the power supply of the programmable controller itself. Activating the external power supply first results in the risk of erroneous output and malfunction, resulting in module failure.
- When installing the RFID interface module and amplifier/antenna cables, do not bundle the cables with or install the cables close to the main circuit, power lines, or the like. Be sure to separate the cables and lines by about 100mm or more. Failure to do so will cause noise, resulting in malfunction.

[DESIGN PRECAUTIONS]

⚠ CAUTION

- When storing the product, be sure to observe the defined storage ambient temperature and humidity. Failure to do so will lead to module malfunction and failure.
- Look the control panel so that only those who are trained and have acquired enough knowledge of electric facilities can open control panel.
- Install the emergency stop switch outside the control panel so that workers can operate it easily.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Use the programmable controller in an environment that reflects the general specifications stated in the user's manual of the CPU module used. Using the programmable controller in an environment out of the general specification range results in the risk of electric shock, fire, malfunction, and product damage or deterioration.
- During installation, fully insert the tabs used to secure the module into the holes of the base unit while pressing down the module mounting lever located at the bottom of the module, using the unit holes as support points. An incorrectly mounted module results in the risk of malfunction, failure, and dropping. When used in an environment of high oscillation, secure the module with screws.
- Tighten the screws within the specified torque range. If a screw is too loose, a dropped module, short circuit, or malfunction may result. If a screw is too tight, screw and/or module damage may occur, resulting in a dropped module, short circuit, or malfunction.
- Be sure to shut off all phases of the external power supply used by the system before module installation or removal.
  Failure to do so results in the risk of product damage.
- Do not directly touch a powered section or electronic component of the module. Doing so results in the risk of module malfunction and failure.

[WIRING PRECAUTIONS]

⚠ CAUTION

- After the installation and wiring work, be sure to install the provided terminal cover on the product when you want to activate and operate the module. Failure to do so results in the risk of electric shock.
- Fully mount the antenna cable to the module connector. After mounting, check for separation. Insufficient contact results in the risk of erroneous input and output.
- Be sure to place the communication cables and power cables connected to the module in a duct, or secure them with clamps. Failure to do so results in the risk of cable movement and drift, module or cable damage caused by careless pulling, and malfunction caused by insufficient cable contact.

[WIRING PRECAUTIONS]

⚠ CAUTION

- When connecting a cable, first verify the connection interface type and then connect the cable properly. Connecting a cable to a wrong interface or miswiring a cable results in the risk of module and external device malfunction.
- Tighten the screws within the specified torque range. If a screw is too loose, a short circuit or malfunction may result. If a screw is too tight, screw and/or module damage may occur, resulting in a short circuit or malfunction.
- When removing a communication cable or power cable connected to the module, do not pull the cable section. For cables with connectors, hold the connector of the section connected to the module during removal. For terminal block cables, loosen the screws of the terminal block and then remove the cable. Pulling a cable while it is connected to the module results in the risk of malfunction and module and cable damage.
- Be careful to prevent foreign matter such as dust or wiring chips from entering the module interior. Failure to do so results in the risk of fire, failure, and malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring.
  Do not remove the film during wiring.
  Remove it for heat dissipation before system operation.
- Do not connect the power supply in reverse. Doing so results in risk of failure.
- Use the module after confirming that the external input DC power supply is within the rated power supply voltage.
  Failure to do so results in the risk of failure and malfunction.
- Do not bundle the control or communication cables with or install the cables close to the main circuit, power lines, or the like. Be sure to separate the cables and lines by about 100mm or more.

[STARTUP AND MAINTENANCE PRECAUTIONS]

⚠ CAUTION

- Do not disassemble or modify the module. Doing so results in the risk of failure, malfunction, injury, and fire.
- Be sure to shut off all phases of the external power supply used by the system before module installation or removal. Failure to do so results in the risk of module failure and malfunction.
- After product use begins, be sure the number of times the module, base, and terminal block are installed and removed does not exceed 50 (JIS B 3502 compliant). Exceeding 50 results in the risk of malfunction.
- Do not touch the terminals while the module is powered. Doing so results in the risk of malfunction.

[STARTUP AND MAINTENANCE PRECAUTIONS]

⚠ CAUTION

- Be sure to shut off all phases of the external power supply used in the system before cleaning or tightening terminal screws or module screws. Failure to do so results in the risk of module failure and malfunction. If a screw is too loose, a dropped module, short circuit, or malfunction may result. If a screw is too tight, screw and/or module damage may occur, resulting in a dropped module, short circuit, or malfunction.
- The module case is made of plastic. Do not drop the case or expose the case to strong impact. Doing so results in the risk of module damage.
- Before touching the module, be sure to touch grounded metal or the like to release the static electricity from your body. Failure to do so results in the risk of module failure or malfunction.
- When cleaning, do not use thinner, benzene, acetone, or kerosene. Doing so results in the risk of module damage.
- Do not insert water or wire through the gaps in the case. Doing so results in the risk of fire or electric shock.
- This product cannot be used as a detector for physical protection. Erroneous output or malfunction may result in an accident.
- When installing or removing the antenna from the amplifier, first turn OFF the module power supply. Failure to do so results in the risk of module failure and malfunction.
- Installation of multiple antennas may result in a decrease in communication performance due to mutual interference. Refer to the description of mutual interference between antennas in the antenna user's manual.
- In the unlikely event that you feel something is wrong with the product, stop using the product immediately, turn OFF the power supply, and consult with your local Mitsubishi service center or representative. Continued use as is results in the risk of module failure and malfunction.
- Do not use the product in locations where chemical products and oil are scattered. Doing so results in the risk of module failure and malfunction.
- When using the product, be sure to observe the defined ambient temperature and humidity. Failure to do so results in the risk of module failure and malfunction.
- Do not touch any connectors when the module is powered. Doing so results in the risk of module malfunction caused by the static electricity in your body.

[DISPOSAL PRECAUTIONS]

⚠ CAUTION

- At the time of disposal, treat the product as industrial waste.

REVISIONS

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

Print Date	*Manual Number	Revision
Oct. 2011	50CM-D180057-B	First edition
Nov. 2012	50CM-D180057-C	Partial correction Section 6.5 changed to Section 6.6 Addition Section 6.5
Apr. 2014	50CM-D180057-D	Partial correction EMC Directive and Low Voltage Directive Compliance, Section 2.1, Section 2.3, Section 4.6
Oct. 2014	50CM-D180057-E	Partial correction Section 2.1, Section 2.5, Section 4.7, Section 5.2, APPENDIX 1, APPENDIX 2
Dec. 2014	50CM-D180057-F	Partial correction EMC Directive and Low Voltage Directive Compliance
Feb. 2016	50CM-D180057-G	Partial correction EMC Directive and Low Voltage Directive Compliance, Section 2.2, Section 2.3
Jul. 2016	50CM-D180057-H	Partial correction EMC Directive and Low Voltage Directive Compliance
Aug. 2018	50CM-D180057-J	Partial correction EMC Directive and Low Voltage Directive Compliance

INTRODUCTION

Thank you for purchasing the RFID interface module manufactured by Mitsubishi Electric Engineering Company, Ltd.
Prior to use, please read this manual carefully to develop full familiarity with the functions and performance of the MELSEC-Q series programmable controller to ensure correct use.

CONTENTS

EMC Directive and Low Voltage Directive Compliance

(1) Programmable controller system

When you want to incorporate an EMC Directive and Low Voltage Directive compliant programmable controller into your product to ensure directive compliance, refer to Appendix 7, “EMC and Low Voltage Directives” of the QCPU User’s Manual (Hardware Design, Maintenance, and Inspection). A programmable controller that is compliant with the EMC Directive and Low Voltage Directive has a CE mark printed on the rating plate of the main unit.

- Authorized representative in Europe

  Authorized representative in Europe si shown below

  Company name: Mitsubishi Electric Europe B.V.

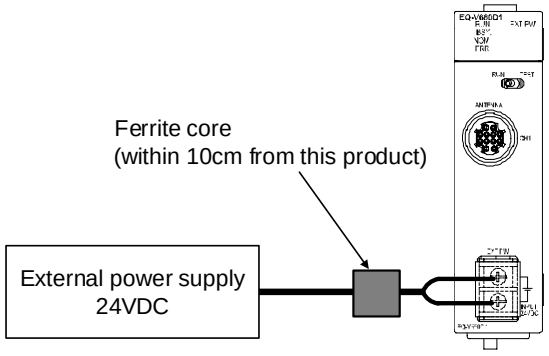
  Address: Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany

(2) This product

To make this product compliant with the EMC Directive and Low Voltage Directive, the following countermeasure is required.

- As an EMC countermeasure, install the supplied ferrite core to the power supply terminal line.

  The target position of the ferrite core is within 10cm from this product.



- As an EMC countermeasure, connect a cable shield (ECBR-AL, manufactured by Kitagawa Industries Co., Ltd.) to the RFID communication cable (amplifier and extension cables) as necessary.
- Use antenna cable of 30m or shorter.

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Manuals

The manuals related to this product include the following.
Direct any inquiries to your local sales store, Mitsubishi Electric Engineering service office, or any Mitsubishi Electric product dealer, as necessary.

Detailed manuals

Included manual

Manual Title	Manual Number
RFID Interface Module User's Manual (Hardware)	50CM-D180056

Manufactured by
Mitsubishi Electric Corporation Mitsubishi general-purpose programmable controller MELSEC-Q series manual

Manual Title	Manual Number
QCPU User's Manual (Hardware Design, Maintenance and Inspection)	SH-080483ENG

Generic Terms and Abbreviations

This manual uses the following generic terms and abbreviations in product explanations, unless otherwise specified.

Generic Term / Abbreviation	Description
RFID interface module	A generic term for an EQ-V680D1/EQ-V680D2 RFID interface module.
GX Developer	A generic product name for product models SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV, and SWnD5C-GPPW-EVA (where n indicates version 4 or later). -A indicates a multiple license product, and -V indicates a version upgrade product.
QCPU (Q mode)	A generic term for Q00JCPU, Q00CPU, Q01CPU, Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU, Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU, Q12PRHCPU, Q25PRHCPU, Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q13UDHCPU, Q26UDHCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q13UDEHCPU, and Q26UDEHCPU.

Product Portfolio

The following indicates the product portfolio of this product.

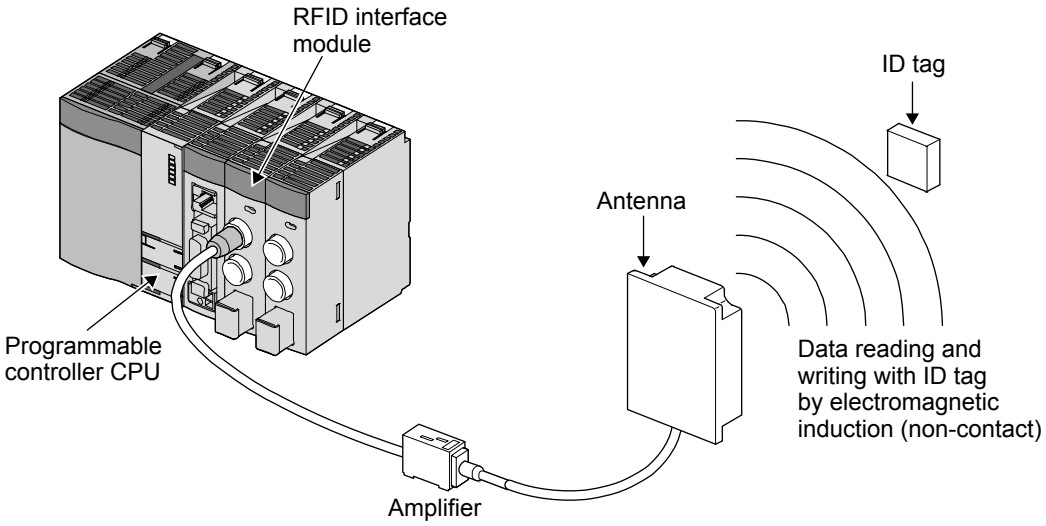
Model	Product Name	Quantity
EQ-V680D1	EQ-V680D1 RFID interface module (for one channel)	1
	User's Manual (Hardware) (Included with module)	1
	Ferrite core (Included with module)	1
EQ-V680D2	EQ-V680D2 RFID interface module (for two channels)	1
	User's Manual (Hardware) (Included with module)	1
	Ferrite core (Included with module)	1

Chapter 1 OVERVIEW

This user's manual describes the specifications, use, ID tag communication method, and other information related to the EQ-V680D1/EQ-V680D2 RFID interface module (hereinafter "RFID interface module").
The RFID interface module is mounted on a base unit of the Mitsubishi general-purpose programmable controller MELSEC-Q series, enabling reading and writing with Omron RFID system V680 series ID tags.
When utilizing the program examples introduced in this manual in an actual system, be sure to fully verify that use will not be problematic in the control of the target system.

1.1 RFID Interface Module Overview

The RFID interface module has one or two channels that connect to a V680 series antenna, and fulfills the role as an interface for V680 series ID tag reading and writing and the programmable controller CPU.



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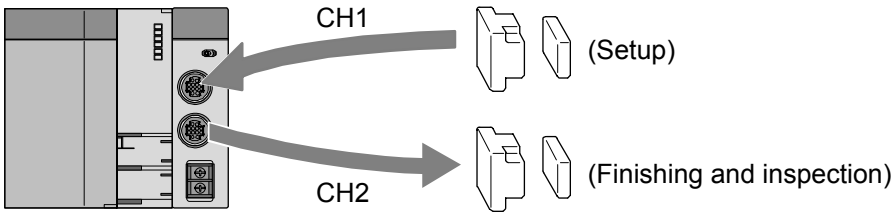
1.2 RFID Interface Module Features

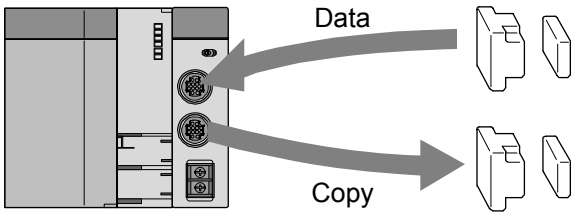
The following describes the features of the RFID interface module.

(1) The RFID interface module uses a rich group of Mitsubishi Electric MELSEC-Q series products, and is capable of controlling Omron RFID system V680 series products.

(2) The two-channel RFID interface module enables independent antenna operation per channel.



(3) The two-channel RFID interface module allows you to the module allows you to copy data between ID tags using the Copy Data command.



(4) The one-channel RFID interface module enables use of an amplifier built-in type antenna.

(5) The module is provided with various test functions as standard.

- The communication test function allows you to check whether or not communication with an ID tag is possible without operating the sequence program.
- The distance level measurement function measures the distance between the antenna and ID tag with respect to the communication area, dividing the margin into six stages.
- The communication success rate measurement function executes communication with a static ID tag 100 times, and measures the repeated communication success rate.
- The speed level measurement function measures the number of times communication can be performed continuously according to the speed of an ID tag that moves within the antenna communication area.
- The noise level measurement function measures the noise level in the area surrounding the antenna installation location.

(6) The module allows you to simply develop programs by downloading an FB (function block) library that can be used with Mitsubishi Electric MELSOFT GX Works 2 from the Mitsubishi Electric Corporation FA device information site MELFANSweb.

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Chapter 2 SYSTEM CONFIGURATION

The following describes the system configuration of the RFID interface module.

2.1 Application System

The following describes the application system.

(1) Mountable modules, mountable quantities, and mountable base units

(a) When mounted with a CPU module

The table below indicates the mountable CPU modules, mountable quantities, and mountable base units for the RFID interface module.

Note that, depending on the combination with other mounted modules and the number of modules mounted, the power supply capacity may be insufficient.

When mounting the modules, be sure to take the power supply capacity into consideration.

In the event the power supply capacity is insufficient, investigate the combination of the mounted modules.

Table 2.1 Application system

Mountable CPU Module			Mountable Quantity*1	Mountable Base Unit*2	
CPU Type		CPU Model		Main Base Unit	Extension Base Unit
Programmable controller CPU	Basic model QCPU	Q00JCPU	8, maximum	○	○
		Q00CPU	24, maximum		
		Q01CPU			
	High performance model QCPU	Q02CPU	64, maximum	○	○
		Q02HCPU			
		Q06HCPU			
		Q12HCPU			
		Q25HCPU			
	Process CPU	Q02PHCPU	64, maximum	○	○
		Q06PHCPU			
		Q12PHCPU			
		Q25PHCPU			
	Dual CPU	Q12PRHCPU	53, maximum	×	○
		Q25PRHCPU			
	Universal model CPU	Q00UJCPU	8, maximum	○	○
		Q00UCPU	24, maximum		
		Q01UCPU			
		Q02UCPU	36, maximum		
		Q03UDCPU	64, maximum		
		Q04UDHCPU			
		Q06UDHCPU			
		Q10UDHCPU			
		Q13UDHCPU			
		Q20UDHCPU			
		Q26UDHCPU			

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Table 2.1 Application system (Continued)

Mountable CPU Module			Mountable Quantity*1	Mountable Base Unit*2	
CPU Type		CPU Model		Main Base Unit	Extension Base Unit
Programmable controller CPU	Universal model CPU	Q03UDECPU	64, maximum	○	○
		Q04UDEHCPU			
		Q06UDEHCPU			
		Q10UDEHCPU			
		Q13UDEHCPU			
		Q20UDEHCPU			
		Q26UDEHCPU			
	Safety CPU	QS001CPU	Not mountable	×	×*3
C-language controller module		Q06CCPU-V-H01	Not mountable	×	×
		Q06CCPU-V			
		Q06CCPU-V-B			
		Q12DCCPU-V			

○:Mountable, ×:Not mountable

*1. Limited to within the range of the number of IO points of the CPU module.
*2. Mountable in any IO slot of a mountable base unit.
*3. An extension base unit cannot be connected to a safety CPU.

(b) Mounting to a MELSECNET/H remote I/O station

The table below shows the network modules and base units applicable to the RFID interface module and quantities for each network module model.

Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient.

Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

Applicable network module	No. of modules*1	Base unit*2	
		Main base unit of remote I/O station	Extension base unit of remote I/O station
QJ72LP25-25	Up to 64	○	○
QJ72LP25G			
QJ72LP25GE			
QJ72BR15			

○:Applicable, ×:N/A

*1. Limited within the range of I/O points for network module.
*2. Can be installed to any I/O slot of a base unit.

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(2) Compatibility with multiple CPU systems

When you want to use the RFID interface module in a multiple CPU system, be sure to first refer to the manual below:

• QCPU User's Manual (Multiple CPU System)

(a) Compatible RFID interface modules

The RFID interface module has supported a multiple CPU system from the beginning with function version B.

(b) Intelligent function module parameters

Execute programmable controller writing of intelligent function module parameters to the control CPU of the RFID interface module only.

(3) Omron RFID system V680 series dedicated use

The RFID interface module connects with amplifiers and antennas of the Omron RFID system V680 series, enabling reading and writing with V680 series ID tags.

(4) Compatible software packages

The following table indicates the compatibility between systems that use the RFID interface module and software packages.

When using an RFID interface module, GX Developer is required.

Table 2.2 Compatible software packages list

		Software Version
		GX Developer
Q00J/Q00/Q01CPU	Single CPU system	Version 7 or later
	Multiple CPU system	Version 8 or later
Q02/Q02H/Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later
	Multiple CPU system	Version 6 or later
Q02PH/Q06PHCPU	Single CPU system	Version 8.68W or later
	Multiple CPU system	
Q12PH/Q25PHCPU	Single CPU system	Version 7.10L or later
	Multiple CPU system	
Q12PRH/Q25PRHCPU	Dual system	Version 8.45X or later
Q00UJ/Q00U/Q01UCPU	Single CPU system	Version 8.76E or later
	Multiple CPU system	
Q02U/Q03UD/Q04UDH/ Q06UDHCPU	Single CPU system	Version 8.48A or later
	Multiple CPU system	
Q10UDH/Q20UDHCPU	Single CPU system	Version 8.76E or later
	Multiple CPU system	
Q13UDH/Q26UDHCPU	Single CPU system	Version 8.62Q or later
	Multiple CPU system	
Q03UDE/Q04UDEH/Q06UDEH/ Q13UDEH/Q26UDEHCPU	Single CPU system	Version 8.68W or later
	Multiple CPU system	
Q10UDEH/Q20UDEHCPU	Single CPU system	Version 8.76E or later
	Multiple CPU system	

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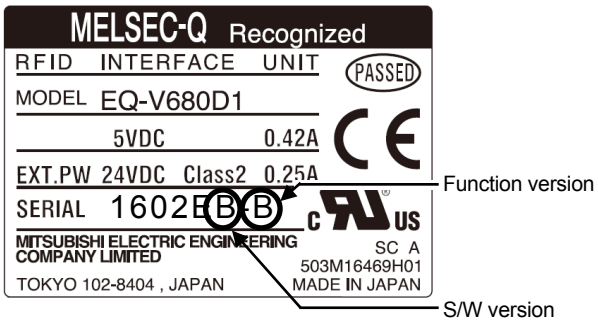
2.2 Verifying the Function Version

The following describes the method used to verify the function version of the RFID interface module.

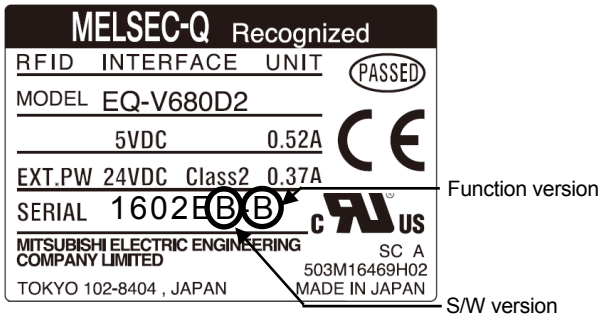
(1) Verifying the function version of the RFID interface module

(a) When verifying the version by viewing the “SERIAL” area of the rating plate on the side of the module

・EQ-V680D1

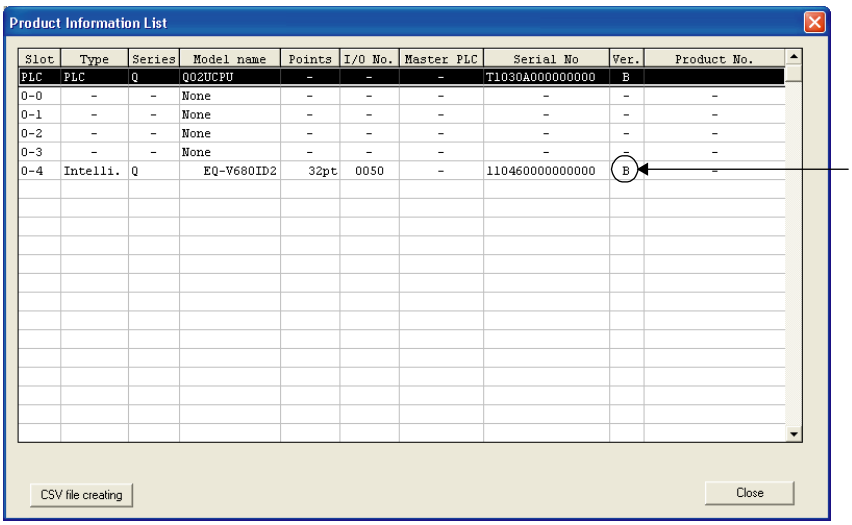


・EQ-V680D2



(b) When verifying the version by viewing the system monitor (product information list)

To view the system monitor, select “Diagnostics” -> “System Monitor” in GX Developer, and click the Product Information List button.



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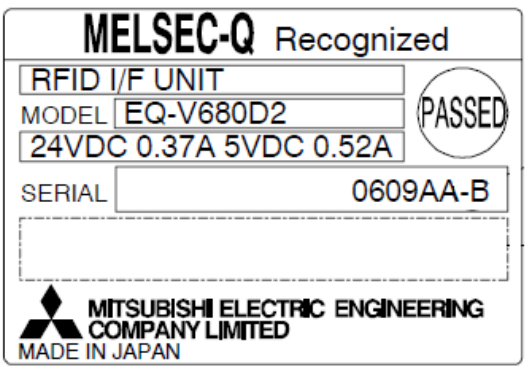
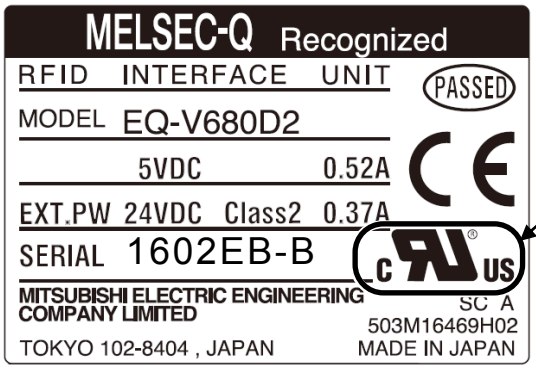
2.3 Identification of the UL/cUL authorization acquisition item

The RFID interface module produced after September, 2011 is shipped as the UL/cUL authorization acquisition item.
The RFID interface module can distinguish the UL/cUL authorization acquisition item by the rating plate on the side of the module.

Before August, 2011(Not acquisition)



After September, 2011(Acquisition)



UL/cUL authorization acquisition

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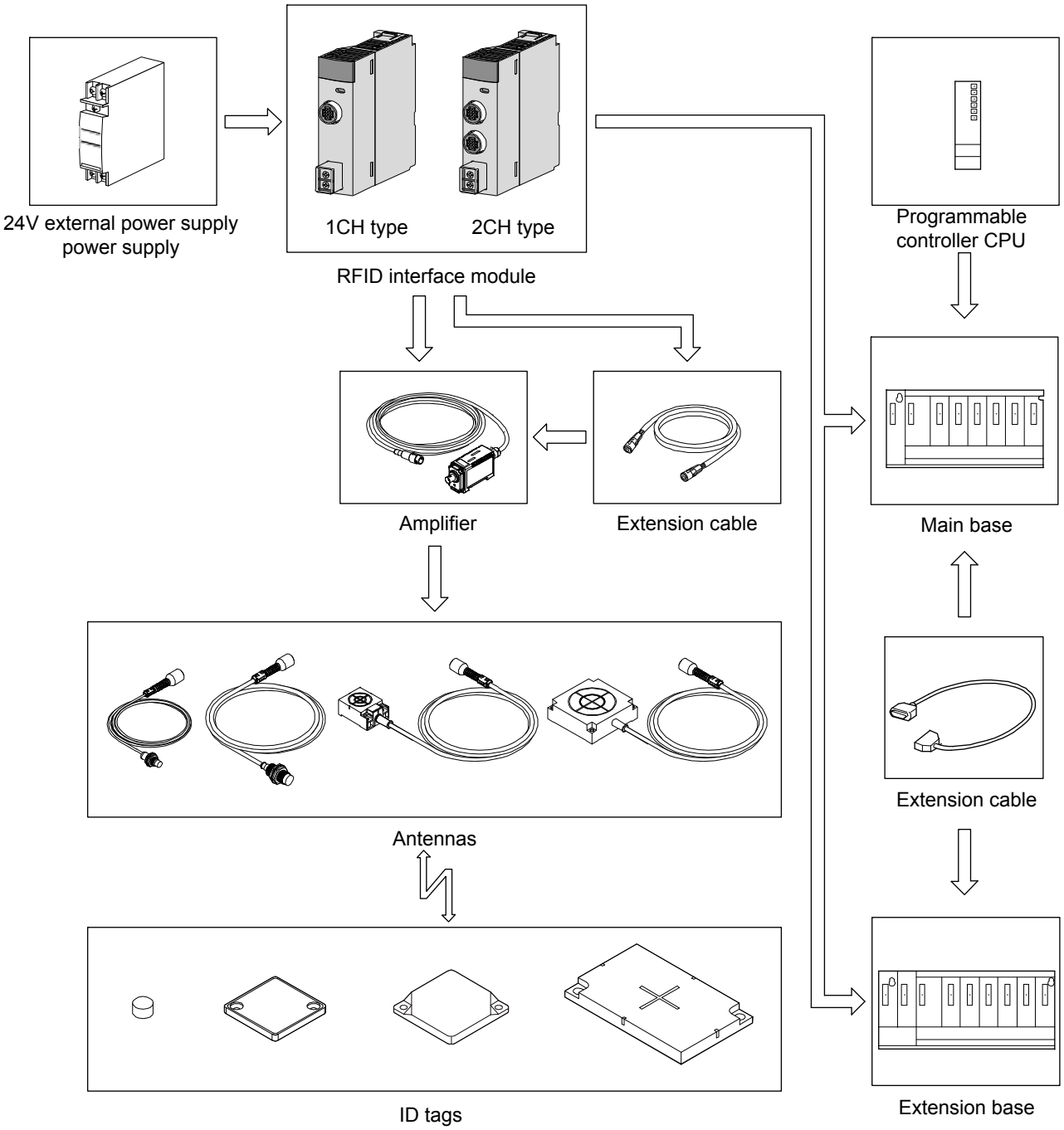
2.4 Overall Configuration

The following indicates the overall configuration of the RFID system.

2.4.1 System that uses a separate amplifier type antenna

The following illustrates a system that uses a separate amplifier type antenna.
The antennas, amplifier and ID tags can be used in certain combinations. Refer to the Omron RFID system V680 series catalog.



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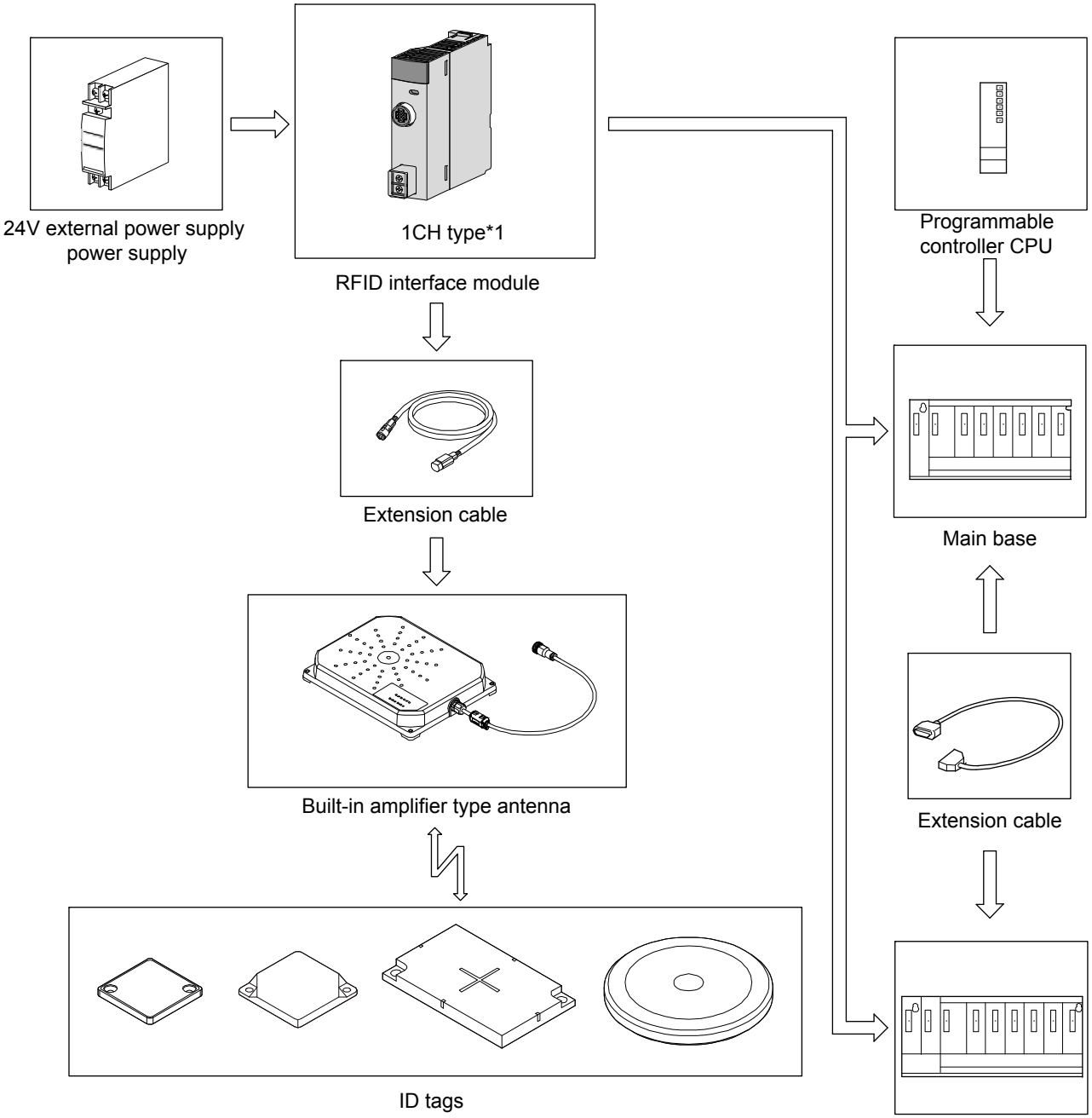
2.4.2 System that uses a built-in amplifier type antenna

The following illustrates a system that uses a built-in amplifier type antenna.
The antennas and ID tags can be used in certain combinations. Refer to the Omron RFID system V680 series user's catalog.



*1. A 2CH type cannot be used.

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2.5 Component List

The component lists the required equipment for using the RFID interface module.

Table 2.3 Component List

Product Name	Model	Remarks
RFID interface module	EQ-V680D1	V680 series RFID interface module; one antenna connected
	EQ-V680D2	V680 series RFID interface module; two antennas connected
Amplifier	V680-HA63A	For EEPROM-type ID tags (V680-D1KP□□)
	V680-HA63B	For FRAM-type ID tags (V680-D2KF□□/V680-D8KF□□/V680-D32KF□□)
Antenna (separate amplifier type)	V680-HS51	For ID tag communication; Φ18mm type Cable length: 2m/12.5m
	V680-HS52	For ID tag communication; Φ22mm type Cable length: 2m/12.5m
	V680-HS63	For ID tag communication; 40x53mm type Cable length: 2m/12.5m
	V680-HS65	For ID tag communication; 100x100mm type Cable length: 2m/12.5m
Antenna (built-in amplifier type)	V680-H01-V2	For ID tag communication; 250x200mm type Cable length: 0.5m
EEPROM-type ID tag	V680-D1KP52MT	Memory capacity: 1kbytes (1,000 bytes); Φ8mm type; metal embedding permitted
	V680-D1KP53M	Memory capacity: 1kbytes (1,000 bytes); Φ10mm type; metal embedding permitted
	V680-D1KP66MT	Memory capacity: 1kbytes (1,000 bytes); 34x34mm type; metal installation permitted
	V680-D1KP66T	Memory capacity: 1kbytes (1,000 bytes); 34x34mm type
	V680-D1KP66T-SP	Memory capacity: 1kbytes (1,000 bytes); oil-proof and chemical resistant specifications
	V680-D1KP58HT	Memory capacity: 1kbytes (1,000 bytes); Φ80mm type; heat resistant specifications
FRAM-type ID tag	V680-D2KF52M	Memory capacity: 2kbytes (2,000 bytes); Φ8mm type; metal embedding permitted
	V680-D2KF67M	Memory capacity: 2kbytes (2,000 bytes); 40x40mm type; metal installation permitted
	V680-D2KF67	Memory capacity: 2kbytes (2,000 bytes); 40x40mm type
	V680S-D2KF67M	Memory capacity: 2kbytes (2,000 bytes); 40x40mm type; metal installation permitted
	V680S-D2KF67	Memory capacity: 2kbytes (2,000 bytes); 40x40mm type
	V680S-D2KF68M	Memory capacity: 2kbytes (2,000 bytes); 86x54mm type; metal installation permitted
	V680S-D2KF68	Memory capacity: 2kbytes (2,000 bytes); 86x54mm type
	V680-D8KF67M	Memory capacity: 8kbytes (8,192 bytes); 40x40mm type; metal installation possible
	V680-D8KF67	Memory capacity: 8kbytes (8,192 bytes); 40x40mm type
	V680S-D8KF67M	Memory capacity: 8kbytes (8,192 bytes); 40x40mm type; metal installation possible
	V680S-D8KF67	Memory capacity: 8kbytes (8,192 bytes); 40x40mm type
	V680-D8KF68	Memory capacity: 8kbytes (8,192 bytes); 86x54mm type
	V680S-D8KF68M	Memory capacity: 8kbytes (8,192 bytes); 86x54mm type; metal installation possible
	V680S-D8KF68	Memory capacity: 8kbytes (8,192 bytes); 86x54mm type
	V680-D32KF68	Memory capacity: 32kbytes (32,744 bytes); 86x54mm type
Extension cable	V700-A43	For V680-HA63A/63B amplifier connection Cable length: 10m
	V700-A44	For V680-HA63A/63B amplifier connection Cable length: 20m
	V700-A40-W	For V680-H01-V2 built-in amplifier type antenna connection Cable length: 2m/5m/10m/20m/30m

* For amplifier, antenna, and ID tag combinations, refer to the Omron RFID system V680 series catalog.
* For V680S-D8KF□□, use an RFID interface module of S/W version B or later as stated on the rating nameplate, or with 16093 or thereafter as the first five digits of the serial number displayed on the system monitor (Product Information List). For information on how to verify the S/W number, refer to Section 2.2.

Chapter 3 SPECIFICATIONS

The following describes the RFID interface module performance specifications, programmable controller CPU input/output signals, and buffer memory specifications.

The following table shows the general specifications of the RFID interface module.

Item	Specifications
Operating temperature	0 to 55℃(Maximum surrounding air temperature 55℃)
Operating humidity	5 to 95%RH
Pollution degree	2
Operating ambience	No corrosive gases
Operating altitude	0 to 2000m
Overvoltage category	Ⅱ
Enclosure	open type equipment (Must be mounted within an enclosure.)

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3.1 Performance Specifications

The following describes the performance specifications of the RFID interface module.

Table 3.1 Performance specifications

Item			Specifications	
Model			EQ-V680D1	EQ-V680D2
Manufactured by Omron Corporation Connectable antenna			V680-HA63A+V680-HS□□ V680-HA63B+V680-HS□□ V680-H01-V2	V680-HA63A+V680-HS□□ V680-HA63B+V680-HS□□
No. of connectable antennas			1 antenna	2 antennas
No. of occupied IO points			32 points (IO assignments: 32 intelligent module points)	
Data transfer volume			2,048 bytes, maximum	
Power supply	Internal power supply Current consumption 5VDC (supplied from inside the programmable controller) *1		0.42A	0.52A
	External power supply*2 Current consumption 24VDC (20.4 to 26.4VDC)		0.25A	0.37A
	External power supply connection terminal		2-point terminal block	
	Wiring recommendations	Wire standard	Heat Resistant PVC Insulated Wire JIS C 3316 HKIV,JIS C 3317 HIV, UL 758 Style No.1007or1015	
		Temperature rating	Minimum 75℃	
		Voltage rating	300V to 600V	
		Conductors wire size	AWG18(0.75mm^2, 0.9mm^2)	
		Conductors metal	Stranded copper	
	Compatible crimp Contact lugs		1.25-3, R1.25-3	
Outer dimensions			98(H) × 27.4(W) × 106.5(D) [mm]	
Weight			0.2kg	0.2kg

*1. "The Power Supply shall comply with the requirements in the standard for an isolated secondary limited voltage, limited current (LVLC) circuit, defined by UL508." or equivalent.

*2. For external power supply details, refer to Section 4.6.2.

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3.2 Functions

The RFID interface module has two operation modes: RUN mode and TEST mode.
The following describes the functions of each mode.

3.2.1 RUN mode

RUN mode is used during programmable controller operation.
To set the mode to RUN mode, set the test switch located on the front of the RFID interface module to “RUN”.

Table 3.2 RUN mode functions list

Function	Command	Description	Reference
Read	Read	Reads data from an ID tag.	Section 6.2.1
	Read with Error Correction	Reads the data and check code written by the Write with Error Correction function from the ID tag, inspects data reliability, and corrects any 1-bit errors.	Section 6.2.11
	Read UID	Reads the UID (unit identification number) of an ID tag.	Section 6.2.13
Write	Write	Writes data to an ID tag.	Section 6.2.2
	Set Bit	Sets the bit specified in the data of an ID tag to “1”.	Section 6.2.3
	Clear Bit	Clears the bit specified in the data of an ID tag to “0”.	Section 6.2.4
	Write Mask Bit	Protects the data area within the ID tag data that you do not want overwritten, and writes data.	Section 6.2.5
	Write Calculation	Writes an addition or subtraction calculation result (data) to ID tag data.	Section 6.2.6
	Write with Error Correction	Writes data and check codes for inspecting data reliability to an ID tag.	Section 6.2.12
Duplicate	Copy*1	Copies data of an ID tag between channel 1 and channel 2.	Section 6.2.10
Initialize	Fill Data	Initializes data of an ID tag with specified data.	Section 6.2.7
Management	Check Data	Checks whether or not an error occurred in data of an ID tag. Writes data and code for checking data to an ID tag.	Section 6.2.8
	Manage Number of Writes	Writes the number of EEPROM-type ID tag writes to an ID tag, and assesses whether or not the ID tag number of writes has been exceeded.	Section 6.2.9
	Measure Noise	Measures the noise environment around an antenna.	Section 6.2.14

*1. Available with EQ-V680D2.

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3.2.2 TEST mode

TEST mode is used when starting the RFID system or when performing maintenance. To set the mode to TEST mode, either set the test switch located on the front of the RFID interface module to “TEST,” or set the test mode execution request (Y15) to ON in the sequence program.

Table 3.3 TEST mode functions list

Function	Description	Reference
Communication test	Has the RFID interface module read ID tag data without operating the sequence program. Checks whether a sequence program, antenna, or ID tag caused a read error when a data read error occurs with an ID tag.	Section 5.1.3(2)
Distance level measurement	Checks the potential maximum communication distance of the installation distance of the ID tag. Use this function to adjust the installation location.	Section 5.1.3(3)
Communication success rate measurement	Checks the data reading potential in terms of the repeated execution success rate, in the installation state with the ID tag in a stationary state. Use this function to adjust the installation location.	Section 5.1.3(4)
Speed level measurement (read)	Checks the data reading potential in terms of the number of times read can be repeatedly executed while moving an ID tag. Use this function to adjust the ID tag movement speed.	Section 5.1.3(5)
Speed level measurement (write)	Checks the data writing potential in terms of the number of times write can be repeatedly executed while moving an ID tag. Use this function to adjust the ID tag movement speed.	Section 5.1.3(5)
Noise level measurement	Checks whether noise that adversely affects communication with an ID tag is occurring in the area surrounding the antenna installation location.	Section 5.1.3(6)

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3.3 Programmable Controller CPU IO Signals

3.3.1 IO signal list

The following provides a list of the IO signals of the RFID interface module.
Note that the IO numbers (X/Y) shown hereafter indicate the number when the first IO number of the RFID interface module is set to 0.

Table 3.4 IO signal list

Signal Direction: CPU Module <- RFID Interface Module			Signal Direction: CPU Module -> RFID Interface Module		
Device No. (Input)	Signal Name		Device No. (Output)	Signal Name	
X0	Module READY		Y0	Use prohibited	
X1	Use prohibited		Y1		
X2	CH1	ID communication complete	Y2		
X3		ID-BUSY	Y3		
X4		ID command complete	Y4		
X5		Error detection	Y5		
X6	Use prohibited		Y6		
X7			Y7		
X8			Y8		
X9			Y9		
XA	CH2*1	ID communication complete	YA		
XB		ID-BUSY	YB		
XC		ID command complete	YC		
XD		Error detection	YD		
XE	Use prohibited		YE		
XF			YF		
X10			Y10		
X11			Y11		
X12			Y12		
X13			Y13		
X14			Y14	CH1	ID command execution request
X15			Y15	TEST mode execution request*2	
X16			Y16	CH1	Result reception
X17			Y17	Use prohibited	
X18			Y18		
X19			Y19		
X1A			Y1A		
X1B			Y1B		
X1C			Y1C	CH2*1	ID command execution request
X1D			Y1D	Use prohibited	
X1E			Y1E	CH2*1	Result reception
X1F			Y1F	Use prohibited	

*1. Effective only with EQ-V680D2 use.

*2. Available for use only when both the “test mode enable” bit and “Y contact test request enable” bit are set to “0” (enable) on switch 2 of the intelligent function module switch. (Refer to Section 4.7)

Point
Use-prohibited IO signals are used by the system and cannot be used by users. In the unlikely event that a use-prohibited IO signal is turned ON/OFF by a sequence program, the functions of the RFID interface module cannot be guaranteed.

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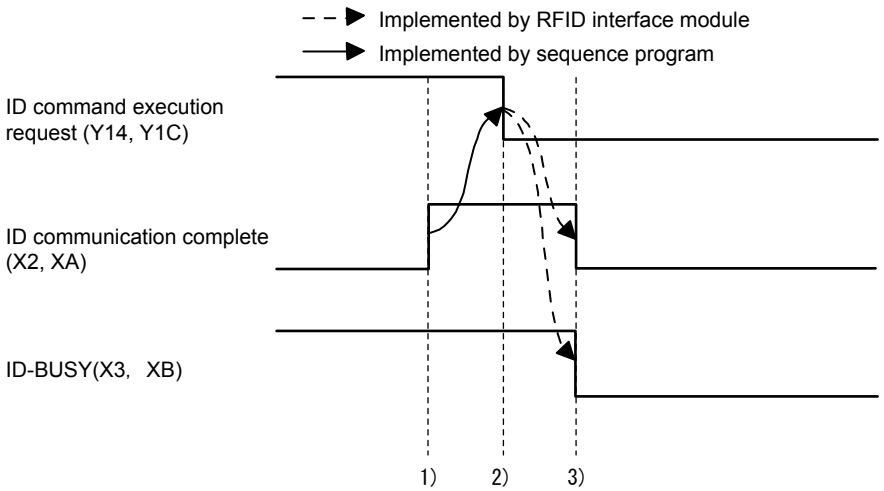
3.3.2 IO signal details

The following describes in detail the input/output signals of the RFID interface module.

(1) Input signals

Device No.	Signal Name	Description
X0	Module READY	(1) Turns ON when the RFID interface module is ready after programmable controller CPU power ON or reset. (2) Turns OFF when an RFID interface module hardware error occurs.
X2, XA	ID communication complete	(1) Turns ON when the communication processing with all ID tags is completed when the communication specification is multi-trigger. (2) Turns ON when RFID interface module communication is suspended due to the elapse of the auto command wait time when the communication specification is repeat auto, FIFO repeat, or multi-repeat. Turns ON when communication is suspended due to antenna disconnection when the communication specification is repeat auto, FIFO repeat, multi-trigger, or multi-repeat. (3) Turns OFF when the ID command execution request (Y14, Y1C) is turned OFF. (4) The timing chart is as follows: 1) ID communication complete (X2, XA) turns ON when the communication specification is Multi-trigger and the last communication is completed. Turns ON when communication is suspended due to the elapse of the auto command wait time when the communication specification is repeat auto, FIFO repeat, or multi-repeat. Turns ON when communication is suspended due to antenna disconnection when the communication specification is repeat auto, FIFO repeat, multi-trigger, or multi-repeat. 2) The ID command execution request (Y14, Y1C) turns OFF when ID communication complete (X2, XA) turns ON. 3) ID communication complete (X2, XA) and ID-BUSY (X3, XB) turn OFF when the ID command execution request (Y14, Y1C) turns OFF. 

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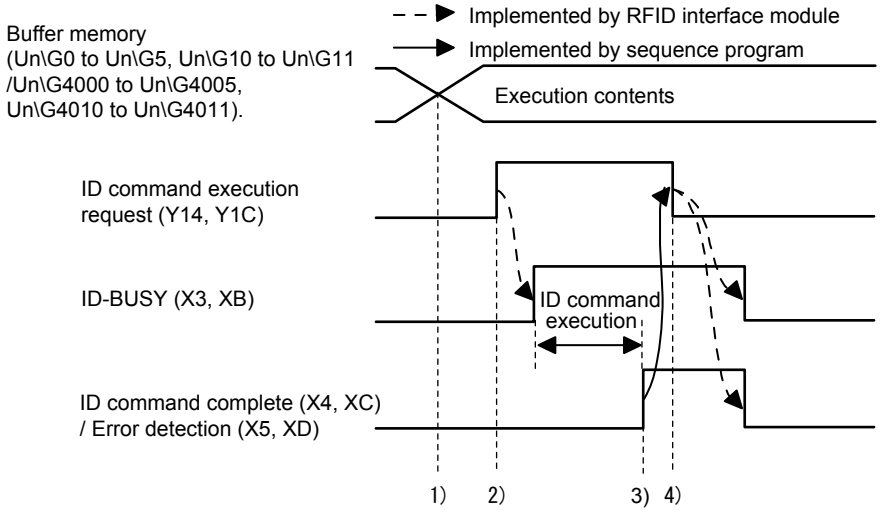
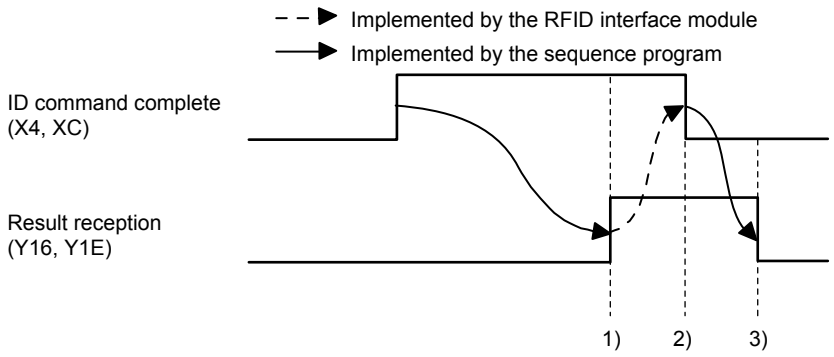
Device No.	Signal Name	Description
X3, XB	ID-BUSY	(1) Turns ON when the ID command execution request (Y14, Y1C) is turned ON and received by the RFID interface module. (2) Turns OFF when the ID command execution request (Y14, Y1C) is turned OFF and received by the RFID interface module. (3) Always ON in TEST mode. (4) For the timing chart, refer to ID command complete (X4, XC).
X4, XC	ID command complete	(1) Turns ON when the ID command execution request (Y14, Y1C) is turned ON and the status is normal upon ID command execution completion. Error detection (X5, XD) turns ON when the status is abnormal upon ID command execution completion. (2) Turns OFF when the ID command execution request (Y14, Y1C) is turned OFF and received by the RFID interface module. (3) The timing chart is as follows: 1) The ID command execution contents are set in the buffer memory (Un\G0 to Un\G5, Un\G10 to Un\G11/Un\G4000 to Un\G4005, Un\G4010 to Un\G4011). 2) ID-BUSY (X3, XB) turns ON when the ID command execution request (Y14, Y1C) turns ON, and the ID command is executed in accordance with the setting contents of Step 1 above. 3) ID command complete (X4, XC) turns ON when the status is normal upon ID command execution completion. Error detection (X5, XD) turns ON when the status is abnormal upon ID command execution completion. 4) ID-BUSY (X3, XB), ID command complete (X4, XC), and error detection (X5, XD) turn OFF when the ID command execution request (Y14, Y1C) turns OFF. 
X5, XD	Error detection	(1) Turns ON when the ID command execution request (Y14, Y1C) is turned ON and the ID command ends abnormally. (2) Turns OFF when the ID command execution request (Y14, Y1C) is turned OFF and received by the RFID interface module. (3) For the timing chart, refer to ID command complete (X4, XC).

(2) Output signals

Device No.	Signal Name	Description
Y14, Y1C	ID command execution request	(1) Executes the ID command of the contents set in the buffer memory (Un\G0 to Un\G5, Un\G10 to Un\G11/Un\G4000 to Un\G4005, Un\G4010 to Un\G4011). when the sequence program turns ON. (2) Processing is executed from channel 1 first when the ID command execution request (Y14, Y1C) turns ON simultaneously on channel 1 and channel 2. The read of channel 2 is ignored when channel 1 is copy and channel 2 is read. A channel 2 copy command error occurs when channel 1 is read and channel 2 is copy. The ID command error (bit 0) of the error details storage area (Un\G4041) turns ON, and error detection (XD) turns ON. (3) For the timing chart, refer to ID command complete (X4, XC).
Y15	TEST mode execution request	(1) Executed when turned ON by the sequence program. (2) Available for use only when both the “test mode enable” bit and “Y contact test request enable” bit are set to “0” (enable) on switch 2 of the intelligent function module switch.
Y16, Y1E	Result reception	(1) Used as a timing signal for communication with the next ID tag when the communication specification is repeat auto, FIFO repeat, multi-trigger, or multi-repeat. (2) The timing chart is as follows: 1) The result information is acquired and result reception (Y16, Y1E) is turned ON when ID command complete (X4, XC) turns ON. 2) ID command complete (X4, XC) turns OFF when result reception (Y16, Y1E) is turned ON. 3) Result reception (Y16, Y1E) is turned OFF when ID command complete (X4, XC) turns OFF. 

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3.4 Buffer Memory

Buffer memory refers to an area that stores read/write data and control information for exchanging data between ID tags and the programmable controller CPU.
The buffer memory can be accessed by the MOV command from the sequence program.
Note that the contents of buffer memory return to default values at power OFF and programmable controller CPU reset.

3.4.1 Buffer memory list

The following table lists the buffer memory of the RFID interface module.

Table 3.5 Buffer memory list

Address		Buffer Memory Address Name	Initial Value	R/W*1	Reference
Intelligent Function Module Device					
CH.1	CH.2				
Un\G0	Un\G4000	Command code specification area	0	R/W	Section 3.4.2 (1)
Un\G1	Un\G4001	Communication specification area	0	R/W	Section 3.4.2(2)
Un\G2	Un\G4002	Processing specification area	0	R/W	Section 3.4.2(3)
Un\G3	Un\G4003	Head address specification area	0	R/W	Section 3.4.2(4)
Un\G4	Un\G4004	No. of processing points specification area	0	R/W	Section 3.4.2(5)
Un\G5	Un\G4005	Command option specification area	0	R/W	Section 3.4.2(6)
Un\G6 to Un\G9	Un\G4006 to Un\G4009	Use prohibited	—	—	—
Un\G10	Un\G4010	Auto command wait time setting area	0	R/W	Section 3.4.2(7)
Un\G11	Un\G4011	Processing result monitor switch setting area	0	R/W	Section 3.4.2(8)
Un\G12 to Un\G39	Un\G4012 to Un\G4039	Use prohibited	—	—	—
Un\G40	Un\G4040	Module status storage area	0	R	Section 3.4.2(9)
Un\G41	Un\G4041	Error details storage area	0	R	Section 3.4.2(10)
Un\G42	Un\G4042	Processing result monitor storage area	0	R	Section 3.4.2(11)
Un\G43 to Un\G89	Un\G4043 to Un\G4089	Use prohibited	—	—	—
Un\G90 to Un\G93	Un\G4090 to Un\G4093	ID tag UID storage area (8 bytes)*2	0	R	Section 3.4.2(12)
Un\G94 to Un\G99	Un\G4094 to Un\G4099	Use prohibited	—	—	—
Un\G100 to Un\G1123	Un\G4100 to Un\G5123	Data storage area (2,048 bytes)	0	R/W	Section 3.4.2(13)
Un\G8000		Test operation mode specification area	0	R/W	Section 3.4.2(14)
Un\G8001		Test operation antenna specification area	0	R/W	Section 3.4.2(15)
Un\G8002		No. of processing points during testing specification area	0	R/W	Section 3.4.2(16)

*1. Read and write are enabled/disabled from the sequence program. R: Read enabled, W: Write enabled.
*2. Does not change according to the setting contents of the data storage order of the processing specification area (Un\G2, Un\G4002).

Point
Use-prohibited buffer memory is used by the system and cannot be used by users. If you execute read or write with this buffer memory in the sequence program, normal operation cannot be guaranteed.

3.4.2 Buffer memory details

(1) Command code specification area (Un\G0, Un\G4000)
This area is used to specify the processing contents for ID tags using command codes.
For command code details, refer to Section 6.2, “Command Specification List.”

(2) Communication specification area (Un\G1, Un\G4001)

The communication specification method is selected according to the ID tag status (stationary, moving, number of ID tags in antenna communication area, etc.).

For details of the control method for each communication specification, refer to Section 6.3, “Control Method by Communication Specification”.

Table 3.6 Communication specification list

Name	Specification Details	Description
Trigger	0000H	(1) Communicates with a static ID tag located within the antenna communication area when the ID command execution request (Y14, Y1C) turns ON. (2) Be sure that there is only one ID tag in the antenna communication area.
Auto	0001H	(1) Waits for detection of an ID tag moving within the antenna communication area after the ID command execution request (Y14, Y1C) turns ON, and then executes communication. (2) Be sure that there is only one ID tag in the antenna communication area.
Repeat auto	0002H	(1) Waits for detection of an ID tag moving within the antenna communication area after the ID command execution request (Y14, Y1C) turns ON, and then executes communication. (2) Does not execute communication with ID tags that stay in the communication area. (3) Waits again for the approach of a moving ID tag after response transmission is completed, continually executes communication with subsequent ID tags, and stops communication when the ID command execution request (Y14, Y1C) turns OFF. (4) Be sure that there is only one ID tag in the antenna communication area.
FIFO trigger *1	0003H	(1) Communicates with an operable ID tag within the antenna communication area after the ID command execution request (Y14, Y1C) turns ON. (2) Sets the ID tag to an operation disabled state after communication completion. (3) Does not communicate with an ID tag with which communication was once already performed when that same ID tag is within the communication range. (4) Be sure that only one operable ID tag is within the antenna communication area during ID tag communication.
FIFO repeat*1	0004H	(1) Waits for detection of an operable ID tag within the antenna communication area after the ID command execution request (Y14, Y1C) turns ON, and then performs communication. (2) Sets the ID tag to an operation disabled state after communication completion. (3) Does not communicate with the same ID tag again when an ID tag with which communication was once already performed is within the communication range. (4) Be sure that only one operable ID tag is within the antenna communication area during ID tag communication. (5) Waits again for the approach of a moving ID tag after response transmission completion, continuously executes communication with subsequent ID tags, and stops communication when the ID command execution request (Y14, Y1C) turns OFF.
Multi-trigger *1, *2	0005H	(1) Communicates with all static ID tags within the antenna communication area after the ID command execution request (Y14, Y1C) turns ON. (2) Sets the ID tag to an operation disabled state after communication completion. (3) Turns ON ID communication complete (X2, XA) upon completion of communication with all ID tags within the antenna communication area. (4) Sends a tag not present error when there is no ID tag within the antenna communication area.
Multi-repeat *1, *2	0006H	(1) Waits for detection of an ID tag moving within the antenna communication area after the ID command execution request (Y14, Y1C) turns ON, and then communicates with all ID tags within the antenna communication area. (2) Sets the ID tag to an operation disabled state after communication completion. (3) Waits again for the approach of a moving ID tag after response transmission completion, continuously executes communication with subsequent ID tags, and stops communication when the ID command execution request (Y14, Y1C) turns OFF.

*1. Cannot be used with communication with V680-D1KP□□.

*2. It may not be possible to execute read/write with all ID tags due to the ID tag installation location and surrounding environment. Be sure to identify the quantity of ID tags to be subject to reading and writing prior to use.

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(3) Processing specification area (Un\G2, Un\G4002)

This area is used to select the processing specification contents according to the commands used.

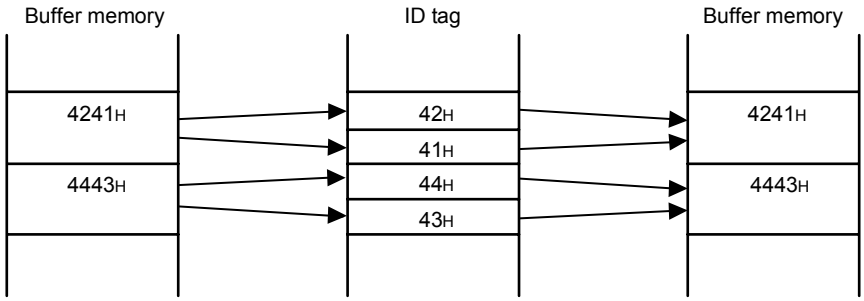
Table 3.7 Processing specification list

Name	Specification Contents	Processing Contents	Applicable Commands
Data storage order	0000H	Upper -> Lower	Read, Write, Set Bit, Clear Bit, Write Mask Bit, Fill Data, Read with Error Correction, Write with Error Correction, Read System
	0001H	Lower -> Upper	
Calculation method	0000H	Addition	Write Calculation, Control No. of Writes
	0001H	Subtraction	
Calculation/Verification	0000H	Calculation	Check Data
	0001H	Verification	

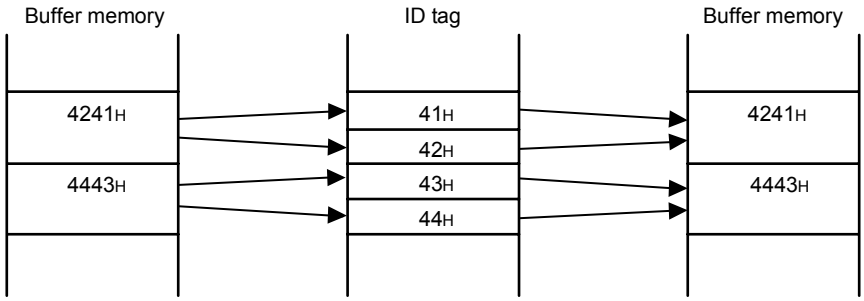
(a) Data storage order setting example

Within ID tag memory, data are processed in units of bytes (8 bytes). Since data are processed in units of words in the RFID interface module, one of the following two data storage orders is selected and specified.

1. Upper -> Lower



2. Lower -> Upper



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(4) Head address specification area (Un\G3, Un\G4003)

This area is used to specify the ID tag head address when ID tag reading and writing are to be executed.

(5) No. of processing points specification area (Un\G4, Un\G4004)

This area is used to specify the number of processed bytes when ID tag reading and writing are to be executed.

(6) Command option specification area (Un\G5, Un\G4005)

This area is used to specify the details of the command processing method when Write Calculation, Control Number of Writes, and Copy commands are executed. (Refer to Section 6.2.6, 6.2.9, 6.2.10)

(7) Auto command wait time setting area (Un\G10, Un\G4010)

This area is used to set the wait time in BCD for an ID tag response after the ID command execution request (Y14, Y1C) is turned ON by an auto command (Auto, Auto Repeat, FIFO Repeat, Multi-repeat).

Table 3.8 Auto command wait time setting list

Setting Value	Description
0000, value other than BCD	Continually executes the ID command until there is a response from the ID tag.
0001 to 9999	Stops the ID command with a tag not present error when an ID tag is not detected within a period of the set value[BCD] x 0.1 seconds, causing error detection to turn ON.

(8) Processing result monitor switch setting area (Un\G11, Un\G4011)

This area is used to set the contents to be stored in the processing result monitor storage area (Un\G42, Un\G4042).

Table 3.9 Processing result monitor switch setting list

Setting Value	Description
0001	Stores the noise level in the processing result monitor storage area (Un\G42, Un\G4042).
Other than 0001	Stores the communication time in the processing result monitor storage area (Un\G42, Un\G4042).

(9) Module status storage area (Un\G40, Un\G4040)

This area stores the operation status of the RFID interface module.

Table 3.10 Module status list

Bit	Name	Description
0	Antenna error*1	0: Normal or antenna not connected 1: An antenna other than the set antenna is connected.
1	24VDC power supply error	0: 24VDC power is normally supplied. 1: 24VDC power is not normally supplied.
2	TEST mode	0: RUN mode in operation 1: TEST mode in operation
3 to 15	Not used	0: Fixed

*1. The antenna error bit is changed to 0 or 1 when 24V DC current is not normally supplied.

(10) Error details storage area (Un\G41, Un\G4041)

When an error occurs, the bit corresponding to the error contents turns ON.
The bit in the error details storage area (Un\G41, Un\G4041) either turns OFF the ID command execution request (Y14, Y1C) or clears when result reception (Y16, Y1E) turns ON/OFF.

Table 3.11 Error details list

Bit	Name	Description
0	ID command error	Turns ON when there is an error in the specified ID command.
1	Not used	--
2	Not used	--
3	Data correction flag	Turns ON when data become normal by data correction as a result of read with error correction.
4	Status flag*1	Turns ON under in the following cases: • When the number of rewrites is exceeded by the Control Number of Writes command. • When the verification results indicate an error as a result of a memory data check (verification). • When a data error occurs as a result of Read with Error Correction. • When overflow occurs as a result of an addition operation of Write Calculation. • When underflow occurs as a result of a subtraction operation of Write Calculation. • When an error occurs as a result of data writing after reading during the Copy command. *1
5	Not used	--
6	Not used	--
7	ID system error 3	ID system error
8	ID system error 2	ID system error
9	ID system error 1	ID system error
10	Tag not present error	Turns ON when there is no communicable ID tag in the antenna communication area.
11	Protect error	Turns ON when data are written in an area set as write protected.
12	Tag communication error	Turns ON when communication with an ID tag does not end normally.
13	Address error	Turns ON when the ID tag address range has been exceeded and an attempt is made to read or write data.
14	Verify error	Turns ON when data writing cannot be performed normally with an ID tag.
15	Antenna error	Turns ON when failure occurs possibly because the antenna is not connected.

*1. When a Copy command error occurs causing an error on the copy destination side, the bit on the copy source side also turns ON.

(11) Processing result monitor storage area (Un\G42, Un\G4042)

This area stores the processing result of each test.
For processing result details, refer to Section 5.1.3.

(12) ID tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)

This area stores the UID (individual identification number) of the ID tag with which communication was performed.

(13) Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)

This area stores read data when reading is performed.
The area stores write data when writing is performed.

(14) Test operation mode specification area (Un\G8000)

This area sets the test contents to be executed.

Table 3.12 Test operation mode specification list

Setting Value	Description
0000_H, value other below	Communication test
$00A0_H$	Distance level
$00B0_H$	Speed level (read)
$00B1_H$	Speed level (write)
$00C0_H$	Noise level
$00C1_H$	Communication success rate
$00C2_H$*1	Use prohibited

*1. Use prohibited. Do not set this value. Normal operation cannot be guaranteed if the value is set.

(15) Test operation antenna specification area (Un\G8001)

This area is used to specify an antenna when tests other than the communication test are executed.

Table 3.13 Test operation antenna specification list

Setting Value	Description
0001_H	Specifies antenna 1.
0002_H	Specifies antenna 2.
Value other than the above*1	Executes the communication test.

*1. The communication test is executed when the setting value is not properly specified.

(16) No. of processing points during testing specification area (Un\G8002)

This area is used to specify the number of bytes to be executed during testing other than the noise level test.

Table 3.14 No. of processing points during testing specification list

Setting Value	Description
0001_H to 0800_H	Specifies the number of bytes to be executed.
Value other than the above*1	Executes the communication test.

*1. The communication test is executed when the setting value is not properly specified.

Chapter 4 SETUP AND PROCEDURES PRIOR TO OPERATION

The following describes the setup and procedures to be executed prior to operation, names of parts, wiring, and the like for a system that uses the RFID interface module.

Point

(1) When using the RFID interface module, be sure to review the ● Safety Precautions ● provided in the beginning of this manual.

(2) The mounting and installation of the RFID interface module are the same as those for the CPU module.

(3) For module mounting and installation, refer to the user's manual of the CPU module used.

4.1 Usage Precautions

The following describes the usage precautions for the RFID interface module unit.

(1) The module case is made of plastic. Do not drop the case or expose the case to strong impact.

(2) Before touching the module, be sure to touch grounded metal or the like to release the static electricity from your body.

(3) Tighten the module screws, etc., within the ranges described below. A loose screw results in the risk of a short circuit, module failure, and malfunction.

Screw Location	Tightening Torque Range
Module screw (M3 screw)*1	0.36 to 0.48N•m (3.2 to 4.3lbf•in)
Power supply terminal block screw (M3 screws)	0.52 to 0.57N•m (4.6 to 5.1lbf•in)

*1. The module can be simply secured to the base unit using the hooks located on top of the module. Note, however, that we recommend securing the module using the module screws in locations of high oscillation.

⚠CAUTION

● Use the programmable controller in an environment that complies with the general specifications described in the user's manual of the CPU module used. Failure to do so results in the risk of electric shock, fire, malfunction, and product damage or deterioration.

● During installation, fully insert the tabs used to secure the module into the holes of the base unit while pressing down the module mounting lever located at the bottom of the module, using the unit holes as support points. An incorrectly mounted module results in the risk of malfunction, failure, and dropping. When used in an environment of high oscillation, secure the module with screws.

● Tighten the screws within the specified torque range. If a screw is too loose, a dropped module, short circuit, or malfunction may result. If a screw is too tight, screw and/or module damage may occur, resulting in a dropped module, short circuit, or malfunction.

● Fully mount the antenna cable to the module connector. After mounting, check for separation. Insufficient contact results in the risk of erroneous input and output.

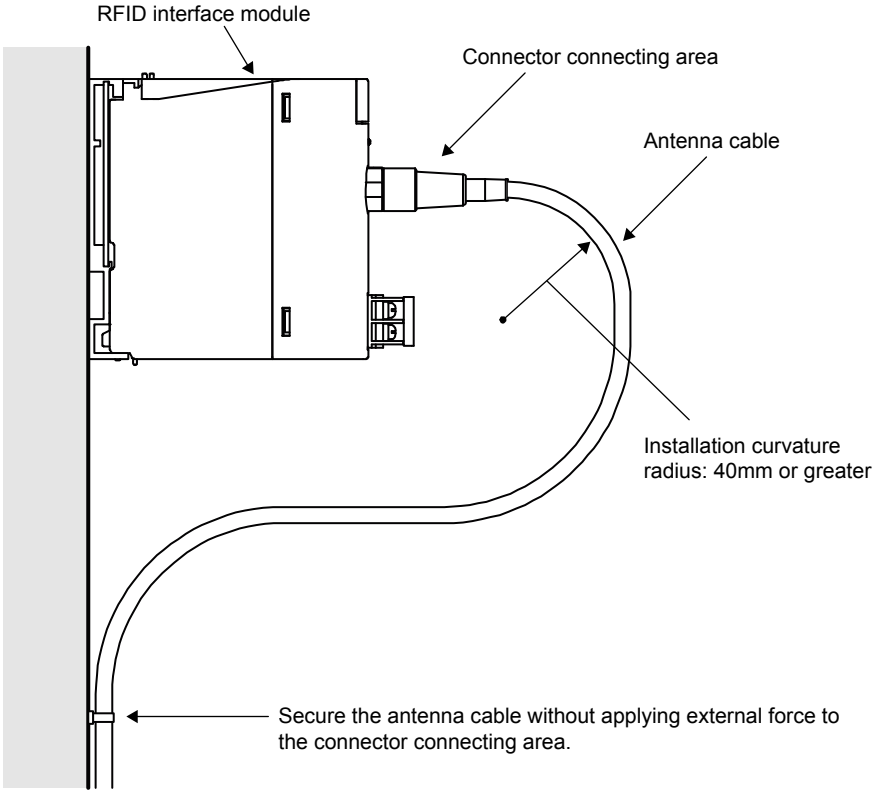
● Do not directly touch a powered section or electronic component of the module. Doing so results in the risk of module malfunction and failure.

4.2 Installation Environment

Refer to the user's manual of the CPU module used.

4.3 Cable Installation

When installing the antenna cable to the RFID interface module, be sure that excessive external force is not applied to the connector connecting area of the module.



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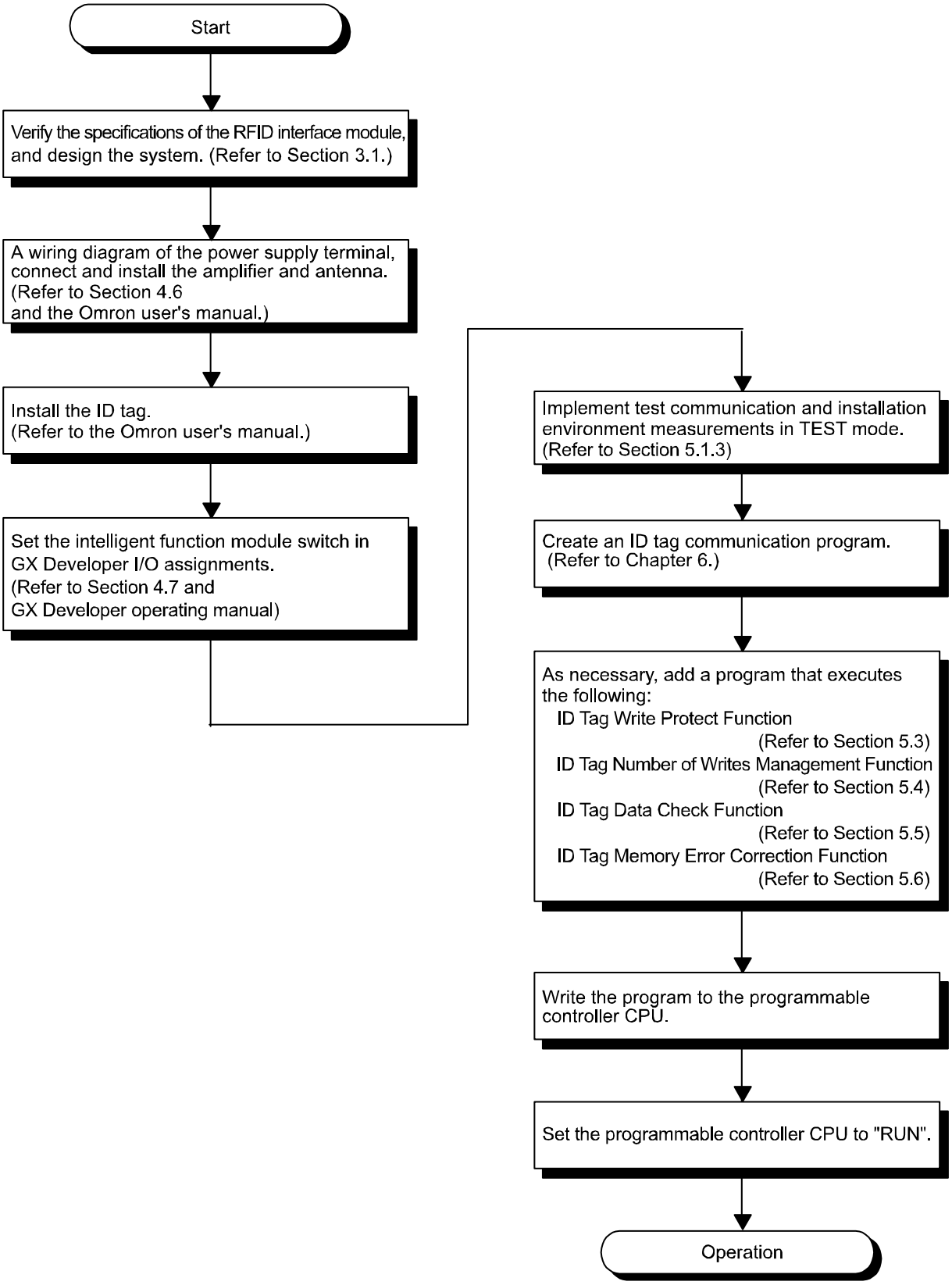
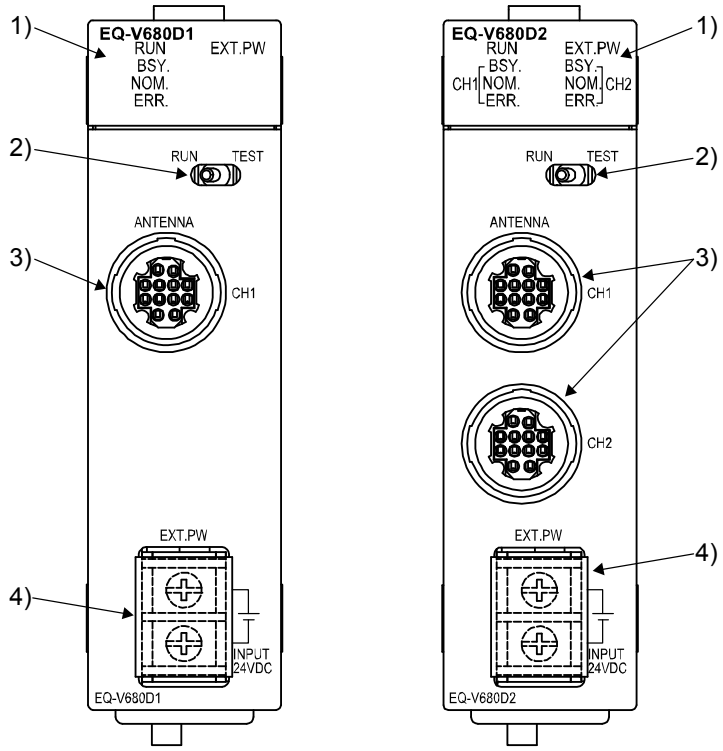
4.4 Setup and Procedures Prior to Operation



4 - 3

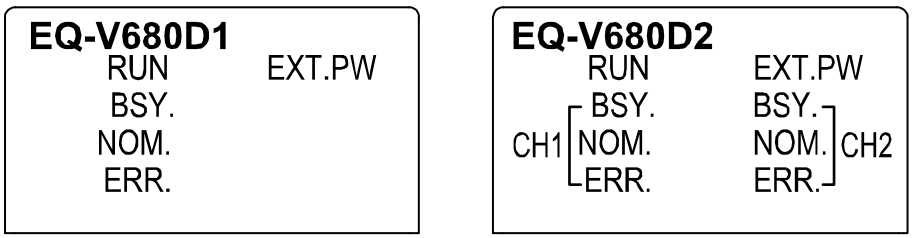
4.5 Names of Parts

The following describes the names of the parts of the RFID interface module.



No.	Name	Description
1)	LED display	Indicates the operating status of the RFID interface module. [For display details, refer to Section (1).]
2)	Test switch	Used to switch between RUN mode and TEST mode.
3)	Antenna connector	A connector for antenna connection.
4)	Power supply terminal	A terminal for 24VDC power supply connection.

(1) LED list



LED Name	Display Details	● :On	○ :Off
RUN	Indicates normal operation.	Normal	Abnormal
BSY.	Indicates the operating status of each channel.	Running	Waiting
NOM.	Indicates the communication completion status of each channel.	Normal completion	Waiting or abnormal completion
ERR.	Indicates whether or not an error exists on each channel.	Error	Normal
EXT.PW	Indicates the status of the power supply to the antenna.	Normal	Abnormal

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4.6 Wiring

The following describes the wiring of the RFID interface module.

4.6.1 Wiring precautions

⚠CAUTION

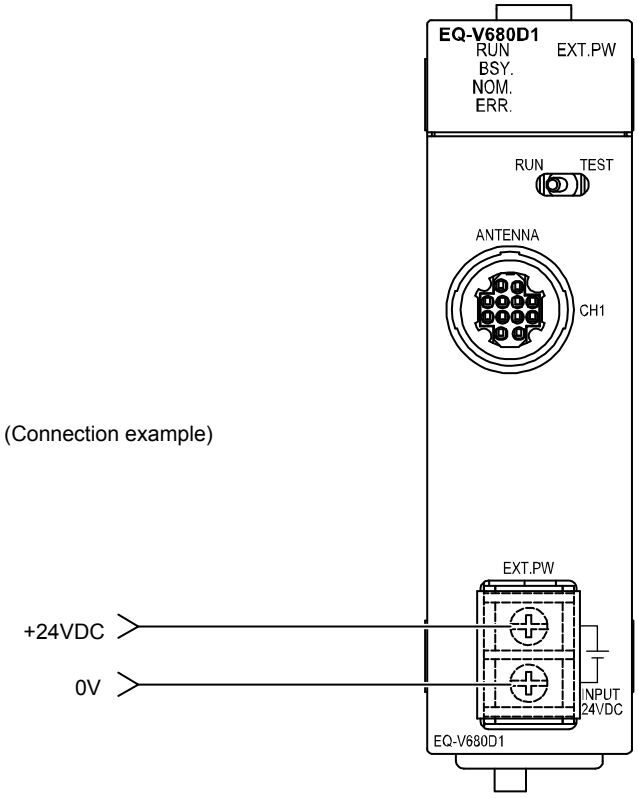
- Do not wire the cables near or bundle the cables with main circuit cables, or power lines. Doing so causes noise and surge impact, resulting in the risk of malfunction. At the very least, separate the module cables from the above by 100mm or more.
- When using a group of equipment, such as inverters, server motors, and the like, be sure to execute class D grounding (type 3 grounding). Failure to do so results in the risk of magnetic field interference and malfunction.
- Do not invert the EXT.PW polarity of an external power supply during connection. The RFID interface module will not operate.
- Do not connect directly to line voltage. Line voltage must be supplied by a suitable,approved isolating transformer or power supply having short circuit capacity not exceeding 100VA maximum or equivalent.

⚠ATTENTION

- Ne pas se connecter directement à la tension de ligne. La tension de ligne doit être fournie par un transformateur d'isolement approprié et approuvé ou par un bloc d'alimentation ayant une capacité de court-circuit ne dépassant pas 100 VA au maximum ou équivalent.

4.6.2 Wiring the external power supply terminal

Wire the external power supply terminal as shown below.



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Connect the 24V DC power supply to the power supply of (1) below.

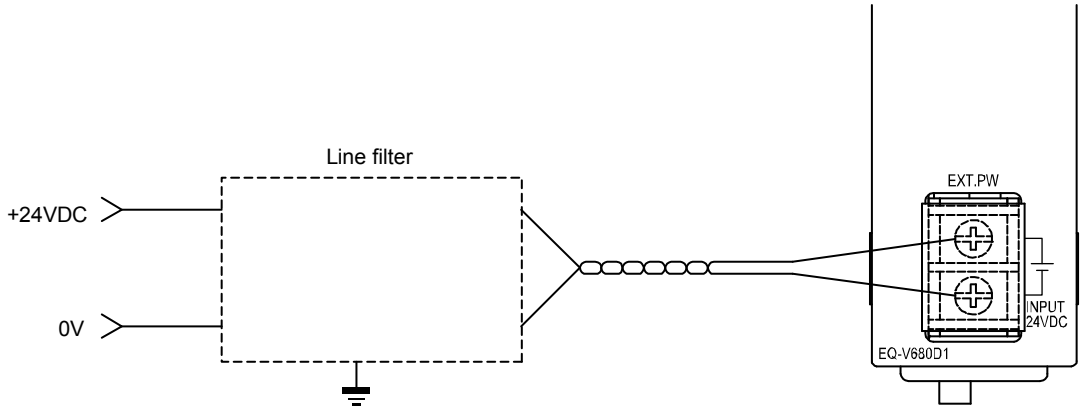
(1) A circuit (class 2 circuit) having a class 2 power supply module in accordance with UL1310 or a class 2 transformer in accordance with UL1585 as a power supply, and a maximum voltage of 30Vrms (42.4 peak) or less

■ Recommended DC power supply

Manufactured by Omron Corporation (small-sized DIN rail installation type)

Model	Input Voltage	Output Capacity
S8VS-03024	100 to 240VAC	24VDC, 1.3A

- While simply corrective action within the RFID interface module is sufficient to counter the noise superimposed on the power line, the noise to the ground can be significantly reduced by supplying power via a line filter.



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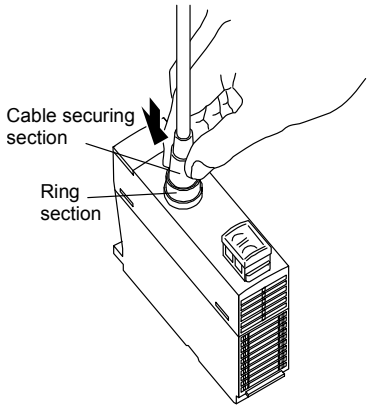
4.6.3 Inserting and removing the antenna cable

When inserting or removing an antenna cable, follow the procedures below.

(1) Insertion Method

1. Hold the section of the connector that secures the cable and insert the connector with the white dot facing upward.
2. Push the connector straight in until the connector locks.

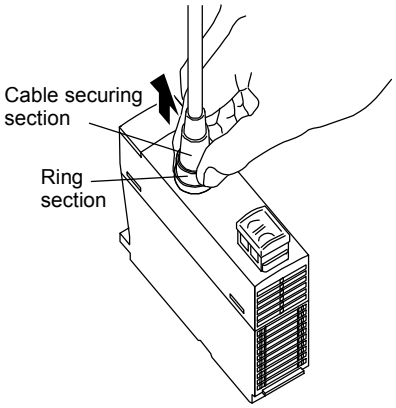


⚠CAUTION

- Do not insert the connector with the power supply ON. Doing so results in the risk of failure.
- The connector will not lock if you push the ring section. Be sure to hold and push the section that secures the cable.

(2) Removal Method

1. Hold onto the ring section and pull straight back.



⚠CAUTION

- The connector cannot be removed by holding and pulling the section that secures the cable. Pulling that section results in the risk of breakage and damage. Do not pull the cable with force.
- Do not remove the connector with the power ON. Doing so results in the risk of failure.

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4.7 Intelligent Function Module Switch Settings

The intelligent function module switch settings are set by the IO assignment settings of GX Developer.

(1) Setting items

The intelligent function module switches include switches 1 to 5, and are set using 16-bit data.

When the intelligent function module switch settings are not set, the default value of each switch 1 to 5 is set to 0.

Table 4.1 Switch Setting Items

	Setting Items			
Switch 1	b15 to b3	b2	b1	b0
	0: Fixed	Write protect setting	ID tag communication speed setting	Write verify setting
Switch 2	b15 to b3	b2	b1	b0
	0: Fixed	Enable channel 2 TEST mode	Enable channel 1 TEST mode	Enable Y contact TEST request
Switch 3	0: Fixed			
Switch 4	0: Fixed			
Switch 5	0: Fixed			

(a) Switch 1 (ID tag communication setting)

1. Write verify setting (b0)

Sets whether or not the write verify function, which automatically verifies that data are normally written by the RFID interface module when a write command is executed, is to be executed.

0 (OFF): Execute

1 (ON): Do not execute

2. ID tag communication speed setting (b1)

Shortens the communication time when the communication time with the ID tag is long with the standard communication speed setting.

0 (OFF): Standard mode

1 (ON): High-speed mode

* When FIFO trigger, FIFO repeat, multi-trigger, or multi-repeat is specified in the communication specification area (Un\G1, Un\G4001), the communication speed becomes the standard mode communication speed, even if the communication speed setting is high-speed mode.
* When the V680S-D8KF□□ ID tag is used, the communication time does not differ from the standard mode time, even if high-speed mode is selected. For communication time details, refer to Appendix 1 "Communication Time" and Appendix 2 "Processing Time."

3. Write protect setting (b2)

Enables/Disables the write protection function (ID tag write prohibit function). For details of the write protection function, refer to Section 5.3.

0 (OFF): Enable

1 (ON): Disable

(b) Switch 2 (TEST mode setting)

For TEST mode, refer to Section 5.1.3.

1. Enable Y contact test request (b0)

Enables/Disables testing using the Y contact (Programmable controller CPU output signal Y15: ON) in RUN mode.

0 (OFF): Enable

1 (ON): Disable

2. Enable channel 1 TEST mode (b1)

Enables/Disables the test switch “TEST” setting and “Enable Y contact TEST request” setting for channel 1.

0 (OFF): Enable

1 (ON): Disable

3. Enable channel 2 TEST mode (b2)

Enables/Disables the test switch “TEST” setting and “Enable Y contact TEST request” setting for channel 2.

0 (OFF): Enable

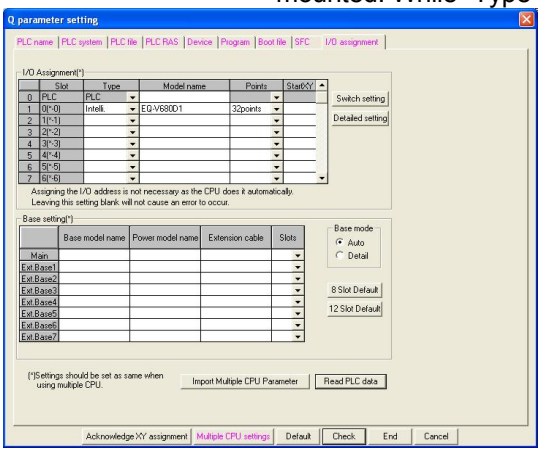
1 (ON): Disable

(2) Operation procedure

The switches are set from the GX Developer IO assignment setting screen.

(a) IO assignment setting screen

Set the following settings in the slot where the RFID interface module is mounted. While “Type” is required, set all other items as necessary.



Type : Select “Intelli”.

Model : Enter the module model.

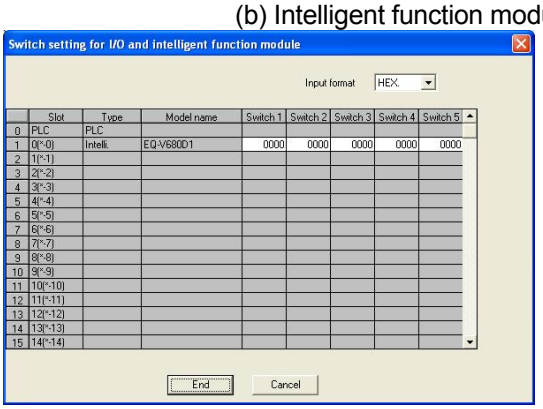
No. of points : Select 32 points.

Head XY : Enter the head IO number of the RFID interface module.

Selected settings : Invalid with the RFID interface module. Setting is not required.

Detailed settings : Specify the control CPU of the RFID interface module. “Output mode at time of error” and “CPU operation mode at time of H/W error” are invalid with the RFID interface module. Setting is not required.

(b) Intelligent function module switch setting screen



Click on “Switch settings” on the IO assignment setting screen to display the screen below, and set switches 1 to 5.

The settings can be simply set by entering the settings in hexadecimal format. Change the input form to hexadecimal and enter the settings.

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Chapter 5 THINGS YOU NEED TO KNOW BEFORE PROGRAMMING

5.1 Operation Mode

The RFID interface module has two operation modes: RUN mode and TEST mode.

5.1.1 Switching the operation mode

The operation mode is switched using one of the following two switches:

1. Test switch located on the front of the RFID interface module
2. Intelligent function module switch

5.1.2 RUN mode

RUN mode allows you to use all commands.

5.1.3 TEST mode

TEST mode is used during ID system installation, maintenance, and troubleshooting.

Table 5.1 TEST mode functions list

Mode	Description	Reference
Communication test	Has the RFID interface module read ID tag data without operating the sequence program. Checks whether a sequence program, antenna, or ID tag caused a read error when a data read error occurs with an ID tag.	Section 5.1.3(2)
Distance level measurement	Checks the potential maximum communication distance of the installation distance of the ID tag. Use this function to adjust the installation location.	Section 5.1.3(3)
Communication success rate measurement	Checks the data reading potential in terms of the repeated execution success rate, in the installation state with the ID tag in a stationary state. Use this function to adjust the installation location.	Section 5.1.3(4)
Speed level measurement (read)	Checks the data reading potential in terms of the number of times read can be repeatedly executed while moving an ID tag. Use this function to adjust the ID tag movement speed.	Section 5.1.3(5)
Speed level measurement (write)	Checks the data writing potential in terms of the number of times write can be repeatedly executed while moving an ID tag. Use this function to adjust the ID tag movement speed.	Section 5.1.3(5)
Noise level measurement	Checks whether noise that adversely affects communication with an ID tag is occurring in the area surrounding the antenna installation location.	Section 5.1.3(6)

5 - 1

(1) Using TEST mode

1. Set the operation mode to TEST mode.
   Set the test contents to be executed in buffer memory (Un\G8000 to Un\G8002).
   For TEST mode operation setting details, refer to Sections 3.4.2 (14) to (16).

Point
(1) The TEST execution contents cannot be changed after the mode has transitioned to TEST mode, even if you change buffer memory (Un\G8000 to Un\G8002). Set the execution contents in buffer memory (Un\G8000 to Un\G8002) before transitioning to TEST mode.

2. Execute TEST mode.
   TEST mode operation is started using the method below based on the buffer memory (Un\G8000 to Un\G8002) setting conditions.
   - When bit 0 of intelligent function module switch 2 is set to "1," start TEST mode by switching the test switch to "TEST".
   - When bit 0 of intelligent function module switch 2 is set to "0," start TEST mode by the above method or by turning the test mode execution request (Y15) ON in RUN mode.

Point
(1) For antennas in which TEST mode is not set to Enable (0) in bits 1 and 2 of the intelligent function module switch, TEST mode will not start even if the test switch is turned ON.

5 - 2

(2) Communication test

The communication test executes communication with the ID tag and stores the communication results in the processing result monitor storage area (Un\G42, Un\G4042).

The results can also be verified using the amplifier operation indicator lamps.

With the 2CH type RFID interface module, CH1 and CH2 alternately repeat this communication.

Point

(1) The communication test checks Read only. It does not check Write.

(2) The communication test is performed using the contents set in advance in buffer memory (Un\G8000 to Un\G8002) (Refer to Section 3.4.2(14) to (16)).
The CH1 and CH2 communication tests are alternately repeated, regardless of the setting in the test operation antenna specification area (Un\G8001).

1. Set the RUN/TEST mode switching method.
   - When you want TEST mode to be started using the test switch only, set bit 0 of intelligent function module switch 2 to “1”.
   - When you want to start TEST mode using the test mode execution request (Y15), set bit 0 of intelligent function module switch 2 to “0”.

2. Set TEST mode operation.
   Set “0000H” in the test operation mode specification area (Un\G8000), and the number of test operation bytes in the number of processed points during testing specification area (Un\G8002).

3. Execute TEST mode.
   The communication test is started based on the buffer memory (Un\G8000 to Un\G8002) setting conditions.
   - When bit 0 of intelligent function module switch 2 is set to “1”, start TEST mode by switching the test switch to “TEST”.
   - When bit 0 of intelligent function module switch 2 is set to “0”, start TEST mode by the above method or by turning the test mode execution request (Y15) ON in RUN mode.

4.Start communication with the ID tag.
   Communication is executed with the ID tag, and the communication results are stored in the processing result monitor storage area (Un\G42, Un\G4042).

Table 5.2 Communication Test Result

Address		Data Format		Processing Time / Error Code
CH1	CH2			
Un\G42	Un\G4042	When normal	“Processing time”	0000 to 9999 [BCD] (Unit: 10ms)
		When abnormal	“E0” + “Error code”	70: Tag communication error 72: Tag not present error 79: ID system error 1 7A: Address error 7C: Antenna error

5 - 3

(3) Distance level measurement

Distance level measurement allows you to easily verify the installation positions of the antenna and ID tag.

The test measures the installation distance between the antenna and the ID tag with respect to the communication area.

The measurement results are stored in the processing result monitor storage area (Un\G42, Un\G4042). The measurement results can also be verified using the amplifier operation indicator lamps.

Point

(1) The distance level significantly varies according to the effects of the surrounding environment. Be sure to establish installation location targets, and fully implement tests in RUN mode in the actual installation environment as well.

(2) Numerical values of distance levels 4 and above are sometimes not shown. This does not impact RUN mode performance and does not indicate an abnormality.

(3) The distance level is measured using the contents set in advance in buffer memory (Un\G8000 to Un\G8002) (Refer to Section 3.4.2(14) to (16)).

1. Set the RUN/TEST mode switching method.
   - When you want TEST mode to be started using the test switch only, set bit 0 of intelligent function module switch 2 to “1”.
   - When you want to start TEST mode using the test mode execution request (Y15), set bit 0 of intelligent function module switch 2 to “0”.

2. Set TEST mode operation.
   Set “00A0H” in the test operation mode specification area (Un\G8000), the test operation antenna number in the test operation antenna specification area (Un\G8001), and the number of test operation bytes in the number of processed points during testing specification area (Un\G8002).

3. Execute TEST mode.
   The communication test is started based on the buffer memory (Un\G8000 to Un\G8002) setting conditions.
   - When bit 0 of intelligent function module switch 2 is set to “1”, start TEST mode by switching the test switch to “TEST”.
   - When bit 0 of intelligent function module switch 2 is set to “0”, start TEST mode by the above method or by turning the test mode execution request (Y15) ON in RUN mode.

4. Start distance level measurement.
   The distance level is measured, and the measurement result is stored in the processing result monitor storage area (Un\G42, Un\G4042).
   The measurement result can also be verified using the amplifier operation indicator lamps.

Table 5.3 Distance Level Measurement Results

Address		Data Format		Measurement Result / Error Code
CH1	CH2			
Un\G42	Un\G4042	During operation	“A0” + “Measurement result”	00 to 06[BCD]
		When abnormal	“E0” + “Error code”	7C: Antenna error

(4) Communication success rate measurement

Communication success rate measurement measures the communication success rate.

The test executes communication with the ID tag 100 times, and measures the communication success rate.

The measurement result is stored in the processing result monitor storage area (Un\G42, Un\G4042).

Point
(1) The communication success rate is measured by Read. The rate is measured using the contents set in advance in buffer memory (Un\G8000 to Un\G8002) (Refer to Section 3.4.2(14) to (16)).

1. Set the RUN/TEST mode switching method.
   - When you want TEST mode to be started using the test switch only, set bit 0 of intelligent function module switch 2 to “1”.
   - When you want to start TEST mode using the test mode execution request (Y15), set bit 0 of intelligent function module switch 2 to “0”.

2. Set TEST mode operation.
   Set “00C1H” in the test operation mode specification area (Un\G8000), the test operation antenna number in the test operation antenna specification area (Un\G8001), and the number of test operation bytes in the number of processed points during testing specification area (Un\G8002).

3. Execute TEST mode.
   The communication success rate is measured based on the buffer memory (Un\G8000 to Un\G8002) setting conditions.
   - When bit 0 of intelligent function module switch 2 is set to “1”, start TEST mode by switching the test switch to “TEST”.
   - When bit 0 of intelligent function module switch 2 is set to “0”, start TEST mode by the above method or by turning the test mode execution request (Y15) ON in RUN mode.

4. Start communication success rate measurement.
   The communication success rate is measured, and the measurement result is stored in the processing result monitor storage area (Un\G42, Un\G4042).

Table 5.4 Communication Success Rate Measurement Result

Address		Data Format		Measurement Result / Error Code
CH1	CH2			
Un\G42	Un\G4042	During operation	“C1” + “Measurement result”	01 to 99 [BCD] (%) EE: When the measurement result is 0% FF: When the measurement result is 100%
		When abnormal	“E0” + “Error code”	7C: Antenna error

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(5) Speed level measurement (read/write)

Speed level measurement allows you to easily verify the ID tag movement speed and the applicable number of bytes.

The test measures the number of times communication can be continuously executed in response to the speed at which the tag passes through the antenna communication area.

The measurement result is stored in the processing result monitor storage area (Un\G42, Un\G4042). The measurement result can also be verified using the amplifier operation indicator lamps.

Point
(1) Speed level measurement (write) is performed in a pseudo manner. Data are not written to the ID tag. The speed level is measured using the contents set in advance in buffer memory (Un\G8000 to Un\G8002) (Refer to Section 3.4.2(14) to (16)).

1. Set the RUN/TEST mode switching method.
   - When you want TEST mode to be started using the test switch only, set bit 0 of intelligent function module switch 2 to “1”.
   - When you want to start TEST mode using the test mode execution request (Y15), set bit 0 of intelligent function module switch 2 to “0”.

2. Set TEST mode operation.
   Set “00B0H” (read) or “00B1H” (write) in the test operation mode specification area (Un\G8000). Set the test operation antenna number in the test operation antenna specification area (Un\G8001), and the number of test operation bytes in the number of processed points during testing specification area (Un\G8002).

3. Execute TEST mode.
   The speed level is measured based on the buffer memory (Un\G8000 to Un\G8002) setting conditions.
   - When bit 0 of intelligent function module switch 2 is set to “1”, start TEST mode by switching the test switch to “TEST”.
   - When bit 0 of intelligent function module switch 2 is set to “0”, start TEST mode by the above method or by turning the test mode execution request (Y15) ON in RUN mode.

4. Start speed level measurement.
   The speed level is measured, and the measurement result is stored in the processing result monitor storage area (Un\G42, Un\G4042).
   The measurement result can also be verified using the amplifier operation indicator lamps.

Table 5.5 Speed Level Measurement Result

Address		Data Format		Measurement Result / Error Code
CH1	CH2			
Un\G42	Un\G4042	During operation	Read: “B0” + “Measurement result” Write: “B1” + “Measurement result”	01 to 99 [BCD] (times) EE: When the measurement result is 0
		When abnormal	“E0” + “Error code”	7C: Antenna error

(6) Noise level measurement

Noise level measurement allows you to verify the effects of noise countermeasures on the noise source. The test measures the noise level of the set surrounding environment. The measurement result is stored in the processing result monitor storage area (Un\G42, Un\G4042).

Point
(1) The noise level is measured using the contents set in advance in buffer memory (Un\G8000, Un\G8001) (Refer to Section 3.4.2(14) to (16)).

1. Set the RUN/TEST mode switching method.
   - When you want TEST mode to be started using the test switch only, set bit 0 of intelligent function module switch 2 to “1”.
   - When you want to start TEST mode using the test mode execution request (Y15), set bit 0 of intelligent function module switch 2 to “0”.

2. Set TEST mode operation.
   Set “00C0H” in the test operation mode specification area (Un\G8000), and the test operation antenna number in the test operation antenna specification area (Un\G8001).

3. Execute TEST mode.
   The noise level is measured based on the buffer memory (Un\G8000, Un\G8001) setting conditions.
   - When bit 0 of intelligent function module switch 2 is set to “1”, start TEST mode by switching the test switch to “TEST”.
   - When bit 0 of intelligent function module switch 2 is set to “0”, start TEST mode by the above method or by turning the test mode execution request (Y15) ON in RUN mode.

4. Start noise level measurement.
   The noise level is measured, and the measurement result is stored in the processing result monitor storage area (Un\G42, Un\G4042).

Table 5.6 Noise Level Measurement Result

Address		Data Format		Measurement Result / Error Code
CH1	CH2			
Un\G42	Un\G4042	During operation	“C0” + “Measurement result”	00 to 99 [BCD] (maximum value)
		When abnormal	“E0” + “Error code”	7C: Antenna error

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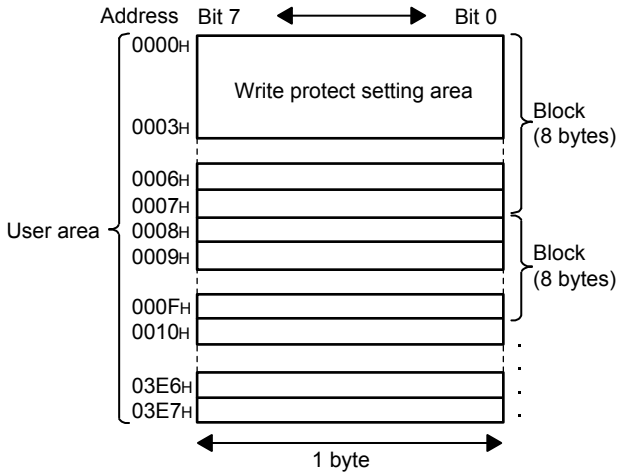
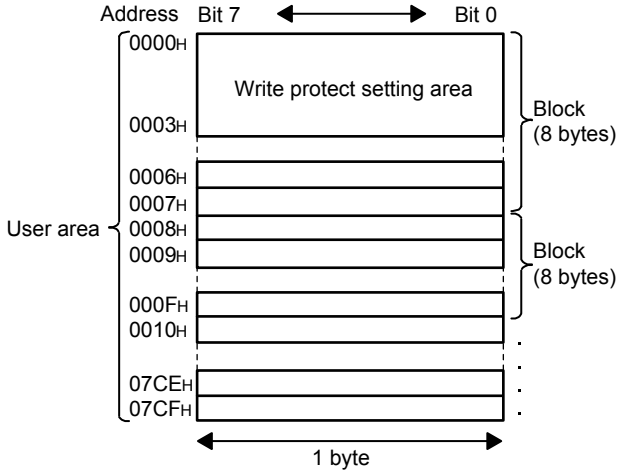
5.2 ID Tag Memory

The following describes the memory of ID tags capable of communicating with the RFID interface module.
Communication between V680 series ID tags and antennas is performed in units of blocks (units of 8 bytes).
When a write error occurs, the possibility exists that a data error exists in a block.

(1) EEPROM type (1k byte): V680-D1KP□□



(2) FRAM type (2k bytes): V680-D2KF□□, V680S-D2KF□□



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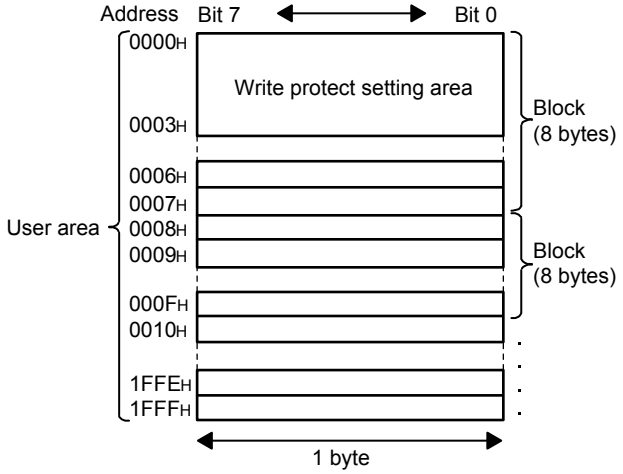
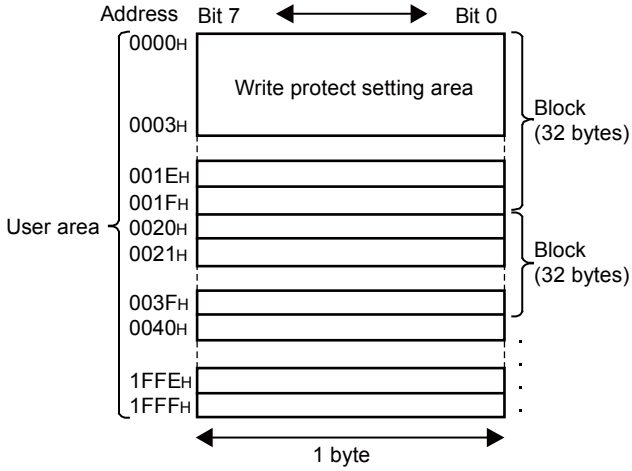
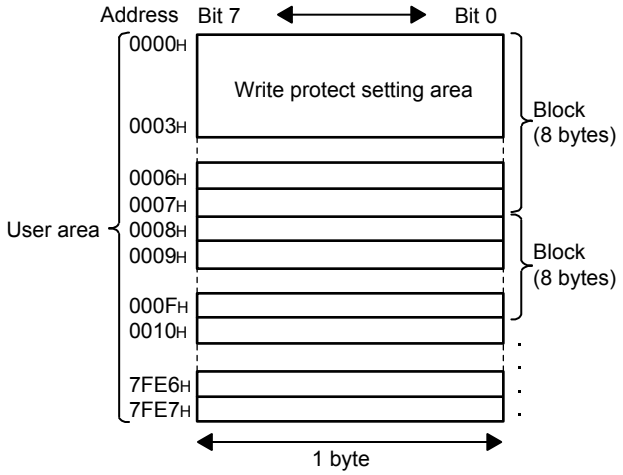
(3) FRAM type (8k bytes): V680-D8KF□□



(4) FRAM type (8k bytes): V680S-D8KF□□



(5) FRAM type (32k bytes): V680-D32KF□□



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5.3 Write Protect Function

The write protect function is provided to ensure that important data, such as the product models and types stored in an ID tag, do not get lost by careless writing.
After important data are written, it is recommended that you write-protect the data using the method described below.
The RFID interface module is provided with a write protect function for enabling/ disabling ID tag write protection.

5.3.1 How to set write protect

Set the write-protect range in the four bytes of addresses 0000H to 0003H of the ID tag.
Specify the enable/disable setting for using the write protect function using the most significant bit of the ID tag address 0000H.

Table 5.7 Write-Protect Setting Method

Address	Bit							
	7	6	5	4	3	2	1	0
0000H	Enable /Disable	Upper two digits of start address (00 to 7F)						
0001H	Lower two digits of start address (00 to FF)							
0002H	Upper two digits of end address (00 to FF)							
0003H	Lower two digits of end address (00 to FF)							

(1) Write protect function enable/disable setting (bit 7 of address 0000H)
0 (OFF): Disable (Do not write protect)
1 (ON): Enable (Write protect)

(2) Write protect range setting (address 0000H to address 0003H)
Start address: 0000H to 7FFFH
End address: 0000H to FFFFH

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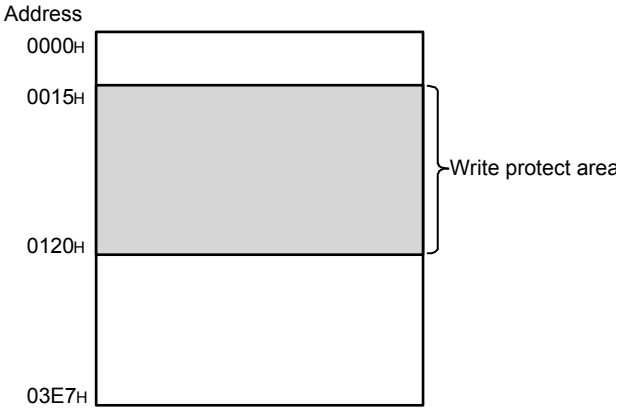
(3) Write protect setting example

(a) When write-protecting data from address 0015H to 0120H (start address < end address)

Table 5.8 Write Protect Setting Example (Start Address < End Address)

Address	Bit							
	Upper				Lower			
0000H	1	0	0	0	0	0	0	0
	8				0			
0001H	0	0	0	1	0	1	0	1
	1				5			
0002H	0	0	0	0	0	0	0	1
	0				1			
0003H	0	0	1	0	0	0	0	0
	2				0			



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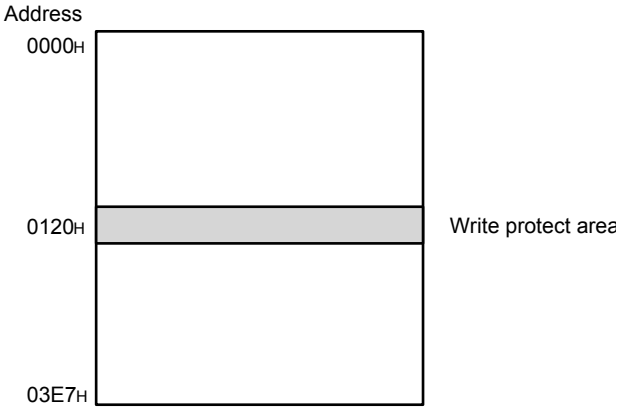
(b) When write-protecting 1 byte only (start address = end address)

Table 5.9 Write Protect Setting Example (Start Address = End Address)

Address	Bit							
	Upper				Lower			
0000_H	1	0	0	0	0	0	0	1
	8				1			
0001_H	0	0	1	0	0	0	0	0
	2				0			
0002_H	0	0	0	0	0	0	0	1
	0				1			
0003_H	0	0	1	0	0	0	0	0
	2				0			



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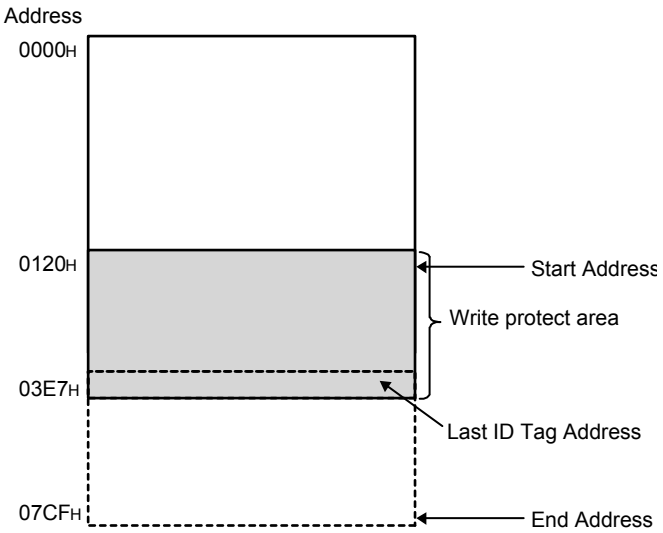
(c) When the end address exceeds the last ID tag address (last ID tag address < end address)
The following is a setting example of a case where the ID tag is V680-D1KP□□.
The addresses up to the last ID tag address 03E7H are write protected.

Table 5.10 Write Protect Setting Example (Last ID Tag Address < End Address)

Address	Bit							
	Upper				Lower			
0000H	1	0	0	0	0	0	0	1
	8				1			
0001H	0	0	1	0	0	0	0	0
	2				0			
0002H	0	0	0	0	0	1	1	1
	0				7			
0003H	1	1	0	0	1	1	1	1
	C				F			



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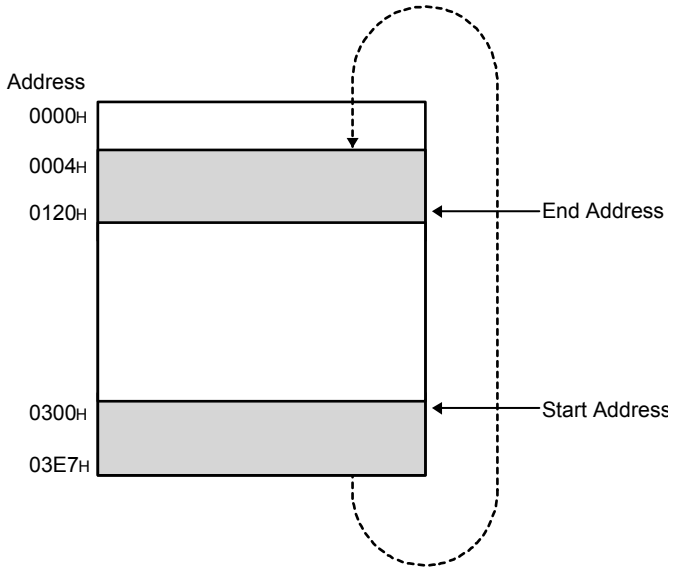
(d) When the start address exceeds the end address (start address > end address)
The following is a setting example of a case where the ID tag is V680-D1KP□□.
The addresses from the start address to the last ID tag address 03E7H and from 0004H to the end address are write protected.

Table 5.11 Write Protect Setting Example (Start Address > End Address)

Address	Bit							
	Upper				Lower			
0000H	1	0	0	0	0	0	1	1
	8				3			
0001H	0	0	0	0	0	0	0	0
	0				0			
0002H	0	0	0	0	0	0	0	1
	0				1			
0003H	0	0	1	0	0	0	0	0
	2				0			



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5.3.2 How to cancel write protect

When you want to cancel a write protect setting, set the most significant bit of the address 0000H to “0”.
The write protect setting is canceled, and the start and end address settings set in addresses 0000H to 0003H are made invalid.

Table 5.12 Write Protect Cancellation Method

Address	Bit							
	Upper				Lower			
0000_H	0	0	0	0	0	0	0	0
	0				0			
0001_H	0	0	0	0	0	0	0	0
	0				0			
0002_H	0	0	0	0	0	0	0	0
	0				0			
0003_H	0	0	0	0	0	0	0	0
	0				0			

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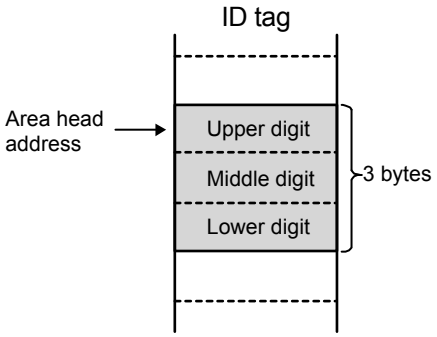
5.4 ID Tag Number of Writes Management Function (EEPROM Type Only)

Whether or not the ID tag number of writes has been exceeded can be assessed using the Manage Number of Writes command.
The write life is detected by assessing whether or not the ID tag number of writes (100,000 or an arbitrary number) has been exceeded using the Manage Number of Writes command.
There are two methods for managing the number of writes: adding the number of writes and assessing whether or not the number exceeds the preset write life of 100,000, or subtracting the number of writes from the write life specified by the user and assessing whether the number of writes has been exceeded.

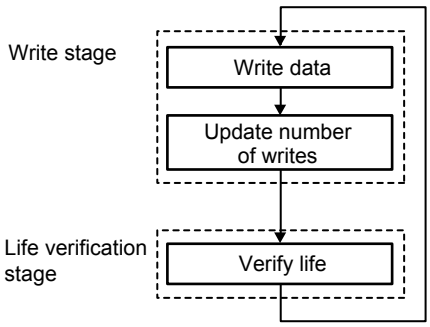
5.4.1 Manage Number of Writes 1 (Write life = Preset number of writes)

The three bytes from the ID tag head address serve as the number of writes management area.
When the sum of the number of writes is written in this area and the value is greater than or equal to 100,000 ($0186A0_H$), the number of writes is exceeded, the status flag (bit 4) of the error details storage area (Un\G41, Un\G4041) turns ON, and error detection (X5, XD) turns ON.
When the data of the management area already exceeds 100,000, the value of the management area is not updated.



(1) Method of use

The write life of an EEPROM-type ID tag is 100,000 for every block (8 bytes), requiring the number of writes of the address within the block in which data are most frequently written to be counted.
When data are written in the address in which data are most frequently written, the number of writes is updated, enabling verification of the write life.
The number of writes can also be verified without updating the number of writes.



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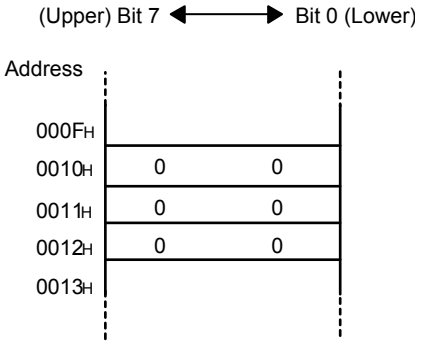
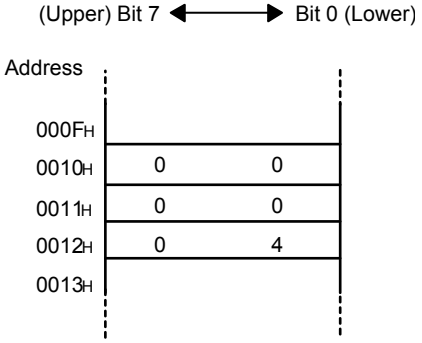
(2) Example of use

The following describes an example of a case where the three bytes from the address 0010H serve as the number of writes management area.

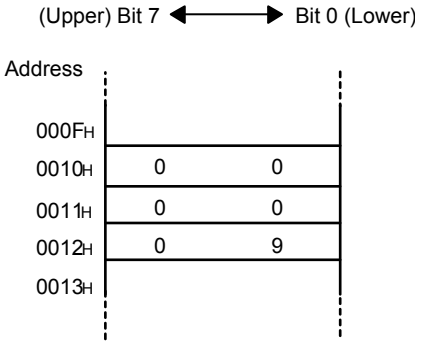
1. The Write command is executed, clearing the management area.



2. With four as the number of writes [specified using command options (Un\G5, Un\G4005)], the Manage Number of Writes command is executed with addition specified.



3. Next, with five as the number of writes [specified using command options (Un\G5, Un\G4005)], the Manage Number of Writes command is executed with addition specified.



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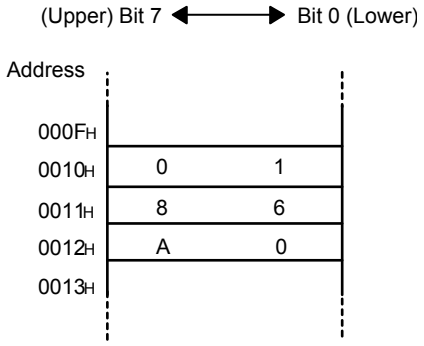
4. The number of accumulated writes is 100,000.
   When the Manage Number of Writes command is executed with addition specified and five as the number of writes [specified using command options (Un\G5, Un\G4005)] in this state, for example, the error details storage area (Un\G41, Un\G4041) status flag (bit 4) turns ON, and error detection (X5, XD) turns ON.



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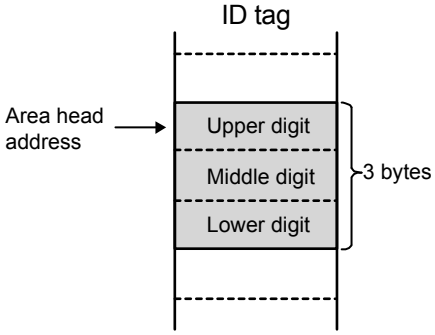
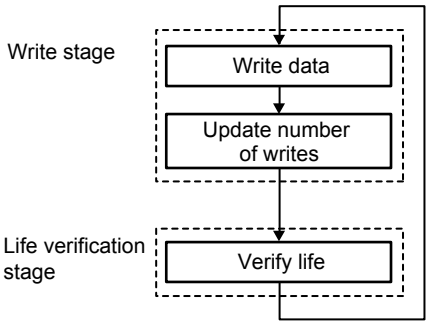
5.4.2 Manage Number of Writes 2 (Write life = Arbitrary number of writes)

The three bytes from the ID tag head address serve as the number of writes management area.
When the difference that results from subtraction of the number of writes is written in this area and the value is smaller than 0, the number of writes is exceeded, the status flag (bit 4) of the error details storage area (Un\G41, Un\G4041) turns ON, and error detection (X5, XD) turns ON.
Accordingly, to manage the number of writes, the write life needs to be entered in advance in the management area.
The EEPROM-type ID tag write life is 100,000 ($0186A0_H$). Be sure to set the write life to a number less than or equal to that value.
When the data of the management area have already reached 0, the value of the management area is not updated.



(1) Method of use

An arbitrary write life is written in advance in the ID tag number of writes management area using the Write command.
Since the ID tag write life is determined for each block (8 byte) unit, the number of writes of the address within the block in which data are most frequently written needs to be counted.
When data are written in the address in which data are most frequently written, the number of writes is updated, enabling verification of the write life.
The number of writes can also be verified without updating the number of writes.



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(2) Example of use

The following describes an example of a case where the three bytes from the address 0010H serve as the number of writes management area.

1. The Write command is executed to write a write life of 100,000 in the management area.

2. With five as the number of writes [specified by command options (Un\G5, Un\G4005), the Manage Number of Writes command is executed with subtraction specified.

3. When the Manage Number of Writes command is executed with subtraction specified and five as the number of writes [specified using command options (Un\G5, Un\G4005)], the error details storage area (Un\G41, Un\G4041) status flag (bit 4) turns ON, and error detection (X5, XD) turns ON.

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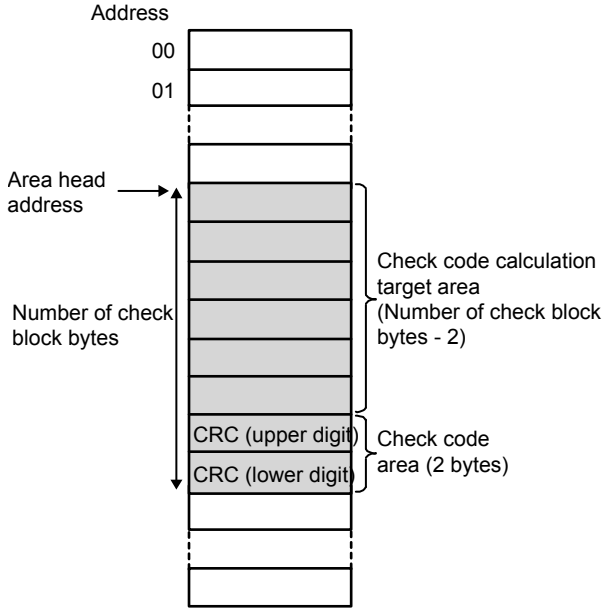
5.5 ID Tag Data Check Function

The ID tag data can be checked using the Check Data command.
This function calculates, writes, and verifies CRC (Cyclic Redundancy Check) code in the check block units specified by the user.
CRC code is calculated by the generating polynomial $X^{16} + X^{12} + X^5 + 1$.
The data check function is used by separating the processing into a process that calculates and writes check code and a process that verifies check code using the processing specification (Un\G2, Un\G4002) of the Check Data command.
In the check block specified by a head address and number of bytes, the area excluding the last two bytes of the block serves as the calculation target area, and the last two bytes of the block serve as the check code area.
When the Check Data command is executed using the specification for writing the check code, the CRC code of the data of the calculation target area is calculated, and the result is written in the check code area.



When data check is executed using the specification for data verification, the CRC code of the data of the calculation target area is calculated and compared with the data stored in the check code area.
When the two match, ID command complete (X4, XC) turns ON.
When the two do not match, the status flag (bit 4) of the error details storage area (Un\G41, Un\G4041) turns ON and error detection (X5, XD) turns ON.

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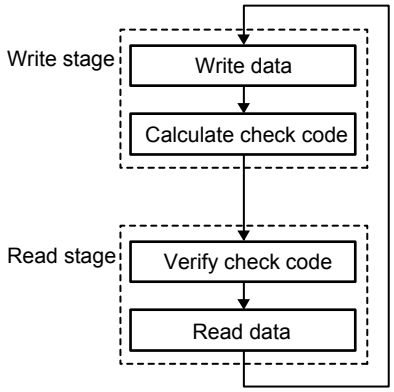
(1) Method of use

After data are written, calculate and write the check code using the Check Data command and specifying the calculation process, and verify the check code prior to reading using the Check Data command and specifying the verification process.

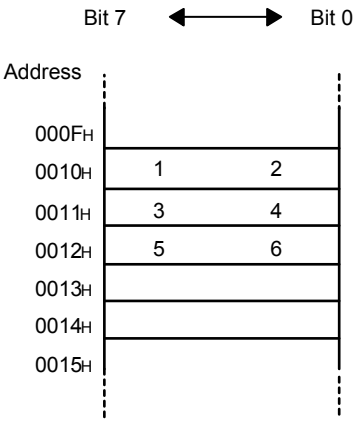
With the above, data damage within an ID tag can be detected before the data are read.



(2) Example of use

The following describes an example of a case where a data check is performed for addresses 0010H to 0012H.

1. First, assume that the following data have been entered.



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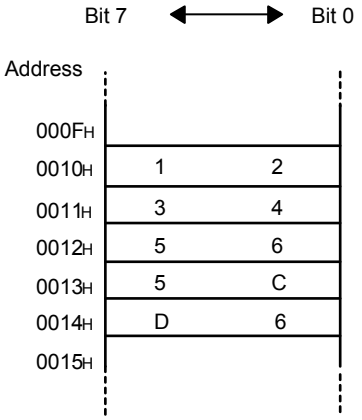
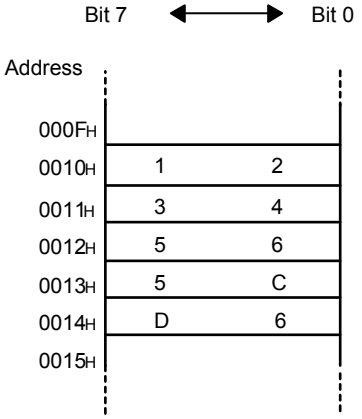
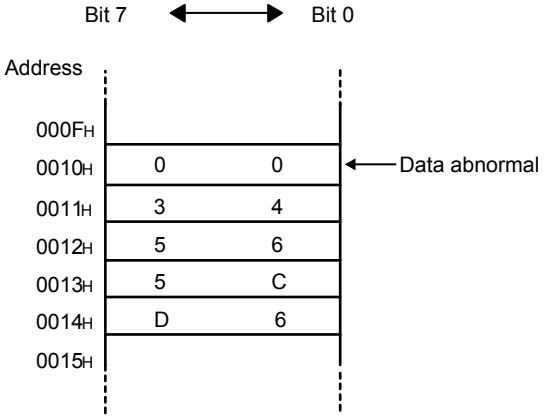
2. With the five bytes specified from address 0010H, a data check (calculation) is executed.
   The CRC code “5CD6H” calculated from data “123456” is written in addresses 0013H to 0014H.



3. With the five bytes specified from address 0010H, a data check (verification) is executed.
   When the data are normal, ID command complete (X4, XC) turns ON.



   When the data are abnormal, the status flag (bit 4) of the error details storage area (Un\G41, Un\G4041) turns ON and error detection (X5, XD) turns ON.



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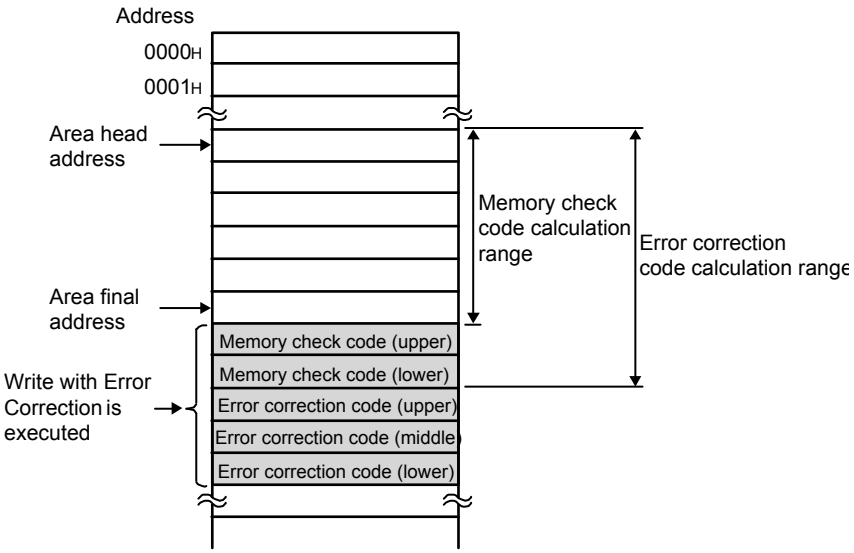
5.6 ID Tag Memory Error Correction Function

The ID tag memory error correction function allows you to execute an ID tag data check and then write five error correction code bytes after the write data using Write with Error Correction.
The function also allows you to execute a data check and correct a one-bit error using Read with Error Correction.



When a one-bit memory error is corrected with Read with Error Correction, the error details storage area (Un\G41, Un\G4041) data correction flag (bit 3) turns ON, error detection (X5, XD) turns ON, a one-bit memory error notification is sent, the data are corrected, and normal data are stored in the data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123).
When a memory error of two or more bits is detected, the error details storage area (Un\G41, Un\G4041) status flag (bit 4) turns ON, error detection (X5, XD) turns ON, a notification indicating there was a non-correctable memory error is sent, and the read data are not returned.

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Chapter 6 HOW TO COMMUNICATE WITH ID TAGS

The following describes the programming method for communicating with ID tags using instructions.
When utilizing the program examples introduced in this chapter into an actual system, be sure to fully verify that control in the target system will be unproblematic.

6.1 Programming Precautions

The following describes the precautions and the like that you need to know before using the RFID interface module to create a program for communicating with ID tags.

(1) Executing instructions on each channel
Multiple instructions cannot be executed simultaneously on a single channel.
Be sure to create an interlock in the program to ensure that multiple instructions are not executed on one channel.
Simultaneous execution on different channels (channel 1 and channel 2) is possible with EQ-V680D2.

(2) Initial value of buffer memory
When the initial value of buffer memory needs to be changed to communicate with ID tags, a sequence program for changing the value needs to be incorporated.

6 - 1

6.2 Instruction/Specification List

The following describes the instruction types and specification contents that can be used with the RFID interface module.

Table 6.1 Instruction/Specification List

Command Name	Command Code (Un\G0, Un\G4000)	Communication Specification (Un\G1, Un\G4001)	Processing Specification (Un\G2, Un\G4002)	Head Address Specification Range (Un\G3, Un\G4003)	Range of No. of Processed Bytes (Un\G4, Un\G4004)	Command Option (Un\G5, Un\G4005)	UID Range (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	Stored Data (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)	Reference
Read	0000_H	0000_H: Trigger 0001_H: Auto 0002_H: Repeat auto 0003_H: FIFO trigger 0004_H: FIFO repeat 0005_H: Multi-trigger 0006_H: Multi-repeat	Data storage order 0000_H: Upper -> Lower 0001_H: Lower -> Upper	0000_H to $FFFF_H$	0001_H to 0800_H	-	UID	Read data	Section 6.2.1
Write	0001_H							Write data	Section 6.2.2
Set bit	0002_H				0001_H to 0004_H			Set bit specification data	Section 6.2.3
Clear bit	0003_H							Clear bit specification data	Section 6.2.4
Write mask bit	0004_H							Mask data (0000_H to $FFFFFFFE_H$) + write data	Section 6.2.5
Write calculation	0005_H		0000_H: Addition 0001_H: Subtraction			Calculation data 0000_H to $FFFF_H$		Calculation result	Section 6.2.6
Fill data	0006_H		Data storage order 0000_H: Upper -> Lower 0001_H: Lower -> Upper		0001_H to 0800_H 0000_H: All data specified	-		Fill data 0000_H to $FFFF_H$	Section 6.2.7
Check data	0007_H	0000_H: Trigger 0001_H: Auto	0000_H: Calculation 0001_H: Verification	0000_H to $FFFD_H$	0003_H to 0800_H			-	Section 6.2.8
Control number of writes	0008_H		0000_H: Addition 0001_H: Subtraction		- (Fixed to 0003_H)	No. of additions/ subtractions 0000_H to $00FF_H$		No. of times calculation result	Section 6.2.9
Copy	0009_H		-	Copy source address (read) 0000_H to $FFFF_H$	0001_H to 0800_H	Copy destination address (write) 0000_H to $FFFF_H$	-	-	Section 6.2.10
Read with error correction	$000A_H$	0000_H: Trigger 0001_H: Auto 0002_H: Repeat auto 0003_H: FIFO trigger 0004_H: FIFO repeat 0005_H: Multi-trigger 0006_H: Multi-repeat	Data storage order 0000_H: Upper -> Lower 0001_H: Lower -> Upper	0000_H to $FFFA_H$	0001_H to $01FE_H$	-	UID	Read data	Section 6.2.11
Write with error correction	$000B_H$							Write data	Section 6.2.12
Read UID	$000C_H$		-	-	-			-	Section 6.2.13
Measure noise	0010_H	-						Measurement result	Section 6.2.14

6.2.1 Read

The Read command reads data from the ID tag starting from the address specified in the head address specification area (Un\G3, Un\G4003), in an amount equivalent to the number of bytes specified in the number of processed points specification area (Un\G4, Un\G4004).
The read data are stored in the data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123).

6.2.2 Write

The Write command writes data to the ID tag starting from the address specified in the head address specification area (Un\G3, Un\G4003), in an amount equivalent to the number of bytes specified in the number of processed points specification area (Un\G4, Un\G4004).
The data to be written are stored in the data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123).

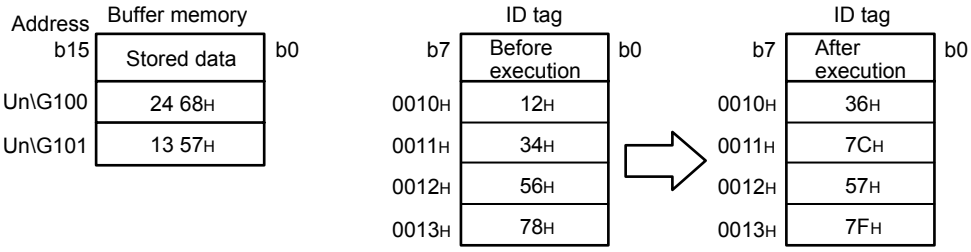
6 - 2

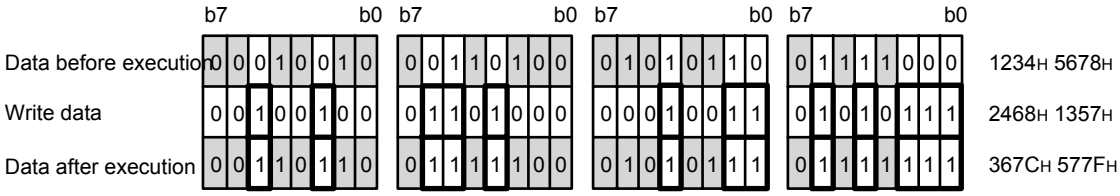
6.2.3 Set bit

The Set Bit command sets the bits of the data of the number of bytes specified in the number of processed points specification area (Un\G4, Un\G4004) from the address specified in the head address specification area (Un\G3, Un\G4003), and writes the result in the same address of the ID tag.
The data for which the bits are to be set are stored in the data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101).

(1) Example of use

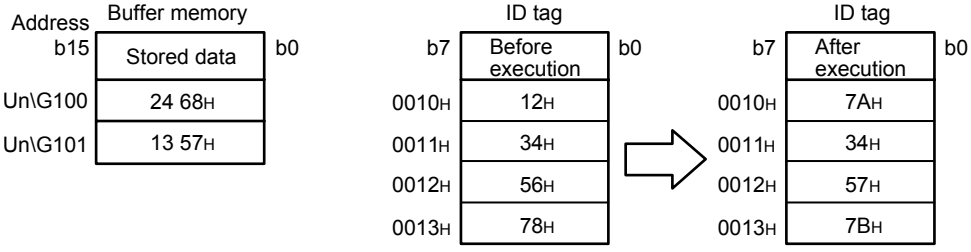
(a) When executing the Set Bit command in the data storage order 0000H (upper -> lower) of the processing specification, for the four bytes from address 0010H

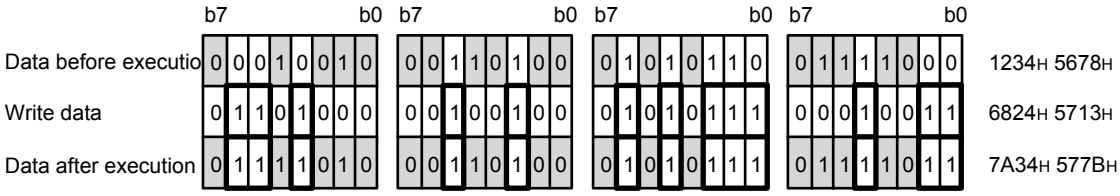




*Shaded area: Holds the data before execution.
*Area outlined in bold: Writes the write data.

(b) When executing the Set Bit command in the data storage order 0001H (lower -> upper) of the processing specification, for the four bytes from address 0010H





*Shaded area: Holds the data before execution.
*Area outlined in bold: Writes the write data.

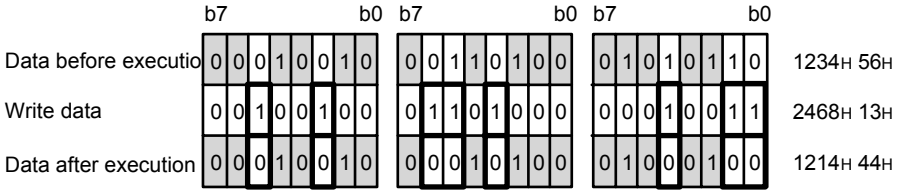
6 - 3

6.2.4 Clear bit

The Clear Bit command clears the bits of the data of the number of bytes specified in the number of processed points specification area (Un\G4, Un\G4004) from the address specified in the head address specification area (Un\G3, Un\G4003), and writes the result in the same address of the ID tag.
The data for which bits are to be cleared are stored in the data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101).

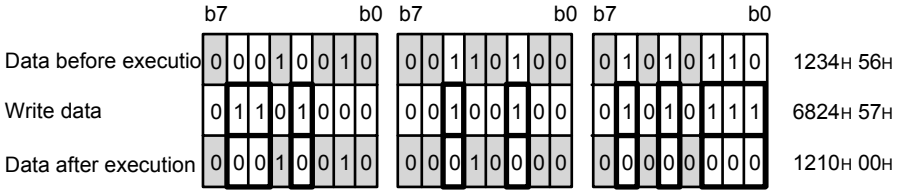
(1) Example of use

(a) When executing the Clear Bit command in the data storage order 0000H (upper -> lower) of the processing specification, for the three bytes from address 0010H



*Shaded area: Holds the data before execution.
*Area outlined in bold: Writes the write data.

(b) When executing the Clear Bit command in the data storage order 0001H (lower -> upper) of the processing specification, for the three bytes from address 0010H



*Shaded area: Holds the data before execution.
*Area outlined in bold: Writes the write data.

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6.2.5 Write mask bit

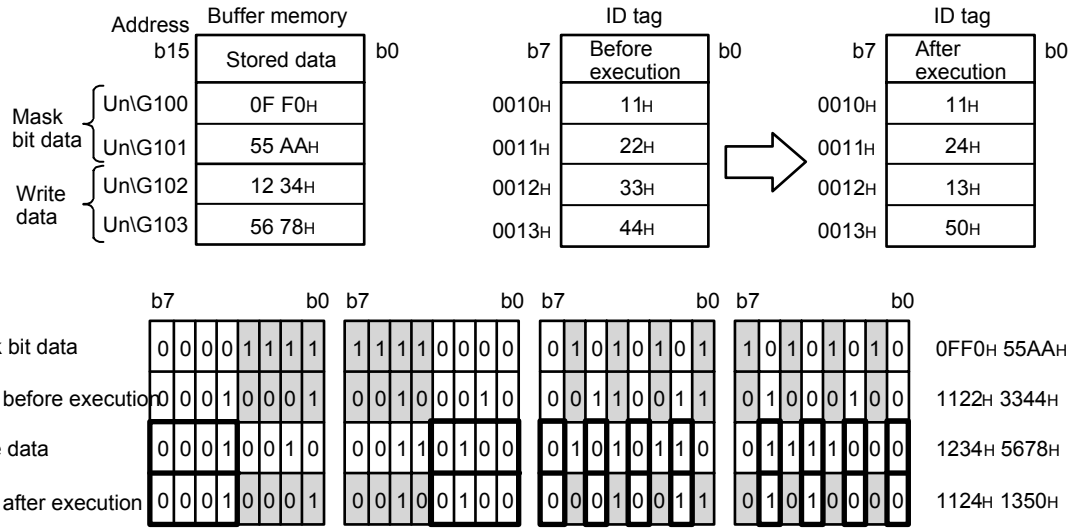
The Write Mask Bit command sets the mask bit of the data of the number of bytes specified in the number of processed points specification area (Un\G4, Un\G4004) from the address specified in the head address specification area (Un\G3, Un\G4003), and writes the result in the same address of the ID tag.
When "1" is specified in the mask bit, the ID tag data prior to execution are held and the buffer memory write data are ignored.
When "0" is specified in the mask bit, the ID tag data prior to execution are replaced with the write data.
The data subject to mask bit and the data to be written are stored in the data storage area (Un\G100 to Un\G103, Un\G4100 to Un\G4103).
The following indicates the area that stores the mask bit data and write data for each number of processed bytes.

Table 6.2 Number of Processed Bytes and Data Storage Area

Number of Processed Bytes	Channel	Address	
		Mask Bit Data	Write Data
1 to 2	CH1	Un\G100	Un\G101
	CH2	Un\G4100	Un\G4101
3 to 4	CH1	Un\G100 to Un\G101	Un\G102 to Un\G103
	CH2	Un\G4100 to Un\G4101	Un\G4102 to Un\G4103

(1) Example of use

(a) When executing the Write Mask Bit command in the data storage order 0000H (upper -> lower) of the processing specification, for the four bytes from address 0010H



*Shaded area: Holds the data before execution.
*Area outlined in bold: Writes the write data.

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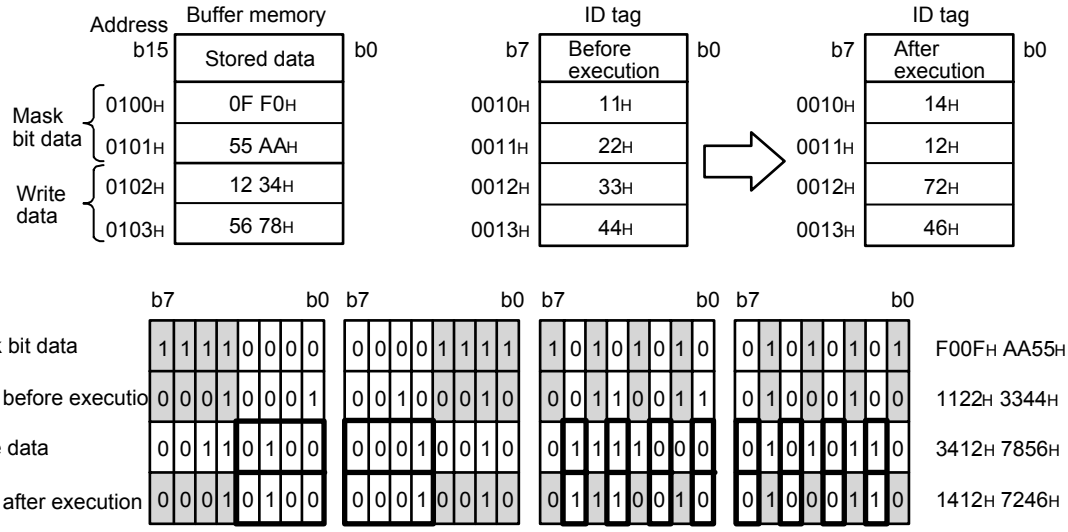
(b) When executing the Set Bit command in the data storage order 0001H (lower -> upper) for the four bytes from address 0010H



*Shaded area: Holds the data before execution.

*Area outlined in bold: Writes the write data.

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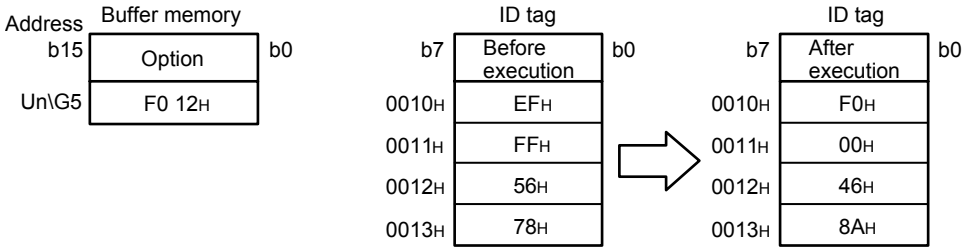
6.2.6 Write calculation

The Write Calculation command performs an addition (subtraction) operation on the data of the number of bytes specified in the number of processed points specification area (Un\G4, Un\G4004) from the address specified in the head address specification area (Un\G3, Un\G4003), and then writes the result to the same address of the ID tag.
The data subject to the addition (subtraction) operation are stored in the command option specification area (Un\G5, Un\G4005).
The calculation result data are also stored in the data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101).
When an addition calculation result indicates overflow, the calculation result is not written to the ID tag, the status flag (bit 4) of the error details storage area (Un\G41, Un\G4041) turns ON, error detection (X5, XD) turns ON, and the operation ends in error.
Similarly, when a subtraction calculation result indicates underflow, the calculation result is not written to the ID tag, the status flag (bit 4) of the error details storage area (Un\G41, Un\G4041) turns ON, error detection (X5, XD) turns ON, and the operation ends in error.

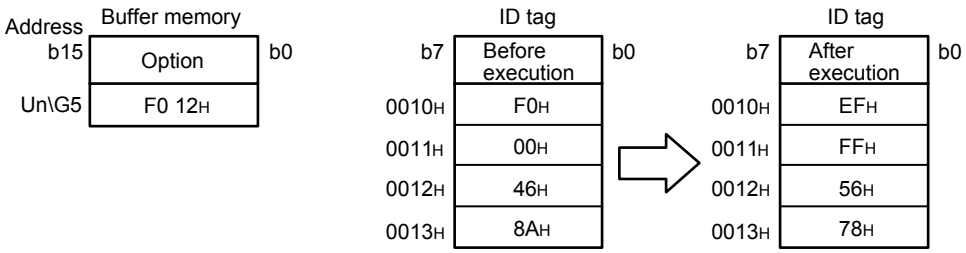
(1) Example of use

(a) When F012H is added to the four bytes from address 0010H



		b7 b0	b7 b0	b7 b0	b7 b0	
Data before execution		11101111	11111111	01010110	01111000	EFFFH 5678H
Addition data	+	00000000	00000000	11110000	00010010	0000H F012H
Data after execution		11110000	00000000	01000110	10001010	F000H 468AH

(b) When F012H is subtracted to the four bytes from address 0010H



		b7 b0	b7 b0	b7 b0	b7 b0	
Data before execution		11110000	00000000	01010110	10001010	F000H 468AH
Subtraction data	−	00000000	00000000	11110000	00010010	0000H F012H
Data after execution		11101111	11111111	01010110	01111000	EFFFH 5678H

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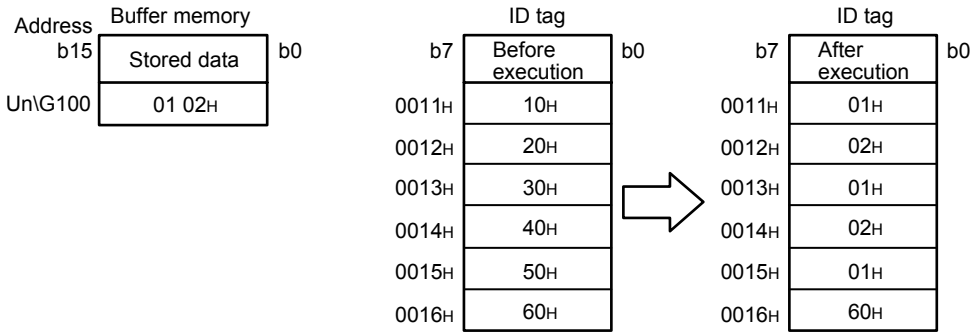
6.2.7 Fill data

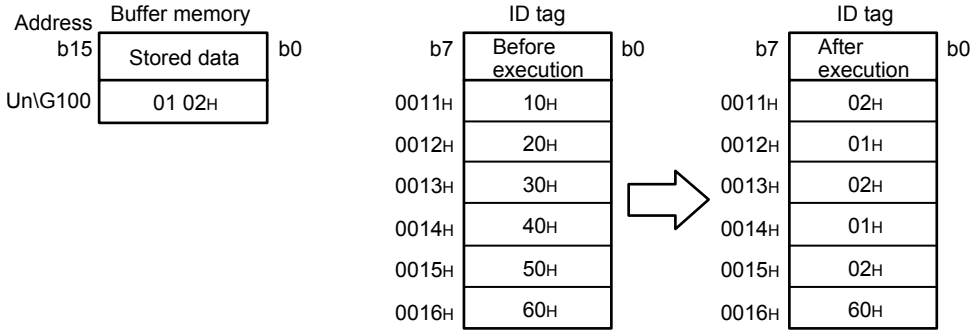
The Fill Data command writes the same data to the ID tag in an amount equivalent to the number of byte sets specified in the number of processed points specification area (Un\G4, Un\G4004) from the address specified in the head address specification area (Un\G3, Un\G4003).
The data for executing Fill Data are stored in the data storage area (Un\G100, Un\G4100).

(1) Example of use

(a) When executing the Fill Data command in the data storage order 0000H (upper -> lower) for the five bytes from address 0011H



(b) When executing the Fill Data command in the data storage order 0001H (lower -> upper) for the five bytes from address 0011H



Point

(1) The Fill Data command ignores the write protect function in order to initialize all data of the ID tag.

(2) When 0000H is specified in the number of processed points specification area (Un\G4, Un\G4004), all data are specified.

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6.2.8 Check data

The Check Data command checks if an error occurred in the data of the ID tag.
The command performs the calculation or verification process indicated below according to the setting contents of the processing specification area (Un\G2, Un\G4002).
For data check function details, refer to Section 5.5, "ID Tag Data Check Function".

(1) Calculation

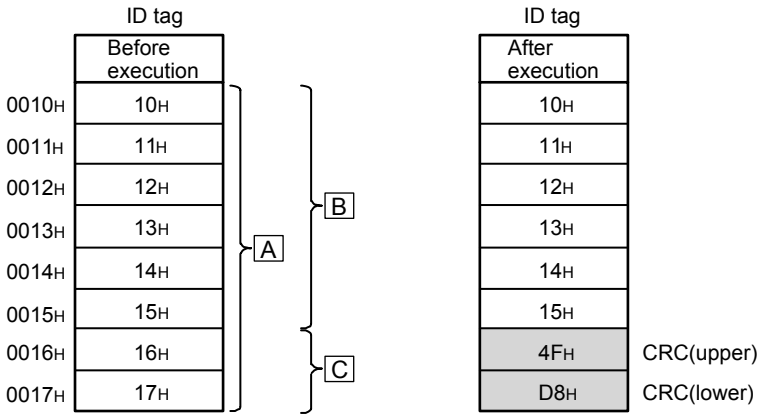
Performs a CRC calculation of the "No. of data sets – 2" specified in the number of processed points specification area (Un\G4, Un\G4004) from the address specified in the head address specification area (Un\G3, Un\G4003), and writes the calculation result in the last two bytes of the specified area.

(2) Verification

Performs a CRC calculation of the "No. of data sets – 2" specified in the number of processed points specification area (Un\G4, Un\G4004) from the address specified in the head address specification area (Un\G3, Un\G4003), compares the result with the data of the last two bytes in the specified area, and outputs the comparison result.

(3) Example of use

(a) When executing calculation for the eight bytes from address 0010H



A : Command specification length (0008H bytes)

B : Check code calculation range (command specification length – 2: 0006H bytes)

C : Check code (2 bytes)

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6.2.9 Control number of writes

The Control Number of Writes command adds (subtracts) specified data targeting the three bytes from the address specified in the head address specification area (Un\G3, Un\G4003), and writes the calculation result to the ID tag.
The data for the addition (subtraction) operation are stored in the command option specification area (Un\G5, Un\G4005).
For details of the number of writes control function, refer to Section 5.4, “ID Tag Number of Writes Control Function (EEPROM Type Only)”.

(1) Addition (write life = Fixed to 100,000)
When the processing specification area (Un\G2, Un\G4002) is 0000H, the data of the check start address are added in an amount equivalent to the number of updates.
When the addition result reaches 100,000 or greater, the number of writes is regarded as 100,000, the status flag (bit 4) of the error details storage area (Un\G41, Un\G4041) turns ON, and error detection (X5, XD) turns ON.

(2) Subtraction (write life = arbitrary number)
When the processing specification area (Un\G2, Un\G4002) is 0001H, the data of the check start address are subtracted in an amount equivalent to the number of updates.
When the subtraction result reaches 0 or less, the number of writes is regarded as 0, the status flag (bit 4) of the error details storage area (Un\G41, Un\G4041) turns ON, and error detection (X5, XD) turns ON.

(3) Example of use
(a) When 0012H is added to the three bytes from the address 0010H using Control Number of Writes (Addition)

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6.2.10 Copy

When the Copy command is specified using the ID instruction execution request (Y14) of antenna 1, the command reads the data of the ID tag of antenna 1 (copy source) and writes the data to the ID tag of antenna 2 (copy destination).
When the Copy command is specified using the ID instruction execution request (Y1C) of antenna 2, the command reads the data of the ID tag of antenna 2 (copy source) and writes the data to the ID tag of antenna 1 (copy destination).
When the Copy command ends normally, ID instruction complete (X4, XC) of the copy source turns ON.

(1) Copy source antenna

The copy source antenna reads from the ID tag the number of byte sets specified in the number of processed points specification area (Un\G4, Un\G4004) from the address specified in the head address specification area (Un\G3, Un\G4003).
The communication specifications available are trigger and auto only.

(2) Copy destination antenna

The copy destination antenna writes data to the ID tag in an amount equivalent to the number of byte sets specified in the number of processed points specification area (Un\G4, Un\G4004) from the address specified in the command option specification area (Un\G5, Un\G4005).
The communication specification is not available for selection. Communication is executed by a trigger.

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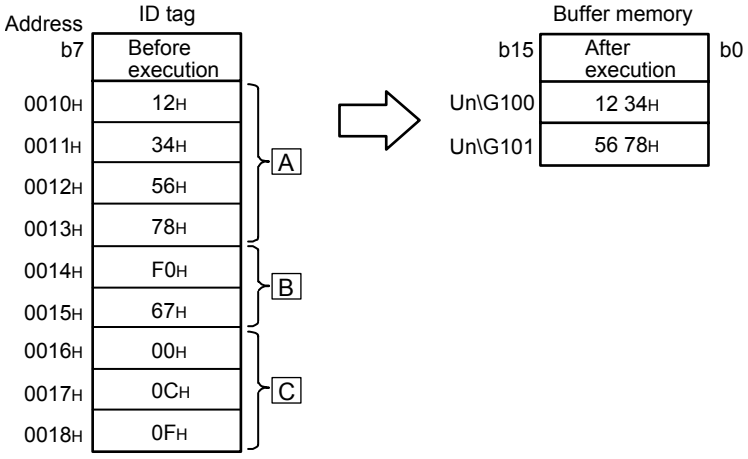
6.2.11 Read with error correction

The Read with Error Correction command reads from the ID tag the number of byte sets specified in the number of processed points specification area (Un\G4, Un\G4004) + the check code (five bytes) from the address specified in the head address specification area (Un\G3, Un\G4003), and checks the correctness of the data from the check code.
When a 1-bit memory error is corrected, the data correction flag (bit 3) of the error details storage area (Un\G41, Un\G4041) turns ON and error detection (X5, XD) turns ON. The normal data after error correction are stored in the data storage area (Un\G100 to UN\G1123, UN\G4100 to Un\G5123).
For details of the error correction function, refer Section 5.6, "ID Tag Memory Error Correction Function".

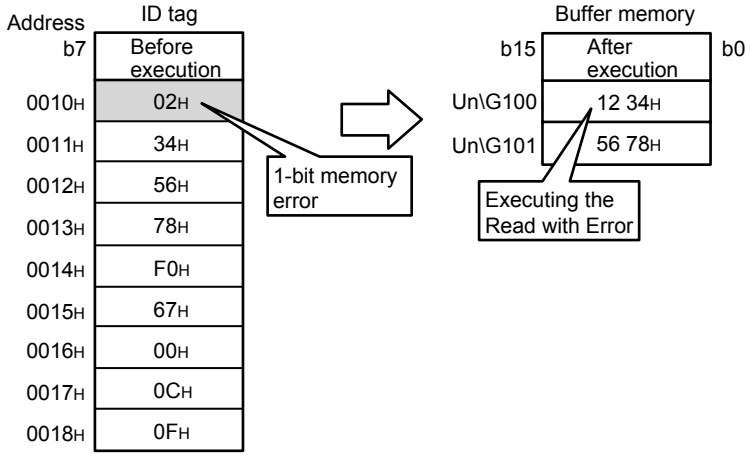
(1) Example of use

(a) When executing the Read with Error Correction command in the data storage order 0000H (upper -> lower), for the four bytes from address 0010H.



A : No. of read bytes (4 bytes)
B : Memory check code (2 bytes)
C : Error correction code (3 bytes)

(b) When executing the Read with Error Correction command in the data storage order 0000H (upper -> lower) for the four bytes from address 0010H and a 1-bit memory error is corrected



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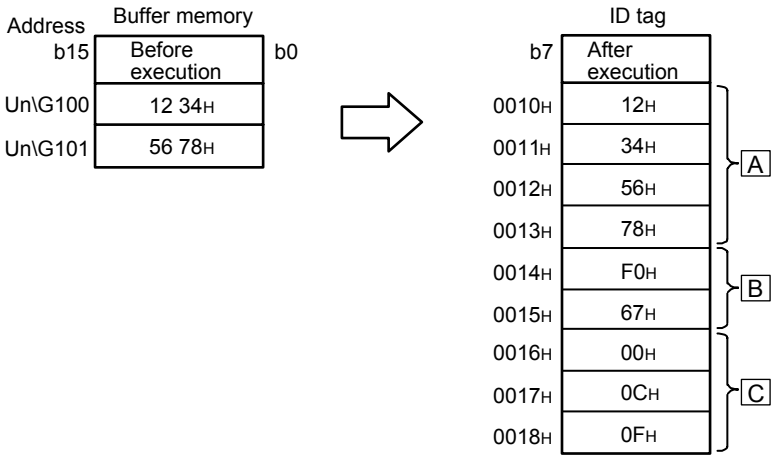
6.2.12 Write with error correction

The Write with Error Correction command writes to the ID tag the number of byte sets specified in the number of processed points specification area (Un\G4, Un\G4004) + the check code (five bytes) from the address specified in the head address specification area (Un\G3, Un\G4003).
For details of the error correction function, refer Section 5.6, “ID Tag Memory Error Correction Function”.

(1) Example of use

(a) When executing the Write with Error Correction command in the data storage order 0000H (upper -> lower), for the four bytes from address 0010H.



A : No. of read bytes (4 bytes)
B : Memory check code (2 bytes)
C : Error correction code (3 bytes)

6.2.13 Read UID

The Read UID command reads the UID (unit identification number) (8bytes) of the ID tag, and stores the value in the ID tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093).

6.2.14 Measure noise

The Measure Noise function measures the noise environment surrounding the antenna, and stores the average value, maximum value, and minimum value of the measured data in the data storage area (Un\G100 to Un\G102, Un\G4100 to Un\G4102).

Address		Buffer memory	
Antenna 1	Antenna 2	Measured data	
Un\G100,	Un\G4100	Average value	"C0" + "00" to "99" [BCD]
Un\G101,	Un\G4101	Maximum value	"C0" + "00" to "99" [BCD]
Un\G102,	Un\G4102	Minimum value	"C0" + "00" to "99" [BCD]

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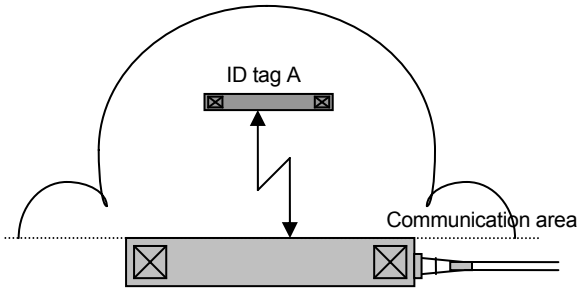
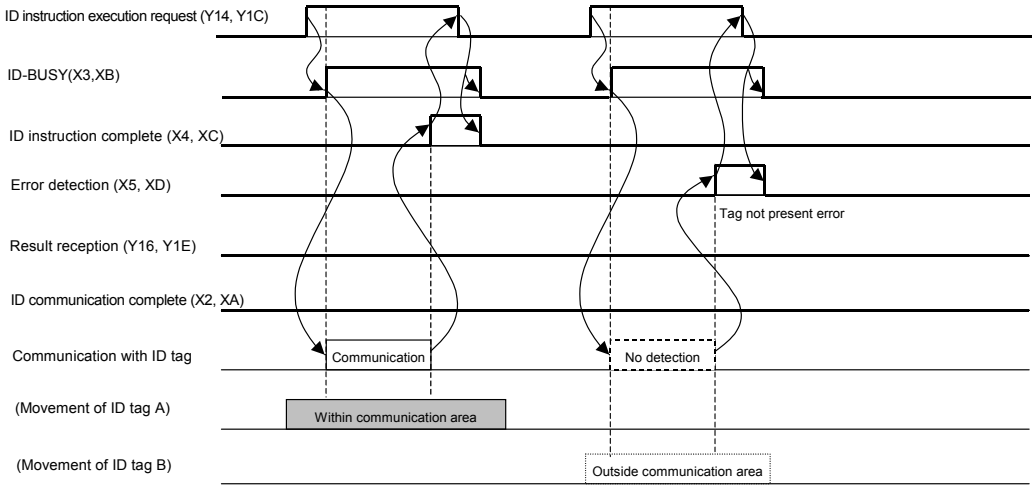
6.3 Control Methods According to Communication Specification

6.3.1 Trigger

With the trigger communication specification, communication is performed with the ID tag stopped within the antenna communication area.

1. When the ID instruction execution request (Y14, Y1C) turns ON, communication with the ID tag is started.
2. After communication with the ID tag ends, ID instruction complete (X4, XC) turns ON.
3. When the ID instruction execution request (Y14, Y1C) is turned OFF, ID instruction complete (X4, XC) turns OFF and the module changes to a standby state.
4. If an ID tag does not exist within the communication area of the antenna the moment the ID instruction execution request (Y14, Y1C) is turned ON, error detection (X5, XD) turns ON.
   With the trigger communication specification, communication cannot be performed normally and error detection (X5, XD) turns ON when multiple ID tags are within the antenna communication area. Thus, make sure there is only one ID tag within the antenna communication area.





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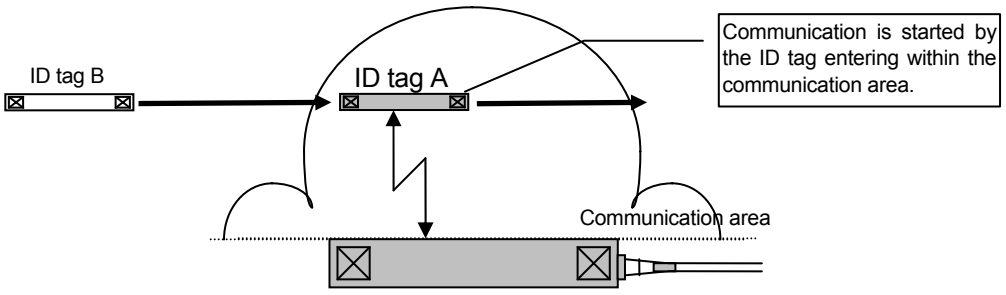
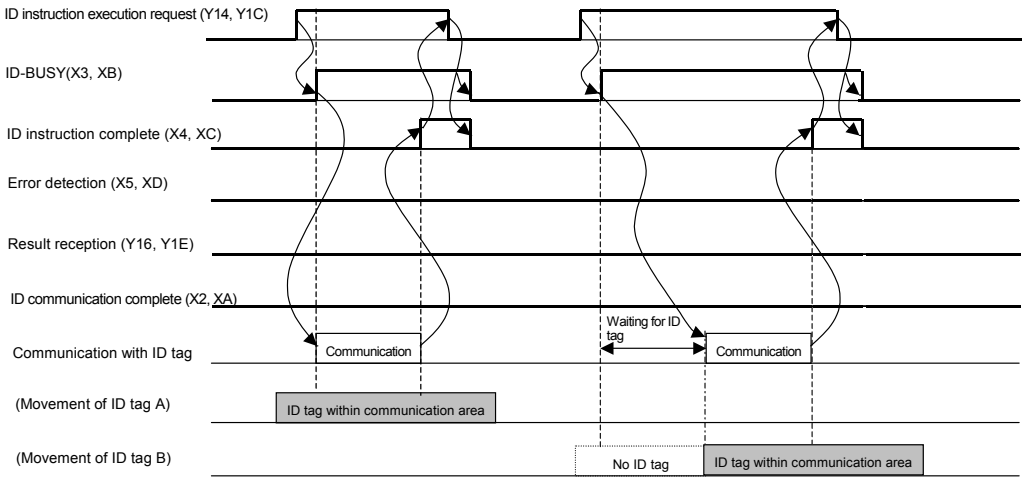
6.3.2 Auto

With the auto communication specification, communication is performed while the ID tag is being moved.

1. When the ID instruction execution request (Y14, Y1C) is turned ON, ID tag detection is started.
2. When an ID tag enters within the antenna communication area, communication with the ID tag is started.
3. After communication with the ID tag ends, ID instruction complete (X4, XC) turns ON.
4. When the ID instruction execution request (Y14, Y1C) is turned OFF, ID instruction complete (X4, XC) turns OFF and the module changes to a standby state.
5. With the auto communication specification, communication cannot be performed normally and error detection (X5, XD) turns ON when multiple ID tags are within the antenna communication area at once. Thus, make sure there is only one ID tag within the antenna communication area.





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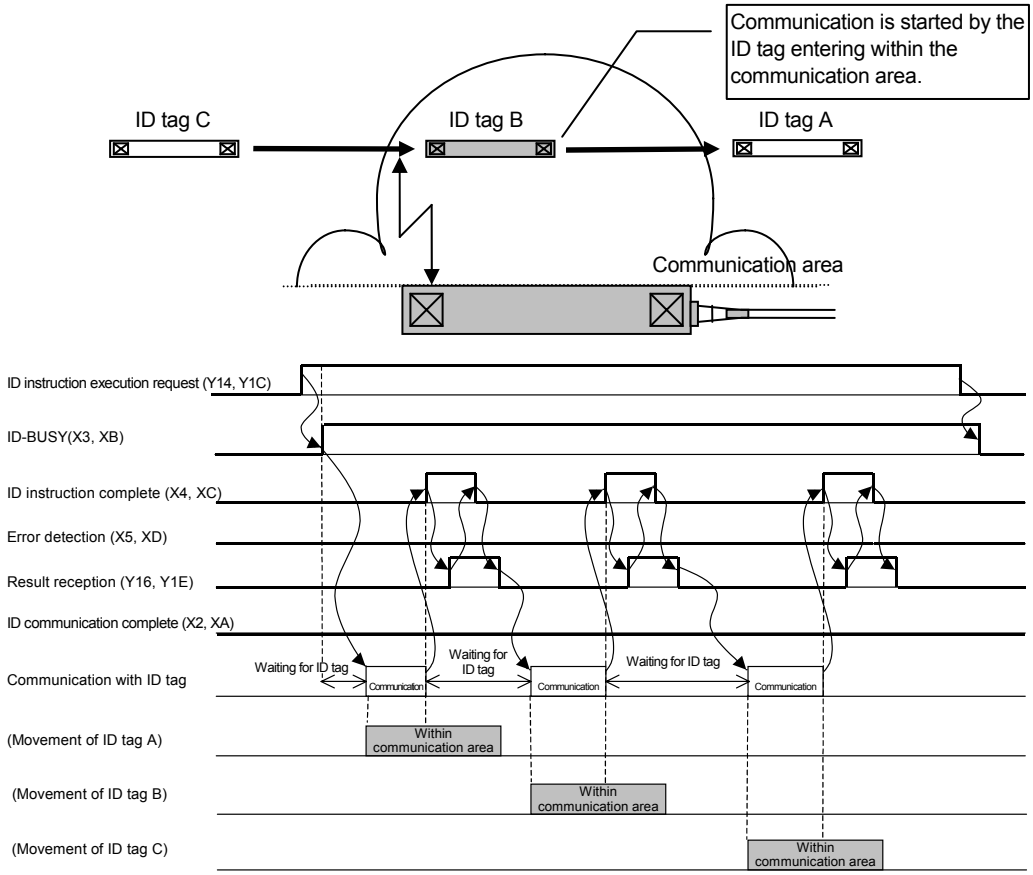
6.3.3 Repeat auto

With the repeat auto communication specification, communication is performed while the ID tag is being moved.
Communication is performed with the ID tags that enter the antenna communication area one after the other, until the ID instruction execution request (Y14, Y1C) is turned OFF.

1. When the ID instruction execution request (Y14, Y1C) is turned ON, ID tag detection is started.
2. When an ID tag enters within the antenna communication area, communication with the ID tag is started.
3. After communication with the ID tag ends, ID instruction complete (X4, XC) turns ON.
4. When result reception (Y16, Y1E) is turned ON, ID instruction complete (X4, XC) turns OFF and detection of the next ID tag within the antenna communication area is started.
5. Subsequently, Steps 2 to 4 are repeated.
6. When the ID instruction execution request (Y14, Y1C) is turned OFF, ID tag detection is ended.
7. With the repeat auto communication specification, communication cannot be performed normally and error detection (X5, XD) turns ON when multiple ID tags are within the antenna communication area at once. Thus, make sure there is only one ID tag within the antenna communication area.



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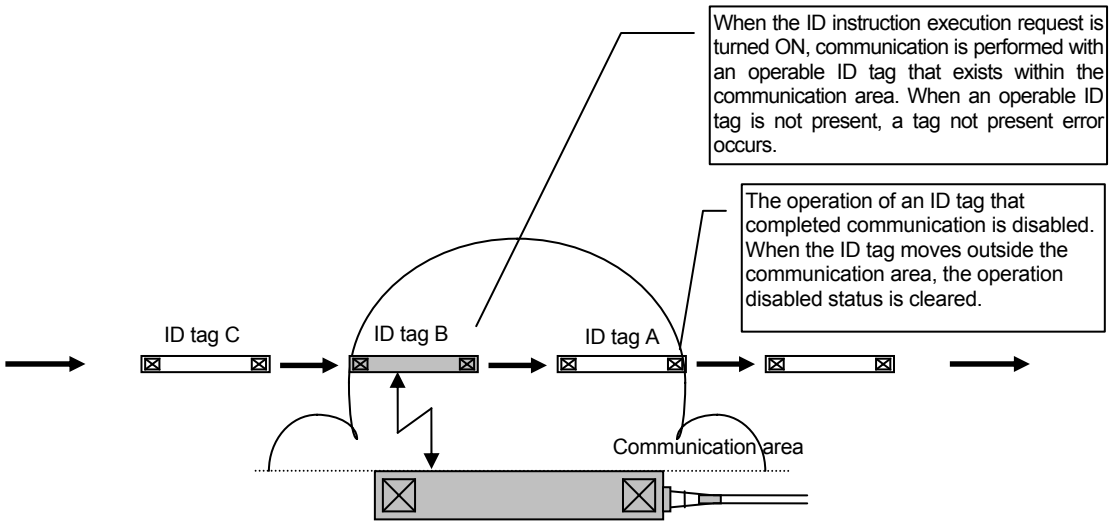
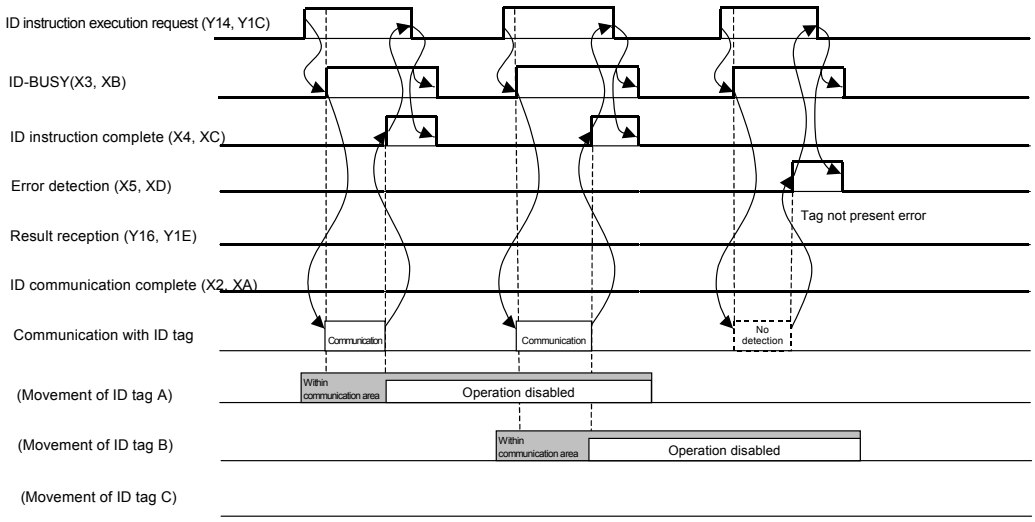
6.3.4 FIFO trigger

With the FIFO trigger communication specification, communication is performed while the ID tag is stopped within the antenna communication area.

1. When the ID instruction execution request (Y14, Y1C) is turned ON, communication with the operable ID tag is started.
2. After communication with the ID tag ends, operation of the ID tag is disabled, and ID instruction complete (X4, XC) turns ON.
3. When the ID instruction execution request (Y14, Y1C) is turned OFF, ID instruction complete (X4, XC) turns OFF, and the module changes to a standby state.
4. When an operable ID tag does not exist within the antenna communication area the moment the ID instruction execution request (Y14, Y1C) is turned ON, error detection (X5, XD) turns ON.
5. With the FIFO trigger communication specification, communication is possible if there is one operable ID tag among the ID tags within the antenna communication area. When two or more operable ID tags exist, communication cannot be performed normally and error detection (X5, XD) turns ON.





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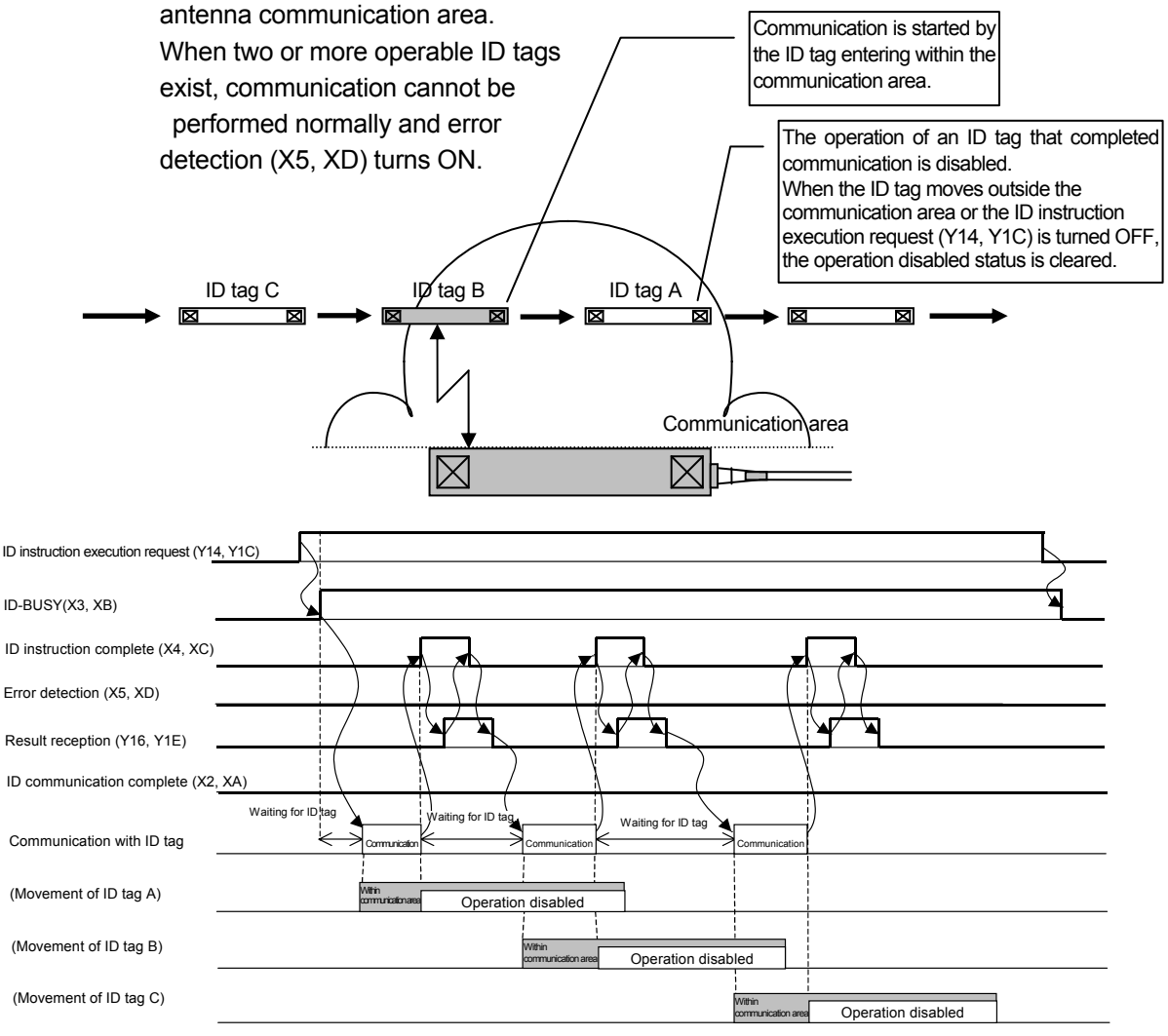
6.3.5 FIFO repeat

With the FIFO repeat communication specification, communication is performed while the ID tag is being moved.
Communication is performed with the ID tags that enter the antenna communication area one after the other, until the ID instruction execution request (Y14, Y1C) is turned OFF.

1. When the ID instruction execution request (Y14, Y1C) is turned ON, detection of operable ID tags is started.
2. When the ID tag enters within the antenna communication area, communication with the ID tag is started.
3. After communication with the ID tag ends, operation of the ID tag is disabled, and ID instruction complete (X4, XC) turns ON.
4. When result reception (Y16, Y1E) is turned ON, ID instruction complete (X4, XC) turns OFF, and detection of the next ID tag that enters the antenna communication area is started.
5. Subsequently, Steps 2 to 4 are repeated.
6. When the ID instruction execution request (Y14, Y1C) is turned OFF, ID tag detection is ended.
7. Communication is possible if there is one operable tag among the ID tags within the antenna communication area.
   When two or more operable ID tags exist, communication cannot be performed normally and error detection (X5, XD) turns ON.



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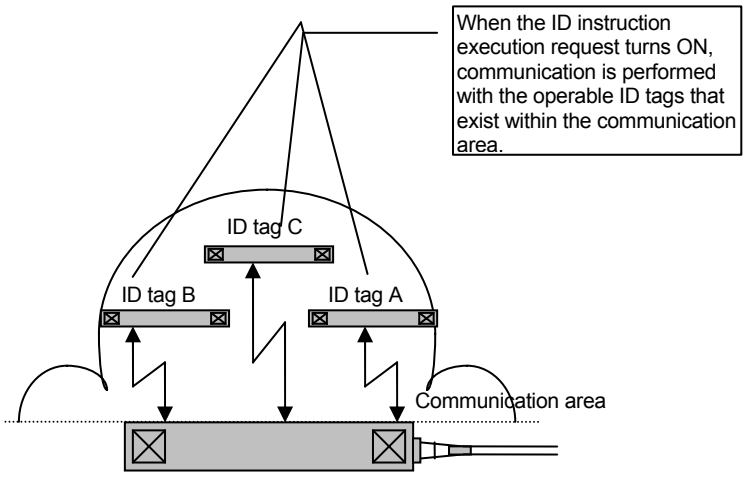
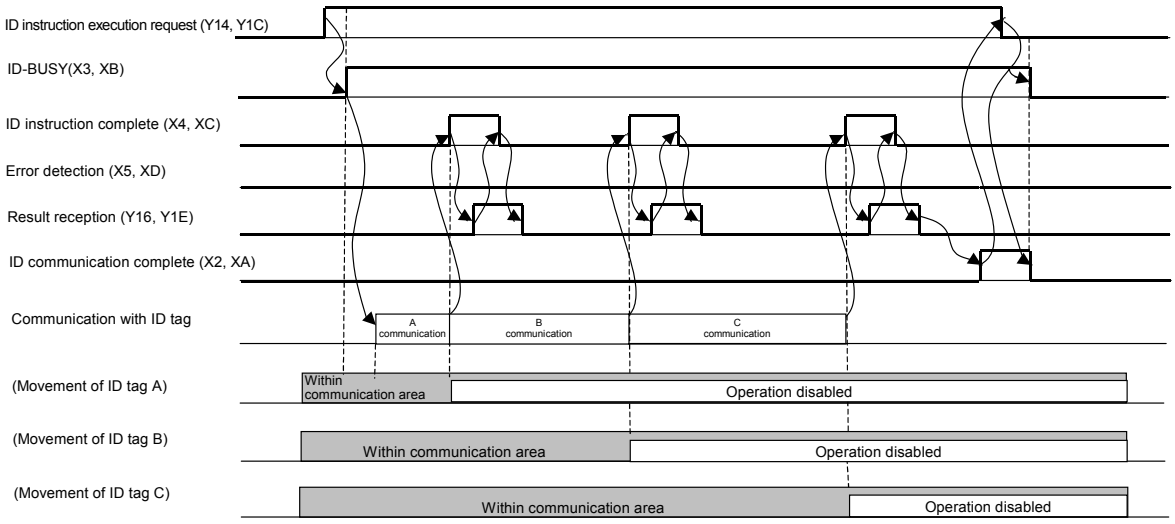
6.3.6 Multi-trigger

With the multi-trigger communication specification, communication is performed with one or more ID tags stopped within the antenna communication area.

1. When the ID instruction execution request (Y14, Y1C) is turned ON, ID tag communication is started.
2. After communication with the ID tag ends, operation of the ID tag is disabled, and ID instruction complete (X4, XC) turns ON. Communication is then started with the next operable ID tag within the antenna communication area.
3. When result reception (Y16, Y1E) is turned ON, ID instruction complete (X4, XC) turns OFF.
4. Subsequently, Steps 2 and 3 are repeated.
5. When communication with all operable ID tags within the antenna communication area is completed, ID communication complete (X2, XA) is turned ON.
6. When the ID instruction execution request (Y14, Y1C) is turned OFF, ID instruction complete (X4, XC) turns OFF and the module changes to a standby state.





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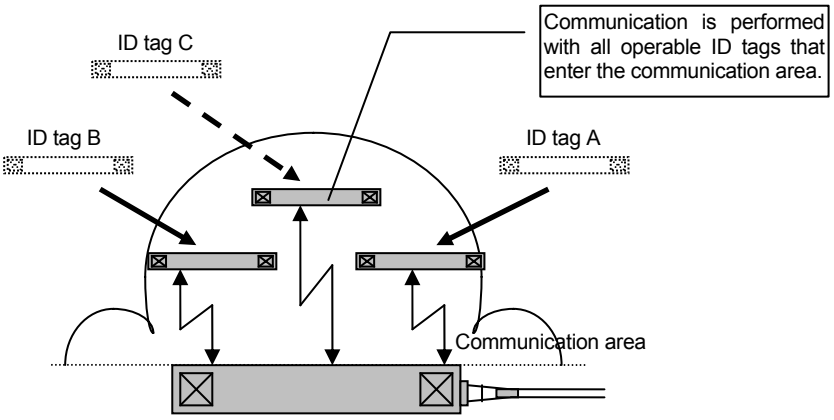
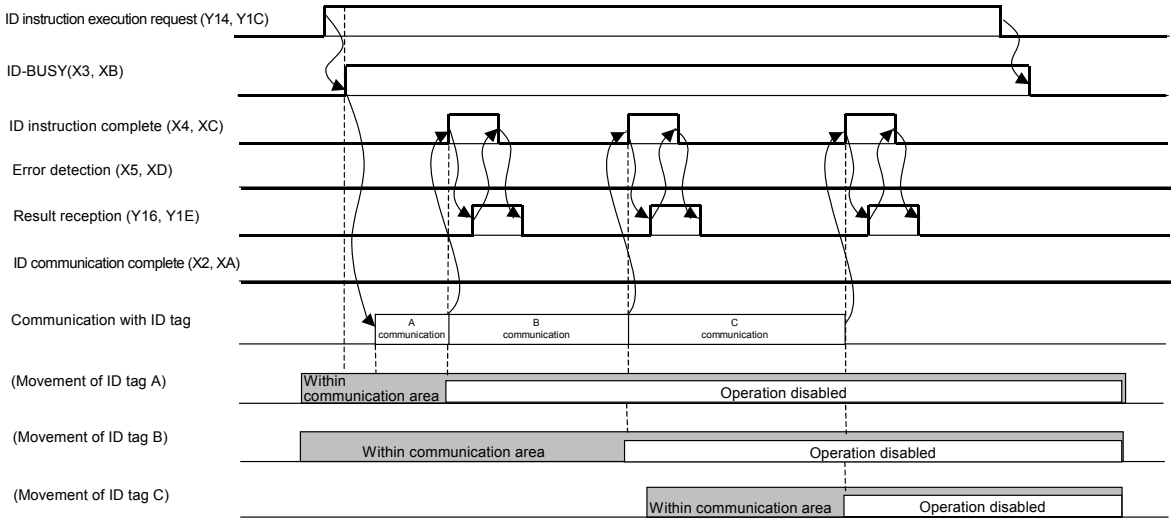
6.3.7 Multi-repeat

With the multi-repeat communication specification, communication is performed while one or more ID tags are being moved.

1. When the ID instruction execution request (Y14, Y1C) is turned ON, detection of ID tags that enter the antenna communication area is started.
2. When an ID tag enters within the antenna communication area, communication with the ID tag is started.
3. After communication with the ID tag ends, operation of the ID tag is disabled, and ID instruction complete (X4, XC) turns ON. Detection of the next operable ID tag within the antenna communication area is then started.
4. When result reception (Y16, Y1E) is turned ON, ID instruction complete (X4, XC) turns OFF.
5. Subsequently, Steps 2 to 4 are repeated.
6. When the ID instruction execution request (Y14, Y1C) is turned OFF, detection of operable ID tags is ended.





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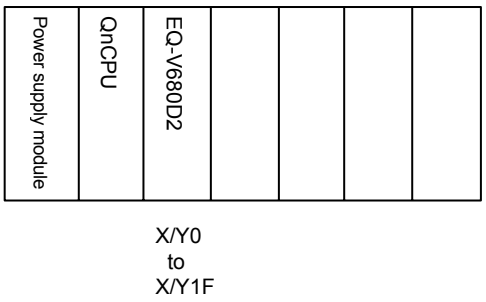
6.4 Sample Programs

The following describes sample programs of the RFID interface module.

(1) System configuration



The following intelligent function module switch settings are set in GX Developer I/O assignment settings as shown below.

- Switch 1 ·····0000H (Write verify setting: Execute
  ID tag communication speed setting: Standard mode
  Write protect setting: Enable)
- Switch 2 ·····0000H (Y contact test request enable: Enable
  Channel 1 test mode enable: Enable
  Channel 2 test mode enable: Enable)
- Switch 3 ·····0000H (0: Fixed)
- Switch 4 ·····0000H (0: Fixed)
- Switch 5 ·····0000H (0: Fixed)

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(2) Sample program list

The sample programs provided include the sixteen programs indicated in Table 6.3.

Table 6.3 Sample Program List

Program Name	Description	Reference
Set parameters	A program for setting parameters such as the communication specification and processing specification.	Section 6.4.1
Read	A program for reading data from an ID tag.	Section 6.4.2
Write	A program for writing data to an ID tag.	Section 6.4.3
Set bit	A program for setting the specified bits of the data of an ID tag to “1”.	Section 6.4.4
Clear bit	A program for clearing the specified bits of the data of the ID tag to “0”.	Section 6.4.5
Write mask bit	A program for writing data to an ID tag while protecting the data that you do not want replaced.	Section 6.4.6
Write calculation	A program for writing the calculation result (data) of an addition or subtraction operation performed with ID tag data.	Section 6.4.7
Fill data	A program for initializing the data of an ID tag with specified data.	Section 6.4.8
Check data	A program for checking if an error occurred in the data of an ID tag. The program performs CRC calculation/writing and verification of the set address data of the ID tag.	Section 6.4.9
Control number of writes	A program for writing to an ID tag the number of writes to EEPROM-type ID tags and assessing if the number of writes has been exceeded.	Section 6.4.10
Copy	A program for copying data of an ID tag between channel 1 and channel 2.	Section 6.4.11
Read with error correction	A program for reading data and check code from an ID tag, inspecting the reliability of the data, and correcting any one-bit errors.	Section 6.4.12
Write with error correction	A program for writing data and data reliability inspection check code to an ID tag.	Section 6.4.13
Read UID	A program for reading the UID (unit identification code) of an ID tag.	Section 6.4.14
Measure noise	A program for measuring the noise environment surrounding an antenna.	Section 6.4.15
Read module status	A program for reading the module status, processing result monitor, etc.	Section 6.4.16

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6.4.1 Set parameters

The Set Parameters program is a program for setting parameters such as the communication specification or processing specification.

(1) Program conditions

(a) Parameter setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G1	Communication specification area (CH1)	K0 (Trigger)
U0\G2	Processing specification area (CH1)	K0 (Data storage order: Upper –> Lower Calculation method: Addition Calculation/Verification: Calculation)
U0\G10	Auto command wait time setting area (CH1)	K0 (Continuously executes the ID instruction until there is a response from the ID tag)
U0\G11	Processing result monitor switch setting area (CH1)	K0 [Stores the communication time in the processing result monitor storage area (U0\G42)]
U0\G4001	Communication specification area (CH2)	K0 (Trigger)
U0\G4002	Processing specification area (CH2)	K0 (Data storage order: Upper –> Lower Calculation method: Addition Calculation/Verification: Calculation)
U0\G4010	Auto command wait time setting area (CH2)	K0 (Continuously executes the ID instruction until there is a response from the ID tag)
U0\G4011	Processing result monitor switch setting area (CH2)	K0 [Stores the communication time in the processing result monitor storage area (U0\G4042)]

(b) Devices used by user

1. External inputs (commands)

Device	Application
M1000	Set parameters command

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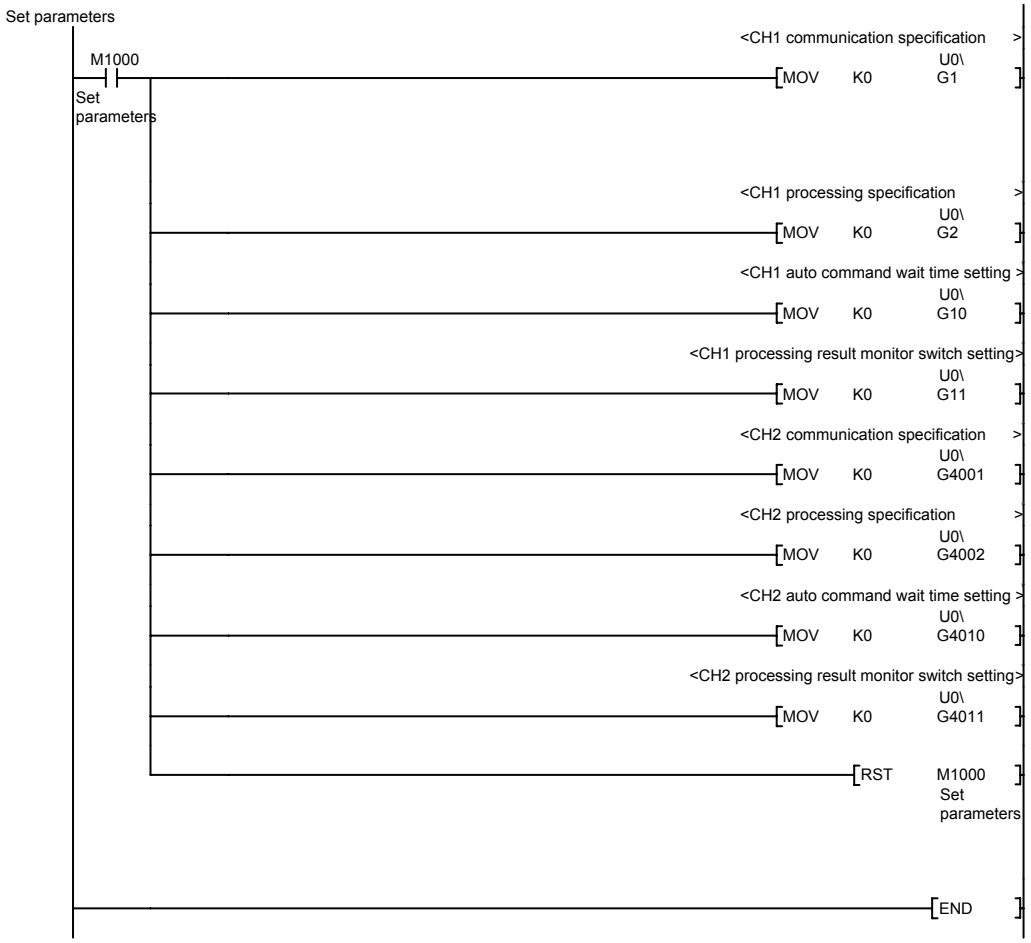
(2) Program example



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6.4.2 Read

The Read program is a program for reading data from an ID tag.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H0 (Read)
U0\G3	Head address specification area (CH1)	K10 (Address: 10)
U0\G4	Number of processed points specification area (CH1)	K8 (8 bytes)

(b) Devices used by user

1. External inputs (commands)

Device	Application
M1010	Read ID Tag command
M1011	Read ID Tag result reception
M1012	Cancel Read ID Tag command

2. External outputs (verification)

Device	Application
M1013	Normal completion during Read ID Tag
M1014	Module error during Read ID Tag
M1015	ID communication complete during Read ID Tag
D1010	Error details storage during Read ID Tag
D1200 to D1203	Read data storage during Read ID Tag

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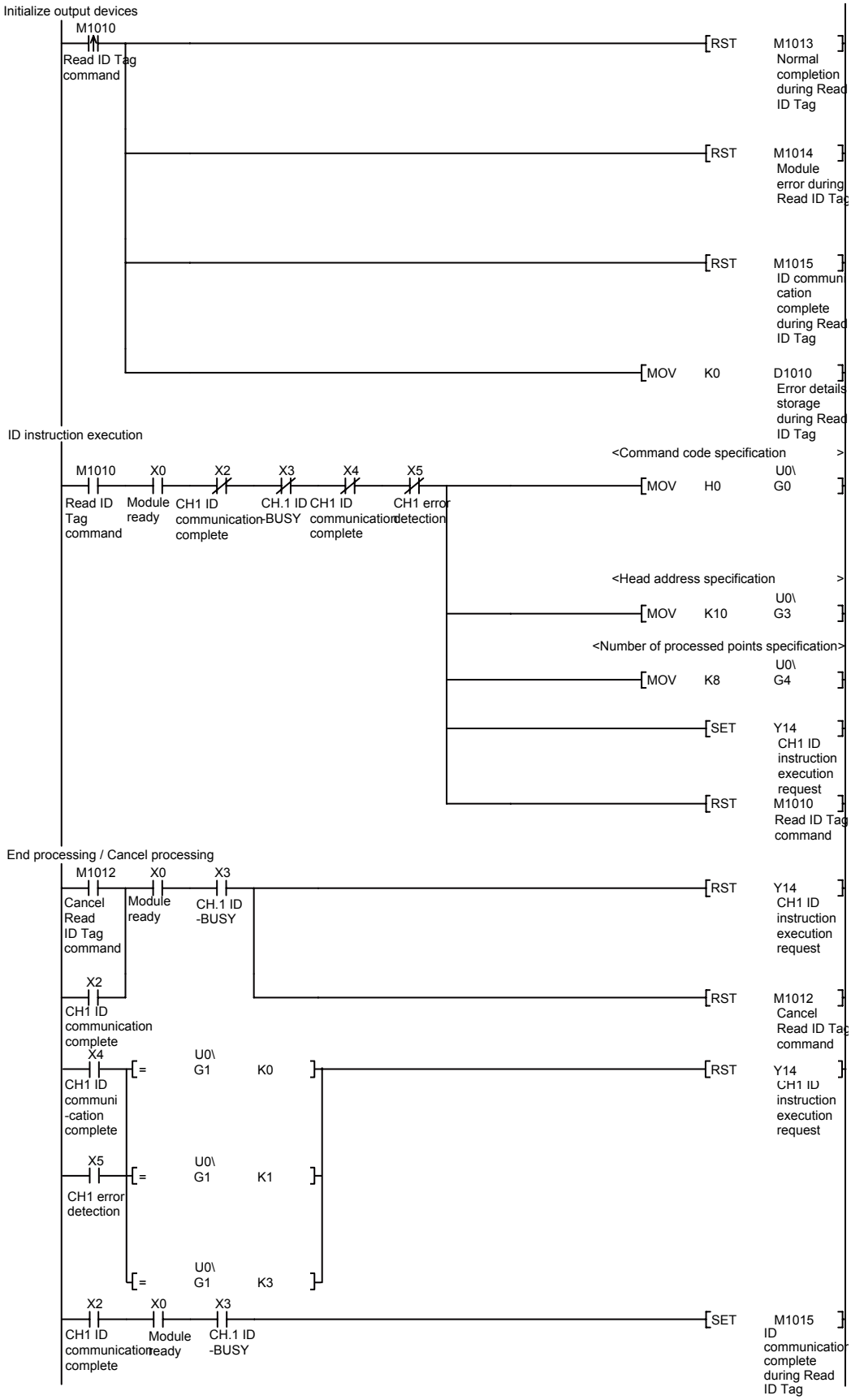
(2) Program example



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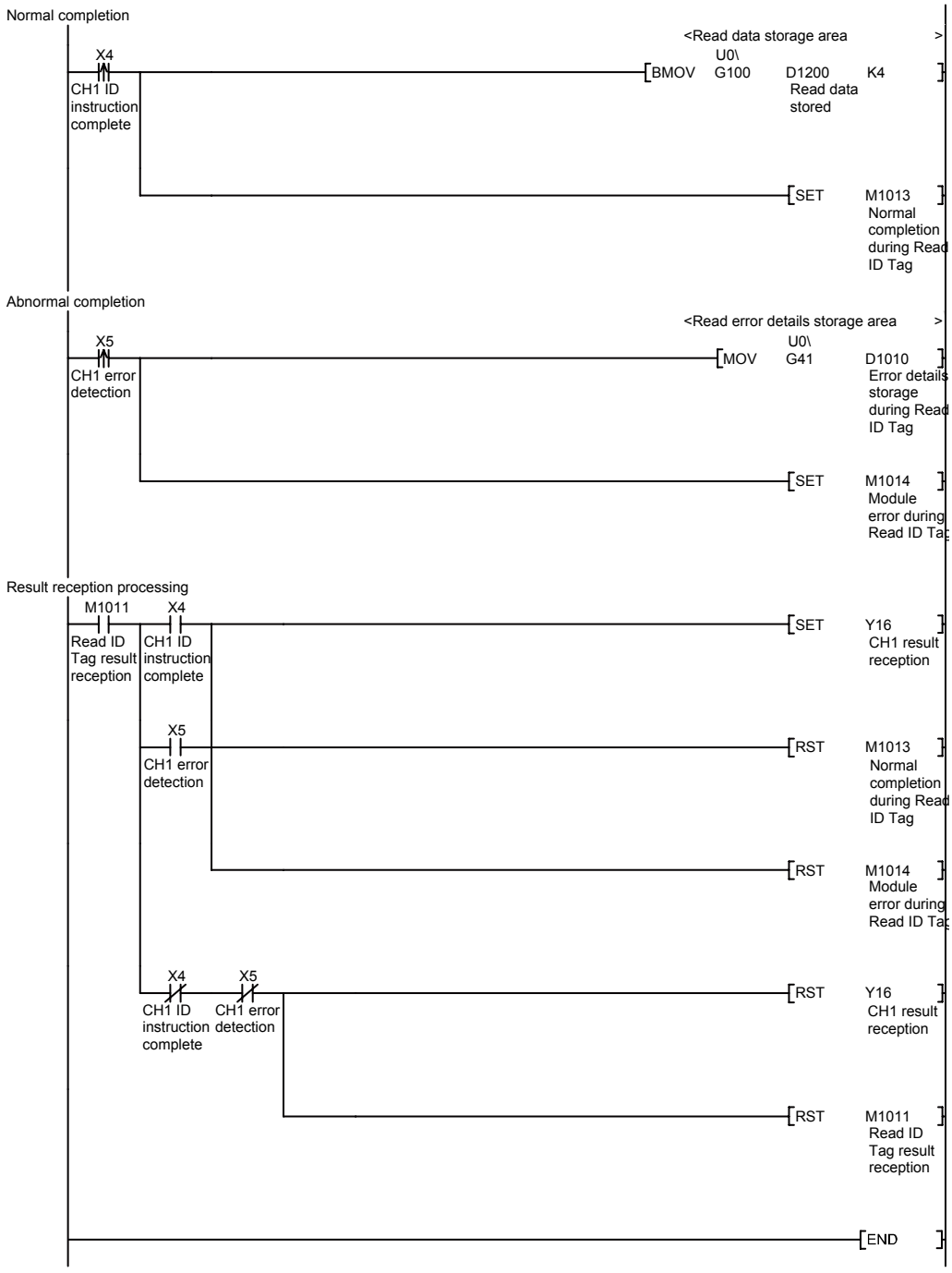
Normal completion
<Read data storage area >
X4
U0\
BMOV G100 D1200 K4
CH1 ID instruction complete
Read data stored
SET M1013
Normal completion during Read ID Tag
Abnormal completion
<Read error details storage area >
X5
U0\
MOV G41 D1010
CH1 error detection
Error details storage during Read ID Tag
SET M1014
Module error during Read ID Tag
Result reception processing
M1011 X4
SET Y16
Read ID Tag result reception
CH1 ID instruction complete
CH1 result reception
X5
RST M1013
CH1 error detection
Normal completion during Read ID Tag
RST M1014
Module error during Read ID Tag
X4 X5
RST Y16
CH1 ID instruction complete
CH1 error detection
CH1 result reception
RST M1011
Read ID Tag result reception
END

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6.4.3 Write

The Write program is a program for writing data to an ID tag.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H1 (Write)
U0\G3	Head address specification area (CH1)	K10 (Address: 10)
U0\G4	Number of processed points specification area (CH1)	K8 (8 bytes)

(b) Devices used by user

1. External inputs (commands/data)

Device	Application
M1020	Write to ID Tag command
M1021	Write to ID Tag result reception
M1022	Cancel Write to ID Tag command
D2300 to D2303	Specifies the data to be written to the ID tag during Write to ID Tag

2. External outputs (verification)

Device	Application
M1023	Normal completion during Write to ID Tag
M1024	Module error during Write to ID Tag
M1025	ID communication complete during Write to ID Tag
D1020	Error details storage during Write to ID Tag

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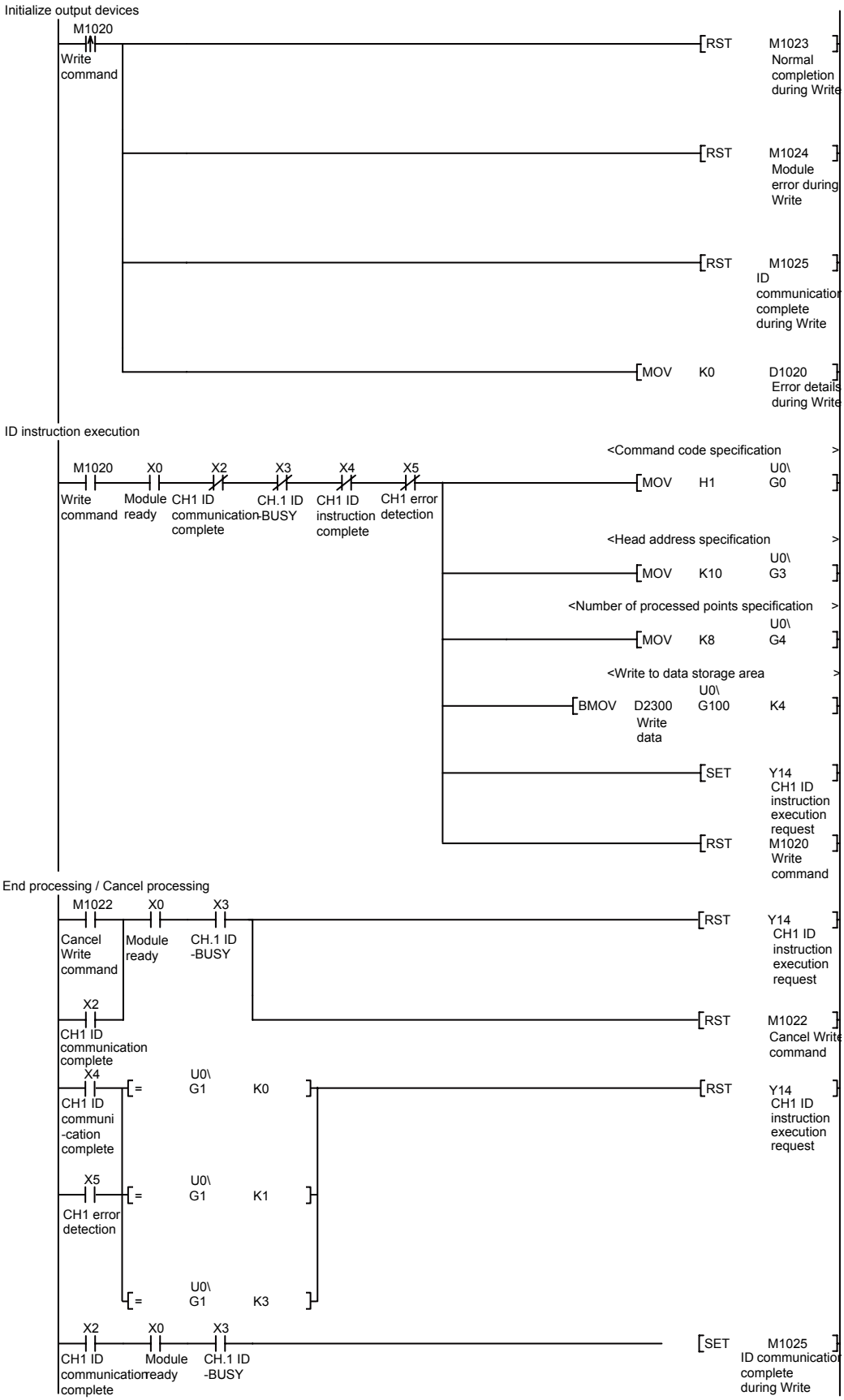
(2) Program example



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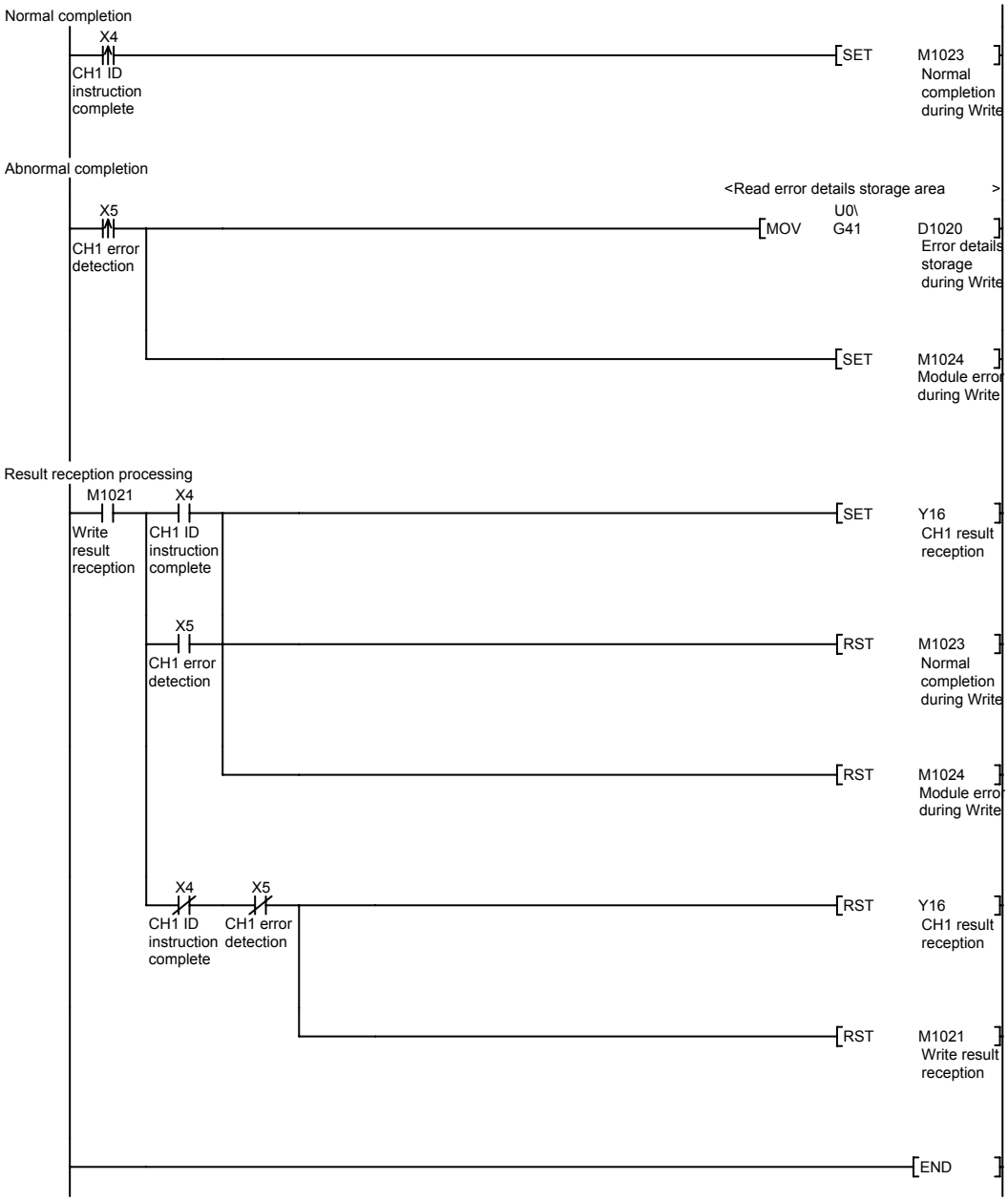
Normal completion
X4
CH1 ID instruction complete
SET M1023
Normal completion during Write
Abnormal completion
<Read error details storage area >
X5
CH1 error detection
MOV U0\G41 D1020
Error details storage during Write
SET M1024
Module error during Write
Result reception processing
M1021
Write result reception
X4
CH1 ID instruction complete
SET Y16
CH1 result reception
X5
CH1 error detection
RST M1023
Normal completion during Write
RST M1024
Module error during Write
X4
CH1 ID instruction complete
X5
CH1 error detection
RST Y16
CH1 result reception
RST M1021
Write result reception
END

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6.4.4 Set bit

The Set Bit program is a program for setting the specified bits of the data of an ID tag to “1”.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H2 (Set bit)
U0\G3	Head address specification area (CH1)	K10 (Address: 10)
U0\G4	Number of processed points specification area (CH1)	K4 (4 bytes)

(b) Devices used by user

1. External inputs (commands/data)

Device	Application
M1030	Set Bit of ID Tag command
M1031	Set Bit of ID Tag result reception
M1032	Cancel Set Bit of ID Tag command
D3400 to D3401	Specifies the data of the ID Tag for which bits are to be set.

2. External outputs (verification)

Device	Application
M1033	Normal completion during Set Bit of ID Tag
M1034	Module error during Set Bit of ID Tag
M1035	ID communication complete during Set Bit of ID Tag
D1030	Error details storage during Set Bit of ID Tag

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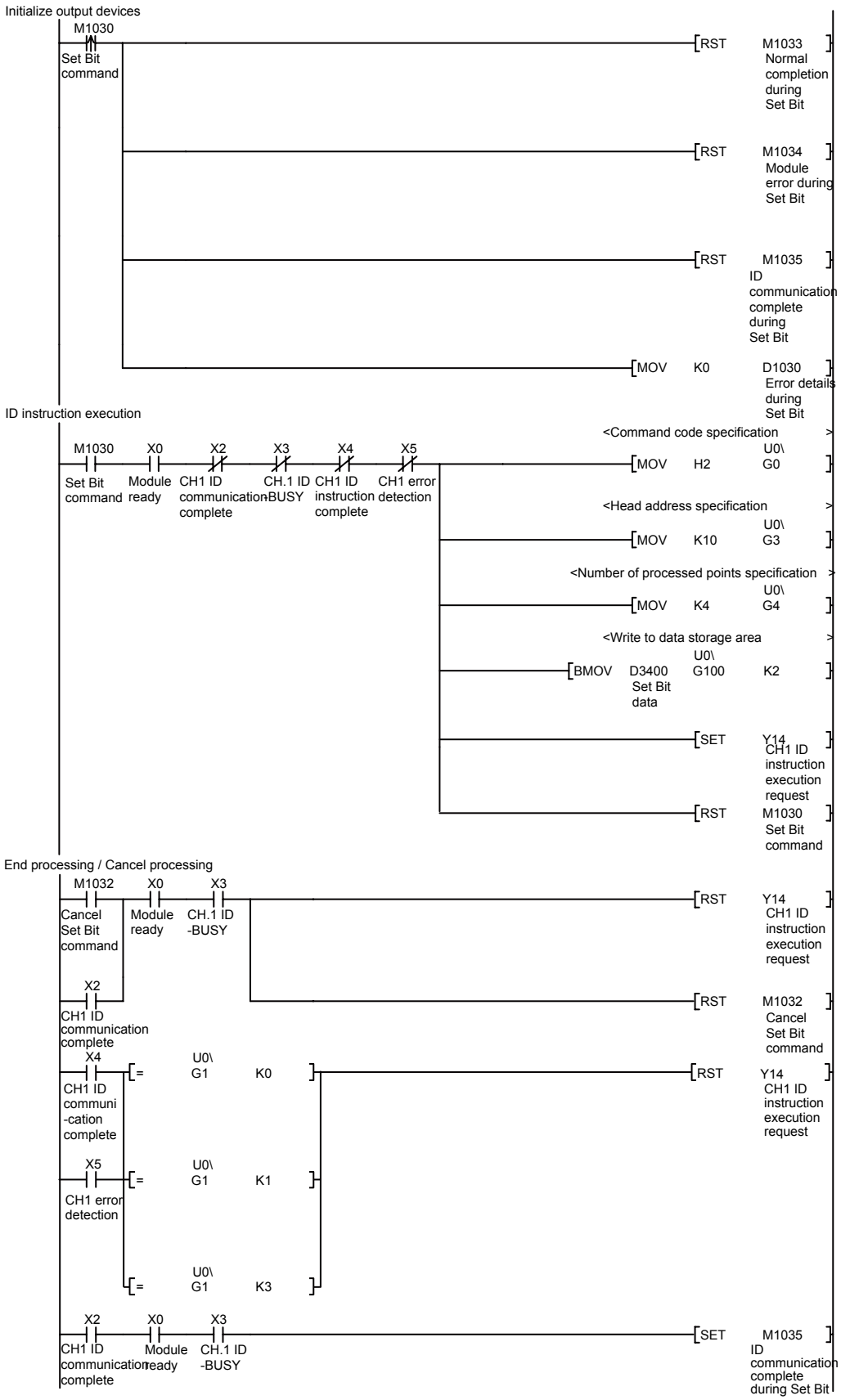
(2) Program example



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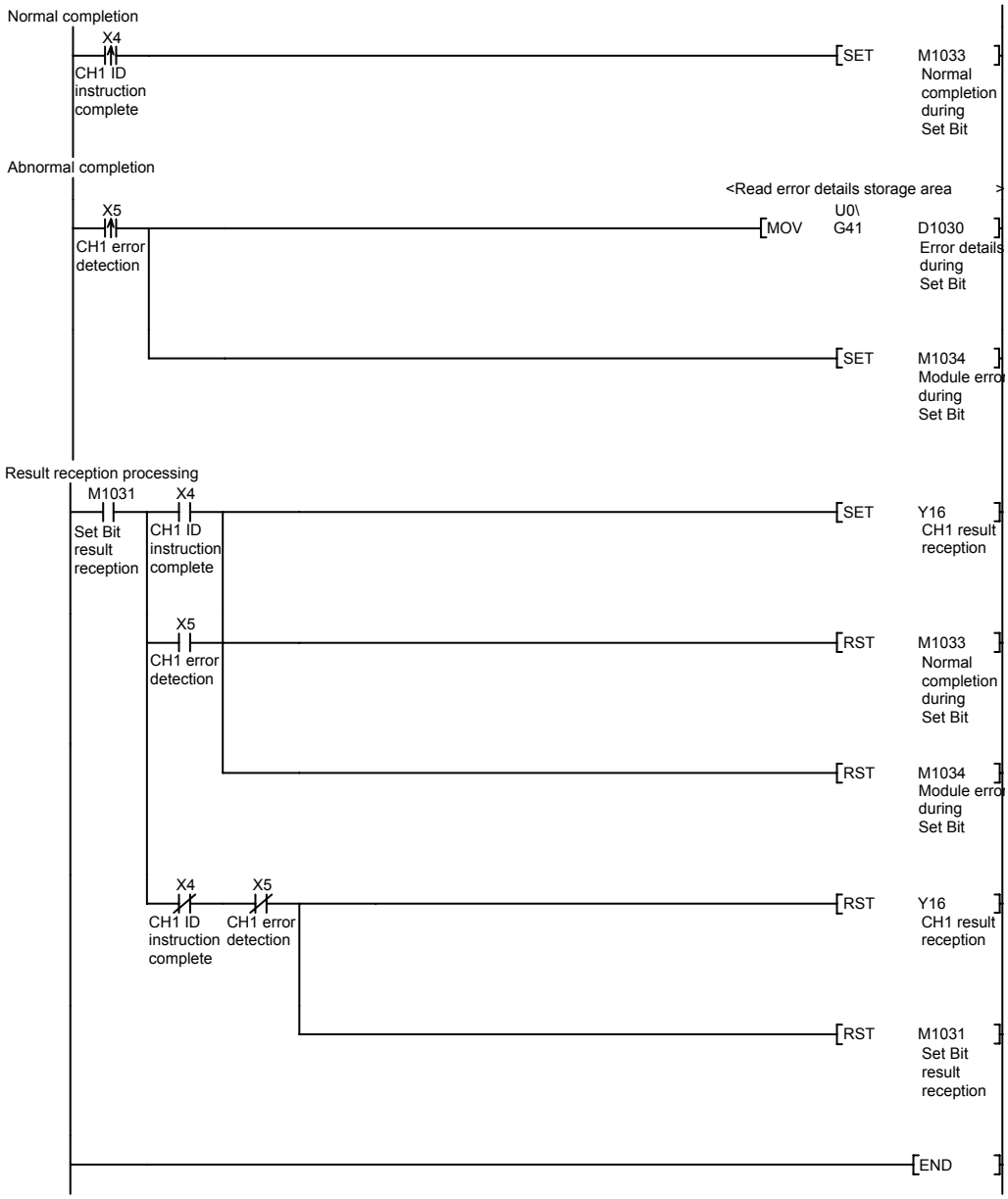
Normal completion
X4
CH1 ID instruction complete
SET M1033 Normal completion during Set Bit
Abnormal completion
<Read error details storage area >
X5
CH1 error detection
MOV U0\G41 D1030 Error details during Set Bit
SET M1034 Module error during Set Bit
Result reception processing
M1031
Set Bit result reception
X4
CH1 ID instruction complete
SET Y16 CH1 result reception
X5
CH1 error detection
RST M1033 Normal completion during Set Bit
RST M1034 Module error during Set Bit
X4
CH1 ID instruction complete
X5
CH1 error detection
RST Y16 CH1 result reception
RST M1031 Set Bit result reception
END

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6.4.5 Clear bit

The Clear Bit program is a program for clearing the specified bits of the data of an ID tag to “0”.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H3 (Clear bit)
U0\G3	Head address specification area (CH1)	K10 (Address: 10)
U0\G4	Number of processed points specification area (CH1)	K4 (4 bytes)

(b) Devices used by user

1. External inputs (commands/data)

Device	Application
M1040	Clear Bit of ID Tag command
M1041	Clear Bit of ID Tag result reception
M1042	Cancel Clear Bit of ID Tag command
D3410 to D3411	Specifies the data of the ID Tag for which bits are to be cleared.

2. External outputs (verification)

Device	Application
M1043	Normal completion during Clear Bit of ID Tag
M1044	Module error during Clear Bit of ID Tag
M1045	ID communication complete during Clear Bit of ID Tag
D1040	Error details storage during Clear Bit of ID Tag

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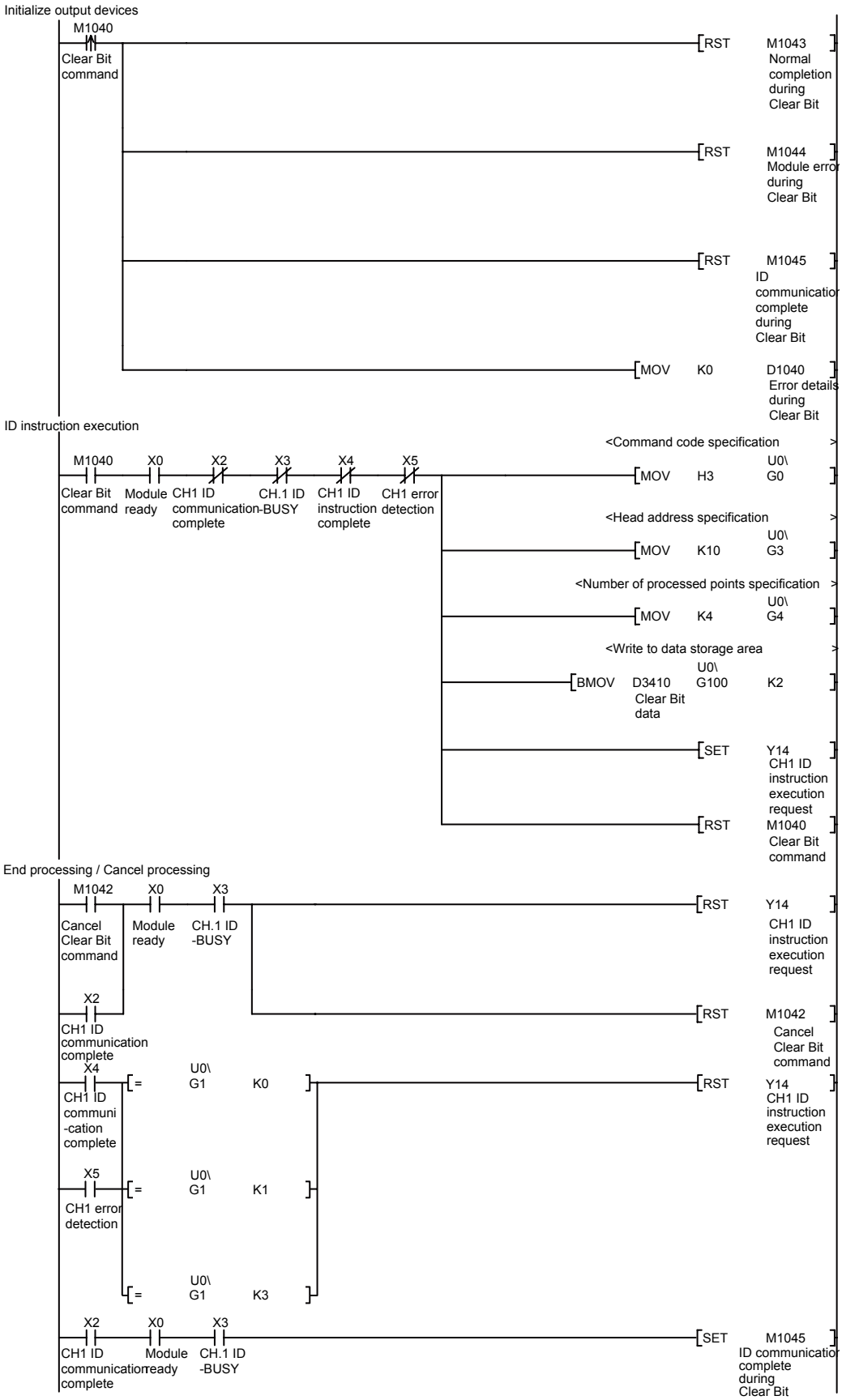
(2) Program example



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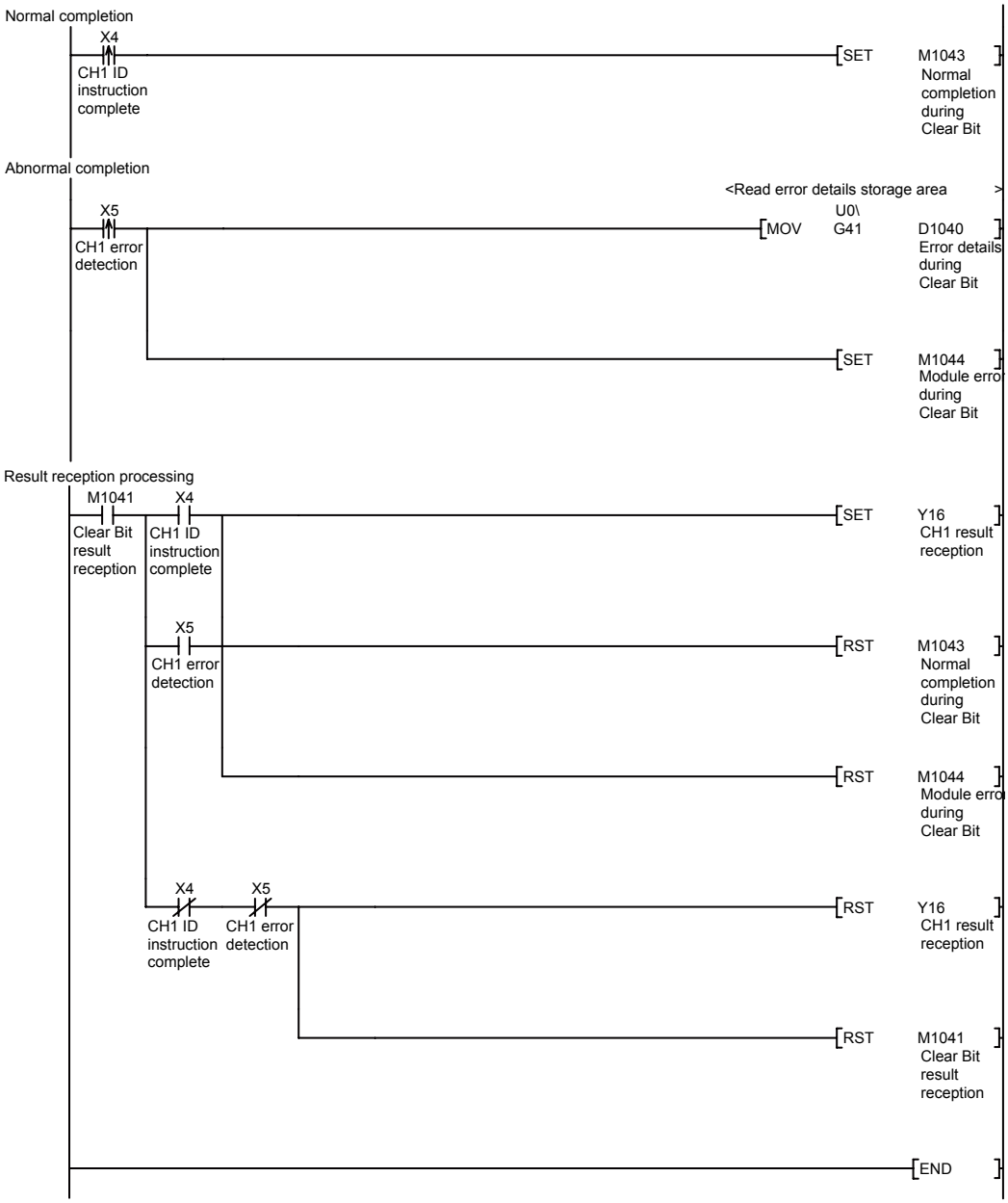
Normal completion
X4
CH1 ID instruction complete
SET
M1043
Normal completion during Clear Bit
Abnormal completion
<Read error details storage area >
X5
CH1 error detection
MOV
U0\G41
D1040
Error details during Clear Bit
SET
M1044
Module error during Clear Bit
Result reception processing
M1041
Clear Bit result reception
X4
CH1 ID instruction complete
SET
Y16
CH1 result reception
X5
CH1 error detection
RST
M1043
Normal completion during Clear Bit
RST
M1044
Module error during Clear Bit
X4
CH1 ID instruction complete
X5
CH1 error detection
RST
Y16
CH1 result reception
RST
M1041
Clear Bit result reception
END

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6.4.6 Write mask bit

The Write Mask Bit program is a program for writing data to an ID tag while protecting the data that you do not want replaced.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H4 (Write Mask Bit)
U0\G3	Head address specification area (CH1)	K10 (Address: 10)
U0\G4	Number of processed points specification area (CH1)	K4 (4 bytes)

(b) Devices used by user

1. External inputs (commands/data)

Device	Application
M1050	Write Mask Bit of ID Tag command
M1051	Write Mask Bit of ID Tag result reception
M1052	Cancel Write Mask Bit of ID Tag command
D3420 to D3421	Specifies the data to be masked with Write Mask Bit of ID Tag.
D3422 to D3423	Specifies the data to be written with Write Mask Bit of ID Tag.

2. External outputs (verification)

Device	Application
M1053	Normal completion during Write Mask Bit of ID Tag
M1054	Module error during Write Mask Bit of ID Tag
M1055	ID communication complete during Write Mask Bit of ID Tag
D1050	Error details storage during Write Mask Bit of ID Tag

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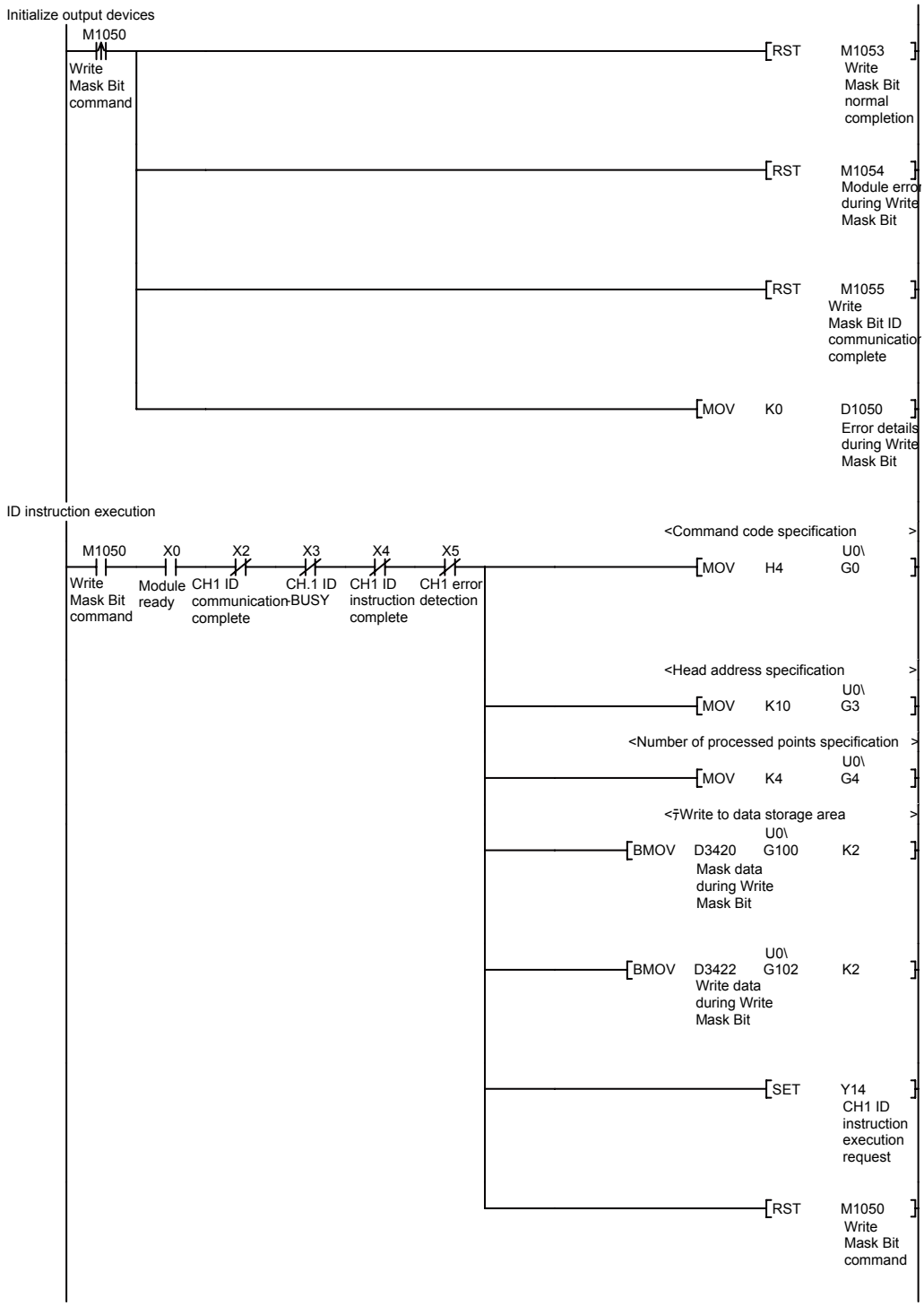
(2) Program example



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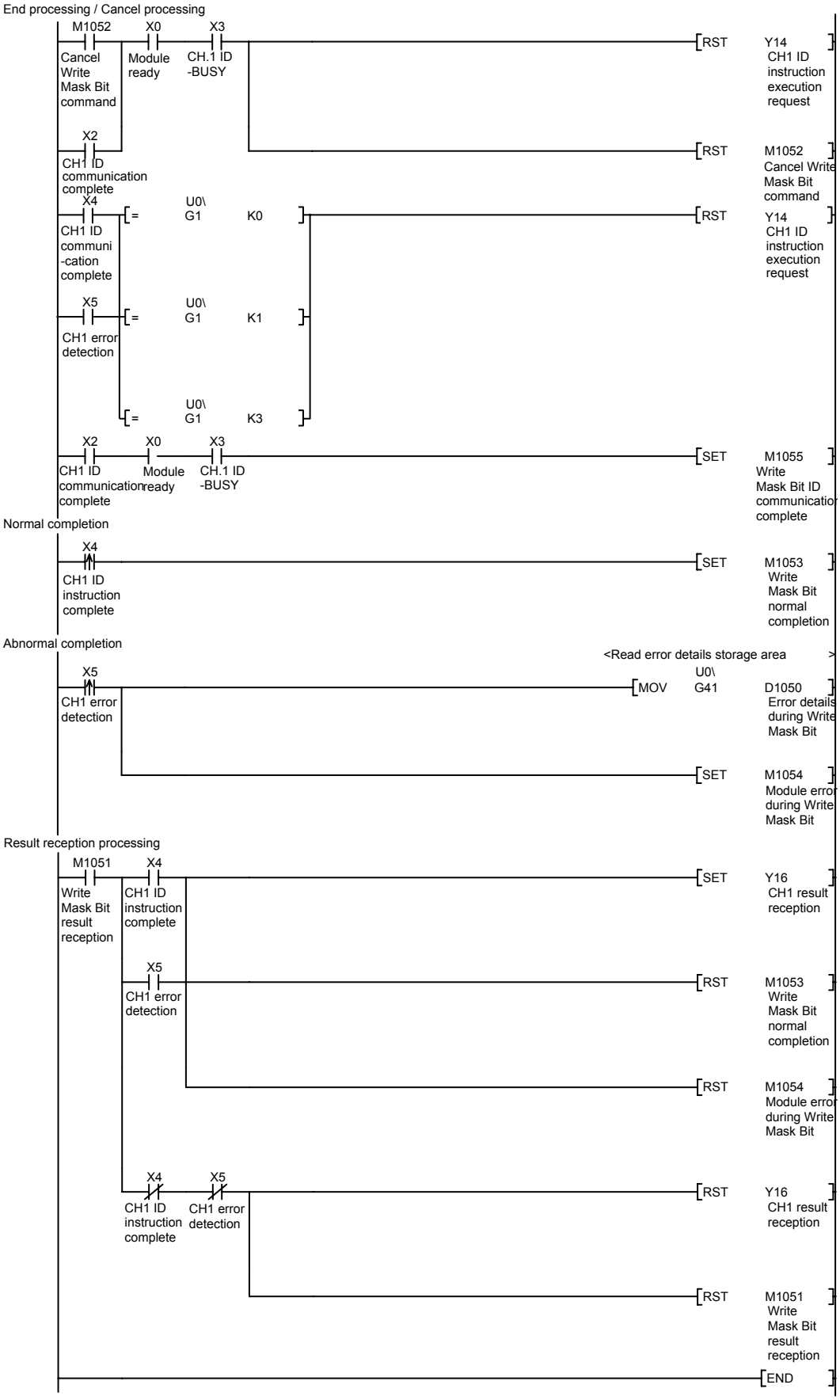
End processing / Cancel processing
M1052
Cancel Write Mask Bit command
X0
Module ready
X3
CH.1 ID -BUSY
RST
Y14
CH1 ID instruction execution request
X2
CH1 ID communication complete
RST
M1052
Cancel Write Mask Bit command
X4
CH1 ID communi -cation complete
U0\ G1 K0
RST
Y14
CH1 ID instruction execution request
X5
CH1 error detection
U0\ G1 K1
U0\ G1 K3
X2
CH1 ID communication complete
X0
Module ready
X3
CH.1 ID -BUSY
SET
M1055
Write Mask Bit ID communication complete
Normal completion
X4
CH1 ID instruction complete
SET
M1053
Write Mask Bit normal completion
Abnormal completion
<Read error details storage area >
X5
CH1 error detection
MOV
U0\ G41
D1050
Error details during Write Mask Bit
SET
M1054
Module error during Write Mask Bit
Result reception processing
M1051
Write Mask Bit result reception
X4
CH1 ID instruction complete
SET
Y16
CH1 result reception
X5
CH1 error detection
RST
M1053
Write Mask Bit normal completion
RST
M1054
Module error during Write Mask Bit
X4
CH1 ID instruction complete
X5
CH1 error detection
RST
Y16
CH1 result reception
RST
M1051
Write Mask Bit result reception
END

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6.4.7 Write calculation

The Write Calculation program is a program for writing the calculation result (data) of an addition or subtraction operation performed with ID tag data.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H5 (Write Calculation)
U0\G3	Head address specification area (CH1)	K10 (Address: 10)
U0\G4	Number of processed points specification area (CH1)	K4 (4 bytes)
U0\G5	Command option specification area (CH1)	K1 (Addition data 1)

(b) Devices used by user

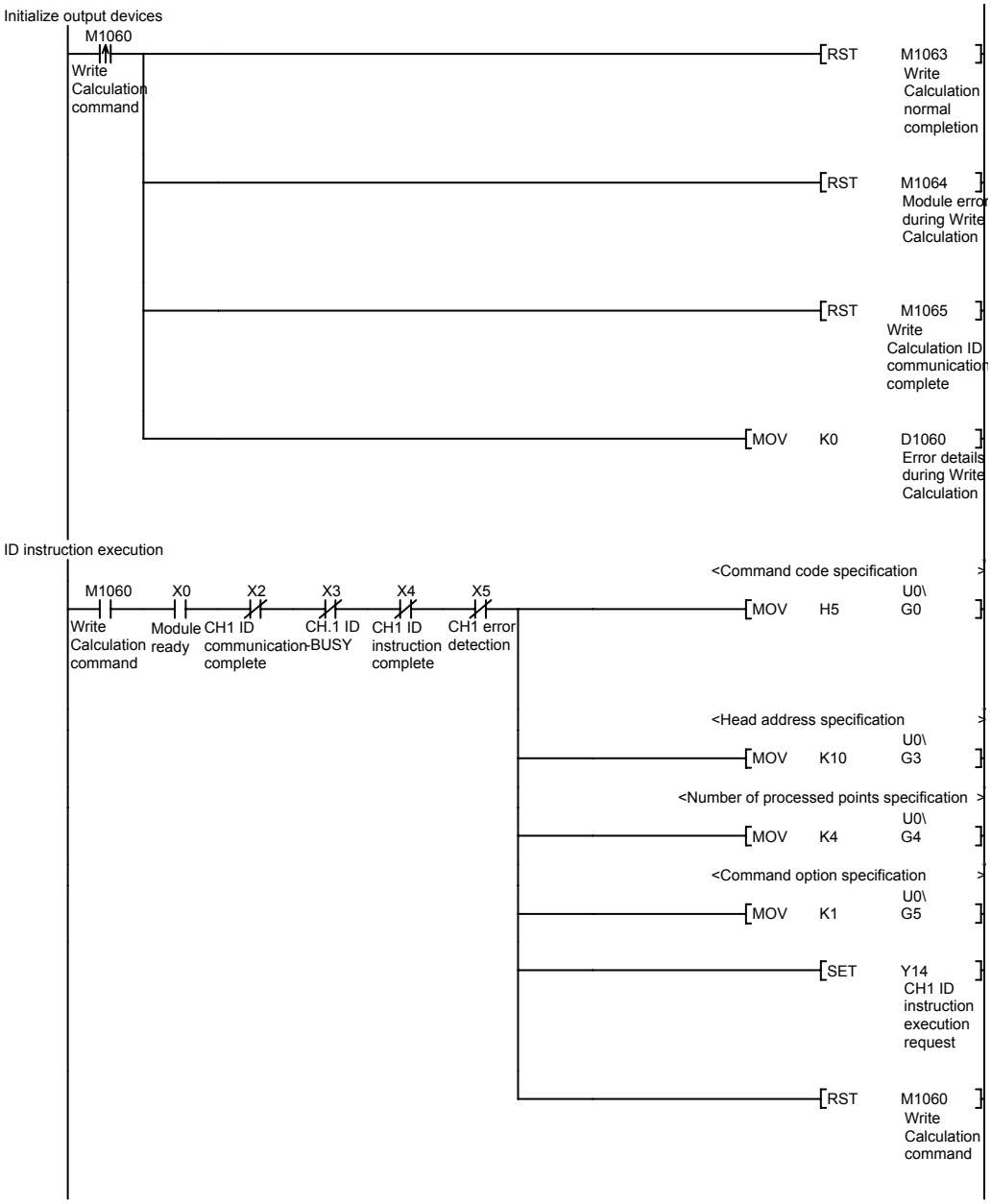
1. External inputs (commands/data)

Device	Application
M1060	Write Calculation of ID Tag command
M1061	Write Calculation of ID Tag result reception
M1062	Cancel Write Calculation of ID Tag command

2. External outputs (verification)

Device	Application
M1063	Normal completion during Write Calculation of ID Tag
M1064	Module error during Write Calculation of ID Tag
M1065	ID communication complete during Write Calculation of ID Tag
D1060	Error details storage during Write Calculation of ID Tag
D1061 to D1062	Calculation result storage during Write Calculation of ID Tag

(2) Program example



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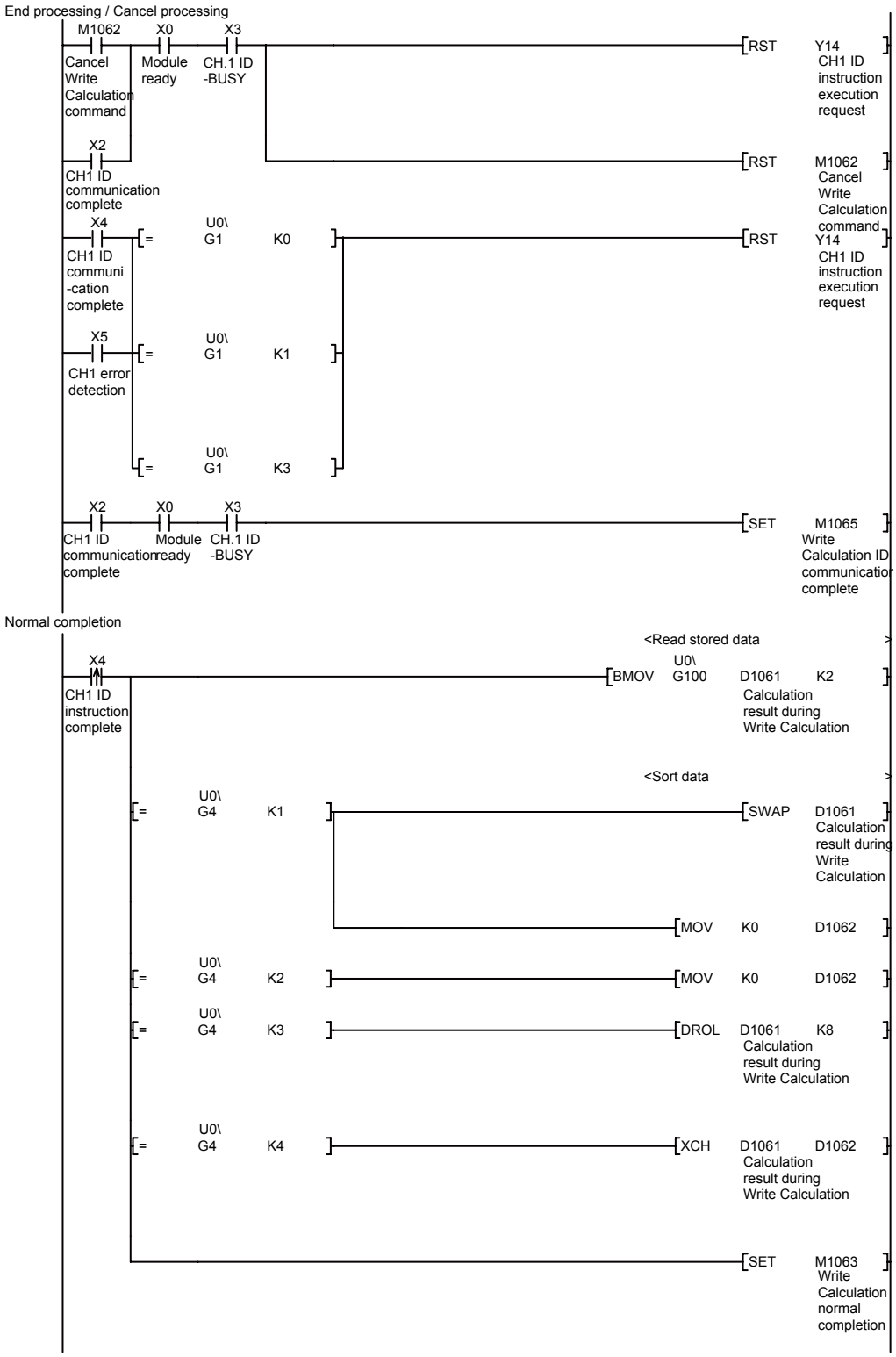
End processing / Cancel processing
M1062
Cancel Write Calculation command
X0
Module ready
X3
CH.1 ID -BUSY
RST Y14
CH1 ID instruction execution request
X2
CH1 ID communication complete
RST M1062
Cancel Write Calculation command
X4
CH1 ID communi -cation complete
U0\ G1 K0
RST Y14
CH1 ID instruction execution request
X5
CH1 error detection
U0\ G1 K1
U0\ G1 K3
X2
CH1 ID communication complete
X0
Module ready
X3
CH.1 ID -BUSY
SET M1065
Write Calculation ID communication complete
Normal completion
<Read stored data
X4
CH1 ID instruction complete
U0\ G100 BMOV D1061 K2
Calculation result during Write Calculation
<Sort data
U0\ G4 K1
SWAP D1061
Calculation result during Write Calculation
MOV K0 D1062
U0\ G4 K2
MOV K0 D1062
U0\ G4 K3
DROL D1061 K8
Calculation result during Write Calculation
U0\ G4 K4
XCH D1061 D1062
Calculation result during Write Calculation
SET M1063
Write Calculation normal completion

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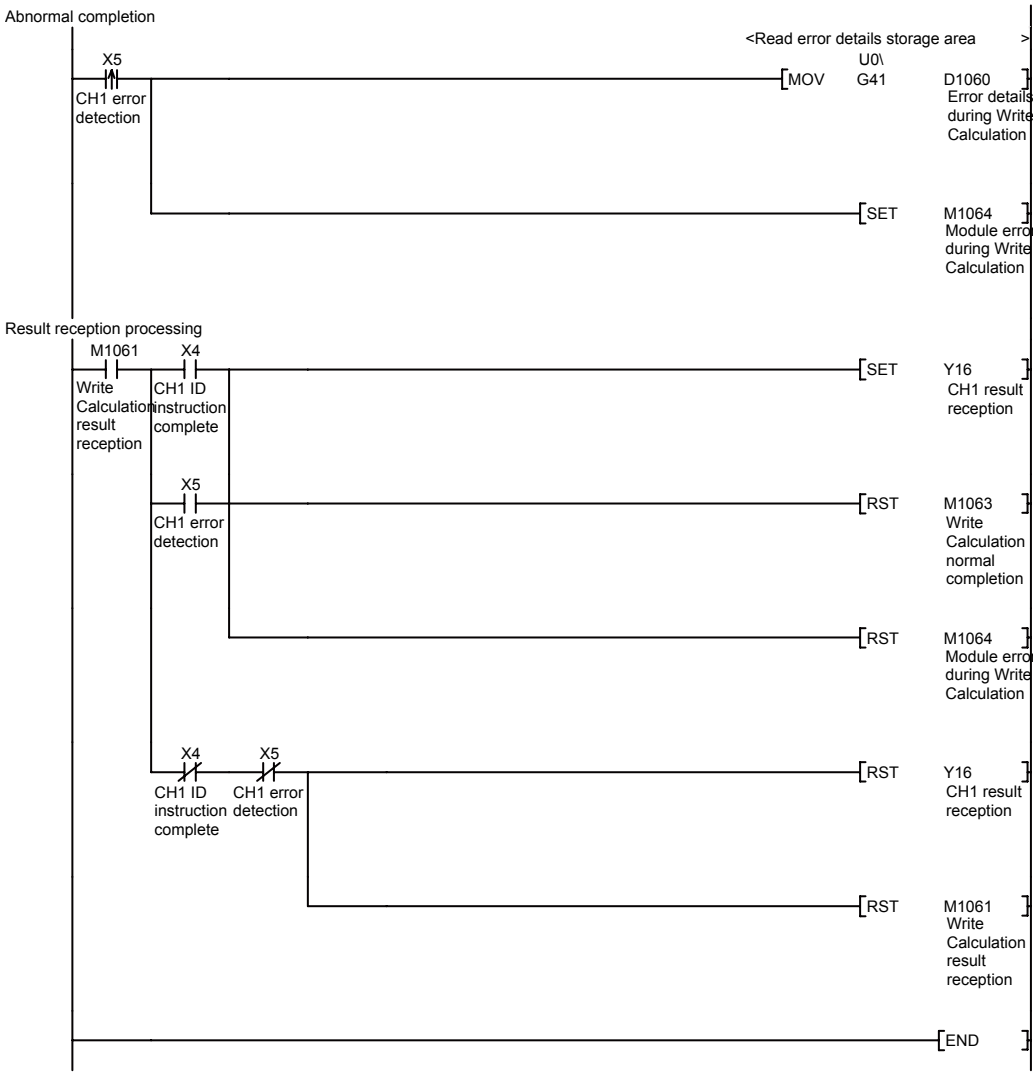
Abnormal completion
<Read error details storage area >
X5
CH1 error detection
MOV
U0\G41
D1060
Error details during Write Calculation
SET
M1064
Module error during Write Calculation
Result reception processing
M1061
Write Calculation result reception
X4
CH1 ID instruction complete
SET
Y16
CH1 result reception
X5
CH1 error detection
RST
M1063
Write Calculation normal completion
RST
M1064
Module error during Write Calculation
X4
CH1 ID instruction complete
X5
CH1 error detection
RST
Y16
CH1 result reception
RST
M1061
Write Calculation result reception
END

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6.4.8 Fill data

The Fill Data program is a program for initializing the data of an ID tag with specified data.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H6 (Fill Data)
U0\G3	Head address specification area (CH1)	K0 (Address: 0)
U0\G4	Number of processed points specification area (CH1)	K0 (All data specified)
U0\G100	Data storage area (CH1)	K0 (Fill data: 0)

(b) Devices used by user

1. External inputs (commands/data)

Device	Application
M1070	Fill Data of ID Tag command
M1071	Fill Data of ID Tag result reception
M1072	Cancel Fill Data of ID Tag command

2. External outputs (verification)

Device	Application
M1073	Normal completion during Fill Data of ID Tag
M1074	Module error during Fill Data of ID Tag
M1075	ID communication complete during Fill Data of ID Tag
D1070	Error details storage during Fill Data of ID Tag

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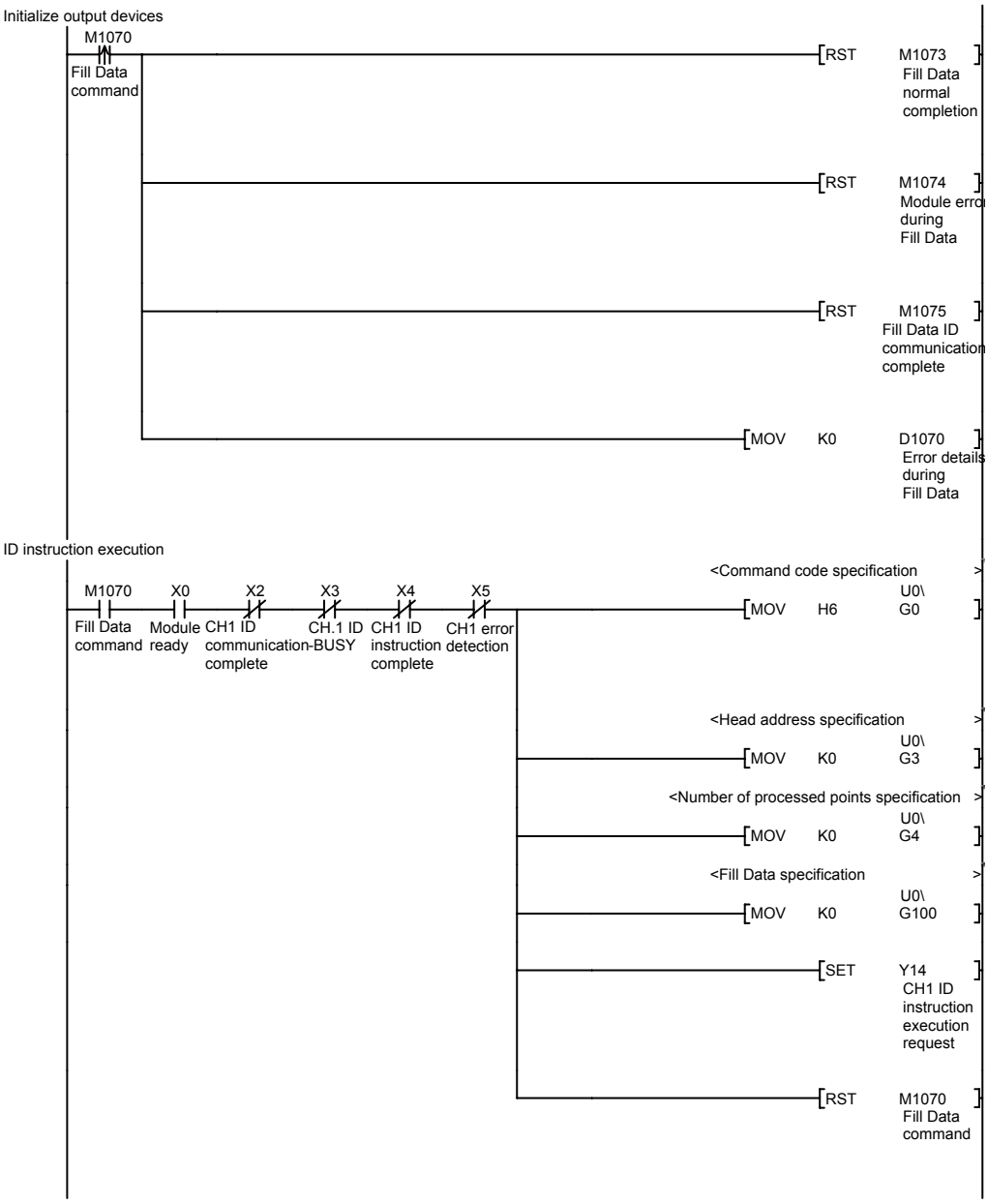
(2) Program example



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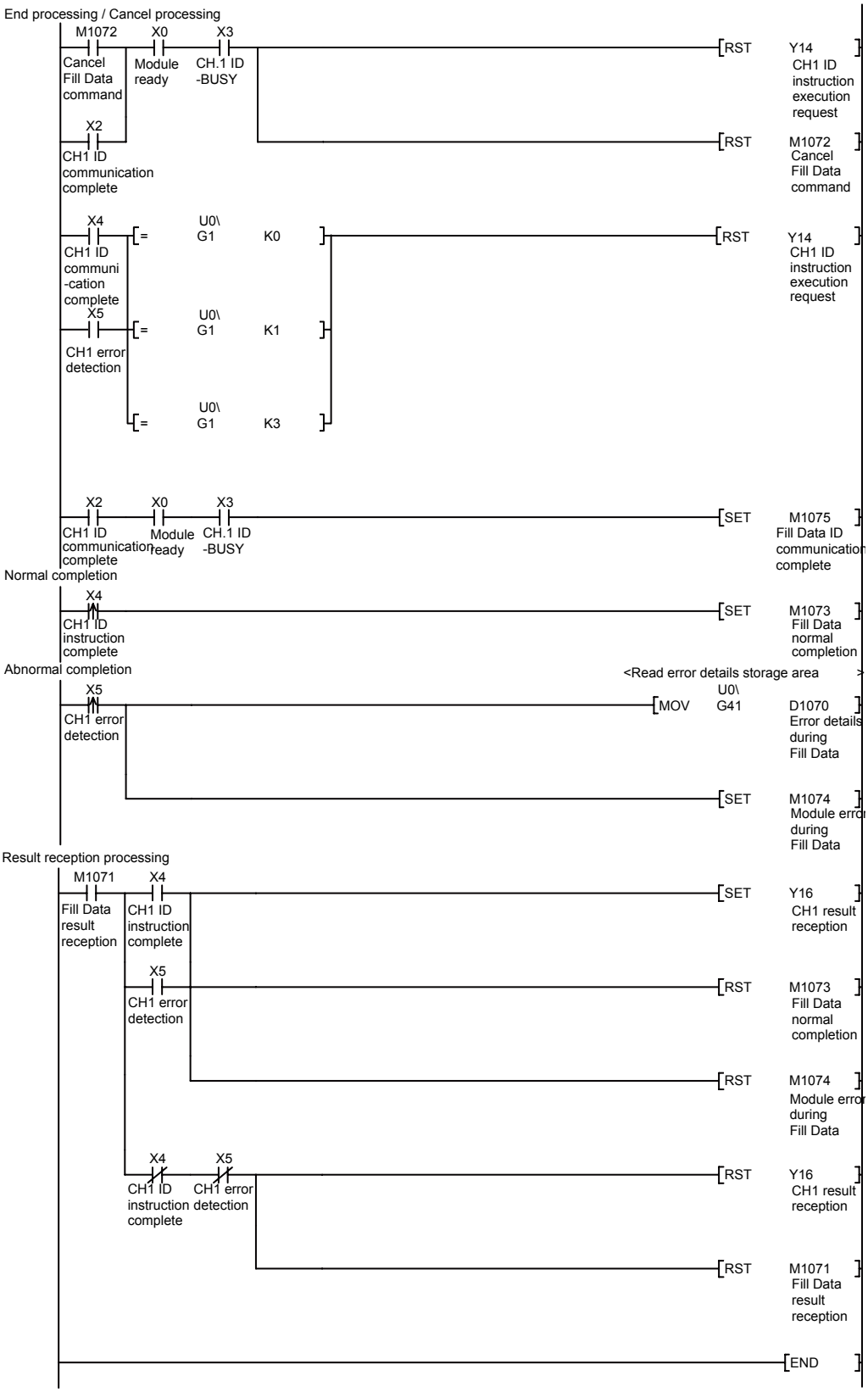
End processing / Cancel processing
M1072
Cancel Fill Data command
X0
Module ready
X3
CH.1 ID -BUSY
RST
Y14
CH1 ID instruction execution request
X2
CH1 ID communication complete
RST
M1072
Cancel Fill Data command
X4
CH1 ID communi -cation complete
U0\ G1
K0
RST
Y14
CH1 ID instruction execution request
X5
CH1 error detection
U0\ G1
K1
U0\ G1
K3
X2
CH1 ID communication complete
X0
Module ready
X3
CH.1 ID -BUSY
SET
M1075
Fill Data ID communication complete
Normal completion
X4
CH1 ID instruction complete
SET
M1073
Fill Data normal completion
Abnormal completion
<Read error details storage area >
X5
CH1 error detection
MOV
U0\ G41
D1070
Error details during Fill Data
SET
M1074
Module error during Fill Data
Result reception processing
M1071
Fill Data result reception
X4
CH1 ID instruction complete
SET
Y16
CH1 result reception
X5
CH1 error detection
RST
M1073
Fill Data normal completion
RST
M1074
Module error during Fill Data
X4
CH1 ID instruction complete
X5
CH1 error detection
RST
Y16
CH1 result reception
RST
M1071
Fill Data result reception
END

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6.4.9 Check data

The Check Data program is a program for checking if an error occurred in the data of an ID tag. The program writes data and data check code to the ID tag.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H7 (Check Data)
U0\G3	Head address specification area (CH1)	K10 (Address: 0)
U0\G4	Number of processed points specification area (CH1)	K10 (10 bytes)

(b) Devices used by user

1. External inputs (commands/data)

Device	Application
M1080	Check Data of ID Tag command
M1081	Cancel Check Data of ID Tag command

2. External outputs (verification)

Device	Application
M1082	Normal completion during Check Data of ID Tag
M1083	Module error during Check Data of ID Tag
D1080	Error details storage during Check Data of ID Tag

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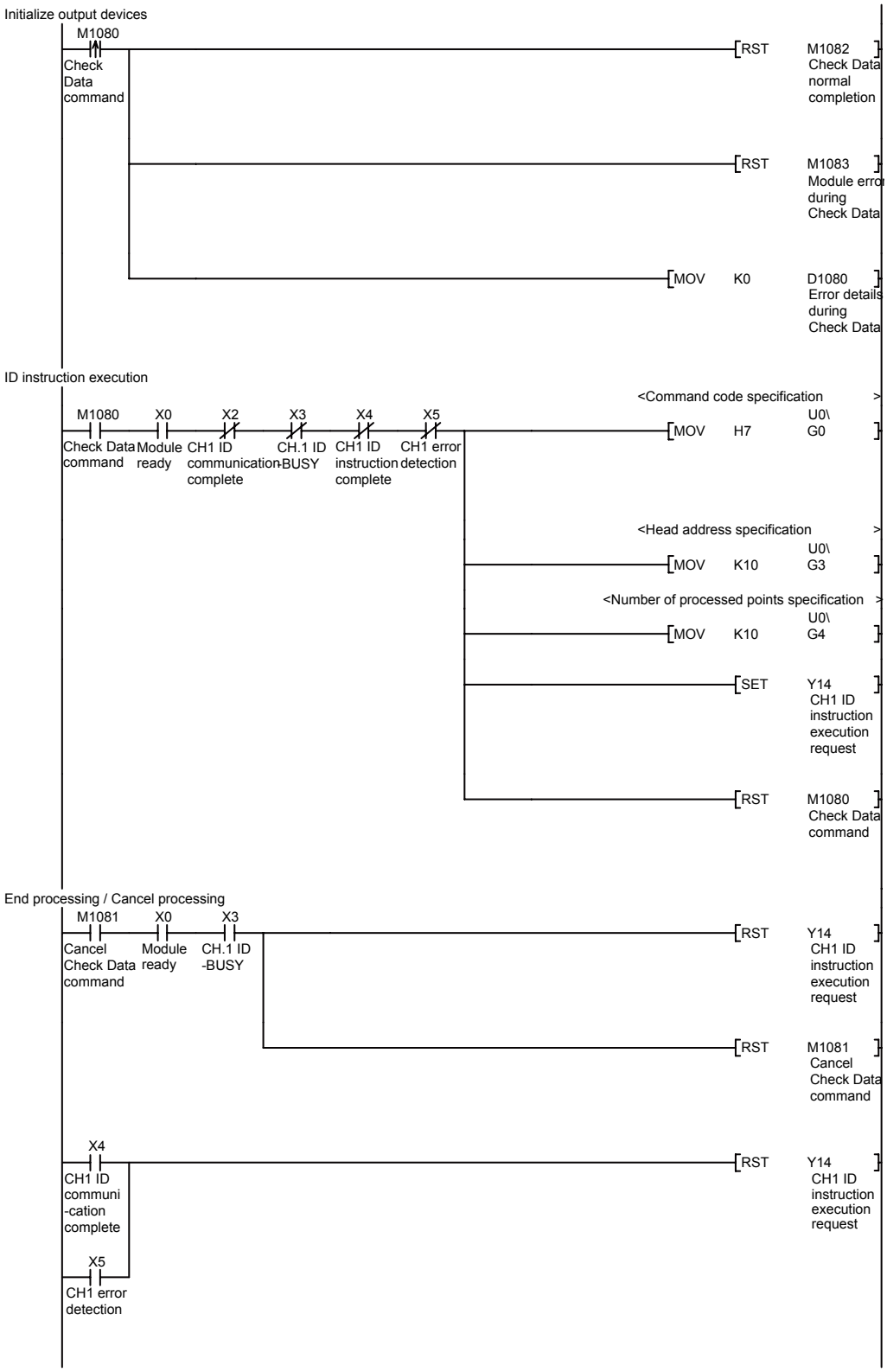
(2) Program example



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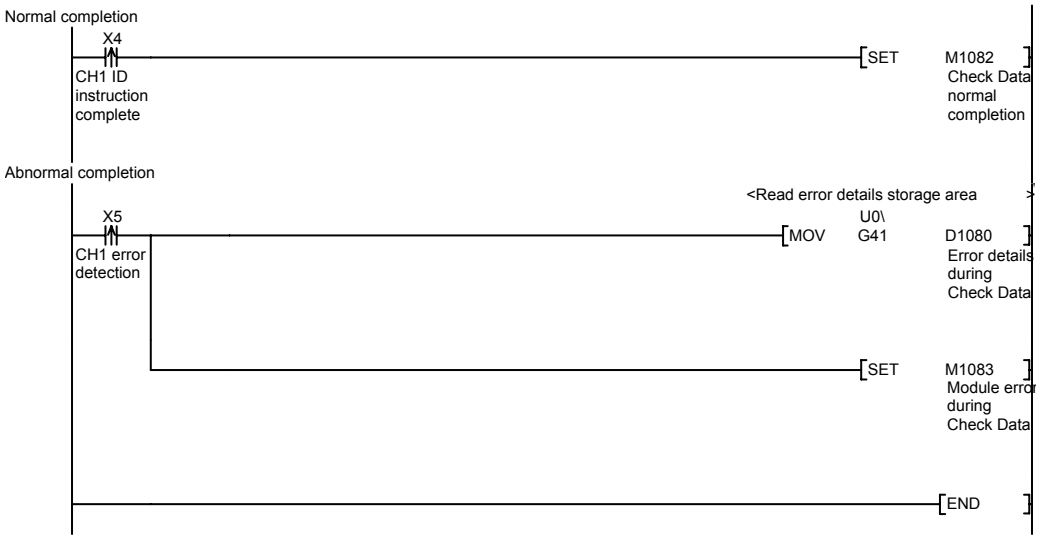
Normal completion
X4
CH1 ID instruction complete
SET
M1082
Check Data normal completion
Abnormal completion
<Read error details storage area
X5
CH1 error detection
MOV
U0\G41
D1080
Error details during Check Data
SET
M1083
Module error during Check Data
END

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6.4.10 Control number of writes

The Control Number of Writes program is a program for writing to an ID tag the number of writes to EEPROM-type ID tags, and assessing whether or not the number of writes of the ID tag has been exceeded.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H8 (Control Number of Writes)
U0\G3	Head address specification area (CH1)	K10 (Address: 10)
U0\G5	Command option specification area (CH1)	K5 (Number of times added: 5)

(b) Devices used by user

1. External inputs (commands/data)

Device	Application
M1090	Control Number of Writes of ID Tag command
M1091	Cancel Control Number of Writes of ID Tag command

2. External outputs (verification)

Device	Application
M1092	Normal completion during Control Number of Writes of ID Tag
M1093	Module error during Control Number of Writes of ID Tag
D1090	Error details storage during Control Number of Writes of ID Tag
D1091 to D1092	Number of writes calculation result storage during Control Number of Writes of ID Tag

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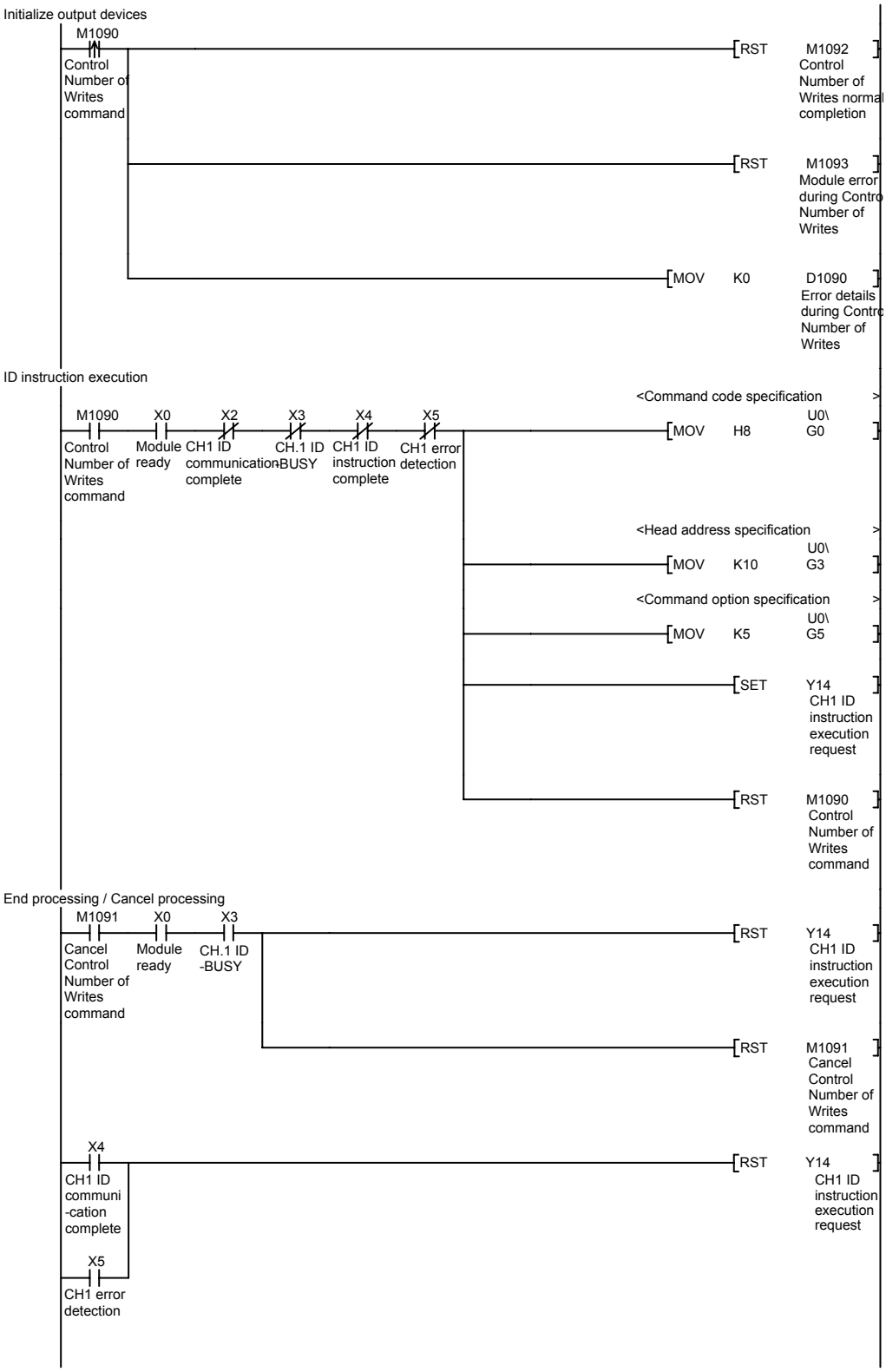
(2) Program example



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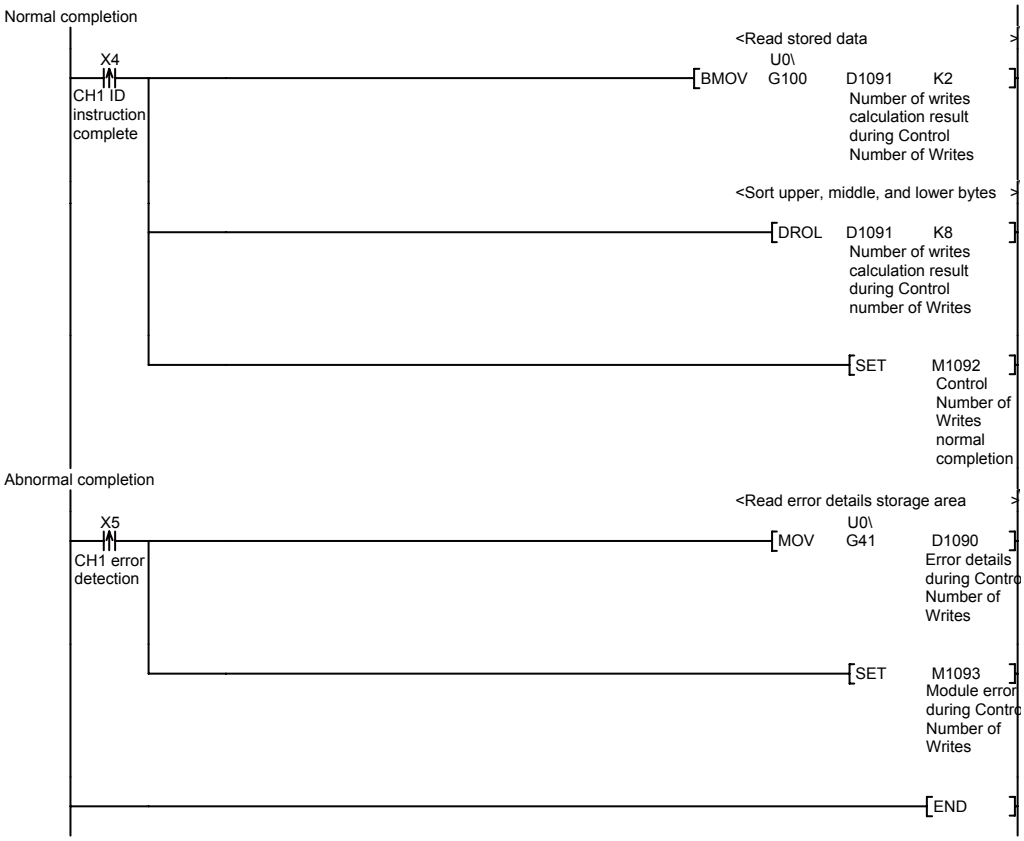
Normal completion
<Read stored data
X4
U0\
BMOV G100 D1091 K2
CH1 ID instruction complete
Number of writes calculation result during Control
Number of Writes
<Sort upper, middle, and lower bytes
DROL D1091 K8
Number of writes calculation result during Control number of Writes
SET M1092
Control Number of Writes normal completion
Abnormal completion
<Read error details storage area
X5
U0\
MOV G41 D1090
CH1 error detection
Error details during Contro
Number of Writes
SET M1093
Module error during Contro
Number of Writes
END

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6.4.11 Copy

The Copy program is a program for copying data of an ID tag between Channel 1 and Channel 2.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H9 (Copy)
U0\G3	Head address specification area (CH1)	K10 (Copy source head address: 10)
U0\G4	Number of processed points specification area (CH1)	K100 (100 bytes)
U0\G5	Command option specification area (CH1)	K110 (Copy destination head address: 110)

(b) Devices used by user

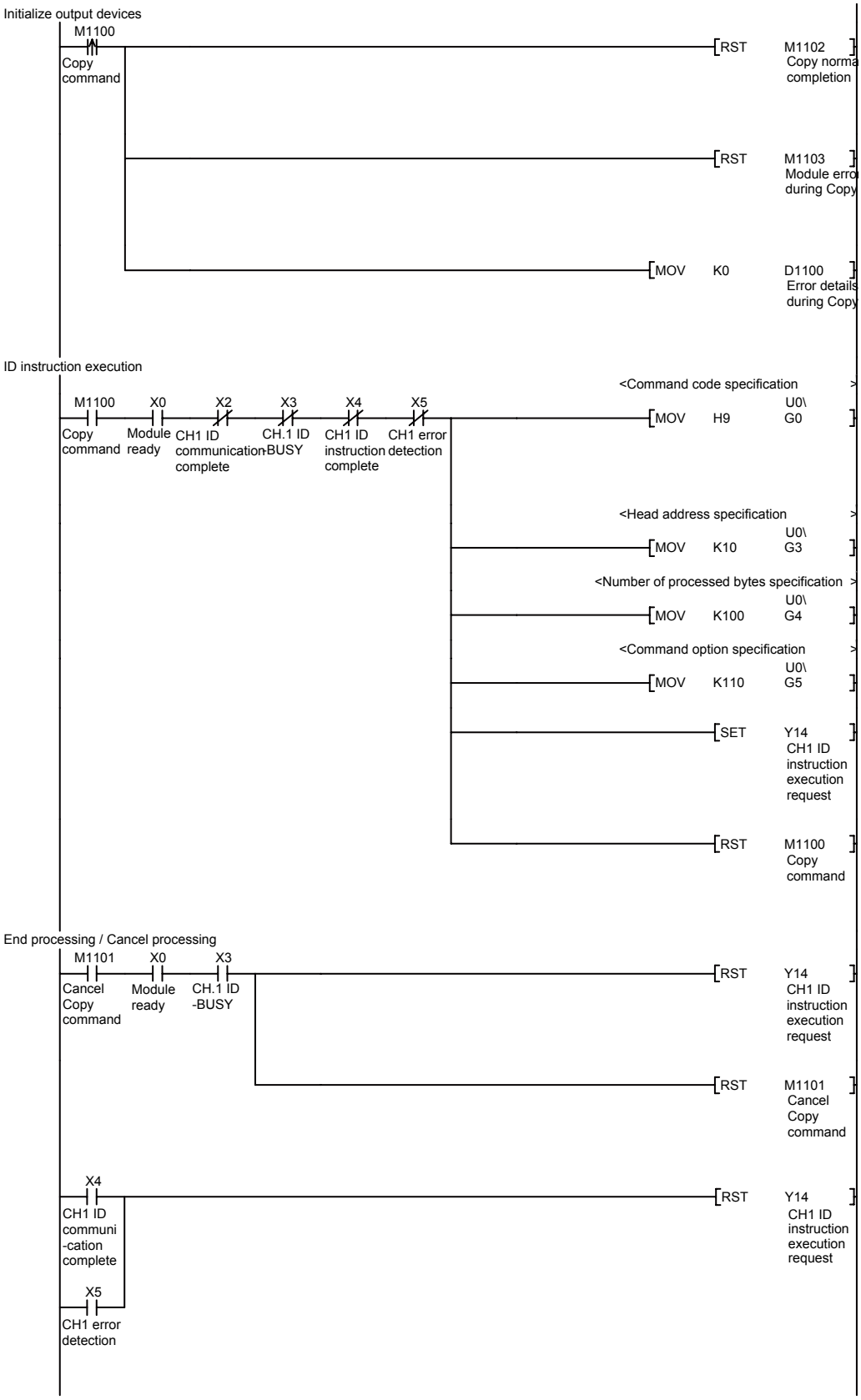
1. External inputs (commands/data)

Device	Application
M1100	Copy Between ID Tags command
M1101	Cancel Copy Between ID Tags command

2. External outputs (verification)

Device	Application
M1102	Normal completion during Copy Between ID Tags
M1103	Module error during Copy Between ID Tags
D1100	Error details storage during Copy Between ID Tags

(2) Program example



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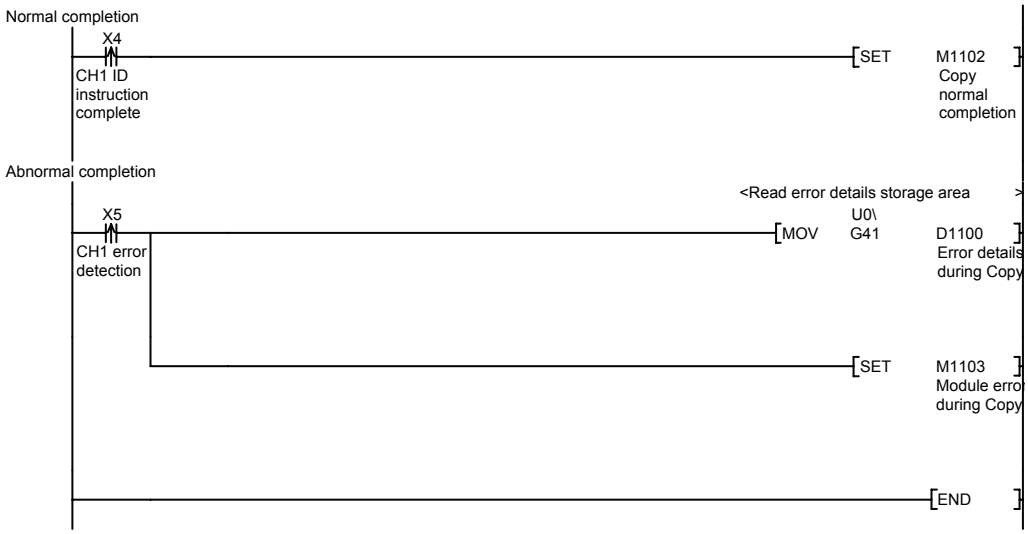
Normal completion
X4
CH1 ID instruction complete
SET M1102 Copy normal completion
Abnormal completion
<Read error details storage area >
X5
CH1 error detection
MOV U0\G41 D1100 Error details during Copy
SET M1103 Module error during Copy
END

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6.4.12 Read with error correction

The Read with Error Correction program is a program for reading data and check code from an ID tag, inspecting data reliability, and correcting one bit errors.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	HA (Read with Error Correction)
U0\G3	Head address specification area (CH1)	K10 (Address: 10)
U0\G4	Number of processed points specification area (CH1)	K8 (8 bytes)

(b) Devices used by user

1. External inputs (commands/data)

Device	Application
M1110	Read with Error Correction of ID Tag command
M1111	Read with Error Correction of ID Tag result reception
M1112	Cancel Read with Error Correction of ID Tag command

2. External outputs (verification)

Device	Application
M1113	Normal completion during Read with Error Correction of ID Tag
M1114	Module error during Read with Error Correction of ID Tag
M1115	ID communication complete during Read with Error Correction of ID Tag
D1110	Error details storage during Read with Error Correction of ID Tag
D1200 to D1203	Read data storage during Read with Error Correction of ID Tag

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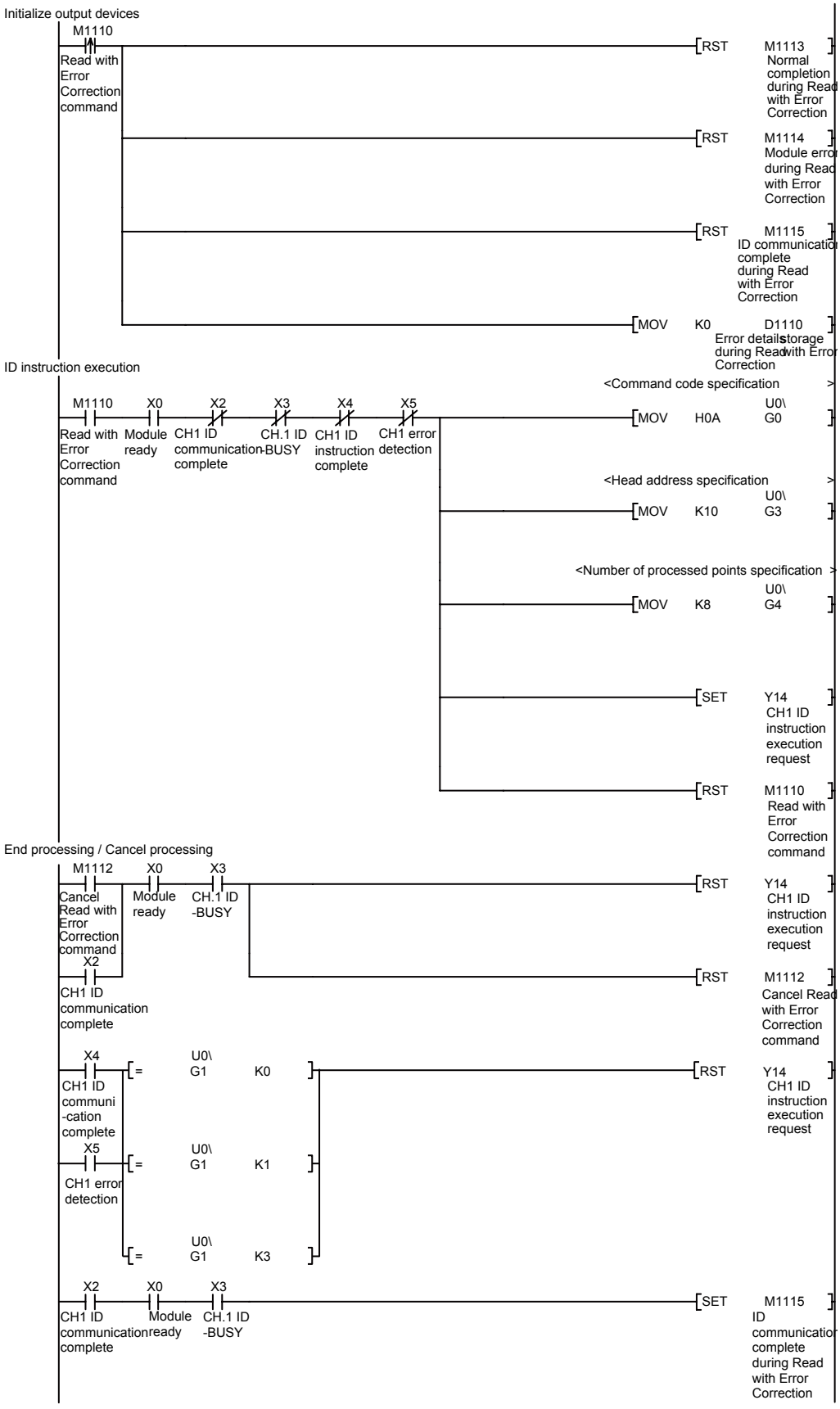
(2) Program example



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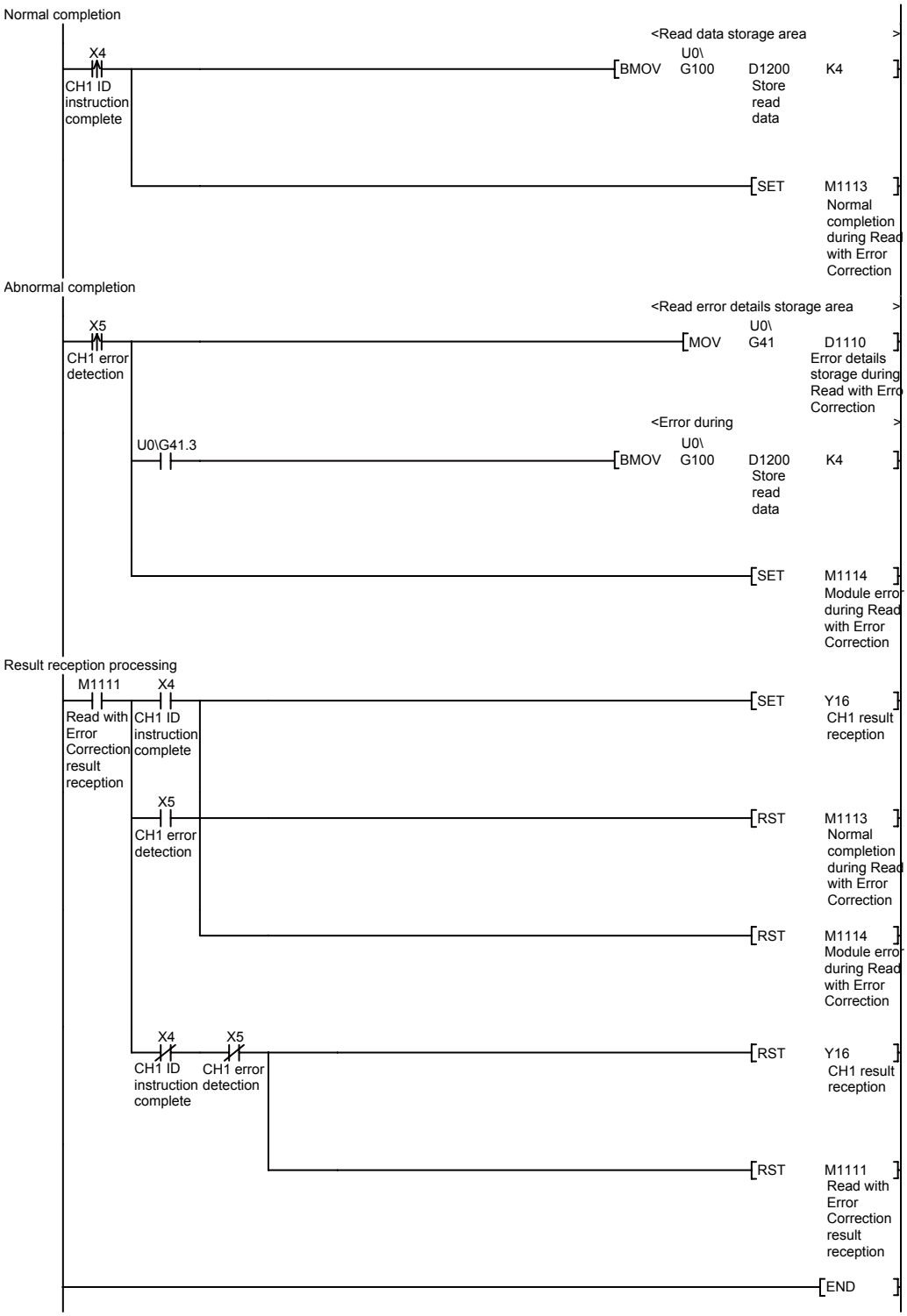
Normal completion
<Read data storage area >
X4
U0\
CH1 ID instruction complete
BMOV G100 D1200 K4
Store read data
SET M1113
Normal completion during Read with Error Correction
Abnormal completion
<Read error details storage area >
X5
U0\
CH1 error detection
MOV G41 D1110
Error details storage during Read with Error Correction
<Error during >
U0\G41.3
U0\
BMOV G100 D1200 K4
Store read data
SET M1114
Module error during Read with Error Correction
Result reception processing
M1111
X4
Read with Error Correction result reception
CH1 ID instruction complete
SET Y16
CH1 result reception
X5
CH1 error detection
RST M1113
Normal completion during Read with Error Correction
RST M1114
Module error during Read with Error Correction
X4
X5
CH1 ID instruction complete
CH1 error detection
RST Y16
CH1 result reception
RST M1111
Read with Error Correction result reception
END

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6.4.13 Write with error correction

The Write with Error Correction program is a program for writing data and data reliability inspection check code to an ID tag.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	HB (Write with Error Correction)
U0\G3	Head address specification area (CH1)	K10 (Address: 10)
U0\G4	Number of processed points specification area (CH1)	K8 (8 bytes)

(b) Devices used by user

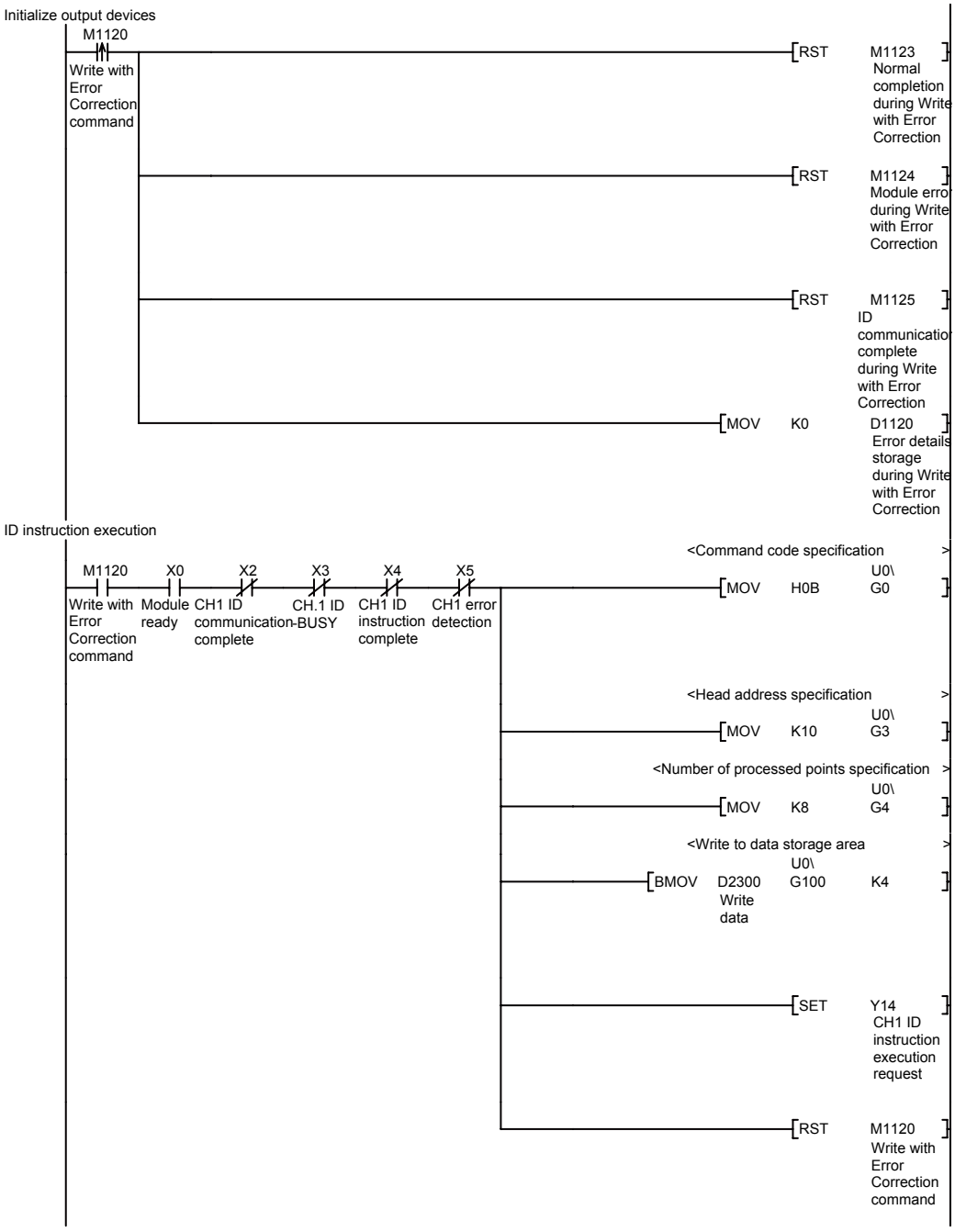
1. External inputs (commands/data)

Device	Application
M1120	Write with Error Correction of ID Tag command
M1121	Write with Error Correction of ID Tag result reception
M1122	Cancel Write with Error Correction of ID Tag command
D2300 to D2303	Specifies data to be written to ID tag during Write with Error Correction of ID Tag

2. External outputs (verification)

Device	Application
M1123	Normal completion during Write with Error Correction of ID Tag
M1124	Module error during Write with Error Correction of ID Tag
M1125	ID communication complete during Write with Error Correction of ID Tag
D1120	Error details storage during Write with Error Correction of ID Tag

(2) Program example



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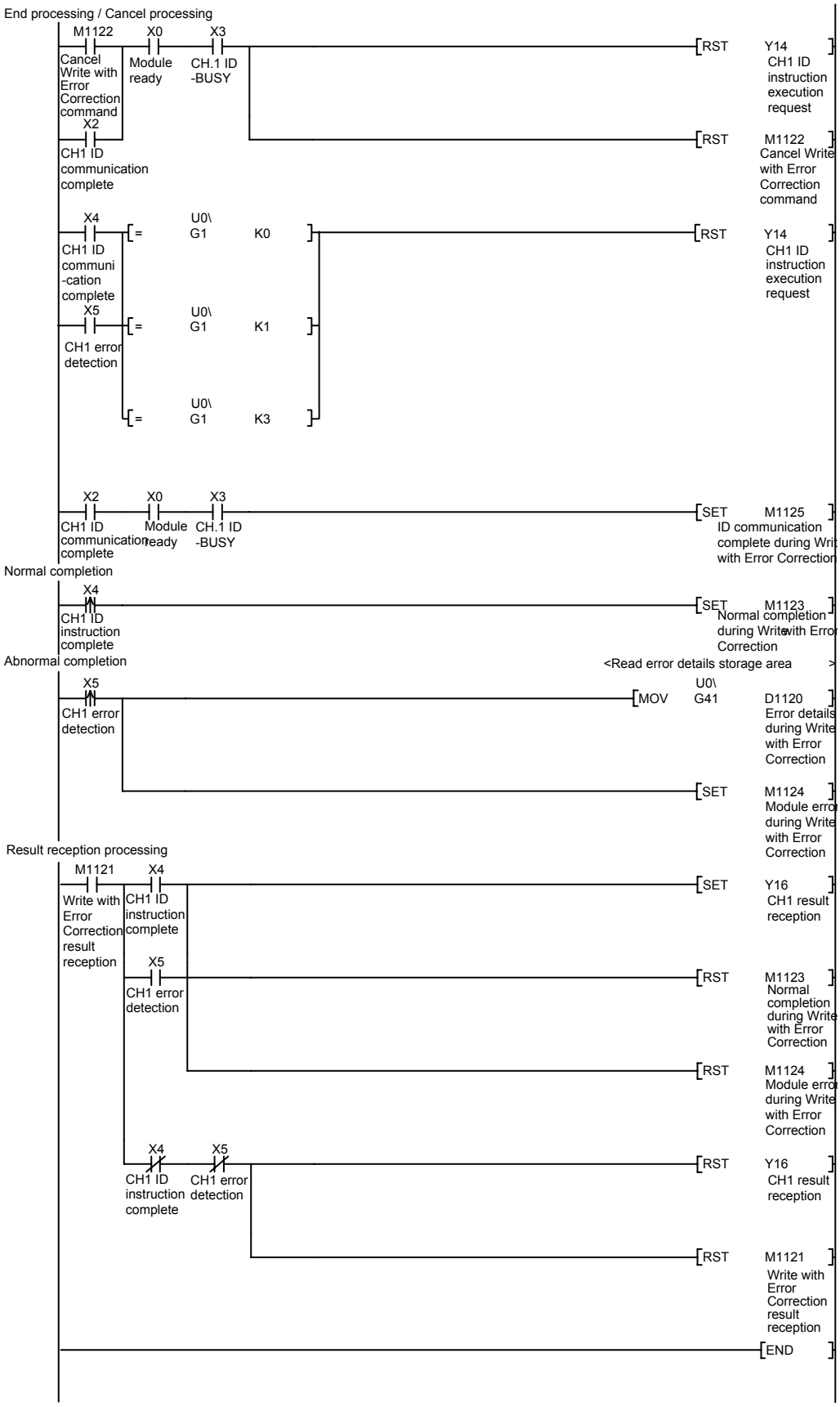
End processing / Cancel processing
M1122
Cancel Write with Error Correction command
X0
Module ready
X3
CH.1 ID -BUSY
RST Y14
CH1 ID instruction execution request
X2
CH1 ID communication complete
RST M1122
Cancel Write with Error Correction command
X4
CH1 ID communi -cation complete
= U0\ G1 K0
RST Y14
CH1 ID instruction execution request
X5
CH1 error detection
= U0\ G1 K1
= U0\ G1 K3
X2
CH1 ID communication complete
X0
Module ready
X3
CH.1 ID -BUSY
SET M1125
ID communication complete during Writ with Error Correction
Normal completion
X4
CH1 ID instruction complete
SET M1123
Normal completion during Write with Error Correction
Abnormal completion
<Read error details storage area >
X5
CH1 error detection
MOV U0\ G41 D1120
Error details during Write with Error Correction
SET M1124
Module error during Write with Error Correction
Result reception processing
M1121
Write with Error Correction result reception
X4
CH1 ID instruction complete
SET Y16
CH1 result reception
X5
CH1 error detection
RST M1123
Normal completion during Write with Error Correction
RST M1124
Module error during Write with Error Correction
X4
CH1 ID instruction complete
X5
CH1 error detection
RST Y16
CH1 result reception
RST M1121
Write with Error Correction result reception
END

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6.4.14 Read UID

The Read UID program is a program for reading the UID (unit identification number) of an ID tag.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	HC (Read UID)

(b) Devices used by user

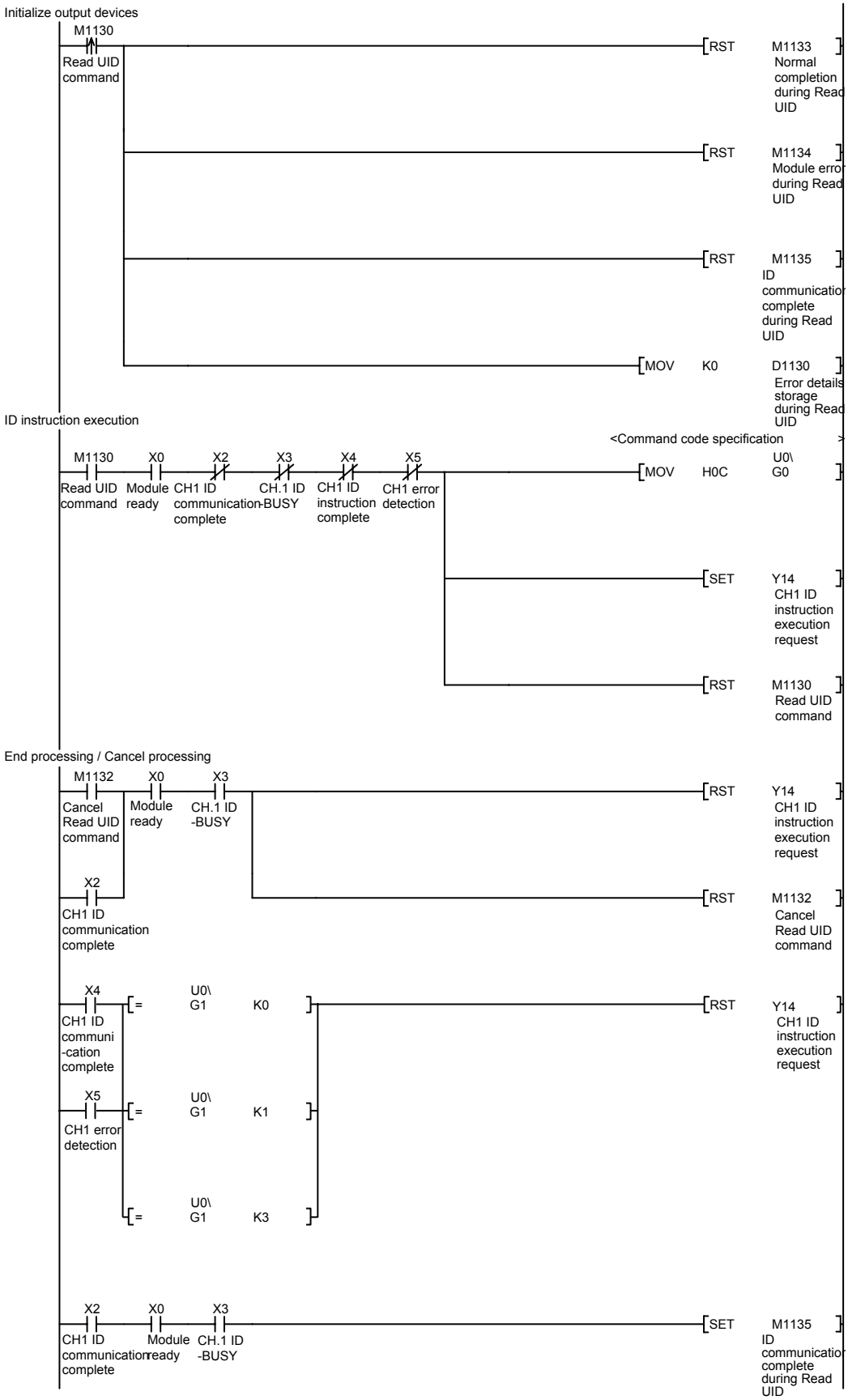
1. External inputs (commands)

Device	Application
M1130	Read UID of ID Tag command
M1131	Read UID of ID Tag result reception
M1132	Cancel Read UID of ID Tag command

2. External outputs (verification)

Device	Application
M1133	Normal completion during Read UID of ID Tag
M1134	Module error during Read UID of ID Tag
M1135	ID communication complete during Read UID of ID Tag
D1130	Error details storage during Read UID of ID Tag
D1131 to D1134	ID tag UID storage during Read UID of ID Tag

(2) Program example



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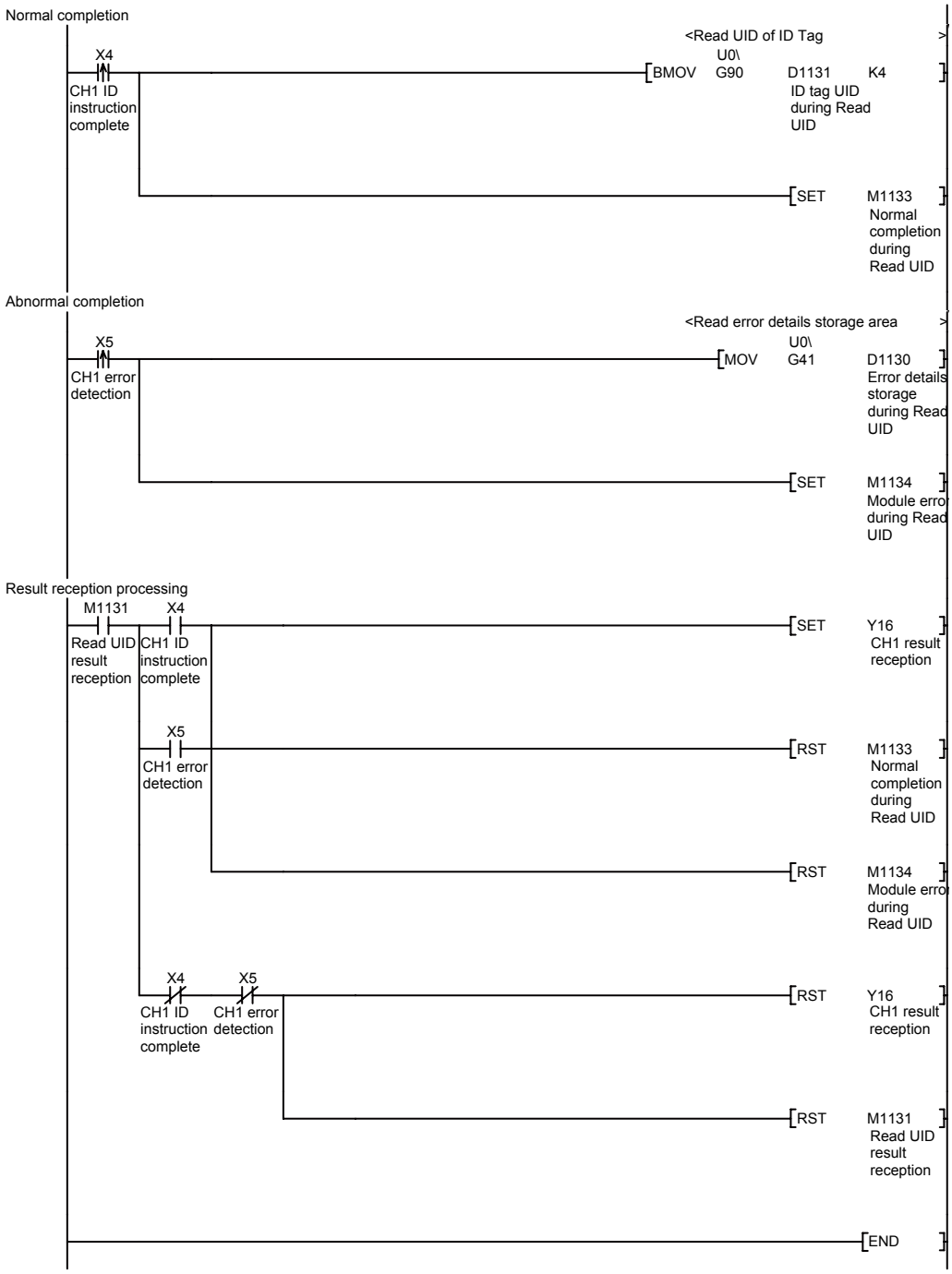
Normal completion
<Read UID of ID Tag >
X4
CH1 ID instruction complete
U0\G90
BMOV
D1131
ID tag UID during Read UID
K4
SET
M1133
Normal completion during Read UID
Abnormal completion
<Read error details storage area >
X5
CH1 error detection
U0\G41
MOV
D1130
Error details storage during Read UID
SET
M1134
Module error during Read UID
Result reception processing
M1131
Read UID result reception
X4
CH1 ID instruction complete
SET
Y16
CH1 result reception
X5
CH1 error detection
RST
M1133
Normal completion during Read UID
RST
M1134
Module error during Read UID
X4
CH1 ID instruction complete
X5
CH1 error detection
RST
Y16
CH1 result reception
RST
M1131
Read UID result reception
END

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6.4.15 Measure noise

The Measure Noise program is a program for measuring the noise environment surrounding an antenna.

(1) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents
U0\G0	Command code specification area (CH1)	H10 (Measure Noise)

(b) Devices used by user

1. External inputs (commands)

Device	Application
M1140	Measure Noise command

2. External outputs (verification)

Device	Application
M1141	Normal completion during Measure Noise
M1142	Module error during Measure Noise
D1140	Error details storage during Measure Noise
D1141 to D1143	Measurement result storage during Measure Noise

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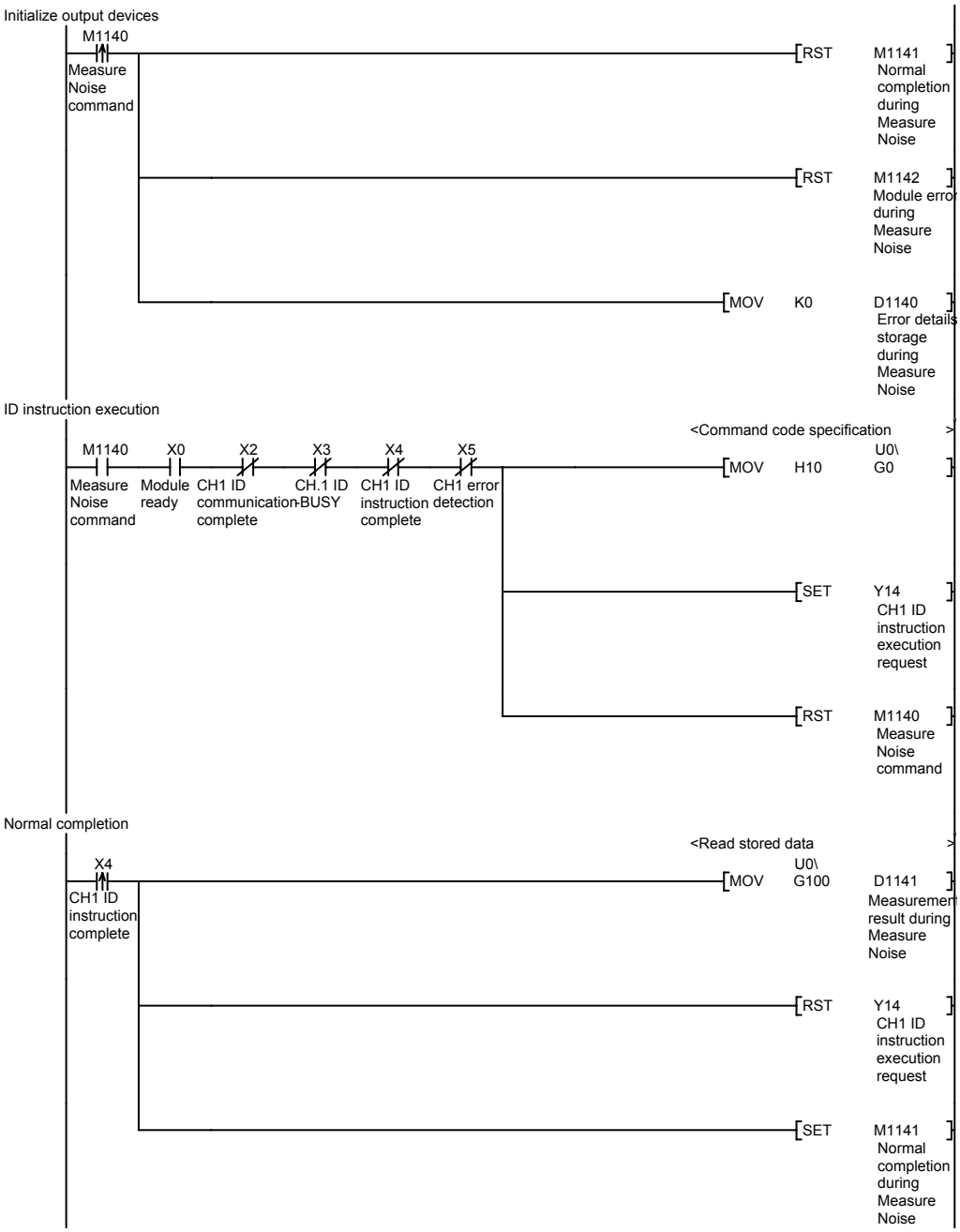
(2) Program example



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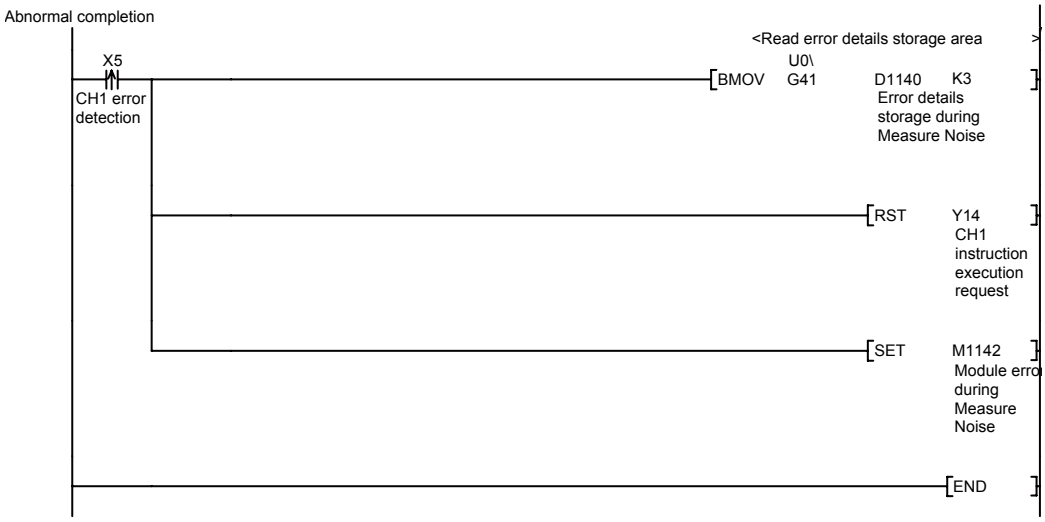
Abnormal completion
<Read error details storage area
X5
CH1 error detection
U0\
BMOV G41 D1140 K3
Error details storage during Measure Noise
RST Y14
CH1 instruction execution request
SET M1142
Module error during Measure Noise
END

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6.4.16 Read module status

The Read Module Status program is a program for reading the module status, monitoring result monitor, and the like.

(1) Program conditions

(a) Read contents

Intelligent Function Module Device Address	Buffer Memory Name
U0\G40	Module status storage area (CH1)
U0\G42	Processing result monitor storage area (CH1)
U0\G90 to U0\G93	ID tag UID storage area (CH1)
U0\G4040	Module status storage area (CH2)
U0\G4042	Processing result monitor storage area (CH2)
U0\G4090 to U0\G4093	ID tag UID storage area (CH2)

(b) Devices used by user

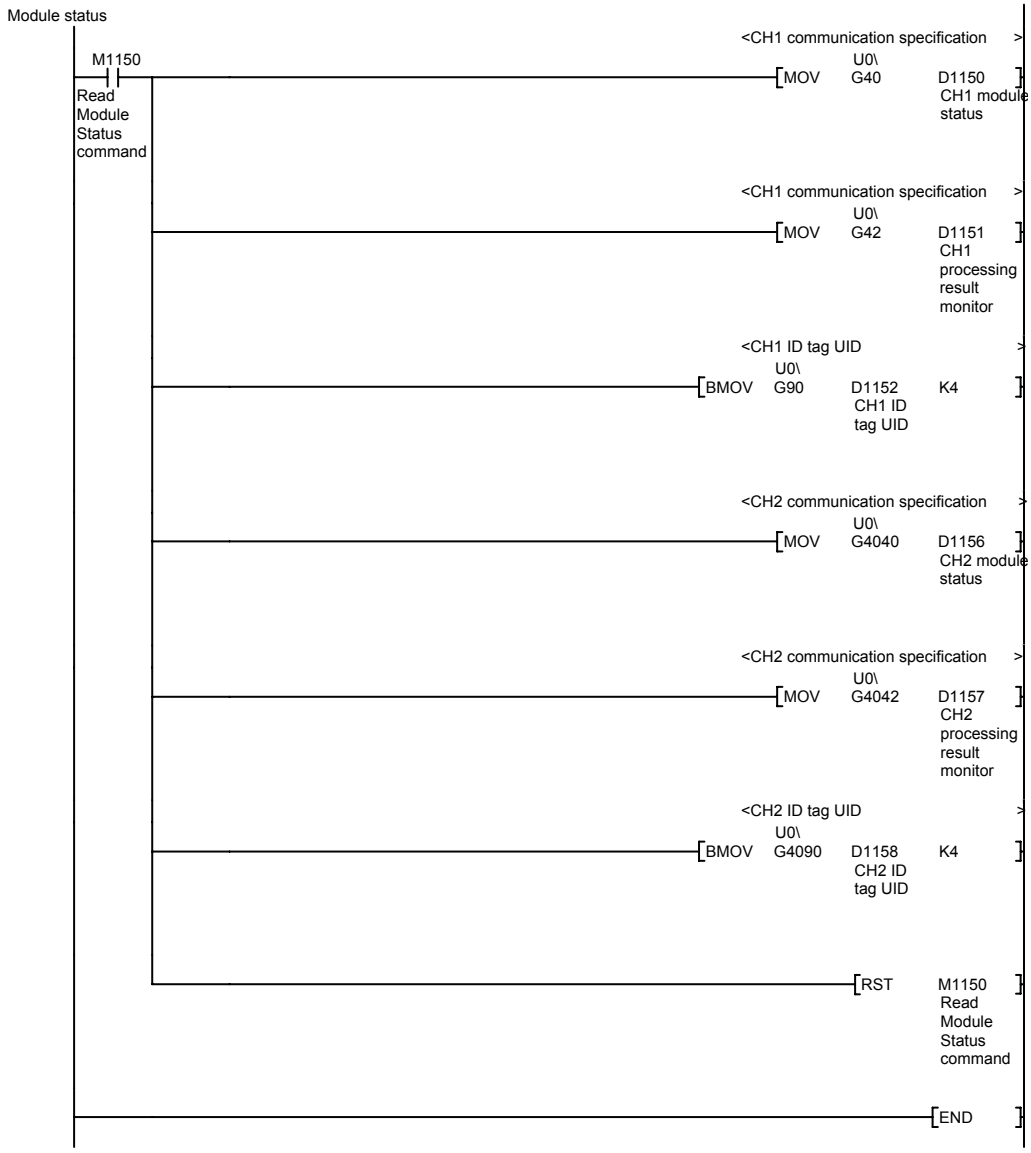
1. External inputs (commands)

Device	Application
M1150	Read Module Status command

2. External outputs (verification)

Device	Application
D1150	CH1 module status storage during Read Module Status
D1151	Ch1 processing result monitor storage during Read Module Status
D1152 to D1155	CH1 ID tag UID storage during Read Module Status
D1156	CH2 module status storage during Read Module Status
D1157	Ch2 processing result monitor storage during Read Module Status
D1158 to D1161	CH2 ID tag UID storage during Read Module Status

(2) Program example



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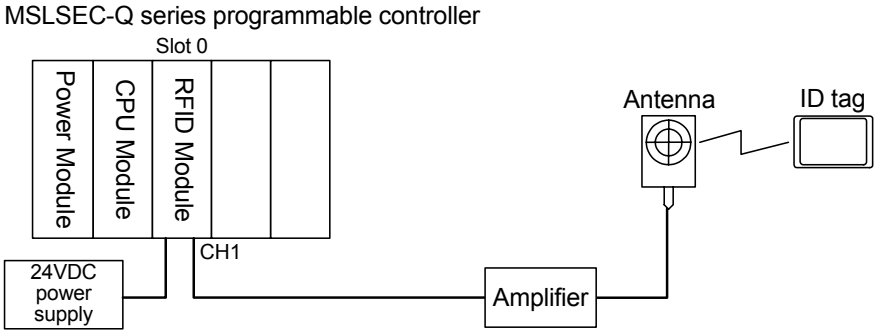
6.5 Specialized Sample Program for Read/Write of ID Tags with the Trigger Communication

The following describes a simple and versatile sample program specialized for reading data from and writing data to an ID tag with the trigger communication.

6.5.1 Sample program

(1) System configuration



(2) Operating conditions

Mounting and connection of the RFID module	Mount the RFID module to slot 0 of the MELSEC-Q programmable controller and connect the amplifier and the antenna to channel 1 for communication with ID tags.
Communication method	Trigger
Reading data from an ID tag	By turning on the Read command signal (M1010), the 8 bytes of data from address 10 to address 17 of the ID tag are read and stored in the CPU module's data register D1200 to D1203.
Writing data to an ID tag	By turning on the Write command signal (M1020), the 8 bytes of data stored in the CPU module's data register D2300 to D2303 are written to address 20 to address 27 of the ID tag.

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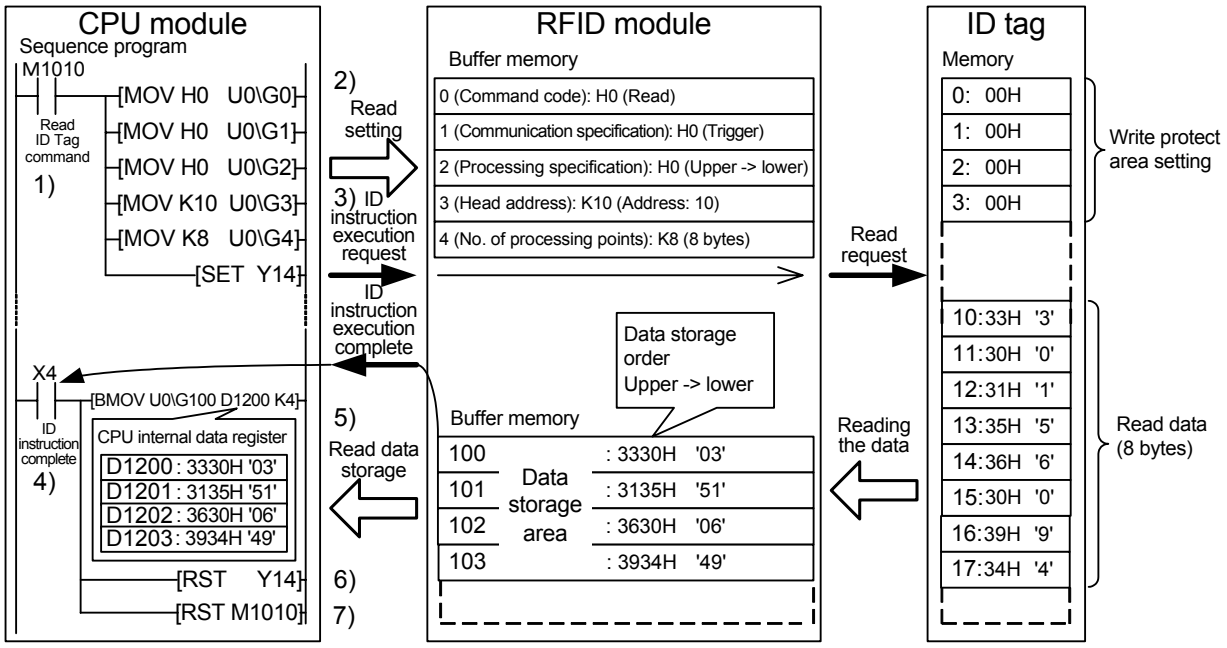
(3) Explanation of the operation

(a) Reading from ID tags



1) By turning on the Read ID Tag command signal (M1010), the subsequent Read program is executed.
2) The Read command and the data required for reading are set in the buffer memory (Un\G0 to G4) of the RFID module.
3) The ID instruction execution request (Y14) turns on.
4) The data is read from the ID tag and the ID instruction complete signal (X4) turns on when reading ends normally.
5) The data read from the data storage area (starting from U0\G100) in the buffer memory are transferred to the CPU module's data register D1200 to D1203.
6) The ID instruction execution request (Y14) turns off.
7) The Read ID Tag command signal (M1010) turns off.

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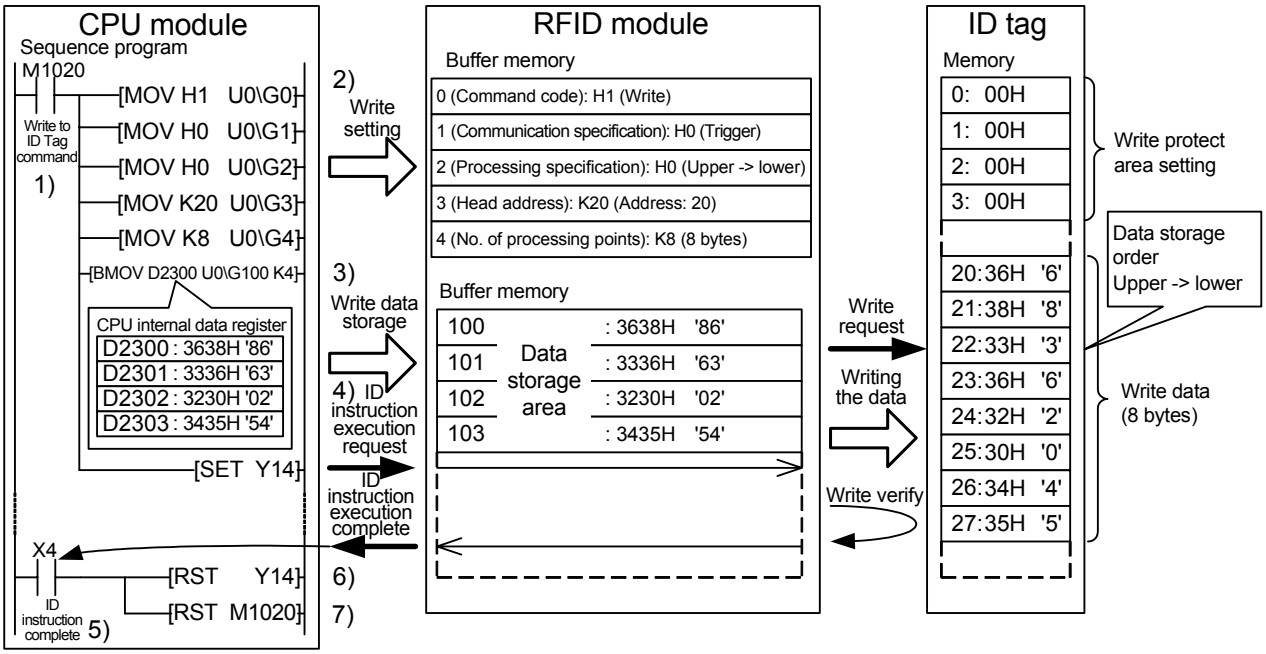
(b) Writing to ID tags



1) By turning on the Write to ID Tag command signal (M1020), the subsequent Write program is executed.
2) The Write command and the data required for writing are set in the buffer memory (U0\G0 to G4) of the RFID module.
3) The data to be written to the ID tag are transferred to the buffer memory (starting from U0\G100) of the RFID module.
4) The ID instruction execution request (Y14) turns on.
5) When writing to the ID tag ends normally, the ID instruction complete signal (X4) turns on.
6) The ID instruction execution request (Y14) turns off.
7) The Write to ID Tag command signal (M1020) turns off.

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(4) Program conditions

(a) Setting contents

Intelligent Function Module Device Address	Buffer Memory Name	Setting Contents	
		Read	Write
U0\G0	Command code specification area (CH1)	H0 (Read)	H1 (Write)
U0\G1	Communication specification area (CH1)	K0 (Trigger)	
U0\G2	Processing specification area (CH1)	K0 (Data storage order: Upper -> lower Calculation method: Addition Calculation/Verification: Calculation)	
U0\G3	Head address specification area (CH1)	K10 (Address: 10)	K20 (Address: 20)
U0\G4	No. of processing points specification area (CH1)	K8 (8 bytes)	

(b) Devices used by user

1. External inputs (commands)

Device	Application
M1010	Read ID Tag command
M1020	Write to ID Tag command

2. External outputs (verification)

Device	Application
D1200 to D1203	Read data storage during Read ID tag
D1020	Error details storage

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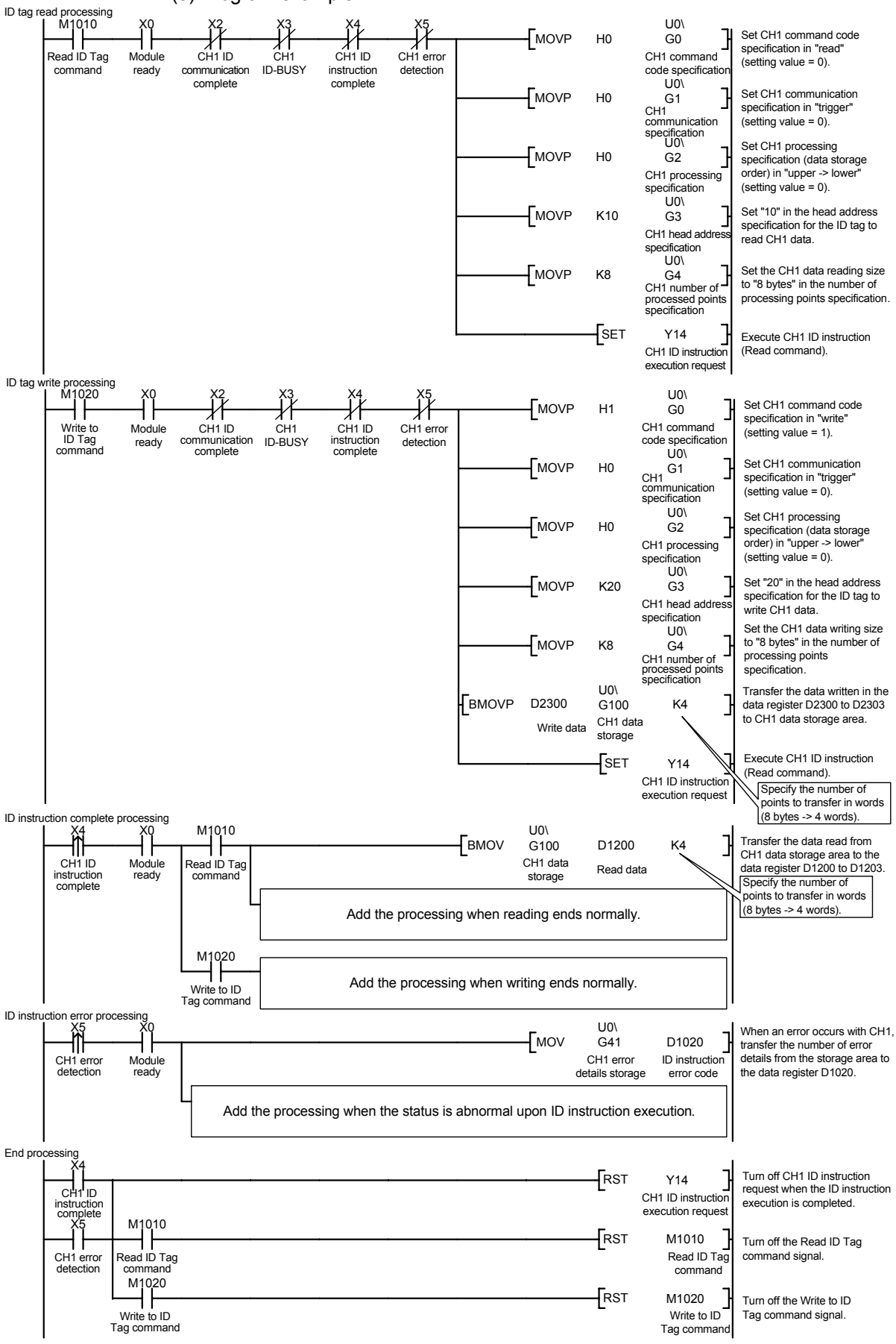
(5) Program example



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(6) Applications of the sample program

1) Application 1: Change of the channel to connect the antenna and the amplifier

When connecting the antenna and the amplifier for communication with ID tags to channel 2, change the I/O signal and intelligent function module device settings as shown below.

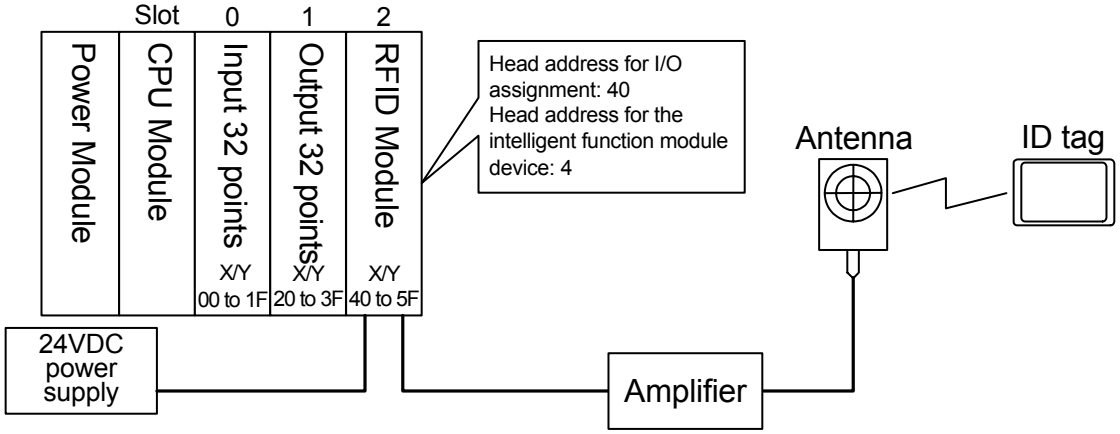
Name \ Channel		CH1	CH2
I/O signal	ID communication complete	X2	XA
	ID-BUSY	X3	XB
	ID instruction complete	X4	XC
	Error detection	X5	XD
	ID instruction execution request	Y14	Y1C

Name \ Channel		CH1	CH2
Intelligent function module device	Command code specification area	U0\G0	U0\G4000
	Communication specification area	U0\G1	U0\G4001
	Processing specification area	U0\G2	U0\G4002
	Head address specification area	U0\G3	U0\G4003
	No. of processing points specification area	U0\G4	U0\G4004
	Error details storage area	U0\G41	U0\G4041
	Data storage area	U0\G100	U0\G4100

2) Application 2: Change of the slot to mount the RFID module

When mounting the RFID module to the slot other than slot 0 of the programmable controller, change the I/O signal and intelligent function module device settings as shown below.

MELSEC-Q series programmable controller



Name \ Channel		CH1	CH2
I/O signal	ID communication complete	X**4**2	X**4**A
	ID-BUSY	X**4**3	X**4**B
	ID instruction complete	X**4**4	X**4**C
	Error detection	X**4**5	X**4**D
	ID instruction execution request	Y**5**4	Y**5**C

Name \ Channel		CH1	CH2
Intelligent function module device	Command code specification area	U**4**\G0	U**4**\G4000
	Communication specification area	U**4**\G1	U**4**\G4001
	Processing specification area	U**4**\G2	U**4**\G4002
	Head address specification area	U**4**\G3	U**4**\G4003
	No. of processing points specification area	U**4**\G4	U**4**\G4004
	Error details storage area	U**4**\G41	U**4**\G4041
	Data storage area	U**4**\G100	U**4**\G4100

Changes are shown in **bold** fonts.

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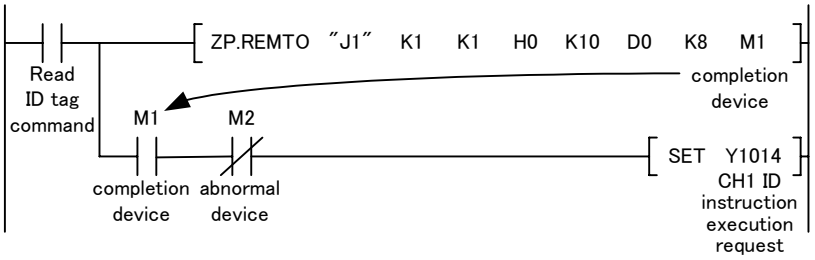
6.6 For Use in Remote I/O Network

6.6.1 Sample program for use in remote I/O Network

This sentence is explanation of the usage of the RFID module on the MELSECNET/H remote I/O network.

Point

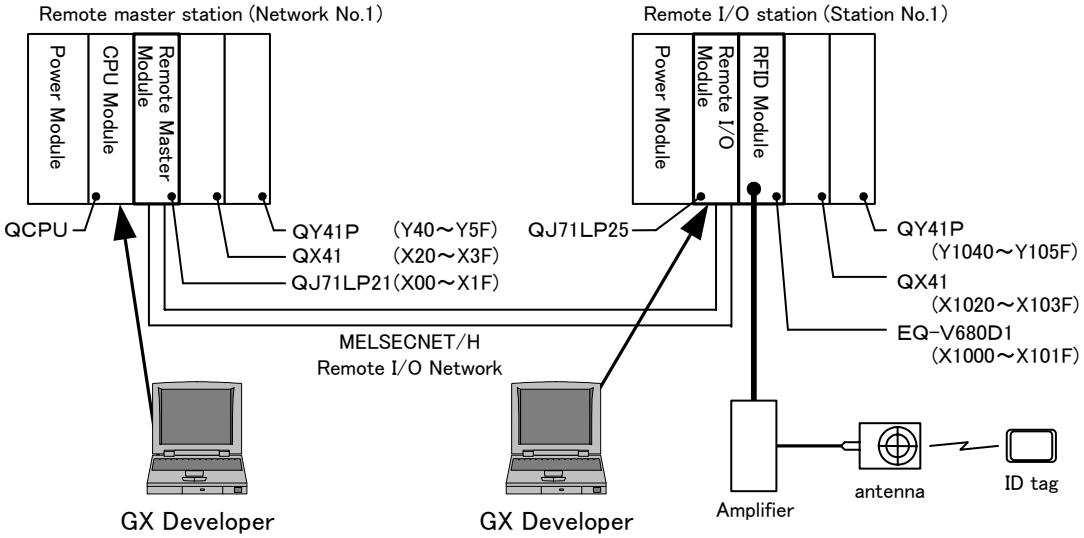
The dedicated instructions used for reading/writing the buffer memory of the intelligent function module on a remote I/O station (REMTO and REMFR) are the execution type for which several scans are needed. Therefore, transmissions of the execution results are not synchronized with the I/O signal operations.
When control the output device after reading/writing the buffer memory of the intelligent function module, put an interlock circuit which controls an output device after the completion device of the dedicated instructions turn on by all means.



For details on the MELSECNET/H remote I/O network, please refer to the following manual published from Mitsubishi Electric Corporation about these.

Manual Name	Document Number
Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O Network)	SH-080124

(1) System configuration



【CPU settings for Master Station】
1.PC parameters
2.Network parameters ・・・ refer to (2)
・Network range assignment ・・・ refer to (3)
・Refresh parameters ・・・ refer to (4)
3.Sequence Program ・・・ refer to (8)
Set device comments, initial device value as needed.

【Remote I/O module settings】
1.PC parameter (I/O assignment)
・Switch setting for intelligent function module ・・・ refer to (5)
・Detailed setting (Output mode at the time of the CPU error) ・・・ refer to (6)

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(2) Network parameters

The network parameters to set to a CPU module of the remote I/O master station are as follows.

	Unit 1
Network type	MNET/H（Remote master）
Starting I/O No.	0000H
Network No.	1
Total stations	1
Mode	Online

Items are set in GX Developer.

(3) Network range assignment

The network range assignment of the network parameter to set to a CPU module of the remote I/O master station, are as follows.

Station No.	M station -> R station						M station <- R station					
	Y			Y			X			X		
	Points	Start	End	Points	Start	End	Points	Start	End	Points	Start	End
1	96	1000	105F	96	0000	005F	96	1000	105F	96	0000	005F

Items are set in GX Developer.

(4) Refresh parameters

The refresh parameters of the network parameter to set to a CPU module of the remote I/O master station are as follows.

	Link side					PLC side			
	Dev. name	Points	Start	End		Dev. name	Points	Start	End
Transfer SB	SB	512	0000	01FF	⇔	SB	512	0000	01FF
Transfer SW	SW	512	0000	01FF	⇔	SW	512	0000	01FF
Random cyclic	LB				⇔				
Random cyclic	LW				⇔				
Transfer 1	LB	8192	0000	1FFF	⇔	B	8192	0000	1FFF
Transfer 2	LW	8192	0000	1FFF	⇔	W	8192	0000	1FFF
Transfer 3	LX	96	1000	105F	⇔	X	96	1000	105F
Transfer 4	LY	96	1000	105F	⇔	Y	96	1000	105F

Items are set in GX Developer.

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(5) Intelligent function module switch setting

The Intelligent function module switch setting of the remote I/O module at remote I/O station is as follows.

When use intelligent function module switch setting in the default state, the parameter setting is not necessary.

	Slot	Type	Module name	Switch1	Switch 2	Switch 3	Switch 4	Switch 5
0	Remote I/O	Remote I/O	QJ72LP25					
1	0(*-0)	INTERI	EQ-V680D1	0004	0000	0000	0000	0000
2	1(*-1)	INPUT	QX41					
3	2(*-2)	OUTPUT	QY41P					

Items are set in GX Developer.

Switch Setting Items

	b15～b3	b2	b1	B0
Switch1	0：Fixed	Write protect setting 0(OFF)：Enable 1(ON) ：Disable	ID tag communication speed setting 0(OFF)：Standard mode 1(ON) ：High-speed mode	Write verify setting 0(OFF)：Execute 1(ON) ：Do not execute
	b15～b3	b2	b1	b0
Switch2	0：Fixed	Enable ch.2 Test mode 0(OFF)：Enable 1(ON) ：Disable	Enable ch.1 Test mode 0(OFF)：Enable 1(ON) ：Disable	Enable Y contact test request 0(OFF)：Enable 1(ON) ：Disable

(6) Output mode at the time of the CPU error

The output mode at the time of the CPU error of the remote I/O module at remote I/O station is as follows.

Output mode at the time of the CPU error	Clear

Items are set in GX Developer.

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(7) Programming

(1) Program conditions

(a) Setting contents

Buffer Memory Address	Buffer Memory Name	Setting Contents	
		Reading	Writing
0	Command code specification area (CH1)	H0 (Read)	H1 (Write)
1	Communication specification area (CH1)	K0 (Trigger)	
2	Processing specification area (CH1)	K0 (Data storage order: Upper –> Lower Calculation method: Addition Calculation/Verification : Calculation)	
3	Head address specification area (CH1)	K10 (Address: 10)	
4	Number of processed points specification area (CH1)	K8 (8 bytes)	
100	Data storage area (CH1)	—	Specifies the data to be written to the ID tag

(b) Devices used by user

1. External inputs (commands)

Device	Application
M1160	Read ID Tag command
M1161	Cancel Read ID Tag command
M1170	Write ID Tag command
M1171	Cancel Write ID Tag command
D0	Command code
D1	Communication specification
D2	Processing specification
D3	Head address
D4	Number of processed points
D1170～D1173	Specifies the data to be written to the ID tag during Write to ID Tag

2. External outputs (verification)

Device	Application
D1178	Error details storage during Read ID Tag
D1160～D1163	Read data storage during Read ID Tag

(8) Sample Program

(a) The operation of the program

Action	Explanation of the operation
Read data from an ID tag	The data from address 10 of the ID tag to 8 bytes are retrieved by turning on a device (M1160). And, those data are stored by a storage device (D1160 to D1163).
Write in data at an ID tag	By turning on a device (M1170), read the data of the device (D1170 to D1173) and write in data for 8 bytes from address 10 of the ID tag..
Error Processing	When an operation error occurs to the RFID module, an error code is stored by device (D1178).
Cancel Operation	In the case of communications specification method is either of repeat auto, FIFO repeat, multi-repeat, the reading or writing to ID tag is continued till turning on a device (M1171).

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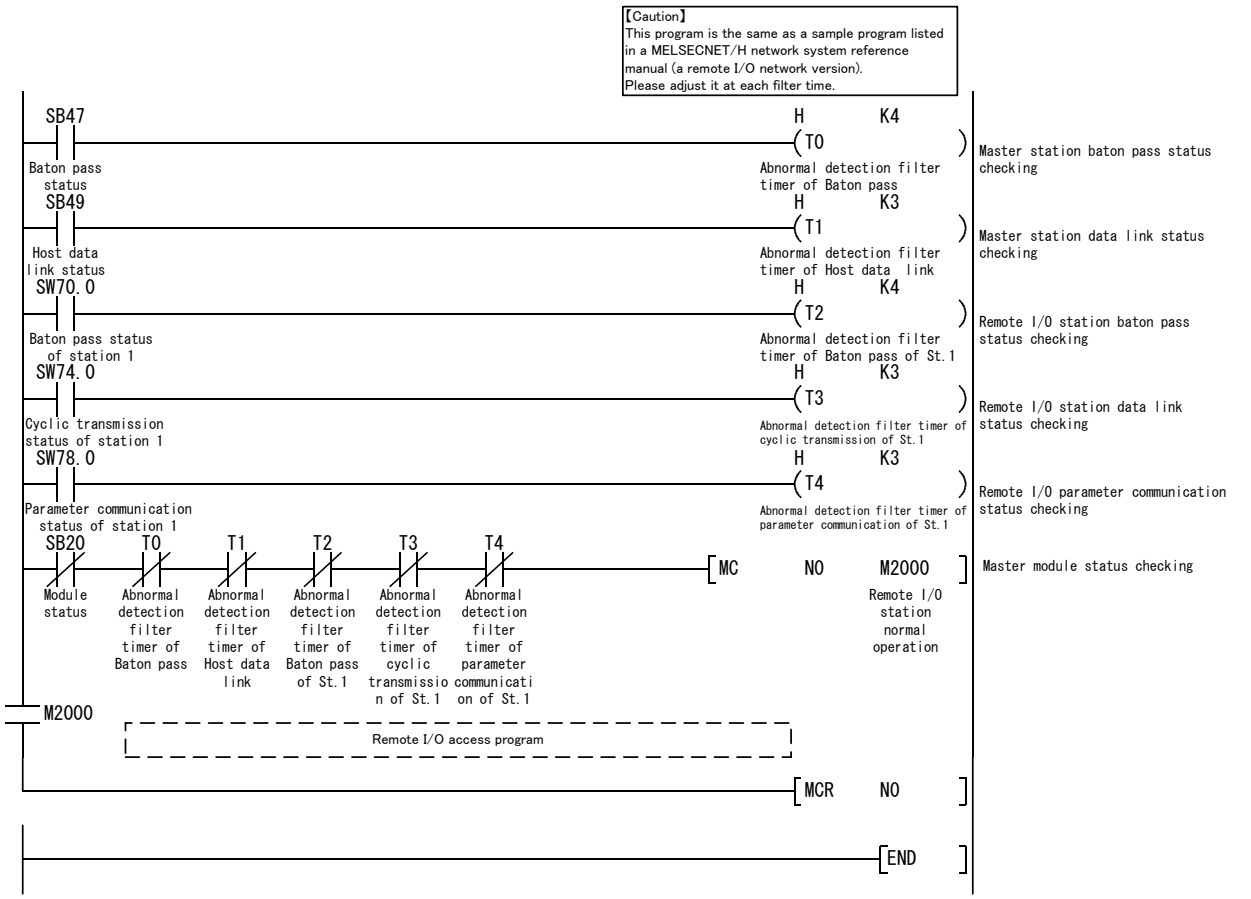
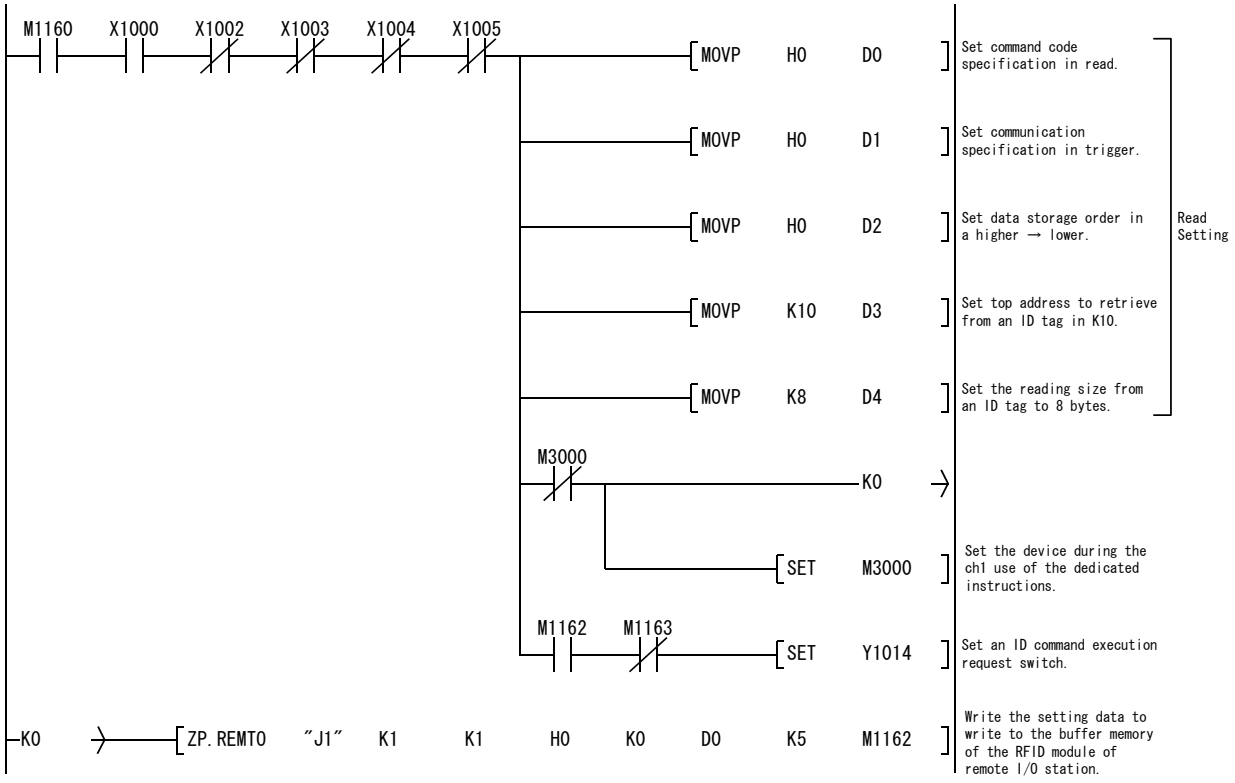
(b) Remote I/O station operating status checking（Common）



(c) Read ID Tag



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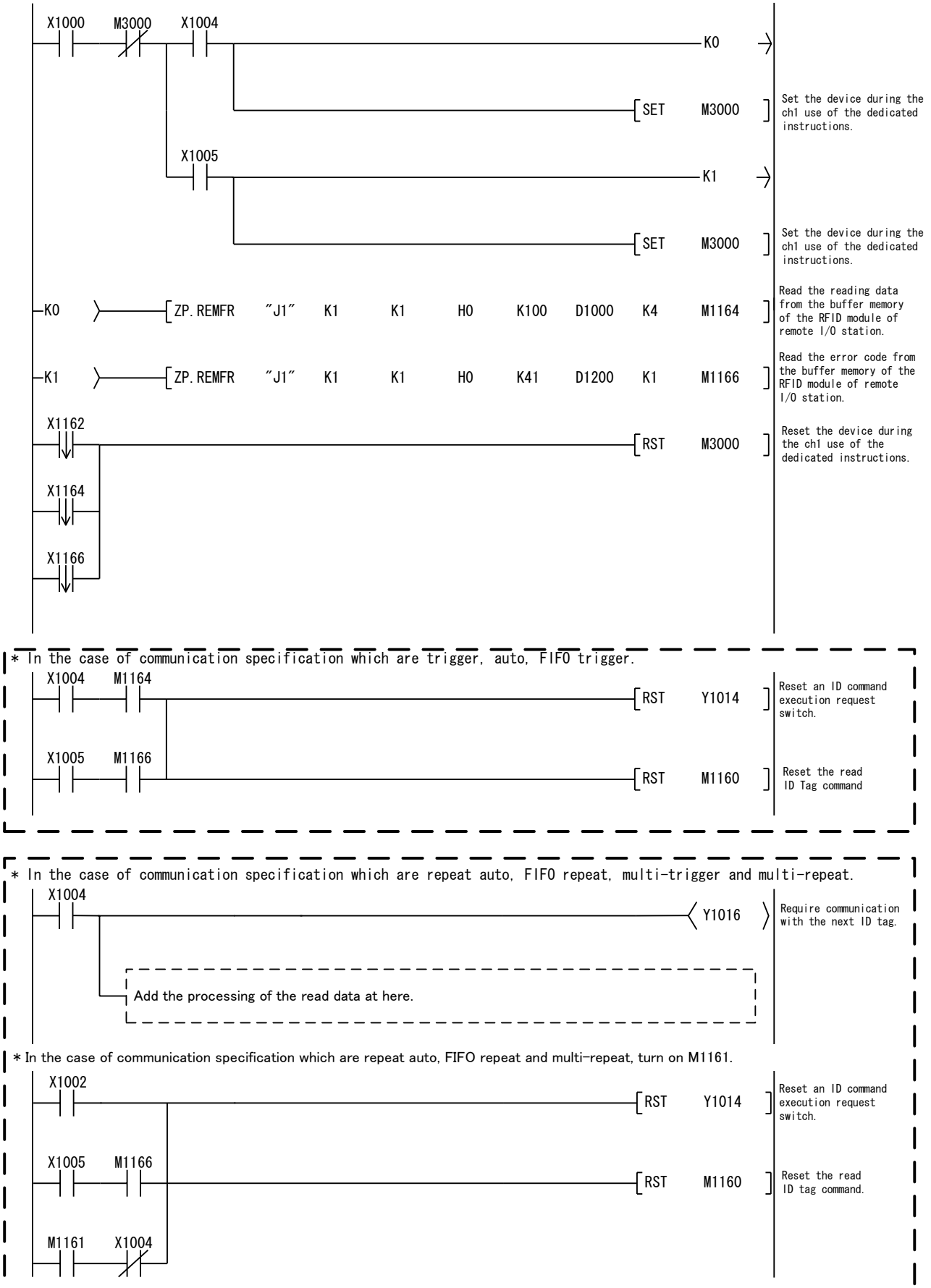
X1000
M3000
X1004
K0
SET M3000
Set the device during the ch1 use of the dedicated instructions.
X1005
K1
SET M3000
Set the device during the ch1 use of the dedicated instructions.
K0
ZP.REMFR "J1" K1 K1 H0 K100 D1000 K4 M1164
Read the reading data from the buffer memory of the RFID module of remote I/O station.
K1
ZP.REMFR "J1" K1 K1 H0 K41 D1200 K1 M1166
Read the error code from the buffer memory of the RFID module of remote I/O station.
X1162
X1164
X1166
RST M3000
Reset the device during the ch1 use of the dedicated instructions.
* In the case of communication specification which are trigger, auto, FIFO trigger.
X1004
M1164
RST Y1014
Reset an ID command execution request switch.
X1005
M1166
RST M1160
Reset the read ID Tag command
* In the case of communication specification which are repeat auto, FIFO repeat, multi-trigger and multi-repeat.
X1004
Y1016
Require communication with the next ID tag.
Add the processing of the read data at here.
* In the case of communication specification which are repeat auto, FIFO repeat and multi-repeat, turn on M1161.
X1002
RST Y1014
Reset an ID command execution request switch.
X1005
M1166
RST M1160
Reset the read ID tag command.
M1161
X1004

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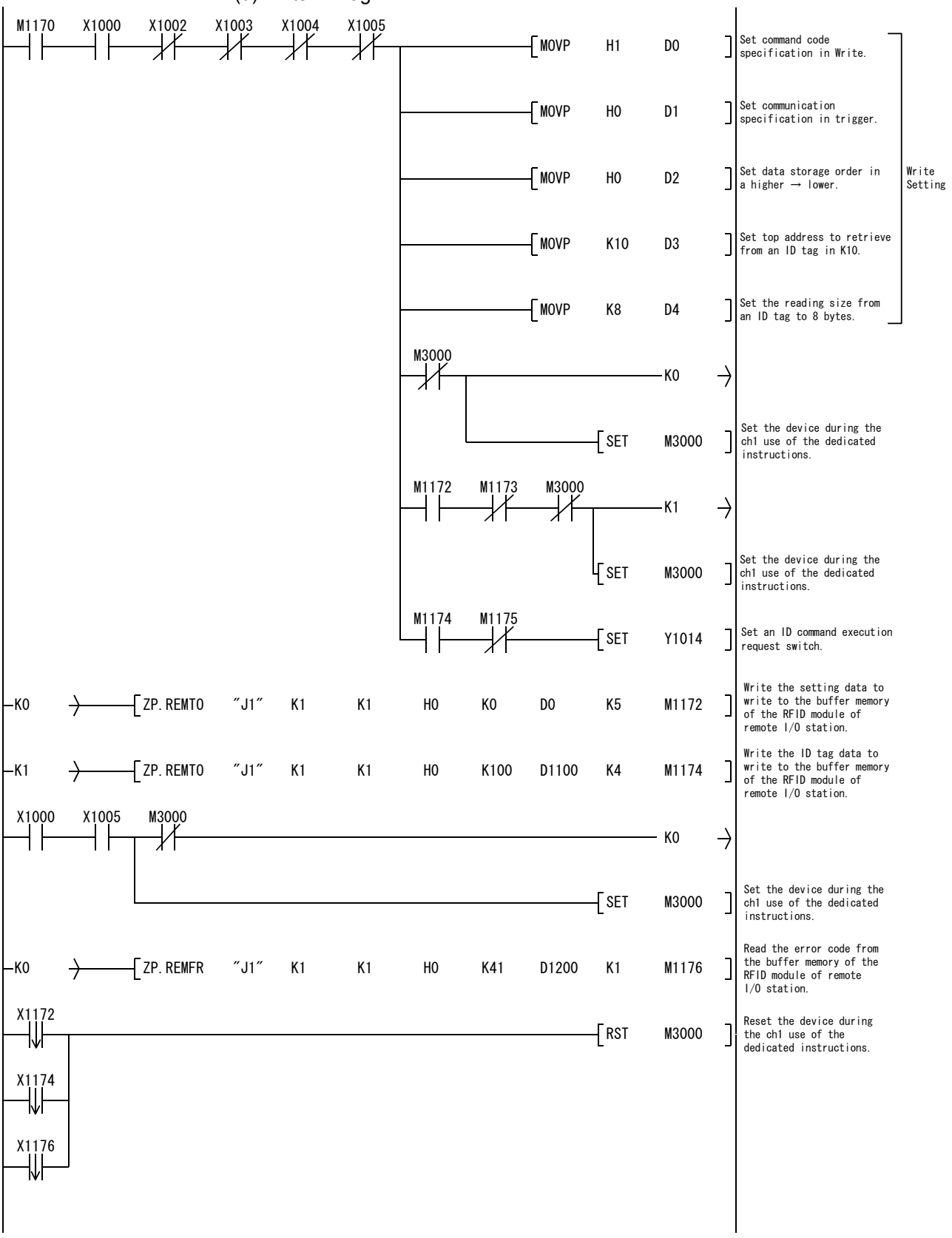
(d) Write ID Tag



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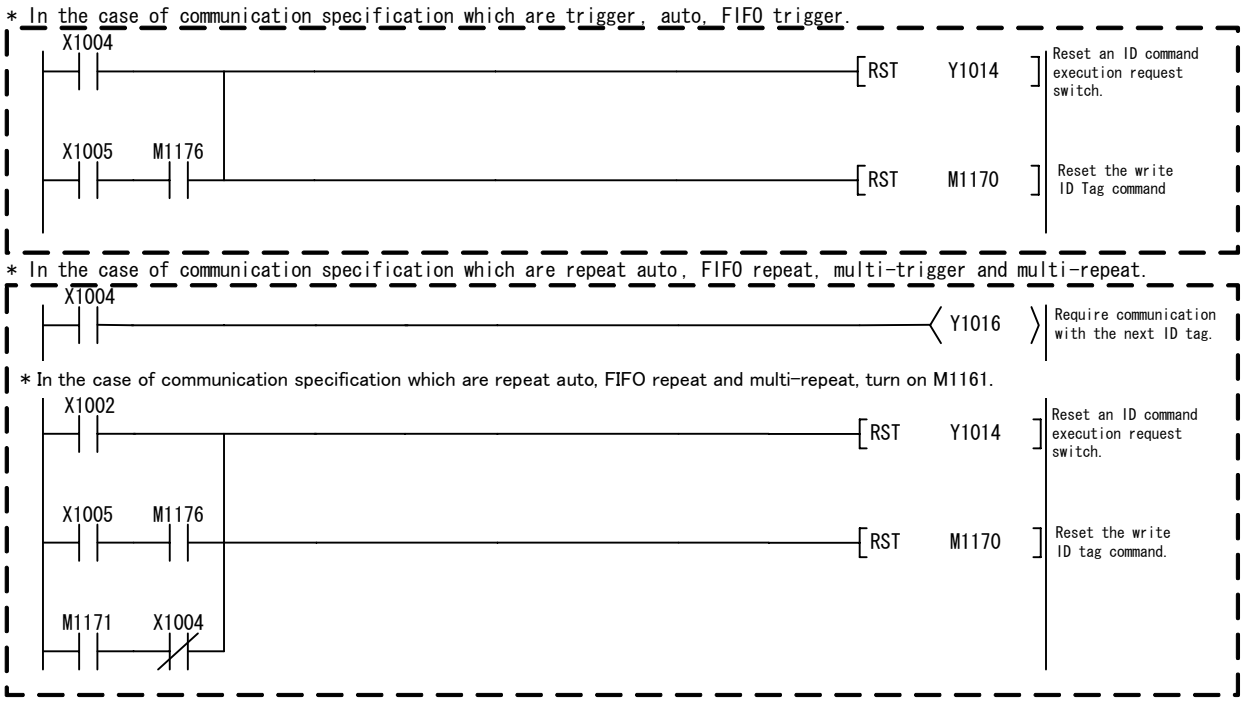
* In the case of communication specification which are trigger, auto, FIFO trigger.
X1004
RST Y1014
Reset an ID command execution request switch.
X1005 M1176
RST M1170
Reset the write ID Tag command
* In the case of communication specification which are repeat auto, FIFO repeat, multi-trigger and multi-repeat.
X1004
Y1016
Require communication with the next ID tag.
* In the case of communication specification which are repeat auto, FIFO repeat and multi-repeat, turn on M1161.
X1002
RST Y1014
Reset an ID command execution request switch.
X1005 M1176
RST M1170
Reset the write ID tag command.
M1171 X1004

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6.6.2. Attention and limitation using the RFID module at MELSECNET/H remote I/O station

(1) Attention in the sequence programming

The interlock circuit which operates the RFID module only when a MELSECNET/H remote I/O network system works normally is necessary as show in section 6.6.1 (8) (b).

(2) The limitation on executing reading or writing of the buffer memory of the RFID module

GX Configurator for RFID modules is not prepared for. Therefore, the update of periodical data by the automatic refreshment setting of the intelligent functional unit parameter is not possible.

When read/write of the buffer memory of the RFID module, please use the buffer memory read/write command (an REMFR command / REMTO command) of the intelligent function module of remote I/O station that is a command for exclusive use of the link.

(3) The limitation of the data storage device

Can not use the local device of the CPU module for a device used in the buffer memory read/write (an REMFR command / REMTO command) of the intelligent function module of remote I/O station those are a command for exclusive use of the link.

In addition, please do not choose the parameter to "Use a file name same as a program name" for when use a file register device.

(4) The limitation of the data size that read/write is possible at the same time

The read/write size when execute the read/write (an REMFR command and an REMTO command) of the buffer memory of the intelligent function module of remote I/O station that is a command for exclusive use of the link is 960 words.

(The read/write size when attached an RFID module to a base same as a CPU module is 1024 words.)

Besides the above, some instructions and restrictions are applied to use a MELSECNET/H remote I/O network system. Please refer to the following manual published from Mitsubishi Electric Corporation about these.

Manual Name	Document Number
Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O Network)	SH-080124

Chapter 7. TROUBLESHOOTING

The following describes the details of the errors that may occur when using the RFID interface module, and the corresponding troubleshooting methods.

7.1 Error Details List

When an error occurs, the RFID interface module turns ON the bit corresponding to the error details in the error details storage area (Un\G41, Un\G4041).
The bits of the error details storage area (Un\G41, Un\G4041) are cleared by either turning OFF the ID command execution request (Y14, Y1C) or turning ON and then OFF result reception (Y16, Y1E).

Table 7.1 Error Details List

Bit	Name*1	Description
0	ID command error	Turns ON when there is an error in the specified ID command.
1	Not used	-
2	Not used	-
3	Data correction flag	Turns ON when data become normal by data correction as a result of Read with Error Correction.
4	Status flag*1	Turns ON in the following cases: • When the number of rewrites is exceeded by the Control Number of Writes command. • When the verification results indicate an error as a result of a memory data check (verification). • When a data error occurs as a result of Read with Error Correction. • When overflow occurs as a result of an addition operation of Write Calculation. • When underflow occurred as a result of a subtraction operation of Write Calculation. • When an error occurs as a result of data writing after reading during the Copy command. *1
5	Not used	-
6	Not used	-
7	ID system error 3	ID system error
8	ID system error 2	ID system error
9	ID system error 1	ID system error
10	Tag not present error	Turns ON when there is no communicable ID in the antenna communication area.
11	Protect error	Turns ON when data are written to an area set as write-protected.
12	Tag communication error	Turns ON when communication with an ID tag does not end normally.
13	Address error	Turns ON when the ID tag address range has been exceeded and an attempt is made to read or write data.
14	Verify error	Turns ON when data writing cannot be performed normally with an ID tag.
15	Antenna error	Turns ON when failure occurs possibly because the antenna is not connected.

*1. When a Copy command error occurs causing an error on the copy destination side, the bit on the copy source side also turns ON.

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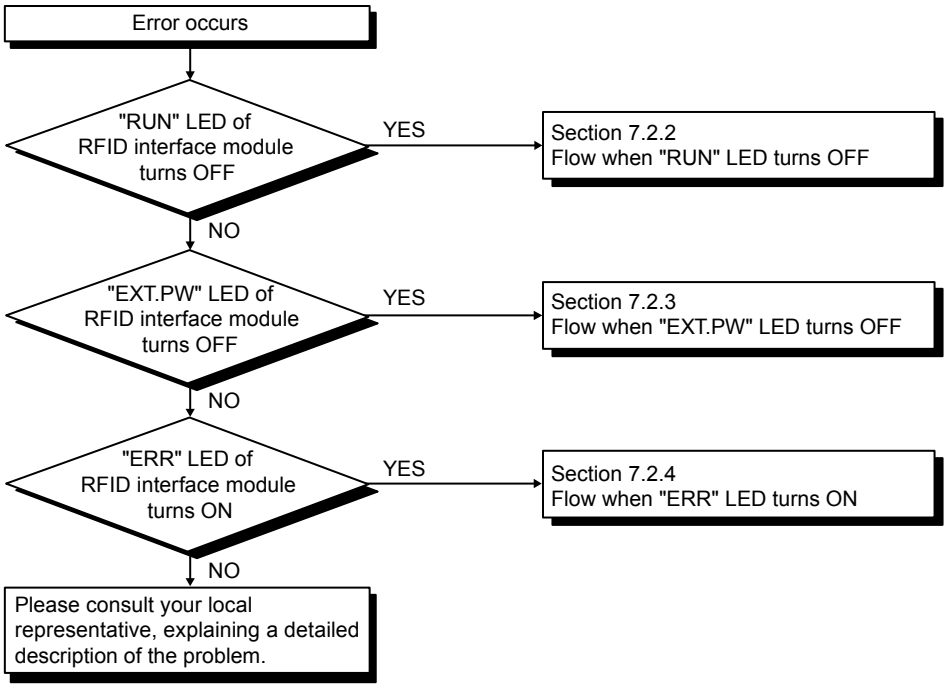
7.2 Troubleshooting

The following describes simple troubleshooting methods to be employed when using the RFID interface module.
For programmable controller CPU related troubleshooting, refer to the user's manual of the CPU module used.

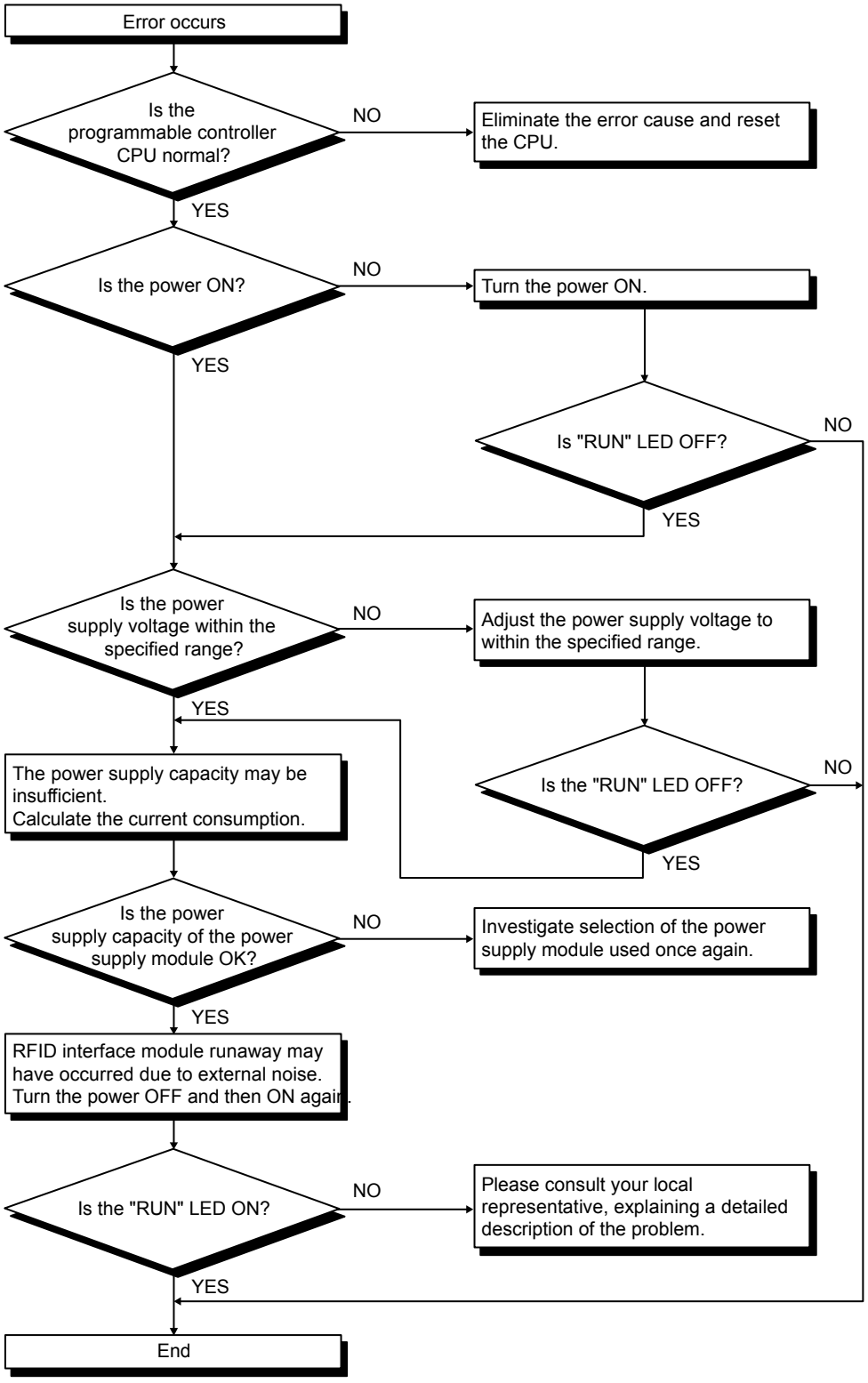
7.2.1 Troubleshooting flow

In this section, error details are described by first dividing the errors into groups according to the events that occur as described below.



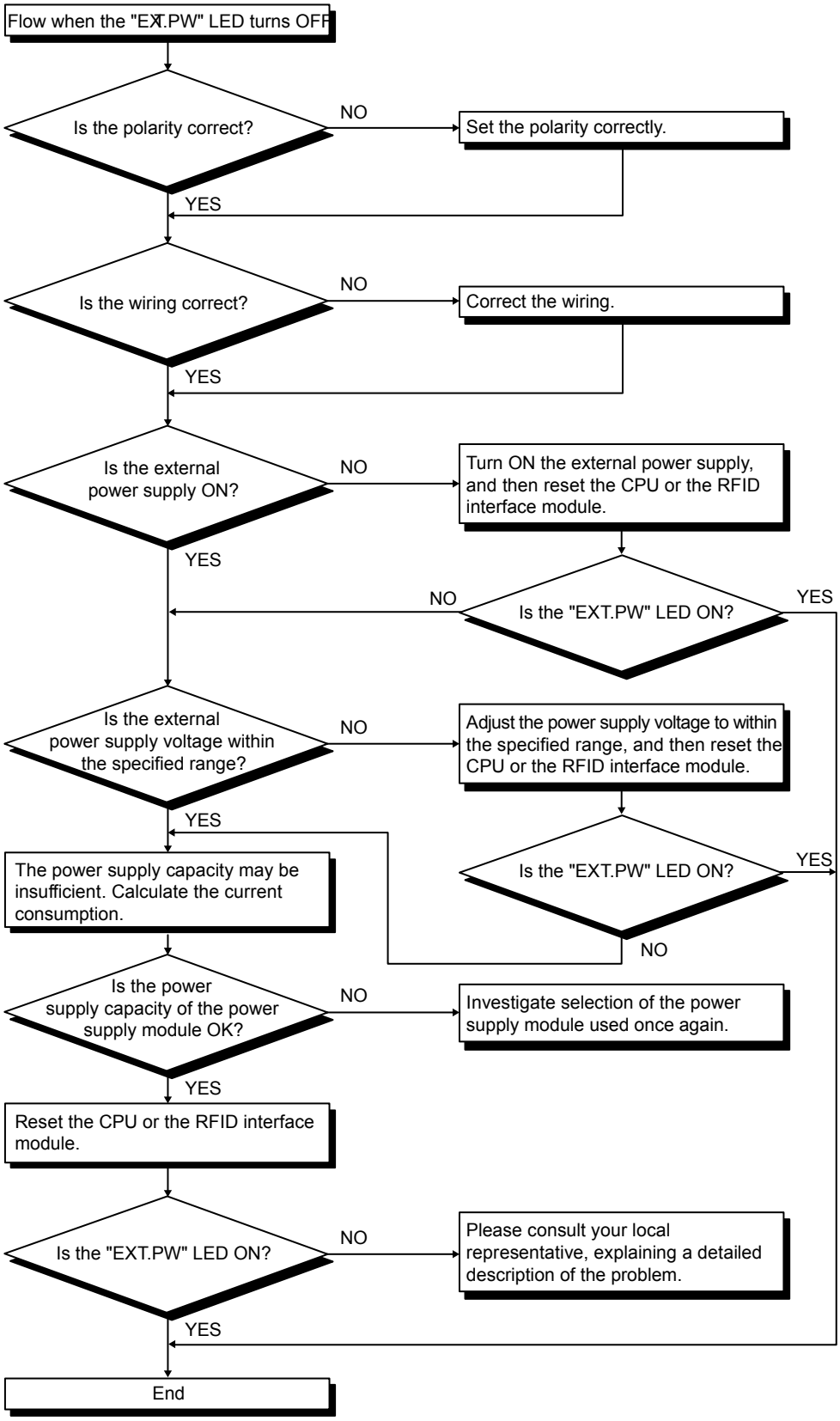
7 - 2

7.2.2 Flow when “RUN” LED turns OFF



7 - 3

7.2.3 Flow when the “EXT.PW” LED turns OFF



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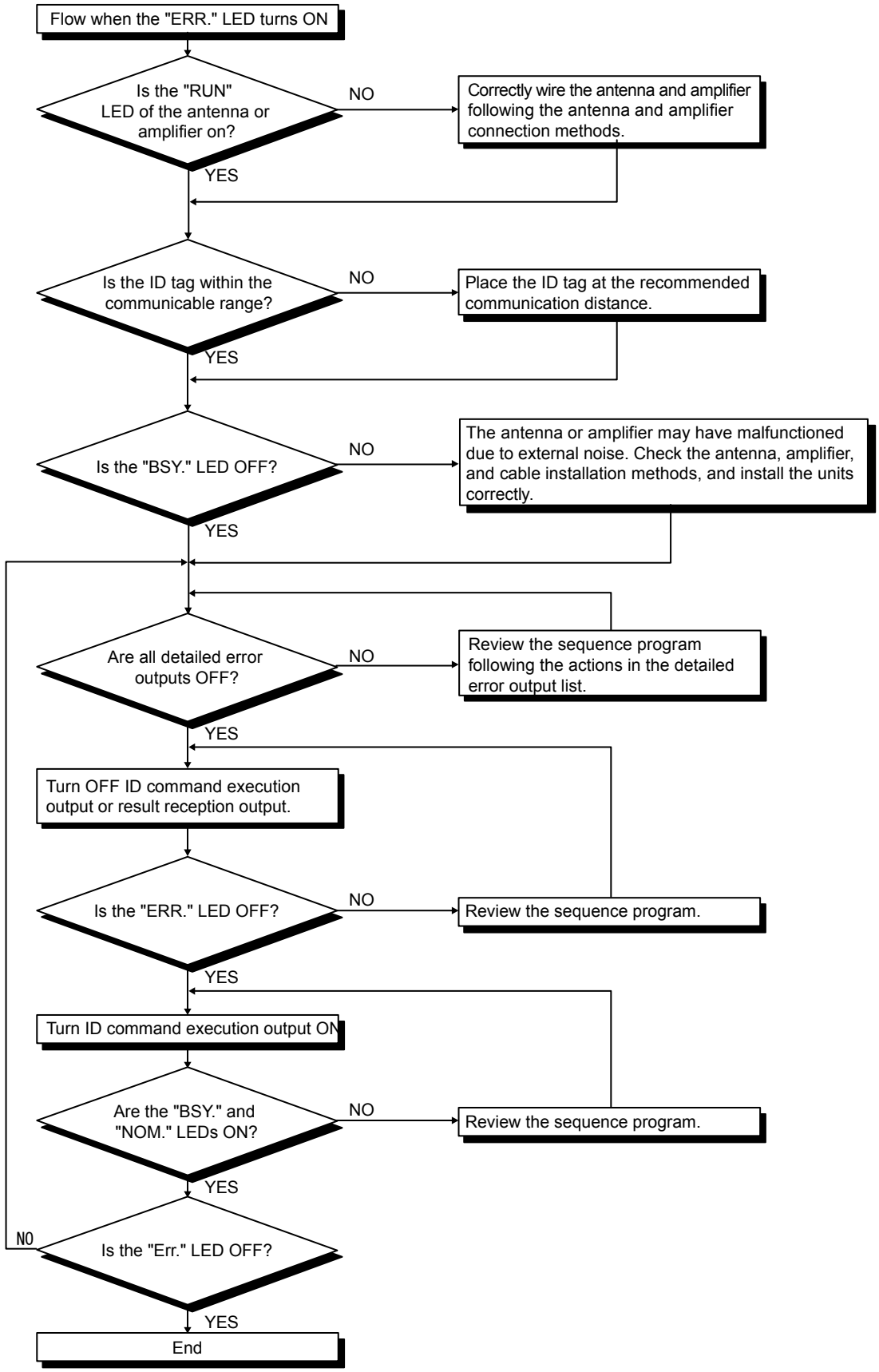
7.2.4 Flow when the “ERR.” LED turns ON



7 - 5

APPENDICES

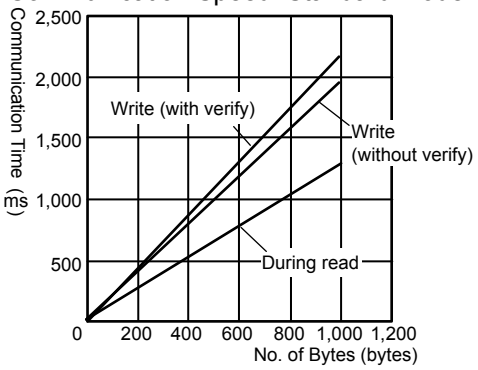
APPENDIX 1 COMMUNICATION TIME (REFERENCE)

The following describes the communication time between the RFID interface module and ID tag, according to ID tag type.
For suitable ID tag and antenna combinations, refer to the Omron RFID system V680 series manual.

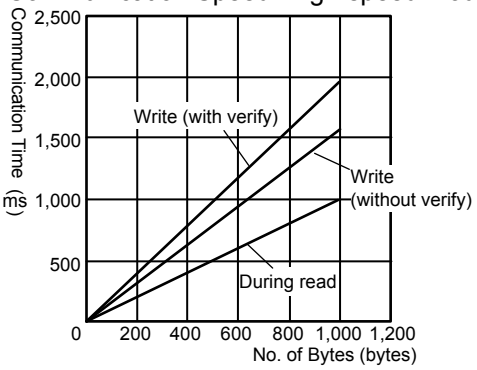
(1) EEPROM type (1kbyte): V680-D1KP□□

Communication Speed Setting	Command	Communication Time N: Number of Processed Bytes
Standard mode	Read	T=1.3×N+31
	Write (with verify)	T=2.2×N+58
	Write (without verify)	T=1.9×N+56
High-speed mode	Read	T=1.0×N+29
	Write (with verify)	T=1.8×N+51
	Write (without verify)	T=1.5×N+47

●Communication Speed: Standard Mode



●Communication Speed: High-speed Mode

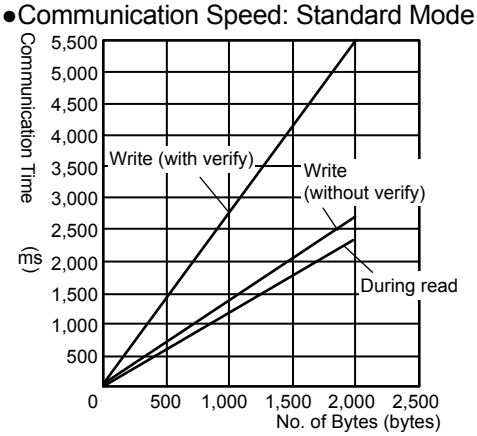


(2) FRAM type (2kbytes): V680-D2KF□□/V680S-D2KF□□

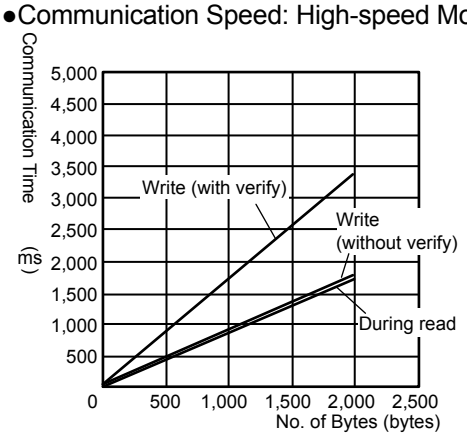
Communication Speed Setting	Command	Communication Time N: Number of Processed Bytes
Standard mode	Read	T=1.2×N+30
	Write (with verify)	T=2.6×N+49
	Write (without verify)	T=1.3×N+49
High-speed mode *1	Read	T=0.9×N+27
	Write (with verify)	T=1.9×N+49
	Write (without verify)	T=0.9×N+49

*1. When FIFO trigger, FIFO repeat, multi-trigger, or multi-repeat is specified in the communication specification area (Un\G1, Un\G4001), the communication time becomes the standard mode communication time, even if the ID tag communication speed setting is high-speed mode.

●Communication Speed: Standard Mode



●Communication Speed: High-speed Mode



App

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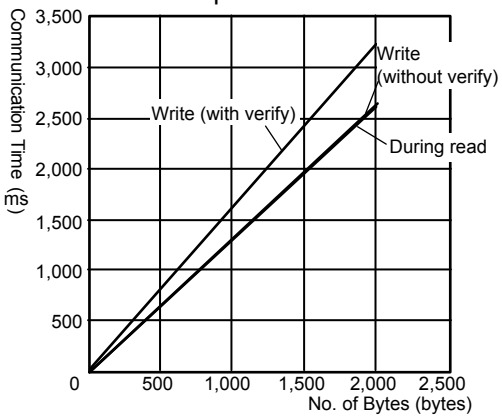
(3) FRAM type (8kbytes/32kbytes): V680-D8KF□□/V680-D32KF□□

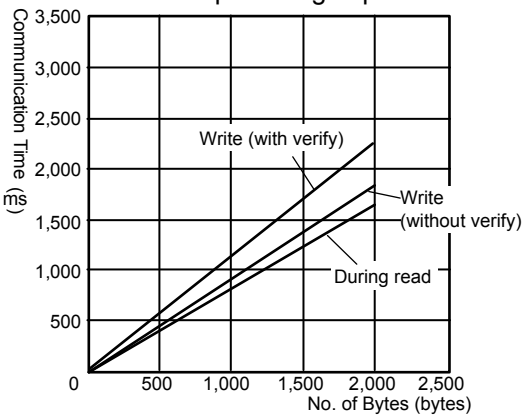
Communication Speed Setting	Command	Communication Time N: Number of Processed Bytes
Standard mode	Read	T=1.3×N+30
	Write (with verify)	T=1.6×N+59
	Write (without verify)	T=1.3×N+59
High-speed mode *1	Read	T=0.8×N+25
	Write (with verify)	T=1.1×N+41
	Write (without verify)	T=0.9×N+40

*1. When FIFO trigger, FIFO repeat, multi-trigger, or multi-repeat is specified in the communication specification area (Un\G1, Un\G4001), the communication time becomes the standard mode communication time, even if the ID tag communication speed setting is high-speed mode.

●Communication Speed: Standard Mode



●Communication Speed: High-speed Mode

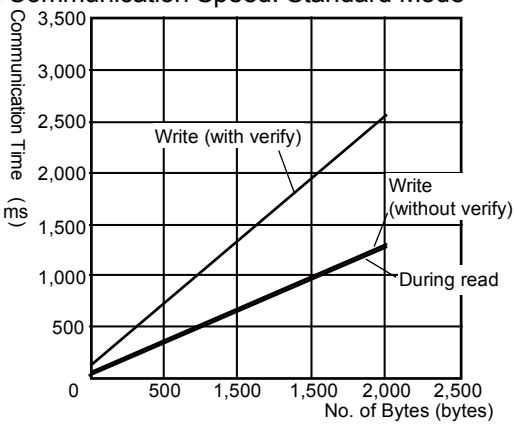


(4) FRAM type (8kbytes): V680S-D8KF□□

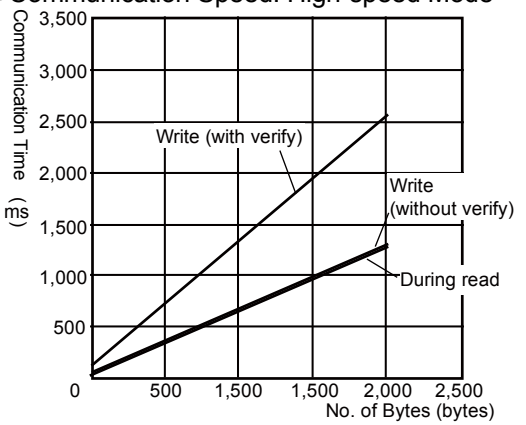
Communication Speed Setting	Command	Communication Time N: Number of Processed Bytes
Standard mode	Read	T=0.6×N+47
	Write (with verify)	T=1.2×N+128
	Write (without verify)	T=0.6×N+101
High-speed mode *1	Read	T=0.6×N+47
	Write (with verify)	T=1.2×N+128
	Write (without verify)	T=0.6×N+101

*1. When the V680S-D8KF□□ ID tag is used, the communication time does not differ from the standard mode time, even if high-speed mode is selected.

●Communication Speed: Standard Mode



●Communication Speed: High-speed Mode

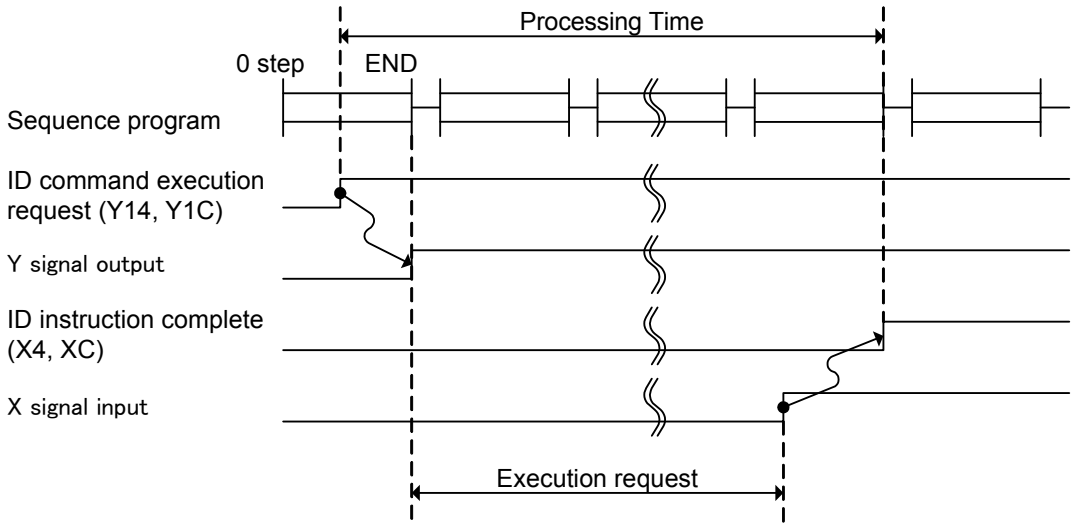


App

App - 2

APPENDIX 2 PROCESSING TIME (REFERENCE)

The processing time is the time from the moment the ID instruction execution request (Y14, Y1C) is turned ON to the time ID instruction complete (X4, XC) turns OFF.



(1) EEPROM type (1kbytes): V680-D1KP□□

Communication Speed Setting	Command	Number of Processed Bytes (byte)	Processing Time (ms) S: Scan Time (ms)
Standard mode	Read	100	169 + 2 × S
		256	372 + 2 × S
		512	705 + 2 × S
		1,000	1339 + 2 × S
	Write (with verify)	100	289 + 2 × S
		256	637 + 2 × S
		512	1208 + 2 × S
		1,000	2296 + 2 × S
	Write (without verify)	100	257 + 2 × S
		256	559 + 2 × S
		512	1053 + 2 × S
		1,000	1994 + 2 × S
High-speed mode *1	Read	100	137 + 2 × S
		256	293 + 2 × S
		512	549 + 2 × S
		1,000	1037 + 2 × S
	Write (with verify)	100	241 + 2 × S
		256	525 + 2 × S
		512	991 + 2 × S
		1,000	1879 + 2 × S
	Write (without verify)	100	206 + 2 × S
		256	442 + 2 × S
		512	829 + 2 × S
		1,000	1565 + 2 × S

*1. When FIFO trigger, FIFO repeat, multi-trigger, or multi-repeat is specified in the communication specification area, the processing time becomes the standard mode processing time, even if the communication speed setting is high-speed mode.

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(2) FRAM type (2kbytes): V680-D2KF□□ / V680S-D2KF□□

Communication Speed Setting	Command	Number of Processed Bytes (byte)	Processing Time (ms) S: Scan Time (ms)
Standard mode	Read	100	158 + 2 × S
		256	346 + 2 × S
		512	653 + 2 × S
		1,000	1238 + 2 × S
		2,000	2438 + 2 × S
	Write (with verify)	100	320 + 2 × S
		256	731 + 2 × S
		512	1404 + 2 × S
		1,000	2687 + 2 × S
		2,000	5317 + 2 × S
	Write (without verify)	100	190 + 2 × S
		256	398 + 2 × S
		512	738 + 2 × S
		1,000	1387 + 2 × S
		2,000	2717 + 2 × S
High-speed mode *1	Read	100	125 + 2 × S
		256	266 + 2 × S
		512	496 + 2 × S
		1,000	935 + 2 × S
		2,000	1835 + 2 × S
	Write (with verify)	100	249 + 2 × S
		256	549 + 2 × S
		512	1041 + 2 × S
		1,000	1977 + 2 × S
		2,000	3897 + 2 × S
	Write (without verify)	100	148 + 2 × S
		256	290 + 2 × S
		512	523 + 2 × S
		1,000	967 + 2 × S
		2,000	1877 + 2 × S

*1. When FIFO trigger, FIFO repeat, multi-trigger, or multi-repeat is specified in the communication specification area, the processing time becomes the standard mode processing time, even if the communication speed setting is high-speed mode.

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(3) FRAM type (8kbytes / 32kbytes): V680-D8KF□□ / V680-D32KF□□

Communication Speed Setting	Command	Number of Processed Bytes (byte)	Processing Time (ms) S: Scan Time (ms)
Standard mode	Read	100	168 + 2 × S
		256	371 + 2 × S
		512	704 + 2 × S
		1,000	1338 + 2 × S
		2,000	2638 + 2 × S
	Write (with verify)	100	230 + 2 × S
		256	485 + 2 × S
		512	902 + 2 × S
		1,000	1697 + 2 × S
		2,000	3327 + 2 × S
	Write (without verify)	100	200 + 2 × S
		256	408 + 2 × S
		512	747 + 2 × S
		1,000	1397 + 2 × S
		2,000	2727 + 2 × S
High-speed mode *1	Read	100	113 + 2 × S
		256	238 + 2 × S
		512	443 + 2 × S
		1,000	833 + 2 × S
		2,000	1633 + 2 × S
	Write (with verify)	100	161 + 2 × S
		256	336 + 2 × S
		512	623 + 2 × S
		1,000	1169 + 2 × S
		2,000	2289 + 2 × S
	Write (without verify)	100	139 + 2 × S
		256	281 + 2 × S
		512	514 + 2 × S
		1,000	958 + 2 × S
		2,000	1868 + 2 × S

*1. When FIFO trigger, FIFO repeat, multi-trigger, or multi-repeat is specified in the communication specification area, the processing time becomes the standard mode processing time, even if the communication speed setting is high-speed mode.

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(4) FRAM type (8kbytes): V680S-D8KF□□

Communication Speed Setting	Command	Number of Processed Bytes (byte)	Processing Time (ms) S: Scan Time (ms)
Standard mode	Read	100	115 + 2 × S
		256	209 + 2 × S
		512	362 + 2 × S
		1,000	655 + 2 × S
		2,000	1255 + 2 × S
	Write (with verify)	100	259 + 2 × S
		256	451 + 2 × S
		512	766 + 2 × S
		1,000	1366 + 2 × S
		2,000	2596 + 2 × S
	Write (without verify)	100	172 + 2 × S
		256	271 + 2 × S
		512	432 + 2 × S
		1,000	739 + 2 × S
		2,000	1369 + 2 × S
High-speed mode *1	Read	100	115 + 2 × S
		256	209 + 2 × S
		512	362 + 2 × S
		1,000	655 + 2 × S
		2,000	1255 + 2 × S
	Write (with verify)	100	259 + 2 × S
		256	451 + 2 × S
		512	766 + 2 × S
		1,000	1366 + 2 × S
		2,000	2596 + 2 × S
	Write (without verify)	100	172 + 2 × S
		256	271 + 2 × S
		512	432 + 2 × S
		1,000	739 + 2 × S
		2,000	1369 + 2 × S

*1. When the V680S-D8KF□□ ID tag is used, the communication time does not differ from the standard mode time, even if high-speed mode is selected.

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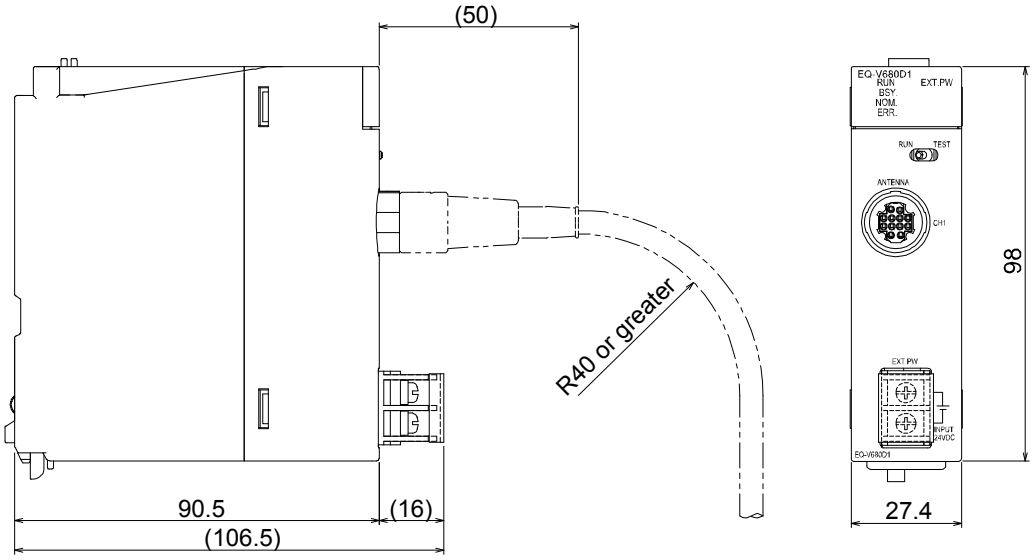
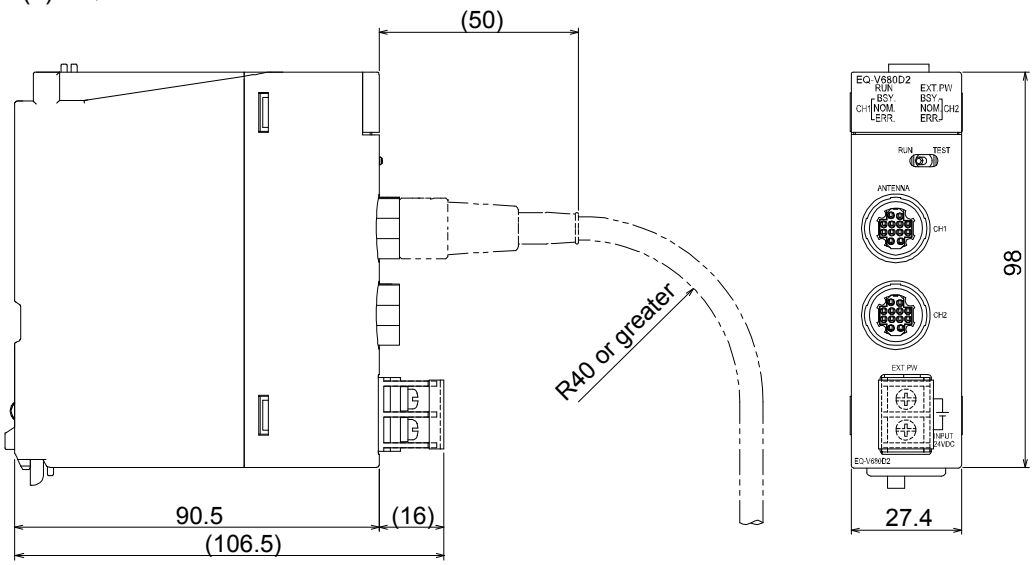
APPENDIX 3 EXTERNAL DIMENSIONS

(1) EQ-V680D1



Unit: mm

(2) EQ-V680D2



Unit: mm

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Product Warranty Details

Please confirm the following product warranty details prior to product use.

Gratis Warranty Terms and Gratis Warranty Range

If any fault or defect (hereinafter referred to as "Failure") attributable to Mitsubishi Electric Engineering Company Limited (hereinafter referred to as "MEE") should occur within the gratis warranty period, MEE shall repair the product free of charge via the distributor from whom you made your purchase.

■Gratis Warranty Period

The gratis warranty period of this product shall be one (1) year from the date of purchase or delivery to the designated place. Note that after manufacture and shipment from MEE, the maximum distribution period shall be six (6) months, and the gratis warranty period after manufacturing shall be limited to eighteen (18) months.
In addition, the gratis warranty period for repaired products shall not exceed the gratis warranty period established prior to repair.

■Gratis Warranty Range

The gratis warranty range shall be limited to normal use based on the usage conditions, methods and environment, etc., defined by the terms and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

Warranty Period after Discontinuation of Production

(1) MEE shall offer product repair services (fee applied) for seven (7) years after production of the product has been discontinued. Discontinuation of production shall be reported via distributors.
(2) Product supply (including spare parts) is not possible after production has been discontinued.

Exclusion of Opportunity Loss and Secondary Loss from Warranty Liability

Regardless of the gratis warranty period, MEE shall not be liable for compensation for damages arising from causes not attributable to MEE, opportunity losses or lost profits incurred by the user due to Failures of MEE products, damages or secondary damages arising from special circumstances, whether foreseen or unforeseen by MEE, compensation for accidents, compensation for damages to products other than MEE products, or compensation for other work carried out by the user.

Changes in Product Specifications

The specifications given in the catalogs, manuals and technical documents are subject to change without notice.

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Model	EQ-V680D-MAN-E
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