RFID Interface Module

Model

ER-1V680D1/ER-1V680D2

User's Manual (Detailed Edition)

ER-1V680D1
ER-1V680D2

MELSEC iQ-R series Recognized

SAFETY PRECAUTIONS

(Read these precautions before using this product.)

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

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

If this product is used in a manner not specified, the protective functions and performance of the product may be impaired.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".

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

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Please keep the manual in a safe place for future reference, and be sure to deliver the manual to the end user.

[Design Precautions]

⚠ WARNING

- Configure external safety circuits to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so can cause an accident due to an incorrect output or malfunction.
  (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured outside the programmable controller.
  (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
  - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
  - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.

  (3) All outputs may be turned ON if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit outside the programmable controller. For a fail-safe circuit example, refer to "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.
- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. Before executing the other control operations (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully for proper and safe operation. Improper operation can damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module when a communication failure.

[Design Precautions]

⚠WARNING

- Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so can cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.
- To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures.

[Design Precautions]

⚠CAUTION

- When installing the RFID interface module and amplifier/antenna cables, do not bundle the cables with or install the cables close to such as main circuit and power lines. Keep a distance of 100mm or more between them. Failure to do so will cause noise, resulting in malfunction.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time change until RUN state.
- Do not power off the programmable controller or reset the CPU module while the settings are being written. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so also can cause failure or malfunction of the module.
- When storing the product, be sure to observe the defined storage ambient temperature and humidity. Failure to do so can cause malfunction or failure of the module.
- Lock 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]

⚠WARNING

- Shut off all phases of the external power supply used in the system before installing or removing the module. Failure to do so can cause damage or malfunction of the module or electric shock.

[Installation Precautions]

⚠CAUTION

- Use the module in an environment that complies with the general specifications described in the user's manual of the CPU module used. Failure to do so can cause electric shock, fire, malfunction, damage, or deterioration of the module.
- Do not directly touch the conductive part of the module. Failure to do so can cause malfunction or failure of the module.
- Fully mount the antenna cable to the module connector. Insufficient contact can cause malfunction of the module.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect mounting can cause malfunction, failure, and drop of the module.
- When using the programmable controller in an environment with frequent vibrations, fix the module with screws.
- Securely fix the module with mounting screws. Tighten the screws within the specified torque range. Undertightening can cause insufficient contact or malfunction of the module. Overtightening can cause damage of the screws and/or circuit board, resulting in short-circuit or malfunction of the module.
- Do not drop the case or expose the case to strong impact. Doing so can cause malfunction or failure of the module.

[Wiring Precautions]

⚠WARNING

- Shut off all phases of the external power supply used in the system before installing or removing the module. Failure to do so can cause damage or malfunction of the module or electric shock.

[Wiring Precautions]

⚠CAUTION

- Individually ground the FG and LG terminals of the programmable controller with ground resistance of 100Ω or less. Failure to do so can cause electric shock or malfunction of the module.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring can cause fire or failure.
- Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections can cause short circuit, fire, or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range.
- Fully mount the amplifier/antenna cable to the module connector. After mounting, check for separation. Insufficient contact can cause erroneous input and output.
- Place the amplifier/antenna cables and power cables connected to the module in a duct, or clamp them. Failure to do so can cause movement or drift of cables, damage of the module or cables due to careless pulling, or malfunction of the module due to insufficient cable contact.

[Wiring Precautions]

⚠CAUTION

- Check the interface type and correctly connect the cable. Connecting a cable to an incorrect interface or miswiring results in the risk of module and external device malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause short-circuit or malfunction of the module. Overtightening can cause damage of the screws and/or module, resulting in short-circuit or malfunction of the module.
- When removing an amplifier/antenna cable or power cable connected to the module, do not pull the cable. Push into the open button of connector with a flathead screwdriver and then remove the cable connected to the terminal block. Pulling a cable while it is connected to the module results in the risk of malfunction and module and cable damage.
- Do not remove the amplifier/antenna cable with the power supply on. Doing so can cause failure of the module.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual published by Mitsubishi Electric Corporation.
- Do not wire the cables near or bundle the cables with main circuit cables, or power lines. Keep a distance of 100mm or more between them. Failure to do so will cause noise, resulting in malfunction.
- Do not connect the polarities of +24V and 24G of external power supply conversely. Doing so can cause in failure of the module.

[Startup and Maintenance Precautions]

⚠WARNING

- Do not touch the terminals while the module is powered. Doing so can cause electric shock or malfunction of the module.
- Shut off all phases of the external power supply used in the system before cleaning or tightening module screws. Failure to do so can cause damage or malfunction of the module or electric shock. Undertightening can cause drop, short circuit, or malfunction of the module. Overtightening can damage the screws and/or module, resulting in drop, short circuit, or malfunction of the module.
- Before changing data and operating status, and modifying program of the running programmable controller, ensure the safety.

[Startup and Maintenance Precautions]

⚠CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. Before executing the other control operations (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully for proper and safe operation. Improper operation can damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module when a communication failure.
- Do not disassemble or modify the module. Doing so can cause injury, fire, or failure or malfunction of the module.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller. Failure to do so can cause malfunction of the module.
- Shut off all phases of the external power supply used in the system before installing or removing the module. Failure to do so can cause failure or malfunction of the module.
- After the first use of the product, do not remove/install the module and base unit more than 50 times (compliant with IEC 61131-2/JIS B 3502). Exceeding the limit may cause malfunction of the module.
- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- The module case is made of plastic. Do not drop the case or expose the case to strong impact. Doing so can cause damage of the module.
- Before touching the module, be sure to touch such as grounded metal to release the static electricity from your body. Failure to do so can cause failure or malfunction of the module.
- When cleaning, do not use thinner, benzene, acetone, or kerosene. Doing so can cause damage of the module.
- Do not insert water or wire through the gaps in the case. Doing so can cause fire or electric shock.
- This product cannot be used as a detector for physical protection. Erroneous output or malfunction can cause an accident.
- When installing or removing the antenna from the amplifier, first turn off the module power supply. Failure to do so can cause failure or malfunction of the module.
- Installation of multiple antennas can cause 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 something is abnormal with the product, stop using the product immediately, turn off the power supply, and please consult your local Mitsubishi representative. Continued use of the module in this condition can cause failure and malfunction of the module.
- Do not use the product in locations where chemical products and oil are scattered. Failure to do so can cause failure or malfunction of the module.

[Startup and Maintenance Precautions]

⚠CAUTION

- When using the product, be sure to observe the defined ambient temperature and humidity. Failure to do so can cause failure or malfunction of the module.
- Do not touch any connectors when the module is powered. Doing so can cause malfunction of the module due to the static electricity in your body.

[Operating Precautions]

⚠CAUTION

- Before changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully for proper and safe operation. Improper operation can damage machines or cause system malfunction or accidents.

[Disposal Precautions]

⚠CAUTION

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

[Transportation Precautions]

⚠CAUTION

- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, can cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

CONDITIONS OF USE FOR THE PRODUCT

(1) This Mitsubishi Electric Engineering Company Limited (hereinafter referred to as “MEE”) product shall be used in applications that will not lead to a major accident even in the unlikely event any failure or defect should occur in the product in which this Mitsubishi product is incorporated, and shall be systematically provided with external backup and fail-safe functions that operate in the event of any failure or defect.

(2) This MEE product has been designed and manufactured as a general purpose product for general industry applications and the like.

Thus, the product shall be excluded from use in special equipment, system, and other applications such as those listed below. If used in such applications, Mitsubishi shall not bear any responsibility whatsoever for the quality, performance, and safety of the Mitsubishi product (including but not limited to non-performance of main obligation, defect liability, quality assurance liability, tort liability, and product liability):

- Applications in which the public could be greatly affected such as the applications of the nuclear and other power plants operated by the respective power companies
- Applications in which a special quality assurance system is required, such as the applications of railway companies or government or other public offices
- Use in aircraft, medical applications, railway applications, incineration and fuel devices, passenger vehicles, manned transport devices, equipment for recreation and amusement, and safety devices, in which human life or assets could be greatly affected

Note that such an application of the Mitsubishi product may be permitted as determined by Mitsubishi if the user accepts that the application is to be limited and a special quality is not to be required (a quality that exceeds the general specifications). For details, please consult with Mitsubishi.

INTRODUCTION

Thank you for purchasing the RFID interface module manufactured by Mitsubishi Electric Engineering Company, Ltd.
This manual describes the functions, parameter settings, and troubleshooting of the relevant products listed below.
Prior to use, please read this manual carefully to develop full familiarity with the functions and performance of the MELSEC iQ-R series programmable controller to ensure correct use.
When utilizing the program examples introduced in this manual into an actual system, be sure to fully verify that control in the target system is will be unproblematic.
Please ensure that the end users read this manual.

Compliant Module

ER-1V680D1, ER-1V680D2

Point

Unless otherwise specified, this manual provides program examples in which the I/O numbers of X/Y0 to X/Y1F are assigned to the RFID interface module. Assign I/O numbers when applying the program examples to an actual system. For I/O number assignment, refer to the following.

MELSEC iQ-R Module Configuration Manual

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MANUALS

This chapter describes the manuals related to this product.
Please consult your local Mitsubishi Electric representative, if necessary.
This manual does not include information on module FBs (function blocks).
For details on module FBs, refer to the FB Reference for the module used.

Manuals published by Mitsubishi Electric Engineering Co., Ltd.

Manual name [manual number]	Description	Available form
RFID Interface Module ER-1V680D1/ER-1V680D2 User's Manual [50CM-D180426] (this manual)	Specifications and handling methods of the RFID interface module and the communication methods with RF tags	Print book e-Manual PDF
MELSEC iQ-R Series ER-1V680D1 Type/ER-1V680D2 Type RFID Interface Module (Compatible with OMRON V680 Series) FB Reference Manual [50CM-D180429]	FB reference of the RFID interface module	e-Manual PDF

Manuals published by Mitsubishi Electric Corporation

Manual name [manual number]	Description	Available form
MELSEC iQ-R Module Configuration Manual [SH081262ENG]	Common items related to the hardware structure of Mitsubishi Electric programmable controller, MELSEC iQ-R series	Print book e-Manual PDF
MELSEC iQ-R CPU Module User's Manual (Startup) [SH081263ENG]	Specifications, procedures before operation, and troubleshooting of Mitsubishi Electric programmable controller, MELSEC iQ-R series CPU module	Print book e-Manual PDF
MELSEC iQ-R CPU Module User's Manual (Application) [SH081264ENG]	Memory, functions, devices, and parameters of Mitsubishi Electric programmable controller, MELSEC iQ-R series CPU module	Print book e-Manual PDF
MELSEC iQ-R Programming Manual (Program Design) [SH081265ENG]	Program specifications (ladder, ST, FBD/LD, and SFC programs)	e-Manual PDF
MELSEC iQ-R Programming Manual (CPU Module Instructions, Standard Functions/Function Blocks) [SH081266ENG]	Instructions and standard functions/function blocks for Mitsubishi Electric programmable controller, MELSEC iQ-R series CPU module	e-Manual PDF
MELSEC iQ-R Online Module Change Manual [SH081501ENG]	Online module change, which allows a module to be changed without stopping the system for Mitsubishi Electric programmable controller, MELSEC iQ-R series	Print book e-Manual PDF
GX Works3 Operating Manual [SH081215ENG]	System configuration, parameter settings, and online operations of Mitsubishi Electric engineering tool, GX Works3	e-Manual PDF

Point

e-Manual refers to the Mitsubishi Electric FA electronic book manuals that can be browsed by using a dedicated tool. e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.
- Sample programs can be copied to an engineering tool.

TERMS

Unless otherwise specified, this manual uses the following terms.

Terms	Description
Amplifier	Connects to the RFID interface module to perform noncontact communication.
Antenna	Connects to the RFID interface module to perform noncontact communication.
Buffer memory	Memory in an intelligent function module for storing data such as setting values and monitored values. When integrated into the CPU module, this memory refers to a memory for storing data such as setting values and monitored values of the Ethernet function, and data used for data communication of the multiple CPU system function.
Device	Memory in a CPU module for storing data. Devices include X, Y, M, and D depending on the application.
Engineering tool	Another name for GX Works3.
Global label	A label that is valid for all the program data when multiple program data are created in the project. There are two types of global label: a module specific label (module label), which is generated automatically by GX Works3, and an optional label, which can be created for any specified device.
Intelligent function module	A module that has functions other than input and output, such as an A/D converter module and D/A converter module.
Label	A label that represents a device in a given character string
Module label	A label that represents one of memory areas (I/O signals and buffer memory areas) specific to each module in a given character string. For the module used, GX Works3 automatically generates this label, which can be used as a global label.
UID	Means the unique numbers to identify RF tags.

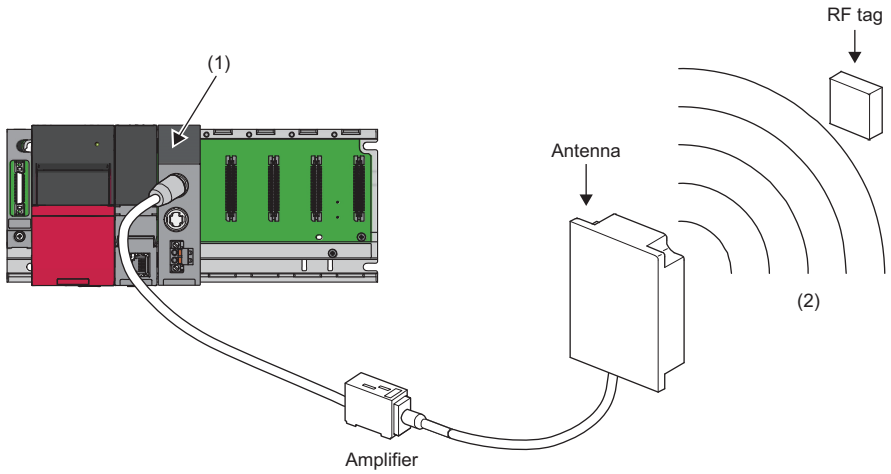
GENERIC TERMS AND ABBREVIATIONS

Unless otherwise specified, this manual uses the following generic terms and abbreviations.

Generic terms and abbreviations	Description
ID command	Another name of commands to send from an RFID interface module to an amplifier/antenna.
Process CPU	A generic term for R08PCPU, R16PCPU, R32PCPU, and R120PCPU of Mitsubishi Electric programmable controller MELSEC iQ-R series.
Process CPU (process mode)	A Process CPU operating in process mode. Process control function blocks and the online module change function can be executed.
Process CPU (redundant mode)	A Process CPU operating in redundant mode. A redundant system is configured with this CPU module. Process control function blocks and the online module change function can be used even in this mode.
Programmable controller CPU	A generic term for R00CPU, R01CPU, R02CPU, R04CPU, R04ENCPU, R08CPU, R08ENCPU, R16CPU, R16ENCPU, R32CPU, R32ENCPU, R120CPU, and R120ENCPU of Mitsubishi Electric programmable controller MELSEC iQ-R series.
Remote head module	An abbreviation for the RJ72GF15-T2 CC-Link IE Field Network remote head module of Mitsubishi Electric programmable controller MELSEC iQ-R series.
RF tag	A generic term for response equipment in noncontact communication.
RFID interface module	A generic term for ER-1V680D1/ER-1V680D2 RFID interface module.
RFID system V680 series	A generic term for Omron RFID system V680 series products.
RnCPU	A generic term for R00CPU, R01CPU, R02CPU, R04CPU, R08CPU, R16CPU, R32CPU, and R120CPU of Mitsubishi Electric programmable controller MELSEC iQ-R series.
RnENCPU	A generic term for R04ENCPU, R08ENCPU, R16ENCPU, R32ENCPU, and R120ENCPU of Mitsubishi Electric programmable controller MELSEC iQ-R series.
Safety CPU	A generic term for R08SFCPU, R16SFCPU, R32SFCPU, and R120SFCPU of Mitsubishi Electric programmable controller MELSEC iQ-R series. This module is used with a safety function module as a pair, and performs both standard control and safety control.

1 OVERVIEW

The RFID interface module is mounted on a base unit of the Mitsubishi general-purpose programmable controller MELSEC iQ-R series, enabling reading and writing with Omron RFID system V680 series RF tags.
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 RF tag reading and writing and the CPU module.



(1) RFID interface module
(2) Data reading and writing with RF tag by electromagnetic induction (non-contact)

RFID interface module features

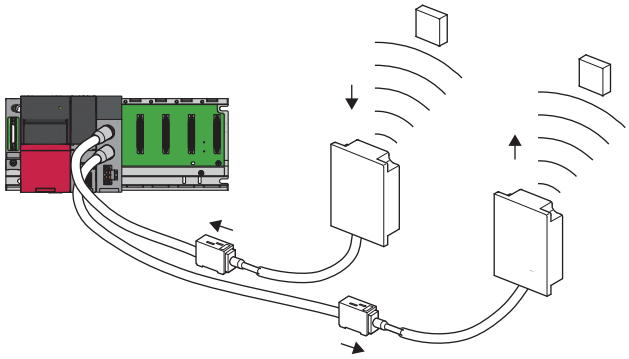
This section describes the features of the RFID interface module.

■Compatible with Mitsubishi Electric MELSEC iQ-R series products

- Using an RFID interface module (ER-1V680D1/ER-1V680D2) together with a Mitsubishi Electric MELSEC iQ-R series CPU module enables the CPU module to control Omron RFID system V680 series products. RFID sensor systems using rich and various products of Mitsubishi Electric MELSEC iQ-R series can be constructed by using the RFID interface module (ER-1V680D1/ER-1V680D2).
- An RFID interface module (EQ-V680D1/EQ-V680D2), which is manufactured by Mitsubishi Electric Engineering Co., Ltd. and used with MELSEC-Q series products, can be replaced with this RFID interface module (ER-1V680D1/ER-1V680D2) in a simple way, since the ER-1V680D1/ER-1V680D2 are compatible with I/O signals and buffer memory of the EQ-V680D1/EQ-V680D2.
- The event history including errors, alarms, and operation is saved to the CPU module. The event history is used to identify the error causes from the operation at the time of error occurrence or the tendency of the error occurrence.
- The RFID interface module is available for the online module change. When an error occurs, the RFID interface module is changed without stopping the programmable controller system. (📖 MELSEC iQ-R Online Module Change Manual)
- The RFID interface module allows you to develop programs by using an FB (function block) library that can be used with Mitsubishi Electric MELSOFT GX Works3. (📖 MELSEC iQ-R Series ER-1V680D1 Type/ER-1V680D2 Type RFID Interface Module (Compatible with OMRON V680 Series) FB Reference Manual)

■Available for the Omron RFID system V680 series products

- All antennas of the Omron RFID system V680 series products are supported. (The built-in amplifier type antennas are used only for the ER-1V680D1.) The RFID interface module connects a built-in amplifier type antenna whose communication range is 150mm, supporting the use that communication range changes.
- The two-channel RFID interface module enables independent antenna operation per channel.
- The two-channel RFID interface module allows you to copy data between RF tags using the Copy command.



- The RFID interface module read/writes up to 2048 bytes at a time from/to the RF tag.
- The RFID interface module has the test function for the RFID system.

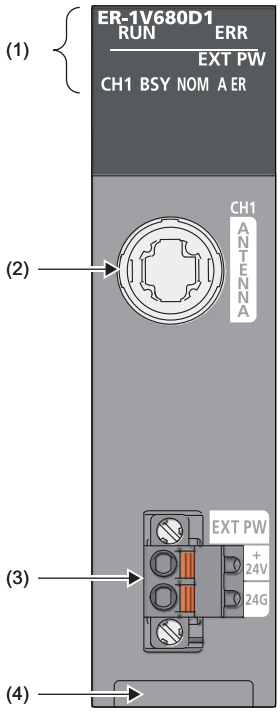
Item	Description
Communication test	Reads data from an RF tag without running a program. If an error occurs when the data is read from an RF tag, this function shows whether the error is caused by the program, antenna, or RF tag.
Communication success rate	Communicates 100 times and calculates the success rate. This function is used to adjust the installation location.
Speed level (read)	Measures the number of times that the RF tag passing through the antenna communication area is read continuously. This function is used to adjust the moving speed of RF tag.
Speed level (write)	Measures the number of times that the RF tag passing through the antenna communication area is written continuously. This function is used to adjust the moving speed of RF tag.
Noise level	Checks whether noise that adversely affects communication with an RF tag is occurring around the antenna.

- The test functions are carried out using programs or module parameter settings without running the programs. (☞ Page 34 Basic Setting)

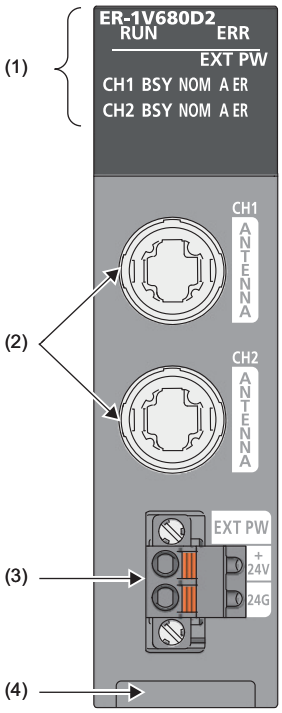
1.1 Part Names

This section describes the part names of the RFID interface module.

• ER-1V680D1



• ER-1V680D2



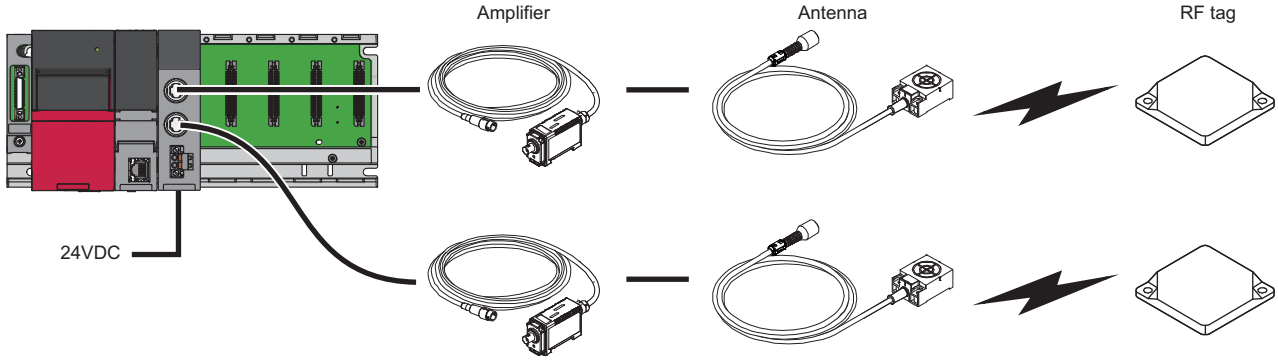
Number	Name		Description
(1)	RUN LED		Indicates the module operating status. On: Normal operation Blinking: When selecting the target module for online module change Off: Error (☞ Page 111 When the RUN LED turns off) or module replacement status at the time of online module change
	ERR LED		Indicates the module error. On: Error (☞ Page 111 When the ERR LED turns on) Off: Normal operation
	EXT PW LED		Indicates the status of power supply to antenna. On: Normal operation Off: Error (☞ Page 111 When the EXT PW LED turns off)
	CH1/CH2	BSY LED	Indicates the operating status of channels. On: Executing ID command or TEST mode Off: Waiting
		NOM LED	Indicates the communication completion status of channels. On: Normal completion of ID command or TEST mode Off: Waiting or when completed with an error
		A ER LED	Indicates the channel error. On: Error (☞ Page 112 When the A ER LED turns on or blinks) Blinking: Error at the time of the communication test under TEST mode (☞ Page 112 When the A ER LED turns on or blinks) Off: Normal operation
(2)	Antenna connector		A connector for antenna connection.
(3)	Connector for external power supply		A connector to connect with a power supply (24VDC) for antenna.
(4)	Rating plate		The serial number (6 digits) is displayed on the plate. (☞ Page 144 Rating plate on the front of module)

1.2 System Configuration

This section describes the system configuration of the RFID interface module.

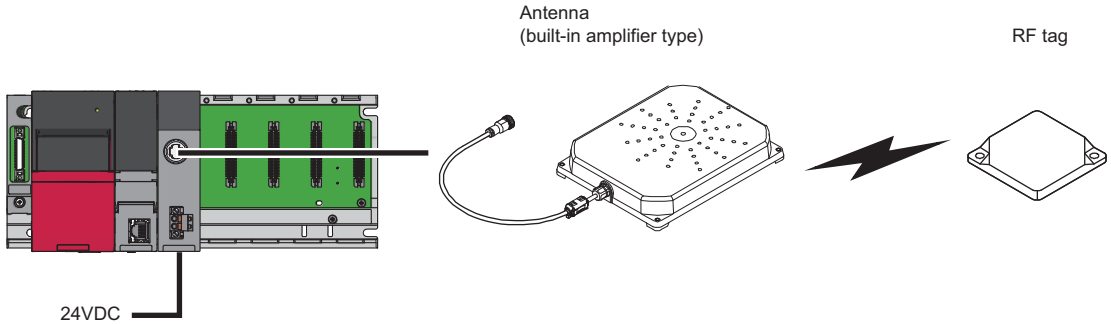
Ex.

System that uses a separate amplifier type antenna



Ex.

System that uses a built-in amplifier type antenna (ER-1V680D1 only)



- The RFID interface module is mountable on an extension base unit and an intelligent device station of CC-Link IE Field Network (remote head module) as well as a main base unit.
- The built-in amplifier type antenna is available for the ER-1V680D1. (The antenna is not available for the ER-1V680D2.)
- The RFID interface module requires the 24VDC power supply.
- Use antennas, amplifiers, and RF tags in an available combination. For details, refer to the catalogs for Omron RFID system V680 series products.

1.3 Applicable System

This section describes the applicable system.

Mountable CPU module

The following table lists CPU modules that can be mounted together with the RFID interface module.

CPU module	
Programmable controller CPU	R00CPU, R01CPU, R02CPU, R04CPU, R08CPU, R16CPU, R32CPU, R120CPU
	R04ENCPU, R08ENCPU, R16ENCPU, R32ENCPU, R120ENCPU
Process CPU*2	R08PCPU, R16PCPU, R32PCPU, R120PCPU
Safety CPU*1	R08SFCPU, R16SFCPU, R32SFCPU, R120SFCPU
Remote head module	RJ72GF15-T2

*1 The RFID interface module is available only for general programs. (The RFID interface module is not available for safety programs.)
*2 The RFID interface module is available only under the process mode. (The RFID interface module is not available under the dual mode.)

Point

The RFID interface module is available for the multiple CPU system. For details, refer to the following beforehand.
MELSEC iQ-R CPU Module User's Manual (Application)

Mountable base units

The RFID interface module is mountable on any I/O slot of a mountable base unit.
Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient. Use the modules within the power capacity. (MELSEC iQ-R Module Configuration Manual)
If the power capacity is insufficient, change the combination of the modules.

Compatible engineering tools

The following table lists the necessary engineering tools and compatible versions for RFID interface module.

Engineering tool	Model	Version
GX Works3	SW1DNC-GXW3-J/-E	1.046Y or later

For the available OS, refer to the GX Works3 Installation Instructions.

Compatible RFID system

This section lists the components of Omron RFID system V680 series that can be used with the RFID interface module. (As of February 2020)

Product	Model	Remarks
Amplifier	V680-HA63A	For EEPROM-type RF tags (V680-D1KP□□)
	V680-HA63B	For FRAM-type RF tags (V680-D2KF□□/V680-D8KF□□)
Antenna (separate amplifier type)	V680-HS51	For RF tag communication; ϕ12mm type, cable length: 2m/12.5m
	V680-HS52	For RF tag communication; ϕ22mm type, cable length: 2m/12.5m
	V680-HS63	For RF tag communication; 40×53mm type, cable length: 2m/12.5m
	V680-HS65	For RF tag communication; 100×100mm type, cable length: 2m/12.5m
Antenna (built-in amplifier type)	V680-H01-V2*1	For RF tag communication; 250×200mm type, cable length: 0.5m
EEPROM-type RF tag	V680-D1KP52MT	Memory capacity: 1k bytes (1000 bytes); ϕ8mm type; metal embedding permitted
	V680-D1KP53M	Memory capacity: 1k bytes (1000 bytes); ϕ10mm type; metal embedding permitted
	V680-D1KP54T	Memory capacity: 1k bytes (1000 bytes); ϕ20mm type
	V680-D1KP66MT	Memory capacity: 1k bytes (1000 bytes); 34×34mm type; metal installation permitted
	V680-D1KP66T	Memory capacity: 1k bytes (1000 bytes); 34×34mm type
	V680-D1KP66T-SP	Memory capacity: 1k bytes (1000 bytes); oil-proof and chemical resistance
	V680-D1KP58HTN	Memory capacity: 1k bytes (1000 bytes); ϕ80mm type; heat resistance
	V680-D1KP52M-BT01	Memory capacity: 1k bytes (1000 bytes); installation with M10 bolts
	V680-D1KP52M-BT11	Memory capacity: 1k bytes (1000 bytes); installation with M8 bolts
FRAM-type RF tag	V680-D2KF52M	Memory capacity: 2k bytes (2000 bytes); ϕ8mm type; metal embedding permitted
	V680S-D2KF67M	Memory capacity: 2k bytes (2000 bytes); 40×40mm type; metal installation permitted
	V680S-D2KF67	Memory capacity: 2k bytes (2000 bytes); 40×40mm type
	V680S-D2KF68M	Memory capacity: 2k bytes (2000 bytes); 86×54mm type; metal installation permitted
	V680S-D2KF68	Memory capacity: 2k bytes (2000 bytes); 86×54mm type
	V680-D2KF52M-BT01	Memory capacity: 2k bytes (2000 bytes); installation with M10 bolts
	V680-D2KF52M-BT11	Memory capacity: 2k bytes (2000 bytes); installation with M8 bolts
	V680S-D8KF67M	Memory capacity: 8k bytes; 40×40mm type; metal installation permitted
	V680S-D8KF67	Memory capacity: 8k bytes; 40×40mm type
	V680S-D8KF68M	Memory capacity: 8k bytes; 86×54mm type; metal installation permitted
	V680S-D8KF68	Memory capacity: 8k bytes; 86×54mm type
Extension cable	V700-A40	For V680-HA63A/63B amplifier connection, cable length: 2m
	V700-A41	For V680-HA63A/63B amplifier connection, cable length: 3m
	V700-A42	For V680-HA63A/63B amplifier connection, cable length: 5m
	V700-A43	For V680-HA63A/63B amplifier connection, cable length: 10m
	V700-A44	For V680-HA63A/63B amplifier connection, cable length: 20m
	V700-A45	For V680-HA63A/63B amplifier connection, cable length: 30m
	V700-A40-W*1	For V680-H01-V2 built-in amplifier type antenna connection, cable length: 2/5/10/20/30m

*1 Only for ER-1V680D1.

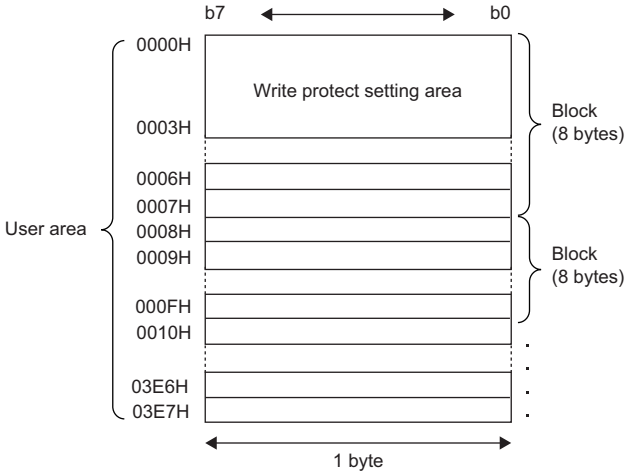
Point

Use antennas, amplifiers, and RF tags in an available combination. For details, refer to the catalogs for Omron RFID system V680 series products.

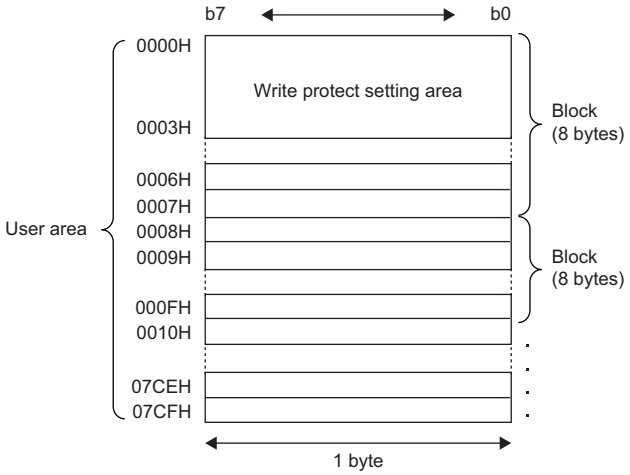
RF tag memory

This section describes the memory of RF tags capable of communicating with the RFID interface module.
Communication between V680 series RF tags and antennas is performed in blocks. When a write error occurs, a data error can occur in blocks.

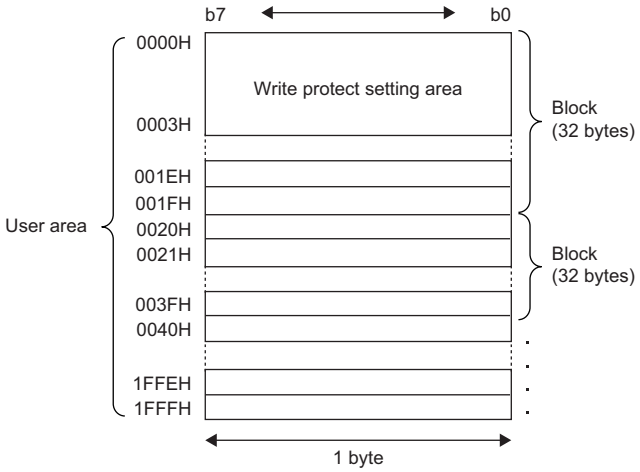
- EEPROM type (1k bytes): V680-D1KP□□



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



- FRAM type (8k bytes): V680S-D8KF□□



2 SPECIFICATIONS

This chapter describes the general specifications and performance specifications of RFID interface module.

2.1 General Specifications

Item	Specifications					
Operating ambient temperature	0 to 55℃					
Storage ambient temperature	-25 to 75℃					
Operating ambient humidity	5 to 95%RH, no condensation					
Storage ambient humidity	5 to 95%RH, no condensation					
Vibration resistance	Compliant with JIS B 3502, IEC 61131-2	—	Frequency	Acceleration	Amplitude	Number of sweeps
		Place with intermittent vibration	5 to 8.4Hz	—	3.5mm	10 times in each direction of X, Y, and Z
			8.4 to 150Hz	9.8m/s²	—	
		Place with continuous vibration	5 to 8.4Hz	—	1.75mm	—
			8.4 to 150Hz	4.9m/s²	—	
Shock resistance	Compliant with JIS B 3502, IEC 61131-2 (147m/s², three times in each direction of X, Y, and Z)					
Operating atmosphere	No corrosive gas, no flammable gas, and little conducting dust					
Operating altitude*1	0 to 2000m*4					
Installation location	In a control panel*5					
Overvoltage category*2	Ⅱor lower					
Pollution degree*3	2 or lower					
Equipment class	Class Ⅲ					

*1 Do not use or keep this product in the environment pressurized over the atmospheric pressure at an altitude of 0m. Doing so can cause malfunction.

*2 This indicates which distribution part is assumed to be connected to the product in the public electrical power distribution network or in the on-site machinery. The category Ⅱ applies to the devices powered by the fixed equipment. The surge voltage withstand of the product whose rated voltage is up to 300V is 2500V.

*3 This degree is the index value to indicate the occurrence rate of conductive materials in the operating environment. The pollution degree 2 means the situation where the non-conductivity materials occur. However, temporary condensation can occur due to accidental condensation.

*4 Using the product at the high altitude over 2000m lowers the upper limit of withstand voltage and operating ambient temperature. In this case, the product can malfunction.

*5 Install the RFID interface module in the control panel that satisfies IP20 protection classification and Type 1 or higher level specified in UL50. Design the control panel suitable for the environment if necessary.

2.2 Functional Specifications

This section lists the functional specifications of RFID interface module.

Item		Specifications	
		ER-1V680D1	ER-1V680D2
RFID specifications	Connectable antenna	☞ Page 18 Compatible RFID system (Antennas of Omron RFID system V680 series are supported.)	
	Number of connectable antennas	1	2
	Connector to be used	RFID dedicated connector	
	RF tag	☞ Page 18 Compatible RFID system (RF tags of the Omron RFID system V680 series are supported.)	
Number of occupied I/O points		32 points	
Data transfer volume		2048 bytes maximum	
External power supply*1	Power supply specifications	20.4 to 28.8VDC (24VDC: -15%, +20%) (ripple ratio: 5% or less)	
	Current consumption	0.20A	0.32A
Wiring recommendations	Wire standard	PVC Insulated Wire: JIS C 3316 HKIV, JIS C 3317 HIV, UL 758 Style No.1007 or 1015	
	Rated temperature	75℃ or higher	
	Rated voltage	300 to 600V	
	Conductors wire size	Core: 0.3 to 1.5㎟ (22 to 16 AWG)	
	Conductors metal	Stranded copper	
Applicable solderless terminal		☞ Page 25 Wiring the power supply	
Internal current consumption (5VDC)*1		0.18A	0.21A
External dimensions	Height	106mm (98mm for base unit)	
	Width	27.8mm	
	Depth	125mm	
Weight		0.20kg	0.21kg

*1 Use the power supply suitable for the limited voltage/current (LVLC) specified in UL 508 or the power supply suitable for the safety extra-low voltage (SELV) and limited energy (LIM).

For the communication time and processing time between an antenna and RF tag, refer to the following.

☞ Page 133 Communication time

☞ Page 136 Processing time

3 PROCEDURES BEFORE OPERATION

This chapter describes the procedures before operation of the RFID interface module.

1. System design

Verify the specifications of RFID interface module and design the system. (☞ Page 21 Functional Specifications)

2. Installation

Install the RFID interface module to the base unit. (📖 MELSEC iQ-R Module Configuration Manual)

3. Wiring

Wire the power supply, and connect and install the amplifiers and antennas. (☞ Page 24 INSTALLATION AND WIRING, 📖 User's manual for Omron RFID system V680 series products)

4. RF tag installation

Install the RF tags. (📖 User's manual for Omron RFID system V680 series products)

5. Profile installation

Install the profile, module label, and module FB to the engineering tool. (☞ Page 32 Profile installation)

6. Powering on the systems

After checking that the CPU module is in STOP state, power-on the RFID interface module.

7. Addition of modules and parameter setting

Add the RFID interface module to the module structure and set the parameters using the engineering tool. (☞ Page 31 Setting Procedure)

8. Test communication

Implement test communication and installation environment measurements in TEST mode. (☞ Page 78 Test Function)

9. Programming

Create a communication program with RF tags. (☞ Page 93 Sample Program, Page 101 Sample Program (with Remote Head Module))

Create the programs to execute the following functions as required.

- RF Tag Write Protect Function (☞ Page 87 Write protect function)
- RF Tag Number of Writes Management Function (☞ Page 62 Manage number of writes)
- RF Tag Data Check Function (☞ Page 59 Check data)
- RF Tag Memory Error Correction Function (☞ Page 42 Read with error correction, Page 54 Write with error correction)

10. Writing data to the programmable controller

Write the set parameters and created programs to the CPU module with the engineering tool. After writing, power off and on, or reset the CPU module. (📖 MELSEC iQ-R CPU Module User's Manual (Startup))

11. Program execution

Set the CPU module to RUN state, check that the program is normally running.

MEMO

4 INSTALLATION AND WIRING

This chapter describes installation and wiring of RFID interface module.

4.1 Installation of RFID Interface Module

For details, refer to the following.

MELSEC iQ-R Module Configuration Manual

Consider sufficiently operability, maintainability, and environmental resistance before installing the RFID interface module and programmable controller in a control panel. Use the RFID interface module indoors.

Precautions

- Do not drop the case or expose the case to strong impact. Doing so can cause failure or malfunction.
- Prevent foreign matter such as dust or wire chips from entering the RFID interface module. Doing so can cause fire, failure, or malfunction.
- An incorrectly mounted RFID interface module results in the risk of malfunction, failure, and dropping. When used in an environment of high oscillation, secure the RFID interface module with screws.
- Do not touch the conductive parts and electronic components while the module is powered. Doing so can cause malfunction or electric shock.
- Before installing or removing the module, shut off all phases of the external power supply. Failure to do so can cause product damage.
- Before cleaning the module or tightening the module fixing screws or connector screws for external power supply, shut off all phases of the external power supply. Failure to do so can cause the module failure or malfunction. Undertightening can cause drop, short-circuit, or malfunction of the module. Overtightening can damage the screws and/or module, resulting in drop, short-circuit, or malfunction of the module.

4.2 Wiring the External Power Supply

This section describes wiring of the external power supply.

Installing the connectors for external power supply

To connect the connectors for external power supply (FKC2.5/3-STF-5.08), tighten the connector screws with a flathead screwdriver. Tighten the connector screws within the following torque range.

Screw	Tightening torque
Connector screw for external power supply (M2.5 screw)	0.2 to 0.3N·m

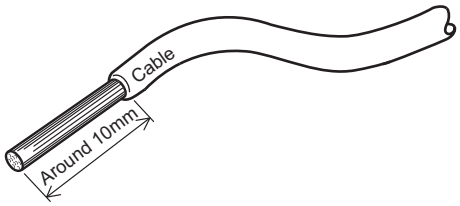
Tighten the screws securely. Failure to do so can cause drop, short-circuit, or malfunction of the module. Overtightening can occur damage of RFID interface module case or connectors.
To remove the connectors for external power supply, untighten the connector screws with a flathead screwdriver.

Wiring the power supply

The following table lists the wires to connect to the connectors for external power supply.

Wire diameter	Type	Material	Temperature rating
0.3 to 1.5mm² (22 to 16 AWG)	Stranded copper	Copper wire	75℃ or higher

Strip the coating about 10mm from the end of the wire, and mount a ferrule terminal to the stripped part.



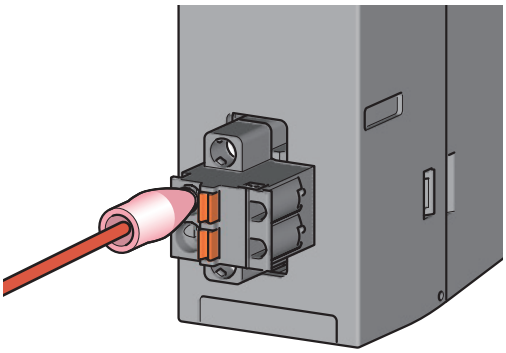
If the coating is stripped too long, the conductive part protrudes to the front of the connector, resulting in the risk of electric shock or short circuit between terminals. If the coating is stripped too short, contact failure can occur.
The following table lists the reference products of ferrule terminals and crimping tools.

Model	Applicable wire size	Crimping tool	Inquiry destination
AI 0.34-8TQ	0.3mm²	CRIMPFOX6	PHOENIX CONTACT GmbH & Co. KG
AI 0.5-8WH, AI 0.5-10WH	0.5mm²		
AI 0.75-8GY, AI 0.75-10GY	0.75mm²		
AI 1-8RD, AI 1-10RD	1.0mm²		
AI 1.5-8BK, AI 1.5-10BK	1.5mm²		

Installation

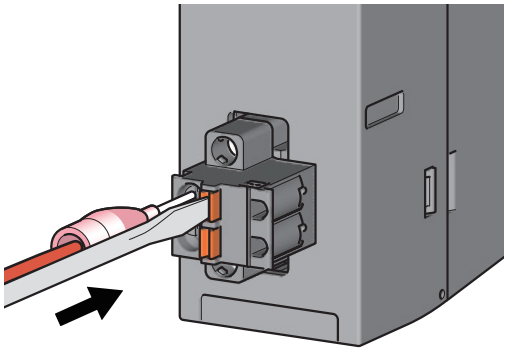
Confirm that all phases of the external power supply used in the system are shut off in advance.

Insert and push the wire with the ferrule terminal into the wire insertion opening. Pull the wire lightly to check that the wire is securely clamped.

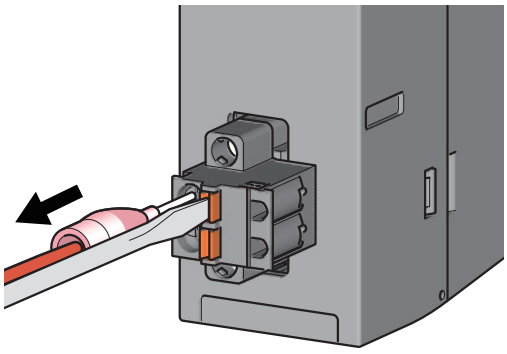


Disconnection

Confirm that all phases of the external power supply used in the system are shut off in advance.



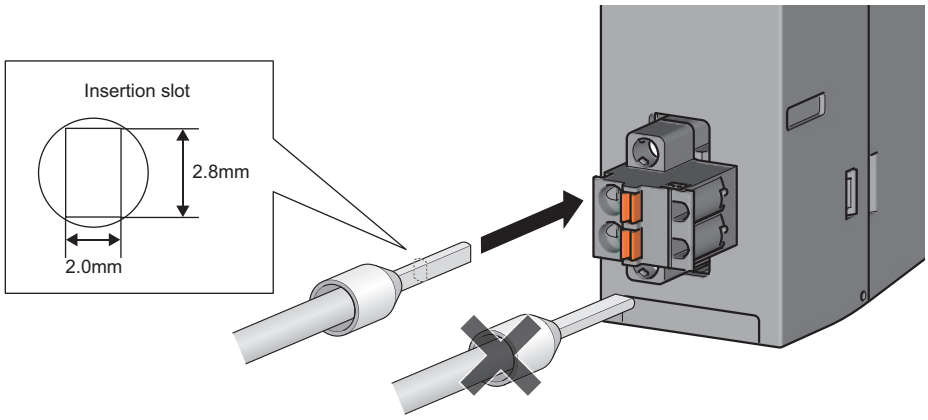
1. Push the open/close button for external power supply with a flathead screwdriver.



2. While pushing the button, pull out the wire with the ferrule terminal.

Precautions

- Use ferrule terminals to connect the connectors for external power supply. If the stripped wire is inserted to the wire insertion opening, the wire is not clamped.
- For the wire strip length, follow the specifications of ferrule terminals. Use the dedicated crimping tool to install ferrule terminals to wires.
- Select the correct size of ferrule terminals and insert them in the correct direction. Failure to do so may cause biting of terminals or damage of terminal blocks. When using the products other than reference products, use the ferrule terminals whose cross-sectional shape size including a processing error is smaller than the following size. Insert the terminal as shown below.



Point

For the size of bar solderless terminal including a processing error, please refer to the manufacturer of ferrule terminals and crimping tools.

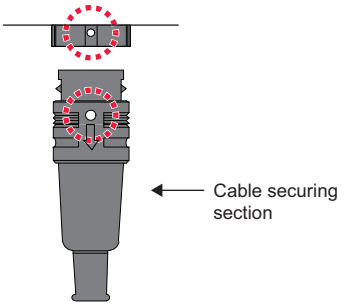
4.3 Wiring the Antenna Cables

This section describes the wiring of antenna cables. For connectable antennas, refer to the following.

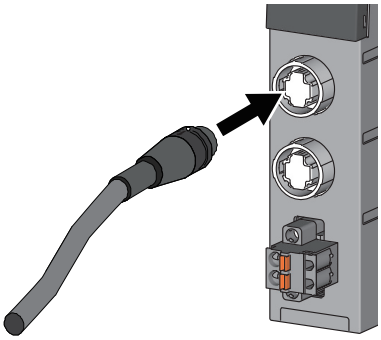
☞ Page 18 Compatible RFID system

Installation

Confirm that all phases of the external power supply used in the system are shut off in advance.



1. Hold the cable securing section of connector and insert the connector so that the white dot of connector fits the white dot of RFID interface module.

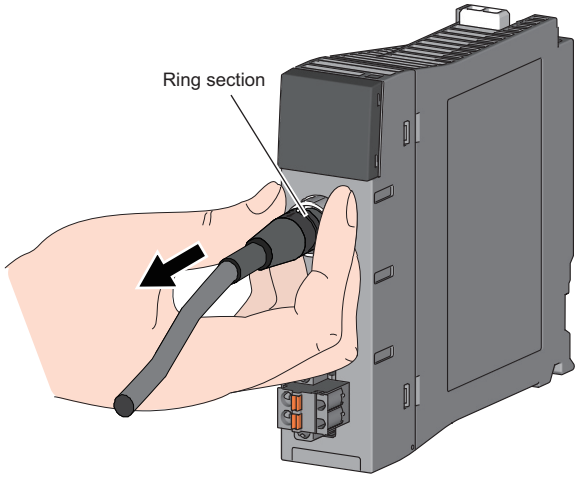


2. Push in the connector straight until the connector locks.

Disconnection

Confirm that all phases of the external power supply used in the system are shut off in advance.

1. Hold on the ring section and pull out the cable straight.

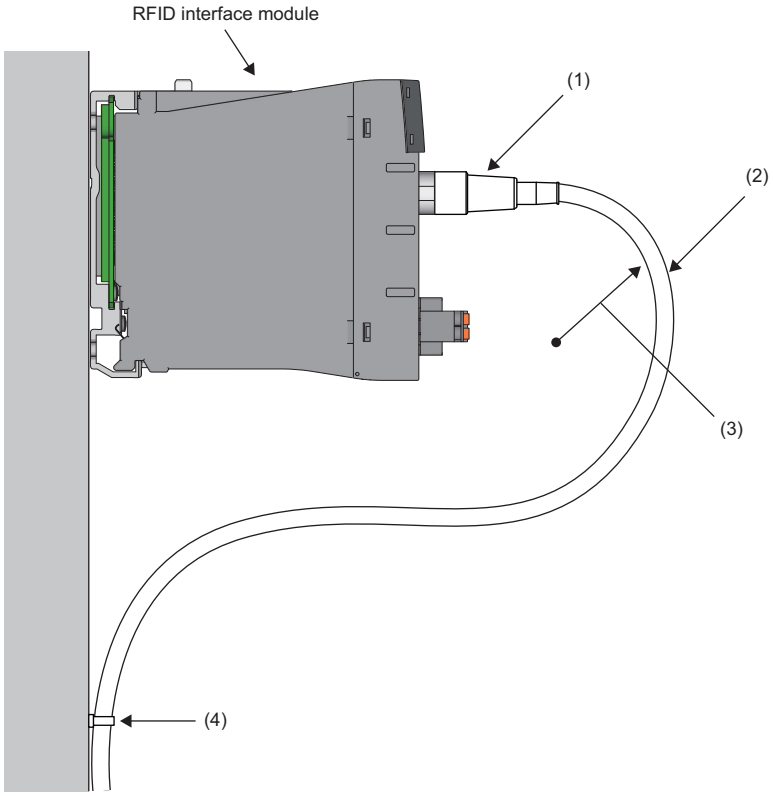


Precautions

- Do not install/remove the antenna cables with the power supply on. Doing so can cause failure.
- The connector cannot be pulled out with holding the cable fixing section. Do not pull the cables forcibly.

4.4 Wiring Precautions

- Do not wire/bundle the cables and connectors near/with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so will cause noise or surge impact, resulting in malfunction.
- Do not connect the power supply in reverse. Doing so can cause failure.
- Check the rated voltage and signal layout before wiring to the RFID interface module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring can cause fire or failure.
- Install the antenna cables to the RFID interface module so that excessive external force is not applied to the connector connecting section.



(1) Connector connecting section
(2) Antenna cable
(3) Installation curvature radius: 40mm or more
(4) Fix the antenna cable so that no external force is applied to the connector connecting section.

5 PARAMETER SETTING

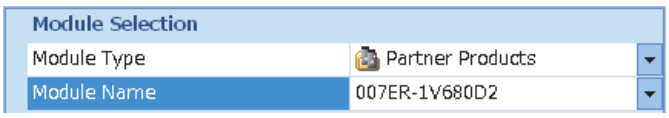
This chapter describes the parameter setting of RFID interface module.

5.1 Setting Procedure

1. Install the profile, module label, and module FB to the engineering tool. (☞ Page 32 Profile installation)
2. Add the RFID interface module to the engineering tool.

[Navigation Window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Right-click ⇨ [New Module Addition]

In the engineering tool, "Partner Products" represents "Module Type", and "007ER-1V680D1" or "007ER-1V680D2" represent "Module Model Name".



3. Select the parameter from the tree of the following window to set.

[Navigation Window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Module model name ⇨ [Module Parameter]

4. Write the settings to the CPU module using the engineering tool.

[Online] ⇨ [Write to PLC]

5. Reset or power off and on the CPU module to reflect the settings.

Profile installation

When using the RFID interface module in the engineering tool, install the profile, module label, and module FB.

Point

For the latest profile, module label, and module FB, please consult your local Mitsubishi representative.

Installation procedure

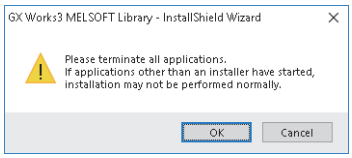
This section describes the installation procedure of the profile, module label, and module FB. (Names of windows and menus may differ depending on the version of the OS.)

Point

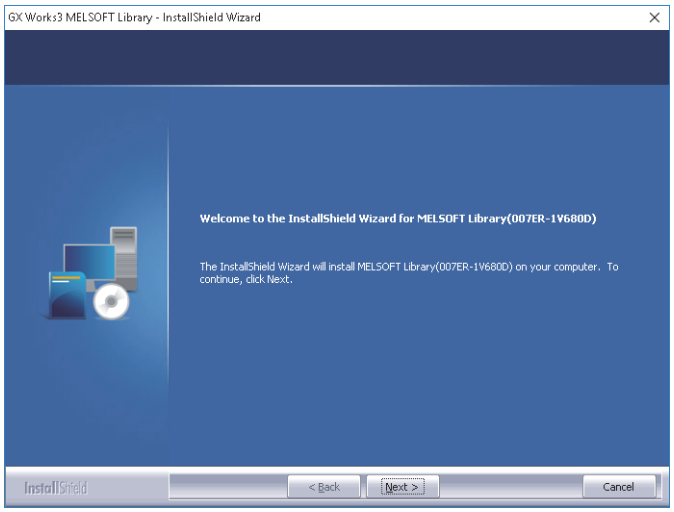
Check the following before installation.

- Log on the personal computer as a user of "Administrator".
- Before installation, terminate all applications running on the OS. Failure to do so can cause unsuccessful installation.

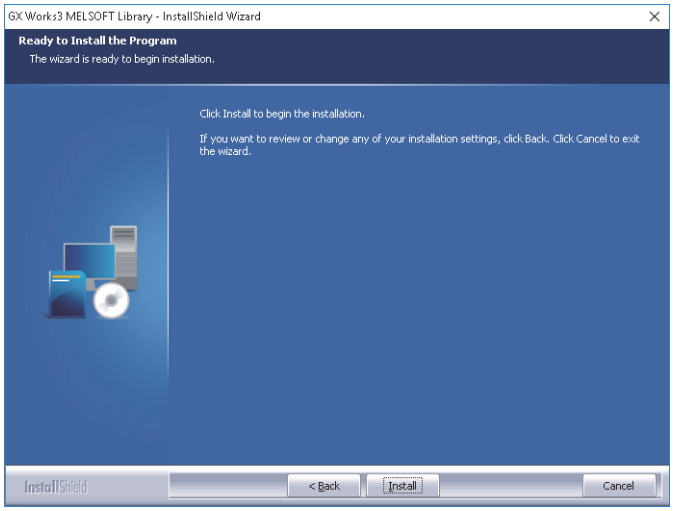
1. End the engineering tool.
2. Execute the installer (setup.exe). Click "OK" shown in the left.

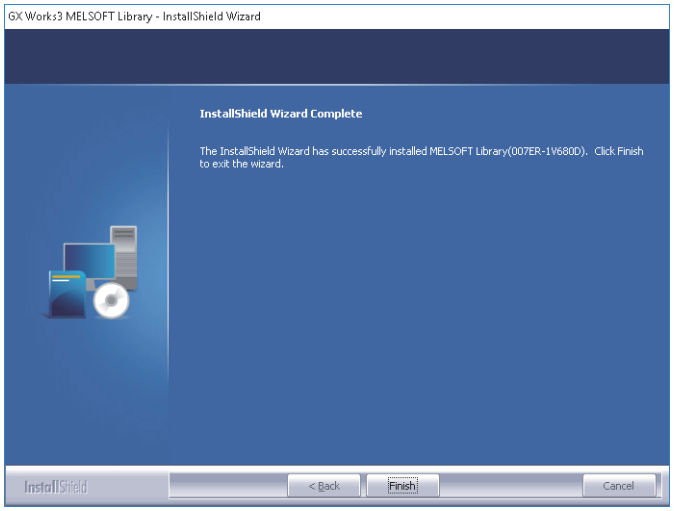


3. Click "Next".

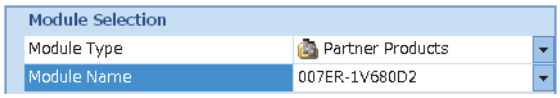


4. Click "Install".





5. Click "Finish".



6. Start the engineering tool and check that the ER-1V680D1 and ER-1V680D2 are selectable.

[Navigation Window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Right-click ⇨ [New Module Addition]

In the engineering tool, "007ER-1V680D1" and "007ER-1V680D2" are displayed.

Point

For the usage of the engineering tool and module label, refer to the following.

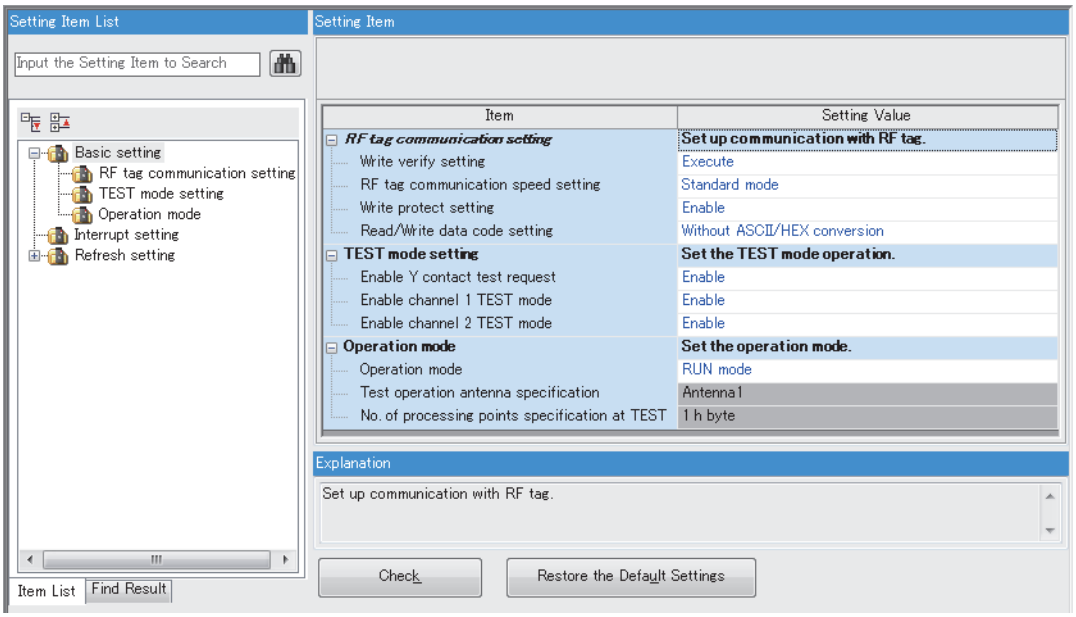
GX Works3 Operating Manual

For the usage of the module FB, refer to the following.

MELSEC iQ-R Series ER-1V680D1 Type/ER-1V680D2 Type RFID Interface Module (Compatible with OMRON V680 Series) FB Reference Manual

5.2 Basic Setting

This section describes the parameter setting related to the basic functions when using the RFID interface module.



Item		Description	Setting range
RF tag communication setting	Write verify setting	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.	• Execute (Default) • Do not execute
	RF tag communication speed setting*1*2	Shortens the communication time when the communication time with the RF tag in the standard communication speed setting is too long.	• Standard mode (Default) • High-speed mode
	Write protect setting	Enables/Disables the write protection function (RF tag write prohibit function). ☞ Page 87 Write protect function	• Enable (Default) • Disable
	Read/Write data code setting	Sets the Read/Write data code. When converting the hexadecimal data to ASCII data to write to the RF tag, set this code. ASCII data are converted to hexadecimal data to read. ☞ Page 91 Read/Write data code setting	• Without ASCII/HEX conversion (Default) • With ASCII/HEX conversion
TEST mode setting	Enable Y contact test request	Enables/Disables testing using the Y contact (programmable controller CPU output signal Y15: ON) in RUN mode.	• Enable (Default) • Disable
	Enable channel 1 TEST mode	Enables/Disables the "TEST mode" setting and "Enable Y contact TEST request" setting of operation mode setting for channel 1.	• Enable (Default) • Disable
	Enable channel 2 TEST mode*3	Enables/Disables the "TEST mode" setting and "Enable Y contact TEST request" setting of operation mode setting for channel 2.	• Enable (Default) • Disable
Operation mode	Operation mode	Sets the operation mode of the RFID interface module. All commands can be used in RUN mode. TEST mode is used at the time of installation, maintenance, and troubleshooting.	• RUN mode (Default) • TEST mode (Communication test) • TEST mode (Communication success rate) • TEST mode (Speed level (read)) • TEST mode (Speed level (write)) • TEST mode (Noise level)
	Test operation antenna specification	Specifies the test operation antenna on the Communication success rate, Speed level, and Noise level.	• Antenna 1 (Default) • Antenna 2
	No. of processing points specification at TEST	Specifies the number of test operation bytes on the communication test, communication success rate, and speed level.	1 to 800h bytes (Default: 1h byte)

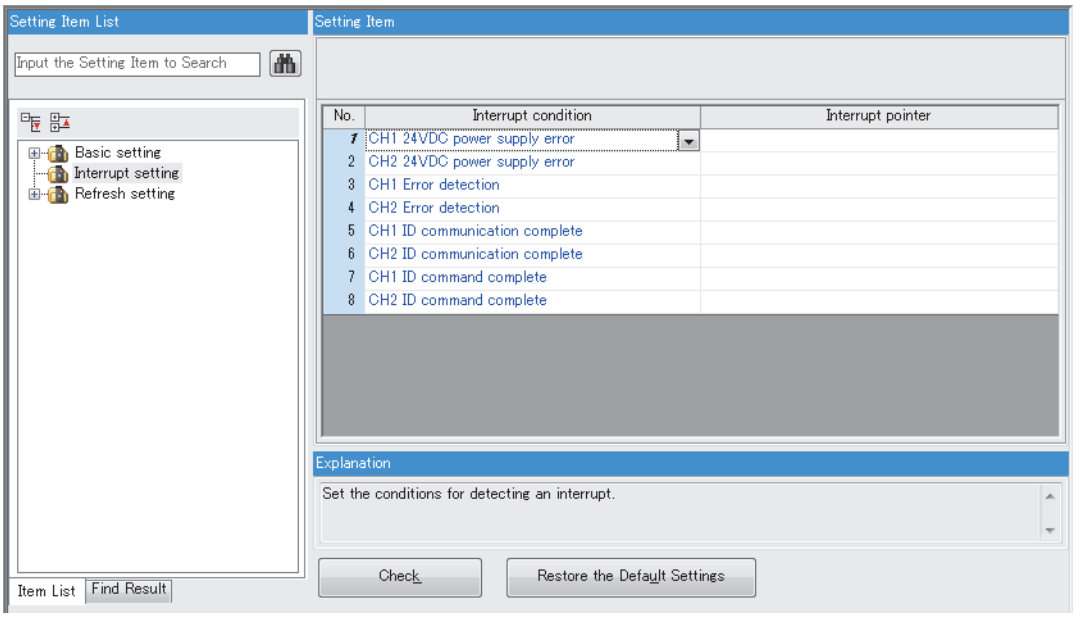
*1 When the FIFO trigger, FIFO repeat, multi-trigger, or multi-repeat is specified in Communication specification area (Un\G1, Un\G4001), the communication speed is the speed in the standard mode even if the high-speed mode is set.

*2 When the V680S-D8KF□□ is used, the communication time is the same as the time in the standard mode even if the high-speed mode is set.

*3 Only for ER-1V680D2.

5.3 Interrupt Setting

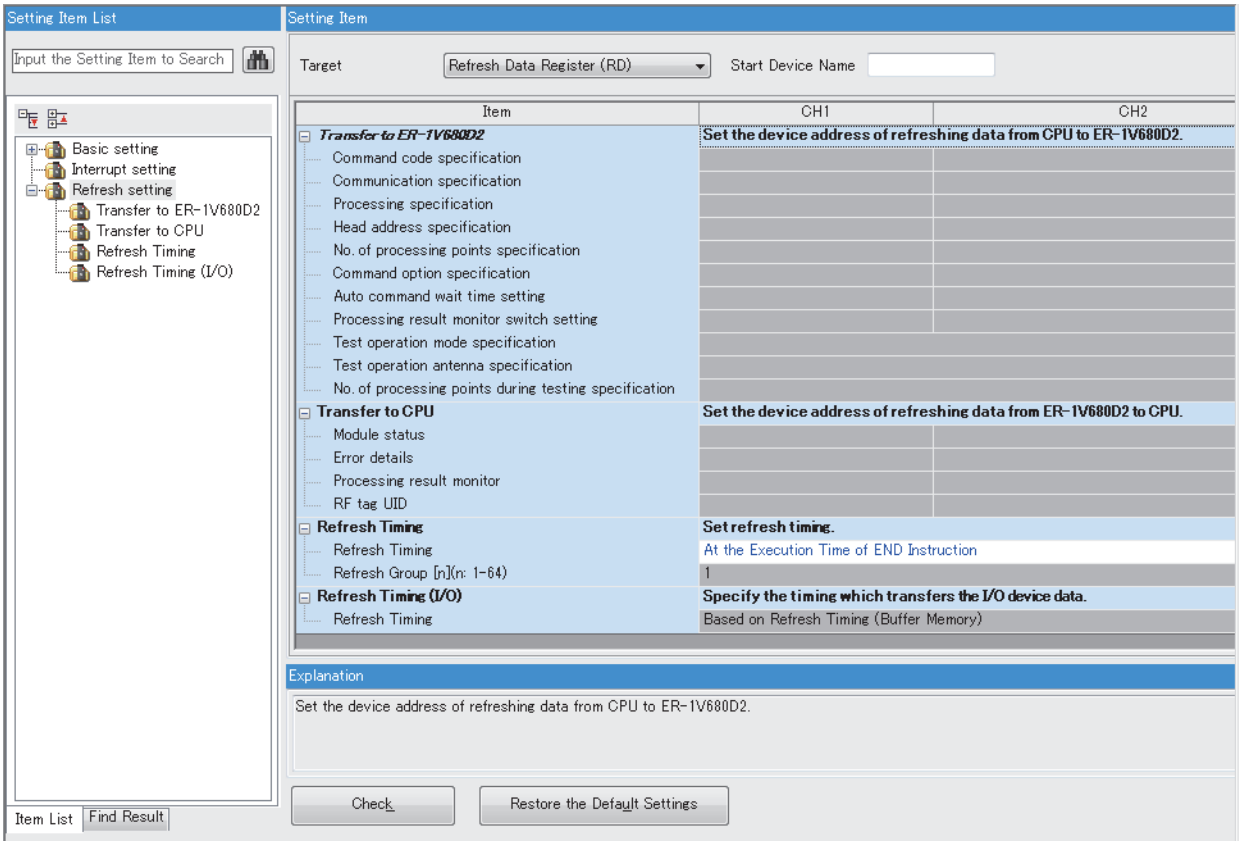
This section describes the interrupt settings of the RFID interface module.



No.	Interrupt condition	Interrupt pointer
1 to 8	Interrupt factors • CH1 24VDC power supply error • CH2 24VDC power supply error • CH1 Error detection • CH2 Error detection • CH1 ID communication complete • CH2 ID communication complete • CH1 ID command complete • CH2 ID command complete (The CH2 is available for the ER-1V680D2.)	Specify the number of interrupt pointer that starts up when an interrupt factor is detected. The setting range is I0 to I15 or I50 to I1023. Do not specify the same interrupt pointer. (Default: Not specified)

5.4 Refresh Setting

This section describes the settings to transfer the buffer memory of RFID interface module to the device of CPU module. With this refresh settings, a program to read data is not required.



Item	Description	Setting range
Target	Select the refresh target. ■Refresh Data Register (RD) The buffer memory is transferred to the refresh data register (RD) of CPU module. The transfer destinations of all items are automatically set by setting the start device to "Start Device Name". ■Device The buffer memory is transferred to the specified device of CPU module. X, Y, M, L, B, D, W, R, ZR, or RD is available to the specified device. When using X, Y, M, L, or B of bit device, set the number to be divisible by 16 points (such as X10, Y120, and M16). The buffer memory is stored to the area for 16 points from the specified device number.	• Refresh Data Register (RD) (Default) • Device

Item		Description	Setting range
Transfer to ER-1V680D1/ER-1V680D2[*1]	Command code specification	Specifies the device where the data to transfer to Command code specification area (Un\G0, Un\G4000) is stored. (Refresh size: one word for one channel)	• Refresh device (RD) • Specified device
	Communication specification	Specifies the device where the data to transfer to Communication specification area (Un\G1, Un\G4001) is stored. (Refresh size: one word for one channel)	
	Processing specification	Specifies the device where the data to transfer to Processing specification area (Un\G2, Un\G4002) is stored. (Refresh size: one word for one channel)	
	Head address specification	Specifies the device where the data to transfer to Head address specification area (Un\G3, Un\G4003) is stored. (Refresh size: one word for one channel)	
	No. of processing points specification	Specifies the device where the data to transfer to No. of processing points specification area (Un\G4, Un\G4004) is stored. (Refresh size: one word for one channel)	
	Command option specification	Specifies the device where the data to transfer to Command option specification area (Un\G5, Un\G4005) is stored. (Refresh size: one word for one channel)	
	Auto command wait time setting	Specifies the device where the data to transfer to Auto command wait time setting area (Un\G10, Un\G4010) is stored. (Refresh size: one word for one channel)	
	Processing result monitor switch setting	Specifies the device where the data to transfer to Processing result monitor switch setting area (Un\G11, Un\G4011) is stored. (Refresh size: one word for one channel)	
	Test operation mode specification	Specifies the device where the data to transfer to Test operation mode specification area (Un\G8000) is stored. (Refresh size: one word)	
	Test operation antenna specification	Specifies the device where the data to transfer to Test operation antenna specification area (Un\G8001) is stored. (Refresh size: one word)	
	No. of processing points during testing specification	Specifies the device where the data to transfer to No. of processing points during testing specification area (Un\G8002) is stored. (Refresh size: one word)	
Transfer to CPU[*2]	Module status	Specifies the device to store the module status. (Refresh size: one word for one channel)	
	Error details	Specifies the device to store the error details. (Refresh size: one word for one channel)	
	Processing result monitor	Specifies the device to store the processing result monitor. (Refresh size: one word for one channel)	
	RF tag UID	Specifies the device to store the RF tag UID. (Refresh size: four words for one channel)	
Refresh Timing	Refresh Timing	Specifies the timing to refresh.	• At the Execution of END Instruction (Default) • At the Execution Time of Specified Program
	Refresh Group [n] (n: 1-64)	Specifies the refresh group of program. (The refresh group program is specified in the program settings of CPU parameter.)	1 to 64 (Default: 1)
Refresh Timing (I/O)	Refresh Timing	The timing to transfer the data of I/O device depends on the settings of buffer memory.	—

*1 The refresh size for one channel is 11 words, and that size for two channels is 19 words.

*2 The refresh size for one channel is 7 words, and that size for two channels is 14 words.

6 FUNCTIONS

6.1 Function List

This section lists the functions of the RFID interface module.

Function			Description	Reference
Command	Read	Read	Reads data from an RF tag.	Page 41 Read
		Read with error correction	Reads data and check codes from an RF tag, inspects data reliability, and corrects 1-bit errors.	Page 42 Read with error correction
		Read UID	Reads the UID (unit identification number) of an RF tag.	Page 44 Read UID
	Write	Write	Writes data to an RF tag.	Page 45 Write
		Set bit	Sets 1 to the specified bit in data of an RF tag.	Page 46 Set bit
		Clear bit	Sets 0 to the specified bit in data of an RF tag.	Page 48 Clear bit
		Write mask bit	Protects the RF tag data that you do not want overwritten and writes other data.	Page 50 Write mask bit
		Write calculation	Writes an addition or subtraction calculation result (data) to data of an RF tag.	Page 52 Write calculation
		Write with error correction	Writes data and check codes for inspecting data reliability to an RF tag.	Page 54 Write with error correction
	Duplicate	Copy[*1]	Copies data of an RF tag between the channel 1 and channel 2.	Page 56 Copy
	Initialize	Fill data	Initializes data of an RF tag by using specified data.	Page 57 Fill data
	Management	Check data	Checks whether or not an error occurred in data of an RF tag.	Page 59 Check data
		Manage number of writes	Judges whether or not the number of RF tag writes exceeds the specified number of EEPROM-type RF tag writes.	Page 62 Manage number of writes
		Measure noise	Measures the noise around an antenna.	Page 65 Measure noise
Communication specification	Trigger		Communicates with an RF tag and outputs the result when ID command execution request is turned on with the RF tag stopped within the antenna communication area.	Page 67 Trigger
	Auto		Automatically starts to communicate with an RF tag coming into the antenna communication area and outputs the result.	Page 68 Auto
	Repeat auto		Automatically detects an RF tag coming into the antenna communication area and communicates with the tag. Communicates with tags coming into the communication area one after another until ID command execution request is turned off.	Page 69 Repeat auto
	FIFO trigger		Communicates with an RF tag and outputs the result when ID command execution request is turned on with the RF tag stopped within the antenna communication area. After communicating, the RF tag is prohibited to move.	Page 71 FIFO trigger
	FIFO repeat		Automatically detects an RF tag coming into the antenna communication area and communicates with the tag. Communicates with tags coming into the communication area one after another until ID command execution request is turned off. After communicating, the RF tag is prohibited to move.	Page 72 FIFO repeat
	Multi-trigger		Communicates with RF tags stopped in the antenna communication area.	Page 74 Multi-trigger
	Multi-repeat		Automatically detects RF tags coming into the antenna communication area and communicates with the tags. Communicates with tags coming into the communication area one after another until ID command execution request is turned off. After communicating, the RF tag is prohibited to move.	Page 76 Multi-repeat
Interrupt function			Starts up the interrupt program of CPU module when an interrupt factor including ID command complete and error detection is detected.	Page 35 Interrupt Setting

Function		Description	Reference
Test function	Communication test	Reads data from an RF tag without running a program. If an error occurs when data is read from an RF tag, this function shows whether the error is caused by the program, antenna, or RF tag.	Page 79 Communication test
	Communication success rate	Communicates 100 times and calculates the success rate. Use this function to adjust the installation location.	Page 81 Communication success rate
	Speed level (read)	Measures the number of times that the RF tag passing through the antenna communication area is read continuously. Use this function to adjust the moving speed of RF tag.	Page 83 Speed level (read/write)
	Speed level (write)	Measures the number of times that the RF tag passing through the antenna communication area is written continuously. Use this function to adjust the moving speed of RF tag.	
	Noise level	Checks whether noise that adversely affects communication with an RF tag is occurring around the antenna.	Page 85 Noise level
Option	RF tag communication speed setting	Specifies the communication speed.	Page 34 Basic Setting
	Write verify setting	Sets to enable/disable the verify function when writing.	Page 34 Basic Setting
	Write protect function	Enables/Disables to write to an RF tag.	Page 87 Write protect function
	Read/Write data code setting	This function is used to set whether or not converting hexadecimal data to ASCII data to write to an RF tag. ASCII data are converted to hexadecimal data to read.	Page 91 Read/Write data code setting

*1 Available only when ER-1V680D2 is used.

6.2 Command

This section describes the commands to use for RFID interface module and the specification detail.

Specify the commands for RF tags in Command code specification area (Un\G0, Un\G4000).

Item	Command code specification area (Un\G0, Un\G4000)	Description	Reference
Read	0000H	Reads data from an RF tag.	Page 41 Read
Write	0001H	Writes data to an RF tag.	Page 45 Write
Set bit	0002H	Sets 1 to the bit specified in data of an RF tag.	Page 46 Set bit
Clear bit	0003H	Sets 0 to the bit specified in data of an RF tag.	Page 48 Clear bit
Write mask bit	0004H	Protects the RF tag data area that you do not want overwritten and writes other data.	Page 50 Write mask bit
Write calculation	0005H	Writes an addition or subtraction calculation result (data) to data of an RF tag.	Page 52 Write calculation
Fill data	0006H	Initializes data of an RF tag by using specified data.	Page 57 Fill data
Check data	0007H	Checks whether or not an error occurred in data of an RF tag.	Page 59 Check data
Manage number of writes	0008H	Judges whether or not the number of RF tag writes exceeds the specified number of EEPROM-type RF tag writes.	Page 62 Manage number of writes
Copy	0009H	Copies data of an RF tag between channel 1 and channel 2.	Page 56 Copy
Read with error correction	000AH	Reads data and check codes from an RF tag, inspects data reliability, and corrects 1-bit errors.	Page 42 Read with error correction
Write with error correction	000BH	Writes data and check codes for inspecting data reliability to an RF tag.	Page 54 Write with error correction
Read UID	000CH	Reads the UID (unit identification number) of an RF tag.	Page 44 Read UID
Measure noise	0010H	Measures the noise around an antenna.	Page 65 Measure noise

Point

- When ID command execution request (Y14, Y1C) is turned on, the command specified in Command code specification area (Un\G0, Un\G4000) is executed. (☞ Page 125 ID command execution request (Y14, Y1C))
- Specify the execution timing in Communication specification area (Un\G1, Un\G4001). (☞ Page 66 Communication Specification)
- The area from Un\G0 to Un\G1123 is used for the buffer memory of CH1, and the area from Un\G4000 to Un\G5123 is used for the buffer memory of CH2. (☞ Page 126 List of buffer memory addresses)

Read

This command is used to read data from an RF tag.

Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0000H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	Data storage order 0000H: Upper → Lower 0001H: Lower → Upper
Head address specification area (Un\G3, Un\G4003)	0000H to FFFFH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 0800H
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)*1	Read data

*1 The use range differs depending on No. of processing points specification area (Un\G4, Un\G4004).

Processing details

This command reads the RF tag data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003).
The read data is stored in Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123).

Read with error correction

Reads data and check codes from an RF tag, inspects data reliability, and corrects 1-bit errors.

Point

This command inspects data reliability of the data written by using the Write with error correction command and the check code and corrects 1-bit errors. (☞ Page 54 Write with error correction)

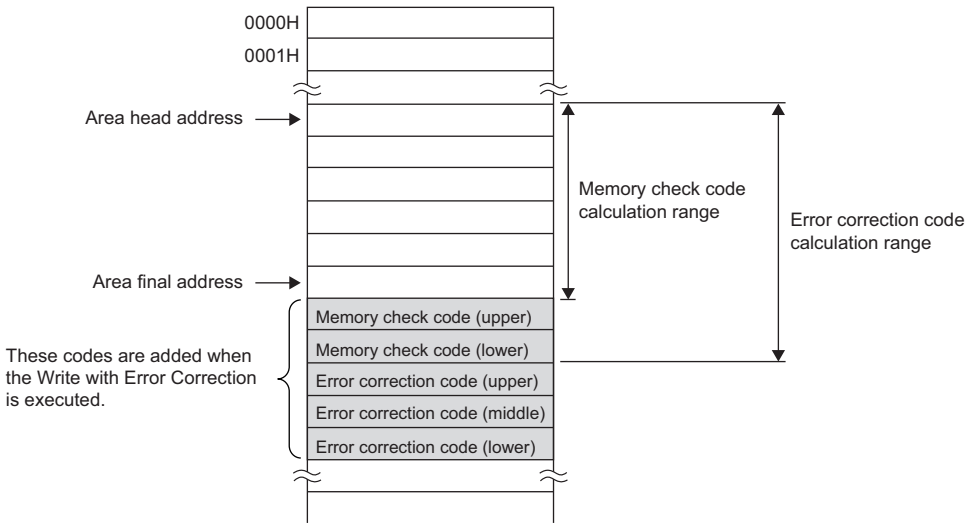
Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	000AH
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	Data storage order 0000H: Upper → Lower 0001H: Lower → Upper
Head address specification area (Un\G3, Un\G4003)	0000H to FFFAH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 01FEH
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)*1	Read data

*1 The use range differs depending on No. of processing points specification area (Un\G4, Un\G4004).

Processing details

This command reads the RF tag data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) and check code (five bytes) starting from the address specified in Head address specification area (Un\G3, Un\G4003), and checks the correctness of data from the check code.

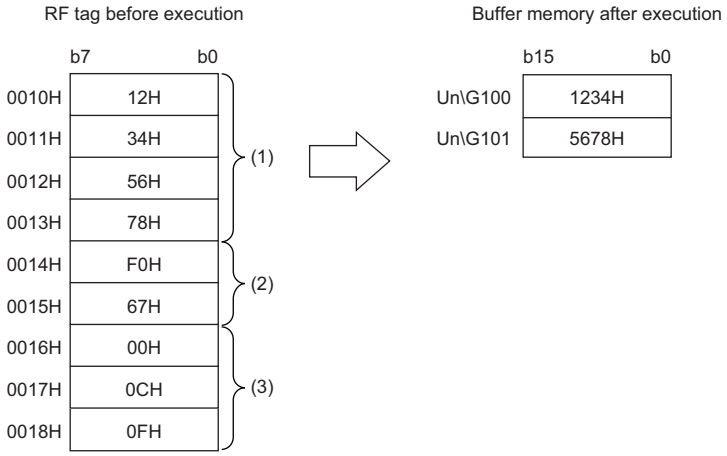


When a 1-bit memory error is corrected, the data correction flag (bit 3) in Error details storage area (Un\G41, Un\G4041) and the error detection (X5, XD) turn on. The corrected data are stored in Data storage area (Un\G100 to UN\G1123, UN\G4100 to Un\G5123).

When a memory error of 2 or more bits is detected, the status flag (bit 4) of Error details storage area (Un\G41, Un\G4041) turns on and error detection (X5, XD) turns on to inform that the uncorrectable memory error has occurred. The read data is not returned.

Ex.

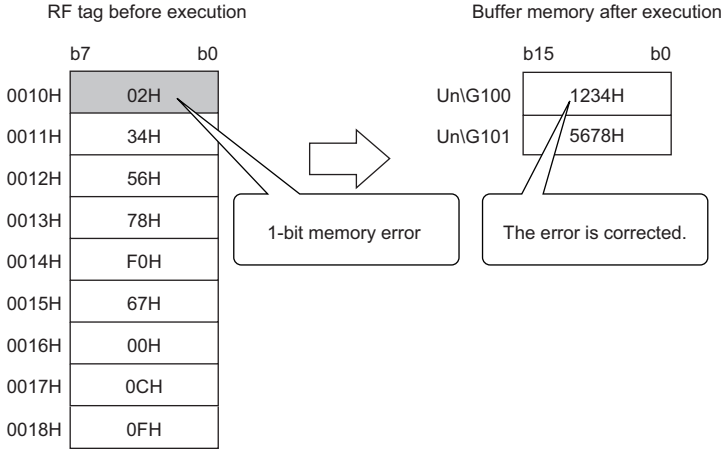
When executing the Read with error correction command to four bytes of data starting from the address 0010H in the data storage order 0000H (Upper → Lower)



(1) Number of read bytes (4 bytes)
(2) Memory check code (2 bytes)
(3) Error correction code (3 bytes)

Ex.

When executing the Read with error correction command to four bytes of data starting from the address 0010H in the data storage order 0000H (Upper → Lower) to correct the 1-bit memory error



In this case, the data in the RF tag is not corrected.

Read UID

This command is used to read the UID (unit identification number) of an RF tag.

Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	000CH
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	—
Head address specification area (Un\G3, Un\G4003)	—
No. of processing points specification area (Un\G4, Un\G4004)	—
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)	—

Processing details

This command reads the RF tag UID (unit identification number) (8 bytes) and stores the UID to RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093).

Write

This command is used to write data to an RF tag.

Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0001H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	Data storage order 0000H: Upper → Lower 0001H: Lower → Upper
Head address specification area (Un\G3, Un\G4003)	0000H to FFFFH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 0800H
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)*1	Write data

*1 The use range differs depending on No. of processing points specification area (Un\G4, Un\G4004).

Processing details

This command writes the data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003) to an RF tag.
The write data is stored in Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123).

Set bit

This command is used to set 1 to the specified bit in the data of RF tag.

Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0002H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	Data storage order 0000H: Upper → Lower 0001H: Lower → Upper
Head address specification area (Un\G3, Un\G4003)	0000H to FFFFH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 0004H
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101)	Set bit specification data

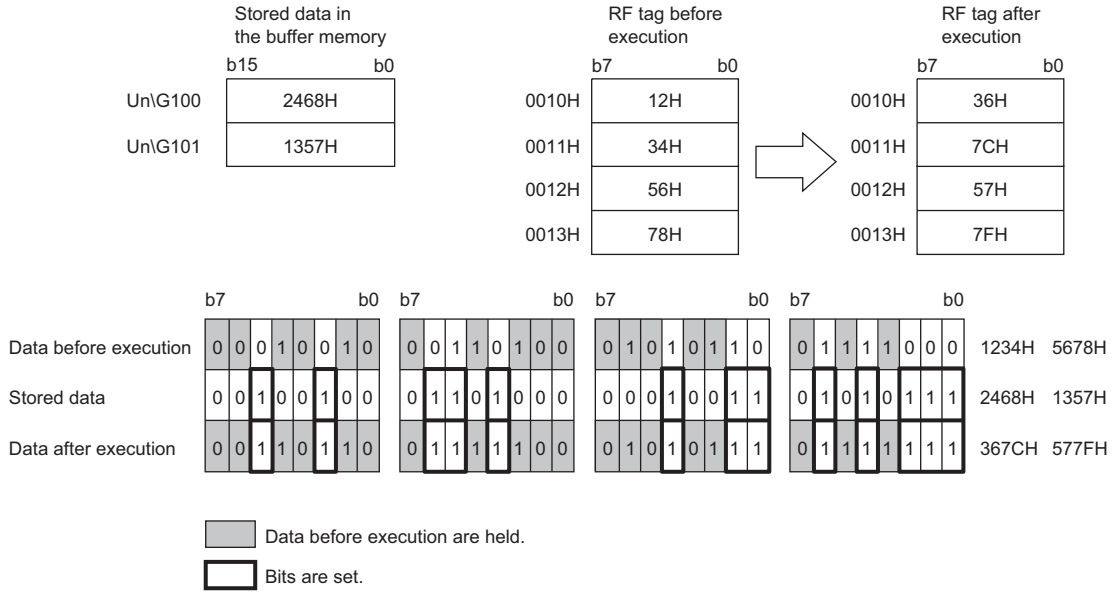
Processing details

This command sets 1 to the data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003), and writes the result to the same address of the RF tag.

The write data is stored in Data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101).

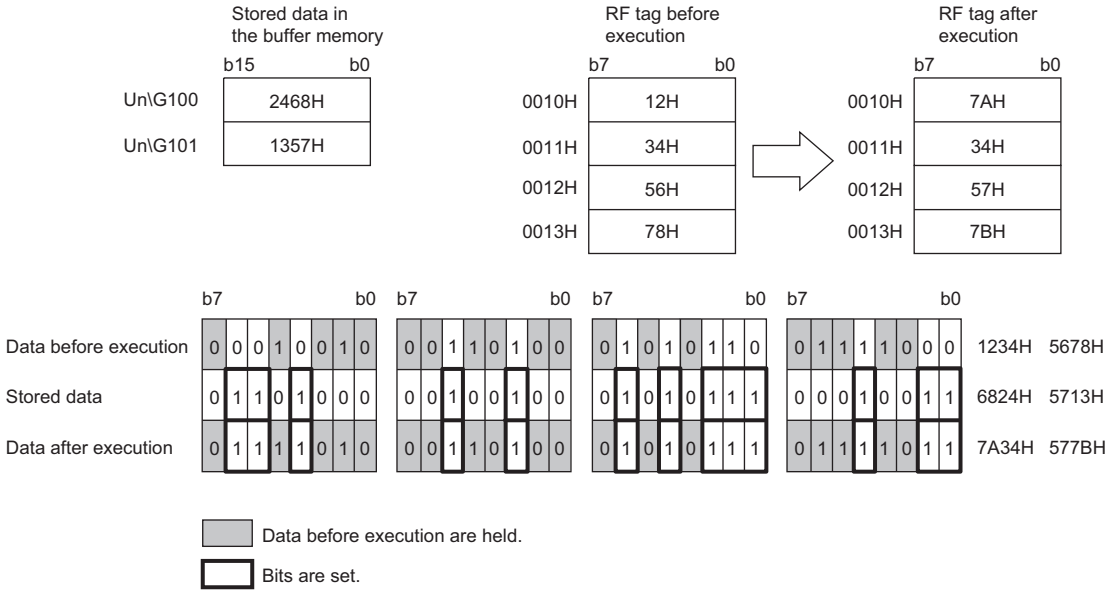
Ex.

When executing the Set bit command to four bytes of data starting from the address 0010H in the data storage order 0000H (Upper → Lower)



Ex.

When executing the Set bit command to four bytes of data starting from the address 0010H in the data storage order 0001H (Lower → Upper)



Clear bit

This command is used to set 0 to the specified bit in the data of RF tag.

Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0003H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	Data storage order 0000H: Upper → Lower 0001H: Lower → Upper
Head address specification area (Un\G3, Un\G4003)	0000H to FFFFH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 0004H
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101)	Clear bit specification data

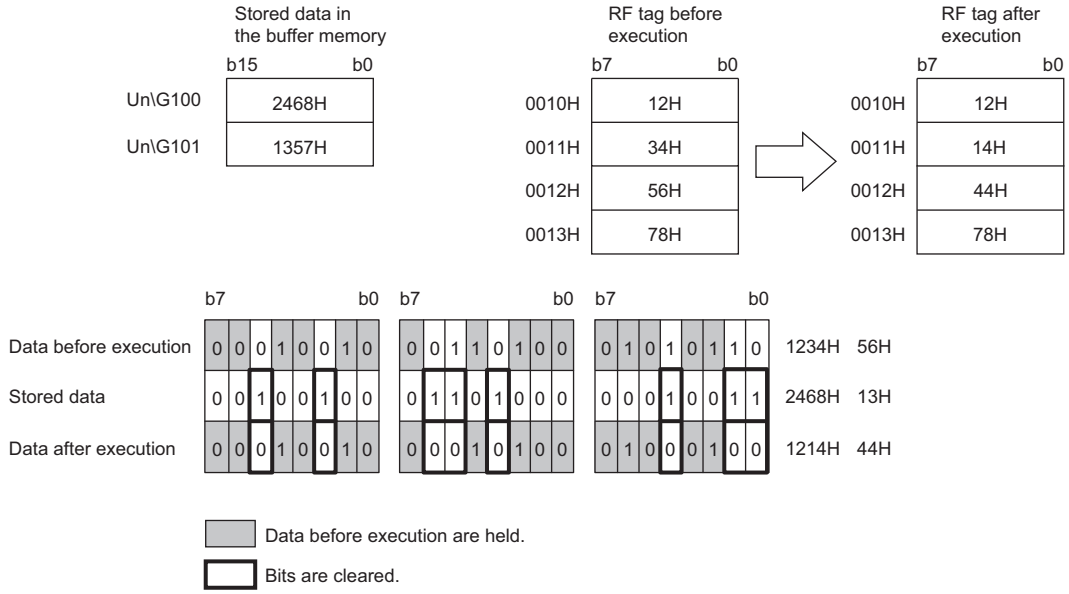
Processing details

This command clears the data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003), and writes the result to the same address of the RF tag.

The data to be cleared is stored in Data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101).

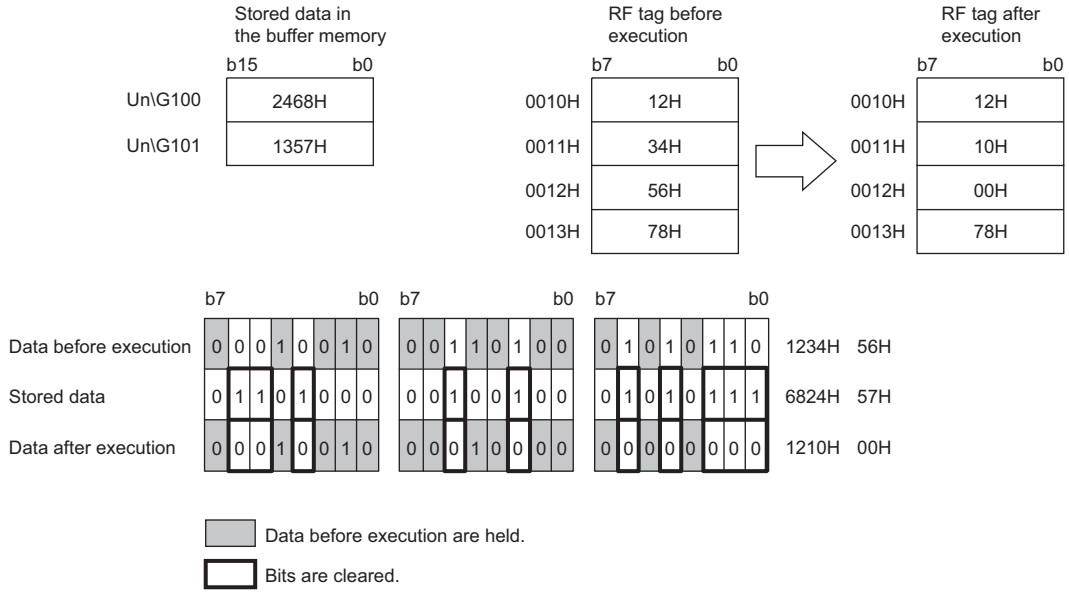
Ex.

When executing the Clear bit command to the data of three bytes starting from the address 0010H in the data storage order 0000H (Upper → Lower)



Ex.

When executing the Clear bit command to the data of three bytes starting from the address 0010H in the data storage order 0001H (Lower → Upper)



Write mask bit

This command is used to protect the RF tag data area that you do not want overwritten and writes other data.

Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0004H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	Data storage order 0000H: Upper → Lower 0001H: Lower → Upper
Head address specification area (Un\G3, Un\G4003)	0000H to FFFFH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 0004H
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G103, Un\G4100 to Un\G4103)	Mask bit data (0000H to FFFFFFFEH) + write data

Processing details

This command protects the data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003), and writes the result to the same address of the RF tag.

- When "1" is specified to the Write mask bit, the RF tag data before command execution are held and the write data in buffer memory are ignored.
- When "0" is specified to the Write mask bit, the RF tag data before command execution are replaced with the write data.

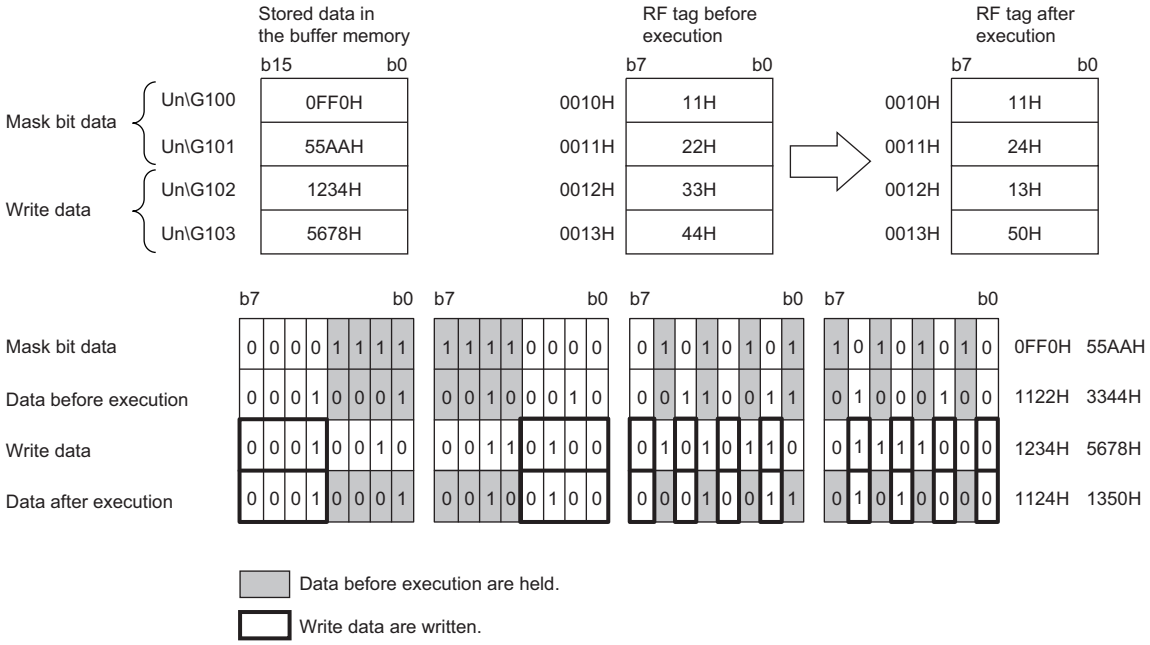
The data to be protected and the data to be written are stored in Data storage area (Un\G100 to Un\G103, Un\G4100 to Un\G4103).

The following table lists the storage area of the mask bit data and write data for each number of processed bytes.

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

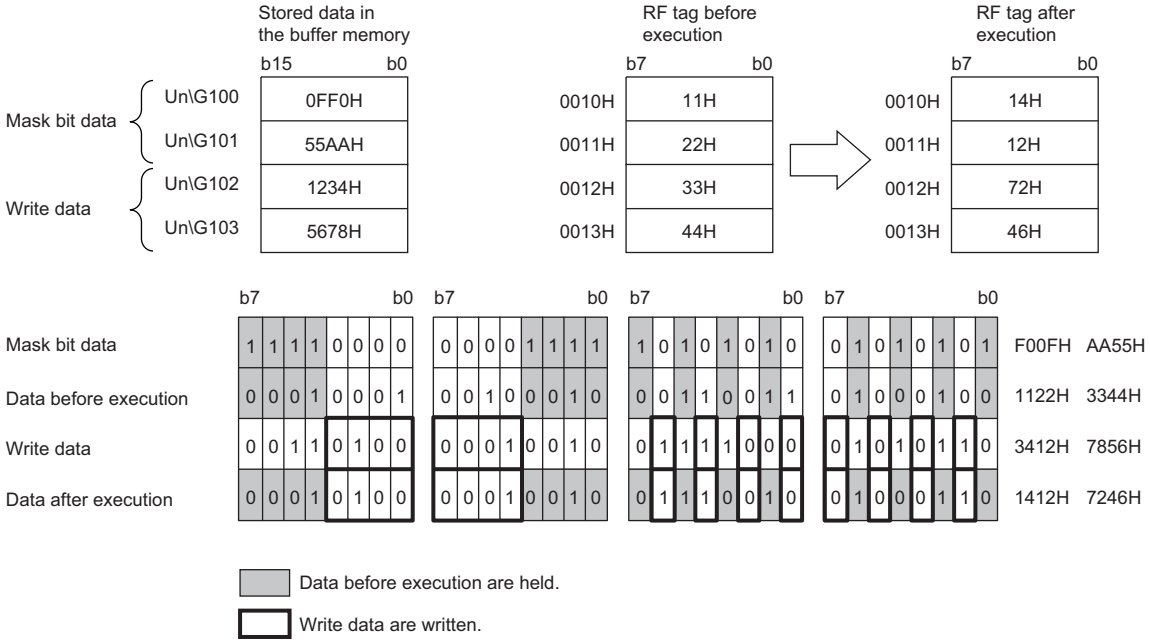
Ex.

When executing the Write mask bit command to the data of four bytes starting from the address 0010H in the data storage order 0000H (Upper → Lower)



Ex.

When executing the Write mask bit command to the data of four bytes starting from the address 0010H in the data storage order 0001H (Lower → Upper)



Write calculation

This command is used to write an addition or subtraction calculation result (data) to data of an RF tag.

Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0005H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	0000H: Addition 0001H: Subtraction
Head address specification area (Un\G3, Un\G4003)	0000H to FFFFH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 0004H
Command option specification area (Un\G5, Un\G4005)	Calculation data 0000H to FFFFH
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101)	Calculation result

Processing details

This command adds/subtracts to/from the data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003), and writes the result to the same address of the RF tag.

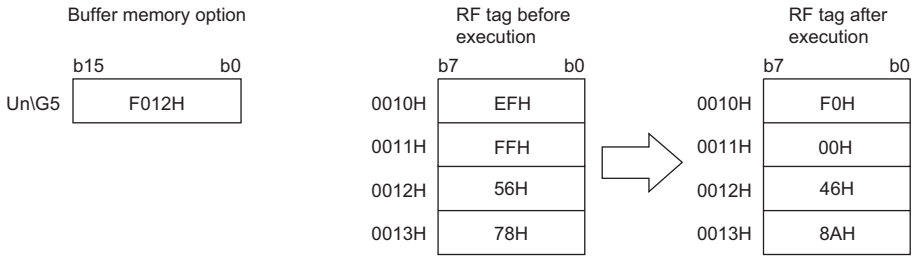
The data to be added or subtracted is stored to Command option specification area (Un\G5, Un\G4005).

The operation result are stored also in Data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101).

If the addition result overflows or the subtraction result underflows, the operation result is not written to the RF tag. In this case, the status flag (bit 4) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on, and the command is completed with an error.

Ex.

When adding F012H to the data of four bytes starting from the 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

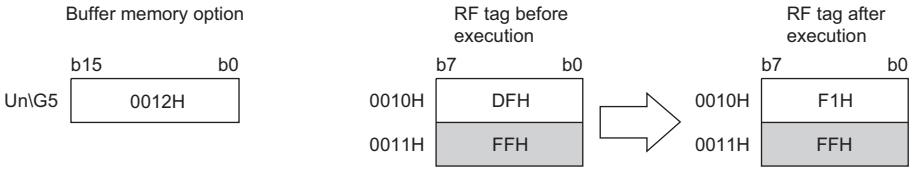
Ex.

When subtracting F012H from the data of four bytes starting from the address 0010H

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

Ex.

When adding 12H to the data of one byte starting from the address 0010H



		b7 b0	
Data before execution		11011111	DFH
Addition data	+	00010010	12H
Data after execution		11110001	F1H

Write with error correction

This command is used to write data and check codes for inspecting data reliability to an RF tag.

Point

This command inspects the data reliability for the data written by using the Write with error correction command and the check code and corrects any 1-bit errors by using the Read with error correction command. (☞ Page 42 Read with error correction)

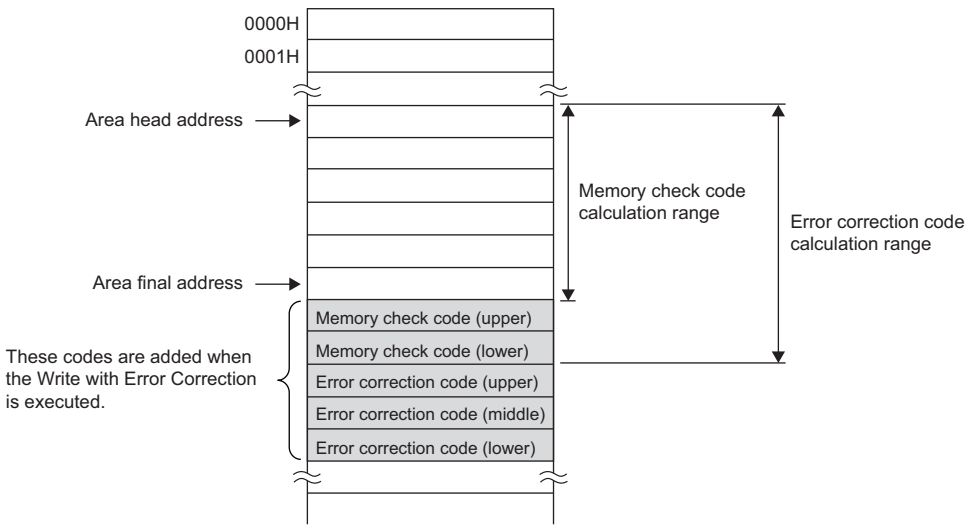
Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	000BH
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	Data storage order 0000H: Upper → Lower 0001H: Lower → Upper
Head address specification area (Un\G3, Un\G4003)	0000H to FFFAH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 01FEH
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)*1	Write data

*1 The use range differs depending on No. of processing points specification area (Un\G4, Un\G4004).

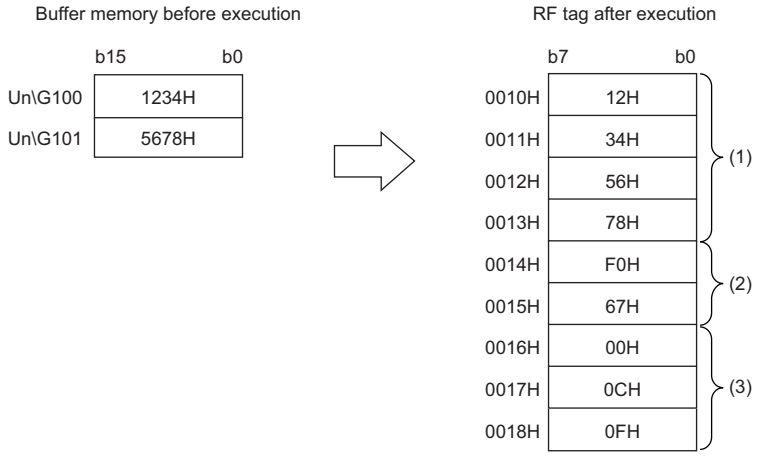
Processing details

This command writes the data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) and check code (five bytes) starting from the address specified in Head address specification area (Un\G3, Un\G4003) to an RF tag.



Ex.

When executing the Write with error correction command to the data of four bytes starting from the address 0010H in the data storage order 0000H (Upper → Lower)



(1) Number of write bytes (4 bytes)
(2) Memory check code (2 bytes)
(3) Error correction code (3 bytes)

Copy

This command is used to copy data of an RF tag between the channel 1 and channel 2.

Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0009H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto
Processing specification area (Un\G2, Un\G4002)	—
Head address specification area (Un\G3, Un\G4003)	Copy source address (Read) 0000H to FFFFH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 0800H
Command option specification area (Un\G5, Un\G4005)	Copy destination address (Write) 0000H to FFFFH
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	—
Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)	—

Processing details

When executed with ID command execution request (Y14) of antenna 1, the Copy command reads the data of the RF tag of antenna 1 (copy source) and writes the data to the RF tag of antenna 2 (copy destination).
When executed with ID command execution request (Y1C) of antenna 2, the Copy command reads the data of the RF tag of antenna 2 (copy source) and writes the data to the RF tag of antenna 1 (copy destination).
When the Copy command is completed successfully, ID command complete (X4, XC) of the copy source turns on.

■Copy source antenna

This command reads the RF tag data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003).
Trigger or Auto can be set to Communication specification area (Un\G1, Un\G4001).

■Copy destination antenna

This command writes the data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Command option specification area (Un\G5, Un\G4005) to an RF tag.
Only Trigger can be set to Communication specification area (Un\G1, Un\G4001).

Fill data

This command is used to initialize data of an RF tag by using specified data.

Setting data

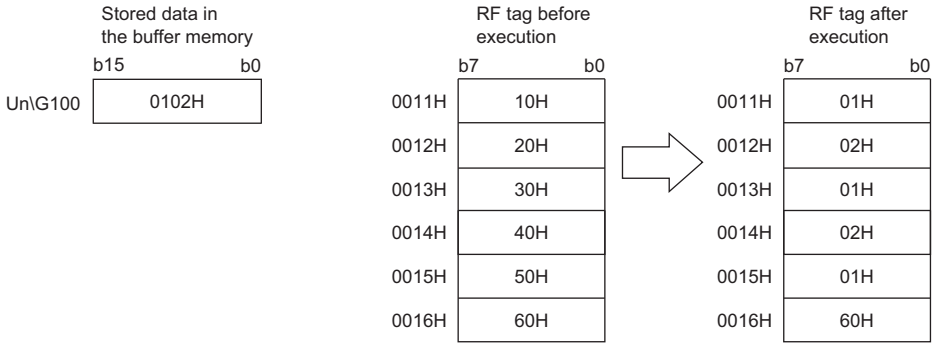
Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0006H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto 0002H: Repeat auto 0003H: FIFO trigger 0004H: FIFO repeat 0005H: Multi-trigger 0006H: Multi-repeat
Processing specification area (Un\G2, Un\G4002)	Data storage order 0000H: Upper → Lower 0001H: Lower → Upper
Head address specification area (Un\G3, Un\G4003)	0000H to FFFFH
No. of processing points specification area (Un\G4, Un\G4004)	0001H to 0800H 0000H: All data specified
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100, Un\G4100)	Fill data 0000H to FFFFH

Processing details

This command writes the same data of the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003) to an RF tag.
The data subject to the Fill data are stored in Data storage area (Un\G100, Un\G4100).

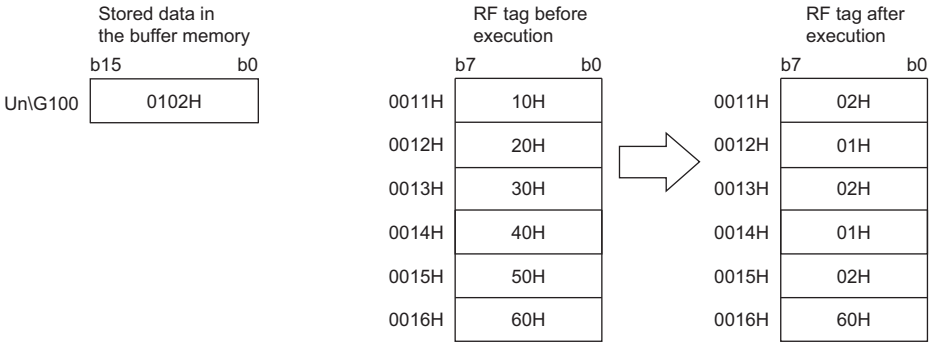
Ex.

When executing the Fill data command to the data of five bytes starting from the address 0011H in the data storage order 0000H (Upper → Lower)



Ex.

When executing the Fill data command to the data of five bytes starting from the address 0011H in the data storage order 0001H (Upper → Lower)



Point

- The Fill data command initializes all data of the RF tag and ignores the write protect function.
- When 0000H is specified in No. of processing points specification area (Un\G4, Un\G4004), all data are initialized.

Check data

This command is used to check whether or not an error occurs in data of an RF tag.

Setting data

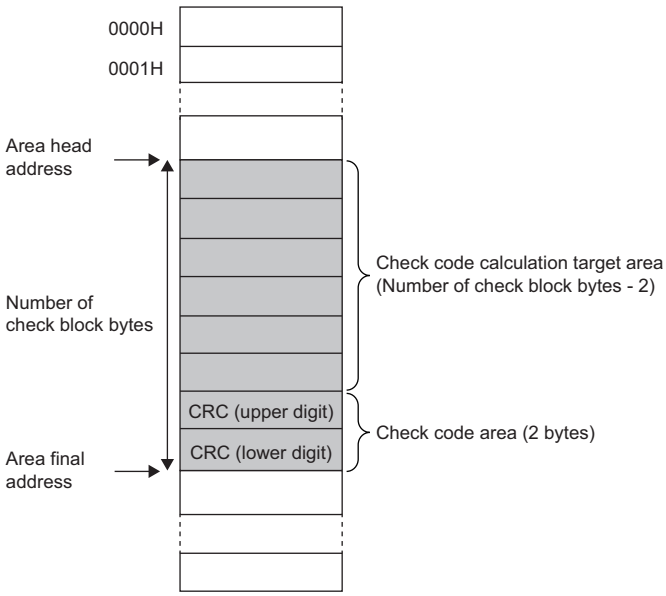
Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0007H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto
Processing specification area (Un\G2, Un\G4002)	0000H: Calculation (☞ Page 59 Calculation and write) 00001H: Verification (☞ Page 60 Verification)
Head address specification area (Un\G3, Un\G4003)	0000H to FFFDH
No. of processing points specification area (Un\G4, Un\G4004)	0003H to 0800H
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)	—

Processing details

Depending on the value of Communication specification area (Un\G2, Un\G4002), one of the following processing is performed.

- Calculation and write of check code (☞ Page 59 Calculation and write)
- Verification of check code (☞ Page 60 Verification)

In the check block specified in Head address specification area (Un\G3, Un\G4003) and No. of processing points specification area (Un\G4, Un\G4004), 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.



■Calculation and write

This command performs the CRC calculation to subtract 2 from the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003), and writes the check code of the calculation result to the last 2 bytes in the specified area.

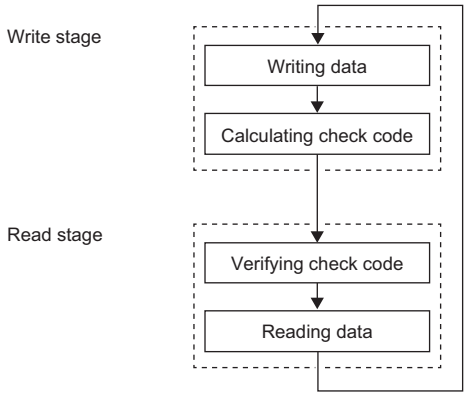
The CRC calculation uses the generating polynomial $X^{16} + X^{12} + X^5 + 1$.

■Verification

This command performs the CRC calculation to subtract two from the number of bytes specified in No. of processing points specification area (Un\G4, Un\G4004) starting from the address specified in Head address specification area (Un\G3, Un\G4003), and compares the value with the check code stored in the last two bytes in the specified area.
When the comparison result matches, ID command complete (X4, XC) turns on. When the comparison result does not match, the status flag (bit 4) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.

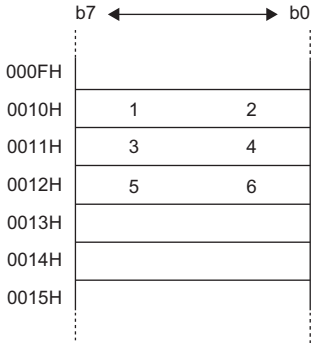
Point

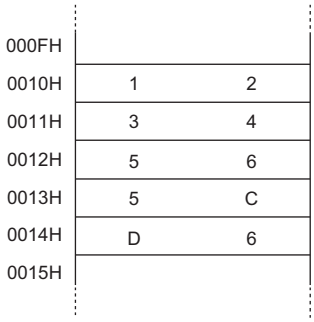
With the calculation and write of the check code after writing the data and the verification of the check data before reading the data, data damage within the RF tag can be detected before reading the data.



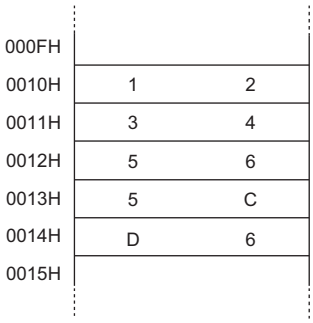
■Application example

This section describes an example of data check when 123456H is write to the addresses 0010H to 0012H.

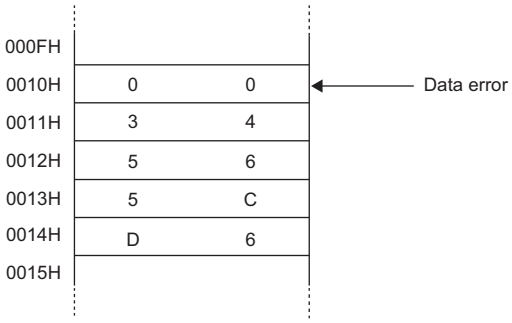




1. With the the data of five bytes starting from address 0010H, a data check (calculation) is executed.
2. The check code 5CD6H calculated from the data 123456H is written in addresses 0013H to 0014H.



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



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

Manage number of writes

This command is used to Judge whether or not the number of RF tag writes exceeds the specified number of EEPROM-type RF tag writes.

Setting data

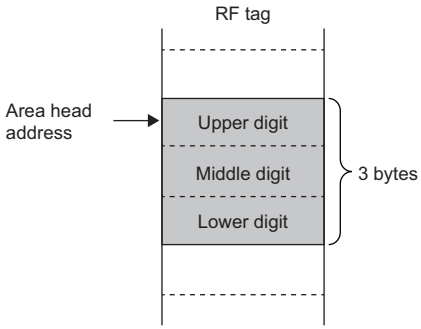
Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0008H
Communication specification area (Un\G1, Un\G4001)	0000H: Trigger 0001H: Auto
Processing specification area (Un\G2, Un\G4002)	0000H: Addition (☞ Page 63 Addition (write life: fixed to 100,000)) 0001H: Subtraction (☞ Page 64 Subtraction (write life: arbitrary number of writes))
Head address specification area (Un\G3, Un\G4003)	0000H to FFFDH
No. of processing points specification area (Un\G4, Un\G4004)	— (The number of processing points is fixed to three.)
Command option specification area (Un\G5, Un\G4005)	Number of additions/subtractions 0000H to 00FFH
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G101, Un\G4100 to Un\G4101)	Calculation result of the number of writes

Processing details

Whether or not the RF tag number of writes exceeds can be assessed with the Manage number of writes command.
There are the following methods to manage the number of writes.

- Adding the number of writes to assess whether or not the number exceeds the preset write life of 100,000 (☞ Page 63 Addition (write life: fixed to 100,000))
- Subtracting the number of writes from the specified write life to assess whether or not the number of writes exceeds (☞ Page 64 Subtraction (write life: arbitrary number of writes))

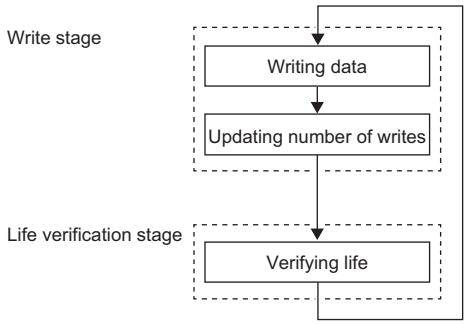
This command adds/subtracts the number of writes to/from the management area of the number of writes, which is the three bytes starting from the address specified in Head address specification area (Un\G3, Un\G4003), and writes the calculation result to the RF tag.



When the number of writes has been exceeded, the status flag (bit 4) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
The data to be added or subtracted is stored to Command option specification area (Un\G5, Un\G4005).

Point

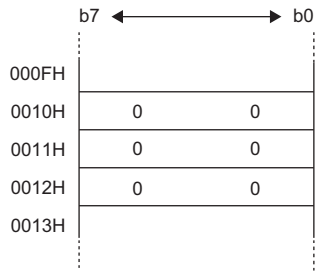
The write life of an EEPROM-type RF tag is 100,000 times for every block (8 bytes), therefore the number of writes of the address in the block to which data are most frequently written must be counted.
The number of writes is updated after data are written in the address to which data are most frequently written, therefore the write life can be checked.
The number of writes can also be checked without updating the number of writes.



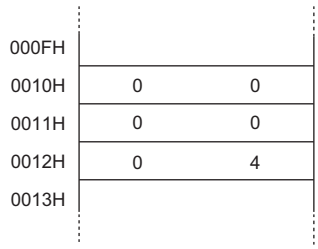
■Addition (write life: fixed to 100,000)

When 0000H is set in Processing specification area (Un\G2, Un\G4002), the sum of the number of writes is written in the management area of the number of writes.
When the value is 100,000 (0186A0H) or larger, the status flag (bit 4) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
If the data in management area of the number of writes already exceeds 100,000, the value of the management area is not updated.

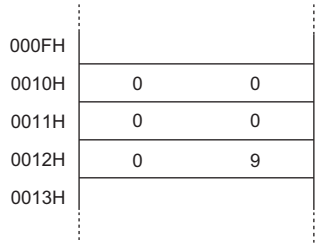
Ex.
When the number of writes is added to the number of writes management area of the data of three bytes starting from the address 0010H



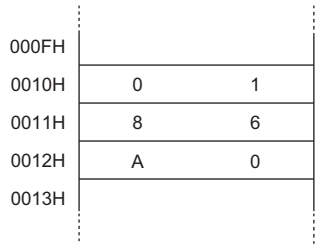
1. The Write command is executed to clear the management area of the number of writes.



2. With four as the number of writes (Un\G5, Un\G4005 = 4), the Manage number of writes command is executed with addition specified.



3. Next, with five as the number of writes (Un\G5, Un\G4005 = 5), the Manage number of writes command is executed with addition specified.

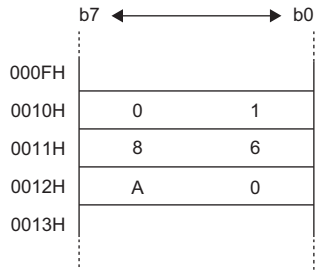


4. This is the state that the number of writes is 100,000.
In this case, if the Manage number of writes command is executed with addition specified and with five as the number of writes (Un\G5, Un\G4005 = 5), the status flag (bit 4) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on. The data of the management area of the number of writes is not updated.

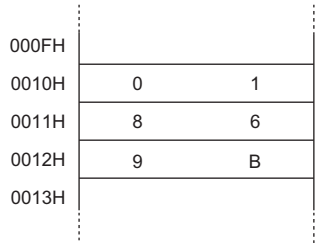
■Subtraction (write life: arbitrary number of writes)

When 0001H is set to Processing specification area (Un\G2, Un\G4002), the value after subtracting the number of writes is written in the management area of the number of writes.
When the value is smaller than 0, the number of writes is exceeded, and the status flag (bit 4) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
To manage the number of writes with subtraction, the write life needs to be entered in advance in the management area by using the Write command. The write life of EEPROM-type RF tag is 100,000 (0186A0H). Set a number of 100,000 or less.
If the data of the management area of the number of writes is 0, the value of the management area is not updated.

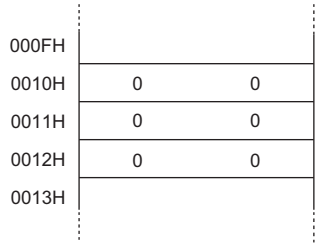
Ex.
When the number of writes is subtracted from the number of writes management area of the data of three bytes starting from the address 0010H



1. Write the write life (100,000) to the management area of the number of writes by using the Write command in advance.



2. With five as the number of writes (Un\G5, Un\G4005 = 5), the Manage number of writes command is executed with subtraction specified.



3. This is the state that the number of writes is 100,000. When the Manage number of writes command is executed with subtraction specified and with five as the number of writes (Un\G5, Un\G4005 = 5), the status flag (bit 4) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on. The data of the management area of the number of writes is not updated.

Measure noise

This command is used to measure the noise around an antenna.

Setting data

Buffer memory	Range/Data to be stored
Command code specification area (Un\G0, Un\G4000)	0010H
Communication specification area (Un\G1, Un\G4001)	—
Processing specification area (Un\G2, Un\G4002)	—
Head address specification area (Un\G3, Un\G4003)	—
No. of processing points specification area (Un\G4, Un\G4004)	—
Command option specification area (Un\G5, Un\G4005)	—
RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)	UID
Data storage area (Un\G100 to Un\G102, Un\G4100 to Un\G4102)	Measurement result

Processing details

This command is used to measure the noise surrounding the antenna and to store the average value, maximum value, and minimum value of the measured data in Data storage area (Un\G100 to Un\G102, Un\G4100 to Un\G4102).

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]

6.3 Communication Specification

Communicates with an RF tag depending on the setting of Communication specification area (Un\G1, Un\G4001).

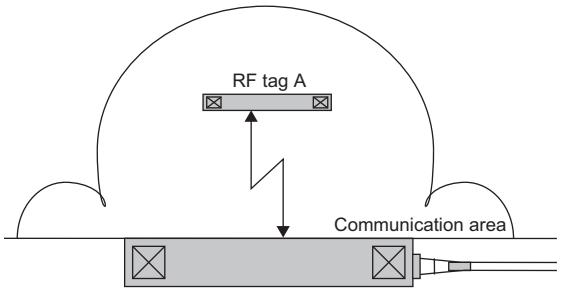
Item	Communication specification area (Un\G1, Un\G4001)	Description	Reference
Trigger	0000H	Communicates with an RF tag and outputs the result when ID command execution request is turned on with the RF tag stopped within the antenna communication area.	Page 67 Trigger
Auto	0001H	Automatically starts to communicate with an RF tag coming into the antenna communication area and outputs the result.	Page 68 Auto
Repeat auto	0002H	Automatically detects an RF tag coming into the antenna communication area and communicates with the tag. Communicates with tags coming into the communication area one after another until ID command execution request is turned off.	Page 69 Repeat auto
FIFO trigger	0003H	Communicates with an RF tag and outputs the result when ID command execution request is turned on with the RF tag stopped within the antenna communication area. After communicating, the RF tag is prohibited to move.	Page 71 FIFO trigger
FIFO repeat	0004H	Automatically detects an RF tag coming into the antenna communication area and communicates with the tag. Communicates with tags coming into the communication area one after another until ID command execution request is turned off. After communicating, the RF tag is prohibited to move.	Page 72 FIFO repeat
Multi-trigger	0005H	Communicates with RF tags stopped in the antenna communication area.	Page 74 Multi-trigger
Multi-repeat	0006H	Automatically detects RF tags coming into the antenna communication area and communicates with the tags. Communicates with tags coming into the communication area one after another until ID command execution request is turned off. After communicating, the RF tag is prohibited to move.	Page 76 Multi-repeat

Point

- When ID command execution request (Y14, Y1C) is turned on, the command is executed in the timing specified in Communication specification area (Un\G1, Un\G4001). (☞ Page 125 ID command execution request (Y14, Y1C))
- Specify the command to execute in Command code specification area (Un\G0, Un\G4000). (☞ Page 40 Command)
- The area from Un\G0 to Un\G1123 is used for the buffer memory of CH1, and the area from Un\G4000 to Un\G5123 is used for the buffer memory of CH2. (☞ Page 126 List of buffer memory addresses)

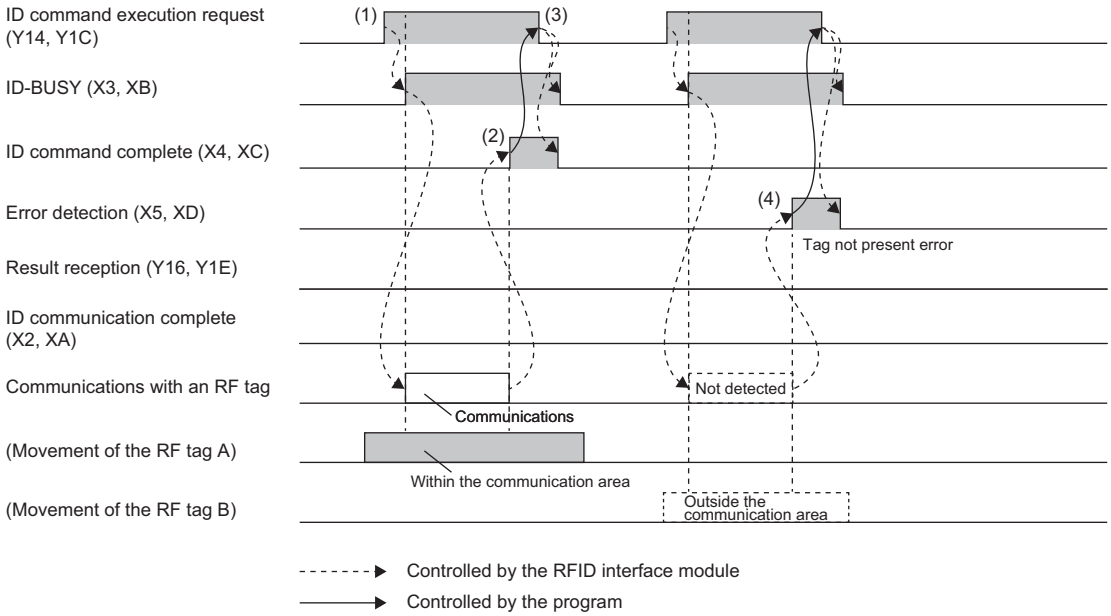
Trigger

This command is used to communicate with an RF tag and output the result when ID command execution request is turned on with the RF tag stopped within the antenna communication area.
When using this command, set 0000H to Communication specification area (Un\G1, Un\G4001).



- When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and communication with the RF tag is started.
- After communication with the RF tag, ID command complete (X4, XC) turns on.
- When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) and ID command complete (X4, XC) turn off and the module changes to a standby state.
- If no RF tags are within the antenna communication area when ID command execution request (Y14, Y1C) is turned on, the status flag (bit 10) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
- Set only one RF tag in the antenna communication area. When multiple RF tags are within the antenna communication area, communication is not performed normally and Error detection (X5, XD) turns on.

Ex.

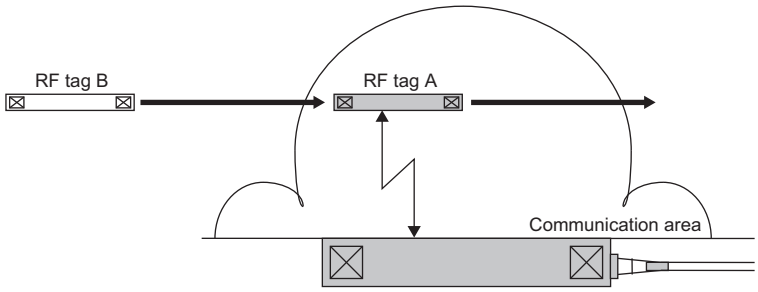


(1) When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and the module starts to communicate with an RF tag.
(2) After communication with the RF tag, ID command complete (X4, XC) turns on.
(3) When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) and ID command complete (X4, XC) turn off and the module changes to a standby state.
(4) If no RF tags are within the antenna communication area, the status flag (bit 10) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.

Auto

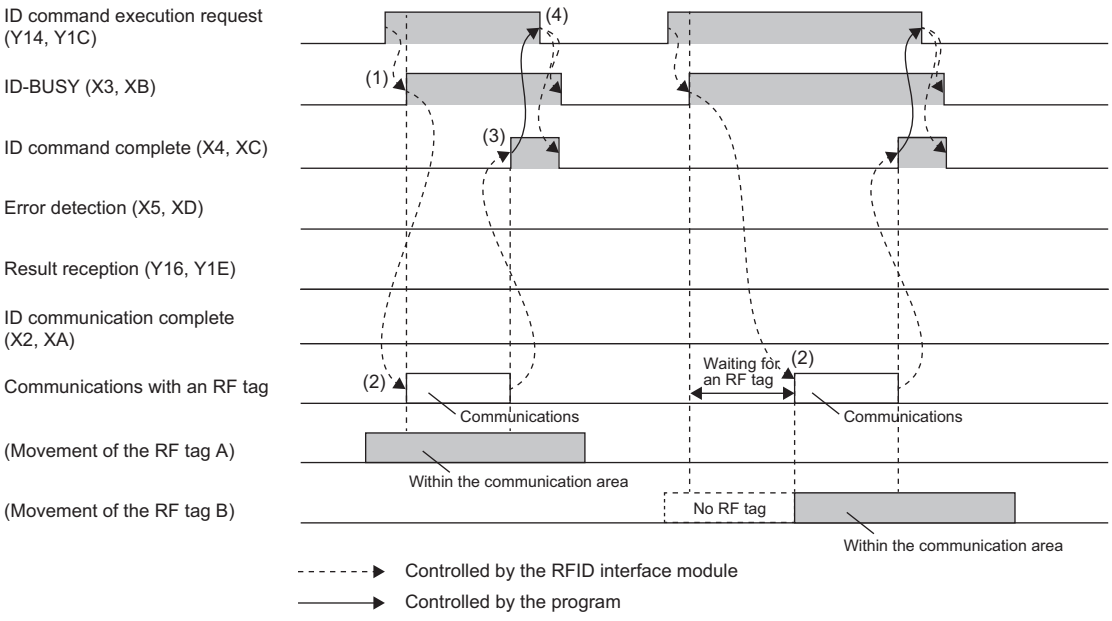
This command is used to automatically start to communicate with an RF tag coming into the antenna communication area and output the result.

When using this command, set 0001H to Communication specification area (Un\G1, Un\G4001).



- When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on. The module starts to communicate with an RF tag coming into the antenna communication area.
- After communication with the RF tag, ID command complete (X4, XC) turns on.
- When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) and ID command complete (X4, XC) turn off and the module changes to a standby state.
- Set only one RF tag in the antenna communication area.
- When the time specified in Auto command wait time setting area (Un\G10, Un\G4010) elapses before a communicable tag enters the communication area, the status flag (bit 10) of Error details storage area (Un\ G41, Un\G4041) and Error detection (X5, XD) turns on.

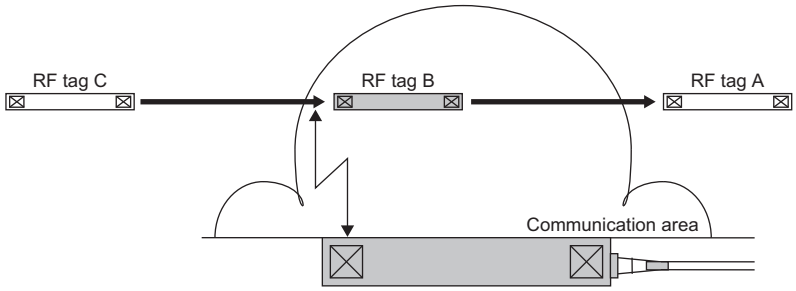
Ex.



(1) When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and RF tag detection is started.
(2) The module starts to communicate with an RF tag coming into the antenna communication area.
(3) After communication with the RF tag, ID command complete (X4, XC) turns on.
(4) When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) and ID command complete (X4, XC) turn off and the module changes to a standby state.

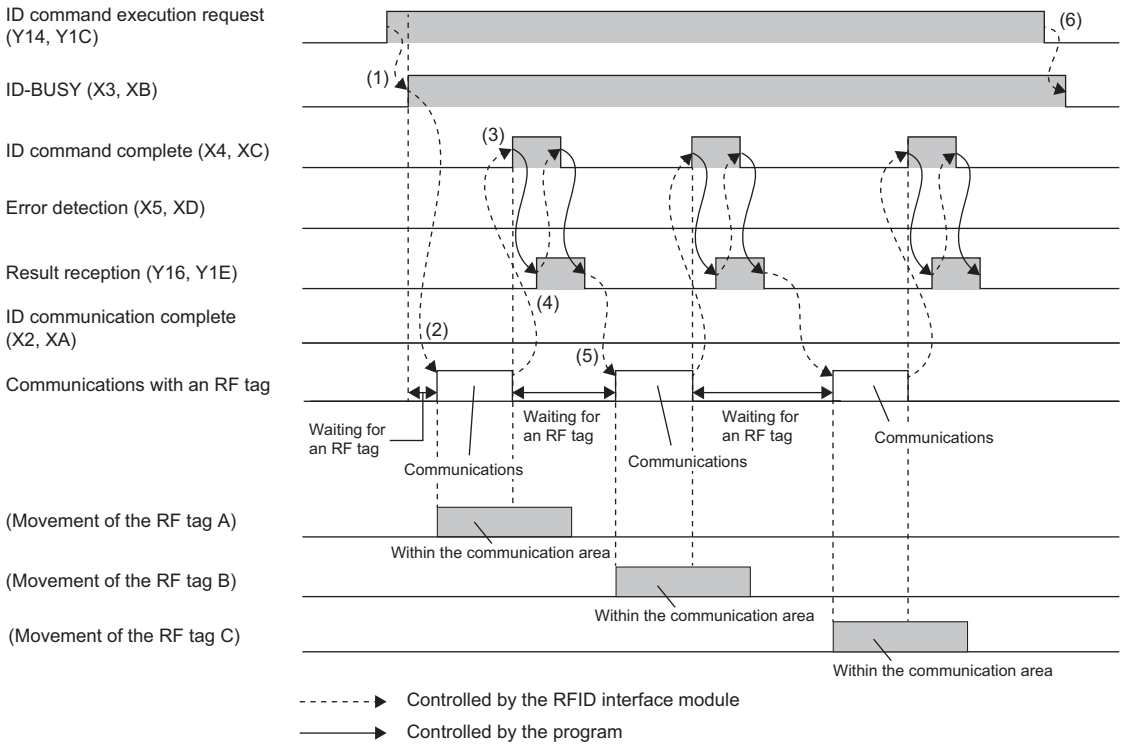
Repeat auto

This command is used to automatically detect an RF tag coming into the antenna communication area and communicate with the tag. Communicates with RF tags coming into the communication area one after another until ID command execution request (Y14, Y1C) is turned off.
When using this command, set 0002H to Communication specification area (Un\G1, Un\G4001).



- When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on. The module starts to communicate with an RF tag coming into the antenna communication area.
- After communication with the RF tag, ID command complete (X4, XC) turns on. When result reception (Y16, Y1E) is turned on, ID command complete (X4, XC) turns off and the module starts to detect the next RF tag entering the antenna communication area.
- When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) turns off and the module ends to detect an RF tag.
- Set only one RF tag in the antenna communication area.
- When the time specified in Auto command wait time setting area (Un\G10, Un\G4010) elapses before a communicable tag enters the communication area, the status flag (bit 10) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
- The module does not re-communicate with the RF tag remaining in the communication area.

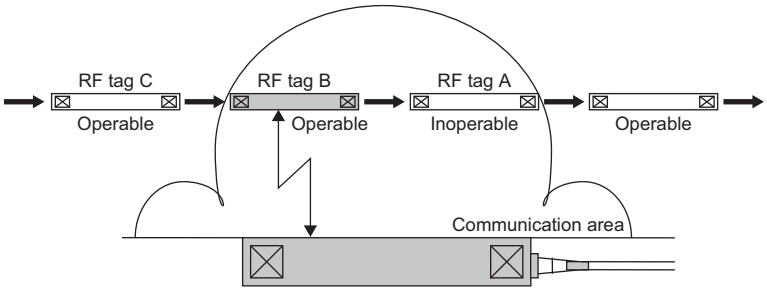
Ex.



(1) When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and RF tag detection is started.
(2) The module starts to communicate with an RF tag coming into the antenna communication area.
(3) After communication with the RF tag, ID command complete (X4, XC) turns on.
(4) When Result reception (Y16, Y1E) is turned on, ID command complete (X4, XC) turns off and the module starts to detect the next RF tag entering the antenna communication area.
(5) The steps (2) to (4) mentioned above are repeated.
(6) When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) turns off and the module ends to detect the RF tag.

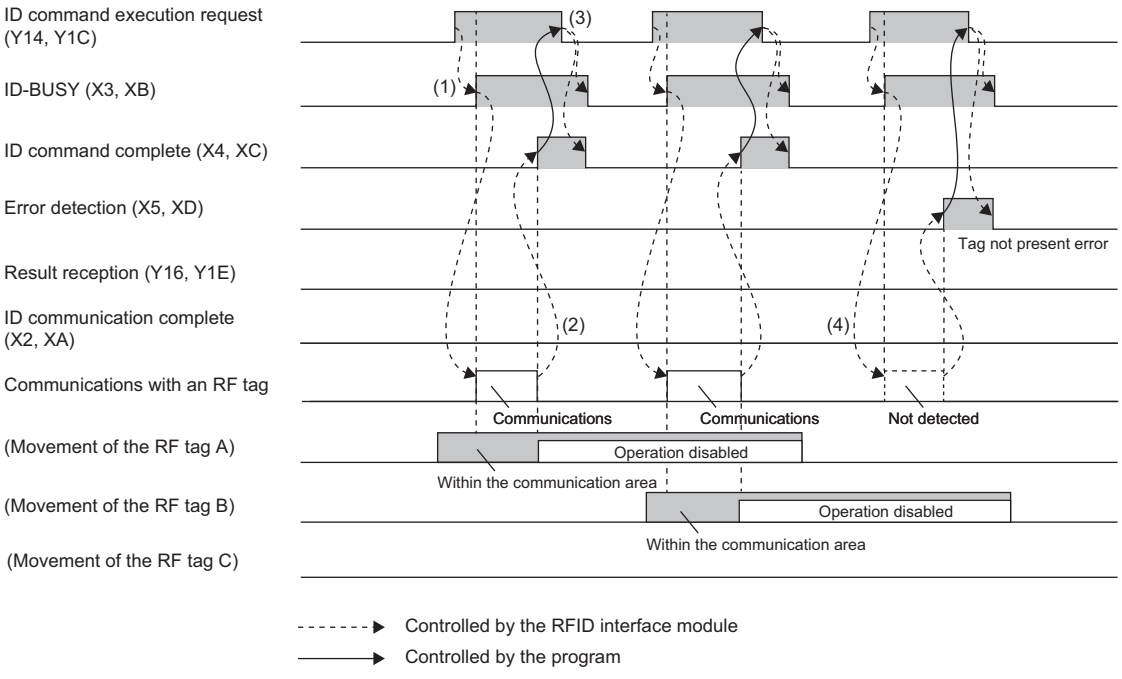
FIFO trigger

This command is used to communicate with an RF tag and output the result when ID command execution request is turned on with the RF tag stopped within the antenna communication area.
After communicating, the RF tag is prohibited to move.
When using this command, set 0003H to Communication specification area (Un\G1, Un\G4001).



- When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and the module starts to communicate with an available RF tag.
- After communication with the RF tag, the RF tag is prohibited to move and ID command complete (X4, XC) turns on.
- When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) and ID command complete (X4, XC) turn off and the module changes to a standby state.
- If no available RF tags are within the antenna communication area when ID command execution request (Y14, Y1C) is turned on, the status flag (bit 10) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
- The module does not communicate with the RF tag (prohibited to move) that have already communicated with in the communication area. When the RF tag prohibited to move moves outside the communication area, the moving prohibition of RF tag is cleared.
- Set only one available RF tag in the antenna communication area. When multiple available RF tags are within the antenna communication area, communication is not performed normally and Error detection (X5, XD) turns on.
- This function cannot be used to communicate with V680-D1KP□□.

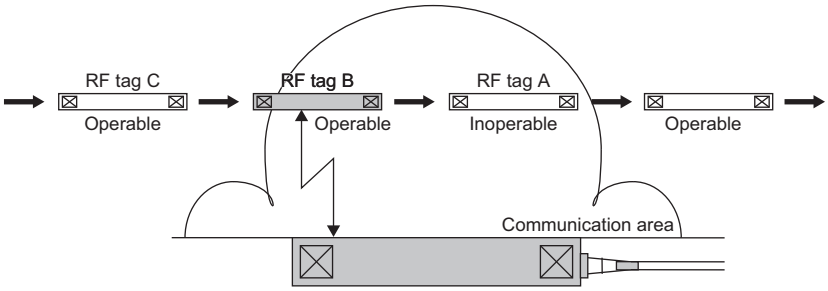
Ex.



(1) When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and the module starts to communicate with an available RF tag.
(2) After communication with the RF tag, the RF tag is prohibited to move and ID command complete (X4, XC) turns on.
(3) When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) and ID command complete (X4, XC) turn off and the module changes to a standby state.
(4) If no available RF tags are within the antenna communication area when ID command execution request (Y14, Y1C) is turned on, the status flag (bit 10) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.

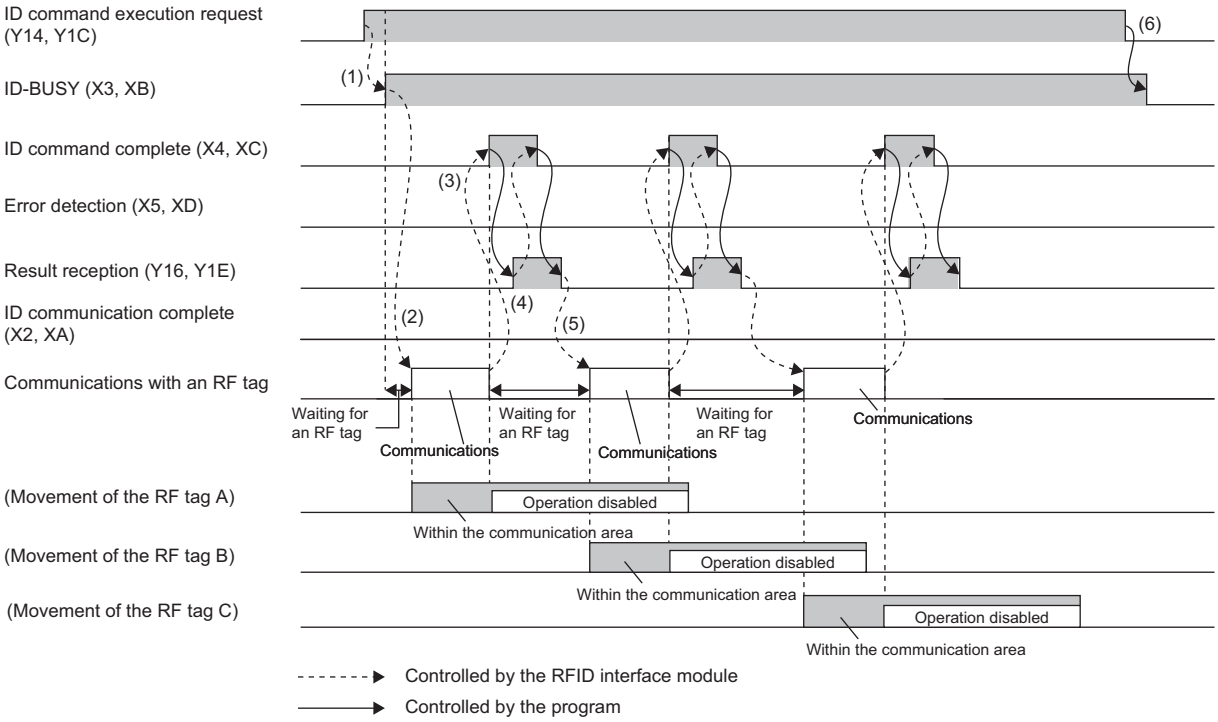
FIFO repeat

This command is used to automatically detect an RF tag coming into the antenna communication area and communicate with the tag. Communicates with RF tags coming into the communication area one after another until ID command execution request (Y4, Y1C) is turned off. After communicating, the RF tag is prohibited to move.
When using this command, set 0004H to Communication specification area (Un\G1, Un\G4001).



- When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on. The module starts to communicate with an RF tag coming into the antenna communication area.
- After communication with the RF tag, the RF tag is prohibited to move and ID command complete (X4, XC) turns on. When result reception (Y16, Y1E) is turned on, ID command complete (X4, XC) turns off and the module starts to detect the next RF tag entering the antenna communication area.
- When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) turns off and the module ends to detect an RF tag.
- Set only one available RF tag in the antenna communication area.
- The module does not communicate with the RF tag (prohibited to move) that have already communicated with in the communication area. When the RF tag prohibited to move moves outside the communication area or ID command execution request (X14, Y1C) is turned off, the moving prohibition of RF tag is cleared.
- When the time specified in Auto command wait time setting area (Un\G10, Un\G4010) elapses before a communicable tag enters the communication area, the status flag (bit 10) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
- This function cannot be used to communicate with V680-D1KP□□.

Ex.

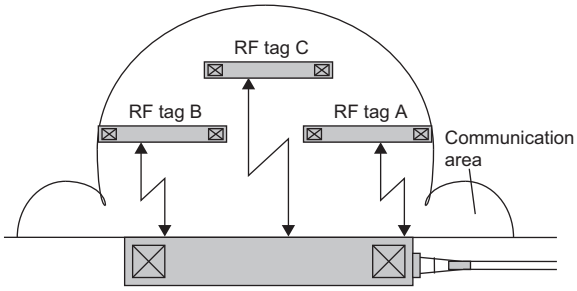


(1) When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and the module starts to communicate with an available RF tag.
(2) The module starts to communicate with an RF tag coming into the antenna communication area.
(3) After communication with the RF tag, the RF tag is prohibited to move and ID command complete (X4, XC) turns on.
(4) When Result reception (Y16, Y1E) is turned on, ID command complete (X4, XC) turns off and the module starts to detect the next RF tag entering the antenna communication area.
(5) The steps (2) to (4) mentioned above are repeated.
(6) When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) turns off and the module ends to detect the RF tag.

Multi-trigger

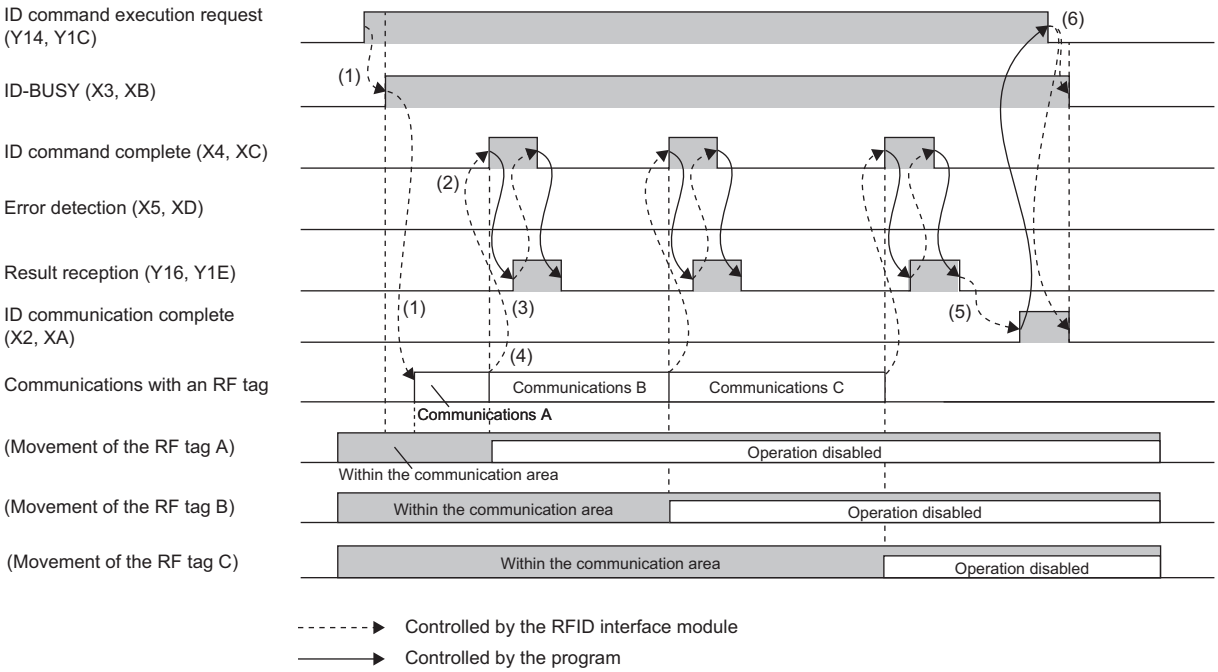
This command is used to communicate with RF tags stopped in the antenna communication area. After communicating, the RF tag is prohibited to move.

When using this command, set 0005H to Communication specification area (Un\G1, Un\G4001).



- When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and the module starts to communicate with an available RF tag.
- After communication with the RF tag, the RF tag is prohibited to move and ID command complete (X4, XC) turns on. The module starts to communicate with the next available RF tag in the antenna communication area.
- When Result reception (Y16, Y1E) is turned on, ID command complete (X4, XC) turns off.
- When communication with all available RF tags in the antenna communication area is completed, ID communication complete (X2, XA) turns on.
- When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) and ID communication complete (X2, XA) turn off and the module changes to a standby state. The moving prohibition of RF tag is cleared.
- When no RF tags are in the antenna communication area, the tag not present error is stored.
- This function cannot be used to communicate with V680-D1KP□□.

Ex.



(1) When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and the module starts to communicate with an available RF tag in the communication area.

(2) After communication with the RF tag, the RF tag is prohibited to move and ID command complete (X4, XC) turns on. The module starts to communicate with the next available RF tag in the antenna communication area.

(3) When Result reception (Y16, Y1E) is turned on, the ID command complete (X4, XC) turns off.

(4) The steps (2) to (3) mentioned above are repeated.

(5) When communication with all available RF tags in the antenna communication area is completed, ID communication complete (X2, XA) turns on.

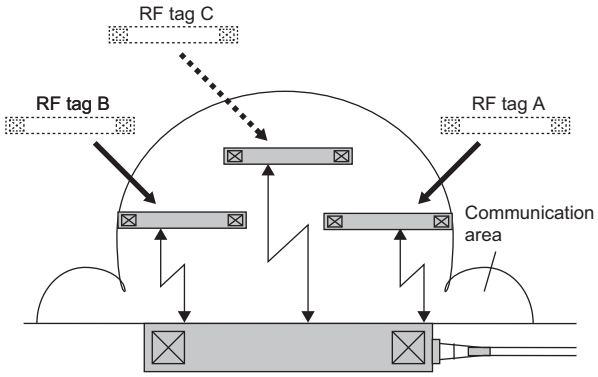
(6) When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) and ID communication complete (X2, XA) turn off and the module changes to a standby state.

Precautions

The RF tags may not be read or written due to their installation location and environment. Identify the number of RF tags to be subject to reading or writing prior use.

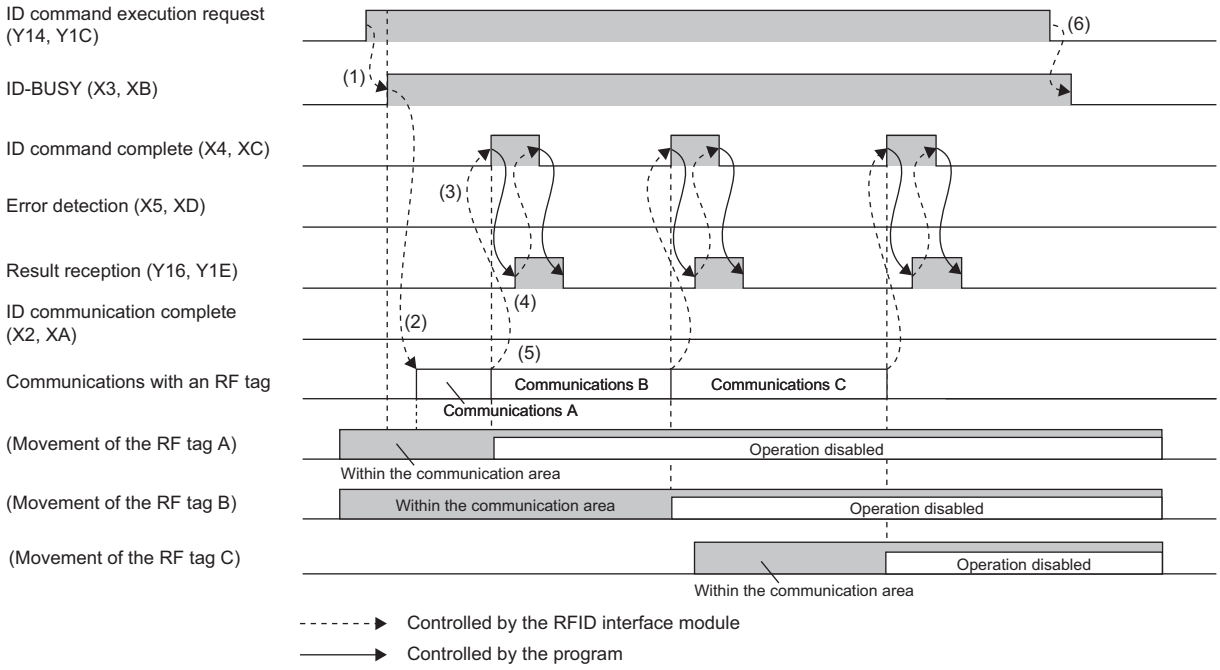
Multi-repeat

This command is used to automatically detect RF tags coming into the antenna communication area and communicate with the tags. Communicates with RF tags coming into the communication area one after another until ID command execution request (Y4, Y1C) is turned off. After communicating, the RF tag is prohibited to move.
When using this command, set 0006H to Communication specification area (Un\G1, Un\G4001).



- When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and the module starts to detect the next RF tag entering the antenna communication area. The module starts to communicate with an RF tag coming into the antenna communication area.
- After communication with the RF tag, the RF tag is prohibited to move and ID command complete (X4, XC) turns on. The module starts to detect the next available RF tag in the antenna communication area.
- When Result reception (Y16, Y1E) is turned on, ID command complete (X4, XC) turns off.
- When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) turns off and the module ends to detect the RF tag.
- When the RF tag prohibited to move moves outside the communication area or ID command execution request (X14, Y1C) is turned off, the moving prohibition of RF tag is cleared.
- This function cannot be used to communicate with V680-D1KP□□.

Ex.



(1) When ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and the module starts to detect the next RF tag entering the antenna communication area.
(2) The module starts to communicate with an RF tag coming into the antenna communication area.
(3) After communication with the RF tag, the RF tag is prohibited to move and ID command complete (X4, XC) turns on. The module starts to detect the next available RF tag in the antenna communication area.
(4) When Result reception (Y16, Y1E) is turned on, the ID command complete (X4, XC) turns off.
(5) The steps (2) to (4) mentioned above are repeated.
(6) When ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) turns off and the module ends to detect the RF tag.

Precautions

The RF tags may not be read or written due to their installation location and environment. Identify the number of RF tags to be subject to reading or writing prior use.

6.4 Test Function

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

- RUN mode is used when the programmable controller is running. In RUN mode, all commands can be used.
- TEST mode is used at the time of RFID system installation, maintenance, and troubleshooting.

How to switch the operation mode

This section describes how to switch the operation mode.

Switching using programs

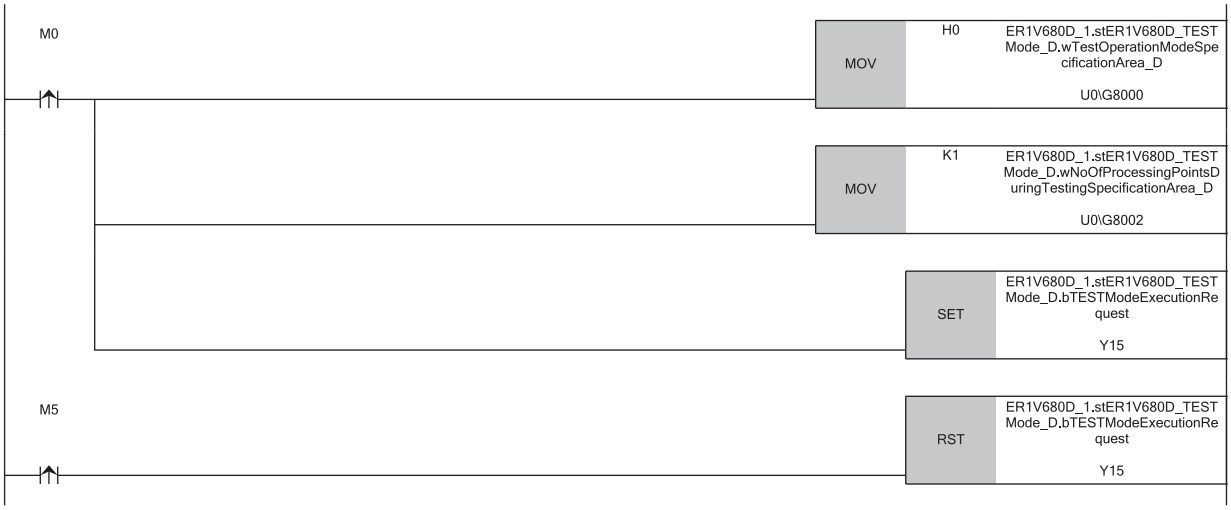
When TEST mode execution request (Y15) is turned on, the operation mode changes to TEST mode. When TEST mode execution request (Y15) is turned off, the operation mode changes to RUN mode. (☞ Page 125 TEST mode execution request (Y15))

Point

- This method is available for use only when "Enable" is set to "Enable channel 1 TEST mode", "Enable channel 2 TEST mode (ER-1V680D2 use)" and "Enable Y contact test request" on the unit parameters. The channels that "Enable" is not set to "Enable channel 1 TEST mode" and "Enable channel 2 TEST mode (ER-1V680D2 use)" do not start TEST mode. (☞ Page 34 Basic Setting)
- Before switching to TEST mode, set the buffer memory (Un\G8000 to Un\G8002). If the buffer memory (Un\G8000 to Un\G8002) is changed after switching to TEST mode, the test execution details cannot be changed. (☞ Page 132 TEST mode)

Ex.

Program to switch to TEST mode when M0 turns on and to RUN mode when M5 turns on



Switching using module parameters

Set "TEST mode" to "Operation mode" of module parameter to write to the CPU module, and reset the CPU module or power off and on. (☞ Page 34 Basic Setting)

Communication test

This function is used to read data from an RF tag without running a program.
If an error occurs when data is read from an RF tag, this function shows whether the error is caused by the program, antenna, or RF tag.
Communication with the antenna is performed every 1 second. For ER-1V680D2, CH1 and CH2 alternately communicate with the RF tag.

Point

- The communication test is performed only when reading. The test is not performed when writing.
- CH1 and CH2 alternately repeat to communicate with antenna regardless of the setting in Test operation antenna specification area (Un\G8001).

Communication test using programs

This section describes the communication test method.

1. Check of parameters

Check that "Enable" is set to "Enable channel 1 TEST mode", "Enable channel 2 TEST mode (ER-1V680D2 use)" and "Enable Y contact test request".

2. Operation setting of TEST mode

Set "0000H" to Test operation mode specification area (Un\G8000).

3. Setting of the number of processing points during testing

Set the number of test operation bytes to No. of processing points during testing specification area (Un\G8002).

4. Starting to communicate with RF tag

When TEST mode execution request (Y15) is turned on, the module communicates with the RF tag.

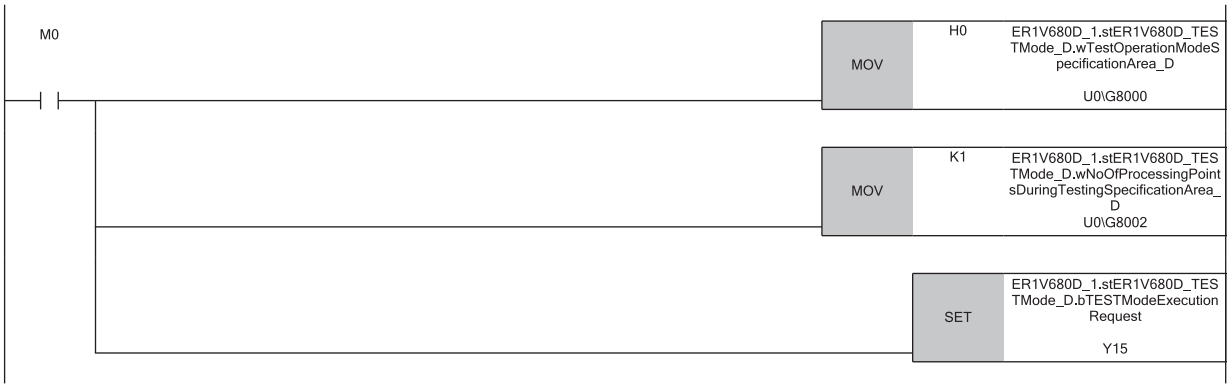
5. Check of test results

The test results are stored in Processing result monitor storage area (Un\G42, Un\G4042). (☞ Page 80 Test results)

Ex.

Program that starts a test under the following conditions when M0 turns on

- Operation mode: TEST mode (Communication test)
- No. of processing points during testing specification: 1 byte



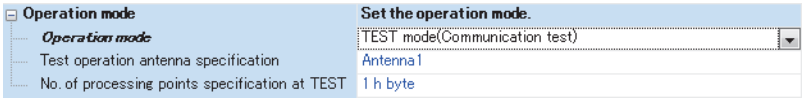
Communication test using module parameters

This section describes the communication test method.

1. Setting of module parameters

[007ER-1V680D1] or [007ER-1V680D2] ⇨ [Module Parameter] ⇨ [Basic Setting]

Set "TEST mode (Communication test)" to "Operation mode".



Check that "Enable" is set to "Enable channel 1 TEST mode" and "Enable channel 2 TEST mode (ER-1V680D2 use)".

2. Writing data to the CPU module

To switch to TEST mode, write the data to the CPU module and reset the CPU module or power off and on.

3. Check of test results

The test results are stored in Processing result monitor storage area (Un\G42, Un\G4042). (☞ Page 80 Test results)

Test results

Processing result monitor storage area		Data format
CH1	CH2	
Un\G42	Un\G4042	■When completed successfully (processing time) 0000 to 9999 [BCD] (in units of 10ms) ■When completed with an error (E0 + error code) E070H: Tag communication error E072H: Tag not present error E079H: ID system error 1 E07AH: Address error E07CH: Antenna error

Point

The test results can be checked with the operation indication lamps of amplifier. For details, refer to the manuals for the amplifier to use.

Communication success rate

This function is used to communicate 100 times and calculates the success rate.
Use this function to adjust the installation location.

Measuring using programs

This section describes the method to calculate the communication success rate.

1. Check of parameters

Check that "Enable" is set to "Enable channel 1 TEST mode", "Enable channel 2 TEST mode (ER-1V680D2 use)" and "Enable Y contact test request".

2. Operation setting of TEST mode

Set "00C1H" to Test operation mode specification area (Un\G8000).

3. Setting of antenna

Set the antenna to be tested to Test operation antenna specification area (Un\G8001).

4. Setting of the number of processing points during testing

Set the number of test operation bytes to No. of processing points during testing specification area (Un\G8002).

5. Starting to communicate with RF tag

When TEST mode execution request (Y15) is turned on, the module communicates with the RF tag.

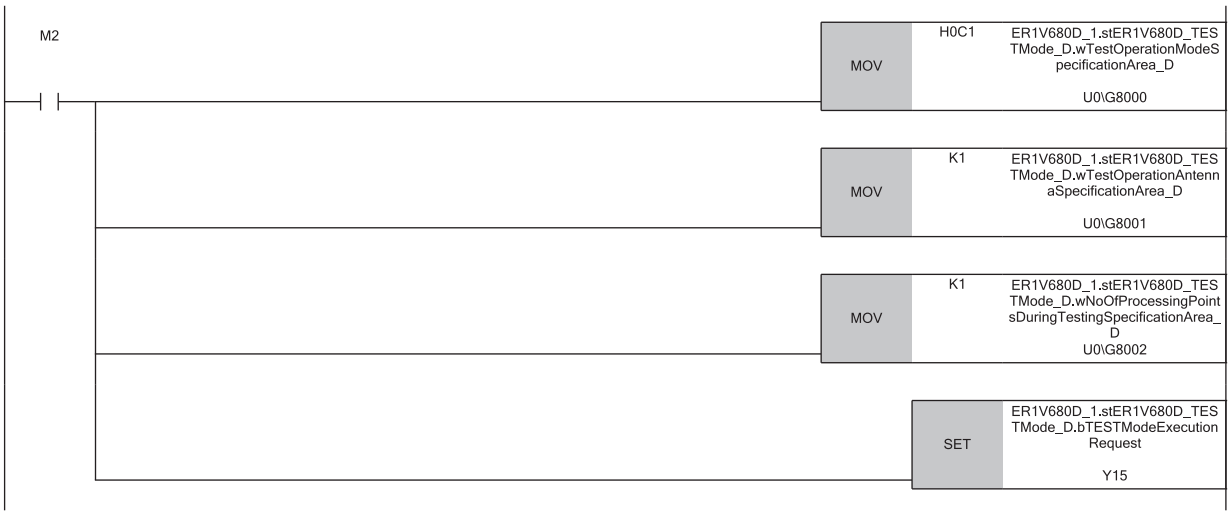
6. Check of test results

The test results are stored in Processing result monitor storage area (Un\G42, Un\G4042). (☞ Page 82 Test results)

Ex.

Program that starts a test under the following conditions when M2 turns on

- Operation mode: TEST mode (Communication success rate)
- Test operation antenna specification: Antenna 1
- No. of processing points during testing specification: 1 byte



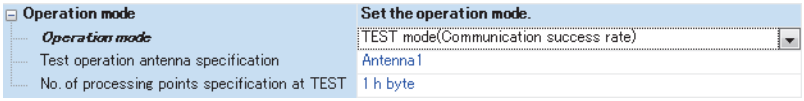
Measuring using module parameters

This section describes the method to calculate the communication success rate.

1. Setting of module parameters

[007ER-1V680D1] or [007ER-1V680D2] ⇨ [Module Parameter] ⇨ [Basic Setting]

Set "TEST mode (Communication success rate)" to "Operation mode".



Check that "Enable" is set to "Enable channel 1 TEST mode" and "Enable channel 2 TEST mode (ER-1V680D2 use)".

2. Writing data to the CPU module

To switch to TEST mode, write the data to the CPU module and reset the CPU module or power off and on.

3. Check of test results

The test results are stored in Processing result monitor storage area (Un\G42, Un\G4042). (☞ Page 82 Test results)

Test results

Processing result monitor storage area		Data format
CH1	CH2	
Un\G42	Un\G4042	■When completed successfully (C1 + measurement result) C101 to C199 [BCD] (Unit: %) C1EE: 0% (measurement result) C1FF: 100% (measurement result) ■When completed with an error (E0 + error code) E07CH: Antenna error

Point

The test results can be checked with the operation indication lamps of amplifier. For details, refer to the manuals for the amplifier to use.

Speed level (read/write)

This function measures the number of times that the RF tag passing through the antenna communication area is written continuously.

Use this function to adjust the moving speed of RF tag.

Point

Speed level (write) is performed in a pseudo manner. Data are not written to the RF tag.

Measuring using programs

This section describes the method to measure the speed level.

1. Check of parameters

Check that "Enable" is set to "Enable channel 1 TEST mode", "Enable channel 2 TEST mode (ER-1V680D2 use)" and "Enable Y contact test request".

2. Operation setting of TEST mode

Set "00B0H" (read) or "00B1H" (write) to Test operation mode specification area (Un\G8000).

3. Setting of antenna

Set the antenna to be tested to Test operation antenna specification area (Un\G8001).

4. Setting of the number of processing points during testing

Set the number of test operation bytes to No. of processing points during testing specification area (Un\G8002).

5. Starting to communicate with RF tag

When TEST mode execution request (Y15) is turned on, the module communicates with the RF tag.

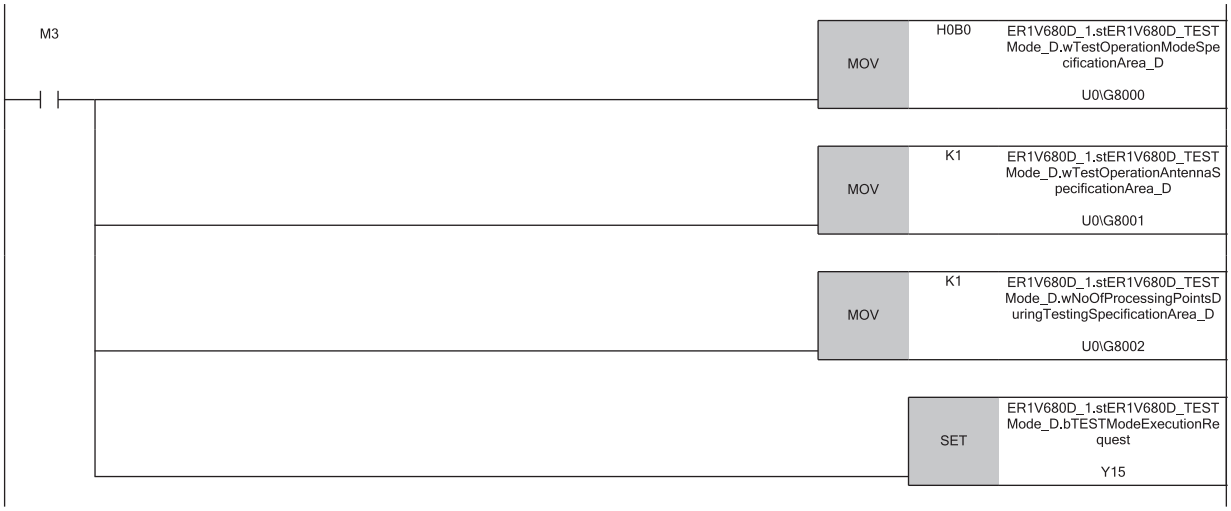
6. Check of test results

The test results are stored in Processing result monitor storage area (Un\G42, Un\G4042). (☞ Page 84 Test results)

Ex.

Program that starts a test under the following conditions when M3 turns on

- Operation mode: TEST mode (Speed level (read))
- Test operation antenna specification: Antenna 1
- No. of processing points during testing specification: 1 byte



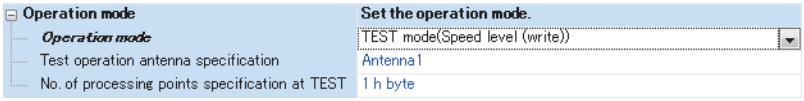
Measuring using module parameters

This section describes the method to measure the speed level.

1. Setting of module parameters

[007ER-1V680D1] or [007ER-1V680D2] ⇨ [Module Parameter] ⇨ [Basic Setting]

Set "TEST mode (Speed level (read))" or "TEST mode (Speed level (write))" to "Operation mode".



Check that "Enable" is set to "Enable channel 1 TEST mode" and "Enable channel 2 TEST mode (ER-1V680D2 use)".

2. Writing data to the CPU module

To switch to TEST mode, write the data to the CPU module and reset the CPU module or power off and on.

3. Check of test results

The test results are stored in Processing result monitor storage area (Un\G42, Un\G4042). (☞ Page 84 Test results)

Test results

• When reading

Processing result monitor storage area		Data format
CH1	CH2	
Un\G42	Un\G4042	■When completed successfully (B0 + measurement result) B001 to B099 [BCD] (Unit: Number of times) B0EE: 0 times ■When completed with an error (E0 + error code) E07CH: Antenna error

• When writing

Processing result monitor storage area		Data format
CH1	CH2	
Un\G42	Un\G4042	■When completed successfully (B1 + measurement result) B101 to B199 [BCD] (Unit: Number of times) B1EE: 0 times ■When completed with an error (E0 + error code) E07CH: Antenna error

Point

The test results can be checked with the operation indication lamps of amplifier. For details, refer to the manuals for the amplifier to use.

Noise level

This function is used to check whether noise that adversely affects communication with an RF tag is occurring around the antenna.

Measuring using programs

This section describes the method to measure the noise level.

1. Check of parameters

Check that "Enable" is set to "Enable channel 1 TEST mode", "Enable channel 2 TEST mode (ER-1V680D2 use)" and "Enable Y contact test request".

2. Operation setting of TEST mode

Set "00C0H" to Test operation mode specification area (Un\G8000).

3. Setting of antenna

Set the antenna to be tested to Test operation antenna specification area (Un\G8001).

4. Starting to communicate with RF tag

When TEST mode execution request (Y15) is turned on, the module communicates with the RF tag.

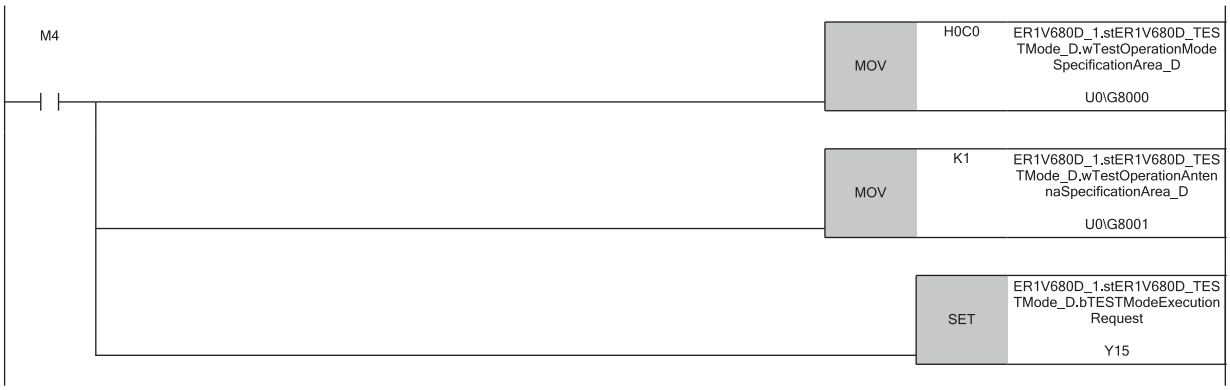
5. Check of test results

The test results are stored in Processing result monitor storage area (Un\G42, Un\G4042). (☞ Page 86 Test results)

Ex.

Program that starts a test under the following conditions when M4 turns on

- Operation mode: TEST mode (Noise level)
- Test operation antenna specification: Antenna 1



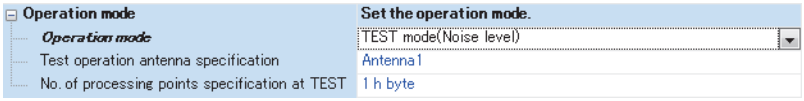
Measuring using module parameters

This section describes the method to measure the noise level.

1. Setting of module parameters

[007ER-1V680D1] or [007ER-1V680D2] ⇨ [Module Parameter] ⇨ [Basic Setting]

Set "TEST mode (Noise level)" to "Operation mode".



Check that "Enable" is set to "Enable channel 1 TEST mode" and "Enable channel 2 TEST mode (ER-1V680D2 use)".

2. Writing data to the CPU module

To switch to TEST mode, write the data to the CPU module and reset the CPU module or power off and on.

3. Check of test results

The test results are stored in Processing result monitor storage area (Un\G42, Un\G4042). (☞ Page 86 Test results)

Test results

Processing result monitor storage area		Data format
CH1	CH2	
Un\G42	Un\G4042	■When completed successfully (C0 + measurement result) C000 to C099 [BCD] (maximum value) ■When completed with an error (E0 + error code) E07CH: Antenna error

Point

The test results can be checked with the operation indication lamps of amplifier. For details, refer to the manuals for the amplifier to use.

6.5 Option

Write protect function

The function prevents important data, such as the product models and types stored in an RF tag, from getting lost by careless writing.

After important data are written, protect the data according to the following procedure.

Point

- The write protect function is available when "Enable" is set to "Write protect setting" of the module parameter. (☞ Page 34 Basic Setting)
- When important data are written in an RF tag, do not specify all data to the Fill data command. The Fill data command overwrites data regardless of the write protect setting.

Setting method

Set the protection range to the four bytes of RF tag addresses 0000H to 0003H.

Specify the enable/disable setting for write protect function to the most significant bit of the RF tag address 0000H.

RF tag address	b7	b6	b5	b4	b3	b2	b1	b0
0000H	Enable/ Disable	Upper two digit of start address (00H to 7FH)						
0001H	Lower two digit of start address (00H to FFH)							
0002H	Upper two digit of end address (00H to FFH)							
0003H	Lower two digit of end address (00H to FFH)							

■Enable/Disable setting of write protect function (b7 of 0000H)

- 0 (OFF): Disable (not protect data)
- 1 (ON): Enable (protect data)

■Setting of write protect range (0000H to 0003H)

- Start address: 0000H to 7FFFH
- End address: 0000H to FFFFH

How to clear the function

To clear the write protect function, set 0 to the most significant bit of 0000H.

The write protect function is cleared, and the settings of start address and end address from 0000H to 0003H are disabled.

RF tag address	b7	b6	b5	b4	b3	b2	b1	b0	Byte
0000H	0 (Disable)	0	0	0	0	0	0	0	00H
0001H	0	0	0	0	0	0	0	0	00H
0002H	0	0	0	0	0	0	0	0	00H
0003H	0	0	0	0	0	0	0	0	00H

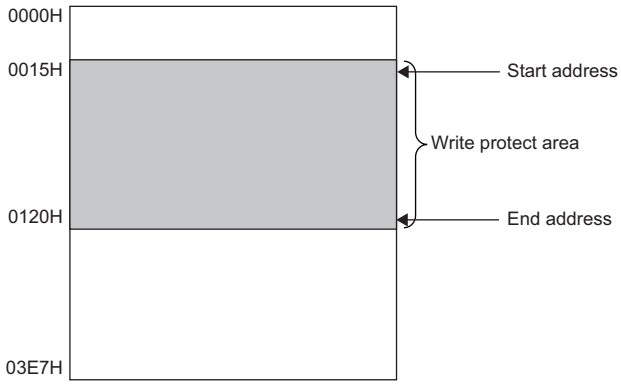
Setting example

■Start address < End address

Ex.

When protecting the addresses from 0015H to 0120H

RF tag address	b7	b6	b5	b4	b3	b2	b1	b0	Byte
0000H	1 (Enable)	0	0	0	0	0	0	0	80H
0001H	0	0	0	1	0	1	0	1	15H
0002H	0	0	0	0	0	0	0	1	01H
0003H	0	0	1	0	0	0	0	0	20H

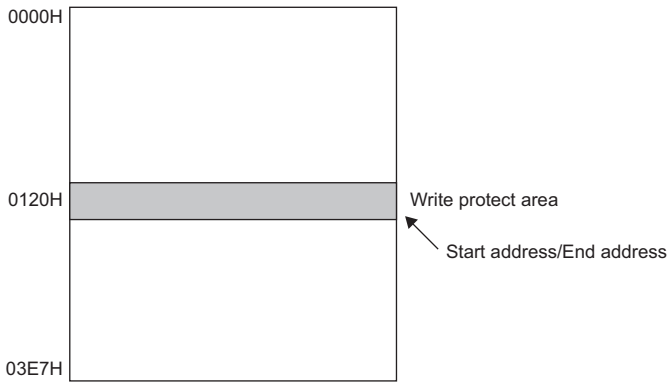


■Start address = End address

Ex.

When protecting only one byte

RF tag address	b7	b6	b5	b4	b3	b2	b1	b0	Byte
0000H	1 (Enable)	0	0	0	0	0	0	1	81H
0001H	0	0	1	0	0	0	0	0	20H
0002H	0	0	0	0	0	0	0	1	01H
0003H	0	0	1	0	0	0	0	0	20H



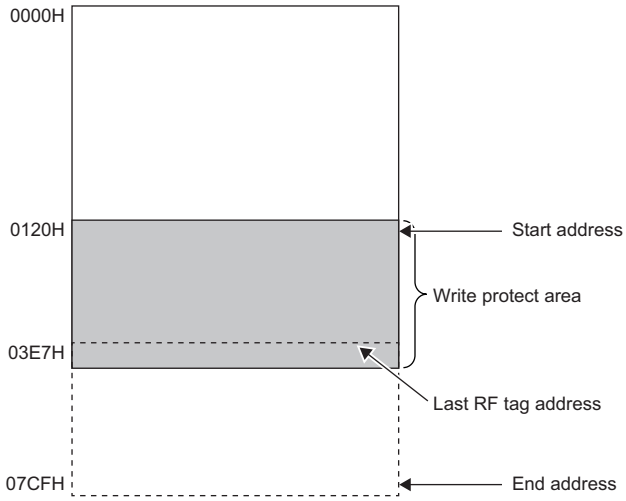
■Last address of RF tag < End address

When the end address exceeds the last RF tag address, the addresses up to the last address of RF tag are protected.

Ex.

V680-D1KP□□ (last RF tag address: 03E7H)

RF tag address	b7	b6	b5	b4	b3	b2	b1	b0	Byte
0000H	1 (Enable)	0	0	0	0	0	0	1	81H
0001H	0	0	1	0	0	0	0	0	20H
0002H	0	0	0	0	0	1	1	1	07H
0003H	1	1	0	0	1	1	1	1	CFH



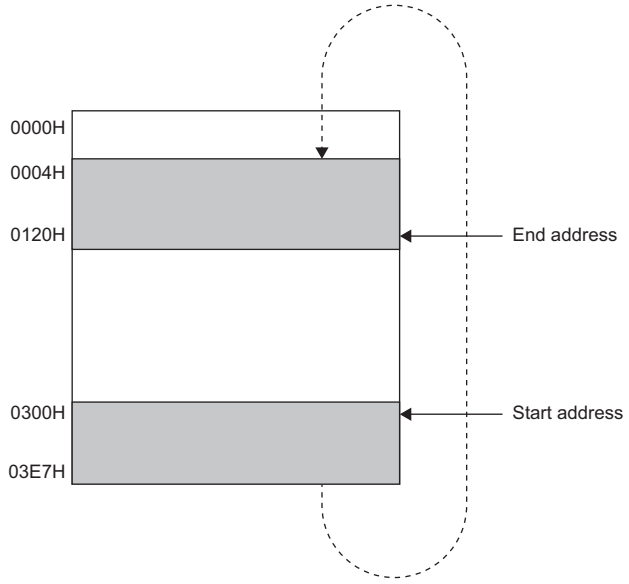
■Start address > End address

When the start address exceeds the end address, the addresses from the start address to the last address of RF tag and from 0004H to the end address are protected.

Ex.

V680-D1KP□□ (last RF tag address: 03E7H)

RF tag address	b7	b6	b5	b4	b3	b2	b1	b0	Byte
0000H	1 (Enable)	0	0	0	0	0	1	1	83H
0001H	0	0	0	0	0	0	0	0	00H
0002H	0	0	0	0	0	0	0	1	01H
0003H	0	0	1	0	0	0	0	0	20H



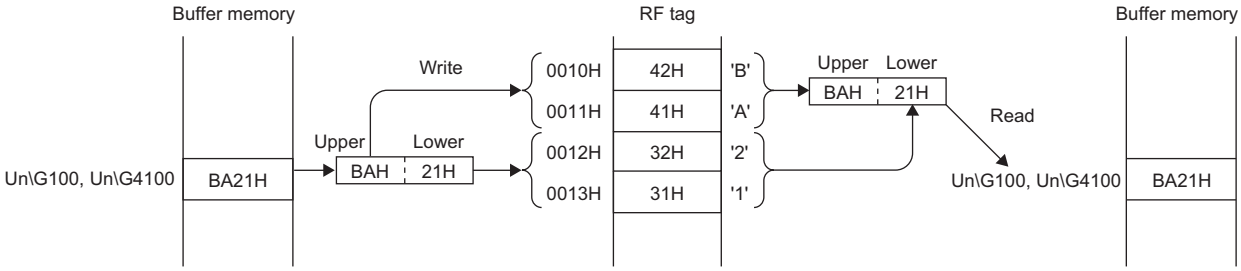
Read/Write data code setting

This function is used to set whether or not converting hexadecimal data to ASCII data to write to an RF tag. ASCII data are converted to hexadecimal data to read.

The read/write data code setting is available for read and write.

Ex.

When the data storage order is "Upper → Lower" and the number of processing points is four



Point

The read/write data code is set by using the module parameter of RFID interface module. (☞ Page 34 Basic Setting)

- When "With ASCII/HEX conversion" is set, set the number of bytes to read/write from/to the RF tag to No. of processing points specification area (Un\G4, Un\G4004). Set an even number to the number of bytes.
- When the conversion source data is a non-hexadecimal code other than 0 to 9 and A to F, the status flag (bit 14) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
- When the number of processing points in No. of processing points specification area (Un\G4, Un\G4004) is an odd number, the status flag (bit 0) of Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
- The ASCII/HEX conversion is not available to the "Write calculation", "Fill data", "Check data", Control number of writes", "Copy", "Read with error correction", "Write with error correction", "Read UID", and "Measure noise".

7 OPERATION PROGRAM EXAMPLE

This chapter describes the programming method to communicate with RF tags by using the RFID interface module.

7.1 Precautions on Programming

This section describes the precautions you need to know before programming.

Command execution on each channel

Create an interlock in the program to secure that multiple commands are not executed on one channel. Multiple commands cannot be executed simultaneously on one channel.
For ER-1V680D2, the channel 1 and 2 can execute commands simultaneously.

Initial value of buffer memory

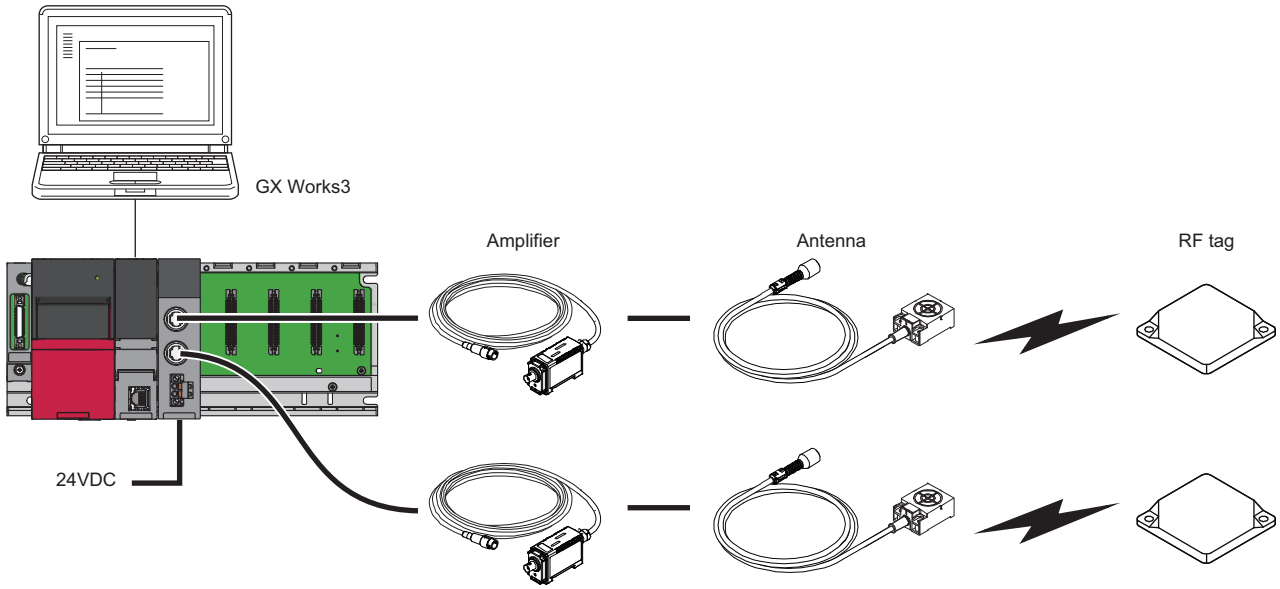
When changing the initial value of buffer memory to communicate with RF tags, incorporate the program to change the value.

7.2 Sample Program

This section describes the sample program of RFID interface module.

System configuration

The following system configuration is used to describe the sample program of RFID interface module.



Install the RFID interface module to the slot No.0 and set 0000 to the first I/O number.

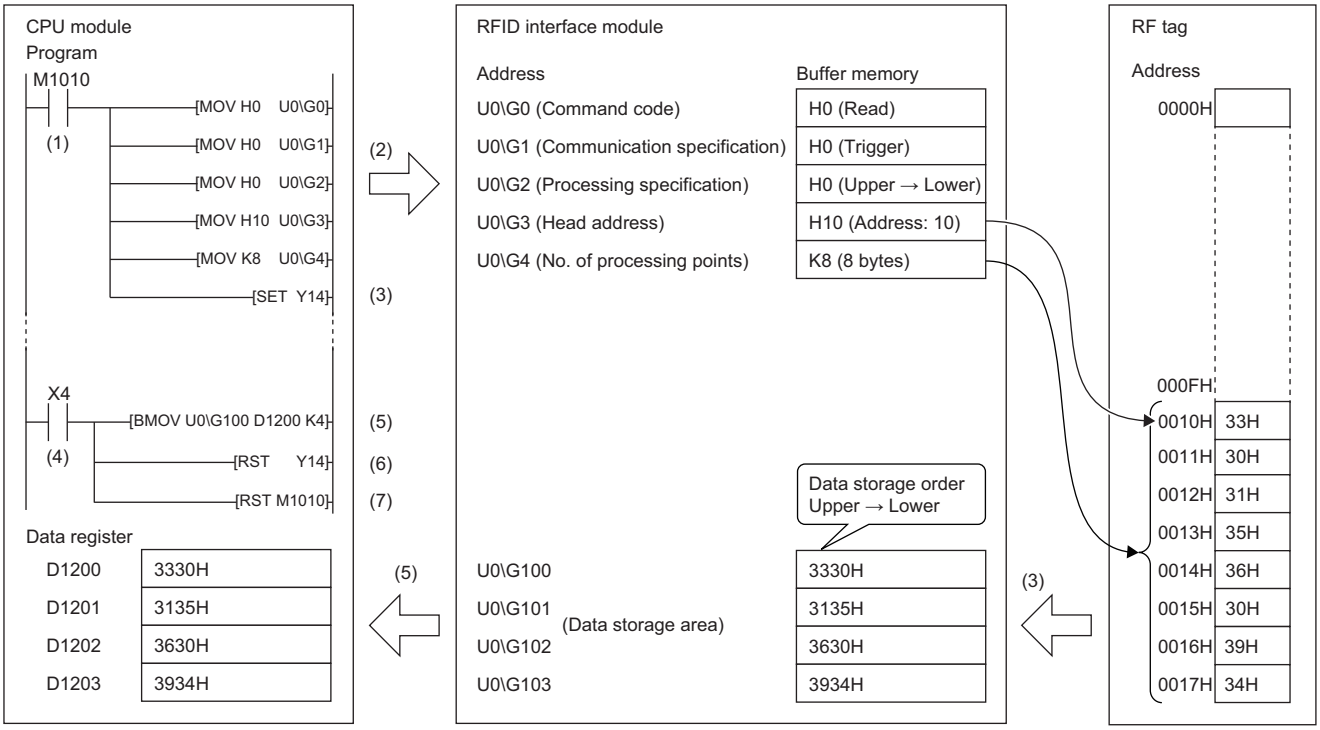
Operation description

The program, which reads and writes RF tags through trigger communications, is simple and easy to apply.

Item	Description
Communication method	Trigger
Reading data from the RF tag	When the Read command signal (M1010) turns on, the 8 bytes of data from 0010H to 0017H of the RF tag are read and stored in the CPU module data register D1200 to D1203.
Writing data to the RF tag	When the Write command signal (M1020) turns on, the 8 bytes of data stored in the CPU module data register D2300 to D2303 are written to 0020H to 0027H of the RF tag.

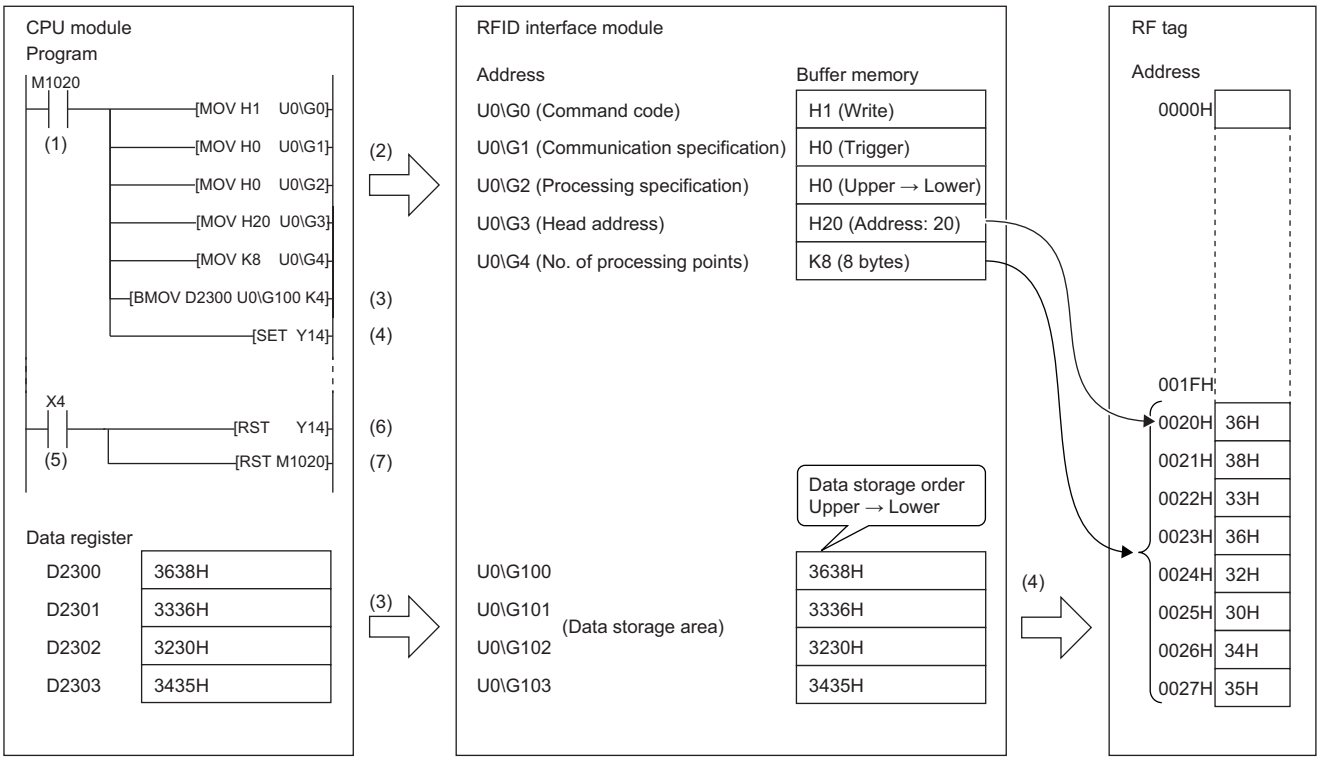
Operation explanation

■Reading from RF tags



(1) When the Read command signal (M1010) of the RF tag turns on, the read program is executed.
(2) Set the Read command and the data required for reading in the buffer memory (U0\G0 to U0\G4) of RFID interface module.
(3) When ID command execution request (Y14) is turned on, the data is read from the RF tag.
(4) When reading is completed successfully, ID command complete (X4) turns on.
(5) The data stored in Data storage area (U0\G100 to U0\G103) in buffer memory are transferred to the CPU module data register D1200 to D1203.
(6) ID command execution request (Y14) is turned off.
(7) The Read command signal (M1010) of the RF tag turns off.

■Writing to RF tags



(1) When the Write command signal (M1020) turns on, the write program is executed.
(2) Set the Write command and the data required for writing in the buffer memory (U0\G0 to U0\G4) of RFID interface module.
(3) The data in the CPU module data register D2300 to D2303 are transferred to the buffer memory (U0\G100 to U0\G104) of the RFID interface module.
(4) ID command execution request (Y14) is turned on.
(5) When writing is completed successfully, ID command complete (X4) turns on.
(6) ID command execution request (Y14) is turned off.
(7) The Write command signal (M1020) of the RF tag turns off.

Setting details

Buffer memory

Address	Buffer memory name	Setting details	
		Read	Write
U0\G0	Command code specification area (CH1)	H0 (Read)	H1 (Write)
U0\G1	Communication specification area (CH1)	H0 (Trigger)	
U0\G2	Processing specification area (CH1)	H0 (Data storage order: Upper → Lower)	
U0\G3	Head address specification area (CH1)	H10 (Reading source address 0010H)	H20 (Writing destination address 0020H)
U0\G4	No. of processing points specification area (CH1)	K8 (8 bytes)	

Devices

Item	Device	Description
External input (Command)	M1010	Read command of the RF tag
	M1020	Write command of the RF tag
	D2300 to D2303	When the Write command is executed, the write data is stored.
External output (Check)	D1200 to D1203	When the Read command is executed, the read data is stored.
	D1020	Error details are stored.

Module parameter (RFID interface module)

Set the module parameters of RFID interface module as shown in the tables below.

■Basic Settings

Item		Setting value
RF tag communication setting	Write verify setting	Execute
	RF tag communication speed setting	Standard mode
	Write protect setting	Enable
	Read/Write data code setting	Without ASCII/HEX conversion
TEST mode setting	Enable Y contact test request	Enable
	Enable channel 1 TEST mode	Enable
	Enable channel 2 TEST mode	Enable
Operation mode setting	Operation mode setting	RUN mode

■Interrupt setting

Item	Setting value
Target condition setting	Disable

■Auto refresh setting

Item	Setting value
Refresh Setting	Specify Device

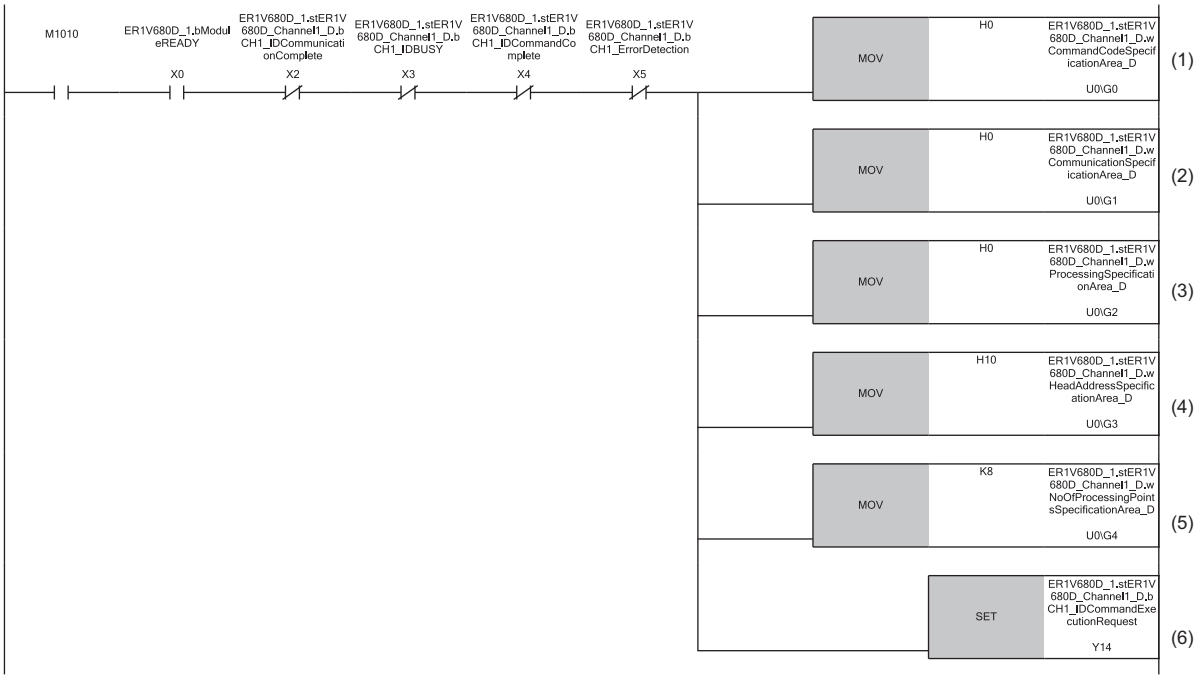
Program example

This section describes the program example with the module label.

Point

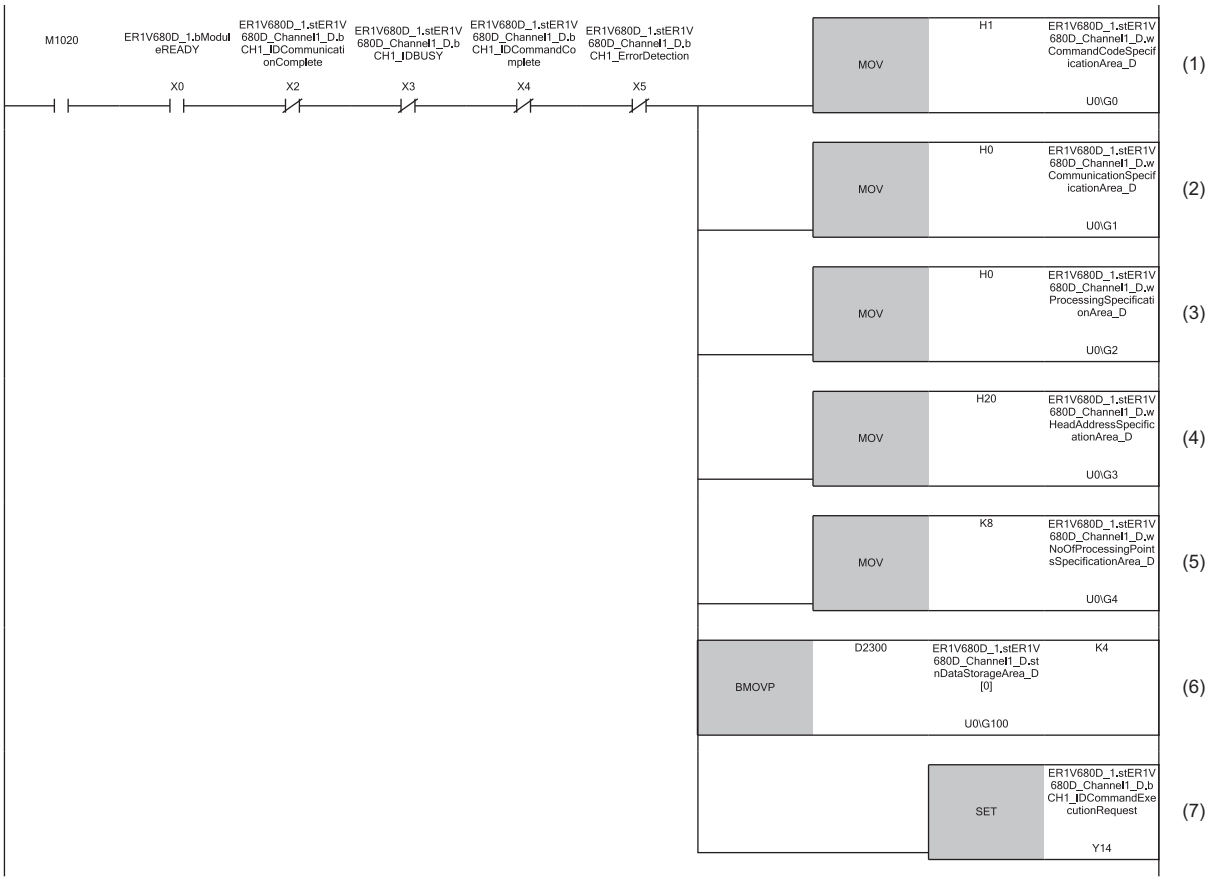
The module label means the label in which the I/O signals and buffer memory to use are predefined. Using the label helps you to create easy to reuse programs without being conscious of internal addresses of the module. (☞ Page 117 Module Label)

Reading processing from RF tags



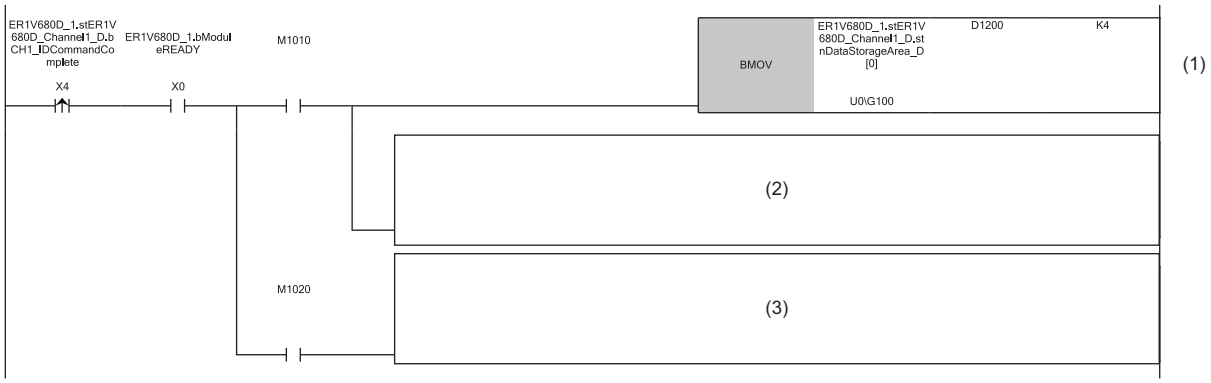
(1) Set "Read" (0H) to Command code specification area of CH1.
(2) Set "Trigger" (0H) to Communication specification area of CH1.
(3) Set "Upper → Lower" (0H) to Processing specification area (Data storage order) of CH1.
(4) Set H10 to Head address specification area of the RF tag that reads the data of CH1.
(5) Set eight bytes to No. of processing points specification area of the RF tag that reads the data of CH1.
(6) The ID command (Read command) of CH1 is executed.

Writing processing to RF tags



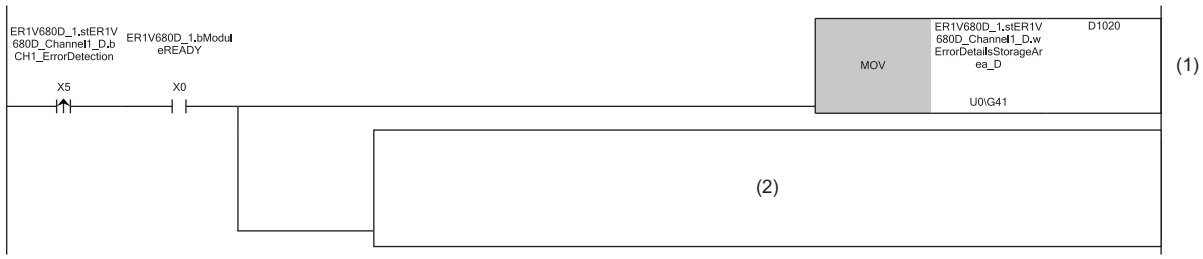
(1) Set "Write" (1H) to Command code specification area of CH1.
(2) Set "Trigger" (0H) to Communication specification area of CH1.
(3) Set "Upper → Lower" (0H) to Processing specification area (Data storage order) of CH1.
(4) Set H20 to Head address specification area of the RF tag that writes the data of CH1.
(5) Set eight bytes to No. of processing points specification area of the RF tag that writes the data of CH1.
(6) The data in the data register D2300 to D2303 object to write are transferred to the data storage area of CH1.
(7) The ID command (Write command) of CH1 is executed.

ID command complete processing



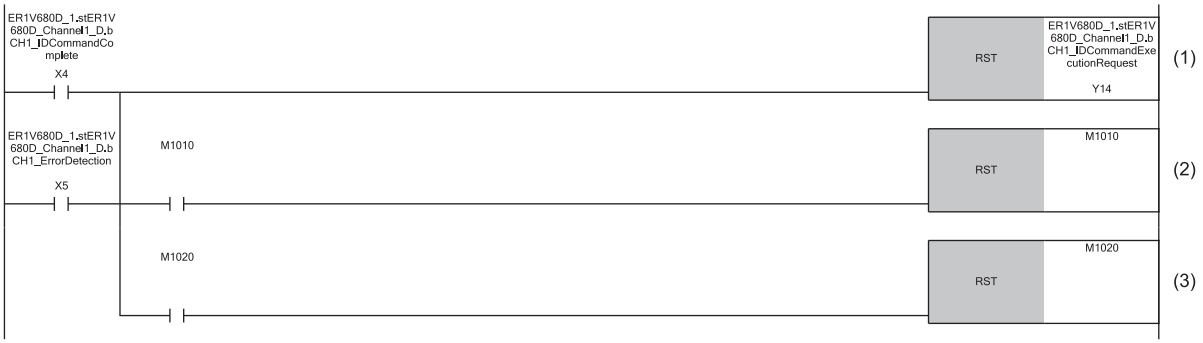
(1) The data in the data storage area of CH1 are transferred to the data register D1200 to D1203.
(2) Add the processing when reading is completed successfully.
(3) Add the processing when writing is completed successfully.

ID command error processing



(1) The number of error details occurred in CH1 in the storage area is transferred to the data register D1020.
(2) Add the processing when an ID command error occurs.

End processing



(1) When the ID command is completed, the ID command execution request of CH1 is turned off.
(2) The Read command signal of the RF tag turns off.
(3) The Write command signal of the RF tag turns off.

Application of the sample program

When connecting the antenna/amplifier to communicate with the RF tag to the channel 2, change the I/O signals and buffer memory of CH1 to the I/O signals and buffer memory of CH2.

I/O signal

Item	CH1		CH2	
	Label name	I/O signal	Label name	I/O signal
ID communication complete	ER1V680D_1.stER1V680D_Channel1_D.bCH1_IDCommunicationComplete	X2	ER1V680D_1.stER1V680D_Channel2_D.bCH2_IDCommunicationComplete	XA
ID-BUSY	ER1V680D_1.stER1V680D_Channel1_D.bCH1_IDBUSY	X3	ER1V680D_1.stER1V680D_Channel2_D.bCH2_IDBUSY	XB
ID command complete	ER1V680D_1.stER1V680D_Channel1_D.bCH1_IDCommandComplete	X4	ER1V680D_1.stER1V680D_Channel2_D.bCH2_IDCommandComplete	XC
Error detection	ER1V680D_1.stER1V680D_Channel1_D.bCH1_ErrorDetection	X5	ER1V680D_1.stER1V680D_Channel2_D.bCH2_ErrorDetection	XD
ID command execution request	ER1V680D_1.stER1V680D_Channel1_D.bCH1_IDCommandExecutionRequest	Y14	ER1V680D_1.stER1V680D_Channel2_D.bCH2_IDCommandExecutionRequest	Y1C

Buffer memory

Item	CH1		CH2	
	Label name	Address	Label name	Address
Command code specification area	ER1V680D_1.stER1V680D_Channel1_D.wCommandCodeSpecificationArea_D	U0\G0	ER1V680D_1.stER1V680D_Channel2_D.wCommandCodeSpecificationArea_D	U0\G4000
Communication specification area	ER1V680D_1.stER1V680D_Channel1_D.wCommunicationSpecificationArea_D	U0\G1	ER1V680D_1.stER1V680D_Channel2_D.wCommunicationSpecificationArea_D	U0\G4001
Processing specification area	ER1V680D_1.stER1V680D_Channel1_D.wProcessingSpecificationArea_D	U0\G2	ER1V680D_1.stER1V680D_Channel2_D.wProcessingSpecificationArea_D	U0\G4002
Head address specification area	ER1V680D_1.stER1V680D_Channel1_D.wHeadAddressSpecificationArea_D	U0\G3	ER1V680D_1.stER1V680D_Channel2_D.wHeadAddressSpecificationArea_D	U0\G4003
No. of processing points specification area	ER1V680D_1.stER1V680D_Channel1_D.wNoOfProcessingPointsSpecificationArea_D	U0\G4	ER1V680D_1.stER1V680D_Channel2_D.wNoOfProcessingPointsSpecificationArea_D	U0\G4004
Error details storage area	—*1	U0\G41	—*1	U0\G4041
Data storage area	ER1V680D_1.stER1V680D_Channel1_D.stnDataStorageArea_D[0]	U0\G100	ER1V680D_1.stER1V680D_Channel2_D.stnDataStorageArea_D[0]	U0\G4100

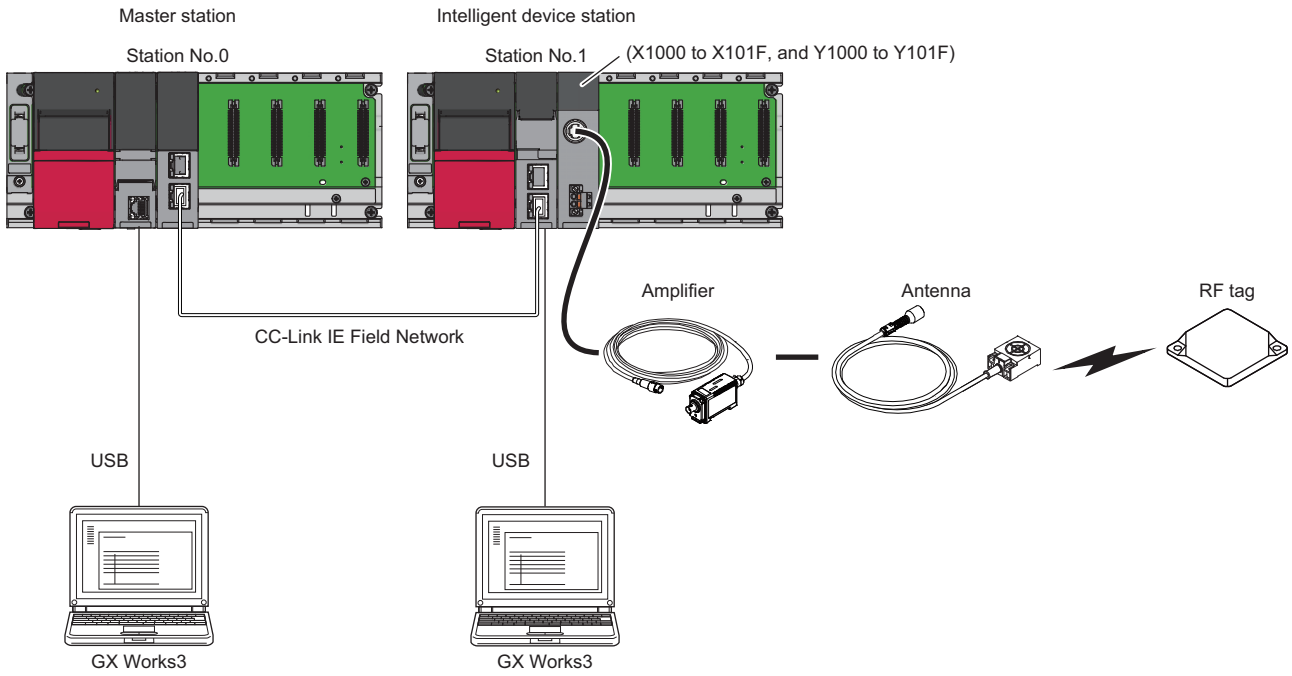
*1 For the module labels for bit of each error, refer to the following.
☞ Page 117 Module label list

7.3 Sample Program (with Remote Head Module)

This section describes the sample program of RFID interface module with the remote head module.

System configuration

The following system configuration is used to describe the sample program of RFID interface module.



This section describes the system configuration of the master station and intelligent device station.

Item		Model
Master station	Power supply module	R61P
	CPU module	R04CPU
	CC-Link IE Field Network module	RJ71GF11-T2
Intelligent device station	Power supply module	R61P
	CC-Link IE Field Network remote head module	RJ72GF15-T2
	RFID interface module	ER-1V680D1
	Amplifier	V680-HA63B
	Antenna	V680-HS63
	RF tag	V680S-D2KF67

Point

In the project of CPU module, network modules are added, module parameters (Required Settings/Basic Settings) are set, and a sequence program is created.
In the project of remote head module, RFID interface modules are added and module parameters (Basic Settings) are set.
For addition of RFID interface modules, refer to the following.
☞ Page 31 Setting Procedure

Operation description

Item	Description
Reading data from the RF tag	When the Read command signal (M1160) turns on, the data of 8 bytes from the address 10H of ID tag are read, and the data is stored to the data register D1160 to D1163.
Writing data to the RF tag	When the Write command signal (M1170) turns on, the data that is stored in the data register D1170 to D1173 is written to the area of 8 bytes from the address 10H of ID tag.
Error processing	When an error occurs in the RFID interface module, the error code is stored to the data register D1178.

Setting details of the CPU module

Devices

Item	Device	Description
External input (command/data)	M1160	Read command of the RF tag
	M1170	Write command of the RF tag
	D0	Command code
	D1	Communication specification
	D2	Processing specification
	D3	Head address
	D4	Number of processing points
	D1170 to D1173	The data to write to the RF tag is stored.
External output (Check)	D1178	Error details are stored.
	D1160 to D1163	The data read from the RF tag is stored.

Module parameter (RJ71GF11-T2)

Set the module parameters of the RJ71GF11-T2 as shown in the tables below.

■Required setting

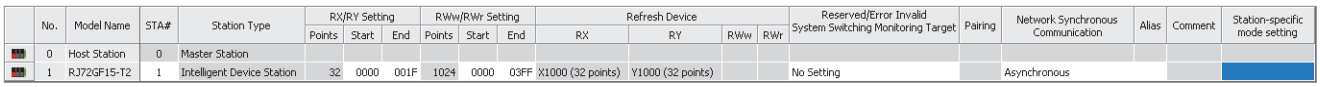
Item		Setting value
Station type setting	Station type	Master station
Network number setting	Network number	1
Station number setting	Station number setting method	Set the station number using parameters.
	Station number	0 (Fixed)
Parameter setting method	Setting method of Basic Settings/Application settings	Set the settings using parameters.

■Basic Settings

Item		Setting value
Network Configuration Settings	Network Configuration Settings	<Detailed Setting> ☞Page 103 Basic Settings - Network Configuration Settings
Refresh Setting	Refresh Setting	<Detailed Setting> ☞Page 103 Basic Settings - Refresh Setting
Network Topology	Network Topology	Line, Star, or Line/Star
Operation of Master Station after Reconnection	Operation of Master Station after Reconnection	Return as Master Operation Station

■Basic Settings - Network Configuration Settings

Set "Network Configuration Settings" in "Basic Settings" as shown in the table below.



	No.	Model Name	STA#	Station Type	RX/RY Setting			RWw/RWr Setting			Refresh Device				Reserved/Error Invalid System Switching Monitoring Target	Pairing	Network Synchronous Communication	Alias	Comment	Station-specific mode setting
					Points	Start	End	Points	Start	End	RX	RY	RWw	RWr						
	0	Host Station	0	Master Station																
	1	RJ72GF15-T2	1	Intelligent Device Station	32	0000	001F	1024	0000	03FF	X1000 (32 points)	Y1000 (32 points)			No Setting		Asynchronous			

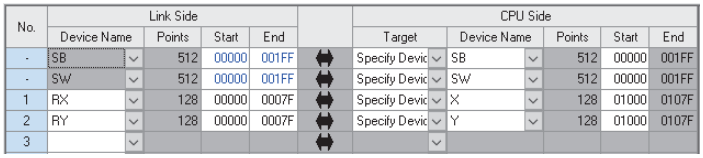
Item		Setting value
Model Name		RJ72GF15-T2
STA#		1
Station Type		Intelligent Device Station
RX/RY Setting	Points	32
	Start	0000
RWw/RWr Setting	Points	1024
	Start	0000
Reserved/Error Invalid/System Switching Monitoring Target		No Setting (Default)
Network Synchronous Communication		Asynchronous

To add stations, select a module from "Module List" and drag and drop the module to the station list or the network map. For details on operation, refer to the following.

MELSEC iQ-R CC-Link IE Field Network User's Manual (Application)

■Basic Settings - Refresh Setting

Set "Refresh Setting" in "Basic Settings" as shown in the table below.



No.	Link Side					CPU Side				
	Device Name	Points	Start	End		Target	Device Name	Points	Start	End
-	SB	512	00000	001FF		Specify Devic	SB	512	00000	001FF
-	SW	512	00000	001FF		Specify Devic	SW	512	00000	001FF
1	RX	128	00000	0007F		Specify Devic	X	128	01000	0107F
2	RY	128	00000	0007F		Specify Devic	Y	128	01000	0107F
3										

No.	Link Side			CPU Side		
	Device Name	Start	End	Target	Device Name	Start
—	SB	00000	001FF	Specify Device	SB	00000
—	SW	00000	001FF	Specify Device	SW	00000
1	RX	00000	0007F	Specify Device	X	01000
2	RY	00000	0007F	Specify Device	Y	01000

Setting details of remote head module

Buffer memory

Address	Buffer memory name	Setting details	
		Read	Write
0	Command code specification area (CH1)	H0 (Read)	H1 (Write)
1	Communication specification area (CH1)	H0 (Trigger)	
2	Processing specification area (CH1)	H0 (Data storage order: Upper → Lower)	
3	Head address specification area (CH1)	HA (Address 000AH)	
4	No. of processing points specification area (CH1)	K8 (8 bytes)	
100	Data storage area (CH1)	—	Writing data to the RF tag

CPU parameter (Remote head module)

Set the CPU parameters of remote head module as shown in the table below.

■Network required setting

Item		Setting value
Network number setting	Network number	1
Station number setting	Station number	1

Module parameter (RFID interface module)

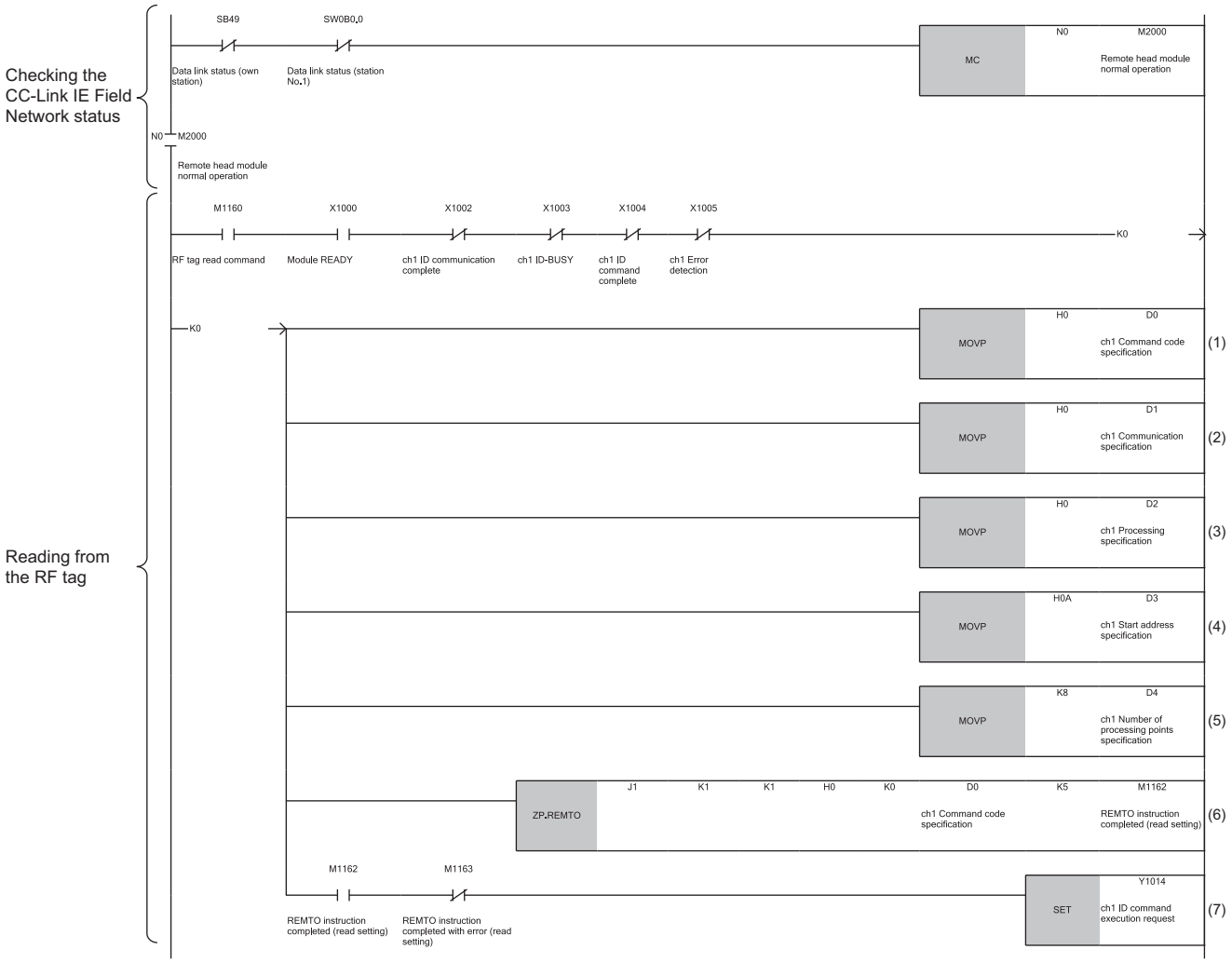
Set the module parameters of RFID interface module as shown in the table below.

■Basic Settings

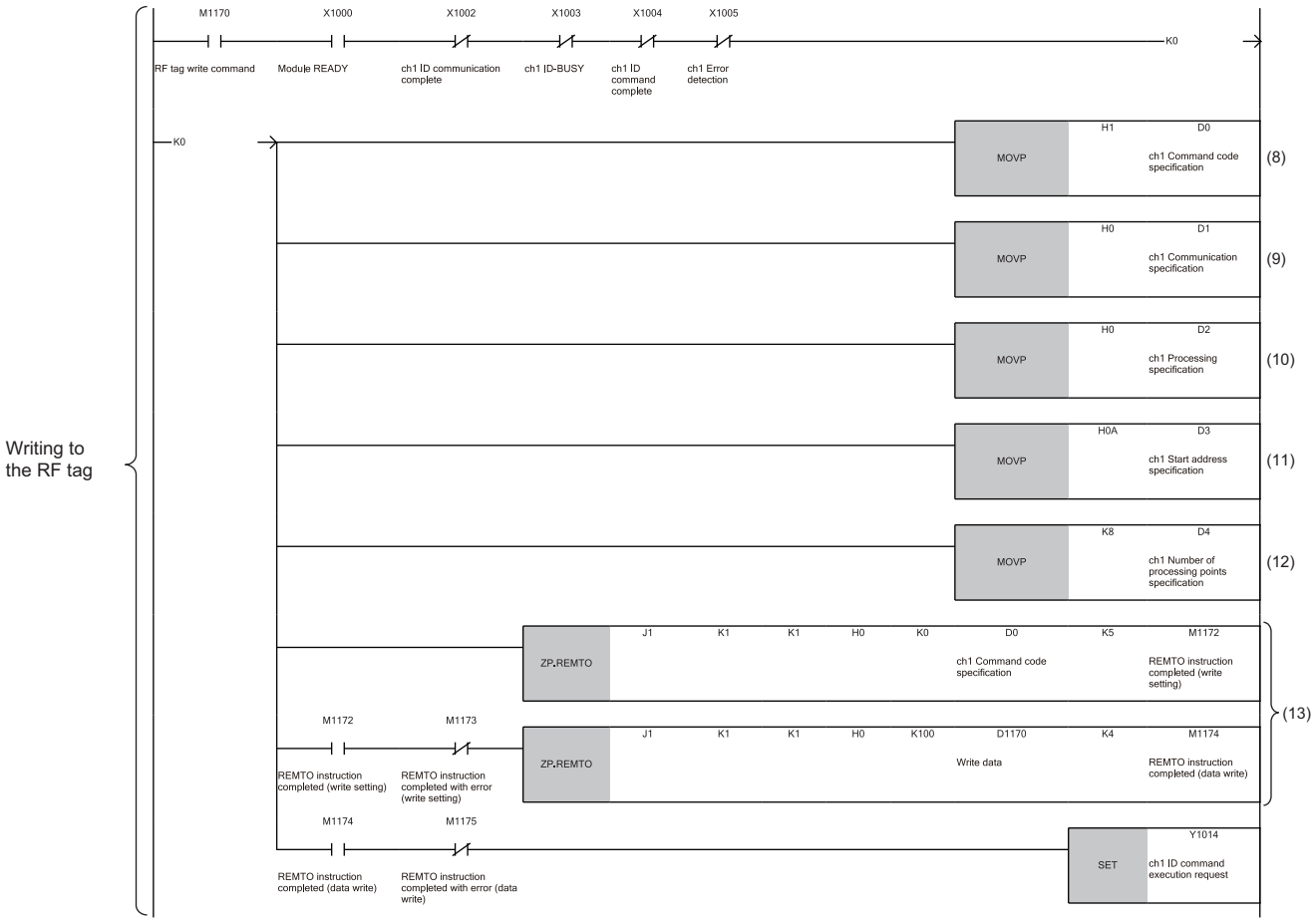
Item		Setting value
RF tag communication setting	Write verify setting	Execute
	RF tag communication speed setting	Standard mode
	Write protect setting	Disable
	Read/Write data code setting	Without ASCII/HEX conversion
TEST mode setting	Enable Y contact test request	Enable
	Enable channel 1 TEST mode	Enable
	Enable channel 2 TEST mode	Enable
Operation mode setting	Operation mode setting	RUN mode
	Test operation antenna specification	Antenna 1 (Fixed)
	No. of processing points during testing specification	1 h byte (Fixed)

Program example

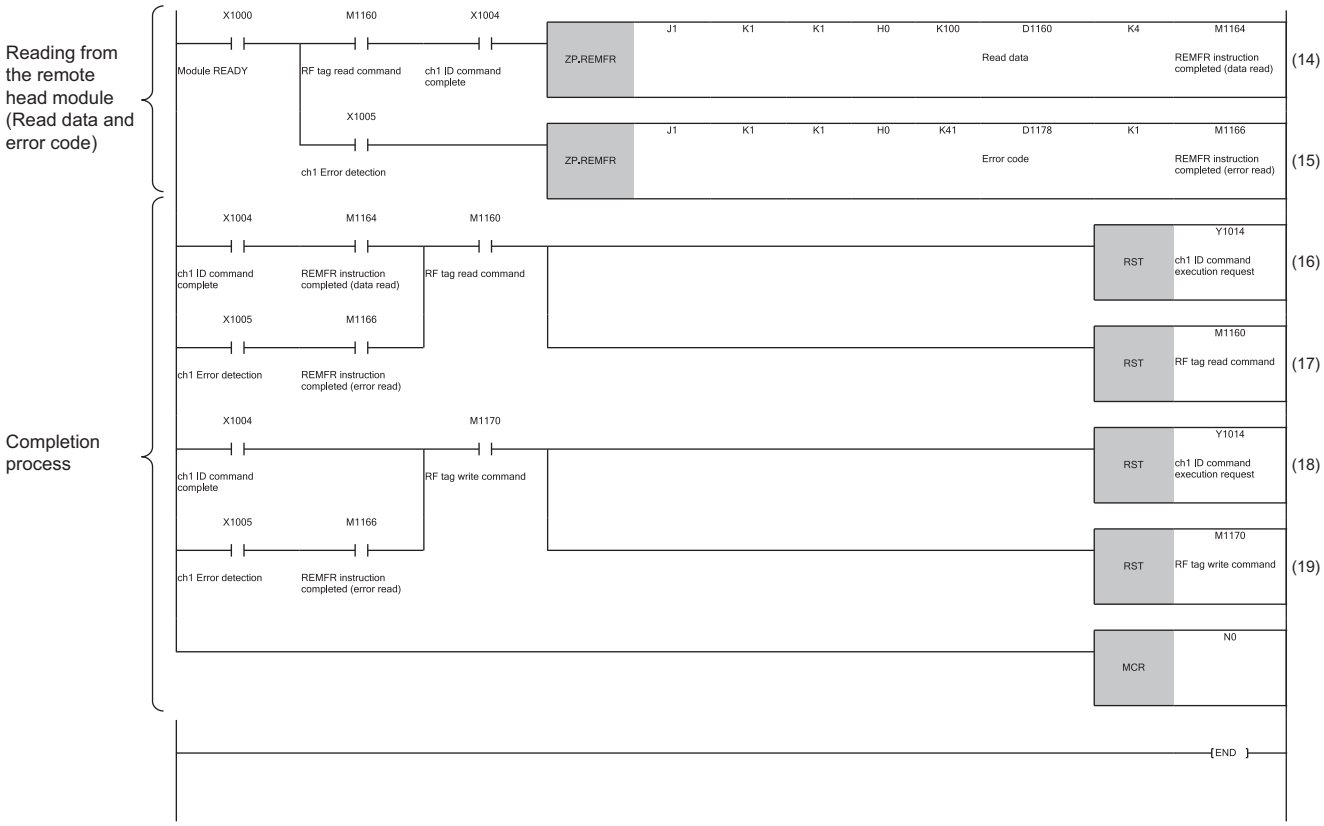
The following figure shows a program example.



(1) Set Read command.
(2) Set "Trigger" to the communication specification.
(3) Set "Upper → Lower" to the data storage order.
(4) Set HA to the start address to read data from the RF tag.
(5) Set 8 bytes to the number of points to read data from the RF tag.
(6) The data that is set to be read is written to the remote head module.
(7) ID command execution request is turned on.



(8) Set Write command.
(9) Set "Trigger" to the communication specification.
(10) Set "Upper → Lower" to the data storage order.
(11) Set HA to the start address to write data to the RF tag.
(12) Set 8 bytes to the number of points to write data to the RF tag.
(13) The data that is set to write is written to the remote head module.

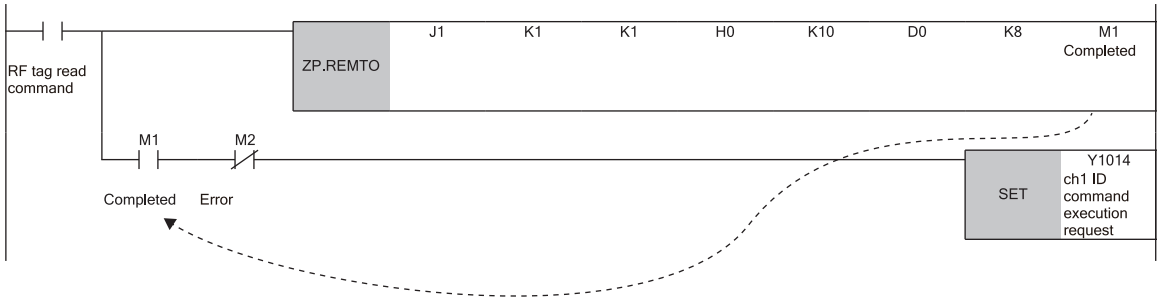


(14) The data to be read is read from the remote head module.
(15) The error code is read from the remote head module.
(16) ID command execution request is turned off after ID command is completed or the error code is read.
(17) Read command of RF tag is turned off.
(18) ID command execution request is turned off after ID command is completed or the error code is read.
(19) Write command of RF tag is turned off.

Point

The dedicated instruction (REMTO/REMFR) to read/write the buffer memory of intelligent device station takes a few scans before the instruction is completed. The result of dedicated instruction is not synchronous with the result of I/O signals operation.

When controlling the output signal after reading/writing buffer memory, set the interlock so that the I/O signals are controlled after the completion device of dedicated instruction turns on.



For details on the dedicated instructions (REMTO/REMFR), refer to the following.

MELSEC iQ-R Programming Manual (Module Dedicated Instructions)

8 TROUBLESHOOTING

This chapter describes the details of errors that can occur in the RFID interface module and troubleshooting.

Point

The RFID interface module is available for the online module change. When an error occurs, the RFID interface module is changed without stopping the programmable controller system. (The online module change from ER-1V680D1 to ER-1V680D2 or from ER-1V680D2 to ER-1V680D1 is not available.)
For the replacement procedure and the CPU modules available for the online module change, refer to the following.
MELSEC iQ-R Online Module Change Manual

8.1 Check with LED

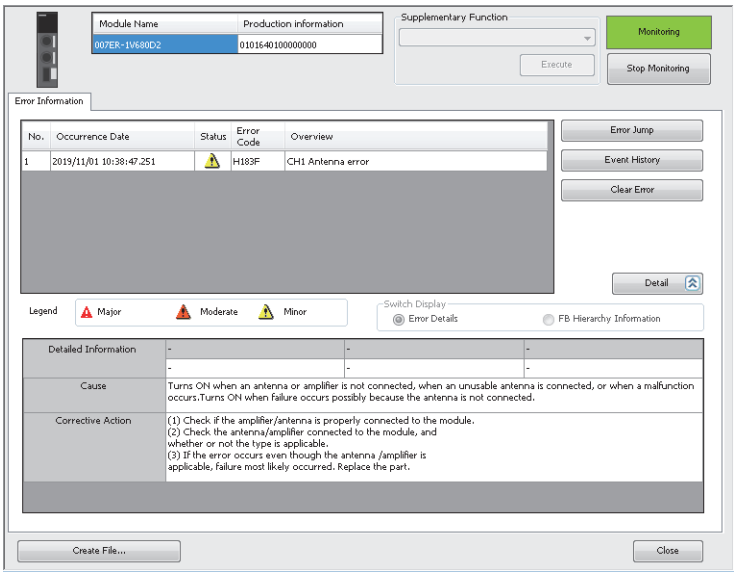
Checking the LED indicator status is the primary diagnostics without an engineering tool, resulting narrowing the scope of the error cause.
The status of RFID interface module is checked with RUN LED, ERR LED, EXT PW LED, and A ER LED. The following tables lists the LEDs and the status of RFID interface module.

LED	LED status	Description	Reference
RUN LED	On	Normal operation	—
	Blinking	When selecting the target module for online module change	MELSEC iQ-R Online Module Change Manual
	Off	Power-off	—
		Error	Page 111 When the RUN LED turns off
		Module replacement status at the time of online module change	MELSEC iQ-R Online Module Change Manual
ERR LED	On	Error	Page 111 When the ERR LED turns on
	Off	Normal operation	—
EXT PW LED	On	Normal operation	—
	Off	Error (error of power supply to antenna)	Page 111 When the EXT PW LED turns off
A ER LED	On	Error	Page 112 When the A ER LED turns on or blinks
	Blinking	Error at the time of the communication test under TEST mode	Page 79 Communication test
	Off	Normal operation	—

8.2 Module Status Check

The error codes, error causes, and actions of the module and the event history are checked on the module diagnostics window of engineering tool.

[Diagnostics] ⇨ [System Monitor] ⇨ Right-click the RFID interface module ⇨ "Module Diagnostics"



8.3 Troubleshooting by Symptom

When the RUN LED turns off

Check item	Action
Is the power on?	If the power is not on, turn the power on.
Is the voltage of external power supply a value within the specified range?	If the voltage is not a value within the specified range, adjust the voltage of external power supply to a value within the specified range and reset the CPU module. For the specified voltage of external power supply, refer to the following. ☞ Page 21 Functional Specifications
Is the power capacity of power supply module installed to the base unit sufficient?	The power capacity can be insufficient. Calculate the current consumption and review the power supply module. For the calculation method of current consumption, refer to the following. 📖 MELSEC iQ-R Module Configuration Manual
Is the RFID interface module executing the online module change?	If the RFID interface module is executing the online module change, finish the online module change.
Is the CPU module normal?	If an error occurs in the CPU module, perform processing for the causes and reset the CPU module. For the check items and actions of CPU module, refer to the following. 📖 MELSEC iQ-R CPU Module User's Manual (Application)
Is the module affected by noise?	The RFID interface module can have occurred an error due to external noise. Eliminate the noise source and turn the power off and on.

If the LED does not turn on even if the above items are checked and corrected, please consult your local Mitsubishi representative and explain the error details.

When the ERR LED turns on

Reset the CPU module.

If the LED does not turn off even if the CPU module is reset, please consult your local Mitsubishi representative and explain the error details.

When the EXT PW LED turns off

Check item	Action
Is the polarity of external power supply correct?	If the polarity is not correct, set the correct polarity.
Is the wiring of external power supply correct?	If the wiring is not correct, correct the wiring. For the wiring method, refer to the following. ☞ Page 25 Wiring the External Power Supply
Is the external power supply on?	If the external power supply is not on, turn it on and reset the CPU module.
Is the voltage of external power supply a value within the specified range?	If the voltage is not a value within the specified range, adjust the voltage of external power supply to a value within the specified range and reset the CPU module. For the specified voltage of external power supply, refer to the following. ☞ Page 21 Functional Specifications
Is the power capacity of power supply module installed to the base unit sufficient?	The power capacity can be insufficient. Calculate the current consumption and review the power supply module. For the calculation method of current consumption, refer to the following. 📖 MELSEC iQ-R Module Configuration Manual

If the LED does not turn on even if the above items are checked and corrected, please consult your local Mitsubishi representative and explain the error details.

When the A ER LED turns on or blinks

Check item	Action
Is the RUN LED of antenna or amplifier on?	If the RUN LED is not on, connect the antenna and amplifier correctly. For the wiring method of antenna cable, refer to the following. ☞ Page 28 Wiring the Antenna Cables
Is the RF tag within the communication range?	If the RF tag is not within the range, place the RF tag within the recommended communication distance. For the recommended communication distance, refer to the manual for the Omron RFID system V680 series products.
Is the BSY LED off?	If the BSY LED is not off, the conceivable cause is malfunction of the antenna or amplifier due to noise. Check the installation method of antenna, amplifier, and cables, and correctly install them.
Are any bits on in Error details storage area (Un\G41, Un\G4041)?	If any bits are on in the area, check the actions of list of error codes and review the program. (☞ Page 113 List of Error Codes)
When ID command execution request (Y14, Y1C) or Result reception (Y16, Y1E) is turned off, does the A ER LED turn off?	If the A ER LED does not turn off, review the program.
When ID command execution request (Y14, Y1C) is turned on, does the BSY LED and NOM LED turn on?	If the BSY LED and NOM LED do not turn on, review the program.

If the LED does not turn off even if the above items are checked and corrected, please consult your local Mitsubishi representative and explain the error details.

8.4 List of Error Codes

This chapter describes the error codes that can occur in the RFID interface module. The errors of the RFID interface module are classified in the minor error.

Point

The error codes are checked on the window of system monitor or module diagnostics of an engineering tool. (GX Works3 Operating Manual)

RUN mode

When an error occurs in the RFID interface module, the bit of Error details storage area (Un\G41, Un\G4041) corresponding to the error details turns on. When either ID command execution request (Y14, Y1C) is turned off or Result reception (Y16, Y1E) is turned on/off*1, the bit in Error details storage area (Un\G41, Un\G4041) is cleared.

*1 When Repeat auto, FIFO repeat, Multi-trigger or Multi-repeat is set to Communication specification area (Un\G1, Un\G4001)

Error code		Bit in the Un\G41, Un\G4041	Error name*2	Description	Action
CH1	CH2				
1810H	1820H	0	ID command error	The specified ID command is incorrect.	Specify the correct ID command.
				For ASCII/HEX conversion, the number of processing points (read/write) is an odd number of bytes.	For ASCII/HEX conversion, set an even number of bytes to the number of processing points (read/write).
1813H	1823H	3	Data correcting flag	Data become normal by data correction as a result of Read with error correction.	—
1814H	1824H	4	Status flag (ERR_76)	The number of rewrites is exceeded by the Manage number of writes command.	Exchange the EEPROM type RF tag with a new RF tag.
				• The verification results indicate an error as a result of a memory data check (verification). • A data error occurs as a result of Read with error correction. • The overflow occurs as a result of an addition operation of Write calculation. • The underflow occurs as a result of a subtraction operation of Write calculation. • An error occurs as a result of data writing after reading at the Copy command.*3	• Place only one RF tag within the antenna communication range. • Measure the ambient noise. If excessive noise is generated, eliminate the noise source. (☞ Page 85 Noise level) • Slow down the movement speed of the RF tag. • Check the distance between the antenna and RF tag, and set them within the communication range. • When using two antennas or more, keep suitable distance between antennas. • Check that the antenna, amplifier, and RF tag are available for the module. Even so, if an error occurs, the devices may break. • If the overflow or underflow occurs as a result of Write calculation, set the suitable value to the calculation data.
1817H	1827H	7	ID System error 3 (ERR_7F)	ID System error	Please consult your local Mitsubishi representative and explain the error details.
1818H	1828H	8	ID System error 2 (ERR_7E)	ID System error	Please consult your local Mitsubishi representative and explain the error details.
1819H	1829H	9	ID System error 1 (ERR_79)	ID System error	Please consult your local Mitsubishi representative and explain the error details.
181AH	182AH	10	Tag not present error (ERR_72)	No communicable RF tag are in the antenna communication area.*4	• Check the distance between the antenna and RF tag, and set them within the communication range. • Keep the less axis gap between the antenna and RF tag. • Measure the ambient noise. If excessive noise is generated, eliminate the noise source. (☞ Page 85 Noise level) • Check that the antenna is connected correctly. • Check that the antenna, amplifier, and RF tag connected to the module are available for the module. Even so, if an error occurs, the devices may break.

Error code		Bit in the Un\G41, Un\G4041	Error name*2	Description	Action
CH1	CH2				
181BH	182BH	11	Protect error (ERR_7D)	Data are written in a protected area.*4	• Correct the head address and the number of processing points to write to the RF tag. • Correct the start address and end address of the write protect setting area. • Set "Disable" to "Write protect enable/disable setting" to clear the write protect setting.
181CH	182CH	12	Tag communication error (ERR_70)	Communication with the RF tag is not completed successfully.*4	• Place only one RF tag within the antenna communication range. • Measure the ambient noise. If excessive noise is generated, eliminate the noise source. (☞ Page 85 Noise level) • Slow down the movement speed of the RF tag. • Check the distance between the antenna and RF tag, and set them within the communication range. • When using two antennas or more, keep suitable distance between antennas. • Check that the antenna, amplifier, and RF tag connected to the module are available for the module. Even so, if an error occurs, the devices may break.
181DH	182DH	13	Address error (ERR_7A)	Read/Write data exceed the address range of RF tag.	Set the correct value to the head address and No. of processing points specification area (Un\G4, Un\G4004) of the RF tag memory.
181EH	182EH	14	Verify error ASCII/HEX conversion error (ERR_71)	Data are not written to the RF tag normally.*4	• Slow down the movement speed of the RF tag. • Measure the ambient noise. If excessive noise is generated, eliminate the noise source. (☞ Page 85 Noise level)
				When data are read with ASCII/HEX conversion, the RF tag includes data that cannot be converted.	Specify the data that consists of only "0" to "9" and "A" to "F".
181FH	182FH	15	Antenna error (ERR_7C)	The following causes are conceivable. • The antenna or amplifier is not connected. • An unavailable antenna is connected. • The antenna breaks.	• Check that the antenna and amplifier are connected correctly. • Check that the antenna and amplifier are available for the module. Even so, if an error occurs, the devices may break.

*2 (ERR_□□) means the system error code of the Omron RFID system.

*3 When an error occurs at the Copy command on the copy destination side, the bit of the copy source side turns on.

*4 When an error occurs as a result of data writing after reading at the Copy command, the status flag (bit 4) turns on.

TEST mode

When an error occurs, the value corresponding to the error details is stored in Processing result monitor storage area (Un\G42, Un\G4042).

Error code		Un\G42, Un\G4042	Error name	Description	Action
CH1	CH2				
1839H	1849H	E079H	ID System error 1	ID System error	Please consult your local Mitsubishi representative and explain the error details.
183AH	184AH	E072H	Tag not present error	No communicable RF tag are in the antenna communication area.	• Check the distance between the antenna and RF tag, and set them within the communication range. • Keep the less axis gap between the antenna and RF tag. • Measure the ambient noise. If excessive noise is generated, eliminate the noise source. (☞ Page 85 Noise level) • Check that the antenna is connected correctly. • Check that the antenna, amplifier, and RF tag connected to the module are available for the module. Even so, if an error occurs, the devices may break.
183CH	184CH	E070H	Tag communication error	Communication with the RF tag is not completed successfully.	• Place only one RF tag within the antenna communication range. • Measure the ambient noise. If excessive noise is generated, eliminate the noise source. (☞ Page 85 Noise level) • Slow down the movement speed of the RF tag. • Check the distance between the antenna and RF tag, and set them within the communication range. • When using two antennas or more, keep suitable distance between antennas. • Check that the antenna, amplifier, and RF tag are available for the module. Even so, if an error occurs, the devices may break.
183DH	184DH	E07AH	Address error	Read/Write data exceed the address range of RF tag.	Set the correct value to the No. of processing points specification area (Un\G4, Un\G4004) of the RF tag.
183FH	184FH	E07CH	Antenna error	The following causes are conceivable. • The antenna or amplifier is not connected. • An unavailable antenna is connected. • The antenna breaks.	• Check that the amplifier and antenna are connected correctly. • Check that the antenna and amplifier connected to the module are available for the module. Even so, if an error occurs, the devices may break.

RUN mode/TEST mode

When an error occurs, the bit of Module status storage area (Un\G40, Un\G4040) corresponding to the error details turns on.

Error code		Bit in the Un\G40, Un\G4040	Error name	Description	Action
CH1	CH2				
1850H		1	24VDC power supply error	24VDC power is not supplied normally.	• Check that it is wired correctly. • Check that the external power supply voltage is within the specified range. • Check that the power capacity of external power supply is sufficient.
1851H	1861H	0	Antenna error	An unavailable antenna is connected.	Connect an available antenna.

APPENDICES

Appendix 1 Module Label

The functions of the RFID interface module can be set with module labels.

Module label list

The following table lists the model labels.

[X] of a label name means the module number that is added to identify the modules having the same module name.

R: Readable, W: Writable

Type	Label name	Description	Available device No./ buffer memory address	R/W
System	ER1V680D_[x]	Module label structure	—	—
	ER1V680D_[x].uIO	First I/O No.	—	R
Input signal	ER1V680D_[x].bModuleREADY	Module READY	X0	R
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_IDCommunicationComplete	CH1 ID communication complete	X2	R
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_IDBUSY	CH1 ID-BUSY	X3	R
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_IDCommandComplete	CH1 ID command complete	X4	R
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_ErrorDetection	CH1 Error detection	X5	R
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_IDCommunicationComplete	CH2 ID communication complete	XA	R
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_IDBUSY	CH2 ID-BUSY	XB	R
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_IDCommandComplete	CH2 ID command complete	XC	R
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_ErrorDetection	CH2 Error detection	XD	R
	ER1V680D_[x].bModuleREADY_D	Module READY (direct)	DX0	R
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_IDCommunicationComplete_D	CH1 ID communication complete (direct)	DX2	R
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_IDBUSY_D	CH1 ID-BUSY (direct)	DX3	R
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_IDCommandComplete_D	CH1 ID command complete (direct)	DX4	R
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_ErrorDetection_D	CH1 Error detection (direct)	DX5	R
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_IDCommunicationComplete_D	CH2 ID communication complete (direct)	DXA	R
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_IDBUSY_D	CH2 ID-BUSY (direct)	DXB	R
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_IDCommandComplete_D	CH2 ID command complete (direct)	DXC	R
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_ErrorDetection_D	CH2 Error detection (direct)	DXD	R
Output signal	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_IDCommandExecutionRequest	CH1 ID command execution request	Y14	R/W
	ER1V680D_[x].stER1V680D_TESTMode_D.bTESTModeExecutionRequest	TEST mode execution request	Y15	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_ResultReception	CH1 Result reception	Y16	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_IDCommandExecutionRequest	CH2 ID command execution request	Y1C	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_ResultReception	CH2 Result reception	Y1E	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_IDCommandExecutionRequest_D	CH1 ID command execution request (direct)	DY14	R/W
	ER1V680D_[x].stER1V680D_TESTMode_D.bTESTModeExecutionRequest_D	TEST mode execution request (direct)	DY15	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.bCH1_ResultReception_D	CH1 Result reception (direct)	DY16	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_IDCommandExecutionRequest_D	CH2 ID command execution request (direct)	DY1C	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.bCH2_ResultReception_D	CH2 Result reception (direct)	DY1E	R/W

Type	Label name	Description	Available device No./ buffer memory address	R/W
Command (CH1)	ER1V680D_[x].stER1V680D_Channel1_D.wCommandCodeSpecificationArea_D	CH1 Command code specification area (direct)	Un\G0	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.wCommunicationSpecificationArea_D	CH1 Communication specification area (direct)	Un\G1	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.wProcessingSpecificationArea_D	CH1 Processing specification area (direct)	Un\G2	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.wHeadAddressSpecificationArea_D	CH1 Head address specification area (direct)	Un\G3	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.wNoOfProcessingPointsSpecificationArea_D	CH1 No. of processing points specification area (direct)	Un\G4	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.wCommandOptionSpecificationArea_D	CH1 Command option specification area (direct)	Un\G5	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.wAutoCommandWaitTimeSettingArea_D	CH1 Auto command wait time setting area (direct)	Un\G10	R/W
	ER1V680D_[x].stER1V680D_Channel1_D.wProcessingResultMonitorSwitchSettingArea_D	CH1 Processing result monitor switch setting area (direct)	Un\G11	R/W
Command (CH2)	ER1V680D_[x].stER1V680D_Channel2_D.wCommandCodeSpecificationArea_D	CH2 Command code specification area (direct)	Un\G4000	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.wCommunicationSpecificationArea_D	CH2 Communication specification area (direct)	Un\G4001	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.wProcessingSpecificationArea_D	CH2 Processing specification area (direct)	Un\G4002	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.wHeadAddressSpecificationArea_D	CH2 Head address specification area (direct)	Un\G4003	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.wNoOfProcessingPointsSpecificationArea_D	CH2 No. of processing points specification area (direct)	Un\G4004	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.wCommandOptionSpecificationArea_D	CH2 Command option specification area (direct)	Un\G4005	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.wAutoCommandWaitTimeSettingArea_D	CH2 Auto command wait time setting area (direct)	Un\G4010	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.wProcessingResultMonitorSwitchSettingArea_D	CH2 Processing result monitor switch setting area (direct)	Un\G4011	R/W
TEST	ER1V680D_[x].stER1V680D_TESTMode_D.wTestOperationModeSpecificationArea_D	Test operation mode specification area (direct)	Un\G8000	R/W
	ER1V680D_[x].stER1V680D_TESTMode_D.wTestOperationAntennaSpecificationArea_D	Test operation antenna specification area (direct)	Un\G8001	R/W
	ER1V680D_[x].stER1V680D_TESTMode_D.wNoOfProcessingPointsDuringTestingSpecificationArea_D	No. of processing points during testing specification area (direct)	Un\G8002	R/W

Type	Label name	Description	Available device No./ buffer memory address	R/W
Monitor (CH1)	ER1V680D_[x].stER1V680D_Channel1_D.wModuleStatusStorageArea_D	CH1 Module status storage area (direct)	Un\G40	R
	ER1V680D_[x].stER1V680D_Channel1_D.stModuleStatusStorageArea_D.bAntennaError_D	CH1 Antenna error (direct)	Un\G40.0	R
	ER1V680D_[x].stER1V680D_Channel1_D.stModuleStatusStorageArea_D.bAntennaPowerSupplyError_D	CH1 24VDC power supply error (direct)	Un\G40.1	R
	ER1V680D_[x].stER1V680D_Channel1_D.stModuleStatusStorageArea_D.bTestMode_D	CH1 TEST mode (direct)	Un\G40.2	R
	ER1V680D_[x].stER1V680D_Channel1_D.wErrorDetailsStorageArea_D	CH1 Error details storage area (direct)	Un\G41	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bIDCommandError_D	CH1_ID command error (direct)	Un\G41.0	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bErrorCorrection_D	CH1_Data correcting flag (direct)	Un\G41.3	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bRFTagStatus_D	CH1_Status flag (direct)	Un\G41.4	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bIDSystemError3_D	CH1_ID system error 3 (direct)	Un\G41.7	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bIDSystemError2_D	CH1_ID system error 2 (direct)	Un\G41.8	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bIDSystemError1_D	CH1_ID system error 1 (direct)	Un\G41.9	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bTagMissingError_D	CH1_Tag not present error (direct)	Un\G41.A	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bProtectionError_D	CH1_Protect error (direct)	Un\G41.B	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bTagCommunicationError_D	CH1_Tag communication error (direct)	Un\G41.C	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bTagAddressError_D	CH1_Address error (direct)	Un\G41.D	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bVerificationError_D	CH1_Verify_ASCII_HEX conversion error (direct)	Un\G41.E	R
	ER1V680D_[x].stER1V680D_Channel1_D.stErrorDetailsStorageArea_D.bAntennaError_D	CH1_Antenna error (direct)	Un\G41.F	R
	ER1V680D_[x].stER1V680D_Channel1_D.wProcessingResultMonitorStorageArea_D	CH1 Processing result monitor storage area (direct)	Un\G42	R
	ER1V680D_[x].stER1V680D_Channel1_D.wRFTagUIDStorageArea_D	CH1 RF tag UID storage area (direct)	Un\G90	R

Type	Label name	Description	Available device No./ buffer memory address	R/W
Monitor (CH2)	ER1V680D_[x].stER1V680D_Channel2_D.wModuleStatusStorageArea_D	CH2: Module status storage area (direct)	Un\G4040	R
	ER1V680D_[x].stER1V680D_Channel2_D.stModuleStatusStorageArea_D.bAntennaError_D	CH2 Antenna error (direct)	Un\G4040.0	R
	ER1V680D_[x].stER1V680D_Channel2_D.stModuleStatusStorageArea_D.bAntennaPowerSupplyError_D	CH2 24VDC power supply error (direct)	Un\G4040.1	R
	ER1V680D_[x].stER1V680D_Channel2_D.stModuleStatusStorageArea_D.bTestMode_D	CH2 TEST mode (direct)	Un\G4040.2	R
	ER1V680D_[x].stER1V680D_Channel2_D.wErrorDetailsStorageArea_D	CH2 Error details storage area (direct)	Un\G4041	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bIDCommandError_D	CH2_ID command error (direct)	Un\G4041.0	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bErrorCorrection_D	CH2_Data correcting flag (direct)	Un\G4041.3	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bRFTagStatus_D	CH2_Status flag (direct)	Un\G4041.4	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bIDSystemError3_D	CH2_ID system error 3 (direct)	Un\G4041.7	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bIDSystemError2_D	CH2_ID system error 2 (direct)	Un\G4041.8	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bIDSystemError1_D	CH2_ID system error 1 (direct)	Un\G4041.9	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bTagMissingError_D	CH2_Tag not present error (direct)	Un\G4041.A	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bProtectionError_D	CH2_Protect error (direct)	Un\G4041.B	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bTagCommunicationError_D	CH2_Tag communication error (direct)	Un\G4041.C	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bTagAddressError_D	CH2_Address error (direct)	Un\G4041.D	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bVerificationError_D	CH2_Verify_ASCII_HEX conversion error (direct)	Un\G4041.E	R
	ER1V680D_[x].stER1V680D_Channel2_D.stErrorDetailsStorageArea_D.bAntennaError_D	CH2_Antenna error (direct)	Un\G4041.F	R
	ER1V680D_[x].stER1V680D_Channel2_D.wProcessingResultMonitorStorageArea_D	CH2 Processing result monitor storage area (direct)	Un\G4042	R
	ER1V680D_[x].stER1V680D_Channel2_D.wRFTagUIDStorageArea_D	CH2 RF tag UID storage area (direct)	Un\G4090	R
Data	ER1V680D_[x].stER1V680D_Channel1_D.stnDataStorageArea_D*1	CH1 Data storage area (direct)	Un\G100	R/W
	ER1V680D_[x].stER1V680D_Channel2_D.stnDataStorageArea_D*1	CH2 Data storage area (direct)	Un\G4100	R/W

*1 The name consists of the array of 0..1023.

Appendix 2 I/O Signals

This section describes the I/O signals for the CPU module. The I/O signals are assigned when the first I/O number of RFID interface module is 0.

I/O signal list

The following table lists the I/O signals.

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	System area	
X1	System area		Y1		
X2	CH1	ID communication complete	Y2		
X3		ID-BUSY	Y3		
X4		ID command complete	Y4		
X5		Error detection	Y5		
X6	System area		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	System area		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	System area	
X18			Y18		
X19			Y19		
X1A			Y1A		
X1B			Y1B		
X1C			Y1C	CH2*1	ID command execution request
X1D			Y1D	System area	
X1E			Y1E	CH2*1	Result reception
X1F			Y1F	System area	

*1 Available for use only when ER-1V680D2 is used.

*2 Available for use only when "Enable" is set to "Enable channel 1 TEST mode", "Enable channel 2 TEST mode (ER-1V680D2 use)" and "Enable Y contact test request" on the module parameters.

Restriction

Do not use the I/O signals for system area. Doing so can cause abnormal operation.

I/O signal details

This section describes the details of I/O signals.

Input signals

■Module READY (X0)

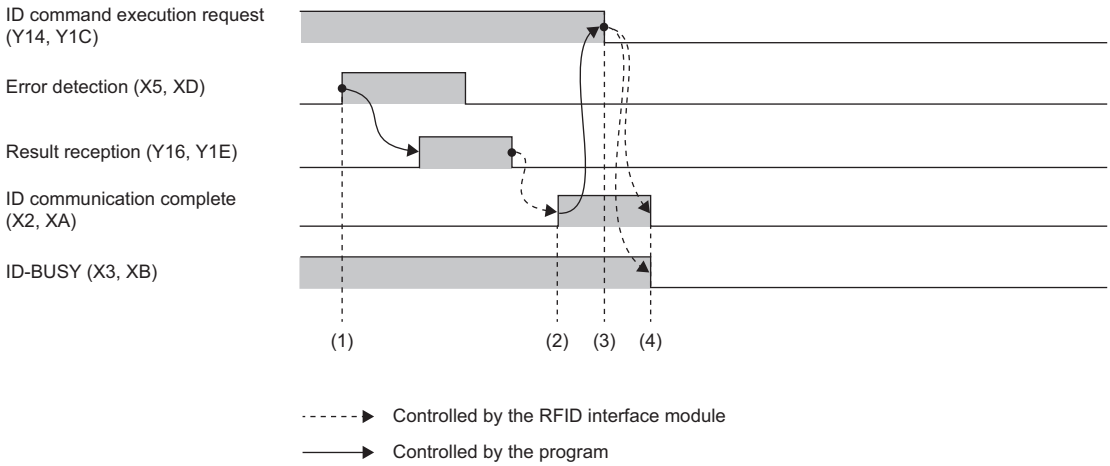
When the RFID interface module is ready after the CPU is powered on or is reset, Module READY (X0) turns on.
When a hard ware error of the RFID interface module occurs, Module READY (X0) turns off.

■ID communication complete (X2, XA)

ID communication complete (X2, XA) is available when Repeat auto, FIFO repeat, Multi-trigger, or Multi-repeat is set to Communication specification area (Un\G1, Un\G4001).

- When Repeat auto, FIFO repeat, or Multi-repeat is set to Communication specification area (Un\G1, Un\G4001), ID communication complete (X2, XA) turns on when Error detection (X5, XD) turns on and Result reception (Y16, Y1E) is turned on and off after the RFID interface module is suspended due to the elapse of the auto command wait time.
- When Multi-trigger is set to Communication specification area (Un\G1, Un\G4001), ID communication complete (X2, XA) turns on once the communication processing with all RF tags is completed.

When Error detection (X5, XD) turns on and Result reception (Y16, Y1E) is turned on and off after communication is suspended due to antenna disconnection, ID communication complete (X2, XA) turns on.
When ID command execution request (Y14, Y1C) is turned off, ID communication complete (X2, XA) turns off.



(1) When communication is suspended due to the elapse of the auto command wait time or antenna disconnection, Error detection (X5, XD) turns on. When Result reception (Y16, Y1E) is turned on and off, ID communication complete (X2, XA) turns on.
(2) When Multi-trigger is set to Communication specification area (Un\G1, Un\G4001) and the last communication is completed, ID communication complete (X2, XA) turns on.
(3) When ID communication complete (X2, XA) turns on, ID command execution request (Y14, Y1C) is turned off.
(4) When the ID command execution request (Y14, Y1C) is turned off, ID communication complete (X2, XA) and ID-BUSY (X3, XB) turn off.

■ID-BUSY (X3, XB)

When ID command execution request (Y14, Y1C) is turned on and received by the RFID interface module, ID-BUSY (X3, XB) turns on.

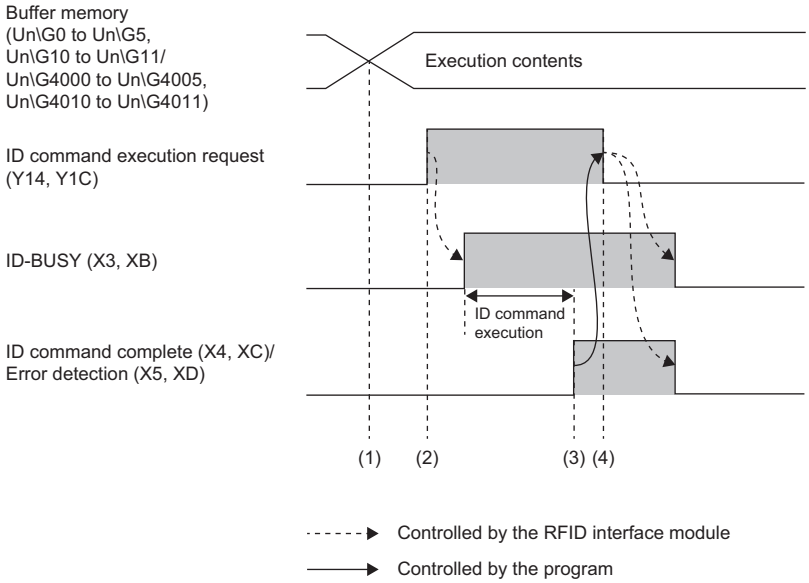
When ID command execution request (Y14, Y1C) is turned off and received by the RFID interface module, ID-BUSY (X3, XB) turns off.

ID-BUSY (X3, XB) is always ON in TEST mode.

■ID command complete (X4, XC)

When ID command execution request (Y14, Y1C) is turned on and the ID command is completed successfully, ID command execution complete (X4, XC) turns on. (When completed with an error, Error detection (X5, XD) turns on.)

When ID command execution request (Y14, Y1C) is turned off and received by the RFID interface module, ID command complete (X4, XC) turns off.



(1) Set the ID command execution content 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) When the ID command execution request (Y14, Y1C) is turned on, ID-BUSY (X3, XB) turns on and the ID command is executed depending on the execution content to be set.

(3) When the ID command is completed successfully, ID command complete (X4, XC) turns on.

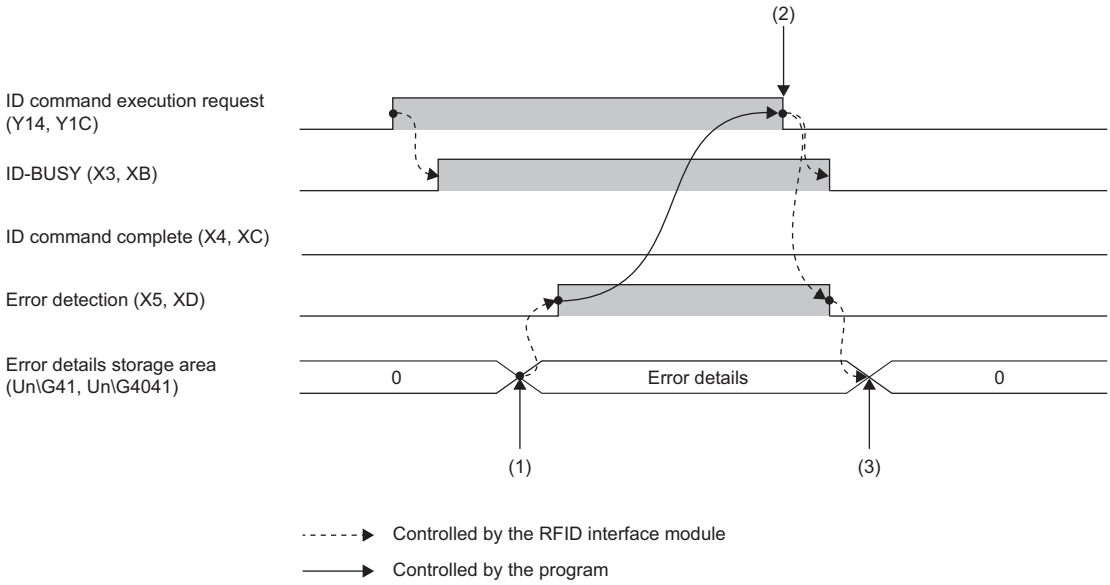
(4) When the ID command execution request (Y14, Y1C) is turned off, ID-BUSY (X3, XB) and ID command complete (X4, XC) turn off.

■Error detection (X5, XD)

When ID command execution request (Y14, Y1C) is turned on and ID command is completed with error, Error detection (X5, XD) turns on. In this case, ID command complete (X4, XC) does not turn on.

When ID command execution request (Y14, Y1C) is turned off and received by the RFID interface module, Error detection (X5, XD) turns off.

When the watchdog timer error occurs, Error detection (X5, XD) does not turn on. (RUN LED turns off.)



(1) When the ID command is completed with error, Error detection (X5, XD) turns on.

(2) When ID command execution request (Y14, Y1C) is turned off, Error detection (X5, XD) turns off.

(3) The error is cleared and Error details storage area (Un\G41, Un\G4041) becomes 0.

Output signal

■ID command execution request (Y14, Y1C)

When ID command execution request (Y14, Y1C) is turned on in the program, the ID command 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) is executed.

When ID command execution request (Y14, Y1C) of channel 1 and channel 2 are turned on simultaneously, the channel 1 is processed first. When the channel 1 receives the Copy command and the channel 2 receives the Read command, the command of channel 2 is ignored. When the channel 1 receives the Read command and the channel 2 receives the Copy command, the channel 2 occurs a command error. The ID command error (b0) of Error details storage area (Un\G4041) and Error detection (XD) turn on.

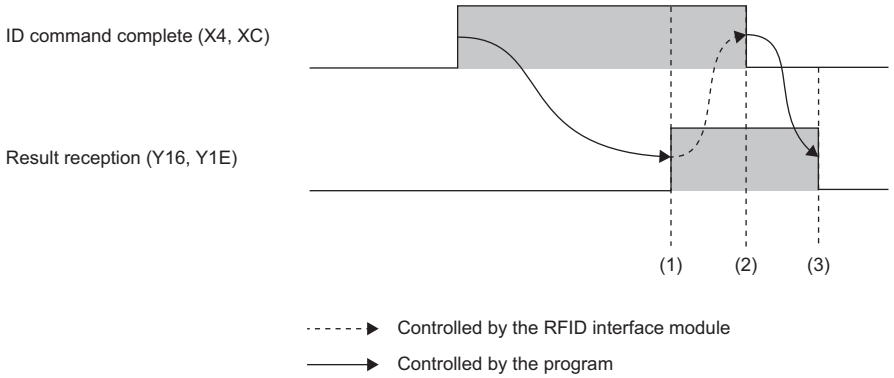
■TEST mode execution request (Y15)

When TEST mode execution request (Y15) is turned on in the program, TEST mode is executed.

TEST mode execution request (Y15) is available only when "Enable" is set to both the "Y contact test request enable" and "Enable channel 1 TEST mode" or "Enable channel 2 TEST mode" on "TEST mode setting" of module parameter.

■Result reception (Y16, Y1E)

Result reception (Y16, Y1E) is available when Repeat auto, FIFO repeat, Multi-trigger or Multi-repeat is set to Communication specification area (Un\G1, Un\G4001). Result reception (Y16, Y1E) is used as a trigger signal when communicating with the next RF tag.



(1) When ID command complete (X4, XC) turns on, the result information is acquired and Result reception (Y16, Y1E) is turned on.
(2) When Result reception (Y16, Y1E) is turned on, ID command complete (X4, XC) turns off.
(3) When ID command complete (X4, XC) turns off, Result reception (Y16, Y1E) is turned off.

A

Appendix 3 Buffer Memory

The buffer memory is used to exchange data between the RFID interface module and the CPU module. The buffer memory content returns to its default (initial value) when the CPU module is powered off or is reset.

List of buffer memory addresses

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

Address (decimal)		Name	Initial value	Read, write	Reference
CH1	CH2				
Un\G0	Un\G4000	Command code specification area	0	Read, write	Page 127 Command code specification area (Un\G0, Un\G4000)
Un\G1	Un\G4001	Communication specification area	0	Read, write	Page 127 Communication specification area (Un\G1, Un\G4001)
Un\G2	Un\G4002	Processing specification area	0	Read, write	Page 128 Processing specification area (Un\G2, Un\G4002)
Un\G3	Un\G4003	Head address specification area	0	Read, write	Page 128 Head address specification area (Un\G3, Un\G4003)
Un\G4	Un\G4004	No. of processing points specification area	0	Read, write	Page 129 No. of processing points specification area (Un\G4, Un\G4004)
Un\G5	Un\G4005	Command option specification area	0	Read, write	Page 129 Command option specification area (Un\G5, Un\G4005)
Un\G6 to Un\G9	Un\G4006 to Un\G4009	System area	—	—	—
Un\G10	Un\G4010	Auto command wait time setting area	0	Read, write	Page 129 Auto command wait time setting area (Un\G10, Un\G4010)
Un\G11	Un\G4011	Processing result monitor switch setting area	0	Read, write	Page 129 Processing result monitor switch setting area (Un\G11, Un\G4011)
Un\G12 to Un\G39	Un\G4012 to Un\G4039	System area	—	—	—
Un\G40	Un\G4040	Module status storage area	0	Read	Page 129 Module status storage area (Un\G40, Un\G4040)
Un\G41	Un\G4041	Error details storage area	0	Read	Page 130 Error details storage area (Un\G41, Un\G4041)
Un\G42	Un\G4042	Processing result monitor storage area	0	Read	Page 131 Processing result monitor storage area (Un\G42, Un\G4042)
Un\G43 to Un\G89	Un\G4043 to Un\G4089	System area	—	—	—
Un\G90 to Un\G93	Un\G4090 to Un\G4093	RF tag UID storage area (8 bytes)*1	0	Read	Page 131 RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)
Un\G94 to Un\G99	Un\G4094 to Un\G4099	System area	—	—	—
Un\G100 to Un\G1123	Un\G4100 to Un\G5123	Data storage area (2048 bytes)	0	Read, write	Page 131 Data storage area (Un\G100 to Un\G1123, Un\G4100 to Un\G5123)
Un\G8000		Test operation mode specification area	0	Read, write	Page 132 Test operation mode specification area (Un\G8000)
Un\G8001		Test operation antenna specification area	0*2	Read, write	Page 132 Test operation antenna specification area (Un\G8001)
Un\G8002		No. of processing points during testing specification area	0*2	Read, write	Page 132 No. of processing points during testing specification area (Un\G8002)

*1 Regardless of the setting in Processing specification area (Un\G2, Un\G4002), the data storage order does not change.

*2 The value varies with the setting of module parameters. (☞ Page 34 Basic Setting)

Restriction

Do not use the buffer memory of system area. Doing so can cause abnormal operation.

Buffer memory details

Command, communication specification

■Command code specification area (Un\G0, Un\G4000)

This area is used to specify the command code of processing details for RF tags. The system operates with the setting of ID command execution request (Y14, Y1C) when starting up.

Command code	Name	Reference
0000H	Read	Page 41 Read
0001H	Write	Page 45 Write
0002H	Set bit	Page 46 Set bit
0003H	Clear bit	Page 48 Clear bit
0004H	Write mask bit	Page 50 Write mask bit
0005H	Write calculation	Page 52 Write calculation
0006H	Fill data	Page 57 Fill data
0007H	Check data	Page 59 Check data
0008H	Manage number of writes	Page 62 Manage number of writes
0009H	Copy	Page 56 Copy
000AH	Read with error correction	Page 42 Read with error correction
000BH	Write with error correction	Page 54 Write with error correction
000CH	Read UID	Page 44 Read UID
0010H	Measure noise	Page 65 Measure noise

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

This area is used to specify the communication specification method depending on the RF tag status (stationary or moving status, or the number of RF tags in antenna communication area). The system operates with the setting of ID command execution request (Y14, Y1C) when starting up.

Specification details	Name	Reference
0000H	Trigger	Page 67 Trigger
0001H	Auto	Page 68 Auto
0002H	Repeat auto	Page 69 Repeat auto
0003H	FIFO trigger*1	Page 71 FIFO trigger
0004H	FIFO repeat*1	Page 72 FIFO repeat
0005H	Multi-trigger*1*2	Page 74 Multi-trigger
0006H	Multi-repeat*1*2	Page 76 Multi-repeat

*1 Not available for communication with V680-D1KP□□.

*2 The RF tags may not be read or written due to their installation location and surrounding environment. Identify the number of RF tags to be subject to reading or writing prior use.

Do not specify the value out of range. If the value out of range is specified, Error detection (X5, XD) turns on and communication is not performed normally.

A

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

This area is used to specify the processing specification details depending on the commands to use. The system operates with the setting of ID command execution request (Y14, Y1C) when starting up.

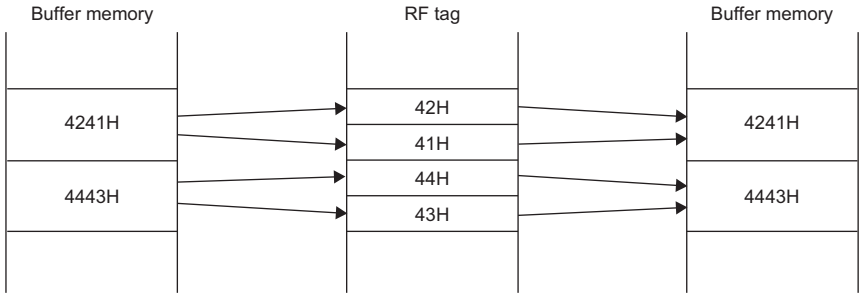
Name	Specification details	Processing details	Applicable commands
Data storage order	0000H	Upper → Lower	Read, Write, Set bit, Clear bit, Write mask bit, Fill data, Read with error correction, and Write with error correction
	0001H	Lower → Upper	
Calculation method	0000H	Addition	Write calculation and Manage number of writes
	0001H	Subtraction	
Calculation/Verification	0000H	Calculation	Check data
	0001H	Verification	

Do not specify the value out of range. If the value out of range is specified, Error detection (X5, XD) turns on and communication is not performed normally.

The following figure shows the processing details for each data storage order.

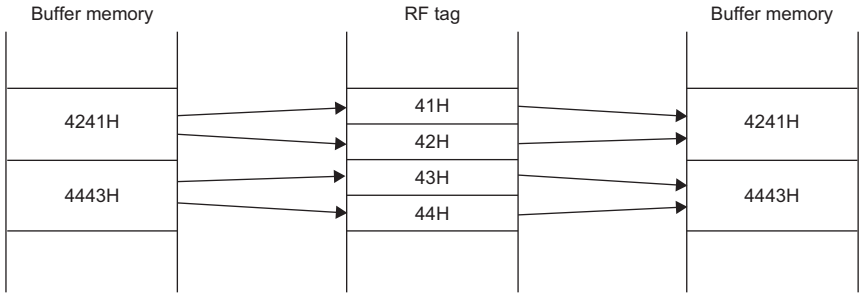
Ex.

Upper → Lower (0000H)



Ex.

Lower → Upper (0001H)



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

This area is used to specify the start address of RF tag to be subject to reading or writing. Specify the copy source address when executing the RF tag copy.

The system operates with the setting of ID command execution request (Y14, Y1C) when starting up.

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

This area is used to specify the number of processed bytes of RF tag to be subject to reading or writing.
When "With ASCII/HEX conversion" is set to "Read/Write data code setting", specify an even number to the number of bytes of ASCII to read/write from/to the RF tag. When an odd number is specified, the status flag (b0) in Error details storage area (Un\G41, Un\G4041) and Error detection (X5, XD) turn on.
The system operates with the setting of ID command execution request (Y14, Y1C) when starting up.

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

This area is used to specify the details of the command processing method when the Write calculation, Control number of writes, and Copy commands are executed. The system operates with the setting of ID command execution request (Y14, Y1C) when starting up.

Command	Description	Reference
Write calculation	The addition data or subtraction data is stored.	Page 52 Write calculation
Manage number of writes	The addition data or subtraction data is stored.	Page 62 Manage number of writes
Copy	The copy destination address is specified.	Page 56 Copy

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

This area is used to set the wait time in BCD for the RF tag response after ID command execution request (Y14, Y1C) is turned on with an auto command (Auto, Auto Repeat, FIFO Repeat, Multi-repeat). The system operates with the setting of ID command execution request (Y14, Y1C) when starting up.

Setting value	Description
0000, value other than BCD	The ID command is continually executed until the response from the RF tag.
0001 to 9999	When an RF tag is not detected within the set value [BCD] × 0.1 seconds, the ID command stops due to Tag not present error and Error detection (X5, XD) turns on.

Ex.
When setting 3 seconds to the wait time, set 0030H.

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

This area is used to set the data to store in Processing result monitor storage area (Un\G42, Un\G4042). The system operates with the setting of ID command execution request (Y14, Y1C) when starting up.

Setting value	Description
0001	The noise level is stored in Processing result monitor storage area (Un\G42, Un\G4042).
Other than 0001	The communication time is stored in Processing result monitor storage area (Un\G42, Un\G4042).

Processing result

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

The operation status of RFID interface module is stored.

Bit	Name	Description
0	Antenna error*1	0: Normal operation, or antenna is not connected. 1: Unavailable antenna is connected.
1	24VDC power supply error	0: 24VDC power supply is normally supplied. 1: 24VDC power supply is not normally supplied.
2	TEST mode	0: RUN mode 1: TEST mode
3 to 15	System area	0: Fixed

*1 When 24VDC power supply is not normally supplied, the antenna error (b0) is changed to 0 or 1.

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

When an error occurs, the bit corresponding to the error details turns on.

When either ID command execution request (Y14, Y1C) is turned off or Result reception (Y16, Y1E) is turned on/off[*1], the bit in Error details storage area (Un\G41, Un\G4041) is cleared.

*1 When Repeat auto, FIFO repeat, Multi-trigger or Multi-repeat is set to Communication specification area (Un\G1, Un\G4001)

Bit	Name	Description
0	ID command error	Turns on when the specified ID command is incorrect. Turns on when the number of processing points (read/write) for ASCII/HEX conversion is an odd number of bytes.
1	System area	—
2	System area	—
3	Data correcting flag	Turns on when data become normal by data correction as a result of read with error correction.
4	Status flag	Turns on in the following cases: • When the number of rewrites is exceeded in the Manage number of writes command. • When the result of a memory data check (verification) is not normal. • When the data error occurs as a result of the Read with error correction. • When the result of an addition operation of the Write calculation overflows. • When the result of a subtraction operation of the Write calculation underflows. • When an error occurs as a result of data writing after reading during the Copy command.[*2]
5	System area	—
6	System area	—
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 no communicable RF tags are 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 RF tag does not end normally.
13	Address error	Turns on when reading or writing is performed exceeding the address range of RF tag.
14	Verify error ASCII/HEX conversion error	Turns on when data are not written to the RF tag normally. Turns on when data are read with ASCII/HEX conversion and the RF tag includes data that cannot be converted.
15	Antenna error	Turns on in the following cases: • The antenna or amplifier is not connected. • An unavailable antenna is connected. • The antenna breaks.

*2 When an error occurs at the Copy command on the copy destination side, the bit of the copy source side turns on.

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

Depending on the setting of Processing result monitor switch setting area (Un\G11, Un\G4011), the noise level and communication time are stored in the storage area. (☞ Page 129 Processing result monitor switch setting area (Un\G11, Un\G4011))

This area is used to store the results of tests during the TEST mode.

Test description	Processing result
Communication test	■When completed successfully (processing time) 0000 to 9999 [BCD] (in units of 10ms) ■When completed with an error (E0 + error code) E070H: Tag communication error E072H: Tag not present error E079H: ID system error 1 E07AH: Address error E07CH: Antenna error
Communication success rate	■When completed successfully (C1 + measurement result) C101 to C199 [BCD] (Unit: %) C1EE: 0% C1FF: 100% ■When completed with an error (E0 + error code) E07CH: Antenna error
Speed level (read)	■When completed successfully (B0 + measurement result) B001 to B099 [BCD] (Unit: Number of times) B0EE: 0 times ■When completed with an error (E0 + error code) E07CH: Antenna error
Speed level (write)	■When completed successfully (B1 + measurement result) B101 to B199 [BCD] (Unit: Number of times) B1EE: 0 times ■When completed with an error (E0 + error code) E07CH: Antenna error
Noise level	■When completed successfully (C0 + measurement result) C000 to C099 [BCD] (maximum value) ■When completed with an error (E0 + error code) E07CH: Antenna error

■RF tag UID storage area (Un\G90 to Un\G93, Un\G4090 to Un\G4093)

This area is used to store the UID (unit identification number) of communicated RF tag.

Read/Write data

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

For the Read command, data to be read is stored. For the Write command, data to write is stored

TEST mode

■Test operation mode specification area (Un\G8000)

This area is used to set the test description to execute.

Setting value	Description
0000H, or value other than the below	Communication test
00B0H	Speed level (read)
00B1H	Speed level (write)
00C0H	Noise level
00C1H	Communication success rate
00C2H	Use prohibited

Restriction

Do not specify 00C2H. Doing so can cause abnormal operation.

■Test operation antenna specification area (Un\G8001)

When the tests other than the communication test are executed, this area is used to specify the antenna to use.

Setting value	Description
0001H	The antenna 1 is specified.
0002H	The antenna 2 is specified.
Values other than the above	The communication test is executed.

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

This area is used to set the number of bytes to execute in the test other than the Noise level.

Setting value	Description
0001H to 0800H	Specify the number of bytes to execute.
Values other than the above	The communication test is executed.

Appendix 4 Communication Time and Processing Time

This chapter describes the communication time between the RFID interface module and RF tag and the processing time from execution start to ID command completion.

Communication time

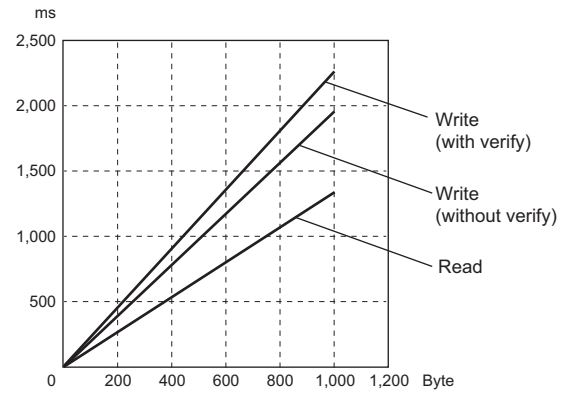
This section describes the communication time between an antenna and RF tag.
For the available combination of antennas and RF tags, refer to the catalogs for Omron RFID system V680 series products.

EEPROM-type RF tag

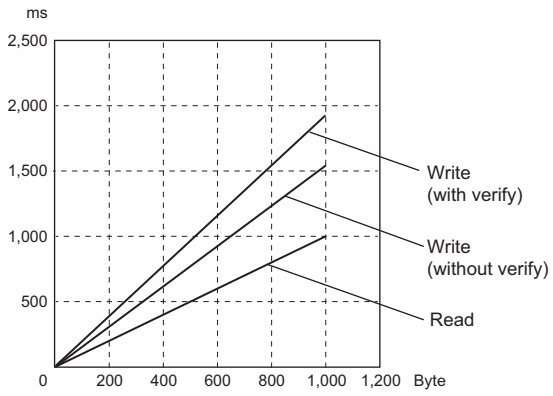
The following table lists the communication time of V680-D1KP□□.

RF tag communication speed setting	Command	Communication time (N: Number of processed bytes)
Standard mode	Read	T = 1.3 × N + 31 [ms]
	Write (with verify)	T = 2.2 × N + 58 [ms]
	Write (without verify)	T = 1.9 × N + 56 [ms]
High-speed mode	Read	T = 1.0 × N + 29 [ms]
	Write (with verify)	T = 1.8 × N + 51 [ms]
	Write (without verify)	T = 1.5 × N + 47 [ms]

Standard mode



High-speed mode



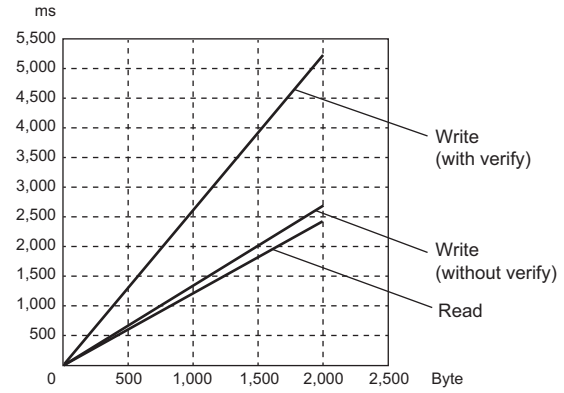
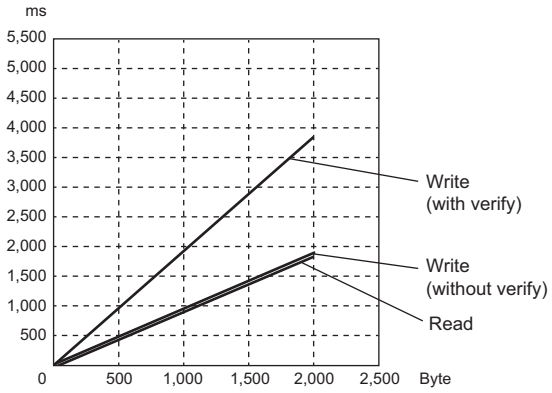
A

FRAM-type RF tag (2k bytes)

The following table lists the communication time of V680-D2KF□□ and V680S-D2KF□□.

RF tag communication speed setting	Command	Communication time (N: Number of processed bytes)
Standard mode	Read	T = 1.2 × N + 30 [ms]
	Write (with verify)	T = 2.6 × N + 49 [ms]
	Write (without verify)	T = 1.3 × N + 49 [ms]
High-speed mode*1	Read	T = 0.9 × N + 27 [ms]
	Write (with verify)	T = 1.9 × N + 49 [ms]
	Write (without verify)	T = 0.9 × N + 49 [ms]

*1 When FIFO trigger, FIFO repeat, Multi-trigger, or Multi-repeat is set to the communication specification, even if the high-speed mode is set to the RF tag communication speed setting, the communication time is the same as the time of the standard mode.

Standard mode	High-speed mode
	

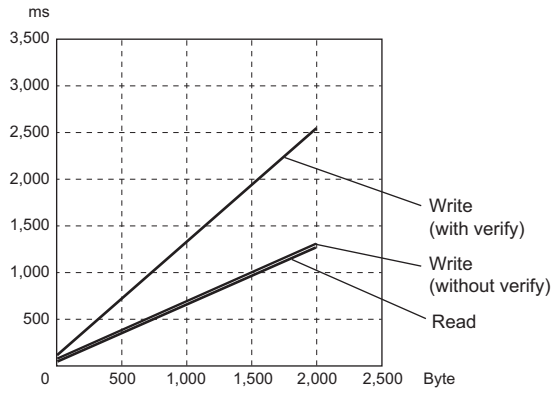
FRAM-type RF tag (8k bytes)

The following table lists the communication time of V680S-D8KF□□.

RF tag communication speed setting	Command	Communication time (N: Number of processed bytes)
Standard mode High-speed mode*1	Read	T = 0.6 × N + 47 [ms]
	Write (with verify)	T = 1.2 × N + 128 [ms]
	Write (without verify)	T = 0.6 × N + 101 [ms]

*1 When the RF tag of V680S-D8KF□□ is used, even if the high-speed mode is set, the communication time is the same as the time of standard mode.

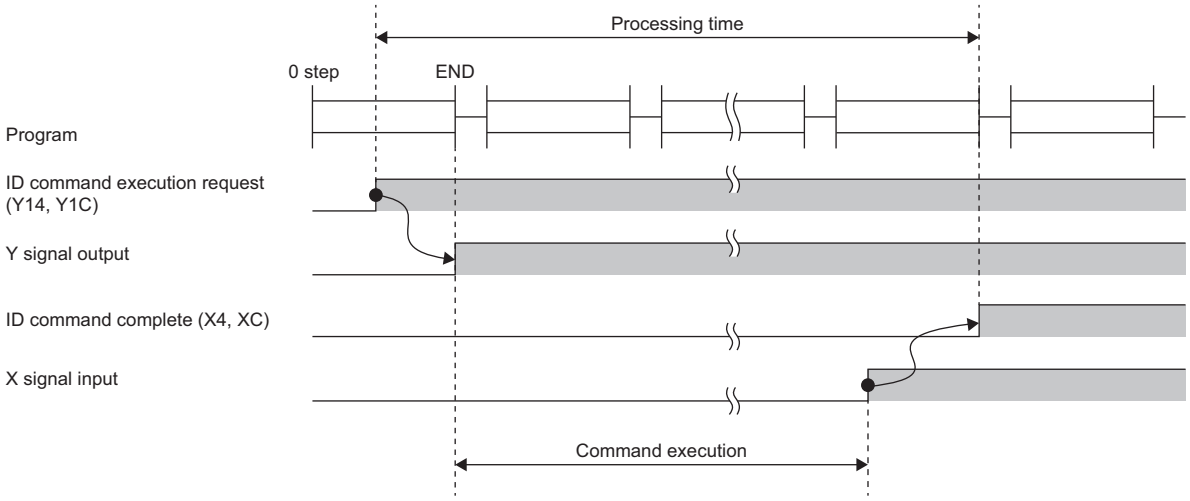
Standard mode
High-speed mode



A

Processing time

The processing time is the time from when ID command execution request (Y14, Y1C) is turned on to when ID command complete (X4, XC) turns on.



EEPROM type (1k bytes)

The following table lists the processing time of V680-D1KP□□.

RF tag communication speed setting	Command	Number of processed bytes	Processing time (S: Scan time) (ms)
Standard mode	Read	100	169 + 2 × S
		256	372 + 2 × S
		512	705 + 2 × S
		1000	1339 + 2 × S
	Write (with verify)	100	289 + 2 × S
		256	637 + 2 × S
		512	1208 + 2 × S
		1000	2296 + 2 × S
	Write (without verify)	100	257 + 2 × S
		256	559 + 2 × S
		512	1053 + 2 × S
		1000	1994 + 2 × S
High-speed mode*1	Read	100	137 + 2 × S
		256	293 + 2 × S
		512	549 + 2 × S
		1000	1037 + 2 × S
	Write (with verify)	100	241 + 2 × S
		256	525 + 2 × S
		512	991 + 2 × S
		1000	1879 + 2 × S
	Write (without verify)	100	206 + 2 × S
		256	442 + 2 × S
		512	829 + 2 × S
		1000	1565 + 2 × S

*1 When FIFO trigger, FIFO repeat, Multi-trigger, or Multi-repeat is specified to Communication specification area (Un\G1, Un\G4001), even if the high-speed mode is set to the RF tag communication speed setting, the processing time is the same as the time of the standard mode.

FRAM type (2k bytes)

The following table lists the processing time of V680-D2KF□□ and V680S-D2KF□□.

RF tag communication speed setting	Command	Number of processed bytes	Processing time (S: Scan time) (ms)
Standard mode	Read	100	158 + 2 × S
		256	346 + 2 × S
		512	653 + 2 × S
		1000	1238 + 2 × S
		2000	2438 + 2 × S
	Write (with verify)	100	320 + 2 × S
		256	731 + 2 × S
		512	1404 + 2 × S
		1000	2687 + 2 × S
		2000	5317 + 2 × S
	Write (without verify)	100	190 + 2 × S
		256	398 + 2 × S
		512	738 + 2 × S
		1000	1387 + 2 × S
		2000	2717 + 2 × S
High-speed mode*1	Read	100	125 + 2 × S
		256	266 + 2 × S
		512	496 + 2 × S
		1000	935 + 2 × S
		2000	1835 + 2 × S
	Write (with verify)	100	249 + 2 × S
		256	549 + 2 × S
		512	1041 + 2 × S
		1000	1977 + 2 × S
		2000	3897 + 2 × S
	Write (without verify)	100	148 + 2 × S
		256	290 + 2 × S
		512	523 + 2 × S
		1000	967 + 2 × S
		2000	1877 + 2 × S

*1 When FIFO trigger, FIFO repeat, Multi-trigger, or Multi-repeat is specified to Communication specification area (Un\G1, Un\G4001), even if the high-speed mode is set to the RF tag communication speed setting, the processing time is the same as the time of the standard mode.

FRAM type (8k bytes)

The following table lists the processing time of V680S-D8KF□□.

RF tag communication speed setting	Command	Number of processed bytes	Processing time (S: Scan time) (ms)
Standard mode High-speed mode*1	Read	100	115 + 2 × S
		256	209 + 2 × S
		512	362 + 2 × S
		1000	655 + 2 × S
		2000	1255 + 2 × S
	Write (with verify)	100	259 + 2 × S
		256	451 + 2 × S
		512	766 + 2 × S
		1000	1366 + 2 × S
		2000	2596 + 2 × S
	Write (without verify)	100	172 + 2 × S
		256	271 + 2 × S
		512	432 + 2 × S
		1000	739 + 2 × S
		2000	1369 + 2 × S

*1 When the RF tag of V680S-D8KF□□ is used, even if the high-speed mode is set, the processing time is the same as the processing time under the standard mode.

Appendix 5 EMC and Low Voltage Directives

Since 1996, the products released in Europe has been legally required to comply with the EMC Directive of the EU directives. And since 1997, the products has been legally required to comply with the Low Voltage Directive of the EU directives. When the manufacturer recognizes that the product conforms with these directives, the manufacturer must make a declaration of conformity and display the "CE mark" on the product.

European authorized representative

European authorized representative is shown below.

Name: MITSUBISHI ELECTRIC EUROPE B.V.

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

Requirements for compliance with EMC Directive

The EMC Directive specifies about the following items:

- "Emission (electromagnetic interference): Do not emit strong electromagnetic waves to the outside", and
- "Immunity (electromagnetic sensitivity): Not affected by external electromagnetic waves".

This chapter describes the precautions when the machinery configured using MELSEC iQ-R series modules complies with the EMC Directive.

This chapter is created based on the requirements and standards of directives that our company has obtained, which does not guarantee that all machinery manufactured according to this content complies with the above directives.

The manufacturer of machinery must define the conformity assessment procedures and assess the conformance for the EMC Directive.

Standards related to EMC Directive

■Requirements for emission

Specification: EN61131-2: 2007

Test item*1	Description	Value of standard
CISPR16-2-3 Radiated emission	To measure the radio wave emitted by the product.	• 30M to 230MHz QP: 40dBμV/m (10m measurement)*2 • 230M to 1000MHz QP: 47dBμV/m (10m measurement)
CISPR16-2-1, CISPR16-1-2 Radiated emission	To measure the noise that the product emits to the power supply line.	• 150k to 500kHz QP: 79dB, Mean: 66dB*2 • 500k to 30MHz QP: 73dB, Mean: 60dB

*1 A programmable controller is an open-type device (built-in device of the other equipment) and requires to install in the conductive control panel. Therefore, this test was performed on the products in the control panel. A programmable controller was tested with the maximum rated input value of power supply module to use.

*2 QP (Quasi-Peak): Quasi-peak value, Mean: Mean value

■Requirements for immunity

Specification: EN61131-2: 2007

Test item[*1]	Description	Value of standard
EN61000-4-2 Electrostatic discharge immunity	Immunity test to apply static electricity to the body in the equipment	• 8kV air discharge • 4kV contact discharge
EN61000-4-3 Radiated, radio-frequency electromagnetic field immunity	Immunity test to irradiate a product with electric field	80% AM (1kHz) • 80 to 1000MHz: 10V/m • 1.4GHz to 2.0GHz: 3V/m • 2.0 to 2.7GHz: 1V/m
EN61000-4-4 First transient burst immunity	Immunity test to apply burst noise to the power cable and signal wire	• AC power cable: ±2kV • DC power cable: ±2kV • I/O power supply (DC): ±2kV • DC I/O, analog, communication cable (shielded): ±1kV
EN61000-4-5 Surge immunity[*2]	Immunity test to apply lighting surge to the power cable and signal wire	• AC power cable Common mode: ±2kV Differential mode: ±1kV • DC power cable Common mode: ±0.5kV Differential mode: ±0.5kV • I/O power supply (DC) Common mode: ±0.5kV Differential mode: ±0.5kV • DC I/O, analog, communication cable (shield) Common mode: ±1kV
EN61000-4-6 Conducted RF immunity	Immunity test to apply high-frequency noise to the power cable and signal wire	0.15 to 80MHz, 80% AM (1kHz), 10Vrms
EN61000-4-8 Power-frequency magnetic field immunity	Immunity test to place a product in the magnetic field of induction coil	50/60Hz, 30A/m
EN61000-4-11 Voltage dips and interruption immunity	Immunity test to apply momentary power failure to the power supply voltage	• 0%, 0.5 period, start with zero-crossing • 0%, 250/300 period (50/60Hz) • 40%, 10/12 period (50/60Hz) • 70%, 25/30 period (50/60Hz)

*1 A programmable controller is an open-type device (built-in device of the other equipment) and requires to install in the conductive control panel. Therefore, this test was performed on the products in the control panel.

*2 Use the connection cables of 30m or shorter for the amplifier and antenna.

Installation in control panel

A programmable controller is an open-type device and required to install in a control panel.
Installing a programmable controller in a control panel has a great effect not only for ensuring safety but also for shielding noise generated from the modules.

■Control panel

- Use a conductive control panel.
- After fixing the top plate and bottom plate of control panel with bolts, mask the grounding part of the control panel not to paint the part.
- The inner plate in the control panel requires the electric contact with the body of control panel. Secure conductivity in the wide area as much as possible by masking the bolts mounting to the body.
- Ground the control panel with a thick ground cable so as to secure the low impedance even if in the high frequency.
- Use a control panel with a hole less than 10cm in diameter. If the hole is larger than 10cm in diameter, radio wave can leak. Radio wave leaks from the gap between the control panel door and the body. Install them with no gap. If there is a gap, seal the painted surface with the EMI gaskets of the following manufacturer to close the gap and suppress leakage of radio wave.

Manufacturer	Inquiry destination
KITAGAWA INDUSTRIES CO., LTD.	www.kitagawa-ind.com
Zippertubing (Japan), Ltd.	www.ztj.co.jp
SEIWA ELECTRIC MFG. CO., LTD.	www.seiwa.co.jp

Our company tested to the damping characteristic control panel with maximum 37dB and average 30dB (30 to 300MHz, 3m measurement)

■Power cable and ground cable

- Set the grounding point of control panel near the power supply module, and ground the LG (line ground) terminal and FG (frame ground) terminal with as thick and short ground cable as possible (length: 30cm or shorter). Shorten the ground cable as possible.
- Twist the ground cable drawn out from the grounding point with the power cable. When a noise filter is mounted to the power cable, the power cable may not need to twist with the ground cable.

■DIN rail

An aluminum DIN rail may be covered with an insulating film. If the DIN rail does not contact with the programmable controller electrically, secure conductivity as much as possible. The following methods are available to secure conductivity.

- Screw the programmable controller to the control panel. (Do not use the DIN rail.)
- Use an iron DIN rail including TH35-7.5Fe and TH35-15Fe.

■Power supply module

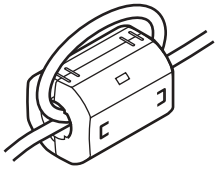
Short-circuit and ground LG and FG terminals.

■External power supply

- Use an external power supply conformed to CE marking and ground the FG terminal.
- Use connectors of 10m or shorter for external power supply.

■Ferrite core

A ferrite core is effective for reducing interference caused by high-frequency noise (0.5MHz to 80MHz frequency band).
For an antenna cable that extends from the control panel, install a ferrite core with the damping characteristics equivalent to that of the ZCAT3035-1330 (manufactured by TDK Corporation), 15cm or less away from the module. Wrap the cable around the ferrite core by one as shown below.
(Ferrite core used for the tests conducted by Mitsubishi Electric Engineering Co., Ltd.: ZCAT3035-1330 (manufactured by TDK Corporation)



Manufacturer	Contact
TDK Corporation	www.global.tdk.com

Requirements for Low Voltage Directive compliance

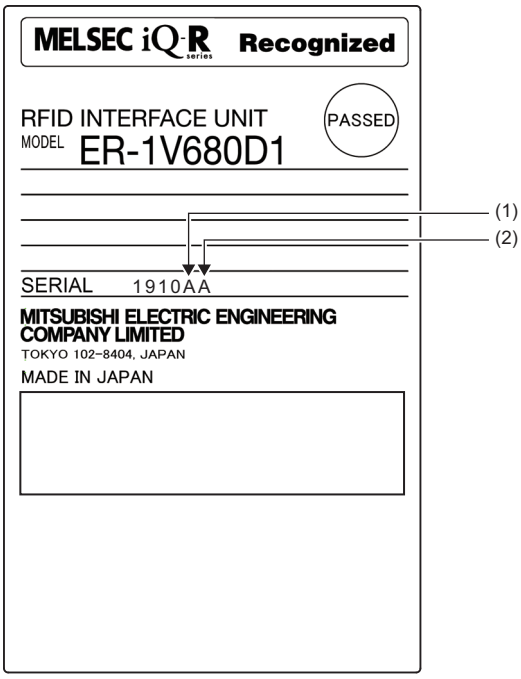
The RFID interface module uses the inner circuit with a 24VDC rating or lower, so the module is outside the scope of the Low Voltage Directive.

Appendix 6 Serial Number and Version

This chapter describes how to check the serial number and the version of RF interface module.

Rating plate on the side of module

The serial number (6 digits) is displayed on the SERIAL field. The lower 2 digits of serial number means the H/W version and S/W version.

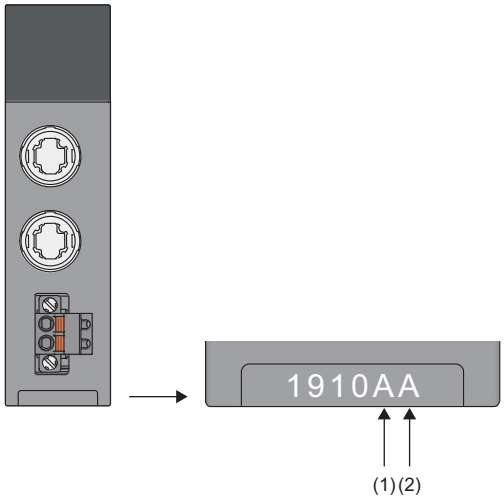


(1) H/W Version
(2) S/W Version

A

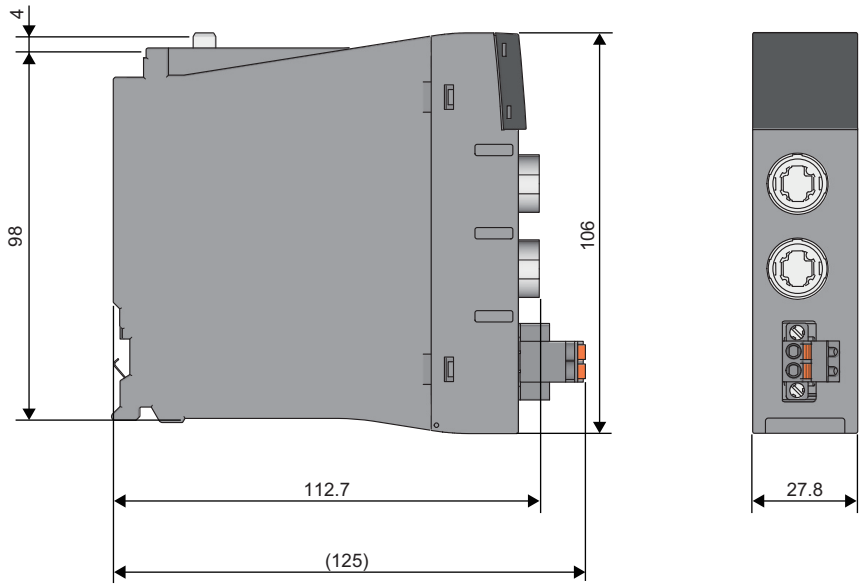
Rating plate on the front of module

The serial number (6 digits) is displayed on the front of module. The lower 2 digits of serial number means the H/W version and S/W version.



(1) H/W Version
(2) S/W Version

Appendix 7 External Dimensions



Unit: mm

The above figure shows the external dimensions of the ER-1V680D2. The ER-1V680D2 has the same external dimensions as the ER-1V680D1.

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REVISIONS

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

Revision date	*Manual number	Description
February 2020	50CM-D180426-A	First edition

WARRANTY

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

1. 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.

2. 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.

3. 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.

4. Changes in Product Specifications

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

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50CM-D180426-A(2002)MEE
MODEL: ER-1V680D-M1E

Published February 2020