MITSUBISHI ELECTRIC

Programmable Controller

MELSEC Q series

QnUCPU User's Manual (Communication via Built-in Ethernet Port)

-Q03UDVCPU
-Q03UDECPU
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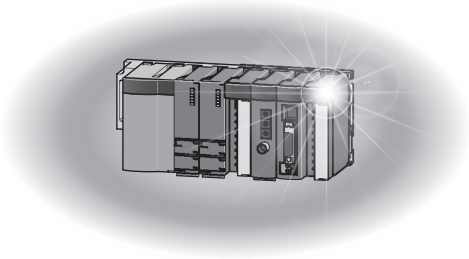
-Q20UDEHCPU
-Q26UDVCPU
-Q26UDPVCPU
-Q26UDEHCPU
-Q50UDEHCPU
-Q100UDEHCPU



●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.

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.
Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

⚠WARNING

● Configure safety circuits external 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 may result in an accident due to an incorrect output or malfunction.

(1) Configure external safety circuits, such as an emergency stop circuit, protection circuit, and protective interlock circuit for forward/reverse operation or upper/lower limit positioning.

(2) The programmable controller stops its operation upon detection of the following status, and the output status of the system will be as shown below.

	Q/L series module	AnS/A series module
Overcurrent or overvoltage protection of the power supply module is activated.	All outputs are turned off	All outputs are turned off
The CPU module detects an error such as a watchdog timer error by the self-diagnostic function.	All outputs are held or turned off according to the parameter setting.	All outputs are turned off

All outputs may turn on when an error occurs in the part, such as 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 external to the programmable controller. For a fail-safe circuit example, refer to the QCPU User's Manual (Hardware Design, Maintenance and Inspection).

(3) Outputs may remain on or off due to a failure of an output module relay or transistor. Configure an external circuit for monitoring output signals that could cause a serious accident.

[Design Precautions]

⚠ WARNING

- In an output module, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply.
  If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to relevant manuals for the network.
  Incorrect output or malfunction due to a communication failure may result in an accident.
- To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.
- When changing data of the running programmable controller from a peripheral connected to the CPU module or from a personal computer connected to an intelligent function module, configure an interlock circuit in the sequence program to ensure that the entire system will always operate safely. For program modification and operating status change, read relevant manuals carefully and ensure the safety before operation.
  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 sequence program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.

[Design Precautions]

⚠ CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables.
  Keep a distance of 100mm or more between them.
  Failure to do so may result in malfunction due to noise.
- When a device such as a lamp, heater, or solenoid valve is controlled through an output module, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on.
  Take measures such as replacing the module with one having a sufficient current rating.
- 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.

[Installation Precautions]

⚠CAUTION

- Use the programmable controller in an environment that meets the general specifications in the QCPU User's Manual (Hardware Design, Maintenance and Inspection).
  Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount the module, while pressing the module mounting lever in the lower part of the module, fully insert the module fixing projection(s) into the hole(s) in the base unit and press the module until it snaps into place.
  Incorrect mounting may cause malfunction, failure, or drop of the module.
  When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
  Tighten the screw within the specified torque range.
  Undertightening can cause drop of the screw, short circuit, or malfunction.
  Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- When using an extension cable, connect it to the extension cable connector of the base unit securely.
  Check the connection for looseness.
  Poor contact may cause incorrect input or output.
- When using a memory card, fully insert it into the memory card slot.
  Check that it is inserted completely.
  Poor contact may cause malfunction.
- When using an SD memory card, fully insert it into the SD memory card slot.
  Check that it is inserted completely.
  Poor contact may cause malfunction.
- Securely insert an extended SRAM cassette into the cassette connector of a CPU module.
  After insertion, close the cassette cover to prevent the cassette from coming off.
  Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing a module. Failure to do so may result in damage to the product.
  A module can be replaced online (while power is on) on any MELSECNET/H remote I/O station or in the system where a CPU module supporting the online module change function is used.
  Note that there are restrictions on the modules that can be replaced online, and each module has its predetermined replacement procedure.
  For details, refer to the relevant sections in the QCPU User's Manual (Hardware Design, Maintenance and Inspection) and in the manual for the corresponding module.
- Do not directly touch any conductive parts and electronic components of the module, memory card, SD memory card, or extended SRAM cassette.
  Doing so can cause malfunction or failure of the module.
- When using a Motion CPU module and modules designed for motion control, check that the combinations of these modules are correct before applying power.
  The modules may be damaged if the combination is incorrect.
  For details, refer to the user's manual for the Motion CPU module.

[Wiring Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring.
  Failure to do so may result in electric shock or damage to the product.
- After wiring, attach the included terminal cover to the module before turning it on for operation.
  Failure to do so may result in electric shock.

[Wiring Precautions]

⚠CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100Ω or less.
  Failure to do so may result in electric shock or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and terminal layout before wiring to the module, and connect the cables correctly.
  Connecting a power supply with a different voltage rating or incorrect wiring may cause a fire or failure.
- Securely connect the connector to the module. Failure to do so may cause malfunction.
- Connectors for external connection must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered.
  Incomplete connections could result in short circuit, fire, or malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables.
  Keep a distance of 100mm or more between them.
  Failure to do so may result in malfunction due to noise.
- Place the cables in a duct or clamp them.
  If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact.
- Check the interface type and correctly connect the cable.
  Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
- Tighten the terminal screw within the specified torque range.
  Undertightening can cause short circuit, fire, or malfunction.
  Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- 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.

[Wiring Precautions]

⚠CAUTION

- When disconnecting the cable from the module, do not pull the cable by the cable part.
  For the cable with connector, hold the connector part of the cable.
  For the cable connected to the terminal block, loosen the terminal screw.
  Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- Mitsubishi Electric 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 maintenance personnel who is familiar with protection against electric shock. For wiring methods, refer to the QCPU User's Manual (Hardware Design, Maintenance and Inspection).

[Startup and Maintenance Precautions]

⚠WARNING

- Do not touch any terminal while power is on.
  Doing so will cause electric shock or malfunction.
- Correctly connect the battery connector.
  Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock.
  Doing so will cause the battery to produce heat, explode, ignite, or leak, resulting in injury and fire.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws.
  Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Startup and Maintenance Precautions]

⚠CAUTION

- Before performing online operations (especially, program modification, forced output, and operation status change) for the running CPU module from the peripheral connected, read relevant manuals carefully and ensure the safety.
  Improper operation may damage machines or cause accidents.
- Do not disassemble or modify the modules.
  Doing so may cause failure, malfunction, injury, or a fire.
- 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 may cause malfunction.

[Startup and Maintenance Precautions]

⚠CAUTION

- Shut off the external power supply (all phases) used in the system before mounting or removing a module. Failure to do so may cause the module to fail or malfunction.
  A module can be replaced online (while power is on) on any MELSECNET/H remote I/O station or in the system where a CPU module supporting the online module change function is used.
  Note that there are restrictions on the modules that can be replaced online, and each module has its predetermined replacement procedure.
  For details, refer to the relevant sections in the QCPU User's Manual (Hardware Design, Maintenance and Inspection) and in the manual for the corresponding module.
- After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively.
  Exceeding the limit of 50 times may cause malfunction.
- After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
- Do not drop or apply shock to the battery to be installed in the module.
  Doing so may damage the battery, causing the battery fluid to leak inside the battery.
  If the battery is dropped or any shock is applied to it, dispose of it without using.
- Before handling the module, touch a grounded metal object to discharge the static electricity from the human body.
  Failure to do so may cause the module to fail or malfunction.

[Disposal Precautions]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.
  When disposing of batteries, separate them from other wastes according to the local regulations.
  (For details of the battery directive in EU member states, refer to the QCPU User's Manual (Hardware Design, Maintenance and Inspection).)

[Transportation Precautions]

⚠CAUTION

- When transporting lithium batteries, follow the transportation regulations.
  (For details of the regulated models, refer to the QCPU User's Manual (Hardware Design, Maintenance and Inspection).)

●CONDITIONS OF USE FOR THE PRODUCT●

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

This manual describes the function of the Universal model QCPU using Ethernet communication.

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the Q series programmable controller to handle the product correctly.
When applying the program examples introduced in this manual to the actual system, ensure the applicability and confirm that it will not cause system control problems.

■Relevant CPU module

CPU module	Model
Built-in Ethernet port QCPU	Q03UDVCPU, Q03UDECPU, Q04UDVCPU, Q04UDPVCPU, Q04UDEHCPU, Q06UDVCPU, Q06UDPVCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDVCPU, Q13UDPVCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDVCPU, Q26UDPVCPU, Q26UDEHCPU, Q50UDEHCPU, Q100UDEHCPU

Remark

This manual does not describe any functions other than the functions of CPU module using Ethernet communication. For details of functions other than the functions of CPU module using Ethernet communication, refer to the following manual.

QnUCPU User's Manual (Function Explanation, Program Fundamentals)

Memo

CONTENTS

MANUALS

To understand the main specifications, functions, and usage of the CPU module, refer to the basic manuals. Read other manuals as well when using a different type of CPU module and its functions. The manuals related to this product are listed below. Please place an order as needed.

●: Basic manual, ○: Other CPU module manuals/Use them to utilize functions.

(1) CPU module user's manual

Manual name <manual number (model code)>	Description	Manual type
QCPU User's Manual (Hardware Design, Maintenance and Inspection) <SH-080483ENG (13JR73)>	Specifications of the hardware (CPU modules, power supply modules, base units, extension cables, memory cards, SD memory cards, extended SRAM cassettes, and batteries), system maintenance and inspection, troubleshooting, and error codes	●
QnUCPU User's Manual (Function Explanation, Program Fundamentals) <SH-080807ENG (13JZ27)>	Functions, methods, and devices for programming	●
QCPU User's Manual (Multiple CPU System) <SH-080485ENG (13JR75)>	Information on building multiple CPU systems (system configurations, I/O numbers, communications between CPU modules, and communications with I/O modules and intelligent function modules)	○
QnUDVCPU/LCPU User's Manual (Data Logging Function) <SH-080893ENG (13JZ39)>	Detailed description of the data logging function of the CPU module	○

(2) Programming manual

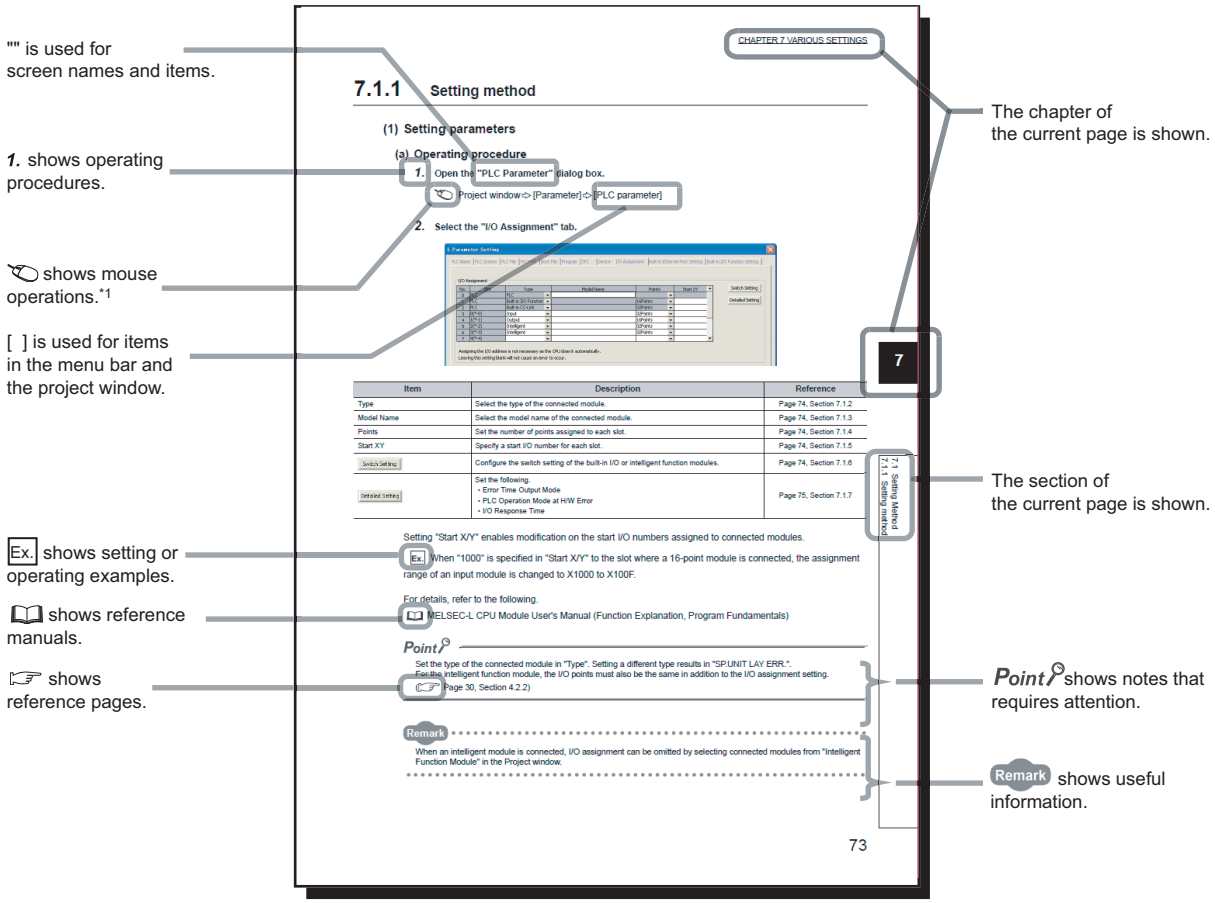
Manual name <manual number (model code)>	Description	Manual type
MELSEC-Q/L Programming Manual (Common Instruction) <SH-080809ENG, 13JW10>	Detailed description and usage of instructions used in programs	●
MELSEC-Q/L/QnA Programming Manual (SFC) <SH-080041, 13JF60>	System configuration, specifications, functions, programming, and error codes for SFC (MELSAP3) programs	○
MELSEC-Q/L Programming Manual (MELSAP-L) <SH-080076, 13JF61>	System configuration, specifications, functions, programming, and error codes for SFC (MELSAP-L) programs	○
MELSEC-Q/L Programming Manual (Structured Text) <SH-080366E, 13JF68>	System configuration and programming using structured text language	○
MELSEC-Q/L/QnA Programming Manual (PID Control Instructions) <SH-080040, 13JF59>	Dedicated instructions for PID control	○
MELSEC-Q Programming/Structured Programming Manual (Process Control Instructions) <SH-080316E, 13JF67>	Dedicated instructions for process control	○

(3) Operating manual

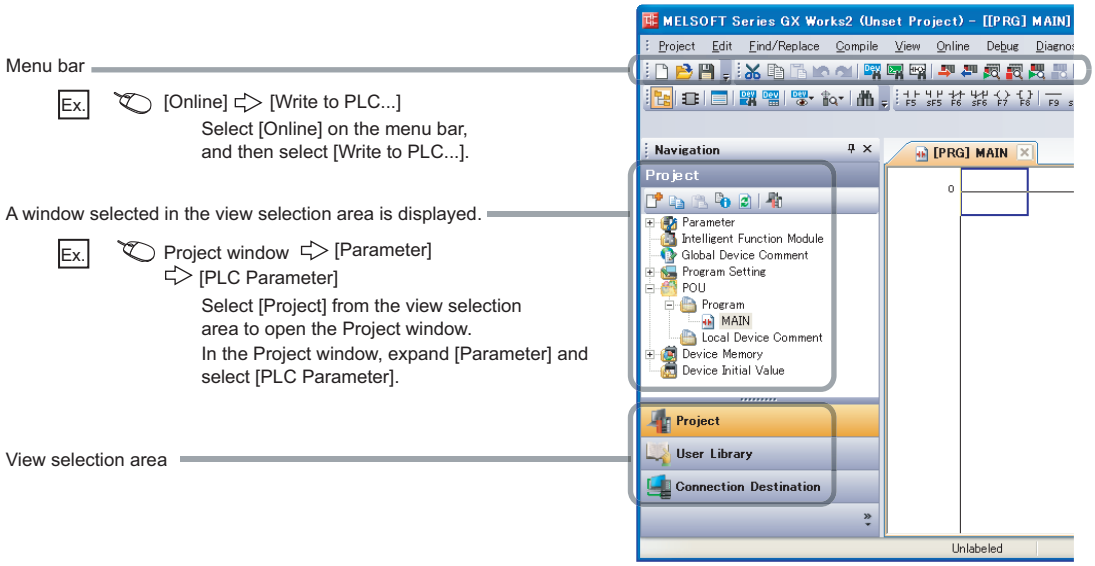
Manual name <manual number (model code)>	Description	Manual type
GX Works2 Version 1 Operating Manual (Common) <SH-080779ENG, 13JU63>	System configuration, parameter settings, and online operations of GX Works2, which are common to Simple projects and Structured projects	●
GX Developer Version 8 Operating Manual <SH-080373E, 13JU41>	Operating methods of GX Developer, such as programming, printing, monitoring, and debugging	○

MANUAL PAGE ORGANIZATION

In this manual, pages are organized and the symbols are used as shown below. The following page illustration is for explanation purpose only, and is different from the actual pages.



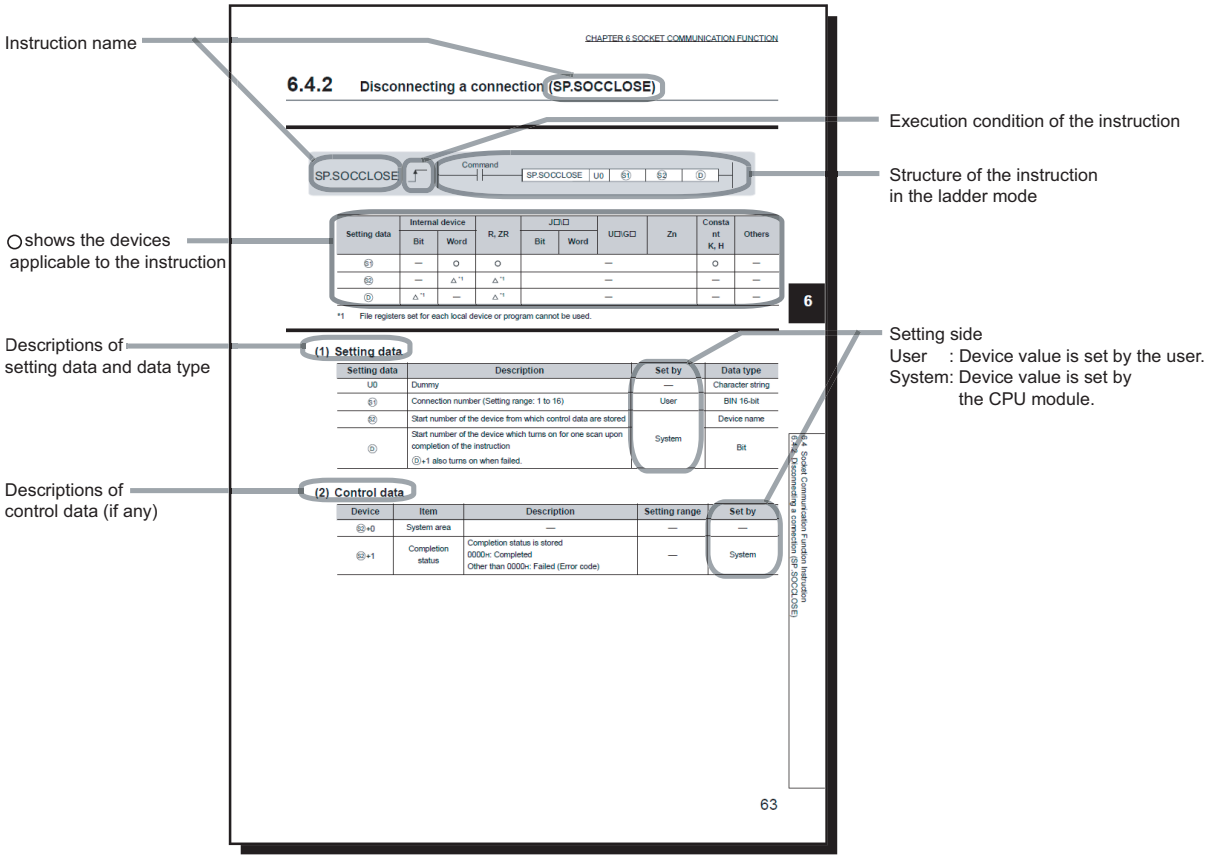
*1 The mouse operation example is provided below. (For GX Works2)

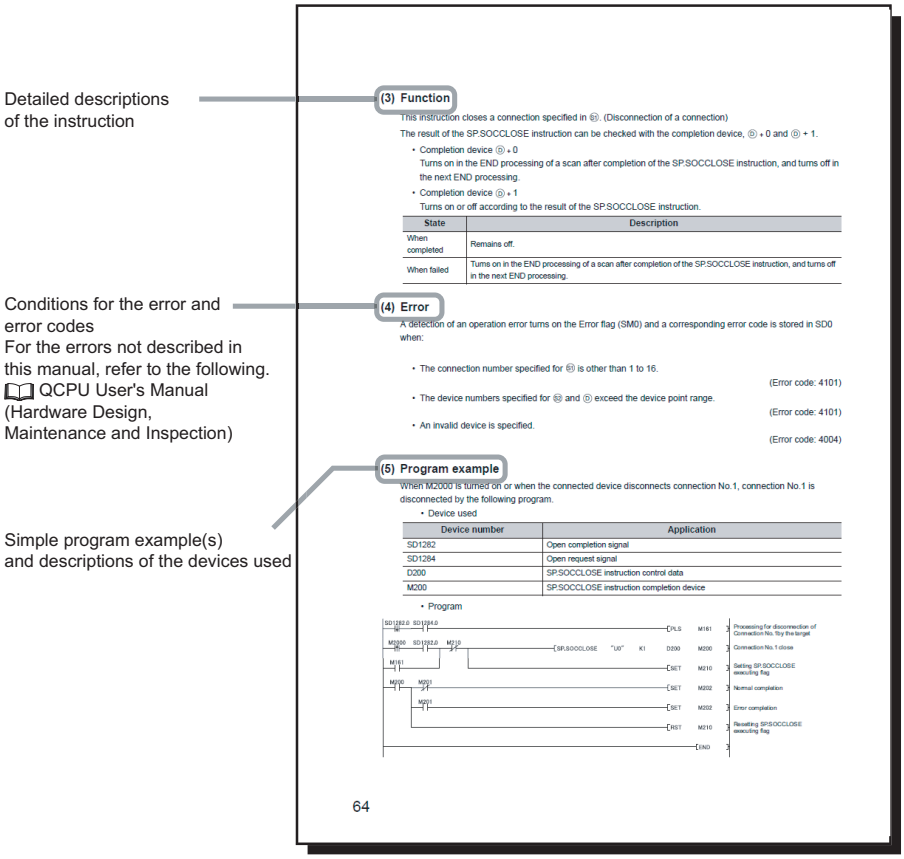


Icon Universal model QCPU	Description
Universal	Icons indicate that specifications described on the page contain some precautions.

Pages describing instructions are organized as shown below.

The following page illustrations are for explanation purpose only, and are different from the actual pages.





• Instructions can be executed under the following conditions.

Execution condition	Any time	During on	On the falling edge	During off	On the falling edge
Symbol	No symbol				

• The following devices can be used.

Setting data	Internal device (system, user)		File register	Link direct device J□\□*4		Intelligent function module U□\G□	Index register Zn	Constant *5	Others *5
	Bit	Word		Bit	Word				
Applicable device*1	X, Y, M, L, SM, F, B, SB, FX, FY*2	T, ST, C, D, W, SD, SW, FD, @□*2*3	R, ZR	J□\X, J□\Y, J□\B, J□\SB	J□\W, J□\SW	U□\G□	Z	K, H, E, $	P, I, J, U, DX, DY, N, BL, TR, BL\S, V

*1 For details on each device, refer to the following.

QnUCPU User's Manual (Function Explanation, Program Fundamentals)

*2 FX and FY can be used for bit data only, and FD for word data only.

*3 When T, ST, and C are used for instructions other than the following instructions, they can be used for word data only (but cannot be used for bit data).
[Instructions available for bit data] LD, LDI, AND, ANI, OR, ORI, LDP, LDF, ANDP, ANDF, ORP, ORF, OUT, and RST

*4 Available for CC-Link IE, MELSECNET/H, and MELSECNET/10

*5 In the "Constant" and "Others" columns, a device(s) that can be set for each instruction is shown.

• The following data types can be used.

Data type	Description
Bit	Bit data or the start number of bit data
BIN 16-bit	16-bit binary data or the start number of word device
BIN 32-bit	32-bit binary data or the start number of double-word device
BCD 4-digit	Four-digit binary-coded decimal data
BCD 8-digit	Eight-digit binary-coded decimal data
Real number	Floating-point data
Character string	Character string data
Device name	Device name data

TERMS

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

*☐ represents the model or version.

(Example): Q33B, Q35B, Q38B, Q312B → Q3☐B

Generic term/abbreviation	Description
■ CPU module type	
CPU module	A generic term for the Universal model QCPU
Universal model QCPU	A generic term for the Q00UJCPU, Q00UCPU, Q01UCPU, Q02UCPU, Q03UDCPU, Q03UDVCPU, Q03UDECPU, Q04UDHCPU, Q04UDVCPU, Q04UDPVCPU, Q04UDEHCPU, Q06UDHCPU, Q06UDVCPU, Q06UDPVCPU, Q06UDEHCPU, Q10UDHCPU, Q10UDEHCPU, Q13UDHCPU, Q13UDVCPU, Q13UDPVCPU, Q13UDEHCPU, Q20UDHCPU, Q20UDEHCPU, Q26UDHCPU, Q26UDVCPU, Q26UDPVCPU, Q26UDEHCPU, Q50UDEHCPU, and Q100UDEHCPU
Built-in Ethernet port QCPU	A generic term for the Q03UDVCPU, Q03UDECPU, Q04UDVCPU, Q04UDPVCPU, Q04UDEHCPU, Q06UDVCPU, Q06UDPVCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDVCPU, Q13UDPVCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDVCPU, Q26UDPVCPU, Q26UDEHCPU, Q50UDEHCPU, and Q100UDEHCPU
High-speed Universal model QCPU	A generic term for the Q03UDVCPU, Q04UDVCPU, Q06UDVCPU, Q13UDVCPU, and Q26UDVCPU
Universal model Process CPU	A generic term for the Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, and Q26UDPVCPU
■ CPU module model	
QnUDVCPU	A generic term for the Q03UDVCPU, Q04UDVCPU, Q06UDVCPU, Q13UDVCPU, and Q26UDVCPU
QnUDPVCPU	A generic term for the Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, and Q26UDPVCPU
QnUDE(H)CPU	A generic term for the Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU, Q50UDEHCPU, and Q100UDEHCPU
■ Network module	
CC-Link IE module	A generic term for the CC-Link IE Controller Network module and CC-Link IE Field Network module
MELSECNET/H module	An abbreviation for the MELSECNET/H network module
Ethernet module	An abbreviation for the Ethernet interface module
CC-Link module	An abbreviation for the CC-Link system master/local module
■ Network	
CC-Link IE	A generic term for CC-Link IE Controller Network and CC-Link IE Field Network
MELSECNET/H	An abbreviation for the MELSECNET/H network system
■ Software package	
Programming tool	A generic term for GX Works2 and GX Developer
GX Works2	The product name of the software package for the MELSEC programmable controllers
GX Developer	
■ Others	
GOT	A generic term for Mitsubishi Electric Graphic Operation Terminal, GOT-A*** series, GOT-F*** series, GOT1000 series, and GOT2000 series

CHAPTER 1 OVERVIEW

1.1 Features

The features specific to the Built-in Ethernet port QCPU are described below.

(1) Connection of programming tools and GOTs (☞Page 24, CHAPTER 3)

- The Find CPU function makes it possible to find the Built-in Ethernet port QCPU connected to the same hub as programming tool and displays a list.
- Access is available via routers on a network such as a corporate LAN.
- GOT on Ethernet can be accessed from the programming tool via the built-in Ethernet port of a CPU module.

(2) Direct connection to a programming tool (simple connection) (☞Page 48, CHAPTER 4)

The CPU module can be directly connected to a programming tool with a single Ethernet cable only, without using a hub (simple connection). In direct connections, communications can be performed simply by the transfer setup, without setting IP addresses.

(3) MC protocol communication (☞Page 51, CHAPTER 5)

From an external device such as a personal computer or HMI, device data of the CPU module can be read or written using MC protocol commands.
In addition, MC protocol messages (QnA-compatible 3E frame and 4E frame) can be sent from the CPU module to external devices connected on the Ethernet network.

(4) Data communications using the predefined protocol (☞Page 76, CHAPTER 6)

The predefined protocol function sends and receives packets predefined by using GX Works2, enabling easy communications with external devices (such as measuring instruments and bar code readers). Protocol can be either selected from the prepared predefined protocol library, or created and edited by users.

(5) Socket communication function (☞Page 87, CHAPTER 7)

By using instructions dedicated to socket communication, any data can be transferred from and to the external devices connected through Ethernet using TCP or UDP.

(6) Time setting function (SNTP client) (☞Page 137, CHAPTER 8)

- Automatic time setting of the CPU module can reduce the maintenance cost for time setting.
- By sharing the same clock data among CPU modules connected to Ethernet via their built-in Ethernet ports, the order of errors between processes can be traced, facilitating problem solving.
- Since the automatic time setting is enabled upon power-on of the CPU module, operations can be started based on accurate clock data.

(7) File transfer function (FTP) (☞Page 140, CHAPTER 9)

Each of the files stored in the CPU module can be read or written from the interfacing device with the FTP client function, and a large amount of data can be easily transferred.

(8) Remote password (☞Page 164, CHAPTER 10)

Remote password setting can prevent unauthorized access from the outside and enhance the security of the system.

(9) Simple PLC communication function (☞Page 171, CHAPTER 11)

Device data can be communicated between the CPU modules connected with Ethernet cable without programming.

(10) IP address change function (☞Page 193, CHAPTER 12)

The IP address of the built-in Ethernet port can be changed from a GOT, not in the Built-in Ethernet Port Setting of the PLC Parameter.

(11) IP packet transfer function (☞Page 203, CHAPTER 13)

Communications can be performed with a device which supports the following IP addresses, which have been specified via a CC-Link IE Controller Network module or CC-Link IE Field Network module, using a protocol such as the FTP or HTTP via a built-in Ethernet port from an Ethernet device such as a personal computer.

- External devices on CC-Link IE Controller Network or CC-Link IE Field Network
- External devices on the Ethernet network, which are connected through the built-in Ethernet ports

(12) Reading/writing device data from/to the CPU module on another station by specifying an IP address (☞Page 205, CHAPTER 14)

Dedicated instructions allow the CPU module on the host station to read/write device data from/to the CPU module on another station.

Point

Some functions have been added by the upgrade of the serial numbers of CPU modules or the programming tool. For the list of functions added by the upgrade, refer to Page 224, Appendix 3.

CHAPTER 2 COMMUNICATION SPECIFICATIONS

The following are the communication specifications of the built-in Ethernet port of the CPU module.

Item			Specification
Transmission specifications	Data transfer speed		100 or 10 Mbps
	Communication mode		Full-duplex or half-duplex
	Transmission method		Base band
	Maximum distance between hub and node		100 m
	Maximum number of nodes/connection	10BASE-T	Cascade connection: Up to four*2
		100BASE-TX	Cascade connection: Up to two*2
Number of connections	TCP/IP		Total of 16 for socket communication, MELSOFT connection, MC protocol, and predefined protocol. One for FTP
	UDP/IP		
Connection cable*1	10BASE-T		Ethernet cable of category 3 or higher (STP/UTP cable)*3
	100BASE-TX		Ethernet cable of category 5 or higher (STP cable)

*1 Straight cables can be used.
When the CPU module is directly connected to GOT with Ethernet cable, a cross cable of Category 5e or lower can also be used.

*2 This number applies when a repeater hub is used.
When using a switching hub, check the number of cascaded stages with the manufacturer of the hub to be used.

*3 Use of STP cables is recommended in an environment with noise.

Hubs with 10BASE-T or 100BASE-TX ports*4 can be used.

Up to 16 external devices can access one CPU module at the same time.

*4 The ports must comply with the IEEE802.3 10BASE-T or IEEE802.3 100BASE-TX standards.

Point

- Use a switching hub with the auto-negotiation function to connect a hub. The CPU module determines the cable used (10BASE-T or 100BASE-TX) and the communication mode (full-duplex or half-duplex) according to the hub. Set the hub into the half-duplex mode if the hub that does not have the auto-negotiation function.
- The operation of commercial devices used for the following applications is not guaranteed. Check the operation before using the module.
  - Internet (general public line)
    (Internet-access service offered by an Internet service provider or a telecommunications carrier)
  - Firewall device(s)
  - Broadband router(s)
  - Wireless LAN
- If Ethernet communication is performed with "Specify service process execution counts" selected for "Service processing setting" in the PLC system tab of PLC parameter, a scan time increases by time for service processing (approximately 500ms).
  To reduce it to 500ms or less, select an item other than "Specify service process execution counts".
  (Example: Select "Specify service process time" and then enter a time value.)
- If broadcast storm occurs in the network, scan time may be increased.
- If the destination device of the CPU module does not respond due to power-off or other reasons, Ethernet communication of the CPU module may delay up to 500ms.

Remark

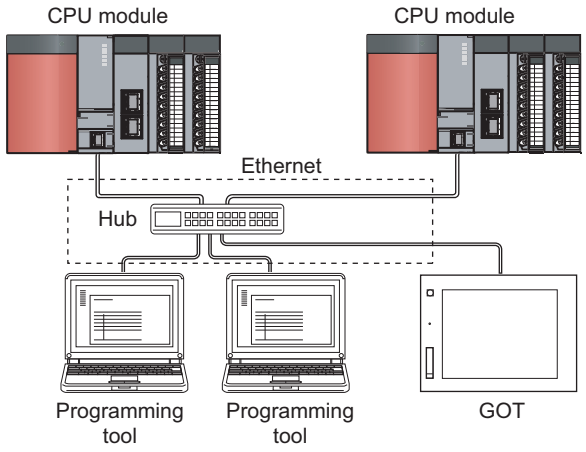
TCP and UDP are defined as follows:

- TCP (Transmission Control Protocol)
  In communications among programmable controllers and networked devices, this protocol establishes a connection between port numbers of the two devices to perform reliable data communications.
- UDP (User Datagram Protocol)
  This is a connectionless protocol and thereby its speed is faster than that of TCP. However, the reliability in data communications is low. (Data may be lost or not be received in correct order.) Note that simultaneous broadcast is available.

Select an appropriate protocol, considering the specifications of the external device and the characteristics of the above protocols.

CHAPTER 3 CONNECTION OF PROGRAMMING TOOLS AND GOT

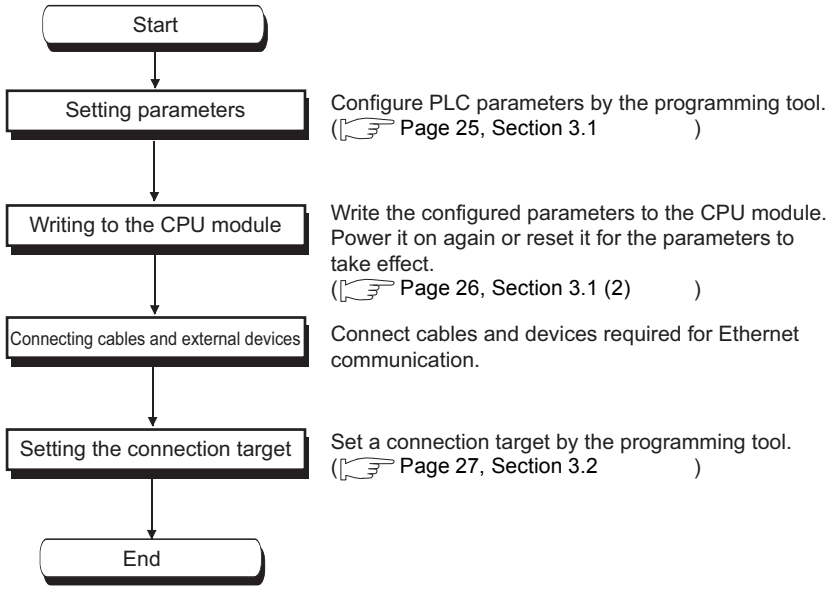
This chapter explains how to connect the CPU module to a programming tool or GOT.



Point

- The CPU module and programming tool can be connected directly (simple connection) through one Ethernet cable. In direct connection, the module and the tool can communicate with each other without each other's IP address in mind.
  (Page 48, CHAPTER 4)
- GOT on Ethernet can be accessed from the programming tool via the built-in Ethernet port of a CPU module.
  (Page 31, Section 3.5)

To start Ethernet communication, perform the following steps.



For the GOT setting, refer to the following manual.

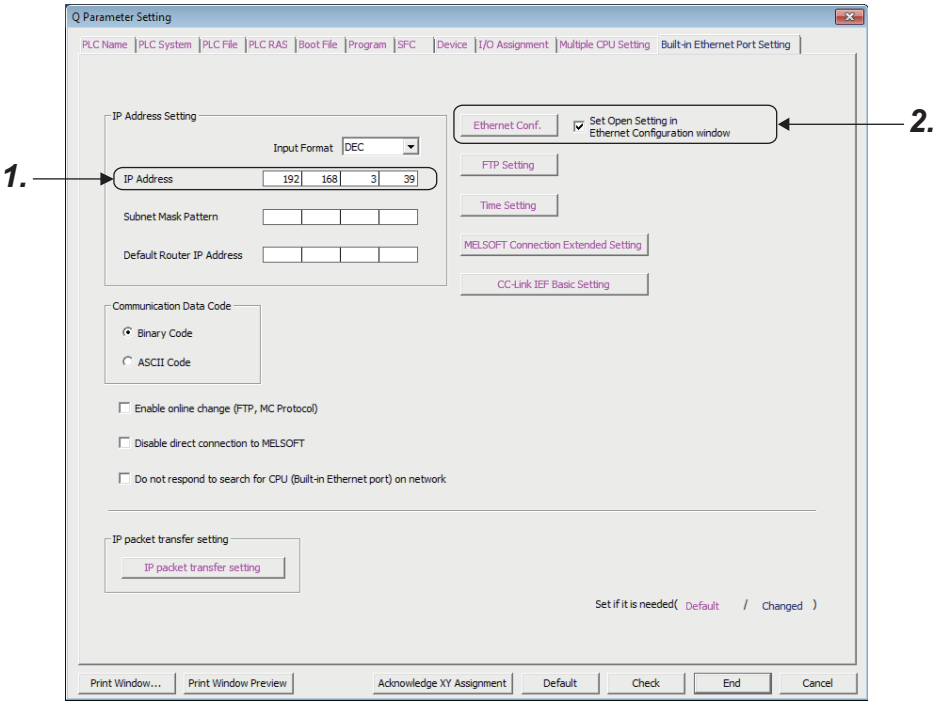
Connection Manual (Mitsubishi Products) for GOT used

3.1 Setting for the CPU Module

(1) PLC parameter setting

Select the "Built-in Ethernet Port Setting" tab and set the parameters.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]



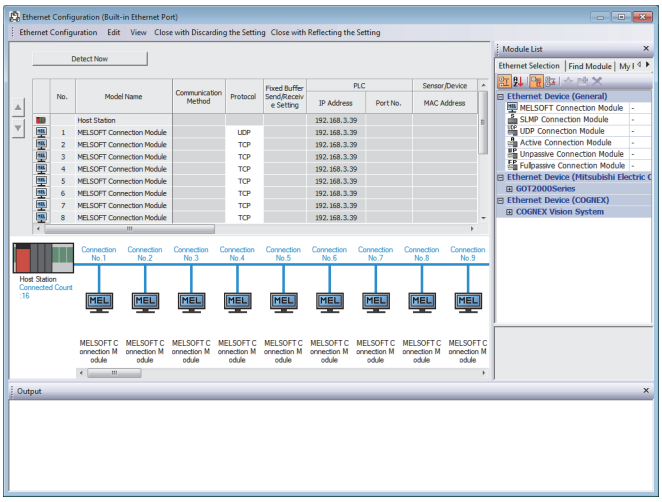
1. **Set the IP address of the CPU module.**

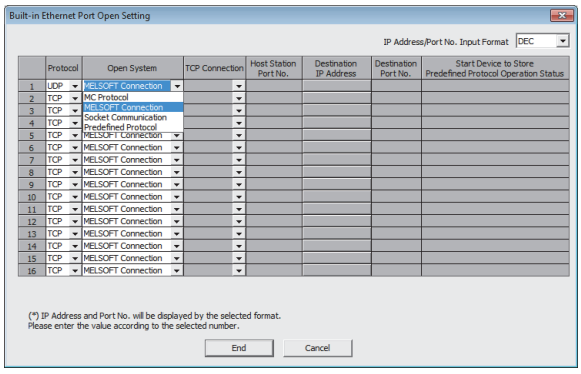
2. Set MELSOFT connection.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

⇨ Ethernet Conf. / Open Setting button*1

*1 Ethernet Conf. button can be used with the QnUDVCPU and QnUDPVCPU.





- For "Ethernet Conf.", drag and drop the "MELSOT Connection Module" from "Module List" to the left side on the window. Select a protocol from "Protocol" depending on the target device.
- For "Open Setting"

Item	Setting
Protocol	Select "TCP" or "UDP" depending on the connected device.
Open System	Select "MELSOFT Connection".

(2) Writing to the CPU module

From the "Write to PLC" window, write the parameter settings to the CPU module.

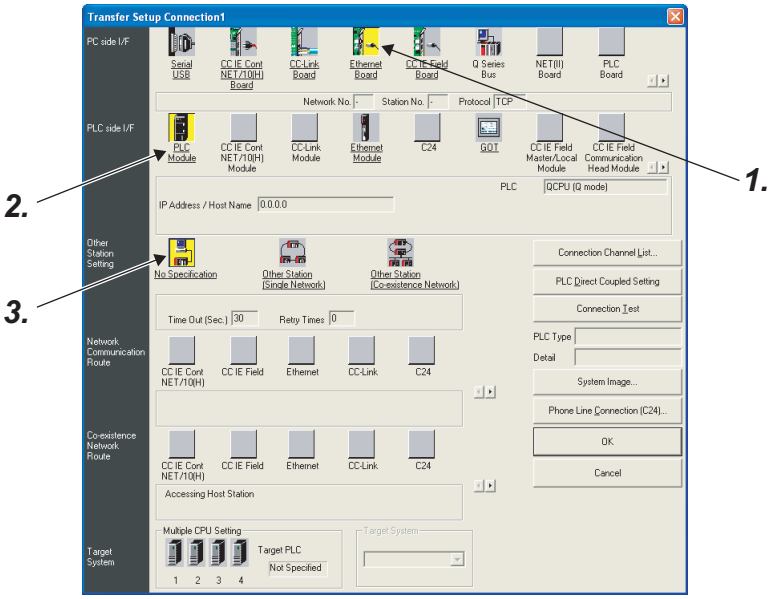
[Online] ⇨ [Write to PLC]

After writing the parameters to the CPU module, power off and on or reset the CPU module to enable the parameters.

3.2 Setting for the Programming Tool

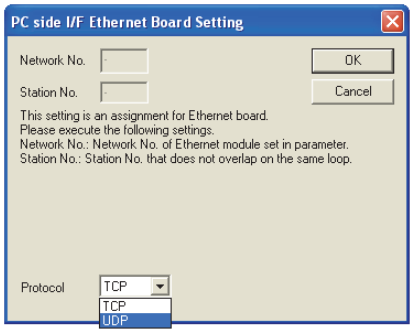
Configure the settings in the "Transfer Setup" window.

Connection Destination window ⇨ [Connection1]



1. Select "Ethernet Board" for "PC side I/F".

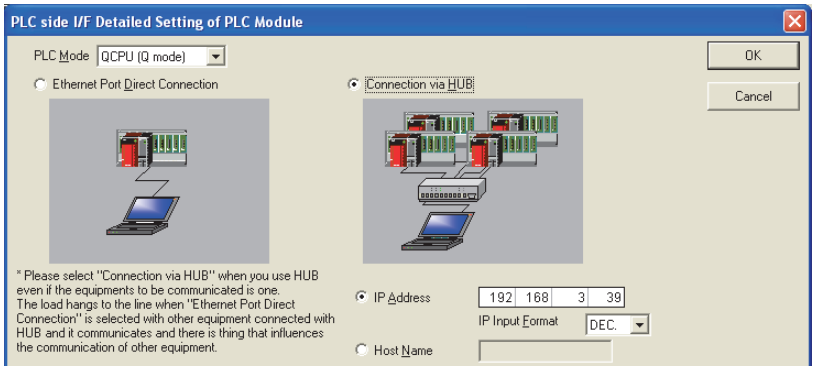
In the "PC side IF Ethernet Board Setting" window, select a "TCP" or "UDP" protocol. Select the same protocol as the one set in the Ethernet Configuration or the Open Setting window. (Page 25, Section 3.1)



2. **Select "PLC Module" for "PLC side I/F".**

Enter the IP address or host name of the CPU module in the "PLC side I/F Detailed Setting of PLC Module" window, as shown below.

(For the host name, enter the name set in the Microsoft® Windows® hosts file.)



3. **Set "Other Station Setting".**

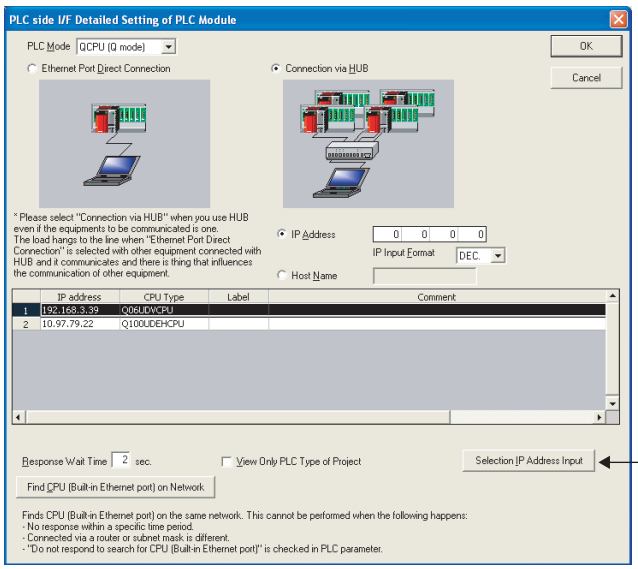
Select an item appropriate to the operating environment.

When performing relay communication to another network, make the following settings as well, and use the connection destination specification of the programming tool to access another network.

(☞Page 31, Section 3.5)

3.3 Searching CPU Modules on the Network

In a configuration using a hub, clicking [Find CPU (Built-in Ethernet port) on Network] in the "PLC side I/F Detailed Setting of PLC Module" window will start searching for CPU modules connected to the hub where the programming tool is also connected, and display a list of them.

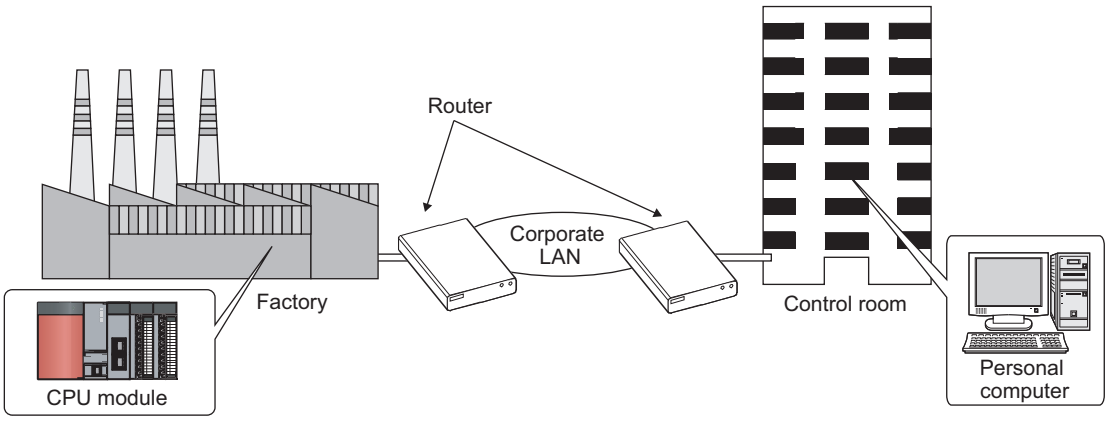


Clicking this button will automatically enter the IP address of the CPU module.

- CPU modules connected to cascaded hubs are also searched and a list of them is displayed.
- CPU modules connected via a router cannot be searched.
- Some CPU modules connected via wireless LAN may not be found since Ethernet communication may not be stable due to packet loss.
- If multiple CPU modules with the same IP address are found in the list, check the IP address parameters for the CPU modules. Starting communication with the IP address duplicated will cause a communication error.
- Appropriate CPU modules may not be found if a heavy load for service processing is applied.
  Increase the response waiting time value in the "Find CPU (Built-in Ethernet port)" window, or the service processing time value in the Service processing setting tab of PLC parameter.
- By selecting the option shown below in the Built-in Ethernet port tab of PLC parameter, the Find CPU function can be disabled and the system does not respond to a search request on the network.

3.4 Communication via Routers

From the built-in Ethernet port, access is available via routers on a network such as a corporate LAN.*1

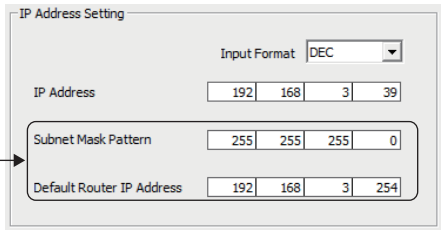


*1 For some functions as shown below, communications via a router are not available.
- Searching CPU modules on the network
- Simultaneous broadcast in socket communication

For access via a router, follow the instruction in the step 1 on Page 25, Section 3.1 (1) to set the subnet mask pattern and the default router IP address in addition to the IP address.

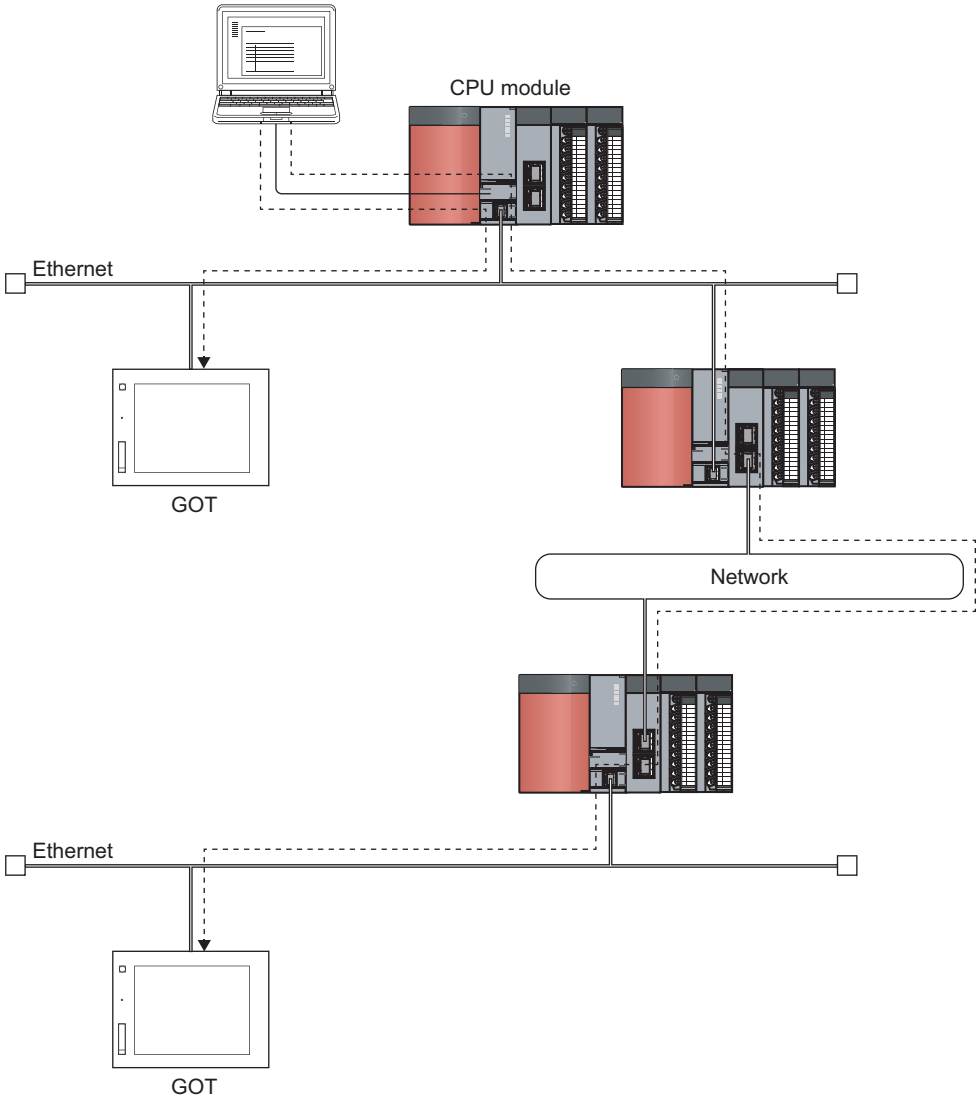
Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

Set the subnet mask pattern and default router IP address.



3.5 MELSOFT Connection Extended Setting Note 3.1

GOT on Ethernet can be accessed from the programming tool via the built-in Ethernet port of a CPU module. An access via another network is also enabled.

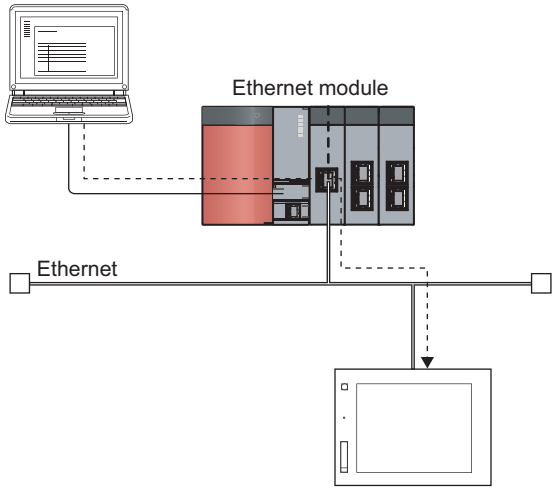


Note 3.1 Universal

The MELSOFT connection extended setting is enabled with the QnUDVCPU and QnUDPVCPU.
When using the MELSOFT connection extended setting, check the versions of the CPU module and programming tool.
(Page 224, Appendix 3)

Remark

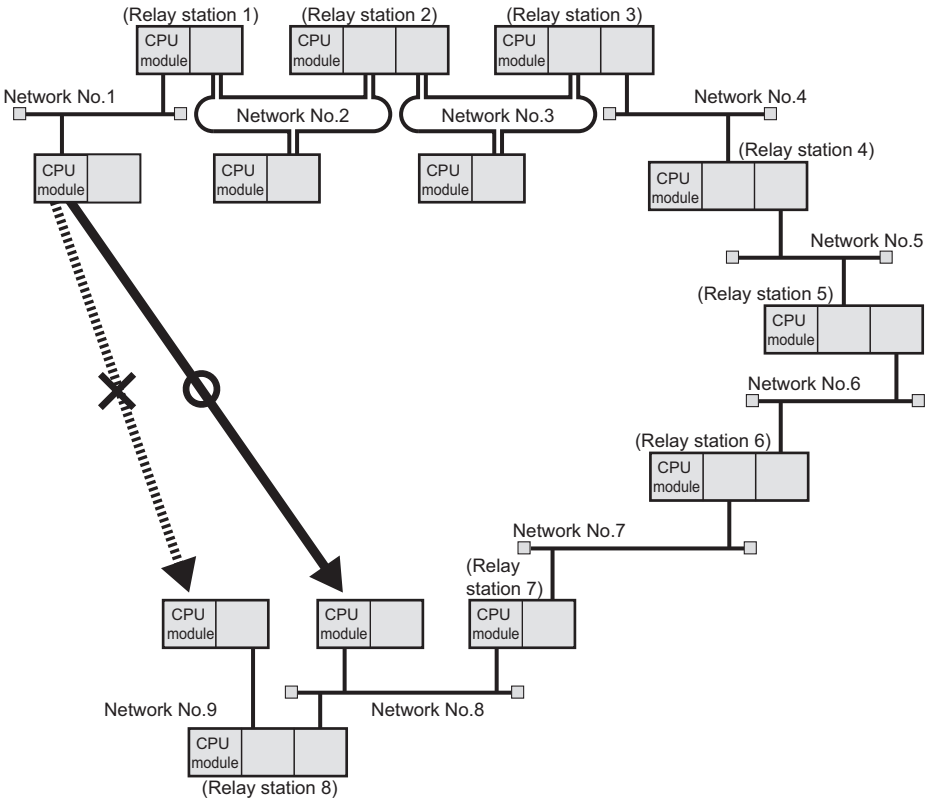
If the MELSOFT connection extended setting is not used, an Ethernet module needs to be used to access the GOT and modules on Ethernet from the programming tool.



By setting the routing parameter, the following network stations other than Ethernet can also be accessed.

- CC-Link IE Controller Network
- MELSECNET/H
- CC-Link IE Field Network
- CC-Link

When relaying multiple networks, communications can be made with stations up to eight networks apart (number of relay stations: 7).



Remark

Access from other stations using MELSOFT connection extended setting is performed using the UDP/IP protocol and data is always communicated in binary code.

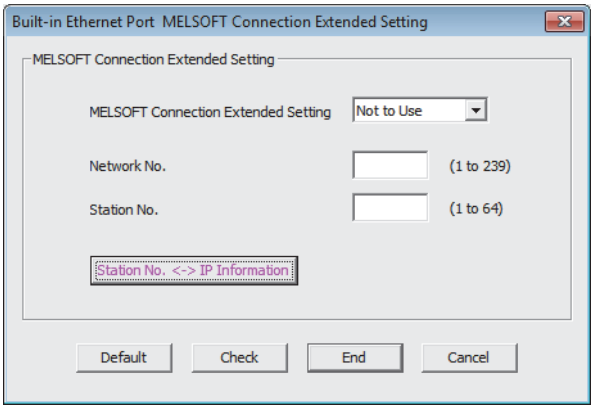
3.5.1 Setting method

(1) MELSOFT connection extended setting

Set the network number and station number of a CPU module.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

⇨ MELSOFT Connection Extended Setting Button



Item	Description	Setting range
MELSOFT Connection Extended Setting	Select whether to use this function.	• Not to Use (default) • Use
Network No.	Set the network number of a CPU module.	1 to 239
Station No.	Set the station number of a CPU module.	1 to 64
Station No. <-> IP Information	For communication using the MELSOFT connection extended setting, set the associations among the network number, station number, and IP address. (Page 35, Section 3.5.1 (2))	-

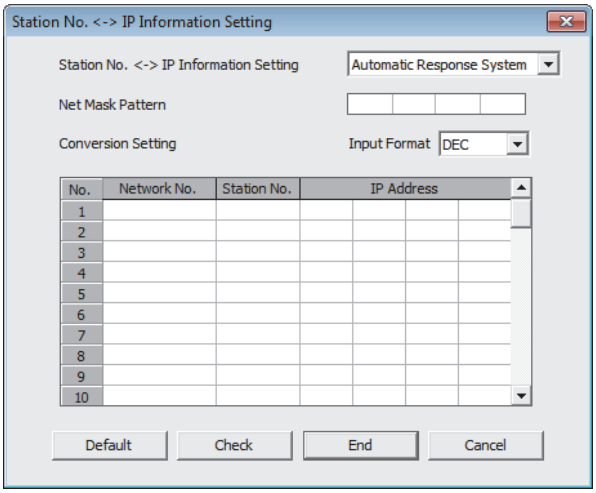
Remark

When the MELSOFT connection extended setting is used, do not overlap the network number to be set for a CPU module with the network number of another relay network. Set a station number different from those used in the same network.

(2) Station No. <-> IP information setting

Communication in Ethernet is performed based on the IP address and UDP port number while communication in other networks is performed based on the network number and station number.
Communication is relayed between another network and Ethernet, the network number and station number are converted into an IP address. To enable this conversion, the Station No. <-> IP Information, which is the information of the association between the network and station numbers and IP address, needs to be set. Set this information for all CPU modules that go through Ethernet.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting] ⇨ [MELSOFT Connection Extended Setting] ⇨ Station No. <-> IP Information button



Item	Description	Setting range
Station No. <-> IP Information Setting System	Select the station No. <-> IP information setting system (conversion method).	• Automatic Response System (default) • IP Address Calculation System • Table Exchange System • Combination Use System
Net Mask Pattern	Set the mask value used in the logical product with the own station's IP address. This setting is required when "IP Address Calculation System" or "Combination Use System" is selected in the "Station No. <-> IP Information Setting System".	$C0000000_H$ to $FFFFFFFC_H$
Input Format	Select the input format of "Net Mask Pattern" and "IP Address".	• Decimal (default) • Hexadecimal
Network No.	Set the network numbers of the request destination/source stations. This setting is required when "Table Exchange System" or "Combination Use System" is selected in "Station No. <-> IP Information Setting System".	1 to 239 (set in decimal)
Station No.	Set the station number of the request destination/source stations. This setting is required when "Table Exchange System" or "Combination Use System" is selected in "Station No. <-> IP Information Setting System".	1 to 64 (set in decimal)
IP Address	Set the IP address of the request destination/source stations. This setting is required when "Table Exchange System" or "Combination Use System" is selected in "Station No. <-> IP Information Setting System".	00000001_H to $DFFFFFFE_H$

(a) Station No. <-> IP information setting system (conversion method)

There are four kinds of station No. <-> IP information setting system as shown below.

○: Setting required, ×: Setting not required

Conversion method	Net mask pattern	Conversion setting
Automatic response system	×	×
IP address calculation system	○	×
Table exchange system	×	○
Combination use system	○	○

For details of each conversion method, refer to Page 39, Section 3.5.2.

(b) Net mask pattern

Specify the mask value based on the guidelines given below. This pattern is used in a logical sum with the own station's IP address when calculating the IP address of the external device using the IP address computation system.

- When setting the sub-net mask, specify the target settings of the IP address class, network address, and sub-net address so that all bits are "1" in the mask pattern. The mask pattern is specified with a decimal/hexadecimal value obtained by dividing the 32-bit mask value into 8-bit segments.
- When the sub-net mask is not specified, the mask pattern specification is not necessary. When the mask pattern is not specified, the following mask value is used as the mask pattern according to the own station IP Address class.

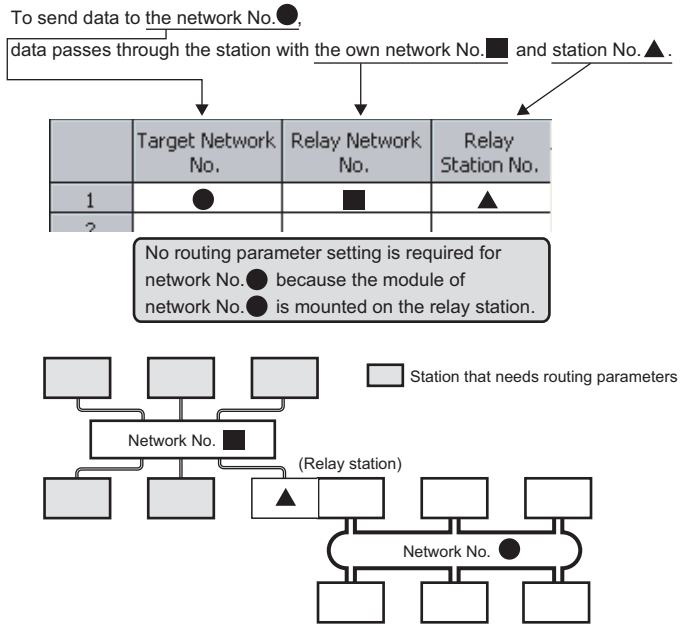
Class	Mask value used
Class A	$FF.00.00.00_H$
Class B	$FF.FF.00.00_H$
Class C	$FF.FF.FF.00_H$

(c) Conversion setting (conversion information)

- The conversion setting is required to obtain the IP address from the network number and station number using the table exchange system.
- When communicating between modules on Ethernet, specify network numbers, station numbers, and IP addresses.
- Specify the network number in the range of 1 to 239 (1_H to EF_H) and the station number in the range of 1 to 64 (1_H to 40_H).

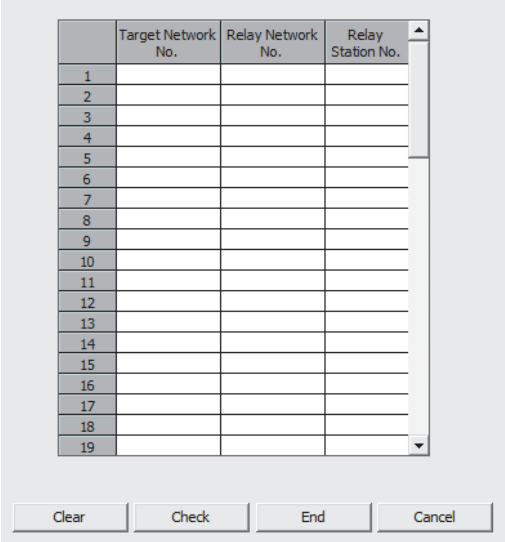
(3) Routing parameter settings

For communication through multiple networks, the communication path needs to be set. For this purpose, routing parameters need to be set for relaying CPU modules.



Project window ⇨ [Parameter] ⇨ [Network Parameter]

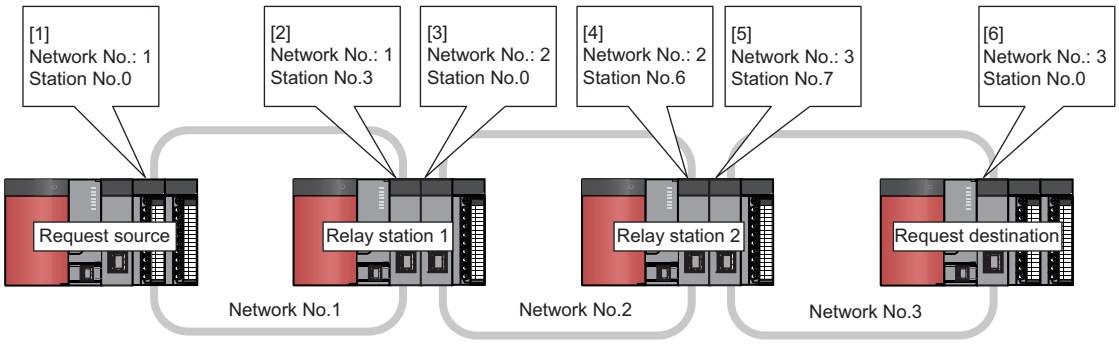
⇨ [Ethernet/CC IE/MELSECNET] ⇨ Routing Parameters buttons



Item	Description	Setting range
Target Network No.	Set the network number of the transfer destination network.	1 to 239
Relay Network No.	Set the network numbers of relay stations.	1 to 239
Relay Station No.	Set the station numbers of relay stations.	0 to 120

(a) Setting examples

Making access from request source (network No.1) to request destination (network No.3) via network No. 2



Station	Request route	Response route
Request source	[1] Target network No. / Relay network No. / Relay station No.: 3 / 1 / 3 The data is transferred to the relay station [2] of the own network to go to the network No.3.	[1]
Relay station 1	[2] [3] Target network No. / Relay network No. / Relay station No.: 3 / 2 / 6 The data is transferred to the relay station [4] of the own network to go to the network No.3.	[2] [3] The data has been transferred to the network No.1, and is to be transferred to [1].
Relay station 2	[4] [5] The data has been transferred to the network No.3, and is to be transferred to [6].	[4] [5] Target network No. / Relay network No. / Relay station No.: 1 / 2 / 0 The data is transferred to the relay station [3] of the own network to go to the network No.1.
Request destination	[6]	Target network No. / Relay network No. / Relay station No.: 1 / 3 / 7 The data is transferred to the relay station [5] of the own network to go to the network No.1.

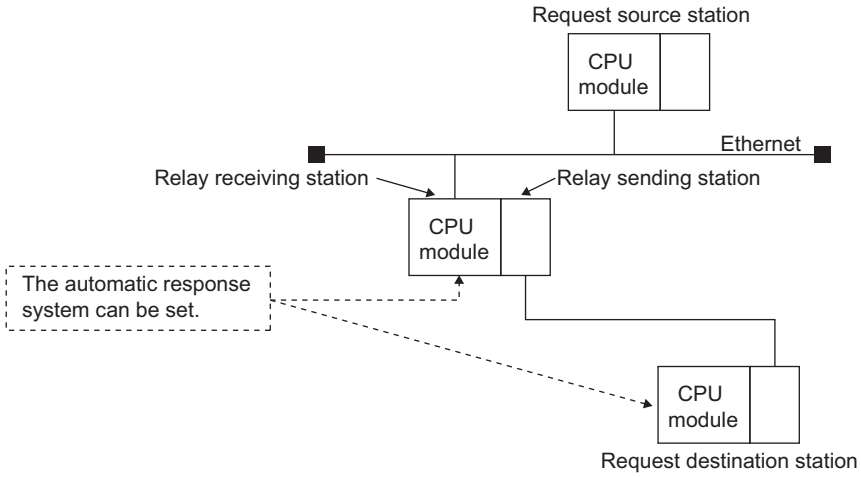
3.5.2 Convert format between the network number/station number and IP address/port number

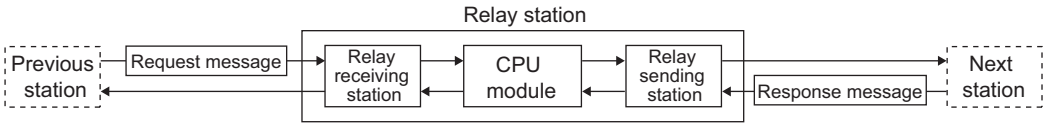
This section provides an overview of the processing of the conversion method that is set in "Station No. <-> IP Information Setting".

(1) Automatic response system

The automatic response system can only be specified when the CPU module is the request destination station or relay receiving station.

There is no need to set the IP address and port number of the partner station.





When the CPU module receives other station access request message (command frame), the send source network number, IP address, and UDP port number in the request message, are stored internally. The response message (response) for the request message is returned to the destination IP address and UDP port number calculated from the stored network number and station number. Therefore, by receiving the other station access request message first, the communication partner stations can be maintained.

The maximum number of station information that can be set is 64. When more than 64 other station access request messages are received, the CPU module starts deleting from the oldest data to store the station information in the newly received request message. However, it is ignored if the station information is the same as the station information already stored. *1

*1 Information from the same station is not stored twice.

(2) IP address calculation system

During calculation, the IP address of the partner station is obtained from the calculation equation below according to the network number and station number, and the UDP port number predefined for the CPU module system is used as the UDP port number of the destination.

For more information about the net mask pattern for routing other networks, refer to Page 36, Section 3.5.1 (2) (b).

IP address of the partner station = (IP address of the own station Logical product Net mask pattern) Logical sum Network number and station number of the destination

When a request message (command frame) to access other station is received, the IP address is calculated from the network number and station number of the destination in the request message, and the request message is sent to the next station.*1

The response message (response) for the request message is returned based on the return IP address and the stored data above.

*1 The network number and station number of the destination in the request message are stored in the CPU module.

The logical sum is calculated differently depending on the class of the own station IP address. An IP address is calculated for each class as follows.

Ex. For class A

- When the own station IP Address is 79238102_H
- When the net mask pattern for routing other networks is $FF000000_H$
- When the destination network number is 03_H, and the station number is 05_H

Own station IP Address		7 9 . 2 3 . 8 1 . 0 2
Net Mask Pattern	Logical product	F F . 0 0 . 0 0 . 0 0
Logical product value		7 9 . 0 0 . 0 0 . 0 0
Network No. and station No.	Logical sum	0 3 . 0 5
Partner station IP Address		7 9 . 0 0 . 0 3 . 0 5

Ex. For class B

- When the own station IP Address is $8438FA0A_H$
- When the net mask pattern for routing other networks is $FFFF0000_H$
- When the destination network number is 03_H, and the station number is 05H

Own station IP Address		8 4 . 3 8 . F A . 0 A
Net Mask Pattern	Logical product	F F . F F . 0 0 . 0 0
Logical product value		8 4 . 3 8 . 0 0 . 0 0
Network No. and station No.	Logical sum	0 3 . 0 5
Partner station IP Address		8 4 . 3 8 . 0 3 . 0 5

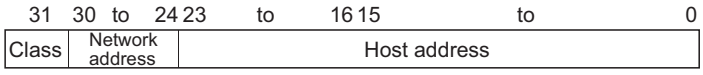
Ex. For class C

- When the own station IP Address is $CA65300A_H$
- When the net mask pattern for routing other networks is $FFFFFF00_H$
- When the destination network number is 02_H (The network number is not used.)

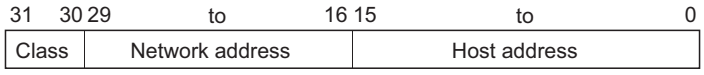
Own station IP Address		C A . 6 5 . 3 0 . 0 A
Net Mask Pattern	Logical product	F F . F F . F F . 0 0
Logical product value		C A . 6 5 . 3 0 . 0 0
Network No. and station No.	Logical sum	0 2
Partner station IP Address		C A . 6 5 . 3 0 . 0 2

Remark

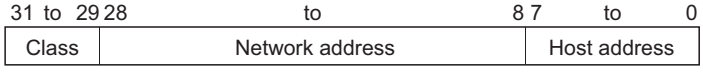
- IP address configuration of class A



- IP address configuration of class B



- IP address configuration of class C

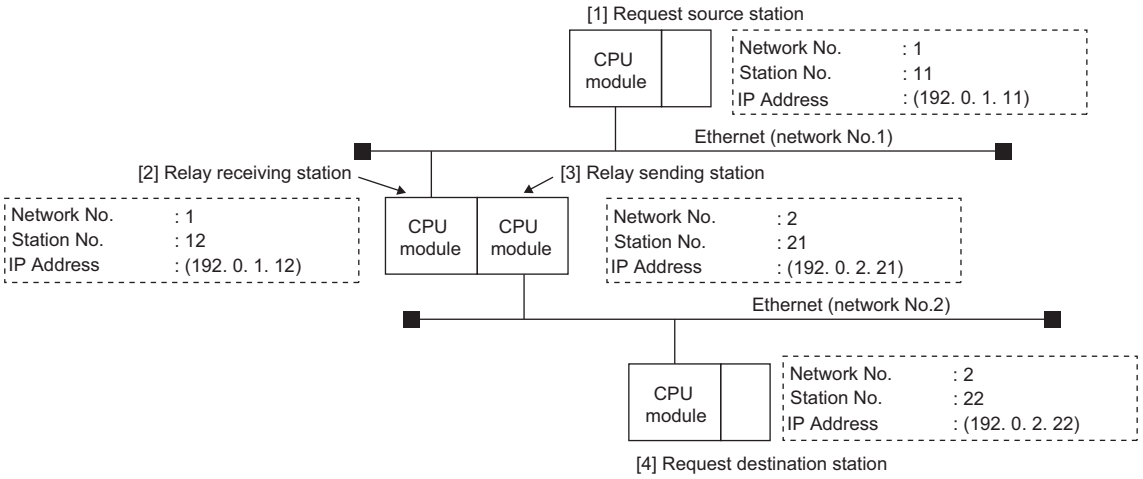


(3) Table exchange system

This method uses the network number, station number, and IP address set in the conversion table of the Station No. <-> IP information, and uses the UDP port number predefined for the Ethernet system as the UDP port number of the destination.
If duplicate network and station numbers are set in the conversion table, the data set with the younger registration number is used. If all the required values are not set, communication may not be performed successfully.

When a request message (command frame) to access other station is received, the same network number and station number are searched in the conversion table of the Station No. <-> IP information, and the request message is sent to the partner station with the corresponding IP address.
The response message (response) for the request message is returned based on the return IP address and the data in the conversion table above.

Ex. Specification example



Item		Module setting details when accessing from CPU [1] to CPU [2]			
		[1] Request source station *1	[2]	[3]	[4]
Setting value (Decimal)	Network No., station number	1, 12	Setting not necessary	Setting not necessary	Setting not necessary
	IP Address	192.0.1.12			

Item		Module setting details when accessing from CPU [1] to CPU [4]			
		[1] Request source station *1	[2] Relay receiving station *2	[3] Relay sending station *1	[4] Request destination station *2
Setting value (Decimal)	Network No., station number	1, 12	1, 11	2, 22	2, 21
	IP Address	192.0.1.12	192.0.1.11	192.0.2.22	192.0.2.21

Item		Module setting details when accessing from CPU [2] to CPU [1]			
		[1]	[2] Request destination station *1	[3]	[4]
Setting value (Decimal)	Network No., station number	Setting not necessary	1, 11	Setting not necessary	Setting not necessary
	IP Address		192.0.1.11		

Item		Module setting details when accessing from CPU [3] to CPU [4]			
		[1]	[2]	[3] Relay sending station *1	[4]
Setting value (Decimal)	Network No., station number	Setting not necessary	Setting not necessary	2, 22	Setting not necessary
	IP Address			192.0.2.22	

Item		Module setting details when accessing from CPU [4] to CPU [1]			
		[1] Request source station *2	[2] Relay sending station *1	[3] Relay receiving station *2	[4] Request destination station *1
Setting value (Decimal)	Network No., station number	1, 12	1, 11	2, 22	2, 21
	IP Address	192.0.1.12	192.0.1.11	192.0.2.22	192.0.2.21

Item		Module setting details when accessing from CPU [4] to CPU [3]			
		[1]	[2]	[3]	[4] Request destination station *1
Setting value (Decimal)	Network No., station number	Setting not necessary	Setting not necessary	Setting not necessary	2, 21
	IP Address				192.0.2.21

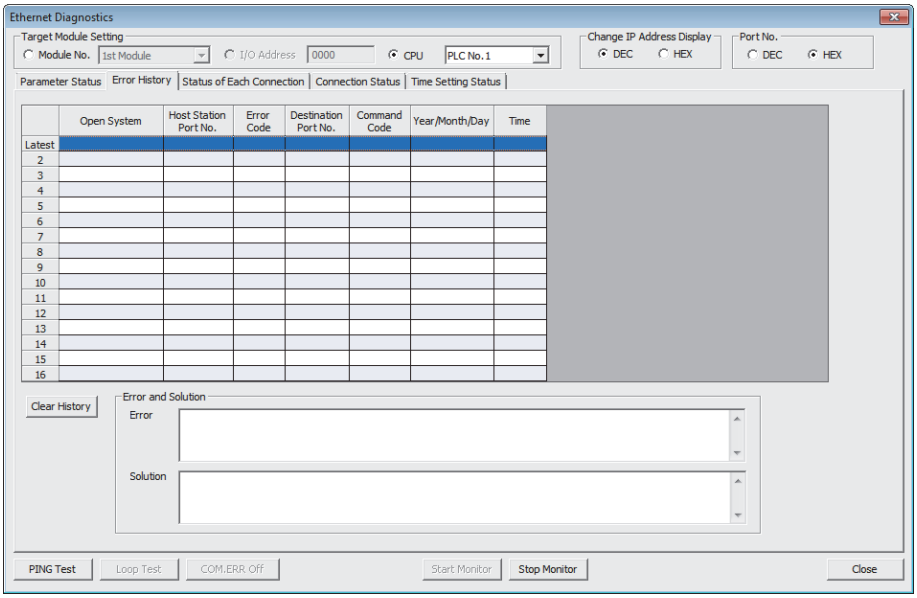
*1 Indicates that the set value is for sending request messages.
*2 Indicates that the set value is for sending response messages.

(4) Combination use system

This method uses both the IP address calculation system and the table exchange system.
Select this method to access other stations with the same network number, accessing other stations in other networks or accessing Ethernet with different Network No., and relaying from other networks to the Ethernet network system.
When a request message (command frame) to access other station is received, the request message is sent to the next station obtained by the table exchange system at first.
If the IP address of the CPU module cannot be obtained by the table exchange system, the IP address is obtained by the IP address calculation system to send the request message.
The response message (response) to the request message is returned based on the return IP address and the data in the conversion table or the stored data.

3.5.3 Checking communication status

Among the errors that occurred when the MELSOFT connection extended setting is used, those arising from communication errors are stored in the error history of Ethernet diagnostics. "MELSOFT connection" is displayed for the connection number and open system of each error.



For information on the Ethernet diagnostics, refer to the following manual.

GX Works2 Version 1 Operating Manual (Common)

3.6 Precautions

(1) IP address duplication

Check that the IP address is not duplicated when configuring a network or connecting a new device to a network. If the IP address is duplicated, a device may communicate with the wrong device.
Check for the IP address duplication in the following ways.

- Check for the IP address duplication with the find CPU function.
- Disconnect the device from the line and send ping to the IP address of the disconnected device. Having a response means the IP address duplication.

(2) KeepAlive check

When the protocol is set to TCP, KeepAlive check is performed. (Checking for a response to a KeepAlive ACK message)
An alive check message is sent five seconds after reception of the last message from the connected device to check if the device returns a response or not. If no response is received, the alive check message will be resent at intervals of five seconds. When no response is received for 45 seconds, the connected device is regarded as non-existent and the connection is disconnected. If the connected device does not support the TCP KeepAlive function, the connection may be disconnected.

(3) Connections exceeding the setting

Do not exceed the number of connections set for the Ethernet configuration or the open settings parameters. Establishing too many TCP connections from a personal computer may cause the following states, depending on the application.

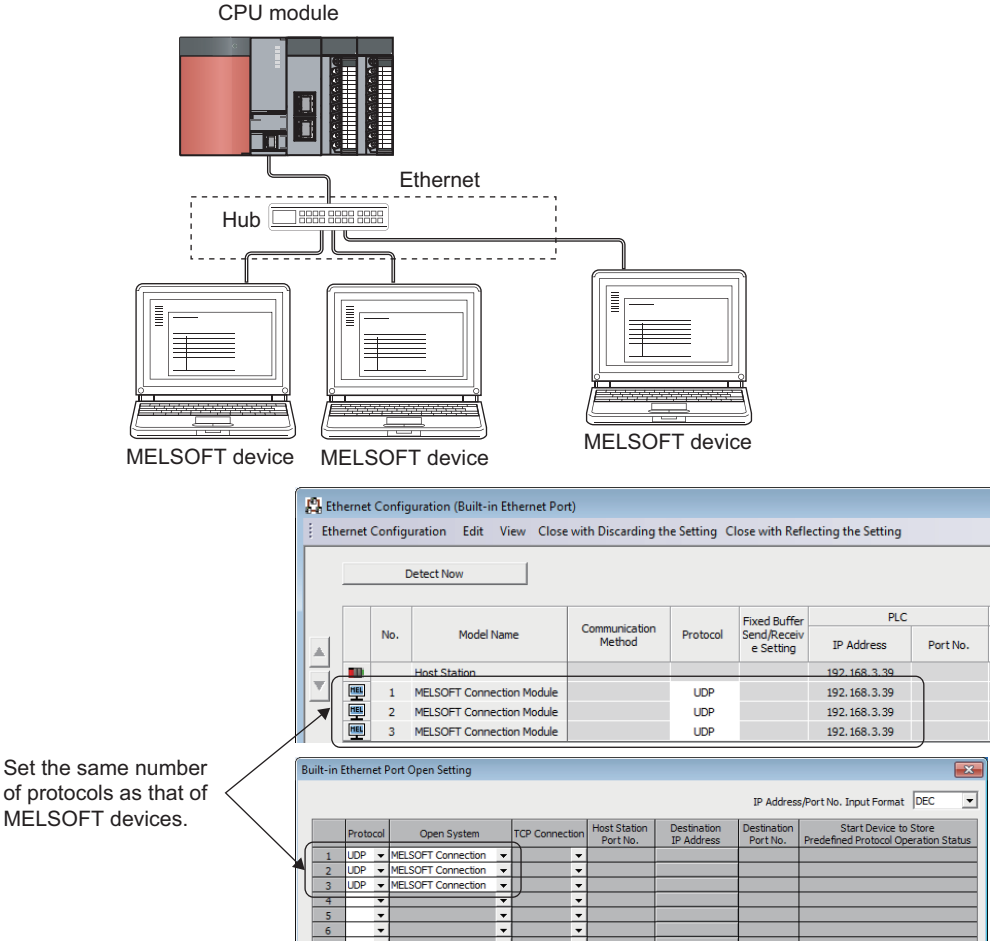
- Time before timeout error detection is increased.
- An unexpected timeout error occurs in any of the communicating devices.

(4) Retransmission on TCP connection

If no ACK response is returned from the other end of a TCP connection, the ACK will be resent six times, starting in 0.3 seconds after the first transmission, and then 0.6, 1.2, 2.4, 4.8, and 9.6 seconds. When no TCP ACK response is returned within 19.2 seconds after the last retransmission, the device is regarded as faulty and the connection is disconnected. (As a result, the connection is disconnected in total of 38.1 seconds.)

(5) MELSOFT connection over TCP or UDP

For TCP or UDP communications with multiple MELSOFT devices, set the same number of protocols as that of the connected MELSOFT devices in the setting of the PLC parameter.



Point

When all MELSOFT devices start communicating at the same time, devices may fail to communicate because of the congestion of communications. In such a case, schedule the timing for when each device starts communicating so that the communication congestion will not occur. When using GOTs, for example, set different rise time and timeout values in the GOTs.

(6) Sampling trace

When the function has been executed using the programming tool via a built-in Ethernet port, stop the function before powering off or resetting the CPU module.

(7) Remote STOP or remote PAUSE

When remote STOP or remote PAUSE has been executed using the programming tool via a built-in Ethernet port, perform the following operations before powering off or resetting the CPU module.

- Remote RUN
- Remote RESET

(8) Network No. and station number overlapping

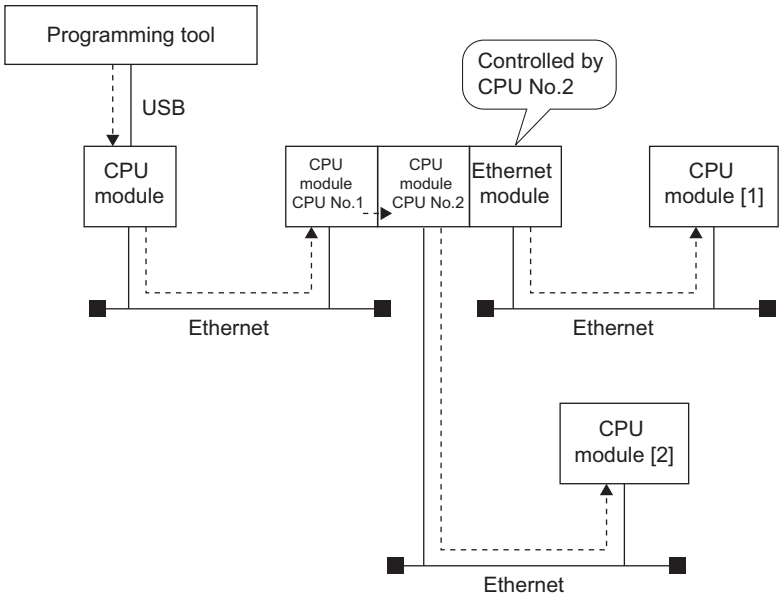
When the MELSOFT connection extended setting is used, do not overlap the network number to be set for a CPU module with the network number of another relay network. Set a station number different from those used in the same network.

(9) Relay communication in multiple CPU system configuration

When the MELSOFT connection extended setting is used, the target station or the relay station may configure multiple CPU system. In this case, configure the MELSOFT connection extended setting not only for the CPU modules in the target station or in the relay path but also for the control CPU of the network module in the relay path.

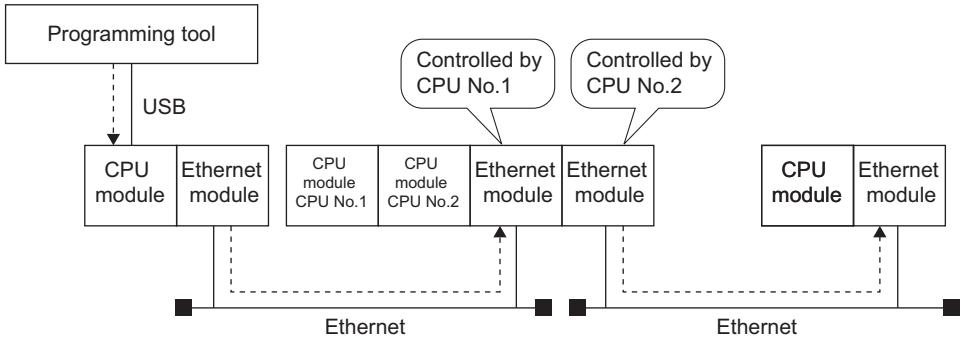
Ex. A case where the MELSOFT connection extended setting is required

When CPU No.1 communicates with CPU module [1] or CPU module [2], configure the MELSOFT connection extended setting for CPU No.1 and CPU No.2 in a multiple CPU system.



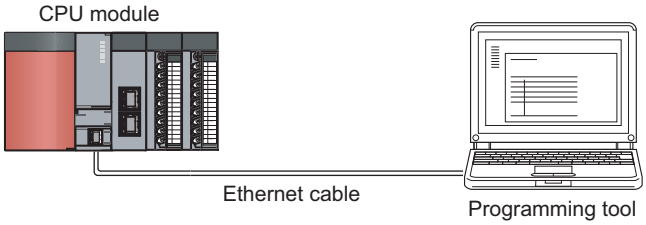
Ex. A case where the MELSOFT connection extended setting is not required

When Ethernet modules are used for all the relay paths, the MELSOFT connection extended setting for CPU modules does not affect relay communications.



CHAPTER 4 DIRECT CONNECTION TO PROGRAMMING TOOL (SIMPLE CONNECTION)

The CPU module can be directly connected to the programming tool with an Ethernet cable, without using a hub (simple connection).
For direct connection, the IP address and host name need not be specified in the connection target setting. (Simultaneous broadcast is used.)



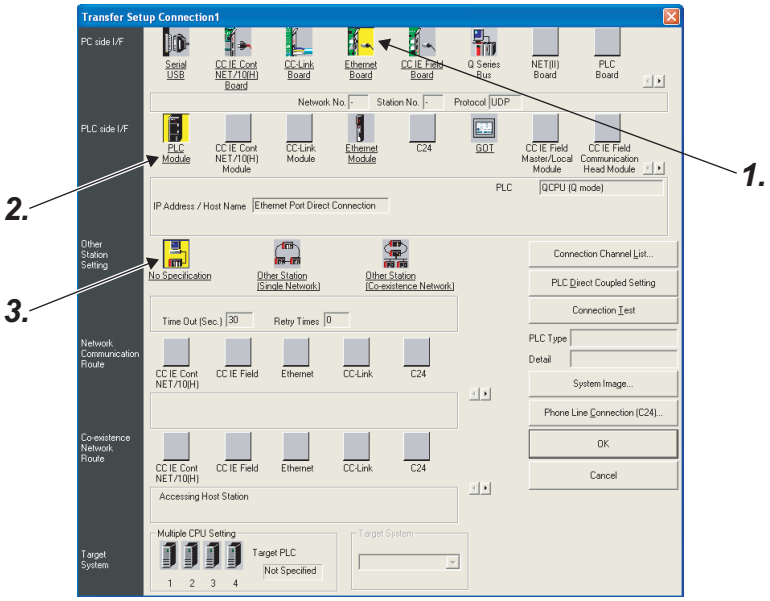
Point

An Ethernet cable used for direct connection will be longer compared with the case of using a USB cable. This can cause an unauthorized connection from a remote location.
Unauthorized connections can be prevented by selecting the following option in the Built-in Ethernet port tab of the PLC parameter window.

4.1 Setting Method

Set the items on the Transfer Setup window.

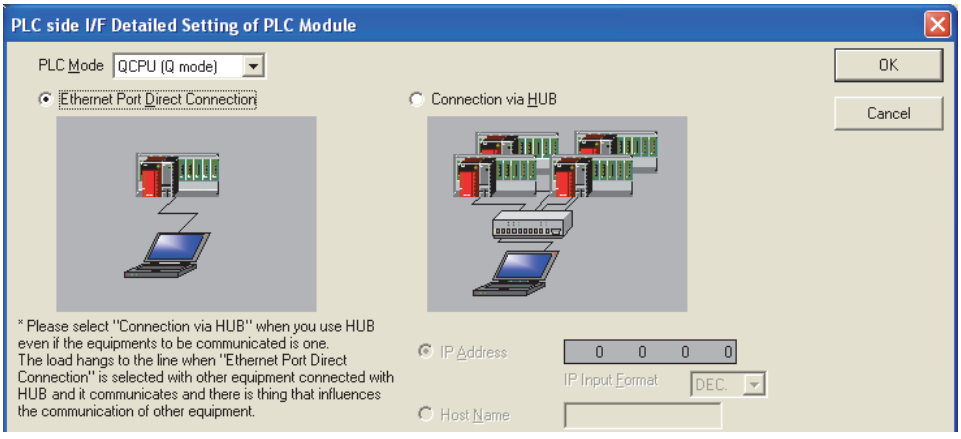
Connection Destination window ⇨ [Connection1]



1. Select "Ethernet Board" for "PC side I/F".

2. Select "PLC Module" for "PLC side I/F".

In the "PLC side IF Detailed Setting of PLC Module" window, select the Ethernet Port Direct Connection checkbox as shown below.



3. Complete setting of "Other Station Setting".

Select an item appropriate to the operating environment.

When performing relay communication to another network, make the following settings as well, and use the connection destination specification of the programming tool to access another network.

(Page 31, Section 3.5)

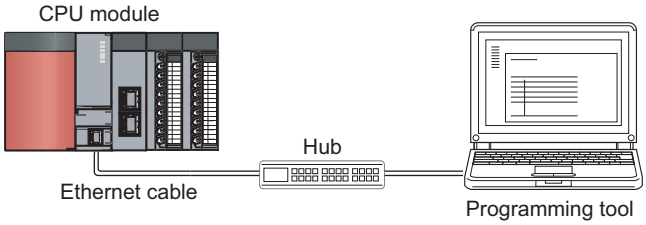
4.2 Precautions

(1) Connection to LAN line

When connecting the CPU module to a LAN line, do not set direct connection. Doing so will apply a load to the LAN line and adversely affect communications with other external devices.

(2) Indirect connection

- Do not set up direct connection when a CPU module is connected to an external device in a one-to-one basis using a hub as shown below.



- When two or more Ethernet ports are enabled in the network connections setting on the personal computer, communication by direct connection is not possible. In the setting, leave only one Ethernet port enabled for direct connection and disable other Ethernet ports.

(3) Conditions that disallow direct connection

When any of the following conditions is met, communication by direct connection may not be available. In that case, check the setting of the CPU module and/or personal computer.

- In the CPU module IP address bits, the bits corresponding to "0" in the personal computer subnet mask are all ON or all OFF.

Ex.	CPU module IP address	:	64.	64.	255.	255
	Personal computer IP address	:	64.	64.	1.	1
	Personal computer subnet mask	:	255.	255.	0.	0

- In the CPU module IP address bits, the bits corresponding to the host address of the class in the personal computer IP address are all ON or all OFF.

Ex.	CPU module IP address	:	64.	64.	255.	255
	Personal computer IP address	:	192.	168.	0.	1
	Personal computer subnet mask	:	255.	0.	0.	0

Remark

- The IP address pattern for each class is as follows.
  Class A: 0.x.x.x to 127.x.x.x Class B: 128.x.x.x to 191.x.x.x Class C: 192.x.x.x to 223.x.x.x
- The host address for each class is the part shown with "0".
  Class A: 255. 0. 0. 0 Class B: 255.255. 0. 0 Class C: 255.255.255. 0

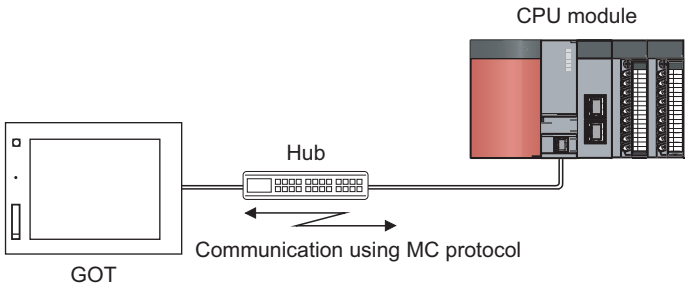
CHAPTER 5 MC PROTOCOL COMMUNICATION

The built-in Ethernet port allows MC protocol communication.

5.1 Sending a Command from an External Device to the CPU Module

From peripherals such as a personal computer or HMI, device data of the CPU module can be read or written using MC protocol. Monitoring of CPU module operation, data analysis, and production control are available on a personal computer or HMI by these device data reading and writing.

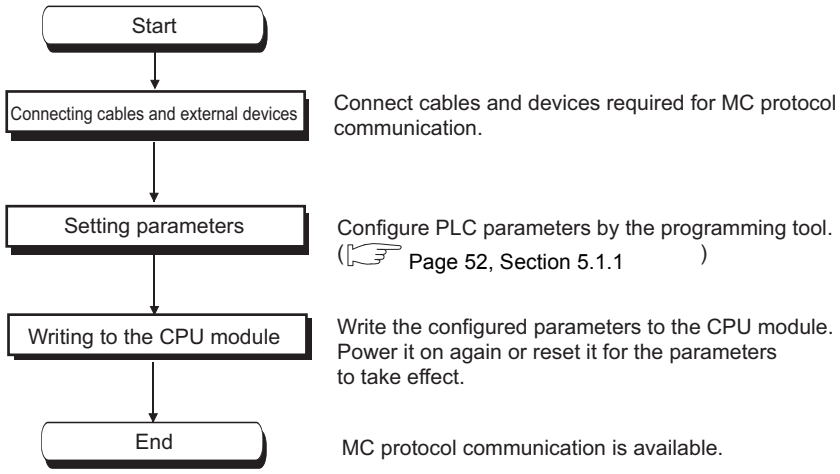
Besides, the remote password function can prevent unauthorized access from outside of the system. (Page 164, CHAPTER 10)



Point

From the peripherals such as a personal computer or HMI, only the CPU module connected can communicate using MC protocol.
An access to a CPU on another station via CC-Link network is not allowed.

To start MC protocol communication, perform the following steps.



For the MC protocol communication, refer to the following manual.

MELSEC Communication Protocol Reference Manual

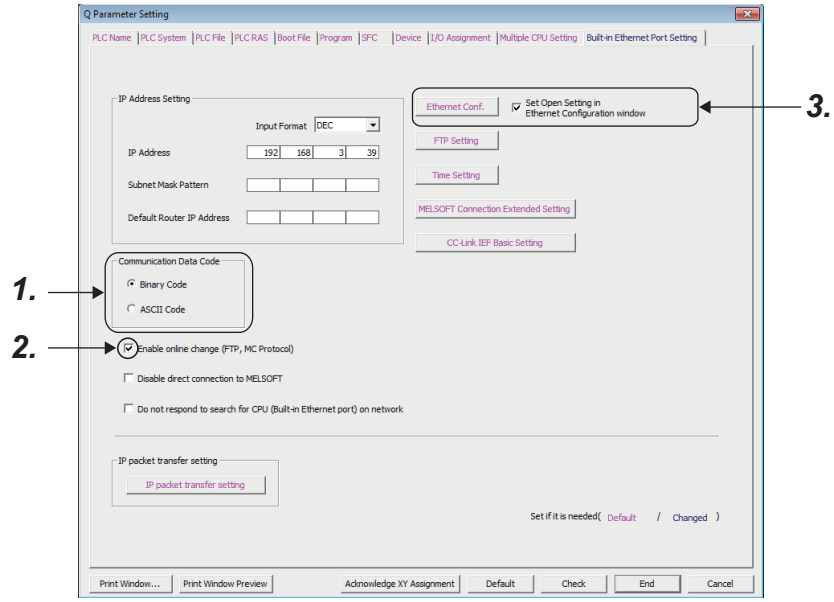
Remark

Access through routers is also available. When configuring the settings for it, set the subnet mask pattern and default router IP address. (Page 30, Section 3.4)

5.1.1 Setting Method

Setting for communication using the MC protocol is described below.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]



1. Select Binary or ASCII code as the communication data code used for MC protocol.

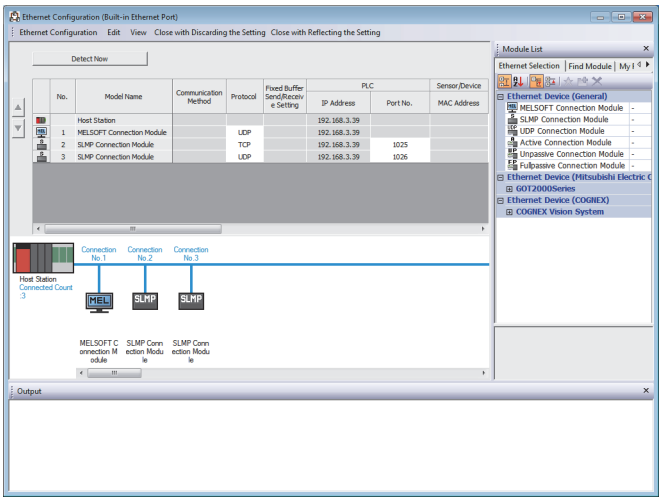
2. Select the "Enable online change (FTP, MC Protocol)" checkbox to enable data to be written to the CPU module even in the RUN state.

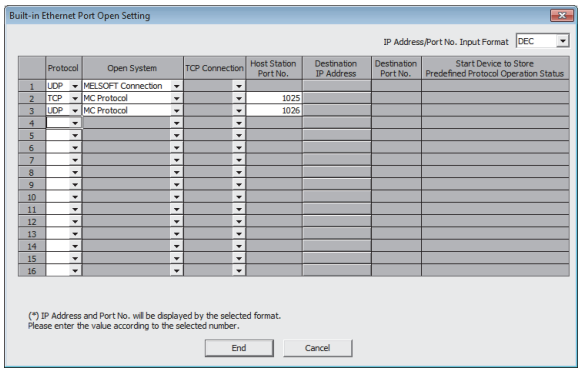
3. Set connections used for MC protocol communication.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

⇨ Ethernet Conf. / Open Setting button*1

*1 Ethernet Conf. button can be used with the QnUDVCPU and QnUDPVCPU.





- For "Ethernet Conf.", drag and drop "SLMP Connection Module" from "Module List" to the left side on the window. Select a protocol from "Protocol" depending on the target device. Set the port number of the host station in "Port No.". (Setting range: 1025 to 4999, 5010 to 65534) Do not specify 5000 to 5009 because these ports are used by the system. (Page 223, Appendix 2)
- For "Open Setting"

Item	Description
Protocol	Select TCP or UDP depending on the target device.
Open System	Select "MC Protocol".
Host Station Port No.	Set the port number of the host station. (Setting range: 0401_H to 1387_H, 1392_H to $FFFE_H$ (1025 to 4999, 5010 to 65534))*1

*1 Do not specify 1388_H to 1391_H (5000 to 5009) because these ports are used by the system. (Page 223, Appendix 2)

Point

When the "Enable online change (FTP, MC protocol)" setting is disabled, if the CPU module in the RUN state receives a data write request from the target device, data will not be written and an NAK message will be returned.

5.1.2 MC protocol commands

(1) Command list

The following commands are executable for MC protocol communication of the CPU module.

(a) When 4E frame or QnA-compatible 3E frame is used

○: Available, ×: N/A

Function			Command (Subcommand)	Description	Number of processed points	CPU module state		
						STOP	RUN	
							Write enabled	Write disabled
Device memory	Batch read	In units of bits	0401 (0001)	Reads bit devices in units of one point.	ASCII: 3584 points BIN: 7168 points	○	○	○
		In units of words	0401 (0000)	Reads bit devices in units of 16 points.	960 words (15360 points)			
				Reads word devices in units of one point.	960 points			
	Batch write	In units of bits	1401 (0001)	Writes bit devices in units of one point.	ASCII: 3584 points BIN: 7168 points	○	○	×
		In units of words	1401 (0000)	Writes bit devices in units of 16 points.	960 words (15360 points)			
				Writes word devices in units of one point.	960 points			
	Random read*1*2	In units of words	0403 (0000)	Reads bit devices in units of 16 or 32 points by randomly specifying the target.	192 points	○	○	○
				Reads word devices in units of one or two points by randomly specifying the target.				
	Test (Random write)	In units of bits	1402 (0001)	Sets or resets bit devices in units of one point by randomly specifying the target.	188 points	○	○	×
		In units of words *1	1402 (0000)	Sets or resets bit devices in units of 16 or 32 points by randomly specifying the target.	*4			
				Writes word devices in units of one or two points by randomly specifying the target.				
	Monitor registration *1*2*3	In units of words	0801 (0000)	Registers bit devices to be monitored in units of 16 or 32 points.	192 points	○	○	○
				Registers word devices to be monitored in units of one or two points.				
	Monitor	In units of words	0802 (0000)	Monitors the devices registered.	Number of registered points	○	○	○
Remote password	Unlock		1630 (0000)	Specifies a remote password to unlock the locked state.	-	○	○	○
	Lock		1631 (0000)	Specifies a remote password to lock the unlocked state.	-	○	○	○

*1 Devices, TS, TC, SS, SC, CS, and CC cannot be specified in units of words.
Specifying any of these for monitor registration will cause an error (4032_H) at the time of monitoring execution.

*2 The monitor condition specification cannot be used for these commands.

*3 Do not execute monitor registration from multiple devices. If executed, the last monitor registration takes effect.

*4 Set the number of processed points so that the following condition is satisfied.
(Number of word access points) × 12 + (Number of double-word access points) × 14 ≤ 1920
For bit devices, one point is regarded as 16 bits in word access and 32 bits in double-word access.
For word devices, one point is regarded as one word in word access, and two words in double-word access.

(b) When A-compatible 1E frame is used

○: Available, ×: N/A

Function			Command /response type	Description	Number of processed points	Status of CPU module		
						STOP	RUN	
							Write enabled	Write disabled
Device memory	Batch read	In units of bits	00_H	Reads bit devices in units of one point.	256 points	○	○	○
		In units of words	01_H	Reads bit devices in units of 16 points.	128 words (2048 points)			
				Reads word devices in units of one point.	256 points			
	Batch write	In units of bits	02_H	Writes bit devices in units of one point.	256 points	○	○	×
		In units of words	03_H	Writes bit devices in units of 16 points.	40 words (640 points)			
				Writes word devices in units of one point.	256 points			
	Test (Random write)	In units of bits	04_H	Sets/resets bit devices in units of one point by randomly specifying a device or device number.	80 points	○	○	×
		In units of words *1	05_H	Sets/resets bit devices in units of 16 points by randomly specifying a device or device number.	40 words (640 points)			
				Writes word devices in units of one points by randomly specifying a device or device number.	40 points			
	Monitor data registration	In units of bits	06_H	Registers bit devices to be monitored in units of one points.	40 points	○	○	○
		In units of words *1	07_H	Registers bit devices to be monitored in units of 16 point.	20 words (320 points)			
				Registers word devices to be monitored in units of one point.	20 points			
	Monitor	In units of bits	08_H	Monitors devices with monitor data registered.	Number of registered points	○	○	○
		In units of words *1	09_H					

*1 Devices such as TS, TC, CS, and CC cannot be specified in units of words. If specified, an error (4032_H) occurs during monitoring.

(2) Available devices

The following table lists the devices available in the commands used for MC protocol communication.

(a) When 4E frame or QnA-compatible 3E frame is used

Classification	Device		Device code*1		Device number range	
			ASCII	Binary		
Internal user device	Input		X*	$9C_H$	The number range of a device in a CPU module, which is accessed to, can be specified.	Hexadecimal
	Output		Y*	$9D_H$		Hexadecimal
	Internal relay		M*	90_H	The number range of a device in a CPU module, which is accessed to, can be specified. Note that the access to a local device is not possible.	Decimal
	Latch relay		L*	92_H		Decimal
	Annunciator		F*	93_H		Decimal
	Edge relay		V*	94_H		Decimal
	Link relay		B*	$A0_H$		Hexadecimal
	Data register		D*	$A8_H$		Decimal
	Link register		W*	$B4_H$		Hexadecimal
	Timer	Contact	TS	$C1_H$		Decimal
		Coil	TC	$C0_H$		
		Current value	TN	$C2_H$		
	Retentive timer	Contact	SS	$C7_H$		Decimal
		Coil	SC	$C6_H$		
		Current value	SN	$C8_H$		
	Counter	Contact	CS	$C4_H$		Decimal
		Coil	CC	$C3_H$		
		Current value	CN	$C5_H$		
	Link special relay		SB	$A1_H$		Hexadecimal
	Link special register		SW	$B5_H$		Hexadecimal
	Step relay		S*	98_H		Decimal
	Direct input*2		DX	$A2_H$		Hexadecimal
	Direct output*2		DY	$A3_H$		Hexadecimal
Internal system device	Function input		-	-	Cannot be accessed.	Hexadecimal
	Function output		-	-		Hexadecimal
	Function register		-	-		Decimal
	Special relay		SM	91_H	The number range of a device in a CPU module, which is accessed to, can be specified. Note that the access to a local device is not possible.	Decimal
	Special register		SD	$A9_H$		Decimal
Index register			Z*	CC_H		Decimal
File register			R*	AF_H	The number range of a device in a CPU module, which is accessed to, can be specified.	Decimal
			ZR	$B0_H$		Decimal
Extended data register			D*	$A8_H$	• Binary: Within the device number range of the CPU module accessed • ASCII: 000000 to 999999 (up to 976.6K points)	Decimal
Extended link register			W*	$B4_H$	The number range of a device in a CPU module, which is accessed to, can be specified.	Hexadecimal

1 This is a code specified in MC protocol messages. When communicating data in ASCII code, specify the code in two characters. If the code consists of only one character, add "" (ASCII code: $2A_H$) or a space (ASCII code: 20_H) after the character.

*2 Devices of DX/DY1000 or later are not available. Use X/Y devices to access devices of X/Y1000 or later.

(b) When A-compatible 1E frame is used

Classification	Device	Device code		Device range	Device number
		ASCII	Binary		
internal user device	Input	5820 (35_H/38_H/32_H /30_H)	58_H/20_H	X0 to X7FF	0000_H to $07FF_H$
	Output	5920 (35_H/39_H/32_H /30_H)	59_H/20_H	Y0 to Y7FF	0000_H to $07FF_H$
	Internal relay	4D20 (34_H/44_H/32_H /30_H)	$4D_H$/20_H	• M0 to M8191 • M9000 to M9255 (SM1000 to SM1255)*1 Note, however, that local devices cannot be accessed.	• 0000_H to $1FFF_H$ • 2328_H to 2427_H
	Latch relay	-	-	Cannot be accessed.	
	Annunciator	4620 (34_H/36_H/32_H /30_H)	46_H/20_H	F0 to F2047	0000_H to $07FF_H$
	Edge relay	-	-	Cannot be accessed.	
	Link relay	4220 (34_H/32_H/32_H /30_H)	42_H/20_H	B0 to BFFF	0000_H to $0FFF_H$
	Data register	4420 (34_H/34_H/32_H /30_H)	42_H/20_H	• D0 to D6143 • D9000 to D9255 (SD1000 to SD1255)*1 Note, however, that local devices cannot be accessed.	• 0000_H to $17FF_H$ • 2328_H to 2427_H
	Link register	5720 (35_H/37_H/32_H /30_H)	57_H/20_H	W0 to WFFF	0000_H to $0FFF_H$

Classification	Device		Device code		Device range	Device number
			ASCII	Binary		
internal user device	Timer	Contact	5453 (35_H/34_H/35_H /33_H)	54_H/53_H	T0 to T2047 Note, however, that local devices cannot be accessed.	0000_H to $07FF_H$
		Coil	5443 (35_H/34_H/34_H /33_H)	54_H/43_H		
		Current value	544E (35_H/34_H/34_H /45_H)	54_H/$4E_H$		
	Retentive timer	Contact	-	-	Cannot be accessed.	
		Coil	-	-		
		Current value	-	-		
	Counter	Contact	4353 (34_H/33_H/35_H /33_H)	43_H/53_H	C0 to C1023 Note, however, that local devices cannot be accessed.	0000_H to $03FF_H$
		Coil	4343 (34_H/33_H/34_H /33_H)	43_H/43_H		
		Current value	434E (34_H/33_H/34_H 45_H)	43_H/$4E_H$		
	Link special relay		-	-	Cannot be accessed.	
	Link special register		-	-		
	Step relay		-	-		
	Direct input		-	-		
	Direct output		-	-		
Internal system device	Function input		-	-		
	Function output		-	-		
	Function register		-	-		
	Special relay		-	-		
	Special register		-	-		
Index register			-	-		
File register*2			5220 (35_H/32_H/32_H /30_H)	52_H/20_H	R0 to R8191 Note that local devices cannot be accessed.	0000_H to $1FFF_H$
Extended data register			4420 (34_H/34_H/32_H /30_H)	42_H/20_H	• D0 to D6143 • D9000 to D9255 (SD1000 to SD1255)*1	• 0000_H to $17FF_H$ • 2328_H to 2427_H
Extended link register			5720 (35_H/37_H/32_H /30_H)	57_H/20_H	W0 to WFFF	0000_H to $0FFF_H$

*1 When M9000 to M9255 (D9000 to D9255) are specified, specify SM1000 to SM1255 (SD1000 to SD1255). Make sure to check the checkbox in the "A-PLC Compatibility Setting" field in the PLC system tab of the PLC parameters.

*2 Available for the CPU modules with the following serial number (first five digits).

- QnUDE(H)CPU: "14112" or later
- QnUDVCPU: "15043" or later
- QnUDPVCPU: "15072" or later

5.1.3 Precautions

(1) Number of devices

Only the external devices set in "Ethernet Conf." or "Open Setting" can be connected concurrently using MC protocol.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

⇨ Ethernet Conf. / Open Setting button*1

*1 Ethernet Conf. button can be used with the QnUDVCPU and QnUDPVCPU.

(2) Data communication frame

The following table lists the availability of data communication frames.

Communication frame	Availability
4E frame	○ *2*3
QnA-compatible 3E frame	○ *3
A-compatible 1E frame	○ *1*3

*1Available for the QnUDE(H)CPU with a serial number (first five digits) of "13102" or later

*2 Available for the High-speed Universal model QCPU and Universal model Process CPU with serial number (first five digits) of "18052" or later

*3 Even if the monitoring timer is set, the set value is ignored.

(3) Access range

- Only the connected CPU module can be accessed. Accessing another module will cause an error.
- In a multiple CPU system, other CPU modules not connected to Ethernet cannot be accessed.
- Accessing a CPU module on another station in CC-Link IE, MELSECNET/H, Ethernet or CC-Link via a connected CPU module is not possible.

(4) When UDP is selected for Protocol

- If a new request message is sent to a UDP port after the previous request message is sent to the same port and before no response is returned, the new request message will be discarded.
- Setting the same host station port number for multiple UDP connections is regarded as one setting. For communication with multiple devices using the same host station port number, select TCP.

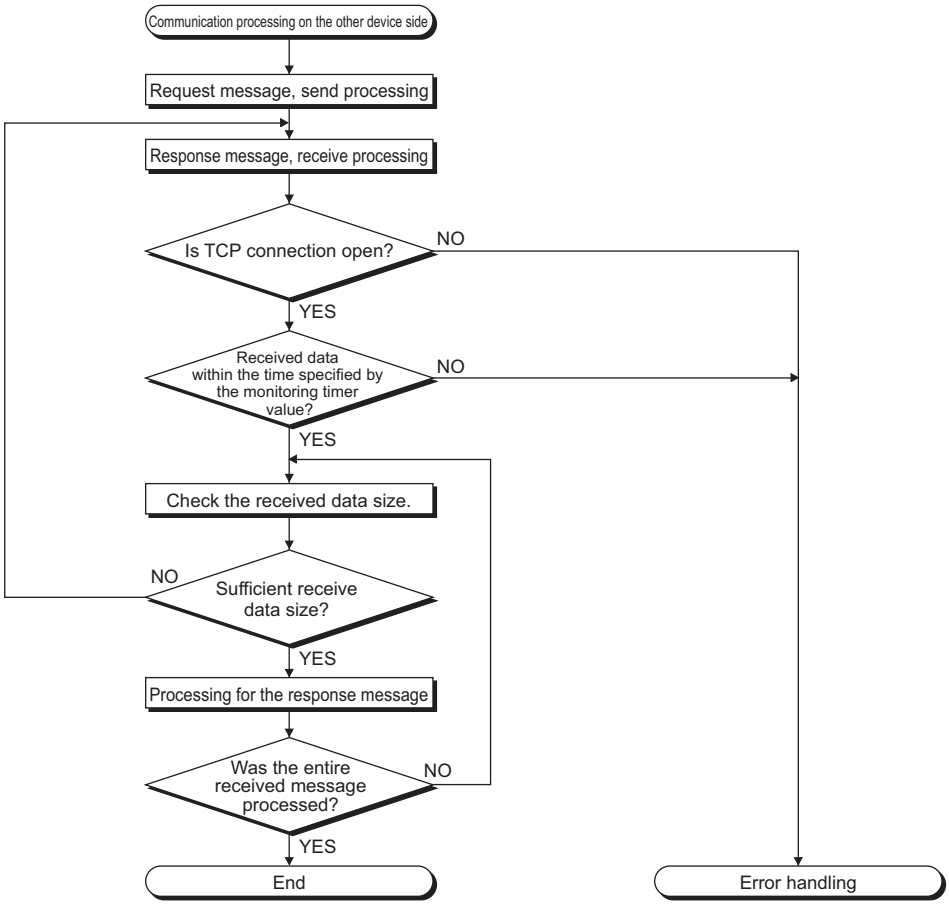
(5) File access during MC communication

The CPU module will perform file access processing prior to Ethernet communication processing. Because of this, processing of the MC protocol function may be delayed if a file is accessed by FTP or a programming tool during use of the MC protocol function.

When accessing a file while response time monitoring is performed on the connected device with the MC protocol function, add the time required for file access to the monitoring time.

(6) Receiving a response message

The following shows an example of receive processing on the other device side.



Point

For Ethernet communication, TCP socket functions are used inside personal computers.
The functions do not have boundary concept. Therefore, if the sender sent data by calling the "send" function once, the receiver needs to call the "recv" function once or more times to read out the data. ("send" does not correspond to "recv" on the one-to-one basis.) For this reason, the processing shown above is always required on the program of the receiving device. Note that, if the "recv" function is used in blocking mode, data may be read by calling the function once.

(7) Sending request messages consecutively

When request messages are sent consecutively without waiting for the reception of the response message using 4E frame, the number of commands must not exceed the limit listed as follows.

TCP/UDP	Applicable number of commands for processing per one connection*1
TCP	11680 ÷ Message size (byte)
UDP	1 + (Number of messages that can be stored in receive buffer (576) ÷ Number of connections to be used)

*1 If the calculation result became a decimal, the number after the decimal points will be rounded down to an integer.

Remark

If the number of commands exceeds the limit, the communication becomes in the following state. In that case, decrease frequency of request message transmission.

- For TCP, there becomes no space in the receive buffer of the CPU module. Since the window size becomes zero, an external device stops sending request messages until the receive buffer will have enough space.
- For UDP, an error may occur in the CPU module or the response message may not be sent from the CPU module.

5.1.4 Error codes, end codes, and abnormal codes in MC protocol communication

When an error occurs during MC protocol communication, an error code is sent from the CPU module to the external device. The following table lists error codes, error descriptions, and corrective actions.

(1) When 4E frame or QnA-compatible 3E frame is used

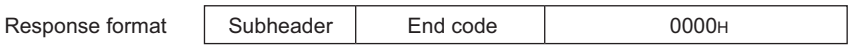
Error code (Hexadecimal)	Description	Corrective action
4000_H to $4FFF_H$	Errors detected by the CPU module (Errors occurred in other than MC protocol communication)	Refer to the following manual. QCPU User's Manual(Hardware Design, Maintenance and Inspection)
0050_H	A code other than specified ones is set to command/response type of subheader.	• Check the command data of MC protocol and others. • Perform communication again. If the same error occurs, please consult your local Mitsubishi representative.
0055_H	Although online change is disabled, the connected device requested the RUN-state CPU module for data writing.	• Before enabling online change, write the data. • Change the CPU module state to STOP and write the data.
$C050_H$	When "Communication Data Code" is set to ASCII Code, ASCII code data that cannot be converted to binary were received.	• Select Binary Code for "Communication Data Code", and restart the CPU module. • Correct the send data of the connected device and resend the data.
$C051_H$ to $C054_H$	The number of read or write points is outside the allowable range.	Correct the number of read or write points, and resend the data to the CPU module.
$C056_H$	The read or write request exceeds the maximum address.	Correct the start address or the number of read or write points, and resend the data to the CPU module. (The maximum address must not be exceeded.)
$C058_H$	The request data length after ASCII-to-binary conversion does not match the data size of the character area (a part of text data).	Check and correct the text data or the request data length of the header, and resend the data to the CPU module.
$C059_H$	• The command and/or subcommand are specified incorrectly. • The CPU module does not support the command and/or subcommand.	• Check the request. • Use commands and/or subcommands supported by the CPU module.
$C05B_H$	The CPU module cannot read data from or write data to the specified device.	Check the device to be read or written.
$C05C_H$	The request data is incorrect. (e.g. reading or writing data in units of bits from or to a word device)	Correct the request data and resend it to the CPU module. (e.g. subcommand correction)
$C05D_H$	No monitor registration	Perform monitor registration before monitoring.
$C05F_H$	The request cannot be executed to the CPU module.	• Correct the network number, PC number, request destination module I/O number, or request destination module station number. • Correct the read/write request data.
$C060_H$	The request data is incorrect. (ex. incorrect specification of data for bit devices)	Correct the request data and resend it to the CPU module.
$C061_H$	The request data length does not match the number of data in the character area (a part of text data).	Check and correct the text data or the request data length of the header, and resend the data to the CPU module.
$C06F_H$	The CPU module received a request message in ASCII format when "Communication Data Code" is set to Binary Code, or received it in binary format when the setting is set to ASCII Code. (This error code is only registered to the error history, and no abnormal response is returned.)	• Send a request message that matches the "Communication Data Code" setting. • Change the "Communication Data Code" setting so that it will match the request message.
$C070_H$	The device memory extension cannot be specified for the target station.	Read data from or write data to the device memory without specifying the extension.
$C0B5_H$	The CPU module cannot handle the data specified.	• Correct the request data. • Stop the current request.
$C200_H$	The remote password is incorrect.	Correct the remote password, and unlock and lock the remote password function again.

Error code (Hexadecimal)	Description	Corrective action
$C201_H$	The port used for communication is locked with the remote password. Or, because of the remote password lock status with "Communication Data Code" set to ASCII Code, the subcommand and later part cannot be converted to a binary code.	Unlock the remote password before communication.
$C204_H$	The connected device is different from the one that requested for unlock processing of the remote password.	From the device that requested the unlock processing, request for lock processing of the remote password.

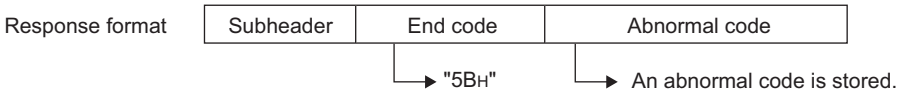
(2) When A-compatible 1E frame is used

An end code and abnormal code are added to a response in MC protocol communication that uses A-compatible 1E frames.

◆When the end code is a value other than "5BH"



◆When the end code is "5BH"



(a) End codes

End code	Description	Corrective action
00_H	Data is communicated successfully.	-
54_H	When the communication data code setting is set to ASCII code in the Built-in Ethernet port QCPU, ASCII code data that cannot be converted to binary code was received.	Correct the send data on the external device side.
55_H	When the setting for online change is disabled on the Built-in Ethernet port tab of PLC parameter in GX Developer, an external device requested online change to the CPU module.	• Enable online change and write data. • Change the status of the CPU module to STOP and write data.
56_H	An external device specified the incorrect device.	Specify the device correctly.
57_H	• The number of points for a command specified by an external device exceeds the maximum number of processing points (number of points can be processed per communication) for each processing. • The number of points specified from the start address (start device number) exceeds the maximum address (maximum device number) for each processing. • The length of a command message is too short to analyze.	• Correct the number of points specified or the start address (start device number). • Check the command.
	Monitoring was requested without monitor data being registered.	Register the monitor data.
58_H	The start address (start device number) of a command specified by an external device exceeds the setting range.	Correct the start address within the setting range for each processing.
	The file register (R) cannot be specified.	Check the device.
	• A word device is specified in a command for bit devices. • In a command for word devices, the start number of a bit device is specified by a value other than a multiple of 16.	Correct the command or the specified device.
$5B_H$	The CPU module cannot process requests from an external device.	Identify an error location according to the abnormal code and correct the error.

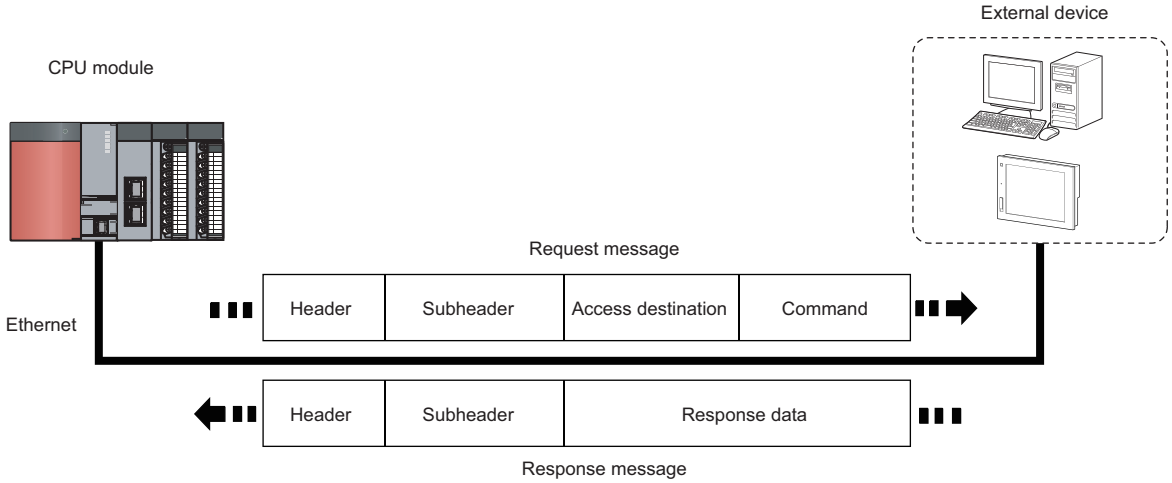
(b) Abnormal codes

If the end code is "$5B_H$," an abnormal code is attached immediately after the code. The following table lists the abnormal codes to be attached, error details, and required actions.

Abnormal code	Description	Corrective action
4000_H to $4FFF_H$	CPU detected error (Error that occurred in other than communication using the MC protocol)	Refer to the following manual. QCPU User's Manual (Hardware Design, Maintenance and Inspection)
$C080_H$	PC number of another station (01_H to 80_H) is specified.	Specify the PC number of own station (FF_H).
$C201_H$	The communication target port is in the remote password locked status. Or, when the communication data code setting is set to ASCII code, any data of subcommands and later cannot be converted to binary code since the remote password is locked.	Perform remote password unlock processing before communication.

5.2 Sending a Command from the CPU Module to an External Device Note 5.1

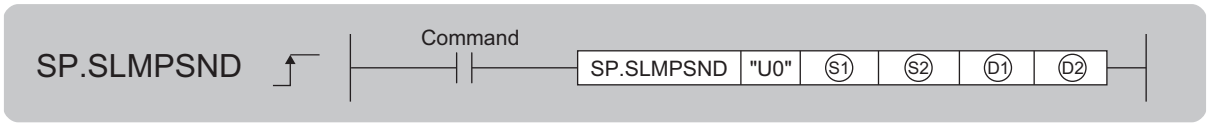
MC protocol messages (QnA-compatible 3E frame and 4E frame) can be sent from the CPU module to external devices on the Ethernet network.
To send the messages, use the SLMP frame send instruction.



Note 5.1 Universal

The SLMP frame send instruction can be used only with the QnUDVCPU and QnUDPVCPU.
When sending a command from the CPU module to an external device, check the versions of the CPU module.
(Page 224, Appendix 3)

5.2.1 Sending an SLMP frame (SP.SLMPSND)



Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
(S1)	-	○*1	○*1	-				-	-
(S2)	-	○	○	-				-	-
(D1)	-	○*1	○*1	-				-	-
(D2)	○*1	-	○*1	-				-	-

*1 File registers set for each local device or program cannot be used.

(1) Setting data

Setting data	Description	Set by*1	Data type
U0	Dummy	-	Character string
(S1)	Start number of the device from which control data are stored	User, system	Device name
(S2)	Start number of the device from which a request frame is stored	User	Device name
(D1)	Start number of the device from which a response frame is stored	System	Device name
(D2)	Start number of the device which turns on for one scan upon completion of the instruction. (D2)+1 also turns on when the instruction is completed with an error.	System	Bit

*1 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SLMPSND instruction.
System: The CPU module stores the execution result of the SP.SLMPSND instruction.

(2) Control data

Device	Item	Description	Setting range	Set by[*1]
ⓢ1+0	Execution/error completion type	b15 b7 b0 1 | 0 | [2] | 0 | [1] [1] Execution type • 0: Without arrival check (The instruction is regarded as completed when a request message is sent from the host station.)[*2] • 1: With arrival check (The instruction is regarded as completed when a response message is received from the external device.) [2] Error completion type Specify whether to set data the instruction is completed with an error. • 0: Do not set data in ⓢ1+13 and later at completion with an error. (Clear ⓢ1+13 and later.) • 1: Set data in ⓢ1+13 and later at completion with an error.	-	User
ⓢ1+1	Completion status	The completion status is stored. 0000_H: Completed normally Other than 0000_H: Completed with an error (error code)	-	System
ⓢ1+2	Host station channel No.	Specify the channel to be used by own station. Since whether or not a serial number[*3] is given to the request message depends on the channel, specify the channel as follows according to the application. • 1: No serial number is given • 2 to 9: Serial number is given	1 to 9	User
ⓢ1+3	IP address of external device (third and fourth octets)	Specify the IP address (third and fourth octets) of external device. b15 b8 b7 b0 3 | 4 3, 4: Indicates the octets of the IP address.	00000001H to FFFFFFFEH (1 to 4294967294) (both ⓢ1+3 and ⓢ1+4 together)	User
ⓢ1+4	IP address of external device (first and second octets)	Specify the IP address (first and second octets) of external device. b15 b8 b7 b0 1 | 2 1, 2: Indicates the octets of the IP address.		User
ⓢ1+5	Target device port number	Specify the port number of the target device.	1 to 65534 (1 to $FFFE_H$)	User
ⓢ1+6	Request destination network number	Fixed to 0000_H	0000_H	User
ⓢ1+7	Request destination station number	Fixed to $00FF_H$	$00FF_H$	User

Device	Item	Description	Setting range	Set by[*1]
⑤1+8	Request destination module I/O number	Specify an access target module. • $03FF_H$: Host station/control CPU • $03E0_H$: Multiple CPU No.1 • $03E1_H$: Multiple CPU No.2 • $03E2_H$: Multiple CPU No.3 • $03E3_H$: Multiple CPU No.4 • $03D0_H$: Control system CPU • $03D1_H$: Standby system CPU • $03D2_H$: System A CPU • $03D3_H$: System B CPU	$03FF_H$, $03E0_H$ to $03E3_H$, $03D0_H$ to $03D3_H$	User
⑤1+9	Request destination multidrop station number	Fixed to 0000_H	0000_H	User
⑤1+10	Number of resends	The device becomes effective when the execution type specified by ⑤1+0 is "1: With arrival check". (1) Before instruction execution Specify the number of resends to be performed if the instruction is not completed within the monitoring time specified by ⑤1+11. (0 to 15 (times)) (2) At completion of instruction The number of resends performed (result) is stored. (0 to 15 (times))	0 to 15	User/system
⑤1+11	Arrival monitoring time	Specify the monitoring time until completion of processing. If processing is not completed within the monitoring time, the request is resent for the number of resends specified in ⑤1+10. 0: 10 seconds 1 to 32767: 1 to 32767 seconds	0 to 32767	User
⑤1+12	Clock setting flag	The validity status (valid or invalid) of the data in ⑤1+13 and later is stored. The data in ⑤1+13 and later is cleared when the instruction is completed normally. 0: Invalid 1: Valid	-	System
⑤1+13	Clock data	Upper 8 bits: Month (01_H to 12_H) Lower 8 bits: Last two digits of the year (00_H to 99_H)	-	System
⑤1+14		Upper 8 bits: Hour (00_H to 23_H) Lower 8 bits: Day (01_H to 31_H)		
⑤1+15		Upper 8 bits: Second (00_H to 59_H) Lower 8 bits: Minute (00_H to 59_H)		
⑤1+16		Upper 8 bits: First two digits of the year (00_H to 99_H) Lower 8 bits: Day of the week (00_H (Sun) to 06_H (Sat))		

Device	Item	Description	Setting range	Set by*1
Ⓢ1+17	IP address of error detected device (third and fourth octets)	The IP address (third and fourth octets) of the device where an error was detected is stored. b15 b8 b7 b0 3 | 4 3, 4: Indicates the octets of the IP address.	-	System
Ⓢ1+18	IP address of error detected device (first and second octets)	The IP address (first and second octets) of the device where an error was detected is stored. b15 b8 b7 b0 1 | 2 1, 2: Indicates the octets of the IP address.		

*1 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SLMPSND instruction.
System: The CPU module stores the execution result of the SP.SLMPSND instruction.

*2 If Ⓢ1+0 is set to "0: Without arrival check", receive data is not set. Set 0 in Ⓢ1+0 in the following cases:
- When a command that does not return a response message is used
- When a response message is not referred to

*3 Give the serial numbers when sending several request messages to the same MC protocol-compatible device. Serial numbers to be given are automatically numbered by the system. For the serial number, refer to the following.

MELSEC Communication Protocol Reference Manual

(3) Request frame

Device	Item	Description	Setting range	Set by*1
ⓢ2+0	Request data length	Specify the data length from the monitoring timer to the request data. (In units of bytes)	1 to 2000	User
ⓢ2+1	Monitoring timer	This timer sets the waiting time for the external device that received a request message to wait for the response after it issued a processing request to the access destination. (Unit: Increments of 250ms) 0: Infinite wait 1 to 65535: 1 to 65535 × 250ms	0 to 65535	User
ⓢ2+2 to ⓢ2+n	Request data	The request data of the MC protocol message is stored.	-	User

*1 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SLMPSND instruction.

(4) Response frame

Device	Item	Description	Setting range	Set by*1
ⓓ1+0	Response data length	The data length from the end code to the response data is stored. (In units of bytes)	2 to 2000	System
ⓓ1+1	End code	The result of command processing is stored. In normal end, 0 is stored. In abnormal end, an error code set by the external device is stored.	-	System
ⓓ1+2 to ⓓ1+n	Response data	Execution results for the request data are set. (Some commands do not return response data.)	-	System

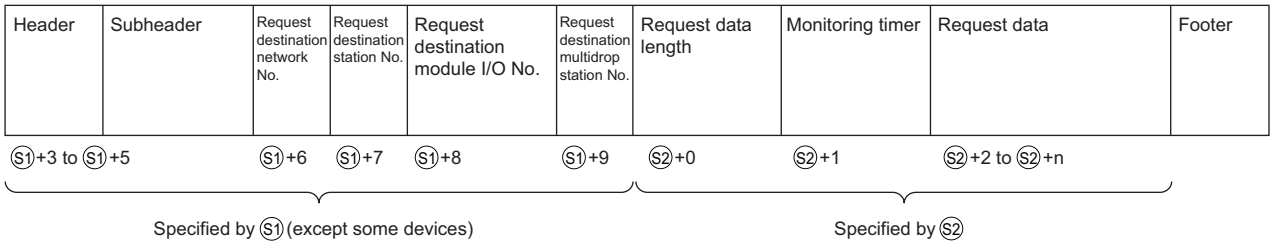
*1 The "Set by" column indicates the following.
System: The CPU module stores the execution result of the SP.SLMPSND instruction.

(5) Function

- This instruction sends the request frame in the device specified by (S2) and later to the external device specified by the external device IP address in the control data. When a response message is received from the external device, it is stored in the device specified by (D1).

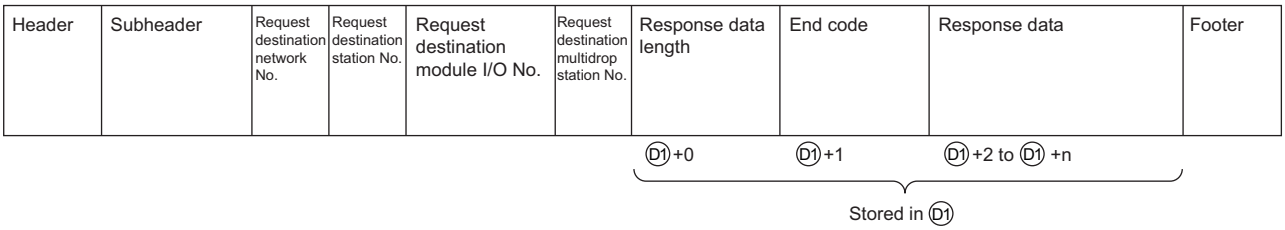
The following figures show the request data and the response data when the instruction is completed normally or with an error.

- Request data

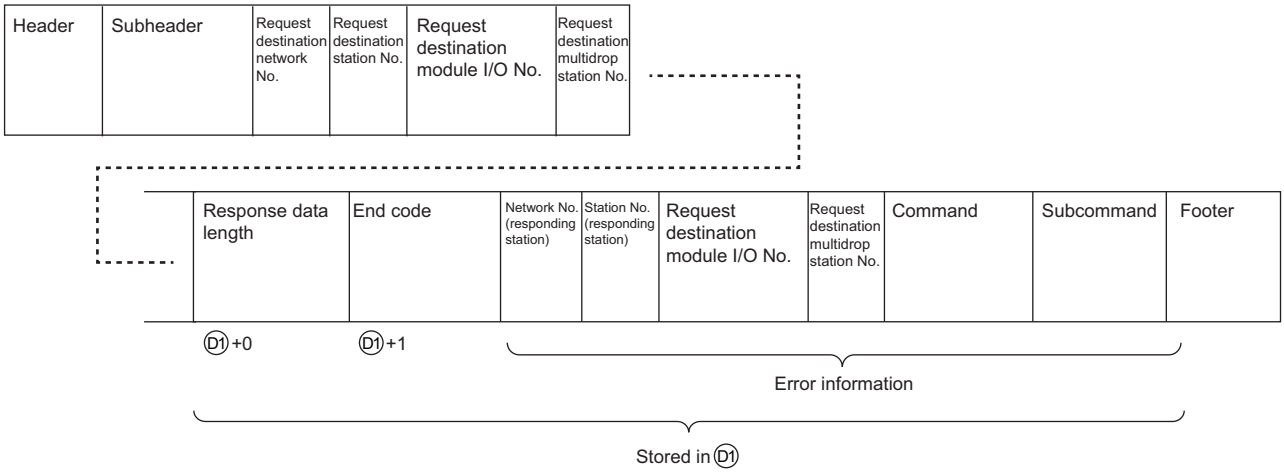


- Response data

When completed normally



When completed with an error



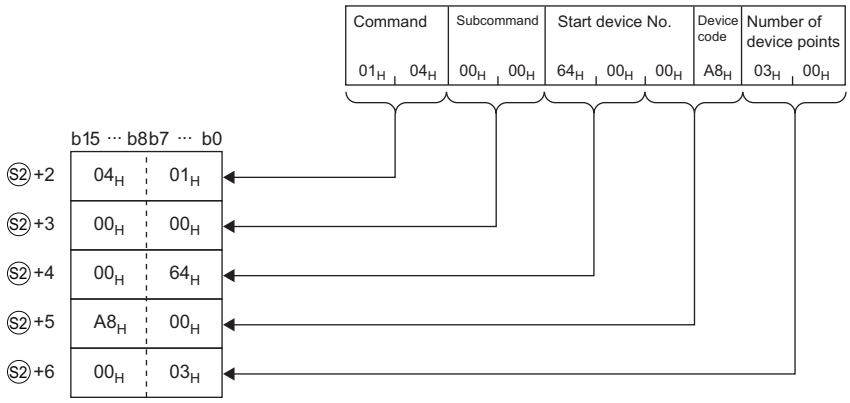
- The SP.SLMPSND instruction communicates using UDP. Set the external device to use UDP.
- The SP.SLMPSND instruction communicates in binary code. Match the setting of the external device also with the binary code.
- When the setting is configured in "Simple PLC Communication Setting" of the PLC parameter, the SP.SLMPSND instruction cannot be executed.

- The result of the SP.SLMPSND instruction can be checked with the completion device, (D2)+0 and (D2)+1.
  - Completion device (D2)+0
    This device turns on at the END processing of the scan in which the SP.SLMPSND instruction is completed and turns off at the next END processing.
  - Completion device (D2)+1
    This device turns on or off according to the result of the SP.SLMPSND instruction.

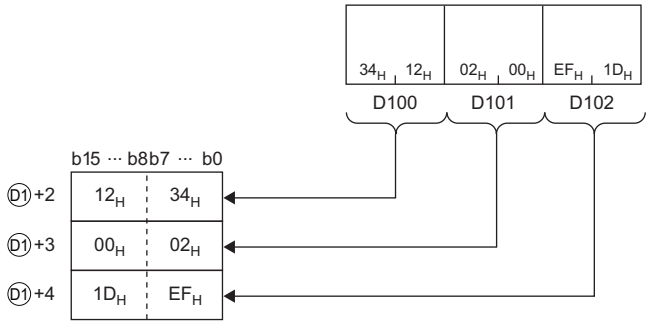
State	Description
When completed normally	Remains off.
When completed with an error	Turns on at the END processing of scan in which the SP.SLMPSND instruction is completed and turns off at the next END processing. When the instruction is completed with an error, an error code is stored in the completion status of (S1)+1.

Ex. Sending "Batch read in word units (command: 0401_H)" which reads the value in D100 to D102

- Request data



- Response data



(6) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

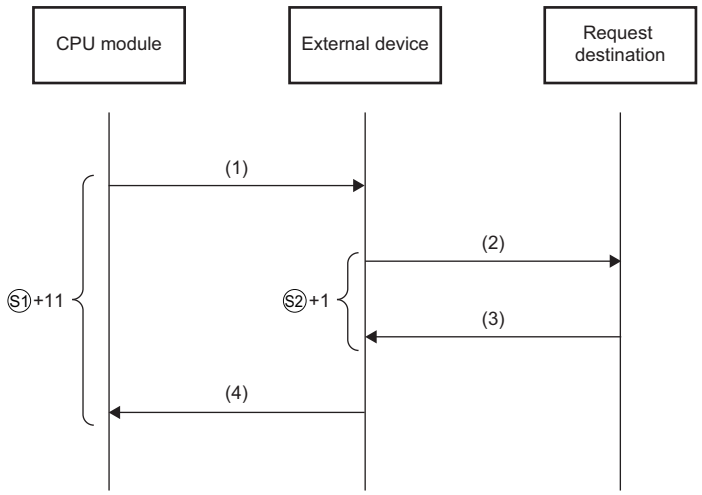
- An instruction is used in a CPU module with a serial number (first five digits) of "18111" or earlier.
  (Error code: 4002)
- The value specified by ⓢ1+2 as the host station channel number is outside the specified range.
  (Error code: 4101)
- The value specified by ⓢ2+0 as the request data length is out of the range of 1 to 2000.
  (Error code: 4100)
- The device specified by ⓢ1, ⓢ2, ⓓ1, or ⓓ2 exceeds the range of the number of device points.
  (Error code: 4101)
- A device which cannot be specified is specified.
  (Error code: 4004)
- An instruction has been executed when the simple PLC communication is set in the PLC parameter.
  (Error code: 4161)

When the instruction completes with an error, the completion status indication device ⓓ2+1 turns on and an error code is stored in the completion status ⓢ1+1. For the error code stored in the completion status ⓢ1+1, refer to the following.

QCPU User's Manual(Hardware Design, Maintenance and Inspection)

(7) Precautions

- When executing multiple SP.SLMPSND instructions concurrently, be careful not to overlap the channels of the SP.SLMPSND instructions. Multiple SP.SLMPSND instructions specifying the same channels cannot be used concurrently. When the execution conditions of the SP.SLMPSND instructions in the same channel are satisfied in the same sequence scan, only the SP.SLMPSND instruction that has been executed first is enabled and the subsequent SP.SLMPSND instructions are not executed. In addition, any subsequent SP.SLMPSND instruction of the same channel setting as the SP.SLMPSND instruction being executed is not executed.
- Specify the arrival monitoring time (Ⓢ1+11) of the control data and monitoring timer (Ⓢ2+1) of the request frame so that the value of the arrival monitoring time is equal to or greater than that of the monitoring timer.



(1) Request message
(2) Processing request from external device to request destination
(3) Processing response from request destination to external device
(4) Response message

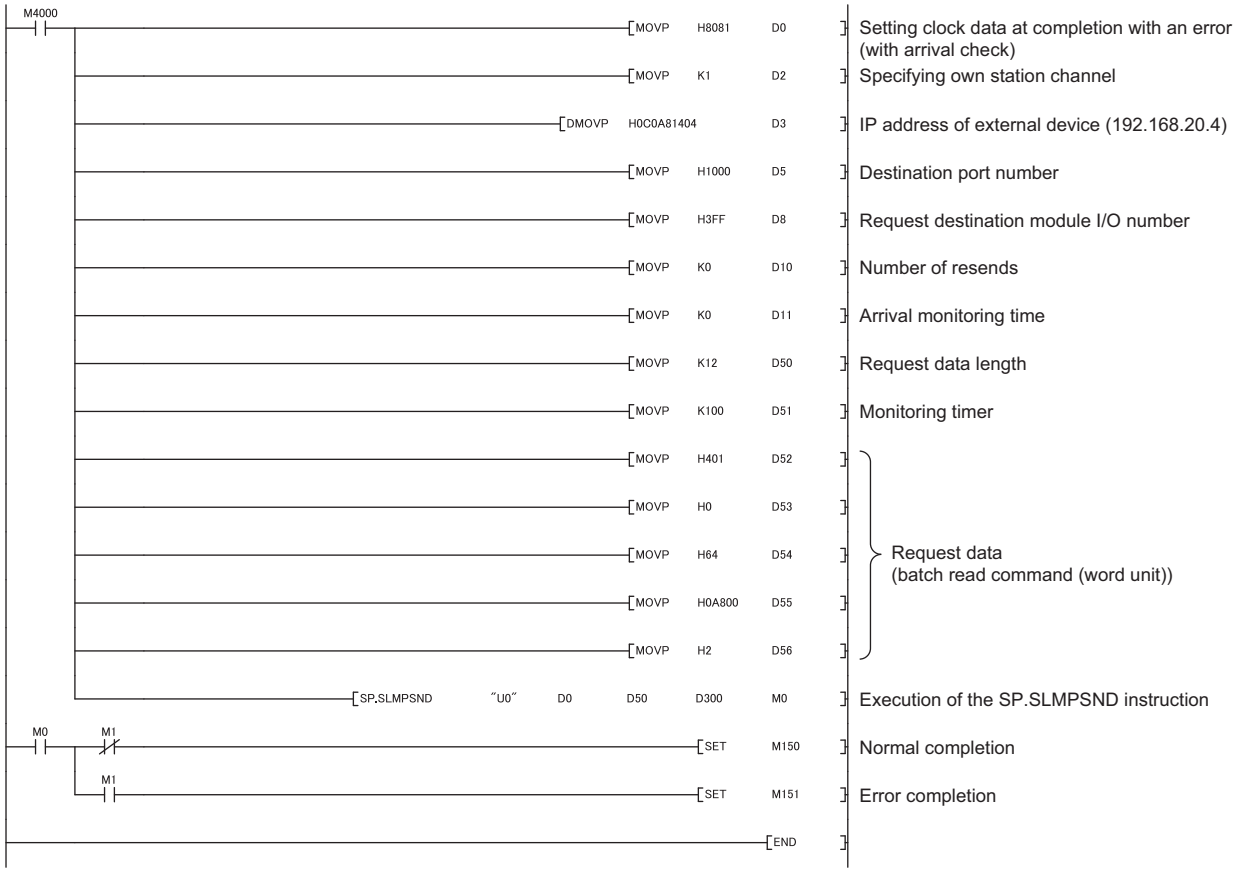
Point

The SP.SLMPSND instruction is normally completed even if the external device returns an abnormal response. When the SP.SLMPSND instruction is completed normally, whether the response is normal or abnormal can be identified by the end code of the response frame. When an abnormal response is returned, check the manual of the external device being used and take corrective action.

- An available port number $F000_H$ to $FFFE_H$ is used for the SP.SLMPSND instruction as a host station port number. Therefore, during the execution of the SP.SLMPSND instruction, do not specify $F000_H$ to $FFFE_H$ as a host station port number for other functions such as the SP.SOCOPEN instruction and the iQ Sensor Solution function of the built-in Ethernet port. If these numbers are set, the function may not be completed properly.

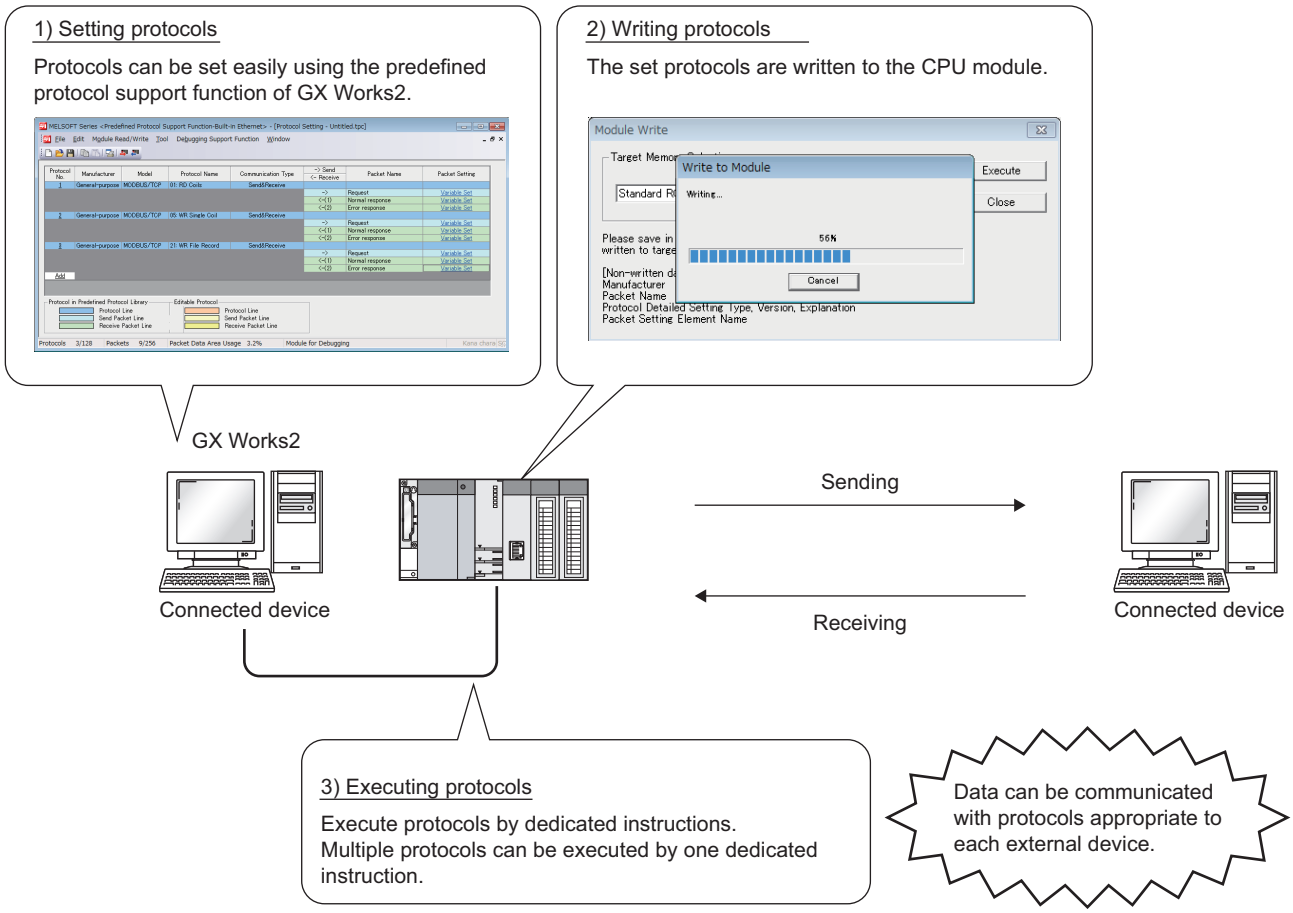
(8) Program example

When M4000 is turned on, this sample program sends "Batch read in word units (command: 0401_H)" to the CPU module on another station for which the IP address has been set to 192.168.20.4, and reads the values in D100 to D101 (two words).



CHAPTER 6 DATA COMMUNICATIONS USING THE PREDEFINED PROTOCOL Note 6.1

The predefined protocol function sends and receives packets predefined by using GX Works2, enabling easy communications with external devices (such as measuring instruments and bar code readers). Protocols can be either selected from the prepared predefined protocol library, or created and edited by users.



Note 6.1 Universal

The predefined protocol function can only be used for the QnUDVCPU and QnUDPVCPU.
When using the predefined protocol function, check the versions of the CPU module and GX Works2.
(Page 224, Appendix 3)

6.1 Specifications

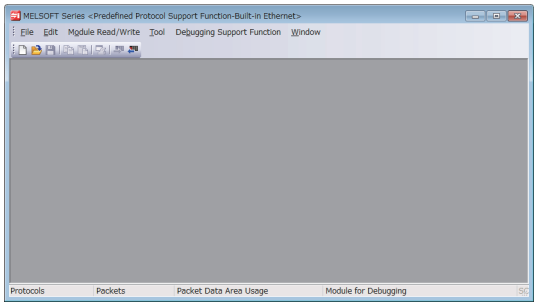
The following table lists the specifications.

Item		Description
Protocol setting data	Number of protocols*1	Up to 128
	Number of packets*2	Up to 256
	Packet area data size*3	Up to 12288 bytes
Available connection		Connection No.1 to No.16
Protocol execution method		SP.ECPRTCL instruction
Communication data code		Binary code
Length of data that can be sent or received at a time		Up to 2046 bytes

*1 Number of protocols specified as the protocol setting data
*2 Total number of packets set to each protocol
*3 Size as a sum of all packets

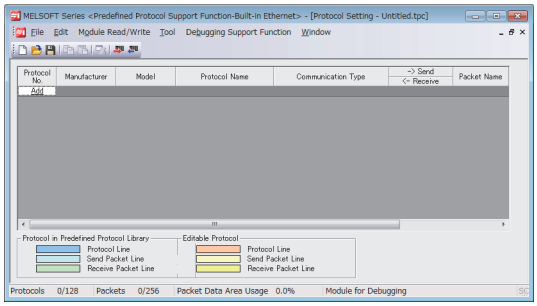
6.2 Setting Method

The setting required for using the predefined protocol function is described below.



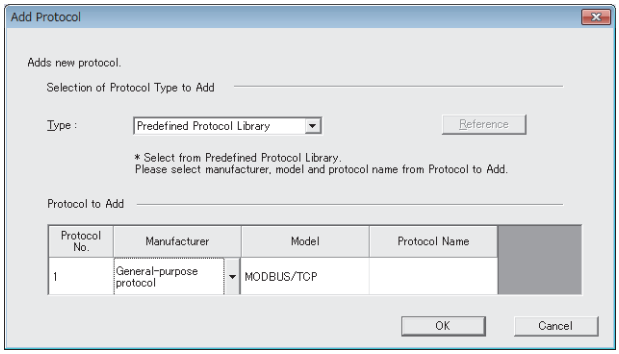
1. Open the "Predefined Protocol Support Function" window.

[Tool] ⇨ [Predefined Protocol Support Function] ⇨ [Built-in Ethernet]



2. Create a new file.

[File] ⇨ [New...] ⇨ "Add"



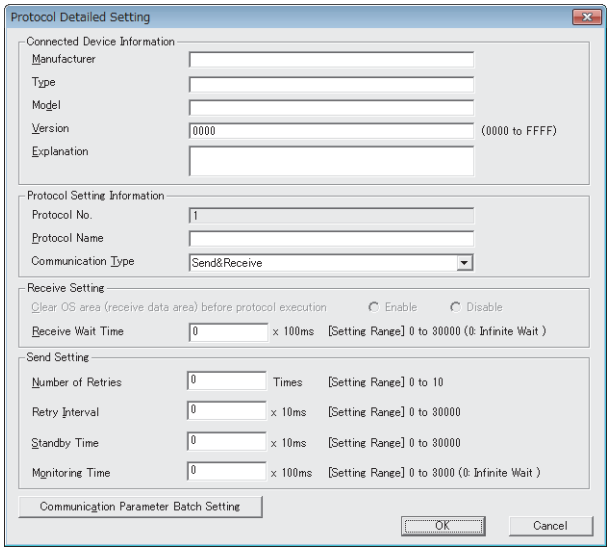
3. In the "Add Protocol" window, select "Predefined Protocol Library" or "Add New".

When "Predefined Protocol Library" is selected, select a desired protocol from the library registered in GX Works2.

Point

Select "User Protocol Library" in the "Add Protocol" window to read the protocol stored by the user. For details of the user protocol library, refer to the following.

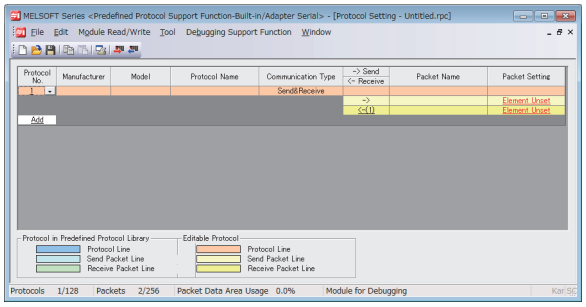
GX Works2 Version 1 Operating Manual (Intelligent Function Module)



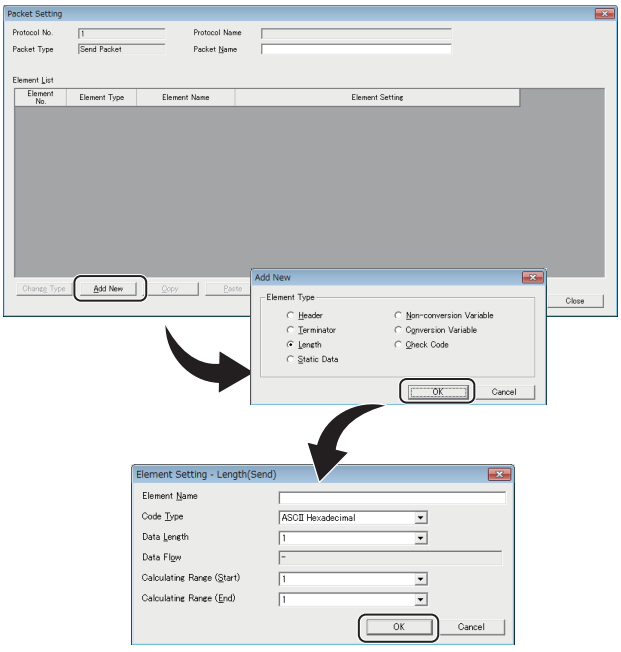
4. **Set the items required for data communications.**

In the "Protocol Detailed Setting" window, set the communication parameters for the protocol.

"Protocol Setting" window ⇨ Select protocol ⇨ [Edit] ⇨ [Protocol Detailed Setting]



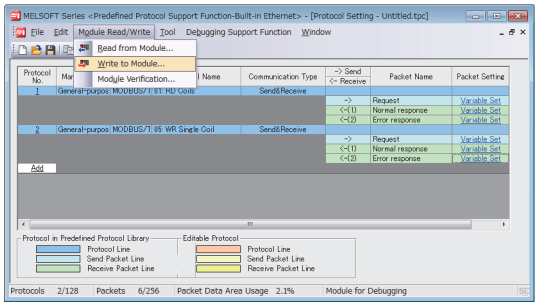
↓



5. **Set the packet configuration.**

In the "Packet Setting" window, set the configuration of packets to be sent or received.

"Protocol Setting" window ⇨ "Variable Unset" or "Element Unset"



6. Write the protocol setting data to the CPU module.

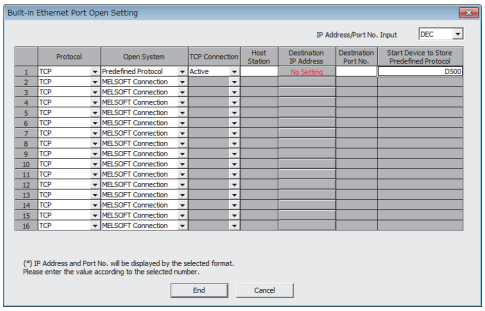
In the "Writing Protocol Setting" window, specify the write-target drive in the CPU module and write the protocol setting data.*1

[Module Read/Write] ⇨ [Write to Module]

*1 The written protocol setting data will be enabled when
- the CPU module is powered on or is reset, or
- SM1355 (Predefined protocol setting check request) is turned on.

Point

- To enable the written protocol setting data without powering off or resetting the CPU module, turn on SM1355 (Predefined protocol setting check request). Before enabling the protocol setting data, stop the CPU module and check that no instruction is being executed. Depending on the on-timing of SM1355 (Predefined protocol setting check request), the instruction being executed may end abnormally.

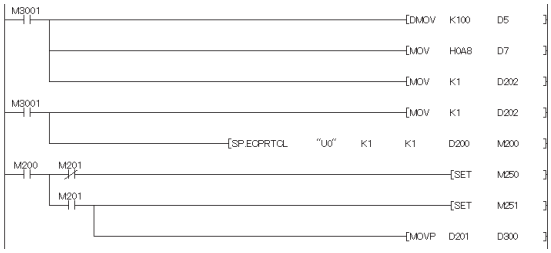


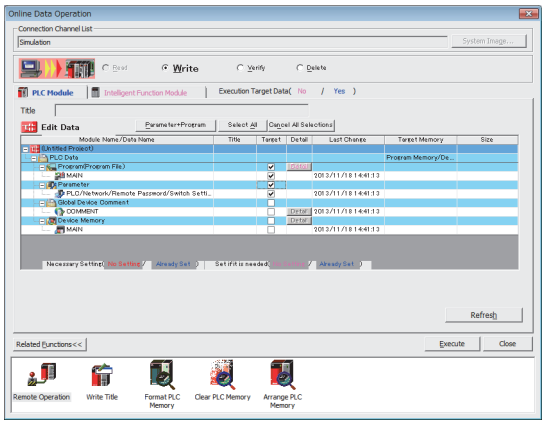
7. Set the connection for connecting the predefined protocol.

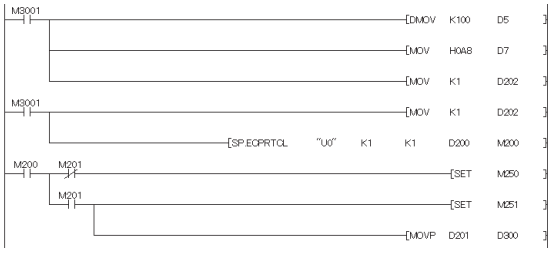
[PLC Parameter] ⇨ [Built-in Ethernet Port Setting] ⇨ [Open Setting]

Item	Description
Protocol	Select "TCP" or "UDP".
Open System	Select "Predefined Protocol".
TCP Connection	When "Protocol" is "TCP", select the connection method. (☞ Page 89, Section 7.1)
Host Station	Set the port number of the CPU module. Setting range: 0001_H to 1387_H, 1392_H to $FFFE_H$ (1 to 4999, 5010 to 65534)*1
Destination IP Address	Set the IP address of the external device. Setting range: 0.0.0.1 to 223.255.255.254
Destination Port No.	Set the port number of the external device. • Setting range: 0001_H to $FFFE_H$ (1 to 65534) (for TCP) • Setting range: 0001_H to $FFFE_H$/$FFFF_H$ (1 to 65534/65535) (for UDP)
Start Device to Store Predefined Protocol	Set the start device number for storing the protocol execution status, received data verification result, number of protocol executions, and protocol cancellation status. (☞ Page 82, Section 6.2 (1)) The area of 19 words starting from the specified device is used. Available devices: D, W, R, ZR

*1 Do not specify 1388_H to 1391_H (5000 to 5009) because these ports are used by the system. (☞ Page 223, Appendix 2)







8. Create a program for starting data communications.

- In the case of Active open, create the program in which SP.SOCOPEN instruction is used to establish a connection. (Page 107, Section 7.4.1)
- To activate the predefined protocol, the SP.ECPRTCL instruction is used. (Page 84, Section 6.4.1)

9. Write the program to the CPU module.

[Online] ⇨ [Write to PLC]

10. Execute the program written to the CPU module by using the SP.ECPRTCL instruction.

For the protocol setting method, refer to the following.

GX Works2 Version 1 Operating Manual (Intelligent Function Module)

(1) Start device to store the predefined protocol operation status

In the open setting, set the start device where the predefined protocol operation status is to be stored. The following information is stored in the area of 19 words starting from the selected device.

Start Device to Store Predefined Protocol (offset)	Name	Description*1
+0	Protocol execution status	The execution status of the predefined protocol function is stored. (Default: 0) • 0: Not executed • 1: Waiting for data to be sent • 2: Data being sent • 3: Waiting for data to be received • 5: Execution completed
+1	Received data verification result (received packet No.1)	The verification result of received packet No.1 is stored. (Default: 0) (☞ Page 82, Section 6.2 (1) (a)) • b0 to b7: Element No. where the verification result did not match • b8 to b15: The cause of mismatch (verification result code)
+2 to 16	Received data verification result (received packet No.2 to 16)	The bit configuration is the same as the received packet No.1.
+17	Number of protocol executions	The number of protocol executions is stored. (Default: 0) • 0: No execution • 1 to 65535: Number of executions (The value remains the same after 65535.)
+18	Protocol cancellation specification	The protocol cancellation request status is stored. (Default: 0) • 0: No cancellation requested • 1: Cancellation requested (set by users) • 2: Cancellation completed (set by the system)

*1 Even after data communications by the predefined protocol function (executed by the SP.ECPRTCL instruction) is completed, the stored values are held.

(a) Received data verification result

The following information is stored in the Received data verification result.

• Element No. where the verification result did not match (b0 to b7)

Stored value	Description
0	Verification matched
1 to 32	Element No. where the verification result did not match
FF_H	Verification not performed

• The cause of mismatch (verification result code) (b8 to b15)

Stored value	Description	Cause
00_H	Normal	—
01_H	Insufficient receive data	The total packet size of receive data is smaller than that set in protocol data.
10_H	Data not matched	The receive data do not match the value set in protocol data.
11_H	ASCII-Binary conversion error	When "ASCII Hexadecimal" is set in Code Type, data not in ASCII code are received.
12_H	Data length error	The received Length value exceeds 2046 bytes.
30_H	Data length size error	The Length value received from the external device does not match the actual length of received data.
FF_H	Verification not performed	—

6.3 Setting Items of Predefined Protocol Support Function

6.3.1 Communication type

There are three protocol communication types: "Send Only", "Receive Only", and "Send & Receive".

For details of the protocol communication types, refer to the following.

Q Corresponding Ethernet Interface Module User's Manual (Basic)

6.3.2 Packet elements set for "Packet Setting"

The packet elements include "Length", "Static data", "Non-conversion Variable", and "Non-verified Reception".
Up to 32 elements can be set in a single packet.

The protocol setting method and packet elements are the same as those of the Ethernet interface module, except for some differences.

Q Corresponding Ethernet Interface Module User's Manual (Basic)

The following are the differences.

- Read the E71 (Ethernet interface module) as the CPU module in the manual.
- Buffer memory cannot be set as a data storage area for non-conversion variable.

6.4 Predefined Protocol Function Instructions

The predefined protocol function instructions are provided for the CPU module to use the predefined protocol function. This section describes the predefined protocol function instructions.

Instruction	Description	Reference
SP.SOCOPEN	Establishes a connection with the external device. If an Active open is performed by the CPU module, the SP.SOCOPEN instruction is used to establish a connection with the external device.	Page 89, Section 7.1 Page 107, Section 7.4.1
SP.SOCCLOSE	Closes a connection with the external device.	Page 111, Section 7.4.2
SP.SOCCINF	Reads out connection information.	Page 125, Section 7.4.6
SP.SOCCSET	Changes the target of the connection for UDP/IP communications.	Page 128, Section 7.4.7
SP.ECPRTCL	Executes the configured predefined protocol.	Page 84, Section 6.4.1

Point

If the instruction has a completion device, do not change any data (such as control data and request data) specified for the instruction until the execution is completed.

6.4.1 Executing the predefined protocol (SP.ECPRTCL)

This instruction sends and receives packets set by the predefined protocol support function of GX Works2.
Usage of the SP.ECPRTCL instruction is the same as that of the GP.ECPRTCL instruction for the Ethernet interface module, except for some differences. For the GP.ECPRTCL instruction, refer to the following.

Q Corresponding Ethernet Interface Module User's Manual (Basic)

The following are the differences.

Item	Differences
Setting data Un	U0 (dummy) needs to be specified. Since this is a dummy, no change is required when replacing from the GP.ECPRTCL instruction of the Ethernet interface module.
Setting data n1	The connection No. set in the "Open Setting" of the "Built-in Ethernet Port Setting" tab need to be specified.
Protocol execution status	The protocol execution status can be checked by "Start Device to Store Predefined Protocol" in the "Open Setting" of the "Built-in Ethernet Port Setting" tab.
Pairing open	The pairing open setting is not available in the CPU module. The CPU module sends and receives data using one connection.
Cancellation of protocol execution	Protocol execution can be cancelled by "Start Device to Store Predefined Protocol" (offset+18) set in the "Open Setting" of the "Built-in Ethernet Port Setting" tab. (Page 82, Section 6.2 (1))

6.5 Execution Conditions of Predefined Protocol Function

The predefined protocol function can be executed when the protocol setting data is enabled and SM1354 (Predefined protocol ready) is on. The written protocol setting data will be enabled when

- the CPU module is powered on or is reset, or
- SM1355 (Predefined protocol setting check request) is turned on

SM1354 is used as an interlock signal to execute the protocol.

(1) Operation of SM1354

SM1354 (Predefined protocol ready) is turned on when the protocol setting data is normal, and remains off when the protocol setting data is abnormal or not written.

If the protocol setting data is abnormal, the following occurs.

- The error details are stored in SD1359 to SD1362 (Predefined protocol setting data error information).
- The error code is stored in SD1381 (Predefined protocol function error code).

Registration of the protocol setting data can be checked in the following special register areas.

- SD1363 (Number of protocols registered)
- SD1365 to SD1372 (Protocol registration status)

(2) Changing the protocol setting data without powering off or resetting the CPU module

The protocol setting data can be changed by turning on SM1355 (Predefined protocol setting check request).

After SM1355 turns on, the following occurs.

- SM1354 (Predefined protocol ready) turns off.
- If the protocol setting data is normal, SM1354 turns on, and SM1355 turns off.
- If the protocol setting data is abnormal, SM1354 does not turn on, and SM1355 turns off. The error information is stored in SD1359 to SD1362 (Predefined protocol setting data error information) and SD1381 (Predefined protocol function error code).

6.6 Operation Image and Data Structure of the Predefined Protocol Function

For operation image and data structure of the predefined protocol function, refer to the following. (Read the E71 (Ethernet interface module) as the CPU module.)

Q Corresponding Ethernet Interface Module User's Manual (Basic)

6.7 Precautions

(1) Send/receive packet

- When a message larger than 1460 bytes is sent from the external device using TCP, a packet may be divided. As a result, data may not be received as one message with the predefined protocol function. Keep the message less than 1460 bytes or use UDP.
- When data is received using TCP, separate data blocks that are sent successively may be combined at the receiving side. Therefore, handshaking is required prior to communications.

(2) Predefined protocol setting

Power on or reset the CPU module, or turn on SM1355 (Predefined protocol setting check request) to enable the written protocol setting data. If the written data are not enabled, the data may be changed unintentionally when the CPU module is powered on or is reset.

(3) Device data

Data set by the predefined protocol function are communicated during the service processing. Therefore, if the COM instruction is executed while b15 of SD778 (Refresh processing selection when the COM/CCOM instruction is executed) is on, data communications are also performed at the execution of the COM instruction.

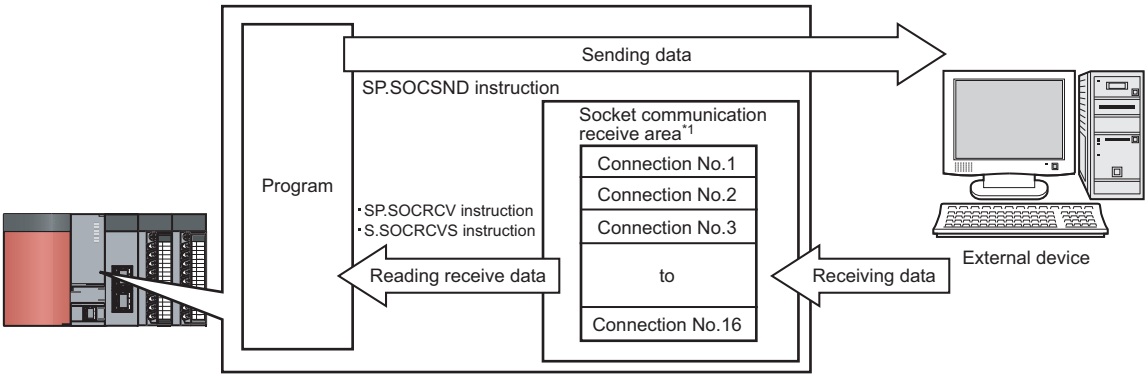
(4) Connection with different open systems

Even the connection for which the open system is set to "Socket Communication" in parameter can be reopened as the predefined protocol after the connection is closed. Similarly, the connection for which the open system is set to "Predefined Protocol" in parameter can be reopened as the socket communication after the connection is closed.

However, if the connection for which the open system is set to "Socket Communication" in parameter is reopened as the predefined protocol after completion of closing, the status storage and protocol cancellation are not possible since the start device to store the predefined protocol operation status cannot be specified.

CHAPTER 7 SOCKET COMMUNICATION FUNCTION Note 7.1

The socket communication function allows data communications with the devices on Ethernet by TCP or UDP using various dedicated instructions.



*1 The area is used for storing data received from the connected open devices.

Remark

- For dedicated instructions used for the socket communication function, refer to: Page 106, Section 7.4
- Access through routers is also available (except for simultaneous broadcast). When configuring the settings for it, set the subnet mask pattern and default router IP address. (Page 30, Section 3.4)

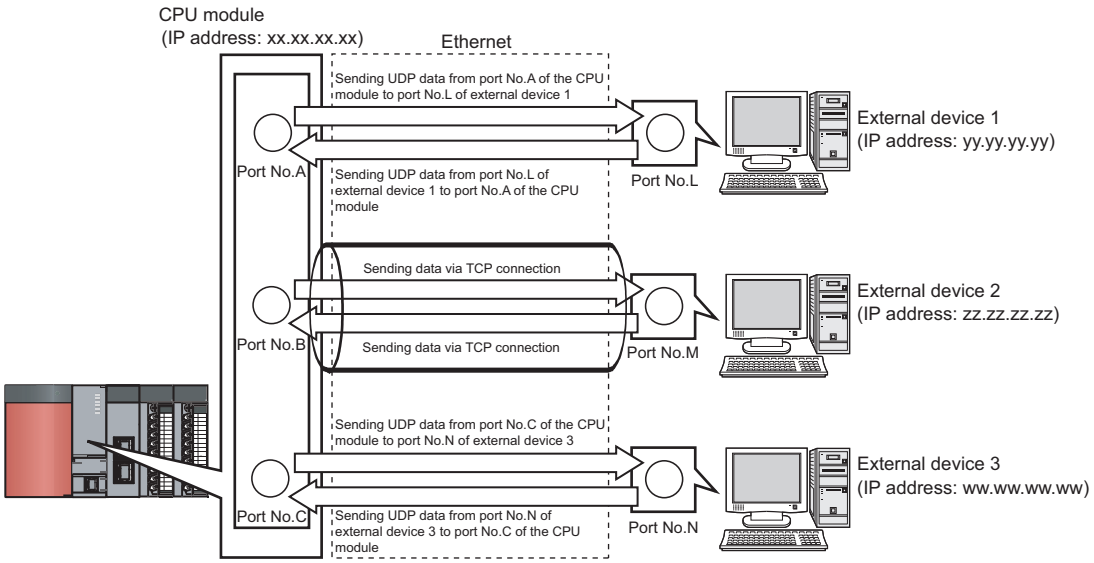
Note 7.1 Universal

Before using the socket communication function for the QnUDE(H)CPU, check the versions of the CPU module and programming tool. (Page 224, Appendix 3)

(1) Port numbers

In socket communication, port numbers are used to identify respective communications and thereby multiple communications are available both on TCP and UDP.

- For sending
  Specify the port number of the CPU module from which data are sent, and the port number of the destination device.
- For receiving
  Specify the port number of the CPU module, and read out the data sent to the port.



7.1 Communication Using TCP

TCP (Transmission Control Protocol) establishes a connection to a device with a port number, and performs reliable data communications.

To perform socket communication using TCP, confirm the following in advance.

- IP address and port number of the target device
- IP address and port number of the CPU module
- Which side will open a connection, the target device or CPU module?
  (Active open or Passive open)

(1) TCP connection

There are two types of open operation for TCP connection: Active open and Passive open.

Firstly, the device waiting for a TCP connection performs a Passive open at the specified port.

The other device performs an Active open by specifying the port number of the device which is waiting in Passive open state.

Through the above process, a TCP connection is established and communication is available.

(a) Active open

Active open is a TCP connection method, which actively opens a connection to the device that is passively waiting for a TCP connection.

(b) Passive open

The following two types of Passive open methods are available for TCP connection.

Type of TCP connection	Description
Unpassive	Allows a connection regardless of the IP address and port number of the connected device. (The IP address and port number of the device connected can be acquired using the SP.SOCCINF instruction.)
Fullpassive	Allows a connection to the device only when the specified IP address and port number are met. A connection made by another device that does not have the specified IP address and port number is automatically disconnected before communication.

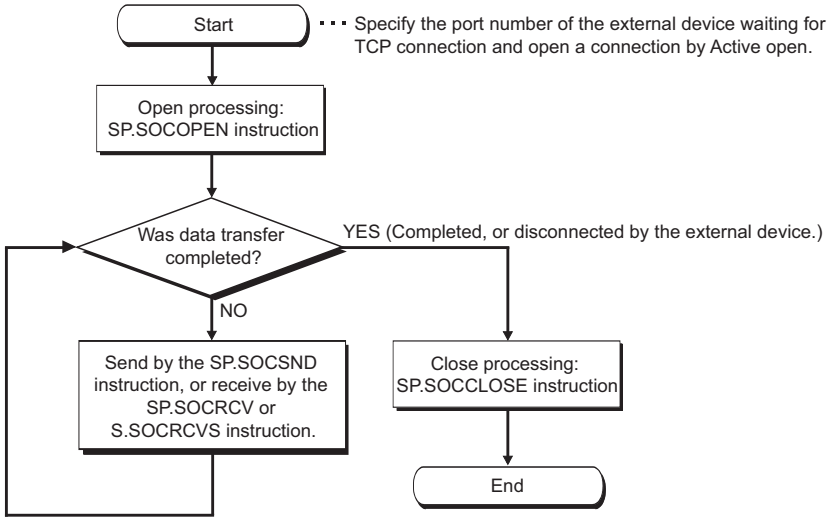
Remark

The expressions of Active and Passive opens may vary according to the device.

- Active open: TCP connection initiating device, client, connecting side, etc.
- Passive open: TCP connection waiting device, server, listening side, etc.

(2) Program example for Active open

The following shows a communication flow of an Active open.



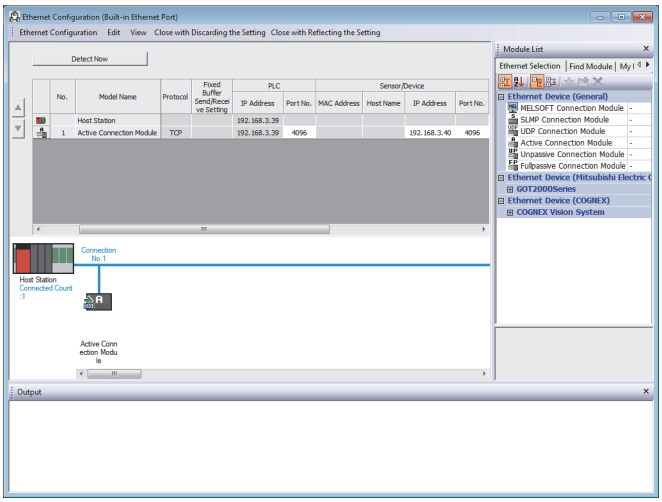
(a) Parameter setting

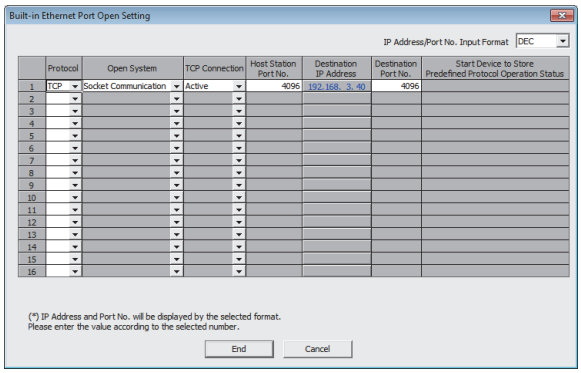
The following parameters are set for the sample program.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

⇨ Ethernet Conf. / Open Setting button*1

*1 Ethernet Conf. button can be used with the QnUDVCPU and QnUDPVCPU.





- For "Ethernet Conf.", drag and drop "Active Connection Module" from "Module List" to the left side on the window. Set the port numbers and IP address as mentioned below.

Item		Setting
PLC	Port No.	4096 (Setting range: 1 to 4999, 5010 to 65534) Do not specify 5000 to 5009 because these ports are used by the system. (☞ Page 223, Appendix 2)
Sensor/Device	IP Address	192.168.3.40 (Setting range: 0.0.0.1 to 223.255.255.254)
	Port No.	4096 (Setting range: 1 to 65534)

• For "Open Setting"

Item	Setting
Protocol	TCP
Open System	Socket Communication
TCP Connection	Active
Host Station Port No.	1000_H (Setting range: 0001_H to 1387_H, 1392_H to $FFFE_H$)*1
Destination IP Address	192.168.3.40 (Setting range: 0.0.0.1 to 223.255.255.254)
Destination Port No.	1000_H (Setting range: 0001_H to $FFFE_H$)

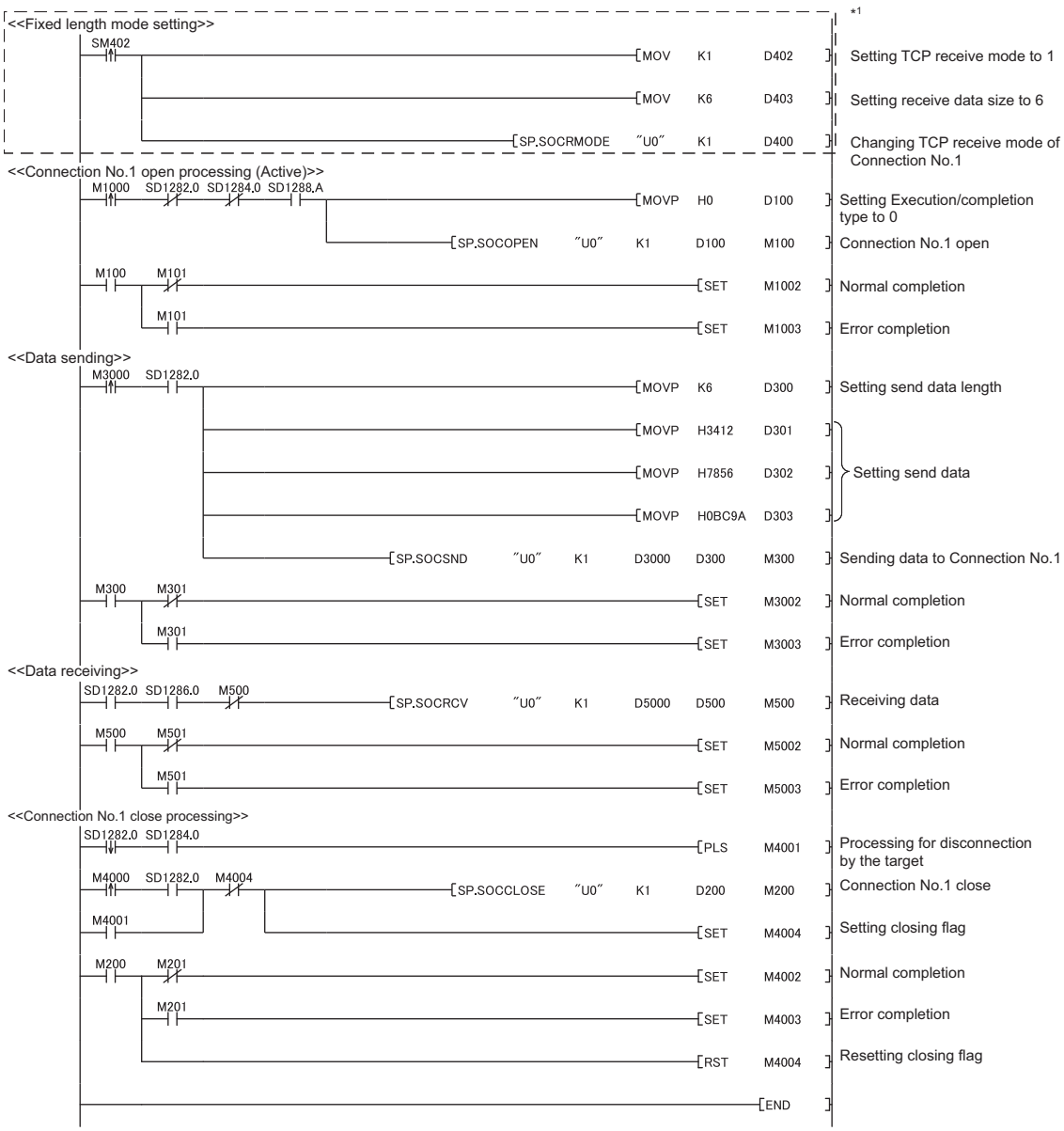
*1 Do not specify 1388_H to 1391_H (5000 to 5009) because these ports are used by the system. (☞ Page 223, Appendix 2)

(b) Devices used in the program

The following table lists the device numbers and applications used in the sample program.

Device number	Application
M1000	Open direction
D100 to D109	SP.SOCOPEN instruction control data
M100 and M101	SP.SOCOPEN instruction completion device
M1002	Normal open indication
M1003	Open error indication
M3000	Send direction
D3000 and D3001	SP.SOCSND instruction control data
M300 and M301	SP.SOCSND instruction completion device
D300 to D303	Send data length and send data (6 bytes of 12_H, 34_H, 56_H, 78_H, $9A_H$, and BC_H)
M3002	Normal send indication
M3003	Send error indication
M4000	Close direction
M4001	Disconnection by the other device
SD1282	Open completion signal
SD1284	Open request signal
SD1286	Receive state signal
SD1288	Connection state signal
D200 and D201	SP.SOCCLOSE instruction control data
M200 and M201	SP.SOCCLOSE instruction completion device
M4002	Normal close indication
M4003	Close error indication
M4004	Closing flag
D400 to D403	SP.SOCRMODE instruction control data
D5000 and D5001	SP.SOCRCV instruction control data
M500 and M501	SP.SOCRCV instruction completion device
D500 and higher	Receive data length and receive data
M5002	Normal receive indication
M5003	Receive error indication

(c) Sample program



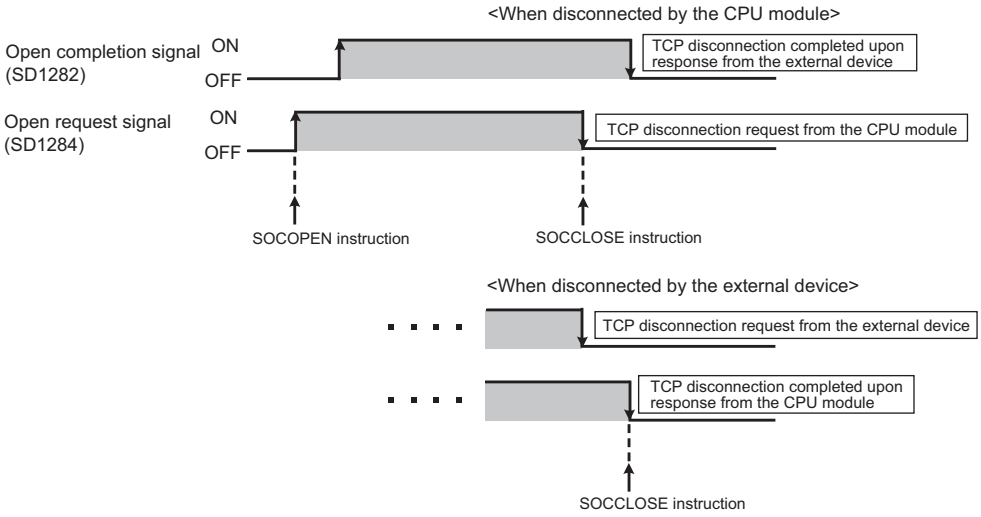
*1 There are two kinds of TCP receive modes: TCP standard receive mode and TCP fixed-length receive mode. For fixing the data size, run the program enclosed by a dotted line. (It can be omitted when the data size is not fixed.)

For the TCP receive mode, refer to the section for the SP.SOCRMODE instruction. (☞ Page 130, Section 7.4.8)

(d) Precaution for Active open communication

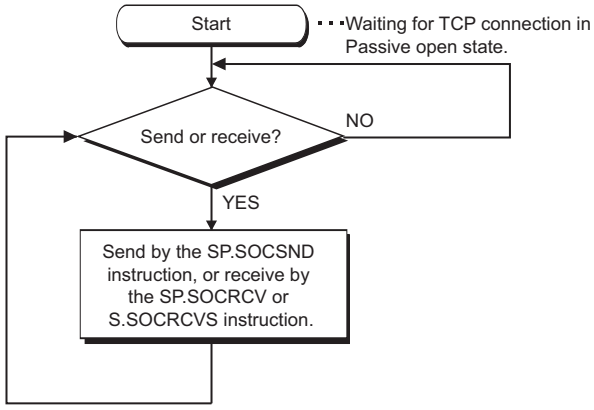
Configure an interlock circuit using the Open completion signal (SD1282) and Open request signal (SD1284) in the program.

The following chart shows on/off timings of the Open completion signal and Open request signal.



(3) Program example for Passive open

The following shows a communication flow of a Passive open.



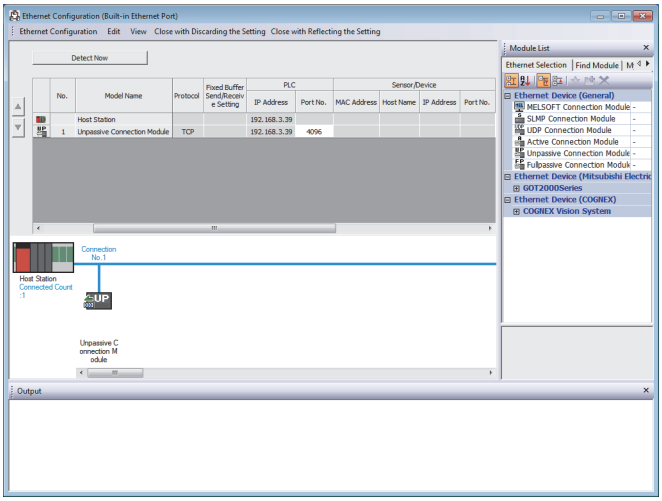
(a) Parameter setting

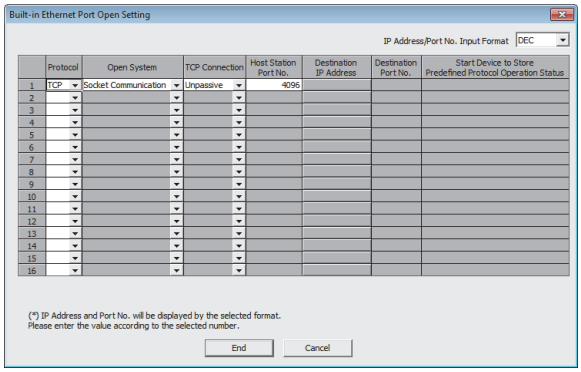
The following parameters are set for the sample program.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

⇨ Ethernet Conf. / Open Setting button*1

*1 Ethernet Conf. button can be used with the QnUDVCPU and QnUDPVCPU.





- For "Ethernet Conf.", drag and drop "Unpassive Connection Module" or "Fullpassive Connection Module" from "Module List" to the left side on the window. Set the port numbers and IP address as mentioned below.

Item		Setting
PLC	Port No.	4096 (Setting range: 1 to 4999, 5010 to 65534) Do not specify 5000 to 5009 because these ports are used by the system. (☞ Page 223, Appendix 2)
Sensor/Device	IP Address	Blank. When "Fullpassive Connection Module" is selected, a value must be set. (Setting range: 0.0.0.1 to 223.255.255.254)
	Port No.	Blank. When "Fullpassive Connection Module" is selected, a value must be set. (Setting range: 1 to 65534)

• For "Open Setting"

Item	Setting
Protocol	TCP
Open System	Socket Communication
TCP Connection	Unpassive
Host Station Port No.	1000_H (Setting range: 0001_H to 1387_H, 1392_H to $FFFE_H$ (1 to 4999, 5010 to 65534))*1
Destination IP Address	Blank. When "Fullpassive" is selected for "TCP Connection", a value must be set. (Setting range: 0.0.0.1 to 223.255.255.254)
Destination Port No.	Blank. When "Fullpassive" is selected for "TCP Connection", a value must be set. (Setting range: 0.0.0.1 to 223.255.255.254)

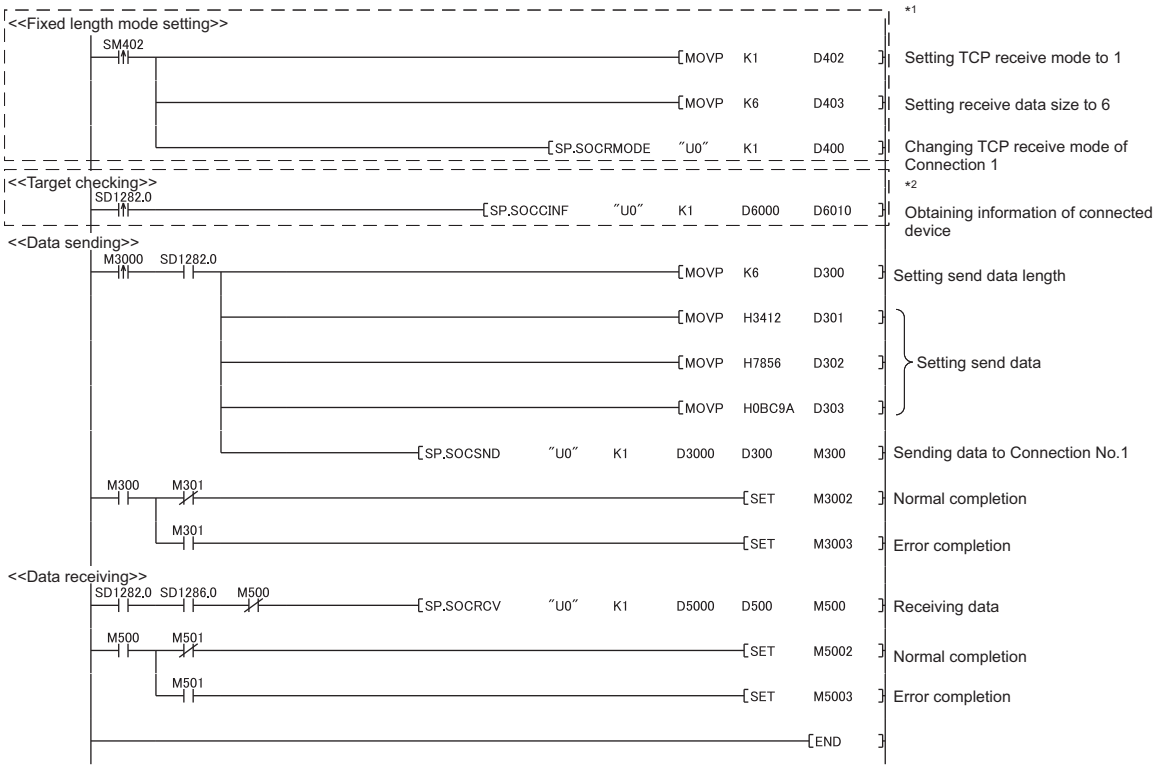
*1 Do not specify 1388_H to 1391_H (5000 to 5009) because these ports are used by the system. (☞ Page 223, Appendix 2)

(b) Devices used in the program

The following table lists the device numbers and applications used in the sample program.

Device number	Application
M3000	Send direction
D3000 and D3001	SP.SOCSND instruction control data
M300 and M301	SP.SOCSND instruction completion device
D300 to D303	Send data length and send data (6 bytes of 12_H, 34_H, 56_H, 78_H, $9A_H$, and BC_H)
M3002	Normal send indication
M3003	Send error indication
D400 to D403	SP.SOCRMODE instruction control data
SD1282	Open completion signal
SD1286	Receive state signal
D5000 and D5001	SP.SOCRCV instruction control data
M500 and M501	SP.SOCRCV instruction completion device
D500 and higher	Receive data length and receive data
M5002	Normal receive indication
M5003	Receive error indication
D6000 and D6001	SP.SOCCINF instruction control data
D6010 to D6014	SP.SOCCINF instruction completion device

(c) Sample program

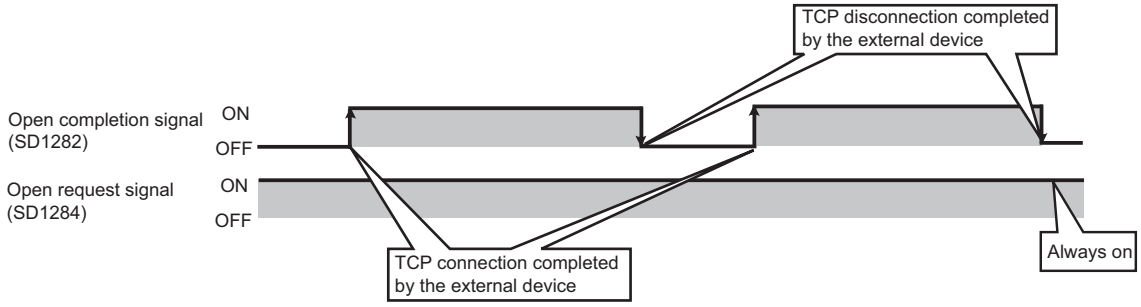


*1 There are two kinds of TCP receive modes: TCP standard receive mode and TCP fixed-length receive mode.
For fixing the data size, run the program enclosed by a dotted line. (It can be omitted when the data size is not fixed.)
For the TCP receive mode, refer to the section for the SP.SOCRMODE instruction. (☞ Page 130, Section 7.4.8)

*2 For acquiring information of the device connected on TCP, run the program enclosed by a dotted line. (It can be omitted when the information acquisition is not needed.)

(d) Precaution for Passive open communication

- Configure an interlock circuit using the Open completion signal (SD1282) and Open request signal (SD1284) in the program.
  The following chart shows on/off timings of the Open completion signal and Open request signal.



- When a device establishes a connection by Passive open, the IP address and port number of the connected device can be acquired using the SP.SOCCINF instruction.
  For the SP.SOCCINF instruction, refer to: ☞ Page 125, Section 7.4.6
- On TCP, one connection is established with one target device.
  To communicate with multiple devices from one port number, prepare the same number of connections as that of the target devices.
  A connection that exceeds the preset number of connections will be disconnected immediately.
- Do not accept a connection from a device until the CPU module is placed in the wait-for-open state.
  If a TCP connection request is received before entering the wait-for-open state after completion of CPU startup, the request will be recognized as an error, and a forced close message for the connection will be returned to the interfacing device.
  In this case, wait until the CPU state is changed to the wait-for-open state and then retry the connection from the device.
- Do not execute the SP.SOCCLOSE instruction in a program.
  Doing so will disable data transfer since the Open completion signal and Open request signal of the corresponding connection turn off for close processing.
  To reopen a closed connection, execute the SP.SOCOPEN instruction.
  For the SP.SOCOPEN instruction, refer to: ☞ Page 107, Section 7.4.1

7.2 Communication Using UDP

UDP (User Datagram Protocol) is a simple protocol that does not perform data sequencing and retransmission.
To perform socket communication using UDP, confirm the following in advance.

- IP address and port number of the target device
- IP address and port number of the CPU module

(1) Program example

This section provides a program example for communication using UDP.

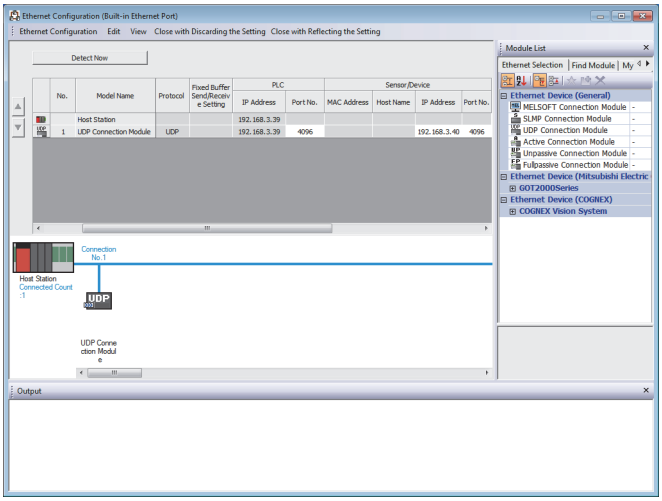
(a) Parameter setting

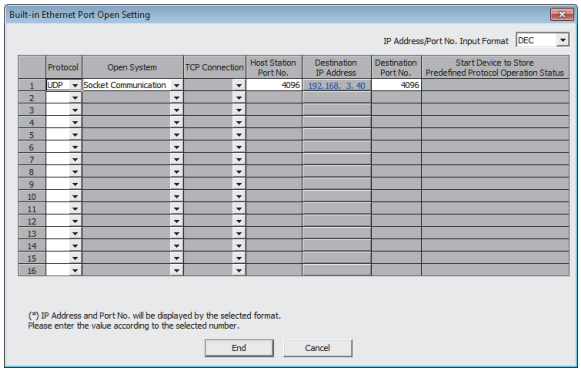
The following parameters are set for the sample program.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

⇨ Ethernet Conf. / Open Setting button*1

*1 The Ethernet Conf. button can be used with the QnUDVCPU and QnUDPVCPU.





- For "Ethernet Conf.", drag and drop "UDP Connection Module" from "Module List" to the left side on the window. Set the port numbers and IP address as mentioned below.

Item		Setting
PLC	Port No.	4096 (Setting range: 1 to 4999, 5010 to 65534) Do not specify 5000 to 5009 because these ports are used by the system. (☞ Page 223, Appendix 2)
Sensor/Device	IP Address	192.168.3.40 (Setting range: 0.0.0.1 to 223.255.255.254/255.255.255.255)
	Port No.	4096 (Setting range: 1 to 65534/65535)

• For "Open Setting"

Item	Setting
Protocol	UDP
Open System	Socket Communication
TCP Connection	Blank
Host Station Port No.	1000_H (Setting range: 0001_H to 1387_H and 1392_H to $FFFE_H$ (1 to 4999, 5010 to 65534))*1
Destination IP Address	192.168.3.40 (Setting range: 0.0.0.1 to 223.255.255.254/255.255.255.255)
Destination Port No.	1000_H (Setting range: 0001_H to $FFFE_H$/$FFFF_H$ (1 to 65534/65535))

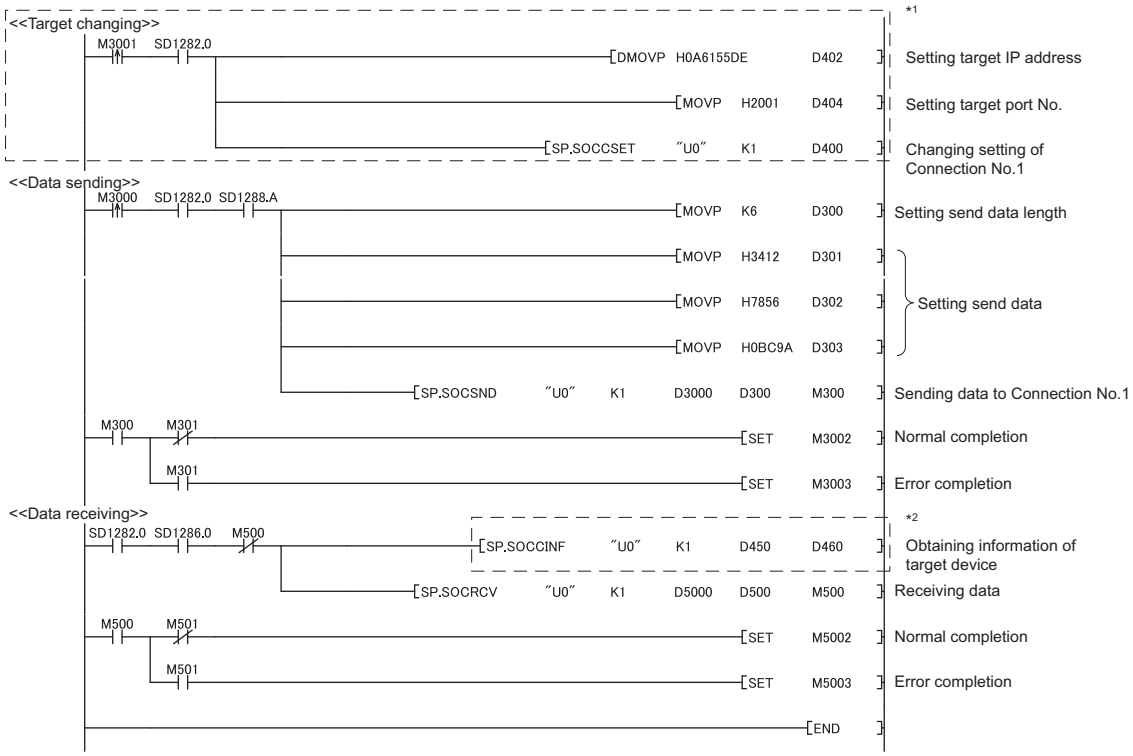
*1 Do not specify 1388_H to 1391_H (5000 to 5009) because these ports are used by the system. (☞ Page 223, Appendix 2)

(b) Devices used in the program

The following table lists the device numbers and applications used in the sample program.

Device number	Application
M3000	Send direction
D3000 and D3001	SP.SOCSND instruction control data
M300 and M301	SP.SOCSND instruction completion device
D300 and D303	Send data length and send data (6 bytes of 12_H, 34_H, 56_H, 78_H, $9A_H$, and BC_H)
M3002	Normal send indication
M3003	Send error indication
D5000 to D5001	SP.SOCRCV instruction control data
M500 to M501	SP.SOCRCV instruction completion device
SD1282	Open completion signal
SD1286	Receive state signal
SD1288	Connection state signal
M3001	Target change direction
D500 and higher	Receive data length and receive data
M5002	Normal receive indication
M5003	Receive error indication
D400 to D404	SP.SOCCSET instruction control data
D450 to D451	SP.SOCCINF instruction control data
D460 to D464	SP.SOCCINF instruction connection information

(c) Sample program



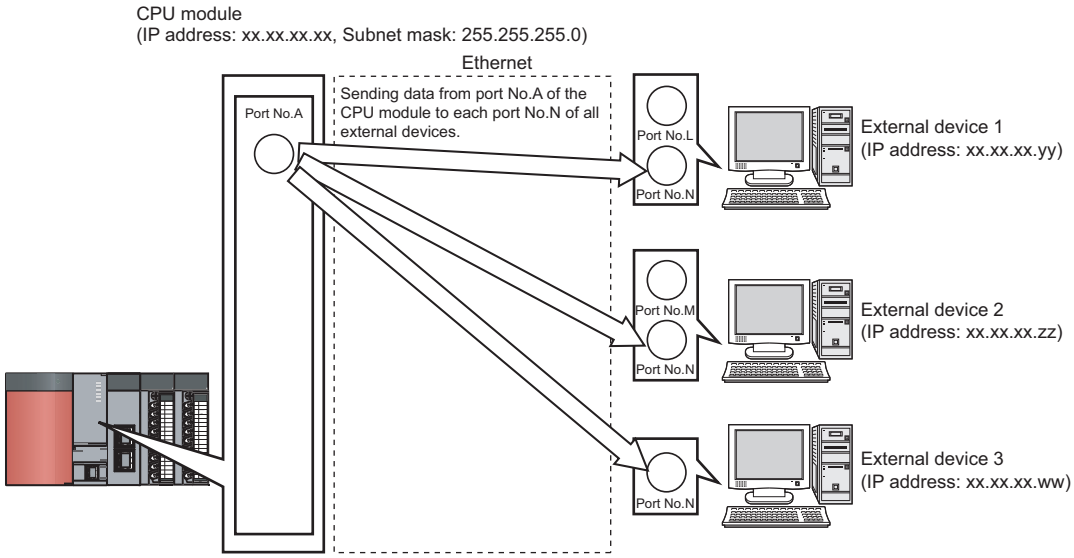
*1 For changing the target device, run the program enclosed by a dotted line. (It can be omitted when the communication target is not changed.) For details, refer to the section of the SP.SOCCSET instruction. (☞ Page 128, Section 7.4.7)

*2 For acquiring information of the target device connected on UDP, run the program enclosed by a dotted line. (It can be omitted when the information acquisition is not needed.)

(2) Simultaneous broadcast

For simultaneous broadcast using UDP, set the parameters as follows.

- Destination IP Address: $FF.FF.FF.FF_H$
- Destination Port No.: $FFFF_H$



Destination IP Address	Destination Port No.	Receiving	Sending
Other than $FF.FF.FF.FF_H$	Other than $FFFF_H$	Receives only the data sent from the specified IP address and port No. among the entire data sent to the host station port No.	Sends data from the host station port No. to the specified IP address and port No.
Other than $FF.FF.FF.FF_H$	$FFFF_H$	Receives the data sent from all ports of the specified IP address among the entire data sent to the host station port No.	N/A
$FF.FF.FF.FF_H$	Other than $FFFF_H$	Receives the data sent from the specified port No. of all the IP addresses among the entire data sent to the host station port No.	Sends data to the port No. specified in the settings for simultaneous broadcast.
$FF.FF.FF.FF_H$	$FFFF_H$	Receives all data that have sent to the host station port No.	N/A

(3) Precautions

(a) Use of UDP

Data may be lost, or may arrive out of order.
Consider the application of TCP if any problem is expected.

(b) Sending and receiving data

Data sending process may be terminated even if the communication line between the CPU module and target device is not connected due to a reason such as cable disconnection.
To avoid this, it is recommended to provide communication procedures at the user's discretion.

(c) Changing the target

Use the SP.SOCCSET instruction to change the target device.
For the SP.SOCCSET instruction, refer to: ☞ Page 128, Section 7.4.7

(d) Open completion signal and Open request signal

Once UDP is selected for a connection, the Open completion signal and Open request signal of the connection are always on.

(e) SP.SOCCLOSE instruction

Do not execute the SP.SOCCLOSE instruction in the program.
Doing so will disable data transfer since the Open completion signal and Open request signal of the corresponding connection turn off for close processing.
To reopen the closed connection, execute the SP.SOCOPEN instruction.
For the SP.SOCOPEN instruction, refer to: ☞ Page 107, Section 7.4.1

(f) Simultaneous broadcast targets

With simultaneous broadcast, data can be sent to the devices which are connected to the same hub of the CPU module, and to those connected to the cascaded hub(s).
Data cannot be received from the devices connected through routers.

(g) Receiving data using simultaneous broadcast

When data are received through a connection of simultaneous broadcast, the IP address and port number of the sender can be acquired by the SP.SOCCINF instruction.
For the SP.SOCCINF instruction, refer to: ☞ Page 125, Section 7.4.6

(h) Connection of simultaneous broadcast

Data cannot be sent when $FFFF_H$ is specified for the port number of the transmission target.
To send data, specify a value other than $FFFF_H$.

(i) Destination IP address of the message transferred by simultaneous broadcast

Use a CPU module IP address of which all the bits corresponding to the host address are on.
When the subnet musk pattern is specified, apply the pattern before using the above mentioned IP address.

Ex.	IP address of the CPU module side	:	64.	168.	3.	39
	Subnet mask pattern	:	None			
	IP address of simultaneous broadcast	:	64.	255.	255.	255

Ex.	IP address of the CPU module side	:	64.	168.	3.	39
	Subnet mask pattern	:	255.	255.	255.	0
	IP address of simultaneous broadcast	:	64.	168.	3.	255

7.3 Precautions for the Socket Communication Function

This section provides other precautions for the socket communication function.

(1) Port number

Host station port number, 0001_H to $03FF_H$, are assigned for reserved port numbers (WELL KNOWN PORT NUMBERS) and $F000_H$ to $FFFE_H$ are for other communication functions. Therefore, using 0400_H to 1387_H and 1392_H to $EFFF_H$ is recommended.

Do not specify 1388_H to 1391_H because these ports are used by the system. (☞Page 223, Appendix 2)

Do not specify 0014_H and 0015_H for the socket communication function when using the FTP function.

Do not specify $007B_H$ for the socket communication function when using the time setting function (SNTP).

Do not specify $F000_H$ to $FFFE_H$ for the socket communication function when using the data logging file transfer function.

(2) Reading out received data

Read out received data when the Receive state signal (SD1286) has turned on.

Communication via the built-in Ethernet port may be affected if a considerable amount of received data have not been read out for a long time.

(3) Conditions for closing

In TCP communications, even if no close request is sent from the connected device, the Open completion signal will turn off to close the connection in the following cases.

- Alive check is timed out.
- Forced close is received from the connected device.

(4) Elements for TCP connection

The following four elements control TCP connections, and only one connection can be established with a unique setting for these elements. To use multiple TCP connections at the same time, at least one of the four elements must be different.

- IP address of the CPU module
- Port number of the CPU module
- IP address of the target device
- Port number of the target device

(5) Reestablishment of the same connection

Allow eight seconds or more before reestablishing a connection of the same target IP address, the same host station port number, and the same target port number after closing it.

If the reestablishment is time-critical, it is recommended to change the host station port number on the Active open side.

(6) Precautions for file access during communication

The CPU module will perform file access processing prior to Ethernet communication processing. Because of this, processing of the socket communication function may be delayed if a file is accessed by FTP or a programming tool during the processing.

When accessing a file while response time monitoring is performed on the connected device with the socket communication function, add the time required for file access to the monitoring time.

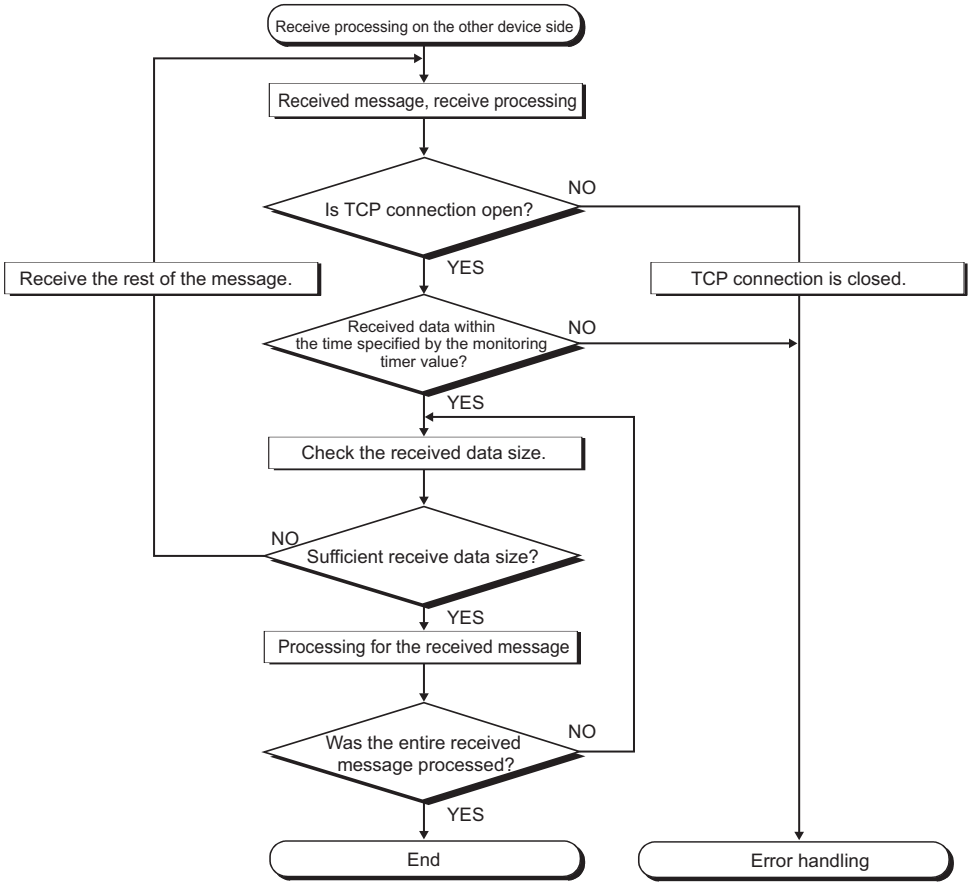
(7) Checking receive data length

Since no delimiter is provided for TCP communication data, on the receiving end, separate data blocks that are sent continuously may be combined, or data sent all at once may be segmented.

The receive data length must be confirmed on the receiving side as necessary.

When data are received on the CPU side and the data length is determined, the fixed-length mode is recommended.

When receiving data on the target device side, confirm the receive data length as shown below.



(8) If an error (error code: $41A0_H$) has occurred

In TCP communications, if an error (error code: $41A0_H$) occurs at the sender, part of send data may have been sent. Therefore, if the data are sent again after the error (error code: $41A0_H$), close the connection to discard the data. Then open a connection again, and send the data again.

7.4 Socket Communication Function Instructions

The socket communication function instructions are provided for the CPU module to use the socket communication function.
This section explains the socket communication function instructions.

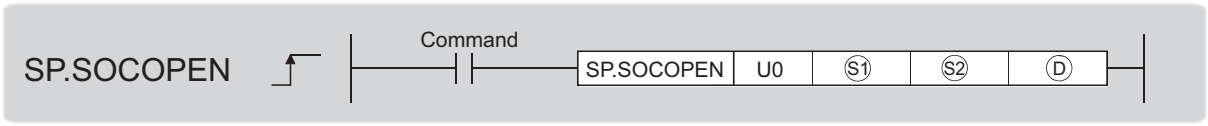
The following is a list of the instructions.

Instruction	Description	Reference
SP.SOCOPEN	Establishes a connection.	Page 107, Section 7.4.1
SP.SOCCLOSE	Closes a connection.	Page 111, Section 7.4.2
SP.SOCRCV	Reads out received data (in END processing).	Page 114, Section 7.4.3
S.SOCRCVS	Reads out received data (upon instruction execution).	Page 118, Section 7.4.4
SP.SOCSND	Sends data.	Page 121, Section 7.4.5
SP.SOCCINF	Reads out connection information.	Page 125, Section 7.4.6
SP.SOCCSET	Changes the target of the connection for UDP/IP communication.	Page 128, Section 7.4.7
SP.SOCRMODE	Changes receive mode of the connection.	Page 130, Section 7.4.8
S(P).SOCRDATA	Reads out data from the socket communication receive data area.	Page 134, Section 7.4.9

Point

- For configuration of data communication using the socket communication function, refer to: Page 89, Section 7.1, Page 98, Section 7.2
- If the instruction has a completion device, do not change any data, such as control data and request data, that are specified for the instruction until the execution of the instruction is completed.
- Do not execute any socket communication function instruction in an interrupt program.
- For error codes, refer to the following.
  QCPU User's Manual (Hardware Design, Maintenance and Inspection)

7.4.1 Establishing a connection (SP.SOCOPEN)



Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
(S1)	-	○	○	-				○	-
(S2)	-	○ *1	○ *1	-				-	-
(D)	○ *1	○ (except for T, ST, and C)	○ *1	-				-	-

*1 File registers set for each local device or program cannot be used.

(1) Setting data

Setting data	Description	Set by*2	Data type
U0	Dummy	-	Character string
(S1)	Connection number (Setting range: 1 to 16)	User	BIN 16-bit
(S2)	Start number of the device from which control data are stored	User, system	Device name
(D)	Start number of the device which turns on for one scan upon completion of the instruction (D)+1 also turns on when failed.	System	Bit

*2 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCOPEN instruction.
System: The CPU module stores the execution result of the SP.SOCOPEN instruction.

Point

When replacing the ZP.OPEN instruction (Ethernet module dedicated instruction), dummy argument can be used in a Built-in Ethernet port QCPU instruction without rewriting.

(2) Control data

Device	Item	Description	Setting range	Set by*3
(S2)+0	Execution/completion type	Specify which settings are used to open a connection, parameter settings configured by a programming tool or control data settings (S2)+2 to (S2)+9. 0000_H: Connection is opened according to the settings set in "Open settings" of PLC parameter. 8000_H: Connection is opened according to the values specified for control data (S2)+2 to (S2)+9.	0000_H 8000_H	User
(S2)+1	Completion status	Completion status is stored 0000_H: Completed Other than 0000_H: Failed (Error code)	-	System
(S2)+2	Application setting area	b15 b14 b13 to b10 b9 b8 b7 to b0 (S2)+2 [4] 0 [3] [2] [1] 0 [1] Communication method (protocol) 0: TCP/IP 1: UDP/IP [2] Socket communication and predefined protocol procedure 1: Nonprocedural (fixed) [3] Predefined protocol setting 0: Predefined protocol function is not used. (Socket communication function is used.) 1: Predefined protocol function is used. [4] Open system 00: Active open or UDP/IP 10: Unpassive open 11: Fullpassive open	As described in the left column	User
(S2)+3	Host station port number	Specify the port number of the host station.	1_H to 1387_H 1392_H to $FFFE_H$	
(S2)+4 (S2)+5	Target device IP address*4	Specify the IP address of the target device.	1_H to $FFFFFFFF_H$ ($FFFFFFFF_H$: Simultaneous broadcast)	
(S2)+6	Target device port number*4	Specify the port number of the target device.	1_H to $FFFF_H$ ($FFFF_H$: Simultaneous broadcast)	
(S2)+7 to (S2)+9	-	Use prohibited	-	System

*3 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCOPEN instruction.
System: The CPU module stores the execution result of the SP.SOCOPEN instruction.

*4 For the Unpassive open, the IP address and port number of the target device are ignored.

*5 Using 0400_H to 1387_H and 1392_H to $EFFF_H$ is recommended because the host station port numbers, 0001_H to $03FF_H$, are assigned for generally reserved port numbers (WELL KNOWN PORT NUMBERS), and $F000_H$ to $FFFE_H$ are used for other communication functions. Do not specify 1388_H to 1391_H because these ports are used by the system. (☞ Page 223, Appendix 2)

(3) Function

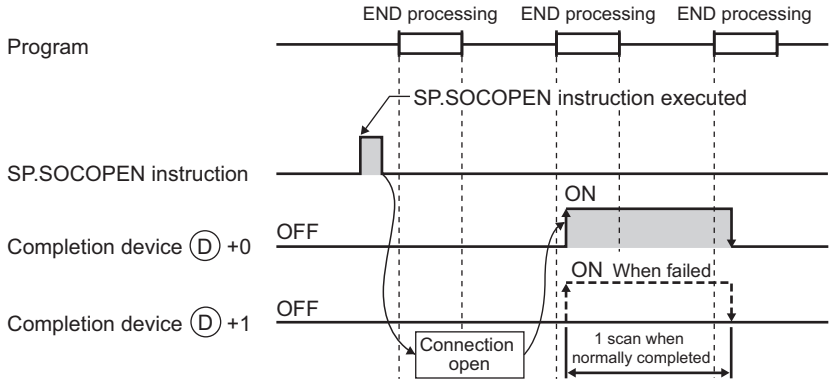
This instruction opens a connection specified in ⓢ1.

The set values used for the open processing is selected in ⓢ2+0.

The result of the SP.SOCOPEN instruction can be checked with the completion device, ⓓ+0 and ⓓ+1.

- Completion device ⓓ+0
  Turns on in the END processing of the scan after completion of the SP.SOCOPEN instruction, and turns off in the next END processing.
- Completion device ⓓ+1
  Turns on or off according to the result of the SP.SOCOPEN instruction.

State	Description
When completed	Remains off.
When failed	Turns on in the END processing of the scan after the SP.SOCOPEN instruction is completed and turns off in the next END processing.



- A connection with no parameters (no protocol is specified) can be opened. In this case, specify 8000_H for ⓢ2+0 and configure open settings in ⓢ2+2 to ⓢ2+9.

(4) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

- The instruction is executed in the QnUDE(H)CPU with a serial number (first five digits) of "11011" or earlier or a CPU module other than the Built-in Ethernet port QCPU.

  (Error code: 4002)
- The connection number specified for ⓢ1 is other than 1 to 16.

  (Error code: 4101)
- The device numbers specified for ⓢ2 and ⓓ exceed the device point range.

  (Error code: 4101)
- An invalid device is specified.

  (Error code: 4004)

(5) Program examples

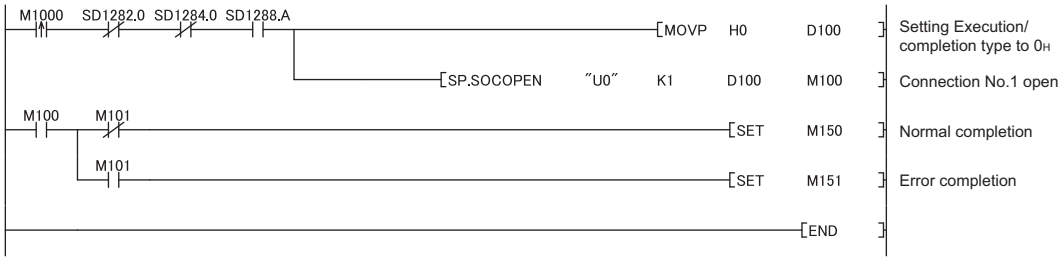
(a) Opening a connection using parameter settings

When M1000 is turned on, connection No.1 is opened using the parameters set in "Open settings" of PLC parameter.

- Devices used

Device number	Application
SD1282	Open completion signal
SD1284	Open request signal
SD1288	Connection state signal
D100	SP.SOCOPEN instruction control data
M100	SP.SOCOPEN instruction completion device

- Program



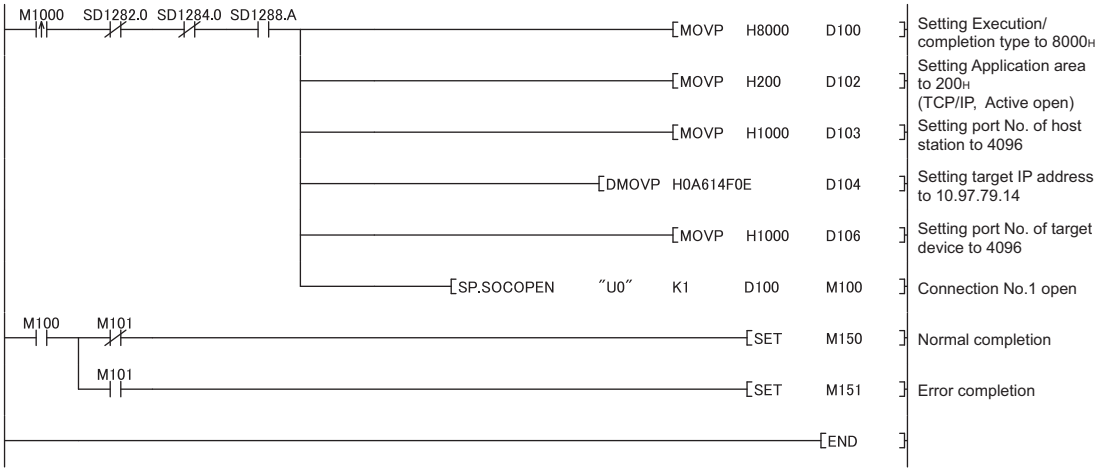
(b) Opening a connection using control data settings

When M1000 is turned on, connection No.1 is opened using control data.

- Devices used

Device number	Application
SD1282	Open completion signal
SD1284	Open request signal
SD1288	Connection state signal
D100	SP.SOCOPEN instruction control data
M100	SP.SOCOPEN instruction completion device

- Program



7.4.2 Disconnecting a connection (SP.SOCCLOSE)

Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
(S1)	-	○	○	-				○	-
(S2)	-	○ *1	○ *1	-				-	-
(D)	○ *1	○ (except for T, ST, and C)	○ *1	-				-	-

*1 File registers set for each local device or program cannot be used.

7

(1) Setting data

Setting data	Description	Set by*2	Data type
U0	Dummy	-	Character string
(S1)	Connection number (Setting range: 1 to 16)	User	BIN 16-bit
(S2)	Start number of the device from which control data are stored	System	Device name
(D)	Start number of the device which turns on for one scan upon completion of the instruction (D)+1 also turns on when failed.		Bit

*2 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCCLOSE instruction.
System: The CPU module stores the execution result of the SP.SOCCLOSE instruction.

Point

When replacing the ZP.CLOSE instruction (Ethernet module dedicated instruction), dummy argument can be used in a Built-in Ethernet port QCPU instruction without rewriting.

(2) Control data

Device	Item	Description	Setting range	Set by*3
(S2)+0	System area	-	-	-
(S2)+1	Completion status	Completion status is stored 0000_H: Completed Other than 0000_H: Failed (Error code)	-	System

*3 The "Set by" column indicates the following.
System: The CPU module stores the execution result of the SP.SOCCLOSE instruction.

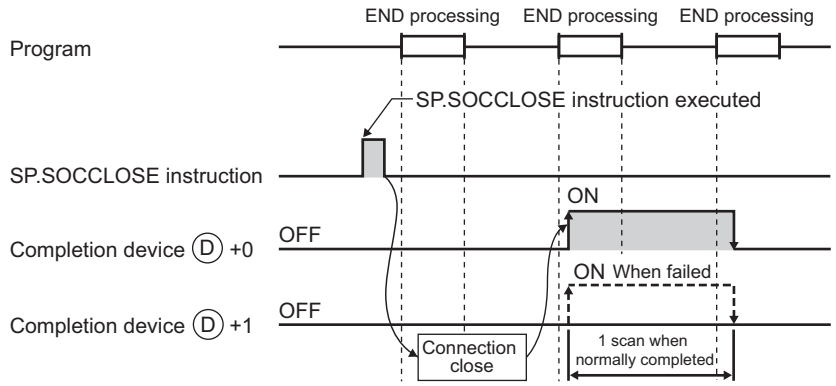
(3) Function

This instruction closes a connection specified in ⓢ1. (Disconnection of a connection)

The result of the SP.SOCCLOSE instruction can be checked with the completion device, ⓓ+0 and ⓓ+1.

- Completion device ⓓ+0
  Turns on in the END processing of a scan after completion of the SP.SOCCLOSE instruction, and turns off in the next END processing.
- Completion device ⓓ+1
  Turns on or off according to the result of the SP.SOCCLOSE instruction.

State	Description
When completed	Remains off.
When failed	Turns on in the END processing of a scan after completion of the SP.SOCCLOSE instruction, and turns off in the next END processing.



(4) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

- The instruction is executed in the QnUDE(H)CPU with a serial number (first five digits) of "11011" or earlier or a CPU module other than the Built-in Ethernet port QCPU.

  (Error code: 4002)
- The connection number specified for ⓢ1 is other than 1 to 16.

  (Error code: 4101)
- The device numbers specified for ⓢ2 and ⓓ exceed the device point range.

  (Error code: 4101)
- An invalid device is specified.

  (Error code: 4004)

Remark

Do not use Passive open for execution of the SP.SOCCLOSE instruction. Doing so will turn off the Open completion signal and Open request signal of the connection and cause close processing, which disables data transfer.

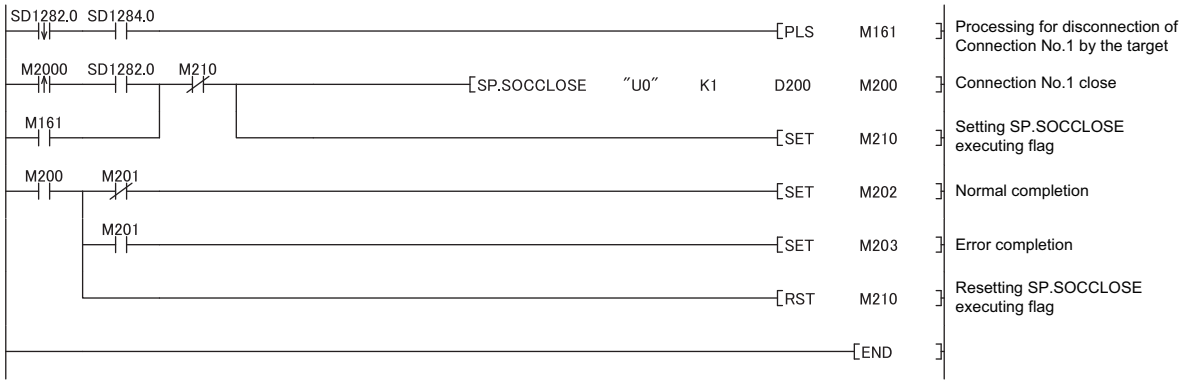
(5) Program example

When M2000 is turned on or when the connected device disconnects connection No.1, connection No.1 is disconnected by the following program.

- Devices used

Device number	Application
SD1282	Open completion signal
SD1284	Open request signal
D200	SP.SOCCLOSE instruction control data
M200	SP.SOCCLOSE instruction completion device

- Program



7.4.3 Reading out received data in the END processing (SP.SOCRCV)

Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
ⓢ1	-	○	○	-				○	-
ⓢ2	-	○*1	○*1	-				-	-
ⓓ1	-	○*1	○*1	-				-	-
ⓓ2	○*1	○ (except for T, ST, and C)	○*1	-				-	-

*1 File registers set for each local device or program cannot be used.

(1) Setting data

Setting data	Description	Set by*2	Data type
U0	Dummy	-	Character string
ⓢ1	Connection number (Setting range: 1 to 16)	User	BIN 16-bit
ⓢ2	Start number of the device from which control data are specified	System	Device name
ⓓ1	Start number of the device from which receive data are stored		
ⓓ2	Start number of the device which turns on for one scan upon completion of the instruction ⓓ2+1 also turns on when failed.		Bit

*2 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCRCV instruction.
System: The CPU module stores the execution result of the SP.SOCRCV instruction.

Point

When replacing the ZP.BUFRCV instruction (Ethernet module dedicated instruction), dummy argument can be used in a Built-in Ethernet port QCPU instruction without rewriting.

(2) Control data

Device	Item	Description	Setting range	Set by*3
(S2)+0	System area	-	-	-
(S2)+1	Completion status	Completion status is stored. 0000_H: Completed Other than 0000_H: Failed (Error code)	-	System
(D1)+0	Receive data length	The length of the data which were read out from the Socket communication receive data area is stored (in bytes).	0 to 10238*4	
(D1)+1 to (D1)+n	Receive data	The data which were read out from the Socket communication receive data area are stored in order.	-	

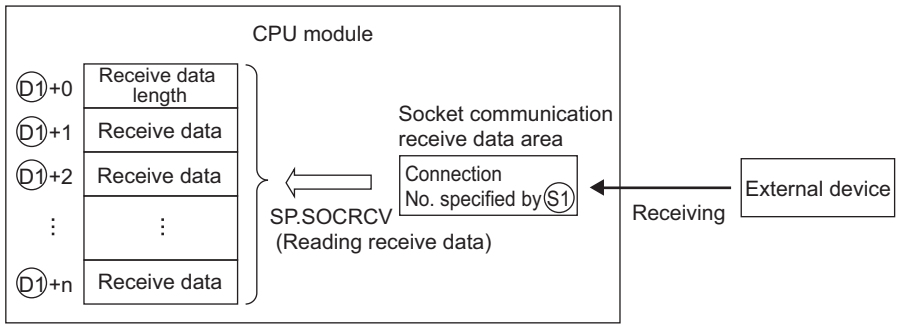
*3 The "Set by" column indicates the following.
System: The CPU module stores the execution result of the SP.SOCRCV instruction.
*4 0 to 2046 for the QnUDE(H)CPU with a serial number (first five digits) of "12051" or earlier

Point

- Receive data size is 2046 bytes by default. To receive data over 2046 bytes, change the receive data size with the SP.SOCRMODE instruction.
- When the SP.SOCRCV instruction is executed, data are read from Socket communication receive data area at END processing. Therefore, executing the SP.SOCRCV instruction will increase the scan time.
- If the CPU module receives odd-byte data, invalid data is stored to the high byte of the device where the last received data is stored.

(3) Function

This instruction reads out received data of the connection specified in (S1) from the Socket communication receive data area in the END processing after execution of the SP.SOCRCV instruction.

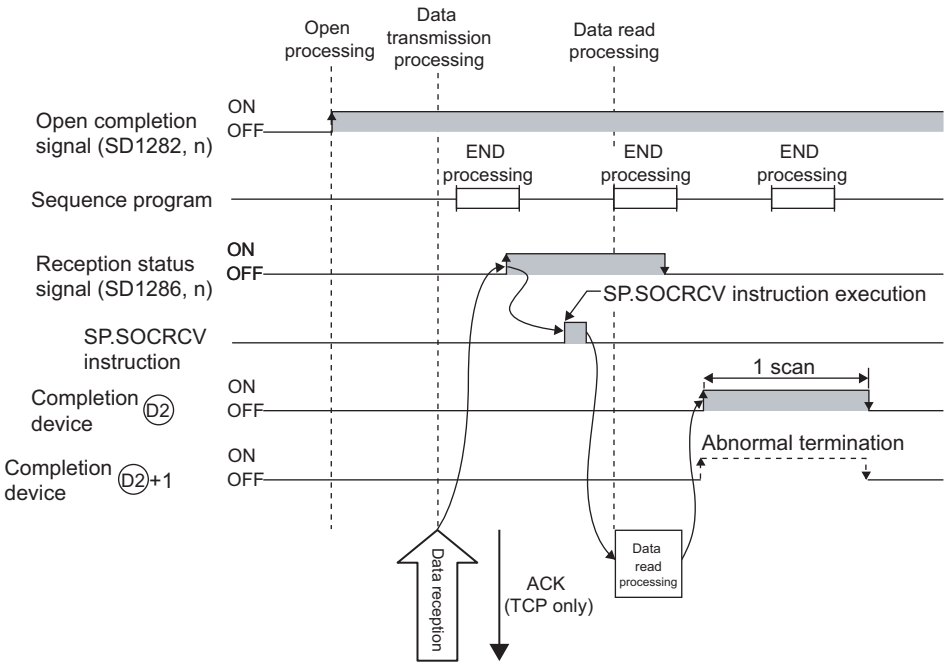


The result of the SP.SOCRCV instruction can be checked with the completion device (D2)+0 and (D2)+1.

- Completion device (D2)+0
  Turns on in the END processing of the scan after completion of the SP.SOCRCV instruction, and turns off in the next END processing.
- Completion device (D2)+1
  Turns on or off according to the result of the SP.SOCRCV instruction.

State	Description
When completed	Remains off
When failed	Turns on in the END processing of the scan after completion of the SP.SOCRCV instruction, and turns off in the next END processing.

The following figure shows the timing of reception processing with the SP.SOCRCV instruction.



(4) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

- The instruction is executed in the QnUDE(H)CPU with a serial number (first five digits) of "11011" or earlier or a CPU module other than the Built-in Ethernet port QCPU.

  (Error code: 4002)

- The connection number specified for ⓢ1 is other than 1 to 16.

  (Error code: 4101)

- The received data size exceeds the size of the receive data storage device.

  (Error code: 4101)

- The device numbers specified for ⓢ2, ⓓ1, and ⓓ2 exceed the device point range.

  (Error code: 4101)

- An invalid device is specified.

  (Error code: 4004)

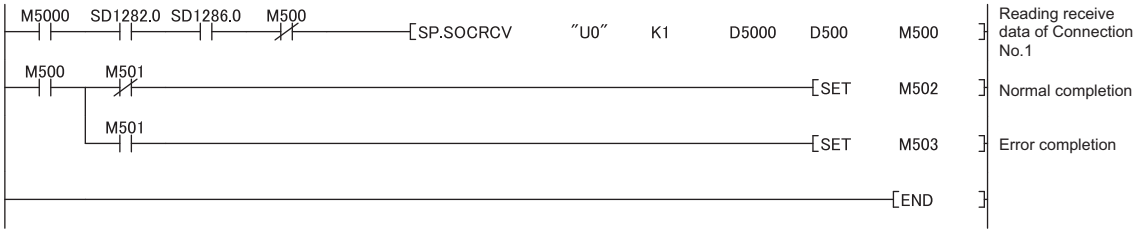
(5) Program example

When M5000 is turned on, data received from the connected device are read out.

- Devices used

Device number	Application
SD1282	Open completion signal
SD1286	Receive state signal
D5000	SP.SOCRCV instruction control data
D500	Receive data length and receive data storage location
M500	SP.SOCRCV instruction completion device

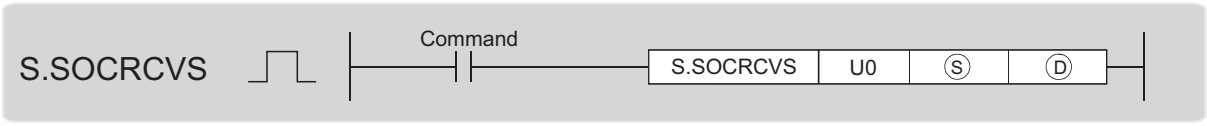
- Program



Point

- To avoid receiving large amounts of data, the volume of received data can be limited by setting the receive data size using the SP.SOCRMODE instruction.
- Consecutively sent data can be consecutively read out by connecting the completion device of the SP.SOCRCV instruction to the execution command at the normally closed contact.

7.4.4 Reading out received data during instruction execution (S.SOCRCVS)



Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
Ⓢ	-	○	○	-				○	-
Ⓓ	-	○	○	-				-	-

(1) Setting data

Setting data	Description	Set by*1	Data type
U0	Dummy	-	Character string
Ⓢ	Connection number (Setting range: 1 to 16)	User	BIN 16-bit
Ⓓ	Start number of the device from which received data are stored	System	Device name

*1 The "Set by" column indicates the following.
User: The data must be set before executing the S.SOCRCVS instruction.
System: The CPU module stores the execution result of the S.SOCRCVS instruction.

Point

When replacing the Z.BUFRCVS instruction (Ethernet module dedicated instruction), dummy argument can be used in a Built-in Ethernet port QCPU instruction without rewriting.

(2) Control data

Device	Item	Description	Setting range	Set by*2
Ⓓ+0	Receive data length	The length of the data which were read out from the Socket communication receive data area is stored (in bytes).	0 to 10238*3	System
Ⓓ+1 to Ⓓ+n	Receive data	The data which were read out from the Socket communication receive data area are stored in ascending order of addresses.	-	

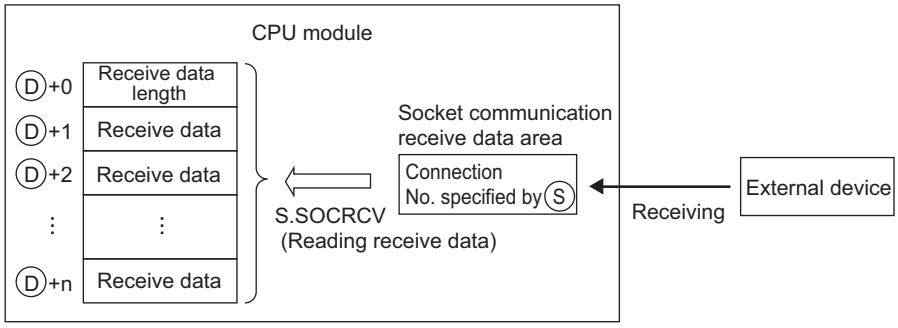
*2 The "Set by" column indicates the following.
System: The CPU module stores the execution result of the S.SOCRCVS instruction.
*3 0 to 2046 for the QnUDE(H)CPU with a serial number (first five digits) of "12051" or earlier

Point

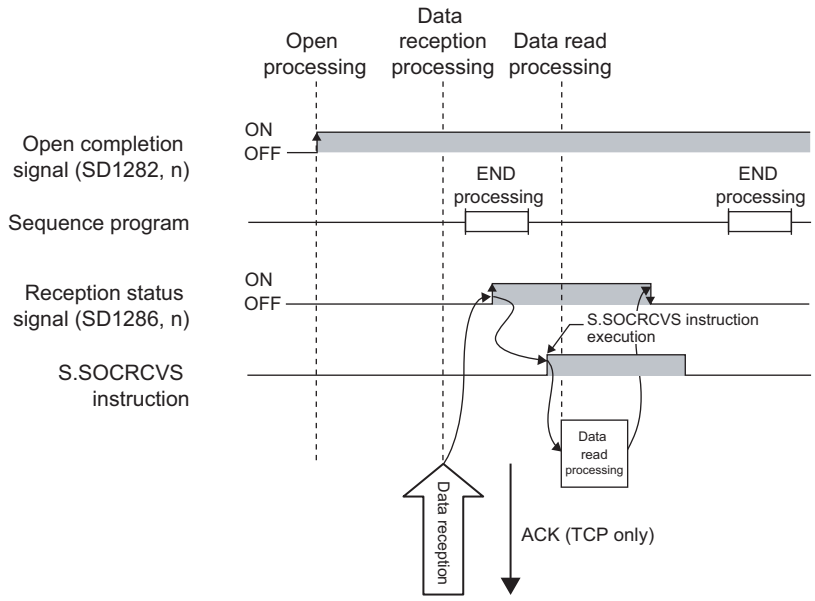
- Receive data size is 2046 bytes by default. To receive data over 2046 bytes, change the receive data size with the SP.SOCRMODE instruction.
- If the CPU module receives odd-byte data, invalid data is stored to the high byte of the device where the last received data is stored.

(3) Function

This instruction reads out received data of the connection specified in Ⓢ from the Socket communication receive data area.



The following figure shows the timing of reception processing with the S.SOCRCVS instruction.



(4) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

- The instruction is executed in the QnUDE(H)CPU with a serial number (first five digits) of "11011" or earlier or a CPU module other than the Built-in Ethernet port QCPU.

  (Error code: 4002)

- The connection number specified for Ⓢ is other than 1 to 16.

  (Error code: 4101)

- The received data size exceeds the size of the receive data storage device.

  (Error code: 4101)

- The device number specified for Ⓓ exceeds the device point range.

  (Error code: 4101)

- An invalid device is specified.

  (Error code: 4004)

(5) Precaution

Do not use both this and SP.SOCRCV instructions when reading out receive data of the same connection.

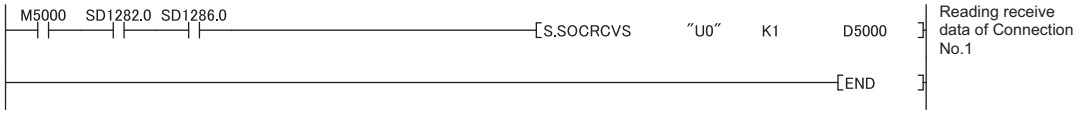
(6) Program example

When M5000 is turned on, data received from the connected device are read out.

- Devices used

Device number	Application
SD1282	Open completion signal
SD1286	Receive state signal
D5000	Receive data length and receive data storage location

- Program



Point

- To avoid receiving large amounts of data, the volume of received data can be limited by setting the receive data size using the SP.SOCRMODE instruction.
- Data reception can be speeded up by placing a receive processing program at the beginning of multiple programs.

7.4.5 Sending data (SP.SOCSND)

Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
(S1)	-	○	○	-				○	-
(S2)	-	○ *1	○ *1	-				-	-
(S3)	-	○	○	-				-	-
(D)	○ *1	○ (except for T, ST, and C)	○ *1	-				-	-

*1 File registers set for each local device or program cannot be used.

(1) Setting data

Setting data	Description	Set by*2	Data type
U0	Dummy	-	Character string
(S1)	Connection number (Setting range: 1 to 16)	User	BIN 16-bit
(S2)	Start number of the device where control data are specified	System	Device name
(S3)	Start number of the device from which send data are stored	User	
(D)	Start number of the device which turns on for one scan upon completion of the instruction (D)+1 also turns on when failed.	System	Bit

*2 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCSND instruction.
System: The CPU module stores the execution result of the SP.SOCSND instruction.

Point

When replacing the ZP.BUFSND instruction (Ethernet module dedicated instruction), dummy argument can be used in a Built-in Ethernet port QCPU instruction without rewriting.

(2) Control data

Device	Item	Description	Setting range	Set by*3
(S2)+0	System area	-	-	-
(S2)+1	Completion status	Completion status is stored. 0000_H: Completed Other than 0000_H: Failed (Error code)	-	System
(S3)+0	Send data length	The length of send data is specified (in bytes).	1 to 10238*4	User
(S3)+1 to (S3)+n	Send data	Send data are specified.	-	

*3 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCSND instruction.
System: The CPU module stores the execution result of the SP.SOCSND instruction.

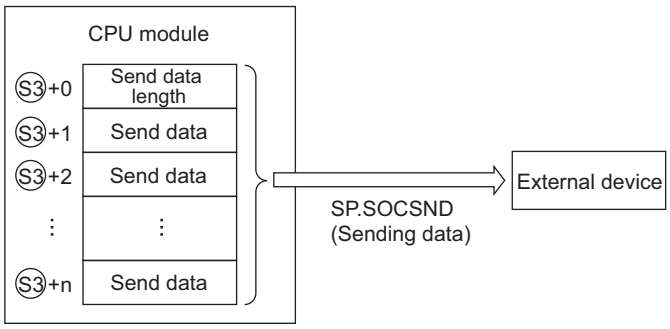
*4 1 to 2046 for the QnUDE(H)CPU with a serial number (first five digits) of "12051" or earlier

Point

For TCP, set the send data length within the maximum window size of the target device (receive buffer of TCP). Data whose size exceeds the maximum window size cannot be sent.

(3) Function

This instruction sends data set in (S1) to the target device of the connection specified by (S3).

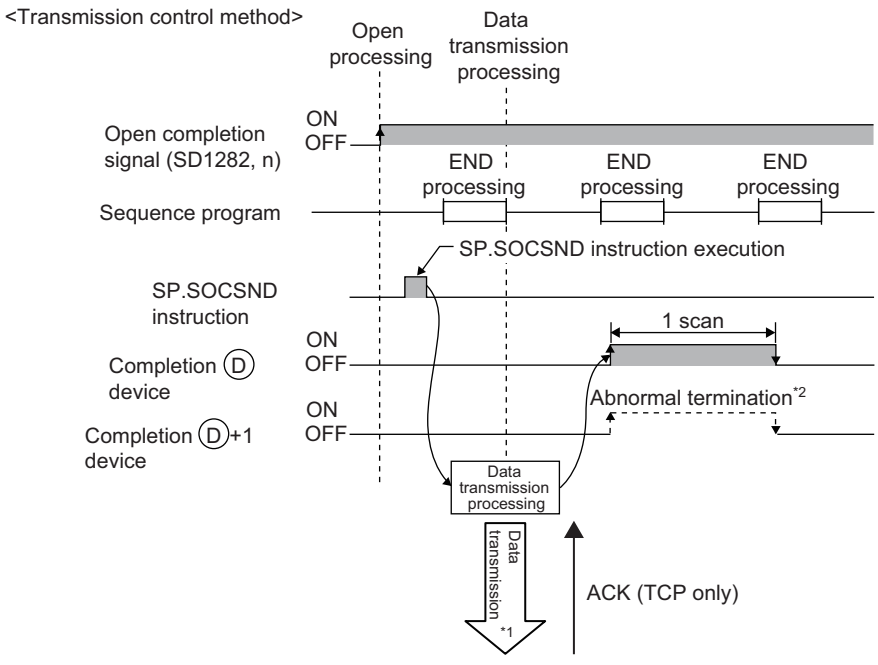


The result of the SP.SOCSND instruction can be checked with the completion device, (D)+0 and (D)+1.

- Completion device (D)+0
  Turns on in the END processing of the scan after completion of the SP.SOCSND instruction, and turns off in the next END processing.
- Completion device (D)+1
  Turns on or off according to the result of the SP.SOCSND instruction.

State	Description
When completed	Remains off.
When failed	Turns on in the END processing of the scan after completion of the SP.SOCSND instruction, and turns off in the next END processing.

The following figure shows the timing of reception processing with the SP.SOCRCV instruction.



*1 Even after the completion device turns on, data transmission may continue.

*2 When data are transmitted using TCP and no ACK response is received from the destination device for 30 seconds, the transmission completes with an error.

(4) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

- The instruction is executed in the QnUDE(H)CPU with a serial number (first five digits) of "11011" or earlier or a CPU module other than the Built-in Ethernet port QCPU.

  (Error code: 4002)

- The connection number specified for ⓢ1 is other than 1 to 16.

  (Error code: 4101)

- The device numbers specified for ⓢ2, ⓢ3, and ⓓ exceed the device point range.

  (Error code: 4101)

- An invalid device is specified.

  (Error code: 4004)

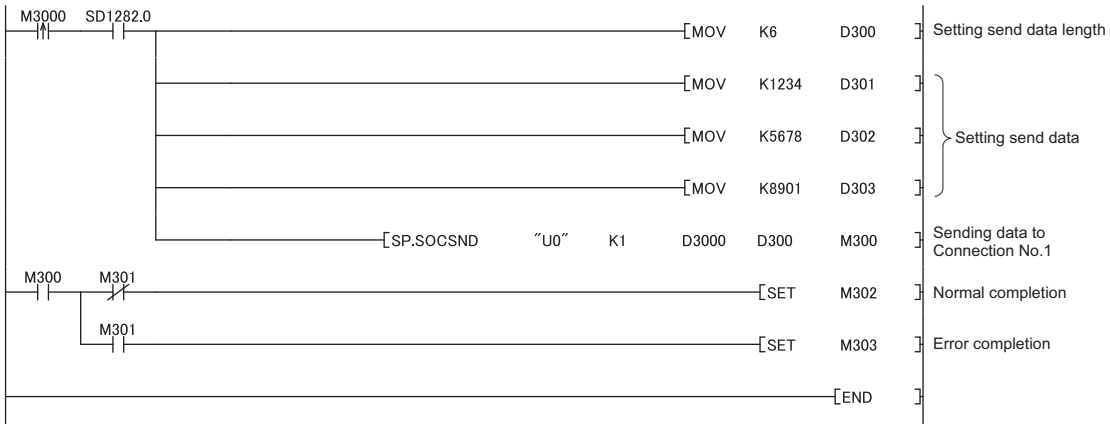
(5) Program example

When M3000 is turned on, data (1234, 5678, and 8901) are sent to the target device using the socket communication function.

- Devices used

Device number	Application
SD1282	Open completion signal
D3000	SP.SOCSND instruction control data
D300	Send data length and send data storage location
M300	SP.SOCSND instruction completion device

- Program



7.4.6 Reading out connection information (SP.SOCCINF)

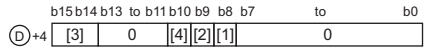
Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
ⓢ1	-	○	○	-				○	-
ⓢ2	-	○	○	-				-	-
Ⓓ	-	○	○	-				-	-

(1) Setting data

Setting data	Description	Set by*1	Data type
U0	Dummy	-	Character string
ⓢ1	Connection number (Setting range: 1 to 16)	User	BIN 16-bit
ⓢ2	Start number of the device from which control data are stored	System	Device name
Ⓓ	Start number of the device from which connection information is stored		

*1 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCCINF instruction.
System: The CPU module stores the execution result of the SP.SOCCINF instruction.

(2) Control data

Device	Item	Description	Setting range	Set by*2
(S2)+0	System area	-	-	-
(S2)+1	Completion status	Completion status is stored. 0000_H: Completed Other than 0000_H: Failed (Error code)	-	System
(D)+0 (D)+1	Target device IP address	IP address of the target device is stored.	1_H to $FFFFFFFF_H$ *4 *5	
(D)+2	Target device port number	Port number of the target device is stored.	1_H to $FFFF_H$ *4 *6	
(D)+3	Host station port number	Port number of the host station is stored.	1_H to 1387_H 1392_H to $FFFE_H$ *3 *4	
(D)+4	Application setting area	 [1] Communication method (protocol) 0: TCP/IP 1: UDP/IP [2] Socket communication procedure 1: Nonprocedural (fixed) [3] Open system 00: Active open or UDP/IP 10: Unpassive open 11: Fullpassive open [4] Predefined protocol settings 0: Predefined protocol support function is not used. (Socket communication function is used.) 1: Predefined protocol support function is used.	*4	

*2 The "Set by" column indicates the following.
System: The CPU module stores the execution result of the SP.SOCCINF instruction.

*3 Using 0400_H to 1387_H and 1392_H to $EFFF_H$ is recommended because the host station port numbers, 0001_H to $03FF_H$, are assigned for generally reserved port numbers (WELL KNOWN PORT NUMBERS), and $F000_H$ to $FFFE_H$ are used for other communication functions. Do not specify 1388_H to 1391_H because these ports are used by the system. (Page 223, Appendix 2)

*4 When the item is performed by the unopened connection, 0_H is returned.

*5 When the instruction is performed to the connection set the target device IP address to $FFFFFFFF_H$ (simultaneous broadcast), the source IP address of the received data is returned. In this case, perform the instruction when Receive state signal (SD1286) is on. When the instruction is performed before the data are received, $FFFFFFFF_H$ is returned.

*6 When the instruction is performed to the connection set the target device port number to $FFFF_H$ (simultaneous broadcast), the source port number of the received data is returned. In this case, perform the instruction when Receive state signal (SD1286) is on. When the instruction is performed before the data are received, $FFFF_H$ is returned.

(3) Function

This instruction reads out connection information specified in ⓢ1.

(4) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

- The instruction is executed in the QnUDE(H)CPU with a serial number (first five digits) of "11011" or earlier or a CPU module other than the Built-in Ethernet port QCPU.

  (Error code: 4002)

- The connection number specified for ⓢ1 is other than 1 to 16.

  (Error code: 4101)

- The device numbers specified for ⓢ2 and ⓓ exceed the device point range.

  (Error code: 4101)

- An invalid device is specified.

  (Error code: 4004)

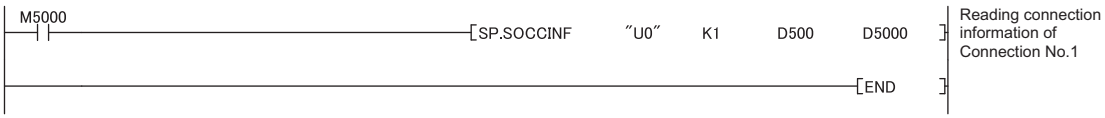
(5) Program example

When M5000 is turned on, connection information of connection No.1 is read out.

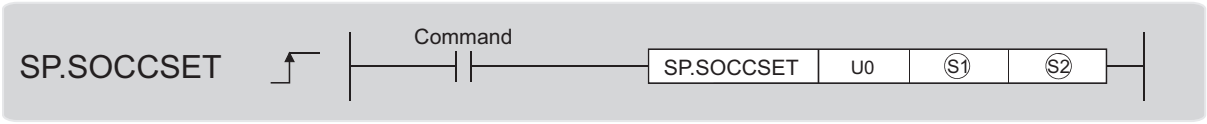
- Devices used

Device number	Application
D500	SP.SOCSND instruction control data
D5000	Storage location of connection information

- Program



7.4.7 Changing the target of a connection (UDP/IP) (SP.SOCCSET)



Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
(S1)	-	○	○	-				○	-
(S2)	-	○	○	-				-	-

(1) Setting data

Setting data	Description	Set by*1	Data type
U0	Dummy	-	Character string
(S1)	Connection number (Setting range: 1 to 16)	User	BIN 16-bit
(S2)	Start number of the device from which control data are stored	User, System	Device name

*1 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCCSET instruction.
System: The CPU module stores the execution result of the SP.SOCCSET instruction.

(2) Control data

Device	Item	Description	Setting range	Set by*2
(S2)+0	System area	-	-	-
(S2)+1	Completion status	Completion status is stored. 0000_H: Completed Other than 0000_H: Failed (Error code)	-	System
(S2)+2 (S2)+3	Target device IP address	IP address of the target device is specified.	1_H to $FFFFFFFF_H$ ($FFFFFFFF_H$: Simultaneous broadcast)	User
(S2)+4	Target device port number	Port number of the target device is specified.	1_H to $FFFF_H$ ($FFFF_H$: Simultaneous broadcast)	

*2 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCCSET instruction.
System: The CPU module stores execution result of the SP.SOCCSET instruction.

(3) Function

This instruction changes the IP address and port number of the target device of which connection is specified in ⓢ1.

(Note that this instruction is available only for UDP/IP communications.)

Point

- The target device can be changed without closing the connection by using the SP.SOCCSET instruction.
- The set values take effect at the following SP.SOCCSET instruction execution timing:
  - When data exist in the socket communication receive data area: After execution of the SP.SOCRCV or S.SOCRCVS instruction, only once after execution of the SP.SOCCSET instruction
  - When no data exists in the socket communication receive data area: After execution of the SP.SOCCSET instruction

(4) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

- The instruction is executed in the QnUDE(H)CPU with a serial number (first five digits) of "11011" or earlier or a CPU module other than the Built-in Ethernet port QCPU.

  (Error code: 4002)
- The connection number specified for ⓢ1 is other than 1 to 16.

  (Error code: 4101)
- The device number specified for ⓢ2 exceeds the device point range.

  (Error code: 4101)
- An invalid device is specified.

  (Error code: 4004)

(5) Precaution

Do not change the target device using the SP.SOCCSET instruction during execution of the SP.SOCSND instruction.

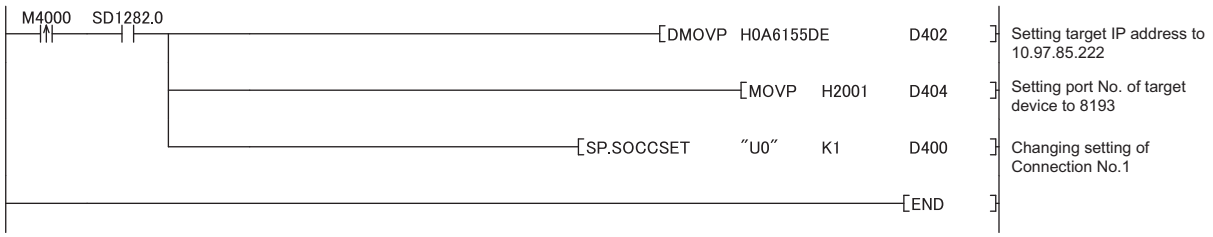
(6) Program example

When M4000 is turned on, the connection destination (IP address and port number of the target device) of connection No.1, which is open, is changed.

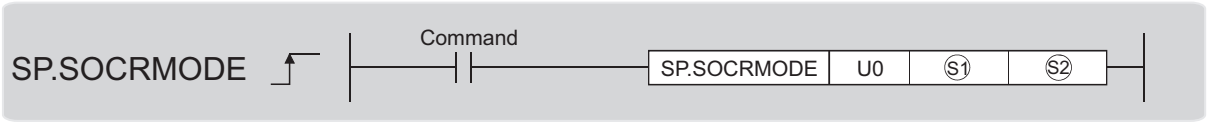
- Devices used

Device number	Application
SD1282	Open completion signal
D400	SP.SOCCSET instruction control data

- Program



7.4.8 Changing the receive mode of a connection (SP.SOCRMODE)



Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
(S1)	-	○	○	-				○	-
(S2)	-	○	○	-				-	-

(1) Setting data

Setting data	Description	Set by[*1]	Data type
U0	Dummy	-	Character string
(S1)	Connection number (Setting range: 1 to 16)	User	BIN 16-bit
(S2)	Start number of the device from which control data are stored	User, System	Device name

*1 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCRMODE instruction.
System: The CPU module stores the execution result of the SP.SOCRMODE instruction.

(2) Control data

Device	Item	Description	Setting range	Set by[*3]
(S2)+0	System area	-	-	-
(S2)+1	Completion status	Completion status is stored. 0000_H: Completed Other than 0000_H: Failed (Error code)	-	System
(S2)+2	TCP receive mode[*2]	TCP receive mode is stored. 0: TCP standard receive mode 1: TCP fixed-length receive mode	0 or 1	User
(S2)+3	Receive data size	Receive data size in the socket communication is stored (in bytes).	1 to 10238[*4]	

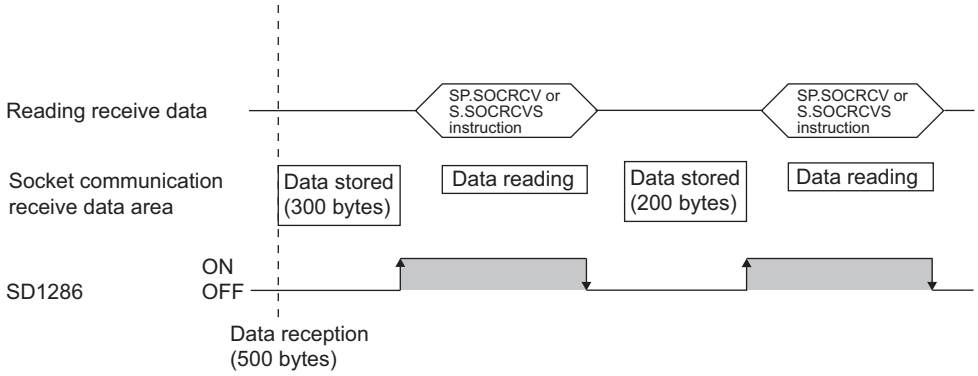
*2 Invalid for connections in UDP communications.
*3 The "Set by" column indicates the following.
User: The data must be set before executing the SP.SOCRMODE instruction.
System: The CPU module stores the execution result of the SP.SOCRMODE instruction.
*4 1 to 2046 for the QnUDE(H)CPU with a serial number (first five digits) of "12051" or earlier

(3) Function

This instruction changes the TCP receive mode and receive data size of the connection specified in ⓢ1. The mode is changed as specified in ⓢ2+2. (This instruction is invalid for UDP connections.)

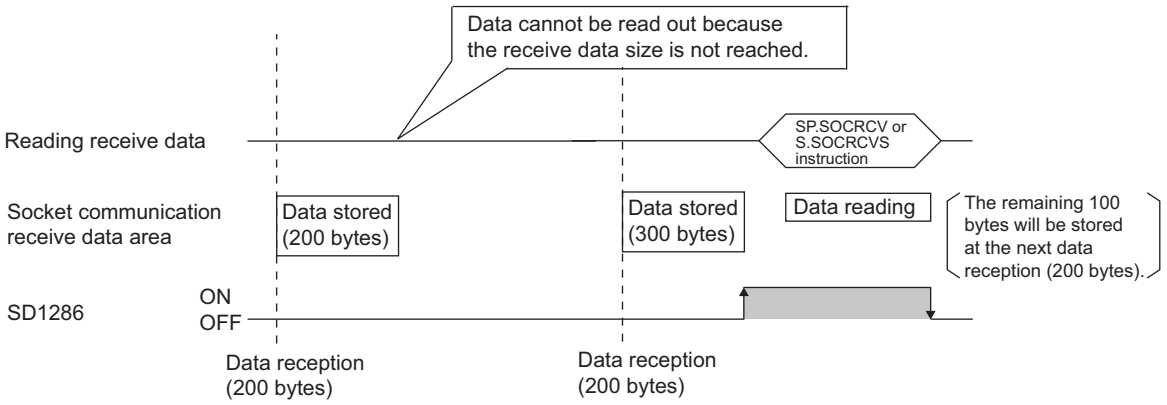
(a) TCP standard receive mode

When data are received, they are stored in the Socket communication receive data area, and SD1286 turns on.
If data are received exceeding the specified receive data size, the excess data are read out the next time.
Ex. The receive data size is set to 300 bytes, and 500-byte data are received.



(b) TCP fixed-length receive mode

When data are received, they are stored in the Socket communication receive data area, and SD1286 (Receive state signal) turns on. However, if the size of the data does not reach the specified receive data size, SD1286 does not turn on.
Data reception is repeated and once the data size reaches to the specified size, SD1286 turns on.
If data are received exceeding the specified receive data size, the excess data are read out the next time.
Ex. The receive data size is set to 300 bytes, and 200-byte data are consecutively received.



Point

- Effective use of devices
  Devices can be effectively used by setting the receive data size to less than 1024 words while the default size of the receive data storing devices for the SP.SOCRCV and S.SOCRCVS instructions is 1024 words.
- Prevention of receive data fragmentation
  Data from the connected device may be fragmented depending on the line type. To prevent this, the receive data size can be specified in the TCP fixed-length receive mode.
- Prevention of receive data binding
  Separately sent data may be combined depending on the interfacing device due to a delay in receive processing of the program.
  To prevent this, the receive data size can be specified in the TCP fixed-length receive mode.

Remark

The set values will take effect at the following timing of the SP.SOCRMODE instruction execution.

- Before opening: Values take effect after opening a connection.
- When there are data in the Socket communication receive data area:
  Values take effect after execution of the SP.SOCRCV or S.SOCRCVS instruction once after the S.SOCRMODE instruction.
- When there is no data in the Socket communication receive data area:
  Values take effect after the SP.SOCRMODE instruction is executed.

(4) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

- The instruction is executed in the QnUDE(H)CPU with a serial number (first five digits) of "11011" or earlier or a CPU module other than the Built-in Ethernet port QCPU.

  (Error code: 4002)
- The connection number specified for ⓢ1 is other than 1 to 16.

  (Error code: 4101)
- The device number specified for ⓢ2 exceeds the device point range.

  (Error code: 4101)
- Invalid device is specified.

  (Error code: 4004)

Remark

Even when the Receive state signal is not on in the TCP fixed-length receive mode, the data received at the point can be read out with the SP.SOCRDATA instruction. This allows you to check whether the data sent from the connected device is adequate in size.

(5) Program example

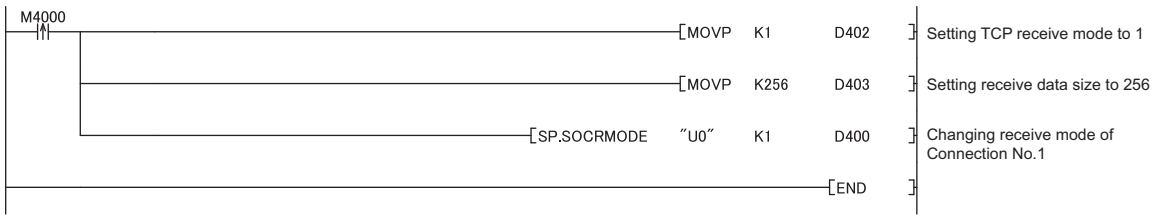
When M4000 is turned on, connection No.1 is set to the TCP fixed-length receive mode and the receive data size is set to 256 bytes.

After execution of the instruction and when the receive data size of connection No.1 reaches 256 bytes, the Receive state signal is turned on.

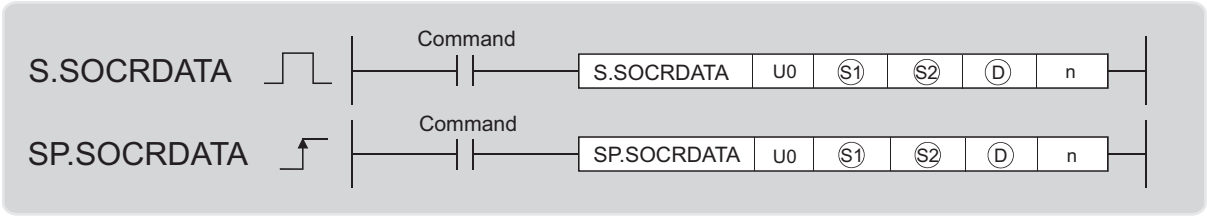
- Device used

Device number	Application
D400	SP.SOCRMODE instruction control data

- Program



7.4.9 Socket communication receive data read (S(P).SOCRDATA)



Setting data	Internal device		R, ZR	J□\□		U□\G□	Zn	Constant K, H	Others
	Bit	Word		Bit	Word				
ⓢ1	-	○	○	-				○	-
ⓢ2	-	○	○	-				-	-
ⓓ	-	○	○	-				-	-
n	○	○	○	-				○	-

(1) Setting data

Setting data	Description	Set by*1	Data type
U0	Dummy	-	Character string
ⓢ1	Connection number (Setting range: 1 to 16)	User	BIN 16-bit
ⓢ2	Start number of the device from which control data are stored		Device name
ⓓ	Start number of the device where read data are stored		
n	Number of read data (1 to 5120 words*2)		BIN 16-bit

*1 The "Set by" column indicates the following.
User: The data must be set before executing the S(P).SOCRDATA instruction.

*2 1 to 1024 for the QnUDE(H)CPU with a serial number (first five digits) of "12051" or earlier

(2) Control data

Device	Item	Description	Setting range	Set by*2
ⓢ2+0	System area	-	-	-
ⓢ2+1	Completion status	Completion status is stored. 0000_H: Completed Other than 0000_H: Failed (Error code)	-	System

*2 The "Set by" column indicates the following.
System: The CPU module stores the execution result of the S(P).SOCRDATA instruction.

(3) Function

This instruction reads out the data of the amount specified for n from the Socket communication receive data area of which connection is specified in Ⓢ1, and stores them in the device specified in Ⓓ or higher. No processing is performed when the number of read data (n) is 0.

Point

- Data of the receive data length can be read out by setting the number of read data to one word.
  This allows change of the device storing receive data, upon execution of the SP.SOCRCV or S.SOCRCVS instruction.
- In the following order, based on the data currently received, the size of the data received the next time can be specified.
  1. Check the data currently received using the S(P).SOCRDATA instruction.
  2. Specify the size of the data to be received the next time using the SP.SOCRMODE instruction.
  3. Read out the data currently received using the SP.SOCRCV or S.SOCRCVS instruction.

Remark

- Even if the S(P).SOCRDATA instruction is executed, the next receive data will not be stored in the Socket communication receive data area because the area is not cleared and the Receive state signal does not change.
- To update the receive data, read out the data using the SP.SOCRCV or S.SOCRCVS instruction.

(4) Error

A detection of an operation error turns on the Error flag (SM0) and a corresponding error code is stored in SD0 when:

- The instruction is executed in the QnUDE(H)CPU with a serial number (first five digits) of "11011" or earlier or a CPU module other than the Built-in Ethernet port QCPU.

  (Error code: 4002)
- The connection number specified for Ⓢ1 is other than 1 to 16.

  (Error code: 4101)
- The device numbers specified for Ⓢ2, Ⓓ, and n1 exceed the device point range.

  (Error code: 4101)
- An invalid device is specified.

  (Error code: 4004)
- The device value specified for n is larger than 5120.

  (Error code: 4100)

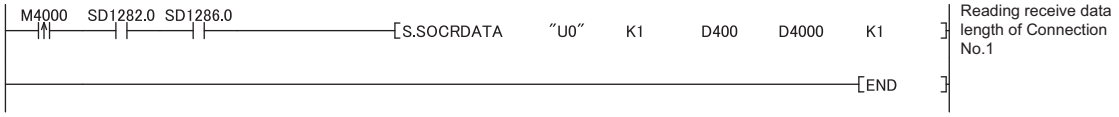
(5) Program example

When M4000 is turned on, the receive data length of connection No.1 is read out.

- Devices used

Device number	Application
SD1282	Open completion signal
SD1286	Receive state signal
D400	S.SOCRDATA instruction control data
D4000	Storage location where data are read out
K1	Number of read data (one word)

- Program



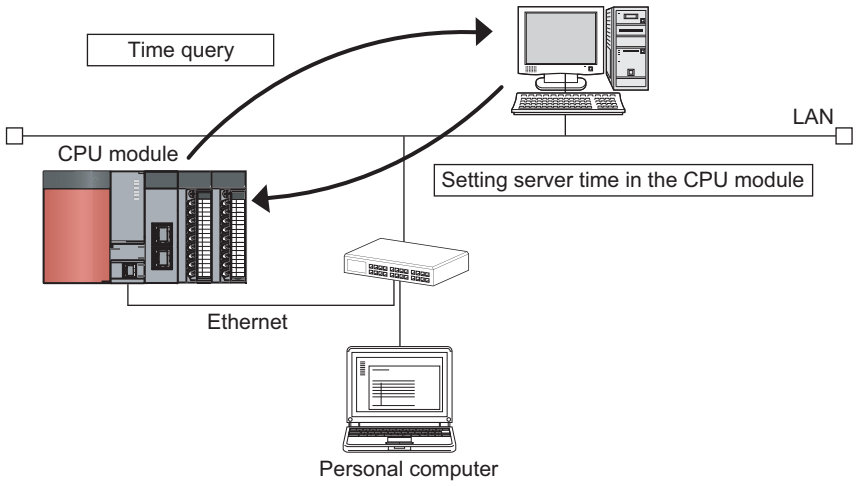
CHAPTER 8 TIME SETTING FUNCTION (SNTP CLIENT)

The CPU module collects time information from a time information server on LAN, and automatically sets its own time. With this time setting function, the CPU module queries the server for time information at the specified timing, and can set the time information sent from the server as its own clock data.

The time setting can performed at the following timing.

- When the CPU module is powered off and then on, or is reset
- At the specified time intervals (Execution interval)
- At the specified clock time (Execution time)
- According to the special relay state*1

*1 Time is set when SM1270 is turned on for one scan.



Point

- Confirm the connection of the hub or the interfacing device in advance when setting time at the timing of CPU module power-on or reset.
- The time setting results can be checked with the special register (SD1270 to SD1275).
- During execution of the time setting function, other time setting operations are ignored.

Remark

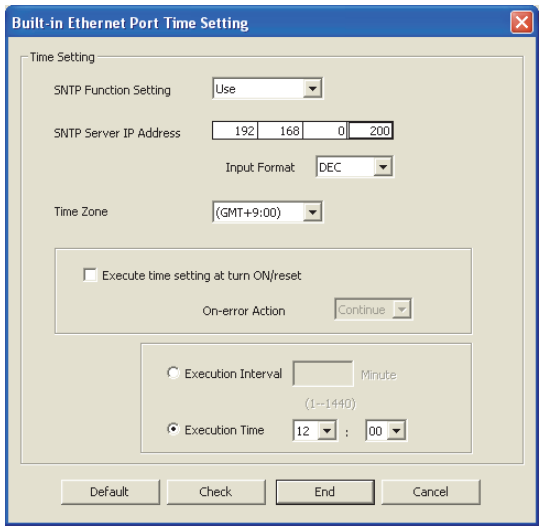
Access through routers is also available. When configuring the settings for it, set the subnet mask pattern and default router IP address. (Page 30, Section 3.4)

8.1 Setting Method

Configure the time settings in the Built-in Ethernet port tab of the PLC parameter window.

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

⇨ Time Setting button



Item	Description	Setting range
SNTP Function Setting	Select whether to use this function or not.	Used or Not used
SNTP Server IP Address	Specify the IP address of the SNTP server.	0.0.0.1 to 223.255.255.254
Time Zone	Specify a time zone in which the time is to be synchronized. Japan Standard Time "GMT+9:00" is set by default.	(GMT-12:00 to GMT+13:00)
Execute time setting at turn ON/reset	Select whether to execute the time setting function upon power-on or reset of the CPU module.	-
At Error Occurrence	Select whether to stop or continue the time setting when an error is detected upon power-on or reset of the CPU module.	Continue or Stop
Execution Interval*2	Select this when executing the time setting function at fixed time intervals.	1 to 1440 (min.)
Execution Time*2	Select this when executing the time setting function at a specified time (in increments of 30 minutes).	00:00 to 23:30

*2 Either of these two options must be selected.

8.2 Precautions

(1) Communication timeout

A communication timeout occurs when 20 seconds have elapsed without receiving any response after sending a time query.

At the time of a communication timeout, the value in SD1270 is $FFFF_H$.

(2) Time information server

When the time setting function is used, an SNTP server (time information server) is required on the LAN.

(3) Delay resulted from the time required for communication

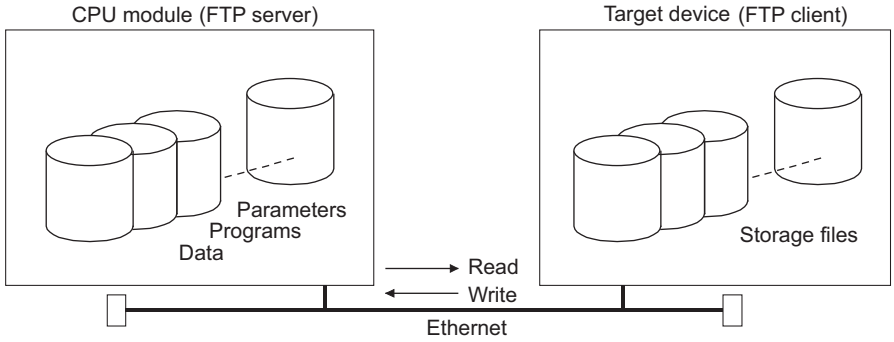
A delay occurs and affects the set time as a result of the time spent for communication with the SNTP server computer. For a high-accuracy time setting, specify an SNTP server computer that is networked as close to the CPU module as possible.

(4) For multiple CPU system configuration

In a multiple CPU system, enable the time setting function of only the Built-in Ethernet port QCPU No.1. When a CPU module other than the Built-in Ethernet port QCPU No.1 is enabled, the clock data of the Built-in Ethernet port QCPU No.1 is automatically set.

CHAPTER 9 FILE TRANSFER FUNCTION (FTP)

The CPU module supports the server function for FTP (File Transfer Protocol) which is a protocol designed for file transfer to or from the connected device.
The device with the FTP client function can directly access any files located in the CPU module.



The following operations can be performed between the connected device with the FTP client function and the CPU module.

(a) Reading files from the CPU module (download)

The files in the CPU module can be stored in the connected device.

(b) Writing files to the CPU module (upload)

The files stored in the connected device can be registered to the CPU module.

(c) Browsing the names of the files in the CPU module

The files registered to the CPU module can be checked from the connected device.

Point

In a multiple CPU system, only the CPU module connected with an Ethernet cable can transfer files.

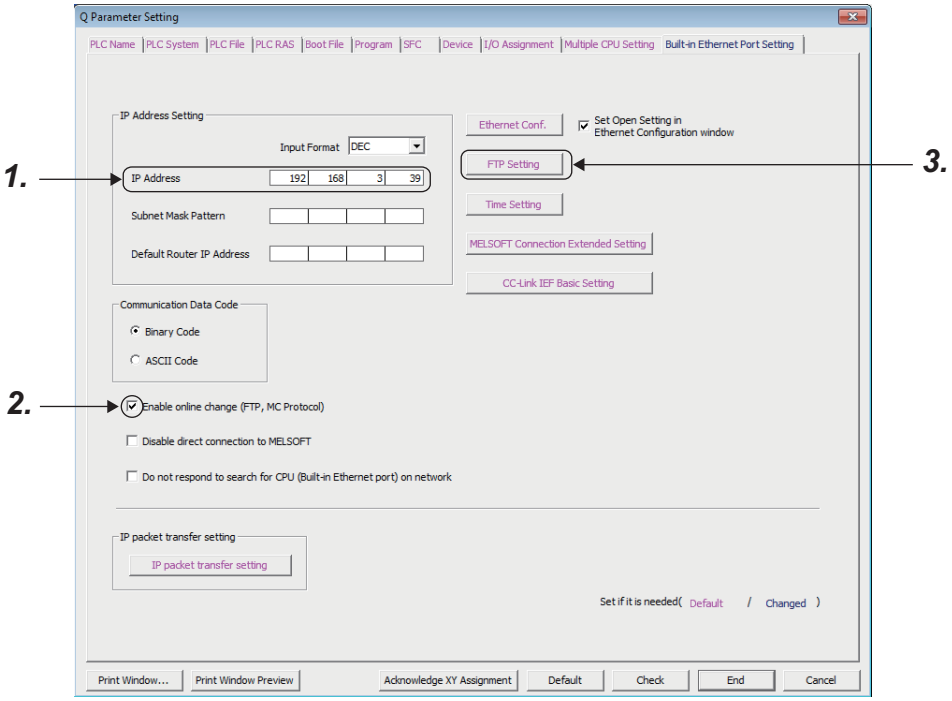
Remark

Access through routers is also available. When configuring the settings for it, set the subnet mask and default router IP address. (☞ Page 30, Section 3.4)

9.1 Setting for FTP Communication

(1) Operation on the CPU module side

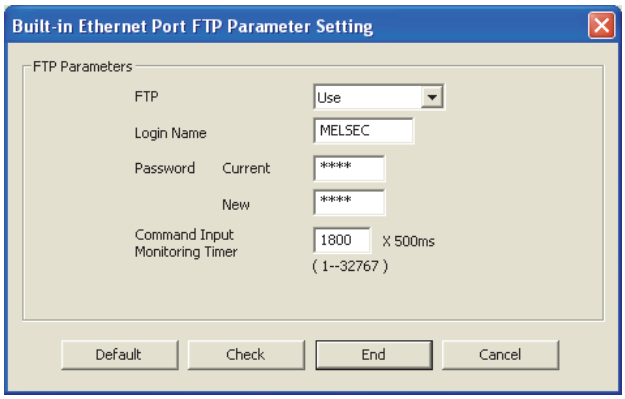
Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]



1. **Set the IP address of the CPU module.**

2. **Select "Enable online change (FTP, MC Protocol)" when data need to be written even while the CPU module is in RUN state.**

3. Configure the FTP settings.



Item	Description
FTP	Select "Used".
Login Name	Set a log-in name used for file transfer (login) request from an external device. [Default value] • QnUDVCPU, QnUDPVCPU: "MELSEC" • QnUDE(H)CPU: "QNUDECPU"
Password	Set an FTP password used for file transfer request from an external device. To change the password, enter both the current password and a new password for confirmation. [Default value] • QnUDVCPU, QnUDPVCPU: "MELSEC" • QnUDE(H)CPU: "QNUDECPU"
Command Input Monitoring Timer	Set a time for monitoring command input performed by the CPU module. When no command is input within the set period of time, the FTP connection is disconnected. (Setting range : 1 to 32767 (× 500ms)) Set a time value larger than the time required for file transfer.

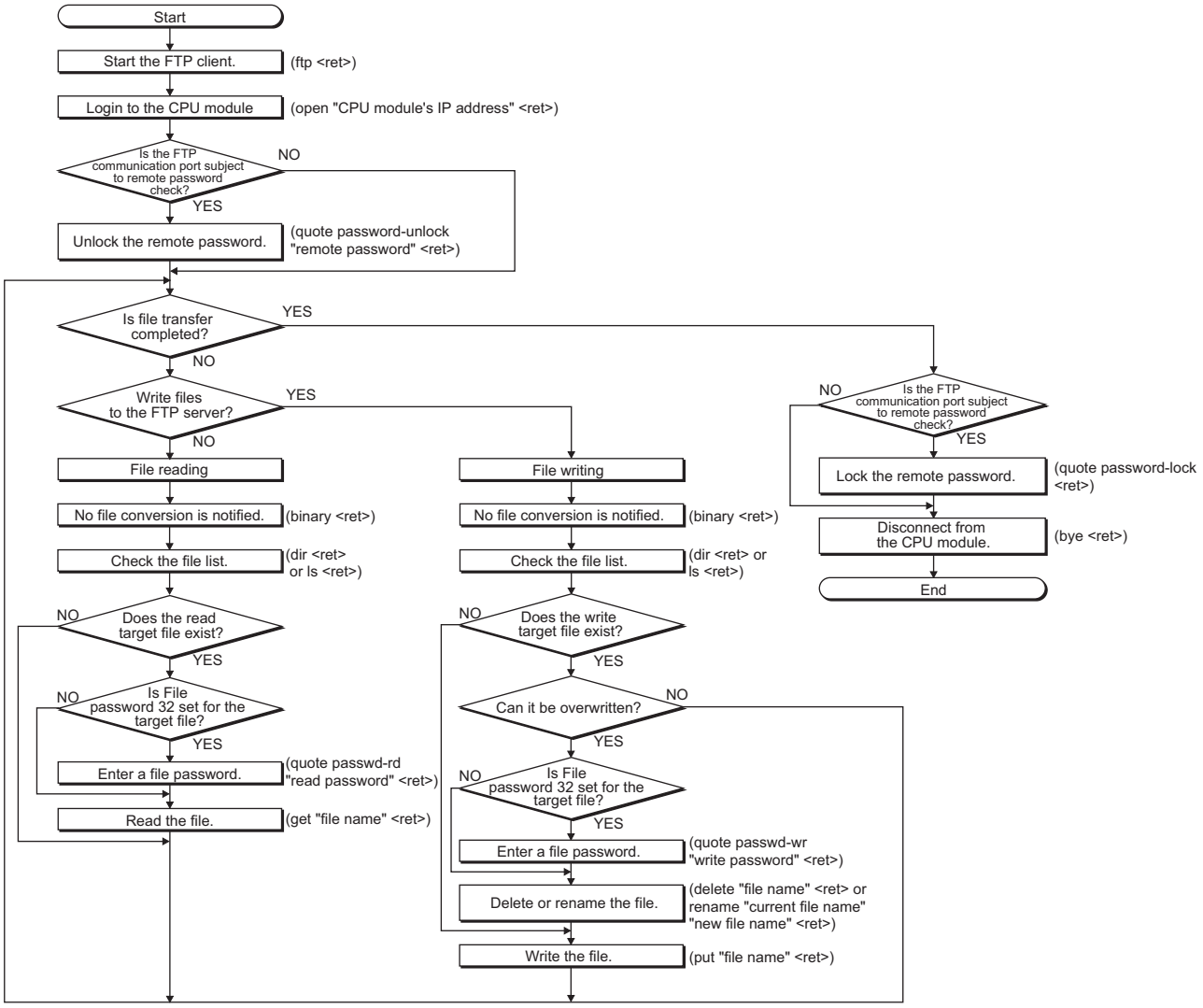
(2) Operation on the connected device (FTP client) side

The following describes the procedure and processing on the connected device side, which is required for using the FTP server function of the CPU module.

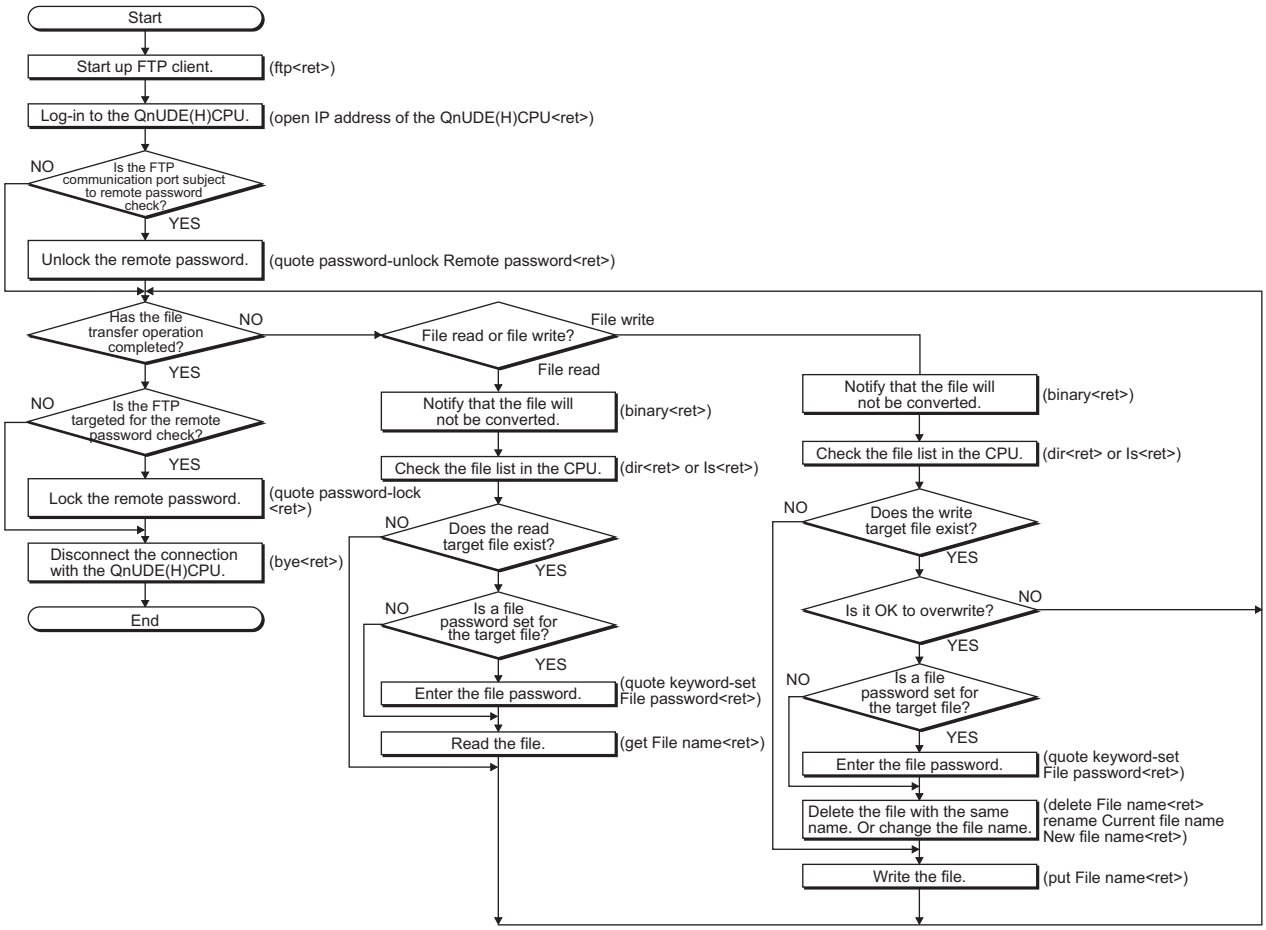
Various FTP commands and how to enter each of them are also shown.

(<ret> indicates an input of the CR, Enter, or Return key.)

(a) For the High-speed Universal model QCPU and Universal model Process CPU



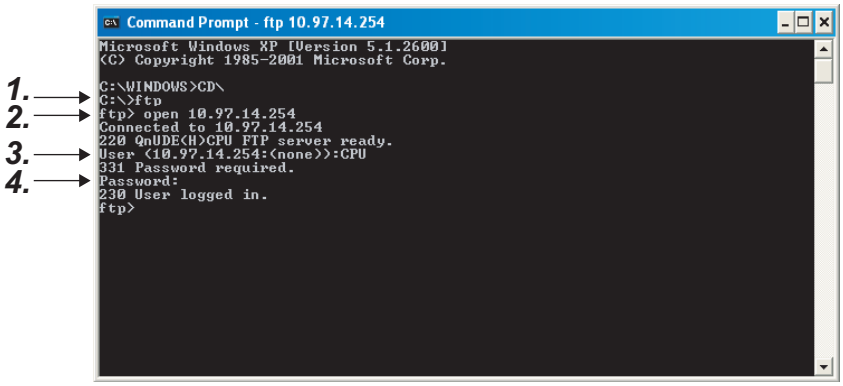
(b) For the QnUDE(H)CPU



(c) Logging in to the CPU module

The following explains the operation flow from starting an FTP session until log-in to the CPU module.

Ex. Start up the FTP from the MS-DOS prompt of Microsoft® Windows®.



1. **Start an FTP session. (FTP <ret>)**
2. **Open a connection to the FTP server (open "IP address of the CPU module" <ret>)**
3. **Specify the login name (Login name <ret>)**
4. **Specify the password (Password <ret>)**

(d) Locking and unlocking a remote password

If the FTP communication port is specified as a remote password check target in the remote password settings, unlock the remote password using the following command.
(quote password-unlock "Remote password" <ret>)

When terminating the operation, lock the unlocked remote password using the following command.
(quote password-lock <ret>)

Point

If the FTP communication port is specified as a remote password check target, any other commands cannot be used until the remote password is unlocked.

(e) Entering a file password

When a file password has been set in the target file, the file password has to be entered using the following command before accessing the file.

CPU module	Command
QnUDVCPU, QnUDPVCPU	Write password (quote passwd-wr "write password" <ret>)
	Read password (quote passwd-rd "read password" <ret>)
QnUDE(H)CPU	File password (quote keyword-set "file password" <ret>)

9.2 Files Transferable Using FTP

The following table lists the files that can be transferred using the file transfer function.

○ :Available, × :N/A

File type	Program memory *2*3	Standard RAM	Standard ROM*4	SRAM card	Flash card	ATA card	SD memory card*4	File name and extension (Any name can be specified for ***.)
	Drive 0	Drive 3	Drive 4	Drive 1	Drive 2			
Parameter	○	×	×	×	×	×	×	PARAM.QPA
Intelligent function module parameter	○	×	×	×	×	×	×	IPARAM.QPA
Program*7	○	×	×	×	×	×	×	***.QPG
Device comment	○	×	×	×	×	×	×	***.QCD
Device initial value	○	×	×	×	×	×	×	***.QDI
File register	×	○	×	○	○	×	×	***.QDR
Local device	×	×	×	×	×	×	×	***.QDL
Sampling trace file	×	×	×	×	×	×	×	***.QTD
Programmable controller user data*1	×	×	○	×	×	○	○	Any file name
Source information	×	×	×	×	×	×	×	*5
Drive heading	×	×	×	×	×	×	×	QN.DAT
Device data storage file	×	×	×	×	×	×	×	DEVSTORE.QST
Module error log file	×	×	×	×	×	×	×	IERRLOG.QIE
Boot setting file	×	×	×	×	×	×	×	AUTOEXEC.QBT
Remote password	×	×	×	×	×	×	×	00000000.QTM
Latch data backup file	×	×	×	×	×	×	×	LCHDAT00.QBP
Backup data file	×	×	×	×	×	×	×	MEMBKUP0.QBP
Data logging setting file	×	×	×	×	×	×	×	LOGCOM.QLG, LOG01.QLG to LOG10.QLG
Data logging file	×	×	×	×	×	×	○	***.CSV
Predefined protocol setting file	×	×	×	×	×	×	×	ECPRTCL.QPT
System file for the iQ Sensor Solution function (data backup/restoration)	×	×	×	×	×	×	×	SSBRINF.QSI
Backup data file for the iQ Sensor Solution function (data backup/restoration)	×	×	×	×	×	×	×	_*6
System information file for CPU module data backup/restoration	×	×	×	×	×	×	×	BKUPINF.QSL
System data file for CPU module data backup/restoration	×	×	×	×	×	×	×	BKUPDAT.QBK
Device data file for CPU module data backup/restoration	×	×	×	×	×	×	×	DEVDATA.QDT
Operation history file	×	×	○	×	×	×	○	OPERATE.QOL

*1 The SP.FWRITE or SP.FREAD instruction in the program will write or read the file respectively.
For details, refer to the following manual.
MELSEC-Q/L Programming Manual (Common Instruction)

*2 Files can be written to the program memory only when the CPU module is in the STOP state.

*3 Write destination is the program cache memory.
The user should back up files using the "pm-write" command as required. (Page 150, Section 9.4.1)

*4 The following number of files can be stored using FTP.
[Maximum number of files storable on the drive - 1]

*5 Except for the High-speed Universal model QCPU and Universal model Process CPU, file names are SRCINF1M.CAB and SRCINF2M.CAB for Simple projects (with labels), and SRCINF1I.CAB and SRCINF2I.CAB for Structured projects.
For the High-speed Universal model QCPU and Universal model Process CPU, file names are SRCINF1M.C32 and SRCINF2M.C32 for Simple projects (with labels), and SRCINF1I.C32 and SRCINF2I.C32 for Structured projects.

*6 The file name depends on the connection type of the data backup/restoration. (iQ Sensor Solution Reference Manual)

*7 When the block password for which "Execution Program Protection Setting" is enabled is set, files cannot be transferred by using the command "get" and "mget", and file names cannot be changed by using the command "rename".

9.3 Files That Can Be Deleted Using FTP

The following table lists the files that can be deleted using the file transfer function.

○: Deletable, △: Not deletable only in RUN state, ×: Not deletable, -: Not writable

File type	Program memory *2*3	Standard RAM	Standard ROM*4	SRAM card	Flash card	ATA card	SD memory card*4	File name and extension (Any name can be specified for ***.)
	Drive 0	Drive 3	Drive 4	Drive 1	Drive 2			
Parameter	△	○*6	○	○	○	○	○	PARAM.QPA
Intelligent function module parameter	△	○*6	○	○	○	○	○	IPARAM.QPA
Program	△	○*6	○	○	○	○	○	***.QPG
Device comment	△	○*6	○	○	○	○	○	***.QCD
Device initial value	△	○*6	○	○	○	○	○	***.QDI
File register	-	○	-	○	○	-	-	***.QDR
Local device	-	○	-	○	-	-	-	***.QDL
Sampling trace file	-	○	-	○	-	-	-	***.QTD
Programmable controller user data*1	-	-	○	-	-	○	○	Any file name
Source information	△	○	○	○	○	○	○	*5
Drive heading	△	○*6	○	○	○	○	○	QN.DAT
Device data storage file	-	-	△	-	-	-	-	DEVSTORE.QST
Module error log file	-	×	-	-	-	-	-	IERRLOG.QIE
Boot setting file	△	○*6	○	○	○	○	○	AUTOEXEC.QBT
Remote password	△	○*6	○	○	○	○	○	00000000.QTM
Latch data backup file	-	-	×	-	-	-	-	LCHDAT00.QBP
Backup data file	-	-	-	○	○	○	○	MEMBKUP0.QBP
Data logging setting file	-	-	○	-	-	-	○	LOGCOM.QLG, LOG01.QLG to LOG10.QLG
Data logging file	-	-	-	-	-	-	○	***.CSV
Predefined protocol setting file	-	-	○	×	×	×	○	ECPRTCL.QPT
System file for the iQ Sensor Solution function (data backup/restoration)	-	-	-	-	-	-	○	SSBRINF.QSI
Backup data file for the iQ Sensor Solution function (data backup/restoration)	-	-	-	-	-	-	○	-*7
System information file for CPU module data backup/restoration	-	-	-	-	-	-	○	BKUPINF.QSL
System data file for CPU module data backup/restoration	-	-	-	-	-	-	○	BKUPDAT.QBK
Device data file for CPU module data backup/restoration	-	-	-	-	-	-	○	DEVDATA.QDT
Operation history file	-	-	○	-	-	-	○	OPERATE.QOL

*1 The SP.FWRITE or SP.FREAD instruction in the program will write or read the file respectively.
For details, refer to the following manual.
MELSEC-Q/L Programming Manual (Common Instruction)

*2 Files can be written to the program memory only when the CPU module is in the STOP state.

*3 Write destination is the program cache memory.
The user should back up files using the "pm-write" command as required. (Page 150, Section 9.4.1)

*4 The following number of files, which can be written using FTP, can be stored.
[Maximum number of files storable on the drive - 1]

*5 Except for the High-speed Universal model QCPU and Universal model Process CPU, file names are SRCINF1M.CAB and SRCINF2M.CAB for Simple projects (with labels), and SRCINF1I.CAB and SRCINF2I.CAB for Structured projects.
For the High-speed Universal model QCPU and Universal model Process CPU, file names are SRCINF1M.C32 and SRCINF2M.C32 for Simple projects (with labels), and SRCINF1I.C32 and SRCINF2I.C32 for Structured projects.

*6 For the QnUDE(H)CPU, this file cannot be stored.

*7 The file name depends on the connection type of the data backup/restoration. (iQ Sensor Solution Reference Manual)

Point

When the online change settings is disabled in the "Built-in Ethernet Port Setting" tab of PLC Parameter, deleting a file in RUN state will cause an error.

9.4 FTP Commands

9.4.1 List of FTP commands

○ : Available, × : N/A

Command	Function	CPU module state			Remote password	
		STOP	RUN		Unlocked *2	Locked *2
			Write enabled *1	Write disabled *1		
binary*5	Notifies the FTP server of file transfer without conversion.	○	○	○	○	×
bye	Disconnects the line to the FTP server and terminates the session.	○	○	○	○	○
close	Disconnects the line to the FTP server.	○	○	○	○	○
delete*6	Deletes a file in the CPU module.*4	○	○	×	○	×
dir	Displays file information of the CPU module.*4	○	○	○	○	×
get*6	Reads a file from the CPU module.*4	○	○	○	○	×
ls	Displays file names of the files stored in the CPU module.*4	○	○	○	○	×
mdelete*6	Deletes file(s) stored in the CPU module.*4	○	○	×	○	×
mdir	Stores file information of the CPU module into a file.*4	○	○	○	○	×
mget*6	Reads file(s) from the CPU module.*4	○	○	○	○	×
mls	Stores CPU module's file names into a file.*4	○	○	○	○	×
mput*6	Writes file(s) to the CPU module.	○	○	×	○	×
open	Connects to the FTP server.	○	○	○	○	○
put*6	Writes a file to the CPU module.	○	○	×	○	×
pwd	Displays the current directory of the CPU module.	○	○	○	○	×
quit	Disconnects the line to the FTP server and terminates the connection.	○	○	○	○	○
quote	Sends an FTP server subcommand.*3	○	○	○	○	○
rename*6	Changes a CPU module file name.*4	○	○	×	○	×
user	Inputs the user name and password of the CPU module.	○	○	○	○	○

*1 Whether the online change settings is enabled or not is indicated in the "Built-in Ethernet Port" tab in the PLC Parameter window.

*2 These indicate whether the remote password can be used or not when the FTP communication port is specified as a remote password check target in the remote password setting. For remote passwords, refer to: ☞ Page 164, CHAPTER 10

*3 On the next page, subcommands available with the "quote" command are shown.

*4 Each of these commands can include a folder name in the file specification.

*5 This command is set automatically in the CPU module. Therefore, a file transfer is coded in binary regardless of the "Communication Data Code" of the "Built-in Ethernet Port Setting" in PLC Parameter.

*6 The command cannot be used for access control target files in the file access control by security key.

The following table lists the subcommands available with the command, "quote".

○ : Available, × : N/A

Subcommand	Function	CPU module state			Remote password	
		STOP	RUN		Unlocked	Locked
			Write enabled	Write disabled		
change*5	Displays or changes the CPU module file attribute.*2	○	○	×	○	×
keyword-set*3	Sets/displays/clears the Built-in Ethernet port QCPU file access password.	○	○	○	○	×
password-lock	Locks an unlocked remote password.	○	○	○	○	×*1
password-unlock	Unlocks an locked remote password.	○	○	○	○	○
status	Displays the operation information of the CPU module.	○	○	○	○	×
run	Changes the CPU module state to RUN.	○	○	○	○	×
stop	Changes the CPU module state to STOP.	○	○	○	○	×
pm-write	Writes data to the program memory.	○	×	×	○	×
passwd-rd*4	Sets, displays, or clears file password 32 (read password).	○	○	○	○	×
passwd-wr*4	Sets, displays, or clears file password 32 (write password).	○	○	○	○	×

*1 Even if the subcommand is executed, the remote password remains locked with no error occurred.
*2 This command can include a folder name in the file specification.
*3 The subcommand cannot be used for the QnUDVCPU and QnUDPVCPU.
*4 The subcommand cannot be used for the QnUDE(H)CPU.
*5 The subcommand cannot be used for access control target files in the file access control by security key.

9.4.2 How to specify an FTP command

This section explains how to specify a file with an FTP command on the FTP client (connected device), which is supported by the CPU module.

(1) File specification

A file can be specified for an FTP command on the FTP client side as follows:

- For CPU modules, each file is specified using a drive name and a file name.*2
- When specifying a file in the CPU module using the FTP function, specify the target file in the following order.

[Specification format] Drive name:\Folder name*1\File name.Extension

[Example] 3:\MAINSEQ1.QDR (other than drive 2)

2:\LOGGING\LOG01\00000001\LOG01_00000001.CSV (drive 2)

[Specification details] Refer to (a) and (b) below.

*1 Only for a file in drive 2, the folder name can be specified.

*2 Use "\" as a delimiter.

(a) Drive name (drive No.)

Specify the drive name of the file transfer target memory.

For the CPU module's memories and drive names, refer to: ☞ Page 146, Section 9.2

(b) Folder name, file name, and extension

- Specify a folder name and a file name according to the rules described in the following manual.

  QnUCPU User's Manual (Function Explanation, Program Fundamentals)
- Set an extension predetermined by the CPU module. ☞ Page 146, Section 9.2
- For an FTP command which can be used for multiple files, specify the file name and extension using a wild card character (* or ?).
  - *: Indicates all files having any characters (including no character) from the position where "*" is used.
  - ?: Indicates all files having any characters (including no character) at the position where "?" is used. (Multiple "?" can be used.)

Some FTP clients have other restrictions on the characters that can be used for file names.

Point

The part enclosed with brackets in the specification format can be omitted.

9.4.3 Details of FTP commands

Details of the FTP commands on the FTP client side, which are supported by the CPU module, and how to use each of them are described below.

Point

Note that some FTP commands may not function as described in this manual, depending on the FTP application used on the FTP client side.
Check the functions and operation methods, referring to the manual(s) for the FTP client.

(1) FTP server support commands

●binary

[Function]	Notifies the FTP server of file transfer without conversion. Neither return codes nor kanji codes are converted. This command is set automatically in the CPU module.
[Specification format]	binary (abbreviated to "bin")

●bye

[Function]	Disconnects the line to the FTP server, and terminates the FTP session.
[Specification format]	bye
[Identical command]	quit

●close

[Function]	Disconnects the line to the FTP server.
[Specification format]	close

●delete

[Function]	Deletes a file stored in the CPU module.
[Specification format]	delete "file path name"
[Example]	When deleting a file stored in an SD memory card: delete 2:\MAINSEQ1.USR
[Similar command]	mdelete

●dir

[Function]	Displays the names, creation dates, and sizes of the files stored in the CPU module.
[Specification format]	dir [drive name:\]
[Example]	When displaying the detailed information of the files stored in an SD memory card: dir 2:\
[Similar command]	ls

●get

[Function]	Reads a file from the CPU module.
[Specification format]	get "source file path name" [destination file path name]
[Example 1]	When reading a file stored in the standard RAM and saving it under the same file name: get 3:\MAINSEQ1.QDR
[Example 2]	When reading a file stored in the standard RAM and saving it under a different file name: get 3:\SEQ1BAK.QDR \SEQ\SEQ10LD.QDR
[Note]	• When no destination file path name (FTP client side) is specified, the file is saved in the FTP client using the same source file name (CPU module side). • The transfer destination is on the current directory where FTP is started up and connected to the server.

●ls

[Function]	Displays the names of the files stored in the CPU module.
[Specification format]	ls [drive name:\]
[Example]	When displaying the names of the files stored in an SD memory card: ls 2:\
[Similar command]	dir

●mdelete

[Function]	Deletes a file stored in the CPU module. To delete multiple files, specify the file name and extension within the file path name using a wild card character (* or ?).
[Specification format]	mdelete "file path name" (abbreviated to "mdel")
[Example]	When deleting all the files whose extensions are "QPG" from the program memory: mdelete 0:*.QPG
[Similar command]	delete

●mdir

[Function]	Saves detailed information (file names, creation dates, and sizes) of the files stored in the CPU module as log data into a file on the FTP client side.
[Specification format]	mdir "source drive name" :\"destination file path name"
[Example]	When saving detailed information of the files stored in an SD memory card into the S990901.LOG file: mdir 2:\ S990901.LOG
[Note]	• Type "\" immediately after the source drive name. • Specify a source drive name when specifying a destination file path name (FTP client side). • Without a destination file path name, the file is saved using a file name determined by the FTP application on the FTP client side. • The transfer destination is on the current directory where FTP is started up and connected to the server.
[Similar command]	mls

●mget

[Function] Reads out a file from the CPU module.
To read out multiple files, specify the file name and extension within the file path name using a wild card (* and/or ?).
When reading multiple files, reception is checked for each file transfer.

[Specification format] mget "file path name"

[Example] When reading all the files whose extensions are "USR" among the files stored in an SD memory card:
mget 2:*.USR

[Note] The file read out is saved on the FTP client side under the same file name.
The storage destination is on the current directory where FTP is started up and connected to the server.

●mls

[Function] Stores the names of the files in the CPU module as log data into a file on the FTP client side.

[Specification format] mls "source drive name":\"destination file path name"

[Example] When storing the names of the files in an SD memory card into the S990901F.LOG file:
mls 2:\ S990901F.LOG

[Note]
- Type "\" immediately after the source drive name.
- Specify a source drive name when specifying a destination file path name (FTP client side).
- Without a destination file path name, the file is stored using a file name determined by the FTP application on the FTP client side.
- The transfer destination is on the current directory where FTP is started up and connected to the server.

[Similar command] mdir

●mput

[Function] Writes a file to the CPU module.
To write multiple files, specify the file name and extension within the file path name using a wild card (* or ?).
When writing multiple files, transmission is checked for each file transfer.

[Specification format] mput "source file path name"

[Example] When writing all the files whose extensions are "USR":
mput *.USR

[Note] The storage destination file name is the same as that on the FTP client side.
The transfer destination is the memory in which current parameter files are stored.

●open

[Function] Connects to the FTP server by specifying the host name or IP address and port number of the FTP server.

[Specification format] open "host name" [port number]
open "IP address" [port number]
- Host name: Host name set in the Microsoft® Windows® hosts file
- IP address: CPU module IP address
- Port number: Port number to be used

[Example 1] When connecting to the FTP server by specifying a host name:
open HOST

[Example 2] When connecting to the FTP server by specifying an IP address:
open 192.0.1.254

[Note] Connection is also possible by specifying an IP address at startup of FTP.

●put

[Function]	Writes a file to the CPU module.
[Specification format]	put "source file path name" [destination file path name]
[Example 1]	When writing the MAINSEQ1.QDR file to the standard RAM with the same file name: put MAINSEQ1.QDR 3:\MAINSEQ1.QDR
[Example 2]	When writing the MAINSEQ.QDR file to the standard RAM with a different file name: put MAINSEQ.QDR 3:\MAINSEQ1.QDR
[Note]	• If no directory is specified for the source file path name (FTP client side), the file on the current directory where FTP is started up and connected to the server is written. • When no destination file path name (FTP server side) is specified, the file is saved in the memory in which current parameter files are stored.

●pwd

[Function]	Displays the current directory name of the CPU module.
[Specification format]	pwd
[Note]	"\" is displayed as the execution result of the "pwd" command.

●quit

[Function]	Disconnects the line from the FTP server and terminates the FTP session.
[Specification format]	quit
[Identical command]	bye

●quote

[Function]	Sends an FTP server subcommand (a subcommand dedicated to CPU modules).
[Specification format]	quote
[Example]	quote password-lock
[Note]	Only CPU module dedicated subcommands can be specified. Refer to (2).

●rename

[Function]	Renames a CPU module file.
[Specification format]	rename "old file path name" "new file path name" (abbreviated to "ren")
[Example]	When renaming a file stored in the standard RAM: rename 3:\MAINSEQ1.QDR 3:\SEQ1OLD.QDR
[Note]	Either of the following response codes is displayed upon completion. 350 Need more info. 250 Rename successful.

●user

[Function]	Inputs the user name and password of the connected FTP server.
[Specification format]	user "user name" [FTP password] • User name: Login name set with a CPU module parameter • FTP password: FTP password set with a CPU module parameter
[Example 1]	When specifying a user name: user CPU
[Example 2]	When specifying a user name and password: user CPU CPU

(2) CPU-module-dedicated subcommands

The CPU-module-dedicated subcommands affixed to an FTP command, "quote," are described below.

●change

[Function]	Displays or changes the attribute of a file stored in the CPU module.
[Specification format 1]	When displaying the file attribute: quote change "file path name" Either of the following is displayed as an execution result upon completion. • When the specified file is read-only: ----- R • When the specified file is writable and readable: ----- W
[Specification format 2]	When changing the file attribute: quote change "file path name" "attribute" Use either of the following to specify the attribute. • To change it to a read-only file: r • To change it to a writable and readable file: w
[Example 1]	When displaying the attribute of the file stored in the standard RAM: quote change 3:\MAINSEQ1.QDR
[Example 2]	When changing the attribute of the file stored in the standard RAM: quote change 3:\MAINSEQ1.QDR r

●keyword-set

[Function]	Sets a file password registered in the file transfer target file into the Built-in Ethernet port QCPU.*1 Or, displays/clears the password set for FTP settings in parameter.
[Specification format]	quote keyword-set [File password] • File password :Specify the file password registered in the Built-in Ethernet port QCPU file. To clear the set file password, specify "****". One of the following is displayed as the execution result upon normal completion. • When setting a file password : 200 Command successful • When displaying a file password: 200 Keyword is "File password" • When clearing a file password : 200 Command successful
[Example 1]	When setting the password (1234) quote keyword-set 1234
[Example 2]	When displaying the password currently set for FTP settings in parameter quote keyword-set
[Example 3]	When clearing the password currently set for FTP settings in parameter quote keyword-set ****
[Note]	• One file password can be set for the FTP settings in Built-in Ethernet port QCPU parameter. When the file targeted for file transfer changes, re-set the file password of the target file when a file password is also registered for the change target file. • When logging in to the Built-in Ethernet port QCPU, the file password is initialized (cleared) to "*****".

*1 : This command is used only when a file password is registered in the file transfer target file. The QnUDE(H)CPU checks a file password when a specified file is accessed.

●password-unlock

[Function]	Specify the remote password set in the CPU module to unlock the password.*2
[Specification format]	quote password-unlock [remote password] • Remote password: Specify the remote password set with a parameter for the CPU module. The following is displayed as an execution result upon completion. 200 Command Okey The following is displayed if the entered remote password does not match the setting. 556 Password Error The following is displayed if another command is requested before unlock processing of the remote password. 555 Password Locked
[Example]	When specifying a remote password (1234): quote password-unlock 1234
[Note]	• The remote password is locked when you log in if the remote password check is enabled for the FTP communication port. • By executing this command before various FTP operations, the password is unlocked, allowing file operations of the CPU module. • Unlock processing will be completed if the remote password is unlocked when the remote password check is disabled for the FTP communication port.

*2 Use this command only when the FTP communication port is specified as a remote password check target.

●password-lock

[Function]	Locks the remote password set in the CPU module.*3
[Specification format]	quote password-lock The following is displayed as an execution result upon completion. 200 Command Okey
[Example]	When locking the remote password: quote password-lock

*3 Use this command only when the FTP communication port is specified as a remote password check target.

●run

[Function] Changes the CPU module state to RUN. (Remote RUN.)
At this time, device memory clear can be specified.

[Specification format] quote run [mode [clear mode]]
- Mode: Specify whether to force remote RUN or not.
  0: Normal RUN (default)
  1: Forced RUN
- Clear mode:
  Specify the CPU module device memory clear (initialization) processing performed when the operation starts by executing remote RUN.
  0 : Do not clear device (default)
  1 : Clear other than the latch range
  2 : Clear all including the latch range

The following message is displayed as an execution result upon completion.
200 Command successful

[Example 1] When executing remote RUN, with "Normal RUN" and "Do not clear device" specified:
quote run

[Example 2] When executing remote RUN, with "Forced RUN" and "Do not clear device" specified:
quote run 1

[Example 3] When executing remote RUN, with "Forced RUN" and "Clear other than the latch range": specified
quote run 1 1

[Note]
- Forced RUN should be used only to force remote RUN to the CPU module from another device when a device that executed remote STOP to the CPU module have a problem and cannot perform remote RUN.
  With Normal RUN, the CPU module state cannot be changed from STOP/PAUSE to RUN if the previous state is set by a different device.
- Specify the clear mode at the start of an operation, according to the system arrangement. After completing the specified clear processing, the CPU module runs in accordance with the PLC parameter settings ("Initial Device value" setting on the PLC file tab).

●status

[Function] Displays information of the CPU module operation.
This command is used to check the information on the CPU module operation before transferring a file to the CPU module.

[Specification format] quote status
One of the following is displayed as an execution result upon completion.
- When the CPU module is in RUN state: "RUN"
- When the CPU module is in STOP state: "STOP"
- When the CPU module is in PAUSE state: "PAUSE"

●stop

[Function] Changes the CPU module state to STOP (remote STOP).

[Specification format] quote stop
The following message is displayed as an execution result upon completion.
200 Command successful

[Note] Before writing data to the program memory, set the CPU module into the STOP state using this command.

●pm-write

[Function]	Transfers program cache memory to the program memory.
[Specification format]	quote pm-write The following message is displayed as an execution result upon completion. 200 Command successful
[Note]	Before writing data, set the CPU module to STOP.

●passwd-rd

[Function]	Set the read password (file password 32) that has been registered in a target file to transfer in the CPU module. Displays and clears the read password that has been set in the CPU module. Use this command only when a read password has been registered in the target file to transfer. The CPU module checks a password when a specified file is accessed.
[Specification format 1]	When setting a read password in the CPU module quote passwd-rd "read password" The following message is displayed as an execution result at the normal end. • 200 Command successful
[Specification format 2]	When displaying the read password that has been set in the CPU module quote passwd-rd Any of the following is displayed as an execution result at the normal end. • When the command is executed with a read password set: 200 Read-password is "read password." • When the command is executed with no read passwords set: 200 Read-password is not set.
[Specification format 3]	When clearing the read password that has been set in the CPU module quote passwd-rd c or quote passwd-rd C The following message is displayed as an execution result at the normal end. • 200 Command successful
[Note]	• A read password can be set for the CPU module. When the target file to transfer is changed, re-set a read password for a new target file if the read password has been registered in the new file. • Re-set a read password before accessing the target file to transfer because the password that has been set using the command is initialized or cleared upon login to the CPU module.

●passwd-wr

[Function]
Sets the write password (file password 32) that has been registered in a target file to transfer in the CPU module.
Displays and clears the write password that has been set in the CPU module.
Use this command only when a write password has been registered in the target file to transfer.
The CPU module checks a password when a specified file is accessed.

[Specification format 1]
When setting a write password in the CPU module
quote passwd-wr "write password"
The following message is displayed as an execution result at the normal end.
- 200 Command successful

[Specification format 2]
When displaying the write password that has been set in the CPU module
quote passwd-wr
Any of the following messages is displayed as an execution result at the normal end.
- When the command is executed with a write password set: 200 Write-password is "write password."
- When the command is executed with no write passwords set: 200 Write-password is not set.

[Specification format 3]
When clearing the write password that has been set in the CPU module
quote passwd-wr c or quote passwd-wr C
The following message is displayed as an execution result at the normal end.
- 200 Command successful

[Note]
- A write password can be set for the CPU module.
  When the target file to transfer is changed, re-set a write password for a new target file if the write password has been registered in the new file.
- Re-set a write password before accessing the target file to transfer because the password that has been set using the command is initialized or cleared upon login to the CPU module.

9.5 Precautions

(1) FTP clients

- Some FTP clients may have FTP command specifications different from those described in this manual. In such a case, check the functions and operation methods, referring to the manuals for the FTP client.
- An FTP operation from Microsoft® Internet Explorer is not allowed. If it is attempted, an error will occur in Internet Explorer.

(2) CPU module side processing

- Files only in the drives of the host station CPU module can be accessed.
- Files may be in failure. Stop accessing the memory card or SD memory card before turning off the power supply, resetting the module, or unloading the memory card or SD memory card. By using SM606 (SD memory card forced disable instruction), accesses to the SD memory card can be disabled at a time. For details on the SD memory card forced disable instruction, refer to the following.

  QCPU User's Manual (Hardware Design, Maintenance and Inspection)
- During file access, do not operate the file from a peripheral such as a programming tool. (Also do not perform online operations such as online change, scam time measurement, registration of the step number set for a monitoring condition). If the file is operated during operation of the FTP function, an error may occur in the peripheral. Perform the processing suspended due to an error again after performing the FTP function.
- An error will occur if an FTP client tries to connect while the backup or restoration using a memory card is being performed for the CPU module change function. Execute the connection again after the end of the backup or restoration. An error will also occur if the backup or restoration is performed while an FTP client is being connected. Execute the backup or restoration again after disconnecting the FTP client.

(3) Communication processing

- If a timeout error occurs during file transfer, the TCP connection will be closed (disconnected). To restart the file transfer, log in to the CPU module once again from the FTP client.
- For each FTP connection, the existence of the target device is checked. For details, refer to: ☞ Page 45, Section 3.6
- The processing time for file transfer depends on the factors such as the Ethernet line congestion, the number of connections simultaneously used (communication processing of other connections), and the system configuration.
- Only one FTP client can log in to a CPU module at the same time. If another FTP client attempts to connect to a CPU module that is already in the logged-in state, the connection cannot be established, resulting in an error.
- An attempt to execute another communication (MELSOFT connection or MC protocol) using UDP during file transfer using FTP may cause an error such as a timeout error.
  Execute it after completion of the file transfer, or use TCP.

(4) File writing

- An existing file cannot be overwritten.
  Delete or rename an existing file with the file delete command (delete, mdelete) or the file rename command (rename) before writing files.
- A read-only file or a file locked by the function except for FTP cannot be written. If attempted, a write error occurs.
- A file cannot be transferred when the memory card or SD memory card used is protected. If attempted, a write error occurs.
- A temporary file (FTP_I***.TMP) is automatically created at a file writing. The file is renamed the write target file name when a writing is completed, however, the temporary file may remain if the CPU module is powered off or reset during a file writing. In this case, delete the temporary file.
- Before writing or deleting data to the file register in the standard RAM, set the CPU module to STOP.
- When the file register in the standard RAM is set as an auto refresh device, do not perform any writing or deletion to the corresponding drive.
- When writing a large file to a memory card or SD memory card, set the CPU module to STOP. If writing is performed in RUN state, a communication error may occur.

(5) File deletion

- The timing for deleting files must be determined by the user, considering the overall system including the CPU module and programming tool.
- When a memory card or SD memory card is protected, no files can be deleted. An error occurs if a file is deleted.

(6) Password for FTP

When you forgot the FTP password, set the FTP parameters again by the following steps.

1. **Read out the parameters from the CPU module to the programming tool.**
2. **In the FTP Parameter Setting window, click the "Default" button to return all the FTP parameters to default values.**

   Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

   ⇨ FTP Setting button
3. **Configure the FTP parameter settings again.**
4. **Write the parameters to the CPU module from the "Write to PLC" window.**

   [Online] ⇨ [Write to PLC]
5. **Power off and then on or reset the CPU module to enable the parameters.**

CHAPTER 10 REMOTE PASSWORD

A remote password is checked when a connection is requested for the following.

- Communication using a programming tool
- Communication using MC protocol
- File transfer (FTP)

Point

The remote password function is one of the preventive methods against unauthorized access (e.g. destruction of data and programs) from external devices.
However, this function cannot completely prevent unauthorized access.
Other preventive measures should be taken at users' discretion if security of the programmable controller system needs to be maintained against unauthorized access from external devices. We cannot be held responsibility for any problems caused by unauthorized access.

[Examples of measures against unauthorized access]

- Install a firewall.
- Set up a personal computer as a relay station, and control the relay of communication data using an application program.
- Set up an external device that can control access rights as a relay station.
  For devices that can control access rights, please consult your network service provider or networking equipment vendors.

10.1 Communication Using Remote Password

Communication is performed in the order described below when a remote password is set for the CPU module.

(1) Allowing access (unlock processing)

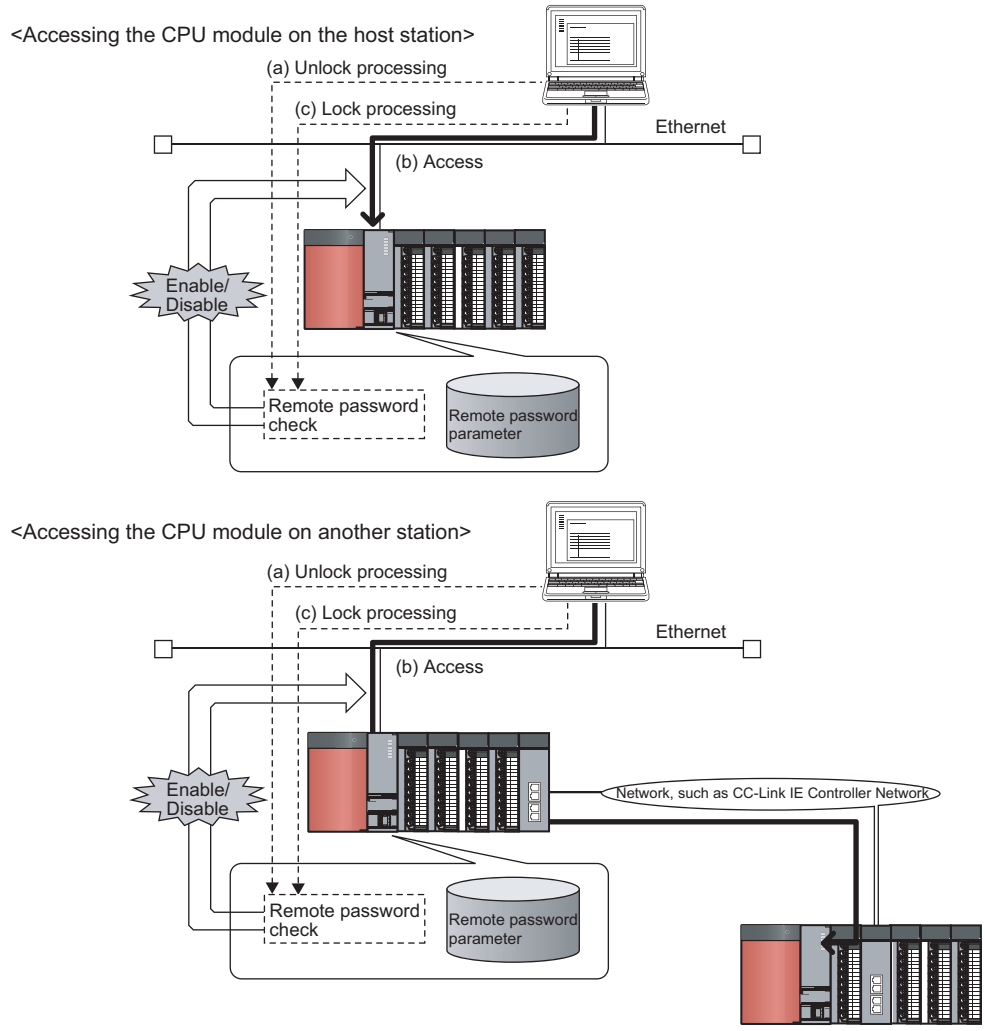
On a communication device such as a personal computer, unlock the remote password set for the CPU module. If it is not unlocked, an error will occur on the connected device because the CPU module will prohibit any access.

(2) Access processing

Access the CPU module after completion of the remote password unlock processing.

(3) Prohibiting access (lock processing)

When terminating access from the personal computer, lock the remote password to prohibit an access from any other personal computers.

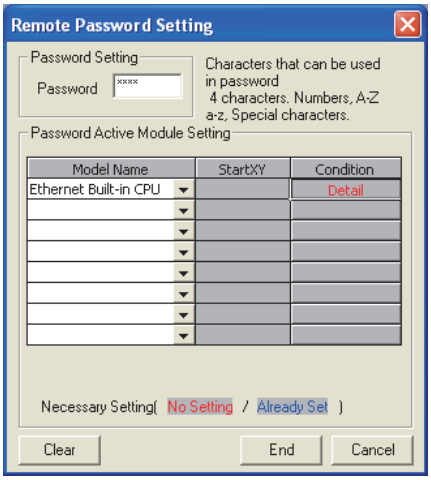


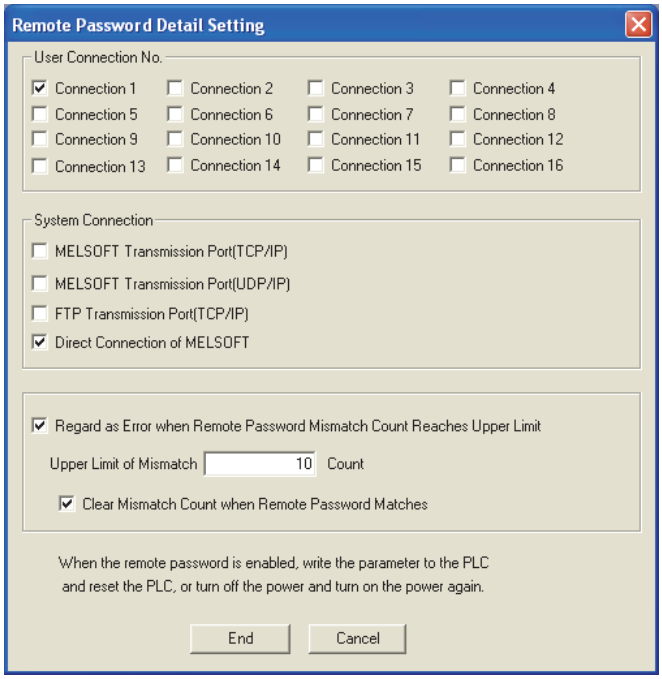
10.2 Remote Password Setting

(1) Setting a remote password

Set a remote password and a target connection in the programming tool, and write the data to the CPU module.

Project window ⇨ [Parameter] ⇨ [Remote Password]





Item		Description	Setting range
Password Setting		Enter a remote password to be set for the CPU module.*1	Up to four characters
Password Active Module Setting	Model Name	Select a CPU model to enable the remote password for the built-in Ethernet port of the CPU module. Only one CPU model is selectable.	Ethernet Built-in CPU
	Condition	Click this to display the "Remote Password Detail Setting" window.	-
User Connection No.*5	Connection 1 to 16	Select one of them when the remote password is to be enabled for the built-in Ethernet port. (Setting of an unused connection or MELSOFT connection is ignored.)	Select the checkboxes appropriate to the target connection.
System Connection*6	MELSOFT Transmission Port (TCP/IP)*2	Select one of them when the remote password is to be enabled for the built-in Ethernet port.	
	MELSOFT Transmission Port (UDP/IP)*2*3		
	FTP Transmission Port (TCP/IP)		
	Direct Connection of MELSOFT*4		
Regard as Error when Remote Password Mismatch Count Reaches Upper Limit		Select this when enabling this operation. (Useful for detecting unauthorized access) (Page 170, Section 10.4)	
Upper Limit of Mismatch		Specify the maximum number of mismatches.	1 to 65535
Clear Mismatch Count when Remote Password Matches		Select the checkbox when this operation is to be performed.	-

*1 One-byte alphanumeric and special characters can be used for remote password entry.
(Case-sensitive)

*2 To enable the remote password for the port for which the open system is set to "MELSOFT Connection" in PLC Parameter, select the following checkbox.
When Protocol is set to "TCP" → "MELSOFT Transmission Port (TCP/IP)".
When Protocol is set to "UDP" → "MELSOFT Transmission Port (UDP/IP)".
When MELSOFT connection extended setting is used → "MELSOFT Transmission Port (UDP/IP)".

*3 When connecting the CPU module and a GOT via Ethernet, do not select "MELSOFT Transmission Port (UDP/IP)".

*4 Select this checkbox to enable the remote password for the CPU module that is directly connected to the programming tool using the built-in Ethernet port. (Page 48, CHAPTER 4)

*5 User connection is for users for communications such as MC protocol communications and communications using fixed buffers.

*6 System connection is used by the system for communications such as FTP communications and MELSOFT communications (TCP/IP, UDP/IP).

(2) Writing to the CPU module

Write the remote password to the CPU module from the "Write to PLC" window.

[Online] ⇨ [Write to PLC]

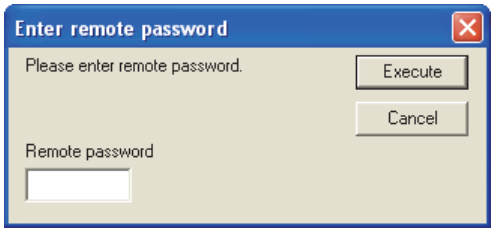
After writing the parameters to the CPU module, power off and then on or reset the CPU module to enable the parameters.

(3) Unlocking or locking the remote password

The remote password is unlocked or locked from an external device such as a personal computer, as described below.

(a) When using MELSOFT connection

Enter a remote password in the following window that appears during communication.
When the remote password is entered, the programming tool performs unlock processing and then accesses the CPU module



(b) When using MC protocol

Use commands dedicated to MC protocol. (Page 54, Section 5.1.2)

(c) When using the FTP function

Use the "password-lock" and "password-unlock" commands. (Page 150, Section 9.4.1)

(d) When using the simple PLC communication function

Unlock the remote password in the Simple PLC Communication Setting.

10.3 Precautions

(1) When a remote password is set for UDP connections

- Determine a target device before data communication. (The communication target needs to be determined because, after unlocking of the remote password, communication is available with any other devices.)
- At the end of data communication, always lock the remote password.
  (If the lock processing is not performed, the unlock state is held until a timeout occurs. No communication for 10 minutes causes a timeout, and the CPU module automatically performs lock processing.)

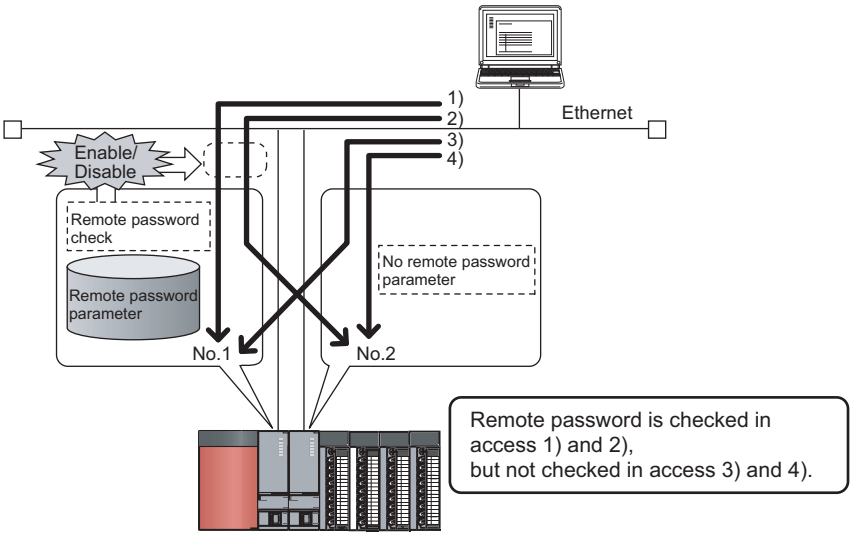
To prevent unauthorized access using the remote password setting, it is recommended to set all connection protocols to TCP/IP and disable direct connection with the parameter.

(2) When a TCP/IP connection is closed before lock processing

The CPU module automatically performs lock processing.

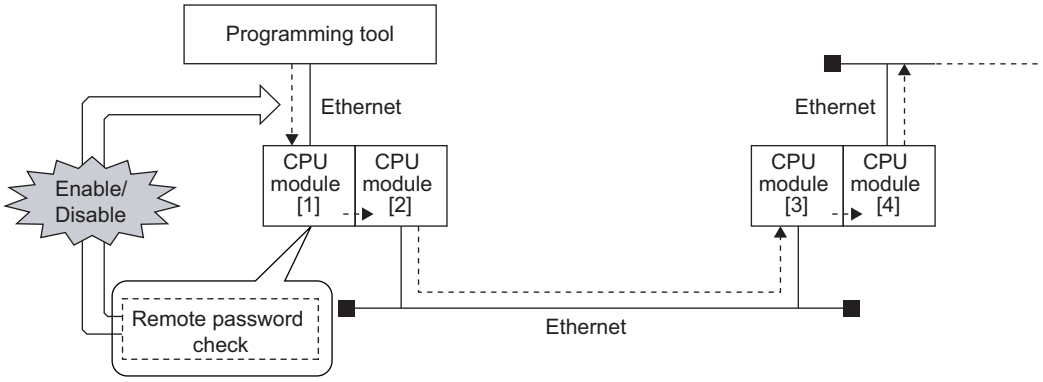
(3) Remote password valid range

The remote password is valid only for access from the Built-in Ethernet port QCPU for which the parameter settings were made. When multiple CPU modules are used in a multiple CPU system, set a remote password for each setting target CPU module respectively.



(4) Operation performed when CPU modules are set as relay stations

The following shows the accessibility when CPU modules are set as relay stations in the MELSOFT connection extended setting.



While a remote password is set for all CPU modules, the remote password set for CPU module [1] can be unlocked so that the relay station CPU modules can be accessed without password checking.

10.4 Detection of Unauthorized Access and Actions

When the remote password mismatch count reaches the upper limit in unlock processing, "REMOTE PASS FAIL" (error code: 2700) is detected.
If this occurs, unauthorized access from the outside of the system can be considered as a cause of the error.

Take the following actions as needed.

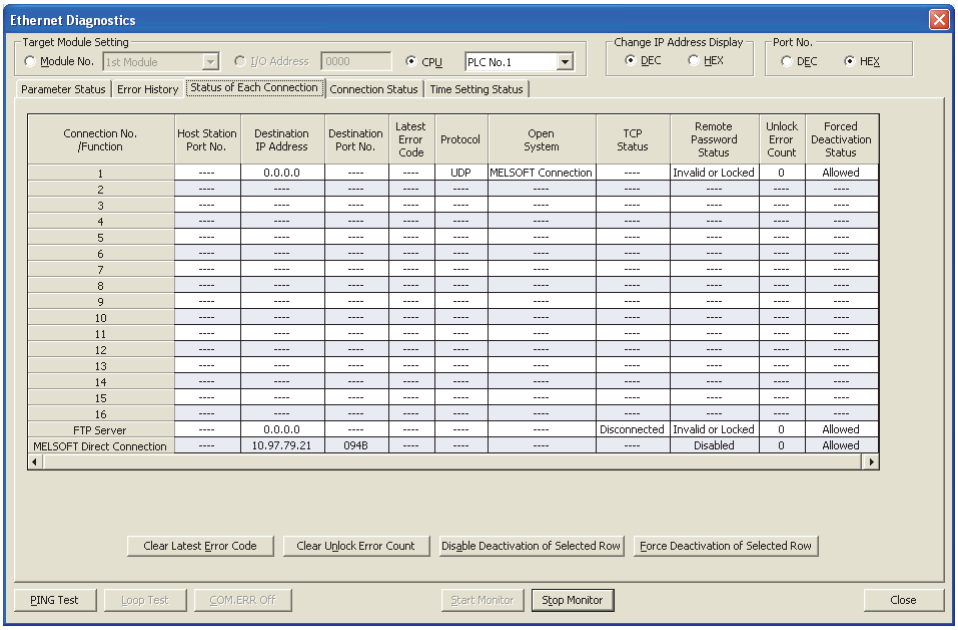
1. Monitor the Remote password count (SD979 to SD999) and identify the connection of which remote mismatch count has reached the upper limit in unlock processing.

2. Stop the communication by disabling the connection as shown below.

- Select the connection in the "Ethernet diagnostics" window, and force it to be deactivated.

(GX Works2 Version 1 Operating Manual (Common))

[Diagnostics] ⇨ [Ethernet Diagnostics] ⇨ "Status of Each Connection"



- Turn on the force deactivation flag of the connection in the special register (SD1276, SD1277).

3. Clear the "REMOTE PASS FAIL" error (error code: 2700).
The remote password count (SD979 to SD999) is also cleared.

4. Inform your system administrator that the number of unlock processing failures exceeded the limit, and take appropriate actions.

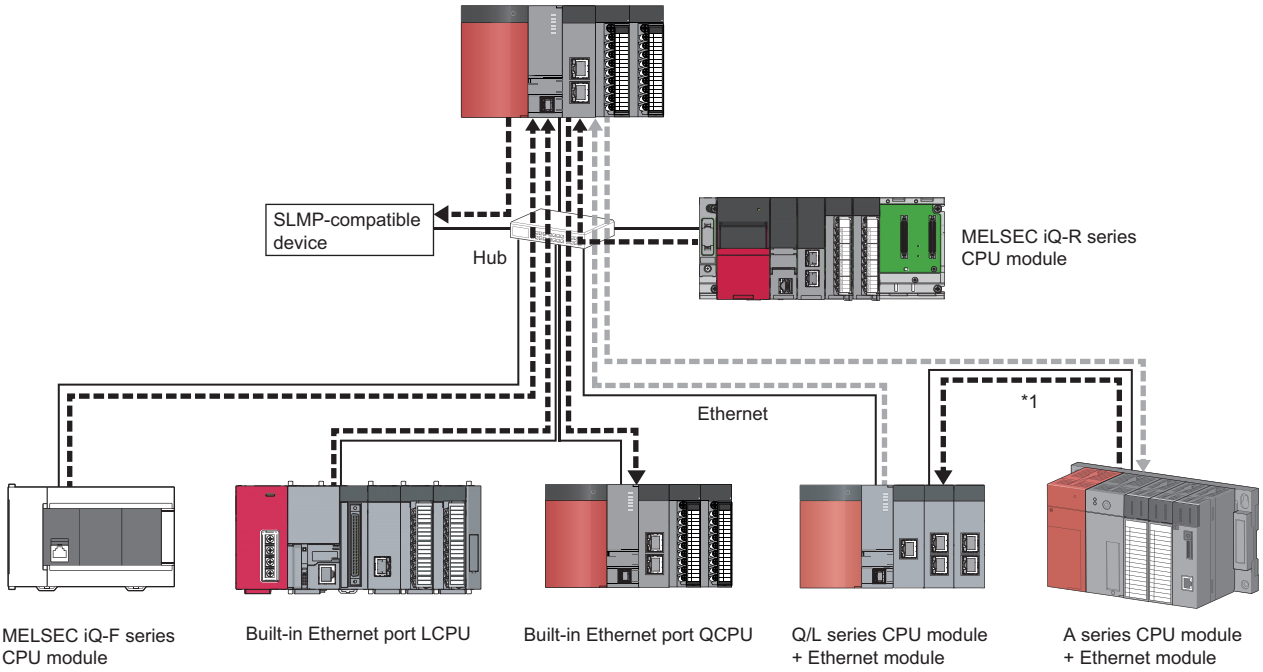
Point

If the error is detected due to frequent incorrect typing by authorized users, prevent this by the following operations.

- Enable "Clear Mismatch Count when Remote Password Matches" in the "Remote Password Detail Setting" window.
- Clear the accumulated count of remote password mismatches using the special relay (SM1273).

CHAPTER 11 SIMPLE PLC COMMUNICATION FUNCTION Note 11.1

This function allows data communications between specified devices at the specified timing just by doing simple settings from a programming tool. Specify one device (transmission source) to one device (transmission destination). The communications are performed between the specified devices.
The communications using this function are not possible when a stop error occurs in the CPU module where the parameters are set.



*1 Device data are communicated between the CPU modules where parameters are not set by relaying the device data via a CPU module where parameters are set.

Point

The communications using this function are possible only for the CPU modules connected over Ethernet. The following communications are not possible.

- Communication with a CPU module on other stations via CC-Link network
- Communication with a CPU module except the connected Built-in Ethernet port QCPU when multiple CPU system is configured
- Communication with a CPU module that does not control the connected Ethernet module when multiple CPU system is configured

Note 11.1 Universal

The simple PLC communication function is available only with the QnUDVCPU and QnUDPVCPU.

Before using the simple PLC communication function, check the version of the CPU module used. (Page 224, Appendix 3)

Remark

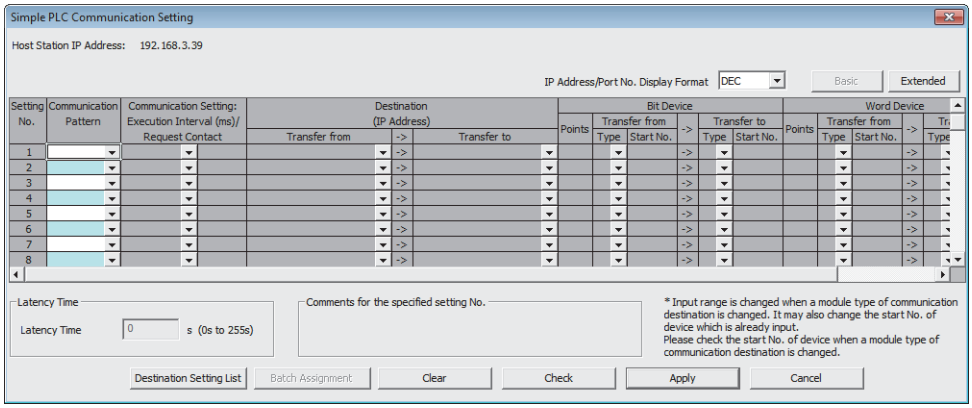
- For an external device, refer to Page 175, Section 11.1 (3) (b).
- Access via routers is also available. For the access, set the subnet mask pattern and the default router IP address. (☞ Page 30, Section 3.4)

11.1 Setting Method

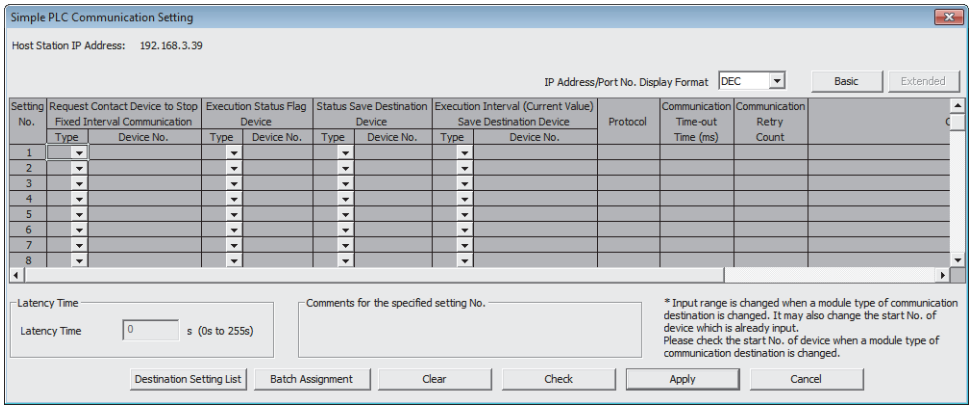
To use this function, configure the settings in "Simple PLC Communication Setting". Up to 64 devices can be set in "Simple PLC Communication Setting".

Project window ⇨ [Parameter] ⇨ [PLC Parameter] ⇨ [Built-in Ethernet Port Setting]

[Base Setting]



[Extended Setting]



Simple PLC Communication Setting consists of Base Setting (essential) and Extended Setting (optional). To switch the window, use the [Basic] and [Extended] button on the top right of the window.

(1) Communication Pattern

Select the pattern from the following items.

Setting item	Description
Read	Read the data of the specified destination device (transmission source) to the specified device of the host station (transmission destination).
Write	Write the data of the specified device of the host station (transmission source) to the specified destination device (transmission destination).
Transfer	Read the data of the specified destination device (transmission source) and write it to another specified destination device (transmission destination).*1

*1 The device data is not reflected in the CPU module where the parameters are set (the CPU module that relays the data).

(2) Communication Setting: Execution Interval (ms)/Request Contact

Select the communication timing from the following items.

Setting item		Description	Setting range
Fixed	-	Data are communicated between the devices at a specified execution interval.	-
	Execution Interval	Execution interval is set.	10ms to 65535ms (in increments of 1ms)
On Request	-	Data are communicated between the devices only when requested.	-
	Request Contact*1	Data are communicated at the rising (off to on) of the device that is specified as Request Contact. The on/off status of Request Contact is confirmed in the END processing.	X, M, B

*1 Request Contact cannot be specified overlapped with the following devices.
- Request Contact Device to Stop Fixed Interval Communication
- Execution Status Flag Device
- Source device when the host station is a transmission destination device
- Request Contact Device to Stop Fixed Interval Communication that is used for other setting No.
- Execution Status Flag Device that is used for other setting No.
- Source device when the host station is a transmission destination device, which is used for other setting No.

Point

- Actual time of execution interval may be longer than the value of the setting because the time is affected by the specified devices or Ethernet line congestion. For the preventive measures, refer to the troubleshooting described in the following manual.

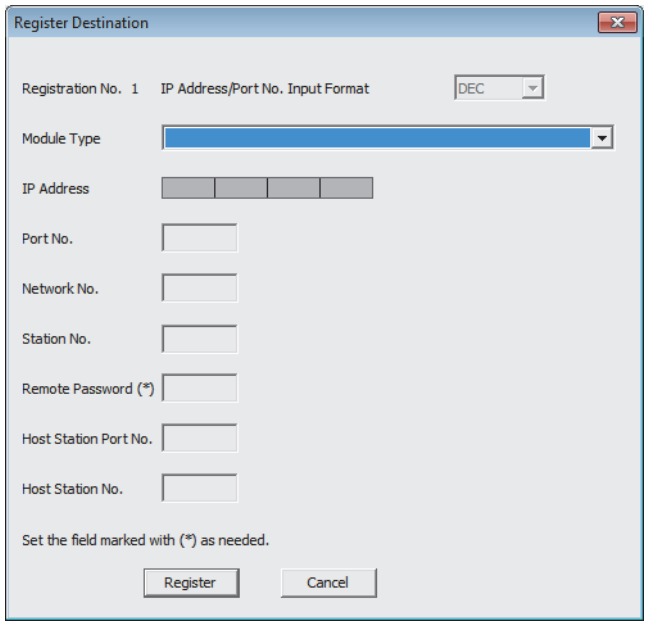
  QCPU User's Manual(Hardware Design, Maintenance and Inspection)

- If latency time is set, data communication is started after the latency time has passed. (Page 187, Section 11.1 (14))

(3) Register Destination

(a) Setting of devices for communications

Set the devices for both transmission source and transmission destination. Up to 64 devices can be registered. This setting also can be done in the "Destination Setting List" window that will open by clicking the [Destination Setting List] button in the "Simple PLC Communication Setting" window. Use the "Destination Setting List" window as well to change the setting information.



Setting item	Description	Setting range
IP Address/Port No. Input Format	Select the input format of IP address and port No.	DEC/HEX*2
Module Type	Select the device for communications.	Page 175, Section 11.1 (3) (b)
IP Address	Set the IP address of the device.	0.0.0.1 to 223.255.255.254
Port No.	Set the port No. of the device.	401_H to 1387_H, 1392_H to $FFFE_H$ (1025 to 4999, 5010 to 65534)*3
Network No.	Set the network No. of the device (host station).	1 to 239
Station No.	Set the station No. of the device.	1 to 64
Remote Password	If a remote password is set for the destination device, the communication is possible by entering the password.	4 characters or less (one-byte alphanumeric and special characters)
Host Station Port No.	Set the port No. of the host station.	0401_H to 1387_H, 1392_H to $EFFF_H$ (1025 to 4999, 5010 to 61439)
Host Station No.	Set the station No. of the host station.*1	1 to 64

*1 Set the station number not to overlap the numbers set for other devices on the same Ethernet network (such as Ethernet module, programming tool, and GOT).

*2 This item shows the format selected in "IP Address/Port No. Display Format" in the "Simple PLC Communication Setting" window and it cannot be changed in the "Register Destination" window. To change the format, go back to the "Simple PLC Communication Setting" window.

*3 When selecting MELSEC-A (Ethernet Module) or MELSEC-FX3 (Ethernet Block/Adapter), set this parameter within the range applicable to both each model and this setting.

Point

If the L/Q/QnA series modules are used for the simple PLC communication, $F000_H$ to $FFFE_H$ is automatically selected for the port No. of the host station. Therefore, when using the simple PLC communication function, do not set $F000_H$ to $FFFE_H$ to Host Station Port No. for the establishing a connection instruction (SP.SOCOPEN) of the socket communication function. If set, the instruction may not be completed properly.

(b) Module Type list

The following table shows the communication devices and specifications applicable to each module.

Module type	Device for communications	Communication specification
MELSEC-Q/L (Built-in Ethernet Function)	Built-in Ethernet port QCPU	MELSOFT connection (protocol: UDP)
	Built-in Ethernet port LCPU	
MELSEC iQ-R (Built-in Ethernet Function)	RnCPU, RnENCPU*1, RnPCPU, RnSFCPU, RnPSFCPU	
MELSEC iQ-F (Built-in Ethernet Function)*2	FX5U CPU module, FX5UC CPU module	
MELSEC-Q/L (Ethernet Module)	Basic model QCPU + Ethernet module	
	High Performance model QCPU + Ethernet module	
	Process CPU + Ethernet module	
	Universal model QCPU + Ethernet module	
	Built-in Ethernet port LCPU + Ethernet module	
MELSEC-QnA (Ethernet Module)	QnACPU + Ethernet module	
MELSEC-A (Ethernet Module)/MELSEC-FX3 (Ethernet Block/Adapter)	ACPU + Ethernet module	MC protocol A-compatible 1E frame (binary code communication) • Batch device read (word) (command type = 01_H) • Batch device write (word) (command type = 03_H)
	High Performance model QCPU (A mode) + Ethernet module	
	FX3U(C)CPU + Ethernet block	
	FX3CPU + Ethernet adapter	
SLMP-Compatible Device (QnA Compatible 3E Frame)	• MC protocol 3E frame-compatible device • SLMP-compatible device (no serial number)	MC protocol QnA-compatible 3E frame (SLMP) • Batch device read (0401_H) • Batch device write (1401_H)

*1 When using the RnENCPU, connect the cable to the Ethernet port on the CPU part.

*2 The supported firmware version is "1.110" or later.

(c) Setting for each device for communications

The settings vary depending on the device for communications.

○: Setting required, —: Setting not required

Device for communications	Setting item				
	IP address	Network No.	Station No.	Port No.	Remote password
MELSEC-Q/L (Built-in Ethernet Function)	○	—	—	—	○*3
MELSEC iQ-R (Built-in Ethernet Function)	○	—	—	—	—
MELSEC iQ-F (Built-in Ethernet Function)	○	—	—	—	—
MELSEC-Q/L (Ethernet Module)	○	○*1*2	○*1*2	—	○*3
MELSEC-QnA (Ethernet Module)	○	○*1*2	○*1*2	—	—
MELSEC-A (Ethernet Module)/MELSEC-FX3 (Ethernet Block/Adapter)	○	—	—	○*1	—
SLMP-Compatible Device (QnA Compatible 3E Frame)	○	—	—	○*1	—

*1 Setting of the host station is required.

*2 For the "MELSEC-Q/L (Ethernet Module)" and "MELSEC-QnA (Ethernet Module)," settings of these items in "Simple PLC Communication Setting" are required because these modules perform communication processing using the network No. and station No.

*3 When a remote password is set in the destination device, setting of this item is required.

(4) Settings for destination devices for communications

If following devices are used as the destination devices for communications, the settings of these devices are also required.

Destination device for communications	Necessary setting		
	Parameter	Programming tool	DIP switch on the front of the module
MELSEC-Q/L (Built-in Ethernet Function)	Set the following items (for the number of devices) in the "Open Setting" window.[*1] • Protocol: "UDP" • Open System: "MELSOFT Connection"	—	—
MELSEC iQ-R (Built-in Ethernet Function)	—[*5]	—	—
MELSEC iQ-F (Built-in Ethernet Function)	[Module Parameter] → [Ethernet Port] → [Application Settings] → [Security] → Select "Enable" (Default) on "Disable Direct Connection with MELSOFT".	—	—
MELSEC-Q/L (Ethernet Module)	Set the following items from the Ethernet setting of Network Parameter. • "Send Frame Setting" of "Operation Setting": "Ethernet(V2.0)" • "Station No.<->IP Information System" of "Station No.<->IP Information": "Automatic Response System"	—	—
MELSEC-QnA (Ethernet Module)	Set the following items from the Ethernet setting of Network Parameter. • "Send Frame Setting" of "Operation Setting": "Ethernet(V2.0)" • "Station No.<->IP Information System" of "Station No.<->IP Information": "Automatic Response System"	• Create an initial processing program and turn off the bits (6 and 7) in the special function setting area (address: 4 (4_H)) of buffer memory. • Turn on the bit 15 in the exchange instruction area during STOP (address: 103 (67_H)) of buffer memory.[*3]	Set the following items. • SW3 (Automatic start up mode setting): ON (When the Ethernet module is in automatic start up mode), OFF (When the Ethernet module is not in automatic start up mode) • SW7 (CPU exchange timing setting): ON[*2]
MELSEC-A (Ethernet Module)[*4]	—	• Create an initial processing program and do the settings as shown below. • Set the IP address and the port No. referring to (3) in this section. • Set "UDP" for the communication method. • Turn on the bit 15 in the exchange instruction area during STOP (address: 496 ($1F0_H$)) of buffer memory, and the bits corresponding to the connection No. used for bits 0 to 7.[*3]	Set the following items. • SW2 (Data code setting): OFF • SW7 (CPU exchange timing setting): ON[*2]

Destination device for communications	Necessary setting		
	Parameter	Programming tool	DIP switch on the front of the module
MELSEC-FX3 (Ethernet Block/Adapter)*4	• Set "Communication Data Code" of "Ethernet Port" to "Binary Code". • Set the following items (for the number of devices) in the "Open Setting" window. • Protocol: "UDP" • "Open System": "MC Protocol" • Set the IP address and the port No. referring to (3) in this section.	—	—
SLMP-Compatible Device (QnA Compatible 3E Frame)	Set the corresponding settings in the SLMP-compatible device so that the QnA-compatible 3E frame (SLMP) of MC protocol can be used. (Manual for the device used) • Set the communication data code as binary code. • Set the protocol to UDP.		

*1 The module has the setting by default to communicate with one device whose protocol is "UDP".

*2 To execute the simple PLC communication function when the CPU module (destination device for communications) is in RUN state, turn on this switch.

*3 To execute the simple PLC communication function when the CPU module (destination device for communications) is in STOP state or in stop error state, turn on the bits.

*4 The module cannot communicate regardless of the setting if a stop error occurs in it.

*5 Since an auto-open UDP port is used for communications, the setting is not required.

(5) Number of device points

Set the number of device points to the total number of setting No.1 to 64 (4096 words maximum).

The maximum number of points for each setting No. may differ depending on the communication destination.

• For the MELSEC-FX3 (Ethernet Block/Adapter)

Transmission source: 96 words maximum (word device 64 points + bit device 512 points)

Transmission destination: 74 words maximum (word device 64 points + bit device 160 points)

• For the cases other than the above

Transmission source/destination: 512 words maximum (word device 256 points + bit device 4096 points)

(6) Devices that can be specified

The devices that can be specified as transmission source and transmission destination vary depending on the destination device for communications. Bit device and word device can be set together for each setting number. For the size of the devices, a bit device can be specified in units of 16 points and a word device can be specified in units of one point. Use 0 or multiples of 16 to specify the device number of a bit device.

Point

- Do not write any data to the special relay and the special register that are set on the system side. Doing so may cause a system failure or communication failure.
- For I/O processing when X and Y are specified as transmission destination, refer to the following.
  QnUCPU User's Manual (Function Explanation, Program Fundamentals)

(a) Devices that can be specified for the host station

The following table lists the devices that can be specified for the host station.

Type	Applicable device	
	Symbol	Range
Bit device	X	0_H to $1FFF_H$
	Y	0_H to $1FFF_H$
	M	0 to 8191
	L	0 to 8191
	B	0_H to $1FFF_H$
	SB	0_H to $7FF_H$
	SM	0 to 2047
Word device	D	0 to 143359
	W	0_H to $1FFF_H$
	R	0 to 32767
	ZR	0 to 393215
	SW	0_H to $7FF_H$
	SD	0 to 2047

(b) When the destination device for communications is MELSEC-Q/L (Built-in Ethernet Function), MELSEC-Q/L (Ethernet Module), or MELSEC iQ-R (Built-in Ethernet Function)

Type	Applicable device[*1*2]	
	Symbol	Range
Bit device	X	0_H to $1FFF_H$
	Y	0_H to $1FFF_H$
	M	0 to 61439
	L	0 to 32767
	B	0_H to $EFFF_H$
	SB	0_H to $7FFF_H$
	SM	0 to 2047
Word device	D	0 to 4910079[*3]
	W	0_H to $4AEBFF_H$[*3]
	R	0 to 32767[*4]
	ZR	0 to 4849663
	SW	0_H to $7FFF_H$
	SD	0 to 2047

*1 The numbers of points are the maximum numbers of points when the Q4MCA-8MBS is inserted in the Q26UDVCPU. The number of points varies depending on the model of the CPU module used and use of an extended SRAM cassette.

*2 When the destination device for communications is MELSEC iQ-R (Built-in Ethernet Function), device data can be communicated within the range that modules of MELSEC-Q/L (Built-in Ethernet Function) can handle.

*3 This indicates the maximum number of points when the extended data register and extended link register are set. The extended data register and extended link register are supported by the following modules.
- Universal model QCPU with a serial number (first five digits) of "09042" or later (except the Q00UJCPU)
- Built-in Ethernet port LCPU

*4 Data are read and written according to the file register settings of the destination device.

(c) When the destination device for communications is MELSEC iQ-F (Built-in Ethernet Function)

Type	Applicable device	
	Symbol	Range
Bit device	X	0 to 1777[*1]
	Y	0 to 1777[*1]
	M[*2]	0 to 32767
	L	0 to 32767
	B	0_H to $7FFF_H$
	SB	0_H to $7FF_H$
	SM	0 to 9999
Word device	D[*2]	0 to 7999
	W	0_H to $7FFF_H$
	R[*3]	0 to 32767
	SW	0_H to $7FF_H$
	SD	0 to 11999

*1 Octal notation is used for X and Y devices.

*2 A local device cannot be specified.

*3 Data are read or written following the file register settings of the destination device.

(d) When the destination device for communications is MELSEC-QnA (Ethernet Module)

Type	Applicable device	
	Symbol	Range
Bit device	X	0_H to $1FFF_H$
	Y	0_H to $1FFF_H$
	M	0 to 32767
	L	0 to 32767
	B	0_H to $7FFF_H$
	SB	0_H to $7FF_H$
	SM	0 to 2047
Word device	D	0 to 25983
	W	0_H to $657F_H$
	R	0 to 32767
	ZR	0 to 1042431
	SW	0_H to $7FF_H$
	SD	0 to 2047

(e) When the destination device for communications is MELSEC-A (Ethernet Module)

Type	Applicable device	
	Symbol	Range
Bit device	X	0_H to $7FF_H$
	Y	0_H to $7FF_H$
	M*1	0 to 8191, 9000 to 9255
	B	0_H to FFF_H
Word device	D	0 to 6143, 9000 to 9255
	W	0_H to FFF_H
	R	0 to 8191

*1 Use "M9000 + multiples of 16" when specifying the device of M9000 or later.

(f) When the destination device for communications is MELSEC-FX3 (Ethernet Block/Adapter)

Type	Applicable device*1	
	Symbol	Range
Bit device	X	0_H to $7FF_H$
	Y	0_H to $7FF_H$
	M*2	0 to 8191, 9000 to 9255
Word device	D	0 to 6143, 9000 to 9255
	R	0 to 8191

*1 When B or W is specified for the device, an error occurs in the FX3 side and the communications are disabled.
*2 Use "M9000 + multiples of 16" when specifying the device of M9000 or later.

(g) When the destination device for communications is SLMP-Compatible Device (QnA Compatible 3E Frame)

Devices that can be used vary depending on the SLMP-compatible device used. For the devices that can be used, refer to the manual for each SLMP-compatible device.

The applicable devices are X, Y, M, L, B, SB, SM, D, W, SW, SD, R, and ZR. The device range of accessible destination is the range that can be specified with subcommands (00□1 and 00□0) of the QnA-compatible 3E frame (SLMP) of MC protocol.

(7) Timing of write or read of the device data

The data of a bit device and a word device set for each setting No. are communicated in the END processing.*1 Even so, depending on the destination device for communications, data communications for one setting may not be done completely, resulting in data inconsistency.

Destination device for communications	Device data		Data inconsistency for one setting
	Bit device	Word device	
MELSEC-Q/L (Built-in Ethernet Function) MELSEC iQ-R (Built-in Ethernet Function) MELSEC iQ-F (Built-in Ethernet Function)	Data of a bit device and a word device are guaranteed to be communicated by setting unit.		The timing of data read/write is the same between a bit device and a word device.
MELSEC-Q/L (Ethernet Module) MELSEC-QnA (Ethernet Module)	Data of a bit device are guaranteed to be communicated by setting unit.	Data of a word device are guaranteed to be communicated by setting unit.	When both a bit device and a word device are set for the same setting No., the timing of data read/write may differ between a bit device and a word device.*2
MELSEC-A (Ethernet Module) MELSEC-FX3 (Ethernet Block/Adapter)	Within the setting range, data of a bit device are guaranteed to be communicated in units of 32 bits (2 words).	Within the setting range, data of a word device are guaranteed to be communicated in units of 2 words.	• When both a bit device and a word device are set for the same setting No., the timing of data read/write may differ between a bit device and a word device.*2 • When the data of 32 bits (2 words) or larger is communicated, the timing of data read/write may differ by 32 bits (2 words).*3
SLMP-Compatible Device (QnA Compatible 3E Frame)	Data of a bit device are guaranteed to be communicated by setting unit.	Data of a word device are guaranteed to be communicated by setting unit.	When both a bit device and a word device are set for the same setting No., the timing of data read/write may differ between a bit device and a word device.*2

*1 If the COM or CCOM instruction is used, the data are written or read not only in the END processing but also during sequence scan (at the execution of the COM or CCOM instruction).

*2 The order of the write and read is shown below.
- When "Write" is set for Communication Pattern: A word device comes first, then a bit device.
- When "Read" is set for Communication Pattern: A bit device comes first, then a word device.
- When "Transfer" is set for Communication Pattern: The host station reads the data of transmission source in order of a bit device and a word device, and writes them to transmission destination in order of a word device and a bit device.

*3 Because the write and read is performed from the data with smaller device number, use the device with the largest No. to secure the data.

(8) Request Contact Device to Stop Fixed Interval Communication

Select the device from X, M, or B and specify it as Request Contact Device to Stop Fixed Interval Communication.*1 If "Fixed Interval" is set for Communication Setting, the communications for the specified setting No. temporarily stop when Request Contact Device to Stop Fixed Interval Communication turns on. The communications re-start when Request Contact Device to Stop Fixed Interval Communication turns off. The on/off status is confirmed in the END processing. This stop request is enabled when the communication status is "Communicating" or "Error".

*1 Request Contact cannot be specified overlapped with the following devices.
- Request Contact
- Execution Status Flag Device
- Source device when the host station is a transmission destination device
- Request Contact that is used for other setting No.
- Execution Status Flag Device that is used for other setting No.
- Source device when the host station is a transmission destination device, which is used for other setting No.

Point

- When communications are stopped by the request to stop fixed interval communication, the data communications at a specified execution interval, which is performed when "Fixed" is set for Communication Setting, is ignored.
- The stop time by the request to stop fixed interval communication is not counted as Execution Interval (Current Value).
- If the communications are stopped by the request to stop fixed interval communication during retry of communication, the retry count is reset to 0.

(9) Execution Status Flag Device

Select the device from X, M, or B and specify it as a device to store the execution status.*1 The on/off status below indicates the execution status.

- ON: Communicating (the state of "Status" being "3_H")
- OFF: Communication stop

*1 Execution Status Flag Device cannot be specified overlapped with the following devices.
- Request Contact
- Request Contact Device to Stop Fixed Interval Communication
- Source device when the host station is a transmission destination device
- Request Contact that is used for other setting No.
- Request Contact Device to Stop Fixed Interval Communication that is used for other setting No.
- Execution Status Flag Device that is used for other setting No.
- Source device when the host station is a transmission destination device, which is used for other setting No.

Point

For examples of how to use this device, refer to Page 188, Section 11.2

(10)Status Save Destination Device

Select the device from D, D (extended data register), W, W (extended link register), R, or ZR and specify it as a device to store the communication status.*1 The values listed below indicate the communication status.

Item	Description	
	Communication status	Description
1_H	Preparing	Indicates the waiting state for the latency time to pass or the state until communications start after the CPU module is powered off and on or reset.
2_H	Waiting for the request	Indicates the waiting state for the communication request by Request Contact. (Only when Communication Setting is set as "On Request")
3_H	Communicating	Indicates the state that device data are being sent or received.
4_H	Communication stop	Indicates the state that the simple PLC communication function is stopped by the request to stop fixed interval communication. (Only when Communication Setting is set as "Fixed")
Error code No.	The corresponding error code is stored.	

*1 Status Save Destination Device cannot be specified overlapped with the following devices.
- Status Save Destination Device
- Execution Interval (Current Value) Save Destination Device
- Source device when the host station is a transmission destination device
- Status Save Destination Device that is used for other setting No.
- Execution Interval (Current Value) Save Destination Device that is used for other setting No.
- Source device when the host station is a transmission destination device, which is used for other setting No.

Point

For examples of how to use this device, refer to Page 188, Section 11.2.

(11)Execution Interval (Current Value) Save Destination Device

Select the device from D, D (extended data register), W, W (extended link register), R, or ZR and specify it as a device to store Execution Interval (Current Value).*1

Item	Description
Execution Interval (Current Value)	If "Fixed" is set to Communication Setting, the actual execution interval of the communications is stored. If the communications have never been performed properly, "0" is stored.

*1 Execution Interval (Current Value) Save Destination Device cannot be specified overlapped with the following devices.
- Status Save Destination Device
- Execution Interval (Current Value) Save Destination Device
- Source device when the host station is a transmission destination device
- Status Save Destination Device that is used for other setting No.
- Execution Interval (Current Value) Save Destination Device that is used for other setting No.
- Source device when the host station is a transmission destination device, which is used for other setting No.

Point

For examples of how to use this device, refer to Page 188, Section 11.2.

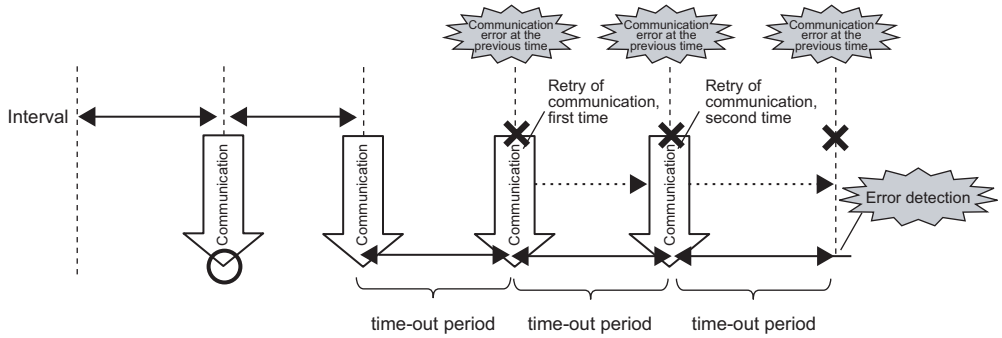
(12)Time-out Time and Retry Count

Setting item	Description	Setting range
Communication Time-out Time	Set the time interval until an error is detected or the retry of communication is performed when the destination device for communications does not respond or communications fail.	10ms to 65535ms (in increments of 1ms)*1
Communication Retry Count	Set the number of communication retry to be performed when the destination device for communications does not respond or communications fail.	0 to 255*2

*1 When the destination device for communications is "MELSEC-A (Ethernet Module)/MELSEC-FX3 (Ethernet Block/Adapter)" or "SLMP-Compatible Device (QnA Compatible 3E Frame)", the value is fixed at 65535ms.

*2 When the destination device for communications is "MELSEC-A (Ethernet Module)/MELSEC-FX3 (Ethernet Block/Adapter)" or "SLMP-Compatible Device (QnA Compatible 3E Frame)", the value is fixed at 0.

Ex. Error detection timing when 2 is set to Communication Retry Count



Point

The error is detected if the destination device does not respond or communications fail by when the following time has passed: (Communication Retry Count + 1) × Communication Time-out Time

(a) Operation at retry of communication

If no response is received or an error occurs (error response) after a data transmission to the destination device, communications are retried after the communication timeout time elapses.

Communications at a specified execution interval (when "Fixed" is set for Communication Setting) or communications according to the on status of Request Contact (when "On Request" is set for Communication Setting) are ignored during retry of communication because that period is regarded as Communication Timeout Time.

For writing of device data during retry of communication, the data at the time of communication error is sent to the destination device. For reading of device data, the data at the time of the retry of communication is received.

When multiple setting numbers have the same destination device for communication, if a retry of communication occurs in one setting, data communications at a specified execution interval are not performed in other settings. When the communications are enabled by the retry of communication, the data communication of other settings are restarted. If the communications do not return to normal even though the retry is performed, the error (4902_H) occurs in other settings having the same destination devices.

(13)Comment

Comment can be set by entering up to 32 one-byte characters (16 double-byte characters).

(14)Latency Time

By setting the latency time, the start timing in the communications can be switched in the following cases.

- To prevent an error due to the overlap of the start timing in the communications
- To start communications after the destination device is ready for the communications

During the latency time, "Preparing" is indicated in Communication status.

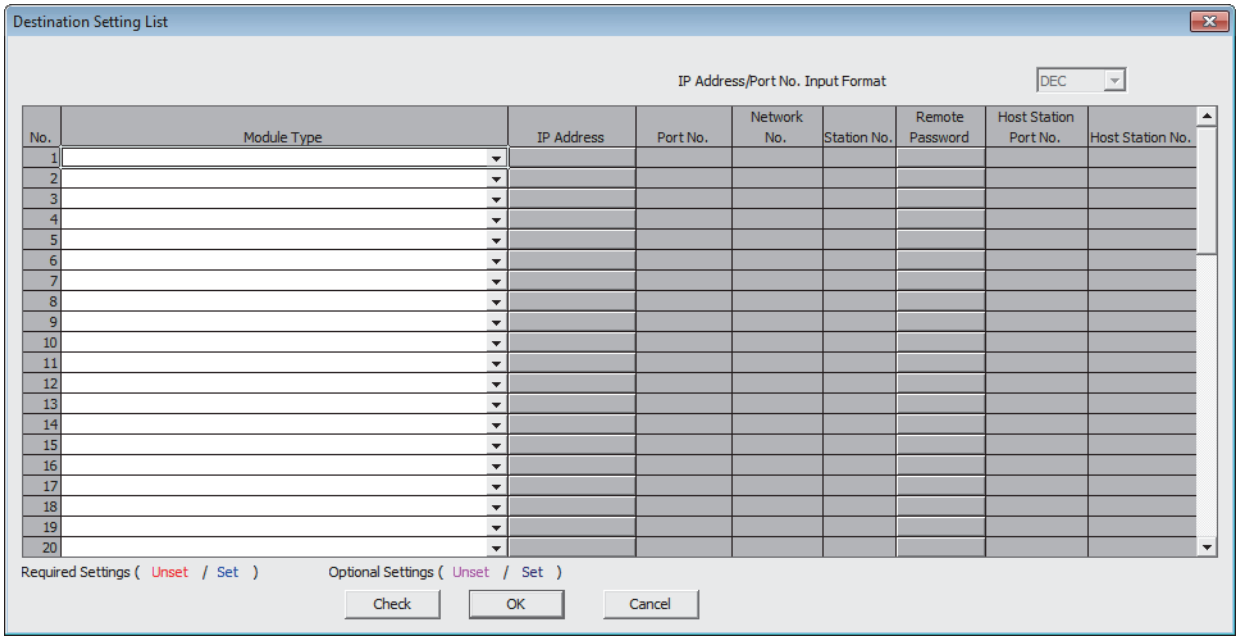
Setting item	Description	Setting range
Latency Time	Set the time required to start communications after completion of the CPU module startup.	0s to 255s (in increments of 1s)

Point

Communications at a specified execution interval (when "Fixed" is set for Communication Setting) or communications at the rising (off to on) of Request Contact (when "On Request" is set for Communication Setting) are ignored during the latency time.

(15)Destination Setting List

Up to 64 devices can be registered. By registering devices on this window in advance, the registered devices can be just selected for destination instead registering them at each setting No.



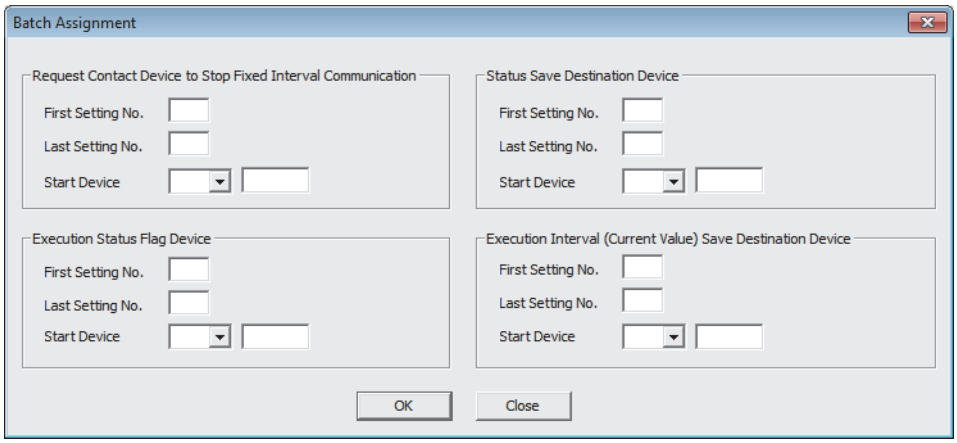
For details on the setting items, refer to the following.

Page 174, Section 11.1 (3)

(16)Batch Assignment

To set Batch Assignment, click the [Extended] button in the simple PLC communication setting window. Specify the first setting number, last setting number, and start device for the following. The specified device can be set in a batch sequentially from the set start device for the specified setting numbers.

- Request Contact Device to Stop Fixed Interval Communication
- Execution Status Flag Device
- Status Save Destination Device
- Execution Interval (Current Value) Save Destination Device



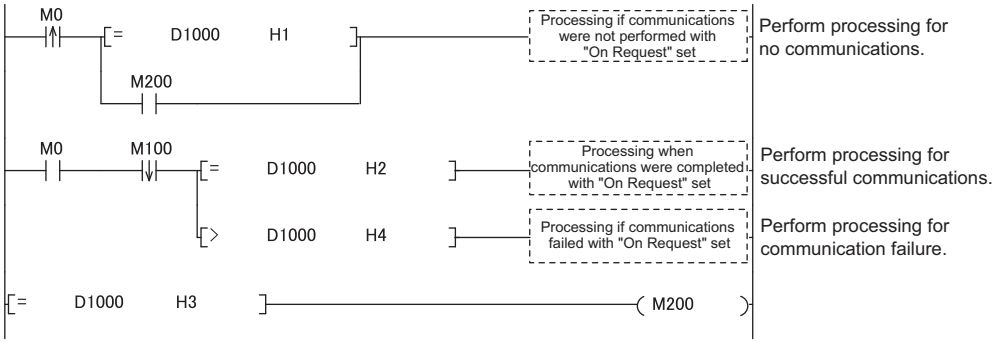
11.2 Program to Check Communications

This section shows the program used to check communications when "On Request" is set for Communication Setting.

(1) Devices used in programs

Device	Application
M0	Request Contact for setting No.1
M100	Execution Status Flag Device for setting No.1
M200	Flag to check if Request Contact turns on (when the status is "Communicating")
D1000	Status Save Destination Device for setting No.1

(2) Program example



11.3 Diagnostics

The communication status of the simple PLC communication function can be checked in the "Simple PLC Communication Status" tab of the "Ethernet Diagnostics" window.

[Diagnostics] ⇨ [Ethernet Diagnostics]

For details on Ethernet diagnostics, refer to the following.

GX Works2 Version 1 Operating Manual (Common)

11.4 Errors Related to the Simple PLC Communication Function

If an error related to this function occurs, it is not regarded as a diagnostic error in the CPU module. Instead the simple PLC communication status (the corresponding error code) is stored.

(1) Errors caused by the operation status of the CPU module or the operations of each function

The errors are not stored in the history of Ethernet diagnostics.

Error code	Error item	Error timing	Description	Action
4900_H	Other errors	When the parameters are written to the CPU module	After the values in the "Device" setting of PLC parameter of the CPU module, where the simple PLC communication function had been set, were changed, the parameters were written to the CPU module.	Power off and on or reset the CPU module.
4901_H		When an error related to the simple PLC communication function occurs (at corresponding setting No.)	The file register used for the simple PLC communication function became out of range.	Correct the device number of the file register, and then power off and on or reset the CPU module.
4902_H		When an error related to the simple PLC communication function occurs (at the other setting No.)	The communication was stopped because an error occurred at the other setting No., for which the same destination device of the corresponding setting No. had been set.	Eliminate the error cause.
4903_H		When a stop error occurs	The communication was stopped because a stop error occurred in the CPU module where the simple PLC communication function had been set.	Power off and on or reset the CPU module.

(2) Errors caused by communication failure

The errors are stored in the history of Ethernet diagnostics.

An error response from the destination device for communication is stored as error code. For the error details and action of displayed error code, refer to the manual for the destination device.

(3) Operations after the error

After the occurrence of the error, if the conditions are restored for proper communications, data communications are re-started at the following timing.

- When "Fixed" is set for Communication Setting: At the timing of the execution interval
- When "On Request" is set for Communication Setting: At the rising (off to on) of Request Contact

11.5 Precautions

This section provides precautions for the simple PLC communication function.

(1) The timing when the settings are enabled

The settings for this function are enabled at the following timing.

- When powering off and on the CPU module
- When resetting the CPU module

Even if the values of the settings are changed and the CPU module state is changed from STOP to RUN during execution of this function, the CPU module keeps operating with the previous settings. Note that if the "Device" setting of PLC parameter is changed and the parameters are written to the CPU module, an error (error code: 4900_H) occurs while the parameters are being written.

(2) Communications with other CPU modules

- The communications are possible only between the CPU modules connected over Ethernet. (Communications with the other CPU modules cannot be performed through the CPU module connected over Ethernet.)
- When the simple PLC communications are performed between the devices that need to be set the host station port number (MELSEC-A (Ethernet Module)/MELSEC-FX3 (Ethernet Block/ Adapter) and SLMP-Compatible Device (QnA Compatible 3E Frame)), if the own station port numbers are not unique, the communications cannot be performed normally. Ensure that all the host station port numbers set are different.
- When the simple PLC communications are performed using MELSEC-A (Ethernet Module) or MELSEC-FX3 (Ethernet Block/ Adapter), specify the port number within the usable range for the simple PLC communications.
  (Some port numbers of MELSEC-A (Ethernet Module) and MELSEC-FX3 (Ethernet Block/Adapter) are not available for the simple PLC communications even though the numbers are within the setting range.)

(3) Device data

If the COM or CCOM instruction is used in the CPU module of the host station, not only the data in the END processing but also the data during sequence scan (at the execution of the COM or CCOM instruction) are subjected to communications. To always use data in the END processing in a program, perform the following operations.

- [Transmission source] For the program, use a different device from the one specified for this function. At the end of the program (just before the END), reflect the data of that device to the one specified for this function.
- [Transmission destination] At the beginning of the program, reflect the data of the device specified for this function to the other device, and use that device for the program.

(4) Incomplete data reception and timeout

Because the load of Ethernet communication becomes heavy during the simple PLC communication, if the other communication (MELSOFT connection or MC protocol) is simultaneously performed by using protocol UDP, the data reception of UDP may not be completed, resulting in a timeout error. Therefore, to perform other communications during the simple PLC communication, the communication using TCP is recommended. Also conduct following operations to reduce Ethernet communication load.

- Increase the execution interval of the simple PLC communication.
- Reduce the number of device points for communication.

(5) Communication stop

For a certain setting No., if the device is waiting for the response of the destination device due to power off of the module, cable disconnection, or power off of the hub, communications for the other setting No. might be stopped for 1000ms.

(6) Errors at the destination device

If an error related to this function occurs, following errors might be detected at the destination device.

- When the destination device is Q/L series: Remote password mismatch error
- When the destination device is A series: Device number specification error

Also, an error might be detected depending on the settings of the destination device or the conditions of Ethernet communication.

(7) Communications with the CPU module for which a remote password is set

When performing communications from multiple CPU modules to the CPU module for which a remote password is set, set the latency time to avoid overlapping of start timings of communications. When the simple PLC communications from multiple CPU modules to a single CPU module are simultaneously started, communication timings are overlapped and an error may occur.

(8) When the destination device is MELSEC iQ-R (Built-in Ethernet Function) or MELSEC iQ-F (Built-in Ethernet Function)

The simple PLC communications cannot be performed when the destination device for communications is the MELSEC iQ-R series or the MELSEC iQ-F series CPU module and a remote password is set to it. Clear the remote password of the destination device.

(9) Execution of the SLMP frame send instruction

The SP.SLMPSND instruction cannot be executed when the parameters of the simple PLC communication setting are set.

(10) Specification of a file register (R, ZR)

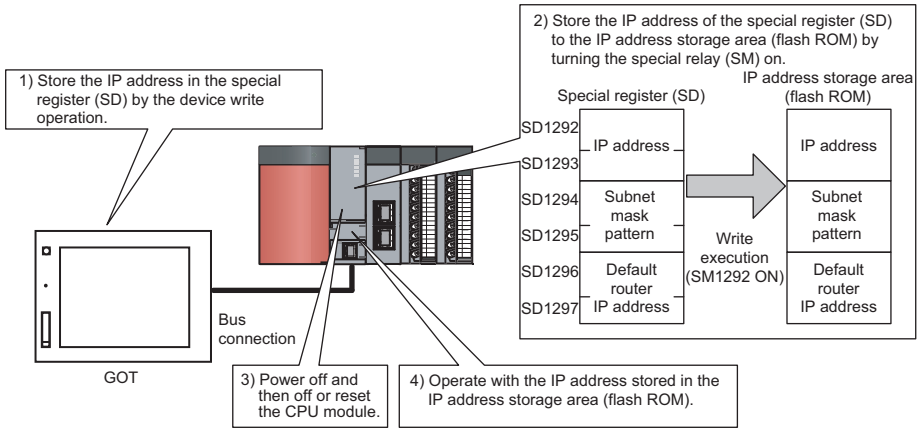
"Use the same file name as the program" cannot be specified for a file register (R, ZR) in the following cases. (If the setting is specified and a file register (R, ZR) is set for the simple PLC communications, "PARAMETER ERROR" (error code: 3000) will occur.)

In addition, the file register cannot be switched by using the QDRSET instruction. (If the QDRSET instruction is executed in the following cases, an error (4901_H) will occur in the simple PLC communication function.)

- When "Write" is set for communication pattern, a file register (R, ZR) is specified for a transmission destination.
- When "Read" is set for communication pattern, a file register (R, ZR) is specified for a transmission source.

CHAPTER 12 IP ADDRESS CHANGE FUNCTION Note 12.1

The IP address of a built-in Ethernet port can be changed without changing the built-in Ethernet port settings of PLC parameters, by storing the values in special relays and special registers.



Point

This function can also be used by changing values for special relay and special register from GOT. For details of the special relay and special register used for this function, refer to the lists of the special relay and special register in the following.

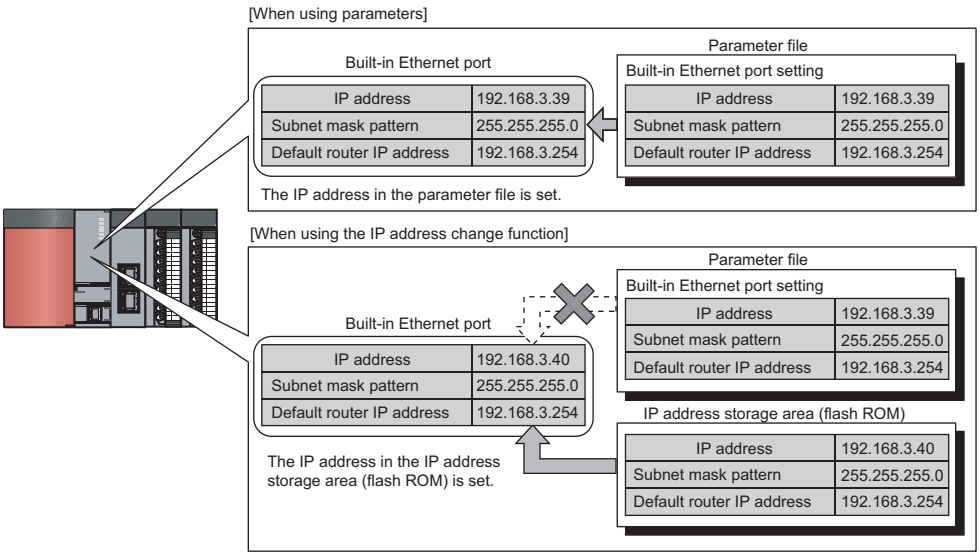
QCPU User's Manual (Hardware Design, Maintenance and Inspection)

Note 12.1 Universal

To use the IP address change function for the QnUDE(H)CPU, check the version of the CPU module. (Page 224, Appendix 3)

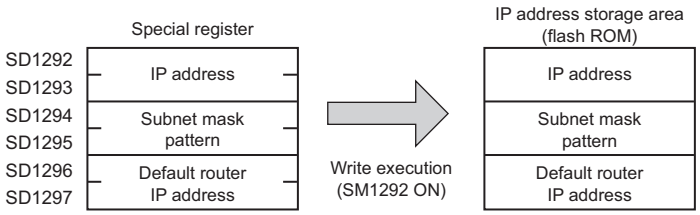
12.1 IP Address of the Built-in Ethernet Port

For IP address of the built-in Ethernet port, a value of the built-in Ethernet port setting of the PLC Parameter is set at the initial processing of the CPU module. When this function is used, the value stored in the IP address storage area (flash ROM) will be set to the IP address of the built-in Ethernet port which is set during the initial processing of the CPU module, instead of the value set in the parameter.



(1) Write and clear operation to the IP address storage area (flash ROM)

Write a value of IP address to the IP address storage area (flash ROM). The special relay and special register are used to perform the write and clear operations.



(2) Execution timing of writing to and clearing the IP address storage area (flash ROM)

Write and clear processing are executed in the END processing. Therefore, the scan time is increased during execution.

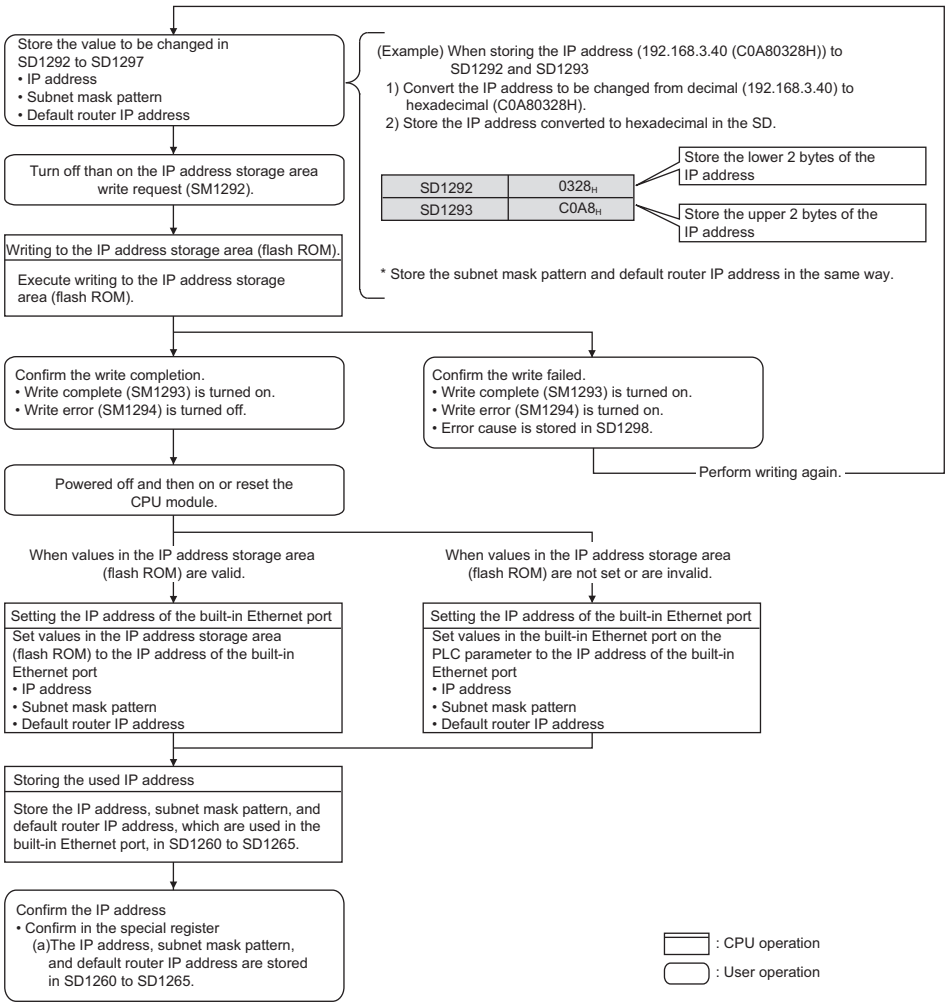
12.2 How to Use the Function

12.2.1 Write operation

This operation can be performed by storing the IP address to be changed in SD1292 to SD1297 and turning off and on SM1292 (IP address storage area write request).

(1) Operating procedure

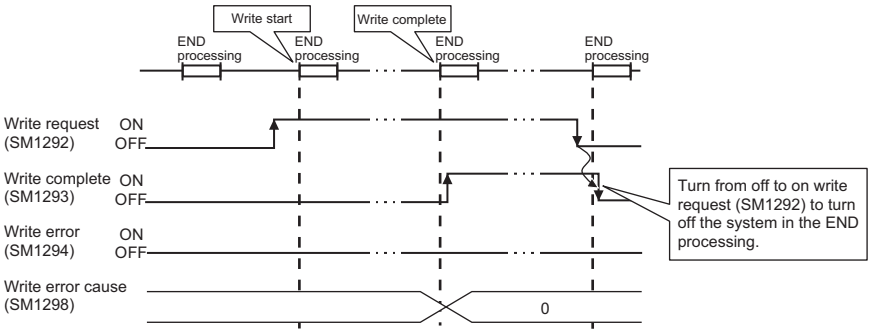
The following shows the write operation flow.



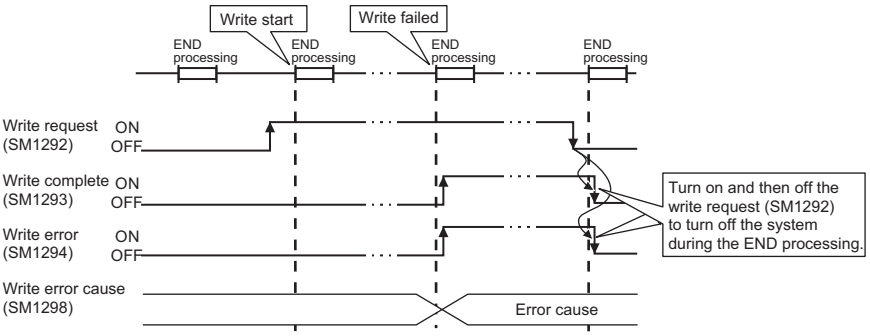
(2) Operations of special relay and special register

The following shows the operations of special relay and special register during the operation of writing to the IP address storage area (flash ROM).

(a) Operations of special relay and special register during the operation of writing to the IP address storage area (flash ROM)



(b) Operations of special relay and special register when the operation of writing to the IP address storage area (flash ROM) failed



(3) Cause of failure to write to the IP address storage area (flash ROM)

If the processing of writing to the IP address storage area (flash ROM) is not completed, the error cause is stored in SD1298 (IP address storage area write error factor).

Value in SD1298	Error cause
100_H	The value in SD1292 to SD1297 is outside the setting range.
200_H	An error occurred during writing.
300_H	Writing cannot be performed since the following functions are being executed. • Online Program Change • Export to ROM format • Write to PLC (flash ROM) • CPU module data backup/restoration function
400_H	Writing is started during clear processing execution.

(4) Program example

The following shows a program example of writing to the IP address storage area (flash ROM).

(a) Devices used in programs

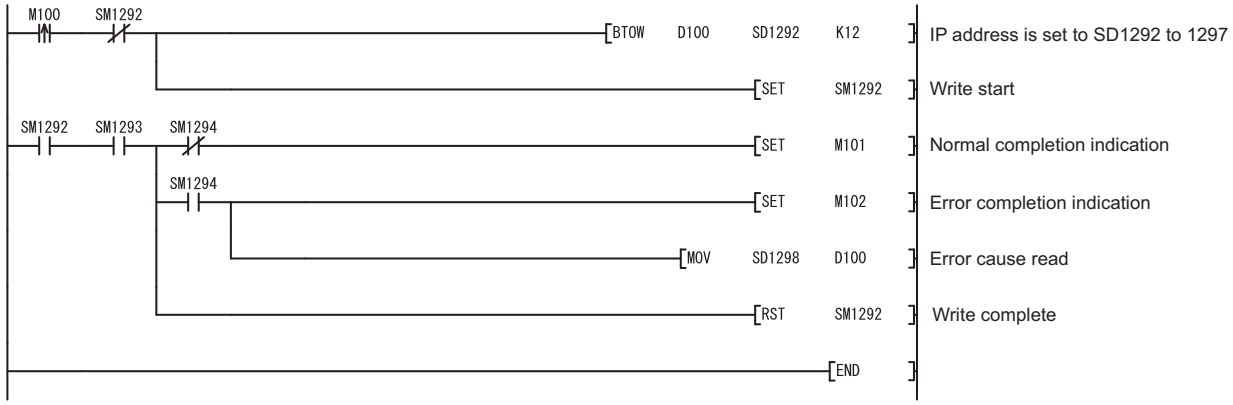
Device number	Application	Device number	Application
M100	Write Instruction	SM1293	IP address storage area write complete
D100 to D103*1	IP address to be changed	SM1294	IP address storage area write error
D104 to D107*1	Subnet mask pattern to be changed	M101	Normal write completion indication
D108 to D111*1	Default router IP address to be changed	M102	Abnormal write completion indication
SD1292 to SD1297	IP address setting	SD1298	IP address storage area write error factor
SM1292	IP address storage area write request	D100	Write error factor display

*1 Set as follows.

Example When setting the IP address 192.168.3.40 in D100 to D103

D100	40
D101	3
D102	168
D103	192

(b) Sample program

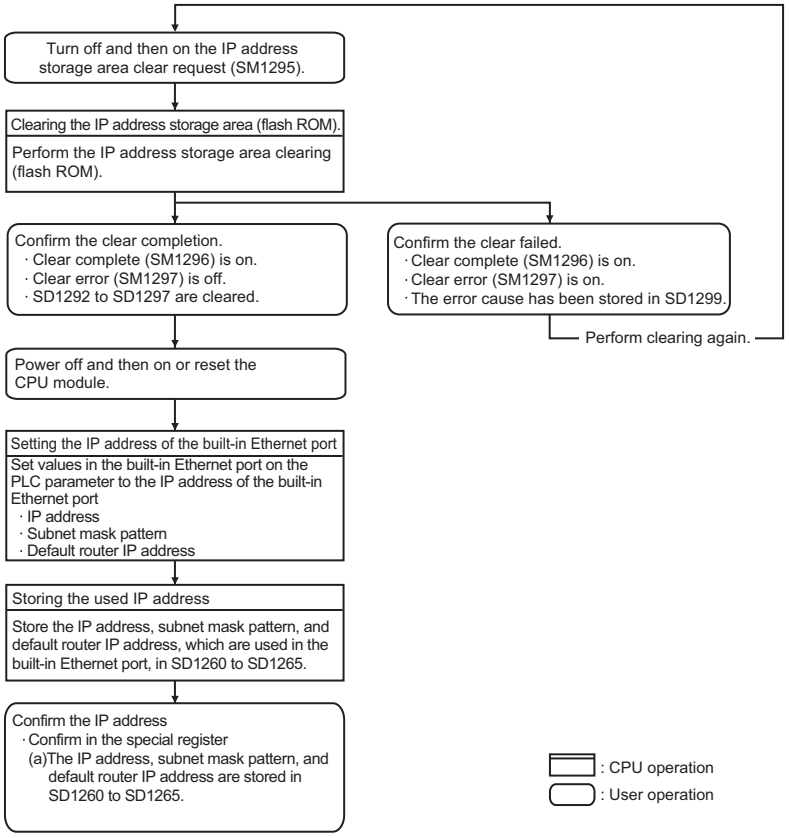


12.2.2 Clear operation

This operation can be performed by turning off and on SM1295 (IP address storage area clear request).

(1) Operating procedure

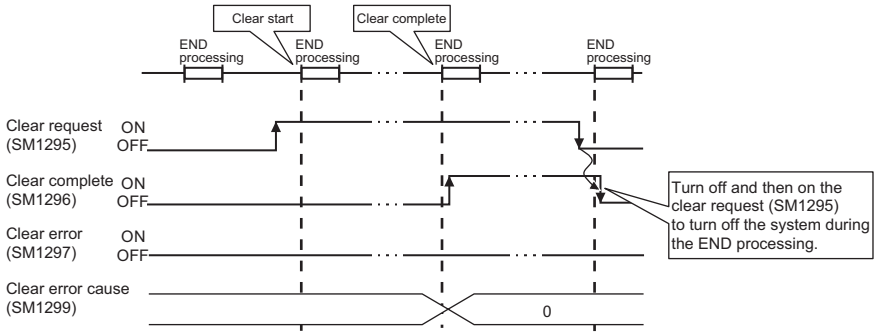
The following shows the clear operation flow.



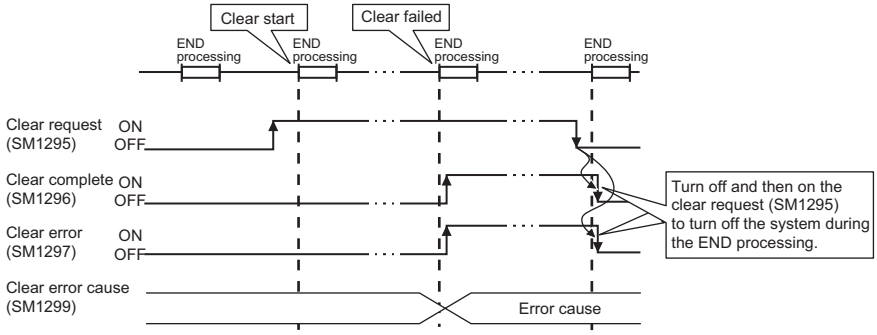
(2) Operations of special relay and special register

The following shows the operations of special relay and special register during the operation of clearing the IP address storage area (flash ROM).

(a) Operations of special relay and special register during the operation of clearing the IP address storage area (flash ROM)



(b) Operations of special relay and special register when the operation of clearing the IP address storage area (flash ROM) failed



(3) Cause of failure to clear the IP address storage area (flash ROM)

If the processing of clearing the IP address storage area (flash ROM) is not completed, the error cause is stored in SD1299 (IP address storage area clear error factor).

Value in SD1299	Error cause
200_H	An error occurred during clearing.
300_H	Clearing cannot be performed since the following functions are being executed. • Online Program Change • Export to ROM format • Write to PLC (flash ROM) • CPU module data backup/restoration function
400_H	Clearing is started during write processing execution.

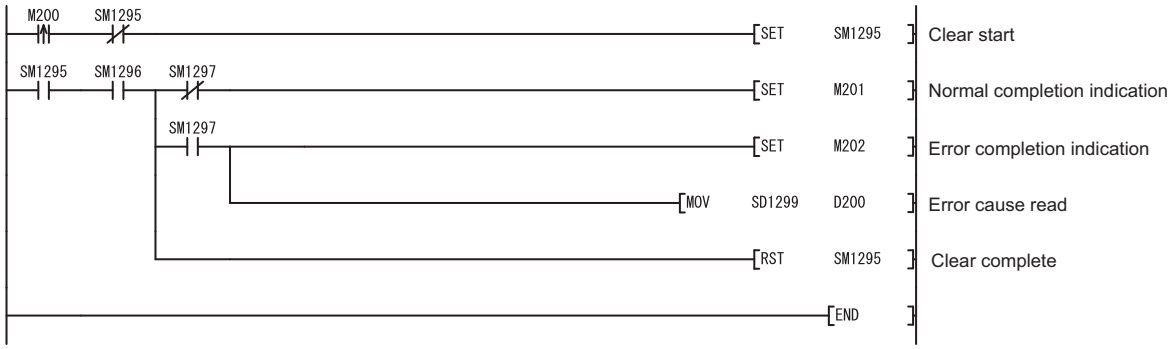
(4) Program example

The following shows a program example of clearing the IP address storage area (flash ROM).

(a) Devices used in programs

Device number	Application	Device number	Application
M200	Clear instruction	M201	Normal clear completion indication
SM1295	IP address storage area clear request	M202	Abnormal clear completion indication
SM1296	IP address storage area clear completion	SD1299	IP address storage area clear error factor
SM1297	IP address storage area clear error	D200	Clear error factor display

(b) Sample program



12.3 Checking the IP Address

(1) Checking using the Ethernet diagnostics

The IP address of the built-in Ethernet port can be checked with the Ethernet diagnostics. For details of the Ethernet diagnostics, refer to the following.

GX Works2 Version 1 Operating Manual (Common)

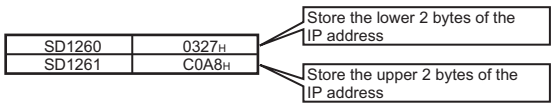
(2) Confirmation using the special register

The IP address of the built-in Ethernet port can be checked with the special register.*1

- IP address: SD1260, SD1261
- Subnet mask pattern: SD1262, SD1263
- Default router IP address: SD1264, SD1265

*1 Stored as follows.

Example When IP address is 192.168.3.39 ($C0A80327_H$)



12.4 Precautions

The following describes precautions for the IP address change function.

(1) Power-off and reset operations

Do not power off and reset the CPU module while writing to or clearing the IP address storage area (flash ROM). Values may not be reflected to the IP address storage area (flash ROM). Check that SM1293 (IP address storage area write complete) and SM1296 (IP address storage area clear complete) are started before powering off and resetting the CPU module.

(2) IP address of parameters

For IP address of the built-in Ethernet port, values in the IP address storage area (flash ROM) take priority over values of parameters. To use the IP address specified by parameters, clear the value in the IP address storage area (flash ROM).

(3) Duplicated IP addresses

When changing an IP address, check that the changed IP address is not the same as that of other devices. If IP addresses are duplicated, communication may be performed with a wrong device. The duplicated status can be checked by either of the following methods.

- By using the Find CPU function
- By disconnecting an external device from the network and performing a PING test to the IP address of the disconnected external device (The IP address is duplicated if a response message is returned.)

(4) Functions that cannot be performed during write processing and clear processing

The following functions cannot be executed during the write or clear processing to the IP address storage area. Do not execute the functions before the processing is completed. Doing so may cause an error.
If operation of writing to or clearing the IP address storage area (flash ROM) is executed during the execution of the following functions, the write or clear operation is processed as an error.

- Online Program Change
- Export to ROM format
- Write to PLC (flash ROM)
- CPU module data backup/restoration function

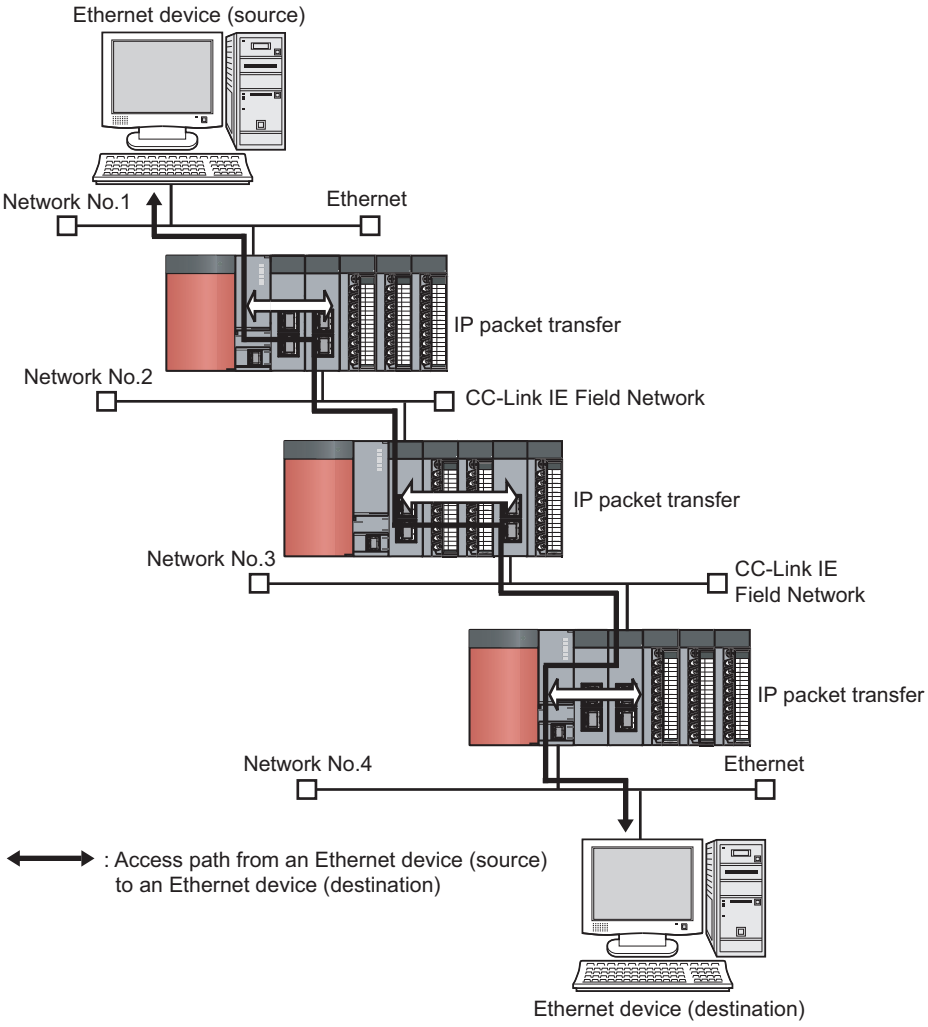
(5) Execution timing of write processing and clear processing

- Since the status on SM1292 (IP address storage area write request) and SM1295 (IP address storage area clear request) are checked in the END processing, processing of writing to or clearing the IP address storage area (flash ROM) cannot be executed if a contact is turned off and on, or turning on and off in one scan.
- If SM1292 (IP address storage area write request) is turned off and on again while writing to the IP address storage area (flash ROM), the write processing executed earlier is completed properly and the processing executed later is ignored. (The same occurs for the clear operation.)
- If SM1295 (IP address storage area clear request) is turned off and on while writing to the IP address storage area (flash ROM), the clear operation is processed as an error. (The same occurs when the write operation is executed during the clear processing execution.)
- If SM1292 (IP address storage area write request) and SM1295 (IP address storage area clear request) are turned off and on in one scan, the write operation is prior to be executed, and the clear operation is processed as an error.

CHAPTER 13 IP PACKET TRANSFER FUNCTION Note 13.1

Communications can be performed with a device which supports the following IP addresses, which have been specified via a CC-Link IE Controller Network module or CC-Link IE Field Network module, using a protocol such as the FTP or HTTP via a built-in Ethernet port from an Ethernet device such as a personal computer.

- External devices on CC-Link IE Controller Network or CC-Link IE Field Network
- External devices on the Ethernet network, which are connected through the built-in Ethernet ports



Point

This function is supported only by GX Works2. (It is not supported by GX Developer.)

Note 13.1 Universal

Check the versions of the CPU module and GX Works2 when using the IP packet transfer function for the QnUDE(H)CPU. (Page 224, Appendix 3)

(1) How to use

For the settings of IP packet transfer function or how to use the function, refer to the following.

Manual for the CC-link IE Controller Network module used

Manual for the CC-link IE Field Network module used

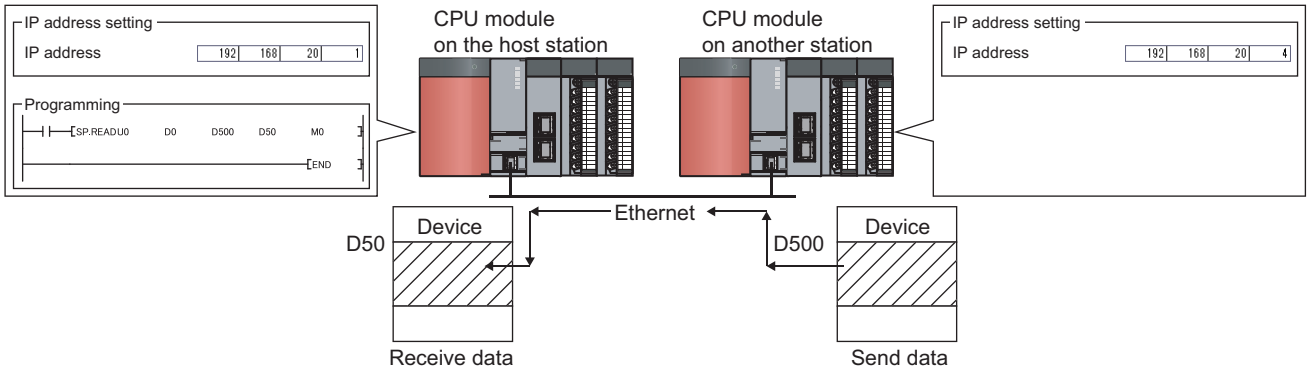
(2) Precautions

- The data that are communicated using the IP packet transfer function are communicated separately by the following processing.
    - Service processing by a sequence scan of a CPU module
    - Link scan on CC-Link IE Controller Network
    - Link scan on CC-Link IE Field Network

  The above processing causes communication speeds to be slower than Ethernet lines. Manuals for the CC-Link IE Controller Network module or CC-Link IE Field Network module describe targeted communication speeds when the IP packet transfer function is used.
- Broadcast communication and multicast communication cannot be performed with the IP packet transfer function. Perform unicast communication (communication with one request destination specified).
- If the application timeout of the request source device occurs due to a heavy communication load on the path that an IP packet takes, measure the response time using the ping command from the request source device and adjust the application timeout time.
- Data size must be within 1460 bytes when the ping command is used.
- UDP provides less reliable data communications compared with TCP and thus data may be lost or arrive out of order. Use TCP communications if a problem occurs with the UDP communications.

CHAPTER 14 READING/WRITING DEVICE DATA OF ANOTHER STATION CPU BY IP ADDRESS SPECIFICATION Note 14.1

Dedicated instructions allow the CPU module on the host station to read/write device data from/to the CPU module on another station.



14.1 Instructions to Read/write Device Data of Another Station CPU by IP Address Specification

This section describes the instructions for reading/writing device data from/to the CPU module on another station by specifying an IP address.

(1) List of instructions

The following table lists the instructions associated with reading/writing device data from/to the CPU module on another station by specifying an IP address:

Instruction	Description	Reference
SP.READ	Reads device data from another station's CPU module device identified by the specified IP address.	Page 208, Section 14.1.1
SP.WRITE	Writes device data to another station's CPU module device identified by the specified IP address.	Page 214, Section 14.1.2

Point

The SP.READ/SP.WRITE instructions cannot be used in an interrupt program or fixed scan execution type program.

Note 14.1 Universal

Reading/writing device data from/to the CPU module on another station by specifying an IP address is available with QnUDVCPU and QnUDPVCPU only.
Before reading/writing device data from/to the CPU module on another station by specifying an IP address is used, check the versions of the CPU modules (i.e., the CPU modules of the host and other stations) and the versions of the programming tools. (Page 224, Appendix 3)

(2) Applicable devices

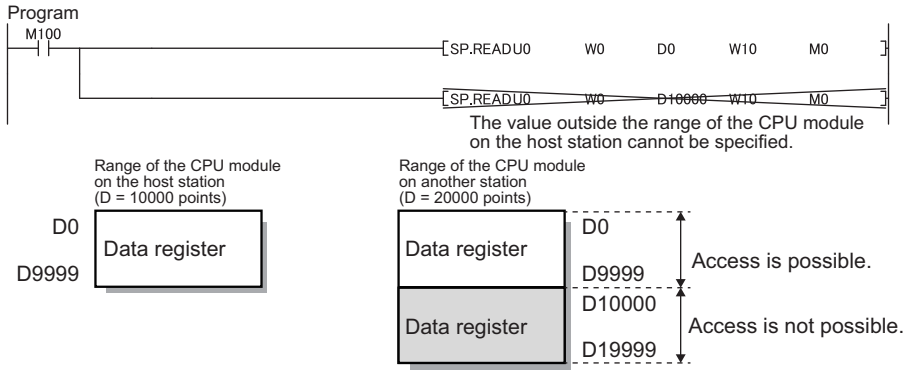
The following table lists the devices whose data can be read from and written to a target CPU module using the SP.READ/SP.WRITE instructions:

Category	Type	Device name	Requirements for configuration
Internal user device	Bit device	X, Y, M, L, B, F, SB	• The digit specification range must be 16 bits. • The bit device number must be a multiple of 16 (10_H).
	Word device	T, ST, C, D, W, SW	-
Internal system device	Bit device	SM	• The digit specification range must be 16 bits. • The bit device number must be a multiple of 16 (10_H).
	Word device	SD	-
File register	Word device	R, ZR	-

(3) How to specify the CPU module device on another station

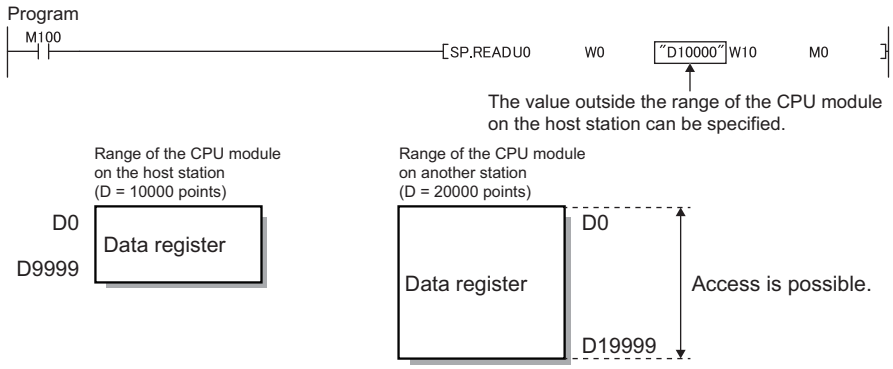
(a) Device specification

In the device specification method, data can be read from and written to the devices within the device range of the CPU module on the host station. To access the entire device range of the CPU module on another station, the device range of the CPU module on the host station must be the same as that of the CPU module on another station.



(b) String specification

In the string specification method, data can be read from and written to the entire device range of the CPU module on another station. The device range of the CPU module on the host station does not have to be the same as that of the CPU module on another station.



(4) When executing multiple SP.READ/SP.WRITE instructions simultaneously

When executing multiple SP.READ/SP.WRITE instructions simultaneously, ensure that SP.READ/SP.WRITE instruction channels are not duplicated. If multiple SP.READ or SP.WRITE instructions are set to the same channel, then cannot be executed simultaneously. If the same channel is shared by multiple SP.READ or SP.WRITE instructions, those SP.READ/SP.WRITE instructions must be executed sequentially (one after another), rather than simultaneously. The completion status of SP.READ/SP.WRITE instructions can be checked using the completion device for SP.READ/SP.WRITE instructions.

(a) Channels

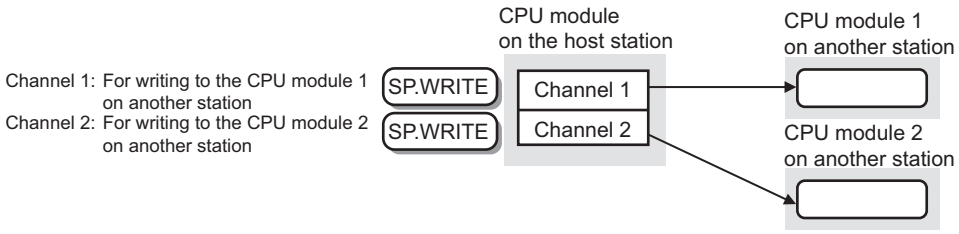
A channel is an area in the CPU module that contains the data handled by the SP.READ/SP.WRITE instructions. Using multiple channels allows the CPU module on the host station to access the CPU modules of multiple other stations simultaneously or read/write data at the same time from/to the same CPU module on another station.

(b) Maximum available number of channels

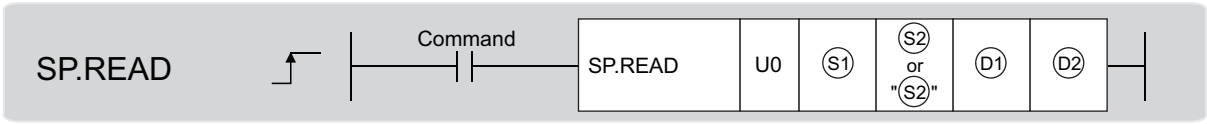
The system provides eight channels that can be used along with the SP.READ/SP.WRITE instructions. Using these eight channels allows the host station to execute eight SP.READ/SP.WRITE instructions simultaneously.

(c) An example of using channels

- When the CPU module on the host station accesses the CPU modules on multiple other stations simultaneously:
  Ensure that the host station uses a different channel for each request destination.



14.1.1 Reading device data (SP.READ)



Setting data	Internal device		R, ZR	Indirect specification	J□\□		U□\G□	Zn	Constant string	Other
	Bit	Word			Bit	Word				
(S1)	-	○ *1	○ *1	○ *1	-				-	-
(S2)	-	○ *1*2	○ *1	○ *1	-				○ *3	-
(D1)	-	○ *1	○ *1	○ *1	-				-	-
(D2)	○ *1	○ *1	○ *1	-	-				-	-

*1 Local devices and the file registers set for individual programs cannot be used.

*2 Word devices T, C, D, W, ST, SD, and SW can be specified.

*3 For information on string data specified with (S2), refer to Page 206, Section 14.1 (2).

(1) Setting data

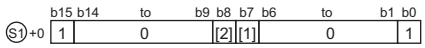
Setting data	Description	Set by*4	Data type
U0	Dummy	-	String
(S1)	Start device that contains control data.	User, system	Device name
(S2)	Start device of the CPU module of the other station that contains the data to be read.	User	Device name
(D1)	Start device of the CPU module of the host station that contains the data read.	System	Device name
(D2)	The host station's CPU module device that will be turned ON for one scan upon the completion of the instruction. (D2)+1 will also be turned on in the event of error completion.	System	Bit

*4 In the "Set by" column:
"User" means that the data is set before executing the SP.READ instruction.
"System" means that the result of executing the SP.READ instruction is stored in the CPU module.

Point

When specifying the start device by the device specification method, ensure that the CPU module device on another station from which to read data is within the range of devices available to the CPU module on the host station.
(The start device (S2) of the CPU module on another station from which to read data) + (number of reads - 1)
≤(the end device number of the CPU module on the host station (the end device number of the CPU module on the host station that has the same device name as (S2)))

(2) Control data

Device	Item	Description	Setting range	Set by*1
(S1)+0	Instruction execution type	 [1] Error completion type Specifies whether or not clock data setting is required upon error completion. 0: Clock data setting is not required. 1: Clock data setting is required. [2] Arrival monitoring time setting Specifies the unit of arrival monitoring time 0: Units of 1 second 1: Units of 100 ms	8001H 8081H 8101H 8181H	User
(S1)+1	Completion status	Stores the status after the completion of the instruction. 0: Completed normally Other than 0: Completed with an error (error code)	-	System
(S1)+2	Channel used by the host station	Specifies which channel the host station uses. 1 to 8 (channel) (Page 207, Section 14.1 (4))	0001H to 0008H	User
(S1)+3	Target CPU module type	Sets 0000H or 03FFH. (Either setting provides access to the target CPU module.)	0, 03FFH	User
(S1)+4 (S1)+5	IP address setting*2	Specifies the IP address of the CPU module of the other station. (S1)+4: IP address (lower 16 bits) (S1)+5: IP address (upper 16 bits)	1H to FFFFFFFEH	User
(S1)+6	-	(Fixed value)	0	User
(S1)+7	Number of resends	(1) When the instruction is executed Specifies how many times to resend the data in the event of failure to complete within the monitoring time set with (S1)+8. 0 to 15 (times) (2) When the instruction is completed Stores how many times the data was resent (and the result thereof). 0 to 15 (times)	0 to 15	User System
(S1)+8	Arrival monitoring time	Specifies the monitoring time allowed before the completion of the processing. If the processing does not complete within the monitoring time, the system resends data until it reaches the number of resends specified with (S1)+7. If the arrival monitoring time setting is set to 1s with (S1)+0: 1 to 16383: Monitoring time (set in units of 1 second)	1 to 16383	User
		If the arrival monitoring time setting is set to 100 ms with (S1)+0: 1 to 65535: Monitoring time (set in units of 0.1 second)	1 to 65535	
(S1)+9	Length of the data to be read	Specifies the length of the data to be read. 1 to 960 (words)	1 to 960	User
(S1)+10	(Not used)	-	-	-

Device	Item	Description	Setting range	Set by*1
ⓢ1+11	Clock set flag	Stores the enable/disable state of the data for ⓢ1+12 to ⓢ1+17. 0: Disable 1: Enable	-	System
ⓢ1+12 ⓢ1+13 ⓢ1+14 ⓢ1+15	Clock data (set only upon error completion)	Stores the clock data upon error completion. This data is stored only when ⓢ1+0 is configured to set the error completion type to "1: Clock data setting is required." b15 to b8 b7 to b0 ⓢ1+12: Month (01H to 12H) / Year (00H to 99H), last 2 digits ⓢ1+13: Hour (00H to 23H) / Day (01H to 31H) ⓢ1+14: Second (00H to 59H) / Minute (00H to 59H) ⓢ1+15: Year (00H to 99H), first 2 digits / Day of week (00H to 06H) 00H (Sun.) to 06H (Sat.)	-	System
ⓢ1+16 ⓢ1+17	Error-detected IP address*3	Stores the IP address where an error was detected. ⓢ1+16: IP address (lower 16 bits) ⓢ1+17: IP address (upper 16 bits)	1H to FFFFFFFEH	System

*1 In the "Set by" column:
"User" means that the data is set before executing the SP.READ instruction.
"System" means that the result of executing the SP.READ instruction is stored in the CPU module.

2 An IP address that ends with ".*.*.0" or "*.*.*.255" cannot be specified.

*3 Not stored if the host detects an error when it receives the instruction.

Point

- The read data storage device ⓓ1 requires a contiguous area as large as the length of the data to be read (specified with ⓢ1+9) (up to 960 words).
- The number of resends (ⓢ1+7) must be set whenever the instruction is executed.

(3) Function

This function reads the specified device data from the CPU module on another station specified with the IP address setting in the control data. When the function finished reading the device data, the completion device specified with ⓓ2 turns on.

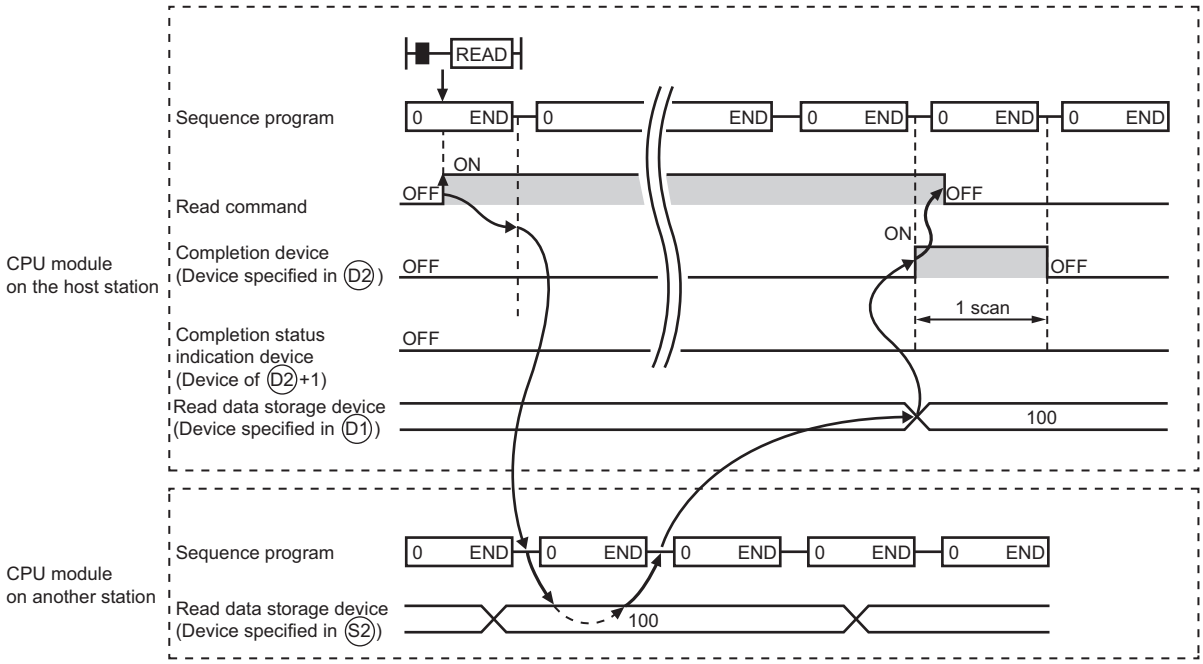
The completion status of the SP.READ instruction can be checked using the completion devices ⓓ2+0 and ⓓ2+1.

- Completion device ⓓ2+0
  Turns on at the time of the END processing for the scan in which the SP.READ instruction completes and turns off at the time of the next END processing.
- Completion status indication device ⓓ2+1
  Turns on or off depending on the status after the completion of the SP.READ instruction.

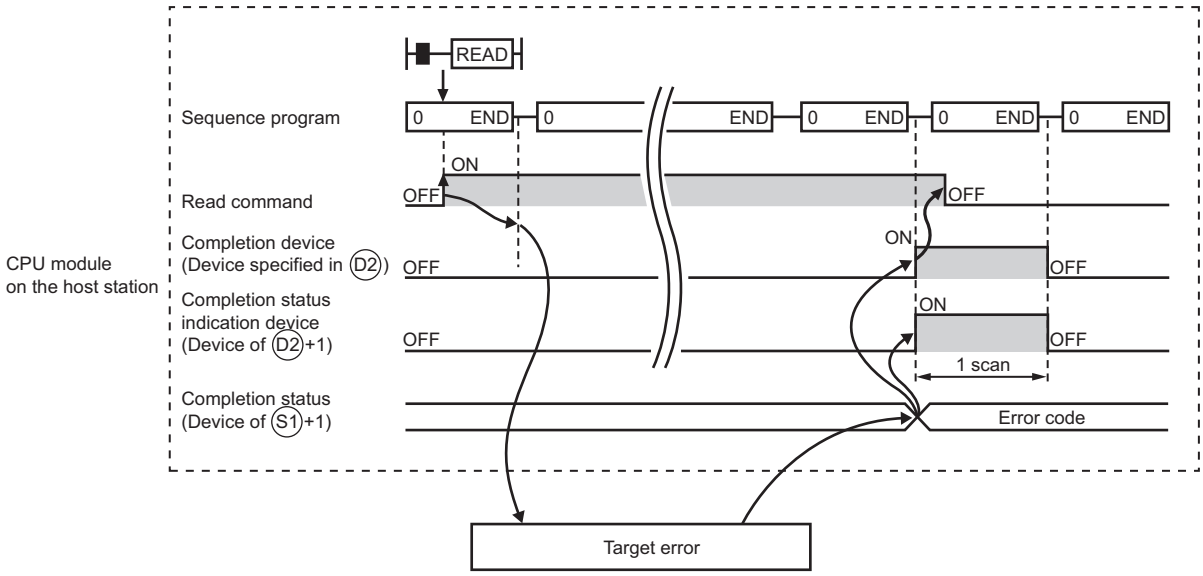
State	Description
When completed normally	Remains off.
When completed with an error	Turns on at the time of the END processing for the scan in which the SP.READ instruction completes and turns off at the time of the next END processing.

The following are the timing charts for the SP.READ instruction:

- When completed normally



- When completed with an error



(4) Error

(a) An operation error occurs, the error flag (SM0) turns on, and the error code is stored in SD0 in the following cases:

- The instruction is executed on an unsupported QnUDVCPU and QnUDPVCPU.

  (Error code: 4002)
- The number of devices is incorrect.

  (Error code: 4003)
- A device that cannot be specified was specified.

  (Error code: 4004)
- A device using an invalid string was specified.

  (Error code: 4004)
- The number of devices specified with ⓢ1, ⓢ2, ⓓ1, and ⓓ2 exceeds the upper limit.

  (Error code: 4101)
- The channel to be used by the host station is outside the setting range.

  (Error code: 4101)
- Length of the data to be read is outside the setting range.

  (Error code: 4101)

(b) The completion device (ⓓ2)+1 turns on and the error code is stored in the completion status area (ⓢ1)+1 in the following cases:

- The CPU module device on another station specified by the CPU module on the host station does not exist or the device number is outside the range.

  (Error code: 4031_H)
- The IP address specified does not exist in the target.

  (Error code: 4181_H)
- The IP address specified is not supported by the SP.READ instruction.

  (Error code: 4182_H)
- No cable connection is detected through the built-in Ethernet port.

  (Error code: $41AD_H$)
- b15 of ⓢ1+0 (Instruction execution type) is off.

  (Error code: $41B9_H$)
- The target station CPU module type is outside the setting range.

  (Error code: $41B9_H$)
- The IP address setting is outside the setting range.

  (Error code: $41B9_H$)
- The number of resends is outside the setting range.

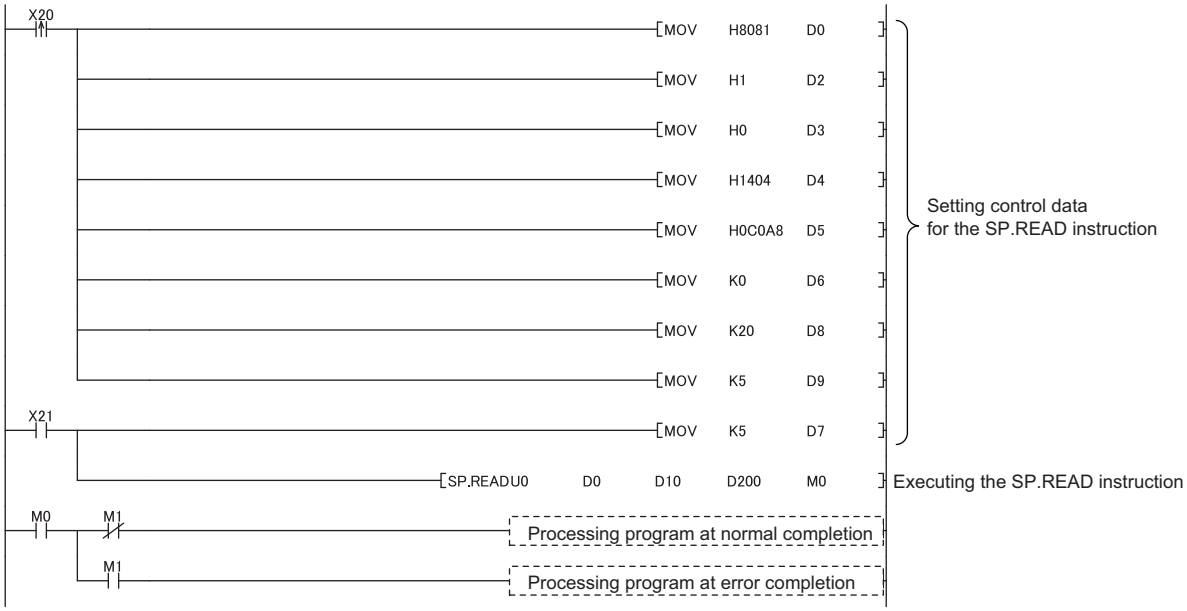
  (Error code: $41B9_H$)
- The arrival monitoring time is outside the setting range.

  (Error code: $41B9_H$)
- Length of the data to be read is outside the setting range.

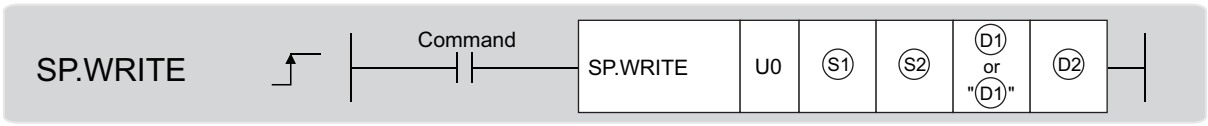
  (Error code: $41B9_H$)

(5) Sample program

This sample program reads data from devices D10 to D14 of the CPU module on another station identified by an IP address of 192.168.20.4 and stores the data in devices D200 to D204 of the CPU module on the host station.



14.1.2 Writing device data (SP.WRITE)



Setting data	Internal device		R, ZR	Indirect specification	J□\□		U□\G□	Zn	Constant string	Other
	Bit	Word			Bit	Word				
(S1)	-	○ *1	○ *1	○ *1	-				-	-
(S2)	-	○ *1*2	○ *1	○ *1	-				-	-
(D1)	-	○	○	○	-				○ *3	-
(D2)	○ *1	○ *1	○ *1	-	-				-	-

*1 Local devices and the file registers set for individual programs cannot be used.

*2 Word devices T, C, D, W, ST, SD, and SW can be specified.

*3 For information on string data specified with (S2), refer to Page 206, Section 14.1 (2).

(1) Setting data

Setting data	Description	Set by*4	Data type
U0	Dummy	-	String
(S1)	Start device that contains control data.	User, system	Device name
(S2)	Start device of the CPU module of the host station that contains the data to be written.	User	Device name
(D1)	Start device of the CPU module of the other station where to write the data.	System	Device name
(D2)	The host station's CPU module device that will be turned ON for one scan upon the completion of the instruction. (D2)+1 will also be turned on in the event of error completion.	System	Bit

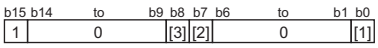
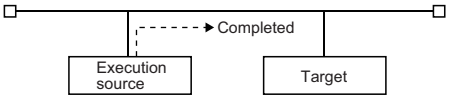
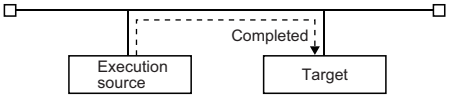
*4 In the "Set by" column:
"User" means that the data is set before executing the SP.WRITE instruction.
"System" means that the result of executing the SP.WRITE instruction is stored in the CPU module.

Point

When specifying the start device by the device specification method, ensure that the CPU module on another station to which to write data is within the range of devices available to the CPU module on the host station.

(The start device (S2) of the CPU module on another station to which to write data) + (number of writes - 1)
≤(the end device number of the CPU module on the host station (the end device number of the CPU module device on the host station that has the same device name as (S2))

(2) Control data

Device	Item	Description	Setting range	Set by*1
(S1)+0	Instruction execution type	 [1] Execution type 0: No arrival confirmation The instruction completes as soon as it sends data from the host station's CPU module.  1: With arrival confirmation The instruction completes after writing the data to the other station's CPU module.  [2] Error completion type Specifies whether or not clock data setting is required upon error completion. 0: Clock data setting is not required. 1: Clock data setting is required. [3] Arrival monitoring time setting 0: Units of 1 second 1: Units of 100 ms	8000H 8001H 8080H 8081H 8100H 8101H 8180H 8181H	User
(S1)+1	Completion status	Stores the status upon the completion of the instruction. 0: Completed normally Other than 0: Completed with an error (error code)	-	System
(S1)+2	Channel used by the host station	Specifies which channel the host station uses. (1 to 8 channel) (Page 207, Section 14.1 (4))	0001H to 0008H	User
(S1)+3	Target CPU module type	Sets 0000H or 03FFH. (Either setting provides access to the target CPU module.)	0, 03FFH	User
(S1)+4 (S1)+5	IP address setting*2	Specifies the IP address of the CPU module of the other station. (S1)+4: IP address (lower 16 bits) (S1)+5: IP address (upper 16 bits)	1H to FFFFFFFEH	User
(S1)+6	-	(Fixed value)	0	User
(S1)+7	Number of resends	This setting takes effect when (S1)+0 is configured to set the execution type to "1: With arrival confirmation." (1) When the instruction is executed Specifies how many times to resend the data in the event of failure to complete within the monitoring time set with (S1)+8. 0 to 15 (times) (2) When the instruction is completed Stores how many times the data was resent (and the result thereof). 0 to 15 (times)	0 to 15	User System

<table>
<tr><th>Device</th><th>Item</th><th colspan="2">Description</th><th>Setting range</th><th>Set by*1</th></tr>
<tr><td rowspan="2">(S1)+8</td><td rowspan="2">Arrival monitoring time</td><td rowspan="2">Specifies the monitoring time allowed before the completion of the processing. If the processing does not complete within the monitoring time, the system resends data until it reaches the number of resends specified with (S1)+7.
(This setting takes effect when (S1)+0 is configured to set the execution type to "1: With arrival confirmation.")</td><td>If the arrival monitoring time setting is set to 1s with (S1)+0:
1 to 16383: Monitoring time (set in units of 1 second)</td><td>1 to 16383</td><td rowspan="2">User</td></tr>
<tr><td>If the arrival monitoring time setting is set to 100ms with (S1)+0:
1 to 65535: Monitoring time (set in units of 0.1 second)</td><td>1 to 65535</td></tr>
<tr><td>(S1)+9</td><td>Length of the data to be written</td><td colspan="2">Specifies the length of the data to be written.
1 to 960 (words)</td><td>1 to 960</td><td>User</td></tr>
<tr><td>(S1)+10</td><td>(Not used)</td><td colspan="2">-</td><td>-</td><td>-</td></tr>
<tr><td>(S1)+11</td><td>Clock set flag</td><td colspan="2">Stores the enable/disable state of the data for (S1)+12 to (S1)+17.
0: Disable
1: Enable</td><td>-</td><td>System</td></tr>
<tr><td>(S1)+12
(S1)+13
(S1)+14
(S1)+15</td><td>Clock data (set only upon error completion)</td><td colspan="2">Stores the clock data upon error completion.
This data is stored only when (S1)+0 is configured to set the error completion type to "1: Clock data setting is required."
<table><tr><th></th><th>b15 to b8</th><th>b7 to b0</th></tr><tr><td>(S1)+12</td><td>Month (01H to 12H)</td><td>Year (00H to 99H), last 2 digits</td></tr><tr><td>(S1)+13</td><td>Hour (00H to 23H)</td><td>Day (01H to 31H)</td></tr><tr><td>(S1)+14</td><td>Second (00H to 59H)</td><td>Minute (00H to 59H)</td></tr><tr><td>(S1)+15</td><td>Year (00H to 99H), first 2 digits</td><td>Day of week (00H to 06H)</td></tr></table>00H (Sun.) to 06H (Sat.)</td><td>-</td><td>System</td></tr>
<tr><td>(S1)+16
(S1)+17</td><td>Error-detected IP address*3</td><td colspan="2">Stores the IP address where an error was detected.
(S1)+16: IP address (lower 16 bits)
(S1)+17: IP address (upper 16 bits)</td><td>1H to FFFFFFFEH</td><td>System</td></tr>
</table>

*1 In the "Set by" column:
"User" means that the data is set before executing the SP.WRITE instruction.
"System" means that the result of executing the SP.WRITE instruction is stored in the CPU module.

2 An IP address that ends with ".*.*.0" or "*.*.*.255" cannot be specified.

*3 Not stored if the host detects an error when it receives the instruction.

Point

- The write data storage device (S2) requires a contiguous area as large as the length of the data to be written (specified with (S1)+9) (up to 960 words).
- The number of resends ((S1)+7) must be set whenever the instruction is executed.

(3) Function

This function writes the data to the specified device of the CPU module on another station specified with the IP address setting in the control data. When the function finished writing the device data, the completion device specified with ⓓ2 turns on.

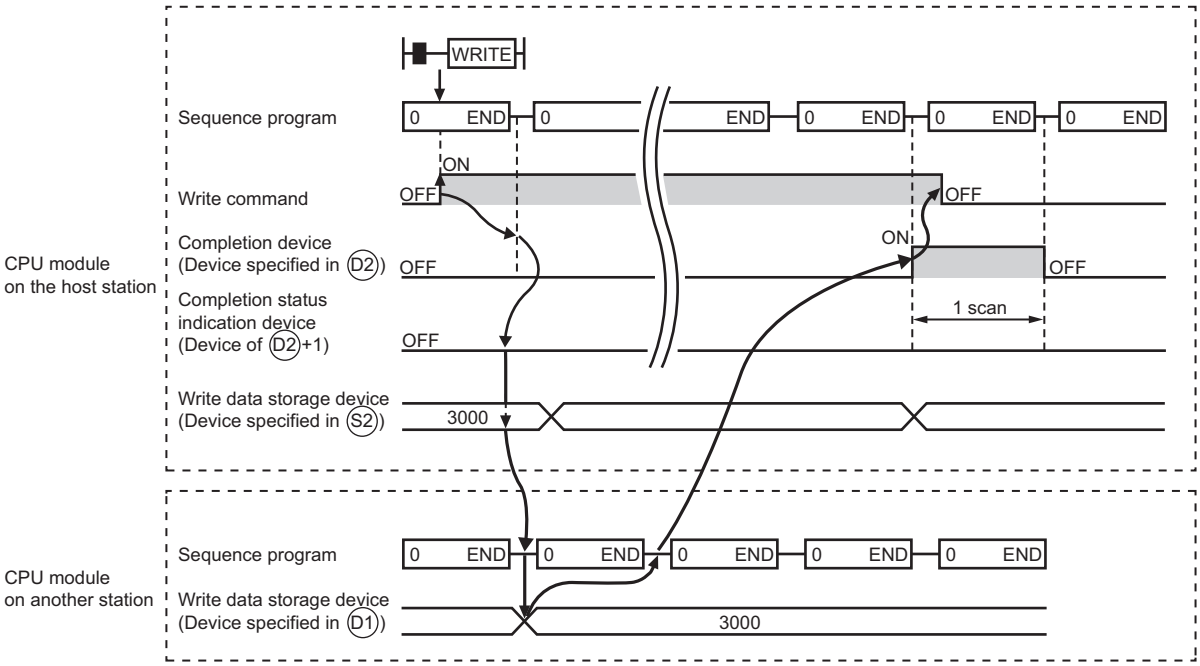
The completion status of the SP.WRITE instruction can be checked using the completion devices ⓓ2+0 and ⓓ2+1.

- Completion device ⓓ2+0
  Turns on at the time of the END processing for the scan in which the SP.WRITE instruction completes and turns off at the time of the next END processing.
- Completion status indication device ⓓ2+1
  Turns on or off depending on the status after the completion of the SP.WRITE instruction.

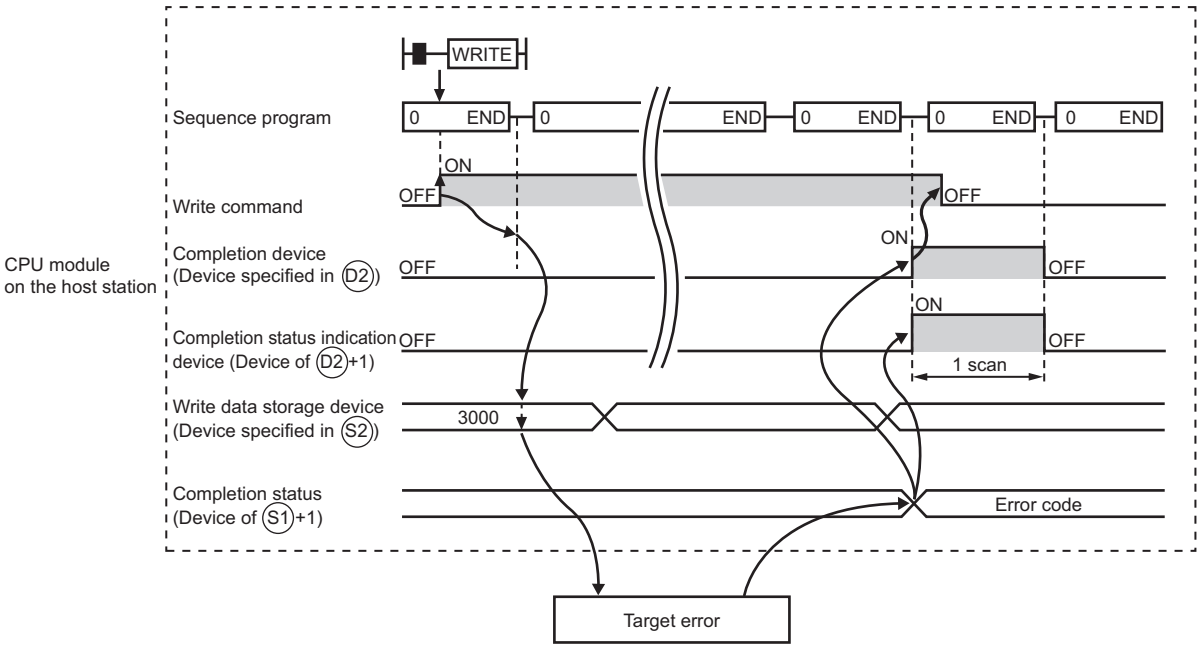
State	Description
When completed normally	Remains off.
When completed with an error	Turns on at the time of the END processing for the scan in which the SP.WRITE instruction completes and turns off at the time of the next END processing.

The following are the timing charts for the SP.WRITE instruction:

- When completed normally



- When completed with an error



(4) Error

(a) An operation error occurs, the error flag (SM0) turns on, and the error code is stored in SD0 in the following cases:

- The instruction is executed on an unsupported QnUDVCPU and QnUDPVCPU.

  (Error code: 4002)
- The number of devices is incorrect.

  (Error code: 4003)
- A device that cannot be specified was specified.

  (Error code: 4004)
- A device using an invalid string was specified.

  (Error code: 4004)
- The number of devices specified with ⓢ1, ⓢ2, ⓓ1, or ⓓ2 and exceeds the upper limit.

  (Error code: 4101)
- The channel to be used by the host station is outside the setting range.

  (Error code: 4101)

(b) The completion device (ⓓ2)+1 turns on and the error code is stored in the completion status area (ⓢ1)+1 in the following cases:

- The CPU module device on another station specified by the CPU module on the host station does not exist or the device number is outside the range.

  (Error code: 4031_H)
- The IP address specified does not exist in the target.

  (Error code: 4181_H)
- No cable connection is detected through the built-in Ethernet port.

  (Error code: $41AD_H$)
- The IP address specified is not supported by the SP.WRITE instruction.

  (Error code: 4182_H)
- b15 of ⓢ1+0 Instruction execution type is off.

  (Error code: $41B9_H$)
- The target station CPU module type is outside the setting range.

  (Error code: $41B9_H$)
- The IP address setting is outside the setting range.

  (Error code: $41B9_H$)
- The number of resends is outside the setting range.

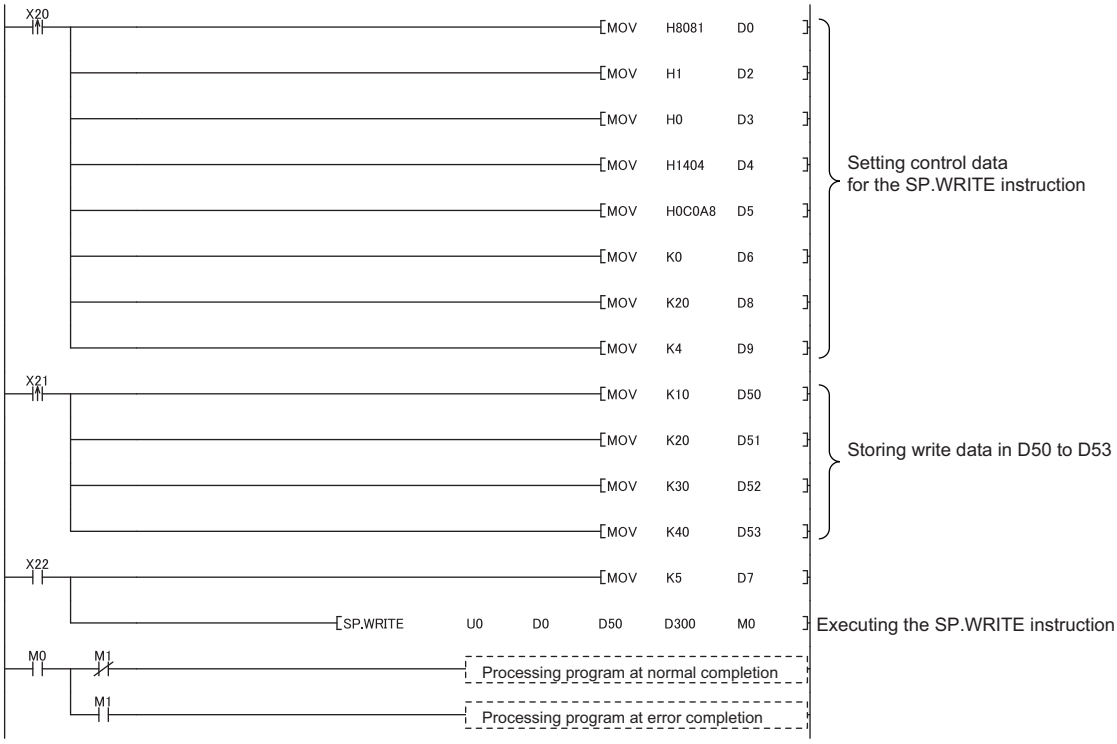
  (Error code: $41B9_H$)
- The arrival monitoring time is outside the setting range.

  (Error code: $41B9_H$)
- Length of the data to be written is outside the setting range.

  (Error code: $41B9_H$)

(5) Sample program

This sample program writes the data stored in devices D50 to D53 of the CPU module on the host station to the devices D300 to D303 of the CPU module identified by an IP address of 192.168.20.4.



APPENDICES

Appendix 1 Operation Processing Time for Each Instruction

The following table lists the processing time of instructions described in this manual.

For details on the processing time, refer to the following.

MELSEC-Q/L Programming Manual (Common Instruction)

Type	Instruction	Condition		Processing time(μs)			
				QnUDVCPU, QnUDPVCPU		QnUDE(H)CPU	
				Minimum	Maximum	Minimum	Maximum
Instructions for the socket communication function	SP.SOCOPEN	TCP	Active	14.900	34.800	18.500	40.900
			Unpassive	14.900	32.500	18.400	40.900
			Fullpassive	14.900	32.400	18.400	40.900
		UDP		14.900	34.600	18.400	40.900
	SP.SOCCLOSE	TCP	From the host CPU	14.600	34.100	18.500	40.100
			From the connected device	14.600	34.000	18.500	40.000
		UDP		14.600	33.400	18.900	40.100
	SP.SOCRCV	TCP	Minimum data volume (1 byte)	6.400	25.000	17.000	39.100
			Maximum data volume (2046 bytes)	6.300	24.900	17.500	39.100
			Maximum data volume (10238 bytes)	6.200	24.700	17.500	39.100
		UDP	Minimum data volume (1 byte)	6.200	25.000	17.100	39.100
			Maximum data volume (2046 bytes)	6.300	25.000	17.500	39.100
			Maximum data volume (10238 bytes)	6.300	24.900	17.500	39.100
	S.SOCRCVS	TCP	Minimum data volume (1 byte)	14.000	36.600	12.300	29.100
			Maximum data volume (2046 bytes)	37.900	66.700	243.400	259.100
			Maximum data volume (10238 bytes)	149.100	190.400	1168.600	1185.300
		UDP	Minimum data volume (1 byte)	14.200	36.500	12.800	30.100
			Maximum data volume (2046 bytes)	38.100	69.100	243.400	259.100
			Maximum data volume (10238 bytes)	153.800	191.800	1167.600	1185.300
	SP.SOCSND	TCP	Minimum data volume (1 byte)	11.700	34.500	18.900	43.100
			Maximum data volume (2046 bytes)	41.100	75.900	290.000	313.700
			Maximum data volume (10238 bytes)	177.600	235.800	1367.600	1407.300
		UDP	Minimum data volume (1 byte)	11.400	35.400	18.900	43.100
			Maximum data volume (2046 bytes)	41.800	76.800	290.000	313.700
			Maximum data volume (10238 bytes)	189.800	235.900	1367.600	1407.300
	SP.SOCCINF	-		4.900	20.800	12.700	32.200
	SP.SOCCSET	-		4.200	19.200	10.700	29.200
	SP.SOCRMODE	Standard mode → Fixed-length mode		8.500	19.400	9.700	27.200
		Fixed-length mode → Standard mode		8.300	19.400	9.700	27.200
	SP.SOCRDATA	Minimum data volume (1 word)		4.400	19.200	9.700	27.200
		Maximum data volume (1024 words)		28.100	51.800	241.700	258.200
		Maximum data volume (5120 words)		144.200	173.800	1168.600	1184.300

Type	Instruction	Condition	Processing time(μs)			
			QnUDVCPU, QnUDPVCPU		QnUDE(H)CPU	
			Minimum	Maximum	Minimum	Maximum
Instruction for the predefined protocol function	SP.ECPRTCL	-	15.900	50.300	-	-
Device read/write instructions	SP.READ	Number of processing points = 1 word	43.10	48.60	-	-
		Number of processing points = 960 words	43.10	48.60	-	-
	SP.WRITE	Number of processing points = 1 word	43.10	48.20	-	-
		Number of processing points = 960 words	66.70	71.90	-	-
SLMP frame send instruction	SP.SLMPSND	Batch read in word units (command: 0401_H): Number of read points = 1 point	25.000	51.400	-	-

Appendix 2 Port Numbers Used by Built-in Ethernet Port QCPU

Do not specify the following port numbers, because these numbers are used by the system.

Port number	Application
1388_H (5000)	For future extension (For Ethernet modules, this port number is used for "Auto Open UDP Port".)
1389_H (5001)	MELSOFT communication port (UDP/IP)
$138A_H$ (5002)	For future extension (For Ethernet modules, this port number is used for "MELSOFT application transmission port (TCP/IP)".)
$138B_H$ (5003) to $138D_H$ (5005)	For future extension
$138E_H$ (5006)	MELSOFT communication port (UDP/IP)
$138F_H$ (5007)	MELSOFT communication port (TCP/IP)
1390_H (5008)	MELSOFT direct connection port
1391_H (5009)	For future extension

Appendix 3 Added and Changed Functions

The following table lists added or modified functions in the CPU module and programming tool for built-in Ethernet port communications and the corresponding serial numbers of CPU modules and software versions of GX Works2 software.

×: Not available, -: A function not related to the programming tool

Added function	Corresponding function version	The first five digits of the corresponding serial number	The corresponding version of the programming tool	
			GX Works2	GX Developer
Socket communication function (Page 87, CHAPTER 7)	B	"11012" or later	1.15R or later	8.78G or later
IP address change function (Page 171, CHAPTER 11)		"11082" or later	-	-
Data up to 10238 bytes can be exchanged with the SP.SOCSND/S(P).SOCRCV(S)/S(P).SOCRDATA instructions (Page 87, CHAPTER 7)		"12052" or later		
A-compatible IE frame for communication using the MC protocol (Page 59, Section 5.1.3)		"13102" or later		
IP packet transfer function (Available for CC-Link IE Field Network) (Page 193, CHAPTER 12)*2		"14022" or later	1.77F or later	×
IP packet transfer function (Available for CC-Link IE Controller Network) (Page 193, CHAPTER 12)*2			1.98C or later	
File registers available for the A-compatible 1E frame in the MC protocol (Page 57, Section 5.1.2 (2))*1		*3	-	-
Predefined protocol function (Page 76, CHAPTER 6)		"15103" or later	1.501X or later	×
Reading/writing device data from/to the CPU module on another station by specifying an IP address (Page 203, CHAPTER 13)*1		“16043” or later	1.513K or later	×
MELSOFT connection extended setting (Page 31, Section 3.5)*1		"17052" or later	1.535H or later	×
MC protocol communication using the 4E frame (Page 59, Section 5.1.3)*1		"18052" or later	-	-
SLMP frame send instruction (Page 65, Section 5.2)*1		"18112" or later	-	×
Simple PLC communication function (Page 171, CHAPTER 11)*1		"20042" or later	1.575Z or later	×
Simple PLC communication function (for MELSEC iQ-F series) (Page 171, CHAPTER 11)*1		"20102" or later	1.580E or later	×

*1 This function cannot be used for some models. For the availability of the function, refer to each reference.

*2 For the versions of the intelligent function modules that support the function, refer to the manual for the intelligent function module used.

*3 Available for the CPU modules with the following serial number (first five digits).

- QnUDE(H)CPU: "14112" or later
- QnUDVCPU: "15043" or later
- QnUDPVCPU: "15072" or later

Appendix 4 Performance List of Simple PLC Communication Function

This section shows the performance of the execution interval (simple PLC communication function). The execution interval varies depending on the number of settings, the number of communication points, the scan time of the CPU module. The interval is also affected by the execution conditions of other functions or Ethernet communication condition.

(1) Condition 1

- Communication Setting: "Fixed"
- Destination: "MELSEC-Q/L (Built-in Ethernet Function)"
- Sequence scan time (host station): 1ms (the scan time before the execution of the simple PLC communication function)
- Sequence scan time (destination device): 1ms (the scan time before the execution of the simple PLC communication function)
- Device data: Bit device = M, Word device = D
- The numbers of settings (1, 8, 16, 32, or 64) are as shown in the following lists. Each setting number has a different destination device. (All the set destination devices are different.)
- The retry of communication is not performed.

Communication pattern	Number of communication points for one setting	Processing time by the number of settings (unit: ms)				
		1	8*2	16*2	32*2	64*2
Read	32 words for each*1 (64 words in total)	10	11	11	18	38
	64 words for each*1 (128 words in total)	10	11	11	18	-
	256 words for each*1 (512 words in total)	10	11	-	-	-
Write	32 words for each*1 (64 words in total)	10	11	11	18	39
	64 words for each*1 (128 words in total)	10	11	11	19	-
	256 words for each*1 (512 words in total)	10	11	-	-	-
Transfer	32 words for each*1 (64 words in total)	10	14	19	35	-
	64 words for each*1 (128 words in total)	10	14	19	36	-
	256 words for each*1 (512 words in total)	10	15	-	-	-

*1 Number of points for each device (bit device and word device)

*2 The more setting numbers with the same destination device for communication exist, the slower the execution interval becomes. It takes approximately ten times as much time at maximum.

(2) Condition 2

- Communication Setting: "On Request"
- Destination: "MELSEC-Q/L (Built-in Ethernet Function)"
- Sequence scan time (host station): 1ms (the scan time before the execution of the simple PLC communication function)
- Sequence scan time (destination device): 1ms (the scan time before the execution of the simple PLC communication function)
- Device data: Bit device = M, Word device = D
- The numbers of settings (1, 8, 16, 32, or 64) are as shown in the following lists. Each setting number has a different destination device. (All the set destination devices are different.)
- The retry of communication is not performed.

Communication pattern	Number of communication points for one setting	Processing time by the number of settings (unit: ms)				
		1	8*2	16*2	32*2	64*2
Read	32 words for each*1 (64 words in total)	4	7	9	16	35
	64 words for each*1 (128 words in total)	4	7	10	17	-
	256 words for each*1 (512 words in total)	4	8	-	-	-
Write	32 words for each*1 (64 words in total)	5	8	11	18	38
	64 words for each*1 (128 words in total)	5	8	11	18	-
	256 words for each*1 (512 words in total)	5	9	-	-	-
Transfer	32 words for each*1 (64 words in total)	7	13	17	34	-
	64 words for each*1 (128 words in total)	7	13	18	35	-
	256 words for each*1 (512 words in total)	8	14	-	-	-

*1 Number of points for each device (bit device and word device)

*2 The more setting numbers with the same destination device for communication exist, the slower the execution interval becomes. It takes approximately ten times as much time at maximum.

Appendix 5 Specifications Comparison with Ethernet Module

(1) Specifications comparison with the Ethernet module

The following table lists the comparison of specifications between the Built-in Ethernet port QCPU and the Ethernet module (QJ71E71-100).

○ : Available, △ : Available but partially restricted, × : Not available

Item			Description	Availability	
				Built-in Ethernet port QCPU	QJ71E71-100
MC protocol communication	4E frame		• Reads/writes data in the CPU module from/to an external device. • A frame format that can receive multiple request messages at a time.	△ *13	○
	QnA-compatible 3E frame	Reading/Writing data in device memory	Reads/writes data (device) in the CPU module from/to an external device.	○ *1*8	○
		Other	Reads/writes data (file) in the CPU module from/to an external device.	×	○
	A-compatible 1E frame		• Reads/writes data in the CPU module from/to an external device. • A frame format that is compatible with A series E71.	△ *11	○
Fixed buffer communication	With procedure ("Procedure exist")		Sends/receives any data between the CPU module and an external device using the fixed buffer of the Ethernet module.	×	○
	Without procedure ("No procedure")			△ *9	○
Random access buffer communication			Reads/writes data from/in the random access buffer of the Ethernet module from/to multiple external devices.	×	○
E-mail function			Sends/receives data by e-mail. • Sending/receiving e-mail by the CPU module • Sending/receiving e-mail using the CPU module monitoring function (the automatic notification function) of the Ethernet module	×	○
Communication using data link instructions			Reads/writes data in the CPU module on another station via Ethernet using data link instructions.	×	○
File transfer (FTP server function)			Reads/writes data in the CPU module in file units from/to an external device using FTP commands.	○ *2	○
Web function			Communicates CPU module information (a state of the CPU module or a device value) with a personal computer or a programmable controller in remote locations through Internet.	×	○
Communications relayed through CC-Link IE Controller Network, CC-Link IE Field Network, MELSECNET/H, and/or MELSECNET/10			Communicates data over multiple networks in the system where an Ethernet network and other networks co-exist, or where data are communicated over multiple Ethernet networks.	△ *11*12	○
Router relay function			Communicates data via a router or gateway. (The router relay function is not a function by which the Ethernet module works as a router.)	○ *3	○
Send frame setting	Ethernet (V2.0)		Sends data using the frame format selected for the Ethernet header of the data link layer.	○	○
	IEEE802.3			×	○

Item		Description	Availability	
			Built-in Ethernet port QCPU	QJ71E71-100
Alive check function (alive check of an external device)	Check with Ping ("Use the Ping")	Checks the connection status of an external device by sending a Ping message (ICMP Echo) to an external device. Closes the corresponding connection if no response message is received.	×	○
	Check with KeepAlive ("Use the KeepAlive")	Checks the connection status of an external device by sending an ACK message, which notifies an open status of the connection opened using the TCP protocol to an external device.	○ *4	○
Pairing open		Enables data communications using two connections with opening of one port, by pairing the receiving connection with the sending connection.	×	○
Communication using automatic open UDP port setting		Enables communications without performing open/close processing after the station, in which an Ethernet module is mounted, is started up.	×	○
Remote password check		Prevents unauthorized access to the CPU module by users in remote locations.	○	○
Simultaneous broadcast		Enables simultaneous broadcast to all Ethernet module mounted stations within the same Ethernet network, when fixed buffer communications are performed without procedure on the condition that UDP/IP is used.	△ *10	○
Connection to MELSOFT products or GOT		Enables the connection to a MELSOFT product (such as a programming tool and MX Component) or GOT	○	○
Find CPU function		Finds the CPU modules connected to the same hub as GX Developer, and displays a list.	○	×
Time setting function (SNTP client)		Collects time information from the time information server and sets time in the CPU module automatically.	○	×
User connection		Connection which is used by user during communications using the MC protocol or the fixed buffer. Can be used as MELSOFT communication port of system connection by setting parameters. Up to 16 connections can be used.	○	○
System connection	Auto open UDP port	Connection which is used by the system only.	×	○
	FTP transmission port		○	○
	MELSOFT transmission port (UDP/IP)		○ *5	○ *6
	MELSOFT transmission port (TCP/IP)		○ *5	○ *6*7
	HTTP port		×	○
	MELSOFT direct connection		○	×
Simple PLC communication function		Allows data communications between specified devices at the specified timing just by doing simple settings from a programming tool.	○	×
IP packet transfer function		Communicates data (using FTP or HTTP) through the built-in Ethernet ports from an Ethernet device (such as a personal computer) to the following IP-compatible devices connected via a CC-Link IE Controller Network or CC-Link IE Field Network module. • External devices on CC-Link IE Controller Network or CC-Link IE Field Network • External devices on the Ethernet network, which are connected through the built-in Ethernet ports	○	×
Communications using SLMP		Enables an external device to read/write data from/to the SLMP-compatible device connected to the shared network with the Ethernet module. In addition, enables an external device to read/write data from/to a device in the CPU module connected to the Ethernet module.	×	○

Item	Description	Availability	
		Built-in Ethernet port QCPU	QJ71E71-100
Data communications using the predefined protocol	Enables the Ethernet module to send/receive data to/from an external device by using the protocol for the external device. The external device side protocol can be easily selected, or created/edited from the Predefined Protocol Library of GX Works2.	○ *11	○
SLMP frame send instruction	Sends MC protocol messages (QnA-compatible 3E frame) from the CPU module to external devices connected on the Ethernet network.	○ *13	×

*1 Available commands are limited. (☞ Page 65, Section 5.2)

*2 The "quote cpuchg" command cannot be used. (☞ Page 150, Section 9.4)

*3 Only the default router can be specified.

*4 Settings are fixed to the following: Interval timer: 5 seconds, Resend timer: 8 times.

*5 Up to 16 devices can be connected by setting "MELSOFT Connection" for user connections in PLC parameter.

*6 The MELSOFT transmission port corresponds to the GX Developer transmission port of QJ71E71-100.

*7 Up to 17 devices can be connected (including one system connection) by setting "MELSOFT Connection" for user connections in the network parameter.

*8 For processing on the external device side, refer to Page 230, Appendix 5 (2).

*9 Executable with the socket communication function. Refer to (3) in this section for the differences.
Check the versions of the CPU module and programming tool before using the function. (☞ Page 224, Appendix 3)

*10 Executable with the socket communication function.
Check the versions of the CPU module and programming tool before using the function. (☞ Page 224, Appendix 3)

*11 Check the versions of the CPU module and programming tool before using the function. (☞ Page 224, Appendix 3)

*12 In the case of MELSOFT connection or direct connection, multiple networks can be relayed if the MELSOFT connection extended setting is used. However, MELSECNET/10 cannot be related.

*13 The function is available for the High-speed Universal model QCPU and Universal model Process CPU. Check the versions of the CPU module before using the function. (☞ Page 224, Appendix 3)

Remark

For Ethernet modules, refer to the following.

📖 Q Corresponding Ethernet Interface Module User's Manual (Basic)

(2) Differences on MC protocol functions between the Built-in Ethernet port QCPU and Ethernet module

Item	QJ71E71-100	Built-in Ethernet port QCPU	Consequence of a communication with the Built-in Ethernet port QCPU	Action
Data sending method on TCP when the response message size exceeds 1460 bytes (TCP Maximum Segment Size Option transmission)	Data sending method is selectable. (Default: "Disable TCP Maximum Segment Size Option transmission")	Data sending method is fixed to "Enable TCP Maximum Segment Size Option transmission" and cannot be changed.	If the response message size exceeds 1460 bytes, the message split by the external device may not be read correctly.	Perform the procedure described in Page 60, Section 5.1.3 (6) so that the external device can process split data.
Wait time for receiving entire message (from the first message to the last message) when a request message is split and sent	1 to 16383.5 seconds. (Default: 30 seconds) (The time value can be changed in "Response monitoring timer" under "Timer setting" of GX Developer.)	Fixed to one second. (A request message is discarded if the next part of the split message cannot be received within one second.)	If each part of the split request message is not sent within one second, a response message is not returned and a communication timeout occurs in the external device.	Retry communication from the external device. If a communication timeout frequently occurs, reduce the load of the external device or Ethernet network.
Operation when request messages are consecutively sent to one connection	Even when one connection consecutively receives request messages, each request message can be processed.	When one connection receives another request message before responding a request message, the second message is discarded.*1	If request messages are consecutively sent to one connection, response messages are not returned and a communication timeout may occur in the external device.	Check that the external device receives a response message before sending next request message. (Do not consecutively send request messages from the external device.)

*1 When the 4E frame is used in the High-speed Universal model QCPU and Universal model Process CPU with serial number (first five digits) of "18052", even if one connection consecutively receives request messages, each request message can be processed.

(Page 61, Section 5.1.3 (7))

(3) Differences between the socket communication and the nonprocedural communication using a fixed buffer of the Ethernet module

Item	QJ71E71-100	Built-in Ethernet port QCPU	Consequence of a communication with the Built-in Ethernet port QCPU	Action
Instruction name	ZP.OPEN ZP.CLOSE ZP.BUFRCV Z.BUFRCVS ZP.BUFSND	SP.SOCOPEN SP.SOCCLOSE SP.SOCRCV S.SOCRCVS SP.SOCSND	-	Replace the instruction name.
Pairing open not necessary	When sending or receiving data using one connection, two connections are occupied by the pairing open setting.	When sending or receiving data using one connection, pairing setting is not used.	-	Set only one connection by parameter. When connection No. of the instruction is the same as the second connection No. of pairing open, replace it with the first connection No.
Automation of UDP and TCP-Full/Unpassive open	Select whether UDP and TCP-Full/Unpassive open is performed by the initial timing setting parameter automatically or by an instruction.	UDP and TCP-Full/Unpassive open is automatically performed.	-	Delete the instructions for open and close for UDP and TCP-Full/Unpassive.
Data sending method on TCP when the message size exceeds 1460 bytes (TCP Maximum Segment Size Option transmission)	Select whether to enable TCP Maximum Segment Size Option transmission in the buffer memory. (Default: "Disable TCP Maximum Segment Size Option transmission")	"Enable TCP Maximum Segment Size Option transmission"	When communications with the QJ71E71-100 are used for a CPU module which performs TCP communications with an external device with the message size over 1460 bytes, the external device may not correctly read split data.	Perform the procedure indicated in Page 105, Section 7.3 (7) so that the external device can process split data.
Connection information acquisition and setting methods	Performed by reading from or writing to the buffer memory.	Performed using socket function instructions.	-	Replace the information acquisition and setting methods with the SP.SOCCINF or SP.SOCCSET instruction.
Activation of an interrupt program in data receiving	An interrupt program can be activated during data receiving.	An interrupt program cannot be activated during data receiving.	-	Program the data receiving processing at the beginning of the scan program.
Host station port number	The following numbers cannot be used as host station port number. 1388_H to $138A_H$ (5000 to 5002)	The following numbers cannot be used as host station port number. 1388_H to 1391_H (5000 to 5009)	-	Change the port number.
Specification of alive check	Select whether to perform alive check of TCP/IP and UDP/IP using parameters.	Alive check for TCP/IP is performed by default. Alive check for UDP/IP is not available.	-	As described in the left columns.
Ethernet address specification using the OPEN instruction	Ethernet address (MAC address) of the external device can be specified using the ZP.OPEN instruction.	Ethernet address (MAC address) of the external device cannot be specified.	-	Specify "0" for the Ethernet address. (No specification is required. The Ethernet address is automatically acquired for communication.)
Maximum communication data size	2046 bytes	• Serial number (first 5 digits) is "12051" or earlier: 2046 bytes • Serial number (first 5 digits) is "12052" or later: 10238 bytes	-	-

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REVISIONS

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

Print date	*Manual number	Revision
December 2008	SH(NA)-080811ENG-A	First edition
March 2009	SH(NA)-080811ENG-B	Revisions involving function addition to the Built-in Ethernet port QCPU (support for the serial number (first five digits) of "11012" and later) Correction SAFETY PRECAUTIONS, MANUAL PAGE ORGANIZATION, GENERIC TERMS AND ABBREVIATIONS, Section 1.1, CHAPTER 2, 3 , Appendix 1 Addition Section 3.4, CHAPTER 4, Appendix 2, 3 Change of section No. Section 3.4 → Section 3.5, Section 3.5 → Section 3.6, Section 3.6 → Section 3.7
April 2010	SH(NA)-080811ENG-C	Revisions involving function addition to the Built-in Ethernet port QCPU (support for the serial number (first five digits) of "11082" and later) Model addition Q50UDEHCPU, Q100UDEHCPU Correction SAFETY PRECAUTIONS, MANUAL PAGE ORGANIZATION, GENERIC TERMS AND ABBREVIATIONS, Section 1.1, CHAPTER 2, CHAPTER 3, Section 3.1.2, 3.1.4, 3.1.5, 3.2, 3.2.1, 3.2.2, 3.3, 3.3.3, 3.3.4, 3.3.5, 3.4, 3.4.1, 3.4.2, 3.4.3, 3.5, 3.5.1, 3.5.2, 3.6, 3.6.1, 3.6.2, 3.6.3, 3.6.5, 3.6.6, 3.7.2, CHAPTER 4, Section 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, Appendix 1, Appendix 2, Appendix 3 Addition Section 3.1.3, 3.8, 3.8.1, 3.8.2, 3.8.3, 3.8.4
August 2010	SH(NA)-080811ENG-D	Revision on the new functions of the Universal model QCPU with a serial number (first 5 digits) of "12052" or later Correction SAFETY PRECAUTIONS, CHAPTER 2, Section 3.6.2, 3.6.6, 4.3, 4.4, 4.5, 4.8, 4.9, Appendix 1, Appendix 2
July 2011	SH(NA)-080811ENG-E	Correction SAFETY PRECAUTIONS, CHAPTER 2, Section 3.3.1, 3.3.3, 3.4.1, 3.4.2, 3.4.3, 4.1, 4.6, Appendix 1 Addition Appendix 4
October 2011	SH(NA)-080811ENG-F	Revision on the new functions of the Universal model QCPU with a serial number (first five digits) of "13102" or later Correction MANUAL PAGE ORGANIZATION, Section 3.1.1, 3.1.2, 3.1.4, 3.2.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.4.1, 3.4.2, 3.6.4, 3.7.4, 3.8, CHAPTER 4, Appendix 1, Appendix 2
February 2012	SH(NA)-080811ENG-G	Revision on the new functions of the Universal model QCPU with a serial number (first 5 digits) of "14022" or later Correction Section 1.1, CHAPTER 3, Section 3.3.5, Appendix 1, Appendix 2, Appendix 4 Addition Section 3.9
May 2012	SH(NA)-080811ENG-H	Correction Section 4.2

Print date	*Manual number	Revision
February 2013	SH(NA)-080811ENG-I	Overall revision due to addition of the Universal model QCPU and the changed manual layout Model addition Q03UDVCPU, Q04UDVCPU, Q06UDVCPU, Q13UDVCPU, Q26UDVCPU
September 2013	SH(NA)-080811ENG-J	Revision on the new functions of the Universal model QCPU with a serial number (first 5 digits) of "15043" or later Correction Section 5.2.2, 8.1, 8.2, 8.4.1, Appendix 3
January 2014	SH(NA)-080811ENG-K	Revision on the new functions of the Universal model QCPU with a serial number (first five digits) of "15103" or later Partial correction Section 1.1, Chapter 2, Section 7.3, 7.4.1, 9.2, 9.3, Chapter 10, Section 11.4, Appendix 1, Appendix 3, Appendix 4 Addition Chapter 6
February 2014	SH(NA)-080811ENG-L	Partial correction Section 7.4.1
July 2014	SH(NA)-080811ENG-M	Revision on the functions for High-speed Universal model QCPU with a serial number (first 5 digits) of "16043" or later Partial correction Section 1.1, 7.4.1, 7.4.2, 7.4.3, 7.4.5, 7.4.9, Appendix 1, 3 Addition Chapter 13
March 2015	SH(NA)-080811ENG-N	Revision on the functions for High-speed Universal model QCPU with a serial number (first 5 digits) of "17012" or later Partial correction Section 7.4.2, 7.4.4, 9.2, 11.3
June 2015	SH(NA)-080811ENG-O	Revision on the functions for High-speed Universal model QCPU with a serial number (first 5 digits) of "17052" or later Partial correction Section 1.1, CHAPTER 3, Section 3.6, CHAPTER 4, Section 10.2, 10.3, Appendix 2, 3, 4 Addition Section 3.5
December 2015	SH(NA)-080811ENG-P	Revision on the functions for High-speed Universal model QCPU with a serial number (first 5 digits) of "17103" or later Partial correction Section 9.2, 9.3, CHAPTER 11
July 2016	SH(NA)-080811ENG-Q	Revision on the functions for High-speed Universal model QCPU with a serial number (first 5 digits) of "18052" or later Partial correction Section 5.2.1, 5.2.2, 5.3, 5.4, Appendix 3, 4

Print date	*Manual number	Revision
January 2017	SH(NA)-080811ENG-R	Revision on the functions for High-speed Universal model QCPU with a serial number (first 5 digits) of "18112" or later Partial correction Section 1.1, Chapter 5, Appendix 1, 3, 4 Addition Section 5.2
April 2017	SH(NA)-080811ENG-S	Partial correction Section 9.2
August 2017	SH(NA)-080811ENG-T	Revision on the functions for High-speed Universal model QCPU with a serial number (first 5 digits) of "19062" or later Partial correction Section 9.2, 9.3
September 2018	SH(NA)-080811ENG-U	Revision on the functions for High-speed Universal model QCPU and Universal model Process CPU with a serial number (first 5 digits) of "20042" or later Model addition Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, Q26UDPVCPU Partial correction SAFETY PRECAUTIONS, Section 1.1, 5.1.2, 5.2.1, 7.4.4, 7.4.6, 10.2, Appendix 3, 4 Addition CHAPTER 11
December 2018	SH(NA)-080811ENG-V	Revision on the functions for High-speed Universal model QCPU and Universal model Process CPU with a serial number (first 5 digits) of "20102" or later Partial correction CHAPTER 11, Appendix 3

Japanese manual version SH-080806-X

WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place. Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

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

SH(NA)-080811ENG-V(1812)MEE
MODEL: QNUDEHCPU-U-ET-E
MODEL CODE: 13JZ29

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