MELSEC Q series

Programmable Controller

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

QnUCPU

01042010
SH(NA)-080811
Version C

MITSUBISHI ELECTRIC INDUSTRIAL AUTOMATION

●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.

Status	Output
Overcurrent or overvoltage protection of the power supply module is activated.	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 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 Chapter 10 LOADING AND INSTALLATION in 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.

- 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, in the case of a control from an external device to a remote programmable controller, immediate action cannot be taken for a problem on 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.

⚠CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables.
  Keep a distance of 100mm (3.94 inches) 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.

- Time from when the CPU module is powered on or is reset to when it enters in RUN status depends on the system configuration, parameter settings, and program size.
  Design the program 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 located 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.

- Shut off the external power supply for the system in all phases before mounting or removing the 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 part of the module.
  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 for the system in all phases before 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.

⚠CAUTION

- Ground the FG and LG terminals to the protective ground conductor dedicated to the programmable controller.
  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.
- 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.
- 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

- Mitsubishi 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.

- Correctly connect the battery connector.
  Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire.
  Doing so will cause the battery to produce heat, explode, or ignite, resulting in injury and fire.

- Shut off the external power supply for the system in all phases before cleaning the module or retightening the terminal screws or module fixing screws.
  Failure to do so may result in electric shock.
  Undertightening the terminal screws can cause short circuit or malfunction.
  Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.

⚠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 (9.85 inches) 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 for the system in all phases before mounting or removing the 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 more than 50 times (IEC 61131-2 compliant) respectively.
Exceeding the limit of 50 times 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 countries, 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.

REVISIONS

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

Print date	*Manual number	Revision
Dec., 2008	SH(NA)-080811ENG-A	First edition
Mar., 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
Apr., 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, 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

Japanese manual version SH-080806-D

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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.

■Relevant CPU module

CPU module	Model
Universal model QCPU	Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, 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)

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CHAPTER3 COMMUNICATION FUNCTION VIA BUILT-IN ETHERNET PORTS OF CPU MODULE 3-1 to 3-75

CHAPTER4 SOCKET COMMUNICATION FUNCTION INSTRUCTIONS 4-1 to 4-29

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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.
Order each manual as needed, referring to the following list.

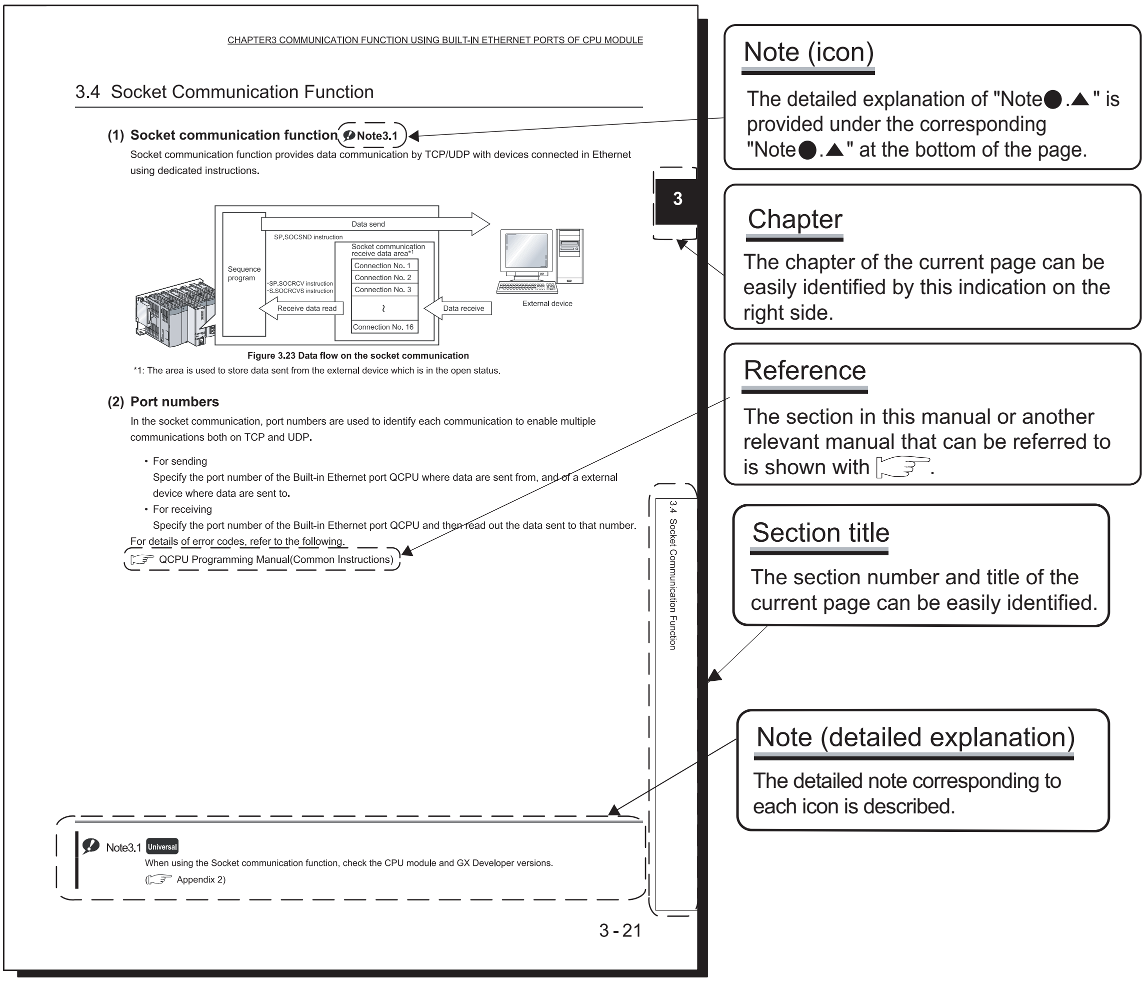
● :Basic manual, ○:Other CPU module manuals

Manual name < Manual number (model code) >	Description	Manual type
■ **User's manual**		
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, and memory cards), 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 multiple CPU system configuration (system configuration, I/O numbers, communication between CPU modules, and communication with the input/output modules and intelligent function modules)	○
QnUCPU User's Manual (Communication via Built-in Ethernet Port) < SH-080811ENG (13JZ29) >	Functions for the communication via built-in Ethernet port of the CPU module	○
■ **Programming manual**		
MELSEC-Q/L Programming Manual (Common Instruction) < SH-080809ENG (13JW10) >	How to use sequence instructions, basic instructions, and application instructions	●
MELSEC-Q/L/QnA Programming Manual (SFC) < SH-080041 (13JF60) >	System configuration, performance specifications, functions, programming, debugging, and error codes for SFC (MELSAP3) programs	○
MELSEC-Q/L Programming Manual (MELSAP-L) < SH-080076 (13JF61) >	Programming methods, specifications, and functions for SFC (MELSAP-L) programs	○
MELSEC-Q/L Programming Manual (Structured Text) < SH-080366E (13JF68) >	Programming methods using structured languages	○
MELSEC-Q/L/QnA Programming Manual (PID Control Instructions) < SH-080040 (13JF59) >	Dedicated instructions for PID control	○

Other relevant manuals

Manual name	Description
CC-Link IE Controller Network Reference Manual < SH-080668ENG (13JV16) >	Specifications, procedures and settings before system operation, parameter setting, programming, and troubleshooting of the CC-Link IE controller network module
MELSEC-Q CC-Link IE Field Network Master/ Local Module User's Manual < SH-080917ENG (13JZ47) >	Specifications, procedures and settings before system operation, parameter setting, programming, and troubleshooting of the CC-Link IE field network module
Q Corresponding MELSECNET/H Network System Reference Manual (PLC to PLC network) < SH-080049 (13JF92) >	Specifications, procedures and settings before system operation, parameter setting, programming, and troubleshooting of a MELSECNET/H network system (PLC to PLC network)
Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O network) < SH-080124 (13JF96) >	Specifications, procedures and settings before system operation, parameter setting, programming, and troubleshooting of a MELSECNET/H network system (remote I/O network)
Q Corresponding Ethernet Interface Module User's Manual (Basic) < SH-080009 (13JL88) >	Specifications, procedures for data communication with external devices, line connection (open/close), fixed buffer communication, random access buffer communication, and troubleshooting of the Ethernet module
Q Corresponding Ethernet Interface Module User's Manual (Application) < SH-080010 (13JL89) >	E-mail function, programmable controller CPU status monitoring function, communication via MELSECNET/H or MELSECNET/10, communication using the data link instructions, and file transfer function (FTP server) of the Ethernet module
CC-Link System Master/Local Module User's Manual < SH-080394E (13JR64) >	System configuration, performance specifications, functions, handling, wiring, and troubleshooting of the QJ61BT11N
Q Corresponding Serial Communication Module User's Manual (Basic) < SH-080006 (13JL86) >	Overview, system configuration, specifications, procedures before operation, basic data communication method with external devices, maintenance and inspection, and troubleshooting for using the serial communication module
MELSEC-Q/L Serial Communication Module User's Manual (Application) < SH-080007 (13JL87) >	Special functions (specifications, usage, and settings and data communication method with external devices of the serial communication module
MELSEC-Q/L MELSEC Communication Protocol Reference Manual < SH-080008 (13JF89) >	Communication method using the MC protocol, which reads/writes data to/ from the CPU module via the serial communication module or Ethernet module
GX Developer Version 8 Operating Manual < SH-080373E (13JU41) >	Operating methods of GX Developer, such as programming and printout
GX Works2 Version1 Operating Manual (Common) < SH-080779ENG (13JU63) >	Operating methods of GX Works2, such as programming and printout

MANUAL PAGE ORGANIZATION



CHAPTER3 COMMUNICATION FUNCTION USING BUILT-IN ETHERNET PORTS OF CPU MODULE

3.4 Socket Communication Function

(1) Socket communication function Note3.1

Socket communication function provides data communication by TCP/UDP with devices connected in Ethernet using dedicated instructions.

Figure 3.23 Data flow on the socket communication

*1: The area is used to store data sent from the external device which is in the open status.

(2) Port numbers

In the socket communication, port numbers are used to identify each communication to enable multiple communications both on TCP and UDP.

- For sending
  Specify the port number of the Built-in Ethernet port QCPU where data are sent from, and of a external device where data are sent to.
- For receiving
  Specify the port number of the Built-in Ethernet port QCPU and then read out the data sent to that number.

For details of error codes, refer to the following.

☞ QCPU Programming Manual(Common Instructions)

Note3.1 Universal

When using the Socket communication function, check the CPU module and GX Developer versions.

(☞ Appendix 2)

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3

3.4 Socket Communication Function

Note (icon)

The detailed explanation of "Note●.▲" is provided under the corresponding "Note●.▲" at the bottom of the page.

Chapter

The chapter of the current page can be easily identified by this indication on the right side.

Reference

The section in this manual or another relevant manual that can be referred to is shown with ☞.

Section title

The section number and title of the current page can be easily identified.

Note (detailed explanation)

The detailed note corresponding to each icon is described.

*The above page illustration is for explanation purpose only, and is different from the actual page.

Icon	Description
Universal model QCPU	
Universal	This icon indicates that specifications described on the page contain some precautions.

In addition, this manual uses the following types of explanations.

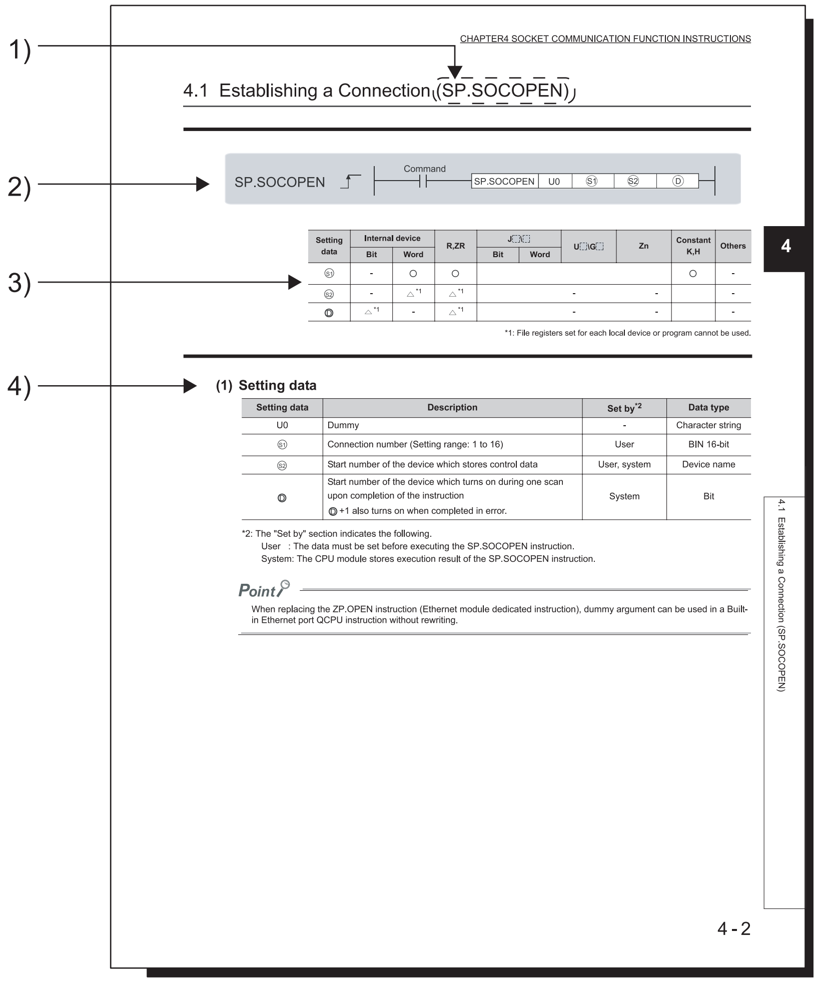
Point

In addition to description of the page, notes or functions that require special attention are described here.

Remark

The reference related to the page or useful information are described here.

Chapters describing instructions are organized as follows.



CHAPTER4 SOCKET COMMUNICATION FUNCTION INSTRUCTIONS

4.1 Establishing a Connection (SP.SOCOPEN)

SP.SOCOPEN ↑ Command | SP.SOCOPEN | U0 | S1 | S2 | D |

Setting data	Internal device		R,ZR	J\		U\G	Zn	Constant K,H	Others
	Bit	Word		Bit	Word				
S1	-	○	○					○	-
S2	-	△*1	△*1			-	-		-
D	△*1	-	△*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 which stores control data	User, system	Device name
D	Start number of the device which turns on during one scan upon completion of the instruction D +1 also turns on when completed in error.	System	Bit

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

4.1 Establishing a Connection (SP.SOCOPEN)

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1) Instruction code is indicated.

2) Expression in the ladder mode and execution condition of the instruction are indicated.

Execution condition	Always executed	Executed during on	Executed one time when turned on	Executed during off	Executed one time when turned off
Symbol	Blank	⊓	↑	⊔	↓

3) ○ is shown for devices appilcable in the instruction.

The table below indicates usages of devices.

Setting data	Internal device (System, user)		File register R,ZR	Link direct device *4 J\		Intelligent function module U\G	Index register Zn	Constant *5	Others *5
	Bit	Word		Bit	Word				
Applicable devices *1	X, Y, M, L, SM, F, B, SB, FX, FY *2	T, ST, C,*3 D, W, SD, SW, FD, @	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 the description of each device, refer to the following.

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

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

*3 : When using T, ST, or C must be used only as word data when using other than in the following instructions.
(These devicess cannot be used as bit data.)
[Devices that can be used as bit data] LD, LDI, AND, ANI, OR, ORI, LDP, LDF, ANDP, ANDF, ORP, ORF, OUT, and RST

*4 : The devices can be used in CC-Link IE, MELSECNET/H, and MELSECNET/10.

*5 : In the Constant and Others columns, applicable devices are indicated.

4) Description of the setting data and data type of the instruction are indicated.

Data type	Description
Bit	Bit data or start number in bit data
BIN 16 bits	BIN 16-bit data or start number in word device
BIN 32 bits	BIN 32-bit data or start number in double word device
BCD 4-digit	4-digit BCD data
BCD 8-digit	8-digit BCD data
Real number	Floating decimal point data
Character string	Character string data
Device name	Device name data

The following items are described as well.

- Function : Function of the instruction.
- Error : Conditions that generates errors, and error numbers.
  For errors not described in this manual, refer to the following manual.
  ☞ MELSEC-Q/L Programming Manual (Common Instruction)
- Program example : A simple program example is provided both in the ladder mode and list mode.
  Function of each device in instruction execution in the program is also indicated.

GENERIC TERMS AND ABBREVIATIONS

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

* □indicates a part of the model or version.

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

Generic term/abbreviation	Description
■ Series	
Q series	Generic term for Mitsubishi MELSEC-Q series programmable controller
■ CPU module type	
CPU module	Generic term for the Universal model QCPU
Universal model QCPU	Generic term for the Q00UJCPU, Q00UCPU, Q01UCPU, Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q10UDHCPU, Q13UDHCPU, Q20UDHCPU, Q26UDHCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU, Q50UDEHCPU and Q100UDEHCPU
Built-in Ethernet port QCPU	Generic term for the Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU, Q50UDEHCPU and Q100UDEHCPU
■ CPU module model	
QnUDE(H)CPU	Generic term for the Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU, Q50UDEHCPU and Q100UDEHCPU
■ Network module	
CC-Link IE module	Generic term for the CC-Link IE controller network and CC-Link IE field network
MELSECNET/H module	Abbreviation for the MELSECNET/H network module
Ethernet module	Abbreviation for the Ethernet network module
CC-Link module	Abbreviation for the CC-Link system master/local module
■ Network	
CC-Link IE	Generic term for the CC-Link IE controller network module and CC-Link IE field network module
MELSECNET/H	Abbreviation for the MELSECNET/H network system
Ethernet	Abbreviation for the Ethernet network system
CC-Link	Abbreviation for the Control & Communication Link
■ Others	
GX Developer	Product name of the software package for MELSEC programmable controllers
GX Works2	
GOT	Generic term for Mitsubishi Graphic Operation Terminal, GOT-A*** series, GOT-F*** series, and GOT1000 series

CHAPTER1 OVERVIEW

1.1 Features

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

(1) GX Developer/GOT connection (☞ Section 3.1)

- The Find CPU function makes it possible to find the Built-in Ethernet port QCPU connected to the same hub as GX Developer and displays a list.
- MELSOFT connection allows access to CPU modules on the network, such as internal LAN, via routers.

(2) GX Developer direct connection (simple connection) (☞ Section 3.2)

When connecting the Built-in Ethernet port QCPU with GX Developer, the direct connection (simple connection), which connects them using only one Ethernet cable (not using a hub) is available. The direct connection enables communication with only specifying connection target. IP address setting is not required.

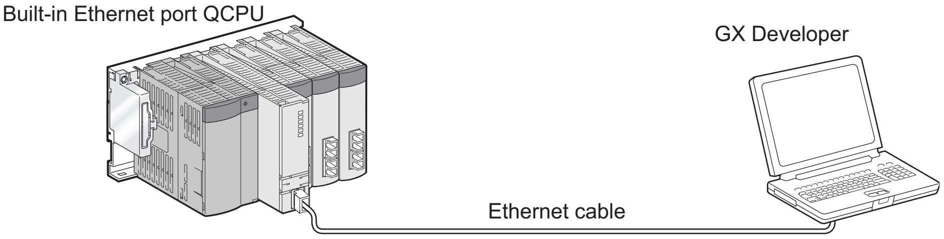


Figure 1.1 Direct connection (simple connection)

(3) MC protocol communication (☞ Section 3.3)

External devices such as personal computers and display devices read/write device data from/to the Built-in Ethernet port QCPU. This enables external devices to monitor the operation of the CPU module, analyze data, and manage production.

(4) Socket communication(☞ Section 3.4)

Any given data can be sent to or read from external devices on the Ethernet by TCP/UDP using a socket communication instruction.

(5) Time setting function (SNTP client) (☞ Section 3.5)

- The time setting function enables automatic time setting for the Built-in Ethernet port QCPU, resulting in reducing the maintenance cost for time setting.
- By synchronizing the Built-in Ethernet port QCPU connected via Ethernet, error occurrence order for each process can be checked and troubleshooting becomes easy.
- Since time setting can be performed automatically at programmable controller CPU power ON, the CPU module can start operation with accurate time data.

(6) File transfer function (FTP) (☞ Section 3.6)

From an external device with the FTP client function, reading or writing each file in the Built-in Ethernet port QCPU possible, and a large volume of data can be transferred easily.

(7) Remote password (☞ Section 3.7)

Setting a remote password can prevent unauthorized access from outside of the system and enhance the security.

(8) IP address change function (☞ Section 3.8)

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.

Point

Some functions of the CPU module were added when the serial number of the CPU module or GX Developer version was updated.
For the list of the functions added by the improvement of the Universal model QCPU, refer to Appendix 2.

CHAPTER2 COMMUNICATION SPECIFICATIONS

Table2.1 shows the communication specifications for built-in Ethernet ports of the CPU module.

Table2.1 Ethernet communication specifications

Item			Specifications
Transmission specifications	Data transfer speed		100/10Mbps
	Communication mode		Full-duplex/Half-duplex
	Transmission method		Base band
	Maximum distance between hub and node		100m (328.08feet)
	Maximum number of nodes/ connections	10BASE-T	Cascade connection: Up to four bases
		100BASE-TX	Cascade connection: Up to two bases
Number of connections	TCP/IP		Total of 16 for Socket communications, MELSOFT connections, and MC protocols. 1 for FTP
	UDP/IP		
Connection cable [*1]	10BASE-T		Ethernet-compliant cable Category 3 or higher (STP/UTP cable)[*2]
	100BASE-TX		Ethernet-compliant cable Category 5 or higher (STP cable)

*1 : Straight cables can be used.
Crossing cables can also be used for connecting the Built-in Ethernet port QCPU with GOT directly using an Ethernet cable.

*2 : STP cables are recommended for the use under noisy environment.

Hubs with 10BASE-T or 100BASE-TX ports[*3] can be used.
The maximum number of devices that can access to one CPU module simultaneously is 16.

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

Point

- When connecting with a hub, the Built-in Ethernet port QCPU determines the cable used (10BASE-T or 100BASE-TX) and the communication mode (full-duplex or half-duplex).
  Set the communication mode to the half-duplex mode on the hub side when the hub that does not have the auto-negotiation function is used.
- The operation of the commercially available devices used for the following is not guaranteed. Check the operation on the user side before using.
  - Connections using the Internet (general public line) (Internet connection service provided by Internet service providers and telecommunications carriers)
  - Connections using devices in which a firewall is installed
  - Connections using broadband routers
  - Connections using wireless LAN
- Approximately 500ms may be required for service processing if communicated via Ethernet with "Specify service process execution counts" selected for "Service processing setting" in the PLC system tab of PLC parameter.
  To process in 500ms or less, select any parameter other than "Specify service process execution counts".
  (Example: Select "Specify service process time" and then enter the value.)

Remark

The following describes TCP and UDP.

- TCP (Transmission Control Protocol)
  TCP is one of the core protocols which provides reliable communications among programmable controllers and external devices connected in a network by establishing a connection between the port number of the devices.
- UDP (User Datagram Protocol)
  Unlike TCP, UDP does not establish a connection. Thus, communication is faster and less reliable. (Data may be lost, may arrive out of order, and other such problem are expected.) UDP provides simultaneous broadcast.

Select an appropriate protocol according to specifications of the external device and features of the protocols described above.

CHAPTER3 COMMUNICATION FUNCTION VIA BUILT-IN ETHERNET PORTS OF CPU MODULE

The Built-in Ethernet port QCPU can communicate data by connecting built-in Ethernet ports of the QCPU module with personal computers and/or display devices using an Ethernet cables (100BASE-TX, 10BASE-T).

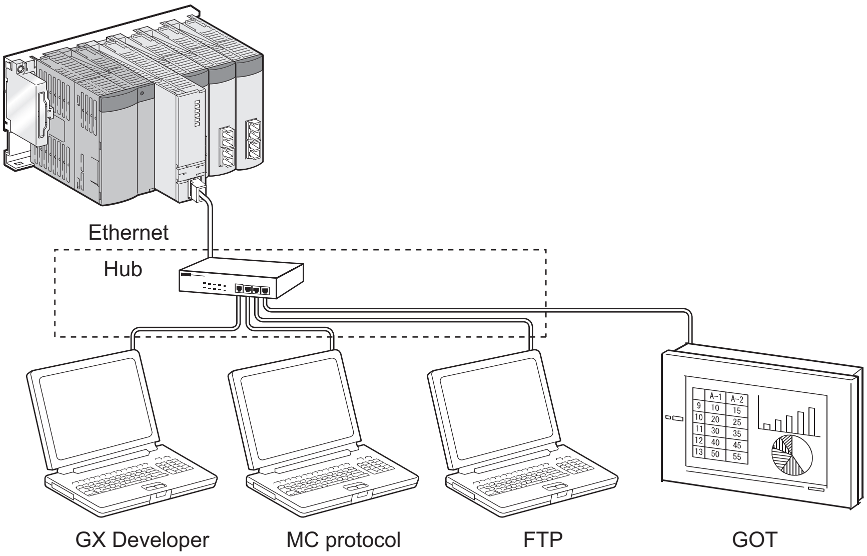


Figure 3.1 Connection example using built-in Ethernet ports of CPU module

For the comparison with the conventional MELSEC-Q series Ethernet module (QJ71E71-100), refer to Appendix 1.

The following table lists the functions using built-in Ethernet ports of the CPU module.

Table3.1 List of functions

Function	Reference
GX Developer/GOT connection	Section 3.1
GX Developer direct connection (simple connection)	Section 3.2
MC protocol communication	Section 3.3
Socket communication function	Section 3.4
Time setting function (SNTP client)	Section 3.5
File transfer function (FTP server)	Section 3.6
Remote password	Section 3.7
IP address change function	Section 3.8

3.1 GX Developer/GOT Connection

The following describes the setting method for connecting the Built-in Ethernet port QCPU with GX Developer and/or GOT

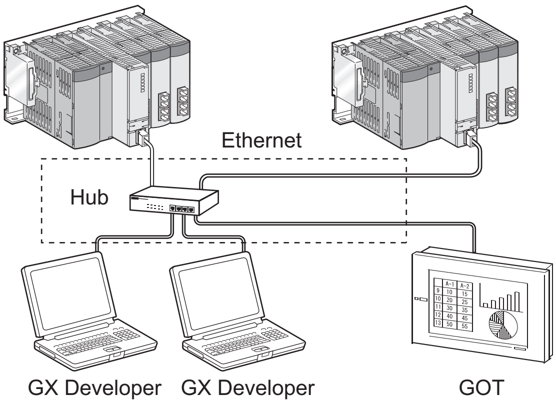


Figure 3.2 Connection example using hub

Point

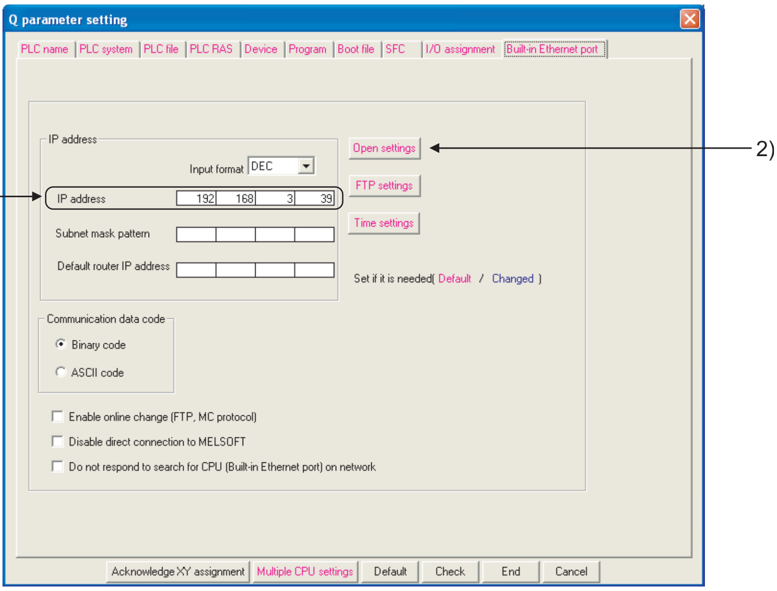
- The Built-in Ethernet port QCPU can be connected directly with GX Developer using one Ethernet cable. (Direct connection (simple connection))
  The direct connection (simple connection) enables the QnUDE(H)CPU and GX Developer to communicate without setting IP addresses. For details, refer to Section 3.2.
- For setting on the GOT side, refer to following manual.
  ☞ GOT1000 Series Connection Manual

3.1.1 Setting for CPU module

The setting for the CPU module is described below.

(1) PLC parameter setting

Set the items in the Built-in Ethernet port tab of the PLC parameter dialog box as shown in Figure 3.3.



Q parameter setting

PLC name | PLC system | PLC file | PLC RAS | Device | Program | Boot file | SFC | I/O assignment | Built-in Ethernet port

IP address

Input format: DEC

IP address: 192 . 168 . 3 . 39

Subnet mask pattern:

Default router IP address:

Communication data code

● Binary code

○ ASCII code

□ Enable online change (FTP, MC protocol)

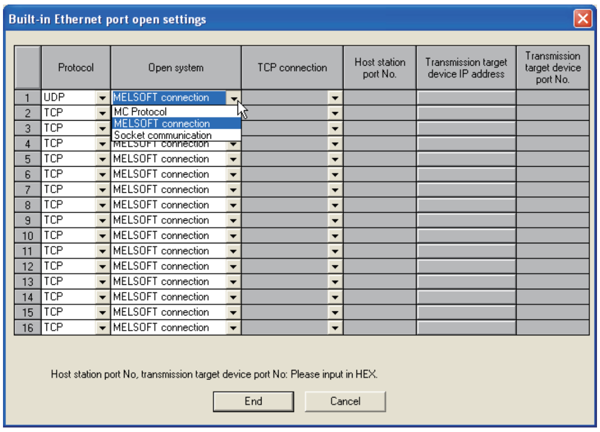
□ Disable direct connection to MELSOFT

□ Do not respond to search for CPU (Built-in Ethernet port) on network

Figure 3.3 Built-in Ethernet port tab

1) Set the CPU module IP address.

2) Set the connection for GX Developer (MELSOFT connection). (Refer to Figure 3.4)



Built-in Ethernet port open settings

	Protocol	Open system	TCP connection	Host station port No.	Transmission target device IP address	Transmission target device port No.
1	UDP	MELSOFT connection				
2	TCP	MC Protocol MELSOFT connection Socket communication				
3	TCP					
4	TCP	MELSOFT connection				
5	TCP	MELSOFT connection				
6	TCP	MELSOFT connection				
7	TCP	MELSOFT connection				
8	TCP	MELSOFT connection				
9	TCP	MELSOFT connection				
10	TCP	MELSOFT connection				
11	TCP	MELSOFT connection				
12	TCP	MELSOFT connection				
13	TCP	MELSOFT connection				
14	TCP	MELSOFT connection				
15	TCP	MELSOFT connection				
16	TCP	MELSOFT connection				

Host station port No, transmission target device port No: Please input in HEX.

Figure 3.4 Built-in Ethernet port open settings screen

- Protocol : Select the protocol to be used, "TCP" or "UDP" in accordance with the external device. Select "TCP" to emphasize communication reliability.
- Open system : Select "MELSOFT connection". (For the MELSOFT connection, refer to Section 3.3.)
- Host station port No. :Set the number when "MC Protocol" is selected.

(2) Operation for validating parameters

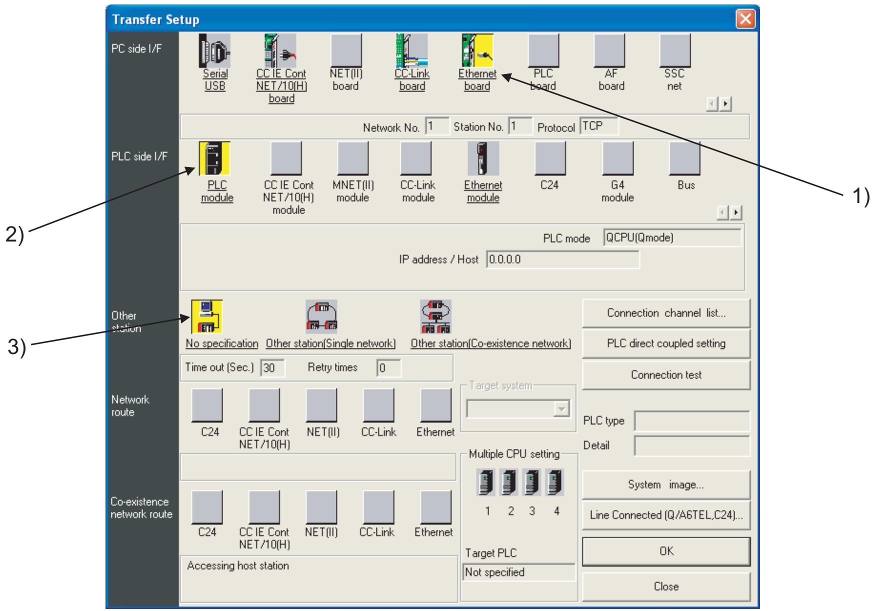
Using Ethernet direct connection or USB connection, write the settings in PLC parameter to the CPU module by selecting [Online] → [Write to PLC] in GX Developer. After writing the parameter settings, power the programmable controller OFF → ON or perform the reset operation of the CPU module using the RUN/STOP/RESET switch so that the parameters become valid.
For the Ethernet direct connection, refer to the following section.
(☞ Section 3.2)

Point

For the reset operation using the RUN/STOP/RESET switch, refer to the following manual.
☞ QCPU User's Manual (Hardware Design, Maintenance and Inspection)

3.1.2 Setting on GX Developer side

Setting on GX Developer side is described below.



Network No. 1 Station No. 1 Protocol TCP

PLC mode QCPU(Qmode)

IP address / Host 0.0.0.0

Time out (Sec.) 30 Retry times 0

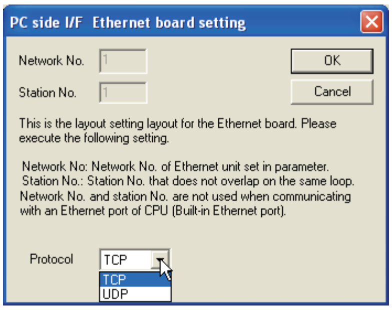
Accessing host station

Target PLC Not specified

Figure 3.5 Transfer Setup screen

1) Select "Ethernet board" for "PC side I/F".

Select a protocol to be used in the Ethernet board setting screen as shown in Figure 3.6.



Network No. 1

Station No. 1

This is the layout setting layout for the Ethernet board. Please execute the following setting.

Network No: Network No. of Ethernet unit set in parameter.
Station No.: Station No. that does not overlap on the same loop.
Network No. and station No. are not used when communicating with an Ethernet port of CPU (Built-in Ethernet port).

Protocol TCP

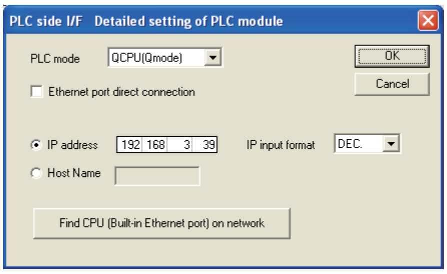
Figure 3.6 PC side I/F Ethernet board setting screen

- Network No., Station No.: Not used.
- Protocol: Select the protocol to be used, "TCP" or "UDP".
  (Select the same protocol which has been set under the Open settings at Section 3.1.1.)

2) Select "PLC module" for "PLC side I/F".

Enter the IP address or host name of the CPU module in the Detailed setting of PLC module screen as shown in Figure 3.7.

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


PLC side I/F Detailed setting of PLC module
OK
Cancel
Find CPU (Built-in Ethernet port) on network

PLC mode QCPU(Qmode)

□ Ethernet port direct connection

● IP address 192 168 3 39 IP input format DEC.

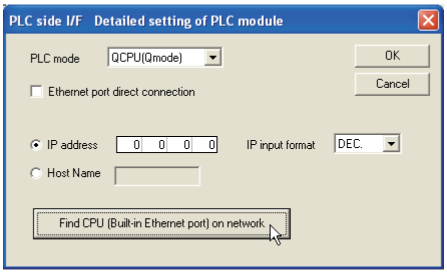
○ Host Name

Figure 3.7 PLC side I/F Detailed setting of PLC module screen

3) Make the setting for "Other station".

3.1.3 Searching CPU Modules on the Network

The Find CPU function can be used for specifying the CPU side IP address in the configuration using a hub.
This function can be activated on the PLC side I/F Detailed setting of PLC module screen, finds the CPU modules connected to the same hub as GX Developer, and displays a list.



PLC side I/F Detailed setting of PLC module

PLC mode: QCPU(Qmode)

□ Ethernet port direct connection

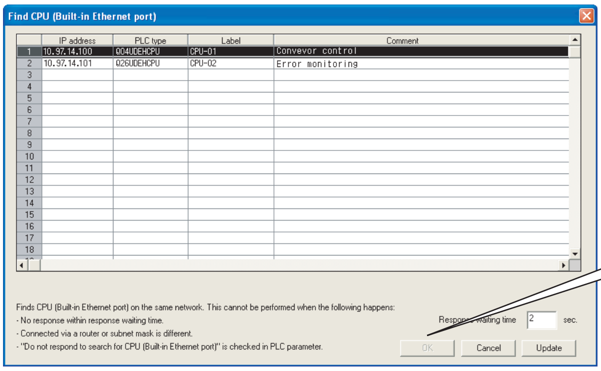
● IP address: 0 . 0 . 0 . 0

IP input format: DEC.

○ Host Name

Figure 3.8 PLC side I/F Detailed setting of PLC module screen

A list of the CPU modules found is displayed.



Find CPU (Built-in Ethernet port)

	IP address	PLC type	Label	Comment
1	10.97.14.100	Q04UDEHCPU	CPU-01	Convevor control
2	10.97.14.101	Q26UDEHCPU	CPU-02	Error monitoring
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				

Finds CPU (Built-in Ethernet port) on the same network. This cannot be performed when the following happens:
- No response within response waiting time.
- Connected via a router or subnet mask is different.
- "Do not respond to search for CPU (Built-in Ethernet port)" is checked in PLC parameter.

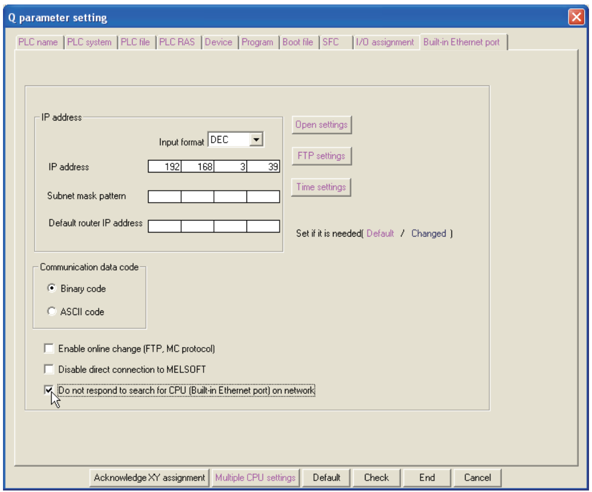
Response waiting time: 2 sec.

The IP address of the corresponding CPU is input automatically by clicking the OK button.

Figure 3.9 Find CPU (Built-in Ethernet port) screen

- CPU modules connected to a cascade connected hub are also found and displayed in the list.
- CPU modules connected via a router cannot be found.
- CPU modules connected via wireless LAN may not be found since the Ethernet communication may not be stable due to lost packets.
- If CPU modules with the same IP address are found in the list, correct the parameter settings of the CPU side IP address. If communication is performed in this situation, a communication error occurs.
- CPU modules may not be found if the service processing load on CPU modules is heavy.
  In that case, extend the response waiting time in the Find CPU (Built-in Ethernet port) dialog box as shown above or extend the service processing time on the service processing setting of the PLC parameter dialog box.

- Select the checkbox in the Built-in Ethernet port tab of the PLC parameter dialog box in Figure 3.10 so that CPU modules to be searched do not respond on the network.



IP address

Input format: DEC

IP address: 192 168 3 39

Subnet mask pattern:

Default router IP address:

Set if it is needed(Default / Changed)

Communication data code

● Binary code

○ ASCII code

□ Enable online change (FTP, MC protocol)

□ Disable direct connection to MELSOFT

☑ Do not respond to search for CPU (Built-in Ethernet port) on network

Figure 3.10 Built-in Ethernet port tab

3.1.4 Precautions

The following are the precautions must be taken when connecting the Built-in Ethernet port QCPU with GX Developer or GOT.

(1) Existence check using the KeepAlive function

When setting the protocol to TCP, the status is checked using the KeepAlive function. (Response to the ACK message for the KeepAlive function)

The CPU module sends an existence check message five seconds after the last message from the external device is received and waits to see whether a response from the external device is received.

If there is no response, the CPU module keeps sending an existence check message in five-second intervals.

When a response has not been confirmed within 45 seconds, the connection is disconnected, considering that no external device exists.

The connection may be disconnected if the external device does not support the TCP KeepAlive function.

(2) Number of connections exceeding setting range

Establish connections within the number of protocols set for open settings of PLC parameter.

If TCP connections exceeding the set number of connections are made with a personal computer, the status of some applications may change as described below.

- The time period for a timeout error occurring is increased.
- A timeout error occurs suddenly in any of the communicating external devices.

(3) Retransmission processing in TCP connection

In TCP connection, if no ACK response message for TCP protocol is received from the external device, retransmission processing is performed.

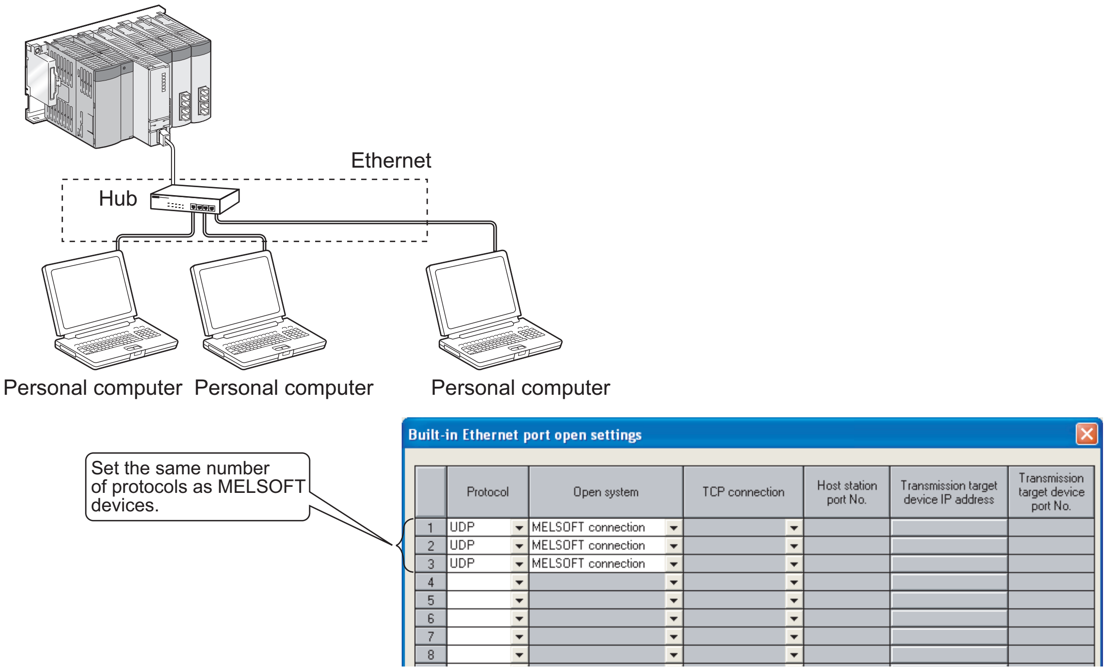
Resend processing is performed six times, 0.3, 0.6, 1.2, 2.4, 4.8, and 9.6 seconds after the first message.

If there is no ACK response within a period of 19.2 seconds after the last message is resent, the connection is disconnected, considering that the external device is not operating normally.

(The connection is disconnected within the total period of 38.1 seconds.)

(4) Communication with MELSOFT devices in UDP protocol

To communicate with multiple MELSOFT devices using the UDP protocol, set the same number of protocols as MELSOFT devices in PLC parameter.



Set the same number of protocols as MELSOFT devices.

Built-in Ethernet port open settings

	Protocol	Open system	TCP connection	Host station port No.	Transmission target device IP address	Transmission target device port No.
1	UDP	MELSOFT connection				
2	UDP	MELSOFT connection				
3	UDP	MELSOFT connection				
4						
5						
6						
7						
8						

Figure 3.11 Setting for MELSOFT connection using UDP protocol

Point

When all MELSOFT devices start to communicate simultaneously, the communication may be difficult to succeed due to the concentration of communication.
In this case, start each MELSOFT device at different timings not to concentrate the starts.
For example, when using GOTs, set the rising time and the communication timeout time in each GOT.

(5) Sampling trace

When the sampling trace function is executed using GX Developer which is connected with built-in Ethernet ports of the CPU module, stop the function before powering OFF the programmable controller or resetting the CPU module.

(6) Remote STOP or remote PAUSE

When executing the remote STOP or remote PAUSE with GX Developer from the built-in CPU Ethernet port, perform the following operations before powering off or resetting the CPU module.

- remote RUN
- remote RESET

3.1.5 Communication via routers

MELSOFT connection allows access to CPU modules on the network, such as internal LAN, from the built-in CPU Ethernet port via routers.[*1]

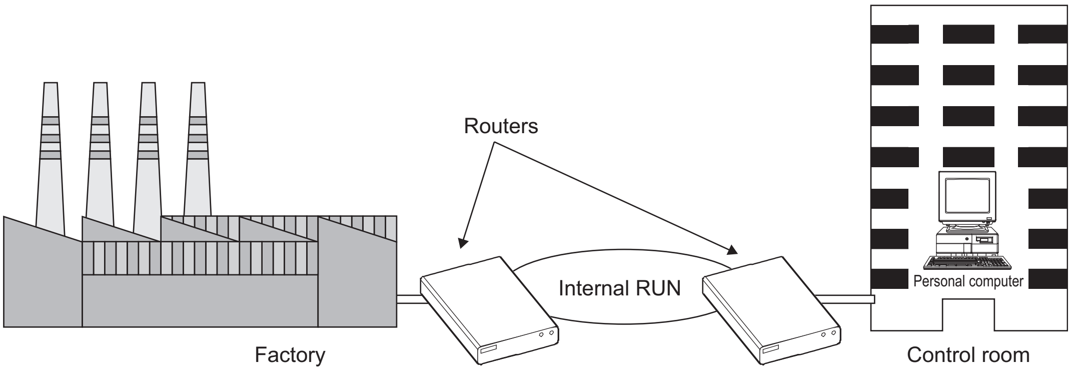
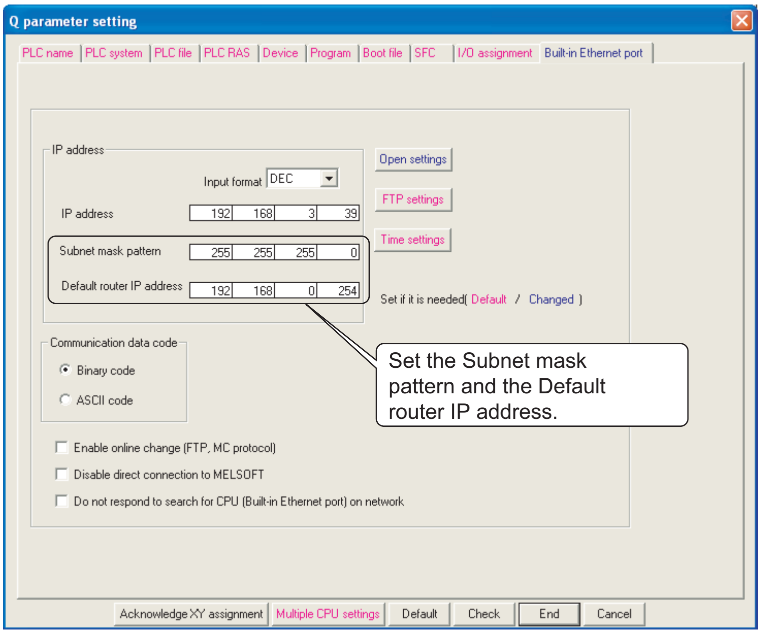


Figure 3.12 Example of router use

[*1] In some functions, the communication via routers is not available.
The following shows the functions that cannot be used via routers.

- Searching CPU modules on the network
- Simultaneous broadcast of the socket communication function

When accessing a CPU module via routers, set the items in parameter as shown in Figure 3.13.
For other settings, refer to Section 3.1.1.



Q parameter setting

PLC name | PLC system | PLC file | PLC RAS | Device | Program | Boot file | SFC | I/O assignment | Built-in Ethernet port

IP address
Input format: DEC
IP address: 192 . 168 . 3 . 39
Subnet mask pattern: 255 . 255 . 255 . 0
Default router IP address: 192 . 168 . 0 . 254

Open settings
FTP settings
Time settings
Set if it is needed(Default / Changed)

Communication data code
● Binary code
○ ASCII code

□ Enable online change (FTP, MC protocol)
□ Disable direct connection to MELSOFT
□ Do not respond to search for CPU (Built-in Ethernet port) on network

Set the Subnet mask pattern and the Default router IP address.

Figure 3.13 Built-in Ethernet port tab

3.2 GX Developer Direct Connection (Simple Connection)

When connecting the Built-in Ethernet port QCPU with GX Developer, the direct connection (simple connection), which connects them using only one Ethernet cable (not using a hub) is available.
The direct connection enables communication with only specifying connection target (Use simultaneous broadcast to communicate.). IP address setting is not required.

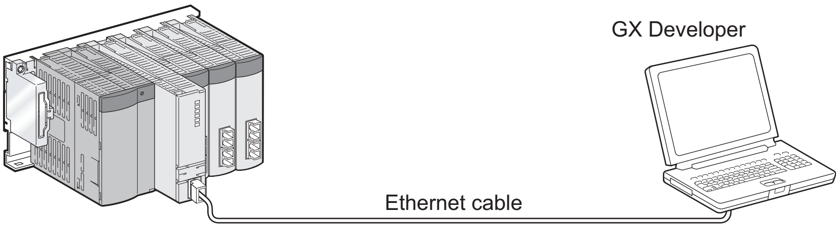
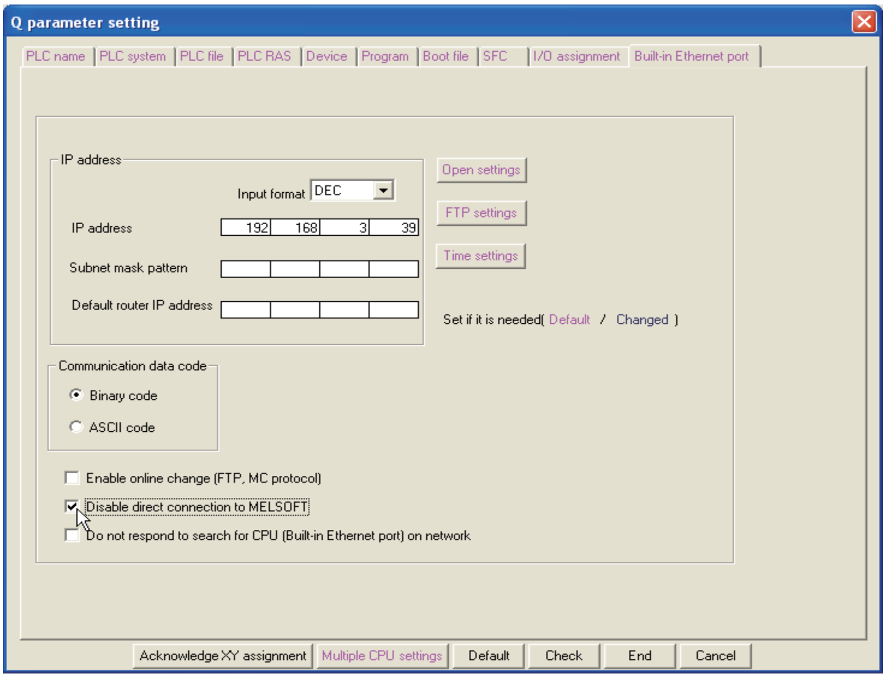


Figure 3.14 Direct connection (simple connection)

Point

When directly connecting the Built-in Ethernet port QCPU with GX Developer using an Ethernet cable, the wired cable is longer than when using a USB cable. Therefore, the Built-in Ethernet port QCPU can be connected with a device located at distant locations improperly.
Unauthorized connection to the Built-in Ethernet port QCPU can be prevented by selecting the checkbox as shown in Figure 3.15 in the Built-in Ethernet port tab of the PLC parameter dialog box.


Q parameter setting
PLC name | PLC system | PLC file | PLC RAS | Device | Program | Boot file | SFC | I/O assignment | Built-in Ethernet port
Open settings
FTP settings
Time settings
Acknowledge XY assignment | Multiple CPU settings | Default | Check | End | Cancel

IP address
Input format DEC
IP address 192 168 3 39
Subnet mask pattern
Default router IP address

Set if it is needed(Default / Changed)

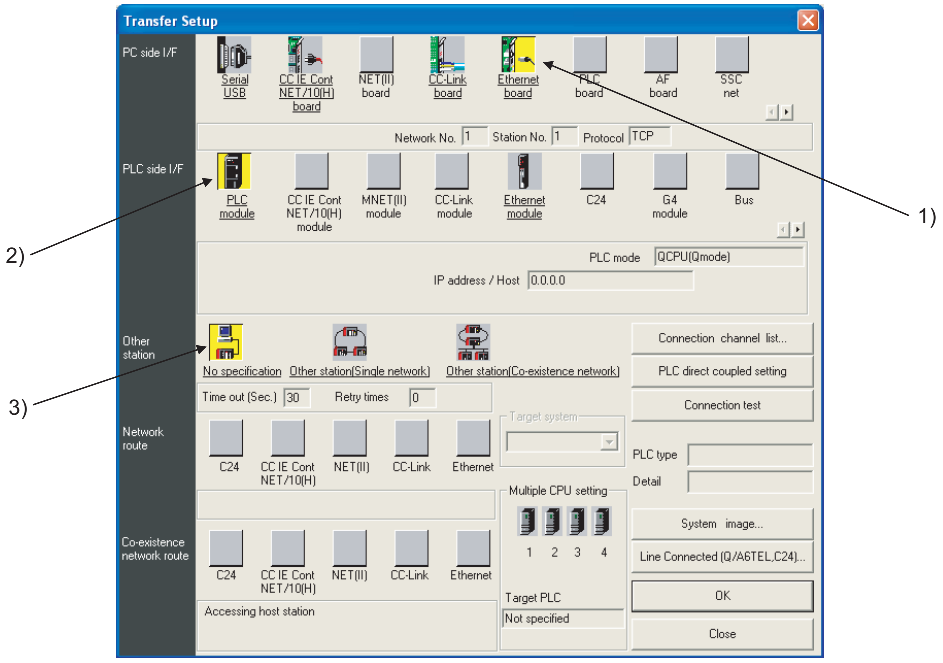
Communication data code
● Binary code
○ ASCII code

□ Enable online change (FTP, MC protocol)
☑ Disable direct connection to MELSOFT
□ Do not respond to search for CPU (Built-in Ethernet port) on network

Figure 3.15 Setting for preventing direct connection

3.2.1 Communication setting in GX Developer

Set the items on the Transfer Setup screen in GX Developer as shown in Figure 3.16.



Network No. 1 Station No. 1 Protocol TCP

PLC mode QCPU(Qmode)

IP address / Host 0.0.0.0

Time out (Sec.) 30 Retry times 0

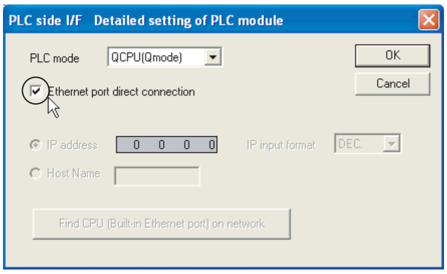
Target PLC Not specified

Figure 3.16 Transfer Setup screen

1) Select "Ethernet board" for "PC side I/F".

2) Select "PLC module" for "PLC side I/F".

Check the "Ethernet port direct connection" checkbox on the detailed setting screen as shown in Figure 3.17.


PLC side I/F Detailed setting of PLC module
OK
Cancel
IP input format
DEC.
Find CPU (Built-in Ethernet port) on network

PLC mode QCPU(Qmode)

☑ Ethernet port direct connection

● IP address 0 0 0 0

○ Host Name

Figure 3.17 PLC side I/F Detailed setting of PLC module screen

3) Make the setting for "Other station".

Select it according to the operating environment.

3.2.2 Precautions

The following are the precautions must be taken when directly connecting the Built-in Ethernet port QCPU with GX Developer.

(1) Connection to LAN line

When the CPU module is connected to the LAN line, do not set the direct connection. It may increase a load to the line and adversely affect the communication or other devices.

(2) Indirect connection

- Do not configure the direct connection in a system configuration that connects the Built-in Ethernet port QCPU with an external device using a hub in Figure 3.18.

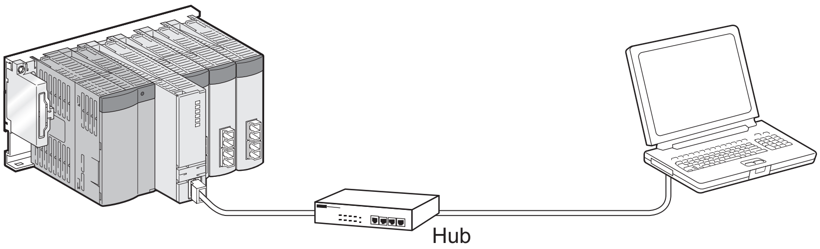


Figure 3.18 Non-direct connection

- 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 the other Ethernet ports.

(3) Conditions that disallow direct connection

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

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

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

2) In the CPU module IP address, bits corresponding to the host address for each class in the personal computer IP address are all ON or all OFF.

Example		
	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 addresses for each class are described below.
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 addresses for each class are described below.
Class A :255. 0. 0. 0 Class B :255.255. 0. 0 Class C :255.255.255. 0

3.3 MC Protocol Communication

Built-in Ethernet ports of the Built-in Ethernet port QCPU enable communication using the MC protocol[*1].
Device data of the CPU module can be read from and written to a personal computer, display device, and others, using the MC protocol.
External devices monitor the operation of the CPU module, analyze data, and manage production by reading/writing device data.
Besides, the remote password function can prevent unauthorized access to the CPU module from outside of the system.(Section 3.7)

[*1] : The MC protocol is an abbreviation for the MELSEC communication protocol.
The MELSEC communication protocol is a name of the communication method used to access CPU modules from external devices in accordance with the communication procedure of Q series programmable controllers (such as serial communication modules, Ethernet modules).
For details on the MC protocol, refer to the following manual.
MELSEC-Q/L MELSEC Communication Protocol Reference Manual

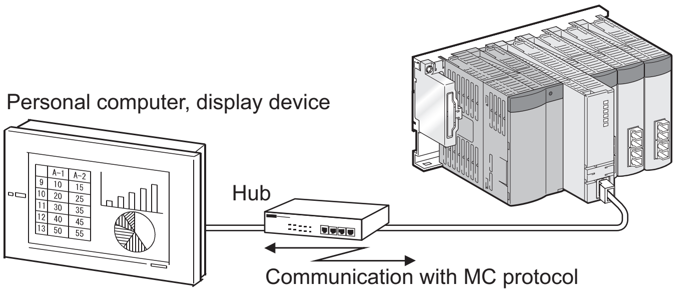

Personal computer, display device
A-1
A-2
9 10 15
10 20 25
11 30 35
12 40 45
13 50 55
Hub
Communication with MC protocol

Figure 3.19 MC protocol communication

Point

External devices such as personal computers and display devices can communicate with only the connected CPU module using the MC protocol.
An access to any of the following CPU modules is not available.

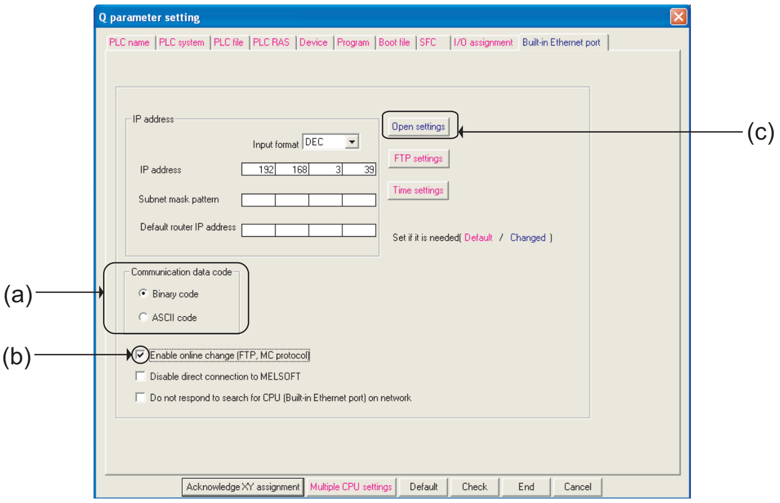
- CPU modules on other stations, via CC-Link or others
- Other CPU modules in a multiple CPU system

Remark

An access via routers is also available. For the setting, specify the Subnet mask pattern and Default router IP address as well.
(Section 3.1.4)

3.3.1 Setting for MC protocol communication

Setting for communication using the MC protocol is described below.
Set the items of following (a) to (c) in the Built-in Ethernet port tab of the PLC parameter dialog box.



IP address

Input format DEC

IP address 192 168 3 39

Subnet mask pattern

Default router IP address

Set if it is needed(Default / Changed)

Communication data code

● Binary code

○ ASCII code

☑ Enable online change (FTP, MC protocol)

□ Disable direct connection to MELSOFT

□ Do not respond to search for CPU (Built-in Ethernet port) on network

Figure 3.20 Built-in Ethernet port tab

(a) Communication data code

Select a communication data code used for the MC protocol, "Binary code" or "ASCII code".

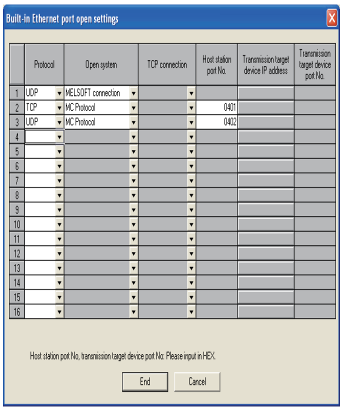
(b) Enable online change (FTP, MC protocol)

Check the checkbox to enable online change when writing data to the CPU module from the external device that communicates using the MC protocol.

For details on the available functions with this setting, refer to Section 3.3.2.

(c) Open settings

- Protocol :Select a connection used as MC protocol. (Up to 16 CPU modules can be connected.)
- Open system : Select "MC protocol".
- Host station port No. : Set the host station port number (in hexadecimal). (Required)
  (Setting range : 0401H to 1387H, 1392H to FFFEH)



	Protocol	Open system	TCP connection	Host station port No.	Transmission target device IP address	Transmission target device port No.
1	UDP	MELSOFT connection				
2	TCP	MC Protocol		0401		
3	UDP	MC Protocol		0402		
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Host station port No, transmission target device port No: Please input in HEX.

Figure 3.21 Open settings screen

Point

When the "Enable online change (FTP, MC protocol)" box is unchecked, if a data write request is sent from an external device to the CPU module which is in the RUN status, data will not be written to the CPU module and the module returns the NAK message.

3.3.2 Command list

When the Built-in Ethernet port QCPU communicates using the MC protocol, commands listed in Table3.2 can be executed.

Table3.2 List of MC protocol commands supported in MC protocol communication function of Built-in Ethernet port QCPU

Function			Command (Subcommand)*1	Description	Number of processed points	Status of CPU module		
						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 *2	In units of words	0403 (0000)	Reads bit devices in units of 16 or 32 points by randomly specifying a device or device number.	192 points	○	○	○
				Reads word devices in units of one or two points by randomly specifying a device or device number.				
	Test (Random write)	In units of bits	1402 (0001)	Sets/resets bit devices in units of one point by randomly specifying a device or device number.	188 points	○	○	×
		In units of words *2	1402 (0000)	Sets/resets bit devices in units of 16 or 32 points by randomly specifying a device or device number.	*5			
				Writes word devices in units of one or two points by randomly specifying a device or device number.				
	Monitor registration *2*3*4	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 devices registered.	Number of registered points	○	○	○
Remote password	Unlock		1630 (0000)	Specifies the remote password and changes the status from locked to unlocked.	---	○	○	○
	Lock		1631 (0000)	Specifies the remote password and changes the status from unlocked to locked.	---	○	○	○

○: Available, ×: Not available

*1 : Subcommand is for the QnA-compatible 3E frame.

*2 : Devices such as TS, TC, SS, SC, CS, and CC cannot be specified in units of words.
For the monitor registration, an error (4032H) occurs during the monitor operation.

*3 : During monitor registration, monitor condition cannot be set.

*4 : Do not execute monitor registration from multiple external devices. If executed, the last monitor registration becomes valid.

*5 : 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

- Bit devices are regarded as 16 bits during word access and 32 bits during double-word access.
- Word devices are regarded as one word during word access and two words during double-word access.

3.3.3 Available devices

Table3.3 lists the devices available in commands used in the MC protocol communication function.

Table3.3 List of available devices in Built-in Ethernet port QCPU

Classification	Device		Device code	Device number range(Default)		Remarks
Internal system device	Special relay		SM	000000 to 002047	Decimal	---
	Special register		SD	000000 to 002047	Decimal	
internal user device	Input		X	000000 to 001FFF	Hexadecimal	
	Output		Y	000000 to 001FFF	Hexadecimal	
	Internal relay		M	000000 to 008191	Decimal	• When the device number range is changed, access is possible up to the largest device number after the change. • Local devices cannot be accessed.
	Latch relay		L	000000 to 008191	Decimal	
	Annunciator		F	000000 to 002047	Decimal	
	Edge relay		V	000000 to 002047	Decimal	
	Link relay		B	000000 to 001FFF	Hexadecimal	
	Data register		D	000000 to 012287	Decimal	
	Link register		W	000000 to 001FFF	Hexadecimal	
	Timer	Contact	TS	000000 to 002047	Decimal	
		Coil	TC			
		Current value	TN			
	Retentive timer	Contact	SS	000000 to 002047	Decimal	
		Coil	SC			
		Current value	SN			
	Counter	Contact	CS	000000 to 001023	Decimal	
		Coil	CC			
		Current value	CN			
	Link special relay		SB	000000 to 0007FF	Hexadecimal	
	Link special register		SW	000000 to 0007FF	Hexadecimal	
	Step relay		S	000000 to 008191	Decimal	
	Direct input		DX	000000 to 000FFF	Hexadecimal	*1
	Direct output		DY	000000 to 000FFF	Hexadecimal	
Index register	Index register		Z	000000 to 000019	Decimal	---
File register	File register		R	000000 to 032767	Decimal	
			ZR	000000 to 3FD7FF	Hexadecimal	
Extended data register	Extended data register		D	• Binary: 000000 to 4184063 (4086k points maximum) • ASCII: 000000 to 999999 (976.6k points maximum)	Decimal	If the number of points is set on the PLC file tab of PLC parameter, access is possible up to the largest device number after the setting. However, in the ASCII code communication, the number of points described on the left is the access limit.
Extended link register	Extended link register		W	000000 to 3FD7FF (4086k points maximum)	Hexadecimal	If the number of points is set on the PLC file tab of PLC parameter, access is possible up to the largest device number after the setting.

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

3.3.4 Precautions

(1) Number of connected devices

In the connection with external devices using the MC protocol, the number of CPU modules specified as "MC protocol" on the "Built-in Ethernet port open settings" screen can be simultaneously connected.

(2) Data communication frame

Table3.4 indicates frames applicable in the Built-in Ethernet port QCPU.

Table3.4 Available frames in Built-in Ethernet port QCPU

Communication frame	Built-in Ethernet port QCPU
4E frame	×
QnA-compatible 3E frame	○
A-compatible 1E frame	×

(3) Access range

- Only connected CPU module can be accessed.
  Accessing a CPU module not connected results in 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) Precautions when UDP protocol is selected

- If a new request message is sent to the same UDP port while the port waits for a response message, the new request message is discarded.
- Setting same host station port number to multiple UDP ports is regarded as one setting. When communicating with multiple external devices using the same host station port number, select TCP protocol.

(5) Precautions for the file access during communication using the MC protocol

The Built-in Ethernet port QCPU sets priority on file access over the Ethernet communication processing. Therefore, the processing of the MC protocol function may be delayed if a file is accessed by FTP or GX Developer during using the MC protocol function.

When accessing to the file while an external device is monitoring the response time using the MC protocol function, increase the monitoring time for file access.

(6) Response message receive processing

Figure 3.22 shows an example of the response message receive processing on the external device side.

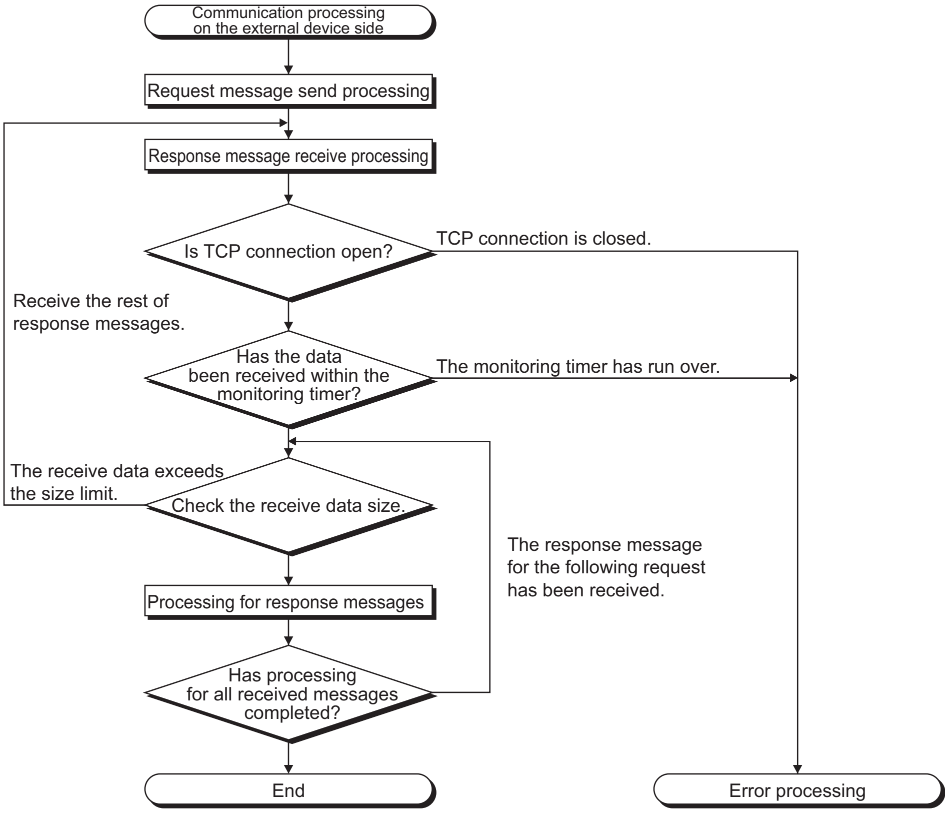

Communication processing on the external device side
Request message send processing
Response message receive processing
Is TCP connection open?
TCP connection is closed.
Receive the rest of response messages.
Has the data been received within the monitoring timer?
The monitoring timer has run over.
The receive data exceeds the size limit.
Check the receive data size.
The response message for the following request has been received.
Processing for response messages
Has processing for all received messages completed?
End
Error processing

Figure 3.22 Example of the response messages receive processing on the external device side

Remark

Personal computers use the TCP socket functions internally for Ethernet communication.
These functions do not have the concept for boundary.
When data is sent by executing the "send" function once, the "recv" function needs to be executed more than one time to receive the same data.
(One execution of the "send" function does not correspond to one execution of the "recv" function.)
For this reason, receive processing described above is required on the external device side.
If the "recv" function is used in blocking mode, data may be read by executing the function once.

3.3.5 Error codes for communication using MC protocol

Table3.5 shows the error codes, error descriptions, and corrective actions that will be sent from the CPU module to an external device when an error occurs during communication using the MC protocol.

Table3.5 List of available devices in CPU module

No.	Error code (Hexadecimal)	Description	Corrective action
1	4000$_H$ to 4FFF$_H$	CPU detected error (Error that occurred in other than communication using the MC protocol)	Refer to the QCPU User's Manual (Hardware Design, Maintenance and Inspection) and take corrective action.
2	0055$_H$	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.
3	C050$_H$	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.	• Set the communication data code to binary code and restart the Built-in Ethernet port QCPU for communication. • Correct the send data on the external device side and resend the data.
4	C051$_H$ to C054$_H$	The number of device points for reading/writing is outside the allowable range.	Correct the number of device points for reading/writing and resend the data to the Built-in Ethernet port QCPU.
5	C056$_H$	The read/write request data exceeds the allowable address range.	Correct the start address or the number of device points for reading/writing, and resend the data to the Built-in Ethernet port QCPU. (Do not exceed the allowable address range.)
6	C058$_H$	The request data length after the 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 data, and resend the data to the Built-in Ethernet port QCPU.
7	C059$_H$	• The command and/or subcommand are specified incorrectly. • The command and/or subcommand not supported in the Built-in Ethernet port QCPU are specified.	• Check the request data. • Use commands and/or subcommands supported in the Built-in Ethernet port QCPU.
8	C05B$_H$	The Built-in Ethernet port QCPU cannot read/write data from/to the specified device.	Check the device for reading/writing data.
9	C05C$_H$	The request data is incorrect. (ex. specifying data in units of bits for reading/writing of word devices)	Correct the request data (such as subcommand correction) and resend the data to the Built-in Ethernet port QCPU.
10	C05D$_H$	Monitor registration is not performed.	Perform the monitor registration before monitor operation.
11	C05F$_H$	The external device sent a request that cannot be executed in the target CPU module.	• Correct the network number, PC number, request destination module I/O number, and request destination module station number. • Correct the write/read request data.
12	C060$_H$	The request data is incorrect. (ex. incorrect specification of data for bit devices)	Correct the request data and resend the data to the Built-in Ethernet port QCPU.
13	C061$_H$	The request data length 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 data, and resend the data to the Built-in Ethernet port QCPU.
14	C06F$_H$	The CPU module received a request message in ASCII when the communication data code setting is set to binary code, or received a request message in binary when the data code setting is set to ASCII code. (As for this error code, only error history is registered. The error response message is not returned.)	• Send request messages corresponding to the communication data code setting. • Set the communication data code corresponding to the request message.
15	C070$_H$	The device memory extension cannot be specified for the target station.	Read/Write data to the device memory without specifying the extension.
16	C0B5$_H$	Data that cannot communicate in the CPU module is specified.	• Check the request data. • Stop the current request.
17	C200$_H$	The remote password is incorrect.	Check the remote password and perform unlock/lock processing again.
18	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.
19	C204$_H$	The external device is different from the one that quested remote password unlock processing.	Have the same external device which has requested unlock processing request remote password lock processing.

3.4 Socket Communication Function

(1) Socket communication function Note3.1

The socket communication function provides data communication by TCP/UDP with external devices connected to the Ethernet using dedicated instructions

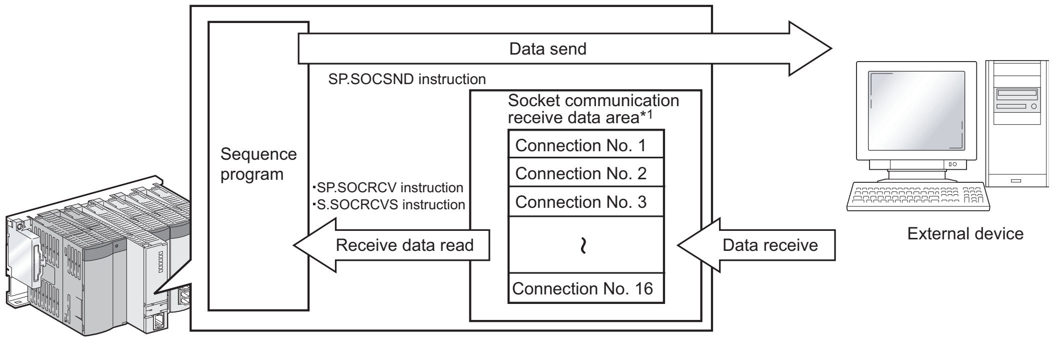


Figure 3.23 Data flow on the socket communication

*1: The area is used to store data sent from the external device which is in the open status.

Remark

- For dedicated instructions used for the Socket communication function, refer to CHAPTER 4.
- An access via routers is also available. For the setting, specify the Subnet mask pattern and Default router IP address as well. (☞ Section 3.1.4)

Note3.1 Universal

When using the Socket communication function, check the CPU module and GX Developer versions. (☞ Appendix 2)

(2) Port numbers

In the socket communication, port numbers are used to identify each communication to enable multiple communications both on TCP and UDP.

- For sending
  Specify the port number of the Built-in Ethernet port QCPU where data are sent from, and of a external device where data are sent to.
- For receiving
  Specify the port number of the Built-in Ethernet port QCPU and then read out the data sent to that number.

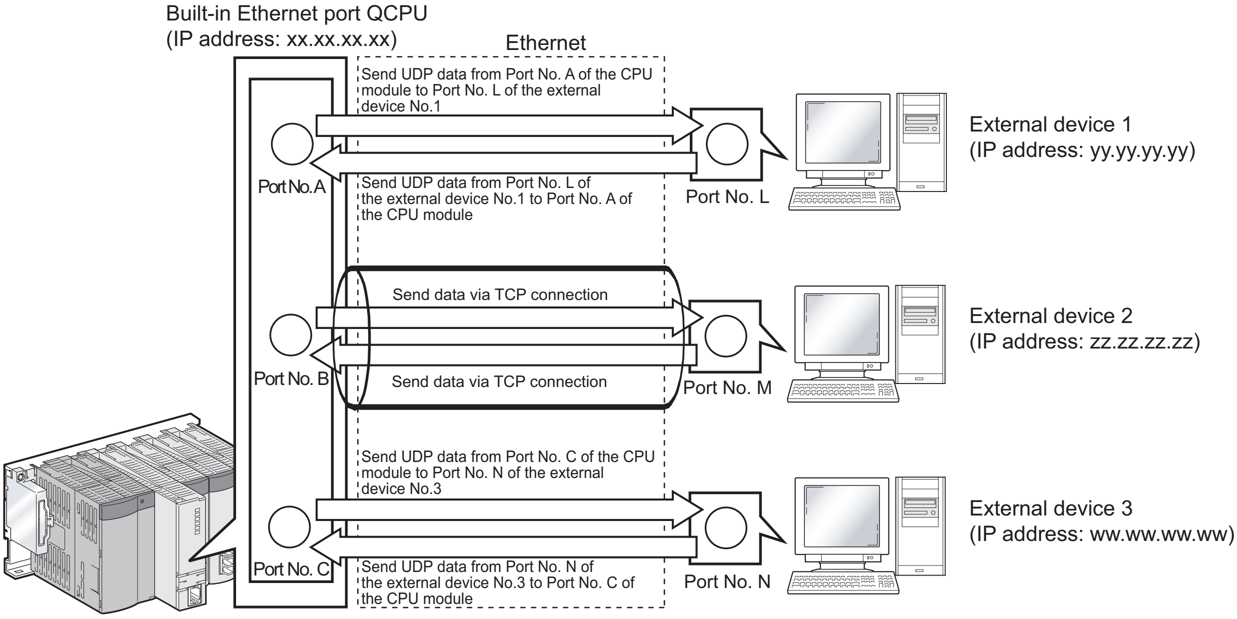

Built-in Ethernet port QCPU
(IP address: xx.xx.xx.xx)
Ethernet
Send UDP data from Port No. A of the CPU module to Port No. L of the external device No.1
Port No. A
Send UDP data from Port No. L of the external device No.1 to Port No. A of the CPU module
Port No. L
External device 1
(IP address: yy.yy.yy.yy)
Send data via TCP connection
Port No. B
Send data via TCP connection
Port No. M
External device 2
(IP address: zz.zz.zz.zz)
Send UDP data from Port No. C of the CPU module to Port No. N of the external device No.3
Port No. C
Send UDP data from Port No. N of the external device No.3 to Port No. C of the CPU module
Port No. N
External device 3
(IP address: ww.ww.ww.ww)

Figure 3.24 Concept of port numbers

3.4.1 Communication using TCP

TCP establishes a connection between device port numbers, which provides reliable data communications.
To perform the socket communication using TCP, check the following prior to the communication.

- IP address and port number of the external device (communication target)
- IP address and port number of the Built-in Ethernet port QCPU
- Check whether the Built-in Ethernet port QCPU or external device (communication target) opens. (Active open or Passive open)

(1) TCP connection

Two types of open operation are used for connecting to TCP which is Active open and Passive open.
Firstly, the device which waits for the TCP connection performs Passive open with the specified port number(s).
The device which establishes the TCP connection performs Active open by specifying the port number(s) of the device which is waiting in Passive open and then TCP connection is completed.
After these, the TCP connection is executed and the communication becomes possible by establishing the connection.

(a) Active open

Active open is one of two TCP connection methods which attempts to connect to the external device passively-waiting for the TCP connection.

(b) Passive open

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

- Unpassive :
  Allows communications regardless of the IP address and port numbers of the external device.
  (The IP address and port number of the external device connected can be acquired using the SP.SOCCINF instruction.)

- Fullpassive :
  Allows communications only to the external devices specified by the IP address and the port number.
  If a connection is established by a non-specified device, it is automatically disconnected before communication.

Remark

The expression for Active open and Passive open may differ according to the external device.

- Active open: Devices which attempt connection, client, connection, and others
- Passive open: Devices which wait for connection, server, listen, and others

(2) Program example

This section provides examples of communication using Active open and Passive open.

<Active open>

The Figure 3.25 shows the communication flow using Active open.

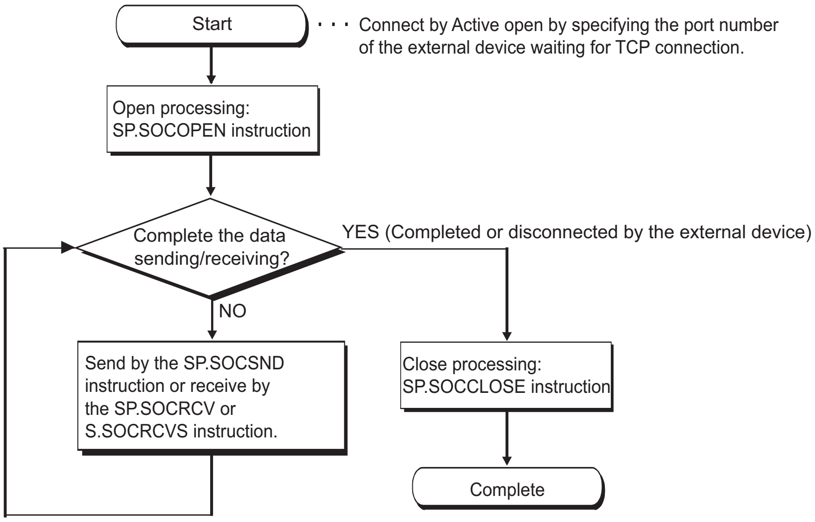

Start
· · · Connect by Active open by specifying the port number of the external device waiting for TCP connection.
Open processing: SP.SOCOPEN instruction
Complete the data sending/receiving?
YES (Completed or disconnected by the external device)
NO
Send by the SP.SOCSND instruction or receive by the SP.SOCRCV or S.SOCRCVS instruction.
Close processing: SP.SOCCLOSE instruction
Complete

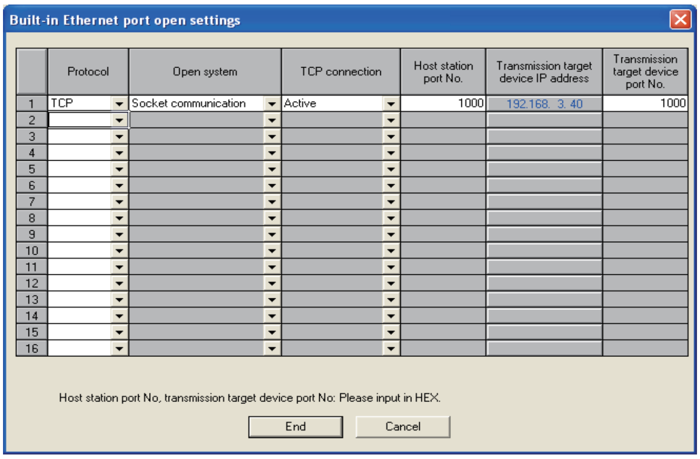
Figure 3.25 Communication flow using Active open

(a) Parameters

Parameter settings for this program is as follows.

To set the parameters, click the Open settings button in the Built-in Ethernet port tab of the PLC parameter.

• Protocol	: TCP
• Open system	: Socket communication
• TCP connection	: Active
• Host station port No.	: 1000H (Setting range: 0001H to 1387H and 1392H to 0FFFEH)
• Transmission target device IP address	: 192.168.3.40 (Setting range: 0.0.0.1 to 223.255.255.254)
• Transmission target device port No.	: 1000H (Setting range: 0001H to FFFEH)



	Protocol	Open system	TCP connection	Host station port No.	Transmission target device IP address	Transmission target device port No.
1	TCP	Socket communication	Active	1000	192.168. 3. 40	1000
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Host station port No, transmission target device port No: Please input in HEX.

Figure 3.26 Open settings (Active open)

(b) Devices used in the program

Table3.6 indicates device numbers and applications of the devices used in the sample programs.

Table3.6 Devices used in the program

Device number	Application	Device number	Application
M1000	Open direction	SD1284	Open request signal
D100 to D109	SP.SOCOPEN instruction control data	SD1286	Reception status signal
M100 and M101	SP.SOCOPEN instruction completion device	SD1288	Connection status signal
M1002	Normal open completion	D200 and D201	SP.SOCCLOSE instruction control data
M1003	Error open completion	M200 and M201	SP.SOCCLOSE instruction completion device
M3000	Send direction	M4002	Normal close completion
D3000 and D3001	SP.SOCSND instruction control data	M4003	Error close completion
M300 and M301	SP.SOCSND instruction completion device	M4004	Close in process flag
D300 to D303	Send data length and send data *1	D400 to D403	SP.SOCRMODE instruction control data
M3002	Normal send completion	D5000 and D5001	SP.SOCRCV instruction control data
M3003	Error send completion	M500 and M501	SP.SOCRCV instruction completion device
M4000	Close direction	D500 and higher	Receive data length and receive data
M4001	Disconnection from the communication target	M5002	Normal receive completion
SD1282	Open completion signal	M5003	Error receive completion

*1 : Send data is 6 bytes of 12H, 34H, 56H, 78H, 9AH, and BCH.

(c) Sample program

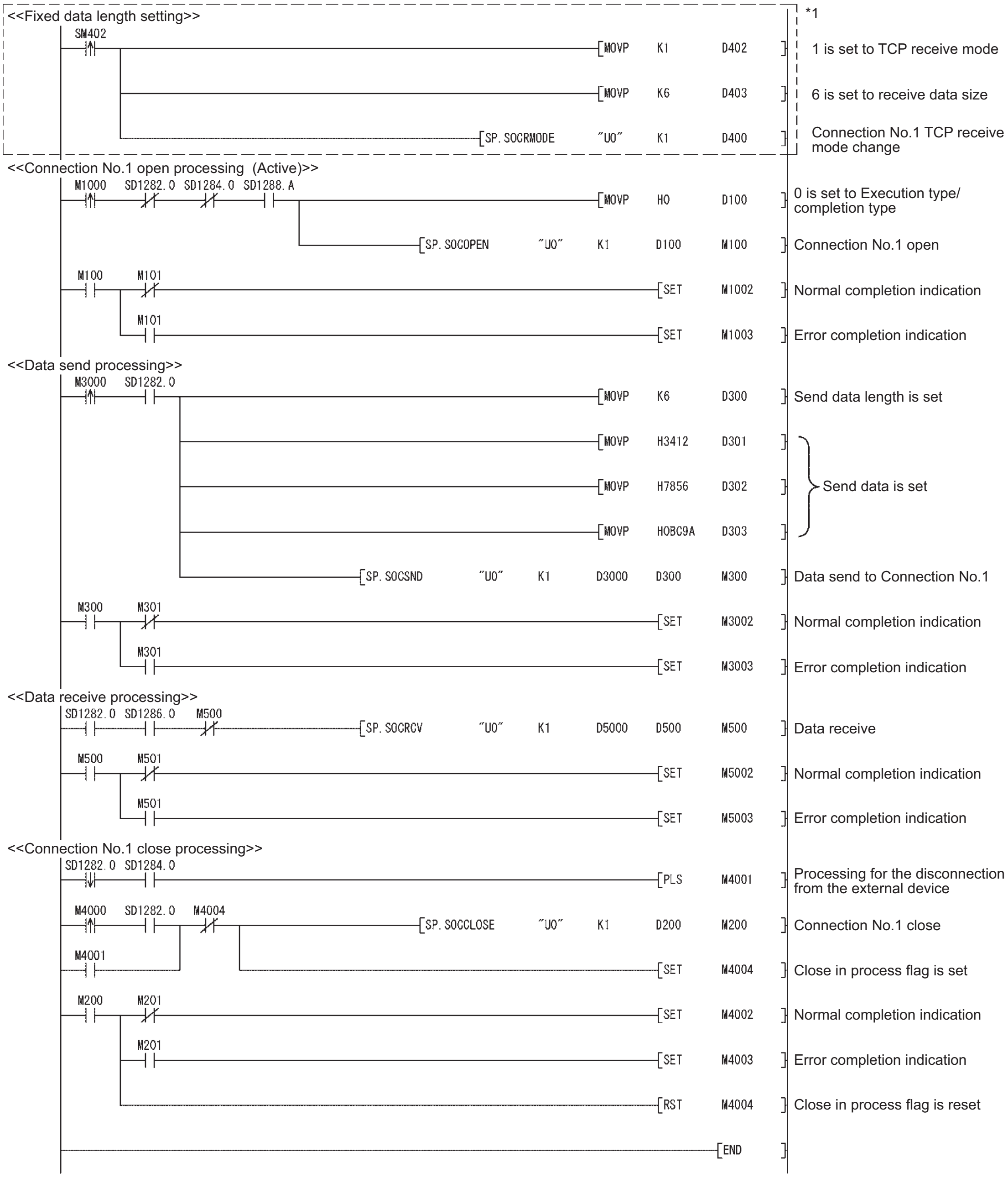

*1
<<Fixed data length setting>>
SM402
MOVP K1 D402
1 is set to TCP receive mode
MOVP K6 D403
6 is set to receive data size
SP.SOCRMODE "U0" K1 D400
Connection No.1 TCP receive mode change
<<Connection No.1 open processing (Active)>>
M1000 SD1282.0 SD1284.0 SD1288.A
MOVP H0 D100
0 is set to Execution type/ completion type
SP.SOCOPEN "U0" K1 D100 M100
Connection No.1 open
M100 M101
SET M1002
Normal completion indication
M101
SET M1003
Error completion indication
<<Data send processing>>
M3000 SD1282.0
MOVP K6 D300
Send data length is set
MOVP H3412 D301
MOVP H7856 D302
MOVP H0BC9A D303
Send data is set
SP.SOCSND "U0" K1 D3000 D300 M300
Data send to Connection No.1
M300 M301
SET M3002
Normal completion indication
M301
SET M3003
Error completion indication
<<Data receive processing>>
SD1282.0 SD1286.0 M500
SP.SOCRCV "U0" K1 D5000 D500 M500
Data receive
M500 M501
SET M5002
Normal completion indication
M501
SET M5003
Error completion indication
<<Connection No.1 close processing>>
SD1282.0 SD1284.0
PLS M4001
Processing for the disconnection from the external device
M4000 SD1282.0 M4004
SP.SOCCLOSE "U0" K1 D200 M200
Connection No.1 close
M4001
SET M4004
Close in process flag is set
M200 M201
SET M4002
Normal completion indication
M201
SET M4003
Error completion indication
RST M4004
Close in process flag is reset
END

Figure 3.27 Sample program (Active open)

*1 : Two types of TCP receive mode are available.

- TCP normal receive mode
- TCP fixed length receive mode

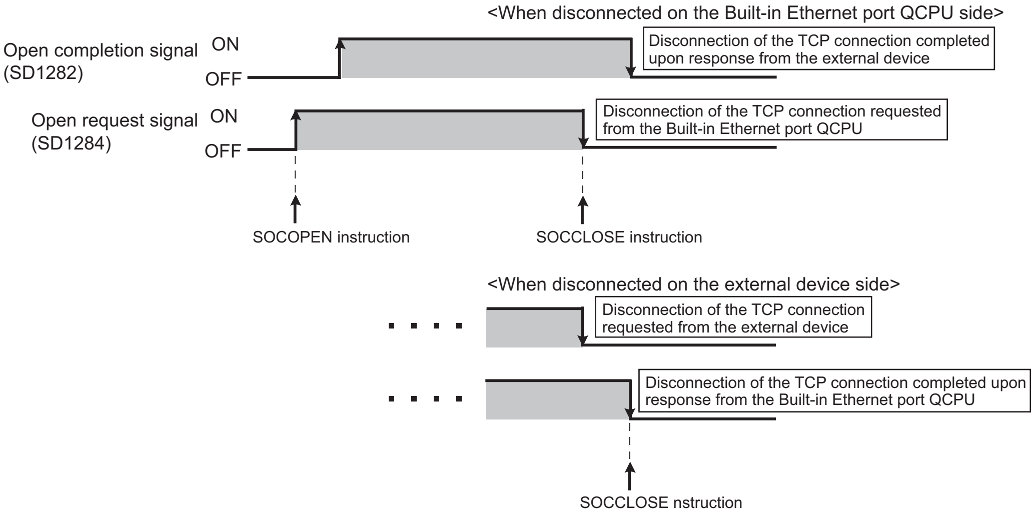
To fix data size, run the program indicated in the dotted line.
(The program can be omitted when not fixing data size.)

For details of the TCP receive mode, refer to the section for the SP.SOCRMODE instruction. (☞ Section 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.

Figure 3.28 indicates on and off timings of the Open completion signal (SD1282) and Open request signal (SD1284).



<When disconnected on the Built-in Ethernet port QCPU side>
Open completion signal (SD1282)
ON
OFF
Disconnection of the TCP connection completed upon response from the external device
Open request signal (SD1284)
ON
OFF
Disconnection of the TCP connection requested from the Built-in Ethernet port QCPU
SOCOPEN instruction
SOCCLOSE instruction
<When disconnected on the external device side>
Disconnection of the TCP connection requested from the external device
Disconnection of the TCP connection completed upon response from the Built-in Ethernet port QCPU
SOCCLOSE nstruction

Figure 3.28 On and off timings of the Open completion (SD1282) and Open request signal (SD1284)

<Passive open>

The Figure 3.29 shows the communication flow using Active open.

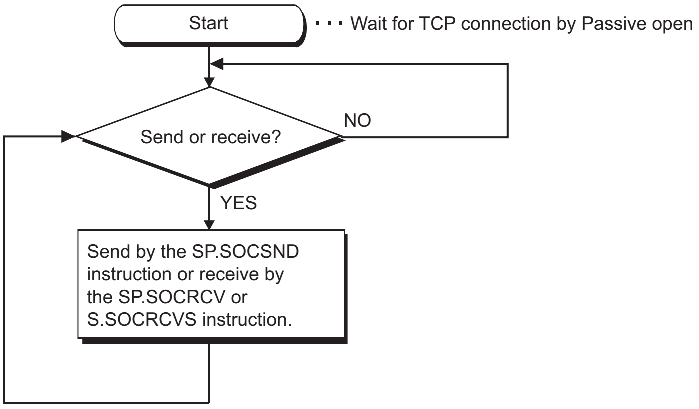

Start
· · · Wait for TCP connection by Passive open
Send or receive?
NO
YES
Send by the SP.SOCSND instruction or receive by the SP.SOCRCV or S.SOCRCVS instruction.

Figure 3.29 Communication flow using Passive open

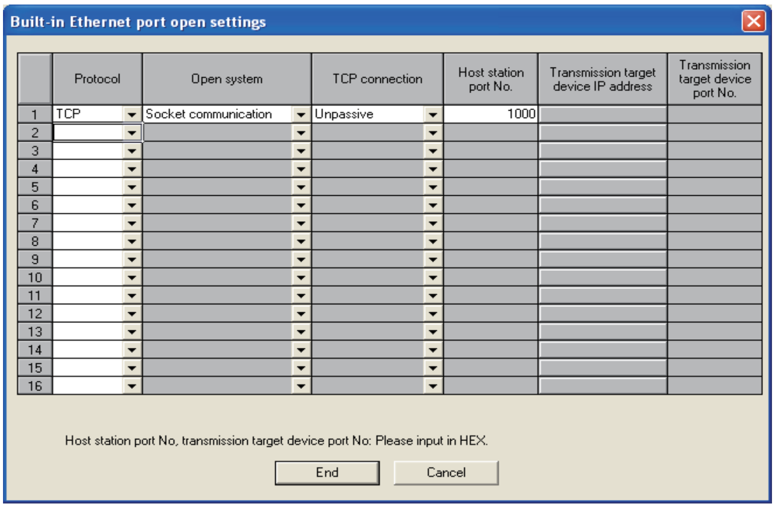
(a) Parameters

Parameter settings for this program is as follows.

To set the parameters, click the Open settings button in the Built-in Ethernet port tab of the PLC parameter.

• Protocol	: TCP
• Open system	: Socket communication
• TCP connection	: Unpassive
• Host station port No.	: 1000H (Setting range: 0001H to 1387H and 1392H to FFFEH)
• Transmission target device IP address	: Blank *1 (Setting range: 0.0.0.1 to 223.255.255.254)
• Transmission target device port No.	: Blank *1 (Setting range: 0001H to FFFEH)

*1 : Be sure to set the values when "Fullpassive" is selected for TCP connection.



Built-in Ethernet port open settings

	Protocol	Open system	TCP connection	Host station port No.	Transmission target device IP address	Transmission target device port No.
1	TCP	Socket communication	Unpassive	1000		
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Host station port No, transmission target device port No: Please input in HEX.

Figure 3.30 Open settings (Passive open)

(b) Devices used in the program

Table3.7 indicates device numbers and applications of the devices used in sample programs.

Table3.7 Devices used in the program

Device number	Application	Device number	Application
M3000	Send direction	SD1286	Reception status signal
D3000 and D3001	SP.SOCSND instruction control data	D5000 and D5001	SP.SOCRCV instruction control data
M300 and M301	SP.SOCSND instruction completion device	M500 and M501	SP.SOCRCV instruction completion device
D300 to D303	Send data length and send data *1	D500 and higher	Receive data length and send data
M3002	Normal send completion	M5002	Normal receive completion
M3003	Error send completion	M5003	Error receive completion
D400 to D403	SP.SOCRMODE instruction control data	D6000 and D6001	SP.SOCCINF instruction control data
SD1282	Open completion signal	D6010 to D6014	SP.SOCCINF instruction completion device

*1 : Send data is 6 bytes of 12H, 34H, 56H, 78H, 9AH, and BCH.

(c) Sample program

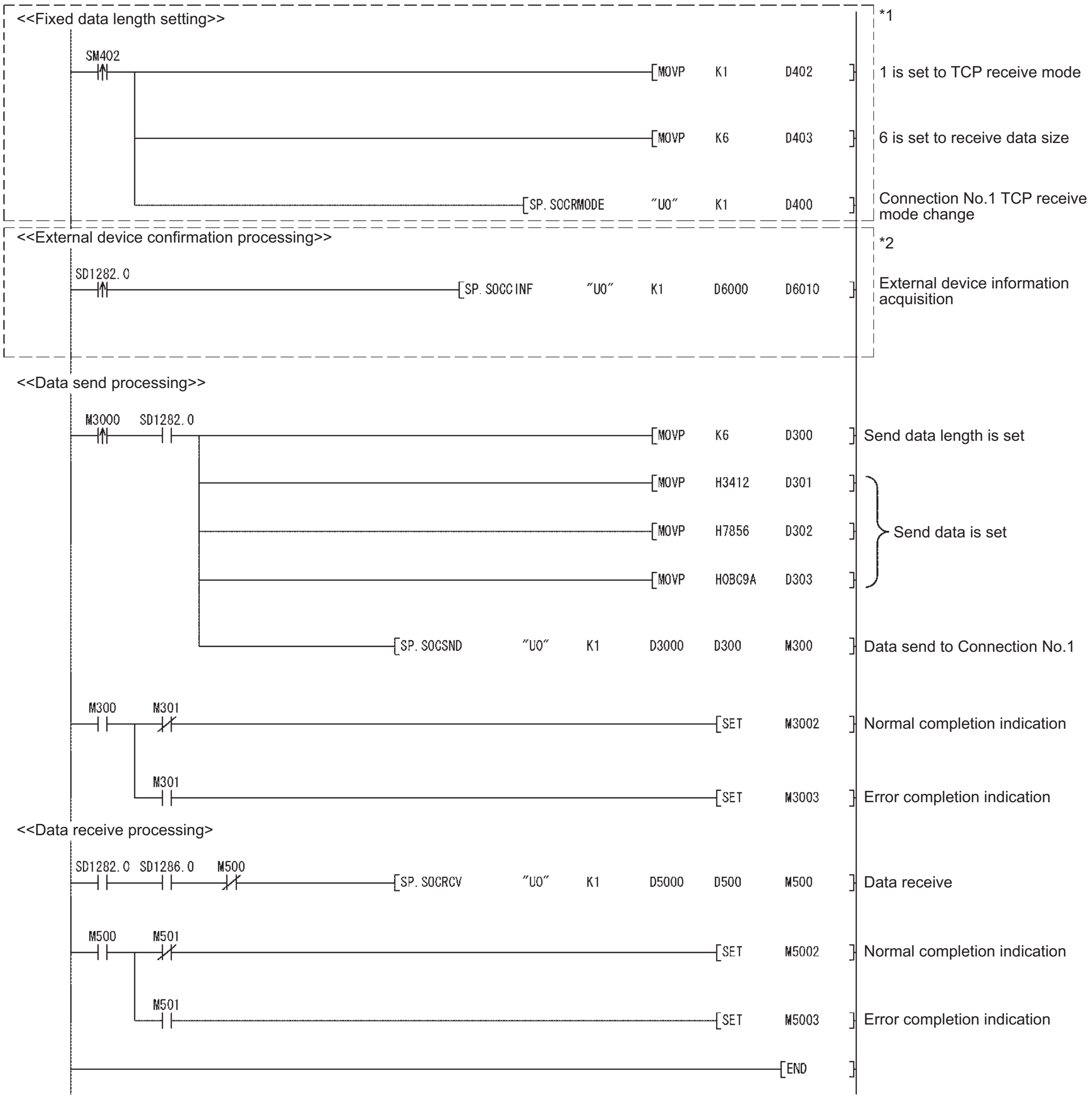

<<Fixed data length setting>>
*1
SM402
MOVP K1 D402
1 is set to TCP receive mode
MOVP K6 D403
6 is set to receive data size
SP.SOCRMODE "U0" K1 D400
Connection No.1 TCP receive mode change
<<External device confirmation processing>>
*2
SD1282.0
SP.SOCCINF "U0" K1 D6000 D6010
External device information acquisition
<<Data send processing>>
M3000 SD1282.0
MOVP K6 D300
Send data length is set
MOVP H3412 D301
MOVP H7856 D302
MOVP H0BC9A D303
Send data is set
SP.SOCSND "U0" K1 D3000 D300 M300
Data send to Connection No.1
M300 M301
SET M3002
Normal completion indication
M301
SET M3003
Error completion indication
<<Data receive processing>
SD1282.0 SD1286.0 M500
SP.SOCRCV "U0" K1 D5000 D500 M500
Data receive
M500 M501
SET M5002
Normal completion indication
M501
SET M5003
Error completion indication
END

Figure 3.31 Sample program (Passive open)

*1 : Two types of TCP receive mode are available.

- TCP normal receive mode
- TCP fixed length receive mode

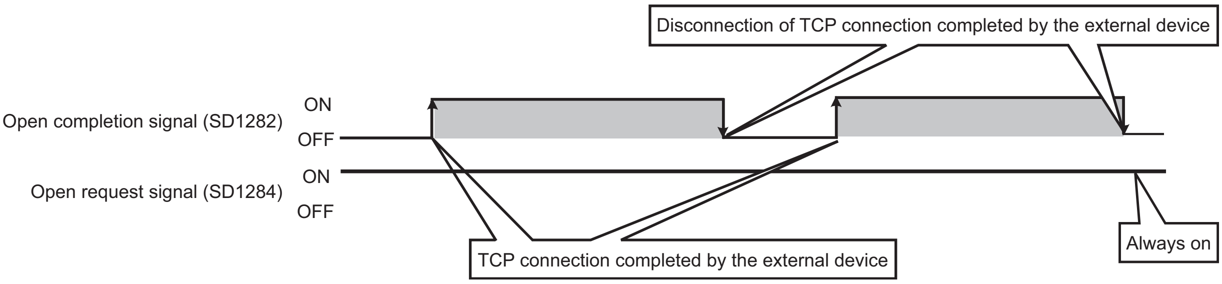
To fix data size, run the program indicated in the dotted line.
(The program can be omitted when not fixing data size.)

For details of the TCP receive mode, refer to the section for the SP.SOCRMODE instruction. (Section 4.8)

*2 : To acquire information of the external device connected on TCP, run the program indicated in the dotted line.
(The program can be omitted when not acquiring the information.)

(d) Precaution on Passive open communication

1) Configure an interlock circuit using the Open completion signal (SD1282) and Open request signal (SD1284) in the program.
Figure 3.32 indicates on and off timings of the Open completion signal (SD1282) and Open request signal (SD1284).



Disconnection of TCP connection completed by the external device
Open completion signal (SD1282)
ON
OFF
Open request signal (SD1284)
ON
OFF
Always on
TCP connection completed by the external device

Figure 3.32 On and off timings for the Open completion signal (SD1282) and Open request signal (SD1284)

2) When a external device establishes a connection in the Passive open status, the IP address and port number of the device can be acquired using the SP.SOCCINF instruction.
For the SP.SOCCINF instruction, refer to Section 4.6.

3) On TCP, one attempt of connection can establish a connection with one external device.
To communicate with multiple external devices at one port number, prepare the same number of connections as that the devices.
If more than the prepared number of connections are attempted, it is promptly disconnected.

4) Do not establish a connection with an external device before the CPU module is in the wait-for-open status.
If not, the TCP connection request from the external device becomes an error during the CPU start-up and CPU status change (to open), and then the connection is forcibly closed (disconnected).
In this case, wait until the CPU changes to the wait-for-open status and then retry the connection from the external device.

5) Do not execute the SP.SOCCLOSE instruction in a sequence program.
If executed, data can not be sent or received since the Open completion signal (SD1282) and Open request signal (SD1284) of the corresponding connection turn off for closing processing.
To reopen the closed connection, execute the SP.SOCOPEN instruction.
For the SP.SOCOPEN instruction, refer to Section 4.1.

3.4.2 Communication using UDP

UDP is a simple protocol that does not control sequencing or data resending.

To perform the socket communication using UDP, check the following prior to the communication.

- IP address and port number of the external target
- IP address and port number of the Built-in Ethernet port QCPU

(1) Program example

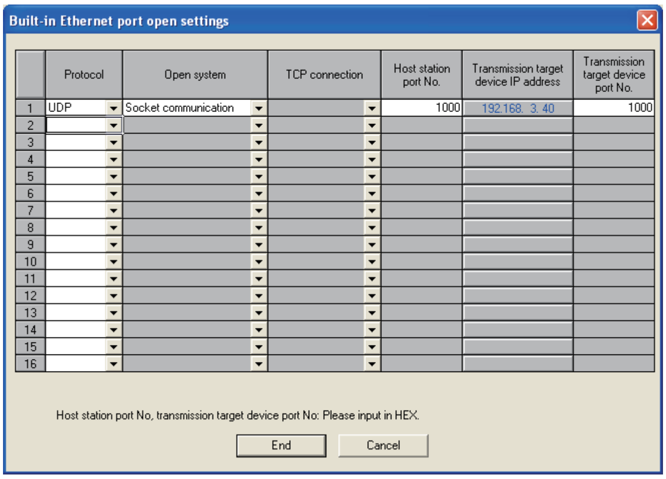
This section provides examples of communication using UDP.

(a) Parameters

Parameter settings for this program is as follows.

To set the parameters, click the Open settings button in the Built-in Ethernet port tab of the PLC parameter.

• Protocol	: UDP
• Open system	: Socket communication
• TCP connection	: No setting
• Host station port No.	: 1000H (Setting range: 0001H to 1387H and 1392H to 0FFFEH)
• Transmission target device IP address	: 192.168.3.40 (Setting range: 0.0.0.1 to 223.255.255.254/255.255.255.255)
• Transmission target device port No.	: 1000H (Setting range: 0001H toFFFEH/FFFFH)



Built-in Ethernet port open settings

	Protocol	Open system	TCP connection	Host station port No.	Transmission target device IP address	Transmission target device port No.
1	UDP	Socket communication		1000	192.168. 3. 40	1000
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Host station port No, transmission target device port No: Please input in HEX.

Figure 3.33 Open settings (UDP communication)

(b) Devices used in the program

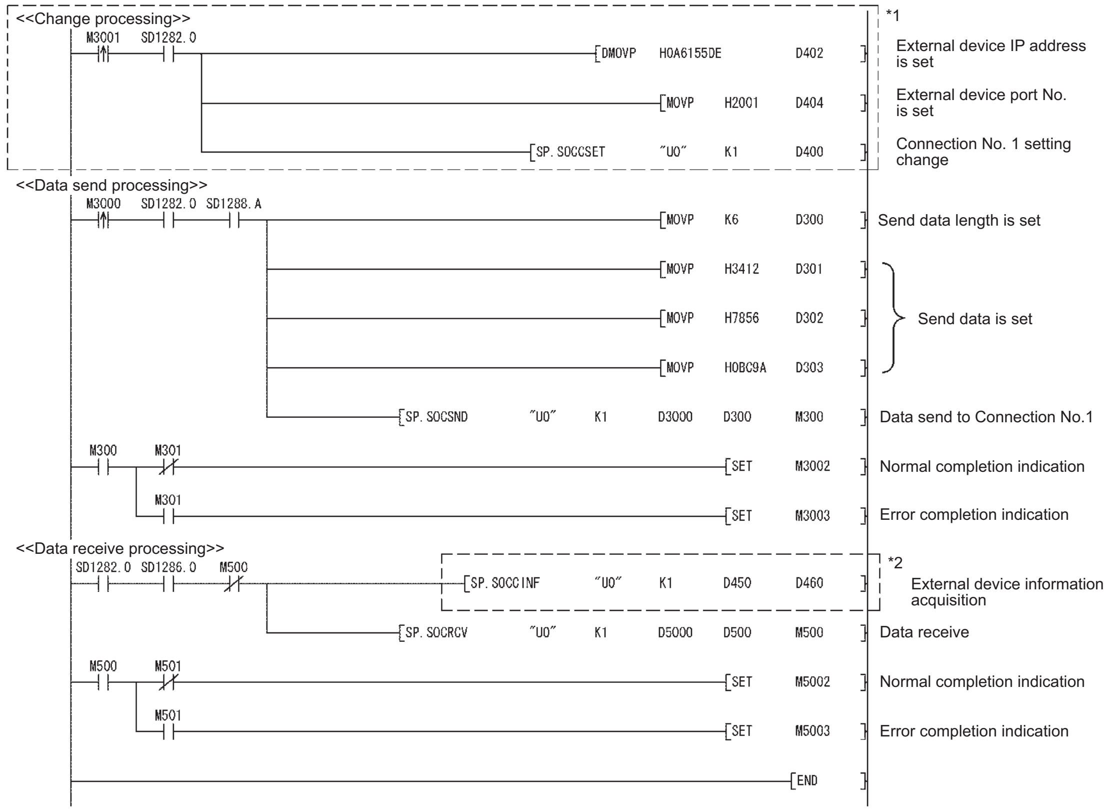
Table3.8 indicates device numbers and applications of the devices used in sample programs.

Table3.8 Devices used in the program

Device number	Application	Device number	Application
M3000	Send direction	SD1286	Reception status signal
D3000 and D3001	SP.SOCSND instruction control data	SD1288	Connection status signal
M300 and M301	SP.SOCSND instruction completion device	M3001	Target change direction
D300 and D303	Send data length and send data *1	D500 and higher	Receive data length and receive data
M3002	Normal send completion	M5002	Normal receive completion
M3003	Error send completion	M5003	Error receive completion
D5000 to D5001	SP.SOCRCV instruction control data	D400 to D404	SP.SOCCSET instruction control data
M500 to M501	SP.SOCRCV instruction completion device	D450 to D451	SP.SOCCINF instruction control data
SD1282	Open completion status	D460 to D464	SP.SOCCINF instruction connection information

*1 : Send data is 6 bytes of 12H, 34H, 56H, 78H, 9AH, and BCH.

(c) Sample program



<<Change processing>>
M3001
SD1282.0
DMOVP H0A6155DE D402
MOVP H2001 D404
SP.SOCCSET "U0" K1 D400
*1
External device IP address is set
External device port No. is set
Connection No. 1 setting change
<<Data send processing>>
M3000
SD1282.0
SD1288.A
MOVP K6 D300
MOVP H3412 D301
MOVP H7856 D302
MOVP H0BC9A D303
SP.SOCSND "U0" K1 D3000 D300 M300
Send data length is set
Send data is set
Data send to Connection No.1
M300
M301
SET M3002
Normal completion indication
M301
SET M3003
Error completion indication
<<Data receive processing>>
SD1282.0
SD1286.0
M500
SP.SOCCINF "U0" K1 D450 D460
*2
External device information acquisition
SP.SOCRCV "U0" K1 D5000 D500 M500
Data receive
M500
M501
SET M5002
Normal completion indication
M501
SET M5003
Error completion indication
END

Figure 3.34 Sample program (UDP communication)

*1 : To change the external device (communication target), run the program indicated in the dotted line. (The program can be omitted when not changing the target.)

For details, refer to the SP.SOCCSET instruction. (☞ Section 4.7)

*2 : To acquire the information of the external device connected on UDP, run the program indicated in the dotted line. (The program can be omitted when not acquiring the information.)

(2) Simultaneous broadcast

For the UDP simultaneous broadcast, configure the IP address and port No. of the external device as follows.

- External device IP Address: FF.FF.FF.FFH
- External device port No.: FFFFH

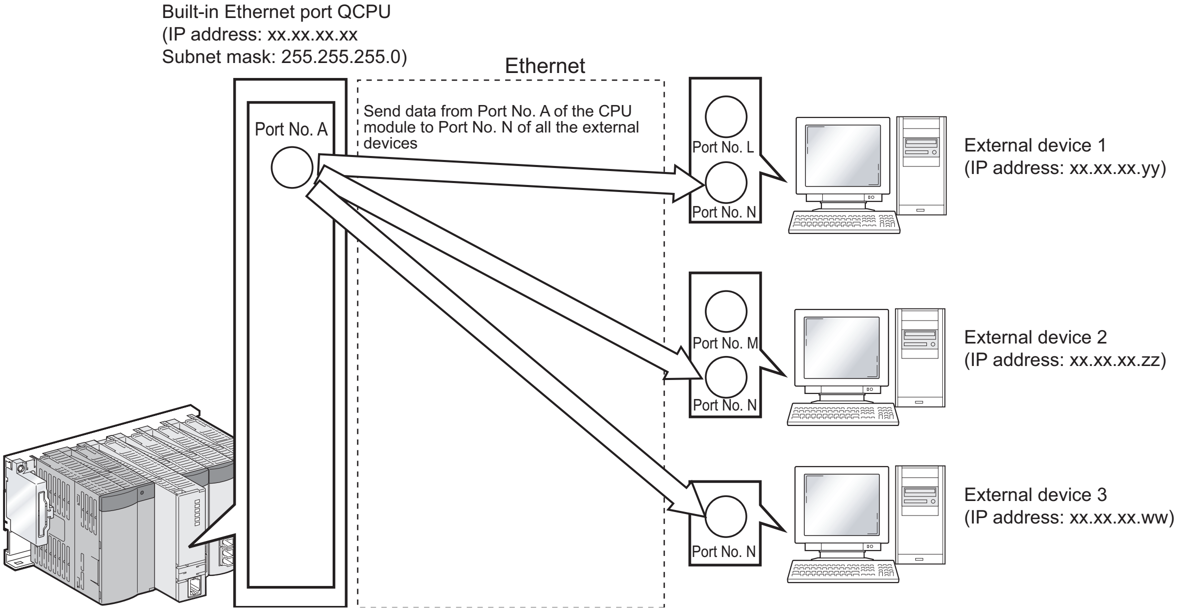

Built-in Ethernet port QCPU
(IP address: xx.xx.xx.xx
Subnet mask: 255.255.255.0)
Ethernet
Port No. A
Send data from Port No. A of the CPU module to Port No. N of all the external devices
Port No. L
Port No. N
External device 1
(IP address: xx.xx.xx.yy)
Port No. M
Port No. N
External device 2
(IP address: xx.xx.xx.zz)
Port No. N
External device 3
(IP address: xx.xx.xx.ww)

Figure 3.35 Simultaneous broadcast flow

Table3.9 IP address and port number setting and corresponding behavior of send and receive

IP address	Port No.	Data to be received	Data to be sent
Other than FF.FF.FF.FFH	Other than FFFFH	Receive the only data sent from the specified port No. of the specified IP address among entire data that have arrived to the corresponding host station port No.	Send data from the corresponding host station port No. to the specified port number of the specified IP address.
Other than FF.FF.FF.FFH	FFFFH	Receive the data sent from all the port No. of the specified IP address among entire data that have arrived to the corresponding host station port No.	N/A
FF.FF.FF.FFH	Other than FFFFH	Receive the data sent from the specified port No. of all the IP addresses among entire data that have arrived to the corresponding host station port No.	Send data to the port No. specified in the settings for simultaneous broadcast.
FF.FF.FF.FFH	FFFFH	Receive all data that have arrived to the corresponding host station port No.	N/A

(3) Precautions

Precautions for communication using UDP are as follows.

(a) UDP

Data may be lost, may arrive out of order, and other such problem are expected.
Reconsider the application of UDP if it is not suitable.

(b) Sending and receiving data

Data sending may be completed normally even when the communication line between the CPU module and external device (communication target) is not connected due to disconnection of a cable or other such reasons.
To avoid this, it is recommended that the user provide procedures for sending and receiving data.

(c) Changing the target

Use the SP.SOCCSET instruction to change the external device (communication target).
For the SP.SOCCSET instruction, refer to Section 4.7.

(d) Open completion signal (SD1282) and Open request signal (SD1284)

When UDP is selected for the communication, the Open completion signal (SD1282) and Open request signal (SD1284) of the connection are always on.

(e) SP.SOCCLOSE instruction

Do not execute the SP.SOCCLOSE instruction in a sequence program.
If executed, the Open completion signal (SD1282) and Open request signal (SD1284) of the connection turns off, which disables data sending and receiving required for close processing.
To reopen the closed connection, execute the SP.SOCOPEN instruction.
For the SP.SOCOPEN instruction, refer to Section 4.1.

(f) Communication target for simultaneous broadcast

With simultaneous broadcast, data can be sent to external devices (communication target) which are connected to the same hub as for the Built-in Ethernet port QCPU, and to the hub in the cascade connection.
Data cannot be received from external devices (communication target) connected by routers.

(g) Data receiving using simultaneous broadcast

When data is received using a connection for simultaneous broadcast, the IP address and port number of the external device (communication target) can be acquired by the SP.SOCCINF instruction.
For the SP.SOCCINF instruction, refer to Section 4.6.

(h) Connection for simultaneous broadcast

Data cannot be sent when FFFF$_H$ is specified as a port number of the external device (communication target).
To send data, specify the port number other than FFFF$_H$.

(i) Destination IP address for simultaneous broadcast

When the subnet musk pattern is specified, apply the pattern prior to use the IP address whose all the bits counted for the host address are on.

Example1	IP address of the CPU module side	:	64.	168.	3.	39
	Subnet mask pattern	:	Blank			
	IP address of simultaneous broadcast	:	64.	255.	255.	255

Example2	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

3.4.3 Precautions for the Socket communication function

This section provides other precautions for the Socket communication function.

(1) Port number

The port number of host station 0001H to 03FFH are assigned to major protocol (WELL KNOWN PORT NUMBERS), it is recommended to use port number 0400H to 1387H or 1392H to FFFEH.
Do not specify 0014H or 0015H for the Socket communication function when using the FTP function.
Do not specify 007BH for the Socket communication function when using the time setting function.

(2) Reading out received data

Read out received data when the Reception status signal (SD1286) turned on.
Communication via a built-in Ethernet port may be affected if data are left unread.

(3) Closing conditions

In communications on TCP, the Open completion signal (SD1282) turns off and a connection is closed (disconnected) in the following cases in addition to a close request from the external device (communication target).

- Existence check function is timed-out
- Forced close from the external device (communication target) is received

(4) Parameters for TCP connection

TCP connection is controlled by the following four elements, and the connection which of those are the same cannot be duplicated.

- IP address of the CPU module
- Port No. of the CPU module
- IP address of the external device
- Port No. of the external device

(5) Reconnection to the same connection

In communications on TCP, to reconnect to the connection with the same external device (IP address), the same port number of host station, and the same port number of the external device after closing, wait for at least eight seconds.
If there is no time to wait for reconnection, it is recommended to change the host port number on the Active open side.

(6) Precautions for the file access during communication

The Built-in Ethernet port QCPU sets priority on file access over the Ethernet communication processing.
Therefore, processing of the socket communication function may be delayed if a file is accessed by FTP or GX Developer during using the socket communication function.
When accessing to the file while the external device is monitoring the response time using the socket communication function, increase the monitoring time for the file access.

(7) Data length

In communications on TCP, since no delimiter is available in data, consecutively sent data may be combined, and batch-sent data may be separated after reception.

Confirm the data length by the receiving side as necessary and process them.

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

When data are received on the external device side, confirm the data length and follow the procedure shown Figure 3.36.

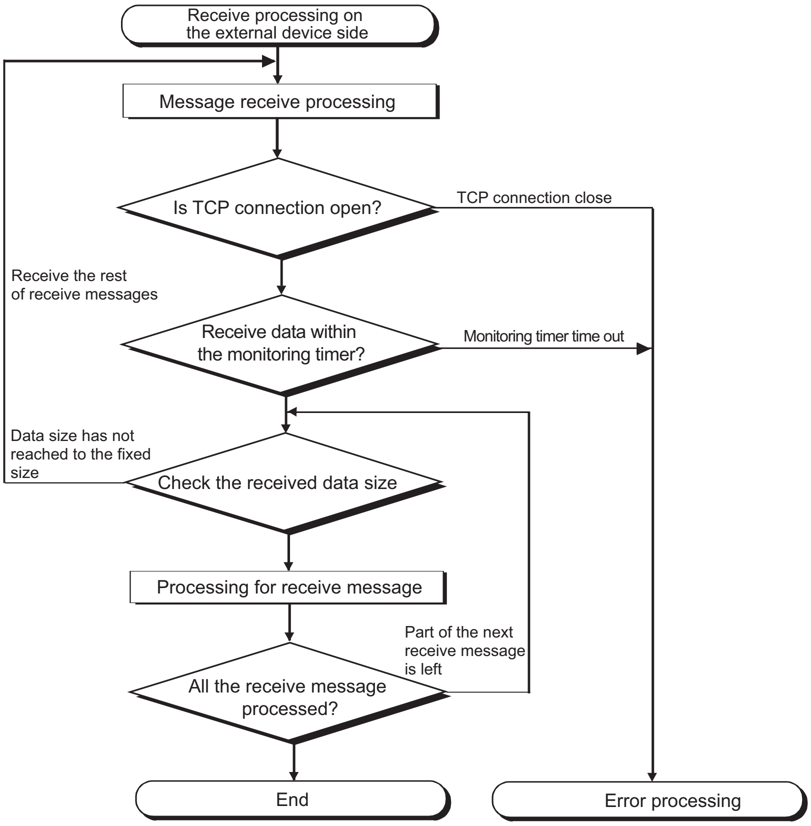

Receive processing on the external device side
Message receive processing
Is TCP connection open?
TCP connection close
Receive the rest of receive messages
Receive data within the monitoring timer?
Monitoring timer time out
Data size has not reached to the fixed size
Check the received data size
Processing for receive message
Part of the next receive message is left
All the receive message processed?
End
Error processing

Figure 3.36 Processing example on the external device

3.5 Time Setting Function (SNTP Client)

The Built-in Ethernet port QCPU collects time information from a time information server connected to LAN (SNTP server), making it possible to set the CPU time automatically.
The time setting function queries the time information server to ask the time at the specified timing.
Also, setting the time sent from the time information server as a clock data of the CPU module.

The time setting operation is executed based on the following timing.

- At programmable controller power ON or CPU module reset.
- Execution at a specified time interval (Execution interval)
- Execution at a specified time (Execution time)
- At special relay ON.[*1]

[*1] : Time is set when the special relay (SM1270) is turned ON for one scan.

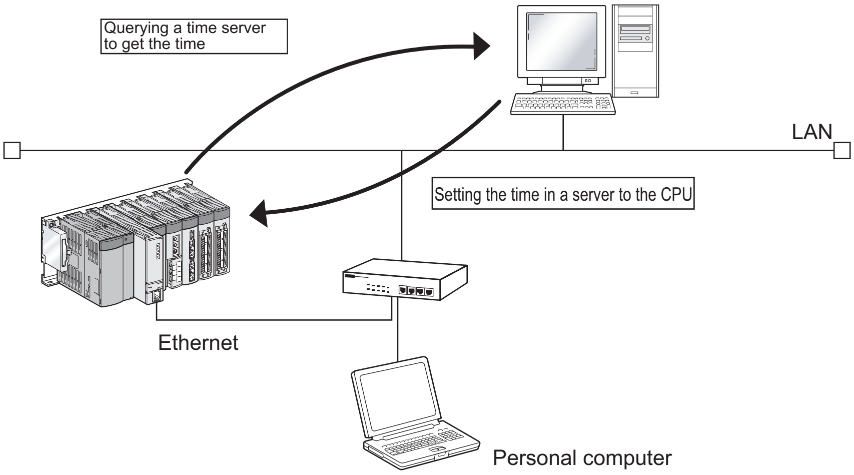

Querying a time server to get the time
LAN
Setting the time in a server to the CPU
Ethernet
Personal computer

Figure 3.37 Image of time setting function

Point

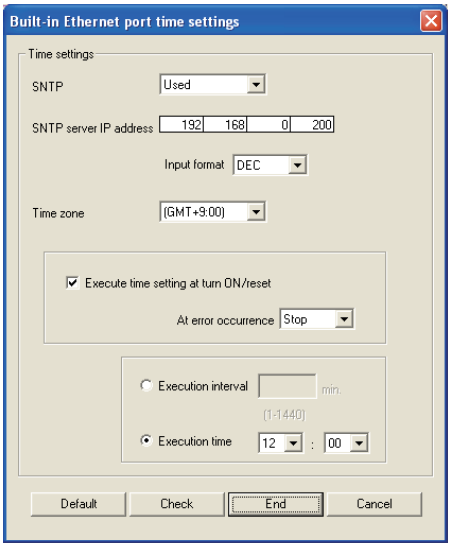
- ● Check the connection of the hub or the external device first when executing a time setting operation at programmable controller power ON or CPU module reset.
- ● The time setting result details can be checked with the special registers (SD1270 to SD1275).
- ● Other time setting operations are ignored during execution of the time setting function.

Remark

An access via routers is also available. For the setting, specify the Subnet mask pattern and Default router IP address as well.
(☞ Section 3.1.4)

3.5.1 Setting for time setting function

Set the time in the Built-in Ethernet port time settings tab of the PLC parameter dialog box.



Built-in Ethernet port time settings

Time settings

SNTP: Used

SNTP server IP address: 192 . 168 . 0 . 200

Input format: DEC

Time zone: (GMT+9:00)

☑ Execute time setting at turn ON/reset

At error occurrence: Stop

○ Execution interval [ ] min. (1-1440)

● Execution time 12 : 00

Figure 3.38 Time settings screen

Table3.10 Setting items on the time settings screen

Item	Description	Setting range
SNTP	Select whether to use the time setting function.	Used or Not used
SNTP server IP address	Specify the SNTP server IP address.	-
Time zone	Specify the time zone in which the time is to be synchronized. Default is set to Japan Standard Time "GMT + 9:00".	(GMT-12:00 to GMT+13:00)
Execute time setting at turn ON/ reset	Select whether to execute the time setting function when the programmable controller is powered ON or when the CPU module is reset.	-
At error occurrence	Select whether to stop or continue when a time setting error occurs when the programmable controller is powered ON or when the CPU module is reset.	Continue or Stop
Execution interval [*2]	Select to execute the time setting function at a specified time interval.	1 to 1440 min.
Execution time [*2]	Select to execute the time setting function at a specified time. (in increments of 30 minutes)	00:00 to 23:30

*2 : Either of the two options must be selected.

3.5.2 Precautions

(1) Communication time-out

A communication time-out occurs when the Built-in Ethernet port QCPU has not received time information for 20 seconds from when querying a time information server.
Besides, when a communication time-out occurs, the value in SD1270 changes to 0FFFFH.

(2) Time information server

To use the time setting function, an SNTP server personal computer (time information server) is required on LAN.

(3) Delay resulted from the time required for communication

A delay occurs with respect to the time as a result of the time required for communication with the personal computer for the SNTP server.
To set the time with higher accuracy, specify the closest personal computer for the SNTP server on the network.

(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.

3.6 File Transfer Function (FTP)

The Built-in Ethernet port QCPU supports the FTP (File Transfer Protocol) server function. FTP is a protocol for transferring files between CPU modules and external devices.
An external device with a FTP client function can simply access to files within the CPU module directly by using this FTP server function.

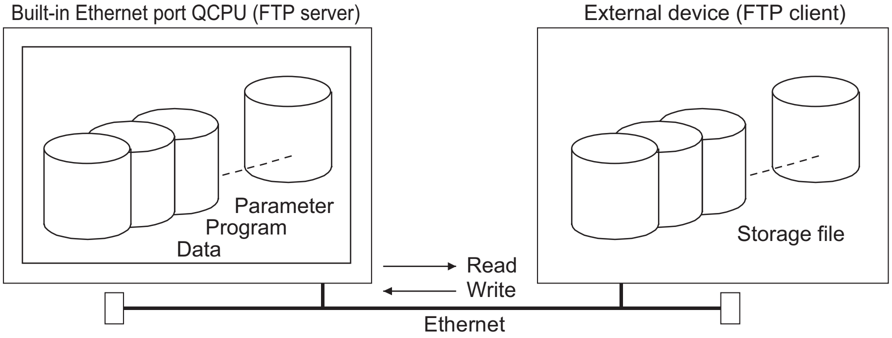

Built-in Ethernet port QCPU (FTP server)
External device (FTP client)
Parameter
Program
Data
Storage file
Read
Write
Ethernet

Figure 3.39 File transfer function (FTP)

The following accesses can be performed to files in the Built-in Ethernet port QCPU from an external device with a FTP client function.

(a) Reading (downloading) files from Built-in Ethernet port QCPU

A function for storing CPU module files in an external device.

(b) Writing (uploading) files to Built-in Ethernet port QCPU

A function for registering files stored in an external device to the CPU module.

(c) Browsing Built-in Ethernet port QCPU file names

A function for checking files registered in the CPU module on the external device side.

Point

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

Remark

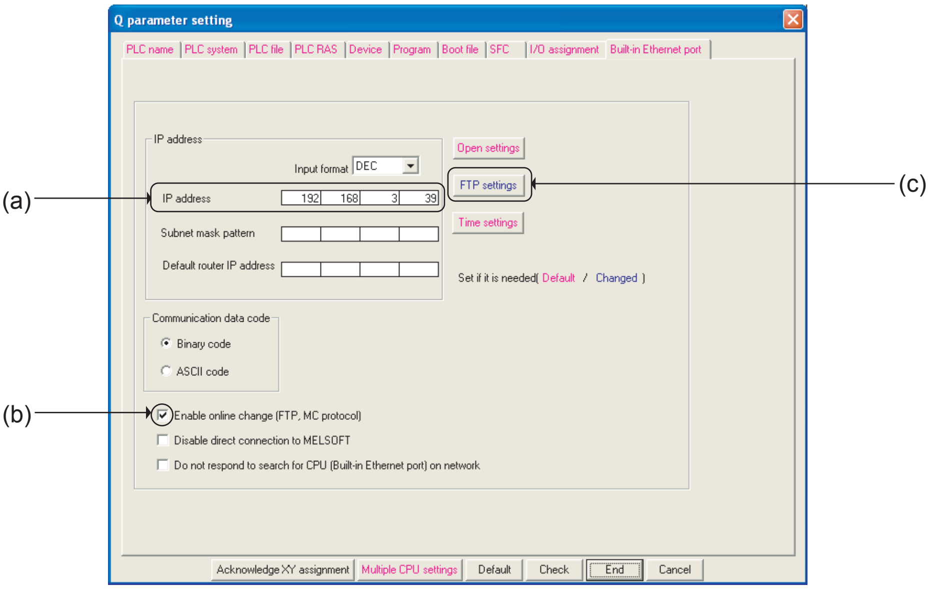
An access via routers is also available. For the setting, specify the Subnet mask pattern and Default router IP address as well.
(☞ Section 3.1.4)

3.6.1 Setting for FTP communication

Setting for communication using the FTP is described below.

(1) Operation for CPU module

Set the items in the Built-in Ethernet port tab of the PLC parameter dialog box.



IP address
Input format DEC
IP address 192 168 3 39
Subnet mask pattern
Default router IP address

Set if it is needed(Default / Changed)

Communication data code
● Binary code
○ ASCII code

☑ Enable online change (FTP, MC protocol)
□ Disable direct connection to MELSOFT
□ Do not respond to search for CPU (Built-in Ethernet port) on network

Figure 3.40 Built-in Ethernet port tab

(a) IP address

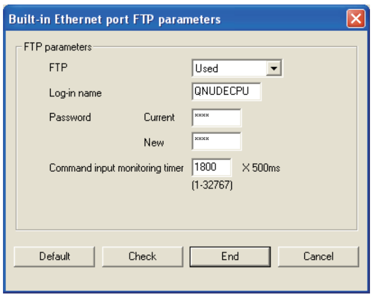
Set an IP address for CPU module.

(b) Enable online change (FTP, MC protocol)

Check this checkbox to enable online change.

(c) FTP setting

Set the FTP parameters as shown below.



FTP parameters
FTP Used
Log-in name QNUDECPU
Password Current ****
New ****
Command input monitoring timer 1800 ×500ms
(1-32767)

Figure 3.41 FTP settings screen

Table3.11 Setting items on the FTP settings screen

Item	Description
FTP	Set to "Used".
Log-in name	Set the login name for an external device to request file transfer (log in). (Default: QNUDECPU)
Password	Set the FTP password for an external device to request file transfer (log in). To change the password, enter both the old and the new passwords for confirmation. (Default: QNUDECPU)
Command input monitoring timer	Set the monitoring time for 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 the value so that the time will be larger than the time required for file transfer.

(2) Operation on external device (FTP client) side

The procedure and required processing on the external device side when using the FTP server function of Built-in Ethernet port QCPU are described below.

FTP operation commands used in each operation and their input methods are also described.

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

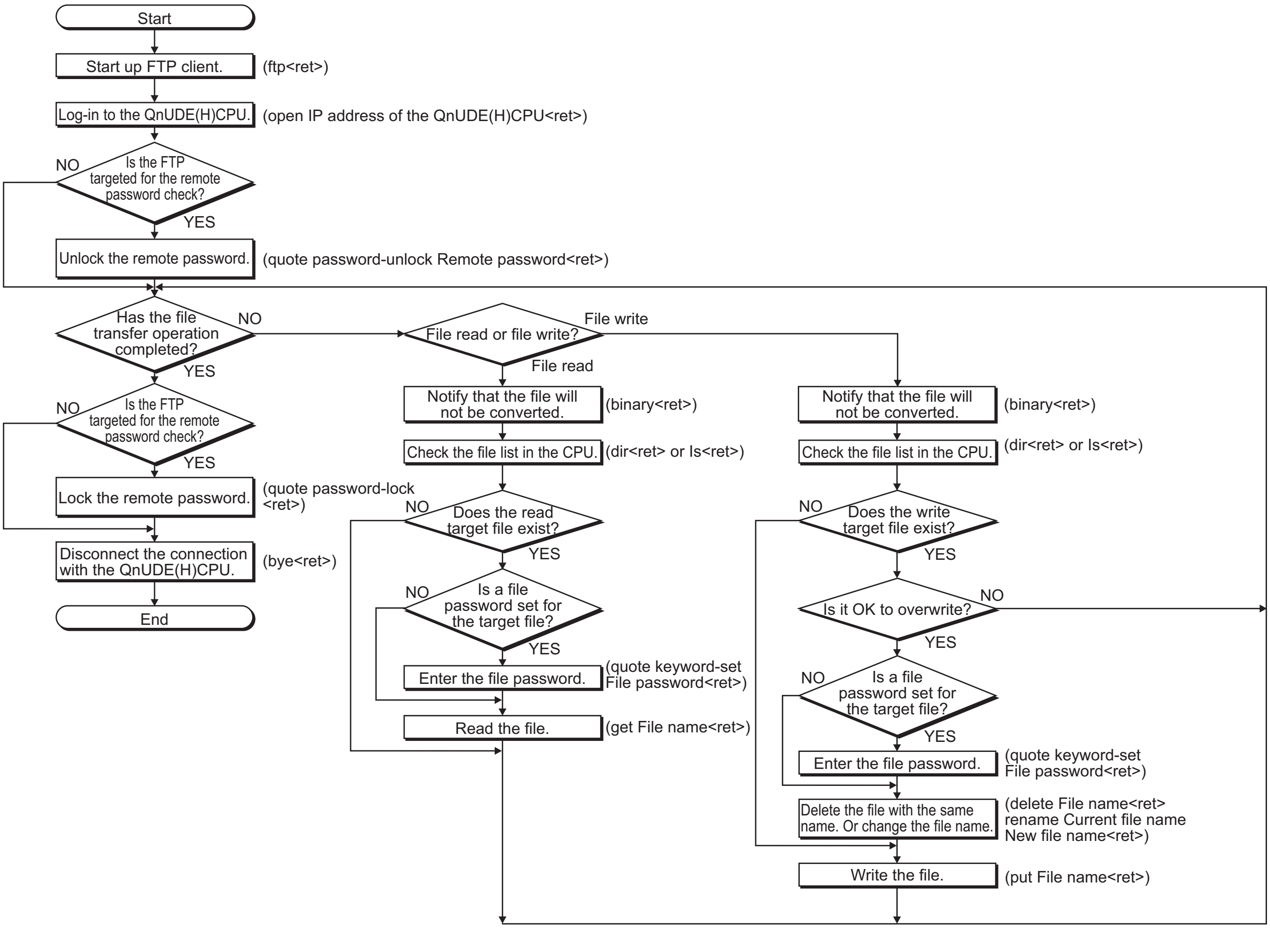
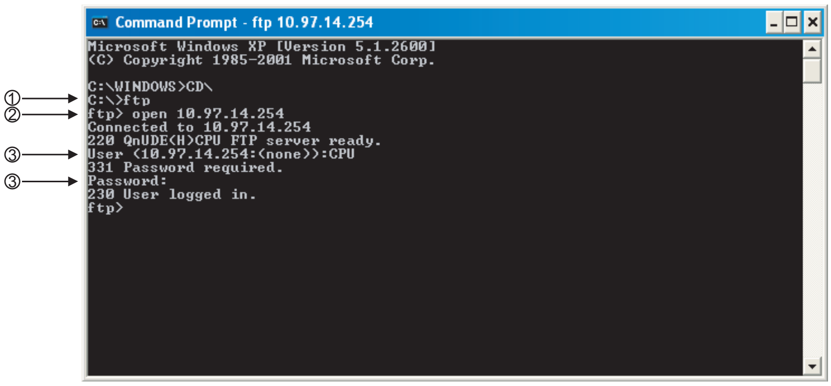

Start
Start up FTP client.
(ftp<ret>)
Log-in to the QnUDE(H)CPU.
(open IP address of the QnUDE(H)CPU<ret>)
NO
Is the FTP targeted for the remote password check?
YES
Unlock the remote password.
(quote password-unlock Remote password<ret>)
Has the file transfer operation completed?
NO
YES
NO
Is the FTP targeted for the remote password check?
YES
Lock the remote password.
(quote password-lock <ret>)
Disconnect the connection with the QnUDE(H)CPU.
(bye<ret>)
End
File read or file write?
File write
File read
Notify that the file will not be converted.
(binary<ret>)
Check the file list in the CPU.
(dir<ret> or ls<ret>)
NO
Does the read target file exist?
YES
NO
Is a file password set for the target file?
YES
Enter the file password.
(quote keyword-set File password<ret>)
Read the file.
(get File name<ret>)
Notify that the file will not be converted.
(binary<ret>)
Check the file list in the CPU.
(dir<ret> or ls<ret>)
NO
Does the write target file exist?
YES
Is it OK to overwrite?
NO
YES
NO
Is a file password set for the target file?
YES
Enter the file password.
(quote keyword-set File password<ret>)
Delete the file with the same name. Or change the file name.
(delete File name<ret> rename Current file name New file name<ret>)
Write the file.
(put File name<ret>)

Figure 3.42 FTP client side operation procedure

(a) Logging in to Built-in Ethernet port QCPU

Operations from starting the FTP to logging in to the Built-in Ethernet port QCPU are described below.

Example) Start up the FTP from the MS-DOS prompt of a Microsoft® Windows®.



```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\WINDOWS>CD\
C:\>ftp
ftp> open 10.97.14.254
Connected to 10.97.14.254
220 QnUDE(H)CPU FTP server ready.
User (10.97.14.254:(none)):CPU
331 Password required.
Password:
230 User logged in.
ftp>
```

Figure 3.43 Example of screen for logging in to Built-in Ethernet port QCPU

① Start FTP (FTP<ret>)

② Connect to FTP server (open Built-in Ethernet port QCPU IP address<ret>)

③ Specify login name (Login name<ret>)
Specify password (Password<ret>)

(b) Unlocking/Locking remote password

When the FTP communication port is specified to target at the remote password check in remote password settings, unlock the remote password using the following command.
(quote password-unlock Remote password<ret>)

At the end of the operation, change the remote password to the locked status using the following command.
(quote password-lock<ret>)

Point

When the FTP communication port is specified for a remote password check target in remote password settings, other commands cannot be used until the remote password is unlocked.

(c) Entering file password

When a file password is set for the target file, the file password needs to be entered using the following command before accessing the file.
(quote keyword-set File password<ret>)

3.6.2 List of transferable files

Table3.12 lists the transferable files using the file transfer function.

Table3.12 List of transferable files

Item	Built-in memory of CPU module			Memory card (RAM)	Memory card (ROM)		File name and extension
	Program memory *2 *3	Standard RAM	Standard ROM *4	SRAM card	Flash card	ATA card *4	
	Drive 0	Drive 3	Drive 4	Drive 1	Drive 2	Drive 2	
Parameter	○	×	×	×	×	×	PARAM.QPA
Intelligent function module parameter	○	×	×	×	×	×	IPARAM.QPA
Program	○	×	×	×	×	×	***.QPG
Device comment	○	×	×	×	×	×	***.QCD
Device initial value	○	×	×	×	×	×	***.QDI
Device data	×	×	×	×	×	×	***.QST
File register	×	○	×	○	○	×	***.QDR
Local device	×	×	×	×	×	×	***.QDL
Sampling trace file	×	×	×	×	×	×	***.QTD
Error history data	×	×	×	×	×	×	***.QFD
Device data storage file	×	×	○	×	×	×	DEVSTORE. QST
Module error collection file	×	○	×	×	×	×	IERRLOG.QIE
Backup data file	×	×	×	○	○	○	MEMBKUP0. QBP
Programmable controller user data	×	×	○	×	×	○ *1	Any file name
User setting area	×	×	×	×	×	×	-

○ :Transferable, × :Not transferable

*1 : A file for reading/writing data by a sequence program using the following instructions:

- SP.FREAD (Batch-reads data from the specified file in the memory card.)
- SP.FWRITE (Batch-writes data to the specified file in the memory card.)

For details on the SP.FREAD/SP.FWRITE instructions, refer to the following manual.

☞ MELSEC-Q/L Programming Manual (Common Instruction)

*2 : Writing files to the program memory is enabled only when the CPU module is in the STOP status.

*3 : Write destination is the program cache memory.
The user should back up files using the "pm-write" command as required.(☞ Section 3.6.5)

*4 : The number of files written using the File transfer function (FTP) is up to the number described below.
[The maximum number of files can be stored in the corresponding drive -1]

3.6.3 List of FTP commands

Table3.13 lists the FTP client commands can be used in the Built-in Ethernet port QCPU.

Table3.13 List of FTP client side user interface commands

Command	Function	CPU module status			Remote password		Remarks
		STOP	RUN		Unlocked *2	Locked *2	
			Write enabled *1	Write disabled *1			
binary *4	Notifies that a file is to be transferred to the FTP server without conversion.	○	○	○	○	×	-
bye	Disconnects the FTP server connection and ends the FTP function.	○	○	○	○	○	
close	Disconnects the FTP server connection.	○	○	○	○	○	
delete	Deletes a file stored in the Built-in Ethernet port QCPU.	○	○	×	○	×	
dir	Displays file information stored in the Built-in Ethernet port QCPU.	○	○	○	○	×	
get	Reads a file from the Built-in Ethernet port QCPU.	○	○	○	○	×	
ls	Displays the file names of files stored in the Built-in Ethernet port QCPU.	○	○	○	○	×	
mdelete	Deletes a file stored in the Built-in Ethernet port QCPU.	○	○	×	○	×	
mdir	Saves information of files stored in the Built-in Ethernet port QCPU.	○	○	○	○	×	
mget	Reads a file from the Built-in Ethernet port QCPU.	○	○	○	○	×	
mls	Saves names of files stored in the Built-in Ethernet port QCPU.	○	○	○	○	×	
mput	Writes a file to the Built-in Ethernet port QCPU.	○	○	×	○	×	
open	Connects to the FTP server.	○	○	○	○	○	
put	Writes a file to the Built-in Ethernet port QCPU.	○	○	×	○	×	
pwd	Displays the current directory name of the Built-in Ethernet port QCPU.	○	○	○	○	×	
quit	Disconnects the FTP server connection and ends the FTP function.	○	○	○	○	○	
quote	Sends an FTP server subcommand.	○	○	○	○	○	*3
rename	Renames a Built-in Ethernet port QCPU file.	○	○	×	○	×	-
user	Inputs the user name and password of Built-in Ethernet port QCPU.	○	○	○	○	○	

○ : Performablel, × : Not performable

*1 : These indicate the online change enable and disable settings made in the Built-in Ethernet port tab of the PLC parameter dialog box.

*2 : These indicate the remote password execution status when FTP communication port specified for remote password check target on the Remote password detail settings screen in GX Developer.
For details of the remote password, refer to Section 3.7.

*3 : Table3.14 lists the subcommands that can be used with the "quote" command.

*4: 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.

Table3.14 Subcommands that can be used with "quote" command

Command	Function	CPU module status			Remote password		Remarks
		STOP	RUN		Unlocked	Locked	
			Write enabled	Write disabled			
change	Displays/changes the Built-in Ethernet port QCPU file attribute.	○	○	×	○	×	-
keyword-set	Sets/displays/clears the Built-in Ethernet port QCPU file access password.	○	○	○	○	×	
password-lock	Specifies the remote password and changes the status from unlocked to locked.	○	○	○	○	× [*1]	
password-unlock	Specifies the remote password and changes the status from locked to unlocked.	○	○	○	○	○	
status	Displays the operation information of the Built-in Ethernet port QCPU.	○	○	○	○	×	
run	Changes the Built-in Ethernet port QCPU status to RUN.	○	○	○	○	×	
stop	Changes the Built-in Ethernet port QCPU status to STOP.	○	○	○	○	×	
pm-write	Writes files to the program memory.	○	×	×	○	×	

○ : Performablel, × : Not performable

*1 : Even if the subcommand is executed, the remote password status remains locked and an error does not occur.

3.6.4 How to read FTP commands

(1) FTP command descriptions

The FTP operation commands (on the FTP client (external device) side) which can be used in the Built-in Ethernet port QCPU are described below.

How to read descriptions
Sections in brackets at [Specification format] can be omitted.

(2) File specification methods

File specification method which is specified during execution of an FTP operation command (on the FTP client side) is described below.

- For the Built-in Ethernet port QCPU, files are specified using drive names and file names.
- When specifying a file in the Built-in Ethernet port QCPU using the FTP function, specify the target file in the following order.

  [Specification format]   Drive name : \ File name . extension
  [Specification example] 3:\MAINSEQ1.QDR
  [Specification details]   Refer to the following 1) and 2).

1) Drive name (Drive No.)

   Specify the drive name of the file transfer target memory.
   For the correspondence between Built-in Ethernet port QCPU target memory and drive name, refer to Table3.12.

2) File name, extension

   - Specify the file transfer target file.
   - Specify the file name according to the rules for naming files using GX Developer.
     Characters that can be used are one-byte alphabets (uppercase), numbers, and symbols. Lowercase alphabets cannot be used.

File name	: 8 characters maximum (one-byte)
Extension	: 3 characters maximum (one-byte)

     Alphabets are not case-sensitive. Lowercase alphabets are treated as uppercase alphabets.
   - For the extension, the name fixed by the Built-in Ethernet port QCPU must be used.
     Specify the extension for the target file in accordance with Table3.12.
   - For details of the file names and extensions, refer to the following manual.
     ☞ GX Developer Version 8 Operating Manual
   - When using FTP operation commands which can target multiple files, specify the file names and extensions within the file path name using a wild card (* and/or ?).

     * : Used for specifying all files having arbitrary characters (including no characters) after the location where "*" is used.

     ? : Used for specifying all files having arbitrary characters (including no characters) at the location where the "?" is used. (Multiple "?" can be used.)

   Some FTP clients have restrictions on characters that can be used for file names other than those described above.

3.6.5 Detail of FTP commands

Functions and usages of FTP commands (on the FTP client side) which can be used in the Built-in Ethernet port QCPU are described below.

Point

Note that some FTP commands may not operate as described in this manual depending on the FTP application by different clients.
Check the functions and operation methods, referring to the manuals on the FTP client side.

(1) FTP server support commands

● binary

[Function]	Notifies that a file is to be transferred to the FTP server without conversion. Neither return codes nor kanji codes are converted. This command is set automatically in the Built-in Ethernet port QCPU.
[Specification format]	binary (abbreviated format bin)

● bye

[Function]	Disconnects the FTP server connection and ends the FTP function.
[Specification format]	bye
[Identical function]	quit

● close

[Function]	Disconnects the FTP server connection.
[Specification format]	close

● delete

[Function]	Deletes a file stored in the Built-in Ethernet port QCPU.
[Specification format]	delete File path name
[Specification example]	When deleting a file stored in the ATA card delete2:\MAINSEQ1.USR
[Similar function]	mdelete

● dir

[Function]	Displays the names, created dates, and sizes of files stored in the Built-in Ethernet port QCPU.
[Specification format]	dir [Drive name:\]
[Specification example]	When displaying the detailed information of files stored in the RAM area of the memory card dir1:\
[Similar function]	ls

● get

[Function] Reads a file from the Built-in Ethernet port QCPU.

[Specification format] get Transfer source file path name [Transfer destination file path name]

[Specification example1] When reading a file stored in the SRAM card and saving that file under the same file name
get1:\MAINSEQ1.QDR

[Specification example2] When reading a file stored in the SRAM card and saving that file under a different file name
get1:\SEQ1BAK.QDR\SEQ10LD.QDR

[Note]

- When the transfer destination file path name (FTP client side) is not specified, the file is saved on the FTP client side using the same file name as the transfer source file name (Built-in Ethernet port QCPU side).
- The transfer destination is on the current directory of which when FTP is started up and connected to the server.

● ls

[Function] Displays the names of files stored in the Built-in Ethernet port QCPU.

[Specification format] ls [Drive name:\]

[Specification example] When displaying the names of files stored in the SRAM card
ls1:\

[Similar function] dir

● mdelete

[Function] Deletes a file stored in the Built-in Ethernet port QCPU.
To delete multiple files, specify the file names and extensions within the file path name using a wild card (* and/or ?).

[Specification format] mdelete File path name (abbreviated format: mdel)

[Specification example] When deleting all files whose extensions are "QPG" among the files stored in the ATA card
mdelete2:*.QPG

[Similar function] delete

● mdir

[Function] Saves detailed information (file names, created dates, and sizes) of files stored in the Built-in Ethernet port QCPU as log data in a file on the FTP client side.

[Specification format] mdir Transfer source drive name:\ Transfer destination file path name

[Specification example] When saving detailed information of files stored in the SRAM card to the S990901.LOG file
mdir1:\S990901.LOG

[Note]

- Specify "\" immediately after the transfer source drive name.
- Specify the transfer source drive name when specifying the transfer destination file path name (FTP client side).
- When the transfer destination file path name is not specified, 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 of which when FTP is started up and connected to the server.

[Similar function] mls

● mget

[Function] Reads a file from the Built-in Ethernet port QCPU.
To read multiple files, specify the file names and extensions within the file path name using a wild card (* and/or ?).
When reading multiple files, receive status is checked for each file transfer.

[Specification format] mget File path name

[Specification example] When reading all files whose extensions are "USR" among the files stored in the ATA card
mget2:*.USR

[Note] The read file is saved on the FTP client side under the same file name.
The save destination is on the current directory of which when FTP is started up and connected to the server.

● mls

[Function] Saves the names of files stored in the Built-in Ethernet port QCPU as log data in a file on the FTP client side.

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

[Specification example] When saving the names of files stored in the SRAM card to the S990901F.LOG file
mls1:\S990901F.LOG

[Note]
- Specify "\" immediately after the transfer source drive name.
- Specify the transfer source drive name when specifying the transfer destination file path name (FTP client side).
- When the transfer destination file path name is not specified, 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 of which when FTP is started up and connected to the server.

[Similar function] mdir

● mput

[Function] Writes a file to the Built-in Ethernet port QCPU.
To write multiple files, specify the file names and extensions within the file path name using a wild card (* and/or ?).
When writing multiple files, send status is checked for each file transfer.

[Specification format] mput Transfer source file path name

[Specification example] When writing all files whose extensions are "USR"
mput*.USR

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

● open

[Function] Connects to the FTP server based on a specified host name or IP address and port number on the FTP server side.

[Specification format]
open Host name [Port number]
open IP address [Port number]

- Host name : Host name set in Microsoft® Windows® hosts file
- IP address: Built-in Ethernet port QCPU IP address
- Port number: Port number to be used

[Specification example1] When connecting to the FTP server by specifying a host name
open HOST

[Specification example2] 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 when FTP is started up.

● put

[Function] Writes a file to the Built-in Ethernet port QCPU.

[Specification format] put Transfer source file path name [Transfer destination file path name]

[Specification example1] When writing the MAINSEQ1.QDR file to the SRAM card with the same file name
put MAINSEQ1.QDR1:\MAINQDR1.QDR

[Specification example2] When writing the MAINSEQ.QDR file to the SRAM card with a different file name
put MAINSEQ.QDR1:\MAINQDR1.QDR

[Note]
- When the transfer destination file path name (FTP client side) is not specified, the files on the current directory of which when FTP is started up and connected to the server are written.
- When the transfer destination file path name (FTP server side) is not specified, the files are saved in the memory in which the parameter files used during the current operation are stored.

● pwd

[Function] Displays the current directory name of the Built-in Ethernet port QCPU.

[Specification format] pwd

[Note] "\" is displayed as the execution result of the "pwd" command.

● quit

[Function] Disconnects the FTP server connection and ends the FTP function.

[Specification format] quit

[Identical function] bye

● quote

[Function] Sends an FTP server subcommand (Built-in Ethernet port QCPU dedicated subcommand).

[Specification format] quote

[Specification example] quote password-lock

[Note] Only Built-in Ethernet port QCPU dedicated subcommands can be specified. Refer to (2).

● rename

[Function] Renames a Built-in Ethernet port QCPU file.

[Specification format] rename Old file path name New file path name (abbreviated format: ren)

[Specification example] When renaming a file stored in the SRAM card
rename 1:\MAINSEQ1.QDR1:\SEQ1OLD.QDR

[Note] The following response codes are displayed upon normal 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 in Built-in Ethernet port QCPU parameter
- FTP password: FTP password set in Built-in Ethernet port QCPU parameter

[Specification example1] When specifying a user name
user CPU

[Specification example2] When specifying a user name and password
user CPU CPU

(2) Built-in Ethernet port QCPU dedicated subcommands

The Built-in Ethernet port QCPU dedicated subcommands added to and sent with the FTP operation "quote" command are described below.

● change

[Function] Displays/changes Built-in Ethernet port QCPU file attribute.

[Specification format1] When displaying file attribute
quote change File path name
One of the following is displayed as the execution result upon normal completion.

- When the specified file is a read-only file : ----- R
- When the specified file is a read/write-enabled file : ----- W

[Specification format2] When changing file attribute
quote change File path name Attribute
Use one of the following for specifying the attribute.

- To change the file to read-only file : r
- To change the file to a read/write-enabled disk file : w

[Specification example1] When displaying file attribute stored in the SRAM card
quote change 1:\MAINSEQ1.QDR

[Specification example2] When changing file attribute stored in the SRAM card
quote change 1:\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

[Specification example1] When setting the password (1234)
quote keyword-set 1234

[Specification example2] When displaying the password currently set for FTP settings in parameter
quote keyword-set

[Specification example3] 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. When accessing the specified file, the Built-in Ethernet port QCPU checks the file password.

● password-unlock

[Function]
Specifies the remote password set in the Built-in Ethernet port QCPU and performs unlock processing.[*2]

[Specification format]
quote password-unlock [Remote password]

- Remote password: Specify the remote password set in Built-in Ethernet port QCPU parameter.

The following is displayed as the execution result upon normal completion.
200 Command 0key

The following is displayed when the entered remote password and set remote password do not match.
556 Password Error

The following is displayed when another command is requested before unlock processing of the remote password is performed.
555 Password Locked

[Specification example]
When specifying the remote password (1234)
quote password-unlock 1234

[Note]

- The remote password is locked when logged in to the Built-in Ethernet port QCPU if the FTP communication port is specified for a remote password check target.
- Performing unlock processing by executing this command before the various FTP operations enables file operations in the Built-in Ethernet port QCPU.
- Processing completes normally if the remote password unlock processing is performed when the FTP communication port is not specified for a remote password check target.

[*2] This command is used only when FTP communication port is specified for a remote password check target.

● password-lock

[Function]
Performs lock processing of the remote password set in the Built-in Ethernet port QCPU.[*3]

[Specification format]
quote password-lock
The following is displayed as the execution result upon normal completion.
200 Command 0key

[Specification example]
When locking the remote password
quote password-lock

[*3] This command is used only when FTP communication port is specified for a remote password check target.

● run

[Function] Changes the Built-in Ethernet port QCPU status to RUN. (Executes remote RUN.)
When changing the Built-in Ethernet port QCPU status to RUN, device memory clear can be specified.

[Specification format] quote run [Mode [Clear mode]]

- Mode: Specify whether to execute remote RUN forcibly.
  0 : Normal RUN (default)
  1 : Forced RUN
- Clear mode:
  Specify the clear (initialization) processing of the Built-in Ethernet port QCPU device memory when an operation starts by executing remote RUN.
  0 : Do not clear device (default)
  1 : Clear all devices excluding latch range
  2 : Clear all devices including latch range

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

[Specification example1] When executing remote RUN, specifying "Normal RUN" and "Do not clear device"
quote run

[Specification example2] When executing remote RUN, specifying "Forced RUN" and "Do not clear device"
quote run 1

[Specification example3] When executing remote RUN, specifying "Forced RUN" and "Clear all devices excluding latch range"
quote run 1 1

[Note]

- Forced RUN mode is used to forcibly execute remote RUN to the Built-in Ethernet port QCPU from other devices when a trouble occurs in the device which executed remote STOP to the Built-in Ethernet port QCPU (the device can no longer execute remote RUN to the Built-in Ethernet port QCPU).
  When Normal RUN mode is specified, the status will not change to RUN if the Built-in Ethernet port QCPU is already set in the STOP/PAUSE status by another device.
- Specify the clear mode at the start of an operation based on the system arrangement. After the specified clear processing is performed, the Built-in Ethernet port QCPU changes to the RUN status in accordance with the parameter settings ("Initial Device value" setting on the PLC file tab of PLC parameter).

● status

[Function] Displays the operation information of the Built-in Ethernet port QCPU.
This command checks the Built-in Ethernet port QCPU operation information when executing file transfer to the Built-in Ethernet port QCPU.

[Specification format] quote status

One of the following is displayed as the execution result upon normal completion.

- When the Built-in Ethernet port QCPU is in the RUN status: "RUN"
- When the Built-in Ethernet port QCPU is in the STOP status: "STOP"
- When the Built-in Ethernet port QCPU is in the PAUSE status: "PAUSE"

● stop

[Function]	Changes the Built-in Ethernet port QCPU status to STOP. (Executes remote STOP.)
[Specification format]	quote stop The following message is displayed as the execution result upon normal completion. 200 Command successful
[Note]	Write files to the program memory after the Built-in Ethernet port QCPU status is changed to STOP using this command.

● pm-write

[Function]	Transfers files in the program cache memory to the program memory.
[Specification format]	quote pm-write The following message is displayed as the execution result upon normal completion. 200 Command successful
[Note]	Write files after the Built-in Ethernet port QCPU status is changed to STOP.

3.6.6 Precautions

Precautions for using the file transfer function are described below.

(1) FTP clients

- FTP command specifications may differ from those described in this manual, depending on the FTP client. In such a case, check the functions and operation methods, referring to the manuals on the FTP client side.
- FTP operations cannot be performed from Microsoft® Internet Explorer. If performed, an error occurs with Internet Explorer.

(2) Processing in Built-in Ethernet port QCPU

- Files only in the drives of the host station Built-in Ethernet port QCPU can be accessed.
- During file access, do not turn OFF the power supply, reset the CPU module or install/remove a memory card. Doing so may result in a file corruption. Do not perform both the file operation and the operation of FTP function from peripherals at the same time.
  Doing so may result in a communication error in either of two operations and the processing is suspended.
- During online change, do not perform any file operations using the FTP function. When a file operation is performed, an error may occur.
- During file access using the FTP function, do not perform any online operations from peripherals such as GX Developer. When an online operation is performed, an error may occur on the peripheral side.
- During backup or restoration of the CPU module change function using a memory card, an error occurs in file access from FTP clients.
  In that case, access the file again after the backup or restoration operation is completed.
  Moreover, if the backup or restoration operation is performed during file access from FTP clients, an error occurs.
  In that case, perform the backup or restoration operation again after blocking the communication with FTP clients.

(3) Communication processing

- When a time-out error occurs during file transfer, the TCP connection will be closed (disconnected). To restart the file transfer, log in to the Built-in Ethernet port QCPU once again from an FTP client.
- In a communication using FTP connections, an existence check of external devices is performed. For operation details, refer to Section 3.1.4.
- The file transfer processing time depends on the following factors.
  1) Load rate of the Ethernet line (line traffic)
  2) Number of connections simultaneously used (communication processing of other connections)
  3) System configuration
- The number of external devices (FTP clients) that can be simultaneously logged in to the Built-in Ethernet port QCPU is only one. When another FTP client attempts the connection to the Built-in Ethernet port QCPU which is in the logged-in status, connection cannot be established and an error occurs.
- If the File transfer function using the FTP is executed simultaneously with other communication functions (MELSOFT connection, MC protocol) using the UDP, an error, such as a time-out error, may occur. Execute other communication functions after file transfer is completed or communicate using the TCP.

(4) Writing to files

- Operation to overwrite an existing file cannot be performed.
  Either delete the file using a file delete command (delete, mdelete) or rename the file using a file name change command (rename) before writing the file.
- Files whose attribute is read-only or files which are locked by other devices/functions cannot be written. If files are written, a write error occurs.
- File transfer (writing files) cannot be executed when a write-protected memory card is used. If files are written, a write error occurs.
- When a file is written, a temporary file (FTP_I***.TMP) is created automatically. The name of this file is changed to the name of written file upon normal completion. However, if the power failure or reset of the CPU module occurs during the file write, this temporary file may remain. If this occurs, delete the temporary file.
- When file registers are used in the standard RAM or SRAM card, change the CPU status to STOP first, and then write /delete files to/in these drives.
- When file registers used in the standard RAM or SRAM card are set as auto refresh devices, do not write/delete files to/in these drives.
- If large-capacity files are written to the ATA card during RUN, a load on write processing increases and a communication error may occur. Change the CPU status to STOP to write large-capacity files.

(5) Deleting files

- The timing for deleting files is to be arranged by the user considering the overall system, including Built-in Ethernet port QCPU and GX Developer.
- Files whose attribute is read-only or files which are locked by other devices/functions cannot be deleted. If files are deleted, a delete error occurs.
- Deleting files cannot be executed when a write-protected memory card is used. If files are deleted, a delete error occurs.

(6) FTP password

When forgetting a FTP password, set FTP parameters in the following procedure again.

1) Read the parameters from the CPU module to GX Developer.

2) Click the "Default" button on FTP Setting in the Built-in Ethernet Port Setting of the PLC Parameter and then return all the parameters to the default values.

3) Set the FTP parameters again.

4) Write the set parameters to the CPU module by Write to PLC.

5) Enable the parameters by powering off and then on, or resetting the CPU module.

3.7 Remote Password

This function checks a remote password when the communication using the following connections is requested.

- Communication using GX Developer
- Communication using the MC protocol
- File transfer

Point

The remote password function is a function to prevent unauthorized access (ex. corrupting data and programs) from external devices.
However, this function cannot completely prevent unauthorized access.
Users should incorporate safety measures by themselves 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 control access authority as a relay station.
  Please consult a network provider or equipment sales company regarding external devices that can control access authority.

3.7.1 Communication method when a remote password is set

The communication procedure with the Built-in Ethernet port QCPU with a preset remote password is described below.

(1) Access enable processing (unlock processing)

An external device such as a personal computer performs remote password unlock processing for the CPU module.

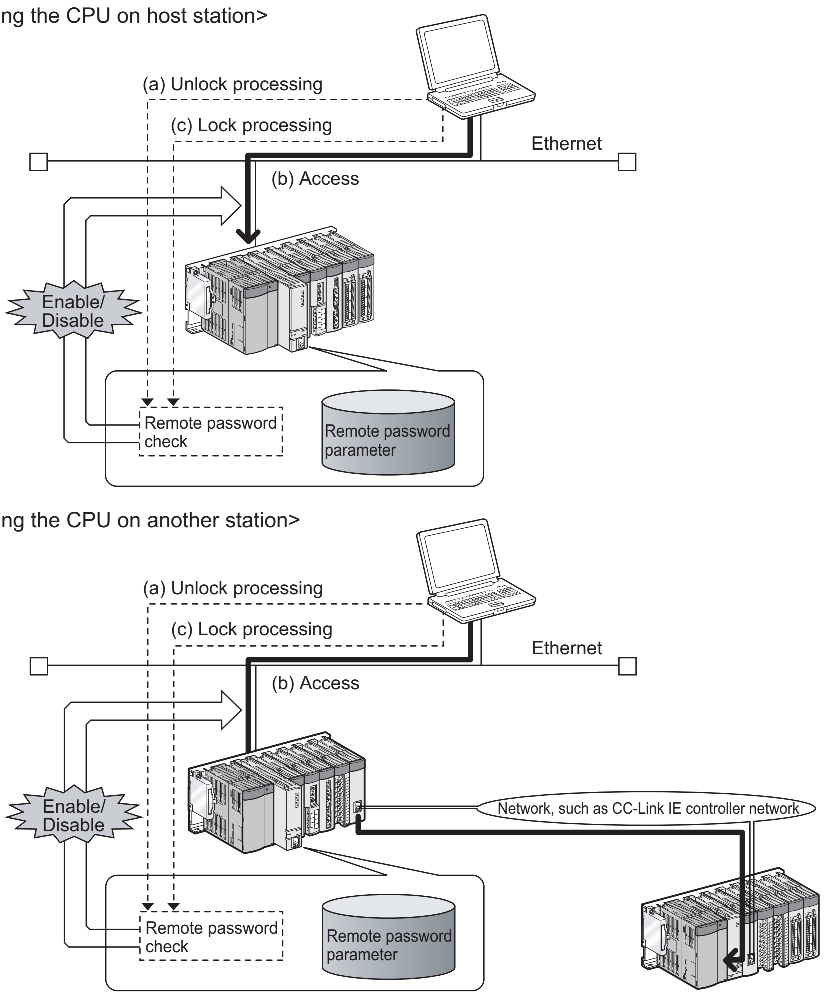
When unlock processing is not performed, an error occurs in the external device since the CPU module does not accept access.

(2) Access processing

Access is enabled after the remote password unlock processing is completed normally.

(3) Access disable processing (lock processing)

Remote password lock processing is performed from the external device to disable subsequent access after the access is completed.


<Accessing the CPU on host station>

<Accessing the CPU on another station>

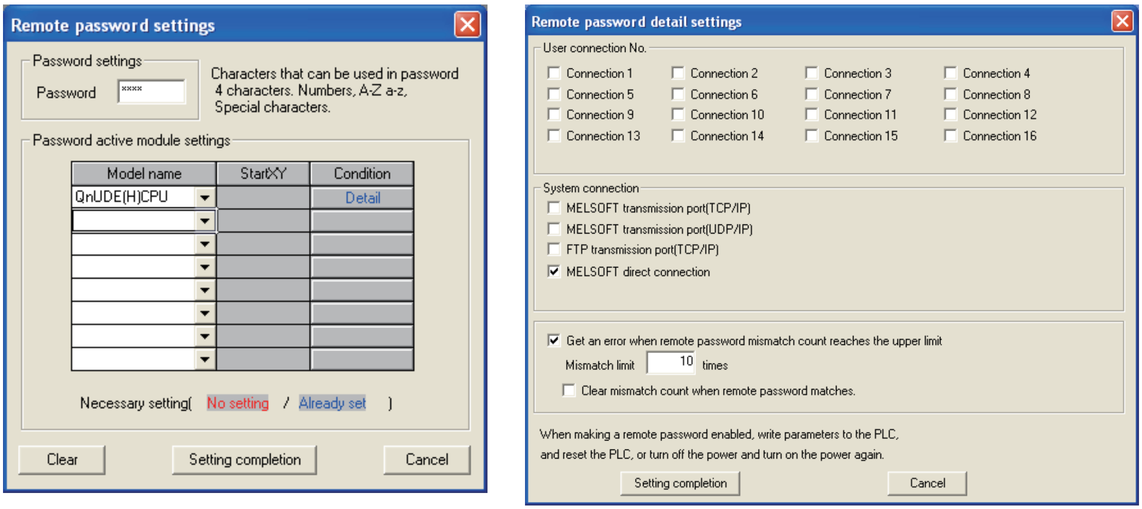
Figure 3.44 Remote password operation overview

3.7.2 Remote password setting

Setting method for remote password is described below.

(1) Setting remote password and writing parameters to CPU module

Set the remote password and the connection target in GX Developer and write the parameter settings to the CPU module.



Remote password settings

Password settings

Password ****

Characters that can be used in password 4 characters. Numbers, A-Z a-z, Special characters.

Password active module settings

Model name	StartXY	Condition
QnUDE(H)CPU		Detail

Necessary setting(No setting / Already set)

Remote password detail settings

User connection No.

□ Connection 1 □ Connection 2 □ Connection 3 □ Connection 4
□ Connection 5 □ Connection 6 □ Connection 7 □ Connection 8
□ Connection 9 □ Connection 10 □ Connection 11 □ Connection 12
□ Connection 13 □ Connection 14 □ Connection 15 □ Connection 16

System connection

□ MELSOFT transmission port(TCP/IP)
□ MELSOFT transmission port(UDP/IP)
□ FTP transmission port(TCP/IP)
☑ MELSOFT direct connection

☑ Get an error when remote password mismatch count reaches the upper limit

Mismatch limit 10 times

□ Clear mismatch count when remote password matches.

When making a remote password enabled, write parameters to the PLC, and reset the PLC, or turn off the power and turn on the power again.

Figure 3.45 Screens for setting remote password

Table3.15 Setting items on the screens for setting remote password

Item		Description	Setting range
Password settings		Enter the remote password to be set in the QCPU.[*1]	Up to four one-byte characters
Password active module settings	Model name	Select the CPU model to enable the remote password for built-in Ethernet ports of the QCPU module. Only one CPU model is available.	QnUDE(H)CPU
	Condition	Click this to display the Remote password detail settings screen.	Detail
User connection No.	Connection 1 to 16	Select the connection port for which the remote password is to be enabled. (Setting to the unused connection or to the MELSOFT connection is ignored.)	Check the checkbox of target connection.
System connection	MELSOFT transmission port (TCP/IP) [*2]	Select the connection port for which the remote password is to be enabled.	
	MELSOFT transmission port (UDP/IP) [*2*3]		
	FTP transmission port (TCP/IP)		
	MELSOFT direct connection		
Get an error when remote password mismatch count reaches the upper limit		Check the checkbox to perform this operation. (To detect unauthorized access.)(☞ Section 3.7.4)	
Mismatch limit		Set the number of mismatch limits.	1 to 65535
Clear mismatch count when remote password matches		Check the checkbox to perform this operation. (To ignore the entry error.)	Check the checkbox of target connection.

[*1] : Characters that can be used for remote passwords are one-byte alphanumeric characters and one-byte special characters. (Case-sensitive)
Refer to the following when setting a remote password.
- Avoid using character strings having simple numbers or letters only.
- Combine numbers, letters, and special characters.
- Avoid using character strings, including user's name or date of birth.

[*2] : To enable the remote password for the port for which the open system is set to "MELSOFT connection" in PLC parameter, check the checkbox as follows.
- When protocol is set to "TCP", check "MELSOFT transmission port (TCP/IP)".
- When protocol is set to "UDP", check "MELSOFT transmission port (UDP/IP)".

[*3] : When connecting GOT with the Built-in Ethernet port QCPU via Ethernet, do not check "MELSOFT transmission port (UDP/IP)".

(2) Enabling parameter settings

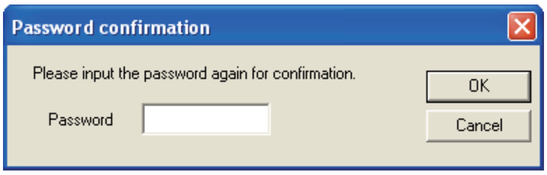
After writing parameter settings to the CPU module, settings are enabled by powering the programmable controller ON or resetting the CPU module.

(3) Performing remote password unlock/lock processing

Perform the remote password unlock/lock processing from an external device using respective protocol as follows.

(a) Using MELSOFT connection

Enter the remote password in the following dialog box that appears during communication.
GX Developer performs unlock processing upon entering the remote password and then access the CPU module.



Password confirmation

Please input the password again for confirmation.

Figure 3.46 Password confirmation screen

(b) Using MC protocol

Use the dedicated commands for the MC protocol.

(c) Using file transfer (FTP server) function

Use the "password-lock"/"unlock" commands.(☞ Section 3.6.5)

3.7.3 Precautions

Precautions for the remote password check function are described below.

(1) Setting remote password to UDP connections

- Determine the communication target external device and do not communicate with unspecified external devices. (The communication target external device needs to be determined since UDP/IP connections can communicate with any other devices, including the device that has performed unlock processing, after the remote password unlocking processing is completed normally.)
- At the end of data communication, always perform the remote password lock processing. (If lock processing is not performed, unlock status is held until a time-out occurs. When there is no communication for 10 minutes, the CPU module automatically performs time-out based lock processing.)

To prevent unauthorized access more strictly using the remote password, it is recommended to set all connection protocols to TCP/IP and disable GX Developer direct connection in parameter.

(2) Performing close processing before lock processing for TCP/IP connections

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.

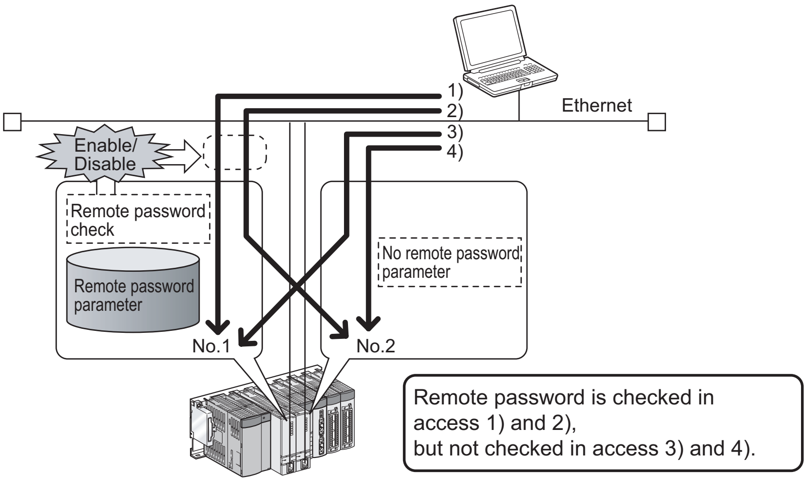

1)
2)
3)
4)
Ethernet
Enable/ Disable
Remote password check
Remote password parameter
No remote password parameter
No.1
No.2
Remote password is checked in access 1) and 2), but not checked in access 3) and 4).

Figure 3.47 Remote password in multiple CPU system

3.7.4 Detection and corrective action of unauthorized access

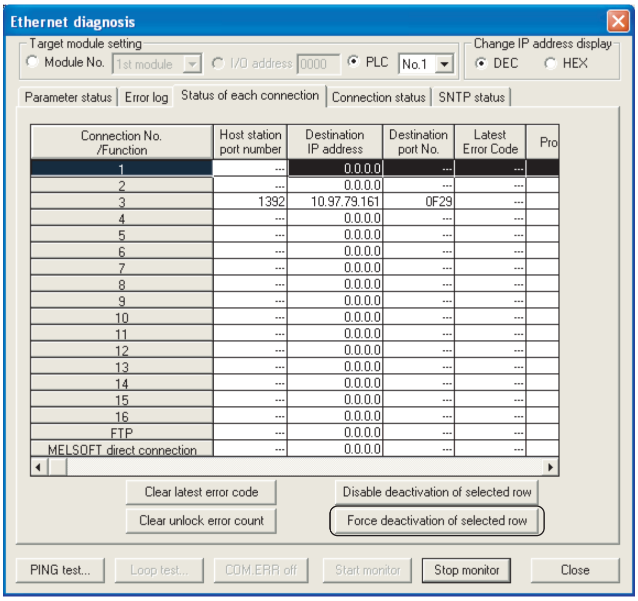
When remote password mismatch count reaches the upper limit during unlock processing, an error (error code: 2700) occurs in the Built-in Ethernet port QCPU.
The error cause is considered to be unauthorized access from outside of the system.

Perform the following corrective action as needed.

1) Monitor the Remote password count (SD979 to SD999) and check the connection that remote mismatch count reaches the upper limit during unlock processing.

2) Disable the communication by making the corresponding connection invalid. The corresponding connection can be set to invalid by the operation described below.

- By selecting the target connection on the Status of each connection tab, which is displayed by clicking the "Built-in Ethernet port diagnostics" button on the PLC diagnostics screen in GX Developer.
  (☞ QCPU User's Manual (Hardware Design, Maintenance and Inspection))



Target module setting: ○ Module No. 1st module ○ I/O address 0000 ● PLC No.1

Change IP address display: ● DEC ○ HEX

Connection No. /Function	Host station port number	Destination IP address	Destination port No.	Latest Error Code	Pro
1	---	0.0.0.0	---	---	
2	---	0.0.0.0	---	---	
3	1392	10.97.79.161	0F29	---	
4	---	0.0.0.0	---	---	
5	---	0.0.0.0	---	---	
6	---	0.0.0.0	---	---	
7	---	0.0.0.0	---	---	
8	---	0.0.0.0	---	---	
9	---	0.0.0.0	---	---	
10	---	0.0.0.0	---	---	
11	---	0.0.0.0	---	---	
12	---	0.0.0.0	---	---	
13	---	0.0.0.0	---	---	
14	---	0.0.0.0	---	---	
15	---	0.0.0.0	---	---	
16	---	0.0.0.0	---	---	
FTP	---	0.0.0.0	---	---	
MELSOFT direct connection	---	0.0.0.0	---	---	

Figure 3.48 Ethernet diagnosis screen

- By turning ON the forced invalidation flag (bit) of the corresponding connection using the special registers (SD1276, SD1277).

3) Clear the error (error code: 2700).
   The remote password count (SD979 to SD999) is cleared in accordance with clearing of the error.

4) Inform the system manager that the number of error completions of unlock processing is exceeding the mismatch limit and take appropriate corrective actions.

Point

To prevent such errors, perform the following operations.

- Check the checkbox of "Clear mismatch count when remote password matches" on the Remote password detail settings screen in GX Developer.
- Clear the accumulated count of remote password mismatches using the special relay (SM1273).

3.8 IP Address Change Function Note3.2

IP address of the Built-in Ethernet port can be changed by storing it in the special relay and special register, not in the Built-in Ethernet Port Setting of the PLC Parameter.

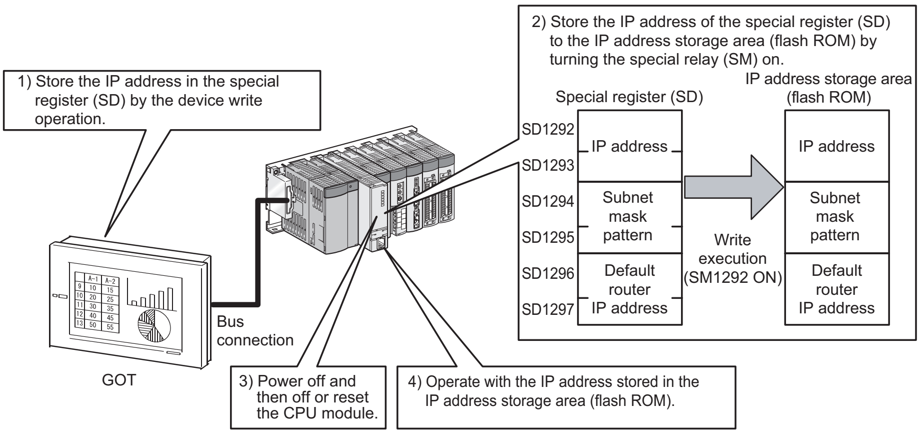

1) Store the IP address in the special register (SD) by the device write operation.
2) Store the IP address of the special register (SD) to the IP address storage area (flash ROM) by turning the special relay (SM) on.
Special register (SD)
IP address storage area (flash ROM)
SD1292
SD1293
SD1294
SD1295
SD1296
SD1297
IP address
Subnet mask pattern
Default router IP address
Write execution (SM1292 ON)
IP address
Subnet mask pattern
Default router IP address
Bus connection
GOT
3) Power off and then off or reset the CPU module.
4) Operate with the IP address stored in the IP address storage area (flash ROM).

Figure 3.49 IP address setting

Point

This function can also be used by operating values for special relay and special register from GOT.
For details on the special relay and special register using in this function, refer to the lists of the special relay and special register in the following.

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

Note3.2 Universal

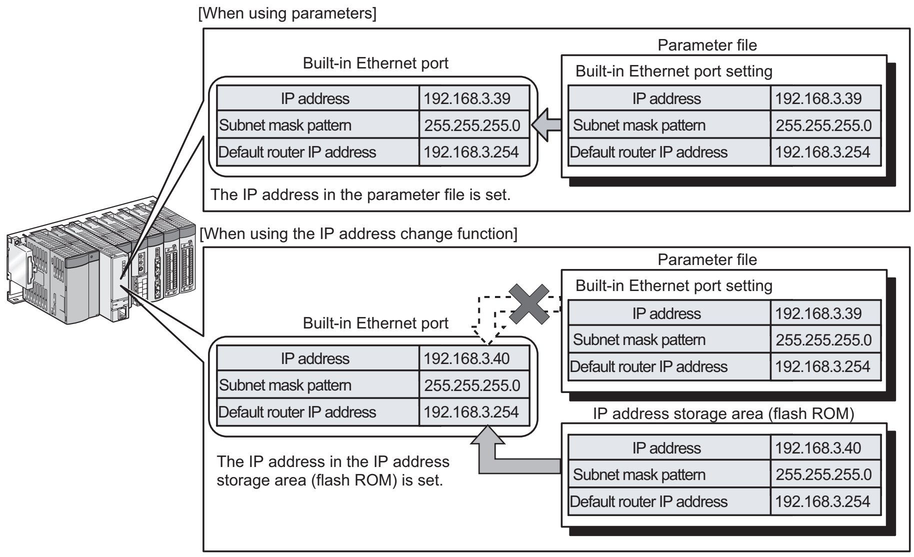
For the IP address change function, confirm the version of the CPU module. (Appendix 2)

3.8.1 IP address of the Built-in Ethernet port

(1) IP address using in 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 using the IP address change function, not the value set in the parameter but stored in the IP address storage area (flash ROM) will be set to the IP address of the Built-in Ethernet port.


[When using parameters]
Built-in Ethernet port
Parameter file
Built-in Ethernet port setting
The IP address in the parameter file is set.
[When using the IP address change function]
Parameter file
Built-in Ethernet port setting
Built-in Ethernet port
IP address storage area (flash ROM)
The IP address in the IP address storage area (flash ROM) is set.

[When using parameters]

Built-in Ethernet port

IP address	192.168.3.39
Subnet mask pattern	255.255.255.0
Default router IP address	192.168.3.254

Parameter file: Built-in Ethernet port setting

IP address	192.168.3.39
Subnet mask pattern	255.255.255.0
Default router IP address	192.168.3.254

[When using the IP address change function]

Built-in Ethernet port

IP address	192.168.3.40
Subnet mask pattern	255.255.255.0
Default router IP address	192.168.3.254

Parameter file: Built-in Ethernet port setting

IP address	192.168.3.39
Subnet mask pattern	255.255.255.0
Default router IP address	192.168.3.254

IP address storage area (flash ROM)

IP address	192.168.3.40
Subnet mask pattern	255.255.255.0
Default router IP address	192.168.3.254

Figure 3.50 IP address setting of the built-in Ethernet port

(2) Write and clear operation to the IP address storage area (flash ROM)

For using the IP address change function, write a value of IP address to the IP address storage area (flash ROM). The special relay and special register perform the write and clear operation.

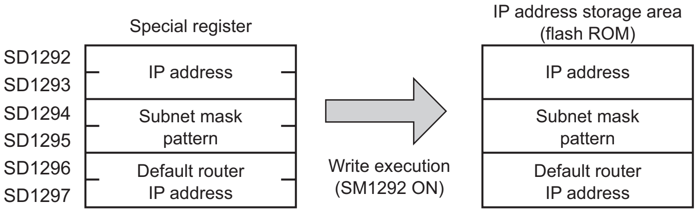

Special register
SD1292
SD1293
SD1294
SD1295
SD1296
SD1297
IP address
Subnet mask pattern
Default router IP address
Write execution (SM1292 ON)
IP address storage area (flash ROM)
IP address
Subnet mask pattern
Default router IP address

Figure 3.51 Writing to the IP address storage area (flash ROM)

(3) Execution timing of writing to and clearing the IP address storage area (flash ROM)

Write and clear operation are executed in the END processing.

Therefore, the scan time is increased during execution.

3.8.2 How to use

(1) When writing to the IP address storage area (flash ROM)

This operation can be executed by storing the IP address to be changed in SD1292 to 1297, and turning off and then on SM1292 (IP address storage area write request).

(a) Operating procedure

The following shows the write operation flow.

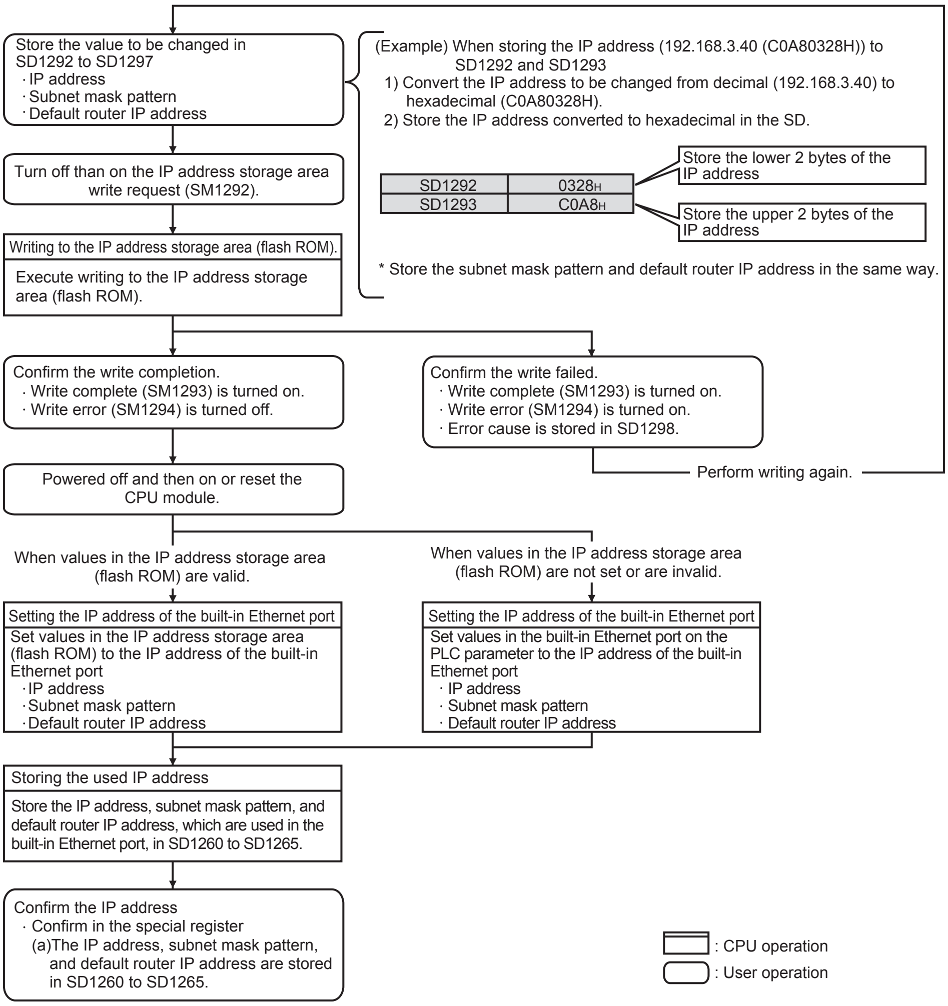

Store the value to be changed in SD1292 to SD1297
· IP address
· Subnet mask pattern
· Default router IP address
(Example) When storing the IP address (192.168.3.40 (C0A80328H)) to SD1292 and SD1293
1) Convert the IP address to be changed from decimal (192.168.3.40) to hexadecimal (C0A80328H).
2) Store the IP address converted to hexadecimal in the SD.
SD1292
0328H
SD1293
C0A8H
Store the lower 2 bytes of the IP address
Store the upper 2 bytes of the IP address
* Store the subnet mask pattern and default router IP address in the same way.
Turn off than on the IP address storage area write request (SM1292).
Writing to the IP address storage area (flash ROM).
Execute writing to the IP address storage area (flash ROM).
Confirm the write completion.
· Write complete (SM1293) is turned on.
· Write error (SM1294) is turned off.
Confirm the write failed.
· Write complete (SM1293) is turned on.
· Write error (SM1294) is turned on.
· Error cause is stored in SD1298.
Perform writing again.
Powered off and then on or reset the CPU module.
When values in the IP address storage area (flash ROM) are valid.
When values in the IP address storage area (flash ROM) are not set or are invalid.
Setting the IP address of the built-in Ethernet port
Set values in the IP address storage area (flash ROM) to the IP address of the built-in Ethernet port
· IP address
· Subnet mask pattern
· Default router IP address
Setting the IP address of the built-in Ethernet port
Set values in the built-in Ethernet port on the PLC parameter to the IP address of the built-in Ethernet port
· IP address
· Subnet mask pattern
· Default router IP address
Storing the used IP address
Store the IP address, subnet mask pattern, and default router IP address, which are used in the built-in Ethernet port, in SD1260 to SD1265.
Confirm the IP address
· Confirm in the special register
(a)The IP address, subnet mask pattern, and default router IP address are stored in SD1260 to SD1265.
: CPU operation
: User operation

Figure 3.52 Operation flow for writing to the IP address storage area (flash ROM)

(b) 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).

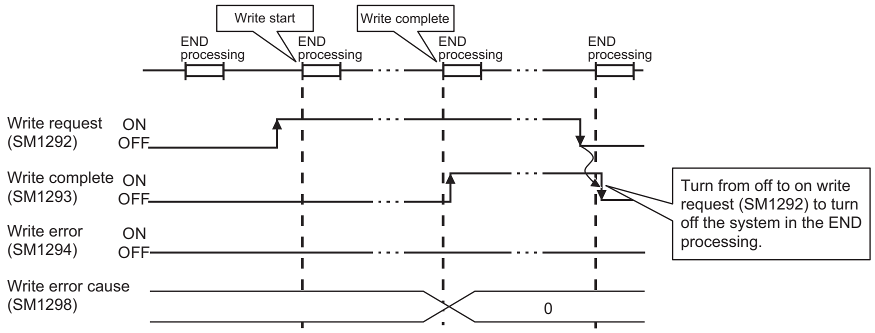


Figure 3.53 Operations of special relay and special register during the operation of writing to the IP address storage area (flash ROM)

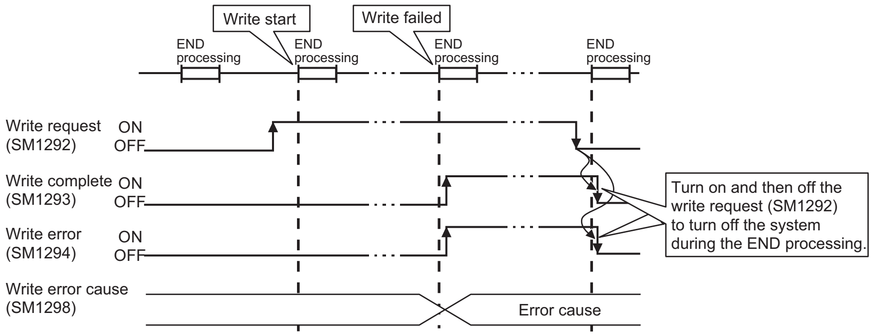


Figure 3.54 Operations of special relay and special register when the operation of writing to the IP address storage area (flash ROM) is failed

(c) Error cause by the failues of writing to the IP address storage area (flash ROM)

If the operation 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 cause).

Table3.16 Write error cause list

Value in SD1298	Error cause
100H	The value in SD1292 to 1297 is outside the setting range.
200H	An error occurred during writing.
300H	The write processing is not vailable since the following functions are in execution: • Online change • Copy program memory data into ROM • Write to PLC (flash ROM)
400H	Writing started during clear processing execution.

(d) Program example

The following shows a program example of writing to the IP address storage area (flash ROM).

1) Devices used in programs

Table3.17 Devices used in programs

Device number	Application	Device number	Application
M100	Instruction of device for writing	SM1293	IP address storage area write complete
D100 to D103 [*1]	IP Address to be changed	SM1294	IP address storage area write failed
D104 to D107 [*1]	Subnet mask pattern to be changed	M101	Write normal completion display
D108 to D111 [*1]	Default router IP address to be changed	M102	Write abnormal completion display
SD1292 to SD1297	IP address setting	SD1298	IP address storage area write error cause
SM1292	IP address storage area write request	D100	Write error cause 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

2) Sample program

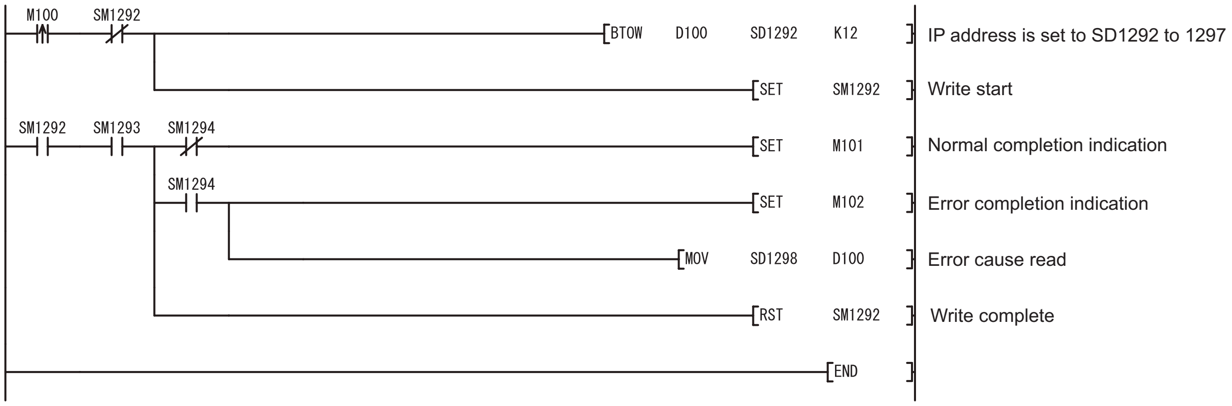


Figure 3.55 Sample program

(2) When clearing the IP address storage area (flash ROM)

This operation can be executed by turning off and then on SM1295 (IP address storage area clear request).

(a) Operating procedure

The following shows the clear operation flow.

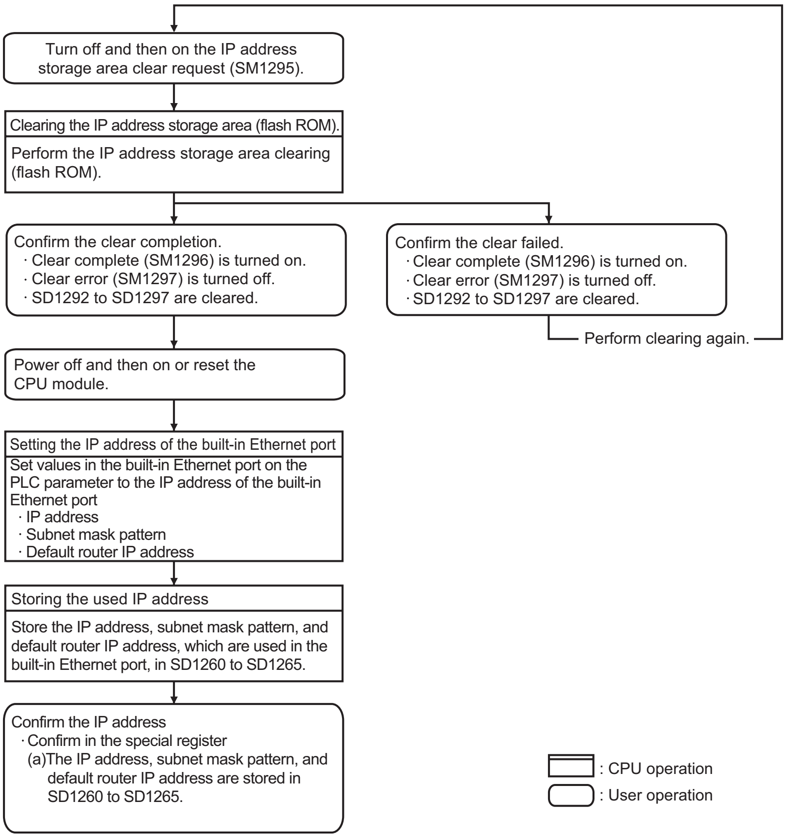

Turn off and then on the IP address storage area clear request (SM1295).
Clearing the IP address storage area (flash ROM).
Perform the IP address storage area clearing (flash ROM).
Confirm the clear completion.
· Clear complete (SM1296) is turned on.
· Clear error (SM1297) is turned off.
· SD1292 to SD1297 are cleared.
Confirm the clear failed.
· Clear complete (SM1296) is turned on.
· Clear error (SM1297) is turned off.
· SD1292 to SD1297 are cleared.
Perform clearing again.
Power off and then on or reset the CPU module.
Setting the IP address of the built-in Ethernet port
Set values in the built-in Ethernet port on the PLC parameter to the IP address of the built-in Ethernet port
· IP address
· Subnet mask pattern
· Default router IP address
Storing the used IP address
Store the IP address, subnet mask pattern, and default router IP address, which are used in the built-in Ethernet port, in SD1260 to SD1265.
Confirm the IP address
· Confirm in the special register
(a)The IP address, subnet mask pattern, and default router IP address are stored in SD1260 to SD1265.
: CPU operation
: User operation

Figure 3.56 Operation flow for clearing the IP address storage area (flash ROM)

(b) 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).

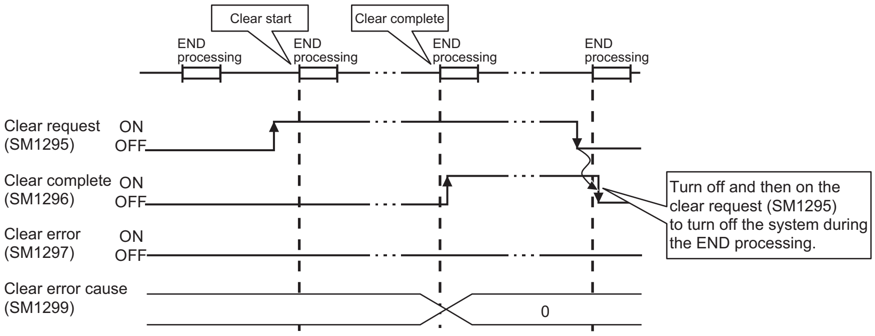

Clear start
Clear complete
END processing
END processing
END processing
END processing
Clear request (SM1295) ON OFF
Clear complete (SM1296) ON OFF
Clear error (SM1297) ON OFF
Clear error cause (SM1299)
0
Turn off and then on the clear request (SM1295) to turn off the system during the END processing.

Figure 3.57 Operations of special relay and special register during the operation of clearing the IP address storage area (flash ROM)

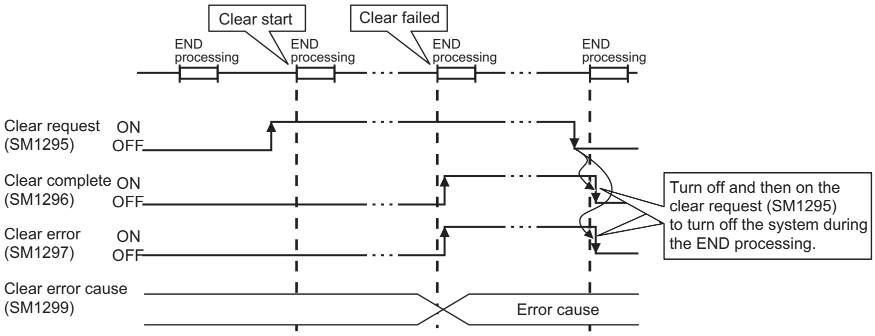

Clear start
Clear failed
END processing
END processing
END processing
END processing
Clear request (SM1295) ON OFF
Clear complete (SM1296) ON OFF
Clear error (SM1297) ON OFF
Clear error cause (SM1299)
Error cause
Turn off and then on the clear request (SM1295) to turn off the system during the END processing.

Figure 3.58 Operations of special relay and special register when the operation of clearing the IP address storage area (flash ROM) is failed

(c) Error cause by the failure of clearing the IP address storage area (flash ROM)

If the operation 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 cause).

Table3.18 Clear error cause list

Value in SD1299	Error cause
200H	An error occurred during clearing.
300H	The clear processing cannot be executed since the following functions are in execution: • Online change • Copy program memory data into ROM • Write to PLC (flash ROM)
400H	Clearing started during clear processing execution.

(d) Program example

The following shows a program example of clearing the IP address storage area (flash ROM).

1) Devices used in programs

Table3.19 Devices used in programs

Device number	Application	Device number	Application
M200	Instruction of clearing device	M201	Clear normal completion display
SM1295	IP address storage area clear request	M202	Clear abnormal completion display
SM1296	IP address storage area clear complete	SD1299	IP address storage area clear error cause
SM1297	IP address storage area clear error	D200	Clear error cause display

(3) Sample program

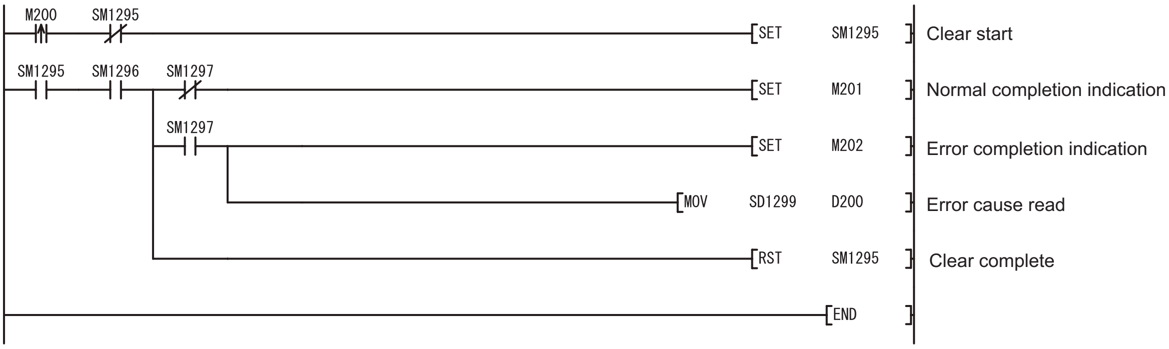


Figure 3.59 Sample program

3.8.3 Checking the IP address

(1) Checking in the Ethernet diagnostics dialog box

The IP address of the built-in CPU Ethernet port can be checked in the Ethernet diagnostics dialog box.
For details of the check, refer to the following.

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

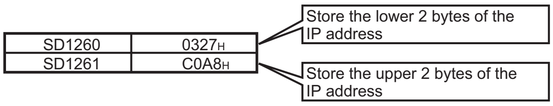
(2) Checking by the special relay and special register

The IP address of the built-in CPU Ethernet port can be checked using the special relay and special register.

- IP Address: SD1260 to 1261
- Subnet mask pattern: SD1262 to 1263
- Default router IP address: SD1264 to 1265

*1: Stored as follows.

Example When IP address is 192.168.3.39 (C0A80327$_H$)



SD1260	0327$_H$
SD1261	C0A8$_H$

Store the lower 2 bytes of the IP address

Store the upper 2 bytes of the IP address

3.8.4 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 IP address storage are (flash ROM).

(3) Functions that cannot be performed during write processing and clear processing

The following functions cannot be performed during the write to or clear processing to the IP address storage area. Therefore, perform them after the processing is completed.
Doing so may result in 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, a write to or clear will not be in process.

- Online change
- Copy program memory data into ROM
- Write to PLC (flash ROM)

(4) 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 even if a contact is turning on, off, and then on, or turning off, on, and then off in one scan.
- If SM1292 (IP address storage area write request) is turned off and then on again during 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 then on during writing to the IP address storage area (flash ROM), an error occurs in the clear operation. (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 then on in one scan, the write operation is prior to be executed and an error occurs in the clear operation.

CHAPTER4 SOCKET COMMUNICATION FUNCTION INSTRUCTIONS

This chapter describes the socket communication function instructions.
Socket communication function instructions are used in the Built-in Ethernet port QCPU to use the Socket communication function.

Table4.1 shows the list of socket communication function instructions.

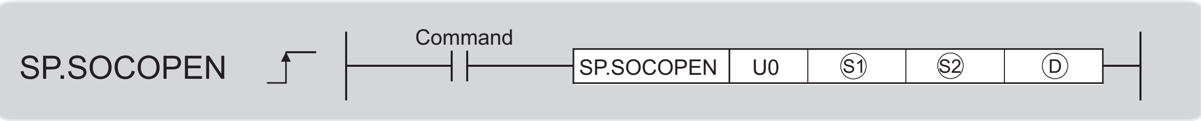
Table4.1 Socket communication function instruction list

Instruction	Description	Reference section
SP.SOCOPEN	Establishes a connection	Section 4.1
SP.SOCCLOSE	Disconnects a connection	Section 4.2
SP.SOCRCV	Reads out received data (in END processing)	Section 4.3
S.SOCRCVS	Reads out received data (upon execution)	Section 4.4
SP.SOCSND	Sends data	Section 4.5
SP.SOCCINF	Reads out connection information	Section 4.6
SP.SOCCSET	Changes communication target of UDP/IP communication	Section 4.7
SP.SOCRMODE	Changes receive mode of the connection	Section 4.8
S(P).SOCRDATA	Reads out data in the Socket communication receive data area	Section 4.9

Point

- For configuration of communication using the Socket communication function, refer to Section 3.4.
- For instructions containing a completion flag, do not change each data such as control data and request data specified by the instruction before completion of the instruction.
- Do not execute the socket communication function instruction during the interrupt program.
- For details of error codes, refer to the following.
  ☞ MELSEC-Q/L Programming Manual (Common Instruction)

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				
Ⓢ1	-	○	○	-				○	-
Ⓢ2	-	△*1	△*1	-				-	-
Ⓓ	△*1	-	△*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 which stores control data	User, system	Device name
Ⓓ	Start number of the device which turns on during one scan upon completion of the instruction Ⓓ+1 also turns on when completed in error.	System	Bit

*2: The "Set by" section indicates the following.
User : The data must be set before executing the SP.SOCOPEN instruction.
System: The CPU module stores 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 type/ completion type	Whether to use settings configured with GX Developer or the control data S2+2 to S2+9 is specified in open process for a connection 0000H: Connection is opened according to the settings set in "Open settings" in GX Developer 8000H: Connection is opened according to the settings specified in the control data S2+2 to S2+9.	0000H 8000H	User
S2+1	Completion status	Completion status is stored 0000H: Normal completion Other than 0000H: Error completion (Error code)	-	System
S2+2	Application setting area	b15 b14 b13 ~ b10 b9 b8 b7 ~ b0 S2+2 [3] 0 [2] [1] 0 [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	-	User
S2+3	Host station port number	Port number of host station is specified	1H to 1387H 1392H to FFFEH (400H and higher recommended)	
S2+4 S2+5	External device IP address*4	IP address of the external device (communication target) is specified	1H to FFFFFFFFH (FFFFFFFFH: Simultaneous broadcast)	
S2+6	External device port number*4	Port number of the external device (communication target) is specified	1H to FFFFH (FFFFH: Simultaneous broadcast)	
S2+7 to S2+9	-	Use prohibited	-	System

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

*4 : When the connection was opened in Unpassive, the IP address and port number of the external device (communication target) is ignored.

Point

Using the port number 400H higher is recommended since the port number 1H to 3FFH are generally reserved (WELL KNOWN PORT NUMBERS).

(3) Function

(a) This instruction opens a connection specified by S1. The setting value used in the open processing is selected by S2+0.

(b) To confirm whether the SP.SOCOPEN instruction is completed, use the completion device Ⓓ+0 or Ⓓ+1.

1) Completion device Ⓓ+0

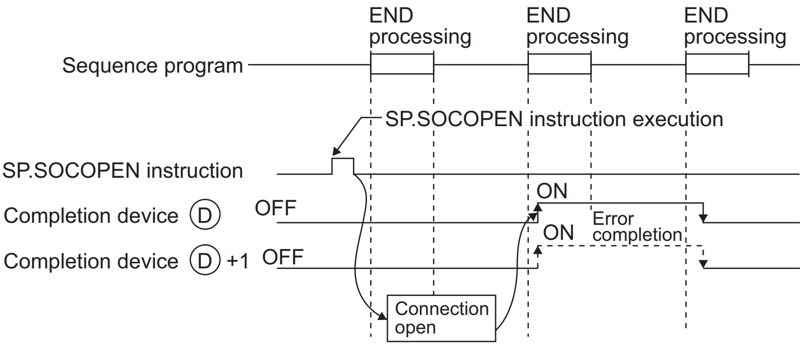
Turns on in the END processing of a scan after the SP.SOCOPEN instruction is completed and turns off in the next END processing.

2) Completion device Ⓓ+1

Turns on or off according to the status after the SP.SOCOPEN instruction is completed.

Normal completion: Remains off.

Error completion : Turns on in the END processing of a scan after the SP.SOCOPEN instruction is completed and turns off in the next END processing.



3) A connection with no parameters (protocol is not specified) can be used. In this case, specify 8000H to S2+0 (execution type/completion type) and configure open settings to S2+2 to S2+9.

(4) Error

An operation processing error which turns on the Error flag (SM0) will occur, and a corresponding error code is stored in SD0 when:

- When the instruction is executed in the CPU module of the Built-in Ethernet port QCPU with the first 5 digits of the serial number, which is older than "11011" or other than the Built-in Ethernet port QCPU.

(Error code: 4002)

- The connection number specified in S1 is other than 1 to16.

(Error code: 4101)

- The device points of the devices specified by S2 and Ⓓ are exceeding the limit.

(Error code: 4101)

- Invalid device is specified.

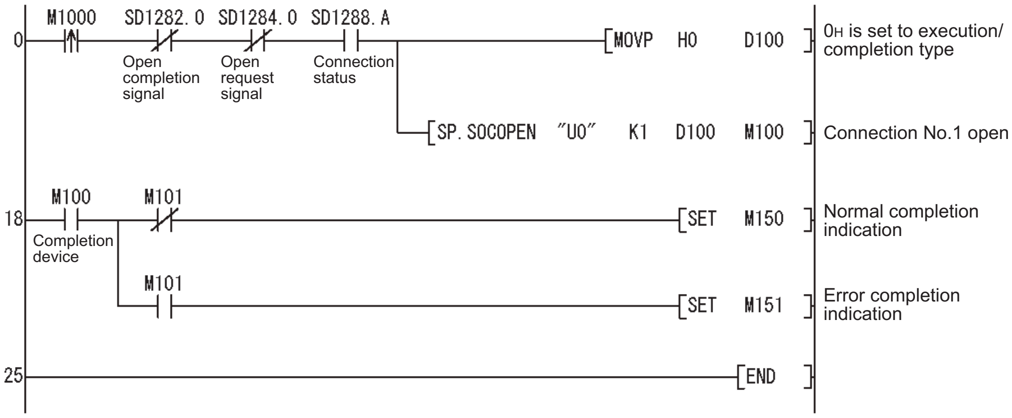
(Error code: 4004)

(5) Program example

(a) Opening a connection using parameter settings

In the following programs, Connection No.1 is opened using parameters set in "Open settings" of PLC parameter in GX Developer upon turning on M1000.

[Ladder mode]



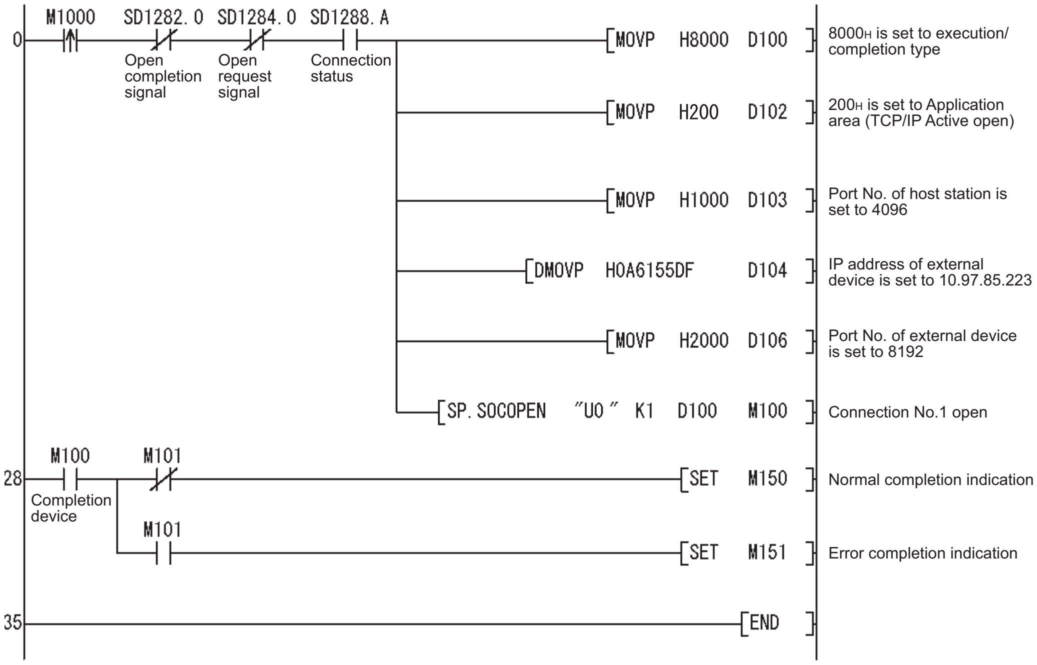
[List mode]

Step	Instruction	Device
0	LDP	M1000
1	ANI	SD1282.0
2	ANI	SD1284.0
3	AND	SD1288.A
4	MOVP	H0 D100
6	SP.SOCOPEN	"U0" K1 D100 M100
18	LD	M100
19	MPS	
20	ANI	M101
21	SET	M150
22	MPP	
23	AND	M101
24	SET	M151
25	END	

(b) Opening a connection using control data settings

In the following programs, Connection No.1 is opened using control data upon turning on M1000.

[Ladder mode]

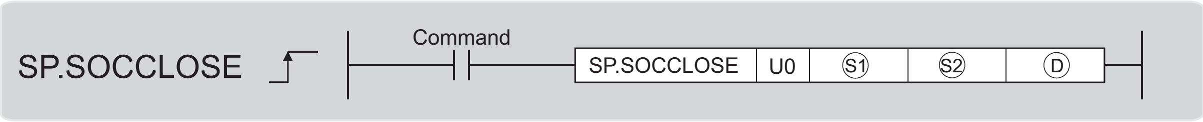

0
M1000
SD1282.0
Open completion signal
SD1284.0
Open request signal
SD1288.A
Connection status
MOVP H8000 D100
8000H is set to execution/ completion type
MOVP H200 D102
200H is set to Application area (TCP/IP Active open)
MOVP H1000 D103
Port No. of host station is set to 4096
DMOVP H0A6155DF D104
IP address of external device is set to 10.97.85.223
MOVP H2000 D106
Port No. of external device is set to 8192
SP.SOCOPEN "U0" K1 D100 M100
Connection No.1 open
28
M100
Completion device
M101
SET M150
Normal completion indication
M101
SET M151
Error completion indication
35
END

[List mode]

```
Step  Instruction  Device

 0   LDP          M1000
 1   ANI          SD1282.0
 2   ANI          SD1284.0
 3   AND          SD1288.A
 4   MOVP         H8000     D100
 6   MOVP         H200      D102
 8   MOVP         H1000     D103
10   DMOVP        H0A6155DF          D104
13   MOVP         H2000     D106
15   SP.SOCOPEN   "U0"      K1       D100      M100
28   LD           M100
29   MPS
30   ANI          M101
31   SET          M150
32   MPP
33   AND          M101
34   SET          M151
35   END
```

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				
Ⓢ1	-	○	○	-				○	-
Ⓢ2	-	△*1	△*1	-				-	-
Ⓓ	△*1	-	△*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 which stores control data	System	Device name
Ⓓ	Start number of the device which turns on during one scan upon completion of the instruction Ⓓ+1 also turns on when completed in error.		Bit

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

Point

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

(2) Control data

Device	Item	Description	Setting range	Set by*3
Ⓢ2+0	System area	-	-	-
Ⓢ2+1	Completion status	Completion status is stored 0000H: Normal completion Other than 0000H: Error completion (Error code)	-	System

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

(3) Function

(a) This instruction closes a connection specified by Ⓢ1. (Disconnection of a connection)

(b) To confirm whether the SP.SOCCLOSE instruction is completed, use the completion device Ⓓ+0 and Ⓓ+1.

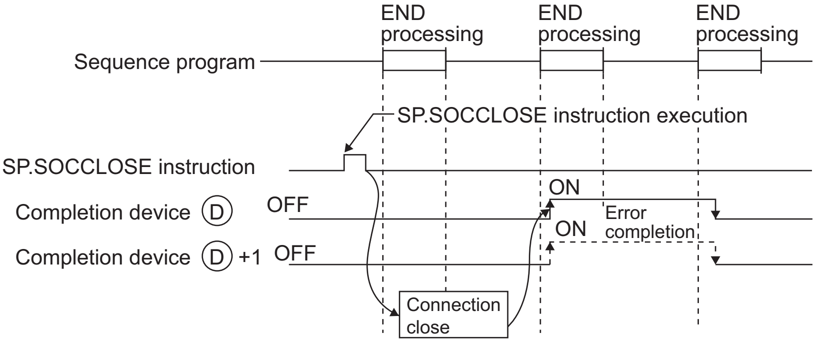
1) Completion device Ⓓ+0

Turns on in the END processing of a scan after the SP.SOCCLOSE instruction is completed and turns off in the next END processing.

2) Completion device Ⓓ+1

Turns on or off according to the status after the SP.SOCCLOSE instruction is completed.

Normal completion	: Remains off.
Error completion	: Turns on in the END processing of a scan after the SP.SOCCLOSE instruction is completed and turns off in the next END processing.



(4) Error

An operation processing error which turns on the Error flag (SM0) will occur, and a corresponding error code is stored in SD0 when:

- When the instruction is executed in the CPU module of the Built-in Ethernet port QCPU with the first 5 digits of the serial number, which is older than "11011" or other than the Built-in Ethernet port QCPU.
  (Error code: 4002)
- The connection number specified in Ⓢ1 is other than 1 to16.
  (Error code: 4101)
- The device points of the devices specified by Ⓢ2 and Ⓓ are exceeding the limit.
  (Error code: 4101)
- Invalid device is specified.
  (Error code: 4004)

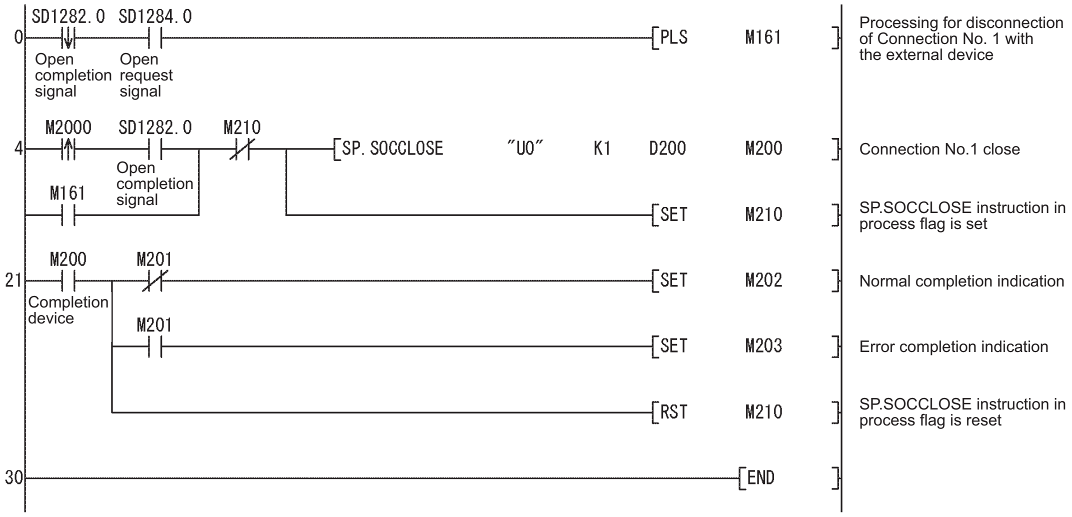
Remark

When specifying the connection that is waiting for the SP.SOCCLOSE instruction in TCP Passive, both the SP.SOCOPEN and SP.SOCCLOSE instructions complete normally and the connection is closed.

(5) Program example

In the following programs, Connection No.1 is disconnected upon turning on M2000 or when the external device (communication target) disconnect Connection No.1.

[Ladder mode]

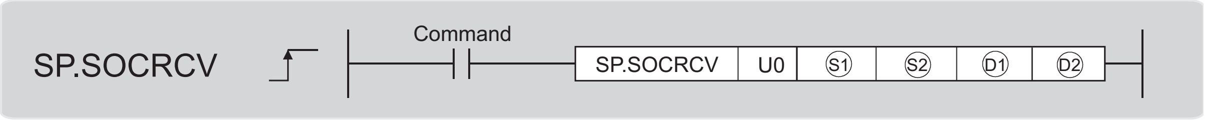

SD1282.0
SD1284.0
0
Open completion signal
Open request signal
PLS M161
Processing for disconnection of Connection No. 1 with the external device
M2000
SD1282.0
M210
4
Open completion signal
M161
SP.SOCCLOSE "U0" K1 D200 M200
Connection No.1 close
SET M210
SP.SOCCLOSE instruction in process flag is set
M200
M201
21
Completion device
SET M202
Normal completion indication
M201
SET M203
Error completion indication
RST M210
SP.SOCCLOSE instruction in process flag is reset
30
END

[List mode]

```
Step   Instruction   Device

  0   LDF          SD1282.0
  1   AND          SD1284.0
  2   PLS          M161
  4   LDP          M2000
  5   AND          SD1282.0
  6   OR           M161
  7   ANI          M210
  8   SP.SOCCLOSE  "U0"     K1      D200     M200
 20   SET          M210
 21   LD           M200
 22   MPS
 23   ANI          M201
 24   SET          M202
 25   MRD
 26   AND          M201
 27   SET          M203
 28   MPP
 29   RST          M210
 30   END
```

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				
S1	-	○	○	-				○	-
S2	-	△*1	△*1	-				-	-
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*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 which specifies control data	System	Device name
D1	Start number of the device which stores received data		
D2	Start number of the device which turns on during one scan upon completion of the instruction D2+1 also turns on when completed in error		Bit

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

Point

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

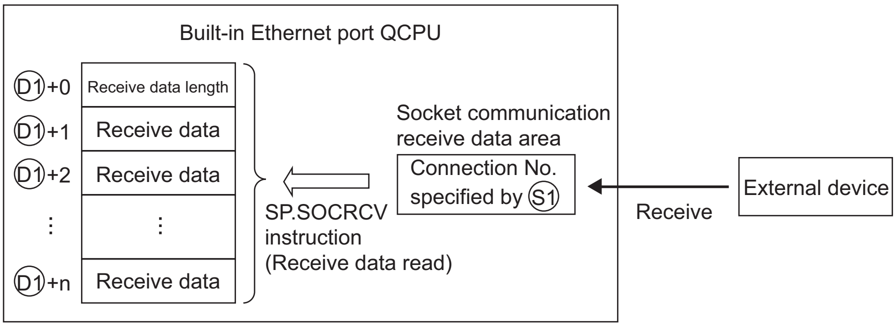
(2) Control data

Device	Item	Description	Setting range	Set by[*3]
S2 +0	System area	-	-	-
S2 +1	Completion status	Completion status is stored. 0000H: Normal completion Other than 0000H: Error completion (Error code)	-	System
D1 +0	Receive data length	Data length of the data which were read out from the Socket communication receive data area is stored (in bytes).	0 to 2046	
D1 +1 to D1 +n	Receive data	Data length of the data which were read out from the Socket communication receive data area is stored in the order of smaller address.	-	

*3 : The Set by section indicates the following.
System: The CPU module stores execution result of the SP.SOCRCV instruction.

(3) Function

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

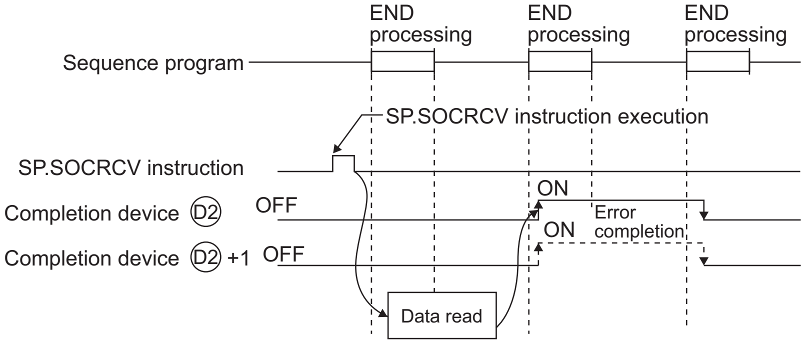

Built-in Ethernet port QCPU
D1+0
Receive data length
D1+1
Receive data
D1+2
Receive data
D1+n
Receive data
SP.SOCRCV instruction (Receive data read)
Socket communication receive data area
Connection No. specified by S1
Receive
External device

(b) To confirm whether the SP.SOCRCV instruction is completed, use the completion device D2+0 or D2+1.

1) Completion device D2+0
Turns on in the END processing of a scan after the SP.SOCRCV instruction is completed and turns off in the next END processing.

2) Completion device D2+1
Turns on or off according to the status after the SP.SOCRCV instruction is completed.

Normal completion : Remains off
Error completion : Turns on in the END processing of a scan after the SP.SOCRCV instruction is completed and turns off in the next END processing.



(4) Error

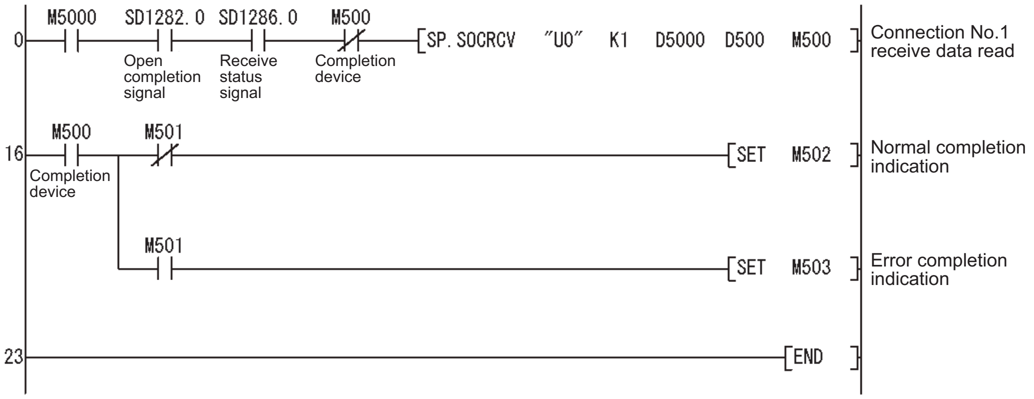
An operation processing error which turns on the Error flag (SM0) will occur, and a corresponding error code is stored in SD0 when:

- When the instruction is executed in the CPU module of the Built-in Ethernet port QCPU with the first 5 digits of the serial number, which is older than "11011" or other than the Built-in Ethernet port QCPU.
  (Error code: 4002)
- The connection number specified in Ⓢ1 is other than 1 to16.
  (Error code: 4101)
- The received data size is exceeding that of the received data storage location.
  (Error code: 4101)
- The device points of the devices specified by Ⓢ2, Ⓓ1 and Ⓓ2 are exceeding the limit.
  (Error code: 4101)
- Invalid device is specified.
  (Error code: 4004)

(5) Program example

In the following programs, data received from the external device is read out upon turning on M5000.

[Ladder mode]



[List mode]

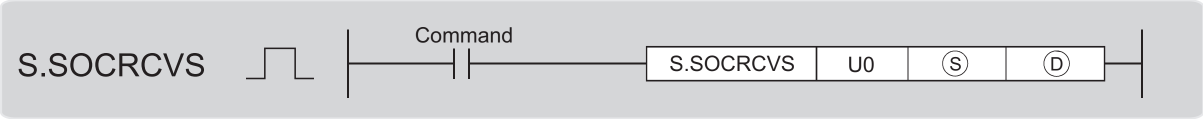
```
Step   Instruction   Device

  0  LD          M5000
  1  AND         SD1282.0
  2  AND         SD1286.0
  3  ANI         M500
  4  SP.SOCRCV   "U0"   K1   D5000   D500   M500
 16  LD          M500
 17  MPS
 18  ANI         M501
 19  SET         M502
 20  MPP
 21  AND         M501
 22  SET         M503
 23  END
```

Point

- To avoid receiving large amounts of data, the amount 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 normally closed contact.

4.4 Reading Out Receive 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 which stores received data	System	Device name

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

Point

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

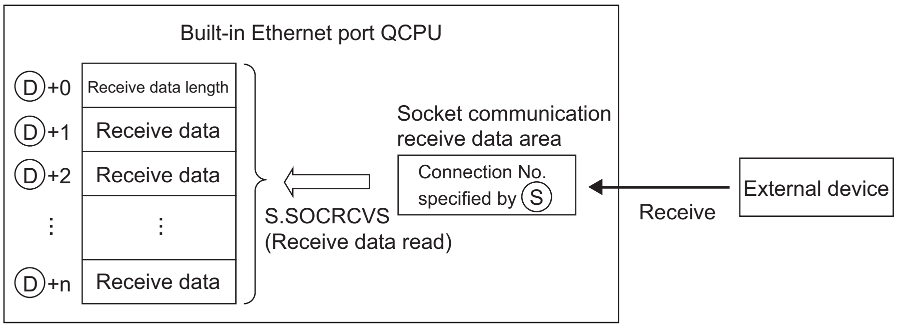
(2) Control data

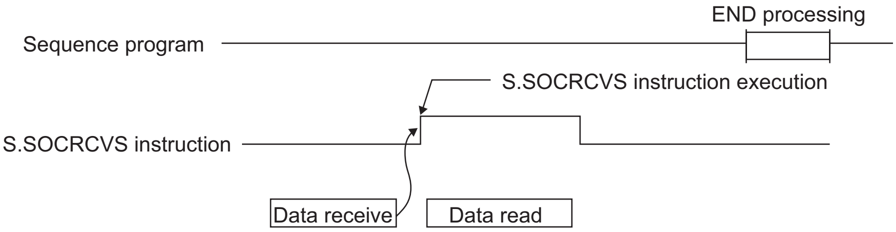
Device	Item	Description	Setting range	Set by[*2]
Ⓓ+0	Receive data length	Data length of the data which were read out from the Socket communication receive data area is stored (in bytes).	0 to 2046	System
Ⓓ+1 to Ⓓ+n	Receive data	Data length of the data which were read out from the Socket communication receive data area is stored in the order of smaller address.	-	

*2 : The Set by section indicates the following.
System: The CPU module stores execution result of the S.SOCRCVS instruction.

(3) Function

(a) This instruction reads out received data of the connection specified by Ⓢ from the Socket communication receive data area.





(4) Error

An operation processing error which turns on the Error flag (SM0) will occur, and a corresponding error code is stored in SD0 when:

- When the instruction is executed in the CPU module of the Built-in Ethernet port QCPU with the first 5 digits of the serial number, which is older than "11011" or other than the Built-in Ethernet port QCPU.

  (Error code: 4002)

- The connection number specified in Ⓢ1 is other than 1 to16.

  (Error code: 4101)

- The received data size is exceeding that of the received data storage location.

  (Error code: 4101)

- The device points of the devices specified by Ⓓ are exceeding the limit.

  (Error code: 4101)

- Invalid device is specified.

  (Error code: 4004)

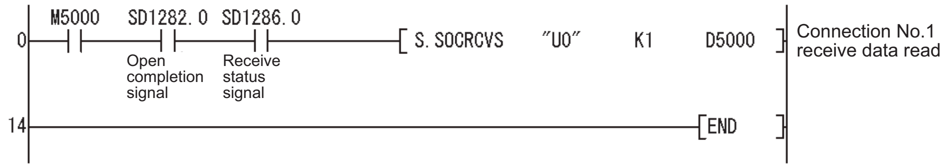
(5) Precaution

(a) Do not use this instruction and the SP.SOCRCV instruction in turn to read out receive data of one and the same connection.

(6) Program example

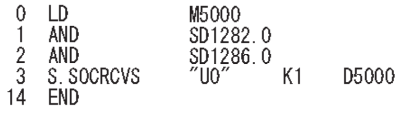
In the following programs, data received from the external device are read out upon turning on M5000.

[Ladder mode]



[List mode]

Step	Instruction	Device

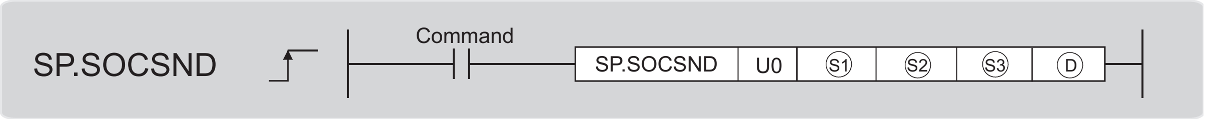


```
 0  LD          M5000
 1  AND         SD1282.0
 2  AND         SD1286.0
 3  S.SOCRCVS   "U0"     K1    D5000
14  END
```

Point

- To avoid receving large amounts of data, the amount can be limited by setting the receive data size using the SP.SOCRMODE instruction.
- Data reception can be speeded up by programming the receive process at the beginning of a scan program.

4.5 Sending Data (SP.SOCSND)



Setting data	Internal device		R,ZR	J□\□		U□\G□	Zn	Constant K,H	Others
	Bit	Word		Bit	Word				
Ⓢ1	-	○	○	-				○	-
Ⓢ2	-	△*1	△*1	-				-	-
Ⓢ3	-	○	○	-				-	-
Ⓓ	△*1	-	△*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 which specifies control data	System	Device name
Ⓢ3	Start number of the device which stores send data	User	
Ⓓ	Start number of the device which turns on during one scan upon completion of the instruction Ⓓ+1 also turns on when completed in error	System	Bit

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

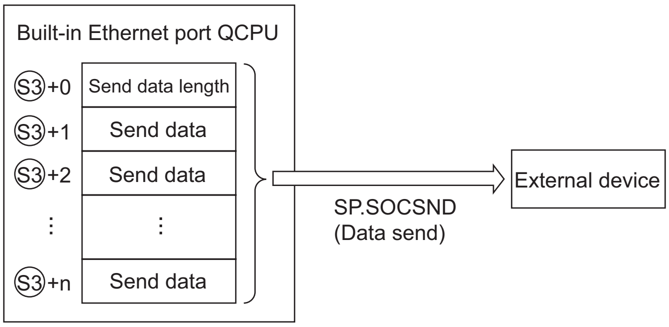
(2) Control data

Device	Item	Description	Setting range	Set by[*3]
S2+0	System area	-	-	-
S2+1	Completion status	Completion status is stored. 0000H: Normal completion Other than 0000H: Error completion (Error code)	-	System
S3+0	Send data length	Send data length is specified (in bytes).	1 to 2046	User
S3+1 to S3+n	Send data	Send data is specified.	-	

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

(3) Function

(a) This instruction sends data set to S3 to the external device specified by S1.



(b) To confirm whether the SP.SOCSND instruction is completed, use the completion device D+0 or D+1.

1) Completion device D+0

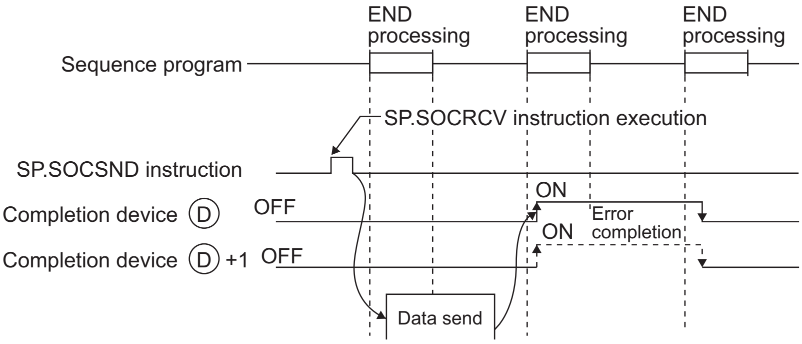
Turns on in the END processing of a scan after the SP.SOCSND instruction is completed and turns off in the next END processing.

2) Completion device D+1

Turns on or off according to the status after the SP.SOCSND instruction is completed.

Normal completion : Remains off.

Error completion : Turns on in the END processing of a scan after the SP.SOCSND instruction is completed and turns off in the next END processing.



(4) Error

An operation processing error which turns on the Error flag (SM0) will occur, and a corresponding error code is stored in SD0 when:

- When the instruction is executed in the CPU module of the Built-in Ethernet port QCPU with the first 5 digits of the serial number, which is older than "11011" or other than the Built-in Ethernet port QCPU.

  (Error code: 4002)
- The connection number specified in Ⓢ1 is other than 1 to16.

  (Error code: 4101)
- The device points of the devices specified by Ⓢ2, Ⓢ3, and Ⓓ are exceeding the limit.

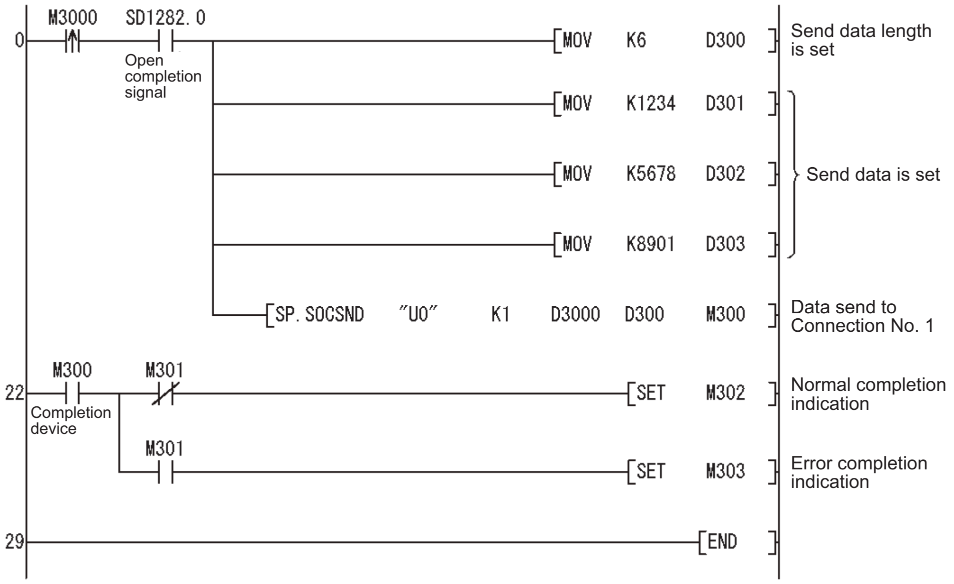
  (Error code: 4101)
- Invalid device is specified.

  (Error code: 4004)

(5) Program example

In the following programs, data (1234, 5678, and 8901) are sent to the external device in the socket communication upon turning on M3000.

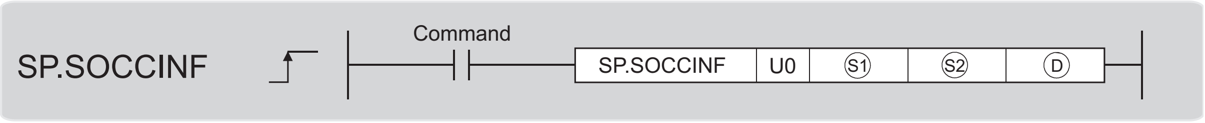
[Ladder mode]



[List mode]

```
Step   Instruction      Device
   0   LDP              M3000
   1   AND              SD1282.0
   2   MOV              K6        D300
   4   MOV              K1234     D301
   6   MOV              K5678     D302
   8   MOV              K8901     D303
  10   SP.SOCSND        "U0"      K1    D3000   D300   M300
  22   LD               M300
  23   MPS
  24   ANI              M301
  25   SET              M302
  26   MPP
  27   AND              M301
  28   SET              M303
  29   END
```

4.6 Reading Out Connection Information (SP.SOCCINF)



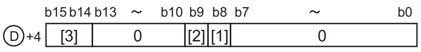
Setting data	Internal device		R,ZR	J□\□		U□\G□	Zn	Constant K,H	Others
	Bit	Word		Bit	Word				
S1	-	○	○	-				○	-
S2	-	○	○	-				-	-
D	-	○	○	-				-	-

(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 which stores control data	System	Device name
D	Start number of the device which stores connection information		

*1 : The Set by section indicates the following.
User : The data must be set before executing the SP.SOCCINF instruction.
System: The CPU module stores 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. 0000H: Normal completion Other than 0000H: Error completion (Error code)	-	System
D+0 D+1	External device IP address	IP address of the external device (communication target) is stored.	1H to FFFFFFFFH 0H: No external device (FFFFFFFFH: Simultaneous broad cast)	
D+2	External device port number	Port number of the external device (communication target) is stored.	1H to FFFFH (FFFFH: Simultaneous broad cast)	
D+3	Host station port number	Port number of host station is stored.	1H to 1387H 1392H to FFFEH	
D+4	Application setting area	 b15 b14 b13 ~ b10 b9 b8 b7 ~ b0 D+4 [3] 0 [2] [1] 0 [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	-	

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

(3) Function

(a) This instruction reads out connection information specified by S1.

(4) Error

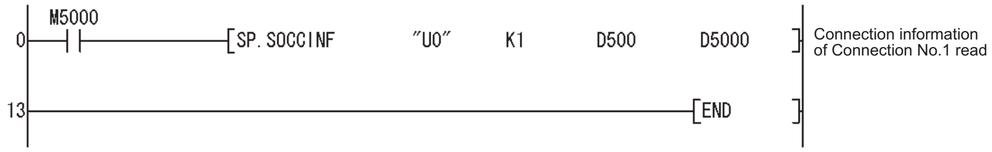
An operation processing error which turns on the Error flag (SM0) will occur, and a corresponding error code is stored in SD0 when:

- When the instruction is executed in the CPU module of the Built-in Ethernet port QCPU with the first 5 digits of the serial number, which is older than "11011" or other than the Built-in Ethernet port QCPU.
  (Error code: 4002)
- The connection number specified in S1 is other than 1 to16.
  (Error code: 4101)
- The device points of the devices specified by S2 and D are exceeding the limit.
  (Error code: 4101)
- Invalid device is specified.
  (Error code: 4004)

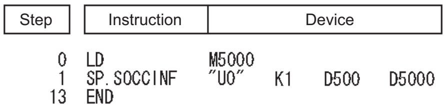
(5) Program example

In the following programs, connection information of Connection No.1 is read out upon turning on M5000.

[Ladder mode]



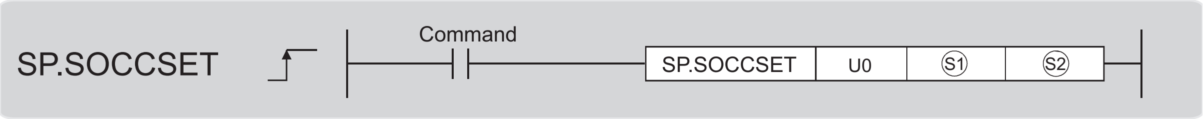
[List mode]



```
Step   Instruction   Device

   0   LD            M5000
   1   SP.SOCCINF    "U0"   K1   D500   D5000
  13   END
```

4.7 Changing Communication 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				
Ⓢ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 which stores control data	User, System	Device name

*1 : The Set by section 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.

(2) Control data

Device	Item	Description	Setting range	Set by[*2]
Ⓢ2+0	System area	-	-	-
Ⓢ2+1	Completion status	Stores completion status. 0000H: Normal completion Other than 0000H: Error completion (Error code)	-	System
Ⓢ2+2 Ⓢ2+3	External device IP address	IP address of the external device (communication target) is specified.	1H to FFFFFFFFH (FFFFFFFFH: Simultaneous broadcast)	User
Ⓢ2+4	External device port number	Port number of the external device (communication target) is specified.	1H to FFFFH (FFFFH: Simultaneous broadcast)	

*2 : The Set by section 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

(a) This instruction changes the IP address and port number of the external device (communication target) of which connection is specified by Ⓢ1. Note that this is available only in UDP/IP communications.

Point

- The external device (communication target) can be changed without closing the connection by using the SP.SOCCSET instruction.
- The following shows the timings when the set value become valid at the execution timing of the SP.SOCCSET instruction:
  - When some data exist in the socket communication receive data area: the set value becomes valid after the SP.SOCRCV instruction or S.SOCRCVS instruction is executed only once and after the SP.SOCCSET instruction is executed.
  - When no data exists in the socket communication receive data area: the set value becomes valid after the SP.SOCCSET instruction is executed.

(4) Error

An operation processing error which turns on the Error flag (SM0) will occur, and a corresponding error code is stored in SD0 when:

- When the instruction is executed in the CPU module of the Built-in Ethernet port QCPU with the first 5 digits of the serial number, which is older than "11011" or other than the Built-in Ethernet port QCPU.
(Error code: 4002)
- The connection number specified in S1 is other than 1 to16
(Error code: 4101)
- The device specified by S2 is exceeding the limit.
(Error code: 4101)
- Invalid device is specified.
(Error code: 4004)

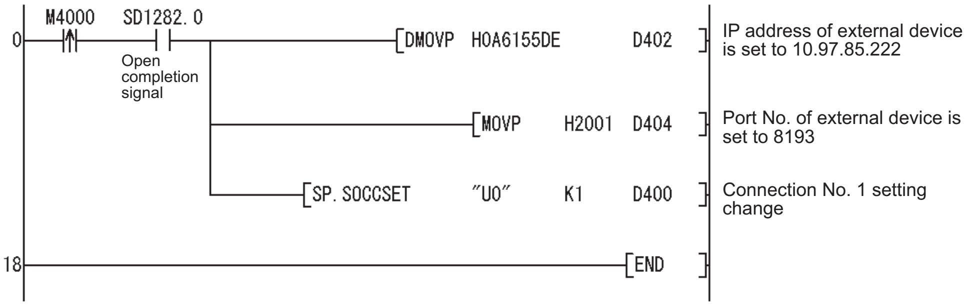
(5) Precaution

(a) Do not change the external device (communication target) using the SP.SOCCSET instruction while the SP.SOCSND instruction is in process.

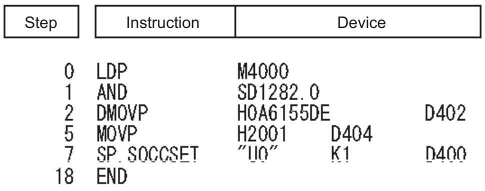
(6) Program example

In the following programs, the connection destination (IP address and port number of the communication target) of Connection No.1, which is opened, is changed upon turning on M4000.

[Ladder mode]


0
M4000
SD1282.0
Open completion signal
DMOVP H0A6155DE D402
IP address of external device is set to 10.97.85.222
MOVP H2001 D404
Port No. of external device is set to 8193
SP.SOCCSET "U0" K1 D400
Connection No. 1 setting change
18
END

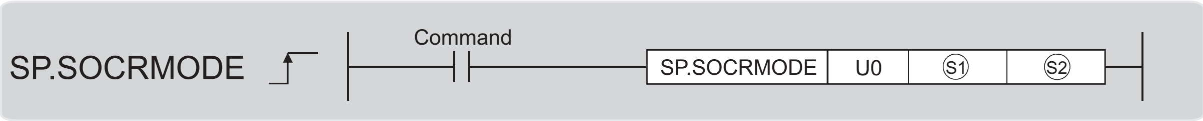
[List mode]



Step	Instruction	Device

```
 0  LDP         M4000
 1  AND         SD1282.0
 2  DMOVP       H0A6155DE          D402
 5  MOVP        H2001     D404
 7  SP.SOCCSET  "U0"      K1       D400
18  END
```

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 which stores control data	User, System	Device name

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

(2) Control data

Device	Item	Description	Setting range	Set by[*2]
S2 +0	System area	-	-	-
S2 +1	Completion status	Completion status is stored. 0000H: Normal completion Other than 0000H: Error completion (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 2046	

*2 : Disabled for connections in communication on UDP
*3 : The Set by section indicates the following.
User : The data must be set before executing the SP.SOCRMODE instruction.
System: The CPU module stores execution result of the SP.SOCRMODE instruction.

(3) Function

(a) This instruction changes the TCP receive mode (not available for communications on UDP) and receive data size of the connection specified by Ⓢ1.

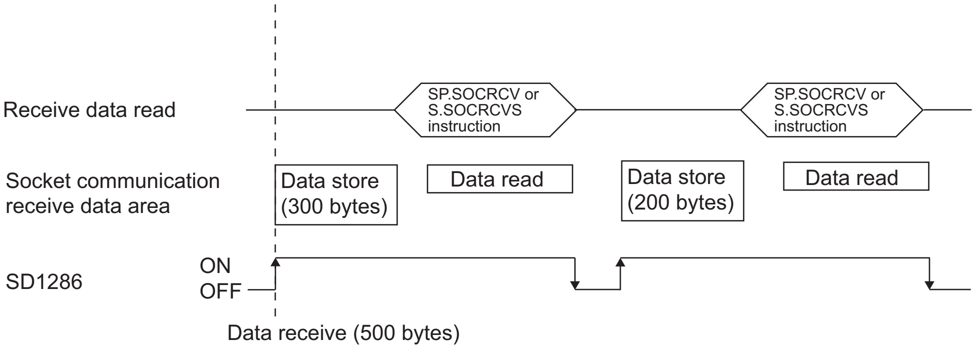
(b) The mode is changed as specified by Ⓢ2+2.

1) TCP standard receive mode

Once data are received, the data are stored in the Socket communication receive data area, and SD1286 turns on.

When the received data size exceeds the specified size, only data within the specified size are received and the rest are regarded as the next data.

Example When the receive data size is set to 300 bytes, and 500-byte data are received



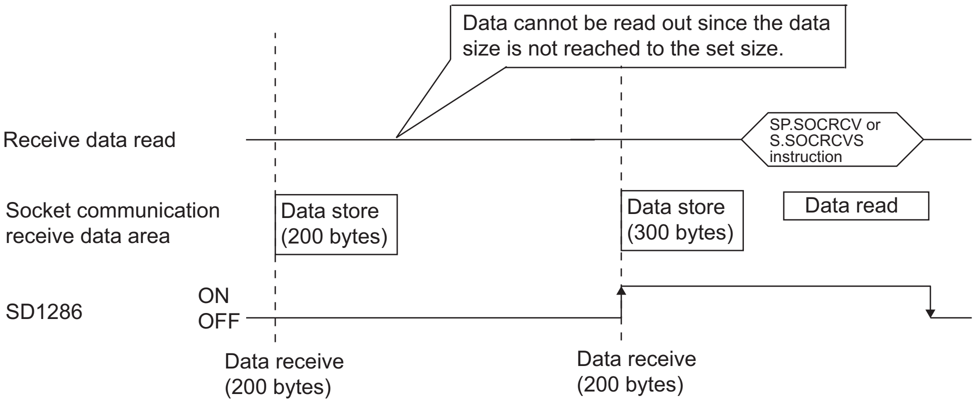
2) TCP fixed-length receive mode

Once data are received, the data are stored in the Socket communication receive data area, but SD1286 does not turn on until data size reaches to the fixed size.

Data are repeatedly received and once the data size reaches to the fixed size, SD1286 turns on.

When the received data size exceeds the specified size, only data within the specified size are received and the rest are regarded as the next data.

Example When the receive data size is set to 300 bytes, and 200-byte data are consecutively received


Data cannot be read out since the data size is not reached to the set size.
Receive data read
SP.SOCRCV or S.SOCRCVS instruction
Socket communication receive data area
Data store (200 bytes)
Data store (300 bytes)
Data read
SD1286
ON
OFF
Data receive (200 bytes)
Data receive (200 bytes)

Point

- Effective use of devices
  Devices can be effectively used by setting the receive data size to less than 1024 words even though devices for receive data storage used in the SP.SOCRCV and S.SOCRCVS instructions require 1024 words by default.
- Preventing receive data partition
  Data from the external device may be partitioned depending on the line type. To prevent this, specify the receive data size using the TCP fixed-length receive mode.
- Preventing receive data binding
  Separately sent data may be bound depending on the external device due to delay in receive processing of the programmable controller.
  To prevent this, specify the receive data size using the TCP fixed-length receive mode.

Remark

The timing for the set values to take effect depends on the timing of the SP.SOCRMODE instruction execution.

- Before open: Values take effect after open
- When there are data in the Socket communication receive data area:
  Values take effect when the SP.SOCRCV orS.SOCRCVS instruction is executed once after the S.SOCRMODE instruction is executed.
- When there is no data in the Socket communication receive data area:
  Values take effect after the SP.SOCRMODE instruction is executed.

(4) Error

An operation processing error which turns on the Error flag (SM0) will occur, and a corresponding error code is stored in SD0 when:

- When the instruction is executed in the CPU module of the Built-in Ethernet port QCPU with the first 5 digits of the serial number, which is older than "11011" or other than the Built-in Ethernet port QCPU.

  (Error code: 4002)
- The connection number specified in Ⓢ1 is other than 1 to16.

  (Error code: 4101)
- The device points of the devices specified by Ⓢ2 are exceeding the limit.

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

  (Error code: 4004)

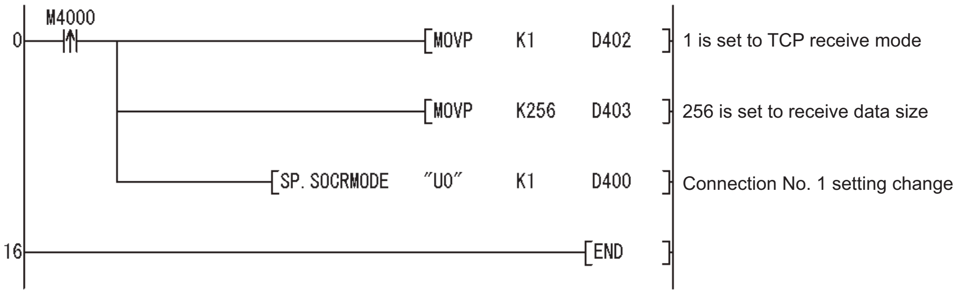
Remark

When the Receive status signal does not turn on in the TCP fixed-length receive mode, whether the data sent from the external device is adequate or not can be checked by reading out the data received as of this moment, using the SP.SOCRDATA instruction.

(5) Program example

In the following programs, Connection No.1 is set to the TCP fixed-length receive mode and the receive data size is set to 256 bytes upon turning on M4000.
After executing the instruction, Connection No.1 turns on the Receive status signal when receive data size reaches to 256 bytes.

[Ladder mode]



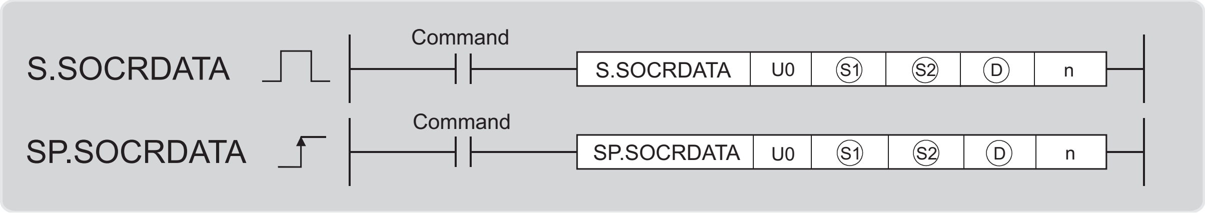
```
    M4000
 0 ─┤↑├──┬────────────────────[MOVP        K1     D402 ]  1 is set to TCP receive mode
         ├────────────────────[MOVP        K256   D403 ]  256 is set to receive data size
         └──────[SP.SOCRMODE  "U0"        K1     D400 ]  Connection No. 1 setting change
16 ──────────────────────────────────────[END          ]
```

[List mode]

Step	Instruction	Device

```
 0  LDP          M4000
 1  MOVP         K1       D402
 3  MOVP         K256     D403
 5  SP.SOCRMODE  "U0"     K1       D400
16  END
```

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	-	○	○	-				-	-
Ⓓ	-	○	○	-				-	-
n1	-	○	○	-				○	-

(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 which stores control data		Device name
Ⓓ	Start number of the device which stored read data		
n1	Number of read data (1 to 1024 words)		BIN 16-bit

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

(2) Control data

Device	Item	Description	Setting range	Set by*2
Ⓢ2 +0	System area	-	-	-
Ⓢ2 +1	Completion status	Stores completion status. 0000H: Normal completion Other than 0000H: Error completion (Error code)	-	System

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

(3) Function

(a) This instruction reads out the amount of data specified by n1 from the Socket communication receive data area of which connection is specified by Ⓢ1, and stores them in the device specified by Ⓓ or higher.

(b) No processing is performed when the read data n1 is 0.

Point

- Receive data length can be read out by setting read data size to 1 word.
  This allows to change the device which stores receive data upon execution of the SP.SOCRCV and S.SOCRCVS instruction.
- Desired amount of data can be read out using the SP.SOCRCV or S.SOCRCVS instruction by checking coming data size using the S(P).SOCRDATA instruction and then specifying the data size of coming data using the SP.SOCRMODE instruction.
  This allows to specify the data size of coming data based on the currently received data.

Remark

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

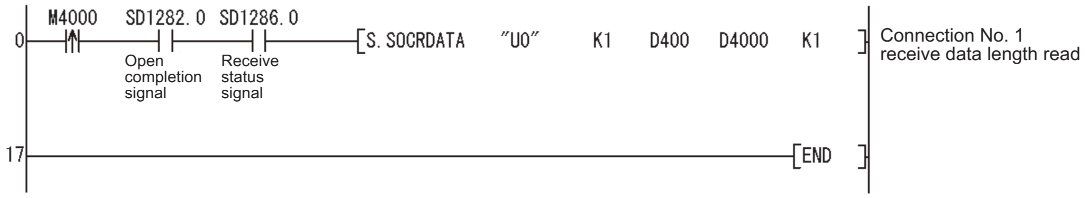
(4) Error

An operation processing error which turns on the Error flag (SM0) will occur, and a corresponding error code is stored in SD0 when:

- When the instruction is executed in the CPU module of the Built-in Ethernet port QCPU with the first 5 digits of the serial number, which is older than "11011" or other than the Built-in Ethernet port QCPU.
  (Error code: 4002)
- The connection number specified in S1 is other than 1 to16.
  (Error code: 4101)
- The device points of the devices specified by S2, D, and n are exceeding the limit.
  (Error code: 4101)
- Invalid device is specified.
  (Error code: 4004)

(5) Program example

In the following programs, receive data length of Connection No.1 is read out upon turning on M4000.
[Ladder mode]


0
M4000
SD1282.0
SD1286.0
Open completion signal
Receive status signal
S.SOCRDATA "U0" K1 D400 D4000 K1
Connection No. 1 receive data length read
17
END

[List mode]

```
Step    Instruction    Device

  0  LDP          M4000
  1  AND          SD1282.0
  2  AND          SD1286.0
  3  S.SOCRDATA   "U0"    K1    D400    D4000    K1
 17  END
```

APPENDICES

Appendix 1 Specifications Comparison with Ethernet Module

(1) Specifications Comparison with Ethernet Module

TableApp.1 shows the specifications comparison between the Ethernet port of the Built-in Ethernet port QCPU and the Ethernet module (QJ71E71-100).

TableApp.1 Specification comparisons between Ethernet port of the Built-in Ethernet port QCPU and Ethernet module

Item			Description	Availability	
				Built-in Ethernet port QCPU	QJ71E71-100
Communication using MC protocol	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.	×	○
	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.	×	○
Communication using fixed buffer	With procedure ("Procedure exist")		Sends/receives arbitrary data between the CPU module and an external device using the fixed buffer of the Ethernet module.	×	○
	Without procedure ("No procedure")			△[9]	○
Communication using random access buffer			Reads/writes data from in the random access buffer of the Ethernet module from/to multiple external devices.	×	○
Data communication (sending/receiving) by e-mail			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]	○
Communication using Web function			Accesses the CPU module from a personal computer in remote locations via the Internet using a commercially available Web browser.	×	○
CC-Link IE, MELSECNET/H, MELSECNET/10 relay communication			Communicates data in the Ethernet, regarding the system as equivalent to CC-Link IE, MELSECNET/H or MELSECNET/10.	×	○
Router relay communication (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			×	○

○ : Available, △ : Available but partially restricted, × : Not available

(To the next page)

TableApp.1 Specification comparisons between Ethernet port of the Built-in Ethernet port QCPU and Ethernet module(Continued)

Item		Description	Availability	
			Built-in Ethernet port QCPU	QJ71E71-100
Existence check of external device (Existence check function)	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	○
Communication using pairing open method		Pairs the receiving and sending connections and opens as one connection. (For communication using the fixed buffer.)	×	○
Communication using automatic open UDP port setting		Enables communication after the station in which an Ethernet module is mounted has been powered ON. (Open/close processing for communication by a sequence program is not required.)	×	○
Remote password check		Prevents unauthorized access to the CPU module by users in remote locations.	○	○
Simultaneous broadcast		Sends/receives data for all external devices on the same Ethernet where the Ethernet module is mounted in data communication using the UDP/IP protocol.	△*10	○
MELSOFT product (such as GX Developer) and/or GOT connection		Connects a MELSOFT product and/or GOT using the TCP/IP or UDP/IP protocol. Multiple MELSOFT products and/or GOTs can be connected simultaneously.	○	○
Find CPU function		Finds the CPU modules connected to the same hub as GX Developer, and displays a list.	○	×
Time setting function		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		○	×

○ : Available, △ : Available but partially restricted, × : Not available

*1 : Available commands are restricted. (Section 3.3)

*2 : The "quote cpuchg" command is not supported. (Section 3.6)

*3 : Only a default router can be specified.

*4 : Settings are fixed to the following: Interval timer: 5 seconds, Resend timer: 8 times.

*5 : Up to 16 MELSOFT products can be connected by setting "MELSOFT connection" for user connections in PLC parameter.

*6 : "MELSOFT transmission port" corresponds to "GX Developer transmission port" of the QJ71E71-100.

*7 : Up to 17 MELSOFT products can be connected by setting "MELSOFT connection" for user connections (including one system connection) in Network parameter.

*8 : For processing on the external device side, refer to (2) in this section.

*9 : Executable in the Socket communication function. Refer to (3) in this section for partial differences.
Check the CPU module and GX Developer versions before using the function.(Appendix 2)

*10 :Executable in the Socket communication function.
Check the CPU module and GX Developer versions before using the function.(Appendix 2)

Remark

For details on Ethernet modules, refer to the following manuals.

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

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

(2) Differences on MC protocol functions between the Built-in Ethernet port QCPU and Ethernet module

TableApp.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)	Whether to enable TCP Maximum Segment Size Option transmission can be selected. (Default: "Disable TCP Maximum Segment Size Option transmission")	"Disable TCP Maximum Segment Size Option transmission"	When the communication target of the external device communicating with the Ethernet module on TCP using MC protocol is changed to the Built-in Ethernet port QCPU: Response message may not be correctly read out if the message size is exceeding 1460 bytes since the message was split in the external device.	Perform the procedure indicated in Section 3.3.4(6) so that the external device can process split data.
Waiting time for receiving entire message of a split message.	Timer setting - Setting value in "Response monitoring timer" is applied. (Default: 30 seconds)	Fixed to 1 second Response message is discarded when the last part of the message is received within 1 second.	When the communication target of the external device communicating with the Ethernet module on TCP using MC protocol is changed to the Built-in Ethernet port QCPU: An error such as communication timeout may occur in the external device due to no response message since the intervals of sending a split message are exceeding one second.	Retry from the external device side.
Behavior when consecutively receiving request messages at the host IP address and port number	Each consecutive messages can be processed.	If another message was received before responding to a current message, the message received later is discarded.	When the communication target of the external device communicating with the Ethernet module on TCP using MC protocol is changed to the Built-in Ethernet port QCPU: An error such as communication timeout may occur in the external device due to no response message when the request messages are consecutively sent to the host IP address and port No.	• Refrain from sending response messages consecutively from the external device. • Before sending next request message, check that the response message is received by the external device.

(3) Differences between the socket communication and the nonprocedural communication using a fixed buffer of the Ethernet module

TableApp.3 Differences between the nonprocedural communication using a fixed buffer of the Ethernet module and the socket communication

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 paring open setting.	When sending or receiving data using one connection, paring 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 paring 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")	"Disable TCP Maximum Segment Size Option transmission"	When the communication target of the external device communicating with the QJ71E71-100 on TCP is changed to the Built-in Ethernet port QCPU: The message may not be correctly read out if the message size is exceeding 1460 bytes since the message was split in the external device.	Perform the procedure indicated in Section 3.4.3 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. 1388H to 138AH (5000 to 5002)	The following numbers cannot be used as host station port number. 1388H to 1391H (5000 to 5009)	-	Change the port number.
Specification of existence check	Select whether to perform existence check of TCP/IP and UDP/IP using parameters.	Existing check for TCP/IP is performed by default. Existing check for UDP/IP is not available.	-	As described in the left columns.
Ethernet address specification usint 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.	-	No specification is necessary. Ethernet address is automatically acquired for communication.

Appendix 2 Upgrade by Function Addition

The Built-in Ethernet port QCPU is upgraded when any function is added or specifications are changed. Therefore, the functions and specifications which can be used differ depending on the function version and serial number of the Built-in Ethernet port QCPU.

(1) Functions added and supported CPU module and GX Developer versions

TableApp.4 Functions added and supported CPU module and GX Developer versions

Function	Function version	First 5 digits of serial No.	GX Developer
Socket communication function (☞ Section 3.4)	B	"11012" or later	Version 8.78G or later
IP address change function (☞ Section 3.8)		"11082" or later	—

– : Not related to GX Developer

(2) Functions added and supported CPU module and GX Works2 versions

TableApp.5 Functions added and supported CPU module and GX Works2 versions

Function	Function version	First 5 digits of serial No.	GX Works2
IP address change function (☞ Section 3.8)	B	"11082" or later	—

– : Not related to GX Works2

Appendix 3 Instruction Processing Time

This section indicates the processing time required for the instructions introduced in this manual.
For concept of QCPU processing time, refer to the following.

☞ MELSEC-Q/L Programming Manual (Common Instruction)

TableApp.6 Processing time for each instruction

Instruction	Instruction name	Conditions		Processing time(μs)			
				Q03UDECPU		Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU, Q50UDEHCPU, Q100UDEHCPU	
				Minimum	Maximum	Minimum	Maximum
Socket communication function instruction	SP.SOCOPEN	TCP	Active	18.40	61.00	16.90	60.00
			Unpassive				
			Fullpassive				
		UDP					
	SP.SOCCLOSE	TCP	Executed by the host CPU	18.50	60.00	17.70	59.00
			Executed by the external device				
		UDP					
	SP.SOCRCV	TCP	1 byte	30.60	60.00	30.00	59.00
			2046 bytes				
		UDP	1 byte				
			2046 bytes				
	S.SOCRCVS	TCP	1 byte	22.60	50.00	22.00	49.00
			2046 bytes	254.60	280.00	215.00	270.00
		UDP	1 byte	22.60	50.00	22.00	49.00
			2046 bytes	254.60	280.00	215.00	270.00
	SP.SOCSND	TCP	1 byte	35.50	65.00	33.90	64.00
			2046 bytes	288.50	310.00	224.90	300.00
		UDP	1 byte	35.50	65.00	33.90	64.00
			2046 bytes	288.50	310.00	224.90	300.00
	SP.SOCCINF	-		12.70	50.00	12.10	49.00
	SP.SOCCSET	-		10.70	50.00	10.10	49.00
	SP.SOCRMODE	Standard mode → Fixed-length mode		9.70	50.00	9.10	49.00
		Fixed-length mode → Standard mode					
	SP.SOCRDATA	1 byte		11.70	50.00	11.10	49.00
		2046 bytes		241.70	280.00	202.10	270.00

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Warranty

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
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5. Changes in product specifications

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

QnUCPU
User's Manual

Communication via Built-in Ethernet Port

MODEL	QNUDEHCPU-U-ET-E
MODEL CODE	13JZ29
SH(NA)-080811ENG-C(1004)MEE	

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