MITSUBISHI

Changes for the Better

Mitsubishi Programmable
Logic Controller

Training Manual

Ethernet course(Q-series)

●SAFETY PRECAUTIONS●

(Always read these instructions before the exercise.)

When designing the system, always read the relevant manuals and give sufficient consideration to safety. During the exercise, pay full attention to the following points and handle the product correctly.

[EXERCISE PRECAUTIONS]

⚠ WARNING

- Do not touch the terminals while the power is on to prevent electric shock.
- When opening the safety cover, turn off the power or conduct a sufficient check of safety before operation.

⚠ Caution

- Follow the instructor's direction during the exercise.
- Do not remove the module of the demonstration machine or change wirings without permission.
  Doing so may cause failures, malfunctions, personal injuries and/or a fire.
- Turn off the power before installing or removing the module.
  Failure to do so may result in malfunctions of the module or electric shock.
- When the demonstration machine (X/Y table, etc.) emits abnormal odor/sound, press "Power switch" or "Emergency switch" to turn off.
- When a problem occurs, notify the instructor as soon as possible.

REVISIONS

* The text number is given on the bottom left of this textbook.

Print date	* Textbook number	Revision
Jan., 2006	SH-080618ENG-A	First edition

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INTRODUCTION

This textbook explains how to use the Ethernet module QJ71E71 of MELSEC-Q series and its programming. Use a personal computer applicable to Microsoft® Visual Basic® 6.0 as an external device for exercises.

The related manuals are shown below.

Manual name	Manual number (Model code)
Q Corresponding Ethernet Interface Module User's Manual (Basic) Explains the specification of the Ethernet module, the data communication procedure with target device, the line connection (open/close), the fixed buffer communication, the random access buffer communication, and the troubleshooting.	SH-080009 (13JL88)
Q Corresponding Ethernet Interface Module User's Manual (Application) Explains the e-mail function of Ethernet module, the PLC CPU status monitoring function, the communication function via MELSECNET/H, MELSECNET/10, as well as the communication function using the data link instructions, and how to use the file transfer (FTP server), etc.	SH-080010 (13JL89)
Q Corresponding Ethernet Interface Module User's Manual (Web function) Explains how to use the Web function of the Ethernet module.	SH-080180 (13JR40)
Q Corresponding MELSEC Communication Protocol Reference Manual Explains the communication methods and control procedures through the MC protocol for the external devices to read and write data from/to the PLC CPU using the serial communication module/Ethernet module.	SH-080008 (13JF89)
MX Component Version 3 Operating Manual (Startup) Explains the procedures for installing and uninstalling MX Component and for browsing the operating manual.	SH-080270 (13JU31)
MX Component Version 3 Operating Manual Explains the setting and operating methods of each utility on MX Component.	SH-080271 (13JU32)
MX Component Version 3 Programming Manual Explains the programming procedures, detailed descriptions and error codes of the Active X control.	SH-080272 (13JF66)
GX Developer Version 8 Operating Manual Explains the functions such as the program creating method, printout method, monitoring method and debug method on GX Developer.	SH-080373E (13JU41)

CONTENTS

About Generic Terms and Abbreviations

Unless otherwise stated, this textbook uses the following abbreviations and terms for the explanation of MX Component.

Generic term/Abbreviation	Description
PC CPU module	Abbreviation of PC CPU module and IBM PC/AT® compatible personal computer.
Ethernet module	Generic term of the QJ71E71, QJ71E71-B2 and QJ71E71-100.
MELSEC communication protocol (MC protocol)	Name of the communication system for accessing the PLC CPU from external devices using the communication procedures for Q series serial communication modules or Ethernet interface modules. (Described as the MC protocol in this textbook) Two types of communication systems are available; one using ASCII code data and the other using binary code data.
QJ71E71	Abbreviation of QJ71E71 type Ethernet interface module.
QJ71E71-B2	Abbreviation of QJ71E71-B2 type Ethernet interface module.
QJ71E71-100	Abbreviation of QJ71E71-100 type Ethernet interface module.
External device	Generic term for personal computers, computers, workstations (WS) and other Ethernet module, etc. that are connected to Ethernet.
Internet (Internet)	Huge computer network that connects global networks using the communication protocol TCP/IP. The Internet is a decentralized network without a computer which controls the overall network. Also, it is established by allowing the server computers all over the world to interconnect and provide services individually.
Intranet (Intranet)	Intra-corporate network that is constructed by the internet standard technology such as the communication protocol TCP/IP. There is a specific advantage such as building an application in collaboration with internet and the integration of operability.
Personal computer	Generic term for IBM PC/AT (or 100% compatible) personal computer.

MEMO

Chapter 1 BASICS OF ETHERNET NETWORK

Note

This textbook mainly describes how to use MELSEC-Q Series Ethernet module.
For details of general computer network technology (TCP/IP communication, etc.), refer to commercially-available textbooks.
In addition, for details of the Ethernet module, refer to the relevant manuals.

1.1 Ethernet

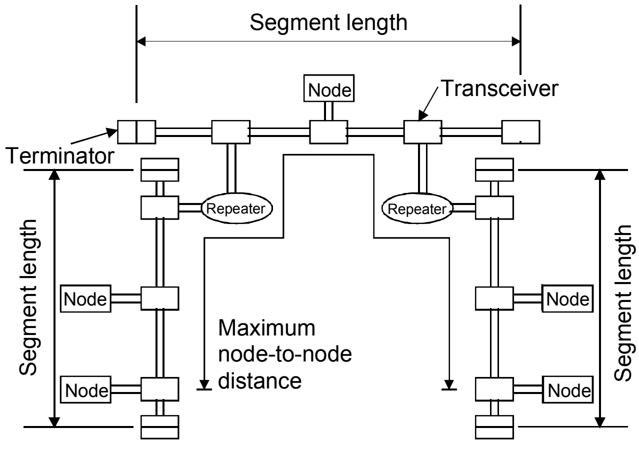
The development of Ethernet was started by Xerox Palo Alto Research Center in the U.S. in 1973, and Ethernet has been approved as a network technology by ISO and ANSI/IEEE standards.
Lately it is widely used for networking gear and communication channel, etc. (*1)
For actual network operation, hardware technique such as transmission lines which is defined by Ethernet (in the narrow sense) and communication technology for TCP/IP communication (protocol: a procedure for data transmission) are necessary.

General Ethernet specifications are shown below.

Specification	10BASE5	10BASE2	10BASE-T	100BASE-TX
Data transmission speed	10 Mbps	10 Mbps	10 Mbps	100 Mbps
Maximum segment length	500m	185m	100m	100m
Maximum network length (or Maximum node-to-node interval)	2500m (5 segments)	925m (5 segments)	—	—
Minimum node-to-node distance	2.5m	0.5m	—	—
Cable	Coaxial 50Ω (12mm diameter) *Known as: yellow cable	Coaxial 50Ω (5mm diameter)	UTP(unshielded twisted pair cable) category 3	UTP(unshielded twisted pair cable) category 5, STP(unshielded twisted pair cable) IBM Type1, 2
Network topology	Bus	Bus	Star	Star

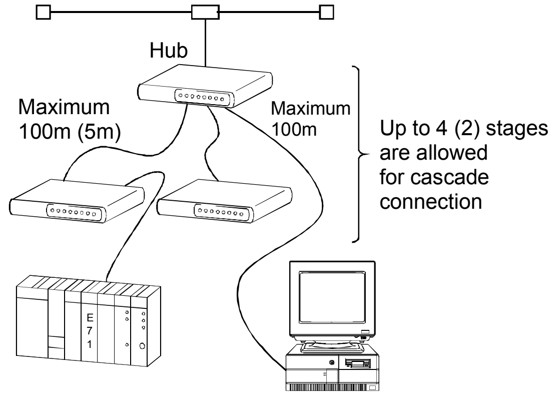
*1 Communication lines (10 BASE-T, 10BASE-TX, 10 BASE5 and 10BASE2) are referred to as "Ethernet" in this textbook.

[Connection using 10BASE2/10BASE5]



* There is no transceiver when connecting using 10BASE2.

[Connection using 10BASE-T/100BASE-TX]

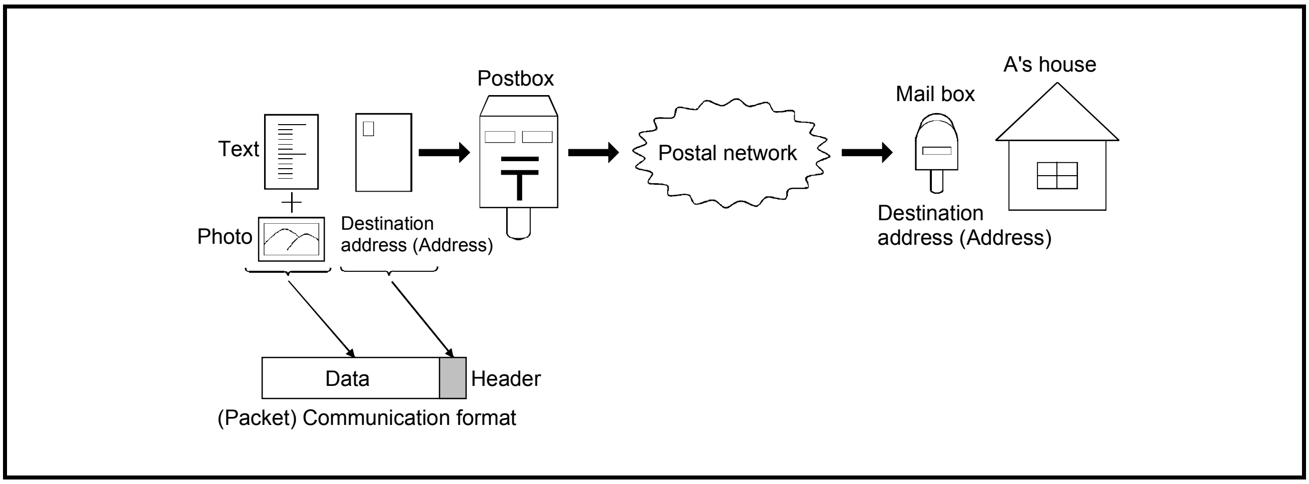


* The value in parentheses ( ) is used for connection using 100BASE-TX.

1.2 Addresses

The devices and computers connected to Ethernet must have their own addresses to communicate on the network.

For Ethernet, the addresses which the user needs to consider are basically IP addresses.


Postbox
A's house
Mail box
Text
Postal network
Photo
Destination address (Address)
Destination address (Address)
Data
Header
(Packet) Communication format

1.2.1 MAC address (Ethernet address)

The MAC address (Media Access Control Address) is a unique physical address which is assigned to each network device.
(No other devices have the same MAC address.)
In Ethernet, it is shown as a 6-byte code: a vender code of 3 bytes (managed by IEEE management) indicating an equipment manufacturer and a node number of 3 bytes (managed by each manufacturer). (*1)

As each Ethernet-connected device communicates automatically getting a MAC address from IP addresses designated by the user, the user need not be take account of it.
The MAC address is sometimes called "Ethernet address" or "Internet address", however, note that it differs from the IP address described below.

*1 MAC address of the Ethernet module is indicated in MAC ADD. of the rating plate located on the side of the module.

1.2.2 IP address

The IP address (Internet Protocol Address) is an identification number assigned to identify each device or computer connected to the IP network such as the Internet or intranet. (It corresponds to a mail address or a telephone number)
Unique addresses managed by each country are used on the internet where the network is connected on a global scale.
An IP address is expressed by a 32-bit number for IPV4, which is now used commonly.
It is generally divided into 4 parts of 8 bits like "192.168.1.1" and represented as decimal notation.
The 32-bit value consists of the network part which identifies each network and the host part which identifies the connected device in the network (PC, etc.)

(IP address) = ((Class) + network part address) + (host part address)

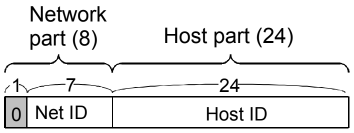
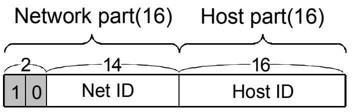
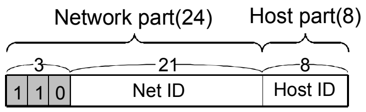
Representations of IP address
An IP address (IPv4) is described by a 32-bit number.

```
Binary number 00000000000000000000000000000000 to 11111111111111111111111111111111
Decimal number                                 0 to 4294967295
Hexadecimal number                             0 to FFFFFFFF
```

They are divided by 8 bits for easier comprehension.

```
Binary number 00000000.00000000.00000000.00000000 to 11111111.11111111.11111111.11111111
Decimal number       0.       0.       0.       0 to      255.      255.      255.      255
Hexadecimal number   0.       0.       0.       0 to       FF.       FF.       FF.       FF
```

(1) Classification by class
The classification system called "class" has been traditionally used to fixedly handle the boundary between the IP address network part and the host part .

Class	Bit assignment (*1) Higher bits -----------------------Lower bits	Higher 8 bits	Boundary of network address	Private IP address range
Class A	 Network part (8) Host part (24) 1 7 24 0 Net ID Host ID	0******* (0 to 127)	8 bits from the highest	10.0.0.0 to 10.255.255.255
Class B	 Network part(16) Host part(16) 2 14 16 1 0 Net ID Host ID	10****** (128 to 191)	16 bits from the highest	172.16.0.0 to 172.31.255.255
Class C	 Network part(24) Host part(8) 3 21 8 1 1 0 Net ID Host ID	110***** (192 to 223)	24 bits from the highest	192.168.0.0 to 192.168.255.255

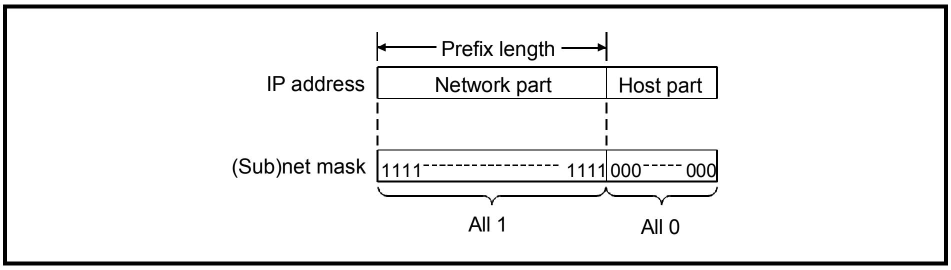
*1 The ▨part at the higher of the IP addresses indicates classes.

The classes A to C are the addresses for public use.
The address usable for the devices that are not directly connected to the Internet is called "private IP address".

The address management was once carried out in this class unit. Nowadays the class address with the variable-length border bit number is used for ensuring the effective use of the address space.

(2) Management by class address

The management was once carried out in class unit. Nowadays, due to the shortage of IP address, the class address with the variable-length network part is used for ensuring the effective use of the address space.

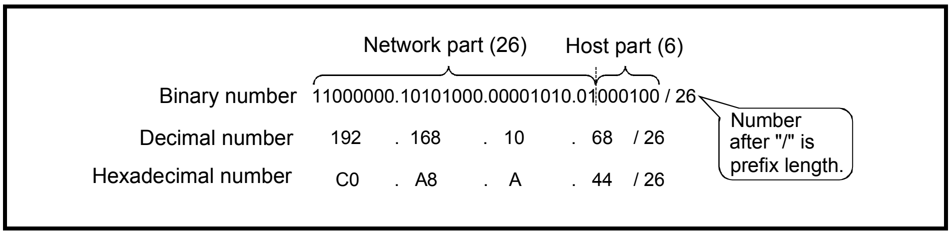


The IP address of which host part which has all 0 for the bits is a network address (in the Ethernet unit). "/" may be added to the end of the IP address for clearly specifying the network address length (prefix length), and also the bit length of the network address part may be added.

The netmask is commonly used for a historical reason. The netmask has all 1 for the network part and all 0 for the host part.

As it is divided to manage the network (sub-networking), the netmask is also called "subnet mask".

Example: For the IP address 192.168. 10. 68 and the prefix length 26 bits



Information examples when setting the IP address to the host

Information	Address	Address value (Binary)				Remark
IP address	192.168. 10. 68/26	1100 0000	1010 1000	0000 1010	0100 0100	—
(Sub)net mask	255.255.255.192	1111 1111	1111 1111	1111 1111	1100 0000	
Network address	192.168. 10. 64/26	1100 0000	1010 1000	0000 1010	0100 0000	
Broadcast address	192.168. 10.127	1100 0000	1010 1000	0000 1010	0111 1111	Address of which host part is 1.

REMARK

Special IP addresses

(1) All bits are 0 or 1

The IP address 0.0.0.0 is used when you do not know your own IP address or it is not necessary to inform an IP address to the target.

255.255.255.255 signifies a broadcast address (destination: all devices and PCs connected to the same network).

(2) Loopback address

This is the address which is used between the programs executed on the same device (PLC).

The range is from 127.0.0.0 to 127.255.255.255.

(3) Multicast address

This is the address used for communications within a specific group.

The range is from 224.0.0.0 to 239.255.255.255.

(4) Private address

It seems that any IP address can be used when a PC is not connected to the Internet. However, an address which can be freely assigned is designated for avoiding a trouble.

This is called a private address.

Network address (*1)	IP address range (*2)
10/8	10.0.0.0 to 10.255.255.255
172.16/12	172.16.0.0 to 172.31.255.255
192.168/16	192.168.0.0 to 192.168.255.255

*1 The numerical value on the right side of "/" indicates the number of bits in the network address (the bits counted from the most significant bit) shown in the high-order part of the IP address.

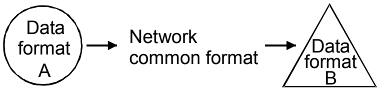
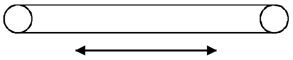
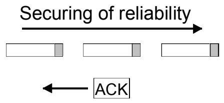
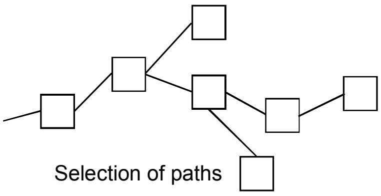
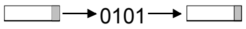
*2 It contains the IP address for broadcast.

1.3 Communication Protocol

The MELSEC-Q Ethernet module described here supports two communication protocols, TCP/IP and UDP/IP.

1.3.1 Communication model

"OSI reference model" is a famous communication mechanism model defined by ISO (International Organization for Standardization).
This model classifies the functions required for communication into 7 layers.

	Layer	Functions	Image	Protocol example
7	Application layer	"What the users wants to do" • Agreement on contents of actual services • What the users can see • Available services themselves	Protocol for each application Remote login ↔ TELNET protocol File transfer ↔ FTP protocol	HTTP TELNET FTP SMTP
6	Presentation layer	"Definition and conversion of data format" • Definition of data representation system • Coding/decoding and compression/decompression of data • Text code, data format	 Absorption of differences in data representation	MIME HTML XML
5	Session layer	"Communication connection establishment" • Connection establishment/disconnection • Authentication of connection • Synchronization for transmitting data	Management of communication connection 	RPC
4	Transport layer	"Delivering to the target correctly" • Securing reliable data transfer between the source and destination. • Error correction (arrival sequence correction, retransmission request) • Flow control of communication		TCP UDP
3	Network layer	"Communication procedure with the target not adjoining" • Definition of path control (routing) • Definition of communication path decision • Establishment of virtual connection using address	 Selection of paths	IP
2	Data link layer	"Data delivery to the next" • Communication procedure between adjacent devices. • Format definition of transmission and reception data • Data error detection between devices and correction method definition	 Conversion of frame and bit sequence Data transfer between adjacent devices	Ethernet PPP
1	Physical layer	"Physical connection" • Conditions for electrical connection at the lowest level • ON/OFF definition of data signals • Connector shape and pin layout for each signal		Ethernet ISDN Telephone line

The bigger numbers correspond to the higher (more logical) layers and the smaller numbers to the lower (more physical) layers.
IP corresponds to the network layer, and both TCP and UDP to the transport layer.
Ethernet corresponds to the data link layer and the physical layer.

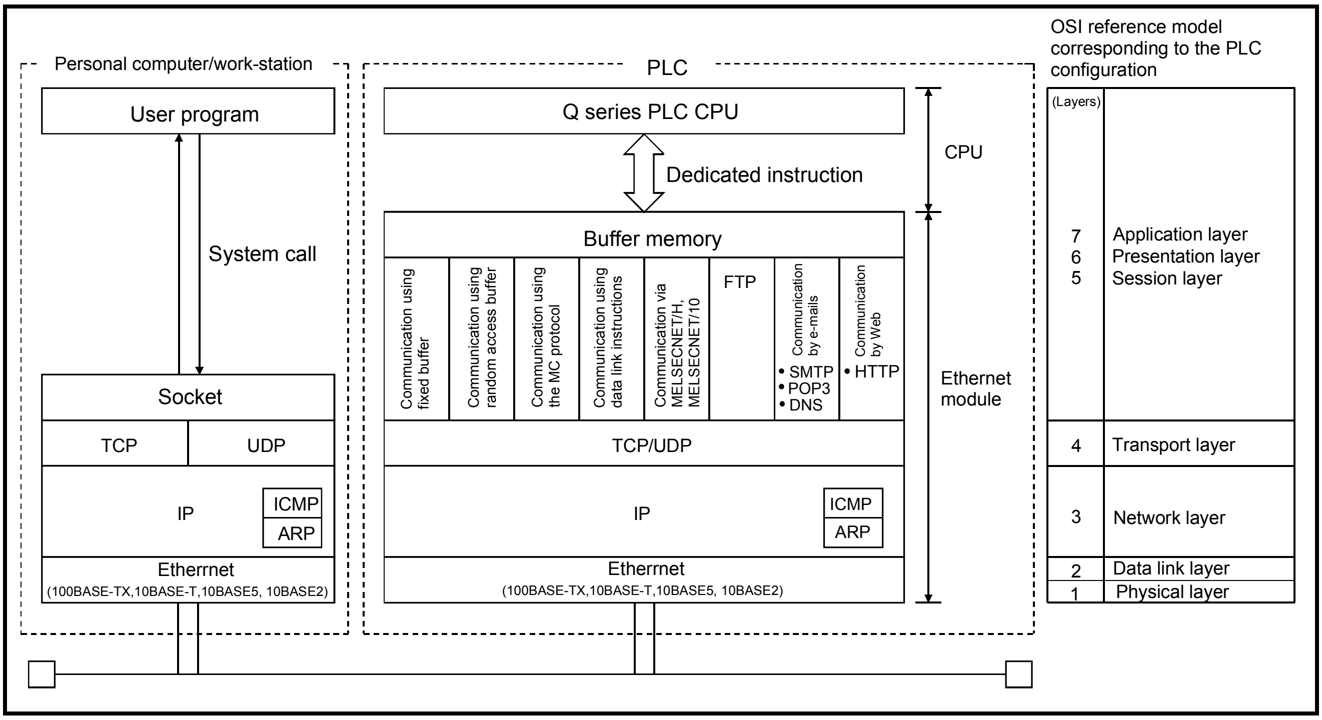
<Ethernet module and communication model>

The following shows the software configuration of the Ethernet module corresponding to the "OSI reference model".

The Physical and Data link layers correspond to the "Ethernet" part of the Ethernet module.

The Network and the Transport layers correspond to "IP" and "TCP/UDP" parts of the Ethernet module.

Much higher layers such as Session, Presentation and Application correspond to the software part for various functions designed specific to the MELSEC-Q, which has been realized by combinations of the Q series PLC CPUs and the Ethernet module.


Personal computer/work-station
PLC
OSI reference model corresponding to the PLC configuration
User program
System call
Socket
TCP
UDP
IP
ICMP
ARP
Etherrnet
(100BASE-TX,10BASE-T,10BASE5, 10BASE2)
Q series PLC CPU
Dedicated instruction
CPU
Buffer memory
Communication using fixed buffer
Communication using random access buffer
Communication using the MC protocol
Communication using data link instructions
Communication via MELSECNET/H, MELSECNET/10
FTP
Communication by e-mails
• SMTP
• POP3
• DNS
Communication by Web
• HTTP
Ethernet module
TCP/UDP
IP
ICMP
ARP
Ethernet
(100BASE-TX,10BASE-T,10BASE5, 10BASE2)
(Layers)
7 Application layer
6 Presentation layer
5 Session layer
4 Transport layer
3 Network layer
2 Data link layer
1 Physical layer

1.3.2 IP protocol

(1) Role of IP

IP is a network layer protocol which is processed by all devices connected to an IP network.

The most important role of the TCP/IP (UDP/IP) network is "data transfer to a device or PLC at the target address".

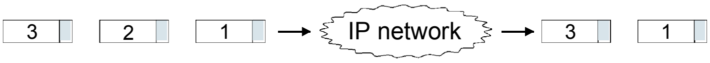
This role is achieved by IP (Internet Protocol).

Data (packets) are delivered with the information called "IP header" (tag) attached.

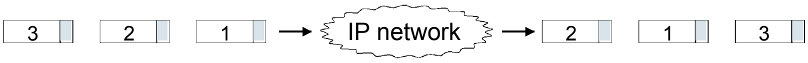
(2) Restrictions on IP

Although IP transfers data to a target PLC, there are some restrictions.

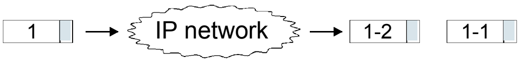
(a) No guarantee to reach the destination



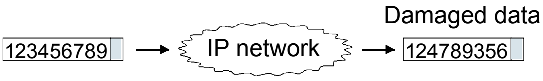
(b) No guarantee to reach in the order of sending



(c) As the transfer size at one time is limited, a packet may be divided into several pieces at transmission. (*1)



(d) No guarantee for no data damage



To put it shortly, IP bends every effort to transfer data (packets) to the target device or PLC, however, it does not guarantee delivery of packets (Best effort).

Note that, there is no need to consider these restrictions when using TCP over IP.

When using UDP as a higher layer, care should be taken since the above restrictions apply except the data damage detection.

*1 The size of one message (1 packet) that can be transmitted by the Ethernet module is up to 1500 bytes (including the IP header).

Data exceeding 1500 bytes are divided in either case of the TCP/IP or UDP/IP communication. The divided data are reassembled into one data on the receiving side and handed to the application program.

1.3.3 TCP and UDP

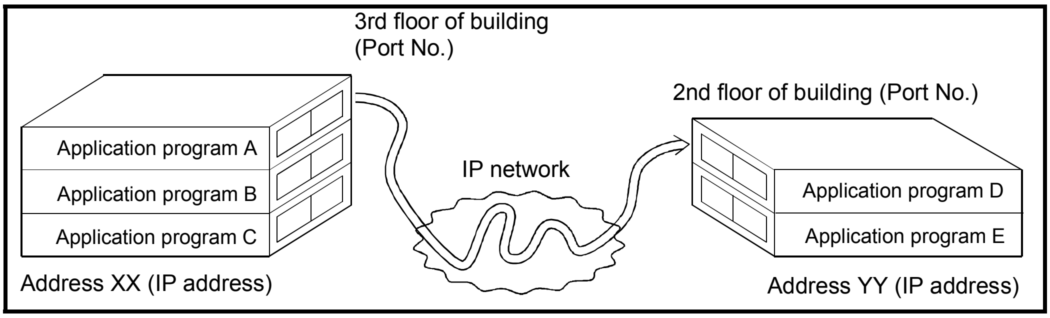
TCP and UDP are protocols which are processed by the devices and PCs on the both ends of communication (Transport layer).

(1) Port Number

The actual communication is performed between the application programs operated on devices and PCs.

TCP and UDP identify which application programs are communicating with each other using the port number.

If the IP address is regarded as "address", the port number corresponds to “the floor of a building".



In reality, combinations of the following five items identifiy individual communication.

- Destination IP address
- Source IP address
- Destination port number
- Source port number
- Protocol number (TCP=6H, UDP=17H)

(2) Comparison between TCP and UDP

The request level for the network differs depending on the user application.

However, it is difficult to create each unique protocol for many requests.

Then, TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) are developed as minimally-required basic services.

TCP .... Fixes connection to the destination at first and performs bidirectional 1:1 communication with high reliability.

UDP............ Performs one-way communication to transfer the data given from an application to the designated destination.

This is a high speed communication as data are directly sent using IP.

The following table compares the characteristics of TCP and UDP.

Item	TCP	UDP	Remarks
Reliability	High	Low	
(Processing) Speed	Low	High	
No. of target devices	1:1	1:1 or 1:n	Unicast (1:1 communication) Multicast (1:n communication) (*1)
Guarantee to reach destination	Guaranteed	Not guaranteed	
Operation when send error occurs	Resends automatically (depending on setting)	No resending (packet disposal)	
Communication connection establishment	Required	Not required	Reaches in order of sending packets for TCP.
Transfer type	Stream type (Instructions and data are sent with character strings)	Datagram type (Sent in fixed format)	Datagram transfer can be performed in the application level even for TCP.
Flow control	Available	Not available	Sending side controls the send data amount depending on the buffer size of the receiving side.
Congestion control (Resend control) (*2)	Available	Not available	Send packet amount is controlled depending on the congestion degree of the network.
Target device change during an open connection	Not possible	Possible (*3)	Refer to Section 2.3 for connection.

TCP is suitable for assured data transfer.

UDP is suitable for real time monitoring by the PC display.

*1 The "n" of multicast (1:n communication) represents multiple devices belonging to one group on the same Ethernet.

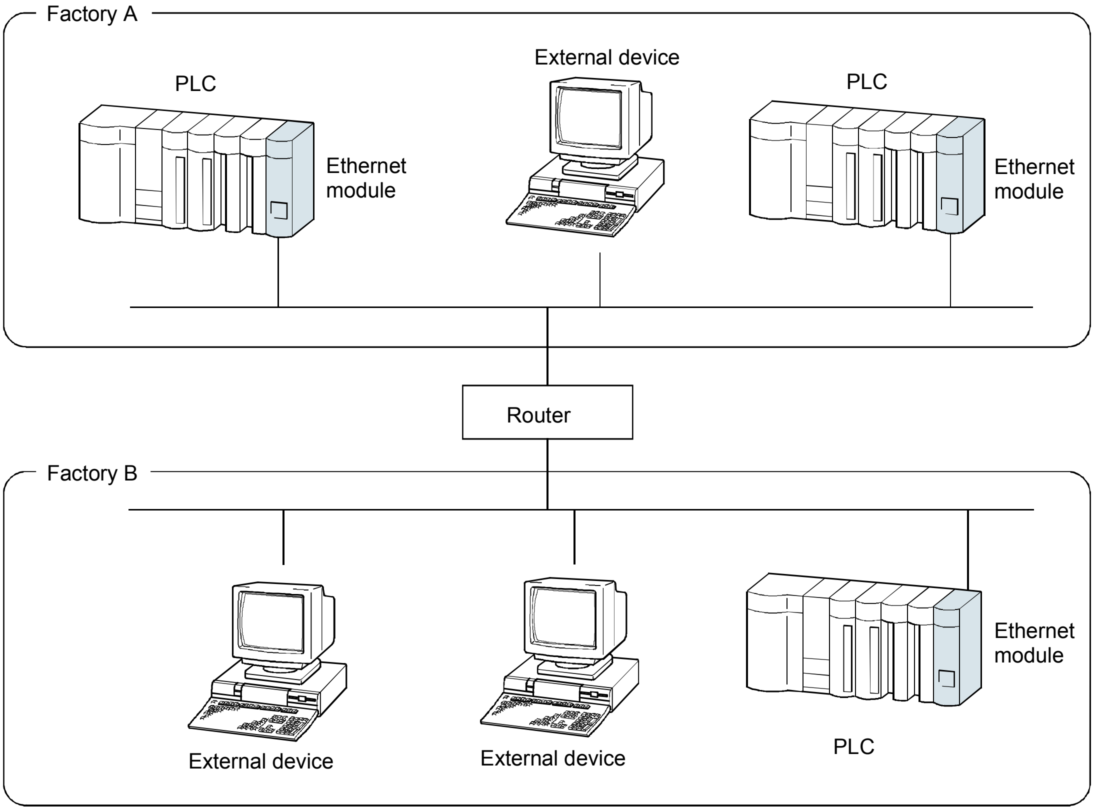
*2 The buildup of communication packets on the network is called "congestion".

*3 Target device change during an open connection may cause communication troubles.
Do not change the target device while a connection is open.

1.4 MELSEC-Q Ethernet Module

1.4.1 Role of Ethernet module

The Ethernet module supports the data communications between external devices and a PLC CPU or between PLC CPUs on Ethernet, and sends/receives data to/from a target device with the TCP/IP or UDP/IP communication.
In consequence, the PLC CPU status can be checked from an external device located far from the PLC CPU.



All the external devices can communicate with PLCs in factories A and B via Ethernet.
Also, the PLCs in factories A and B can communicate with each other.

1.4.2 Outline of Ethernet module

(1) Supporting the TCP/IP and UDP/IP communications
The Ethernet module supports the TCP/IP and UDP/IP communications.
A communication method suitable for the target device can be selected.

(2) Data code selection is available
The Ethernet module can handle binary or ASCII code data.
For details of data codes, refer to Section 2.1.

(3) Three communication functions provided for various purposes
The Ethernet module has three communication functions shown below.
Data communication can be performed with either one of these functions,which is selected according to the user's communication purpose.
For details, refer to Section 2.2.

- Communication using the MC protocol
- Communication using the fixed buffer (Procedure exist, No procedure)
- Communication using the random access buffer

POINT

The communication method and the data code for the data to be transfered should match between the communicating devices.

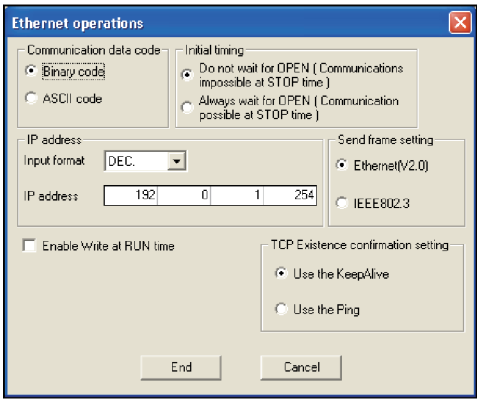
(4) Remote communications by e-mail
The e-mail function enables data communication with a PLC in a remote place.
By setting an automatic notification condition, an e-mail is automatically sent when the condition is satisfied.

(5) Internet access using the Web function (QJ71E71-100 only)
A system administrator can monitor a Q series PLC CPU in a remote place via the Internet using a commercially-available Web browser.
For using the Web function, it is necessary to store the communication library, user-created screens and Q series CPU access programs in the Web server.

CHAPTER 2 BEFORE USING ETHERNET MODULE

2.1 Two Data Codes

The Ethernet module can exchange data with external devices using binary or ASCII codes.
The code setting can be switched between binary and ASCII using GX Developer.
For details, refer to Section 4.6.



Ethernet operations

Communication data code
- ● Binary code
- ○ ASCII code

Initial timing
- ● Do not wait for OPEN (Communications impossible at STOP time)
- ○ Always wait for OPEN (Communication possible at STOP time)

IP address
- Input format: DEC.
- IP address: 192 . 0 . 1 . 254

Send frame setting
- ● Ethernet(V2.0)
- ○ IEEE802.3

□ Enable Write at RUN time

TCP Existence confirmation setting
- ● Use the KeepAlive
- ○ Use the Ping

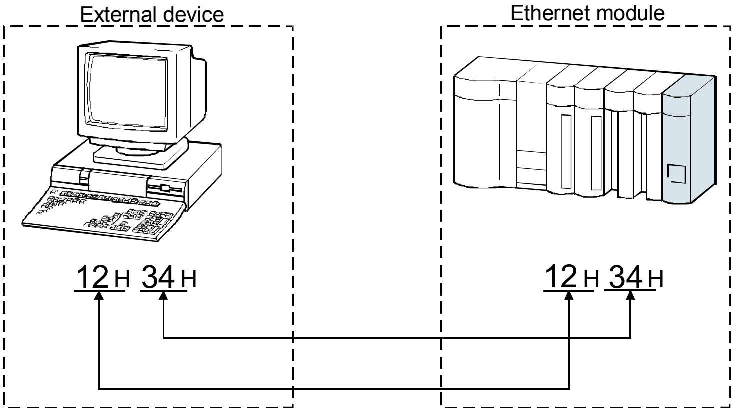
(1) Communication using the binary code
The Ethernet module sends/receives 1-byte data without change.

(a) Merit

1) The capacity of data to be sent/received is a half compared to the ASCII code, and the load on the line is reduced.
2) The data of 00_H to FF_H can be processed.

(b) Demerit
To display numerical data, they must be converted to the ASCII code data.

Example: When sending/receiving 1234_H



・1-byte data are sent/received without change.

(2) Communication using the ASCII code

The Ethernet module sends/receives 1-byte data as data equivalent to two characters in the ASCII code.

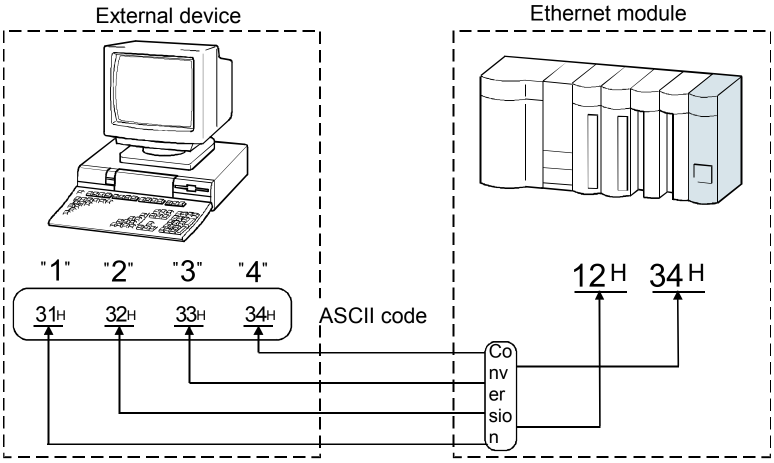
(a) Merit

On the external device side, data can be displayed as they are.

(b) Demerit

1) The capacity of data to be sent/received is doubled in size compared with the data in the binary code, and the load on the line is increased.
2) Numerical data must be converted between ASCII and binary codes.
3) (On the Ether module side, data will be automatically converted.)

Example: When sending/receiving "1234"



• 1-byte data on the PLC side are sent/received as data equivalent to two charactes

(3) Relationship between each communication method and data codes

The following shows the usability of data codes in each communication method.

Data communication function		Communication data code setting	
		Binary code	ASCII code
Communication using MC protocol	Automatically open UDP port	○*1	-
	User open port	○	○
Communication using fixed buffer	With procedures	○	○
	No procedure	○*1	-
Communication using random access buffer		○	○

○: Selectable -: N/A

*1 The Ethernet module performs communication using binary code data regardless of the communication data code setting by GX Developer.

2.2 Types of Data Communication Functions

The Ethernet module has three types of communication functions: "Communication using MC protocol", "Communication using fixed buffer" and "Communication using random access buffer".
The following describes the outline of each communication function.

2.2.1 Communication using MC protocol

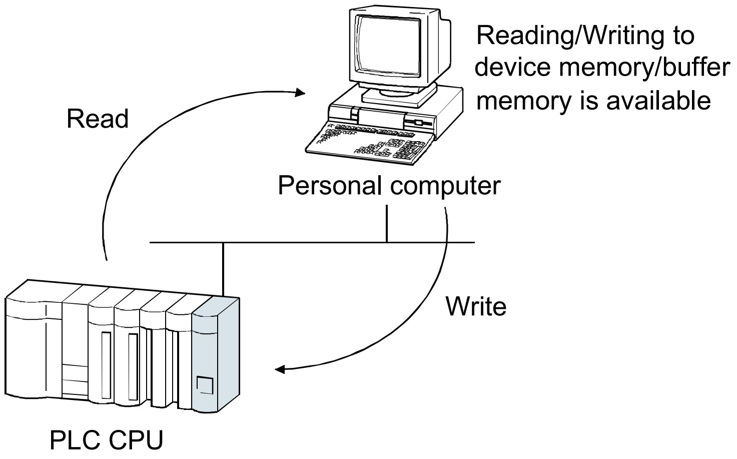
The MC protocol is used for reading or writing device data and programs of a PLC CPU from/to a personal computer via an Ethernet module or a Q series serial communication module.
On the personal computer side, creating a program for data transfer with MC protocol enables an easy access to the PLC CPU.
On the PLC CPU side, there is no need to create a communication program.

POINT

When performing data communication using the MC protocol, refer to the Q Corresponding MELSEC Communication Protocol Reference Manual.

(1) MC protocol functions

(a) Reading/writing PLC CPU data
This function allows data reading from or writing to the PLC CPU device memory of the station (local station) connected to the Ethernet network system or another station on the MELSECNET/H, MELSECNET/10 as well as the intelligent function module buffer memory.
By reading and writing data, the PLC CPU operation monitoring, data analysis and production management can be performed on a personal computer.
Also, production instructions can be executed from the personal computer.

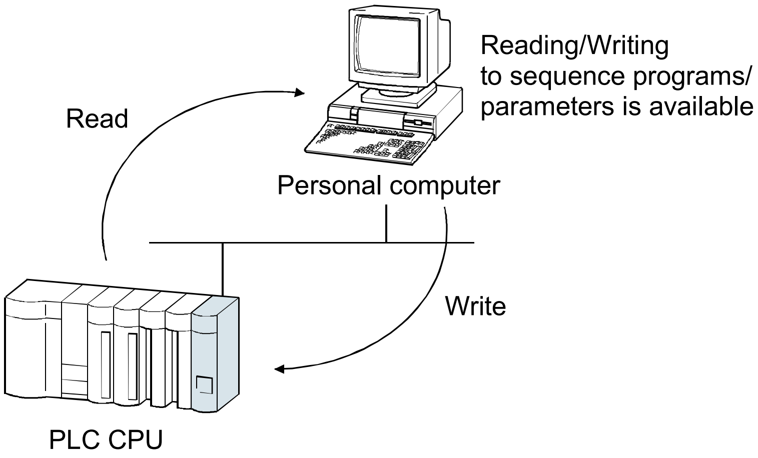


(b) Reading/writing file in PLC CPU

This function reads and writes files such as sequence program files or parameter files that are stored in the PLC CPU.

By reading and writing these files, file management for QCPUs and QnACPUs on other stations can be performed on a personal computer.

Also, execution programs for the PLC CPU can be changed (replaced) from the personal computer.


Read
Reading/Writing to sequence programs/ parameters is available
Personal computer
Write
PLC CPU

(c) Remote control of the PLC CPU

This function enables the remote RUN/STOP/PAUSE/latch clear/reset operations.

Remote operations of the PLC CPU can be performed from the personal computer using the PLC CPU remote control function.

(2) Utilizing the MX Component, MX Links

For the personal computer which runs one of the operation systems below, communication programs can be created without considering details of MC protocol (transmission/reception procedures) using MX Component or MX Links (SW3D5F-CSKP-E or later).

(Supported basic operation systems)

- Microsoft® Windows® 95 Operating System
- Microsoft® Windows® 98 Operating System
- Microsoft® Windows NT® Workstation 4.0 Operating System
- Microsoft® Windows® Millennium Edition Operating System (*1)
- Microsoft® Windows® 2000 Professional Operating System (*1)

*1 Supported from MX Component Version 2 or later.

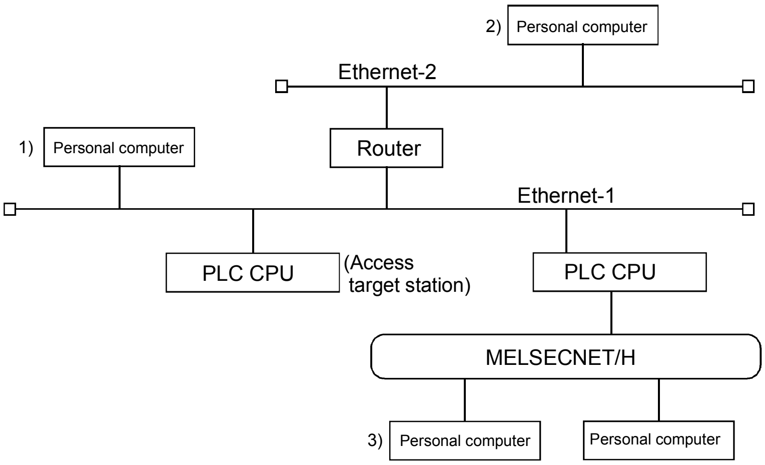
The assignment dealing with MX Component is given in Chapter 5 of this textbook.

Appendix 2 describes the features of MX Component.

(3) External devices capable of exchanging data

The communication using the MC protocol can be performed from the following external devices.

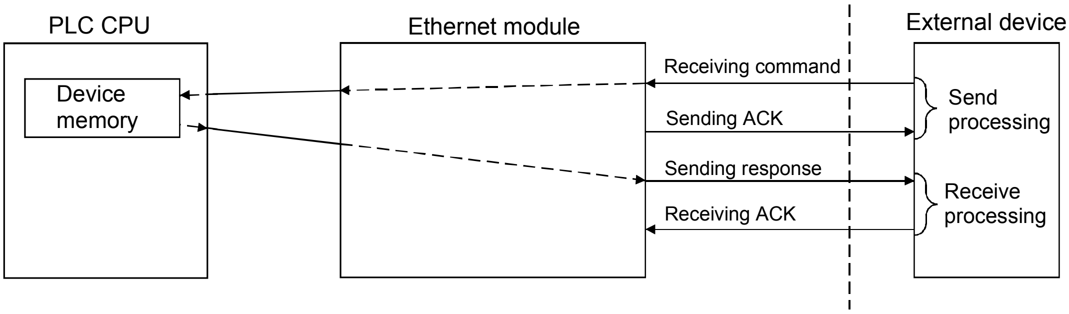
1) External devices that are connected to the same Ethernet as the Ethernet module
2) External devices that are connected to other Ethernet networks via routers
3) External devices that are connected to the MELSECNET/H via PLC CPUs



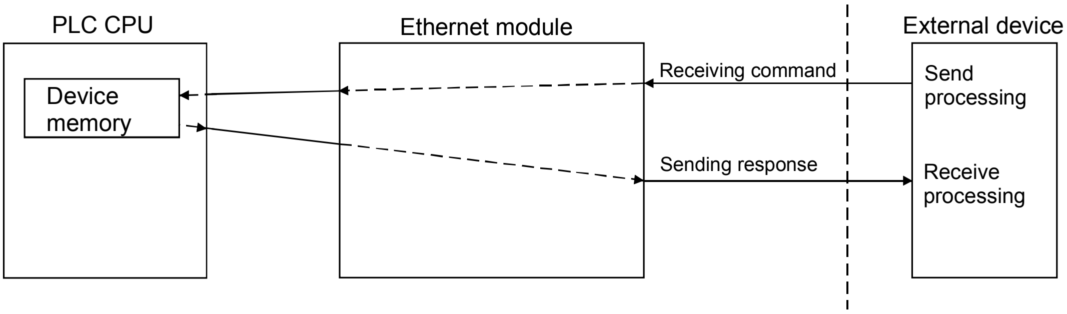
(4) Outline of data sending/receiving procedures

Data are sent/received as shown below.

(a) TCP/IP communication



(b) UDP/IP communication



REMARK

Refer to the Q Corresponding Ethernet Interface Module User's Manual (Basic) for a communication program example on the personal computer side when using the following languages for communication using the MC protocol.

- Microsoft® Corporation Visual C++
- Microsoft® Corporation visual basic

2.2.2 Fixed buffer communication

A PLC CPU can communicate with other PLC CPUs or a personal computer using the fixed buffers in the buffer memory of the Ethernet module

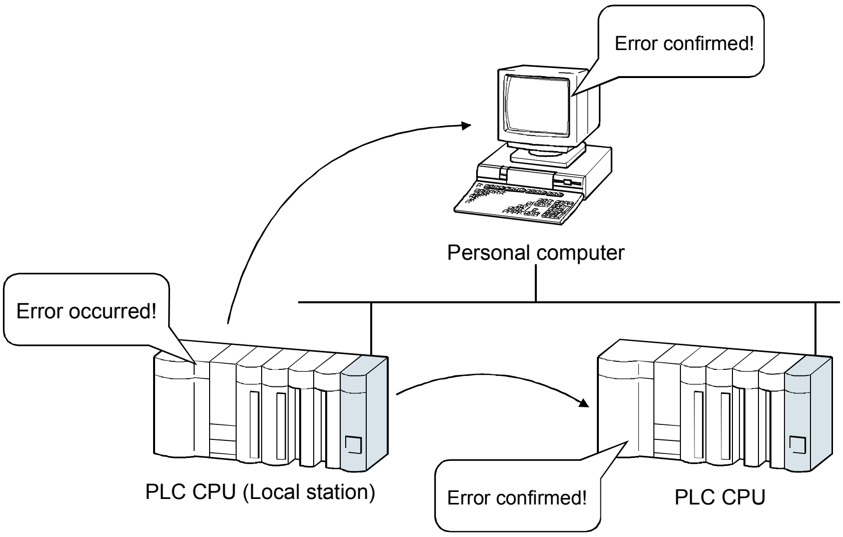
A maximum of 1k words of arbitrary data can be sent or received between PLCs or between the PLC and the host system.

An Ethernet module has 16 fixed buffer data areas of 1k word storage space, and each area is assigned as either a sending or receiving buffer for an arbitrary device.

While the communication using the MC protocol is passive, the communication using the fixed buffers is the function for active communications.

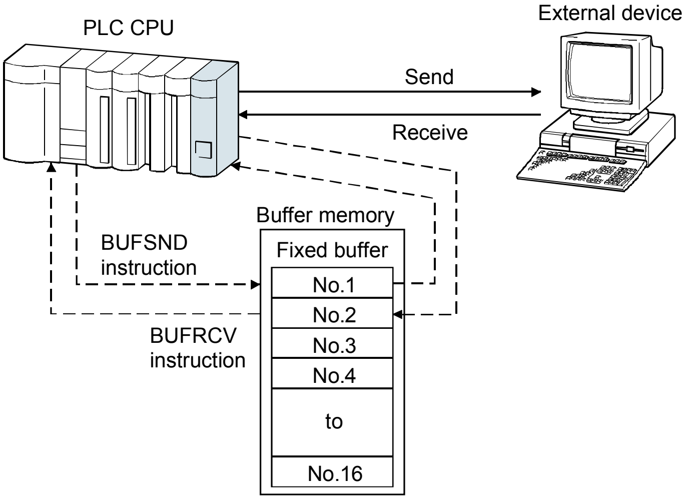
Data can be sent from the PLC CPU side to the host system when a mechanical error occurs or when some conditions are satisfied.

Furthermore, by using interrupt programs in data reception, retrieval of receive data to the PLC CPU may be expedited.



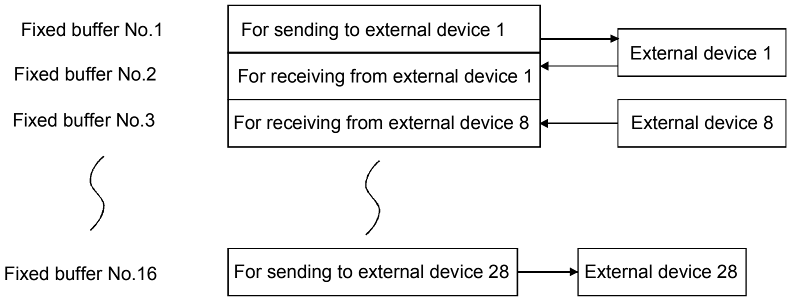
(1) Control method

The fixed buffer areas in the Ethernet module are used to communicate with an external device.



As shown in the diagram below, set IP addresses and usage conditions (e.g. sending/receiving, with/without procedures) of external devices to respective fixed buffer areas(No.1 to 16) when opening a connection (logic circuit) of the Ethernet module to fix each external device to each buffer. (*1)

*1 The connection No. (1 to 16) used for data communication are the same as those for the fixed buffer.


Fixed buffer No.1
For sending to external device 1
External device 1
Fixed buffer No.2
For receiving from external device 1
Fixed buffer No.3
For receiving from external device 8
External device 8
Fixed buffer No.16
For sending to external device 28
External device 28

(2) Differences between with and without procedures

The following shows the differences between the fixed buffer communication (Procedure exist) and the fixed buffer communication (No procedure).

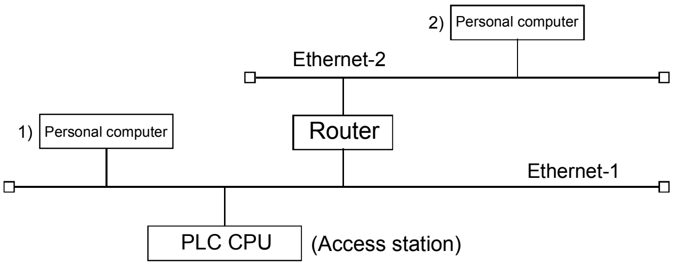
	Procedure exist	No procedure
Communication method	The application programs of the local station's PLC CPU and an external device communicate through handshaking.	The application programs of the local station's PLC CPU and an external device communicate without handshaking (Data reception of data at external devices cannot be confirmed for data transmission.)
Applications for connection opened	Communications using fixed buffer, random access buffer, and MC protocol are available.	Only fixed buffer communication is available.
Message format of application data unit	Message format determined by the Ethernet module	No restrictions on the message format (Communication is available in the message format of the external device.)
Communication data code	ASCII code or Binary code	Binary code
Unit of data length for dedicated instructions	Word	Byte

(3) External devices capable of exchanging data

The communication using the fixed buffer can be performed with the following external devices.

1) External devices that are connected to the same Ethernet as the Ethernet module

2) External devices that are connected to other Ethernet networks via routers

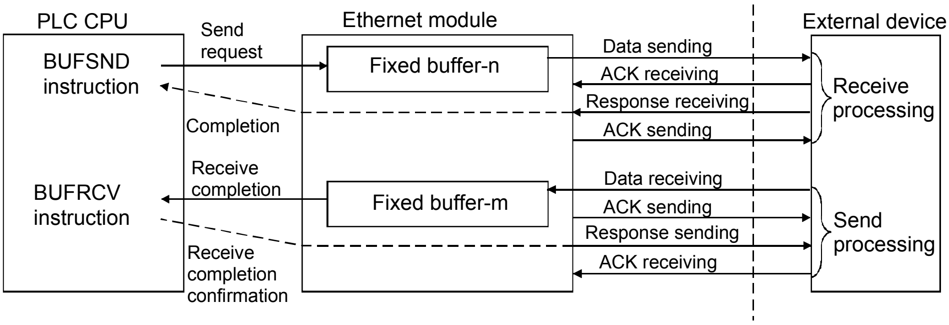


(4) Outline of data sending/receiving procedures

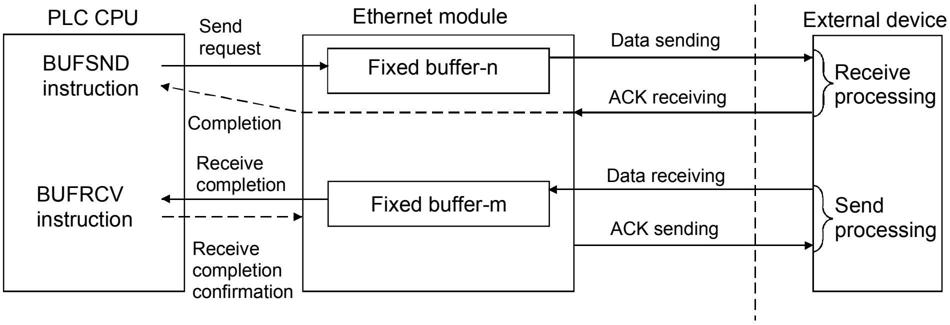
Data sending/receiving is performed as shown in the following figure.

(a) At TCP/IC communication

1) Fixed buffer communication (Procedure exist)

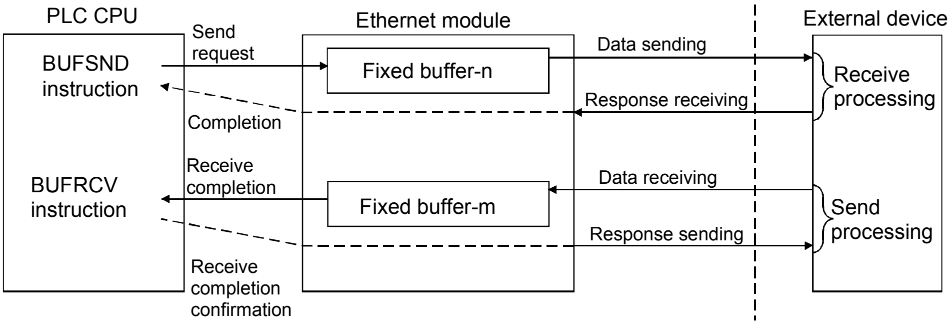


2) Fixed buffer communication (No procedure)

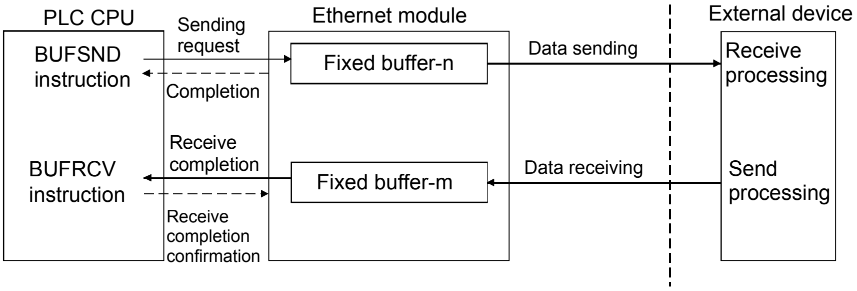


(b) At UDP/IP communication

1) Fixed buffer communication (Procedure exist)



2) Fixed buffer communication (No procedure)



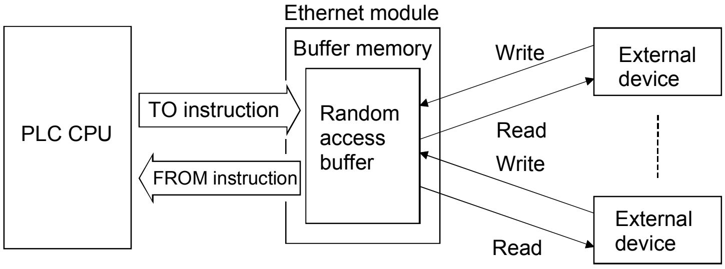
2.2.3 Communication using random access buffer

A PLC CPU can communicate with a personal computer using the random access buffer in the buffer memory of the Ethernet module.
When the data size is too large for the fixed buffer communication (up to 1k words of data), the use of the communication through the random access buffer enables sending/receiving a large amount of data.

(1) Utilizing as the common memory for the PLC CPU and external devices
Data of larger size (up to 6k words) can be exchanged with the external devices.
In the random access buffer, data can be freely written to and read from any external device (*1) without fixing access to a specific external device.
Thus, it can be used as a common buffer area for all of the external devices connected to the Ethernet. (*2)

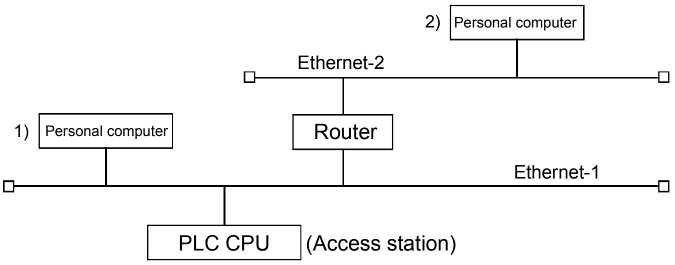
*1 The communication function using the random access buffer cannot be used for the communication between PLC CPUs.

*2 Reading/writing from the PLC CPU to the random access buffer is performed asynchronously with reading/writing from external devices.



(2) External devices capable of exchanging data
The communication using the random access buffer can be performed with the following external devices.

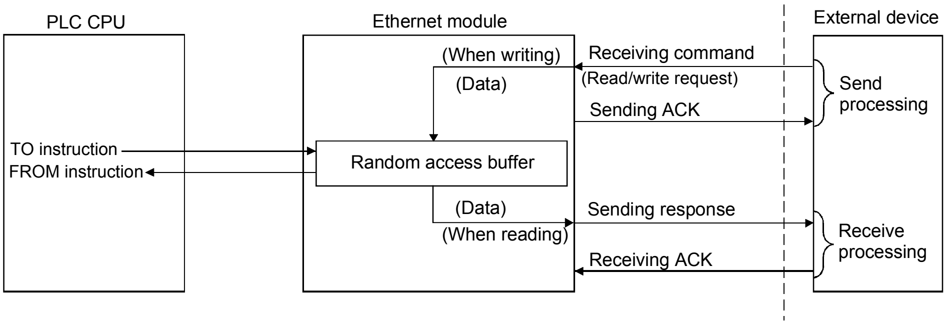
1) External devices that are connected to the same Ethernet as the Ethernet module
2) External devices that are connected to other Ethernet networks via routers



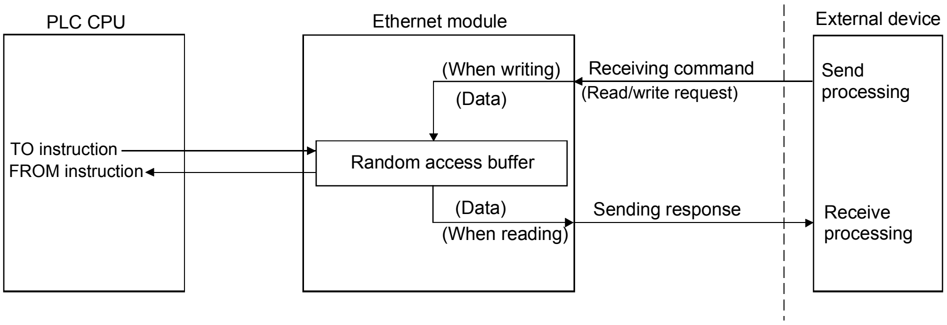
(3) Outline of data sending/receiving procedures

Data are sent or received as shown in the following figures.

(a) TCP/IC communication



(b) UDP/IP communication



2.2.4 Communicability with external devices for each data communication function

The Ethernet module has three types of communication functions: "Communication using MC protocol", "Communication using fixed buffer" and "Communication using random access buffer".

The following table shows the communicability with external devices for each communication function of the Ethernet module.

Function	External device (*1)				
	Personal computer ↓ QJ71E71	Personal computer ↑ QJ71E71	QJ71E71 ↓ ↑ QJ71E71	QJ71E71 ↓ Conventional model	Conventional model ↑ QJ71E71
Communication using the MC protocol	○	×			
Communication using the fixed buffer	○				
Communication using the random access buffer	○	×			

○: Available ×:N/A

*1 Conventional models represent Ethernet interface modules of MELSEC-A and QnA series.

2.3 Open/Close Processing

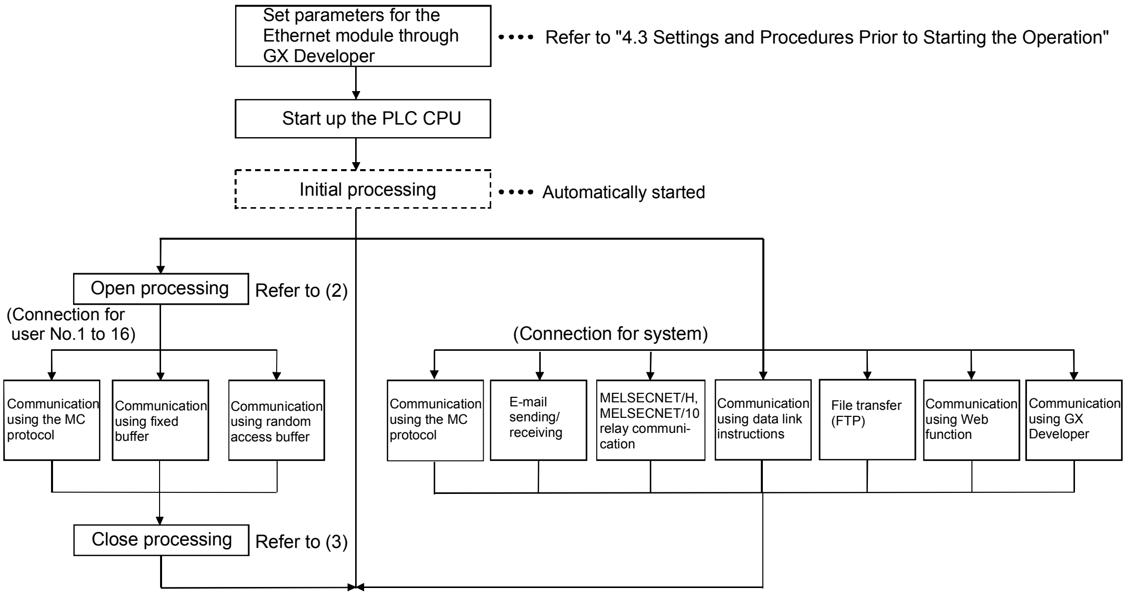
For data communication with external devices using the Ethernet module, a connection must be established (connection of logic circuit) after completion of the initial processing automatically carried out at module start up.

For the Ethernet modules, there are two connection types: one for the system and the other for the user. Completing all of the open processing makes data communication with external devices executable.

When the communication is completed, the close processing is performed for the established connection.

The following describes the Ethernet module connection, and its open and close processing.

(Diagram of data communication procedures)



Set parameters for the Ethernet module through GX Developer
•••• Refer to "4.3 Settings and Procedures Prior to Starting the Operation"
Start up the PLC CPU
Initial processing
•••• Automatically started
Open processing
Refer to (2)
(Connection for user No.1 to 16)
(Connection for system)
Communication using the MC protocol
Communication using fixed buffer
Communication using random access buffer
Communication using the MC protocol
E-mail sending/ receiving
MELSECNET/H, MELSECNET/10 relay communi-cation
Communication using data link instructions
File transfer (FTP)
Communication using Web function
Communication using GX Developer
Close processing
Refer to (3)

(1) Connection of the Ethernet module

(a) Connection for system

1) This is a connection for users to perform data communication using the special functions of the Ethernet module, as shown on the right side of the above diagram.

2) The open processing is automatically performed at start of the Ethernet module.
Users need not to open and close the connection.

(b) Connection for user

1) This is a connection for users to perform data connection using the basic functions of the Ethernet module, as shown on the left side of the above diagram.

2) User performs the open processing when starting data communication with external devices and the close processing when finishing the data communication.

3) According to the communication method set up for the data communication with external devices, the connection is established.

(In TCP/IP communication)

- The connection is established when the open processing is completed normally.
- When the close processing performed after completion of the data communication is normally completed, the connection is disconnected.
- There are the following methods for establishing a connection: Active open and Passive open.

  (Active open)

  Active open makes a request to establish a connection to the designated external device that is waiting for connection establishment.

  Compared to the telephone line, it is a caller side.

  (Passive open)

  There are Fullpassive open and Unpassive open.

  Compared to the telephone line, it is a receiver side.

  The open and close processing by Passive open on the Ethernet module side can be performed from PLC CPU or the Ethernet module system. (*1)

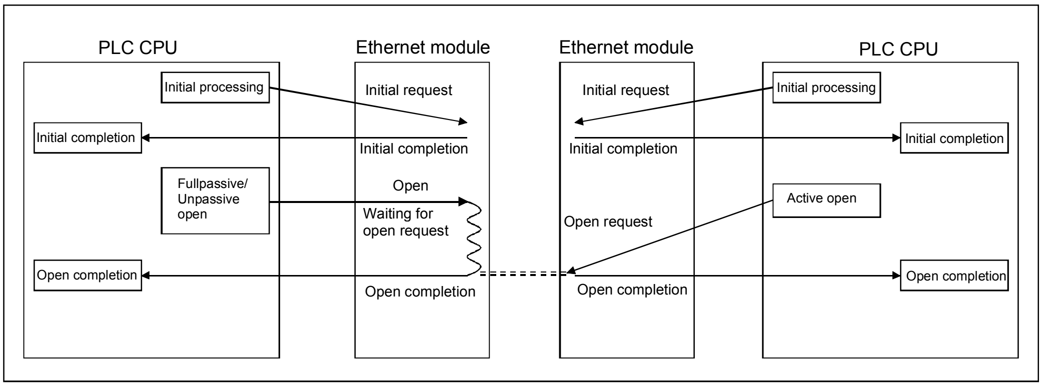
  (Fullpassive open)

  Fullpassive open waits for a connection establishment request (Active open) addressed to the local station from the designated external device.

  (Unpassive open)

  Unpassive open waits for a connection establishment request (Active open) addressed to the local station from any external devices.

(Diagram of connection establishing procedure)



(In UDP/IP communication)

- The open and close processing is done as internal processing of the Ethernet module to enable data communication with external devices.
- A connection is established during data communication after the open processing is completed normally.
- The open and close processing on the Ethernet module side in the UDP/IP communication can be performed from the PLC CPU or the Ethernet module system. (*1)

*1 For the open and close processing on the Ethernet module side shown below, there are two methods:performing from the PLC CPU and by the Ethernet module system. The method is determined by the following parameter setting value for the Ethernet module on the GX Developer.

- The open and close processing by Passive open in the TCP/IP communication
- The open and close processing in the UDP/IP communication

(1) If the following 1) and 2) are satisfied in the parameter settings for the Ethernet module on GX Developer, the Ethernet module system performs the open and close processings of the corresponding connection.
No open and close processing from sequence programs is required.
(Refer to the next page for the setting screen.)

1) "Always wait for OPEN" is set for "Initial timing" of the operational settings. (Common setting to all connections for users)
2) For the connection for users, the following are set for "Protocol" and "Open system" of the open setting.
   - "Protocol" = TCP, "Open system" = Unpassive
   - "Protocol" = TCP, "Open system" = Fullpassive
   - "Protocol" = UDP, "Open system" = (No setting is required)

REMARK

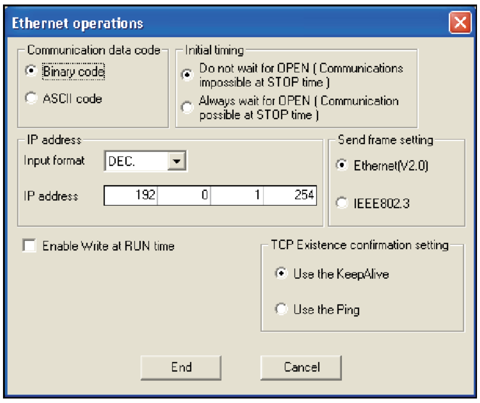
When the Ethernet module was started in the setting described above
(Connection set as "Protocol" = TCP)

- The open processing (Active open) from an external device makes the connection open and enables data communication.
- For finishing the data communication, the close processing from the external device disconnects the connection.
- If necessary, perform the open and close processing from external devices, and executes data communication at any time.
  However, when closing a connection from the PLC CPU side due to a communication error while the connection is open, use the CLOSE instruction in the sequence program.
  In this case, as the wait for OPEN processing of the corresponding connection will not be performed by the Ethernet module system, all the subsequent open processing (using the OPEN instruction) and close processing on the Ethernet module side must be performed using the sequence program .

("Protocol" = UDP)
Starting the Ethernet module enables the data communication with external devices.

(2) If the following 1) or 2) are set in the previously mentioned parameter settings, the open and close processing of the corresponding connection is performed using the sequence program.
The Ethernet module system does not perform the open and close processing.

1) "Do not wait for OPEN" is set for "Initial timing" in the operational settings. (Common setting to all connections for users)
2) For the connection for users, the following are set for "Protocol" and "Open system" of the open setting.
• "Protocol" = TCP, "Open system" = Active



Ethernet operations

Communication data code
● Binary code
○ ASCII code

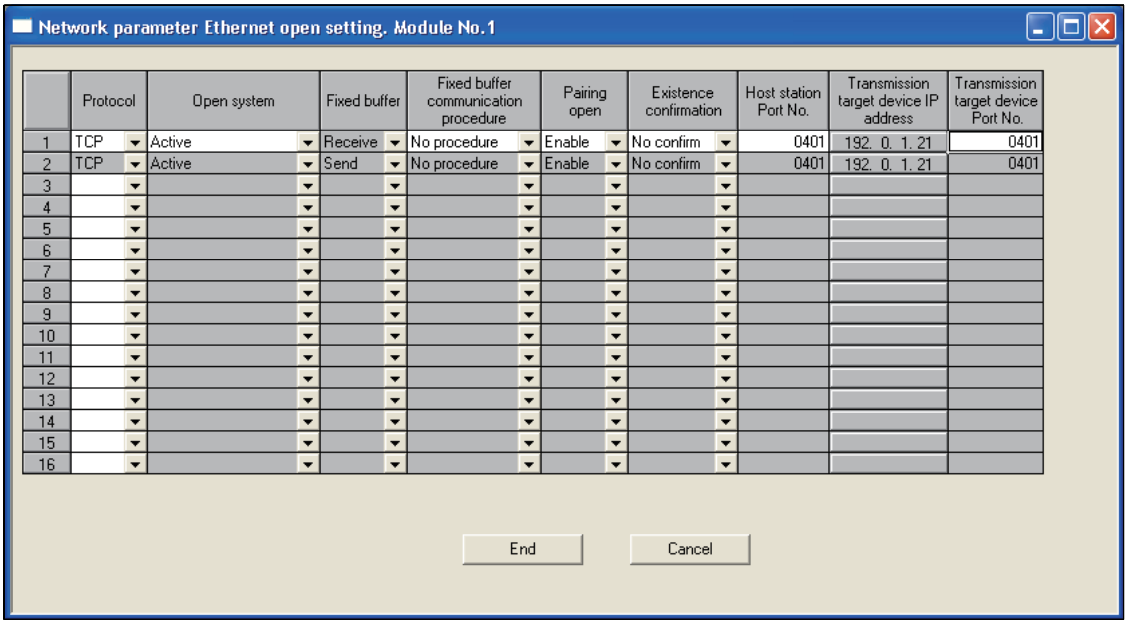
Initial timing
● Do not wait for OPEN (Communications impossible at STOP time)
○ Always wait for OPEN (Communication possible at STOP time)

IP address
Input format: DEC.
IP address: 192 0 1 254

Send frame setting
● Ethernet(V2.0)
○ IEEE802.3

□ Enable Write at RUN time

TCP Existence confirmation setting
● Use the KeepAlive
○ Use the Ping



Network parameter Ethernet open setting, Module No.1

	Protocol	Open system	Fixed buffer	Fixed buffer communication procedure	Pairing open	Existence confirmation	Host station Port No.	Transmission target device IP address	Transmission target device Port No.
1	TCP	Active	Receive	No procedure	Enable	No confirm	0401	192. 0. 1. 21	0401
2	TCP	Active	Send	No procedure	Enable	No confirm	0401	192. 0. 1. 21	0401
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

(2) Open processing

(a) The open processing is a processing which enables data communication with external devices.

1) In TCP/IP communication

- The Ethernet module system communicates with an external device using a connection after establishing the connection (connection of logic circuit).
- The users can send and receive data using the connection after completing the open processing normally.

2) In UDP/IP communication

- The Ethernet module system performs the internal processing.
- The users can send and receive data through the open connection after completing the open processing normally.

(b) In order to perform the open processing, the initial processing must have been completed normally.

(c) Connections can be opened for up to 16 external devices.
Note that two fixed buffers are required when communicating with the same external device using the fixed buffer communication. Because of this, the number of the external devices may be reduced.

POINT

Note the following when performing the communications using the MC protocol and the random access buffer.

- To continue data communication even after turning the PLC CPU of the Ethernet-module-installed station to STOP, set "Initial timing" to "Always wait for OPEN (Communication possible at STOP time)".

(3) Close processing

(a) The close processing is a processing which disables data communication with external devices.

1) In TCP/IP communication

- The Ethernet module system communicates with the external device using the connection used in data communication and disconnects the connection (disconnection of logic circuit).
- Completing the close processing normally enables change of the external device that uses the connection.

2) In UDP/IP communication

- The Ethernet module system performs the internal processing.
- Completing the close processing normally enables change of the external device that uses the connection.

(b) The close processing is performed mainly in the following cases.

- Terminate a connection with an external device
- Change an external device to communicate
- Change communication conditions

(c) Perform the close processing using the sequence program for the connection that has been opened using the sequence program.

(d) Determine the timing for the close processing with the external device.

POINT

Even if the close processing is not requested, the open completion signal (corresponding bit in address: 5000H) automatically turns off and the communication line is closed in the following cases:

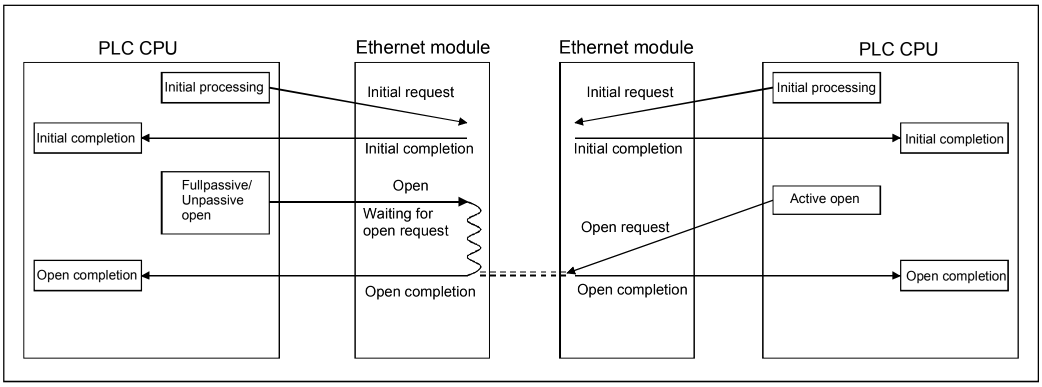
(1) When an existence confirmation function time out occurs.

(2) When a close or ABORT (RST) instruction is received from an external device.

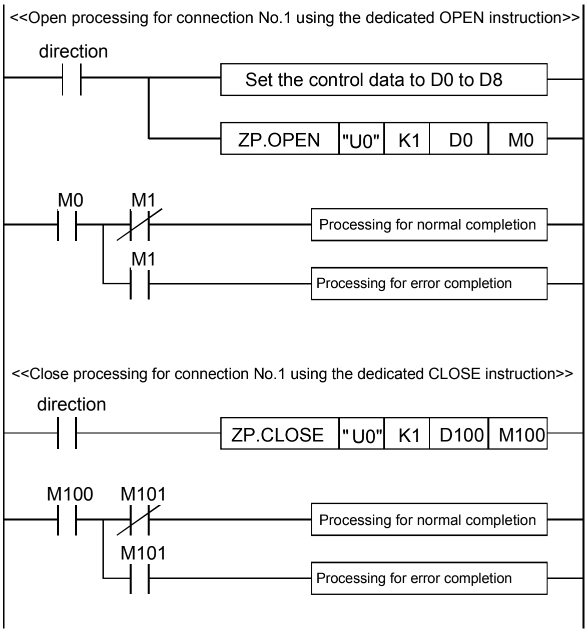
(3) When the Active open request is received again from the external device in the open completion status of TCP/IP. (The connection will be closed after the RST command is sent.)

2.3.1 Active open/close processing

The Active open executes the connection processing to the external device, which TCP/IP connection is in the wait for OPEN status (Fullpassive/Unpassive), and enables data communication.



The following describes an Ethernet module sequence program and a timing chart.

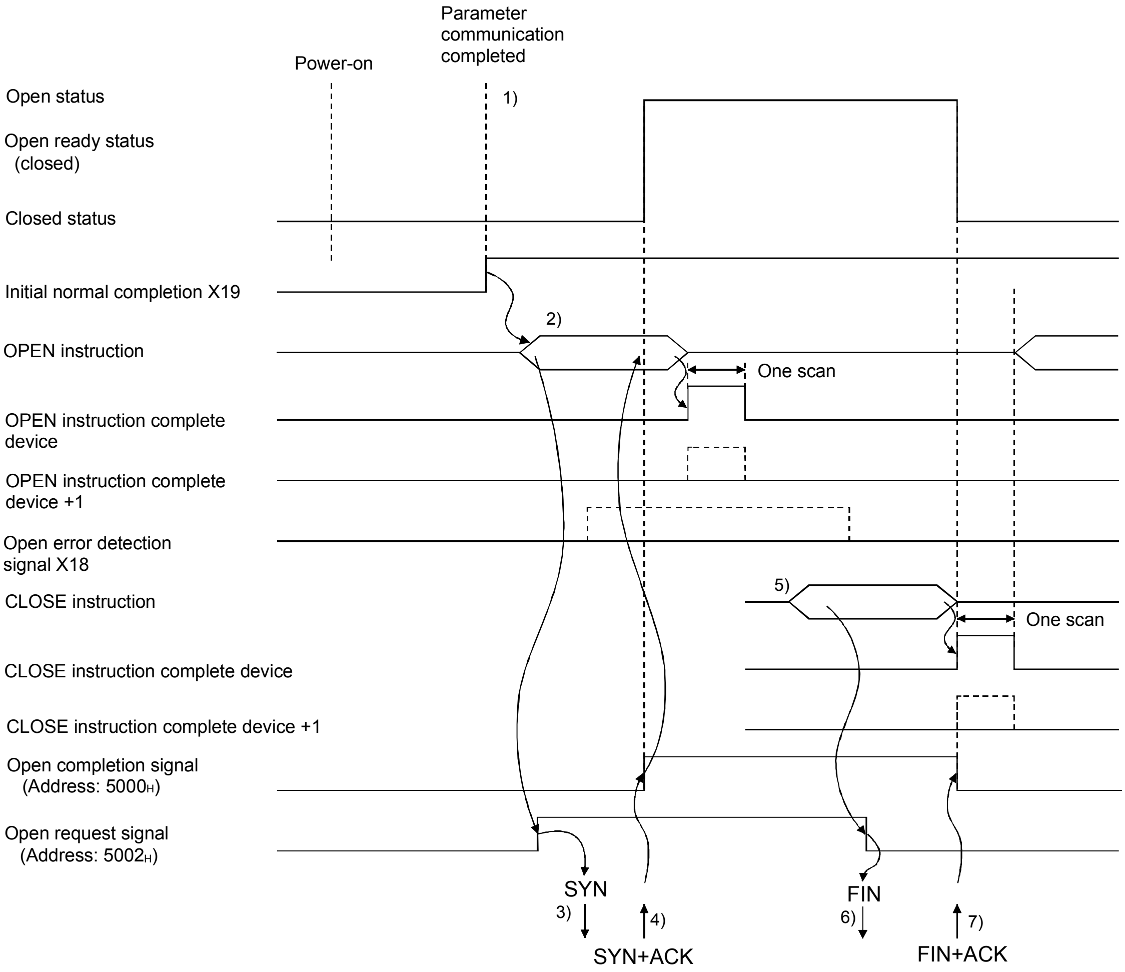

<<Open processing for connection No.1 using the dedicated OPEN instruction>>
direction
Set the control data to D0 to D8
ZP.OPEN "U0" K1 D0 M0
M0
M1
Processing for normal completion
M1
Processing for error completion
<<Close processing for connection No.1 using the dedicated CLOSE instruction>>
direction
ZP.CLOSE "U0" K1 D100 M100
M100
M101
Processing for normal completion
M101
Processing for error completion

When using "Application" set in "Open settings" of GX Developer (*1)
・Control data [D0]: H0

When setting "Application" in "Control data" of OPEN instruction (*1)
・ [D0]: H8000
・ Set [D1] to [D9] according to the application

*1 The setting items of "Application" are as follows.
For details, refer to the Q Corresponding Ethernet Interface Module User's Manual (Basic).

- Application of fixed buffers (For sending, For receiving)
- Destination existence check (Confirm, No confirm)
- Paring open (Pairs, No pairs)
- Communication method (TCP/IP, UDP/IP)
- Fixed buffer communication (Procedure exist, No procedure)
- Open system (Active open or UDP/IP, Unpassive, Fullpassive)


Parameter communication completed
Power-on
Open status
Open ready status (closed)
Closed status
Initial normal completion X19
OPEN instruction
OPEN instruction complete device
OPEN instruction complete device +1
Open error detection signal X18
CLOSE instruction
CLOSE instruction complete device
CLOSE instruction complete device +1
Open completion signal (Address: 5000H)
Open request signal (Address: 5002H)
1)
2)
One scan
5)
One scan
SYN
3)
4)
SYN+ACK
FIN
6)
7)
FIN+ACK

Number	Description
1)	After parameter communication, confirm normal completion of the Ethernet module initial processing. (Initial normal completion signal (X19): ON)
2)	Start the open processing using the dedicated instruction, OPEN. (Open request signal (address: 5002$_H$ … b0): ON)
3)	The open processing is executed.
4)	• When the open processing completes normally Data communication is enabled. • When the open processing completes abnormally Confirm "Complete status" stored in the control data of the OPEN instruction and perform the recovery processing.
5)	Start the close processing using the dedicated instruction-CLOSE instruction. (Open request signal: OFF)
6)	The close processing is executed.
7)	Open completion signal turns OFF.

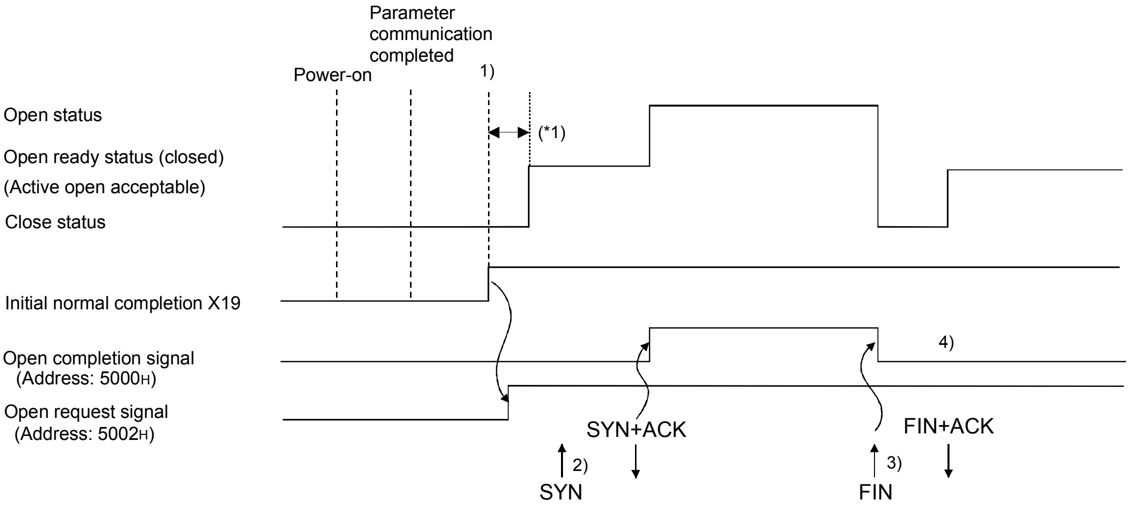
2.3.2 Passive open/close processing

The Passive open puts the open request (connection request by Active open) from an external device of the TCP/IP connection into the receive wait status.
The Passive open includes Unpassive open and Fullpassive open.
Both of them are passive open processings for the TCP connection.

Open system	Description
Unpassive	Waits for receiving an open request (connection request) addressed to the local station from any of all the devices connected to a network.
Fullpassive	Waits for receiving an open request (connection request) addressed to the local station from the designated devices.

The processing of the Ethernet module varies depending on the setting value of the initial timing ("Do not wait for OPEN", "Always wait for OPEN") in the operational settings of GX Developer.

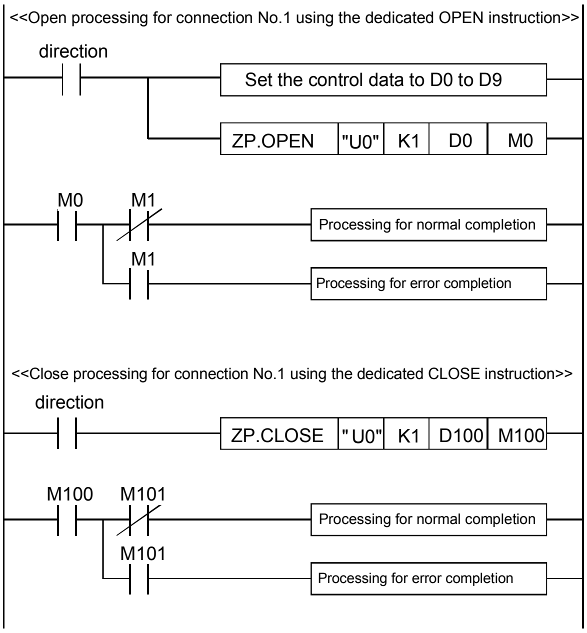
(1) When setting "Always wait for OPEN" in the operational settings
The Ethernet module system always puts the connection into the wait-for-OPEN status.
(No sequence programs for the open and close processing are required.)



Number	Description
1)	After parameter communication, confirm normal completion of the Ethernet module initial processing. (Initial normal completion signal (X19): ON) After the initial processing is normally completed, the connection is placed in the open ready status and the Ethernet module waits for receiving an open request from an external device.
2)	The Ethernet module starts the open processing upon receiving the open request (SYN) from the external device. When the open processing is normally completed, the open completion signal (address: 5000H... b0) turns on and data communication is enabled.
3)	The Ethernet module starts the close processing upon receiving the close request (FIN) from the external device. When the close processing is completed, the open completion signal turns off and the data communication is disabled.
4)	After the Ethernet module’s close processing is completed, the connection returns to the open ready status.

*1 An open request (SYN) received during the time from normal completion of the initial processing to change to the open acceptable status generates an error, and the Ethernet module sends a connection forced close (RST).

(2) When "Do not wait for OPEN" is set in the operational settings
The open and close processings are performed using the sequence program.
After the open processing for the connection is completed normally, data communication is enabled.
The open and close processing must be performed using dedicated instructions.

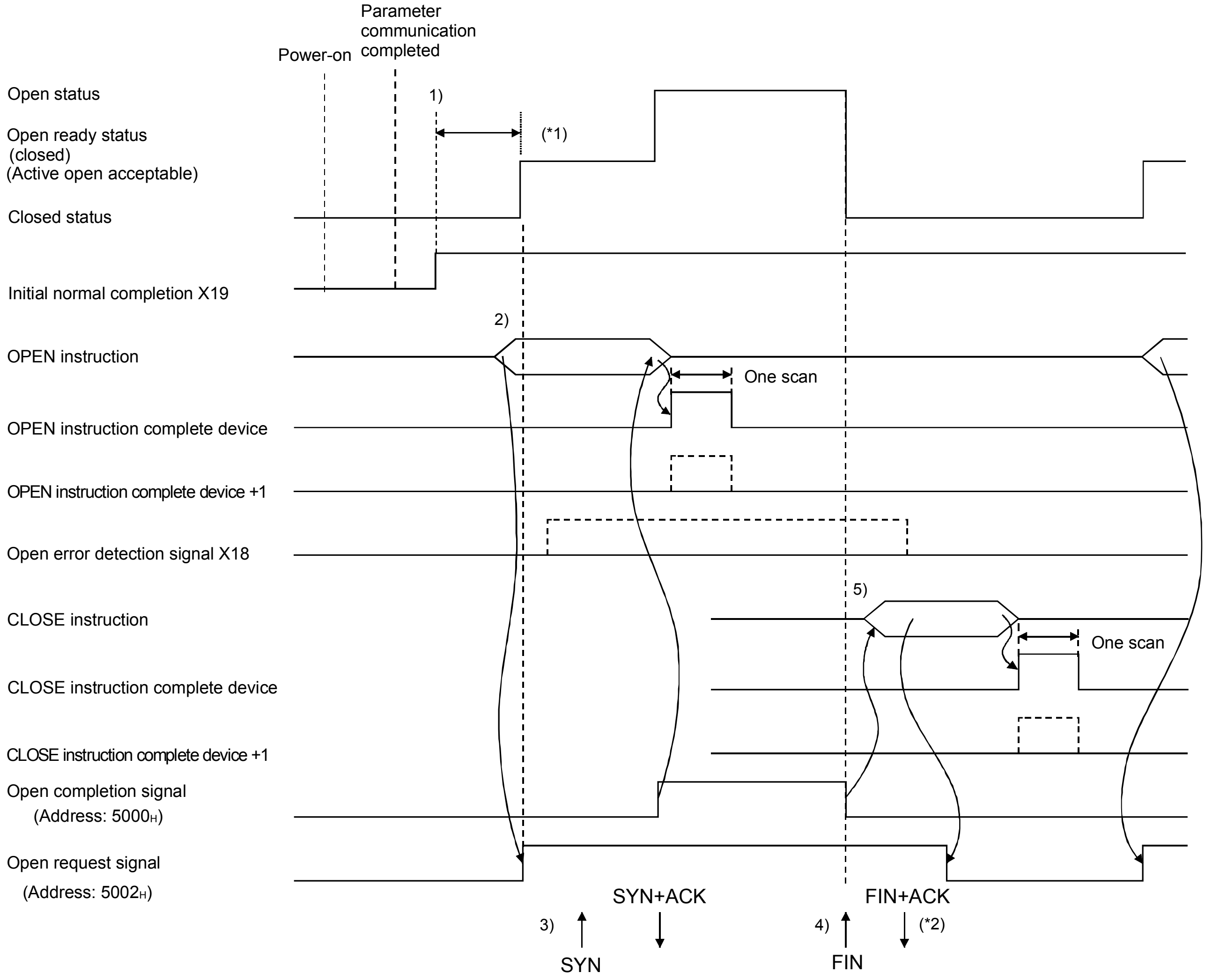


<<Open processing for connection No.1 using the dedicated OPEN instruction>>
direction
Set the control data to D0 to D9
ZP.OPEN "U0" K1 D0 M0
M0
M1
Processing for normal completion
M1
Processing for error completion
<<Close processing for connection No.1 using the dedicated CLOSE instruction>>
direction
ZP.CLOSE "U0" K1 D100 M100
M100
M101
Processing for normal completion
M101
Processing for error completion

When using "Application" set in the "Open settings" of GX Developer (*1)
- Control data [D0]: H0

When setting the "Application" in the "Control data" of OPEN instruction (*1)
- [D0]: H8000
- Set [D1] to [D9] according to the application

*1 The setting items of "Application" are as follows.
For details, refer to the Q Corresponding Ethernet Interface Module User's Manual (Basic).
- Application of fixed buffers (For sending, For receiving)
- Destination existence check (Confirm, No confirm)
- Paring open (Pairs, No pairs)
- Communication method (TCP/IP, UDP/IP)
- Fixed buffer communication (Procedure exist, No procedure)
- Open system (Active open or UDP/IP, Unpassive, Fullpassive)


Parameter communication completed
Power-on
Open status
Open ready status (closed) (Active open acceptable)
Closed status
Initial normal completion X19
1)
(*1)
2)
OPEN instruction
One scan
OPEN instruction complete device
OPEN instruction complete device +1
Open error detection signal X18
5)
CLOSE instruction
One scan
CLOSE instruction complete device
CLOSE instruction complete device +1
Open completion signal (Address: 5000H)
Open request signal (Address: 5002H)
SYN+ACK
3)
SYN
FIN+ACK
4)
(*2)
FIN

Number	Description
1)	After the parameter communication, confirm normal completion of the Ethernet module initial processing. (Initial normal completion signal (X19): ON)
2)	Start the open processing using the dedicated instruction, OPEN. (Open request signal (address: 5002H … b0): ON)
3)	The Ethernet module starts the open processing upon receiving the open request (SYN) from the external device. • When the open processing completes normally The open completion signal (address: 5000H… b0) turns on and data communication is enabled. • When the open processing completes abnormally Confirm "Complete status" stored in the control data of the OPEN instruction and perform the recovery processing.
4)	The Ethernet module starts the close processing upon receiving the close request (FIN) from the external device. When the close processing is completed, the open completion signal turns off and the data communication is disabled.
5)	Start the close processing using the dedicated instruction, CLOSE. (Open request signal: OFF)

*1 An open request (SYN) received during the time from normal completion of the initial processing to change to the open acceptable status generates an error, and the Ethernet module sends a connection forced close (RST).

*2 The above chart shows how the Ethernet module side closes a connection in response to a close request from the external device side.
When disconnecting the connection from the Ethernet module side, the CLOSE instruction is executed using the sequence program to start the close processing.
(The FIN is sent and the FIN+ACK is received.)

2.3.3 UDP/IP open/close processing

The open and close processing in UDP/IP is internal processing of the Ethernet module.

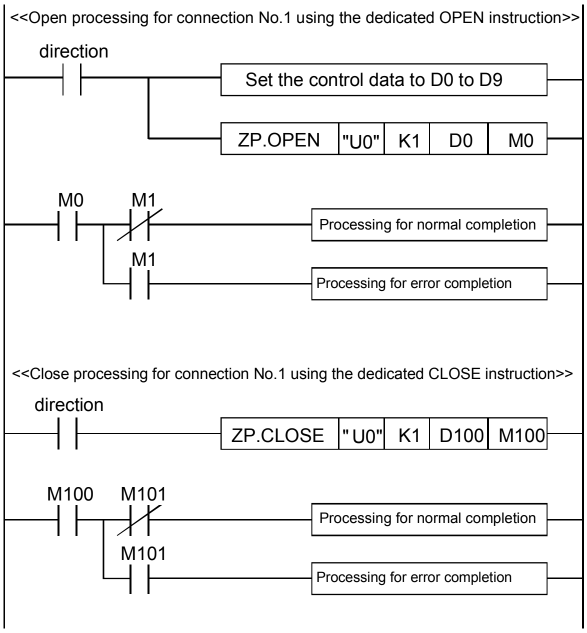
The processing of the Ethernet module varies depending on the setting value of the initial timing setting ("Do not wait for OPEN", "Always wait for OPEN") in the operational settings of GX Developer.

(1) When "Always wait for OPEN" is set in the operational settings
The Ethernet module system is put into the status where data communication can be always performed.
(No sequence program for the open and close processing is required.)

REMARK

When the open or close processing has been done using the dedicated instructions - OPEN or CLOSE from the Ethernet module side, all the open or close processing of the corresponding connection after that should be performed by the sequence program even if "Always wait for OPEN (Connection possible at STOP time)" is set.
(The open and close processing same as that for "Always wait for OPEN (Communication impossible at STOP time)" is required.)

(2) When "Do not wait for OPEN" is set in the operational settings (Communications impossible at STOP time)
The open and close processing is performed using the sequence program.
After the open process of the connection is completed normally, data communication is enabled.
The open and close processing must be performed using the dedicated instructions.

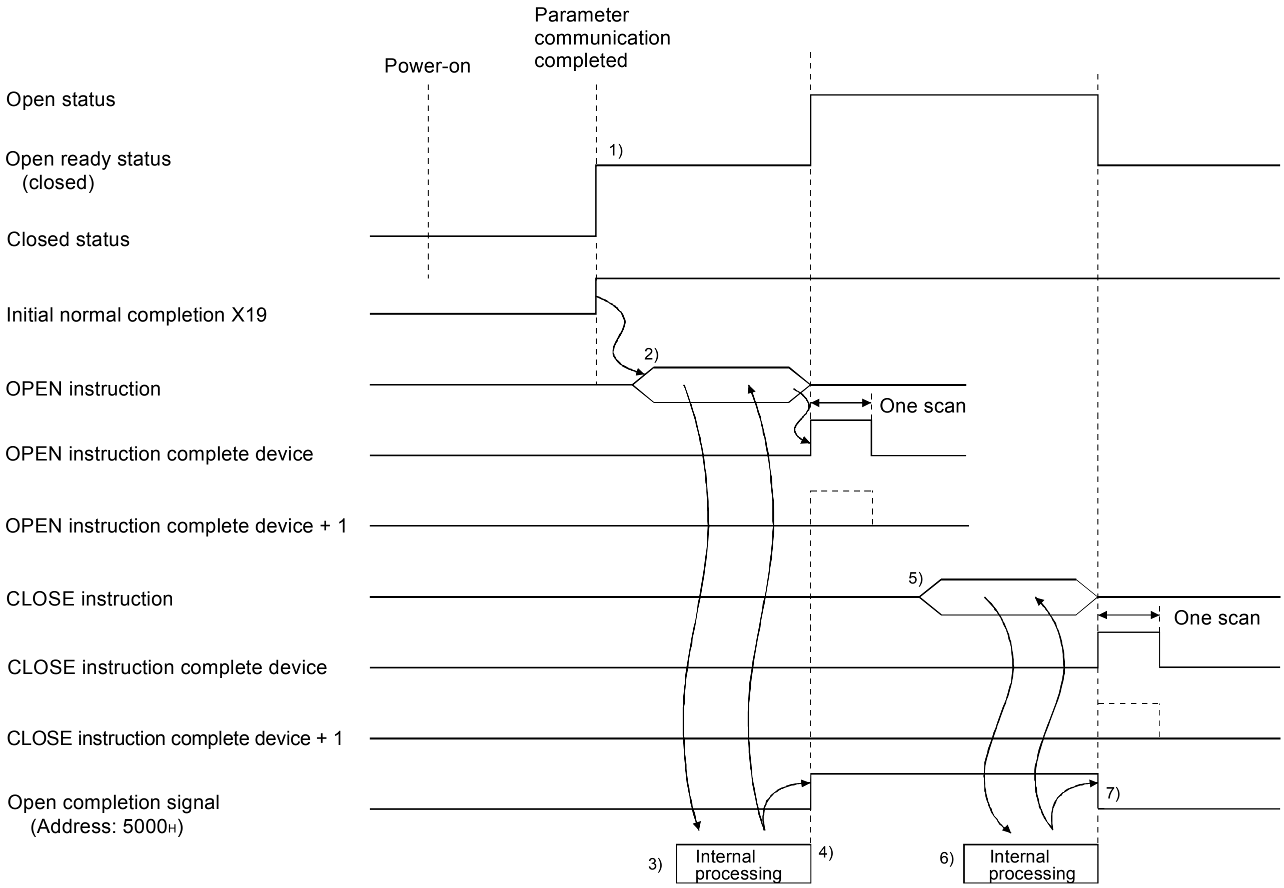


<<Open processing for connection No.1 using the dedicated OPEN instruction>>
direction
Set the control data to D0 to D9
ZP.OPEN "U0" K1 D0 M0
M0
M1
Processing for normal completion
M1
Processing for error completion
<<Close processing for connection No.1 using the dedicated CLOSE instruction>>
direction
ZP.CLOSE "U0" K1 D100 M100
M100
M101
Processing for normal completion
M101
Processing for error completion

When using "Application" set in "Control data" of GX Developer (*1)
・Control data [D0]: H0

When setting the "Application" in "Control data" of OPEN instruction (*1)
・[D0]: H8000
・Set [D1] to [D9] according to the application.

*1 Refer to Section 2.3.1 for the setting items of "Application".
For details, refer to the Q Corresponding Ethernet Interface Module User's Manual (Basic).


Parameter communication completed
Power-on
Open status
Open ready status (closed)
Closed status
Initial normal completion X19
OPEN instruction
OPEN instruction complete device
OPEN instruction complete device + 1
CLOSE instruction
CLOSE instruction complete device
CLOSE instruction complete device + 1
Open completion signal (Address: 5000H)
1)
2)
One scan
5)
One scan
7)
3)
Internal processing
4)
6)
Internal processing

Number	Description
1)	After parameter communication, confirm normal completion of the Ethernet module initial processing. (Initial normal completion signal (X19): ON)
2)	Start the open processing using the dedicated instruction, OPEN. (Open request signal (address: 5002H … b0): ON)
3)	The Ethernet module executes the open processing. (Internal processing only)
4)	• When the open processing completes normally Open completion signal (address: 5000H ... b0) turns on. Data communication is enabled. • When the open processing completes abnormally Confirm "Complete status" stored in the control data of the OPEN instruction and perform the recovery processing.
5)	Start the close processing using the dedicated instruction, CLOSE. (Open request signal: OFF)
6)	The close processing is executed. (Internal processing only)
7)	Open completion signal turns OFF.

MEMO

CHAPTER 3 SYSTEM CONFIGURATION

3.1 Applicable Systems

The Ethernet modules can be used in systems to which the following descriptions apply.

(1) Applicable modules and number of mountable modules
The following table lists the CPU modules and remote I/O stations where the Ethernet module can be mounted and the number of mountable modules.

Applicable Module		Number of modules that can be mounted	Remark
CPU module	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Up to 4	• Available only in Q mode. • Up to 8 in total including modules for MELSECNET/H (*1)
	Q00JCPU Q00CPU Q01CPU	1 at max	(*1)
Remote I/O station	QJ72LP25-25 QJ72LP25G QJ72BR15	Up to 4	MELSECNET/H remote I/O station (*2)(*3)

*1 Refer to the User's Manual (Function Explanation, Program Fundamentals) for the CPU module to be used.
*2 Refer to the Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O network).
*3 Use the Ethernet module of function version B.

(2) Applicable base unit
The Ethernet module can be mounted in any I/O slot (*1) of the base unit.
*1 Limited within the I/O point range of the CPU module and remote I/O station.

(3) Applicable software packages
The following table shows the software packages available for the Ethernet module.

(a) Software for PLC

Product name	Model	Remark
GX Developer	SWnD5C-GPPW-E	MELSEC PLC programming software. The "n" in the model name must be 4 or greater.

(b) Communication support tool for external devices

Product name	Model	Remark
MX Component	SWnD5C-ACT-E	Active X library for communication. The "n" in the model name must be 0 or greater.
MX Links	SWnD5F-CSKP-E	DLL library for communication. The "n" in the model name must be 3 or greater.

3.2 Devices Required for Network Configuration

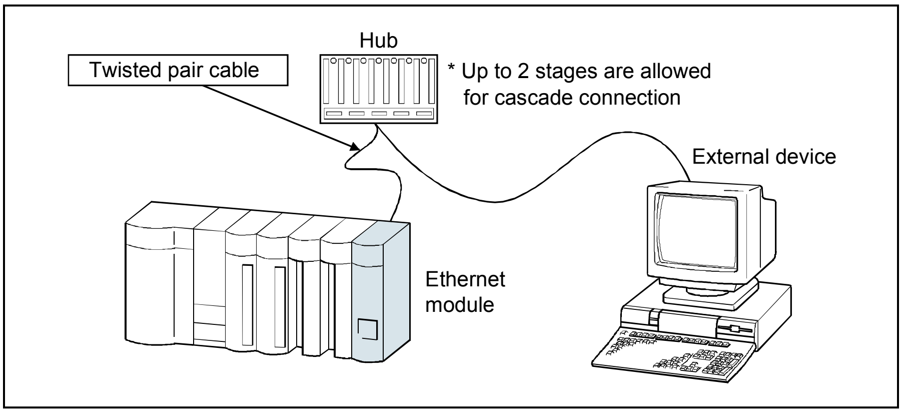
This section explains the devices that are required to configure a network.
Network installation work needs sufficient safety measures; please ask a qualified network installer.

REMARK

This section is described for use of QJ71E71-100.
For the other modules (QJ71E71, QJ71E71-B2), refer to Q corresponding Ethernet Interface Module User's Manual (Basic).

(1) When configuring an Ethernet system using QJ71E71-100
When connecting the QJ71E71-100 to a network, either 10BASE-T or 100BASE-TX can be used.
The Ethernet module detects whether it is 10BASE-T or 100BASE-TX according to the hub.

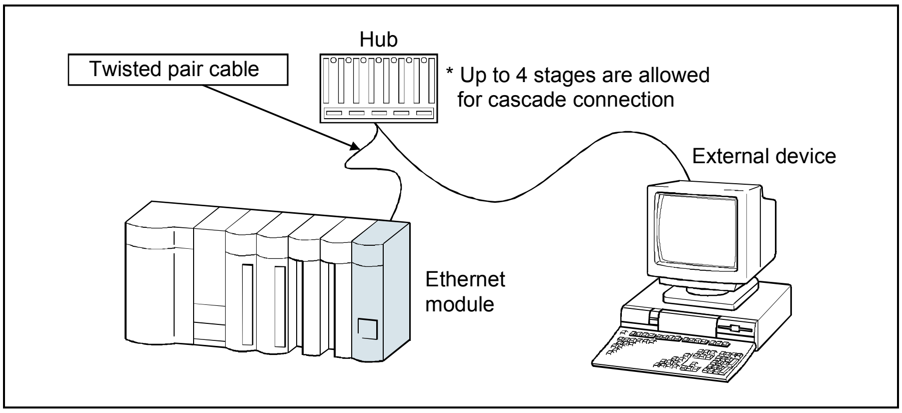
(a) Connection using 100BASE-TX



Use the devices that satisfy the standards of IEEE802.3 ,100BASE-TX.
(About the devices shown under the hub)

- Shielded twisted pair cable (STP cable) (category 5)
  - * Straight cables can be used.
    (Correct operation is not guaranteed if a crossed cable is connected to an external device via 100BASE-TX of the Ethernet module.
    However, use of crossed cables is allowed for data communication between two Ethernet modules (i.e., two QJ71E71-100 modules) or for connection to a GOT.)
- RJ45 jacks
- 100Mbps hub

(b) Connection using 10BASE-T



Use devices that satisfy the standards of IEEE802.3, 10BASE-T.

(About the devices shown under the hub)

- Unshielded twisted pair cable (UTP cable) (category 3 (4, 5))
  - * Straight cables can be used.
    (Correct operation is not guaranteed if a crossed cable is connected to an external device via 10BASE-T of the Ethernet module.
    However, use of crossed cables is allowed for data communication between two Ethernet modules (i.e., two QJ71E71-100 modules, or QJ71E71 and QJ71E71-100) or for connection to a GOT.)
- RJ45 jacks
- 10Mbps hub

POINT

In the high-speed communication (100Mbps) by 100BASE-TX connection, a communication error may occur due to the effect of high frequency noise from devices other than the PLC in a given installation environment.

The following describes preventive measures on the QJ71E71-100 side, which can be taken for the construction of a network system.

(1) Wiring
- Do not connect the twisted pair cables together with the main circuit and the power wires.
- Make sure to place the twisted pair cables in a duct.

(2) Communication method
- Use the TCP/IP communication.
- Increase the number of retries as necessary.

(3) 10Mbps communication
- Replace the hub connected to the QJ71E71-100 with the one capable of handling 10Mbps to perform communications at the data transmission rate of 10Mbps.

MEMO

CHAPTER 4 SPECIFICATIONS OF ETHERNET MODULE & SETTINGS AND PROCEDURES PRIOR TO OPERATION

4.1 Performance Specifications

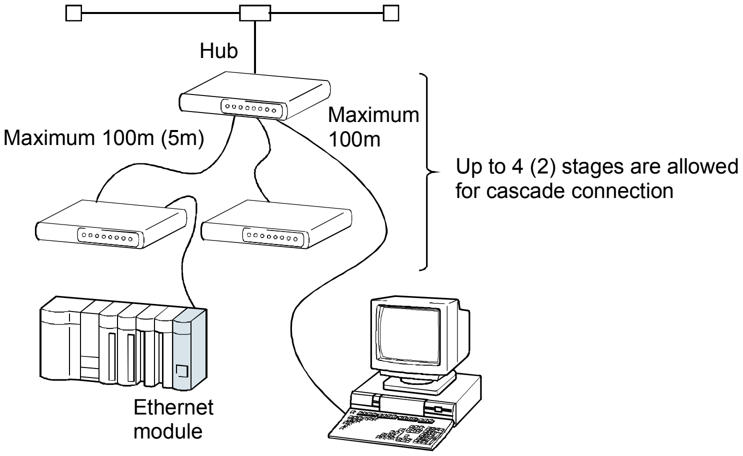
The following explains the performance specifications of the QE71E71-100.
For the performance specifications of other Ethernet modules, refer to Q corresponding Ethernet Interface Module User's Manual (Basic).

Item			Specifications	
			100BASE-TX	10BASE-T
Transmission specifications	Data transmission speed		100Mbps	10Mbps
	Transmission method		Base band	
	Maximum node-to-node distance		—	
	Length between hub and node		100m	
	Maximum No. of nodes/connection		Cascade connection Maximum 2 stages	Cascade connection Maximum 4 stages
	Interval between the minimum nodes		—	
Transmission data storage memory	Number of simultaneously open connection allowed		16 connections (Connections usable by the sequence program)	
	Fixed buffer		1k words × 16	
	Random access buffer		6k words × 1	
	E-mail	Attached file	6k words × 1 (*1)	
		Main text	960 words × 1 (*1)	
Number of I/O points occupied			32 points (I/O assignment: intelligent)	
5V DC internal current consumption			0.50A	
Noise durability			Depends on the specifications of the power module to which the Ethernet module is installed.	
Withstand voltage				
Insulation resistance				
External dimensions			98 (H) x 27.4 (W) x 90 (D) [mm]	
Weight			0.11kg	
E-mail transmission specifications Transmission and reception data (*1)	Data size	Attached file	6k words × 1	
		Main text	960 words × 1	
	Data transfer method		When sending: Sends either a file as attachment or main text (select one). When receiving: Receives a file as attachment.	
	Subject		Us-ASCII format or ISO-2022-JP (Base64)	
	Attached file format		MIME format	
	MIME		Version 1.0	
	Data format of attached file		Binary/ASCII/CSV can be selected. File name: XXXX.bin(binary), XXXX.asc(ASCII), XXXX.csv(CSV) (CSV: Comma Separated Value)	
	Division of attached file		Cannot be divided (only one file can be sent/received) * If any divided file is received, only the first file will be received and the remaining files will be discarded.	
	When sending (encode)		Subject : Base64/7bits Main text : 7bits Attached file : Base64	
	When receiving (decode)		Subject : (Does not decode) Main text : (Cannot be received) Attached file : Base64/7bit/8bit/Quoted Printable * If e-mail is sent from the external device to the PLC side, specify the encoding method (Base64/7 bits/8 bits/Quoted Printable) of the attached file.	
	Encryption		No	
	Compression		No	
	Communication with mail server		SMTP (sending server) Port number=25 POP3 (receiving server) Port number=110	

*1 The e-mail transmission and reception function of the PLC CPU and the random access buffer communication function cannot be used together. Only one of the functions can be used at a time. (The e-mail transmitting function of the Ethernet module's PLC CPU monitoring function and the random access buffer communication function can be used together.)

REMARK

The following shows the transmission specification for the connection using the 10BASE-T/100BASE-TX.



* The item in parentheses ( ) indicates when a connection is established using 100BASE-TX.

4.2 Ethernet Module Function List

This section shows a list of Ethernet module functions.

(1) Basic functions of the Ethernet module
The Ethernet module can perform the communications shown in the table below using the TCP/IP or UDP/IP communication.

Function		Description	Reference section
Communication using the MC protocol	QnA compatible 3E frame	Reads/writes PLC CPU data from/to an external device.	MELSEC Communication Protocol Reference
	A compatible 1E frame		
Communication using the fixed buffer	Procedure exist	Sends/receives arbitrary data between the PLC CPU and the external device using the fixed buffer of the Ethernet module.	Chapter 6
	No procedure		Chapter 7
Communication using the random access buffer		Reads/writes data from multiple external devices to the random access buffer of the Ethernet module.	Q Corresponding Ethernet Interface Module User's Manual (Basic)
Sending/receiving by e-mail		Sends/receives data by e-mail. • Sending/receiving by PLC CPU • Sending by PLC CPU monitoring function (automatic notification function)	Q Corresponding Ethernet Interface Module User's Manual (Application)
Communication using data link instructions		Reads/writes the PLC CPU data of other station via Ethernet using data link instructions.	
File transfer (FTP server function)		Reads/writes in file unit using FTP commands from the external device.	
Communication using Web functions		Reads/writes the PLC CPU data via the Internet using a commercially available Web browser.	Q Corresponding Ethernet Interface Module User's Manual (Web function)

(2) Additional functions of the Ethernet module

The following table lists the additional functions of the Ethernet module that can be used.

Function	Description	Reference section
MELSECNET/H, MELSECNET/10 relay communication	In a network system on which Ethernet and, MELSECNET/H or MELSECNET/10, coexist, or in a network system that relays multiple Ethernets, data communication is performed via multiple number of such networks.	Q Corresponding Ethernet Interface Module User's Manual (Application)
Router relay communication (router relay function)	Performs data communication via a router or gateway. (The router relay function is not a function by which the Ethernet module works as a router.)	Chapter 8
Existence check of external device (Existence / check function)	Checks whether or not the external device is working normally after a connection is established (open processing).	Q Corresponding Ethernet Interface Module User's Manual (Basic)
Communication via pairing open	Pairs and then opens a reception connection and a transmission connection. (For fixed buffer)	
Communication via automatic open UDP port	Enables communication after the station in which an Ethernet module is mounted has been started. (Open/close processing by the sequence program is not required.)	
Remote password check	Prevents unauthorized access by a remote user to a QCPU.	
Simultaneous broadcast	Sends/receives data for all external devices on the same Ethernet as the Ethernet module is on in the data communication using UDP/IP. (Simultaneous broadcast)	

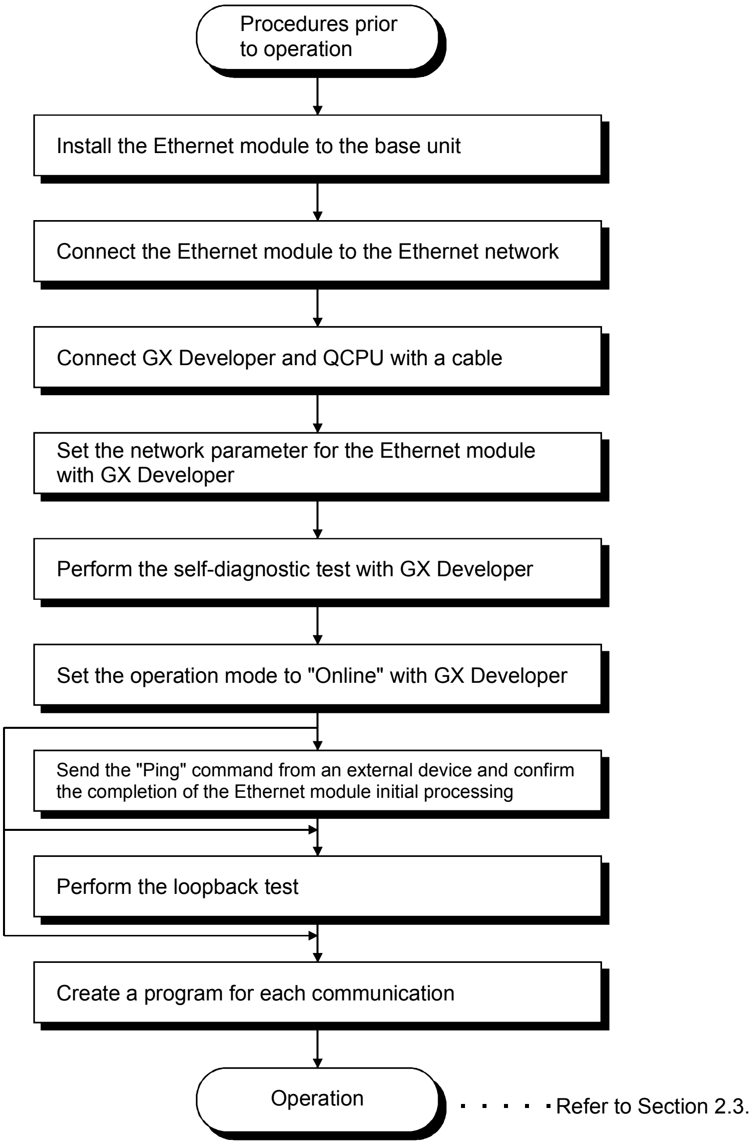
(3) Status check of the Ethernet module

Whether the Ethernet module is working normally and whether it can communicate normally are checked.

Function	Description	Reference section
Self refrain test	Checks the Ethernet module's sending/receiving function and line connection status.	Section 4.7.1
Hardware test	Tests the RAM and ROM of the Ethernet module.	Section 4.7.2
Communication error storage	When a data communication error occurs, this function stores the error information (error log), including the message subheader and the IP address of the external device for a maximum of 16 pairs in the buffer memory.	Q Corresponding Ethernet Interface Module User's Manual (Basic)

4.3 Settings and Procedures Prior to Starting the Operation

The following shows the Ethernet module settings and a flow of the operation procedures.


Procedures prior to operation
Install the Ethernet module to the base unit
Connect the Ethernet module to the Ethernet network
Connect GX Developer and QCPU with a cable
Set the network parameter for the Ethernet module with GX Developer
Perform the self-diagnostic test with GX Developer
Set the operation mode to "Online" with GX Developer
Send the "Ping" command from an external device and confirm the completion of the Ethernet module initial processing
Perform the loopback test
Create a program for each communication
Operation
· · · · · Refer to Section 2.3.

POINT

To operate the Ethernet module after the parameter settings are added or modified with GX Developer, the PLC CPU must be reset after saving the parameter values in the PLC CPU.

Important

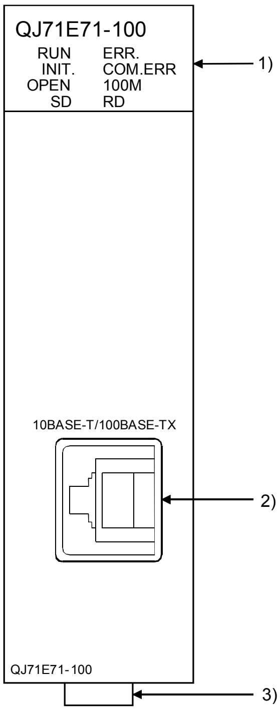
(1) Do not write any data in the "System area" of the buffer memory of the intelligent function module.

(2) Do not output (turn ON) the "Use prohibited" signal, which is one of the output signals.

(3) When the Ethernet module is replaced, reset the external device as well. (If the external device retains the MAC address of the communicating module, it may be impossible to continue the communication because a module is replaced and the MAC address changes.)
In the same way, when the external device (personal computer, etc.) is replaced, restart the Ethernet module.

4.4 Components of the Ethernet Module

This section shows the names of the Ethernet module components.



	Name	Description
1)	LED display	Refer to the contents of LED display contents (1).
2)	10BASE-T/100BASE-TX connector	Connector for connecting the Ethernet module to the 10BASE-T/100BASE-TX. (The Ethernet module discriminates between 10BASE-T and 100BASE-TX according to the hub (external device).)
3)	Module installation lever	Guide for installing the Ethernet module to the base unit correctly.

(1) LED display contents (*1)

LED name	Display description	When the LED is on	When the LED is off
RUN	Normal operation display	Normal	Abnormal
INIT.	Initial processing status display	Normally completed	Not processed
OPEN	Open processing status display	Normally opened connection available	Normally opened connection not available
SD	Data sending display	Data being sent	Data is not sent
ERR.	Setting abnormal display	Abnormal	Normal setting
COM.ERR.	Communication abnormal display	Communication abnormal occurrence	Normal communication in progress
100M	Transmission speed display	100Mbps	10Mbps/When not connected
RD	Data receiving status display	Data being received	Data not received

*1 Refer to Appendix 4.1 for causes of error displays and the corresponding corrective actions.

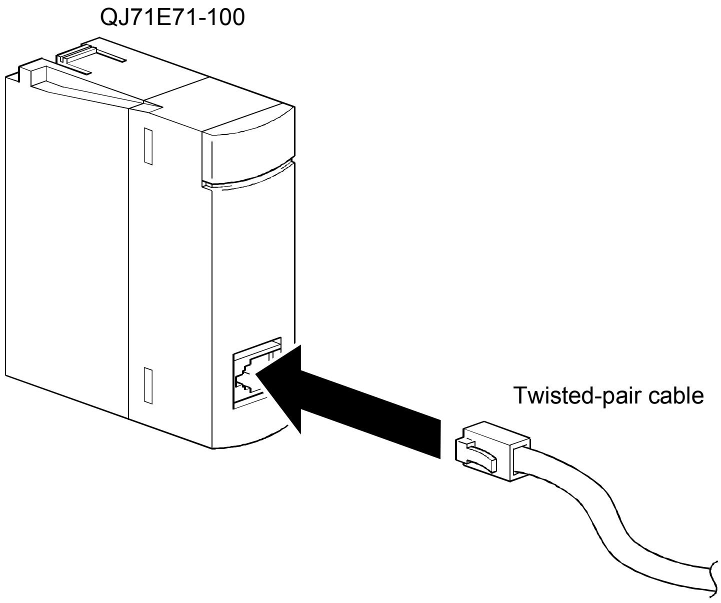
4.5 Connecting to the Network

The following explains how to connect the Ethernet module to the 10BASE-T/ 100BASE-TX network.

<Operating procedure>

(Step 1) Connect the twisted-pair cable to the hub.
If the connection is made on a one-to-one basis, connect to the connector of the external device.

(Step 2) Connect the twisted-pair cable to the Ethernet module as shown below.



POINT
The Ethernet module discriminates between 10BASE-T and 100BASE-TX according to the hub (external device).

4.6 Settings from GX Developer

To use the Ethernet module, parameters must be previously set from GX Developer.

For the parameter settings of each assignment in this textbook, refer to the parameter settings of each assignment (Chapter 5 to 8).

For details of each screen, refer to the GX Developer Operating Manual and Q Corresponding Ethernet Module User's Manual.

To perform the parameter setting using this textbook, GX Developer Version 8 or later is required. (This textbook uses GX Developer Version 8 to explain.)

(1) Multiple CPU setting

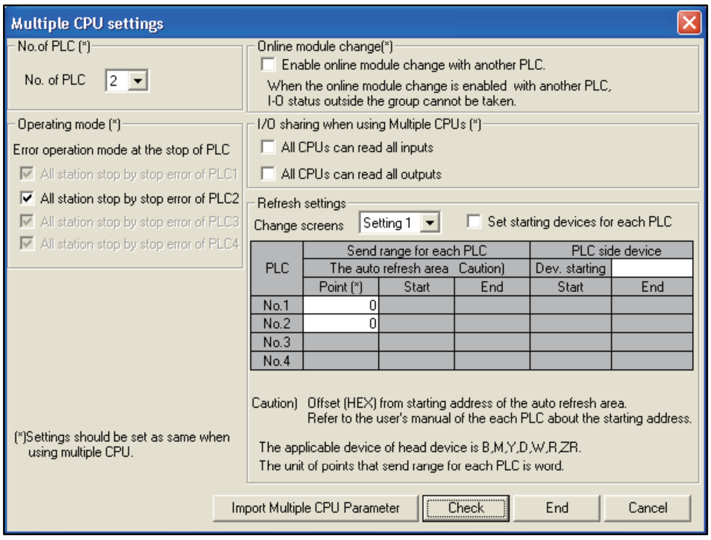
The settings for the No. of PLC, Operating mode, Refresh settings, etc. are performed to configure the multiple CPU system. Always make this setting when using the multiple CPU system.

For the operation prior to displaying the multiple CPU settings screen, refer to Section 5.2.1.

REMARK

As the demonstration machine used in this textbook has two CPUs installed for the multiple CPU configuration, setting PLC parameters for the multiple CPU system is required.

For the setting of the multiple CPU system, this textbook uses default values for the parameters (setting of control CPU, etc.) other than the following.



Multiple CPU settings

No.of PLC (*)

No. of PLC 2

Online module change(*)

□ Enable online module change with another PLC.

When the online module change is enabled with another PLC, I-O status outside the group cannot be taken.

Operating mode (*)

Error operation mode at the stop of PLC

☑ All station stop by stop error of PLC1

☑ All station stop by stop error of PLC2

☑ All station stop by stop error of PLC3

☑ All station stop by stop error of PLC4

I/O sharing when using Multiple CPUs (*)

□ All CPUs can read all inputs

□ All CPUs can read all outputs

Refresh settings

Change screens Setting 1

□ Set starting devices for each PLC

PLC	Send range for each PLC			PLC side device	
	The auto refresh area Caution)			Dev. starting	
	Point (*)	Start	End	Start	End
No.1	0				
No.2	0				
No.3					
No.4					

Caution) Offset (HEX) from starting address of the auto refresh area.
Refer to the user's manual of the each PLC about the starting address.

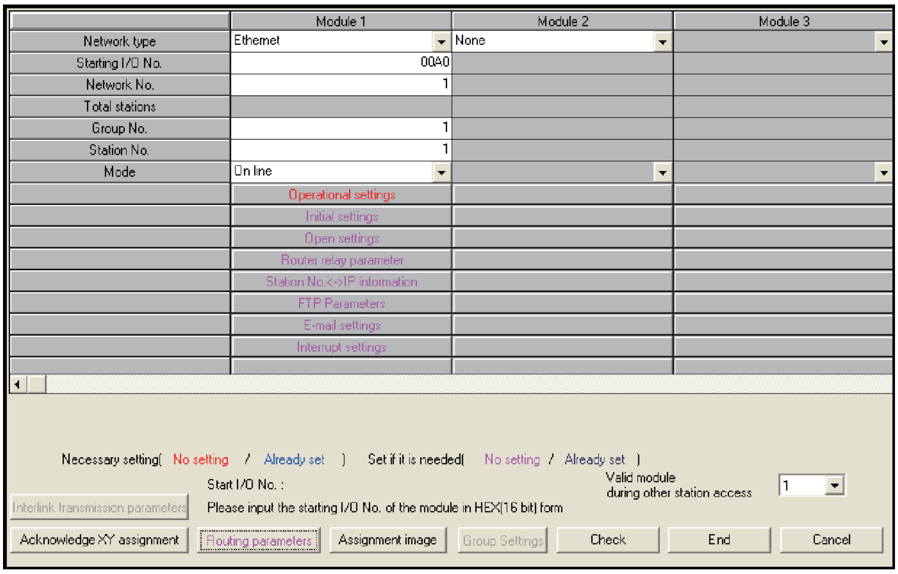
(*)Settings should be set as same when using multiple CPU.

The applicable device of head device is B,M,Y,D,W,R,ZR.
The unit of points that send range for each PLC is word.

Item	Setting details
No. of PLC	Set the number of PLCs when using a multiple CPU system.
Operating mode	Set the operation (stop) at a PLC stop error.
I/O sharing when using Multiple CPUs *1	Set whether the input/output of the module outside the group is permitted or not. When the modules are not grouped, they are all put under the control of the PLC No.1. OPERATION ERROR appears if access is made to any module outside the groups.
Refresh settings *1	Set the CPU shared memory G between multiple CPUs.
Import Multiple CPU Parameter button *1	Specify the project to be diverted and reads the multiple parameters.

*1 Not used in this text book.

(2) "Network parameters Setting the number of MNET/10H Ethernet cards"
Settings for the Ethernet module to use as a network module are performed.
Also, it is the main screen for "Operational settings" and "Initial settings" to use the Ethernet module.



	Module 1	Module 2	Module 3
Network type	Ethernet	None	
Starting I/O No.	00A0		
Network No.	1		
Total stations			
Group No.	1		
Station No.	1		
Mode	On line		
	Operational settings		
	Initial settings		
	Open settings		
	Router relay parameter		
	Station No.<->IP information		
	FTP Parameters		
	E-mail settings		
	Interrupt settings		

Necessary setting(No setting / Already set) Set if it is needed(No setting / Already set)

Start I/O No. :

Please input the starting I/O No. of the module in HEX(16 bit) form

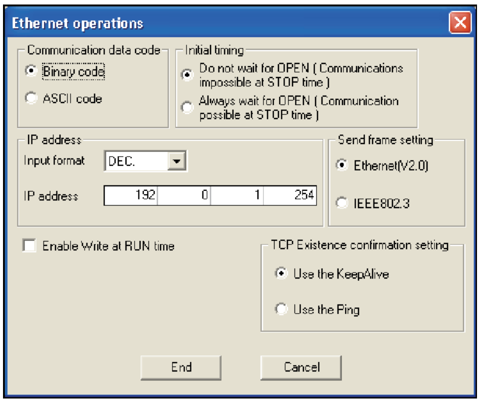
Valid module during other station access 1

Item	Setting details
Network type	Set Ethernet.
Starting I/O No.	Set the starting I/O No. of the Ethernet module.
Network No.	Set the network No. for MELSECNET/H or MELSECNET/10 of the Ethernet module.
Group No.	Set the group No. for MELSECNET/H or MELSECNET/10 of the Ethernet module.
Station No.	Set the station No. for MELSECNET/H or MELSECNET/10 of the Ethernet module.
Mode	Set the mode of the Ethernet module.
Operational settings	Set the communication data codes and the IP address, etc of the Ethernet module.
Initial settings *1	Set the common timer values for the TCP/IP communication as well as for setting the DNS server in order to use the e-mail function.
Open settings	Set the connection open processing settings and the settings related to buffer memory usage when using fixed buffer communication to communicate data with an external device.
Router relay parameter (Routing information)	This setting is for communicating a data with external devices connected to other Ethernet via a router.
Station No. ↔ IP information (MNET/10 routing information) *1	Set for communicating with PLC CPUs on other stations via Ethernet or MELSECNET/H, MELSECNET/10.
FTP parameters *1	This setting is for using the file transfer (FTP server) function.
E-mail settings *1	This setting is for the e-mail transmission/reception.
Interrupt settings *1	This setting is for executing the interrupt program.

*1 Not used in this text book.

(a) Operational settings

Set the communication data code, the timing to start the OPEN processing, and the local station Ethernet module IP address.



Ethernet operations

Communication data code
- ● Binary code
- ○ ASCII code

Initial timing
- ● Do not wait for OPEN (Communications impossible at STOP time)
- ○ Always wait for OPEN (Communication possible at STOP time)

IP address
- Input format: DEC.
- IP address: 192 0 1 254

Send frame setting
- ● Ethernet(V2.0)
- ○ IEEE802.3

□ Enable Write at RUN time

TCP Existence confirmation setting
- ● Use the KeepAlive
- ○ Use the Ping

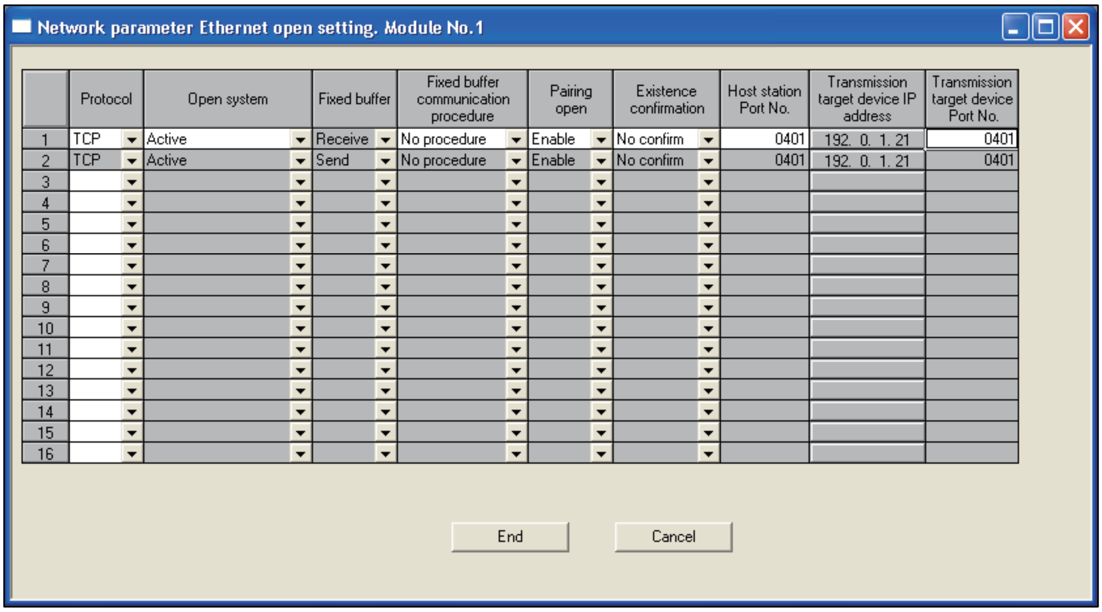
Item	Setting details
Communication data code	Select whether the binary code or the ASCII code is used for communication. When the automatic open UDP port in the MC protocol communication or no procedure in the fixed buffer communication is used, the communication is performed with the binary code regardless of the setting.
Initial timing	Set the open timing of connection.
IP address	Set the local station IP address.
Send frame setting	Set the frame sent by the Ethernet module. In this textbook, only "Ethernet (V2.0)" is used.
Enable Write at RUN time	Select enable/disable external devices to write data while communicating through the MC protocol while the PLC CPU is running.

POINT

The operational settings are common to each connection for the user on the Ethernet module side.

(b) Open settings

Set the protocols and the connection open systems for a data communication.



Network parameter Ethernet open setting. Module No.1

	Protocol	Open system	Fixed buffer	Fixed buffer communication procedure	Pairing open	Existence confirmation	Host station Port No.	Transmission target device IP address	Transmission target device Port No.
1	TCP	Active	Receive	No procedure	Enable	No confirm	0401	192. 0. 1. 21	0401
2	TCP	Active	Send	No procedure	Enable	No confirm	0401	192. 0. 1. 21	0401
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

Item	Setting details
Protocol	Set the communication method (TCP or UDP).
Open system	Select the connection open system (Active, Unpassive or Fullpassive) when TCP is selected for "Protocol". Or, select MELSOFT connection (for connection with MELSOFT products). Refer to Section 2.3 for details on the connection open system.
Fixed buffer	Select any sending or receiving for which the fixed buffer is used.
Fixed buffer communication procedure	Select "Procedure exist" or "No procedure".
Pairing open	Select whether the paring open is performed or not.
Existence confirmation	Select whether the existence of the external device is confirmed or not.
Host station Port No. (*1)	Set in hexadecimal the host station port number to be used for data communication.
Transmission target device IP address (*1)	Set the IP addresses of the external devices for data communication.
Transmission target device Port No. (*1)	Set the port numbers of the external devices for data communication.

*1 Make the following settings according to the setting value of "Protocol" and "Open system".

Protocol	TCP (Active)		TCP (Passive)		MELSOFT connection	UDP	
open system	ARP function of external		Unpassive	Fullpassive		ARP function of external	
Setting item	Yes	No				Yes	No
Host station Port No.	○	○	○	○	×	○	○
Transmission target device IP address	○	○	×	○	×	○	○
Transmission target device Port No.	○	○	×	○	×	○	○

○: Setting required ×: Setting not required

POINT

(1) The numerical values (1 to 16) on the left side of the screen correspond to the connection numbers on the Ethernet module side.

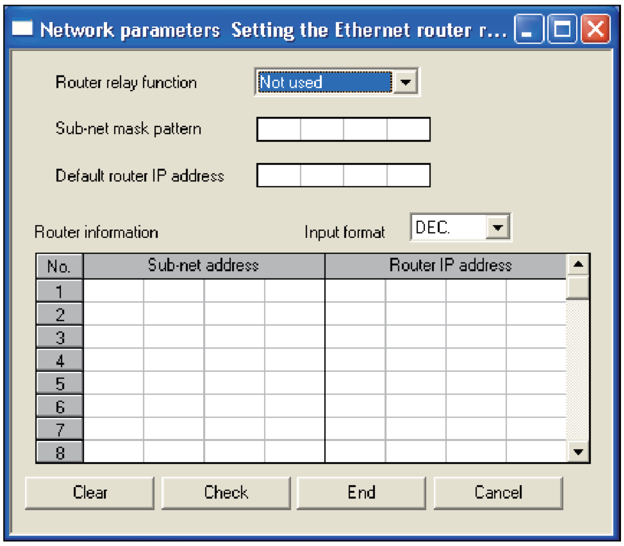
(2) For all the connections to be used, make the open settings.

(3) For the communication with devices without the ARP function, use the OPEN instruction (dedicated instruction) to perform the open processing. (Set the MAC address of the external devices in the control data of the OPEN instruction and then perform the open processing. (refer to Appendix 5.2))

(c) Router relay parameter (Routing information)

This is the setting for the data communication with external devices via a router.

The routing information is used in Assignment IV. For details, refer to CHAPTER 8.



Network parameters Setting the Ethernet router r...

Router relay function: Not used

Sub-net mask pattern:

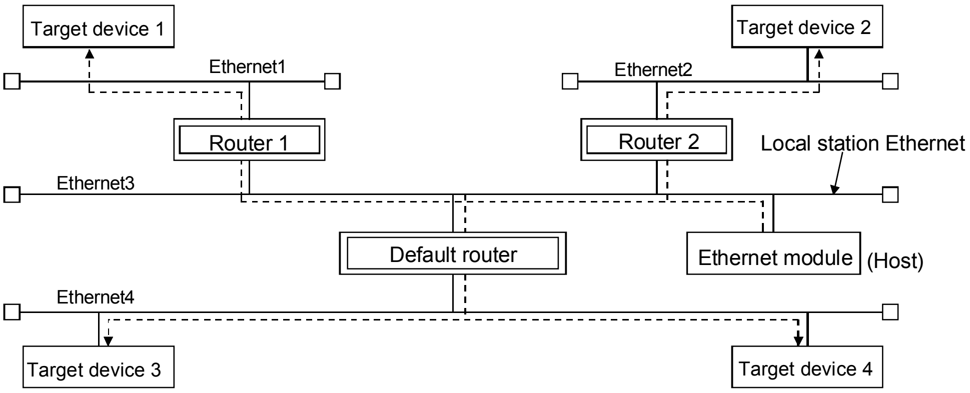
Default router IP address:

Router information

Input format: DEC.

No.	Sub-net address	Router IP address
1		
2		
3		
4		
5		
6		
7		
8		

Item	Setting details
Router relay function	Select whether the router relay function is used or not.
Sub-net mask pattern	Set the sub-net mask on the network.
Default router IP address	Set the router (default router) IP address that is to be the main path for data communication with external devices on another Ethernet.
Input format	Select the input format (decimal/hexadecimal) of each setting item.
Sub-net address	Set the net address or sub-net address of the other station for the data communication with external devices on another Ethernet via other than the default router.
Router IP address	Set the IP address of a router used for the data communication with an external device on another Ethernet via a router other than the default router.



When the Ethernet module communicates with the external device, it does not tran smit data to the target station directly but transmits the data to the specified router once according to the routing information. Then, the rou ter transmits the received data to the targtet station again.

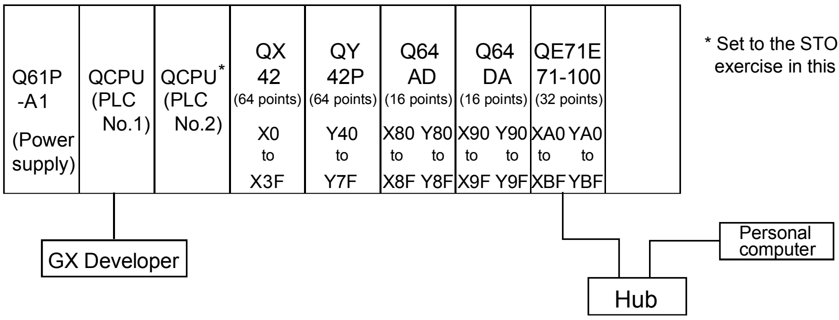
4.7 Self-Diagnostic Tests

4.7.1 Self refrain test

The self refrain test is used to check whether the Ethernet module transmits a test message addressed to the host station and then the station can receive it correctly.

(1) System configuration of the demonstration machine

The following indicates the system configuration of the demonstration machine.



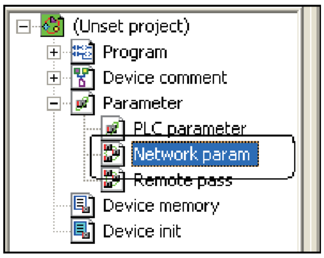
* Set to the STOP status for the exercise in this textbook.

(2) Parameter setting

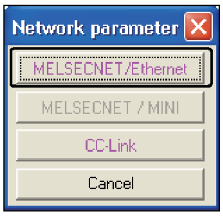
When a self refrain test is performed, parameter settings using the GX Developer is required.

The following indicates the operation procedure of the parameter settings.

1) With reference to Section 5.2.1, make the multiple CPU setting after starting a project.



2) Double-click "Network parameter" from the project data list.



3) As the network parameter selection dialog box is displayed, click the MELSECNET/Ethernet button.

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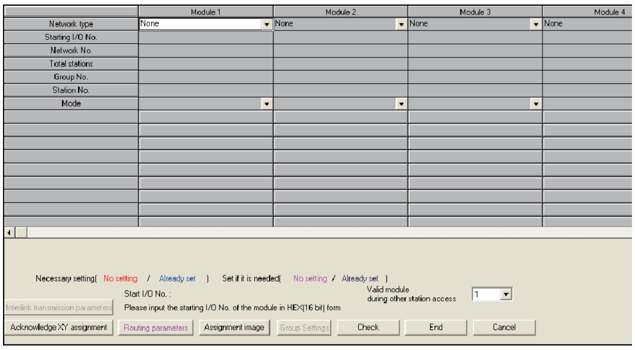


	Module 1	Module 2	Module 3	Module 4
Network type	None	None	None	None
Starting I/O No.				
Network No.				
Total stations				
Group No.				
Station No.				
Mode				

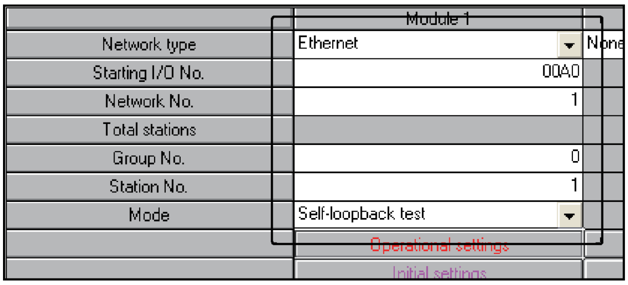
Necessary setting(No setting / Already set) Set if it is needed(No setting / Already set)

Start I/O No. :

Please input the starting I/O No. of the module in HEX(16 bit) form

Valid module during other station access: 1

4) The Network parameters Setting the number of MNET/10H Ethernet cards screen is displayed.



	Module 1	
Network type	Ethernet	None
Starting I/O No.	00A0	
Network No.	1	
Total stations		
Group No.	0	
Station No.	1	
Mode	Self-loopback test	
	Operational settings	
	Initial settings	

5) Set as follows.

Network type : Ethernet

Starting I/O No. : 00A0

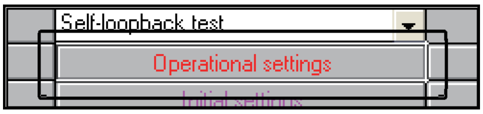
(Start input/output signal of the Ethernet module)

Network No. : 1 to 239 (option)

Group No. : 0 to 32 (option)

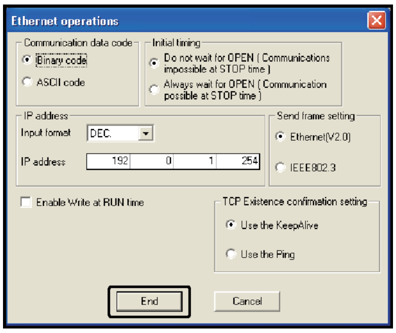
Station No. : 1 to 64 (option)

Mode : Self-loopback test



Self-loopback test

6) Click the Operational settings button to display the Ethernet operations dialog box.



Ethernet operations

Communication data code
● Binary code
○ ASCII code

Initial timing
● Do not wait for OPEN (Communications impossible at STOP time)
○ Always wait for OPEN (Communication possible at STOP time)

IP address
Input format DEC.
IP address 192 0 1 254

Send frame setting
● Ethernet(V2.0)
○ IEEE802.3

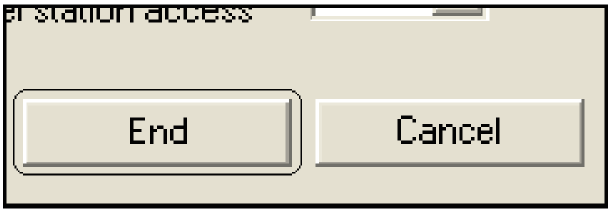
□ Enable Write at RUN time

TCP Existence confirmation setting
● Use the KeepAlive
○ Use the Ping

7) Click the End button to close the Ethernet operations dialog box.

The self refrain test operates even though the setting details are arbitrary.

(In this textbook, the default values are used.)



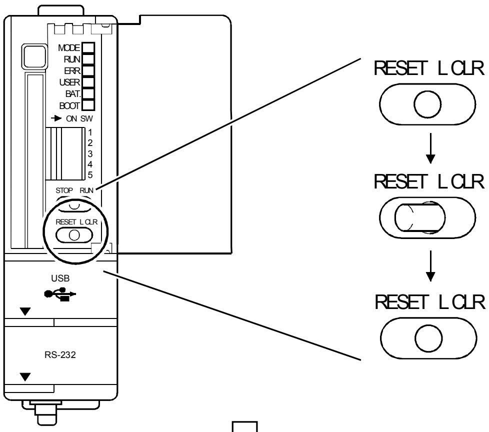
8) Click the End button to close the Network parameters Setting the number of MNET/10H Ethernet cards screen.

This completes the parameter setting of the self refrain test.

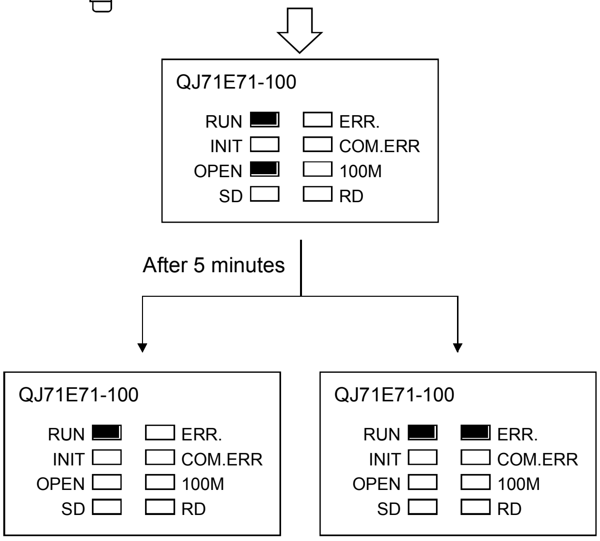
Next, write the setting details to the PLC CPU.

(3) Writing the parameters to the PLC CPU
The set parameters are written to the PLC CPU.
For designating the connection destination, refer to Section 5.2.3.
For the parameter write operation, refer to Section 5.2.4.

(4) Executing a self refrain test
Connect the Ethernet module and the hub with the twisted-pair cable before executing a self refrain test.



1) Open the cover of the PLC CPU, set the RESET/L. CLR switch to RESET, and then return it to the initial position.
(Set the STOP/RUN switch to STOP.)



Module normal

Module error

2) After "RUN" and "OPEN" of the Ethernet module display LEDs light up for five minutes, check the LED status.

- When only "RUN" LED lights up
  Ethernet module is normal.

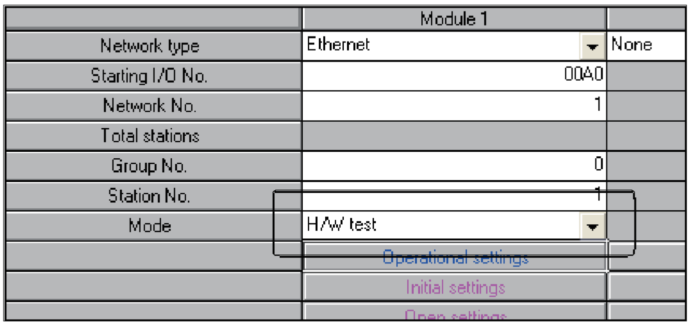
- When "RUN" and "ERR." LEDs light up
  the Ethernet module hardware has an error.
  Check the buffer memory (E5H) error codes of the Ethernet module to take corrective actions.
  For the contents of error codes, refer to Q Corresponding Ethernet Interface Module User's Manual (Basic).

4.7.2 Hardware test

The hardware test is performed to confirm that RAM and ROM of the Ethernet module are normal.

The operation procedure of the hardware test is the same as that of the self refrain test.

Set "H/W test" for "Mode" in the Network parameters Setting the number of MNET/10H Ethernet cards screen.



	Module 1	
Network type	Ethernet	None
Starting I/O No.	00A0	
Network No.	1	
Total stations		
Group No.	0	
Station No.	1	
Mode	H/W test	
	Operational settings	
	Initial settings	
	Open settings	

(1) When the test results indicate a module error

The Ethernet module RAM/ROM is faulty.

Check the buffer memory (E5H) error code of the Ethernet module to take corrective actions.

For the contents of error code, refer to Q Corresponding Ethernet Interface Module User's Manual (Basic).

4.8 Mounting and Dismounting the Module

This section explains the procedures when mounting/dismounting the Ethernet module.

(1) Operation procedure when replacing the Ethernet module

(Step 1) Turn off the power supply to the Ethernet module installed station.

(Step 2) Remove the network cable and the Ethernet module.

(Step 3) Install and start up the new Ethernet module according to "4.3 Settings and Procedures Prior to Starting the Operation".

(Step 4) Reset the external device.

POINT

When the Ethernet module is replaced, reset the external device as well.
(If the external device retains the Ethernet address of the communicating module, it may be impossible to continue the communication because a module is replaced and the Ethernet address changes.)
In the same way, when the external device (personal computer, etc.) is replaced, restart the Ethernet module.

(2) Operation procedure when replacing the QCPU

(Step 1) Read the parameters for the Ethernet module from the PLC CPU and save them using the GX Developer. (*1)

(Step 2) Replace the QCPU. (Refer to the applicable QCPU User's Manual.)

(Step 3) Load the parameters for the Ethernet module that have been saved in GX Developer to the new QCPU.

(Step 4) Reset the external device.

*1 It is recommended to record and save parameters not only when the CPU is replaced but also when parameters for the Ethernet module are created and modified.

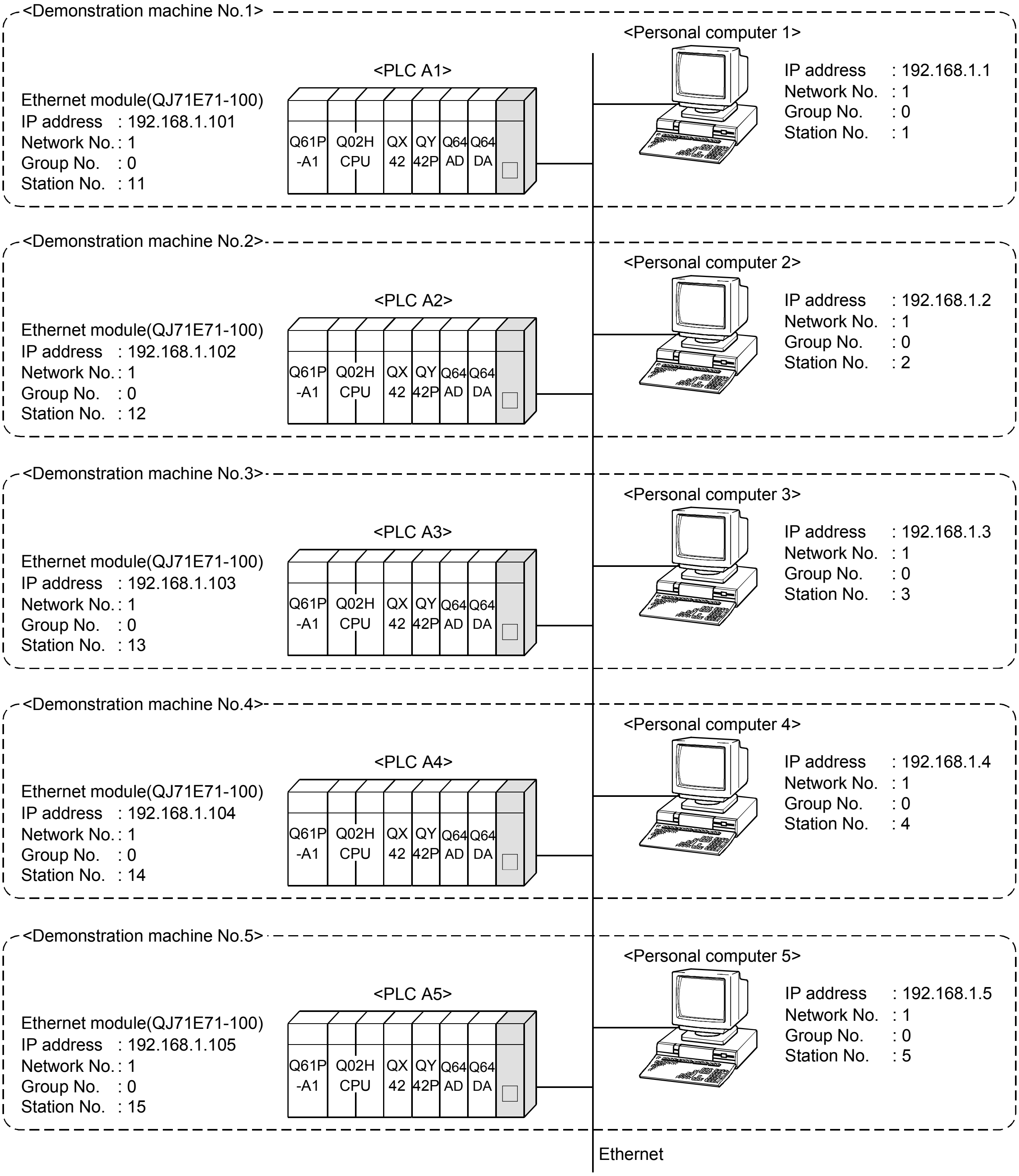
CHAPTER 5 ASSIGNMENT I (MC PROTOCOL COMMUNICATION BETWEEN PLC AND PLC CPU)

In this assignment, the exercise of the MC protocol communication function is performed. The personal computer on the other end reads/writes the PLC CPU information using the MX Component.

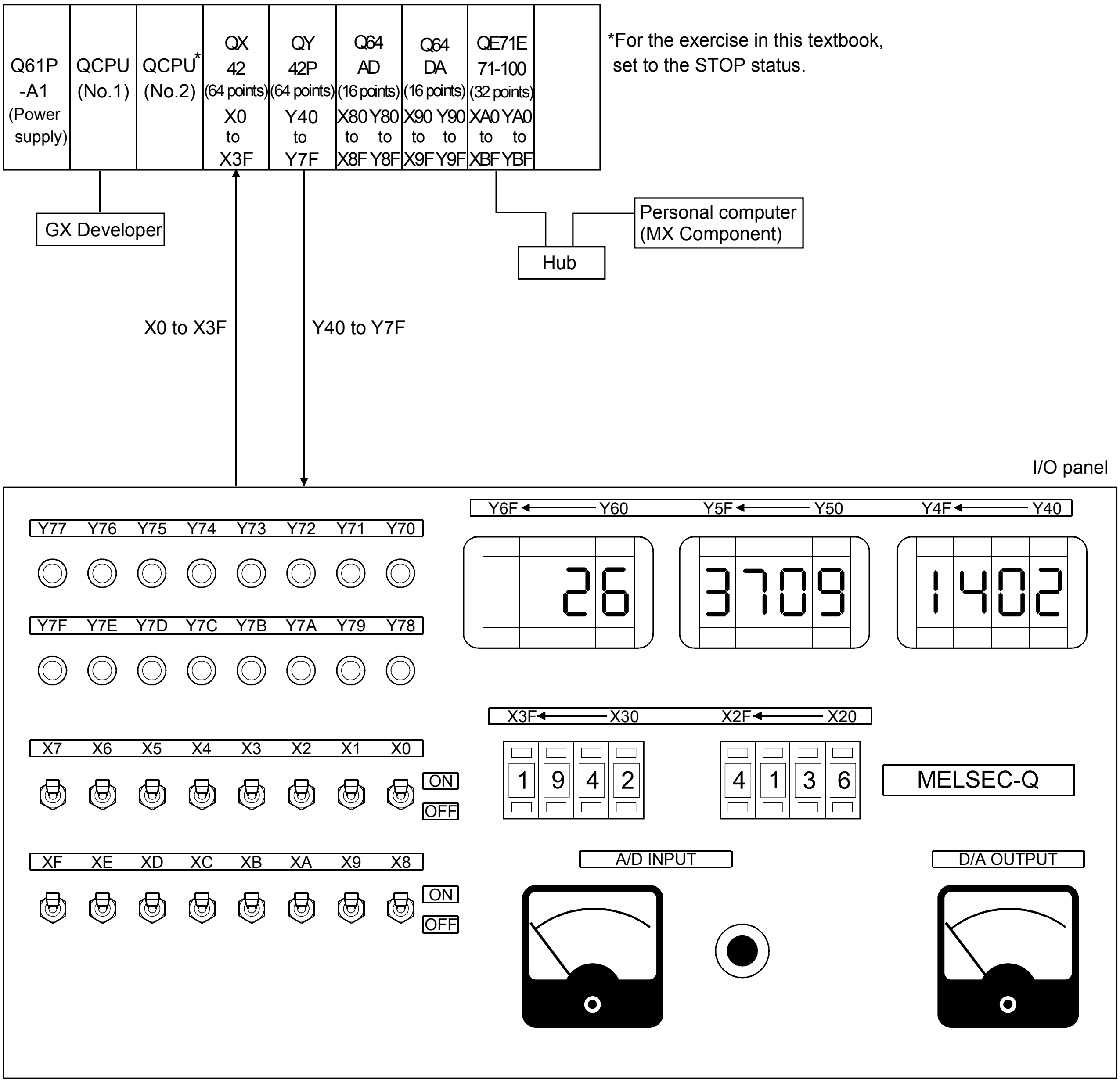
5.1 System Configuration for Exercise

The following shows the system configuration for the exercise in Assignment I.
Although 10 devices are connected to the Ethernet, communication will be made between only the devices of the same demonstration machine No. in Assignment I.

(1) Module configuration



(2) I/O assignment

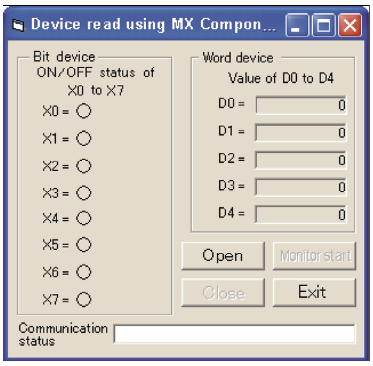


*For the exercise in this textbook, set to the STOP status.

(3) Exercise description

Monitors and writes a device in the program using the MX Component.

<Device read (Section 5.4)>



Device read using MX Compon...

Bit device
ON/OFF status of X0 to X7

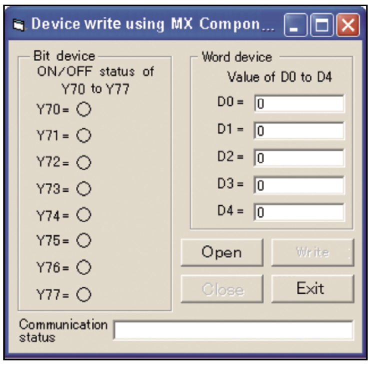
X0 = ○
X1 = ○
X2 = ○
X3 = ○
X4 = ○
X5 = ○
X6 = ○
X7 = ○

Word device
Value of D0 to D4

D0 = 0
D1 = 0
D2 = 0
D3 = 0
D4 = 0

Communication status

<Device write (Section 5.5)>



Device write using MX Compon...

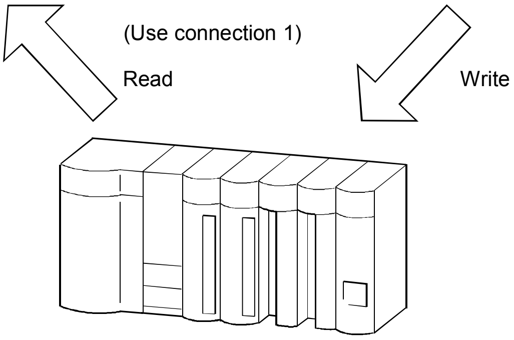
Bit device
ON/OFF status of Y70 to Y77

Y70 = ○
Y71 = ○
Y72 = ○
Y73 = ○
Y74 = ○
Y75 = ○
Y76 = ○
Y77 = ○

Word device
Value of D0 to D4

D0 = 0
D1 = 0
D2 = 0
D3 = 0
D4 = 0

Communication status



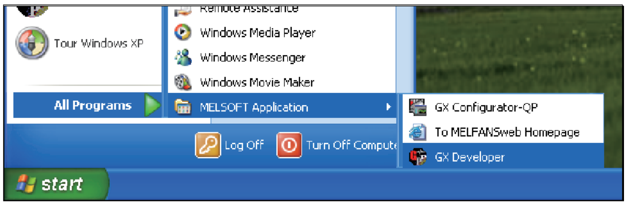
PLC CPU

5.2 Parameter Settings and TCP/IP Settings for PC

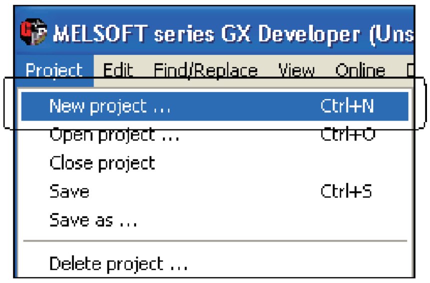
The parameters of the Ethernet module on the PLC CPU side are set using the GX Developer before the communication with a personal computer.
The TCP/IP settings for the personal computer to which the MX Component is installed are also performed.
The setting details should be the same as those of Section 5.1.

5.2.1 GX Developer startup and multiple CPU settings

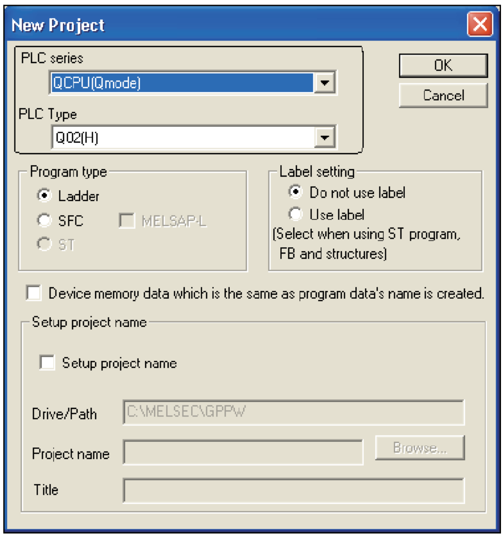
For the multiple CPU settings and the Ethernet parameter settings on the PLC CPU side, the GX Developer is started up.



1) Click [Start] → [All Programs] → [MELSOFT Application] → [GX Developer].



2) After the GX Developer starts up, click the [Project] → [New project] menu.



PLC series: QCPU(Qmode)

PLC Type: Q02(H)

Program type: ● Ladder ○ SFC ☐ MELSAP-L ○ ST

Label setting: ● Do not use label ○ Use label
(Select when using ST program, FB and structures)

☐ Device memory data which is the same as program data's name is created.

Setup project name

☐ Setup project name

Drive/Path: C:\MELSEC\GPPW

Project name:

Title:

3) As Q02HCPU is used in this exercise, set "PLC series" to "QCPU (Q mode)" and "PLC Type" to "Q02(H)" and then click the $\boxed{\text{OK}}$ button.

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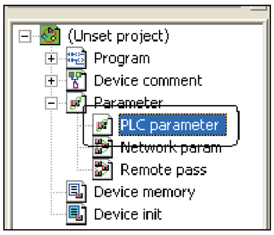
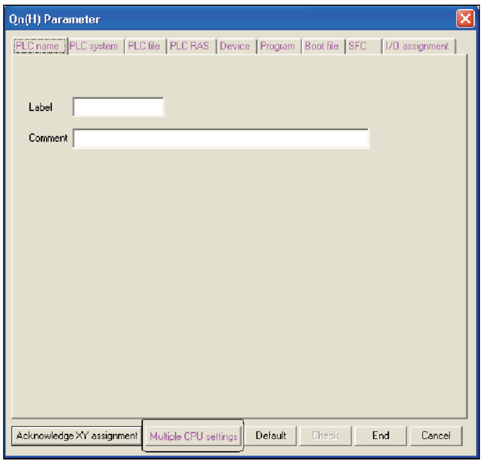
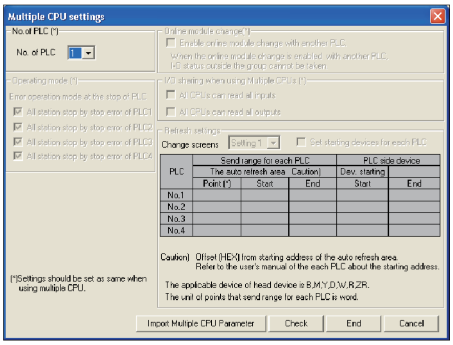


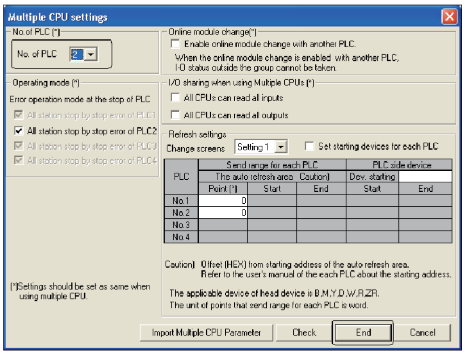
4) Double-click "PLC parameter" from the project data list.



5) After the "Qn(H) Parameter" dialog box appears, click the Multiple CPU settings button.


Multiple CPU settings
No.of PLC (*)
No. of PLC
1
Online module change(*)
Enable online module change with another PLC.
Operating mode (*)
I/O sharing when using Multiple CPUs (*)
All CPUs can read all inputs
All CPUs can read all outputs
Refresh settings
Change screens
Setting 1
Set starting devices for each PLC
Import Multiple CPU Parameter
Check
End
Cancel

6) The "Multiple CPU settings" dialog box appears.



No.of PLC (*)

No. of PLC 2

Online module change(*)

☐ Enable online module change with another PLC.

When the online module change is enabled with another PLC, I-O status outside the group cannot be taken.

Operating mode (*)

Error operation mode at the stop of PLC

☑ All station stop by stop error of PLC1

☑ All station stop by stop error of PLC2

☑ All station stop by stop error of PLC3

☑ All station stop by stop error of PLC4

I/O sharing when using Multiple CPUs (*)

☐ All CPUs can read all inputs

☐ All CPUs can read all outputs

Refresh settings

Change screens Setting 1 ☐ Set starting devices for each PLC

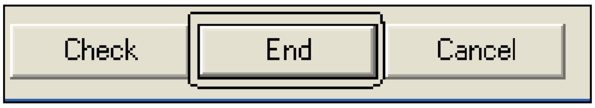
PLC	Send range for each PLC			PLC side device	
	The auto refresh area Caution)			Dev. starting	
	Point (*)	Start	End	Start	End
No.1	0				
No.2	0				
No.3					
No.4					

Caution) Offset (HEX) from starting address of the auto refresh area. Refer to the user's manual of the each PLC about the starting address.

The applicable device of head device is B,M,Y,D,W,R,ZR.
The unit of points that send range for each PLC is word.

(*)Settings should be set as same when using multiple CPU.

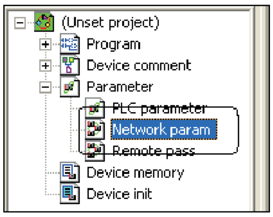
7) Set "No. of PLC" to "2" and then click the End button.



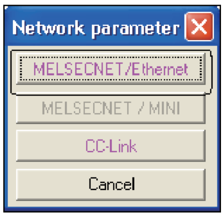
8) Click the End button of the "Qn(H) Parameter" dialog box.

5.2.2 Network parameters setting the number of MNET/10H Ethernet cards

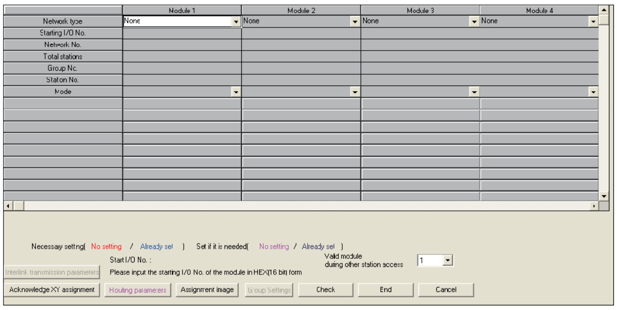
Ethernet parameter setting is performed for connecting to Ethernet.



1) Double-click "Network parameter" from the project data list.



2) After the network parameter selection dialog box appears, click the MELSECNET/Ethernet button.



	Module 1	Module 2	Module 3	Module 4
Network type	None	None	None	None
Starting I/O No.				
Network No.				
Total stations				
Group No.				
Staton No.				
Mode				

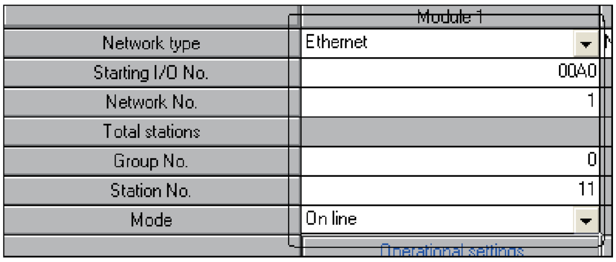
Necessary setting(No setting / Already set) Set if it is needed(No setting / Already set)

Start I/O No. :

Please input the starting I/O No. of the module in HEX(16 bit) form

Valid module during other station access 1

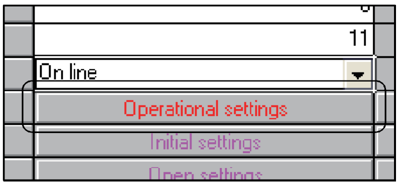
3) The Network parameters Setting the number of MNET/10H Ethernet cards screen appears.



	Module 1
Network type	Ethernet
Starting I/O No.	00A0
Network No.	1
Total stations	
Group No.	0
Station No.	11
Mode	On line

4) Set as follows.

Network type	: Ethernet
Starting I/O No.	: 00A0
Network No.	: 1
Group No.	: 0
Station No.	: Set the station No. of each demonstration machine (11 to 15)
Mode	: Online



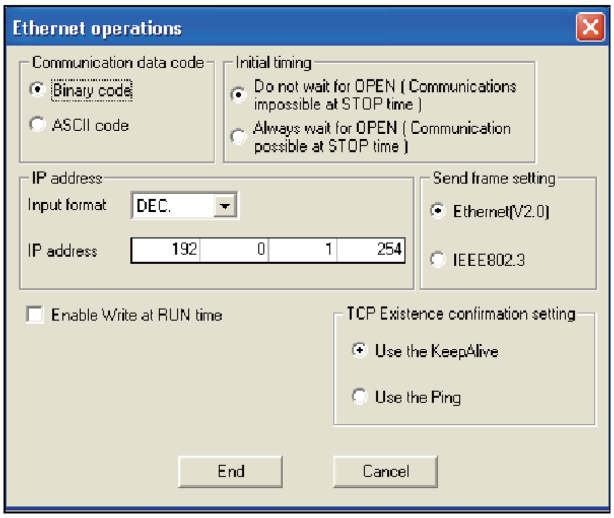
11

On line

5) Click the Operational settings button to display the "Ethernet operations" dialog box.

Continued to the next page

Continued from the previous page



Ethernet operations

Communication data code
● Binary code
○ ASCII code

Initial timing
● Do not wait for OPEN (Communications impossible at STOP time)
○ Always wait for OPEN (Communication possible at STOP time)

IP address
Input format: DEC.
IP address: 192 0 1 254

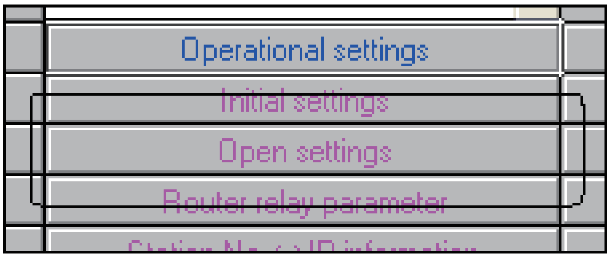
Send frame setting
● Ethernet(V2.0)
○ IEEE802.3

□ Enable Write at RUN time

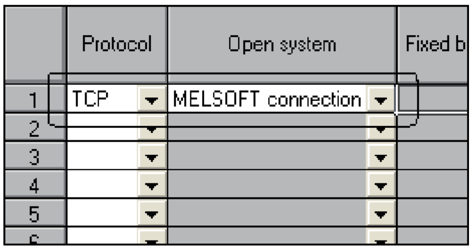
TCP Existence confirmation setting
● Use the KeepAlive
○ Use the Ping

6) Set the following contents, click the End button, and then close the "Ethernet operations" dialog box. (Set 192.168.1.101 to 192.168.1.105 for IP address.)

Communication data code : Binary code
Initial timing : Do not wait for OPEN
IP address : Set the IP address of each demonstration machine.
(192.168.1.101 to 192.168.1.105)
Send frame setting : Ethernet (V2.0)
Enable Write at RUN time : Enable



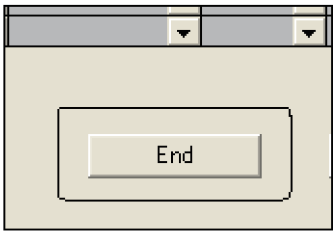
7) Click the Open settings button to display the network parameter Ethernet open settings screen.



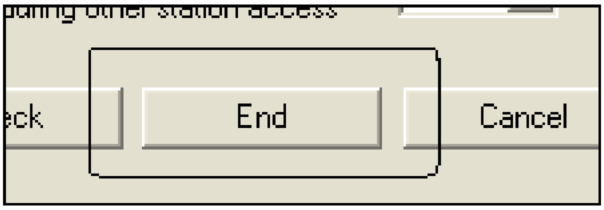
	Protocol	Open system	Fixed b
1	TCP	MELSOFT connection	
2			
3			
4			
5			

8) Set the following contents.
Protocol : TCP
Open system : MELSOFT connection

Designating MELSOFT connection enables access to the PLC CPU from other MELSOFT products at a time.



9) Click the End button to close the network parameter Ethernet open settings screen.



10) Click the End button to close the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.

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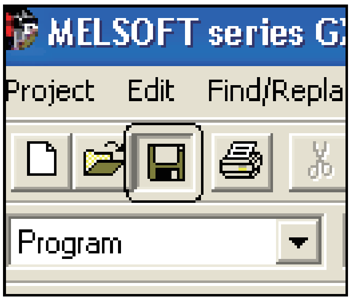
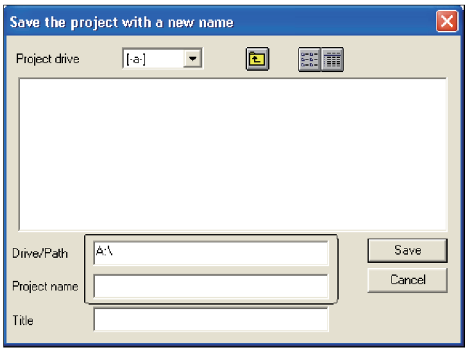
Continued from the previous page



11) Click the 💾 button.
(Overwriting the project)



Project drive [-a-]

Drive/Path A:\

Project name

Title

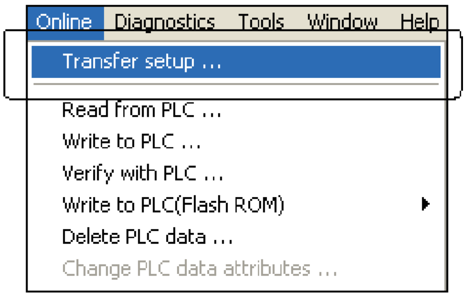
12) Set Drive/Path and Project name, then click the Save button.

Drive/Path : A:\Q-E71
Project name : EX1-A □

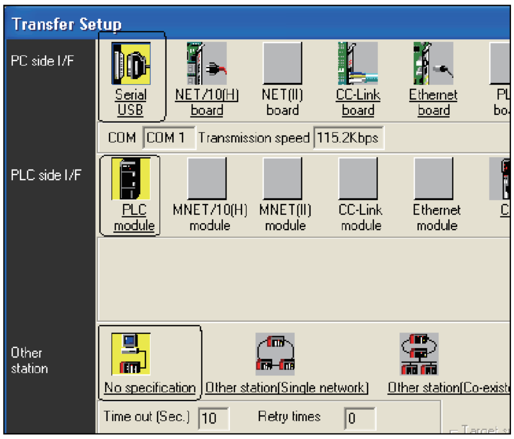
□ indicates a demonstration machine No.
Example. For demonstration machine No.1
EX1-A1

5.2.3 Transfer setup

Transfer setup is performed to write a parameter to the PLC CPU.



1) Click the [Online] → [Transfer setup] menu.

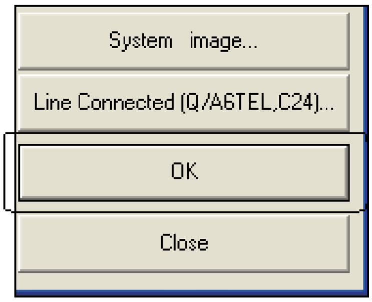


COM COM 1 Transmission speed 115.2Kbps

Time out (Sec.) 10 Retry times 0

2) Confirm the following settings on the "Transfer Setup" screen.
"PLC side I/F" : "Serial USB"
"PLC side I/F" : "PLC module"
"Other station" : "No specification"

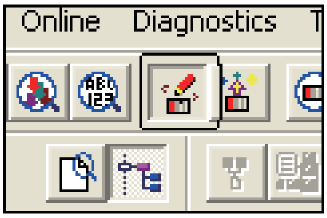
Clicking "Connection test" can confirm whether or not there is any problem in the connection status or transmission specification settings.
Perform the test operation as required.



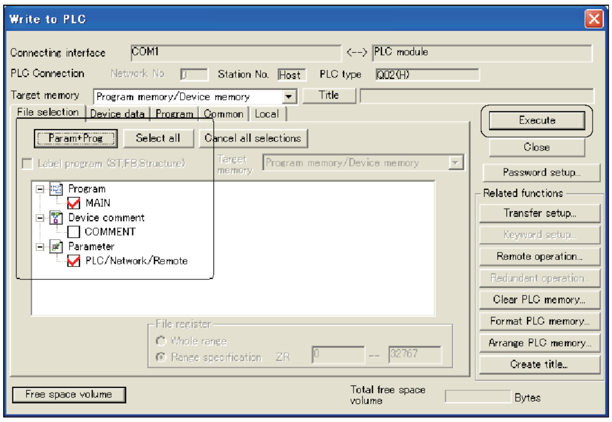
3) Click the OK button.
This completes the transfer setup.

5.2.4 Parameter write

The set parameters are written to the PLC CPU.



1) Click ![]. (Write to PLC)


Write to PLC

Connecting interface: COM1 <--> PLC module

PLC Connection: Network No. 0, Station No. Host, PLC type Q02(H)

Target memory: Program memory/Device memory ▼ Title

File selection | Device data | Program | Common | Local

Param+Prog | Select all | Cancel all selections

☐ Label program (ST,FB,Structure) Target memory: Program memory/Device memory

- Program
  - ☑ MAIN
- Device comment
  - ☐ COMMENT
- Parameter
  - ☑ PLC/Network/Remote

File register: ○ Whole range ● Range specification ZR 0 -- 32767

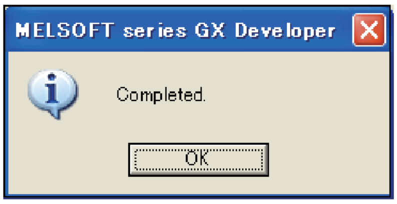
Execute | Close | Password setup...

Related functions: Transfer setup... | Keyword setup... | Remote operation... | Redundant operation... | Clear PLC memory... | Format PLC memory... | Arrange PLC memory... | Create title...

Free space volume | Total free space volume Bytes

2) Click the Param+Prog button on the "Write to PLC" dialog box and select "MAIN" of Program and "PLC/Network/Remote" of Parameter.

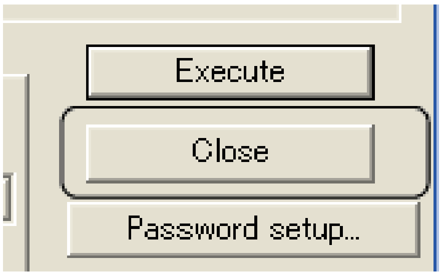
3) Click the Execute button to write the parameter.


MELSOFT series GX Developer

Completed.

OK

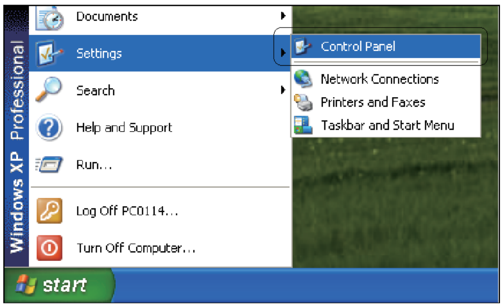
4) When the write is completed, the screen shown on the left appears. Click the OK button.



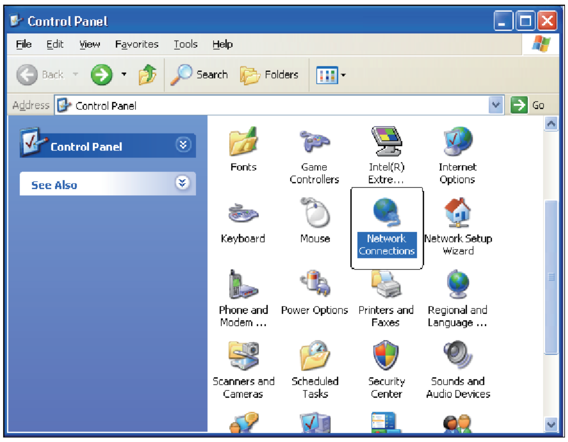
5) Click the Close button to close the "Write to PLC" dialog box.
Reset the PLC CPU to make the written parameters valid.
This completes the parameter write.

5.2.5 TCP/IP settings for PC

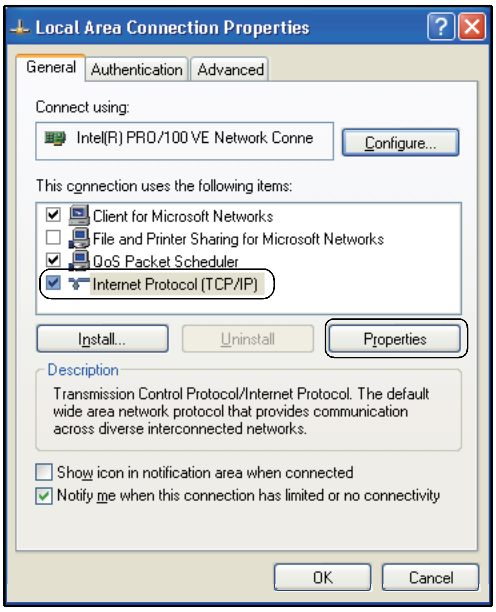
TCP/IP settings for PC are performed.
This textbook explains using a PLC operated with Microsoft® Windows® XP professional Operating System.



1) Click [Start] → [Settings] → [Control Panel].



2) After the Control Panel appears, select "Network Connections".



Local Area Connection Properties

General | Authentication | Advanced

Connect using:

Intel(R) PRO/100 VE Network Conne [Configure...]

This connection uses the following items:

☑ Client for Microsoft Networks
☐ File and Printer Sharing for Microsoft Networks
☑ QoS Packet Scheduler
☑ Internet Protocol (TCP/IP)

[Install...] [Uninstall] [Properties]

Description

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

☐ Show icon in notification area when connected
☑ Notify me when this connection has limited or no connectivity

[OK] [Cancel]

3) After the "Local Area Connection Properties" dialog box appears, select "Internet Protocol (TCP/IP)" and click the Properties button.

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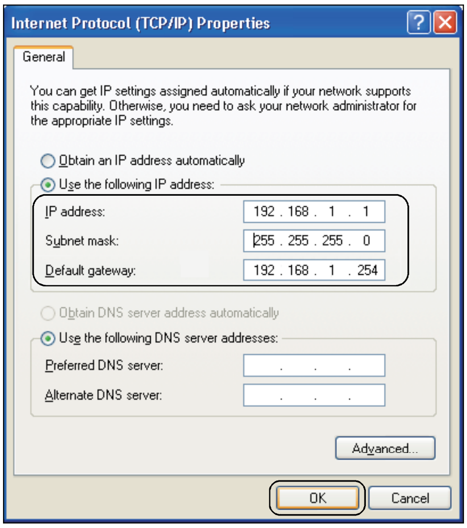


You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically
● Use the following IP address:
IP address: 192 . 168 . 1 . 1
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 168 . 1 . 254

○ Obtain DNS server address automatically
● Use the following DNS server addresses:
Preferred DNS server: . . .
Alternate DNS server: . . .

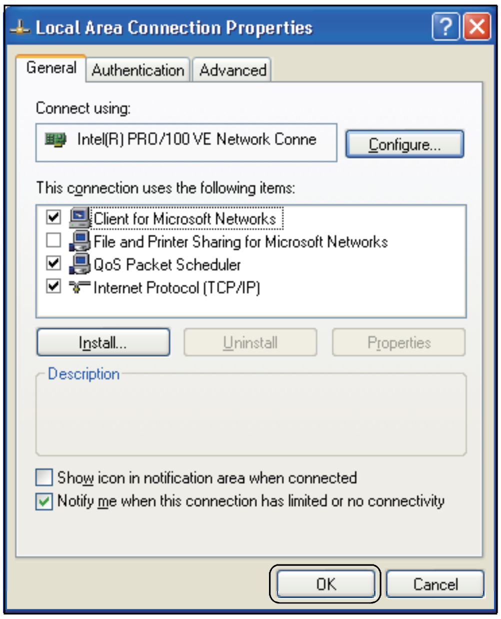
4) Select "Use the following IP address" and make the setting for the following contents.

IP address : IP address of each personal computer.
(192.168.1.1 to 192.168.1.5)

Subnet mask : 255.255.255.0 (class C)

Default gateway : router IP address
(192.168.1.254)

5) Click the OK button to close the screen.



Connect using:
Intel(R) PRO/100 VE Network Conne

This connection uses the following items:
☑ Client for Microsoft Networks
□ File and Printer Sharing for Microsoft Networks
☑ QoS Packet Scheduler
☑ Internet Protocol (TCP/IP)

□ Show icon in notification area when connected
☑ Notify me when this connection has limited or no connectivity

6) Click the OK button to close "Local Area Connection Properties" dialog box.

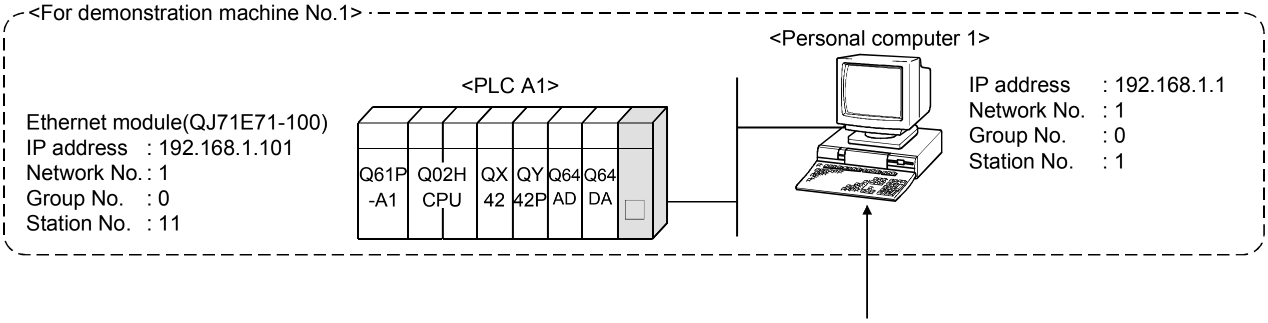
5.3 Operation of MX Component

This section explains the operation of the MX Component.
This textbook explains the functions when creating applications with Visual Basic® and accessing to PLC CPU via Ethernet

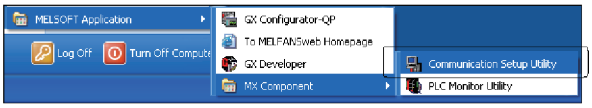
5.3.1 Setting the logical station number

For the logical station number, the connection target information required for opening the communication line is combined into one data using the communication setup utility, and that data is provided with a logical number.
Firstly, set the logical station number to access to the PLC CPU.

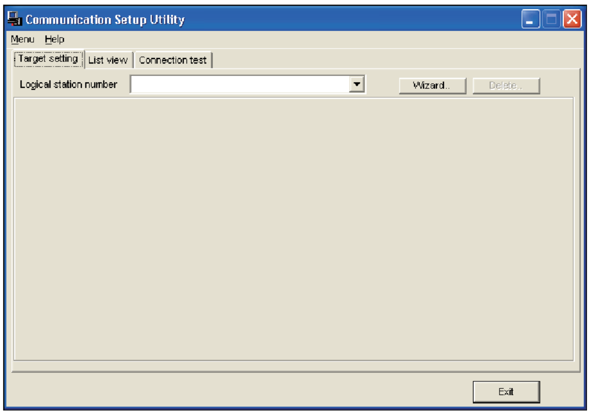
(Example) At Ethernet communication



Target information up to Q02HCPU to communicate with is combined into one data, to which logical station number is assigned.



1) Click [Start] → [All Programs] → [MELSOFT Application] → [MX Component] → [Communication Setup Utility].



2) Communication setup utility is set up.

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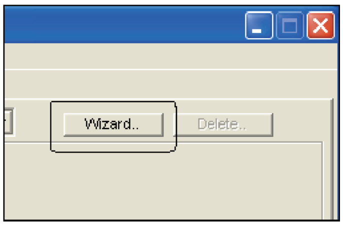
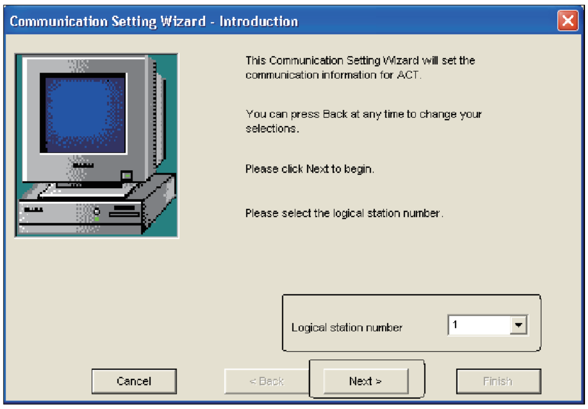


3) Click the Wizard button.


Communication Setting Wizard - Introduction

This Communication Setting Wizard will set the communication information for ACT.

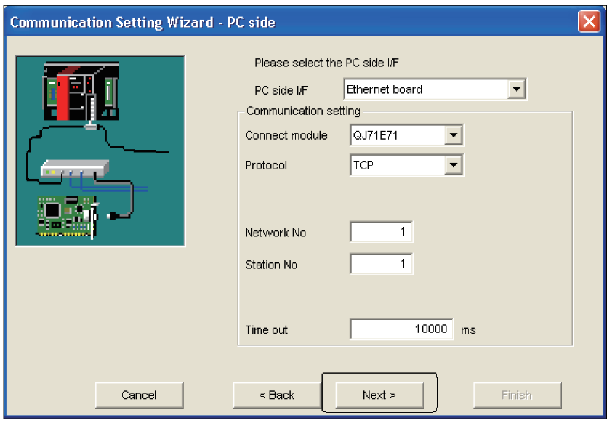
You can press Back at any time to change your selections.

Please click Next to begin.

Please select the logical station number.

Logical station number: 1

4) After the screen shown on the left appears, set "Logical station number" to "1" and click the Next> button.


Communication Setting Wizard - PC side

Please select the PC side I/F

PC side I/F: Ethernet board

Communication setting

Connect module: QJ71E71

Protocol: TCP

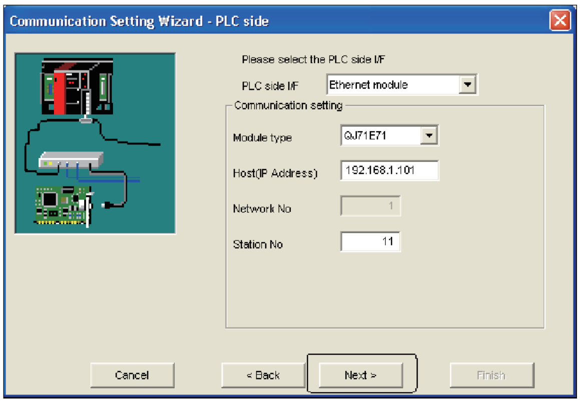
Network No: 1

Station No: 1

Time out: 10000 ms

5) As the setting on the personal computer side is performed, set the following contents and click the Next> button.

PLC side I/F : Ethernet board
Connect module : QJ71E71
Protocol : TCP
Network No. : 1
Station No. : Set the station No. of each demonstration machine. (1 to 5)
Time out : 10000ms (For monitoring response receiving)


Communication Setting Wizard - PLC side

Please select the PLC side I/F

PLC side I/F: Ethernet module

Communication setting

Module type: QJ71E71

Host(IP Address): 192.168.1.101

Network No: 1

Station No: 11

6) As the setting on the PLC side is performed, set the following contents and click the Next> button.

PLC side I/F : Ethernet module
Module type : QJ71E71
Host (IP Address) : Set IP address of each demonstration machine (192.168.1.101 to 192.168.1.105)
Network No. : (1)
Station No. : Set the station No. of each demonstration machine (11 to 15)

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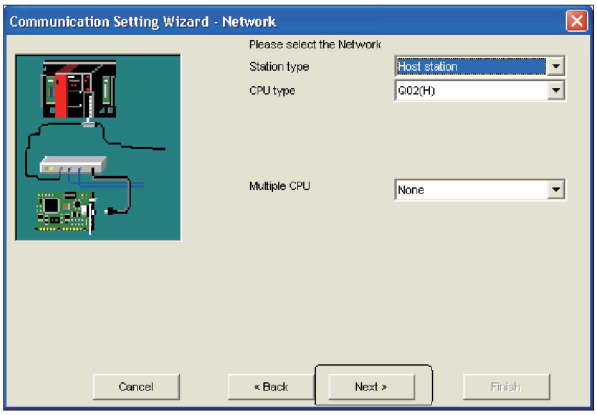


Communication Setting Wizard - Network

Please select the Network

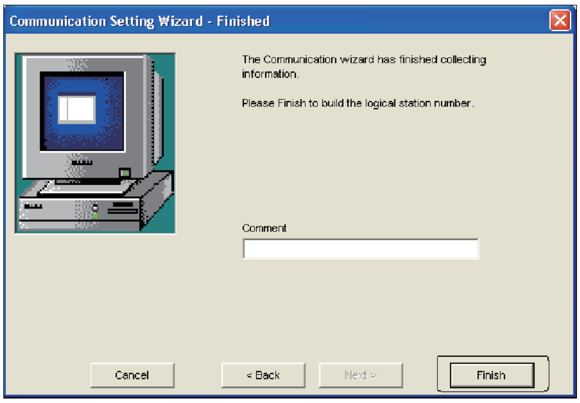
Station type: Host station

CPU type: Q02(H)

Multiple CPU: None

7) As the communication setting is performed, set the following contents and click the Next> button.

Station type	: Host station
CPU type	: Q02(H)
Multiple CPU	: None



Communication Setting Wizard - Finished

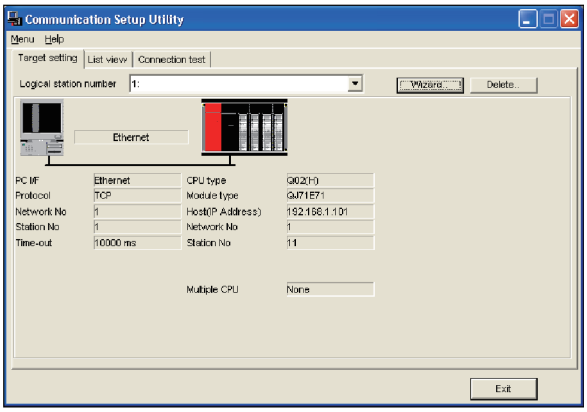
The Communication wizard has finished collecting information.

Please Finish to build the logical station number.

Comment

8) As the comment is not set in this textbook, click the Finish button.

(When setting the comment to the logical station number, set it on this screen.)



Communication Setup Utility

Menu Help

Target setting | List view | Connection test

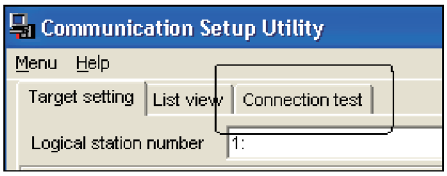
Logical station number: 1:

PC I/F	Ethernet	CPU type	Q02(H)
Protocol	TCP	Module type	QJ71E71
Network No	1	Host(IP Address)	192.168.1.101
Station No	1	Network No	1
Time-out	10000 ms	Station No	11
		Multiple CPU	None

9) When the setting is completed, the "Communication Setup Utility" screen appears. Then confirm the setting contents.

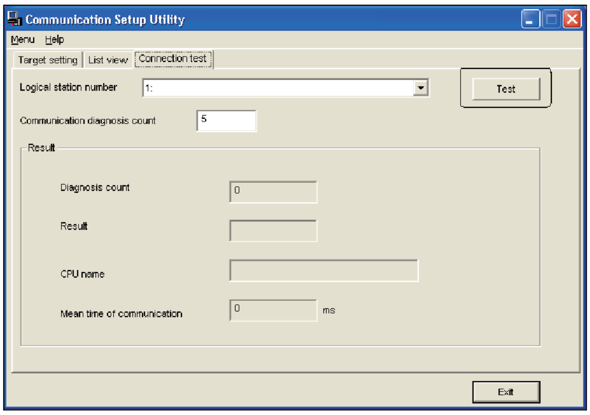
5.3.2 Communication diagnostics

Execute the communication diagnostics and confirm whether or not the logical station number is properly set.



Logical station number 1:

1) Click the "Connection test" tab.



Logical station number 1:

Communication diagnosis count 5

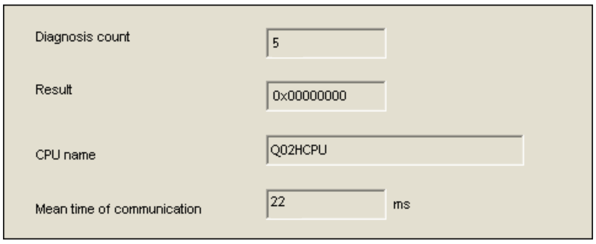
Diagnosis count 0

Result

CPU name

Mean time of communication 0 ms

2) The communication test screen appears.
Designate the logical station number to which the communication test is made (designate "1" in this textbook).
Click the Test button to execute the connection test.



Diagnosis count 5

Result 0x00000000

CPU name Q02HCPU

Mean time of communication 22 ms

3) When the communication is performed properly to the PLC CPU, "Communication test is successful." appears.
Also, "0x00000000" appears in Result.
When an error occurs, check the error code indicated.
For error codes, refer to Appendix 2.3.

4) Click the Exit button.

5.4 Visual Basic Program (Device Read)

The contents of ON/OFF status for PLC CPU bit device X0 to X7 (eight points) and of word device D0 to D4 (five words) are read.

5.4.1 Visual basic program

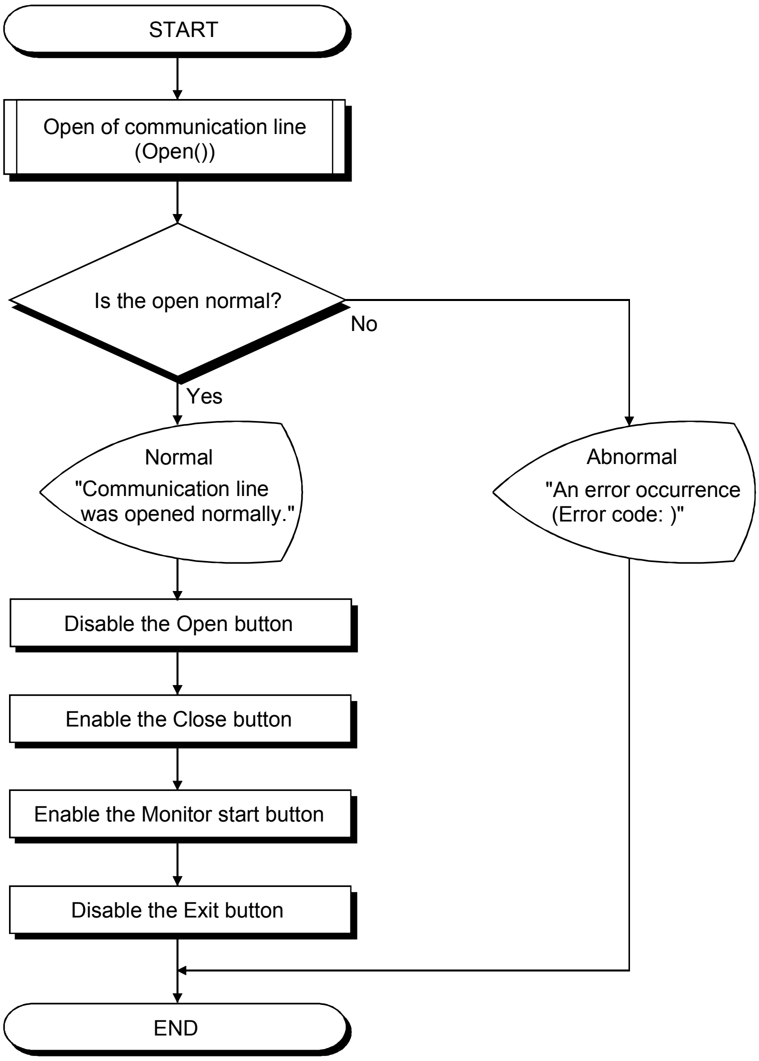
Project file name	E71-1.VBP

```
Option Explicit                                          ’Force the declaration of variables

Const MonitorTime As Integer = 100                       'Device monitor interval

Private Sub cmdOpen_Click()

    Dim lRet As Long                                     'Return value

    lRet = ActEasyIF1.Open                               'Open the communication line

    If lRet = 0 Then
        txtStatus.Text = _
          "Communication line was opened normally. "     'Message at normal
        cmdOpen.Enabled = False                          'Disable the Open button
        cmdClose.Enabled = True                          'Enable the Close button
        cmdMonitor.Enabled = True                        'Enable the Monitor start button
        cmdEnd.Enabled = False                           'Disable the End button
    Else
        txtStatus.Text = _
          "Error occurrence (Error code: " + Hex$(lRet) + ")"    'Message at abnormal
    End If

End Sub

Private Sub cmdClose_Click()

    Dim lRet As Long                                     'Return value

    lRet = ActEasyIF1.Close                              'Close the communication line

    If lRet = 0 Then
        txtStatus.Text = _
            "Communication line was closed normally. "   'Message at normal
        cmdOpen.Enabled = True                           'Enable the Open button
        cmdClose.Enabled = False                         'Disable the Close button
        cmdMonitor.Enabled = False                       'Disable the Monitor start button
        cmdEnd.Enabled = True                            'Enable the End button
    Else
        txtStatus.Text = _
         "Error occurrence (Error code: " + Hex$(lRet) + ")"    'Message at abnormal
    End If

End Sub
```

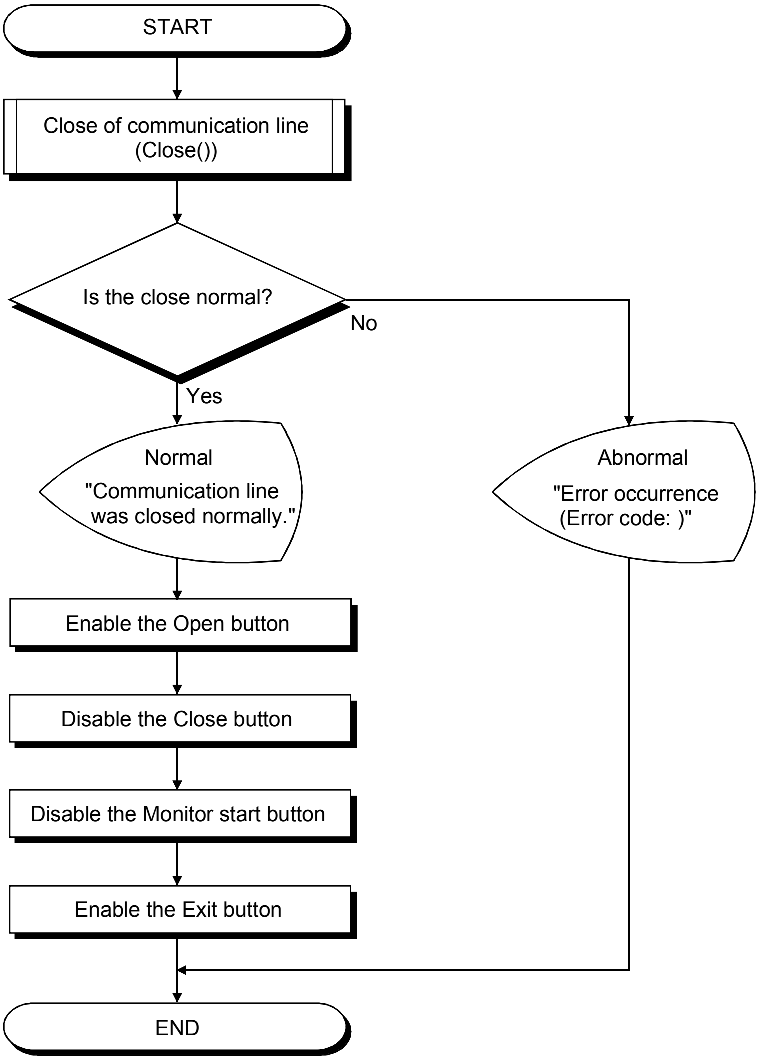
```
Private Sub cmdMonitor_Click()

    If tmrTime.Interval = 0 Then                        'Confirm whether it is in process of monitoring or not
        tmrTime.Interval = MonitorTime                  'Execute the monitoring
        txtStatus.Text = "Monitoring"                   'Display the Monitoring message
        cmdMonitor.Caption = "Monitor stop"             'Change the button display
        cmdClose.Enabled = False                        'Disable the Close button
    Else
        tmrTime.Interval = MonitorTime                  'End the monitoring
        txtStatus.Text = "Monitoring was stopped. "     'Display the Monitor was stopped message
        cmdMonitor.Caption = "Monitor start"            'Change the button display
        cmdClose.Enabled = True                         'Enable the Close button
    End If

End Sub

Private Sub cmdEnd_Click()

    End                                                 'Program end

End Sub

Private Sub tmrTime_Timer()
    Dim i As Integer                                    'Variable 1 for loop
    Dim j As Integer                                    'Variable 2 for loop
    Dim k As Integer                                    'Variable 3 for loop
    Dim szDeviceList As String                          'For monitor device storage
    Dim Devbox(12) As String                            'For monitor device temporary storage
    Dim lData(12) As Long                               'Monitor device value storage
    Dim lRet As Long                                    'Return value

    Const lSize As Long = 13                            'Number of devices to be monitored

    'Set device to be monitored
    Devbox(0) = "X0"
    Devbox(1) = "X1"
    Devbox(2) = "X2"
    Devbox(3) = "X3"
    Devbox(4) = "X4"
    Devbox(5) = "X5"
    Devbox(6) = "X6"
    Devbox(7) = "X7"
    Devbox(8) = "D0"
    Devbox(9) = "D1"
    Devbox(10) = "D2"
    Devbox(11) = "D3"
    Devbox(12) = "D4"

    For i = 0 To lSize - 1
        szDeviceList = szDeviceList + Devbox(i)         'Set the device to be monitored
        If i <> lSize Then
            szDeviceList = szDeviceList + vbLf
        End If
    Next
    'Execute the random read
    lRet = ActEasyIF1.ReadDeviceRandom(szDeviceList, lSize, lData(0))
    If lRet <> 0 Then
        txtStatus.Text = _
            "Error occurrence (Error code: " + Hex$(lRet) + ")"    'Display the error code at error
    End If

    'Display the bit devices (X0 to X7)
    For j = 0 To 7
        If lData(j) = 1 Then
            lblON_OFF(j).Caption = "●"                             'Display ● when turning ON
        Else
            lblON_OFF(j).Caption = "○"                             'Display ○ when turning OFF
        End If
    Next

    'Display the word devices (D0 to D4)
    For k = 0 To 4
        lbl_Dvalue(k).Caption = lData(k + 8)
    Next

End Sub
```

(1) Flowchart

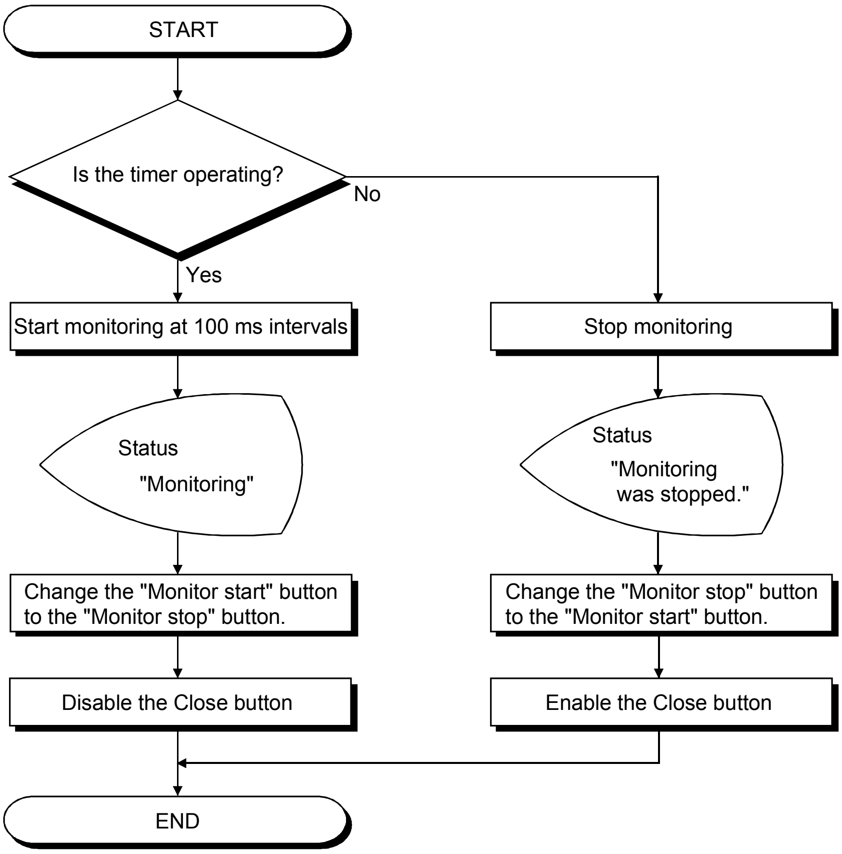
(a) cmdOpen_Click() (Operation by clicking the Open button)



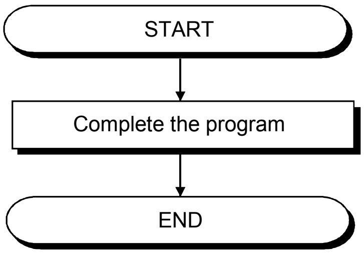
(b) cmdClose_Click() (Operation by clicking the Close button)


START
Close of communication line
(Close())
Is the close normal?
No
Yes
Normal
"Communication line was closed normally."
Abnormal
"Error occurrence (Error code:)"
Enable the Open button
Disable the Close button
Disable the Monitor start button
Enable the Exit button
END

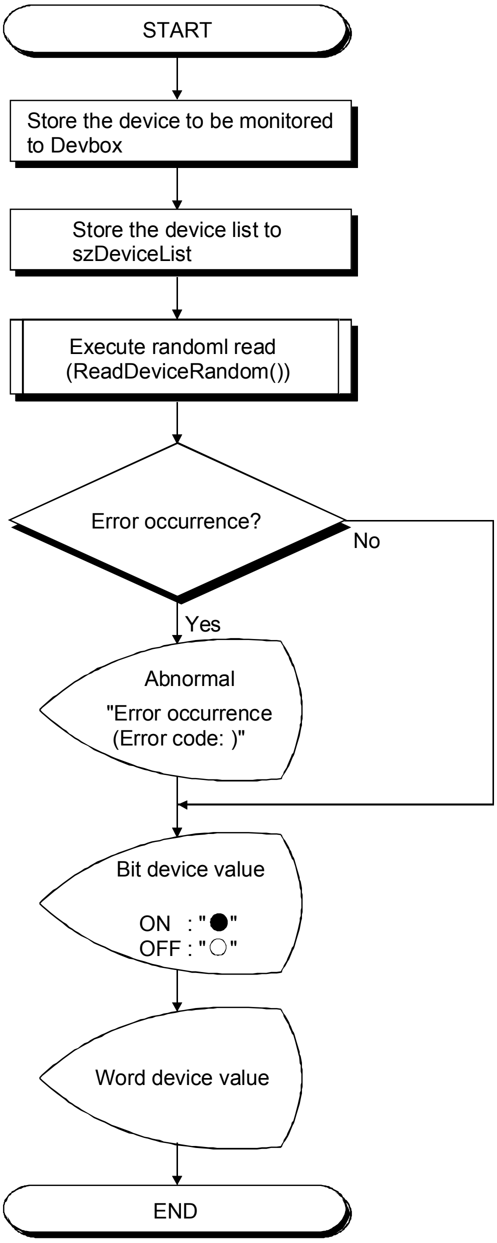
(c) cmdMonitor_Click() (Operation by clicking the Monitor start button)


START
Is the timer operating?
No
Yes
Start monitoring at 100 ms intervals
Stop monitoring
Status "Monitoring"
Status "Monitoring was stopped."
Change the "Monitor start" button to the "Monitor stop" button.
Change the "Monitor stop" button to the "Monitor start" button.
Disable the Close button
Enable the Close button
END

(d) cmdEnd_Click() (Operation by clicking the End button)



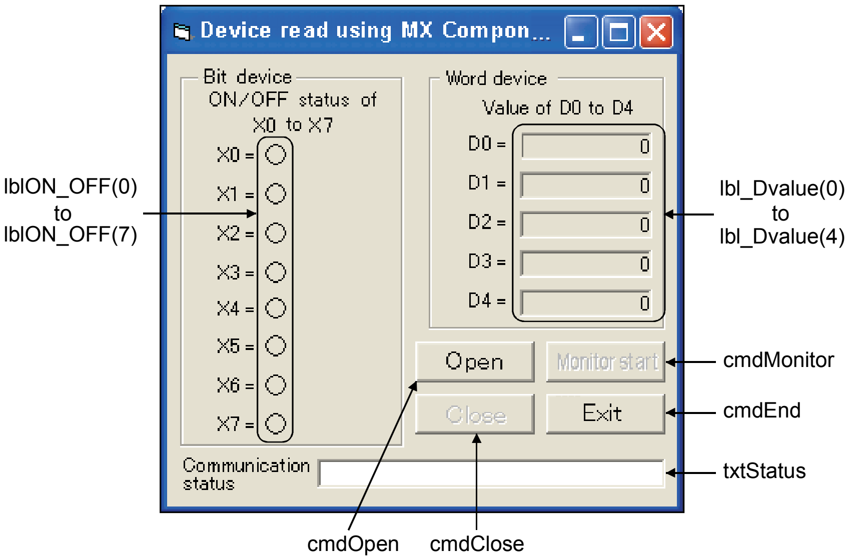
(e) tmrTime_Timer() (Operation during monitoring)


START
Store the device to be monitored to Devbox
Store the device list to szDeviceList
Execute randoml read (ReadDeviceRandom())
Error occurrence?
No
Yes
Abnormal
"Error occurrence
(Error code:)"
Bit device value
ON : "●"
OFF : "○"
Word device value
END

5.4.2 Operation of demonstration machine

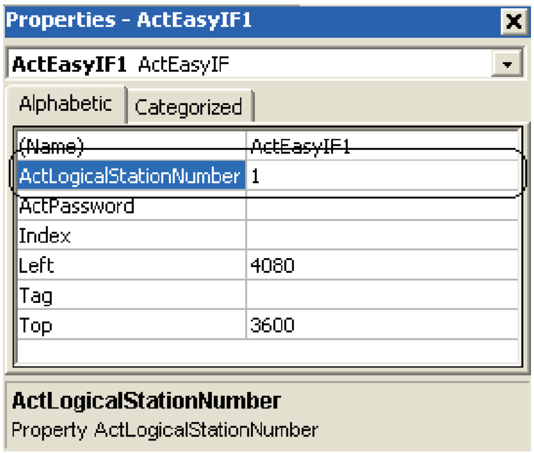
The program is executed, and the device of PLC CPU is monitored.

(1) Program screen
The following indicates object names on the program screen.



(2) Check of device status of X0 to X7

1) Start up Visual Basic and read the project file (E71-1.VBP) shown in Section 5.4.1.



Properties - ActEasyIF1

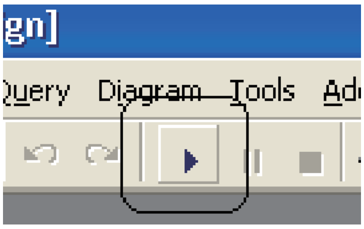
ActEasyIF1 ActEasyIF

Alphabetic | Categorized

(Name)	ActEasyIF1
ActLogicalStationNumber	1
ActPassword	
Index	
Left	4080
Tag	
Top	3600

ActLogicalStationNumber
Property ActLogicalStationNumber

2) Check that ActLogicalStationNumber of ActEasyIF1 property is "1".
This setting number is corresponding to the logical station number set in Section 5.3.1.
By using the logical station number, the communication can be performed with the path set in the logical station number.



3) Click the ▶ (start) button to execute the program.

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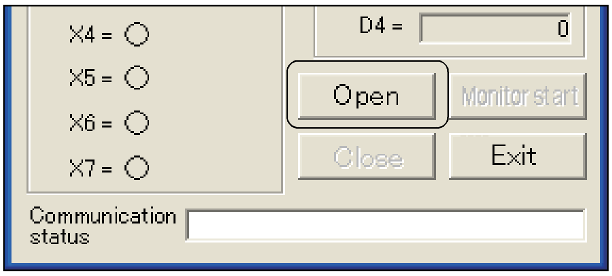


X4 = ○

X5 = ○

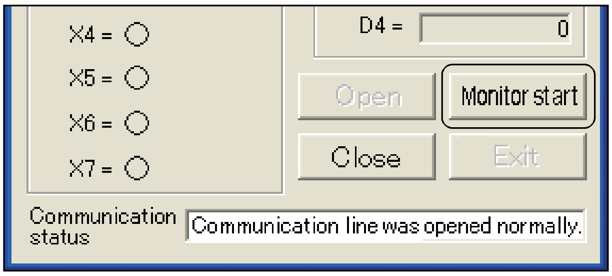
X6 = ○

X7 = ○

D4 = 0

Communication status

4) Click the Open button to open the communication line.
When opening normally, "Communication line was opened normally." appears in Communication status.
The error code appears at abnormal.
For details of error code, refer to Appendix 2.3.



X4 = ○

X5 = ○

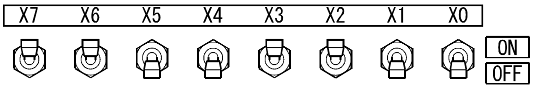
X6 = ○

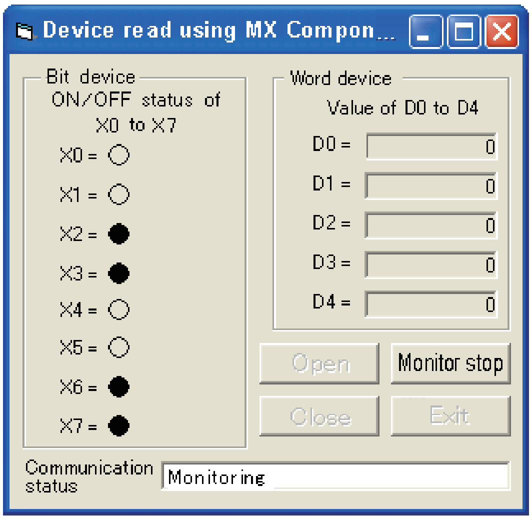
X7 = ○

D4 = 0

Communication status: Communication line was opened normally.

5) When opening normally, the Monitor start button becomes active. Then click the button to start monitoring.





Bit device
ON/OFF status of X0 to X7

X0 = ○

X1 = ○

X2 = ●

X3 = ●

X4 = ○

X5 = ○

X6 = ●

X7 = ●

Word device
Value of D0 to D4

D0 = 0

D1 = 0

D2 = 0

D3 = 0

D4 = 0

Communication status: Monitoring

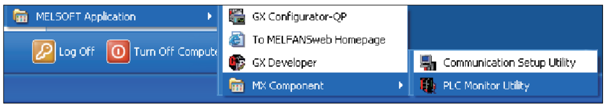
6) Check that the bit device status on the program varies depending on turning ON or OFF the X0 to X7 switch of the I/O panel.
Also, check the contents of the word devices (D0 to D4).

(3) Check of device status of D0 to D4

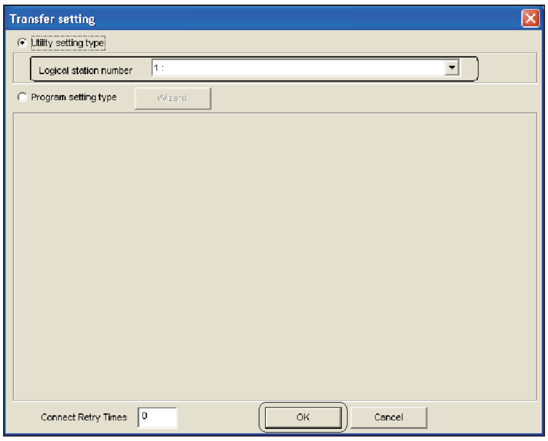
The numerical value changed by the MX Component is checked in a program. (*1)

*1 The following can be processed using X7 to XB of the demonstration machine and the display.

X7	: Store "0" in D0 to D4
X8, X9	: Store any numerical value in D0 to D4
XA	: Display the numerical value of D0 to D2
XB	: Display the numerical value of D3 to D4



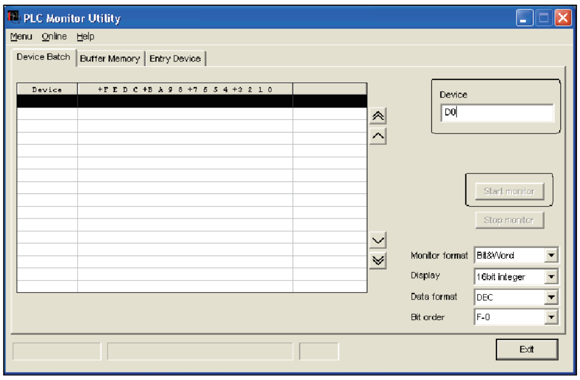
1) Click [Start] → [All Programs] → [MELSOFT Application] → [MX Component] → [PLC Monitor Utility].



Logical station number: 1 :

Connect Retry Times: 0

2) After the "Transfer setting" screen appears, set "Logical station number" to "1" and click the OK button.



Device: D0

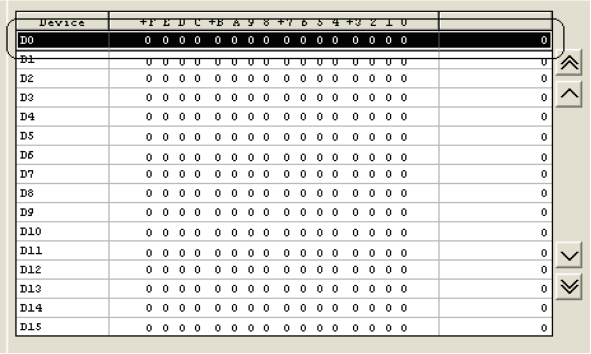
Monitor format: Bit&Word

Display: 16bit integer

Data format: DEC

Bit order: F-0

3) "PLC Monitor Utility" starts up. Then set "Device" to "D0" and click the Monitor start button.



Device	+F E D C +B A 9 8 +7 6 5 4 +3 2 1 0	
D0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D6	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D8	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D9	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D10	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D11	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D12	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D13	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D14	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D15	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0

4) After the devices appear, double-click the device column for changing a value.
When changing the values of D0 to D4 (*1), D0 to D4 on the program is changed.
*1 Input the value with the format designated in the screen.

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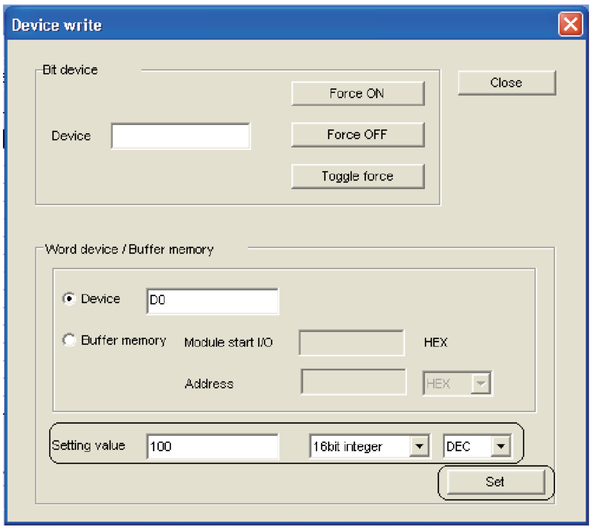


Device write

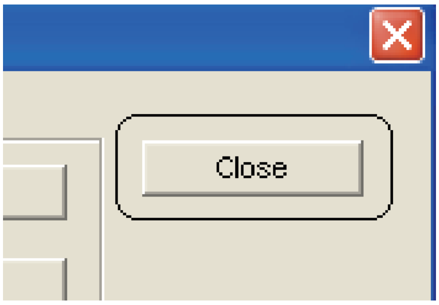
Bit device: Device

Word device / Buffer memory: ● Device D0 ○ Buffer memory

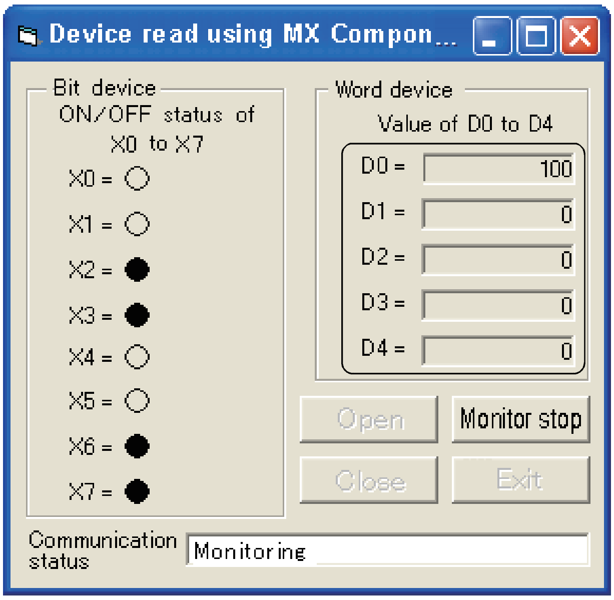
Setting value 100 16bit integer DEC

5) After the "Device write" screen appears, input any numerical value to "Setting value" and click the Set button.

Set D0 to 100 in this case.



6) Click the Close button on the "Device write" screen to close the screen.



X0 =	○	D0 =	100
X1 =	○	D1 =	0
X2 =	●	D2 =	0
X3 =	●	D3 =	0
X4 =	○	D4 =	0
X5 =	○		
X6 =	●		
X7 =	●		

Communication status Monitoring

7) Set the program to active (*1) and check that the value of device is changed.
When repeating the operations of 4) to 5) and changing the value of D0 to D4, the value D0 to D4 on the program is changed.
*1 Display on the top of the windows.

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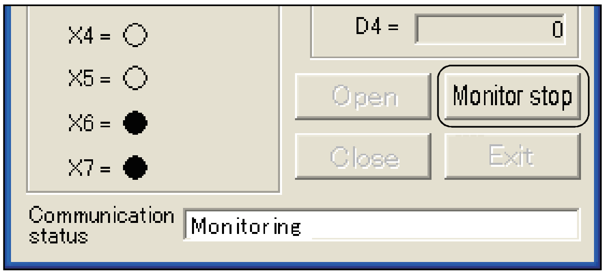
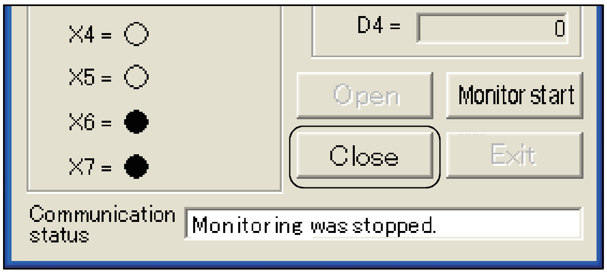


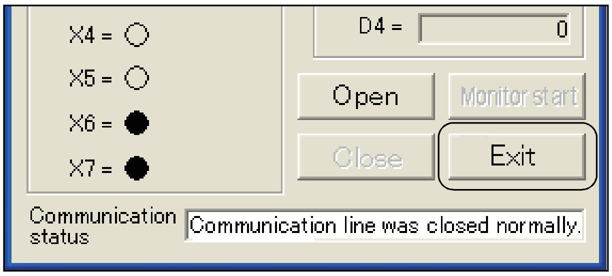
X4 = ○
X5 = ○
X6 = ●
X7 = ●
D4 = 0
Communication status: Monitoring

8) To end monitoring, click the Monitor stop button.



X4 = ○
X5 = ○
X6 = ●
X7 = ●
D4 = 0
Communication status: Monitoring was stopped.

9) Click the Close button to close the communication line.
When closing normally, "Communication line was closed normally." appears in Communication status.
The error code appears at abnormal.
For details of error code, refer to Appendix 2.3.



X4 = ○
X5 = ○
X6 = ●
X7 = ●
D4 = 0
Communication status: Communication line was closed normally.

10) Click the Exit button to complete the program.

Reading the following project file is enabled.

5.5 Visual Basic Program (Device Write)

The contents of PLC CPU bit device Y70 to Y77 (eight points) and of word device D0 to D4 (five words) are changed.

5.5.1 Visual basic program

Project file name	E71-2.VBP

```
Option Explicit                                      ’Force the declaration of variables

Const MonitorTime As Integer = 100                   'Device monitor interval

Private Sub cmdOpen_Click()

    Dim lRet As Long                                 'Return value

    lRet = ActEasyIF1.Open                           'Open the communication line

    If lRet = 0 Then
        txtStatus.Text = _
          "Communication line was opened normally. "   'Message at normal
        cmdOpen.Enabled = False                      'Disable the Open button
        cmdClose.Enabled = True                      'Enable the Close button
        cmdMonitor.Enabled = True                    'Enable the Monitor start button
        cmdEnd.Enabled = False                       'Disable the End button
    Else
        txtStatus.Text = _
          "Error occurrence (Error code: " + Hex$(lRet) + ")"   'Message at abnormal
    End If

End Sub

Private Sub cmdClose_Click()

    Dim lRet As Long                                 'Return value

    lRet = ActEasyIF1.Close                          'Close communication line

    If lRet = 0 Then
        txtStatus.Text = _
            "Communication line was closed normally. "   'Message at normal
        cmdOpen.Enabled = True                       'Enable the Open button
        cmdClose.Enabled = False                     'Disable the Close button
        cmdMonitor.Enabled = False                   'Disable the Monitor start button
        cmdEnd.Enabled = True                        'Enable the End button
    Else
        txtStatus.Text = _
         "Error occurrence (Error code: " + Hex$(lRet) + ")"   'Message at abnormal
    End If

End Sub
```

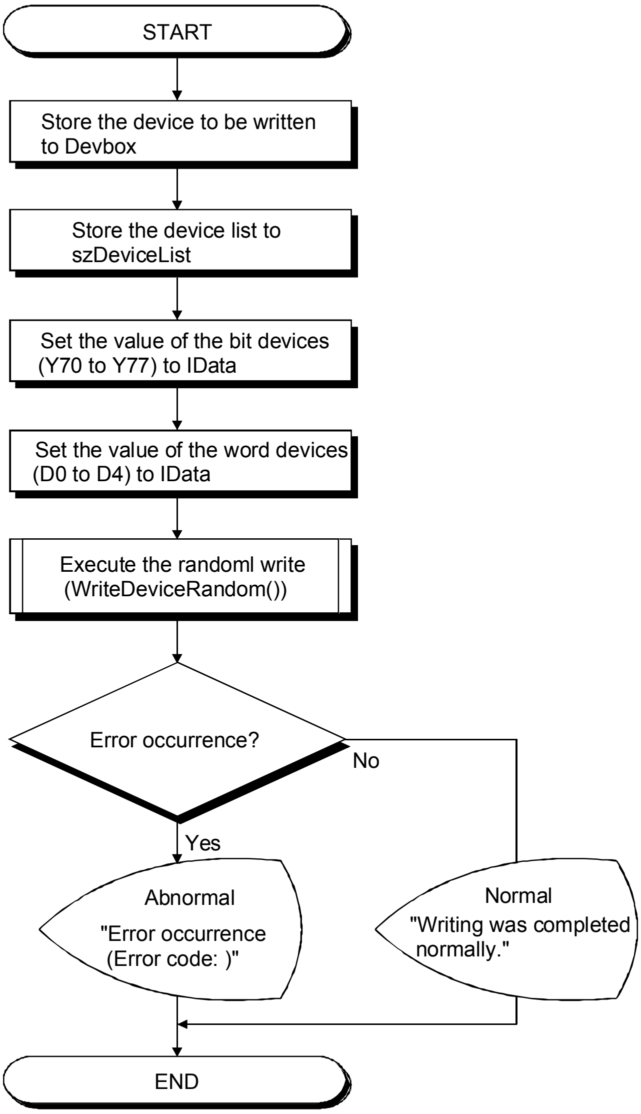
```
Private Sub cmdMonitor_Click()

    Dim i As Integer                                'Variable 1 for loop
    Dim j As Integer                                'Variable 2 for loop
    Dim k As Integer                                'Variable 3 for loop
    Dim szDeviceList As String                      'For write device storage
    Dim Devbox(12) As String                        'For write device temporary storage
    Dim lData(12) As Long                           'Write device value storage
    Dim lRet As Long                                'Return value

    Const lSize As Long = 13                        'Number of devices to be written

    'Set device to be written
    Devbox(0) = "Y70"
    Devbox(1) = "Y71"
    Devbox(2) = "Y72"
    Devbox(3) = "Y73"
    Devbox(4) = "Y74"
    Devbox(5) = "Y75"
    Devbox(6) = "Y76"
    Devbox(7) = "Y77"
    Devbox(8) = "D0"
    Devbox(9) = "D1"
    Devbox(10) = "D2"
    Devbox(11) = "D3"
    Devbox(12) = "D4"

    For i = 0 To lSize - 1
        szDeviceList = szDeviceList + Devbox(i)     'Set device to be written
        If i <> lSize Then
            szDeviceList = szDeviceList + vbLf
        End If
    Next

    'Set the value of bit devices (Y70 to Y77)
    For j = 0 To 7
        If lblON_OFF(j).Caption = "●" Then
            lData(j) = 1                            'For ●, store "1"
        Else
            lData(j) = 0                            'For ○, store "0"
        End If
    Next

    'Set the value of word devices (D0 to D4)
    For k = 0 To 4
        lData(k + 8) = Val(txtDvalue(k).Text)
    Next
    'Execute the random write
    lRet = ActEasyIF1.WriteDeviceRandom(szDeviceList, lSize, lData(0))
    If lRet = 0 Then
        txtStatus.Text = "The value was written normally. "           'Message at normal
    Else
        txtStatus.Text = _
            "Error occurrence (Error code: " + Hex$(lRet) + ")"      'Display the error code at error
    End If

End Sub

Private Sub cmdEnd_Click()

    End                                                              'Program end

End Sub

Private Sub lblON_OFF_DblClick(Index As Integer)

    'Reverse ● and ○ with a double-click
    If lblON_OFF(Index).Caption = "●" Then
        lblON_OFF(Index).Caption = "○"
    Else
        lblON_OFF(Index).Caption = "●"
    End If
End Sub
```

(1) Flowchart

(a) cmdOpen_Click() (Operation by clicking the Open button)
Refer to Section 5.4.1 (1) (a).

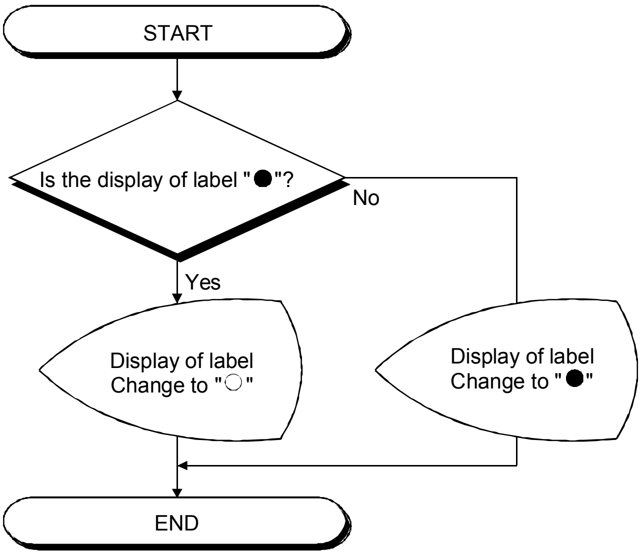
(b) cmdOpen_Click() (Operation by clicking the Close button)
Refer to Section 5.4.1 (1) (b).

(c) cmdMonitor_Click() (Operation by clicking the Monitor start button)


START
Store the device to be written to Devbox
Store the device list to szDeviceList
Set the value of the bit devices (Y70 to Y77) to IData
Set the value of the word devices (D0 to D4) to IData
Execute the randoml write (WriteDeviceRandom())
Error occurrence?
No
Yes
Abnormal
"Error occurrence (Error code:)"
Normal
"Writing was completed normally."
END

(d) cmdEnd_Click() (Operation by clicking the End button)
Refer to Section 5.4.1 (1) (d).

(e) lblON_OFF_DblClick() (Operation when double-clicking a label)

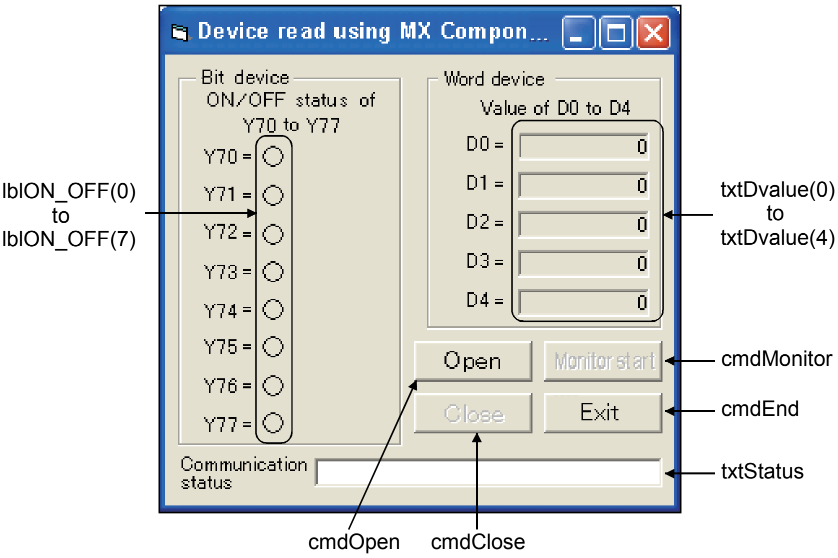


5.5.2 Operation of demonstration machine

The program is executed, and the device value of the PLC CPU is changed.

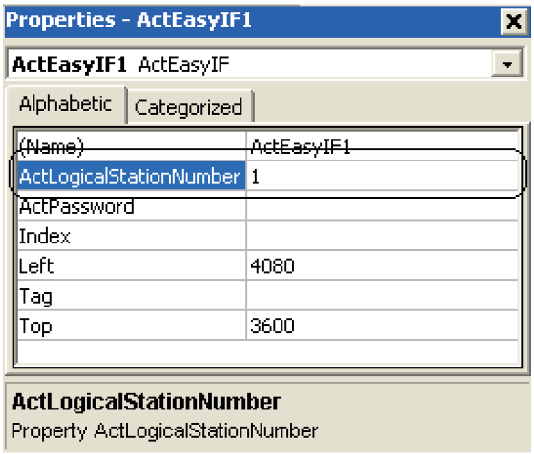
(1) Program screen

The following indicates object names on the program screen.



(2) Operating procedure

1) Start up Visual Basic® and read the project file (E71-2.VBP) shown in Section 5.5.1.


Properties - ActEasyIF1

ActEasyIF1 ActEasyIF

Alphabetic | Categorized

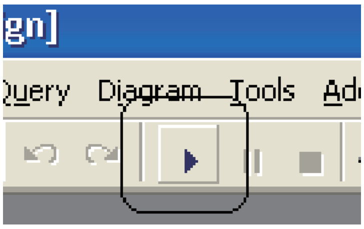
(Name)	ActEasyIF1
ActLogicalStationNumber	1
ActPassword	
Index	
Left	4080
Tag	
Top	3600

ActLogicalStationNumber

Property ActLogicalStationNumber

2) Check that ActLogicalStationNumber of ActEasyIF1 property is "1".
The logical station number set in Section 5.3.1 is set.
By setting the logical station number, the communication can be performed with the path set in the logical station number.

⇩



3) Click the ▶ (start) button to execute the program.

⇩

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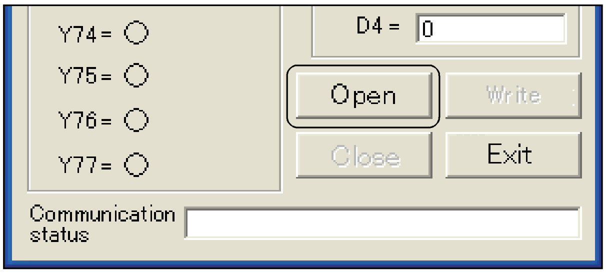
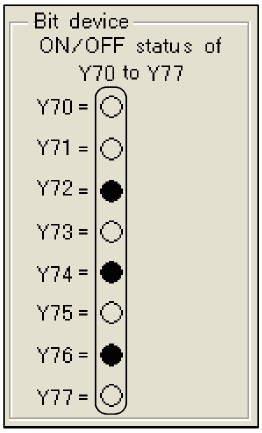
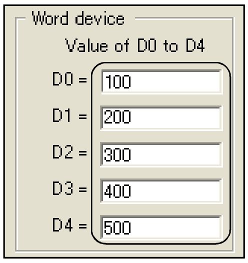

Y74 = ○
Y75 = ○
Y76 = ○
Y77 = ○
D4 = 0

Communication status

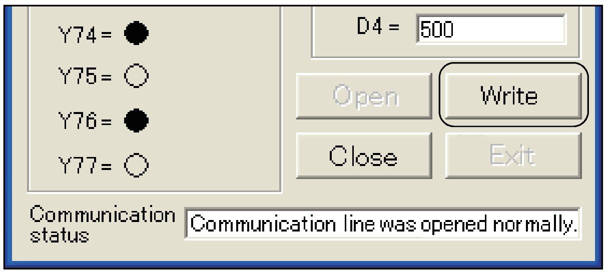
4) Click the Open button to open the communication line.
When opening normally, "Communication line was opened normally." appears in Communication status.
The error code appears at abnormal.
For details of error codes, refer to Appendix 2.3.


Bit device
ON/OFF status of Y70 to Y77
Y70 = ○
Y71 = ○
Y72 = ●
Y73 = ○
Y74 = ●
Y75 = ○
Y76 = ●
Y77 = ○

5) Double-click "○" of the bit device which value is changed and turn it ON or OFF.
"○" indicates OFF, and "●" indicates ON.

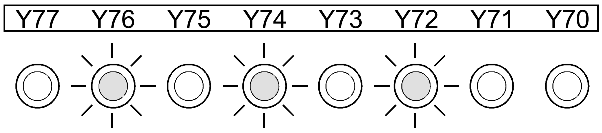

Word device
Value of D0 to D4
D0 = 100
D1 = 200
D2 = 300
D3 = 400
D4 = 500

6) Input a numerical value to the text box of the word device which value is changed.
The input numerical value is used as decimal number.


Y74 = ●
Y75 = ○
Y76 = ●
Y77 = ○
D4 = 500

Communication status: Communication line was opened normally.

7) Click the Write button to execute writing.



8) When the writing is completed normally, "Writing was completed normally." appears in the communication status.
Check the Y70 to Y77 LEDs of the I/O panel.
Check that the LEDs of the bit devices that are turned ON in the program are ON.

Continued to the next page

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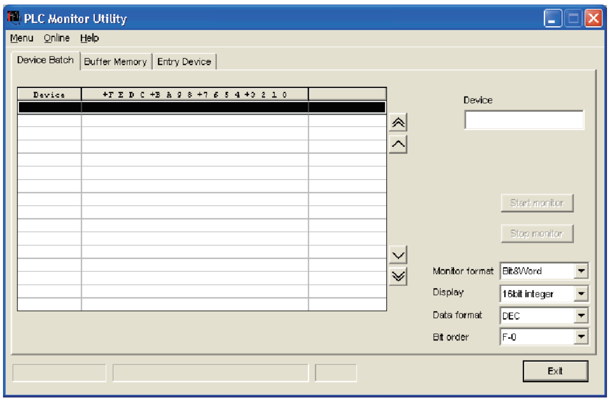
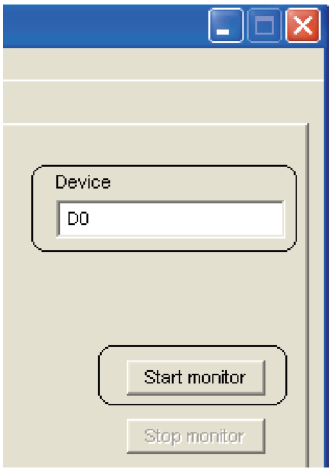


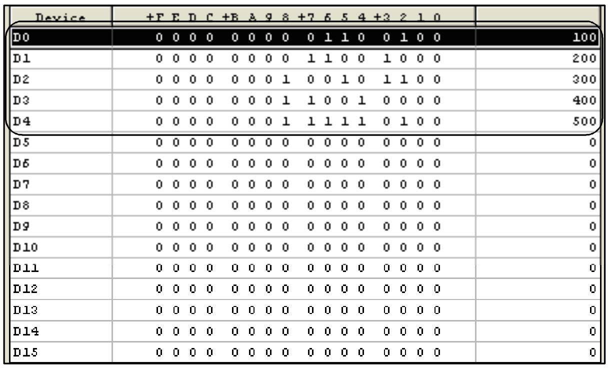
9) Check the written numerical value in the MX Component.
(*1)
Refer to Section 5.4.2 (3), start up "PLC Monitor Utility" and set the logical station number to "1".

Click [Start] → [All Programs] → [MELSOFT Application] → [MX Component] → [PLC Monitor Utility].

In the Transfer setting screen, set "Logical station number" to "1" and click the OK button.


Device: D0

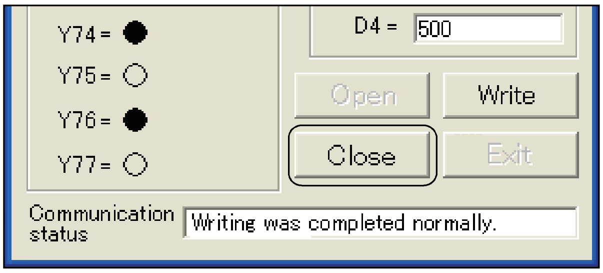
10) Input "D0" in "Device", then click the Start monitor button.



Device	+F E D C +B A 9 8 +7 6 5 4 +3 2 1 0	
D0	0 0 0 0 0 0 0 0 0 1 1 0 0 1 0 0	100
D1	0 0 0 0 0 0 0 0 1 1 0 0 1 0 0 0	200
D2	0 0 0 0 0 0 0 1 0 0 1 0 1 1 0 0	300
D3	0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0	400
D4	0 0 0 0 0 0 0 1 1 1 1 1 0 1 0 0	500
D5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D6	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D8	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D9	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D10	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D11	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D12	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D13	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D14	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
D15	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0

11) Check that the written device value appears.

Then click the Exit button.

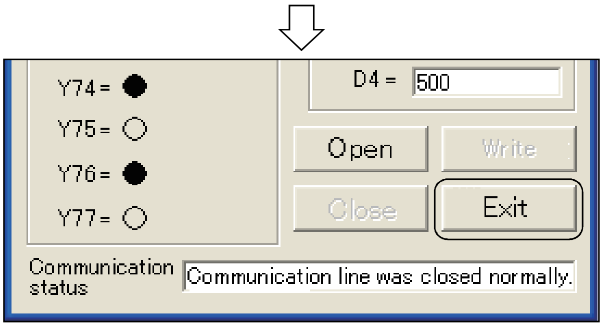

Y74 = ●
Y75 = ○
Y76 = ●
Y77 = ○
D4 = 500

Communication status: Writing was completed normally.

12) Click the Close button to close the communication line.
When closing normally, "Communication line was closed normally." appears in Communication status.
The error code appears at abnormal.
For details of error codes, refer to Appendix 2.3.

Continued to the next page

Continued from the previous page



Communication line was closed normally.

13) Click the Exit button to complete the program.

Reading the following project file is enabled.

*1 The following can be processed using X7 to XB of the demonstration machine and the display.

X7	: Store "0" in D0 to D4
X8, X9	: Store any numerical value in D0 to D4
XA	: Display the numerical value of D0 to D2
XB	: Display the numerical value of D3 to D4

MEMO

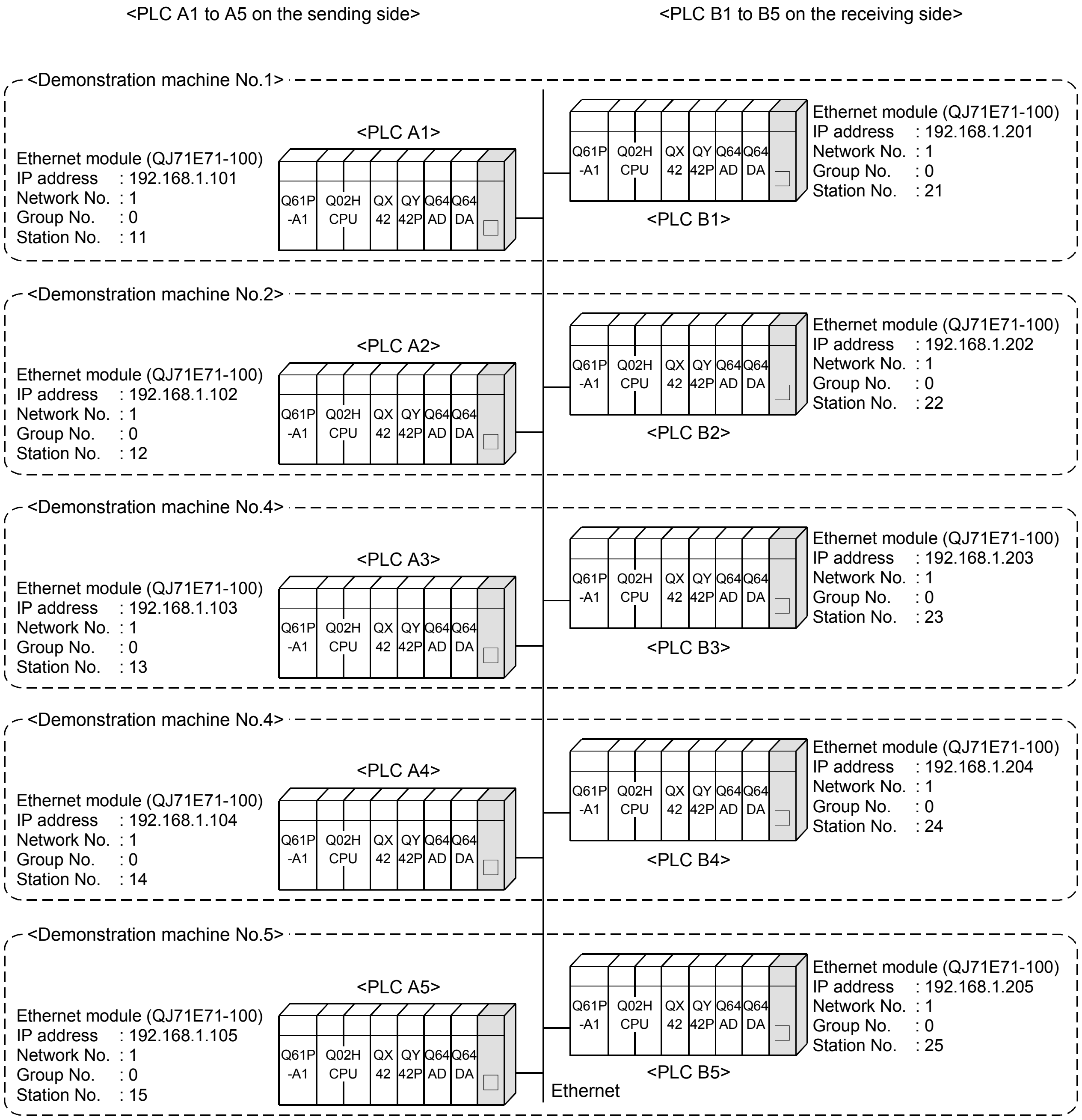
CHAPTER 6 ASSIGNMENT II (FIXED BUFFER COMMUNICATION BETWEEN PLC CPUS (PROCEDURE EXIST))

In this assignment, the exercise of the fixed buffer communication (procedure exist) function is performed.
The PLC A side sends data and the PLC B side receives data.

6.1 System Configuration of Exercise

The following shows the system configuration for the exercises in Assignment II.
In Assignment II, data are communicated using the TCP/IP communication, and the device (X) of the PLC CPU on the sending side is monitored using the demonstration machine on the receiving side.
Although 10 PLC CPUs are connected to the Ethernet, the communication is made only between the PLC CPUs which have the same demonstration machine No. in Assignment II.

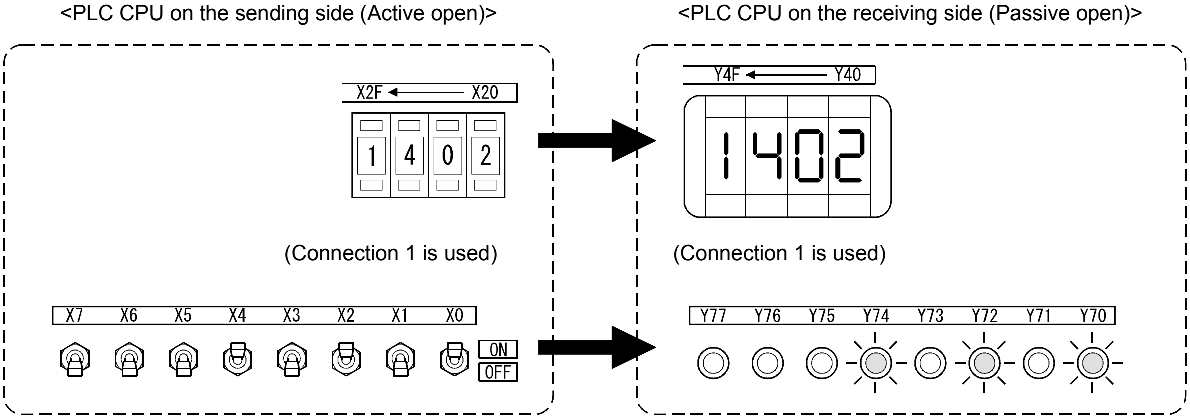
(1) Module configuration



<PLC A1 to A5 on the sending side>
<PLC B1 to B5 on the receiving side>
<Demonstration machine No.1>
<PLC A1>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.101
Network No. : 1
Group No. : 0
Station No. : 11
Q61P -A1
Q02H CPU
QX 42
QY 42P
Q64 AD
Q64 DA
<PLC B1>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.201
Network No. : 1
Group No. : 0
Station No. : 21
<Demonstration machine No.2>
<PLC A2>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.102
Network No. : 1
Group No. : 0
Station No. : 12
<PLC B2>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.202
Network No. : 1
Group No. : 0
Station No. : 22
<Demonstration machine No.4>
<PLC A3>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.103
Network No. : 1
Group No. : 0
Station No. : 13
<PLC B3>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.203
Network No. : 1
Group No. : 0
Station No. : 23
<Demonstration machine No.4>
<PLC A4>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.104
Network No. : 1
Group No. : 0
Station No. : 14
<PLC B4>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.204
Network No. : 1
Group No. : 0
Station No. : 24
<Demonstration machine No.5>
<PLC A5>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.105
Network No. : 1
Group No. : 0
Station No. : 15
<PLC B5>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.205
Network No. : 1
Group No. : 0
Station No. : 25
Ethernet

(2) Exercise description

Display the information about X0 to X7 and about X20 to X2F of the PLC CPU on the sending side on Y70 to Y77 and Y40 to Y4F of the PLC CPU on the receiving side.



6.2 Ethernet Module Settings on the Sending Side

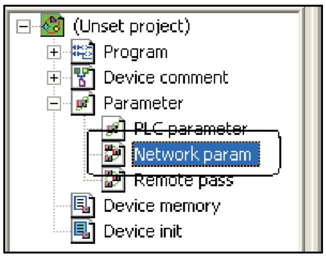
The Ethernet module settings on the sending side are performed.

6.2.1 Setting parameters with GX Developer

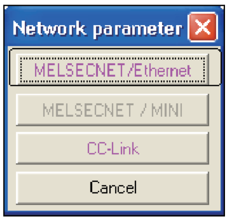
The Ethernet module parameters are set using the GX Developer.
The setting details should be the same as those of Section 6.1.

(1) GX Developer startup and multiple CPU setting
Make the same multiple CPU setting as that of Section 5.2.1.

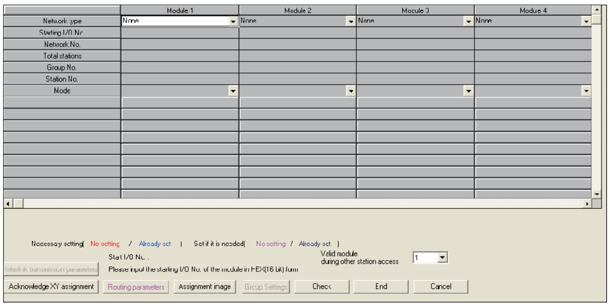
(2) "Network parameters Setting the number of MNET/10H Ethernet cards"



1) Double-click "Network parameter" from the project data list.



2) After the Network parameter selection dialog box appears, click the MELSECNET/Ethernet button.



	Module 1	Module 2	Module 3	Module 4
Network type	None	None	None	None
Starting I/O No				
Network No.				
Total stations				
Group No.				
Station No.				
Mode				

Necessary setting(No setting / Already set) Set if it is needed(No setting / Already set)

Start I/O No. :
Please input the starting I/O No. of the module in HEX(16 bit) form

Valid module during other station access: 1

3) The Network parameters Setting the number of MNET/10H Ethernet cards screen appears.

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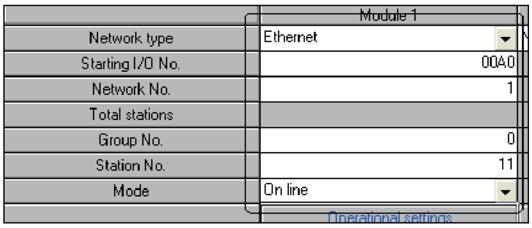
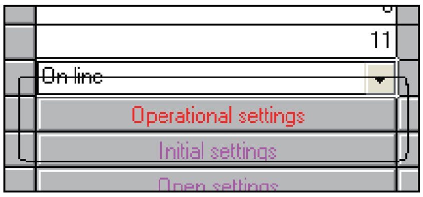


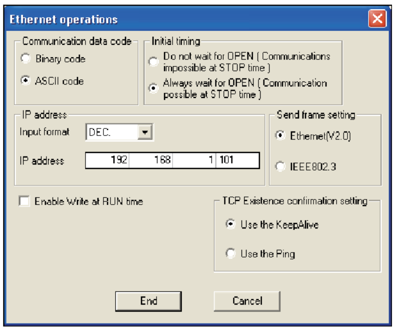
	Module 1
Network type	Ethernet
Starting I/O No.	00A0
Network No.	1
Total stations	
Group No.	0
Station No.	11
Mode	On line

4) Set the following contents of the Network parameters Setting the number of MNET/10H Ethernet cards screen.

Network type : Ethernet
I/O No. : 00A0
Network No. : 1
Group No. : 0
Station No. : Set the station No. of each demonstration machine (11 to 15)
Mode : On line



5) Click the Operational settings button to display the Ethernet operations dialog box.



Ethernet operations

Communication data code
○ Binary code
● ASCII code

Initial timing
○ Do not wait for OPEN (Communications impossible at STOP time)
● Always wait for OPEN (Communication possible at STOP time)

IP address
Input format: DEC.
IP address: 192 . 168 . 1 . 101

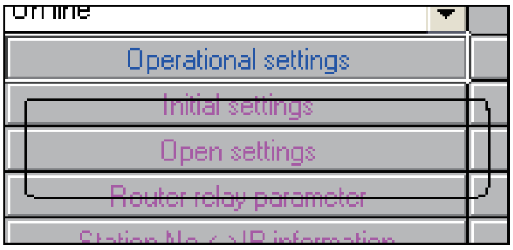
Send frame setting
● Ethernet(V2.0)
○ IEEE802.3

□ Enable Write at RUN time

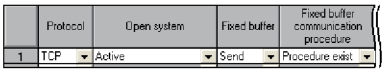
TCP Existence confirmation setting
● Use the KeepAlive
○ Use the Ping

6) Set the following contents, click the End button, and then close the Ethernet operations dialog box.

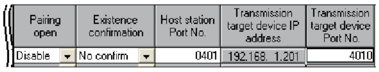
Communication data code : ASCII code
Initial timing : Always wait for OPEN
IP address : Set the IP address of each demonstration machine (192.168.1.101 to 192.168.1.105)
Send frame setting : Ethernet (V2.0)



7) Click the Open settings button to display the Network parameter Ethernet open settings screen.



	Protocol	Open system	Fixed buffer	Fixed buffer communication procedure
1	TCP	Active	Send	Procedure exist



Pairing open	Existence confirmation	Host station Port No.	Transmission target device IP address	Transmission target device Port No.
Disable	No confirm	0401	192.168. 1.201	4010

8) Set the following contents.

Protocol : TCP
Open system : Active
Fixed buffer : Send
Fixed buffer communication procedure:
Procedure exist
Pairing open : Disable
Existence confirmation : No confirm
Host station Port No. : 0401
Transmission target device IP address:
Set the IP address of each demonstration machine (192.168.1.201 to 192.168.1.205)
Transmission target device Port No.:
0401

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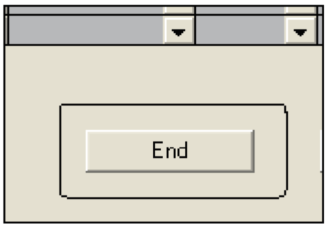
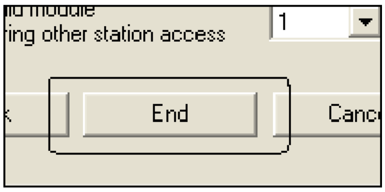
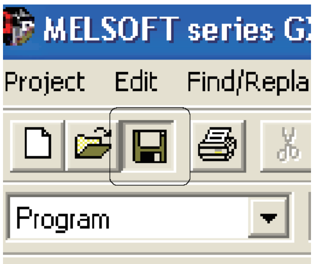


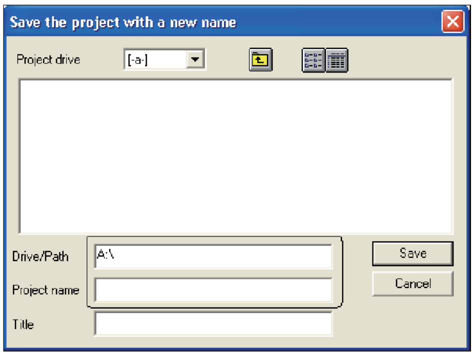
9) Click the End button to close the Network parameter Ethernet open settings screen.



10) Click the End button to close the Network parameters Setting the number of MNET/10H Ethernet cards screen.



11) Click the 💾 button.
(Save)


Save the project with a new name

Project drive [-a-]

Drive/Path A:\

Project name

Title

12) Set Drive/Path and Project name, then click the Save button.

Drive/Path : A:\Q-E71
Project name : EX2-A□
□ indicates a demonstration machine No.
Example. For demonstration machine No.1
EX2-A1

6.2.2 Sequence program

Create a sequence program to send data to the PLC CPU on the receiving side.
Perform the open processing for the connection 1 and send data.
After data sending, perform close processing for connection 1.

POINT

After creating a sequence program, perform the following operations with the GX Developer.

1) Saving to FD

    Drive/Path : A:\Q-E71
    Project name : EX2-A□ (□ indicates a demonstration machine No.)
    Example: For demonstration machine No.1, EX2-A1

2) Designating connection destination (Refer to Section 5.2.3)

3) Writing to PLC CPU (Refer to Section 5.2.4)

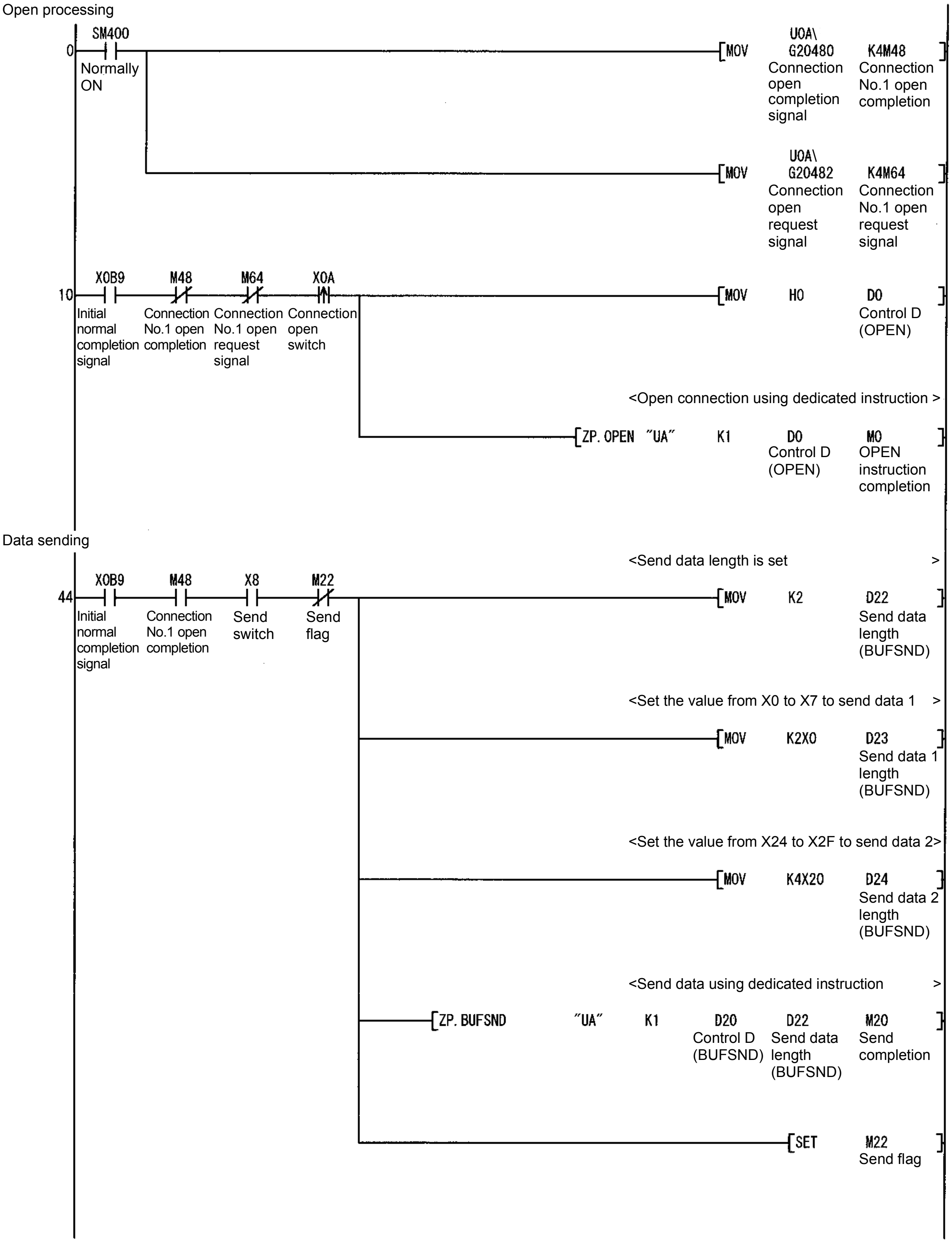
(1) List of devices to be used

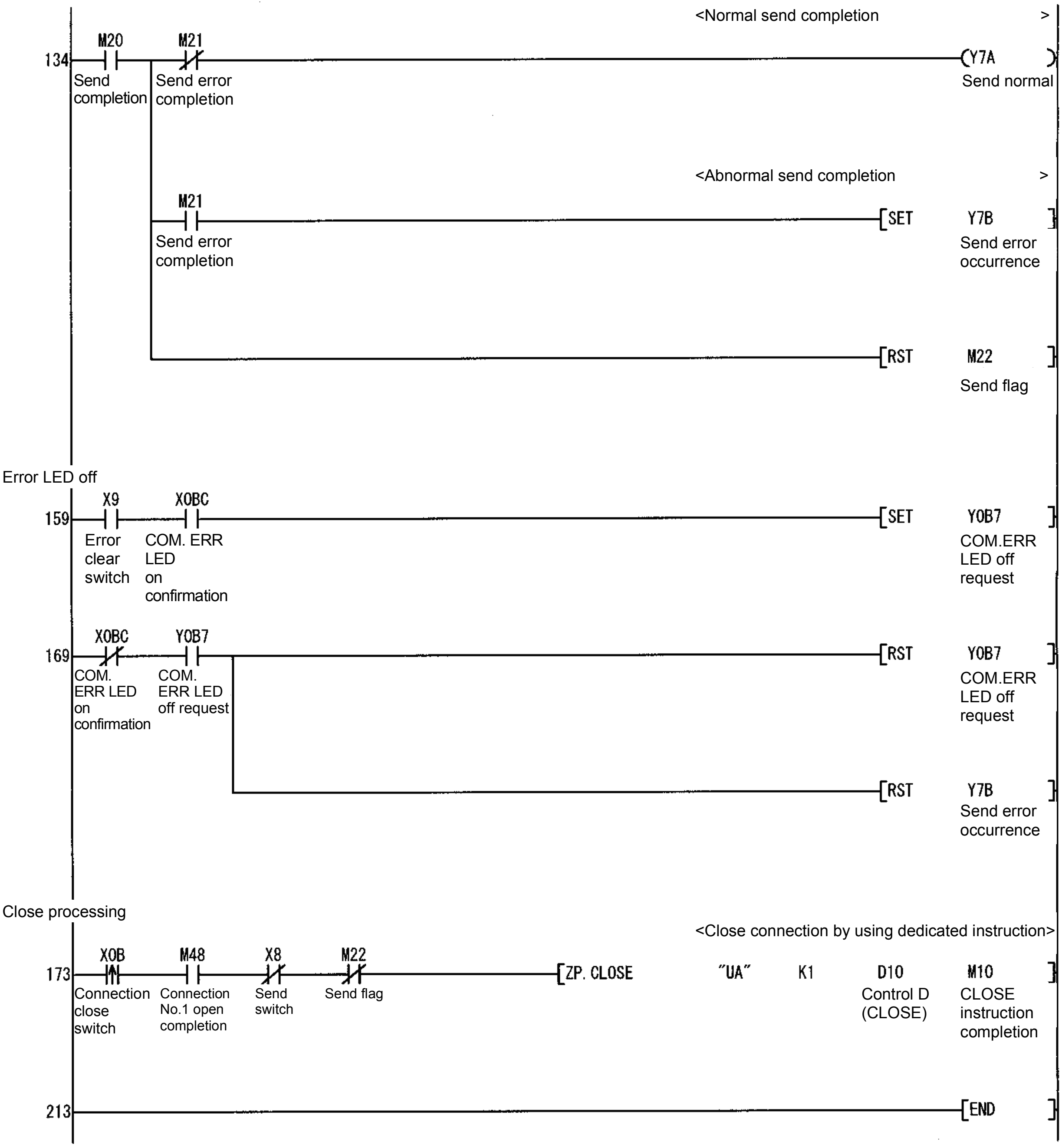
Device name	Description	Device name	Description
SM400	Normally ON	X0B	Switch to command closing the connection.
M0	Turns ON for only 1 scan after the open processing for connection No.1 is completed.	X20 to X2F	Data sent to the receiving side.
M1	Turns ON for only 1 scan when the open processing for connection No.1 is completed abnormally.	X0B9 (X(n+1)9)	Turns ON when the initial processing of the Ethernet module is completed normally.
M10	Turns ON for only 1 scan after the close processing for connection No.1 is completed.	X0BC (X(n+1)C)	Turns ON when COM.ERR LED turns on.
M11	Turns ON for only 1 scan when the close processing for connection No.1 is completed abnormally.	Y7A	Turns ON when the data sending is completed normally.
M20	Turns ON for only 1 scan after the data sending is completed.	Y7B	Turns ON when the data sending is completed abnormally.
M21	Turns ON for only 1 scan when the data sending is completed abnormally.	Y0B7	COM. ERR LED off request
M22	Turns ON at the data sending. Turns OFF at the completion of data sending.	D0 to D9	Stores the control data of the OPEN instruction.
M48	Turns ON when the connection No. 1 is in the open status.	D10 to D11	Stores the control data of the CLOSE instruction.
M64	Turns ON when the open request for the connection No. 1 is being performed or while the connection No. 1 is opened.	D20 to D21	Stores the control data of the BUFSND instruction.
X0 to X7	Data sent to the receiving side.	D22	Stores the send data length.
X8	Switch to command sending data	D23	Stores the send data (X0 to X7).
X9	Switch to command clearing the error display on the display LED	D24	Stores the send data (X20 to X2F).
X0A	Switch to command opening the connection	——	————

(2) Sequence program

For details on dedicated instructions, refer to Chapter 10 of Q Corresponding Ethernet Interface Module User's Manual (Basic).

Drive/Path	A:\Q-E71
Project name	EX2-A □


Open processing
0
SM400
Normally ON
MOV U0A\G20480 K4M48
Connection open completion signal
Connection No.1 open completion
MOV U0A\G20482 K4M64
Connection open request signal
Connection No.1 open request signal
10
X0B9
M48
M64
X0A
Initial normal completion signal
Connection No.1 open completion
Connection No.1 open request signal
Connection open switch
MOV H0 D0
Control D (OPEN)
<Open connection using dedicated instruction >
ZP.OPEN "UA" K1 D0 M0
Control D (OPEN)
OPEN instruction completion
Data sending
<Send data length is set >
44
X0B9
M48
X8
M22
Initial normal completion signal
Connection No.1 open completion
Send switch
Send flag
MOV K2 D22
Send data length (BUFSND)
<Set the value from X0 to X7 to send data 1 >
MOV K2X0 D23
Send data 1 length (BUFSND)
<Set the value from X24 to X2F to send data 2>
MOV K4X20 D24
Send data 2 length (BUFSND)
<Send data using dedicated instruction >
ZP.BUFSND "UA" K1 D20 D22 M20
Control D (BUFSND)
Send data length (BUFSND)
Send completion
SET M22
Send flag


<Normal send completion >
134
M20
Send completion
M21
Send error completion
Y7A
Send normal
<Abnormal send completion >
M21
Send error completion
SET Y7B
Send error occurrence
RST M22
Send flag
Error LED off
159
X9
Error clear switch
X0BC
COM. ERR LED on confirmation
SET Y0B7
COM.ERR LED off request
169
X0BC
COM. ERR LED on confirmation
Y0B7
COM. ERR LED off request
RST Y0B7
COM.ERR LED off request
RST Y7B
Send error occurrence
Close processing
<Close connection by using dedicated instruction>
173
X0B
Connection close switch
M48
Connection No.1 open completion
X8
Send switch
M22
Send flag
ZP. CLOSE "UA" K1 D10 M10
Control D (CLOSE)
CLOSE instruction completion
213
END

6.3 Ethernet Module Settings on the Receiving Side

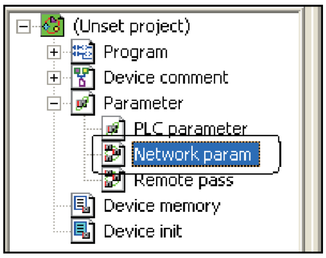
The Ethernet module settings on the receiving side are performed.

6.3.1 Setting parameters with GX Developer

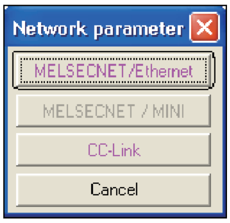
The Ethernet module parameters are set using the GX Developer.
The setting details should be the same as those of Section 6.1.

(1) GX Developer startup and multiple CPU setting
Make the same multiple CPU setting as that of Section 5.2.1.

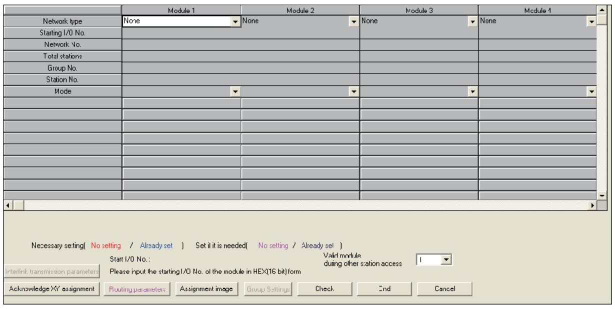
(2) "Network parameters Setting the number of MNET/10H Ethernet cards"



1) Double-click "Network parameter" from the project data list.



2) As the Network parameter selection dialog box is displayed, click the MELSECNET/Ethernet button.



	Module 1	Module 2	Module 3	Module 4
Network type	None	None	None	None
Starting I/O No.				
Network No.				
Total stations				
Group No.				
Station No.				
Mode				

Necessary setting(No setting / Already set) Set it it is needed(No setting / Already set)
Start I/O No. :
Please input the starting I/O No. of the module in HEX(16 bit) form
Valid module during other station access: 1

3) The Network parameters Setting the number of MNET/10H Ethernet cards screen appears.

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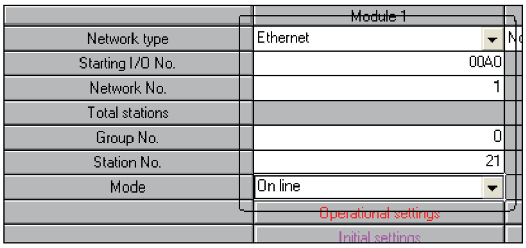
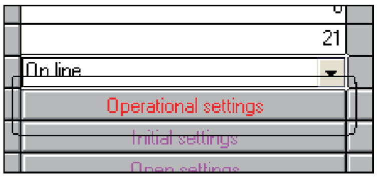


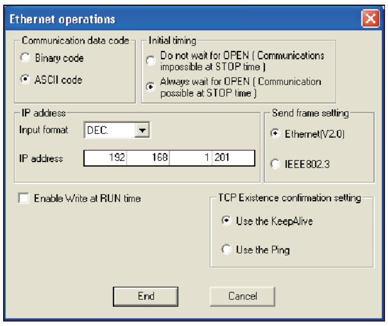
	Module 1
Network type	Ethernet
Starting I/O No.	00A0
Network No.	1
Total stations	
Group No.	0
Station No.	21
Mode	On line

4) Set the following contents of the Network parameters Setting the number of MNET/10H Ethernet cards screen.

Network type : Ethernet
I/O No. : 00A0
Network No. : 1
Group No. : 0
Station No. : Set the station No. for each demonstration machine (21 to 25)
Mode : On line



5) Click the Operational settings button to display the Ethernet operations dialog box.



Ethernet operations

Communication data code
○ Binary code
● ASCII code

Initial timing
○ Do not wait for OPEN (Communications impossible at STOP time)
● Always wait for OPEN (Communication possible at STOP time)

IP address
Input format: DEC.
IP address: 192 . 168 . 1 . 201

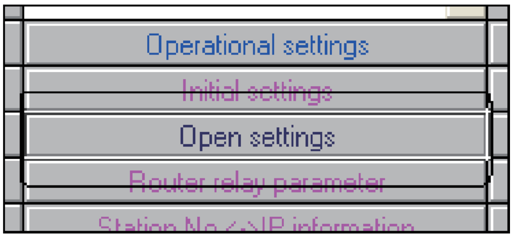
Send frame setting
● Ethernet(V2.0)
○ IEEE802.3

□ Enable Write at RUN time

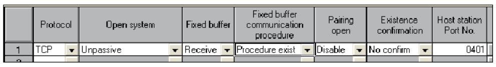
TCP Existence confirmation setting
● Use the KeepAlive
○ Use the Ping

6) Set the following contents, click the End button, and then close the Ethernet operations dialog box.

Communication data code : ASCII code
Initial timing : Always wait for OPEN
IP address : Set the IP address of each demonstration machine (192.168.1.201 to 192.168.1.205)
Send frame setting : Ethernet (V2.0)



7) Click the Open settings button to display the Network parameter Ethernet open settings screen.



	Protocol	Open system	Fixed buffer	Fixed buffer communication procedure	Pairing open	Existence confirmation	Host station Port No.
1	TCP	Unpassive	Receive	Procedure exist	Disable	No confirm	0401

8) Set the following contents.

Protocol : TCP
Open system : Unpassive
Fixed buffer : Receive
Fixed buffer communication procedure: Procedure exist
Pairing open : Disable
Existence confirmation : No confirm
Host station Port No. : 0401

Continued to the next page

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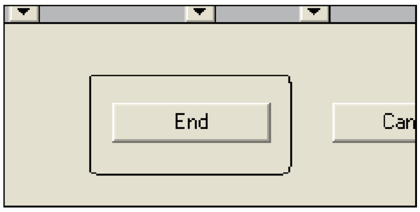
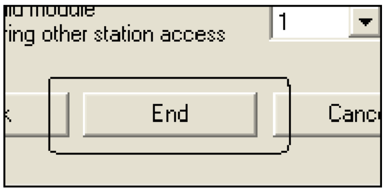
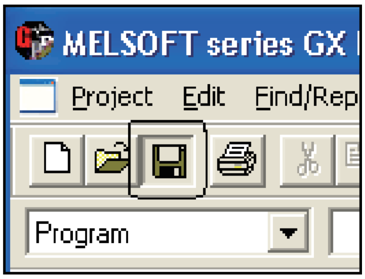


9) Click the End button to close the Network parameter Ethernet open settings screen.

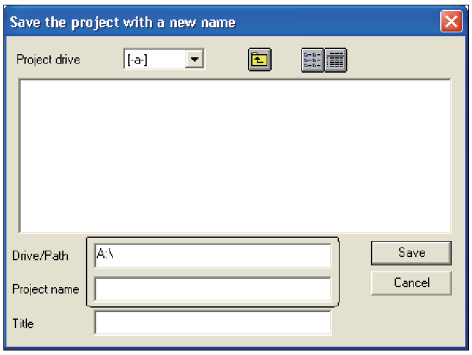


10) Click the End button to close the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.



11) Click the 💾 button.

(Save)



Project drive [-a-]

Drive/Path A:\

Project name

Title

12) Set Drive/Path and Project name, then click the Save button.

Drive/Path : A:\Q-E71

Project name : EX2-B□

□ indicates a demonstration machine No.

Example. For demonstration machine No.1

EX2-B1

6.3.2 Sequence program

Create a sequence program that performs the receive processing for the data sent from the external device.
When the data receive is completed correctly, the send data (X0 to X7, X20 to X2F) are output to Y70 to Y77, Y40 to Y4F.

POINT

After creating a sequence program, perform the following operations with the GX Developer.
1) Saving to FD
Drive/Path: A:\Q-E71
Project name: EX2-B □ (□ indicates a demonstration machine No.)
Example: For demonstration machine No.1, EX2-B1
2) Designating connection destination (Refer to Section 5.2.3)
3) Writing to PLC CPU (Refer to Section 5.2.4)

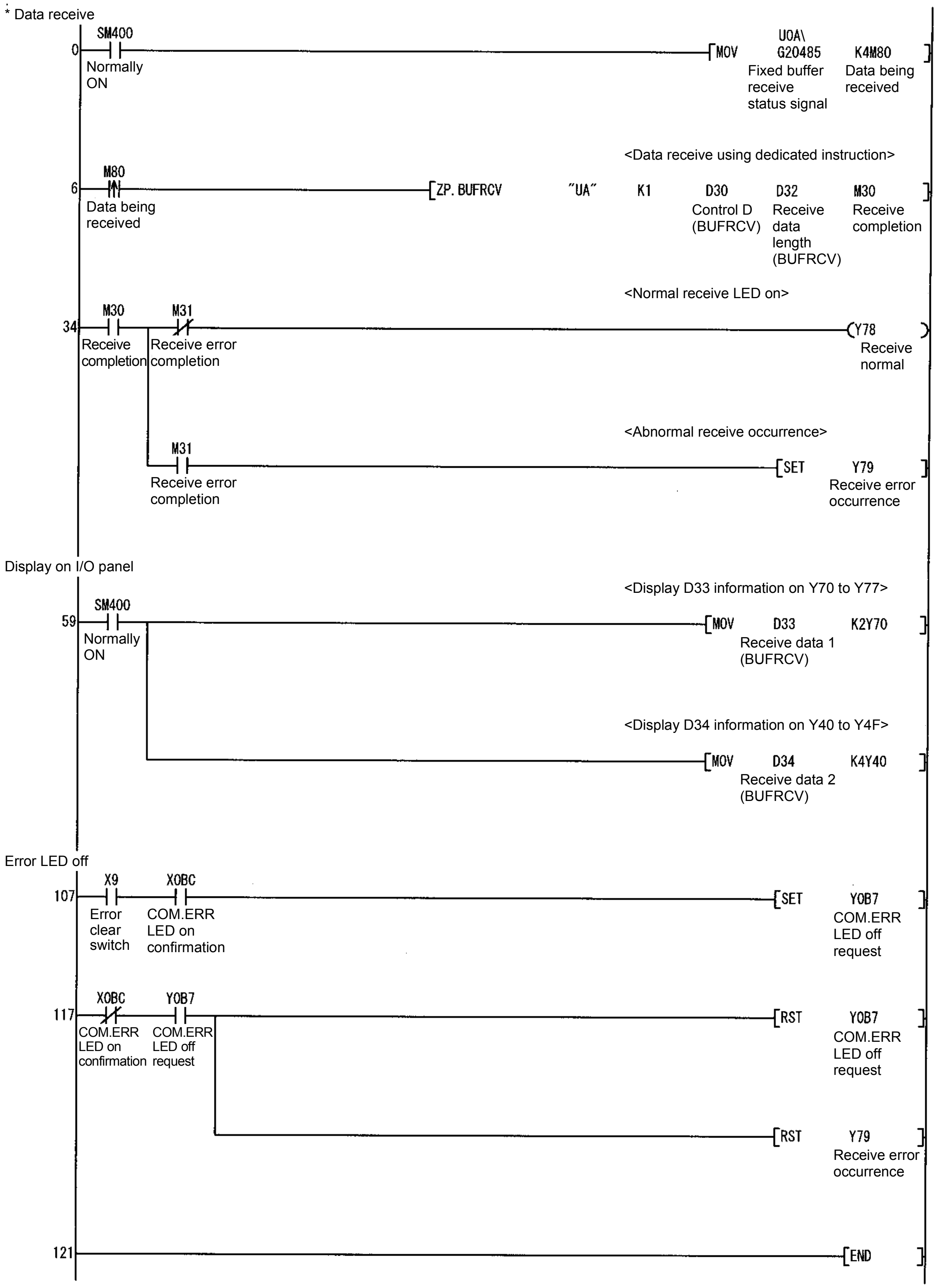
(1) List of devices to be used

Device name	Description	Device name	Description
SM400	Normally ON	Y78	Turns ON when the data receiving is completed normally.
M30	Turns ON for only 1 scan after the data receiving is completed.	Y79	Turns ON when the data receiving is completed abnormally.
M31	Turns ON for only 1 scan when the data receiving is completed abnormally.	Y0B7 (Y(n+1)7)	COM. ERR LED off request
M80	Turns ON while the connection No.1 of the Ethernet module is receiving data.	D30 to D31	Stores the control data of the BUFRCV instruction.
X9	Switch to command clearing the error display on the display LED	D32	Stores the receive data length.
X0BC (X(n+1)C)	Turns ON when COM.ERR LED turns on.	D33	Stores the receive data (X0 to X7).
Y40 to Y4F	Stores the information of X20 to X2F sent from the sending side.	D34	Stores the receive data (X20 to X2F)
Y70 to Y77	Stores the information of X0 to X7 sent the from the sending side.	——	————

(2) Sequence program

For details on dedicated instructions, refer to Chapter 10 of Q Corresponding Ethernet Interface Module User's Manual (Basic).

Drive/Path	A:\Q-E71
Project name	EX2-B □

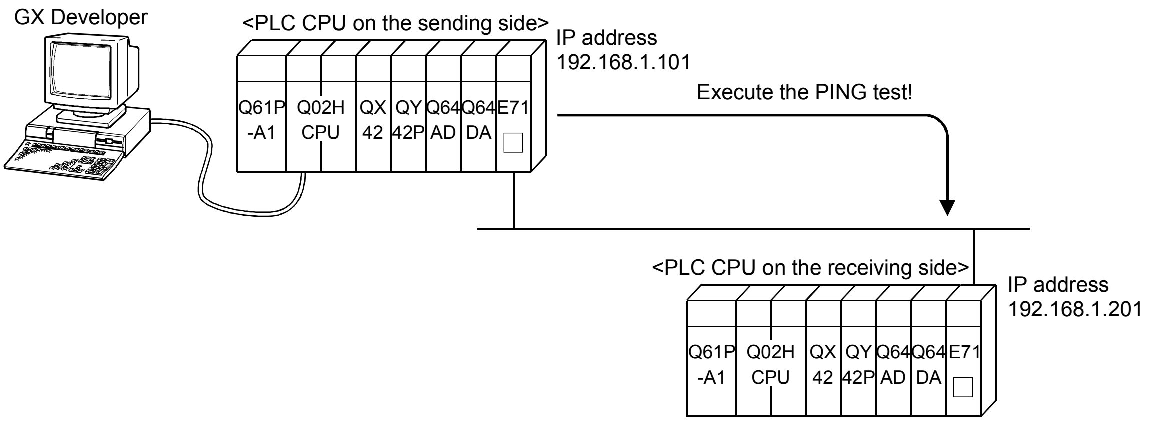


6.4 PING Test Using GX Developer (Via CPU)

Execute the PING test using the GX Developer.

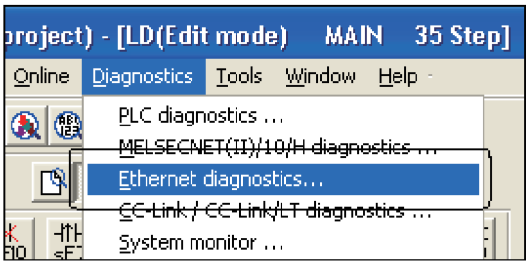
The PING test is performed to check that the initial processing of the local station’s Ethernet module is normally completed and the external device on the same Ethernet is properly connected.

Before starting the PING test, turn on the power of the PLC CPU on the sending and receiving sides and then put them into the STOP status.

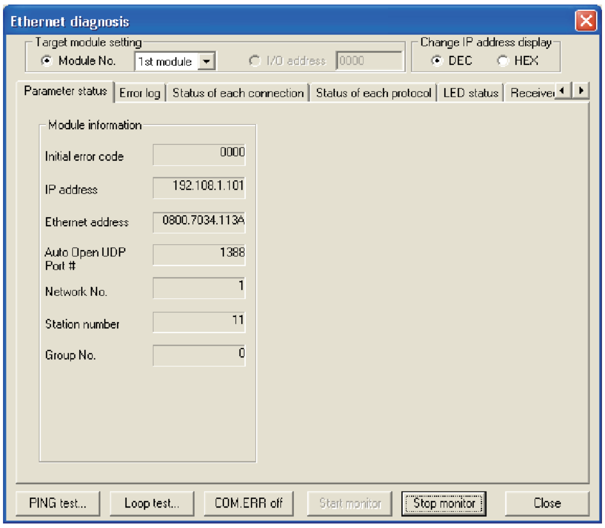


1) Open the project file of the PLC CPU on the sending side.

2) Click [Diagnostics] → [Ethernet diagnostics] menu.


project) - [LD(Edit mode) MAIN 35 Step]
Online
Diagnostics
Tools
Window
Help
PLC diagnostics ...
MELSECNET(II)/10/H diagnostics ...
Ethernet diagnostics...
CC-Link / CC-Link/LT diagnostics ...
System monitor ...

3) The Ethernet diagnostics screen appears.
Specify the target local station Ethernet module in the "Module No." for the Ethernet diagnostics.


Ethernet diagnosis

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

Change IP address display: ● DEC ○ HEX

Parameter status | Error log | Status of each connection | Status of each protocol | LED status | Receive

Module information

Initial error code	0000
IP address	192.108.1.101
Ethernet address	0800.7034.113A
Auto Open UDP Port #	1388
Network No.	1
Station number	11
Group No.	0

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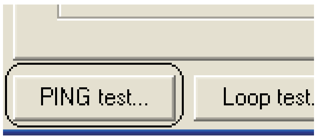
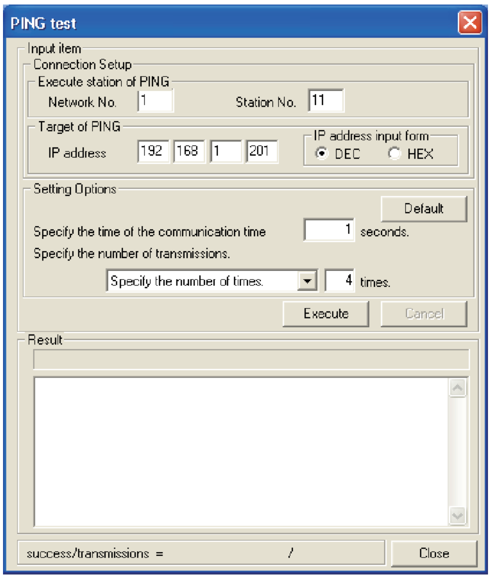


4) Click the PING test button.


PING test

Input item

Connection Setup

Execute station of PING

Network No. 1 Station No. 11

Target of PING

IP address 192 168 1 201

IP address input form ● DEC ○ HEX

Setting Options

Specify the time of the communication time 1 seconds.

Specify the number of transmissions.

Specify the number of times. 4 times.

Result

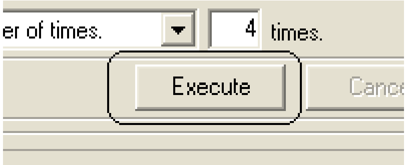
success/transmissions = /

5) The PING test screen appears. Set as follows.

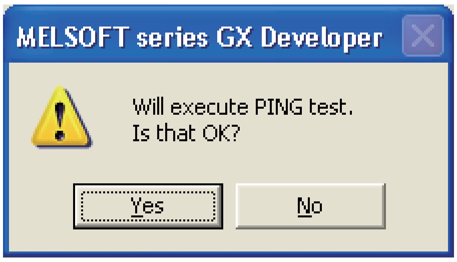
Network No. : 1

Station No. : Set the station No. for each demonstration machine (11 to 15)

IP address : Set the IP address of each target demonstration machine.
(192.168.1.201 to 192.168.1.205)



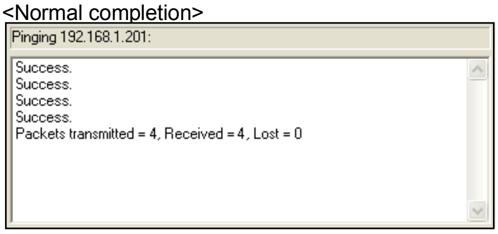
6) Click the Execute button.


MELSOFT series GX Developer

Will execute PING test.
Is that OK?

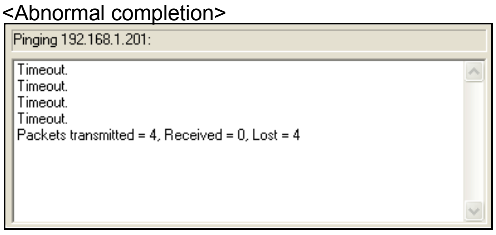
7) Click the Yes button to execute the PING test.

<Normal completion>


```
Pinging 192.168.1.201:
Success.
Success.
Success.
Success.
Packets transmitted = 4, Received = 4, Lost = 0
```

8) The execution result of the PING test appears.

<Abnormal completion>


```
Pinging 192.168.1.201:
Timeout.
Timeout.
Timeout.
Timeout.
Packets transmitted = 4, Received = 0, Lost = 4
```

When Timeout is displayed, "the target IP address is wrong" or "wire breakage may occur". Check and correct it.

REMARK

The following example illustrates how to confirm the completion of the initial processing by issuing the PING command to the local station’s Ethernet module from an external device connected on the same Ethernet (DOS/V personal computer → Ethernet module).
(In the example, the confirmation is made between devices whose IP address class and net ID are identical.)

[Designation]
ping IP address

[Program example]
IP address of the Ethernet module: 192.168.1.201

Example of screen at normal completion

```
C:\>ping 192.168.1.201  …  Execute the ping command

Pinging 192.168.1.201 with 32 bytes of data:

Reply from 192.168.1.201: bytes=32 time=2ms TTL=250
Reply from 192.168.1.201: bytes=32 time<1ms TTL=250
Reply from 192.168.1.201: bytes=32 time<1ms TTL=250
Reply from 192.168.1.201: bytes=32 time<1ms TTL=250

Ping statistics for 192.168.1.201:
        Packets: Sent = 4,  Received = 4,  Lost = 0 (0% loss)
Approximate round trip times in milli-seconds:
        Minimum = 1ms,  Maximum = 2ms,  Average = 1ms

C:\>_
```

Example of screen at abnormal completion

```
C:\>ping 192.168.1.201   …  Execute the ping command

Pinging 192.168.1.201 with 32 bytes of data:

Request timed out:
Request timed out:
Request timed out:
Request timed out:

Ping statistics for 192.168.1.201:
        Packets: Sent = 4,  Received = 0,  Lost = 4 (100% loss)
Approximate round trip times in milli-seconds:
        Minimum = 0ms,  Maximum = 0ms,  Average = 0ms

C:\>_
```

<When the test is completed abnormally>
Check the following, then perform the PING test again.

- How the Ethernet module is mounted on the base unit.
- Status of the connection to the Ethernet.
- Contents of the parameters written to the PLC CPU.
- Operating status of the PLC CPU (whether any errors have occurred.)
- IP address of the target Ethernet module designated with the PING command.

6.5 Operation of Demonstration Machine

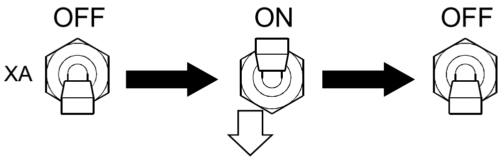
Operate the demonstration machine to confirm that data is sent from the PLC CPU A (sending side) to the PLC CPU B (receiving side) via Ethernet.

1) Write the parameters and programs to the PLC CPU A and the PLC CPU B referring to Section 5.2.4.

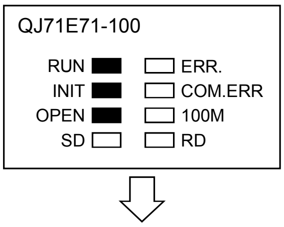
2) Put both the PLC CPU A (sending side) and the PLC CPU B (receiving side) into the RUN status.

3) Turn "XA" on the I/O panel of the PLC CPU A from OFF to ON and to OFF again, then open the connection.

   As the PLC CPU B has been set to the following in the operation settings of parameters, it is in the wait for OPEN status (Unpassive open).
   Initial timing: Always wait for OPEN

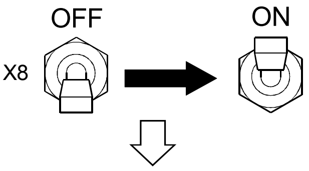


4) The connection of the Ethernet module is opened, and the "OPEN" LED is lit.

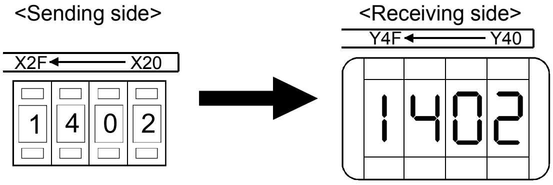


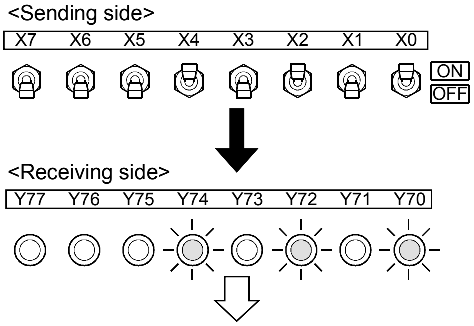
5) Turn X0 to X7 ON/OFF of the PLC CPU A.
   Also, input numerical values to the digital switch (X20 to X2F).

   Turn "X8" ON on the I/O panel of the PLC CPU A and perform the data sending.



6) Y70 to Y77 on the PLC CPU B are lit according to the status of X0 to X7 on the PLC CPU A.
   Also, the numerical values of the digital switch (X20 to X2F) on the PLC CPU A are displayed on the LED display (Y40 to Y4F) on the PLC CPU B.





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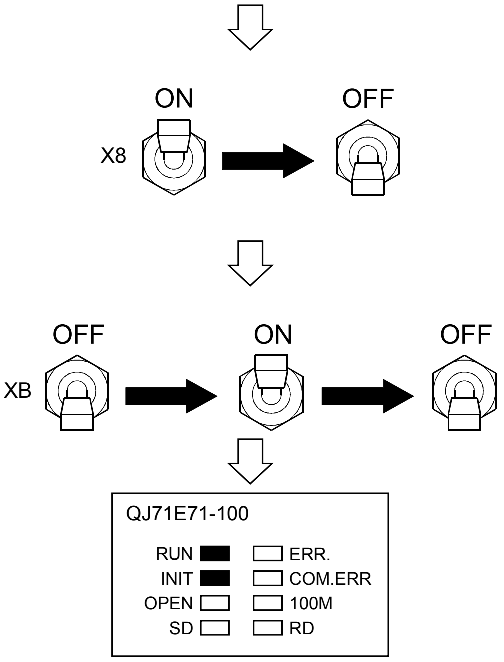


7) After the check on the I/O panel is completed, turn OFF "X8" of the PLC CPU A and complete the data sending.

When executing the data sending again, execute from Step 5).

8) Turn "XB" on the I/O panel of the PLC CPU A from OFF to ON and to OFF again, then close the connection.

9) After the connection is closed, the "OPEN" LED of each Ethernet module turns off.

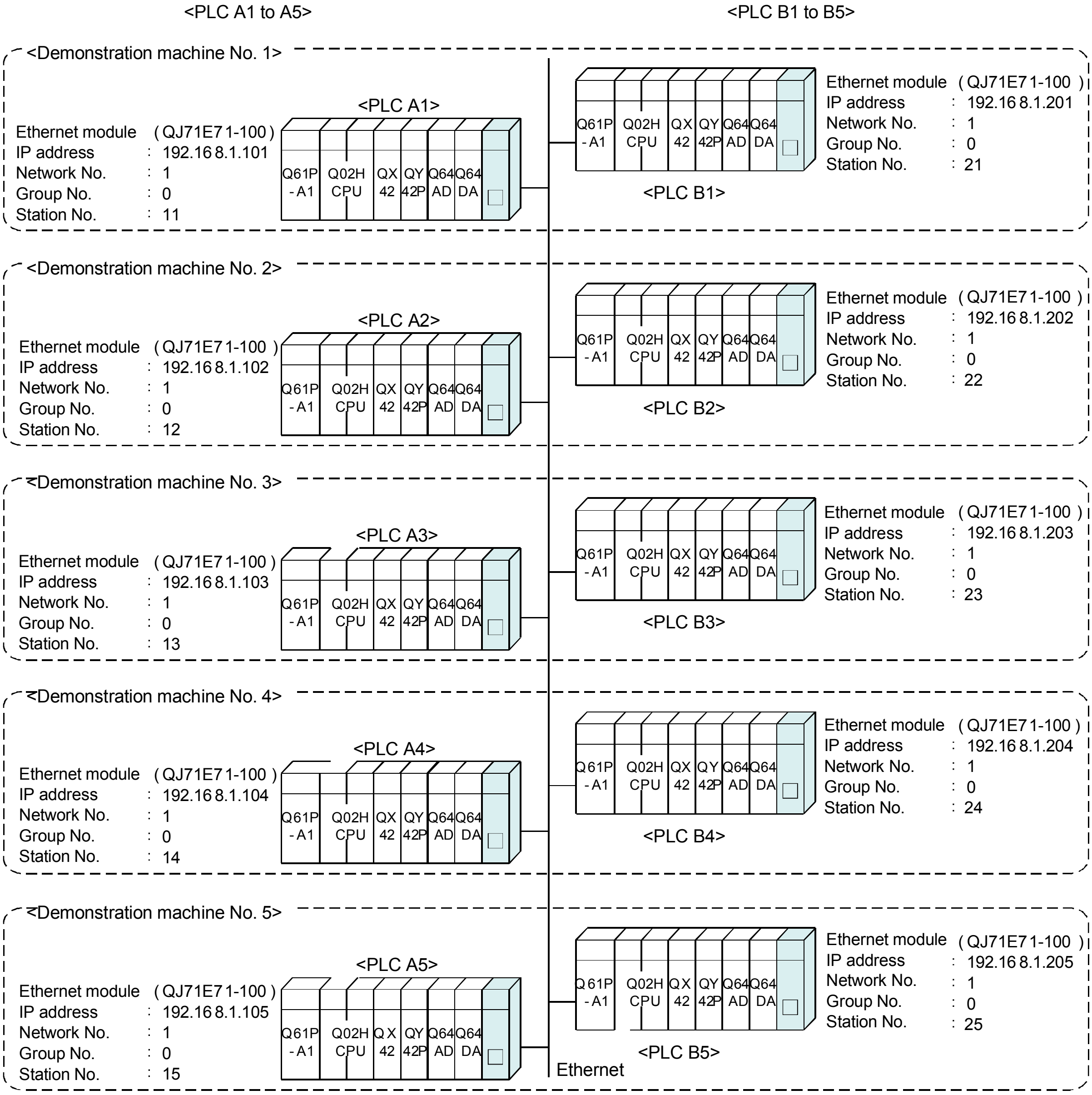
CHAPTER 7 ASSIGNMENT III (FIXED BUFFER COMMUNICATION BETWEEN PLC CPUS (NO PROCEDURE))

In this assignment, the exercise of fixed buffer communication (no procedure) functions is performed.
The PLC A side and B side respectively carry out the data sending and data receiving.

7.1 System Configuration of Exercise

The following shows the system configuration of the exercises in Assignment III.
In Assignment III, send and receive data in the TCP/IP communication, and monitor the device (X) of the PLC CPU on the sending side using the demonstration machine on the receiving side.
Although ten PLC CPUs are connected to the Ethernet, the communication is, in Assignment III, only made between the PLC CPUs which have the same demonstration machine No.

(1) Module configuration



<Demonstration machine No. 1>

<PLC A1>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.101
Network No. : 1
Group No. : 0
Station No. : 11

<PLC B1>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.201
Network No. : 1
Group No. : 0
Station No. : 21

<Demonstration machine No. 2>

<PLC A2>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.102
Network No. : 1
Group No. : 0
Station No. : 12

<PLC B2>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.202
Network No. : 1
Group No. : 0
Station No. : 22

<Demonstration machine No. 3>

<PLC A3>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.103
Network No. : 1
Group No. : 0
Station No. : 13

<PLC B3>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.203
Network No. : 1
Group No. : 0
Station No. : 23

<Demonstration machine No. 4>

<PLC A4>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.104
Network No. : 1
Group No. : 0
Station No. : 14

<PLC B4>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.204
Network No. : 1
Group No. : 0
Station No. : 24

<Demonstration machine No. 5>

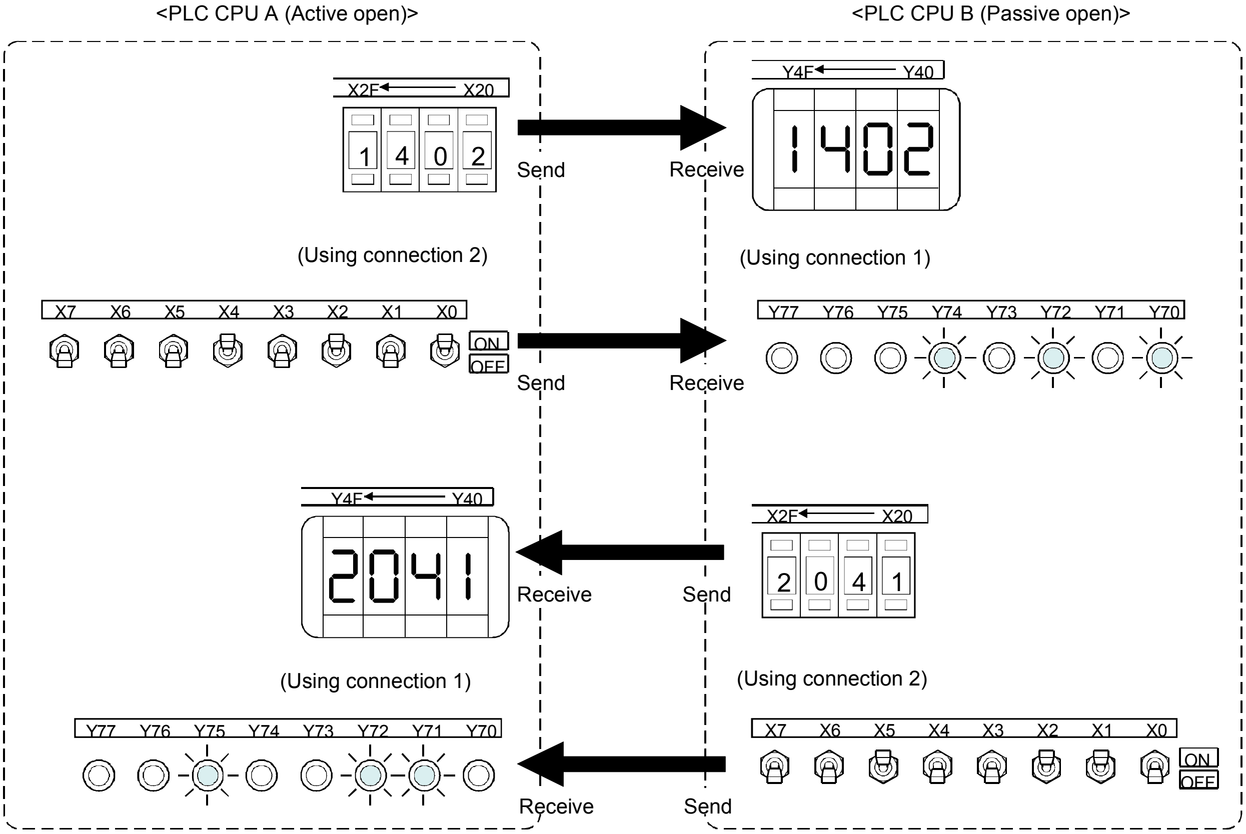
<PLC A5>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.105
Network No. : 1
Group No. : 0
Station No. : 15

<PLC B5>
Ethernet module (QJ71E71-100)
IP address : 192.168.1.205
Network No. : 1
Group No. : 0
Station No. : 25

(2) Exercise description

Display the information about X0 to X7 and about X20 to X2F of the PLC CPU A on Y70 to 77 and Y40 to Y4F of the PLC CPU B.

Then, display the information about X0 to X7 and about X20 to X2F of the PLC CPU B on Y0 to Y77 and Y40 to Y4F of the PLC CPU A.



7.2 Ethernet Module Settings (PLC A1 to A5)

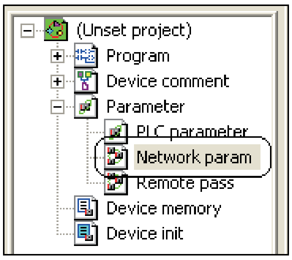
The Ethernet module settings on PLC A1 to A5 side are performed.

7.2.1 Setting parameters with GX Developer

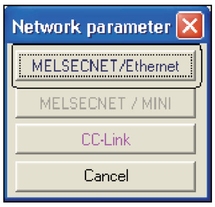
The Ethernet module parameters are set using the GX Developer.
The setting details should be the same as those of Section 7.1.

(1) Starting GX Developer and setting multiple CPU
Make the same multiple CPU settings as those of Section 5.2.1.

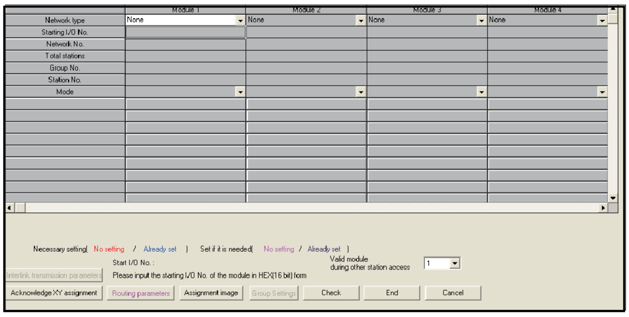
(2) Network parameters Setting the number of MNET/10H Ethernet cards



1) Double-click "Network parameter" from the project data list.



2) As the network parameter selection dialog box is displayed, click the [MELSECNET/Ethernet] button.



	Module 1	Module 2	Module 3	Module 4
Network type	None	None	None	None
Starting I/O No.				
Network No.				
Total stations				
Group No.				
Station No.				
Mode				

Necessary setting(No setting / Already set) Set if it is needed(No setting / Already set)

Start I/O No. :

Please input the starting I/O No. of the module in HEX(16 bit) form

Valid module during other station access: 1

3) The "Network parameters Setting the number of MNET/10H Ethernet cards" screen is displayed.

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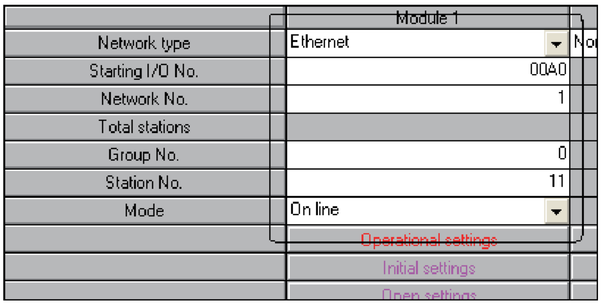
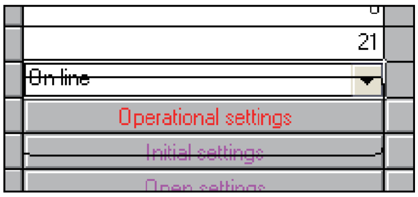


	Module 1	No
Network type	Ethernet	
Starting I/O No.	00A0	
Network No.	1	
Total stations		
Group No.	0	
Station No.	11	
Mode	On line	

4) Set the following contents of the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.

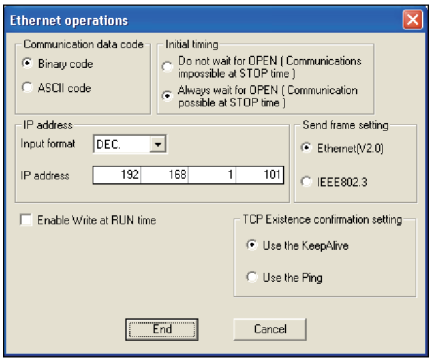
Network type	: Ethernet
Starting I/O No.	: 00A0
Network No.	: 1
Group No.	: 0
Station No.	: Set the station No. for each demonstration machine (11 to 15)
Mode	: Online



21

On line

5) Click the Operational settings button to display the Ethernet operations dialog box.



Ethernet operations

Communication data code
● Binary code
○ ASCII code

Initial timing
○ Do not wait for OPEN (Communications impossible at STOP time)
● Always wait for OPEN (Communication possible at STOP time)

IP address
Input format DEC.
IP address 192 168 1 101

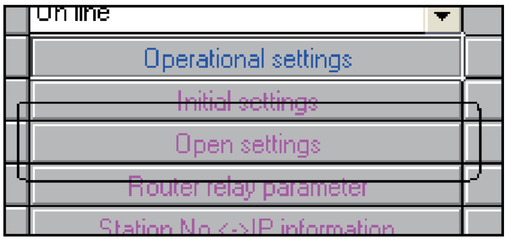
Send frame setting
● Ethernet(V2.0)
○ IEEE802.3

□ Enable Write at RUN time

TCP Existence confirmation setting
● Use the KeepAlive
○ Use the Ping

6) Set the following contents, click the End button, and then close the Ethernet operations dialog box.

Communication data code	: Option (Communicates using binary code regardless of the setting.)
Initial timing	: Always wait for OPEN
IP address	: Set the IP address of each demonstration machine (192.168.1.101 to 192.168.1.105)
Send frame setting	: Ethernet(V2.0)



On line

7) Click the Open settings button to display the network parameter Ethernet open settings screen.

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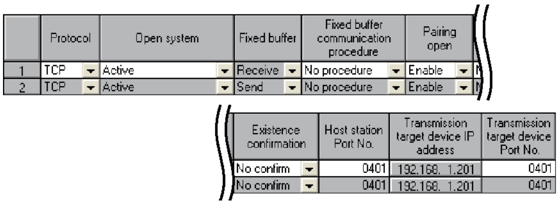
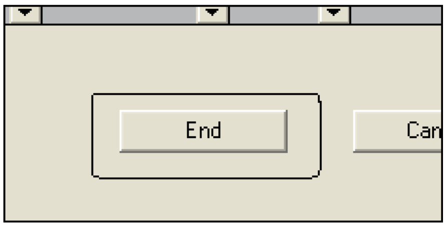


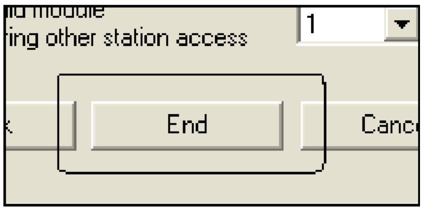
	Protocol	Open system	Fixed buffer	Fixed buffer communication procedure	Pairing open
1	TCP	Active	Receive	No procedure	Enable
2	TCP	Active	Send	No procedure	Enable

Existence confirmation	Host station Port No.	Transmission target device IP address	Transmission target device Port No.
No confirm	0401	192.168. 1.201	0401
No confirm	0401	192.168. 1.201	0401

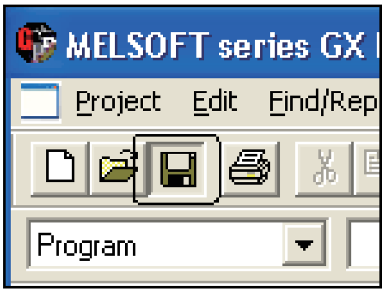
8) Set the following contents.
   Protocol : TCP
   Open system : Active
   Fixed buffer communication procedure :
   No procedure
   Pairing open : Enable
   Existence confirmation : No confirm
   Host station Port No. : 0401
   Transmission target device IP address :
   Set the IP address of each demonstration machine (192.168.1.201 to 192.168.1.205)
   Transmission target device Port No. : 0401



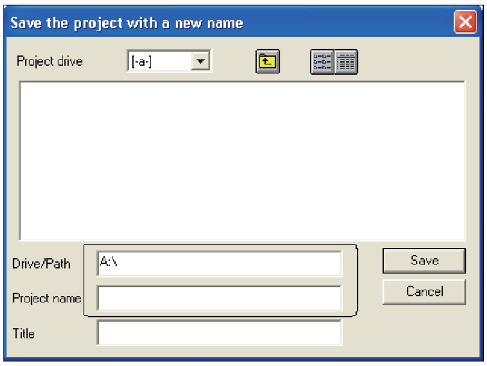
9) Click the End button to close the network parameter Ethernet open settings screen.



10) Click the End button to close the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.



11) Click the 💾 button.
   (Overwriting the project)



Save the project with a new name

Project drive [-a-]

Drive/Path A:\

Project name

Title

12) Set Drive/Path and Project name, then click the Save button.

   Drive/Path : A:\Q-E71
   Project name : EX3-A □
   □ indicates a demonstration machine No.
   Example.
   For demonstration machine No.1 EX3-A1

7.2.2 Sequence program

Create a sequence program.
Perform the open processing (Paring open specification) for connection 1 and connection 2 with the paring open specification set in the open setting of parameters to send and receive the data.
After sending and receiving the data, perform the close processing for connection 1 and 2.

POINT

(1) When communicating without procedures, note that the specification of data length is in byte units.
When communicating with procedures, it is in word units.

(2) After creating a sequence program, perform the following operations with the GX Developer.

1) Saving to FD
Drive/Path name: A:\Q-E71
Project name : EX3-A □ (□ indicates a demonstration machine No.)
Example: For the demonstration machine No.1, EX3-A1

2) Designating the connection destination (Refer to Section 5.2.3)

3) Writing to the PLC CPU (Refer to Section 5.2.4)

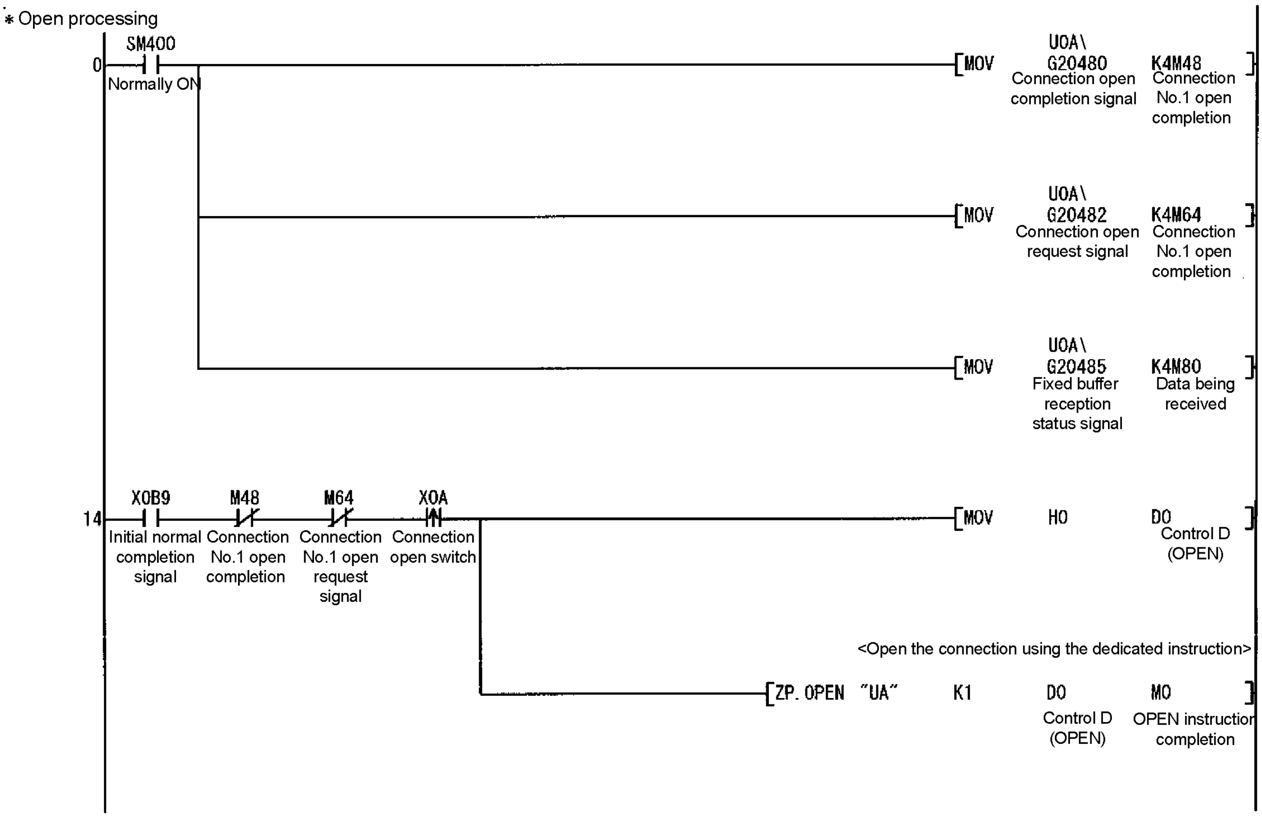
(1) List of devices to be used

Device name	Description	Device name	Description
SM400	Normally ON	X20 to X2F	Data to be sent to the PLC CPU B
M0	Turns ON for only 1 scan after the open processing for the connection No.1 is completed.	X0B9 (X(n+1)9)	Turns ON when the initial processing of the Ethernet module is completed normally.
M1	Turns ON for only 1 scan when the open processing for the connection No.1 is completed abnormally.	X0BC (X(n+1)C)	Turns ON when COM.ERR LED turns on.
M10	Turns ON for only 1 scan after the close processing for the connection No.1 is completed.	Y40 to Y4F	Stores the information of X20 to X2F sent from the PLC CPU B.
M11	Turns ON for only 1 scan when the close processing for the connection No.1 is completed abnormally.	Y70 to Y77	Stores the information of X0 to X7 sent from the PLC CPU B.
M20	Turns ON for only 1 scan after the data sending is completed.	Y78	Turns ON when the data receiving is completed normally.
M21	Turns ON for only 1 scan when the data sending is completed abnormally.	Y79	Turns ON when the data receiving is completed abnormally.
M22	Turns on at the data sending. Turns OFF at the completion of the data sending.	Y7A	Turns ON when the data sending is completed normally.
M30	Turns ON for only 1 scan after the data receiving is completed.	Y7B	Turns ON when the data sending is completed abnormally.
M31	Turns ON for only 1 scan when the data receiving is completed abnormally.	Y0B7 (Y(n+1)7)	COM. ERR LED off request
M48	Turns ON when the connection No. 1 is in the open status.	D0 to D9	Stores the control data of the OPEN instruction.
M49	Turns ON when the connection No.2 is in the open status.	D10 to D11	Stores the control data of the CLOSE instruction.
M64	Turns ON when the open request for the connection No. 1 is being performed or while the connection No. 1 is opened.	D20 to D21	Stores the control data of the BUFSND instruction.
M65	Turns ON when the open request for the connection No. 2 is being performed or while the connection No. 2 is opened.	D22	Stores the send data length.
M80	Turns ON while the connection No.1 of the Ethernet module is receiving data.	D23	Stores the send data (X0 to X7).
X0 to X7	Data to be sent to the PLC CPU B	D24	Stores the send data (X20 to X2F).
X8	Switch to command sending data	D30 to D31	Stores the control data of the BUFRCV instruction.
X9	Switch to command clearing the error display on the display LED	D32	Stores the receive data length.
X0A	Switch to command opening the connection	D33	Stores the receive data (X0 to X7).
X0B	Switch to command closing the connection	D34	Stores the receive data (X20 to X2F)

(2) Sequence program

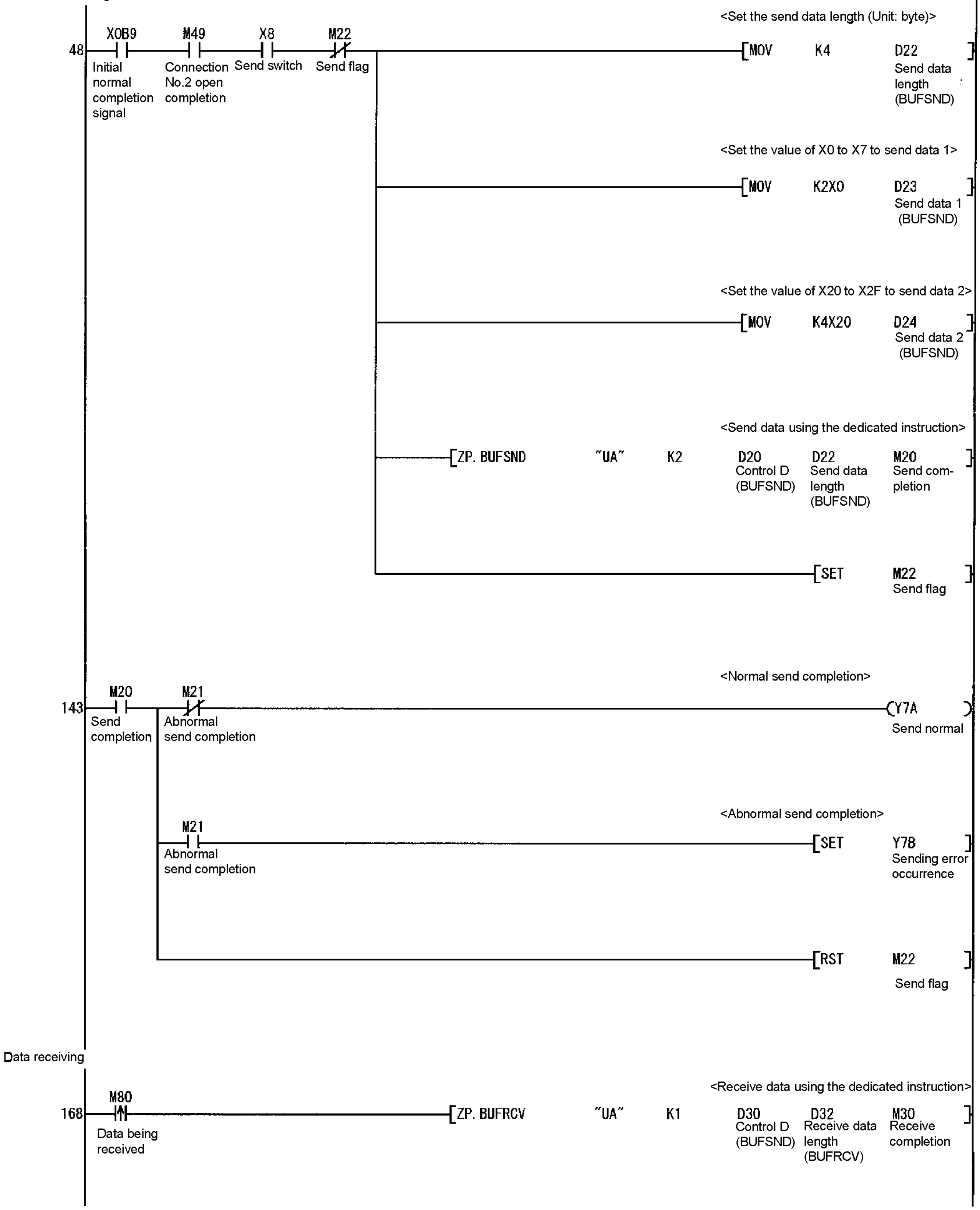
For details on dedicated instructions, refer to Chapter 10 of Q Corresponding Ethernet Interface Module User's Manual (Basic).

Drive/Path	A:\Q-E71
Project name	EX3-A □



* Open processing
0
SM400
Normally ON
MOV U0A\G20480 K4M48
Connection open completion signal
Connection No.1 open completion
MOV U0A\G20482 K4M64
Connection open request signal
Connection No.1 open completion
MOV U0A\G20485 K4M80
Fixed buffer reception status signal
Data being received
14
X0B9
Initial normal completion signal
M48
Connection No.1 open completion
M64
Connection No.1 open request signal
X0A
Connection open switch
MOV H0 D0
Control D (OPEN)
<Open the connection using the dedicated instruction>
ZP.OPEN "UA" K1 D0 M0
Control D (OPEN)
OPEN instruction completion

Data sending


<Set the send data length (Unit: byte)>

<Set the value of X0 to X7 to send data 1>

<Set the value of X20 to X2F to send data 2>

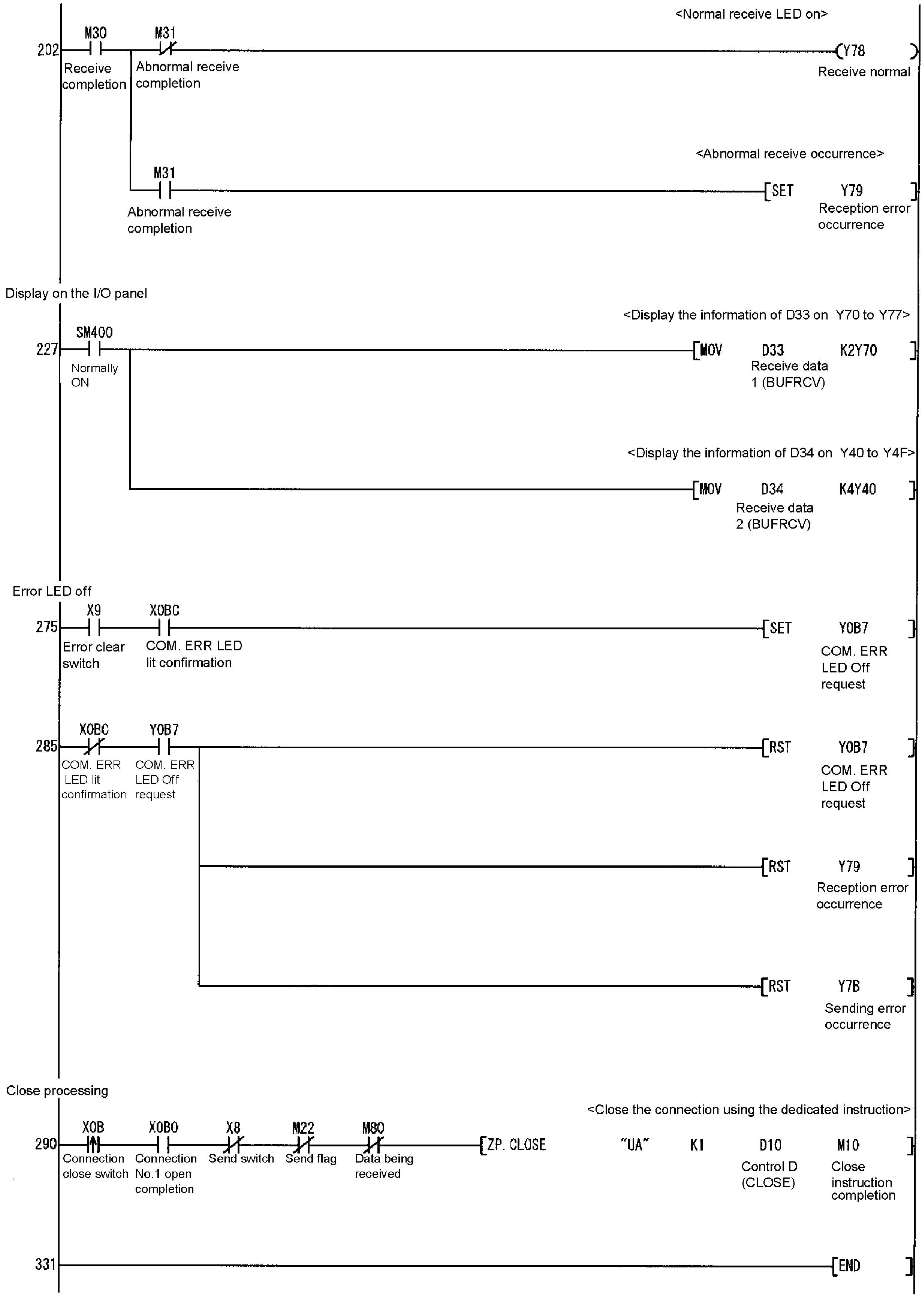
<Send data using the dedicated instruction>

<Normal send completion>

<Abnormal send completion>

Data receiving

<Receive data using the dedicated instruction>


<Normal receive LED on>
202
M30
M31
Y78
Receive completion
Abnormal receive completion
Receive normal
<Abnormal receive occurrence>
M31
SET Y79
Abnormal receive completion
Reception error occurrence
Display on the I/O panel
<Display the information of D33 on Y70 to Y77>
227
SM400
MOV D33 K2Y70
Normally ON
Receive data 1 (BUFRCV)
<Display the information of D34 on Y40 to Y4F>
MOV D34 K4Y40
Receive data 2 (BUFRCV)
Error LED off
275
X9
X0BC
SET Y0B7
Error clear switch
COM. ERR LED lit confirmation
COM. ERR LED Off request
285
X0BC
Y0B7
RST Y0B7
COM. ERR LED lit confirmation
COM. ERR LED Off request
COM. ERR LED Off request
RST Y79
Reception error occurrence
RST Y7B
Sending error occurrence
Close processing
<Close the connection using the dedicated instruction>
290
X0B
X0B0
X8
M22
M80
ZP. CLOSE "UA" K1 D10 M10
Connection close switch
Connection No.1 open completion
Send switch
Send flag
Data being received
Control D (CLOSE)
Close instruction completion
331
END

7.3 Ethernet Module Settings (PLC B1 to B5)

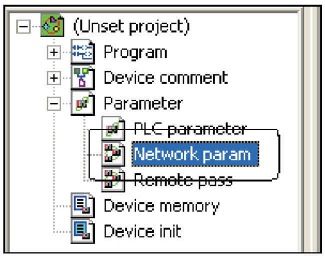
The Ethernet module settings on the PLC B1 to B5 side are performed.

7.3.1 Setting parameters with GX Developer

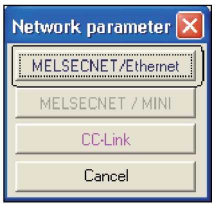
The Ethernet module parameters are set using the GX Developer.
The setting details should be the same as those of Section 7.1.

(1) Starting GX Developer and setting multiple CPU
Make the same multiple CPU settings as those of Section 5.2.1.

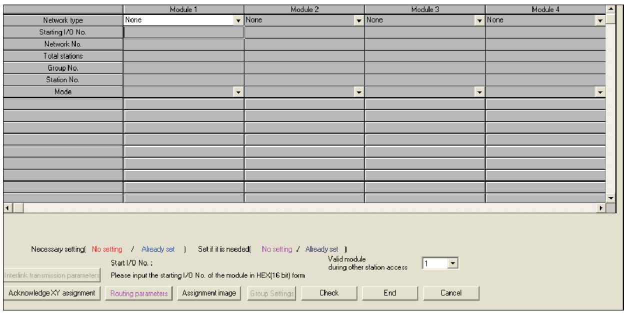
(2) Network parameters Setting the number of MNET/10H Ethernet cards



1) Double-click "Network parameter" from the project data list.



2) As the network parameter selection dialog box is displayed, click the MELSECNET/Ethernet button.



	Module 1	Module 2	Module 3	Module 4
Network type	None	None	None	None
Starting I/O No.				
Network No.				
Total stations				
Group No.				
Station No.				
Mode				

Necessary setting(No setting / Already set) Set if it is needed(No setting / Already set)
Start I/O No. :
Please input the starting I/O No. of the module in HEX(16 bit) form
Valid module during other station access 1

3) The "Network parameters Setting the number of MNET/10H Ethernet cards" screen is displayed.

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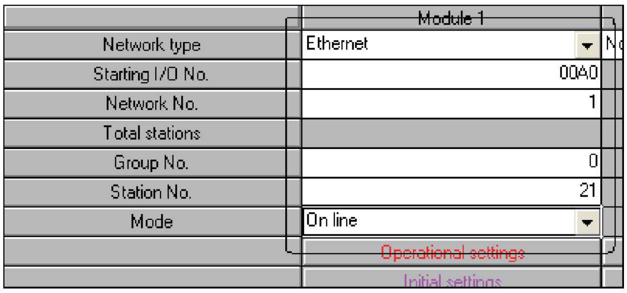
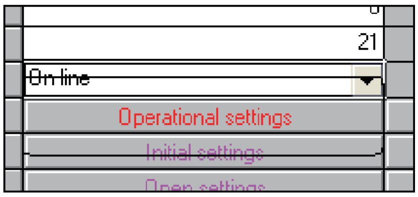


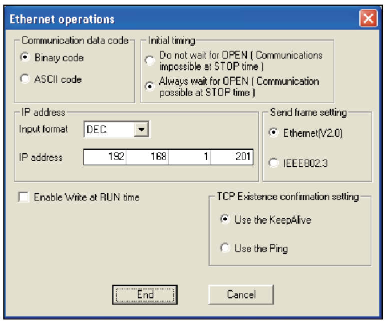
	Module 1
Network type	Ethernet
Starting I/O No.	00A0
Network No.	1
Total stations	
Group No.	0
Station No.	21
Mode	On line

4) Set the following contents of the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.

Network type	: Ethernet
Starting I/O No.	: 00A0
Network No.	: 1
Group No.	: 0
Station No.	: Set the station No. for each demonstration machine (21 to 25)
Mode	: Online



5) Click the Operational settings button to display the Ethernet operations dialog box.



Ethernet operations

Communication data code
● Binary code
○ ASCII code

Initial timing
○ Do not wait for OPEN (Communications impossible at STOP time)
● Always wait for OPEN (Communication possible at STOP time)

IP address
Input format: DEC.
IP address: 192 168 1 201

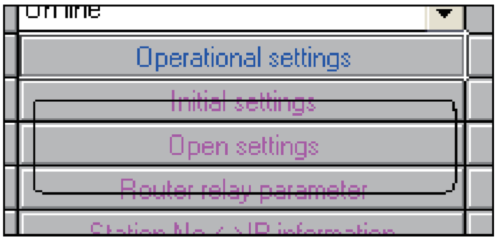
Send frame setting
● Ethernet(V2.0)
○ IEEE802.3

□ Enable Write at RUN time

TCP Existence confirmation setting
● Use the KeepAlive
○ Use the Ping

6) Set the following contents, click the End button, and then close the Ethernet operations dialog box.

Communication data code	: Option (Communicates using binary code regardless of the setting.)
Initial timing	: Always wait for OPEN
IP address	: Set the IP address of each demonstration machine (192.168.1.201 to 192.168.1.205)
Send frame setting	: Ethernet(V2.0)



7) Click the Open settings button to open the network parameter Ethernet open settings screen.

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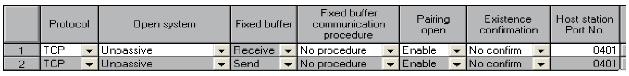
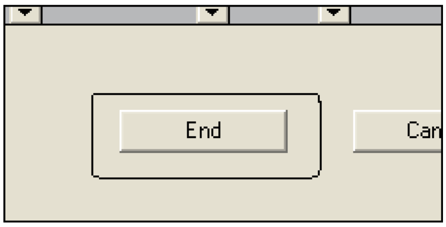
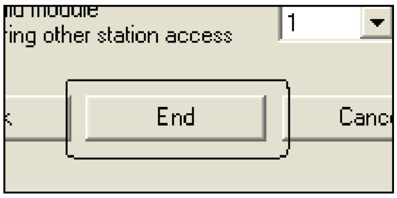


	Protocol	Open system	Fixed buffer	Fixed buffer communication procedure	Pairing open	Existence confirmation	Host station Port No.
1	TCP	Unpassive	Receive	No procedure	Enable	No confirm	0401
2	TCP	Unpassive	Send	No procedure	Enable	No confirm	0401

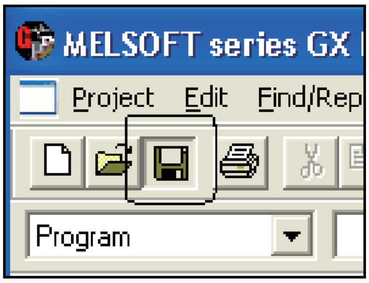
8) Set the following contents.
Protocol : TCP
Open system : Unpassive
Fixed buffer communication procedure
: No procedure
Pairing open : Enable
Existence confirmation : No confirm
Host station Port No. : 0401



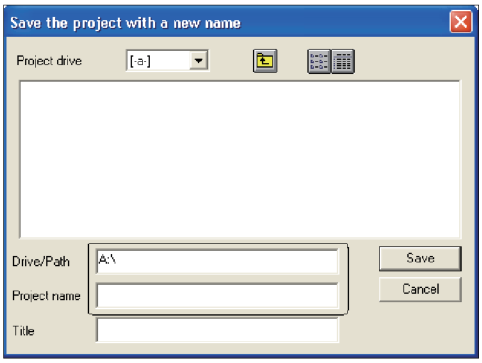
9) Click the End button to close the network parameter Ethernet open settings screen.



10) Click the End button to close the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.



11) Click the 💾 button.
(Overwriting the project)



Project drive [-a-]
Drive/Path A:\
Project name
Title

12) Set Drive/Path and Project name, then click the Save button.

Drive/Path : A:\Q-E71
Project name : EX3-B □
□ indicates a demonstration machine No.
Example. For demonstration machine No.1
EX3-B1

7.3.2 Sequence program

Create a sequence program.
Establish a connection with Active open of the PLC CPUs on the A1 to A5 side, and then send and receive data.

POINT

(1) When communicating without procedures, note that the specification of data length is in byte units.
When communicating with procedures, it is in word units.

(2) After creating a sequence program, perform the following operations with the GX Developer.
1) Saving to FD
Drive/Path name: A:\Q-E71
Project name: EX3- B □ (□ indicates demonstration machine No.)
Example: For the demonstration machine No.1, EX3-B1
2) Designating the connection destination (Refer to Section 5.2.3)
3) Writing to the PLC CPU (Refer to Section 5.2.4)

(1) List of devices to be used

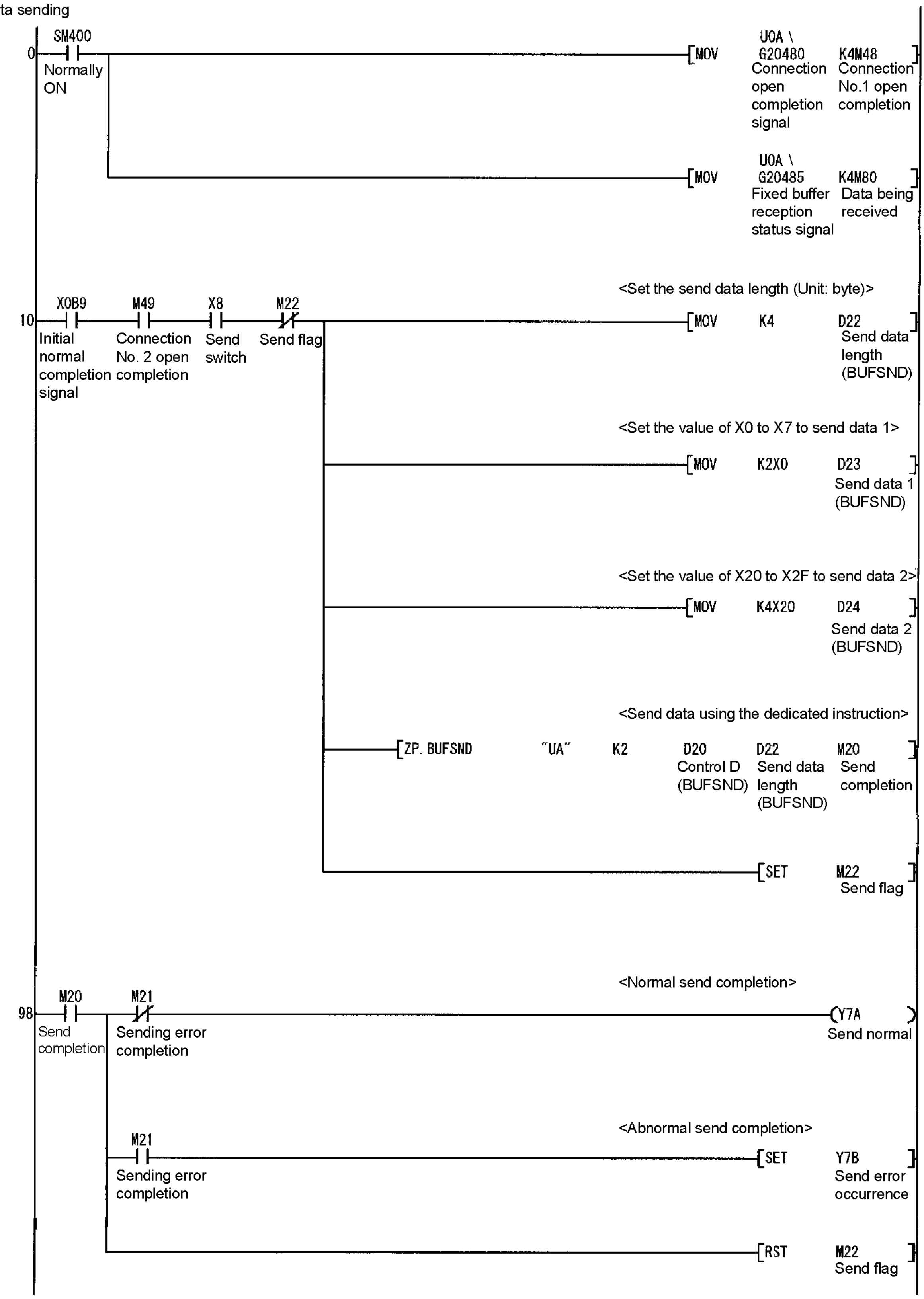
Device name	Description	Device name	Description
SM400	Normally ON	Y40 to Y4F	Stores the information of X20 to X2F sent from the PLC CPU A.
M20	Turns ON for only 1 scan after the data sending is completed.	Y70 to Y77	Stores the information of X0 to X7 sent from the PLC CPU A.
M21	Turns ON for only 1 scan when the data sending is completed abnormally.	Y78	Turns ON when the data receiving is completed normally.
M22	Turns ON at the data sending. Turns OFF at the completion of data sending.	Y79	Turns ON when the data receiving is completed abnormally.
M30	Turns ON for only 1 scan after the data receiving is completed.	Y7A	Turns ON when the data sending is completed normally.
M31	Turns ON for only 1 scan when the data receiving is completed abnormally.	Y7B	Turns ON when the data sending is completed abnormally.
M48	Turns ON when the connection No. 1 is in the open status.	Y0B7	COM. ERR LED off request
M80	Turns ON while the connection No.1 of the Ethernet module is receiving data.	D20 to D21	Stores the control data of the BUFSND instruction.
X0 to X7	Data to be sent to the PLC CPU A	D22	Stores the send data length.
X8	Switch to command sending data	D23	Stores the send data (X0 to X7).
X9	Switch to command clearing the error display on the display LED	D24	Stores the send data (X20 to X2F).
X20 to X2F	Data to be sent to the PLC CPU A	D30 to D31	Stores the control data of the BUFRCV instruction.
X0B0 (X(n+1)0)	Turns ON when the connection NO.1 is completely open.	D32	Stores the receive data length.
X0B9 (X(n+1)9)	Turns ON when the initial processing of the Ethernet module is completed normally.	D33	Stores the receive data (X0 to X7).
X0BC (X(n+1)C)	Turns ON when COM.ERR LED is on.	D34	Stores the receive data (X20 to X2F)

(2) Sequence program

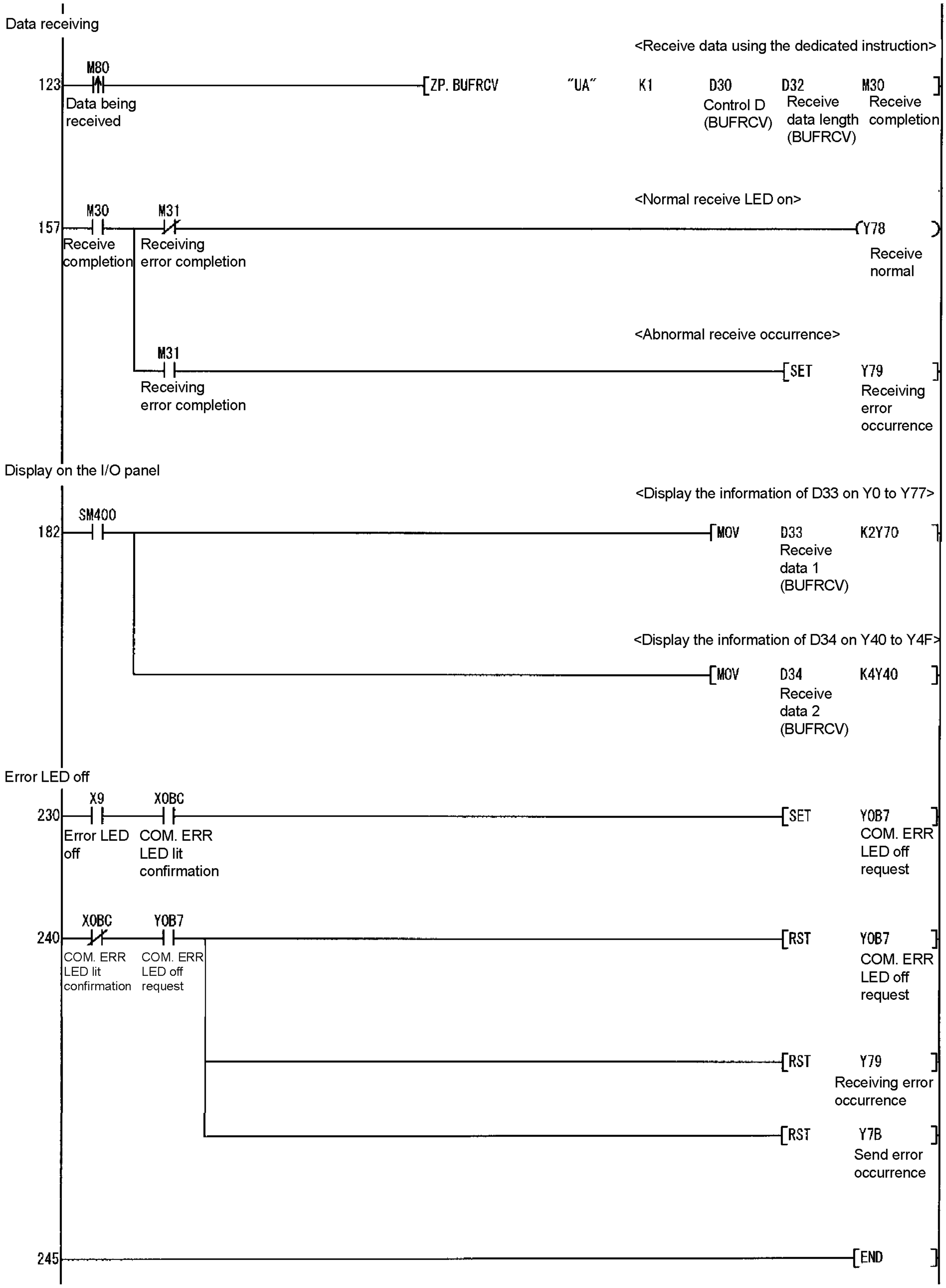
For details on dedicated instructions, refer to Chapter 10 of Q Corresponding Ethernet Interface Module User's Manual (Basic).

Drive/Path	A:\Q-E71
Project name	EX3-B

*Data sending



0
SM400
Normally ON
MOV U0A\G20480 K4M48
Connection open completion signal
Connection No.1 open completion
MOV U0A\G20485 K4M80
Fixed buffer reception status signal
Data being received
10
X0B9
Initial normal completion signal
M49
Connection No. 2 open completion
X8
Send switch
M22
Send flag
<Set the send data length (Unit: byte)>
MOV K4 D22
Send data length (BUFSND)
<Set the value of X0 to X7 to send data 1>
MOV K2X0 D23
Send data 1 (BUFSND)
<Set the value of X20 to X2F to send data 2>
MOV K4X20 D24
Send data 2 (BUFSND)
<Send data using the dedicated instruction>
ZP. BUFSND "UA" K2 D20 D22 M20
Control D (BUFSND)
Send data length (BUFSND)
Send completion
SET M22
Send flag
98
M20
Send completion
M21
Sending error completion
<Normal send completion>
Y7A
Send normal
<Abnormal send completion>
M21
Sending error completion
SET Y7B
Send error occurrence
RST M22
Send flag

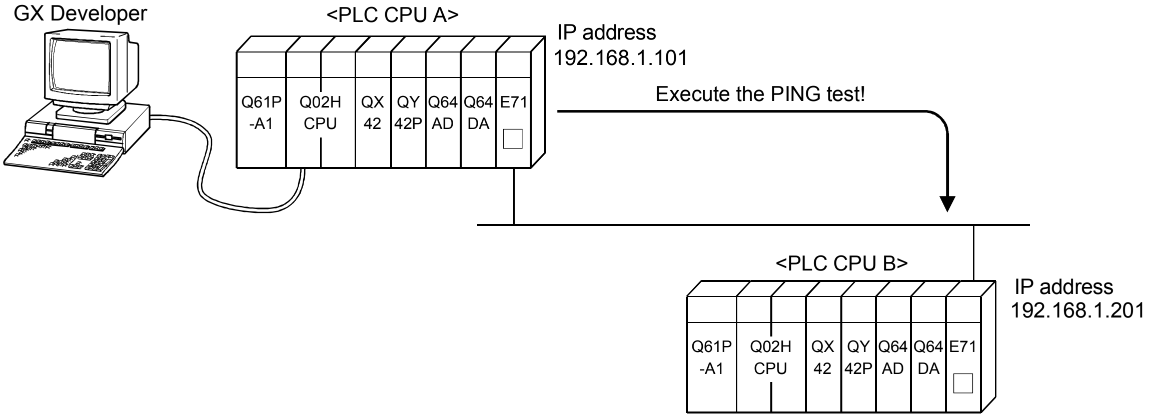

Data receiving
<Receive data using the dedicated instruction>
123
M80
Data being received
ZP.BUFRCV
"UA"
K1
D30
Control D (BUFRCV)
D32
Receive data length (BUFRCV)
M30
Receive completion
<Normal receive LED on>
157
M30
Receive completion
M31
Receiving error completion
Y78
Receive normal
<Abnormal receive occurrence>
M31
Receiving error completion
SET
Y79
Receiving error occurrence
Display on the I/O panel
<Display the information of D33 on Y0 to Y77>
182
SM400
MOV
D33
Receive data 1 (BUFRCV)
K2Y70
<Display the information of D34 on Y40 to Y4F>
MOV
D34
Receive data 2 (BUFRCV)
K4Y40
Error LED off
230
X9
Error LED off
X0BC
COM. ERR LED lit confirmation
SET
Y0B7
COM. ERR LED off request
240
X0BC
COM. ERR LED lit confirmation
Y0B7
COM. ERR LED off request
RST
Y0B7
COM. ERR LED off request
RST
Y79
Receiving error occurrence
RST
Y7B
Send error occurrence
245
END

7.4 PING Test Using GX Developer (Via CPU)

Execute the PING test using the GX Developer.

The PING test is used to check that the initial processing of the local station's Ethernet module is normally completed and the external device on the same Ethernet is properly connected.

Before starting the PING test, turn on the powers of PLC A1 to A5 and PLC B1 to B5 and then put them into the STOP status.



For the operation procedures, refer to Section 6.4 since the procedures are same.

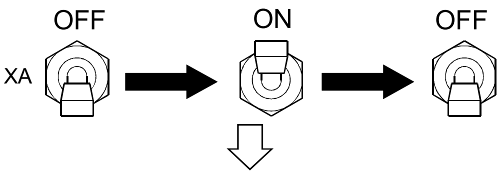
7.5 Operation of Demonstration Machine

By operating the demonstration machine, confirm that data is sent and received between the PLC A and the PLC B via Ethernet.

In the following, the PLC A1 to A5 side is called PLC A and the PLC B1 to B5 side PLC B.

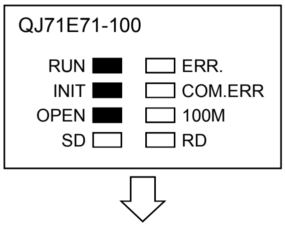
1) Write the parameters and the programs to the PLC A and the PLC B referring to Section 5.4.2.

2) Put both PLC A and PLC B into the RUN status.

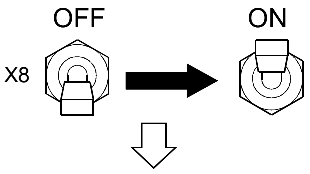


3) Turn "XA" on the I/O panel of the PLC CPU A from OFF to ON and to OFF again, then open the connection.

As the PLC CPU B has been set to the following in the operation settings of parameters, it is in the wait for OPEN status (Unpassive open).

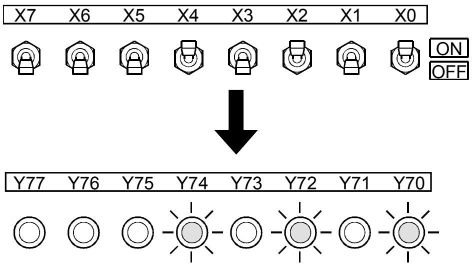


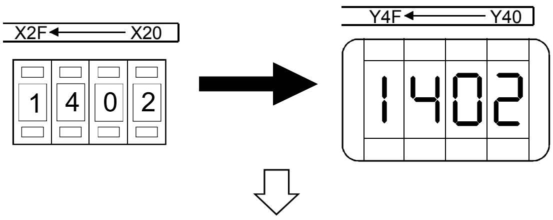
4) The connection of the Ethernet module is opened, and the "OPEN" LED is lit.



5) Turn ON and OFF X0 to X7 of the PLC CPU on the sending side.
Also, input numerical values to the digital switch (X20 to X2F).

Turn ON "X8" on the I/O panel of the PLC CPU on the sending side, and perform the data sending





6) Y70 to Y77 on the receiving side are lit according to the status of X0 to X7 on the sending side.
Also, the numerical values of the digital switch (X20 to X2F) on the sending side are displayed on the LED display (Y40 to Y4F) on the receiving side.

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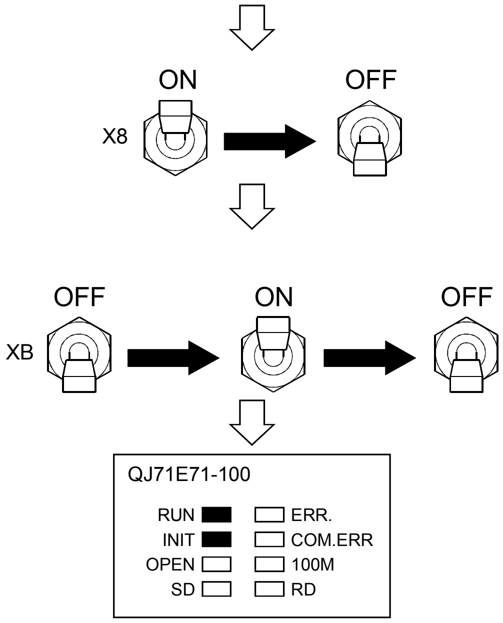


7) After checking the I/O panel is completed, turn OFF "X8" on the I/O panel on the sending side and complete the data sending.

When executing the data sending again, execute from Step 5).

8) Switch "XB" on the I/O panel of the PLC A from OFF to ON and to OFF again, then close the connection.

9) After the connection is closed, the "OPEN" LED of each Ethernet module turns off.

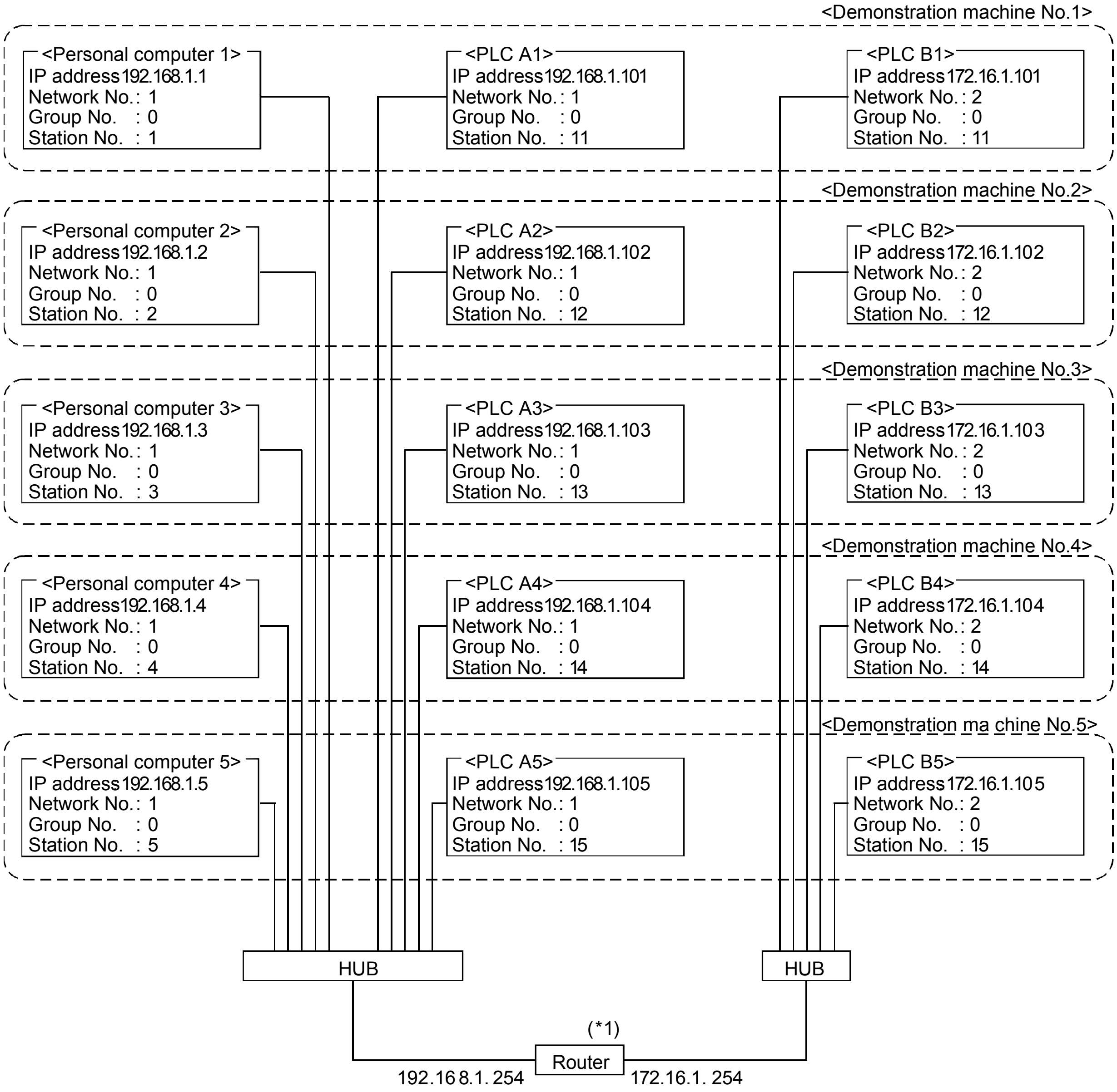
CHAPTER 8 ASSIGNMENT IV (FIXED BUFFER COMMUNICATION BETWEEN PLC CPUS VIA ROUTER (NO PROCEDURE))

In this assignment, data communication via router is performed.
For the data communication, the fixed buffer communication (no procedure) shown in Chapter 7 Assignment III is performed via router.

8.1 System Configuration of Exercise

The following shows the system configuration of the exercises in Assignment IV.
Although 10 PLC CPUs are connected to the Ethernet, make the communication between the PLC CPUs which have the same demonstration machine No. only in Assignment IV.

(1) Module configuration



*1 Make a router setting according to the manual of a router to be used.

(2) Exercise description
Refer to Section 7.1 (2), since the same exercise as Assignment III is performed.

8.2 Ethernet Module Settings (PLC A1 to A5)

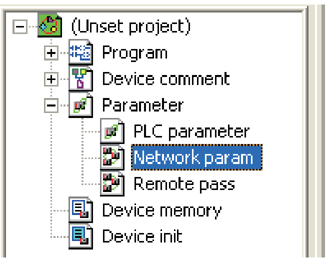
The Ethernet module settings on the PLC A1 to A5 side are performed.

8.2.1 Setting parameters with GX Developer

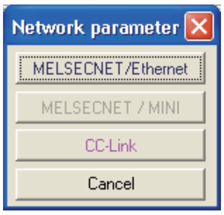
The Ethernet module parameters are set using the GX Developer.
The setting details should be the same as those of Section 8.1.

(1) Starting GX Developer and setting multiple CPU
Make the same multiple CPU settings as those of Section 5.2.1.

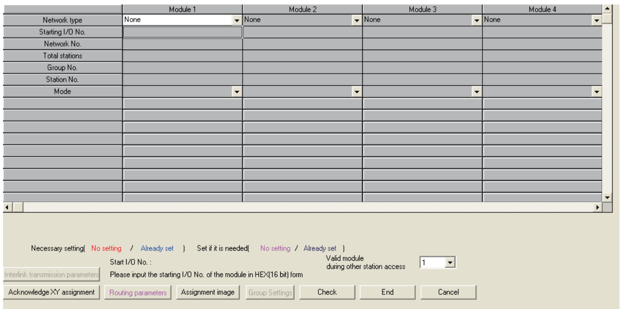
(2) Network parameters Setting the number of MNET/10H Ethernet cards



1) Double-click "Network parameter" from the project data list.



2) As the network parameter selection dialog box is displayed, click the MELSECNET/Ethernet button.



	Module 1	Module 2	Module 3	Module 4
Network type	None	None	None	None
Starting I/O No.				
Network No.				
Total stations				
Group No.				
Station No.				
Mode				

Necessary setting(No setting / Already set) Set if it is needed(No setting / Already set)

Start I/O No. :

Please input the starting I/O No. of the module in HEX(16 bit) form

Valid module during other station access 1

3) The "Network parameters Setting the number of MNET/10H Ethernet cards" screen is displayed.

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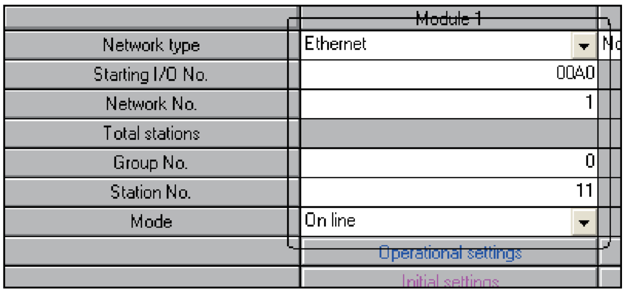
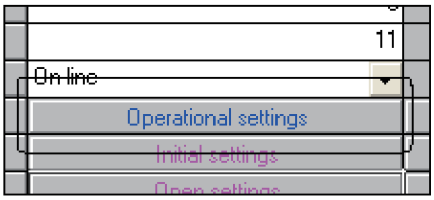


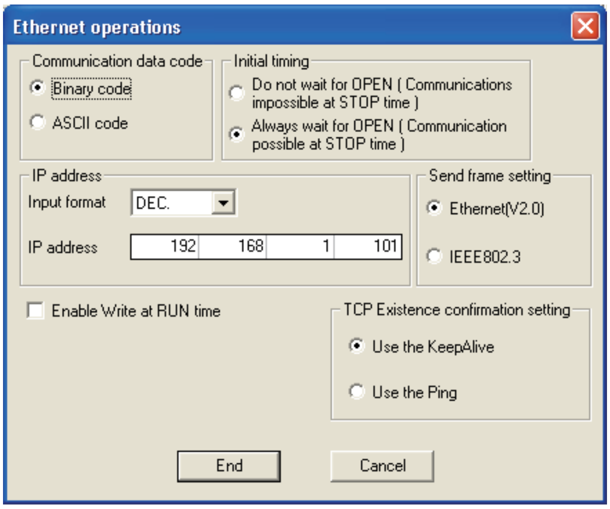
	Module 1
Network type	Ethernet
Starting I/O No.	00A0
Network No.	1
Total stations	
Group No.	0
Station No.	11
Mode	On line
	Operational settings
	Initial settings

4) Set the following contents of the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.

Network type : Ethernet
Starting I/O No. : 00A0
Network No. : 1
Group No. : 0
Station No. : Set the station No. of each demonstration machine (11 to 15)
Mode : Online



5) Click the Operational settings button to display the Ethernet operations dialog box.



Ethernet operations

Communication data code
● Binary code
○ ASCII code

Initial timing
○ Do not wait for OPEN (Communications impossible at STOP time)
● Always wait for OPEN (Communication possible at STOP time)

IP address
Input format DEC.
IP address 192 168 1 101

Send frame setting
● Ethernet(V2.0)
○ IEEE802.3

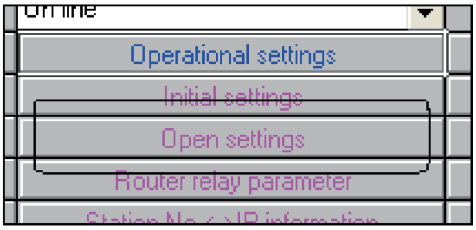
□ Enable Write at RUN time

TCP Existence confirmation setting
● Use the KeepAlive
○ Use the Ping

End Cancel

6) Set the following contents, click the End button, and then close the Ethernet operations dialog box.

Communication data code : Option (Communicates using binary code regardless of the setting.)
Initial timing : Always wait for OPEN
IP address : Set the IP address of each demonstration machine (192.168.1.101 to 192.168.1.105)
Send frame setting : Ethernet (V2.0)



7) Click the Open settings button to open the network parameter Ethernet open settings screen.

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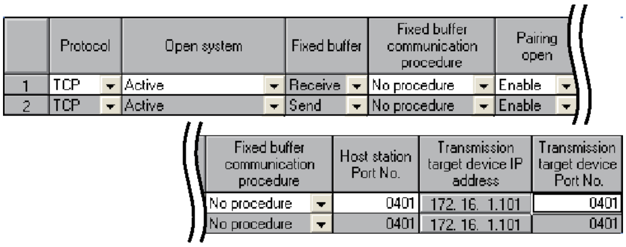
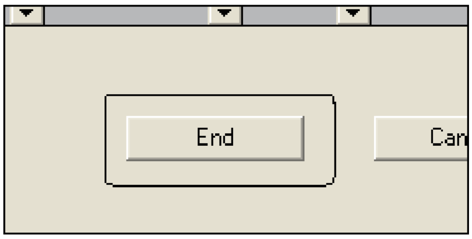
Continued from the previous page



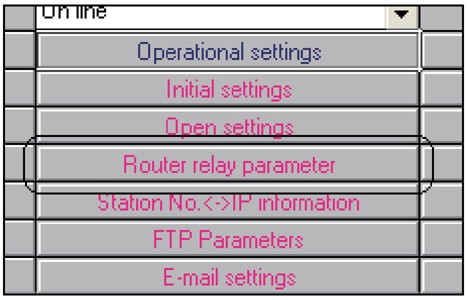
	Protocol	Open system	Fixed buffer	Fixed buffer communication procedure	Pairing open
1	TCP	Active	Receive	No procedure	Enable
2	TCP	Active	Send	No procedure	Enable

Fixed buffer communication procedure	Host station Port No.	Transmission target device IP address	Transmission target device Port No.
No procedure	0401	172. 16. 1.101	0401
No procedure	0401	172. 16. 1.101	0401

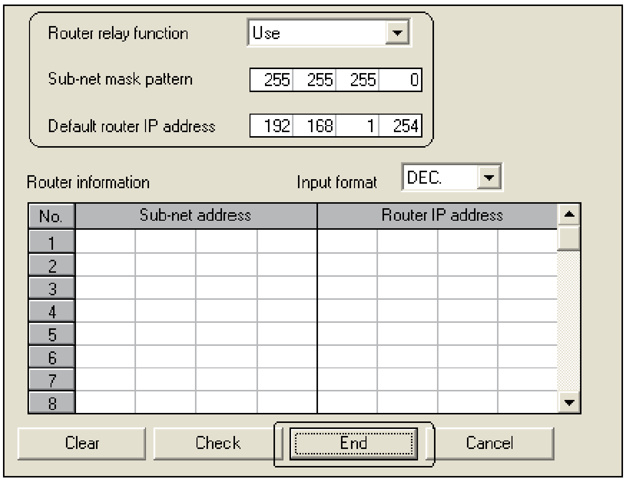
8) Set the following contents.
Protocol : TCP
Open system : Active
Fixed buffer communication procedure:
No procedure
Pairing open : Enable
Existence confirmation : No confirm
Host station Port No. : 0401
Transmission target device IP address:
Set the IP address of each demonstration machine (172.16.1.101 to 172.16.1.105)
Transmission target device Port No.:
0401



9) Click the End button to close the network parameter Ethernet open settings screen.



10) Click the Router relay parameter button to display the Ethernet routing information settings screen.



Router relay function: Use
Sub-net mask pattern: 255 255 255 0
Default router IP address: 192 168 1 254
Router information
Input format: DEC.

No.	Sub-net address	Router IP address
1		
2		
3		
4		
5		
6		
7		
8		

11) Set the following contents, click the End button, and then close the Ethernet routing information settings screen.

Router relay function : Use
Sub-net mask pattern : 255.255.255.0
(This textbook uses the default of class C.)
Default router IP address : 192.168.1.254

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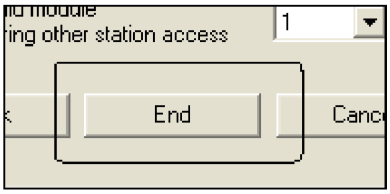
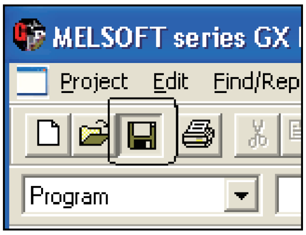
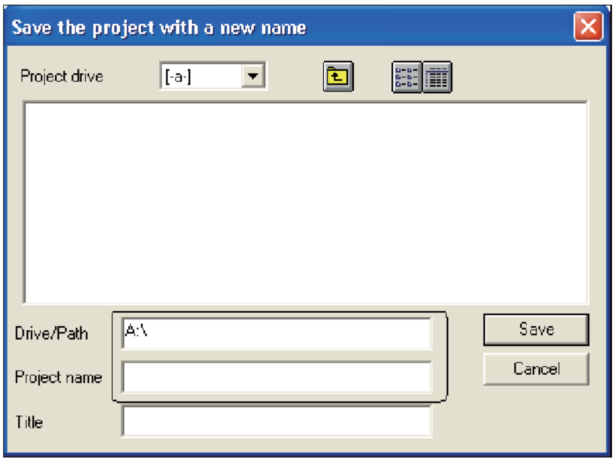


12) Click the End button to close the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.



13) Click the 💾 button.
(Overwriting the project)



Drive/Path: A:\

Project name:

14) Set Drive/Path and Project name, then click the Save button.

Drive/Path : A:\Q-E71
Project name : EX4-A□
□ indicates a demonstration machine No.
Example. For demonstration machine No.1 EX4-A1

8.2.2 Sequence program

Use the same sequence program as that of Section 7.2.2.

POINT

After creating a sequence program, perform the following operations with GX Developer.

1) Saving to FD
Drive/Path : A:\Q-E71
Project name : EX4-A□ (□ indicates a demonstration machine No.)
Example: For the demonstration machine No.1, EX4-A1

2) Designating the connection destination (Refer to Section 5.2.3)

3) Writing to the PLC CPU (Refer to Section 5.2.4)

8.3 Ethernet Module Settings (PLC B1 to B5)

The Ethernet module settings on the PLC B1 to B5 side are performed.

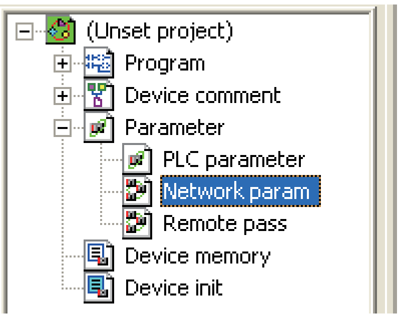
8.3.1 Setting parameters with GX Developer

The Ethernet module parameters are set using the GX Developer.
The setting details should be the same as those of Section 8.1.

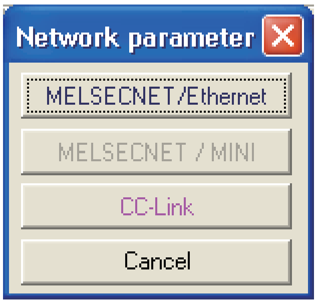
(1) Starting GX Developer and setting multiple CPU

Make the same multiple CPU settings as those of Section 5.2.1.

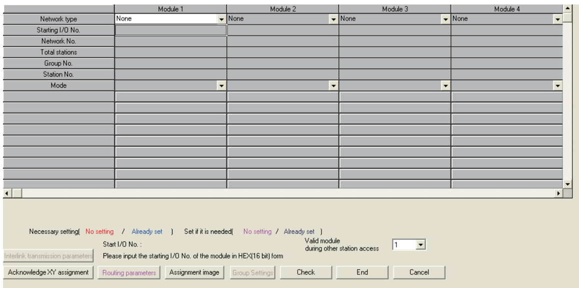
(2) Network parameters Setting the number of MNET/10H Ethernet cards



1) Double-click "Network parameter" from the project data list.



2) As the network parameter selection dialog box is displayed, click the MELSECNET/Ethernet button.



	Module 1	Module 2	Module 3	Module 4
Network type	None	None	None	None
Starting I/O No.				
Network No.				
Total stations				
Group No.				
Station No.				
Mode				

Necessary setting(No setting / Already set) Set if it is needed(No setting / Already set)

Start I/O No. :

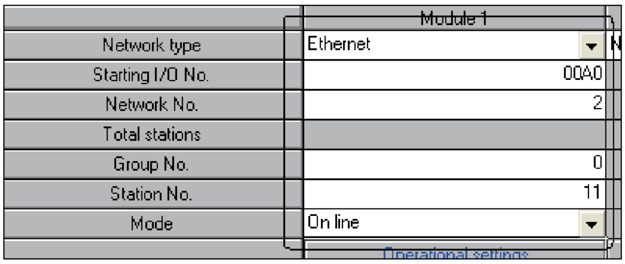
Please input the starting I/O No. of the module in HEX(16 bit) form

Valid module during other station access: 1

3) The "Network parameters Setting the number of MNET/10H Ethernet cards" screen is displayed.

Continued to the next page

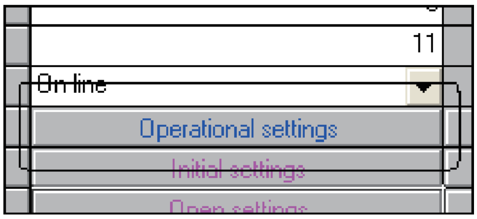
Continued from the previous page



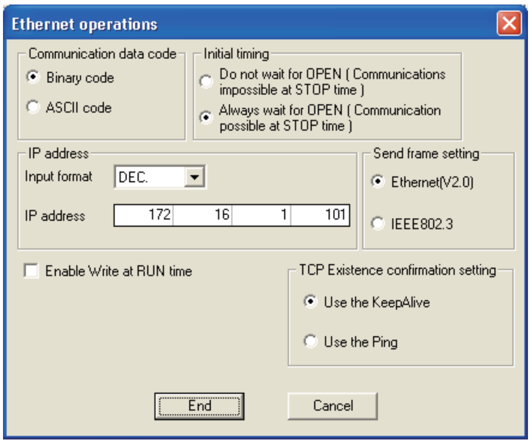
	Module 1
Network type	Ethernet
Starting I/O No.	00A0
Network No.	2
Total stations	
Group No.	0
Station No.	11
Mode	On line
	Operational settings

4) Set the following contents of the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.

Network type	: Ethernet
Starting I/O No.	: 00A0
Network No.	: 2
Group No.	: 0
Station No.	: Set the station No. for each demonstration machine (11 to 15)
Mode	: Online



5) Click the Operational settings button to display the Ethernet operations dialog box.



Ethernet operations

Communication data code
● Binary code
○ ASCII code

Initial timing
○ Do not wait for OPEN (Communications impossible at STOP time)
● Always wait for OPEN (Communication possible at STOP time)

IP address
Input format: DEC.
IP address: 172 16 1 101

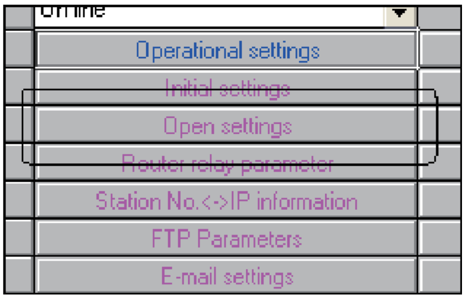
Send frame setting
● Ethernet(V2.0)
○ IEEE802.3

□ Enable Write at RUN time

TCP Existence confirmation setting
● Use the KeepAlive
○ Use the Ping

6) Set the following contents, click the End button, and then close the Ethernet operations dialog box.

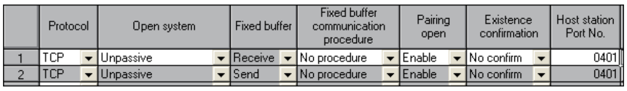
Communication data code	: Option (Communicates using binary code regardless of the setting.)
Initial timing	: Always wait for OPEN
IP address	: Set the IP address of each demonstration machine (172.16.1.101 to 172.16.1.105)
Send frame setting	: Ethernet (V2.0)



7) Click the Open settings button to open the network parameter Ethernet open settings screen.

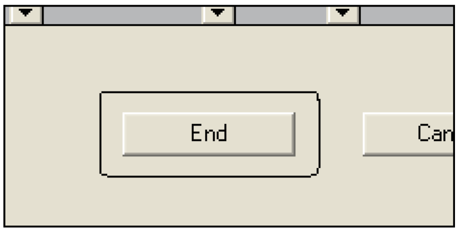
Continued to the next page

Continued from the previous page

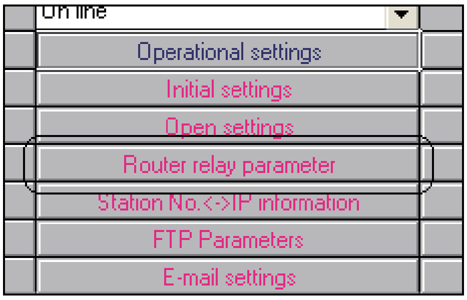


	Protocol	Open system	Fixed buffer	Fixed buffer communication procedure	Pairing open	Existence confirmation	Host station Port No.
1	TCP	Unpassive	Receive	No procedure	Enable	No confirm	0401
2	TCP	Unpassive	Send	No procedure	Enable	No confirm	0401

8) Set the following contents.
Protocol : TCP
Open system : Unpassive
Fixed buffer communication procedure:
No procedure
Pairing open : Enable
Existence confirmation : No confirm
Host station Port No. : 0401

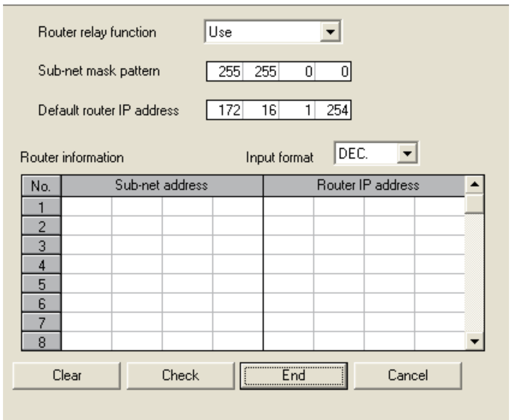


9) Click the End button to close the network parameter Ethernet open settings screen.



10) Click the Router relay parameter button to display the Ethernet routing information settings screen.

The setting of this routine relay parameter is for the PING test described in Section 8.4.
When performing only the data communication of this chapter, the setting for this routine relay parameter is not required.

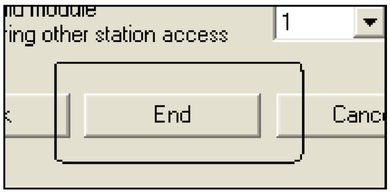


Router relay function: Use
Sub-net mask pattern: 255 255 0 0
Default router IP address: 172 16 1 254
Router information Input format: DEC.

No.	Sub-net address	Router IP address
1		
2		
3		
4		
5		
6		
7		
8		

11) Set the following contents, click the End button, and then close the Ethernet routing settings information screen.

Router relay function : Use
Sub-net mask pattern : 255.255.0.0
(This textbook uses the default of class B.)
Default router IP address : 172.16.1.254



12) Click the End button to close the "Network parameters Setting the number of MNET/10H Ethernet cards" screen.

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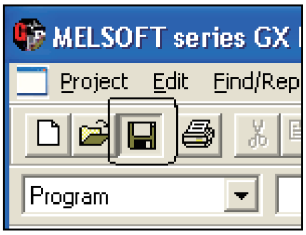
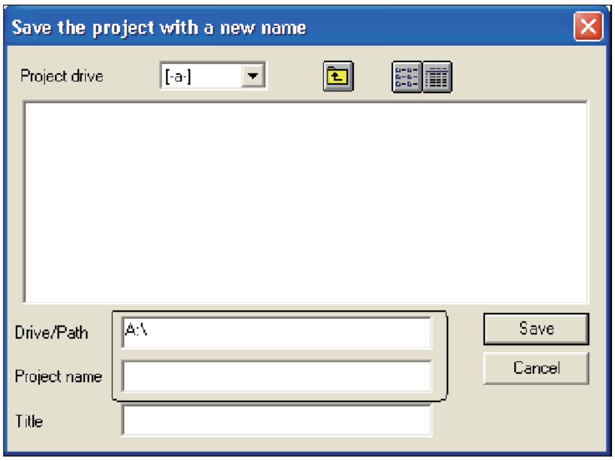


13) Click the 💾 button.

(Overwriting the project)


Save the project with a new name

Project drive [-a-]

Drive/Path A:\

Project name

Title

14) Set Drive/Path and Project name, then click the Save button.

Drive/Path : A:\Q-E71

Project name : EX4-B□

□ indicates a demonstration machine No.

Example. For demonstration machine No.1 EX4-B1

8.3.2 Sequence program

Use the same sequence program as that of Section 7,3,2

POINT

After creating a sequence program, perform the following operations with GX Developer.

1) Saving to FD

Drive/Path : A:\Q-E71

Project name : EX4-B□ (□ indicates a demonstration machine No.)

Example: For the demonstration machine No.1, EX4-B1

2) Designating the connection destination (Refer to Section 5.2.3)

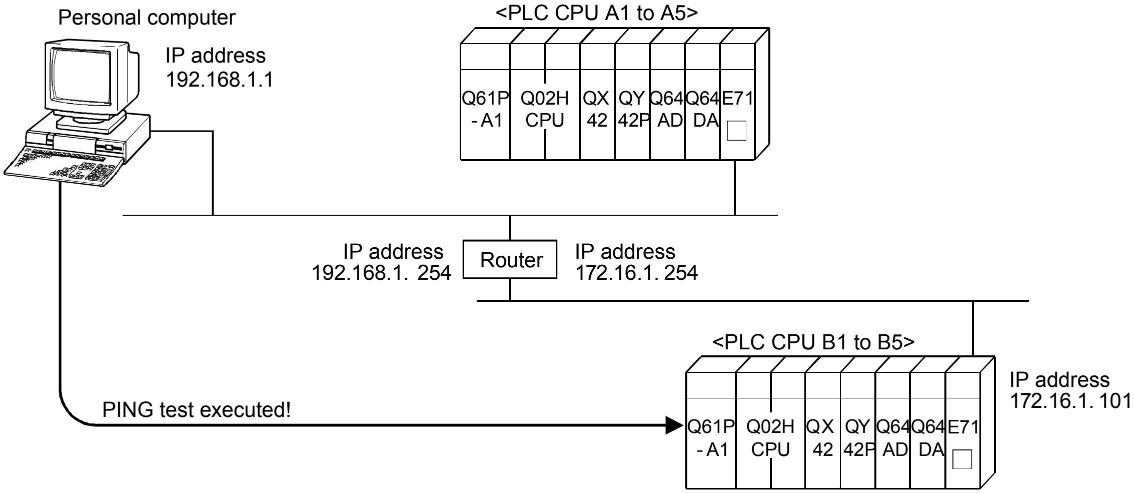
3) Writing to the PLC CPU (Refer to Section 5.2.4)

8.4 PING Test from Personal Computer

The PING test is performed from the personal computer that executed the exercise of the MX Component to the CPU B side.

It is used to check that the initial processing of the Ethernet module on the CPU B side is normally completed and that the personal computer and the CPU B side are properly connected.

Before starting the PING test, turn on the powers of the PLC A1 to A5 and the PLC B1 to B5 and then put them into the STOP status.



Refer to Section 6.4 REMARK for the operation procedure example on the personal computer side.

8.5 Operation of Demonstration Machine

Refer to Section 7.5.

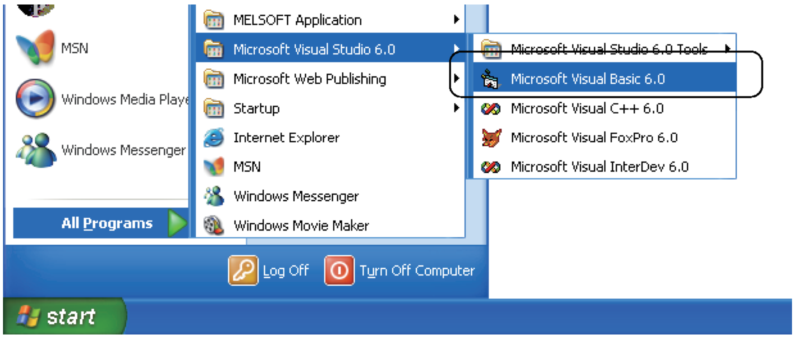
APPENDIX

Appendix 1 Visual Basic® Version 6

Appendix 1.1 Startup of Visual Basic®

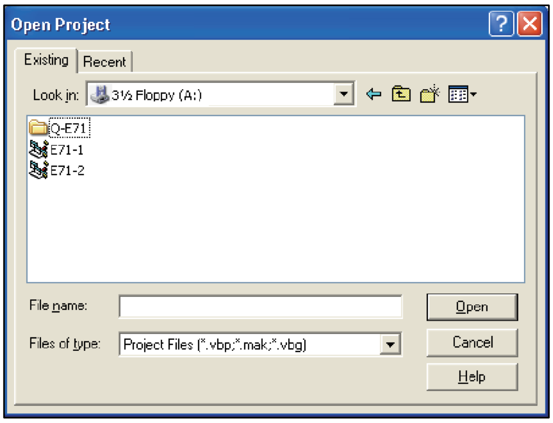
[Startup]

1) Click [Start] – [All Programs] – [Microsoft Visual Studio 6.0] – [Microsoft Visual Basic 6.0].



[Reading the applications]

1) Select [File] – [Open Project].
2) Insert the text FD into A drive and select [a:] for the drive (V).
3) Select the project file name and click the [Open] button.



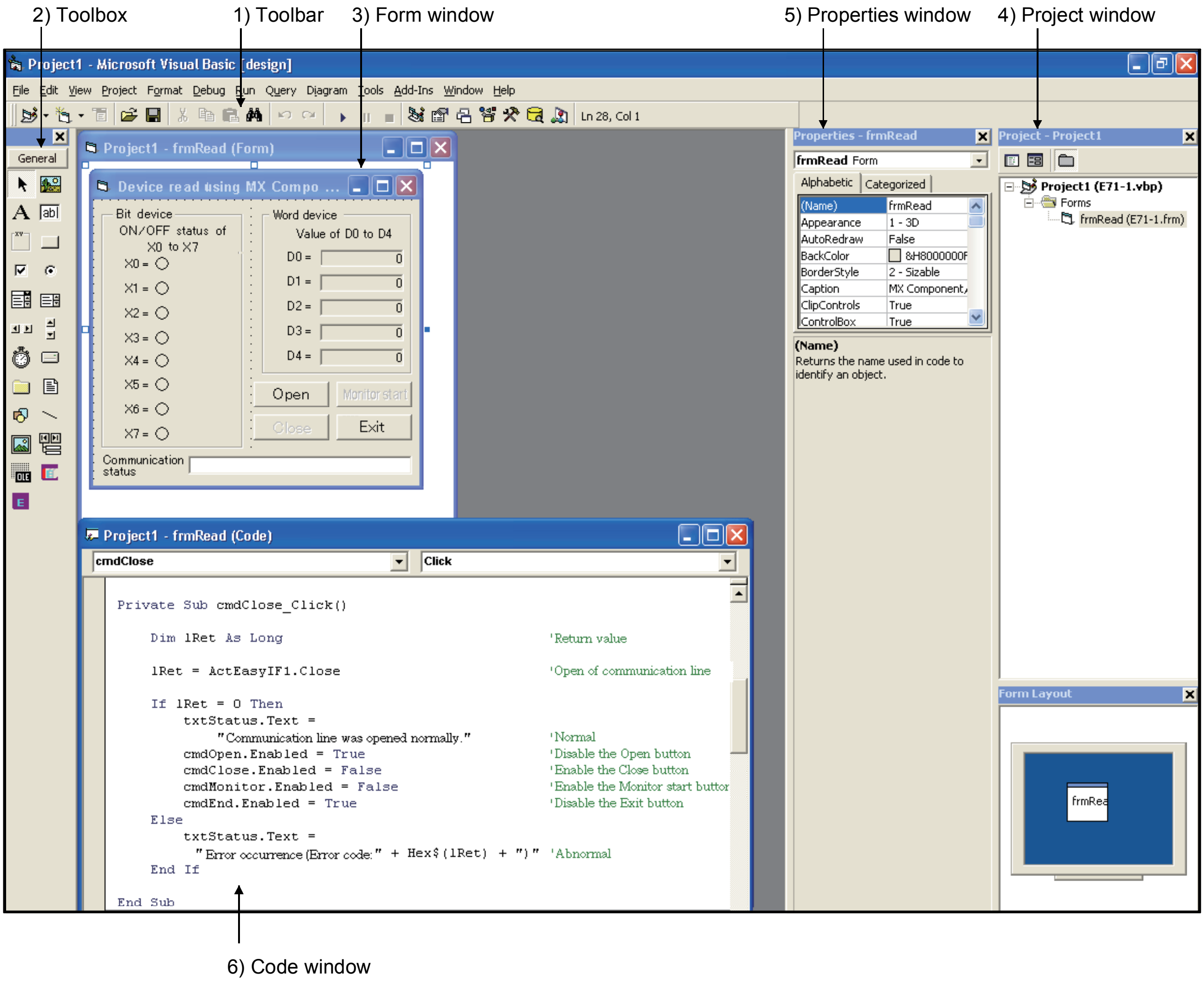
Look in: 3½ Floppy (A:)

File name:

Files of type: Project Files (*.vbp;*.mak;*.vbg)

All files included in the project are read.

[Visual Basic® screen]



(Name)	frmRead
Appearance	1 - 3D
AutoRedraw	False
BackColor	□ &H8000000F
BorderStyle	2 - Sizable
Caption	MX Component,
ClipControls	True
ControlBox	True

(Name)
Returns the name used in code to identify an object.

```
Private Sub cmdClose_Click()

    Dim lRet As Long                                          'Return value

    lRet = ActEasyIF1.Close                                   'Open of communication line

    If lRet = 0 Then
        txtStatus.Text =
            "Communication line was opened normally."         'Normal
        cmdOpen.Enabled = True                                'Disable the Open button
        cmdClose.Enabled = False                              'Enable the Close button
        cmdMonitor.Enabled = False                            'Enable the Monitor start buttor
        cmdEnd.Enabled = True                                 'Disable the Exit button
    Else
        txtStatus.Text =
         "Error occurrence (Error code:" + Hex$(lRet) + ")"   'Abnormal
    End If

End Sub
```

1) Toolbar
   The commands used frequently can be selected from here.
2) Toolbox
   A window for selecting the control to be placed on the form
3) Form window
   A window which forms the basis of the application
   The control is placed on the form to create the target interface.
4) Project window
   The file list configuring the projects (application programs) is displayed.
5) Properties window
   A window for setting the attributes (properties) such as form, color, etc. in the control
6) Code window
   When double-clicking the objects placed on the form, a window is displayed. Then, describe Basic code (program) in the window.

[Display of Form window]

Select the form module file from the Project window and click the [Form] button.

[Display of Code window]

Double-click a control from Form.

Or, select the form module file from the Project window and click the [Code] button.

[Display of Properties window]

Click inside the Properties window.

Or, set the form window to active and select [View] → [Properties window] (☰ (Properties window) of toolbar).

[Execution]

Select [Run] → [Start] (▶ (Start) of toolbar).

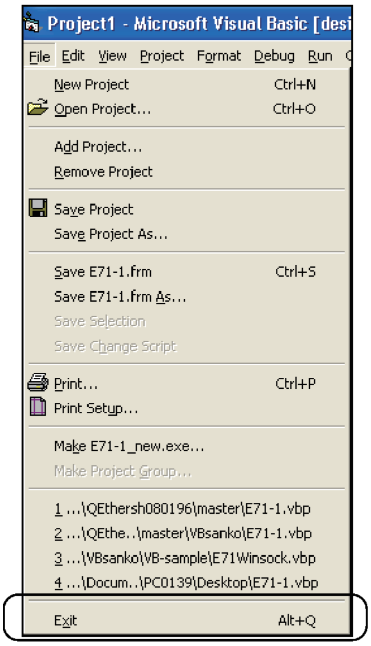
[Exit of application]

Select [Run] → [End] (■ (End) of toolbar).

Or, select [Close] from the title bar icons of the application.

[Exit]

Select [File] → [Exit].



For...Next statement

Functions

The flow control statement which repeats a series of statements for the designated number of times

Format

```
For counter = start To end[Step step]
   [statements]
   [Exit For]
   [statements]
Next[counter]
```

The following shows the designated items of the For...Next statement.

Designated items	Description
counter	Designates the numeric variables to be used for a loop counter. A factor of user definition type cannot be designated.
start	Designates the initial value of an argument counter.
end	Designates the final value of an argument counter.
step	Designates the value to be added to an argument counter every time the loop is repeated. If the argument step is skipped, "1" is added to an argument counter every time the loop is repeated.
statements	A series of statements which is executed inside the loop and described between For and Next Statements described here are executed for the number of times designated by For...Next.

Explanation

For the argument step, positive values and negative values can be designated.

Depending on the designated value in the argument step, the execution of loop is controlled as follows:

Set value	Execution condition
Positive value or 0	counter<=end
Negative value	counter<=end

After the execution of program moves to the loop, a series of statements inside the loop are all executed, and then the value of the argument step will be added to the argument counter.

At this point, if the completion condition is not satisfied, the statement inside the loop is executed again. In other cases, the control leaves the loop, and moves to the next statement of the Next statement.

The Exit For statement can be used only inside the control structure For Each...Next or For...Next, and can complete For...Next in conditions other than the designated number of times.

The Exit For statement can be designated repeatedly in any place inside For Each...Next or For...Next.

The Exit For is often used with the assessment of conditions (such as If...Then), and passes the control to the statement right after Next.

The For...Next loop can be made into a nested structure.

In other words, a For...Next loop can be inside another For...Next loop.

When making the loop nested, designate different variable names for each argument counter.

The following shows an example of correct statement.

```
For I = 1 To 10
    For J = 1 To 10
        For K = 1 To 10
            . . .
        Next K
    Next J
Next I
```

Caution

If the argument counter of the Next statement is skipped, the argument counter continues execution as if it is designated.

If the Next statement is located before the corresponding For statement, an error will occur.

Hex function

Functions

Returns a character string which indicates the designated value in hexadecimal.

Format

Hex(number)

For an argument number, any mathematical expression or character string expression can be designated.

Explanation

When the argument number is not an integral number, it is rounded to the closest integral number before conversion.

Number value	Return value
Null	Null value
Empty	0
Other numerical value	A character string which consists of the maximum 8 digits indicating a hexadecimal number

If &H is added in front of a value within the proper range when describing, the value can be directly indicated in hexadecimal.

For example, 16 in decimal can be described as &H10 in hexadecimal.

If...Then...Else statement

Functions

The flow control statement which performs the execution with condition based on the value of an expression

Format

```
If condition Then statements[Else elsestatements]
```

Or, the following syntax in block form can be used.

```
If condition Then
    [statements]
[ElseIf condition-n Then
    [elseifstatements]]...
[Else
    [elsestatements]]
End If
```

The following shows the designated items of the If...Then...Else statement.

Designated items	Description
condition	Designates either of the following two expressions. A mathematical expression or string expression evaluating True or False If the value of an argument condition is Null, the argument condition is considered as False. Expression in the TypeOf objectname Is objecttype format The argument objectname is a reference of any object, and the argument objecttype is any valid object type. This expression returns True if the argument objectname is the objecttype designated by the argument objecttype. In other cases, it returns False.
statements	Executed when the argument condition is True. Designates a series of statements divided with colon (:).
condition-n	Same as argument condition
elseifstatements	Designates a series of statement to be executed when the argument condition-n is True.
elsestatements	Designates a series of statements to be executed when any of conditions (argument condition and condition-n) defined before Else is not True.

Explanation

The single-line If...Then...Else statement (first syntax) is used in making a brief and simple conditional judgment.

The If…Then...Else statement (second syntax) in block form can make a more structured and flexible description compared to the single-line syntax.

In addition, the code readability and maintainability are improved, and debugging can be easily performed.

Caution

Though the first syntax can describe several statements for one condition, it is necessary to describe it in one line dividing with a colon as shown below.

```
If A>10 Then A=A+1:B=B+A:C=C+B
```

When If (second syntax) in block form is executed, the argument condition is firstly evaluated. When the argument condition is True, the statement following Then is evaluated.

When the argument condition is False, the condition (condition-n) designated with Elself is evaluated instead.

When either condition is True, the statement following the corresponding Then is executed.

When both conditional experssions designated with Elself are False (or no Elself clause exists), the statement following Else is executed.

When the statement following Then or Else completes, the execution of the program continues from the next statement of End If.

Both the Else clause and the ElseIf clause are defined as necessary.

In addition, the number of the ElseIf clause to be designated is not limited for If in block form.

However, the ElseIf clause cannot be designated after the Else clause.

For If in block form, a nested structure can be made .

Appendix 1.3 Term

Form

A window which forms the basis of an application interface
An application consists of at least one form.

Control

Various parts which are arranged in a form (command button, text box, etc.)

Object

The Object is a generic term for what are targeted for the operation by users, such as form, control, etc.

Property

Attributes of an object.
By setting a value to the property, it becomes possible to define the apparent characteristics such as the object size and color, the display position on the screen and the condition such as whether or not the size can be changed.

Event

Operations such as clicking a mouse and pressing a key.
The event which can be recognized varies depending on the object type.
In an application, a processing corresponding to each event is described in Basic codes.
An event is mainly generated from the object operation by users. However, there are other events which are generated from the program itself or from the system side.

Method

A keyword for controlling objects.
Described in an object name and a method type.

Appendix 1.4 Toolbox List

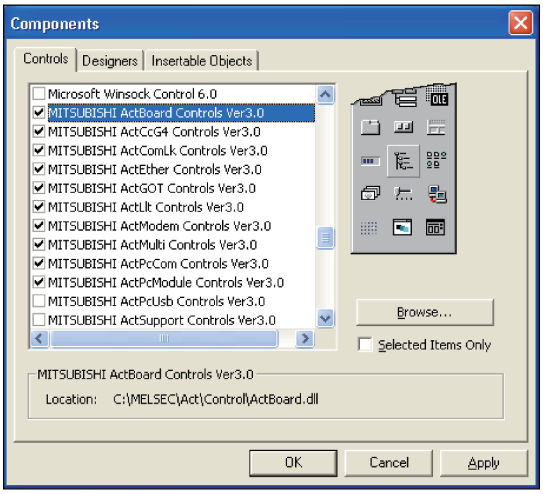
When arranging a control to a form, the buttons on the toolbox can be used.

Control	Function
Pointer	Moves a form and an arranged control and changes their size. The pointer is not a control.
Picture box	Displays bitmap, icon, metafile of Microsoft Windows, etc. Can also display a text and arrange other controls in a picture box.
Label	Displays a text. This text cannot be directly input or changed by users.
Text box	Performs the input or display of a text.
Frame	Arranges controls in a frame individually by the appearance and function, and divides them into groups.
Command button	Executes the command or operation selected by users.
Check box	Makes the settings for ON (checked) and OFF (not checked). It is possible to make multiple checkboxes ON at a time.
Option button	Selects one item from multiple items. Uses multiple option buttons as one group.
List box	Displays a list and allows users to select an item on the list.
Combo box	Combination of text boxes and list boxes.
Horizontal and vertical scroll bars	Used when displaying or setting a value, which continuously changes within a certain range such as a volume setting, etc.
Timer	Makes an event generated at a certain time interval.
Drive list box	Displays the list of valid disc drives and allows users to select them.
Directory list box	Displays directory paths and allows users to select them.
File list box	Displays file names in the directory and allows users to select them.
Shape	Used when drawing a rectangle, an ellipse and a circle in a form.
Line	Used when drawing a straight line in a form.
Image	Displays bitmap, icon, metafile of Windows, etc. Operates as the command button does by clicking.
Data	Connects to the existing data base, and displays the information on a form.
OLE	Makes an OLE object available for an application to be created.

The control that is not provided for the standard toolbox is called the ActiveX control. The custom control can add/delete a control using the [Components] command on the [Project] menu.

[Addition of control]

1) Select [Project] – [Components].
2) Put a check mark in the check box of control to be added and then select [OK].



□ Microsoft Winsock Control 6.0
☑ MITSUBISHI ActBoard Controls Ver3.0
☑ MITSUBISHI ActCcG4 Controls Ver3.0
☑ MITSUBISHI ActComLk Controls Ver3.0
☑ MITSUBISHI ActEther Controls Ver3.0
☑ MITSUBISHI ActGOT Controls Ver3.0
☑ MITSUBISHI ActLlt Controls Ver3.0
☑ MITSUBISHI ActModem Controls Ver3.0
☑ MITSUBISHI ActMulti Controls Ver3.0
☑ MITSUBISHI ActPcCom Controls Ver3.0
☑ MITSUBISHI ActPcModule Controls Ver3.0
□ MITSUBISHI ActPcUsb Controls Ver3.0
□ MITSUBISHI ActSupport Controls Ver3.0

□ Selected Items Only

MITSUBISHI ActBoard Controls Ver3.0
Location: C:\MELSEC\Act\Control\ActBoard.dll

REMARK

When using the MX Component, add "MITSUBISHI Act ～".

Appendix 1.5 Toolbar List

The following buttons are provided to easily call out frequently-used commands.

Button	Name	Function
	Standard EXE	The project type which can be added to the currently opened project group are displayed as a submenu. The icon turns into the type of the project lastly added.
	ActiveX EXE	
	ActiveX DLL	
	ActiveX control	
	Form module	The list of items which can be added to the currently worked project is displayed on the submenu. The icon turns into the object lastly added.
	MDI form module	
	Standard module	
	Class module	
	User control	
	Property page	
	User document	
	Menu editor	Displays the [Menu editor] dialog box.
	Open project	By loading a project, the current project closes and the existing project opens.
	Save project	Saves the current project and all components of the project.
	Cut	Deletes the selected control or character string, and transfers it to the clipboard.
	Copy	Copies the selected control or character string to the clipboard.
	Paste	Inserts the contents of the clipboard in the current cursor position.
	Search	Searches the designated character string within the range designated in the [Search] dialog box.
	Undo	Undoes the last performed editing operation.
	Redo	When no other operation is performed after the [Undo] operation, restores the last edited character string.

Button	Name	Function
▶	Start	Executes the application that has been created at design.
❚❚	Break	Cancels the execution of the program, and turns into the interrupt mode.
■	End	Cancels the execution of the program, and returns to design.
	Project Explorer	Displays the Project window.
	Properties window	Displays the Properties window.
	Form layout window	Displays the Form layout window.
	Object browser	Displays the Object browser.
	Toolbox	Displays the Toolbox.
	Data view window	Displays the Data view window.
	Visual Component Manager	Displays the Visual Component Manager.

Appendix 1.6 Property List

Property	Description
Action	Operation to be executed by the OLE client
ActiveContol	Control with focus
ActiveForm	Form with focus
Align	Display method of a picture box
Alignment	Aligns the Caption property.
Appearance	Makes the appearance display of the control flat or not.
AppIsRunning	Runs the object creating source application of the OLE container or not.
Archive	Displays an archive attribute file in the file list box or not.
AutoActivate	Sets the method which makes an object active by the OLE container.
AutoRedraw	Automatically carries out the redraw of graphics or not.
AutoShowChildren	Displays the MDI child form at loading or not.
AutoSize	Automatically changes the size of a control according to the contents or not.
AutoVerbMenu	Displays a pop-up menu when right-clicking on the OLE container or not.
BackColor	Object background color
BackStyle	Background of labels and shapes
BoderColor	Control border color
BoderStyle	Control border line style
BorderWidth	Control border line width
Calendar	Sets a calendar type used for a project.
Cancel	Changes a command button to a cancel button or not.
Caption	Text to be displayed on a title of a form or a control
Checked	Puts a checkmark beside a menu command or not.
Class	OLE object class name embedded
ClipControls	Redraws the whole object or not when drawing graphics.
Columns	Scroll direction of list box
ControlBox	Displays the control menu box on a form at execution or not.
Count	Number of loaded forms and controls on a form
CurrentX	X coordinate of the display start point
CurrentY	Y coordinate of the display start point
Data	Handle of a memory in which data are stored or a GDI object
DataBindingBehavior	Designates a method of binding an object with the data source.
DataChanged	Determines whether the data in the current control is different from the data in the current record or not.
DataField	Sets a field name of a combined data base.
DataFormat	Sets a data format to be displayed on the combined AD0 data control.
DataMember	Sets a data member name of the data set to be referred by the associated AD0 data control.
DataSource	Sets a data control name to be combined at designing.
DataSourceBehavior	Operates as a data source or not.
DataText	Character string of an OLE object

Property	Description
Default	Command button used by default
DisplayType	Sets an object display form.
DownPicture	Sets a picture to be displayed when a control is clicked and held down.
DragIcon	Icon to be a pointer at the drag-and-drop operation
DragMode	Mode at the drag-and-drop operation
DrawMode	Graphics appearance
DrawStyle	Types of line to be used for the graphics method
DrawWidth	Width of line to be used for the graphics method
Drive	Acquires and sets a drive selected at the execution with the drive list box.
Enabled	Sets whether an object recognizes an event or not.
EXEName	Root name of an executable file
FileName	File name of a file selected in the file list box
FileNumber	OLE object storage, file No. at loading
FillColor	Color to paint inside figures
FillStyle	Pattern to paint inside figures
FontBold	Designates bold for a font.
FontCount	Acquires the number of available fonts.
FontItalic	Designates italic for a font.
FontName	Designates a font.
Fonts	Acquires a font name.
FontSize	Sets a font size.
FontStrikeThru	Designates a font strike-through.
FontTransparent	Displays the font background as transparent.
FontUnderline	Designates the underline for a font.
ForeColor	Font color.
Format	Data setting of a server application, data format at acquisition
HasDC	Assigns a display context to a control or not.
hdc	Device context handle
Height	Object height
HelpContextID	Context No. corresponding to Help
HelpFile	Help file name of an application
Hidden	Displays a hidden attribute file in the file list box or not.
HideSelection	Highlights a selected text or not when a control loses focus.
HostName	Client application name
hWnd	Object handle
Icon	Icon when a form is iconized.
Image	Handle corresponding to bitmap with a continued display attribute
IMEMode	IME mode designated for a control with focus
Index	No. to identify a control in the control array

Property	Description
Instancing	Sets the instance operation of the ActiveX class module.
IntegralHeight	Automatically changes a list height or not so that all items can be displayed on the list.
Interval	Time interval at which the timer event of a timer control occurs
ItemData	No. of each item of combo boxes or list boxes
Key	Character string to identify the specific member in a collection
KeyPreview	Keyboard event execution sequence of forms and controls
LargeChange	Amount of a scroll when clicking a scroll bar
LBound	Minimum index No. in a control array
Left	Distance between a left end of an object and that of a container
LinkItem	Data transmitted to the destination control in the DDE communication
LinkMode	Types of DDE communication links
LinkTimeout	Control time-out for a DDE message
LinkTopic	Data sent and received in the DDE communication
List	List items
ListCount	Number of list items
ListIndex	Index No. of selected list items
Locked	Locks for preventing a text or line from being changed, or not.
lpOleObject	Address of an OLE object
MaskColor	Sets a color masked (transparent) with a control picture.
Max	Maximum value of a Value property
MaxButton	Displays the maximize button on a form or not.
MaxLength	Length of a text property in a text box
MDIChild	Sets whether a form will be a child form of an MDI form or not.
Min	Minimum value of a Value property
MinButton	Displays the minimize button on a form or not.
MiscFlags	Sets an expanded function to be used.
MouseIcon	Sets an icon of user definition used when setting the Mouse Pointer property to "99".
MousePointer	Types of a mouse pointer
Moveable	Moves a form or not
MultiLine	Makes the multiple lines input available in the text box or not.
MultiSelect	Makes the multiple items selection available in the list box or not.
Name	Object name to be referred in a program
Negotiate	Displays a control or not when displaying the tool bar of an active object.
NegotiateMenus	Loads a menu to the menu bar of a form from an object on the form or not.
NegotiatePosition	Displays the top level menu control on the menu bar or not.
NegotiateToolbars	Displays the active object tool bar on the MDI form or not.
NewIndex	Index No. of an item finally added to the list box
Normal	Displays a normal attribute file in the file list box or not.
Object	Acquires an object, a property or method of an object.

Property	Description
ObjectAcceptFormats	Data format list that can be accepted in an object
ObjectAcceptFormatsCount	Number of factors included in the data format list that can be accepted
ObjectGetFormats	Data format list that can be provided by an object
ObjectGetFormatsCount	Number of factors included in the data format list that can be provided
ObjectVerbFlags	Menu status corresponding to an OLE verb
ObjectVerbs	A series of OLE verbs supported by an object
ObjectVerbsCount	Number of OLE verbs supported by an object
OLEDragMode	Sets whether a programmer carries out the processing for the OLE drag-and-drop operation or not.
OLEDropAllowed	Sets whether an OLE container will be a drop target or not.
OLEDropMode	Method through which a control processes the drop operation
OLEType	Object status in an OLE container
OLETypeAllowed	Object format which can be set in an OLE container
Page	Current page number at printing
Palette	Sets a bitmap image in which the palette used with a control is stored.
PaletteMode	Sets a palette mode used for a control arranged in an object.
Parent	Parent form of a control or a child form
PasswordChar	A character string displayed when inputting a password in a text box
PasteOK	Sets whether the contents in a clipboard can be pasted to the OLE client control or not.
Path	Absolute path of a currently expanded directory
Pattern	Pattern of a file name displayed in a file list box
Persistale	Determines whether an object can store and restore a data between instances or not.
Picture	Bitmap or icon displayed in a control
Public	Sets whether a control can be shared with other applications or not.
ReadOnly	Displays a ReadOnly attribute file in a file list box or not.
RightToLeft	Pool value indicating the display direction of a text
ScaleHeight	Vertical direction length of an object
ScaleLeft	Horizontal coordinate of the left end of an object
ScaleMode	Unit of the coordinate system of an object
ScaleTop	Vertical coordinate of the top end of an object
ScaleWindth	Horizontal direction length of an object
ScrollBars	Sets a horizontal or vertical scroll bar.
SelCount	Number of items selected by the list box control
Selected	Sets whether items in a list box are in the selected status or not.
SelLength	Number of characters of a selected text
SelStart	Start point of a selected text
SelText	Character string of a selected text
Shape	Shape of a shape control
Shortcut	Shortcut key on the menu
ShowInTaskbar	Displays a form object on the taskbar or not.

Property	Description
SizeMode	Sets the display methods of a OLE container size or image when an object is in.
SmallChange	Amount of a scroll when clicking the arrow of a scroll bar
Sorted	Automatically sorts the items in a list box or not.
SourceDoc	File name when creating a OLE project based on a file
SourceItem	Data when creating a OLE project based on a file
StartUpPosition	Sets the form initial display position.
Stretch	Changes the size of a picture adjusting to that of an image control or not.
Style	Types of combo box
System	Displays a system attribute file in a file list box or not.
TabIndex	Sequence when the focus of a control is moved by the Tab key
TabStop	Sets whether the focus moves to an object or not when it is moved by the Tab key.
Tag	Character string to store the data for referring from a program
Text	Text to be displayed in a text box, combo box and grid box
ToolTipText	Sets a text to be displayed when a mouse is placed on a control at execution.
Top	Distance between the top end of an object and that of a container
TopIndex	Items to be displayed on the top end of a list box
TwipsPerPixelX	Number of twips per horizontal pixel of an object
TwipsPerPixelY	Number of twips per vertical pixel of an object
UBound	Maximum index No. in control array
UpdateOptions	Type of the link with a server
UseMaskColor	Uses the colors set to the MaskColor property as the mask colors or not.
UseMnemonic	Defines the access key for a character string of the Caption property using an ampersand, or not.
Value	Whether the check box or option button are selected or not / Current position of a scroll bar
Verb	Operation to be executed when an OLE object is made active
Visible	Displays an object on the screen or not.
WhatsThisButton	Displays the [?] button on the title bar of a form or not.
WhatsThisHelp	Uses either context help or main help window.
WhatsThisHelpID	Context No. setting of a help topic corresponding to an object
Width	Width of an object
WindowList	Manages MDI child windows using the menu or not.
WindowState	Display status of a form window
WordWrap	Widens the label width depending on the Caption property or not.
X1,X2,Y1,Y2	Coordinates indicating a start point (X1, Y1) and end point (X2, Y2) of line control

Appendix 1.7 Method List

Method	Description
AddItem	Adds items to the list box, grid, etc.
Arrange	Aligns windows and icons on the MDI form.
Circle	Draws a circle, an ellipse and a circular arc.
Clear	Clears contents of list box.
Close	Closes an object and completes the connection with the application providing the object.
Cls	Clears a text and a graphics.
Copy	Copies the object of OLE container to the clipboard.
CreatEmbed	Creates an embedding object.
CreateLink	Creates a link object from the contents of file.
Delete	Deletes the designated object and unloads the assigned memory.
DoVerb	Sets the OLE verb to be executed by the OLE object.
Drag	Designates the operation of control drag.
Enddoc	Passes the control of output processing to the print device or spooler.
FetchVerbs	Updates OLE verbs list supported by an object.
GetData	Returns the pictures loaded to the clipboard.
GetFormat	Returns the data format in the clipboard.
GetText	Returns the text character string from the clipboard.
Hide	Hides a form.
Item	Returns the member of Collection object designated with integral number or key character string.
Line	Draws a line or quadrangle to an object.
LinkExecute	Sends the command character string to the souce application of DDE communication.
LinkPoke	Sends the contents of control to the souce application of DDE communication.
LinkRequest	Requests to update the contents of control to the souce application of DDE communication.
LinkSend	Sends the contents of picture control to the destination application of DDE communication.
Move	Moves a form or control.
NewPage	Completes the current page and goes to the next page.
OLEDrag	Starts OLE drag-and-drop operation.
PaintPicture	Draws graphics in any position on the form, picture box and Printer object.
Paste	Pastes data from the clipboard to the OLE container.
PasteSpecialDlg	Displays the Paste Special dialog box.
Point	Acquires the color of points designated on the form or picture.
PopupMenu	Displays the shortcut menu at the current position of mouse or the designated coordinate.
Print	Outputs the character string to an object with the font and color set currently.
PrintForm	Sends the image by bit unit on the form to a printer.
PSet	Draws points in an object with the designated color.

Method	Description
ReadFromFile	Reads an object from the data file created with the SaveToFile method.
Refresh	Updates a form or control forcibly.
Remove	Deletes items from the collection.
RemoveItem	Deletes items from the list box and combo box, and lines from the grid.
SaveToFile	Saves an object to the data file.
SaveToOle1File	Saves an object in the file format of OLE Version 1.0.
Scale	Defines the coordinate system of control.
ScaleX/ScaleY	Converts the unit set in the ScaleMode property to the other unit.
SetData	Sends a picture to the clipboard.
SetFocus	Sets a focus to the designated control or form.
SetText	Sends the text character string to the clipboard.
Show	Displays a form.
ShowWhatsThis	Displays the topics selected from the help file using the context help.
TextHeight	Returns the text character string with the height when outputting the text character string with the current font.
TextWidth	Returns the text character string with the width when outputting the text character string with the current font.
Update	Loads the latest data from the applications which has provided an object, and displays the data on the OLE container as graphic data.
WhatsThisMode	Changes the mouse pointer to the help pointer to display the contex help.
ZOrder	Changes the Z order in the same hierarchy of the designated form and control.

Appendix 1.8 Function List

Function	Description
Abs	Returns the absolute value of mathematical expression.
Array	Returns the variant value with array data.
Asc	Returns the character code of head character in the designated character string.
Atn	Returns the designated numerical value arctangent as double-precision floating-point number.
CallByName	Executes the method of object specified or acquires and sets the property value.
CBool	Converts a numerical value or character string to the bool.
CByte	Converts a numerical value or character string to the byte.
CDate	Converts a numerical value or character string to the date.
CCur	Converts a numerical value or character string to the currency.
CDbl	Converts a numerical value or character string to the double-precision floating-point number.
Choose	Chooses a value from the argument list and returns it.
Chr,Chr $	Returns the character string corresponding to the ASCII code designated.
CInt	Converts a numerical value or character string to the integer.
Clng	Converts a numerical value or character string to the long integer.
Command,Command $	Returns the character string of command line specified when starting VisualBasic.
Cos	Returns the cosine value of the designated angle.
CreateObject	Creates the OLE automation object.
CSng	Converts a numerical value or character string to the single-precision floating-point number.
CStr	Converts a numerical value or character string to the character string.
CurDir,CurDir $	Returns the current path of drive designated.
CVar	Converts a numerical value or character string to the variant.
CVDate	Converts the designated expression to the variant of VarType7 (date).
Date,Date $	Returns the character string indicating the current date.
DateAdd	Returns the character string of date to which the designated time interval is added.
DateDiff	Returns the character string indicating the two designated time intervals of date.
DatePart	Returns the character string including the designated part of date.
DateSerial	Returns the character string corresponding to year, month and day designated as an argument.
DateValue	Returns the serial value indicating the date specified in the character string.
Day	Returns the date from the serial value of date.
DDB	Returns the depreciation on asset for specific term using the designated method such as the method of multiplying factor, etc.
Dir,Dir $	Returns the file name compatible with the designated file pattern and attribute.
DoEvents	Passes the control occupied with a program to the operating system so that the event generated is processed by the system.
Environ,Environ $	Returns the character string assigned to the environment variable of OS.
EOF	Confirms that the current position of file gets to its end.
Error,Error $	Returns the error message compatible with the designated error No.

Function	Description
Exp	Exponential function
FileAttr	Returns the file handle information of OS or the file mode.
FileDateTime	Returns the character string indicating the file creation and updated date.
FileLen	Returns the file length.
Filter	Returns the zero-base array including the subset of character string array based on the designated filter conditions.
Fix	Drops the fractional portion from a numerical value and returns only the integer portion.
Format,Format $	Returns a numerical value, date, time and character string according to a format.
FormatCurrency	Converts to the character string of currency format using the format defined in the [Control panel] of system
FormatDateTime	Returns the character string of date or time fomat.
FormatNumber	Returns the character string of number format.
FormatPercent	Adds a percent sign to the percent expression multiplied by 100 and returns it.
FreeFile	Returns the next available file No.
FV	Pays a flat fee regularly and returns the future value of investment assuming that the interenst rate is constant.
GetAllsettings	Acquires the key setting value list from the entry of application in the registry of Windows.
GetAttr	Returns the attributes of file, directory and volume label.
GetObject	Acquires the OLE automation object.
GetSetting	Acquires the key setting value list from the items of application in the registry of Windows.
Hex,Hex $	Returns the character string indicating a numerical value in hexadecimal.
Hour	Returns the integral value for indicating an hour (0 to 23) from the serial value of date-time.
IIf	Returns one of two arguments depending on the evaluation results of expression.
IMEStatus	Acquires the current status of IME.
Input,Input $	Reads the character string with length designated from a sequential file and returns it.
InputB,InputB $	Reads the character string with length designated from a sequential file and returns it.
InputBox,InputBox $	Displays a prompt in the dialog box and returns the contents of text box.
InStr	Searches the designated character string from some string and returns the identified character position.
InStrB	Searches the designated character string from some string and returns the identified byte position.
InstrRev	Searches the designated character string from the reverse direction of some string and returns the identified character position.
Int	Drops the fractional portion from a numerical value and returns the integer portion smaller than it.
IPmt	Returns the interest rate paid at the term designated in the investment period.
IRR	Returns the internal profit rate for a series of regular cash flow.
IsArray	Returns whether the variant argument is an array or not.
IsDate	Returns whether the variant argument can be coverted to the date or not.
IsEmpty	Returns whether the variant argument is the Empty value or not.
IsError	Returns whether the variant argument is the error value or not.
IsMissing	Returns whether the designated argument is passed or not.
IsNull	Returns whether the variant value is the Null or not.
IsNumeric	Returns whether the variant argument can be coverted to a numerical value or not.

Function	Description
IsObject	Returns whether an object is actually referred by an expression or not.
Join	Returns the character string created with combining the internal character string of each factor included in the array.
LBound	Returns maximum value of array subscript.
LCase,LCase $	Converts an uppercase alphabet to a lowercase one.
Left,Left $	Removes the characters of its counts designated from the left end of character string.
LeftB,LeftB $	Removes the characters of byte counts designated from the lef end of character string.
Len	Returns the number of characters in character string and number of bytes in variable.
LenB	Returns the number of bytes in character string and number of bytes in variable.
LoadPicture	Loads a picture.
LoadResData	Loads a format data that can be loaded from a resource file and returns the byte array.
LoadResPicture	Loads bitmap, icon or cursor from a resource file.
LoadResString	Loads a character string from a resource file.
Loc	Returns the current position of file.
LOF	Returns the file length to byte unit.
Log	Natural logarithm
LTrim,LTrim $	Deletes a head space from a character string.
Mid,Mid $	Returns character strings of its counts designated from character strings.
MidB,MidB $	Returns characters of byte counts designated from a character string.
Minute	Returns the integral value for indicating a minute (0 to 59) from the serial value of date-time.
MIRR	Returns the adjustment internal profit rate based on cash flow.
Month	Returns the integral value for indicating a month (1 to 12) from the serial value of date-time.
MonthName	Returns the character string indicating the month designated.
MsgBox	Displays a message box.
Now	Returns the serial value indicating the current date-time.
NPer	Returns the period needed for investments based on arguments.
NPV	Returns the net present value of investments based on arguments.
Oct,Oct $	Returns the character string indicating a value in octal.
Partition	Returns the character string indicating which one of multiple partitioned areas is included in.
Pmt	Returns the regular amount of payment needed for investments based on arguments.
PPmt	Returns the principal paid at the term designated based on arguments.
PV	Returns the current value of investments based on arguments.
QBColr	Returns the value indicating the RGB code compatible with the color No. used in the traditional QuickBasic.
Rate	Returns the interest rate during investments based on arguments.
Replase	Returns the character strings of which designted part is replaced using characters counts designated with the other ones.
RGB	Returns the RGB value of color.
Right,Right $	Removes the characters of its counts designated from the right end of character string.
RightB,RightB $	Removes the characters of byte counts designated from the right end of character string.

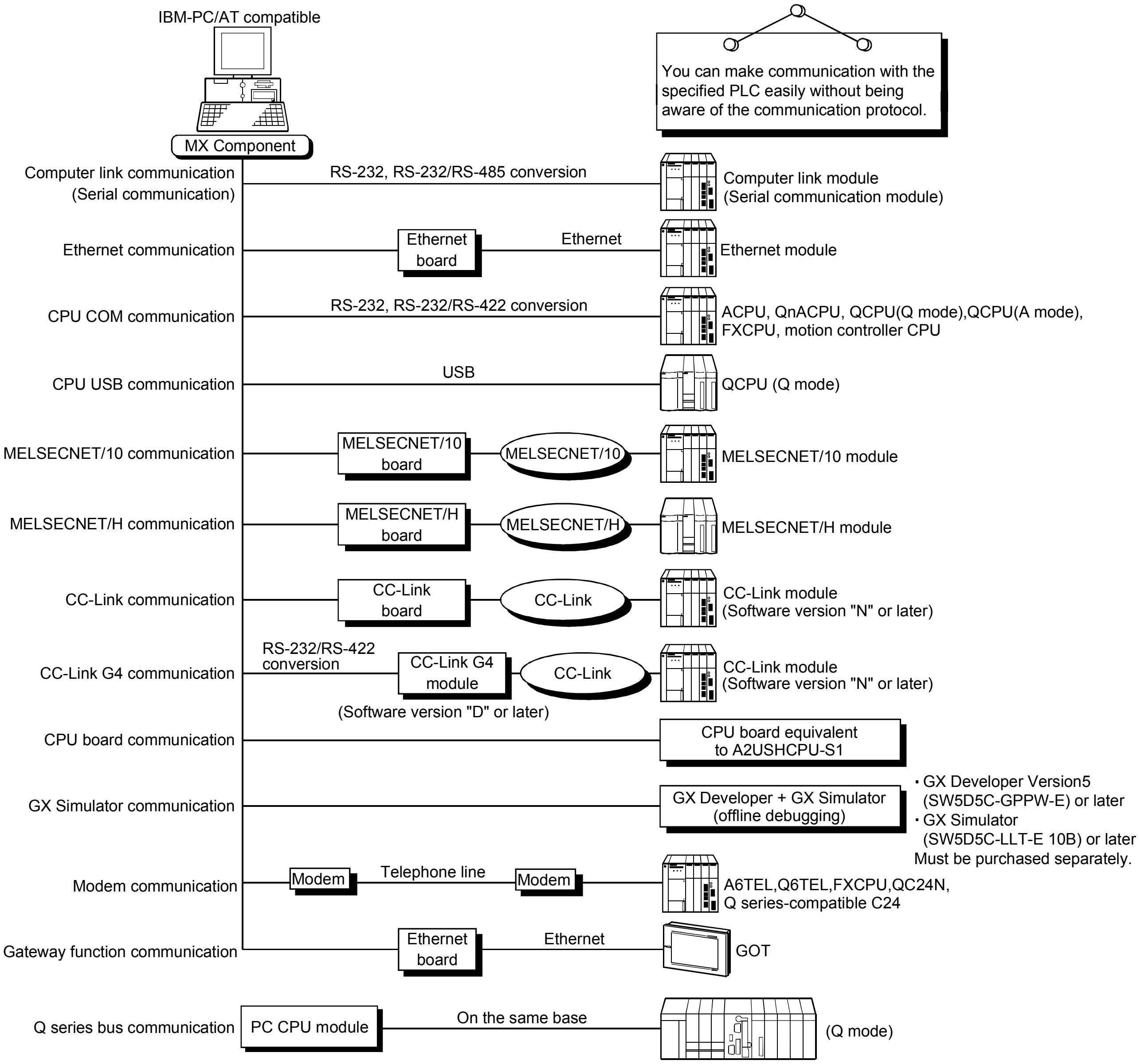
Function	Description
Rnd	Generates a random number.
Round	Returns a numerical value rounded at the designated decimal point
RTrim,RTrim $	Deletes the space at the right end of character string.
Second	Returns the second from the serial value of date-time.
Seek	Returns the current position of file.
Sgn	Returns the sign of numerical value.
Shell	Starts the designated program.
Sin	Returns the sine value of the designated angle.
SLN	Returns the depreciation expense on assets per term using a straight line method based on arguments.
Space,Space $	Returns the number of spaces designated.
Spc	Uses the function during the methods of Print# and Print, and returns the number of spaces designated.
Split	Creates and retursn the one-dimensional array from the character string partitioned by each factor.
Sqr	Returns a square root.
Str,Str $	Converts a numerical value to a decimal character string.
StrComp	Compares two character strings.
StrConv	Converts to the designated character string.
String,String $	Returns the head character of characters or character strings indicated by the designated character code, and the strings arranged by the specified character counts.
StrReverse	Returns the character strings of which disignated character alignment is reversed.
Switch	Evaluates a list of expression and returns a value compatible with the first conditional expression to be a truth in the list.
SYD	Returns the depreciation at the designated term using the sum-of-year's digits method based on arguments.
Tab	Uses the function during the methods of Print# and Print, and designates the output position of next character.
Tan	Returns the tangent value of the designated angle.
Time,Time $	Returns the character string indicating the current time.
Timer	Returns the number of seconds elapsed after midnight.
TimeSerial	Returns the serial value compatible with the designated hrs/min/sec.
TimeValue	Returns the serial value compatible with the designated time.
Trim,Trim $	Deletes the head and right end spaces of character strings.
TypeName	Returns the character string of character string type providing the information for variables.
UBound	Returns maximum value of array No.
UCase,UCase $	Converts a lowercase alphabet to an uppercase one.
Val	Converts a character string to a numerical value.
VarType	Returns the data type of variant indicated with arguments.
Weekday	Returns the integral value for indicating the day of the week from the serial value of date.
WeekdayName	Returns the character string indicating the day of the week designated.
Year	Returns the integral value for indicating the year from the serial value of date.

Appendix 2 MX Component

Appendix 2.1 Functions of MX Component

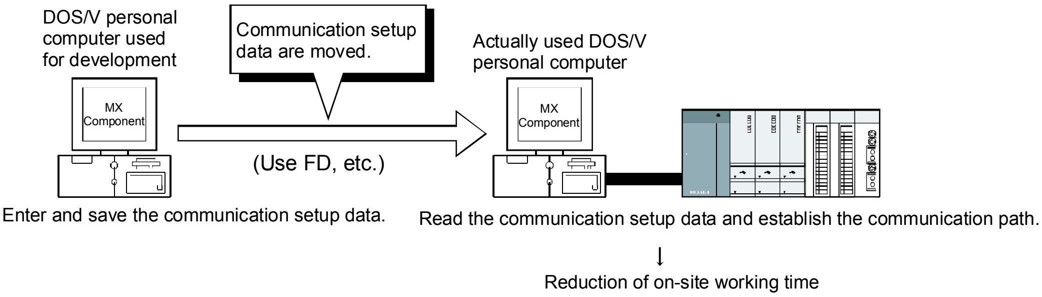
The MX Component is used to access to the PLC CPU via various communication paths with the applications created by Visual Basic®, Visual C++®, VBScript and VBA.
In this textbook, the applications are created by Visual Basic® and accessed to the PLC CPU via Ethernet.

(1) Support of a wide range of communication paths for PLC
A wide range of communication paths to the PLC is supported to enable the user to configure a system as desired.

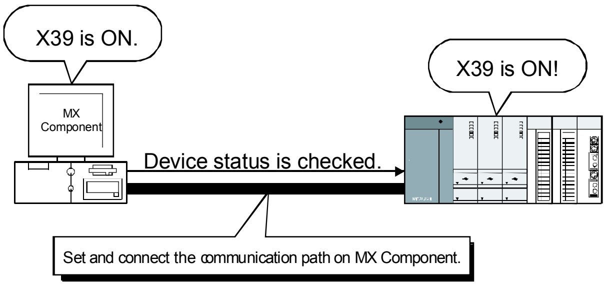

IBM-PC/AT compatible
MX Component
You can make communication with the specified PLC easily without being aware of the communication protocol.
Computer link communication (Serial communication)
RS-232, RS-232/RS-485 conversion
Computer link module (Serial communication module)
Ethernet communication
Ethernet board
Ethernet
Ethernet module
CPU COM communication
RS-232, RS-232/RS-422 conversion
ACPU, QnACPU, QCPU(Q mode),QCPU(A mode), FXCPU, motion controller CPU
CPU USB communication
USB
QCPU (Q mode)
MELSECNET/10 communication
MELSECNET/10 board
MELSECNET/10
MELSECNET/10 module
MELSECNET/H communication
MELSECNET/H board
MELSECNET/H
MELSECNET/H module
CC-Link communication
CC-Link board
CC-Link
CC-Link module (Software version "N" or later)
CC-Link G4 communication
RS-232/RS-422 conversion
CC-Link G4 module
(Software version "D" or later)
CC-Link
CC-Link module (Software version "N" or later)
CPU board communication
CPU board equivalent to A2USHCPU-S1
GX Simulator communication
GX Developer + GX Simulator (offline debugging)
・GX Developer Version5 (SW5D5C-GPPW-E) or later
・GX Simulator (SW5D5C-LLT-E 10B) or later
Must be purchased separately.
Modem communication
Modem
Telephone line
Modem
A6TEL,Q6TEL,FXCPU,QC24N, Q series-compatible C24
Gateway function communication
Ethernet board
Ethernet
GOT
Q series bus communication
PC CPU module
On the same base
(Q mode)

(2) Substantial improvement in user's development efficiency
The MX Component comes with the wizard type communication setting utility.
By simply making interactive settings on the screen, the users can make communication settings to access the PLC CPU to communicate with.
Once the communication settings have been made, the access can be made by merely designating the logical station number of the PLC stored on the communication setting utility.

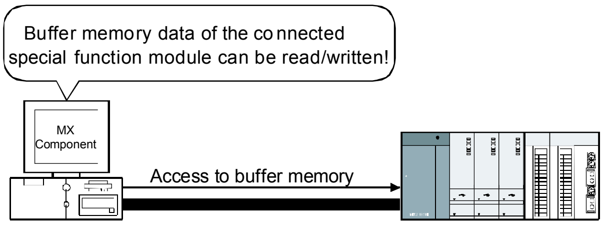
(3) Save and read of communication settings
The MX Component has the functions to save and read the communication settings made on the communication setting utility.
You can easily move the setting data from the DOS/V personal computer used for development to the actually used DOS/V personal computer.
Note: The MX Component must be previously installed in both the DOS/V personal computer used for development and the actually used DOS/V personal computer.


DOS/V personal computer used for development
Communication setup data are moved.
Actually used DOS/V personal computer
MX Component
MX Component
(Use FD, etc.)
Enter and save the communication setup data.
Read the communication setup data and establish the communication path.
↓
Reduction of on-site working time

(4) Device monitoring function
Utilizing the PLC monitor utility enables you to monitor the status of the designated device and change its data.

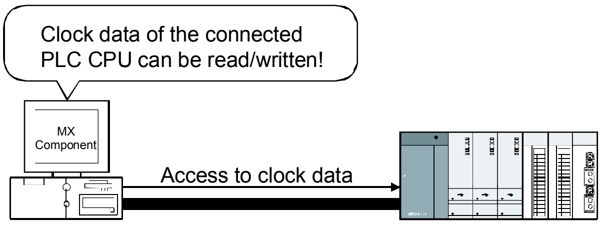

X39 is ON.
X39 is ON!
MX Component
Device status is checked.
Set and connect the communication path on MX Component.

(5) Access to buffer memory of special function module
The access can be made to not only the devices of the PLC CPU but also the buffer memory of a special function module.


Buffer memory data of the connected special function module can be read/written!
MX Component
Access to buffer memory

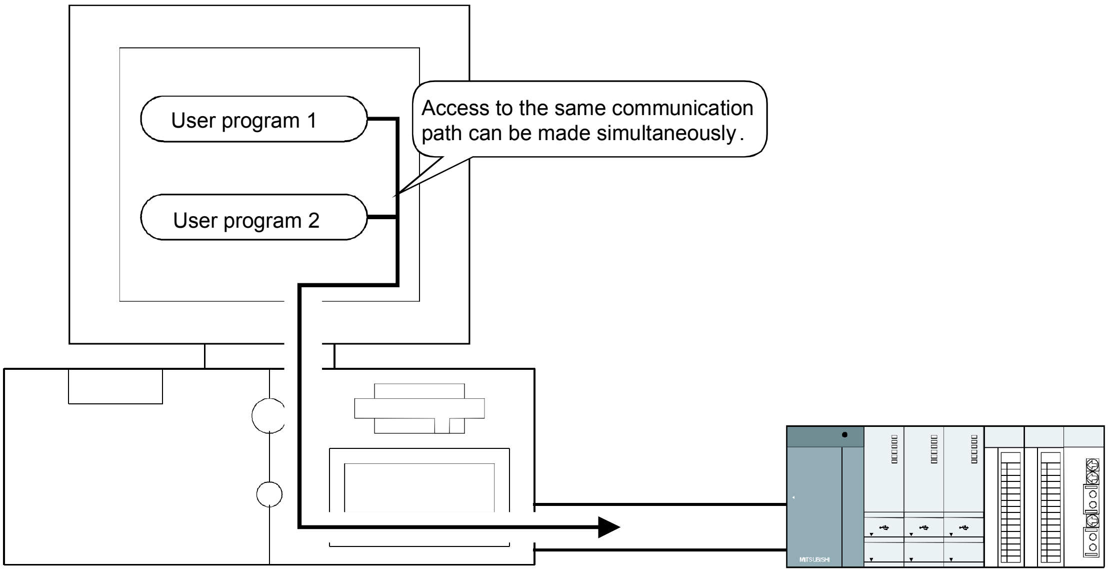
(6) Read and write of PLC CPU clock data

You can read and write the clock data of the PLC CPU connected to the DOS/V personal computer.



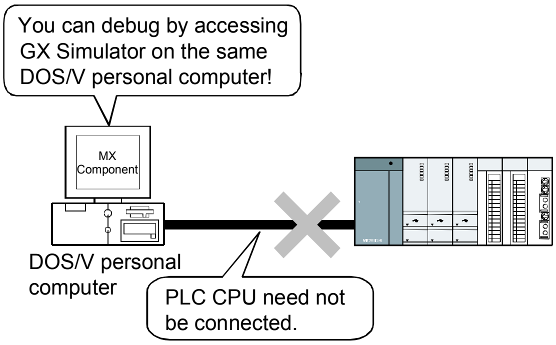
(7) Multithread communication

The access to the same communication path can be made from multiple threads at the same time.


User program 1
User program 2
Access to the same communication path can be made simultaneously.

(8) GX Simulator for offline debugging

By using the GX Developer and GX Simulator, you can perform debugging on a single DOS/V personal computer without connecting the PLC.


You can debug by accessing GX Simulator on the same DOS/V personal computer!
MX Component
DOS/V personal computer
PLC CPU need not be connected.

POINT

The GX Developer and GX Simulator must be separately purchased to use the GX Simulator.

(9) A wide variety of programming languages

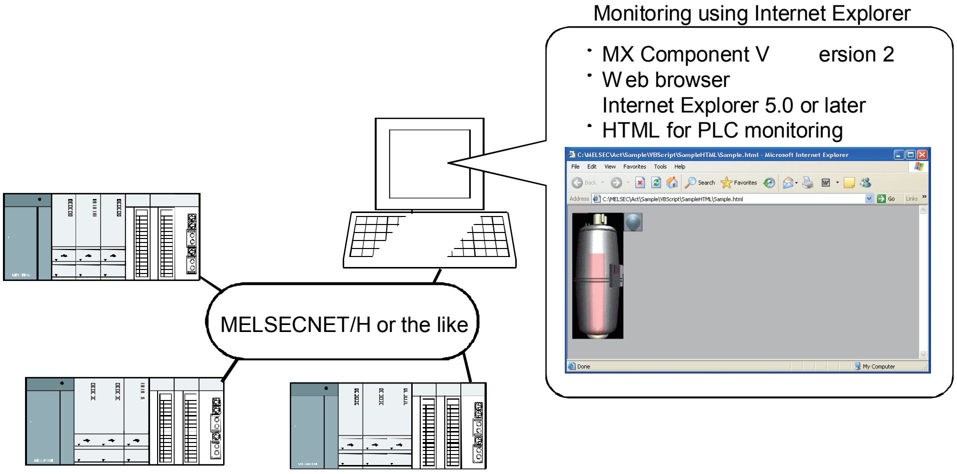
MX Component supports VBScript and VBA as well as Visual Basic® and Visual C++®.

(a) Creation of monitoring pages using VBScript

1) Monitoring pages can be created in HTML format

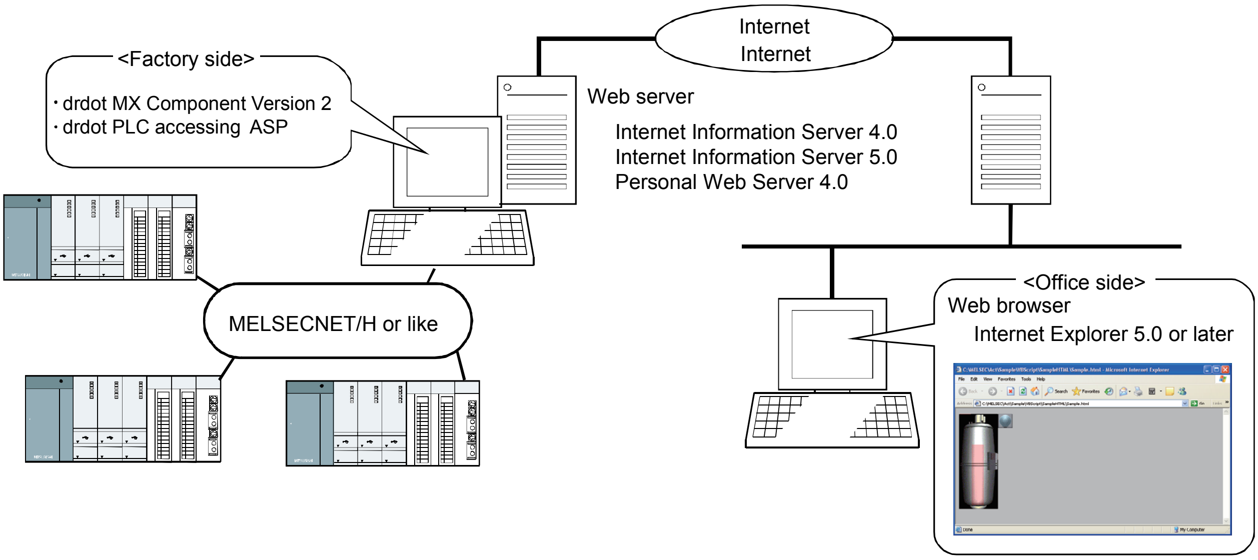
Using the text editor, you can create a graphical monitoring home page (HTML format).

You need not purchase Visual Basic®, Visual C++® or the like.


Monitoring using Internet Explorer
・MX Component V ersion 2
・W eb browser
Internet Explorer 5.0 or later
・HTML for PLC monitoring
MELSECNET/H or the like

2) Using ASP function for monitoring via Internet/intranet

Using the ASP function of VBScript to make public the Web pages on the factory side (the side which monitors data using the MX Component) enables the PLC device status or fault occurrence-time remote operation to be performed from a remote location or business destination via the Internet/intranet by merely designating the factory side URL on the Internet Explorer.

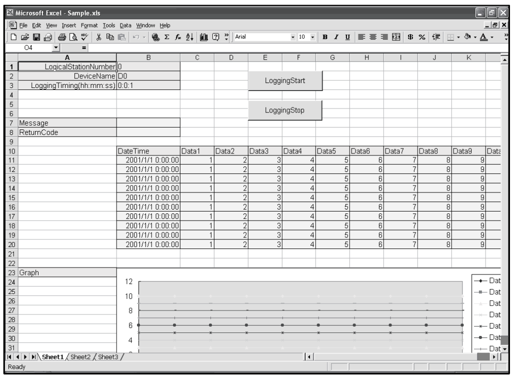

Internet
Internet
<Factory side>
・drdot MX Component Version 2
・drdot PLC accessing ASP
Web server
Internet Information Server 4.0
Internet Information Server 5.0
Personal Web Server 4.0
MELSECNET/H or like
<Office side>
Web browser
Internet Explorer 5.0 or later

(b) VBA-driven data collection and monitoring function

Programming using VBA (*1) allows Excel or Access functions to be utilized to create an application for providing a real-time graph display.

You can log the device data of the PLC and collect/save the device data in real time.

<Excel>

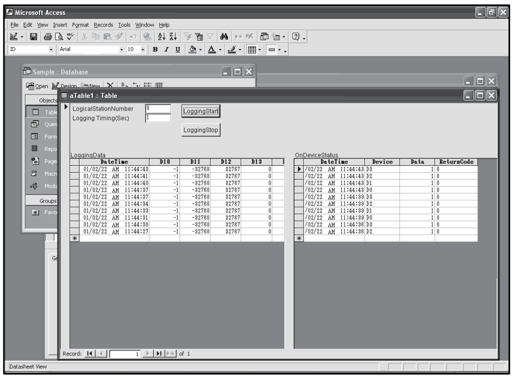


Microsoft Excel - Sample.xls

LogicalStationNumber	0	
DeviceName	D0	
LoggingTiming(hh:mm:ss)	0:0:1	
Message		
ReturnCode		

DateTime	Data1	Data2	Data3	Data4	Data5	Data6	Data7	Data8	Data9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9
2001/1/1 0:00:00	1	2	3	4	5	6	7	8	9

<Access>



Microsoft Access

aTable1 : Table

LogicalStationNumber 0

Logging Timing(Sec) 1

LoggingData

DateTime	D10	D11	D12	D13
01/02/22 AM 11:44:43	-1	-32768	32767	0
01/02/22 AM 11:44:41	-1	-32768	32767	0
01/02/22 AM 11:44:40	-1	-32768	32767	0
01/02/22 AM 11:44:37	-1	-32768	32767	0
01/02/22 AM 11:44:37	-1	-32768	32767	0
01/02/22 AM 11:44:34	-1	-32768	32767	0
01/02/22 AM 11:44:33	-1	-32768	32767	0
01/02/22 AM 11:44:31	-1	-32768	32767	0
01/02/22 AM 11:44:30	-1	-32768	32767	0
01/02/22 AM 11:44:27	-1	-32768	32767	0

OnDeviceStatus

DateTime	Device	Data	ReturnCode
/02/22 AM 11:44:43	D3	1	0
/02/22 AM 11:44:43	D2	1	0
/02/22 AM 11:44:43	D1	1	0
/02/22 AM 11:44:43	D0	1	0
/02/22 AM 11:44:39	D3	1	0
/02/22 AM 11:44:39	D2	1	0
/02/22 AM 11:44:39	D1	1	0
/02/22 AM 11:44:39	D0	1	0
/02/22 AM 11:44:36	D3	1	0
/02/22 AM 11:44:36	D2	1	0

*1 Common macro language to each application of Microsoft®

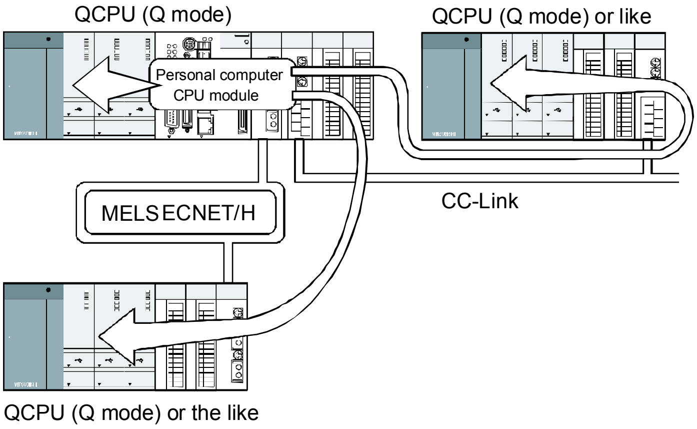
(10) Compatibility with multi-CPU system of QCPU (Q mode)

Making the communication setting utility or the ACT control property enables the access to the multi-CPU system.

(11) Operability on PLC CPU module

The Q series bus communication from the PLC CPU module enables the access to the QCPU (Q mode) on the same base.

Using the MELSECNET/H communication control and the CC-Link communication control enables the access to other stations via the MELSECNET/H module or the CC-Link module controlled by the PLC CPU module.



Appendix 2.2 Function List

The following shows the function list of the MX Component.
(1) to (4) indicate the details of the functions used in this textbook.
For details of the other functions, refer to the MX Component Version 3 Programming manual.

Function	Description
Open	Opens a communication line. Refer to (1)
Close	Closes a communication line. Refer to (2)
ReadDeviceBlock	Batch-reads data from devices.
WriteDeviceBlock	Batch-writes data to devices.
ReadDeviceRandom	Randomly reads data from devices. Refer to (3)
WriteDeviceRandom	Randomly writes data to devices. Refer to (4)
SetDevice	Sets one device.
GetDevice	Acquires the data of one device.
ReadBuffer	Reads from buffer memory.
WriteBuffer	Writes to buffer memory.
GetClockData	Reads clock data from the PLC CPU.
SetClockData	Writes clock data to the PLC CPU.
GetCpuType	Reads a PLC CPU type.
SetCpuStatus	Remote RUN/STOP/PAUSE of the PLC CPU
EntryDeviceStatus	Registers device status monitor.
FreeDeviceStatus	Deregisters device status monitor.
OnDeviceStatus	Announces event.

(1) Open (Open of communication line)

(a) Function

Opens a communication line.

(b) Format

Visual Basic®, Visual C++®, VBA: lRet = object.Open()

Long	lRet	Return value	Output

VBScript: varRet = object.Open()

VARIANT	varRet	Return value (The contents are LONG type.)	Output

(c) Description

Connects the lines based on the setting value for the property for Open method.

(d) Return value

Normal completion : Returns 0.
Abnormal completion : Returns other than 0. (Refer to Appendix 2.3)

POINT

(1) Even if changing the property for Open method after the Open completion, the communication target is not changed.
When changing the communication setting, set the communication target after closing a communication line once, and reopen the communication line.

(2) When carrying out the Open, the Open may be normally completed even if inputting the CPU of which type is different from that of the CPU communicaing to the property ActCpuType.
In such a case, the connectable range and the range of available methods and devices are narrowed.
When carrying out the Open, set the correct CPU type to the property ActCpuType.

(2) Close (Close of communication line)

(a) Usable ACT control

Usable for all ACT controls.

(b) Function

Closes a communication line.

(c) Format

Visual Basic®, Visual C++®, VBA: lRet = object.Close()

Long	lRet	Return value	Output

VBScript: varRet = object.Close()

VARIANT	varRet	Return value (The contents are LONG type.)	Output

(d) Description

Closes a line connected with the Open function.

(e) Return value

Normal completion : Returns 0.
Abnormal completion : Returns other than 0. (Refer to Appendix 2.3)

(3) ReadDeviceRandom (Random read of devices)

(a) Usable ACT control
Usable for all ACT controls.

(b) Function
Randomly reads devices.

(c) Format
Visual Basic®, VBA : lRet = object.ReadDeviceRandom(szDeviceList, lSize, lData(0))

Long	lRet	Return value	Output
String	szDeviceList	Device name	Input
Long	lSize	Number of read points	Input
Long	lData(n)	Read device value	Output

Visual C++®: lRet = object.ReadDeviceRandom(szDeviceList, lSize, *lplData)

Long	lRet	Return value	Output
CString	szDeviceList	Device name	Input
Long	lSize	Number of read points	Input
Long	*lplData	Read device value	Output

VBScript: varRet = object.ReadDeviceRandom(varDeviceList, varSize, lpvarData)

VARIANT	varRet	Return value (The contents are LONG type.)	Output
VARIANT	varDeviceList	Device name (The contents are character string type.)	Input
VARIANT	varSize	Number of read points (The contents are LONG type.)	Input
VARIANT	lpvarData	Read device value (The contents are LONG type.)	Output

(d) Description
- Reads the devices designated at szDeviceList (varDeviceLicst) by only the device values for lSize (varSize).
- The read device values are stored in lData (lplData or lpvarData).
- Partition the character strings designated to the device list by breaking symbols.
  The breaking symbols are not necessary after the last device.
  (Examples)
  Visual Basic®, VBA, VBScript : "D0" & vbLf & "D1" & vbLf & "D2"
  Visual C++® : D0\nD1\nD2
- Ensure the strings longer than lsize (varSize) for lData (lplData or lpvarData).

(e) Device designation

The following explains how to designate devices.

(Example 1) When designating as follows (three device points)

When using Visual Basic®, VBA, VBScript : M0 & vbLf & D0 & vbLf & K8M0

When using Visual C++® : M0\nD0\nK8M0

Higher 2 bytes	Lower 2 bytes
*1	M0
*1	D0
M16 to M31*2	M0 to M15*2

(Example 2) When designating the devices including CN200 or later of FXCPU (total of three points) *3

When using Visual Basic®, VBA, VBScript : D0 & vbLf & CN200 & vbLf & D1

When using Visual C++® : D0\nCN200\nD1

Higher 2 bytes	Lower 2 bytes
*1	D0
H of CN200	L of CN200
*1	D1

(Example 3) When designating the devices including FD (Total of 3 device points)

When using Visual Basic®, VBA, VBScript : D0 & vbLf & FD0 & vbLf & D1

When using Visual C++® : D0\nFD0\nD1

Higher 2 bytes	Lower 2 bytes
*1	D0
*1	LL of FD
*1	D1

*1: Not used (0 is stored.)

*2: Stored from the lower bit, in the order of device No.

*3: In CN200 or later of FXCPU, the data are randomly read by two words as 1 point.

(f) Return value

Normal completion : Returns 0.

Abnormal completion : Returns other than 0. (Refer to Appendix 2.3)

POINT

(1) Max. read points that can be designated in lSize (varSize) are 0x7FFFFFFF.

(2) For lData (lplData or lpvarData), ensure the memory area by points designated in lSize (varSize).

When there are no memory areas, a serious error such as an application error may occur.

(4) WriteDeviceRandom (Random write of devices)

(a) Usable ACT control
Usable for all ACT controls.

(b) Function
Randomly writes devices.

(c) Format
Visual Basic®, VBA: lRet = object.WriteDeviceRandom(szDeviceList, lSize, lData(0))

Long	lRet	Return value	Output
String	szDeviceList	Device name	Input
Long	lSize	Number of write points	Input
Long	lData(n)	Device value to be written	Input

Visual C++®: lRet = object.WriteDeviceRandom(szDeviceList, lSize, *lplData)

Long	lRet	Return value	Output
CString	szDeviceList	Device name	Input
Long	lSize	Number of write points	Input
Long	*lplData	Device value to be written	Intput

VBScript: varRet = object.WriteDeviceRandom(varDeviceList, varSize, varData)

VARIANT	varRet	Return value (The contents are LONG type.)	Output
VARIANT	varDeviceList	Device name (The contents are character string type.)	Input
VARIANT	varSize	Number of write points (The contents are LONG type.)	Input
VARIANT	varData	Device value to be written (The contents are LONG type.)	Intput

(d) Description
- Writes the devices designated at szDeviceList (varDeviceLicst) by only device values for lSize (varSize).
- The device values to be written are stored in lData (lplData or varData).
- Partition the character strings designated to the device list by breaking symbols.
  The breaking symbols are not necessary after the last device.
  (Examples)
  Visual Basic®, VBA, VBScript : "D0" & vbLf & "D1" & vbLf & "D2"
  Visual C++® : D0\nD1\nD2
- Ensure the strings longer than Isize (varSize) for lData (lplData or varData).

(e) Device designation

The following explains how to designate devices.

(Example 1) When designating as follows (three device points)

When using Visual Basic®, VBA, VBScript : M0 & vbLf & D0 & vbLf & K8M0
When using Visual C++® : M0\nD0\nK8M0

Higher 2 bytes	Lower 2 bytes
*1	M0
*1	D0
M16 to M31*2	M0 to M15*2

(Example 2) When designating the devices including CN200 or later of FXCPU (total of three points) *3

When using Visual Basic®, VBA, VBScript : D0 & vbLf & CN200 & vbLf & D1
When using Visual C++® : D0\nCN200\nD1

Higher 2 bytes	Lower 2 bytes
*1	D0
H of CN200	L of CN200
*1	D1

(Example 3) When designating the devices including FD (Total of 3 device points)

When using Visual Basic®, VBA, VBScript : D0 & vbLf & FD0 & vbLf & D1
When using Visual C++® : D0\nFD0\nD1

Higher 2 bytes	Lower 2 bytes
*1	D0
*1	LL of FD
*1	D1

*1: Not used (0 is stored.)

*2: Stored from the lower bit, in the order of device No.

*3: In CN200 or later of FXCPU, the data are randomly read by two words as 1 point.

(f) Return value

Normal completion: Returns 0.

Abnormal completion: Returns other than 0. (Refer to Appendix 2.3)

POINT

(1) Max. write points that can be designated in lSize (varSize) are 0x7FFFFFFF.

(2) For lData (lplData or varData), ensure the memory area by points designated in lSize (varSize).
When there are no memory areas, a serious error such as application error may be generated.

Appendix 2.3 Error code List

The following explains the error codes to be returned by the ACT control and by the PLC CPU, intelligent function module, network board when using the MX Component.

(1) Error code to be returned by ACT control
The following indicates the error code to be returned by ACT control.

Error code	Description of error	Corrective action
0x00000000	Normal completion	—
0x01010002	Disabled error during RUN Operation that should not be operated during RUN was executed.	Execute after changing to the STOP status. *1
0x01010005	Sum check error Sum check of packet is error.	Check the system noise.
0x01010010	PLC No. error Communication cannot be carried out with the designated station No.	Check the designated station No. in the communication setting utility. Check the station No. designated at ActStationNumber.
0x01010013	Other data error Communication cannot be carried out for some reason.	Confirm that the configuration of system is not the one without support. Confirm that the correct CPU type is set. Complete a program and restart the DOS/V personal computer. Contact with a call center of Mitsubishi Electric Corporation.
0x01010018	Remote request error Executing the remote operation via the separate path from the one communicating.	Cancel the remote operation executing via the separate path.
0x01010020	Link error Link communication cannot be carried out.	Confirm that the reset operation is not carried out to the communication target, control station (master station) or the station passed by routing. Confirm that the network parameter is set correctly.
0x01800001	No command error	Not supported by the corresponding method.
0x01800002	Memory lock error	Complete a program and restart the DOS/V personal computer.
0x01800003	Memory secure error	Complete a program and restart the DOS/V personal computer. Complete other programs and secure a free memory.
0x01800004	DLL load error	Complete a program and restart the DOS/V personal computer. Complete other programs and secure a free memory. Reinstall the MX Component.
0x01800005	Resource secure error	Complete a program and restart the DOS/V personal computer. Complete other programs and secure a free memory.
0x01801002	Multiple lines open error	Complete a program and restart the DOS/V personal computer.
0x01801003	Open not executed	Complete a program and restart the DOS/V personal computer.
0x01801005	Designated port error	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x01801006	Designated module error	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.

*1: For using the network board, a timeout error may occur. Check the cable status.

Error code	Description of error	Corrective action
0x01801007	Designated CPU error	Check the station No. designated at ActCpuType. Confirm that the configuration of system is not the one without support. Complete a program and restart the DOS/V personal computer. Reinstall the MX Component. Check the packet type designated at ActPacketType.
0x01801008	Target station access error	Review the target station.
0x0180100C	Registry search failure	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x0180100D	GetProcAddress failure	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x0180100E	Not DLL load error	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x0180100F	Other object executing The method cannot be carried out during exclusive control.	Take some time and carry it out again.
0x01802001	Device error The device character string designated in a method is unauthorized.	Review the device name.
0x01802002	Device No. error The device character string No. designated in a method is unauthorized.	Review the device No.
0x01802004	Sum check error Sum check value of data received is error.	Check the sum check setting on the module side. Check the property for sum check of control. Check a cable. Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x01802005	Size error The points designated in a method are unauthorized.	Check the points designated in the method. Review the systems such as the PLC CPU, module setting and cable status. Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x01802006	Block No. error The block designated No. of device character string designated in a method is unauthorized.	Review the block designated No. of device character string designated in the method.
0x01802007	Receive data error The received data is error.	Review the systems such as the PLC CPU, module setting and cable status. Check a cable. Complete a program and restart the DOS/V personal computer.
0x0180200B	PLC type mismatch The CPU types set in property and in the communication setting utility are mismatched with that of communication target CPU.	Set the correct CPU type in the property. Set the correct CPU type in the communication setting utility. Review the systems such as the PLC CPU, module setting and cable status.

Error code	Description of error	Corrective action
0x01802016	Station No. designation error The method does not support the operation for the designated station No.	Review the station No.
0x0180201C	Write clock data error As the designated write clock data is error, the data cannot be correctly written.	Review the write clock data.
0x0180201D	Write clock data error during RUN Writing the clock data has failed. For the PLC CPU being RUN, the clock data cannot be written.	Change the PLC CPU to the STOP status.
0x01802020	Starting I/O No. error The starting I/O No. designated in a method is unauthorized.	Check the starting I/O No. designated in the method. Check the PLC CPU parameter (I/O assignment) with the GPP function. Complete a program and restart the DOS/V personal computer.
0x01802021	Starting address error The buffer address designated in a method is unauthorized.	Check the buffer address value designated in the method. Complete a program and restart the DOS/V personal computer.
0x01802038	Clock data read/write error The clock data read/write method is executed for the PLC CPU without the clock element.	Do not execute the clock data read/write.
0x01808001	Double open error	Complete a program and restart the DOS/V personal computer.
0x01808002	Channel No. designation error The port Nos. that has set a property and is set in the communication setting utility are unauthorized.	Set the correct value in the port No. of property. Perform the communication setting in the communication setting utility again.
0x01808003	Driver not started The driver of network board is not started.	Start the driver.
0x01808005	MUTEX generation error MUTEX generation for exclusive control has failed.	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x01808007	Socket object generation error The generation of Socket object has failed.	Confirm that the application using the same port No. is started. Retry the generation after changing the port No. of property. Retry the generation after changing the port No. in the communication setting utility. Set the Ethernet board and protocol in the control panel of OS. Complete a program and restart the DOS/V personal computer.
0x01808008	Port connection error Establishment of connection has failed. Communication target has not responded.	Review the IP address and port No. of property. Review the port No. in the communication setting utility. Review the systems such as the PLC CPU, module setting and cable status. Complete a program and restart the DOS/V personal computer.

Error code	Description of error	Corrective action
0x01808009	COM port handle error The handle of COM port cannot be acquired. The COM port object cannot be copied. The SOCKET object cannot be copied.	Confirm that there is no application using the COM port. Complete a program and restart the DOS/V personal computer.
0x0180800A	Buffer size setting error The buffer size setting of the COM port has failed.	Confirm that there is no application using the COM port. Set the COM port in the control panel of the OS. Complete a program and restart the DOS/V personal computer.
0x0180800B	DCB value acquisition error Acquiring the DCB value of the COM port has failed.	Confirm that there is no application using the COM port. Set the COM port in the control panel of the OS. Complete a program and restart the DOS/V personal computer.
0x0180800C	DCB setting error Setting the DCB value of COM port has failed.	Confirm that there is no application using the COM port. Set the COM port in the control panel of the OS. Complete a program and restart the DOS/V personal computer.
0x0180800E	Shared memory open error The open processing of the shared memory has failed.	Confirm that the GX simulator is started. Complete a program and restart the DOS/V personal computer.
0x0180800D	Timeout value setting error Setting the timeout value of the COM port has failed.	Review the timeout value of property. Review the timeout value in the communication setting utility. Confirm that there is no application using the COM port. Set the COM port in the control panel of the OS. Complete a program and restart the DOS/V personal computer.
0x01808101	Double close error	Complete a program and restart the DOS/V personal computer.
0x01808102	Handle close error The handle close of the COM port has failed.	Complete a program and restart the DOS/V personal computer.
0x01808103	Driver close error The handle close of the driver has failed.	Complete a program and restart the DOS/V personal computer.
0x01808201	Send error Sending a data has failed.	Review the systems such as the PLC CPU, module setting and cable status. Set the COM port in the control panel of the OS. Set the Ethernet board and protocol in the control panel of the OS. Complete a program and restart the DOS/V personal computer.
0x01808202	Send data size error Sending a data has failed.	Complete a program and restart the DOS/V personal computer.
0x01808203	Queue clear error The queue clear of the COM port has failed.	Complete a program and restart the DOS/V personal computer. Execute the Close, then execute the Open again
0x01808301	Receive error Receiving a data has failed.	Review the systems such as the PLC CPU, module setting and cable status. Review the timeout value of the property. Review the timeout value in the communication setting utility. Complete a program and restart the DOS/V personal computer.

Error code	Description of error	Corrective action
0x01808304	Insufficient size of the receive buffer The receive data is greater than the data provided by a system.	Complete a program and restart the DOS/V personal computer.
0x01808401	Control error The communication control of the COM port has failed.	Complete a program and restart the DOS/V personal computer.
0x01808403	Signal line designation error Changing the communication control of the COM port has failed.	Complete a program and restart the DOS/V personal computer.
0x01808404	Open not executed	Execute the open. Complete a program and restart the DOS/V personal computer.
0x01808405	Communication parameter error The combination of data and the stop bit of property is unauthorized.	Review the data and the stop bit value of the property. Reset it in the communication setting utility.
0x01808406	Baudrate value designation error The baudrate of the property is unauthorized.	Review the baudrate value of the property. Reset it in the communication setting utility.
0x01808407	Data length error The data bit value of the property is unauthorized.	Review the data bit value of the property. Reset it in the communication setting utility.
0x01808408	Parity designation error The parity value of the property is unauthorized.	Review the parity value of the property. Reset it in the communication setting utility.
0x01808409	Stop bit designation error The stop bit value of property is unauthorized.	Review the stop bit value of the property. Reset it in the communication setting utility.
0x0180840A	Communication control setting error The control value of property is unauthorized.	Review the control value of the property. Reset it in the communication setting utility.
0x0180840B	Timeout error Though a timeout time has passed, the data cannot be received.	Review the timeout value of the property. Reset it in the communication setting utility. Review the systems such as the PLC CPU, module setting and cable status. Execute the Close, then execute the Open again Complete a program and restart the DOS/V personal computer.
0x0180840C	Connect error	Complete a program and restart the DOS/V personal computer.
0x0180840D	Double connect error	Complete a program and restart the DOS/V personal computer.
0x0180840E	Attach failure The attachment of Socket object has failed.	Complete a program and restart the DOS/V personal computer.
0x0180840F	Signal line status acquisition failure Acquiring the signal line status of the COM port has failed.	Complete a program and restart the DOS/V personal computer.
0x01808410	CD signal line OFF The CD signal of the communication target is the OFF status.	Review the systems such as the PLC CPU, module setting and cable status. Complete a program and restart the DOS/V personal computer.
0x01808411	Password mismatch error	Check the remote password of the property.
0x01808501	USB driver load error The USB driver load has failed.	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.

Error code	Description of error	Corrective action
0x01808502	USB driver connection error The USB driver connection has failed.	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x01808503	USB driver send error Sending the data has failed.	Review the systems such as the PLC CPU, module setting and cable status. Set the USB setting in the control panel of OS (device manager). Complete a program and restart the DOS/V personal computer.
0x01808504	USB driver receive error Receiving the data has failed.	Review the systems such as the PLC CPU, module setting and cable status. Set the USB setting in the control panel of the OS (device manager). Complete a program and restart the DOS/V personal computer.
0x01808506	USB driver initialization error The USB driver initialization has failed.	Set the USB setting in the control panel of the OS (device manager). Complete a program and restart the DOS/V personal computer.
0x01808507	Other USB errors An error relating to the data transmission has occurred.	Connect a line again after unplugging a cable once. Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x04000001	No command error The designated CPU type cannot process.	Check the station No. designated at ActCpuType. Confirm that the configuration of system is not the one without support. Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x04000004	Internal server DLL load error The start of the internal server has failed.	Confirm that the install file of the MX Component is not deleted or moved. Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x10000002	The start of the MX Component communication DLL has failed.	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x10000003	The Open has failed. (DiskDrive)	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x10000004	Double Open error	Complete a program and restart the DOS/V personal computer.
0x1000000C	Execution has failed for the other applications or threads executing requests.	Take some time and carry it out again. Program following the multithread rules of COM and ActiveX. Complete a program and restart the DOS/V personal computer.
0x10000011	Memory secure error	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0x10000012	Open not executed	Complete a program and restart the DOS/V personal computer.
0x10000017	The designated size (number of devices) is unauthorized.	Check the points designated in the method. Complete a program and restart the DOS/V personal computer.
0x10000018	No registered devices	Complete a program and restart the DOS/V personal computer.
0x1000001E	Searching registry has failed.	Complete a program and restart the DOS/V personal computer. Complete the other programs and secure a free memory. Reinstall the MX Component.
0x10000032	Designated device error	Review the contents of designated device. Complete a program and restart the DOS/V personal computer. Complete the other programs and secure a free memory.

Error code	Description of error	Corrective action
0x10000033	Designated device range error	Review the contents of the designated device. Complete a program and restart the DOS/V personal computer. Complete the other programs and secure a free memory.
0x10000040	The server start has failed.	Complete a program and restart the DOS/V personal computer.
0xF0000001	No license error A license is not provided to the DOS/V personal computer.	Provide a license to the DOS/V personal computer by the license key FD.
0xF0000002	Setting data read error Reading the setting data of the logical station No. has failed.	Designate the correct logical station No. Set the logical station No. in the communication setting utility.
0xF0000003	Already opened error The Open method is executed in the open status.	When changing the communication target CPU, execute the Open method after executing the Close.
0xF0000004	Not open error The Open method is not executed.	Execute the appropriate method after executing the Open method.
0xF0000005	Initialization error Initializing an object held in the MX Component has failed.	Complete a program and restart the DOS/V personal computer. Reinstall the MX Component.
0xF0000006	Memory secure error Securing the MX Component internal memory has failed.	Complete a program and restart the DOS/V personal computer. Complete the other programs and secure a free memory.
0xF0000007	Function not supported error Not supported by the corresponding method.	Not supported by the corresponding method.
0xF1000001	Character code conversion error Conversion of character code (UNICODE → ASCII code or ASCII code → UNICODE) has failed.	Check the character string designated in the method. The ASCII character string acquired from the PLC CPU is error. Review the systems such as the PLC CPU, module setting and cable status. Complete a program and restart the DOS/V personal computer. Retry the GetCpuType method.
0xF1000002	Starting I/O No. error The starting I/O No. designated is unauthorized. There is no starting I/O No. matched.	Check the starting I/O No. designated in the method. Check the PLC CPU parameter (I/O assignment) with the GPP function.
0xF1000003	Buffer address error The buffer address designated is unauthorized. The buffer address is out of range.	Check the buffer address value designated in the method.
0xF1000004	Buffer read size error Acquiring the designated size after reading a buffer has failed.	Execute the Open processing again. Review the systems such as the PLC CPU, module setting and cable status. Retry it. Complete a program.

Error code	Description of error	Corrective action
0x1000005	Size error The size designated in the read/write method is error. The read/write starting + size is over the area of device or buffer.	Check the size designated in the method.
0xF1000006	Operation error The operation with remote operation is unauthorized value.	Check the designated value of the operation designated in the method.
0xF1000007	Clock data error The clock data has an error.	Check the clock data designated in the method. Set the correct clock data to the clock data of the PLC CPU.
0xF1000008	Monitoring device registered counts over The device points registered in EntryDeviceStatus method is less than 0 point. The device points registered in EntryDeviceStatus method is more than 20 points.	Register the device points as more than 1 point and less than 20 points in EntryDeviceStatus method.
0xF1000009	Monitoring device data already registered error	Execute the EntryDeviceStatus method again after canceling the registration in the FreeDeviceStatus method.
0xF1000010	Starting the device status monitor processing has failed. Completing the device status monitor processing has failed.	Execute the start/end of the device status monitor processing in the EntryDeviceStatus() method.
0xF1000011	The data type of the VARIAN argument is wrong.	Review the data type designated in the VARIAN argument. • Check that the size of string variable is sufficient. • Confirm that the data type designated in each method is set.
0xF1000012	The range of device monitor status interval time is other than 1 sec. to 1 hrs. (1 to 3600).	Designate the device status monitor time as a value from 1 to 3600.
0xFF000001	MX Component trial version error The MX Component trial version has expired.	Uninstall the MX Component trial version. Then install the release to manufacture or the trial version again.

(2) Error codes returned from PLC CPU, intelligent function module and network board.
The following explains the error codes returned from the PLC CPUs, intelligent function modules or network boards.

POINT

The error codes may not be returned as described in "(a) Error code list."
Before referring to "(a) Error code list", read "(b) Precautions for error code confirmation."

(a) Error code list
When an error is detected by the PLC CPU, intelligent function module or network board, the following error code is returned.
The higher two bytes indicate an error detection module, and the lower two bytes indicate the error code returned from the module where the error is detected.
For details of errors, refer to the manuals of the PLC CPU, intelligent function module or network board corresponding to error codes.

Error Code	Error detection module
0x01010000 to 0x0101FFFF *1	QCPU (A mode), ACPU, Motion controller CPU
0x01020000 to 0x0102FFFF *1	QnACPU
0x01030000 to 0x0103FFFF *1	C24
0x01040000 to 0x0104FFFF *1	QC24(N)
0x01050000 to 0x0105FFFF *1	E71
0x01060000 to 0x0106FFFF *1	QE71
0x01070000 to 0x0107FFFF *1	MELSECNET/H board, MELSECNET/10 board, MELSECNET(II) board, CC-Link board, CPU board and AF board
0x01090000 to 0x0109FFFF *1	FXCPU
0x010A0000 to 0x010AFFFF *1	QCPU (Q mode)
0x010B0000 to 0x010BFFFF *1	Q series compatible C24
0x010C0000 to 0x010CFFFF *1	Q series compatible E71
0x010D0000 to 0x010DFFFF *1	PLC CPU module

*1: Refer to "POINT".

(b) Precautions for error code confirmation
The following describes the precautions for error code confirmation returned from the PLC CPU, intelligent function module or network board.
1) Property setting error
When the system configuration does not match with the property value setting, the higher two bytes cannot indicate the correct error detection module.
For example, when the ACPU's property value is set to ActCpuType in the QCPU (Q mode), the higher two bytes may indicate the ACPU as an error detection module.
In such a case, communicate again after confirming the system configuration and all the property value settings.
In addition, when using the ActMulti or ActMLMulti control, confirm the setting of the communication setting utility.

2) When using AJ71E71, AJ71QE71

If the lower two bytes error code that is occurred during the E71 and QE71 communications are not listed in the E71 and QE71 manuals, check that the DIP switches (SW2) at the front of the E71 and QE71 modules match with the value setting of the property ActPacketType.

If the DIP switch is not correctly set, the packet format (ASCII/binary) has changed. Therefore, the error codes returned from the module cannot be correctly identified.

3) When accessing to other stations

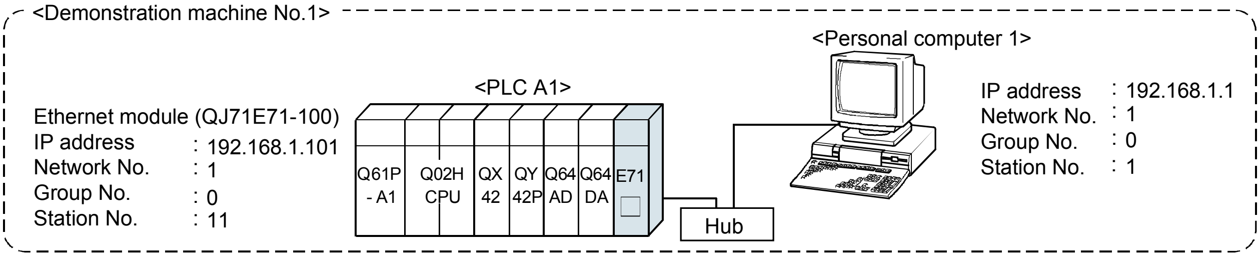
When accessing to other stations, the error codes of the relay module (MELSECNET/H, MELSECNET/10, MELSECNET(II), CC-Link, computer link, and Ethernet module) may set in the lower two bytes.

In such a case, the higher two bytes that indicate an error detection module does not necessarily match with the module where an error occurred. Therefore, confirm the system configuration and refer to the manuals of the CPU, relay network module and network board, which are being used.

Appendix 3 Connecting GX Developer to PLC CPU via Ethernet

This section describes how to operate GX Developer to access a PLC CPU via an Ethernet module where GX Developer is directly connected (called Ethernet connection) .

In this section, the connection topology shown in Assignment I will be changed to the one using Ethernet connection, as an example.



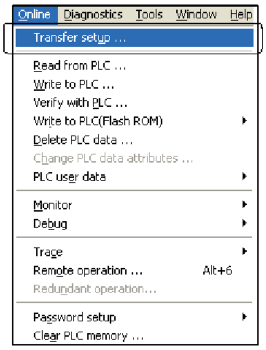
POINT

(1) The Ethernet parameters must be saved (written) to the PLC CPU of the destination station, where the Ethernet module is mounted, before the Ethernet connection.
Write the parameters to the PLC CPU referring to Section 5.2.1 to 5.2.4. (RS-232 connection)

(2) For accessing the other stations (*1), relevant parameters for the MELSECNET/H and MELSECNET/10 relay communication function should be set in the PLC CPUs of the request source station (PLC A1), communication relay station and request destination station (access station).
Set the required parameters to the related PLC CPUs referring to the Q Corresponding Ethernet Interface Module User's Manual (Application).
*1 The above figure shows the access to the PLC CPU on another Ethernet or on the MELSECNET/H via PLC A1.

1) Connect the GX Developer and Ethernet module to the Ethernet.

2) Click the [Online] → [Transfer setup] menu.

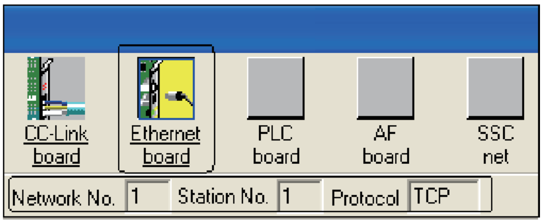


3) Select "Ethernet" of the PC side I/F, and make the setting for the following items.

Network No. : 1

Station No. : Station No. of each personal computer (1 to 5)

Protocol : TCP



Network No. 1 Station No. 1 Protocol TCP

4) Select "Ethernet module" of the PLC side I/F, and make the settings for the following contents.

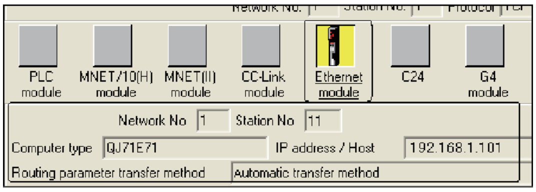
Computer type : QJ71E71

Network No. : 1

Station No. : Station No. of each demonstration machine (11 to 15)

IP address/Host : Set IP address of each demonstration machine(192.168.1.101 to 192.168.1.105)

Routing parameter transfer method: Automatic transfer method (Automatic response system)



Network No 1 Station No 11

Computer type QJ71E71 IP address / Host 192.168.1.101

Routing parameter transfer method Automatic transfer method

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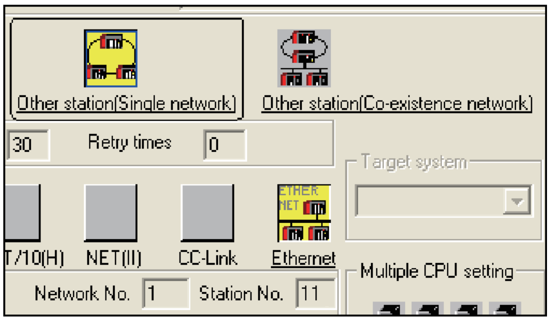
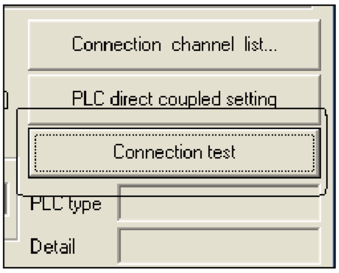
⇩



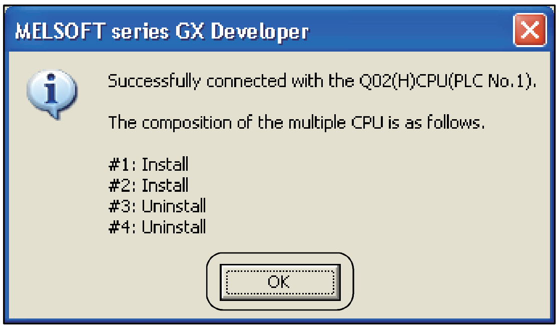
5) Select "Other station (Single network)".

⇩



6) Click the Connection test button to execute the connection test.

⇩



MELSOFT series GX Developer

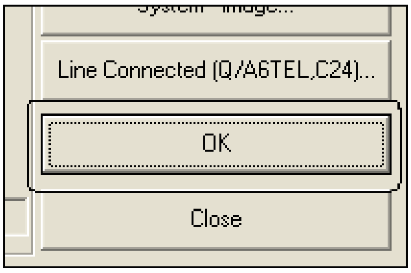
Successfully connected with the Q02(H)CPU(PLC No.1).

The composition of the multiple CPU is as follows.

#1: Install
#2: Install
#3: Uninstall
#4: Uninstall

7) When a connection is successfully made with the PLC CPU, the screen on the left will be displayed. Click the OK button to close the screen.

⇩



8) Click the OK button.
The connection via Ethernet has been made.
The access to the PLC CPU is available.

Appendix 4 Troubleshooting

This section explains the contents of the errors that may occur during communications between the Ethernet module and an external device as well as the troubleshooting procedures.
The following shows the methods for checking whether there is an error on the Ethernet module side or not and the contents of the error.
Use one of the following methods to check whether there is an error or not and its content, then take corrective actions.

(1) Check using the display LED on the front of the Ethernet module (Refer to Appendix 4.1.)
The display LED on/off status can be used to check whether an error is occurring in the Ethernet module.

(2) Check through GX Developer
The GX Developer can be used to check various conditions of the Ethernet module as well as the error code corresponding to the contents of the currently occurring error and to perform tests.
 (a) Ethernet diagnostics (using the dedicated screen)
  1) Monitor for the status of various settings (Refer to Appendix 4.2.)
  2) PING test (Refer to Section 6.4.)
  3) Loop back test
  4) COM. ERR off (Refer to Appendix 4.1.2 and 4.2.1.)

 (b) System monitor (using the dedicated screen: Refer to Appendix 4.2.2.)
  1) Module's detailed information ····· Module status, error code, etc.
  2) H/W Information··························· LED on/off status, switch status, etc.

 (c) Buffer memory batch monitor
 The error code can be checked by monitoring the buffer memory of the Ethernet module.

(3) Check the contents of the error using the error code
The contents of the error can be checked using the error code confirmed on the above dedicated screen or by monitoring the buffer memory referring to the following manual.
Q Corresponding Ethernet Interface Module User's Manual (Basic)

POINT

For the troubleshooting flow for each error code and communication function of the Ethernet module, refer to the following manual.
Q Corresponding Ethernet Interface Module User's Manual (Basic)

REMARK

If line errors and other errors occur when connecting the devices of multiple manufacturers, the users need to isolate the malfunctioning parts using a line analyzer, etc.

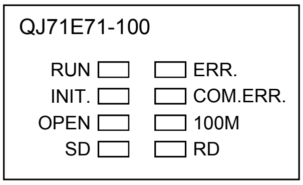
Appendix 4.1 How to Check Errors Using LED Displays

This section describes the errors that can be checked with the LED displays on the front of the Ethernet module.

Appendix 4.1.1 Checking error display

The following can be checked with the LED displays on the front of the Ethernet module.

<Ethernet module LED>



	LED name	Status to check	Cause/corrective action
1	[RUN]	Turns off after powering on the Ethernet module. (*1)	1) Watchdog timer error • When a watchdog timer (approximately 600 ms) error occurs, the watchdog timer error detection signal (X1F) is turned on by the self diagnosis function of the Ethernet module. 2) Ethernet module installation fault • Check if the power supply capacity (5VDC) of the power supply module is insufficient. • Turn off the power supply and reinstall the module.
2	[ERR.]	Turns on after powering on the Ethernet module. (*1)	1) Module parameter setting error • Check/correct the parameter setting values for the Ethernet module using the GX Developer. 2) PLC CPU error • When the PLC CPU's [RUN] LED is off/flashing, or the [ERR.] LED is on, check the content of the error occurring in the PLC CPU and correct the problem. • Check that the Ethernet module is installed on the Q mode PLC CPU. 3) Ethernet module error (H/W error)
3	[COM.ERR]	Turns on after powering on the Ethernet module.	1) Check the contents of the error using the error codes stored by the error detection of the following processing, and remove the causes. • Initial processing • Open processing • Fixed buffer send processing • Data communication processing • E-mail send/receive processing • Other processing (processing by which error codes are stored in the error log area)
4	[SD]	The [SD] LED does not flash at data sending.	1) [ERR.] or [COM.ERR.] LED turns on. • Remove the factors that turn on the [ERR.] or [COM.ERR.] LED. 2) Poor cable connection • Check the connection of the cable.(*2) 3) Program reviewing is required • Review the sequence program for sending.

(Continued to the next page)

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	LED name	Status to check	Cause/corrective action
5	[RD]	[RD] LED stays off and data cannot be received.	1) [ERR.] or [COM.ERR.] LED turns on. • Remove the factors that turn on the [ERR.] or [COM.ERR.] LED. 2) Poor cable connection • Check the connection of the cable.(*2) 3) Local station IP address setting error • If the cable connection is all right, review each setting value of the local station IP address, router setting, and sub-net mask settings using the GX Developer. 4) Program reviewing is required • Review the sequence program for sending.

*1 Conduct a hardware test (H/W test) and check whether or not the Ethernet module operates normally.
For details on the hardware test, refer to see Section 4.7.2.

*2 Conduct a PING test (confirmation of the completion for the initial processing) and check whether or not there is any problem in the cable connection and the Ethernet lines.
For details on the PING test, refer to Section 6.4.

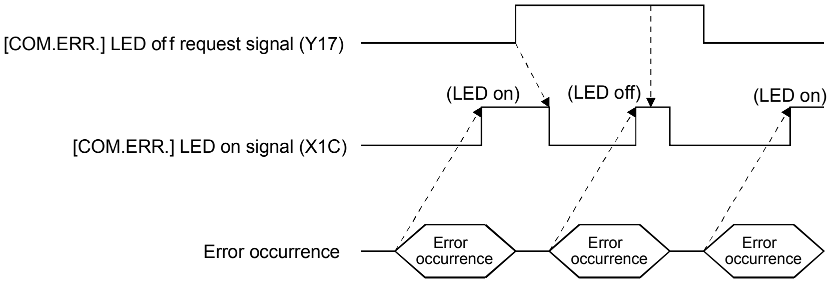
POINT

The on/off status of the [INIT.], [OPEN], [ERR.] and [COM.ERR.] LEDs is stored in the module status area (address: C8H) of the buffer memory.

Appendix 4.1.2 How to turn off COM.ERR. LED and to read/clear error information

This section explains how to turn off the [COM.ERR.] LED and to read/clear the error information using the sequence program.

(1) How to turn off [COM.ERR.] LED using input/output signals
The [COM.ERR.] LED on the front of the Ethernet module is turned on when a communication error occurs in an external device. (Input/output signal X1C: ON)
(a) The [COM.ERR.] LED is turned off by turning on the off request signal (Y17).



(b) The off request is processed continuously while the off request signal (Y17) is on.

(c) The error information in the error log area of the buffer memory is not cleared (deleted) by turning the off request signal (Y17) is on.

(2) How to turn off [COM.ERR.] LED on the "Ethernet diagnostics" screen of GX Developer (Refer to Appendix 4.2.1.)
(a) Clicking on the COM. ERR off button turns the [COM.ERR.] LED off.

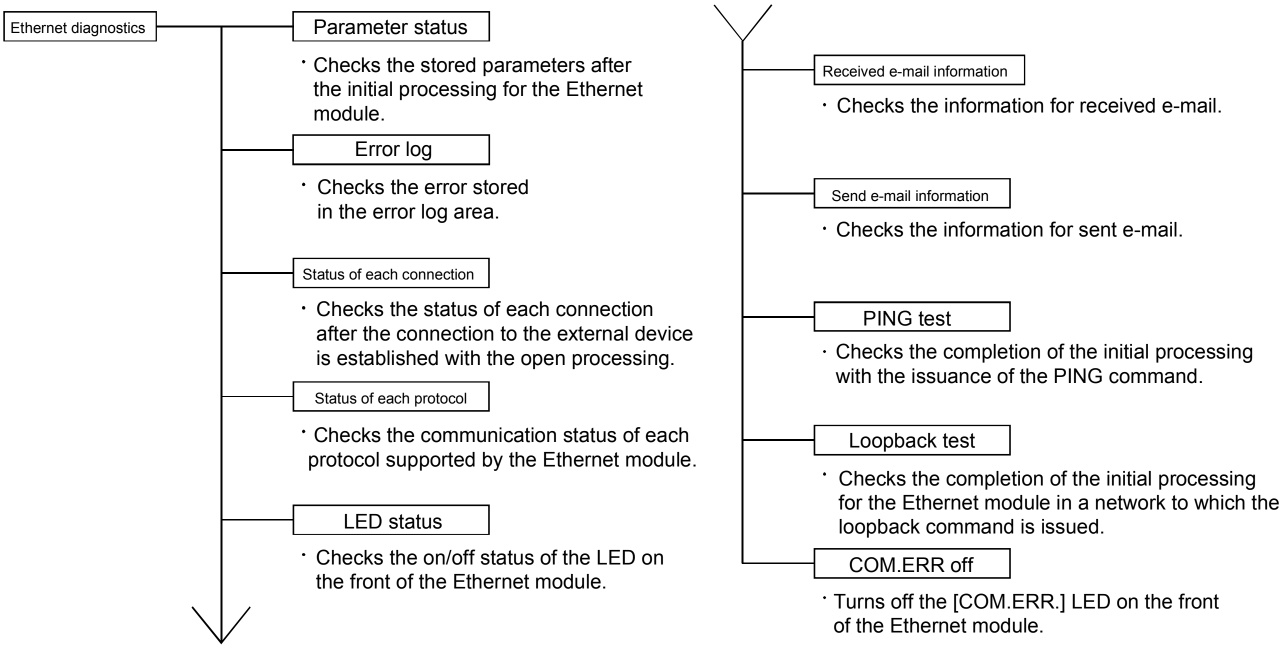
(b) The error information in the error log area of the buffer memory is not cleared (deleted).

(3) How to read/clear error information using the dedicated instructions
Error information can be read/cleared at arbitrary timing by using the following dedicated instructions.
(a) Dedicated ERRRD instruction
Using this instruction, initial abnormal code information or open abnormal code information can be read.
(b) Dedicated ERRCLR instruction
Using this instruction, it is possible to turn off the [COM.ERR.] LED and clear the initial abnormal code/open abnormal code or the error log.
* For the details of the dedicated instruction, refer to the following manual.
Q Corresponding Ethernet Interface Module User's Manual (Basic)

Appendix 4.2 How to Check an Error Through GX Developer

The status of the various settings for the Ethernet module can be checked using the GX Developer functions.
The following shows how to check the status.

(1) Ethernet diagnostics (Refer to Appendix 4.2.1)
The module status of the Ethernet module, parameter settings, communication status, error log and others can be checked using the Ethernet diagnostic function.
The following are the functions of the Ethernet diagnostics.



Ethernet diagnostics

Parameter status
- Checks the stored parameters after the initial processing for the Ethernet module.

Error log
- Checks the error stored in the error log area.

Status of each connection
- Checks the status of each connection after the connection to the external device is established with the open processing.

Status of each protocol
- Checks the communication status of each protocol supported by the Ethernet module.

LED status
- Checks the on/off status of the LED on the front of the Ethernet module.

Received e-mail information
- Checks the information for received e-mail.

Send e-mail information
- Checks the information for sent e-mail.

PING test
- Checks the completion of the initial processing with the issuance of the PING command.

Loopback test
- Checks the completion of the initial processing for the Ethernet module in a network to which the loopback command is issued.

COM.ERR off
- Turns off the [COM.ERR.] LED on the front of the Ethernet module.

(2) System monitor (Refer to Appendix 4.2.2)
The module status of an Ethernet module can be checked from the system monitor.

(a) Module's detailed information
The function version and error code can be checked.

(b) H/W information
The LED on/off status, connection status and parameter status of an Ethernet module can be checked.

(3) Buffer memory batch monitor
The buffer memory of an Ethernet module is monitored.

Appendix 4.2.1 Ethernet diagnostics

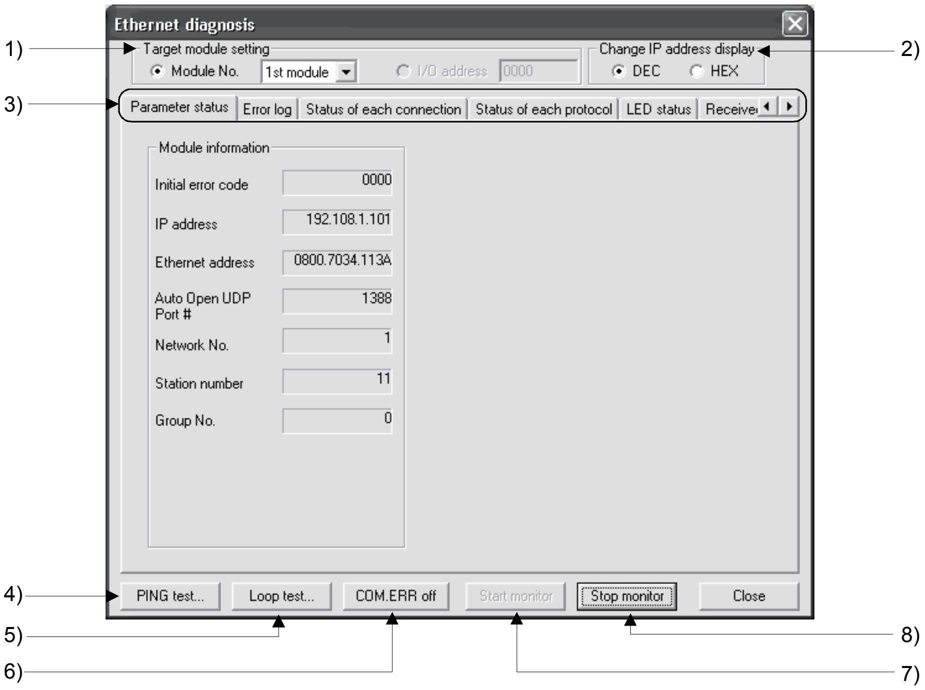
[Purpose]

The module status of the Ethernet module, parameter settings, communication status, error log and others can be checked using the Ethernet diagnostic function of the GX Developer.

[Operating procedure]

GX Developer → [Diagnostics] → Ethernet diagnostics

[Ethernet diagnostics screen]



Ethernet diagnosis

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

Change IP address display
● DEC ○ HEX

Module information

Initial error code	0000
IP address	192.108.1.101
Ethernet address	0800.7034.113A
Auto Open UDP Port #	1388
Network No.	1
Station number	11
Group No.	0

[Explanation of items]

No.	Item	Description	Setting range
1	Target module setting	Specifies the target Ethernet module for monitoring. * Number of cards for the MELSECNET/H module is not included.	Card 1 to Card 4
2	Change IP address display	Switches the IP address display between decimal and hexadecimal.	Decimal/hexadecimal
3	Selection from the various information monitors	Various types of information for the Ethernet module can be monitored.	—
4	PING test	Performs the PING test on the external device. (Refer to Section 6.4)	
5	Loop test	Performs the loop back test for the network.	
6	COM. ERR off	Clicking this button turns the [COM.ERR.] LED off. (Refer to Appendix 4.1.2))	
7	Start monitor	Clicking this button executes the Ethernet diagnostics. The display is updated during monitoring.	
8	Stop monitor	Clicking this button stops the Ethernet diagnostics. The display is retained while the monitoring is stopped.	

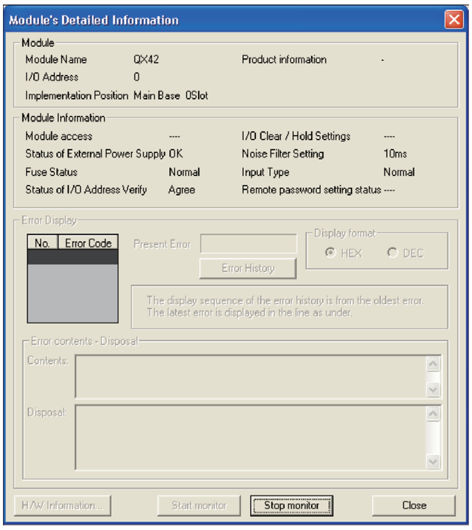
Appendix 4.2.2 System monitor

The module status of an Ethernet module can be checked from the system monitor.

(1) Checking the module status and error codes on the detailed module information screen for the diagnostic functions.

[Start Procedure]

GX Developer → [Diagnostics] → System monitor
→ Module's Detailed Information



Module's Detailed Information

Module

Module Name QX42

I/O Address 0

Implementation Position Main Base 0Slot

Product information -

Module Information

Module access ----

Status of External Power Supply OK

Fuse Status Normal

Status of I/O Address Verify Agree

I/O Clear / Hold Settings ----

Noise Filter Setting 10ms

Input Type Normal

Remote password setting status ----

Error Display

The display sequence of the error history is from the oldest error.
The latest error is displayed in the line as under.

[Displays]

- Module

  The following information is displayed:

  Module Name : Model name of the module installed

  I/O Address : Starting input/output signal number of the target module

  Implementation Position : Slot position where the module is mounted

  Module Information : Product information

  * The function version of the module is shown at the end of the product information.

  (Example) "B" at the end of the product information indicates a module of function version B.

- Module access

  Displays access permissions when the WDT error signal (X1F) is turned off.

- Status of I/O Address Verify

  Displays whether or not the module for which the user has set the parameters matches the installed module.

- Remote password setting status

  Displays the remote password setting status.

- Present Error

  Displays the error code of the latest error occurred.

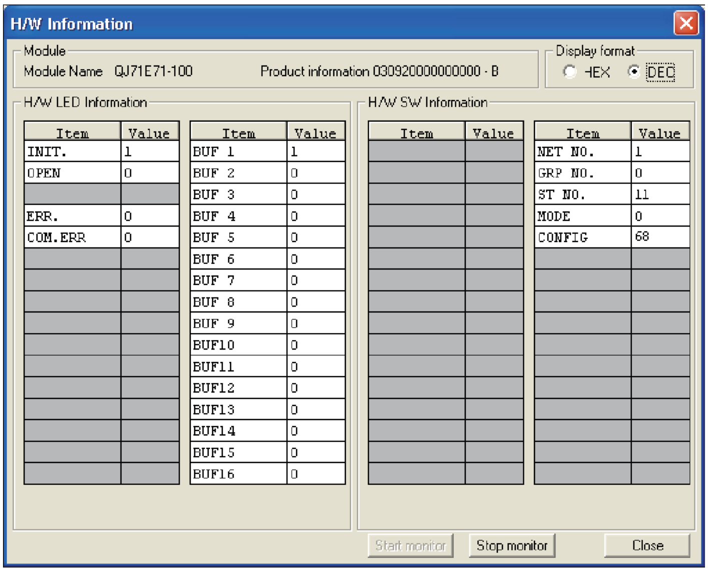
- Error Display

  Displays the error codes stored in the error log area (address: E5H, EEH …, 16CH) of the buffer memory.

(2) Checking the LED on/off status and operation mode number on the H/W information screen of the diagnostic functions

[Start Procedure]

GX Developer → [Diagnostics] → [System monitor]
→ Module's Detailed Information → H/W Information



H/W Information

Module
Module Name QJ71E71-100 Product information 030920000000000 - B

Display format ○ HEX ● DEC

H/W LED Information

Item	Value
INIT.	1
OPEN	0
ERR.	0
COM.ERR	0

Item	Value
BUF 1	1
BUF 2	0
BUF 3	0
BUF 4	0
BUF 5	0
BUF 6	0
BUF 7	0
BUF 8	0
BUF 9	0
BUF10	0
BUF11	0
BUF12	0
BUF13	0
BUF14	0
BUF15	0
BUF16	0

H/W SW Information

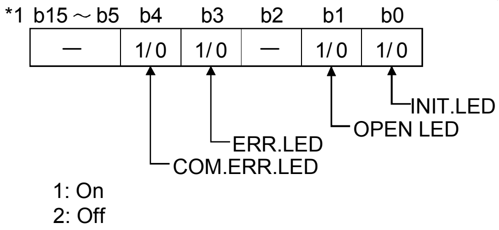
Item	Value

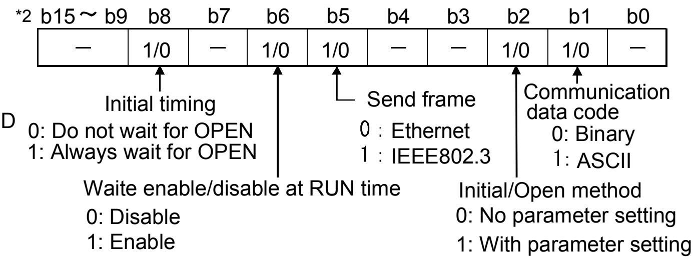
Item	Value
NET NO.	1
GRP NO.	0
ST NO.	11
MODE	0
CONFIG	68

[Displays]

This screen displays the Ethernet module information stored in the following areas of the buffer memory.

No.	Display content		Corresponding buffer memory	Address
1	H/W LED information left side (*1)		Storage area for the LED on/off status	C8H(200)
2	H/W LED information right side		Storage area for the connection status	5000H(20480)
1	H/W SW Information	NET No.	Local station network number/station number storage area	76H(118)
2		GRP No.	Local station group number storage area	77H(119)
3		ST No.	Local station network number/station number storage area	76H(118)
4		MODE	Switch status (operation mode setting) storage area	CAH(202)
5		CONFIG (*2)	Communication status storage area	CBH(203)





Appendix 5 DEDICATED INSTRUCTIONS

Dedicated instructions are used to simplify the programming for using the functions of the intelligent function module.
This section explains the dedicated instruction list for the Ethernet module that can be used by the QCPU and instructions used by sequence programs in this textbook.

Appendix 5.1 Dedicated Instruction List

The following table lists the dedicated instructions for Ethernet module.

Application		Dedicated instruction	Description	Reference section
For opening and closing connections		OPEN	Executes the open processing of the connection.	Appendix 5.2
		CLOSE	Executes the close processing of the connection.	Appendix 5.3
For fixed buffer communication		BUFSND	Transfers the data written in the fixed buffer memory to an external device through the fixed buffer communication.	Appendix 5.4
		BUFRCV	Reads the received data from an external device stored in the fixed buffer memory through the fixed buffer communication. (BUFRCVS: for interrupt program)	Appendix 5.5
		BUFRCVS		User's Manual (Basic)
For reading and clearing error information		ERRCLR	Clears error information. ([COM.ERR.] LED off, Error log clear)	
		ERRRD	Reads error information.	
For re-initialization		UINI	Executes the re-initial processing of the Ethernet module. (IP addresses and operation settings can be changed)	
For sending and receiving e-mails		MRECV	Receives e-mails.	User's manual (Application)
		MSEND	Sends e-mails.	
For communication with the other station PLC CPU (Data link instruction)	For reading/writing device data	READ	Reads the word devices of the other station. (SREAD: with completed devices)	
		SREAD		
		WRITE	Writes data to the word devices of the other station. (SWRITE: with completed devices)	
		SWRITE		
		ZNRD	Reads the word devices of the other station.	
		ZNWR	Writes data to the word devices of the other station.	
	For message (arbitrary data) sending/receiving	SEND	Sends data to the other station.	
		RECV	Reads receive data from the other station. (RECVS: for the interrupt program)	
		RECVS		
	Remote RUN/STOP, Reading/writing clock data	REQ	Issues a remote RUN/STOP request to the other station.	
			Reads/writes clock data for the other station.	

POINT

(1) The user should not change data (control data, request data, etc.) designated by any of the dedicated instructions until the execution of that instruction is completed.
(2) All dedicated instructions must be executed online.
If any of the dedicated instructions is executed offline, no error will occur. However, the execution of the dedicated instruction will not be completed.

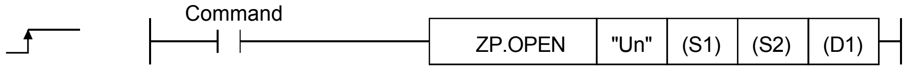
Appendix 5.2 OPEN Instruction

This instruction establishes a connection (open processing) with an external device to perform the data communication.

Setting data	Applicable device									
	Internal device (System, user)		File register	MELSECNET/H, MELSECNET/10 Direct J□\□		Special module U□\G□	Index register Zn	Constant		Others
	Bit	Word		Bit	Word			K,H	$	
(S1)	—	○		—				○	—	—
(S2)	—	○		—				—	—	—
(D1)	○	○		—				—	—	—

[Instruction code] [Executing condition]

ZP.OPEN



Setting data

Setting data	Description	Set by (*1)	Data type
"Un"	Start input/output signal of the Ethernet module (00 to FE: two higher digits of the 3-digit input/output signal)	User	Binary 16 bits
(S1)	Connection number (1 to 16)		Binary 16 bits
(S2)	Head number of the device that stores control data	User, system	Binary 16 bits
(D1)	Head number of the host station bit device that turns on for one scan upon completion of instruction. (D1) + 1 also turns on if the instruction execution ends abnormally.	System	Bit

The file registers for each of the local device and the program cannot be used as devices to be used in the setting data.

Control data

Device	Item	Setting data	Setting range	Set by (*1)
(S2)+0	Execution type/complete type	• Designate which settings to use at the open processing of a connection, either the parameter setting values from the GX Developer or the setting values of the control data starting from (S2) + 2. 0000H : Open processing with the parameters set in [Open settings] of the GX Developer 8000H : Open processing with the parameters designated with the control data from (S2) + 2 to (S2) + 9.	0000H 8000H	User
(S2)+1	Completion status	• Stores the status at completion. 0000H : Normal completion Other than 0000H : Abnormal completion (error code) (*2)	–	System
(S2)+2	Application setting area	• Designate how to use a connection. b15 b14 b13 to b10 b9 b8 b7 b6 to b2 b1 b0 6) 0 5) 4) 3) 0 2) 1) 1) Usage of fixed buffer 0: Sending or fixed buffer communication is not executed 1: For receiving 2) Destination existence confirmation 0: No confirm 1: Confirm 3) Pairing open setting 0: No pairs 1: Pairs 4) Communication method (protocol) 0: TCP/IP 1: UDP/IP 5) Fixed buffer communication 0: Procedure exist 1: No procedure 6) Open system 00: Active open or UDP/IP 10: Unpassive open 11: Fullpassive open	(as described in the left)	User
(S2)+3	Host station Port No.	• Designate the port No. of the host station.(*3)	401H to 1387H 138BH to FFFEH	User
(S2)+4 (S2)+5	Destination IP address	• Designate the IP address of the external device.(*3)	1H to FFFFFFFFH (FFFFFFFFH: simultaneous broadcast)	User
(S2)+6	Destination Port No.	• Designate the port No. of the external device.(*3)	401H to FFFFH (FFFFH: simultaneous broadcast)	User
(S2)+7 to (S2)+9	Destination Ethernet address	• Designate the Ethernet address of the external device.(*3)	n 000000000000H FFFFFFFFFFFFH	User

*1 The "Set by" column indicates the following:
User : Data set by the user before executing a dedicated instruction.
System : The PLC CPU stores the execution results of a dedicated instruction.

*2 For details on the error codes at abnormal completion, refer to Q Corresponding Ethernet Interface Module User's Manual (Basic).

*3 Set according to the communication method and open system.

Communication method open system		TCP				UDP	
		Active		Passive			
Parameter		ARP function of external device		Unpassive	Fullpassive	ARP function of external device	
		Yes	No			Yes	No
Communication address	Host station Port No.	○	○	○	○	○	○
	Destination IP address	○	○	×	○	○	○
	Destination Port No.	○	○	×	○	○	○
	Destination Ethernet address (*5)	○(*4)	○	×	×	○(*4)	○

○: Setting required ×: Setting not required

*4 Use the default value (FFFFFFFFFFFFH) or "0".

*5 When using the "Open settings" of GX Developer, the default value is used.
When communicating with a device without the ARP function, set the Ethernet address of the external device with this OPEN instruction to execute the open processing.

Functions

(1) This instruction performs the open processing for a connection specified by (S1) for the module designated by Un.
The selection of the setting values to be used for the open processing is designated by (S2) + 0.

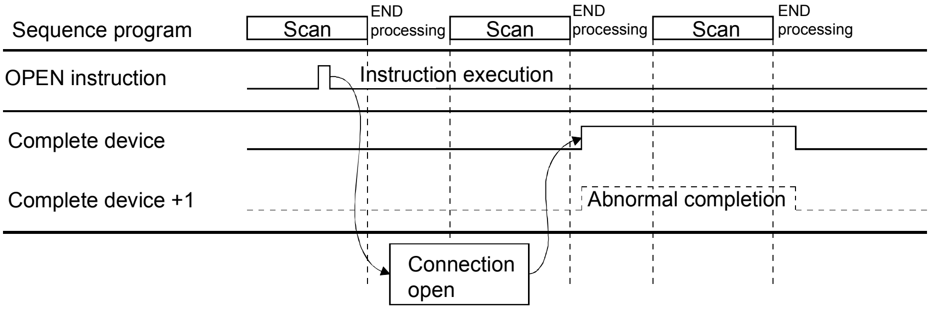
(2) Whether or not the OPEN instruction has been completed can be checked by the complete bit devices (D1) + 0 and (D1) + 1.

(a) Complete bit device (D1) + 0
Turns on at the END processing of the scan where the OPEN instruction is completed, and turns off at the next END processing.

(b) Complete bit device (D1) + 1
Turns on and off depending on the completion status of the OPEN instruction.

- Normal completion :Stays off and does not change.
- Abnormal completion :Turns on at the END processing of the scan where the OPEN instruction is completed, and turns off at the next END processing.

[Operation when the OPEN instruction is being executed]



(3) The ZP.OPEN is executed when the open instruction switches from off to on.

Important
Never execute the open/close processing using input/output signals and the open/close processing using the OPEN or CLOSE dedicated instruction simultaneously for the same connection. It will result in malfunctions.

Errors

(1) When a dedicated instruction ends with an error, the abnormal completion signal, (D1) + 1, turns on and the error code is stored in the complete status area (S2) + 1.
Refer to the following manuals regarding the error codes, check the errors and take corrective actions.

<Error codes>

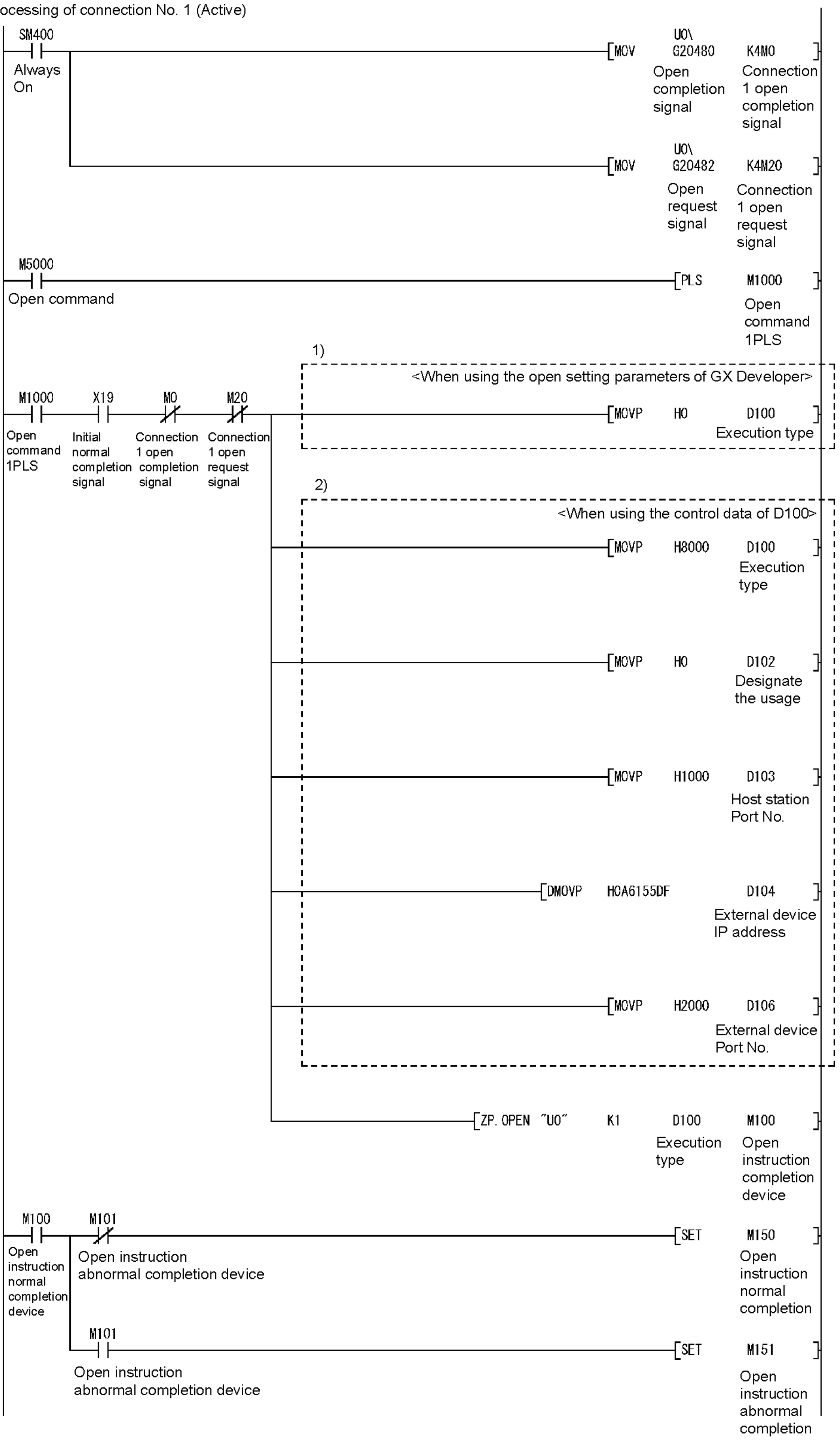
4FFF$_H$ or less	: QCPU (Q Mode) User's Manual (Hardware Design, Maintenance and Inspection)
C000$_H$ or higher	: Q Corresponding Ethernet Interface Module User's Manual (Basic)

Program example

A program that opens the connection 1 for the TCP/IP communication (Active open):

When the input/output signals of the Ethernet module are X/Y00 to X/Y1F

Open processing of connection No. 1 (Active)


SM400
Always On
MOV U0\G20480 K4M0
Open completion signal
Connection 1 open completion signal
MOV U0\G20482 K4M20
Open request signal
Connection 1 open request signal
M5000
Open command
PLS M1000
Open command 1PLS
1)
<When using the open setting parameters of GX Developer>
M1000 X19 M0 M20
Open command 1PLS
Initial normal completion signal
Connection 1 open completion signal
Connection 1 open request signal
MOVP H0 D100
Execution type
2)
<When using the control data of D100>
MOVP H8000 D100
Execution type
MOVP H0 D102
Designate the usage
MOVP H1000 D103
Host station Port No.
DMOVP H0A6155DF D104
External device IP address
MOVP H2000 D106
External device Port No.
ZP.OPEN "U0" K1 D100 M100
Execution type
Open instruction completion device
M100 M101
Open instruction normal completion device
Open instruction abnormal completion device
SET M150
Open instruction normal completion
M101
Open instruction abnormal completion device
SET M151
Open instruction abnormal completion

- * M5000 in the program is a flag that indicates an existence of open command from external.
- * Regarding sections 1) and 2) in the program

  1) is necessary when using the GX Developer "Open Setting" parameter.

  2) is necessary when not using the GX Developer "Open Setting" parameter.

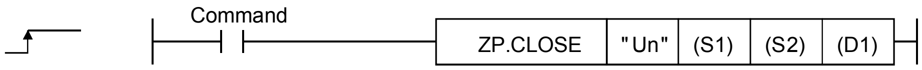
Appendix 5.3 CLOSE Instruction

This instruction disconnects (closes) a connection by which data was communicated with an external device.

Setting data	Applicable device									
	Internal device (System, user)		File register	MELSECNET/H, MELSECNET/10 Direct J□\□		Special module U□\G□	Index register Zn	Constant		Others
	Bit	Word		Bit	Word			K,H	$	
(S1)	–	○		–				○	–	–
(S2)	–	○		–				–	–	–
(D1)	○	○		–				–	–	–

[Instruction code] [Executing condition]

CLOSE



Setting data

Setting data	Description	Set by (*1)	Data type
"Un"	Start input/output signal of the Ethernet module (00 to FE: Two higher digits of the 3-digit input/output signal)	User	Binary 16 bits
(S1)	Connection number (1 to 16)		Binary 16 bits
(S2)	Head number of the device that stores the control data	System	Binary 16 bits
(D1)	Head number of the host station bit device that turns on for one scan upon completion of instruction. (D1) + 1 also turns on if the instruction execution ends abnormally.		Bit

The file registers for each of the local device and the program cannot be used as devices to be used in the setting data.

Control data

Device	Item	Setting data	Setting range	Set by (*1)
(S2)+0	System area	–	–	–
(S2)+1	Complete status	• Stores the status at completion. 0000H : Normal completion Other than 0000H : Abnormal completion (error code) (*2)	–	System

*1 The "Set by" column indicates the following:
User : Data set by the user before executing a dedicated instruction.
System : The PLC CPU stores the execution results of a dedicated instruction.

*2 For details on the error codes at abnormal completion, refer to Q Corresponding Ethernet Interface Module User's Manual (Basic).

Functions

(1) This instruction closes the connection specified by (S1) for the module designated by Un. (Disconnection)

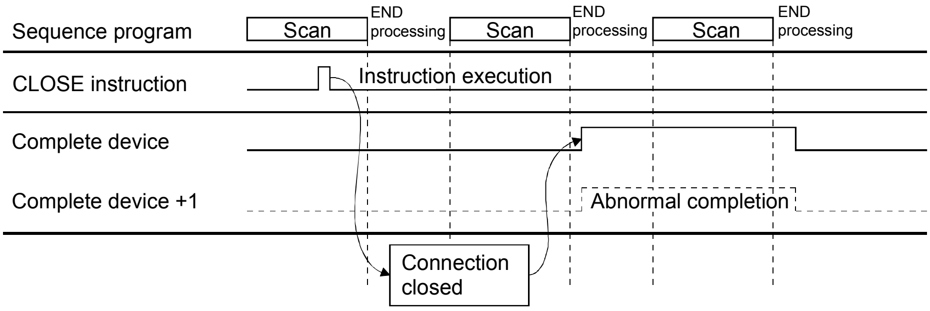
(2) Whether or not the CLOSE instruction has been completed can be checked by the complete bit devices (D1) + 0 and (D1) + 1.

(a) Complete bit device (D1) + 0
Turns on at the END processing of the scan where the CLOSE instruction is completed, and turns off at the next END processing.

(b) Complete bit device (D1) + 1
Turns on and off depending on the completion status of the CLOSE instruction.

- Normal completion : Stays off and does not change.
- Abnormal completion : Turns on at the END processing of the scan where the CLOSE instruction is completed, and turns off at the next END processing.

[Operation when the CLOSE instruction is being executed]



(3) The ZP.CLOSE is executed when the close instruction switches from off to on.

Important

Never execute the open/close processing using input/output signals and the open/close processing using the OPEN or CLOSE dedicated instruction simultaneously for the same connection. It will result in malfunctions.

Errors

(1) When a dedicated instruction ends with an error, the abnormal completion signal, (D1) + 1, turns on and the error code is stored in the complete status area (S2) + 1. Refer to the following manuals regarding the error codes, check the errors and take corrective actions.

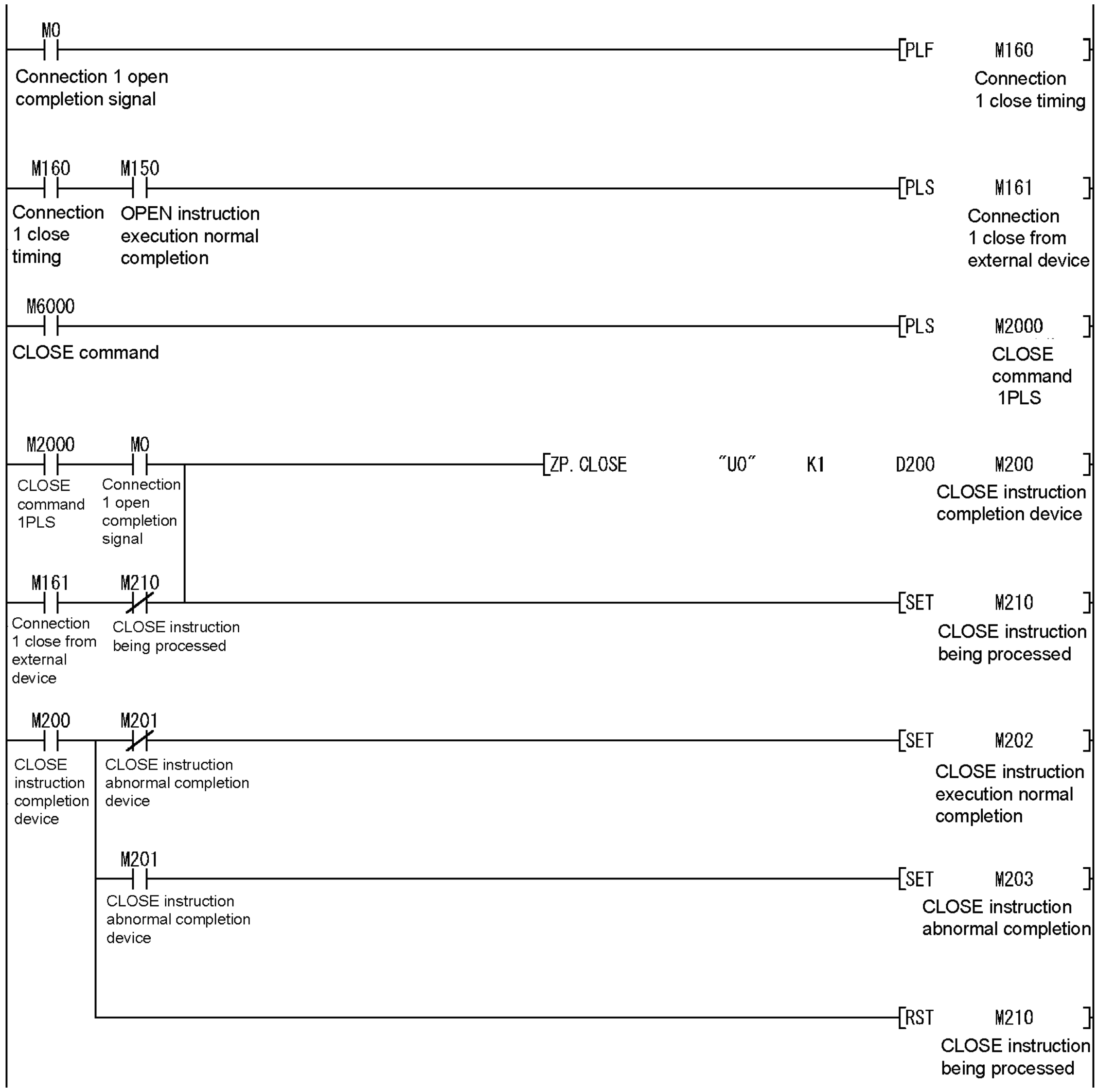
<Error codes>

4FFFH or less	: QCPU (Q Mode) User's Manual (Hardware Design, Maintenance and Inspection)
C000H or higher	: Q Corresponding Ethernet Interface Module User's Manual (Basic)

Program example

A program that closes the connection number 1:

When the input/output signals of the Ethernet module are X/Y00 to X/Y1F


M0
Connection 1 open completion signal
[PLF M160]
Connection 1 close timing
M160
M150
Connection 1 close timing
OPEN instruction execution normal completion
[PLS M161]
Connection 1 close from external device
M6000
CLOSE command
[PLS M2000]
CLOSE command 1PLS
M2000
M0
CLOSE command 1PLS
Connection 1 open completion signal
[ZP.CLOSE "U0" K1 D200 M200]
CLOSE instruction completion device
M161
M210
Connection 1 close from external device
CLOSE instruction being processed
[SET M210]
CLOSE instruction being processed
M200
M201
CLOSE instruction completion device
CLOSE instruction abnormal completion device
[SET M202]
CLOSE instruction execution normal completion
M201
CLOSE instruction abnormal completion device
[SET M203]
CLOSE instruction abnormal completion
[RST M210]
CLOSE instruction being processed

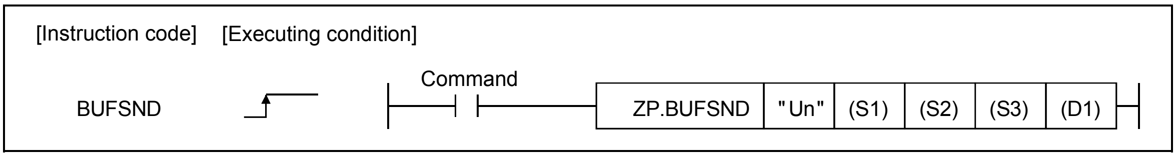
* For details of M0 and M150 in the program, refer to the program example in the section explaining the OPEN instruction.

* M6000 in the program is a flag that indicates an existence of close command from external.

Appendix 5.4 BUFSND Instruction

This instruction sends data to an external device through thefixed buffer communication.

Setting data	Applicable device									
	Internal device (System, user)		File register	MELSECNET/H, MELSECNET/10 Direct J□\□		Special module U□\G□	Index register Zn	Constant		Others
	Bit	Word		Bit	Word			K,H	$	
(S1)	—	○		—				○	—	—
(S2)	—	○		—				—	—	—
(S3)	—	○		—				—	—	—
(D1)	○	○		—				—	—	—


[Instruction code] [Executing condition]

BUFSND

Command

ZP.BUFSND "Un" (S1) (S2) (S3) (D1)

Setting data

Setting data	Description	Set by (*1)	Data type
"Un"	Start input/output signal of the Ethernet module (00 to FE: Two higher digits of the 3-digit input/output signal)	User	Binary 16 bits
(S1)	Connection number (1 to 16)		Binary 16 bits
(S2)	Head number of the device that stores control data	System	Binary 16 bits
(S3)	Head number of the device that stores send data	User	Binary 16 bits
(D1)	Head number of the host station bit device that turns on for one scan upon completion of instruction. (D1) + 1 also turns on if the instruction execution ends abnormally.	System	Bit

The file registers for each of the local device and the program cannot be used as devices to be used in the setting data.

Control data

Device	Item	Setting data	Setting range	Set by (*1)
(S2)+0	System area	—	—	—
(S2)+1	Complete status	• Stores the status at completion. 0000H : Normal completion Other than 0000H : Abnormal completion (error code) (*2)	—	System

Send data

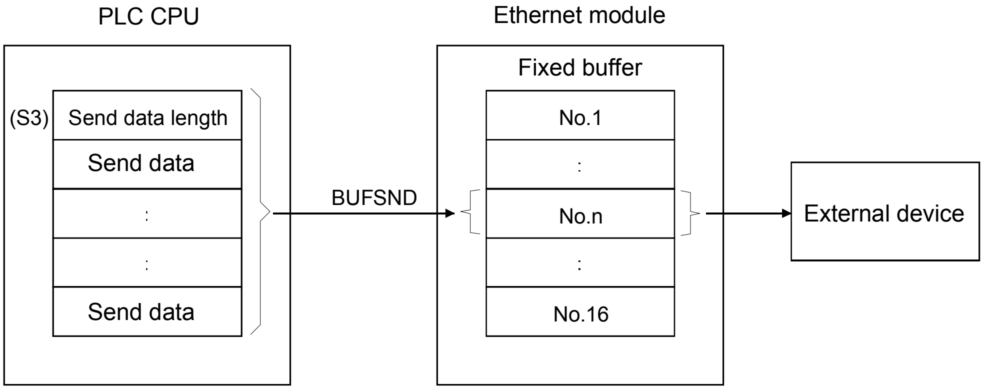
Device	Item	Setting data		Setting range	Set by (*1)
(S3)+0	Send data length	• Designates the send data length in word units. (Designate the data length with number of words or bytes by following the procedures of fixed buffer communication.)		—	User
		There is a procedure (for communication using binary code)	: Number of words	1 to 1017	
		There is a procedure (for communication using ASCII code)	: Number of words	1 to 508	
		Non procedure (for communication using binary code)	: Number of bytes	1 to 2046	
(S3)+1 to (S3)+n	Send data	• Designate the send data.		—	User

*1 The "Set by" column indicates the following:
User : Data set by the user before executing a dedicated instruction.
System : The PLC CPU stores the execution results of a dedicated instruction.

*2 For details on the error codes at abnormal completion, refer to Q Corresponding Ethernet Interface Module User's Manual (Basic).

Functions

(1) This instruction sends the data designated by (S3) to the external device of the connection specified by (S1) for the module designated by Un.

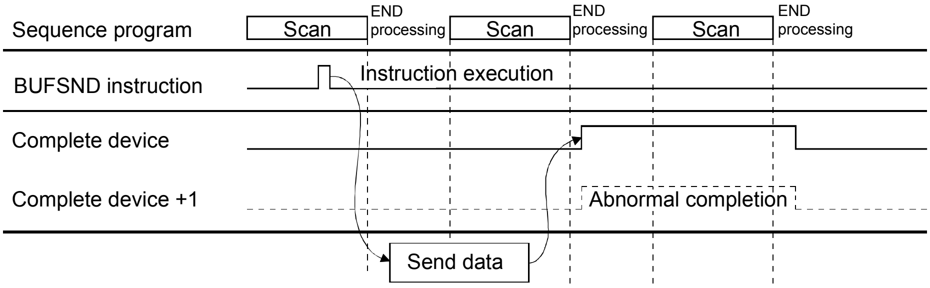


(2) Whether or not the BUFSND instruction has been completed can be checked by the complete bit devices (D1) + 0 and (D1) + 1.

(a) Complete bit device (D1) + 0
Turns on at the END processing of the scan where the CLOSE instruction is completed, and turns off at the next END processing.

(b) Complete bit device (D1) + 1
Turns on and off depending on the complete status of the BUFSND instruction.
• Normal completion : Stays off and does not change.
• Abnormal completion : Turns on at the END processing of the scan where the BUFSND instruction is completed, and turns off at the next END processing.

[Operation when the BUFSND instruction is being executed]



(3) The ZP.BUFSND instruction is executed when the send instruction switches from off to on.

Errors

(1) When a dedicated instruction ends with an error, the abnormal completion signal, (D1) + 1, turns on and the error code is stored in the complete status area (S2) + 1. Refer to the following manuals regarding the error codes, check the errors and take corrective actions.

<Error codes>

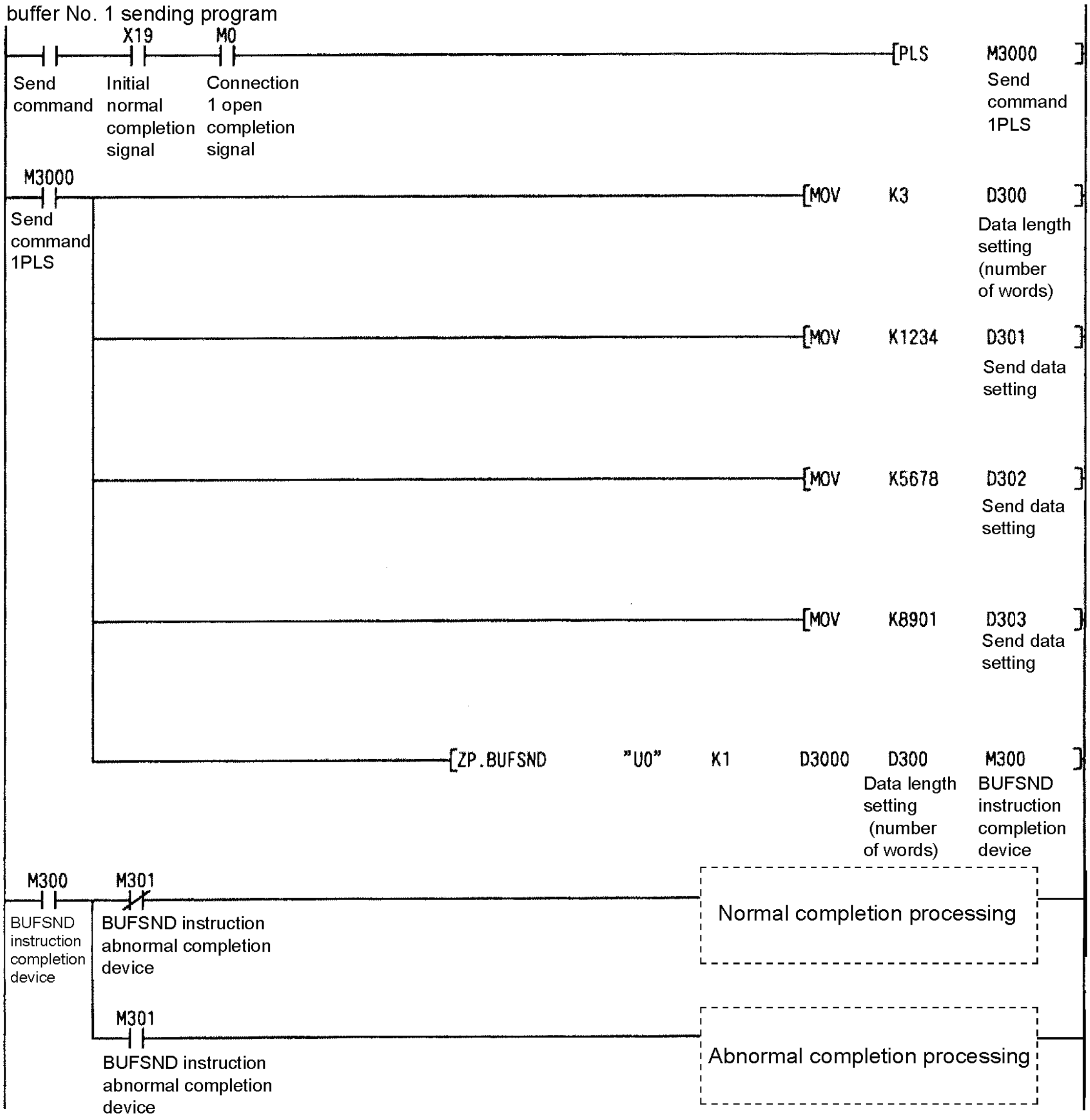
4FFFH or less	: QCPU (Q Mode) User's Manual (Hardware Design, Maintenance and Inspection)
C000H or higher	: Q Corresponding Ethernet Interface Module User's Manual (Basic)

Program example

A program that sends data from the fixed buffer of the connection number 1:

When the input/output signals of the Ethernet module are X/Y00 to X/Y1F

Fixed buffer No. 1 sending program


X19
M0
Send command
Initial normal completion signal
Connection 1 open completion signal
[PLS M3000]
Send command 1PLS
M3000
Send command 1PLS
[MOV K3 D300]
Data length setting (number of words)
[MOV K1234 D301]
Send data setting
[MOV K5678 D302]
Send data setting
[MOV K8901 D303]
Send data setting
[ZP.BUFSND "U0" K1 D3000 D300 M300]
Data length setting (number of words)
BUFSND instruction completion device
M300
BUFSND instruction completion device
M301
BUFSND instruction abnormal completion device
Normal completion processing
M301
BUFSND instruction abnormal completion device
Abnormal completion processing

* For details of M0 in the program, refer to the program example in the section explaining the OPEN instruction.

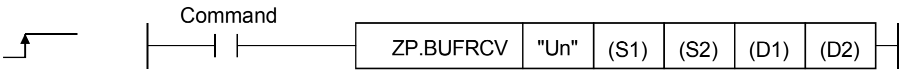
Appendix 5.5 BUFRCV Instruction

This instruction reads data received from an external device through the fixed buffer communication.
This instruction is used in the main program.

Setting data	Applicable device									
	Internal device (System, user)		File register	MELSECNET/H, MELSECNET/10 Direct J□\□		Special module U□\G□	Index register Zn	Constant		Others
	Bit	Word		Bit	Word			K,H	$	
(S1)	–	○		–				○	–	–
(S2)	–	○		–				–	–	–
(D1)	–	○		–				–	–	–
(D2)	○	○		–				–	–	–

[Executing condition] [Instruction code]

BUFRCV



Setting data

Setting data	Description	Set by (*1)	Data type
"Un"	Start input/output signal of the Ethernet module (00 to FE: Two higher digits of the 3-digit input/output signal)	User	Binary 16 bits
(S1)	Connection number (1 to 16)		Binary 16 bits
(S2)	Head number of the devices that designate control data	System	Binary 16 bits
(D1)	Head number of the device that stores receive data		Binary 16 bits
(D2)	Head number of the host station bit device that turns on for one scan upon completion of instruction. (D2) + 1 also turns on if the instruction execution ends abnormally.		Bit

The file registers for each of the local device and the program cannot be used as devices to be used in the setting data.

Control data

Device	Item	Setting data	Setting range	Set by (*1)
(S2)+0	System area	–	–	–
(S2)+1	Complete status	• Stores the status at completion. 0000H : Normal completion Other than 0000H : Abnormal completion (error code) (*2)	–	System

Receive data

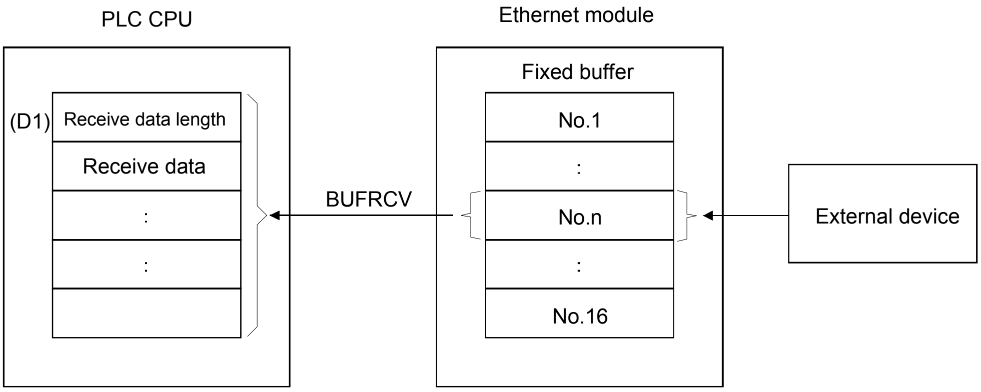
Device	Item	Setting data		Setting range	Set by (*1)
(D1)+0	Receive data length	• Stores the data length of the data read from the fixed buffer data area in word units. (The data length is the number of words or bytes by following the fixed buffer communication.)		–	System
		With procedure (for communication using binary codes)	: Number of words	1 to 1017	
		With procedure (for communication using ASCII codes)	: Number of words	1 to 508	
		No procedure (for communication using binary codes)	: Number of bytes	1 to 2046	
(D1)+1 to (D2)+n	Receive data	• Stores the data read from the fixed buffer sequentially in ascending order.		–	System

*1 The "Set by" column indicates the following:
User : Data set by the user before executing a dedicated instruction.
System : The PLC CPU stores the execution results of a dedicated instruction.

*2 For details on the error codes at abnormal completion, refer to Q Corresponding Ethernet Interface Module User's Manual (Basic).

Functions

(1) This instruction reads receive data (for the fixed buffer communication) from the connection specified by (S1) for the module designated by Un.



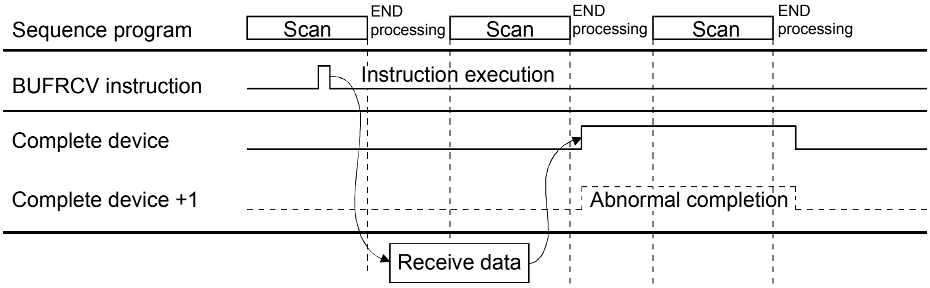
(2) Whether or not the BUFRCV instruction has been completed can be checked by the complete bit devices (D2) + 0 and (D2) + 1.

(a) Complete bit device (D2) + 0
Turns on at the END processing of the scan where the BUFRCV instruction is completed, and turns off at the next END processing.

(b) Complete bit device (D2) + 1
Turns on and off depending on the completion status of the BUFRCV instruction.

- Normal completion : Stays off and does not change.
- Abnormal completion : Turns on at the END processing of the scan where the BUFRCV instruction is completed, and turns off at the next END processing.

[Operation when the BUFRCV instruction is being executed]



(3) The ZP.BUFRCV instruction is executed when the read instruction (indicated by a bit for the applicable connection in the fixed buffer receive status signal storage area (address: 5005H) of the buffer memory) switches from off to on.

(4) When reading receive data from the same connection, this cannot be used together with BUFRCVS instructions (for interrupt programs).

Errors

(1) When a dedicated instruction ends with an error, the abnormal completion signal, (D2) + 1, turns on and the error code is stored in the complete status area (S2) + 1. Refer to the following manuals regarding the error codes, check the errors and take corrective actions.

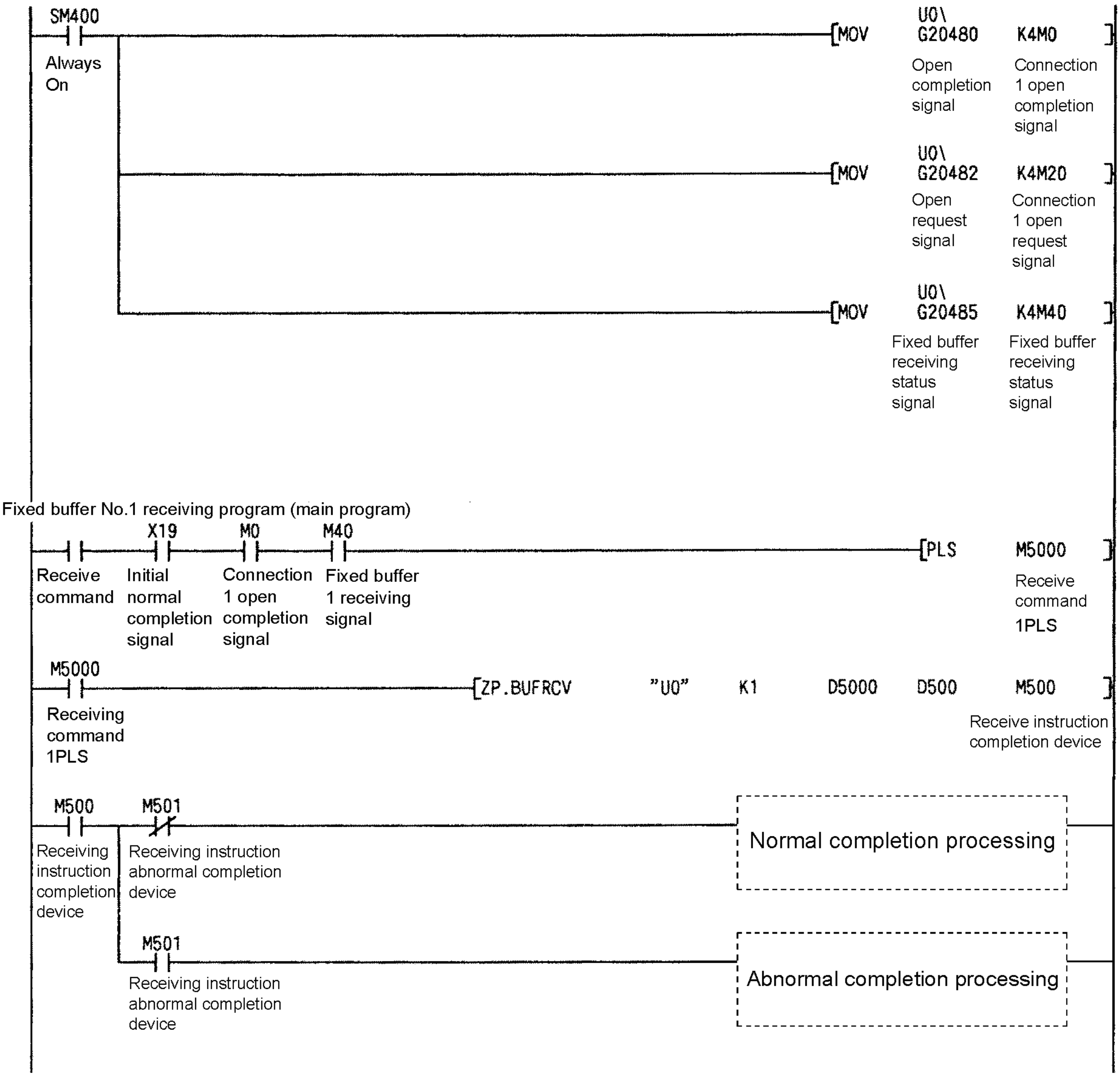
<Error codes>

4FFFH or less	: QCPU (Q Mode) User's Manual (Hardware Design, Maintenance and Inspection)
C000H or higher	: Q Corresponding Ethernet Interface Module User's Manual (Basic)

Program example

A program that reads receive data from the fixed buffer for connection number 1:

When the input/output signals of the Ethernet module are X/Y00 to X/Y1F


SM400
Always On
MOV U0\G20480 K4M0
Open completion signal
Connection 1 open completion signal
MOV U0\G20482 K4M20
Open request signal
Connection 1 open request signal
MOV U0\G20485 K4M40
Fixed buffer receiving status signal
Fixed buffer receiving status signal
Fixed buffer No.1 receiving program (main program)
X19
M0
M40
Receive command
Initial normal completion signal
Connection 1 open completion signal
Fixed buffer 1 receiving signal
PLS M5000
Receive command 1PLS
M5000
Receiving command 1PLS
ZP.BUFRCV "U0" K1 D5000 D500 M500
Receive instruction completion device
M500
Receiving instruction completion device
M501
Receiving instruction abnormal completion device
Normal completion processing
M501
Receiving instruction abnormal completion device
Abnormal completion processing

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Mitsubishi Programmable Logic Controller Training Manual Ethernet course(Q-series)

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