e-Front runners

MICREX-SX series
SPH
USER'S MANUAL

SPH2000 Ethernet Communications
<Intended type: NP1PM-48E, NP1PM-256E>

FEH193

Preface

Thank you for purchasing Fuji Electric Programmable Controller MICREX-SX Series.
This user's manual describes the Ethernet communication specifications and operations of CPU modules with the Ethernet function.
Read this manual carefully to ensure correct operation. When using modules or peripheral devices, be sure to read the corresponding user's manuals listed below:

<SX-Programmer Expert (D300win)>

Title	Manual No.	Contents
User's Manual Instruction, MICREX-SX series	FEH200	Explains the memory, language and system definitions of the MICREX-SX series.
User's Manual Hardware, MICREX-SX series SPH	FEH201	Explains the system configuration, the specifications and operations of modules in the MICREX-SX series.
User's Manual D300win <Reference>, MICREX-SX series	FEH254	Explains the installation procedure, functions and operations of D300winV2.
User's Manual D300win <Reference>, MICREX-SX series	FEH257	Explains the installation procedure, functions and operations of D300winV3.
User's Manual D300win <LD/FBD Editor>, MICREX-SX series	FEH257-1	Explains the operations of LD/FBD added to D300winV3.

<SX-Programmer Standard (Standard loader)>

Title	Manual No.	Contents
User's Manual Instruction, MICREX-SX series	FEH588	Explains the memory, language and system definitions of the MICREX-SX series.
User's Manual Hardware, MICREX-SX series SPH	FEH201	Explains the system configuration, the specifications and operations of modules in the MICREX-SX series.
User's Manual SX-Programmer Standard <Reference>, MICREX-SX series	FEH590	Explains the functions and operations of SX-Programmer Standard.

* This manual is available for both D300win and Standard loader.
* In addition to the above manuals, the following Fuji Electric FA Components & Systems Co., Ltd. site offers various manuals and technical documents associated with MICREX-SX.
  URL http://www.fujielectric.co.jp/fcs/eng/

Notes

1. This manual may not be reproduced in whole or part in any form without prior written approval by the manufacturer.
2. The contents of this manual (including specifications) are subject to change without prior notice.
3. If you find any ambiguous or incorrect descriptions in this manual, please write them down (along with the manual No. shown on the cover) and contact FUJI.

Safety Precautions

Be sure to read the "Safety Precautions" thoroughly before using the module.
Here, the safety precautions items are classified into "Warning" and "Caution".

Warning : Incorrect handling of the device may result in death or serious injury.

Caution : Incorrect handling of the device may result in minor injury or physical damage.

Even some items indicated by "Caution" may result in a serious accident.
Both safety instruction categories provide important information. Be sure to strictly observe these instructions.

Warning

- ❑ Do not touch charged parts such as terminals while the power is ON. Touching such parts may result in electric shocks.
- ❑ Be sure to turn the power OFF before mounting or removing parts or components, wiring operations, maintenance, or inspection. Working with the power ON may cause electric shocks, malfunctions, or failures.
- ❑ Configure the emergency stop, interlocking, and other circuits outside the PLC. Otherwise, errors, if any, in the PLC may result in mechanical damages or accidents.
- ❑ The liquid (liquid crystal) of the liquid crystal display is harmful. If the display panel is damaged, the liquid flowing out of it must not get into your mouth. If your skin or clothes are stained with the liquid, rinse them with soap and water.

Safety Precautions

⚠ Caution

- ❑ Do not use the product or parts found damaged or deformed when unpacking. If done, fire, malfunctions, or failures may occur.
- ❑ Do not give shock to the product by dropping or turning it over. If done, the product may be damaged or failures may occur.
- ❑ When mounting the product, follow the directions given in the User's Manual and other manuals. The product incorrectly mounted may be dropped or cause malfunctions or failures.
- ❑ Use the rated voltage and current specified in the User's Manual and other manuals. Otherwise, fire, malfunctions, or failures may occur.
- ❑ Use or keep the product under the environmental conditions described in the User's Manual and other manuals. Use or storage of the product under high temperature, high humidity, dew condensation, dust, corrosive gas, oil, organic solvent, or excessive vibration or shock may result in electric shock, fire, malfunctions, or failures during operation.
- ❑ Select wires with the size appropriate to the applied voltage and current and tighten the wire terminals with the specified torque. Inappropriate wiring or tightening may cause fire, dropping of the product, malfunctions, or failures.
- ❑ Mount the product so that no foreign matters such as dust, wire chips, or iron powder do not enter it. Otherwise, fire, accidents, malfunctions, or failures may occur.
- ❑ After wiring, be sure to remove the dust cover from the module and unit. Using the product without removing the dust cover may cause fire, accidents, malfunctions, or failures.
- ❑ Periodically check that the terminal and mounting screws are securely tightened. Using the product with the screws not securely tightened may cause fire or malfunctions.
- ❑ Be sure to place the attached connector cover on a connector unused. Otherwise, malfunctions or failures may occur.
- ❑ Completely check safety when transferring screen data during system operation. Otherwise, incorrect operation might cause a machine damage or accident. Operation errors, if any, may suddenly start the machine resulting in accidents or damages to the machine.
- ❑ Insert the loader connectors in the correct direction. Wrong connections may cause malfunctions.
- ❑ Before operating the PLC, touch a grounded metallic object, etc. to discharge static electricity from your body. Excessive static electricity may cause malfunctions or failures.
- ❑ Carry out wirings securely and correctly, observing the instructions described in the User's Manual and other manuals. Incorrect wirings may cause fire, malfunctions, or failures.
- ❑ Do not hold the cord when disconnecting the plug from the receptacle. Otherwise, the cable may be broken resulting in fire or failures.
- ❑ Do not press the key switches with tweezers, a tool or other thing having a sharp edge, nor press them too strongly. Otherwise, they might be flawed or damaged.
- ❑ If the product has a trouble, contact us for repair; never attempt to repair it in the field. When replacing the battery, be careful of the connecting directions. Wrong connections may cause fire, accidents or failures.
- ❑ Do not remodel or reassemble the product. Doing so may cause failures.
- ❑ When discarding the product, handle it as industrial waste observing the related regulations.
- ❑ The product described in this User's Manual has not been designed or manufactured for purposes of use in equipment or systems which involve human lives.
- ❑ If you intend to use the product described in this User's Manual for nuclear energy control, aerospace, medical treatment, transportation, or passenger vehicles or special purposes of such systems, please consult your nearest Fuji Electric agent.
- ❑ When using the product described in this User's Manual for equipment or systems which, in case of failures, may lead to loss of human lives or serious damages, be sure to provide protective measures.

Revision

*The manual No. is printed at the bottom right of the cover of this manual.

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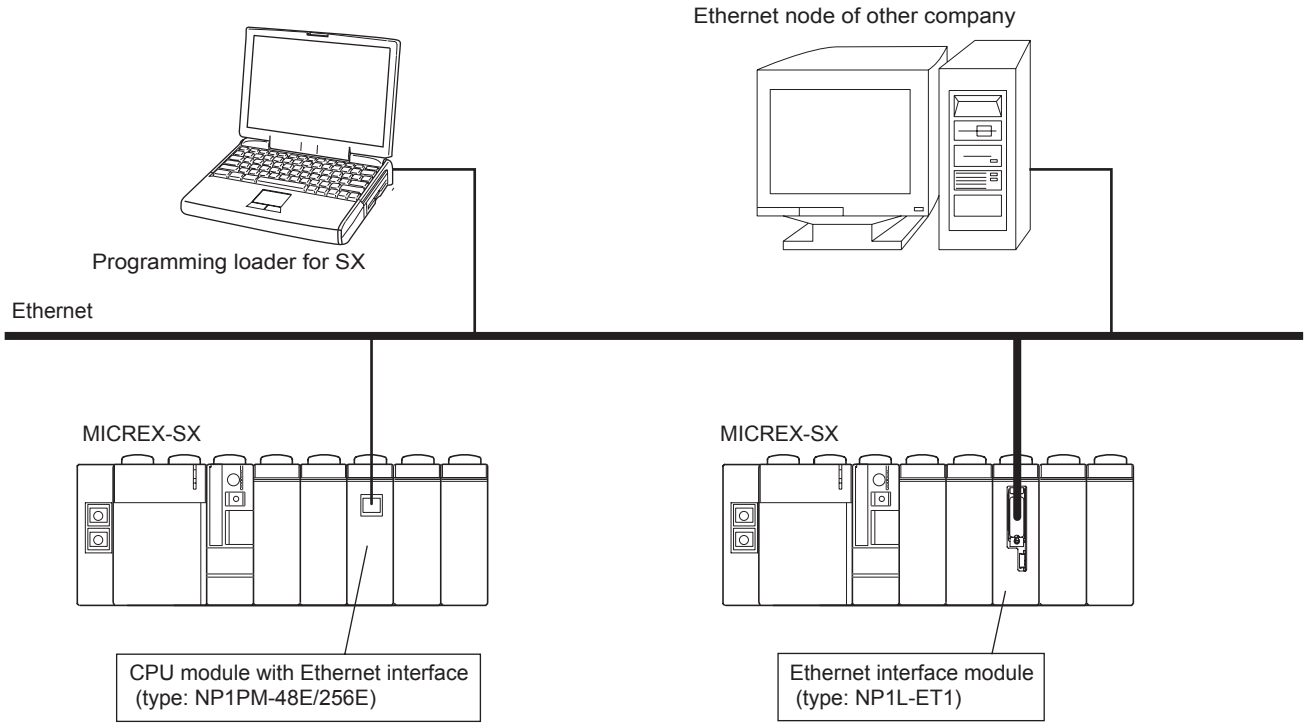
Section 1 General

1-1 Overview of SPH2000 CPU Ethernet Communications

SPH2000 (type: NP1PM-48E/256E) is a CPU module that has the Ethernet communication function.



<Features>

- Ethernet is built in the CPU module.
- 10BASE-T as well as 100BASE-TX is supported. The Auto Negotiation function automatically changes over between 10BASE-T and 100BASE-TX.
- The FTP server function is included.

<Supported versions of CPU and programming loader>

When you want to use the NP1PM-48E/256E for communication via Ethernet, be sure to use the following version of CPU and loader.

- SX-Programmer Expert (D300win): V3.3.2.0 or later
- SX-Programmer Standard: V2.2.2.0 or later

Notes:

1) Sufficient safety measures need to be taken when installing Ethernet.
   It is recommended to entrust the installation work to an expert company.
   For the installation environment, refer to JIS X5252 (ISO 8802-3).
2) For the cable and other peripheral devices, use commercially available ones that conform to IEEE802.3.

* Ethernet is a registered trademark of U.S. based Xerox Corp.

Section 2 Specifications

2-1 Transmission Specifications

2-1-1 List of transmission specifications

Item		Specification	
Interface		10BASE-T	100BASE-TX
Transmission speed		10 Mbps	100 Mbps
Medium (physical specification)		IEEE802.3u	
Interface changeover system		Auto negotiation (automatic changeover)	
Transmission medium		Twisted pair cable	
Max. segment length		100 m	
Max. number of nodes		1 piece/segment	
Communication function	General Purpose Communication mode	Performs communication between SX_CPU and other node, using TCP/IP or UDP/IP protocol. Because of free data format, it is possible to communicate with all kinds of node.	
	Fixed Buffer Communication mode	Communication function using the fixed buffer that Mitsuibishi PLC provides.	
	Loader Command Communication mode	This function can communicate dedicated loader commands between MICREX-SX series devices.	
	FTP server function	CPU modules of SPH2000 become FTP server.	
Access method		CSMA/CD	
Transmission protocol		TCP/IP, UDP/IP, ICMP, ARP	
Max. number of simultaneous communication nodes (number of communication ports)		10 stations (ports)/module Note: The number of communication ports that can simultaneously be opened for one resource is 56. When other communication module exists, be careful that the number of opened ports per CPU doesn't exceed 56.	
Transmission code		Binary/ASCII code	

*** Ethernet transmission frame**

In Ethernet transmission frame (see the figure below), “type” or “length” is entered in the field following the source MAC address, but this module supports only “type” (DIX Ethernet specification).

Destination MAC address	Source MAC address	Type/Length	Destination IP address	.....
6 bytes	6 bytes	6 bytes	6 bytes	.....

Section 2 Specifications

2-1 Transmission Specifications

2-1-2 Communication ports of the module

(1) Number of communication ports (client ports)

NP1PM-48E/256E has 10 ports for communication with other nodes. These 10 ports are shared by the following communication functions.

Communication function	Number of connections
1) Number of General Purpose Communication mode connections	Max. 8
2) Number of Fixed Buffer Communication mode connections	Max. 8
3) Number of Loader Command Communication (send) mode connections (see note)	Max. 4
4) Number of Loader Command Communication (receive) mode connections (see note)	Max. 10
5) Number of connections to loader	Max. 10

Note: Here “send” means the operation on the node side that sends the request of R_WRITE or R_READ; “receive”, the operation on the node side that receives the request of R_WRITE or R_READ sent from a remote node.

(2) Control of communication ports

NP1PM-48E/256E controls communication ports according to the following rules:

- When the target is client connections (1), 2) and 3) in above table)
  Ports can be opened till there remains no free communication port on the NP1PM-48E/256E.
- When the target is server connections (4) and 5) in above table)
  Ports can be opened till the total number of server connections becomes 10 or till there remains no free communication port on NP1PM-48E/256E.

Section 2 Specifications

2-2 Communication Functions

It is possible to communicate with maximum 10 stations (such as personal computer and PLC). NP1PM-48E/256E has the following 4 communication modes:

- General Purpose Communication mode
- Fixed Buffer Communication mode
- Loader Command Communication mode
- FTP server mode

Note: As for the number of stations to communicate with, the number of remote nodes as the total of 1), 2) and 3) communication modes above must be 10 (stations) or less.

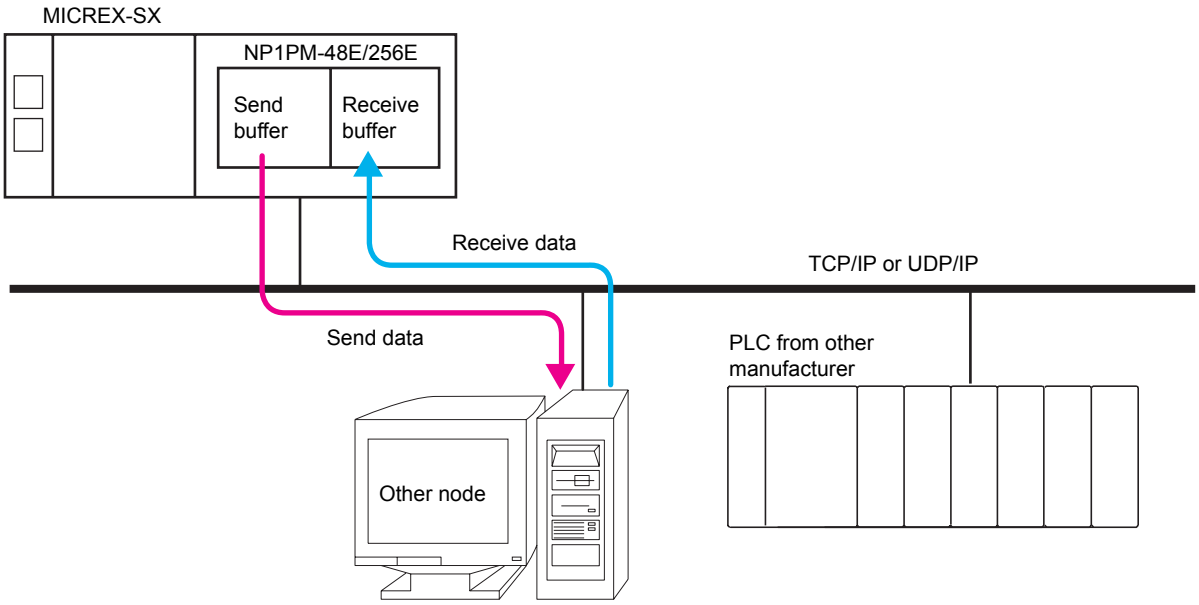
2-2-1 General Purpose Communication mode

This mode is used to communicate mainly between SX_CPU and other nodes, such as PLC systems of other manufacturers, using TCP/IP or UDP/IP protocol. To send data from SX_CPU to other nodes, M_OPEN (channel open) FB and M_SEND (message send) FB are used. To receive data from other nodes, M_OPEN (channel open) FB and M_RECEIVE (message receive) FB are used.

* For more information about concrete communication procedure, refer to “4-3-1 Communication in General Purpose Communication mode”.

<Features of General Purpose Communication mode>

- Because of free data format, it is possible to communicate with all kinds of node.
- It is possible to communicate with maximum 8 stations.
- When remote node uses TPC division for data communication, maximum 730 words can be sent or received at a time. (MICREX-F, FLEX-PC, personal computer, etc.)
  When remote node uses IP division for data communication, maximum 1017 words can be sent or received at a time.
- Broadcast of UDP/IP is available.



Section 2 Specifications

2-2 Communication Functions

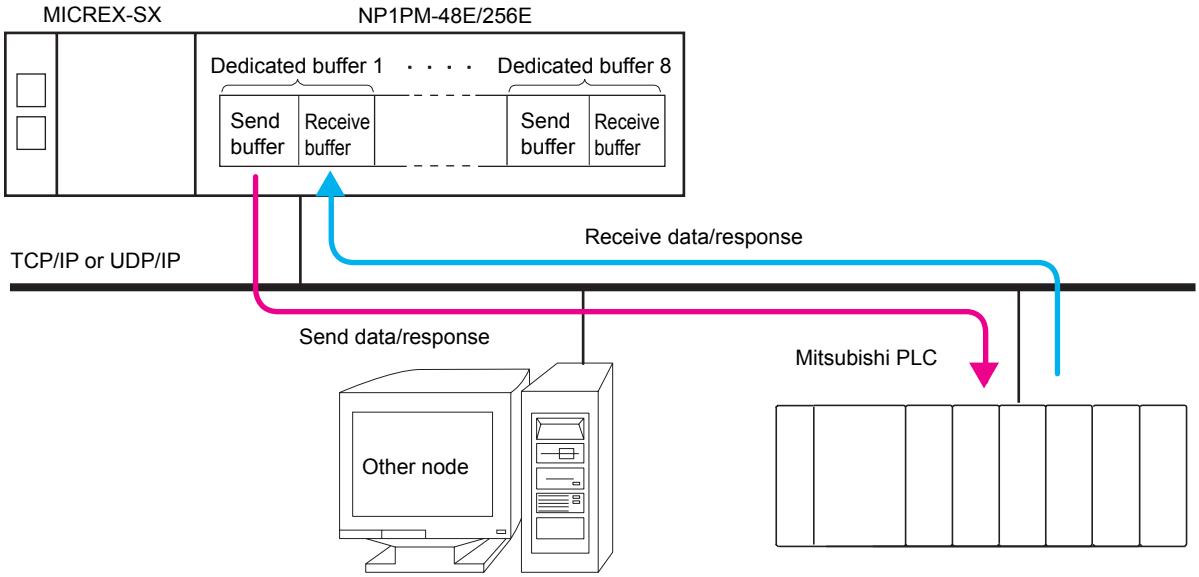
2-2-2 Fixed Buffer Communication mode

This mode is used to communicate data using the fixed buffer that type AJ71E71 Ethernet interface unit from Mitsubishi Electric Corp. provides.
This mode sets a subcommand in the data part of a TCP/IP or UDP/IP packet for General Purpose Communication mode to enable the communication of command type data, where handshaking is made for the communication between PLC and specific node.

* For more information about concrete communication procedure, refer to “4-3-2 Communication in Fixed Buffer Communication mode”.

<Features of Fixed Buffer Communication mode>

- It is possible to communicate with maximum 8 stations (PLC system from Mitsubishi Electric Corp.)
- Maximum 1017 words can be sent or received at a time.



Section 2 Specifications

2-2 Communication Functions

2-2-3 Loader Command Communication mode

This mode communicates data using the loader commands that are dedicated to MICREX-SX series. This mode is used to communicate data between nodes of an SX system or between an application program of a personal computer and SX_CPU. For communication between SX_CPU's, R_READ (remote data read) FB and R_WRITE (remote data write) FB are used on the request sending side. No program is necessary on the request receiving side.
For communication between personal computer and SX_CPU, the application program for sending the request to read or write needs to be created on the personal computer side. No application program is necessary on the SX_CPU side.

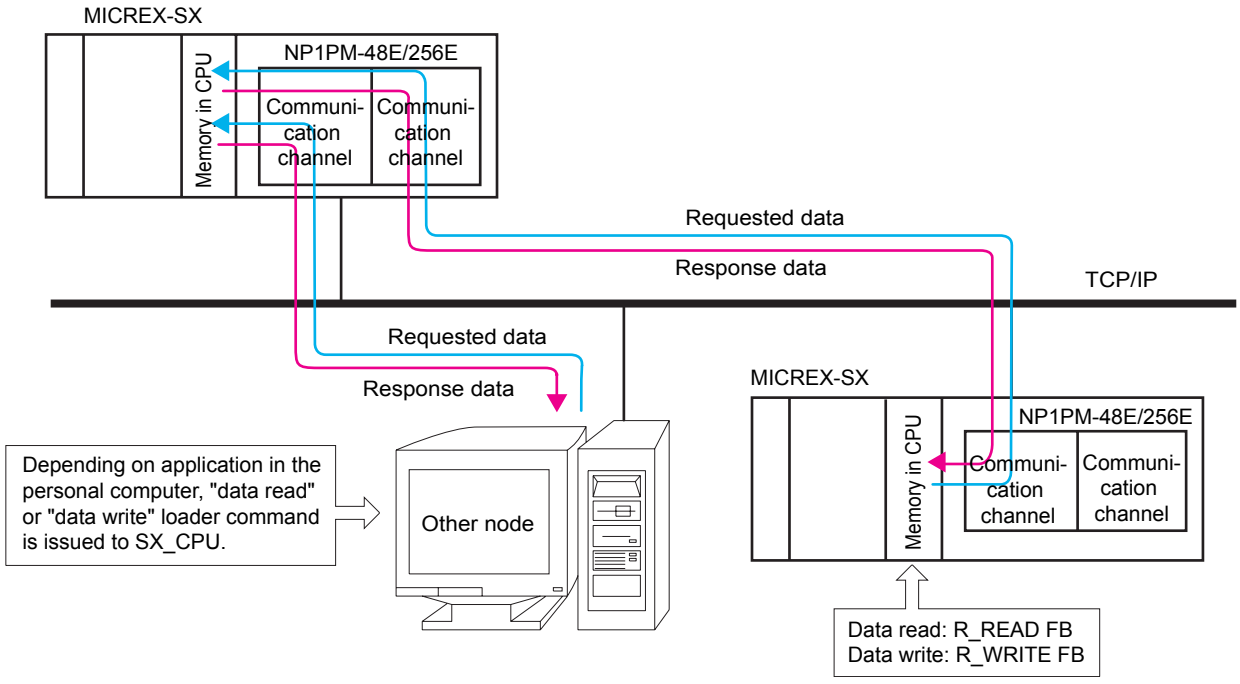
* For more information about concrete communication procedure, refer to "4-3-3 Communication in Loader Command Communication mode".

<Communication conditions>

Communication mode	General purpose
Communications protocol	TCP/IP
Open system	Unpassive
Local port No.	251 (loader command interface)

<Features of Loader Command Communication mode>

- It is possible to communicate with maximum 8 stations.
- This mode is used mainly for the communication with other SX system that supports Ethernet or for the communication with personal computer.
  No application program is necessary for the communication with local node (the SX_CPU that receive loader command). However, to communicate with other SX system, set the local reference port number to "256" (default). If a value other than the default is set, communication is not possible.



* Loader command communication port is local reference port number + 251.
  Default value is 256 + 251 = 507.
  For example, when local reference port number is 1000, 1000 + 251 = 1251 becomes the port number for communicating loader commands.

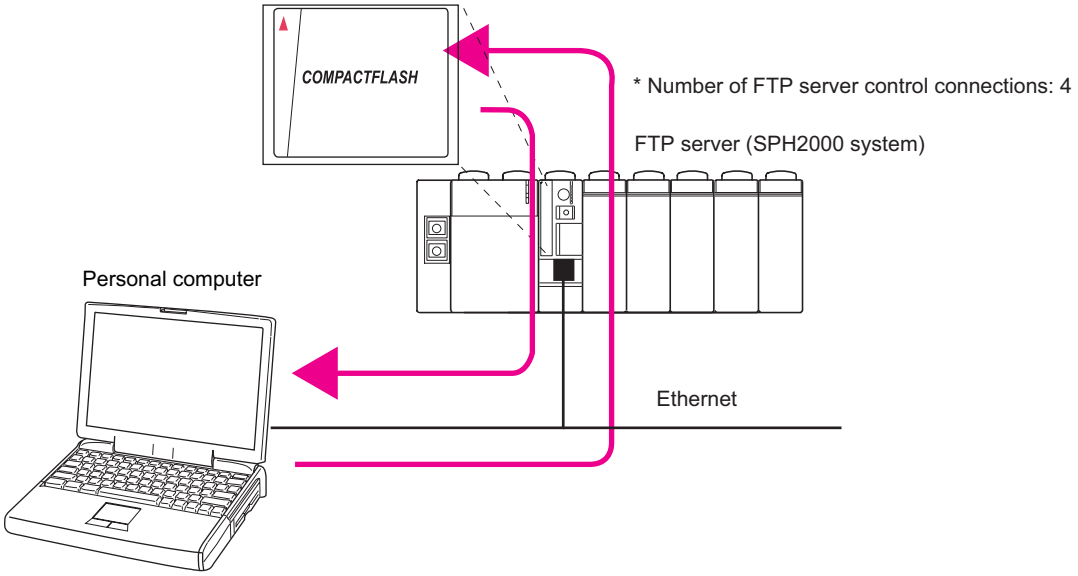
Section 2 Specifications

2-2 Communication Functions

2-2-4 FTP server mode

A CPU module of SPH2000 becomes the FTP server. It is possible to access files in a user ROM card (CF card) that is mounted in SPH2000 from a personal computer, etc.

* For more information about concrete communication procedure, refer to “4-1-3 FTP server communication”.

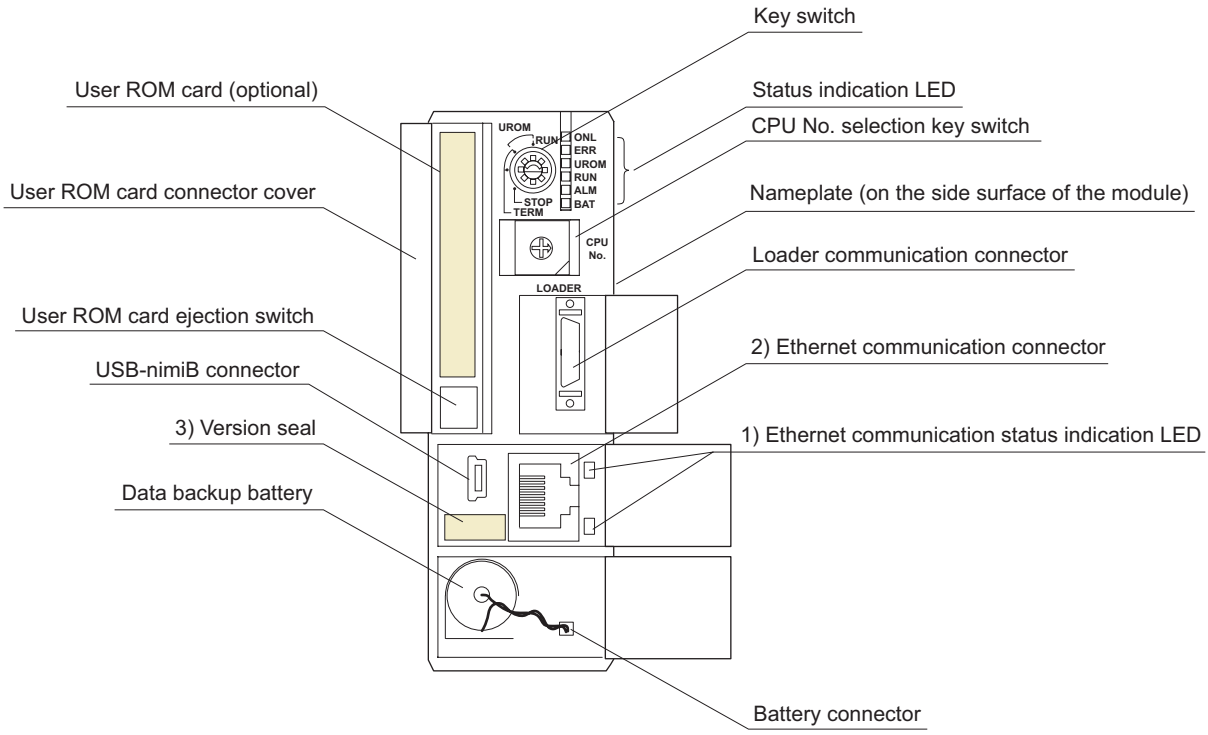


Note: During FTP server communication, execution of project download (incl. rewriting of a program while the PLC is running) and the FB (F_RAED, F_WRITE, CSV interface-related FB, etc.) that performs reading and writing of data from and to a user ROM card have to wait. Especially when FTP server communication is used in two or more ports consecutively or simultaneously, execution is kept waiting. Therefore, when performing FTP server communication, be careful of the access frequency.

Section 2 Specifications

2-3 Names and Functions

(1) Names

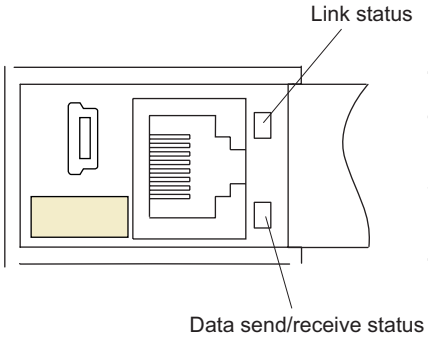


(2) Functions

This manual describes the specifications of the Ethernet interface part. For information about other parts, refer to the user's manual "Hardware (FEH201)".

1) Ethernet communication status indication LED

This LED indicates the current status of NP1PM-48E/256E.



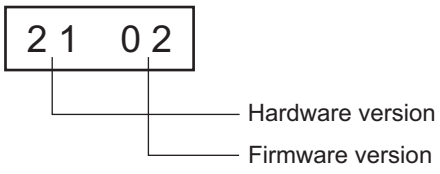
Name	Color	Description
Link status	Green	Indicates the state of connection to Ethernet. Lights when connecting to Ethernet.
Data send/receive status	Green	Indicates the state of data send/receive. Lights when a send/receive packet occurs.

2) 10BASE-T/100BASE-TX connector

10BASE-T or 100BASE-TX communication cable is connected here.

3) Version seal

Versions of the hardware and firmware of NP1PM-48E/256E are indicated on this seal.



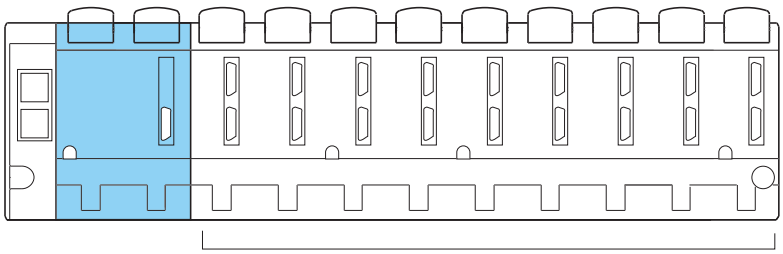
Section 3 Installing the Module

3-1 Mounting on Base Board

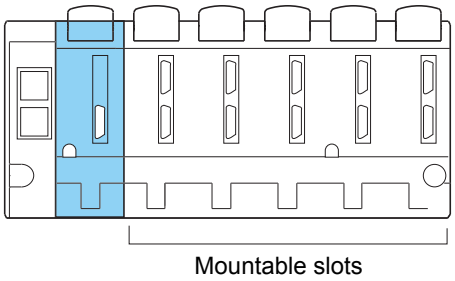
3-1-1 Mounting position

As is the case with normal CPU modules, to use NP1PM-48E/256E module, the module needs to be connected to the SX bus of MICREX-SX series SPH. It may be mounted at any location on a base board that is directly connected to the SX bus, but cannot be mounted on the OPCN-1, DeviceNet, T-link or other remote I/O base board. In addition, when using the processor bus, it must be mounted on a slot with the processor bus.

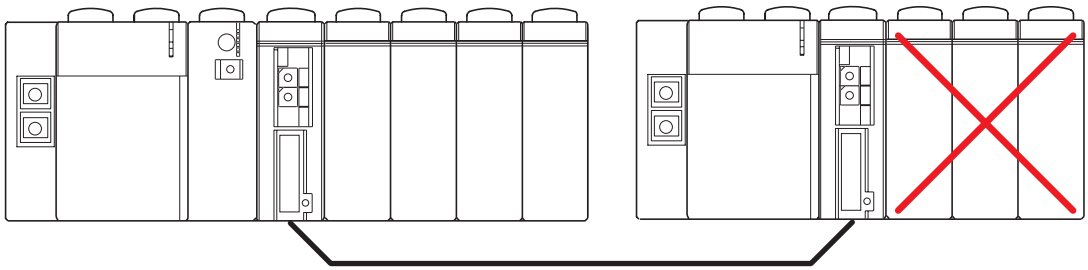
<8/11/13-slots base board>
The NP1PM-48E/256E module can be mounted in any slot except those for the power supply module (the two slots from the left on the base board).



<3/6-slots base board>



Note: NP1PM-48E/256E cannot be mounted on T-link, OPCN-1 or other slave station base board.



3-1-2 Number of mountable modules

The number of mountable modules of NP1PM-48E/256E is the same as CPU modules. Therefore, maximum eight NP1PM-48E/256E modules can be connected for one configuration.

Section 4 Communication Procedures

4-1 Overview of Communication Procedures

Communication with other node is performed basically in the following manner.

4-1-1 General purpose communication mode / Fixed buffer communication mode

1) Initialize
When the system is powered up, the Ethernet part is initialized according to the setting of the CPU parameter in the system configuration.
* For the setting of the Ethernet parameter, refer to "4-2 Operation Definition of Ethernet".

2) Open communication channel
Using M_OPEN FB, make the system ready for communicating with remote node (open the port to establish connection).
* For more information about M_OPEN FB, refer to "4-4-2 Channel open (M_OPEN)".

3) Communicate with remote node
Send or receive data using M_SEND FB or M_RECEIVE FB.
* For more information about communication FBs, refer to "4-4-3 Message send (M_SEND)" and "4-4-4 Message receive (M_RECEIVE)".

4) Close communication channel
Set OFF the open request flag (a variable connected to the EN_C terminal) of M_OPEN FB to close the port and thus cut out the communication line with other node.

4-1-2 Loader command communication mode

1) Initialize and open communication channel
When the system is powered up, two ports are automatically opened to enable the communication using loader commands with maximum 8 stations.

2) Communicate with remote node
For communication between nodes of SX series devices, R_READ FB and/or R_WRITE FB are used. When the remote node of communication is a personal computer, loader commands (data read request and data write request) are issued from application program of the personal computer.
* For more information about communication FBs, refer to “4-4-5 Remote data write (R_WRITE)” and “4-4-6 Remote data read (R_READ)”

3) Close communication channel
No application program is necessary for this. Automatically closed.

4-1-3 FTP server communication

For the FTP server function, in the CPU parameter, specify a user name, password and folder. The FTP server function can be used regardless of other communication modes.

* For the settings to use the FTP server function, refer to “4-2-2 FTP server function setting”.

Section 4 Communication Procedures

To communicate with other node, the operation definition of the module (by setting module parameters) and communication program are necessary.

4-2 Operation Definition of Ethernet

4-2-1 Basic settings of Ethernet

It is necessary to specify NP1PM-48E/256E operations. The setting for this is made in the parameter setting of the CPU module. The setting items are as follows:

Item	Description	Initial value
IP address	IP address	192.168.0.1
	Subnet mask	255.255.255.0
Gateway	Default gateway	None
Detail setting	TCP send/receive timeout value 0 to 300 (in 0.1-second steps)	300
	Maximum TCP end timer value 0 to 600 (in 0.1-second steps)	0 (1 second)
	Response monitoring timer value 0 to 300 (in 0.1-second steps)	300 (30 seconds)
	Loader command monitoring timer value 0 to 3000 (in 0.1-second steps)	3000 (300 seconds)
	Send retry interval 0 to 10 (in 1-second steps)	0
	Send retry count 0 to 30 times	12 times
	Processing for closing at TCP send timeout	Channel not closed
	Processing for closing at response receive timeout	Channel not closed
	Reference number of local port 0 to 65280	256
	Reference number of remote port for communication 0 to 65280	256

1) IP address

Sets IP address for NP1PM-48E/256E module (which is determined by network administrator). IP address is the address for distinguishing nodes on Ethernet. It consists of 32-bit binary data and is defined as a combination of IP network address and IP host address. IP network address is the address for distinguishing networks; IP host address is the ID for identifying the host (node) in a network.

2) Subnet mask

When many nodes are connected to one network, it is hard to control these nodes. When one network is divided into multiple subnets (groups), a value is set for subnet mask. Subnet uses part of host address, where bits are masked such that IP network address part and subnet part become “1” while IP host address part becomes “0”. When there is no subnet, “0.0.0.0” is set.

Example 1) When a class B network is divided into 16 subnets, set as follows:
“255.255.240.0” (FFFFF000)

Example 2) When a class B network is divided into 256 subnets, set as follows:
“255.255.255.0” (FFFFFF00)

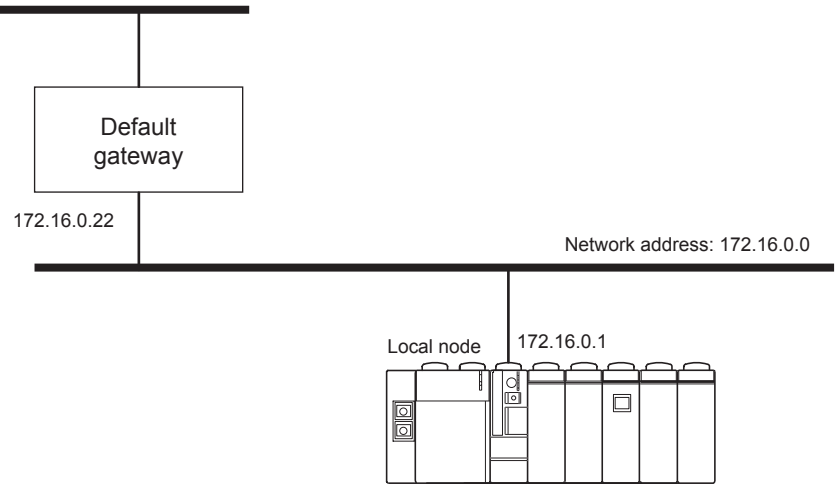
Section 4 Communication Procedures

4-2 Operation Definition of Ethernet

3) Gateway

When IP router (default gateway) is used, multiple IP network segments can be connected. When networks are connected via IP router, it is possible to communicate with other network via the router. In this case, communication with other network becomes possible when gateway is set.

Example)

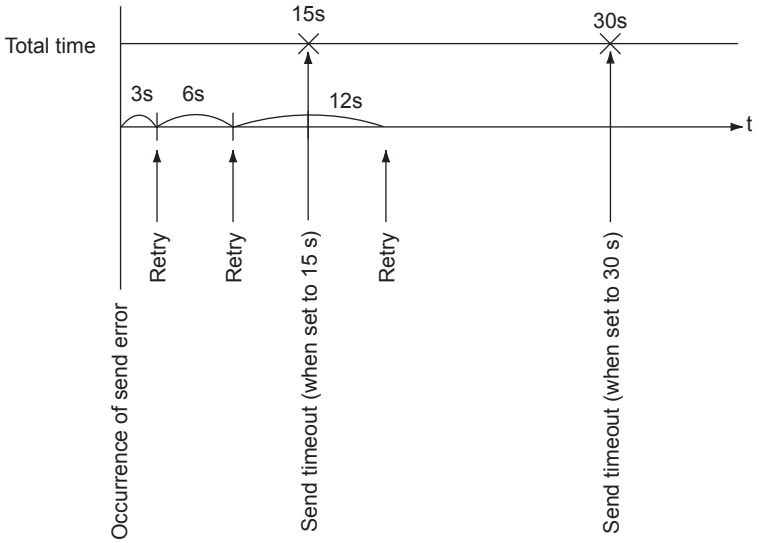


4) TCP send/receive timeout value (setting range: 1 to 300, in 0.1-second steps)

Communication error monitoring timer value when TCP channel is open and data is being sent.
If failed in opening a connection or sending data for TCP/IP communication, Ethernet automatically retries opening or sending. The interval of retry increases exponentially, like 3 seconds, 6 seconds, 12 seconds, ...

1) Abnormal end after the set timeout time elapses if repeating of retry cannot normally end the operation after opening is started
2) Abnormal end when the timing of retry is reached after the set timeout time elapses if repeating of retry cannot normally end the operation after sending is started

For example, when TCP send timeout value is set to 15 seconds or 30 seconds, the internal operation till error is detected becomes as follows:



Section 4 Communication Procedures

4-2 Operation Definition of Ethernet

5) Maximum TCP end timeout value (setting range: 0 to 600, in 0.1-second steps)

This item sets the waiting time to keep the socket for a given time after the closing of a TCP connection was attempted from local station and ended successfully. The maximum waiting time till the processing for closing the remote station is completed successfully when the closing of a TCP connection is attempted from local station is twice the set TCP send timeout value.
If the processing for closing the remote station cannot successfully be completed (when no FIN is received), RST is sent to the remote node to forcibly close the connection.

6) Loader command monitoring timer value (setting range: 0 to 3000, in 0.1-second steps)

This item sets the time to automatically cut out the connection when a client of other node has logged on in loader command communication mode but no command is sent from the client for a given period of time.
Set this item to "0" if you don't want to cut out the connection even when no command is sent from the client, for example, when the loader is connected via NP1PM-48E/256E module.

7) Send retry interval (setting range: 0 to 10 seconds, in 1-second steps)

In TCP sending operation, sending is retried when no ACK frame is received for a given period of time.
Retry is performed set number of times at set intervals.
If the send retry interval is set to "0", the interval of retry increases exponentially like 3 seconds, 6 seconds, 12 seconds ..... and retry is performed up to 12 times in total.

8) Send retry count (setting range: 0 to 30 times)

In TCP sending operation, this item sets the send retry count when no ACK frame is received for a given period of time.
Set this item so that (Send retry count) x (Send retry interval) <= (TCP send/receive timeout value)

9) Processing for closing at TCP send timeout

TCP send timeout occurs if no ACK is returned even when sending is retried specified times during communication under TCP/IP protocol. This item selects how to treat the connection.

10) Processing for closing at response receive timeout

This item selects the treatment of connection in case of response receive timeout.

11) Reference number of local port (setting range: 0 to 65280)

Reference number of local port for TCP/IP or UDP/IP communication. TCP/IP or UDP/IP communication is performed using the port number that is determined by adding the reference number to the local port number that is specified by application FB (user interface).
For example, when the values that are set from the parameter setting window for PC card interface module are
Reference number of local port = 256
Reference number of the remote port for communication = 256
and the setting of M_OPEN FB is
RPORT_NO =1
SPORT_NO = 2, then
NP1PM-48E/256E module side port number: Reference number of local port + SPORT_NO = 258, and
Port number of the remote node (personal computer side): Reference number of remote port + RPORT_NO = 257

Note: Set "256" for communication between MICREX-SX systems using R_READ and/or R_WRITE.

12) Reference number of remote port for communication (setting range: 0 to 65280)

Reference number of remote for TCP/IP or UDP/IP communication. TCP/IP or UDP/IP communication is performed using the port number that is determined by adding the reference number to the remote port number that is specified by M_OPEN FB (user application).

Note: Set "256" for communication between MICREX-SX systems using R_READ and/or R_WRITE.

13) Response monitoring timer value (setting range: 0 to 300, in 0.1-second steps)

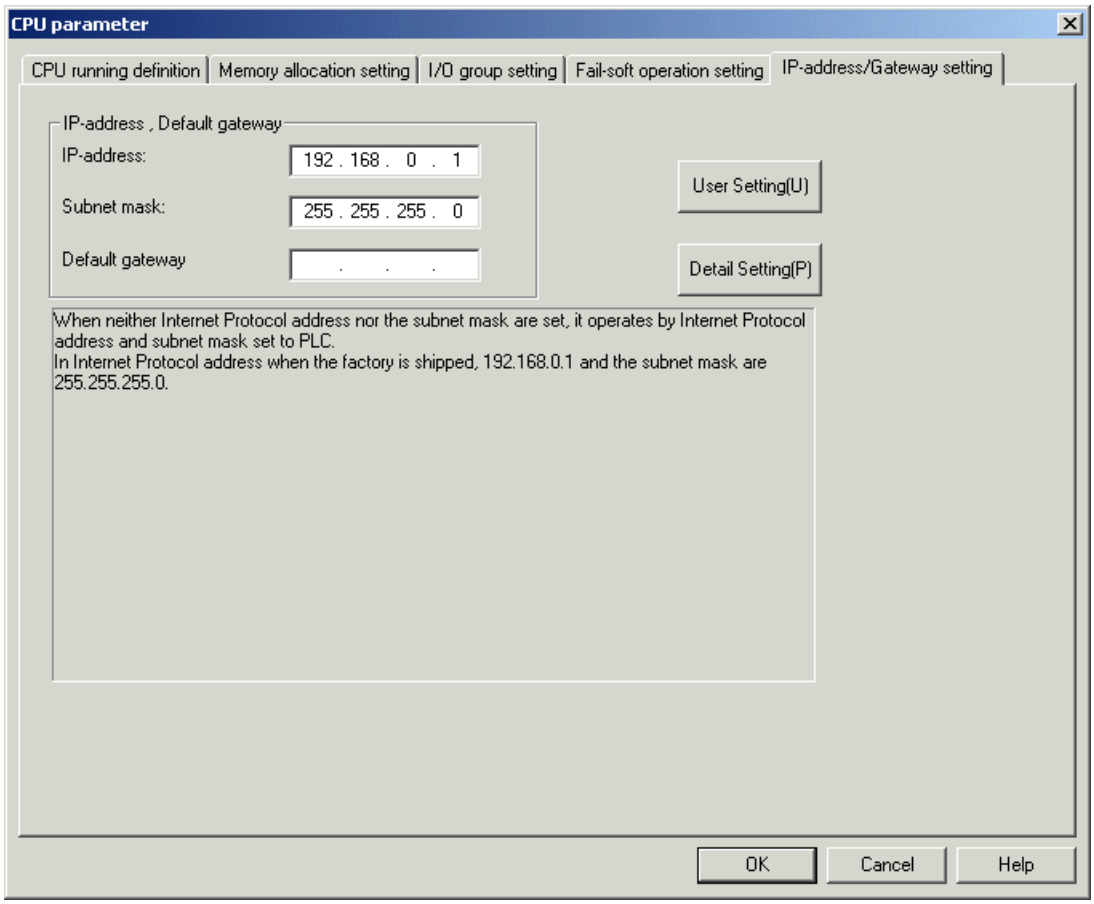
In fixed buffer communication mode, this item sets the waiting time till a response is returned after a command is sent. The timer value is also applied to the waiting time for receive data.

Section 4 Communication Procedures

4-2 Operation Definition of Ethernet

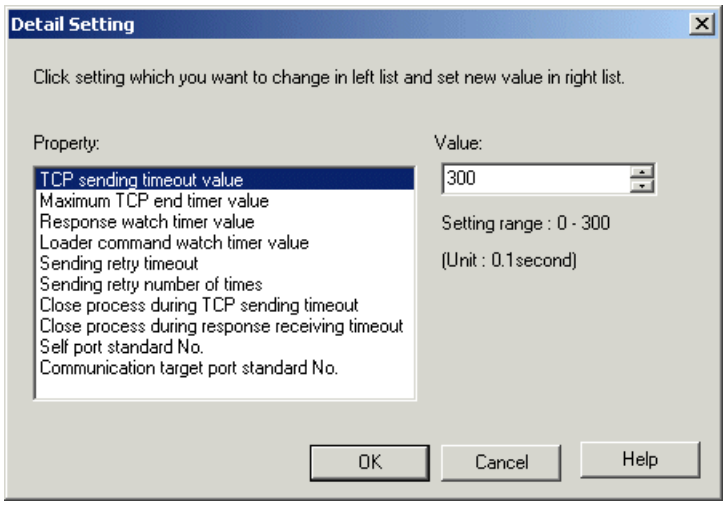
<Setting procedure>

◆ Open the [Module properties] dialog box for the CPU module and click the [Parameter...] button. Then, click the [IP Address] tab to display the [Ethernet parameter setting] dialog.
Set the IP address and subnet mask. If necessary, set the default gateway IP as well.



* Before shipment, the IP address is set to “192.168.0.1”, and the subnet mask is set to “255.255.255.0”.

◆ Click the [Detail Setting] button to display the [Detail Setting] dialog. After setting all necessary items, click the [OK] button to complete the setting.



Section 4 Communication Procedures

4-2 Operation Definition of Ethernet

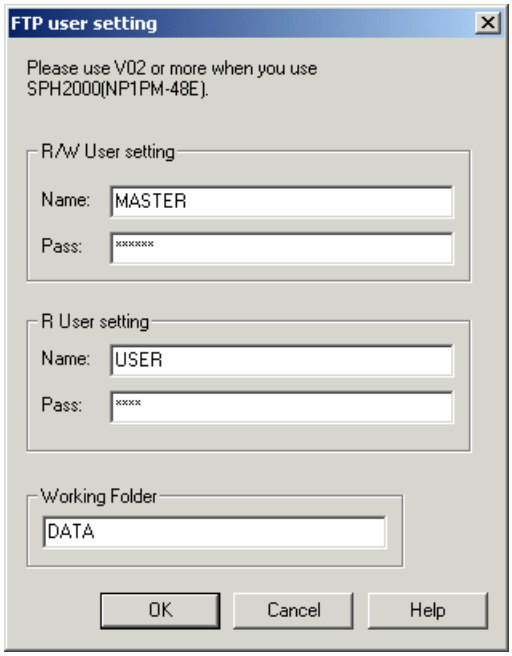
4-2-2 FTP server function setting

To access a file in a user ROM card that is mounted in the CPU module by using the FTP server function, it is necessary to register an FTP user. The setting items are as follows:

Setting item	Description
R/W User (user who can read/write) setting	Set a user name and password.
R User (user who can read) setting	Set a user name and password.
Working Folder	Specify a folder in a user ROM card to access from a personal computer, etc. The default is "DATA".

<Setting procedure>

◆ Click the [User Setting] button on the [Ethernet parameter setting] dialog box to display the [FTP user setting] dialog box.



◆ After setting all necessary items, click the [OK] button to complete the setting.

Section 4 Communication Procedures

4-2 Operation Definition of Ethernet

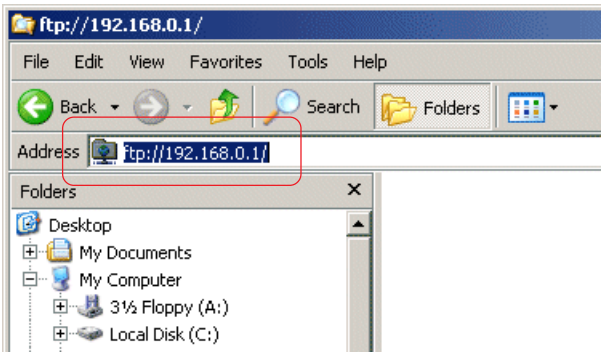
<Example of access from FTP client to FTP server (SPH2000 CPU)>

Example of access from Explorer is described below:

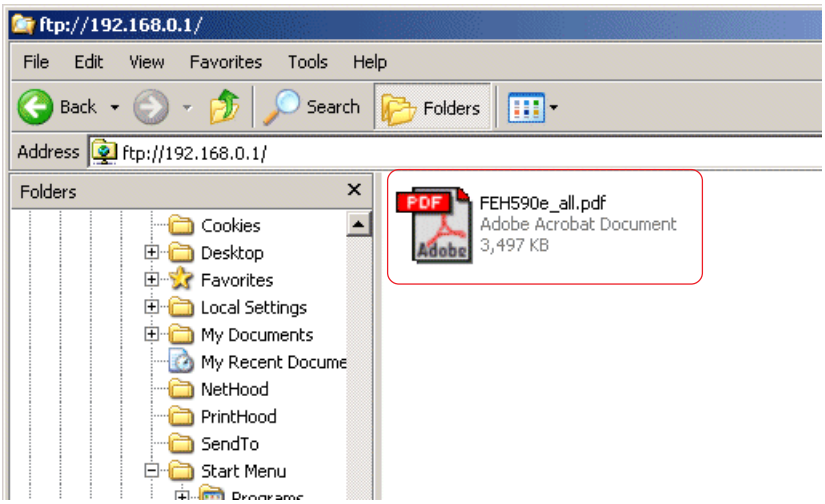
◆ Enter the IP address of the CPU module in the address bar of Explorer. Press the [Return] key to display the logon method dialog.

Setting example: **ftp://192.168.0.1**

IP address of the CPU module



◆ On the logon method dialog, enter the set user name and password, and then click the [Log on] button. As shown below, it becomes possible to access the user ROM card mounted in the CPU module.



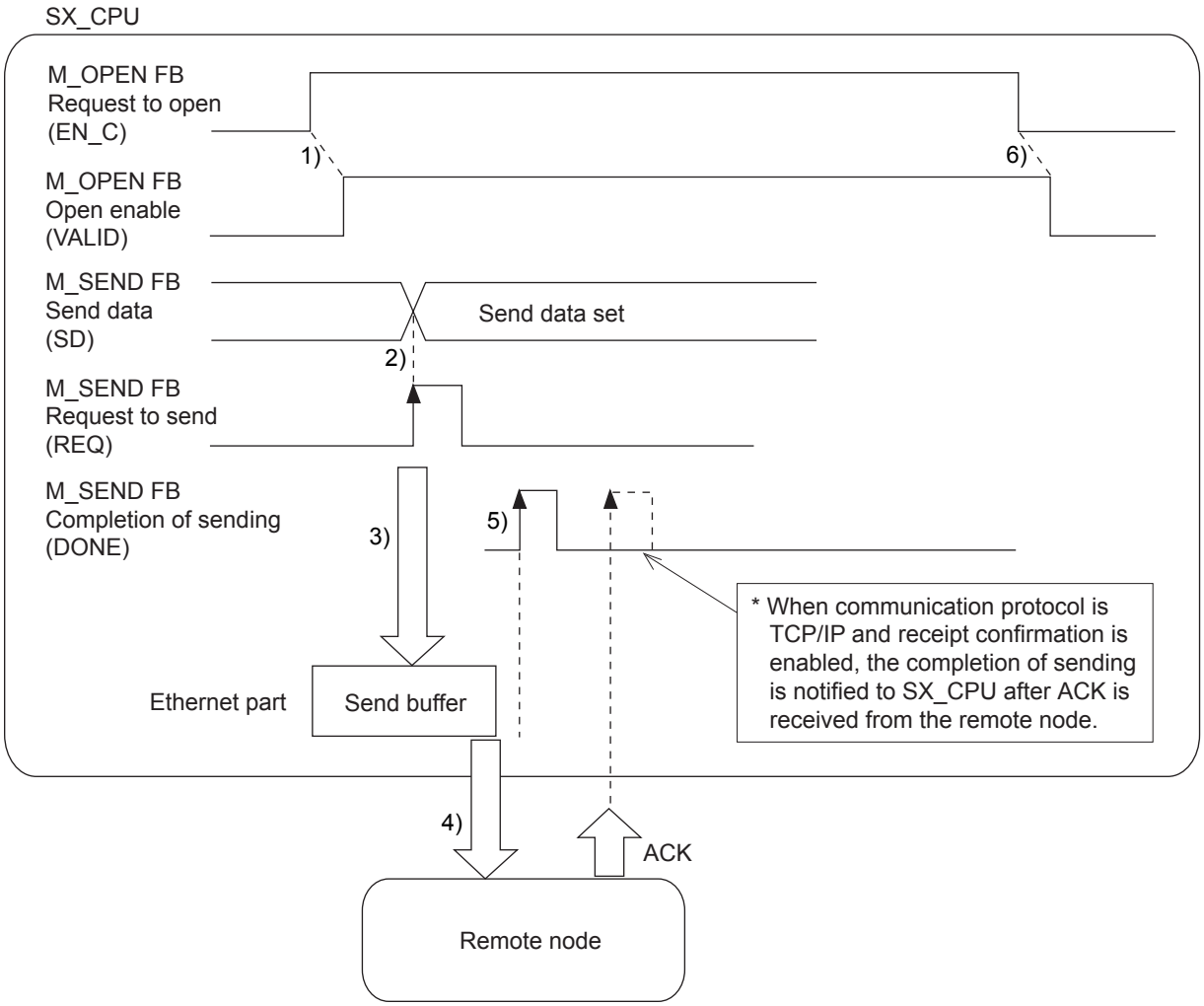
Section 4 Communication Procedures

4-3 Communication Procedures

4-3-1 Communication in general purpose communication mode

(1) Data sending

To send data to other node, M_OPEN FB is used to establish the connection, and M_SEND FB is used to send the data.



1) M_OPEN FB opens the communication channel. When the request to open (EN_C) is set ON, the connection with the remote node is established according to the content of the set M_OPEN FB, and the open enable flag (VALID) is set ON.
2) The target data is set in the send data (SD) of M_SEND FB, and the request to send (REQ) is set ON.
3) At the rising edge of the request to send (REQ), the data is sent to the send buffer of NP1PM-48E/256E.
4) NP1PM-48E/256E adds the header part necessary for communication to the data and then sends the data to the remote node.
5) When the sending of data from NP1PM-48E/256E is completed, the sending completion flag (DONE) is set ON for the period of one scan. When communication protocol is TCP/IP and receipt confirmation is enabled, the sending completion flag (DONE) is set ON for the period of one scan after receipt complete signal (ACK) is sent from the remote node.

Note: If the sending of data cannot successfully be ended, the sending error flag (ERROR) is set ON for the period of one scan. In such case, set the request to send OFF and re-execute the operation for sending (from step 3).

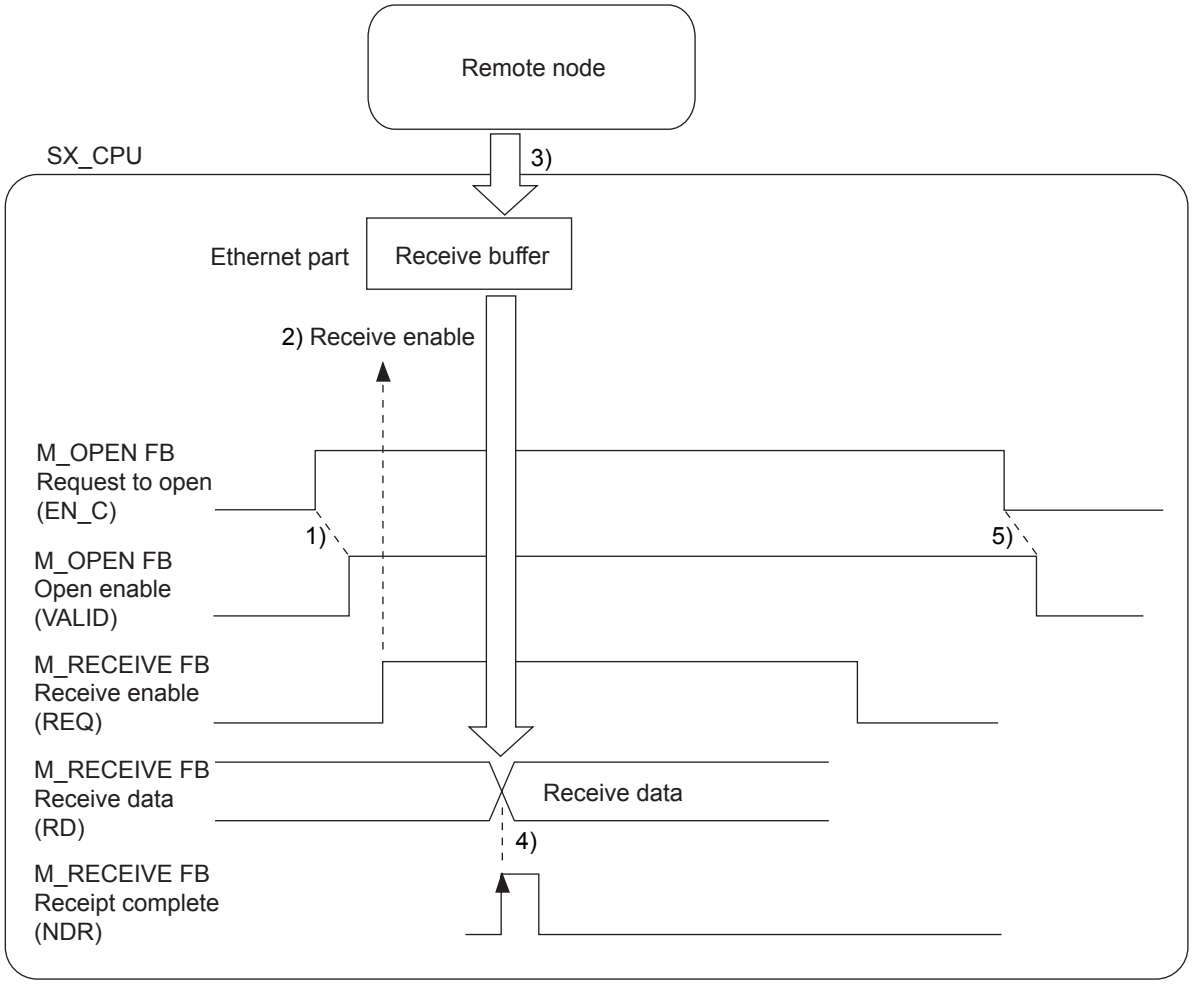
6) To cut out the communication line after the end of communication, set OFF the request to open (EN_C) of M_OPEN FB. Then VALID will be set OFF when the processing for closing is completed.

Section 4 Communication Procedures

4-3 Communication Procedures

(2) Data receiving

To receive data from other node, M_OPEN FB is used to establish the connection, and M_RECEIVE FB is used to receive the data.



1) M_OPEN FB opens the communication channel. When the request to open (EN_C) is set ON, the connection with the remote node is established according to the content of the set M_OPEN FB, and the open enable flag (VALID) is set ON.
2) The receive enable flag (EN_R) of M_RECEIVE FB is set ON to make the module become ready for receiving data.
3) The data sent from the remote node is received in the receive buffer.
4) The receive data that is stored in the receive buffer of NP1PM-48E/256E is transferred to the receive data (RD) of M_RECEIVE FB, and the receipt completion flag (NDR) is set ON for the period of one scan.
If the receive enable flag is set ON, the module stays in receiving waiting mode. Once the module enters receiving waiting mode, the module stays in it even if EN_R is set OFF. To leave receiving waiting mode, set OFF the request to open (EN_C) of M_OPEN FB to cut out the communication line.

Note: If abnormal data is received, the receipt completion flag (NDR) is not set ON, nor the receive data is stored in the receive buffer.

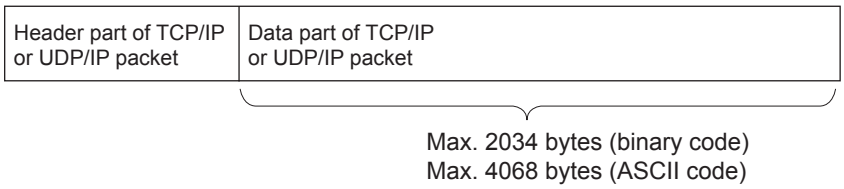
5) To cut out the communication line after the end of communication, set OFF the request to open (EN_C) of M_OPEN FB. Then VALID will be set OFF when the processing for closing is completed.

Section 4 Communication Procedures

4-3 Communication Procedures

(3) Data format

Data received from or sent to other node



1) Header part

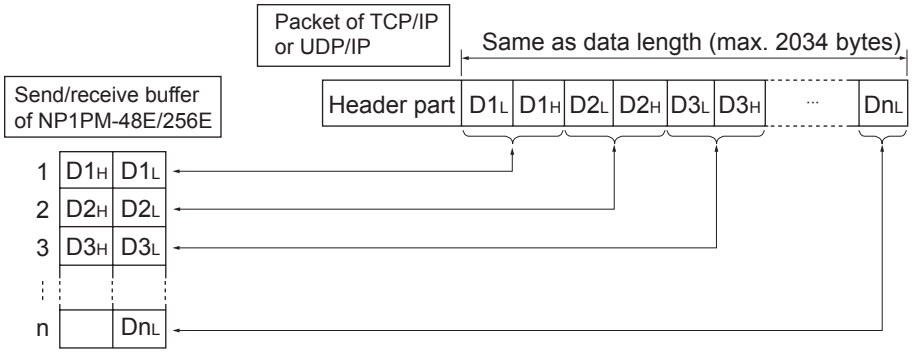
Header part is the header of Ethernet TCP/IP or UDP/IP packet. When an application program sends data to other node, NP1PM-48E/256E automatically adds the header and sends the data with the header to the remote node. When data is received from the remote node, NP1PM-48E/256E removes the header part from the received data, and only data part is sent to the FB.

2) Data part

Data part is the data of Ethernet TCP/IP or UDP/IP packet. When data is sent to other node by M_SEND FB, the data transferred in the send buffer of NP1PM-48E/256E is set in the data part of TCP/IP or UDP/IP packet, and this data is sent. In the case of binary code, the data in the send buffer is sent as it is; in the case of ASCII code, the data in the send buffer is converted into ASCII code, and the converted data is sent.

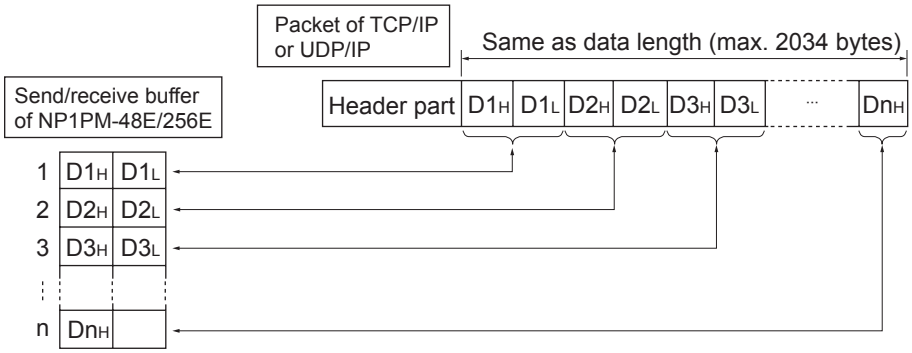
When data is received from other node, the data in the data part of TCP/IP or UDP/IP packet is stored in the receive buffer of NP1PM-48E/256E. In the case of binary code, received data is stored in the buffer as it is; in the case of ASCII code, received data is converted into ASCII code, and the converted data is stored in the buffer.

<Binary code (without data swap)>



Data length is the number of bytes of the data that is stored in the send or receive buffer, expressed by decimal number (maximum 2034 bytes).
When data length is an odd number, the data up to the low-order byte of the last word is effective.

<Binary code (with data swap)>

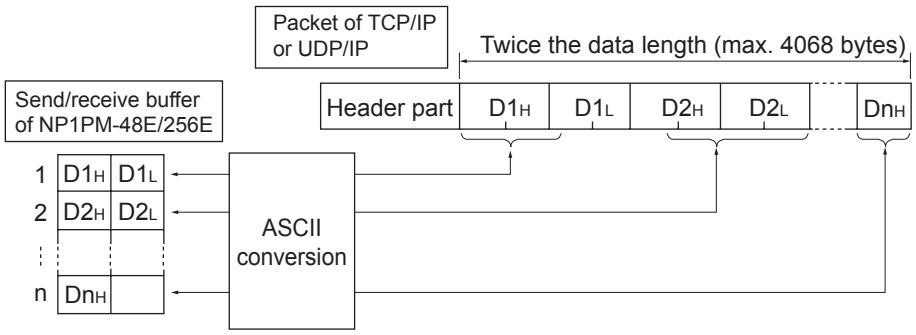


Data length is the number of bytes of the data that is stored in the send or receive buffer, expressed by decimal number (maximum 2034 bytes).
When data length is an odd number, the data up to the high-order byte of the last word is effective.

Section 4 Communication Procedures

4-3 Communication Procedures

<ASCII code>



Data length is the number of bytes of the data that is stored in the send or receive buffer, expressed by decimal number (maximum 2034 bytes).
When data length is an odd number, the data up to the high-order byte of the last word is effective.

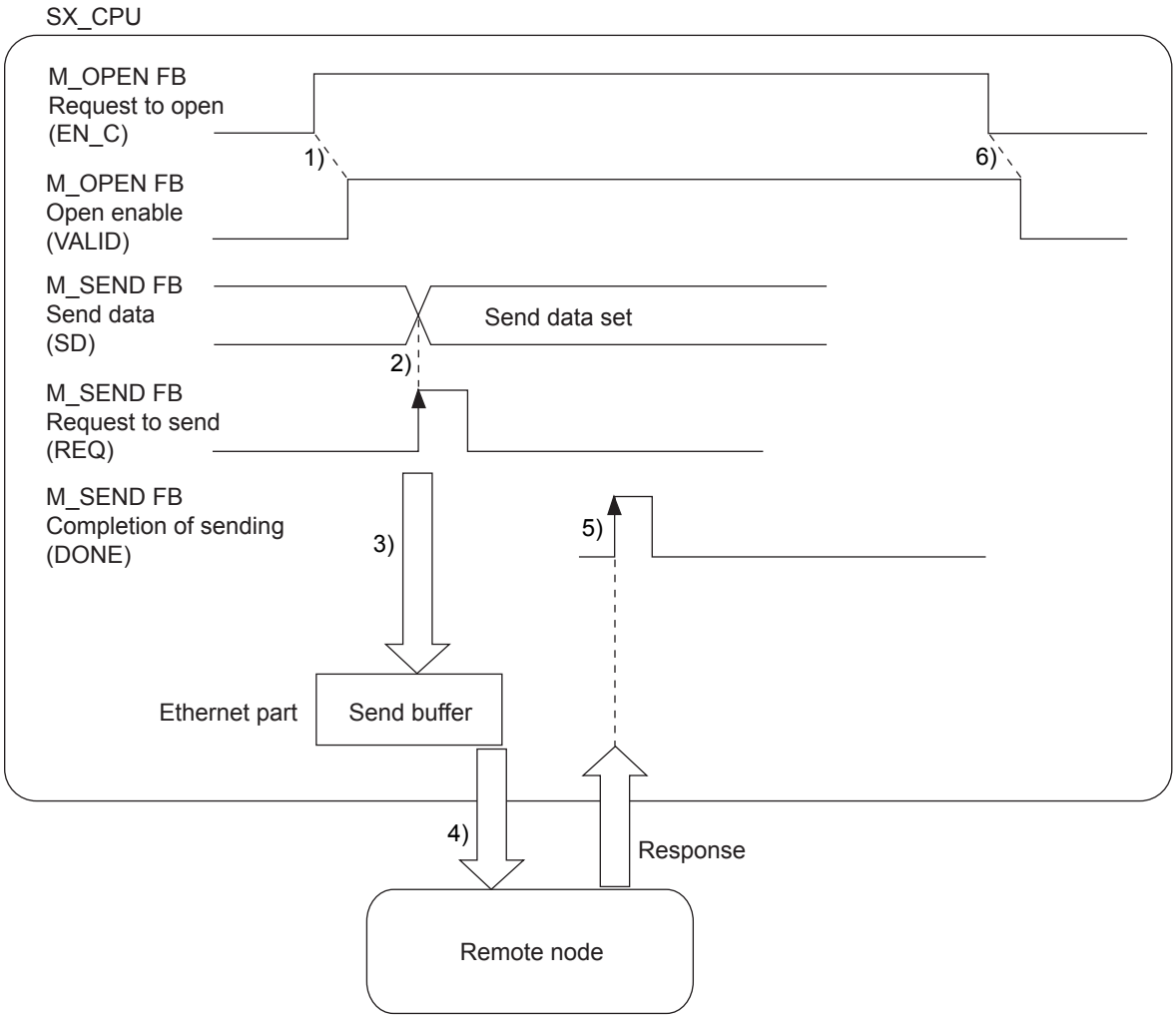
Section 4 Communication Procedures

4-3 Communication Procedures

4-3-2 Communication in fixed buffer communication mode

(1) Data sending

To send data to other node, M_OPEN FB is used to establish the connection, and M_SEND FB is used to send the data.



1) M_OPEN FB opens the communication channel. When the request to open (EN_C) is set ON, the connection with the remote node is established according to the content of the set M_OPEN FB, and the open enable flag (VALID) is set ON.
2) The target data is set in the send data (SD) of M_SEND FB, and the request to send (REQ) is set ON.
3) At the rising edge of the request to send (REQ), the data is sent to the send buffer of NP1PM-48E/256E.
4) NP1PM-48E/256E adds the header part necessary for communication to the data and then sends the data to the remote node.
5) When the sending of data from NP1PM-48E/256E is completed and a response is received from the remote mode, the sending completion flag (DONE) of M_SEND FB is set ON for the period of one scan.

Note: If the sending of data cannot successfully be completed (if no response is sent from the remote node or if the status of the end code returned as the response is not “00”), the sending error flag (ERROR) is set ON for the period of one scan. In such case, set the request to send once OFF and re-execute the operation for sending (from step 3).

6) To cut out the communication line after the end of communication, set OFF the request to open (EN_C) of M_OPEN FB. Then VALID will be set OFF when the processing for closing is completed.

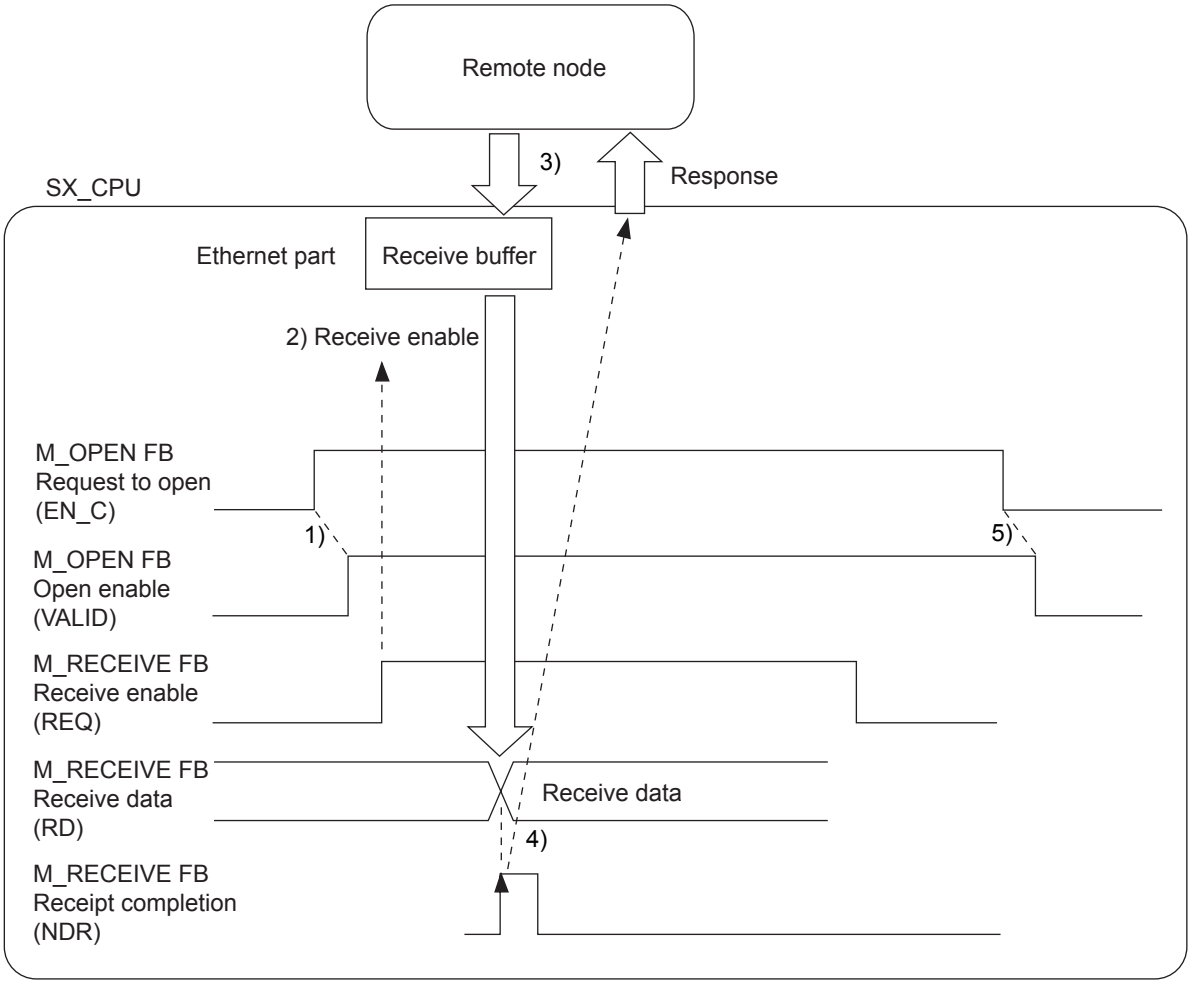
* When the Fixed Buffer Communication mode is used, set separate ports for sending and receiving.

Section 4 Communication Procedures

4-3 Communication Procedures

(2) Data receiving

To receive data from other node, M_OPEN FB is used to establish the connection, and M_RECEIVE FB is used to receive the data.



1) M_OPEN FB opens the communication channel. When the request to open (EN_C) is set ON, the connection with the remote node is established according to the content of the set M_OPEN FB, and the open enable flag (VALID) is set ON.
2) The receive enable flag (EN_R) of M_RECEIVE FB is set ON to make the module become ready for receiving data.
3) The data sent from the remote node is received in the receive buffer.
4) The receive data that is stored in the receive buffer of NP1PM-48E/256E is transferred to the receive data (RD) of M_RECEIVE FB, and the receipt completion flag (NDR) is set ON for the period of one scan. When the receipt completion flag (NDR) is set ON, NP1PM-48E/256E returns a response to the other node.
If the receive enable flag is set ON, the module stays in receiving waiting mode. Once the module enters receiving waiting mode, the module stays in it even if EN_R is set OFF. To leave receiving waiting mode, set OFF the request to open (EN_C) of M_OPEN FB to cut out the communication line.
In processing for receiving, the data length to receive and the size of received data part are checked. Therefore, till all data is received, the system waits for the remaining data being received. Receiving completes when all data is received. If the size of received data is greater than the data length to receive, “E052(h)” is returned as response (E052: abnormal number of data words). At that time, the abnormal end (ERROR) flag is not set ON in the case of R_RECEIVE, and the received data is abandoned.

Note: If abnormal data is received, the receipt completion flag (NDR) is not set ON, nor the receive data is stored in the receive buffer.

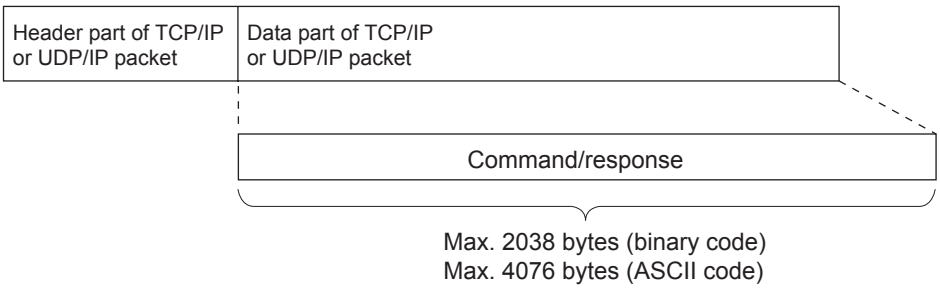
5) To cut out the communication line after the end of communication, set OFF the request to open (EN_C) of M_OPEN FB. Then VALID will be set OFF when the processing for closing is completed.

* When the Fixed Buffer Communication mode is used, set separate ports for sending and receiving.

Section 4 Communication Procedures

4-3 Communication Procedures

(3) Data format



1) Header part

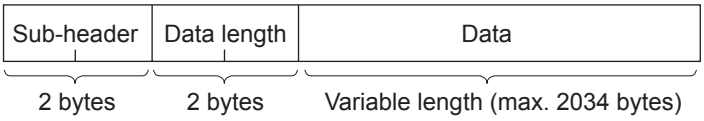
Header part is the header of Ethernet TCP/IP or UDP/IP packet. When an application program sends data to a remote node, NP1PM-48E/256E automatically adds the header and sends the data with the header to the remote node. When data is received from a remote node, NP1PM-48E/256E removes the header part from the received data, and only data part is sent to the FB.

2) Data part

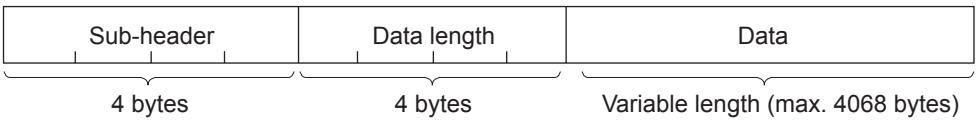
Data part is the data of Ethernet TCP/IP or UDP/IP packet. When data is sent to a remote node by M_SEND FB, sub-header is added to the data transferred in the send buffer of NP1PM-48E/256E, and the sub-header added data is set in the data part of TCP/IP or UDP/IP packet, and this data is sent. In the case of binary code, the data in the send buffer is sent as it is; in the case of ASCII code, the data in the send buffer is converted into ASCII code, and the converted data is sent.
When data is received from a remote node, the data that is removed the sub-header from that in the data part of TCP/IP or UDP/IP packet is stored in the receive buffer of NP1PM-48E/256E. In the case of binary code, received data is stored in the buffer as it is; in the case of ASCII code, received data is converted into ASCII code, and the converted data is stored in the buffer.

<Command format>

Communication by binary code

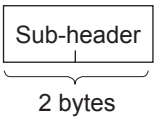


Communication by ASCII code

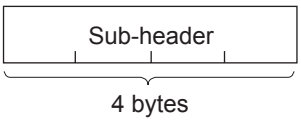


<Sub-header>

Communication by binary code



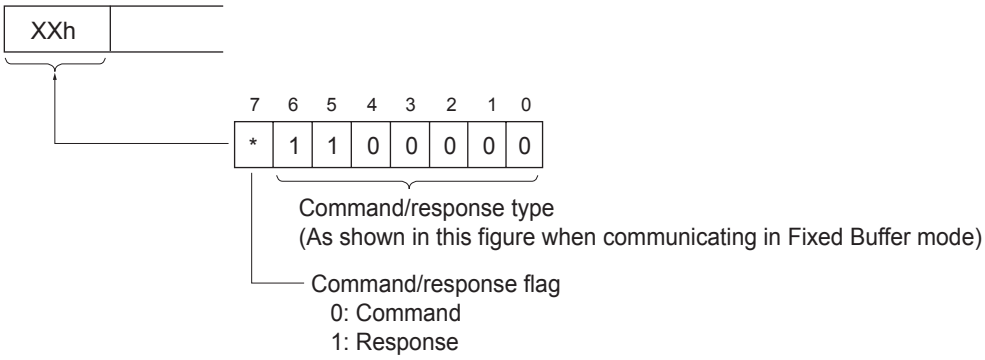
Communication by ASCII code



Section 4 Communication Procedures

4-3 Communication Procedures

<Sub-header>

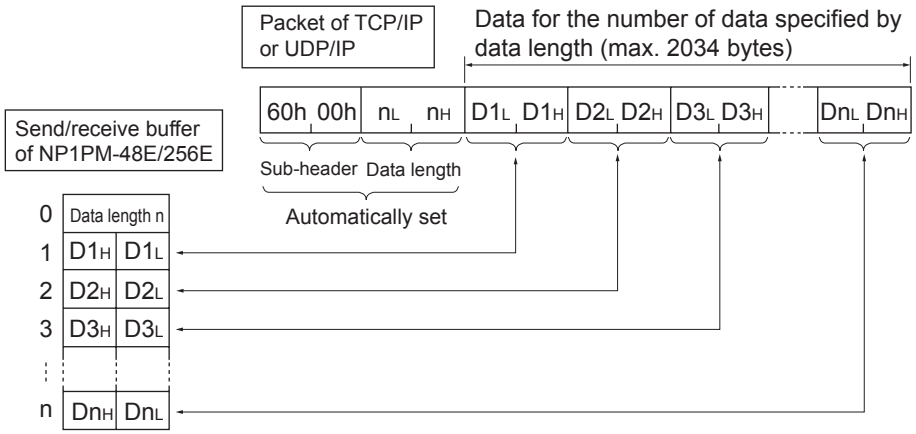


	Command	Response
Binary code	60h 00h	E0h End code
ASCII code	36h 30h 36h 30h "6" "0" "6" "0"	45h 30h End code "E" "0"

End code

Binary code	ASCII code	Meaning	Description
00h	30h 30h	Normal end	—
50h	35h 30h	Command/response type definition error	Unspecified code is set for the type of command/response in sub-header.
52h	35h 32h	Abnormal number of data words	Data length exceeds specified value.
—	35h 34h	ASCII conversion error	During communication using ASCII code, an ASCII code that cannot be converted into binary code was sent from the remote node.

<Data, binary code (without data swap)>

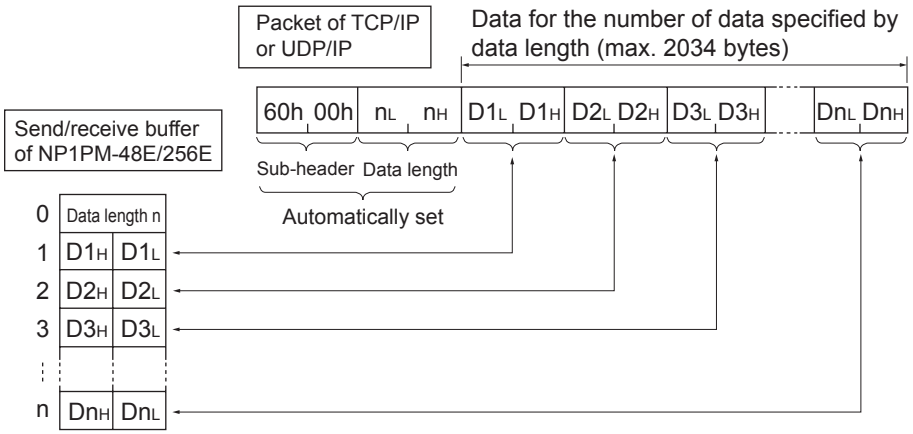


* Data length is the number of bytes of the data that is stored in the send or receive buffer (maximum 1017 words).

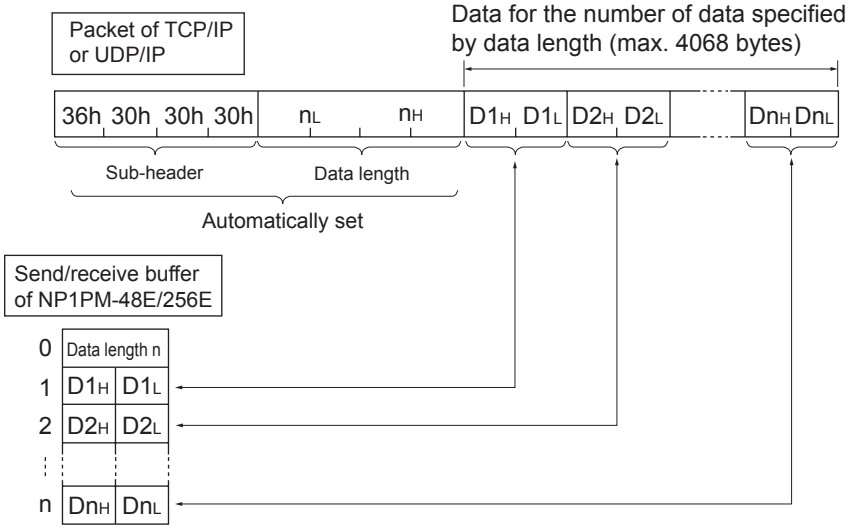
Section 4 Communication Procedures

4-3 Communication Procedures

<Data, binary code (with data swap)>



<Data, ASCII code>



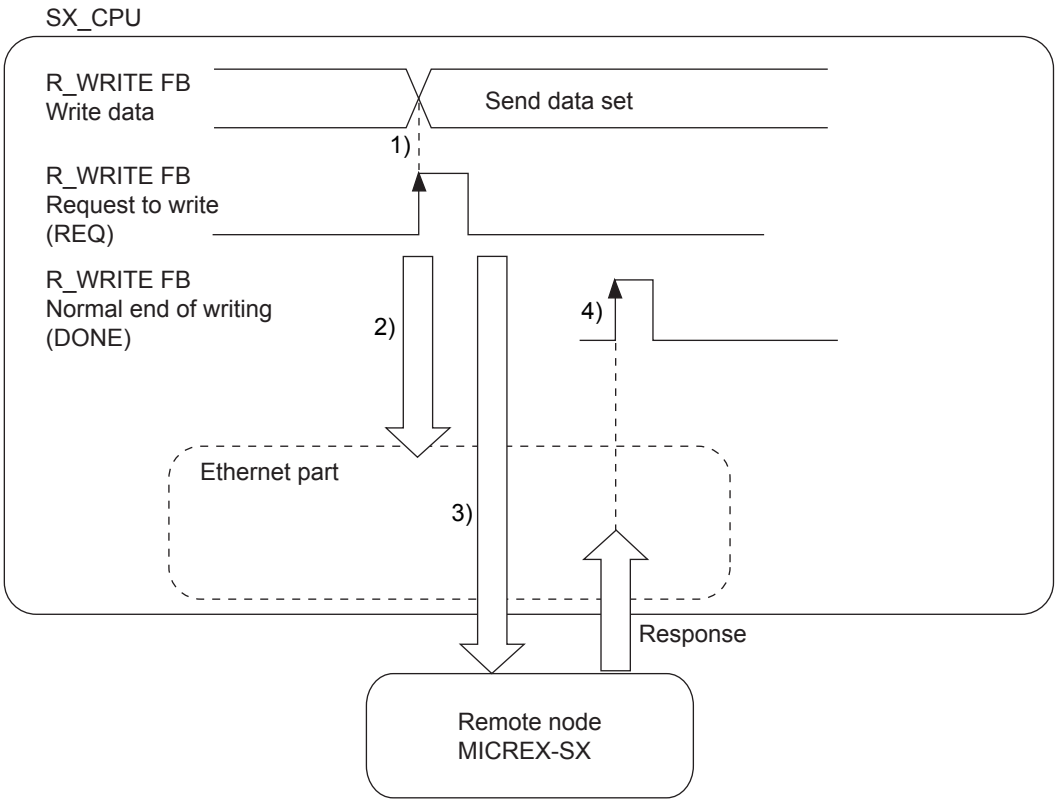
Section 4 Communication Procedures

4-3 Communication Procedures

4-3-3 Communication in loader command communication mode

(1) Data writing

R_WRITE FB is used to write data in a remote SX node (SX_CPU internal memory). R_WRITE FB automatically opens the communication channel and writes data in the remote node (SX system).



1) Target data is set in the send data (SD) of R_WRITE FB, and the request to write (REQ) is set ON.
2) When the request to write (REQ) of R_WRITE FB is set ON, the communication channel to NP1PM-48E/256E is automatically opened.
3) When the connection is established, loader command is sent to the remote SX node via Ethernet to execute writing.
4) The remote SX node (SX_CPU) executes the write command that is issued by R_WRITE FB and sends the result of operation (response) to NP1PM-48E/256E. When normal end signal is received, the flag for the normal end of writing (DONE) is set ON for the period of one scan.

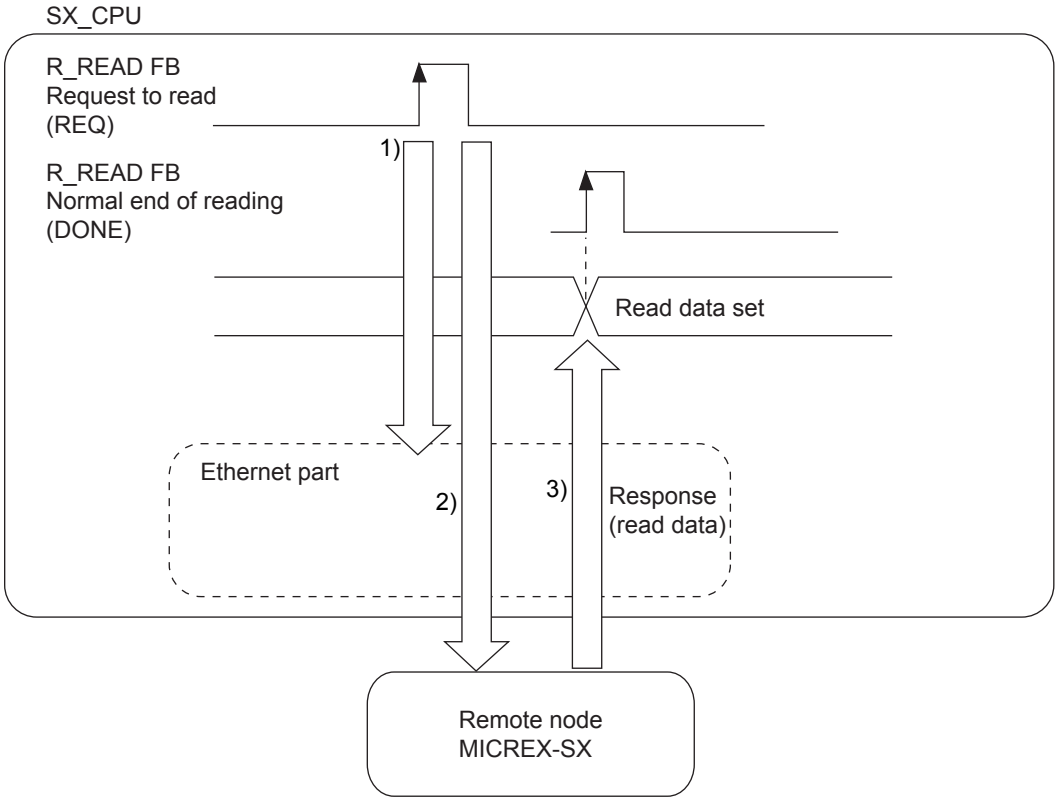
Note: If the writing of data cannot successfully be ended (if no response is sent from the remote node or if the status of the end code returned as the response is not “00”), the receiving error flag (ERROR) is set ON for the period of one scan. In such case, set the request to write once OFF and re-issue the request to write.

Section 4 Communication Procedures

4-3 Communication Procedures

(2) Data reading

R_READ FB is used to read data from a remote SX node (SX_CPU internal memory). R_READ FB automatically opens the communication channel and reads data from the remote node (SX system).



1) When the request to read (REQ) of R_WRITE FB is set ON, the communication channel to NP1PM-48E/256E is automatically opened.
2) When the connection is established, loader command is sent to the remote SX node via Ethernet to request reading data from the internal memory of SX_CPU.
3) The remote SX node (SX_CPU) executes the read command that is issued by R_READ FB and returns the result of operation (read data and status). When normal end signal and read data are received, the flag for the normal end of reading (DONE) is set ON for the period of one scan.

Note: If the reading of data cannot successfully be ended (if no response is sent from the remote node or if the status of the end code returned as the response is not “00”), the receiving error flag (ERROR) is set ON for the period of one scan. In such case, set the request to read once OFF and re-issue the request to read.

Section 4 Communication Procedures

4-4 Communication Program

4-4-1 FBs used in communication program

Ethernet communication programs use the following FBs.

Communication mode	FB used	Purpose and use
General Purpose Communication mode Fixed Buffer Communication mode	M_OPEN	Used in order for the CPU to request the Ethernet communication part to open local ports for it and thus establishing connection.
	M_SEND	Used to send data from SX_CPU (SX system) to other node
	M_RECEIVE	Used in order for SX_CPU to receive data sent from other node.
Loader Command Communication mode (see note)	R_WRITE	Used to write data from SX_CPU (SX system) in the Ethernet node of other SX system. No application program is necessary on the written side.
	R_READ	Used in order for SX_CPU (SX system) to read data from the Ethernet node of other SX system. No application program is necessary on the side that receives the request to read.

Note: Loader Command Communication mode requires no program to open the communication port because communication port is automatically opened at the rising edge of NP1PM-48E/256E module.

4-4-2 Channel open (M_OPEN)

M_OPEN (channel open) FB is used when the CPU requests the Ethernet communication part to open a local port for it and thus to establish the connection for it to communicate with other node that is connected to the CPU module via Ethernet. (Maximum 10 ports can be opened at a time.)
When the processing for opening is completed successfully, a connection number is output as the proof that the connection is established. After this, M_SEND and M_RECEIVE FBs communicate data using this connection number.

(1) Operation of the command

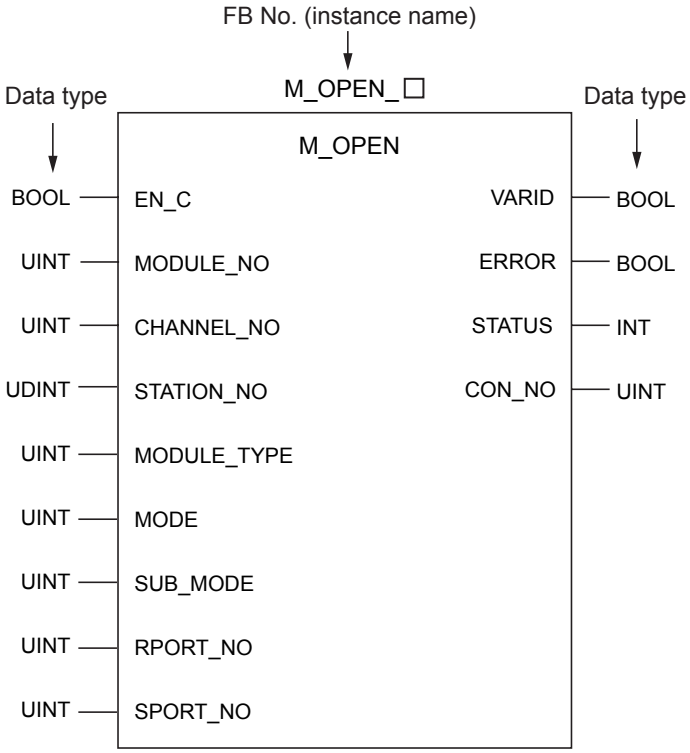
1) At the rising edge of “EN_C”, the processing for opening is performed for the Ethernet communication port. (The processing for opening does not complete within the period of one scan.)
2) When the processing for opening is completed successfully, the “VALID” flag is set ON, and a connection number is output to “CON_NO”. Then it becomes possible to use M_SEND and M_RECEIVE FBs.
3) If the processing for opening cannot successfully be completed, the “ERROR” flag is set ON for the period of one scan, and the corresponding error code is output to “STATUS”. If “EN_C” is ON at this time, the processing for opening is retried.
4) When “EN_C” is set to OFF, the processing for closing is started. (The processing for closing does not end within the period of one scan.)
5) When the processing for closing is completed successfully, the “VALID” flat is set to 0 (zero). (Processing for closing does not ends abnormally.)

Notes:

1) There are two modes for opening the ports: “passive mode” for receiving and “active mode” for sending. To send data, the remote node must be ready for receiving data. Therefore, the processing for opening ports in “passive mode” for receiving data needs to be completed in advance.
2) If reopening is attempted on a same port (when local port and the remote port for communication are the same), the connection will be established during the retry that is performed 3 seconds later because it takes 1 second to open the socket.

4-4 Communication Program

(2) FB format



(3) Explanation of each FB terminal

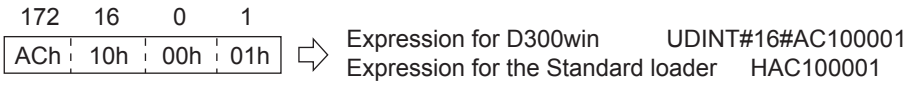
Terminal function name	Terminal name	Data type	I/O	Description
Request to open	EN_C	BOOL	IN	ON : The processing for opening ports is started at the rising edge of this signal OFF: The processing for opening ports is started at the falling edge of this signal.
Communication module No.	MODULE_NO	UINT	IN	Specify the SX bus station number of the CPU module. For CPU No. 0, this item is set to 254.
Communication channel No.	CHANNEL_NO	UINT	IN	For this module, this item is fixed to "524".
Remote station No. *1	STATION_NO	UDINT	IN	Specifies IP address for the remote node of communication.
Module type	MODULE_TYPE	UINT	IN	Sets the type of network for this module. Fixed to "1".
Communication mode *2	MODE	UINT	IN	Sets communication conditions for the port to be opened.
Communication submode *3	SUB_MODE	UINT	IN	Sets enable/disable of receipt confirmation. 0: Disable, 1: Enable
Remote port No.	RPORT_NO	UINT	IN	Specifies port No. for the remote node of communication.
Local port No.	SPORT_NO	UINT	IN	Specifies port No. for the NP1PM-48E/256E module (setting range: 1 to 127). Local port number = Set value + Reference number for local port in the system definition Example) Reference number for local port: 256 Set value of local port number: 1 Local port number: 256+1=257
Open enable	VALID	BOOL	OUT	Turns ON when the processing for opening is completed successfully and the modules becomes ready for communication. Turns OFF when the processing for closing is performed (when EN_C is set OFF).
Error	ERROR	BOOL	OUT	Turns ON for the period of one scan if the processing for opening is ended abnormally.
Status	STATUS	INT	OUT	The result of the processing for opening is output by a status code.
Connection No.	CON_NO	UINT	OUT	When the processing for opening is completed, a connection number is assigned. This number is used for communication by M_SEND and M_RECEIVE FBs.

Section 4 Communication Procedures

4-4 Communication Program

*** 1 Remote station No.**

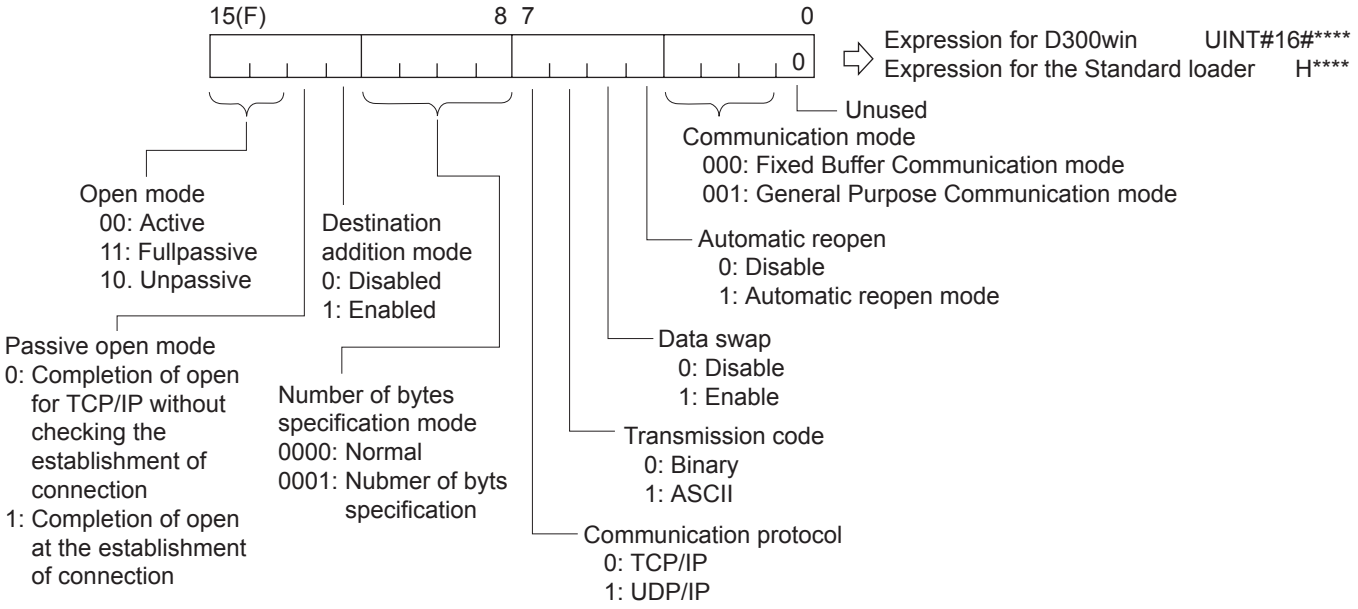
IP address is set in the following manner. Example: When IP address is set to “172.16.0.1”



* When UDP/IP protocol is used, broadcast is possible by setting “255.255.255.255”, and partial broad cast is possible by setting “***.***.***.255”.

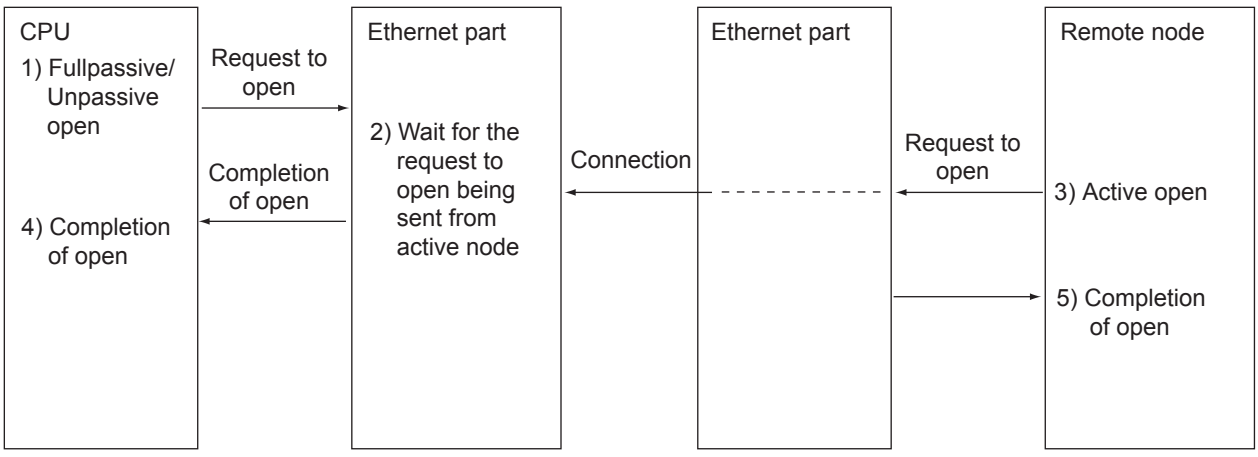
*** 2 Communication mode**

Sets communication conditions for the connection at which a channel is to be opened, in the following format.



<Open mode>

To open ports for TCP/IP communication, the processing for Fullpassive open as well as that for Unpassive open must be finished before the processing for active open is performed.



1) Active open mode

The processing for active open is performed for other nodes that are ready for receiving TCP connection open command.

2) Fullpassive open mode

The processing for passively opening TCP connection is performed only for the nodes that are set in the communication address setting area. Then the module waits for a request of active open being sent from other node that is set in the communication address setting area.

3) Unpassive open mode

The processing for passively opening TCP connection is performed for all other nodes that are connected to the network. Then the module waits for a request of active open being sent from other node connected to the network.

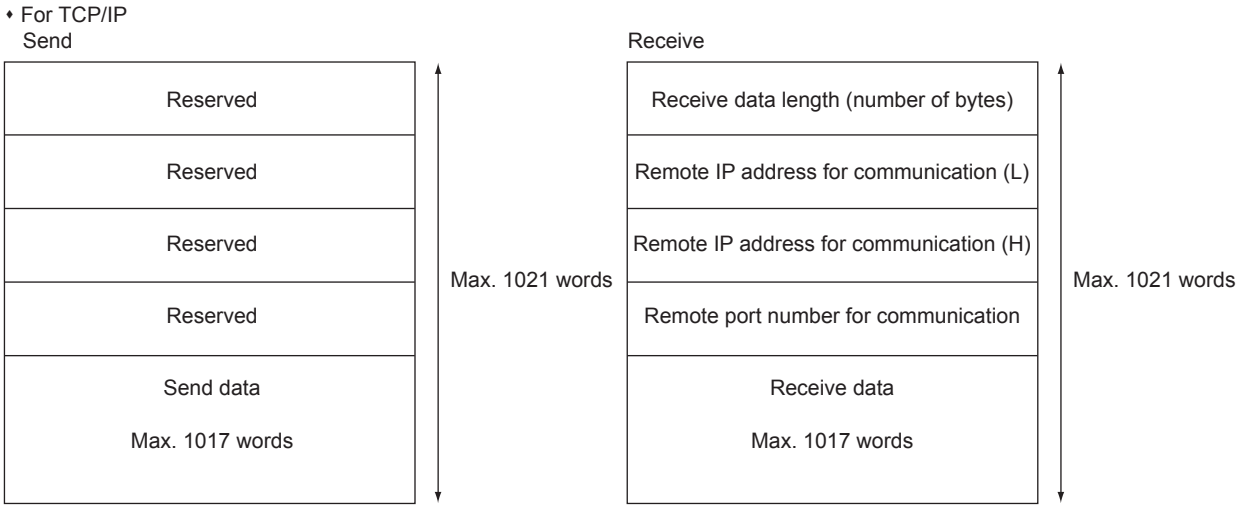
Section 4 Communication Procedures

4-4 Communication Program

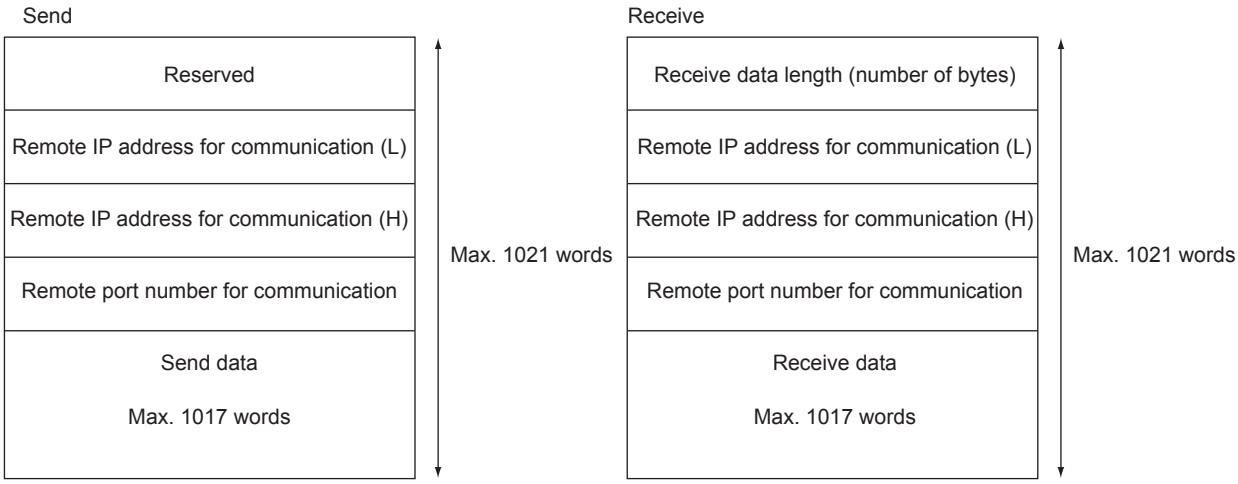
<Passive open mode>
If the completion of open at the establishment of connection is selected, VALID of M_OPEN is set ON when Ethernet connection is established. If connection is not established for 30 seconds after M_OPEN request is issued, open error (status: 193) occurs.

<Destination Addition mode>
When Destination Addition mode is enabled, the first 4 words of data are used as destination information area.

- For TCP/IP



- For UDP/IP



* When UDP/IP protocol is used, broadcast is possible by setting “255.255.255.255”, and partial broad cast is possible by setting “***.***.***.255”.

- IP address and port number are stored by decimal number.
- For UDP/IP sending, data is sent to the remote station set above. It is set by user application.

<Data swap>
When binary is specified as transmission code, the treatment of high-order and low-order bytes of transmission data are reversed. When ASCII is specified as transmission code, this setting does not take effect.

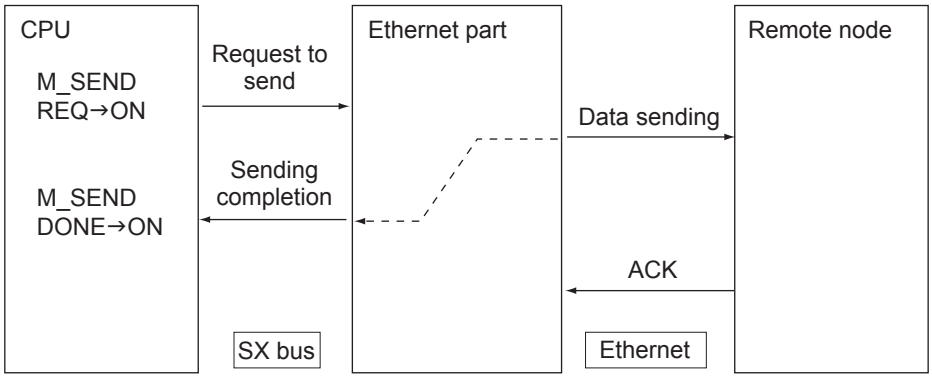
<Automatic reopen>

If Automatic Reopen mode is enabled when “Fullpassive” or “Unpassive” is specified as open mode, the NP1L-ET1 module automatically starts the processing for closing the moment the request to close is received from the remote mode after the connection has been established, and then automatically comes in Request-to-Open waiting mode.

***3 Communication submode**

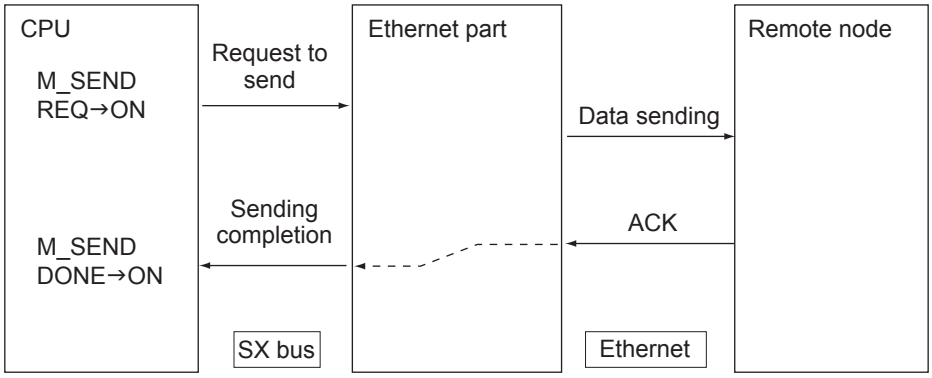
When data is sent using TCP/IP protocol, this submode specifies whether or not to enable receipt confirmation.

1) Operation when receipt confirmation is disabled (SUB_MODE=UINT#0)



* Sending is completed when data is sent onto Ethernet without waiting for ACK from the remote node.

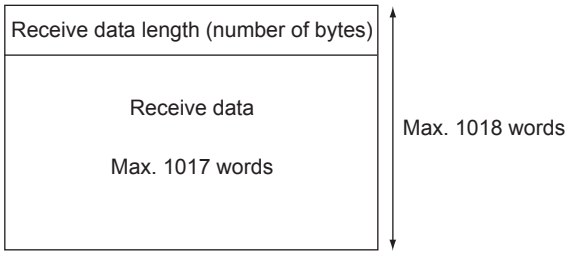
2) Operation when receipt confirmation is enabled (SUB_MODE=UINT#1)



* Sending is completed after waiting for ACK being sent from the remote node.

<Store receive data length>

When “Store receive data length” is enabled, receive data length is stored in the first word of the receive buffer, as shown in the figure below.

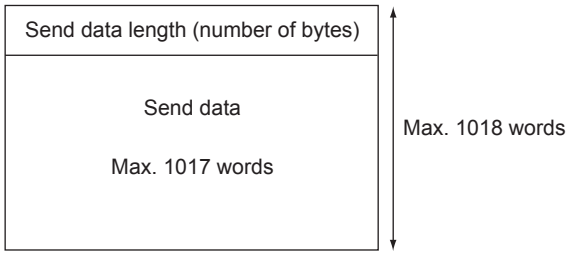


Section 4 Communication Procedures

4-4 Communication Program

<Number of bytes specification mode>

If “number of bytes specification mode” is selected, as shown in the figure below, the first word of the send buffer is regarded as a specified area of the send data length and sending operation is performed in the specified size.



***4 Status**

For information about the status, refer to “4-4-7”.

Section 4 Communication Procedures

4-4 Communication Program

4-4-3 Message send (M_SEND)

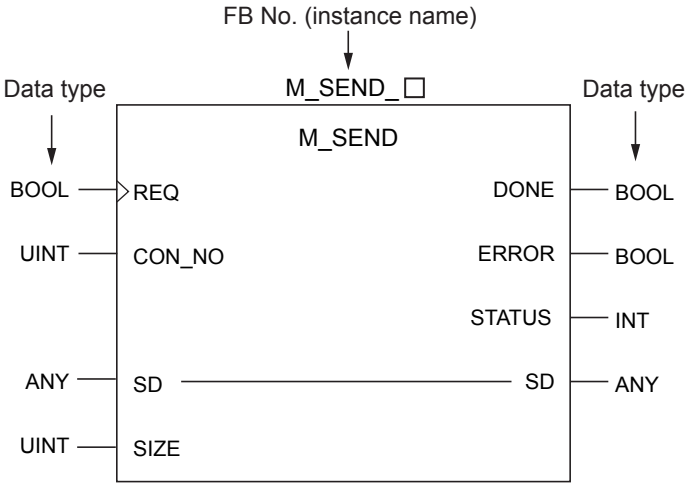
M_SEND (message send) FB is used to send data in General Communication mode or Fixed Buffer Communication mode to a remote node, the communication channel to which is opened by SX_CPU and thus the communication with which becomes possible.

(1) Operation of the command

1) At the rising edge of “REQ”, message is sent to the station having the connection number that is set by “CON_NO”. (The processing for sending does not complete within the period of one scan.)
2) When the sending of message is completed successfully, the “DONE” flag is set ON for the period of one scan.
3) If the sending of message cannot successfully be completed, the “ERROR” flag is set ON for the period of one scan, and the corresponding error code is output to “STATUS”.

Notes:
1) Maximum 1017 words of data can be sent at a time.
2) While a message is being sent (since the rising edge of “REQ” till the “DONE” or “ERROR” flag is set ON), additional “REQ” command (OFF→ON) does not take effect.
3) Do not change “SD” while a message is being sent. Otherwise, the send data cannot be guaranteed.
4) If the number of data specified by "SIZE" exceeds the size of variable specified by “SD”, the data for the excess part becomes undefined. Be sure to enter specified size of variable for “SIZE”.
5) Programming should be made such that request to send, or "REQ", is turned ON after the “VALID” flag turns ON.

(2) FB format



(3) Explanation of each FB terminal

	Terminal function name	Terminal name	Data type	I/O	Description
	Request to send	REQ	BOOL	IN	At the rising edge of this signal, the data prepared in "SD" is sent.
	Connection No.	CON_NO	UINT	IN	Sets a number for the connection that is opened by M_OPEN. The "CON_NO" terminal of M_OPEN FB is connected to this terminal.
* 1, 2	Send data size	SIZE	UINT	IN	Specify the size of send data in units of word.
* 3	Send data	SD	ANY	IN-OUT	Connect a variable in which the data to be sent is stored.
	Normal end of sending	DONE	BOOL	OUT	Turn ON for the period of one scan when the sending of data is completed successfully.
	Abnormal end of sending	ERROR	BOOL	OUT	Turn ON for the period of one scan if the sending of data ended abnormally.
	Status	STATUS	INT	OUT	The result of sending a message is output by a status code. For more information, refer to "4-4-7 Status".

*1 When Destination Addition mode is enabled, 4 words of destination information are added to the send buffer. Set this item to send data size + 4 words.
*2 When Number of bytes Specification mode is enabled, the first 1 word of the send buffer is the data size. Set this item to send data size + 1 word.
*3 When Destination Addition mode is enabled, 4 words of destination information are added to the send buffer. For the send data “SD”, send data size + 4 words of area must be reserved.

4-4-4 Message receive (M_RECEIVE)

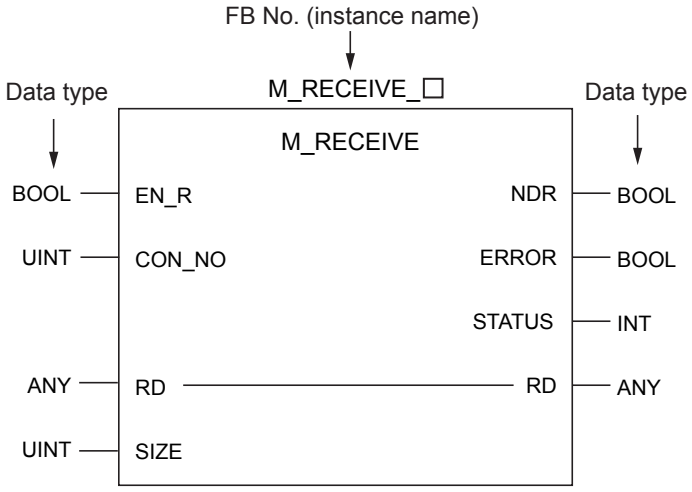
M_RECEIVE (message receive) FB is used to receive data in General Communication mode or Fixed Buffer Communication mode from a remote node, the communication channel to which is opened by SX_CPU and thus the communication with which is possible.

(1) Operation of the command

1) At the rising edge of “EN_R”, message is received from the station having the connection number that is set by “CON_NO”. (The processing for receiving does not complete within the period of one scan.)
2) When the receiving of message is completed successfully, the “NDR” flag is set ON for the period of one scan.
3) If the receiving of message cannot successfully be completed, the “ERROR” flag is set ON for the period of one scan, and the corresponding error code is output to “STATUS”.

Notes:
1) Maximum 1017 words of data can be received at a time.
2) While a message is being received (since the rising edge of “EN_R” till the “NDR” or “ERROR” flag is set ON), “EN_R” must be kept ON. Receiving is halted if “EN_R” is set OFF.
3) Receiving is resumed when “EN_R” is set ON after receiving has been halted. Receiving is resumed using the input values that were effective when operation was halted even if “CON_NO”, “RD” or “SIZE” is changed. These changes have no influence on the processing for receiving a message.
4) If “EN_R” is set ON during the next scan after the processing to receive message has been completed, the processing to receive a message is restarted.
5) “RD” must be kept unchanged while a message is being sent. Otherwise, the receive data cannot be guaranteed.
6) If the number specified by “SIZE” exceeds the size of variable specified by “RD”, the data of other variable area is rewritten. Be sure to enter specified size of variable for “SIZE”.
7) Programming should be done such that 1 (one) is input to “EN_R” after “VALID” of M_OPEN FB is set ON.

(2) FB format



4-4 Communication Program

(3) Explanation of each FB terminal

	Terminal function name	Terminal name	Data type	I/O	Description
	Receive enable	ENR	BOOL	IN	While this signal is turned ON, receiving is enabled and the module can receive messages.
	Connection No.	CON_NO	UINT	IN	Set a number for the connection that is opened by M_OPEN. The "CON_NO" terminal of M_OPEN FB is connected to this terminal.
	Receive data size	SIZE	UINT	IN	Specify the size of receive data in units of word.
* 1	Receive data	RD	ANY	IN-OUT	Connect a variable in which received data is stored.
	Normal end of receiving	NDR	BOOL	OUT	Turn ON for the period of one scan when the receiving of data is completed successfully.
	Abnormal end of receiving	ERROR	BOOL	OUT	Turn ON for the period of one scan if the receiving of data ended abnormally.
	Status	STATUS	INT	OUT	A status code for the result of receiving a message is output. For more information, refer to "4-4-7 Status".

*1 When Destination Addition mode is enabled, 4 words of destination information are added to the receive buffer. For the receive data “RD”, receive data size + 4 words of area must be reserved.

<Precautions for using M_SEND and M_RECEIVE FBs>

1) When communicating in General Purpose Communication mode using UDP/IP protocol, no receipt confirmation or flow control is performed. If the processing on the receiver side is too slow, the receive buffer becomes full and the data sent after that will be discarded. As a result, mismatch occurs between the number of data successfully sent from the sender side and the number of data successfully received on the receiver side.
   If the receive buffer becomes full, it takes approximately 10 seconds to release the buffer, during which the operation to receive data may be stopped.
2) If a request to open is received in Full Passive open mode from a remote node whose IP address and port number do not match, the connection is established first, and then a request to close is sent from the Full Passive side to the Active side. As a result, on the Active side, forcible close (error code 199) occurs after the opening of port is successfully completed and data is sent.
3) If the port number on the sender side does not coincide with that on the receiver side, data send error occurs, and the receiver side forcibly closes the port. As a result, “forcible close” error (error code 199) occurs.
4) During communication between MICREX-SX devices, if sending operation is performed consecutively, depending on the timing of M_RECEIVE, the receiver side may link the one word that is received first with the one word that is received next and 2 words may be received.
   Reduce the communication load so that execution of data receive < execution of data send
   When one-word data is sent, the buffer area for 2 words should be secured on the receiver side. When 2 or more words are sent, the buffer area for the same number of words as that of send data should be secured on the receiver side.
5) When sending data after converting it into ASCII code in General Purpose Communication mode using UDP/IP protocol, if the number of bytes of send data exceeds 1017, the sender side divides the data into two pieces and performs twice the processing to send data. Therefore, the request to receive must be sent twice to the receiver side. In addition, the buffer area on the receiver side must be greater than the send data.

Section 4 Communication Procedures

4-4 Communication Program

4-4-5 Remote data write (R_WRITE)

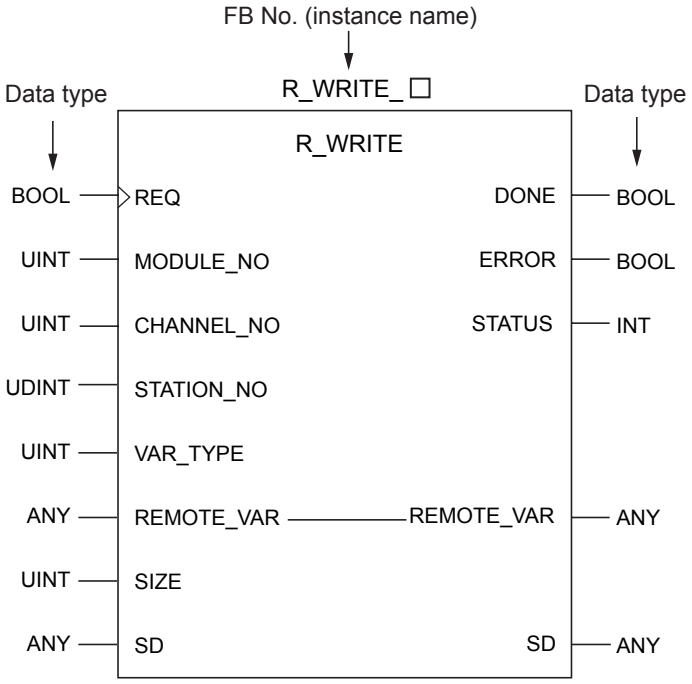
This function is used in Loader Command Communication mode to write data directly in the internal memory of the CPU of MICREX-SX system via Ethernet from SX_CPU. It can be used only when the remote node is an SX system.

(1) Operation of the command

1) At the rising edge of “REQ”, the data specified by “SD” is written in the area that is specified by “MODULE_NO”, “CHANNEL_NO”, “STATION_NO” and “REMOTE_VAR”. (This operation does not complete within the period of one scan.)
2) When the writing of data is completed successfully, the “DONE” flag is set ON for the period of one scan.
3) If the writing of data cannot successfully be completed, the “ERROR” flag is set ON for the period of one scan, and the corresponding error code is output to “STATUS”.

Notes:
1) “REQ” command takes effect at its rising edge and is disabled during writing operation (since the rising edge of “REQ” till “DONE” or “ERROR” is set ON).
2) During writing operation “SD” must not be changed. If changed, the write data cannot be guaranteed.
3) There is no limit on “SIZE” when 0 (zero) is set for “VAR_TYPE”. When other value is set, “SIZE” is limited by the communication module through which data is sent.
4) If the number of data specified by “SIZE” exceeds the size of variable specified by “SD”, the data for the excess part becomes undefined. Be sure to enter specified size of variable for “SIZE”.
5) When “R_WRITE” command is executed successively, the initially set maximum TCP end timer value must be reset to 0 (zero).
6) When “R_READ” and/or “R_WRITE” commands are executed, the reference number of local port and that of remote port must be set to default value (256).

(2) FB format



4-4 Communication Program

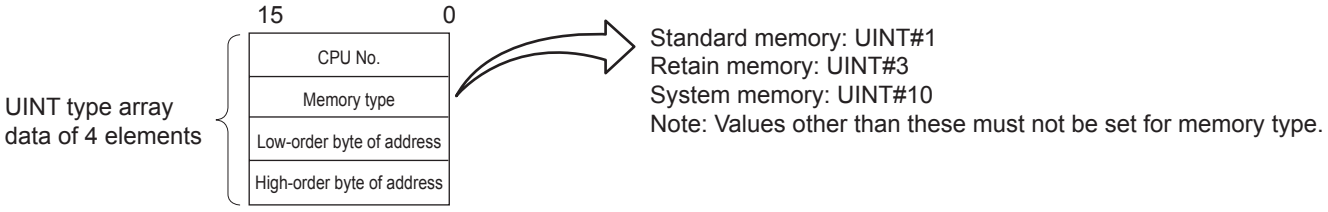
(3) Explanation of each FB terminal

	Terminal function name	Terminal name	Data type	I/O	Description
	Request to write	REQ	BOOL	IN	Command is executed at the rising edge of this signal.
	Communication module No.	MODULE_NO	UINT	IN	Specify the SX bus station number of the local CPU module. For CPU No. 0, this item is set to 254.
	Communication channel No.	CHANNEL_NO	UINT	IN	For this module, this item is fixed to "524".
	Remote station No.	STATION_NO	UDINT	IN	Specifies IP address for the remote node of communication.
	Variable specification method	VAR_TYPE	UINT	IN	Set the method to specify variables. For this module, this item is fixed to "0 (zero)".
* 1	Target variable to access	REMOTE_VAR	ANY	IN-OUT	Specify the target to write (top address) of remote SX_CPU.
	Write data size	SIZE	UINT	IN	Specify the size of write data in units of word.
	Write data	SD	ANY	IN-OUT	Connect the variable in which write data is stored
	Normal end of writing	DONE	BOOL	OUT	Turn ON for the period of one scan when writing is completed successfully
	Abnormal end of writing	ERROR	BOOL	OUT	Turn ON for the period of one scan when writing ended abnormally
	Status	STATUS	INT	OUT	The result of writing operation is output by a status code. For more information, refer to "4-4-7 Status".

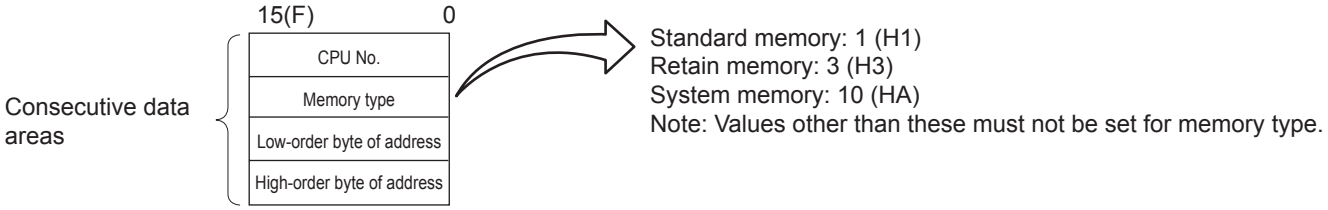
***1 Target variable to access (REMOTE_VAR)**

The target SX_CPU internal memory in which data is to be written is specified in the following format:

<For D300win>



<For the Standard loader>



Section 4 Communication Procedures

4-4 Communication Program

4-4-6 Remote data read (R_READ)

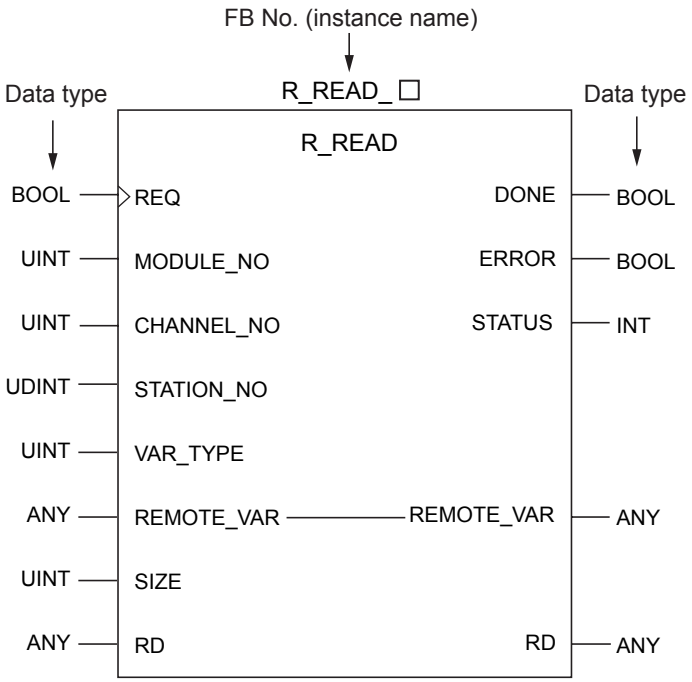
This function is used to directly read from SX_CPU the data stored in the CPU internal memory of MICREX-SX system via Ethernet.

(1) Operation of the command

1) At the rising edge of “REQ”, the data specified by “MODULE_NO”, “CHANNEL_NO”, “STATION_NO” and “REMOTE_VAR” is read out into the area that is specified by “RD”. (This operation does not complete within the period of one scan.)
2) When the reading of data is completed successfully, the “DONE” flag is set ON for the period of one scan.
3) If the reading of data cannot successfully be completed, the “ERROR” flag is set ON for the period of one scan, and the corresponding error code is output to "STATUS".

Notes:
1) “REQ” command is disabled during reading operation (since the rising edge of “REQ” till “DONE” or “ERROR” is set ON).
2) During reading operation "RD" must not be changed. If changed, the read data cannot be guaranteed.
3) There is no limit on “SIZE” when 0 (zero) is set for “VAR_TYPE”. When other value is set, “SIZE” is limited by the communication module through which data is sent.
4) If the number of data specified by “SIZE” exceeds the size of variable specified by “RD”, other variable area is rewritten. Be sure to enter specified size of variable for “SIZE”.
5) When “R_READ” command is executed successively, the initially set maximum TCP end timer value must be reset to 0 (zero).

(2) FB format



4-4 Communication Program

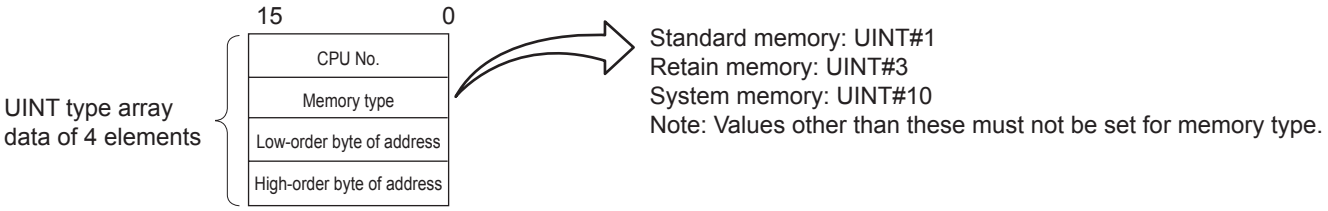
(3) Explanation of each FB terminal

	Terminal function name	Terminal name	Data type	I/O	Description
	Request to read	REQ	BOOL	IN	Command is executed at the rising edge of this signal.
	Communication module No.	MODULE_NO	UINT	IN	Specify the SX bus station number of the CPU module. For CPU No. 0, this item is set to 254.
	Communication channel No.	CHANNEL_NO	UINT	IN	For this module, this item is fixed to "524".
	Remote station No.	STATION_NO	UDINT	IN	Specifies IP address for the remote node of communication.
	Variable specification method	VAR_TYPE	UINT	IN	Set the method to specify variables. For this module, this item is fixed to "0 (zero)".
* 1	Target variable to access	REMOTE_VAR	ANY	IN-OUT	Specify the target to read (top address) of remote SX_CPU.
	Read data size	SIZE	UINT	IN	Specify the size of read data in units of word.
	Read data	SD	ANY	IN-OUT	Connect the variable in which read data is stored
	Normal end of reading	DONE	BOOL	OUT	Turn ON for the period of one scan when reading is completed successfully
	Abnormal end of reading	ERROR	BOOL	OUT	Turn ON for the period of one scan when reading ended abnormally
	Status	STATUS	INT	OUT	The result of reading operation is output by a status code. For more information, refer to "4-4-7 Status".

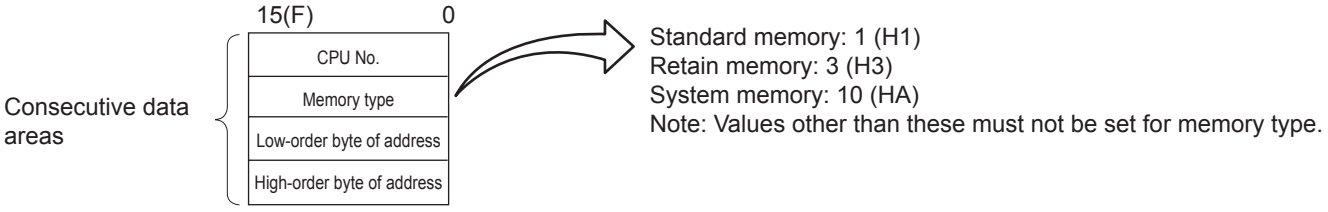
***1 Target variable to access (REMOTE_VAR)**

The target SX_CPU internal memory in which data is to be written is specified in the following format:

<For D300win>



<For the Standard loader>



4-4-7 Status

Error code	Cause
35	Transmission interlock error • Remote CPU is running, such as downloading.
68	Memory address setting error • A wrong address is specified by REMOTE_VAR.
69	Memory size over • The address specified by REMOTE_VAR + SIZE exceed the effective range for the address of remote CPU.
160	Message send destination setting error • No module exists at the SX bus station No. specified by MODULE_NO. • Inexistent CPU No. is specified as the other party of communication by REMOTE_VAR.

4-4 Communication Program

162	No response for command • No response from remote node due to defective wiring or condition of remote node
164	Message sending error • The remote node of communication is disconnected.
170	Message control resource full • 65 or more message FBs are executed at a time. • 9 or more message FBs use a port of the built-in Ethernet at a time. • 11 or more ports of the built-in Ethernet are used at a time.
171	Internal resources exhausted • If 5 or more R_READ and R_WRITE commands are executed at a time, internal resources may be exhausted. * In such case, restart after waiting a while.
177	Parameter error • 0 (zero) was input to the SIZE terminal. • An out-of-spec value was input to VAR_TYPE. • A value other than 1 to 56 is input for connection No. • The send/receive data area exceeds the memory boundary.
193	Channel open error • An abnormal value is set for station No. • An abnormal value is set for communication mode. • "Active" is set for open mode (on the sending side), but the station No. (IP address) of the remote node or RPORT_NO cannot be found on the network. • Connection is not established
195	Message sending error (communication error between NP1PM-48E/256E module and other node) • No data can be sent to the communication module at the remote node. • No response is returned from the communication module at the remote node (sending is completed but no ACK is returned). • Other transmission error on the network
196	Message receive error (communication error between NP1PM-48E/256E module and other node)
199	Channel forcible close (communication error between NP1PM-48E/256E module and other node) • Request to close is received from the remote node. * If this code is received, close once the corresponding port and then re-execute the processing for opening the port.
200	Port setting error • The code specified by SPORT_NO is out of the range of 1 to 127. • Same value is already set as SPORT_NO.
201	Connection No./Client port full • It was attempted to open ports exceeding the number specified for one communication module. (57 or more)
206	Buffer over • Data was received exceeding specified size of receive data. * No receive data is updated.
207	Connection No. error • A connection No. that is not yet opened is used. • "EN_R" (receive enable) is set ON when "EN_C" (request to open) of M_OPEN is set OFF. * Application must be made such that "receive enable" is also set OFF when the request to open of M_OPEN is set OFF. • A currently used connection number is used. (When two M_SEND FBs are used in parallel for one connection)

Note: If UDP/IP is selected for communication protocol, because no communication is performed in opening a channel, no error occurs even when the station No. (IP address) of the remote node cannot be found on the network. In addition, no connection is established in opening a port during UDP/IP communication. NP1PM-48E/256E modules regard a connection as being established when data is received from the remote node.

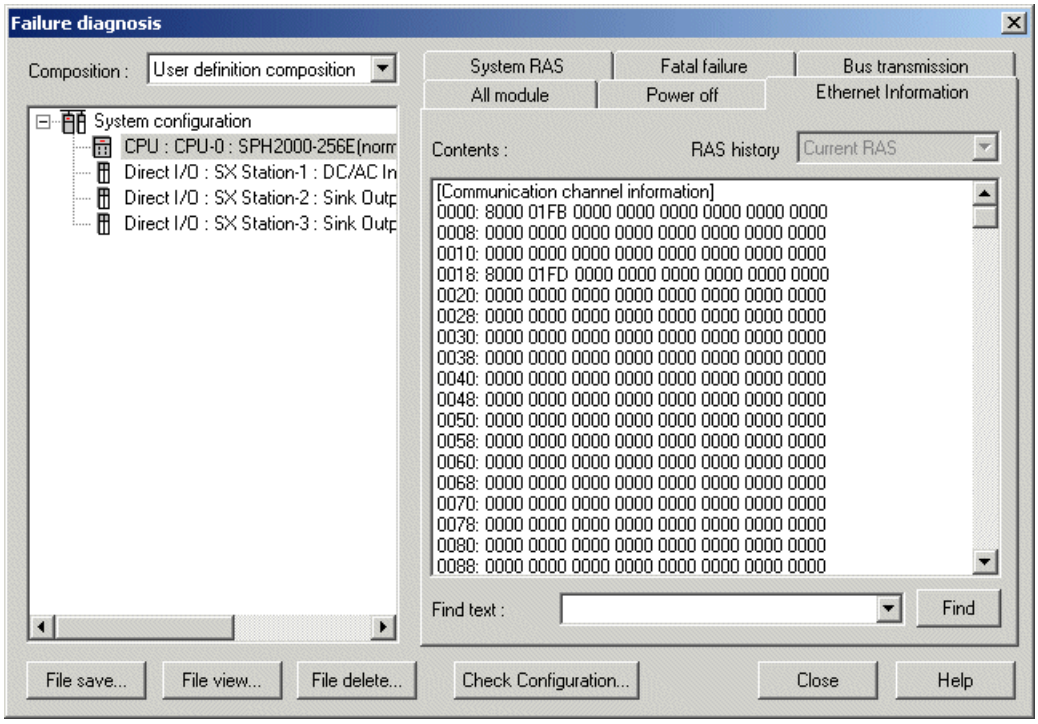
Section 5 Ethernet Communication Information

5-1 Overview of Failure Diagnosis

To diagnose Ethernet built into the CPU module, the diagnostic function of the loader is used. When the CPU module is selected from the “Failure diagnosis” dialog, various information related to the module is displayed.

<Procedure>

◆ Open the “Failure diagnosis” dialog and select the CPU on the system configuration window. Then, click the [Ethernet information] tab on the [Contents] window to display the RAS information about the built-in Ethernet.



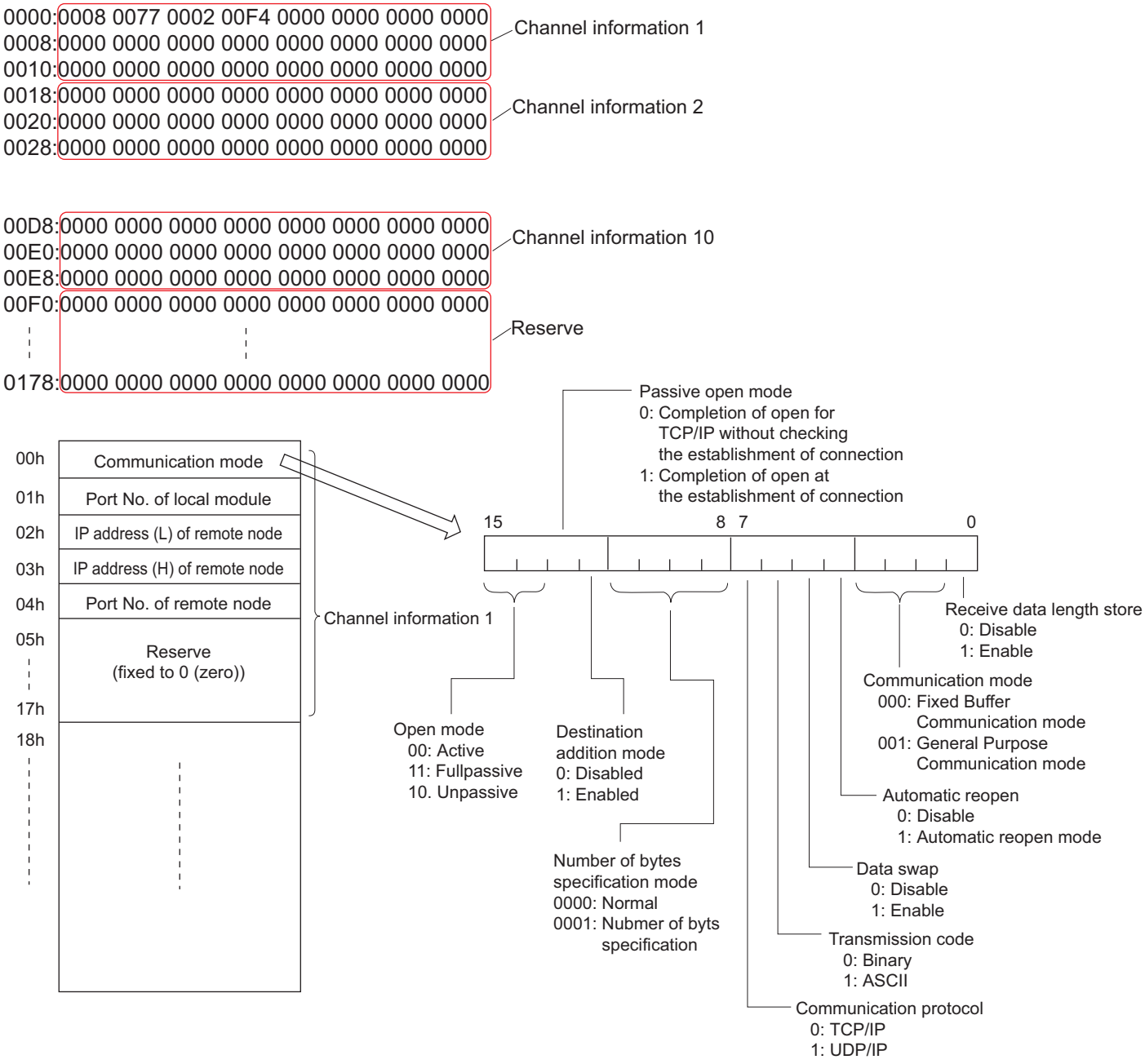
The following information about Ethernet is displayed.
1) Communication channel information
2) Communication channel state information
3) Communication parameter information
4) Node connect information
5) Error logging information
6) Working information

Section 5 Ethernet Communication Information

5-2 Details of Information

5-2-1 Communication channel information

For this type of RAS group, the information about individual communication channel specified by client port number of this module when it is opened is displayed (the information for maximum 10 channels can be displayed). Communication information for one channel is indicated by 24 words as shown in the figure below.

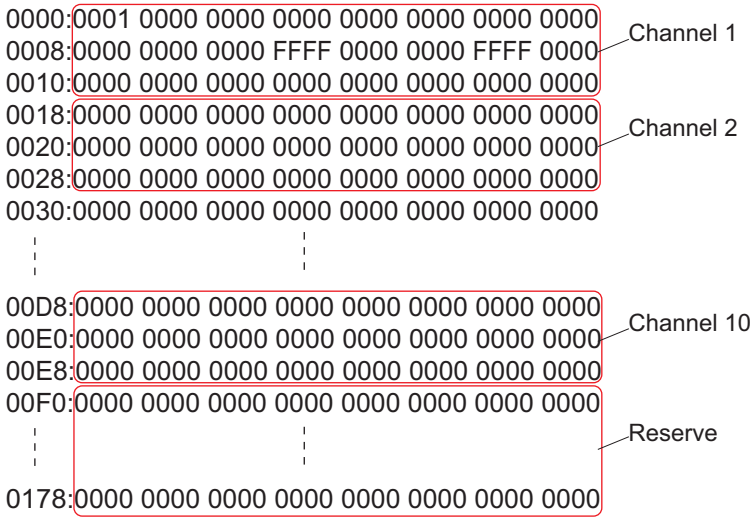


Section 5 Ethernet Communication Information

5-2 Details of Information

5-2-2 Communication channel state information

For this type of RAS group, the information about individual communication channel specified by client port number of this module when it is opened is displayed (the information for maximum 10 channels can be displayed). Communication state information for one channel is indicated by 24 words as shown in the figure below.



+00h	Open status code	+08h	Reserve	+10h	Send count
	Open error code		Number of receive data		Send error count
	Send status code		Sending operation time (max.)		Receive count
	Send error code		Sending operation time (min.)		Receive error count
	Reserve		Sending operation time (current)		Reserve
	Number of send data		Receiving operation time (max.)		Reserve
	Receive status code		Receiving operation time (min.)		Reserve
+07h	Receive error code	+0Fh	Receiving operation time (current)	+17h	Reserve

1) Open status code

The open status of a channel is stored in this area. 0000: Not open, 0001: Opening, 0002: Already open, 0003: Closing, 8xh: Forcible close

2) Open error code

Binary value for the code of an error that occurred while opening a channel is stored in this area. For more information about open error code, refer to “5-2-6 Error code list”.

* The error code is cleared when the next opening operation is completed successfully or communication is started.

3) Send status code

The status of data sending operation is stored in this area. 0000: No request to send or sending completed, 0001: Sending

4) Send error code

Binary value for the code of an error that occurred while sending data is stored in this area. For more information about send error code, refer to “5-2-6 Error code list”.

* The error code is cleared when the next opening operation is completed successfully, communication is started, or sending is completed successfully.

5) Number of send data

Binary value for the number of send data that is specified when data sending is requested is stored in this area. “0000” is stored when there is no request to send data.

* The error code is cleared when the next opening operation is completed successfully or communication is started.

6) Receive status code

The status of data receiving operation is stored in this area. 0000: No request to receive or receiving completed, 0001: Receiving, 0002: Receive data exists (when there is no request to receive)

Section 5 Ethernet Communication Information

5-2 Details of Information

7) Receive error code

Binary value for the code of an error that occurred while receiving data is stored in this area. For more information about receive error code, refer to “5-2-6 Error code list”.

To clear the error code, execute one of the following operations:

* The error code is cleared when the next opening operation is completed successfully, communication is started, or receiving is completed successfully.

8) Number of receive data

Binary value for the number of bytes of receive data that is transferred to the receive data storage area during receipt confirmation after data receiving has been requested is stored in this area.

9) Sending operation time

Maximum, minimum and current values of the operation time for sending in each communication performed are stored in these areas.

(a) Operation time is stored by binary value in steps of 55 ms.

(b) The time required till local module finishes sending after sending is requested.

* This data is cleared when the next opening operation is completed or communication is started.

10) Receiving operation time

Maximum, minimum and current values of the operation time for receiving in each communication performed are stored in these areas.

(a) Operation time is stored by binary value in steps of 55 ms.

(b) For the operation time for receiving, the following values are stored:

<General Purpose Communication mode>

The time till receipt confirmation is called by a user program after local module finished receiving

<Fixed Buffer Communication mode>

The time till receipt confirmation is called by a user program and local module finishes the operation to return a response after local module finished receiving

11) Send count

The total number of successfully completed operations for sending data to other node is stored in this area.

(a) Counted when the communication of command and response is completed successfully.

(b) Counted when one of the following communications is completed successfully.

- Sending data to other node in Fixed Buffer Communication mode
- Reading the data of sheared buffer from other node in Shared Buffer Communication mode
- Sending data to other node in General Purpose Communication mode

* This data is cleared when the next opening operation is completed or communication is started.

12) Send error count

The total number of communication errors that occurred in sending data to other node (when the communication of command and response ended abnormally) is stored in this area.

* This data is cleared when the next opening operation is completed or communication is started.

13) Receive count

The total number of successfully completed operations for receiving data from other node is stored in this area.

(a) Counted when the communication of command and response is completed successfully.

(b) Counted when one of the following communications is completed successfully.

- Receiving data from other node in Fixed Buffer Communication mode
- Writing the data from other node in the sheared buffer in Shared Buffer Communication mode
- Receiving data from other node in General Purpose Communication mode

* This data is cleared when the next opening operation is completed or communication is started.

14) Receive error count

The total number of communication errors that occurred in receiving data from other node (when the communication of command and response ended abnormally) is stored in this area.

* This data is cleared when the next opening operation is completed or communication is started.

Section 5 Ethernet Communication Information

5-2 Details of Information

5-2-3 Communication parameter information

The information about MAC address, IP address, and communication definition for this module is displayed.

Ethernet address IP address
0000:5FB8 1A11 0040 0000 0001 C0A8 FF00 FFFF
0008:0000 0000 012C 0000 0BB8 0000 000C 0000
0010:0000 0100 0100 012C 0000 0000 0000 0000

00h	MAC address (L)	08h	Default gateway address (L)	10h	Receive timeout closing operation
	MAC address (M)		Default gateway address (H)		Reference number of local port
	MAC address (H)		TCP send/receive timeout value		Reference number of remote port
	Reserve		TCP end timer value		Response monitoring timer value
	IP address (L)		Loader command monitoring timer value		Reserve
	IP address (H)		Set value of send retry interval		Reserve
	Subnet mask (L)		Send retry count		Reserve
07h	Subnet mask (H)	0Fh	Send timeout closing operation	0Fh	Reserve

<How to read address>

5FB8 → MAC address (L)
1A11 → MAC address (M)
0040 → MAC address (H)

⇨ MAC address is 00401A115FB8

0001 → IP address (L)
C0A8 → IP address (H)

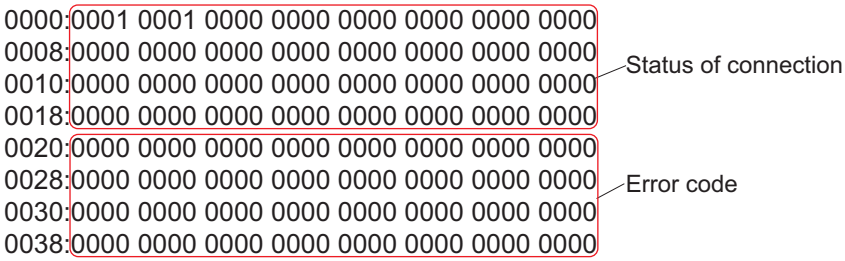
⇨ C0 | A8 | 00 | 01 (192 168 0 1) ⇨ IP address is 192.168.0.1

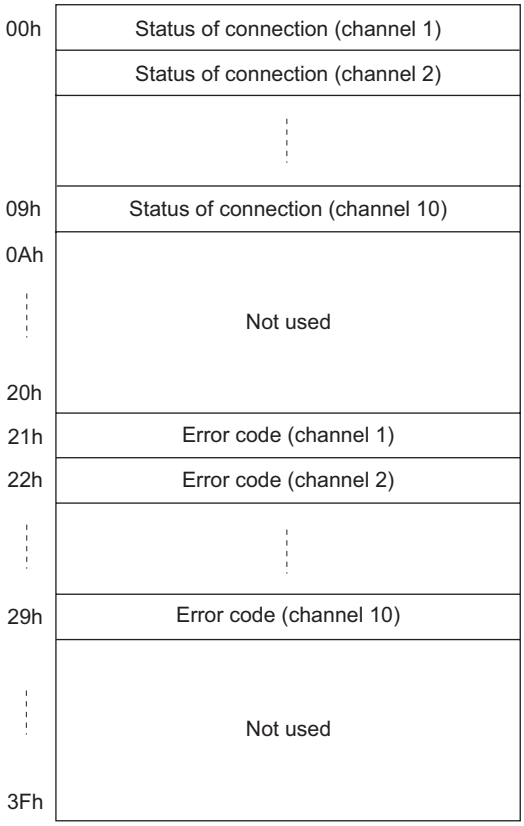
Section 5 Ethernet Communication Information

5-2 Details of Information

5-2-4 Node connect information

For this type of RAS group, the intensive information about the status of individual communication channel that is specified by client port number of this module is displayed (the information for maximum 16 channels can be displayed).





1) Status of connection

The open status of a channel is stored in this area.
0000: Not open
0001: Opening
0002: Already open
0003: Closing
8x: Forcible close

2) Error code

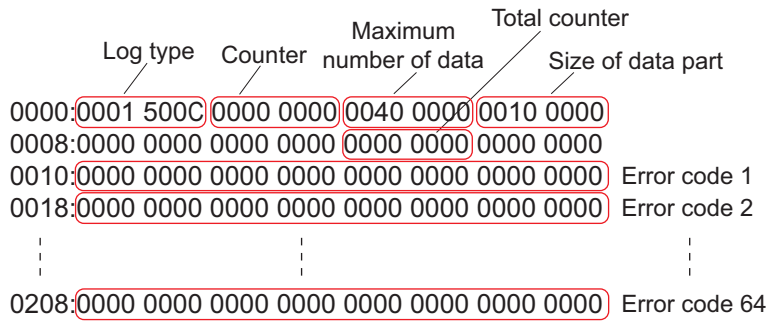
Binary value for the code of an error that occurred when opening a channel, sending data or receiving data is stored in this area. For more information of the error codes, refer to “Error code list”.
* The data is cleared when the next opening operation is completed successfully or communication is started.

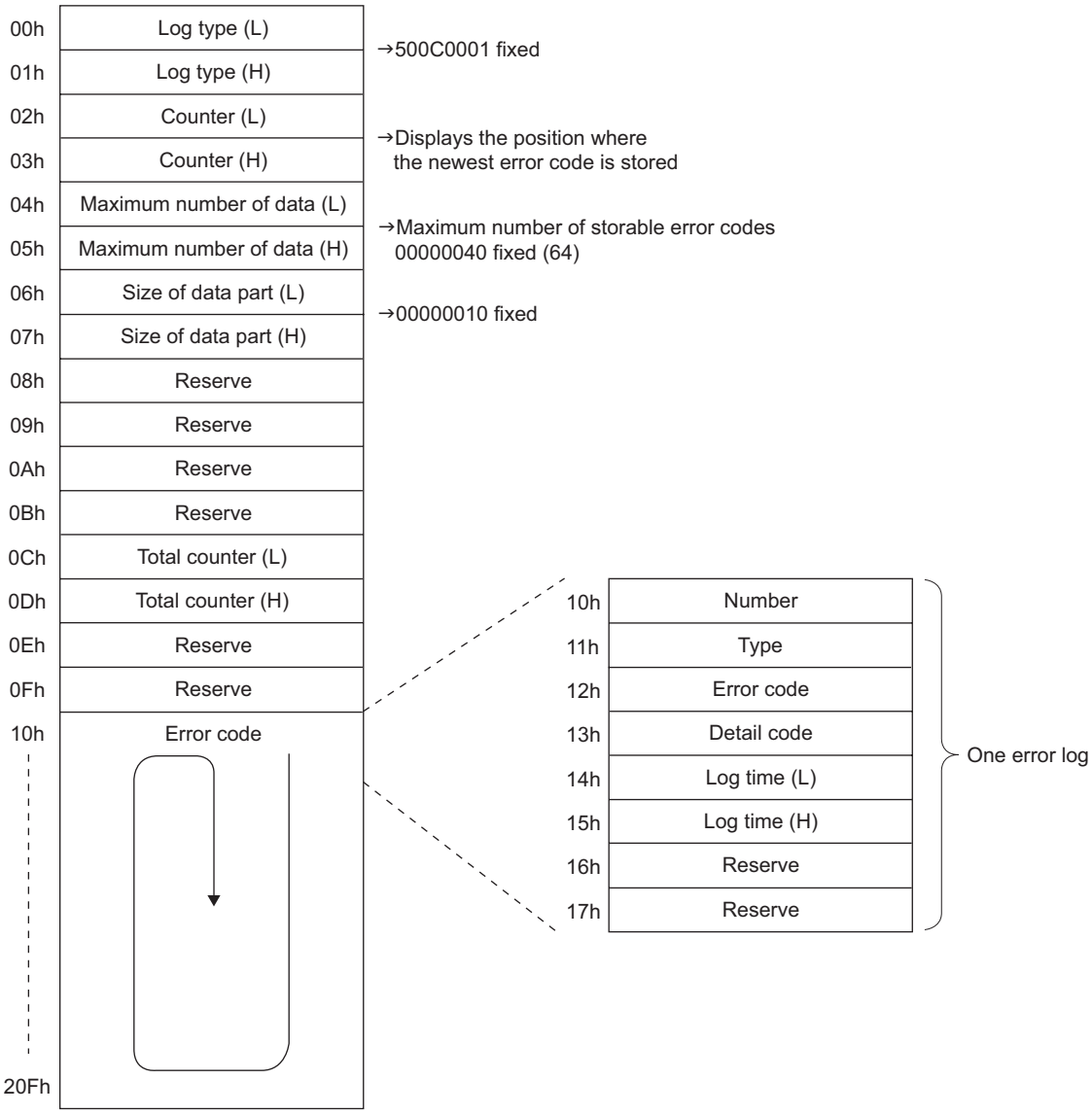
Section 5 Ethernet Communication Information

5-2 Details of Information

5-2-5 Error logging information

This function stores the error information that is detected during Ethernet communication. Error log is stored in ring files. Using 8 words for one information, maximum 64 error information can be stored.





* For more information about error codes, refer to “5-2-6 Error code list”.

Section 5 Ethernet Communication Information

5-2 Details of Information

1) Number

Error log number
The position where the newest error log is stored is the position of an error log number indicated by (counter value) - 1.

2) Type

Indicates the error type.
0001: parameter error, 0002: sequence error, 0003: upper layer error, 0004: protocol error

3) Error code, Detail code

Indicates the contents of an error. For more information, refer to “2-5-6 Error code list”.

4) Log time

Stores the time when an error code is stored. This is a free-running counter from power-on. The unit is “μs”.

Section 5 Ethernet Communication Information

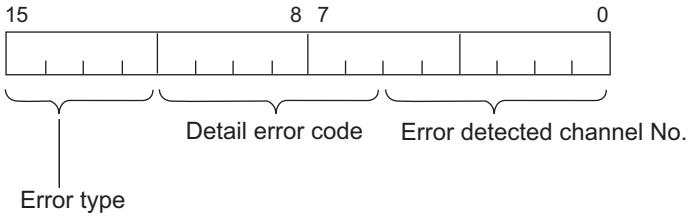
5-2 Details of Information

5-2-6 Error code list

The error codes that are stored as “error logging information”, “communication channel state information” or “node connect information” as well as their contents are shown below:

(1) Format of error code

The format of error codes that are stored as “communication channel state information” and “node connect information” is as shown below:



Error type
0001: Parameter error
0010: Sequence error
0011: Communication error in upper layer
0100: Communication error between physica layer and transport layer

(2) Error codes for individual error type

1) Parameter error

Code	Description
01h (0010h)	"0.0.0.0" or "255.255.255.255" is specified for the IP address of the local module.
02h (0020h)	Parameter for initialization is erroneous.
03h (0030h)	The number of bits of subnet mask is smaller than the number of bits of netmask that is obtained from the IP address of this module.
04h (0040h)	"0.0.0.0" or "255.255.255.255" is specified for the IP address of default gateway.
06h (0060h)	Ethernet part hardware error
10h (0100h)	The IP address of local module, "0.0.0.0" or "255.255.255.255" is specified for the IP address of other node.
13h (0130h)	The same combination of "port No. of local module" and "port No. of other node" as that for already opened connection is set.
16h (0160h)	Wrong communication mode is specified.
20h (0200h)	Send data length is out of specified range (1017 words). * For error logs, a socket No. is stored in the detail code.
22h (0220h)	The storage area for receive data is smaller than receive data length.

* Code display for “error logging information” are shown in parentheses.

2) Sequence error

Code	Description
01h (0010h)	Local module does not yet complete the operation for starting communication.
02h (0020h)	The operation to open the channel is not yet completed.
03h (0030h)	Data was sent or received while the channel is being closed.

* Code display for “error logging information” are shown in parentheses.

5-2 Details of Information

3) Error in upper layer

Code	Description
01h (0010h)	A code other than 00h (normal end) was returned from other node as the end code for response in Fixed Buffer Communication mode. * For error log information, a socket No. is displayed in the detail code.
02h (0020h)	Response monitoring timeout in Fixed Buffer Communication mode * For error log information, a socket No. is displayed in the detail code.
03h (0030h)	Response receive timeout in Fixed Buffer Communication mode * For error log information, a socket No. is displayed in the detail code.

* Code display for “error logging information” are shown in parentheses.

4) Protocol error

Code	Description
02h (0020h)	Connection could not be established by the operation to open TCP connection.
03h (0030h)	During communication using TCP protocol, checksum error was found in the receive data.
04h (0040h)	During communication using UDP protocol, checksum error was found in the receive data.
05h (0050h)	♦ During communication using TCP/IP protocol, TCP send timeout occurred. ♦ During communication using TCP/IP protocol, no ACK was returned from other node.
06h (0060h)	Invalid IP address (network No.) is used.
07h (0070h)	Invalid IP address (host No.) is used.
08h (0080h)	Invalid port No. is used.
09h (0090h)	IP packet was destroyed due to increased traffic.
0Ah (00A0h)	Assembly timeout occurred at remote node.
0Bh (00B0h)	An ICMP error packet that is not supported by the system was received.
0Ch (00C0h)	♦ No Ethernet address exists that corresponds to the specified IP address. ♦ Invalid IP address (network No., host No.) or invalid port No. is used.
0Eh (00E0h)	Head checksum error of received IP packet
0Fh (00F0h)	Cannot open the channel because the internal buffer for opening channels is full.
10h (0100h)	Send error occurred.
11h (0110h)	No send buffer could be secured.
12h (0120h)	During communication using TCP/IP protocol, TCP timeout occurred.
13h (0130h)	ASCII conversion error
14h (0140h)	Receive error occurred.
15h (0150h)	Open error (socket)
16h (0160h)	Open error (bind)
17h (0170h)	Open error (listen)
18h (0180h)	Open error (accept)
19h (0190h)	Open error (connect)
1Ah (01A0h)	Close error
1Bh (01B0h)	Close error / no socket

* Code display for “error logging information” are shown in parentheses.

Section 5 Ethernet Communication Information

5-2 Details of Information

5-2-7 Working information

For the working information, the frequency of occurrences of individual event in Ethernet communications is stored. It is overwritten whenever updated to always provide the newest information. As shown in the figure below, 8 words are used for one information.

* When an event occurs, a number is stored in the number storage area.

No.	Description
0	Number of Ethernet send operations (Number of SMC send normal completion)
1	Number of Ethernet receive operations (Number of times to notify normal SMC receive)
2	Number of Ethernet send interrupts
3	Number of Ethernet receive interrupts
4	Number of send delay collisions
5	Number of carrier losses
6	Number of under run errors
7	Number of 16 collisions
8	Number of send allocation incompletion (when requested)
9	Number of send allocation incompletion (when held)
A	Number of send queueing
B	Number of send queue full
C	Number of send buffer no request source
D	Number of send requests (TASK)
E	Number of send requests (INT)
F	Number of send completion
10	Number of receive alignment errors
11	Number of receive CRC errors
12	Number of receive long packets
13	Number of receive short packets
14	Number of receive data size over
15	Number of receive overrun
16	Number of receive completion
17	Number of receive USNET queue full
18	Number of receive USNET buffer full
19	Number of Ethernet controller memory reset
1A	Number of Ethernet controller memory start
1B	Reserve
1C	Number of illegal code detection in receive data
1D	Number of times to find no starting point of Stream Delimiter in receive data
1E	Number of times to find no end point of Stream Delimiter in receive data
1F	Number of Jabber detection

5-2 Details of Information

No.	Description
20	Number of changeovers from half duplex to full duplex
21	Number of changeovers from half duplex to full duplex
22	Reserve
23	Reserve
24	Number of socket errors
25	Number of bind erros
26	Number of connect errors
27	Number of listen errors
28	Number of accept erros
29	Number of send errors
2A	Number of sendto erros
2B	Number of recv errors
2C	Number of recvfrom errors
2D	Number of closesocket option errors
2E	Number of set socket option errors
2F	Reserve
30	Number of function code errors
31	Number of times to detect no connection information
32	Number of failure to secure connection information notification area
33	Number of cancellation of send request issuance
34	Number of parameter error detection when sending is requested
35	Number of cancellation of receive request issuance
36	Number of parameter error detection when receiving is requested
37	Failure to secure receive descriptor
38	Number of command abnormal ends of loader command server
39	Number of failure to secure channel No.
3A	Number of ASCII conversion work resource full
3B	Data size error
3C	Number of ACK receive wait timeouts
3D	ASCII → Binary conversion error
3E	Reserve
3F	Reserve
40	Number of command code errors (fixed buffer)
41	Number of response frame errors (fixed buffer)
42	Number of response timeouts
43	Number of end code errors when responding
44	Reserve
45	Reserve
46	Reserve
47	Reserve
48	Reserve
49	Reserve
4A	Reserve
4B	Reserve

Section 5 Ethernet Communication Information

5-2 Details of Information

No.	Description
4C	Reserve
4D	Reserve
4E	Reserve
4F	Reserve
50	Self-diagnosis send error
51	Self-diagnosis receive error
52	Self-diagnosis receive data count mismatch
53	Self-diagnosis data comparison error
54	Self-diagnosis MMU stop wait timeout
55	Self-diagnosis memory allocation error
56	Self-diagnosis send status error
57	Self-diagnosis receive status error
58	TCP Active Open Request
59	TCP Active Open Complete
5A	TCP Active Close Request
5B	TCP Active Close Complete
5C	TCP Active Send Request
5D	TCP Active Send Complete
5E	TCP Active Receive Request
5F	TCP Active Receive Complete
60	TCP Passive Open Request
61	TCP Passive Open Complete
62	TCP Passive Close Request
63	TCP Passive Close Complete
64	TCP Passive Send Request
65	TCP Passive Send Complete
66	TCP Passive Reseive Request
67	TCP Passive Receive Complete
68	UDP Open Request
69	UDP Open Complete
6A	UDP Close Request
6B	UDP Close Complete
6C	UDP Send Request
6D	UDP Send Complete
6E	UDP Receive Request
6F	UDP Receive Complete
70	LDC Open Request
71	LDC Open Complete
72	LDC Close Request
73	LDC Close Complete
74	LDC Message Request
75	LDC Messege Complete
76	Reserve
77	Reserve

Section 5 Ethernet Communication Information

5-2 Details of Information

No.	Description
78	TCP Active Normal Event
79	TCP Active Error Event
7A	TCP Passive Normal Event
7B	TCP Passive Error Event
7C	UDP Normal Event
7D	UDP Error Event
7E	LDC Normal Event
7F	LDC Error Event

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Information in this manual is subject to change without notice.