TOYODA

Programmable Controller

TOYOPUC

2PORT-EFR

2PORT-EFR THU-6404

Instruction Manual

JTEKT CORPORATION

TOYOPUC

2PORT-EFR THU-6404

Instruction Manual

FOREWORD

Thank you very much for purchasing our 2PORT-EFR.

- For safety use of this product, read carefully this manual and other related individual instruction manuals. Furthermore, keep these manuals at an easily accessible place so as to be ready for reading any time as necessary.
- Distributor or dealer of this product is kindly requested to hand over this manual to end user without fail.
- The product specification, etc. are subject to change without prior notice due to better modification.
- Where a product applicable to the weapons and strategic materials (or services) stipulated in the Foreign Exchange and Foreign Trade Control Act is exported to overseas from Japan, it is necessary to get the export license from the Japanese Government.
- In the event any defect due to our manufacture is found in our products during the warranty period, we will repair or replace them at our discretion. We shall not be responsible for any direct or indirect damages related to our products except as herein stated.

FOR SAFETY OPERATION

Before installing, operating, maintaining and checking, read carefully this Manual without fail for proper and safety operation and work. Any operator and any maintenance man who relate to this product (Programmable Controller) are requested to acquire the knowledge on devices, safety information and cautions before being engaged in the operation and maintenance. This Manual classifies the safety caution level into "WARNING" and "CAUTION" using alert symbols as follows.

Failure to observe the instructions given in this Manual could result in death or bodily injury of the operator.

Failure to observe the instructions given in this Manual could result in risk of bodily injury or physical damage to equipment, etc.

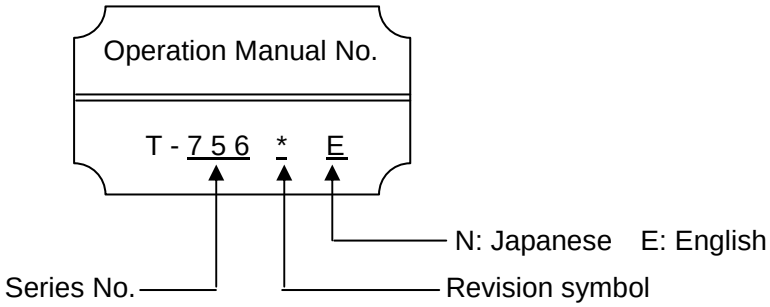
- ☐ Don't overhaul the module and don't touch the module internals, with the power switch kept ON.
  Failure to observe this instruction could result in electric shock.
- ☐ Don't touch the terminals with the power switch kept ON.
  Failure to observe this instruction could result in electric shock.
- ☐ Execute write during PC run (write during run) only when cyclic operation of main equipment/machine is in shutdown.
  Failure to observe this instruction could result in breakdown of its device(s) and bodily injury from miss-operation, if any.

	☐ Regarding safe-related signals and emergency stop circuit, etc., handle those signals in external units without through this system.

	☐ Use this product under an environment which meets the environmental general specification specified in this Manual. ☐ Don't attach/detach each module to/from its base, with the power switch kept ON. ☐ Don't touch directly the electronic circuits inside the module. Failure to observe this instruction could result in breakdown of the module by static electricity.

REVISION HISTORY OF OPERATION MANUAL

Operation manual revision No. is added as a part of Manual No. described on the cover sheet of the manual.



Revision symbol	Date of revision	Content of revision
1	2007.5	The First edition printed
2	2011.4	The content of the description of the whole was reviewed.
3	2012.5	TOYODA brand logo added on the front cover
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	2019.4	Added Reference 12 Error correction

Composition of Related Operation Manuals

Operation manual No.	Title	Outline
T-335*E	PC10G	This manual describes the basic operating procedure, functions, and specifications of PC10G.
T-755*E	FRMT Series	This manual describes the basic operating procedure, functions, and specifications of FRMT Series.
T-754*E	FL/ET-T-V2H	This manual describes the basic operating procedure, functions, and specifications of FL/ET-T-V2H.
T-759*E	FE-SWH05/08	This manual describes the basic operating procedure, functions, and specifications of FE-SWH05/08.

Contents

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1 System configuration

1.1 Outline

2PORT-EFR has two communication ports. By selecting with the switch on the front of the module, it is possible to select either [Ethernet], [FL-net] or [FL remote] for each port.

If the FL-net function is selected, the TOYOPUC CPU can be connected with the FL-net (OPCN-2)*1 network.

Also, if the Ethernet function is selected, the TOYOPUC CPU can be connected with a PC, etc. via Ethernet. Both TCP/IP*2 and UDP/IP*2 protocols are supported.

* 1. Based on the requirements of JEMA (Japan Electrical Manufacturers Associate), the MSTC (Manufacturing Science and Technology Center) plays a central role so that any manufacturer can communicate via an FA open network of specifications determined with the participation of major control device manufacturers.

FL-net (Ver 2.00 onwards) of this module corresponds with “Version 2” defined by JEMA.

* 2. TCP/IP is a highly reliable protocol that controls communication with other nodes.

UDP/IP acquires high speed through-put but there are cases where data being sent fails to reach its destination due to signals colliding on the communication line. In such cases, the user themselves needs to retry.

1.2 Features

1.2.1 Feature of the FL-net function

(1) Complies with FL-net (OPCN-2) protocol. Also corresponds with “Version 2” defined by JEMA.

(2) Able to communicate with a maximum of 254 stations. *1

(3) Uses a Master-free Token Ring method to perform communication between stations capable of communicating at a specific point in time.

(4) Possible to have a data link with a maximum of 8192 link relay points*2 and 8192 link register words*3.

(5) As well as the N:N type, data link also supports 1:N type, making it possible to save link area and standardize sequence programs.

(6) Supports a message server function, (a function that receives command messages sent from other stations and responds), and allows reading/writing, etc. of data from areas other than data link.

(7) If PC3JL-CPU or later is used as the CPU module, a message client function that sends command messages to other stations and reads responses is also available using sequence program processing.

*1: As 250 to 254 are reserved for maintenance purposes, the node numbers which can be allocated to the 2PORT-EFR module are 1 to 249

*2: Maximum of 2048 points for everything other than CPU operation mode [PC3JG separation], [PC10 standard] and [PC10]. (Refer to 2.1.2 Specifications for Data Link)

*3: A maximum of 2048/6144 words are available for the link register using a selection switch. (Refer to 4.2 Switch Settings)

1 word = 2 bytes = 16 points

1.2.2 Feature of the Ethernet function

In Ethernet mode, data is exchanged between a computer and TOYOPUC using either [Computer link method], [File memory method] or [General communication method]. A maximum of 8 ports are available. Either TCP or UDP must be specified for each port.
If the CPU module is of the PC2J series, computer link method and file memory method can not be used concurrently if the version is older than that shown in the table below. (An application command error may occur if these methods are used concurrently)

PC2J	V3.51
PC2	V4.90
PC2JC	V4.10
PC2J16	V2.11

If both of the PORT-EFR communication ports are set to Ethernet, it cannot be used in PC3J-CPU.
The below table shows the number of Ethernet modules able to be set for each CPU.

	CPU module	
	PC10G, PC10P, PC3JG, PC3JG－P, PC3JP, PC3JP－GP, PC3JD Ver 2.0 or later PC3JM, PC3JL,MX, PC2J series, PC2－CPU	PC3J－CPU PC3JNM Earlier than PC3JD Ver 1.10
Relay command	512 bytes or 256 words	512 bytes or 256 words
Other than relay command	Max. data for each command	512 bytes or 256 words
No. of ethernet modules that can be set in parameters *1	Multiple okay	One only

（Current as of April, 2010）

*1 Includes the implemented number of FL/ET-net5, FL/ET-T-V2 and FL/ET-T-V2H used in EN-I/F T and Ethernet mode

■ Ethernet specifications

No.	Item	Specification
1	Physical layer	10BASE-T/100BASE-TX
2	Data transfer rate	10Mbps, 100Mbps*1
3	Maximum cable length	Max. 100m(node to node（with a 1 to 1 connection）, node to HUB, HUB to HUB）
4	Communication function	① Computer link function ② File memory function ③ General communication function *2
5	No. of ports which can be opened	Max. 8
6	Computer link data capacity	Max. 1K byte
7	File memory capacity	Transmission 2K bytes Receipt 2K bytes

*1 The designated HUB is auto negotiation. Transmission rate is 100Mbps if the devices using auto negotiation are connected.

*2 General communication method can be used from Ver 1.20 onwards.

1.2.3 Feature of the FL Remote function

FL Remote is a remote I/O system based on Ethernet.

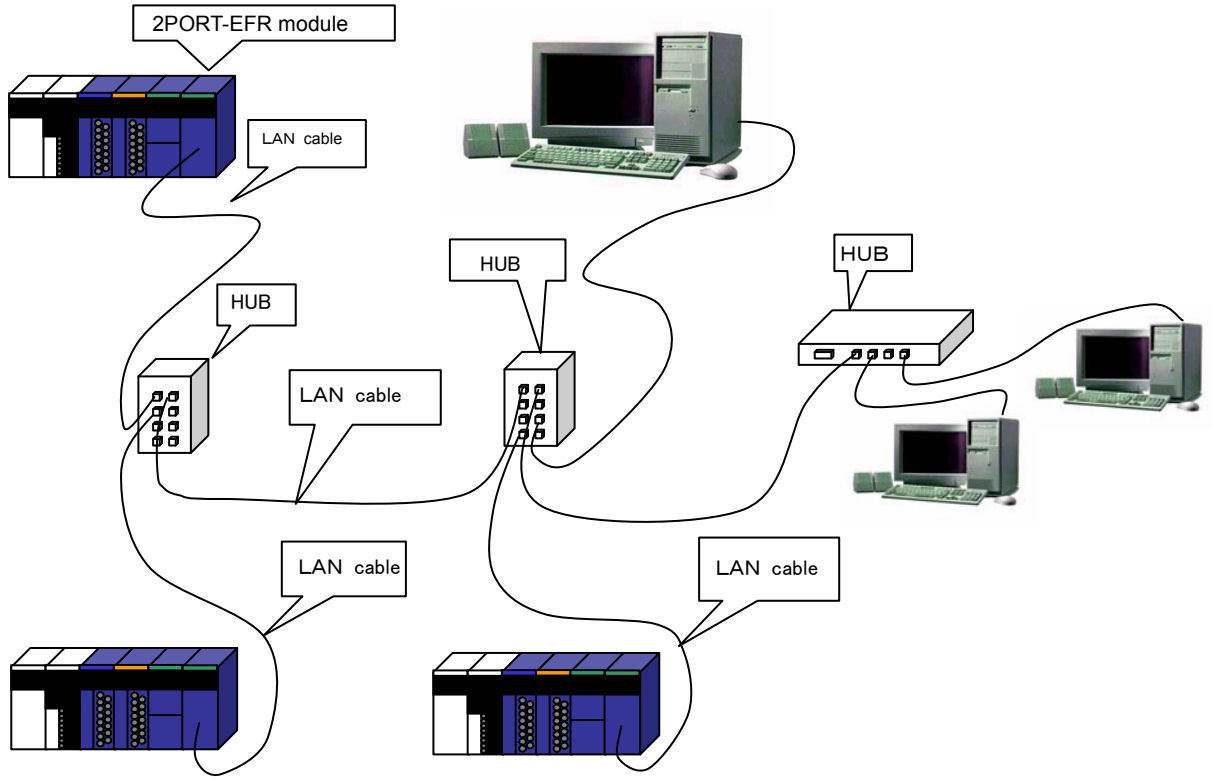
■ FL Remote specifications

Item	Specification
Physical layer	10BASE-T/100BASE-TX
Data transfer rate	10Mbps, 100Mbps*1
Maximum cable length	Max. 100m（Between master and HUB, master and slave（1 to 1 connection）, slave and HUB, HUB and HUB） Total extension length: Max. 2100m（HUB：Max 20 units）
Max. no. of connectable nodes	64 units（1 master, 63 slaves）
Node address	Slave：01 to 63
No of I/O points	Input: Max. 2048 points, output: Max. 2048 points
No. of I/O points for per slave	Input: Max. 64 points, output: Max. 64 points
I/O allocation	Max. unit of 8 points
Link area	X・Y, M, L, EX・EY, EM, EL, GX/GY, GM
Communication function	I/O communication

*1 The designated HUB is auto negotiation. Transmission rate is 100Mbps if the devices using auto negotiation are connected.

1.3 Network configuration

The below is one example of Ethernet network configuration.



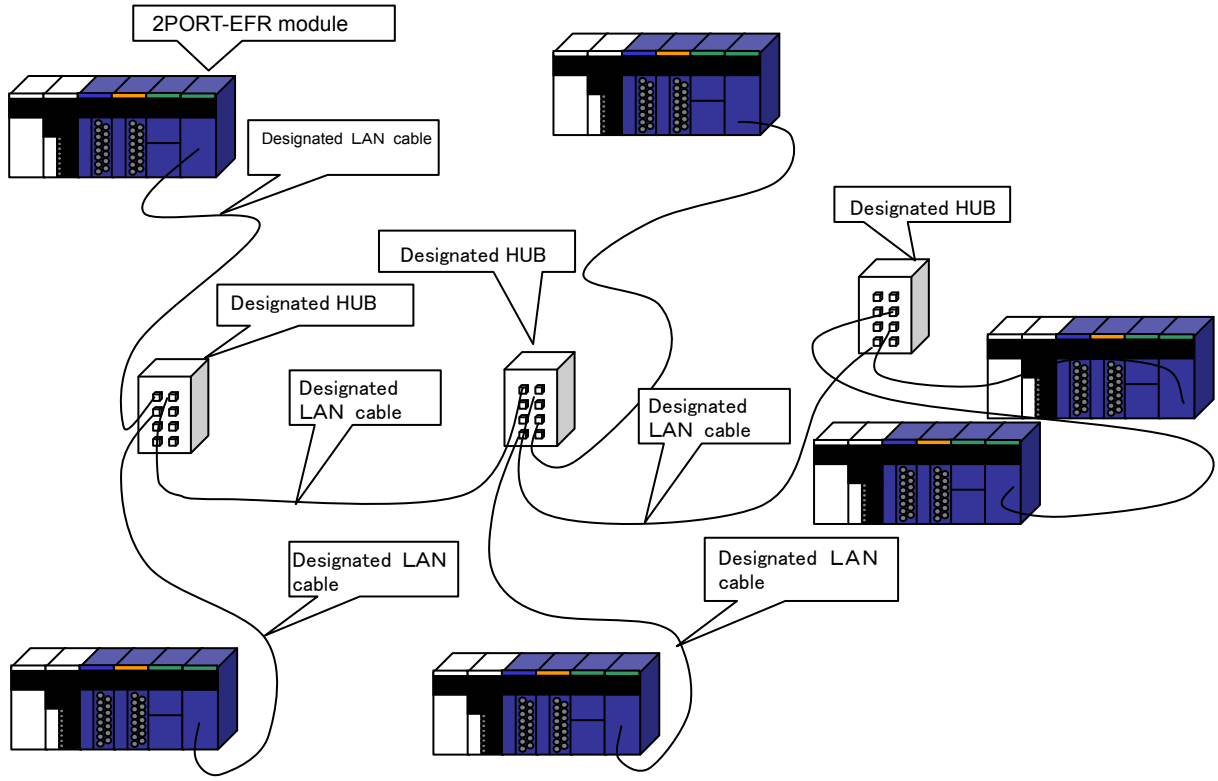
■ Description of devices

Name	Explanation
LAN cable	Cable connecting the 2PORT-EFR module and HUB. Maximum length of 100 meters.
HUB	Used to connect several Ethernet devices.

NOTE) The customer is to procure everything other than the 2PORT-EFR module.

- Make sure to keep the Ethernet LAN, FL-net and FL Remote networks separate.
- Please only use communication devices that comply with IEEE802.3.

The below is one example of FL-net network configuration.



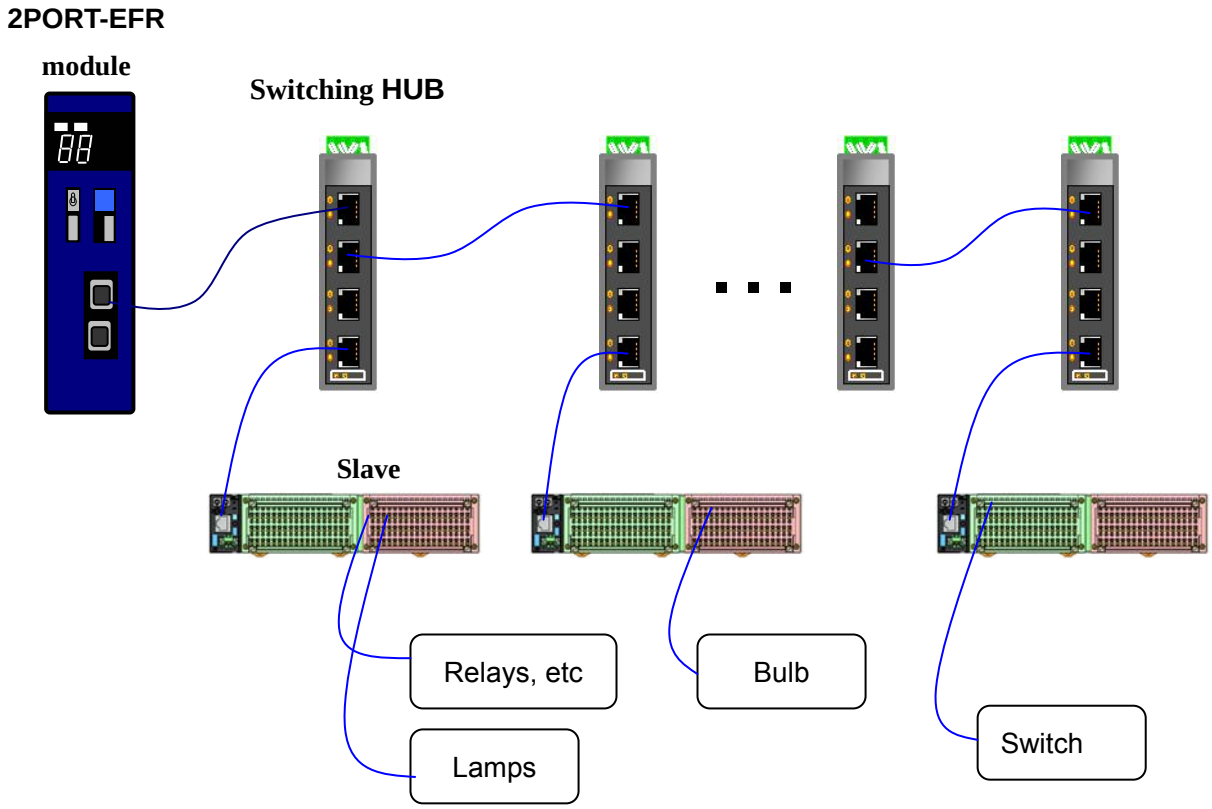
■ Description of devices

Name	Explanation
LAN cable	An FL-net special-purpose communication cable is used.
HUB	Used to connect several FL-net devices. **Our designated Ethernet Switch is FE-SWH05/08 (JTEKT)** **Recommended HUB:FL-HUB8TX-2F(PHOENIX CONTACT)**

NOTE) The customer is to procure everything other than the 2PORT-EFR module.

- Make sure to keep the Ethernet LAN, FL-net and FL Remote networks separate.
- Please use our designated cable.
  (Refer to 3.2 FL-net/Ethernet/FL Remote wiring)

FL Remote network configuration is shown below.



■ Description of devices

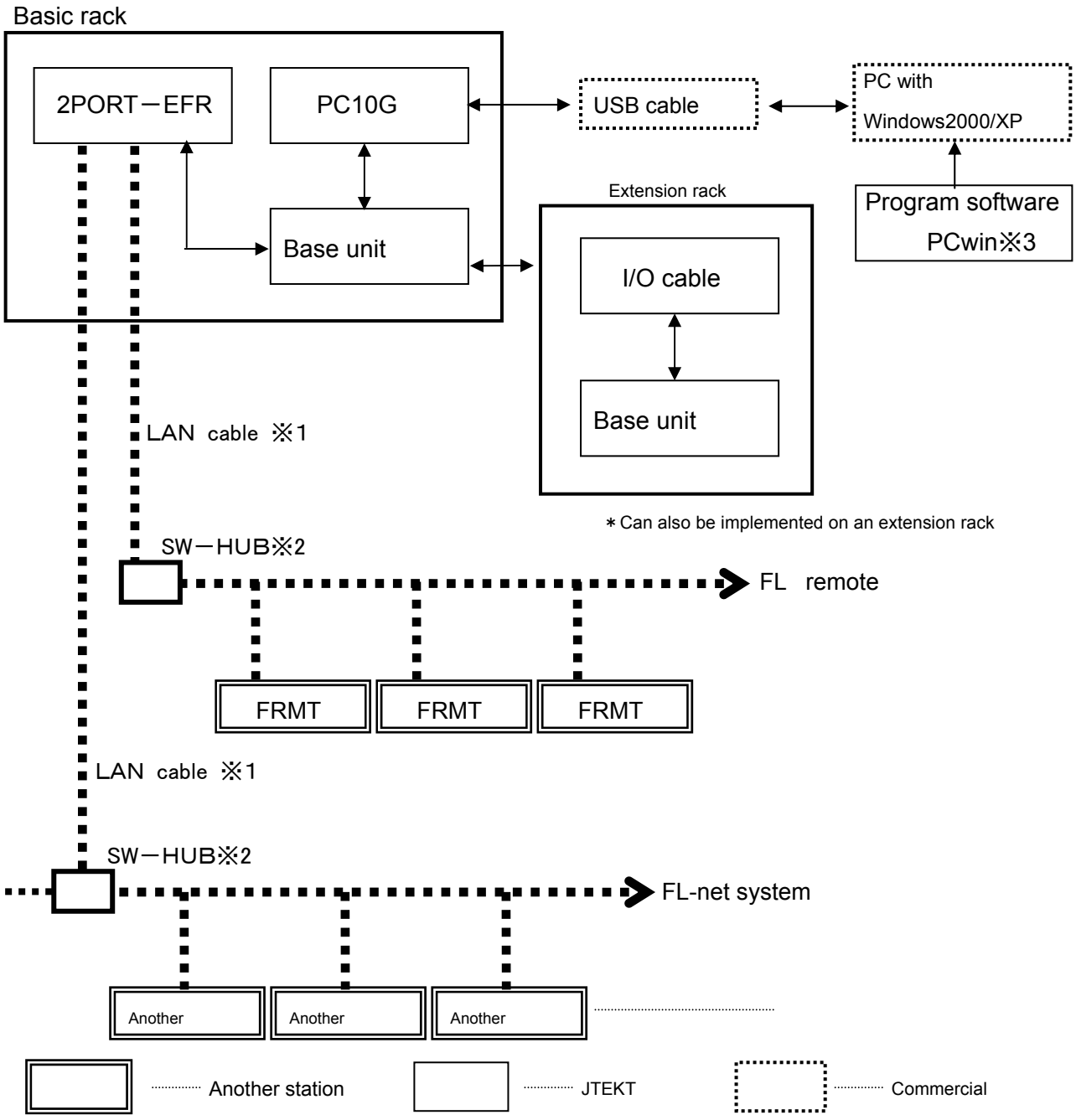
Name	Explanation
Node	Nodes have both a slave which connections input/output devices and a master which links the slaves together. There is one master for every network. The master and slave positions are not fixed and could be at either of the node positions shown in the figure above. FL Remote M is a master module.
Cable	An FL-net special-purpose communication cable is used.
Connection method	Straight cable is used. However, cross cable is used for 1 to 1 connections. If multiple slaves are connected, please use JTEKT's designated switching HUB). Please do not use a repeater HUB.
Communication power	Power for communication is supplied to each node. Please apply 24 V to terminal blocks with +/- on them. Please make the IO power and communication power separate systems.

Note) Please use our designated cable.
(Refer to 3.2 FL-net/Ethernet/FL Remote wiring)

- Please use FE-SWH05/08 (JTEKT) as the HUB.
- Make sure to keep the Ethernet LAN, FL-net and FL Remote networks separate.

1.4 System configuration

Below is an example of the configuration when a 2PORT-EFR module is connected to a PC10 system.

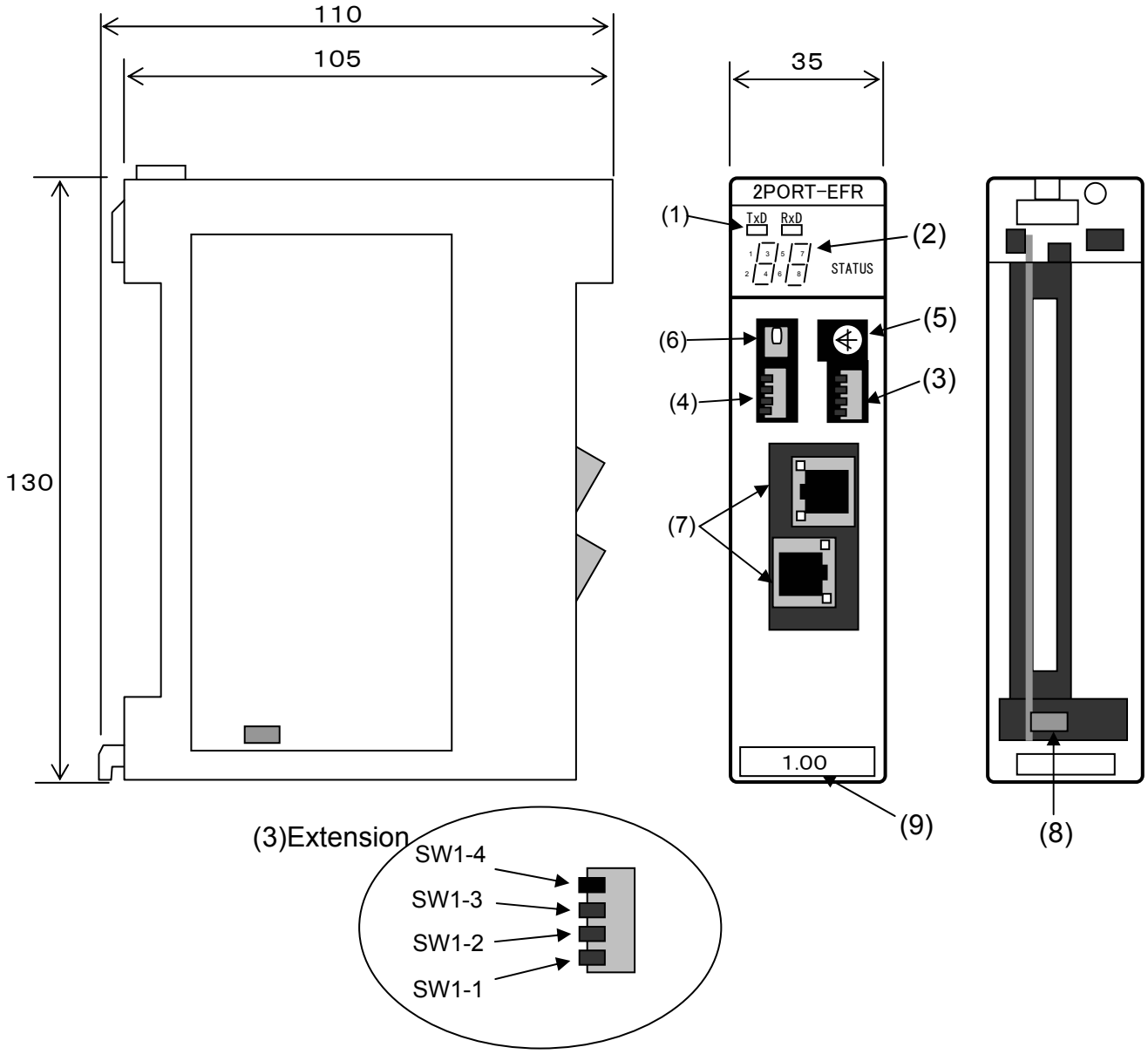


*1 Please use our designated cable for the LAN cable.
(Refer to 3.2 FL-net/Ethernet/FL Remote wiring)

*2 Please use FE-SWH05/08 (JTEKT) as the HUB.

*3 Please use PCwin version 10.0 or later.

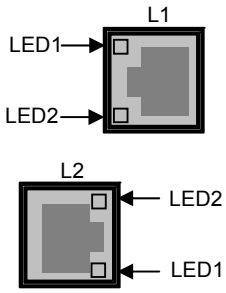
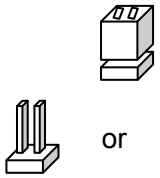
1.5 Name and function of each part



(1)	Sending and receiving LEDs	TxD illuminates when the module sends data and RxD illuminates when the module receives data
(2)	Status LED	In FL-net mode: Node numbers (station numbers) are shown as 2 digit hexadecimal values during normal communication. When an error occurs, an error code is displayed. If no other station exists on the FL-net network and no communication is being performed then --- is displayed. In Ethernet mode: Connections which are open are displayed as shown in the figure to the right during normal communication. (The LED illuminates when open.) When an error occurs, an error code is displayed. (See section 11). For FL Remote Master node numbers are shown as 2 digit hexadecimal values during normal communication. When an error occurs, an error code is displayed.

<table>
<tr><td>(3)</td><td>Module setting switch on the L1 side</td><td>Changes the operation mode and communication speed of .
・Switch SW1-1/ SW1-2/ SW1-3
2PORT-EFR has 5 modes; FL-net mode (8K), FL-net mode (16K), FL-net mode (32K), Ethernet mode and FL Remote.

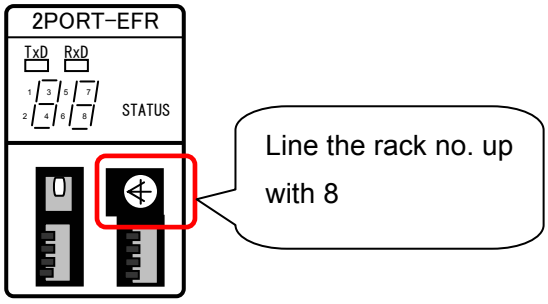
<table>
<tr><th colspan="2">Switch settings</th><th>Mode & FL-net data link capacity
（Total word no. maximum value of receiving area & sending area）</th><th>I/O module ID code</th><th>Link memory capacity</th></tr>
<tr><td>  </td><td>1･2･3 off</td><td>FL-net mode (8K)
Relay link････2048 pts（128 words）*1
Register link･･･2048 words</td><td>C9</td><td>8K byte</td></tr>
<tr><td>  </td><td>1･3 off
2 on</td><td>FL-net mode (16K)
Relay link･････2048 pts（128 words）*1
Register link･･･6144 words</td><td>D9</td><td>16K byte</td></tr>
<tr><td>  </td><td>1･2 on
3 off</td><td>FL-net mode (32K)
Relay link･････2048 pts（128 words）*1
Register link･･･8192 words</td><td>E9</td><td>32K byte</td></tr>
<tr><td>  </td><td>1 on
2･3 off</td><td>Ethernet mode</td><td>B3</td><td>4K byte</td></tr>
<tr><td>  </td><td>1･3 on
2 off</td><td>FL remote mode</td><td>B8</td><td>4K byte</td></tr>
</table>
・Switches SW1-4
Set communication speed
<table>
<tr><th colspan="2">Switch settings</th><th>Transmission rate</th></tr>
<tr><td>  </td><td>ＯＦＦ</td><td>10Mbps</td></tr>
<tr><td>  </td><td>ＯＮ</td><td>Auto negotiation</td></tr>
</table>
</td></tr>
<tr><td>(4)</td><td>Module setting switch on the L2 side</td><td>Same as (3) “Change between L1-side operation mode and communication speed”.</td></tr>
<tr><td>(5)</td><td>Rack number switch</td><td>2PORT-EFR can be implemented on any rack/slot however it also exclusively occupies a quasi rack other than where it is implemented. This exclusively occupied rack no. is set using switch 5. L1 is allocated to slot 0 of the selected rack no. and L2 to slot 1.
8 to E can be selected for the rack no. switch. (Please do not select other numbers.)</td></tr>
<tr><td>(6)</td><td>Display changeover switch</td><td>Changes between status LED displays. By turning it to the L1 side, the L1 status is displayed, and by turning it to the L2 side, the L2 status is displayed.</td></tr>
</table>

(7)	Communication connector 	LED1. Displays hardware status Green solid：Hardware normal Red solid：Hardware error occurring Off：Program not operating LED2. Displays communication status ・For Ethernet/FL-net Green solid: 100 Mbps communication established Green flashing: 100 Mbps communicating Orange solid: 10 Mbps communication established Orange flashing: 10 Mbps communicating Red solid: Link parameter error Red flashing: Connection error/node overlap Off: Cable not connected ・For FL remote Green solid: Remote operating Green flashing: FL participating Red solid: Link parameter error Red flashing: Communication error Green/red alternating: Setting error Off: Cable not connected
(8)	LG jumper	Jumper pin connecting the communication line shield and the FG of the PC.  Short: Shield is earthed Open: Shield isn't earthed In a [short] state at dispatch.
(9)	Version tool	Displays the FL-net function, Ethernet function and FL Remote function software version.

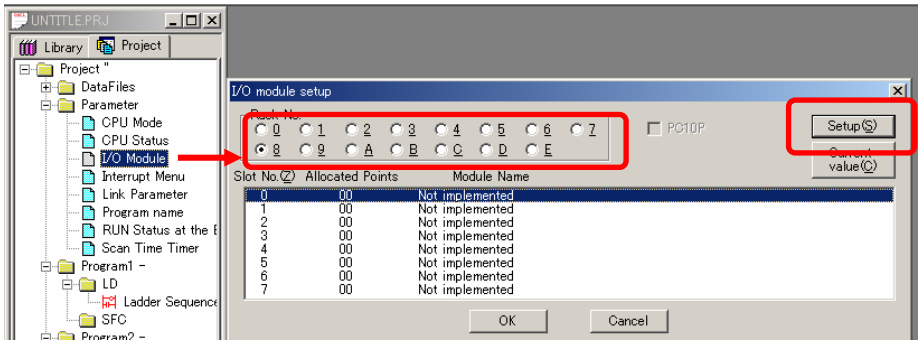
1.6 Example of application

This section explains about the parameter setting method (using PCwin Ver. 10 or later) in the case that L1 is used as Ethernet and L2 as FL Remote. Rack no. will be virtually implemented.

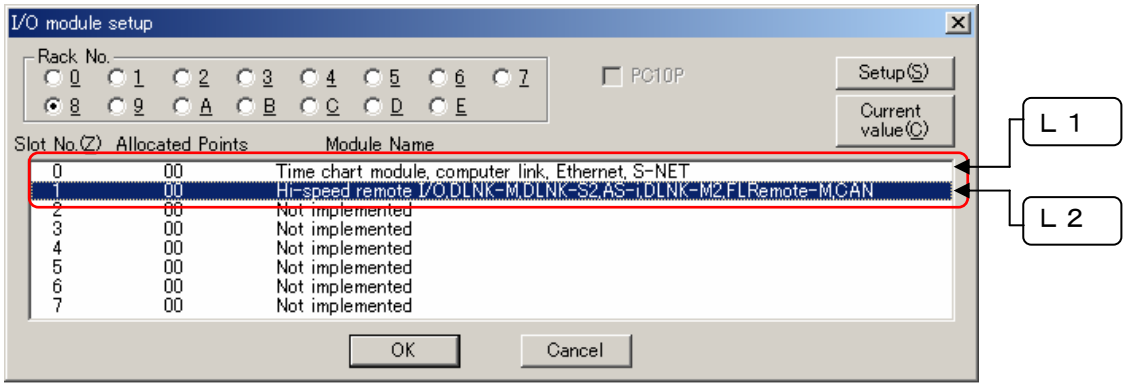
1. Line the rotary switch up with the number of the rack that is to be virtually implemented.



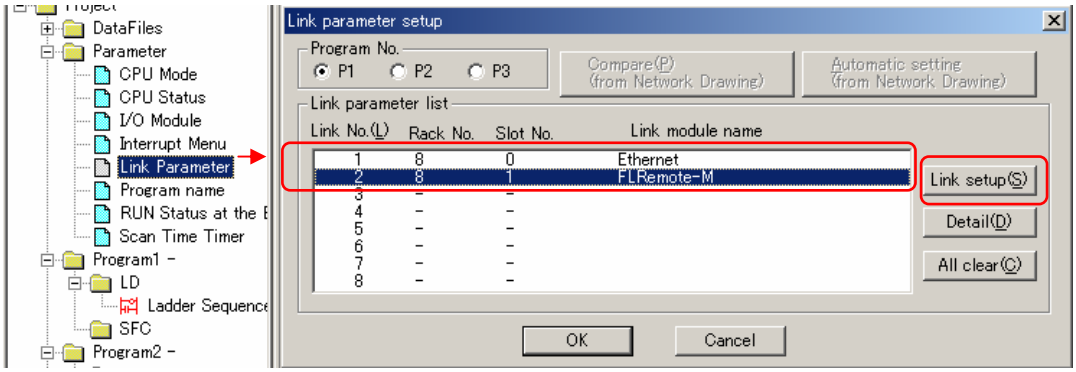
1. Start PCwin, select I/O module from the parameter settings and line the rack no. up with 8.



2. In settings, designate Ethernet for slot 0 and FL Remote-M for slot 1.

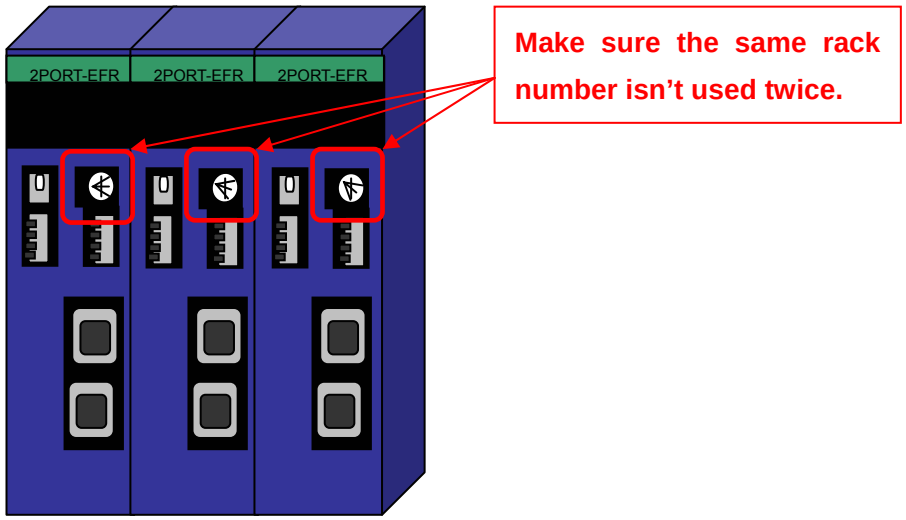


3. In link settings, set the link parameters as shown below. Please refer to “14.2 I/O module settings” for detailed settings.



Precautions when using multiple 2PORT-EFR modules

If multiple 2PORT-EFR modules or 2PORT-LINK modules are used on one CPU module, please make sure that the the same 2PORT-EFR or 2PORT-LINK number is not used twice. If it is, error no. 39 will occur.



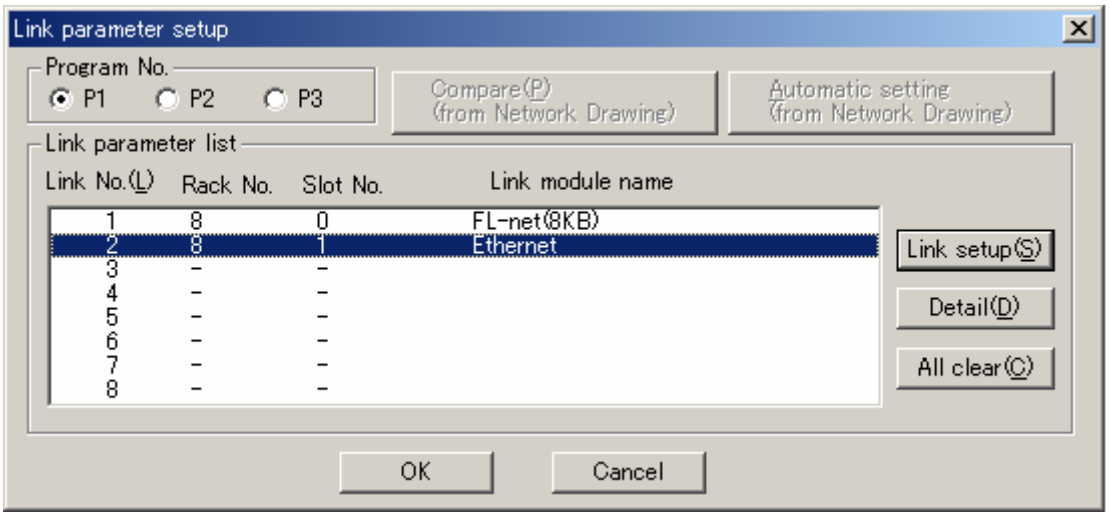
Handling when link is not used

Set the IO module setting for unused ports as “Ethernet”.

Please refer to 1.5 (3) for switch settings.

It is not necessary to perform detailed settings for link parameters.

＜L2 When not set＞



Limitations on number of modules implemented due to power module

In POWER 1/2, the maximum consumption current is 4A. As such, the number of 2PORT-EFR modules that can be implemented is limited.

For details, please see Reference 9 “Limitations on number of modules implemented due to power module “.

2 Functions of the 2PORT-EFR

2.1 Functions of the FL-net

This section describes the functions of the FL-net.

2.1.1 Specifications for the FL-net

No.	Item	Specifications
1	Physical layer	10BASE-T,100BASE-TX
2	Data transfer rate	10Mbps,100Mbps
3	Maximum cable length*1	Max. 100m（Between nodes（1 to 1 connection）, node and HUB, HUB and HUB） Total extension length: Max. 2100m （HUB：Max 20 units）
4	Max. no. of nodes	241（254 stations）*2
5	Communication function	Data link function Message server function Message client function
6	Relay link capacity	512 words
7	Register link capacity	2048 words/6144 words/8192 words (switch with dip switch）
8	Message data capacity	1024 bytes

*1 The designated HUB is auto negotiation. Data transfer rate is 100Mbps if the devices using auto negotiation are connected.

*2 Values shown in parentheses include the number of nodes for maintenance.
If 20 FE-SWH08 units are used, the maximum node number is 122.

2.1.2 Specifications for Data Link

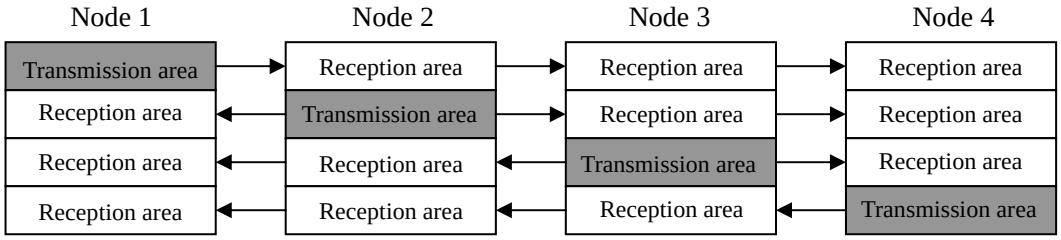
No	Item	Specification	
		Relay link	Register link
1	Link area *1	L000 to L7FF L1000 to L2FFF M000 to M7FF M1000 to M17FF X･Y000 to X･Y7FF EL000 to EL1FFF EM000 to EM1FFF EX･EY000 to EX･EY7FF GX ・ GY0000 to GX ・ GYFFFF GM0000 to GMFFFF	R000 to R7FF D0000 to D2FFF U00000 to U1FFFF*2 EB00000 to EB3FFFF*2
2	Link capacity	512 words	2048 words/6144 words/8192 words (switch with dip switch）
3	Transmitting capacity per unit	↑	↑
4	Communication method	N:N method & 1:N method	N:N method & 1:N method

*1 Available area is limited by operation mode and memory capacity.

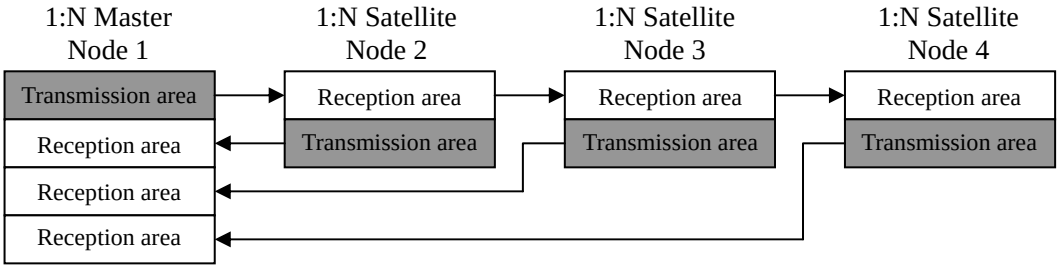
*2 For L1000 to L2FFF, M1000 to M17FF, U08000-U1FFFF, and EB00000-EB3FFFF, please only use PC10 mode.
These cannot be used in PC10 standard mode.

2.1.3 Data Link Method

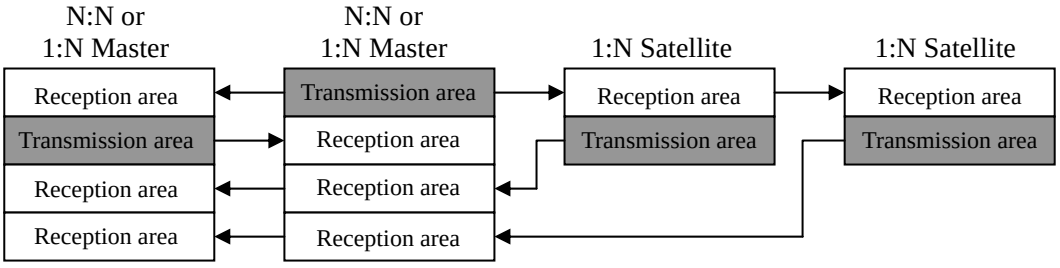
The data link method supports N:N (N to N) and 1:N (1 to N) connections. With N:N connections, the transmission area for a node (station) is the reception area for another node and data is shared by different nodes as shown below.



With 1:N connections, communication is performed between a node designated as 1:N Master and those as 1:N Satellites. No data link is established among 1:N Satellites.

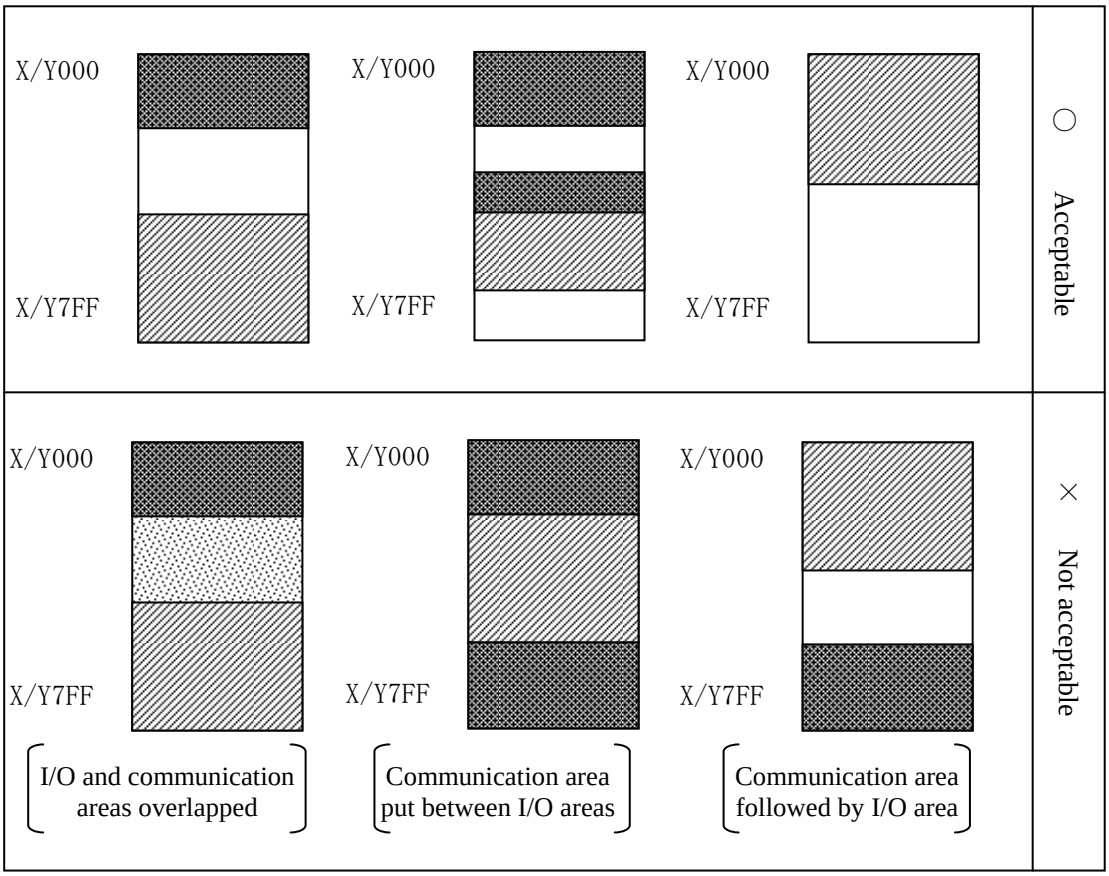


Nodes with N:N connections and those with 1:N connections may coexist on a single network.



2.1.4 Caution in Using I/O (X/Y) Area in Communication Area

(1) Take care not to overlap with I/O addresses of the I/O module connected with the CPU.



…I/O area of PLC

…Communication area of FL-net

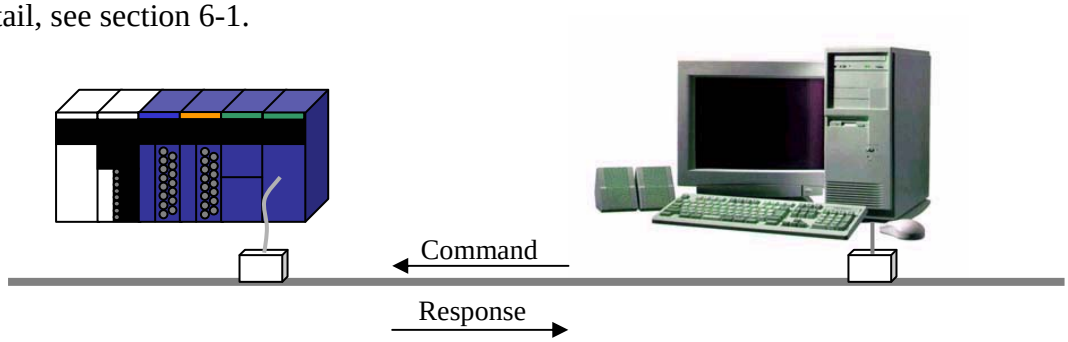
…Where I/O area of PLC and communication area of FL-net are overlapped

(2) I/O refresh (RIO: FUN No. = 280), I refresh (RI: Fun No. = 281), and O refresh (RO: Fun No. = 282) for instructions cannot be used in the communication area.

(3) The area used as transmission area is saved as input area in the CPU. Therefore, it is indicated as X when the communication area is monitored with I/O monitor.

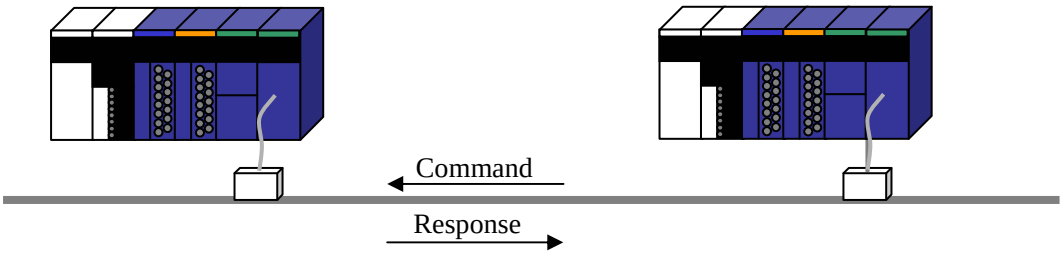
2.1.5 Message Server Function

With this function, a response is made to a command message sent from another node.
The command and response are automatically processed by the 2PORT-EFR module and CPU module. Parameter settings and sequence program processes are not necessary for this function.
For detail, see section 6-1.



2.1.6 Message Client Function *1

With this function, a command message is sent to another node and the response to that message is received.
The sequence program generates the command data, gives instruction to send it to the 2PORT-EFR, and loads the response data from the 2PORT-EFR module to the register.
For detail, see section 6-2.



2.1.7 Node Status Loading Function

The status of another node participating in the FL-net communication may be loaded to the register with the sequence program.
For detail, see section 6-3.

(*1: The message client and node status loading functions are available with CPU modules of the following versions.)

CPU Module	Version
PC10G	1.00 -
PC10P	1.00 -
PC3JG,PC3JG-P	1.30 -
PC3JP,PC3JP-GP	1.70 -
PC3JD	2.10 -
PC3JM	2.00 -
PC3JL	2.00 -
AF2K	2.00 -
MX	2.00 -

2.1.8 Monitor Function

The nodes (stations Nos. 1 to 254) participating in the FL-net communication can be monitored with special registers S3*0 to S3*F. Correspondence between the station No. (hexadecimal) and the bit address is shown below.
Moreover, when the version of FL-net is 1.4 or more, the own node number (hexadecimal) is stored in special register S3xF.

	MSB F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	LSB 0
S3*0	0F	0E	0D	0C	0B	0A	09	08	07	06	05	04	03	02	01	
S3*1	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10
S3*2	2F	2E	2D	2C	2B	2A	29	28	27	26	25	24	23	22	21	20
S3*3	3F	3E	3D	3C	3B	3A	39	38	37	36	35	34	33	32	31	30
S3*4	4F	4E	4D	4C	4B	4A	49	48	47	46	45	44	43	42	41	40
S3*5	5F	5E	5D	5C	5B	5A	59	58	57	56	55	54	53	52	51	50
S3*6	6F	6E	6D	6C	6B	6A	69	68	67	66	65	64	63	62	61	60
S3*7	7F	7E	7D	7C	7B	7A	79	78	77	76	75	74	73	72	71	70
S3*8	8F	8E	8D	8C	8B	8A	89	88	87	86	85	84	83	82	81	80
S3*9	9F	9E	9D	9C	9B	9A	99	98	97	96	95	94	93	92	91	90
S3*A	AF	AE	AD	AC	AB	AA	A9	A8								
S3*B	BF	BE	BD	BC	BB	BA	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
S3*C	CF	CE	CD	CC	CB	CA	C9	C8	C7	C6	C5	C4	C3	C2	C1	C0
S3*D	DF	DE	DD	DC	DB	DA	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
S3*E	EF	EE	ED	EC	EB	EA	E9	E8	E7	E6	E5	E4	E3	E2	E1	E0
S3*F		FE	FD	FC	FB	FA	F9	F8	F7	F6	F5	F4	F3	F2	F1	F0
.																
.																
.																
S3xF	Own node number(hexadecimal)															

Bit 1 = Participating in the communication
Bit 0 = Not participating in the communication

■ "*" and"x" in the special register No. is determined by the link No.

Link No.	1	2	3	4	5	6	7	8
*	0	2	4	6	8	A	C	E
x	1	3	5	7	9	B	D	F

If the link No. of the 2PORT-EFR module is 3, for example, the station with node No. 85 (55h) may be monitored by checking the fifth bit of S355.

The above area is cleared with reset/start or the power supply switching off.
Moreover, 2PORT-EFR secedes from the communication line, and starts the communication joining processing by reset again

2.1.9 Communication response time of FL-net

（1） Refresh cycle time

Communication of FL-net has adopted the masterless token system. Time from the acquisition of a cert ain node of the token(Transmission right) to the next acquisition of the token(Time for a token to take 1 round) is called " refresh cycle time ".

Refresh cycle time(average) T=P+0.002N [ms]

P: nodes number

N: Number of words in which total of all nodes is put on numb er of transmission words of each node

(Number of transmission words=Number of relay link transmission words + Number of register link transmission words)

（2） Response time

Response time is time from turning on the input by the transmission side PLC to the output by the reception side PLC turns on..(when communicating by the module(TOYOPUC 2PORT-EFR))

Composition Transmission side PLC Reception side PLC

Response time(average) $R=12+N\times0.01+T+Tsc1\times2+Tsc2\times2+T_{ID}+T_{OD}$ [ms]

T: refresh cycle time

N: Number of words in which total of all nodes is put on number of transmissio n words of each node

T_{SC1}: scanning time by transmission side PLC

T_{SC2}: scanning time by reception side PLC

T_{ID}: Input module delay time

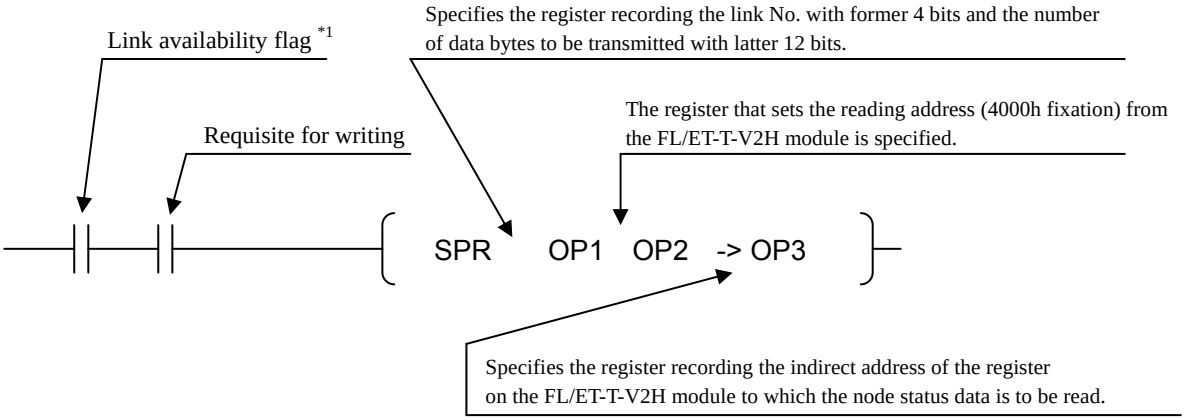
T_{OD}: output module delay time

2.1.10 Communication state confirmation function

This function confirms the state of the line. This function reads the following content among Log information on the node.

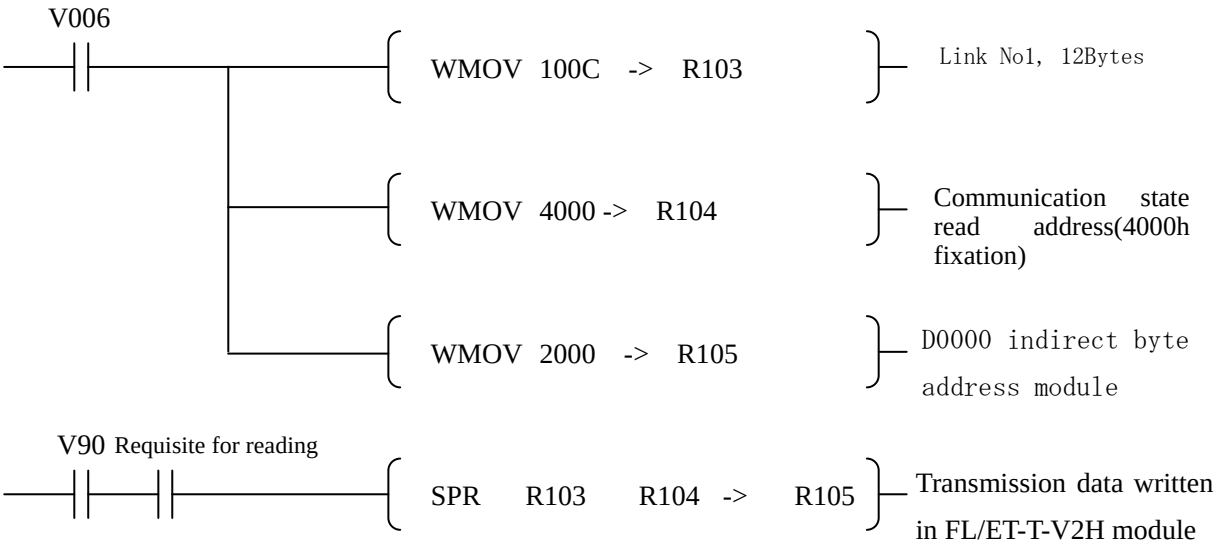
(1)Reissued tokens
(2)Token retention time-outs
(3)Token monitor time-outs

These information is read by the SPR command.



*1: The link availability flag is V90 for the 2PORT-EFR module with link No. 1, V92 with link No. 2, or V9E with link No. 8.

Example of programming sequence that reads communication to register D0000-D0005



Response format of example of circuit

Address	Data size	Contents
+0 (D0001・D0000)	4 byte	Reissued tokens
+4 (D0003・D0002)	4 byte	Token retention time-outs
+8 (D0005・D0004)	4 byte	Token monitor time-outs

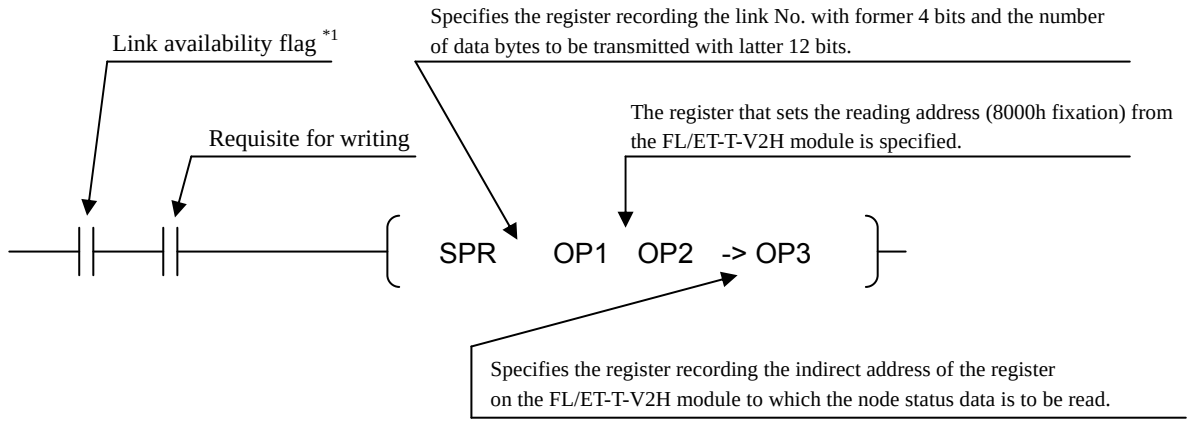
The above-mentioned value cannot be called the state of the line excellence when the count improvement is regularly done.
Please improve it referring to the following examples of measures.

1) The content of 5-1"Loop back test abnormality" is confirmed.
2) The communications cable is separated from the power line and established.
3) LAN cable uses a specified cable.
4) Recommendation HUB is used.
5) When the other party node is grounded, the pin of the jumper in the module is removed.
6) When the transmission rate is 100Mbps, it changes to 10Mbps fixation (SW1-4=OFF).
7) Allowable minimum frame interval time is enlarged.

2.1.11 Reading function of network management information

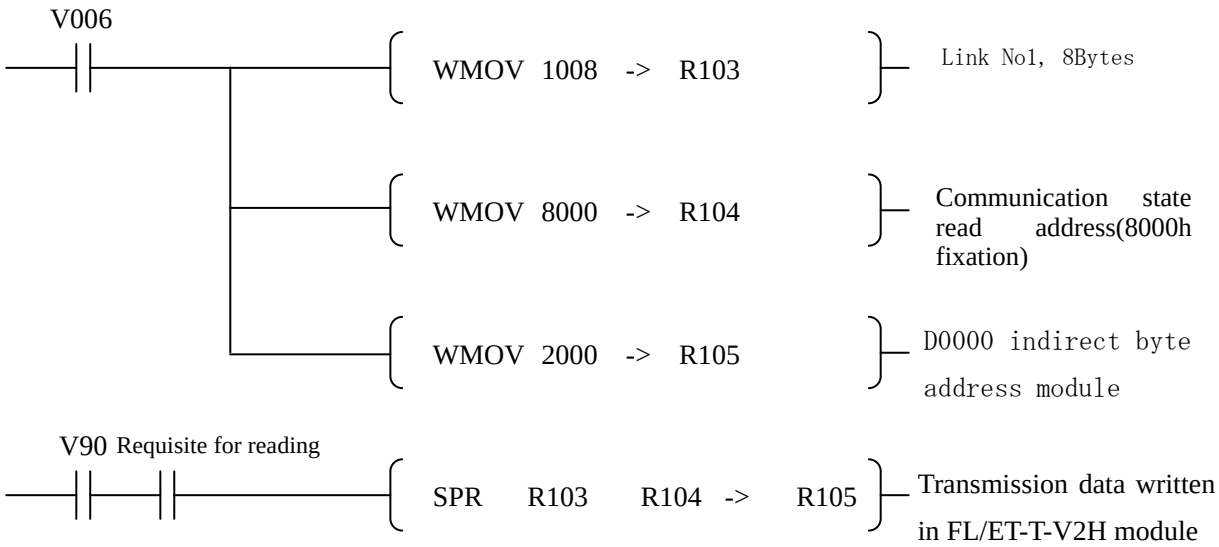
This function is a function to read network management information.

These information is read by the SPR command.



*1: The link availability flag is V90 for the 2PORT-EFR module with link No. 1, V92 with link No. 2, or V9E with link No. 8.

Example of programming sequence that reads D0000 network management information



Response format of example of circuit

Address	Data size	Contents
+0 (D0000)	2 byte	Measured refresh cycle time (current)
+2 (D0001)	2 byte	Measured refresh cycle time (max)
+4 (D0002)	2 byte	Measured refresh cycle time (min)
+6 (D0003)	2 byte	Minimum permissible frame interval

2.2 Functions of the Ethernet

This section describes functions of the Ethernet.

2.2.1 Specifications for the Ethernet

No.	Item	Specifications
1	Physical layer	10BASE-T/100BASE-TX
2	Data transfer rate	10Mbps, 100Mbps
3	Maximum cable length*1	Max. 100m (Between nodes (1 to1 connection), node and HUB, HUB and HUB)
4	Communication function	① Computer link function ② File memory function ③ General communication function *2
5	No. of openable ports	Max. 8
6	Computer link data capacity	Max. 1K byte
7	File memory capacity	Transmission 2K bytes Receipt 2K bytes

*1 The designated HUB is auto negotiation. Data transfer rate is 100Mbps if the devices using auto negotiation are connected.

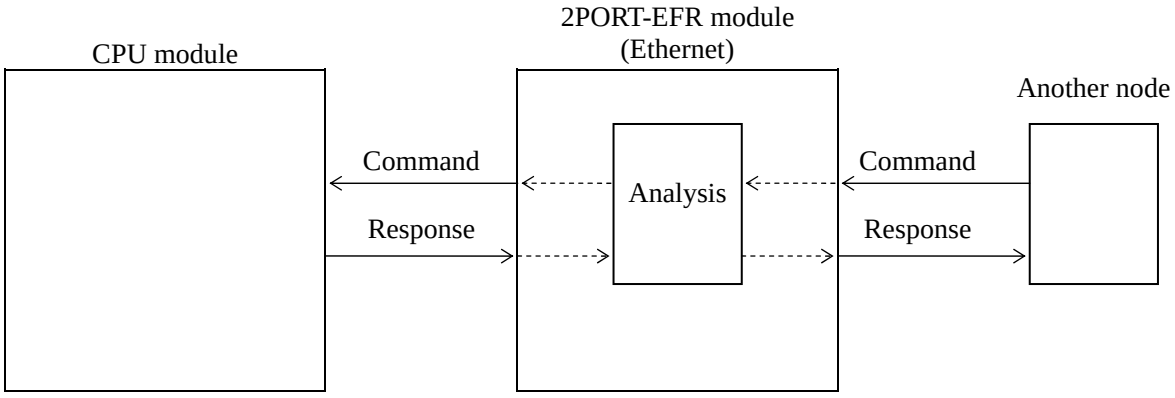
*2 General communication method can be used from Ver 1.20 onwards.

2.2.2 Communication with Computer Link Method

Transmit a command from another node to read/write data in the CPU module. Since the 2PORT-EFR module is responsible for command analysis and communication with the CPU module, no sequence program is required for data exchange.

Another node may be a personal computer or host and data exchange between TOYOPUCs is not attainable.

For detail, see section 6.

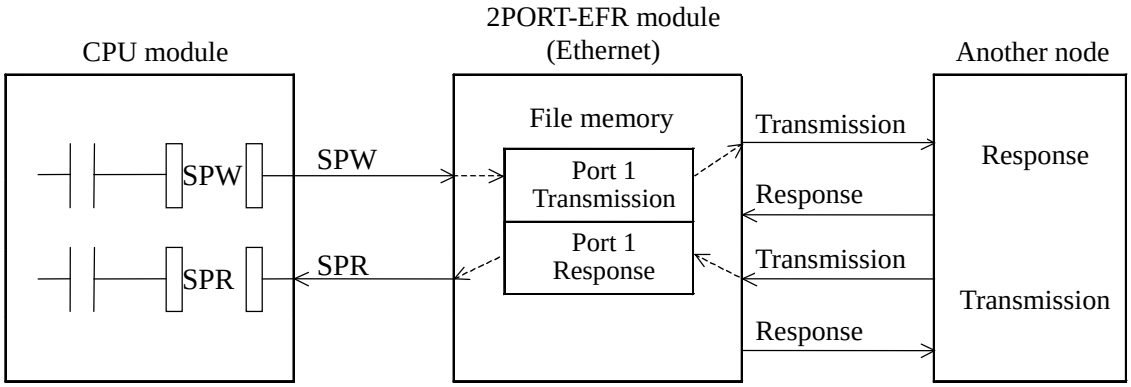


2.2.3 Communication with File Memory Method

Use instructions of the sequence program such as SPR (to read the file memory) and SPW (to write the file memory) to read/write the file memory in the 2PORT-EFR module for transmission/recepetion.

Another node may be any device other than a personal computer or host and data exchange between 2PORT-EFR modules of a PLC is attainable. (No communication is possible with Ethernet modules offered by other manufacturers.)

For detail, see section 10.



2.2.4 PING Test Function

Conduct a PING Test to verify that the communication circuit is connected with a communicatee/ communicator and that communication is attainable normally.
If the module fails in the PING test, the following causes are suspected.

- The cable is disconnected or poorly connected.
- The transceiver power supply is disconnected from the terminal block on the 2PORT-EFR module.
- A communication device such as transceiver between the 2PORT-EFR module and the other node is out of order.
- The other mode has not been started.
- Both nodes have the same IP address.
- Both nodes have the same network ID in the IP address. (See Attachment 5.)

2.2.5 PING Test Procedure

Set any of the following addresses as defined by the link No. to which the FL/NT-net-5 module has been assigned, to the IP address of the other node by hexadecimal notation using peripheral equipment or such.

Link No.	Write IP address of the other node at:
1	S31C - S31D
2	S33C - S33D
3	S35C - S35D
4	S37C - S37D
5	S39C - S39D
6	S3BC - S3BD
7	S3DC - S3DD
8	S3FC - S3FD

If the 2PORT-EFR module has been assigned to link No. 1 and the IP address of the other node is 172.16.93.133, for example, set S31C to '5D85' and S31D to 'AC10.'
After completion of the PING test, change these values back to 0000.

The PING test is performed every two seconds and results are expressed by the 3rd and 4th bits at file memory address 106 (see Attachment 2). The 3rd bit turns on if the PING test is successfully completed and the 4th bit turns on if not. Results of the PING test may also be found from the status monitor area (see section 2-2-6).
A sequence program using an SPR command is required to load data from the file memory (see Attachments 1 and 2).

The module status may be monitored by checking special registers S300's of the CPU module. The addresses to be monitored are determined by the link No. as shown below.

Link No.	Write IP address of the other node at:
1	S300 - S30F
2	S320 - S32F
3	S340 - S34F
4	S360 - S36F
5	S380 - S38F
6	S3A0 - S3AF
7	S3C0 - S3CF
8	S3E0 - S3EF

The status of the control flag in the file memory and connection error codes, if any, may be monitored by checking this area using peripheral equipment.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
S3#0	CN8	Request for active open						CN1	0	0	0	0	0	0	0	*1
S3#1	CN8	Request for file memory reception						CN1	CN8	Request for file memory transmission						CN1
S3#2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*3	*2
S3#3	CN8	Open normal						CN1	0	0	0	0	0	0	*5	*4
S3#4	CN8	File memory transmission complete						CN1	CN8	Connection error						CN1
S3#5	0	0	0	0	*9	*8	*7	*6	CN8	File memory reception complete						CN1
S3#6	4th digit of own Ethernet address *10								5th digit of own Ethernet address *10							
S3#7	6th digit of own Ethernet address *10								CN8	General communication						CN1
S3#8	Connection 1: Connection error code															
S3#9	Connection 2: Connection error code															
S3#A	Connection 3: Connection error code															
S3#B	Connection 4: Connection error code															
S3#C	Connection 5: Connection error code															
S3#D	Connection 6: Connection error code															
S3#E	Connection 7: Connection error code															
S3#F	Connection 8: Connection error code															

*1: Request for initialization *2: Error log reception confirmed

*3: ICMP log reception confirmed *4: Normally initialized

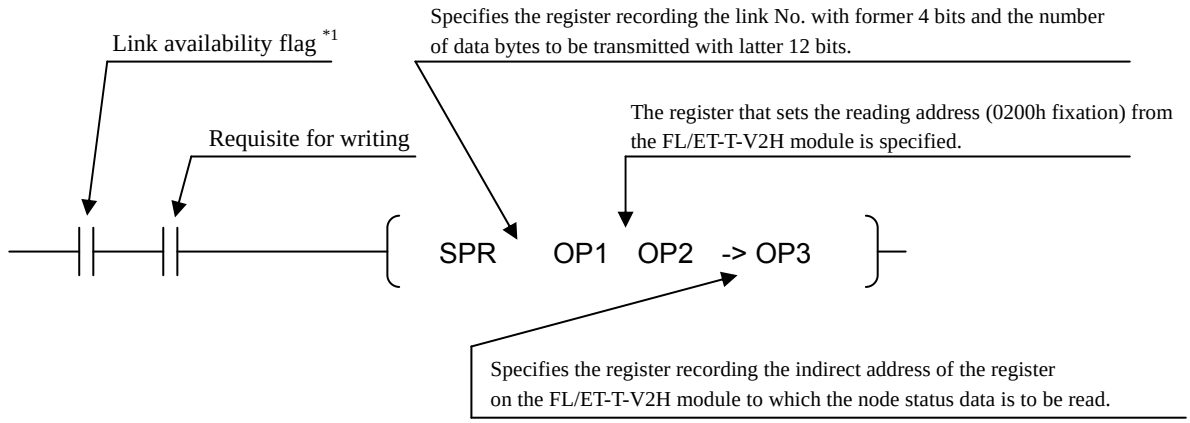
*5: Abnormally initialized *6: Error log received

*7: ICMP log received *8: PING passed *9: PING failed

*10: Former 3 digits of Ethernet address are fixed to 00.60.53.

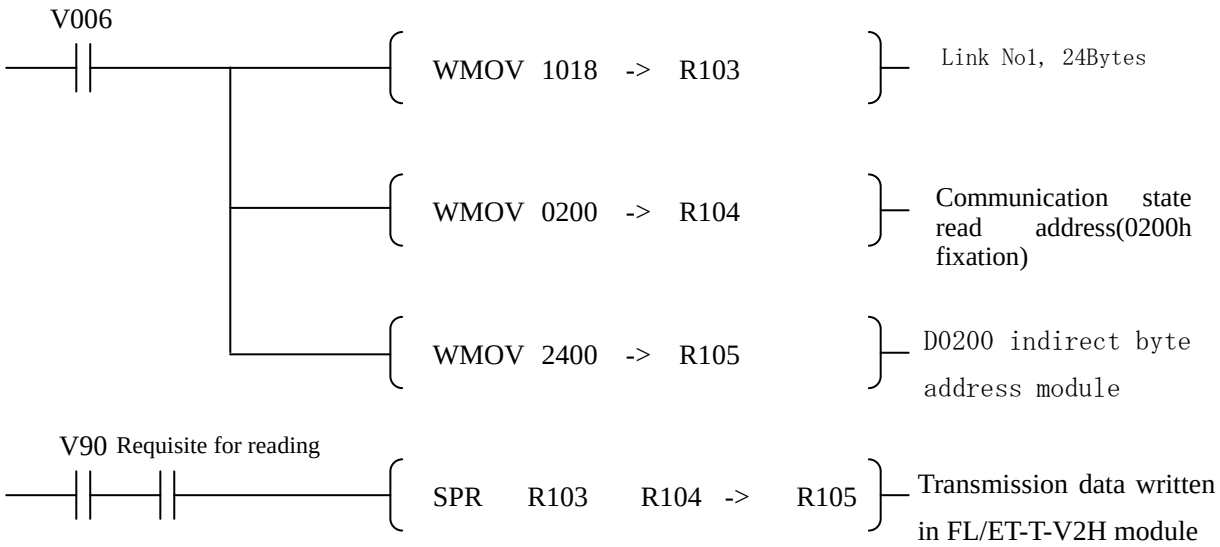
2.2.7 Communication state confirmation function

Sending and receiving packet information can be read to the register of CPU module by this function. These information is read by the SPR command.



*1: The link availability flag is V90 for the 2PORT-EFR module with link No. 1, V92 with link No. 2, or V9E with link No. 8.

Example of programming sequence that reads D0000 network management information



Response format of example of circuit

Address	Data size	Contents
+0 (D0201 D0200)	4 Byte	Number of receiving packets
+4 (D0203 D0202)	4 Byte	Number of receiving errors
+8 (D0205 D0204)	4 Byte	Number of transmission packets
+C (D0207 D0206)	4 Byte	Number of transmission errors

The numbers of counts other than A and B are excellent and when the count improvement is regularly done, the state of the network is not excellent. Please improve it referring to the following examples of measures.

1) The communications cable is separated from the power line and established.
2) LAN cable uses a specified cable.
3) Recommendation HUB is used.
4) When the other party node is grounded, the pin of the jumper in the module is removed.
5) When the transmission rate is 100Mbps, it changes to 10Mbps fixation (SW1-4=OFF).

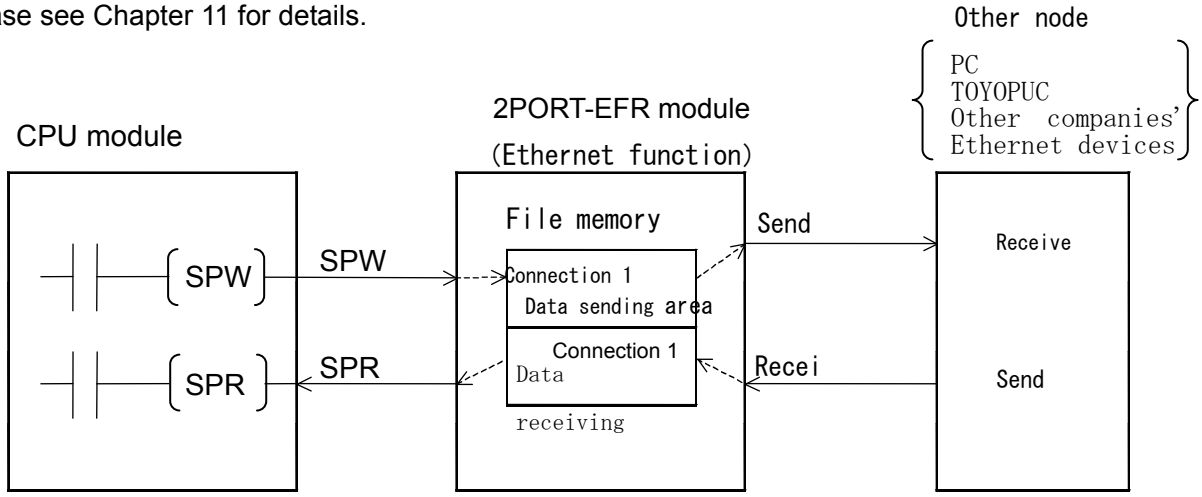
2.2.8 Communication using the general communication method

Sends and receives data using a sequence program application command SPR (file memory read), SPW (file memory write) to read or write the file memories in the 2PORT-EFR module.

The general communication function differs from file memory communication in the sense that the TCP/UDP data section is free formatted, meaning that Ethernet devices of a fixed communication format can be connected.

However, there are no transfer control procedures, and checking for mistakes, etc is the responsibility of the user.

Please see Chapter 11 for details.

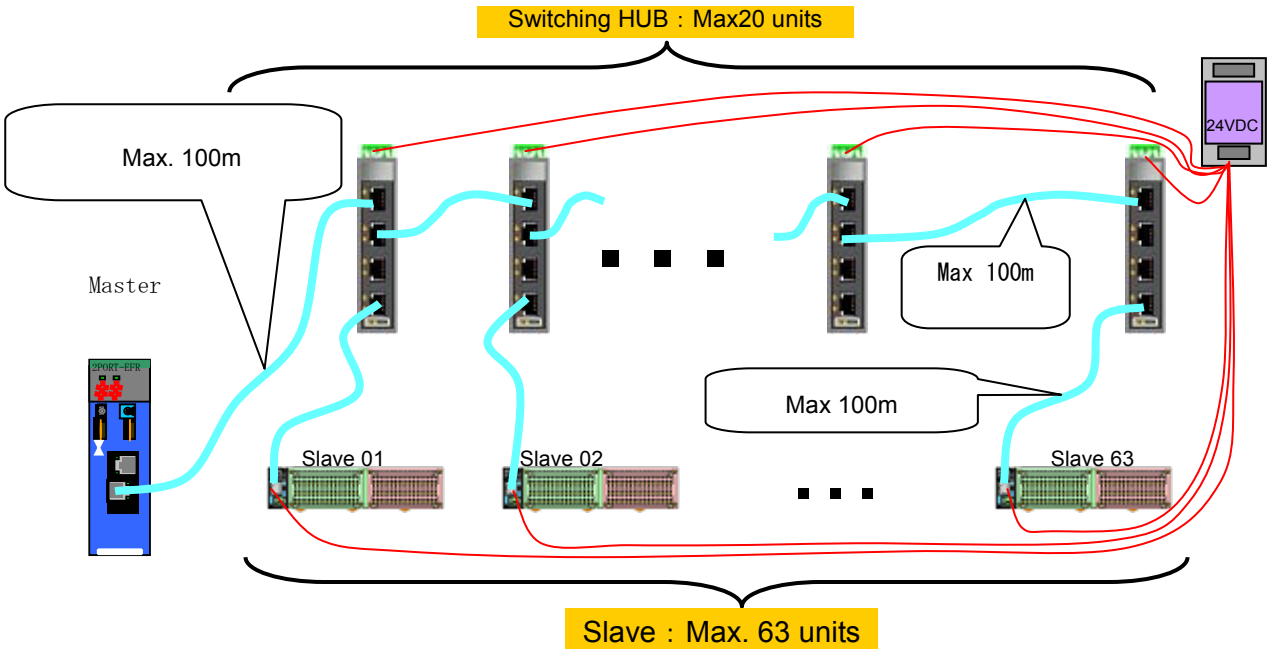


2.3. Functions of the FL Remote

2.3.1 Specifications for the FL Remote

Item	Specifications
Data transfer rate	10Mbps, 100Mbps
Maximum cable length*1	Max. 100m(Between master and HUB, master and slave（1 to 1 connection）,slave to HUB, HUB to HUB) Total extension length: Max. 2100m （HUB：Max 20 units）
Max. no of nodes	64 units(1 master, 63 slaves)
Node address	Slave：01 to 63
No. of I/O points	Input: Max. of 2048 points, output: Max of 2048 points
No. of I/O points for per slave	Input: Max. 64 points, output: Max. 64 points
I/O allocation	Minimum unit = 8 points
Link area	X・Y, M, L, EX・EY, EM, EL, GX/GY, GM
Communication function	I/O communication

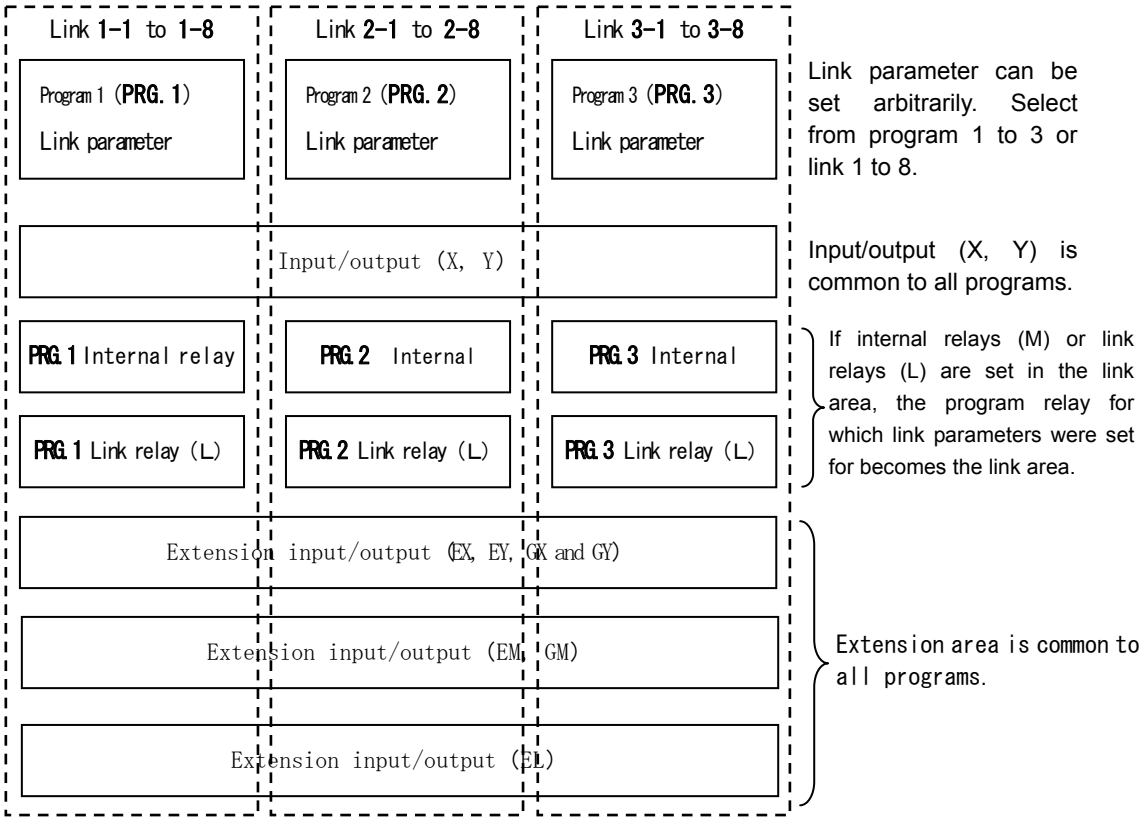
*1 The designated HUB and FRMT are auto negotiation. Data transfer rate is 100Mbps if the devices using auto negotiation are connected.



(2)Link numbers and areas

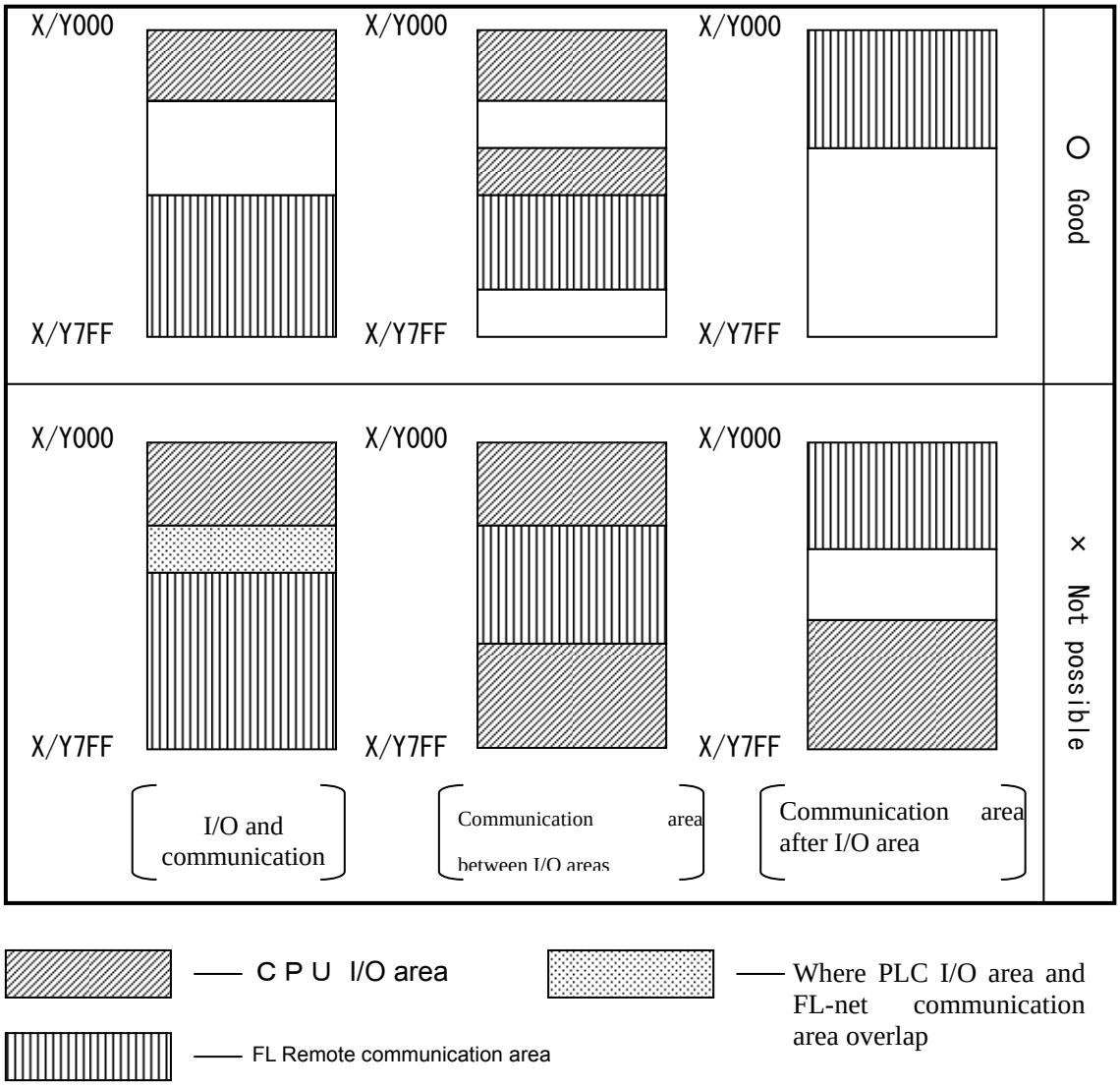
The user can select link parameters at their discretion from links 1 to 8 of programs 1 to 3.

If internal relays (M) or link relays (L) are set in the link area, the program relay for which link parameters were set becomes the link area. Input/output (X, Y) and extension areas (EX and EY, EM, EL, GX and GY, GM) are common to all programs.



(3)Precautions when using inputs and outputs (X, Y) in the communication area

1. Please be careful not to overlap the I/O addresses of the I/O module implemented on the CPU and those of the communication area.

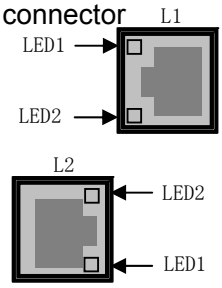


2. The application commands, I/O refresh (RIO: FUN No. = 280), input refresh (RI: Fun No. = 281) and output refresh (RO: Fun No. = 282), cannot be used in the communication area.

3. If “Y” is used in communication area addresses, the CPU internal address display will all be shown as “X”. Therefore, if the communication area is monitored on an I/O monitor, the display will read “x”.

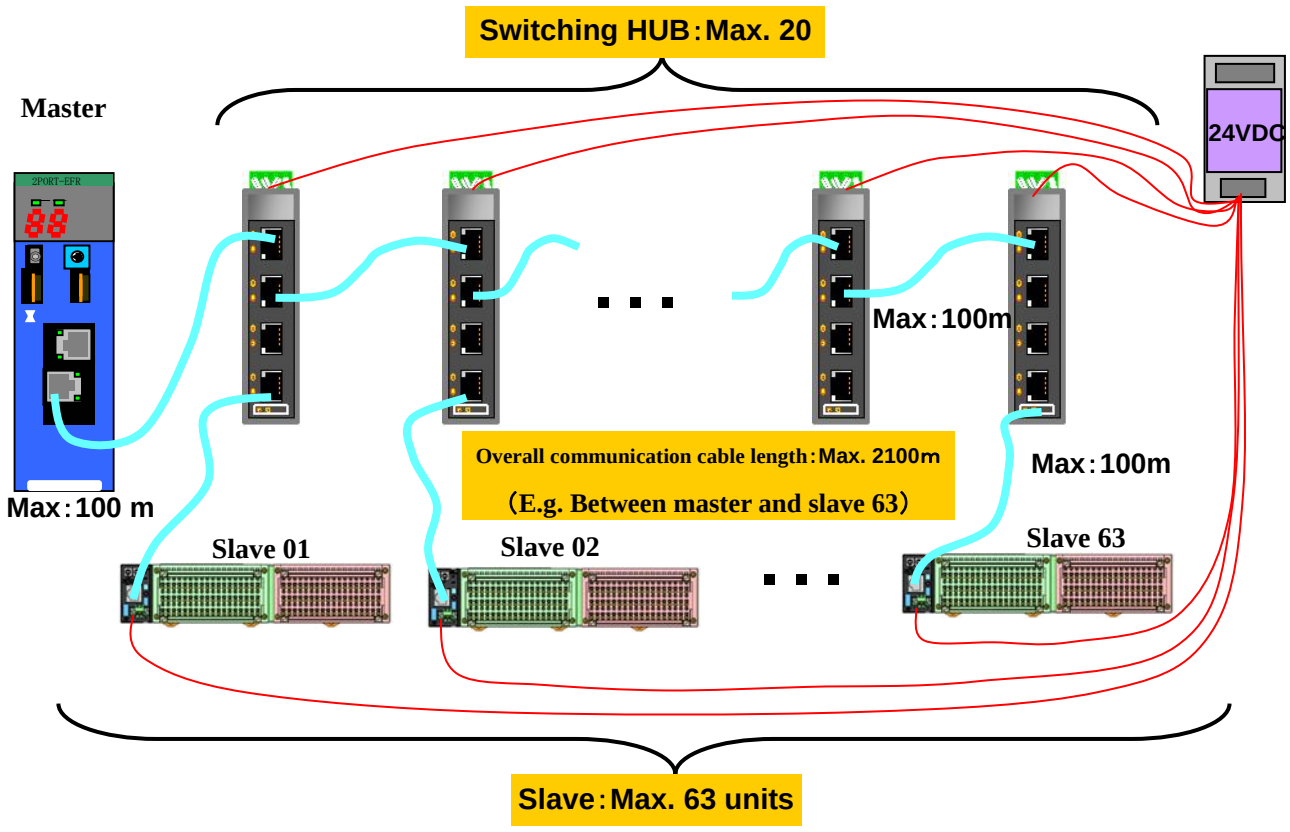
(4)Display

There are two FL Remote-M status display lamps, LED1 and LED2, which are green and red respectively. These lamps illuminate solid, flash or go out in the below situations.

Lamp name	Lamp status and description
Communication connector  	LED1. Displays hardware status Green solid：Hardware normal Red solid：Hardware error occurring Off：Program not operating LED2.LED2. Displays communication status ・For FL Remote Green solid:：Remote operating Green flashing: FL participating Red solid: Link parameter error Red flashing: Communication error Green flashing: Setting error Off: Cable not connected

2.3.2 Network configuration

The FL Remote network is configured as shown below.



■Description of devices

Name	Explanation
Node	Nodes have both a slave which connections input/output devices and a master which links the slaves together. There is one master for each network. The master and slave positions are not fixed and could be in either of the node positions shown in the figure above. FL Remote M is a master module.
FL Remote master	PC10G built-in link, 2PORT-EFR, etc are used as the FL Remote master.
Cable	Please use JTEKT's specified LAN cable. * 1
Communication method	Straight cable is used. However, cross cable is used for 1 to 1 connections. If multiple slaves are connected, please use JTEKT's designated switching HUB (*2).
Communicaton power II/O power	Power for communication is supplied to each node. For communication power, please apply 24V and 0V to terminal blocks with +, - on them. For I/O power, please apply 24V and 0V to terminal blocks with +V, -V on them. Please make the IO power and communication power separate systems.

* 1 Refer to 3.2 FL-net/Ethernet/FL Remote wiring.

*2 Please use FE-SWH05/08 (Jtekt) as the HUB.

2.3.3 Powering up sequence

When turning on power, either turn on the slaves first then the master or both at the same time.

A communication error may occur if the master is turned on before the slaves.

Communication errors will also occur if slaves are turned off after communication has begun.

Powering up sequence	Result
Master → slave	×
Slave → master	○
Simultaneously	○

Even if the master receives no response form a slave that has been powered up, it will not judge it as an error for the first 18 seconds.

During this time, the master performs a communication recovery operation. If communication isn't recovered after 18 seconds, the master alerts the CPU of a communication error.

Note 1: To clear a communication error, reset/start the CPU or turn the communication reset special relay on. (For details, please refer to 2.3.4 Communication reset.)

Note 2: The master continues communicating as long as communication with all slaves is normal. Communication will stop if even one station becomes faulty. (Communication could be continued if the isolation function was used. For details please refer to 2.3.5 Isolation function. Depending on link parameter settings, it is possible to select whether communication is stopped or not in the event of a communication error occurring.)

2.3.4 Communication reset

Communication reset is a function to reopen communication in the event that communication has stopped due to a communication error.

By changing the communication reset special relay from [OFF] to [ON], it is possible to reset communication.

The I/O addresses of the communication reset special relay per link number are as shown in the table below.

Link no.	I/O address
1	V80
2	V81
3	V82
4	V83
5	V84
6	V85
7	V86
8	V87

Note 1: Communication reset is only enabled when the special relay is on.

Note 2: Communication reset is only enabled when a communication error is occurring. It is disabled when communication is normal.

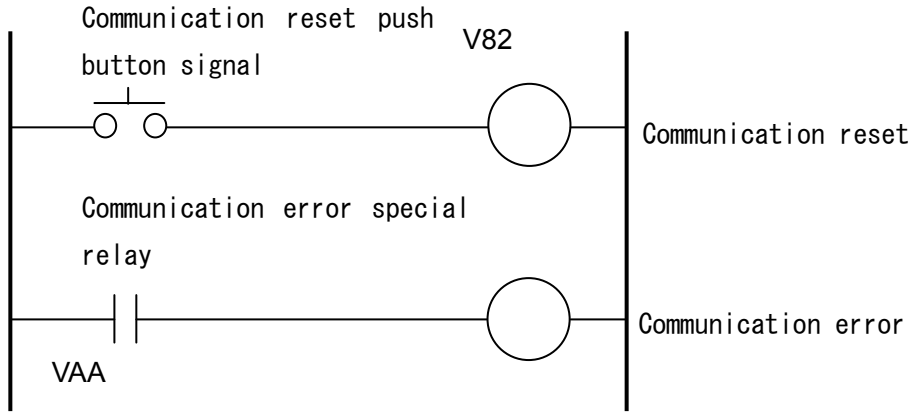
■ Resetting communication by resetting the CPU

Communication can be reset with the CPU reset switch.

■ Example of a communication reset circuit

Reset circuit is not necessary for the first 18 seconds after power is turned on as the communication recovery operation is performed.

The below diagram is an example of a circuit to recover communication in the event of errors.



Note 1: **The above is an example of a circuit when the link number is 3.**
The communication error special relay and communication reset differs depending on the link number.

Note 2: The above circuit is not valid if [CPU RUN STOP] has been set for communication errors.

2.3.5 Isolation function

If a communication error occurs on one of the slaves the master will stop communicating with all of the slaves and alert the CPU of the error.

The isolation function can be used to separate (or restore) a specific slave from or to the communication network. With this function, the error slave can be removed from the communication network and communication can continue with those slaves which are normal.

■ Communicating in an isolated state

(1) If the isolated slave is normal

The master will send I/O OFF data to the slave which has been designated as “isolated”. Any data received from that slave will be discarded and processing will be performed as though I/O OFF data has been received.

Even if an output to the isolated slave turns on, OFF data will be communicated for communication purposes only. I/O data will be communicated as normal to all other stations which have not been designated as isolated.

Even if power to the master is turned off then on again or communication is reset, the isolation designation will still be valid and OFF data will be exchanged.

（2）The master will continue communication recovery operation until the error on that

slave is cleared. Once the error is cleared and a normal response is received, the exchange of OFF data will begin. During this time I/O data will be communicated with other slaves as normal.

In order to report that a communication error has occurred on the isolated slave the master will display error code D9 (transfer error) and number of the faulty slave to the 7-segment display unit.

(3) If isolation state is cancelled

If slave is normal….ON/OFF I/O data will be exchanged as normal.

If slave is faulty….It will be treated as a normal error, error will be notified and communication will all slaves will cease.

(4) Other

If a communication error occurs on a slave not designated as being isolated, the master will report the error and cease communication with all slaves.

■ Designating the slave for isolation

The isolation status of each slave is set by setting data in special register S3*C to 3*F data.

Each bit number expresses a node address (station number).

	MSB															LSB
S3*C	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	-
S3*D	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
S3*E	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
S3*F	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48

Individual bit = 1: Designated as “isolated”.

Individual bit = 0: Not designated as “isolated”.

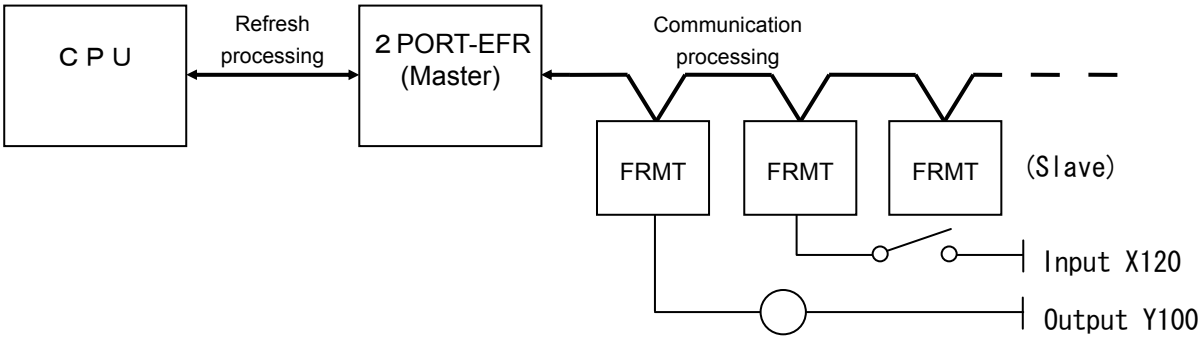
■ The ＊ section of the special register depends on the link number.

Link no.	1	2	3	4	5	6	7	8
＊	1	3	5	7	9	B	D	F

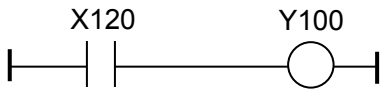
2.3.6 Communication data response time

（1）Configuration

Slaves are all FRMT (TCU-6405, TCU-6406, TCU-6407). (Communication speed = 100 Mbps)



（2）Program



The time taken from slave input to slave output is the communication data response time.

(3) Formula

Average response time = 20 + 2.7 x (No. of slaves) + (input response time + output response time) + (scan time) x 2 [ms]

Maximum response time = 30 + 3.7 × (No. of slaves) + (input response time + output response time) + (scan time) ×2 [ms]

（Reference）FRMT input/output response time specifications

OFF→ ON : 1.5 ms or less

ON→ OFF : 1.5 ms or less

3 Installation and Wiring

3.1 Installation

3.1.1 Environment for installation

The unit should not be installed where;

（１）the ambient temperature falls below 0°C or rises above 55°C,

（２）the ambient humidity falls below 30%RH or rises above 85%RH,

（３）condensation occurs due to sudden temperature change,

（４）corrosive or combustible gas exists,

（５）the atmosphere contains a large amount of dust, iron powder or other conductive particles, oil mist, saline, or organic solvent,

（６）the unit is exposed to splashes of oils and/or chemicals,

（７）a strong electric or magnetic field is generated,

（８）the unit is exposed to the direct sunlight, or

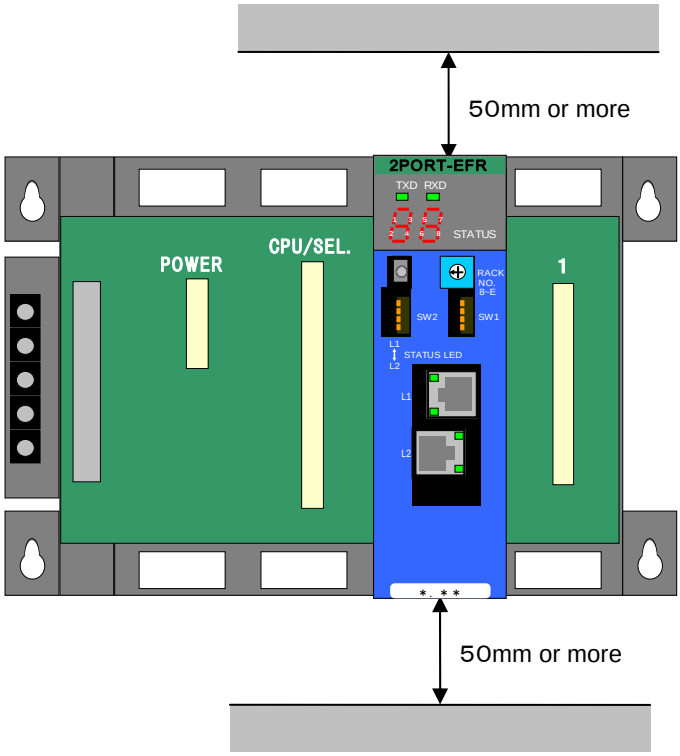
（９）vibration or impact may be directly transmitted to the unit.

If this module is used in the above environments, please install it in a place where favorable conditions can be maintained, i.e. storing in a sealed control panel, etc. Please do not leave the control panel door open.

Furthermore, if a fan or the like is used in the control panel, please install the module so it is not directly exposed to the wind. Please be aware that if the wind directly comes in contact with the module, a large quantity of dust, etc. may adhere to the surface, preventing accurate measurement.

3.1.2 Installation of the unit

The 2PORT-EFR is implemented on slots 0 to 7 of the base unit, and occupies one of the I/O module slots. A space of 50 mm or wider should be provided between the top and bottom of the unit and other constructions and components to facilitate ventilation and unit replacement.



3.2 FL-net/Ethernet/FL Remote wiring

External devices needed for wiring

To construct FL-net/Ethernet/FL Remote systems, the following external devices are required. These should be prepared by the customer. Please use communication devices that comply with IEEE802.3.

(a) Designated cable

The cables designated for FL-net/Ethernet/FL Remote are shown below.

Please purchase cables from the following assembly manufacturers;

[Shinwa Co., Ltd], [KOM Co., Ltd] or [Nichigoh Communication Electric Wire Co., Ltd].

The cable must a Category 5e equivalent product.

Straight cable assembly: FLG－S－＊＊＊

Cross conversion cable: FLG－X－002（0.2m）

Note）Please do not install the communication cable in parallel or in close proximity with high voltage cables such as power cables and so forth.

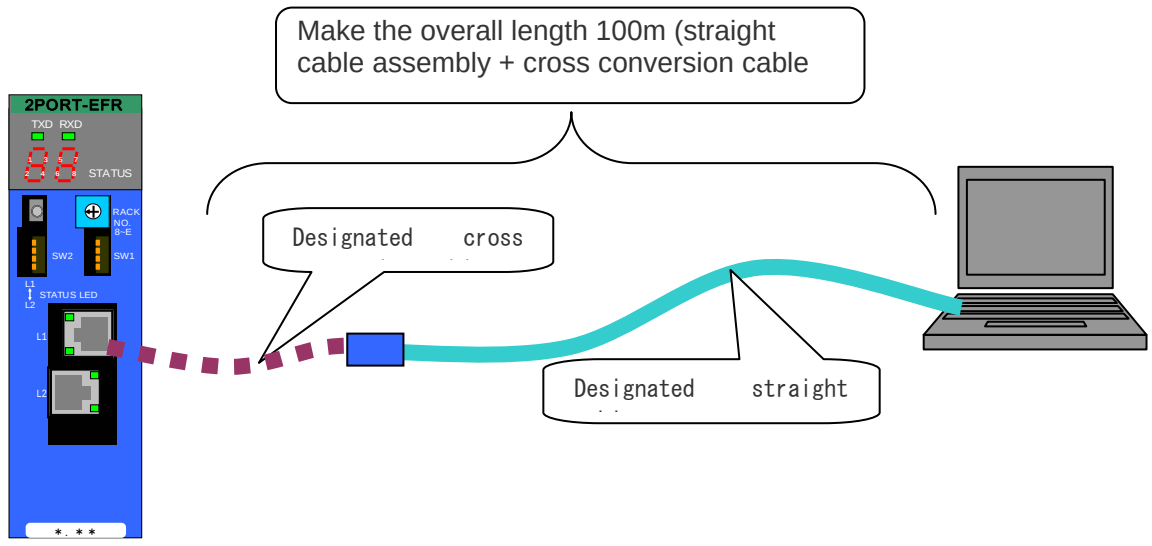
(b) Designated HUB

	No. of ports	Name	Type
SW-HUB	5	FE-SWH05	TCU-6414
	8	FE-SWH08	TCU-6415

Note) Please earth the HUB. For details, please see the HUB instruction manual, T-759N.

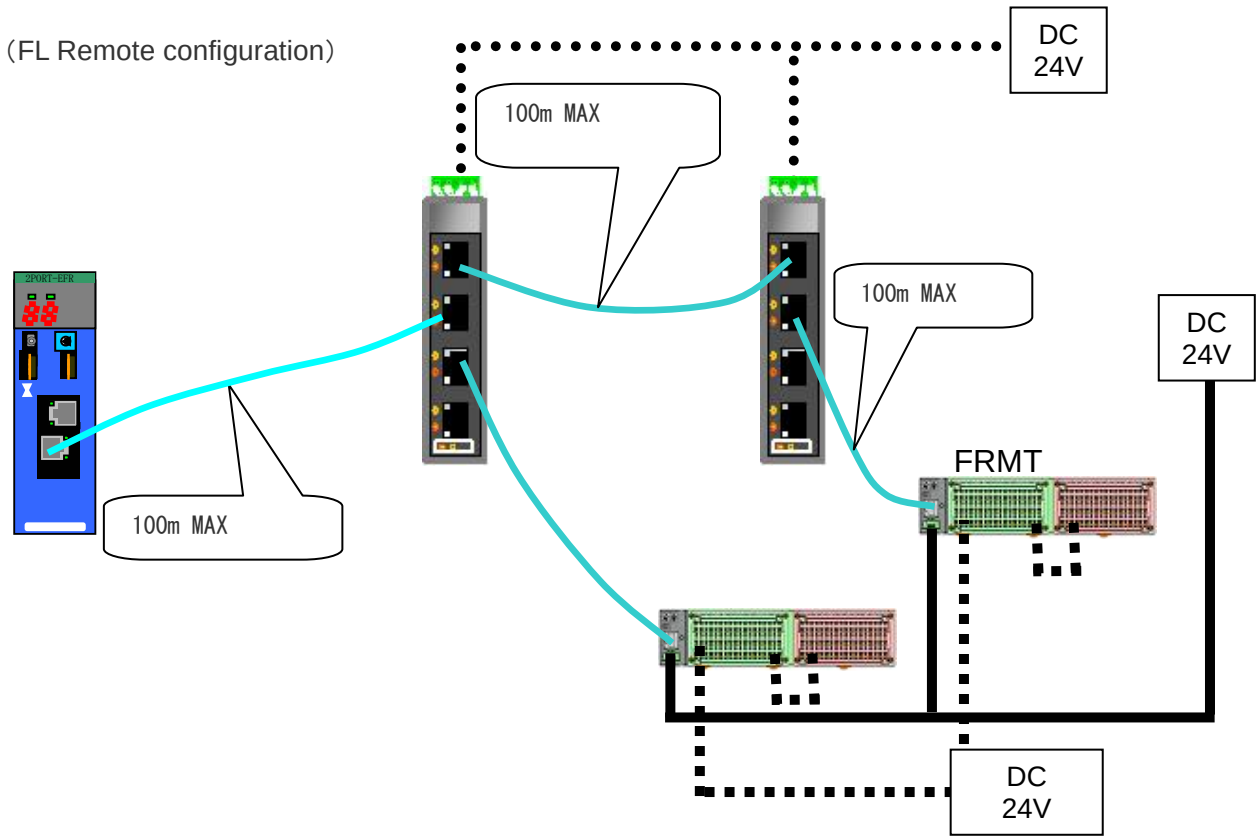
When 1:1 connection is made with another node

Connect the 2PORT-EFR（FL-net /Ethernet/ FL Remote） module and the other node using a cross cable.



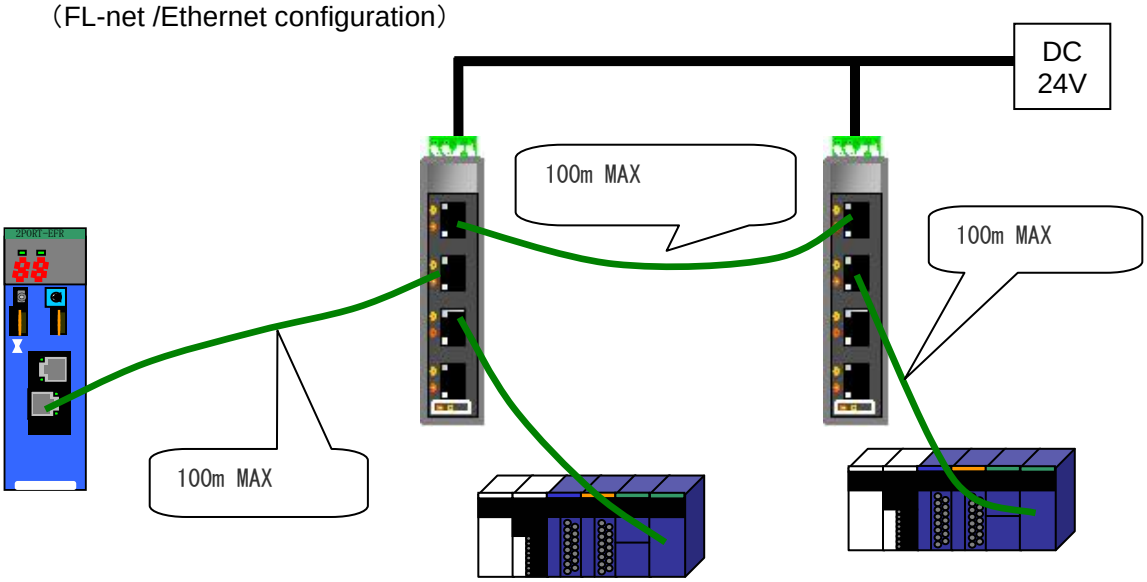
Connect 2PORT-EFR (FL-net/Ethernet/FL Remote) and the hub using a straight cable.
Connect one hub to another hub using cross-cable or straight cable. However, do not combine FL-net/Ethernet/FL Remote on the same system network.

（FL Remote configuration）



(Separate I/O power and unit power)

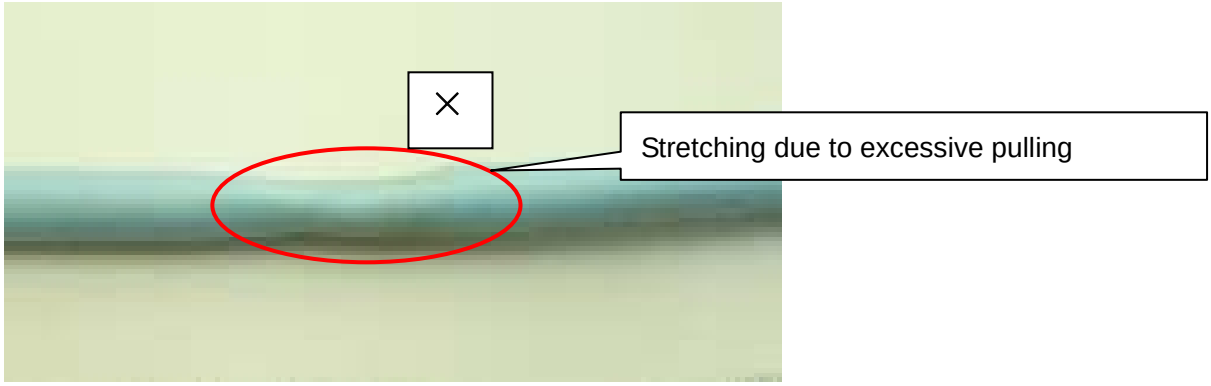
（FL-net /Ethernet configuration）



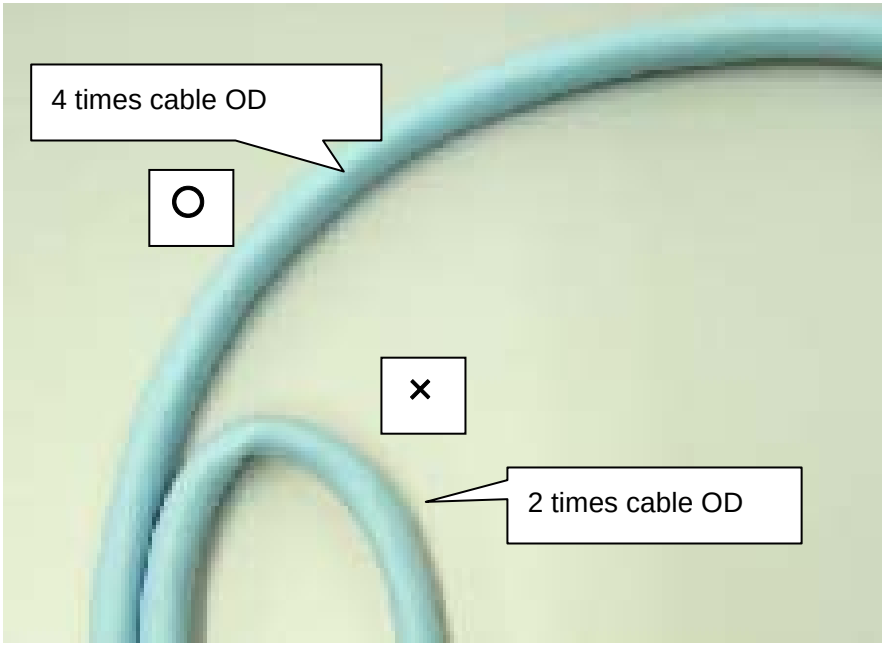
Cable installation

Please be aware of the following points when installing the cable.

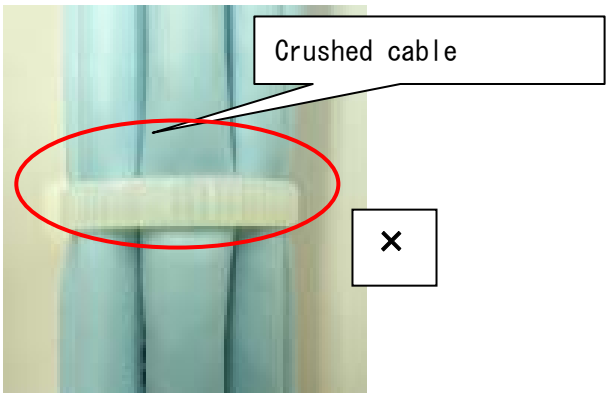
1. Make sure when laying the cable not to pull too tight.



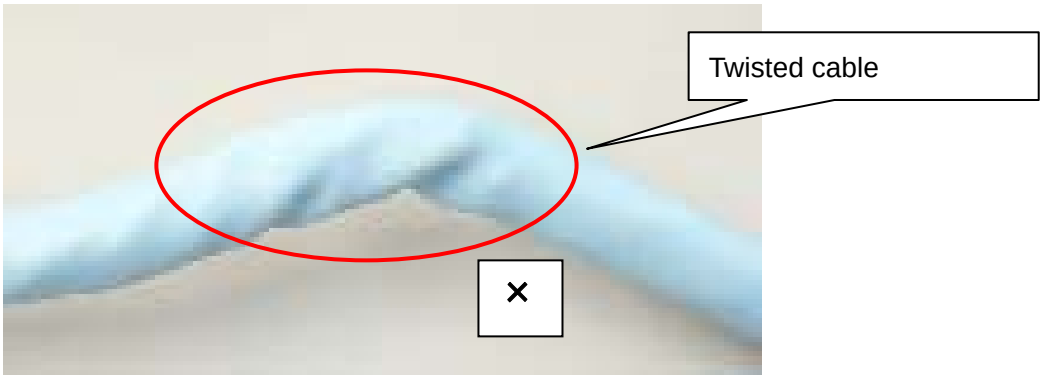
2. Make the turning radius of the fixed portion 4 times or more the OD of the cable.



3. When securing the cable, do not make the cable tie, etc too tight.



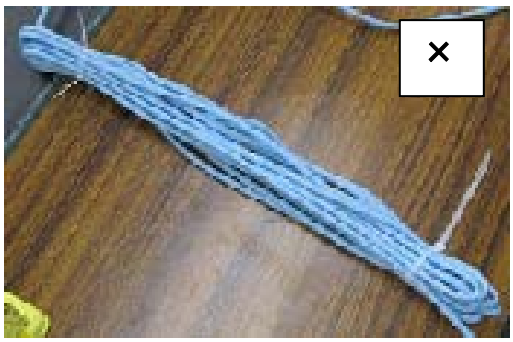
4. Make sure not to twist the cable.

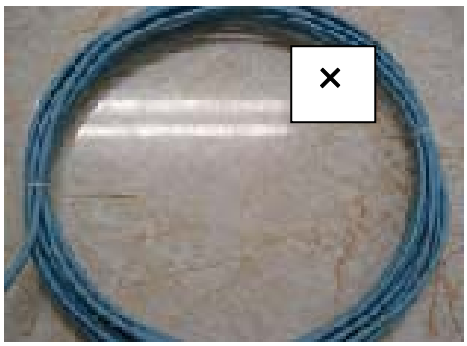


5. Where possible, try not to have too much excess cable.

If small diameter loops or an excessive number of loops are left, cross talk will occur between cables of the same color, potentially creating problems.

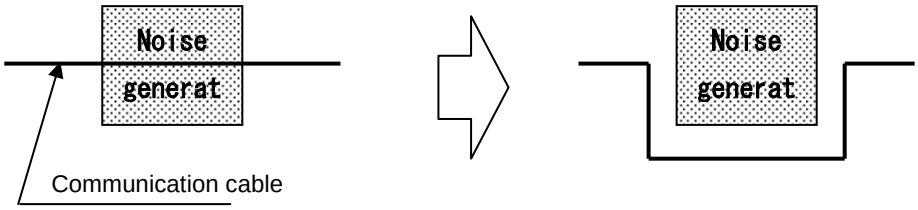
Cross talk is when a transmitted signal leaks into other transmission routes.





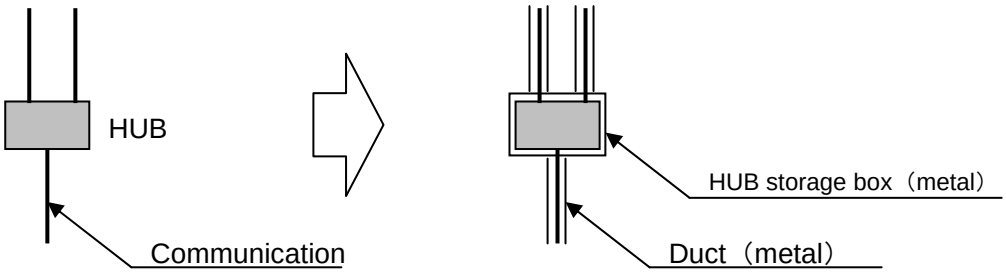
6. Keep cables away from noise generating sources.

Keep the communication cable and HUB as far away as possible from noise sources such as welding equipment and motor drive circuits and high current power cables.



7. Shield with metal duct

If it is not possible to keep cables away from noise generating sources, shield the communication cables and HUB with a metal duct, etc.

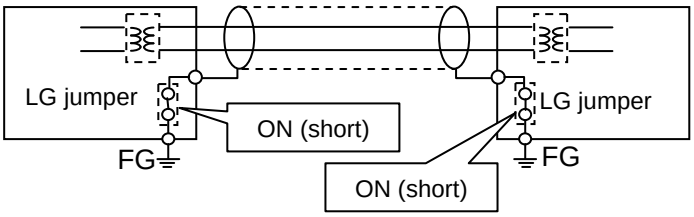


3.3 LG Jumper

(1) The role of the LG jumper

The LG jumper is a jumper pin which connects the shield of a communication line, and the PC FG.

If LG jumper is set to "ON" (short), the noise guided to the LAN cable is dropped on FG, and noise resistance can be improved. Normally, please use the LG jumper in an "ON" state.



(2) When setting the LG jumper to OFF (open)

On rare occasions communication errors occur, and these may cause an electrical current in the cable shield.

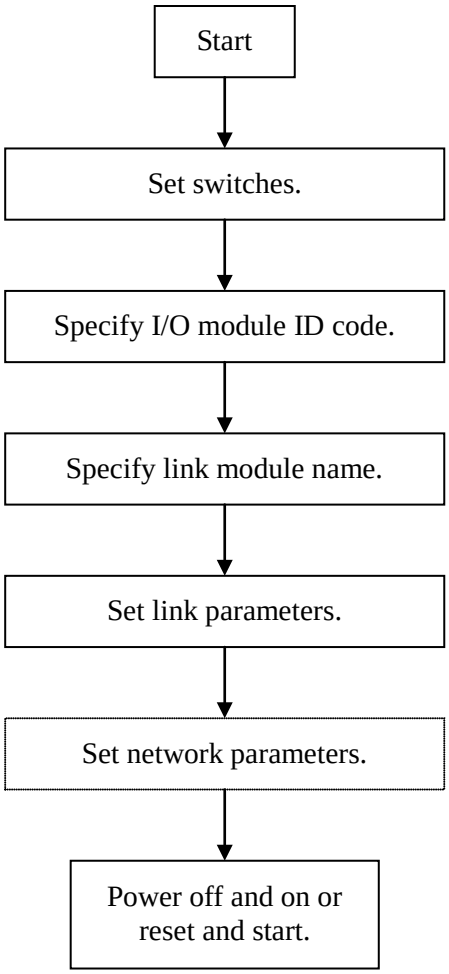
Turn the LG jumper "OFF" because it affects the potential difference in control panel grounding.

4 Initial Settings of the FL-net

4.1 Initial Setting Procedure

Setting procedure upon system start-up

Please use PCwin for the setting of the parameter of FL-net.



See 4-2 'Switch Settings.'

See 4-3 'I/O Module ID Code.'

See 4-4 'Link Module Name.'

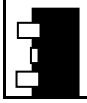
See 4-5 'Link Parameters.'

See 4-6 'Network Parameters.'

(In usual, it is not necessary to change default values.)

4.2 Switch Settings

Set the link memory capacity using the switches at the front of the module.
The I/O module ID code changes as the switch positions change.

Switch positions		I/O module ID code	Link memory capacity	Data link capacity (maximum number of total words in reception and transmission areas)
	1 off 2 off 3 off	C9	8 kbytes	Relay link: 2048 points (128 words) (*2) Register link: 2048 words (*1)
	1 off, 2 on 3 off	D9	16 kbytes	Relay link: 2048 points (128 words) (*2) Register link: 6144 words (*1)
	1 on 2 on 3 off	E9	32 kbytes	Relay link: 2048 points (128 words) (*2) Register link: 8192 words (*1)
	1 on, 2 off 3 off	B3	4 kbytes	The module is operated as Ethernet.
	1 on 2 off 3 on	B8	4 kbytes	The module is operated as FL Remote.

*1: A word = 2 bytes = 16 points

*2: 2.4 and higher version is a maximum of 8192 points (refer to the 2.1 Functions of the FL-net).

The total link memory capacity of all link modules mounted on a single CPU module should be 60 kbytes or less. The link memory capacity should be as small as possible to reserve a necessary data link capacity.

The 16-kbyte and 32-kbyte modes of the FL-net are available with CPU modules of the following versions.

CPU module	Version	CPU module	Version
PC10P	1.00～	PC3JD	2.00～
PC10G	1.00～	PC3JM	2.00～
PC10GE	1.00～	PC3JL	2.00～
PC3JG,PC3JG-P	1.30～	AF10	2.30～
PC3JP,PC3JP-GP	1.70～	MX	2.00～

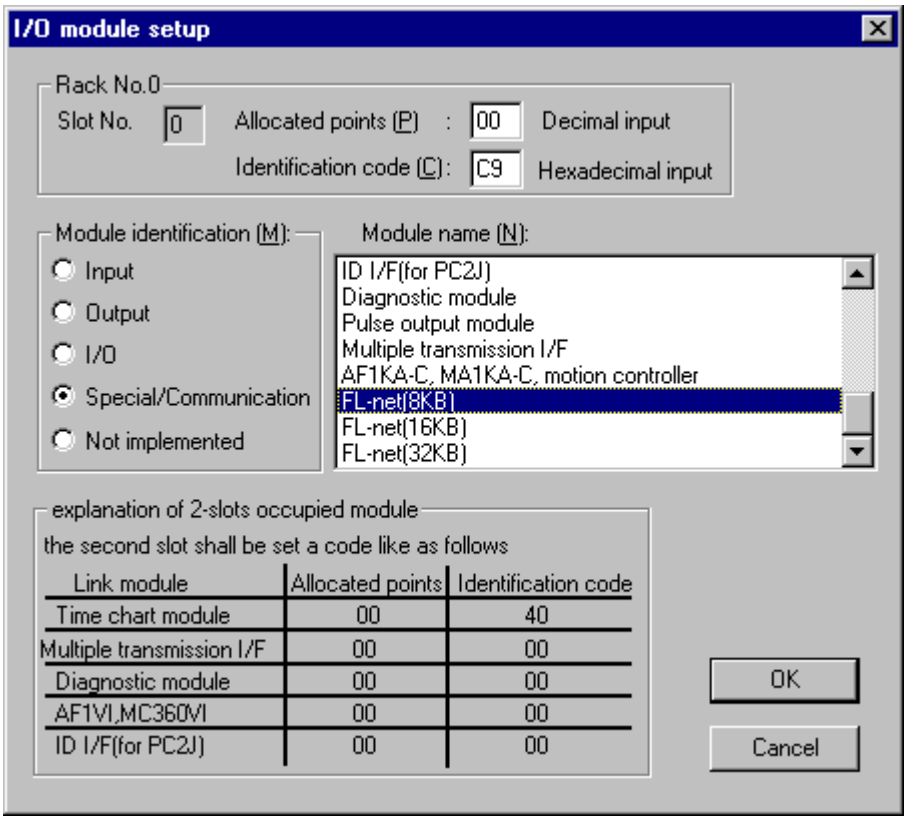
If the link memory capacity is set to 16 or 32 kbytes for a CPU module of another version, the module does not normally operate.

The module must be powered off before changing the switch positions.

Please refer to “Reference 12 Link memory capacity”.

4.3 I/O Module ID Code

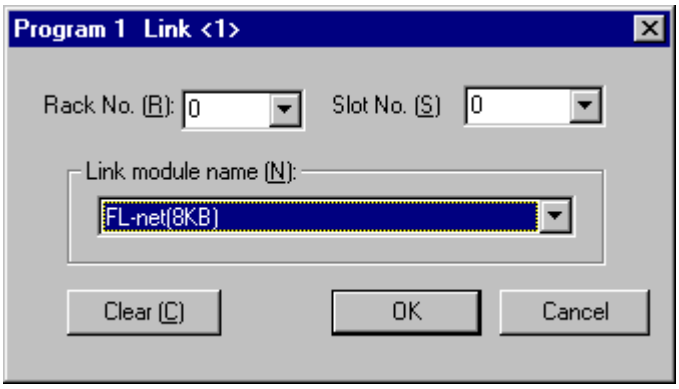
Specify the I/O module ID code on the 'I/O module setup' window under 'Parameter' of Hellowin. The ID code should correspond with the switch positions at the front of the module. If the switch positions and parameter setting are inconsistent, error 48 'I/O Table Inconsistent' appears on the CPU module.



4.4 Link Module Name

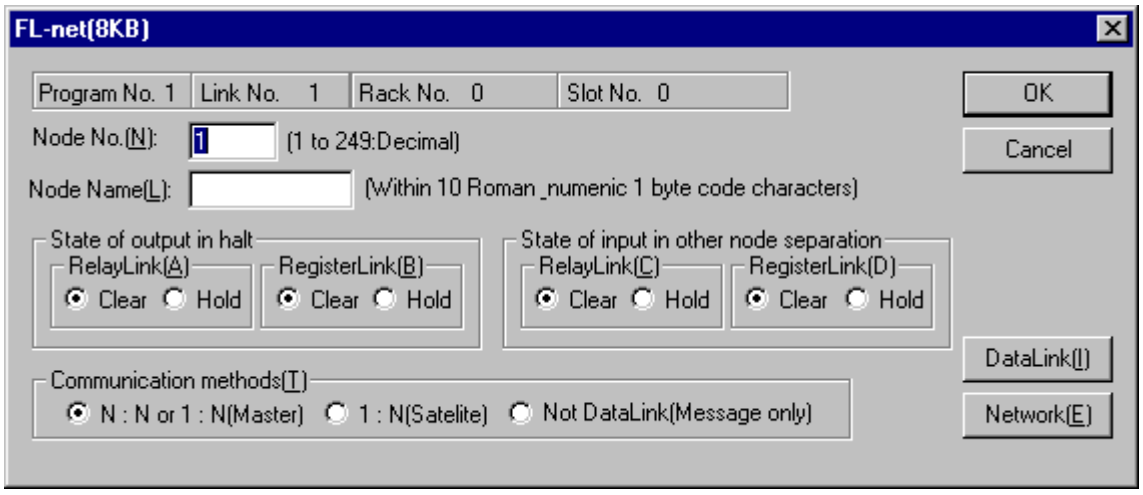
Select the link No. to be assigned to the 2PORT-EFR module and specify the rack No., slot No. and link module name on the 'Link Parameter' window under 'Parameter' of Hellowin.
If the switch positions, I/O module ID code, capacity in the link module name (8KB, 16 KB, or 32 KB) are inconsistent, a link parameter error occurs.

Example of setting



4.5 Link Parameters

After specifying the link module name, set link parameters.



Set the following parameters.

(1) Node No.
(2) Node name
(3) State of output in halt
(4) State of input in other node separation
(5) Communication methods
(6) Data link parameters
(7) Network parameters

These parameter values are usually specified by the network administrator at the end user.

4.5.1 Node No.

Specify the station No. of the 2PORT-EFR module between 1 and159, 168 and 249.
It should not be the same with another node (FL-net station).
If two or more nodes have the same No., the node that attempted later to participate in the communication cannot do so. In this case, error code E7 (node No. duplicated) appears on the LED display at the front of the module.

4.5.2 Node Name

Enter the node name of the 2PORT-EFR module using up to 10 alphanumeric one-byte characters. This field may be kept blank.
The specified node name is read as response data to the 'Request for Reading Network Parameters' command from the host computer or such.

4.5.3 State of Output in Halt

Specify the status of relay link and register link outputs with the CPU module not running. If 'Clear' is checked, the data sent through the data link to your module becomes all zeros when the CPU module stops running. If 'Hold' is checked, the same data is continuously sent as directly before the CPU module stops running.

4.5.4 State of Input in Other Node Separation

Specify, for the relay link and register link, how to process the data received from another node when that node is separated from the network.
If 'Clear' is checked, the data received from the separated node becomes all zeros. If 'Hold' is checked, the data remains the same as directly before the node is separated.

Note:

The data sent from another node not participating in the communication is kept 00. If your module participates in the communication after a participant node leaves the communication, the data sent from that node is also kept 00.

If your module and another node participate in the communication at the same time and the other node leaves after that, the data status depends on the setting of 'State of input in other node separation.'

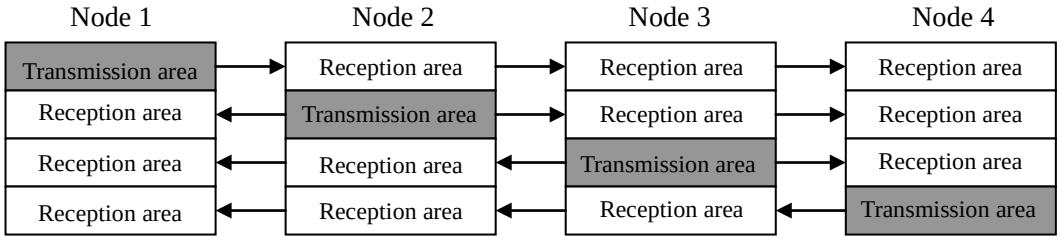
4.5.5 Communication Methods

Select the data link method from 'N:N or 1:N (Master),' '1:N (Satellite),' or 'No Datalink (Message only).'

(1) N:N or 1:N (Master)

With N:N connections, the transmission area for a node (station) is the reception area for another node and data is shared by different nodes. Select this mode for the master station that communicates with 1:N connections.

For detail, see the subsequent sections.



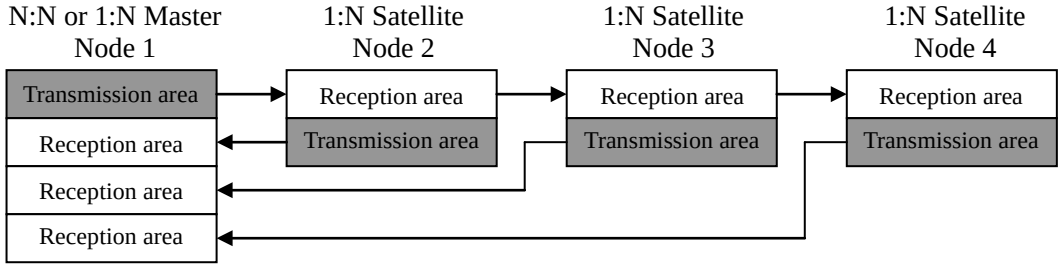
(2) 1:N (Satellite)

Data is linked with a single station in this mode.

An example where 'N:N or 1:N (Master)' has been selected for node 1 and '1:N (Satellite)' for nodes 2 to 4 is given below.

For detail, see the subsequent sections.

This mode saves the memory space at substations and permits the sharing of the sequence program.



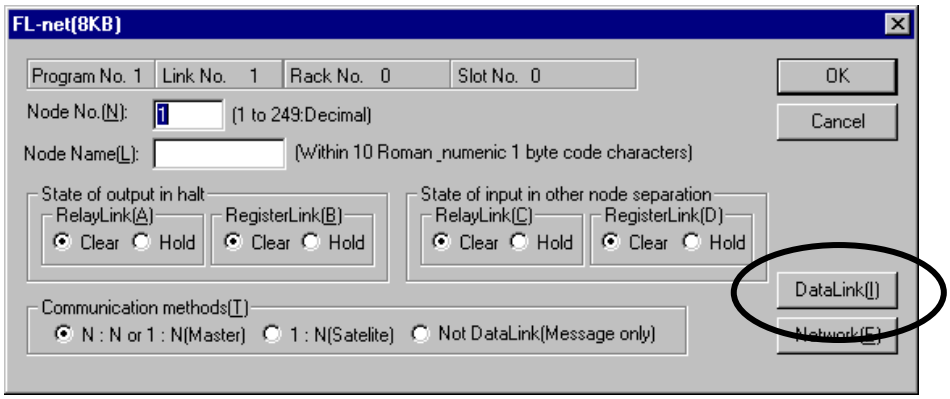
(3) No Datalink (Message only)

No data is linked in this mode. The module participates in the FL-net communication and only exchanges messages.

4.5.6 Data Link Parameters

If 'N:N or 1:N (Master)' or '1:N (Satellite)' has been selected, click the DataLink button and set communication parameters.

For the data linkable area, see 2-2 'Data Link Specifications.'



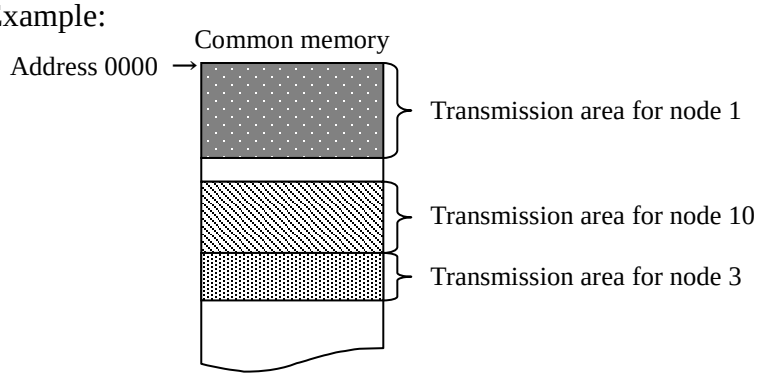
(1) N:N or 1:N (Master)

On the FL-net network, data is transmitted and received via the 'common memory,' a virtual memory space shared by all nodes participating in the communication.

As a node transmits data to the common memory, the data is received by other nodes and shared by the respective nodes.

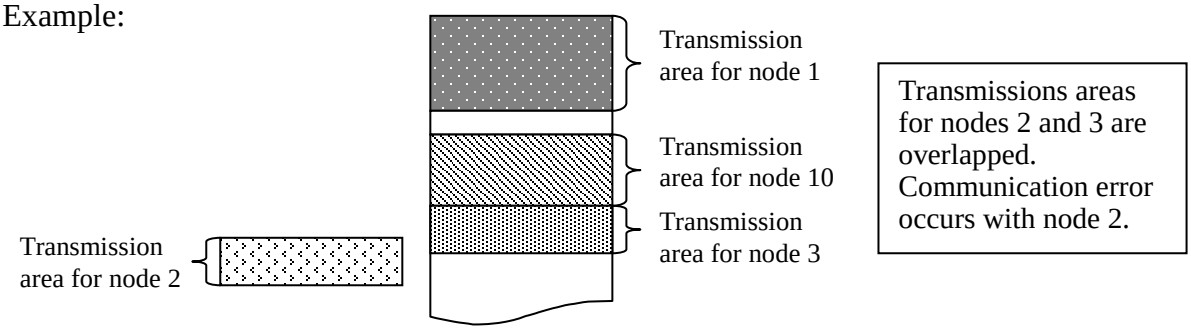
The destination address on the common memory and data size may be specified in units of word (16 bits) for each node. Order of node No. does not coincide with that of destination address.

Example:



Areas on the common memory to which data is to be transmitted from different nodes should be not be overlapped. If they are overlapped, E8 (relay link area overlap) or E9 (register link area overlap) appears on the LED display at the front of the node that participated in the communication later.

Example:



In the 'N:N or 1:N (Master)' mode, it is necessary to specify the data range starting at the top of the common memory, the corresponding top address on the CPU module register, and the top address and size of the area to which data is transmitted from your module, using the following four parameters.
Common memory address 0000 corresponds to the top address of the link area.

(Link area top address ... (1)

Specify the top address of the link area in units of word. This address corresponds with address 0000 on the common memory.

(Link area words ... (2)

Specify the size of the whole area data in which is to be refreshed in units of word.

(Transmission area top address ... (3)

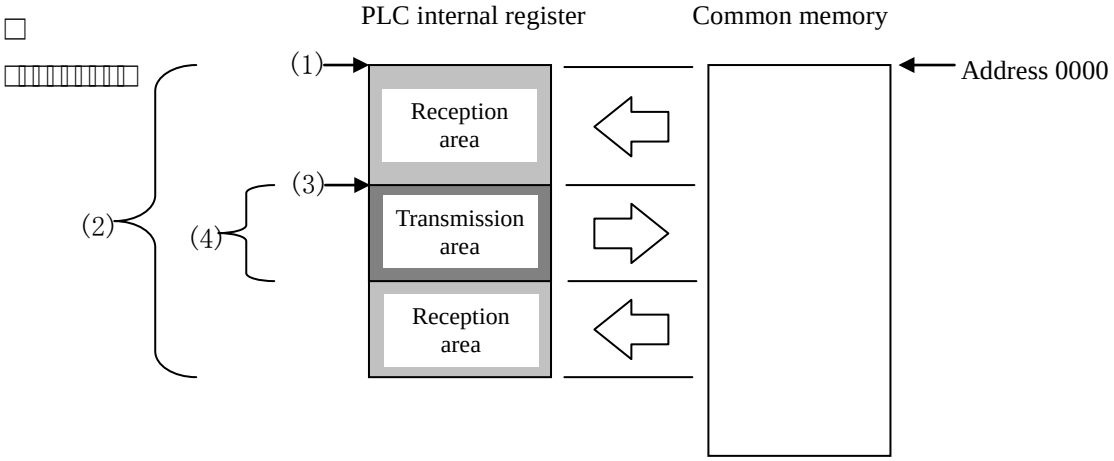
Specify the top address of the area to which data is to be transmitted from your module in units of word.

(Transmission area words ... (4)

Specify the size of the transmission area in units of word.

□

□

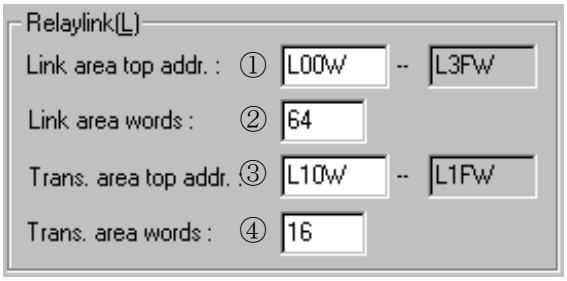


Note:

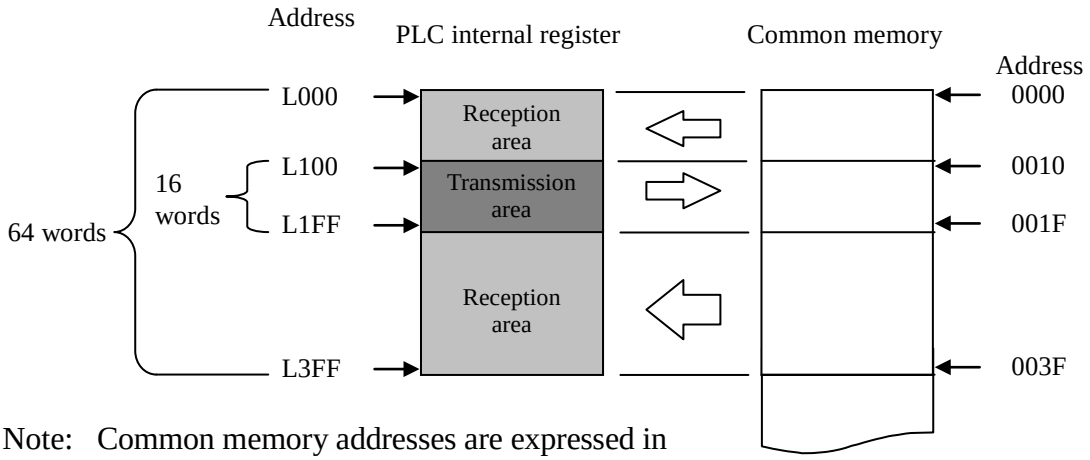
The node No., the destination address on the common memory, and data size are usually determined by the network administrator at the end user.

Example 1

- Relay link parameters

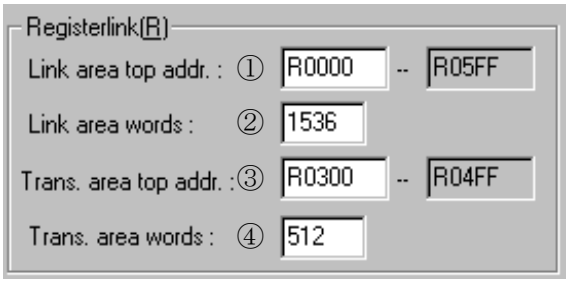


Correspondence between the register data and the common memory with the above parameter settings is shown below.

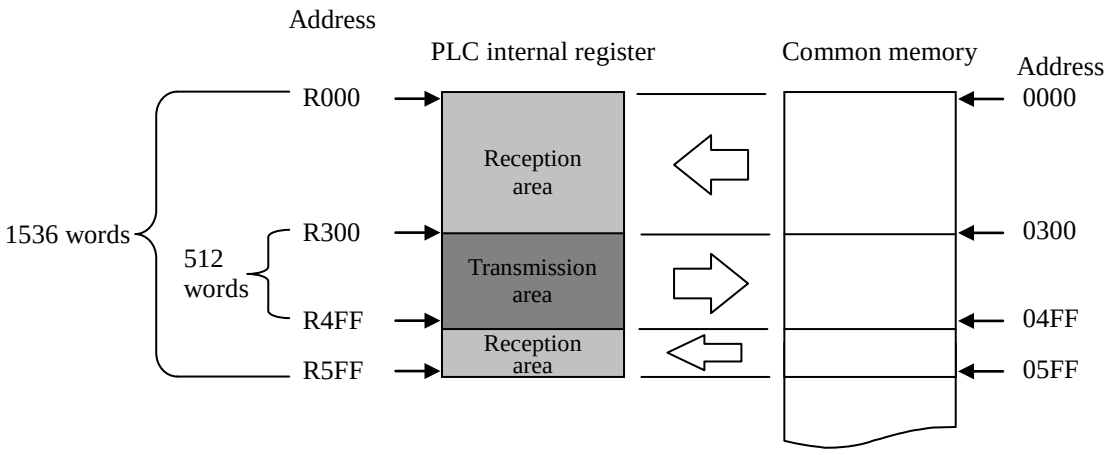


Note: Common memory addresses are expressed in units of word (16 points). For example, L01W represents 16 points from L010 to L01F.

- Register link parameters

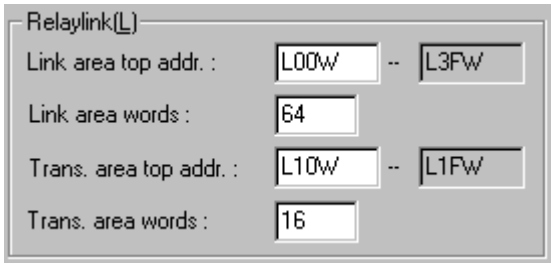


Correspondence between the register data and the common memory with the above parameter settings is shown below.

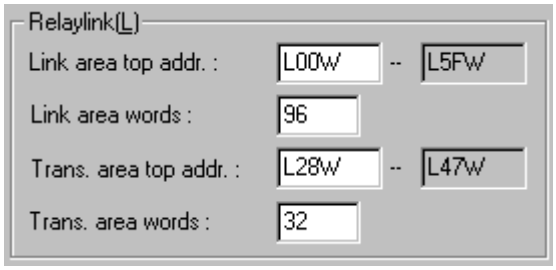


Example 2

Node No. 1

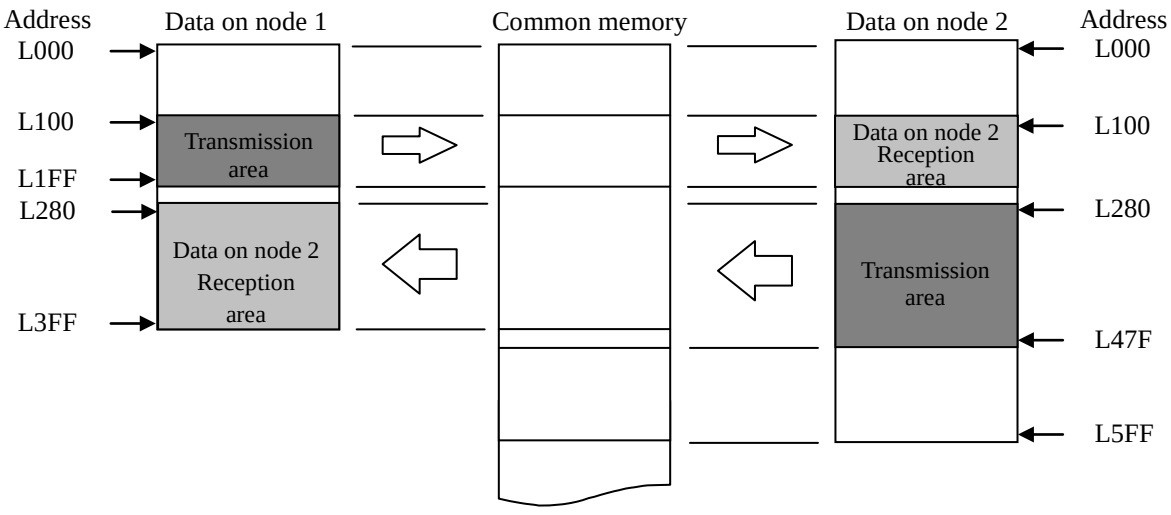


Node No. 2

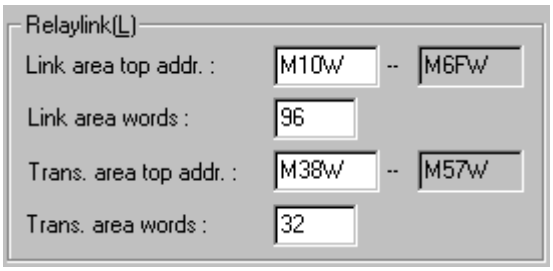


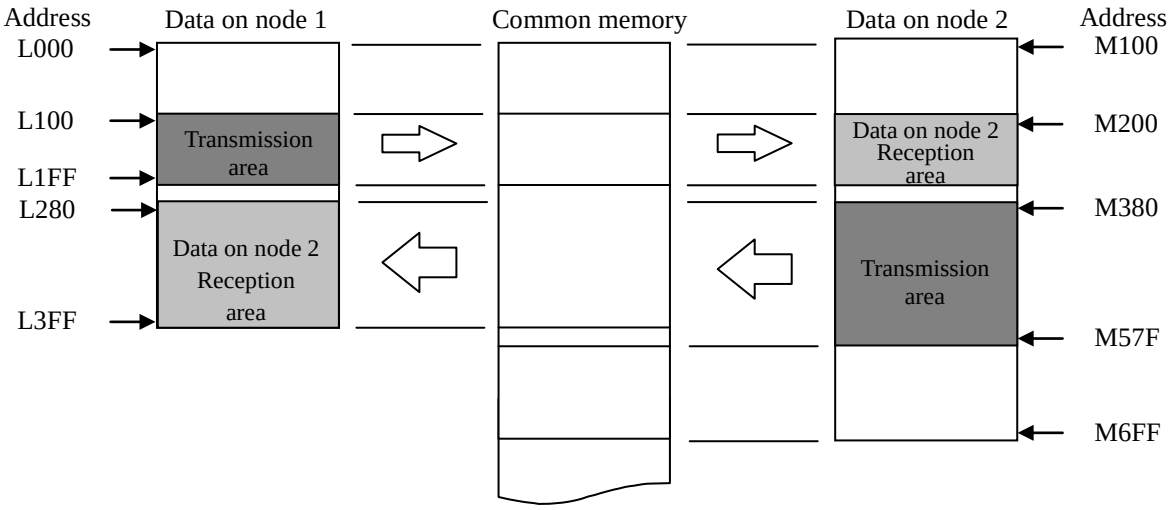
If the above parameter settings are used for two nodes respectively, the data transmitted from L100 to L1FF on node 1 is further transmitted to the same addresses on node 2 via the common memory as shown below.

The data transmitted from L280 to L47F on node 2 is reflected on the common memory but data from L400 to L47F is not accepted by the link area on node 1, L100 to L3FF, and consequently not read by node 1. In this case, data from L280 to L3FF on node 2 is received at the same addresses on node 1.



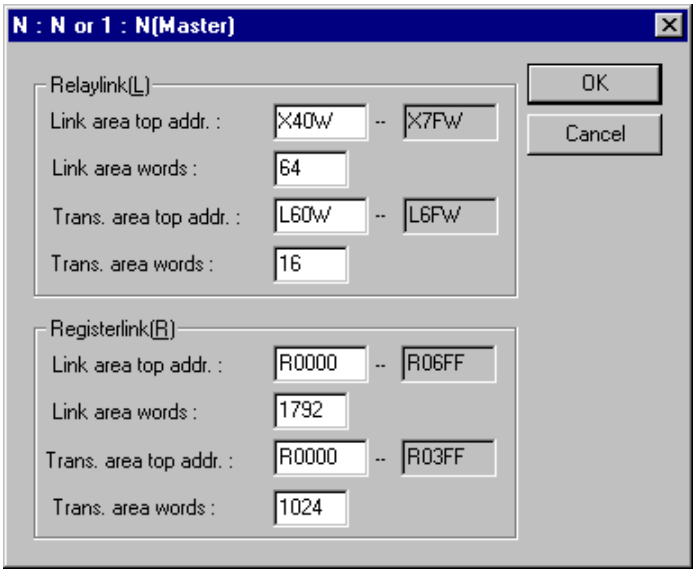
The link area top address does not need to be the same for all nodes. If the following settings are used for node 2, data is exchanged between nodes 1 and 2 as shown below.



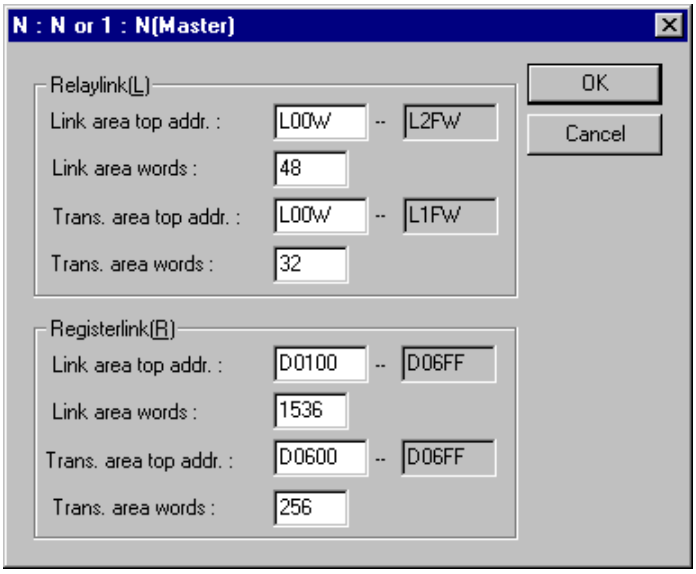


Example 3

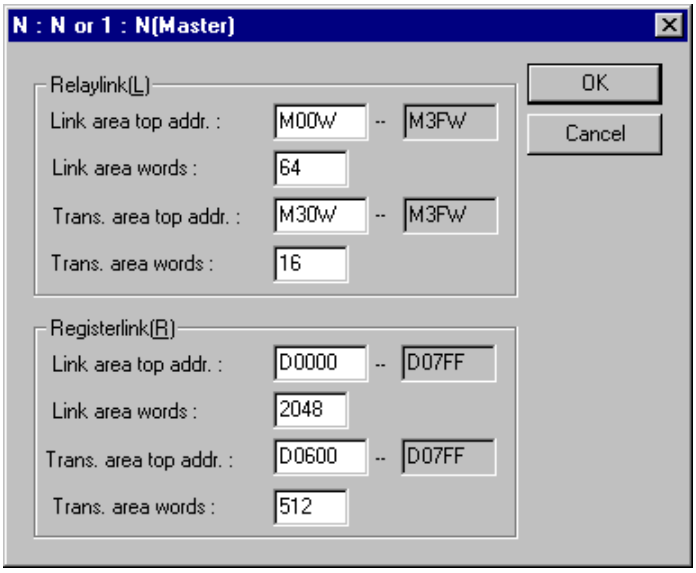
Node No. 10



Node No. 128

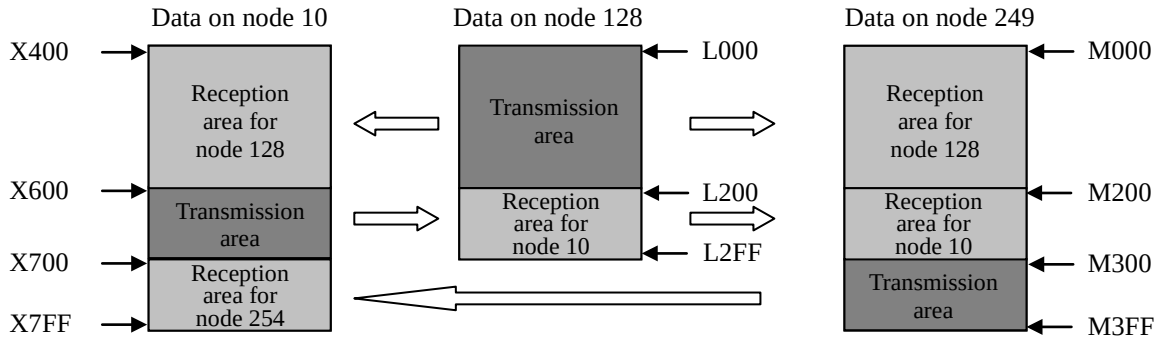


Node No. 249



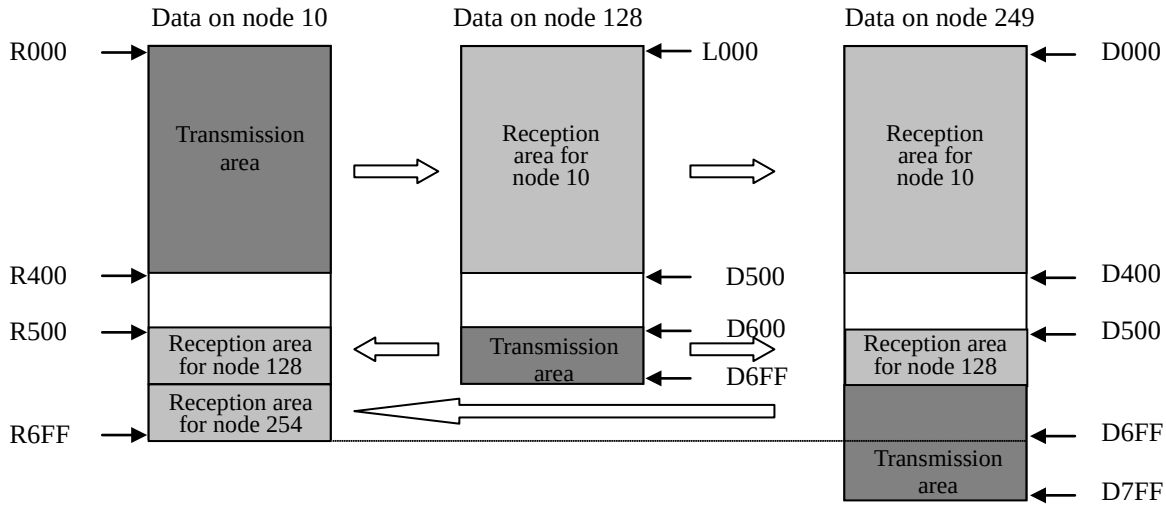
If the above settings are used, data is linked as shown below.

- Relay link parameters



Note: Relay link addresses may be specified in units of word (16 bits). X40W represents X400 to X40F.

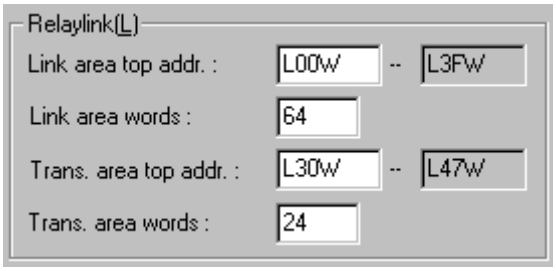
- Register link parameters



Note: Relationship between link area and transmission area

The transmission area defined by the 'transmission area top address' and 'transmission area words' should be completely contained in the link area defined by the 'link area top address' and 'link area words.'

For example, the following settings are not acceptable because the transmission area (L1300 to L47F) overflows the link area (L000 to L3FF). (An error message appears with such settings.)



(2) 1:N (Satellite)

In the 1:N (Satellite) mode, data is only linked with a single station specified by the link parameter. In this mode, it is necessary to specify the station (node) from which data is to be received, the number of words to be received, the register at which data is to be stored, the address on your module from which data is to be transmitted, the number of words to be transmitted, and the top address on the common memory to which data is to be transmitted, using the following parameters.

- Master node No. ... (1)

  Specify the node No. of the station with which data is to be communicated between 1 and 249. Any No. within this range is acceptable. It is not necessary to consider node Nos. of substations.

- Reception area starting address ... (2)

  Specify the top address of the register used to store data received from the master station in units of word.

- Reception words ... (3)

  Specify the number of words to be received from the master station.

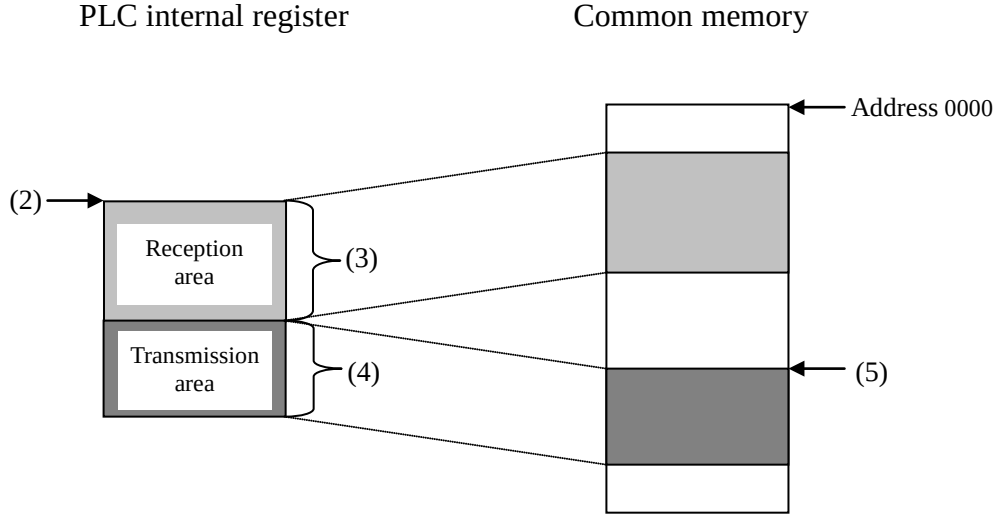
- Transmission words ... (4)

  Specify the number of words to be transmitted from your module. (The top address of the data transmitted from your module directly follows the ending address of the reception area.)

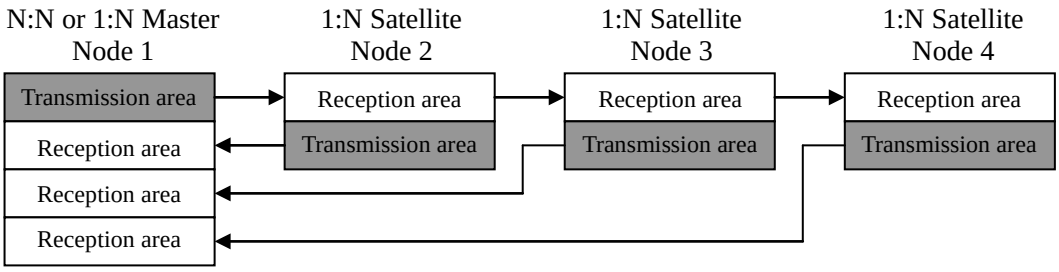
- Common memory (*1) transmission area starting address ... (5)

  Specify the common memory (*1) address of the data to be transmitted from your module.

(*1): The common memory is a virtual memory space shared by all nodes participating in the communication. The FL-net data is linked via the common memory.

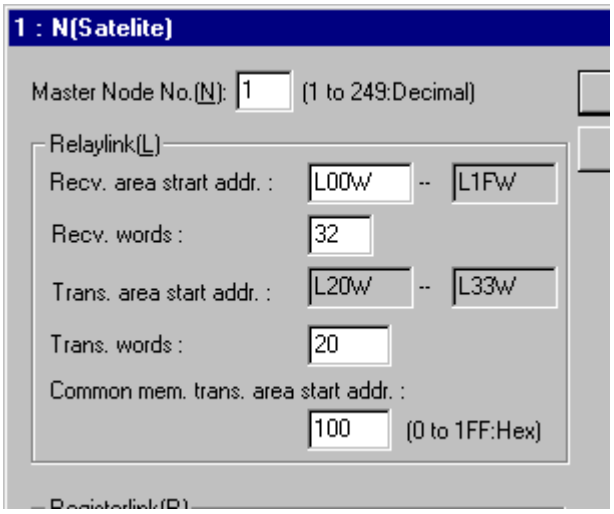


Data is linked as shown below on the whole network.

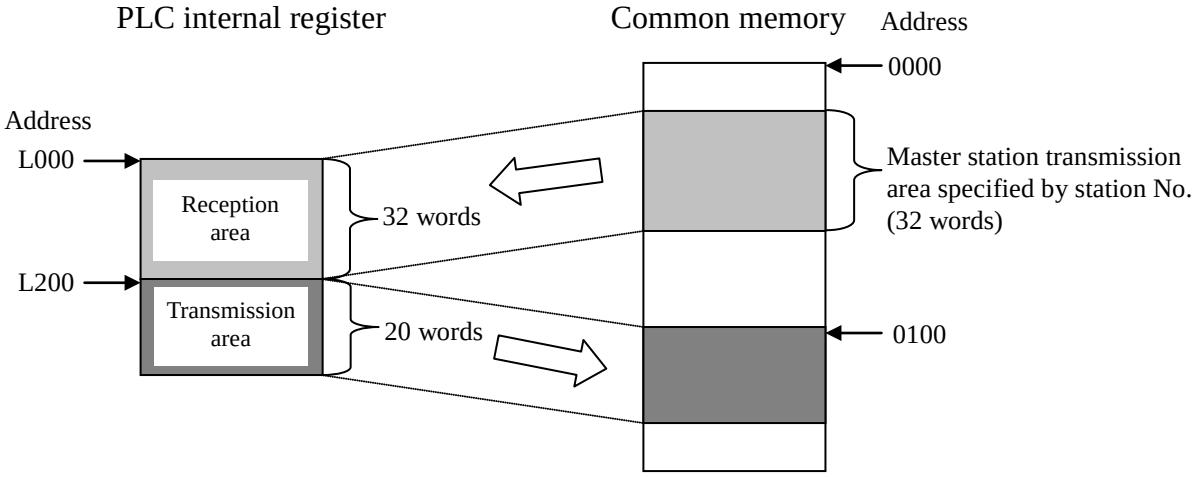


Note: The node No., the destination address on the common memory, and data size are usually determined by the network administrator at the end user.

Example 1



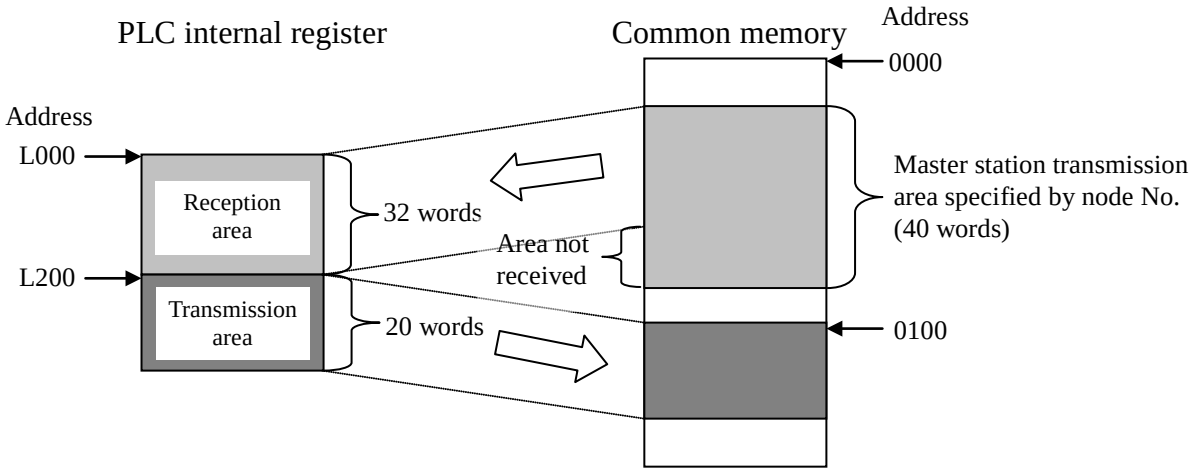
With the above settings, data is linked as shown below.



Note: The data transmitted from the master station to any address on the common memory is received from that address. Therefore, it is not necessary to specify the starting address of the transmission area for the master station.

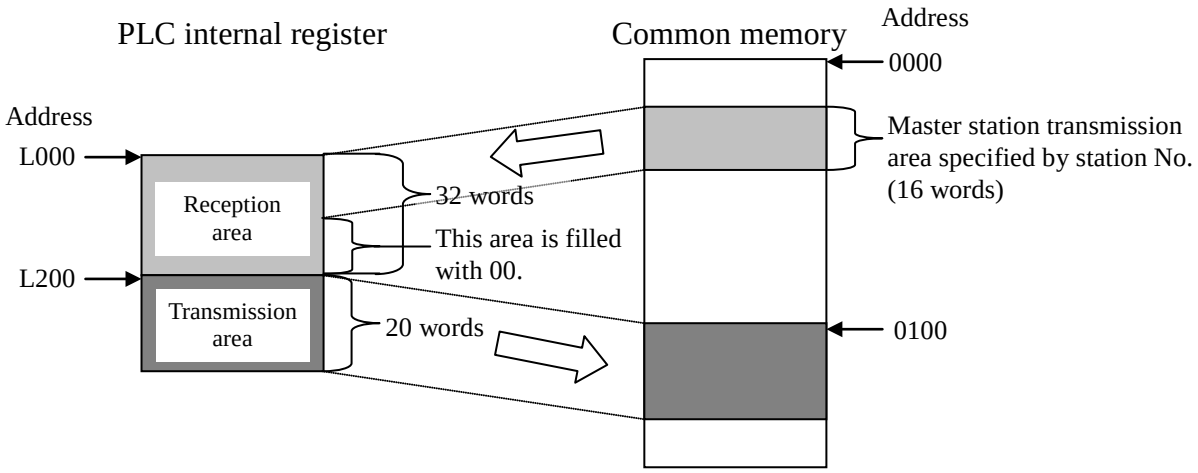
- If the number of words specified by 'Recv. words' is smaller than the actual number of transmission words from the master station:

  → Overflown part of the transmission data from the master station (last 8 words in the following example) is not received.

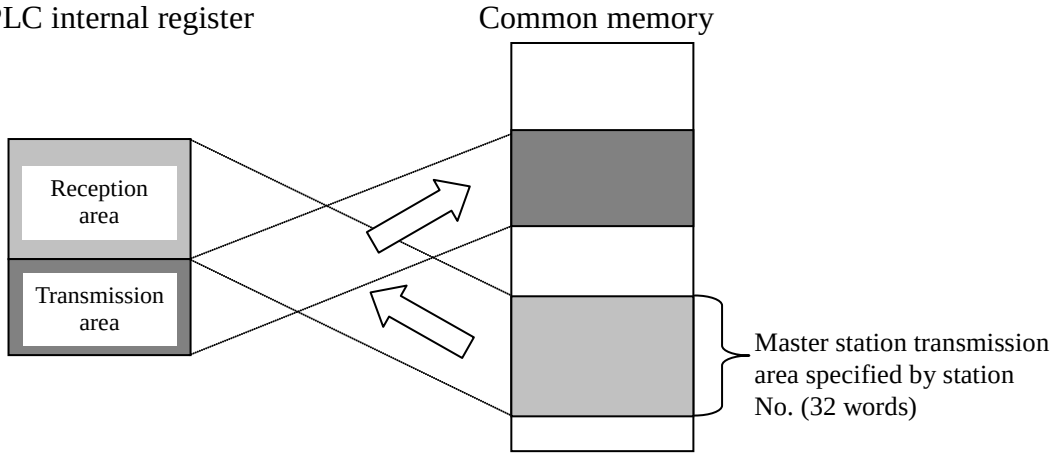


- If the number of words specified by 'Recv. words' is larger than the actual number of transmission words from the master station:

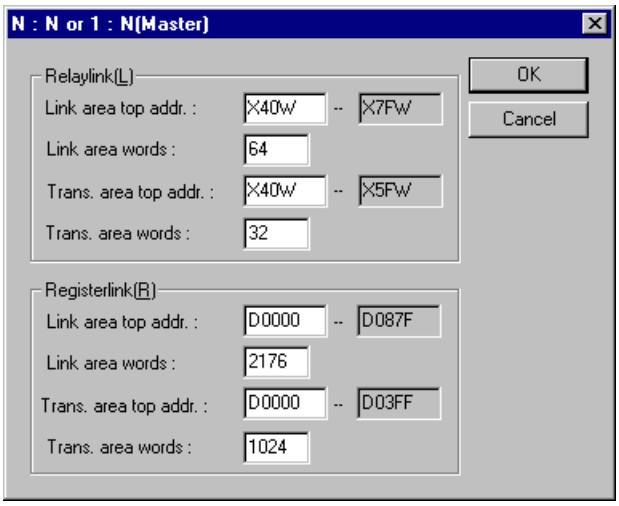
  → Part of the reception area not filled with the data transmitted from the master station (last 16 words in the following example) is filled with 00.



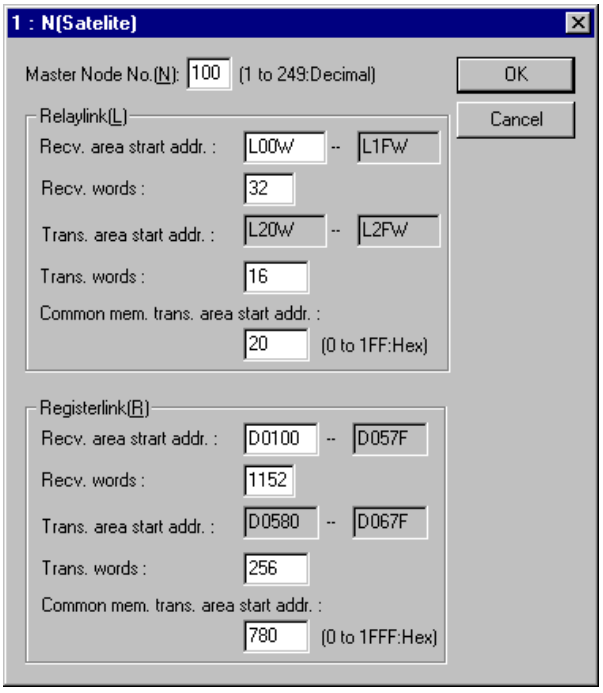
Note: If the hierarchical order of transmission areas on the common memory changes, the order of reception and transmission areas at the PLC internal register remains unchanged.



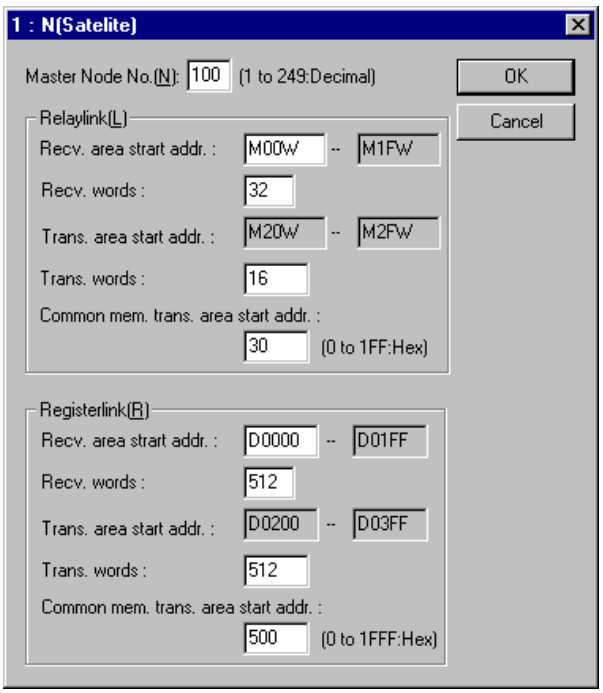
Node No. 100



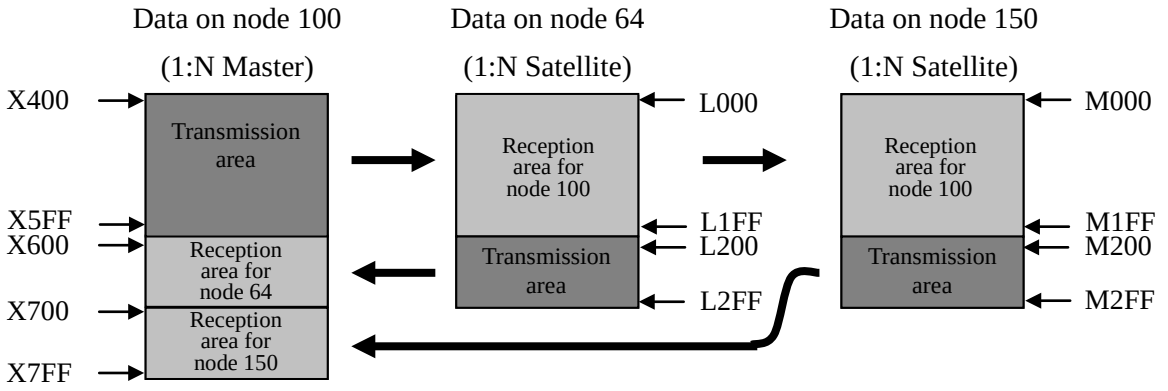
Node No. 64



Node No. 150

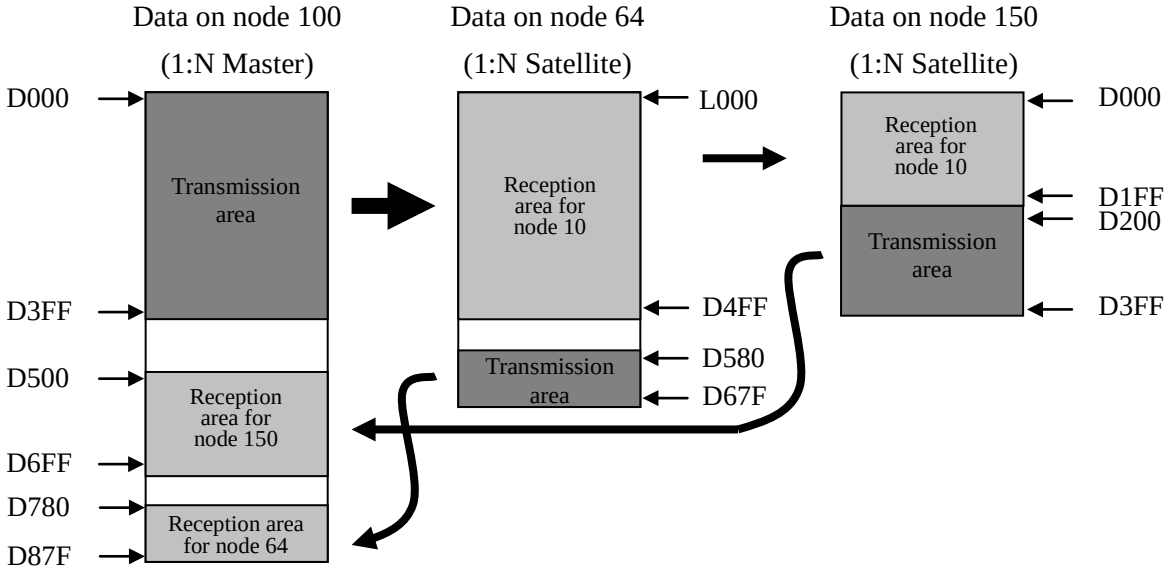


- Relay link parameters



Note: Relay link addresses may be specified in units of word (16 bits). X40W represents X400 to X40F.

- Register link parameters



4.5.7 Notes when CPU module is PC3J-CPU,PC3JNF,PC3JNM

There is the following limitations in the setting of the register link area when CPU module used is PC3J-CPU,PC3JNF,PC3JNM.

1) Please give the switch as FL8K. It is not possible to use it with FL16K.

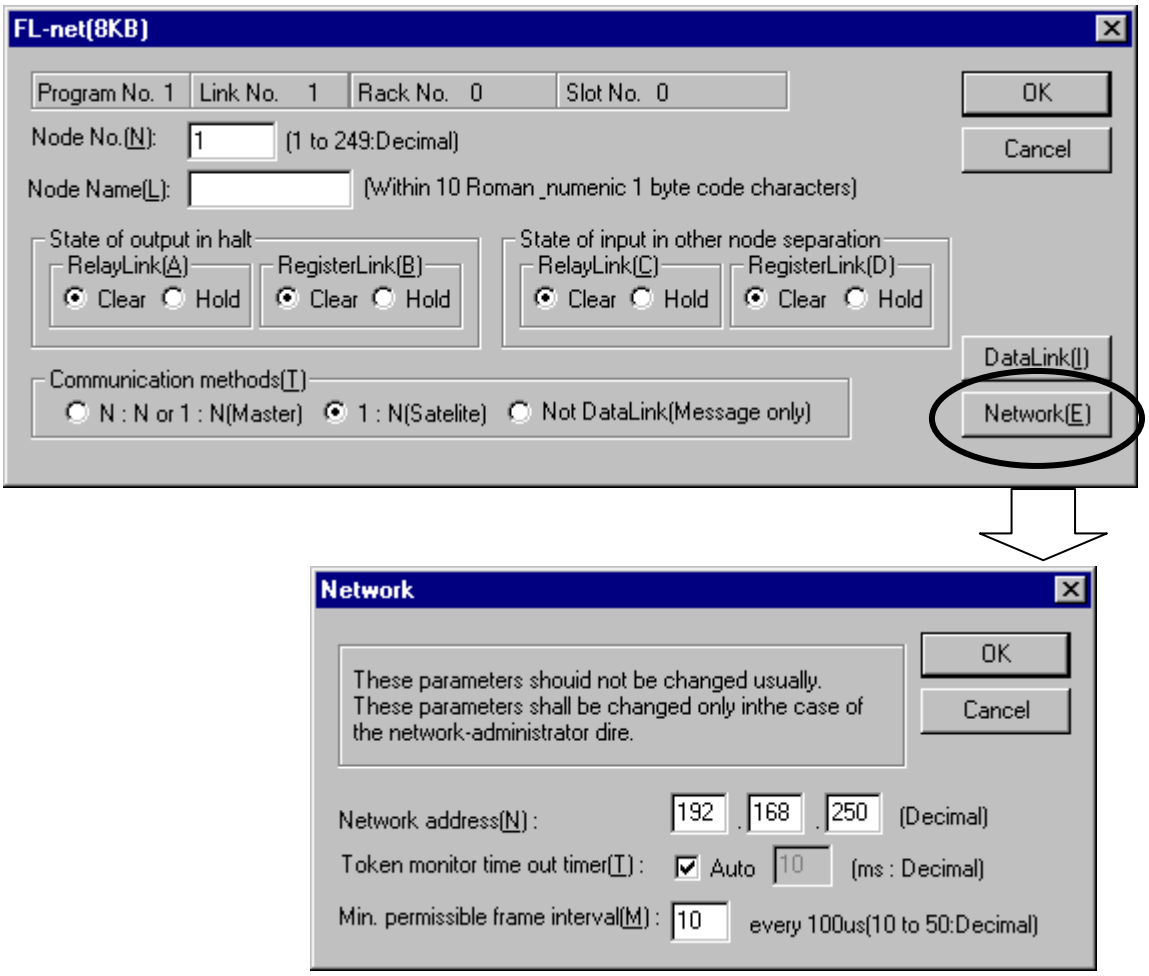
2) The number of link of the register a node transmission words is 2047 words or less.

3) When all the register link areas are used as a reception area (the transmission word the number of =0), the number of register link area words that can be set is 2047 words or less.

4.6 Network Parameters

Network parameters do not need to be changed in usual cases. Do not change them unless otherwise instructed by the network administrator.

Click the Network button and change the network parameters.



4.6.1 Network Address

The FL-net communicates using the UDP/IP protocol. Specify the former 3 digits of the IP address to be used for this protocol as network address. The forth digit of the IP address represents the node No.

If the network address is 192.168.250 and the node No. is 100, for example, the IP address is 192.168.250.100. As PING is sent to this IP address from a personal computer or such, a response is made by the 2PORT-EFR module.

The FL-net broadcasts data using the UDP/UP protocol. At this time, it sends the IP address with the forth digit replaced by FFh as destination IP address. For the node with the IP address of 192.168.250.100, for example, the destination IP address is 192.168.250.255.

All nodes on a single FL-net network should have the same network address.

Any node with a different network address cannot receive data from other nodes and the data transmitted from that node is not received by other nodes. Care is required because all data is monitored by the Ethernet analyzer.

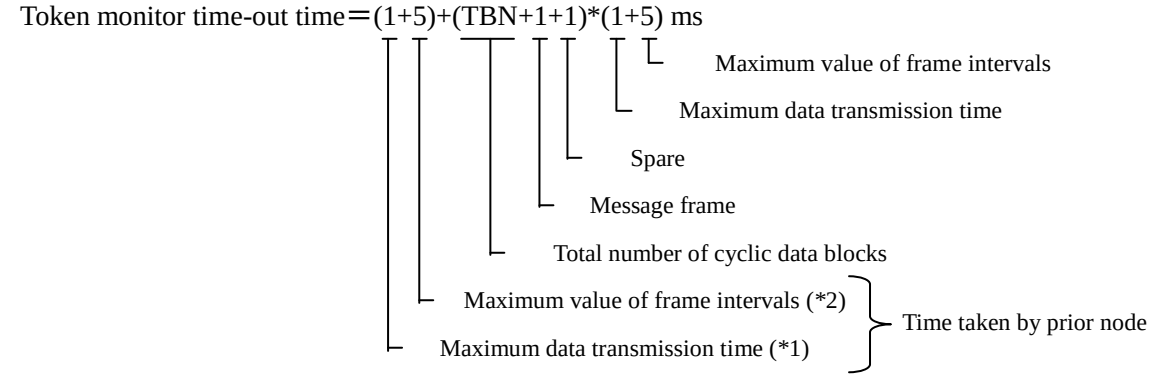
The FL-net standards require the network address be defaulted as 192.168.250.

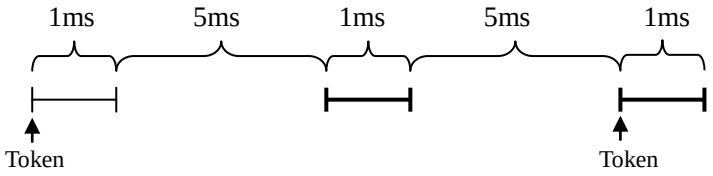
4.6.2 Token Monitor Time-Out Time

For the FL-net communication, each node rotates the token (right to transmit) among other nodes in ascendent order of node No. The node that has received the token transmits data in the data link transmission area and message data, if any, as divided into frames each consisting of 1024 bytes or less and adds the token to the last frame to hand it over to the next node.

The token monitor time-out time means the permissible longest time to be spent after the token is transmitted by the prior node until it is transmitted to the next node. If the token is not transmitted within this time, the next node reissues the token. If this occurs three times, the node that fails to transmit the token is considered to have left and no longer given with the token.

If 'Auto' has been checked, the token monitor time-out time is automatically determined from the data size of the transmission area with the following formula.





(*1): The time required to put 1024-byte data on a 10 Mbps communication line.

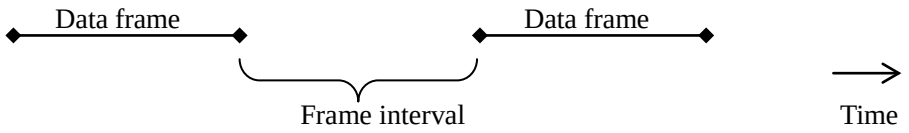
(*2): The maximum value of minimum permissible frame intervals (for detail, see the next section).

To manually preset the token monitor time-out time, remove the check mark in the check box before 'Auto' and enter a desired value between 10 and 255.

If the token is not transmitted within the preset token monitor time-out time, error code EA appears on the LED display at the front of the module. In this case, increase the token monitor time-out time.

4.6.3 Minimum Permissible Frame Interval

The frame interval means the interval between two successive data frames where no data is exchanged through the line.



For the FL-net communication, the minimum permissible frame interval has been preset for each node and its value is always transmitted. Each node always monitors the minimum permissible frame interval values of other nodes and the largest value of all nodes becomes effective. The minimum permissible frame interval is changeable between 0 ms and 5 ms. If nodes with three minimum permissible frame interval values of 1 ms, 3 ms and 5 ms coexist, for example, 5 ms becomes effective and all data frames are transmitted through the line at intervals of 5 ms.

This parameter is intended to adjust the data volume through the line per unit time so that nodes even with a lower processing rate can participate in the communication.

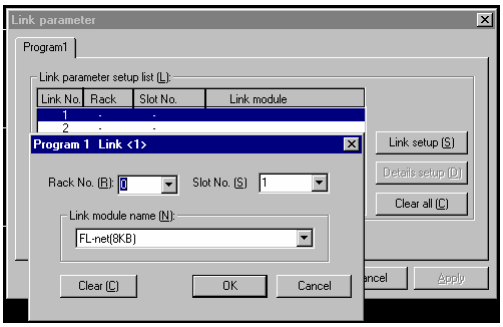
With the TOYOPUC 2PORT-EFR module, the minimum permissible frame interval has been preset to the default of 1 ms. Please note that the communication time of the entire network is postponed when a big value is set by mistake though a value that is bigger than this can be set.

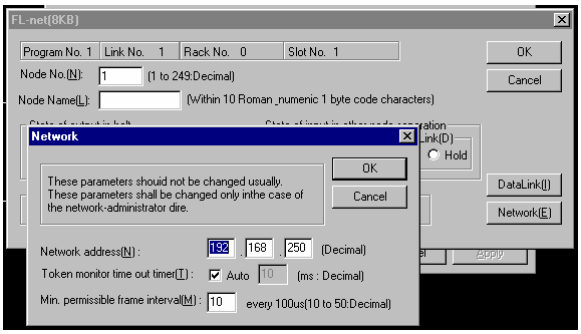
5 Error Codes Used by the FL-net

If the 2PORT-EFR module finds an error, it indicates a two-digit error code on the LED display at the front and warns the CPU module of the error.
The CPU module sets special relays, error information output registers, and link error information output registers according to the content of the error.

5.1 Error Codes

If the 2PORT-EFR module finds an error, it indicates a two-digit error code on the LED display at the front. When the communication cannot be normally performed, check for error code.

Error code	Content of error	Cause and remedy
E5	Link parameters not preset	Preset link parameters if not preset. If all link parameters have been preset, rack No. or slot No. as link parameter may not correspond with the actual position. 
E6	A wrong link parameter value	A link parameter has a wrong value. Read the link error information register and take corrective action as described in the next section.
E7	Node No. duplicated	This error occurs when a node with the same node No. with your module has participated in the communication before your module's attempt to participate. Check the node Nos. of your module and that node as link parameters.
E8	Common memory transmission area address duplicated (relay link)	For the FL-net data link communication, data is transmitted and received via the 'common memory,' a virtual memory space shared by all nodes participating in the communication. Transmission area for a node on the common memory should not be overlapped with that for another node. If another node has been transmitting data to the area part or whole of which is overlapped with transmission area for your module before your module's participation, E8 (relay link area overlap) or E9 (register link area overlap) appears. If FL remote devices are combined on a single network, please separate them from the FL-net network. Check transmission area settings for the module and that node in accordance with 4-5-6 'Data Link Parameters.'
E9	Common memory transmission area address duplicated (register link)	

EA	Token monitor time-out	Token monitor time-out occurs when all data cannot be transmitted from your module within the token monitor time-out time specified as link parameter on 'Network' window. Check 'Auto' for token monitor time-out time or increase the preset value. 
Ed	Data register area overflow	This error occurs when a link area out of the data register area in the CPU module is specified. For example, the PC2J-CPU has data registers at D000 to D0FFF and, if a link area out of this area is specified, error code Ed appears. Check the link area address.
- - - - - -	Failure in loop back test	Upon power-up or reset/start-up, the 2PORT-EFR module automatically checks that data can be normally transmitted and received. This error code appears if the module fails in the test. In this case, the test is automatically repeated until successfully completed. Communication starts after acceptable test results are obtained. Check the following items in accordance with 3 'Installation and Wiring.' (1) Is the LAN cable connector firmly connected to the module and locked with a fitting? (2) Is the connector of LAN cable surely installed in HUB? (3) Is LAN cable disconnected or it not short-circuited? (4) Is the transceiver cable connector firmly connected to the HUB and locked with a fitting? (5) When HUB is stacked and used, is the connection between HUB correct? (6) Is the transceiver cable connector firmly connected to the transceiver and locked with a fitting? (7) Any cut wire or short circuit in the transceiver cable? (8) Any problem about connection between transceiver and bus cable? (9) Is a terminator connected with each end of the bus cable? (10) Any cut wire or short circuit in the bus cable? (If this error occurs with all FL-net modules on the network, (9) or (10) is suspected to be a cause.)
- -	Receive waiting	This will be the display if there are no nodes which participate in the network or when the module's own nodes break away. (1) Is not the power supply of HUB turned off? (2) Is not the power supply of another node turned off? (3) Is the connector of LAN cable surely installed in the module? (4) Is the connector of LAN cable surely installed in HUB? (5) Is LAN cable disconnected or it not short-circuited?

H5	NAK from CPU module	The following causes are suspected. (1) CPU parameters have not been correctly set. (2) 16-kbyte or 32-kbyte FL-net mode has been selected for the CPU module that does not support these modes. (3) A failure of 2PORT-EFR module, CPU module, or base Remedy: (1) -> Check CPU module parameter settings. (2) -> Change switch settings. (3) -> Replace 2PORT-EFR module, CPU module, or base.
Hd	Special module over-assignment or 2PORT-EFR module hardware error	The 2PORT-EFR module is faulty or error code 81 'special module over-assignment' occurs with the CPU module. Check that total link memory capacity does not exceed 60 kbytes in accordance with 4-2 'Switch Settings.' If problem persists, replace the module with a new one.
H0 H1 H2 H3 HE HF HL HU	2PORT-EFR module hardware error	The 2PORT-EFR module is considered to be faulty. Replace the module with a new one.
H4 H6 H7 H8 H9 HA HC	Interface hardware error between 2PORT-EFR module and CPU module	Data cannot be normally exchanged between the 2PORT-EFR module and the CPU module due to a failure of 2PORT-EFR module, CPU module, I/O cable, or base. Replace 2PORT-EFR module, CPU module, I/O cable, and base in turn.
DL	Maintenance mode	2PORT-EFR module is set to the maintenance mode. Please set the setting of the rotary switch and set the rack number from 0 excluding seven. Please exchange modules when it is not solved by abnormality.

5.2 Error Messages Used by the CPU Module

5.2.1 Special Relays

One of the following special relays turns on in case of failure.

Address	Content
VA1 VA5 VA9 VAD VB1 VB5 VB9 VBD	A wrong link parameter setting for link No. 1 A wrong link parameter setting for link No. 2 A wrong link parameter setting for link No. 3 A wrong link parameter setting for link No. 4 A wrong link parameter setting for link No. 5 A wrong link parameter setting for link No. 6 A wrong link parameter setting for link No. 7 A wrong link parameter setting for link No. 8
VA2 VA6 VAA VAE VB2 VB6 VBA VBE	A communication error for link No. 1 A communication error for link No. 2 A communication error for link No. 3 A communication error for link No. 4 A communication error for link No. 5 A communication error for link No. 6 A communication error for link No. 7 A communication error for link No. 8
VC4	Faulty special module (faulty I/O module)
VC8	An I/O configuration error (9 or more I/O modules are mounted.) (I/O module memory capacity is 61 kbytes or more.)
VF2	Incorrect assignment of special modules (Rack No., slot No. or link module names as link parameter does not correspond with the actual position.)

5.2.2 Special Registers

♦ General map of special registers

Address	Content
S200 | S24F	CPU error information output registers
S3*0 | S3*F	Participation of nodes in FL-net network communication Indicates the communication status of each node (1 = participating or 0 = not participating). See 2-8 'Monitor Function.'
S3x0 | S3xB	Link error information output registers
S3xF	Own node number output registers

♦ "*" and "x" in the above addresses are determined by the link No. as shown in the following table.

Link No.	1	2	3	4	5	6	7	8
*	0	2	4	6	8	A	C	E
x	1	3	5	7	9	B	D	F

Example) If the link No. is 1, for example, the communication status of each node is recorded at S300 to S30F and the link error information at S310 to S31B.

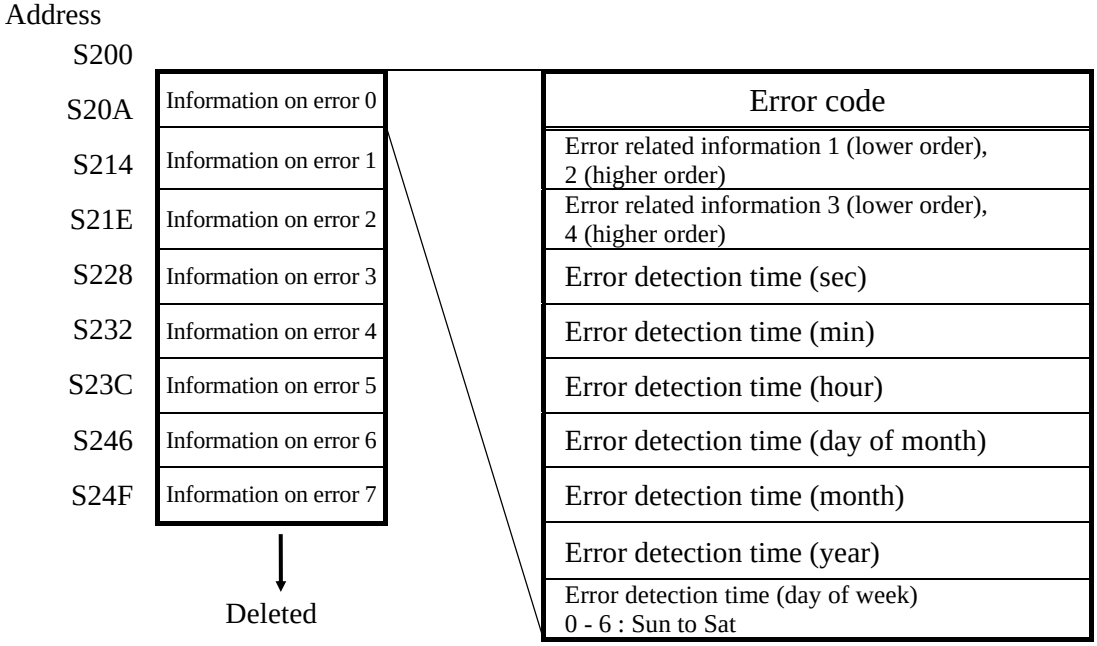
Note: The information recorded at a special register is not cleared after error recovery. If it is to be cleared, enter '0000' at the register using the I/O monitor, programmer or such.

(1) CPU Error Information Output Registers

When an error is detected, an error code, error related information, and error detection time are recorded at registers specially designed for recording error information. Up to 8 errors are recorded at these 8-level shift registers. As the 9th and subsequent errors occur, error records are deleted from the oldest one.

The error information recorded at these registers can be loaded with peripheral equipment or such.

♦ Contents of CPU error information output registers



♦ Error related information

	Error code	Error message on I/O monitor	Content of error	Related informa-tion 1	Related informa-tion 2	Related informa-tion 3	Related informa-tion 4	Remark
Critical errors	81	FUNC. I/O OVER 2	Communication module memory overflow (61 kbytes or more)	—	—	—	—	VC8 ON
	84	I/O MODULE ERROR 2	Failure of I/O module	* Classifi-cation	Rack No.	Slot No.	—	* 2: Detected at CPU 1 and 3: Detected at link
	88	FUNC. I/O OVER 1	9 or more I/O modules mounted	—	—	—	—	VC8 ON
Warnings	85	LINK PRAM. ERROR	A wrong link parameter setting	Link No.	—	—	—	
	86	LINK ERROR	A communication error	Link No.	—	—	—	
	89	FUNC. I/O ALARM	A wrong rack No., slot No. or module name as link parameter	Rack No.	Slot No.	—	—	VF2 ON

Note: These codes are different from the ones indicated on the LED display at the front of the 2PORT-EFR module.

(2) Link Error Information Output Registers

If the 2PORT-EFR module finds an error, it warns the CPU module of the error. The CPU module records content of the error at link error information output registers. Up to 8 errors can be recorded at these 8-level shift registers. As the 9th and subsequent errors occur, error records are deleted from the oldest one.
The error information recorded at these registers can be loaded with peripheral equipment or such.

♦ Contents of link error information output registers

Link No.	Error Indication Address
1	S310 - S31F
2	S330 - S33F
3	S350 - S35F
4	S370 - S37F
5	S390 - S39F
6	S3B0 - S3BF
7	S3D0 - S3DF
8	S3F0 - S3FF

Address	MSB Content LSB	
S3x0	Node No. of your module (hex)	Error code (hex) *1
S3x1	Link parameter error code (hex) *2	
S3x2	Fixed to 0000	
S3x3	Fixed to 0000	
S3x4	Software version (BCD) *3	
S3x5	Node No. and error code stack 1	Latest
S3x6	Node No. and error code stack 2	
S3x7	Node No. and error code stack 3	
S3x8	Node No. and error code stack 4	
S3x9	Node No. and error code stack 5	
S3xA	Node No. and error code stack 6	
S3xB	Node No. and error code stack 7	Oldest
. . .		
S3xF	Own node number	

*1: The same with the error codes indicated at the front of the module. (See 5-1 'Error Codes Used by the 2PORT-EFR Module.')

*2: For link parameter errors only (error code = E6). Fixed to 0000 for other errors.

*3: 0123h for version 1.23.

Note 1) "x" is determined by the link No.

Link No.	1	2	3	4	5	6	7	8
x	1	3	5	7	9	B	D	F

For the 2PORT-EFR module with link No. 1, for example, error information is recorded at S310 to S13B.

♦ Link Parameter Error Codes

If a link parameter has been set to a wrong value, E6 appears on the LED display at the front of the module with error code E6 recorded at link error information output register S3x0 and a link parameter error code at S3x1.
Check link parameters in accordance with the following table.
Before checking link parameters, load them from the CPU module to the peripheral equipment. Parameters in the peripheral equipment may not coincide with those in the CPU module.
If parameters are set with the peripheral equipment such as PCwin, preset values are checked by the peripheral equipment and wrong ones are rejected. If a link parameter error still occurs, link parameters in the CPU module may have been modified by a computer link command except for 0024 (a switch setting error).

Error code at S3x1 (hex)	Content of error	Cause(s)	Communi-cation method
0001	A wrong relay link area top address	• Relay link area top address is not specified by word.	N:N
0002	A wrong register link area top address	• Register link area top address is not specified by word.	
0003	A wrong relay link transmission area top address	• Relay link transmission area top address is wrong. • Number of relay link transmission area words is wrong. • Relay link transmission area top address is not specified by word.	
0004	A wrong register link transmission area top address	• Register link transmission area top address is wrong. • Number of register link transmission area words is wrong. • Register link transmission area top address is not specified by word.	
0005	Relay link area overflow	• Number of relay link area words is wrong. • Relay link area top address and number of words are wrong. • Relay link area top and transmission area top IDs are inconsistent.	
0006	Register link area overflow	• Number of register link area words is wrong. • Register link area top address and number of words are wrong. • Register link area top and transmission area top IDs are inconsistent.	
0010	A wrong relay link reception area top address	• Relay link area top address is not specified by word.	1:N
0011	A wrong resister link reception area top address	• Register link area top address is not specified by word.	
0012	Relay link area overflow	For relay link parameter settings: • Number of reception words is wrong. • Number of transmission area words is wrong. • Reception area top address and number of transmission/reception words are wrong. • Common memory address is wrong.	
0013	Register link area overflow	For register link parameter settings: • Number of reception words is wrong. • Number of transmission area words is wrong. • Reception area top address and number of transmission/reception words are wrong. • Common memory address is wrong.	
0014	A wrong relay link transmission common memory address	• Common memory address in relay link transmission area is wrong.	
0015	A wrong register link transmission common memory address	• Common memory address in register link transmission area is wrong.	
0016	A wrong token monitor time-out	• Master station node No. is smaller than 1 or larger than 254. • Master station node No. is the same with node No. of your module.	
0020	A wrong network address	• Network address is 0.0.0 or 255.255.255.	Common to N:N and 1:N
0021	X/Y area overlap	• X/Y area used by actual I/O and link area are overlapped.	
0022	Communication method not defined	• Communication method is neither N:N nor 1:N.	
0023	A wrong node No. for your module	• Node No. of your module is smaller than 1 or larger than 254.	
0024	A switch setting error	• Switch settings are wrong. (See 4-2 'Switch Settings.')	
0025	A wrong link parameter subcode	• Link parameter subcode is wrong.	
0026	A wrong token monitor time-out	• Token monitor time-out time is set to a value less than 10 ms.	
0027	A wrong minimum permissible frame interval	• Minimum permissible frame interval is not between 1 ms and 5 ms.	

Note 1) "x" is determined by the link No.

Link No.	1	2	3	4	5	6	7	8
x	1	3	5	7	9	B	D	F

5.3 Detection of abnormality by monitor function

The participation secession of the FL-net node can be confirmed by the special register from S3*0 to S3*F.

The node of the corresponding exchange number participates in the network when the flag has been turned on. The node of the corresponding exchange number has seceded the network when the flag is turned off.

The node that secedes the network by observing this flag by the sequence program can be detected.

The flag turned off once by some interference joins the network again as soon as interference recovers and turns on the flag. Please maintain the flag that corresponds to the node that secedes by the sequence program in another address to detect momentary secession.

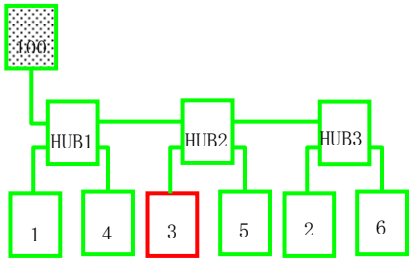
Please refer to the following for specific in an abnormal location where it causes secession.

<Procedure>

1) The network system chart of equipment is prepared.
2) It marks it to the node that the flag is turned off.
3) It confirms it according to the following patterns.

Pattern A: The node secedes only by one.

Example: Abnormal cause when secession of node 3 is detected by node 100



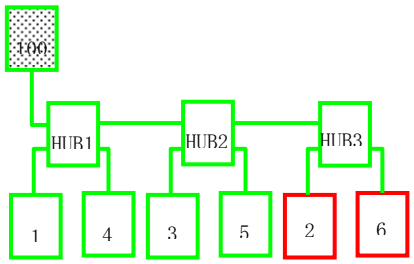
It is thought that the abnormal cause is chiefly in the module or the cable of node 3.

Probable cause	Measures
There is no power supply of node 3.	Please turn on power.
Abnormality occurs in the module of node 3.	Please release the error.
Neither node 3 nor HUB are connected with the cable.	Please connect the cable surely.
Breakdown of node 3	Please exchange nodes 3.
Defective cable of node 3 (disconnection, short-circuit, unspecified cable)	Please exchange cables of node 3.
Port malfunction of HUB2 with which three node cables are connected	Please exchange HUB2.
Defective cable of node 2 (disconnection, short-circuit, unspecified cable) *1	Please exchange cables of node 2.
Breakdown of node 2 *1	Please exchange nodes 2.

*1 Node 3 might become abnormal very uncommonly by intermittent interference of the node (node 2) in front of an abnormal node.

Pattern B: Secession of same HUB all nodes

Example: Abnormal cause when secession of node 2 and 6 is detected by node 100



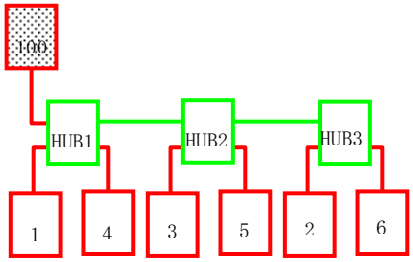
It is thought that the abnormal cause is around HUB.

Probable cause	Measures
There is no power supply of HUB3.	Please turn on power.
HUB3 is not connected with HUB2.	Please connect the cable surely.
Defective cable between HUB2 and HUB3 (disconnection, short-circuit, unspecified cable)	Please exchange the cables between HUB2 and HUB3.
Breakdown of HUB3	Please exchange HUB3.
Breakdown of HUB(HUB2) with which HUB3 cable is connected	Please exchange HUB2.
There is no power supply of node 2 and node 6.	Please turn on power.
Abnormality occurs in node 2 and node 6.	Please release the error.
Neither node 2 nor node 6 are connected with HUB with the cable.	Please connect the cable surely.
Breakdown of node 2 and node 6	Please exchange node 2 and 6.
Defective cable of node 2 and node 6 (disconnection, short-circuit, unspecified cable)	Please exchange cables of node 2 and 6.

Note) There might uncommonly when consecutive node No is abnormality be a cause on the node in front of minimum, abnormal node No. (Refer to example 2 of pattern C.)

Pattern C: All nodes secede or when the secession node is different

Example 1:Abnormal cause when all node secession is detected by node 100

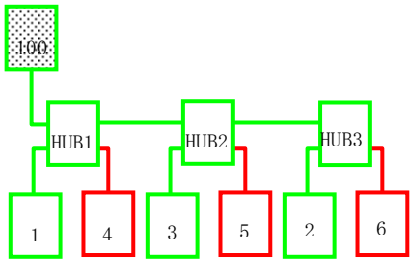


It is thought that the abnormal cause is chiefly in trunk line or node 100.

Probable cause	Measures
There is no power supply of HUB1.	Please turn on power.
Neither node 100 nor HUB1 are connected.	Please connect the cable surely.
Defective cable between HUB1 and node 100 (disconnection, short-circuit, unspecified cable)	Please exchange cables of node 100.
Defective cable between HUB and HUB (disconnection, short-circuit, unspecified cable)	Please exchange cables.
Breakdown of HUB（Either or all from HUB1 to HUB3)	Please exchange HUB
Breakdown of node 100	Please exchange nodes 100.
Defective cable of node 6 (disconnection, short-circuit, unspecified cable) *1	Please exchange cables of node 6.
Breakdown of node 6 *1	Please exchange nodes 6.

Node 100 might become abnormal by intermittent interference of the node of the exchange number in front of an abnormal node (node 6).

Example 2: Abnormal cause when two or more node secession is detected by node 100



It is thought that the abnormal cause is in trunk line or node 100.

Probable cause	Measures
Defective cable between HUB1 and node 100 (disconnection, short-circuit, unspecified cable)	Please exchange cables of node 100.
Defective cable between HUB and HUB (disconnection, short-circuit, unspecified cable)	Please exchange cables.
Breakdown of HUB（Either or all from HUB1 to HUB3)	Please exchange HUB
Breakdown of node 100	Please exchange nodes 100.
Defective cable of node 3 (disconnection, short-circuit, unspecified cable) *1	Please exchange cables of node 3.
Breakdown of node 3 *1	Please exchange nodes 3.

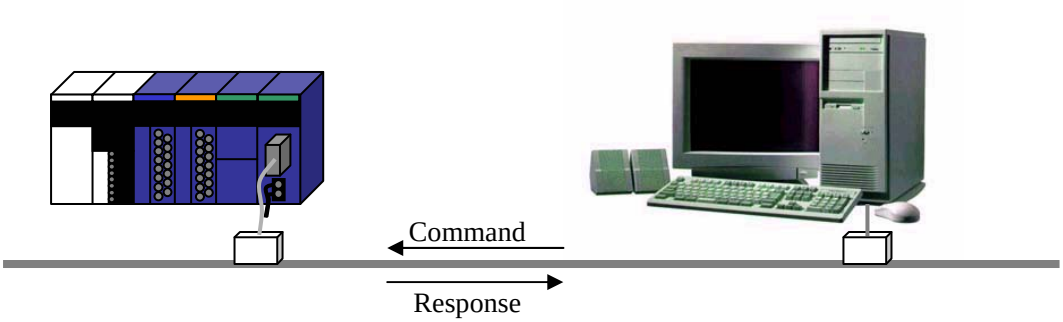
*1 Two or more nodes might secede uncommonly because of the node of the exchange number in front of a minimum, abnormal node when intermittent interference is generated. This is limited for the number where two or more abnormal nodes are consecutive.

6 FL-net Message Functions

The message functions include the message server function for receiving a command from another node and making a response and the message client function for receiving a response. With the message client function, commands are transmitted and response data is read by the sequence program. With the message server function, no special sequence program is required for such processes.

6.1 Message Server Function

The message server function for making a response to the command transmitted from another node by the FL-net message function is described below.



6.1.1 Applicable TCD Codes and Contents of Response Data

The following TCD codes (command codes) as specified by the FL-net standard are applicable.

TCD code	Application	Content
65003 (FDEB)	Read Byte Block Data	Reads register data in the CPU module in units of byte.
65004 (FDEC)	Writes Byte Block Data	Writes register data in the CPU module in units of byte.
65005 (FDED)	Reads Word Block Data	Reads register data in the CPU module in units of word.
65006 (FDEE)	Write Word Block Data	Writes register data in the CPU module in units of word.
65007 (FDEF)	Read Network Parameters	Reads network parameters preset by the 2PORT-EFR module.
65009 (FDF1)	Stop	Stops the CPU module from scanning.
65010 (FDF2)	Run	Starts the CPU module to scan.
65011 (FDF3)	Read Profile	Reads profile data from the 2PORT-EFR module.
65013 (FDF5)	Read Log	Reads log data.
65014 (FDF6)	Clear Log	Clears log data.
65015 (FDF7)	Return Message	Returns received message (for testing).

(1) Read/Write Byte/Word Block Data

For these commands, specify the address of the data to be read or written with four bytes. Specify the CPU module mode and program No. with the former two bytes and the indirect byte or word address with the latter two bytes.

Former two bytes 0000:PC2 compatible mode
0001:PC3J mode program 1
0002:PC3J mode program 2
0003:PC3J mode program 3
0004:PC3J mode expansion area
0007:PC3JG mode expansion area
0008:PC3J mode expansion data register (U)

Latter two bytes Indirect byte address of byte block to be read/written
Indirect word address of word block to be read/written

See below for the indirect byte and word addresses.

No.	ID	Designation	Word address	Indirect byte address	Indirect word address
1	X	Input	X, Y00W - 7FW	200 - 2FF	100 - 17F
2	Y	Output			
3	M	Internal relay	M00W - 7FW	300 - 3FF	180 - 1FF
4	K	Keep relay	K00W - 2FW	40 - 9F	20 - 4F
5	V	Special relay	V00W - 0FW	A0 - BF	50 - 5F
6	T	Timer	T, C00W - 1FW	C0 - FF	60 - 7F
7	C	Counter			
8	L	Link relay	L00W - 7FW	100 - 1FF	80 - FF
9	D	Data register	D0000 - 2FFF	2000 - 7FFF	1000 - 3FFF
10	R	Link register	R0000 - 07FF	1000 - 1FFF	800 - FFF
11	N	Current value register	N0000 - 01FF	C00 - FFF	600 - 7FF
12	S	Special register	S0000 - 03FF	400 - BFF	200 - 5FF
13	EX	Expansion input	EX, EY00W - 7FW	B00 - BFF	580 - 5FF
14	EY	Expansion output			
15	EM	Expansion internal relay	EM00W - 1FFW	C00 - FFF	600 - 7FF
16	EK	Expansion keep relay	EK00W - FFW	200 - 3FF	100 - 1FF
17	EV	Expansion special relay	EV00W - FFW	400 - 5FF	200 - 2FF
18	ET	Expansion timer	ET, EC00W - 7FW	600 - 6FF	300 - 37F
19	EC	Expansion counter			
20	EL	Expansion link relay	EL00W - 1FFW	700 - AFF	380 - 57F
21	U	Expansion data register	U0000 - 7FFF	0000 - FFFF	0000 - 7FFF
22	EN	Expansion current value register	EN0000 - 07FF	2000 - 2FFF	1000 - 17FF
23	H	Expansion preset value register	H0000 - 07FF	3000 - 3FFF	1800 - 1FFF
24	ES	Expansion special register	ES0000 - 07FF	1000 - 1FFF	800 - FFF
25	GX	Expansion input	GX, GY00W - FFFW	0000 – 1FFF	0000 – 0FFF
26	GY	Expansion output			
27	GM	Expansion internal relay	GM00W - FFFW	2000 – 3FFF	1000 – 1FFF

(2) Read Network Parameters

The response data to the Read Network Parameter command uses the format specified by the FL-net protocol standard as shown below.

	15 — 8	7 — 0
offset+0	Node name (equipment name)	
+4		
+5	Vender name	
+9		
+10	Manufacturer's model name	
+14		
+15	Top address of area 1	
+16	Size of area 1	
+17	Top address of area 2	
+18	Size of area 2	
+19	Not used	Token monitor time-out time
+20	Not used	Minimum permissible frame interval
+21	Not used	Link status
+22	Not used	Protocol version
+23	Upper layer status	
+24	RCT setting of permissible refresh cycle time	
+25	Measured refresh cycle time (current)	
+26	Measured refresh cycle time (max)	
+27	Measured refresh cycle time (min)	

For the TOYOPUC 2PORT-EFR module (THU-6289), the response consists of the following data.

Node name	Node name specified by link parameter
Vender name	TOYODA
Manufacturer's model name	THU-6289
Top addresses and sizes of area 1/2	Transmission area on common memory is determined from transmission area specified by link parameter.
Token monitor time-out time	Preset value of parameter
Minimum permissible frame interval	Preset value of parameter
Link status	7 6 5 4 3 2 1 0 [ ][ ][ ][ ] Not used Upper layer operation signal error Common memory data validity notice Common memory settings (address and size) defined Address overlap detection
Protocol version	FL-net protocol version (80h)
Permissible refresh cycle time	The time to be spent after receipt of a token by your module and before receipt of the next token by your module times 1.2. Used to determine the acceptability of sending a message. For detail, see FL-net protocol specifications.
Measured refresh cycle time (current/max/min)	Current, maximum, and minimum values of the time spent after receipt of a token by your module and before receipt of the next token by your module.

(3) Run/Stop

Used to start the CPU module to scan (run) or stops it from scanning.

(4) Read Profile

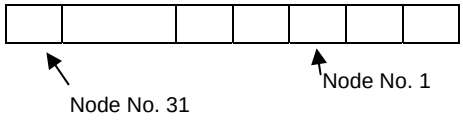
With the TOYOPUC 2PORT-EFR module (THU-6404), the profile data as shown below is sent back.

Seq:179:
Seq:139
Str:6:COMVER
Int:1:1
Str:2:ID
Str:7:SYSPARA
Str:3:REV
Int:1:0
Str:7:REVDATE
Seq:10:
Int:2:2007
Int:1:7
Int:1:7
Str:10:DVCATEGORY
Str:2:PC
Str:6:VENDOR
Str:17:JTEKT CORPORATION.
Str:7:DVMODEL
Str:32:PC3J/PC2J 2PORT-EFR THU-6404
Seq:31:
Str:2:ID
Str:7:DEVPARA
Str:12:SOFT VERSION
Int:2:112h (for version 1.12)

(5) Read Log

The log data format is specified by the FL-net protocol standard as shown below. The counter is reset when the module is powered on/off or reset. Each data record consists of 4 bytes.

Offset	Outline	Item	Contents
0	Transmission and reception	Cumulative number of socket transmissions	Number of frames that have requested lower layers for transmission
1		Cumulative number of socket transmission errors	Number of transmission errors that occurred at socket
2		Number of Ethernet transmission errors	Number of reception errors at Ethernet level
3			
4			
5			
6		Cumulative number of receptions	Number of frames received from lower layer
7		Cumulative number of reception errors	Number of reception errors at socket processor
8		Number of Ethernet reception errors	Number of reception errors at Ethernet level
9			
10			
11			
12	Frame type	Token transmissions	Number of times token was transmitted
13		Cyclic frame transmissions	Number of times cyclic frames not including token were transmitted
14		1:1 message transmissions	Number of times 1:1 message was transmitted
15		1:N message transmissions	Number of times 1:N message was transmitted
16			
17			
18		Token receptions	Number of times token was received
19		Cyclic frame receptions	Number of times cyclic frames not including token were received
20		1:1 message receptions	Number of times 1:1 message was received
21		1:N message receptions	Number of times 1:N message was received
22			
23			
24	Cyclic transfer	Cyclic transfer receptions	Number of errors that occurred in cyclic transfer (including the following ones)
25		Cyclic address size errors	Header address/size inconsistent with control table values
26		Cyclic CBN errors	Number of errors related with CBN
27		Cyclic TBN errors	Number of errors related with TBN
28		Cyclic BSIZE errors	Number of errors related with BSIZE
29			
30			
31			
32			
33			
34			
35			
36	Message transfer	Message transfer retransmissions	Number of times message was retransmitted
37		Message transfer over-transmissions	Number of times message was over-transmitted
38			
39			
40			
41			
42		Message transfer reception errors	Number of messages received with errors
43		Message serial version errors	Number of messages received with serial version errors
44		Recognized message serial No. retransmissions	Number of received messages recognized to be retransmitted ones
45			
46			
47			
48	ACK	ACK errors	Number of ACK related errors
49		ACK serial version errors	Number of inconsistent ACK serial versions
50		ACK serial No. errors	Number of inconsistent ACK serial Nos.
51		ACK node No. errors	Number of inconsistent ACK node Nos.
52		ACK TCD errors	Number of inconsistent ACK TCDs
53			
54			
55			
56			

57			
58			
59			
60	Token	Recognized token multiplications	Number of tokens recognized to be multiplied ones
61		Discarded tokens	Number of times token was discarded
62		Reissued tokens	Number of times token was reissued
63			
64			
65			
66		Token retention time-outs	Number of times token retention time ran out.
67		Token monitor time-outs	Number of times token monitor time ran out.
68			
69			
70			
71			
72	Status 1	Cumulative operation time	Operation time after start-up
73		Frame waiting times	Number of times module waited for frames with no other node on network
74		Participations	
75		Self separations	Number of nodes that were separated due to three retention time-outs or absence of nodes on network
76		Separations due to skipping	Number of nodes that were not given token and consequently skipped and separated
77		Recognized node separations	Number of other nodes recognized as separated
78			
79			
80			
81			
82			
83			
84	Status 2	A list of participant nodes (1 to 31)	Nodes recognized as participant are represented in units of bit. Example) 31 4 3 2 1 0  (1 for participating or 0 for not participating)
85		A list of participant nodes (32 to 63)	
86		A list of participant nodes (64 to 95)	
87		A list of participant nodes (96 to 127)	
88		A list of participant nodes (128 to 159)	
89		A list of participant nodes (160 to 191)	
90		A list of participant nodes (192 to 223)	
91		A list of participant nodes (224 to 254)	

(6) Clear Log

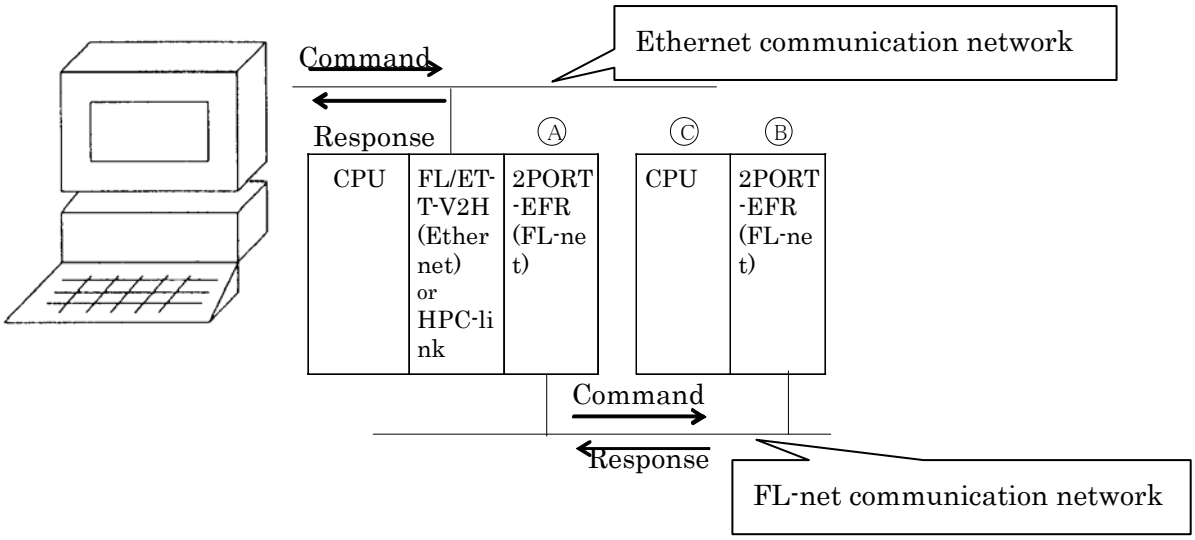
Resets all counters in the log data to zero.

(7) Return Message

Returns a received message for testing.

6.1.2 Remote programming / Remote monitor

Because FL-net corresponds to the relay command, it is possible to monitor from the communication modules such as Ethernet and HPC-LINK remotely and the programming remotely via FL-net.



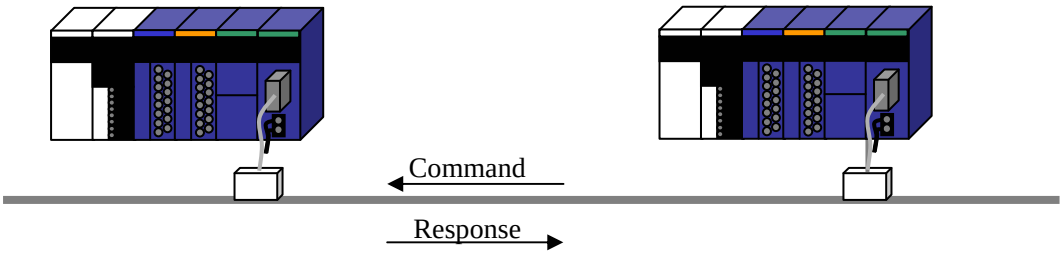
Note 1) Please refer to the manual of each communication module for details of the relay command.

Note 2)When you issue "Reset" command to CPU (above figure Ⓒ) where FL-net is mounted by using the function of remote programming from the peripheral equipment, an abnormal response returns to the peripheral equipment so that the communication of FL-net of Ⓑ may interrupt by reset. In this case, "Reset" command to CPU Ⓒ is normally executed.

6.2 Message Client Function

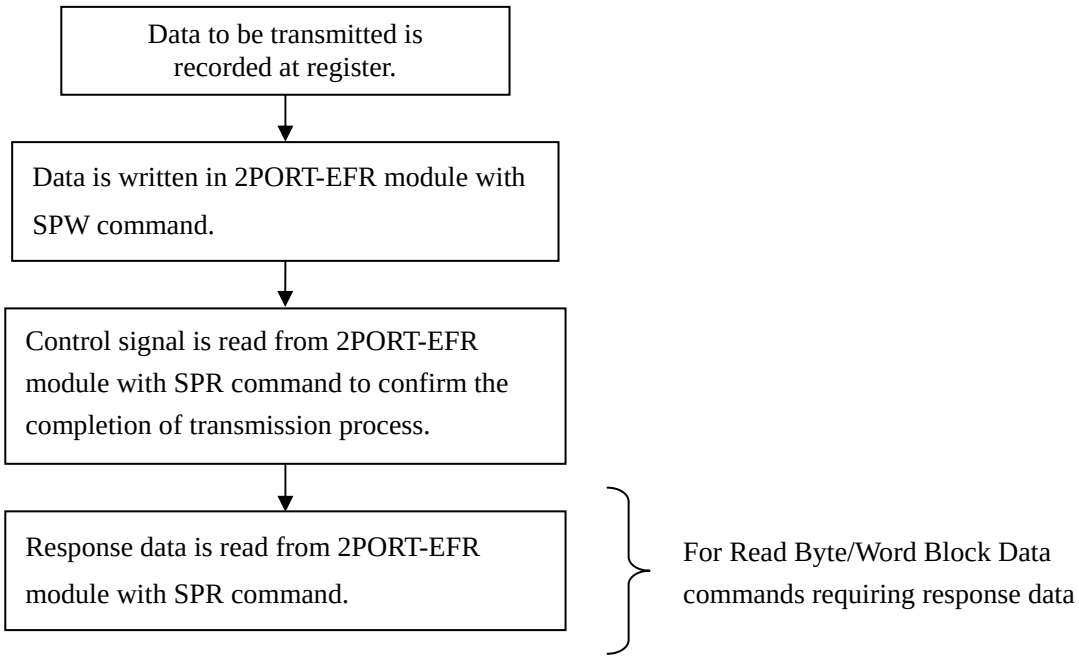
This function is used to transmit a command message to another node and receive a response. It is available with CPU modules of the following versions.

CPU Module	version	CPU Module	version
PC10P	1.00～	PC3JD	2.10～
PC10G	1.00～	PC3JM	2.00～
PC10GE	1.00～	PC3JL	2.00～
PC3JG,PC3JG-P	1.30～	AF10	2.30～
PC3JP,PC3JP-GP	1.70～	MX	2.00～



6.2.1 Message Transmission Procedure

The message transmission process is performed by the sequence program with the following procedure.



Note: The next command can only be transmitted after response data is completely read.

6.2.2 Assembling the Sequence Program

(1) Recording the data to be transmitted

The data to be transmitted should be recorded in the following format (in units of byte).

Offset	Content	Data range
0	Destination node No.	01 - FE
1	Fixed to 0	0
2	TCD code (lower order)	See section 6-1-1.
3	TCD code (higher order)	
4	Virtual memory address (lower order)	See section 6-1-1 (1).
5	Virtual memory address	
6	Virtual memory address	
7	Virtual memory address (higher order)	
8	Data size（lower order）	1024 or less for byte data or 512 or less for word data *1
9	Data size (higher order)	
10	Written data (top)	0 - FF
・ ・	・ ・	
1033(max)	Written data (end)	

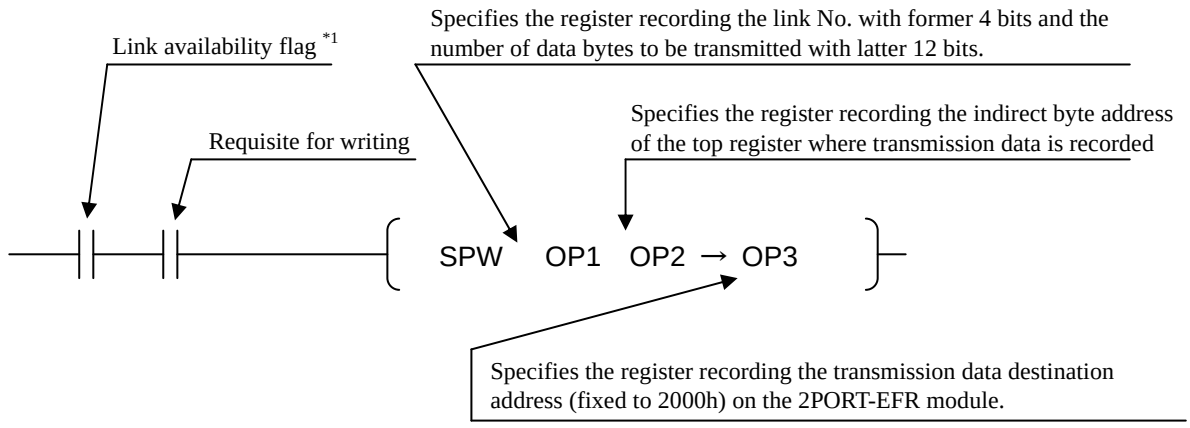
(*1: When data exceeding 1024 bytes is recorded, only 1024 bytes are transmitted.)

■ If a command for writing 2-word data at R100 and R101 of the CPU module connected with a 2PORT-EFR module with node No. 2 is to be transmitted:

Address	Data	Remarks
R200	0002	Destination node No.
R201	FDEE	Write Word Block Data TCD code (65006)
R202	0900	Data destination address
R203	0000	(Indirect word address of PC2 compatible mode R100)
R204	0002	Data size (2 words)
R205	Written data	0000 - FFFF
R206	Written data	0000 - FFFF

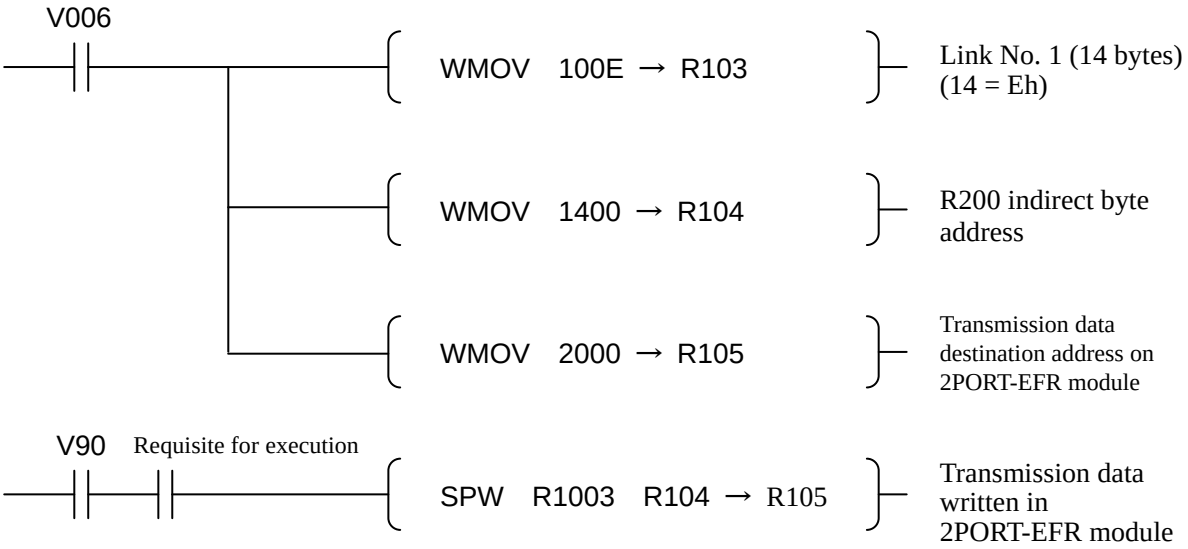
(2) Writing the data to be transmitted in the 2PORT-EFR module

An SPW command is used to write the data to be transmitted in the 2PORT-EFR module.



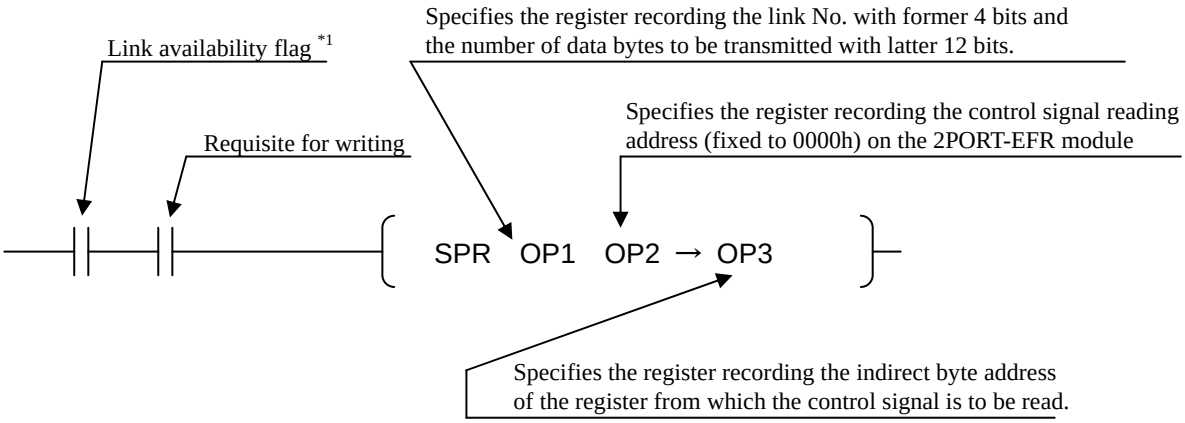
*1: The link availability flag is V90 for the 2PORT-EFR module with link No. 1, V92 with link No. 2, or V9E with link No. 8.

■ An example of sequence program for writing the data shown in the previous page in the 2PORT-EFR module with link No. 1



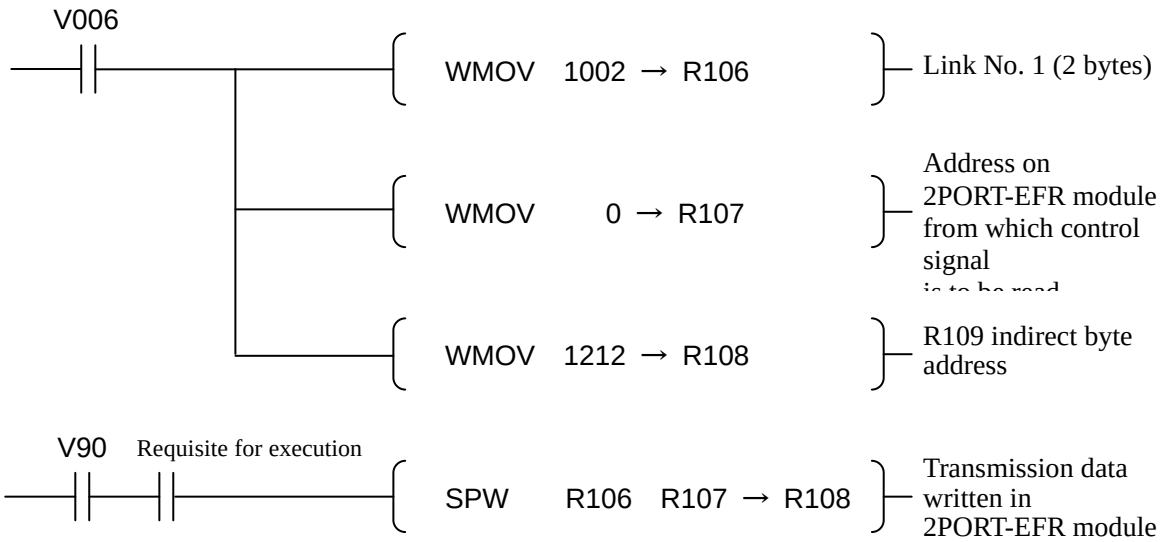
(3) Reading the control signal from the 2PORT-EFR module and confirming the completion of transmission process

It is determined from the control signal read from the 2PORT-EFR module whether the data is normally transmitted and the process completed.
The control signal is read with an SPR command.
The control signal consists of a word (2 bytes).



*1: The link availability flag is V90 for the 2PORT-EFR module with link No. 1, V92 with link No. 2, or V9E with link No. 8.

■ An example of sequence program for reading the control signal from the 2PORT-EFR module with link No. 1 into R109

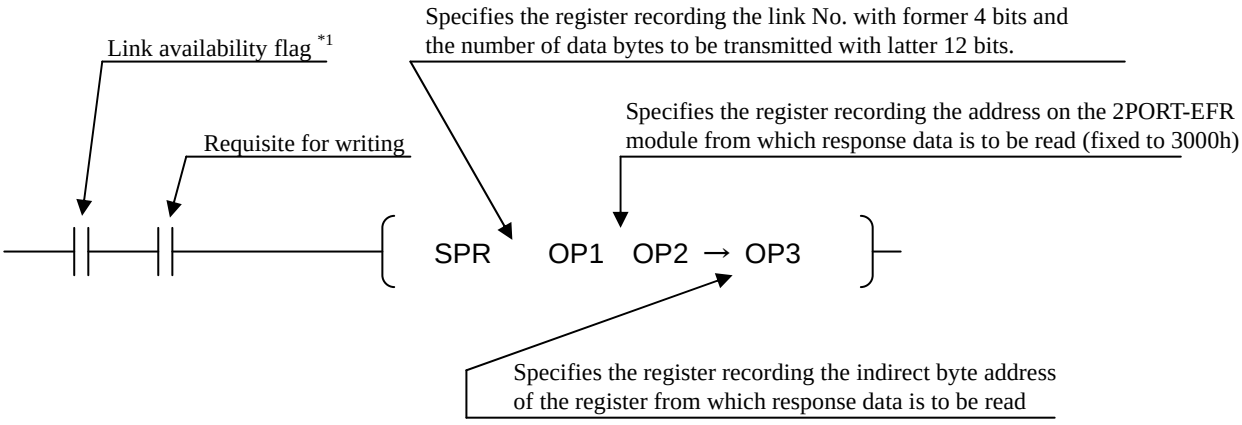


The control signal remains '0000' during the transmission process and changes to '0001' upon the normal completion of the process.
In case of failure, one of the following error codes is sent back.
The control signal should be continuously read by the sequence program until the transmission process is normally or abnormally completed.

Control signal	Content
0000	Transmission process being performed (waiting for response from the other node)
0001	Normally completed
2102	A wrong number of transfer bytes
2302	Undefined TCD code
2502	Impossible to process due to a wrong transfer data size
2702	- Another request for transmission is made before transmission process is completed. - A request for reading response data is made before transmission process is completed.
2802	A wrong response from the other node (m_rlt=1)
2902	Waiting time for response (5 seconds) run out (no response from the other node)
4002	Address out of specified range
4102	Number of bytes out of specified range
6002	Node No. to which message is to be transmitted is 00, FF, or the same with your module.

(4) Reading response data from the 2PORT-EFR module

As a command requesting response data from the other node (Read Byte/Word Block, etc.) is transmitted, the response data is read upon the normal completion of transmission process.
This process is performed with an SPR command.

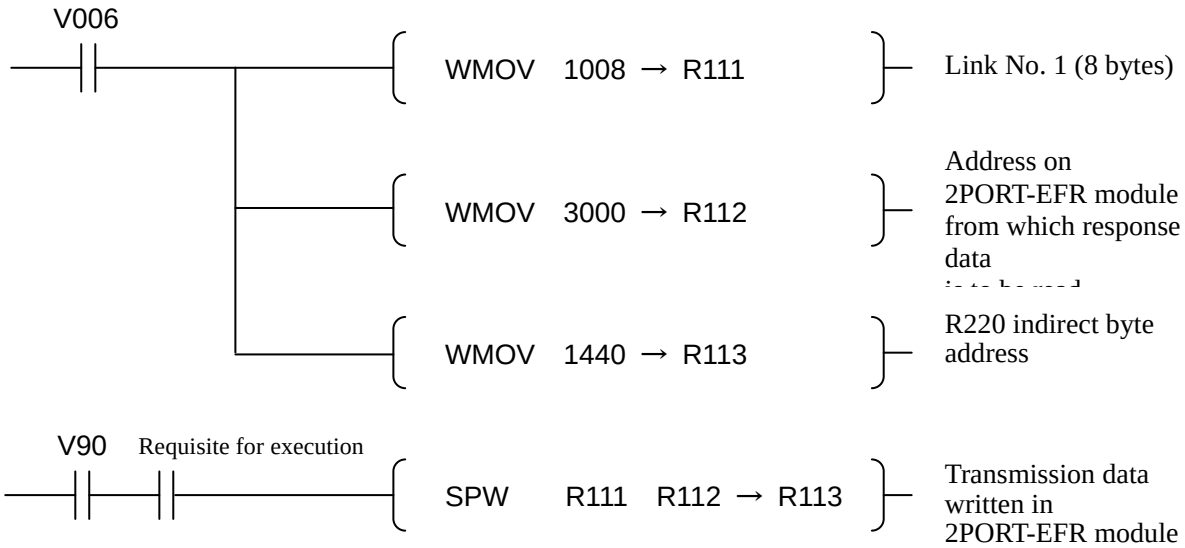


*1: The link availability flag is V90 for the 2PORT-EFR module with link No. 1, V92 with link No. 2, or V9E with link No. 8.

The response data uses the following format (data in units of byte).

Offset	Content	Data range
0	Message transmitting node No.	01 - FE
1	Fixed to 0	0
2	TCD code (lower order)	TCD code of data to be transmitted
3	TCD code (higher order)	
4	Response data（top）	0 - FF
・ ・	・ ・	
1027 (max)	Response data（end）	0 - FF

■ An example of sequence program for reading 8-byte response data from the 2PORT-EFR module with link No. 1 into R220 and subsequent



Notes

If SPW, SPR commands are used, not only will scan time be longer, but part of the processing on the 2PORT-EFR module side will be made to wait. If these commands are executed excessively, communication processing will be effected so please program to minimize the frequency of these commands.

6.2.3 Examples of Sequence Programs

(1) Write Word Block Data

This sequence program transmits a command to write 2-word data at registers R100 and R101 on node No. 2 and checks the control signal to confirm the normal completion of the process.

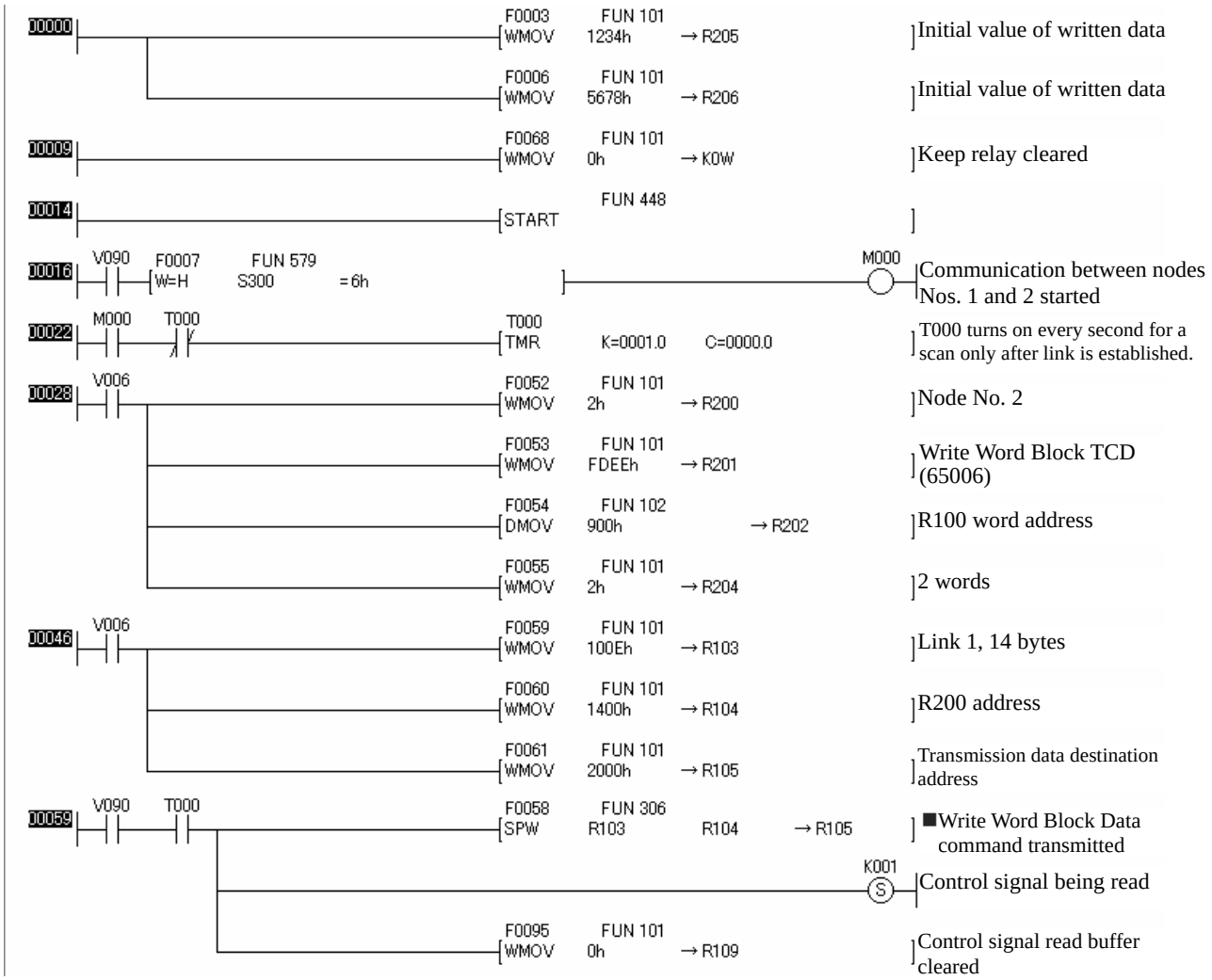
The command is transmitted from node No. 1 with link No. 1.

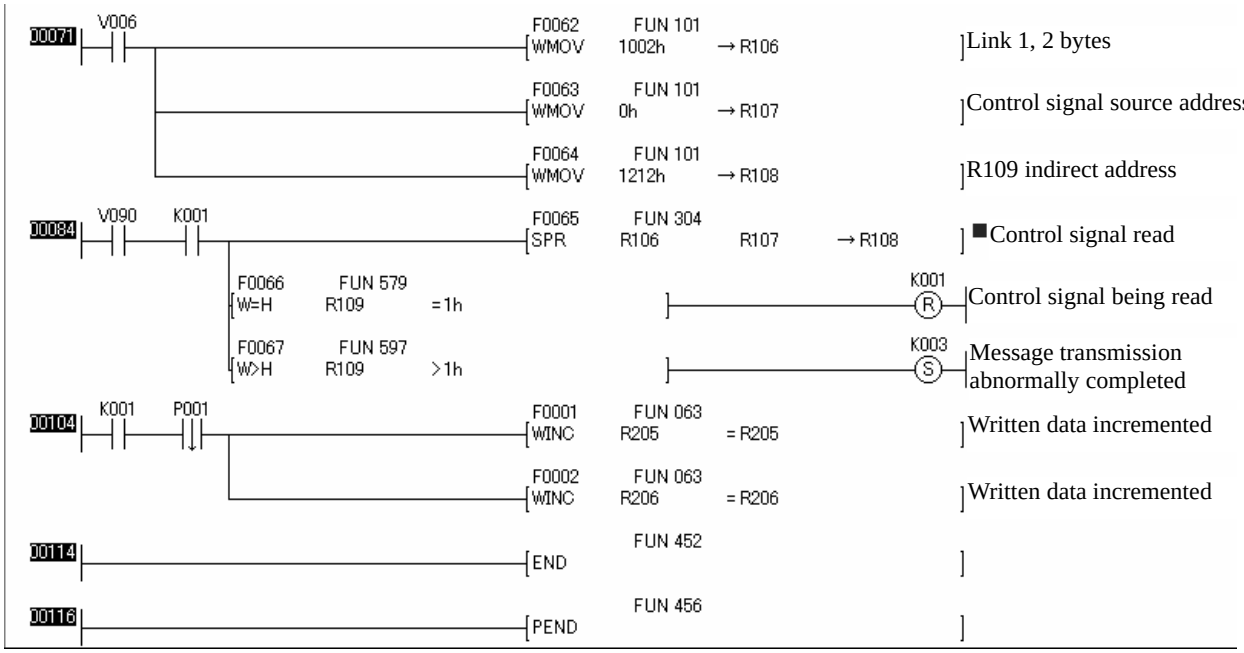
The data to be transmitted is recorded at 7 words (14 bytes) from R200 to R206 and the data to be written in the other node recorded at R205 and R206.

The requisite for transmitting a command is T000, which turns on every second after the communication is started.

After the command is transmitted, the control signal is read into R109. The control signal remains 0000 until a response is sent from the other node and is continuously read until a code other than 0000 is loaded.

With the following sequence program, the control signal is read while K0001 is on. The written data is incremented as the normal completion is confirmed. If the process is not normally completed, K003 turns on.





(2) Read Word Block Data

This sequence program transmits a command to read 2-word data from registers R100 and R101 on node No. 2, checks the control signal to confirm the normal completion of the process, and read response data if the process is normally completed.

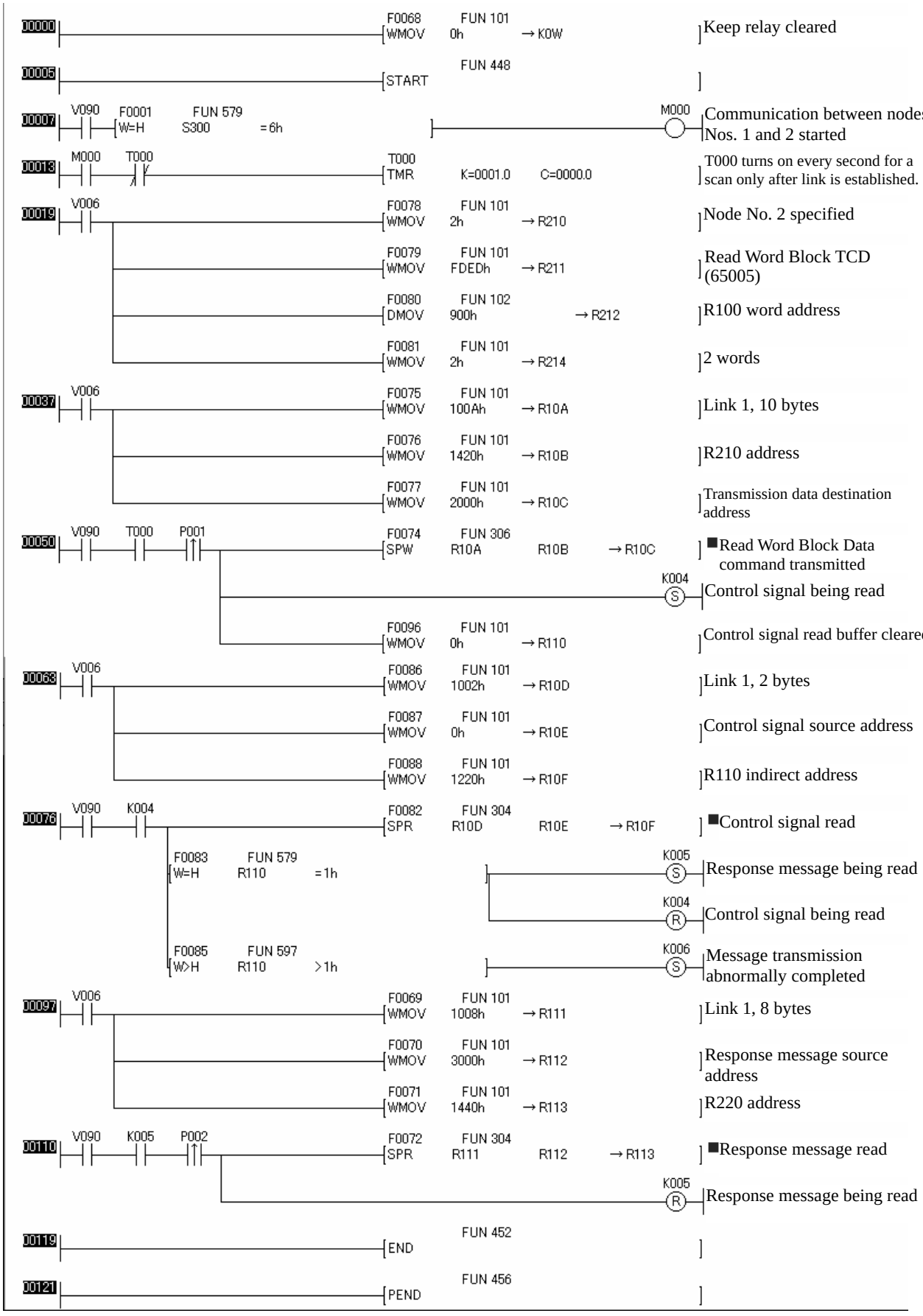
The command is transmitted from node No. 1 with link No. 1.

The data to be transmitted is recorded at 5 words (10 bytes) from R210 to R204. The requisite for transmitting a command is T000, which turns on every second after the communication is started.

After the command is transmitted, the control signal is read into R109. The control signal remains 0000 until a response is sent from the other node and is continuously read until a code other than 0000 is loaded.

With the following sequence program, the control signal is read while K0001 is on.

After the normal completion is confirmed, response data is read into R220 and subsequent.


00000
F0068 FUN 101
WMOV 0h → K0W
Keep relay cleared
00005
FUN 448
START
00007
V090 F0001 FUN 579
W=H S300 =6h
M000
Communication between nodes Nos. 1 and 2 started
00013
M000 T000
T000
TMR K=0001.0 C=0000.0
T000 turns on every second for a scan only after link is established.
00019
V006
F0078 FUN 101
WMOV 2h → R210
Node No. 2 specified
F0079 FUN 101
WMOV FDEDh → R211
Read Word Block TCD (65005)
F0080 FUN 102
DMOV 900h → R212
R100 word address
F0081 FUN 101
WMOV 2h → R214
2 words
00037
V006
F0075 FUN 101
WMOV 100Ah → R10A
Link 1, 10 bytes
F0076 FUN 101
WMOV 1420h → R10B
R210 address
F0077 FUN 101
WMOV 2000h → R10C
Transmission data destination address
00050
V090 T000 P001
F0074 FUN 306
SPW R10A R10B → R10C
■Read Word Block Data command transmitted
K004
S
Control signal being read
F0096 FUN 101
WMOV 0h → R110
Control signal read buffer cleared
00063
V006
F0086 FUN 101
WMOV 1002h → R10D
Link 1, 2 bytes
F0087 FUN 101
WMOV 0h → R10E
Control signal source address
F0088 FUN 101
WMOV 1220h → R10F
R110 indirect address
00076
V090 K004
F0082 FUN 304
SPR R10D R10E → R10F
■Control signal read
F0083 FUN 579
W=H R110 =1h
K005
S
Response message being read
K004
R
Control signal being read
F0085 FUN 597
W>H R110 >1h
K006
S
Message transmission abnormally completed
00097
V006
F0069 FUN 101
WMOV 1008h → R111
Link 1, 8 bytes
F0070 FUN 101
WMOV 3000h → R112
Response message source address
F0071 FUN 101
WMOV 1440h → R113
R220 address
00110
V090 K005 P002
F0072 FUN 304
SPR R111 R112 → R113
■Response message read
K005
R
Response message being read
00119
FUN 452
END
00121
FUN 456
PEND

6.3 Node Status Reading Function

This function reads the status of another node into the I/O register.
It is available with CPU modules of the following versions.

CPU module	version	CPU module	version
PC10P	1.00～	PC3JD	2.10～
PC10G	1.00～	PC3JM	2.00～
PC10GE	1.00～	PC3JL	2.00～
PC3JG,PC3JG-P	1.30～	AF10	2.30～
PC3JP,PC3JP-GP	1.70～	MX	2.00～

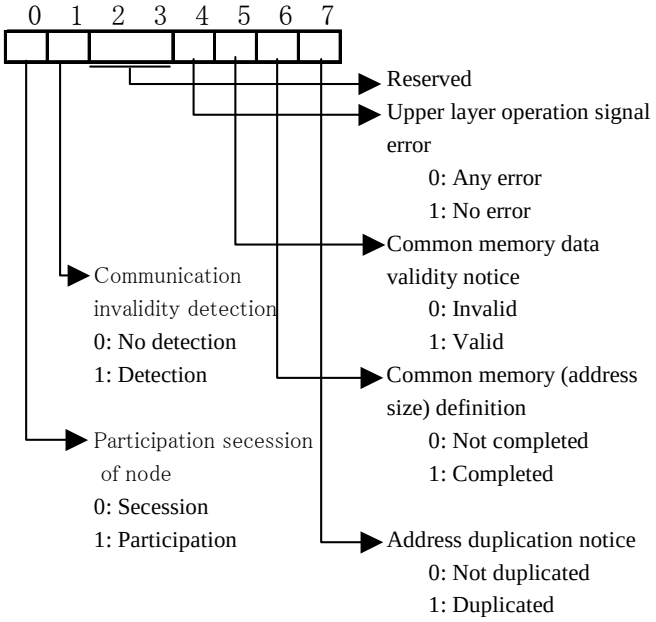
6.3.1 Node Status Data

The following data can be read for other nodes participating in the communication.
The status of any node not participating in the communication is expressed by 0000 if read.

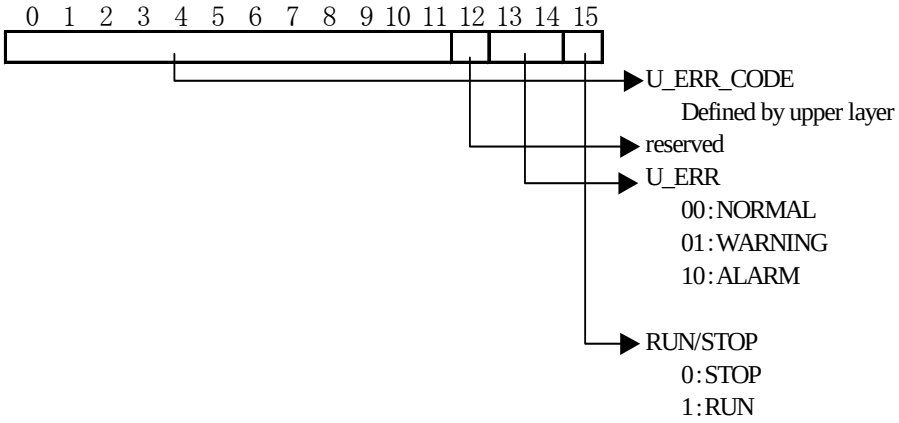
Relative address of read data	Contents	
0000	Fixed to 00	FA link status (*1)
0001	Upper layer status (H) (*1)	Upper layer status (L) (*1)
0002	Address of common memory area 1 (H)	Address of common memory area 1 (L)
0003	Size of common memory area 1 (H)	Size of common memory area 1 (L)
0004	Address of common memory area 2 (H)	Address of common memory area 2 (L)
0005	Size of common memory area 2 (H)	Size of common memory area 2 (L)
0006	Permissible refresh cycle time (H)	Permissible refresh cycle time (L)
0007	Fixed to 00	Token monitor time-out time
0008	Fixed to 00	Minimum permissible frame interval
0009	…	Vender name (L) (*2)
000A	…	…
000B	…	…
000C	…	…
000D	Vender name (H) (*2)	…
000E	…	Manufacturer's model name (L) (*2)
000F	…	…
0010	…	…
0011	…	…
0012	Manufacturer's model name (H) (*2)	…
0013	…	Node name (L) (*2)
0014	…	…
0015	…	…
0016	…	…
0017	Node name (H) (*2)	…

(*1): For the FA link status and upper layer status, see the next page.
(*2): Data might not enter when the node participates in the network on the way.
The vender name, manufacturer's model name, and node name are expressed by ASCII codes.

■ FA link status

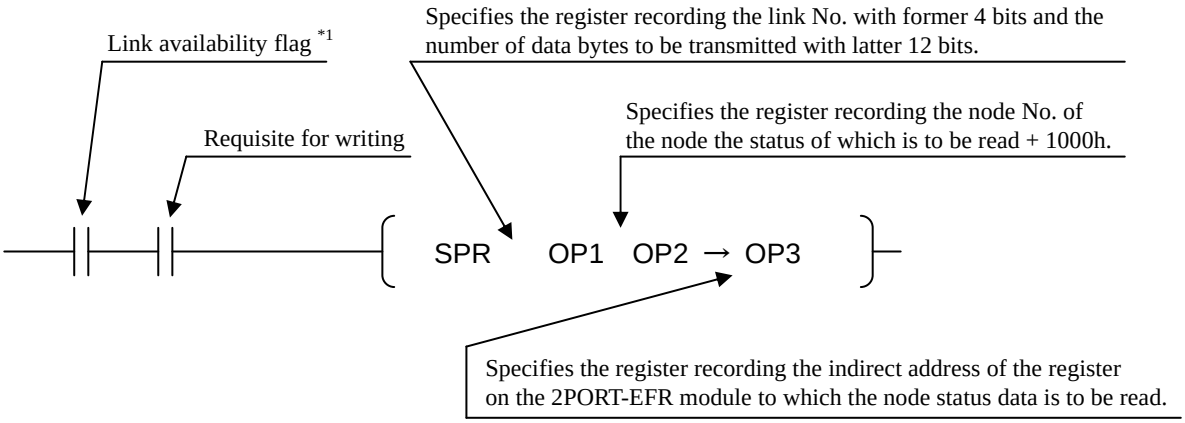


■ Upper layer status



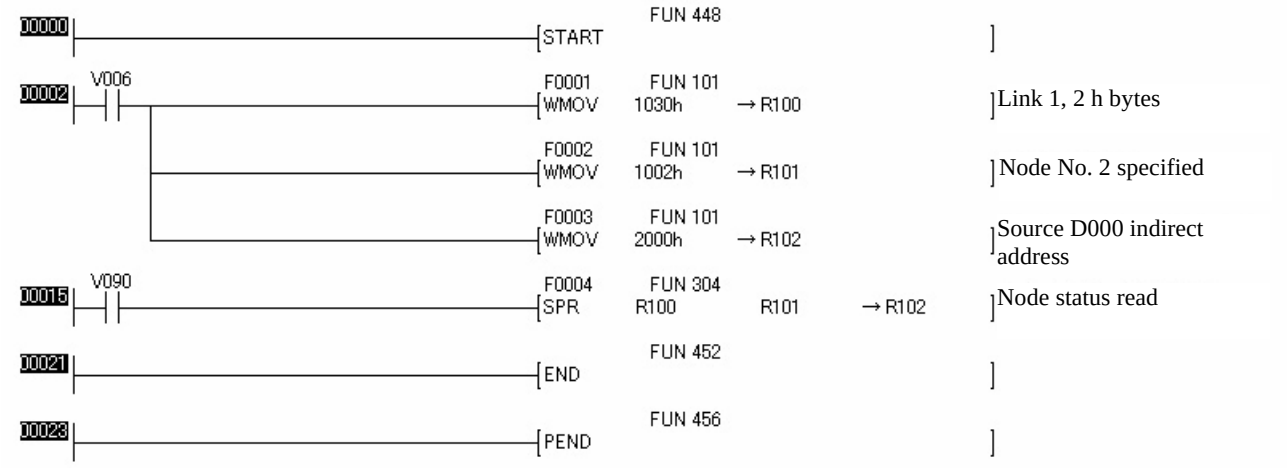
6.3.2 Assembling the Sequence Program

The status of another node is read with an SPR command.



*1: The link availability flag is V90 for the 2PORT-EFR module with link No. 1, V92 with link No. 2, or V9E with link No. 8.

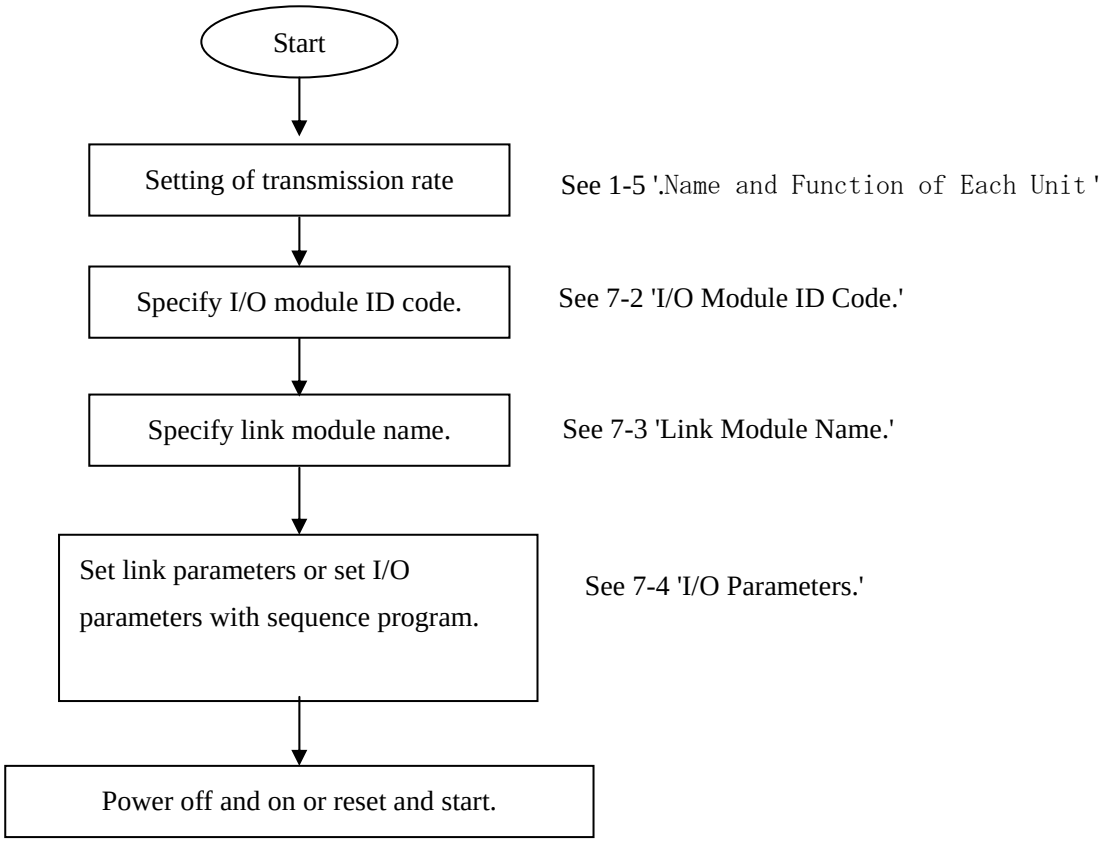
■ An example of sequence program for reading the status of node No. 2 from the 2PORT-EFR module with link No. 1 into 30h bytes from D0000



Note: The node status reading process cannot be executed at the same time with the message data transmission or response data reading process.
If they are executed at the same time, an instruction error occurs.

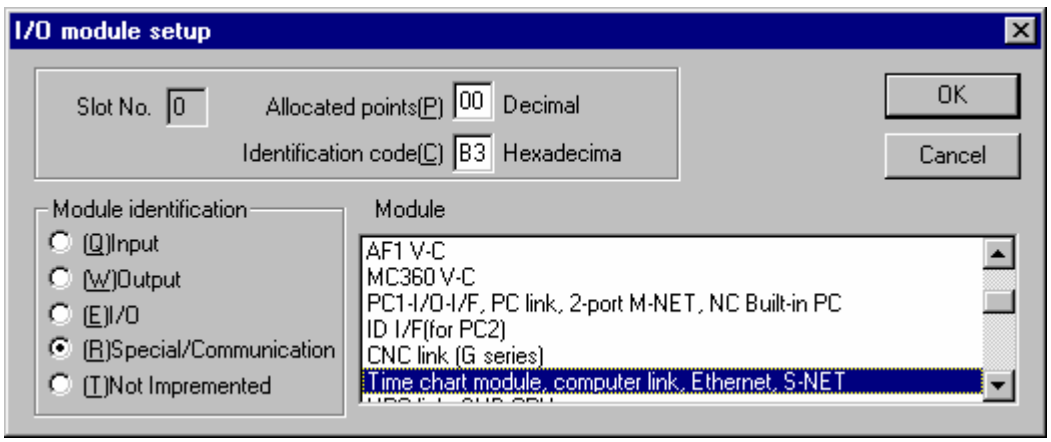
7 Initial Settings of the Ethernet

7.1 Initial Setting Procedure



7.2 I/O Module ID Code

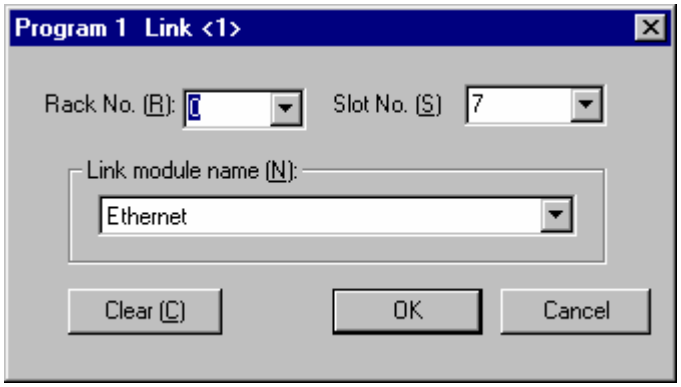
Specify the I/O module ID code on the 'I/O module setup' window under 'Parameter' of the peripheral equipment. When the Ethernet mode is selected, the ID code of the 2PORT-EFR module is B3.



7.3 Link Module Name

Select the rack No. and slot No. to which the 2PORT-EFR module is to be assigned by the settings on 'Link Parameter' window under 'Parameter' of the peripheral equipment. Set the link module name to 'Ethernet.'

When a PC3J series CPU has been used in the program divided mode, also select the program No. correctly.



NOTE) If the link module name is set to [ETHERNET (32 ports)], connections 1 through to 8 can be used but connections 9 to 32 cannot. (Connection 9 to 32 settings will be ignored.)

7.4 I/O Parameters

7.4.1 Description of I/O Parameters

The following I/O parameters are used.

(1) Your own node IP address

The IP address assigned to the 2PORT-EFR module and expressed by four numbers between 0 and 255. Note that 0.0.0.0 and 255.255.255.255 are not acceptable. If two or more nodes on the same line have the same IP address, communication cannot be normally performed.

The IP address consists of a network ID and host ID. The network ID should be the same with that of the node to be communicated with. For detail, see Reference 5 at the end of this manual.

(2) Connection 1 to 8 Used

The 2PORT-EFR module has eight connections from 1 to 8. Specify which connections are to be used.

An error occurs if the Open Protocol, Port No., and Other Node Table No. are not correctly specified for any connection with the `Used' box checked.

(3) Protocol-opening Method

Specify which protocol is to be used for communication, TCP/IP or UDP/IP, and how to open/close the connection if TCP/IP has been selected.

With the TCP/IP, it is necessary to open the line before the start of communication and close or reset it at the end of communication. With the UDP/IP, communication can be started or interrupted without opening or closing the line. With the TCP/IP, it is confirmed from the ACK (acknowledge) response whether data has reached the other node or not and, if it cannot be confirmed, data is re-transmitted. With the UDP/IP, it is not confirmed whether data has reached and, therefore, transmitted data may disappear due to data collision on the line or for another reason before reaching the other node.

(i) TCP Active
A mode used with the TCP/IP protocol where the line cannot be easily opened by the 2PORT-EFR module to the other node.

(ii) TCP Destination - Specified Passive
A mode used with the TCP/IP protocol where the line is opened by a node specified in the other node table. The line is not opened if requested by another node with an IP address or port No. other than specified.

(iii) TCP Destination Non-Specified Passive
A mode used with the TCP/IP protocol where the line is opened by the other node. The IP address and port No. of the other node need not be specified. This mode is normally used for communication with a computer.

(iv) UDP
Communication is performed with the UDP/IP protocol. The line is not opened or closed. It is not confirmed whether data has reached the destination and, therefore, data may be lost before reaching.

(4) Your Own Node Port No.
Specify the port No. for each connection between 1025 and 65534 (0401 and FFFE by hexadecimal notation). The own node port No. should not be the same for different connections.

(5) Other Node Table No.
If 'TCP Active,' 'TCP Destination - Specified Passive' or 'UDP' has been selected, it is necessary to specify the IP address and port No. of the other node. Specify IP addresses and port Nos. of different nodes in Other Node Tables Nos. 1 to 16 and enter a desired Other Node Table No. in the 'Other Node Table NO.' field.

(6) Other Node Tables 1 to 16 Used
IP addresses and port Nos. of up to 16 nodes to be communicated with may be specified. Check the 'Used' boxes for the Other Node Tables where IP addresses and port Nos. are to be specified.

(7) Other Node IP Address

For the Other Node Tables for which the 'Used' boxes have been checked, it is necessary to specify the IP address of the other node with four numbers between 0 and 255.

(8) Other Node Port No.

Specify the node No. of the other node between 1025 and 65534 (0401h and FFFEh by hexadecimal notation).

This is necessary for the other node tables designated as 'Used'.

■ Ref.

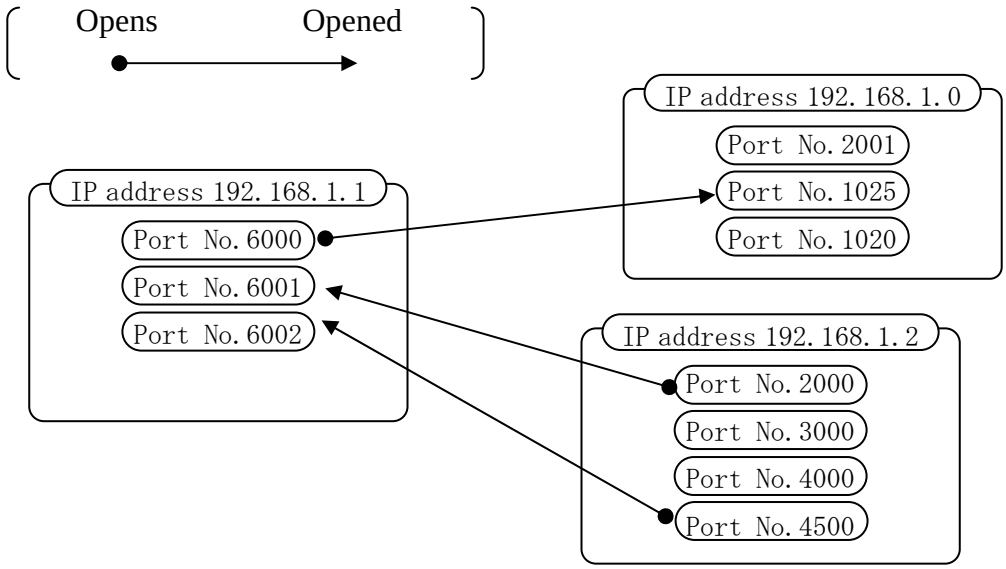
Specify an unique IP address for each node (each device equipped with Ethernet communication function such as personal computer or FL/ET-nete-5 module). Do not specify the same IP address for two or more nodes as doing so prevents normal communication.

More than one port No. may be specified for each node. Do not specify the same port No. more than once for a single node.

Communication may be independently performed for each node.

When the TCP protocol is to be used, determine which ports open connections. Specify the ports that opens them as 'active' and others as 'passive.' The ports communicating with each other do not need to have the same port No.

Example of settings



(9) Sub-Net Mask and Gateway IP Address

If the IP address of your module and that of the node to be communicated with have different network IDs, it is necessary to specify the sub-net mask and gateway IP address. For detail, see Reference 5 at the end of this manual.

Timer settings used for communication are described below.
They do not need to be changed in usual cases.

(10) Reset wait resending times

If no ACK (reception confirmation signal) is sent from the other node in response to the data transmitted through a TCP connection, data is re-transmitted the number of times specified herein. If no ACK is received after the specified number of re-transmissions, the connection is reset by the 2PORT-EFR module. At this time, connection error code 4013 appears. It is cleared when the connection is opened again.

If `Disable' has been checked, data is re-transmitted permanently and the connection is never reset. If any connection at the 2PORT-EFR module remains open because the other node is powered off during communication or for another reason, the connection is no longer normally opened by the other node. To prevent such a problem, it is recommended to specify the reset wait resending times.

(Programmable between 3 and 10, defaulted as 10)

(11) Non-Reception Timer

If no data is sent from the other node through a TCP connection for the number of seconds or minutes specified as 'Non-Reception Timer,' the connection is reset by the 2PORT-EFR module. If 'Disable' has been checked, the module waits permanently for data from the other data without resetting the connection.

(Programmable between 1 second and 255 minutes, defaulted as permanent waiting)

(12) Response Timer

The following timers are set at a time.

- Active open command response waiting timer
- Subsequent data reception timer in case of divided reception data (TCP/UDP)
- Response monitor timer for file memory transmission

(Programmable between 1 and 255 seconds, defaulted as 6 seconds)

(13) Resending Timer (Data)

A timer waiting for ACK (reception confirmation signal) from the other node after data is transmitted. If ACK is not received within the specified time, data is re-transmitted.

(Programmable between 200 ms and 60 seconds, defaulted as 500 ms)

(14) Resending Timer (SYN/FIN)

A timer waiting for a response to SYN (open connection to the other node) or FIN (close connection to the other node). If ACK is not received within the specified time, data is re-transmitted.

(Programmable between 200 ms and 60 seconds, defaulted as 500 ms)

(15) Close Timer

When a connection is to be closed by your module, it is necessary to transmit FIN from your module and receive FIN from the other node. If FIN is not received from the other node within the specified time after FIN is transmitted from your module, the connection is reset.
(Programmable between 2 and 60 seconds, defaulted as 10 sec.)

(16) Packet Alive Time

Set value of Time To Live: Decremented one by one every pass over IP router
(Programmable between 1 and 255, defaulted as 10)

(17) IP Assembly Timer

Standby period to assemble divided packet
(Programmable between 1 and 255 seconds, defaulted as 10 sec.)

7.4.2 Setting I/O Parameters

Parameters can be set in either of two ways as described below.

(1) Set from the 'Link parameter setup' window of the peripheral equipment.

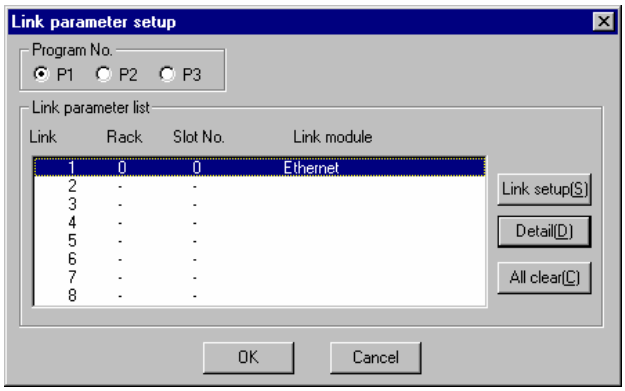
> PCwin or Hellowin (Ver2.2 Rev00 or more) is required to set I/O parameters in this way. They cannot be set from the link parameter setup window of Hellowin(Less than Ver2.2 Rev00), GH3, GL1, GP1, or HP3.

(2) Set with the sequence program.

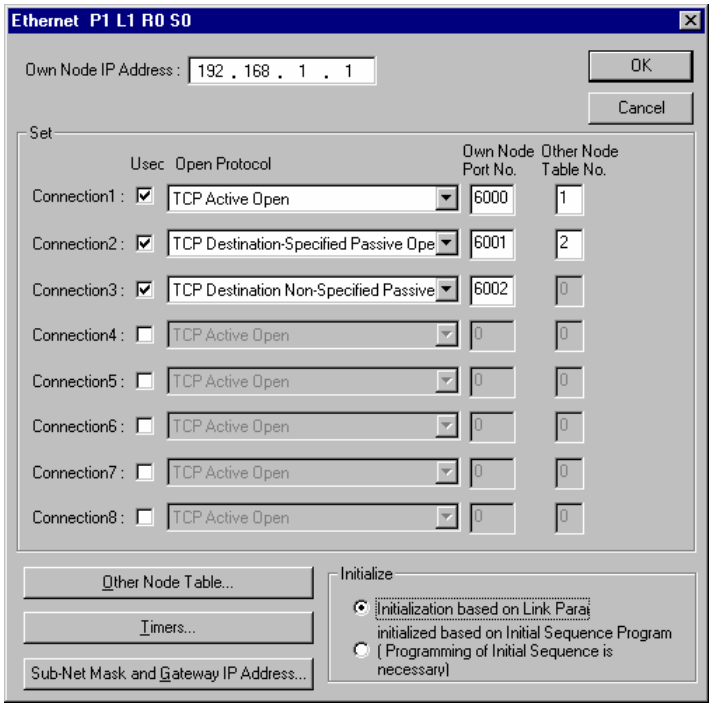
If I/O parameters have been set from link parameters and with the sequence program, the settings from link parameters usually take precedence. If 'Initialized based on Initial Sequence Program' has been selected on the link parameter setup window, however, the settings with the sequence program take precedence over those from link parameters.

(1) Setting I/O parameters from link parameters

(Note: This procedure requires that the peripheral equipment supports the Ethernet link parameter setting function.)



Select 'Ethernet' on the 'Link parameter setup' window and click the 'Detail (D)' button to open the 'Ethernet P1 L1 R0 S0' window.

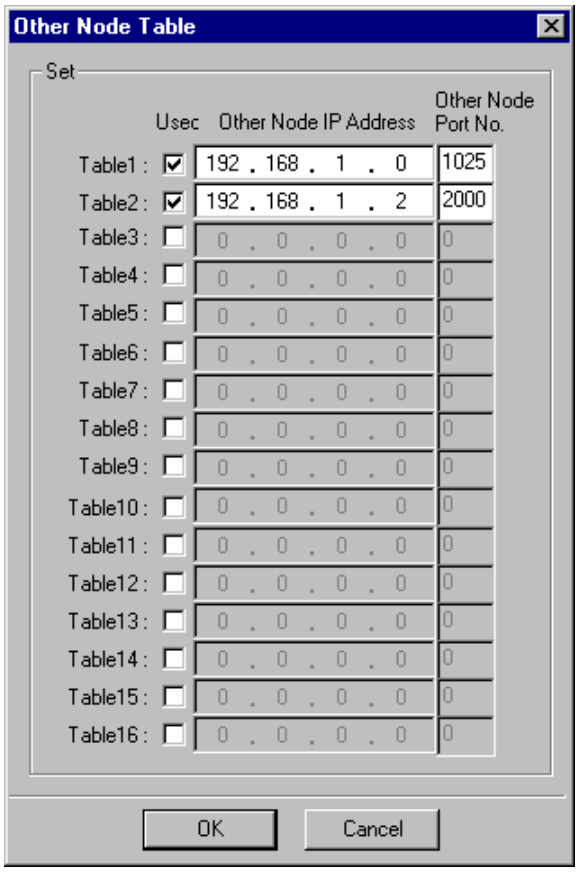


On this window, specify:

- Own Node IP Addresses
- Connection 1 to 8 Used
- Protocol Opening Methods
- Own Node Port Nos.
- Other Node Table Nos.

Then, click the buttons at the left bottom and enter values in the Other Node Table No., Timer, Subnet Mask, and Gateway IP Address fields if necessary.

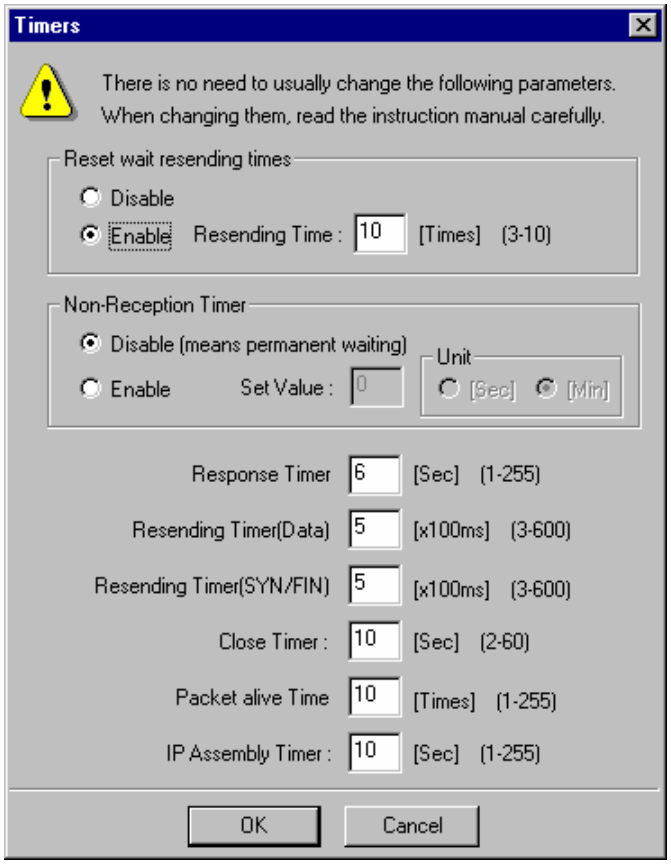
Click the 'Other Node Table ...' button to open the Other Node Table window.



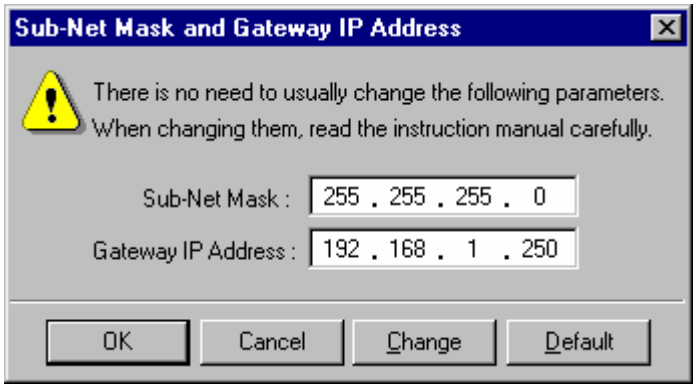
On this window, specify:

- Table 1 to 16 Used
- Other Node IP Addresses
- Other Node Port Nos.

Click the 'Timers ...' button to open the Timers window.

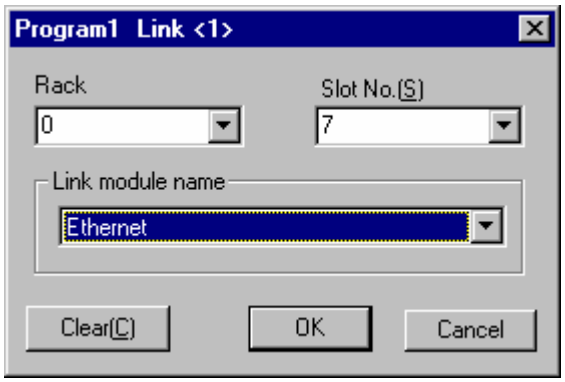


Click the 'Sub-net Mask and Gateway IP Address ...' button to open the Sub-net Mask and Gateway IP Address window. All values are initially defaulted as zero.
Click the 'Change' button when parameters are to be changed.
Click the 'Default' button to reset parameters to default values.



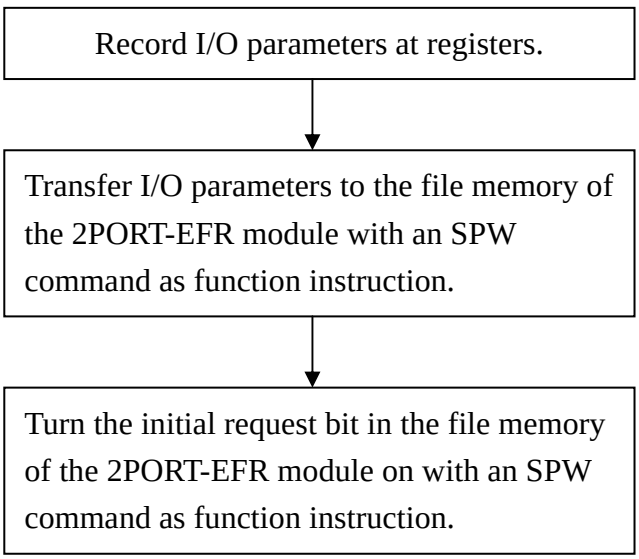
● Caution

If the CPU module parameters are to be set from the link parameter settings of the 2PORT-EFR module by reading to the peripheral equipment parameters from the CPU module with which the 2PORT-EFR module has been initialized with the sequence program, default values are usually changed to zeros. In this case, return to the Program 1 Link <1> window, clear the Ethernet settings, click the 'OK' button, and set the Ethernet parameters again. Moreover, please delete the initial sequence program (material 4). The application instruction error occurs in CPU module if the SPW instruction initial programming it with "Initialization based on link parameter" selected is executed.



(2) Setting I/O parameters with the Sequence Program

I/O parameters may be set with the sequence program with the following procedure.



■ Recording I/O parameters at registers

I/O parameters are written in the 2PORT-EFR module with an SPW command after recorded at registers.
The following example shows I/O parameters and a sequence program that write them into File Memory:

I/O Parameters Sample

Your Own Node IP Address = 192.168.1.2 (C0.A8.01.02h)
Connections No.1,2,& 3 and Other Node Tables No.1 & 2 are used.
Connection 1: TCP Active, Port No.= 6000 (1770h), Other Node Table No.=1
Connection 2: TCP Destination-Specified Passive, Port No.=6001 (1771h), Other Node Table No.=2
Connection 3: TCP Destination Non-Specified Passive, Port No.=6002 (1772h)
Other Node Table 1: IP Address = 192.168.1.1 (C0.A8.01.01h), Port No.=8000 (1F40h)
Other Node Table 2: IP Address = 192.168.1.3 (C0.A8.01.03h), Port No.=8001 (1F41h)

A case of initial parameter configuration starting with R104:

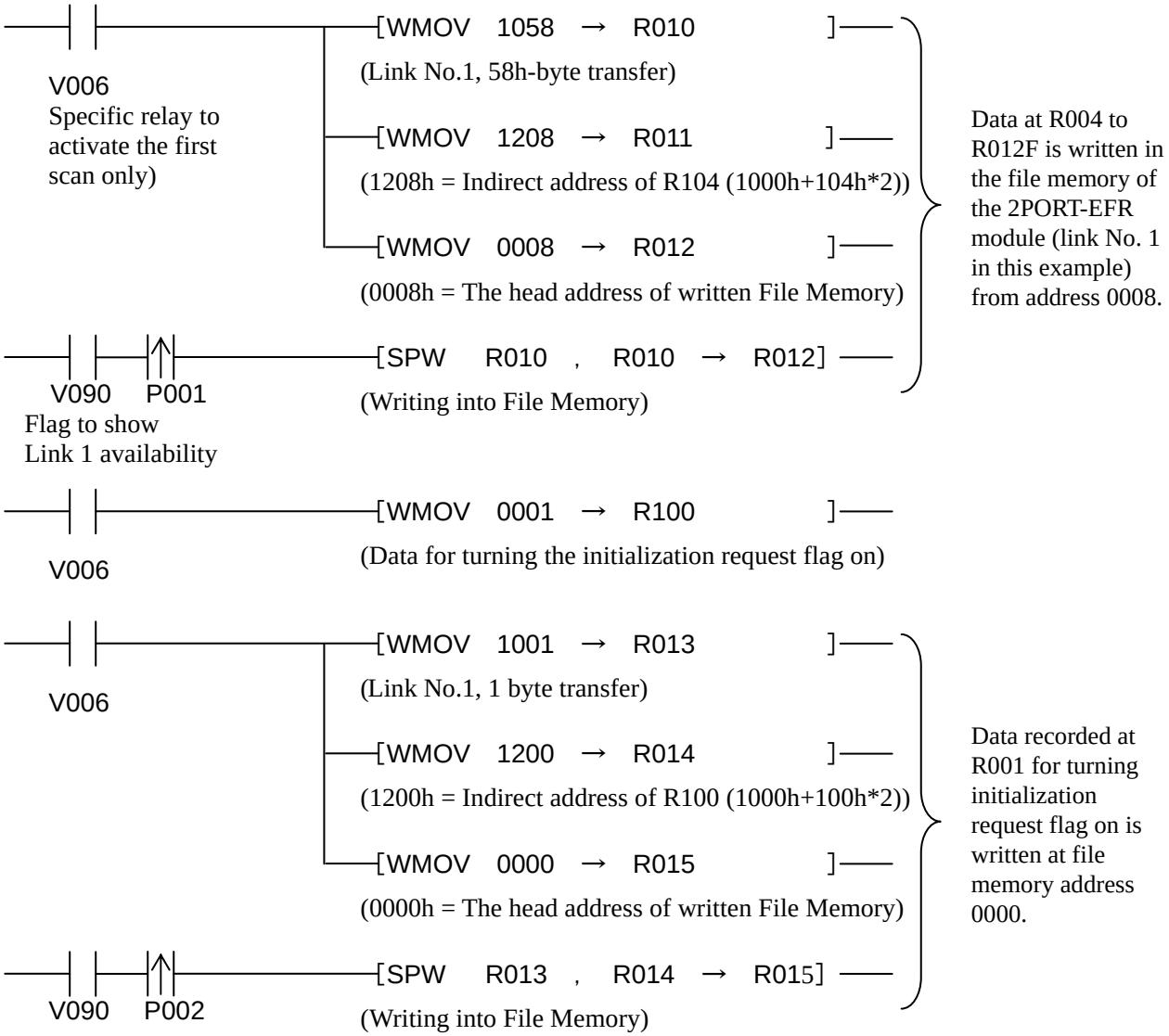
Register Data	Set Data	Data Description
R0104	0102	Your own node IP address (Lower)
R0105	C0A8	Your own node IP address (Higher)
R0106	0307	Using tables (1, 2)/using connections (1 - 3)
R0107	0000	Using connections (9 - 16)
R0108	0000	Connection 1: TCP Active
R0109	1770	Connection 1: Port No.
R010A	0001	Connection 1: Other Node Table No.
R010B	0000	0000 fixed
R010C	0100	Connection 2: TCP Destination-Specified Passive
R010D	1771	Connection 2: Port No.
R010E	0002	Connection 2: Other Node Table No.
R010F	0000	0000 fixed
R0110	0200	Connection 3: TCP Destination-Specified Passive
R0111	1772	Connection 3: Port No.
R0112	0000	Connection 3: Other Node Table No.(N/A)
R0113	0000	0000 fixed
R0114 | R0127	0000 | 0000	(No parameters are set, for connections 4 to 8 are unused.)
R0128	0101	Other Node Table 1: Other Node IP Address (Lower)
R0129	C0A8	Other Node Table 1: Other Node IP Address (Higher)
R012A	1F40	Other Node Table 1: Other Node Port No.
R012B	0000	0000 fixed
R012C	0103	Other Node Table 2: Other Node IP Address (Lower)
R012D	C0A8	Other Node Table 2: Other Node IP Address (Higher)
R012E	1F41	Other Node Table 2: Other Node Port No.
R012F	0000	0000 fixed

Caution) Since CPU Module register data are 16-bit word data, File Memory by 2 bytes is represented by one register datum.

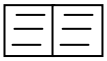
■ An example of sequence program for transferring I/O parameters to 2PORT-EFR module and turning initialization request flag on

A function instruction, SPW, is used to transfer the I/O parameters recorded at registers to the 2PORT-EFR module. For the SPW command, see Reference 1 at the end of this manual.

An example is given below where the I/O parameters as shown in the previous page are written in the file memory of the 2PORT-EFR module and the initialization request flag turned on.



As I/O parameters are normally set and the initialization request flag turned on, the 2PORT-EFR module becomes capable of normally communicating and all LEDs at the front of the module go off. Any I/O parameter has been set to a wrong value, 'E6' appears on the LED display at the front of the module and the CPU module has a communication error. Check I/O parameters in accordance with 7-4 'Communication Errors.'

If I/O parameters are not normally written or the Initialization request flag not turned on due to a sequence program error or the CPU module does not run due to a failure or setting error, the LED display at the front of the module remains showing  .

Note: When a PC3J series CPU has been used in a mode other than PC2 compatible, programs 2 and 3 do not run unless the program execution mode is selected to be 'effective' with CPU operation mode parameter.

■ File memory communication parameter setting address

	bit7							bit0	
0000	8	(00 fixed)						1	1:Initialization Request 8:Parameter area read-only(1:Release 0: read-only)
0001	8	7	6	5	4	3	2	1	1-8:Connections 1-8 Active Open Request (1:Request)
0002	8	7	6	5	4	3	2	1	1-8:Connections 1-8 Transmission Request (1:Request)
0003	8	7	6	5	4	3	2	1	1-8:Connections 1-8 Reception Request (1:Confirmation)
0004	(00 fixed)						2	1	1:Error Log Reception Confirmation, 2:ICMP Log Reception Confirmation
0005	(00 fixed)								
0006	(00 fixed)								
0007	(00 fixed)								
0008	Own Node IP Address 00000001 - FFFFFFE (Lower)								
0009									
000A									
000B	(Higher)								
000C	8	7	6	5	4	3	2	1	1-8:Connection Used (1:Use)
000D	8	7	6	5	4	3	2	1	1-16:Table Used (1:Use)
000E	16	15	14	13	12	11	10	9	
000F	(00 fixed)								
0010	Connection No.1	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0011									
0012		Own Node Port No. 0401h - FFFEh (Lower)							
0013		(Higher)							
0014		Other Node Table No.. 0001h - 0010h (Lower)							
0015		(Higher)							
0016		General communication setting 00h or FFh							
0017		(00 fixed)							
0018	Connection No.2	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0019									
001A		Own Node Port No. 0401h - FFFEh (Lower)							
001B		(Higher)							
001C		Other Node Table No.. 0001h - 0010h (Lower)							
001D		(Higher)							
001E		General communication setting 00h or FFh							
001F		(00 fixed)							
0020	Connection No.3	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0021									
0022		Own Node Port No. 0401h - FFFEh (Lower)							
0023		(Higher)							
0024		Other Node Table No.. 0001h - 0010h (Lower)							
0025		(Higher)							
0026		General communication setting 00h or FFh							
0027		(00 fixed)							
0028	Connection No.4	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0029									
002A		Own Node Port No. 0401h - FFFEh (Lower)							
002B		(Higher)							
002C		Other Node Table No.. 0001h - 0010h (Lower)							
002D		(Higher)							
002E		General communication setting 00h or FFh							
002F		(00 fixed)							
0030	Connection No.5	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0031									
0032		Own Node Port No. 0401h - FFFEh (Lower)							
0033		(Higher)							
0034		Other Node Table No.. 0001h - 0010h (Lower)							
0035		(Higher)							
0036		General communication setting 00h or FFh							
0037		(00 fixed)							

0038	Connection No.6	Connection opening method		TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0039				
003A		Own Node Port No. 0401h - FFFEh	(Lower)	
003B			(Higher)	
003C		Other Node Table No.. 0001h - 0010h	(Lower)	
003D			(Higher)	
003E		General communication setting 00h or FFh		
003F		(00 fixed)		
0040	Connection No.7	Connection opening method		TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0041				
0042		Own Node Port No. 0401h - FFFEh	(Lower)	
0043			(Higher)	
0044		Other Node Table No.. 0001h - 0010h	(Lower)	
0045			(Higher)	
0046		General communication setting 00h or FFh		
0047		(00 fixed)		
0048	Connection No.8	Connection opening method		TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0049				
004A		Own Node Port No. 0401h - FFFEh	(Lower)	
004B			(Higher)	
004C		Other Node Table No. 0001h - 0010h	(Lower)	
004D			(Higher)	
004E		General communication setting 00h or FFh		
004F		(00 fixed)		
0050	Table No.1	Other Node IP Address 00000001 - FFFFFFE	(Lower)	
0051				
0052				
0053			(Higher)	
0054		Other Node Port No. 0401h - FFFEh	(Lower)	
0055			(Higher)	
0056		(00 fixed)		
0057				
0058	Table No.2	Other Node IP Address 00000001 - FFFFFFE	(Lower)	
0059				
005A				
005B			(Higher)	
005C		Other Node Port No. 0401h - FFFEh	(Lower)	
005D			(Higher)	
005E		(00 fixed)		
005F				
0060	Table No.3	Other Node IP Address 00000001 - FFFFFFE	(Lower)	
0061				
0062				
0063			(Higher)	
0064		Other Node Port No. 0401h - FFFEh	(Lower)	
0065			(Higher)	
0066		(00 fixed)		
0067				
0068	Table No.4	Other Node IP Address 00000001 - FFFFFFE	(Lower)	
0069				
006A				
006B			(Higher)	
006C		Other Node Port No. 0401h - FFFEh	(Lower)	
006D			(Higher)	
006E		(00 fixed)		
006F				

0070	Table No.5	Other Node IP Address 00000001 - FFFFFFFE	(Lower)
0071			
0072			
0073			(Higher)
0074		Other Node Port No. 0401h - FFFEh	(Lower)
0075			(Higher)
0076		(00 fixed)	
0077			
0078	Table No.6	Other Node IP Address 00000001 - FFFFFFFE	(Lower)
0079			
007A			
007B			(Higher)
007C		Other Node Port No. 0401h - FFFEh	(Lower)
007D			(Higher)
007E		(00 fixed)	
007F			
0080	Table No.7	Other Node IP Address 00000001 - FFFFFFFE	(Lower)
0081			
0082			
0083			(Higher)
0084		Other Node Port No. 0401h - FFFEh	(Lower)
0085			(Higher)
0086		(00 fixed)	
0087			
0088	Table No.8	Other Node IP Address 00000001 - FFFFFFFE	(Lower)
0089			
008A			
008B			(Higher)
008C		Other Node Port No. 0401h - FFFEh	(Lower)
008D			(Higher)
008E		(00 fixed)	
008F			
0090	Table No.9	Other Node IP Address 00000001 - FFFFFFFE	(Lower)
0091			
0092			
0093			(Higher)
0094		Other Node Port No. 0401h - FFFEh	(Lower)
0095			(Higher)
0096		(00 fixed)	
0097			
0098	Table No.10	Other Node IP Address 00000001 - FFFFFFFE	(Lower)
0099			
009A			
009B			(Higher)
009C		Other Node Port No. 0401h - FFFEh	(Lower)
009D			(Higher)
009E		(00 fixed)	
009F			
00A0	Table No.11	Other Node IP Address 00000001 - FFFFFFFE	(Lower)
00A1			
00A2			
00A3			(Higher)
00A4		Other Node Port No. 0401h - FFFEh	(Lower)
00A5			(Higher)
00A6		(00 fixed)	
00A7			

00A8	Table No.12	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00A9			
00AA			
00AB			(Higher)
00AC		Other Node Port No. 0401h - FFFEh	(Lower)
00AD			(Higher)
00AE		(00 fixed)	
00AF			
00B0	Table No.13	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00B1			
00B2			
00B3			(Higher)
00B4		Other Node Port No. 0401h - FFFEh	(Lower)
00B5			(Higher)
00B6		(00 fixed)	
00B7			
00B8	Table No.14	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00B9			
00BA			
00BB			(Higher)
00BC		Other Node Port No. 0401h - FFFEh	(Lower)
00BD			(Higher)
00BE		(00 fixed)	
00BF			
00C0	Table No.15	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00C1			
00C2			
00C3			(Higher)
00C4		Other Node Port No. 0401h - FFFEh	(Lower)
00C5			(Higher)
00C6		(00 fixed)	
00C7			
00C8	Table No.16	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00C9			
00CA			
00CB			(Higher)
00CC		Other Node Port No. 0401h - FFFEh	(Lower)
00CD			(Higher)
00CE		(00 fixed)	
00CF			
00D0	Sub-Net Mask		(Lower)
00D1			
00D2			
00D3			(Higher)
00D4	Gateway IP Address 00000001 - FFFFFFE		(Lower)
00D5			
00D6			
00D7			(Higher)
00D8	(00 fixed)		
00D9			
00DA			
00DB			
00DC			
00DD			
00DE			
00DF			

00E0	Response Timer	(Lower)
00E1		(Higher)
00E2	Non-Reception Timer	(Lower)
00E3		(Higher)
00E4	Resending Timer (Data)	(Lower)
00E5		(Higher)
00E6	Re-transmitted Data (SYN/FIN)	(Lower)
00E7		(Higher)
00E8	Close Timer	(Lower)
00E9		(Higher)
00EA	Packet alive Time	(Lower)
00EB		(Higher)
00EC	IP Assembly Timer	(Lower)
00ED		(Higher)
00EE	Reset wait resending times	(Lower)
00EF		(Higher)
00F0	(00 fixed)	
00F1		
00F2		
00F3		
00F4		
00F5		
00F6		
00F7		
00F8		
00F9		
00FA		
00FB		
00FC		
00FD		
00FE		
00FF		

●Response time
Set in units of second.
(0006h for 6 seconds)

●Non-reception timer
Set in units of second or minute. If set in units of second, the most significant digit of hexadecimal notation should be 1.
Set to 0 if the timer is not to be used.
（101Eh for 30 seconds, 0002h for 2 minutes, 0000h for permanent waiting）

●Resending Timer (Data)/Re-transmitted Data (SYN/FIN)
Set in units of second or 100 ms. If set in units of 100 ms, the most significant digit of hexadecimal notation should be 1.
(1005h for 500 ms, 0002h for 2 seconds)

●Close Timer
Set in units of second.
(0005h for 5 seconds)

●Packet alive Time
Set in units of time.
（000Ah for 10 times）

●IP Assembly Timer
Set in units of time.
（000Ah for 10 times）

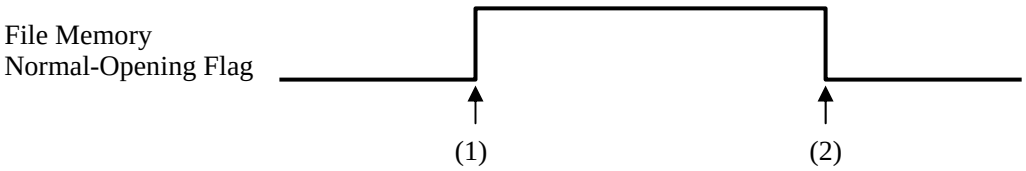
●Reset wait resending times
Set in units of time.
（000Ah for 10 times）

8 Opening/Closing the Ethernet Connections

With the TCP protocol, a connection should be opened before the start of communication. The opening methods include 'passive open' where a connection is opened upon the request from another node and 'active open' where your module requests another node to open the connection. In the specified passive open mode, the connection is only opened when requested by a specified node and, in the non-specified passive open mode, it is opened when requested by any node.
At the end of communication, the connection is closed by the node that opened it.
With the UDP protocol, command/response data can be transmitted and received at any time without opening or closing a connection. The protocol and opening method may be specified by link parameters or with the initialization sequence for each connection.
If the CPU module is reset, TCP connections are reset. Note that, if the CPU module is reset by a command via the 2PORT-EFR module, communication is continued without resetting the connections.

8.1 TCP Passive Opening/Closing

The instant the connection that are set up as TCP Passive with I/O parameters has been initialized, it enters the wait state for an opening request from other nodes.
Then, the connection is opened as the opening request is received from another node and the Normal-Opening flag of the file memory (see Reference 2) and the corresponding LED at the front of the module turn on at the same time.
The connection open status may also be monitored by the status monitor (see 2-2-6). If control input signals to the file memory have been assigned to K30 to K68 as shown in the example of sequence program in Reference 3, the connection open status can be confirmed from the on-status of contacts K38 (connection 1) to K3F (connection 8).

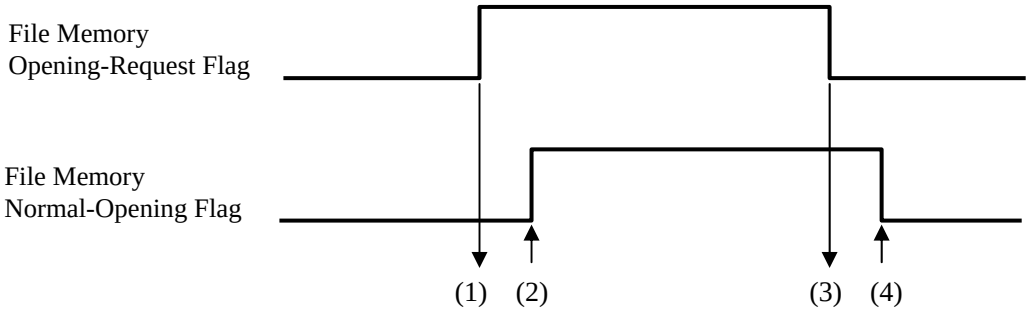


(1) When an opening request from another node is received, the connection is opened to hoist the normal opening flag.
(2) When a closing request from another node is received, the connection is closed to lower the normal opening flag.

8. 2 TCP Active Opening/Closing

After an initialization is completed, an opening request signal is sent toward Other Node designated by Other Node Table No. of I/O parameters, through hoisting Active-Opening Request Flag of File Memory (see Reference 2). Data is written in the file memory with an SPW command. If control input signals to the file memory have been assigned to K30 to K68

as shown in the example of sequence program in Reference 3, the opening request flag turns on as contacts K38 (connection 1) to K3F (connection 8) turn on.
As a connection is normally opened, the Normal-Opening connection flag of the file memory and the corresponding LED at the front of the module turn on at the same time.
The connection open status may also be monitored by the status monitor (see 2-2-6). If any connection cannot be normally opened because the other node does not exist on the line or for another reason, connection error code 4001 appears.



(1) The sequence program turns the opening request flag of the file memory on.

(2) The 2PORT-EFR module opens a connection to the other node and turns the Normal-Opening signal on if the connection is normally opened.

(3) The sequence program turns the opening request flag of the file memory off to close the connection.

(4) The 2PORT-EFR module closes a connection with the other node and turns the Normal-Opening signal off.

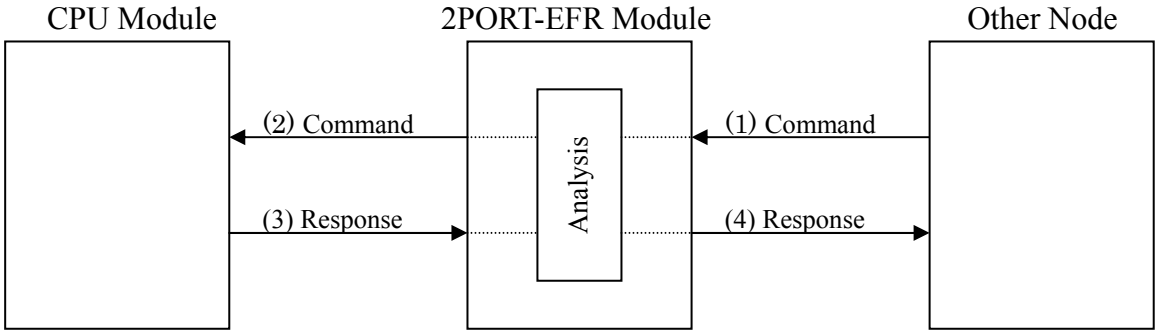
8.3 UDP Connection

With the UDP protocol, connections are not opened/closed and, directly after the completion of initialization, the 'Normal-Opening' connection flag of the file memory and the corresponding LED at the front of the module turn on at the same time to enable the communication.
Note that, with the UDP protocol, the 'Normal-Opening' flag turns on even if the communication line with the other node is not normally connected.

9 Ethernet Computer Linking Method

In this method, a PC or workstation, etc. sends a computer-link command for 2PORT-EFR Module to return a response to it in order to carry out a communication.

Any particular sequence program to process computer-link commands is not required, because 2PORT-EFR Module is responsible for analysing the computer-link commands and for reading & writing the I/O of CPU Module.



9.1 Communication Format of Computer Link Method

Ethernet Header	IP Header	TCP/UDP Header	TOYOPUC Data	Ethernet FCS

Ethernet Header, IP Header, TCP/UDP Header, and Ethernet FCS are generally annexed by communication software automatically.

9.1.1 TOYOPUC Data Field Details

・Command

					Transfer Number ↔
00 (FT)	00	LL	LH	CMD	Command-Field Data

・Response

					Transfer Number ↔
80 (FT)	RC	LL	LH	CMD	Response Data

FT ... Frame Type

RC ... Response Code
(Normally set to 00. If a response code other than 00 is sent back, see 11-5-2 'Error Response Data Error Code Table.')

LL ... Lower Transfer Number

LH ... Higher Transfer Number

CMD ... Command Code

9.2 Address List

9.2.1 PC10 Standard mode, PC3 mode, PC2 Compatible mode

Use the following addresses within the Command-Field Data of computer link, according to each instruction by the word, byte, and bit:

	ID	Designation	Address	Word address	Byte address	Bit address	Program No. (*1)
Bit area	K	Keeping Relay	K000-2FF	0020-004F	0040-009F	0200-04FF	PRG.1→01 PRG.2→02 PRG.3→03
	V	Specific Relay	V000-0FF	0050-005F	00A0-00BF	0500-05FF	
	T/C	Timer Counter	T,C0000-1FF	0060-007F	00C0-00FF	0600-07FF	
	L	Link Relay	L000-7FF	0080-00FF	0100-01FF	0800-0FFF	
	X/Y	I/O Relay	X,Y000-7FF	0100-017F	0200-02FF	1000-17FF	
	M	Internal Relay	M000-7FF	0180-01FF	0300-03FF	1800-1FFF	
Word area	S	Specific Register	S0000-03FF	0200-05FF	0400-0BFF	-	
	N	T.C Recent Value	N0000-01FF	0600-07FF	0C00-0FFF	-	
	R	Link Register	R0000-07FF	0800-0FFF	1000-1FFF	-	
	D	Data Register	D0000-2FFF	1000-3FFF	2000-7FFF	-	
	B	File Register	B0000-1FFF	6000-7FFF	C000-FFFF	-	
Expansion bit area	EK	Expansion Keep Relay	EK000-FFF	0100-01FF	0200-03FF	1000-1FFF	00
	EV	Expansion Special Relay	EV000-FFF	0200-02FF	0400-05FF	2000-2FFF	
	ET/EC	Expansion Timer/Counter	ET,EC000-7FF	0300-037F	0600-06FF	3000-37FF	
	EL	Expansion Link Relay	EL000-1FFF	0380-057F	0700-0AFF	3800-57FF	
	EX/EY	Expansion Input/Output	EX,EY000-7FF	0580-05FF	0B00-0BFF	5800-5FFF	
	EM	Expansion Internal Relay	EM000-1FFF	0600-07FF	0C00-0FFF	6000-7FFF	
Expansion word area	ES	Expansion Special Register	ES000-07FF	0800-0FFF	1000-1FFF	-	
	EN	Expansion Current Value Register	EN0000-07FF	1000-17FF	2000-2FFF	-	
	H	Expansion Preset Value Register	H0000-07FF	1800-1FFF	3000-3FFF	-	
	U	Expansion Data Register	U0000-7FFF	0000-7FFF	0000-FFFF	-	08
Exp bit area2	GX/GY	Expansion Input/Output	GX,GY0000-FFFF	0000-0FFF	0000-1FFF	-	07
	GM	Expansion Internal Relay	GM0000-FFFF	0000-0FFF	2000-3FFF	-	
Expansion word area2	EB	Expansion File Register	EB00000-07FFF	0000-7FFF	0000-FFFF	-	09
			EB08000-0FFFF	0000-7FFF	0000-FFFF	-	0A
			EB10000-17FFF	0000-7FFF	0000-FFFF	-	0B
			EB18000-1FFFF	0000-7FFF	0000-FFFF	-	0C

(*1: Used with PC3J expansion command)

For example, if you access Register D0100 via a command that reads/writes the I/O register word, specify the address as "1000H (word address of Register D0000) + 100H = 1100H (lower address:00H, higher address:11H)." Likewise, if you read/write the I/O register byte from/into the same Register D0100, designate the address as "2000H (byte address of Register D0000) + 200H (100H*2) = 2200H (lower address:00H, higher address:22H)."

(Multiplying an address by 2 is necessary because D register has a 16-bit word unit.)

9.2.2 PC10 mode

Please use the address used in the command data of the computer link by the unit (unit of the word, unit of the byte, and unit of the bit) specified by each instruction. (A long unit becomes the same to unit of the word specification.)

Unit of bit

Example) P1-M1000

1) Reference) The bit address is acquired from the address table. (0x61800 is stored in 0bit to 18bit.)

2) Reference) Ex No. (*) is acquired from the address table. (0x0D is stored in 19bit to 26bit.)

3) The bit address is calculated from 32 bit data (0x006E1800).

31 30 29 28 27	26 25 24 23 22 21 20 19	18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
0 fix	Ex No.(0x0D)	Bit Address (0x61800)
0 0 0 0 0	0 0 0 0 1 1 0 1	1 1 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0
0	0 6	E 1 8 0 0
Upper WORD Upper Address	Upper WORD Lower Address	Lower WORD Upper Address / Lower WORD Lower Address

Unit of byte

Example) P2-D2000

1) Reference) Byte address is acquired from the address table. (Even the 15th bit from the 0th bit stores 0x6000.)

2) Reference) Ex No. (*) is acquired from the address table. (Even the 23rd bit from the 16th bit stores 0x0E.)

3) The bit address is calculated from 32 bit data (0x000E6000)

31 30 29 28 27 26 25 24	23 22 21 20 19 18 17 16	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
0 fix	Ex No.(0x0E)	Byte Address ｱﾄﾞﾚｽ(0x6000)
0 0 0 0 0 0 0 0	0 0 0 0 1 1 1 0	0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0	0 E	6 0 0 0
Upper WORD Upper Address	Upper WORD Lower Address	Lower WORD Upper Address / Lower WORD Lower Address

* Please refer to " Reference 11 the Ex number" for Ex. No.

9.3 Command List

If you use PC2J-Series CPU Module or PC2-Interchangeable PC3J-CPU, commands only No.1 to 31 are available.

If you use PC3-Mode PC3J-CPU Module with the commands No.1-31 issued; the program that has program No. where 2PORT-EFR Module is allocated, I/O, and register are processed. To read/write the expansion field data or the program parameters that have different parameter Nos., use the expansion commands No.32 - 42.

No.	Function	Command Code (HEX)	Sub-command
1	Reading Sequence Program Word	18	NO
2	Writing Sequence Program Word	19	NO
3	Reading I/O Register Word	1C	NO
4	Writing I/O Register Word	1D	NO
5	Reading I/O Register Byte	1E	NO
6	Writing I/O Register Byte	1F	NO
7	Reading I/O Register Bit	20	NO
8	Writing I/O Register Bit	21	NO
9	Reading I/O Register Multi-Point Word	22	NO
10	Writing I/O Register Multi-Point Word	32	NO
11	Reading I/O Register Multi-Point Byte	24	NO
12	Writing I/O Register Multi-Point Byte	25	NO
13	Reading I/O Register Multi-Point Bit	26	NO
14	Writing I/O Register Multi-Point Bit	27	NO
15	Reading Parameter	30	NO
16	Writing Parameter	31	NO
17	Reset	32	00, 00
18	Scan Resumption	32	01, 00
19	Scan Stop, Stop Break	32	02, 00
20	Pseudo-Scan Stop, Break	32	03, 00
21	Reading CPU Status	32	11, 00
22	Reading Execution Priority Steady State	32	21, 00
23	Execution Priority Restricting Configuration	32	22, 00

Function Call

	No.	Function		Command Code (HEX)	Sub-command
Function Call	24	Fill		32	32, 00
	25	Reading Set Values & Recent Values of Timer & Counter		32	40, 00
	26	Writing Set Values & Recent Values of Timer & Counter		32	41, 00
	27	Writing Set Values of Timer & Counter		32	42, 00
	28	Writing Recent Values of Timer & Counter		32	43, 00
	29	Reading Clock Time		32	70, 00
	30	Setting Clock Time		32	71, 00
	31	Relay Command		60	NO
	32	Reading Program Expansion Word	*1	90	NO
	33	Writing Program Expansion Word	*1	91	NO
	34	Reading Parameter Expansion	*1	92	NO
	35	Writing Parameter Expansion	*1	93	NO
	36	Reading Data Expansion Word	*1	94	NO
	37	Writing Data Expansion Word	*1	95	NO
	38	Reading Data Expansion Byte	*1	96	NO
	39	Writing Data Expansion Byte	*1	97	NO
	40	Reading Data Expansion Multi-Point	*1	98	NO
	41	Writing Data Expansion Multi-Point	*1	99	NO
	42	Expansion Function Call	*1	A0	*3
	43	PC10 data byte reading	*2	C2	NO
	44	PC10 data byte writing	*2	C3	NO
	45	PC10 multi-point reading	*2	C4	NO
	46	PC10 multi-point writing	*2	C5	NO
	47	PC10 FR register registration	*2	CA	NO

*1: Exclusive command for PC3J

*2: Only the PC10 series can be used.

*3: Identical to the subcommand of function call (command code 32)

9.4 Limited Numbers of Read/Written Data Records and 2PORT-EFR Modules

The number of data records that can be read/written with commands and that of 2PORT-EFR modules (in Ethernet mode) that can be mounted are limited according to the CPU module type. They should not exceed the numbers shown below.

	CPU module	
	PC3JG, PC3JG-P PC3JP, PC3JP-GP PC3JD ver 2.0 or subsequent PC3JM, PC3JL Mx, PC2J series	PC3J-CPU PC3JNM PC3JD ver 1.10 or earlier
Relay commands	512 bytes or 256 words	512 bytes or 256 words
Other than relay commands	Maximum data size for each command	512 bytes or 256 words
Number of Ethernet modules that can be mounted *1	Up to 8	Only one

(As of January, '06)

*1 The number of mounting of EN-I/F T and FL/ET(-net5,-T-V2) used in the "Ethernet mode" is contained.

9.5 Caution in Changing the CPU Module Parameters with Commands via Ethernet

Do not change the program or link No. to which the 2PORT-EFR itself has been assigned, using the Write Parameter command via the 2PORT-EFR module.
If you do so, the 2PORT-EFR module and CPU module cannot communicate with each other and an error may occur.
In this case, shut the module off once.

9.6 Ethernet Command/Response Data Format

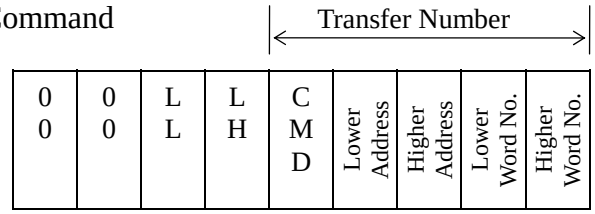
1. Reading Sequence Program Word (CMD = 18H)

(1) Function

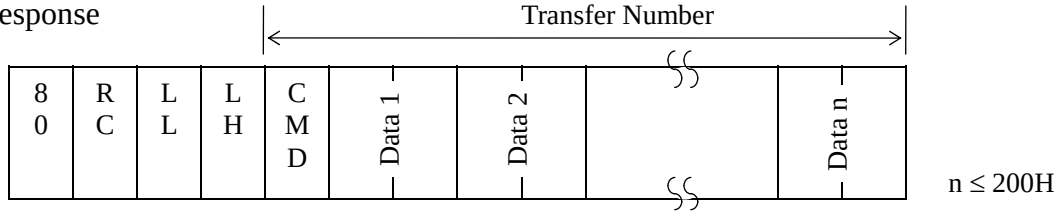
Reading the program memory by the word block

(2) Message format

・Command



・Response



n ≤ 200H

(Example)

A command to read out sequence program at the 0th operand by one word

00. 00. 05. 00. 18. 00. 00. 01. 00

The response to the 0th operand read as NOP

80. 00. 03. 00. 18. 00. 00

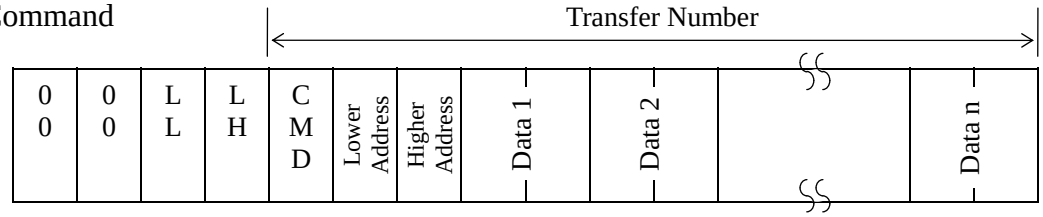
2. Writing Sequence Program Word (CMD = 19H)

(1) Function

Writing the program memory by the word block

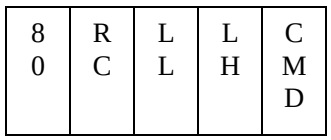
(2)Message format

・Command



n ≤ 200H

・Response



(Example)

A command to write NOP (code:0000) into sequence program at the 1st operand

00. 00. 05. 00. 19. 01. 00. 00. 00

Response

80. 00. 01. 00. 19

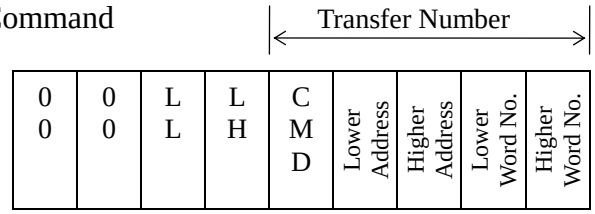
3. Reading I/O Register Word (CMD = 1CH)

(1) Function

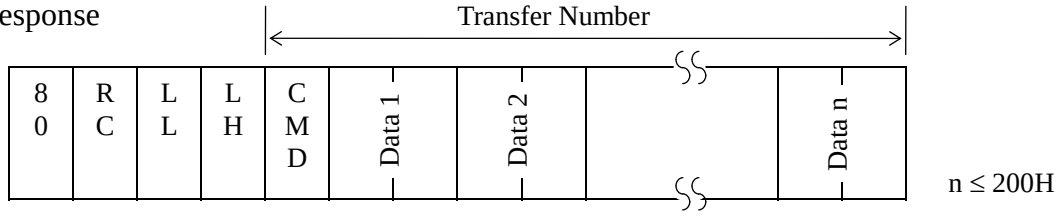
Reading out the data memory by the word block

(2) Message format

・Command



・Response



n ≤ 200H

(Example)

A command to read out data registers D0100-D0102

00. 00. 05. 00. 1C. 00. 11. 03. 00

Command Code

Data 1

Word Address of D0100

Response to D0100=0100, D0101=0302, D0102=0504

80. 00. 07. 00. 1C. 00. 01. 02. 03. 04. 05

D0100 D0101 D0102

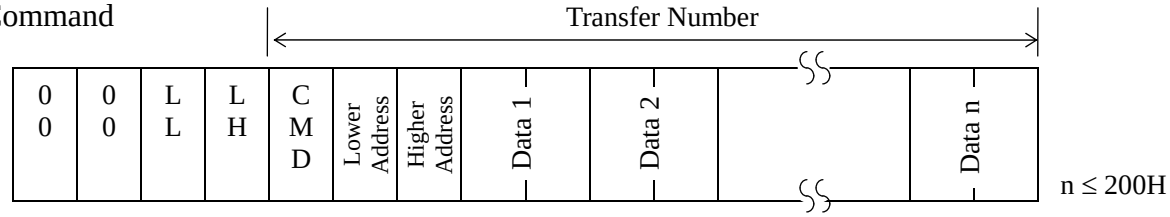
4. Writing I/O Register Word (CMD = 1DH)

(1) Function

Writing the data memory by word block

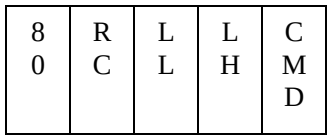
(2)Message format

・Command



n ≤ 200H

・Response



(Example)

A command to write the data, 0001, 0203, and 0405, into data registers D0100-D0102

00. 00. 09. 00. 1D. 00. 11. 01. 00. 03. 02. 05. 04

Command Code | Data 1 | Data 2 | Data 3

Word Address of D0100

Response

80. 00. 01. 00. 1D

5. Reading I/O Register Byte (CMD = 1EH)

(1) Function

Reading out the data memory by the byte block

(2) Message format

・Command

Transfer Number

00	00	LL	LH	CMD	Lower Address	Higher Address	Lower Word No.	Higher Word No.

・Response

Transfer Number

80	RC	LL	LH	CMD	Data 1	Data 2	Data 3	Data 4		Data n

n ≤ 400H

(Example)

A command to read out data registers D0100L-D0102L

00. 00. 05. 00. 1E. 00. 22. 05. 00

5 Bytes

Byte Address of D0100

The response to D0100L=01, D0100H=02, D0101L=03, D0101H=04, D0102L=05

80. 00. 06. 00. 1E. 01. 02. 03. 04. 05

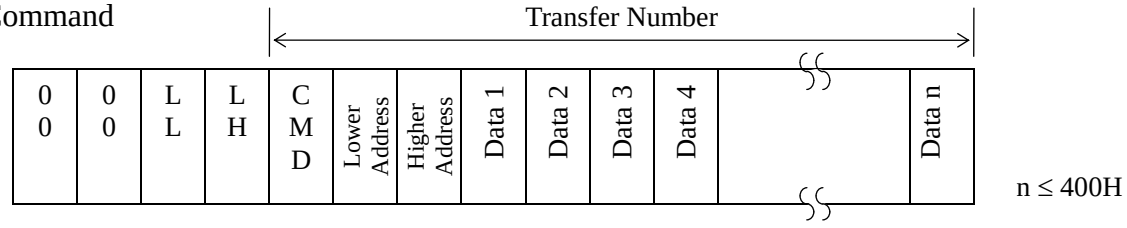
6. Writing I/O Register Byte (CMD = 1FH)

(1) Function

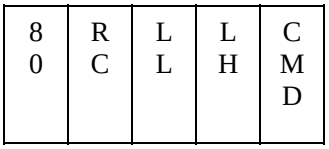
Writing the data memory by the byte block

(2) Message format

・Command



・Response



(Example)

A command to write data, 01,02,03,04,and 05, into data registers D0100L-D0102L

00. 00. 08. 00. 1F. 00. 22. 01. 02. 03. 04. 05

Response

80. 00. 01. 00. 1F

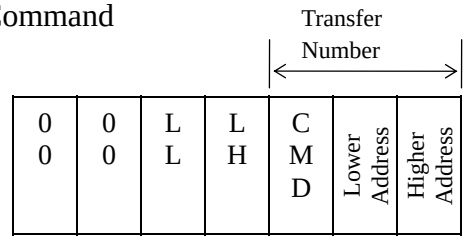
7. Reading I/O Register Bit (CMD = 20H)

(1) Function

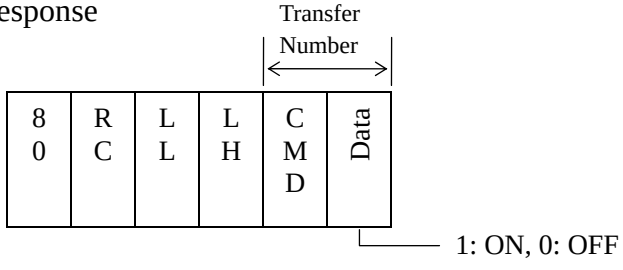
Reading out the data memory at its bit area by one bit
Reading out image memory data for external I/O

(2) Message format

・Command



・Response



(Example)

A command to read out the state of internal relay M0201

00. 00. 03. 00. 20. 01. 1A

Command Code — Bit Access Relative Address

The response to M0201 at ON

80. 00. 02. 00. 20. 01

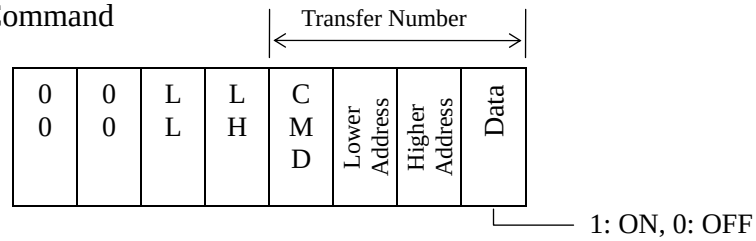
8. Writing I/O Register Bit (CMD = 21H)

(1) Function

Writing the data memory at its bit area by one bit
Writing an image and an output card for external I/O

(2) Message format

・Command



・Response

80	RC	LL	LH	CMD

(Example)

A command to turn on internal relay M0201

00. 00. 04. 00. 21. 01. 1A. 01

Command Code — Bit Address of M0201 — ON Signal

Response

80. 00. 01. 00. 21

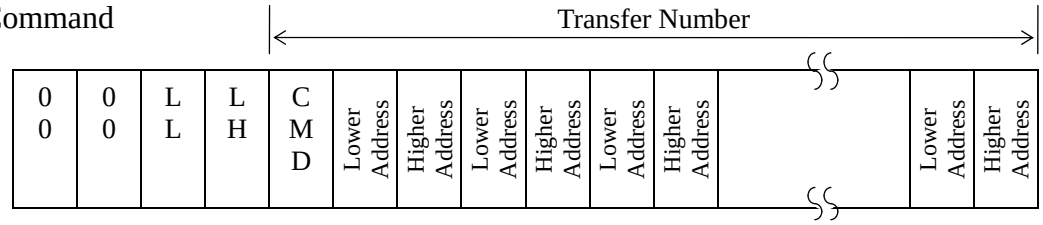
9. Reading I/O Register Multi-Point Word (CMD = 22H)

(1) Function

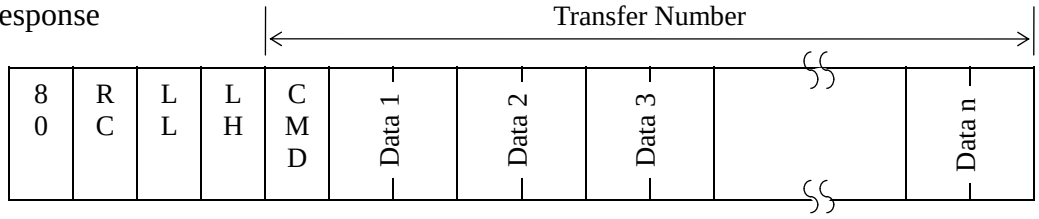
Reading out data memory at multiple points by the word

(2) Message format

・Command



・Response



n ≤ 80H

(Example)

A command to read out the data of data registers D0100,D0200,and D0210

00. 00. 07. 00. 22. 00. 11. 00. 12. 10. 12

Word Access Address of Each Data

The response to D0100=1234, D0200=5678, D210=9ABC

80. 00. 07. 00. 22. 34. 12. 78. 56. BC. 9A

Transfer Number

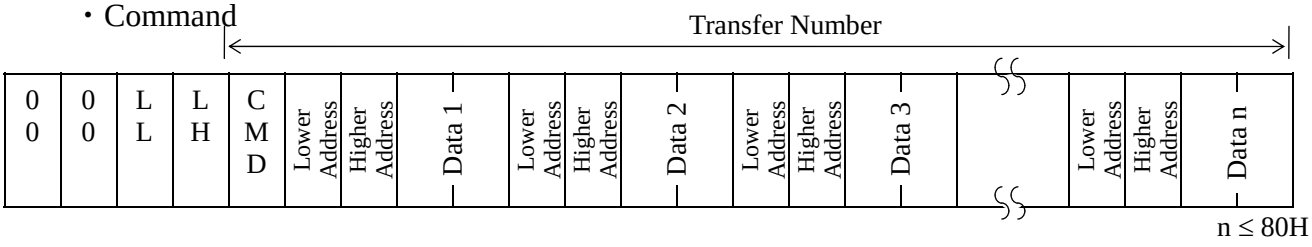
10. Writing I/O Register Multi-Point Word (CMD = 23H)

(1) Function

Writing the data memory at multiple points by the word

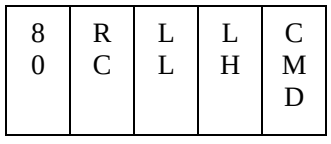
(2) Message format

・Command



n ≤ 80H

・Response



(Example)

A command to write 1234 into data register D0100, 5678 into D0210, and 9ABC into D0210

00. 00. 0D. 00. 23. 00. 11. 34. 12. 00. 12. 78. 56.
10. 12. BC. 9A

Response

80. 00. 01. 00. 23

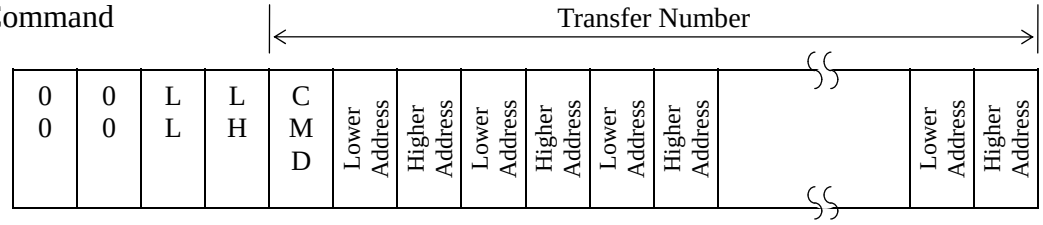
11. Reading I/O Register Multi-Point Byte (CMD = 24H)

(1) Function

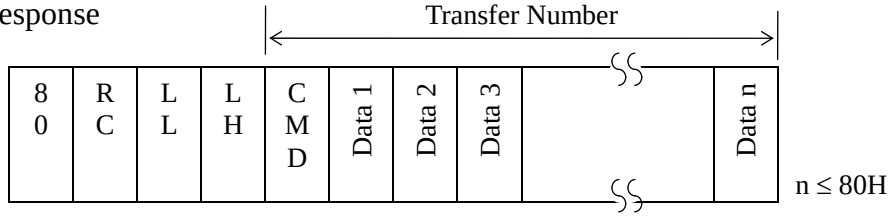
Reading out the data memory at multiple points by the byte

(2) Message format

・Command



・Response



n ≤ 80H

(Example)

A command to read out D800L & D802L

00. 00. 05. 00. 24. 00. 30. 04. 30

The response to D800L=56h, D802L=12h

80. 00. 03. 00. 24. 56. 12

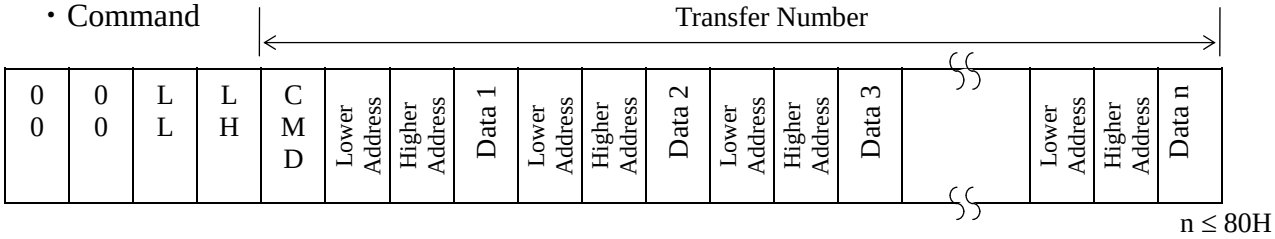
12. Writing I/O Register Multi-Point Byte (CMD = 25H)

(1) Function

Writing the data memory by the byte

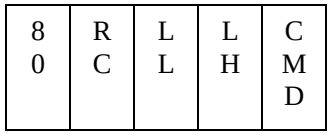
(2) Message format

・Command



n ≤ 80H

・Response



(Example)

A command to write 56h into D800L and 12h into D802L

00. 00. 07. 00. 25. 00. 30. 56. 04. 30. 12

Response

80. 00. 01. 00. 25

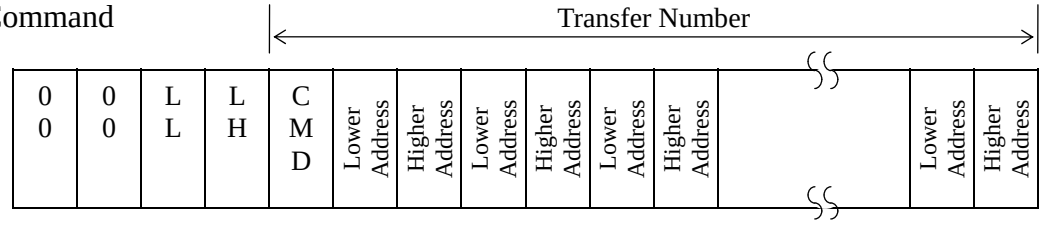
13. Reading I/O Register Multi-Point Bit (CMD = 26H)

(1) Function

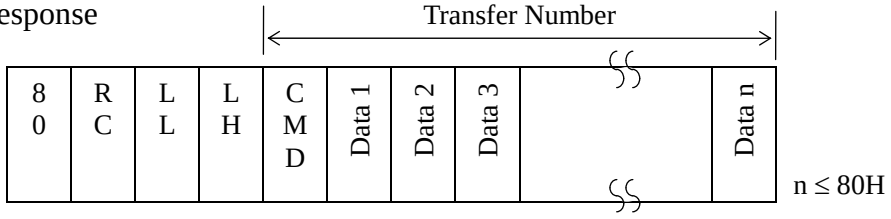
Reading out the data memory at its multiple points by the bit

(2) Message format

・Command



・Response



n ≤ 80H

(Example)

A command to read out M400 & M402

00. 00. 05. 00. 26. 00. 1C. 02. 1C

The response to M400 at ON and M402 at OFF

80. 00. 03. 00. 26. 01. 00

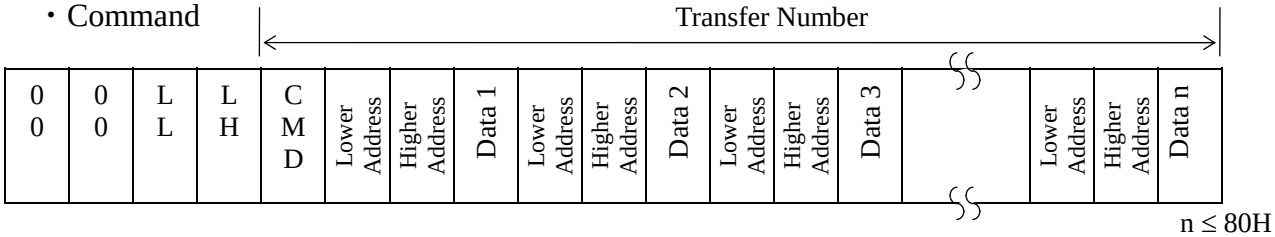
14. Writing I/O Register Multi-Point Bit (CMD = 27H)

(1) Function

Writing the data memory by the bit

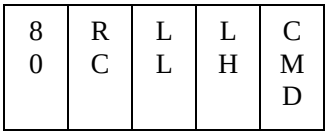
(2) Message format

・Command



n ≤ 80H

・Response



(Example)

A command to turn on M400 and off M402

00. 00. 07. 00. 27. 00. 1C. 01. 02. 1C. 00

Response

80. 00. 01. 00. 27

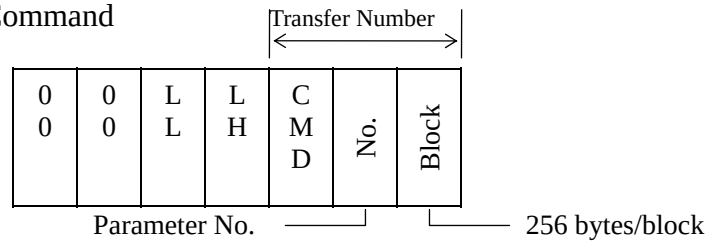
15. Reading Parameter (CMD = 30H)

(1) Function

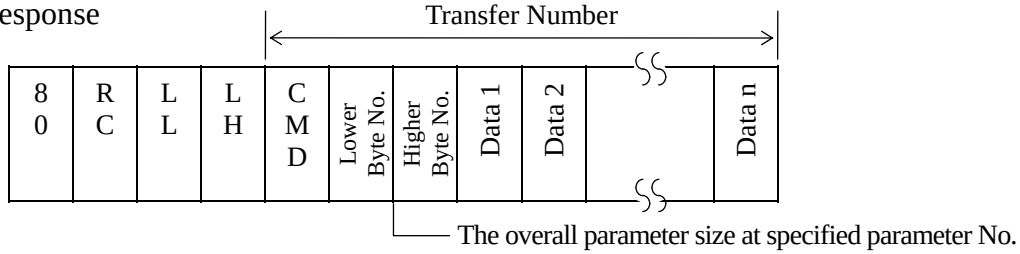
Reading out the parameter field

(2) Message format

・Command



・Response



(Example)

A command to read out parameter No.3 at block No.0 (i.e., program capacity parameter)

00. 00. 03. 00. 30. 03. 00

The response to program capacity 8 kilobytes

80. 00. 04. 00. 30. 01. 00. 08

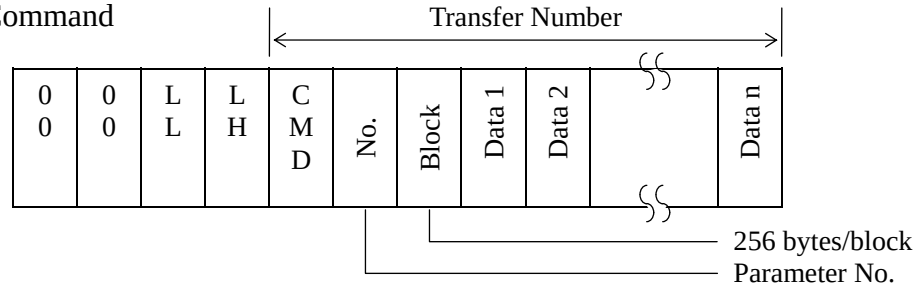
16. Writing Parameter (CMD = 31H)

(1) Function

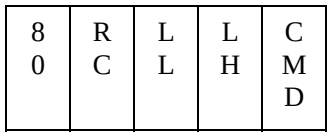
Writing the parameter field and calculating the parameter check sum

(2) Message format

・Command



・Response



(Example)

A command to write 8 (kilobytes) into parameter No.3 at block No.0

00. 00. 04. 00. 31. 03. 00. 08

Response

80. 00. 01. 00. 31

17. Reset (CMD = 32)

(1) Function

Resetting the CPU Module

(2) Message format

・Command

00	00	LL	LH	CMD	00	00

(Example) Command

00. 00. 03. 00. 32. 00. 00

・Response

80	RC	LL	LH	CMD	00	00

(Example) Response

80. 00. 03. 00. 32. 00. 00

After issuing this command, release a scan resumption command to resume scanning.

Caution:

Though issue of this command via Ethernet resets CPU Module, it won't reset the 2PORT-EFR module itself. So care should be taken to the following:

- All the connections the 2PORT-EFR module was communicating with proceed to their communication without being closed/reset after a reset command execution.
- Since the process of a computer link command is aborted temporarily during the reset process of CPU Module, the response can delay up to 200 ms.
- If the scan is resumed via a scan resumption command after a reset command has been executed, the initial sequence program (a sequence program preceding the START Command) runs likewise as an ordinary reset/start in order for V06 (a specific relay to activate only the first scan) to activate the first scan only.
- If any sequence program to initialize and configure 2PORT-EFR Module runs after a scan resumption, the program is ignored by the 2PORT-EFR Module. Accordingly, even if the initial parameters of the 2PORT-EFR Module are modified, the configuration of the 2PORT-EFR Module won't be refreshed. (By turning off then on the power or by resetting/raising the CPU Module via a peripheral device or through the reset/start switch, you can validate the modified initial parameters.)
- If the communication was accompanied by File Memory Method where the sequence program is responsible for the communication, faulty communication may result because of initialized sequence scan.

⚠ Warning

Make sure that safety is secured through ascertaining whether there are no people within or around the equipment and whether the equipment is free from any possible event — if you are at a site apart form the equipment — prior to module reset, scan stopping, or scan resumption via Ethernet.

18. Scan Resumption (CMD = 32)

(1) Function

Resuming a CPU scan.

(2) Message format

・Command

00	00	LL	LH	CMD	01	00

(Example) Command

00. 00. 03. 00. 32. 01. 00

・Response

80	RC	LL	LH	CMD	01	00

(Example) Response

80. 00. 03. 00. 01. 00

19. Scan Stop, Stop Break (CMD = 32)

(1) Function

Stopping a CPU scan or breaking the stop

(2) Message format

・Command

00	00	LL	LH	CMD	02	00	OP1

OP1	Operation
00	Scan-Stop Break
01	Scan Stop

Caution) To resume scanning, issue a Scan Resumption command after a Scan-Stop Break.

・Response

80	RC	LL	LH	CMD	02	00

(Example)

A command to stop scanning

00. 00. 04. 00. 32. 02. 00. 01

Response

80. 00. 03. 00. 32. 02. 00

20. Pseudo-Scan Stop, Break (CMD = 32)

(1) Function

Aborting a CPU scan (with RUN output ON) or breaking the abort

(2) Message format

・Command

00	00	LL	LH	CMD	03	00	OP1

OP1	Operation
00	Break of Abort
01	Abort

Caution) Break an abort to resume scanning.

・Response

80	RC	LL	LH	CMD	03	00

(Example)

A command to abort

00. 00. 04. 00. 32. 03. 00. 01

Response

80. 00. 03. 00. 32. 03. 00

21. Reading CPU Status (CMD = 32)

(1) Function

Reading out the status information of CPU operation

(2) Message format

・Command

00	00	LL	LH	CMD	11	00

・Response

80	RC	LL	LH	CMD	11	00	Data 1	Data 2		Data 8

bit		Description	bit		Description
Data 1	7	RUN	Data 5	7	Trace
	6	Under a stop		6	Scan sampling trace
	5	Under stop-request continuity		5	Periodic sampling trace
	4	Under a pseudo-stop		4	"Enable" detected
	3	Debug mod		3	Trigger detected
	2	I/O monitor user mode		2	One scan step
	1	PC3 mode		1	One block step
	0			0	One instruction step
Data 2	7	Fatal failure	Data 6	7	I/O off-line
	6	Faint failure		6	Remote RUN setting
	5	Alarm		5	Status latch setting
	4			4	
	3	I/O allocation parameter altered		3	
	2	With a memory card		2	
	1			1	
	0			0	
Data 3	7	Memory card operation	Data 7	7	
	6	Write-protected program and supplementary information		6	Write-priority limited program and supplementary information
	5			5	
	4			4	
	3			3	
	2			2	
	1			1	Abnormal write during RUN *
	0			0	Under writing during RUN *
Data 4	7	Read-protected system memory	Data 8	7	
	6	Write-protected system memory		6	
	5	Read-protected system I/O		5	
	4	Write-protected system I/O		4	
	3			3	Under program 3 running *
	2			2	Under program 2 running *
	1			1	Under program 1 running *
	0			0	

*: Exclusive for PC3J

(Example)

A command

00. 00. 03. 00. 32. 11. 00

The response to normal RUN state

80. 00. 0B. 00. 32. 11. 00. 80. 00. 00. 00. 00. 00. 00. 00

22. Reading Execution Priority Steady State (CMD = 32)

(1) Function

Reading out the source that requests for a execution-priority limitation

(2) Message format

・Command

00	00	LL	LH	CMD	21	00

・Response

80	RC	LL	LH	CMD	21	00	Data 1	Data 2		Data 6	Data 7	Data 8

Only Data 7 used with the others unused
Showing the source that requests for a write-priority limitation on program and supplementary information

00 ..... Peripheral device
01-08 ..... Link No.
09 ..... PC2JC (incorporated computer link)
FF ..... No

Caution)

If any Error Code 35 is returned to the Host in attempting to write a program and its complementary information into CPU via a computer link command:
(A) Read out the peripheral device that restricts the execution priority and read out its Link No. with the link command and
(B) Reset the Execution Priority Restricting Configuration with the device that is responsible for Configuring the Execution Priority Restriction so as to
(C) Write such program, etc.
For instance:
In case an Error Code 35 is resend in attempting to write a program through 2PORT-EFR Module at Link No.1 and then "02" (Link No.2) is discovered in response to Reading Execution Priority Restriction, you can accomplish such writing after Resetting Execution Priority Restricting Configuration with the module at Link No.2.

(Example)

A command

00. 00. 03. 00. 32. 21. 00

The response to the module at Link No.2 that set up Execution Priority Restriction

80. 00. 0B. 00. 32. 21. 00. FF. FF. FF. FF. FF. FF. 02. FF

23. Execution Priority Restricting Configuration (CMD = 32)

(1) Function

Limiting a execution priority to the source requesting for execution priority restriction, or cancelling the priority

A priority cancelling is available on the source that requested for execution priority restriction only.

CAUTION)

Execution Priority Restriction is a function for prohibiting or permitting other communication module and peripheral device to write a program and supplementary information (a set for prohibition and a reset for permission).

For example, if you set Execution Priority Configuration through computer link, the peripheral device (graphic programmer GP1) will be disabled from writing. This protection is for prohibiting any overlapped writing by more than one devices.

To privilege other device to write:

(A) Set Execution Priority Configuration,

(B) Complete the setting, and

(C) Reset the Execution Priority Configuration.

(2) Message format

・Command

00	00	LL	LH	CMD	22	00	OP1	OP2

OP1	Operation
00	Execution priority reset
01	Execution priority set

OP2 ..... 40h fixed

・Response

80	RC	LL	LH	CMD	22	00

(Example)

A command to limit an execution priority to the connected 2PORT-EFR module only

00. 00. 05. 00. 32. 22. 00. 01. 40

Response

80. 00. 03. 00. 32. 22. 00

24. Fill (CMD = 32)

(1) Function

Writing the designated data by the word into data memory at desirable field

(2) Message format

・Command

00	00	LL	LH	CMD	32	00	OP1	Lower Address	Higher Address	Lower Word No.	Higher Word No.	Lower Data	Higher Data

OP1	Operation
01	Program Memory
02	Data Memory

OP2 ..... 40h fixed

・Response

80	RC	LL	LH	CMD	32	00

(Example)

A command to fill D0800-D08FF with 1234h

00. 00. 0A. 00. 32. 32. 00. 02. 00. 18. 00. 01. 34. 12

Response

80. 00. 03. 00. 32. 32. 00

25. Reading Set Values & Recent Values of Timer & Counter (CMD = 32)

(1) Function

Reading out the set values and recent values of timer and counter

(2) Message format

・Command

00	00	LL	LH	CMD	40	00	OP1	Lower Address	Higher Address

・Response

80	RC	LL	LH	CMD	40	00	Lower Set Value	Higher Set Value	Lower Recent Value	Higher Recent Value

(Example)

A command to read out the set value and the recent value of T000

00. 00. 05. 00. 32. 40. 00. 00. 06

The response to T000 Set Value = 10 and Recent Value = 08

80. 00. 07. 00. 32. 40. 00. 0A. 00. 08. 00

Caution) The set and recent values are read out in HEX.

26. Writing Set Values & Recent Values of Timer & Counter (CMD = 32)

(1) Function

Simultaneously amending the set values and recent values of timer and counter

(2) Message format

・Command

00	00	LL	LH	CMD	41	00	Lower Address	Higher Address	Lower Set Value	Higher Set Value	Lower Recent Value	Higher Recent Value

・Response

80	RC	LL	LH	CMD	41	00

(Example)

A command to write 10 into the set value of T000 and 08 into the recent value

00. 00. 09. 00. 32. 41. 00. 00. 06. 0A. 00. 08. 00

Response

80. 00. 03. 00. 32. 41. 00

Caution) Specify the set and recent values in HEX.

27. Writing Set Values of Timer & Counter (CMD = 32)

(1) Function

Mending the set values only of timer and counter

(2) Message format

・Command

00	00	LL	LH	CMD	42	00	Lower Address	Higher Address	Lower Set Value	Higher Set Value

・Response

80	RC	LL	LH	CMD	42	00

(Example)

A command to set 10 in T010

00. 07. 00. 32. 42. 00. 10. 06. 0A. 00

Response

80. 00. 03. 00. 32. 42. 00

28. Writing Recent Values of Timer & Counter (CMD = 32)

(1) Function

Amending the recent values only of timer and counter

(2) Message format

・Command

00	00	LL	LH	CMD	43	00	Lower Address	Higher Address	Lower Recent Value	Higher Recent Value

・Response

80	RC	LL	LH	CMD	43	00

(Example)

A command to set 05 in T010

00. 00. 07. 00. 32. 43. 00. 10. 06. 05. 00

Response

80. 00. 03. 00. 32. 43. 00

29. Reading Clock Time (CMD = 32)

(1) Function

Reading out the time of clock incorporated in CPU

(2) Message format

・Command

00	00	LL	LH	CMD	70	00

・Response

80	RC	LL	LH	CMD	70	00	Second	Minute	Hour	Day	Month	Year	Day of the Week

24-Hour System
The Lower 2 Digits of Anno Domini
0:Sunday
1:Monday
BCD Code Data

(Example)

A command

00. 00. 03. 00. 32. 70. 00

The response to 18:43:30 on June 10 Tuesday, 2001

80. 00. 0A. 00. 32. 70. 00. 30. 43. 18. 10. 06. 01. 02

30. Setting Clock Time

(1) Function

Altering the time of clock incorporated in CPU

(2) Message format

・Command

00	00	LL	LH	CMD	71	00	Second	Minute	Hour	Day	Month	Year	Day of the Week

24-Hour System
The Lower 2 Digits of Anno Domini
0:Sunday
1:Monday
BCD Code Data

・Response

80	RC	LL	LH	CMD	71	00

(Example)

A command to set 18:43:30 on June 10 Tuesday, 2001

00. 00. 0A. 00. 32. 71. 00. 30. 43. 18. 10. 06. 01. 02

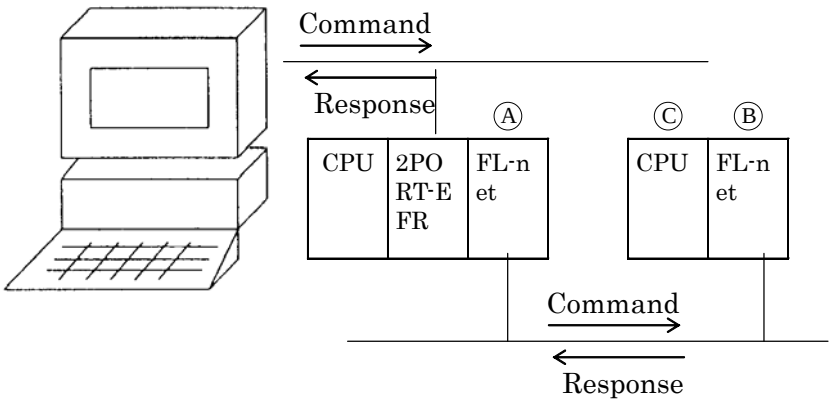
Response

80. 00. 03. 00. 32. 71. 00

31. Relay Command (CMD = 60)

(1) Function

Issuing a command toward HPC Link installed on the CPU Module on which the 2PORT-EFR Module is also installed or toward other CPU Module connected via ME-NET



Caution) If you use relay command, command data length and response data length should be less than 550 bytes.

(2) Message format

・Command

Link No. of Link Module Ⓐ on the above Fig.

Fixed data (ENQ) representing a command

0 0	0 0	L L	L H	C M D	Link No.	Lower Exchange No.	Higher Exchange No.	0 5	L L	L H	Command Code	Data	0 0

Exchange No. of Link Module Ⓑ on the above Fig.

Identical to Message format of commands ①-㊷ corresponding to CPU Module (Ⓒ,above Fig) that issues a command actually.

・Response

Link No. of Link Module Ⓐ on the above Fig.

Fixed data (ACK) representing a command

8 0	R C	L L	L H	C M D	Link No.	Lower Exchange No.	Higher Exchange No.	0 6	L L	L H	Command Code	Response Data	× ×

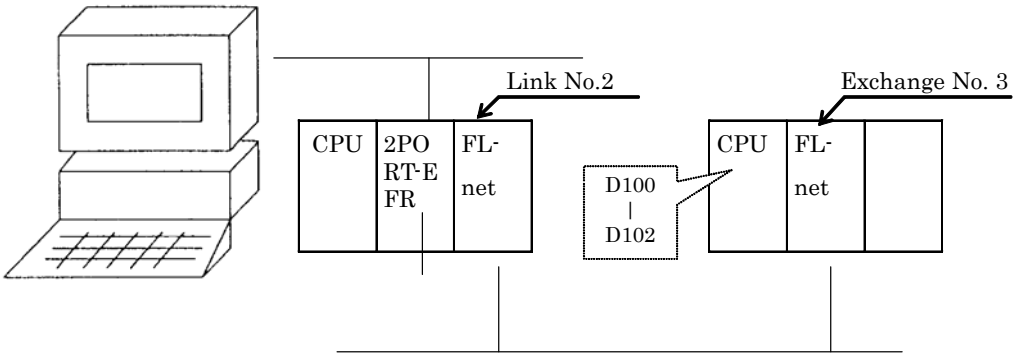
Exchange No. of Link Module Ⓑ on the above Fig.

Identical to Message format of responses ①-㊷ sent from CPU Module Ⓒ on the above Fig.

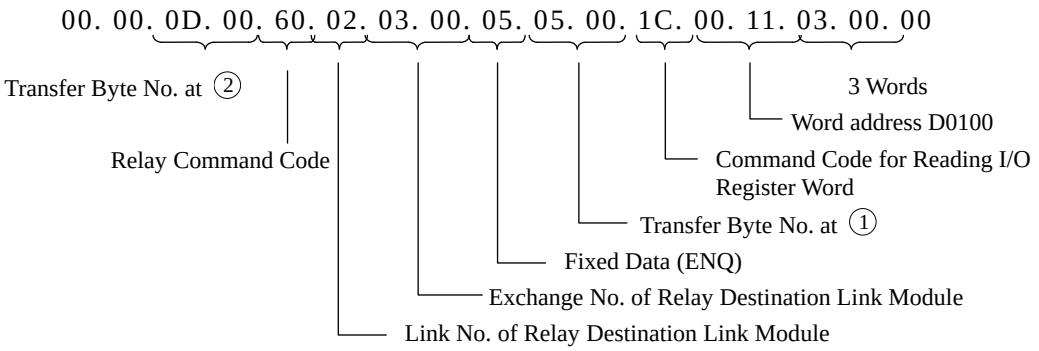
Caution) Specify a program No. to the higher digits of Link No. for divided-mode PC3J.
For link No.4 of program No.2, for instance, specify 24H as link No. data for command and response data.
If the former 4 bits of the link No. (program No.) have been zero to zeros, the command is sent through the link module with the program No. to which the 2PORT-EFR module has been assigned.

(Example)

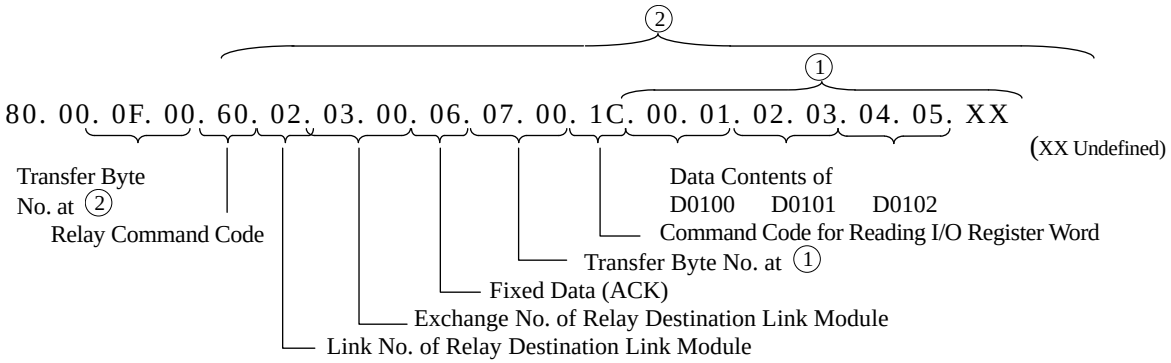
A sample to read out data registers D0100-D0102 of CPU Module on which HPC Link with exchange No.3 to which HPC link with link No.2 is connected is installed.



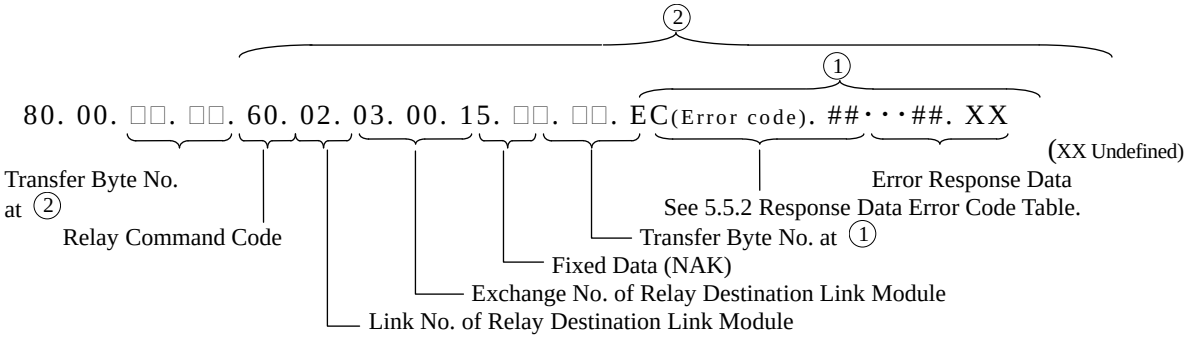
・Command



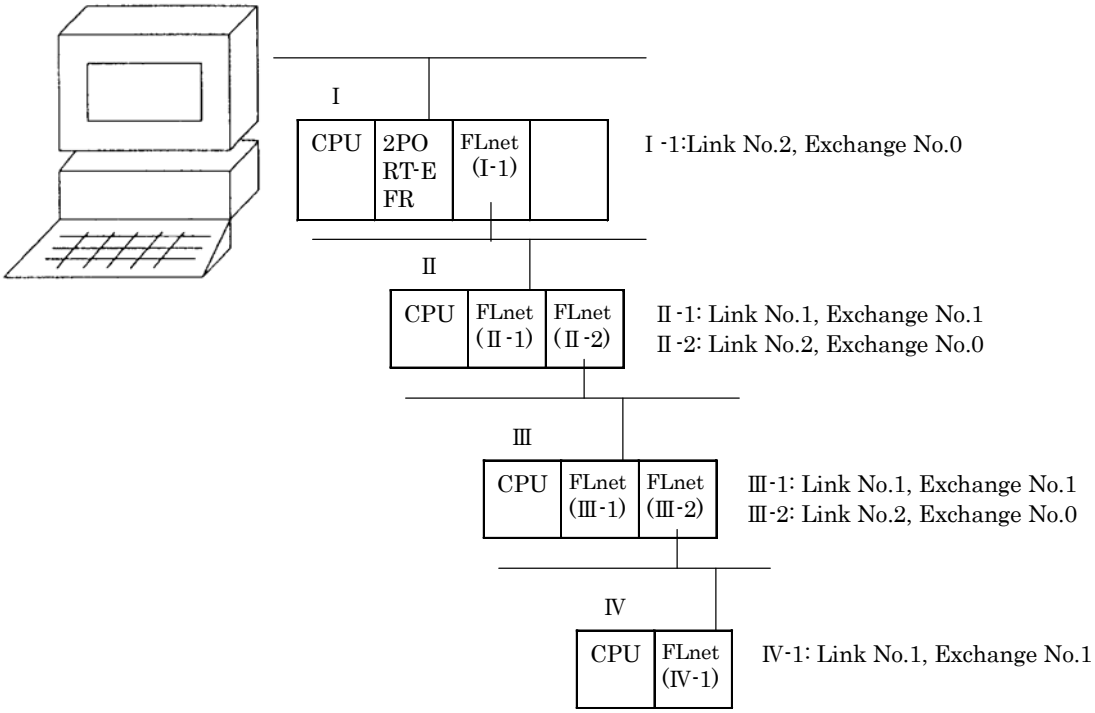
・Response to D0100=0100, D0101=0302, D0102=0504



If any error reply arises on CPU Module at link destination, the following response appears:



Up to 4 stages of relay commands are executable by hierarchized relay command.

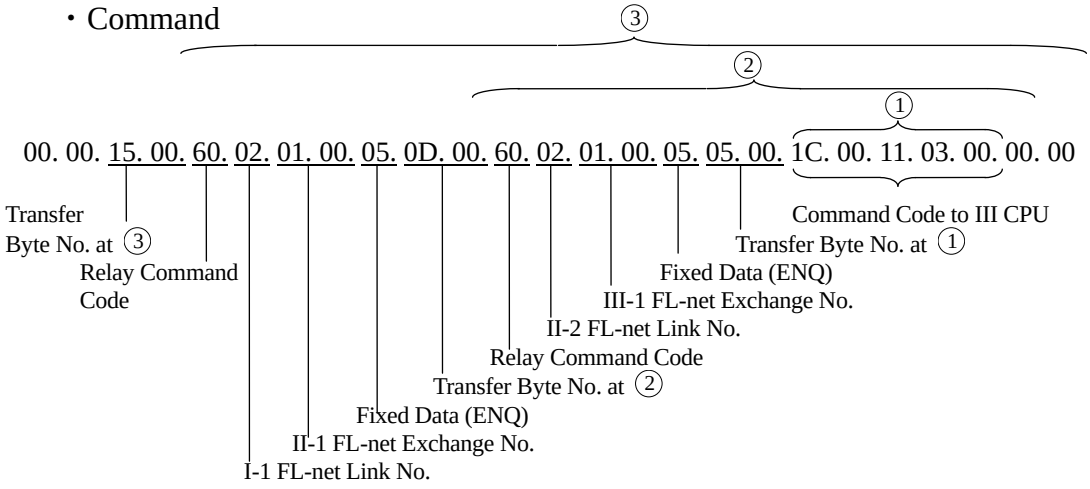


Caution)

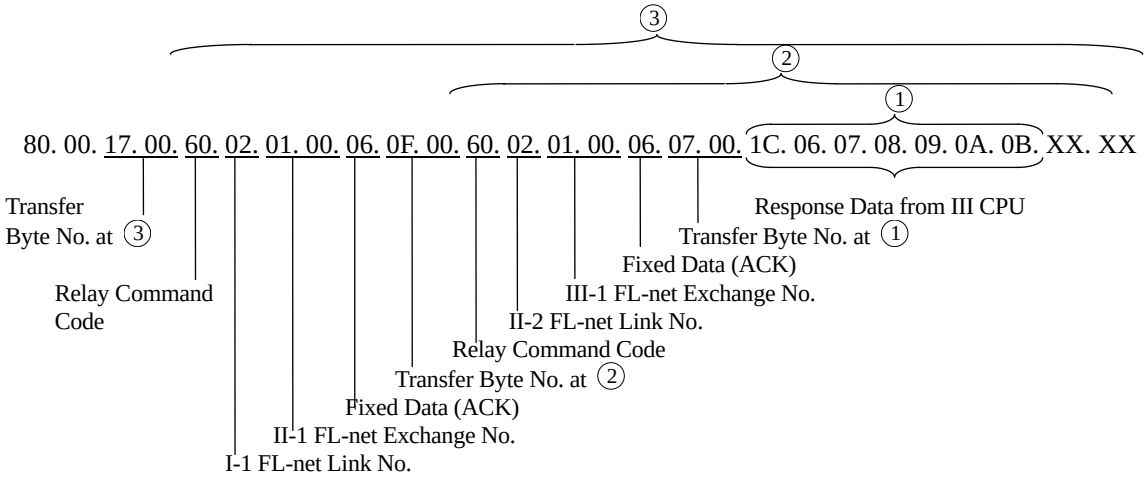
If you transfer a command from child node to parent node (exchange No.00) with HPC or ME-NET, specify 40H as exchange No. of the parent node in command data.

A sample for issuing a command to read out I/O register word into III CPU Module

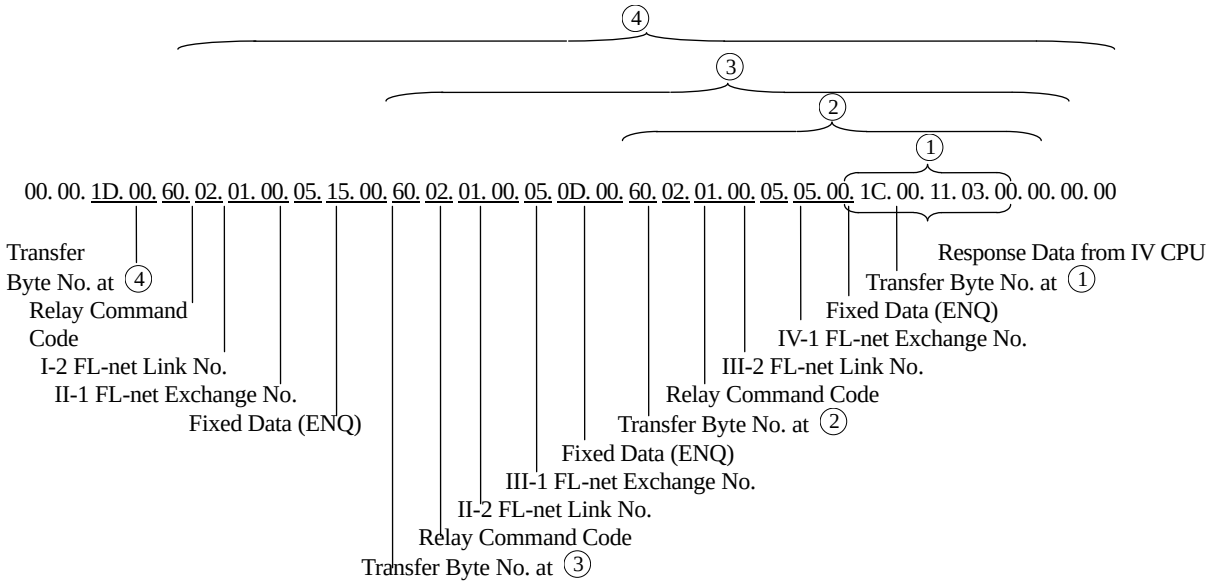
・Command



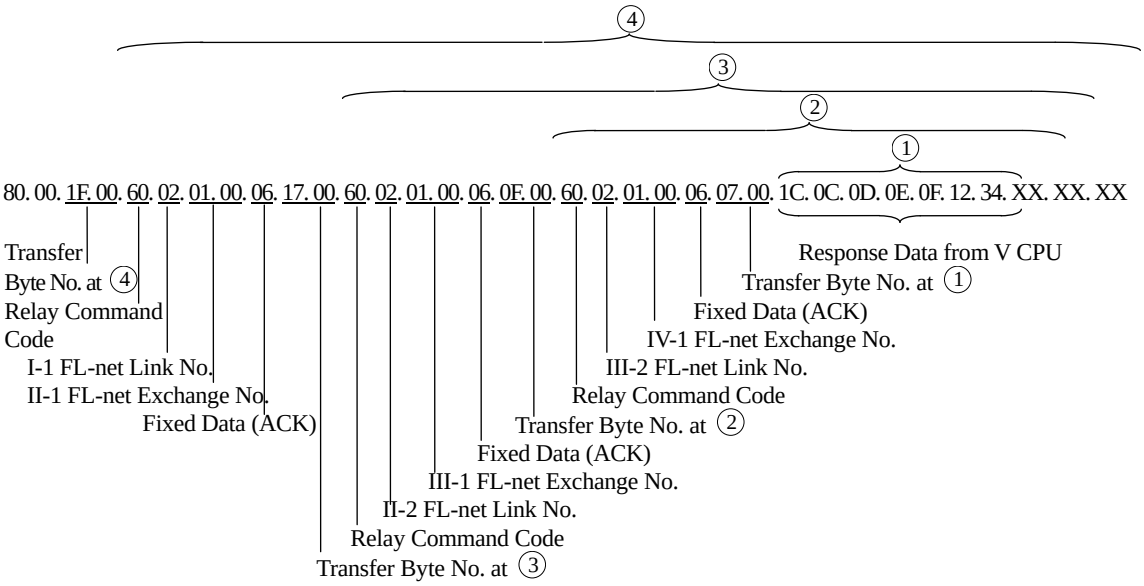
The response to D0100=0706, D0101=0908, D0102=0B0A



A sample for issuing a command to read out I/O register word into IV CPU Module



The response to D0100=0D0C, D0101=0F0E, D0102=3412



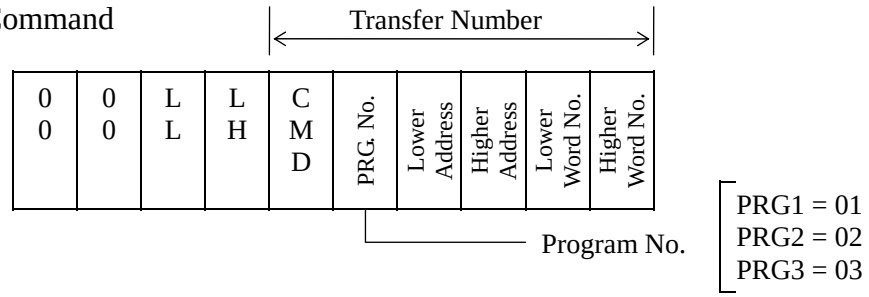
32. Reading Program Expansion Word (CMD = 90H)

(1) Function

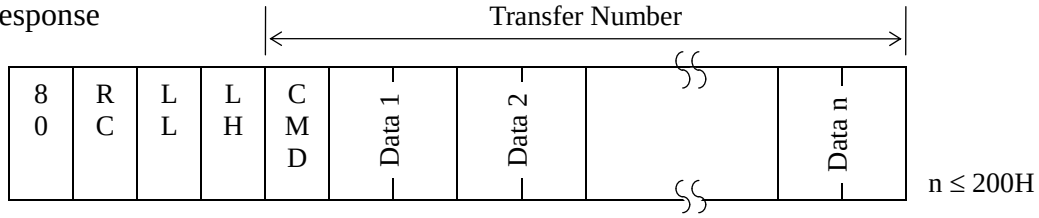
Reading out the program memory by the word block

(2) Message format

・Command



・Response



(Example)

A command to read out 2 words from sequence program No.2 located at the 0th operand

00. 00. 06. 00. 90. 02. 00. 00. 02. 00

The response to the 0th operand read as NOP

80. 00. 05. 00. 90. 00. 00. 00. 00

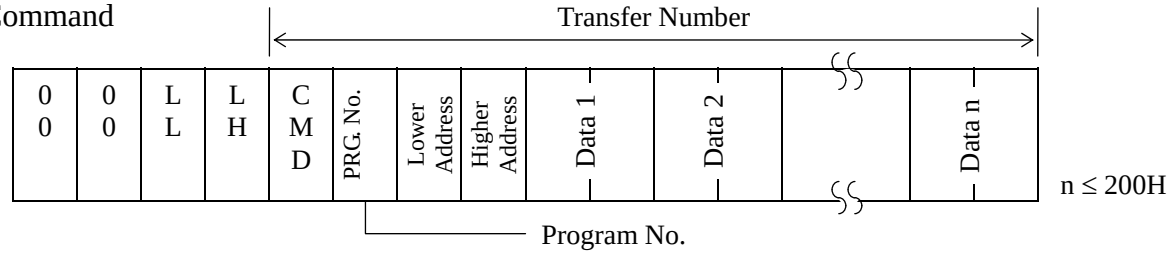
33. Writing Program Expansion Word (CMD = 91H)

(1) Function

Writing the program memory by the word block

(2) Message format

・Command



・Response

8 0	R C	L L	L H	C M D

(Example)

A command to write NOP (code:0000) into sequence program No.2 at the 4th operand

00. 00. 08. 00. 91. 02. 04. 00. 00. 00. 00. 00

Response

80. 00. 01. 00. 91

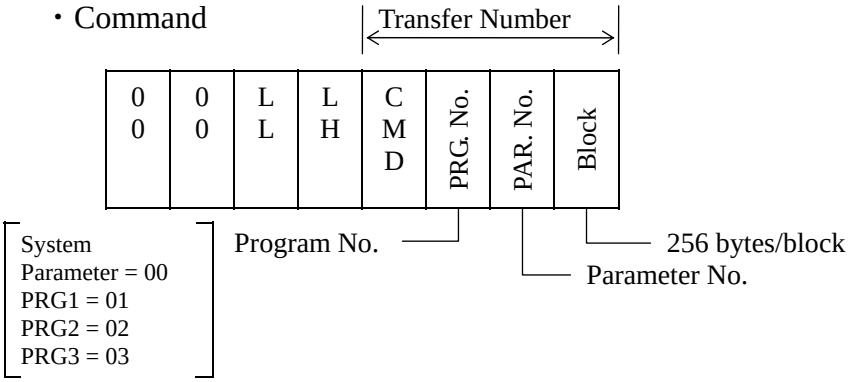
34. Reading Parameter Expansion (CMD = 92H)

(1) Function

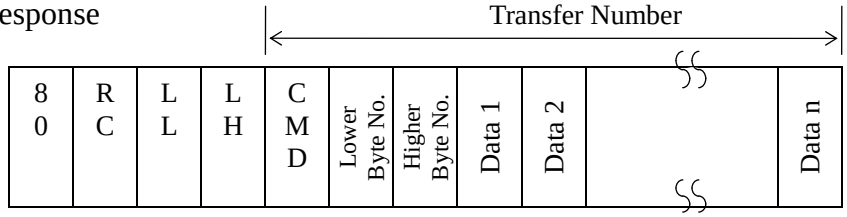
Reading out the parameter field

(2) Message format

・Command



・Response



(Example)

A command to read out block No.0, parameter No.9, program No.1 (program name parameter)

00. 00. 04. 00. 92. 01. 09. 00

The response (program name = PROGRAM 1)

80. 00. 43. 00. 92. 40. 00. 50. 52. 4F. 47. 52. 41 .4D. 31.
00. 00. 00. ・・・・・・ 00

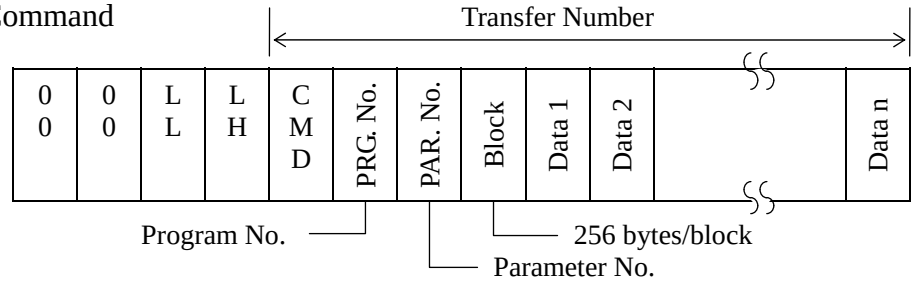
35. Writing Parameter Expansion (CMD = 93H)

(1) Function

Writing the parameter field

(2) Message format

・Command



・Response

80	RC	LL	LH	CMD

(Example)

A command to write PROGRAM 1 into block No.0, parameter No.9, program No.1 (program name parameter)

00. 00. 0C. 00. 93. 01. 09. 00. 50. 52. 4F. 47. 52. 41. 4D. 31

Response

80. 00. 01. 00. 93

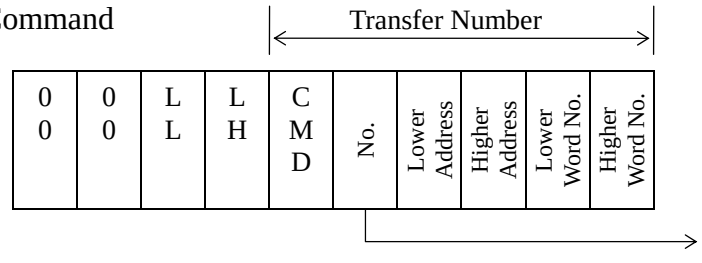
36. Reading Data Expansion Word (CMD = 94H)

(1) Function

Reading out the data memory (including expansion area) by the word block

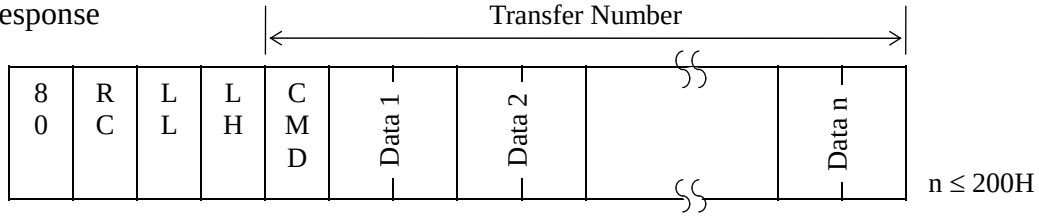
(2) Message format

・Command



No.	Correspondence
00	Expansion Bit Area (including ES, EN, H)
01	PRG. 1
02	PRG. 2
03	PRG. 3
⋮	
08	Expansion Register Area (U)

・Response



(Example)

A command to read out expansion data register U0000 by one word

00. 00. 06. 00. 94. 08. 00. 00. 01 .00

The response to U0000=1234

80. 00. 03. 00. 94. 34. 12

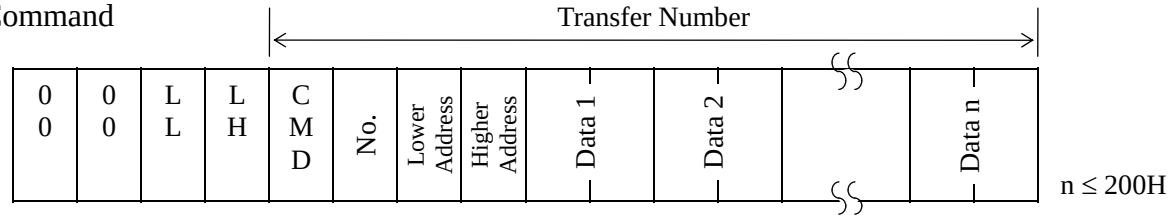
37. Writing Data Expansion Word (CMD = 95H)

(1) Function

Writing the data memory (including expansion area) by the word block

(2) Message format

・Command



・Response

80	RC	LL	LH	CMD

(Example)

A command to write Data 1234H into expansion data register U0000

00. 00. 06. 00. 95. 08. 00. 00. 34. 12

Response

80. 00. 01. 00. 95

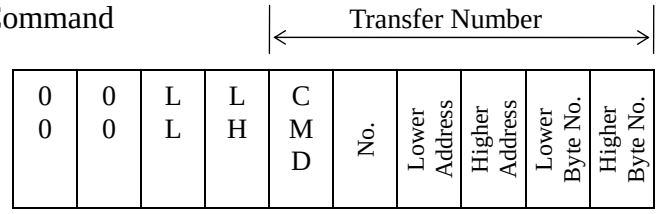
38. Reading Data Expansion Byte (CMD = 96H)

(1) Function

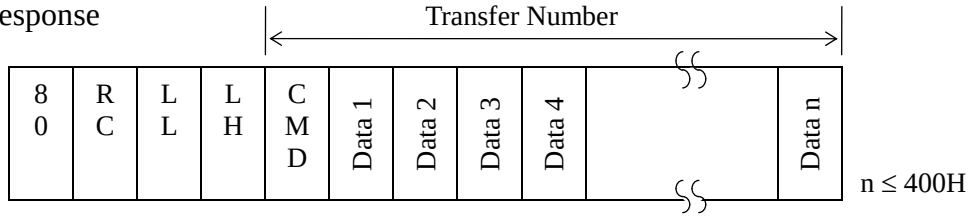
Reading out the data memory (including expansion area) by the byte block

(2) Message format

・Command



・Response



(Example)

A command to read out expansion recent-value register EN0000 by 2 bytes

00. 00. 06. 00. 96. 00. 00. 20. 02. 00

The response to EN0000 = 1234

80. 00. 03. 00. 96. 34. 12

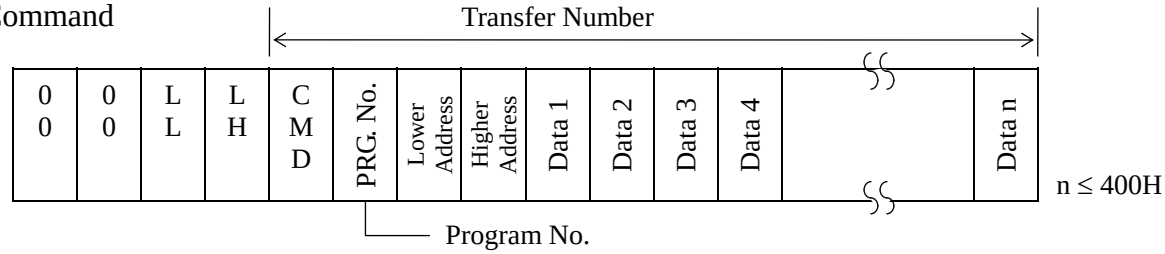
39. Writing Data Expansion Byte (CMD = 97H)

(1) Function

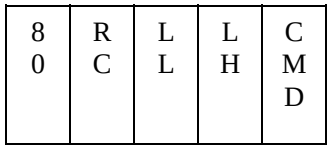
Writing the data memory (including expansion area) by the byte block

(2) Message format

・Command



・Response



(Example)

A command to write 2 bytes, 12H and 34H, into expansion recent-value registers EN0000L and EN0000H

00. 00. 06. 00. 97. 00. 00. 20. 12. 34

Response

80. 00. 01. 00. 97

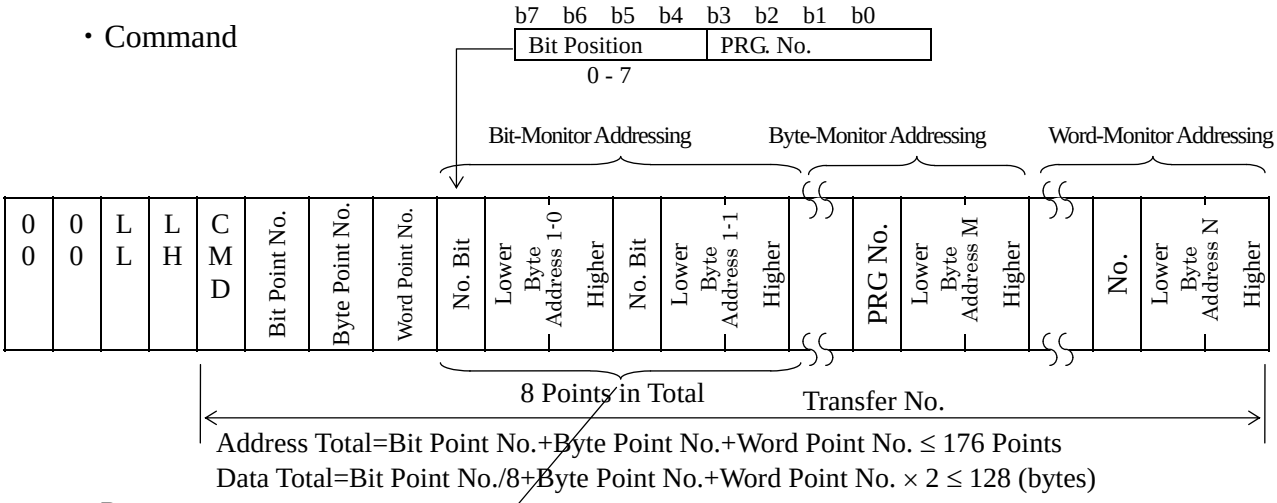
40. Reading Data Expansion Multi-Point (CMD = 98H)

(1) Function

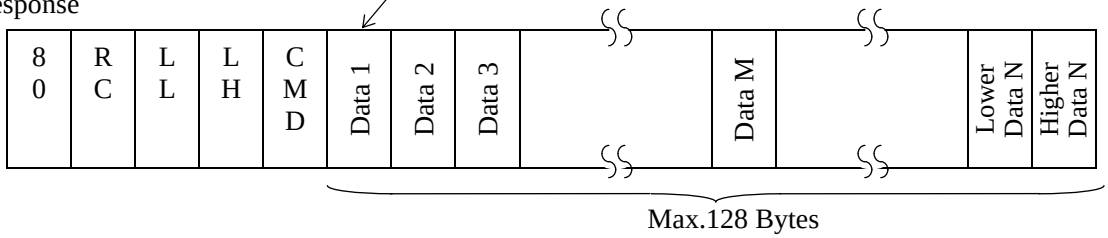
Reading out the data memory (including expansion area) at multiple points by each unit of bit, byte, and word.

(2) Message format

・Command



・Response



(Example)

A command to read out data from bit 7 of expansion internal register EM000, from expansion recent-value register EN0000L, and from expansion data register U0000 respectively by one point

00. 00. 0D. 00. 98. 01. 01. 01. 70. 00. 0C. 00. 00. 20. 08. 00. 00

The response to EN000 with its bit 7 ON, to EN0000L=12H, and to U0000=3456H

80. 00. 05. 00. 98. 01. 12. 56. 34

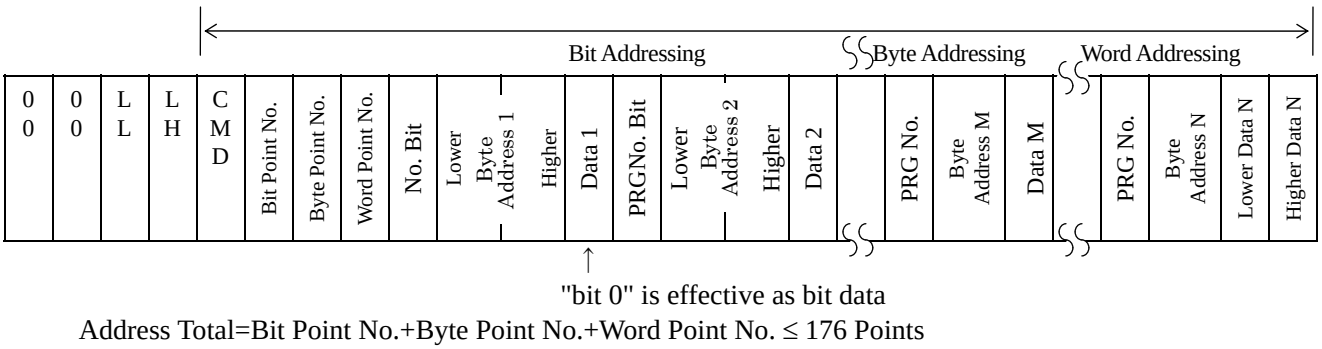
41. Writing Data Expansion Multi-Point (CMD = 99H)

(1) Function

Writing the data memory (including expansion area) at multiple points by each unit of bit, byte, and word.

(2) Message format

・Command



Address Total=Bit Point No.+Byte Point No.+Word Point No. ≤ 176 Points

Data Total=Bit Point No./8+Byte Point No.+Word Point No. × 2 ≤ 128 (bytes)

・Response

80	RC	LL	LH	CMD

(Example)

A command to write the data of expansion internal register EM000 with its bit 7 ON, of expansion recent-value register EN0000L=12H, and of expansion data register U0000=3456H respectively by one point

00. 00. 11. 00. 99. 01. 01. 01. 70. 00. 0C. 01. 00.
00. 20. 12. 08. 00. 00. 56. 34

Response

80. 00. 01. 00. 99

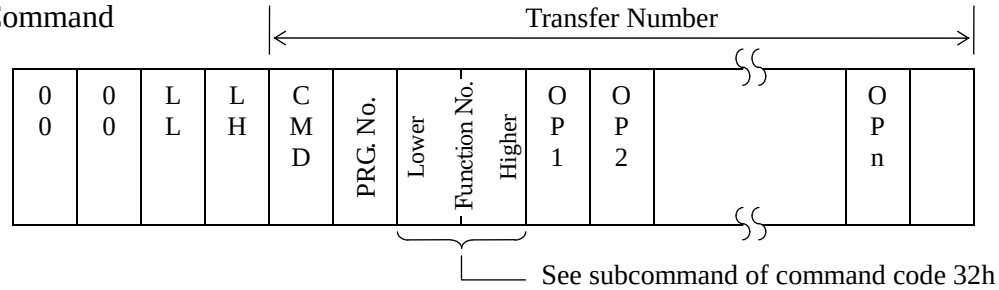
42. Expansion Function Call (CMD = A0H)

(1) Function

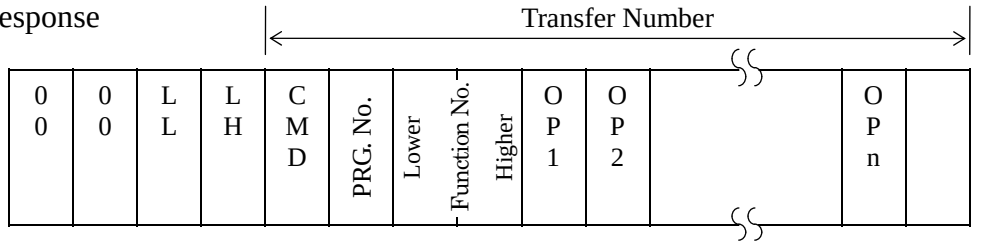
Controlling the PC3J operation, reading and writing the state and each information. Use the same format as function call (CMD = 32H) except that PRG. No. is inserted next to the command code. Note that PRG. No. is fixed at "00" in resetting, reading and setting the clock time, and that, if any reset command is executed, all programs are reset.

(2) Message format

・Command



・Response



(Example)

A command to reset PC3J CPU Module

00. 00. 04. 00. A0. 00. 00. 00

Response

80. 00. 04. 00. A0. 00. 00. 00

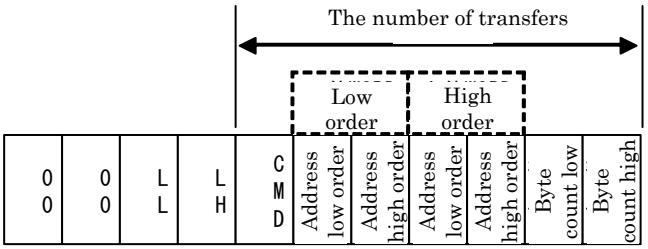
43. PC10 data byte reading (CMD=C2H)

(1) Function

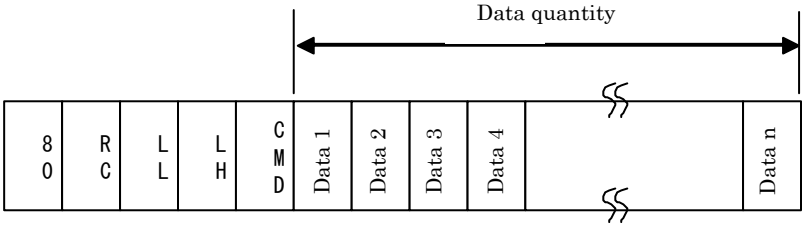
Data memory (PC10 whole area) is read in byte unit block.

(2) Message format

・Command



・Response



n<=3F0H

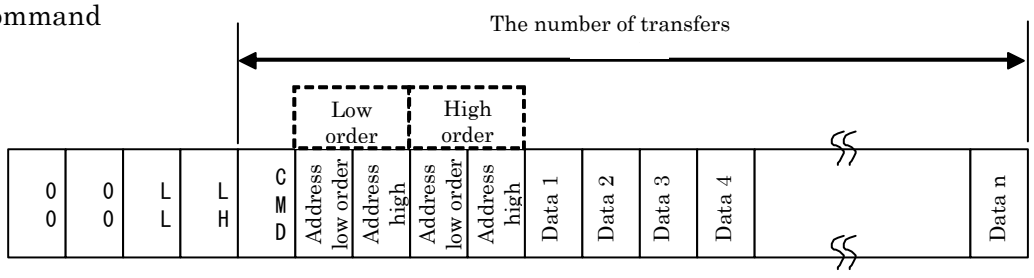
44. PC10 data byte writing (CMD=C3H)

(1) Function

Data memory (PC10 whole area) is read in byte unit block.

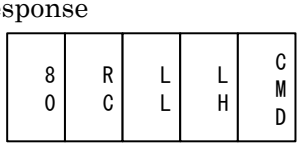
(2) Message format

・Command



n<=3F0H

・Response



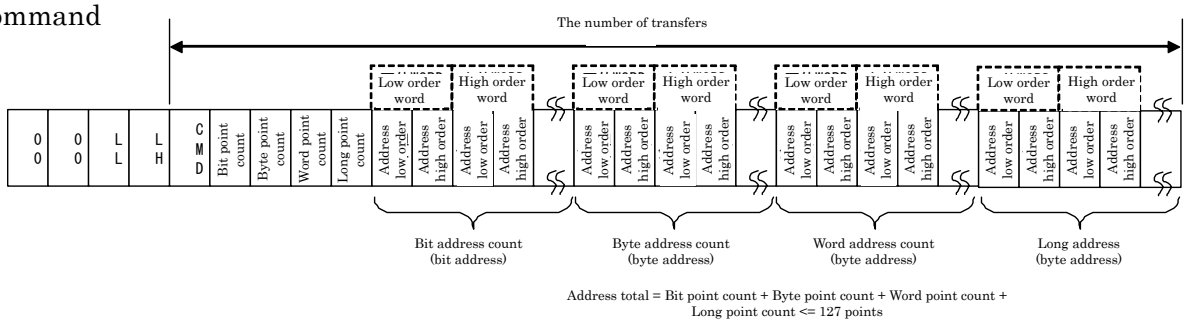
45. PC10 multi-point reading (CMD=C4H)

(1) Function

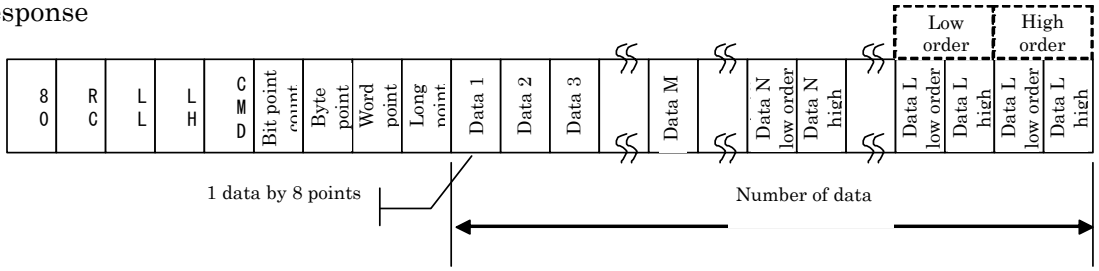
Data memory (PC10 whole area) is read in each unit of bit, byte, word, and long at multipoint.

(2) Message format

・Command



・Response



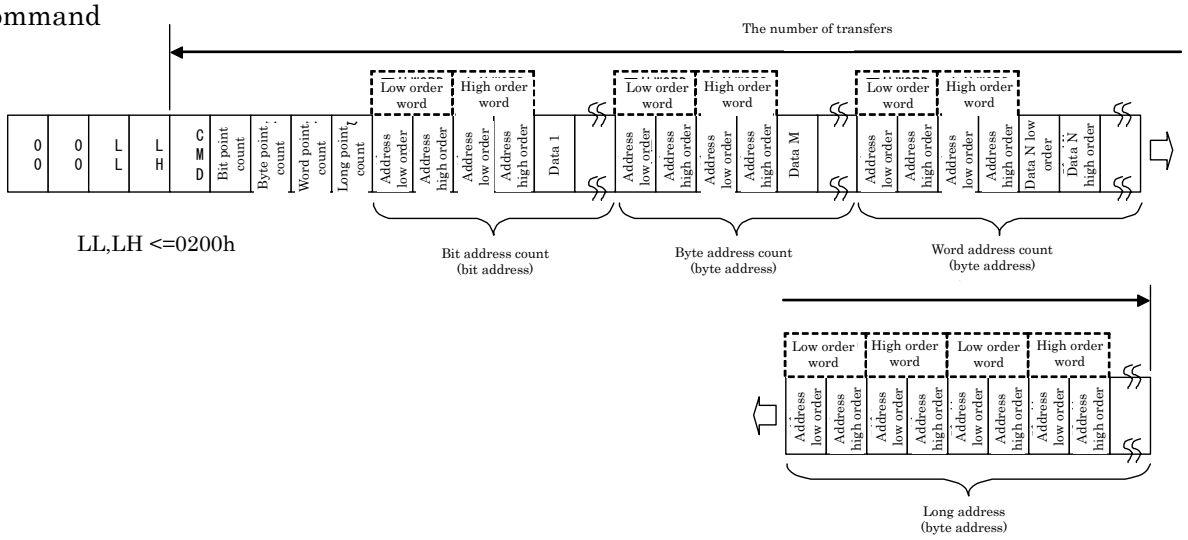
46. PC10 multipoint writing (CMD=C5H)

(1) Function

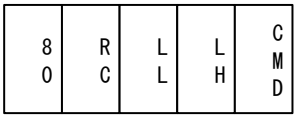
Data memory (PC10 whole area) is read in each unit of bit, byte, word, and long at multipoint.

(2) Message format

・Command



・Response



47. FR register registration (CMD=CAH)

(1) Function

Data of flash register is written to corresponding flash memory.
When only the block is written without issuing flash register registration command, the flash memory recovers the original content by resetting or power-on.

(2) Message format

▪ Command

00	00	LL	LH	CMD	ExNo

See "8.2.4 EX number" for ExNo.

▪ Response

80	RC	LL	LH	CMD

Ex) When writing FR000000 - FR00FFFF

1) [FR000000 - FR007FFF] PC10 data block writing (command C3)
2) Flash register registration (command CA)
3) Flash writing completion check (command A0 and CPU status reading)

} Perform 1) through 3) in the unit of 64kbytes.

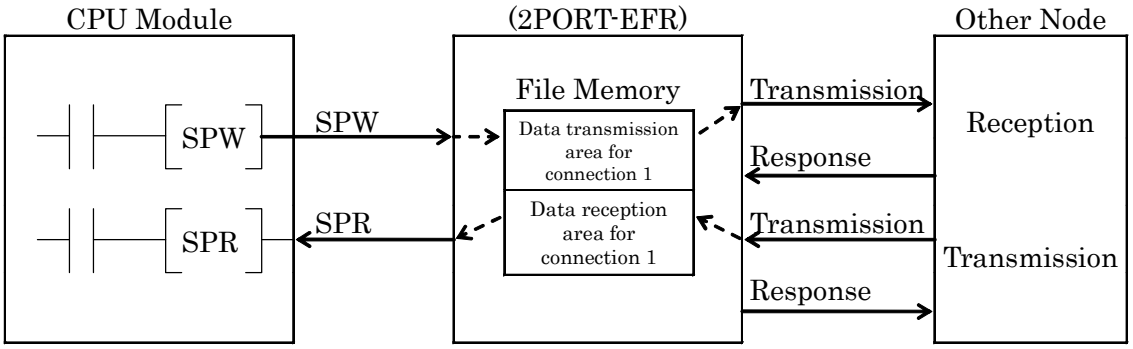
4) [FR008000 - FR00FFFF] PC10 data block writing (command C3)
5) Flash register registration (command CA)
6) Flash writing completion check (command A0 and CPU status reading)

} Perform 1) through 3) in the unit of 64kbytes.

7) Completion

10 Ethernet File Memory Method

Use the transmission/reception data area of File Memory to transfer data between another node with this method. You can communicate with another 2PORT-EFR Module as well as a computer workstation.



Up to 2044 bytes are transmittible/receivable.

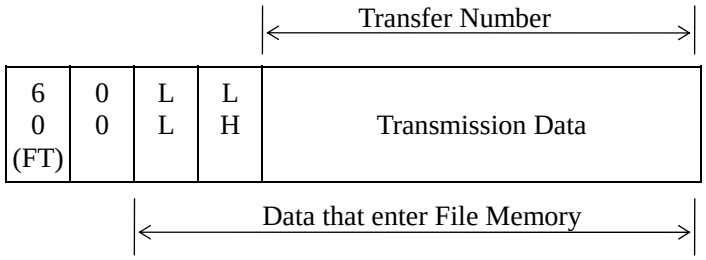
10.1 Communication Format of File Memory Method

Ethernet Header	IP Header	TCP/UDP Header	TOYOPUC Data	Ethernet FCS

Ethernet Header, IP Header, TCP/UDP Header, and Ethernet FCS are generally annexed by communication software automatically. Also, they are added by 2PORT-EFR Module automatically.
TOYOPUC Data Field is depicted hereinafter.

10.1.1 TOYOPUC Data Field Details

・Command



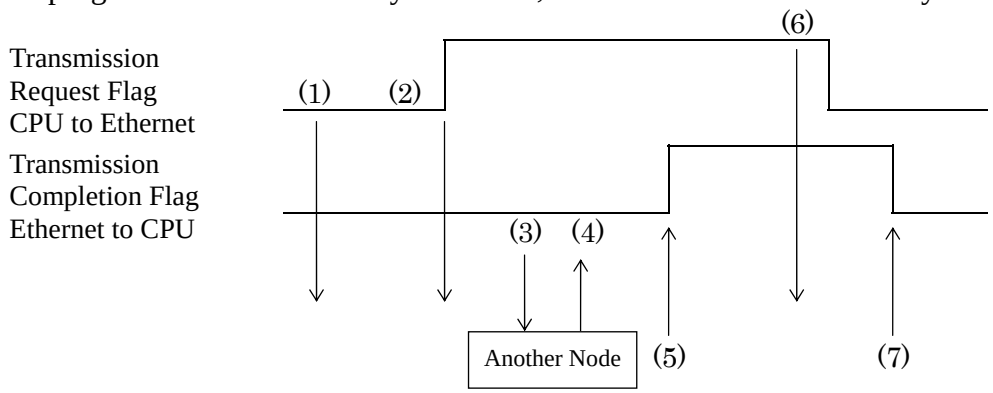
・Response

E 0 (FT)	R C

FT — Frame Type
RC — Response code (Normally set to 00. If a response code other than 00 is sent back, see 12-5-1 'Connection Anomaly Error Code Table' or 12-5-2 'Error Response Data Error Code Table')
LL — Lower Transfer Number
LH — Higher Transfer Number

10.2 File Memory Transmission

Follow the steps below in transmitting the File Memory from your 2PORT-EFRModule through a sequence program. For file memory addresses, see Reference 2 'File Memory Address Map.'



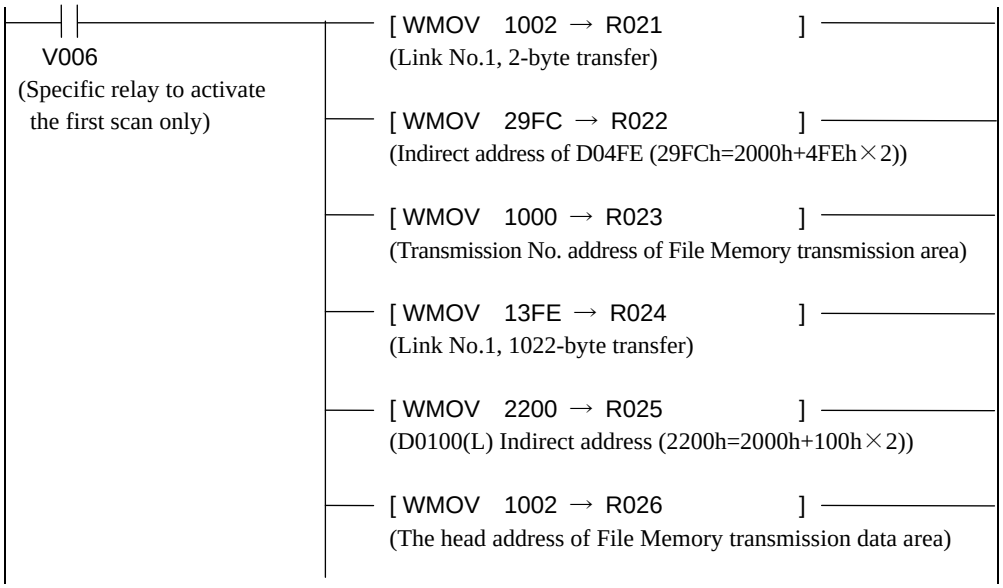
(1) Sequence program writes transmission data into File Memory.
(2) Sequence program hoists transmission request.
(3) 2PORT-EFR Module transmits signals.
(4) Another node resends response data.
(5) 2PORT-EFR Module hoists transmission completion in response to a normal reception.
(6) Sequence program's confirming of transmission completion lowers the transmission request.
(7) 2PORT-EFR Module lowers the transmission completion in response to the lowered transmission request.

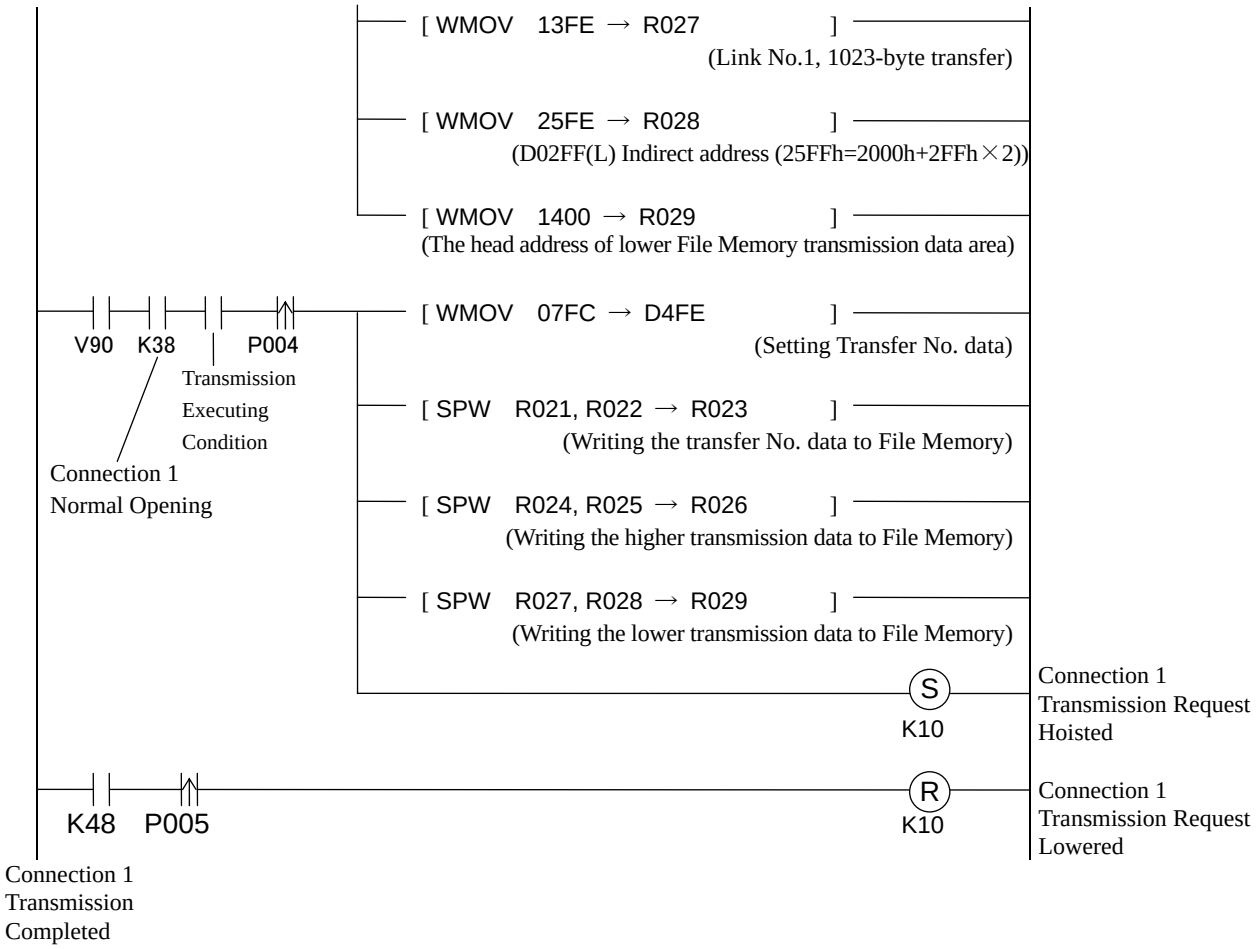
・Sequence Program Sample

An example of sequence program to transmit File Memory is shown below:

Condition:

Transmitting 2044 bytes, D0100-D04FD.
Setting transmission number data to D04FE (D04FE=07FCh).
Connection No.= 1
Link No.= 1
Like the sequence program example in Reference 3; control input/output signals are allocated to K00-K68.





Caution) Since the upper-limit capacity the SPW command can process simultaneously is 1023 (3FFH) bytes, if you read the data exceeding this limitation, divide it into two parts to execute the SPW command.
If you use this sequence program to transmit data, D0100-D04FE, the following data are conveyed:

D0100=0100 D0101=0302
D0102=0504 D0103=0706
D0104=0908 D0105=0B0A
D0106=0D0C D0107=0F0E
D0108=1110 ·····
····· D04FD=FBFA

} Transmission Data

D04FE=07FC Transfer Number Data

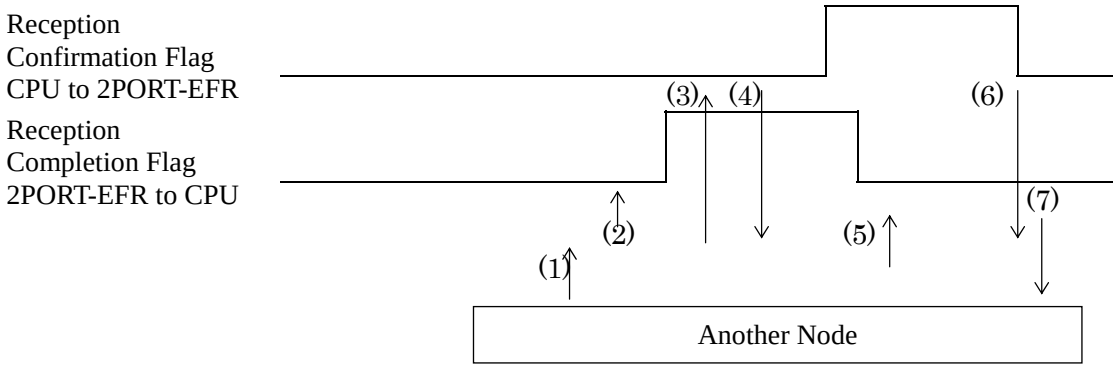
Transfer data for D04FE=07FC is:

60. 00. FC. 07. 00. 01. 02. 03 ·····0F. 10. 11·····FA. FB

- 60. 00: This represents File Memory Transmission. 2PORT-EFR Module annexes it automatically to transmit data.
- FC. 07: Transfer Number Data

10.3 File Memory Reception

Follow the steps below in receiving the File Memory from your 2PORT-EFR Module through a sequence program. For file memory addresses, see Reference 2 'File Memory Address Map'.



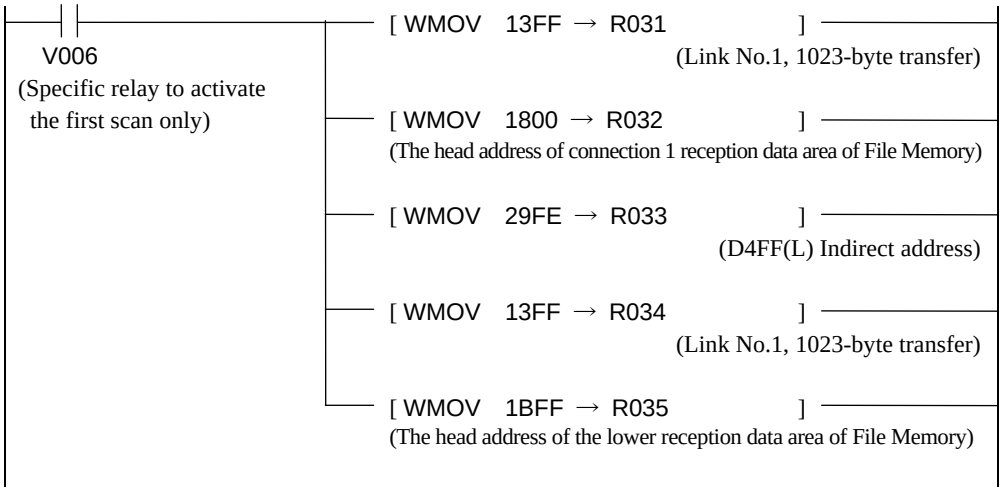
(1) Receive File Memory data from another node.
(2) 2PORT-EFR Module hoists reception completion in response to File Memory data reception.
(3) File Memory is read out via Application Instruction SPR in response to reception completion detected by sequence program.
(4) Sequence Program lowers reception confirmation.
(5) 2PORT-EFR Module lowers the reception completion.
(6) Sequence program's lowering of reception completion lowers the reception confirmation.
(7) 2PORT-EFR Module transmits reception data to another node in response to the lowered reception confirmation.

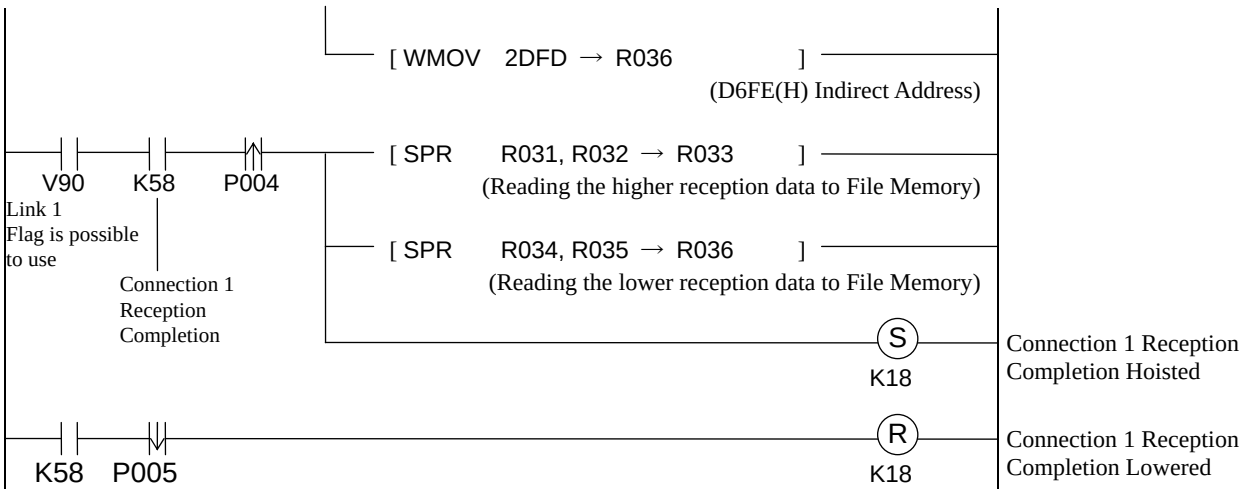
・Sequence Program Sample

An example of sequence program to receive File Memory is shown below:

Condition:

Reading out reception data to Data Registers, D500-D8FE.
Setting transfer number data to D04FE (D04FE=07FCh).
Connection No.= 1
Link No.= 1
Like the sequence program example in Reference 3; control input/output signals are allocated to K00-K68.





Caution) Since the upper-limit capacity the SPR command can process simultaneously is 1023 (3FFH) bytes, if you read the data exceeding this limitation, divide it into two parts to execute the SPR command.

If you transmit the following data toward connection 1 under the said sequence execution:

60. 00. FC. 07. 00. 11. 22. 33. 44. 55. 66. 77. 88. 99. AA. BB. CC. DD. EE. FF. 00. 11 ····· AA. BB

- FC. 07 — Transfer Number Data
- 60. 00 — This represents File Memory Transmission. Ethernet Module detects it to dispose it.

The following register data will be set:

D04FE=07FC Transfer Number Data

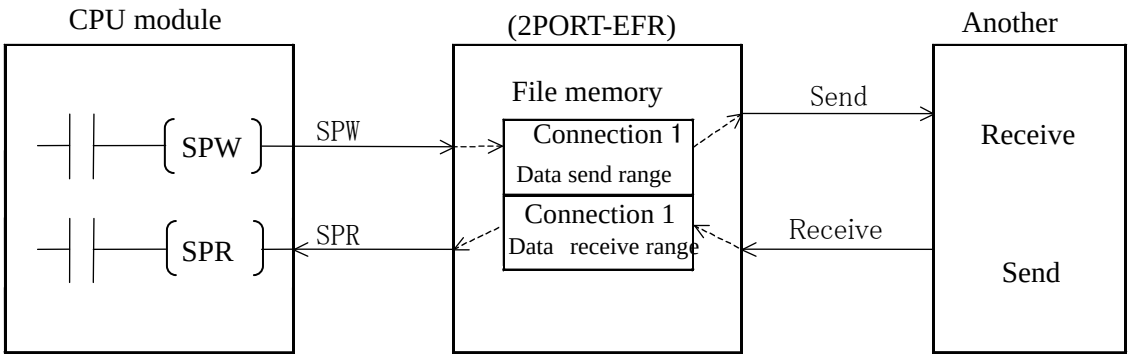
D0500=1100	D0501=3322	Transmission Data
D0502=5544	D0503=7766	
D0504=9988	D0505=BBAA	
D0506=DDCC	D0507=FFEE	
D0508=1110 ·····		
·····	D08FE=BBAA	

11 Ethernet and general communication method

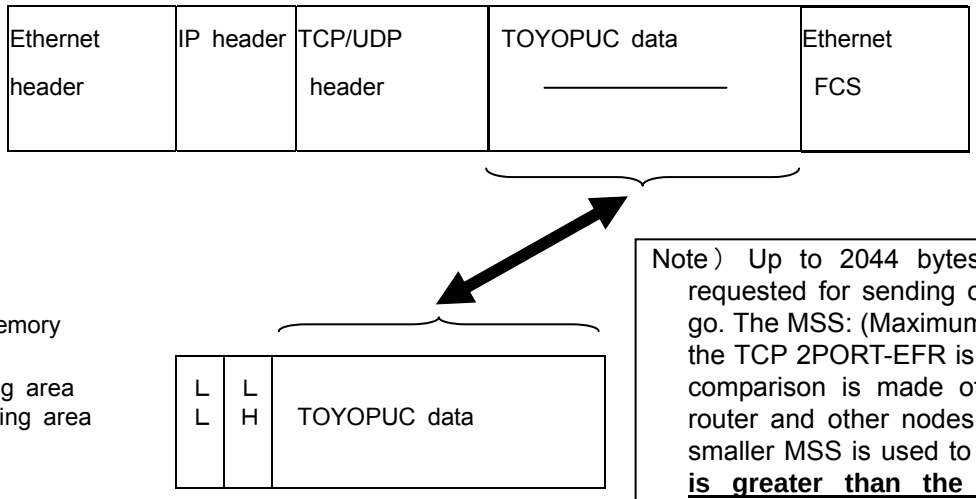
A method that sends and receives data to and from other nodes using file memory sending/receiving data areas.

The general communication method does not have set procedures for sending and receiving, and the TOYOPUC data section can communicate entirely with arbitrary data, therefore not only hosts such as PCs, etc., connection with various Ethernet devices made by other manufacturers is possible.

This function uses 2PORT-EFR Ver1.20 and later.



11.1 Communication format of the general communication method



Note） Up to 2044 bytes of data can be requested for sending or receiving in one go. The MSS: (Maximum Segment Size) of the TCP 2PORT-EFR is 1024. In TCPIP, a comparison is made of the MSS of the router and other nodes and the one with smaller MSS is used to send data. **If data is greater than the MSS it will be sent/received in separate batches.**
For UDP, data will be separated from 1472 bytes or less.

LL－ Transferred number Lower

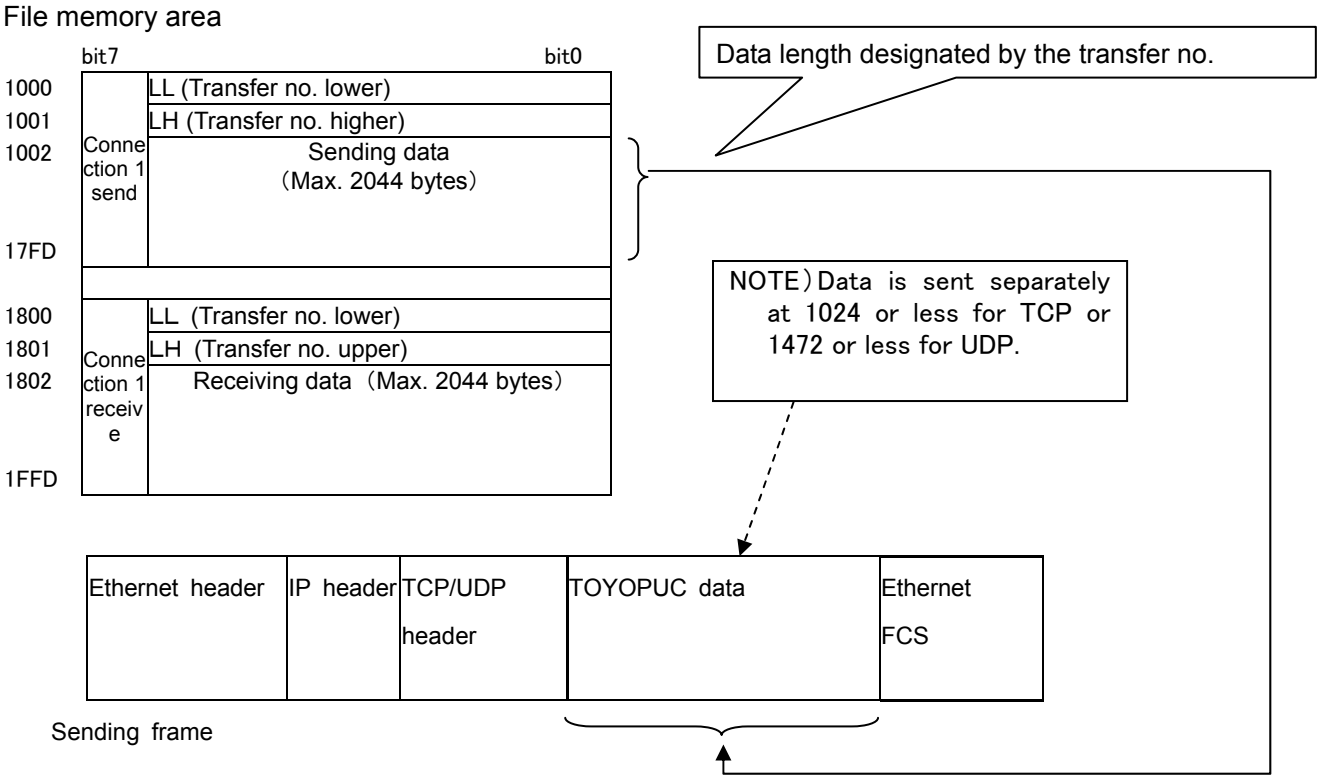
LH－ Transferred number Upper

Normally, communication software or the like automatically adds Ethernet headers, IP headers, TCP/UDP headers or Ethernet FCS. For 2PORT-EFR modules. 2PORT-EFR module also automatically adds these. The sending and receiving area used is one which uses the file memory method.

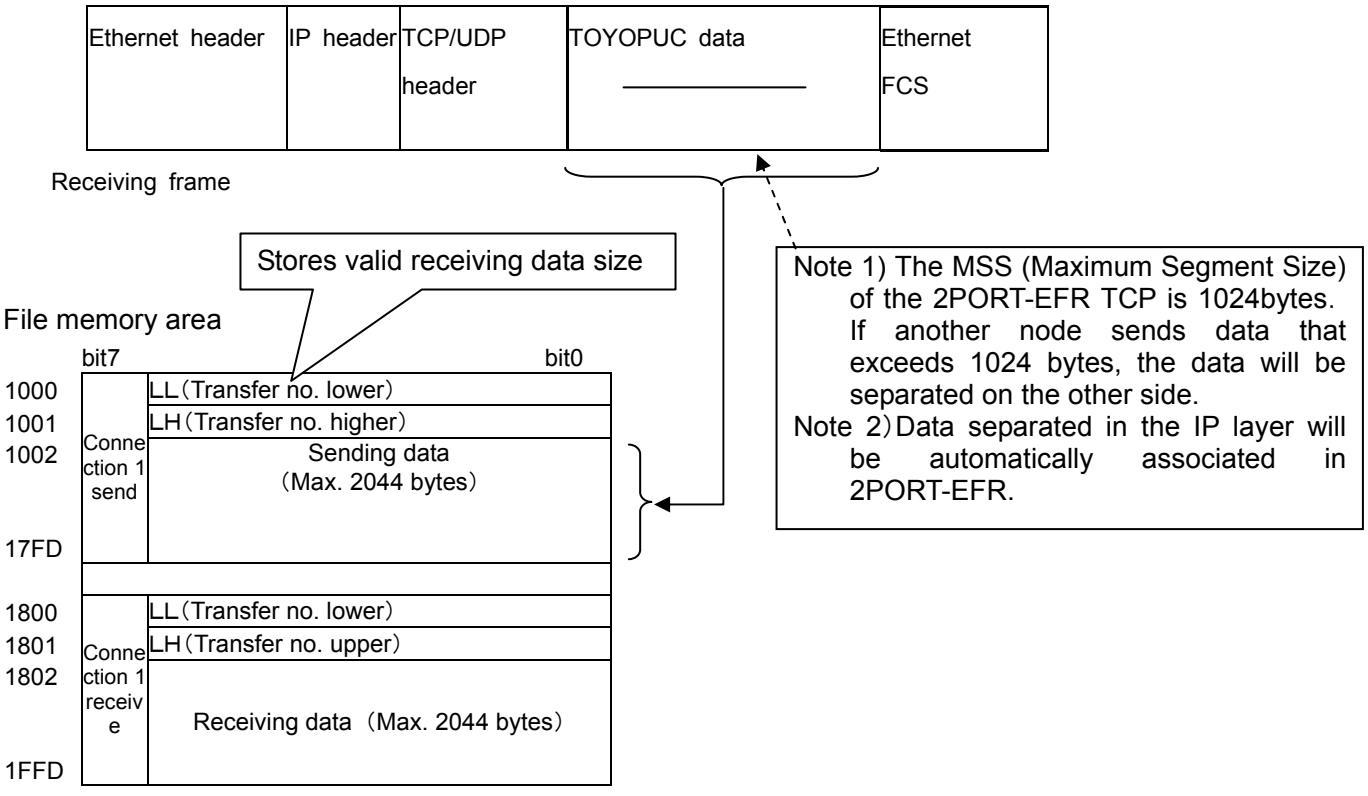
TOYOPUC data content and file memory data content is the same. LL, LH are added to the frame.

Transfer control is nonprocedural, and the user has the responsibility of checking for mistakes, etc. We re commend adding transfer number, data types, etc. to the frame, enabling data reliability to be confirmed

11.1.1 Sending data of the general communication method



11.1.2 Receiving data of the general communication method



11.2 Switching to the general communication method

It is possible to switch to general communication method by writing a pre-determined setting value in the file memory designation area. However, switchover procedures differ depending on communication parameters.

① When setting using link parameters

When setting using link parameters, writing limitations have been put in place in the communication parameter area to prevent the wrong settings from being written. To enable this function, set the designated area (general communication setting) after releasing the parameter area writing limitations. By turning bit 7 of file memory 0000 on, writing limitations to all communication parameters are released.

② When setting using initial sequence program

Write the setting value directly to the designated area (general communication setting).

	bit7							bit0	
0000	**8**	(00 fixed)						1	1:Initial request **8: Parameter area writing prohibited(1:Release)**
0001	8	7	6	5	4	3	2	1	1 to 8:Connection 1 – 8 Active open request
0002	8	7	6	5	4	3	2	1	1 to 8:Connection 1 – 8 Send request
0003	8	7	6	5	4	3	2	1	1 to 8:Connection 1 – 8 Receipt check
0004	(00 fixed)					3	2	1	1: Error log receiving check 2:ICMP log receiving confirmation
0005	(00 fixed)								
0006	(00 fixed)								
0007	(00 fixed)								
0008 0009 000A 000B	Own node IP address 00000001 to FFFFFFFE						(lower) (upper)		
000C	8	7	6	5	4	3	2	1	1 to 8: Connection use
000D	8	7	6	5	4	3	2	1	1 to 16:Table use
000E	16	15	14	13	12	11	10	9	
000F	(00 fixed)								

0010 0011	Connection No. 1	Connection open method		TCP active open:0000h, TCP mate specific passive open:0100h TCP mate non-specific passive open:0200h, UDP:0001h
0012 0013		Own node port no. 0401h to FFFEh	(lower) (upper)	
0014 0015		Own node port no. 0001h to 0010h	(lower) (upper)	
0016		**General communication setting**		General communication disabled: 00h, general communication enabled: FFh
0017		(00 fixed)		
0018 0019	Connection No. 2	Connection open method		TCP active open:0000h, TCP mate specific passive open:0100h TCP mate non-specific passive open:0200h, UDP:0001h
001A 001B		Own node port no. 0401h～FFFEh	(lower) (upper)	
001C 001D		Other node table no. 0001h to 0010h	(lower) (upper)	
001E		**General communication setting**		General communication disabled: 00h, general communication enabled: FFh
001F		(00 fixed)		

General communication settings can be performed for each connection. Settings are performed in SPW command. If values are written to somewhere other than the general communication setting area, the communication parameters will change and there is a chance that communication will not be possible, so be careful not to mistake the writing destination address.

If general communication settings are enabled (FF), computer link method or file memory method cannot be used for that connection.

Please do not set general communication settings to anything other than 00 or FF. (If 01 to FE is set, then operation will be as per 00)

If settings are changed during communication, communication may not be performed correctly. Please do not to change after setting.

The switchover status of the general communication method can be confirmed in the below areas.

1) File memory

When the applicable bit for each connection of file memory address 0107 is on, the general communication method is enabled. When the applicable bit is off, the file memory method and computer link method is enabled.

	bit7							bit0	
0100								1	1：Initial normal
0101	8	7	6	5	4	3	2	1	1 to 8：Connection 1 - 8 Open normal
0102	8	7	6	5	4	3	2	1	1 to 8：Connection 1 - 8 Connection error
0103	8	7	6	5	4	3	2	1	1 to 8：Connection 1 - 8 Sending complete
0104									
0105	8	7	6	5	4	3	2	1	1 to 8：Connection 1 - 8 Receiving complete
0106					4	3	2	1	1：Error log receipt 2：ICMP log receipt 3：PING normal 4：PINGerror
0107	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1 to 8：Connection 1 – 8 General communication method enabled**
0108							（lower）		A specific Ethernet address value is set for each of the Ethernet devices
0109									
010A									
010B	Own Ethernet address								
010C									
010D							（upper）		

2) Status monitor function

It is possible to check the status of the S3#7 lower rank 0 to 7 bit. When the applicable bit of each connection is on, general communication method is enabled. When the applicable bit is off, the file memory method and computer link method is enabled.

	MSB F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	LSB 0
S3#0	CN8	Active open request						CN1	0	0	0	0	0	0	0	*1
S3#1	CN8	File memory sending request						CN1	CN8	File memory sending request						CN1
S3#2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*3	*2
S3#3	CN8	Open normal						CN1	0	0	0	0	0	0	*5	*4
S3#4	CN8	File memory sending complete						CN1	CN8	Connection error						CN1
S3#5	0	0	0	0	*9	*8	*7	*6	CN8	File memory sending complete						CN1
S3#6	4th digit of own Ethernet address *10								5th digit of own Ethernet address *10							
S3#7	6th digit of own Ethernet address *10								CN8	General communication enabled						CN1
S3#8	Connection 1：Connection error code															
S3#9	Connection 2：Connection error code															
S3#A	Connection 3：Connection error code															
S3#B	Connection 4：Connection error code															
S3#C	Connection 5：Connection error code															
S3#D	Connection 6：Connection error code															
S3#E	Connection 7：Connection error code															
S3#F	Connection 8：Connection error code															

*1:Initial request *2:Error log receive confirmation *3:ICMP log receive confirmation

*4:Initial normal *5:Initial error *6:Error log receive

*7:ICMP log receive *8:PING normal *9:PING error

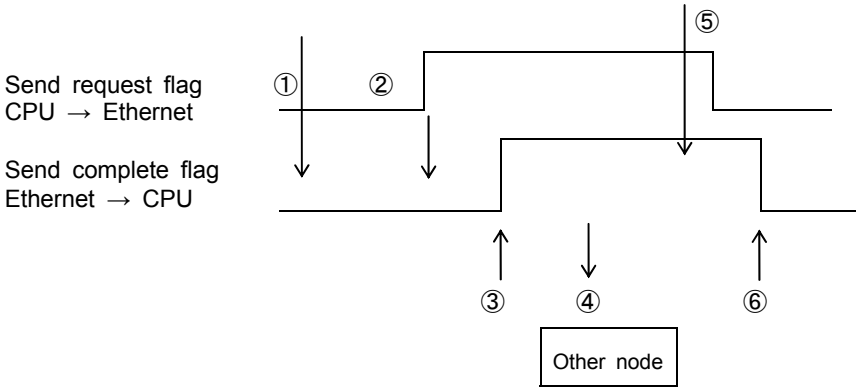
*10:The upper 3 digits of the Ethernet address are 00.60.53 (fixed value）.

"#" changes depending on the link number.

11.3 General communication sending

11.3.1 Sending procedures

If data is sent from the 2PORT-EFR module by the sequence program using the general communication method, it is done so according to the below procedures. For file memory addresses, please see the 2PORT-EFR instruction manual [Reference 2 File memory addr ess map].



① In the sequence program, send data and transfer number is written to the file memory.

② Send request is turned on in the sequence program.

③ Send data is transferred to the sending processing section and “send complete” comes on.

④ The 2PORT-EFR module performs sending.

⑤ Once send complete has been confirmed in the sequence program, send request turns off.

⑥ Send complete will turn off on the 2PORT-EFR module when the send request turns off.

・Sequence program example

Below is an example of a sequence program for file memory sending

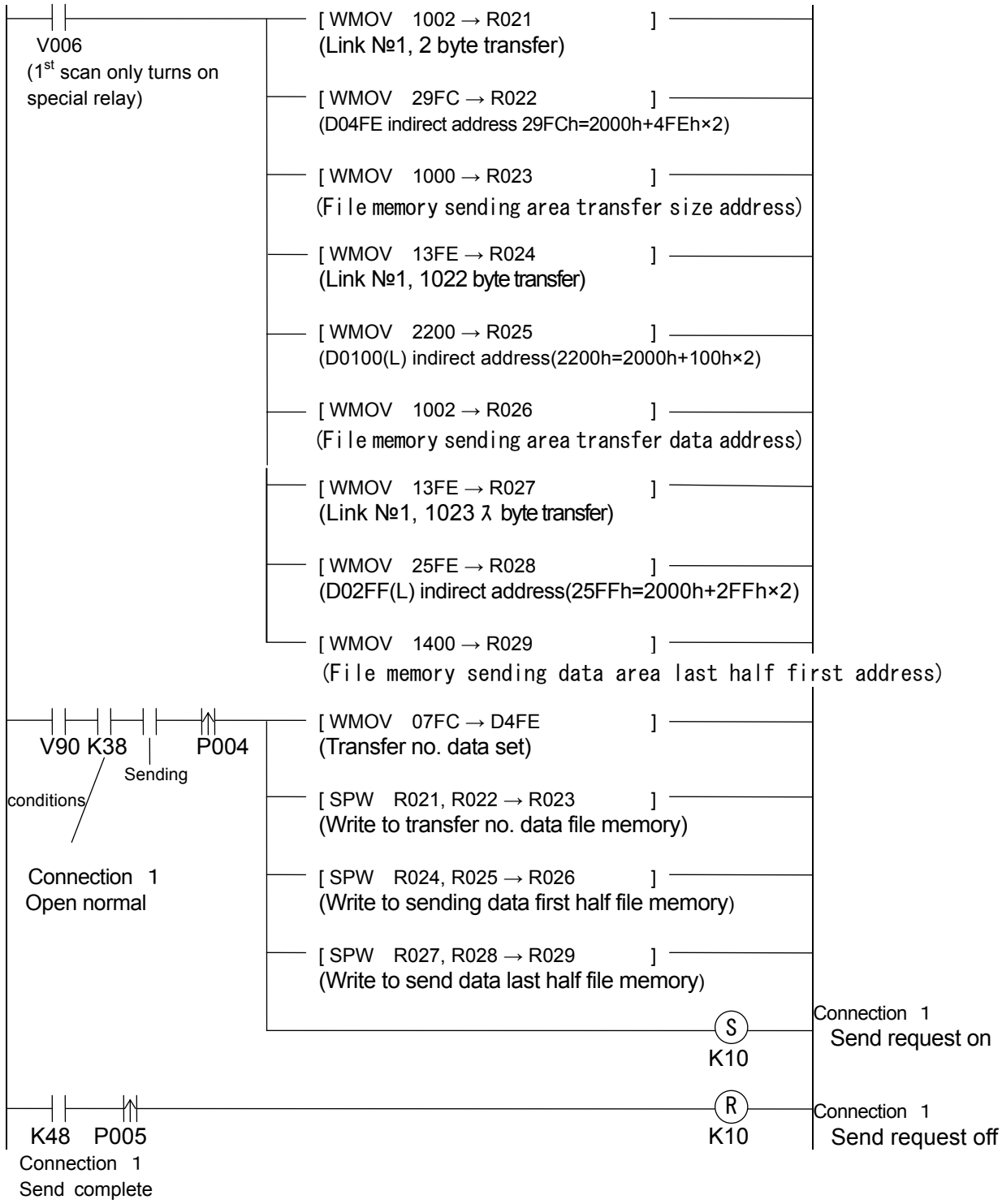
Condition：Sending 2044 byte data from D0100 to D04FD.

Transfer number data is set to D04FE.（D04FE = 07FCh）

Connection № ＝1

Link № ＝1

According to the sequence program example shown in Doc. 3, control input/output signals are allocated from K00 to K68.



Note) On CPUs other than PC10G, the maximum amount of data that can be transferred in one go with the SPW command is 1023 (3FFH) bytes therefore if the data amount exceeds this, please execute the SPW command in two separate goes.
If data from DO100 to DO4FE is sent to this sequence program, data will be sent as shown in the below example.

D0100=0100　　D0101=0302
D0102=0504　　D0103=0706
D0104=0908　　D0105=0B0A
D0106=0D0C　　D0107=0F0E
D0108=1110
D04FD=FBFA　　Send data
D04FE=07FC　　Transfer no. data

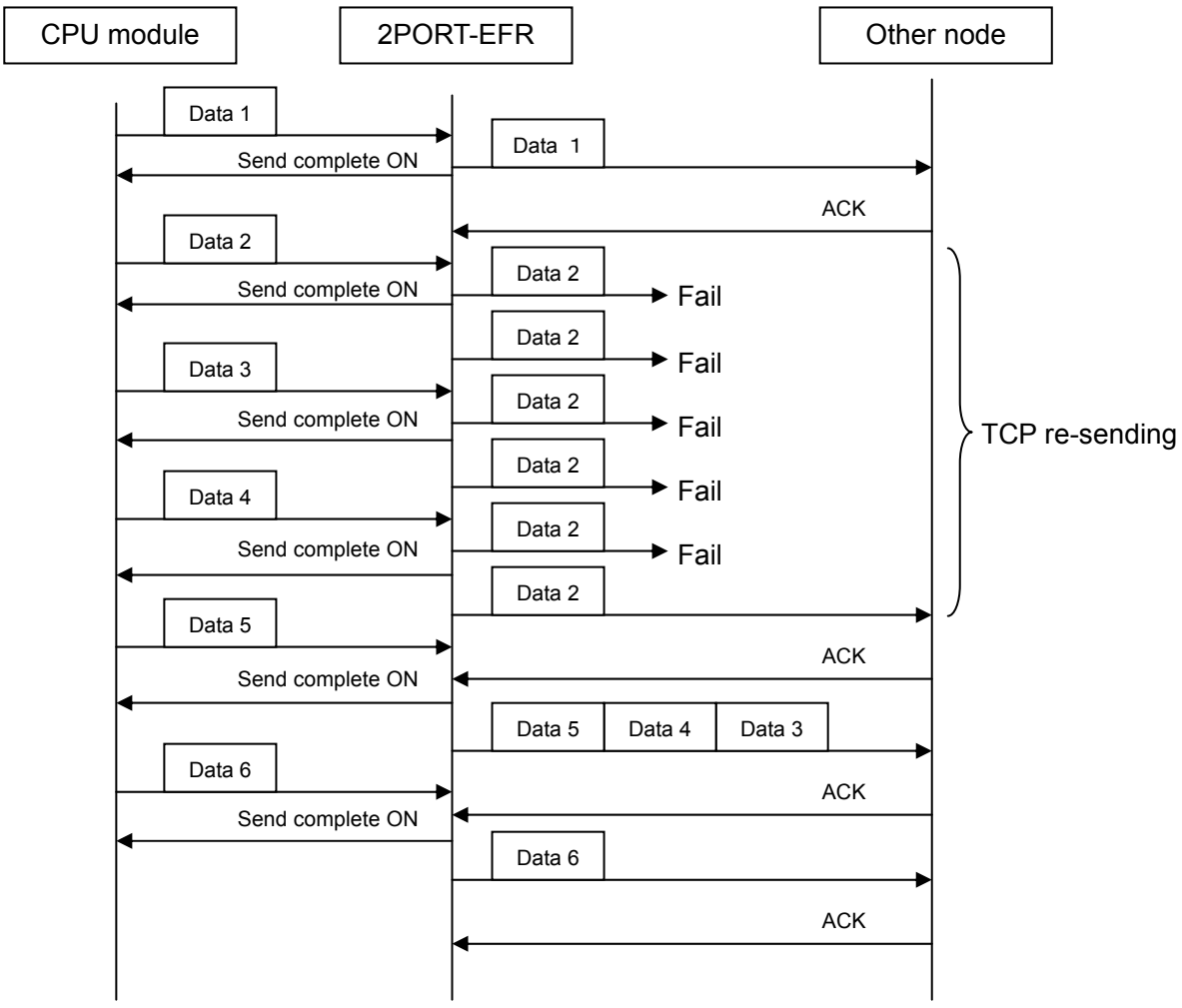
In the above case the sending data will be as follows;
00. 01. 02. 03　　0F. 10. 11　　FA. FB

11.3.2 Operation upon sending error

The send complete signal turns on when send data is handed to the communication module. Therefore, at this stage send data is not sent out to the network (it does not equate to receiving ACK from another node).

For TCP/IP, if the next data is requested while TCP is being sent, send data is held in the send buffer. Furthermore, if the next send request is made, that data is joined with the previous data in the send buffer and stored. If the first data is sent due to re-sending, the send data that was made to wait during TCP re-sending will be joined and sent within the maximum segment size limitations.

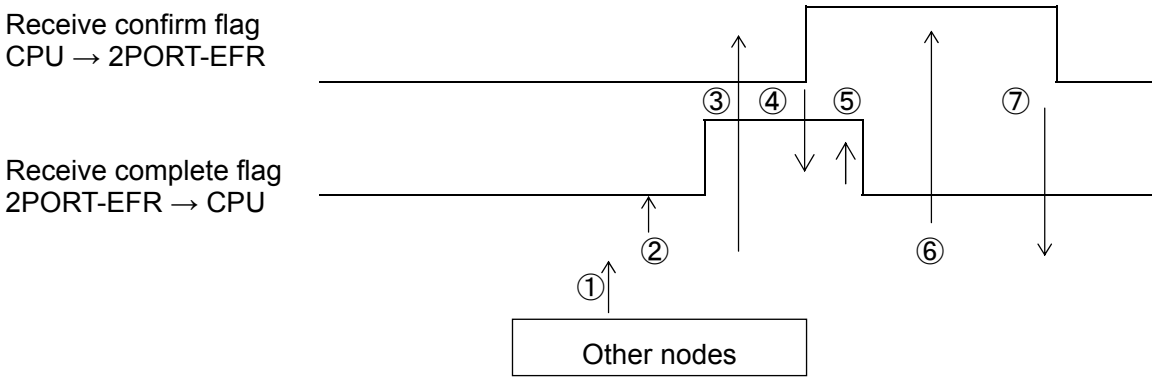
If data is sent continuously, the above operation will be performed therefore we recommend creating a communication program where, after data is sent once, response data from other nodes is received (alternating with send).



11.4 General communication receiving

11.4.1 Receiving procedures

If data is received from the 2PORT-EFR module by the sequence program using the general communication method (mode 1), it is done so according to the below procedures. For file memory addresses, please see the 2PORT-EFR instruction manual [Reference 2 File memory address map].



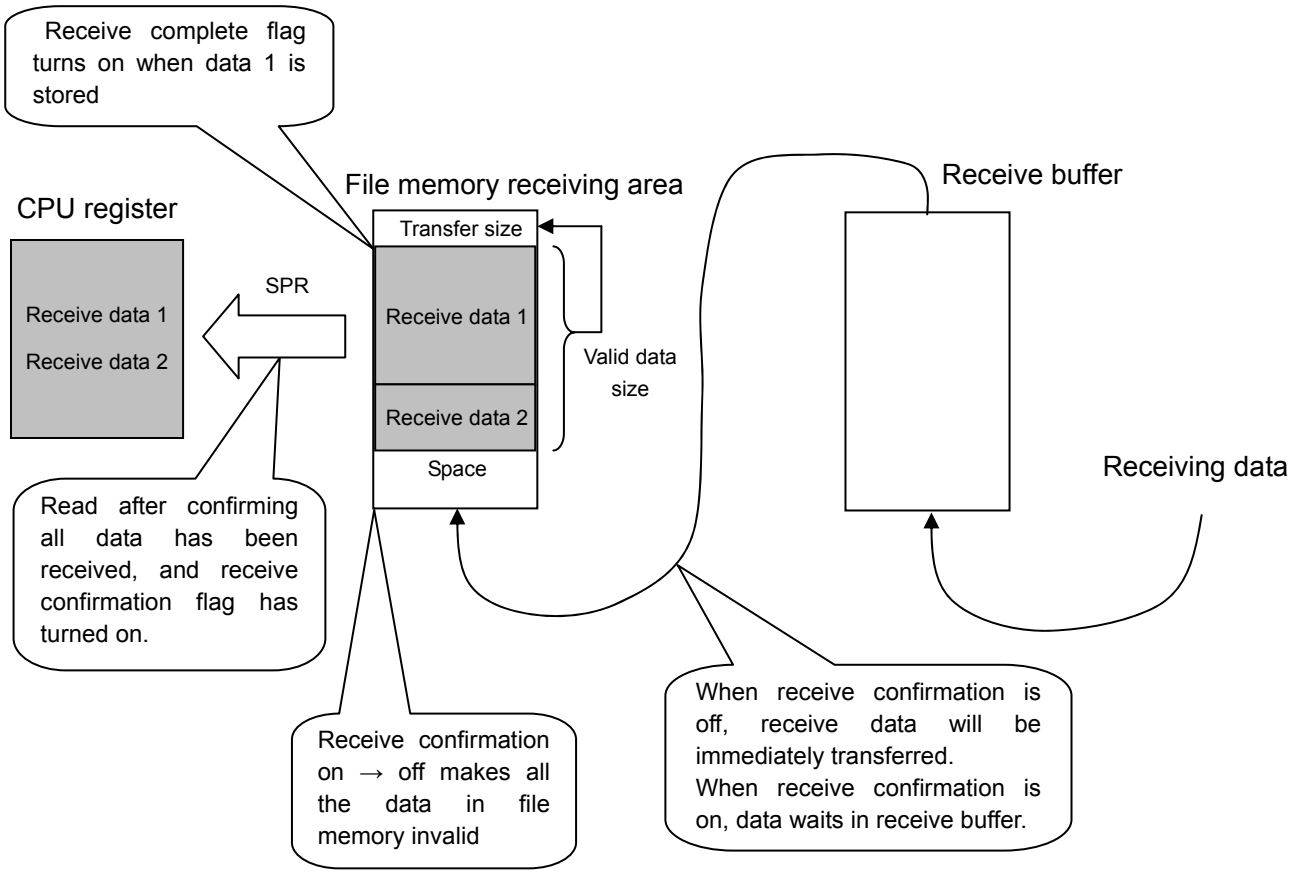
① Receive data from other nodes.
② The receive signal on the 2PORT-EFR module will come on when receive data is stored in file memory.
③ Once receive complete on is confirmed in the sequence program, information such as receiving size, header, etc. will be read in application command SPR and the total data size will be acquired.
④ Once all data has been received, receive confirmation will turn on.
⑤ The receive complete on the 2PORT-EFR module will turn off.
⑥ Once receive complete off is confirmed in the sequence program, file memory content will be read with the application command SPR.
⑦ Receive confirmation will turn off.

Receive data will be immediately stored in file memory if there is space.
The receive complete flag being on indicates that valid data exists in the file memory.
The receive confirmation signal will turn on when it has confirmed that all data has been received by using SPR commands to read size of receiving data, header information on the data portion if necessary, etc. Once receive confirmation turns on, receive complete will turn off and it is at this point that receive data is read from file memory. After receive data reading is complete, receive confirmation will turn off. When the receive confirmation flag turns off, file memory data will be destroyed (transfer no. will become 0). When the receive confirmation flag is on, even if new data is received, the data in the 2PORT-EFR file memory will not change. So that file memory doesn't change during reading, please read receive data after the receive confirmation flag turns on and the receive complete flag turns off.

11.4.2 Receiving separated data

If the data is separated on the sending side, (when other nodes have tried sending data exceeding the maximum segment size, etc) the separate batches of receive data arrive at different times and are not stored in the file memory simultaneously.

In such cases the receive complete flag turns on at the point where the first data batch is stored in the file memory. Receive complete does not necessarily mean that all data that the other node has separated and sent has arrived. Please look at the receive data size and data portion header information, etc. to judge whether all data has been received or not.



11.4.3 Receive data when the CPU has stopped running

Data received when the CPU has stopped running will remain saved in the file memory.

If the CPU is restarted as is, file memory content will be retained. If the CPU is reset then restarted, 2PORT-EFR will be initialized and data received until then will be destroyed.

11.4.4 Sequence program example

Below is an example of a sequence program for file memory receiving.

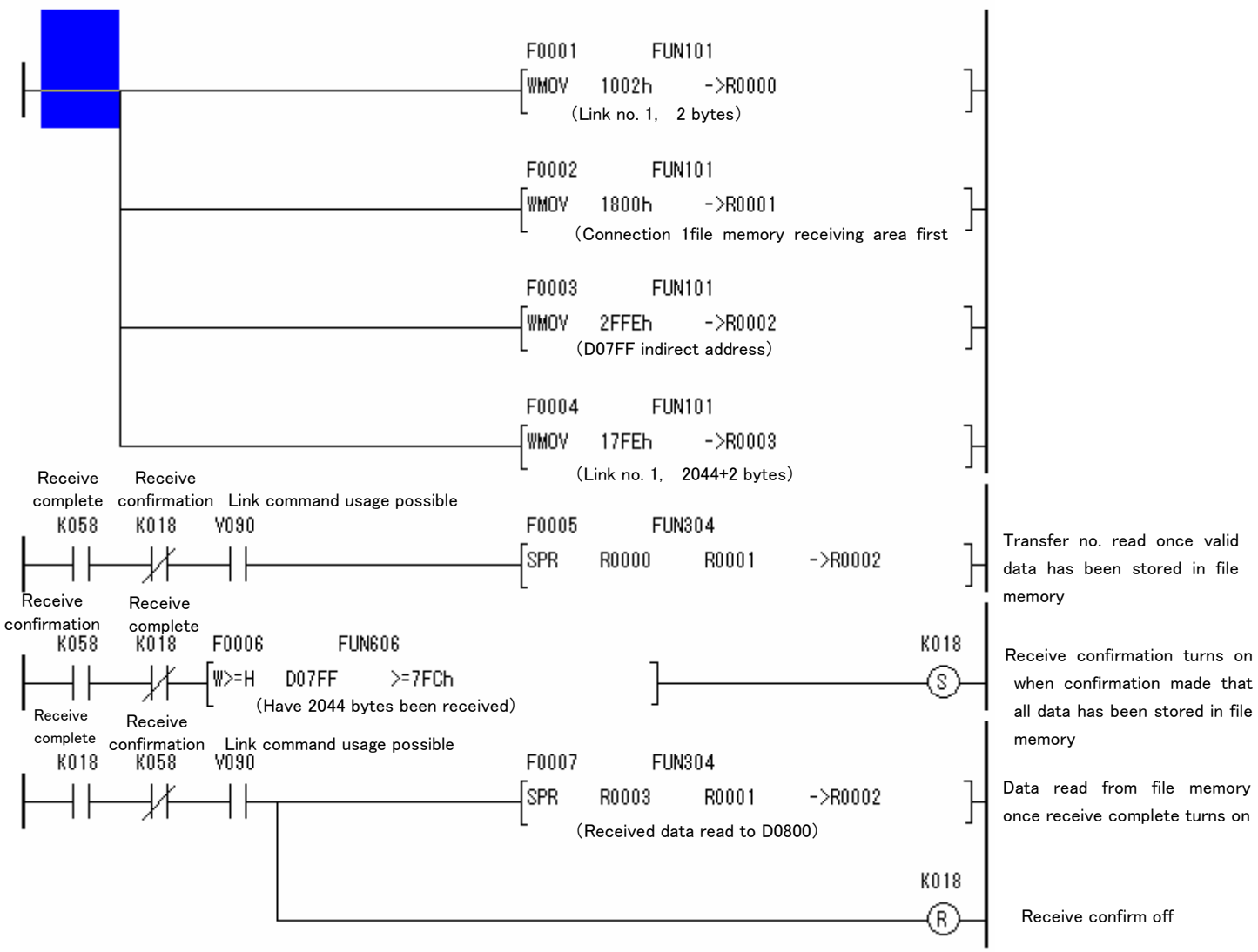
Conditions: Reads 2044 bytes of receive data to register D0800 - D0BFD.

Reads receive transfer no. to D07FF.

Connection № =1

Link № =1

Control input/output signals will be allocated from K00 to K68.



Note) On the PC2J, PC3J series, the data size that can be read with SPR command is limited to 1023 bytes.

To read more than 1023 bytes worth of data, divide the data into two halves.

11.4.5 Operation when file memory data reading is delayed

When new data is received before reading out data in the file memory, the new data is joined with the old data and stored in the file memory as long as there is space.

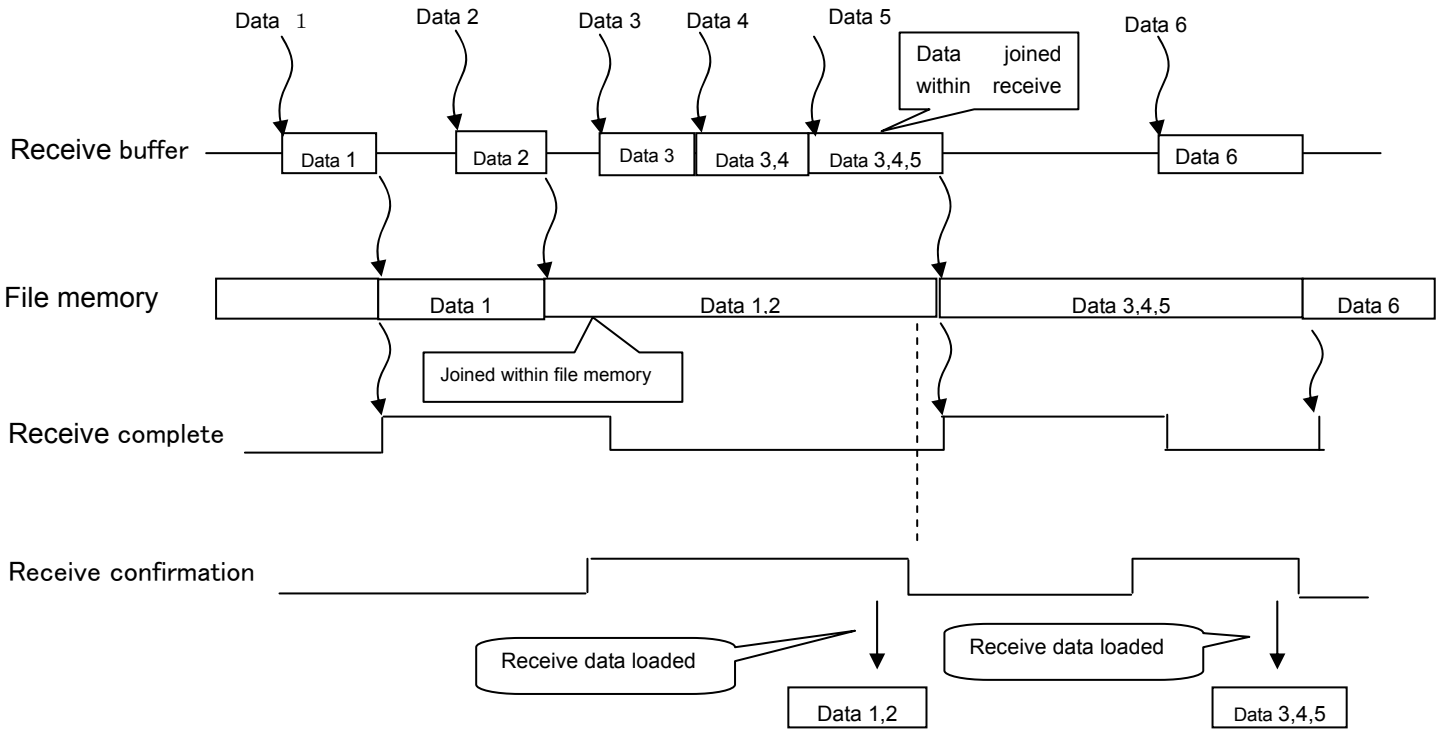
If the file memory is full (2044 bytes), new data will not be destroyed, but will be temporarily held in the receive buffer until space is made.

If multiple new data is received in that time, it will be joined with the data still stored in the buffer.

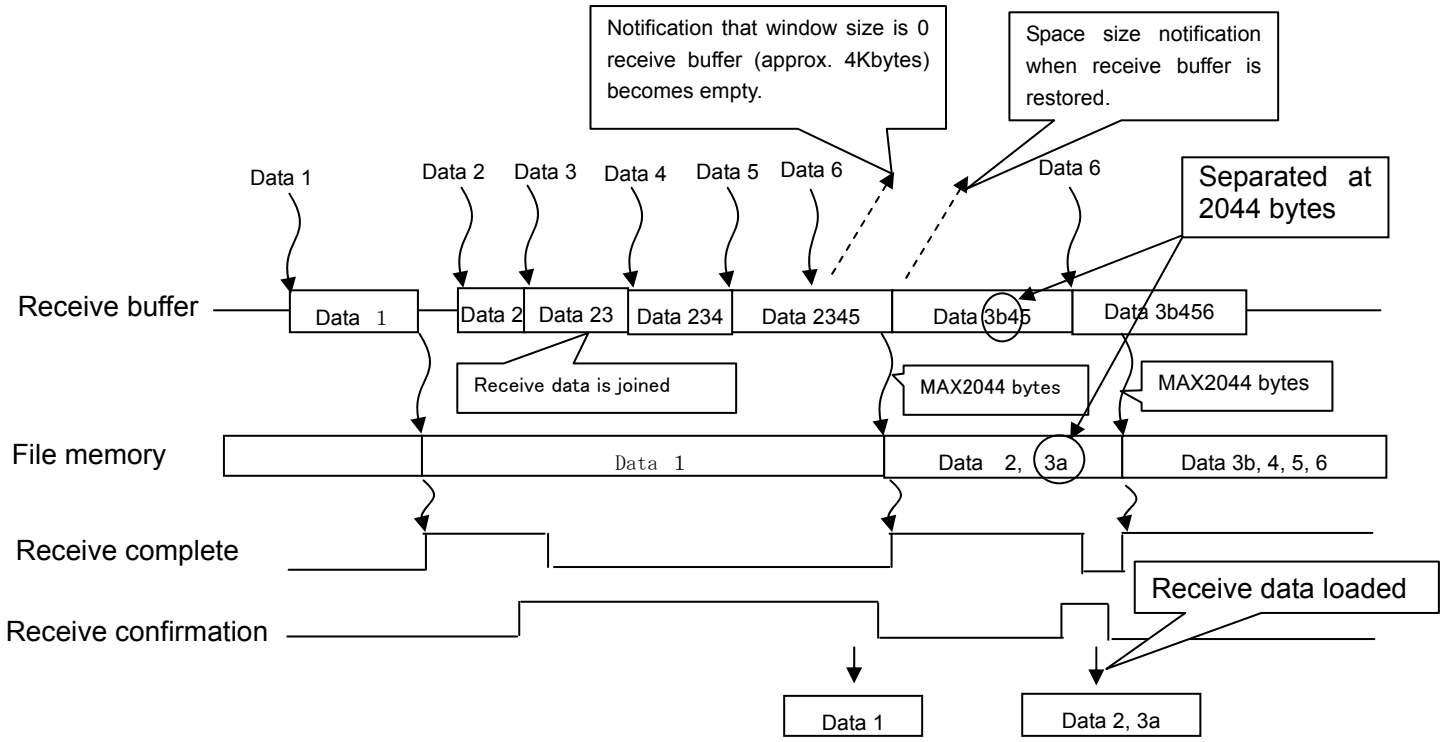
If the receive buffer becomes empty without data being read from the file memory, flow control will be performed on other nodes.

For TCP, the window size will become 0 and the sending of data from other nodes will be stopped. For UDP, ICMP Source Quench response will be sent and data will be destroyed.

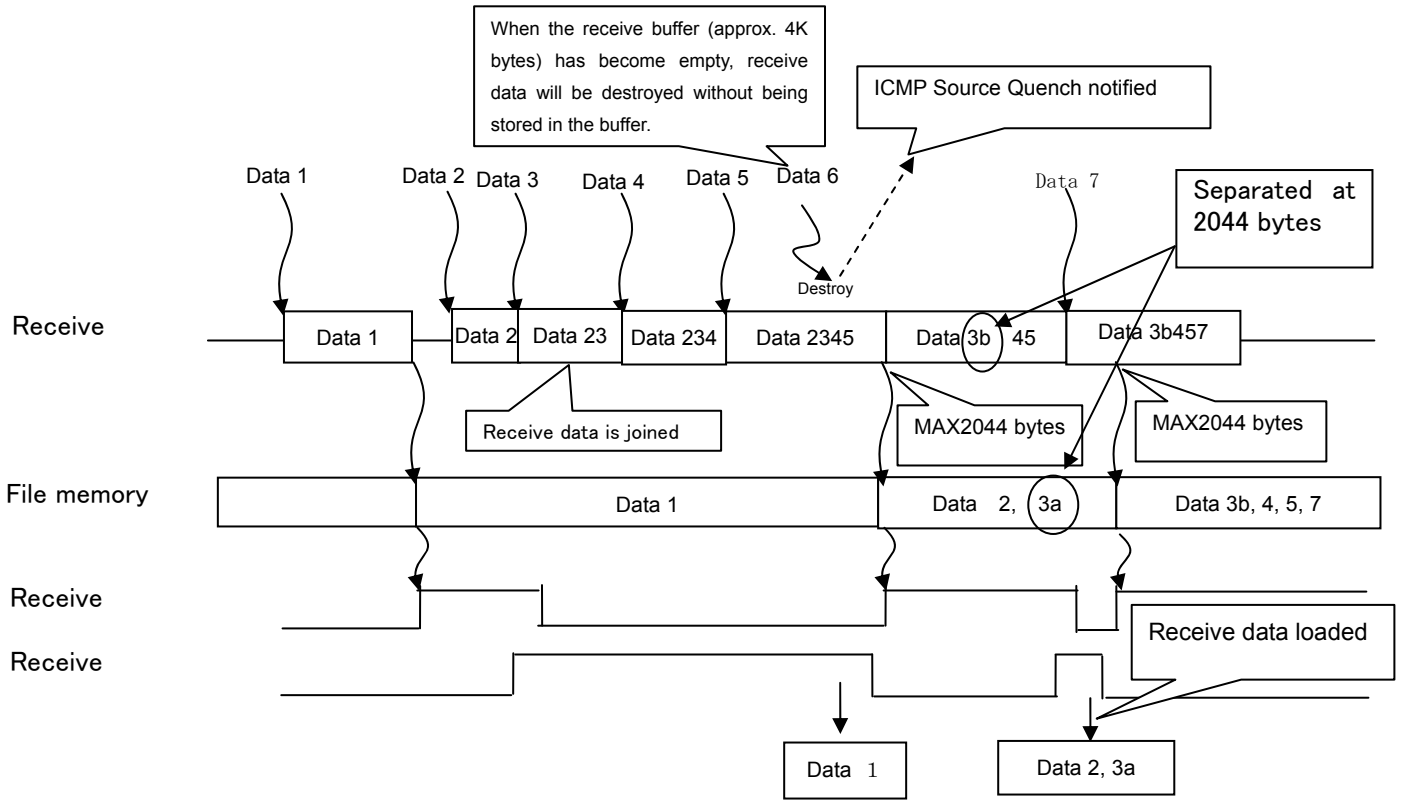
a) If multiple data is received during sequence reading



b) If receive buffer becomes empty (TCP)



c)If receive buffer becomes empty (UDP)



Note) If data is received when the CPU has stopped running the receive buffer will empty and b), c) operations will be performed.
If the CPU is reset then restarted, the Ethernet module will be initialized causing receive d ata to be lost.
If the CPU is simply restarted, the file memory and receive buffer will still contain valid dat a so to receive new data, please discard this remaining data.
For TCP, it is possible to destroy data by reopening connection.

12 Warning by the Ethernet

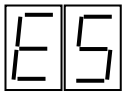
12.1 Classification of Errors

The errors reported by the 2PORT-EFR module are classified as follows.

(1) Hardware errorsFailures of the 2PORT-EFR module or communication errors with the CPU module

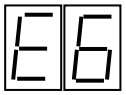
'H*' (* = 0 to F) appears on the LED display of the 2PORT-EFR module and error code 84 (a special module error) on the CPU module.

See 11-2 'Hardware Errors.'

(2) Link parameter errorThe link module name as link parameter has been set to a wrong value on the CPU module. Error code 89 (a link module assignment error) appears on the CPU module and  E5 on the LED display of the 2PORT-EFR module.

Note: This error is only related with the link module name. If any setting written from the Link Module Setup window or with an SPW command of the sequence program is wrong, a communication error of (3) occurs.

(3) Communication errorsA wrong I/O parameter setting (see section 11) or a failure of the sequence program.

If an I/O parameter has been set to a wrong value,  appears on the LED display of the 2PORT-EFR module.

Error code 86 (a communication error) appears on the CPU module and detail data recorded at address S3x0 and subsequent. (* is determined by the link No. of the 2PORT-EFR module.)

See section 11-4 'Communication Errors.'

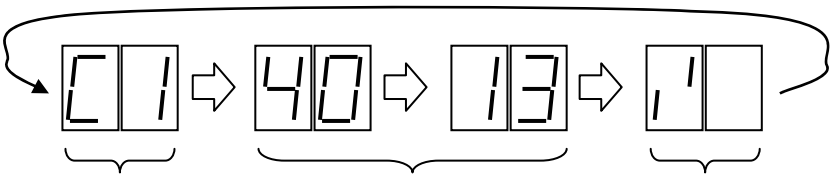
(4) Connection errorsA communication error with another node.

If a connection error occurs, the connection error code is stored in the file memory and the connection error flag turns on.

Connection error codes for each connection may also be read from the monitor area (see 2-2-6).

The connection No. of the connection with which an error occurred and the error code are alternately indicated every second.

If connection 1 is reset after the specified number of TCP re-transmissions (error code 4013), for example:



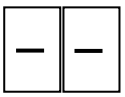
Connection No. Error code Connection open status

As a connection error occurs, the connection error flag of the file memory turns on and the connection error code is stored in the file memory.

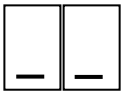
Any connection error does not affect the CPU module.

See 11-5 'Connection Errors.'

(5) Line errorsIf the line does not become available before the power-up or reset/start-up, the LED display becomes as shown below.



(For SW1-3=OFF 10Mbps)



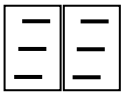
(For SW1-3=ON Auto negotiation)

In this case, the following causes are suspected.

(1) The I/O cable has been disconnected or poorly connected.
(2) The device connected with the I/O cable (hub or computer) has not been started.
(3) A cross cable is used to connect the hub.
(4) A straight cable is used to directly connect a terminal device such as computer.
(5) The cable has a cut wire.
(6) The 2PORT-EFR module has been out of order.

Note: 10 Base-T cables for Ethernet are divided into two types; straight and cross ones.
Use a straight one to connect the hub or a cross one to make a direct 1:1 connection with another device.

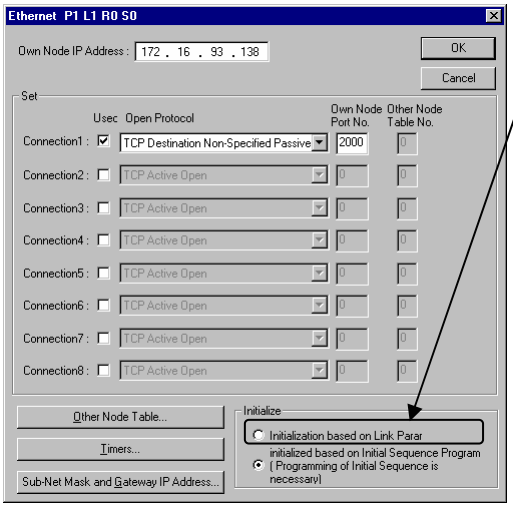
(6) No initial dataIf initial data such as IP address is not received from the CPU module upon the power-up or reset/start-up, the LED display becomes as shown below.



In this case, the following causes are suspected.

(1) Initialization is to be performed by the sequence program and the sequence program for turning the initialization request flag of the file memory on has an error or has not been assembled.

(2) Initialization is to be performed by link parameters and 'Initialization based on Link Parameters' has not been selected.



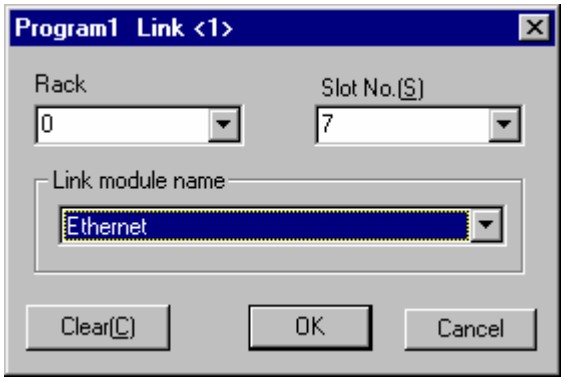
12.2 Hardware Errors

When the 2PORT-EFR module does not normally operate due to a failure of the module or peripheral equipment, it is considered as a hardware error.
Error code 84 (a special module error) appears on the CPU module.
An error code appears on the LED display at the front of the 2PORT-EFR module. Take corrective action in accordance with the following table.

Error code on Ethernet module LED	Error content	Cause and remedy
H0	RAM error	The Ethernet module is considered to be faulty. Replace it with a new one.
H1	Flash memory error	
H2	EEPROM error	
H3	Ethernet error	
HF	Application loading error	
H5	Command disagreement	Malfunctions of the Ethernet module, CPU module, base and I/O cable will prevent the normal sending and receiving of data between the Ethernet and CPU modules. If an error other than error code 84 is occurring on the CPU module, please perform trouble-shooting on the CPU module. If error code 84 is occurring on the CPU module, should this error also be occurring on other communication modules, please perform trouble-shooting on the other modules first. If the error cannot be cleared, please replace the Ethernet module, CPU module, I/O cable and base one by one.
H6	INTL clearness check error	
H7	Communication port hardware error	
Hd	System Abnormal execution	
H9	There is no command response from CPU.	Malfunctions of the Ethernet module, CPU module, base and I/O cable will prevent the normal sending and receiving of data between the Ethernet and CPU modules. If an error other than error code 84 is occurring on the CPU module, please perform trouble-shooting on the CPU module. If error code 84 is occurring on the CPU module, should this error also be occurring on other communication modules, please perform trouble-shooting on the other modules first. If the error cannot be cleared, please replace the Ethernet module, CPU module, I/O cable and base one by one.
		Occurs if communication is being performed via the network from the Ethernet module to a PC on another hierarchy when communication with connected devices has not been normal for an extended period of time due to equipment power supply being shut off, etc. When this error occurs, please reset or restart the CPU module in a state where the network communicating with the other hierarchy is communicating normally.

12.3 Link Parameter Error

The link module name as a link parameter has been set to a wrong value. Select 'Ethernet' as link module name.
For the peripheral equipment of an older type that does not have 'Ethernet' in its menu, select 'Computer link.'



12.4 Communication Errors

When an I/O parameter has been set to a wrong value with the 2PORT-EFR module or the number of bytes to be transmitted with the file memory method is out of the specified range, it is considered as an I/O error.

Error code 86 appears on the CPU module.

Error detailed data codes are recorded at the CPU module's special registers at the following addresses determined by the link No. of the 2PORT-EFR module.

	Error Code	Detailed Data 1	Detailed Data 2	Detailed Data 3
Link No.1	S310	S311	S312	S313
Link No.2	S330	S331	S332	S333
Link No.3	S350	S351	S352	S353
Link No.4	S370	S371	S372	S373
Link No.5	S390	S391	S392	S393
Link No.6	S3B0	S3B1	S3B2	S3B3
Link No.7	S3D0	S3D1	S3D2	S3D3
Link No.8	S3F0	S3F1	S3F2	S3F3

Take corrective action in accordance with the following table

■ Communication Anomaly Error Code Table

Error Code	Description	Detailed Data 1	Detailed Data 2	Detailed Data 3	How to Dispose
0113	Your own node IP address on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether your own IP address is correctly specified. Note that the following IP addresses are not available: ・All bits of network ID are 0 or 1 solidly. ・All bits of host ID are 0 or 1 solidly. ・All bits of subnet ID are 0 or 1 solidly. ・The highest byte is 127 (7Fh). (See Reference 5.)
0114	Gateway IP address on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the gateway IP address is correctly specified.
0115	Other node IP address on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the other node IP address is correctly specified. ・All bits of network ID are 0 or 1 solidly. ・All bits of host ID are 0 or 1 solidly. ・All bits of subnet ID are 0 or 1 solidly. ・The highest byte is 127 (7Fh). (See Reference 5.)
0116	Other node port No. (TCP) on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the other node port No. is correctly specified. The port No. should be between 0401h and FFFEh (1025 and 65534).
0117	Protocol on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the protocol (TCP:00 or UDP:01) is correctly specified.
0118	Mode on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the mode (Active:00, Destination-Specified Passive:01, or Destination Non-Specified Passive:02) is properly written in File Memory when you use TCP as the protocol.
0119	Your own node port No. (TCP) on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the other node port No. is correctly specified. The port No. should be between 0401h and FFFEh (1025 and 65534).
011A	Other node table No. on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the other node port No. is correctly specified and whether the specified table is set as "used" in the Using Table of initial parameter.
011B	Your own node port No. (TCP) on the initialization command may be duplicated.	0000	0000	0000	Ascertain whether your own node port No. is not duplicated.
011C	Your own node port No. (UDP) on the initialization command may be duplicated.	0000	0000	0000	Ascertain whether your own node port No. is not duplicated.
011D	Resending-timer (data) value on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the timer value is within the specification.
011E	Resending-timer (SYN,FIN) value on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the timer value is within the specification.
011F	Closing-timer value on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the timer value is within the specification.
0120	Packet alive time on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the timer value is within the specification.
0121	IP assembly timer value on the initialization command may be erroneous.	0000	0000	0000	Ascertain whether the timer value is within the specification.
0125	Subnet mask on the initialization command may be erroneous.	0000	0000	0000	Limit the altering points between 0 and 1 of the subnet mask to one point only. (See Reference 5.)
0126	Gateway IP address on the initialization command is not configured.	0000	0000	0000	Configure the gateway address or ascertain whether there is not any error on your own node IP address and other node IP addresses. (See Reference 5.)

0127	The initial command indicates an invalid number of re-transmissions.	0000	0000	0000	Ascertain whether the number of retransmissions is within the specified range.
0134	Other node table No. on the active opening command may be invalid.	Connection No.	0000	0000	This anomaly shows that Other Node Table No. is not specified for the connection designated as TCP Active. Ascertain whether the Other Node Table No. is correct and whether the specified table is set as 'used.'
2080	Faulty response timer value of the initial data	0000	0000	0000	Ascertain whether the timer value is within the specification.
2081	Faulty non-reception timer value of the initial data	0000	0000	0000	Ascertain whether the timer value is within the specification.
2082	Faulty transmission data transfer number	Connection No.	Transfer number	0000	Check whether the transfer data size at the head of transmission data area is between 0 and 2044 (7FCh) and whether the transfer data size is properly written in the file memory.
2085	Reception confirmation flag has been already hoisted when the fail reception is completed.	Connection No.	0000	0000	Ascertain whether the reception confirmation flag is not kept hoisted.

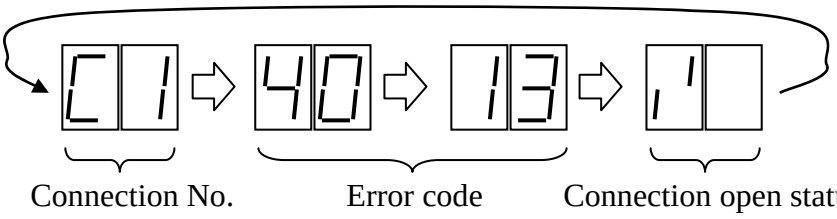
12.5 Connection Errors

When the data received from another node has an error, it is considered as a connection error. In this case, the error is indicated by the following devices.

(1) LED display

The connection No. of the connection with which the error has occurred, the former digits of the connection error code, and the latter digits of the code appear in this order on the LED display at the front of the module.

If connection 1 is reset after the specified number of TCP re-transmissions (error code 4013), for example:



(2) Status monitor

A connection error code is recorded at the CPU module's special registers in the following area.

Link No.	Error response data to the other node
1	S308 - S30F
2	S328 - S32F
3	S348 - S34F
4	S368 - S36F
5	S388 - S38F
6	S3A8 - S3AF
7	S3C8 - S3CF
8	S3E8 - S3EF

S3*8	Connection 1: Connection error code
S3*9	Connection 2: Connection error code
S3*A	Connection 3: Connection error code
S3*B	Connection 4: Connection error code
S3*C	Connection 5: Connection error code
S3*D	Connection 6: Connection error code
S3*E	Connection 7: Connection error code
S3*F	Connection 8: Connection error code

The connection error code can be read by monitoring this area with the peripheral equipment.

(3) File memory

Data is recorded in the connection error code area of the file memory. It may be read into I/O registers with an SPR command of the sequence program.

(See References 1 and 2.)

If a connection error occurs, an error response may be transmitted to the other node.

Take corrective action in accordance with the following table.

Symbols, "(1) – (4), **, and *," Description**

・Trouble finding and correcting, (1) – (4)

In case any anomaly arises, your 2PORT-EFR Module conducts the designated steps, (1) – (4):

(1): Writing the connection anomaly code and hoisting the connection anomaly flag

(2): Resetting the Connection

(3): Transmitting the error response data to the other node

(4): Setting 10 in RC to return the error response data as follows:

"80. 10. 01. 00. □□ " (□□ :Error Code)

Refer to Error Response Data Error Code Table (12-5-2) for error code information.

・Error Response Data, "**, and ***"

The frame type (FT) of error response data is transmitted in the following data:

**: In case of error response against file memory reception, ** = E0.
In case of error response against computer link command, ** = 80.

***: Data with the highest bit of received frame type (FT) set at 1

(i) In case of connection of TCP Passive:

Description	Find & Correct Trouble	Connection Anomaly Code	Error response data to the other node	Clear Timing of Anomaly	Occurrence Cause of Anomaly and Corrective Action
File Memory Transmission Response Data Reception Time Is Up	(1)(2)	4002	–	In Lowering Transmission Request Flag	This arises if no response is returned from the other node within Response Timer (default 6 sec) after a file data transmission via 2PORT-EFR Module. Ascertain whether the other node processes the File Memory Reception properly.
Wrong number of file memory transmission bytes	(1)	4003	–	In Lowering Transmission Request Flag	The number of transmission bytes in the file memory is wrong. Check transfer data size at the head of the file memory transmission data area.
Inability to receive data by the transfer number	(1)(2)(3)	4004	**.05	Opening from other node	This arises if file memory data or computer link command is received or if the transfer-number data (LL,LH) exceeds data number to be transmitted or the data is discontinued in the middle. Ascertain whether the transfer-number data is appropriate and whether all one-frame data are transmitted.
Faulty reception data frame format (Abnormal FT)	(1)(2)(3)	4005	***.01	Opening from other node	Occurs if, when using computer link type or file memory type, the first data (FT: frame type) of the received data is faulty. The FT needs to be one of the below. FT= 00 (computer link command), FT = 60 (file memory sending), FT = E0 (file memory receipt acknowledgement response) Occurs when the general communication method is used and it has not been possible to enable the general communication function.

Faulty reception data frame format (Abnormal RC)	(1)(2)(3)	4005	**.02	Opening from other node	This arises if the second datum (RC:response code) of received data is one besides "00" when file memory data or computer link command is received. Verify your transmission data.
Faulty reception data frame format (Abnormal transfer number)	(1)(2)(3)	4005	**.03	Opening from other node	Occurs if the transfer number data (LL, LH) of the received data is 0000 but exceeds 1274 bytes (computer link command) or 2044 bytes, (file memory sending, general-purpose communication sending). Confirm the sent data.
Though a computer link command has not processed yet, the next computer link command is received.	(1)(2)(3)	4006	80.06	Opening from other node	This arises if the next computer link command is received before resending the response to a received computer link command. Verify the computer link command transmission timing.
Though a file memory transmission has not processed yet, the next file memory data is received.	(1)(2)(3)	4007	E0.07	Opening from other node	This arises if the next file memory data is received before resending the response to received file memory data. Verify the file memory data transmission timing.
Faulty relay command format	(1)(2)(3)	4008	80.04	Opening from other node	Relay command has a wrong transfer data size or ENG code. Check the content of relay command.
Connection reset or closed during file memory transmission process.	(1)	4009	–	In Lowering Transmission Request Flag	A connection was reset or closed during file memory transmission process.
Non-reception timer is time up	(1)(2)	4010	–	Opening from other node	Data from another node cannot be received for a time longer than specified by Non-Reception Timer as initial parameter (defaulted 00: undefined). Check the setting of Non-Reception Timer.
Connection reset after specified number of TCP re-transmissions	(1)(2)	4013	–	Opening from other node	Reception confirmation (ACK) signal was not received from the other node after the number of communication retries specified by 'reset wait resending times' as initial parameter. This occurs when the other node is powered off or the cable has a cut wire. (See 7-4.)
Connection reset by multiple connection opening request from another port with the same IP address	(1)(2)	4014	–	Opening from other node	The connection designated as TCP non-specified passive open is reset if opening request is sent to the same port from another node when the connection is open. As opening request is sent from another node later, the connection with that node opens. (See 7-4.)
Error Response Reception to file memory transmission from other node [++=response code: RC]	(1)(2)	30++	–	In Lowering Transmission Request Flag	This arises if the response code (RC) received from other node is not "00" after a file memory data transmission. Verify the response data.
NAK response from J-CPU during computer link command process	(3)	–	(4)	–	Received computer link command has an error and could not be normally processed. Check the content of computer link command.
Connection errors other than the above	(1)(2)	013+	–	Opening from other node	Occur if an improper open/close request is received from another mode. Please check the communication program of the other node.

(ii) In case of TCP active connection

Description	Find & Correct Trouble	Connection Anomaly Code	Error response data to the other node	Clear Timing of Anomaly	Occurrence Cause of Anomaly and Corrective Action
Failing in active opening	(1)	4001	–	In hoisting opening request flag	The module failed in active-opening a connection with another node. Check that line is correctly connected, the other node has been started, and IP addresses of your node and the other node have the same network ID (see Reference 5).
File Memory transmission response data reception time is up.	(1)(2)	4002	–	In lowering transmission request flag	No response is sent from the other node for the time specified by Response Timer as initial parameter (defaulted 6 secs) after file memory data is transmitted from 2PORT-EFR module. Check that file memory is normally processed by the other node.

Wrong number of file memory transmission bytes	(1)	4003	–	In lowering transmission request flag	The number of transmission bytes in the file memory is wrong. Check transfer data size at the head of the file memory transmission data area.
Inability to receive data by the transfer number	(1)(2)(3)	4004	**.05	In hoisting opening request flag	This arises if file memory data or computer link command is received or if the transfer-number data (LL,LH) exceeds data number to be actually transmitted or the data is discontinued in the middle. Ascertain whether the transfer-number data is appropriate and whether all one-frame data are transmitted.
Faulty reception data frame format (Abnormal FT)	(1)(2)(3)	4005	***.01	In hoisting opening request flag	This arises if the head data (FT:frame type) of reception data is abnormal. FT must be one of the following: FT=00(computer link command),FT=60(file memory transmission), FT=E0(the corresponding response to transmitted file memory)
Faulty reception data frame format (Abnormal RC)	(1)(2)(3)	4005	**.02	In hoisting opening request flag	This arises if the second datum (RC:response code) of received data is one besides "00" when file memory data or computer link command is received. Verify your transmission data.
Faulty reception data frame format (Abnormal transfer number)	(1)(2)(3)	4005	**.03	In hoisting opening request flag	This arises if the transfer-number data (LL,LH) of received data is "0000," exceeds 1274 bytes (computer link command), or exceeds 2044 bytes (file memory transmission). Verify your transmission data.
Though a computer link command has not processed yet, the next computer link command has been received.	(1)(2)(3)	4006	80.06	In hoisting opening request flag	This arises if the next computer link command has been received before resending the response to a received computer link command. Verify the computer link command transmission timing.
Though a file memory transmission has not processed yet, the next file memory data has been received.	(1)(2)(3)	4007	E0.07	In hoisting opening request flag	This arises if the next file memory data has been received before resending the response to received file memory data. Verify the file memory data transmission timing.
Faulty relay command format	(1)(2)(3)	4008	80.04	In hoisting opening request flag	Relay command has a wrong transfer data size or ENG code. Check the content of relay command.
Connection reset or closed during file memory transmission process.	(1)	4009	–	In lowering transmission request flag	A connection was reset or closed during file memory transmission process.
Non-reception timer is time up	(1)(2)	4010	–	In hoisting opening request flag	This arises if data from other node cannot be received for the period or more that is set by Non-Reception Timer (default 00:undefined) of file memory. Check the setting of Non-Reception Timer.
Other node has closed the connection.	(1)	4011	–	In hoisting opening request flag	This arises if the other node has closed the connection after your own node opened a connection through an active opening.
Other node has reset the connection.	(1)	4012	–	In hoisting opening request flag	This arises if the other node has reset the connection after your own node opened a connection through an active opening.
Connection reset after specified number of TCP re-transmissions	(1)	4013	–	In hoisting opening request flag	Reception confirmation (ACK) signal was not received from the other node after the number of communication retries specified by 'reset wait resending times' as initial parameter. This occurs when the other node is powered off or the cable has a cut wire. (See 7-4.)
Error Response Reception to file memory transmission from other node [++=response code: RC]	(1)(2)	30++	–	In hoisting transmission request flag	This arises if the response code (RC) received from other node is not "00" after a file memory data transmission. Verify the response data.
NAK response from J-CPU during computer link command process	(3)	–	(4)	–	Received computer link command has an error and could not be normally processed. Check the content of computer link command.
Continuous open	(1)(2)	0132	–	In hoisting opening request flag	Occurs if the send complete flag turns off while data is being sent, and sending is performed again. If it occurs, please reset the CPU module. Please modify the program so that the send request flag turns off after data sending is complete or a connection error has occurred.

(iii) In case of UDP connection

Description	Find & Correct Trouble	Connection Anomaly Code	Error response data to the other node	Clear Timing of Anomaly	Occurrence Cause of Anomaly and Corrective Action
File Memory transmission response data reception time is up.	(1)	4002	–	In hoisting transmission request flag	No response is sent from the other node for the time specified by Response Timer as initial parameter (defaulted 6 secs) after file memory data is transmitted from 2PORT-EFR module. Check that file memory is normally processed by the other node.
Wrong number of file memory transmission bytes	(1)	4003	–	In hoisting transmission request flag	The number of transmission bytes in the file memory is wrong. Check transfer data size at the head of the file memory transmission data area.
Inability to receive data by the transfer number	(3)		**.05	–	This arises if file memory data or computer link command is received or if the transfer-number data (LL,LH) exceeds data number to be actually transmitted or the data is discontinued in the middle. Ascertain whether the transfer-number data is appropriate and whether all one-frame data are transmitted.
Faulty reception data frame format (Abnormal FT)	(3)		***.01	–	This arises if the head data (FT:frame type) of reception data is abnormal. FT must be one of the following: FT=00(computer link command),FT=60(file memory transmission), FT=E0(the corresponding response to transmitted file memory)
Faulty reception data frame format (Abnormal RC)	(3)		**.02	–	This arises if the second datum (RC:response code) of received data is one besides "00" when file memory data or computer link command is received. Verify your transmission data.
Faulty reception data frame format (Abnormal transfer number)	(3)		**.03	–	This arises if the transfer-number data (LL,LH) of received data is "0000," exceeds 1274 bytes (computer link command), or exceeds 2044 bytes (file memory transmission). Verify your transmission data.
Though a computer link command has not processed yet, the next computer link command has been received.	(3)		80.06	–	This arises if the next computer link command has been received before resending the response to a received computer link command. Verify the computer link command transmission timing.
Though a file memory transmission has not processed yet, the next file memory data has been received.	(3)		E0.07	–	This arises if the next file memory data has been received before resending the response to received file memory data. Verify the file memory data transmission timing.
Faulty relay command format	(3)		80.04	–	Relay command has a wrong transfer data size or ENG code. Check the content of relay command.
Error Response Reception to file memory transmission from other node [++ = response code: RC]	(1)	30++	–	In hoisting transmission request flag	This arises if the response code (RC) received from other node is not "00" after a file memory data transmission. Verify the response data.
NAK response from J-CPU during computer link command process	(3)	–	(4)	–	This arises if received computer link command has any fault resulting in abnormal transaction. Verify the computer link command contents.

12.5.2 Error Response Data Error Code Table

If any NAK (anomaly) reply is returned as the computer link command error response "80.10.01.00. □□ " (□□ :Error Code) or as the relay command response, refer to the following table for reviewing your command data:

□□ : Error Code	Error Description
11	Inability to process data because of faulty CPU Module Hardware
20	Fixed Data (ENQ) within relay command is not "05."
21	Faulty transfer number (there is erroneous transfer byte number within the relay command.)
23	Erroneous command code
24	Erroneous subcommand code
25	Erroneous command-format data byte
26	Erroneous function-call operand number
31	Attempting to write data into the field where any writing is prohibited during a sequence operation or to use the function call which is protected from any execution during a sequence operation.
32	A command that is defeated during a stop continuity is activated during a stop continuity.
33	Attempting to execute a debug function call despite non-debug mode
34	Access prohibited owing to access-prohibited configuration
35	Non-executable owing to execution-priority limiting configuration (*)
36	Non-executable owing to execution-priority limiting configuration by another device (*)
39	Attempting to start scanning without any reset after writing I/O point-number parameters or I/O allocation point-number parameters
3C	During a fatal failure, a command has issued that is not executable during a fatal failure
3D	Non-executable due to competing process while a different-factor command is executed.
3E	Non-executable command due to reset existence
3F	Non-executable command due to stop duration
40	Address of a reading/writing command or of "address + data number" of a command is out of range.
41	Word/byte number is out of range.
42	Non-designated data is sent.
43	Erroneous function-call operand
52	Though any timer or counter is employed, a command for reading/writing the set/recent values is issued.
66	No reply is sent from link module with the link exchange No. specified by a relay command (Owing to no existence of specified link module, power OFF, or faulty circuit, etc.)
70	Non-executable module with the link exchange No. specified by a relay command (Owing to erroneous link No. designation or faulty link module)
72	No reply is sent from link module with the link exchange No. specified by a relay command (Owing to no existence of specified link module, power OFF, or faulty circuit, etc.)
73	Multiple relay commands were issued to the same link module from the CPU module and the link module could not process the commands. (Send commands again.)

*: See command (22), reading execution priority limitation state or (23), setting execution priority limitation.

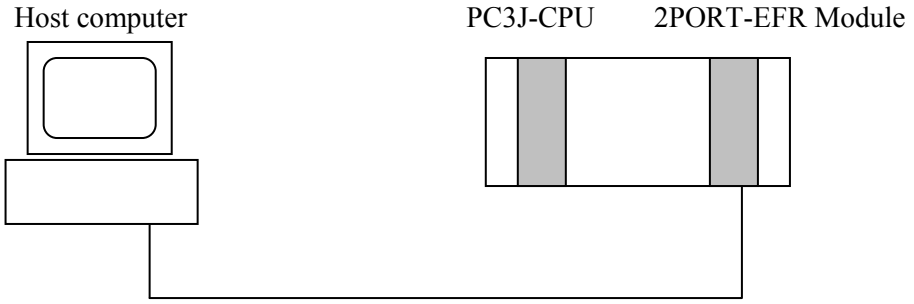
If any error code other than the above is returned, review the entire command data.

13 Ethernet Communication Transaction Time

Use the following equality to figure out Transfer Delay Time for Computer Link Method Communication or File Memory Method Communication.
Note that the Transfer Delay Time can be extended further depending upon network active ratio and system formation.
Consider the value calculated from the equity below as an aim of minimum transfer delay time.
If any data is not transmitted due to heavy congestion on the circuit on data collision occurs on the line, the 2PORT-EFR module waits for the period specified by Resending Timer as an I/O parameter before attempting to re-transmit.

(1) Computer Link Method

The time from the command issue on circuit by host computer to the response issue by 2PORT-EFR Module.



■ Sample of TCP/IP as protocol:

Transfer Delay Time = 8 + (14 + 0.005 × Command byte number + 0.005 × Response byte number) × Number of connections used + Sequence scan time (*1) (ms)

■ Sample of UDP/IP as protocol:

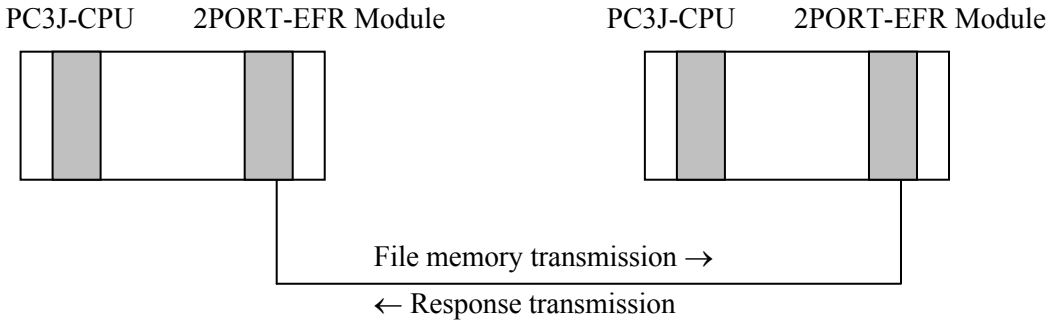
Transfer Delay Time = 8 + (14 + 0.006 × Command byte number + 0.004 × Response byte number) × Number of connections used + Sequence scan time (*1) (ms)

(*1: If the sequence scan time exceeds 25 ms, use 25 ms for calculation.)

(Caution) The said Command Byte Number and Response Byte Number is identical to TOYOPUC data-unit byte number specified in Chapter 6. Computer Link Method.

(2) File Memory Method

The time to be spent by the communicatee, after the communicator hoists the transmission request flag, to read the reception data into registers, hoist the reception confirmation flag, and send a response back to the communicator before the transmission completion flag at the communicator turns on under a communication between TOYOPUC 2PORT-EFR modules.



■ Sample of TCP/IP as protocol:

Transfer Delay Time = 48 + (4 + 0.01 × Transmission data byte number) × Number of connections used + Sequence scan time at communicator + Sequence scan time at communicatee (ms)

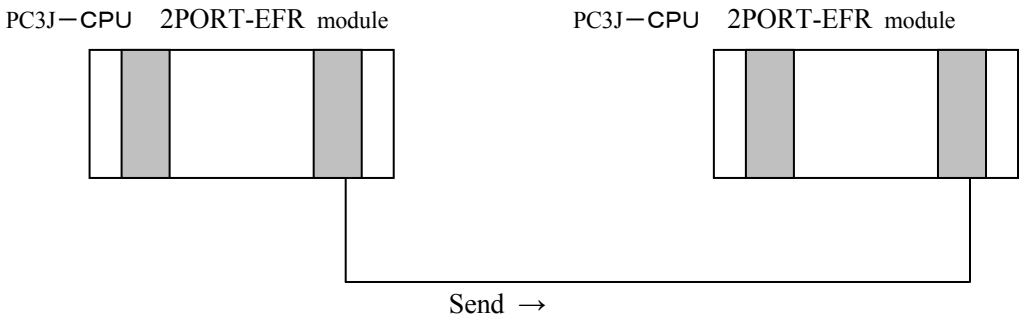
■ Sample of UDP/IP as protocol:

Transfer Delay Time = 44 + (4 + 0.01 × Transmission data byte number) × Number of connections used + Sequence scan time at communicator + Sequence scan time at communicatee (ms)

Caution) Transmission Data Byte Number above is the byte number (value of LL, LH) of file memory data to be transmitted.

(3) General communication method

Below is the time taken from the point where the send request flag turns on on the sending side and the data is read to the register on the receiving side when two TOYOPUC 2POR T-EFR modules communicate with each other.



■ Common to TCP/UDP

Transmit delay time＝13＋(4 + 0.003X send data byte no.)×Used connection no. ＋
Sending-side sequence scan time + receiving-side sequence scan time ×3

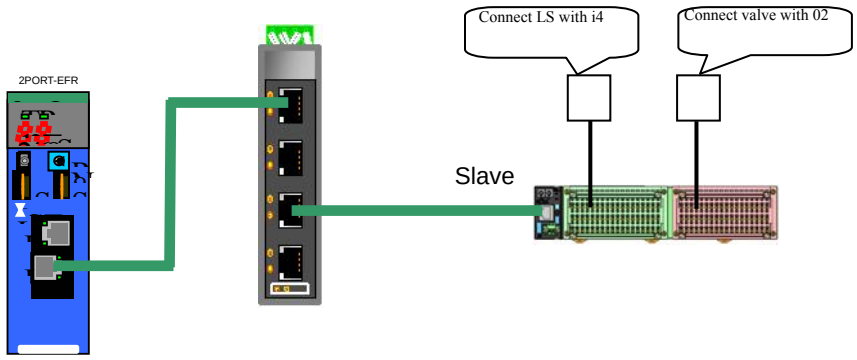
(Note: Send data byte no. is the byte no. of the file memory data sent (LL, LH values).

14 FL-Remote initialization

14.1 Parameter settings

[I/O module] and [link parameters] are set in the program.
Using PC win as an example, below is an explanation on how to perform parameter settings.
NOTE 1: Make sure to change/add parameters after [All Programs + Parameters] has been read from the CPU.
NOTE 2: Please perform [FL Remote - M] link parameter settings on PCwin Ver. 10.0 or later.

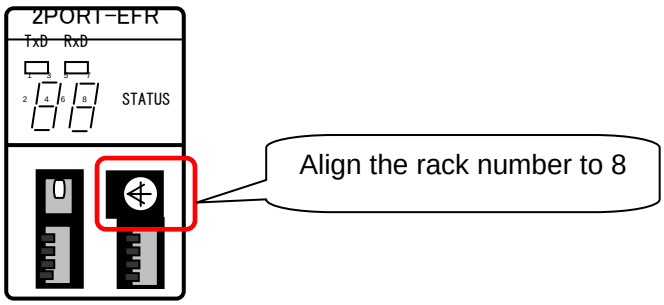
The following explains about the parameter setting method for the below configuration.



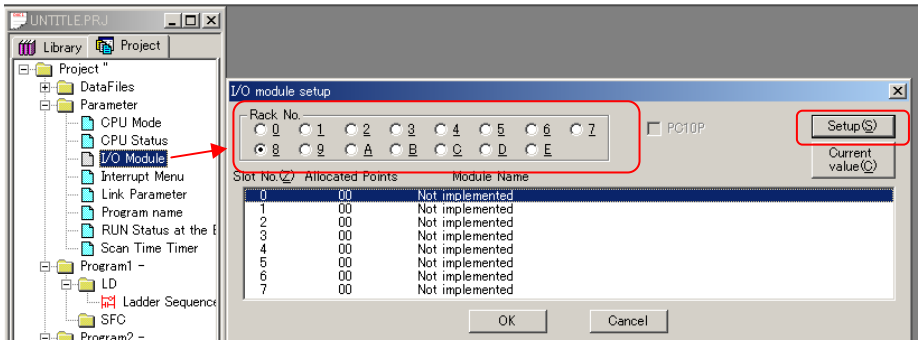
14.2 I/O module setting example

This section explains about the parameter settings (using PC win Ver. 10.0 or later) when L1 is used for Ethernet and L2 for FL Remote.
The rack number to be hypothetically implemented is 8.

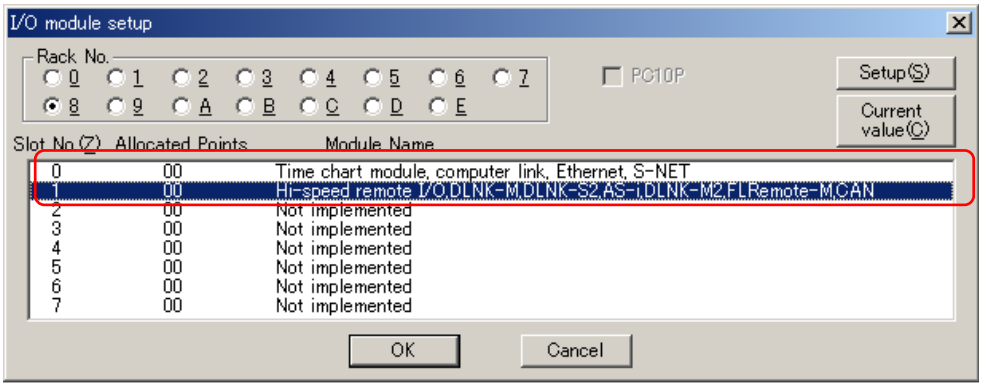
1. Align the rotary switch with the rack number for hypothetical implementation.



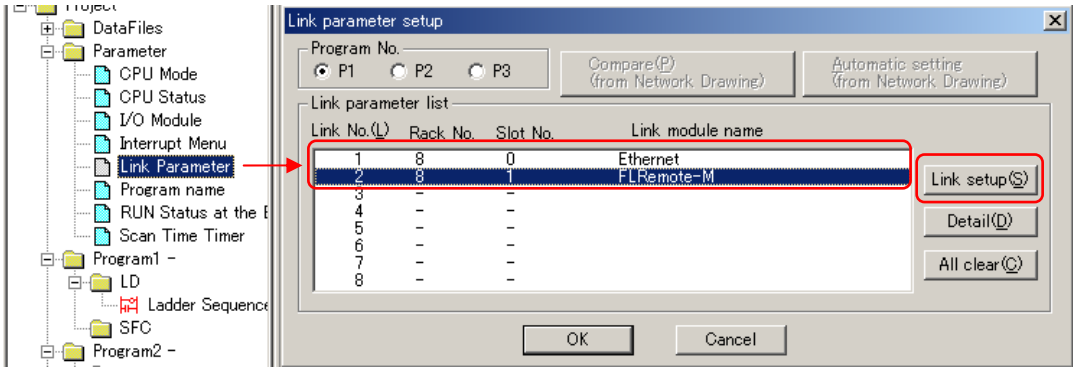
2. After starting PCwin and setting parameters, select I/O module and align the rack number with 8.



3. In settings, designate Ethernet for slot 0 and FL Remote-M for slot 1.



4. In link settings, set the link parameters as shown below.



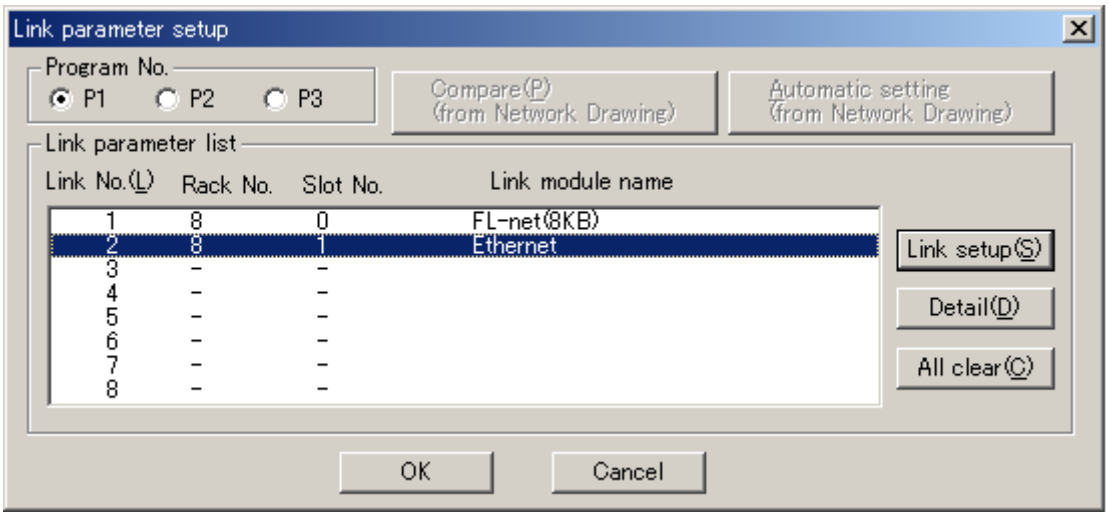
Handling when links not used

Please make the I/O module setting for unused ports [Ethernet].

Regarding switch settings, please see 1.5 Name and funciton of each part.

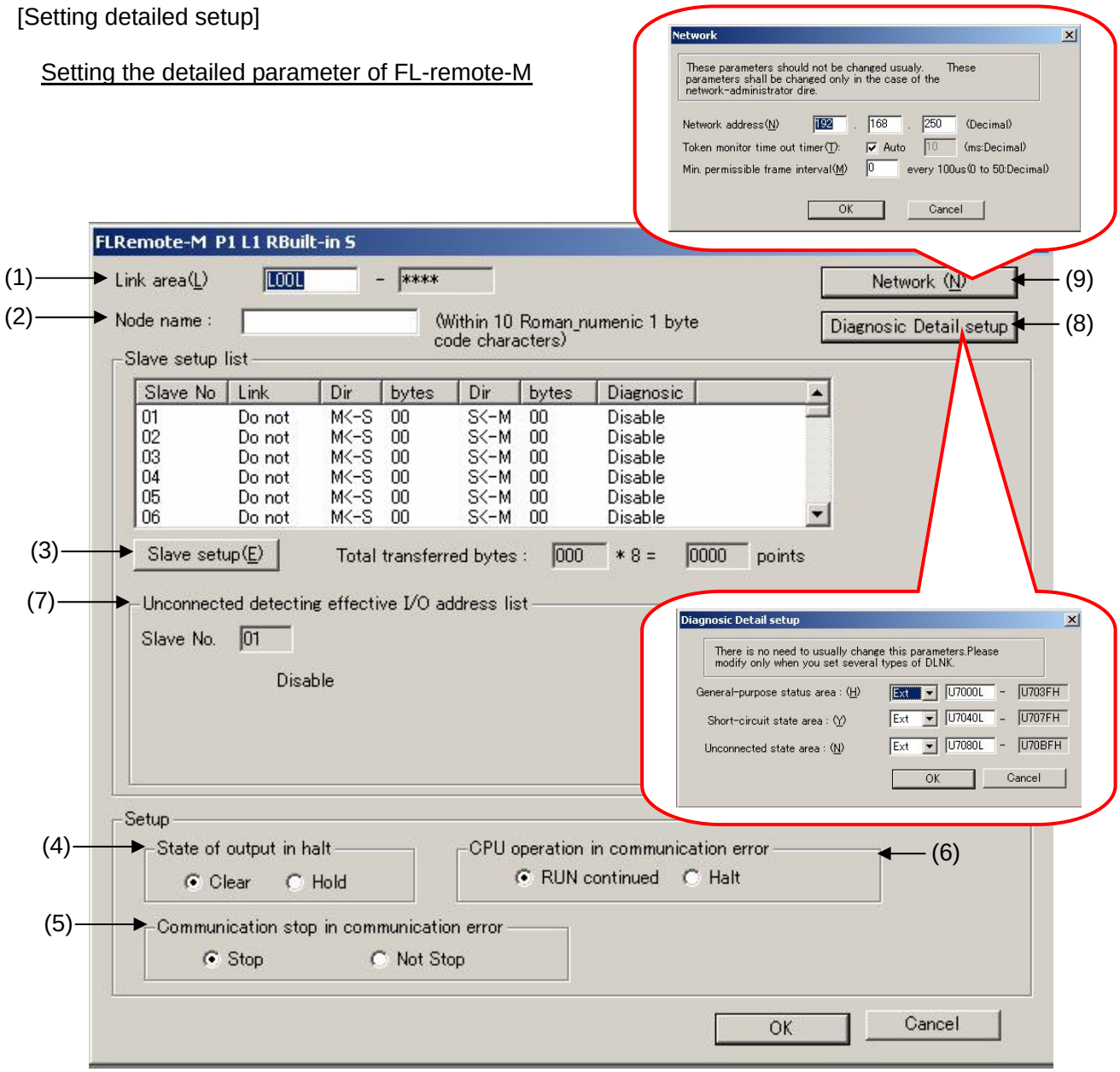
Please note, there is no need to set detailed link parameters.

＜If L2 is not set＞



[Setting detailed setup]

Setting the detailed parameter of FL-remote-M



(1) [Link area]
The top address of the communication area is set up. The last address is automatically set up by the sum total of transmission bytes of slaves.
The area that can be used as I/O address is as follows.
- Link relay: L00L-L7FL, EL000L-EL1FFH
- Internal relay: M00L-M7FH, EM000L-EM1FFH, GM000L-GMFFFH
- Input / Output: X•Y00L-X•Y7FH, EXY000L-EXY7FH, GXY000L-GXYFFFH

Note 1: GX•GY and GM area can be used in the PC3JG separate mode.
Note 2: When using X•Y area for the communication area, don't overlap I/O used by CPU.

(2) [Node name]
Please put the name of FL-remote-M.

(3) [Slave setup]
Slave No. at Slave setup list is clicked, [Slave setup] is clicked, and detailed parameter of Slave is set up. Please refer to "Setting detailed parameter of Slaves" for details.

(4) [State of output in halt]
The output state when RUN of CPU module stops is set up. When it sets up for "Clear", the node transmission data of the data link becomes all 0 if RUN stops. When it sets up for "Hold", it keeps transmitting the data just before RUN stops even if RUN stops.

(5) [Communication stop in communication error]
Communication is set up for "stop" or "not stop" in communication error.
When it sets up for "not stop", the master does not report errors to CPU in communication error, but the master continues the communication with normal slaves. The master resumes the communication with the slaves automatically, when error slaves return normally.

(6) [CPU operation in communication error]
CPU operation when error occurs in the module is set up. When it sets up for "RUN continued", RUN never stops even in communication error. When it sets up for "Stop", RUN stops in communication error.

(7) [Unconnected detecting effective I/O address list]
The I/O address that set “Enable” to Unconnected detecting is displayed about a slave clicked in [Slave setup list].

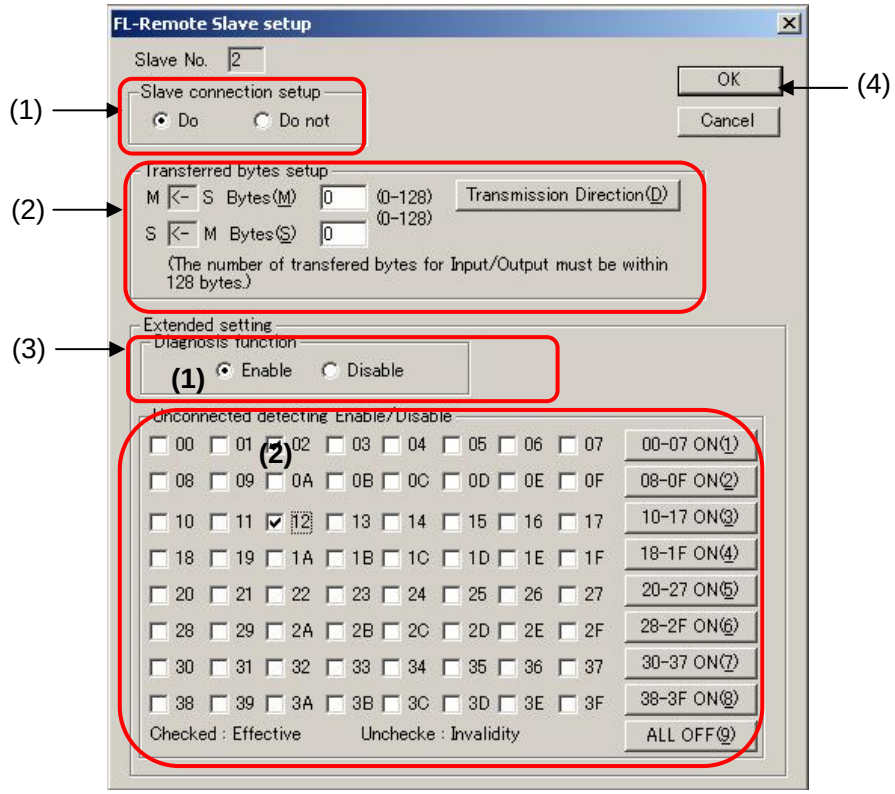
(8) [Diagnosic Detail setup]
When a slave is FRMT series, the area that stores diagnosis data (General-purpose status, Short-circuit state, Unconnected state) in CPU is set up. Please refer to "9.10.6 COLLECTION OF DIAGNOSIS DATA" for details of diagnosis data.

(9) [Network]
It is not necessary to set it for this item.

(10) [OK] is clicked after completing the setup.

[Setting the detailed parameter of slaves]

The slave setting screen of FRMT



(1) [Slave connection setup]
"Do" is set up in the case that connects a slave to the network.
"Do not" is set up in the case that does not connect a slave to the network.

(2) [Transferred bytes setup] M: Master, S: Slave, ←: Transmission Direction
The number of slave I/O bytes is set up with decimal.
The number of input bytes is set to [M ← Bytes transferred to slave], the number of output bytes is set to [S ← Bytes transferred to master].
I/O address of the upper row in [Transferred bytes setup] is previously allocated, I/O address of the lower is allocated in the following order.
In the order of I/O address of the previous setting example, input is previous and output is following. The transmission direction changes by click of [Transmission Direction].
Range of the number of transferred bytes per one slave: Input 0-128 and output 0-128
The sum total of the number of transferred bytes: Less than 256 bytes.

(3) [Extended setting]
In case that the correspondent slave is FRMT series, please set the following.

(3)-1. Diagnosis function
In case that the diagnosis function of FRMT series is used, [Enable] is set. In case that the diagnosis function of FRMT series is not used, [Disable] is set.
Refer to "14.3 Collection of Diagnosis Data" for the details of diagnosis data.

(3)-2. [Unconnected detecting Enable/Disable]
[Enable] or [Disable] for the function of detecting disconnection is set to each point.
Check ☑ is [Enable] and no check ☐ is [Disable].
00 – 3F are I/O address.

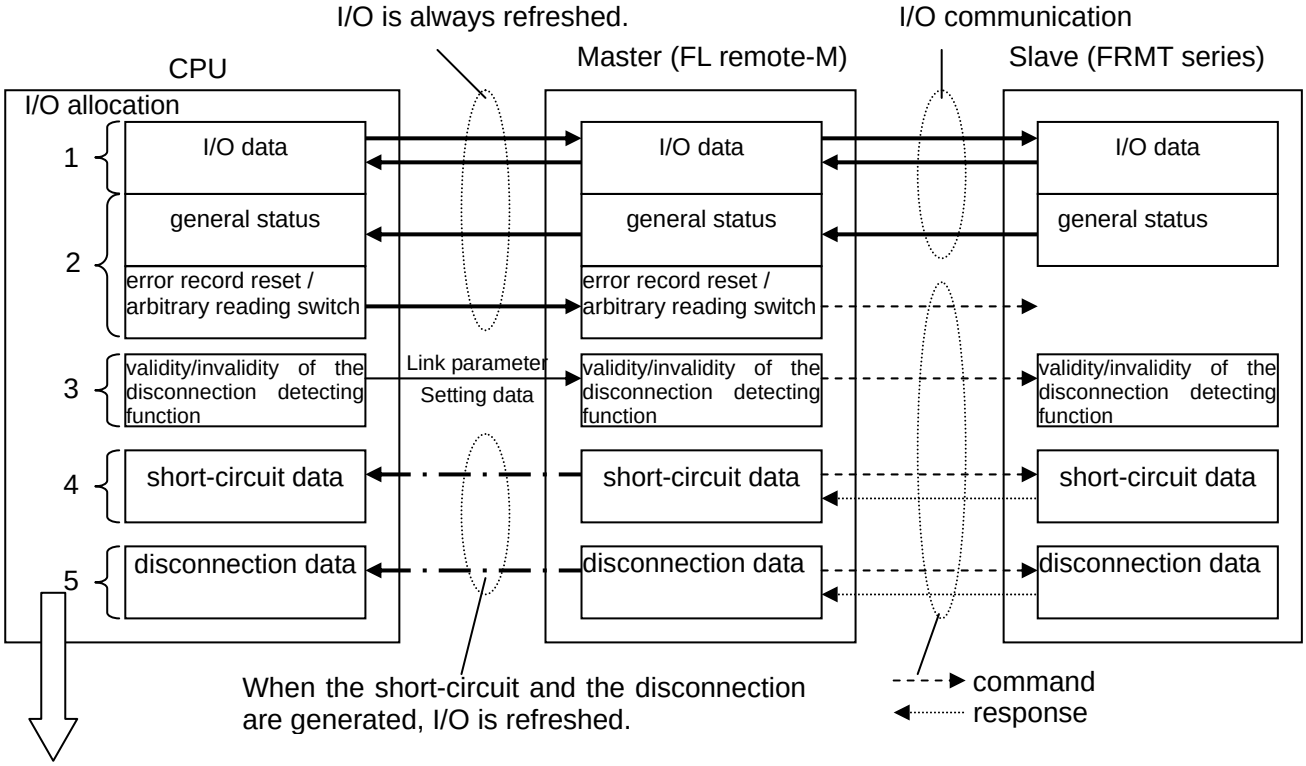
(Note) Data of [Unconnected detecting Enable/Disable] are saved to the slave in initialed processing of the master when diagnosis function "Enable". These data are maintained during turning off slave's power supply.

(4) [OK] is clicked after completing the setup.

14.3 COLLECTION OF DIAGNOSIS DATA

In FL-remote, there are diagnosis data as ‘general-purpose status’, ‘short circuit data’, ‘disconnection data’, and ‘validity/invalidity of the disconnection detecting function’ besides the I/O data.

I/O data / diagnosis data flow



I/O allocation by the link parameter of FL-remote (Refer to “14.3.1 Collection of Diagnosis Data by Link Parameter” about details)

1. I/O data: the top address is set to ‘link area’.
2. General-purpose status and error record reset / arbitrary reading switch: the top address is set to ‘General-purpose status area’ in the extended setting.
3. Validity/invalidity of the disconnection detecting function: ‘validity/invalidity of the disconnection detecting function’ is set for the I/O address of the each slave. This data is kept during turning off the slave's power supply.
4. Short-circuit data: the top address is set to ‘ Short-circuit state area’ in the extended setting.
5. Disconnection data: the top address is set to ‘ Unconnected state area’ in the extended setting.

(Note 1) In general-purpose status, error record reset / arbitrary reading switch, validity/invalidity of the disconnection detecting function, short-circuit data and disconnection data, the target slave is FRMT series and these are effective when set by the link parameter, diagnosis function "Enable".

(Note 2) If the diagnosis functions of all slaves are ‘Disable’, ‘General-purpose status area’ of the node 01-63 must be set to the unused area because these are always I/Orefreshed.

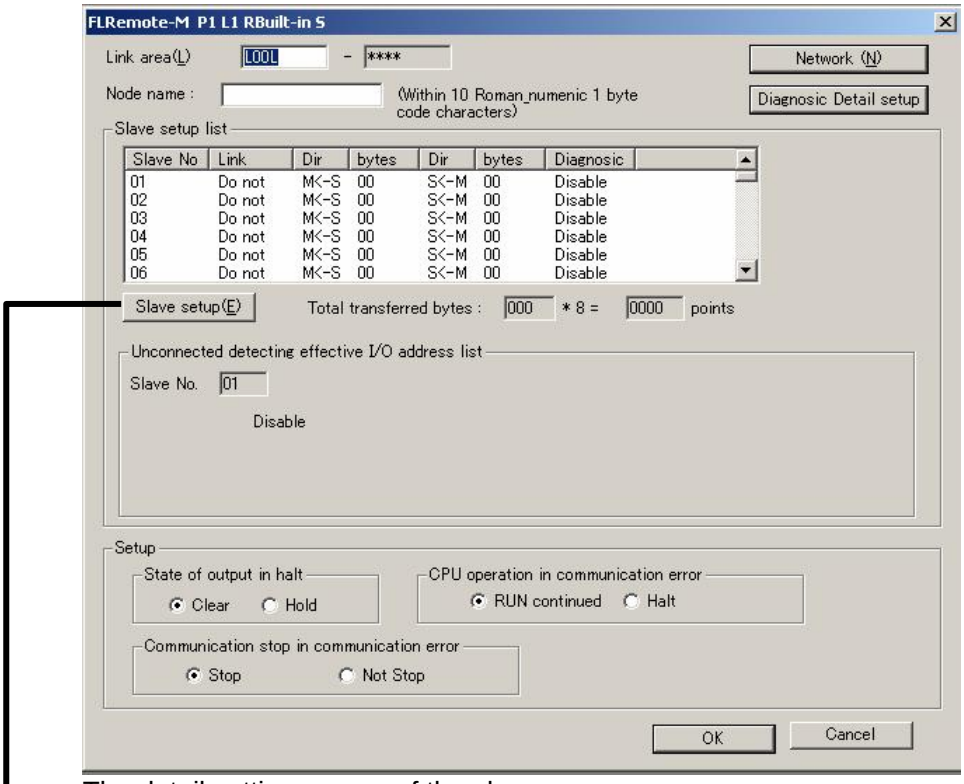
14.3.1 Collection of Diagnosis Data by Link Parameter

I/O allocation to CPU for ‘general-purpose status’, ‘short-circuit data’ and ‘disconnection data’, and the setting of ‘validity/invalidity of the disconnection detecting function’ are set to the link parameter of FL-remote with PCwin (Ver8 or later).

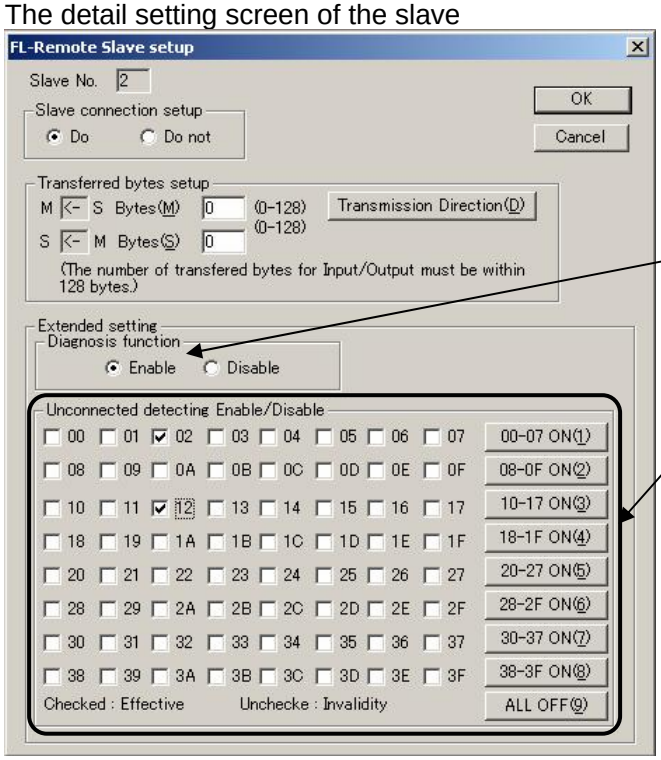
Please refer to “14.1 Parameter Setting” for the method of setting the link parameter.

Initial setting is "general-purpose status area" D000L-D003FH, "short-circuit information area" D0040L-D007FH", and "Un-connect information area" D0080L-D00BFH.

The link parameter setting screen of FL-remote with PCwin



The detail setting screen of the slave



If the diagnosis function is used for the FRMT series, ‘Enable’ is set.

‘validity/invalidity of the disconnection detecting function’ are set.
‘☐’ is checked to the I/O address
‘☑’ : validity, ‘☐’ : invalidity

14.3.2 General-purpose Status

If the general-purpose status is allocated to CPU by the link parameter, 'general-purpose status' is allocated to the top address to set [+00L] – [+1FH], and 'error record reset / arbitrary reading switch' is allocated to [+20L] – [+3FH] in CPU. (Refer to "14.3.2 Error Record Reset / Arbitrary Reading Switch" about details)

The general-purpose status and the error record reset / arbitrary reading switches are allocated in 1byte per 1node.

(Note) Even if the diagnosis functions of all slaves are set to 'Disable' in the link parameter of FRMT, the general-purpose status and the error record reset / arbitrary reading switch of the node 01-63 are allocated.

Allocation of the general-purpose status and error record reset / arbitrary reading switch

relative byte address	data	
+00L		General-purpose status area
+00H	node 01 : general-purpose status	
⋮	⋮	
+1FL	node 62 : general-purpose status	
+1FH	node 63 : general-purpose status	
+20L		Error record reset / arbitrary reading switch
+20H	node 01 : error record reset / arbitrary reading switch	
⋮	⋮	
+3FL	node 62 : error record reset / arbitrary reading switch	
+3FH	node 63 : error record reset / arbitrary reading switch	

The format of general-purpose status is the following.

General-purpose status format

bit	content	
0	I/O terminal block1 (for I/O address 0-F) Power supply voltage state flag 0 : I/O power ON , 1 : I/O power OFF	
1	I/O terminal block2 (for I/O address 0-F) Power supply voltage state flag 0 : I/O power ON , 1 : I/O power OFF	
2	Unused (not defined)	
3	Unused (not defined)	
4	In case of the input unit detection flag of disconnection 0 : normal (all connected) 1 : disconnection (when disconnected sensor is detected) In case of the output unit detection flag of disconnection 0 : normal (all connected) 1 : disconnection (when disconnected external load is detected)	Please refer to the operation manual of the FRMT series ("2.5.2 Detection timing of disconnection") for the state of the flag.
5	In case of the input unit only detection flag of short-circuit 0 : normal (all points are normal) 1 : short-circuit (it is short-circuited) In case of the output unit detection flag of disconnection 0 : normal (all points are normal) 1 :short-circuit (when it is short-circuited)	In error : 1 (keep for minimum 1s) After releasing : 0
6	Unused (not defined)	
7	Unused (not defined)	

14.3.3 Error Record Reset / Arbitrary Reading Switch Format

In DRMT series, after detecting ‘short-circuit’ and ‘disconnection’, if the factor is removed, I/O control is returned automatically but the short-circuit data and the disconnection data are kept and I/O LED is maintained in the red flicker.

Setting various bits of the error record reset switch can reset these kept data.

The error record and the error are loaded to the diagnosis data map (Refer to “14.3.3 Diagnosis Data Map” about details) by setting various bits of the arbitrary reading switch.

Format of error record reset / arbitrary reading switch

bit	content	
0	short-circuit error record reset for input unit (1 : reset)	Error record reset switch (Note) It is validity only the rise differentiation
1	disconnection error record reset for input unit (1 : reset)	
2	short-circuit error record reset for output unit (1 : reset)	
3	disconnection error record reset for output unit (1 : reset)	
4	short-circuit record and reading of current state for input unit (1: reading)	Arbitrary reading switch (Note) It is validity only the rise differentiation
5	disconnection record and reading of current state for input unit (1: reading)	
6	short-circuit record and reading of current state for output unit (1: reading)	
7	disconnection record and reading of current state for output unit (1: reading)	

14.3.4 Diagnosis Data Map

In FRMT series, when detecting ‘short-circuit’ and ‘disconnection’, the master saves the diagnosis data in the short-circuit data area or the disconnection data area automatically.

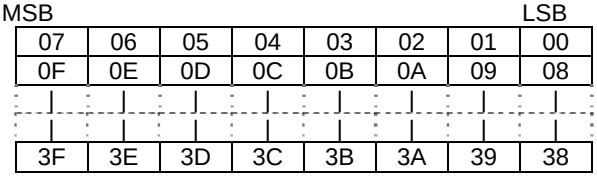
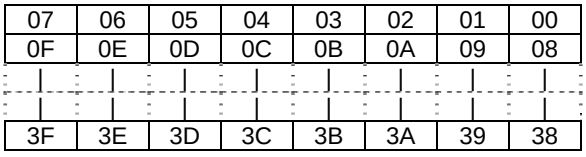
Please refer to ‘(1) Format of short-circuit data area’ about the data from the top address [+00L] to [+3FH] in the short-circuit data area that is set in the link parameter.

Please refer to ‘(2) Format of disconnection data area’ about the data from the top address [+00L] to [+3FH] in the disconnection data area that is set in the link parameter.

Common explanation of ‘Short-circuit data area’ and ‘disconnection data area’

1) The error record data and the error current data are saved at the same time
2) This area is a shift structure of four steps, and information 0 is latest data and data shifts in order of information 1 -> information 2 -> information 3 and information 3 disappears.
3) Get/Set flag (Only information 0)
   When the master (FL-remote) saves the error record data and the error current data, bit 0 of the Get/Set flag is set.
   Bit 0 of the Get/Set flag is observed by sequence program, and when the bit is set, the error record data and the error current data are taken out and clear the bit. (Clear the bit at initialization)

(1) Format of short-circuit data area (U7040L ~ U707FH)

<table>
<tr><th>Data</th><th>Relative address</th><th>Content</th><th>Data format</th></tr>
<tr><td rowspan="12">Short-circuit Record data0
newest data</td><td>+00L</td><td>Get/Set flag</td><td>Bit0=0 : Get, Bit0=1 : Set, Bit1 – 7=0 fixed</td></tr>
<tr><td>+00H</td><td>(Unused)</td><td>00h fixed</td></tr>
<tr><td>+01L</td><td>Node address (Hex)</td><td>00h – 3Fh (0 – 63)</td></tr>
<tr><td>+01H</td><td>(Unused)</td><td>00h fixed</td></tr>
<tr><td>+02L</td><td>Response code Lo</td><td>69h</td></tr>
<tr><td>+02H</td><td>Response code Hi</td><td>00h fixed</td></tr>
<tr><td>+03L</td><td>Error code Lo</td><td>error code (Lo) of message response (Normal : 00h)</td></tr>
<tr><td>+03H</td><td>Error code Hi</td><td>error code (Hi) of message response(Normal : 00h)</td></tr>
<tr><td>+04L
+04H
+05L
+05H
+06L
+06H
+07L
+07H</td><td colspan="2" rowspan="8">Short-circuit record data
I/O 0 – 63</td><td rowspan="8">MSB LSB
 
Numerical value : I/O Address
Bit data=0 : Normal , Bit data=1: Short-circuit</td></tr>
<tr><td rowspan="12">Short-circuit Current data0
newest data</td><td>+08L</td><td>Get/Set flag</td><td>Bit0=0 : Get, Bit0=1 : Set, Bit1 – 7=0 fixed</td></tr>
<tr><td>+08H</td><td>(Unused)</td><td>00h fixed</td></tr>
<tr><td>+09L</td><td>Node address (Hex)</td><td>01h – 3Fh (1 – 63)</td></tr>
<tr><td>+09H</td><td>(Unused)</td><td>00h fixed</td></tr>
<tr><td>+0AL</td><td>Response code Lo</td><td>67h</td></tr>
<tr><td>+0AH</td><td>Response code Hi</td><td>00h fixed</td></tr>
<tr><td>+0BL</td><td>Error code Lo</td><td>error code (Lo) of message response(Normal : 00h)</td></tr>
<tr><td>+0BH</td><td>Error code Hi</td><td>error code (Hi) of message response(Normal : 00h)</td></tr>
<tr><td>+0CL
+0CH
+0DL
+0DH
+0EL
+0EH
+0FL
+0FH</td><td colspan="2" rowspan="8">Short-circuit current data
I/O 0 – 63</td><td rowspan="8">MSB LSB
 
Numerical value : I/O Address
Bit data=0 : Normal , Bit data=1: Short-circuit</td></tr>
<tr><td>Short-circuit Record data1</td><td>+10L
|
+17H</td><td>Same as record data0</td><td>Same as record data0</td></tr>
<tr><td>Short-circuit Current data1</td><td>+18L
|
+1FH</td><td>Same as current data0</td><td>Same as current data0</td></tr>
<tr><td>Short-circuit Record data2</td><td>+20L
|
+27H</td><td>Same as record data0</td><td>Same as record data0</td></tr>
<tr><td>Short-circuit Current data2</td><td>+28L
|
+2FH</td><td>Same as current data0</td><td>Same as current data0</td></tr>
<tr><td>Short-circuit Record data3</td><td>+30L
|
+37H</td><td>Same as record data0</td><td>Same as record data0</td></tr>
<tr><td>Short-circuit Current data3</td><td>+38L
|
+3FH</td><td>Same as current data0</td><td>Same as current data0</td></tr>
</table>

(2) Format of disconnection data area (U7080L ~ U70BFH)

<table>
<tr><th>Data</th><th>Relative address</th><th>Content</th><th>Data format</th></tr>
<tr><td rowspan="12">Disco-nnection Record data0 newest data</td><td>+00L</td><td>Get/Set flag</td><td>Bit0=0 : Get, Bit0=1 : Set, Bit1 – 7=0 fixed</td></tr>
<tr><td>+00H</td><td>(Unused)</td><td>00h fixed</td></tr>
<tr><td>+01L</td><td>Node address (Hex)</td><td>01h – 3Fh (1 – 63)</td></tr>
<tr><td>+01H</td><td>(Unused)</td><td>00h</td></tr>
<tr><td>+02L</td><td>Response code Lo</td><td>6A</td></tr>
<tr><td>+02H</td><td>Response code Hi</td><td>00h</td></tr>
<tr><td>+03L</td><td>Error code Lo</td><td>error code (Lo) of message response(Normal : 00h)</td></tr>
<tr><td>+03H</td><td>Error code Hi</td><td>error code (H) of message response(Normal : 00h)</td></tr>
<tr><td>+04L
+04H
+05L
+05H
+06L
+06H
+07L
+07H</td><td>Disconnection record data I/O 0 – 63</td><td>MSB LSB
<table><tr><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td><td>00</td></tr><tr><td>0F</td><td>0E</td><td>0D</td><td>0C</td><td>0B</td><td>0A</td><td>09</td><td>08</td></tr><tr><td>3F</td><td>3E</td><td>3D</td><td>3C</td><td>3B</td><td>3A</td><td>39</td><td>38</td></tr></table>Numerical value : I/O Address
Bit data=0 : Normal , Bit data=1: Disconnection</td></tr>
<tr><td rowspan="12">Disco-nnection Current data0 newest data</td><td>+08L</td><td>Get/Set flag</td><td>Bit0=0 : Get, Bit0=1 : Set, Bit1 – 7=0 fixed</td></tr>
<tr><td>+08H</td><td>(Unused)</td><td>00h fixed</td></tr>
<tr><td>+09L</td><td>Node address (Hex)</td><td>01h – 3Fh (1 – 63)</td></tr>
<tr><td>+09H</td><td>(Unused)</td><td>00h fixed</td></tr>
<tr><td>+0AL</td><td>Response code Lo</td><td>68h</td></tr>
<tr><td>+0AH</td><td>Response code Hi</td><td>00h fixed</td></tr>
<tr><td>+0BL</td><td>Error code Lo</td><td>error code (Lo) of message response(Normal : 00h)</td></tr>
<tr><td>+0BH</td><td>Error code Hi</td><td>error code (Hi) of message response(Normal : 00h)</td></tr>
<tr><td>+0CL
+0CH
+0DL
+0DH
+0EL
+0EH
+0FL
+0FH</td><td>Disconnection current data I/O 0 – 63</td><td>MSB LSB
<table><tr><td>07</td><td>06</td><td>05</td><td>04</td><td>03</td><td>02</td><td>01</td><td>00</td></tr><tr><td>0F</td><td>0E</td><td>0D</td><td>0C</td><td>0B</td><td>0A</td><td>09</td><td>08</td></tr><tr><td>3F</td><td>3E</td><td>3D</td><td>3C</td><td>3B</td><td>3A</td><td>39</td><td>38</td></tr></table>Numerical value : I/O Address
Bit data=0 : Normal , Bit data=1: Disconnection</td></tr>
<tr><td>Disco-nnection Record data1</td><td>+10L
|
+17H</td><td>Same as record data0</td><td>Same as record data0</td></tr>
<tr><td>Disco-nnection Current data1</td><td>+18L
|
+1FH</td><td>Same as current data0</td><td>Same as current data0</td></tr>
<tr><td>Disco-nnection Record data2</td><td>+20L
|
+27H</td><td>Same as record data0</td><td>Same as record data0</td></tr>
<tr><td>Disco-nnection Current data2</td><td>+28L
|
+2FH</td><td>Same as current data0</td><td>Same as current data0</td></tr>
<tr><td>Disco-nnection Record data3</td><td>+30L
|
+37H</td><td>Same as record data0</td><td>Same as record data0</td></tr>
<tr><td>Disco-nnection Current data3</td><td>+38L
|
+3FH</td><td>Same as current data0</td><td>Same as current data0</td></tr>
</table>

Example of handling short circuits and disconnection information

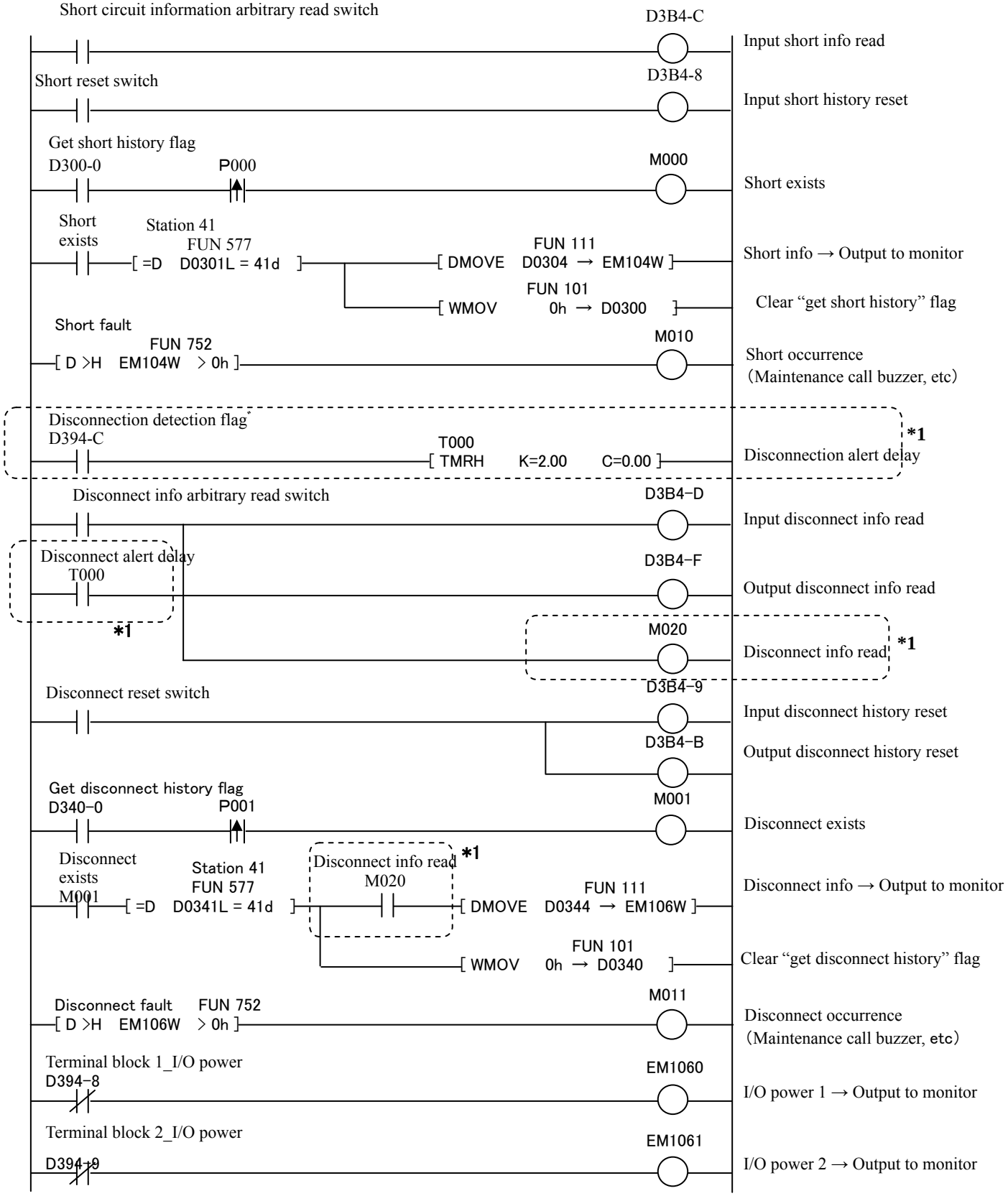
Configuration example Example of outputting the short circuit and disconnection information of station no. 41(DRMT-16/16P) to the direct monitor (panel computer).

General status storage area：D0380L to D03BFH

Short circuit information storage area: D0300L to D033FH

Disconnection information storage area: D0340L to D037FH

Sequence program example



*1: Example of circuit that ignores momentary disconnections 2 seconds or less

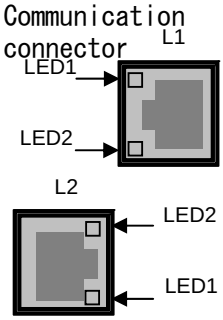
15. Warning by the FL-Remote

If an error is detected in FL Remote, these errors will be reported to FL Remote and the CPU.
For FL Remote, error alerts are performed using LED1 and LED2 lamps and a message display.
For CPU, error alerts are performed using special relays, special registers (register for error information output, register for link error information output) and a message display.
It is also possible to check the status of FL Remote communication on the special register.

(1) LED1, LED2

Each lamp of LED1 and LED2 have green and red and illuminate solid, flash or turn off in the below circumstances.

Also, the ERR lamp illuinates solid, flashes or turns off in the below circumstances.

Lamp name	Lamp status and content
Communication connector  	LED1. Displays hardware status Green solid：Hardware normal Red solid：Hardware error occurring Off：Program not operating LED2. Displays communication status ・For FR Remote Green solid: Remote operating Green flashing: FL participating Red solid: Link parameter error Red flashing: Communication error Green/red alternating: Setting error Off: Cable not connected

15.1. Error information by CPU

(1) Special Relay

All station in communicating flag turn ON at normal, and other flags are turned ON at error.

Address	Contents	At normal	At error
VA0 VA4 VA8 VAC VB0 VB4 VB8 VBC	Link No.1 All station in communicating Link No.2 All station in communicating Link No.3 All station in communicating Link No.4 All station in communicating Link No.5 All station in communicating Link No.6 All station in communicating Link No.7 All station in communicating Link No.8 All station in communicating Note) When the unlinking function is set, it becomes 0.	1	0
VA1 VA5 VA9 VAD VB1 VB5 VB9 VBD	Link No.1 Link parameter error Link No.2 Link parameter error Link No.3 Link parameter error Link No.4 Link parameter error Link No.5 Link parameter error Link No.6 Link parameter error Link No.7 Link parameter error Link No.8 Link parameter error	0	1
VA2 VA6 VAA VAE VB2 VB6 VBA VBE	Link No.1 Communication error Link No.2 Communication error Link No.3 Communication error Link No.4 Communication error Link No.5 Communication error Link No.6 Communication error Link No.7 Communication error Link No.8 Communication error	0	1
VC4	Error with special module(Communication module failure)	0	1
VC8	I/O configuration error (Communication modules are mounted more than the regulated number.)	0	1
VF2	Special module allocated error (Rack No., Slot No., Link module name in link parameter different from state of mounting.)	0	1

(Note) The address of the special relays are the case of the PC2 compatible mode and the data memory separate mode (the PC3 mode).

ON:1
OFF:0

(2) Special Register

FL-remote stores the data of error condition and communication condition into the following address of PLC.

Address	Contents
S200 | S24F	CPU error output register
S3#0 S3#1 S3#2 S3#3	Normal slave data area This displays the communication conditions (normal / error) of each slave.
S3#4	The master status area Indicating master and network status. *1
S3#5	Software version (BCD)
S3#6	The number of times of re-issuing token
S3#7	The number of times of token retention timeout
S3#8	The number of times of token monitor timeout
S3#C | S3#F	Connection office connection state
S3*0 | S3*B	Link error output register
S3*C S3*D S3*E S3*F	Unlinking register

■ The # and * portion of the above address are determined by link No.

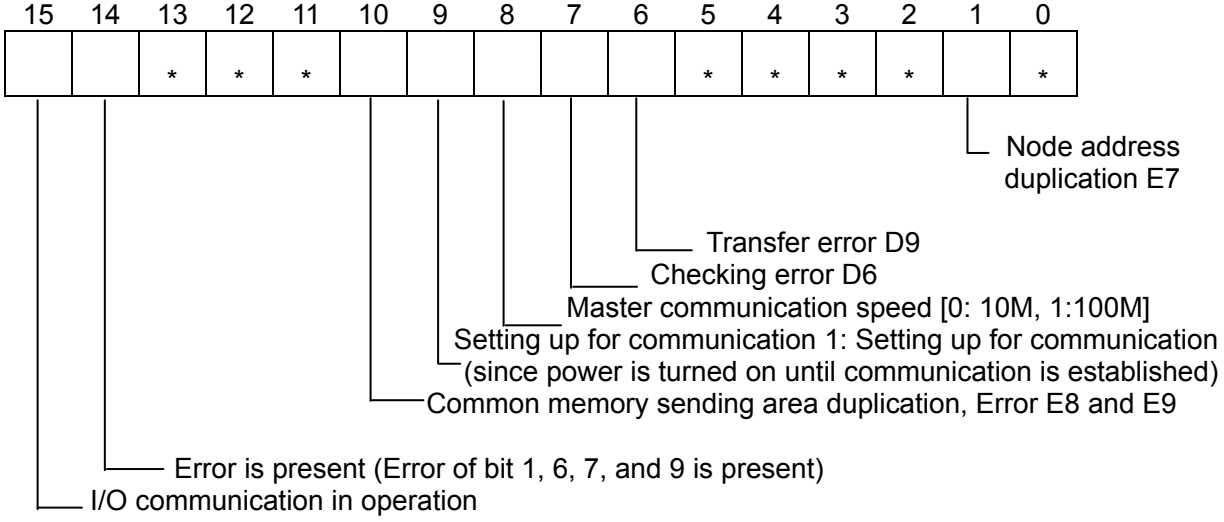
Link No.	1	2	3	4	5	6	7	8
#	0	2	4	6	8	A	C	E
*	1	3	5	7	9	B	D	F

(Note) Information stored in the register S200 to S24F and S3#0 to S3*B is not cleared after restoration from error.

When information must be cleared, write "0000" to the register with PCwin, etc.

The address of the special resisters are the case of the PC2 compatible mode and the data memory separate mode (the PC3 mode).

*1: S3#4 Master status area



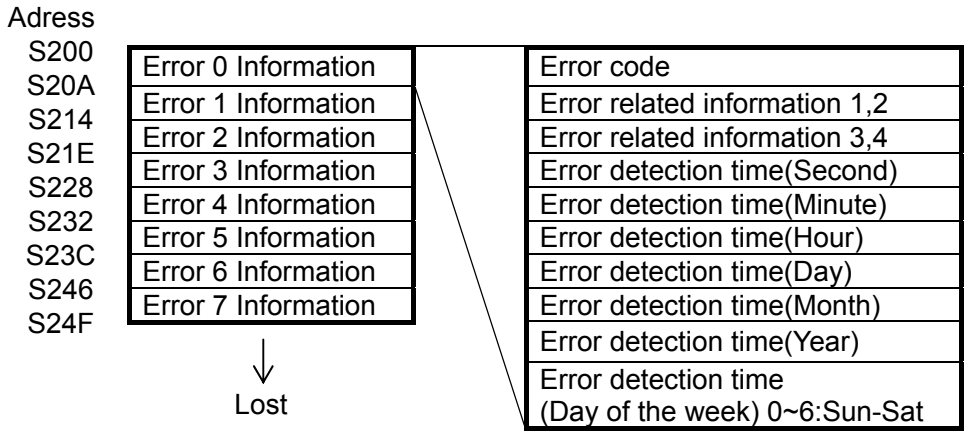
(3) Special Register for CPU Error Information Output

When any error is detected, error code, error related information, and error detection time are stored in the special register for error information. This register is a 8-step shift register and can store up to 8 errors.

When error are detected more than 8 times, the oldest error information is lost.

Error information stored in the register can be displayed by the peripheral device.

■ Contents of register



■ Error related data

	Error code	I/O monitor error message	Error contents	Relation 1	Relation 2	Relation 3	Relation 4	Remarks
Serious error	84	I/O MODULE ERROR 2	Communication module failure	* Classification	Rack No.	Slot No.	-	*2:CPU detection 1,3:Link detection
	88	FUNC. I/O OVER 1	24 or more implementation of communication modules	-	-	-	-	VC8 ON
Alarm	85	LINK PRAM. ERROR	Link parameter Error	Link No.	-	-	-	
	86	LINK ERROR	Communication Error	Link No.	-	-	-	
	89	FUNC. I/O ALARM	Link parameter rack No. slot No. module name error	Rack No.	Slot No.	-	-	VF2 ON

(Note) This differs from error code of FL-remote.

Error information saved in S200- is also stored in S1000- for Ver.3.00 and thereafter.

(See the item 5.1.4 Error information output special resister)

(4) Link Error Data Output Special Register

At detection of error in FL-remote, error message is carried out to CPU, and the error code of FL-remote is stored into the link error data output special register.

This register has an 8-step shift register structure, and can memorize up to 8 errors.

At errors over 8 errors, the first stored error data is deleted.

■ Register contents of link error data output special register

Link No.	Error display address
1	S310 ~ S31F
2	S330 ~ S33F
3	S350 ~ S35F
6	S3B0 ~ S3BF
7	S3D0 ~ S3DF
8	S3F0 ~ S3FF

Address	MSB	Content	LSB
S3*0	Node Address(HEX)	Error Code(hex)	
S3*1	Actual input bytes(HEX)low	Actual output bytes(HEX)low	
S3*2	Input bytes(HEX)low	Output bytes(HEX)low	

S3*5	Node Address + Error Code stack1	NEW
S3*6	Node Address + Error Code stack2	
S3*7	Node Address + Error Code stack3	
S3*8	Node Address + Error Code stack4	
S3*9	Node Address + Error Code stack5	
S3*A	Node Address + Error Code stack6	
S3*B	Node Address + Error Code stack7	OLD

Note 1) * decides by link No..

Link No.	1	2	3	4	5	6	7	8
*	1	3	5	7	9	B	D	F

Note 2) When “Collation error (I/O bytes discrepancy)“, the number of I/O bytes is stored in the S3*1 – S3*4.

S3*1 : The number of I/*O* bytes of the real slave. (low byte)

S3*2 : The number of I/*O* bytes in the link parameters. (low byte)

■ Error Code Details and FL-remote Error Display

	Error code	Display	S03*0	S03*1	Detail
FL-remote	89	E5	---	---	Link parameter is not set yet.
	85	E7	00F0	00F2	Own node number duplication error
	85	ED	00ED	0000	Area overflow
	85	E6	0021	0000	Total byte count has exceeded the limit.
	85	E6	0022	0000	Station number with byte count 0 is found.
	85	E6	0023	0000	Input or output byte count of 1 slave has exceeded the limit.
	85	E6	0025	0000	Communication area overflow
	85	E6	0026	0000	I/O of CPU and communication area are duplicated.
	85	E6	0027	0000	Module sub-code error
	85	E6	0028	0000	Module No. error
	85	E6	0029	0000	Minimum permissible frame interval error
	85	E6	002A	0000	Own node number error
	85	E6	002B	0000	Network address error
	86	E8	00E8	0000	Common memory 1 duplication error
	86	E9	00E9	0000	Common memory 2 duplication error
	86	EA	00EA	0000	Token monitor timeout error
	86	EB	00EB	0000	Cyclic data reading error
	86	EC	00EC	0000	Cyclic data writing error
	86	D6	##D6	*3	*3Checking error S03*1H actual input byte count (HEX) S03*1L actual output byte count (HEX) S03*2H input byte count (HEX) S03*2L output byte count (HEX)
	86	D9	##D9	0000	Transfer error
	84	H5	---	---	Some other trouble of hardware
	84	Hd	---	---	Special module allocation exceeded or 2PORT-EFR hardware error
	84	H0	---	---	2PORT-EFR module hardware error
	84	H1	---	---	
	84	H2	---	---	
	84	H3	---	---	
	84	HE	---	---	
	84	HF	---	---	
	84	HL	---	---	
	84	HU	---	---	
	84	H4	---	---	2PORT-EFR module and CPU module interface hardware error
	84	H6	---	---	
	84	H7	---	---	
	84	H8	---	---	
	84	H9	---	---	
	84	HA	---	---	
	84	HC	---	---	
	84	DL	---	---	Maintenance mode

*1: The portion * of special register S3*0 is determined by link No.

Link No.	1	2	3	4	5	6	7	8
*	1	3	5	7	9	B	D	F

Content of S3*0 ##: Node address of error slave

*2: When the error situation is released, "E0" and "E2" displays of Master error code become the exchange number blinking displays.

15.2. Communication Status

FL-remote outputs the communication status in the special register.

(1) Normal Slave Data Area

Each bit of normal slave data area shows communication status of each slave.
The state flags of each slave are output to special register S3#0 - S3#3.
Each bit No. represents node address.

	MSB															LSB
S3#0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
S3#1	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
S3#2	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
S3#3	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48

1: Communication normal state
0: Communication error state (or node not to use)
(Either communications error or verification errors have occurred.)

■ # part of the special register decides by link No.

Link No.	1	2	3	4	5	6	7	8
#	0	2	4	6	8	A	C	E

Note 1) At the occurrence of sending timeout, network power error, all the bits of normal slave data area are set at OFF (0).
Even when the slave is unlinking state, and the link parameter is set up for “communication stop in communication error”, this flag functions.

(2) Communication state confirmation function

This function is the standard of the stability of the communication line. The communication error does not necessarily occur, even if error occurs. It is possible that the communication error occurs when error occurs frequently.

■ The content of communication error data area

The data is set in the special register S3#6-3#8 according to the error (six kinds).

Address	Error
S3#6	Number of token reissued
S3#7	The number of times of token retention timeout
S3#8	The number of times of token retention timeout

part of Address decides by the link number.

Link number	1	2	3	4	5	6	7	8
#	0	2	4	6	8	A	C	E

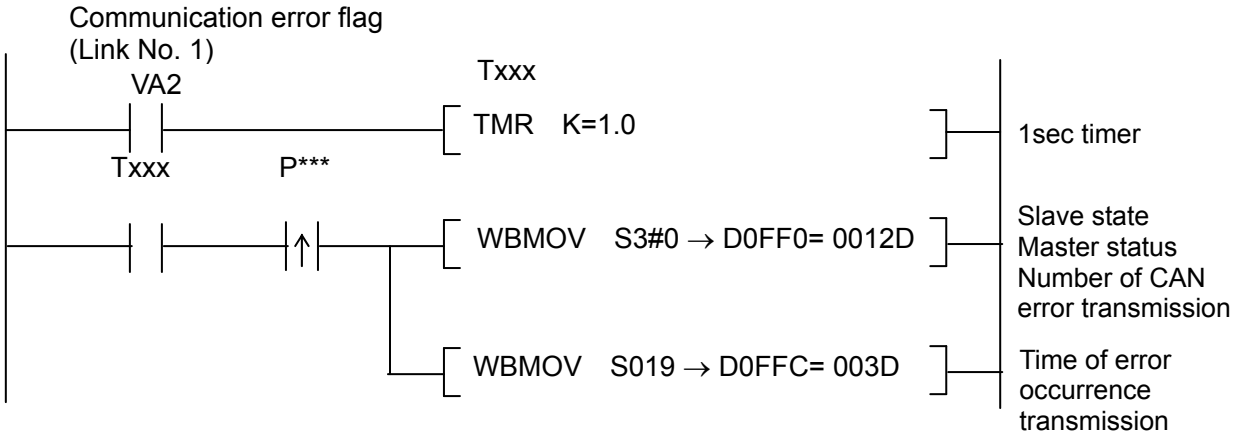
- Error is counted up to 65535 (FFFFh) times at the maximum.
- Error count is cleared when power is turned off or when CPU is reset. But it is not cleared by the communication reset.

■ Saving circuit of the number of errors

The total number of CAN errors (CAN error data area) is cleared by power off or CPU reset at the communication error. But it is not cleared by the communication reset. So, please design the following sequence circuit to save the total number of CAN errors.

Example)

The following circuit is saving the slave state, master status, number of CAN error and time of error occurrence



part of Address decides by the link number.

Link No.	1	2	3	4	5	6	7	8
#	0	2	4	6	8	A	C	E

Address of communication error flag decides by the link number

Link No.	1	2	3	4	5	6	7	8
Communication error flag	VA2	VA6	VAA	VAE	VB2	VB6	VBA	VBE

According to the above-mentioned circuit, the area from D0FF0 is as follows

D0FF0	Normal slave data area	
1		
2		
3	Master status area	
4		
5	Number of CAN error	
6		
7		
8		
9		
A		
B	time	minute, sec (BCD)
C	time	day, hour (BCD)
D	time	year, month (BCD)
E		

(3) Connected slave setting area

It is an area where the connection of the slave set in the link parameter of the CPU is shown. The state flag of each slave is output to special register S3#C-3#F.

0 shows the master, and each bit number shows the node address (station number).

	MSB															LSB
S3#C	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
S3#D	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
S3#E	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
S3#F	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48

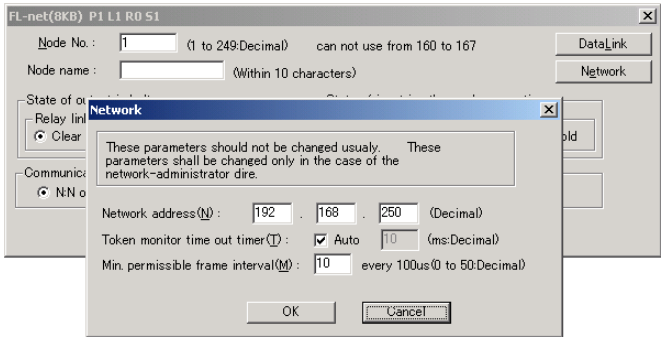
Each bit = 1 : connect
Each bit = 0 : no connect

part of the special register decides by link No..

Link No.	1	2	3	4	5	6	7	8
#	0	2	4	6	8	A	C	E

15.3. Error Contents and Supposed Causes

Specialr egister content note)	Master7 segement display	Error description	Main probable causes	How to reset
-	H5	CPU module NAK response	(1) CPU parameters not set correctly (2) Setting was made in a CPU module not supporting FL-net 16KB or 32KB mode (3) Malfunction of the 2PORT-EFR module, CPU module or base	(1) Revise CPU module parameter settings (2) Modify switch settings (3) Replace 2PORT-EFR module, CPU module or base
-	Hd	Special module allocation exceeded or 2PORT-EFR module hardware error	The 2PORT-EFR module is malfunctioning or error code 81 [Special module allocation exceeded] is occurring on the CPU module.	Refering to [4.2 Switch Settings], check that the total link memory capacity does not exceed 60K. (excluding PC10) Replace the module if the error cannot be cleared.
-	H0	2PORT-EFR module hardware error	2PORT-EFR module malfunction	Replace module
-	H1			
-	H2			
-	H3			
-	HE			
-	HF			
-	HL			
-	HU			
-	H4	2PORT-EFR module and CPU module interface hardware error	Due to a malfunction on the 2PORT-EFR module, CPU module, I/O cable or base, data is not being properly passed between the 2PORT-EFR module and CPU module.	Replace the 2PORT-EFR2PORT-EFR module, CPU module, I/O cable, or base.
-	H6			
-	H7			
-	H8			
-	H9			
-	HA			
-	HC			

Specialr egister content note)	Master7 segemen t display	Error contents	Main supposed cause	Recovery method
0021	E6	Total number of bytes exceeding limitation value	Link parameter error • Error with CPU main body or memory • Disappearance of memory data by a battery voltage drop of CPU main body.	Rewrite normal parameter, and reset or supply power once again. Please refer to the manual of each CPU for details.
0022	E6	Station with 0 byte present		
0023	E6	Number of bytes for input / output per one slave exceeding limitation value		
0024	E6	Input / output designation error		
0025	E6	Range over		
0026	E6	CPU input / output and range in duplication		
0027	E6	Sub code error		
64F0	E7	Master duplication	•Two or more master modules are connected to the network. • FL-net module is connected to the same network.	• Separate any other master module from the network, and turn on power again. • Separate FL-net module from the network, and turn on power again.
00E8	E8	Common memory sending area Address duplication (relay link)		
00E9	E9	Common memory sending area Address communication (register link)		
00EB	EB	Cyclic data reading error	• FL-net module is connected to the same network.	• Separate FL-net module from the network, and turn on power again.
00EC	EC	Cyclic data reading error		
00EA	EA	Token monitor timeout	Token monitor timeout error occurs when all data of own node could not be sent within oken monitor timeout time set in "network" of link parameter. Check the checkbox of "Automatic" of token monitor timeout time, or increase the setting time. 

Special register contents *	Master 7 segment indicator	Error contents	Main supposed cause	Recovery method
##D6	D6	Collation error (Disagreement of the number of I/O bytes)	The number of bytes of a slave and the number of bytes of a link parameter are not in agreement.	Confirm the I/O byte number of the slave to be connected, and change link parameter. When the node address of the slave has been changed, turn on the slave once again and change the link parameter. When the slave has been removed, it is also necessary to change the link parameter.
##D9	D9	Transmission error	The slave cannot join the communication. The slave separated.	Please communication reset or turn on again the power supply or reset CPU. Please confirm whether the power supply is supplied to the slave and HUB when it is generated repeatedly. Please confirm the repetition of the node address. Please confirm the cable whether not to be disconnected to be short-circuited. Please refer to the slave's manual for the slave made of the other companies. Please keep away the communications cable from the noise source.
	Indicate station number	DEV lamp and RMT lamp lights green and communicates normally, but I/O data is not correct.	■ There is an unlinking-designated slave. ■ Duplication of communication area. ■ Mis-setting of I/O address order. ■ Overwrite to communication area by sequence program.	■ Please confirm whether 0 (no unlinking designation) is set by the applicable slave of an unlinking register. ■ Please confirm whether the communication area set to the parameter of the master overlaps with the communication area of other link modules. ■ Please confirm whether I/O address order set by the parameter of the master is set correctly. ■ Please confirm whether to overwrite the communication area in the sequence program.
	DL	Maintenance mode	The rotary switch is not set from 8 to E.	Please change the rotary switch from "8" to either of "E". Please exchange modules when abnormality doesn't solve.

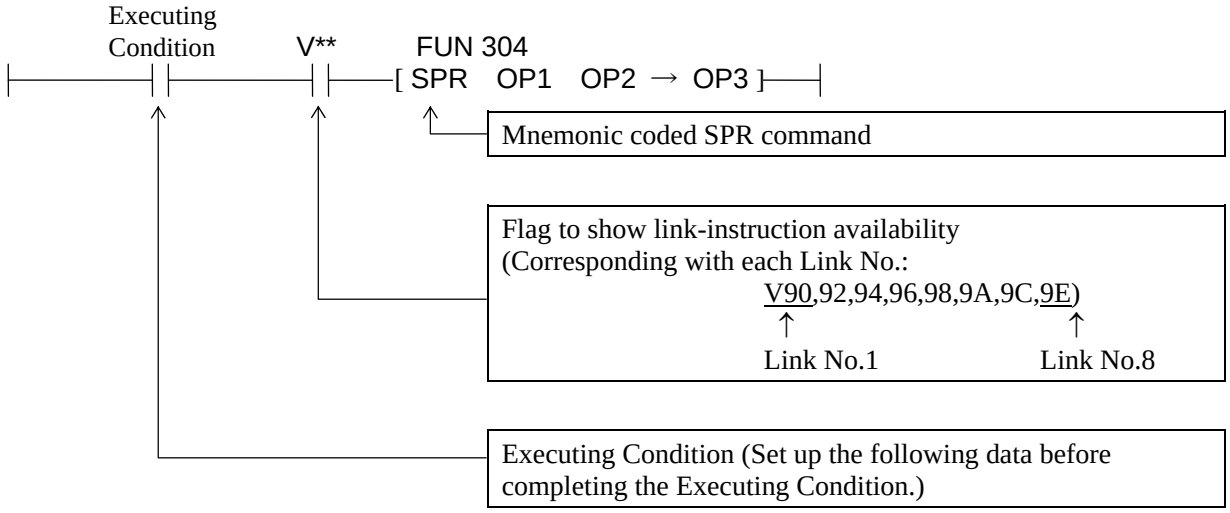
: Node address of abnormal slave

16 Specifications

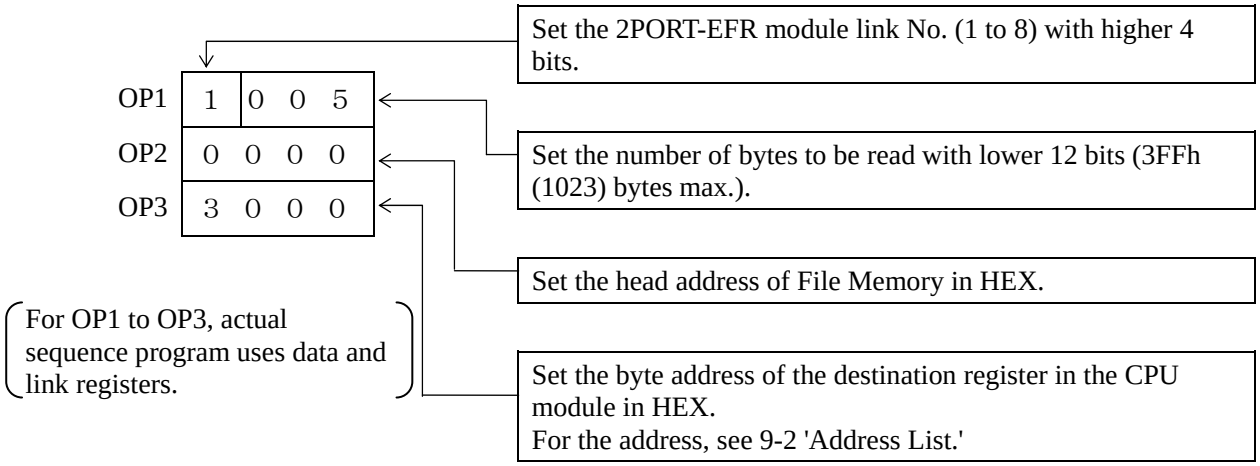
<table>
<tr><th>No.</th><th>Item</th><th colspan="4">Specifications</th></tr>
<tr><td>1</td><td>Ambient Temperature</td><td colspan="4">0 - 55°C</td></tr>
<tr><td>2</td><td>Ambient Humidity</td><td colspan="4">35 - 85% (Without Condensation)</td></tr>
<tr><td>3</td><td>Atmosphere</td><td colspan="4">There shall be no corrosive gases.</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Vibration Resistance</td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep Frequency</td></tr>
<tr><td>10 - 57Hz</td><td>—</td><td>0.15 mm</td><td rowspan="2">10 Times,
1 octave/min</td></tr>
<tr><td>57 - 150Hz</td><td>9.8 m/s^2</td><td>—</td></tr>
<tr><td>5</td><td>Impact Resistance</td><td colspan="4">147 m/s^2, 3 times each in 3 directions</td></tr>
<tr><td>6</td><td>Consumption Current</td><td colspan="4">1.1A</td></tr>
<tr><td>7</td><td>Mass</td><td colspan="4">230g</td></tr>
</table>

Reference 1 Reading/Writing FileMemory through SPR and SPW Commands

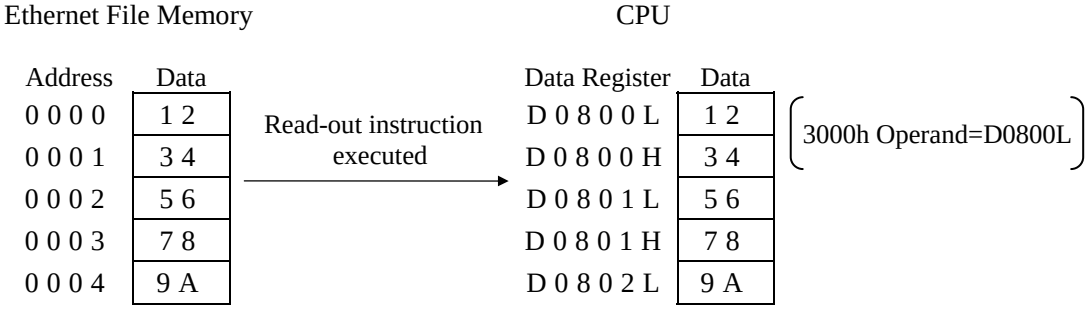
■ Reading File Memory (SPR: Specific-Module Byte-Data Reading Instruction)



● Data contents to be set up before executing SPR command

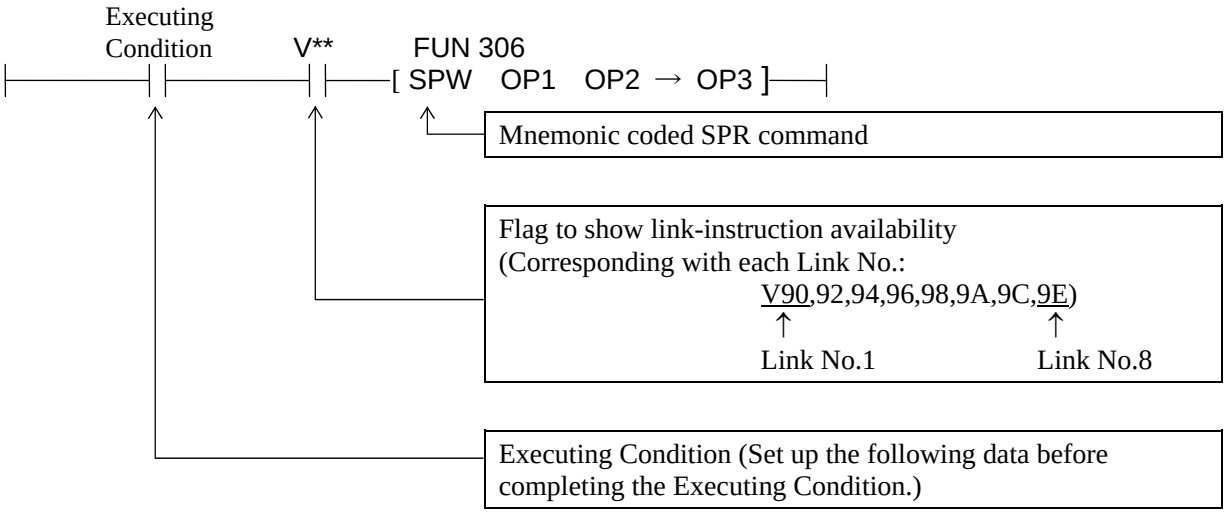


If the read-out instruction as the above example is executed, data are transferred as follows:

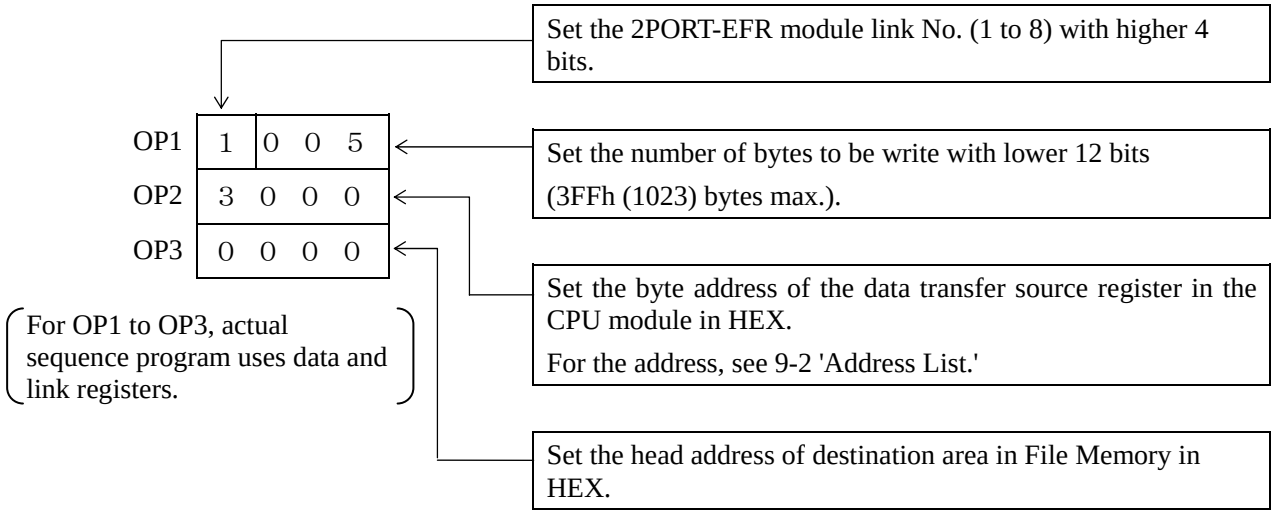


The number of bytes specified by OP1 are read from the file memory head address specified by OP2 into the CPU module address specified by OP3.

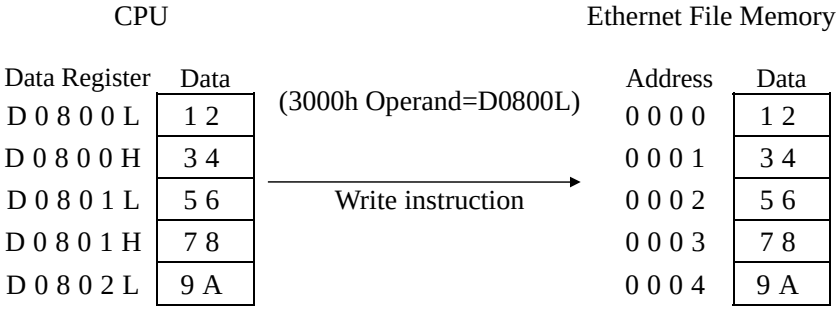
■ Reading File Memory (SPW: Specific-Module Byte-Data Reading Instruction)



● Data contents to be set up before executing SPR command



If the read-out instruction as the above example is executed, data are transferred as follows:



The number of bytes specified by OP1 are transfered from the CPU module address specified by OP2 into the file memory destination address specified by OP3.

Reference 2　Ethernet File Memory Address Map

■ Control signal output and I/O parameter areas (Addresses 0000 to 0FFF) [write only]

	bit7							bit0	
0000	8	(00 fixed)						1	1:Initialization Request　8: Parameter area writing prohibited(1:Release)
0001	8	7	6	5	4	3	2	1	1-8:Connections 1-8 Active Open Request
0002	8	7	6	5	4	3	2	1	1-8:Connections 1-8 Transmission Request
0003	8	7	6	5	4	3	2	1	1-8:Connections 1-8 Reception Request
0004	(00 fixed)						2	1	1:Error Log Reception Confirmation, 2:ICMP Log Reception Confirmation
0005	(00 fixed)								
0006	(00 fixed)								
0007	(00 fixed)								
0008	Own Node IP Address 00000001 - FFFFFFE (Lower)								
0009									
000A									
000B	(Higher)								
000C	8	7	6	5	4	3	2	1	1-8:Connection Used (1:Use)
000D	8	7	6	5	4	3	2	1	1-16:Table Used (1:Use)
000E	16	15	14	13	12	11	10	9	
000F	(00 fixed)								
0010	Connection No.1	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0011									
0012		Own Node Port No. 0401h - FFFEh (Lower)							
0013		(Higher)							
0014		Other Node Table No.. 0001h - 0010h (Lower)							
0015		(Higher)							
0016		General communication setting 00h or FFh							
0017		(00 fixed)							
0018	Connection No.2	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0019									
001A		Own Node Port No. 0401h - FFFEh (Lower)							
001B		(Higher)							
001C		Other Node Table No.. 0001h - 0010h (Lower)							
001D		(Higher)							
001E		General communication setting 00h or FFh							
001F		(00 fixed)							
0020	Connection No.3	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0021									
0022		Own Node Port No. 0401h - FFFEh (Lower)							
0023		(Higher)							
0024		Other Node Table No.. 0001h - 0010h (Lower)							
0025		(Higher)							
0026		General communication setting 00h or FFh							
0027		(00 fixed)							
0028	Connection No.4	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0029									
002A		Own Node Port No. 0401h - FFFEh (Lower)							
002B		(Higher)							
002C		Other Node Table No.. 0001h - 0010h (Lower)							
002D		(Higher)							
002E		General communication setting 00h or FFh							
002F		(00 fixed)							
0030	Connection No.5	Connection opening method							TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0031									
0032		Own Node Port No. 0401h - FFFEh (Lower)							
0033		(Higher)							
0034		Other Node Table No.. 0001h - 0010h (Lower)							
0035		(Higher)							
0036		General communication setting 00h or FFh							
0037		(00 fixed)							

0038	Connection No.6	Connection opening method		TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0039				
003A		Own Node Port No. 0401h - FFFEh	(Lower)	
003B			(Higher)	
003C		Other Node Table No.. 0001h - 0010h	(Lower)	
003D			(Higher)	
003E		General communication setting 00h or FFh		
003F		(00 fixed)		
0040	Connection No.7	Connection opening method		TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0041				
0042		Own Node Port No. 0401h - FFFEh	(Lower)	
0043			(Higher)	
0044		Other Node Table No.. 0001h - 0010h	(Lower)	
0045			(Higher)	
0046		General communication setting 00h or FFh		
0047		(00 fixed)		
0048	Connection No.8	Connection opening method		TCP Active Open: 0000h, TCP Destination-Specified Passive Open: 0100h, TCP Destination Non-Specified Passive Open: 0200h, UDP:0001h
0049				
004A		Own Node Port No. 0401h - FFFEh	(Lower)	
004B			(Higher)	
004C		Other Node Table No. 0001h - 0010h	(Lower)	
004D			(Higher)	
004E		General communication setting 00h or FFh		
004F		(00 fixed)		
0050	Table No.1	Other Node IP Address 00000001 - FFFFFFE	(Lower)	
0051				
0052				
0053			(Higher)	
0054		Other Node Port No. 0401h - FFFEh	(Lower)	
0055			(Higher)	
0056		(00 fixed)		
0057				
0058	Table No.2	Other Node IP Address 00000001 - FFFFFFE	(Lower)	
0059				
005A				
005B			(Higher)	
005C		Other Node Port No. 0401h - FFFEh	(Lower)	
005D			(Higher)	
005E		(00 fixed)		
005F				
0060	Table No.3	Other Node IP Address 00000001 - FFFFFFE	(Lower)	
0061				
0062				
0063			(Higher)	
0064		Other Node Port No. 0401h - FFFEh	(Lower)	
0065			(Higher)	
0066		(00 fixed)		
0067				
0068	Table No.4	Other Node IP Address 00000001 - FFFFFFE	(Lower)	
0069				
006A				
006B			(Higher)	
006C		Other Node Port No. 0401h - FFFEh	(Lower)	
006D			(Higher)	
006E		(00 fixed)		
006F				

0070	Table No.5	Other Node IP Address 00000001 - FFFFFFE	(Lower)
0071			
0072			
0073			(Higher)
0074		Other Node Port No. 0401h - FFFEh	(Lower)
0075			(Higher)
0076		(00 fixed)	
0077			
0078	Table No.6	Other Node IP Address 00000001 - FFFFFFE	(Lower)
0079			
007A			
007B			(Higher)
007C		Other Node Port No. 0401h - FFFEh	(Lower)
007D			(Higher)
007E		(00 fixed)	
007F			
0080	Table No.7	Other Node IP Address 00000001 - FFFFFFE	(Lower)
0081			
0082			
0083			(Higher)
0084		Other Node Port No. 0401h - FFFEh	(Lower)
0085			(Higher)
0086		(00 fixed)	
0087			
0088	Table No.8	Other Node IP Address 00000001 - FFFFFFE	(Lower)
0089			
008A			
008B			(Higher)
008C		Other Node Port No. 0401h - FFFEh	(Lower)
008D			(Higher)
008E		(00 fixed)	
008F			
0090	Table No.9	Other Node IP Address 00000001 - FFFFFFE	(Lower)
0091			
0092			
0093			(Higher)
0094		Other Node Port No. 0401h - FFFEh	(Lower)
0095			(Higher)
0096		(00 fixed)	
0097			
0098	Table No.10	Other Node IP Address 00000001 - FFFFFFE	(Lower)
0099			
009A			
009B			(Higher)
009C		Other Node Port No. 0401h - FFFEh	(Lower)
009D			(Higher)
009E		(00 fixed)	
009F			
00A0	Table No.11	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00A1			
00A2			
00A3			(Higher)
00A4		Other Node Port No. 0401h - FFFEh	(Lower)
00A5			(Higher)
00A6		(00 fixed)	
00A7			

00A8	Table No.12	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00A9			
00AA			
00AB			(Higher)
00AC		Other Node Port No. 0401h - FFFEh	(Lower)
00AD			(Higher)
00AE		(00 fixed)	
00AF			
00B0	Table No.13	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00B1			
00B2			
00B3			(Higher)
00B4		Other Node Port No. 0401h - FFFEh	(Lower)
00B5			(Higher)
00B6		(00 fixed)	
00B7			
00B8	Table No.14	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00B9			
00BA			
00BB			(Higher)
00BC		Other Node Port No. 0401h - FFFEh	(Lower)
00BD			(Higher)
00BE		(00 fixed)	
00BF			
00C0	Table No.15	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00C1			
00C2			
00C3			(Higher)
00C4		Other Node Port No. 0401h - FFFEh	(Lower)
00C5			(Higher)
00C6		(00 fixed)	
00C7			
00C8	Table No.16	Other Node IP Address 00000001 - FFFFFFE	(Lower)
00C9			
00CA			
00CB			(Higher)
00CC		Other Node Port No. 0401h - FFFEh	(Lower)
00CD			(Higher)
00CE		(00 fixed)	
00CF			
00D0	Sub-Net Mask		(Lower)
00D1			
00D2			
00D3			(Higher)
00D4	Gateway IP Address 00000001 - FFFFFFE		(Lower)
00D5			
00D6			
00D7			(Higher)
00D8	(00 fixed)		
00D9			
00DA			
00DB			
00DC			
00DD			
00DE			
00DF			

00E0	Response Timer	(Lower)
00E1		(Higher)
00E2	Non-Reception Timer	(Lower)
00E3		(Higher)
00E4	Resending Timer (Data)	(Lower)
00E5		(Higher)
00E6	Re-transmitted Data (SYN/FIN)	(Lower)
00E7		(Higher)
00E8	Close Timer	(Lower)
00E9		(Higher)
00EA	Packet alive Time	(Lower)
00EB		(Higher)
00EC	IP Assembly Timer	(Lower)
00ED		(Higher)
00EE	Reset wait resending times	(Lower)
00EF		(Higher)
00F0	(00 fixed)	
00F1		
00F2		
00F3		
00F4		
00F5		
00F6		
00F7		
00F8		
00F9		
00FA		
00FB		
00FC		
00FD		
00FE		
00FF		

■ Control signal input and connection error areas (Addresses 0100 to 013F) [read only]

	bit7							bit0	
0101								1	1:Initialization Request
0101	8	7	6	5	4	3	2	1	1-8:Connections 1-8 normally opened
0102	8	7	6	5	4	3	2	1	1-8:Connections 1-8 connection error
0103	8	7	6	5	4	3	2	1	1-8:Connections 1-8 transmission completed
0104									
0105	8	7	6	5	4	3	2	1	1-8: Connections 1-8 reception completed
0106					4	3	2	1	1: Error log received 2: ICMP log received 3: PING OK 4: PING NG
0107	Reserve								
0108 0109 010A 010B 010C 010D	Own Ethernet Address (Lower) (Higher)								Each Ethernet device has an unique Ethernet address.
0120 0121	Connection No.1 Connection error code								Connection error codes can also be monitored with special registers of CPU module.
0122 0123									See 2-2-6 'Status Monitor Function.'
0124 0125	Connection No.2 Connection error code								
0126 0127									
0128 0129	Connection No.3 Connection error code								
012A 012B									
012C 012D	Connection No.4 Connection error code								
012E 012F									
0130 0131	Connection No.5 Connection error code								
0132 0133									
0134 0135	Connection No.6 Connection error code								
0136 0137									
0138 0139	Connection No.7 Connection error code								
013A 013B									
013C 013D	Connection No.8 Connection error code								
013E 013F									

■ File Memory Transmission/Reception Data Areas (Addresses 1000 to 8FFD)

	bit7	bit0
1000	Connection No.1 Transmission	LL (Lower Transfer Number)
1001		LH (Higher Transfer Number)
1002		Transmission data (up to 2044 bytes)
17FD		
1800	Connection No.1 Reception	LL (Lower Transfer Number)
1801		LH (Higher Transfer Number)
1802		Reception data (up to 2044 bytes)
1FFD		
2000	Connection No.2 Transmission	LL (Lower Transfer Number)
2001		LH (Higher Transfer Number)
2002		Transmission data (up to 2044 bytes)
27FD		
2800	Connection No.2 Reception	LL (Lower Transfer Number)
2801		LH (Higher Transfer Number)
2802		Reception data (up to 2044 bytes)
2FFD		
3000	Connection No.3 Transmission	LL (Lower Transfer Number)
3001		LH (Higher Transfer Number)
3002		Transmission data (up to 2044 bytes)
37FD		
3800	Connection No.3 Reception	LL (Lower Transfer Number)
3801		LH (Higher Transfer Number)
3802		Reception data (up to 2044 bytes)
3FFD		
4000	Connection No.4 Transmission	LL (Lower Transfer Number)
4001		LH (Higher Transfer Number)
4002		Transmission data (up to 2044 bytes)
47FD		
4800	Connection No.4 Reception	LL (Lower Transfer Number)
4801		LH (Higher Transfer Number)
4802		Reception data (up to 2044 bytes)
4FFD		

5000	Connection No.5 Transmission	LL (Lower Transfer Number)
5001		LH (Higher Transfer Number)
5002		Transmission data (up to 2044 bytes)
57FD		
5800	Connection No.5 Reception	LL (Lower Transfer Number)
5801		LH (Higher Transfer Number)
5802		Reception data (up to 2044 bytes)
5FFD		
6000	Connection No.6 Transmission	LL (Lower Transfer Number)
6001		LH (Higher Transfer Number)
6002		Transmission data (up to 2044 bytes)
67FD		
6800	Connection No.6 Reception	LL (Lower Transfer Number)
6801		LH (Higher Transfer Number)
6802		Reception data (up to 2044 bytes)
6FFD		
7000	Connection No.7 Transmission	LL (Lower Transfer Number)
7001		LH (Higher Transfer Number)
7002		Transmission data (up to 2044 bytes)
77FD		
7800	Connection No.7 Reception	LL (Lower Transfer Number)
7801		LH (Higher Transfer Number)
7802		Reception data (up to 2044 bytes)
7FFD		
8000	Connection No.8 Transmission	LL (Lower Transfer Number)
8001		LH (Higher Transfer Number)
8002		Transmission data (up to 2044 bytes)
87FD		
8800	Connection No.8 Reception	LL (Lower Transfer Number)
8801		LH (Higher Transfer Number)
8802		Reception data (up to 2044 bytes)
8FFD		

Reference 3 Transfer of Ethernet Control Output/Input Signals to Keep Relays

Addresses 0000-0004h of File Memory are for control-output signals toward 2PORT-EFR Module and 0100-0106h are for control-input signals from 2PORT-EFR Module.

It is recommendable to allocate these fields to keeper relays so as to facilitate a sequence program creation.

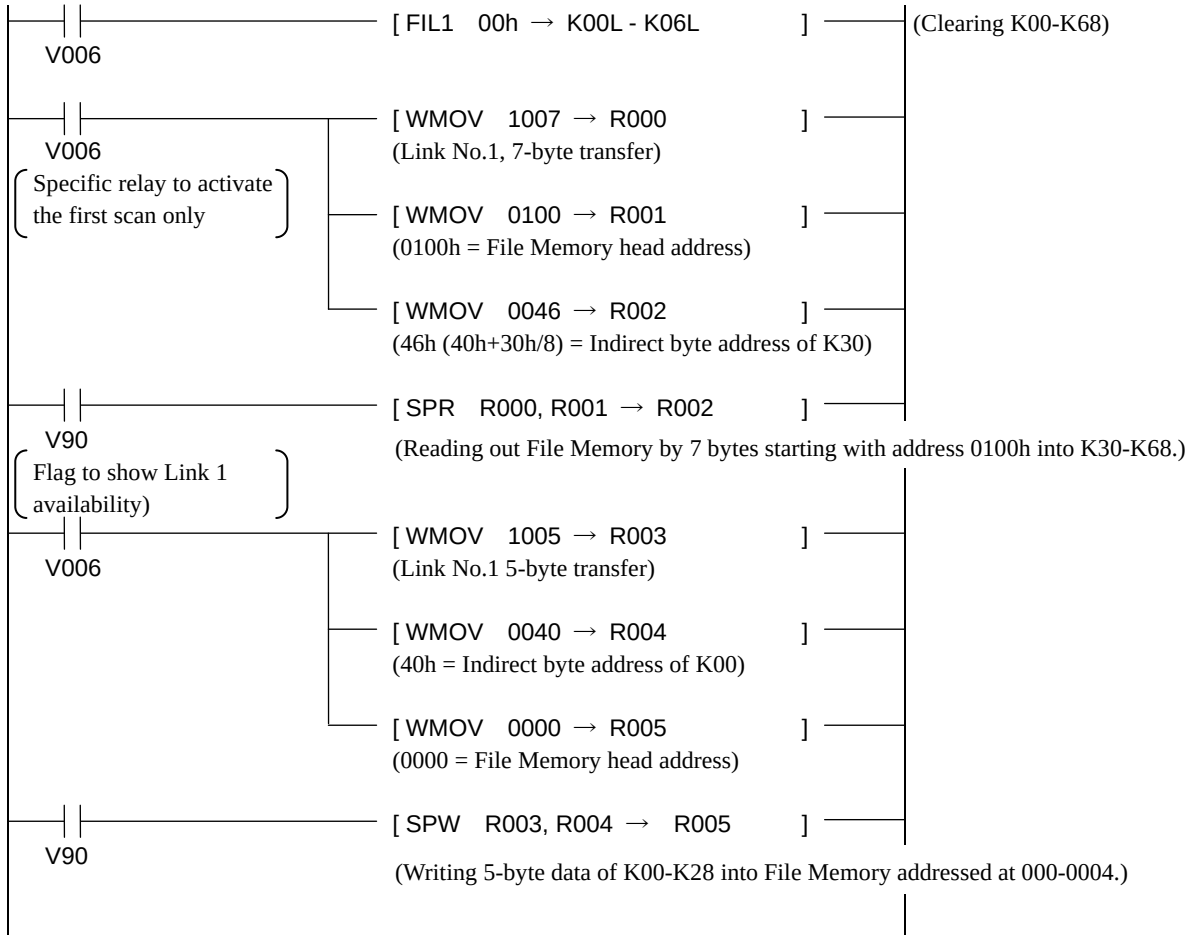
The following sequence program turns on/off keeper relays (K**) in order to turn set/reset each control-output signal and to relate a control-input signal with the status of a keeper-relay contact point.

Ensure to clear keeper relays by the first scan after Power ON, because they won't be reset through a CPU-Module reset or Power ON/OFF.

- **Sequence Program Sample**

2PORT-EFR Module Link No.=1

If K00 to K28 are to be assigned to control output signals at file memory addresses 0000 to 0004 and control input signals at file memory addresses 0100h to 0106h to K30 to K68:



This sequence program assigns control I/O signals as follows:

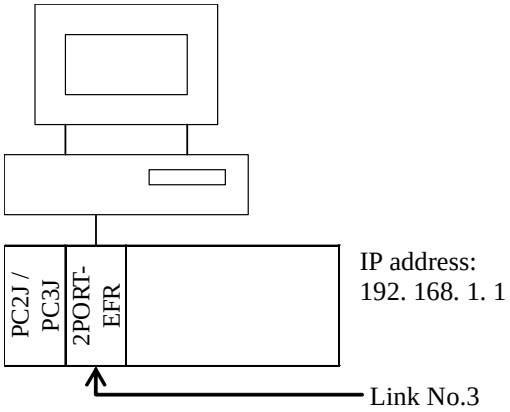
Control Output Signal	Initialization Request Flag	K00
	Active-Open Request Flag	K08 - 0F
	Transmission Request	K10 - 17
	Reception Request	K18 - 1F
	Error Log Reception Confirmation	K20
	ICMP Log Reception Confirmation	K21
Control Input Signal	Normal Initialization	K30
	Abnormal Initialization	K31
	Normal Open	K38 - 3F
	Abnormal Connection	K40 - 47
	Transmission Completed	K48 - 4F
	Reception Completed	K58 - 5F
	Error Log Received	K60
	ICMP Log Received	K61
	Normal PING	K62
	Abnormal PING	K63

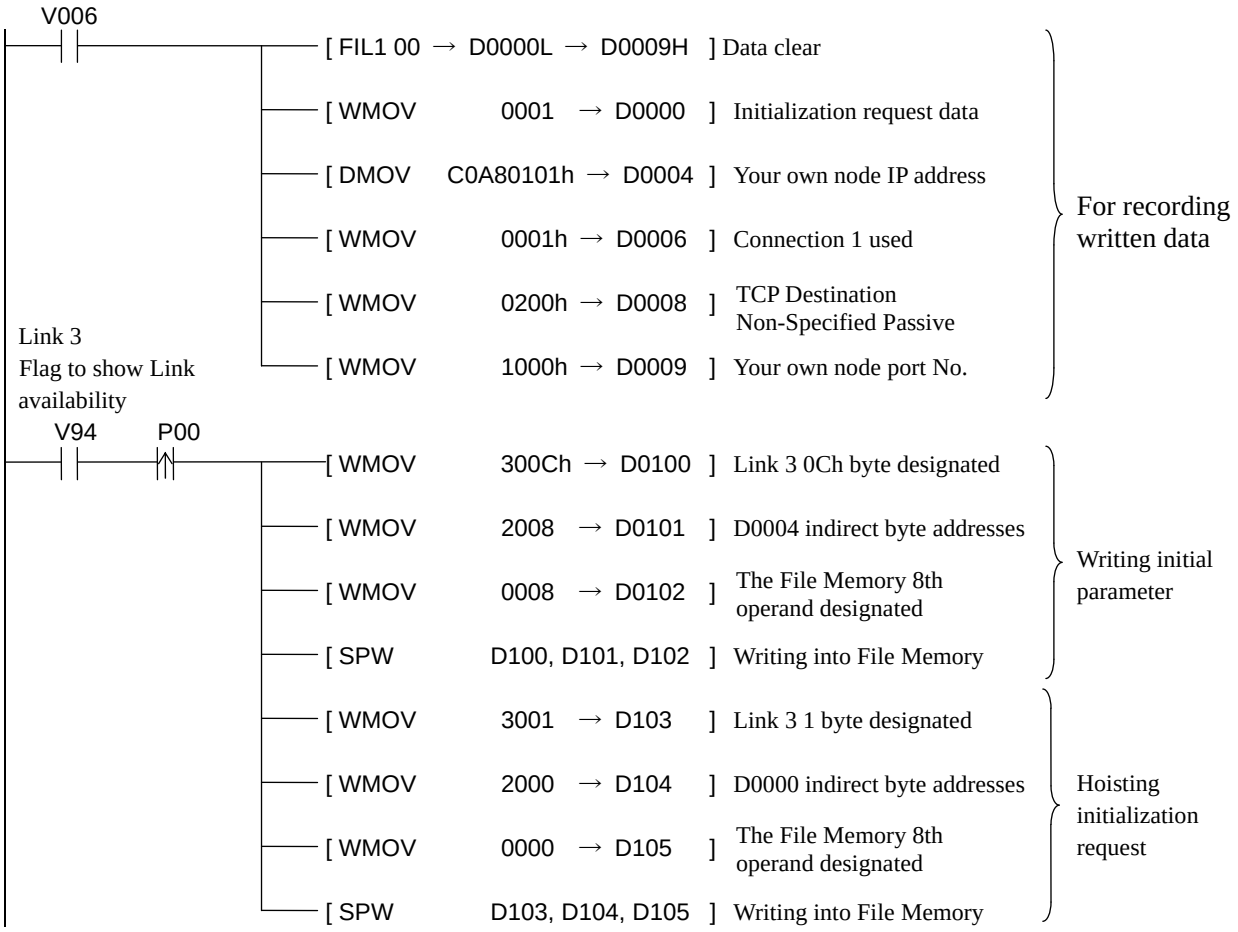
Reference 4　Ethernet Initial Sequence Program Sample

In the following example, the sequence program is used to set I/O parameters.

Condition of setting

- 2PORT-EFR Module link No. is 3.
- Your own node IP address is 192.168.1.1 (C0.A8.01.01)h
- Your own node port No. is 4096 (1000h)
- The file memory 0th operand corresponds with data register D0000.
- Data registers D100-D105 are used for writing file memory.





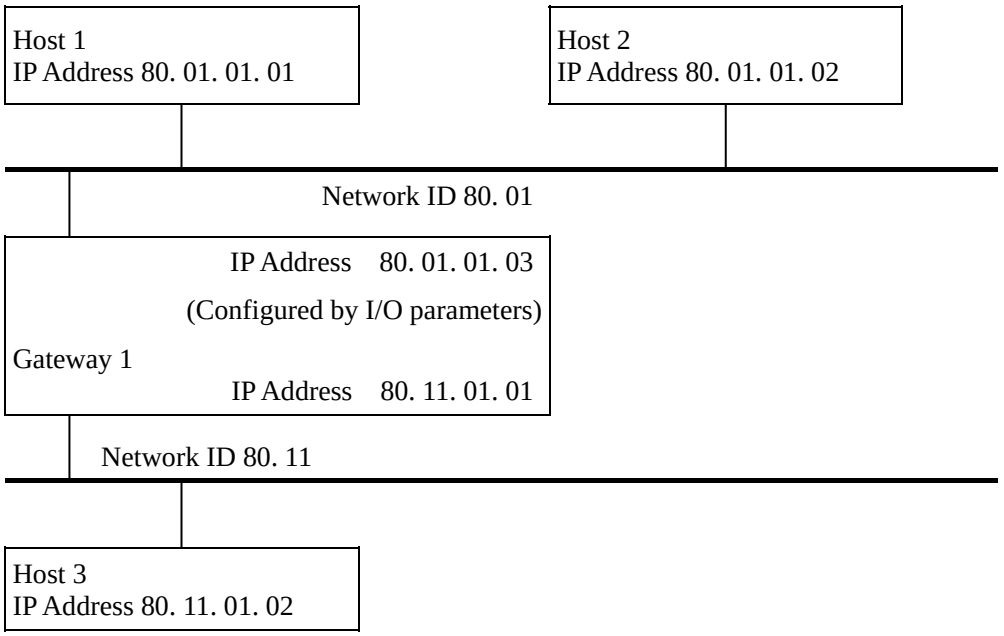
Reference 5 Ethernet IP Address, Gateway IP Address and Subnet Mask

IP Address is notated in 4 bytes to determine up to what bytes from the highest byte of the 4 are considered as network ID based on the higher 1 to 3 bits of the first byte.

First byte bit configuration	First byte	Second byte	Third byte	Fourth byte
Hi Lo 0 * * * * * * * (Class A)	Network ID	Host ID	Host ID	Host ID
1 0 * * * * * * (Class B)	Network ID	Network ID	Host ID	Host ID
1 1 0 * * * * * (Class C)	Network ID	Network ID	Network ID	Host ID

In case the Network ID of destination differs from IP Address Network ID specified by your own node IP address, a command is sent toward the gateway located at the address configured by Gateway IP Address. (Even in this case, Destination IP is kept intact at the original IP and the Gateway's Ethernet Address is used.)

Example)

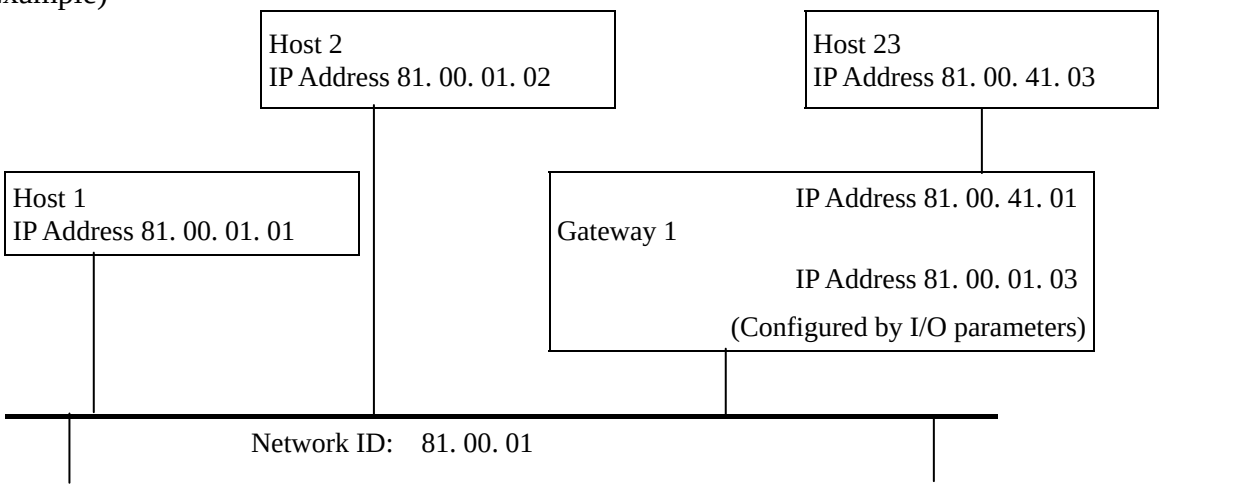


(Note: Each IP address is expressed by hexadecimal notation)

In case any transmission command from host 1 to host 3 is issued; as network ID differs, Ethernet Module transmits it toward Gateway 1.
Gateway 1 sends data to the host 3.

Subnet mask considers the certain higher bits of host ID as a part of network ID, and conduct configuration if data conveyance is required via gateway.
In the following figure, if the subnet mask is set as FF.FF.FF.00 (255.255.255.0), host 1 considers that host 3 is on the different network from one of host 1 for data to be transferred via gateway 1.

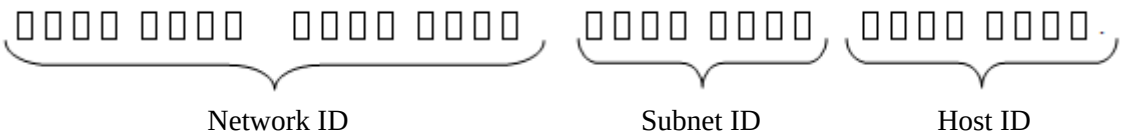
Example)



(Note: Each IP address is expressed by hexadecimal notation)

Limit the altering points of bit data of the subnet mask to one point only.
(Example) 1111 1111 . 1111 1111 . 1111 1111 . 0000 0000 (FF.FF.FF.00)h

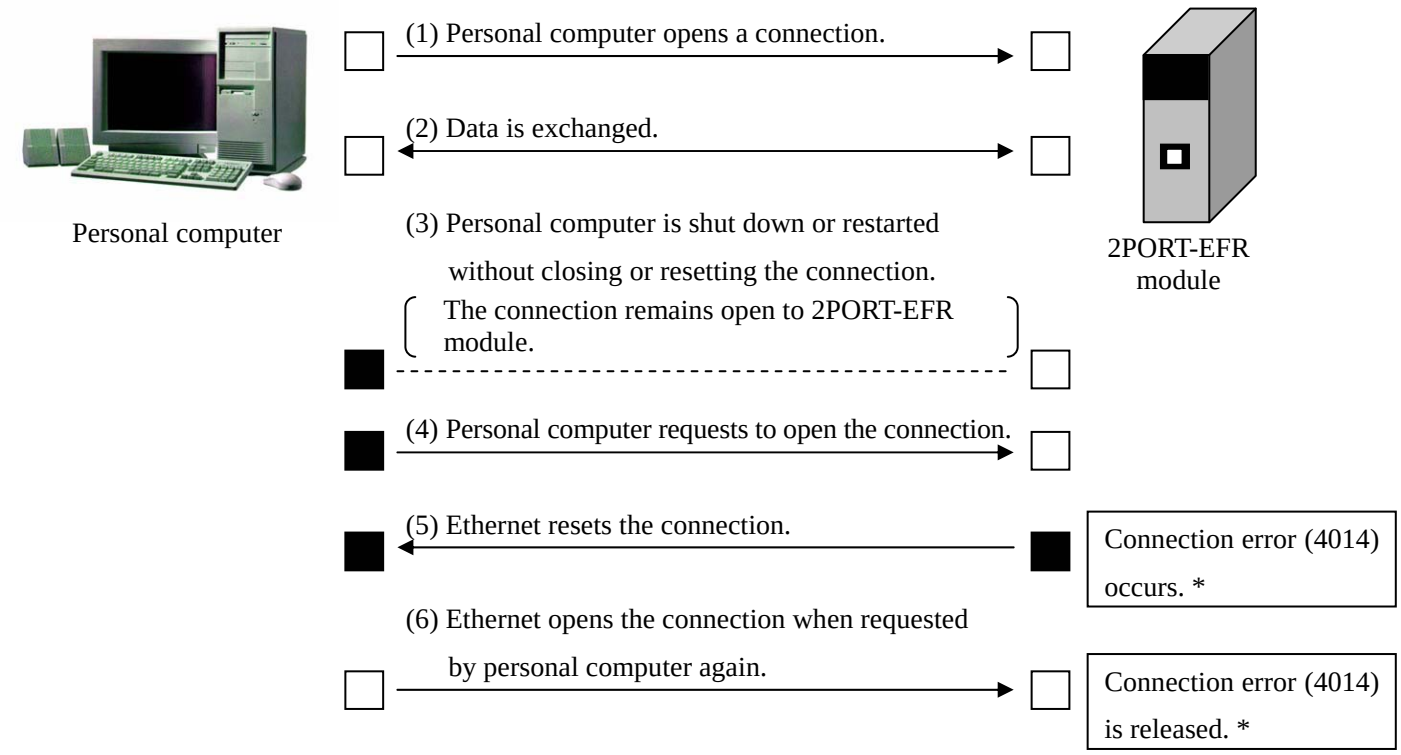
For instance, if class B IP address and this subnet mask are combined, each bit of IP address represents the following three ID sections:



IP address where all bits of each ID section are 0 or 1 evenly is not configureable.
For example, if IP address is 81.00.FF.01 (129.0.256.1) and subnet mask is FF.FF.FF.00 (255.255.255.0); since all subnet ID sections are 1, so they cannot be configured.
If subnet mask and gateway IP address are set as 00.00.00.00, they are assumed to be undefined. In this case, all components are considered as Network ID unit and Host ID only.

Reference 6　Re-opening on Ethernet Function

If a personal computer connected with an 2PORT-EFR module is independently restarted after power-down or reset without closing or resetting a connection that has been opened by the personal computer, the connection remains open to the 2PORT-EFR module and can never be opened by the personal computer unless the port No. is the same with the previous one.
To avoid this problem, the 2PORT-EFR module is equipped to reset an open connection designated as 'non-specified passive open' when requested by a node with the same IP address and with a different port No. and open the connection to that node when requested by that node again.



（□: Connection open, ■: Connection closed）

With this function, the personal computer if accidentally shut down or rest can re-open a connection after a retry.

* Because the error is released at once as for connection error 4014 when the data interval from A to B is short, abnormality might not be able to be confirmed.

Reference 7　Conducting PING Test via Windows-Installed PC

The PING test is to check that the line is correctly connected and the IP address and other parameters correctly specified to enable the communication.

■ Test method

(1) Click the start button [Start], and click [Program] then [MS-DOS prompt].

(2) Append "ping" + "IP address of 2PORT-EFR Module" after C:¥WINDOWS>, and then press the "enter" key.
Example) A case where IP address of 2PORT-EFR Module is 192.168.1.1:
C:¥WINDOWS>ping 192.168.1.1

(3) When the test result is acceptable, the following appears:
Reply from 192.168.1.1:byte 32 time = **ms
If the test result is rejective, the error message, etc. appears as follows:
Request time out.
In this case, check that the PC is correctly wired, the hub and other devices have been powered on, and the IP addresses of the personal computer and 2PORT-EFR module have the same network ID (see Reference 5).

Reference 8 If an 2PORT-EFR module that has replaced an older one does not communicate with a personal computer:

If an 2PORT-EFR module communicating with a personal computer is replaced with a new one, the new one may not communicate with the PC for a while.
This is because the Ethernet communication requires an unique Ethernet address (also called MAC address) as well as an IP address and port No. and the personal computer stores an ARP table showing the correspondence between Ethernet addresses and IP addresses. If an 2PORT-EFR module is replaced with another one with the same IP address but a different Ethernet address stored in the hardware, communication cannot be started as far as previous settings remain in the ARP table.
After communication is suspended for a few minutes, the ARP table is usually cleared to permit the restart of communication. The table may also be cleared with the following procedure.

(1) Click the Start button [Start] on the personal computer. Select 'Programs' and 'MS-DOS Prompt.'

(2) Enter 'arp-d' and the IP address of the 2PORT-EFR module after C:¥WINDOWS>. Press the Enter key.
(Example) If the IP address of the 2PORT-EFR module is 192.168.1.1, for example:
C:¥WINDOWS>arp -d 192.168.1.1

Then, it becomes possible to restart the communication. The ARP table may also be cleared when the personal computer is shut down or restarted.

The ARP table of 2PORT-EFR will be cleared in two minutes.

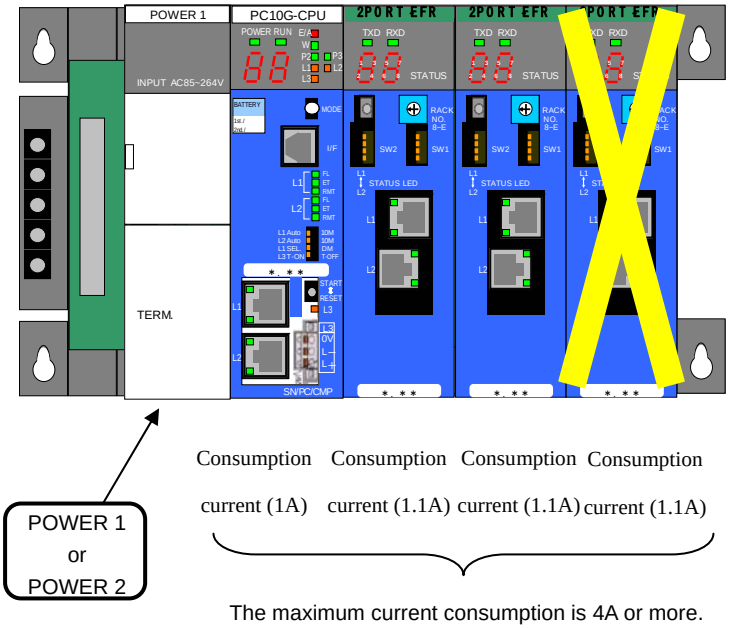
Reference 9　Limitations on number of modules implemented due to power module

Please be careful that the combined consumption current of individual modules does not exceed the maximum output current of the power module.

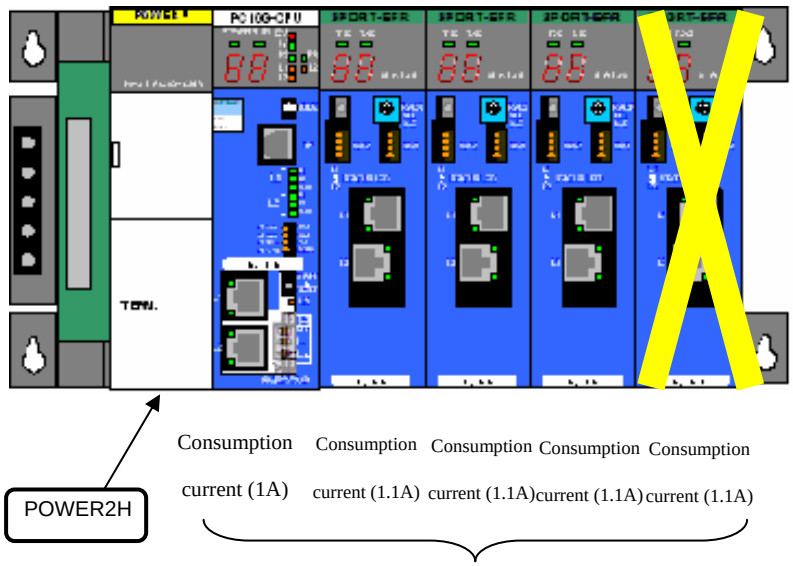
The maximum output current of each power source module is as follows.

Name	Type	Maximum output current
POWER1	THV-2747	4A
POWER2	THV-2748	4A
POWER2H	THV-6374	5A

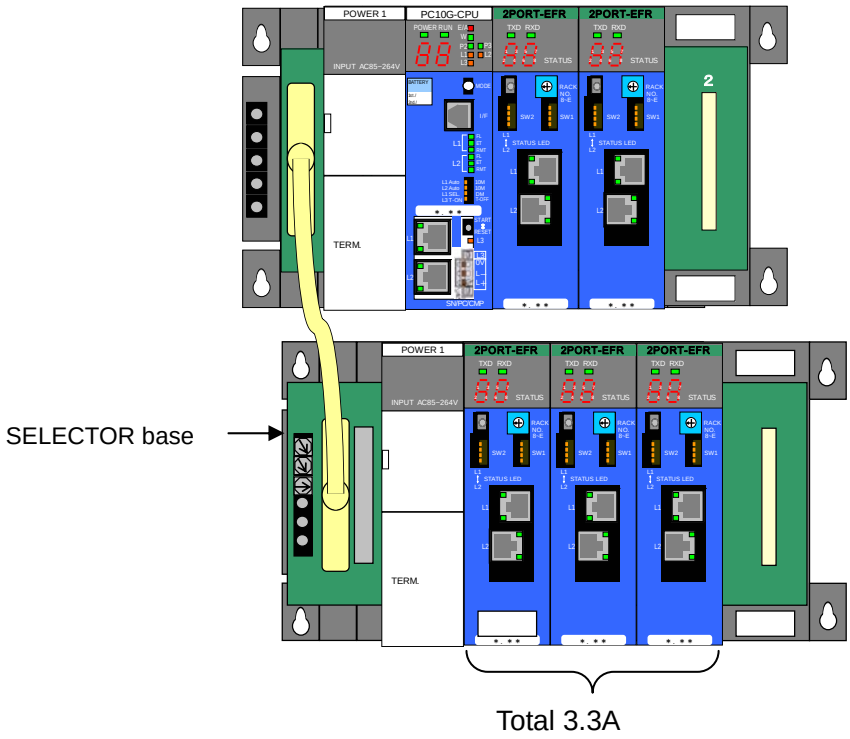
If POWER1 and PC10G (consumption current = 1A) is implemented, a maximum of two can be implemented on 2PORT-EFR.



If POWER2H and PC10G (consumption current = 1A) is implemented, a maximum of three can be implemented on 2PORT-EFR.



It is possible to use it up to seven (rack no. 8 to E) by making the load to each power source module below the maximum output current by using the increase base to increase the number of sheets of the module.（The number of 2PORT-EFR that can be mounted on the increase base is four or less in POWER2H in POWER1 for three or less.)



The next page shows consumption currents (Typ.) for various modules as reference.

■ Consumption current of individual modules (Typ.)

Module name	Consumption current (mA)	Module name	Consumption current (mA)
SELECTOR	31	SIO	310
IN-11,12	60*1	DLNK-M2	260(5VDC)
1N-22D	63*1		40(24VDC)
IN-32F	77*1	DLNK-S2	180(5VDC)
IN-22H	100*1		60(24VDC)
IN-SW	126*1	PC1-I/O-I/F	200
OUT-1,4	174*1	MPLX-TR-I/F	700
OUT-3	356*1	AD	140
OUT-11	336*1	DA	670
OUT-12	380*1	COUNTER	300
OUT-15,16	310*1	PULSE OUT	250
OUT-18,19	136*1	SUB-CPU	380
OUT-28D,29D	210*1	B7A-I/F	100
I/O-329G	330*1	S-LINK	100
FL/ET-T-V2H	600	2PORT-EFR	1100(5VDC)
PC/CMP-LINK	170	CT10	200
PC/CMP2-LINK		EF10	1100(5VDC)
RMT-I/O M	210	AD10	300
RMT-I/O S		ML10	150
HPC-LINK	250	SC10	240
ME-NET	600	TOYOPUC-MCML	150(5VDC)
2PORT-LINK	330	Program name	Consumption current（mA）
2PORT-M-NET	150	HP3	200*2
EN-I/F	600	I/O monitor	300*2

*1 Input and output modules consumption current is the (Typ.) value when all points are on.
*2 If peripheral devices which have power supplied from the PC unit such as HP3 and the like are used, please include their consumption current in calculations.

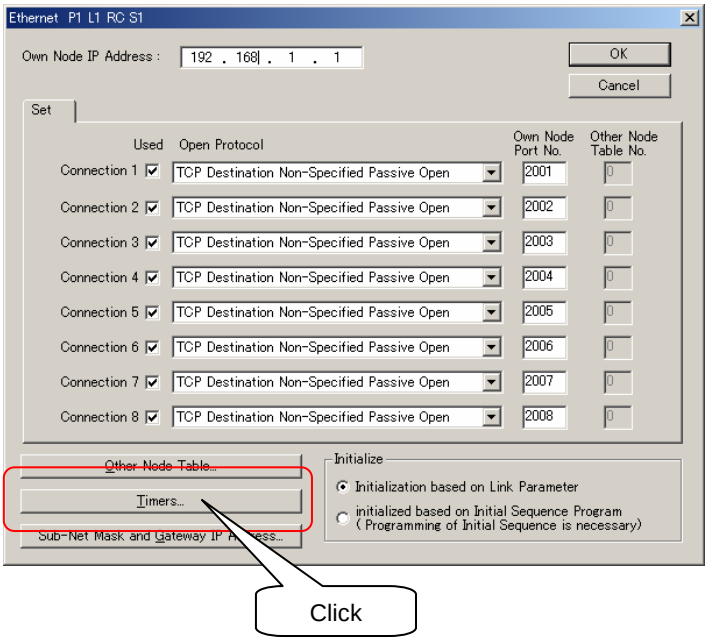
Reference 10　Andon controller link parameter settings

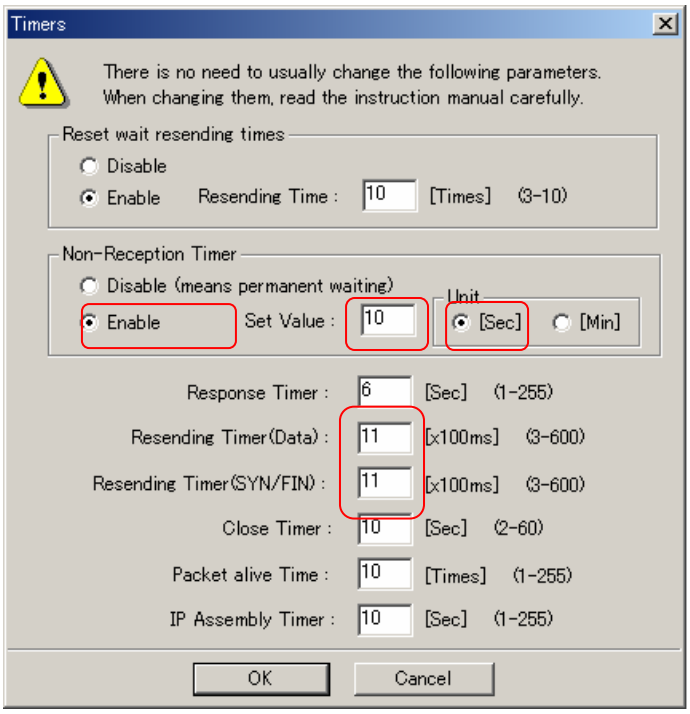
When multiple connections are open on TCP passive, if a [Connection Resend Over] (error code 4013) occurs on multiple ports simultaneously due to cable disconnections, etc, there may be cases where connection cannot be established if the other node requests an open.

If this problem occurs frequently, activate the no-receipt timer, and adjust the timer setting value to prevent a connection resend over error from occurring.

When connecting the Mitsubishi Electric Andon controller (EPC010, EPC020) and 2PORT-EFR, please set each of the timer values for the link parameter as shown below.

Ethernet link parameter screen





Change the sections circled in red. Default settings used for everywhere other than these four places.

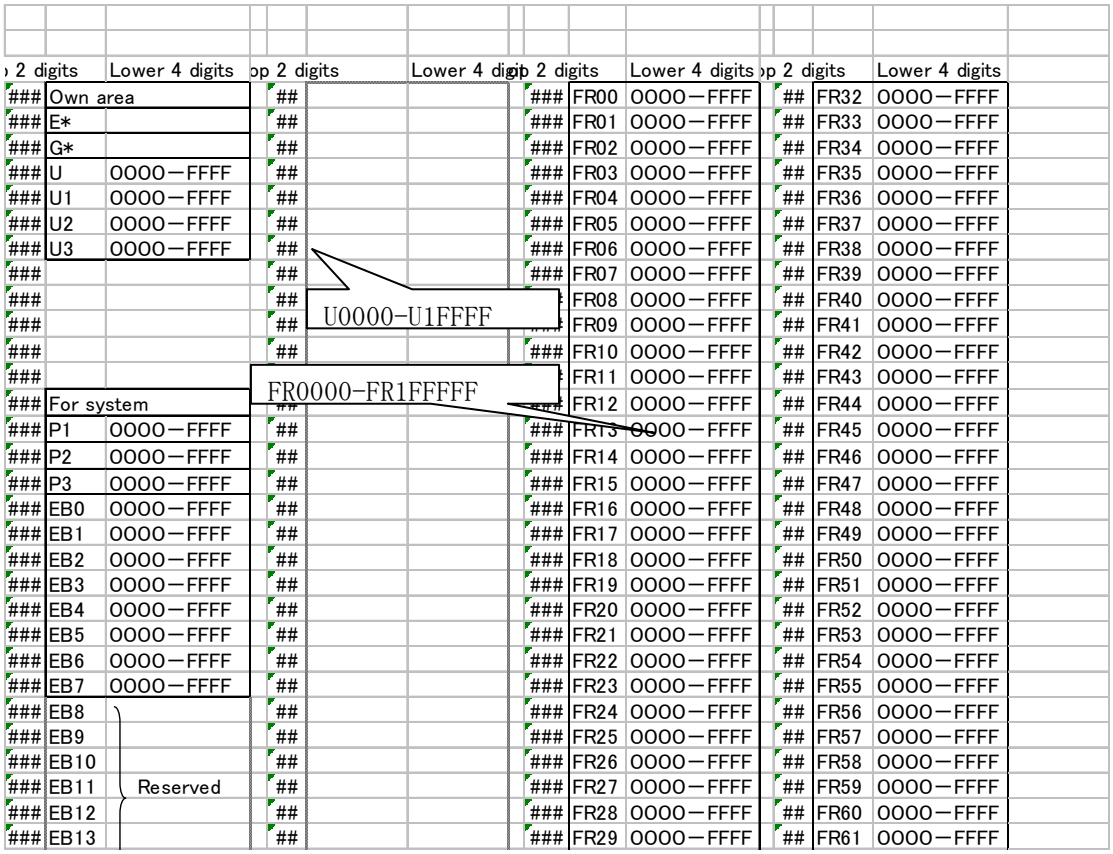
Reference 11　Ex number

In PC10 mode, the overall data area is expressed as **[8 digits (HEX) byte address].**
There are cases where **[8 digit byte address]** and **[Ex number]** use **[Index function]** and **[Flash register].**

8 digit byte address = [00]＋[Ex number（2 digits）]＋[Indirect byte address]

* Please specify Ex number [OD] to [OF] for the basic area.
[00] is specified for own area.
[01] is specified for the [PC3JG/PC10 standard mode] area.

E.g.
P1-D0000 □ 000D2000
EB01234 □ 00102468h
EM0L □ 00010C00h



2 digits	Lower 4 digits	op 2 digits	Lower 4 digits	op 2 digits	Lower 4 digits	op 2 digits	Lower 4 digits
###	Own area	##		###	FR00 OOOO－FFFF	##	FR32 OOOO－FFFF
###	E*	##		###	FR01 OOOO－FFFF	##	FR33 OOOO－FFFF
###	G*	##		###	FR02 OOOO－FFFF	##	FR34 OOOO－FFFF
###	U	OOOO－FFFF	##	###	FR03 OOOO－FFFF	##	FR35 OOOO－FFFF
###	U1	OOOO－FFFF	##	###	FR04 OOOO－FFFF	##	FR36 OOOO－FFFF
###	U2	OOOO－FFFF	##	###	FR05 OOOO－FFFF	##	FR37 OOOO－FFFF
###	U3	OOOO－FFFF	##	###	FR06 OOOO－FFFF	##	FR38 OOOO－FFFF
###			##	###	FR07 OOOO－FFFF	##	FR39 OOOO－FFFF
###			##	###	FR08 OOOO－FFFF	##	FR40 OOOO－FFFF
###			##	###	FR09 OOOO－FFFF	##	FR41 OOOO－FFFF
###			##	###	FR10 OOOO－FFFF	##	FR42 OOOO－FFFF
###			##	###	FR11 OOOO－FFFF	##	FR43 OOOO－FFFF
###	For system		##	###	FR12 OOOO－FFFF	##	FR44 OOOO－FFFF
###	P1	OOOO－FFFF	##	###	FR13 OOOO－FFFF	##	FR45 OOOO－FFFF
###	P2	OOOO－FFFF	##	###	FR14 OOOO－FFFF	##	FR46 OOOO－FFFF
###	P3	OOOO－FFFF	##	###	FR15 OOOO－FFFF	##	FR47 OOOO－FFFF
###	EB0	OOOO－FFFF	##	###	FR16 OOOO－FFFF	##	FR48 OOOO－FFFF
###	EB1	OOOO－FFFF	##	###	FR17 OOOO－FFFF	##	FR49 OOOO－FFFF
###	EB2	OOOO－FFFF	##	###	FR18 OOOO－FFFF	##	FR50 OOOO－FFFF
###	EB3	OOOO－FFFF	##	###	FR19 OOOO－FFFF	##	FR51 OOOO－FFFF
###	EB4	OOOO－FFFF	##	###	FR20 OOOO－FFFF	##	FR52 OOOO－FFFF
###	EB5	OOOO－FFFF	##	###	FR21 OOOO－FFFF	##	FR53 OOOO－FFFF
###	EB6	OOOO－FFFF	##	###	FR22 OOOO－FFFF	##	FR54 OOOO－FFFF
###	EB7	OOOO－FFFF	##	###	FR23 OOOO－FFFF	##	FR55 OOOO－FFFF
###	EB8		##	###	FR24 OOOO－FFFF	##	FR56 OOOO－FFFF
###	EB9		##	###	FR25 OOOO－FFFF	##	FR57 OOOO－FFFF
###	EB10		##	###	FR26 OOOO－FFFF	##	FR58 OOOO－FFFF
###	EB11	Reserved	##	###	FR27 OOOO－FFFF	##	FR59 OOOO－FFFF
###	EB12		##	###	FR28 OOOO－FFFF	##	FR60 OOOO－FFFF
###	EB13		##	###	FR29 OOOO－FFFF	##	FR61 OOOO－FFFF

Reference） Address table

Name			Ex No. (HEX)	Address	Byte address
Basic area 2	P1PC3JG compatible ※2	Edge	0D	P000 - P1FF	0000 - 003F
		Keep relay		K000 - K2FF	0040 - 009F
		Special relay		V000 - V0FF	00A0 - 00BF
		Timer/counter		TC000 - TC1FF	00C0 - 00FF
		Link relay		L000 - L7FF	0100 - 01FF
		Input/output		XY000 - XY7FF	0200 - 02FF
		Internal relay		M000 - M7FF	0300 - 03FF
		Special register		S0000 - S03FF	0400 - 0BFF
		Current value register		N0000 - N01FF	0C00 - 0FFF
		Link register		R0000 - R07FF	1000 - 1FFF
		Data register 1		D0000 - D0FFF	2000 - 3FFF
	P1 PC10 extension	Data register 2		D1000 - D2FFF	4000 - 7FFF
		Edge		P1000 - P17FF	C000 - C0FF
		Special relay		V1000 - V17FF	C100 - C1FF
		Timer/counter		TC1000 - TC17FF	C200 - C2FF
		Internal relay		M1000 - M17FF	C300 - C3FF
		Link relay		L1000 - L2FFF	C400 - C7FF
		Special register		S1000 - S13FF	C800 - CFFF
		Current value register		N1000 - N17FF	D000 - DFFF
	P2 PC3JG compatible ※2	Edge	0E	P000 - P1FF	0000 - 003F
		Keep relay		K000 - K2FF	0040 - 009F
		Special relay		V000 - V0FF	00A0 - 00BF
		Timer/counter		TC000 - TC1FF	00C0 - 00FF
		Link relay		L000 - L7FF	0100 - 01FF
		Input/output		XY000 - XY7FF	0200 - 02FF
		Internal relay		M000 - M7FF	0300 - 03FF
		Special register		S0000 - S03FF	0400 - 0BFF
		Current value register		N0000 - N01FF	0C00 - 0FFF
		Link register		R0000 - R07FF	1000 - 1FFF
		Data register 1		D0000 - D0FFF	2000 - 3FFF
	P2 PC10 extension	Data register 2		D1000 - D2FFF	4000 - 7FFF
		Edge		P1000 - P17FF	C000 - C0FF
		Special relay		V1000 - V17FF	C100 - C1FF
		Timer/counter		TC1000 - TC17FF	C200 - C2FF
		Internal relay		M1000 - M17FF	C300 - C3FF
		Link relay		L1000 - L2FFF	C400 - C7FF
		Special register		S1000 - S13FF	C800 - CFFF
		Current value register		N1000 - N17FF	D000 - DFFF
	P3 PC3JG compatible ※2	Edge	0F	P000 - P1FF	0000 - 003F
		Keep relay		K000 - K2FF	0040 - 009F
		Special relay		V000 - V0FF	00A0 - 00BF
		Timer/counter		TC000 - TC1FF	00C0 - 00FF
		Link relay		L000 - L7FF	0100 - 01FF
		Input/output		XY000 - XY7FF	0200 - 02FF
		Internal relay		M000 - M7FF	0300 - 03FF
		Special register		S0000 - S03FF	0400 - 0BFF
		Current value register		N0000 - N01FF	0C00 - 0FFF
		Link register		R0000 - R07FF	1000 - 1FFF
		Data register 1		D0000 - D0FFF	2000 - 3FFF
	P3 PC10 extension	Data register 2		D1000 - D2FFF	4000 - 7FFF
		Edge		P1000 - P17FF	C000 - C0FF
		Special relay		V1000 - V17FF	C100 - C1FF
		Timer/counter		TC1000 - TC17FF	C200 - C2FF
		Internal relay		M1000 - M17FF	C300 - C3FF
		Link relay		L1000 - L2FFF	C400 - C7FF
		Special register		S1000 - S13FF	C800 - CFFF
		Current value register		N1000 - N17FF	D000 - DFFF

Name			Ex No. (HEX)	Address	Byte address
Extension area 1	PC3JG compatible	Extension edge	01	EP000 - EPFFF	0000 - 01FF
		Extension keep relay		EK000 - EKFFF	0200 - 03FF
		Extension special relay		EV000 - EVFFF	0400 - 05FF
		Extension timer/counter		ETC000 - ETC7FF	0600 - 06FF
		Extension link relay		EL0000 - EL1FFF	0700 - 0AFF
		Extension input/output		EXY000 - EXY7FF	0B00 - 0BFF
		Extension internal relay		EM0000 - EM1FFF	0C00 - 0FFF
		Extension special register		ES0000 - ES07FF	1000 - 1FFF
		Extension current value register		EN0000 - EN07FF	2000 - 2FFF
		Extension setting value register		H0000 - H07FF	3000 - 3FFF
Extension area 2	PC3JG compatible	Extension input/output	02	GXY0000 - GXYFFFF	C000 - DFFF
		Extension internal relay		GM0000 - GMFFFF	E000 - FFFF
Extension area 3	PC3JG compatible	Extension data register	03	U00000 - U07FFF	0000 - FFFF
	PC10 extension		04	U08000 - U0FFFF	0000 - FFFF
			05	U10000 - U17FFF	0000 - FFFF
			06	U18000 - U1FFFF	0000 - FFFF
Extension area 4	PC3JG compatible	Extension buffer register	10	EB00000 - EB07FFF	0000 - FFFF
			11	EB08000 - EB0FFFF	0000 - FFFF
			12	EB10000 - EB17FFF	0000 - FFFF
			13	EB18000 - EB1FFFF	0000 - FFFF
	PC10Extension		14	EB20000 - EB27FFF	0000 - FFFF
			15	EB28000 - EB2FFFF	0000 - FFFF
			16	EB30000 - EB37FFF	0000 - FFFF
			17	EB38000 - EB3FFFF	0000 - FFFF

Name			Ex No. (HEX)	Address	Byte address
Extension area 5	PC10 extension	Flash register	40	FR000000 - FR007FFF	0000 - FFFF
			41	FR008000 - FR00FFFF	0000 - FFFF
			42	FR010000 - FR017FFF	0000 - FFFF
			43	FR018000 - FR01FFFF	0000 - FFFF
			44	FR020000 - FR027FFF	0000 - FFFF
			45	FR028000 - FR02FFFF	0000 - FFFF
			46	FR030000 - FR037FFF	0000 - FFFF
			47	FR038000 - FR03FFFF	0000 - FFFF
			48	FR040000 - FR047FFF	0000 - FFFF
			49	FR048000 - FR04FFFF	0000 - FFFF
			4A	FR050000 - FR057FFF	0000 - FFFF
			4B	FR058000 - FR05FFFF	0000 - FFFF
			4C	FR060000 - FR067FFF	0000 - FFFF
			4D	FR068000 - FR06FFFF	0000 - FFFF
			4E	FR070000 - FR077FFF	0000 - FFFF
			4F	FR078000 - FR07FFFF	0000 - FFFF
			50	FR080000 - FR087FFF	0000 - FFFF
			51	FR088000 - FR08FFFF	0000 - FFFF
			52	FR090000 - FR097FFF	0000 - FFFF
			53	FR098000 - FR09FFFF	0000 - FFFF
			54	FR0A0000 - FR0A7FFF	0000 - FFFF
			55	FR0A8000 - FR0AFFFF	0000 - FFFF
			56	FR0B0000 - FR0B7FFF	0000 - FFFF
			57	FR0B8000 - FR0BFFFF	0000 - FFFF
			58	FR0C0000 - FR0C7FFF	0000 - FFFF
			59	FR0C8000 - FR0CFFFF	0000 - FFFF
			5A	FR0D0000 - FR0D7FFF	0000 - FFFF
			5B	FR0D8000 - FR0DFFFF	0000 - FFFF
			5C	FR0E0000 - FR0E7FFF	0000 - FFFF
			5D	FR0E8000 - FR0EFFFF	0000 - FFFF
			5E	FR0F0000 - FR0F7FFF	0000 - FFFF
			5F	FR0F8000 - FR0FFFFF	0000 - FFFF
			60	FR100000 - FR107FFF	0000 - FFFF
			61	FR108000 - FR10FFFF	0000 - FFFF
			62	FR110000 - FR117FFF	0000 - FFFF
			63	FR118000 - FR11FFFF	0000 - FFFF
			64	FR120000 - FR127FFF	0000 - FFFF
			65	FR128000 - FR12FFFF	0000 - FFFF
			66	FR130000 - FR137FFF	0000 - FFFF
			67	FR138000 - FR13FFFF	0000 - FFFF
			68	FR140000 - FR147FFF	0000 - FFFF
			69	FR148000 - FR14FFFF	0000 - FFFF
			6A	FR150000 - FR157FFF	0000 - FFFF
			6B	FR158000 - FR15FFFF	0000 - FFFF
			6C	FR160000 - FR167FFF	0000 - FFFF
			6D	FR168000 - FR16FFFF	0000 - FFFF
			6E	FR170000 - FR177FFF	0000 - FFFF
			6F	FR178000 - FR17FFFF	0000 - FFFF
			70	FR180000 - FR187FFF	0000 - FFFF
			71	FR188000 - FR18FFFF	0000 - FFFF
			72	FR190000 - FR197FFF	0000 - FFFF
			73	FR198000 - FR19FFFF	0000 - FFFF
			74	FR1A0000 - FR1A7FFF	0000 - FFFF
			75	FR1A8000 - FR1AFFFF	0000 - FFFF
			76	FR1B0000 - FR1B7FFF	0000 - FFFF
			77	FR1B8000 - FR1BFFFF	0000 - FFFF
			78	FR1C0000 - FR1C7FFF	0000 - FFFF
			79	FR1C8000 - FR1CFFFF	0000 - FFFF
			7A	FR1D0000 - FR1D7FFF	0000 - FFFF
			7B	FR1D8000 - FR1DFFFF	0000 - FFFF
			7C	FR1E0000 - FR1E7FFF	0000 - FFFF
			7D	FR1E8000 - FR1EFFFF	0000 - FFFF
			7E	FR1F0000 - FR1F7FFF	0000 - FFFF
			7F	FR1F8000 - FR1FFFFF	0000 - FFFF

Reference 12　Link memory capacity

The total link memory capacity of all link modules mounted on a single CPU module should be 60 kbytes or less.　The link memory capacity should be as small as possible to reserve a necessary data link capacity.
The 16-kbyte and 32-kbyte modes of the FL-net are available with CPU modules of the following versions.

CPU module	Version	CPU module	Version
PC10P	1.00~	PC3JD	2.00~
PC10G	1.00~	PC3JM	2.00~
PC10GE	1.00~	PC3JL	2.00~
PC3JG,PC3JG-P	1.30~	AF10	2.30~
PC3JP,PC3JP-GP	1.70~	MX	2.00~

If the link memory capacity is set to 16 or 32 kbytes for a CPU module of another version, the module does not normally operate.

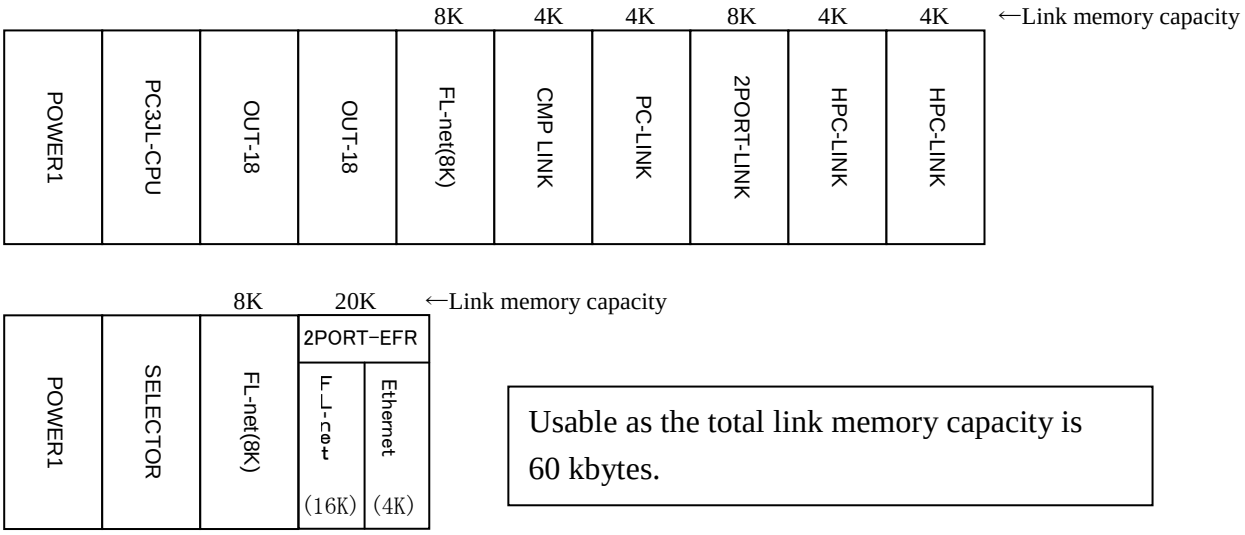
Link memory capacities of different modules

FL/ET-T-V2H 2PORT-EFR	FL-net 8K	8K bytes
	FL-net 16K	16K bytes
	FL-net 32K	32K bytes
FL/ET-T-V2H 2PORT-EFR EF10	Ethernet	4K bytes
2PORT-EFR	FLRemote-M	4K bytes
PC/CMP-LINK		4K bytes
2PORT-LINK		8K bytes
2PORT M-NET		4K bytes
HPC-LINK		4K bytes
SIO		4K bytes
Memory Card I/F		4K bytes
EN-I/F		4K bytes
SUB-CPU		4K bytes
RMT-I/O M		4K bytes
DLNK-M		4K bytes
DLNK-M2		4K bytes
DLNK-S2		4K bytes
PROFI-S2		4K bytes
ID I/F		4K bytes
MPLX-TR-I/F		4K bytes
PC1-I/O-I/F		4K bytes
AF1K-C		4K bytes
MC1K-C		4K bytes
ME-NET		8K bytes
PULSE OUTPUT		8K bytes

Note:

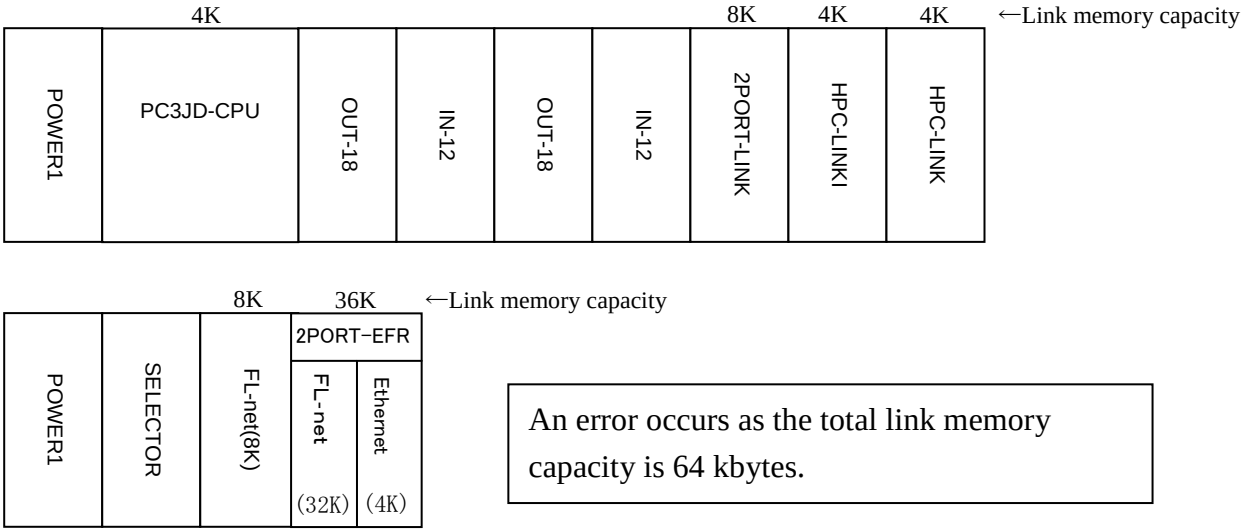
・ For PC2J or PC3J series CPUs, it is not necessary to add the internal or optional link memory capacity except for the DLNK-M contained in the PC3JD etc., which consumes 4 kbytes' link memory space. However, when CPU module is PC10 series, the link memory capacity is not limited.

Example 1



Usable as the total link memory capacity is 60 kbytes.

Example 2



An error occurs as the total link memory capacity is 64 kbytes.

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