HITACHI PROGRAMABLE CONTROLLER

EH-150

Ethernet Module 2(EH-ETH2)
APPLICATION MANUAL

NJI-543C (X)

○ Warranty period and coverage

The product warranty period will be one year after the product has been delivered to the location designated in the order. If a malfunction occurs within the warranty period even though the product has been used within the range of correct conditions according to the product specifications given in this document, we will exchange or repair the defective part free of charge.
However, the following conditions are not be covered by this warranty:

(1) Damage due to negligent handling or misuse by the user.

(2) When the cause of the malfunction is due to components other than those supplied.

(3) When the cause of the error is due to a modification or repair performed by an entity other than the supplier.

(4) When the cause of the error is due to weather or accidents that are out of the supplier's control.

Further, the warranty here refers to that of the product itself, and does not include any damage caused by the malfunction of the product. The warranty is valid only in Japan.

○ General repair

Investigations and repairs outside the warranty period (1 year) will be charged. Also, we will repair damages caused by any reason not covered by the warranty and investigate the cause of malfunctions for a charge within the warranty period. Please contact the place of purchase or one of our service stations. (Research may not be possible, depending on the area of malfunction.)

○ Ordering parts or asking questions

When contacting us for repair, ordering parts or inquiring about other items, please have the following details ready before contacting the place of purchase or service station.

(1) Model

(2) Manufacturing number (MFG no.)

(3) Details of the malfunction

Safety Precautions

Read this manual and related documents thoroughly before installing, operating, performing preventive maintenance or performing inspection, and be sure to use the unit correctly. Use this product after acquiring adequate knowledge of the unit, all safety information, and all cautionary information. Also, make sure this manual enters the possession of the chief person in charge of safety maintenance.
Safety caution items are classified as “Danger” and “Caution” in this document.

DANGER : Cases where if handled incorrectly a dangerous circumstance may be created, resulting in possible death or severe injury.

CAUTION : Cases where if handled incorrectly a dangerous circumstance may be created, resulting in possible minor to medium injury to the body, or only mechanical damage.

However, depending on the circumstances, items marked with CAUTION may result in major accidents.

In any case, they both contain important information, so please follow them closely.

Icons for prohibited items and required items are shown below:

: Indicates prohibited items (items that may not be performed). For example, when open flames are prohibited, is shown.

: Indicates required items (items that must be performed). For example, when grounding must be performed, is shown.

1. About installation

⚠ CAUTION
• Use this product in an environment as described in the catalogue and this document. If this product is used in an environment subject to high temperature, high humidity, excessive dust, corrosive gases, vibration or shock, it may result in electric shock, fire or malfunction. • Perform installation according to this manual. If installation is not performed adequately, it may result in dropping, malfunction or an operational error in the unit. • Do not allow foreign objects such as wire chips to enter the unit. They may become the cause of fire, malfunction or failure.

2. About wiring

REQUIRED

- Always perform grounding (FE terminal).
  If grounding is not performed, there is a risk of electric shocks and malfunctions.

⚠ CAUTION

- Connect power supply that meets rating.
  If a power supply that does not meet rating is connected, fire may be caused.
- The wiring operation should be performed by a qualified personnel.
  If wiring is performed incorrectly, it may result in fire, damage, or electric shock.

3. Precautions when using the unit

⚠ DANGER

- Do not touch the terminals while the power is on.
  There is risk of electric shock.
- Structure the emergency stop circuit, interlock circuit, etc. outside the programmable controller (hereinafter referred to as PLC).
  Damage to the equipment or accidents may occur due to failure of the PLC.
  However, do not interlock the unit to external load via relay drive power supply of the relay output module.

⚠ CAUTION

- When performing program change, forced output, RUN, STOP, etc., while the unit is running, be sure to verify safety.
  Damage to the equipment or accidents may occur due to operation error.
- Supply power according to the power-up order.
  Damage to the equipment or accidents may occur due to malfunctions.

4. About preventive maintenance

DANGER
• Do not connect the ⊕, ⊖ of the battery in reverse. Also, do not charge, disassemble, heat, place in fire, or short circuit the battery. There is a risk of explosion or fire.

PROHIBITED
• Do not disassemble or modify the unit. These actions may result in fire, malfunction, or malfunction.

CAUTION
• Turn off the power supply before removing or attaching module/unit. Electric shock, malfunction or failure may result.

Revision History

NJI No.	DATE	CONTENTS
NJI543(X)	Oct.2009	First release
NJI543A(X)	May.2010	Input of IP address is added to section 6.3 "Connection with LADDER EDITOR for Windows®".
NJI543B(X)	Oct.2010	Procedure of uploading of setup file (setup.dat) of EH-ETH is added to section 5.4.4 "Downloading and Uploading of Setup file"
NJI543C(X)	Jun.2012	Automatic Sending/Receiving function (ASR) Receiving area byte order error correction.

Table of contents

Sample program lists

Chapter 1 Introduction

We appreciate that you have selected the HITACHI Programmable Controller (PLC) EH-150 Series.
This application manual describes how to properly operate the EH-150 Ethernet Module.
Please read this manual carefully to familiarize yourself with the procedures respectively of installation, operation, and maintenance and check.

We have several documentations to refer in below.

Table 1.1 The list of documentations

Items	Name of documentation	Number of Manual
Main system of EH-150	EH-150 APPLICATION MANUAL	NJI-281*(X)
	EHV-CPU APPLICATION MANUAL	NJI-482*(X)
Programming Software	LADDER EDITOR for Windows® INSTRUCTION MANUAL (Windows®95/98/2000/NT4/XP)	NJI-342*(X)
	Control Editor INSTRUCTION MANUAL	NJI-486*(X) / NJI-537*(X)
Ethernet module	Ethernet Module 2 (EH-ETH2) APPLICATION MANUAL	NJI-543(X)

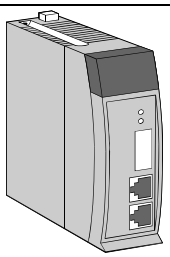
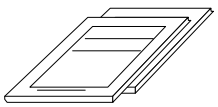
*The last character of the manual number may be modified when the product is revised.
Notes. The contents of this manual may be modified without previous notice.

1.1 Before to use

This module is manufactured carefully. But when you receive this Ethernet Module, kindly to check the following matters:

(1) If the model name is correct.
(2) If there is no shipping damage on product.
(3) If following materials are in a carton box.

Table 1.2 List of Ethernet Module materials

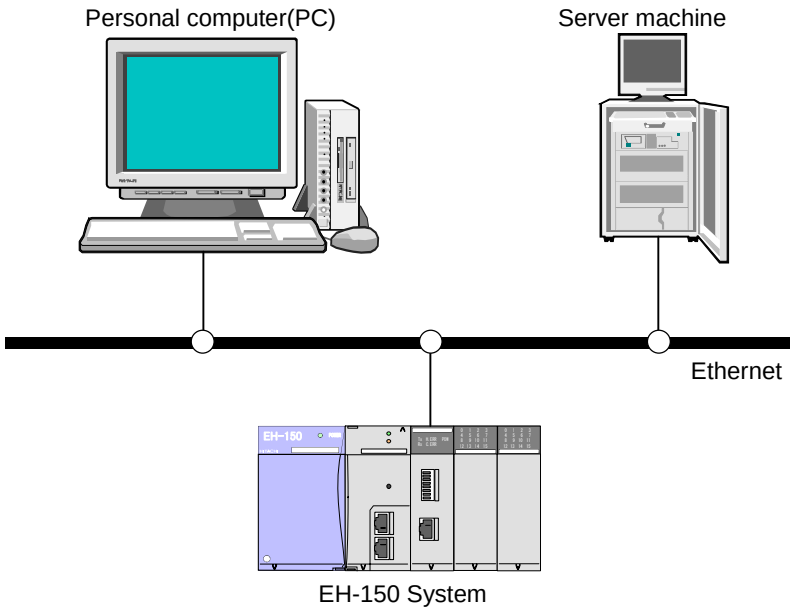
No.	Products Name	Outlook	Model number	pcs	Remarks
1	Ethernet module		EH-ETH2	1	**(CAUTION)** **To use the specified CPU module, when you use this Ethernet module in your system. Please refer the description for Section 1.4.**
2	Data Sheet (Instruction Manual)		NJI-544*: Japanese NJI-544*(X): English	1	This documentation has the description of installation

If you have find something inconvenience, please contact your distributor.

1.2 Outline

This product supports production control and system operation monitor, equipment monitor and maintenance by connecting PLC to information network.

1. EH-ETH2 (this module) can be mounted onto the basic base of EH-150 system and is the communication module can be connected EH-150 system to Ethernet comforms to IEEE802.3.
2. This module connected to Ethernet will operate as one of the station of the network system. For this operation this module can exchange the data with personal computer or engineering workstation connected with network.



1.3 Feature

1. The data sending or receiving connection can be used 10 at once.
   - 6 connections for automatic send/receive and 4 connections for H/EH-series protocol (Taskcode communication) can be used.
   - Sending data and receiving data can be done with one connection.
   - It is selectable TCP/IP or UDP/IP as the communication protocol for each connection.
   - The maximum sending or receiving data size on each ASR connection is 1,454 bytes.

   ASR is omission of Automatic Sending/Receiving.
   When you use cyclic transmission function and automatic transmission function of ASR, you can send/receive a data without making a ladder(user) program.
   Task code communication is original communication protocol for H/EH-series. You can make monitoring system or data logging system by connecting SCADA system which supports its protocol.
2. Saving the developing power with using **ASR function**.
   - The all configuration for communication can be done with using the dedicated software “EH-ETH2 Configurator” before to start communication. The configured data for communication can be saved with text format file.
   - By using ASR function, it is possible to save the development power for programming the user program to communication.
3. Using programming software via Ethernet communication line.
   - It is possible to monitor the I/O data or to handle the program of PLC with LADDER EDITOR for Windows® or Control Editor via Ethernet communication line. You can save the time and cost for maintenance of the user program or total system.

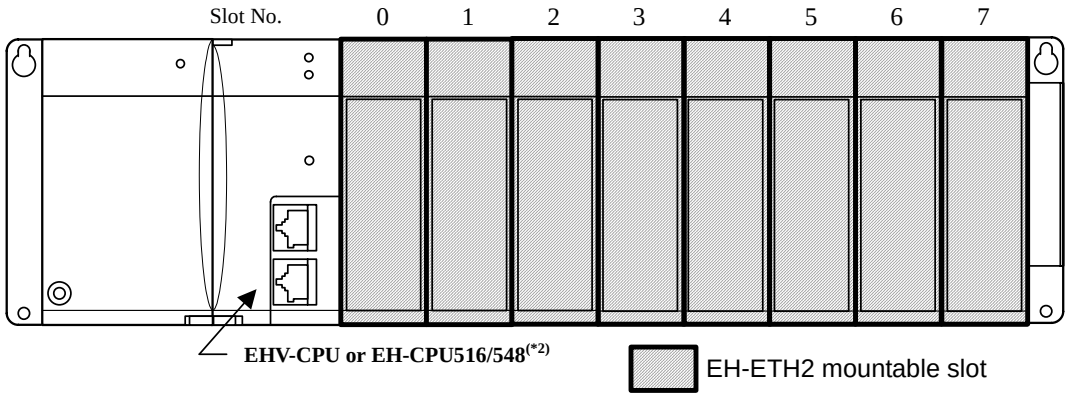
1.4 Notes to use

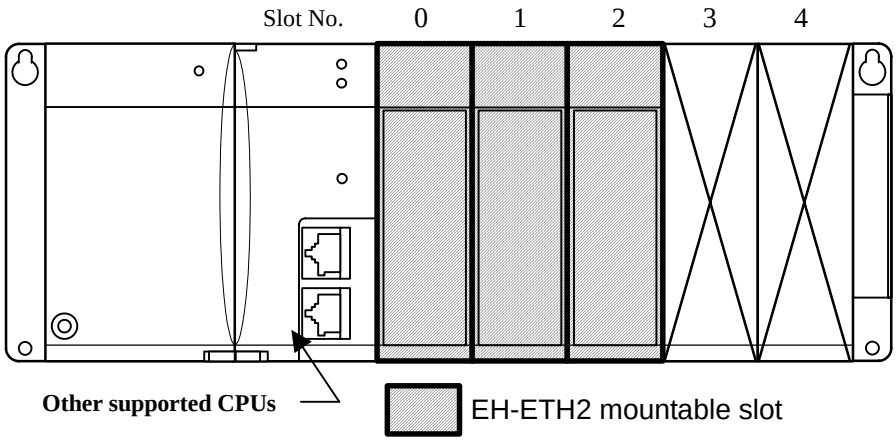
(1) Please note the master CPU type to control this module

Table 1.3 supported CPU

CPU type	supported or not
EH-CPU104	not supported
EH-CPU208	not supported
EH-CPU308	not supported
EH-CPU316	not supported
EH-CPU448	supported
EH-CPU516	supported
EH-CPU548	supported
EH-CPU104A	not supported
EH-CPU208A	not supported
EH-CPU308A	supported
EH-CPU316A	supported
EH-CPU448A	supported
EHV-CPU	supported

(2) It is possible for EHV-CPU to use **8 pcs of EH-ETH2 at once** (*1) with one basic base unit. And it is possible for EH-CPU to use **2 pcs of EH-ETH2 at once** (*1) with one basic base units. Can not use it on the extension base units.





*1: When you use EH-ETH2 together with EH-ETH, the number is the total number of EH-ETH and EH-ETH2.
*2: If you use EH-BS3/5/8, the mountable slot is No.0 to 2.

(3) The power down operation must be required when mounting or removing this module and connecting or removing the external wiring.

1.5 Term and abbreviation

Table 1.4 shows the term and abbreviation in this manual.

Table 1.4 Term and abbreviations

Term / abbreviation	Description
Ethernet parameters	This is general terms of parameter including IP address, task code logic port number etc.
ASR	This abbreviation of Automatic Sending/Receiving
ASR connection	This is connection which is called message communication for data communication in generally.
ASR parameters	This is general terms of parameter including communication protocol, logic port number, other node information etc to set each ASR connection.
Communication parameter	Ethernet parameters and ASR parameters
Task code	This is original communication protocol for H/EH-series PLC.
Task code connection	This is connection for task code communication.
EH-ETH2 configurator	The dedicated software for setting Communication parameter.

Chapter 2 System structure

Figure 2.1 shows an example of FA system consisting of combined EH-150 communication systems.

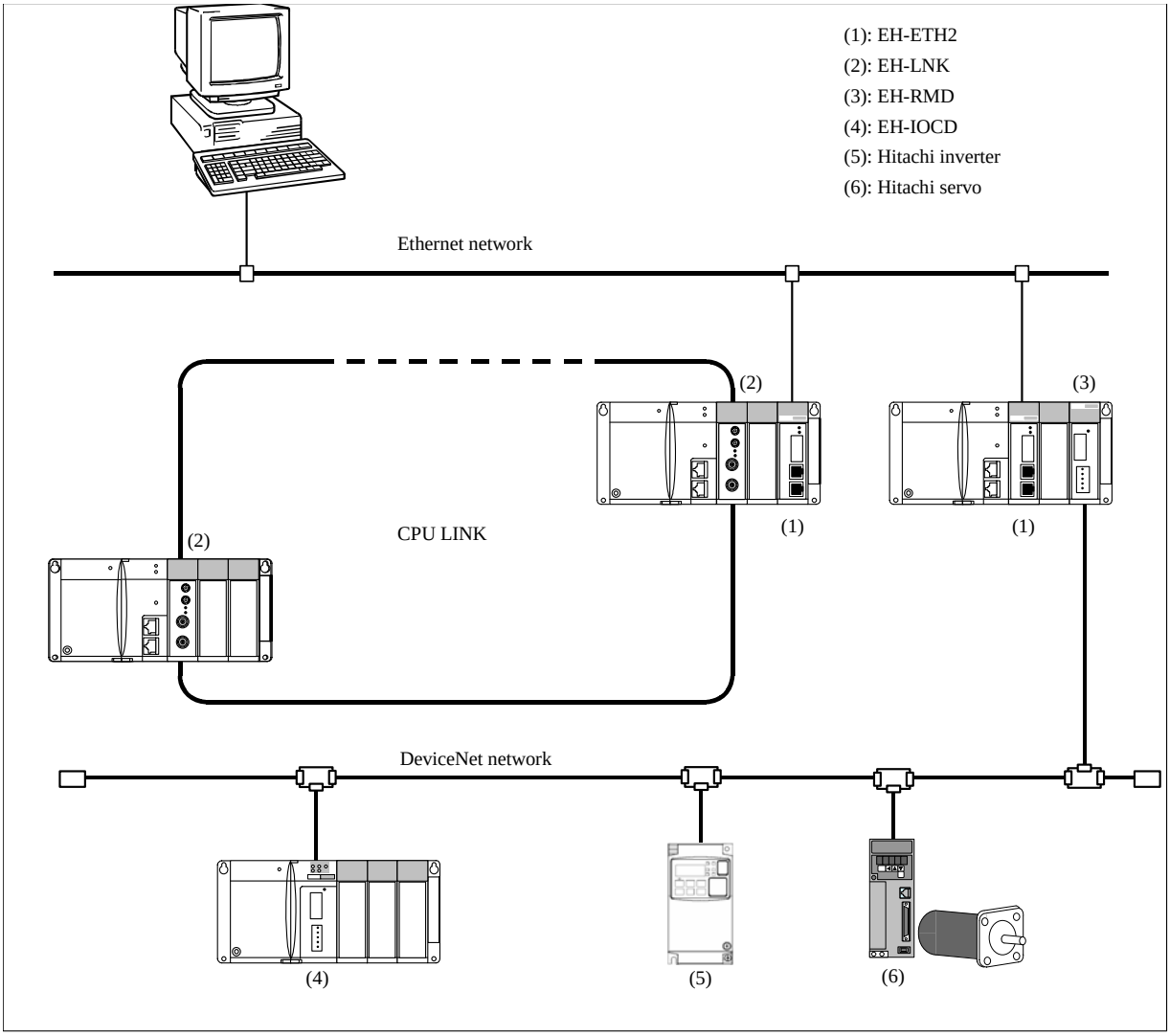


Figure 2.1 An example of FA system configuration with EH-150 series

Chapter 3 Specifications

3.1 General Specifications

The general specifications of this module are show in Table 3.1.

Table 3.1 General Specifications

Items	Specifications
Dielectric withstand voltage	250 V DC between the communication signal and case ground (FE)
Internal current consumption	5 V 470 mA
Operating ambient temperature	0 to 55 °C
Storage ambient temperature	-10 to 75 °C
Operating and storage humidity	5 to 95 % RH (no condensation)
Noise resistance	○ Noise voltage 1,500 Vpp, Noise pulse width 100 ns, 1 μs (Noise created by the noise simulator is applied across the power supply module's input terminals. This is determined by this company's measuring methods.) ○ Static noise: 3,000 V at metal exposed area ○ Conforms to IEC61131-2
Vibration resistance	Conforms to IEC60068-2-6
Usage environment	No corrosive gases, no excessive dust
Structure	Attaches to an open wall
Cooling	Natural air cooling
Number of modules	EH-CPU: 2 units / CPU, EHV-CPU: 8 units / CPU
I/O assignment method	COMM

3.2 Performance Specifications

The performance Specifications of this module are shown in Table 3.2.

Table 3.2 Performance Specifications

Items		Specifications
Communication method	Standard for Ethernet	Conforms to IEEE802.3
	Transmit modulation method	Base band
	Media access method	CSMA/CD
	Transmit speed	10 Mbps / 100 Mbps (Auto negotiation)
	Maximum segment length	100 (m)
	Recommended cable	CAT5 or higher (UTP / STP, straight)
Number of ASR connection		Maximum connection is 6 at once. Maximum data is 1,454 bytes / each sending or receiving
H-protocol (Taskcode communication)		Maximum connection is 4 at once.

3.3 Functional Specifications

The functional specifications of this module are shown in Table 3.3.

Table 3.3 Functional Specifications

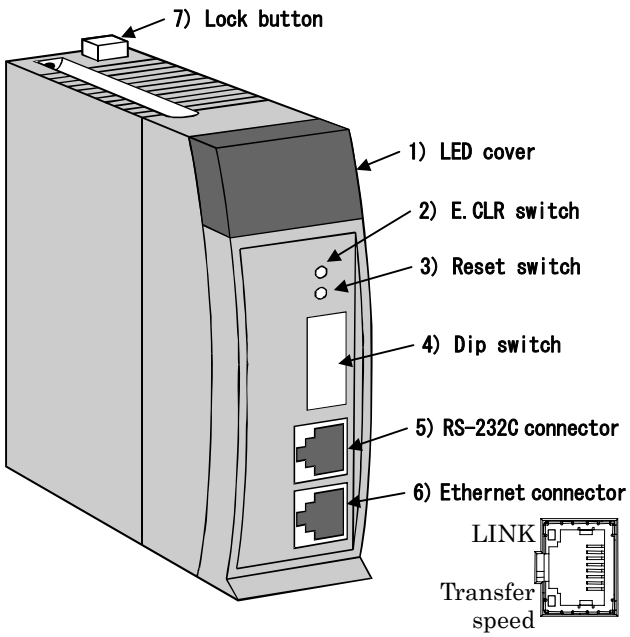
Items	Specifications
Configuration	- Set up EH-ETH2's Communication parameter with the dedicated software "EH-ETH2 Configurator". - The configuration for IP address setting and Taskcode communication should be done at Configuration mode. (*1) - The ASR information should be changed at Configuration mode or normal operation mode. (*1) - IP address or configuration for taskcode communication can be also done by the user program.
Sending data	There are two sending functions. 1. "Cyclic Sending" is periodically-sending function. 2. "Event Sending" is voluntarily-sending function. - It is possible to change the sending functionality for every ASR connection. - It is possible to use EH-ETH2 Configurator to change function of sending, to specify the attention of sending data and to specify the source of sending area.
Cyclic Sending	This should be specified when it is no need to keep synchronizing the data of source area. - It is possible to send the data with only specifying the attention of destination, area of source and time of cyclic. - There is no need to prepare the user program to take care the operation for sending. (*2)
Event Sending	The user program is required to control the everything related with sending operation.
Receiving data	There are two types Receiving mode. One is Normal mode. The other is Optional mode. [Normal mode] This should be specified when it is no need to keep synchronizing the data of destination area. - It is possible to receive the data into destination area with only specifying the attention of source and area of destination. - There is no need to prepare the user program to take care the operation for receiving. (*2) [Optional mode] This should be specified when it is need to keep synchronizing the data of destination area. - It is required to prepare the user program to take care the receiving data into the destination area.
H-protocol (Taskcode Communication)	- It is possible to specify TCP/IP or UDP/IP. - It is possible to communicate using H/EH series taskcode (H-protocol).
Test mode	- Peer to peer sending and receiving test is available.

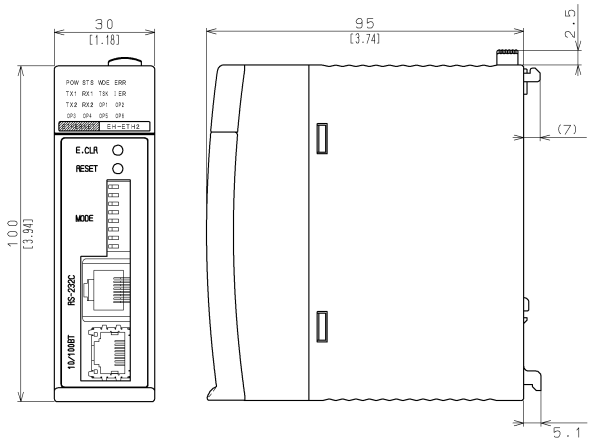
*1: It is required to operate dipswitch setting when changing the operation mode.

*2: You need to make the user program for error procedure at communication abnormal according to your system.

Chapter 4 System equipment

Name and function of each parts	Type	EH-ETH2
	Weight	0.12 kg (0.26 Lb.)
	Dimensions (mm (in.))	





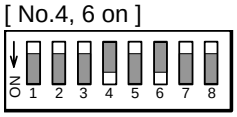
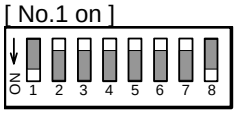
No.	Name	Function	Remarks
1)	LED cover	Refer to “Section 4.2 LED indications” for details.	
2)	E.CLR switch	Used to clear error.	
3)	Reset switch	Used to restart the module.	
4)	Dip switch	Used to set operation mode.	
5)	RS-232C connector	No use.	
6)	Ethernet connector	RJ45 type connector. [LINK LED] Green: Cable is connected. [Transfer speed LED] Orange: 10Mbps Green: 100Mbps	
7)	Lock button	When dismounting the module from a base unit, press this button and lift up the module. If necessary, the module can be fixed using a screw (M4, 10mm) after installation on the base unit.	

4.1 Operating mode

Operation mode of EH-ETH2 is set by a dip switch on the front panel. The mode change is effective after completion of EH-ETH2 initialization. The dip switch setting is effective only when power on or the reset button pressed.

Regarding detailed Ethernet parameters setting, refer to “5.2 Configuration of Ethernet parameters using EH-ETH2 Configurator”. And regarding detailed Utility mode refer to “10.2 Send / Receive test facility”.

Table 4.1 Dip switch setting and operation mode

Dip switch	Operation mode	Description
[All off] (*1) 	Normal operation mode	Operate normal mode
[No.5, 6 on] 	Utility mode	Sending and receiving test
[No.4, 6 on] 		Ethernet parameters are set by the user program.
[No.1 on] 	Configuration mode	Communication parameters (Ethernet parameters and ASR parameters) are set by dedicated software “EH-ETH2 Configurator”. In this case, dip switches No.4 to 8 are the last 5 bits of temporally IP address to connect to “EH-ETH2 Configurator”. (*2)

*1: ☐: Switch position

*2: In case of setting IP address, OFF position of the switch means “0” and ON position means “1”.

[Temporally IP address for Configuration mode]

Via the Ethernet, make Communication parameters setting by EH-ETH2 Configurator. So, require setting temporally IP address to connect to EH-ETH2 Configurator. 3-top octet of temporally IP address is fixed value “192.168.0”. By dip switches No.4 to 8, set lowest octet of temporally IP address. “192.168.0.0”(No.4 to 8 are all off) is invalid. Therefore, the range of assignable temporally IP address is from “192.168.0.1” to “192.168.0.31”.

Table 4.2 Correspondence between ON-OFF of dip switches No.4-8 and temporally IP address

ON-OFF of Dip switches					bin.	hex.	dec.	Temporally IP address
4	5	6	7	8				
OFF	OFF	OFF	OFF	ON	b'00001	H'01	1	192.168.0.1
ON	OFF	ON	ON	OFF	b'10110	H'16	22	192.168.0.22
ON	ON	ON	ON	ON	b'11111	H'1F	31	192.168.0.31

Caution

- Because IP address “192.168.0.0” has a special meaning, dip switches No.4 to 8 should not be all off. If the No.4 to 8 are all off, then the STS LED blinks 4 times cycle and the IER LED turns ON at the same time.

- IP address set by the dip switch is used temporally to access EH-ETH2 Configurator. Therefore **the IP address set by the dip switch is not saved in a FLASH ROM in EH-ETH2.**

- When you change operation mode during normal operation, the all communications will be stopped. Regarding the operation mode change and reset switch operation, please consult a system manager.

- When you restart EH-ETH2, you may operate relation equipments such as PC and work station.

4.2 LED indications

Figure 4.1 shows out view of the LED cover.

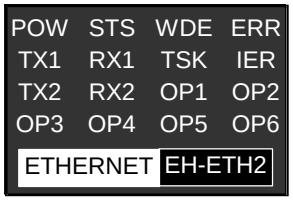


Figure 4.1 Out view of the LED cover

Table 4.3 shows LED indications.

Table 4.3 LED indications

Name	Indication	Description
POW	ON	The module is in Normal operation mode.
	Blinking	The module is in Utility mode.
	OFF	No Power is applied.
STS	ON	The module is OK.
	Slow Blinking	The module detected an error. (*1)
	Fast Blinking	The module is in resetting process. (*2)
	OFF	No Power is applied.
WDE	ON	The module detected Watchdog timer error.
	OFF	The system software is running properly.
ERR	ON	The module detected communication error.
	OFF	The module does not detect communication error.
TX1	ON	The module is sending data in Ethernet port.
	OFF	The module is not sending data in Ethernet port.
RX1	ON	The module is receiving data in Ethernet port.
	OFF	The module is not receiving data in Ethernet port.
TSK	ON	At least one of task code port is opened. (TCP/IP only)
	OFF	None of task code port is opened.
IER	ON	The module detected parameter error.
	OFF	The module does not detect parameter error.
TX2	OFF	Unused.
RX2	OFF	Unused.
OP1 to 6	ON	ASR port No.1 to 6 is opened.
	OFF	ASR port No.1 to 6 is closed.

*1: Regarding details, refer to 4.2.1 “STS LED”

*2: When the power activation, STS LED turns on or fast blinking. If I/O assignment on CPU is done correctly, STS LED’s fast blinking changes to lighting after reset process. If I/O assignment on CPU is not done, STS LED keeps fast blinking.

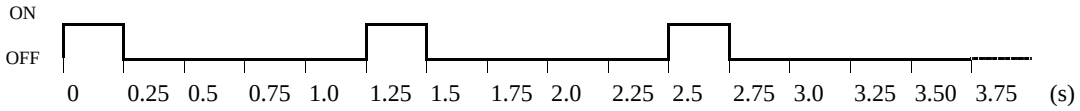
4.2.1 STS LED

STS LED blinks with turning on ERR LED or IER LED, when EH-ETH2 has been detected an error. Table 4.4 shows Error class corresponding between STS LED's blinking pattern and LED turns on concurrently with.

Table 4.4 Error class corresponding between STS LED's blinking pattern and LED turns on concurrently with

Number of blinking	Error class	
	with ERR LED	with IER LED
1	ASR connection open error	Ethernet Information setting error
2	ASR send error	ASR Information setting error
3	ASR receive error	-
4	Task cord communication error	Error of temporally IP address for Configuration mode

1-time blinking



[ASR connection open error]

Refer to "10.1 troubleshooting flow" for details on how to handle.

[Ethernet Information setting error]

An error has been detected in Ethernet Information. Set correct value and push E.CLR button.

2-time blinking

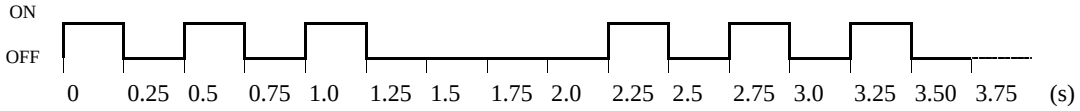
[ASR send error]

At sending data, there is an error of data transmission between EH-ETH2 and CPU module or there is a request for sending data to EH-ETH2 before EH-ETH2 has not completed the previous data sending process.

[ASR Information setting error]

An error has been detected in ASR Information. Set correct value and push E.CLR button.

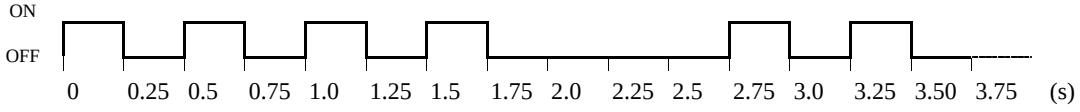
3-times blinking



[ASR receive error]

At receiving data, there is an error of data transmission between EH-ETH2 and CPU module.

4-times blinking



[Task cord communication error]

At task cord communication, there is an error of data transmission between EH-ETH2 and CPU module or there is a task cord reception before EH-ETH2 has not completed the previous data sending process.

[Error of temporally IP address for Communication parameter setting mode]

In Configuration mode, dip switches No.4 to 8 are all off. Set temporally IP address within the range of "192.168.0.1" to "192.168.0.31".

Chapter 5 Configuration of communication parameters

Communication parameters consist of Ethernet parameters and ASR parameters.

5.1 Ethernet parameters

It is required to configure the Ethernet parameters to this module before to start communication. The Ethernet parameters are saved by the retained memory of this module as the part of setup file.

The detail of the Ethernet parameters is shown in Table 5.1.

Table 5.1 Ethernet parameters

Items			Default value
IP address of self station			192.168.0.1
Subnet mask of self station			255.255.255.0
Default gateway address			0.0.0.0
Transfer speed / type			Auto Negotiation
Send / Receive test		Destination IP address	192.168.0.254
		Logical port number	4000
For Task code communication usage	Task Code Port Timeout		Enable
	Timeout value		30 s
	Task code port 1	Logical port number of self station	3004
		Type of service	TCP/IP
	Task code port 2	Logical port number of self station	3005
		Type of service	TCP/IP
	Task code port 3	Logical port number of self station	3006
		Type of service	TCP/IP
	Task code port 4	Logical port number of self station	3007
		Type of service	TCP/IP

There are two ways to configure the Ethernet parameters.

(1) To configure using EH-ETH2 Configurator. (Recommend)

(2) To configure by the user program in CPU module.

In case of (1), it is required to change the position of dip switch into Configuration mode. In case of (2), it is required to change the position of dip switch into Utility mode.

CAUTION

- It is possible to configure “Ethernet parameters” by EH-ETH2 Configurator or the user program. But the configuration of “ASR parameters” can be done by only EH-ETH2 Configurator.
- The both parameters of not only “Ethernet parameters” but also “ASR parameters” are saved into setup file.

5.2 Configuration of Ethernet parameters using EH-ETH2 Configurator

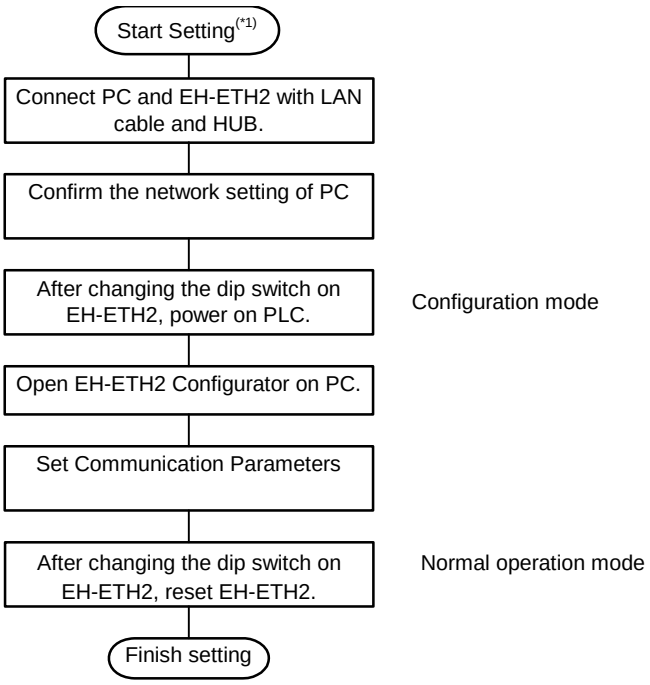
Communication parameters are configured or confirmed via EH-ETH2 Configurator.

Table 5.2 The list of the items can be configured by EH-ETH2 Configurator

Items	Section number to refer
(1) Ethernet parameters IP address of self station Configuration of destination for diagnostic Configuration of task code port	Section 5.2.7
(2) ASR parameters ASR General Information ASR connection setting ASR I/O Area setting	Section 5.4.1 to 3
(3) Downloading/Uploading of setup file	Section 5.4.4
(4) Other Information of firmware version [Reset Module] button	Section 5.2.6

5.2.1 Setting procedure

Figure 5.1 shows the outline of setting procedure.



*1: Please install EH-ETH2 Configurator beforehand.
The Internet access is required for installation of EH-ETH2 Configurator.

Figure 5.1 The outline of setting procedure

5.2.2 Configuration

Please connect PC and HUB, HUB and EH-ETH2 with LAN cable.
The example in Figure 5.2 shows the smallest network by the explanation for convenience.

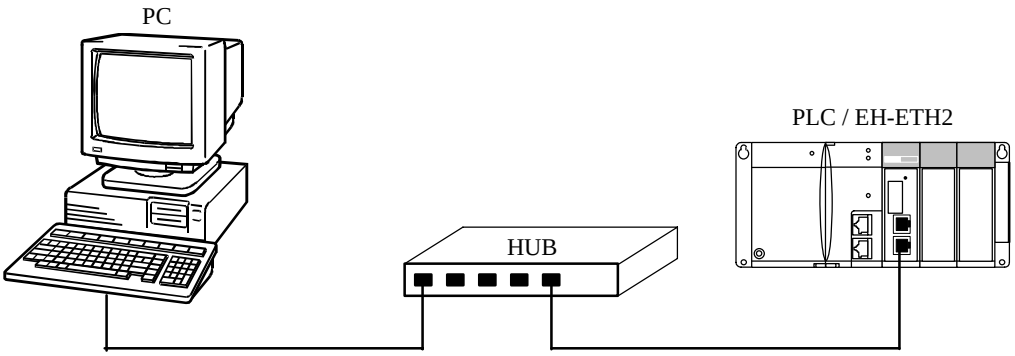


Figure 5.2 Example of network

5.2.3 Network Setting on PC side

At the network configuration of Figure 5.2, to access EH-ETH2 Configurator, the setting of PC must be the below condition.

1) Subnet mask is 255.255.255.0.
2) IP address's top-3 octets is 192.168.0 and 4th octet is not duplicated the EH-ETH2's. (*1)

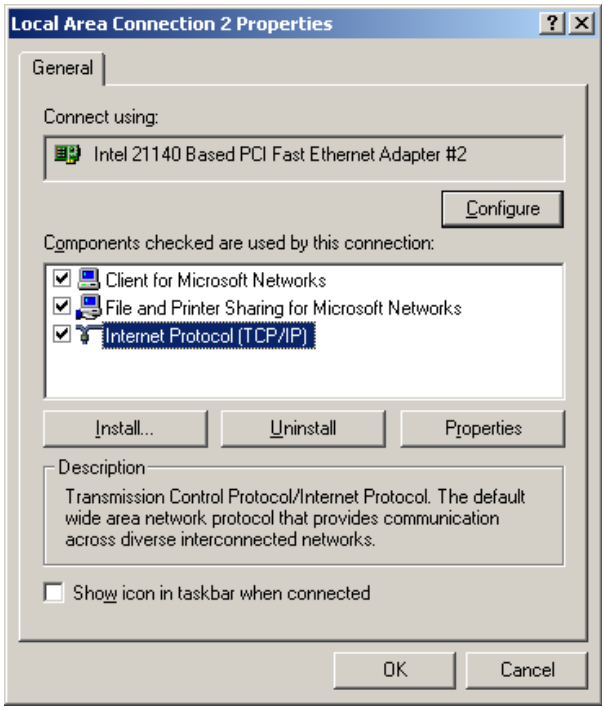
*1: EH-ETH2 IP address 4th octet is set by dipswitch 4 to 8.

Tentatively, in case of subnet mask is **255.255.255.0** at PC side, and IP address is **192.168.0.128**, you do not need to set network setting at PC side. (Recommended value)
On the other hand, in case of subnet mask is **255.255.0.0**, and IP address is **172.16.0.128**, you need to change the network setting on PC.

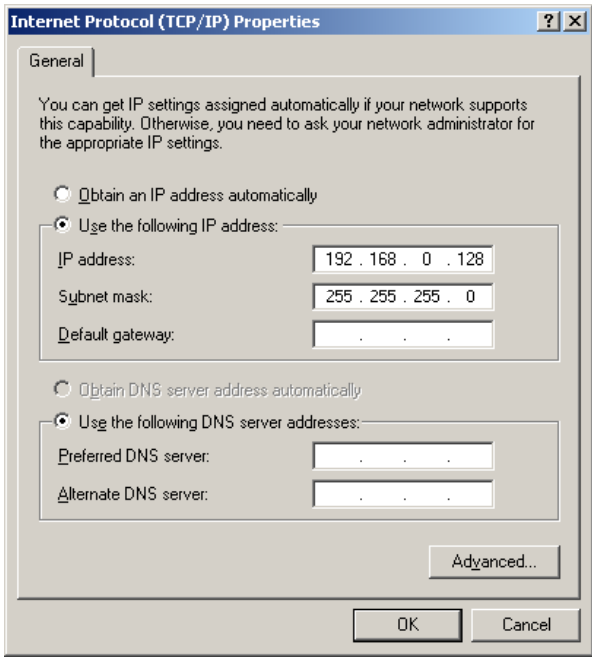
The below explains the changing procedure of network setting at PC side. Furthermore, PC's OS is Windows2000 or later.

- IP address

(1) Open [Network] in control panel.
Click [TCP/IP] protocol and [Property] button.



(2) Select [IP address] tag, input [192.168.0.128] in IP address.



(3) Click [OK] button. If you are requested to restart PC, execute restarting PC.

With over, the network setting change of the PC is completion.

5.2.4 Setting of Dip switch

To set Ethernet parameters by EH-ETH2 Configurator, set **No.1 ON**, **No.2,3 OFF** of dip switch.

In this mode, **No.4 to 8 means lower 5 bits of IP address**. Furthermore remained higher 27 bits of IP address is fixed. Figure 5.3 shows the temporary IP address.

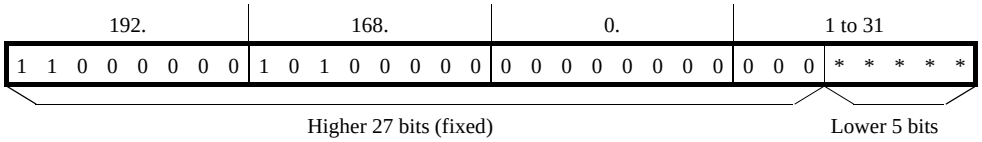


Figure 5.3 Temporary IP address at the time of the Ethernet parameters setting by EH-ETH2 Configurator

As Figure 5.3 shows, the temporary IP address is selected in the range from [192.168.0.1] to [192.168.0.31]. Table 5.3 shows the example of DIP switch setting. After setting the dip switch, power PLC on.

Table 5.3 Dip switch setting (Configuration mode)

Bit No.								Description
1	2	3	4	5	6	7	8	
ON	OFF	OFF	IP address 4th octet b'00001 to b'11111(1 to 31)					Set Ethernet parameters by EH-ETH2 Configurator.

Table 5.4 shows the example of IP address for Configuration mode in relation to states of dip switches.

Table 5.4 Example of dip switch setting

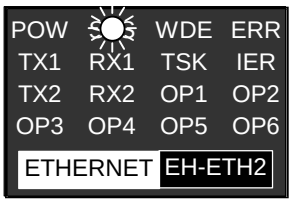
States of dip switches					Bin.	Hex.	Dec.	Temporaly IP address for Configuration mode
4	5	6	7	8				
OFF	OFF	OFF	OFF	ON	b'00001	H'01	1	192.168.0.1
ON	OFF	ON	ON	OFF	b'10110	H'16	22	192.168.0.22
ON	ON	ON	ON	ON	b'11111	H'1F	31	192.168.0.31

Caution

- IP address "192.168.0.0" is special address. Do not set bit 4 to 8 all OFF at bit 1 ON and 2,3 OFF of dip switch. In this condition, when EH-ETH2 is power on, STS LED 4 times a cycle blinking, and IER LED turns on.
- IP address set by dip switch is used temporary to access EH-ETH2 Configurator. This setting of dip switch is not stored to FLASH memory of EH-ETH2.
- When you add EH-ETH2 to Network of established, be careful to the duplicated IP address.

5.2.5 Access to EH-ETH2 Configurator

When PLC is power on, STS LED turns on or blinks. You can access EH-ETH2 Configurator at both conditions. We recommend setup the I/O assignment on CPU at first.



In the case that it is done with I/O correctly	illumination
In the case that it is not done with I/O assignment	blinking 0.25s

Figure 5.4 STS LED condition

Caution

- You can access EH-ETH2 Configurator without I/O assignment, but you can not use on-line connection of LADDER EDITOR for Windows or Control Editor via Ethernet, and ASR connection data transmission without I/O assignment.

Open the “Communication Setting” window from [Option] menu in the initial screen (Figure 5.5), set destination IP address to connect to EH-ETH2.

For instance, in the case of the temporary IP address is "192.168.0.1", input “192.168.0.1” into IP address field (Figure 5.6). Port No. is fixed to “65535”.

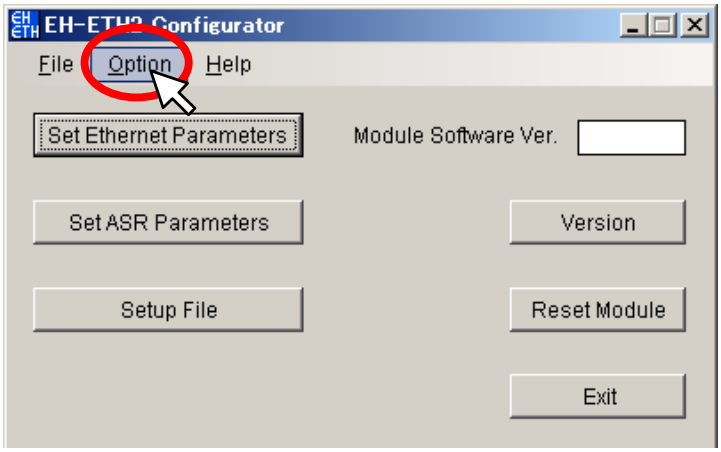


Figure 5.5 The initial screen of EH-ETH2 Configurator

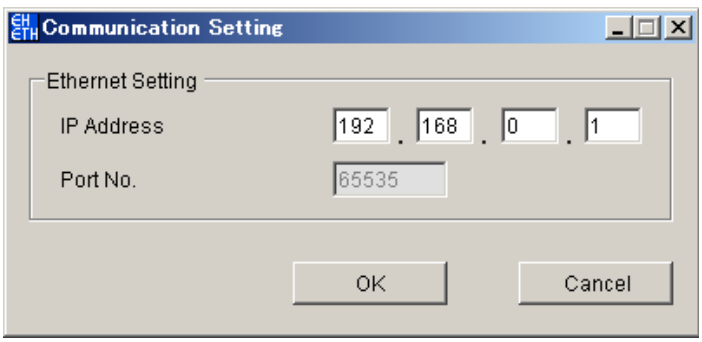


Figure 5.6 Communication Setting window

5.2.6 Initial screen structure of EH-ETH2 Configurator

Figure 5.7 shows the initial screen of EH-ETH2 Configurator.

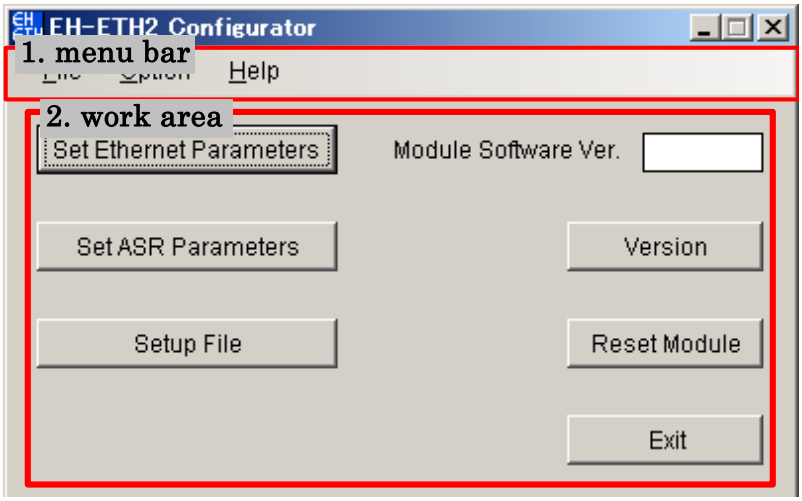


Figure 5.7 The initial screen of EH-ETH2 Configurator

The initial screen of EH-ETH2 Configurator consists of menu bar and work area.

1. menu bar

[File]	The operations in work area can be executed from this too.
[Option]	Set destination IP address to connect to EH-ETH2.
[Help]	About EH-ETH2 Configurator.

2. work area

The names of operation buttons and their explanations are shown below.

Table 5.5 Operation buttons of initial screen

Name	Description
Set Ethernet parameters	Configure Ethernet parameters. Refer to the section 5.2.7 for details.
Set ASR parameters	Configure ASR parameters. Refer to the section 5.4.1 to 5.4.3 for details.
Setup File	Download / Upload / Convert the setup files. Refer to the section 5.4.4 for details.
Version	Display the firm ware version of the connecting EH-ETH2.
Reset Module	Reset the connecting EH-ETH2.
Exit	Exit EH-ETH2 Configurator.

5.2.7 Configuration on Ethernet parameters window

On Ethernet parameters window, configure or confirm Ethernet parameters.

(1) Window structure

Figure 5.8 shows Ethernet parameters window.

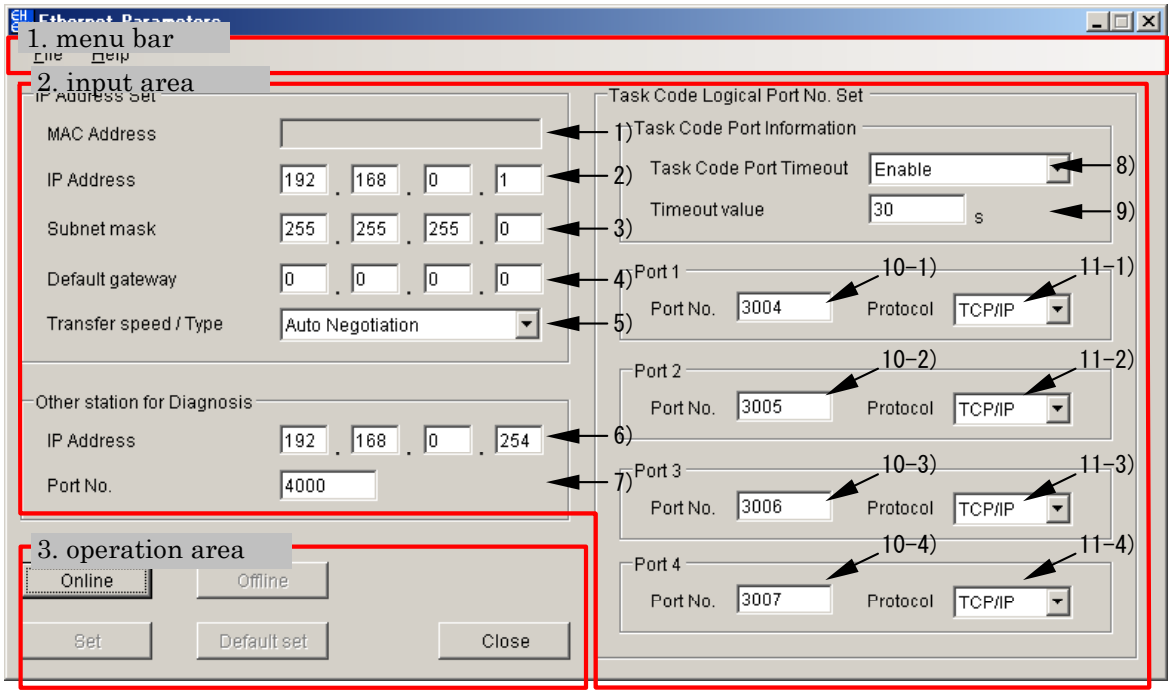


Figure 5.8 Ethernet parameters window

The window consists of menu bar and input area, operation area.

1. Menu bar

   [File] The operations can be executed from this too.

   [Help] The help window will open.

2. Input area

   Refer to “(2) Input items” for details.

3. Operation area

   Refer to “(3) Operation buttons” for details.

(2) Input items

Input items that can be configured in Ethernet parameters window are shown in Table 5.6.

Table 5.6 Input items of Ethernet parameters window

No	Name	Description	Range for setting
IP Address Set			
1)	MAC Address	To confirm the MAC address of EH-ETH2	Confirming only
2)	IP address	To set the IP address of EH-ETH2	Except 0.0.0.0 and 255.255.255.255
3)	Subnet mask	To set the Subnet mask of EH-ETH2	Between 255.0.0.0 and 255.255.255.248
4)	Default gateway	To set the Default gateway address of EH-ETH2	Except 255.255.255.255
5)	Transfer speed / Type	To set transfer speed and type	Auto Negotiation (0), 100Mbps Full Duplex (1), 100Mbps Half Duplex (2), 10Mbps Full Duplex (3), 10Mbps Half Duplex (4)
Other station for Diagnosis			
6)	IP Address	To set the destination IP address of EH-ETH2's testing.	Except 0.0.0.0 and 255.255.255.255
7)	Port No.	To set the destination Port number of EH-ETH2's testing.	Between 1 and 65535
Task Code Logical Port No. Set			
8)	Task Code Port Timeout	To set the timeout of Task code connection is enable or not. This value is valid for all Task code connections. If this is specified as disable, the value of item (9) is not valid.	Enable (0), Disable (1)
9)	Timeout value	To set the value for timeout of Task code connection and this unit is second. This value is valid for all Task code connections.	Between 0 and 65535
Task code port m (m[1:4])			
10-m)	Port No.	To set the logical port number for Task code connection.	Between 1 and 65535
11-m)	Protocol	To select the protocol for Task code connection.	TCP/IP (0), UDP/IP (1)

(3) Operation buttons

The window has the five operation buttons shown below.

Table 5.7 Operation buttons of Ethernet parameters window

Name	Description
Online	To connect to EH-ETH2. At this time, the present values are overwrtiten in each input boxes.
Offline	To disconnect from EH-ETH2.
Set	To set the values in the input boxes.
Default Set	To set the default values.
Close	To close the window.

When you click the "Set" button, EH-ETH2 Configurator will check the parameters. If all parameters are correct, they will be saved into set up file, and the completion massage box will appear. If they are wrong, set up file is not updated. In this case, please check and correct the value, and set again.

5.2.8 Ethernet parameters setting error code

The list of error code of Ethernet parameters setting is shown in Table 5.8.

Table 5.8 The list of error code during the IP address setting

Error Code	Display comment	Causes
1001	Operation mode: Is not Configuration mode.	The position of dip switch is not for “Configuration mode”.
1101	Own station address: IP address is incorrect.	- Illegal value or character is set for IP address. - “0.0.0.0” or “255.255.255.255” is set for IP address.
1102	Own station address: Subnet mask is incorrect.	- Illegal value or character is set for Subnet mask. - The out of value of “255.0.0.0” to “255.255.255.248” is set for Subnet mask.
1103	Own station address: Default Gateway address is incorrect.	- Illegal value or character is set for Default gateway address. - “255.255.255.255” is set for Default gateway address.
1104	Own station address: IP address or Subnet mask is incorrect.	“255.255.255.255” is set for Subnet mask..
1201	Test mode: IP address is incorrect.	“0.0.0.0” or “255.255.255.255” is set for IP address of other station for Diagnosis.
1202	Test mode: Port No. is incorrect.	Illegal value or character is set for port number of other station for Diagnosis.
1203	Test mode: Port No. is in conflict with ASR connection m (*1).	The port number of other station for Diagnosis and the port number of ASR connection m (*1) is in coincidence(conflict).
1301	Task code communication (No. p (*2)): Port No. is incorrect.	Illegal value or character is set for task code port number.
1303	Task code communication: Timeout is incorrect.	Illegal value or character is set for task code time out number.
1305	Task code communication: Port No. conflict with ASR connection m (*1).	The port number of task code and the port number of ASR connection m (*1) is in coincidence (conflict).
1306	The setting of Transfer Speed / Type is incorrect.	The setting of Transfer Speed / Type is out of valid range.

*1: m should be in 1 to 6.

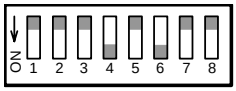
*2: p should be in 1 to 4.

5.3 Configuration of Ethernet parameters by user program

(1) Setting the dip switch

To configure the Ethernet parameters by the user program, setting dip switch No.4 and No.6 are ON is required.

Table 5.9 Setting the dip switch (Configuration Ethernet parameters by the user program)

Dip switches	Description
[No.4, 6 are ON] 	To configure the Ethernet parameters by the user program.

CAUTION

- It is possible to access to this module by EH-ETH2 Configurator at this mode but it is not possible to change the "Ethernet parameters" by EH-ETH2 Configurator.

(2) Table of Ethernet parameters

The Ethernet parameters into retained memory of this module with the format shown in Table 5.10.

Table 5.10 The table of Ethernet parameters

I/O No. offset	items		
+00	Own IP address		(upper)
+01			(lower)
+02	Subnet mask		(upper)
+03			(lower)
+04	Destination IP address for test		(upper)
+05			(lower)
+06	Destination Port No. for test		
+07	Default gateway		(upper)
+08			(lower)
+09 : +2C	No use		
+2D	Task code port 1	Logical Port No.	
+2E		Protocol	
+2F	Task code port 2	Logical Port No.	
+30		Protocol	
+31	Task code port 3	Logical Port No.	
+32		Protocol	
+33	Task code port 4	Logical Port No.	
+34		Protocol	
+35	Task code port timeout value		
+36	Transfer speed / type		

(3) Setting and referring the table value of Ethernet parameters

The dedicated commands (FUN200 on EH-150 series, XYRW on EHV-CPU series) should be used for setting or referring the value of Ethernet parameters of this module. These commands handle the data transfer between internal memory area of CPU and the retained memory of this module. The continuously 55 words of internal memory is required to set the Ethernet parameters by the user program using these commands.

(4) The configuration procedure of Ethernet parameters table

The configuration procedure of Ethernet parameters shown in Table 5.11 is described here. And also the check procedure is described here.

Table 5.11 Example of the configuration

Items			Setting value	The area to set
IP address of self station			192.168.16.8	*(1-H),(1-L)*
Subnet mask			255.255.255.0	*(2-H),(2-L)*
Send / Receive test		Destination IP address	192.168.16.254	*(3-H),(3-L)*
		Logical port number	4000	*(4)*
Default gateway			192.168.16.1	*(5-H),(5-L)*
Task code communication	Task code port 1	Logical port number of own station	3004	*(24)*
		Service type	0 (TCP/IP) (*1)	*(25)*
	Task code port 2	Logical port number of own station	3005	*(26)*
		Service type	0 (TCP/IP) (*1)	*(27)*
	Task code port 3	Logical port number of own station	3006	*(28)*
		Service type	0 (TCP/IP) (*1)	*(29)*
	Task code port 4	Logical port number of own station	3007	*(30)*
		Service type	0 (TCP/IP) (*1)	*(31)*
	The value of timeout for Task code port		15 seconds	*(32)*
Transfer speed / type			0 (Auto Nego) (*1)	*(33)*

*1: Refer to Table 5.6 for the value corresponding to the set contents.

(a) Preparation of setting value

WM100 to WM136 (in total 55 words) shown in Figure 5.9 are used as the source area of Ethernet parameters for this example.

I/O No.	Setting value (HEX) 15–8	7–0	
WM100	192 (C0)	168 (A8)	*(1-H)*
WM101	16 (10)	8 (08)	*(1-L)*
WM102	255 (FF)	255 (FF)	*(2-H)*
WM103	255 (FF)	0 (00)	*(2-L)*
WM104	192 (C0)	168 (A8)	*(3-H)*
WM105	16 (10)	254 (FE)	*(3-L)*
WM106	4000 (0FA0)		*(4)*
WM107	192 (C0)	168 (A8)	*(5-H)*
WM108	16 (10)	1 (01)	*(5-L)*
WM109	0 (00)	0 (00)	(*1)
	:		
	:		

I/O No.	Setting Value (HEX) 15–8	7–0	
	:		
WM12C	0 (00)	0 (00)	(*1)
WM12D	3004 (0BBC)		*(24)*
WM12E	0 (0000)		*(25)*
WM12F	3005 (0BBD)		*(26)*
WM130	0 (0000)		*(27)*
WM131	3006 (0BBE)		*(28)*
WM132	0 (0000)		*(29)*
WM133	3007 (0BBF)		*(30)*
WM134	0 (0000)		*(31)*
WM135	15 (000F)		*(32)*
WM136	0 (0000)		*(33)*

*1: The value of “0” is required for the area offset +09 to +2C.

Figure 5.9 The source area map of Ethernet parameters

(b-1) FUN200 command (for EH-150 series)

The notation of the FUN200 command specification and FUN200 usage for this module are described here.

FUN200 command	
Format	FUN 200 (s)
Parameter	Starting I/O No. of the s parameter area
Function	

- This command handles Ethernet parameters using extended XY area between CPU module and this module.
- The control type supported by this command is only “With hand shaking” for both receiving and sending. Don’t specify and execute “Without hand shaking” for this command.
- 55 words are the possible size when sending or receiving using this command at once.

The description of s parameter area

s + 0	(1) Return code
s + 1	(2) System area
s + 2	(Not be allowed to use by user)
s + 3	(3) Control type
s + 4	(4) The start of the area
s + 5	(5) Control bit I/O No. of starting sending or receiving
s + 6	(6) Starting I/O No. of Destination (or Source)
s + 7	(7) Size

The description of control bit table for sending or receiving

+ 0	(8) Starting execution flag
+ 1	(9) The completion flag without error
+ 2	(10) The completion flag with error

The description of the frame

The area should be set by user
The area inhibited to set by user

(8) Starting execution flag

When to start sending or receiving with FUN200 command, please set “1” by user program.

This bit will be reset by system execution when the sending or receiving is completed.

(9) The completion flag without error

This bit will be set to “1” when the sending or receiving by FUN200 command is completed without error. This will be reset by system when FUN200 start to execution.

(10) The completion flag with error

This bit will be set to “1” when the sending or receiving by FUN200 command is completed with error. This will be reset by system when FUN200 start to execution.

(1) Return code

The execution result of FUN200 command is set.

Completed without error -> = H0000

Completed with error -> != H0000

(2) System area

This area is used by system execution when FUN200 command is executed. Don’t use this area by user.

(3) Control type (“With hand shaking” is supported.)

H0001:The request to get Ethernet parameters from this module

H0002: Don’t set this value.

H0003:The request to put Ethernet parameters to this module

H0004 to HFFFF: Don’t set these value.

(4) The start of the area

b15	b11	b7	b0
Unit No.	Slot No.	The position of word	

Unit No. : Always “0” is required.

Slot No. : Following value is required.

[For EH-CPU516/548] One of 0 to 7.

[For other EH-CPUs] One of 0 to 2.

The position of word : Always “0” is required

(5) Control bit I/O No. of starting sending or receiving

The actual address value of R, L and M which has the starting I/O No. of the sending or receiving control bit area should be set using ADRIO command.

(6) Starting I/O No. of Destination (or Source)

The actual address value of WR, WL and WM which has the starting I/O No. of the source or destination area should be set using ADRIO command.

(7) Size

The size of using area for sending or receiving should be set. For this module, maximum size is 55 words.

(b-2) XYRW command (for EHV-CPU series)

The notation of the XYRW command specification and XYRW usage for this module are described here.

XYRW command	
Format	XYRW (s, t)
Parameter	Starting I/O No. of the s parameter area, starting I/O No. of the t parameter area
Function	

- This command handles Ethernet parameters using extended XY area between CPU module and this module.
- The control type supported by this command is only “With hand shaking” for both receiving and sending. Don’t specify and execute “Without hand shaking” for this command.
- 55 words are the possible size when sending or receiving using this command at once.

The description of s parameter area

s + 0	(1) Return code
s + 1	(2) System area (Not be allowed to use by user)
s + 3	(3) Control type
s + 4	(4) The start of the area
s + 5	(5) Starting I/O No. of Destination (or Source)
s + 7	(6) Size

(1) Return code

The execution result of XYRW command is set.

Completed without error -> = H0000

Completed with error -> != H0000

(2) System area

This area is used by system execution when XYRW command is executed. Don’t use this area by user.

(3) Control type (“With hand shaking” is supported.)

H0001:The request to get Ethernet parameters from this module

H0002: Don’t set this value.

H0003:The request to put Ethernet parameters to this module

H0004 to HFFFF: Don’t set these value.

The description of t parameter area

t + 0	(7) Starting execution flag
t + 1	(8) The completion flag without error
t + 2	(9) The completion flag with error

(4) The start of the area

b15	b11	b7	b0
Unit No.	Slot No.	The position of word	

Unit No. : Always “0” is required

Slot No. : One of 0 to 7 is required

The position of word : Always “0” is required

(5) Starting I/O No. of Destination (or Source)

The actual address value of WR, WL, WM and WN which has the starting I/O No. of the source or destination area should be set using ADR command.

(6) Size

The size of using area for sending or receiving should be set. For this module, maximum size is 55 words.

The description of the frame

The area should be set by user
The area inhibited to set by user

(7) Starting execution flag

When to start sending or receiving with XYRW command, please set “1” by user program.

This bit will be reset by system execution when the sending or receiving is completed.

(8) The completion flag without error

This bit will be set to “1” when the sending or receiving by XYRW command is completed without error. This will be reset by system when XYRW start to execution.

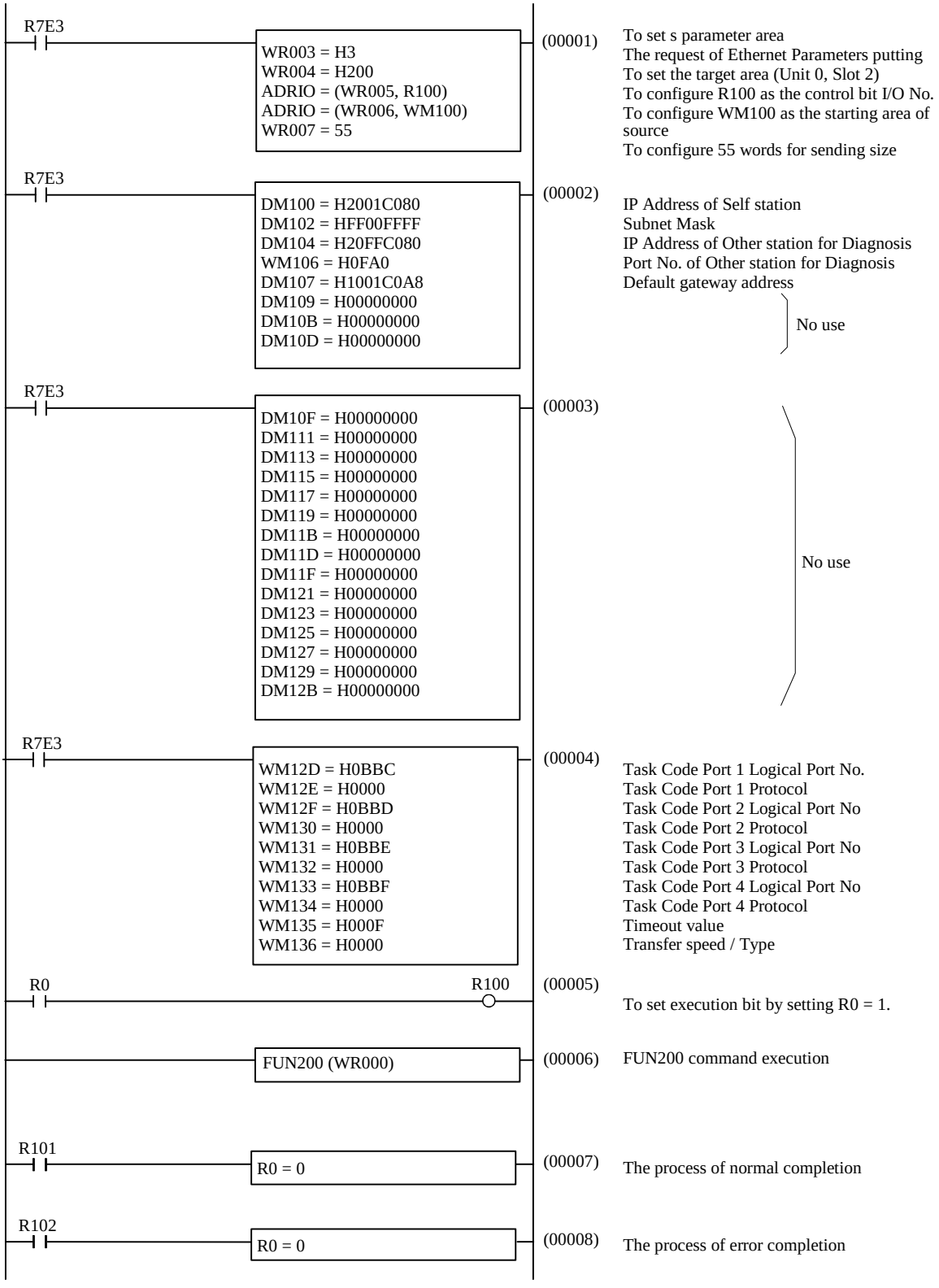
(9) The completion flag with error

This bit will be set to “1” when the sending or receiving by XYRW command is completed with error. This will be reset by system when XYRW start to execution.

Sample program 1 To set Ethernet parameters

(for EH-CPU)

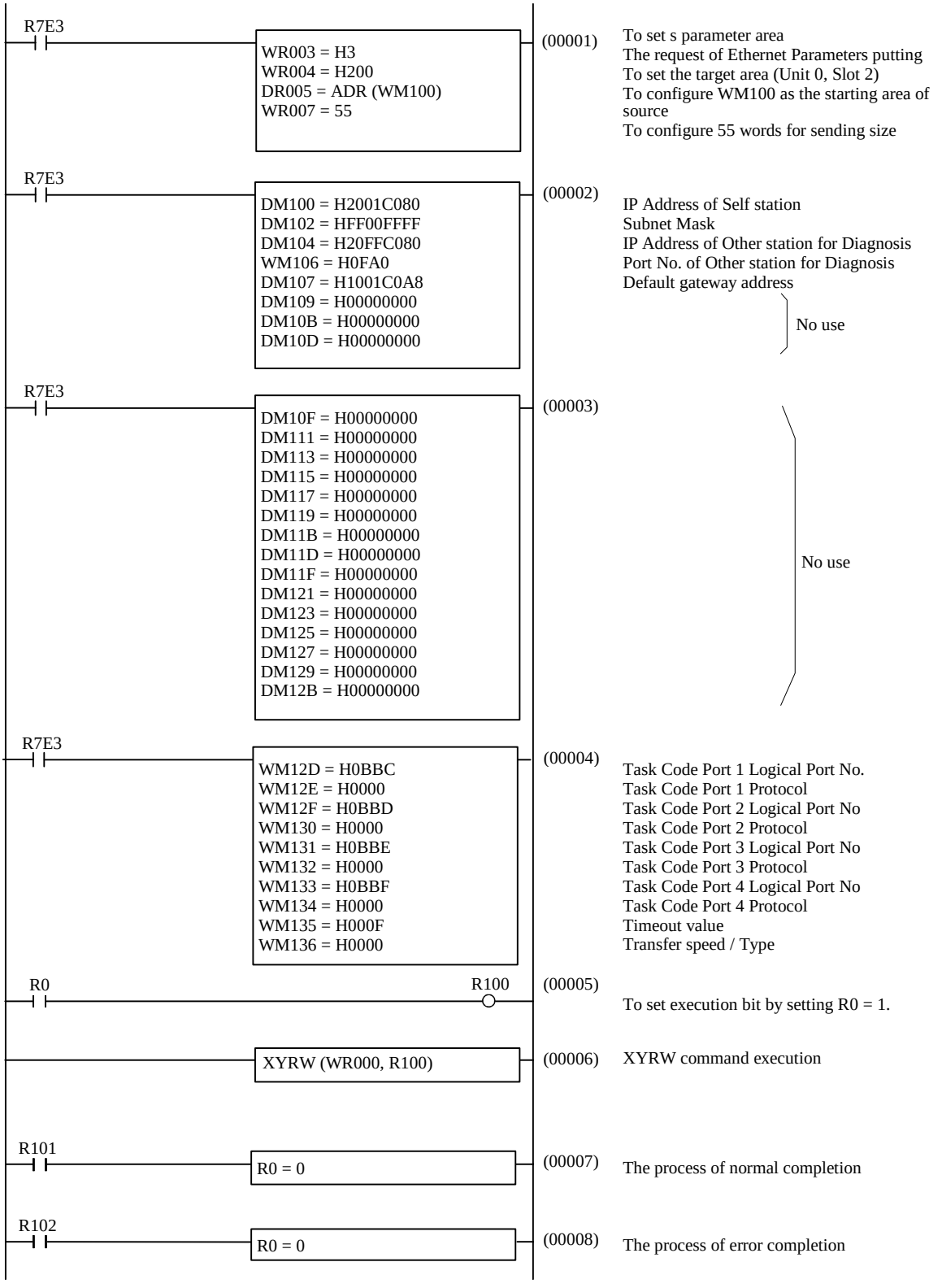
Slot No.	0	1	2
EH-ETH2	-	-	*



Sample program 1 To set Ethernet parameters

(for EHV-CPU)

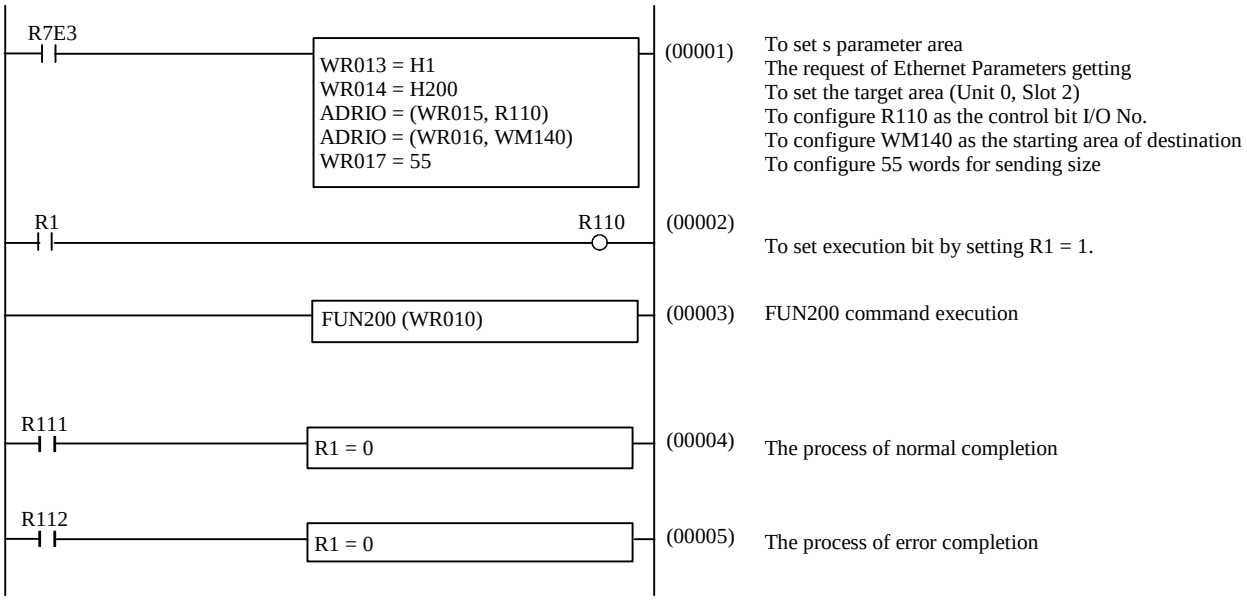
Slot No.	0	1	2
EH-ETH2	-	-	*



Sample program 2 To check Ethernet parameters

(for EH-CPU)

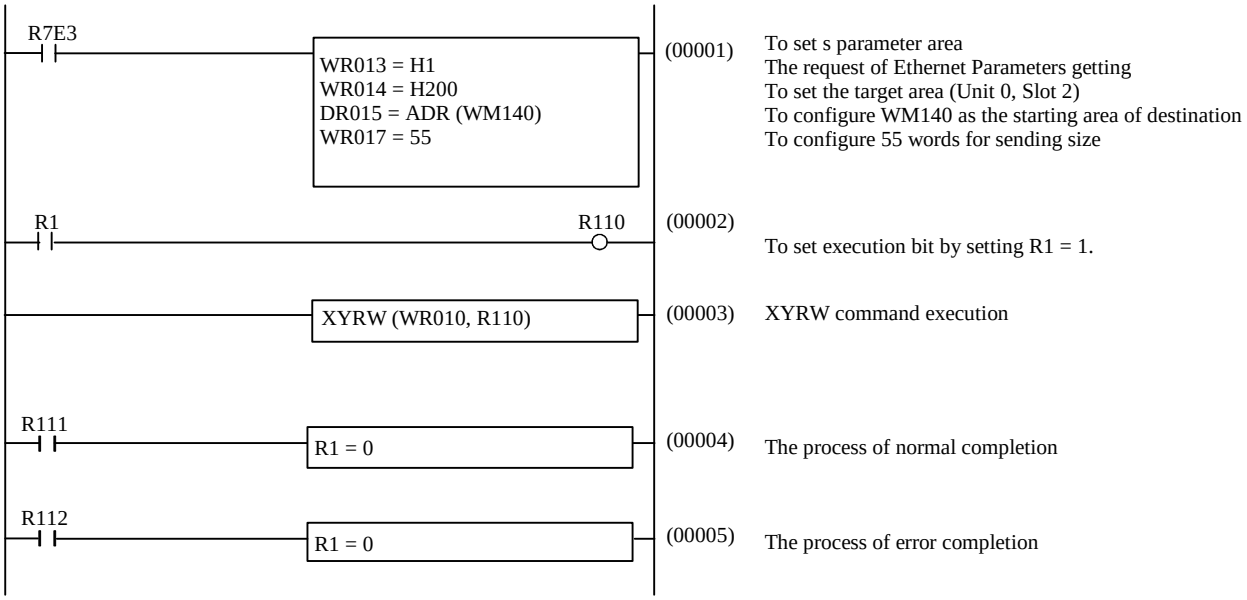
Slot No.	0	1	2
EH-ETH2	-	-	*



Sample program 2 To check Ethernet parameters

(for EHV-CPU)

Slot No.	0	1	2
EH-ETH2	-	-	*



Ethernet parameters read by Sample program 2 are stored in the area below.

WM140	Own IP Address		(upper)
WM141			(lower)
WM142	Subnet mask		(upper)
WM143			(lower)
WM144	IP Address for Diagnosis		(upper)
WM145			(lower)
WM146	Port No. for Diagnosis		
WM147	Default gateway		(upper)
WM148			(lower)
	No use (WM149 to WM16C)		
WM16D	Task code port 1	Logical Port No.	
WM16E		Protocol	
	Omit WM16F to WM172		
WM173	Task code port 4	Logical Port No.	
WM174		Protocol	
WM175	Task code port timeout value		
WM176	Transfer speed / type		

5.4 Configuration of ASR parameters

There are 3 kinds of configuration items for ASR parameters as shown in Table 5.12.

Table 5.12 The classification of ASR parameters

Class	Outline	Description
1	ASR General Information	General setting for all connections.
2	ASR Connection Setting	Setting for every connection
3	ASR I/O Area Setting	I/O area setting to write/read for every connection

5.4.1 Configuration of ASR General Information

You have to set the values that are used for all ASR connection in this window.

(1) Window structure

At the initial screen of EH-ETH2 Configurator, click “Set ASR parameters” button. The "ASR parameters window" will appear. "ASR parameters window" is shown in Figure 5.10.

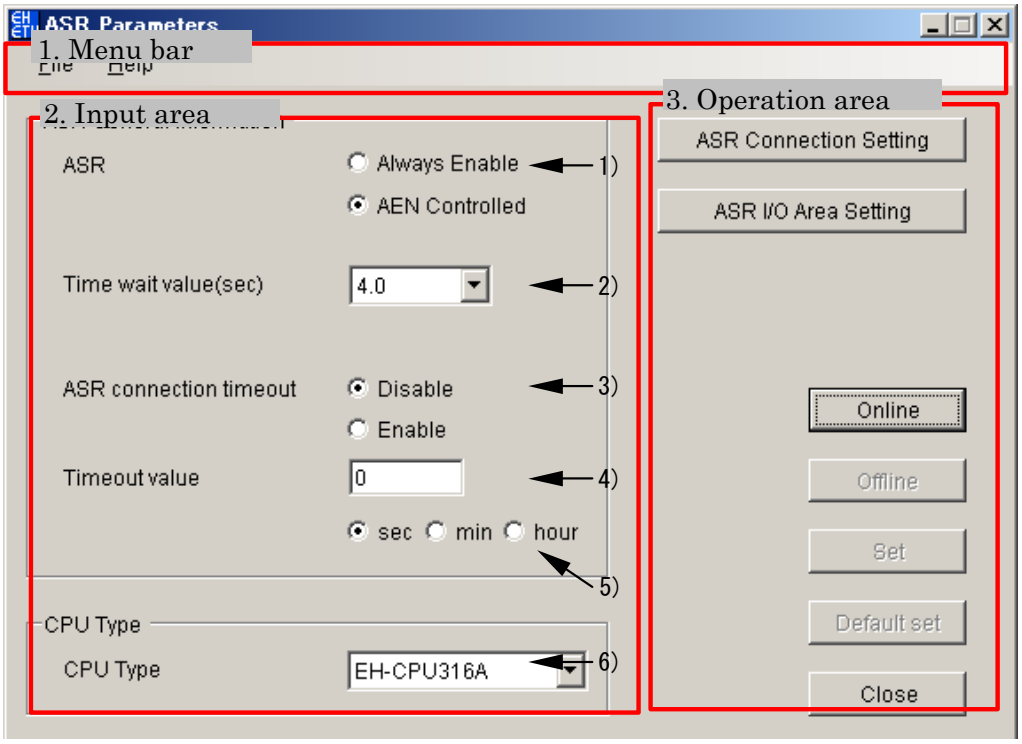


Figure 5.10 ASR parameters window

The window consists of menu bar and input area, operation area.

1. Menu bar
   [File] The operations can be executed from this too.
   [Help] The help window will open.
2. Input area
   Refer to “(2) Input items” for details.
3. Operation area
   Refer to “(3) Operation buttons” for details.

(2) Input items

Input items that can be configured in ASR parameters window are shown in Table 5.13.

Table 5.13 The list of items of ASR General Information

No	Name	Description	Range for setting
ASR General Information			
1)	ASR	To select the enable or disable base on the AEN bit configuration of Module control register (MDCR) whether the ASR is valid without any condition. When the [Always Enable] selected After the power on, if the connection is established, ASR will start soon. When the [AEN Controlled] selected When AEN=0(Initial status), ASR is not valid. When AEN=1, ASR is valid.	Always Enable, AEN Controlled
2)	Time wait value (sec)	To adjust the waiting time between the request of releasing connection and actually releasing the connection.	0 to 4.0(sec) every 0.5(sec)
3)	ASR connection timeout	To set the enable of timeout for the ASR connection. When the Disable is set, 4) and 5) are invalid.	Enable, Disable
4)	Timeout value	To set the timeout value for ASR connection. This value is valid for all ASR connection.	0 to 65535(sec) 0 to 1092(min) 0 to 18(hour)
5)	Unit	The unit for 4) is set here.	sec, min, hour
CPU Type			
6)	CPU Type	Select your CPU type from items of pull down. The selection of this item is reflected in the result of the range of I/O area check on ASR I/O Area Setting. (*1)	

*1 : Refer to the section 5.4.3 for valid combination of CPU and the range of I/O area.

Point

Setting "AEN Controlled" is very useful, when to invoke the ASR after finishing the source I/O area initialization. It is possible to start ASR by setting "MDCR.AEN" to 1 when the initialization is completed.

(3) Operation buttons

The window has the seven operation buttons shown below.

Table 5.14 Operation buttons of ASR parameters window

Name	Description
ASR Connection Setting	To open ASR Connecion Setting window. In ASR Connection Setting window, configure the detail settings of each ASR connections.
ASR I/O Area Setting	To open ASR I/O Area Setting window. In ASR I/O Setting window, configure the sending / receiving data area of each ASR connections.
Online	To connect to EH-ETH2. At this time, the present values are overwrtiten in each input boxes.
Offline	To disconnect from EH-ETH2.
Set	To set the values in the input boxes.
Default Set	To set the default values.
Close	To close the window.

When you click the “Set” button, EH-ETH2 Configurator will check the parameters. If all parameters are correct, they will be saved into set up file, and the completion massage box will appear. If they are wrong, set up file is not updated. In this case, please check and correct the value, and set again.

5.4.2 Configuration of ASR connection

The procedure of setting for ASR connection

(1) Window structure

ASR Connection Setting window is shown in Figure 5.11.

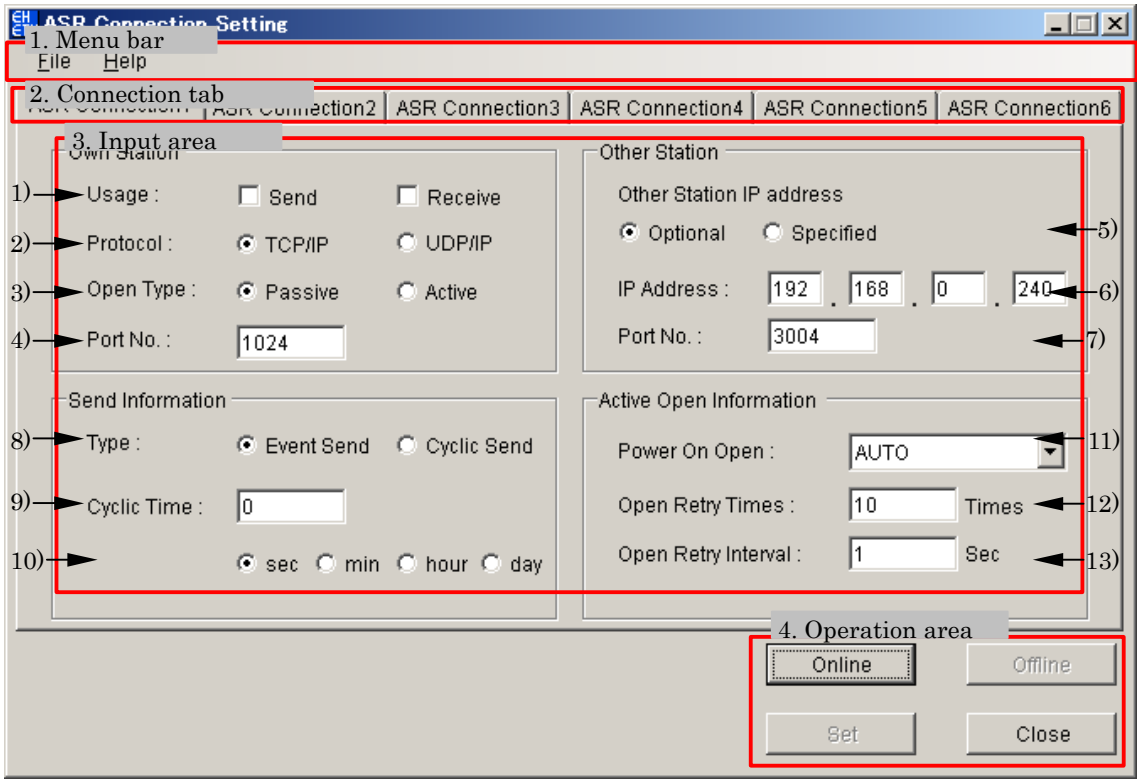


Figure 5.11 ASR Connection Setting window

1. Menu bar

[File] The operations can be executed from this too.

[Help] The help window will open.

2. Connection tab

To select a connection number to configure.

3. Input area

Refer to “(2) Input items” for details.

4. Operation area

Refer to “(3) Operation buttons” for details.

(2) Input items

Input items that can be configured in ASR Connection Setting window are shown in Table 5.15.

Table 5.15 The list of items of ASR connection configuration

No.	Name	Description	Range for setting
Own Station			
1)	Usage	To specify the usage of connection. It is possible to set Send(for sending) or Receive(for receiving). It is possible to specify both. If the Send is not specified, (8) to (10) are not valid.	Send, Receive
2)	Protocol	To specify the protocol of self station.	TCP/IP, UDP/IP
3)	Open Type	To specify the open type of self station. When Active is specified, open request is sent activity. When Passive is specified, open request from the target station is waited. If the Passive is specified, 11) to 13) are not valid.	Active, Passive
4)	Port No.	To specify the logical port number of self station.	1 to 65535
Other Station			
5)	Other Station IP address	To set the decision of specifying the target IP address or not. When Specified is specified, the communication is done only with specified target. When Optional is specified, the target station is not specified. If the Optional is specified, (6) and (7) are not valid.	Optional, Specified
6)	IP Address	To set IP address of target station.	Except 0.0.0.0 and 255.255.255.255
7)	Port No.	To set logical port number of target station.	1 to 65535
Send Informaion			
8)	Type	To specify the sending type of connection. When Event Send is specified, (9) and (10) are not valid.	Event Send, Cyclic Send
9)	Cyclic Time	To specify the time interval of Cyclic Send.	0 to 1073741 (sec) 0 to 17895 (min) 0 to 298 (hour) 0 to 12 (day)
10)	Unit	This is the unit for Cyclic Time.	sec, min, hour, day
Active Open Information			
11)	Power On Open	To select if the module send open request by itself ater power activation. When AUTO is specified, the module does. Otherwise, the module doesn't send one until "Request bit to open connection" in CNCR is ON. (*1)	AUTO, MANUAL
12)	Open Retry Times	To set the number of times of open retry. (*2)	0 to 65535
13)	Open Retry Interval	To set the interval of open retry. (*2)	0 to 65535

*1 : Refer to the section 8.2 Control Registers for details.

*2 : Refer to next page [The relation between the setting of ASR Connection Timeout and Open Retry Times / Interval].

There are some limitations in the combination between parameter 1) 2) 3) 5) in Table 5.15. These are described in Table 5.16.

Table 5.16 The possible combination to set

	Own Station			Other Station	
	2) Protocol	1) Usage	3) Open Type	5) Other Station IP address	6) IP address 7) Port No.
1	TCP/IP	Send, Receive, Send/Receive	Active	Specified	Need
2			Passive	Specified	Need
3				Optional	No need
4	UDP/IP	Send	-	Specified	Need
5		Receive	-	Specified	Need
6				Optional	No need

(3) Operation buttons

The window has the four operation buttons shown below.

Table 5.17 Operation buttons of ASR Connection Setting window

Name	Description
Online	To connect to EH-ETH2. At this time, the present values are overwrtiten in each input boxes.
Offline	To disconnect from EH-ETH2.
Set	To set the values in the input boxes.
Close	To close the window.

When you click the “Set” button, EH-ETH2 Configurator will check the parameters. If all parameters are correct, they will be saved into set up file, and the completion massage box will appear. If they are wrong, set up file is not updated. In this case, please check and correct the value, and set again.

[The relation between the setting of ASR Connection Timeout and Open Retry Times / Interval]
Both ASR Connection Timeout and Open Retry Times / Interval are the parameters to open the connection. The former is used for all ASR connections. The latter are configured on each ASR connections.
If both ASR Connection Timeout and Open Retry Times / Interval are valid setting, the module detects the open error after progress in time of the one that setting time has a short.

5.4.3 Configuration of ASR I/O area

When using ASR connections, it is required to specify the I/O area in the CPU module as the sending source area and the receiving destination area. The configuration procedure for these usages is described here.

(1) Window structure

ASR I/O Area Setting window is shown in Figure 5.12.

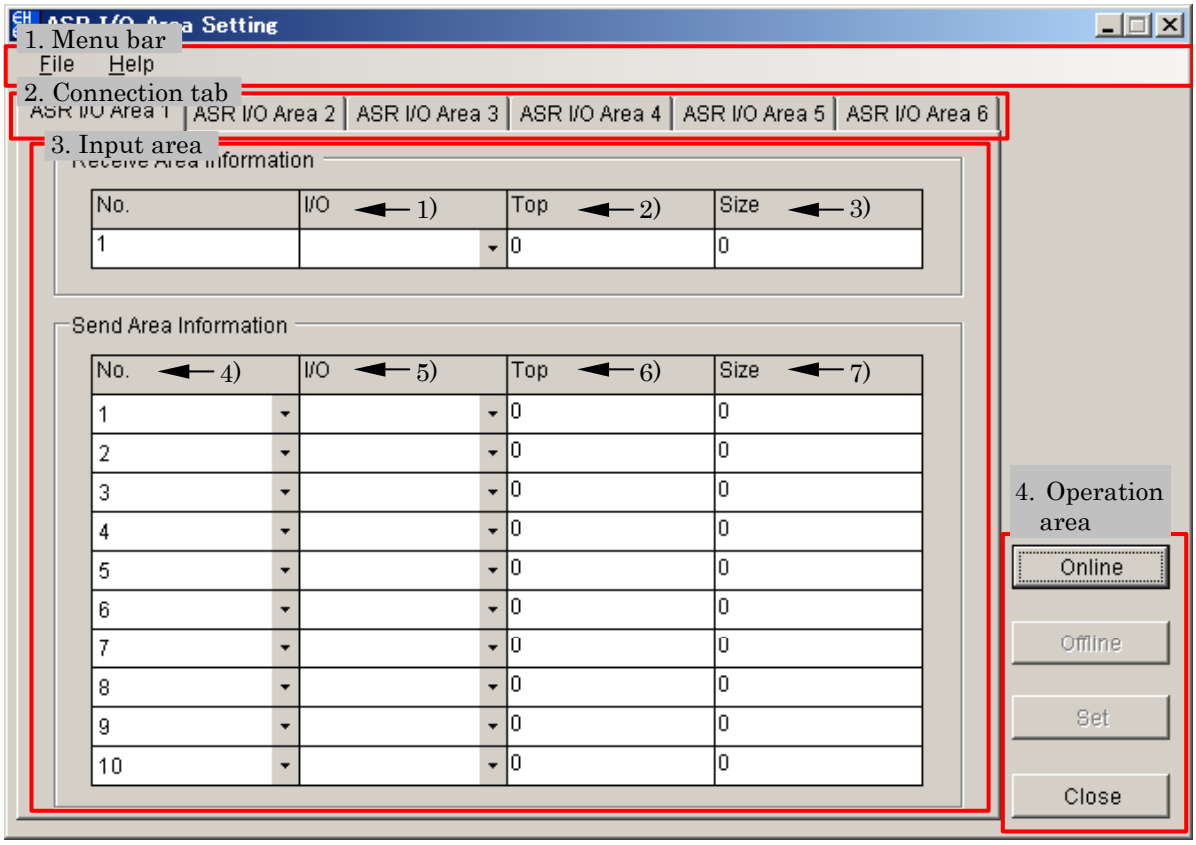


Figure 5.12 ASR I/O Area Setting window

1. Menu bar

[File] The operations can be executed from this too.

[Help] The help window will open.

2. Connection tab

To select a connection number to configure.

3. Input area

Refer to “(2) Input items” for details.

4. Operation area

Refer to “(3) Operation buttons” for details.

(2) Input items

Input items that can be configured in ASR I/O Area Setting window are shown in Table 5.18.

Table 5.18 The list of items of ASR I/O area configuration

No	Name	Description	Range for setting
Receive Area Information			
1)	I/O	To specify the I/O for the receiving area. If there is no specifying, (2) and (3) are not valid.	WY,WR, WL, WM, WN, WEX, WEY
2)	Top	To specify the starting I/O number for the receiving area.	The range is same as each I/O's ranges.
3)	Size	To specify the I/O size (count of words) for the receiving area.	1 to 727(word)
Send Area Information			
4)	No.	To specify the entry number. The entry number means the saving order of the sending I/O area data in the sending message. This is useful to change the I/O area order among the exist configuration. Please specify this No. not to be duplex. (If duplicated, result in error.)	1 to 10
5)	I/O	To specify the I/O for the sending area. If there is no specifying, (6) and (7) are not valid.	X,Y,R,L,M,TD/CU,CL, DIF,DFN,TM,EX,EY, WX,WY,WR,WL,WM, WN,TC,TV,WEX,WEY
6)	Top	To specify the starting I/O number for the sending area.	The range is same with each I/O's ranges.
7)	Size	To specify the I/O size (count of words or bits) for the sending area.	1 to 11632 (bit type) 1 to 727(word type)

Caution

When you use the external I/O as the sending or receiving area, you have to set I/O assignment to the CPU module correctly. If you use the external I/O which is not set I/O assignment, it is not guaranty that data arrive to other station.

(3) Operation buttons

The window has the four operation buttons shown below.

Table 5.19 Operation buttons of ASR I/O Area Setting window

Name	Description
Online	To connect to EH-ETH2. At this time, the present values are overwritten in each input boxes.
Offline	To disconnect from EH-ETH2.
Set	To set the values in the input boxes.
Close	To close the window.

When you click the “Set” button, EH-ETH2 Configurator will check the parameters. If all parameters are correct, they will be saved into set up file, and the completion massage box will appear. If they are wrong, set up file is not updated. In this case, please check and correct the value, and set again.

[About the valid combination of CPU and the range of I/O area]

1. Specify CPU Type correctly, before configuring the items of ASR I/O Area Setting.
2. Don't change the value of CPU Type, after configuring the items of ASR I/O Area Setting.
   It can cause an error indication.
3. If the error happened, disconnect from EH-ETH2.
4. Before changing the value of CPU Type, we recommend to set the default value of ASR parameters by clicking [default set] button in ASR parameters window.
5. The valid combination of CPU and the range of I/O areas is shown in Table 5.20.

Table 5.20 The Table of valid combination of CPU and the range of I/O area

			EHV-CPU			EH-150					
Usage	Length	Type	16 / 32 / 64	128	remarks	308A	316A	448/448A	516	548	remarks
Receive	WORD	WY	0 to 49A7 (*1)			0 to 177 (*1)			0 to 49A7 (*1) (*3)		
		WL	0 to 3FF, … , 7000 to 73FF		8 loops	0 to 3FF, 1000 to 13FF					2 loops
		WR	0 to EFFF			0 to 43FF	0 to 57FF	0 to C3FF	0 to 57FF	0 to C3FF	
		WM	0 to 7FFF			0 to 3FF					
		WN	0 to 7FFF	0 to 1FFFF		-					
		WEX	us00 to us7F (*2)			-					
		WEY	us00 to us7F (*2)			-					
Send	BIT	X	0 to 49A95 (*1)			0 to 1795 (*1)			0 to 49A95 (*1) (*3)		
		Y	0 to 49A95 (*1)			0 to 1795 (*1)			0 to 49A95 (*1) (*3)		
		R	0 to 7BF, 7C0 to FFF			0 to 7BF, 7C0 to 7FF					
		M	0 to 7FFFF			0 to 3FFF					
		L	0 to 3FFF, … , 70000 to 73FFF		8 loops	0 to 3FFF, 10000 to 13FFF					2 loops
		TD/CU	0 to 2559			0 to 511					
		CL	0 to 2559			0 to 511					
		DIF	- (*4)			0 to 511					
		DFN	- (*4)			0 to 511					
		TM	-			-			0 to 2047		
		EX	us000 to us7FF (*2)			-					
		EY	us000 to us7FF (*2)			-					
	WORD	WX	0 to 49A7 (*1)			0 to 177 (*1)			0 to 49A7 (*1) (*3)		
		WY	0 to 49A7 (*1)			0 to 177 (*1)			0 to 49A7 (*1) (*3)		
		WL	0 to 3FF, … , 7000 to 73FF		8 loops	0 to 3FF, 1000 to 13FF					2 loops
		WR	0 to EFFF, F000 to FFFF			0 to 43FF	0 to 57FF	0 to C3FF	0 to 57FF	0 to C3FF	+ F000 to F1FF
		WM	0 to 7FFF			0 to 3FF					
		WN	0 to 7FFF	0 to 1FFFF		-					
		TC	0 to 2559			0 to 511					
		TV	-			-			0 to 2047		
		WEX	us00 to us7F (*2)			-					
		WEY	us00 to us7F (*2)			-					

*1 : The upper address is the maximum address. The validated address follows I/O assignment.

*2 : u means unit No.. s means slot No..

*3 : Slave station No.8 and 9 at the time of the remote use are for expansion.
If these address are set to Send/Receive area, EH-ETH2 detects an error at the time of Sending or Receiving.

*4 : A number is not assigned to DIF and DFN of EHV-CPU.

5.4.4 Downloading and Uploading of Setup file

A user can download to host computer (PC or WS) via EH-ETH2 Configurator. A user can also upload a stored setup.data file to EH-ETH2 from host computer. You do not need to change an operation mode (dip switch setting) when you download the setup file. On the other hand, when you upload the setup file, it is required to change the operation mode into Configuration mode.

The extension of the setup file is *.et2 (" * " is an arbitrary file name).

Moreover, setup file (setup.dat) downloaded from EH-ETH can be up-loaded to EH-ETH2 as it is.

Please refer to tthe "Procedure of selecting setup file of EH-ETH" of next page about a concrete procedure.

(1) Window structure

Setup file window is shown in Figure 5.13.

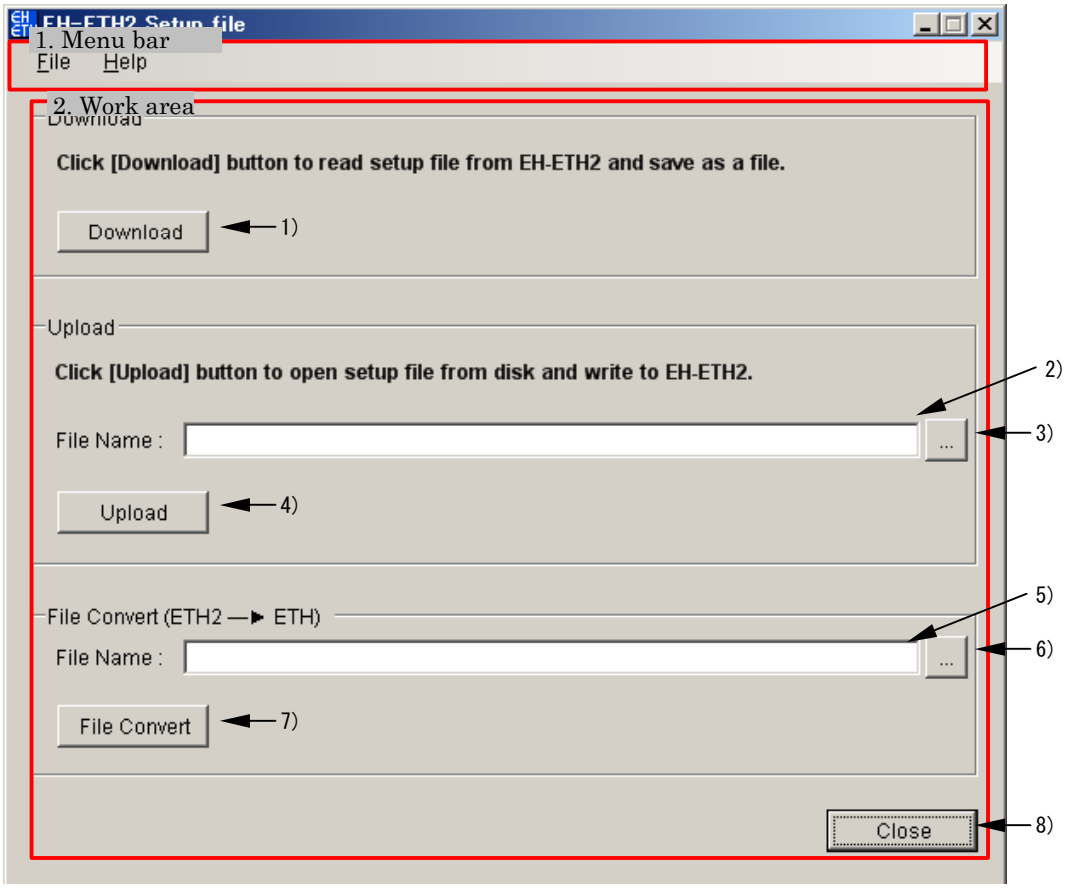


Figure 5.13 Setup file window

The window consists of Menu bar and Work area.

1. Menu bar

[File] The operations in work area can be executed from this too.

[Help] The help window will open.

2. Work area

Refer to “(2) Operation buttons“ for details.

(2) Operation buttons

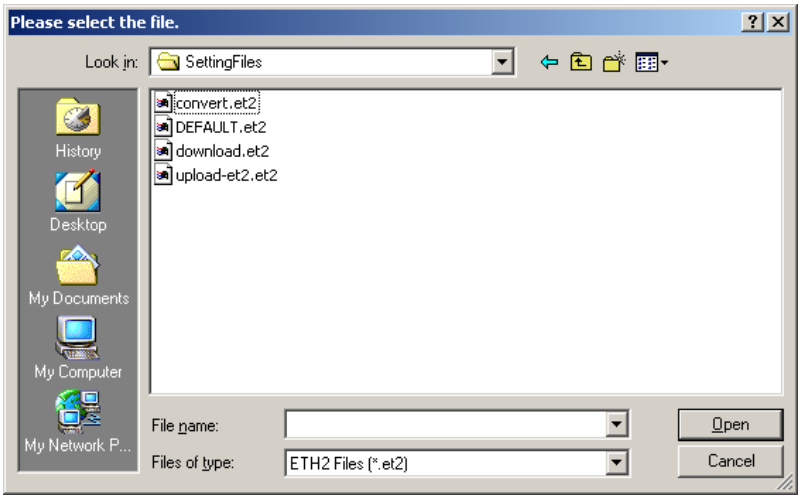
The explanations of the items on the window are shown below.

Table 5.21 Setup file frame parameter

No	Name	Description
Download		
1)	Download	To store a setup file in the PC. When you click this button, the save as dialogue will be displayed. Specify the file name to store.
Upload		
2)	File Name input box	The file name and path of the setup file for **uploading** to EH-ETH2 is displayed. The file is set by 3) button or drag and drop here.
3)	Browse button	When you click this button, the open setup file dialogue will be displayed. Specify the setup file to upload to EH-ETH2.
4)	Upload	Transmit the setup file to **upload**. EH-ETH2 checks the setting contents. If there is error, error message will be appeared.
File Convert		
5)	File Name input box	The file name and path of the setup file for EH-ETH2 to convert into the one for EH-ETH is displayed. The file is set by 6) button or drag and drop here.
6)	Browse button	When you click this button, the select setup file dialogue will be displayed. Specify the setup file to convert.
7)	File Convert	To convert the setup file for EH-ETH2 (*.et2) into the one for EH-ETH (*.dat). The setup file for EH-ETH (*.dat) is maked in a folder same as a file to convert.
8)	Close button	To close Setup file window.

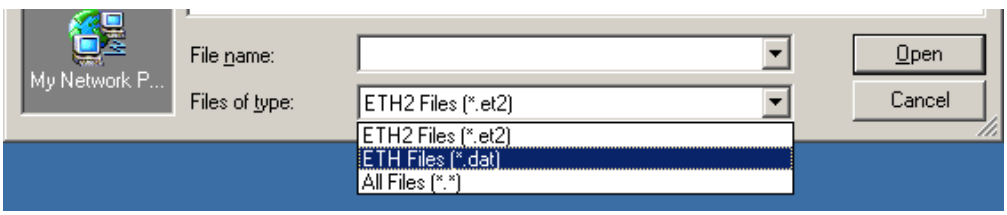
[Procedure of selecting setup file of EH-ETH]

When the browse button is pushed, the window shown in the figure below is displayed.



In the initial state, ETH2 Files (*et2) has been selected as a file type.

Please select ETH Files (*.dat) as a file type when you up-load the setup file of EH-ETH.



5.4.5 ASR parameters setting error code

The list of error code of ASR parameters setting is shown in Table 5.22.

Table 5.22 ASR parameters setting error code

Error code	Comment	Cause
2101	General information (No.n): Port No. is incorrect.	Illegal value or character is set for ASR connection n(*1)port number
2102	General information (No.n): Other station IP address is incorrect.	At ASR connection n(*1) - Illegal value or character is set for ASR other station IP address. - The out of value of “0.0.0.0” to “255.255.255.255” is set for ASR other station IP address.
2103	General information (No.n): Other station Port No. is incorrect.	Illegal value or character is set for ASR other station port number at ASR connection n(*1) .
2104	General information (No.n): Cyclic time is incorrect.	Illegal value or character is set for cyclic transmission time at ASR connection n(*1) .
2105	General information: Timeout is incorrect.	Illegal value or character is set for ASR connection timeout.
2106	General information (No.n): Port No. is in conflict with ASR connection m.	The port number of ASR connection n(*1) and the port number of ASR connection m(*1) is in coincidence(conflict).
2107	General information (No.n): Port No. is in conflict with Task code connection p.	The port number of ASR connection n(*1) and the port number of Task code connection p(*2) is in coincidence(conflict).
2108	General information (No.n): Port No. is in conflict with the Diagnostic port.	The port number of ASR connection n(*1) and the port number of diagnostic is in coincidence(conflict).
2109	General information (No.n): Other station must be specified.	ASR connection n(*1) is active station, but "Optional" is selected for other station.
2202	Receive Information (No.n): Top is incorrect.	At ASR connection n(*1), illegal value or character is set for Top I/O address of receive area.
2203	Receive Information (No.n): Size is incorrect.	At ASR connection n(*1), illegal value or character is set for I/O Size of receive area.
2204	Receive Information (No.n): Top + Size exceeds the limit.	At ASR connection n(*1) , data size of receive area is over the supported I/O area of CPU module.
2302	Send Information (No.n): Top is incorrect.	At ASR connection n(*1), illegal value or character is set for Top I/O address of send area.
2303	Send Information (No.n): Size is incorrect.	At ASR connection n(*1), illegal value or character is set for I/O Size of send area.
2304	Send Information (No.n): Top + Size exceeds the limit.	At ASR connection n(*1) , data size of send area is over the supported I/O area of CPU module.
2305	Send Information (No.n): Total size is too big.	At ASR connection n(*1) , total send data size is over 727 words.
2306	Send Information: Item No. conflict.	Item number of Send areas are duplicated.
2601	General information (No.n): Open Retry Times is incorrect.	At ASR connection n(*1) , illegal value or character is set for Open Retry Times.
2602	General information (No.n): Open Retry Interval is incorrect.	At ASR connection n(*1) , illegal value or character is set for Open Retry Interval(Retry Times != 0, Interval = 0).

*1: n or m should be in 1 to 6.

*2: p should be in 1 to 4.

Chapter 6 Task code communication

H/EH series PLC has a communication protocol called task code, which enables easy communication between host computer and EH-ETH2.

Features of task code communication
- No need user program for task code communication.
- A Host computer is able to up/download a user program to/from a CPU module using the task code. Also, it is possible to write and read any data in CPU module.
- EH-ETH2 transmits the request task code to EH-CPU or EHV-CPU to omit the header information of TCP (or UDP) packet issued by a host computer. This to, EH-ETH2 transmit response task code to a host computer to add TCP (or UDP) packet header information.

6.1 H/EH series communication specification

The detailed function of each task code (command) is described in this chapter.

6.1.1 Outline

The following shows the outline of H/EH series communication specification.

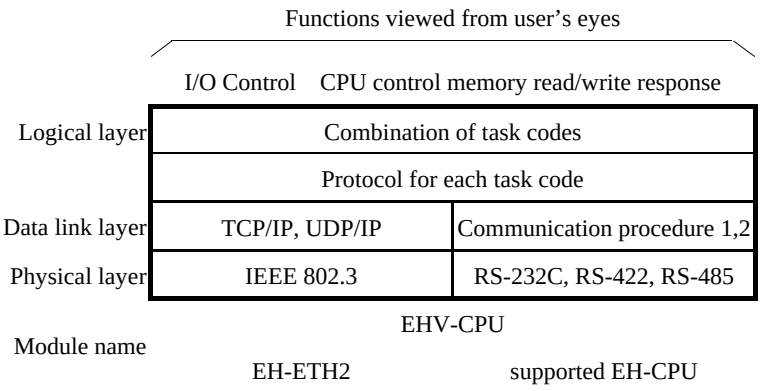


Figure 6.1 Out line of the communication protocols for H/EH series

EH-ETH2 use **uni-directional** procedure at data link layer. At this **uni-directional procedure**, only a host computer can start the communication to H/EH series module. The task code communication supported by EH-ETH2 is passive protocol because EH-ETH2 can respond only.

As explained above, for H/EH-series, the protocol is defied so that the host computer can access all CPU in the network of H/EH-series.

The following five functions of H/EH-series are available to users.

(1) CPU control : RUN/STOP control of CPU, set/reset of occupancy, Read CPU status etc.
(2) I/O control : Various monitors
(3) Read memory : Read programs etc.
(4) Write memory : Clear all, transfer all etc,
(5) Response : Various response from CPU

To utilize these functions, various task codes are to be assembled in the host computer program.

See the **Appendix B Task Code Specifications** for detailed task code (command code). And see the next chapter for data format.

6.1.2 Frame format

The task code format of EH-ETH2 is shown in Figure 6.2. If you make an application program for host computer, you should follow this format, which is different from the standard RS-232C protocol. The data must be binary.

Cautions

EH-ETH2 can accept only **binary data.** ASCII data is not available.

Item	Name	Size(byte)
(a)	Termination command	1
(b)	Through no.	1
(c)	LUMP address	4
(d)	Request/Response task code	Max. 244

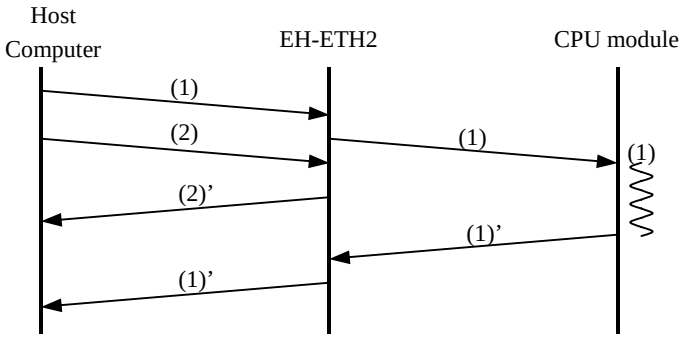
(a)	(b)	(c)	(d)

Figure 6.2 Frame format

(a) Termination command	To use control CPU module.
H00: Normal operation. CPU will reply according to the requested task code. HFF: If CPU receives the task code with HFF, the CPU will stop processing the last task code sent from a host computer. If there is no processing to be stopped, this command is ignored. H01 to HFE: EH-ETH2 discards the task code with command H01 to HFE.	
(b) Through no.	Through number to add request task code
Any number available. CPU will reply with adding same through number as in the command from host computer. You can use it for debugging or your own purpose so that host computer can handle several messages easily at the same time.	
(c) LUMP address	H/EH series network address
See Section 6.1.3 for detailed information.	
(d) Request/Response task code	H/EH series communication command code
See "Appendix B Task Code Specifications".	

Caution

- If EH-ETH2 receives the 2nd task code (2) before the 1st task code has not executed, EH-ETH2 will reply "**busy response"** against the 2nd task code (2)'.



6.1.3 H/EH series network address

At H/EH series network system shown in Figure 6.3, you must specify the CPU address according to the LUMP address rule as below.

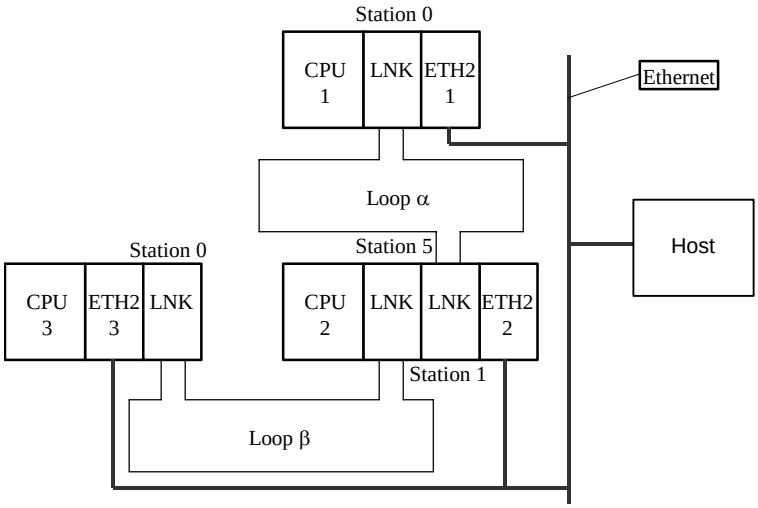
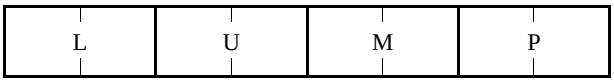


Figure 6.3 Example of H/EH-series network system

Network address configuration is below.



L: Loop No. (CPU link number)

U: Unit No. (CPU link station number)

M: Module No.

P: Port No.

Figure 6.4 Network address

Table 6.1 Network address detail

(1) Loop No.(L)

Item	Loop No.
CPU LINK loop1	01H
CPU LINK loop2	02H
Without CPU LINK	FFH

(2) Unit No.(U)

Item	Unit No.
CPU LINK ST No.0	00H
CPU LINK ST No.63	3FH
Without CPU LINK	FFH

(Note) When loop No. is FFH, Unit No. must be FFH. Even the reverse is similar.

(3) Module No. (M)

Always "00H"

(4) Port No. (P)

Always "00H"

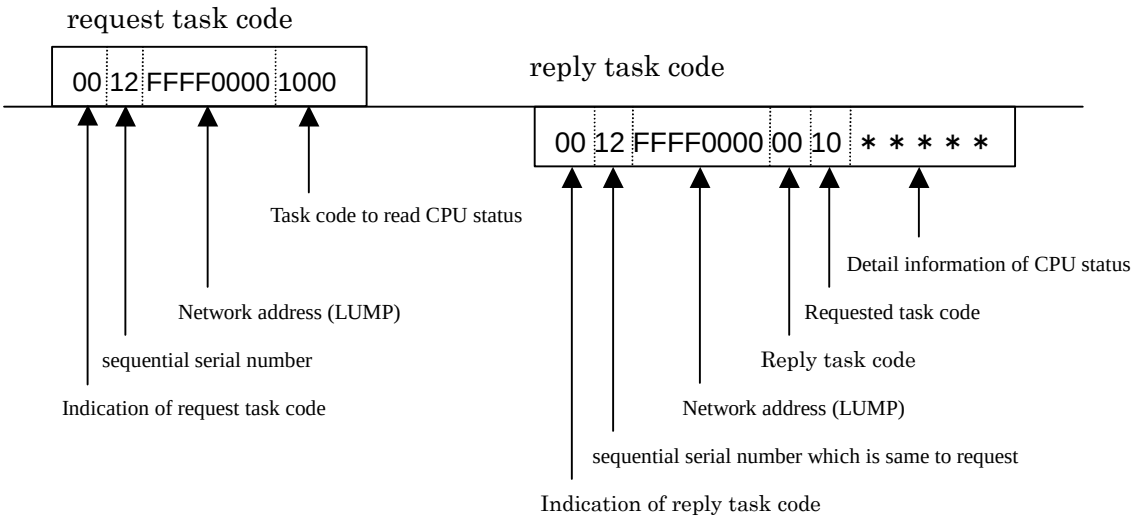
Table 6.2 shows the example of network address setting in Figure 6.3.

Table 6.2 Example of network address setting

No.	Via EH-ETH2	CPU	Network address
1	ETH2 1	CPU1	HFFFF0000
2		CPU2	H01010000
3		CPU3	(No access)
4	ETH2 2	CPU1	H02000000
5		CPU2	HFFFF0000
6		CPU3	H01000000
4	ETH2 3	CPU1	(No access)
5		CPU2	H01050000
6		CPU3	HFFFF0000

6.1.4 Operative example for task code transmission

An example for request / reply task code transmission is below.



See the **Appendix B Task Code Specifications** for detailed task code (command code).

6.2 Task code port

EH-ETH2 has four logical ports for task code communication.

Task code port supports **TCP** and **UDP** of data link layer. Table 6.3 shows the comparison to use.

Table 6.3 Task code port

Compression Item	TCP	UDP
Open request/ close request procedure	Host side: Need EH-ETH2 side: No	Host side: No EH-ETH2 side: No
Communication with LADDER Editor for Windows® or with Control Editor	Possible	Not possible
Reliability of the data in a data link layer level	High	Low

[For host computer programmer]

- When you select TCP

  1.Because all task ports are "LISTEN" (passive), you need to open connection before sending task code.

- When you select UDP,

  1. UDP protocol does not have high reliability of communication, application program needs to confirm the response, and control re-sending and packet order.

  2. You do not have to open connection before issuing task code.

Caution

- Task code port can not transmit data actively regardless of TCP or UDP protocol.
- Task Code ports may stop responding, when a EH-ETH2 got a problem in network. Please set up a timeout value for Task Code ports, in order for you to avoid this problem.

Importance

[Action of task code port in case of trouble; cable disconnection]

- When EH-ETH2 detects the communication timeout on task code port, EH-ETH2 sends the TCP packet which contains the “FIN ACK” flag to the node which connected to EH-ETH2.
- The connection between EH-ETH2 and the node is closed, if the node can send back “ACK” and “FIN ACK” against the above TCP packet.
- The connection between EH-ETH2 and the node is released by “RST ACK” from EH-ETH2, if the node cannot send back “ACK” and “FIN ACK” against the above TCP packet.
- After the normal close of the connection on the relevant task code port, the task code port is communicatble by the request for establishing the connection from other station.

6.3 Connection with LADDER EDITOR for Windows®

You can program CPU module via EH-ETH2 with LADDER EDITOR for Windows®.

This chapter explains at the setting of EH-ETH2 and PC shown in Table 6.4. The setting of EH-ETH2 is default value. IP address of PC should be set at your network environment.
There is a IP address setting and a host name setting in the method of specifying the connecting station.

Table 6.4 Setting

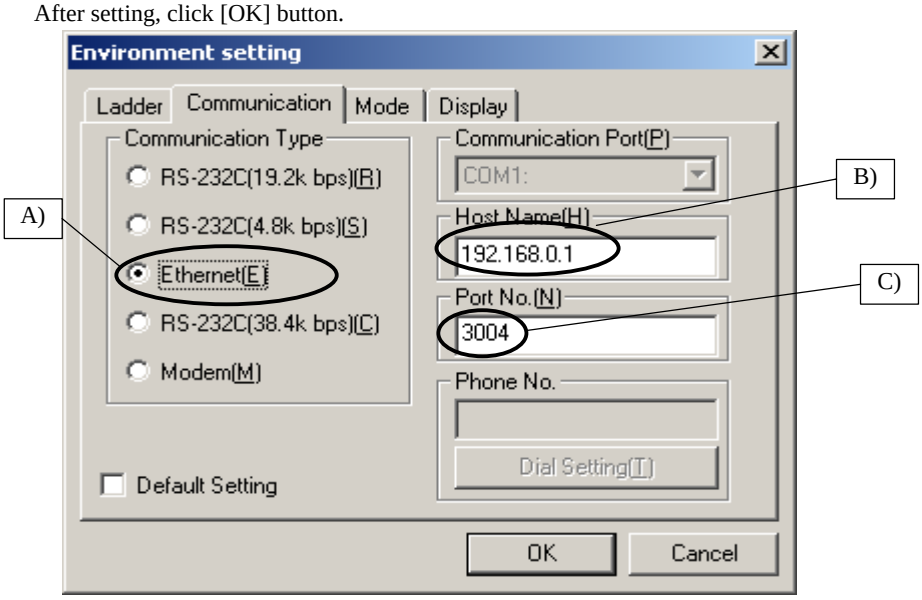
Setting Item	EH-ETH2	PC
IP address	192.168.0.1	192.168.0.128
Subnet mask	255.255.255.0	255.255.255.0
Port number	3004	-

6.3.1 IP address setting

To input IP address directly, OS of a personal computer that is newer than Windows®98SE is needed.
Please set it by inputting the host name of chapter 6.3.2, if you use older OS.

- Setting of LADDER EDITOR for Windows®
  (1) Open LADDER EDITOR for Windows® and go off-line mode.
  (2) Choose [Environment Set] in [Utility] menu in the offline mode.
  (3) Choose [Communication]dialog box.
  A) Communication type : Ethernet
  B) Host name : 192.168.0.1 (IP address of EH-ETH2)
  C) Port number : 3004

After setting, click [OK] button.



(4)Choose [GRS] in [File] menu.

All setting are completed with this process.

After this, LADDER EDITOR for Windows® can communicate via EH-ETH2 in [Online] or [on-direct]

6.3.2 Host name setting

When the connecting station is specified by the host name, the setting of the Hosts file is needed in addition to the setting of LADDER EDITOR for Windows®.

- Editing of **Hosts file**

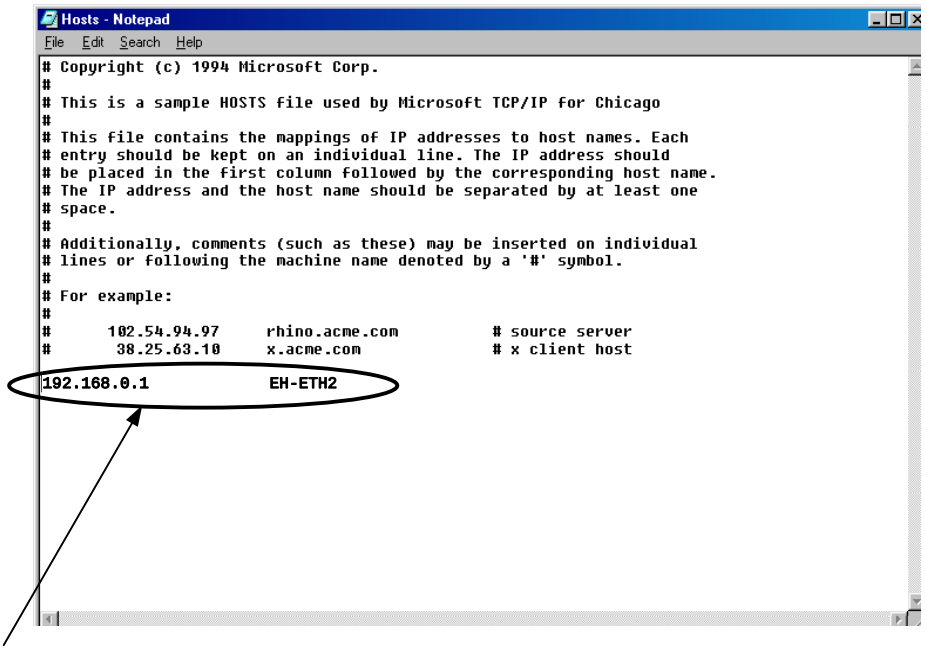
Edit the file "host"(no extended code) in the directly (usually in ¥windows) is installed by the following process.

(1) To keep the current information, back up **Hosts file.**(Ex. Copy it as Hosts.org.)

(2) Open the **Hosts file** by notepad or other text editor.

(3) Type "Host IP address" and "Host name" which were set in EH-ETH2 to the last line. The host name must be same as the host name at the environment setting of LADDER EDITOR for Windows®. (*1) Here is "EH-ETH2" as host name.

*1: Please types it carefully, because capital letter and small letter are distinguished.



192.168.0.1 EH-ETH2

- Setting of LADDER EDITOR for Windows®

(1) Open LADDER EDITOR for Windows® and go off-line mode.

(2) Choose [Environment Set] in [Utility] menu in the offline mode.

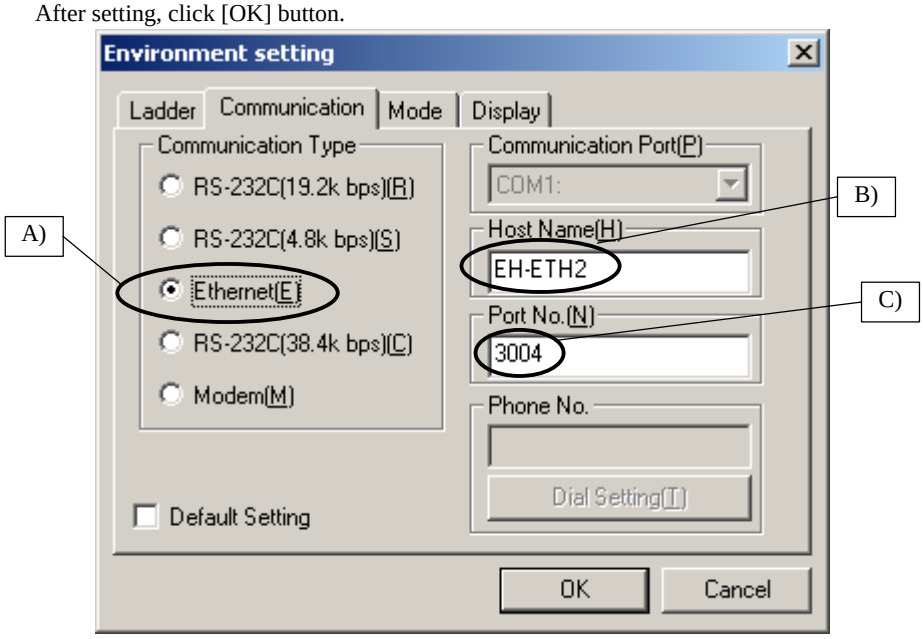
(3) Choose [Communication]dialog box.

A) Communication type : Ethernet

B) Host name : EH-ETH2 (Name in Hosts file)

C) Port number : 3004

After setting, click [OK] button.



(4)Choose [GRS] in [File] menu.

All setting are completed with this process.

After this, LADDER EDITOR for Windows® can communicate via EH-ETH2 in [Online] or [on-direct]

Caution

After setting Ethernet connection, it takes about 45 seconds to display “Communication Error” message in the following cases. This time period is due to Windows internal processing.

(1) To try to go [online] or [on-direct] when the setting of EH-ETH2 is not correct, or to try to go [online] or [on-direct] when the setting of PC or LADDER EDITOR for Windows® is not correct,.

(2) To try to go [online] or [on-direct] to EH-ETH2 without the power.

(3) Power off EH-ETH2 during communication.

(4) To Change I/O assignment during communication.

(5) EH-ETH2 breaks down during communication.

(6) To disconnect LAN cable during communication or breaking the cable.

6.4 Connection with Control Editor

You can program CPU module via EH-ETH2 with Control Editor.

This chapter explains at the setting of EH-ETH2 and PC shown in Table 6.5. The setting of EH-ETH2 is default value. IP address of PC should be set at your network environment.

Table 6.5 Setting

Setting Item	EH-ETH2	PC
IP address	192.168.0.1	192.168.0.128
Subnet mask	255.255.255.0	255.255.255.0
Port number	3004	-

- Setting of Control Editor

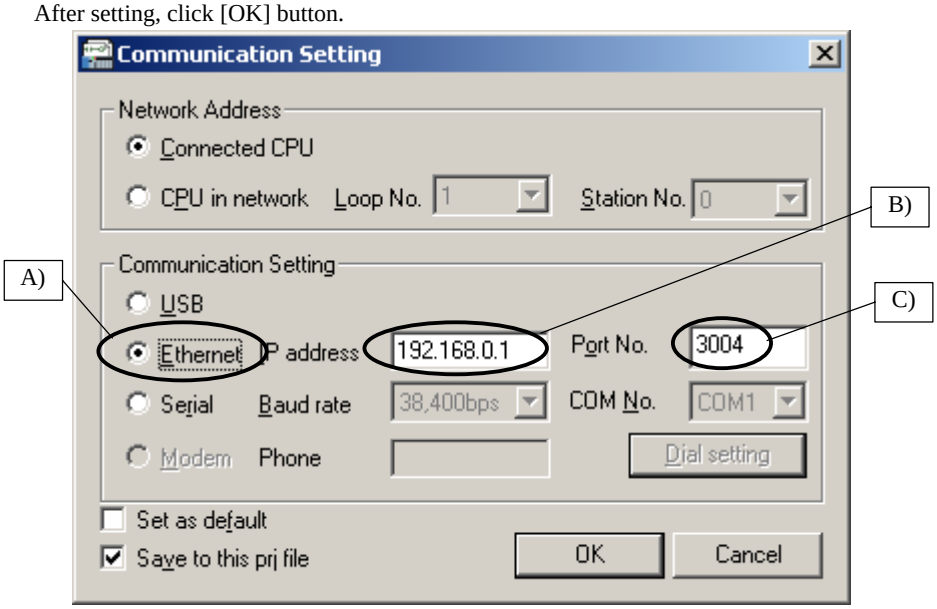
Open Control Editor and go “PC communication settings”.

A) Communication type : Ethernet

B) IP address : 192.168.0.1 (IP address of EH-ETH2)

C) Port number : 3004

After setting, click [OK] button.



All setting are completed with this process.

After this, Control Editor can communicate via EH-ETH2 in [Online] or [on-direct]

Caution

After setting Ethernet connection, it takes about 45 seconds to display “Communication Error” message in the following cases. This time period is due to Windows internal processing.

(1) To try to go [online] or [on-direct] when the setting of EH-ETH2 is not correct, or to try to go [online] or [on-direct] when the setting of PC or Control Editor is not correct,.

(2) To try to go [online] or [on-direct] to EH-ETH2 without the power.

(3) Power off EH-ETH2 during communication.

(4) To Change I/O assignment during communication.

(5) EH-ETH2 breaks down during communication.

(6) To disconnect LAN cable during communication or breaking the cable.

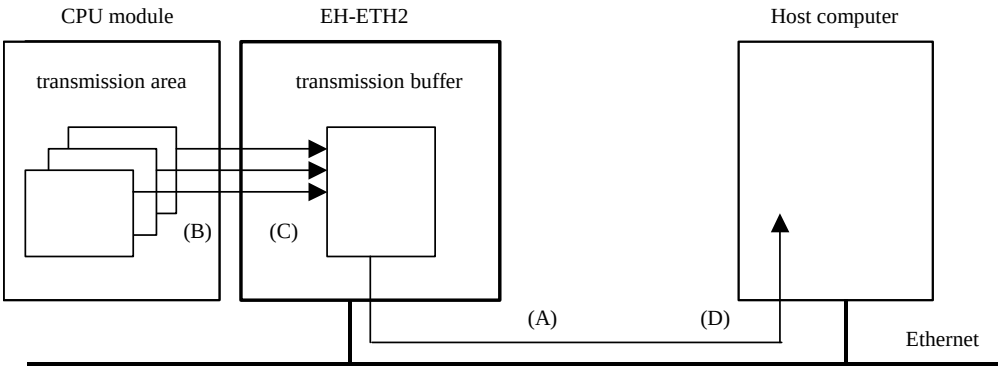
Chapter 7 Automatic Sending/Receiving function (ASR)

7.1 ASR

EH-ETH2 has ASR function. The detailed information is mentioned as follows.

7.1.1 Automatic data sending

An automatic sending function is a function to transmit the data of CPU module to other node. The outline of this function is shown as Figure 7.1. If you choose a cyclic sending, you can use an automatic data sending function. In case of the cyclic sending, you do not have to prepare user program for sending data from CPU to buffer area of EH-ETH2.



(A) After the power ON, EH-ETH2 opens automatic sending connection (here after ASR connection) for EH-ETH2 and host computer.
(B) After the connection opened, EH-ETH2 waits for a request from user program or cyclic timing. Then EH-ETH2 reads designated data. Several kinds of I/O type can be set in the sending area. (1 connection is able to handle up to 10 entry.)
(C) The designated area data is written in a buffer area of EH-ETH2.
(D) The data is sent to host computer.

Figure 7.1 Outline of automatic sending

The specification of automatic data sending is mentioned as below.

(1) ASR connection

A transmission route of TCP/IP is called connection. EH-ETH2 is able to handle up to 6 connections at the same time. One connection can send and receive data.

(2) Sending area

Sending area can be specified in EH-ETH2 Configurator of "ASR I/O Area (Connection n [*1]) Setting". One connection can handle up to 10 sending areas. (One sending area is called as "Entry")

In case of sending several kinds of I/O areas, they are once sent to a sending buffer according to the setting in EH-ETH2 Configurator. The following Figure 7.2 shows an example of R0 to R9 (10 bits) and WM100 to WM101 (2 words).

*1 : n means connection No..

Send Area Information

No.	I/O	Top	Size
1	R	0	10
2	WM	100	2
…			
…			
9			
10			

EH-ETH2 Sending buffer

	MSB							LSB
H00	R0	R1	R2	R3	R4	R5	R6	R7
H01	R8	R9	0	0	0	0	0	0
H02	WM100 High Byte							
H03	WM100 Low Byte							
H04	WM101 High Byte							
H05	WM101 Low Byte							

Figure 7.2 Sending area and sending buffer

Caution

- 1 connection can handle up to 1454 bytes.
- When designated bit size is less than 8 bits (1 byte), the rest bits are all 0.

7.1.2 Automatic data receiving

This function is able to receive data from other EH-ETH2 or host PC to internal buffer and write to designated receiving area. Users do not have to prepare user program for sending the data from the buffer to receiving area in CPU.

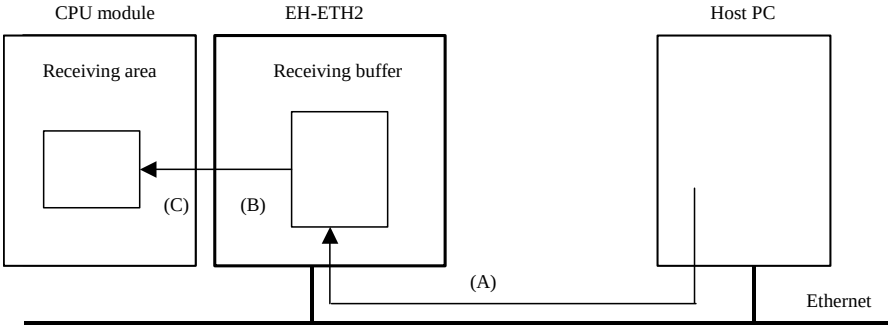


Figure 7.3 Outline of automatic receiving

(A) After the power ON, host PC opens ASR connection between EH-ETH2 and host PC.
(B) After the connection opened, EH-ETH2 waits data from other station.
(C) EH-ETH2 writes received data to receiving area of the CPU.

The specification of automatic data receiving is mentioned as below.

(1) ASR connection

Up to 6 connections are available for the automatic data receiving function. One ASR connection is able to handle both sending and receiving at the same time.

(2). Receiving area

The receiving area can be specified only by “ASR I/O Area (Connection N) Setting” in EH-ETH2 Configurator. The receiving area can be defined every ASR connection. Available I/Os are word I/Os except WX.

Receive Area Information

No.	I/O	Top	Size
1	WR	0	10

EH-ETH2 Receiving buffer

H00	DT1
H01	DT2
H02	DT3
H03	DT4
…	…
H12	DT19
H13	DT20

20 Byte

CPU module I/O Receiving area

WR0	DT1	DT2
WR1	DT3	DT4
WR2	DT5	DT6
WR3	DT7	DT8
…	…	…
WR8	DT17	DT18
WR9	DT19	DT20

10 Word

Figure 7.4 Receiving area and receiving buffer (1)

Caution

- 1 connection can handle up to 1454 bytes.
- When received data size is less than designated receiving area size, the rest area is not overwritten. The previous data is kept.
- When received data size is bigger than designated receiving data size, the excess area is omitted automatically.

Receive Area Information

No.	I/O	Top	Size
1	WR	0	10

Receiving buffer

H00	DT1
H01	DT2
H02	DT3
H03	DT4
…	…
H0E	DT15
H0F	DT16

16 Byte

I/O Receiving area

WR0	DT1	DT2
WR1	DT3	DT4
…	…	…
WR6	DT13	DT14
WR7	DT15	DT16
WR8	DT(n+1)	DT(n)
WR9	DT(n+3)	DT(n+2)

10 Word

: Previous received data

Figure 7.5 Receiving area and receiving buffer (2)

Receive Area Information

No.	I/O	Top	Size
1	WR	0	10

Receiving buffer

H00	DT1
H01	DT2
H02	DT3
H03	DT4
…	…
H1E	DT31
H1F	DT32

32 Byte

I/O Receiving area

WR0	DT1	DT2
WR1	DT3	DT4
WR2	DT5	DT6
WR3	DT7	DT8
…	…	…
WR8	DT17	DT18
WR9	DT19	DT20

10 Word

: excess data

Figure 7.6 Receiving area and receiving buffer (3)

7.2 Presetting

Before the data communication, you have to establish connection against to the other port. Here after, an enabled connection is called as “opened connection”, and a disabled connection is called as “closed connection”.

Caution

EH-ETH2 has 10 connections. **4 connections are only for task code communication, 6 connections are ASR connections for message communication.**

For reference : Other station "Specified" and "Optional"

To open or close TCP/IP connection is like telephone call in our daily life.

For instance, a telephone of A is assumed as EH-ETH2, telephone of B as a host computer.

In case A calls B, when B is ready to receive, B can pick up the receiver. Now both A and B are ready to speak. On the other hand, when B is not ready to pick up the receiver, A must hang up the receiver and give up conversation.

This is replaced to TCP/IP communication. In order EH-ETH2 (A) to communicate with the host computer (B), EH-ETH2 (A), which is specified as active node, must request to open the connection with specifying the destination (IP address and port number of B).
If the host computer (B) is ready to receive the request, the communication is opened and ready to be talked.

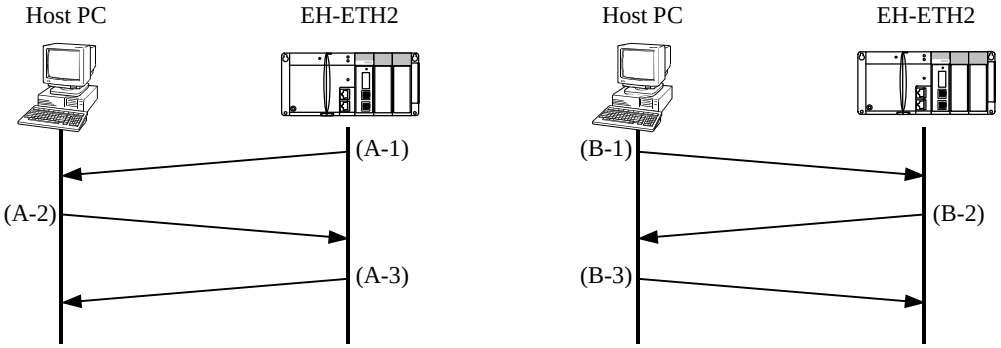
On the other hand, when the host computer (B) is not ready to open the connection, EH-ETH2 (A) must give up the request after connection time out. In this case, EH-ETH2 (A) can not communicate with host computer.

In addition, such receiving (passive) station (B in this case) can get any requests from other than A, and can answer (open) to all the requests. If B should open connection upon all the request, the setting “Other station” must be “Optional”. But if B should open connection upon the request from A only, this must be “Specified”, and the IP address and port number must be specified as well.

In short, a station specified as active must specify the destination. On the other hand, a station specified as passive can be selected "specified other station" or "optional other station".

7.2.1 Open connection

The procedure for opening connection is shown as Figure 7.7.



(A) In case of active open setting (B) In case of passive open setting

(A) In case EH-ETH2 is in active open

	Description	Segment	EH-ETH2 internal status
(A-1)	EH-ETH2 requests active open against host PC of passive open status.	Sending SYN flag	Sending request to connect (SYN-SENT)
(A-2)	Host PC receives the request to connect from **EH-ETH2,** sends a reply of ready to open connection to EH-ETH2, and waits ACK from EH-ETH2.	Sending SYN ACK flag	-
(A-3)	**EH-ETH2** receives the reply from the host PC, and sends back ACK.	Sending ACK flag	Connection opened (ESTABLISHED)

(B) In case EH-ETH2 is in passive open

	Description	Segment	EH-ETH2 internal status
(B-1)	Host PC requests active open against EH-ETH2 of passive open status.	Sending SYN flag	
(B-2)	EH-ETH2 receives the request to connect from Host PC, sends a reply of ready to open connection to Host PC, and waits ACK from Host PC.	Sending SYN ACK flag	Sending request to connect (SYN-RCVD)
(B-3)	Host PC receives the reply from the EH-ETH2, and sends back ACK.	Sending ACK flag	Connection opened (ESTABLISHED)

Figure 7.7 Basic procedure to open connection

Caution

- In case of the task code communication, the way to open is fixed as passive open.
- In case of ASR connection, the way to open is selected as active or passive, which can configured in EH-ETH2 Configurator only.

The each ASR parameters are set properly and EH-ETH2 is in active mode to open ASR connection.
In this explanation, EH-ETH2 is own station and the other equipment is other station.
The following items are "**ASR information"**.

(1) Select communication protocol
(2) Select active open or passive open
(3) Configure own logical port number
(4) Select specified or optional other station.
(5) Configure IP address of the other station (Only in case the other station is “specified”.)
(6) Configure Logical port number of the other station. (Only in case the other station is “specified”.)

ASR parameters are set in EH-ETH2 Configurator. Please refer to “Section 5.4” in details.

There are two ways for EH-ETH2 (specified as active) to open ASR connection.

1. To send a request to open automatically after initializing of EH-ETH2 completed.
2. To send a request to open by user program.

Caution

ASR information must be set correctly to open ASR connection.

Table 7.1 The way to open ASR connection (Active port)

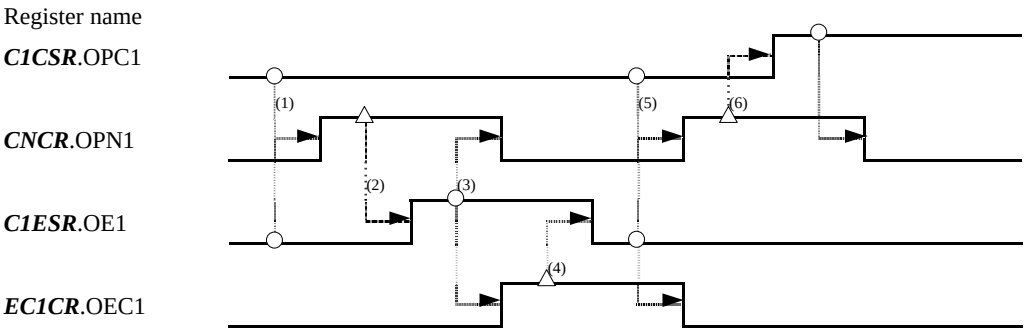
Conditions to open ASR connection	Operation
Initializing (EH-ETH2 is initialized when ;) 1) At Power ON 2) Press the reset button 3) Software initializing (user program required)	A Request to open connection will be sent to specified station
Set 1 to “Request to open bit” (user program required)	

Caution

- In case of initializing, you do not need user program.
- In case you need to open the connection manually, you must use Status Register (SR) and Control Register (CR) with FUN201 command for EH-CPU or SCRW command for EHV-CPU in your user program. Please refer to "Chapter 8 Register Structure" in details about registers.
- In this manual, register and each bit are often described with abbreviation. Refer to "Chapter 8 Table 8.1 The list of registers (page 8-12)" for each abbreviation.
- In this manual, register and each bit are described as below format.
  [***register abbreviation***].[bit abbreviation]
  Ex. Connection control register (CNCR) connection 1 open request bit (OPN1)
  ***CNCR*.OPN1**

If a connection is opened by another station specified as active, the passive station is only waiting. So you do not need any program in the passive station.

EH-ETH2 is able to request to open connection to other stations by setting “Request to open bit” to high. The procedure to open ASR connection 1 is shown as Figure 7.8.



○ : By user, △ : By EH-ETH2

Figure 7.8 Procedure to open connection

(1) Confirm ASR connection is not opened (***C1CSR***.OPC is 0) and the status is not open error (***C1CSR***.OPC is 0). Then set 1 to ***CNCR***.OPN1.

----------*Request to open*

(2) EH-ETH2 receives the request and set 1 to ***C1ESR***.OE1 because it is not ready to be opened.

---------- *Open error*

(3) Confirm the open error reply and set 0 to ***CNCR***.OPN1 and 1 to E***C1CR***.OEC1

---------- *Cancellation of the request to open and clear error bit*

(4) EH-ETH2 receives the request to clear and clear ***C1ESR***.OE1 by setting 0.

---------- *Clear the open error bit*

(5) Examine the error cause and remove. Then set 0 to ***EC1CR***.OEC1 and set 1 to ***CNCR***.OPN1 again after confirmation of ***C1CSR***.OPC=0 and ***C1ESR***.OE1=0.

---------- *Cancellation of the request to clear error bit, and request to open*

(6) EH-ETH2 receives the request and open the ASR connection 1 and set 1 to ***C1CSR***.OPC1

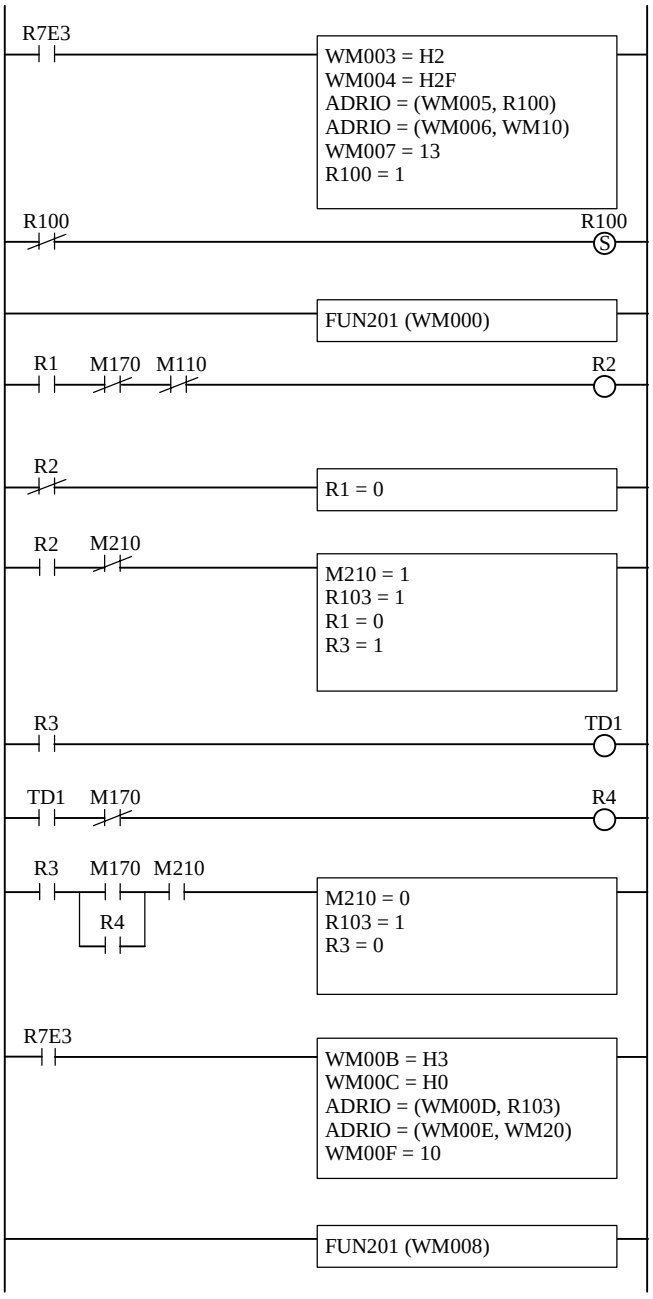
----------*Connection opened*

(7) Confirm the connection opened (***C1CSR***.OPC=1) and cancel the request to open (***CNCR***.OPN1=0)

----------*Cancellation of the request to open*

Sample program 3 To open the connection to other station (for EH-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



(00001) Parameter area setting of FUN201(s) for reading out SR[*1].
Request to read out SR
Area setting (unit:0, slot:0)
Control bit address is R100
Transmission I/O address is starting from WM10
Transmission data size is 13 words
Setting 1 to control bit for reading SR.

(00002) Reading out SR at R100 = 1

(00003) FUN201 for reading out SR

(00004) Request to open connection 1 at R1 = 1.
Check status (M170) and error (M110) of connection 1

(00005) Cancellation the connection open if connection 1 is open (M170=1) or error (M110=1).

(00006) Set 1 to "request to open bit" of connection 1.
Set 1 to "request to write to CR[*2] bit"
Set 0 to "request to open contact" (R1).
Enable the circuit for cancellation the request to open.

(00007) Timer counting from the request to open.

(00008) Set 1 to R4 if the connection is not opened after 1 second.

(00009) Clear "request to open bit" for connection 1.
Set 1 to "request to write CR bit".
Disable the circuit for cancellation the request to open.

(00010) Parameter area setting of FUN201(s) for writing CR.
Request to write CR.
Area setting (unit:0, slot:0)
Control bit address is R103.
Transmission I/O address is starting from WM20.
Transmission data size is 10 words.

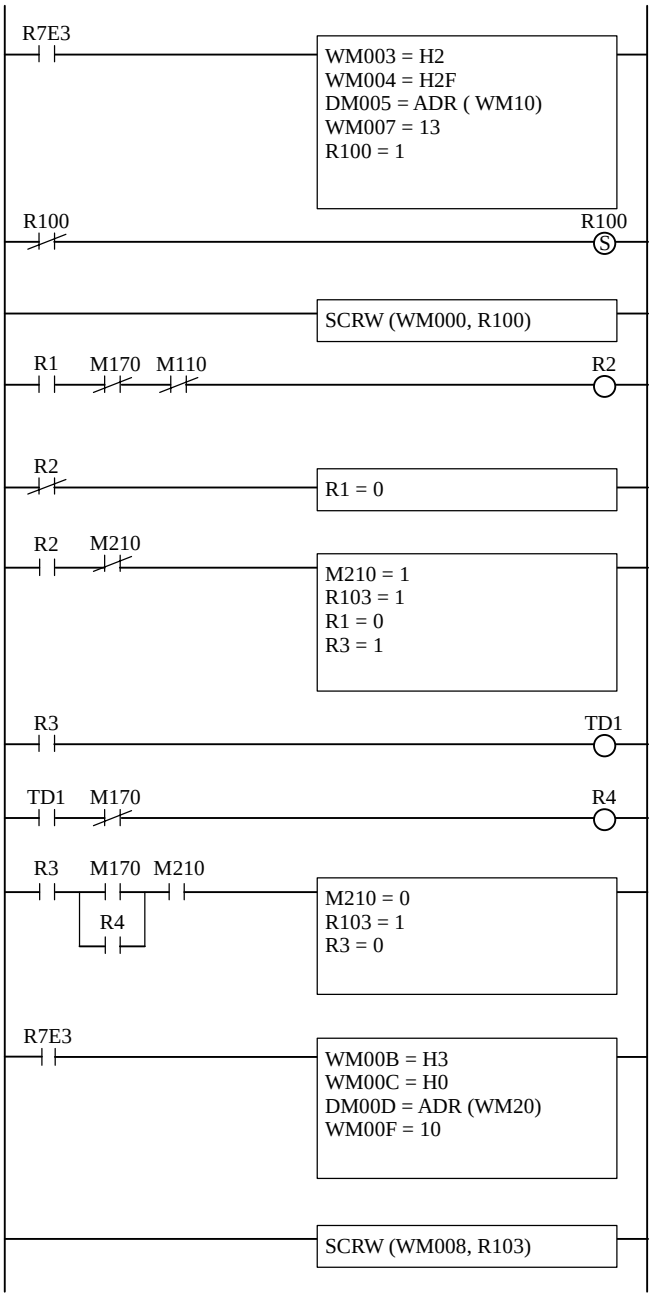
(00011) FUN 201 for writing CR.

*1: SR is abbreviation of Status Register
*2: CR is abbreviation of Control Register.
See "Chapter 8 Register Structure" for detailed.

Sample program 3 To open the connection to other station

(for EHV-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



(00001) Parameter area setting of SCRW for reading out SR[*1].
Request to read out SR
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM10
Transmission data size is 13 words
Setting 1 to control bit for reading SR.

(00002) Reading out SR at R100 = 1

(00003) SCRW for reading out SR

(00004) Request to open connection 1 at R1 = 1.
Check status (M170) and error (M110) of connection 1

(00005) Cancellation the connection open if connection 1 is open (M170=1) or error (M110=1).

(00006) Set 1 to "request to open bit" of connection 1.
Set 1 to "request to write to CR[*2] bit"
Set 0 to "request to open contact" (R1).
Enable the circuit for cancellation the request to open.

(00007) 0.1 10 Timer counting from the request to open.

(00008) Set 1 to R4 if the connection is not opened after 1 second.

(00009) Clear "request to open bit" for connection 1.
Set 1 to "request to write CR bit".
Disable the circuit for cancellation the request to open.

(00010) Parameter area setting of SCRW for writing CR.
Request to write CR.
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM20.
Transmission data size is 10 words.

(00011) SCRW for writing CR.

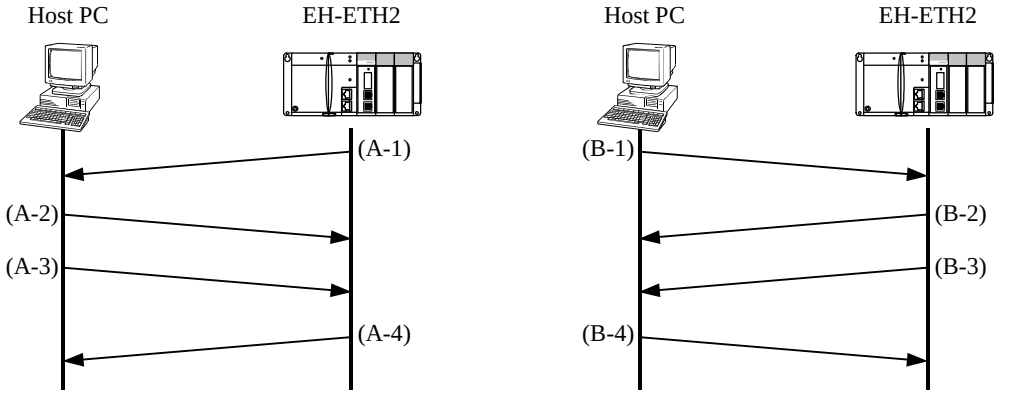
*1: SR is abbreviation of Status Register

*2: CR is abbreviation of Control Register.

See "Chapter 8 Register Structure" for detailed.

7.2.2 Close connection

The procedure for closing connection is shown as Figure 7.9.



(A) In case EH-ETH2 requests to close connection (B) In case host PC requests to close connection

(A) In case EH-ETH2 requests to close connection

	Description	Segment	EH-ETH2 internal status
(A-1)	EH-ETH2 requests to close connection to the host PC.	Sending FIN flag	Connection opened (ESTABLISHED)
(A-2)	Host PC receives the request to close from **EH-ETH2**, and replies back ACK.	Sending ACK flag	Waiting for a request to close1 (FIN WAIT-1)
(A-3)	When the host PC does not have data to send, it replies back FIN ACK.	Sending FIN ACK flag	Waiting for a request to close2 (FIN WAIT-2)
(A-4)	**EH-ETH2** receives the FIN ACK and close after waiting a time designated in Time wait value.	Sending ACK flag	Waiting (TIME WAIT), connection closed (CLOSED)

(B) In case Host PC requests to close connection.

	Description	Segment	EH-ETH2 internal status
(B-1)	Host PC requests to close connection to the EH-ETH2.	Sending FIN flag	Connection opened (ESTABLISHED)
(B-2)	**EH-ETH2** receives the request to close from Host PC, and replies back ACK	Sending ACK flag	Waiting for closing (CLOSE WAIT)
(B-3)	When the EH-ETH2 does not have data to send, it replies back FIN ACK. (*1)	Sending FIN ACK flag	Waiting for a final response (LAST-ACK)
(B-4)	The host PC receives the FIN ACK and replied back ACK.	Sending ACK flag	Connection closed (CLOSED)

*1: This is only in case “Close mode control” is disabled. The “Close mode control” is mentioned in the followings.

Figure 7.9 Basic procedure to open connection

Caution

- In case of the task code communication connection, a host computer must send a request to close.

The conditions to close connection are ;

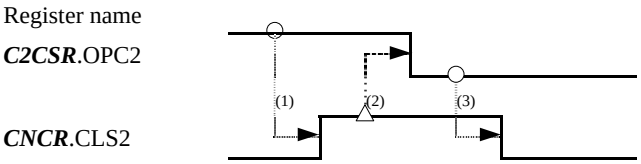
(1) EH-ETH2 receives a request to close from user program in own station during connection opened.

(2) EH-ETH2 receives a request to close from other stations during connection opened.

The following description is regarding the way to close connection from user program.

- In case EH-ETH2 requests to close to other station.

The time chart is shown below in Figure 7.10.



○ : By user, △ : By EH-ETH2

Figure 7.10 Procedure to close connection (1)

(1) Confirm ASR connection 2 is opened (***C2CSR***.OPC2 is 0). Then set 1 to ***CNCR***.CLS2.

---------- *Request to close*

(2) EH-ETH2 receives the request and close the connection 2 and then set 0 to ***C2CSR***.OPC2.

---------- *Close connection*

(3) Confirm the connection closed (***C2CSR***.OPC2 is 0) and cancel the request to close (***CNCR***.CLS2=0).

----------*Cancellation of request to close*

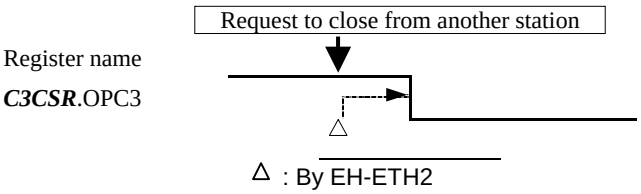
- **In case EH-ETH2 receives a request to close from another station.**

EH-ETH2 has two types of operation mode after receiving a request from another stations, which is called “Close mode control”. This is switched by “Close mode control register bit (CMCR)”.

(a) ***CMCR***.CMn = 0 (“Close mode control” is disabled. “n” is ASR connection number)

EH-ETH2 closes a requested connection from other station without any other conditions. This means user programs for monitoring status or for closing connection are not required.

The time chart to close connection 3 is shown in Figure 7.11.



△ : By EH-ETH2

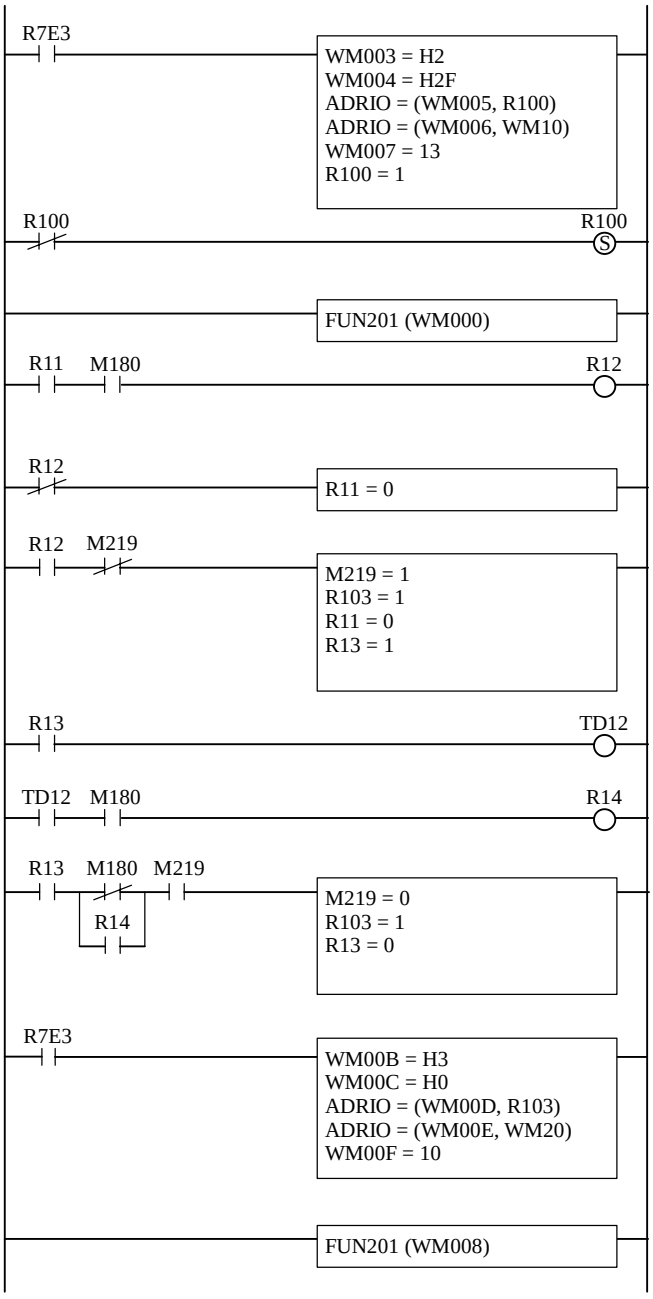
Figure 7.11 Procedure to close connection (2)

(1) EH-ETH2 closes the requested connection. After closing it, EH-ETH2 sets 0 to ***C3CSR***.OPC3

---------- *Close connection*

Sample program 4 To close the connection to other station (for EH-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



(00001) Setting parameter of FUN201(s) for reading out SR[*1].
Request to read out SR
Area setting (unit:0, slot:0)
Control bit address is R100
Transmission I/O address is starting from WM10
Transmission data size is 13 words
Setting 1 to control bit for reading SR

(00002) Reading out SR at R100 = 1

(00003) FUN201 for reading out SR

(00004) Request to close connection 2 by R11 = 1.
Check the status of connection 2 (M180)

(00005) Cancellation the request to close if the connection 2 is closed (M180=0).

(00006) Set 1 to "Request to close bit" for connection 2
Set 1 to "request to write CR[*2] bit"
Set 0 to "request to open contact" (R11).
Enable the circuit for cancellation the request to close.

(00007) Timer counting from the request to close.

(00008) Set 1 to R14 if the connection 2 is not closed after 1 second.

(00009) Clear "request to close bit" for connection 2.
Set 1 to "request to write CR bit".
Disable the circuit for cancellation the request to close.

(00010) Parameter area setting of FUN201(s) for writing CR.
Request to write CR.
Area setting (unit:0, slot:0)
Control bit address is R103.
Transmission I/O address is starting from WM20.
Transmission data size is 10 words.

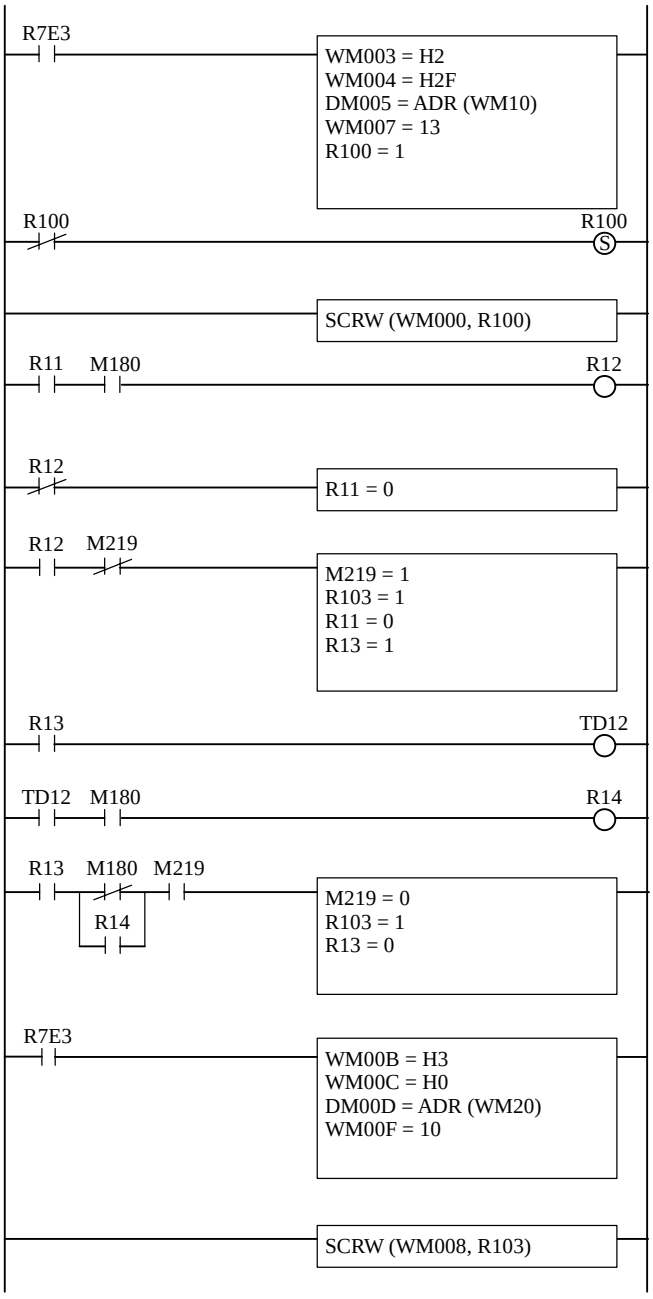
(00011) FUN 201 for writing CR.

*1: SR is abbreviation of Status Register
*2: CR is abbreviation of Control Register.
See "Chapter 8 Register Structure" for detailed.

Sample program 4 To close the connection to other station

(for EHV-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



(00001) Setting parameter of SCRW(s) for reading out SR[*1].
Request to read out SR
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM10
Transmission data size is 13 words
Setting 1 to control bit for reading SR

(00002) Reading out SR at R100 = 1

(00003) SCRW for reading out SR

(00004) Request to close connection 2 by R11 = 1.
Check the status of connection 2 (M180)

(00005) Cancellation the request to close if the connection 2 is closed (M180=0).

(00006) Set 1 to "Request to close bit" for connection 2
Set 1 to "request to write CR[*2] bit"
Set 0 to "request to open contact" (R11).
Enable the circuit for cancellation the request to close.

(00007) Timer counting from the request to close.

(00008) Set 1 to R14 if the connection 2 is not closed after 1 second.

(00009) Clear "request to close bit" for connection 2.
Set 1 to "request to write CR bit".
Disable the circuit for cancellation the request to close.

(00010) Parameter area setting of SCRW (s) for writing CR.
Request to write CR.
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM20.
Transmission data size is 10 words.

(00011) SCRW for writing CR.

*1: SR is abbreviation of Status Register

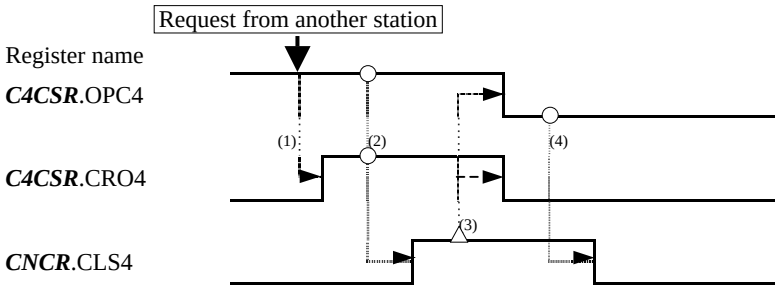
*2: CR is abbreviation of Control Register.

See "Chapter 8 Register Structure" for detailed.

(b) ***CMCR***.CMn = 1 ("Close mode control" is enabled. "n" is ASR connection number)

Even if EH-ETH2 receives a request to close from other station, EH-ETH2 does not close the connection unless a user program is executed for closing the connection.

The time chart to close connection 4 is shown in Figure 7.12.



○ : By user, △ : By EH-ETH2

Figure 7.12 Procedure to close connection (3)

(1) When EH-ETH2 receives a request to close connection 4 from another station, "Close requested bit" goes high. (***C4CSR***.CRO4 is 1)

----------*Receiving a request to close from another station*

(2) Confirm the connection opened (***C4CSR***.OPC4 is 1) and the request received (***C4CSR***.CRO4 is 1), and then set 1 to ***CNCR***.CLS4.

---------- *Request to close*

(3) When EH-ETH2 receives a request to close from user program, EH-ETH2 closes the connection 4 and clear ***C4CSR***.OPC4.

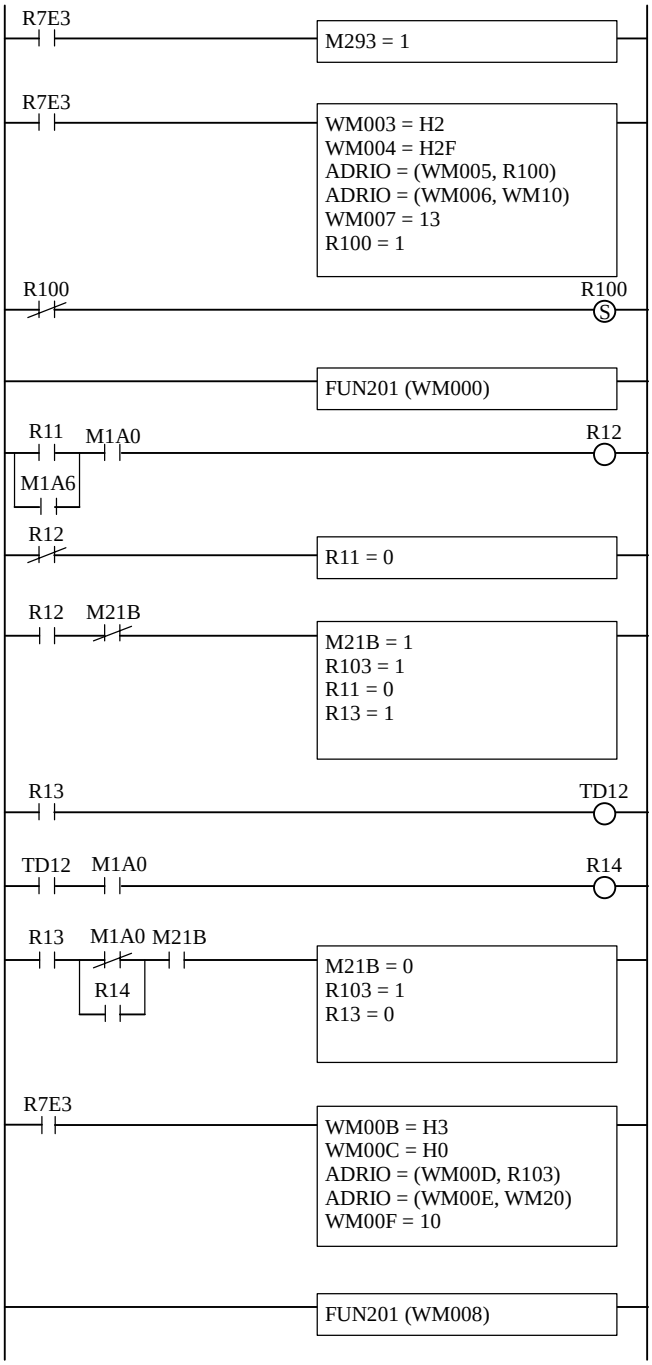
---------- *Clear "Request to close bit" and close the connection.*

(4) Confirm the connection closed (***C4CSR***.OPC4 is 0) and cancel the request to close (***CNCR***.CLS4 is 0)

----------*Cancellation of request to close*

Sample program 5 To close the connection with "Close mode control" enabled (for EH-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



"Close mode control" for connection 4 is enabled.

Setting parameter of FUN201(s) for reading out SR.
Request to read out SR
Area setting (unit:0, slot:0)
Control bit address is R100
Transmission I/O address is starting from WM10
Transmission data size is 13 words
Setting 1 to control bit for reading SR

Reading out SR at R100 = 1

FUN201 for reading out SR

Request to close connection 4 when R11 is 1 or EH-ETH2 receives a request from another station (M1A6=1).

Cancellation the request to close if the connection 4 is closed (M1A0=0).

Set 1 to "Request to close bit" for connection 4.
Set 1 to "request to write CR bit".
Set 0 to "request to open contact" (R11).
Enable the circuit for cancellation the request to close.

Timer counting from the request to close.

Set 1 to R14 if the connection 4 is not closed after 1 second.

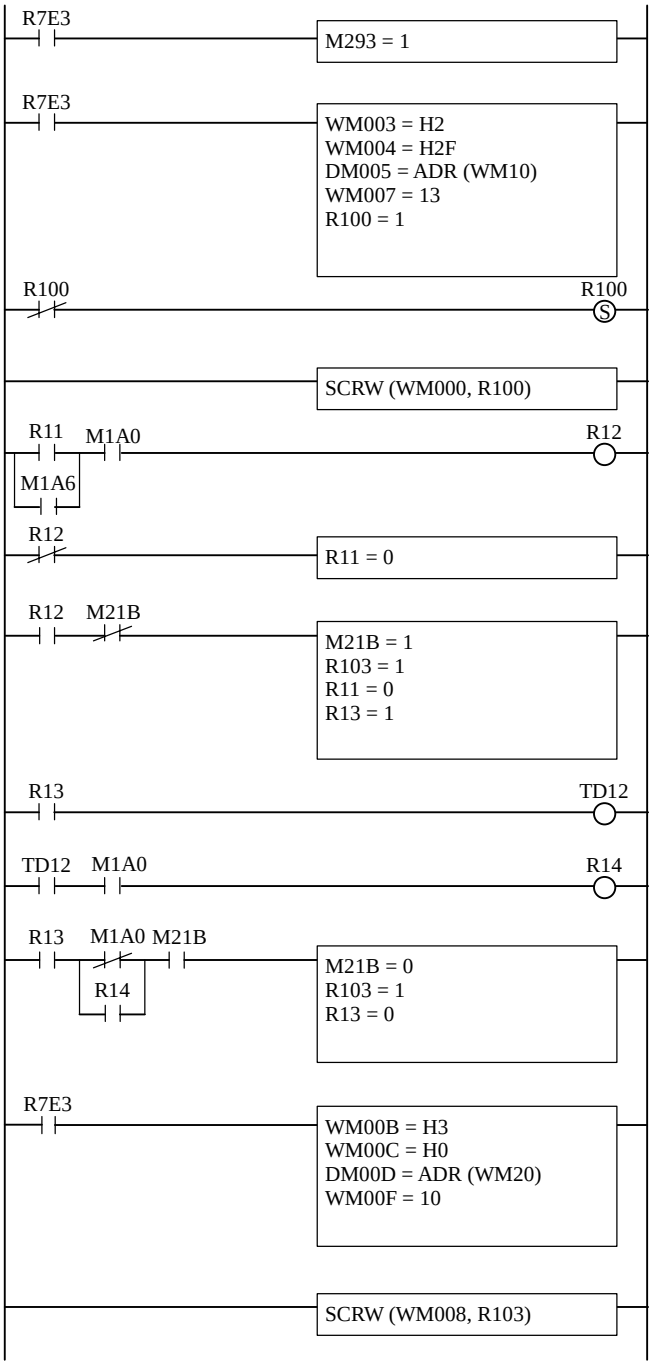
Clear "request to close bit" for connection 4.
Set 1 to "request to write CR bit".
Disable the circuit for cancellation the request to close.

Parameters setting of FUN201(s) for writing CR.
Request to write CR.
Area setting (unit:0, slot:0)
Control bit address is R103.
Transmission I/O address is starting from WM20.
Transmission data size is 10 words.

FUN 201 for writing CR.

Sample program 5 To close the connection with "Close mode control" enabled (for EHV-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



"Close mode control" for connection 4 is enabled.

Setting parameter of SCRW(s) for reading out SR.
Request to read out SR
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM10
Transmission data size is 13 words
Setting 1 to control bit for reading SR

Reading out SR at R100 = 1

SCRW for reading out SR

Request to close connection 4 when R11 is 1 or EH-ETH2 receives a request from another station (M1A6=1).

Cancellation the request to close if the connection 4 is closed (M1A0=0).

Set 1 to "Request to close bit" for connection 4.
Set 1 to "request to write CR bit".
Set 0 to "request to open contact" (R11).
Enable the circuit for cancellation the request to close.

Timer counting from the request to close.

Set 1 to R14 if the connection 4 is not closed after 1 second.

Clear "request to close bit" for connection 4.
Set 1 to "request to write CR bit".
Disable the circuit for cancellation the request to close.

Parameters setting of SCRW (s) for writing CR.
Request to write CR.
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM20.
Transmission data size is 10 words.

SCRW for writing CR.

7.3 ASR with user program

Without any user program, EH-ETH2 is able to send / receive data by using cyclic sending and receiving function. In addition to this function, you can achieve more precise data transmission by using above function with user program.

EH-ETH2 have sending function shown in Table 7.2.

Table 7.2 Sending function

Sending type	Communication control program	Description
Cyclic sending	Not required (*1)	EH-ETH2 execute refresh of internal send buffer and data send **at every send cycle** automatically
Event sending	Required	User program controls refresh of internal send buffer and data send.

*1: Program for error detection of communication or other additional operation is required depending on the occasions.

EH-ETH2 have receiving function shown in Table 7.3.

Table 7.3 Receiving function

Receiving type	Receive mode	Communication control program	Description
Cyclic receiving	Normal	Not required (*2)	Receive buffer is refreshed **whenever data is received**. EH-ETH2 stored EH-ETH2 internal receive buffer data to receive area in CPU module automatically.
	Optional	Required	EH-ETH2 stored the receive data, which is permitted to receive by user program, to a receive buffer of EH-ETH2. After that, EH-ETH2 refresh receive area in CPU module. When receive is not permitted, EH-ETH2 nullify received data.

*2: Program for error detection of communication or other additional operation is required depending on the occasions.

7.3.1 Optional data receiving

- Receive mode is **Optional receiving mode**

EH-ETH2 store data in receive buffer from "other station" to receiving area (CPU internal output) when user program "receive refresh permit".

Outline and time chart of Optional receiving mode is shown in Figure 7.13.

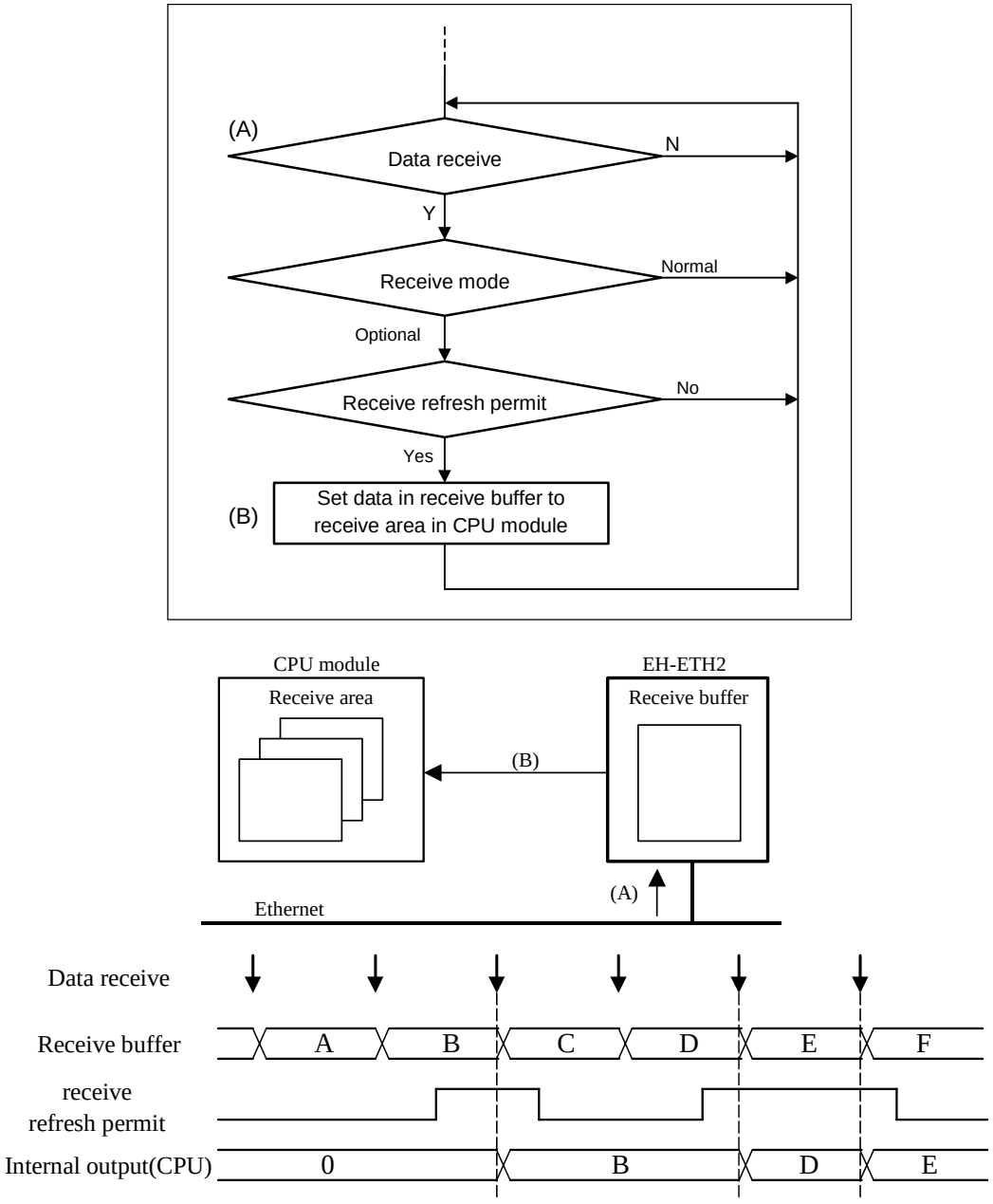
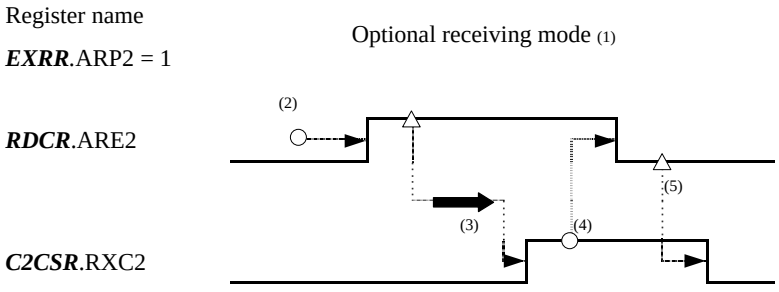


Figure 7.13 Optional control outline and time chart of Automatic receive

Time chart for connection 2 is shown as Figure 7.14.



○ : By user, △ : By EH-ETH2

Figure 7.14 Procedure of Optional receiving

(1) When receive mode is optional mode, set 1 to “receive mode change ” bit (***EXRR***.ARP2).
---------- *Select receive mode*

(2) When data should be refreshed, set 1 to “Ready to transmit” bit (***RDCR***.ARE2).
---------- *Request to refresh data*

(3) EH-ETH2 receives the request and sends designated data to CPU. After the sending completed, EH-ETH2 sets 1 to “Receiving completed” bit (***C2CSR***.RXC2).
---------- *Receiving completed*

(4) Confirm sending completed by ***C2CSR***.RXC2=1, and cancel the “Ready to receive” bit (***RDCR***.ASE2). If data should be refreshed continuously, the cancellation is not necessary.
---------- *Cancellation of a request to refresh*

(5) EH-ETH2 receives the request to cancel, and clear the “Receiving completion” bit (***C2CSR***.RXC2).
---------- *Clear receiving completion bit*

- Receive mode is **Normal receiving mode**

When EH-ETH2 receive data from other station, it set to the receive area (CPU internal output) specified by ASR Receive information. This series of action can be called "automatic receive". See "7.1.2 Automatic data receiving" for detailed.

The sample program uses the below internal I/O.

FUN 201 parameters for reading Status Register (SR)

I/O	Description
WM0	Result (Return code)
WM1	System area
WM2	System area
WM3	Control type (Read / write / etc)
WM4	EH-ETH2 slot number, and starting address for SR
WM5	Address of control bit for reading SR
WM6	Address of data for SR (Destination to read)
WM7	Data size for reading SR
R100	Execution bit for reading SR
R101	OK flag for reading SR
R102	Error flag for reading SR

FUN 201 parameters for writing Control Register

I/O	Description
WM8	Result (Return code)
WM9	System area
WMA	System area
WMB	Control type (Read / write / etc)
WMC	EH-ETH2 slot number, and starting address for CR
WMD	Address of control bit for writing CR
WME	Address of data for CR (Source to write)
WMF	Data size for writing CR
R103	Execution bit for writing CR
R104	OK flag for writing CR
R105	Error flag for writing CR

*1: In the case of EHV-CPU, the command of SCRW is used to read or write to the registers.
The following points are different in the sample programs for EHV-CPU.

a) It does not need setting of Address of control bit for reading or writing (WM5, WMD of the above table).
b) Starting I/O No. of Destination (or Source) (WM6, WME of the above table) is set to WM5, WMD (of the above table).

Status Register (SR) destination I/O

I/O	Description
WM10	Data to read from MDSR
WM11	Data to read from C1ESR
WM12	Data to read from C2ESR
WM13	Data to read from C3ESR
WM14	Data to read from C4ESR
WM15	Data to read from C5ESR
WM16	Data to read from C6ESR
WM17	Data to read from C1CSR
WM18	Data to read from C2CSR
WM19	Data to read from C3CSR
WM1A	Data to read from C4CSR
WM1B	Data to read from C5CSR
WM1C	Data to read from C6CSR

Control Register (CR) source I/O

I/O	Description
WM20	Data to write to MDCR
WM21	Data to write to CNCR
WM22	Reserve
WM23	Data to write to RECR
WM24	Data to write to EXRR
WM25	Data to write to RDCR
WM26	Data to write to EC1CR
WM27	Data to write to EC2CR
WM28	Data to write to EC3CR
WM29	Data to write to CMCR

Setting for ASR connection

IP address : 192.168.0.10

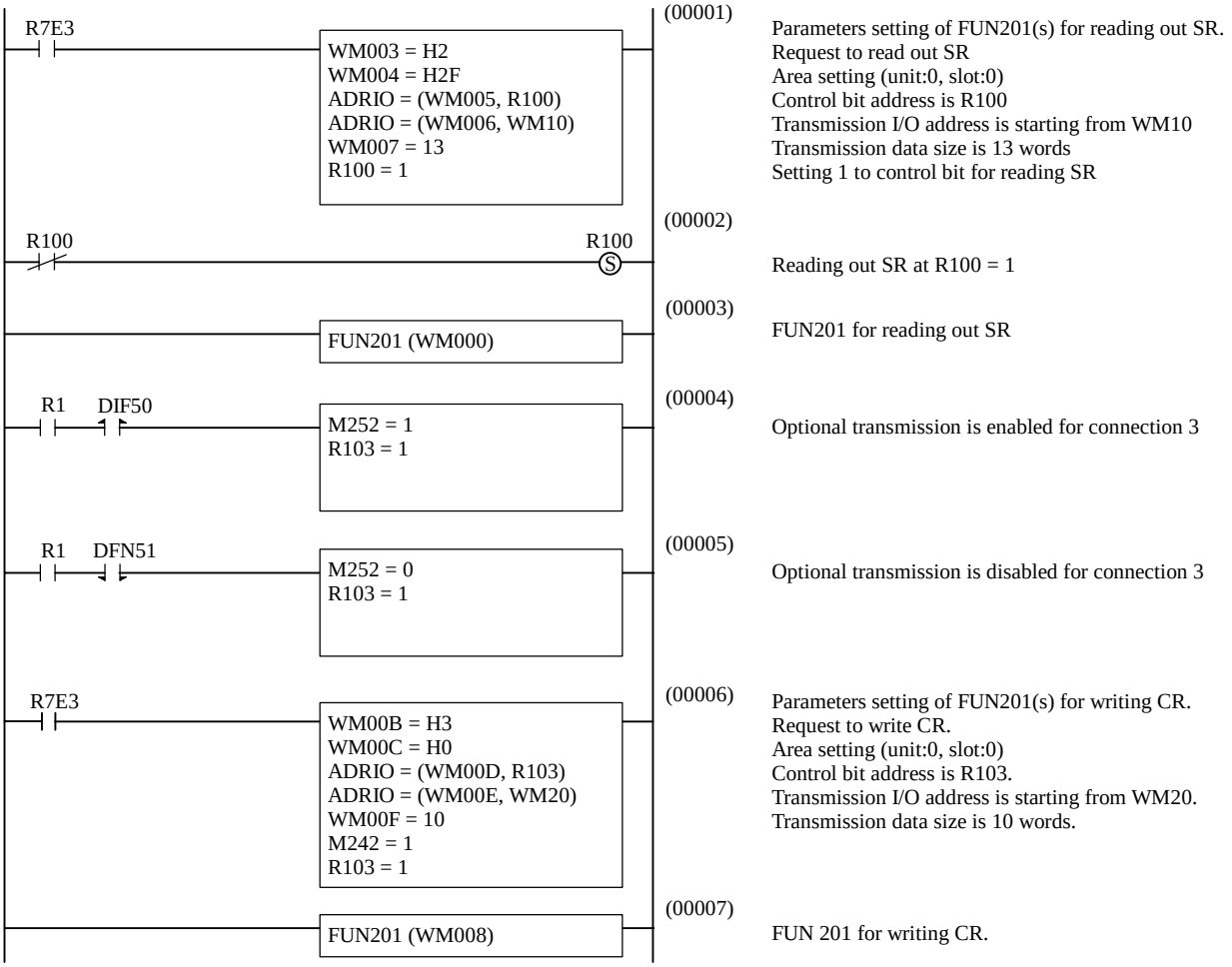
Cn. No.	Own Station				Other Station		Send Information		Send area Info.	
	Usage	Protocol	Open Type	Port No.	IP Address	Port No.	Type	Cyclic Time (s)	I/O / Top	Size (W)
Cn.1	Send	TCP/IP	*(*2)	4101	192.168.0.11	4111	Cyclic	2	WR000	80
Cn.2				4102		4112			WR050	
Cn.3				4103		4113			WR0A0	
Cn.4				4104		4114			WR100	
Cn.5				4105		4115			WR150	
Cn.6				4106		4116			WR1A0	

*2: This can be set as Active or Passive.

Sample program 6 To refresh receiving area with "Optional receiving mode"

(for EH-CPU)

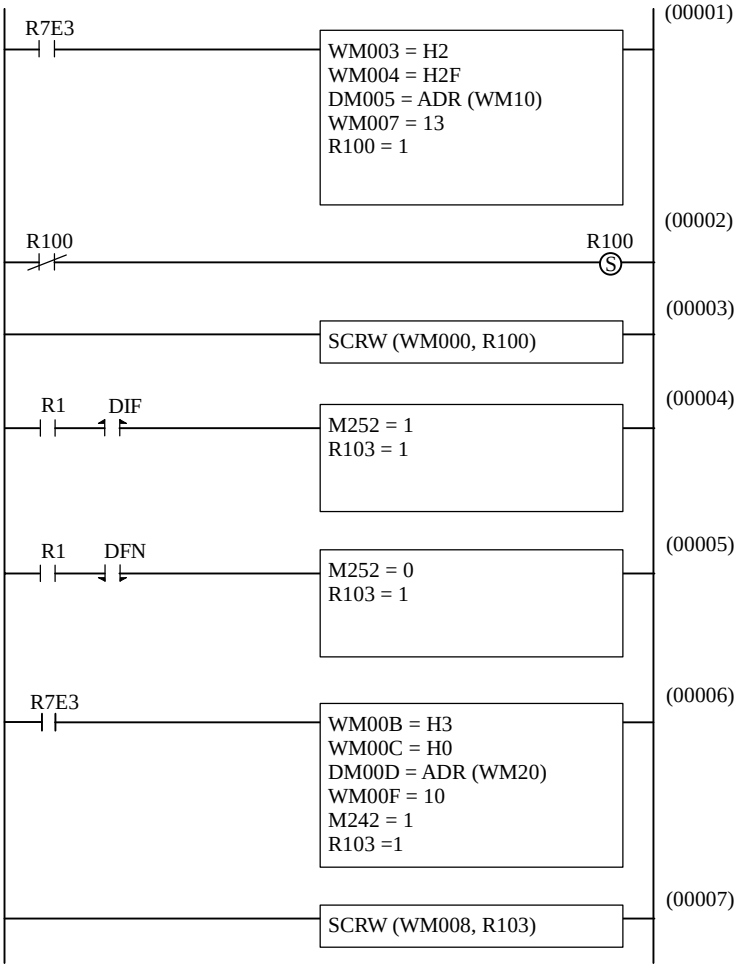
Slot No.	0	1	2
EH-ETH2	*	-	-



Sample program 6 To refresh receiving area with "Optional receiving mode"

(for EHV-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



Parameters setting of SCRW(s) for reading out SR.
Request to read out SR
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM10
Transmission data size is 13 words
Setting 1 to control bit for reading SR

Reading out SR at R100 = 1

SCRW for reading out SR

Optional transmission is enabled for connection 3

Optional transmission is disabled for connection 3

Parameters setting of SCRW (s) for writing CR.
Request to write CR.
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM20.
Transmission data size is 10 words.

SCRW for writing CR.

7.3.2 Event sending

This event sending function is able to send data at any requested timing. This setting is specified in EH-ETH2 Configurator as below. Please refer to "5.4.2 Configuration of ASR connection" for further information.

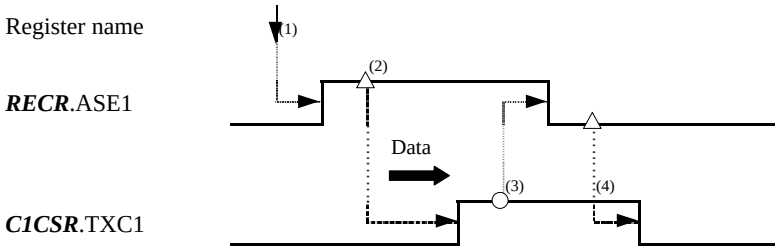
[Setting of parameters]

(1) Select “Event send” at the Type setting.

(2) Enter 0 at text box of Cyclic Time.

[Programming]

Time chart of connection 1 is shown as below.



○ : By user, △ : By EH-ETH2

Figure 7.15 Procedure of event sending.

(1) Set 1 to “Execution bit for event sending” (***RECR***.ASE1).

---------- *Request for event sending*

(2) EH-ETH2 receives the request and sends designated data. After completed, EH-ETH2 sets 1 to ***C1CSR***.TXC1.

---------- *Execution*

(3) Confirm if it is completed by ***C1CSR***.TXC1=1, and cancel the “Execution bit for event sending” (***RECR***.ASE1=0).

---------- *Cancellation of the request for event sending.*

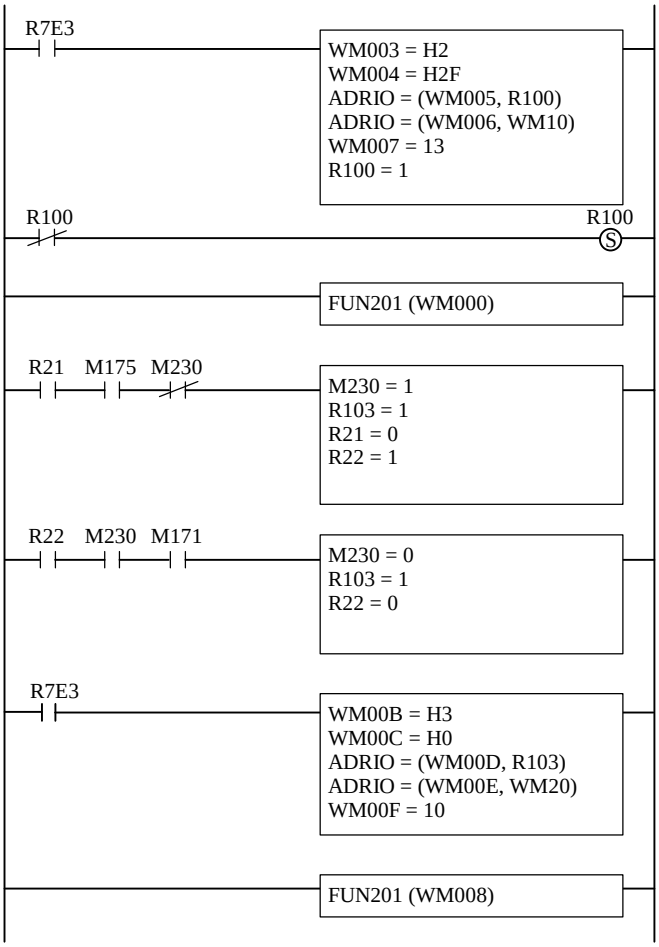
(4) EH-ETH2 receives the request to cancel, and clear the completion flag (***C1CSR***.TXC1).

---------- *Cancellation completed.*

Sample program 7 To execute event sending

(for EH-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



Parameters setting of FUN201(s) for reading out SR.
Request to read out SR
Area setting (unit:0, slot:0)
Control bit address is R100
Transmission I/O address is starting from WM10
Transmission data size is 13 words
Setting 1 to control bit for reading SR

Reading out SR at R100 = 1

FUN201 for reading out SR

Set 1 to “Request for event sending bit”.
Set 1 to “request to write CR bit”.
This circuit disabled.
Next circuit enabled.

Clear “Request for event sending bit”.
Set 1 to “request to write CR bit”.
This circuit disabled.

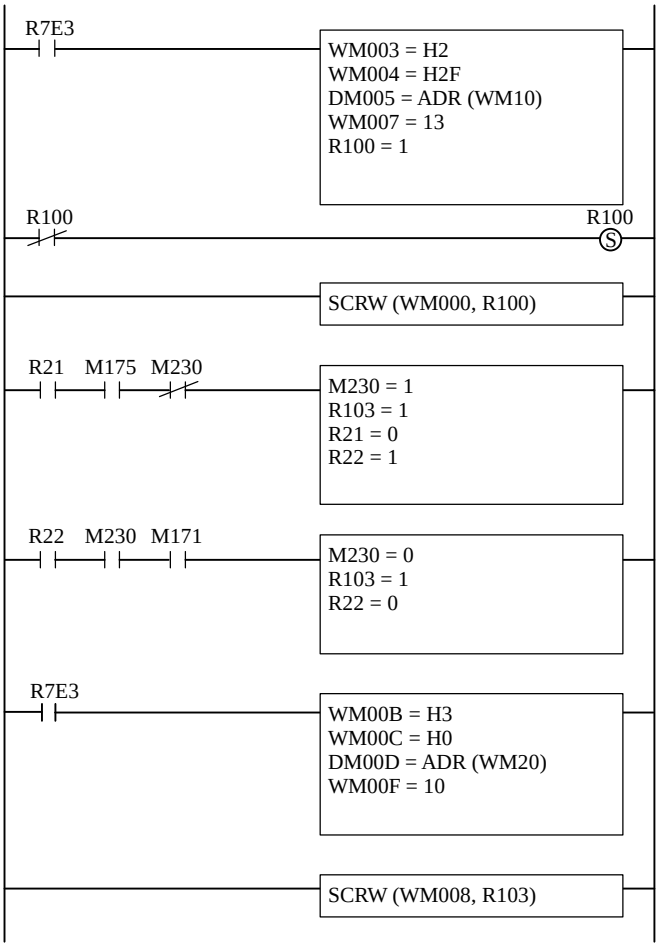
Parameters setting of FUN201(s) for writing CR.
Request to write CR.
Area setting (unit:0, slot:0)
Control bit address is R103.
Transmission I/O address is starting from WM20.
Transmission data size is 10 words.

FUN 201 for writing CR.

Sample program 7 To execute event sending

(for EHV-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



(00001)
Parameters setting of SCRW(s) for reading out SR.
Request to read out SR
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM10
Transmission data size is 13 words
Setting 1 to control bit for reading SR

(00002)
Reading out SR at R100 = 1

(00003)
SCRW for reading out SR

(00004)
Set 1 to “Request for event sending bit”.
Set 1 to “request to write CR bit”.
This circuit disabled.
Next circuit enabled.

(00005)
Clear “Request for event sending bit”.
Set 1 to “request to write CR bit”.
This circuit disabled.

(00006)
Parameters setting of SCRW (s) for writing CR.
Request to write CR.
Area setting (unit:0, slot:0)
Transmission I/O address is starting from WM20.
Transmission data size is 10 words.

(00007)
SCRW for writing CR.

Chapter 8 Register Structure

The register structures of this module are described here.

EH-ETH2 has Status Register (SR) and Control Register (CR). The Status Register is for reading only and mainly set communication status of each connection. The Control Register is for writing only and used to control ASR operation.

User program is able to check communication status and control communication operation by these registers . The dedicated commands (**FUN201** for EH-CPUs**, SCRW** for EHV-CPUs) are used to read Status Register and write Control Register in the user program.

8.1 Status Registers

The information (Communication parameter) related with communication of this module is shown by the status area. Figure 8.1 shows the map of the status area. The status area is structured with 13 kinds of resisters. Each register size is 1 word (16bits).

To get the data of this status area, the dedicated commands (**FUN201** or **SCRW**) should be used in the user program.

I/O No.	Status Registers	
+0	Module status	(*MDSR*)
+H1	Connection 1 error status	(*C1ESR*)
+H2	Connection 2 error status	(*C2ESR*)
+H3	Connection 3 error status	(*C3ESR*)
+H4	Connection 4 error status	(*C4ESR*)
+H5	Connection 5 error status	(*C5ESR*)
+H6	Connection 6 error status	(*C6ESR*)
+H7	Connection 1 communication status	(*C1CSR*)
+H8	Connection 2 communication status	(*C2CSR*)
+H9	Connection 3 communication status	(*C3CSR*)
+HA	Connection 4 communication status	(*C4CSR*)
+HB	Connection 5 communication status	(*C5CSR*)
+HC	Connection 6 communication status	(*C6CSR*)

Figure 8.1 The structure of status area

Module status register (*MDSR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+0	-	-	-	-	-	-	-	-	-	OPM	-	EIE	AVR	ATR	IERR	ERR

Bit 15-7: Reserved

These bits are reserved bits. Usually "0" are set.

Bit 6: Operation mode bit (OPM)

The status of DIP-switch 1 is reflected on this bit.

Bit6: OPM	Description
0	Normal operation mode
1	The other mode.

Bit 5: Reserved

This bit ais reserved bit. Usually "0" are set.

Bit 4: Ethernet information configuration error bit (EIE)

Illegal Ethernet parameters are set. In the case of this bit set "1", IER LED turns on.

Bit4: EIE	Description
0	There is no error.
1	The illegal Ethernet parameters configuration (set-up) is detected.

Bit 3: Existence response bit (AVR)

The result of general working check for EH-ETH2. The data (IAV bit of Control Register) will be reflected here.

Bit3: AVR	Description
0	The data set in Existence confirmation request bit (IAV) of Control Register are reflected.
1	

Bit 2: Automatic Sending/Receiving enable bit (ATR)

This bit shows the current specified status of Automatic Sending/Receiving function is disable or enable.

Bit2: ATR	Description
0	Automatic Sending/Receiving function is disable.
1	Automatic Sending/Receiving function is enable.

Bit 1: IER LED lighting condition bit (IERR)

This bit shows the current condition of IER LED.

Bit1: IERR	Description
0	IER LED is turned off.
1	IER LED is turned on.

Bit 0: ERR LED lighting condition bit (ERR)

This bit show the current condition of ERR LED.

Bit0: ERR	Description
0	ERR LED is turned off.
1	ERR LED is turned on.

Connection *n* error status register (*CnESR*) *n* = 1 to 6

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H1	-	-	-	-	-	-	-	-	-	ATE1	SNE1	RCE1	RAE1	-	STE1	OE1
:																
+H6	-	-	-	-	-	-	-	-	-	ATE6	SNE6	RCE6	RAE6	-	STE6	OE6

The error condition of each connection (1 to 6) is shown in this area.

Bit 15-7: Reserved

These bits are reserved. Normally "0" is set.

Bit 6: ASR table set-up error bit (ATE[6:1])

These bits show the error condition of Automatic Sending/Receiving (ASR) table set-up.

Bit6: ATE[6:1]	Description
0	No error is detected in ASR table set-up.
1	An error is detected in ASR table set-up.

Method to clear : To clear these bits to "0", please set the correct ASR table again.

Bit 5: Send error bit (SNE[6:1])

These bits are set below condition.

- At data send, there is a error of data transmission between EH-ETH2 and CPU module.
- There is a request for sending data to EH-ETH2 before EH-ETH2 has not completed the previous data sending process.

When “send data error” occurs, data in the sending area in CPU module is guaranteed, but data in the sending buffer in EH-ETH2 and receiving data at other station are not guaranteed.

Bit5: SNE[6:1]	Description
0	No error is detected during the data sending.
1	An error is detected during the data sending.

Method to clear : To clear these bits to "0", please set "1" to SNC[6:1] of EC3CR.

Bit 4: Receive error bit (RCE[6:1])

These bits are set below condition.

- At data receiving, there is a error of data transmission between EH-ETH2 and CPU module.

When receive error occurs, receiving area data in CPU module and receiving buffer data in EH-ETH2 and receiving data at other station are not guaranteed.

Bit4: RCE[6:1]	Description
0	No error is detected during the data receiving.
1	An error is detected during the data receiving.

Method to clear: To clear these bits to "0", please set "1" to RCC[6:1] of EC3CR.

Bit 3: Receive area error bit (RAE[6:1])

These bits show the receiving data size is more than allowed size or not.

Bit3: RAE[6:1]	Description
0	Size of received data dose not exceed Receive area size.
1	Size of received data exceeds Receive area size.

Method to clear: To clear these bits to "0", please set "1" to RAC[6:1] of EC2CR.

Bit 2: Reserved

This bit is reserved. Normally "0" is set.

Bit 1: Send timeout error bit (STE[6:1])

These bit the timeout condition during sending data.

Bit1: STE[6:1]	Description
0	No timeout error is detected during sending data.
1	A timeout error is detected during sending data.

Method to clear: To clear these bits to "0", please set "1" to TEC[6:1] of EC1CR.

Bit 0: Open error bit (OE[6:1])

These bits show the condition during opening connection.

Bit0: OE[6:1]	Description
0	No error is detected during opening connection.
1	An error is detected during opening connection.

Method to clear: To clear these bits to "0", please set "1" to OEC[6:1] of EC1CR.

Connection *n* communication status register (*CnCSR*) *n* = 1 to 6

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H7	-	-	-	-	-	-	-	-	-	CRO1	SMF1	-	ERF1	RXC1	TXC1	OPC1
:																
+HC	-	-	-	-	-	-	-	-	-	CRO6	SMF6	-	ERF6	RXC6	TXC6	OPC6

The connection condition of each connection is shown in this area.

Bit 15-7: Reserved

These bits are reserved. Normally "0" is set.

Bit 6: Close request from other station flag (CRO[6:1])

In case close mode bit(CM[6:1]) of Close mode control register(CMCR) is 1, when there is a close request from other station, this bit is set 1.

When own station executes close procedure and connection is closed, system clear 0.

In case close mode bit(CM[6:1]) of Close mode control register(CMCR) is 0, this bit is always 0.

Bit6: CRO [6:1]	Description
0	There is no close request.
1	There is a close request from other station.

Bit 5: Send mode flag (SMF[6:1])

These flags show the specified condition of send mode whether Cyclic or Event for each connection.

Bit5: SMF[6:1]	Description
0	Cyclic send mode.
1	Event send mode.

Bit 4: Reserved

This bit is reserved. Normally "0" is set.

Bit 3: Exclusive receive control flag (ERF[6:1])

These flags show the specified condition of exclusive receive control whether enable or disable.

Bit3: ERF[6:1]	Description
0	Exclusive receive control is disable.
1	Exclusive receive control is enable.

Bit 2: Receive complete bit (RXC[6:1])

These bits are set at below condition.

- Automatic receiving mode is optional mode, and receive area refresh execute bit(ARE[6:1]) of Ready receive control register(RDCR) is "1".

These bits are not changed during normal mode of Automatic Receiving mode.

Bit2: RXC[6:1]	Description
0	Receive not completed.
1	Receive completed.

Bit 1: Transmit complete bit (TXC[6:1])

These bits show the condition of data transmit.

Bit1: TXC[6:1]	Description
0	Transmit not completed
1	Transmit completed.

Bit 0: Open condition bit (OPC[6:1])

These bits show the open condition of the connection.

Bit0: OPC[6:1]	Description
0	Open not completed. (Connection is not established)
1	Open completed. (Connection is established)

8.2 Control Registers

The information to control this module operation are passed from CPU module to this module via Control area. Figure 8.2 shows the map of the control area. The control area is structured with 9 kinds of registers. Each register size is 1 word (16bits).

To put the data of this control area, the dedicated commands (FUN201 or SCRW) are prepared for user program.

I/O No.	Control Registers	
+0	Module control	(*MDCR*)
+H1	Connection control	(*CNCR*)
+H2	-	-
+H3	Ready/Event send control	(*RECR*)
+H4	Exclusive receive control	(*EXRR*)
+H5	Ready receive control	(*RDCR*)
+H6	Error clear1 control	(*EC1CR*)
+H7	Error clear2 control	(*EC2CR*)
+H8	Error clear3 control	(*EC3CR*)
+H9	Close mode control	(*CMCR*)

Figure 8.2 The structure of control area

Module control register (*MDCR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+0													AEN	IAV	EC1	EC0

Bit 15-4: Reserved

These bits are reserved. Please set "0" always.

Bit 3: Automatic Sending/Receiving enable bit (AEN)

To specify whether Automatic Sending/Receiving function is used or not.

Bit3: AEN	Description
0	Request to disable Automatic Sending/Receiving function. (Initial set)
1	Request to enable Automatic Sending/Receiving function.

The confirmation of this bit control can be confirmed referring ATR bit of Module status register (MDSR) bit2.

Bit 2: Request bit to confirm existence of the module (IAV)

This bit is used when to confirm this module is alive or not. The value specified this bit is reflected to AVR bit of Module status register(MDSR) bit3. If the set value is not reflected to AVR, some problem may be happen in this module. If this bit programmed to set by user program, the value of this bit will not be reflected without starting run of CPU module.

Bit2: IAV	Description
0	Request to clear the existence response bit (AVR) of status area. (Initial set)
1	Request to set the existence response bit (AVR) of status area.

Bit 1: IER LED indication/Clear bit (EC1)

This bit is used to turn IER LED off. And also this bit clear IERR bit of Module status register bit1.

Bit1: EC1	Description
0	Nothing is done. (Initial set)
1	Request to turn IER LED off and clear IERR bit to "0". Bit 6 of CnESR : clear ASR table set-up error bit (ATE) to "0".

Bit 0: ERR LED indication/Clear bit (EC0)

This bit is used to turn ERR LED off. And also this bit clear ERR bit of Module status register bit0.

Bit0: EC0	Description
0	Nothing to done. (Initial set)
1	Request to turn ERR LED off and clear ERR bit to "0". Clear the following bits of CnESR. Bit 0 : Open error bit (OE) Bit 1 : Send timeout error bit (STE) Bit 3 : Receive area error bit (RAE) Bit 4 : Receive error bit (RCE) Bit 5 : Send error bit (SNE)

Connection control register (*CNCR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H1	-	-	CLS6	CLS5	CLS4	CLS3	CLS2	CLS1	-	-	OPN6	OPN5	OPN4	OPN3	OPN2	OPN1

"Open request" and "Close request" for each connection is handled using this register.

Bit 15, 14, 7, and 6: Reserved

These bits are reserved. Please set "0" always.

Bit 13-8: Request bit to close connection (CLS[6:1])

These bits request to close for each connection.

Bit13-8: CLS[6:1]	Description
0	Request to clear Close request. (Initial set)
1	Request to close connection.

Bit 5-0: Request bit to open connection (OPN[6:1])

These bits request to open for each connection.

Bit5-0: OPN[6:1]	Description
0	Request to clear Open request. (Initial set)
1	Request to open connection.

Ready/Event send control register (*RECR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H3	-	-	-	-	-	-	-	-	-	-	ASE6	ASE5	ASE4	ASE3	ASE2	ASE1

Bit 15-6: Reserved

These bits are reserved. Please set "0" always.

Bit 5-0: Event send request bit (ASE[6:1])

This bit works as an Event send request bit.

Bit5-0: ASE[6:1]	Description
0	(1) Request to clear Transmit complete bit (TXC) of Connection n communication status (CnCSR). (Initial set) (2) Event send is not done.
1	Request to execute Event sent to this module.

Exclusive receive control register (*EXRR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H4	-	-	-	-	-	-	-	-	-	-	ARP6	ARP5	ARP4	ARP3	ARP2	ARP1

Bit 15-6: Reserved

These bits are reserved. Please set "0" always.

Bit 5-0: Automatic receive mode selective bit (ARP[6:1])

Bit5-0: ARP[6:1]	Description
0	ASR connection n is selected Normal mode. (Initial set)
1	ASR connection n is selected Optional mode.

Ready receive control register (*RDCR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H5	-	-	-	-	-	-	-	-	-	-	ARE6	ARE5	ARE4	ARE3	ARE2	ARE1

Bit 15-6: Reserved

These bits are reserved bits. Please set "0" always.

Bit 5-0: Receive Ready bit (ARE[6:1])

This bit is effective to the connection which is declared as the connection on which Automatic Sending/Receiving function is effective and Exclusive receive control set as enable. Therefore, this bit is ignored when the connection which is declared as the other condition.

Bit5-0: ARE[6:1]	Description
0	(1) Request to clear transmit complete bit (RXC) of Connection n communication status (CnCSR). (Initial set) (2) The received data in the buffer of this module is not transmit to receive area in CPU module. (This data is discarded in this module.)
1	Request to transmit the data from receive buffer in this module to receive area of CPU module.

Error clear 1 control register (*EC1CR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H6	-	-	TEC6	TEC5	TEC4	TEC3	TEC2	TEC1	-	-	OEC6	OEC5	OEC4	OEC3	OEC2	OEC1

This register is used for to clear the bits related to connection error.

Bit 15, 14, 7 and 6: Reserved

These bits are reserved bits. Please set "0" always.

Bit 13-8: STE[6:1]clear bit (TEC[6:1])

These bits request to clear Send timeout error bit (STE[6:1]) in Connection n error status register (CnESR).

Bit13-8: TEC[6:1]	Description
0	Nothing is done. (Initial set)
1	Request to clear STE[6:1] bits.

Bit 5-0: OE[6:1] clear bit (OEC[6:1])

These bits request to clear Open error bit (OE[6:1]) in Connection n error status register.

Bit5-0: OEC[6:1]	Description
0	Nothing is done. (Initial set)
1	Request to clear OE[6:1] bits.

Error clear 2 control register (*EC2CR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H7	-	-	RAC6	RAC5	RAC4	RAC3	RAC2	RAC1	-	-	-	-	-	-	-	-

This register is used for to clear the bits related to connection error.

Bit 15, 14, 7 and 6: Reserved

These bits are reserved bits. Please set "0" always.

Bit 13-8: RAE[6:1]clear bit (RAC[6:1])

These bits request to clear Send timeout error bit (RAE[6:1]) in Connection n error status register (CnESR).

Bit13-8: RAC[6:1]	Description
0	Nothing is done. (Initial set)
1	Request to clear RAE[6:1] bits.

Bit 5-0: Reserved

These bits are reserved bits. Please set "0" always.

Error clear 3 control register (*EC3CR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H8	-	-	SNC6	SNC5	SNC4	SNC3	SNC2	SNC1	-	-	RCC6	RCC5	RCC4	RCC3	RCC2	RCC1

This register is used for to clear the bits related to connection error.

Bit 15, 14, 7 and 6: Reserved

These bits are reserved bits. Please set "0" always.

Bit 13-8: SNE[6:1]clear bit (SNC[6:1])

These bits request to clear Send timeout error bit (SNE[6:1]) in Connection n error status register (CnESR).

Bit13-8: SNC[6:1]	Description
0	Nothing is done. (Initial set)
1	Request to clear SNE[6:1] bits.

Bit 5-0: RCE[6:1] clear bit (RCC[6:1])

These bits request to clear Open error bit (RCE[6:1]) in Connection n error status register.

Bit5-0: RCC[6:1]	Description
0	Nothing is done. (Initial set)
1	Request to clear RCE[6:1] bits.

Close mode control register (*CMCR*)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+H9	-	-	-	-	-	-	-	-	-	-	CM6	CM5	CM4	CM3	CM2	CM1

This is the register which chooses the handling when this module receives Close request from other station.

Bit 15-6: Reserved.

These bits are reserved bits. Please set "0" always.

Bit 13-8: Close mode bit (CM[6:1])

To specify the close mode for each connection.

Bit5-0: CM[6:1]	Description
0	The mode where this module Close connection as soon as this module receives close request from other station. (Initial set)
1	The mode where this module waits for close request from user program when this module receives close request.

Table 8.1 The list of registers

Status Registers

Reg. name	I/O No.	Bit name 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MDSR	+0	-	-	-	-	-	-	-	-	-	OPM	-	EIE	AVR	ATR	IERR	ERR
C1ESR	+H1	-	-	-	-	-	-	-	-	-	ATE1	SNE1	RCE1	RAE1	-	STE1	OE1
C2ESR	+H2	-	-	-	-	-	-	-	-	-	ATE2	SNE2	RCE2	RAE2	-	STE2	OE2
C3ESR	+H3	-	-	-	-	-	-	-	-	-	ATE3	SNE3	RCE3	RAE3	-	STE3	OE3
C4ESR	+H4	-	-	-	-	-	-	-	-	-	ATE4	SNE4	RCE4	RAE4	-	STE4	OE4
C5ESR	+H5	-	-	-	-	-	-	-	-	-	ATE5	SNE5	RCE5	RAE5	-	STE5	OE5
C6ESR	+H6	-	-	-	-	-	-	-	-	-	ATE6	SNE6	RCE6	RAE6	-	STE6	OE6
C1CSR	+H7	-	-	-	-	-	-	-	-	-	CRO1	SMF1	-	ERF1	RXC1	TXC1	OPC1
C2CSR	+H8	-	-	-	-	-	-	-	-	-	CRO2	SMF2	-	ERF2	RXC2	TXC2	OPC2
C3CSR	+H9	-	-	-	-	-	-	-	-	-	CRO3	SMF3	-	ERF3	RXC3	TXC3	OPC3
C4CSR	+HA	-	-	-	-	-	-	-	-	-	CRO4	SMF4	-	ERF4	RXC4	TXC4	OPC4
C5CSR	+HB	-	-	-	-	-	-	-	-	-	CRO5	SMF5	-	ERF5	RXC5	TXC5	OPC5
C6CSR	+HC	-	-	-	-	-	-	-	-	-	CRO6	SMF6	-	ERF6	RXC6	TXC6	OPC6

Control Registers

Reg. name	I/O No.	Bit name 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MDCR	+0	-	-	-	-	-	-	-	-	-	-	-	-	AEN	IAV	EC1	EC0
CNCR	+H1	-	-	CLS6	CLS5	CLS4	CLS3	CLS2	CLS1	-	-	OPN6	OPN5	OPN4	OPN3	OPN2	OPN1
	+H2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RECR	+H3	-	-	-	-	-	-	-	-	-	-	ASE6	ASE5	ASE4	ASE3	ASE2	ASE1
EXRR	+H4	-	-	-	-	-	-	-	-	-	-	ARP6	ARP5	ARP4	ARP3	ARP2	ARP1
RDCR	+H5	-	-	-	-	-	-	-	-	-	-	ARE6	ARE5	ARE4	ARE3	ARE2	ARE1
EC1CR	+H6	-	-	TEC6	TEC5	TEC4	TEC3	TEC2	TEC1	-	-	OEC6	OEC5	OEC4	OEC3	OEC2	OEC1
EC2CR	+H7	-	-	RAC6	RAC5	RAC4	RAC3	RAC2	RAC1	-	-	-	-	-	-	-	-
EC3CR	+H8	-	-	SNC6	SNC5	SNC4	SNC3	SNC2	SNC1	-	-	RCC6	RCC5	RCC4	RCC3	RCC2	RCC1
CMCR	+H9	-	-	-	-	-	-	-	-	-	-	CM6	CM5	CM4	CM3	CM2	CM1

8.3 How to access registers

You use the dedicated commands (**FUN201** for EH-CPUs, **SCRW** for EHV-CPUs) to access EH-ETH2 register. The notation of these commands specification and the usage for this module are described here.

FUN201 command	
Format	FUN 201 (s)
Parameter	Starting I/O No. of the s parameter area
Function	These are the commands to access registers.

- This is the command to read or write Status and Control Register between CPU module and this module.
- The control type supported by this command is only “With hand shaking” for writing. Don’t specify and execute “Without hand shaking” for writing.
- When Status Register is read, select the control type “With hand shaking” or “Without hand shaking”. ("Without hand shaking" is recommended.)

The description of s parameter area

s + 0	(1) Return code
s + 1	(2) System area
s + 2	(Not be allowed to use by user)
s + 3	(3) Control type
s + 4	(4) The start of the area
s + 5	(5) Control bit I/O No. of starting sending or receiving
s + 6	(6) Starting I/O No. of Destination (or Source)
s + 7	(7) Size

The description of control bit table for writing or reading.

+ 0	(8) Starting execution flag
+ 1	(9) The completion flag without error
+ 2	(10) The completion flag with error

The description of the frame

The area should be set by user
The area inhibited to set by user

(8) Starting execution flag

When to start sending or receiving with FUN201 command, please set “1” by user program.

This bit will be reset by system execution when the sending or receiving is completed.

(9) The completion flag without error

This bit will be set to “1” when the sending or receiving by FUN201 command is completed without error. This will be reset by system when FUN201 start to execution.

(10) The completion flag with error

This bit will be set to “1” when the sending or receiving by FUN201 command is completed with error. This will be reset by system when FUN201 start to execution.

(1) Return code

The execution result of FUN201 command is set.

Completed without error -> = H0000

Completed with error -> != H0000

(2) System area

This area is used by system execution when FUN201 command is executed. Don’t use this area by user.

(3) Control type

H0001: The request to get value from Status Register (“With hand shaking” is supported.)

H0002: The request to get value from Status Register (“Without hand shaking” is supported.)

H0003: The request to put value to Control Register.

HA55A: Request to software reset.

Please don't set up any values other than the above.

(4) The start of the area

b15	b11	b7	b0
Unit No.	Slot No.	The position of word	

Unit No.: Always “0” is required

Slot No. : Following value is required.

[For EH-CPU516/548] One of 0 to 7.

[For other EH-CPUs] One of 0 to 2.

The position of word:

[When control type is selected H0001 or H0003]

Always “**H00**” is required

[When control type is selected H0002]

Always “**H2F**” is required

(5) Control bit I/O No. of starting sending or receiving

The actual address value of R, L and M which has the starting I/O No. of the sending or receiving control bit area should be set using ADRIO command.

(6) Starting I/O No. of Destination (or Source)

The actual address value of WR, WL and WM which has the starting I/O No. of the source or destination area should be set using ADRIO command.

(7) Size

The size of using area for sending or receiving should be set. For this module, maximum size is 55 words.

SCRW command	
Format	SCRW (s, t)
Parameter	Starting I/O No. of the s parameter area, Starting I/O No. of the t parameter area
Function	These are the commands to access registers.

- This is the command to read or write Status and Control Register between CPU module and this module.
- The control type supported by this command is only “With hand shaking” for writing. Don’t specify and execute “Without hand shaking” for writing.
- When Status Register is read, select the control type “With hand shaking” or “Without hand shaking”. ("Without hand shaking" is recommended.)

The description of s parameter area

s + 0	(1) Return code
s + 1	(2) System area (Not be allowed to use by user)
s + 3	(3) Control type
s + 4	(4) The start of the area
s + 5	(5) Starting I/O No. of Destination (or Source)
s + 7	(6) Size

The description of t parameter area

t + 0	(7) Starting execution flag
t + 1	(8) The completion flag without error
t + 2	(9) The completion flag with error

The description of the frame

The area should be set by user
The area inhibited to set by user

(7) Starting execution flag
When to start sending or receiving with SCRW command, please set “1” by user program.
This bit will be reset by system execution when the sending or receiving is completed.

(8) The completion flag without error
This bit will be set to “1” when the sending or receiving by SCRW command is completed without error. This will be reset by system when SCRW start to execution.

(9) The completion flag with error
This bit will be set to “1” when the sending or receiving by SCRW command is completed with error. This will be reset by system when SCRW start to execution.

(1) Return code
The execution result of SCRW command is set.
Completed without error -> = H0000
Completed with error -> != H0000

(2) System area
This area is used by system execution when SCRW command is executed. Don’t use this area by user.

(3) Control type
H0001: The request to get value from Status Register (“With hand shaking” is supported.)
H0002: The request to get value from Status Register (“Without hand shaking” is supported.)
H0003: The request to put value to Control Register.
HA55A: Request to software reset.
Please don't set up any values other than the above.

(4) The start of the area

b15	b11	b7	b0
Unit No.	Slot No.	The position of word	

Unit No.: Always “0” is required
Slot No.: One of 0 to 7 is required
The position of word:
[When control type is selected H0001 or H0003]
Always “**H00**” is required
[When control type is selected H0002]
Always “**H2F**” is required

(5) Starting I/O No. of Destination (or Source)
The actual address value of WR, WL, WM and WN which has the starting I/O No. of the source or destination area should be set using ADR command.

(6) Size
The size of using area for sending or receiving should be set. For this module, maximum size is 55 words.

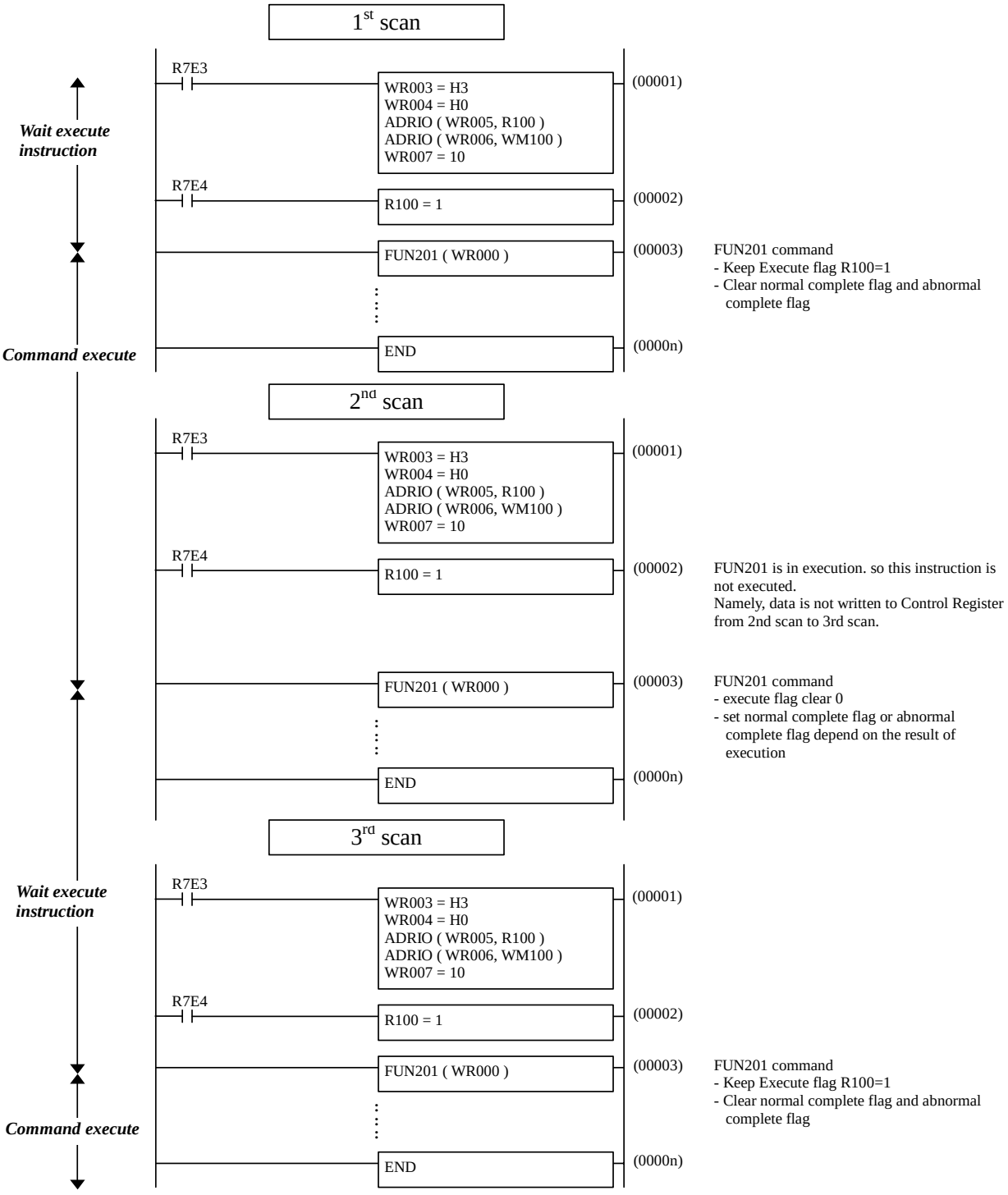
8.3.1 Command processing summary and usage

In this section, we explain the processing summary and usage of these commands with FUN201. (similar about SCRW)

[Operation condition]

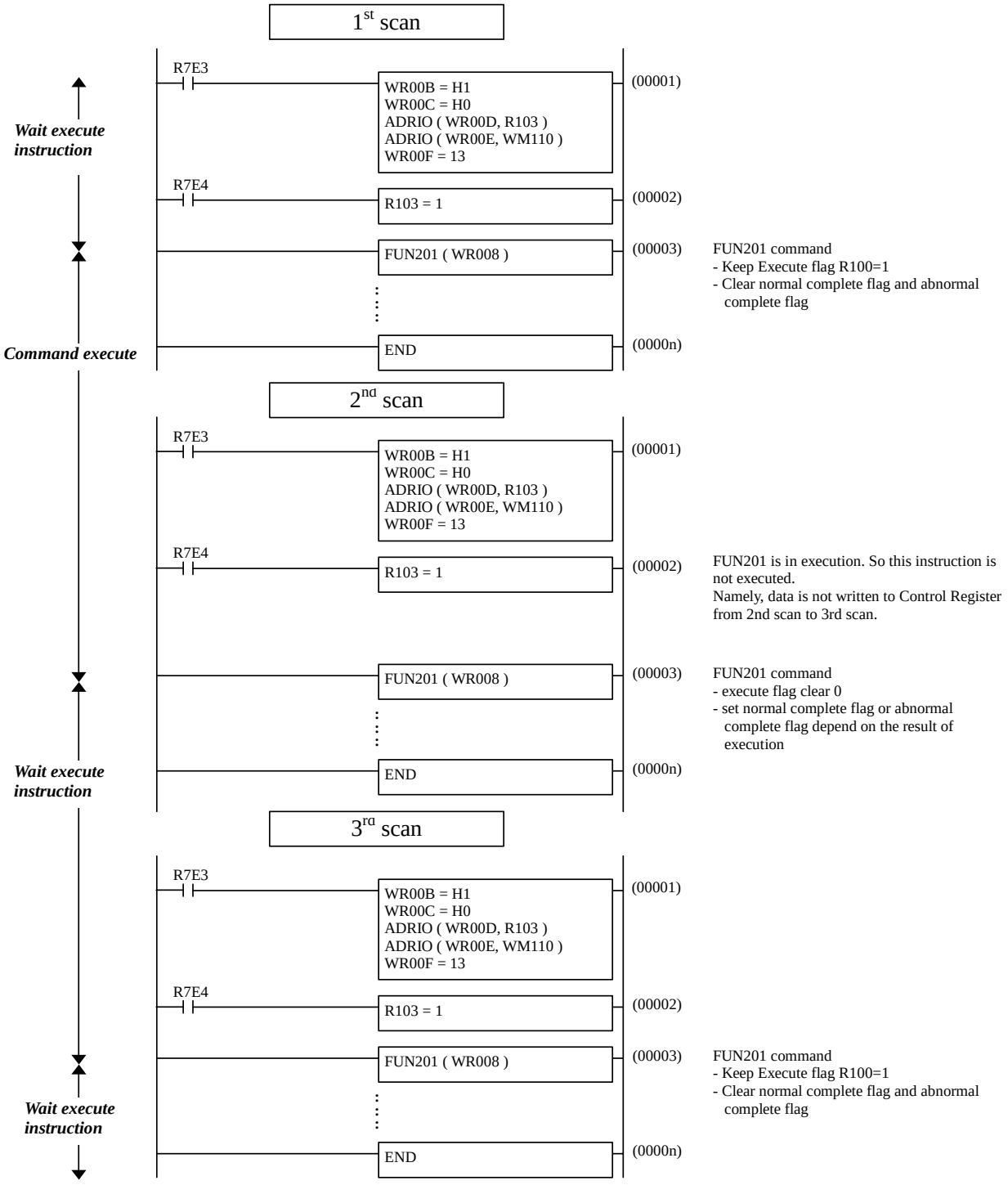
- FUN201 command is in function box without execute condition and in normal scan.
- When you write a data to Control Register in EH-ETH2, set control type "H0003".
- When you read a data from Status Register in EH-ETH2, set control type "H0001(handshake valid)" or "H0002(handshake invalid)".

[Basic operation 1]
To write Control Register (Control type "H0003")



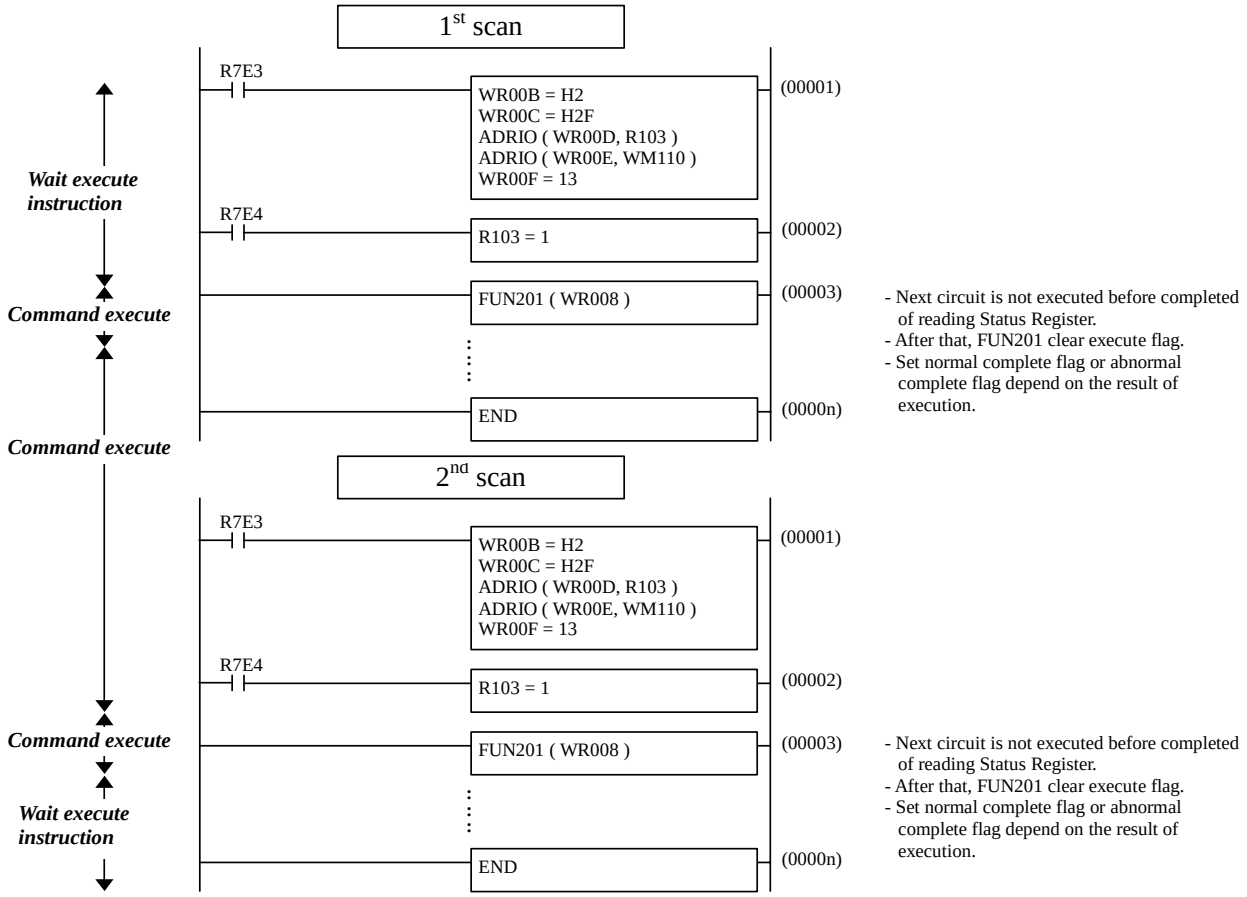
[Basic operation 2]

To read Status Register (Control type "H0001"(handshake valid))



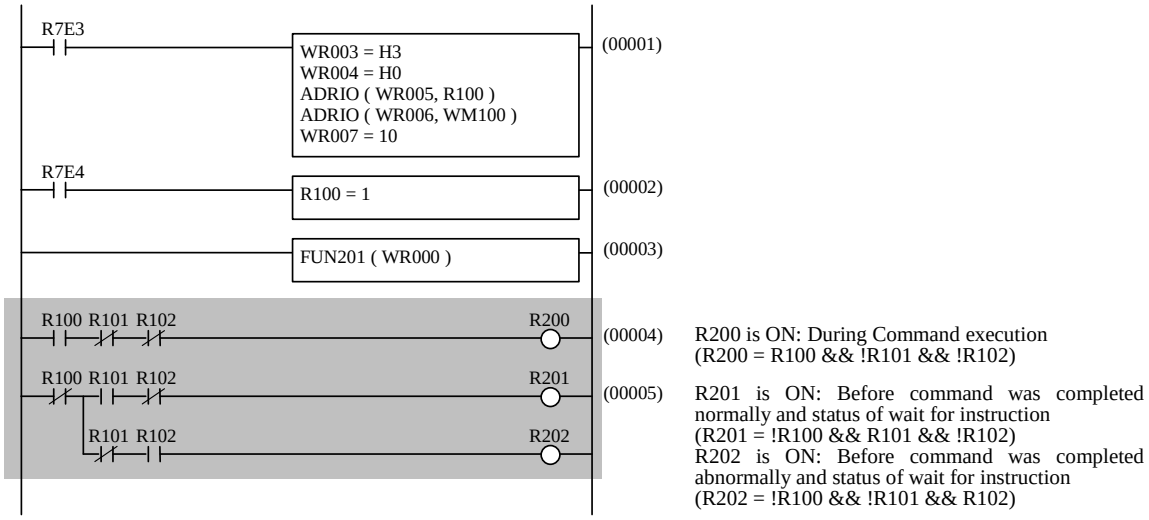
[Basic operation 3]

To read Status Register (Control type "H0002"(handshake invalid))



[Detect of command execution status]

When control type is "H0001" or "H0003" and you add the below two circuits just after FUN201 command circuit, you can detect of command execution status.



Caution:

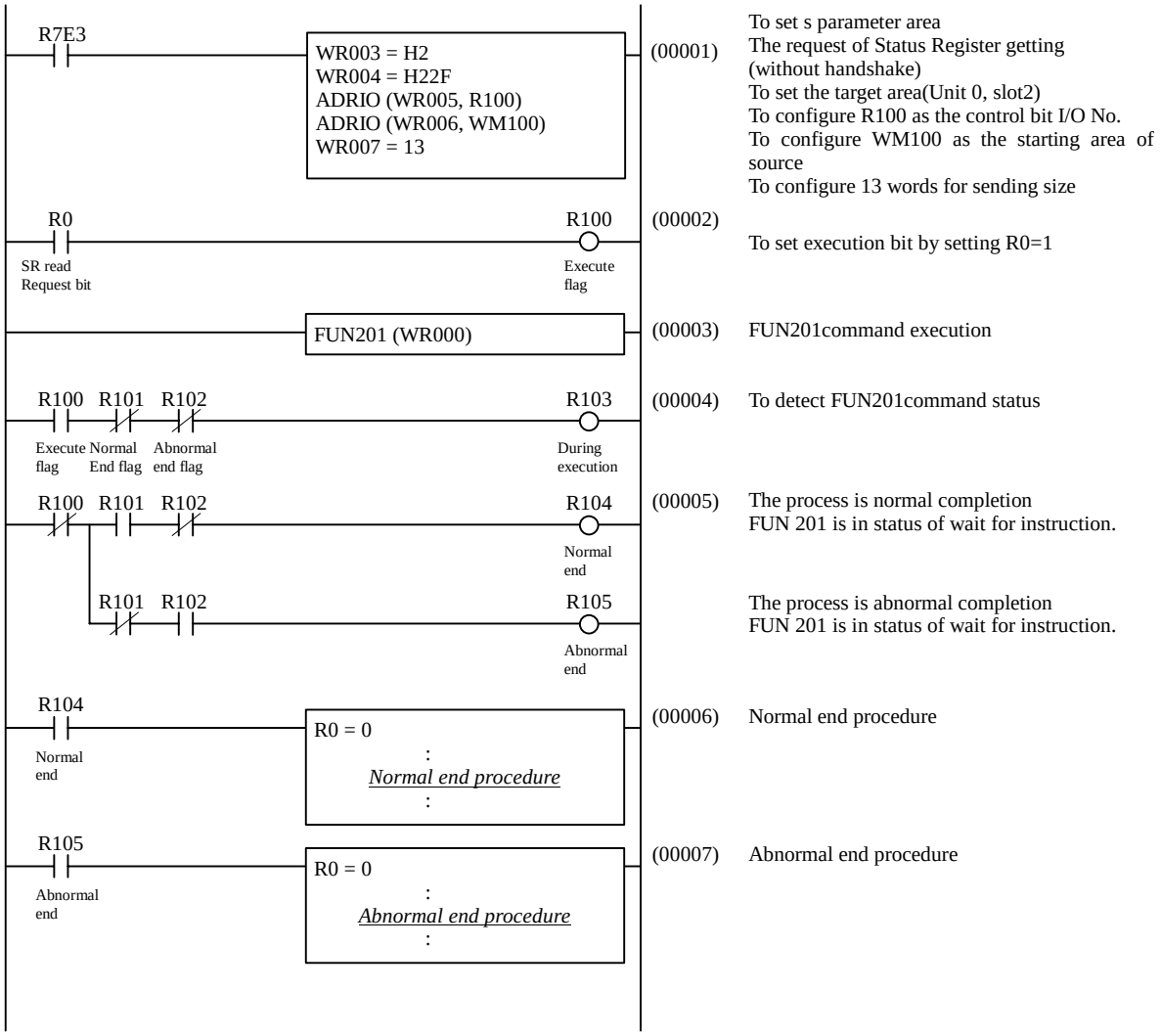
- During execution of command, when system area(s+1, s+2) of s parameter is changed, execution of FUN201 command is not guaranteed.
- If execute flag is set 1, FUN201 command is started to execute maximum 1 scan later.
- When execute flag is 0 and FUN201 is executed, read/write to the applied area is not execute.

Sample program 8 To read Status Register

(for EH-CPU)

Slot No.	0	1	2
EH-ETH2	-	-	*

When FUN201 is executed at R100=1, the value of Status Register will be putting on WM100 to WM10C.

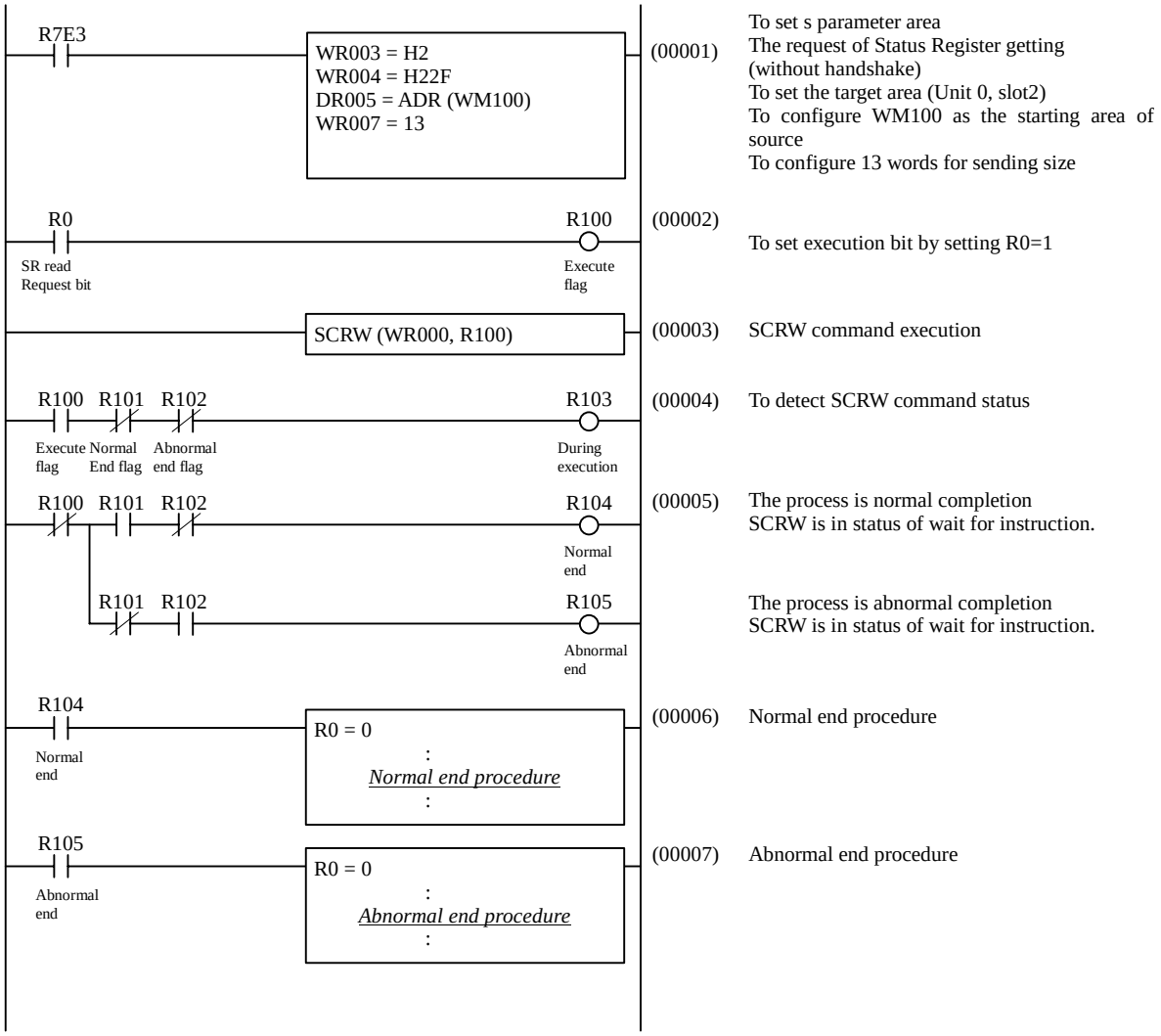


Sample program 8 To read Status Register

(for EHV-CPU)

Slot No.	0	1	2
EH-ETH2	-	-	*

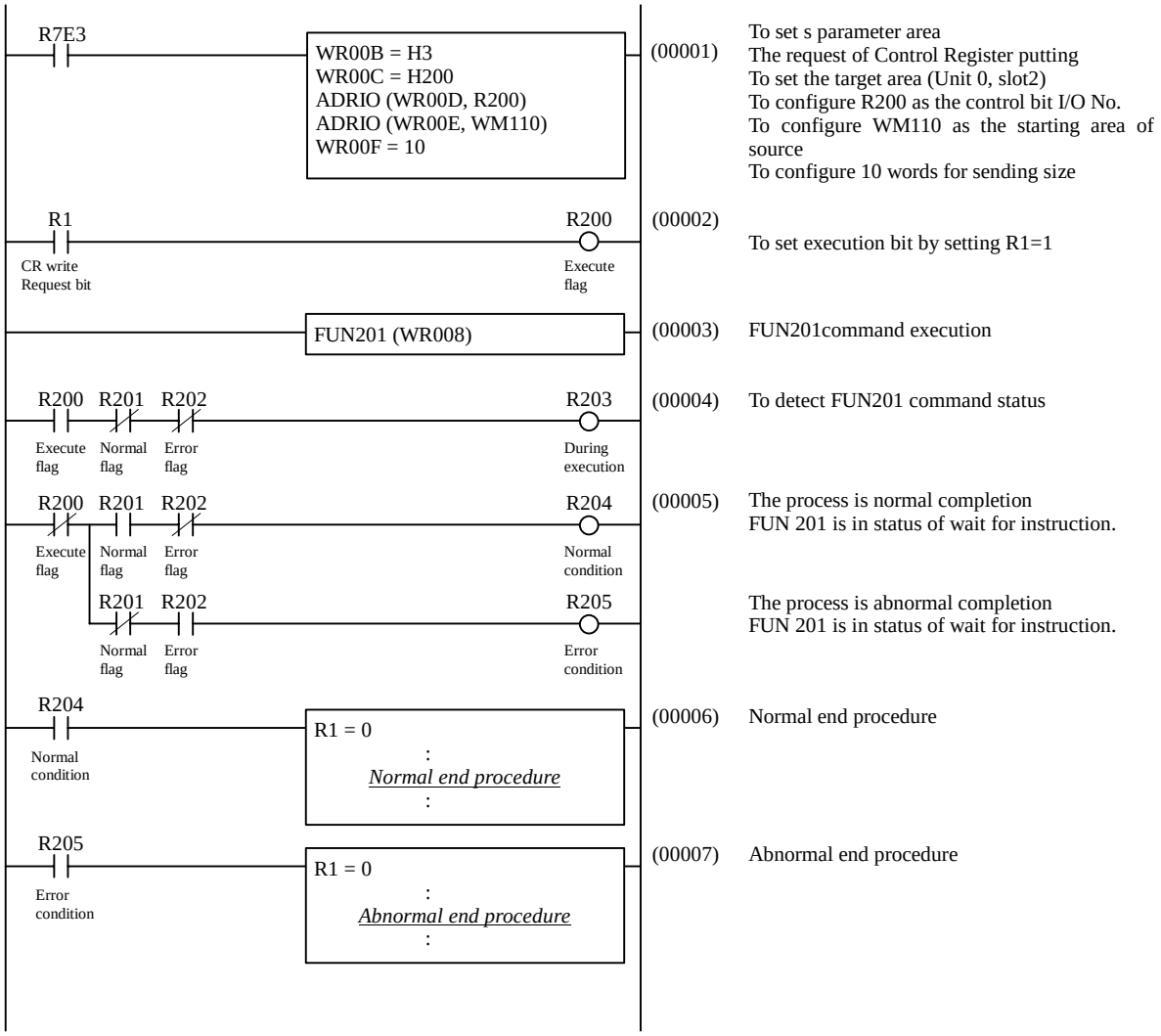
When SCRW is executed at R100=1, the value of Status Register will be putting on WM100 to WM10C.



Sample program 9	To write to Control Register (for EH-CPU)

Slot No.	0	1	2
EH-ETH2	-	-	*

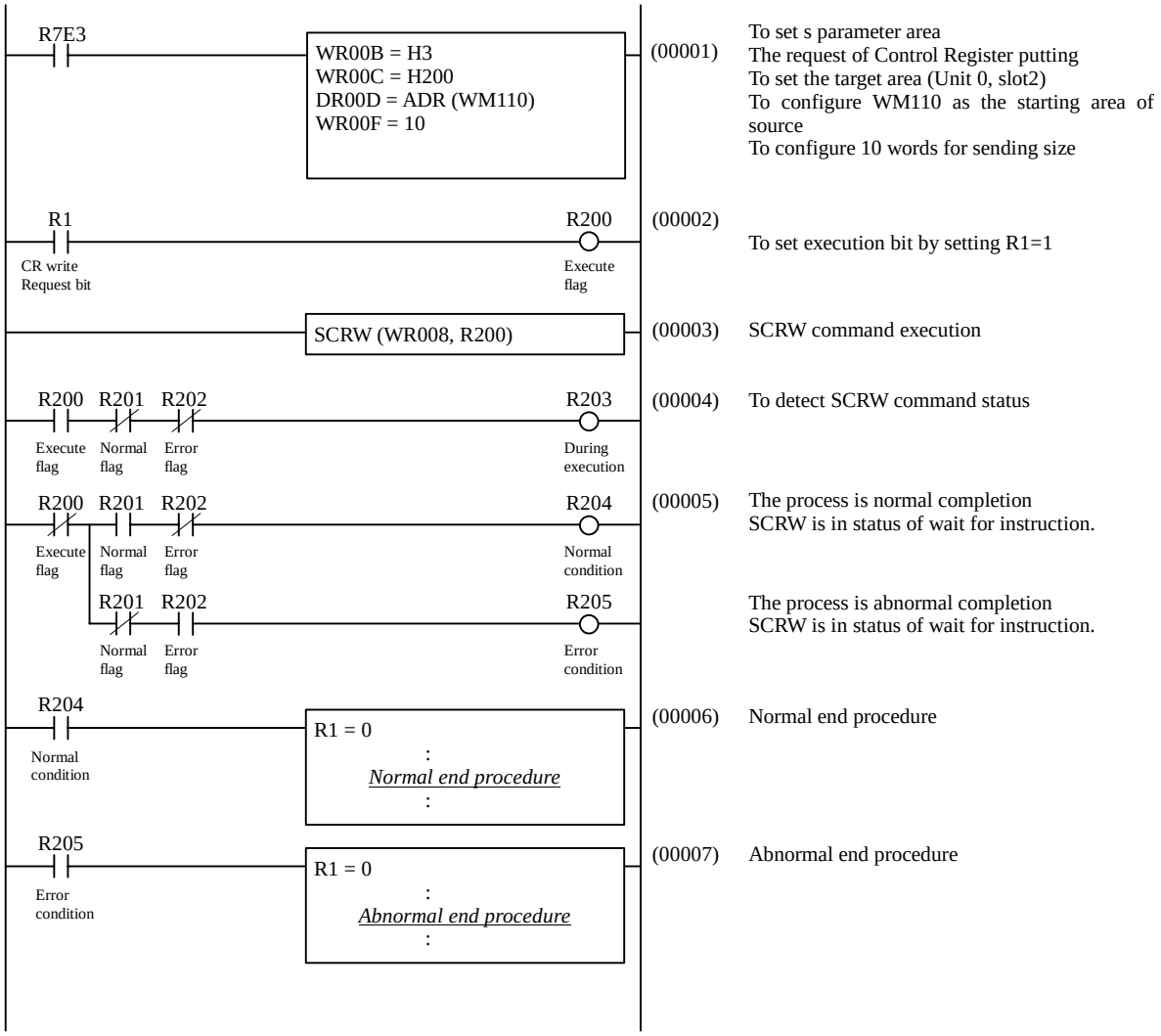
When FUN201 command is executed at R200 = 1, WM110 to WM119 will be putting on Control Register.



Sample program 9	To write to Control Register (for EHV-CPU)

Slot No.	0	1	2
EH-ETH2	-	-	*

When SCRW command is executed at R200 = 1, WM110 to WM119 will be putting on Control Register.



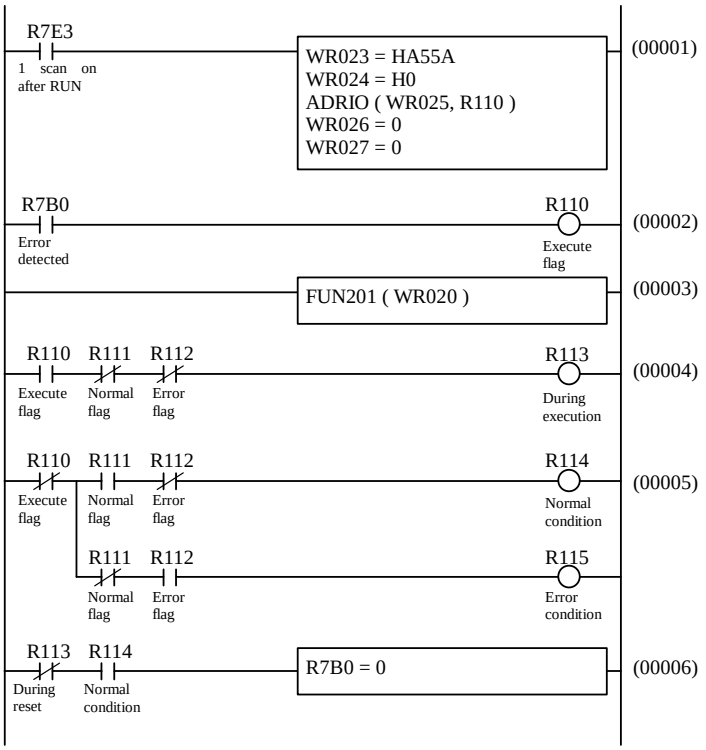
8.3.2 Software reset function

EH-ETH2 support software reset function by the command FUN 201 or SCRW. The below is the sample program of software reset.

Sample program 10 To execute software reset

(for EH-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-

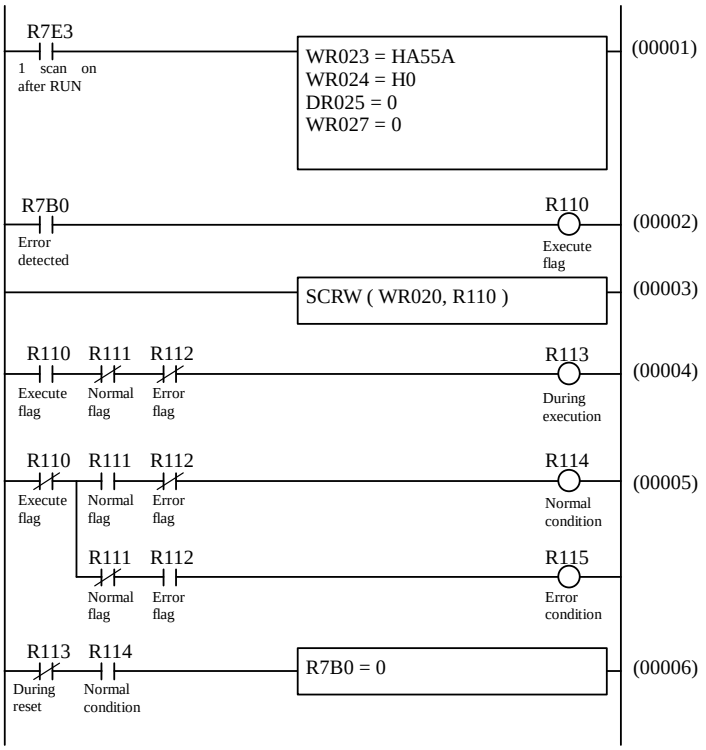


To set s parameter area
Software reset control
To set the target area(unit 0, slot 0)
To configure R110 as the control bit
No need to set starting area
No need to set sending size

Sample program 10 To execute software reset

(for EHV-CPU)

Slot No.	0	1	2
EH-ETH2	*	-	-



To set s parameter area
Software reset control
To set the target area(unit 0, slot 0)
No need to set starting area
No need to set sending size

The average time to complete initial procedure after EH-ETH2 receive software reset request is approx. 3 seconds.

8.4 Data Registers

EH-ETH2 has data registers (WXs0, WYs1)(*1). Data registers consist of Partial data of Status/Control Registers and flags to reset the Ethernet port.

Data registers can be read or write by Arithmetic command. To WXs0 data register, the information of Module status register (MDSR) is assigned. To WYs1 data register, the bits of ERR Clear (EC0) and IER Clear (EC1) in Module control register (MDCR) and the one to reset the Ethernet port are assigned.

Therefore, the information of Module status register (MDSR) can be confirmed on WXs0 and the bits of ERR Clear (EC0) and IER Clear (EC1) in Module control register (MDCR) can be set from WYs1.

*1 : “s” means slot No. that EH-ETH2 is allocated.

WX data register (WXs0)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+0	-	-	-	-	-	-	-	-	-	OPM	-	EIE	AVR	ATR	IERR	ERR

Bit 15-7: Reserved

These bits are reserved bits. Usually "0" are set.

Bit 6: Operation mode bit (OPM)

The status of DIP-switch 1 is reflected on this bit.

Bit6: OPM	Description
0	Normal operation mode
1	The other mode.

Bit 5: Reserved

These bits are reserved bits. Usually "0" are set.

Bit 4: Ethernet information configuration error bit (EIE)

Illegal Ethernet information is set. In the case of this bit set "1", IER LED turns on.

Bit4: EIE	Description
0	There is no error.
1	The illegal Ethernet information configuration (set-up) is detected.

Bit 3: Existence response bit (AVR)

The result of general working check for EH-ETH2. The data (IAV bit of Control Register) will be reflected here.

Bit3: AVR	Description
0	The data set in Existence confirmation Request bit (IAV) of Control area are reflected.
1	

Bit 2: Automatic Sending/Receiving enable bit (ATR)

This bit shows the current specified status of Automatic Sending/Receiving function is disable or enable.

Bit2: ATR	Description
0	Automatic Sending/Receiving function is disable.
1	Automatic Sending/Receiving function is enable.

Bit 1: IER LED lighting condition bit (IERR)

This bit shows the current condition of IER LED.

Bit1: IERR	Description
0	IER LED is turned off.
1	IER LED is turned on.

Bit 0: ERR LED lighting condition bit (ERR)

This bit show the current condition of ERR LED.

Bit0: ERR	Description
0	ERR LED is turned off.
1	ERR LED is turned on.

WY data register (WYs1)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+0	-	APR	A6R	A5R	A4R	A3R	A2R	A1R	T4R	T3R	T2R	T1R	-	-	EC1	EC0

Bit 15: Reserved

This bit are reserved. Please set "0" always.

Bit 14: All Ethernet port reset bit (APR)

This bit is used to reset the all ethernet port.

Bit14: APR	Description
0	Nothing is done. (Initial set)
1	All ethernet port (task code port No.1 to 4 and ASR port No.1 to 6) are reset.

Bit 13 to 8: ASR port reset bit (A6R to A1R)

This bit is used to reset ASR port No.1 to 6 individually.

Bit13 - 8:AnR	Description
0	Nothing is done. (Initial set)
1	ASR port No.n (1 to 6) is reset.

Bit 7 to 4: Task code port reset bit (T4R to T1R)

This bit is used to reset task code port No.1 to 4 individually.

Bit7 - 4:TnR	Description
0	Nothing is done. (Initial set)
1	Task code port No.m (1 to 4) is reset.

Bit 2, 3: Reserved

These bits are reserved. Please set "0" always.

Bit 1: IER LED indication/Clear bit (EC1)

This bit is used to turn IER LED off. And also this bit clear IERR bit of Module status register bit1.

Bit1: EC1	Description
0	Nothing is done. (Initial set)
1	Request to turn IER LED off and clear IERR bit to "0". Bit 6 of CnESR : clear ASR table set-up error bit (ATE) to "0".

Bit 0: ERR LED indication/Clear bit (EC0)

This bit is used to turn ERR LED off. And also this bit clear ERR bit of Module status register bit0.

Bit0: EC0	Description
0	Nothing to done. (Initial set)
1	Request to turn ERR LED off and clear ERR bit to "0". Clear the following bits of CnESR. Bit 0 : Open error bit (OE) Bit 1 : Send timeout error bit (STE) Bit 3 : Receive area error bit (RAE) Bit 4 : Receive error bit (RCE) Bit 5 : Send error bit (SNE)

Chapter 9 Maintenance, Check, Error

Check the module dairy or regularly in order to use EH-ETH2 in best condition and keep the system run normally.

9.1 Dairy Check

Check the following items in operation.
AS to EH-150 series PLC, see the application manual “EH-150 application manual (NJI-280*)” or “EHV-CPU application manual (NJI-481*)”.

Table 9.1 Dairy check item

Check item	LED	Method	Normal	Typical cases of the problem
Status of LEDs	POW	Visual check	ON	Voltage reduction
	IER		OFF	Ethernet setting
	ERR		OFF	Connection open error or communication error
	STS		ON	Blinking : Error (*1)
	WDE		OFF	Hardware error

*1: EH-ETH2 indicates the error content of module by the color and flash interval.
See “4.2 LED indications” for detailed information.

9.2 Regular Check

Take the following check items with power off the PLC and external I/O circuit at least once in half of a year or more frequently according to your condition.

Table 9.2 Regular check

Check item	Details	Measure	Action
Installation	(1) Connection between module and base (2) Connectors (3) Screws (4) Cables	Check if it is no problem.	Tighten the screws Connect firmly Tighten the screws
Connection of transmission cable	Is the cable disconnected?	Check if LINK LED of Ethernet connector is lighting.	Change the cable.
	Is the cable applied irregular weight or tension?	Check if it is no problem	Check the wiring route and if it’s fixed properly.
Appearance	Is the module very dusty? Is there any unusual point?	Check if it is no problem	Cleaning up and implement maintenance
Environment	(1) temperature (2) humidity (3) the others	0 to 55 °C 20 to 90% RH (no condensing) No dust, foreign matter, vibration	Be sure to install in appropriate condition
Spare module	Number of unit, storage condition	Check if it is no problem	-
Program	Check program	The final programs in CPU and in PC must be the same.	Check both master and backup program.

* Be careful not to change the module setting switch by mistake when you clean the module.

CAUTION at the time of the module exchange.
・We recommend that the module exchange is done under the connected equipment's power OFF.
MAC ID for the address resolution managed in the connected equipment side might not be updated if the module exchange is done under the connected equipment's power ON, and therefore, the communication cannot start.

9.3 Error LED and measure

Following table shows the indication and the measure in case an error occurs in communication between EH-ETH2 and other station.

9.3.1 ERR confirmation by LED indication

The LED indications on the module give you information about your network and the module.

Table 9.3 LED indication and Error content

No.	Error content	LED		Cause of error and measurement
		Name	Status	
1	A fault of hardware	WDE	ON	Supply the power or reset by Reset switch to restart.
2	Check sum error of Communication Parameters.	WDE IER	ON	Correct the setting of Communication Parameters.
3	Setting of Communication Parameters is wrong.	IER	ON	Correct the setting of Communication Parameters.
4	Wrong cable	Tx1 / Rx1 LINK LED (of Ethernet connector)	OFF	(1) Wrong kind of cable Check if the using cable is straight or cross type. (2) Wrong connection of cable Check if the cable is plugged in a connector firmly. Check if it is not breaking wire.
5	Connection opening error (active open station) (*1)	ERR STS	ON Blinking	(1) The requested station is not in network. - Check if the station is in the same network. - Check the cables for both own and the other station. (2) Wrong setting at the own station - Check if the IP address and logical port number at the own station. (3) Wrong setting at the other station - Check if the other station is in passive open.
6	Error at data sending			Before the current transmission completed, EH-ETH2 is requested next transmission. - Configure the cyclic transmission period to be longer. - Configure the data size for sending to be smaller.
7	Error at data receiving			Before the current communication completed, EH-ETH2 receives next data. - Configure the transmission period of the other station to be longer. - Configure the data size for receiving to be smaller.

*1: A connection specified passive station does not detect the abnormality below a data link level layer. Therefore, the other station should have detection of error when the connection specified passive station is not open.

9.3.2 How to turn off LED

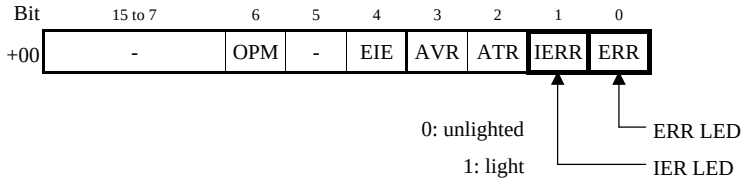
The status of ERR LED and IER LED can be read out or turned off by user program.

(1) Confirm LED light

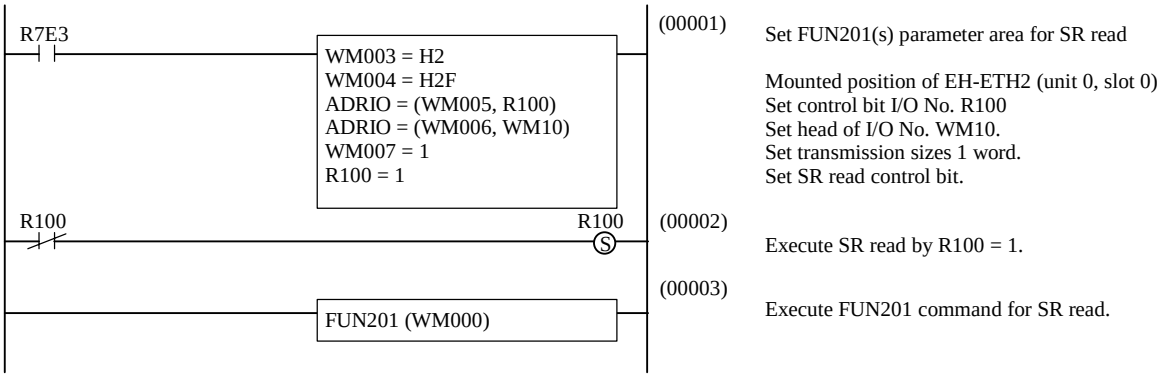
User program can confirm the status (light or unlighted) of ERR and IER.

The status of each LED is stored in Module status register (MDSR) in EH-ETH2.

Module status register (MDSR)



You can read the value of MDSR to WM10 by the below user program (example of EH-CPU). As a result, M100 means the status of ERR LED and M101 means status of IER LED.



(2) How to turn off LED

There are 3 ways to turn off ERR LED or IER LED.

(a) By E.CLR button

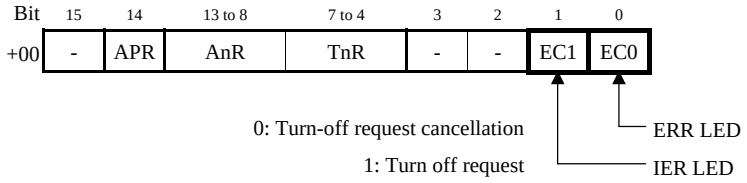
ERR LED and IER LED go off by pushing E.CLR button.In this way, both LED go off. To turn off ERR LED or IER LED individually, operate the way of (b) or (c).

(b) By WYs1

Partial data of Module control register (MDCR) is assigned to WYs1 (*1). By setting "1" in the appropriate bit, corresponding LED goes off.

*1 : "s" means slot No. that EH-ETH2 is allocated.

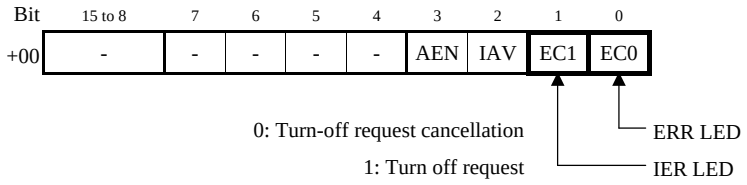
WYs1



(c-1) By user program (for EH-CPU)

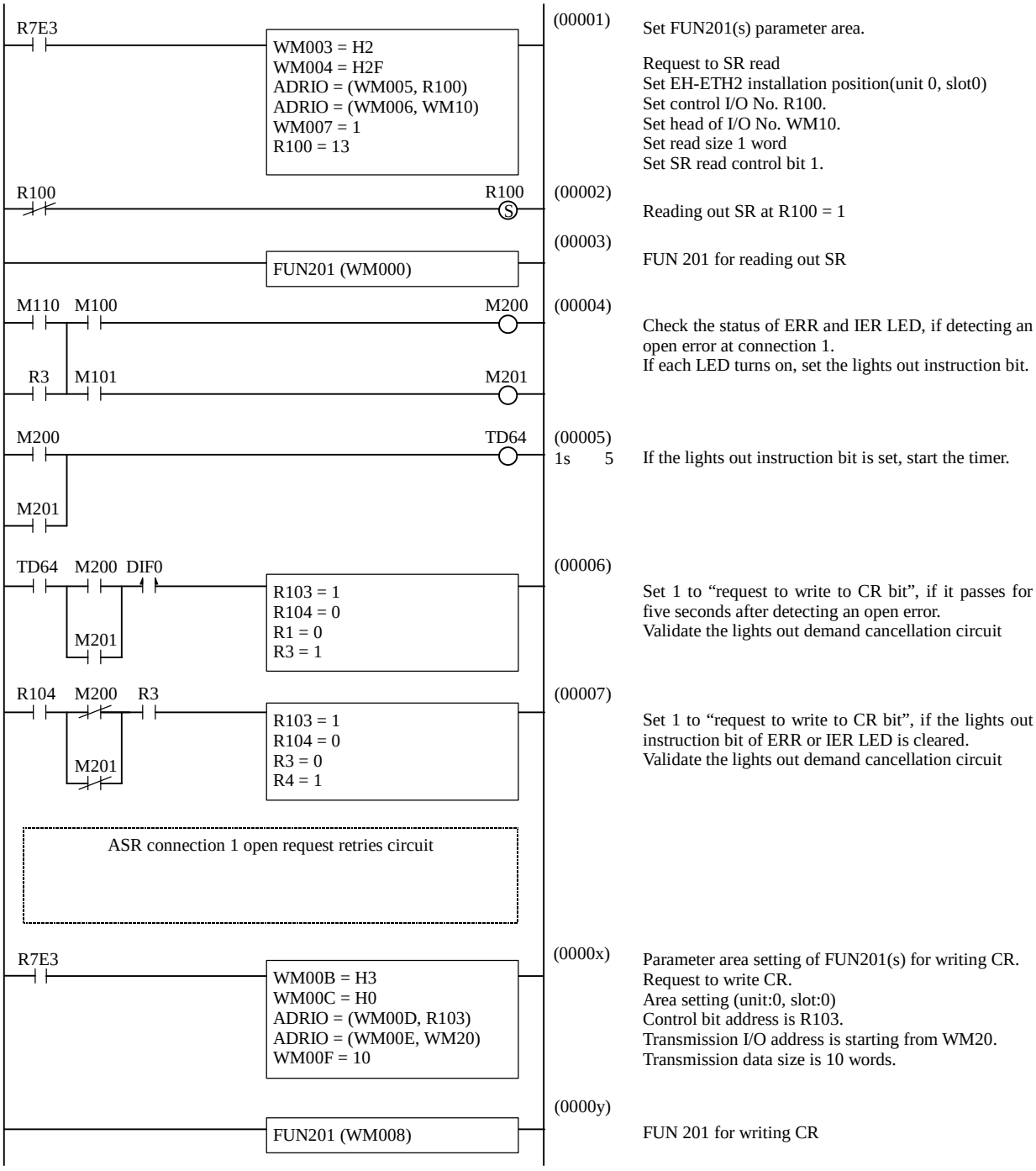
User program can turn off ERR and IER LEDs. To turn each LED off, set Module control register (MDCR).

Module control register (MDCR)



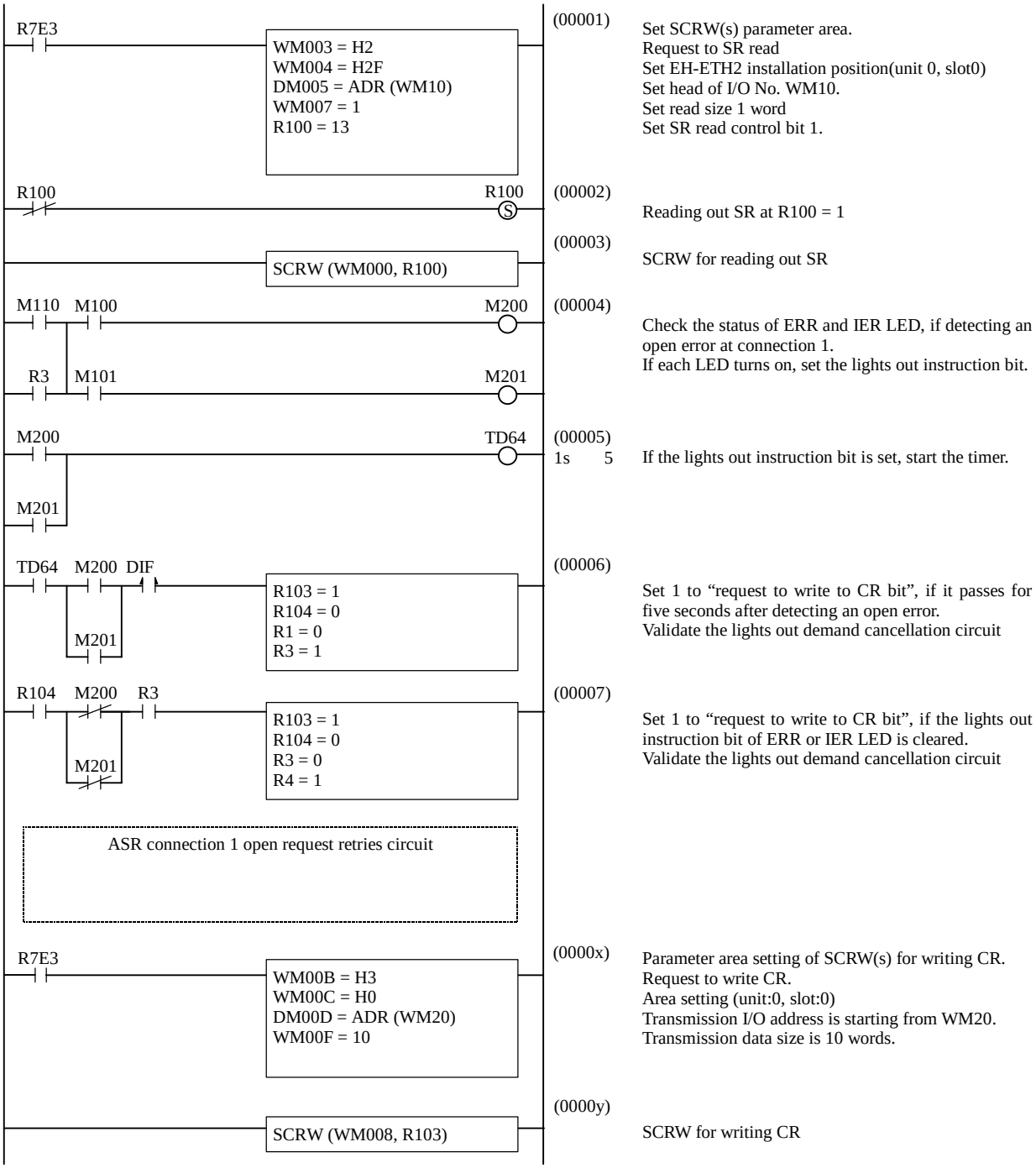
The below user program can monitor the status of ERR and I.ERR LEDs, and turn off LED automatically by the light of LED. This sample program is in case the “open error” happens on ASR connection 1, which is specified as positive station.

Set EC0 bit of MDCR to internal output M200 and EC1 bit to internal output M201 as well.



(c-2) By user program (for EHV-CPU)

The below user program is the sample which converted (c-1) into for EHV-CPUs.



9.3.3 Confirm error by Status Register (SR)

EH-ETH2 has internally Status Register (SR) which stores communication status for each ASR connection. You can monitor this SR and program the retry circuit when the communication error occurs. See the “Chapter 8 Register Structure” for detailed Status Register information.

(1) Open error detected

When open error occurs at the ASR connection of passive station, bit 0 of Connection n error status register (CnESR): open error bit (OEn) is 1.

To confirm if error occurs in open procedure, read this open error bit as occasion demand.

(2) Transmission error detected

When send error occurs at the ASR connection, bit 5 of Connection n error status register(CnESR): send error bit (SNEn) is 1.

(3) Receive error detected

When receive error occurs at ASR connection, bit 4 of Connection n error status register (CnESR): receive error bit (RCEn) is 1.

(4) Receive area error detected

When the size of received data exceeds receive area size at ASR connection, bit 3 of Connection n error status register (CnESR): receive area error bit (RAEn) is 1.

CAUTION

The following errors can not be detected in the Status Register.
Breaking wire or hardware connection error during on line communication (connection open)
Trouble on other stations during on line communication (connection open)

9.4 Special Internal Outputs in the CPU module

The status information on an EH-ETH2 module is stored in the special internal outputs area of CPU module shown in Table 9.4.

Table 9.4 Status information on an EH-ETH2 module

I/O No.	Target slots No.
WRF020	Slot 0
WRF021	
…	…
WRF02E	Slot 7
WRF02F	

[WRF020, F022, F024, F026, F028, F02A, F02C, F02E]

Bit	Description	
0	ASR1 connection status bit	0: Closed 1: Open
1	ASR2 connection status bit	
2	ASR3 connection status bit	
3	ASR4 connection status bit	
4	ASR5 connection status bit	
5	ASR6 connection status bit	
6	ASR1 close request bit	0: No request 1: Request
7	ASR2 close request bit	
8	ASR3 close request bit	
9	ASR4 close request bit	
10	ASR5 close request bit	
11	ASR6 close request bit	
12	Task code port1 status bit	0: Closed 1: Open
13	Task code port2 status bit	
14	Task code port3 status bit	
15	Task code port4 status bit	

[WRF021, F023, F025, F027, F029, F02B, F02D, F02F]

Bit	Description	
0	ASR1 open error status bit	0: Without error 1: Error
1	ASR2 open error status bit	
2	ASR3 open error status bit	
3	ASR4 open error status bit	
4	ASR5 open error status bit	
5	ASR6 open error status bit	
6, 7	Reserved	Always "0"
8	ERR LED status bit	0: Turn off 1: Turn on
9	IER LED status bit	
10	ASR enable status bit	0: Disable 1: Enable
11	AVR flag display bit	The AVR flag of MDSR is displayed.
12	Ethernet information error bit	0: Without error 1: Error
13	Reserved	Always "0"
14	Operation mode bit	0: Normal 1: The other mode
15	Reserved	Always "0"

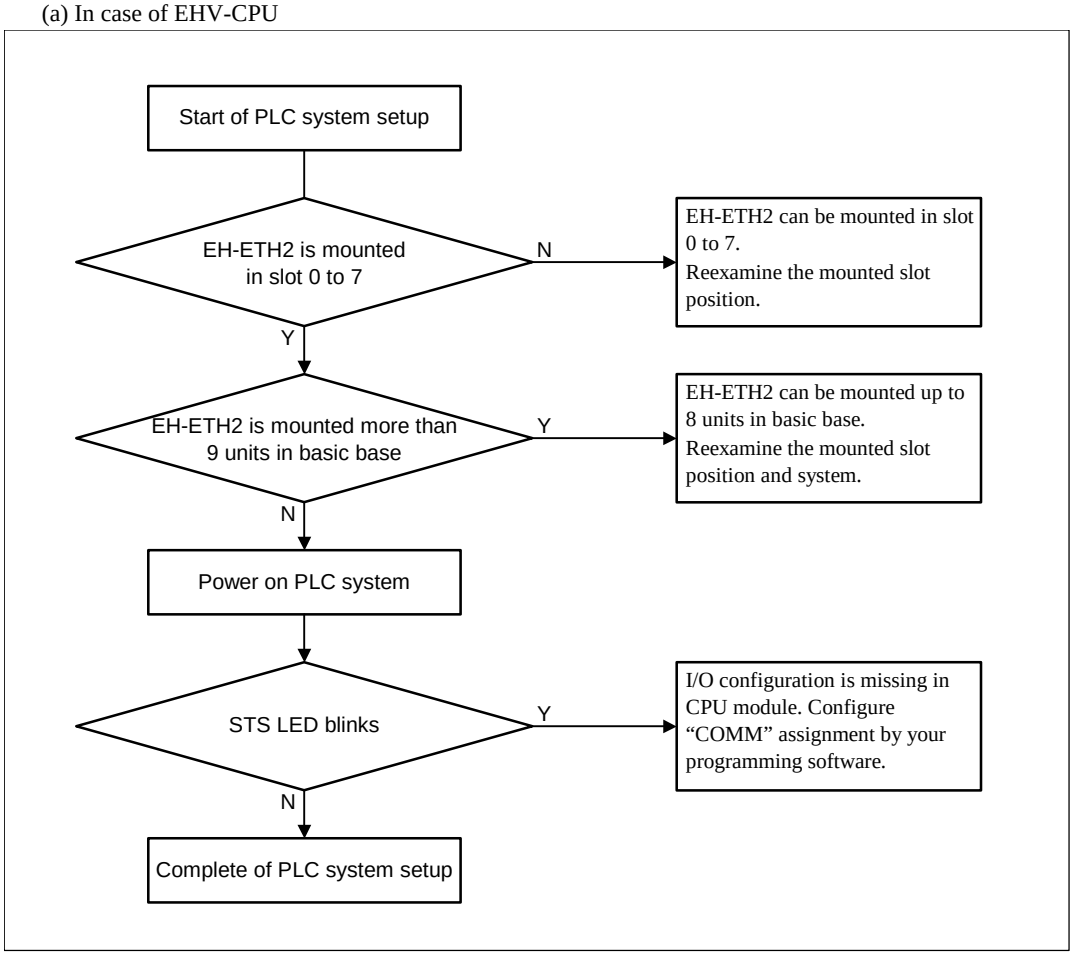
Chapter 10 Troubleshooting

This chapter explains the troubleshooting in case a system using EH-ETH2.

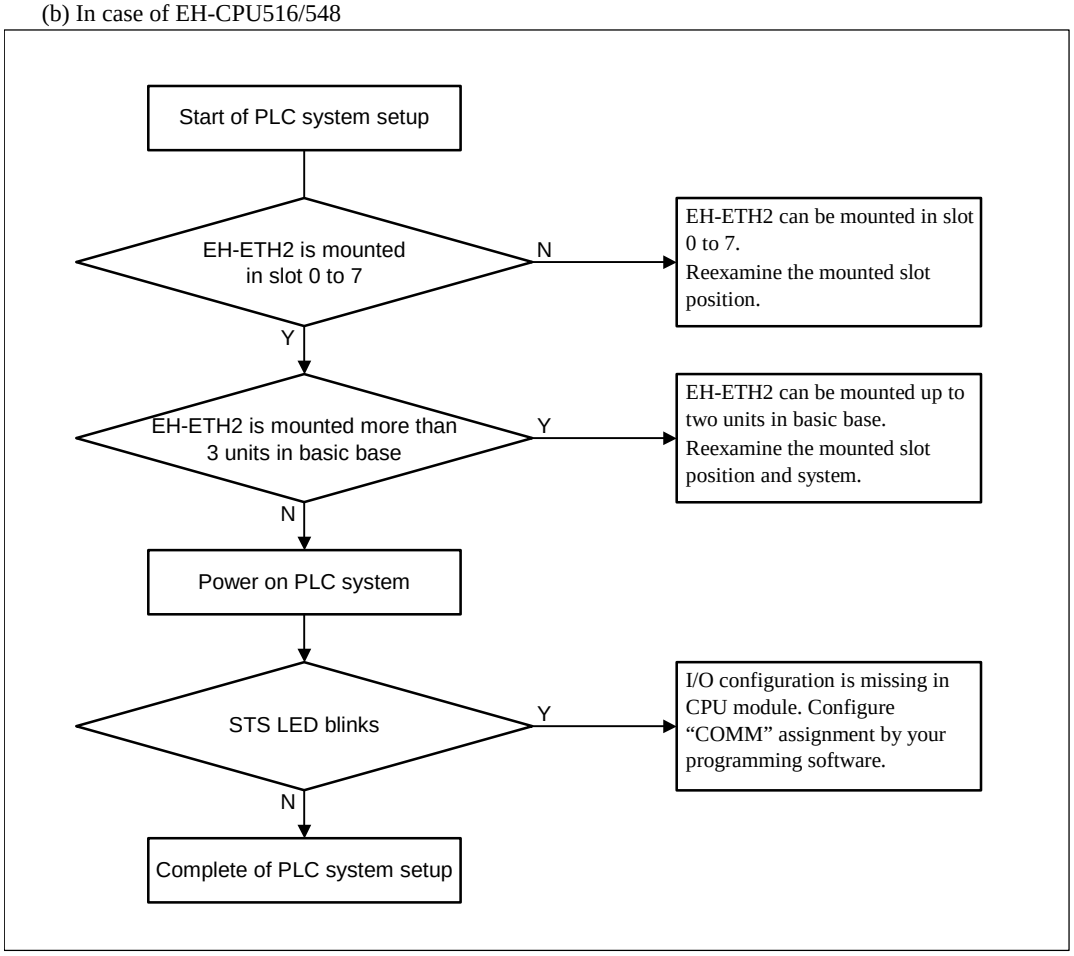
10.1 Troubleshooting flow

(1) Start up

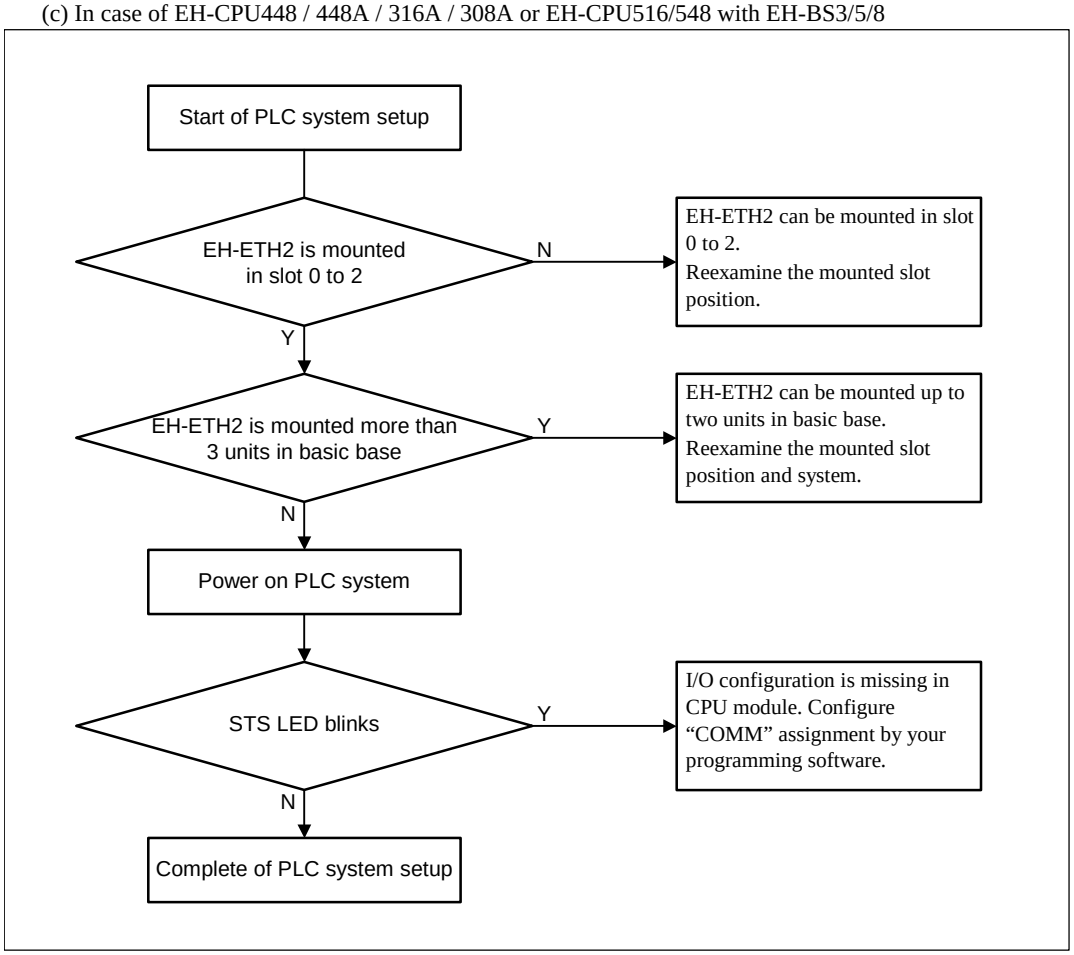
(a) In case of EHV-CPU



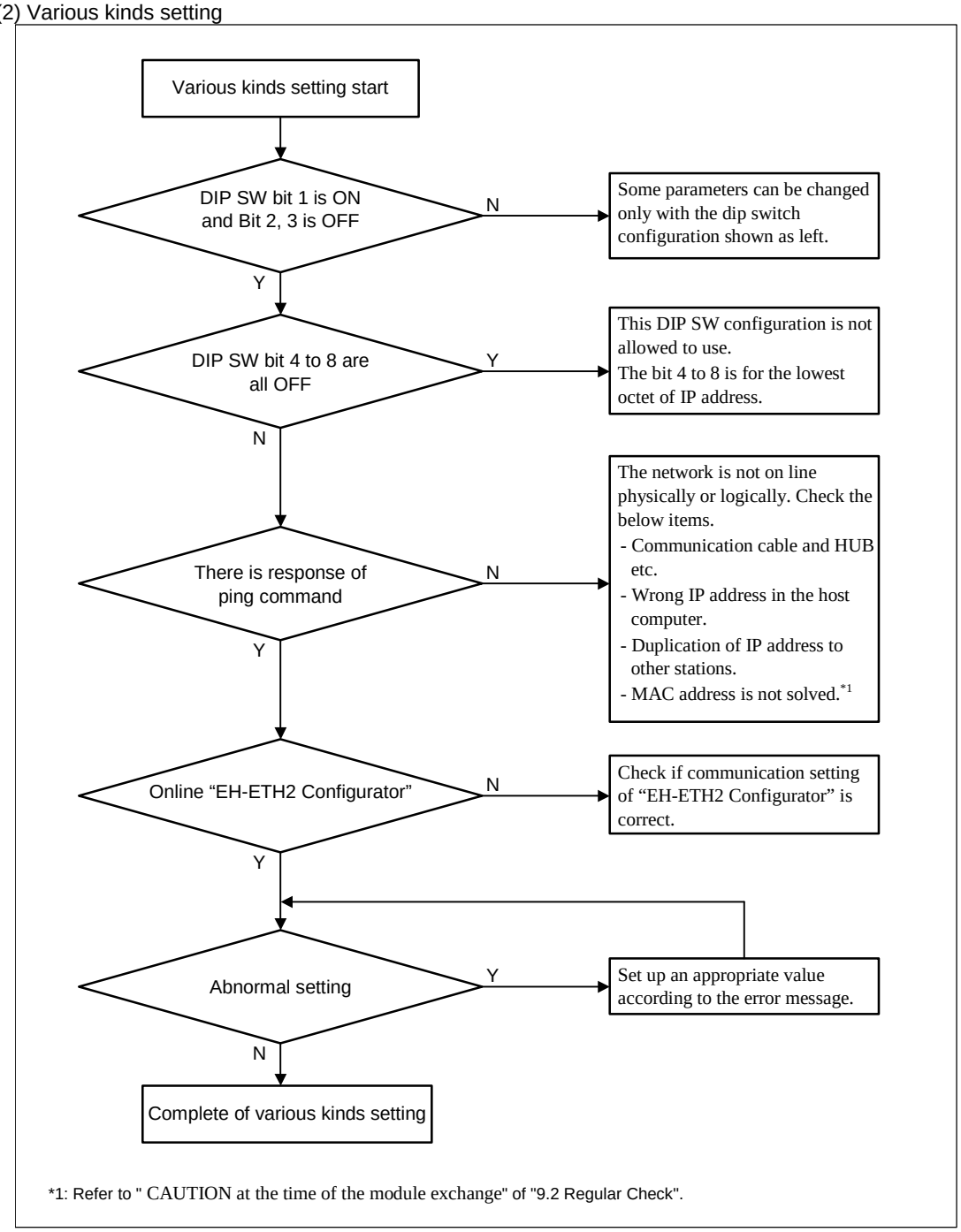
(b) In case of EH-CPU516/548



(c) In case of EH-CPU448 / 448A / 316A / 308A or EH-CPU516/548 with EH-BS3/5/8



(2) Various kinds setting



*1: Refer to " CAUTION at the time of the module exchange" of "9.2 Regular Check".

For reference

In order to check the network connection, the "ping" command is useful.

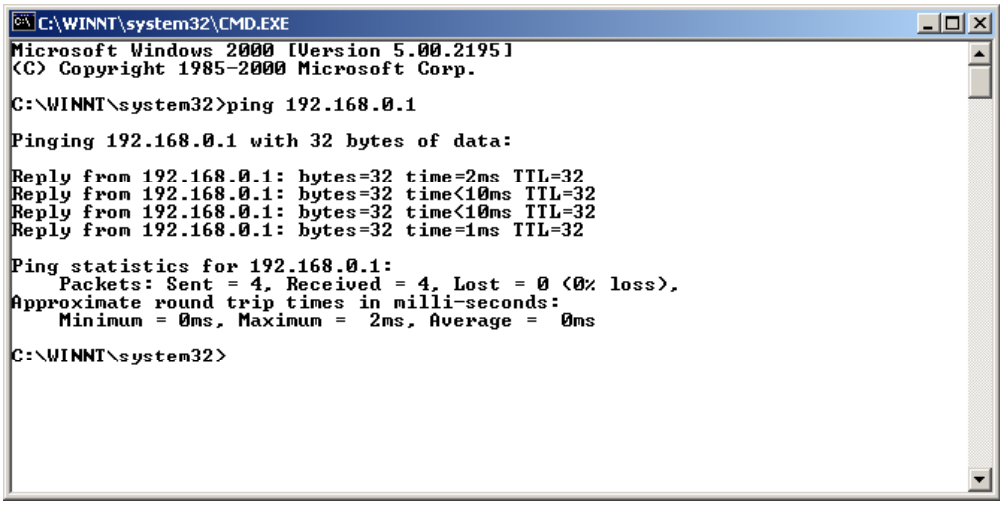
You can simply type “ping” and IP address in Command Prompt. If the network is on line, the requested station will reply as below. In this sample, the DIP Switch configuration is Bit 1=ON, Bit 8=ON, the other=OFF, which means temporal IP address is 192.168.0.1.

[Procedure]

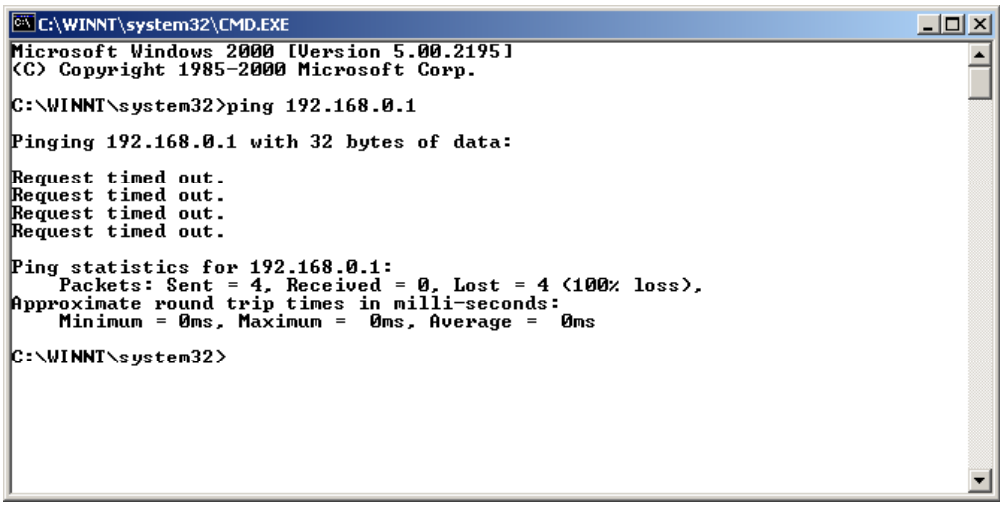
(1) Select [Start]-[Programs]-[Accessories]-[Command Prompt]

(2) Type “ **ping 192.168.0.1** “

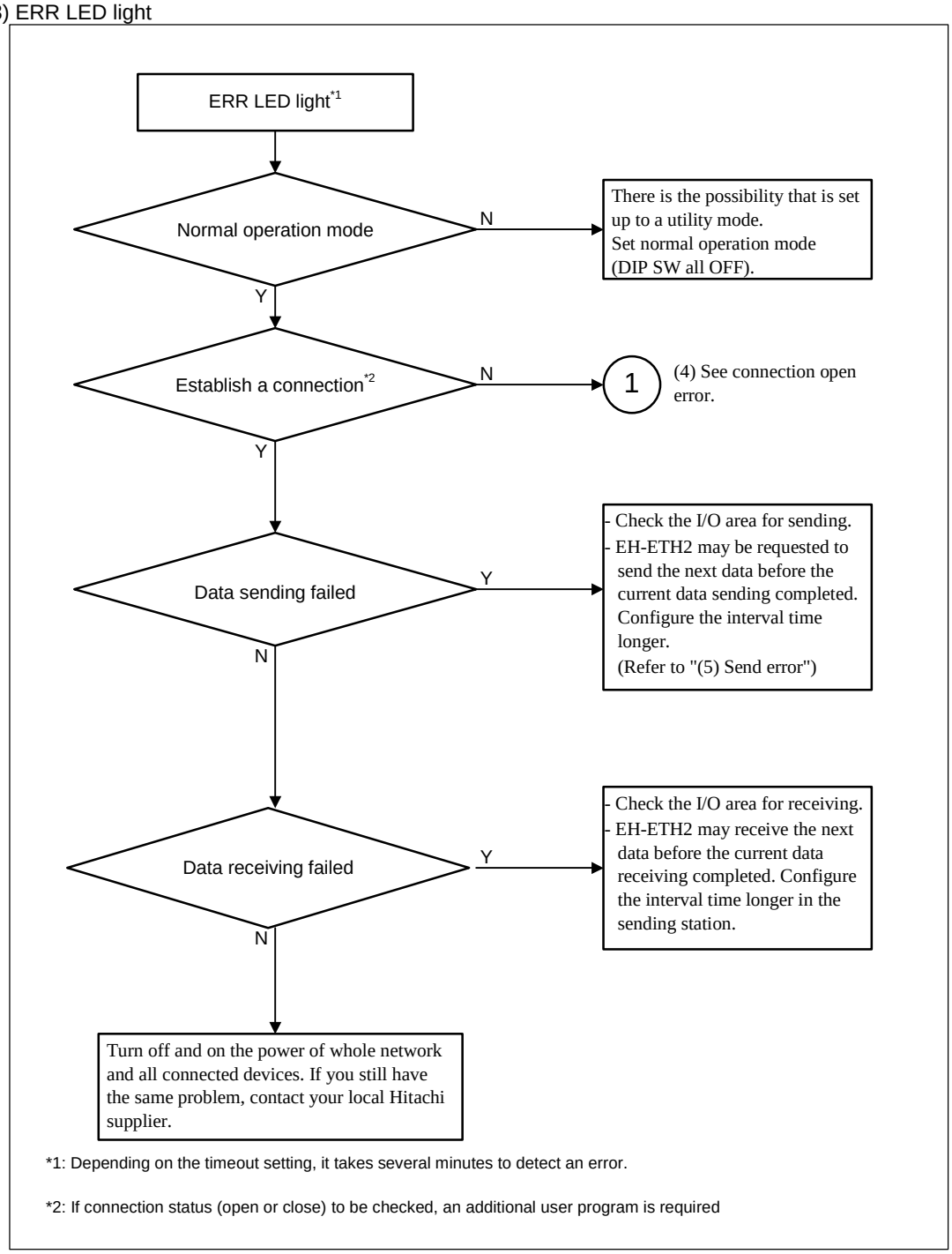
(3-1) If the network is on line, EH-ETH2 will reply as below.



(3-2) If the network is off line, EH-ETH2 will reply as below.



(3) ERR LED light

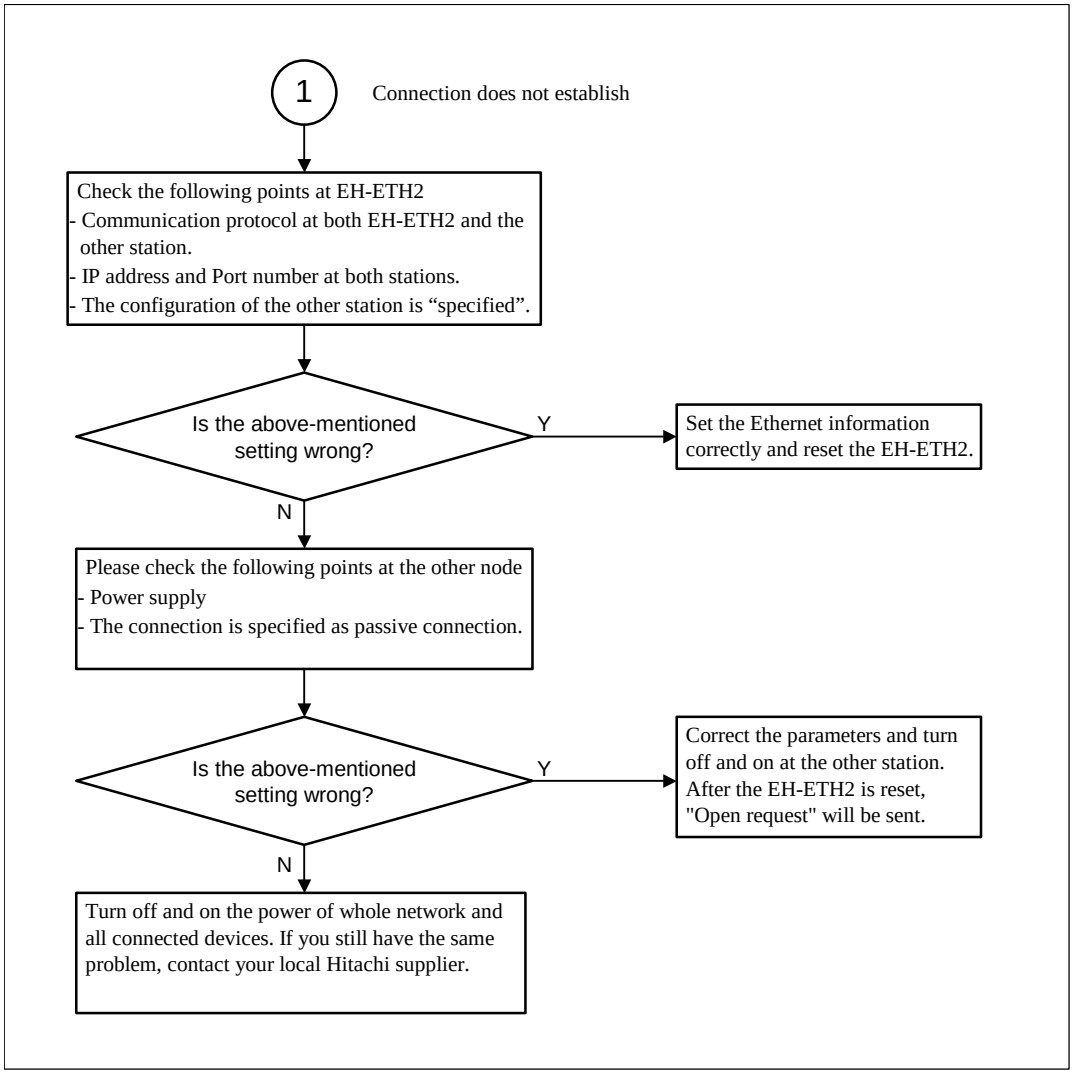


*1: Depending on the timeout setting, it takes several minutes to detect an error.

*2: If connection status (open or close) to be checked, an additional user program is required

(4) Connection open error

EH-ETH2 can detect the connection open error in case of ASR connection specified as active node. When the connection is not established in case of ASR connection specified as passive node or task code connection, check the connection at the other node (active side).



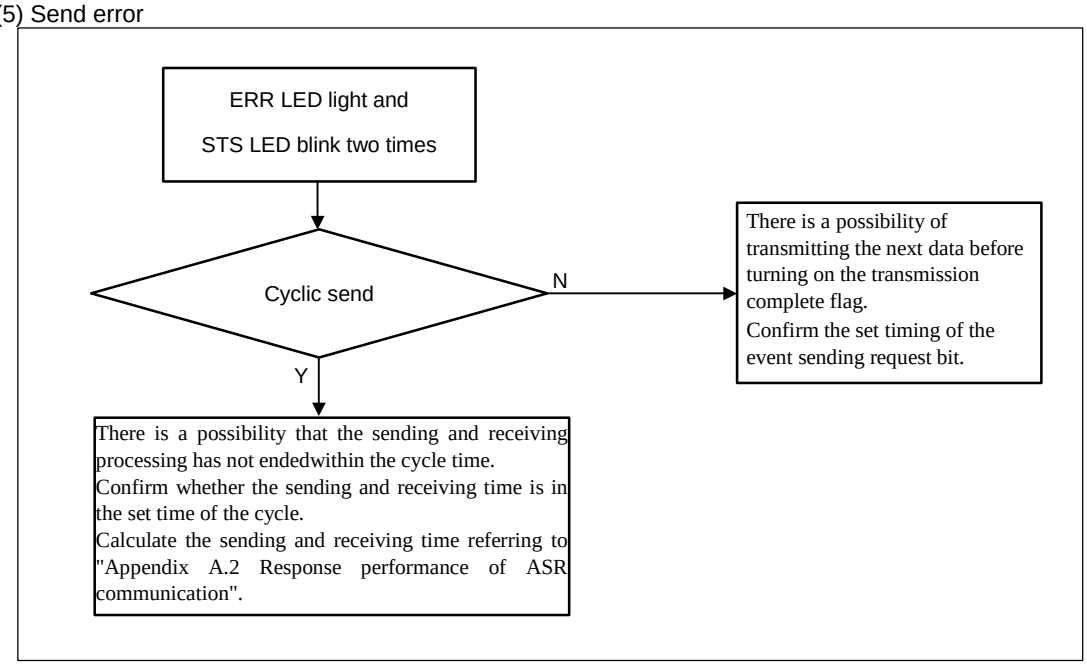
Importance

[Retry action of Open request for active port]

When an other station to a response cannot be found to the open request that EH-ETH2 sends, EH-ETH2 sends the TCP packet which contains the "SYN" flag at intervals followiong the patameter of “Open Retry Times / Intervals”.

When EH-ETH2 detects a timeout, ERR LED turns on and EH-ETH2 waits an open request from the user program.

(5) Send error



Supplement

[When you do ASR cyclic communication by the combination with EHV-CPU]

When EHV-CPU is done from stop to run, it may become a send error. Because of the relations of the number of ASR I/O area data and cyclic time. It is that because the "run beginning process" of CPU is superior to ASR communication. Therefore transmission process did not end in cyclic time.After it shifts in the state of running, it communicates normally. In this case, clear the error with ladder program. (Refer to following sample program 11)

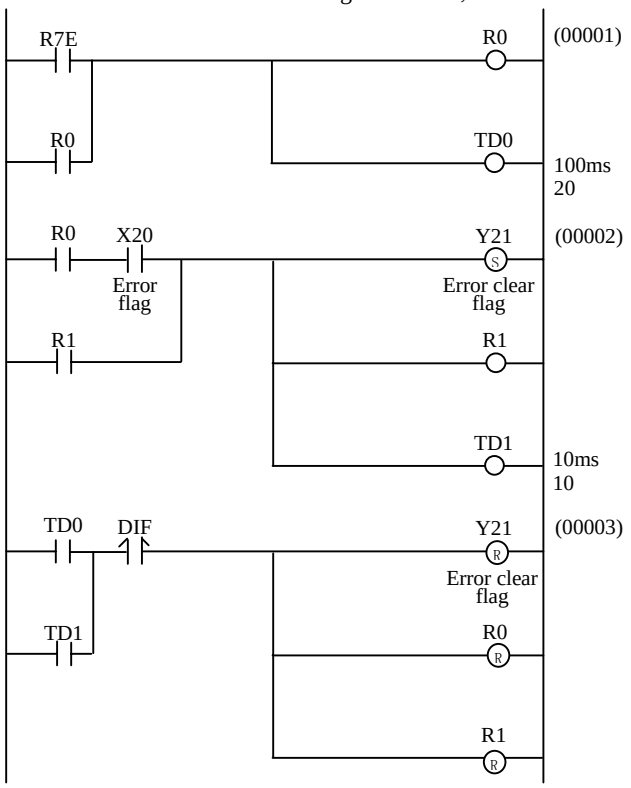
*1: For instance, the cyclic time is one second, and transmission time is 0.8 - 0.9 second.

Refer to "Appendix A.2 Response performance of ASR communication" for calculating the response time.

Sample program 11 To execute error reset (For EHV-CPU)

Slot No.	0	1	2
EH-ETH2	-	-	*

When the error occurs after it begins to drive, the error is reset.



R0 : Check flag
The error flag is observed for "cyclic time + 1sec" after RUN begins.

TD0 : Check timer
Set Time : Cyclic time + 1sec
(When cyclic time is 1sec, set to 2sec)

When error flag(X200) is ON, set error clear flag(Y216) is turned on by set coil.

R1 : ON flag of error clear flag
Set error clear flag ON for 100ms.

TD1 : ON timer of error clear flag
Set time : 100ms
(For 50ms or more necessity)

In the end at the time of error clear flag ON or the observed end, the error clear flag is turned off with the reset coil.
Moreover, R0 and R1 are turned off with the reset coil.

10.2 Send / Receive test facility

This function is to check the communication circuit of EH-ETH2 module. Please set the dip switch as below and initialize the EH-ETH2. The self-diagnosis function will start. EH-ETH2 is initialized only when power on or pressing reset button. Please note that the self-diagnosis will not start only by changing the dip switch. The detail of self-diagnosis is shown in Table 10.1.

Table 10.1 Setting of dip switch

	Setting of dip switch
Sending and receiving test	

- In case of using two EH-ETH2 modules.

[Outline]

UDP message is communicated between the one EH-ETH2 for test and the other EH-ETH2 in normal operation.

[UDP massage format]

The UDP message format which EH-ETH2 sends network is below.

0	1	2	3	4	5	…….	1023 Byte
Command	Message transmission number	Message					
H01	H0000	H00	H01	H02	…….		HFC

[Test procedure]

(a) Set communication parameter according to the Figure 10.1 as below.

(b) Press the reset button of EH-ETH2-2

(c) Press the reset button of EH-ETH2-1. The test will start. (*1)

*1: Right I/O assignment is set to CPU module.

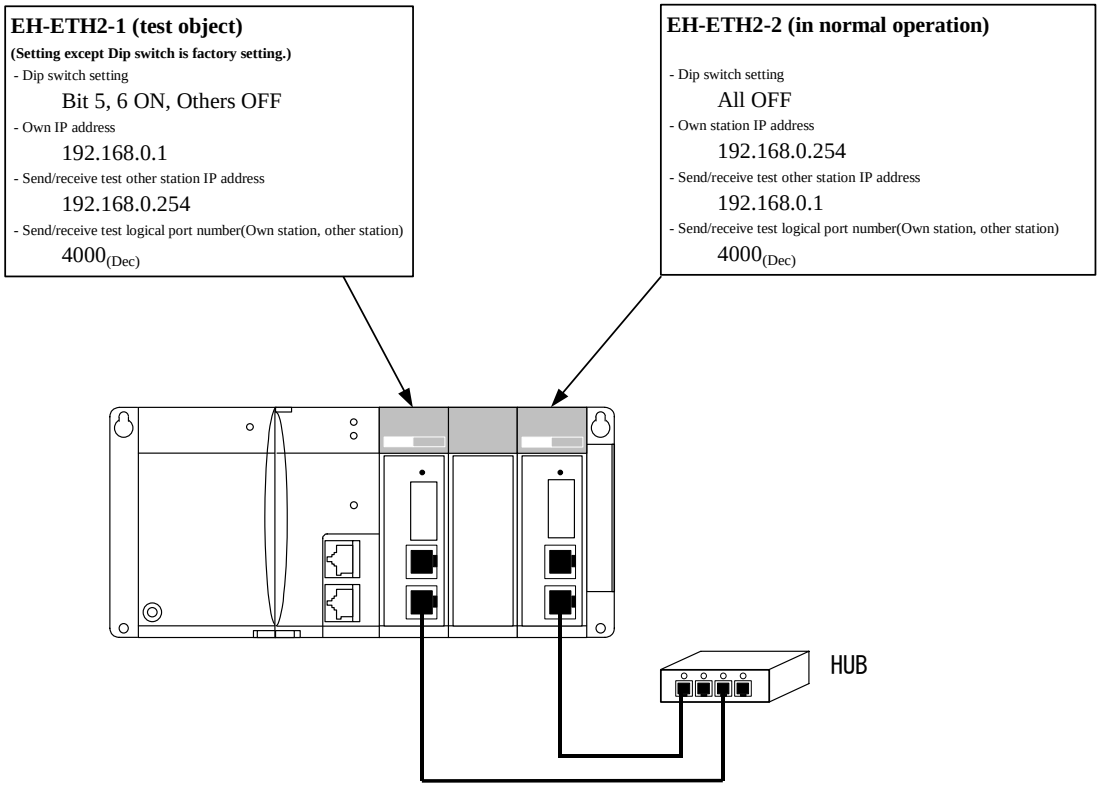


Figure 10.1 System configuration of communication test (1)

- When you use a set of PLC with EH-ETH2 and host computer.

[Test content]

The UDP message is returned between EH-ETH2 of test mode and application software which supports communication specification.

[Communication specification]

- Communication protocol is UDP/IP.
- The application software return the massage which the EH-ETH2 of test mode sends to it.

[Test procedure]

(a) Set communication parameter according to the Figure 10.2.
(b) Execute the application that supports the communication specifications.
(c) When you reset the EH-ETH2, the sending and receiving test will start.

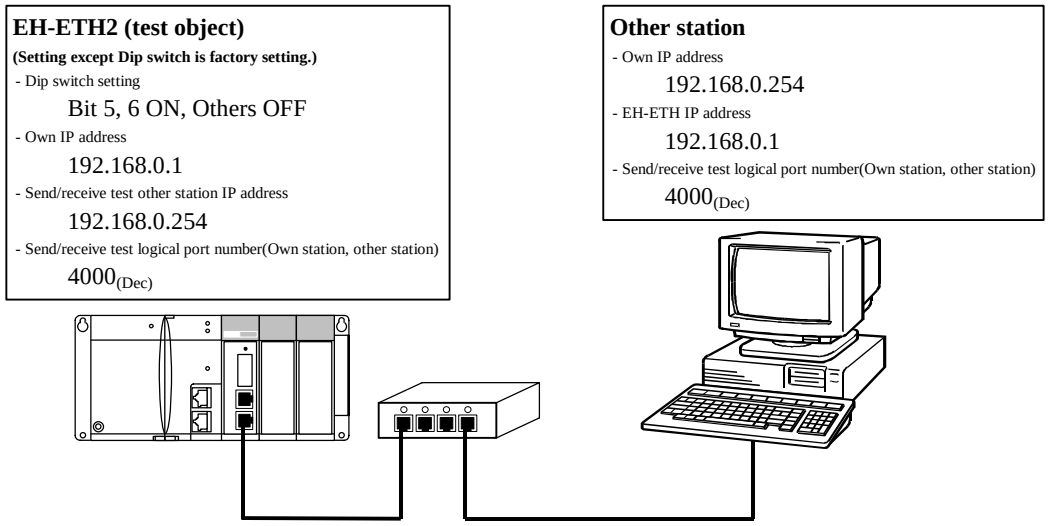


Figure 10.2 System configuration of communication test (2)

Send / Receive test abends in case that test object EH-ETH2 does not receive the reply in 20 seconds from one sent the test data.

Table 10.2 shows lighting pattern of EH-ETH2 LED on the test.

Table 10.2 Result of communication test

POW	STS	ERR	result
Blinking	OFF	OFF	On testing
	ON	OFF	Normal end
	OFF	ON	Abend

Appendix A Response performance

A.1 Response performance of Task code communication

The following data is response time of request task code from peripherals.

Since response time depends on many other factors, please use these values as sample data for your system designing.

Table A.1 shows the response time of the monitor command of 120 words on one EH-ETH2 module.

Table A.1 Task code response performance(unit : ms)

Number of ports	Without ASR communication			With ASR communication		
	EHV-CPU	EH-CPU5**	EH-CPU316A	EHV-CPU	EH-CPU5**	EH-CPU316A
1	30 to 40	←	←	30 to 40	35 to 45	30 to 40
2	30 to 40	←	←	35 to 45	55 to 65	40 to 50
3	35 to 45	←	←	40 to 50	80 to 90	55 to 65
4	40 to 50	←	←	50 to 60	140 to 150	90 to 100

*1) CPU is stop. When CPU is running, response is longer.
*2) Response time doesn't depend on communication speed (10/100M).
*3) "Number of ports" shows the number of ports communicated at the same time.
*4) Without ASR communication / With ASR communication
"With ASR communication" is the state that all ASR connections are sending 120 words and are receiving 120 words.
*5) EH-CPU5** : "EH-CPU5**" means EH-CPU548 or EH-CPU516.

A.2 Response performance of ASR communication

The following data is response time of the ASR communication.
Since response time depends on many other factors, please use these values as sample data for your system designing.

Table A.2 shows the interval time of ASR event sending of 120 or 360 words and shows the interval time of ASR receiving of 120 or 360 words.

Table A.2 ASR response performance(unit : ms)

	Number of ASR connections	120 words			360 words		
		EHV－CPU	CPU5**	CPU316A	EHV－CPU	CPU5**-	CPU316A
Snd	1	30 to 40	←	←	100 to 110	←	←
	2	60 to 70	←	←	190 to 200	←	←
	3	90 to 100	←	←	280 to 290	←	←
	4	120 to 130	←	←	370 to 380	←	←
	5	150 to 160	←	←	460 to 470	←	←
	6	180 to 190	←	←	550 to 560	←	←
Rcv	1	70 to 80	←	50 to 60	130 to 140	←	110 to 120
	2	130 to 140	←	110 to 120	260 to 270	←	190 to 200
	3	190 to 200	←	140 to 150	380 to 390	←	280 to 290
	4	250 to 260	←	190 to 200	500 to 510	←	380 to 390
	5	320 to 330	←	240 to 250	620 to 630	←	460 to 470
	6	370 to 380	←	280 to 290	750 to 760	←	560 to 570

*1) CPU is stop. When CPU is running, response is longer.
*2) Response time doesn't depend on communication speed (10/100M).
*3) "Number of ASR connections" shows the number of ASR connection communicated at the same time.
*4) EH-CPU5** : "EH-CPU5**" means EH-CPU548 or EH-CPU516.
*5) Snd : sending
*6) Rcv : receiving

[Rough estimate of response time]

Calculate the rough estimate value of the response time of the ASR communocation by the following.

Response time : 30ms * T

T : Count of internal processing

- Calculation method of T : $T = T_{SW} + T_{SB} + T_R$

(1) Send area

The count of internal processing is calculated by each item on both word and bit.

- Word data T_{SW} : (Number of send data) / 120 (It rounds up below the decimal point)

(Example) Number of send data = 200 words : T = 2 (200÷120)

- Bit data T_{SB} : (Number of send data) / 240 (It rounds up below the decimal point)

(Example) Number of send data =200 bits : T=1 (200÷240)

(2) Receive area

At 1 connection : T_R : (Number of receive data)÷100 (It rounds up below the decimal point)

(Example) Number of receive data = 120words : T=2 (120÷100)

〔 Example of response time〕

The response performance of the ASR I/O area setting in table A.3 is shown below.

- Send time of word data

T_{SW} = (200÷120) + (200÷120) + (200÷120) + (200÷120) + (200÷120)

= 2 + 2 + 2 + 2 + 2

= 10

- Send time of bit data

T_{SB} = (1÷240) + (1÷240) + (1÷240) + (1÷240) + (1÷240) + (1÷240) + (1÷240) + (1÷240)

= 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1

= 8

- Receive time

T_R = (200÷100) + (200÷100) +(200÷100) +(200÷100) +(200÷100) +(200÷100)

= 2 + 2 + 2 + 2 + 2 + 2

= 12

T== $T_{SW} + T_{SB} + T_R$ = 10 + 8 + 12 = 30

Response time = 30ms * T = 30ms * 30 = 900ms

Therefore, response time becomes 900ms.

***) Set the ASR I/O area so that the response time may become within about 80% at a cyclic time at a cyclic transmission.**

Table A.3 ASR I/O area setting

Connection No.		1	2	3	4	5	6
Number of receive data		200 words	200 words	200 words	200 words	200 words	200 words
Number of send data	Item No.1	1 bits	200 words	200 words	200 words	200 words	200 words
	Item No.2	1 bits					
	Item No.3	1 bits					
	Item No.4	1 bits					
	Item No.5	1 bits					
	Item No.6	1 bits					
	Item No.7	1 bits					
	Item No.8	1 bits					
	Item No.9						
	Item No.10						

Note: The column of the blank in the table is set no data.

Appendix B Task Code Specifications

The EH-150 communicates with the host by issuing task codes. This chapter explains the details of each task code.

(1) Task code function details

This section explains the details of each task code function and response command function.
Each task code is explained using the format shown below:

Task code Response task code	Task code number	Task code description	Classification	Response, CPU control, memory read, memory write or I/O control
Function				
Execution condition				
Shows the task code execution conditions. Details are described on the next page.				
Format				
Format of the request task code and Format of the response task code				
Description				
Example				

How to read the execution condition table

The table indicates the CPU status in which the task code is executable and the memory occupancy status.
For the details of the CPU status, refer to CPU status read of task code H10.

1] Execution condition example 1

CPU status					
STOP	RUN	HALT	ERROR		
×	×	×	×	READ occupancy	Occupancy
○	×	×	○	WRITE occupancy	status

○ : Executable

× : Not-executable

In example 1, the task code can only be executed when the CPU is in the STOP or ERROR status and the memory is WRITE-occupied.

2] Execution condition example 2

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy
○	○	○	○	WRITE occupancy	status

In example 2, the task code is executable if the CPU is occupied.

Task code list

No.	Classification	Task code number	Description	Remarks
1	Response	00	Normal execution	
		01	Task code error	
		02	Warning	
		03	Not-executable	
		05	BUSY	
		08	Network error	
2	CPU control	10	CPU status read	
		11	CPU run / stop designation	*1
		16	CPU occupancy/cancel	
		17	Forced release of occupancy	
		18	Calendar time clock set/read	
		1C	Line disconnection when a modem is connected.	
3	Memory write	20	Clear all	*1
		23	Program transfer with address designation	*1
		26	Write memory assignment	*1
		27	Parameter modification completion	*1
		28	Timer/counter set value modification	*1
4	Memory read	31	Program read with address designation	*1
		33	Final ladder search	*1
		35	Read memory assignment	*1
5	I/O control	40	Monitoring with I/O number designation (N continuous points)	
		42	Forced set/reset with I/O number designation (N continuous points)	
		44	Monitoring with I/O number designation (N random points)	
		45	Forced set/reset with I/O number designation (N random points)	
11	I/O control (not occupied)	A0	Monitoring with I/O number designation (N continuous points)	
		A2	Forced set/reset with I/O number designation (N continuous points)	
		A4	Monitoring with I/O number designation (N random points)	
		A5	Forced set/reset with I/O number designation (N random points)	

*1: Not supported on EHV-CPU.

Response task code	H00	Normal execution	Classification	Response

Function

Indicates that the requested task code has been executed normally.

Format

H00	(a)	(b)

(a) Executed task code

(b) Execution result data

Refer to the description of each task code for details.

Response task code	H01	Task code error	Classification	Response

Function

Indicates that there is an error in the task code requested for execution.
(Task code undefined, parameter error, etc.)

Format

H01	(a)	(b)

(a) Task code requested for execution

(b) Return code

Description

Return code details are shown below:

Return code	Description
H01	Task code is undefined.
H02	Function selection code is undefined.
H04	Abnormal address
H05	Abnormal step number or word number
H06	Abnormal I/O code
H07	Abnormal I/O number
H09	Write was attempted more than the memory capacity.
H0A	Insufficient memory size

Response task code	H02	Warning	Classification	Response

Function

Indicates that the local terminal does not occupy the CPU during monitoring.

Format

H02	(a)	(b)

(a) Task code requested for execution

(b) Execution result data

Refer to the description of each task code for details.

Response task code	H03	Not-executable	Classification	Response

Function

Indicates that the requested task code cannot be executed.

Format

H03	(a)	(b)

(a) Task code requested for execution

(b) Return code

Description

Return code details are shown below:

Return code	Description
H01	This is ROM memory.
H02	Does not match parameter area.
H03	Occupancy code does not match (READ-occupied).
H04	Occupancy code does not match (WRITE-occupied).
H05	Another station is in the process of debugging.
H06	Already READ-occupied in four stations.
H07	Local station does not occupy CPU.
H08	Another station is occupying CPU.
H0A	RAM memory error.
H0B	CPU is running.
H0C	Operation error.
H0D	Program does not exist.
H0E	Task code combination error.
H0F	Program is illogical.

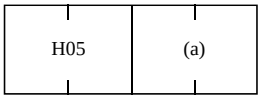
Response task code	H05	BUSY	Classification	Response

Function

Indicates that the requested task code was not executed because another task code was being executed.

(Note) Create a program so that transmission is retried from a request task code when BUSY is returned.

Format



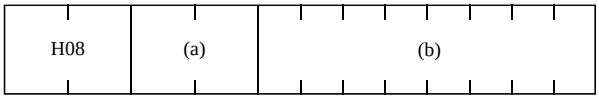
(a) Task code that requested the execution

Response task code	H08	Network error	Classification	Response

Function

Indicates that a communication error has occurred.

Format



(a) Task code requested for execution

(b) The network address that detected the error

Description

Indicates that there was a communication error or the designated destination address does not exist.

Task code	H10	CPU status read	Classification	CPU control

Function

Reads the CPU status, memory-load status and software version.

This task code can also be executed when the CPU is not occupied.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	
○	○	○	○	Not occupied	

Format

Request

H10	(a)

(a) Function selection (subcommand)

1] H00: Reads CPU status.

2] H01: Reads memory status.

3] H02: Reads system software version.

4] H03: Reads error code.

5] H04: Reads CPU name.

Response

1] Read CPU status (subcommand H00)

(a)	H10	(b)	(c)

(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

(b) The read CPU status

(c) User program version (H00 to HFF)

This value is counted up only when memory writing has occurred and the WRITE occupancy is canceled (indicating the number of times WRITE occupancy has occurred). This value is H00 upon power-up.

2] Read memory status (subcommand H01)

(a)	H10	(b)	(c)	(d)

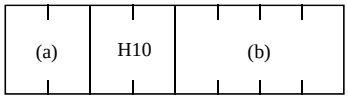
(a) Response task code (H00 when executed normally)

(b) Memory type

(c) User memory capacity (number of steps)

(d) Data memory capacity (number of words)

3] Read system software version (subcommand H02)

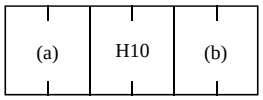


(a) Response task code (H00 when executed normally)

(b) Version (4 digit BCD)

This is the version of the system software (ROM) for CPU.

4] Read error code (subcommand H03)

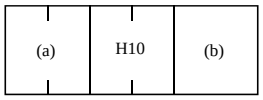


(a) Response task code (H00 when executed normally)

(b) CPU error code (2 digit hexadecimal)

This is the same code as the contents of special internal output WRF000.

5] Read CPU name (subcommand H04)



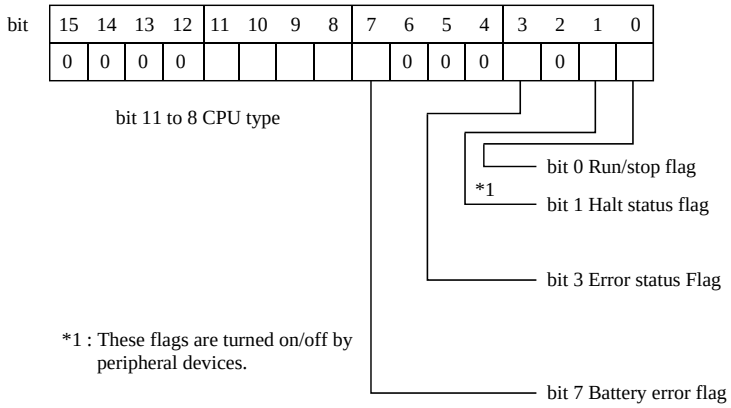
(a) Response task code (H00 when executed normally)

(b) CPU name (16 ASCII-code characters)

If it is less than 16 characters, Null (H20) are added until 16 characters are reached.

Description

1] CPU status (4 digits) b area details (response to the subcommand “H00”)



bit 0 Run/stop flag
Displays the run/stop status of CPU.
“1”: Run / “0”: Stop

bit 1 Halt status flag
Displays whether or not the CPU is halted.
“1”: Halted / “0”: Not halted

bit 2 Unused (“0”)

bit 3 Error status flag
Displays whether or not the CPU is in the error status.
“1”: Error / “0”: Normal
When this flag is 1, error details may be determined by reading the CPU error code (refer to 4]).

bit 4 to 6 Unused (“0”)

bit 7 Battery error flag
Displays whether or not the CPU backup battery is normal.
“1”: Battery is not installed or voltage is low. / “0”: Battery normal

bit 11 to 8 CPU type flag
0011: EH-CPU
0111: EHV-CPU16/32/64
1011: EHV-CPU128

2] Memory status (response to the subcommand H01)

Item	Description	Description	Remarks
Memory type	H00	Memory error	
	H02	RAM memory	
User memory capacity	H0020	8 k Steps	EH-CPU308A
	H0040	16 k Steps	EH-CPU316A/516, EHV-CPU16
	H0080	32 k Steps	EHV-CPU32
	H00C0	48 k Steps	EH-CPU448(A)/548
	H0100	64 k Steps	EHV-CPU64
	H0200	128 k Steps	EHV-CPU128
Data memory capacity	H0080	17 kW	EH-CPU308A
	H0094	22 kW	EH-CPU316A/516
	H0100	49 kW	EH-CPU448(A)/548
	H0100	49 kW	EHV-CPU16/32/64/128

Description

3] System software version (response to the subcommand H02)
The software version of the system software installed in the EH-150.

4] Error code (response to the subcommand H03)
The same code as the error code output in special internal output WRF000 (self-diagnostic error code) can be read

5] CPU name (response to the subcommand H04)

EH-CPU H-302
EHV-CPU16 ..... EHV-CPU16
EHV-CPU32 ..... EHV-CPU32
EHV-CPU64 ..... EHV-CPU64
EHV-CPU128 ..... EHV-CPU128

Example

Function selection (subcommand): H00

Request

1	0	0	0

Response

0	0	1	0	0	3	0	1	0	1

CPU status
EH-CPU running

User program
version = H01

Function selection (subcommand): H01

Request

1	0	0	1

Response

0	0	1	0	0	2	0	0	2	0	0	0	4	C

RAM memory

User memory
capacity: 8 k Steps

Data memory
capacity: 4 kW

Task code	H11	CPU run/stop designation	Classification	CPU control

Function

Controls the run/stop of the CPU from the host.
It will end normally, even if a run designation while running and stop designation while stopped are made.

Execution condition

The following conditions must be met:

1] The RUN switch is set to STOP, and the number 1 DIP switch is on.

2] The CPU status is not ERROR.

3] In the case of function selection and stop designation, the special internal output R7C4 is on.

4] In the case of function selection and run designation, the special internal output R7C3 is on and R7E9 is off. In addition, if the run control input is set using parameters, the contact is on.

Note: If the CPU is WRITE-occupied by another station, a "not-executable" response will be made.
(If the CPU is WRITE-occupied by the local station, execution is possible.)

Format

Request

H11	(a)

(a) Function selection (subcommand)

1] H00: Stop designation

2] H01: Run designation

Response

(a)	H11

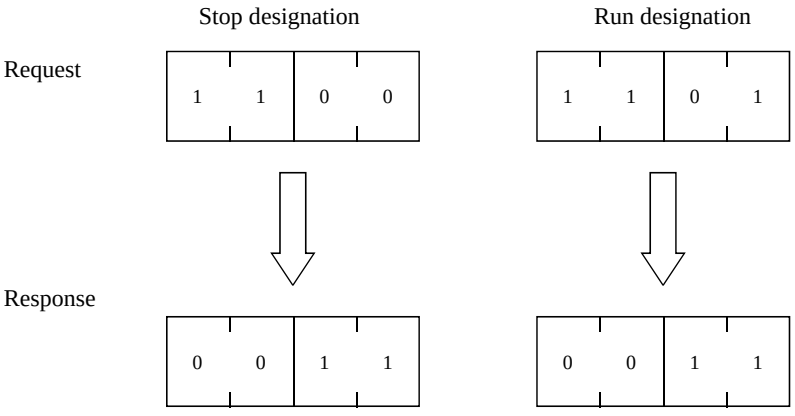
(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the "response list by task code" at the end of this chapter.

Description

1] STOP (subcommand H00)
The CPU operation is stopped.
If a stop designation is sent when the CPU is stopped, a normal response task code results.
If the CPU sends a stop designation during error, the error status can be canceled.
However, the error codes H10 to H2F cannot be canceled.

2] RUN (subcommand H01)
Runs the CPU.
If a run designation is sent when the CPU is already running, a normal response task code results.

Example



Task code	H16	CPU occupancy/cancel	Classification	CPU control

Function

Declares that the user memory will be accessed. The user memory cannot be accessed by the host unless the CPU is occupied using this task code. Also, depending on the function selection, it performs the same processing as the parameter modification completion processing (task code H27).

Execution condition

		CPU status					
		STOP	RUN	HALT	ERROR		
Function selection sub-command	H01	○	○	○	○	READ occupancy	Occupancy status
		×	×	×	×	WRITE occupancy	
	H02	×	×	×	×	READ occupancy	
		○	○	○	○	WRITE occupancy	
	H05	○	○	○	○	READ occupancy	
		○	○	○	○	WRITE occupancy	
	H06	○*1	○*1	○*1	○*1	READ occupancy	
		○	○	○	○	WRITE occupancy	
	H00	○	○	○	○	READ occupancy	
		○	○	○	○	WRITE occupancy	

*1: It cannot be executed while the CPU is READ-occupied by another station.

Format

Request

H16	(a)

(a) Function selection (subcommand)

1] H01: READ occupancy

2] H02: WRITE occupancy

3] H05: Modifies the local station occupancy mode from WRITE occupancy to READ occupancy.

4] H06: Modifies the local station occupancy mode from READ occupancy to WRITE occupancy.

5] H00: Cancels the local station occupancy.

Response

(a)	H16	(b)

(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

(b) User program version (H00 to HFF)

Description

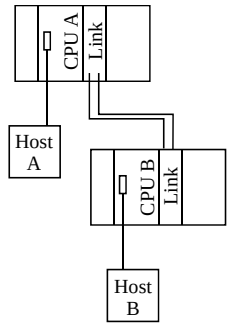
1] READ occupancy (subcommand H01)
This command is used when the local station is not occupying the CPU if performing tasks such as reading the user program, monitoring and setting the data memory or the I/O.

2] WRITE occupancy (subcommand H02)
This command is used when writing the user program if the local station is not WRITE-occupying the CPU. This command cannot be used when another station is occupying the CPU.

3] Occupancy mode modification (modification from WRITE occupancy to READ occupancy) (subcommand H05)
Modifies the CPU occupancy mode of the local station to the READ occupancy.
This command cannot be executed when the local station is not occupying the CPU.
When modifying from WRITE occupancy to READ occupancy, the parameter modification completion processing is performed.

4] Occupancy mode modification(modification from READ occupancy to WRITE occupancy) (subcommand H06)
Modifies the CPU occupancy mode of the local station to WRITE occupancy.
This command cannot be executed when the local station is not occupying the CPU.
This command cannot be executed when another station is occupying the CPU.

5] Occupancy cancel (subcommand H00)
Cancels the local station CPU occupancy.
When canceling the WRITE occupancy, the parameter modification completion processing is performed.



Execution conditions in the occupancy status

CPU occupancy status	Function selection (subcommand)				
	H01	H02	H05	H06	H00
No occupancy	○	○	×	×	○
Local station is WRITE-occupying	×	○	○	○	○
Another station is WRITE-occupying	×	×	×	×	○
Only the local station is READ-occupying	○	×	○	○	○
Local and other stations are READ-occupying	○	×	○	×	○
Only another station is READ-occupying	○	×	×	×	○
Four other stations are READ-occupying	×	×	×	×	○

From the viewpoint of host A, host A is the local station and host B is the other station.
From the viewpoint of host B, host B is the local station and host A is the other station.

Task code	H17	Forced cancel of occupancy	Classification	CPU control

Function

Forces the cancel of CPU occupancy. This command is used in situations such as when another programming device has gone down due to an error while occupying the user memory of the CPU (function selection H00).
When connecting the host to the CPU and occupying it for the first time, use function selection H01 so the local occupancy status is canceled forcibly.
This task code can also be executed when the CPU is not occupied.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	
○	○	○	○	Not occupied	

Format

Request

H17	(a)

(a) Function selection (subcommand)
1] H00: Forced cancel of all occupancy
2] H01: Forced cancel of local station occupancy

Response

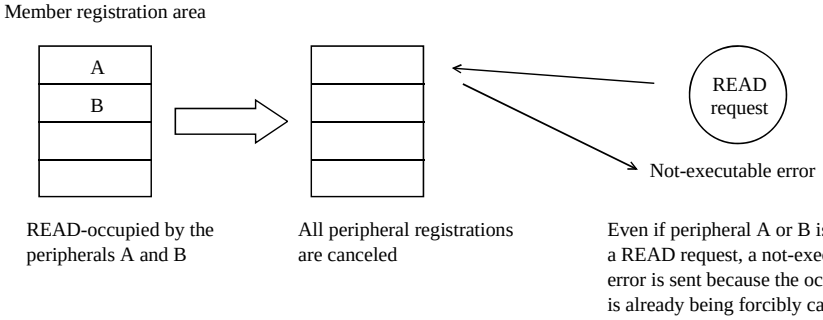
(a)	H17

(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

Description

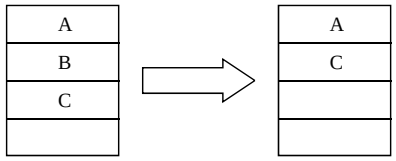
With forced cancel, if there are modification in the parameter area, the same processing as parameter modification completion processing is performed (refer to the task code H27) as well as the canceling of memory occupancy.

1] Forced cancel of all occupancy (subcommand H00)
All occupancy is canceled unconditionally, so when this command has been executed the peripheral that is reading the user memory, for example, will not be able to perform reading. Therefore, verify the registered peripherals by monitoring the occupancy table (WRF040 to WRF04B) when executing this command.



Description

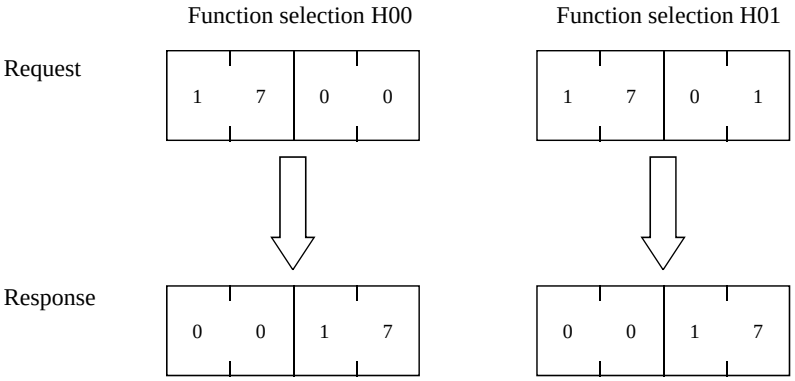
2] Forced cancel of local station occupancy (subcommand H01)
Cancels the occupancy of the local station.
The occupancy of other stations are maintained.



READ-occupied by peripherals A, B, and C

The occupancy by the local station (B) is forcibly canceled.

Example



Task code	H18	Calendar clock set/read	Classification	CPU control

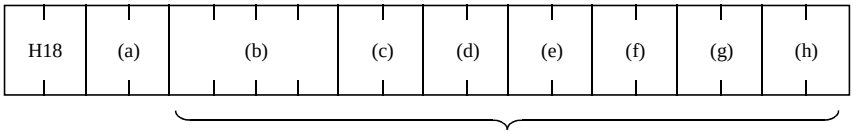
Function

Sets data to or reads data from the internal calendar clock of the CPU module.

Execution condition

When EH-CPU104 is used, the execution not-possible (H03) response task code will be returned as this task code becomes invalid.

Request



(b) to (h) are added when the function selection is H01.

(a) Function selection (subcommand)

1] H00: Read calendar clock

2] H01: Set calendar clock

3] H02: 30 second adjustment (Less than 30 seconds → 0 second, 30 seconds or more → +1 minute and 0 second)

(b) Year (4 digits in BCD)

(c) Month (H01 to H12 in BCD)

(d) Day (H01 to H31 in BCD)

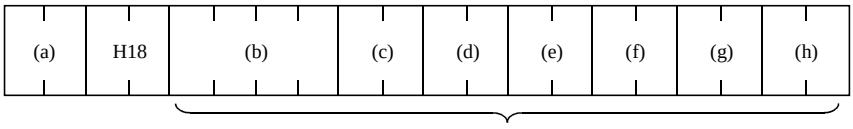
(e) Week (H00: Sunday, H01: Monday, H02: Tuesday, H03: Wednesday, H04: Thursday, H05: Friday, H06: Saturday)

(f) Time (H00 to H23 in BCD)

(g) Minutes (H00 to H59 in BCD)

(h) Seconds (H00 to H59 in BCD)

Response



*1 : Added as response data only when the function selection is H00.

(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

*1: The contents of (b) to (h) are the same as the request task code.

Description

1] Read calendar clock (subcommand H00)
Reads the calendar time data in the CPU module.

2] Set calendar clock (subcommand H01)
Sets the calendar time data in the CPU module.

3] 30 second adjustment (subcommand H02)
Performs second adjustment of the calendar time in the CPU module.
0 to 29 seconds → 00 second
30 to 59 seconds → + 1 minute and 00 second

Example

Function selection (subcommand): H00

Request

1	8	0	0

Response

0	0	1	8	1	9	9	1	0	3	2	1	0	4	0	8	0	5	3	0
Normal execution				1991				March 21				Thursday		8 o'clock 5 minutes 30 seconds					

Function selection (subcommand): H01

Request

1	8	0	1	1	9	9	1	0	4	2	0	0	6	1	6	5	0	3	0
				1991				April 20				Saturday		16 o'clock 50 minutes 30 seconds					

Response

0	0	1	8
Normal execution			

Task code	H20	Clear all	Classification	Memory write

Function

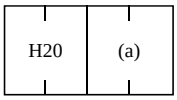
Clear the designated area in the user memory.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
×	×	×	×	READ occupancy	Occupancy status
○	×	×	○	WRITE occupancy	

Format

Request



(a) Function selection (subcommand)

1] H00: Initialization of all user memory area

2] H01: Initialization of the HI-FLOW area *1

3] H02: Initialization of the HI-LADDER area

4] H03: Zero clear of all user memory area

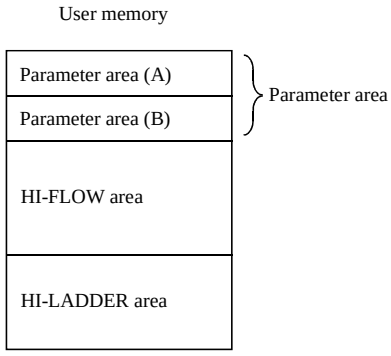
*1: EH-150 does not support HI-FLOW.

Response

(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

Description

(1) The composition of user memory
The user memory has the composition as shown in the diagram to the right. Parameter area (A) stores the I/O assignment, memory assignment and other information, while parameter area (B) stores the timer information, etc.



(2) Description of each function

1] Initialization of all user memory areas (subcommand H00)
Initializes all of parameter areas (A) and (B), the HI-FLOW area and the HI-LADDER area. If this command is executed, memory are assigned as follows. Also, the I/O assignment is erased.

		Assignment capacity
Parameter area ((A), (B) total)	:	H0280
HI-FLOW area	:	H0000
HI-LADDER area	:	Load capacity *2 – H0280

*2 : Determine the load capacity from H10 “CPU status 2] user memory capacity”.

Description

When the subcommand H00 is executed using the task code H20 via the COMM, remote or link module, the I/O assignment of the module will be erased and the communication with the CPU cannot be performed. In such a case, connect a programming device to the CPU and perform the I/O assignment operation. Note that the WRITE-occupancy release operation is necessary when connecting a programming device.

2] Initialization of the HI-FLOW area (subcommand H01)
Only the HI-FLOW area is initialized. (EH-150 does not support HI-FLOW.)

3] Initialization of the HI-LADDER area (subcommand H02)
Only the HI-LADDER area is initialized.

4] Zero clear of all user memory areas (subcommand H03)
Writes zero to all areas equivalent to the load capacity of the memory.

When the subcommand H00 or H03 is executed using task code H20, always execute the task code H27, parameter modification completion, when the write processing is completed with respect to each user-memory area.

Task code	H23	Program transfer with address designation	Classification	Memory write

Function

Writes the designated number of program steps to the user memory, starting with the designated address.

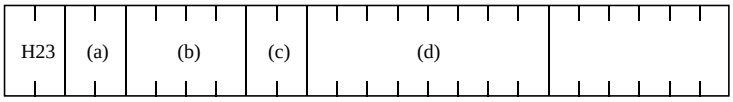
* For EH-150 CPU, the operation of HI-FLOW programs cannot be performed, while the programs can be transferred.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
×	×	×	×	READ occupancy	Occupancy status
○	×	×	○	WRITE occupancy	

Format

Request



(a) Memory area designation (subcommand)

1] H00: Parameter area (A)

2] H01: HI-FLOW area *1

3] H02: HI-LADDER area

4] H03: Parameter area (B)

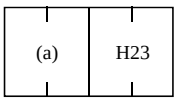
(b) User memory address (absolute address)

(c) Number of steps to be written (H01 to H3C; maximum 60 steps)

(d) Write data (1 step is equivalent to 4 bytes.)

*1: EH-150 does not support HI-FLOW.

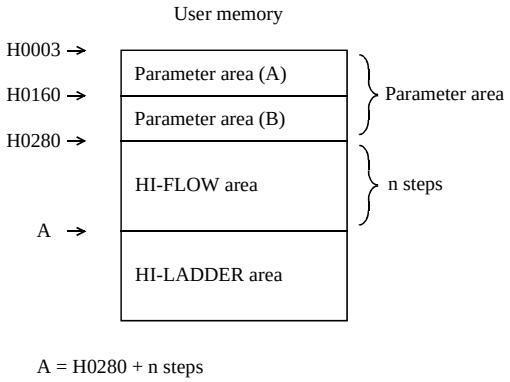
Response



(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

Description

(1) The configuration of user memory
The configuration and address of the user memory are shown in the diagram to the right.



A = H0280 + n steps

Note: Obtain the HI-LADDER area head address using the following equation:
Head address = (H0280) + (HI-FLOW area capacity)
Obtain the HI-FLOW area capacity using the task code H35 “Read memory assignment”.

(2) Description of each function

1] Parameter area (A) (subcommand H00)
Writes the designated data *1 in parameter area (A).

Note: After executing this command, always execute the task code H27, parameter change completion, when the memory write processing is completed.

2] HI-FLOW area (subcommand H01)
Writes the designated program *1 to the HI-FLOW area.

Note: EH-150 does not support HI-FLOW.

3] HI-LADDER area (subcommand H02)
Writes the designated program *1 to the HI-LADDER area.

4] Parameter area (B) (subcommand H03)
Write the designated data *1 to parameter area (B).
The maximum capacity per write is 60 steps.

*1: For the designated data and program, use the data and program read using task code H31 “Program read with address designation.” If an invalid data or program is written, the CPU module may stop due to an error.

Task code	H26	Write memory assignment	Classification	Memory write

Function

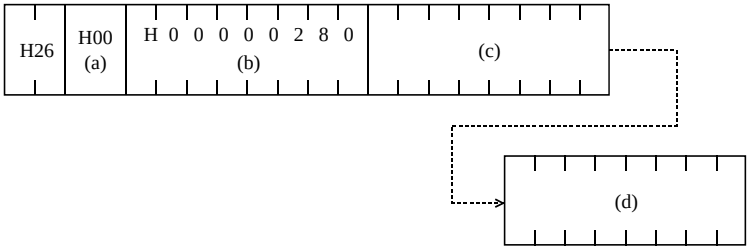
Writes the memory assignment information.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
×	×	×	×	READ occupancy	Occupancy
○	×	×	○	WRITE occupancy	status

Format

Request



(a) Subcommand (fixed to H00)

(b) Memory capacity of the parameter area (fixed to H00000280)

(c) Memory capacity of the HI-FLOW area (designated in 8 digit hexadecimal) *1

(d) Memory capacity of the HI-LADDER area (designated in 8 digit hexadecimal)

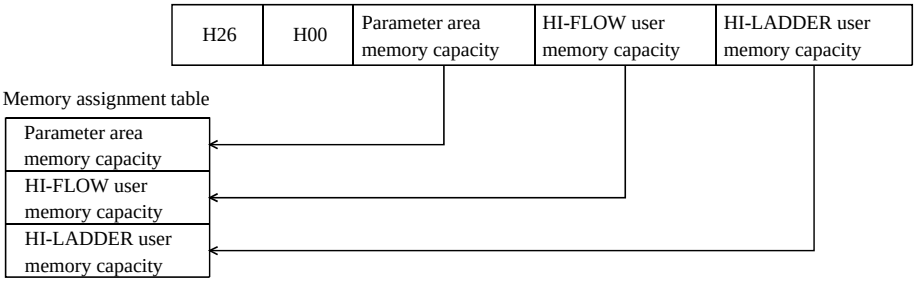
*1: EH-150 does not support HI-FLOW.

Response

(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the "response list by task code" at the end of this chapter.

Description

Request



After this task code is executed, always execute task code H27 "parameter modification completion", when the memory write processing is complete.

Task code	H27	Parameter modification completion	Classification	Memory write

Function

Notifies the CPU that the parameter area data has been modified.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
×	×	×	×	READ occupancy	Occupancy status
○	×	×	○	WRITE occupancy	

Format

Request

Response

(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the "response list by task code" at the end of this chapter.

Description

(1) Conducts I/O assignment based on the parameter information stored in parameter area (A) of the user memory so that the I/O and communication actions are performed according to the new I/O assignment.

(2) When the initialization of all user memory areas, zero clear, change in parameter area (A), or the writing of memory assignment is performed, always execute this task code when the memory write processing is completed.

(3) If the I/O assignment of each communication module is erased, or if the slots are changed after this task code has been executed, communication between the CPU and the connected host cannot be performed. In such cases, connect the programming device to the CPU and perform the necessary operations such as I/O assignment to recover.

Task code	H28	Timer/counter set value modification	Classification	Memory write

Function

Modifies the set value for the HI-LADDER program timer or counter.

Execution condition

1] CPU status

CPU status					
STOP	RUN	HALT	ERROR		
×	×	×	×	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	

2] The special internal output R7C7, which allows modifies while running, is on.

3] Normal scan time is less than 3 seconds while running.

4] In the case of ERROR, it is not in the severe error status.
While a modification is performed in a status other than STOP or ERROR, the special internal output R7EA (modify in progress while running) will turn on.

Format

Request

H28	H02 (a)	(b)	(c)	(d)	(e)	(f1)	(f2)	(g1)	(g2)

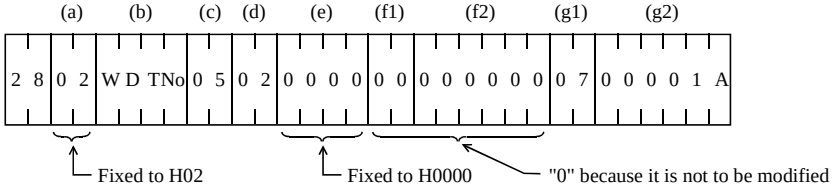
(a) Subcommand : H02 (fixed)

(b) Timer counter number : H0000 to H01FF (0 to 511)

(c) Change code : H00 Modify not performed.
H01 Modify time base only.
H02 Modify set value number 1 only.
H03 Modify time base and set value number 1.
H04 Modify set value number 2 only (WDT command).
H05 Modify time base and set value number 2 (WDT command).
H06 Modify set values number 1 and number2 (WDT command).
H07 Modify time base, set value number1 and set value number 2 (WDT command).

Note : When not making modification, set 0 in all digits.

(Example) When “H05” (change time base and set value number 2) is set as the modification code, set “0” for the I/O code (f1) and the I/O number (f2) of the set value number1, which is not to be modified.



(d) Time base H00: Counter
H01: 0.01 second timer
H02: 0.1 second timer
H03: 1 second timer

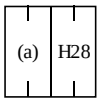
The counter can be specified when the timer counter number is H0000 to H01FF (0 to 511).
The 0.01 second timer can be specified when the timer counter number is H0000 to H003F (0 to 63).
The 0.1 and 1 second timers can be specified when the timer counter number is H0000 to H00FF (0 to 255).

(e) Address H0000 (must be fixed to H0000)

(f1) Set value number 1 I/O code
(f2) Set value number 1 I/O number
(g1) Set value number 2 I/O code
(g2) Set value number 2 I/O number

Type	I/O code	I/O number
Constant	H07	H000000 to H00FFFF
WX	H08	H000000 to H004FF9
WY	H09	H000000 to H004FF9
WR	H0A	H000000 to H0043FF *1
WL	H0B	H000000 to H0003FF
		H001000 to H0013FF
WM	H0C	H000000 to H0003FF

Response



(a) Response task code (H00 when executed normally)

*1: The WR area will vary depending on the CPU type.
EH-CPU308A: to WR43FF EH-CPU316A: to WR57FF EH-CPU448(A): to WRC3FF
EH-CPU516: to WR57FF EH-CPU548: to WRC3FF

Description

Modifies the timer counter set value within the ladder program. While the CPU is running, the set values are modified without stopping the scan when the normal scan END command is executed.

Note : When an address other than H0000 is designated, the settings will be modified if an error with the return code H04 (address error) or H0F (program not logical) occurs or if the timer is written to the designated address in the user program area, so take caution.

Task code	H31	Program read with address designation	Classification	Memory read

Function

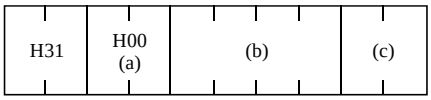
Reads the designated number of program steps, starting with the designated address.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy
○	○	○	○	WRITE occupancy	status

Format

Request

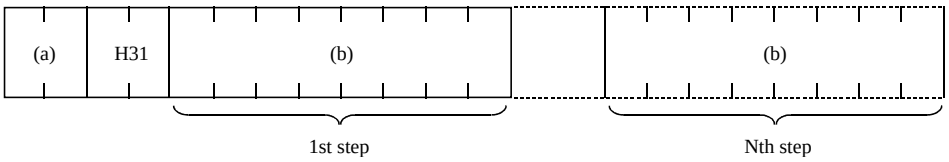


(a) Dummy (must be fixed to H00)

(b) Head address (absolute address in the CPU module)

(c) Number of steps (H01 to H3C, 60 steps maximum)

Response

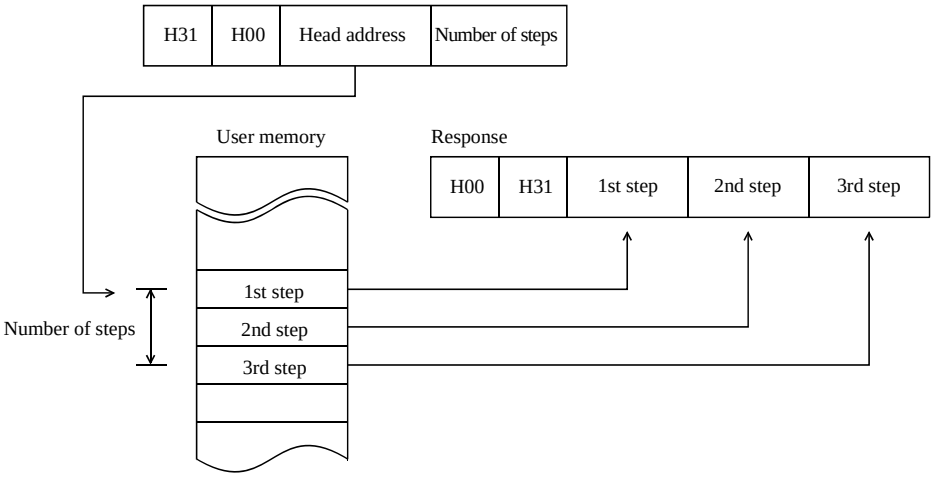


(a) Response task code (H00)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

(b) Program contents

Description

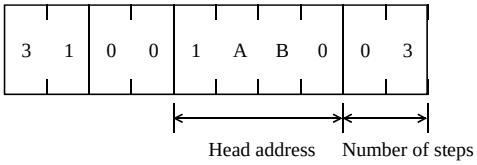
Request



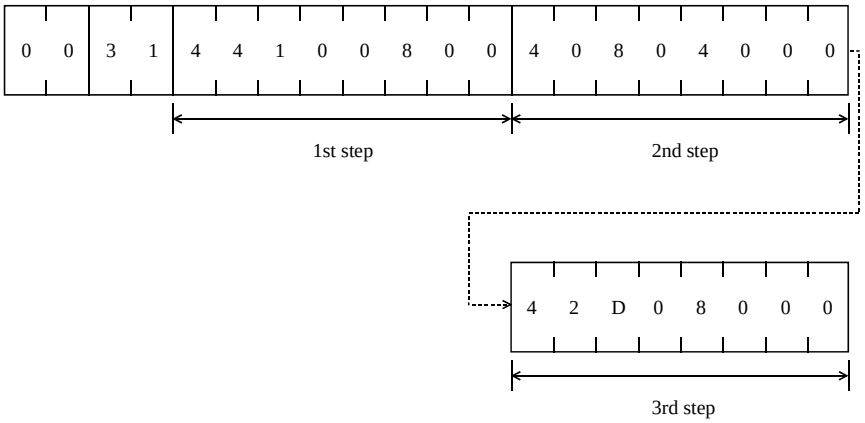
Example

Reads three steps, starting with address H1AB0.

Request



Response



Task code	H33	Final ladder search	Classification	Memory read

Function

Returns the circuit number, head address and the number of steps of the final circuit. (HI-LADDER only)

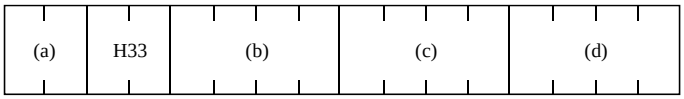
Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	

Format

Request

Response



(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

(b) Circuit number (4 digit hexadecimal)

(c) Head address (4 digit hexadecimal)

(d) Number of steps (4 digit hexadecimal)

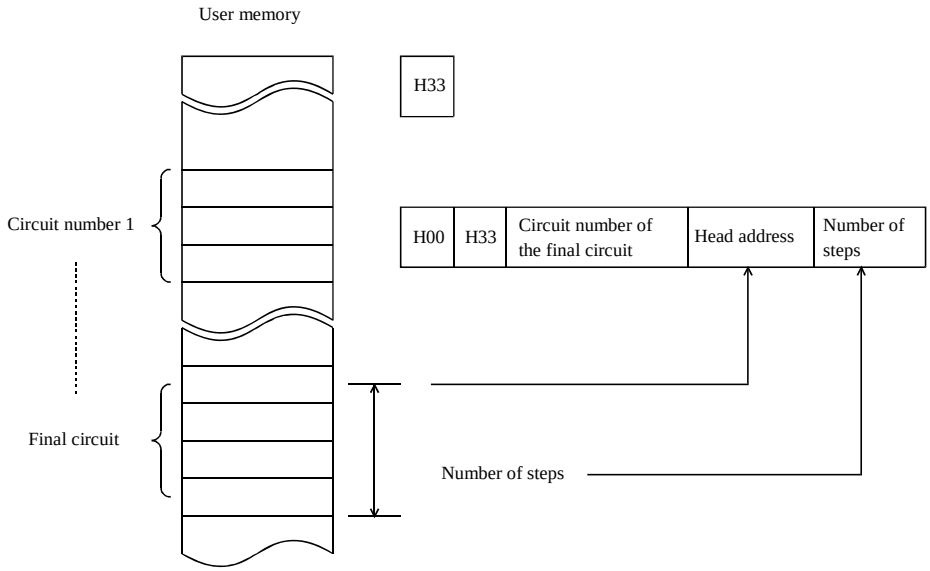
Note : When there is no program

(b) Circuit number = H0000

(c) Head address = H0000

(d) Number of steps = H0000

Description



Example

Assume the final circuit number as 100 (H64), the head address as H1C80 and the number of steps as 10 (H0A).

Request

3	3

Response

0	0	3	3	0	0	6	4	1	C	8	0	0	0	0	A

Circuit number | Head address | Number of steps

Task code	H35	Read memory assignment	Classification	Memory read

Function

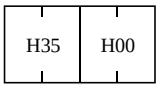
Reads the assigned memory capacity data.

Execution condition

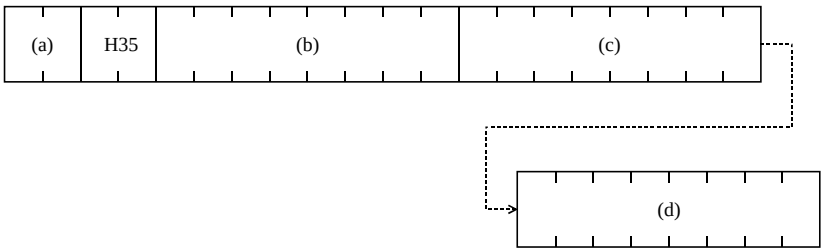
CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	

Format

Request



Response



(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

(b) Parameter area memory capacity (H00000280 fixed)

(c) HI-FLOW user program memory capacity (8 digit hexadecimal) *

(d) HI-LADDER use program memory capacity (8 digit hexadecimal)

* EH-150 does not support HI-FLOW.

Description

Request

H35	H00

Response

H00	H35	Parameter area memory capacity	HI-FLOW user memory capacity	HI-LADDER user memory capacity

Memory assignment table

Parameter area memory capacity
HI-FLOW user memory capacity
HI-LADDER user memory capacity

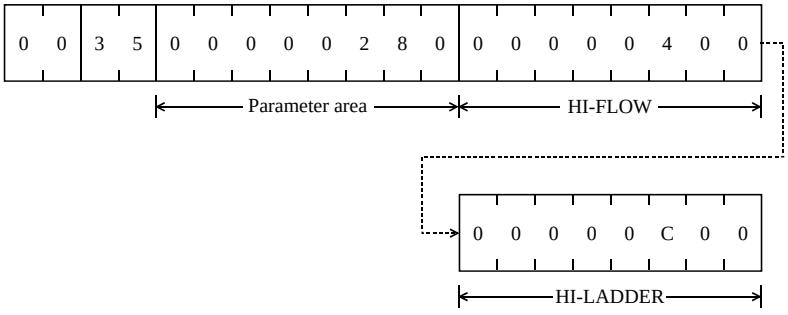
Example

Assume that 640 (H0280) steps are assigned as the parameter area, 1 K (H0400) steps as the HI-FLOW memory capacity and 3 K (H0C00) steps as the HI-LADDER memory capacity.

Request

3	5	0	0

Response



Task code	H40	Monitoring with I/O number designation (N continuous points)	Classification	I/O control

Function

Reads N continuous points (words) of monitor data, starting with the specified I/O number.

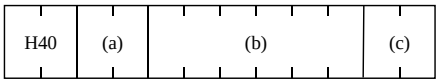
* This task code can also be executed when the CPU is not occupied. However, the response task code will be "H02" (local station is not occupying the CPU).
* The I/O data of EH-150 outside the range returns all off (0).

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	
○	○	○	○	Not occupied	

Format

Request



(a) I/O code (refer to the I/O code chart)

(b) I/O number (refer to I/O number decimal/hexadecimal conversion chart)

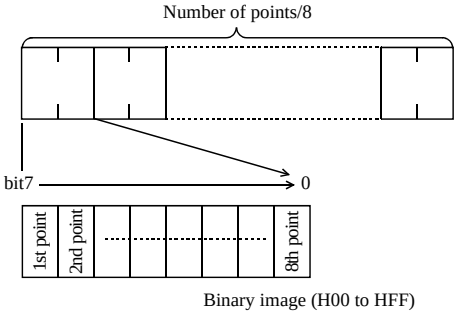
(c) Number of bits H01 to HF0 (1 to 240)
Number of words H01 to H78 (1 to 120)

Response

(a) Response task code
(H00 when executed normally)
For task codes other than the normal task codes, refer to the "response list by task code" at the end of this chapter.

(b) Monitor data

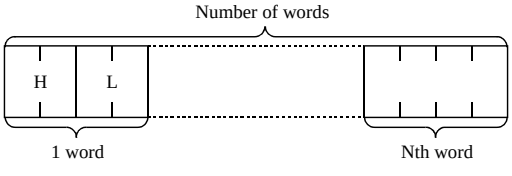
(b) Monitor data
(Bit data)



Binary image (H00 to HFF)

When the number of monitor points is less than 8 points, the open bits are set to 0 (H00 to HFF).

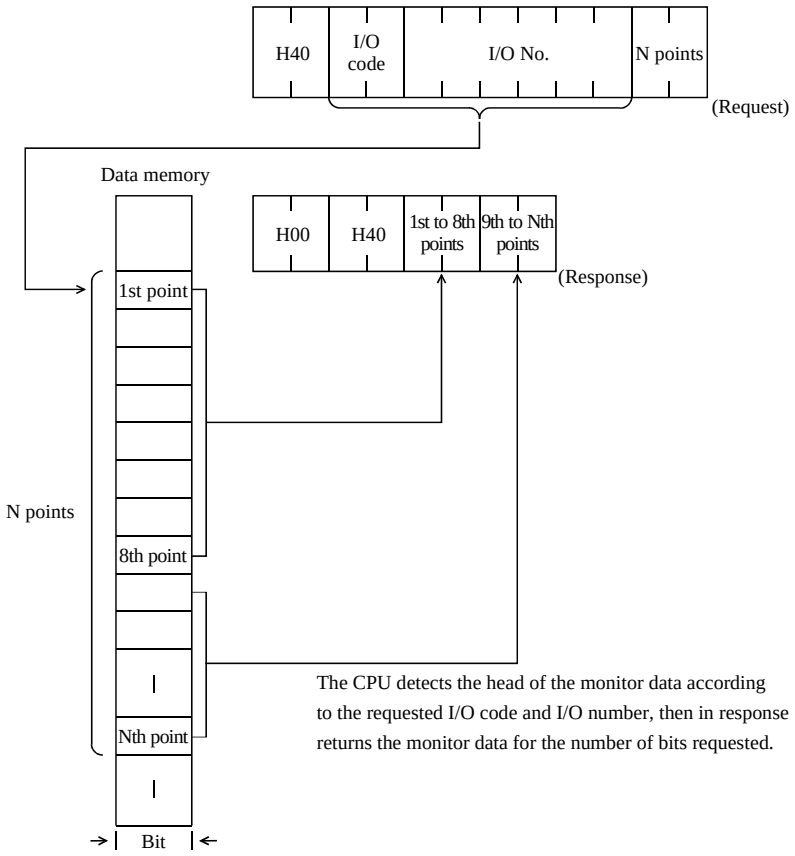
(Word data)



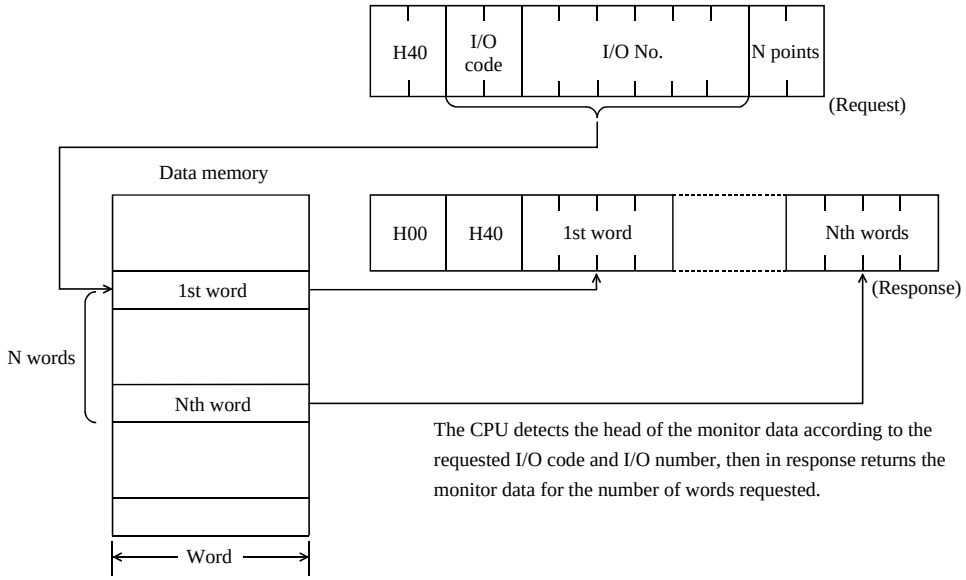
Binary image (H0000 to HFFFF)

Description

(A) When the I/O type code is bit and specified as less than or equal to 16 points



(B) When the I/O type code is word



I/O codes chart

I/O code	Symbol	I/O code	Symbol
H00	X	H20	WN
H01	Y	H21	DN
H02	R	H22	TM
H03	L	H23	TV
H04	M	H2A	WR□.n
H05	TD/CU	H2D	WR□.N
H06	CL	H30	EX
H07	(Unused)	H31	EY
H08	WX	H38	WEX
H09	WY	H39	WEY
H0A	WR		
H0B	WL		
H0C	WM		
H0D	TC		
H0E	DIF		
H0F	DFN		

Note :

1. I/O supported by each CPU is different.
   Refer to Table 5.20 in page 5-26 about the I/O that each CPU supports and the I/O number.

I/O number decimal/hexadecimal conversion chart

Symbol	I/O code	I/O number	
		Decimal (partially hexadecimal)	Decimal (partially hexadecimal)
X	H00	00000 to 4FF95	H000000 to H4FF5F
Y	H01	00000 to 4FF95	H000000 to H4FF5F
TD/CU	H05	0 to 511(EH-150) 0 to 2559(EHV-CPU)	H000000 to H0001FF H000000 to H0009FF
CL	H06	0 to 511(EH-150) 0 to 2559(EHV-CPU)	H000000 to H0001FF H000000 to H0009FF
WX	H08	0000 to 4FF9	H000000 to H004FF9
WY	H09	0000 to 4FF9	H000000 to H004FF9
TC	H0D	0 to 511(EH-150) 0 to 2559(EHV-CPU)	H000000 to H0001FF H000000 to H0009FF
DIF	H0E	0 to 511	H000000 to H0001FF
DFN	H0F	0 to 511	H000000 to H0001FF
TM	H22	0 to 2047	H000000 to H0007FF
TV	H23	0 to 2047	H000000 to H0007FF

Note :

1. In the decimal expression of X and Y, the lower two digits are decimal and the upper three digits are hexadecimal. Perform conversion from decimal to hexadecimal with respect to the lowest two digits.
   (Example) 4FF90 → 4FF5A
2. In the decimal expression of WX, WY, the lowest digit is decimal and the upper three digits are hexadecimal.
3. I/O supported by each CPU is different.
   Refer to Table 5.20 in page 5-26 about the I/O that each CPU supports and the I/O number.

Task code	H42	Forced set/reset with I/O number designation (N continuous points)	Classification	I/O control

Function

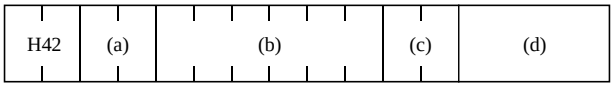
Forcibly sets and resets the designated data in N continuous points (words) of data area, starting with the designated I/O.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	

Format

Request



(a) I/O code
(b) I/O number
} *1

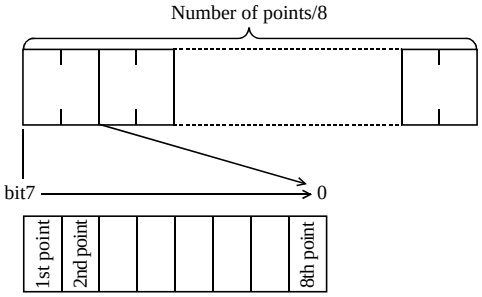
(c) Number of bits
H01 to HC8 (1 to 200)
Number of words
H01 to H64 (1 to 100)

*1: Refer to the task code H40

(d) Set/reset data

(d) Set/reset data

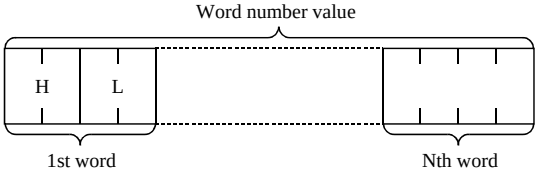
(Bit data)



Binary image (H00 to HFF)

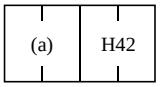
When the number of set/reset points is less than 8 points, set 0 to the open bits.

(Word data)



Binary image (H0000 to HFFFF)

Response



(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

* The EH-150 returns “H00” (normal execution) even for I/Os that are out of range.

Task code	H44	Monitoring with I/O number designation (N random points)	Classification	I/O control

Function

Reads the monitor data by designating N random points (words) of I/O numbers.

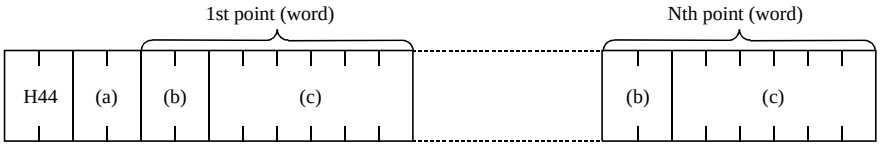
* This task code can also be executed when the CPU is not occupied. However, the response task code will be "H02" (local station is not occupying the CPU).
* The I/O data of EH-150 outside the range returns all off (0).

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	
○	○	○	○	Not occupied	

Format

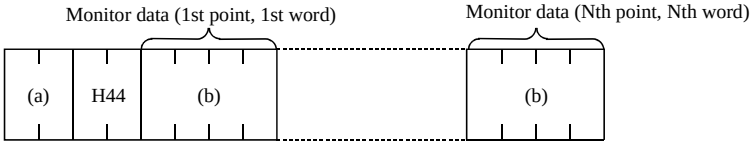
Request



(a) Number of bits/number of words H01 to H3F (1 to 60)

(b) I/O code
(c) I/O number
} Refer to the task code H40.

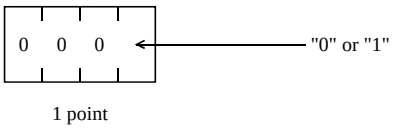
Response



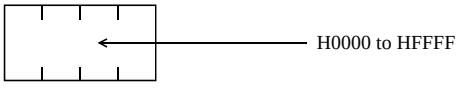
(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the "response list by task code" at the end of this chapter.

(b) Monitor data (refer to below for details)

(Bit data)

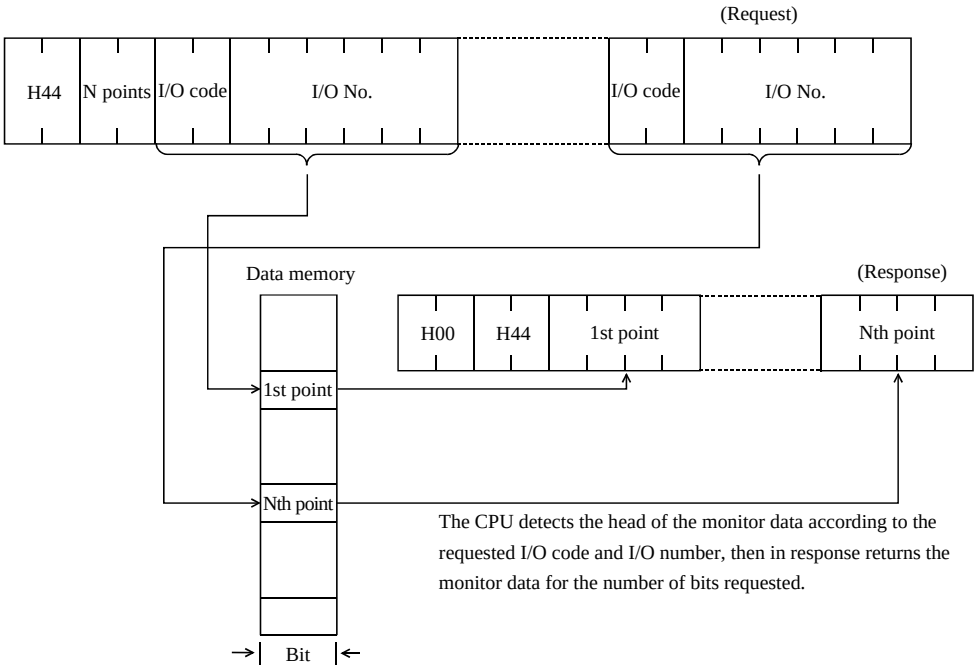


(Word data)



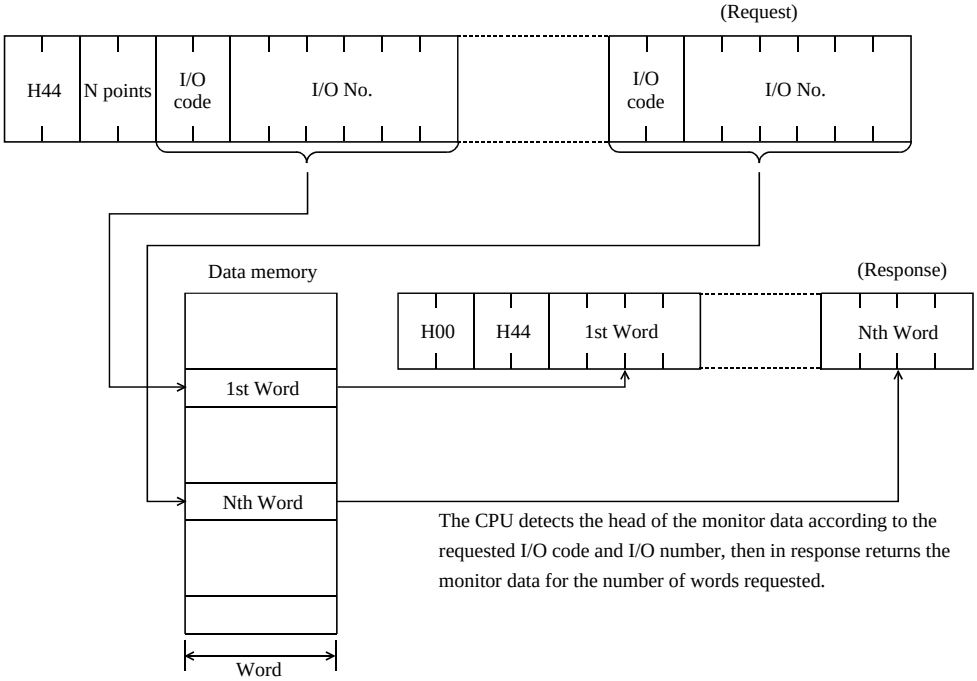
Description

(A) When the I/O code is bit



The CPU detects the head of the monitor data according to the requested I/O code and I/O number, then in response returns the monitor data for the number of bits requested.

(B) When the I/O code is word



The CPU detects the head of the monitor data according to the requested I/O code and I/O number, then in response returns the monitor data for the number of words requested.

Task code	H45	Forced set/reset with I/O number designation (N random points)	Classification	I/O control

Function

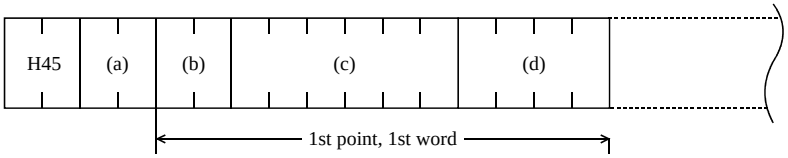
Designates N points (words) of I/O numbers randomly, and forcibly sets the designated data or resets the data area.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	

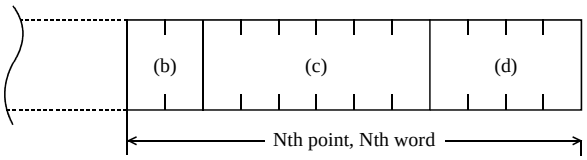
Format

Request

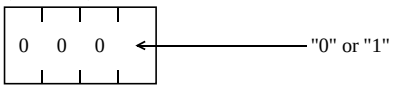


(a) Number of bits/number of words H01 to H28 (1 to 40)
(b) I/O code
(c) I/O number
(d) Data

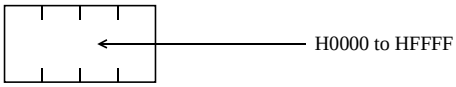
} Refer to the task code H40.



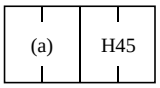
(Bit data)



(Word data)



Response



(a) Response task code
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

* The EH-150 returns “H00” (normal execution) even for I/Os that are out of range.

Task code	HA0	Monitoring with I/O number designation (N continuous points)	Classification	I/O control

Function

Reads N continuous points (words) of monitor data, starting with the designated I/O number.

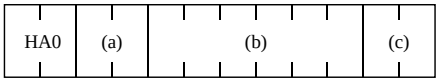
* This task code can also be executed when the CPU is not occupied.
* The I/O data of EH-150 outside the range returns all off (0).

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	
○	○	○	○	Not occupied	

Format

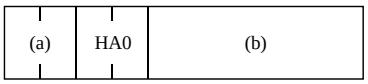
Request



(a) I/O code
(b) I/O number
} Refer to the task code H40.

(c) Number of bits H01 to HF0 (1 to 240)
Number of words H01 to H78 (1 to 120)

Response

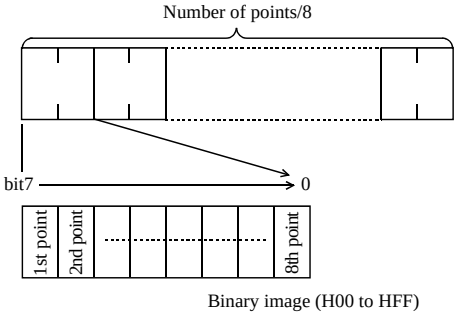


(a) Response task code
(H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

(b) Monitor data

(b) Monitor data

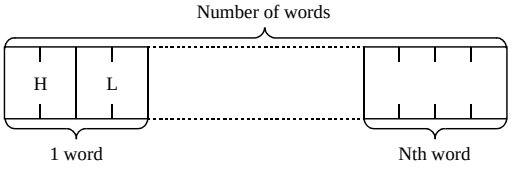
(Bit data)



Binary image (H00 to HFF)

When the number of monitor points is less than 8 points, the open bits are set to 0 (H00 to HFF).

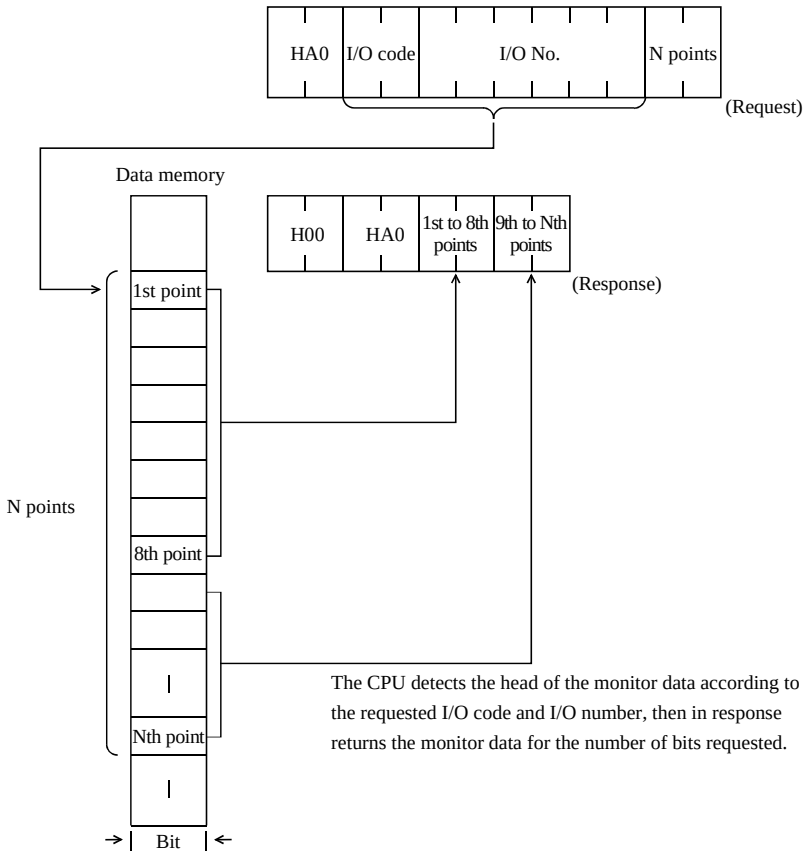
(Word data)



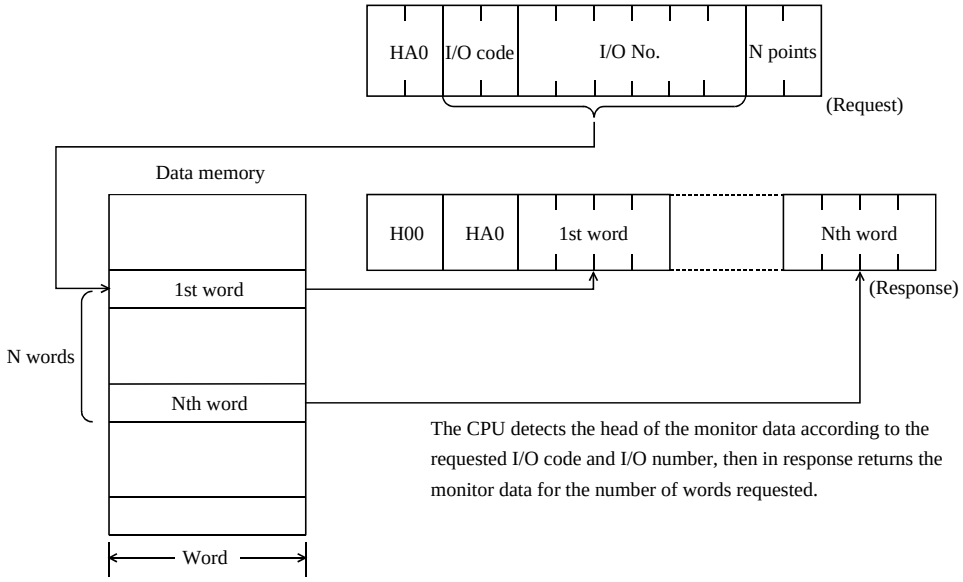
Binary image (H0000 to HFFFF)

Description

(A) When the I/O type code is bit and specified as less than or equal to 16 points.



(B) When the I/O type code is word



Task code	HA2	Forced set/reset with I/O number designation (N continuous points)	Classification	I/O control

Function

Forcibly sets and resets the designated data in N continuous points (words) of data area, starting with the specified I/O.

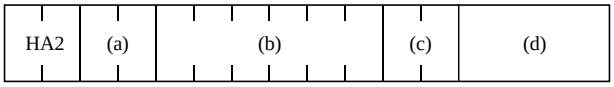
* This task code can also be executed when the CPU is not occupied.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	
○	○	○	○	Not occupied	

Format

Request



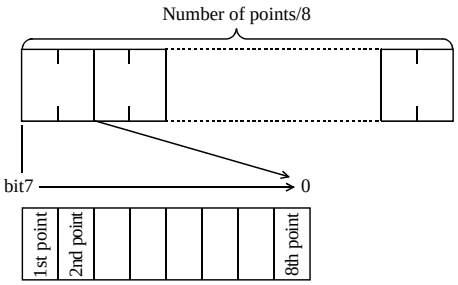
(a) I/O code
(b) I/O number
} Refer to the task code H40.

(c) Number of bits
H01 to HC8 (1 to 200)
Number of words
H01 to H64 (1 to 100)

(d) Set/reset data

(d) Set/reset data

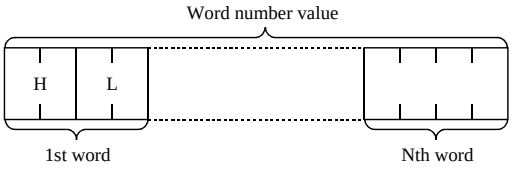
(Bit data)



Binary image (H00 to HFF)

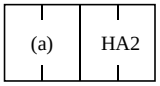
When the number of set/reset points is less than 8 points, set 0 to the open bits.

(Word data)



Binary image (H0000 to HFFFF)

Response



(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

* The EH-150 returns “H00” (normal execution) even for I/Os that are out of range.

Task code	HA4	Monitoring with I/O number designation (N random points)	Classification	I/O control

Function

Reads the monitor data by designating N random points (words) of I/O numbers.

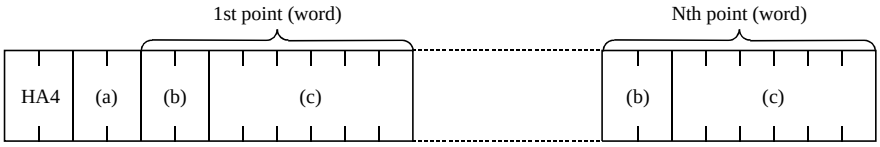
* This task code can also be executed when the CPU is not occupied.
* The I/O data of EH-150 outside the range returns all off (0).

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	
○	○	○	○	Not occupied	

Format

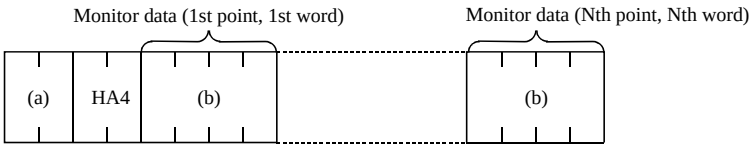
Request



(a) Number of bits/number of words H01 to H3F (1 to 60)

(b) I/O code
(c) I/O number
} Refer to the task code H40.

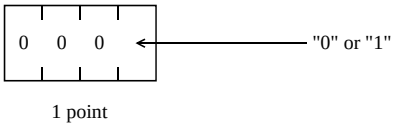
Response



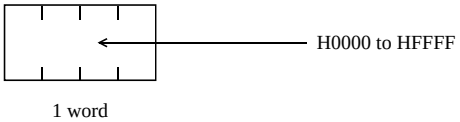
(a) Response task code (H00 when executed normally)
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

(b) Monitor data (refer to below for details)

(Bit data)

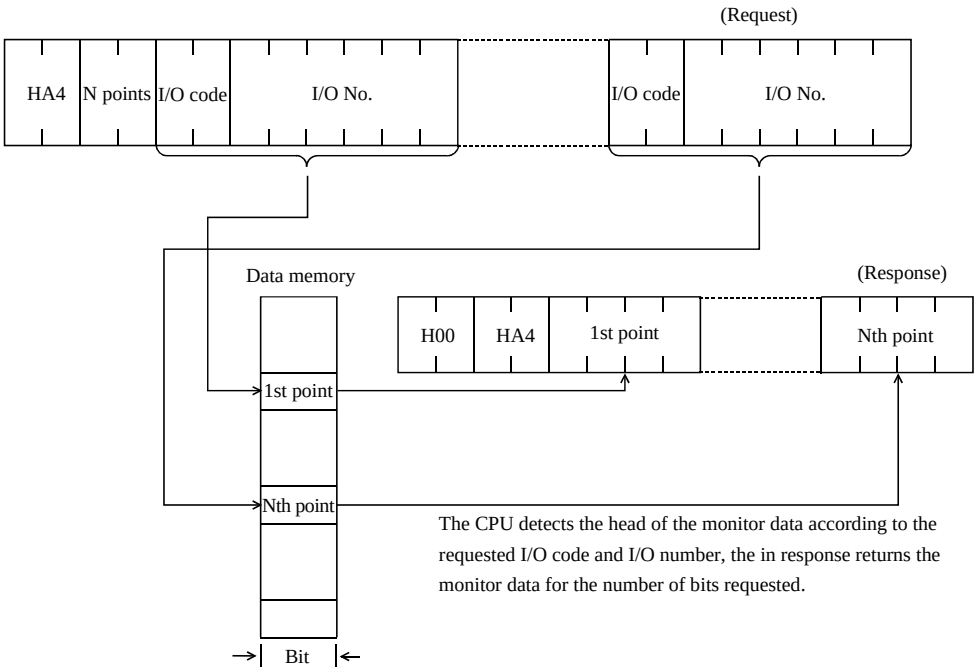


(Word data)



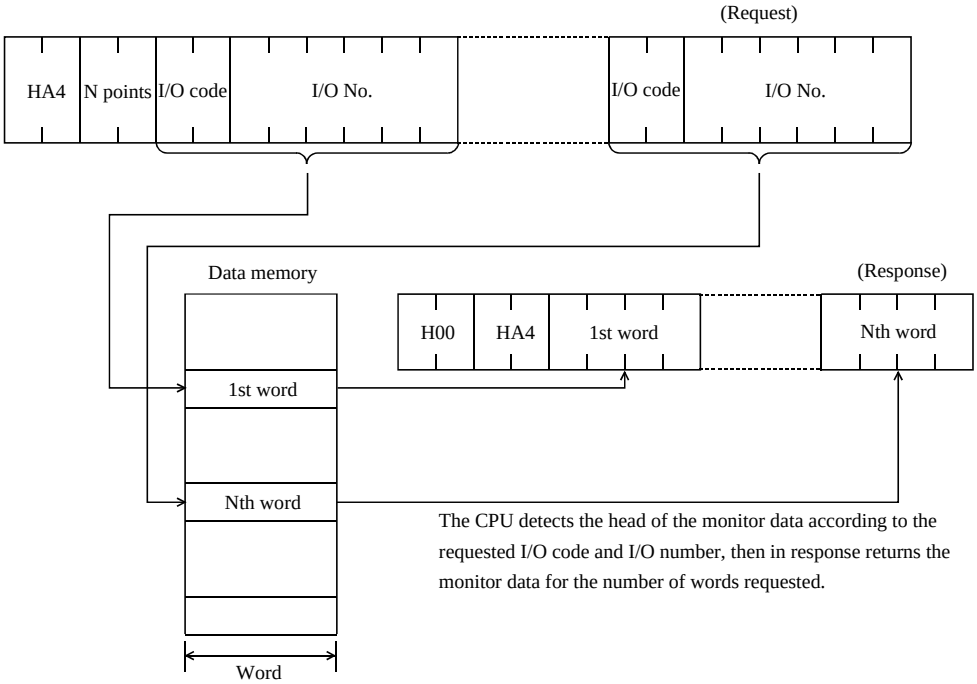
Description

(A) When the I/O code is bit



The CPU detects the head of the monitor data according to the requested I/O code and I/O number, the in response returns the monitor data for the number of bits requested.

(B) When the I/O code is word



The CPU detects the head of the monitor data according to the requested I/O code and I/O number, then in response returns the monitor data for the number of words requested.

Task code	HA5	Forced set/reset with I/O number designation (N random points)	Classification	I/O control

Function

Designates N points (words) of I/O numbers randomly, and forcibly sets the designated data or resets the data area.

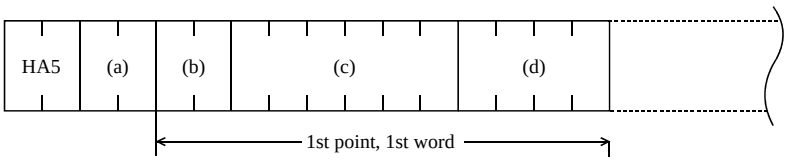
* This task code can also be executed when the CPU is not occupied.

Execution condition

CPU status					
STOP	RUN	HALT	ERROR		
○	○	○	○	READ occupancy	Occupancy status
○	○	○	○	WRITE occupancy	
○	○	○	○	Not occupied	

Format

Request

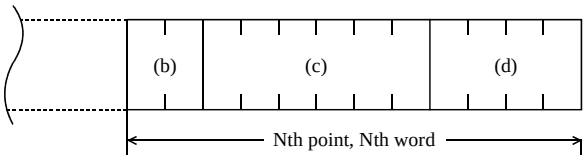


(a) Number of bits/number of words H01 to H28 (1 to 40)

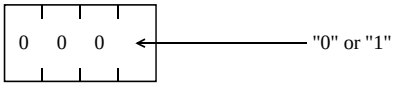
(b) I/O code

(c) I/O number } Refer to the task code H40.

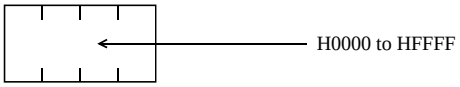
(d) Data



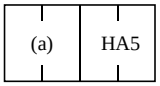
(Bit data)



(Word data)



Response



(a) Response task code
For task codes other than the normal task codes, refer to the “response list by task code” at the end of this chapter.

* The EH-150 returns “H00” (normal execution) even for I/Os that are out of range.

response list by task code

Task code	Subcommand	Code	Response task code	Code	Return code	Code	Error cause
H10	Status	H00	Normal execution	H00			
	Memory status	H01	Normal execution	H00			
	Software version	H02	Normal execution	H00			
	CPU error code	H03	Normal execution	H00			
	Call CPU name	H04	Normal execution	H00			
	Undefined	H05 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
	None		Abnormal task code	H01	Abnormal number of steps/words	H05	Only the task code is input.
H11	Stop designation	H00	Normal execution	H00			
			Not-executable	H03	Operation error	H0C	Setting is not in remote status. Remote STOP is not enabled.
	Run designation	H01	Normal execution	H00			
			Not-executable	H03	Operation error	H0C	Setting is not in remote status. CPU is in error status. WRITE-occupied by other station. Remote RUN is not enabled. User-set run condition is not satisfied.
					Combination error	H0E	A RUN-prohibited task code has already been executed and the CPU is in RUN-prohibited state.
	Undefined	H02 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
	None		Abnormal task code	H01	Abnormal number of steps/words	H05	Only the task code is input.
H16	Cancel occupancy	H00	Normal execution	H00			
	READ occupancy	H01	Normal execution	H00			
			Not-executable	H03	Occupancy code mismatch	H04	Local station is WRITE-occupying CPU.
					READ occupancy maximum exceeded	H06	Already READ-occupied by the other four stations.
					Occupied by another station	H08	Another station is WRITE-occupying CPU.
	WRITE occupancy	H02	Normal execution	H00			
			Not-executable	H03	Occupancy code mismatch	H03	Local station is READ-occupying CPU.
					Occupied by another station	H08	CPU is occupied by another station.
	Occupancy mode modification (WRITE → READ)	H05	Normal execution	H00			
			Not-executable	H03	Not occupied	H07	Local station is not occupying the CPU.
	Occupancy mode modification (READ → WRITE)	H06	Normal execution	H00			
			Not-executable	H03	Not occupied	H07	Local station is not occupying the CPU.
					Occupied by another station	H08	CPU is occupying by another station.
	Undefined	H03, H04, H07 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
	None		Abnormal task code	H01	Abnormal number of steps/words	H05	Only the task code is input.
H17	Forced cancel of all peripherals	H00	Normal completion	H00			
	Forced cancel of local station	H01	Normal completion	H00			
	Undefined	H02 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
	None		Abnormal task code	H01	Abnormal number of steps/words	H05	Only the task code is input.
H18	Reading the calendar clock	H00	Normal execution	H00			
			Not-executable	H03	RTC cannot be accessed	H10	Abnormal RTC, or not mounting
	Setting the calendar clock	H01	Normal execution	H00			
			Abnormal task code	H01	Abnormal number of steps/words	H05	Parameter length is too short.

Task code	Subcommand	Code	Response task code	Code	Return code	Code	Error cause
H18	Setting the calendar clock	H01	Not-executable	H03	Operation error	H0C	Abnormal set value
					RTC cannot be accessed	H10	Abnormal RTC, or not mounting
	30 second adjustment	H02	Normal execution	H00			
			Not-executable	H03	RTC cannot be accessed	H10	Abnormal RTC, or not mounting
	Undefined	H03 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
H1C			Normal execution	H00			
H20	Initialize all user memory area	H00	Normal execution	H00			
			Not-executable	H03	Occupancy code mismatch	H03	Local station is READ-occupying CPU
					Not occupied	H07	Local station is not occupying CPU
					RAM error	H0A	READ/WRITE check results did not match
					CPU is running	H0B	CPU is running
	Initialize HI-FLOW area	H01	Normal execution	H00			
			Not-executable	H03	Occupancy code mismatch	H03	Local station is READ-occupying CPU
					Not occupied	H07	Local station is not occupying CPU
					CPU is running	H0B	CPU is running and “modify during RUN” mode is not set
	Initialize HI-LADDER area	H02	Normal execution	H00			
			Not-executable	H03	Occupancy code mismatch	H03	Local station is READ-occupying CPU
					Not occupied	H07	Local station is not occupying CPU
					CPU is running	H0B	CPU is running and “modify during RUN” mode is not set
	Zero clear all user memory area	H03	Normal execution	H00			
			Not-executable	H03	Occupancy code mismatch	H03	Local station is READ-occupying CPU
					Not occupied	H07	Local station is not occupying CPU
					CPU is running	H0B	CPU is running
	Undefined	H04 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
H23	Write to parameter area (A)	H00	Normal execution	H00			
			Abnormal task code	H01	Abnormal address	H04	Transfer address is outside the specified range of parameter area (A)
					Abnormal number of steps/words	H05	Number of transfer steps are outside the specified range
					Memory over	H09	“Address + number of steps” exceeds the parameter area
			Not-executable	H03	Occupancy code mismatch	H03	Local station is READ-occupying CPU
					Not occupied	H07	Local station is not occupying CPU
					CPU is running	H0B	CPU is running
	Write to HI-FLOW area	H01	Normal execution	H00			
			Abnormal task code	H01	Abnormal address	H04	Transfer address is outside the designated range of HI-FLOW area
					Abnormal number of steps/words	H05	Number of transfer steps are outside the designated range
					Memory over	H09	“Address + number of steps” exceeds the flow area
			Not-executable	H03	Occupancy code mismatch	H03	Local station is READ-occupying CPU
					Not occupied	H07	Local station is not occupying CPU
					CPU is running	H0B	CPU is running
	Write to HI-LADDER area	H02	Normal execution	H00			
			Abnormal task code	H01	Abnormal address	H04	Transfer address is outside the designated range of HI-LADDER area
					Abnormal number of steps/words	H05	Number of transfer steps are outside the designated range
					Memory over	H09	“Address + number of steps” exceeds the ladder area

Task code	Subcommand	Code	Response task code	Code	Return code	Code	Error cause
H23	Write to HI-LADDER area	H02	Not-executable	H03	ROM memory	H01	Program memory is ROM
					Occupancy code mismatch	H03	Local station is READ-occupying CPU
					Not occupied	H07	Local station is not occupying CPU
					CPU is running	H0B	CPU is running and “modify during RUN” mode is not set
	Write to parameter area (B)	H03	Normal execution	H00			
			Abnormal task code	H01	Abnormal address	H04	Transfer address is outside the designated range of parameter area (B)
					Abnormal number of steps/words	H05	Number of transfer steps are outside the designated range
					Memory over	H09	“Address + number of steps” exceeds the parameter area
			Not-executable	H03	Occupancy code mismatch	H03	Local station is READ-occupying CPU
					Not occupied	H07	Local station is not occupying CPU
					CPU is running	H0B	CPU is running and “modify during RUN” mode is not set
	Undefined	H04 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
	None		Abnormal task code	H01	Abnormal number of steps/words	H05	Only the task code is input.
H26	Memory assignment	H00 (Fixed)	Normal execution	H00			
			Abnormal task code	H01	Memory size over	H0A	Memory assignment total has exceeded the physical memory capacity.
			Not-executable	H03	Occupancy code mismatch	H03	READ-occupied by local station.
					Not occupied	H07	Local station is not occupying CPU.
					CPU is running	H0B	CPU is running and “modify during RUN” mode is not set.
	Undefined	H01 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
	None		Abnormal task code	H01	Abnormal number of steps/words	H05	Task code input-parameter length is too short.
H27	End of parameter change		Normal execution	H00			
			Not-executable	H03	Occupancy code mismatch	H03	READ-occupying by local station.
					Not occupied	H07	Local station is not occupying CPU.
					CPU is running	H0B	CPU is running and “modify during RUN” mode is not set.
H28	Change set value of timer counter	H02 (Fixed)	Normal execution	H00			
			Abnormal task code	H01	Undefined subcommand	H02	Subcommand is other than 02H. Modification code is 08H or above.
					Abnormal address	H04	Address is abnormal.
					Abnormal number of steps/words	H05	Task code input-parameter length is too short.
					Abnormal I/O code	H06	I/O code is abnormal. Time base is H04 or above.
					Abnormal I/O number	H07	I/O number is abnormal. Timer counter number is 512 or above. The 1st set value of watchdog (constant) is greater than or equal to the 2nd set value (constant). 0.01 second, 0.1 second or 1.0 second was set as the time base when timer counter number was 256 or above. 0.01 second was set as the time base when timer counter number was 64 or above.
			Not-executable	H03	Inconsistent parameter	H02	The timer of the timer-counter number is used by HI-FLOW.
					Occupancy code mismatch	H03	READ-occupying by local station
					Not occupied	H07	Not occupied by local station.

Task code	Subcommand	Code	Response task code	Code	Return code	Code	Error cause
H28	Change set value of timer counter	H02 (Fixed)	Not-executable	H03	Not-occupied	H07	Local station is not occupying CPU.
					Operation error	H0C	R7C7 is off CPU severe error Scan time is more than 3 seconds
					No program	H0D	No program
					Inconsistent program	H0F	0.01 second, 0.1 second or 1.0 second was set as the time base for a counter. A counter is designated as the time base for a timer. Modification of second set value was specified as the modification code when other than WDT. Timer is not programmed in the designated user address.
H31	Read address designation program	H00 (Fixed)	Normal execution	H00			
			Abnormal task code	H01	Abnormal address	H04	Designated address exceeds the capacity of installed memory.
					Abnormal number of steps	H05	Number of read steps is outside the range of 1 to 60.
			Not occupied	H03	Not occupied	H07	Local station is not occupying CPU.
	Undefined	H01 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
H33	None		Normal execution	H00			
			Not-executable	H03	Not-occupied	H07	Local station is not occupying CPU.
H35	Read memory assignment	H00	Normal execution	H00			
			Not-executable	H03	Not-occupied	H07	Local station is not occupying CPU.
	Reserved subcommand	H02 H04	Do not use.				
	Undefined	H01, H03, H05 to HFF	Abnormal task code	H01	Undefined subcommand	H02	Undefined subcommand is set.
H40	None		Normal execution	H00			
			Abnormal task code	H01	Abnormal number of steps/words	H05	The requested number of points is outside the designated range.
					Abnormal I/O code	H06	The requested I/O type code is undefined or is an I/O that cannot be forced to be set.
					Abnormal I/O No.	H07	The requested I/O type code is undefined or is an I/O that cannot be monitored.
			Warning	H02			Local station is not occupying CPU.
H42	None		Normal execution	H00			
			Abnormal task code	H01	Abnormal number of steps/words	H05	The requested number of points is outside the designated range.
					Abnormal I/O code	H06	The requested I/O type code is undefined.
					Abnormal I/O No.	H07	The requested I/O No. is outside the designated range.
			Not-executable	H03	Not occupied	H07	Local station is not occupying CPU.
H44	None		Normal execution	H00			
			Abnormal task code	H01	Abnormal number of steps/words	H05	The requested number of points is outside the designated range.
					Abnormal I/O code	H06	The requested I/O type code is undefined or is an I/O that cannot be forced to be set.
					Abnormal I/O No.	H07	The requested I/O type code is undefined.
			Warning	H02			Local station is not occupying CPU.
H45	None		Normal execution	H00			
			Abnormal task code	H01	Abnormal number of steps/words	H05	The requested number of points is outside the designated range.
					Abnormal I/O code	H06	The requested I/O type code is undefined or is an I/O that cannot be forced to be set.
					Abnormal I/O No.	H07	The requested I/O No. is outside the designated range.
			Not-executable	H03	Not occupied	H07	Local station is not occupying CPU.

Task code	Subcommand	Code	Response task code	Code	Return code	Code	Error cause
HA0	None		Normal execution	H00			
			Abnormal task code	H01	Abnormal number of steps/words	H05	The requested number of points is outside the designated range.
					Abnormal I/O code	H06	The requested I/O type code is undefined.
					Abnormal I/O No.	H07	The requested I/O No. is outside the designated range.
HA2	None		Normal execution	H00			
			Abnormal task code	H01	Abnormal number of steps/words	H05	The requested number of points is outside the designated range.
					Abnormal I/O code	H06	The requested I/O type code is undefined or is an I/O that cannot be forced to be set.
					Abnormal I/O No.	H07	The requested I/O No. is outside the designated range.
HA4	None		Normal execution	H00			
			Abnormal task code	H01	Abnormal number of steps/words	H05	The requested number of points is outside the designated range.
					Abnormal I/O code	H06	The requested I/O type code is undefined.
					Abnormal I/O No.	H07	The requested I/O No. is outside the designated range.
HA5	None		Normal execution	H00			
			Abnormal task code	H01	Abnormal number of steps/words		The requested number of points is outside the designated range.
					Abnormal I/O code	H06	The requested I/O type code is undefined or is an I/O that cannot be forced to be set.
					Abnormal I/O No.	H07	The requested I/O No. is outside the designated range.

Appendix C Fundamentals of TCP/IP

C.1 IP address

In general, 32 bits logical address called IP address is used in TCP/IP and UDP/IP protocol. IP address is consisted by Network address and Host address. The boundary of Network address and Host address has three types upper 8bits, 16bits or 24bits. Each types are called Class A, B and C.
In general, Class C is mainly used in industrial field.

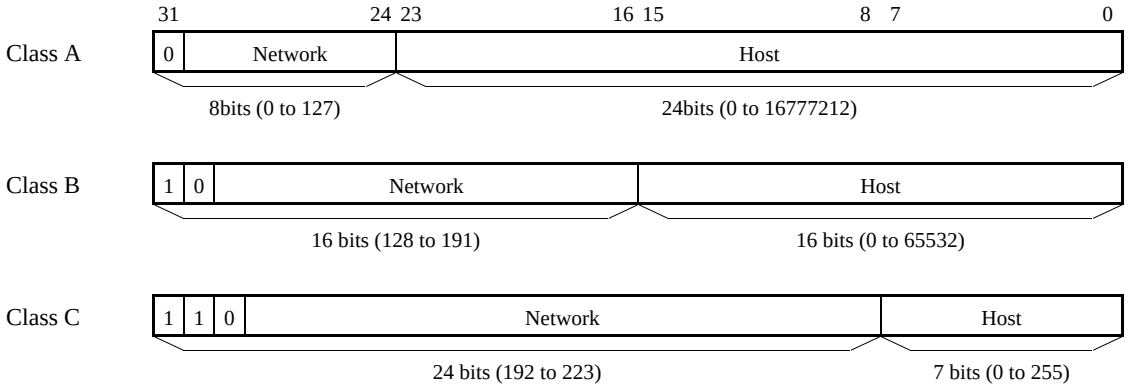


Figure C.1 Classification of IP address

And then, IP address is indicated by decimal with dot character "." every 8 bits. For example, IP address of Class C is indicated as follow.

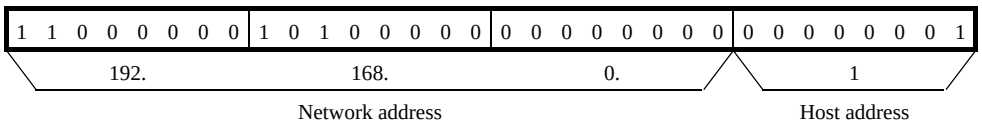


Figure C.2 The example of Class C IP address Ethernet

In general, it is possible to use the address area called "private internet address" when to make the local network system. (Following is the description of RFC1918)

Class A :	10.0.0.0	-	10.255.255.255
Class B :	172.16.0.0	-	172.31.255.255
Class C :	192.168.0.0	-	192.168.255.255

C.2 Sub net mask

Sub Net is used for specifying how many bits of Host address be used as Network address among of the IP address with each Class. Sub Net Mask has 32 bits and is used for specifying how many bits among IP address be used as Network address. Network address can be calculated by logical and operation this Sub Net Mask value and IP address.

- IP address

192. 11000000	168. 10101000	10. 00001010	129 10000001

- Sub Net mask

255. 11111111	255. 11111111	255. 11110000	128 10000000

- Network IP address 192.168.10.128
- Host IP address 192.168.10.1

Figure C.3 The configuration method for Sub Net Mask

C.3 IP(Internet Protocol) and routing table

IP sends an IP packet having IP header and Data to the destination Host or the Router exists on the route way to the destination Host by using the Link layer standing for the Ethernet. The reliability is not so good, because there is no confirmation of response, retry of sending, detecting of error and connection on the IP level. But the reliability becomes better to use with TCP described in later.

Routing means the selection of the pass when the IP packet is sent to the destination Host. To select the pass the Router is the one of the equipment. This Router is placed between networks and forwards the packet to the host on the network or to the other network.
Static Routing and Dynamic Routing are available for the method of selecting the pass. The method of Static Routing, the information of pass is set into the table of the communication equipment before to use the network. On the other hand, the information of pass is saved into the table of the communication equipment dynamically is the method of Dynamic Routing.

C.4 User Datagram Protocol (UDP)

UDP is very simple protocol and handle the limited transport service only. Therefore, there are no confirmation of response and retry of sending, the error control should be taken care by the upper layer protocol using UDP.

C.5 Transmission Control Protocol (TCP)

TCP is the protocol of transport layer with connection and stream type.

With the connection type, a logical connection is established before starting transmission of data and the transmission of data is done under this status. It is required to release the logical connection if the data transmission is completed. Be careful it is not recommended to repeat the establishing and releasing the connection within short term when the data transmission under TCP protocol in general. Because there is the status which called “TIME_WATE status” and during this status, the other connection can’t be established at this moment.

With the stream type, this means that it is possible to send or receive the sequential data stream.
The difference of TCP and UDP is shown in Table C.1.

Table C.1 The difference of TCP and UDP

	TCP	UDP
Connection style	1:1 only	1:1 or 1:n are possible
Method of specifying by application	Port number of TCP	Port number of UDP
Unit of transmission	Stream	Packet
Guarantee of transfer to the destination	Yes	No
The operation after the error on sending	Automatically retrying	Losing the packet
Establishing the logical connection	Need	No need

C.6 Port number

It is required to specify the port number. The port number is used both for destination and source to connect UDP or TCP. The port number has the function to combine the application software with each protocol. The application software makes communication using UDP or TCP. The well used server applications software is called “Well-known Port” in both protocol and the reserved port number is used for this.