User's Manual

LG Programmable Logic Controller

Ethernet I/F Module

GLOFA-GM **G3L-EUEA**
G4L-EUEA

LG Industrial Systems

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Ethernet I/F Module

GLOFA-GM G3L-EUEA
G4L-EUEA

LG INDUSTRIAL SYSTEMS

This user's manual describes functions of Cnet I/F module.
Please read this manual carefully to understand the functions thoroughly prior to system design.

Revision record

Revision record	Date of issue revised	Contents revised

◉ Contents ◉

Chapter 1 Introduction

These instructions give a technically full explanation of the GLOFA-GM Ethernet, Ethernet Module, among GLOFA PLC system network modules.

If you want to write a program, please refer to the instructions below.

- Command collection of GLOFA PLC
- Instructions for GLOFA PLC GMWIN

When making up GLOFA Ethernet system, please take notice of the following.

- GLOFA PLC GMWIN Program Tool: Above ver 3.0
- GLOFA GM1/2 CPU : Above ver 1.2
- GLOFA GM3 CPU : Above ver 1.8

GLOFA Enet possesses the following characteristics.

GLOFA Enet :

- ▶ follows IEEE 802.3 standards. (Support Ethernet standards).
- ▶ supports the protocols of ARP, ICMP, IP, UDP, TCP.
- ▶ is accessible to data by using public network.
- ▶ supports Dynamic Connection/Disconnection by using Function Block.
- ▶ supports high-speed link for high-speed data communication between the modules of one' s own company.
- ▶ is able to communicate with 16 countries at the same time except the high-speed link. (Dedicated line + Function Block communication).
- ▶ makes GMWIN loader service possible through Ethernet. (Dedicated TCP/IP PORT: 2002 allocation).
- ▶ supports 10BASE5, 10BASE2, 10BASE-T media all.
- ▶ connects easily with the systems of other companies by using Function Block and frame editor
- ▶ possesses the function to monitor network status and collect information. (one' s own communication module).
- ▶ sets up automatically TCP port 2004, UDP port 2005, high-speed link port 2006, 2007 for channel list when power is on. (Ports such as 2002, 2004, 2005,2006,2007 should not be used in Function Block service.)
- ▶ makes Variable READ/WRITE service possible by using Function Block. (Using Dynamic Connection)
- ▶ is able to install maximum 4 Ethernet communication modules in one basic base.
- ▶ Supports various system configurations by changing the basic parameters.

1.1 Matters that demand special attention when using

When you install this equipment, please give special attention to the following for reliability and safety of system.

Item	Classification	Contents
Temperature	Condition	When installing the equipment, ambient temperature must maintain between 0 and 55C due to the use of degauss. The equipment should not be exposed to direct ray of light.
	Measures	If the temperature is high, you should install fan or air-conditioner, and if it is low the other way, you should keep up a proper temperature.
Dewfall	Condition	Dew should not be forming at a sudden temperature change. Please install it in the water- and dustproof control board.
	Measures	Frequent On/Off of power can cause the dewfall by the sudden temperature change. In this case, you should switch on even in the night.
Shock	Condition	Please do not install it in a place where a shock or vibration is not applied.
	Measures	In case of a lot of shocks and vibration, you should take proper measures by means of protection rubber to keep them from the equipment.
Gas	Condition	Please install it in a place where there is no corrosive gas.
	Measures	If the corrosive gas comes from outside, take proper measures against it with the air in the control board cleaning.
EMC environment	Condition	Please install it in a place where there is enough electromagnetic compatibility.
	Measures	Please select the exact cable path during wiring work. Confirm if the control board is properly protected from electromagnetic field. Please use glow lamp rather than fluorescent lamp in the control room. When installing power module, you must earth on the standard electric potential.

Chapter 2 Definition of Terminology

Items	Explanation
ARP (Address Resolution Protocol)	A protocol used to obtain MAC address by using IP address of the partner on Ethernet LAN
Bridge	A device used to connect two networks together, which may be similar or dissimilar types, so that they work as if they are one network. Bridge is also used to divide a large network into two small ones in order to improve performance
Client	A user of network service or a computer or a program using the resources of another computer. (mainly the part demanding service)
CSMA/CD (Carrier Sense Multiple Access with Collision Detection)	An access method in which each client checks (Carrier Sense) before sending a message on network whether there are signals. If the network is empty, it can send its data. At this time, every client has the same right to send its message (Multiple Access). If more than two signals of clients collide at exactly the same time, the client, which has detected it (Collision Detect), retries to send its signal after the fixed time
DNS (Domain Name System)	A method used to convert the alphabetic domain name on the Internet into the corresponding Internet number (IP address)
Dot Address	An IP address expressed as ‘100.100.100.100’. Each number is expressed in the decimal system, and it possesses 1 byte each out of the total 4 bytes
E-mail Address	An address of a user possessing his login account in the specific machine connected through the Internet. It is generally given in the format of ‘user’s ID@ domain name (machine name)’. For example, it is like ‘hjjee@microsoft.com, and @ is here called ’at’ and will be shown when pressing ‘shift+2’ on the key board. The name after @ is the domain name of specific company, school, institute, etc. connected with the Internet, and the name before @ is the ID of the user who is registered in the machine. The last letter group of the domain name is that of the top level. The following abbreviations are the most frequently used examples in the U.S.A., and ‘.kr’ is used for Korea as nationality in Korea. .com : mostly for company/ .edu : mostly for educational institute like university (education). / In Korea, .ac(academy) is mainly used. / .gov : for government-related group, for example,

Items	Explanation
E-mail Address	NASA is nasa.gov (government) / .mil : for military-related site. For example, U.S. Air Force is af.mil (military)/ .org : for non-profit organization / .au : for Australia / .uk : for United Kingdom / .ca : for Canada / .kr : for Korea / .jp : for Japan / .fr : for France / .tw : for Taiwan, etc.
Ethernet	The representative LAN access method (IEEE 802.3) developed in a joint venture by Xerox, Intel, DEC in the U.S.A. This network connection system has the transfer capability of 10Mbps, and is using a packet of 1.5kB. As Ethernet can connect various types of computer to a network, its name is now a synonym of LAN. Its product range is not limited to few enterprises any more, but so wide that every enterprise can get various Ethernet products on the market.
FTP (File Transfer Protocol)	One of the application programs offered by TCP/IP protocol, and is used to transfer files between computers. If a user possesses a login account in his computer, it can promptly log in and copy every file wherever it is located in the world.
Gateway	This software/hardware converts two different types of protocols so that they perform without problem. This plays a role as an entry/exit point to the network where information is exchanged between different systems.
Header	A part of packet containing the address of one's own station and the destination stations, the section for error controlling.
HTML	Hypertext Markup Language, standard language of WWW. It is namely a language system to write a hypertext. A document written with HTML can be seen through Web browser.
HTTP	Hypertext Transfer Protocol, standard protocol of WWW. A protocol supporting hypermedia method.
ICMP (Internet Control Message Protocol)	It creates error message and test packet to manage the Internet by IP address expansion protocol.
IP(Internet Protocol)	A protocol of network layer for the Internet.
IP Address (internet Protocol Address)	The address, written as numbers, on the Internet of each computer. It is binary number with a size of 32 bits (4 bytes) to differentiate each machine on the Internet. IP address is made up of two addresses, the network address used to differentiate the network and the host address used to differentiate the host. The network address and the host address are divided into 3 classes, A/B/C, according as how many bits are assigned to them. IP address can not be voluntarily selected because it is one and only all over the world. It is assigned by local NIC (Network Information Center) when subscribing the Internet. In Korea, it is a job of KRNIC to do so. Example) 165.244.149.190

Items	Explanation
ISO (International Standards Organization)	An organization under the umbrella of the U.N. that sets and controlls international standards.
LAN (Local Area Network)	It is also called local network or info-communication network within a area. This network allows users within a confined geographical area to exchange and share data each other with their personal computers connected to communication line.
MAC (Mandatory Access Control)	A method in a broadcast network in which the owner of data determines which device has access to the network within the time allowed
Node	Each personal computer connected to a network is called node.
Packet	A block of data as a basic unit used to transfer data through a network. It mostly makes a packet with dozens to hundreds of bytes, and attaches a header at the front of it, in which the information of the packet's destination and other information required are written.
PORT number	A number used to distinguish a application on a TCP/UDP. Example) 21/tcp : Telnet
PPP (Point-to-Point Protocol)	Telephone communication protocol that allows packet transmission when accessing to Internet. It is namely the most popular protocol of the Internet allowing a computer to be connected to TCP/IP by using normal telephone circuit and modem. It is similar to SLIP, but it demonstrates more excellent performance than the SLIP because it contains modern communication protocol elements such as error detection, data compression, etc.
Protocol	Standards on the method of data transmission between the computers connected to network. It can also means the message exchange standards of low and high level. In other words, interfaces between machines are described in detail by the low level which bit/byte, for example, must go through the line, and the file transfer is performed in Internet by the high level.
Router	A device used when transferring data packet between networks. It transfers data packet to the final destination, if the network is busy, it waits for a moment, and then retries. It judges at plural LAN branch points as well to which LAN it should be connected. In other words, it is a special computer/software that manages more than 2 network connection.
Server	A side meeting a client's demand manually and containing its own resources.

Items	Explanation
TCP (Transmission Control Protocol)	A transport layer protocol for the Internet - Sends and receiving data by using connection - Multiplexing - Reliable sending - Supports urgent data sending
TCP/IP (Transmission Control Protocol/Internet Protocol)	Transmission protocol for the communications between different types of computer. It allows them to communicate possibly between general PC and medium-sized host, between IBM PC and MAC PC, and between medium- and large-sized computers of other companies. It is used as a generic name to transport information between computer networks, and includes FTP, Telnet, SMTP. TCP segments data into packets, and is sent by IP. The packet sent by IP is bundled by TCP again
Telnet	It allows a user to perform remote login from a host to a host through Internet. If he wants to log in on the remote host with TELNET, he in general, must have his account on it. However, he can log in freely on the hosts that offers several public services such as white page directory, even if he does not have his own personal account.
Token Ring	A local area network (LAN) containing physically ring structure, and using token to access to a network. It is also one of the node access methods in network. When a node sending data gains control by getting a token, it can send its message packet. IEEE 802.5, ProNet-1080 and FDDI are good realized examples for it. The term ‘ring’ is often used as the substitute for IEEE 802.5 as well.
UDP (User Datagram Protocol)	A transport layer protocol for the Internet - Makes high-speed communication possible by sending and receiving data without connection - Multiplexing - Low reliability of data transport compared with TCP. In other words, if data have not reached the partner station, it does not try to send them again.

Chapter 3 General Specification

3.1 General Specification

General standard of communication module in GLOFA-GM series is as follows:

<table>
<tr><th>No.</th><th>Item</th><th colspan="7">Standard</th><th>Related standard</th></tr>
<tr><td>1</td><td>Service Temp.</td><td colspan="7">0℃ +55℃</td><td></td></tr>
<tr><td>2</td><td>Storage Temp.</td><td colspan="7">-25℃ +70℃</td><td></td></tr>
<tr><td>3</td><td>Service Humidity</td><td colspan="7">5 95%RH, dew should not fall.</td><td></td></tr>
<tr><td>4</td><td>Storge Humidity</td><td colspan="7">5 95%RH, dew should not fall.</td><td></td></tr>
<tr><td rowspan="8">5</td><td rowspan="8">Internal Vibration</td><td colspan="7">In case of sporadic vibration</td><td></td></tr>
<tr><td colspan="2">Frequency</td><td colspan="2">Acceleration</td><td colspan="2">Amplitude</td><td>Times</td><td rowspan="8">IEC 61131-2</td></tr>
<tr><td colspan="2">10≤f< 57㎐</td><td colspan="2">-</td><td colspan="2">0.075mm</td><td rowspan="5">X,Y,Z
10 times
for each
direction</td></tr>
<tr><td colspan="2">57≤f≤150㎐</td><td colspan="2">9.8㎨</td><td colspan="2">-</td></tr>
<tr><td colspan="6">In case of continuous vibration</td></tr>
<tr><td colspan="2">Frequency</td><td colspan="2">Acceleration</td><td colspan="2">Amplitude</td></tr>
<tr><td colspan="2">10≤f< 57㎐</td><td colspan="2">-</td><td colspan="2">0.035mm</td></tr>
<tr><td colspan="2">57≤f≤150㎐</td><td colspan="2">4.8㎨(0.5G)</td><td colspan="2">-</td></tr>
<tr><td>6</td><td>Internal Shock</td><td colspan="7">* Maximum shock acceleration:147㎨(15G)
* Ack. time:11㎳
* Pulse waveform: a sine carrier wave pulse (X,Y,Z 3 times each for 3 directions)</td><td>IEC 61131-2</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Internal Noise</td><td colspan="2">Square wave impulse noise</td><td colspan="5">±1,500V</td><td>Internal test standard of LG Industrial Systems.</td></tr>
<tr><td colspan="2">Dscharge of static electricity</td><td colspan="5">Voltage : 4 kV(touch discharge)</td><td>IEC 61131-2,
IEC 1000-4-2</td></tr>
<tr><td colspan="2">Radial computer noise</td><td colspan="5">27 ~ 500 MHz, 10 V/m</td><td>IEC 61131-2,
IEC 1000-4-3</td></tr>
<tr><td colspan="2" rowspan="2">Fast transient /Burst noise</td><td>division</td><td>Power module</td><td>Digital in-/output (over24V)</td><td colspan="2">Digital in-/output(over24V)
Analog in-/output
Communication interface</td><td rowspan="2">IEC 61131-2,
IEC 1000-4-4</td></tr>
<tr><td>Voltage</td><td>2 kV</td><td>1 kV</td><td colspan="2">0.25 kV</td></tr>
<tr><td>8</td><td>E nvironment</td><td colspan="7">There should not be corrosive dust.</td><td></td></tr>
<tr><td>9</td><td>Service Altitude</td><td colspan="7">Below 2000m</td><td></td></tr>
<tr><td>10</td><td>Pollution level</td><td colspan="7">Below 2</td><td></td></tr>
<tr><td>11</td><td>Cooling system</td><td colspan="7">Natural air cooling system</td><td></td></tr>
</table>

[Table 3.1] General Standard

Remark

Note1) IEC (International Electrotechnical Commission)

International non-governmental organization promoting international cooperation on standardization of electric and electronic techniques. It also sets international standards, and evaluates, manages their suitability.

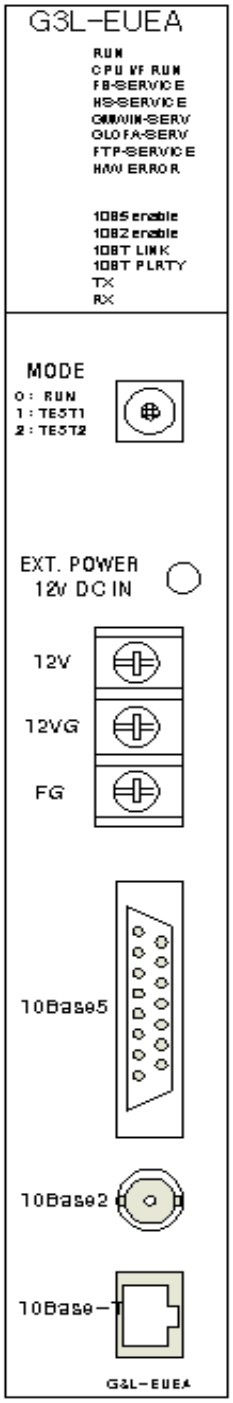
Note2) Pollution Level

An index showing the extent of pollution of service environment for a device which is crucial for its performance. The pollution level 2 means generally the status in which only non-conductible pollution occurs. But, conduction existence because of dewfall also means pollution level 2.

3.2 Structure and Components

3.2.1 The Structure of G3L-EUEA

1) The Front part



Name of Type

LED

(See the right table)

Action Mode Switch
0: Communication
1: Test Mode 1
2: Test Mode 2

Ext. Power Supply terminal/ LED
-Supply of 12V for 10BASE5.

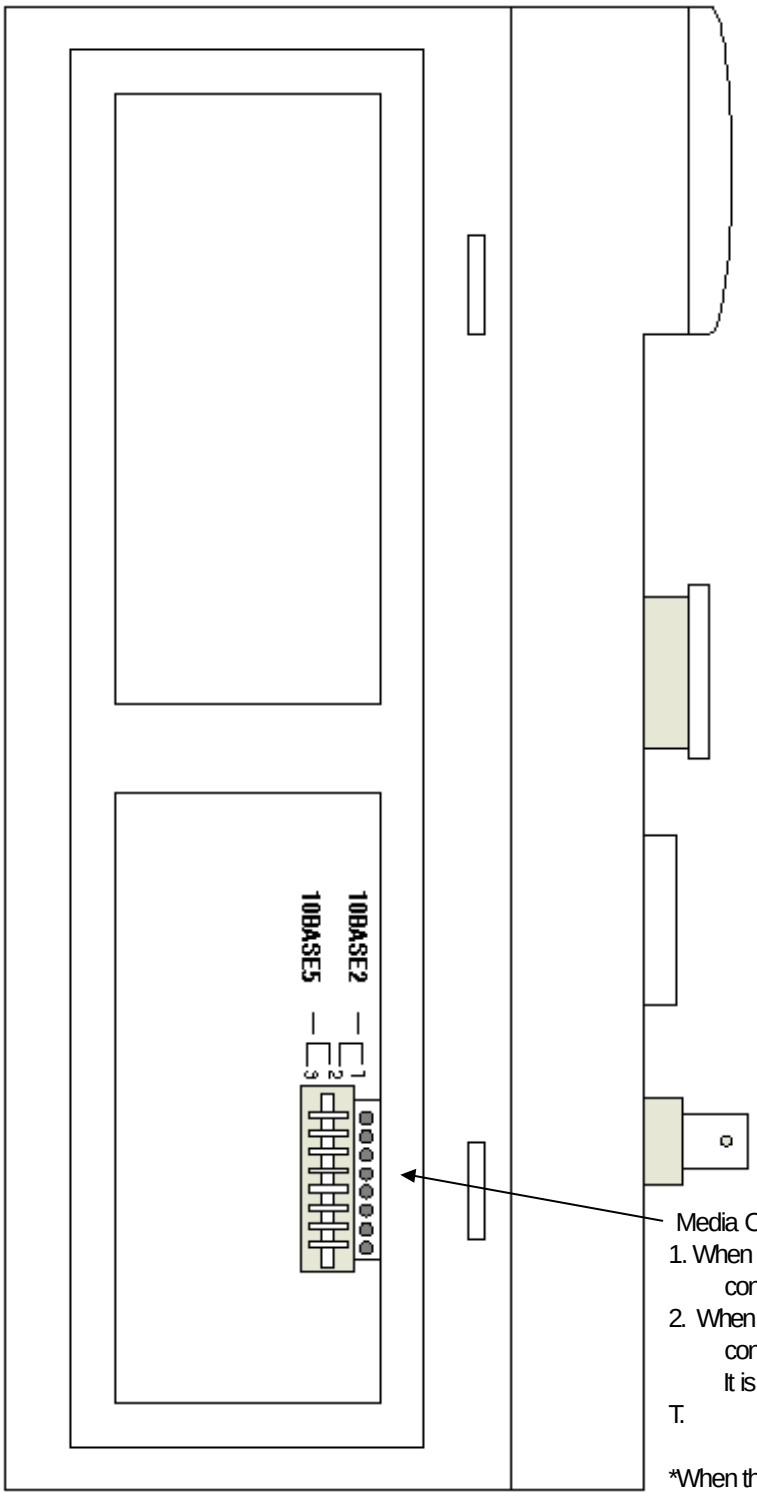
10BASE5 Connector

10BASE2 Connector

10BASE-T Connector

LED No.	Module Front Mark	Description
0	RUN	On when the power supply and sole initialize of module are normal.
1	CPU I/F RUN	On when it can normally communicate with CPU module
2	FB-SERVICE	Out at the service of function block.
3	HS-SERVICE	Out at the service of high-speed link.
4	GMWIN-SERVICE	On when connecting with GMWIN service.
5	GLOFA-SERVICE	On when connecting with dedicated service.
6	FTP-SERVICE	On when connecting with FTP service.
7	HW-ERROR	On when it is impossible for the module to recover an error by itself.
8	–	No use.
9	–	No use.
10	10BASE5 Enable	On when it enables to use 10BASE5.
11	10BASE2 Enable	On when it enables to use 10BASE2.
12	10BASE-T LINK	On when able to link to 10BASE-T.
13	10BASE-T PLRTY	On when connected polarity of 10BASE-T is normal.
14	TX	Out when transporting data.
15	RX	Out when receiving data.

2) The Side part



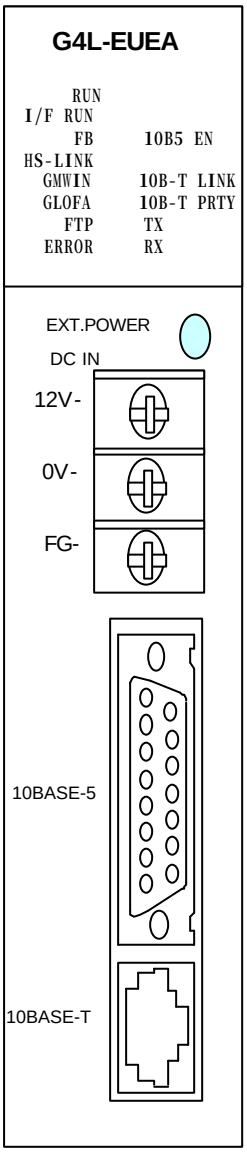
Media Option Switch

1. When you select 10BASE2, you should link the connector to the mark 1, 2 .
2. When you select 10BASE5, you should link the connector to the mark 2,3.
   It is better to link it here when you use 10BASE-T.

*When the product is out on the market, 10BASE5 is already selected..

3.2.2 The Structure of G4L-EUEA

1) The Front part



Name of Type

LED

(See the right table)

Ext. Power Supply terminal/ LED

-Supply of 12V for 10BASE5.

10BASE5 Connector

10BASE-T Connector

LED No.	Module Front Mark	Description
0	RUN	On when the power supply and sole initialize of module are normal.
1	I/F RUN	On when it can normally communicate with CPU module
2	FB	Out at the service of function block.
3	HS-LINK	Out at the service of high-speed link.
4	GMWIN	On when connecting with GMWIN service.
5	GLOFA	On when connecting with dedicated service.
6	FTP	On when connecting with FTP service.
7	ERROR	On when it is impossible for the module to recover an error by itself.
8	–	No use.
9	–	No use.
10	10B5 EN	On when it enables to use 10BASE5.
11	–	No use.
12	10B-T LINK	On when able to link to 10BASE-T.
13	10B-T PRTY	On when connected polarity of 10BASE-T is normal.
14	TX	Out when transporting data.
15	RX	Out when receiving data.

Chapter 4 Performance Specification

4.1 Performance Specification

Item		Standards		
		10BASE5	10BASE2	10BASE-T
Transfer Spec.	Data Transfer Rate	10Mbps		
	Transfer System	Base Band		
	Maximum Extension Distance Between Nodes.	2,500m	925m	-
	Maximum Segment Length.	500m	185m	100m (node-hub)
	Maximum Node No.	100pcs/Segment	30pcs/Segment	Able to link to 4 hub stages.
	Node Interval	Double Integer of 2.5m	Double Integer of 0.5m	-
	Maximum Protocol Volume	1,500bytes		
	Excess Method of Communication Range	CSMA/CD		
	Frame Error Check Method	CRC 16 = $X^{16} + X^{12} + X^5 + 1$		
Basic Spec.	Internal 5V Power for Consumer (mA)	530mA		
	Dimension of External Form (mm)	250H x 35W x 140.7D		
	Weight (kg)	460g		

4.2 Cable Specification

4.2.1 Cable Standards related Ethernet/IEEE 802.3

Items	10BASE5 Coaxial Cable	10BASE2 Coaxial Cable	AUI Cable
Characteristic Impedance	50Ω±2Ω	50Ω±2Ω	78Ω±5Ω
Attenuation	Below 8.5dB for 10MHz, 500m	Below 8.5dB for 10MHz, 185m	Below 3dB for 10MHz, 50m
Transfer Rate C=Velocity of Light(300,000km/s)	Above 0.77C	Above 0.65C	Above 0.65C
Phase Jitter	Below ±7ns at 500m Trailing End	Below ±7ns at 185m Trailing End	Below ±1ns at 50m Trailing End
The Others	External Diameter with PVC Jacket: 10.287±0.178mm External Diameter with FEP Jacket: 9.525±0.254mm	External Diameter with PVC Jacket: 4.9±0.3mm External Diameter with FEP Jacket: 4.8±0.3mm	Electric Resistance of Power Wire: Below 40mΩ/m

4.2.2 An Example of Twisted-Pair Cable (UTP) of Category 5 (CTP-LAN5)

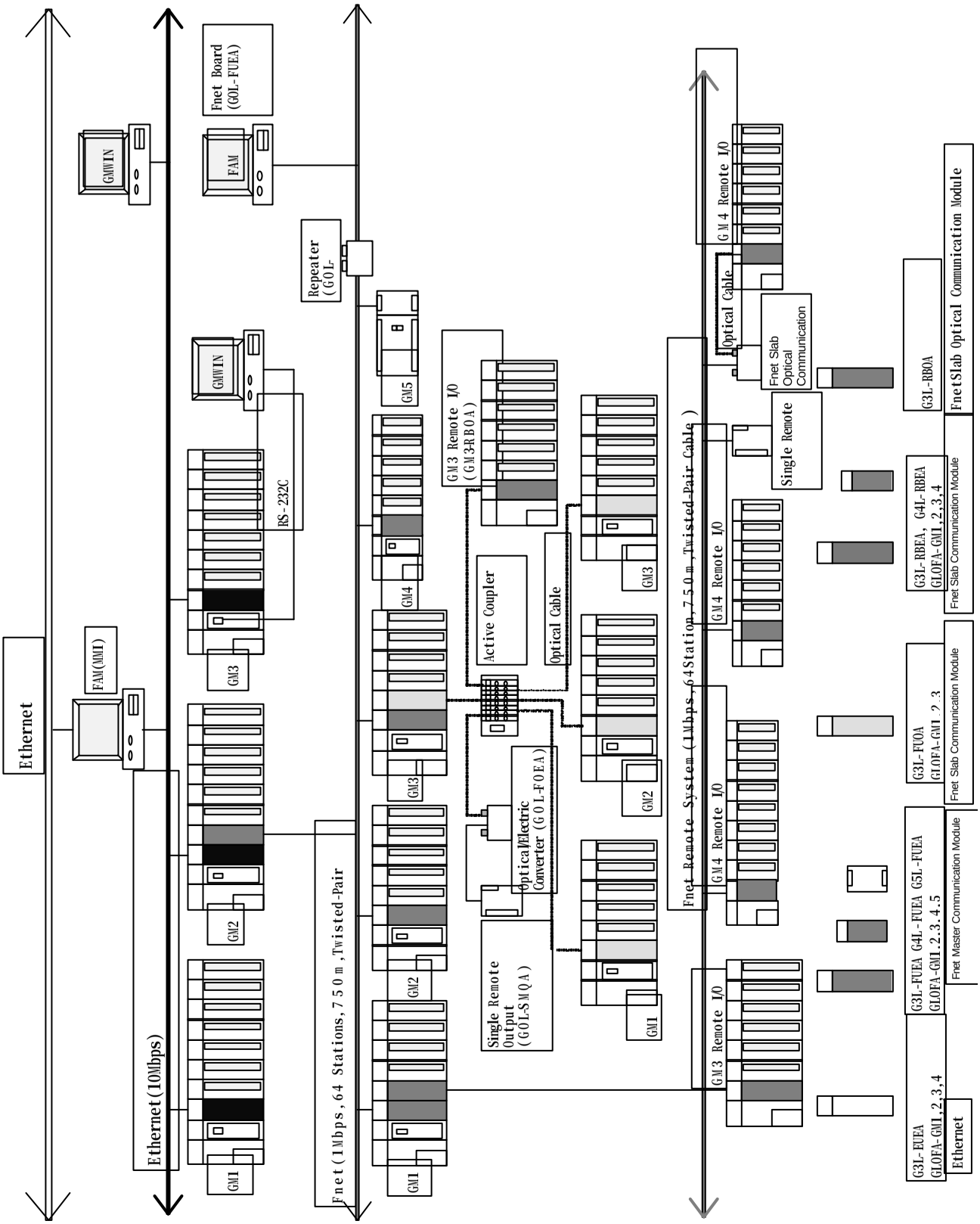
Item	Unit		Value
Conductor Resistance (Maximum)	Ω/km		93.5
Insulation Resistance (Minimum)	MΩ-km		2,500
Internal Voltage	V/Min.		AC 500
Characteristic Impedance	Ω(1~100MHz)		100 ± 15
Attenuation	Below dB/100m	10MHz	6.5
		16MHz	8.2
		20MHz	9.3
Near-end Cross talk Attenuation	Below dB/100m	10MHz	47
		16MHz	44
		20MHz	42

Remark

Note1) You should install it after consultation with an expert because Ethernet connection cables are different according to system component and environment.
Note2) Please use the cable above category 3 for 10Mbps Ethernet communication.

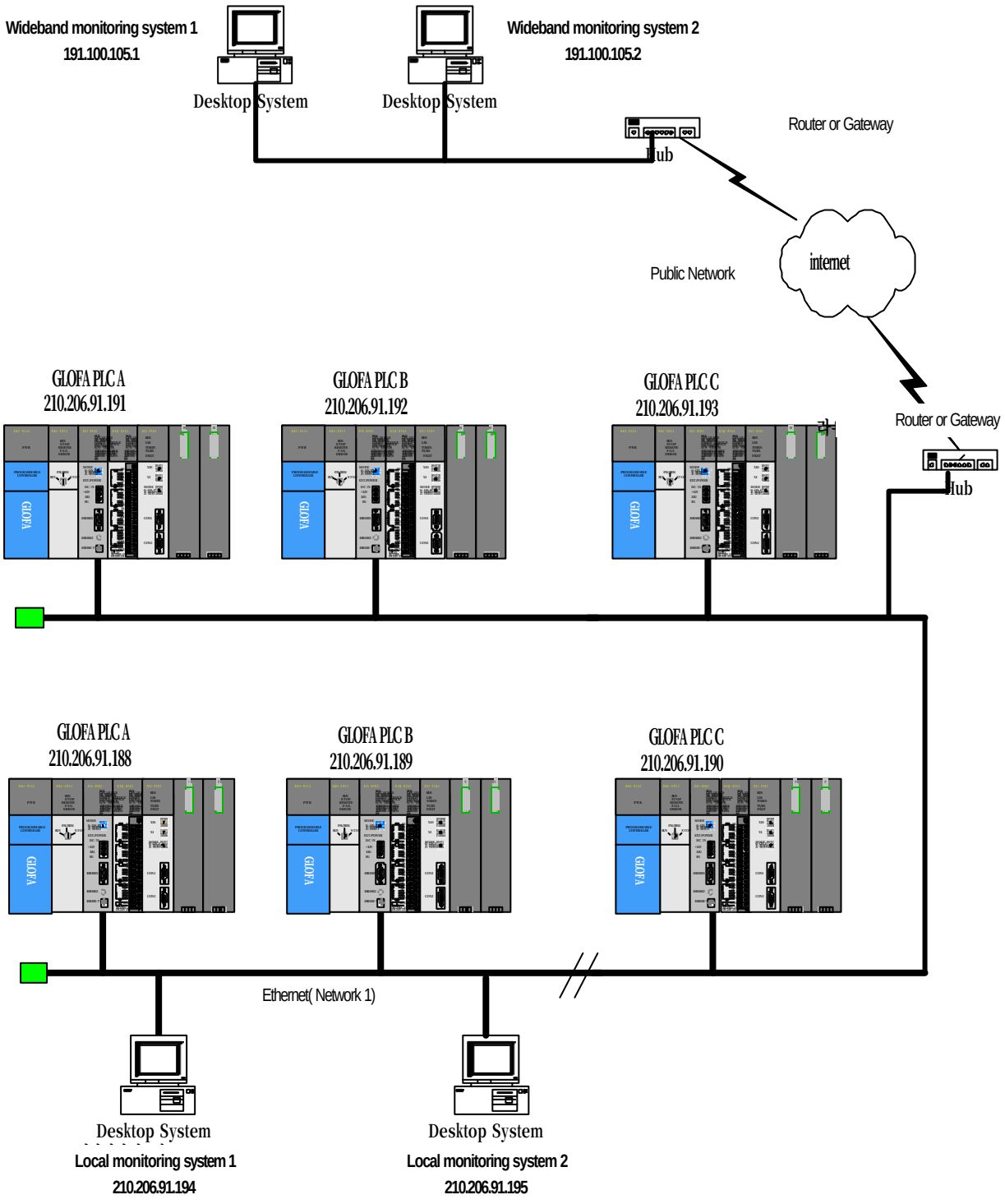
Chapter 5 System Configuration

5.1 GLOFA PLC Network System

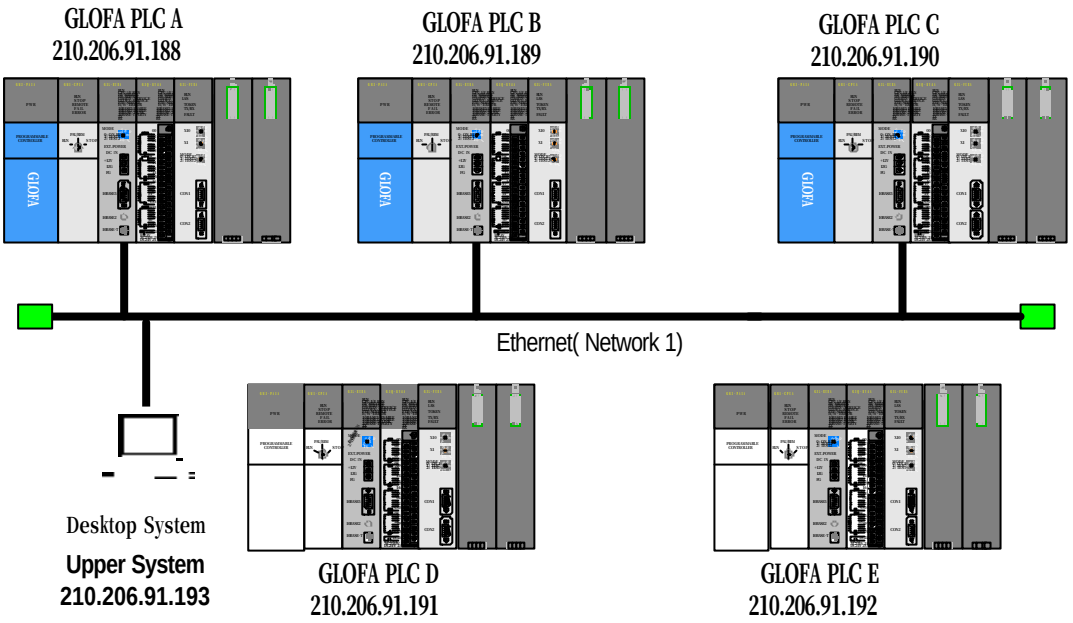


[Fig5.1] GLOFA PLC Network System

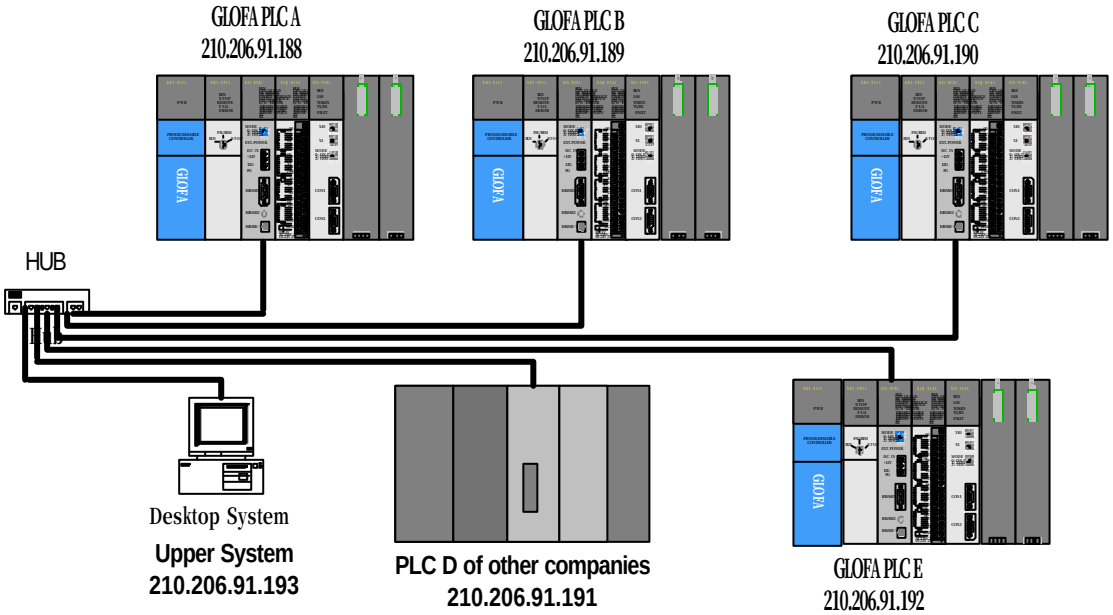
5.2 GLOFA PLC Ethernet Network System



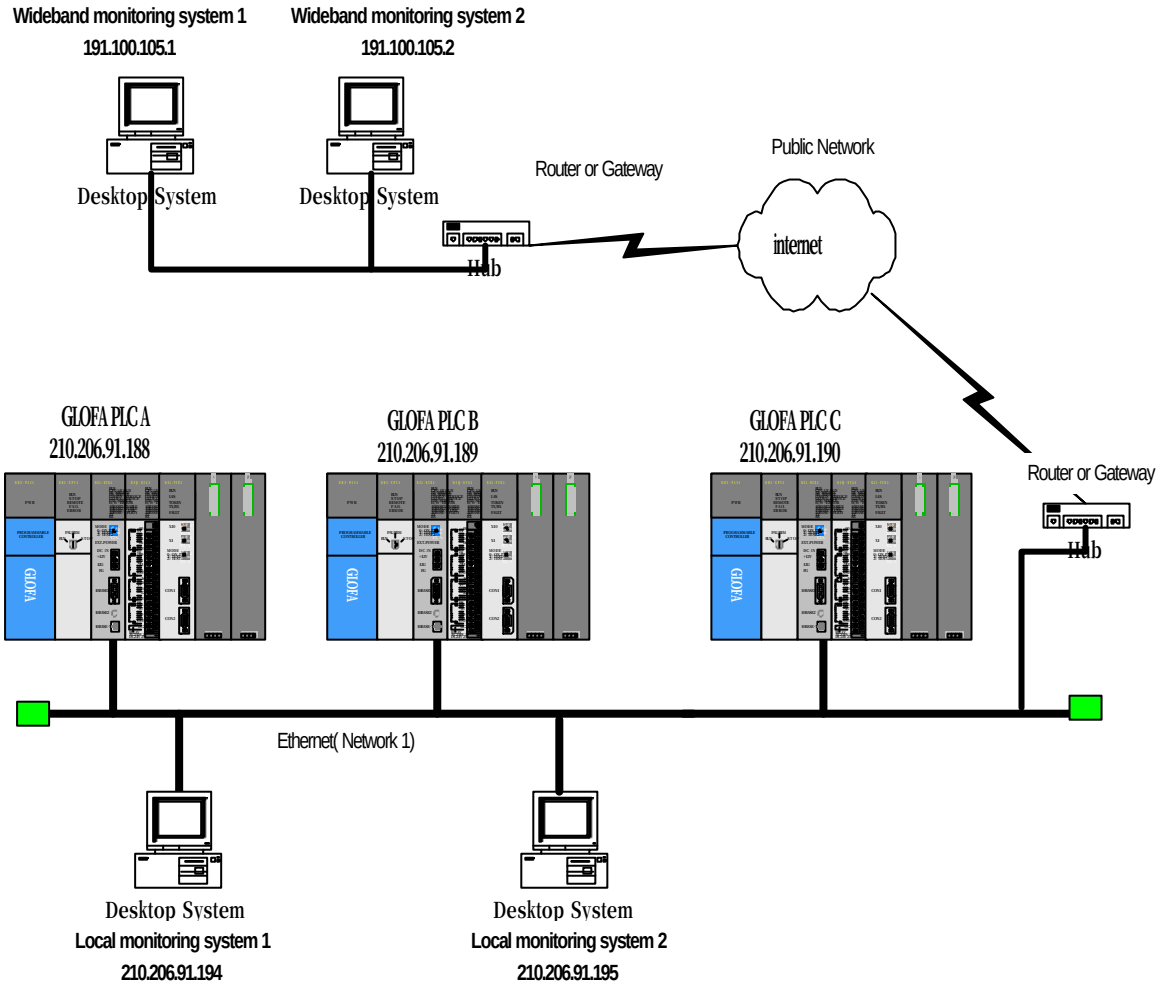
[Figure 5.2(A)] GLOFA PLC Ethernet System



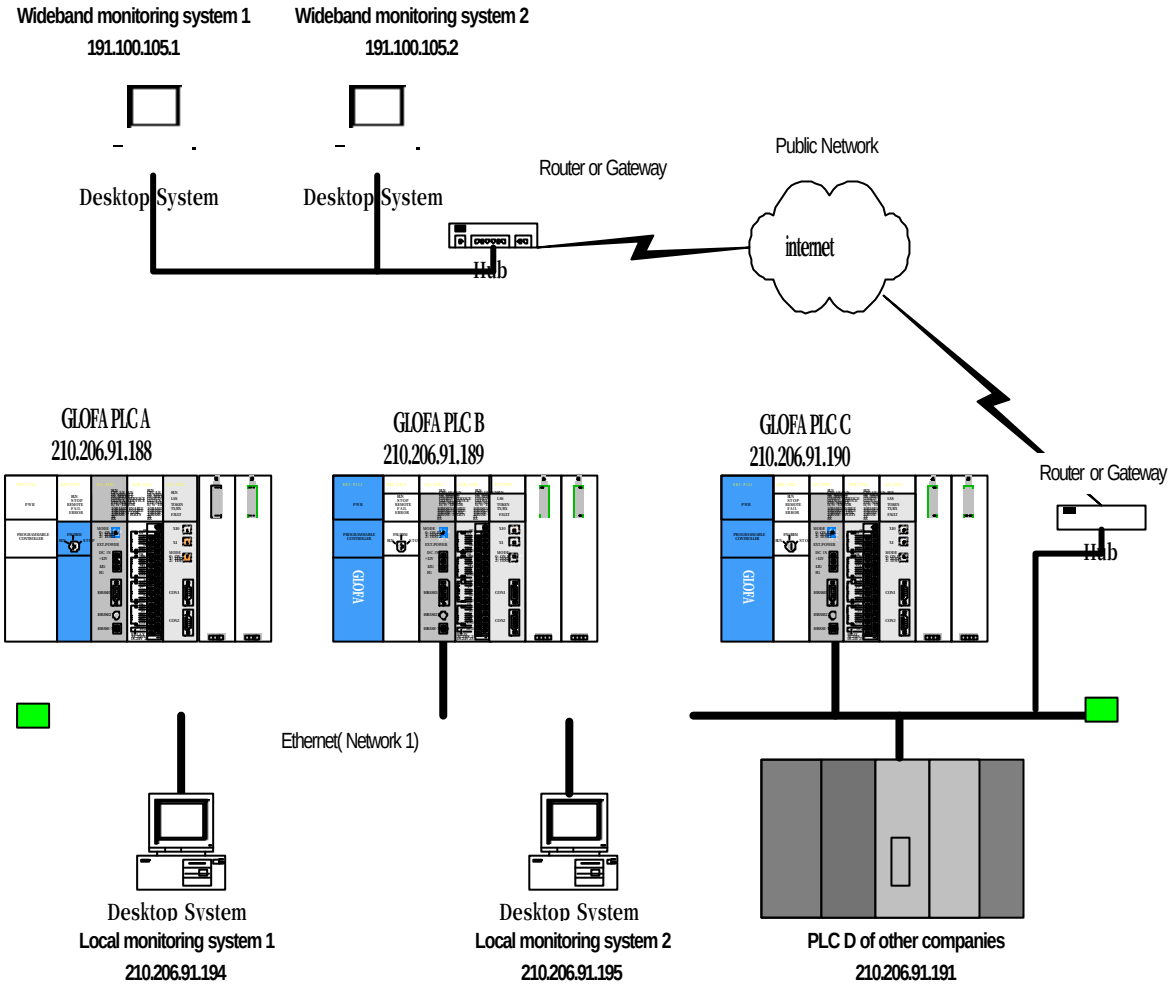
[Figure 5.2(B)] GLOFA PLC Ethernet System (Dedicated Network)



[Figure 5.2(C)] GLOFA PLC Ethernet System (Dedicated Network + Other company)

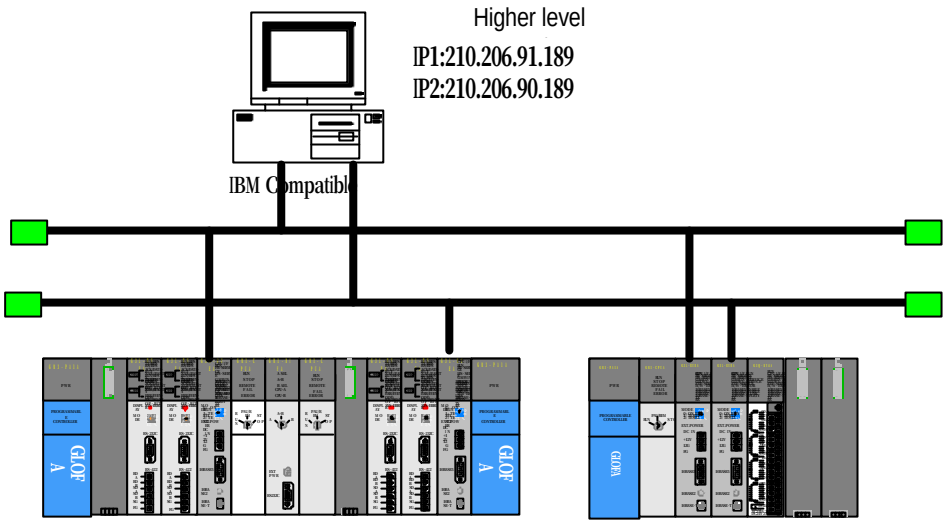


[Figure 5.2(D)] GLOFA PLC Ethernet System (Public Network + Dedicated Network)

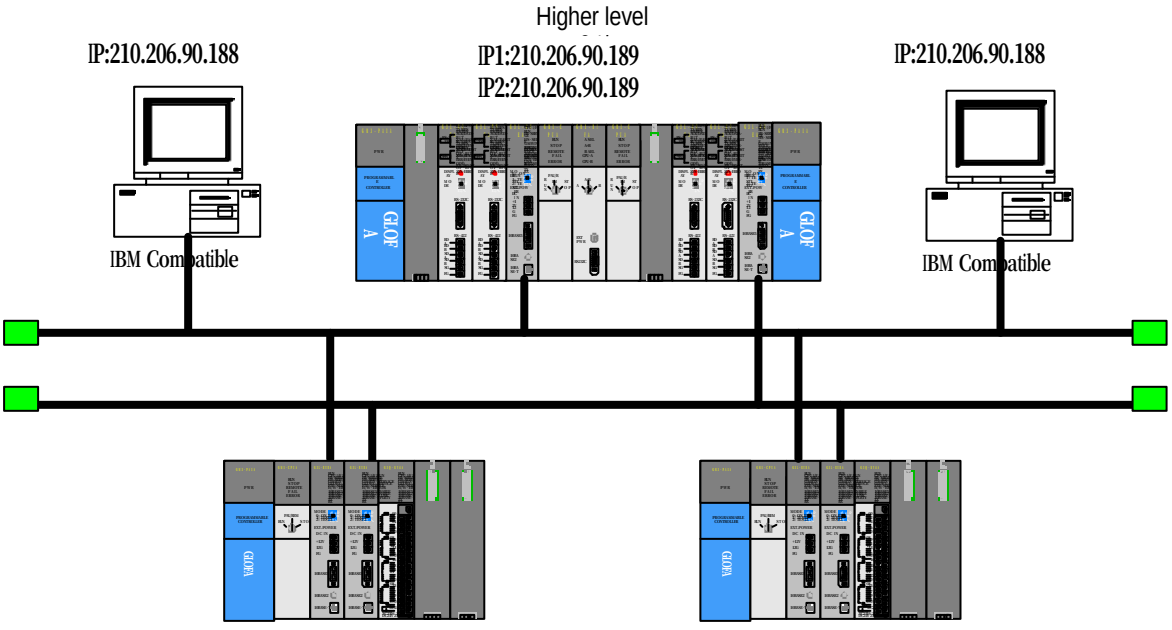


[Figure 5.2(E)] GLOFA PLC Ethernet System (Public Network + Dedicated Network + Other company)

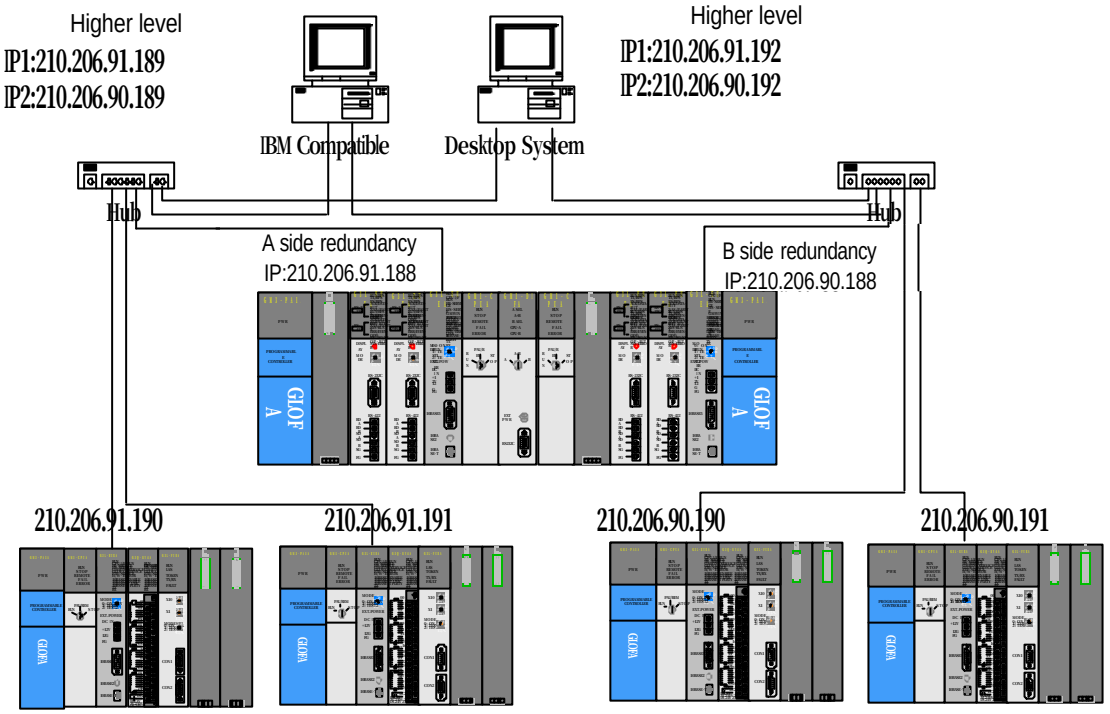
5.3 GLOFA PLC Ethernet Redundancy System



[Figure 5.3(A)] GLOFA PLC Ethernet Redundancy System 1 (MMI + Dedicated Network)



[Figure 5.3(A)] GLOFA PLC Ethernet Redundancy System 2 (MMI + Dedicated Network)



[Figure 5.3(C)] GLOFA PLC Ethernet Redundancy System 3 (MMI + Dedicated Network)

Chapter 6 Communication and Frame Editor

Three usable functions of Enet communication module are follows:

6.1 Communication Function

¨ High Speed Link (HS_Link)

High Speed Link is the communication method between **GLOFA PLC communication modules,** and is used to periodically switch data or information with partner stations. You can effectively use it for the running system by referring periodically to its own or the partner station's changing data, or you can also perform communications by simple setup of parameter. That is, you can do communications by designating the partner station's and your own area and data volume, speed, station number at the High Speed Link parameter of GMWIN. It is possible to communicate with data volume from minimum 1 word (16 bits) up to 12,800 words, it is possible as well to set up parameter according to communication contents at the communication period from minimum 20 ms up to 10 sec. You can do an effective job not only by easy communication with the partner station in setting up the simple parameter, but also by easy periodical handle of lots of data at a time because internal data processing is performed at high speed.

¨ Function Block (FB)

It is a service used to communicate only with the appropriate partner station for the special event occurrence. In other words, if you use this Function Block, you can use command frame suitable to the other company when you want to communicate **with other company's PLC**. It is a difference from the High Speed Link as the periodical communication. You can especially use the Function Block when you should send the content to another station because an error occurs at the partner station, or when you want to communicate in the status of the specific contact input. For a use of this communication, you can take advantage of tcp/ip, udp/ip all, and 5 kinds of Function Blocks are offered for them. The data volume used for the High Speed Link is word (16 bits), but the Function Block has Bit, Byte, Word as its data volume. Therefore, you can perform communication with each partner stations according to the various data types

¨ Dedicated Communication (GLOFA_NET)

This service is **a built-in protocol at GLOFA Enet module.** You are able to read and write information and data in the PLC by using MMI as commercial program, or PC program written by user. It is also a service used to download, upload PLC program, and to control PLC (with it running, stopping, pausing).

You can use this service by means of **TCP port 2004.** It is influenced by the basic parameter setup in the frame editor. (the number of dedicated connection, latency time for receive)

The services described above can be used separately or with mixture. You are namely free and easy to use High Speed Link, dedicated service and Function Block service at the same time.

The differences of high-speed and Function Block are described below.

The differences of the services used to periodically send and receive data to and with the partner station (High Speed Link) and to send the appropriate content when a special event occurs (for Function Block) are explained in short:

Content	High Speed Link	Function Block
Basic Unit for TX/RX Data	1 Word(16 bits)	Usable by data type Ex.) Bit, Byte, Word ...
Communication Period	200 ms ~ 10 sec	Performs whenever ' Function Block enable' (REQ) starts. (Timer)
Communicable Module	Used between GLOFA Enet communication modules	Used for the communication with GLOFA Enet communication module and other company' s module and high order PC.
Station Numbering	Downloading by Enet module after setting up the high-speed station number using the parameter in frame editor.	No use of station number. Downloading by Enet module after setting up IP address using the parameter in frame editor.
Operation Method	Setting up High Speed Link parameter→Downloading into PLC→ Permitting High Speed Link	Writing a program using GMWIN and frame editor-> compiling-> downloading into PLC→running
Control by CPU mode key	Performance of run if CPU module permits High Speed Link to run with RUN, STOP, PAU- SE.	Performance of run according to the status of CPU module key.

[Table 6.1] Differences of performance between High Speed Link and Function Block.

6.2 Setup of Parameter

If you want to use GLOFA Ethernet Communication module, you should first set up system parameter, and then download the set parameter by Ethernet module. A frame that takes charge of such work is called frame editor.

6.2.1 Frame Editor

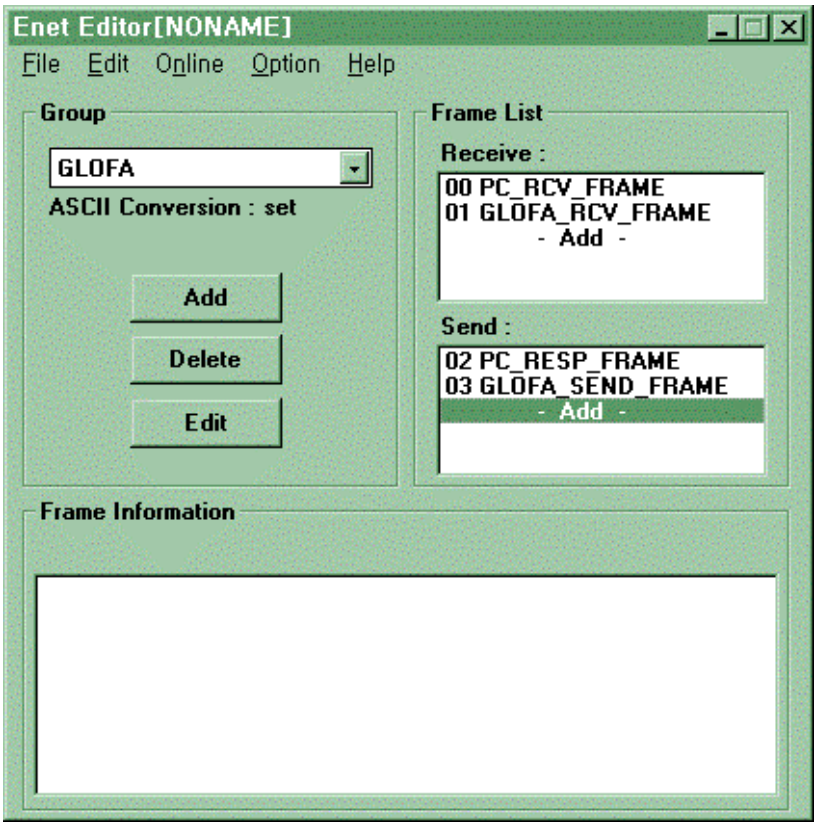
A tool defining basic system parameter, which controls and manages network, and communication frame in Ethernet communication. The frame editor is composed of 2 kinds of setups; **basic parameter setup** and **frame list setup**. The basic setup determines communication system parameter on Ethernet network, and the frame setup defines communication frame when performing Function Block communication. The parameter and frame set by a user can be written (downloaded) in the Ethernet communication module, and they can also be read (uploaded) by the Ethernet module.

And now, we are explaining the setup of the essential basic parameters to perform Ethernet module. For the frame setup, please refer to ‘ Function Block’ .
Figure 6.1 is initial screen of the frame editor when you select frame editor icon.

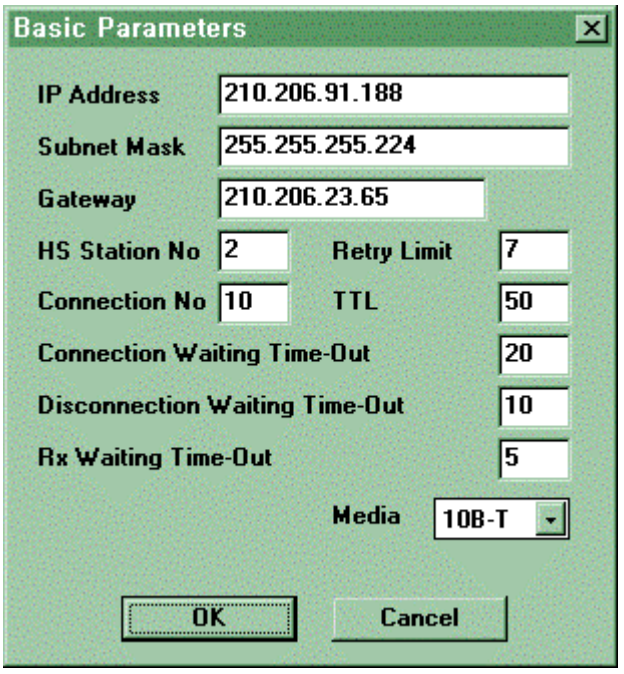
1) Basic Parameter Setup

The basic parameter is used to set communication system parameter in order to control and manage Ethernet network. It determins IP address of Ethernet communication module, subnet mask, gateway address, High Speed Link station number, channel opening time, re-transmission frequency, dedicated connection numbers, RX latency time, TTL (time to live = time for live packet). Thus, to perform Ethernet communication, you have to setup the basic parameter on the basic setup screen within editing button, and then download it.

Figure 6.2.1(A) is showing the set basic parameter.



[Figure 6.2.1(A)] Frame Editor



[Figure 6.2.1(B)] Basic Setup (Initial Value)

The description about the screen on the figure 6.2.1(B) is as follows. **IP Address, High Speed Link station number, media** out of the items below are needed to be set again corresponding to use environment.

IP Address: Sets IP Address of Enet communication module.

Subnet Mask: A value used to distinguish whether partner station is in the same network with it.

Gateway Address: Gateway module address (router address) used to receive and send data through a station, which uses different network from its, or public network.

High-speed Station Number: Sets station number when communicating between GLOFA PLC Enet module with High Speed Link.

Re-transmission Frequency: Frequency of re-transmission if there is no reply from partner station.

Connection Latency Time: Time to wait to connect with partner station, if, in program, XXX_TCPACT, XXX_TCPPAS are set in E_CONN Function Block. An error occurs when it is impossible to connect with it in the set time.

Release Latency Time: Time to wait for the reply of partner station when asking for release of connection. If there is no reply, it quits the connection after waiting for a fixed time.

RX Latency Time : During dedicated communication, if there is no any requirement from high order for the fixed time with high order PC or MMI connected, it quits the dedicated service connection without any relation of normal quit on the assumption that there is a problem in the system. In other words, this latency time is used in dedicated service to set a new channel again in case that a problem occurs in the partner station, or a cable is disconnected.

TTL(Time To LIVE): If partner station does not belong to the network with its own one, it searches the partner station via router within a range of the maximum set value of TTL.

Dedicated Connection Numbers: maximum number of dedicated TCP service to be connected at the same time. (1 up to16)

Media: It selects a media it wants to use.(10BASE5/2 or 10BASE-T)

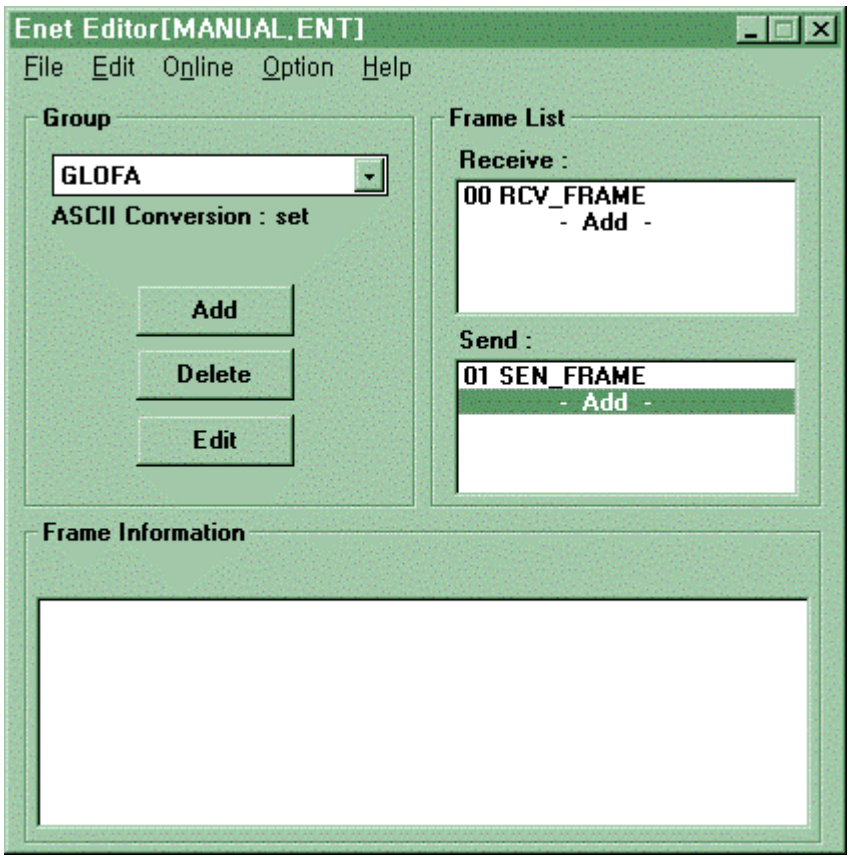
2) Frame Download/Upload

You can download (write) defined basic parameter and frame in the Ethernet communication module with frame editor, or can upload (read) the frame or the parameter from the Ethernet communication module.

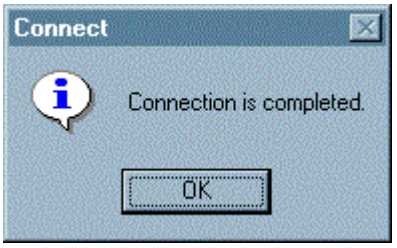
A) Write (Download)

Please perform writing **after stopping CPU** while CPU is running. If you perform the writing during CPU run, it has a large influence on the communication.

① It connects by means of CPU on-line and primary base CPU, in which Ethernet communication module is equipped for using frame and parameter.
Figure 6.2.1(D) is showing that connection is finished. (If you use COM Port like GMWIN, you should connect **after cutting the connection of GMWIN)**.

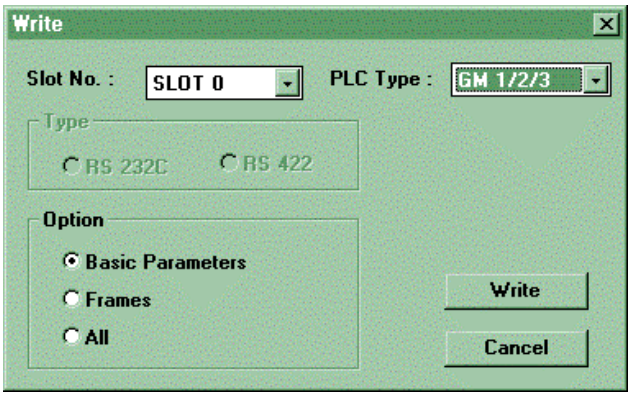


[Figure 6.2.1(C)] Connection Screen



[Figure 6.2.1(D)] ‘ Connection Completed’ Screen

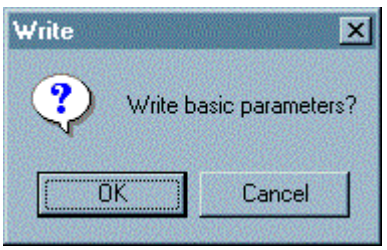
② When you select writing on line after the connection, a screen like figure 6.2.1(E) is shown. Then, you specify slot position, frame and parameter, in which Ethernet communication module is equipped to write (download).



Basic parameter is for setting of IP Address, High Speed Link station link, frame is the one defined by user.

[Figure 6.2.1(E)] Writing Screen

③ When you have selected writing in b, it confirms it again before writing data.



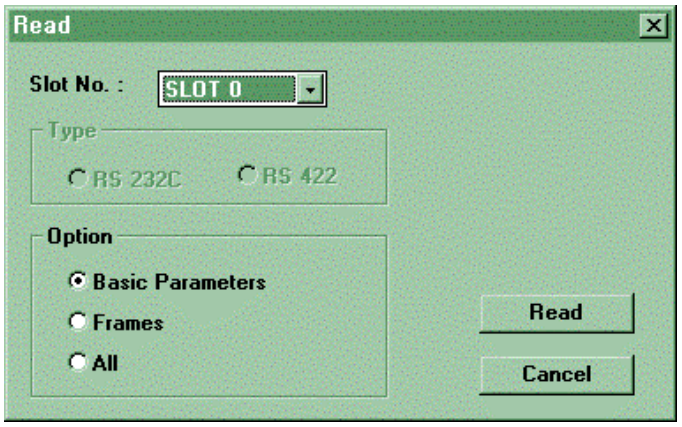
[Figure 6.2.1(F)] Writing Confirmation Screen

④ If all the steps are finished, the writing of frame file is normally finished. But, because the present parameter value, with which Ethernet communication module is running, is the previous downloaded parameter, you **must switch on again or reset**. If not, it performs further with the previous value.

B) Reading (Upload)

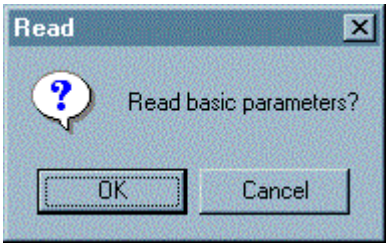
① It connects with primary base CPU, in which Ethernet communication module is equipped for reading.

② After connection, when you select reading on line, figure 6.2.1(G) is shown on the screen. Then, you select slot number and communication option, and then select OK button.



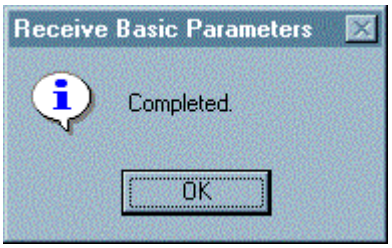
[Figure 6.2.1(G)] Reading Screen

③ When you have selected reading button in b, it confirms reading action again with a screen. If you select OK now, it begins to read.



[Figure 6.2.1(H)] Reading Confirmation Screen

If you check for edit/basic setup on frame editor screen after a screen of ' reading completed', you can see there that data read in Ethernet module is saved.



[Figure 6.2.1(I)] ' RX Completed' Confirmation Screen

Chapter 7 High Speed Link

7.1 Introduction

The High Speed Link is a kind of communication system between **GLOFA PLC communication module.** It can send and receive data by setting up High Speed Link parameter. It is also data transmission service in which a user can exchange data by setting up data volume, period, area and save area of TX/RX in parameter. But, the High Speed Link service can have influence on other communication modules using the same module with it because it uses subnet broad service. Therefore, if a user wants little influence on other modules and efficiency maximization of communication, the user should set up data of nearly the maximum settable numbers (400 bytes) of TX/RX per High Speed Link block. Like that, it is a right way of setting to reduce total block numbers used. To use all the functions, you must download by setting the basic parameter. (See 6.2 Setup of Parameter)

High Speed Link function is as follows.

- ***High Speed Link Block Setting*** : A user can set 64 blocks, 32 for TX and 32 for RX each, if there are several RX/TX areas. Up to 200 words per block can be set. Thus, the maximum link dot number is 12,800 words.
- ***TX/RX Period Setting*** : TX/RX period can be set by a user by each block, and he can also set TX/RX period from 200㎳ to 10 sec for the areas where especially fast RX/TX is required, or not. Therefore, he can raise whole communication efficiency.
- ***TX/RX Area Setting*** : A user can set TX/RX area by each data block according to his I/O MAP.
- ***High Speed Link Information*** : As it offers a user High Speed Link information by user keyword of GMWIN, it is easy to build reliable communication.

Table 7.1 is showing High Speed Link dot numbers per communication device type.

Classification		Maximal communication bit numbers	Maximal transmitting bit numbers	Maximal block numbers	Maximal bit numbers per block
Enet module	G3L-EUEA	12,800	6,400	64 개(0-63)	200
	G4L-EUEA	12,800	6,400	64 개(0-63)	200

[Table 7.1] Maximal Communication length per Device Type

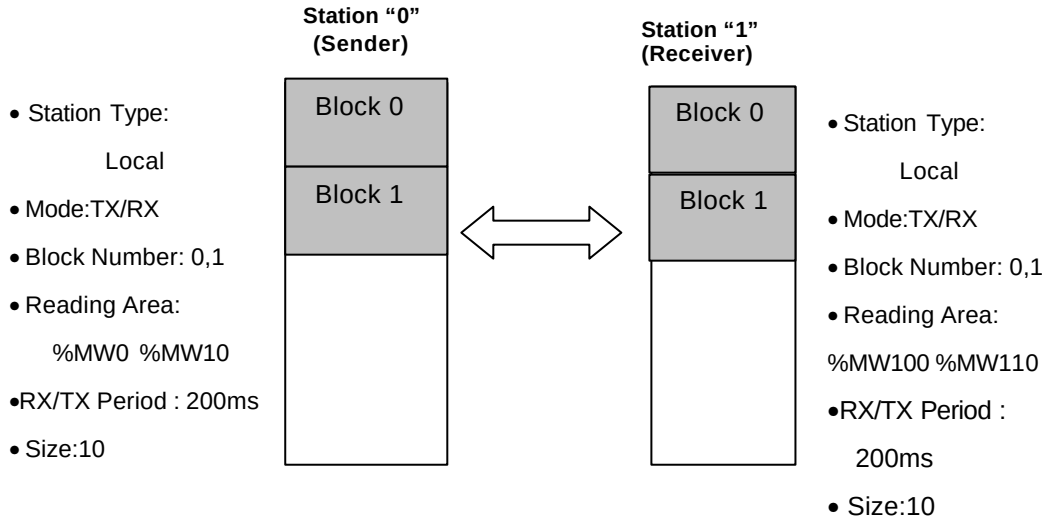
In Table 7.1, the unit of basic link length is 1 word.

7.2. High Speed Link

7.2.1 TX/RX Data Processing of High Speed Link

How to use the High Speed Link is described through a setting example, in which Ethernet modules of "0" station and "1" station have the same data with each other.

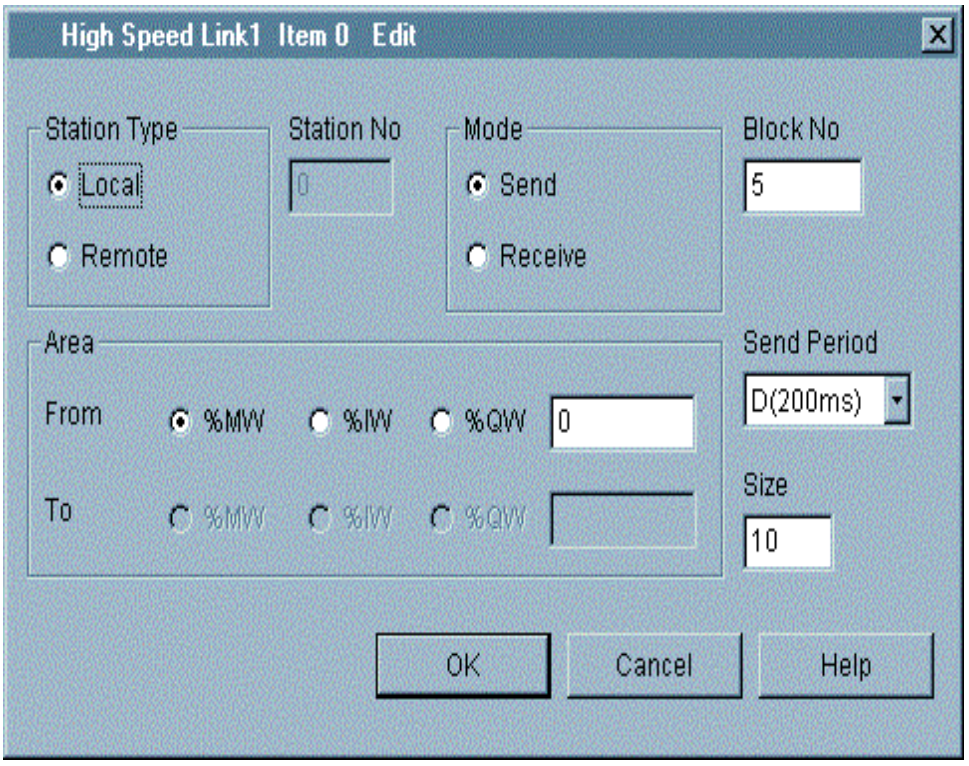
Example) Station "0" sends 10 words of %MW0 data with block number "0". The data sent to station "1" is saved in %MW10. The station "1" receives 10 words of %MW0 data from station "0" and then, it saves them in %MW100, and sends 10 words of %MW110 data to block number "1".



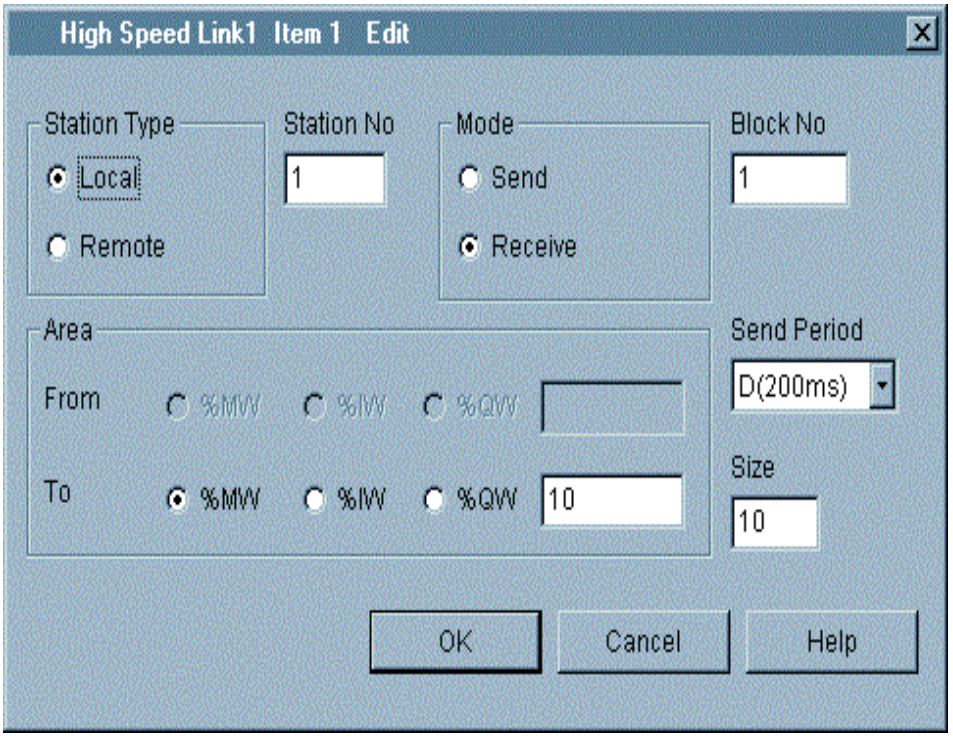
[Figure 7.2.1(A)] Block Diagram of Data Flow

There are 32 block numbers for sending, 32 for receiving in high-speed parameter to send and receive data, and a user can use block numbers by specifying them from 0 to 31 for sending and receiving of data. When sender sends data, it decides only which data it should read, and to which block it should send it without specifying partner station's number. In the example, assuming that the station "0" specifies %MW0 data as the area to be read, sending as mode in its parameter, and then sends data voluntarily through block number "0". On the other hand, the station **"1"** sets receiving as mode, "0" as station number, 0 as block number, and %MW100 as save area in High Speed Link parameter. But, a special attention should be given in this case that receiver should receive the data with the same block number as the sender sent. As the sender can send various

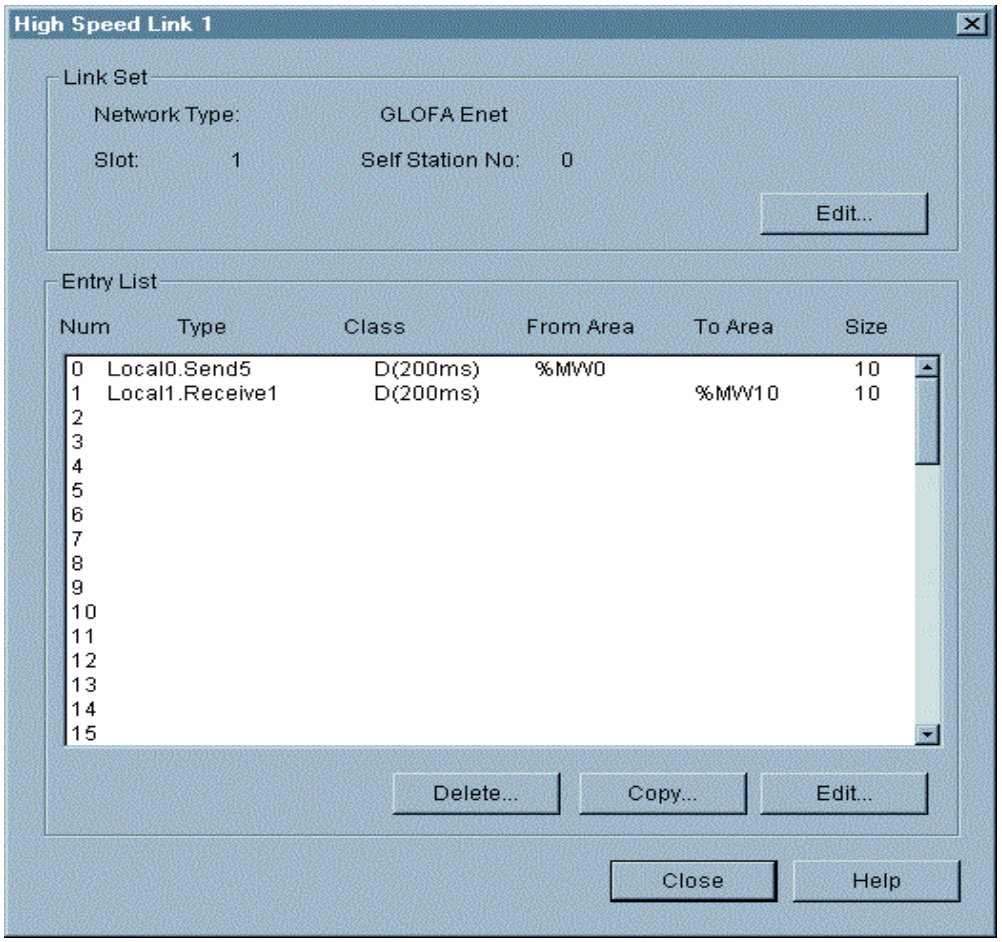
block numbers with various station numbers, the receiver can receive the required data only after he confirms which data of sender is sent in which block, and then sends data through the appropriate block number. On the contrary, the station "1" should only set the data to be sent corresponding to sending setup of the station "0", and the station "0" should only set receiving setup corresponding to that of the station "1".



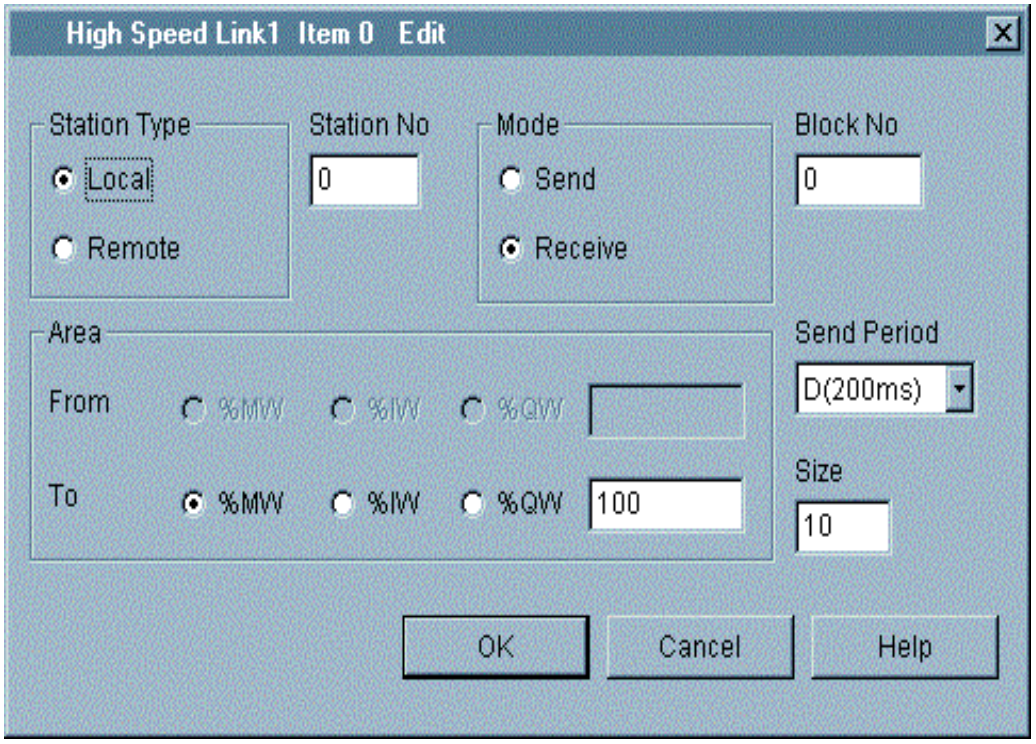
Sending Setup of station " 0"



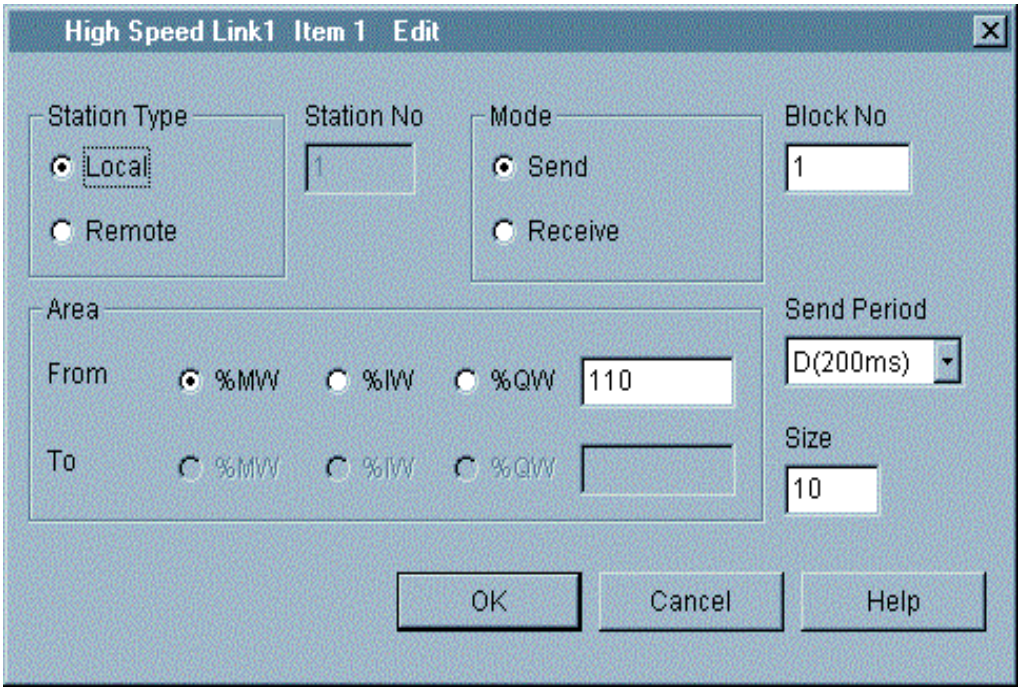
Receiving Setup of Station " 0"



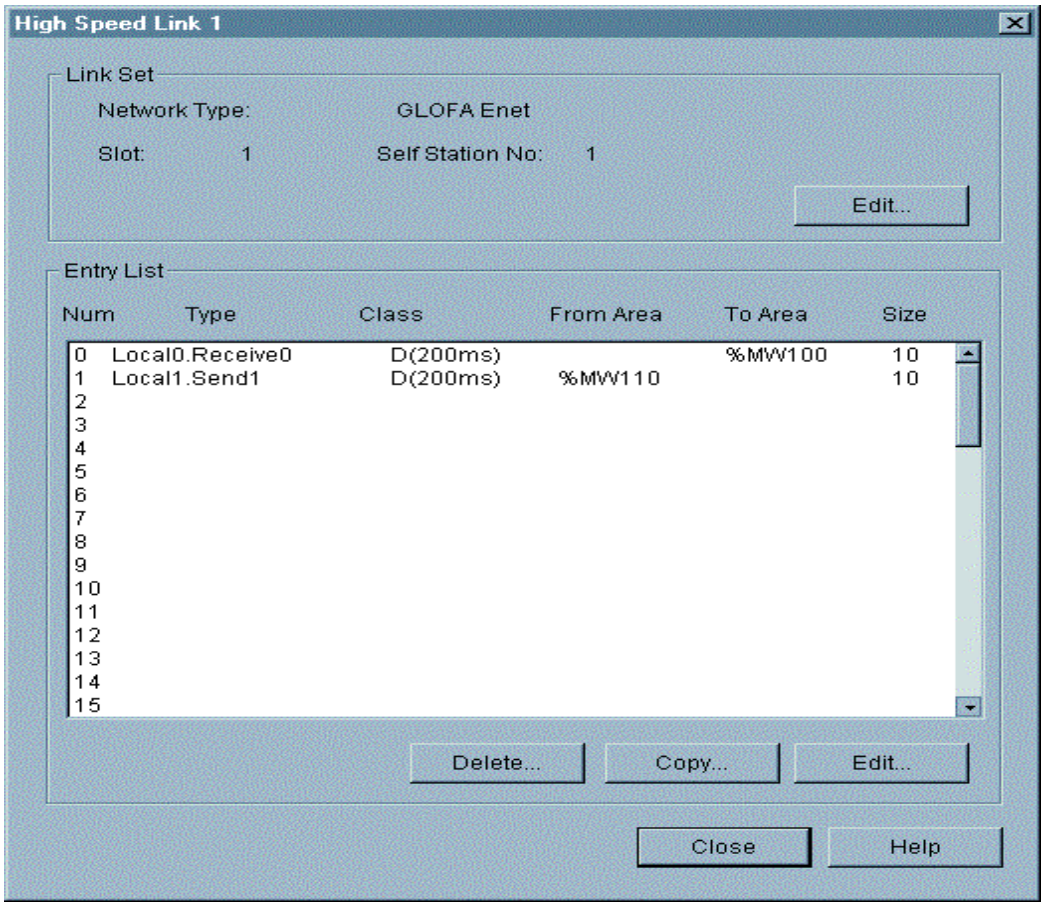
Setup of Sending and Receiving of Station " 0"



Receiving Setup of Station " 1"

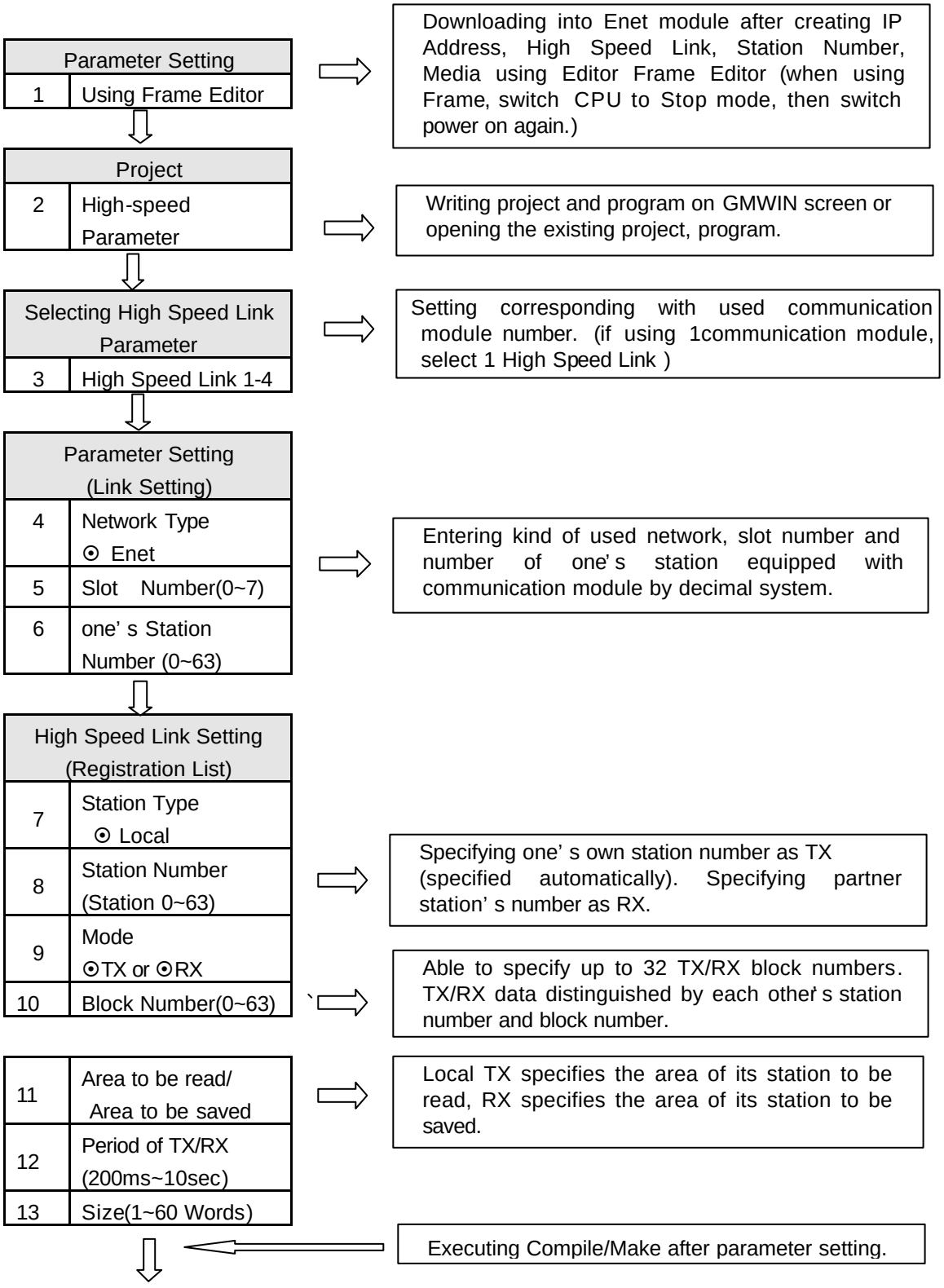


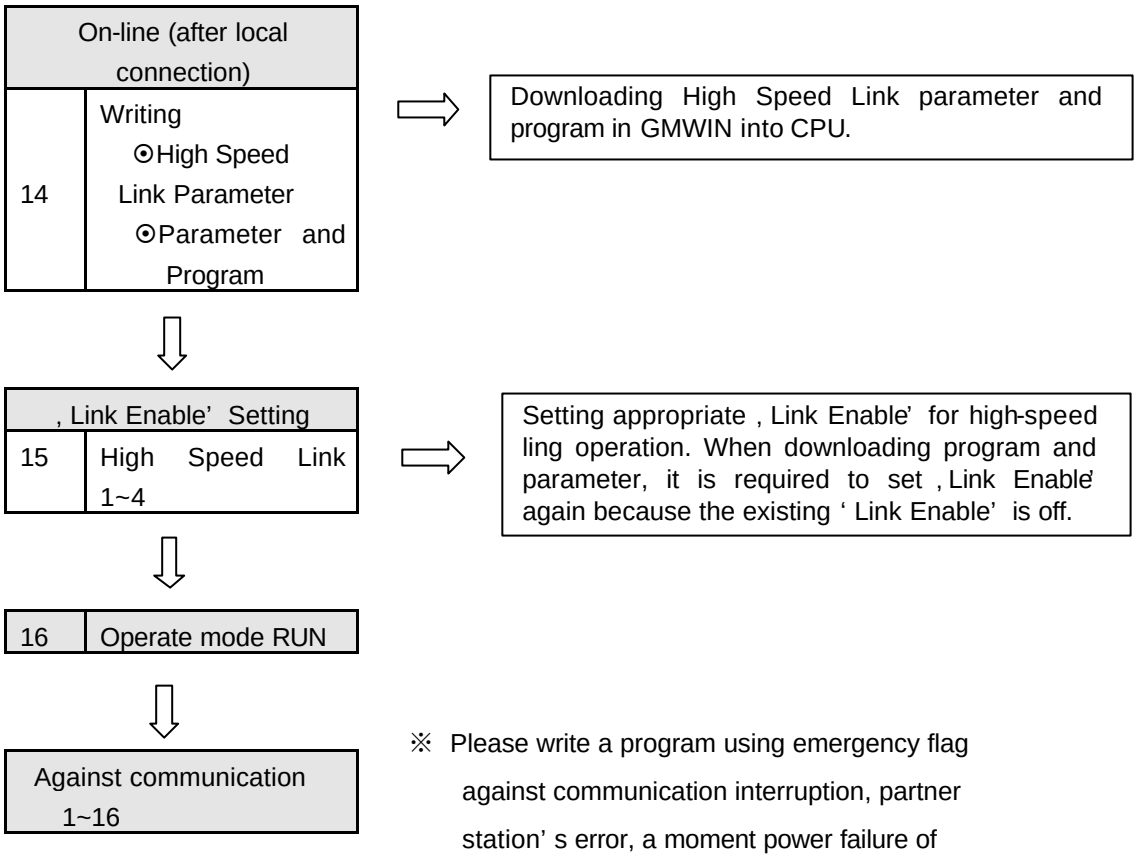
Sending Setup of Station " 1"



Setup of Sending and Receiving of Station " 1"

7.2.2 Operation Order by High Speed Link





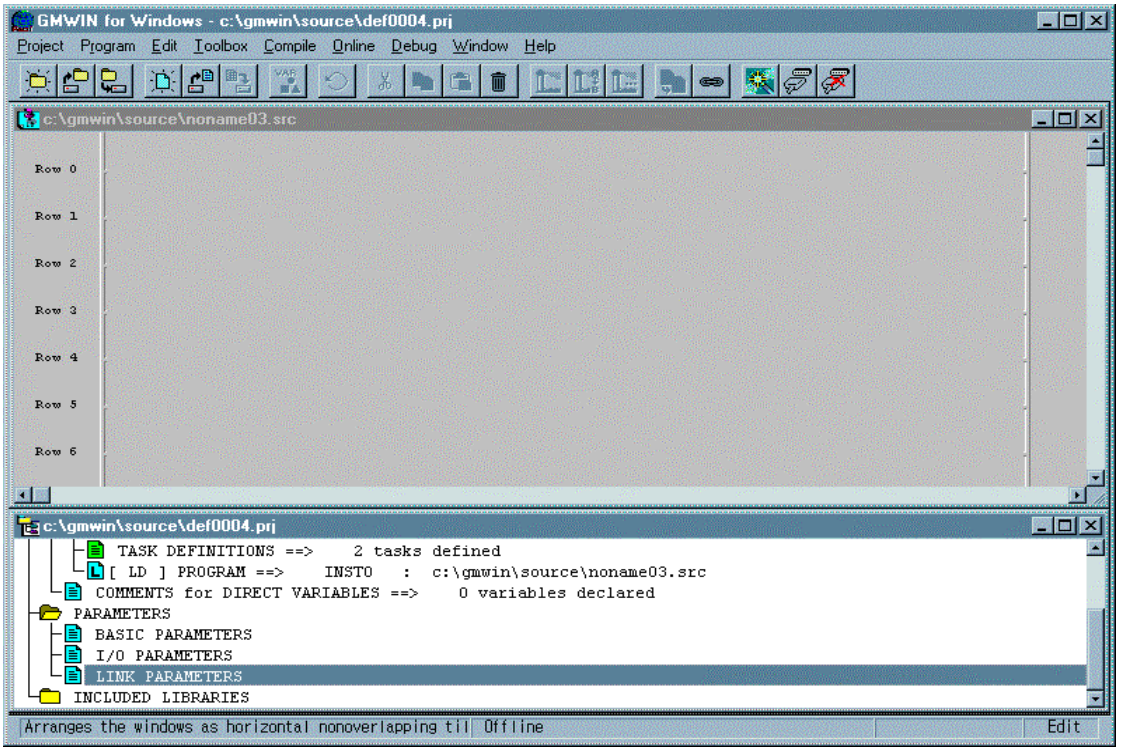
※ Please write a program using emergency flag against communication interruption, partner station' s error, a moment power failure of remote module at time of communication.

7.2.3 Setting High Speed Link Parameter

The High Speed Link parameter sets its appropriate items by selecting link parameter on GMWIN project screen. Setting order and function of each item are as follows:

1) Setting GMWIN Project

If High Speed Link parameter is selected on basic project screen like figure 7.2.3(A). The basic screen of the link parameter like figure 7.2.3(B) appears, and then the appropriate items can be here selected.

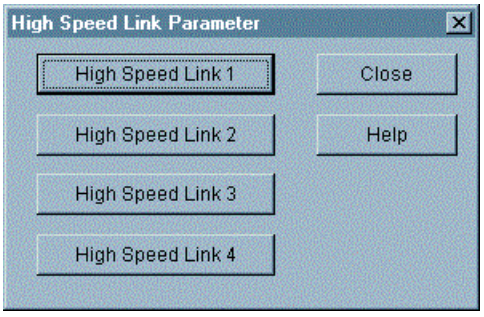


[Figure 7.2.3(A)] Basic Screen of GMWIN Project

2) Selecting Link Parameter

A) Method of Setting

Go into , Setting Parameter' by selecting the appropriate parameter on the basic screen like figure 7.2.3(B).



[Figure 7.2.3(B)] The Basic Screen of High Speed Link Parameter

B) Setting Function

The High Speed Link items of figure 7.2.3(B) means the maximum communication modules to be equipped according to CPU kind of PLC. For example, as GLOFA-GMR/GM1/GM2/GM3 CPU can equip maximum 4 communication modules, it can set High Speed Link 1 to 4. But, as for GLOFA-GM4 CPU, it can equip only maximum 2 communication modules, High Speed Link 1 and 2 buttons are marked with deep color,

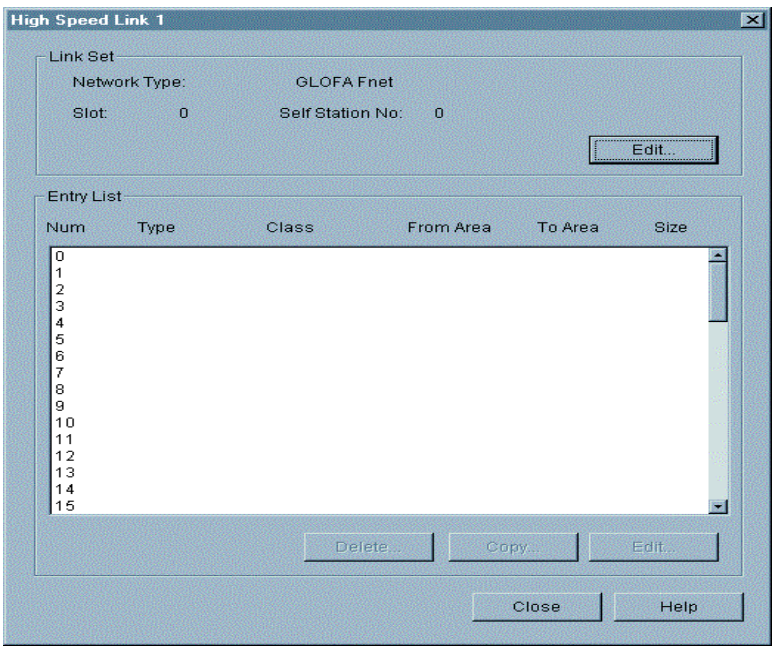
and it is impossible for the rest to set. At this time, the High Speed Link number has nothing to do with equipped slot number, and a user should set slot number on 'Setup' for each parameter, and to set only one High Speed Link parameter for each communication module. Table 7.2.3(A) displays communication device to be equipped and maximum number of equipment for each CPU of GLOFA .

Classification	Communication module to be equipped	Maximum Number of Device to be equipped	Remark
GLOFA-GMR/GM1	G3L-EUEA	4 devices	Able to be equipped with other communication modules.
GLOFA-GM2			
GLOFA-GM3			
GLOFA-GM4	G4L-EUEA	2 devices	

[Table 7.2.3(A)] Relation of Communication Module Equipment by each CPU Device

3) Setting Link Parameter

If you select the appropriate parameter on basic screen for parameter setting in figure 7.2.3(B), initial screen for High Speed Link parameter setting appears like the figure 7.2.3(C).

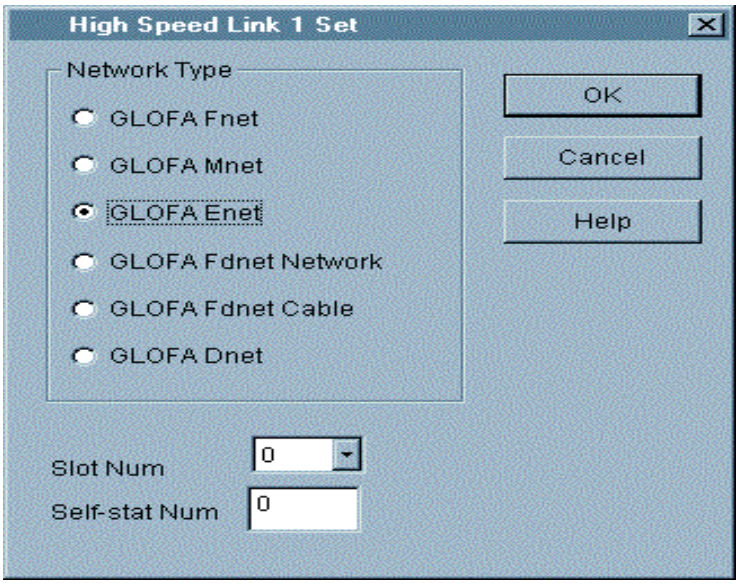


[Figure 7.2.3(C) Initial Screen for Parameter Setting

The initial screen for Parameter setting is composed of ‚Link Setup' and ‚Registration List', and the method and function of setup by each item are as follows.

A) Setting High Speed Link

'Setting High Speed Link' is an item in which you set up the basic item of communication module to be set up in parameter setting, and you select 'Modify' button of link setting in figure 7.2.3(C), and then you should set up module type, slot number, your own station's number respectively in figure 7.2.3(D).



[Figure 7.2.3(D)] Screen for High Speed Link Setting

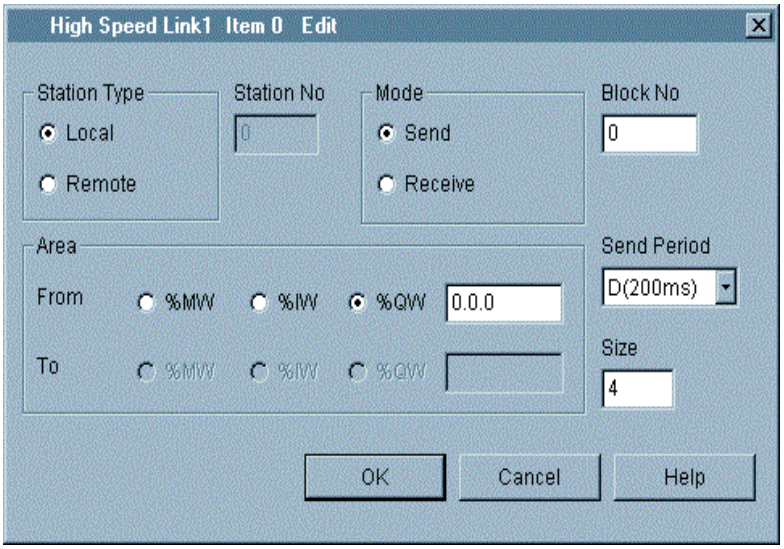
Network Type : You set up the kind of communication module equipped, and should setup Enet.

Slot Number : You set up the position of communication module equipped. (Slot 0-7)

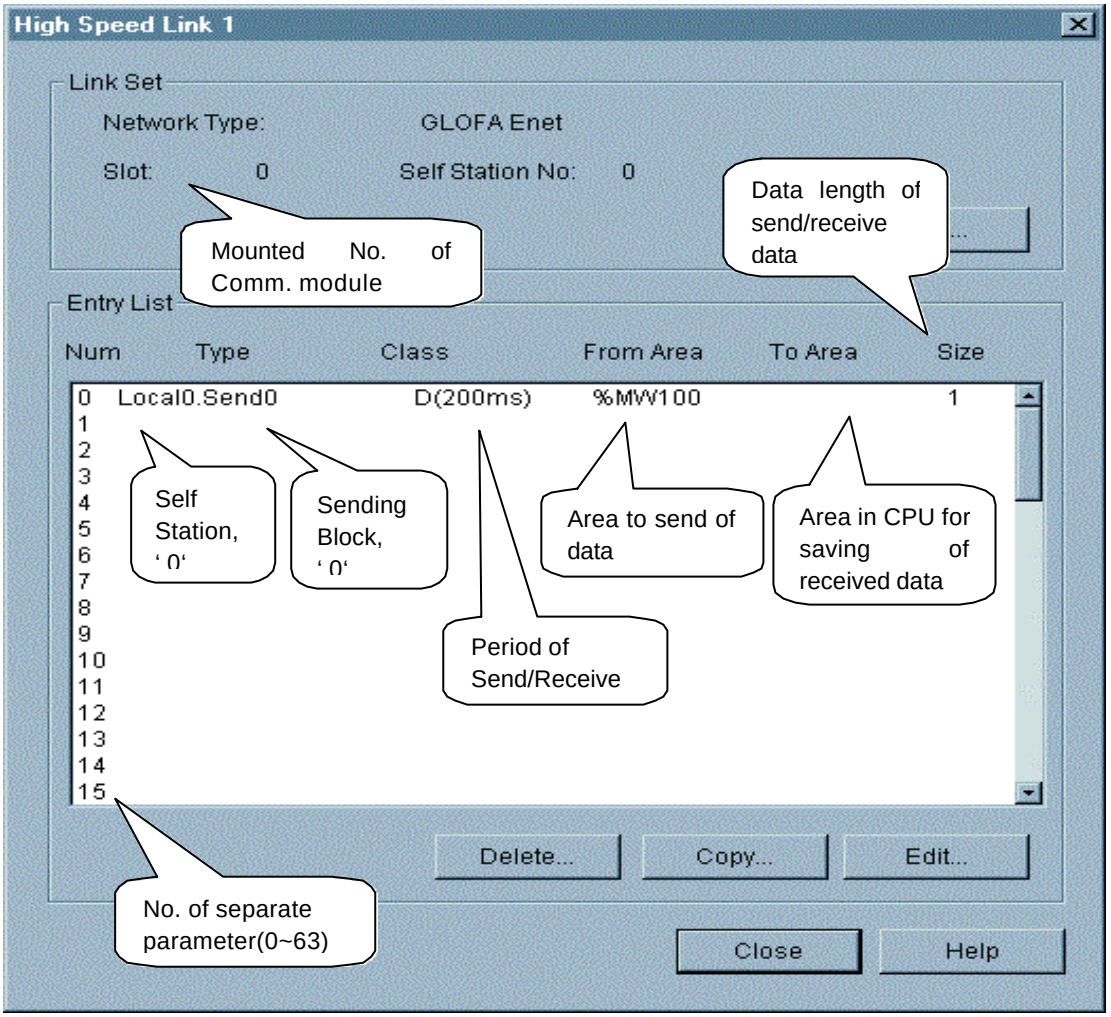
One's Station Number : It has the range of '0' to 63 as station number used for High Speed Link. As one's station number is a proper number, in which it distinguishes communication modules within the same network system, you should not use repeated station number. You also have to use it after you assign station number. (One's station number has to be set up corresponding to the station number for High Speed Link set with frame editor. If not, the station number set with frame editor will be set as the station number for high –speed line).

B) Setting Registration List

Registration List is an area where you register RX/TX information of real data. You should set up from registration number '0' in registration list area after setting link. Major setting items is shown on the upper part of menu of registration list. If an user selects (double click) the appropriate list in the figure 7.2.3(C), he can set up the appropriate item in the 'Modify' window for High Speed Link like the figure 7.2.3(E). The 'b' screen of the figure 7.2.3(E) displays the screen of registration list when TX parameter of local station '0' is set in 'a' screen. You can modify parameter by double click the appropriate registration number on the screen of the figure 7.2.3(E).



a. 'Modify' Screen for High Speed Link Item



b. An Example of Setting Screen for TX Parameter Setting

[Figure 7.2.3(E)] A Screen for Parameter Setting of High Speed Link

The function of each registration items in , a' in the figure 7.2.3(E) is as follows:

- ***Registration Number*** : It means, 0' in, Modify 0 in High Speed Link item 1'. It is also a serial number showing registered order, and you can set 64 from ' 0' to ' 63'. It has nothing to do with the TX/RX order.

- ***Station Type*** : A item, in which you determine the station type you want to perform TX/RX with. Local is set in Enet system.

- ***Station Number*** : When sending data of setting item, you set your station number, and when receiving them, you should set partner station number. When

sending data, your station number is automatically set, and only when receiving them, you have to set the partner station number.

- ***Mode*** : An item, in which you determine the TX/RX possibility of data the appropriate block. **Maximum 32** for each TX/RX can be set, if setting is over 32, an error occurs.

- ***Block Numbe*** : A parameter set to receive and send a lot of data from various area from and to one station, and it also plays a role to distinguish data from a variaty of block. The station number and block number set from sending station is transferred with TX data, and destination station saves appropriate data in receiving area only when the number of station and block set in receiving parameter of High Speed Link are the same each other, you should set the block number with the station number all in RX/TX station. The block number can be set maximum 32 settings from '0' to '31' for each TX/RX toward one station. When setting block number, **you should not set a variety of the same block numbers toward the same station number.**

- ***Area*** : When sending data, you set an area where you read data to be sent. when receiving them, you set an area where you save the data sent. Table 7.2.3(B) shows the area to be set.

Mode / Station type		TX			RX			Remark
		%IW	%QW	%MW	%IW	%QW	%MW	
Local	Area to be read	O	O	O	X	X	X	Area is CPU memory
	Area to be saved	X	X	X	O	O	O	It means the area.

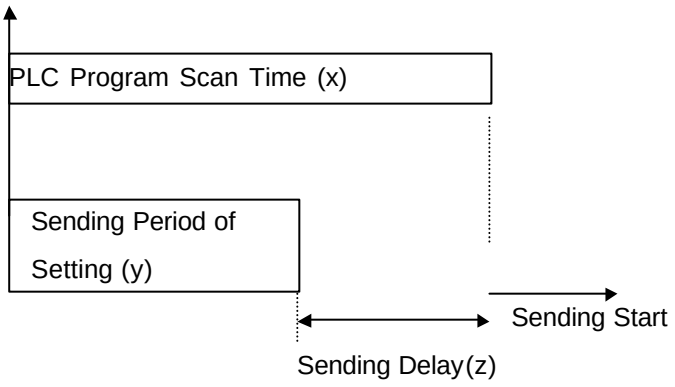
[Table 7.2.3(B)] Setting Area According to the Station Type

- ***Size*** : It means the size of data to perform TX/RX. Its unit is 1 word (16 dots). You can set maximum 200 words for Enet system. In case that data size set from the receiving mode is smaller than the sent data, only the set size can be saved in the saving area. Therefore, you can use by receiving selectively the necessary ones of the data sent from sending station.

- ***TX/RX Period*** : The High Speed Link is a service, that performs TX/RX at the very time of end of PLC program set by user. Thus, when the time of PLC program scan is short like within several ㎳, communication module transfers data according to the program scan, and the increase of

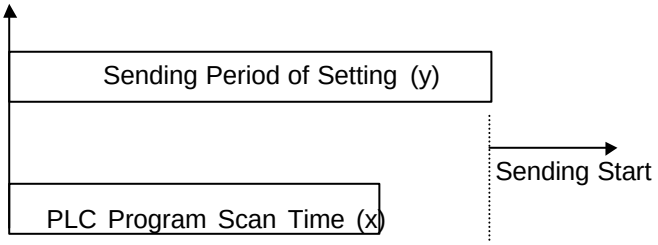
communication volume due to that cause lowering of efficiency for whole communication system. To avoid it, it enables a user to set RX/TX period, and the range of setting is minimum 200㎳ to maximum 10sec. When you do not set, the basic value of 200㎳ is set automatically. TX/RX period means sending period when the appropriate block is set as sending, otherwise, when it is set as receiving, it means period of checking period of data receiving of the appropriate block.

Sending period is parameter that determines the period of data transferring. For example, the sending data set with its basic value of 200㎳ is sent once per 200㎳. If PLC program scan time is longer than the set sending period, it is sent at the time of the end of PLC program scan, and sending period becomes the same as the scan time of PLC program. [Figure 7.2.3(F)].



Sending Delay Time : (z = x - y) ㎳

a. Delay time of sending data when PLC program scan is longer than sending period.



Sending Delay time : (z = 0) ㎳

b. Delay time of sending data when PLC program scan shorter than sending period.

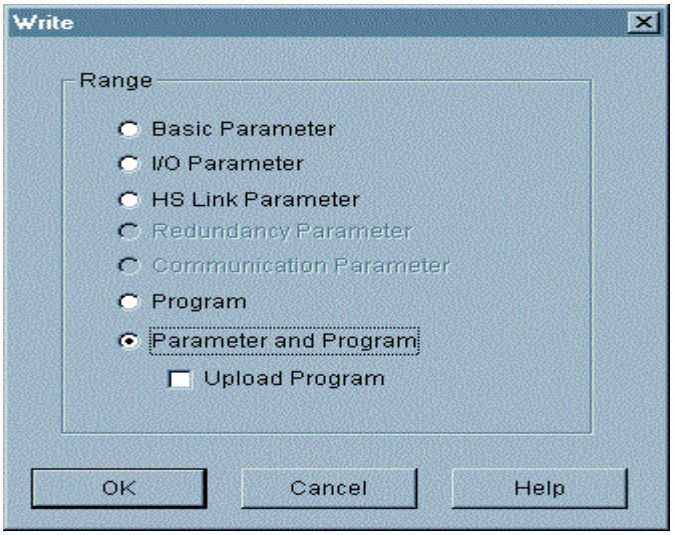
[Figure 7.2.3(F)] PLC Program Scan and sending Period

In case of data sending, when the appropriate block data is received on the set time, the appropriate TRX_MODE flag of link information should be on, and if not, it should be off, then, it makes run-link and link trouble contact. Therefore, you can check whether data are sent normally even after you set above the sending period of the appropriate block set from partner station. TX/RX time becomes different from the total amount of number of block for High Speed Link setting and volume of TX/RX data per block and the total amount of communications such as communication stations of network, let alone the time of PLC program scan. Therefore, if you set TX/RX period, you should set them referring to ‘Speed Calculation of High Speed Link’ in Chapter 7.2.6.

7.2.4 Operation of High Speed Link

After High Speed Link parameter is set, you can start high-speed service by downloading parameter with PLC CPU parameter. If you have changed High Speed Link parameter, first execute 'MAKE' from 'Compile' menu of GMWIN, and start High Speed Link after downloading parameter.

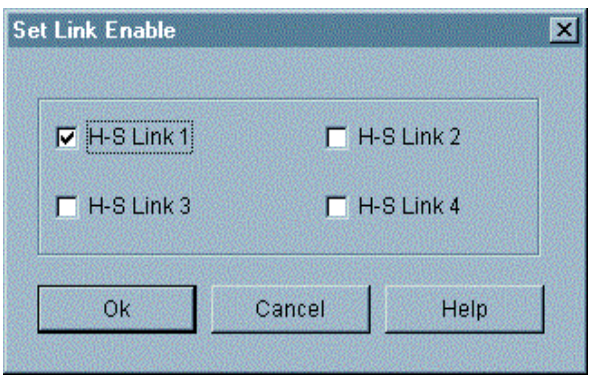
1) Parameter Download



[Figure 7.2.4(A)] Parameter Download Screen

A user should save high-speed parameter edited by him in project file of GMWIN. If you select 'Writing' after you are connected with PLC in on-line of MWIN main menu, the 'Writing' screen of figure 7.2.4(A) appears. If you download parameter by selecting High Speed Link parameter or parameter and program in the figure, the parameter is downloaded with program or alone. At this time, 'LINK Enable' as operation information of High Speed Link becomes off. Therefore, if the program is downloaded, you must turn on again the appropriate parameter in the setting of 'Link Enable'.

2) Operation of High Speed Link



[Figure 7.2.4(B)] Link Enable Setting

If parameter download is finished, and if you set ‘Link Enable’ of on-line menu of GMWIN, ‘Link Enable’ command is delivered into PLC, and now, it is ready for operation

It is only possible for you to set, Link Enable’ only at stop mode of PLC. If the High Speed Link is operated by setting ‘Link Enable’, you can perform High Speed Link without any relation with PLC action mode, parameter and information of ‘Link Enable’ is backed up in PLC CPU. Therefore, data will be kept at the power failure. Table 7.2.4(A) is describing the relation of PLC mode and High Speed Link action.

Classification	Parameter Download	Link Enable Setting	High Speed Link Action	Remark
PLC Run	X	X	O	It is acting only at the time of ‘High Speed Link Enable’.
PLC Stop	O	O	O	
PLC Pause	X	X	O	
PLC Debug	X	X	O	

[Table 7.2.4(A)] Relation of PLC mode and High Speed Link

7.2.5 High Speed Link Information

1) High Speed Link Information Function

As High Speed Link service performs data exchange between more than 2 communication stations, it offers you the method to confirm the High Speed Link service status as High Speed Link information. With this, you can confirm the reliability of data read from partner station through the High Speed Link. That is, communication module offers you the information by High Speed Link whether the High Speed Link is acting with the parameter set by you at the fixed time after putting together the data collected till that time. Link information consists of the followings: Run-Link (_HSxRLINK) with which you are able to know whole information of communication network; individual information such as _HSxSTATE, _HSxTRX, _HSxMOD, _HSxERR, which informs you whole information of Link Trouble (_HSxLTRBL) and communication status by 64 registration lists within parameter. You can use the above information in form of keyword when editing program, and monitor the status of High Speed Link using its information monitor. When you operate a variety of PLC by using the High Speed Link, you should use it after you confirm reliability of TX/RX data by using High Speed Link information such as Run-Link and Link Trouble. Table 7.2.5(A) shows function and definition of High Speed Link information.

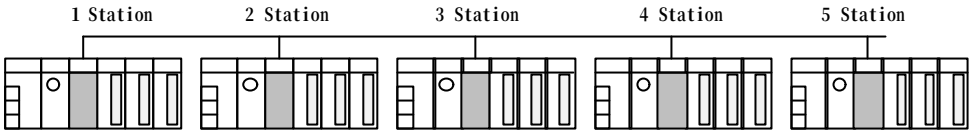
Classification	Run-Link	Link-Trouble	RX/TX Status	Action Mode	Error	High Speed Link Status
Information kind	Total Information	Total Information	Individual Information	Individual Information	IndividualInformation	Individual Information
Keyword Name (x=HS_Link Number)	_HSxRLINK	_HSxLTRBL	_HSxTRX[n] (n=0..63)	_HSxMOD[n] (n=0..63)	_HSxERR[n] (n=0..63)	_HSxSTATE[n] (n=0..63)
Data Type	Bit	Bit	Bit-Array	Bit-Array	Bit-Array	Bit-Array
Available Monitor	Possible	Possible	Possible	Possible	Possible	Possible
Program Use	Possible	Possible	Possible	Possible	Possible	Possible

[Table 7.2.5(A)] High Speed Link Information

A) Run-Link (_HSxRLINK)

Total Information showing whether the High Speed Link is normally operated by the parameter by you. It is also a kind of contact containing ' On' status till ' Link Enable' is turned off once it is turned on. It is turned ' On' under the following condition.

① When , Link Enable' is ' On' .
② When registration list setting of parameter is normally set.
③ When All the data in the registration list of parameter is sent and received corresponding to the ser period.
④ When the status of all the partner stations set in parameter is in ' RUN' and there is no error at the same time.



(a) Configuration of High Speed Link System

Station 1	Station 2	Station 3	Station 4	Station 5
TX: 2 Words RX: 2 Words (2 stations) RX: 2 Words (3 Stations)	TX: 2 Words RX: 2 Words (1 station) RX: 2 Words (4 stations)	TX: 2 Words RX: 2 Words (1 station) RX: 2 Words (5 stations)	TX: 2 Words	TX: 2 Words

(b) An Example of Parameter Setting of High Speed Link of Each Station

[Figure 7.2.5(A)] Condition of Run-Link On

Figure 7.2.5(A) is showing a configuration example of High Speed Link system to describe the condition of ' Run-Link On' . If 5 communication modules are connected with network such as ' a' of the figure 7.2.5(A), and are in the the High Speed Link status with the parameter contents such as the figure ' b' , the condition of ' Run Link O' in one station is as follows:

① When Link-Enable is , On' in one' s station (1 station).
② When One' s station (1 station) is in , RUN' status.
③ When One' s station (1 station) is not in the error status.
④ When TX parameter data set in one' s station (1 station) is sent corresponding to the TX period.
⑤ When Data received from the station 2,3 are received corresponding to the RX period.
⑥ When the action modes of partner station (station 2, 3) sending data to one' s station are

in , RUN' mode, and are not in error status, and performs communication corresponding to the RX/TX period.

⑦ When Other partner stations' (station 4, 5) action modes set in the partner station' s parameter (station 2, 3) of ones station (station 1) are in , RUN' mode, and are not in error status, and performs communication corresponding to the RX/TX period.

If all the conditions meet the qualification, RUN-Link of one' s station is , On' . If you use RUN-Link contact in connection of program in the system, in which PLC of several stations are operating connected with each other through High Speed Link, you can conduct the mutual monitoring of data sent received and reliable communication. But, once ' RUN-Link' contact is ' On' it contains ' On' till Link-Enable is ' Off' . Therefore, if you monitor of abnormal status like communication error, you should use information contact of link trouble of the following item together.

B) Link-Trouble (_HSxLTRBL x=High Speed Link Number (1~4))

A total information displaying whether High Speed Link is normally operated by the parameter set by you as a user. It becomes ' On' if RUN-Link is not under the condition of ' On' , and if it is recovered in the status of ' On' , it becomes ' Off' .

C) RX/TX Status (_HSxTRX[0..63] x=High speed Link Number (1~4))

Individual information showing action status by registration list of High Speed Link parameter, and also showing maximum 64 of RX/TX information by registration list. If RX/TX action toward registration item is done corresponding to RX/TX period, appropriate ' Bit' becomes ' On' , if not, it becomes ' Off' the other way,

D) Action Mode (_HSxMODE[0..63] x=High Speed Link Number (1~4))

Individual information showing action status by registration list of High Speed Link parameter, and also showing maximum 64 of action mode information by registration list as maximum registration numbers. If the station set in the registration item is in ' Run' mode, appropriate ' Bit' becomes ' On' , if it is in Stop/Pause/Debug mode, it becomes ' Off' .

E) Error (_HSxERR[0..63] x=High Speed Link Number (1~4))

Individual information showing action status by registration list of High Speed Link parameter, and also showing maximum 64 error information by registration list as maximum registration number. The ' Error' displays the status overall, in which PLC does not perform user program normally. ' Off' means that partner station' s PLC is normally acting, and ' On' means that the partner station

is in the abnormal status.

F) High Speed Link Status (_HSxSTATE[0..63] x=High Speed Link Number (1~4))

Individual information showing action status by registration list of High Speed Link parameter, and also showing maximum 64 High Speed Link status by registration list as maximum registration number. That is, if RX/TX status of the appropriate list is normal, and action mode is in ' Run' status, and there is no error, it becomes ' On. But, if not, it becomes ' Off' .

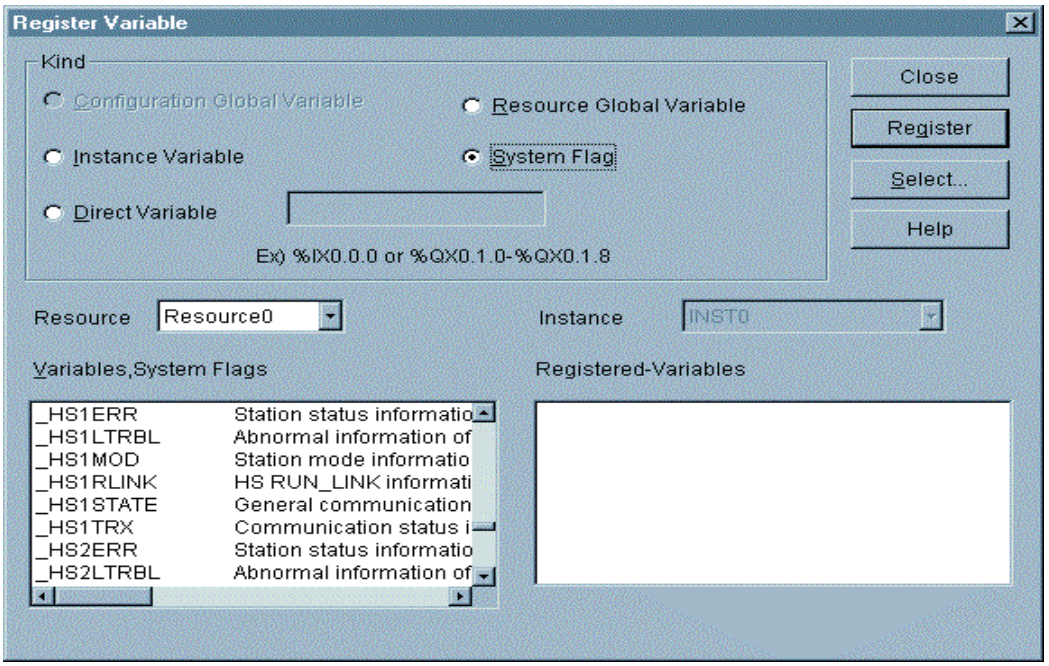
2) Information Monitor of High Speed Link

You can monitor the High Speed Link information using monitoring function after on-line connection to GMWIN. There are two ways to do it: To select variable monitor from the monitoring menu and to monitor link parameter.

A) Variable Monitor

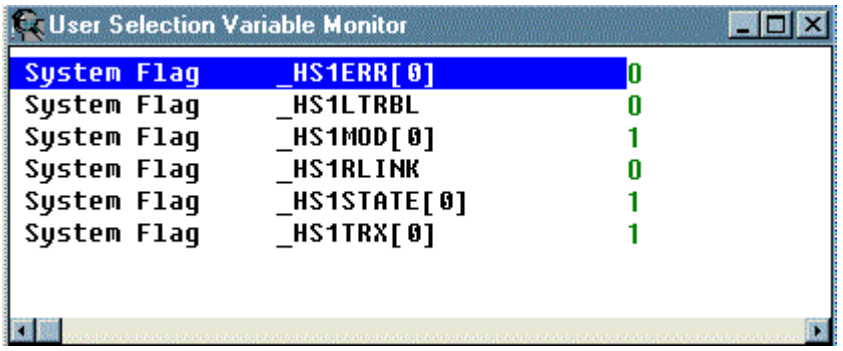
Variable Monitor is a function to monitor only by selecting the necessary items by means of GMWIN flag monitor function. If the variable registration screen like figure 7.2.5(B) appears after selection of variable monitor from on-line monitor item, you can select , Flag' and then register directly each high-speed information flag from the list of variable and flag registration. At this time, as _HSxSTATE[n], _HSxERR[n], _HSxMOD[n], _HSxTRX[n] are flags for , Array' type, you should select directly the array number, and the array number means the registration number within parameter. ' x' means High Speed Link number. It has the range of 1 ~ 4 at GM1/2/3 PLC CPU, and 1 ~ 2 at GM4 PLC CPU, and only number 1 is valid at GM5 PLC CPU.

If you select , Close' in the figure 7.2.5(B) after variable registration. A monitor screen of the figure 7.2.5(C) appears, and then you can monitor by pressing ' Start' from the tool box displayed on the right separately.



[Figure 7.2.5(B)] Screen for Variable Registration of High Speed Link Information

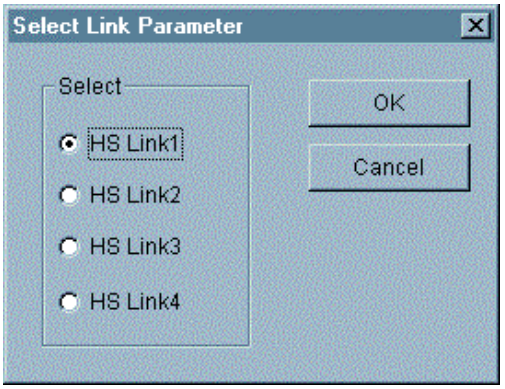
the figure 7.2.5(C) shows monitoring results by monitoring the first parameter of High Speed Link 1.



[Figure 7.2.5(C)] Monitoring Screen for High Speed Link Information (Variable Registration)

B) Link Parameter Monitoring

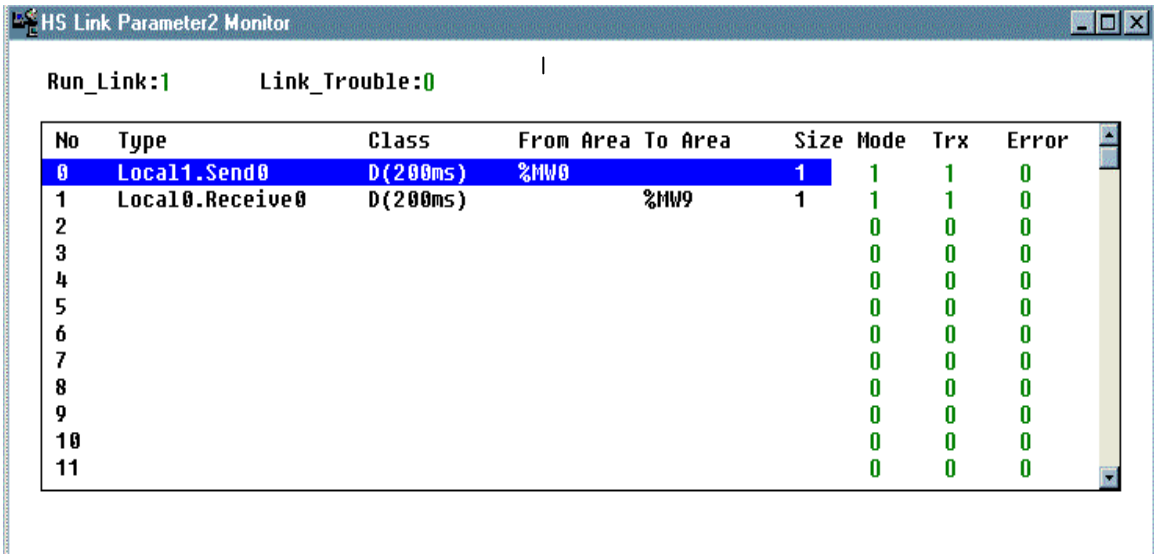
If you select link parameter item from monitoring menu of on-line connection of GMWIN, a screen for selection of link parameter like figure 7.2.5(D) appears. If you click ‘OK’ by selecting the item you want among the parameters set by you, a screen for monitoring high-speed parameter like the figure 7.2.5(E) is open, and the set registration list is showing with it monitored.



[Figure 7.2.5(D)] Screen for Selection of Link Parameter

In link parameter monitoring, total information of RUN-Link, Link Trouble is displayed on the screen top like in figure 7.2.5(E), mode (action mode), communication (RX/TX status), individual information of error are displayed with registration number as many as set numbers.

The figure 7.2.5(E) is showing monitoring screen after you have set 5 High Speed Link parameters to parameter number.



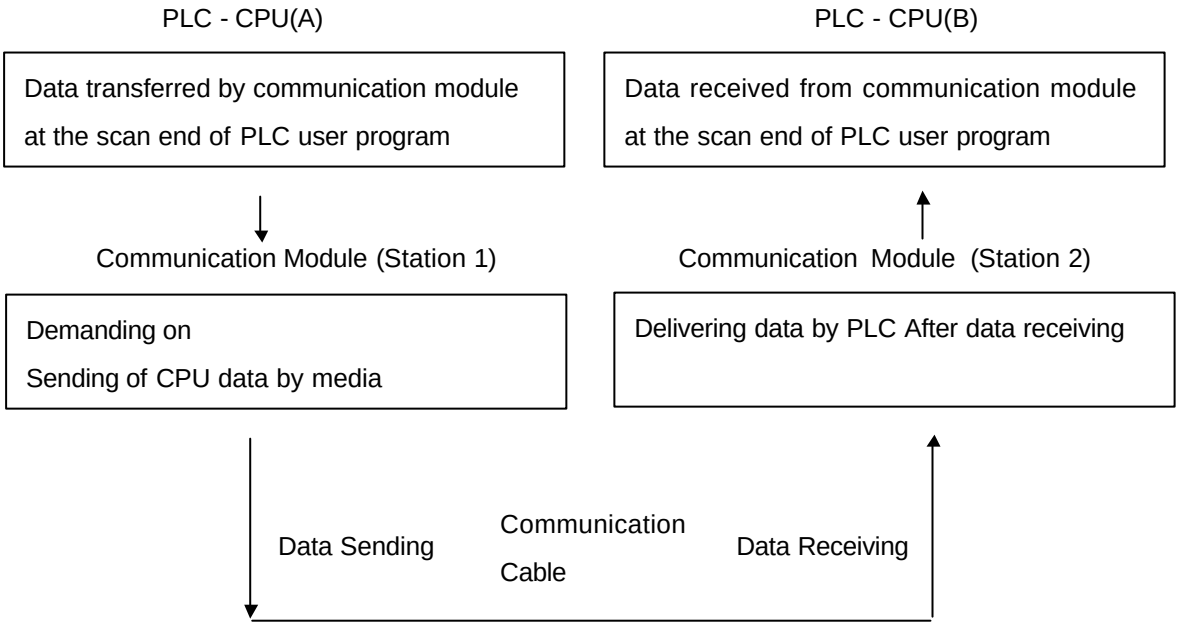
[Figure 7.2.5(E)] Monitoring Screen of High Speed Link Parameter

The High Speed Link parameter set by you and information are all monitored after you have selected High Speed Link information like in the figure 7.2.5(E). So, you can monitor High Speed Link status with I/O data because set individual information value is monitored together.

7.2.6 Speed Calculation of High Speed Link

1) Introduction

The transfer rate of High Speed Link data can be fixed according to various factors. That is because the data of a block go through the same path like the figure 7.2.6(A) till they are saved in the RX area of other stations after they are sent from a station.



[Figure 7.2.6(A)] Data Transfer Path by Communication Module

If you want to send data to other stations using communication like in the figure 7.2.6(A), they go through 3 paths. The spent time on each path is crucial for sending time.

Table 7.2.6(A) shows major path of data transfer and the crucial factors influencing on time by each path.

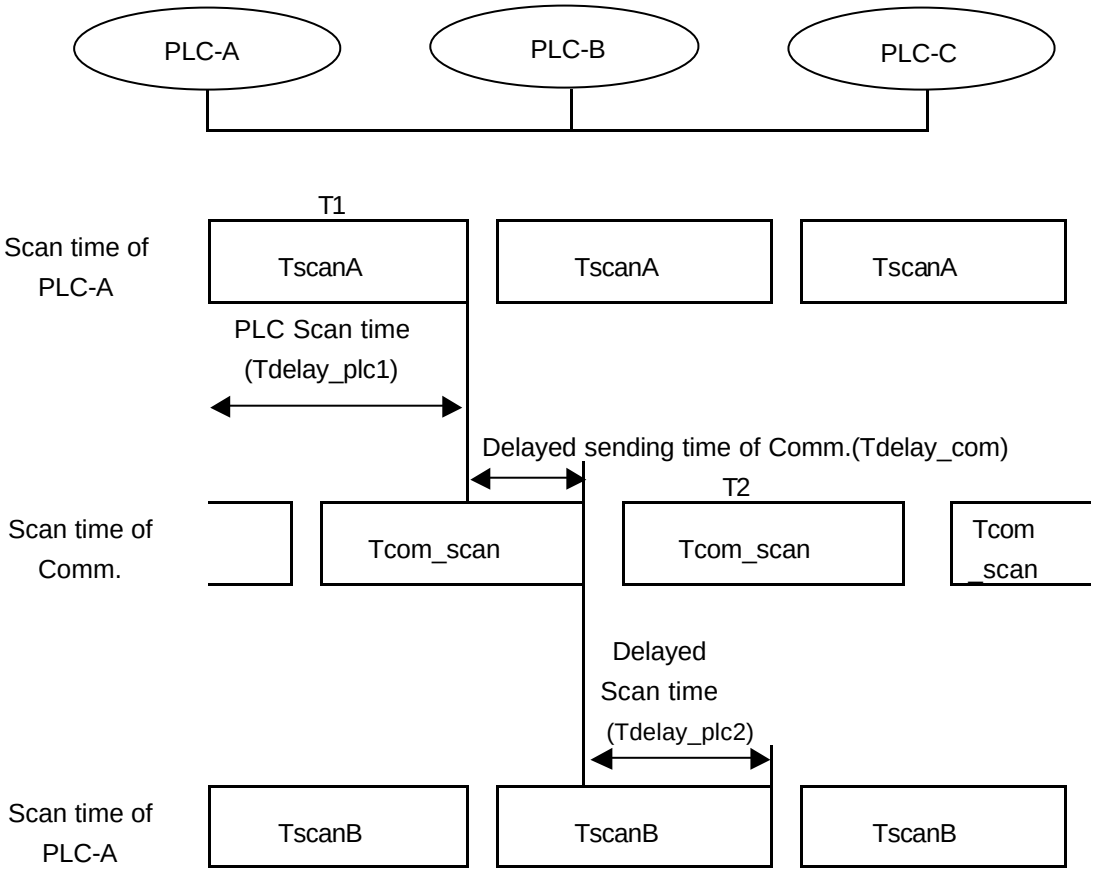
Item	Path	Factor Iinfluencing on Time
1	PLC CPU(A) → Communication Module (Station 1)	Program Scan Time of PLC-A
2	Communication Module (Station 1)→ Communication Module (Station 2)	Communication Scan Time+Communication O/S Scan Time
3	Communication Module (Station 2) → PLC CPU(B)	Program Scan Time of PLC-B

[Table 7.2.6(A)] Data Transfer Path and Time Factor

Data transfer from PLC CPU to communication module or from communication module to PLC CPU is done at the finish time of PLC user program, scan time of PLC user program becomes a crucial factor for data transfer. If you select ' PLC Information' of on-line menu of GMWIN, you are able to know the maximum, minimum and current time of program scan. Furthermore, if

communication module wants to send its data, it must perceive free time of communication cable, and it is fixed according to IEEE standards 802.3.

The figure 7.2.6(B) shows point of sending time according to PLC program scan time and communication scan time.



[Figure 7.2.6(B)] Relation between PLC Scan Time and Communication Scan Time

In the figure 7.1.6(B), PLC-A station transfers TX data by means of communication module at T1, and it is a point of time when the program of PLC-A is finished. Therefore, the time is delayed as much as delay_plc1. Communication module can transfer data after waiting for the communication

scan delay time (Tdelay_com) after it receives data from PLC. It can be delayed as much as Tcom_Scan1 for the longest time delay. In PLC-B as well, as communication module transfers received data after waiting for 2 hours (Tdelay_plc2) to PLC, delay factor as much as maximum Tscan2 comes into existence. Like the figure 7.2.6(A) and figure 7.2.6(B), Communication delay time is fixed according to a variety of fluents such as total number of communication stations, program volume OS scan time of communication module. As it is difficult to calculate the value of such fluents, a method is presented here for a user to calculate easily.

2) Method of Speed Calculation of High Speed Link

You define High Speed Link as the maximum time spent by a block of data from PLC-A to PLC-B using an example of the figure 6.2.7(B). You calculate as follows after you group speed calculation of High Speed Link into a complicated system, in which sending data numbers of more than 10 communication stations are over 512 bytes, a simple system, in which as there are less than 10 communication stations, sending data numbers are under 512 bytes.

A) Simple System

You can calculate speed calculation of High Speed Link using the simple calculation system like the formula 7.2.6(A), in which total number of communication stations is under 10, and total volume of sending data is under 512 bytes.

St = P_ScanA + C_Scan + P_ScanB ---------- [Formular 7.2.6(A)]

(St = maximum transfer time of High Speed Link
P_ScanA = maximum program scan time of plc A
P_ScanB = maximum program scan time of plc B
C_Scan = maximum communication scan time)

Using formular 6.1, C_Scan can be got with the following simple formular.

C_Scan = Th × Sn ---------- [Formular 7.2.6(B)]

(Th = Time of data transfer from a media per 1 station (IEEE standards 802.3)
Sn = Total Station Number : Total Communication Number)

B) complicated System

You can calculate speed calculation of High Speed Link using the complicated calculation system like the formula 7.2.6(C) in which total number of communication stations is over 10, and total volume of sending data is over 512 bytes.

St = Et ×To ×Ntx + Mf ----------[Formular 7.2.6(C)]

{ Et = Effective Tx Ratio(Effective Transfer Ratio)

To = Octet time (Transfer Time of 1 Byte)

Ntx = Total Tx number

Mf = Margin Factor}

Each term is determined as follows:

① Et = St × Nf ---------- [Formular 7.2.6(D)]

{St = Total Communication Station Number

Nf = Constant Value as Network Factor according to Communication System Characteristics, and 1.5 in Enet System}

② To = {Octet time. Spent time when 1 byte of data is transferred through serial data. Its value is as follows}

- Enet : 0.8 ㎲}

③ Ntx = It means total TX data number, and it is calculated including variables service number. It is determined as follows.

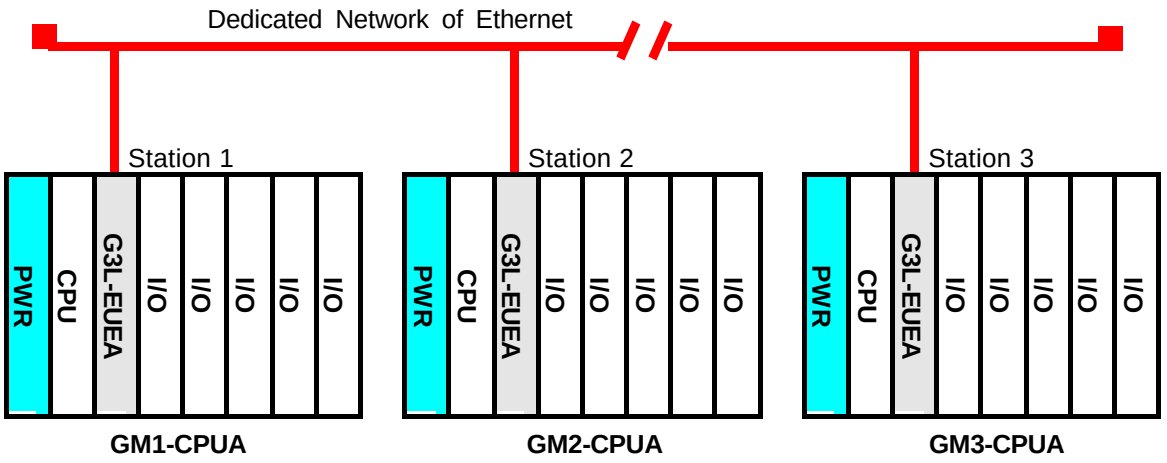
- Enet : Sum of TX bytes number of High Speed Link + FB + Service data number of one' s station × 1,024

④ Mf = Margin factor. It is namely margin value for factors not expressed by above formulas such as O/S scan time of communication module, and it is determined as follows.

- Enet : 25 ㎳

7.2.7 An Example of High Speed Link between PLC of Enet

Setting method of High Speed Link parameter is here described to perform data communication through I/O structure like table 7.2.7(A) in the GLOFA Enet system below.



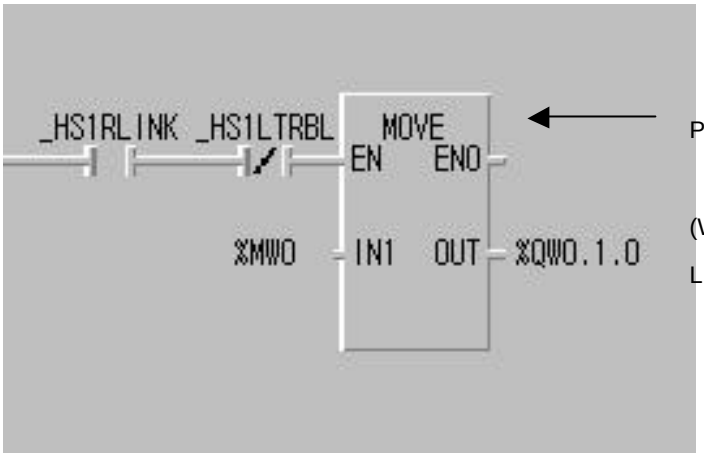
[Figure 7.2.7(A)] I/O Structure and RXTX Data

Structure of TX/RX		I/O Structure (All Stations are equal)	TX Area	RX Area
GM1	TX	Slot 0 : Enet Slot 1 : Output 32dots Slot 2 : Input 32 dots	%IW0.2.0(4Word)	--
(Station1)	RX : <-- GM2		--	%MW0(4Word)
GM2	TX		%IW0.2.0(4Word)	--
(Station2)	RX : <-- GM3		--	%MW0(4Word)
GM3	TX		%IW0.2.0(4Word)	--
(Station 3)	RX : <-- GM1		--	%MW0(4Word)

[Table 7.2.7(A)] I/O Structure and TX/RX Data

In the example, GM1/2/3 CPU all send 4 words as input value of slot number 2, and they output data sent from partner station with output module of slot number 1 after saving them in %MW0. Parameter configuration of High Speed Link and program to exchange data as above are described in the figure 7.2.7(B) and figure 7.2.7(C). The figure 7.2.7(B) is an example to ‘MOVE’ data saved in %MW0 to %QW0.1.0 using monitoring flag of High Speed Link RX/TX.

A) Editing User Program



[Figure 7.2.7(B)] User Program for the Example (GM1/2/3 are common)

The figure 7.2.7(B) is a program of example 1. It allows the system to output RX data, %MW0, through output module of slot number 1 when the High Speed Link is normal (_HS1RLINK=1,_HS1LTRBL=0). If you use the program in mixing with the information of Run-Link and Link Trouble like the figure 7.2.7(B), you can raise reliability of your work.

B) Setting Parameter of High Speed Link

In the system like the figure 7.2.7(A), you, as a user, should edit a map for RX/TX data like the table 7.2.7(A) after writing first a user program like the figure 7.2.7(B) in order to allow stations 1,2,3 to exchange data like the table 7.2.7(A). You also have to edit parameter of High Speed Link, and then you should download with PLC to send and receive data like the table 7.2.7(A). You are able to start the High Speed Link according to the following order.

① Download station number and parameter (using frame editor), Connect communication cable.
② Edit user program (for each station).
③ Editing a map to send and receive data.
④ Set parameter in , Setting High Speed Link parameter' of GMWIN.
⑤ Perform , Compile' and , Make' in compile menu.
⑥ Execute , Writing program and parameter' in on-line menu.
⑦ Set , High Speed Link Enable' corresponding to the setting number by selecting , Link Enable' in on-line menu.

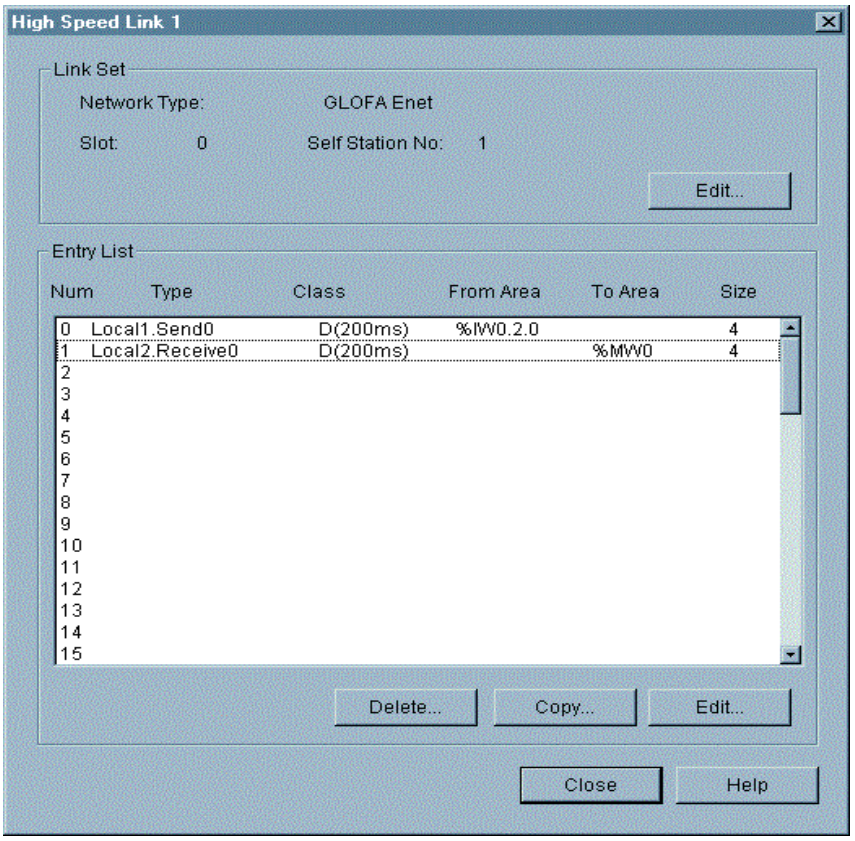
⑧ Change mode into , Run' in on-line menu.

⑨ Check for High Speed Link status through link parameter monitor.

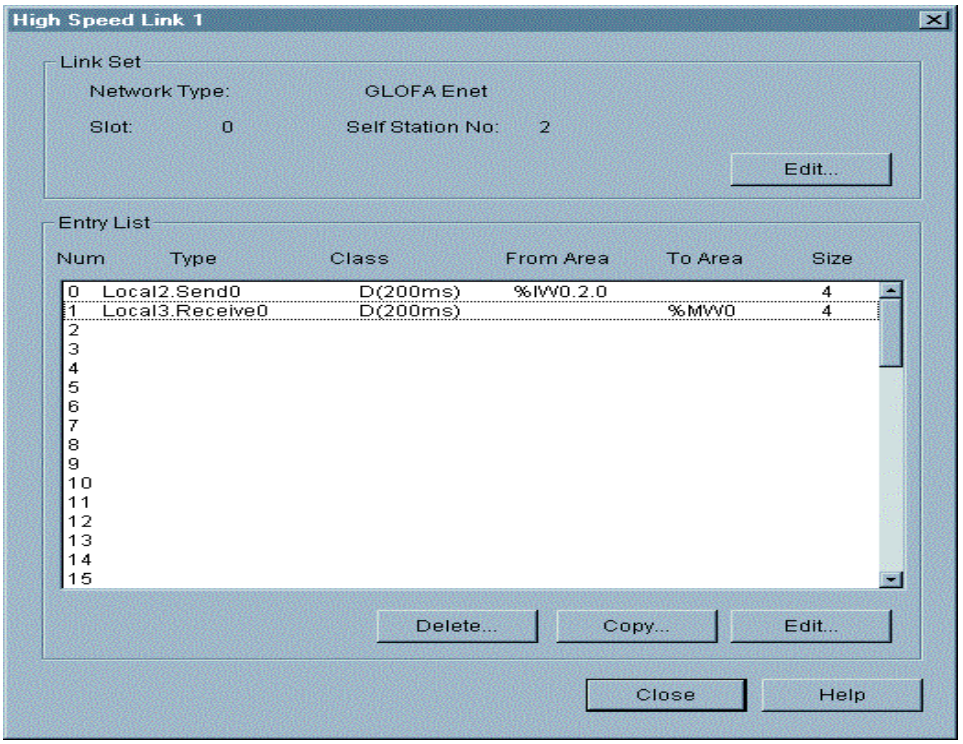
⑩ If an error occurs, repeat the procedures from the number 1.

Parameter of the High Speed Link for the example system is set as follows. You set basic item by selecting 'Modify' of link setting on the screen of High Speed Link setting like the figure 7.2.7(C). First, set module type as 'GLOFA Enet', and select 'OK' after setting installation position of Enet module and station number of the High Speed Link, and then complete the setting of the High Speed Link.

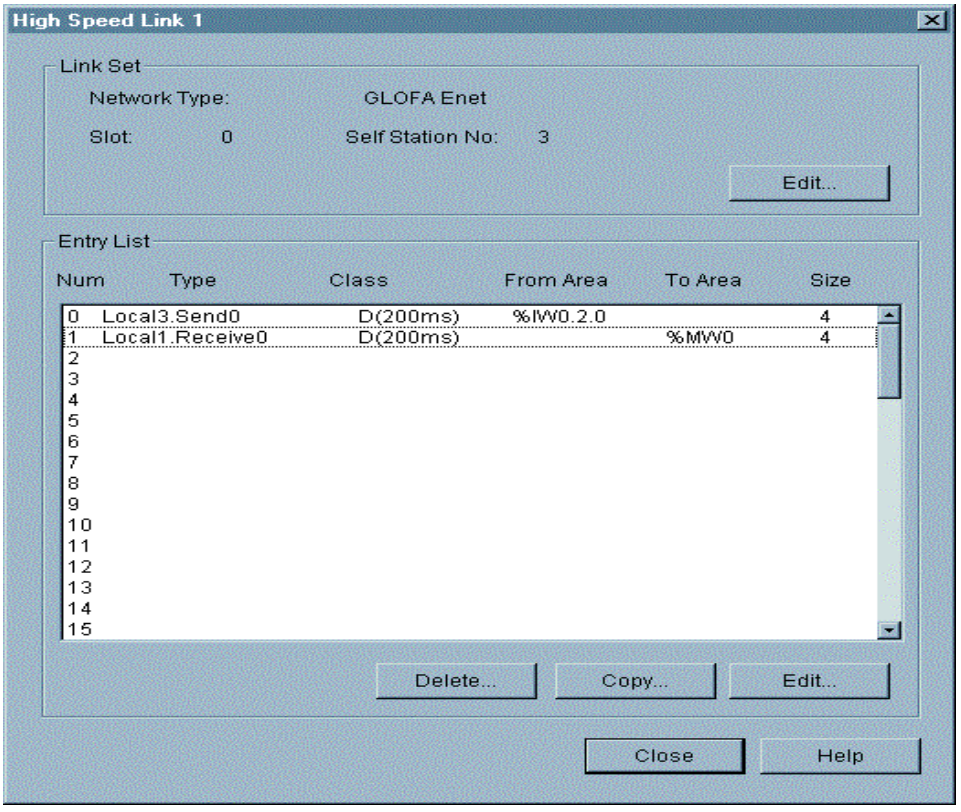
After that, set RX/TX parameter setting from number ,0' on the registration list of the figure 7.2.7(C). For example, the station type for station '1' is local. And as RX/TX are all composed of '0 block, RX/TX are configured with one parameter respectively. After you set RX/TX area according to the RX/TX map, you set further RX/TX period by calculating RX/TX time according to '7.2.6 Speed Calculation of High Speed Link'. Here, 200㎳ is set as basic value. a, b, c of the figure 7.2.7(C) are showing the results, in which parameter in GM1,GM2,GM3 is set with the above method.



a. Parameter of High Speed Link of GM1 (Station 1)



b. Parameter of High Speed Link or GM2 (Station 2)



c. Parameter of High Speed Link of GM3 (Station 3)

[Figure 7.2.7(C)] Examples of Parameter setting for High Speed Link

If you download in the on-line menu into the appropriate PLC, and set 'Link Enable' after editing program and parameter and performing 'Make' in compile menu like the figure 7.1.7(B) and figure 7.2.7(C), the High Speed Link begins to perform RX/TX according to the set parameter, and then you can start the system after you turn on PLC mode as 'Run'.

If you download parameter of the High Speed Link, 'Link Enable' becomes automatically 'Disable'. Therefore, you have to make 'Link Enable' enabled. But, it is only possible to set 'Link Enable' only at stop mode of PLC. (you should download station number into Enet module for each CPU in frame editor)

C) How to Determine Speed of High Speed Link.

The system of examples is a simple system, in which communication modules of 3 stations sends and receives data of 4 words each. Thus, period setting of RX/TX can be easily gained using the formula of speed calculation for simple system in 'Speed Calculation' of Chapter 7.2.6.

Namely, in formula: St = P_ScanA + C_Scan + P_ScanB

(St = maximum transfer time of High Speed Link
P_ScanA = maximum program scan time of plc A
P_ScanB = maximum program scan time of plc B
C_Scan = maximum communication scan time)

P_ScanA, P_ScanB are scan time of GM1, GM2 PLC. Thus, supposing that the time is 5㎳ each in the example above, (it is possible to confirm it by selecting 'On-line/PLC Information/System Information' of GMWIN)

Formula C_Scan = Th × Sn

(Th = Time of data transfer from a media per 1 station (IEEE standards 802.3)
Sn = Total Station Number : Total Communication Number)

Here, as Sn = 3, Th is 2.3㎳ in Enet, CScan = 6.9 ㎳, thus, St = P_ScanA(=5㎳) + P_ScanB(=5㎳) + CScan(6.9 ㎳) = 16.9㎳. It means that you should set RX/TX period above 17㎳.

7.3 High Speed Link of Redundancy System

7.3.1 Introduction

Redundant system using Enet module is **network redundancy** that sends and receives the same data at the same time with 2 same networks configured Enet module by communication like the figure 5.3(A) of chap.5. High Speed Link Redundancy of redundant system performs by adding special function to the existing High Speed Link service. For basic setting of High Speed Link and operation, see ' 7.2 High Speed Link' .

The difference between redundant system and single system is as follows:

1) Communication Length

Communication dot to be set in a block of redundant CPU (GMR-CPUA) is fixed at **maximum 59 words** in all networks of GLOFA.

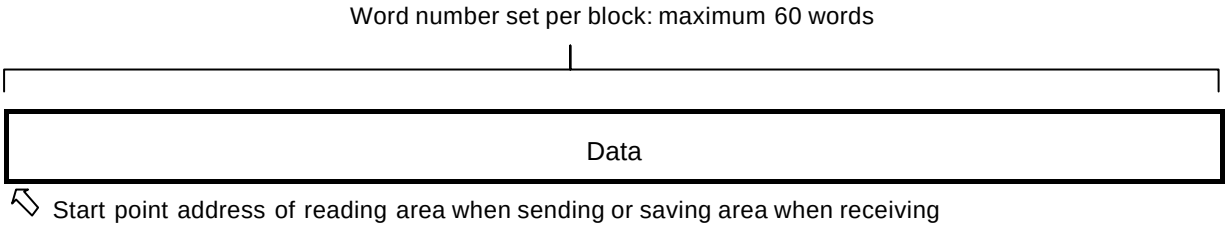
Comparision of CPU with redundant configuration	Redundant CPU (GMR-CPUA)	Redundancy of GM1/2/3 CPU (GMx-CPUA,x=1,2,3)	In case of single system
Maximum number of words to be set per block	Enet: 59words Mnet: 59words Fnet: 59words Fdnet:59words	Enet: 200words Mnet: 200words (excluding x=4) Fnet: 60words Fdnet:60words	Enet: 200words Mnet: 200words Fnet: 60words Fdnet:60words

[Table 7.3.1(A)] Communication Length of Redundancy System per Block

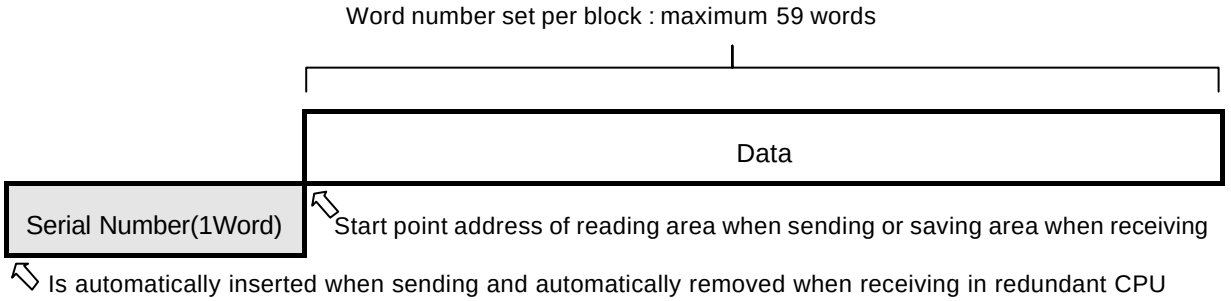
2) Communication Data Format

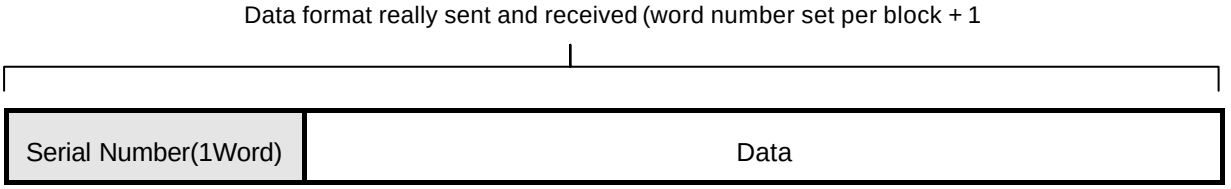
If the number of TX/RX area set in High Speed Link parameter and block are used in redundant system, serial number for redundant process should be placed for the first word of data area.

A) Single System (Existing System : GM1/2/3/4)

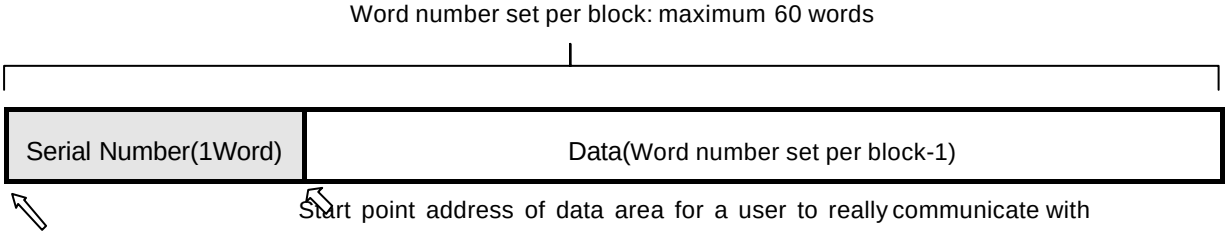


B) In Case of redundant System of CPU (In Case of GMR-CPUA)



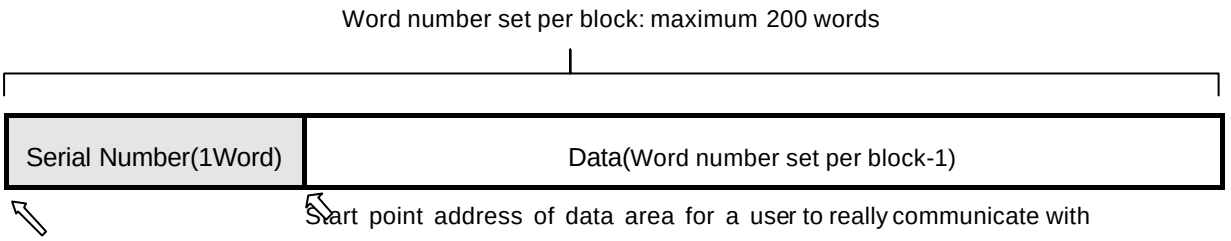


C) In Case of Communication with GMR-CPUA in GM1/2/3 CPU with Network redundancy



In this serial number, 1 added value must be written in this place from user program at every period of RX/TX of the appropriate block when sending. When receiving, the serial number set from the partner station' s CPU is recorded.

D) In Case of Communication with GM1/2/3/4 CPU in GM1/2/3 CPU with Network Redundancy



In this serial number, 1 added value must be written in this place from user program at every period of RX/TX of the appropriate block when sending. When receiving, the serial number set from the partner station' s CPU is recorded.

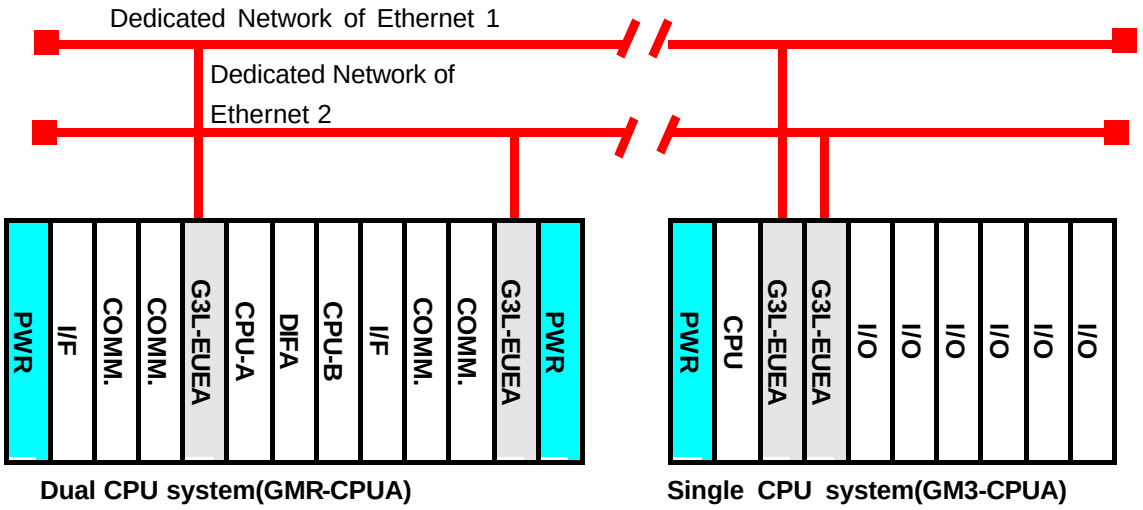
Remark

Note1) When you perform High Speed Link through redundancy in **GM1/2/3 CPU** system, you have to use %M area.

7.3.2 Use of HS_LINK

1) HS_LINK in Redundant CPU System (GMR-CPUA)

Setting and operation of HS_LINK in redundant CPU system is the same as that of single system.



[Figure 7.3.2(A)] Configuration of redundant System

In redundant CPU system, redundant CPU performs a HS_LINK parameter at the same time. In the above figure, as the same configuration of communication module and system are placed in both sides, the both CPU and the communication module perform a program and a communication parameter.

Remark

Note1) When you configure dual system wiht Ethernet, HS_LINK station number of both Enet communication modules, which are installed in a base at the same time, must be set equally. That is, the system configuration of both networks and parameter setting must be the same. But, IP address can be set differently.

- TX of HS_LINK

TX of HS_LINK in dual CPU system sends data by communication module to the TX area set in parameter through each communication module with serial number added at every

period of TX. The serial number increases in accordance with both CPU synchronization, and each block has its own serial number. As processing of the serial number is automatically performed, you do not need any work in user program additionally.

- RX of HS_LINK

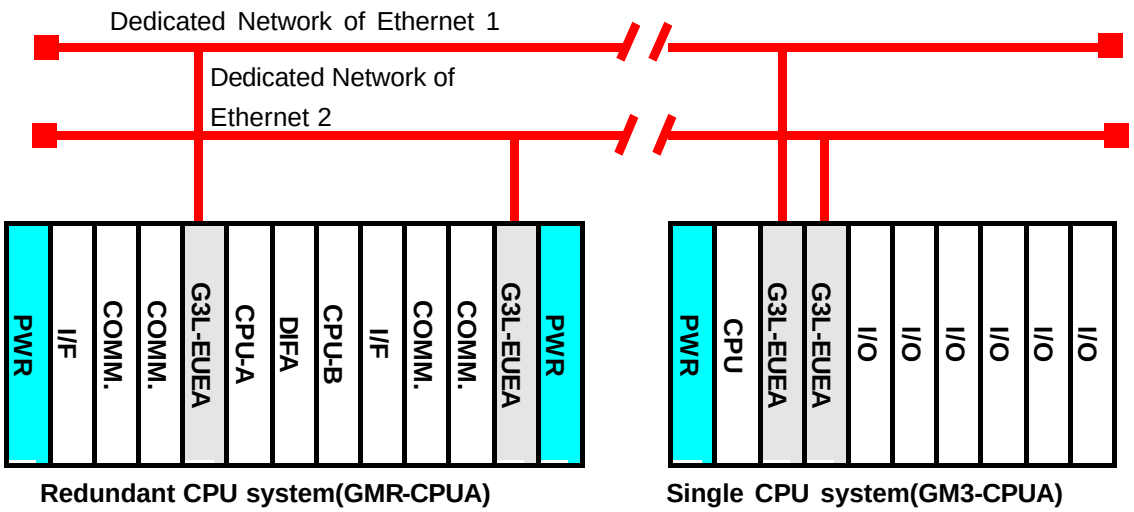
In RX of HS_LINK, serial number and data from communication module are processed in each CPU. Process of the serial number of RX data is automatically performed. Therefore, you do not have any additional job to do in user program.

The method to process RX data of each CPU is as follows. Each CPU allows to save the latest data of two data (the data with larger number of two RX data) received through communication module A and B from partner station. In case that data of only one side is received, it compares them with current serial number. If the data are larger than these, they will be saved.

- Process of HS_LINK Information

HS_LINK information registers the information made in communication module A communication module B by OR (operation) in flag of HS_LINK information. If you execute HS_LINK information monitor, you can see each information of communication module A communication module B.

2) HS_LINK in Single CPU System (GM1/2/3)



[Figure 7.3.2(B)] Configuration of Dual System

The parameters with the same contents are performed in two communication modules of the single CPU system. In the figure above, as two communication modules are installed, communication parameter with the same contents are processed in both the communication modules.

When you set parameter in the single CPU system, you have to know the following.

Remark

Note1) The station numbers of two Enet communication modules are the same. (Both networks have the same configuration). IP address can be set the same or with as another class.
Note2) You should assign HS_LINK in each communication modules. (Example: 1 HS_LINK, 2 HS_LINKs).
Note3) Setting of each block set in High-speed must be the same except RX area and slot number.
Note4) RX area of blocks set in both parameters should not be doubled between two parameters.
Note5) The TX block number of parameter set as TX block must be at least more than 2. (including serial number)

- TX of HS_LINK

TX of HS_LINK sends data to each communication module after it fixes serial number added by each TX period in TX area set from the parameter in single CPU. For serial number, you should write the data added at each TX into serial number position of data in user program.

- RX of HS_LINK

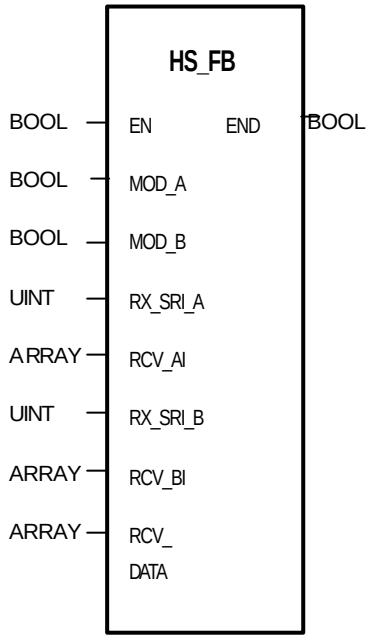
Rx of HS_LINK reads received serial number and data from both sides, and compares their serial numbers, and then edits HS_FB to save the latest data (ones with larger serial number) of both data.

- Information Processing of HS_LINK

As Information process of HS_LINK manages information of each communication module using in HS_FB, it does not send data of abnormal _HSx_MODE,_HSx_RLINK,_HSx_TRX of the two communication modules (of two networks). Therefore, when you edit user program, please edit it using information flag of HS_LINK like the example of chap. 7.3.3, and then you can secure the reliability.

3) Function Block HS_FB (RX Program of the Latest Data of HS_LINK)

It compares data input through two communication modules using HS_FB in redundant library of Function Block, and select the data entered first. Description of each function is as follows:

Function Block	Description
	**Input** EN : Demanding Execution of Function Block from Positive Edge (0 →1) MOD_A : Used to confirm if HS_LINK parameter of Communication module A is in normal RUN (HSxMODE[y]) MOD_B : Used to confirm if HS_LINK parameter of communication module B is in normal RUN (HSxMODE[y]) RX_SRI_A : Specifies word area with serial number in RX data of HS_LINK of communication module A. RCV_AI : Specifies RX area of HS_LINK of communication module A. RX_SRI_B : Specifies word area with serial number in RX data of HS_LINK of communication module B. RCV_BI : Specifies RX area of HS_LINK of communication module B. **Output** ENO : On if Function Block is normally operating. RCV_DATA : Specifies the area to save the last data after comparing HS_LINK input data of communication module A and B.

EN

It is active at positive edge as condition of HS_FB start.

MOD_A, MOD_B

Uses HS_LINK flag HSxMODE[y] to confirm if HS_LINK parameter of communication module A and B is normally operating. As action mode information of individual HS_LINK parameter, the appropriate bit of this flag is 'ON' if the station set in the registration is in 'RUN' mode, and if it is in STOP/PAUSE/DEBUG mode, it becomes 'Off'. The alphabet x in the flag means the number of the currently used HS_LINK number. That is, when editing HS_LINK parameter, it is possible to set from HS_LINK1 to HS_LINK4. It is for

setting parameter to each communication module because it is possible to install up to communication modules into base board. User records currently used HS_LINK (setting range ; x=1~4). In flag, you perform RX/TX toward each station after editing total 64 individual parameters in HS_LINK parameter. The alphabet y means the appropriate parameter number of RX parameter to be applied in the current HS_LINK parameter.

RX_SRI_A, RX_SRI_B

Specifies the area of serial number in HS_LINK data received from communication module A and B. For example, the communication module A receives HS_LINK data sent from partner station from %MW10 to %MW20, and when the communication module B receives from %MW30 to %MW40, it writes head address of received data because serial number is fixed at the data head sent from the partner station to select them. In RX_SRI_A namely, as in case of the figure 7.3.3(B), it defines %MW10 as data position using variables such as HS_RX_SRI_A (data type: UINT), and in RX_SRI_B, it also defines %MW30 as data position using variables such as RX_SRI_B (data type: UINT).

RCV_AI, RCV_BI

It specifies the rest head address in HS_LINK data sent from partner station except serial number. For example, when it receives data in communication module A from %MW10 to %MW20, communication module B receives from %MW30 to %MW40, as in the figure below, data of the communication module A specifies %MW11 to %MW20 as positioning using ARRAY variable such as RCV_A (data type:WORD), and communication module B specifies %MW31 to %MW40 as positioning using ARRAY variable such as RCV_B (data type:WORD).

ENO

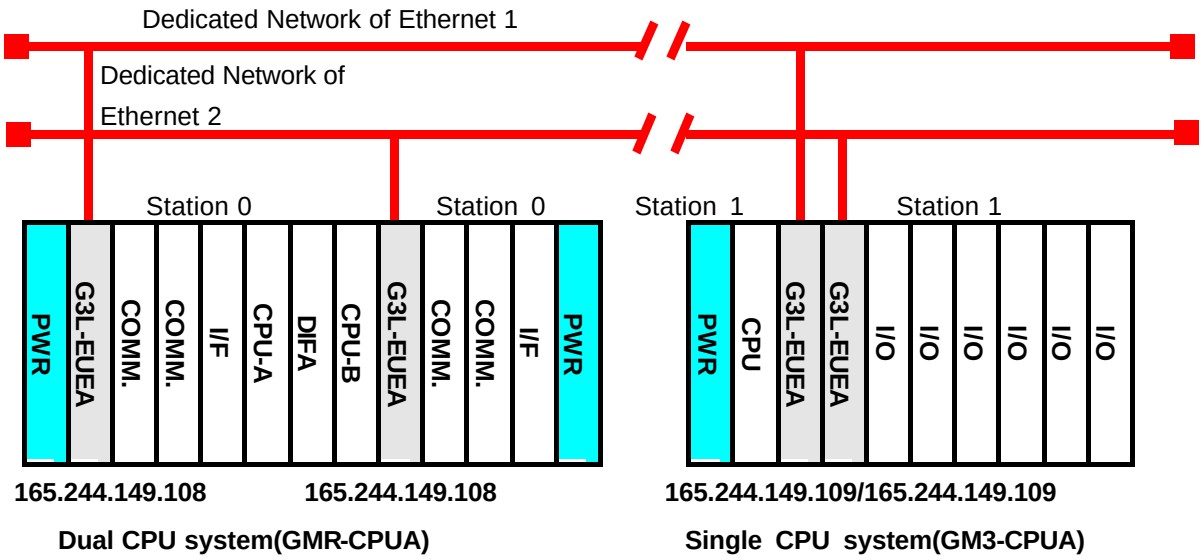
' On' when Function Block is normal.

_RCV_DATA

It finally saves data received late after comparing the data serial number input from two communication modules. As in the example of the figure, it specifies the position to be used by the final user using ARRAY variable such as HS_RDATA. (data type: WORD)

7.3.3 Example between Redundant CPU and GM3 for HS_LINK

Following system configuration is an example in which it performs HS_LINK with communication redundancy in redundant PLC and GM3 PLC.



[Figure 7.3.3(A)] Redundant CPU and Network redundancy of GM3 PLC

A user defines data of RX/TX as follows:

RX/TX Structure		Reading Area	Saving Area	Block Number
Redundant CPU (Station 0)	TX: 10words	%MW0	--	0
	RX: 59words	--	%MW100	1
GM3 CPU (Station 1)	TX: 60words	A side: %MW0 B side: %MW0	--	1
	RX: 11words	--	A side: %MW100 B side: %MW200	0

[Table 7.3.3(A)] Dada Definition to communicate

- Operation Order

① Assign station number of communication module (G3L-EUEA) (use frame editor) and connect communication cable.

② Edit user program (edit by each PLC)

③ Edit map of data RX/TX ([see table 6.1.10(A)])

④ Set parameter in , HS_LINK parameter setting' . Of GMWIN.

⑤ Perform , Compile' and , MAKE' in compile menu' .

⑥ Execute program and , parameter writing' in on-line menu.

⑦ Set suitable HS_LINK Enable for selecting number by selection of , HS_LINK Enable' in on-line.

⑧ Change mode into , RUN' in on-line menu.

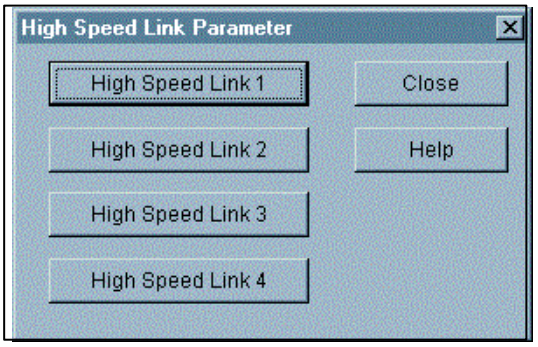
⑨ Check for HS_LINK status through link parameter monitor.

⑩ If an error occurs, repeat the process from number 1.

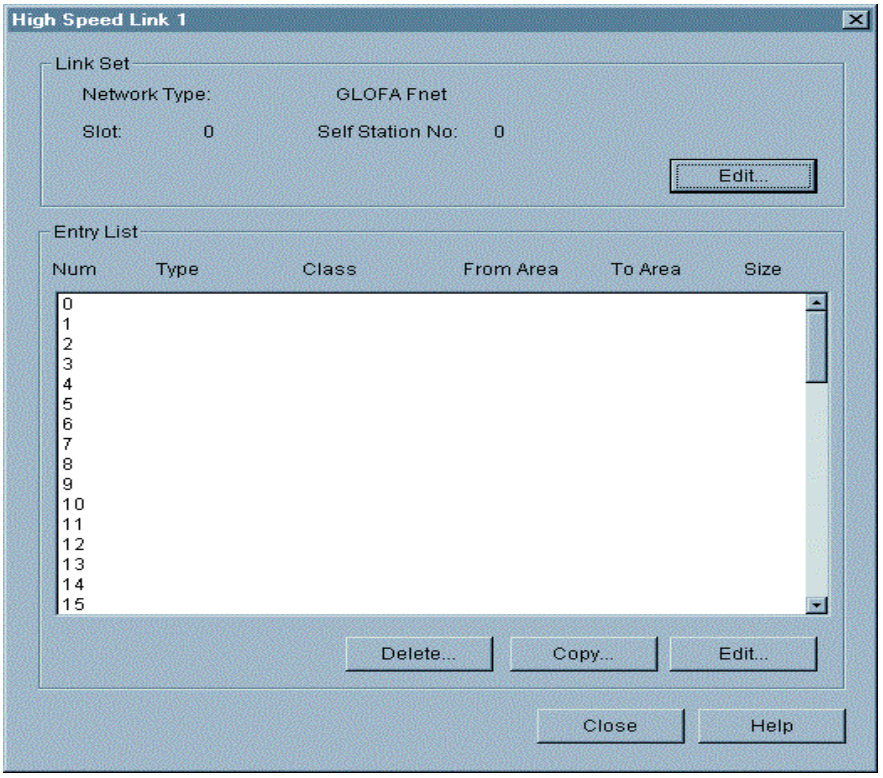
1) Program Editing of Redundant CPU(GMR-CPUA) Side

A) Select first HS_LINK.

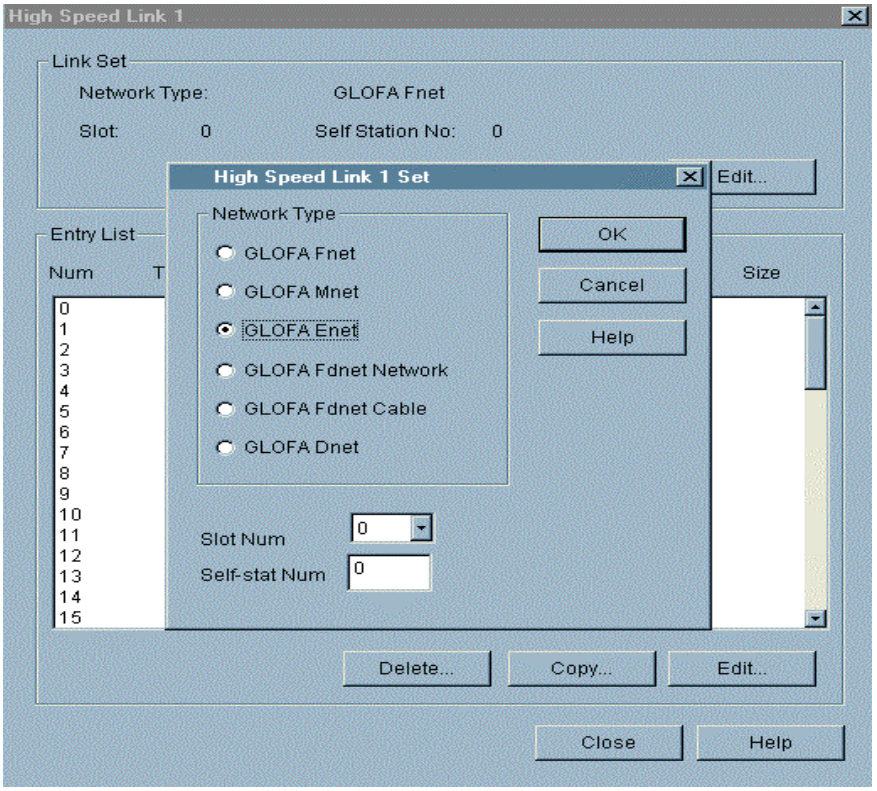
If you select (doubleclick) HS_LINK parameter in project after opening or editing newthe project for redundancy, following screen appears. Select now one of 4 HS_LINK1~4. HS_LINK1 is here selected.



B) If you select HS_LINK1 on the above screen, following screen appears.

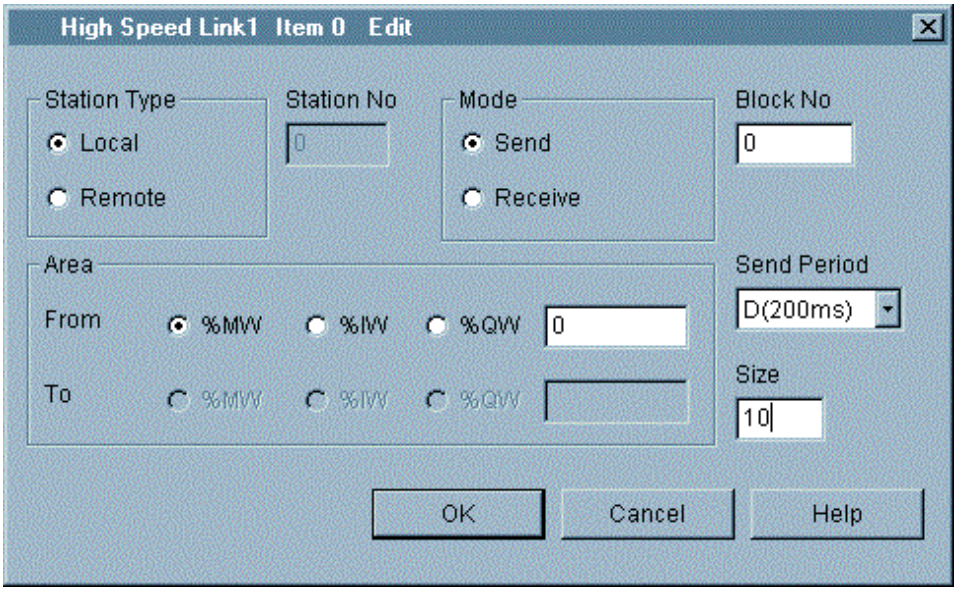


C) Set link setting as follows after selection of , Modify' of link setting on the B screen.

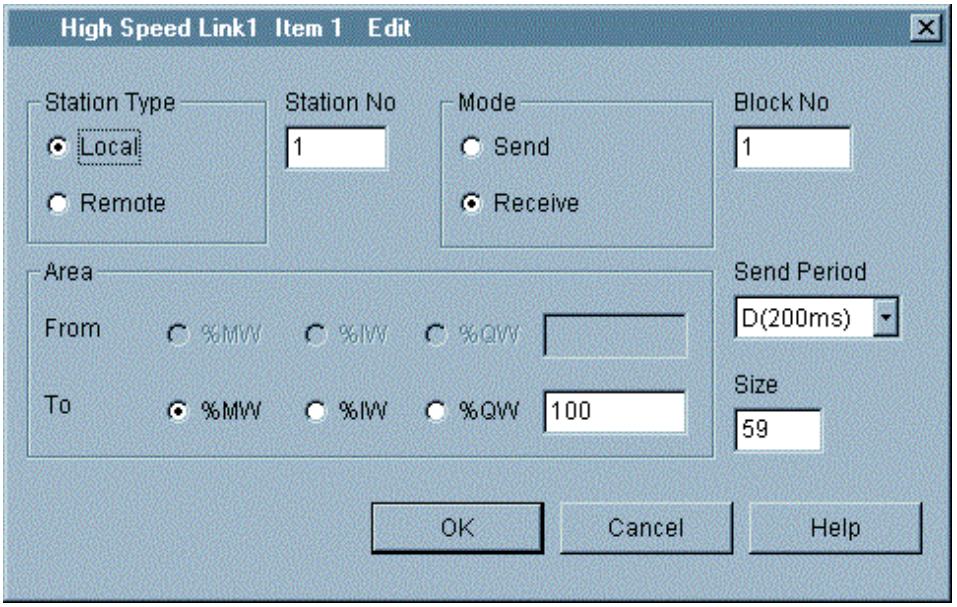


D) Set RX/TX parameter after selection (doubleclick) of number 0 in registration list.

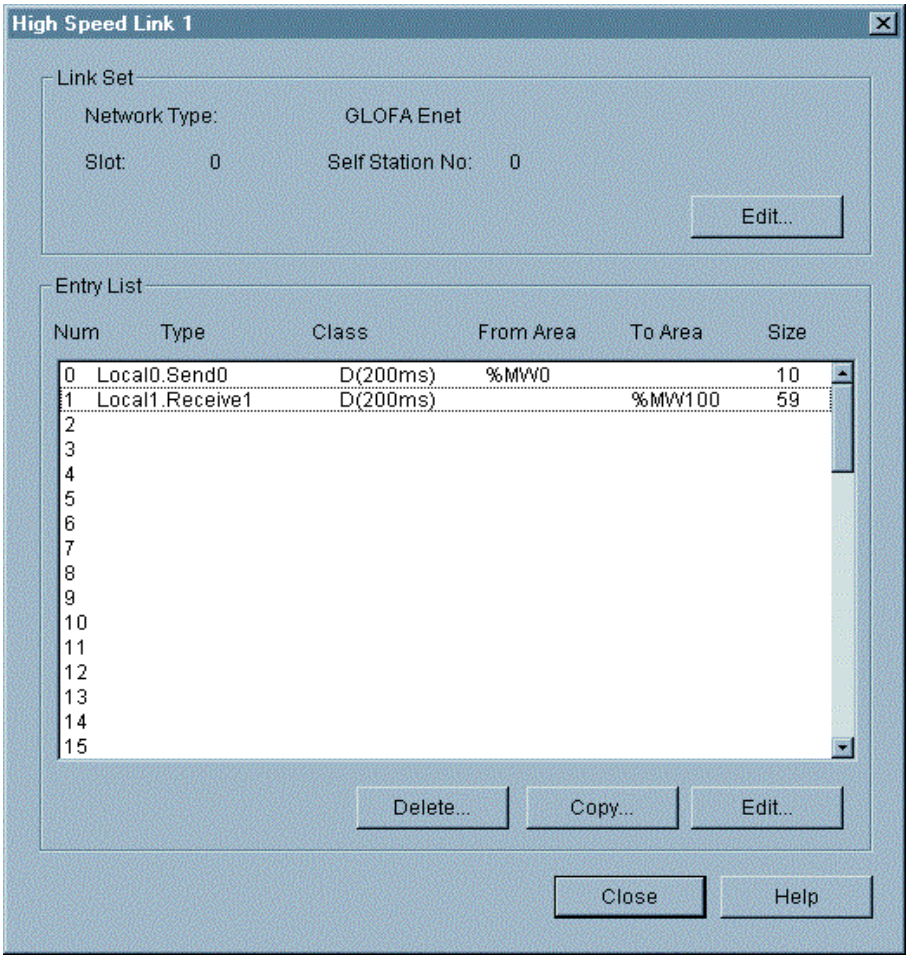
For TX parameter



For RX parameter

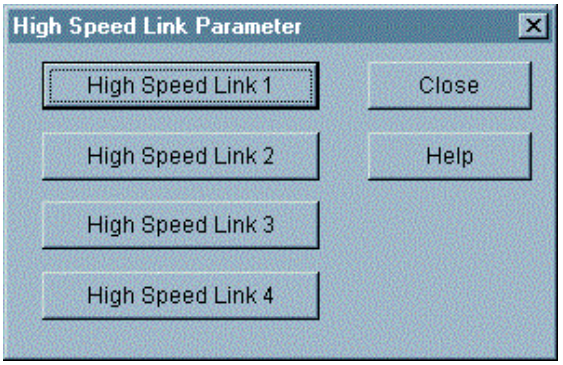


E) The following is set if the operation 1 to 4 is all executed.

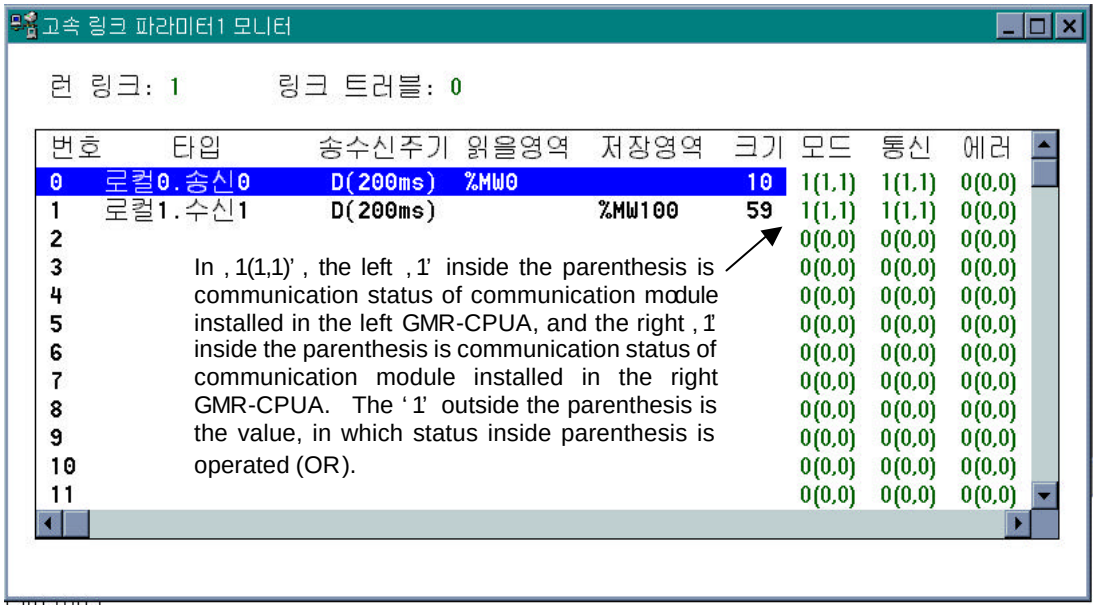


F) Now, select , Close' after setting HS_LINK parameter setting. Next, after editing user program and executing , Compile/Make' , write PLC program.

G) set as follows after selecting , On-line/ Link-Enable setting' .



G) Confirm whether the communication for the set parameter is normally operating by selecting , On-line/Link parameter' and Monitor/HS_LINK1 after positioning PLC mode as RUN. (the appropriate program and HS_LINK parameter in partner station must be normally operating after download as well).

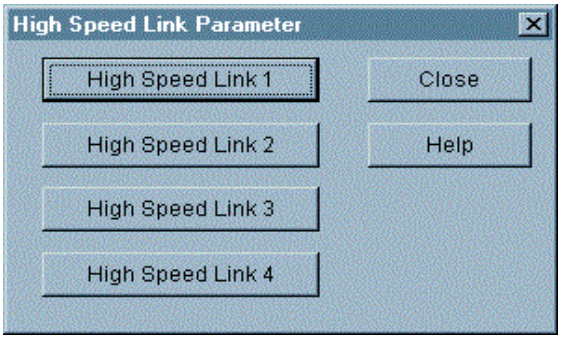


In above screen, if communication of ' Run Link' mode is '1' , ' Link Trouble is '0' , it means normal communication status. The above screen shows that communication with partner station is normal. To confirm the value to be communicated, select direct variable %MW100 in On-line/Monitor/Variable Monitor' .

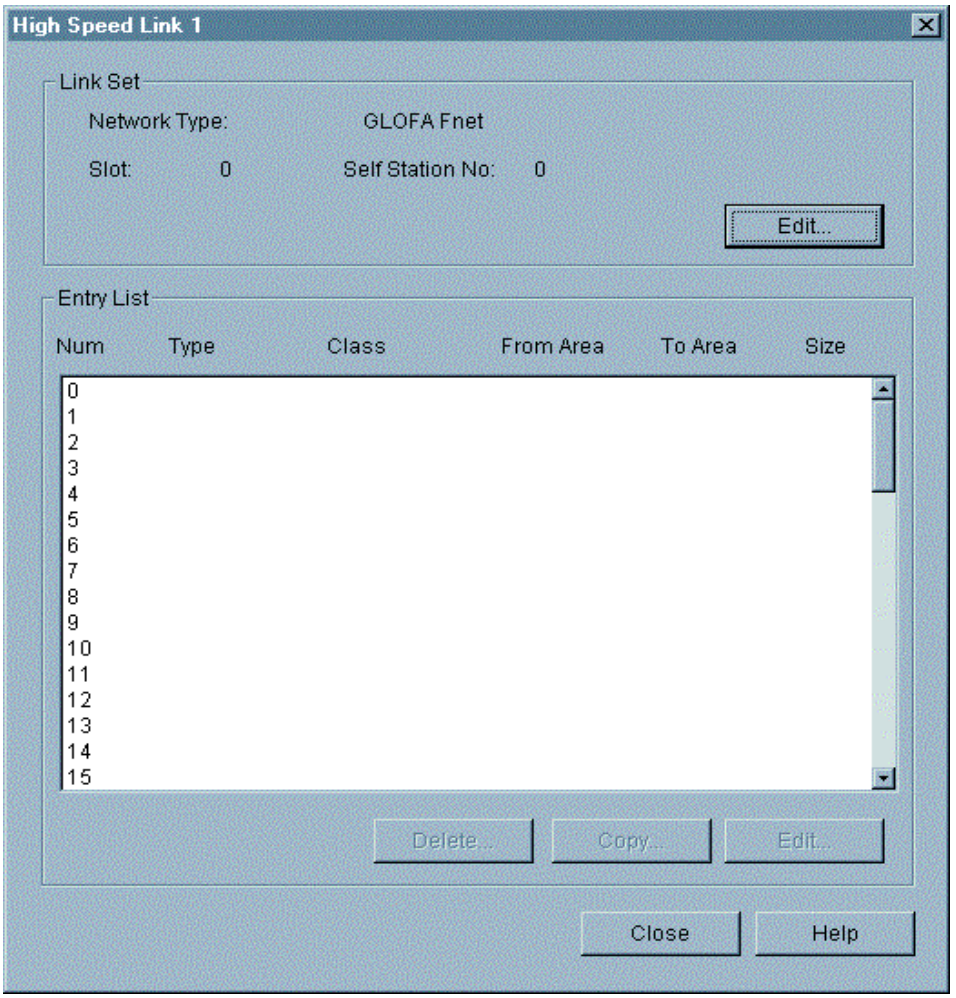
2) Program Editing of GM3 Side

A) Select HS_LINK.

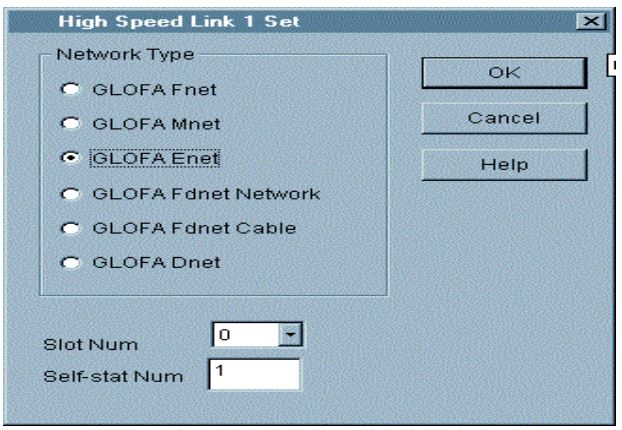
If you select (doubleclick) HS_LINK parameter in project after opening or editing new the project for GM3, following screen appears. Select now one of 4 HS_LINK1~4. HS_LINK1 is here selected to first define for the first module of 2 Enet communication module.



B) If you select HS_LINK1 on the above screen, following screen appears.

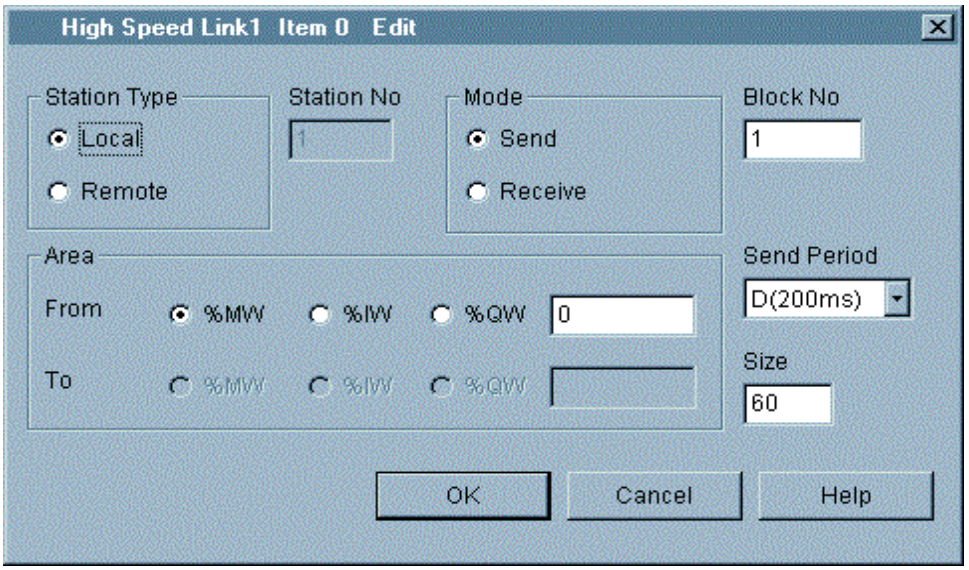


C) Select 'OK' after setting link setting as follows and selecting 'Modify' of link setting on the previous screen.

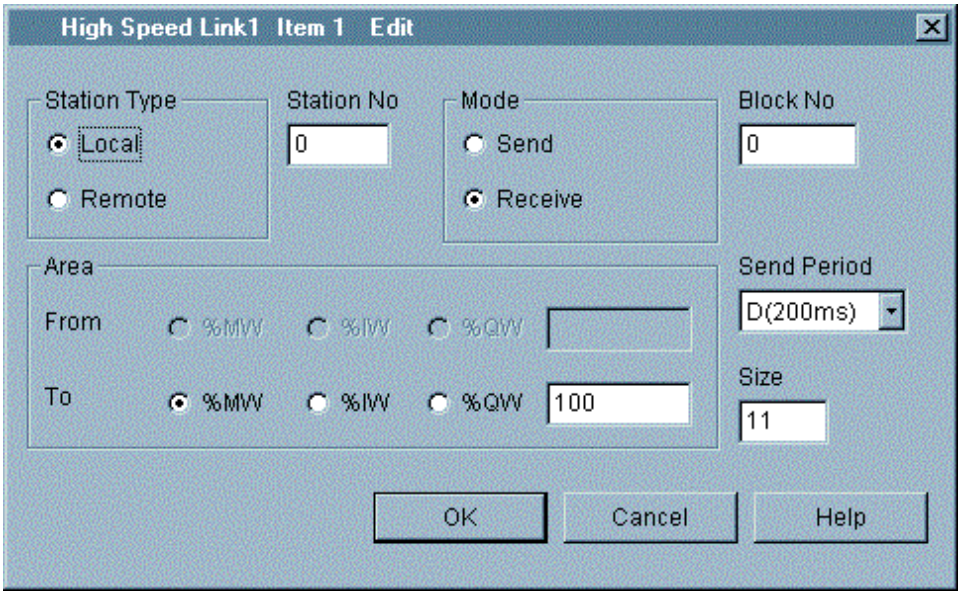


D) Set RX/TX parameter after selection (doubleclick) of number 0 in registration list.

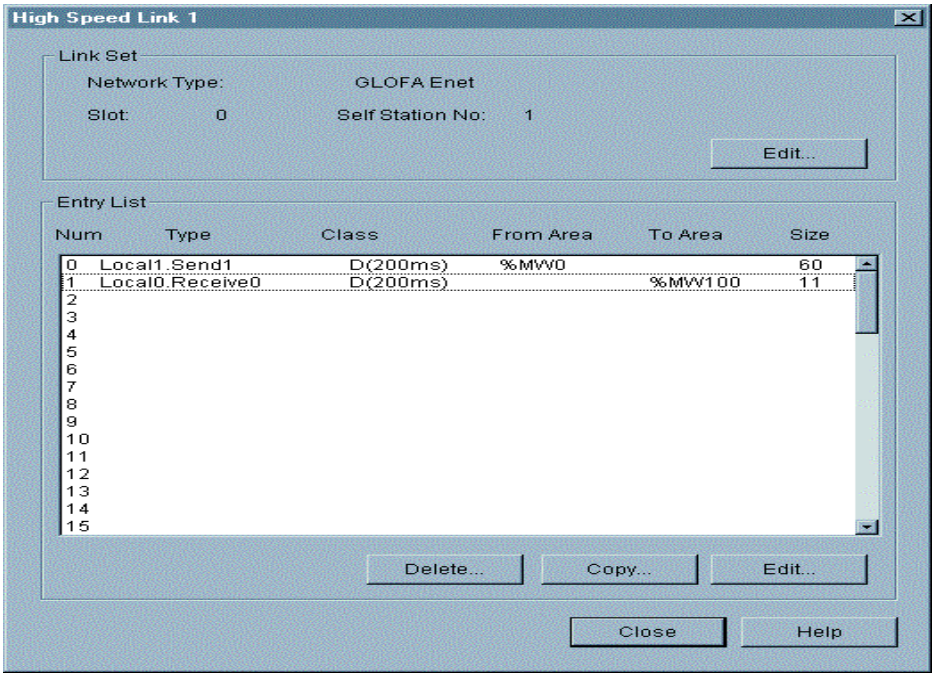
For TX Parameter



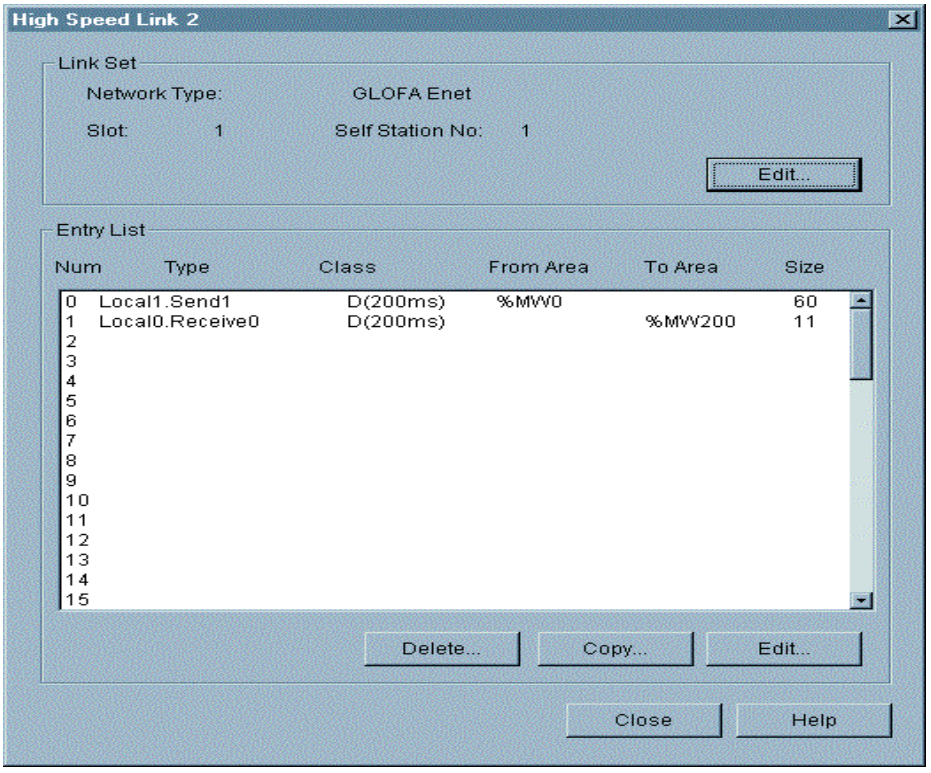
For RX Parameter (Selecting , 1' in registration list)



E) The following is set if the operation 1 to 4 is all executed.



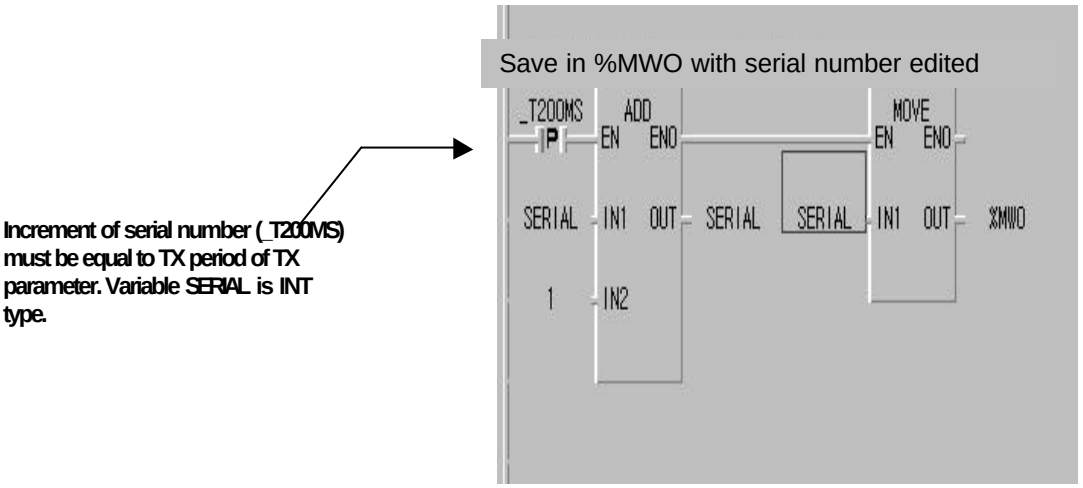
F) Now, select , Close after setting HS_LINK parameter setting of the first Enet communication module. For the second communication module, please set HS_LINK via the process from A to E. At this time, select HS_LINK 2 and slot number 1, and save saving area of RX data %MW200 not to be doubled with the saving area received in the first module. After setting, following screen appears.



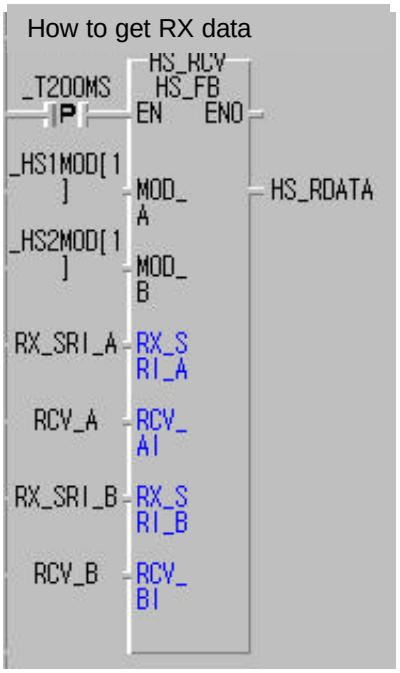
G)The following is for editing user program.

One program is to fix serial number at the first word when sending, and the other is to save only one data after comparing serial numbers of two communication modules in HS_LINK parameter.

How to fix serial number at TX



Program editing at RX



_T200MS: must be identical to RX period of RX parameter.

_HS1MOD[1]/_HS2MOD[1]: receives data when partner station's mode is '1'.

RX_SRI_A/B: variable showing serial number out of data received in each Enet module. (%MW100). Variable of UINT type

RCV_A/B: shows data area received in each Enet module. Variable of UINT Array type. Set more than volume of RX data.

HS_RDATA: area (%MW1) to save data to be finally received out of each Enet module. Variable of UINT Array type. Set more than volume of RX data. Volume of RCV_A/B is identically set.

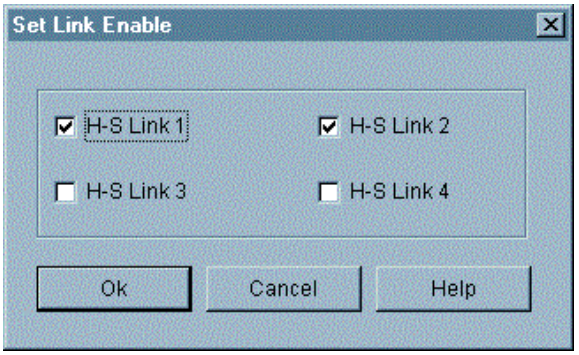
Assigned area of memory address toward variable.

RX_SRI_A : %MW100 (1word)
RCV_A : %MW101 ~ %MW110 (10word)
RX_SRI_B : %MW200 (1word)
RCV_B : %MW201 ~ %MW210 (10word)

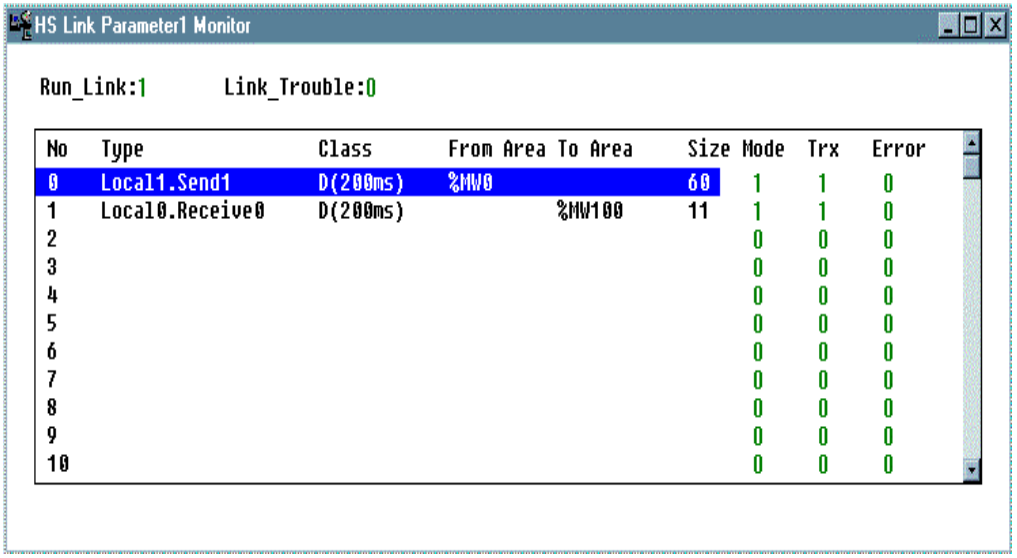
[Figure 7.3.3(B)] Example of Function Block HS_FB

H) Write in PLC after , Compile/Make' of the program above.

I) Set as follows after selecting , On-line/Link-Enable' .



J) Confirm whether the communication for the set parameter is normally operating by selecting , On-line/Link parameter' and Monitor/HS_LINK1 after positioning PLC mode as RUN.



The above screen is showing the situation of HS_LINK 1. If communication of ' Run Link' mode is ' 1' , ' Link Trouble is ' 0' , it means normal communication status.

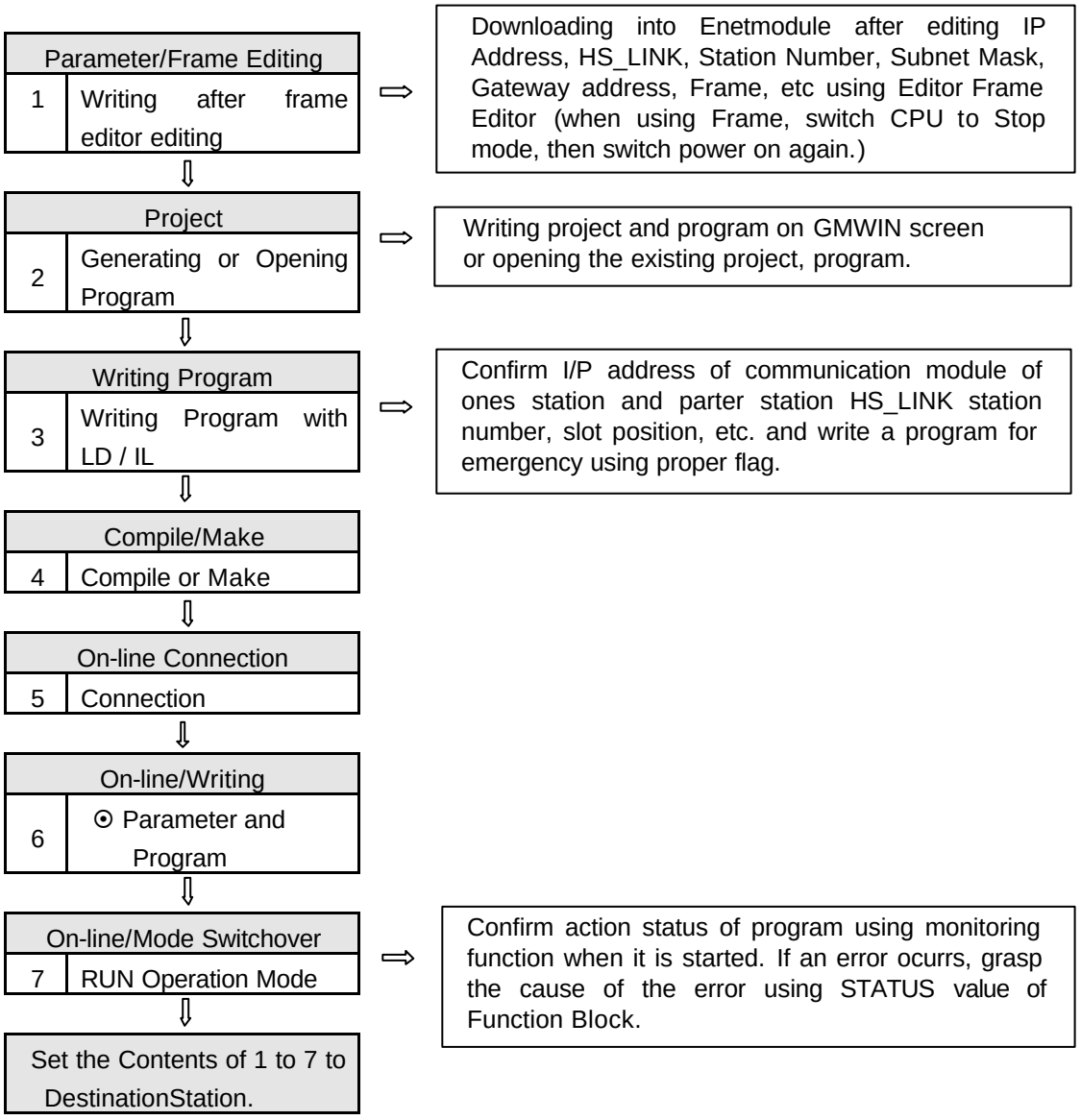
Please confirm HS_LINK 2 with the same way. To confirm the value to be communicated, select direct variable %MW100/200 or variable RX_SRI_A/B,RCV_A/B,HS_ RDATA in On-line/Monitor/Variable Monitor' .

Chapter 8 Fuction Block

8.1 Introduction

8.1.1 Introduction

Function Block is used to communicate between Ethernet communication module of one' s own station and Ethernet communication of destinationstation' s or between Ethernet communications of one' s own stations using TCP/IP or UDP/IP. The communication using Function Block consists of two two ways of communication: Single communication method using only Function Block to communicate independently, and user-defined communication methodusing frame editor.
This chapter describes the kind of Function Block provided to a user and its use.
The following displays program editing order using Function Block.



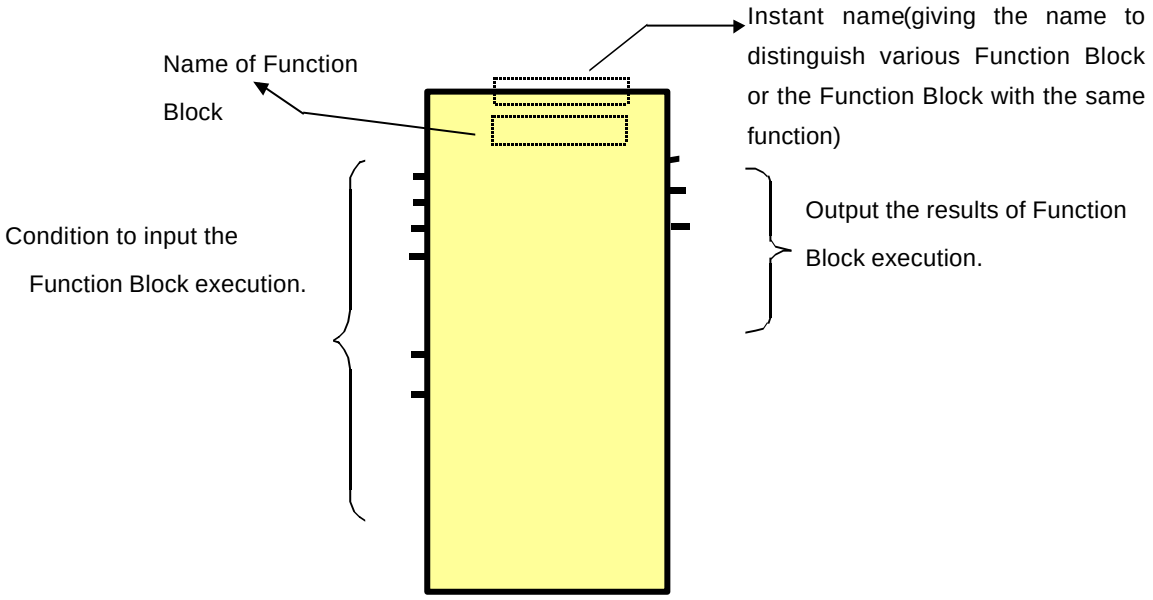
8.1.2 Kind and Use of Function Block

Function Block used when a user is writing a program is composed of 5 kinds according to its service.

Kind	Service
E_CONN	When you establish logical communication channel with destinations-tation.
TCP_SEND	Sending data of one' s station to destinationstation using TCP/IP.
TCP_RCV	Receiving data sent by destinationstation using TCP/IP.
UDP_SEND	Sending data of one' s station to destinationstation using UDP/IP.
UDP_RCV	Receiving data sent by destinationstation using UDP/IP.

[Table 8.1.2(A)] Kind of Function Block

Following figure displays Function Block Structure.

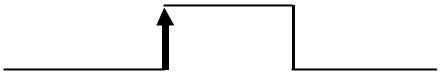


➡ Output results can be shown on the left according the Function Block.

Common I/O of each Function Block is here described.

Input

REQ :



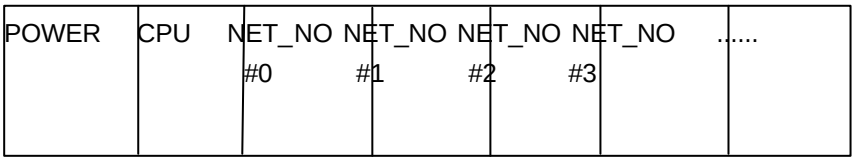
Used for start condition of Function Block except E_CONN Function Block. The Function Block is started at **positive edge** of ' 0' to ' 1' , and once it is started, it will be not influenced before it receives response from destinationstation. That is, as far as it bit of NDR(DONE) or ERR is not set, the Function Block is not influenced, and it restarts in the next scan after the bit of NDR or ERR is set.

EN :

When level is ' 1' , the Function Block starts, and when service is being done, ' 1' must be maintained.
(It applies to only to E_CONN Function Block:BOOL type)
After the service is done, ' 1' must be continuously maintained. If EN bit keeps ' 1' after ERR bit is ' On' , Function Block will ask for service for communication channel establishment in the next scan again. If value is changed from ' 1' into ' 0' , it will ask that established channel should be normally resolved.

NET_NO:

It specifies communication module to perform main Function Block out of the communication modules installed at elementary base. It is namely the slot positon installed by communication at the elementary base, and by slot position of elementary base, slot number ' 0' is next to CPU, and increases ' 1' by ' 1' .
(Available area : 0 ~ 7)



IP_ADDR:

IP address of communication module of of destinationstation or one' s station.
It specifies IP necessary address when communicating or establishing a channel. It needs IP address of destinationstation or one' s station according to Function Block. (Please refer to each Function Block).

Example) ' 150.150.42.150'

D_PORT: Port number of destinationstation' s communicatin module (Setting between h' 400 - h' 7fff).

S_PORT: Port number of communicaton module of one' s station (Setting between h' 400 - h' 7fff.).

CH_NO: Channel number to be established (Selected by user.)

Able to select at least 16 chnannels from channel number ' 0' up to ' 16' , Unable to use the same channel number in two Function Block within a program.

ARR_CNT/DATA_LEN : Data volume to be sent and received. Volume of transferred frame can be up to1,400 bytes, but for redundant system of GMR, the volume of transferred frame is limited to 120 bytes.

Output

NDR :

After Function Block is started, when you receive data normally, it turns ' On' and then it turns ' Off' when the next Function Block will be started.

ERR :

After Function Block is started, when an error occurs, it turns ' On' , when the next Function Block will be started. If an error occurs, data are not received. (For error code, refer to ' A3. Error Code' of appendix).

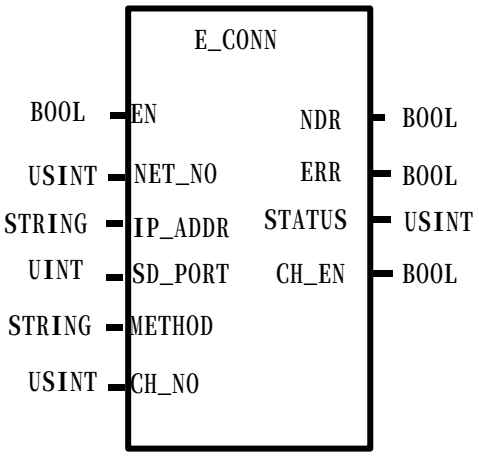
STATUS :

After Function Block is started, when an error occurs, and ERR turns ' On' , It displays detail code value of the error. It keeps its value till the next Function Block is started.

E_CONN

Establishing Logical Communication Chahnnel with DestinationStation

Product	GMR	GM1	GM2	GM3	GM4	GM5	GM6	GM7
Applicability	●	●	●	●	●			

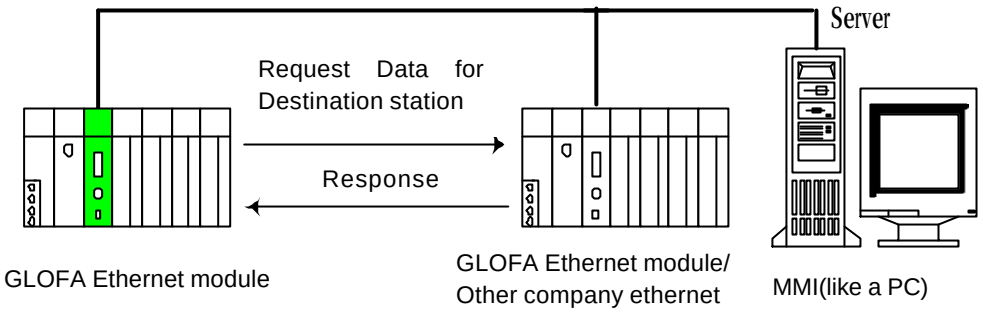
Function Block	Dexcription
	**Input** EN : When level is ‘ 1’ , Function Block is executed. It must keep ‘ 1’ in service. NET_NO : Slot number (0 to 7), in which communication module of one’ s station is installed, to which this Function Block is transferred. IP_ADDR : When establishing a channel, It uses IP address of destination station with TCP_ACTIVE, and uses IP address of one’ s station with TCP_PASSIVE. SD_PORT : When establishing a channel, it uses port of partne station with TCP_ACTIVE, and it uses port of one’ s station with TCP_PASSIVE. METHOD: When establishing a channel, It determines system to activate with TCP or UDP, Clientor Server. (See the description below) CH_NO : Channel number to be established. (0~15) **Output** NDR : It turns ‘ On’ at normal channel establishment. ERR : It turns ’ On’ at error occurance after Function Block is executed. STATUS : It is detail code value of error when it occurs. CH_EN : Results of channel establishment. It turns ‘ On’ at normal channel establishment.

Function Block used when you establish a logical communication channel with destinationstation. The method to establish the logical channel in Ethernet communication consists of 5 kinds. their setting method according to each system service is as follows (IP_ADDR, SD_PORT, METHOD).

1) TCP_ACTIVE

Destination station' s port (Dest Port) + Destination station IP address (Dest IP_ADDR).

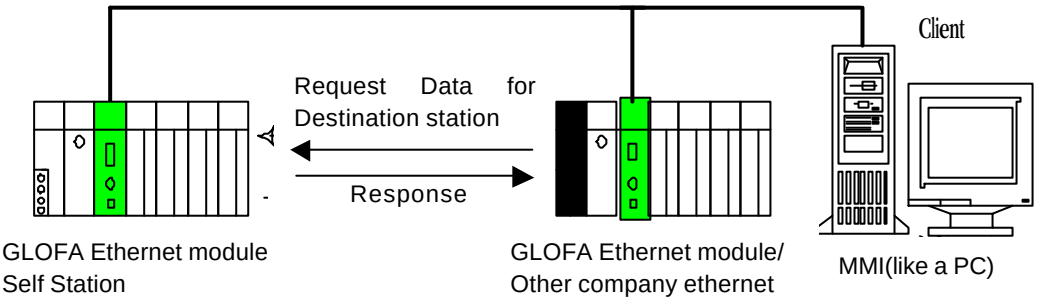
A channel to use TCP/IP with, and it specifies destination station of communication. When communicating with destination station, one' s station is activating as ' Client' .



2) TCP_PASSIVE

One' s station (Source Port) + IP address of one' s station (Source IP_ADDR).

A channel to use TCP/IP with, and it is established for the station that demands its establishment most early. It also means that one' s station is activating with ' Server' when communicating with the specified destination station.



3) TCP_SELECT

Port of One' s Station (Source Port) + IP Address of Destination Station (Dest IP_ADDR) (It does not exist in the standards)

A kind of TCP_PASSIVE. The channel is established for only destination station specifiedby a user. One' s station is activating with ' Server' when communicating with the specified destination station.

4) UDP_ACTIVE

Port of One' s Station (Source Port) + IP Address of One' s station (Source IP_ADDR)

A channel to use UDP/IP with. It opens only ' Socket' . One' s station is activating with ' Client' when communicating with the specified destination station. (It actually has no relation with the channel)

5) UDP_PASSIVE

Port of one' s Station (Source Port) + IP Address of One' s Station (Source IP_ADDR)A channel to use UDP/IP with. It binds only ' Socket' . One' s station is activating with ' Server' when communicating with the specified destination station. (It actually has no relation with the channel)

Remark

Note1) ' PASSIVE(SELECT) OPEN' must be started earlier than ' ACTIVE OPEN' .UDP_ACTIVE, UDP_PASSIVE connects internally only with ' Socket' open without establishing channel through service.

Therefore, you, as a user' should establish a suitable channel for communication characteristics according to the kinds of logical channel establisment. The channel establishment is done value of METHOD during Function Block input.

METHOD : ' XXX_YYY(or ' XXX_YYY_TTT') - (Within 16 letters : String)

XXX : shows name of group set by frame editor.

YYY : Kind of channel establishment. There are 5 kinds: TCPACT, TCPPAS, TCPSEL, UDPACT, UDPPAS.

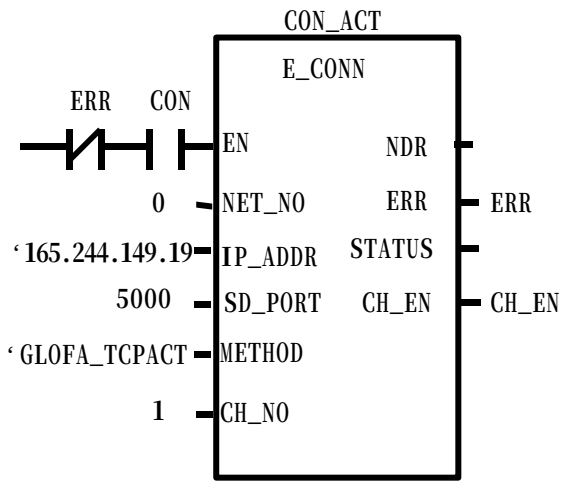
TTT : RX/TX latency time for channel release. (0~FF seconds). It cuts the connection there is no response from partner within the fixed time by force. (In case of TCPPAS)

➡ **Using ' UNFMT' in XXX** : Used to communicate without using frame editor when performing data TX/RX. It sends and receives data without changing Function Block data set by a user after Ethernet communication connection. Therefore, if you bind channel in form of ' UNFMT_YYY' in METHOD input of E_CONN, You must specify ' **_UDATA_SEND**' (TX) or ' **_UDATA_RCV**' (RX) in ' FRAME' within TCP_SEND(UDP_SEND) or TCP_RCV(UDP_RCV) Function Block. Even after that, you can use it.

■ **A Program Example : When demanding connection with TCP ACTIVE from destination station.**

It is a case in which you demand connection from destination station (GLOFA) with 165.244.149.190, as its IP address and 5000 as its port number of its Enet module when Enet module of one' s station is installed in number ' 0' slot. In this case, it uses number ' 1' channel.

L D



I L

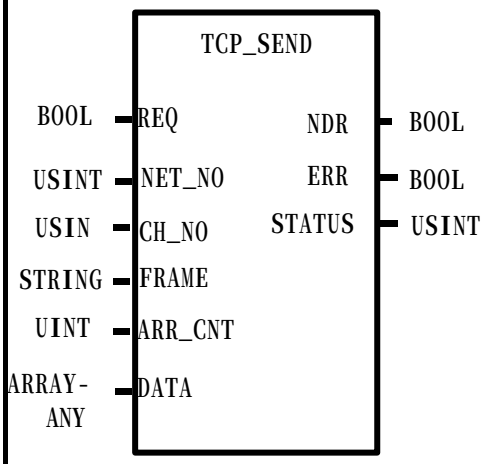
```
LD    1
ST    CON
CAL   E_CONN      CON_ACT
      EN:=        CON
      NET_NO:=    0
      IP_ADDR:..  ' 165.244.149.190'
      SD_PORT:..  5000
      METHOD:=    ' GLOFA_TCPACT'
      CH_NO:=     1
```

If ' CON' contact turns ' On' as Function Block condition, it demands connection with number' 1' channel among 16 channel of one' s station and port number 5000 of destination station. In this case, it is performed through a TCPACT method (METHOD), in which destination station sends data on demand of one' s station. If destination station responses to the connection demand of one' s station, the connection is done between two stations. In this case, it shows now results through ' CH_EN' output. You can now communicate this bit ,' TCP_SEND' ,' TCP_RCV' , ' UDP_SEND' ,' UDP_RCV' , in ' Enable' concition.

TCP_SEND

Used to send data to destination station using TCP/IP

Product	GMR	GM1	GM2	GM3	GM4	GM5	GM6	GM7
Applicability	●	●	●	●	●			

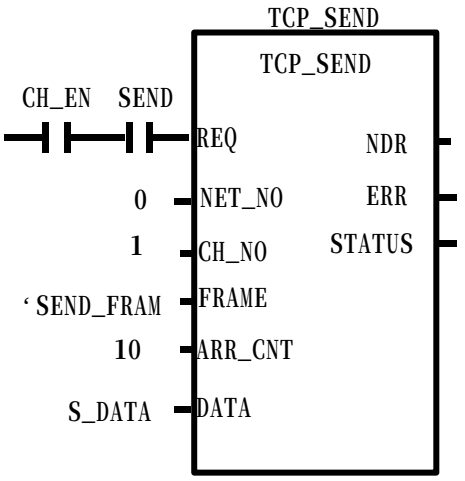
Fundtion Block	Destination
	**Input** REQ : When it is at positive edge (0→1), Function Block is executed. NET_NO : Slot number (0 to 7), in which communication module of one' s station is installed, to which this Function Block is transferred. CH_NO : Channel Number edited in E_CONN Function Block. FRAME : Frame to be sent (distinguished with capital/small letter). It uses the same name used in Frame Editor. ARR-CNT : Number of data to be sent. Number of data type equivalent to ' DATA. DATA : An area saving TX data. Uses ' ARRAY' . **Output** NDR : It turns ' On' at normal service. ERR : It turns ' On' at error occurance after Function Block is executed. STATUS : It is detail code value of error when it occurs.

It is used to send data of one' s station to destination station using TCP/IP.
It sends them to destination station installed with ' CH_NO' channel in form specified in ' FRAME' after reading from ' DATA' as much as ' ARR_CNT' . As the name entered in ' FRAME' , the name, in which TX/RX format is defined in Frame Editor, must be used. If service is normat, NDR bit turns ' Set' . When an error occurs, ERR turns ' Set' , and the code value accorcing such a result is saved in STATUS. (For STATUS code, see ' A3, Error Code' of appendix). If you want to send data defined as a certain specified format, you use frame name set in Frame Editor, but, if you send user data directly by single communication method without frame format set in Frame Editor, you must use the frame name ' _UDATA_SEND' in the frame. That is, if you use the name ' _UDATA_SEND' in ' Frame' of Function Block' , it does not send data with the frame name defined in Frame Editor, but, it sends the contents set in ' DATA' of Function Block directly to destination station after reading data as much as ' ARR_CNT' . If you want to use the frame name ' _UDATA_SEND' , you should set a channel using string value named ' UNFMT_TCPxxx' in ' METHOD' in E_CONN Function Block. (xxx is ACT or PAS).

■ **A Program Example : When sending data to destination station using TCP/IP.**

This is the case, in which Enet module of one' s station is installed in the slot number ' 0' , and you send data to destination station using channel number ' 1' . (It is assumed that channel number ' 1' is established using E_CONN Function Block.)

L D



I L

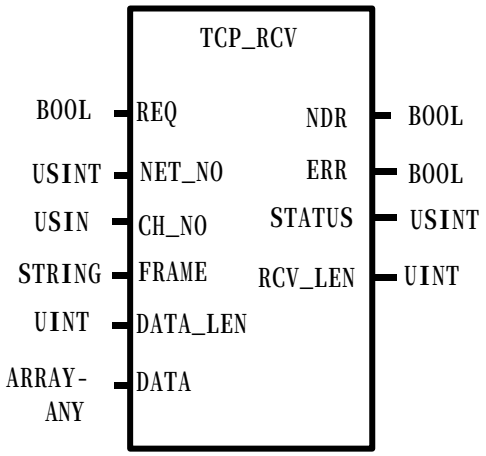
```
LD      CH_EN
CALC    TCP_SEND        TCP_SEND
        REQ:=           SEND
        NET_NO:=        0
        CH:=            1
        FRAME:=         ' SEND_FRAME'
        ARR_CNT:=       10
        DATA:=          S_DATA
```

In the program, CH_EN is a result of channel establishment in E_CONN Function Block.
It is used as a contact to send data if the channel is eatablished. ' SEND_FRAME' is a frame to be sent, and it must be downloaded in Enet module using Frame Editor. 10(ARR_CNT) is a number of data to be sent, is also a number of S_DATA type. S_DATA is ARRAY variable, in which data to be sent is saved.

TCP_RCV

Used to receive data sent from destinat-ion station using TCP/IP

Product	GMR	GM1	GM2	GM3	GM4	GM5	GM6	GM7
Applicability	●	●	●	●	●			

Funtion Block	Description
	**Input** REQ : When it is at positive edge (0→1), Function Block is executed. NET_NO : Slot number (0 to 7), in which communication module of one's station is installed, to which this Function Block is transferred. CH_NO : Channel edited in E_CONN Function Block. FRAME : Frame to be received (distinguished with capital/small letter). It must be downloaded in Enet module after editing in Frame Editor. DATA-LEN : Number of data to be received. Number of data type equivalent to ' DATA. DATA : An area saving RX data. Uses ' ARRAY' . **Output** NDR : It turns ' On' at normal service. ERR : It turns ' On' at error occurance after Function Block is executed. STATUS : It is detail code value of error when it occurs. RCV-LEN : Anumber of data received.

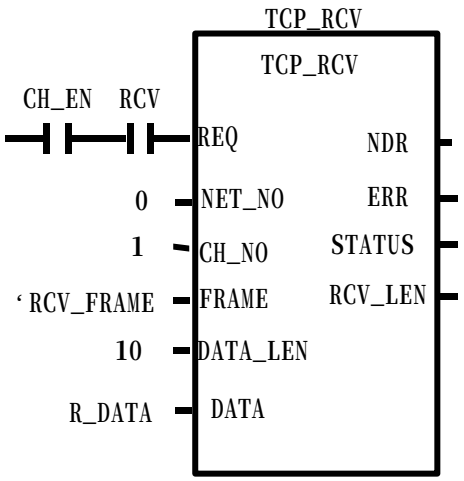
This TCP_RCV Funcrtion Block is used to receive data from destination station using TCP/IP. It is started at positive edge of REQ, and data are received through the communication module of one' s station installed number CH_NO of elementary base. CH_No is a channel set at the channel establishment with destination station in E_CONN Function Block. As data name to come into FRAME, it specifies frame name downloaded into Ethernet communication module, and it receives only if data received from destination station are the same as defined frame. RCV_LEN shows data numbers received from destination station after saving them.

if you want to receive data defined as a certain specified format, you use frame name set in Frame Editor, but, if you receive user data directly by single communication method without frame format set in Frame Editor, you must use the frame name ' _UDATA_RCV' in the frame. That is, if you use the name ' _UDATA_RCV' in ' Frame' of Function Block' , it does not receive data with the frame name defined in Frame Editor, but, it saves the data sent from destination station in ' DATA' after reading the data as much as ' DATA_LEN. If you want to use the frame name ' _UDATA_RCV' , you should set a channel using string value named ' UNFMT_TCPxxx' in ' METHOD' in E_CONN Function Block. (xxx is ACT or PAS).

■ **A Program Example : When receiving data from destination station using TCP/IP.**

This is the case, in which Enet module of one' s station is installed in the slot number ' 0' , and you receive data from destination station using channel number ' 1' . (It is assumed that channel number ' 1' is established using E_CONN Function Block.)

L D



I L

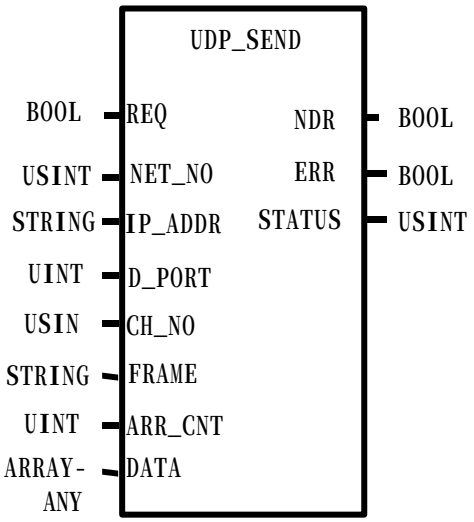
```
LD      CH_EN
CALC    TCP_RCV          TCP_RCV
        REQ:=            RCV
        NET_NO:=          0
        CH:=             1
        FRAME:=          ' RCV_FRAME'
        ARR_CNT:=         10
        DATA:=           R_DATA
```

In the program, CH_EN is a result of channel establishment in E_CONN Function Block. It is used as a contact to receive data even when the channel is eatablished with destination station. ' RCV_FRAME' is a frame to be received, and it must be downloaded in Enet module using Frame Editor.
10(DATA_LEN) is a number of data to be received, is also a number of S_DATA type.
R_DATA is ARRAY variable, in which data to be received is saved.

UDP_SEND

Used to send data to destination station using UDP/IP

Product	GMR	GM1	GM2	GM3	GM4	GM5	GM6	GM7
Applicability	●	●	●	●	●			

Function Block	Description
	**Input** REQ : When it is at positive edge (0→1), Function Block is executed. NET_NO : Slot number (0 to 7), in which communication module of one' s station is installed, to which this Function Block is transferred. IP_ADDR : IP address of destination station D_PORT : Port number of destination station CH_NO : Channel established in E_CONN Function Block. FRAME : Frame to be sent (distinguished with capital/small letter). It must be downloaded in Enet module after editing in Frame Editor. AARR-CNT : Number of data to be sent. Number of data type equivalent to ' DATA. DATA : An area saving TX data. Uses ' ARRAY' . **Output** NDR : It turns ' On' at normal service. ERR : It turns ' On' at error occurance after Function Block is executed. STATUS : It is detail code value of error when it occurs.

It is used to send data of one' s station to destination station using TCP/IP.

If you establish a channel as UDP_ACTIVE or UDP_PASSIVE in E_CONN Function Block, the channel is not actually established through communication, but it connects with each other with ' Socket' open. Therdfore, in UDP/IP sending, you should specify IP address to be sent of destination station and port differently from TCP/IP when sending data.

This Function Block is started when REQ is at positive edge (0→1), and it sends to destination port (D_PORT) with IP address defined in IP_ADDR through communication module of one' s station installed in slot number CH_NO of elementary base.

As frame name to be specified in ' FRAME' , you specifiy the frame name downloaded into Ethernet communication module from Frame Editor. The use of ' _UDATA_SEND' that sends without specification of TX data form is the same as that of TCP/IP.

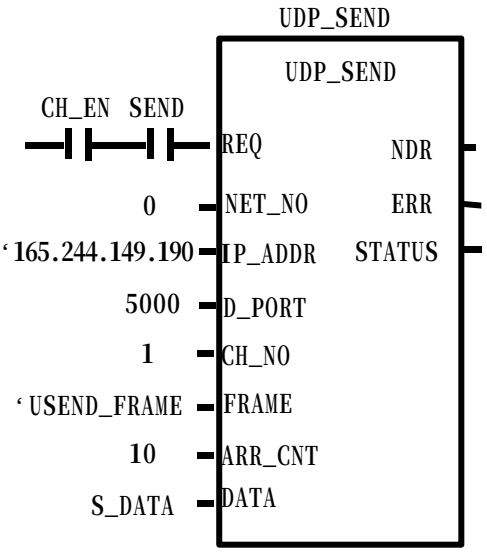
Therefore, this Function Block first reads data as much as ARR_CNT from area saved in DATA,

and then sends them to module port with IP address specified in IP_ADDR with frame form specified in Frame Editor.

■ **A Program Example : When sending data to destination station using TCP/IP.**

This is the case, in which Enet module of one' s station is installed in the slot number ' 0' , and you send data to destination station using channel number ' 1' . (It is assumed that channel number ' 1' is established using E_CONN Function Block.)

L D



I L

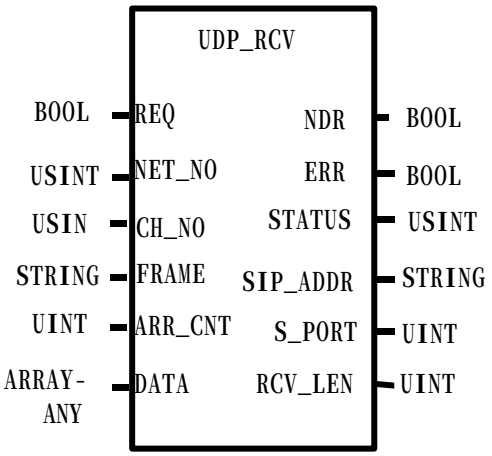
```
LD      CH_EN
CALC    UDP_SEND        UDP_SEND
        REQ:=           SEND
        NET_NO:=        0
        CH:=            1
        FRAME:=         'USEND_FRAME'
        ARR_CNT:=       10
        DATA:=          S_DATA
```

In the program, CH_EN is a result of channel establishment in E_CONN Function Block. It is used as a contact to send data even when the channel is eatablished.
' USEND_FRAME' is a frame to be sent, and it must be downloaded in Enet module using Frame Editor.
10(ARR_CNT) is a number of data to be sent, is also a number of S_DATA type. S_DATA is ARRAY variable, in which data to be sent is saved.

UDP_RCV

Used to receive data sent from destination station using TCP/IP

Product	GMR	GM1	GM2	GM3	GM4	GM5	GM6	GM7
Applicability	●	●	●	●	●			

Function Block	Description
	**Input** REQ : When it is at positive edge (0→1), Function Block is executed. NET_NO : Slot number (0 to 7), in which communication module of one's station is installed, to which this Function Block is transferred. CH_NO : Channel edited in E_CONN Function Block. FRAME : Frame to be received (distinguished with capital/small letter). It must be downloaded in Enet module after editing in Frame Editor. ARR_CNT : Number of data to be received. Number of data type equivalent to ' DATA. DATA : An area saving RX data. Uses ' ARRAY' . **Output** NDR : It turns ' On' at normal service. ERR : It turns ' On' at error occurance after Function Block is executed. STATUS : It is detail code value of error when it occurs. SIP_ADDR : IP address of the station sending data. S_PORT : Port of the station sending data. RCV-LEN : Anumber of data received.

It is used to receive data of destination station using UDP/IP.

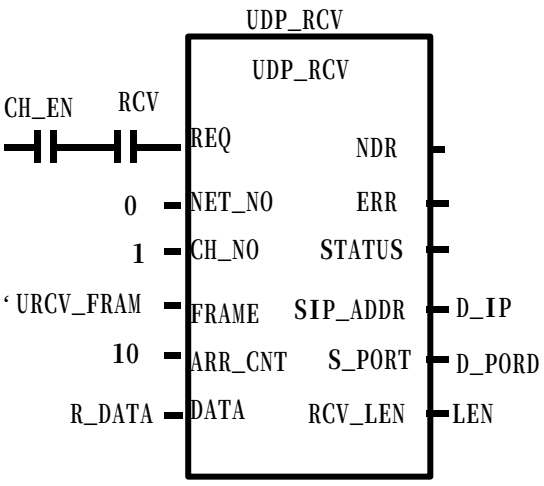
As UDP/IP communiction actually has no channel establishment, it can receive every data sent from any station to open port of one' s station. Therefore, it is possible in UDP_RCV Function Block, differently from TCV_RCV, to know which station (SIP_ADDR) sends data to which port number (S_PORT).

Operation of this Function Block is the same as that of TCP_RCV, but, when it receives data, it is different from TCP_RCV Functon Block to output and display information about destination station that sent data. Execpt this difference, every operation is the same with each other, it is also identical for both to use the frame name such as ' _UDATA_RCV' without special specification of RX data form. Therefore, The operation of this Function Block saves sent data in variable specified in ' DATA' when data sent from the station with established channel is identical to the frame defined as ' FRAME' . (It must be defined as the appropriate name in Frame Editor' , and downloaded in Enet module.)

■ **A Program Example : When receiving data from destination station using UDP/IP.**

This is the case, in which Enet module of one' s station is installed in the slot number ' 0' , and you receive data from destination station using channel number ' 1' . (It is assumed that channel number ' 1' is established using E_CONN Function Block.)

L D



I L

```
LD      CH_EN
CALC    UDP_RCV          UDP_RCV
        REQ:=            RCV
        NET_NO:=         0
        CH:=             1
        FRAME:=          ' URCV_FRAME'
        ARR_CNT:=        10
        DATA:=           R_DATA
```

In the program, CH_EN is a result of channel establishment in E_CONN Function Block. It is used as a contact to receive data even when the channel is eatablished with destination station. ' URCV_FRAME' is a frame to be received, and it must be downloaded in Enet module using Frame Editor.

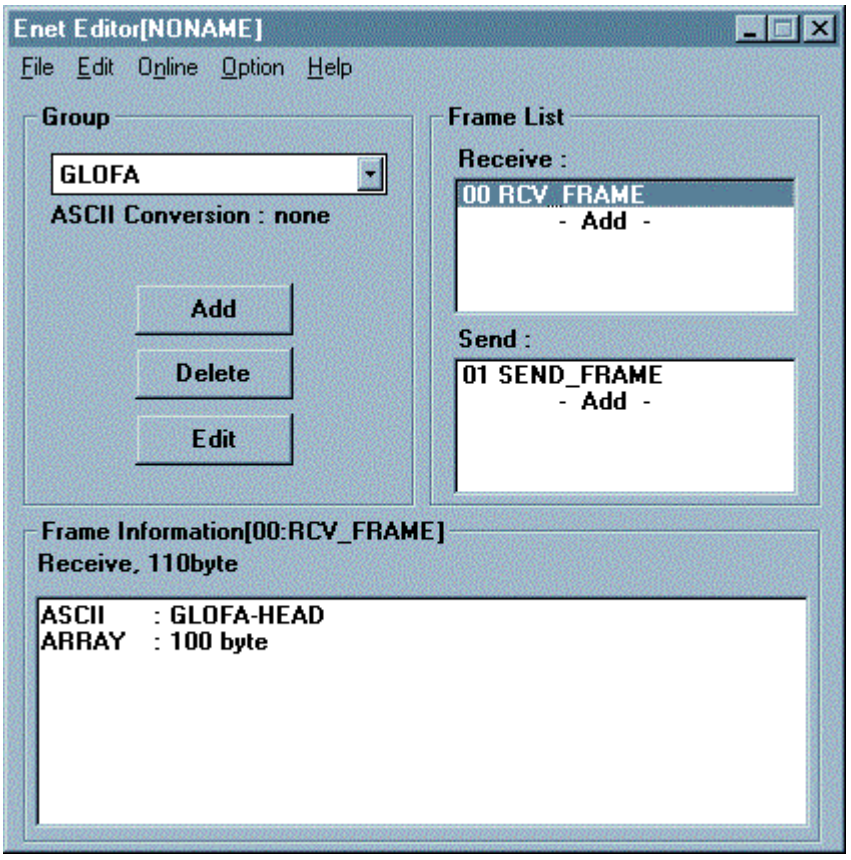
10(ARR_CNT) is a number of data to be received, is also a number of S_DATA type. R_DATA is ARRAY variable, in which data to be received is saved.

SIP_ADDR, S_PORTof output are the address and port of destination station that sent data. RCV_LEN is sent data number, ane a user can response to the destination station that sent data using this information.

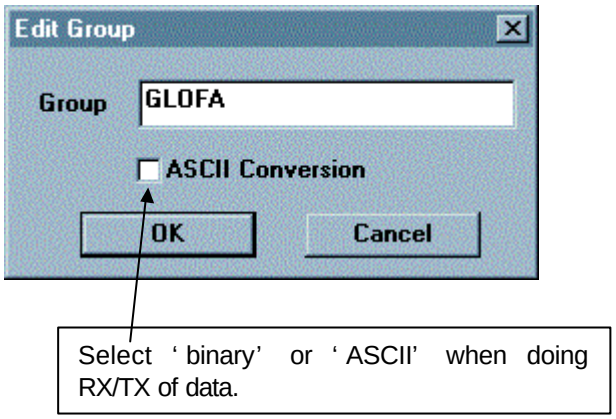
8.2 Frame Setting

8.2.1 Frame Setting

The figure 8.2.1(A) displays the Frame List defining frame and simple Frame Information. In the figure 8.2.1(B), ‘ Group’ is for registering identifier to communicate with Ethernet communication module of other company, and you can register as you will. The ‘ Group’ is used to input METHOD of E_CONN Function Block used to establish channel. ([Figure 8.2.1(A)] it is equivalent to XXX out of ‘ XXX_YYY_TTT’ .) Such ‘ Group’ can be registered maximum up to 20. ‘ Frame List’ means identifier names to identify the frame, and you can use these names in Function Block. Frame Definition’ can define up to 20 for each group. ‘ Frame Information’ shows briefly whole information of the frame after frame definition.



[Figure 8.2.1(A)] Feature of Frame Editor



If you select ASCII Conversion, it sends data set as Function Block by you after converting them into ASCII. Thus, the data to destination station is sent as ASCII value.

[Figure 8.2.1(B)] Edit Group

The following describes with each RX/TX how a user defines frame.

< For TX Frame >

TX Frame : ' GLOFA-HEAD' +h' ff030200+DATA(100 bytes)

If communication frame to send between GLOFA Ethernet communication module is just the same as the one above, you select (doubleclick) ' Frame List' on the screen of the figure 8.2.1(A), and then define the frame on the screen of the figure 8.2.1(C).

A) After you set frame name in the figure 8.2.1(C), set it as ' Send' in ' TX/RX' .

B) Set segment.

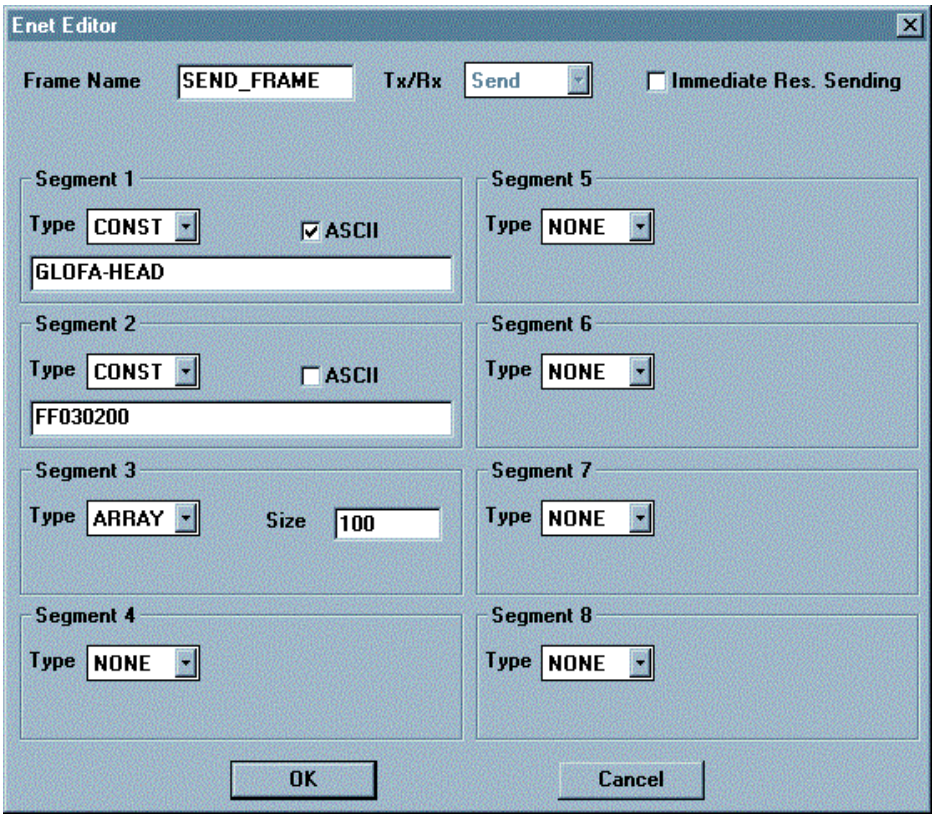
The segment can be set up to maximum 8. Each segment can be set separately as ' CONSTANT' , ' ARRAY' and ' SKIP' respectively.

- For ' CONSTANT' , you can set maximum up to 30 bytes using HEXademical number, and specify it as ' ASCII Conversion' . (If ' ASCII Conversion' is not set, the data is used as HEXa data).
- ' SKIP' is used when a user wants to skip data of RX frame without checking them. (only for RX).
- ' ARRAY' displays the data that a user wants to send in Function Blodk.

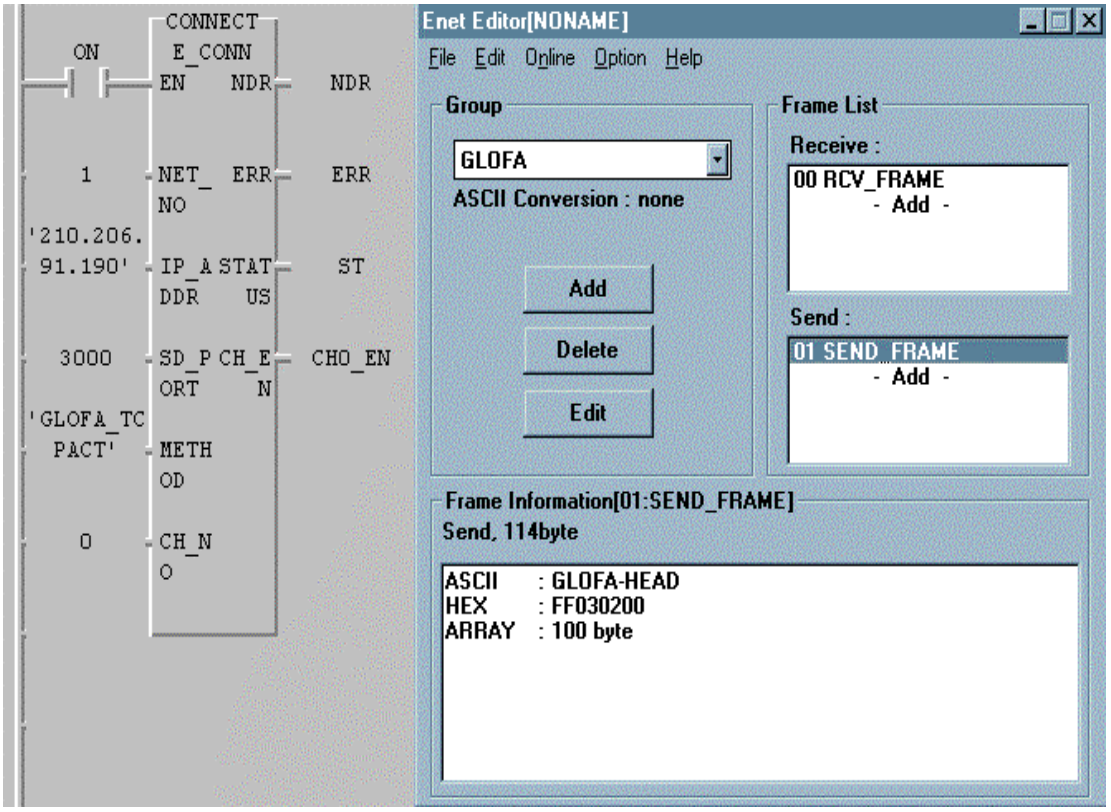
  If you select h' FFFF as size (Unit: Byte) in ' ARRAY' , it means that data are sent to destination station as much as they are given in Function Block. But, if other value than h' FFFF is selected, it compares data number given from Function Block and size defined in frame. At this time, if it is smaller than that used in the Function Block, an error occurs. Therefore, you should set it the same or larger than that. (See the figure 8.2.1(C)).

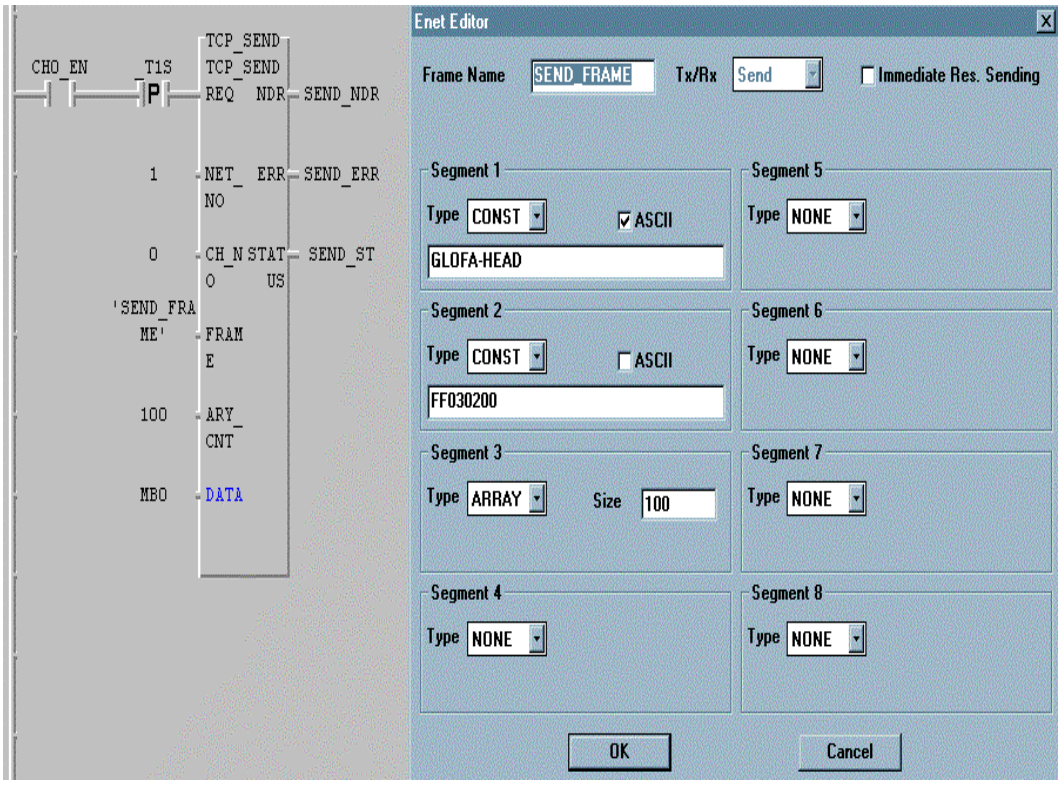
  If you select ' OK' after setting according to the order abive, frame name is registered in the frame list with the screen closed.

  The figure 8.2.1(D) shows the relation of use between the Function Block and Frame Editor.



[Figure 8.2.1(C)] Frame Definition of TX





[Figure 8.2.1(D)] Relation of Frame Editor and Function Block at the time of TX

< For RX Frame >

RX Frame : ‘ GLOFA-HEAD’ +h’ ff030200+DATA(100 bytes)

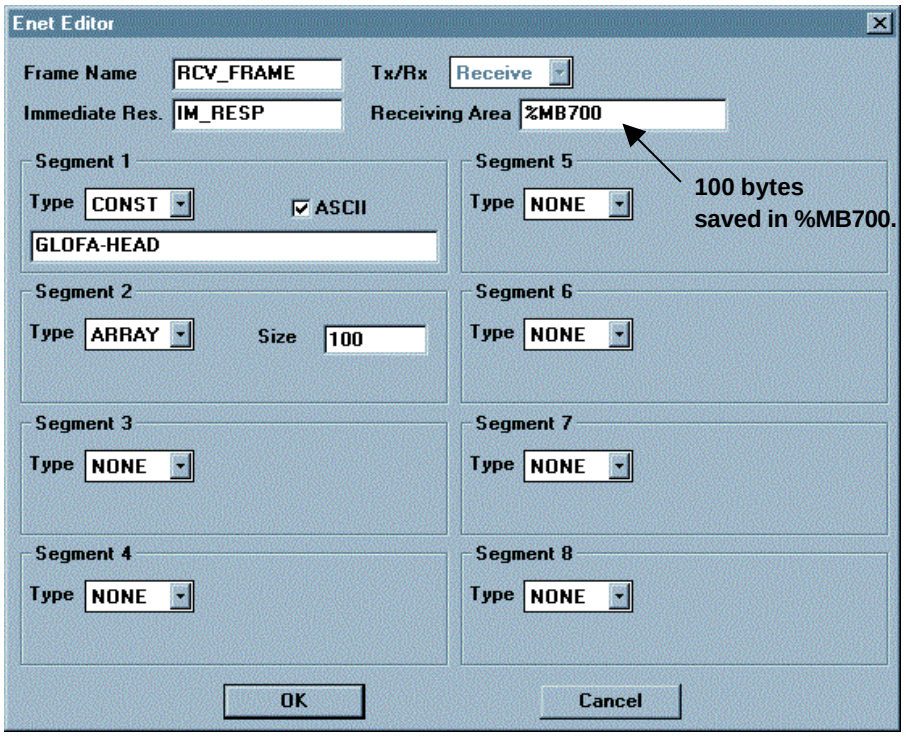
A) After you set frame name, set it as ‘ Send’ in ‘ TX/RX’ .

B) Set segment.

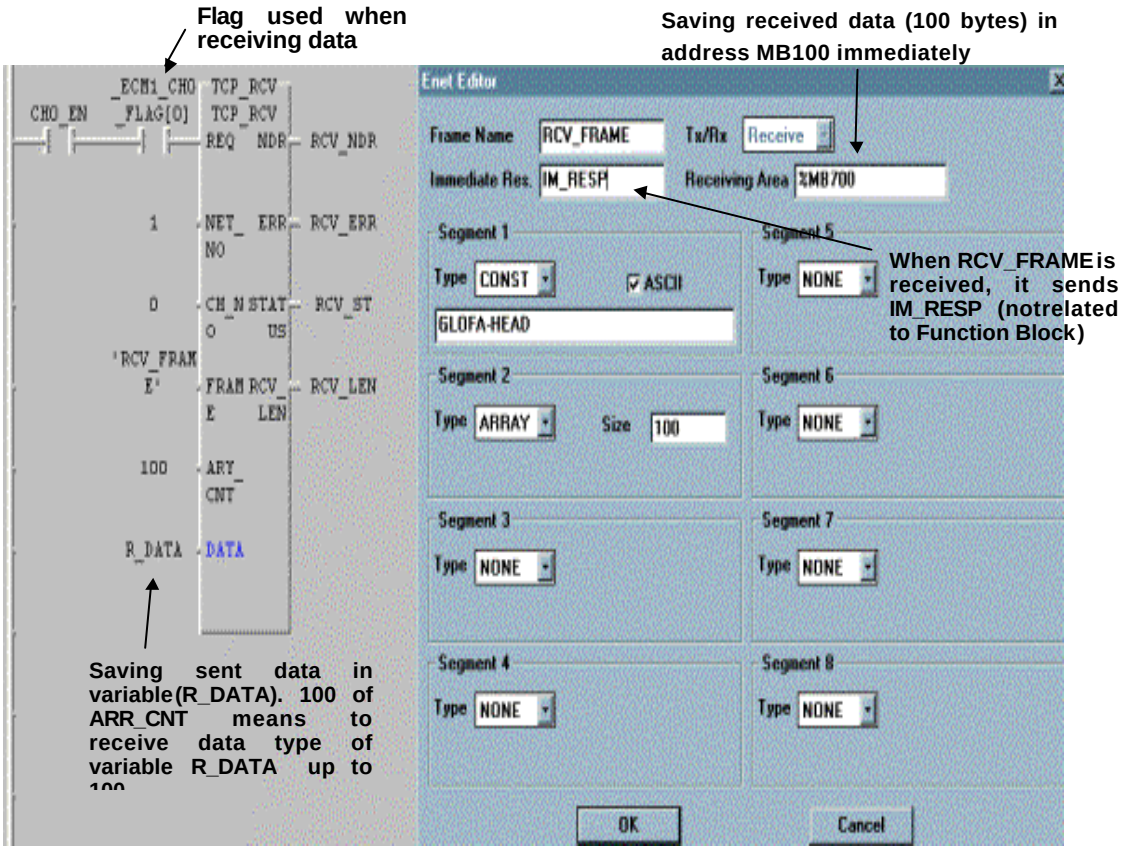
Sefment number 1 and 2 are set as ‘ Constant’ , and number 3 is set as ‘ Array’ . If a user want to save receiving data directely in CPU area without RCV Function Block, he can specify CPU area as receiving area. (Example:%MB700, it provides only byte as data type) [See the figure 8.2.1(E)].

C) Specify ‘ Response Frame’ immediately. [See the figure 8.2.1(G)].

D) ‘ Immediate Response’ does not mean that it sends frame by demand of Function Block within program, but means that it can send response frame to destination station as soon as it receives set frame from the destination station. At this time, ‘ Frame Name’ specified as ‘ Immediate Response’ must be registered in ‘ Frame List’ , and its type is set as ‘ Sending’ . In addition, in case that ‘ ARRAY’ is used in ‘ Segment’ within ‘ Frame’ , you have to specify ‘ Sending Area’ . If not, an error occurs. Therefore, you should set it properly without fail. [See the figure 8.2.1(G)]



[Figure 8.2.1(E)] Sending Frame Definition (when TCP_RCV Function Block is not used)



[Figure 8.2.1(F)] Relation of Frame Editor and Function Block when Receiving Data

The figure 8.2.1(H) is showing the relation between ' Function Block' and ' Editor Frame' when receiving data, and it is also showing the use of flag available when receiving data. When there are data sent by channel selected a user (CH_NO), RCVx_ECM[y] is set. Therefore, it is very convenient for you to use **RCVx_ECM[n]** flag as start condition of Function Block.

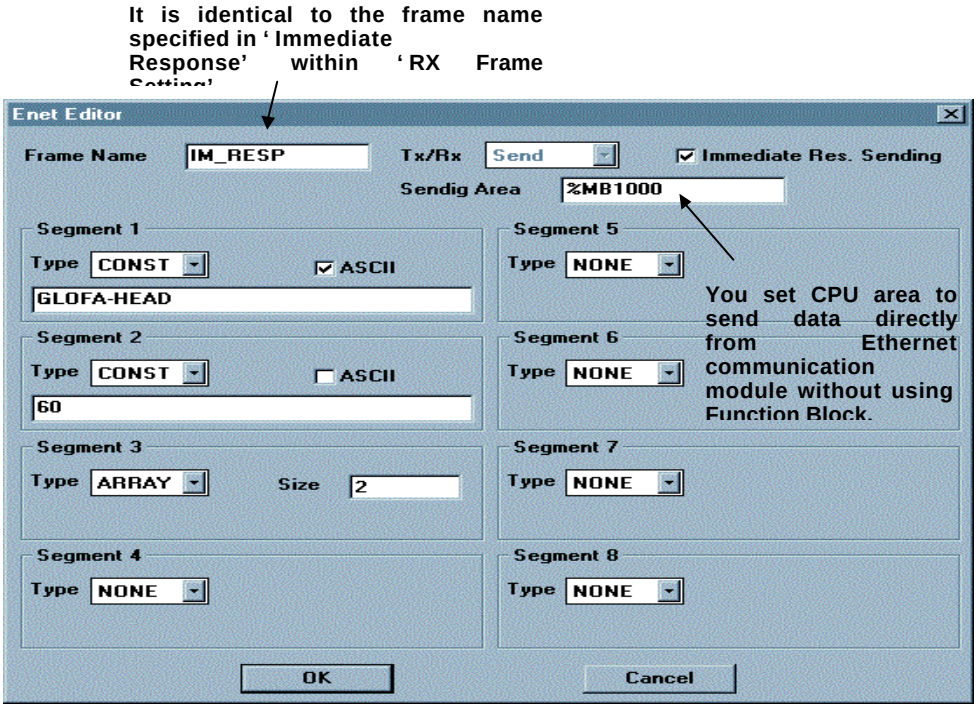
RCVx_ECM[n] : x is slot number in which Enet module is instlled (0~7).
N is the channel number to be received (0~15).

The figure 8.2.1(G) is showing an example of frame setting set as ' Immediate Response' when setting ' RX frame setting' .

Remark

Note1) If you set ' Type' as ' SKIP' in ' Frame Editor' when setting segment, it does not check as much data as appropriate size set, but, it checks ' Segment' set next to it. In ' SKIP' , if you set data number as ' FFFF' in HEX, it means that it throws away received frame from now on without checking them.

Note2) ' Immediate Response' frame is a function given as receiving confirmation from one' s station when destination station asks for special data. It is used to confirm whether the data are properly delivered after the destination station has sent data to one' s station. (It is not necessary to set it according to destination station' s status.).

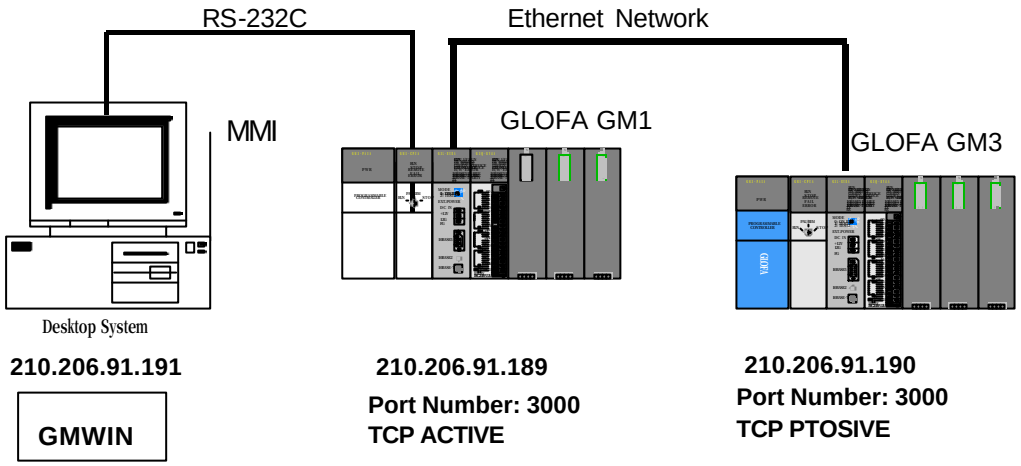


[Figure 8.2.1(G)] Frame Definition of Immediate Response

8.3 Application Programs

8.3.1 Example of Function Block Service between GLOFA Enet' s

The following system is an example about Function Block Service between GLOFA PLC Enet modules.

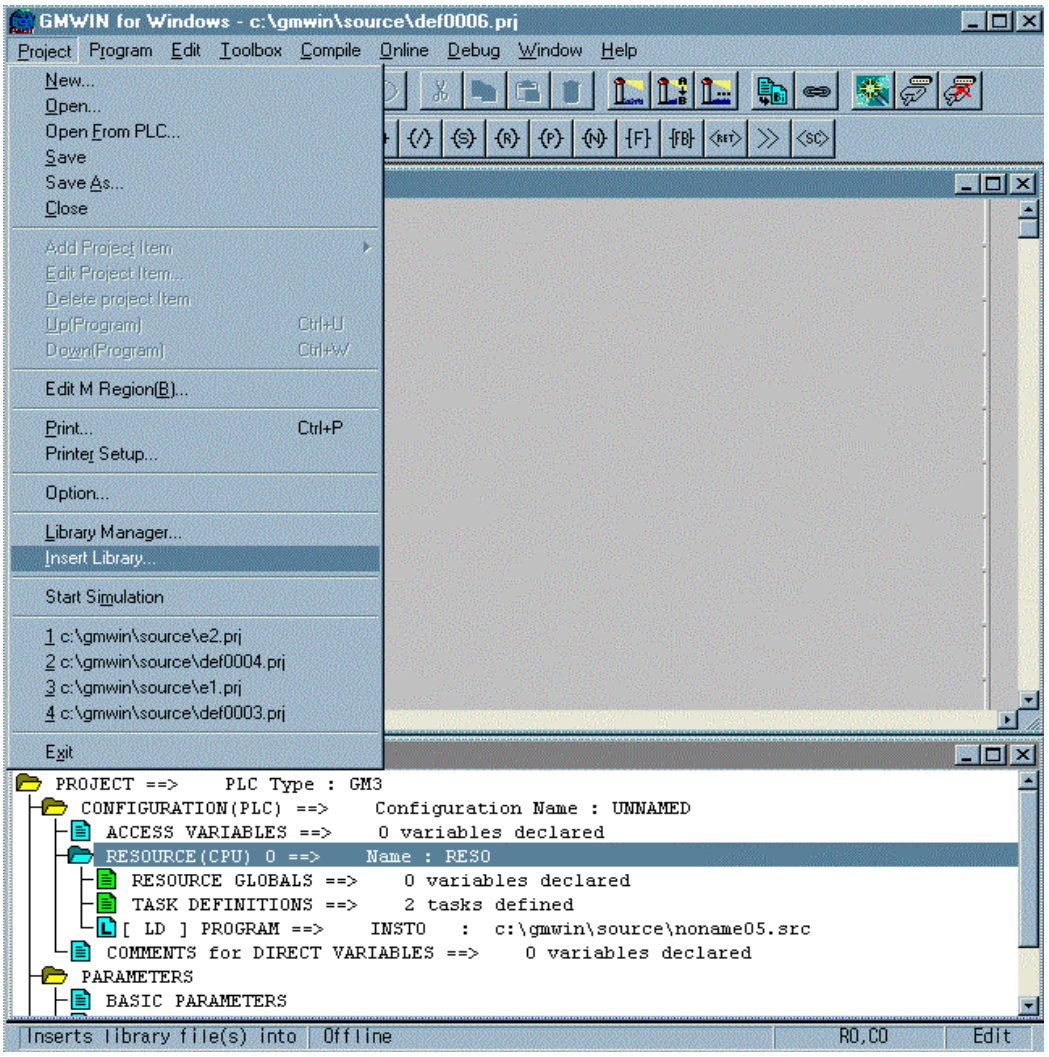


In system configuration example, GM1 connects with GM3 with TCP_ACTIVE method, and GM3 communicates with the contents of the table 8.3.1(A) for GM1 after connecting with TCP_PTOSIVE.

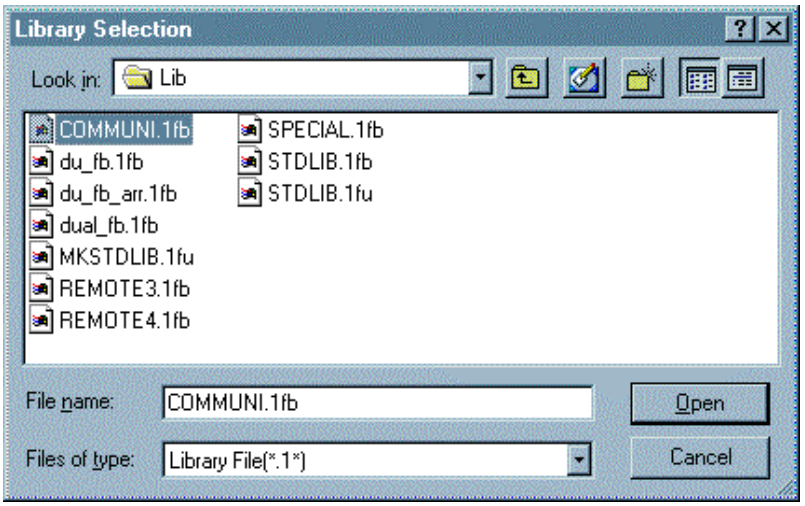
TX/RX Structure		Reading Area	Save Area	Size (Byte)	Service Channel
GM1 (210.206.91.189)	Send Frame: SEND_FRAME	S_DATA		100	0
	Receive Frame: RCV_FRAME		R_DATA	100	0
GM3 (210.206.91.190)	Send rame: SEND_RESP	S_DATA		100	0
	Receive Frame: RCV_FRAME		R_DATA	100	0

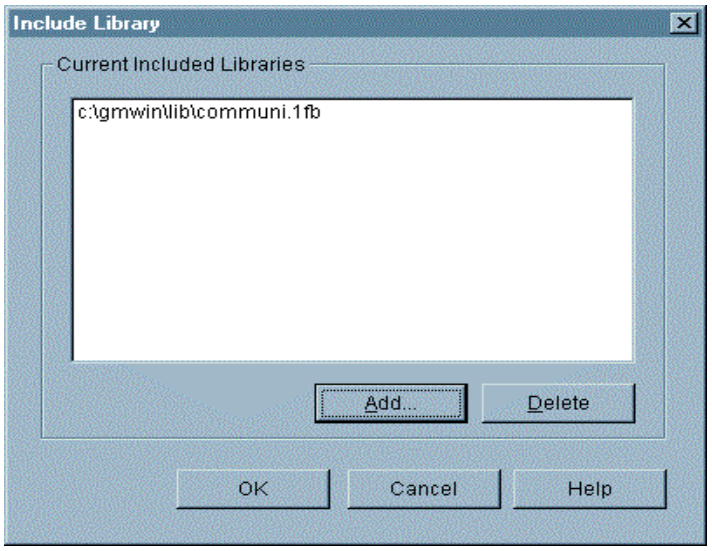
[Table 8.3.1(A)] Data Definition to Communicate

You select PLC type, and open program file after you create or open project file. After that, select ' Inserts Library' of project, and then select suitable ' Library' for CPU type to the following figure.



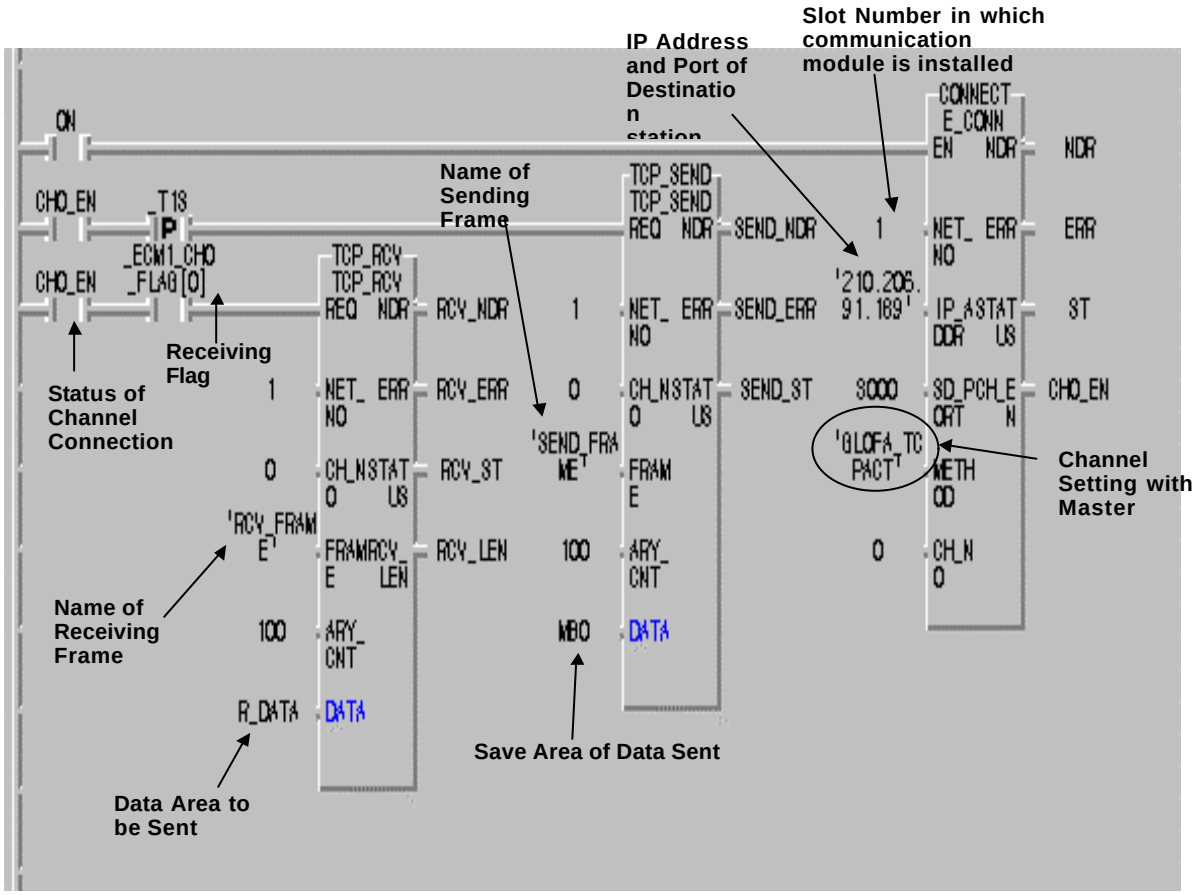
[Figure 8.3.1(A)] Project





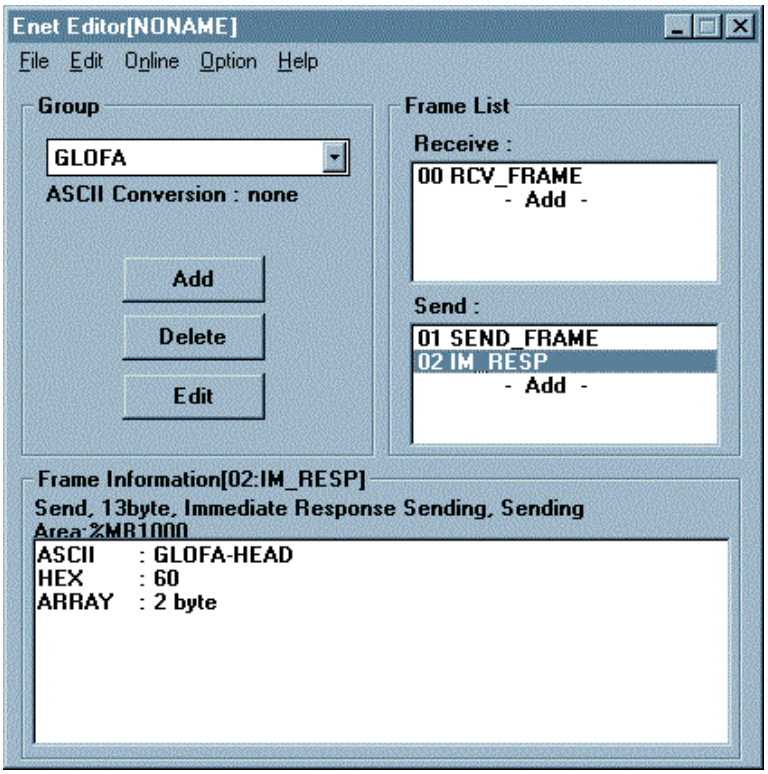
[Figure 8.3.1(B)] Inserts Library

[Program 8.3.1(A)-(B)] is a program sending and receiving data using Ethernet module installed in elementary base such to GM1 and GM3 and TCP/IP. (For the communication using UDP/IP, it has the same method.).

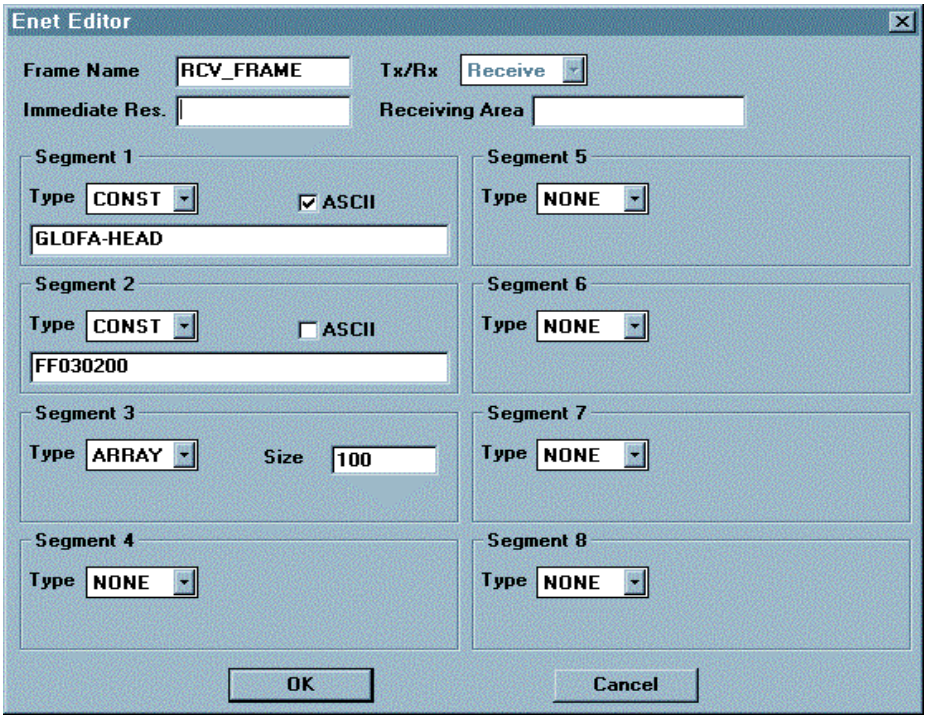


[Program 8.3.1(A)] GM1 Program Example

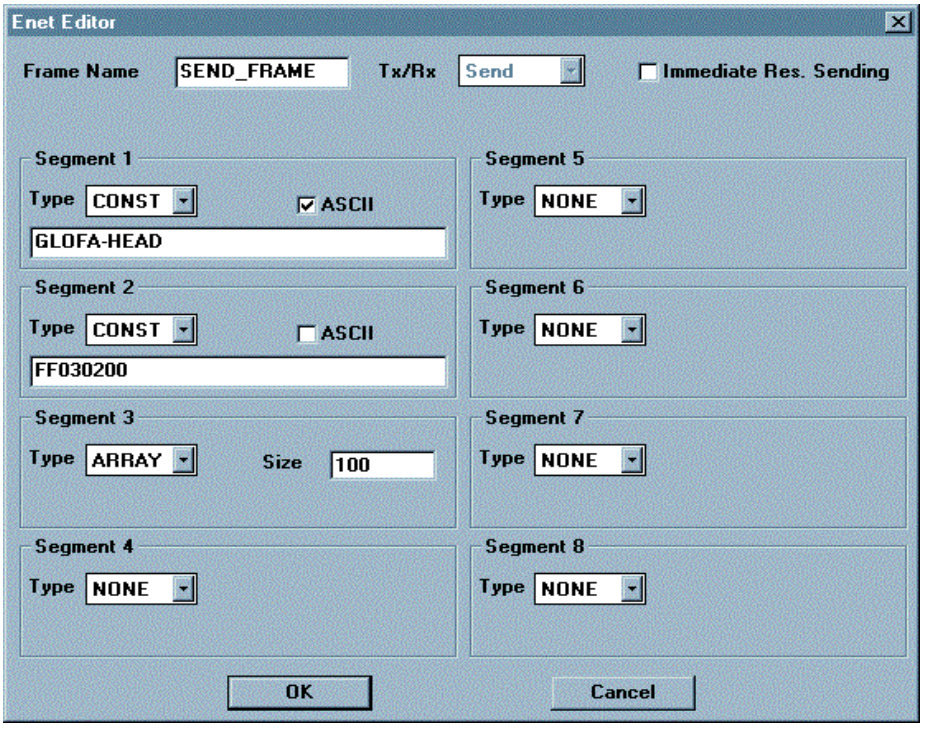
In the program example, GM1 establishes a channel to TCP_ACTIVE with GM 3. After the channel is established, CH_EN is set. When CH_EN is set in TCP_SEND Function Block, you send data to GM3 using timer of 200ms. You can here transfer 100 bytes of S_DATA with frame format defined in Frame Editor. If the sending is performed, flag is used in TCP_RCV Function Block in order to receive answer from destination station, and received data are saved in R_DATA. (_ECM1_CH0_FLAG[0] : There are data sent with receiving frame number ' 0' and channel number ' 0' in Enet module in slot number 1 of elementary module, it turns ' On' .).



a. Example in GM1



b. Sending Frame in GM1

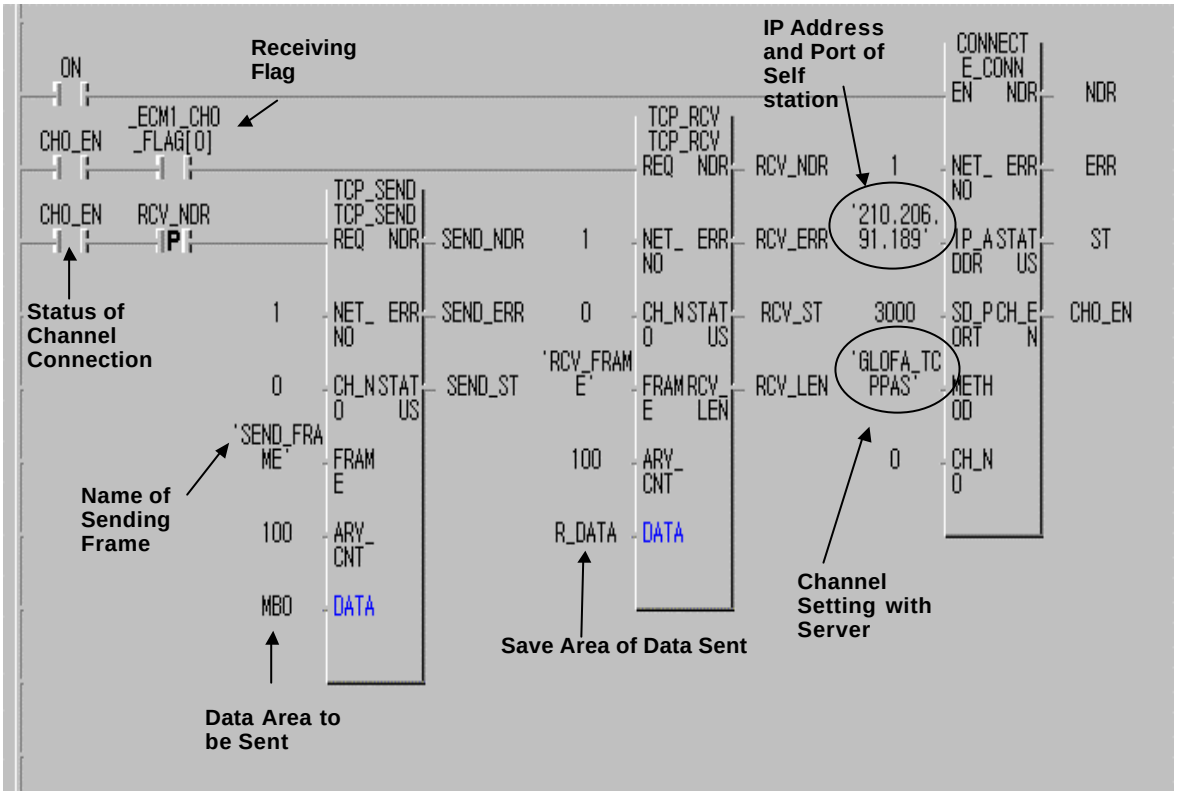


c. Receiving Frame in GM1

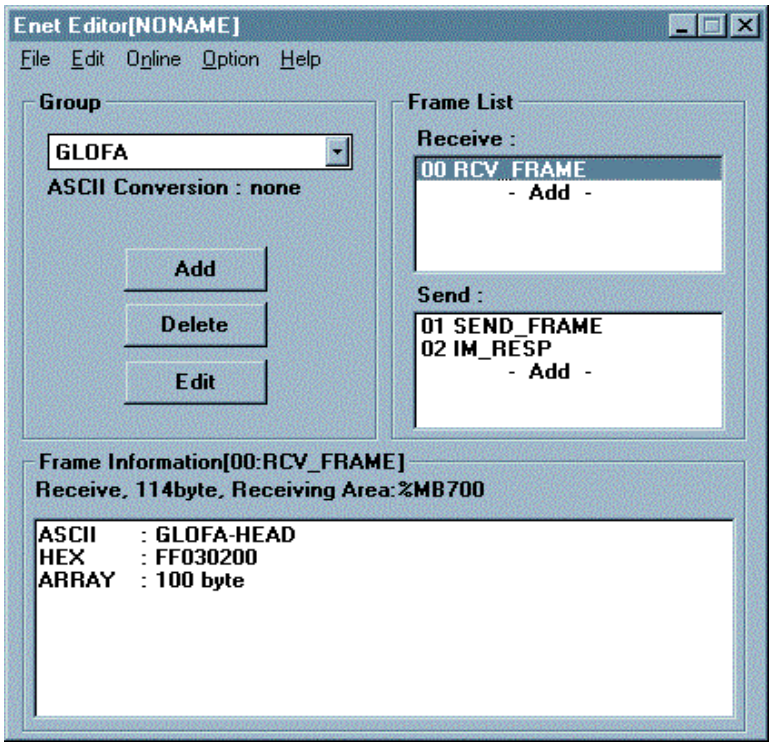
[Figure 8.3.1(C)] An Example of Frame Setting Used in [Program 8.3.1(A)]

In the program example, GM3 establishes a channel as TCP_PTOSIVE with GM 1. If the channel is established, CH0EN is set. As self station is active with server, you can use the flag for receiving confirmation to confirm whether there is any demand from destination station under the condition of TCP_RCV Function Block REQ. If the data are normally received, RCV_NDR is set. (_ECM1_CH0_FLAG[0]: There are data sent with receiving frame number ‘ 0’ and channel number ‘ 0’ in Enet module in slot number 1 of elementary module, it turns ‘ On’ .).

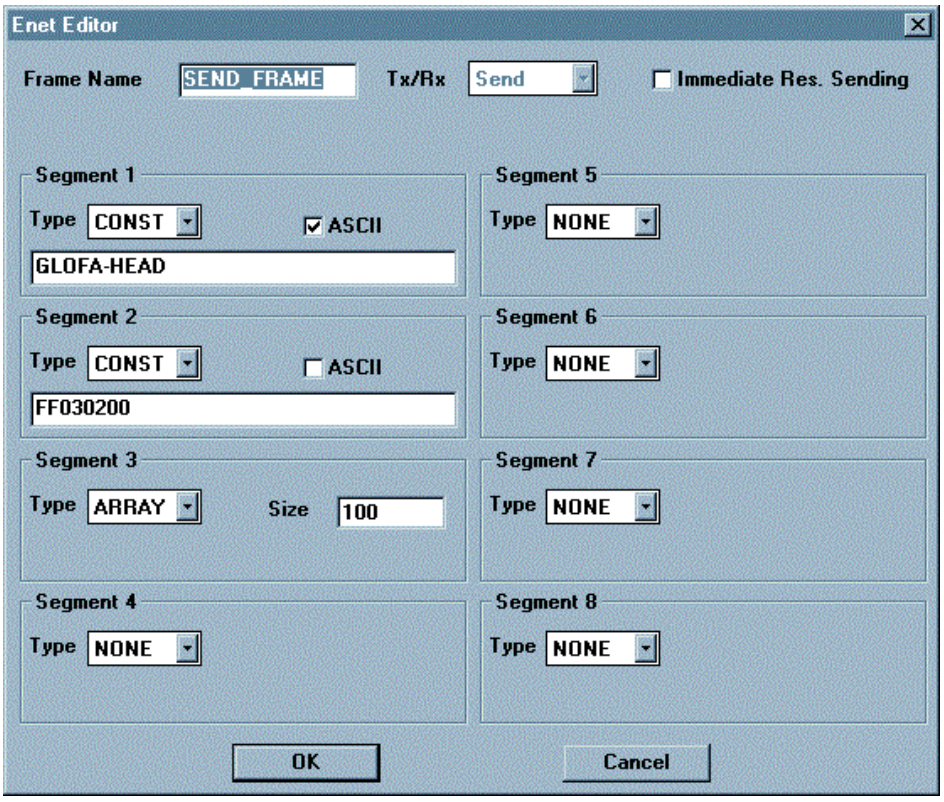
You can now allow to send data to GM 1 after reading the data of MB0 as much as DATA_LAN under the condition TCP_SEND Function Block REQ with this bit and CH0_EN bit as channel establishment signal operated (OR).



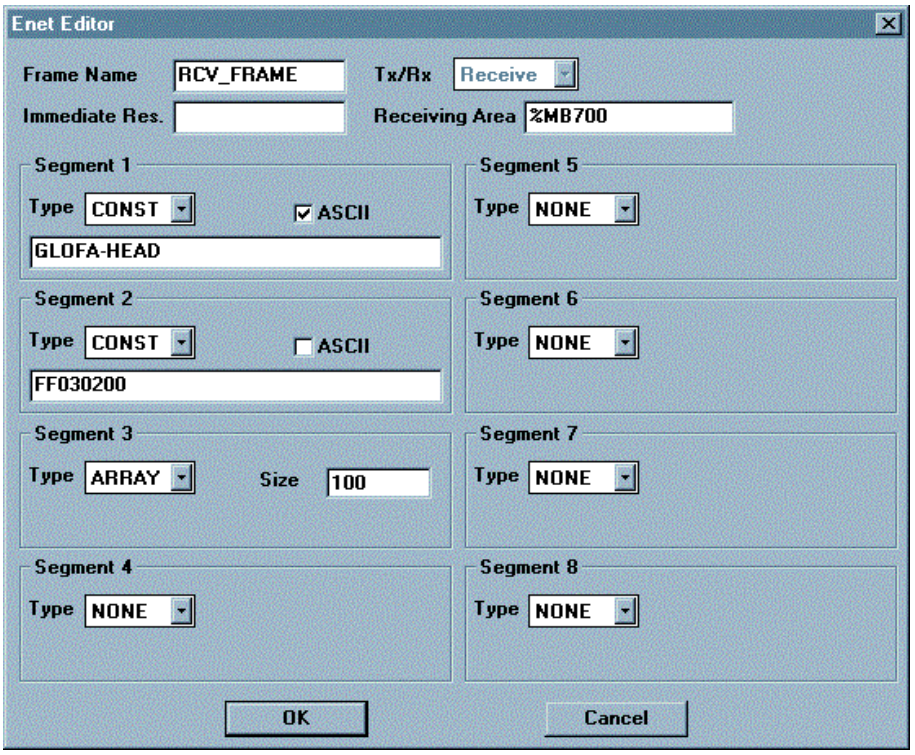
[Program 8.3.1(B)] An Example of GM3 Program

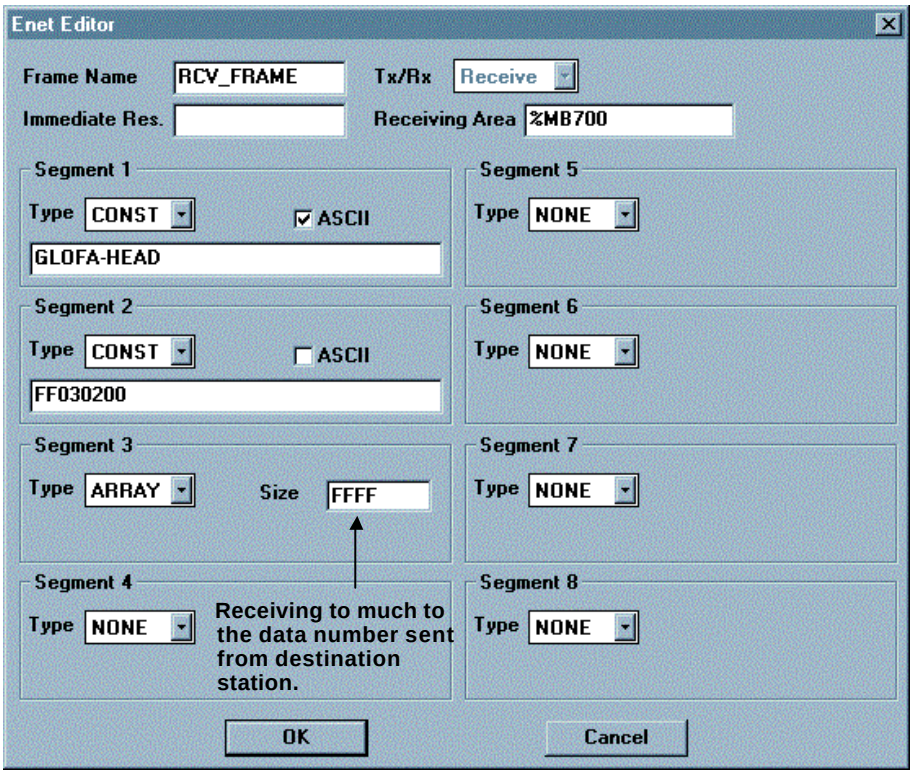


a. An Example of Frame Setting in GM3



b. Sending Frame in GM3





c. Receiving Frame in GM3

[Figure 8.3.1(D)] Frame Setting Used in [Program 8.3.1(A)]

This is an general order to give communication service using Function Block.

1	Set basic parameter and frame using frame editor.
2	After connecting PC and CPU of PLC with cable, download basic parameter and frame into Ethernet module using frame editor.
3	Reset Ethernet communication module or put in power again.
4	Open new project file.
5	Specify instance name of program, and select program language (LD), and then open program. If the program is open, select ‘Inserts Library’ option, and select library for communication.
6	Set input such as Function Block to use and condition contact of positioning start. 1) Setting E_CONN FB Set NET_NO, IP address, port number, etc. corresponding to communication status, and then set METHOD or communication module to TCPACT or TCPPTO using ‘Group’ in frame editor.
7	If there are any data to send after establishment of channel, write a program using SEND FB. 2) Set TCP_SEND FB Set NET_NO, CH_No and size of sending data. At this time, data size must be identical to that set in frame editor. However, if you set array size of frame editor to FFFF, data will be sent as much as the size of send data of FB.
8	There are any data to receive after establishment of channel, write a program using RCV FB. 3) Set TCP_RCV FB Set ECMx_CHy_FLAG[z] (flag), NET_NO, CH_NO and receiving buffer to save data to be received. At this time, size of the buffer to save receive data must be larger than that set in frame editor. But, if you set array size of frame editor to FFFF, every received data is saved in receive buffer of FB. Therefore, you should set size of data to receive just the same as or larger than the data to receive. Description of ECMx_CHy_FLAG[z] x is slot position where communication module is installed. (0~7:8 slot rack) y is channel number set in E_CONN FB (0~15) z is receive frame number in each group set in frame editor. (0~7)

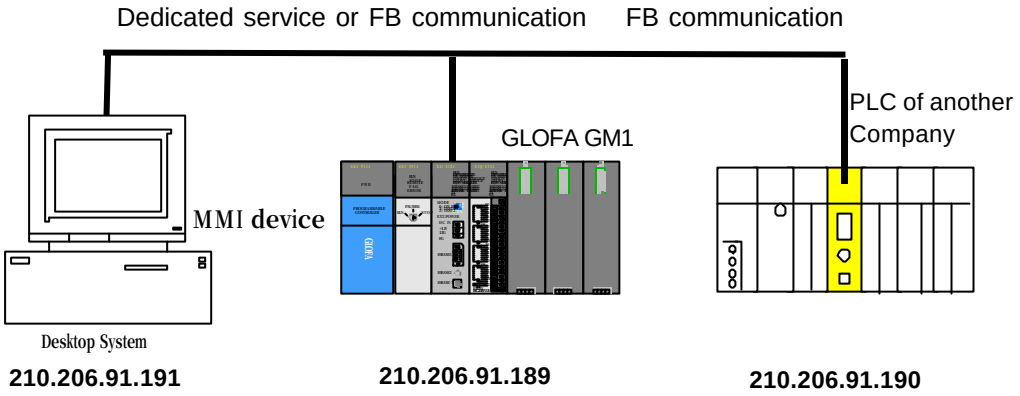
9	Add a program to confirm whether to perform the communication well. Please do add such a program when programming because it is very useful against communication error and its measures.
10	Compile after saving file. After compiling, select ‘ Connecting’ in on-line menu, and then download program.
11	With the program downloaded, start the program, and confirm the results on monitor. If an error occurs, confirm its kind, and stop PLC mode.
12	Remove the source of error, and execute the procedure from the number 1.

8.3.2 Enet module of other company + PC + GLOFA Enet (An example of Function Block service 1)

In general, the system configuration below realizes network with 2 methods.

MMI (GLOFA ENET DRIVER) :CLIENT -> GLOFA GM1(dedicated service) : SERVER
GLOFA GM1(Function Block):CLIENT -> Destination station' s PLC: SERVER

MMI :CLIENT -> GLOFA GM1(Function Block service) : SERVER
GLOFA GM1(Function Block):CLIENT -> 타사 PLC: SERVER



1) The system based on the configuration of the number 1 is here described. This system configuration first establish a channel with PLC of another company and TCP ACTIVE between PC(MMI), PLC of another company on the basis of GM1, and then it communicate each other. For computer, it communicates with it using dedicated service.

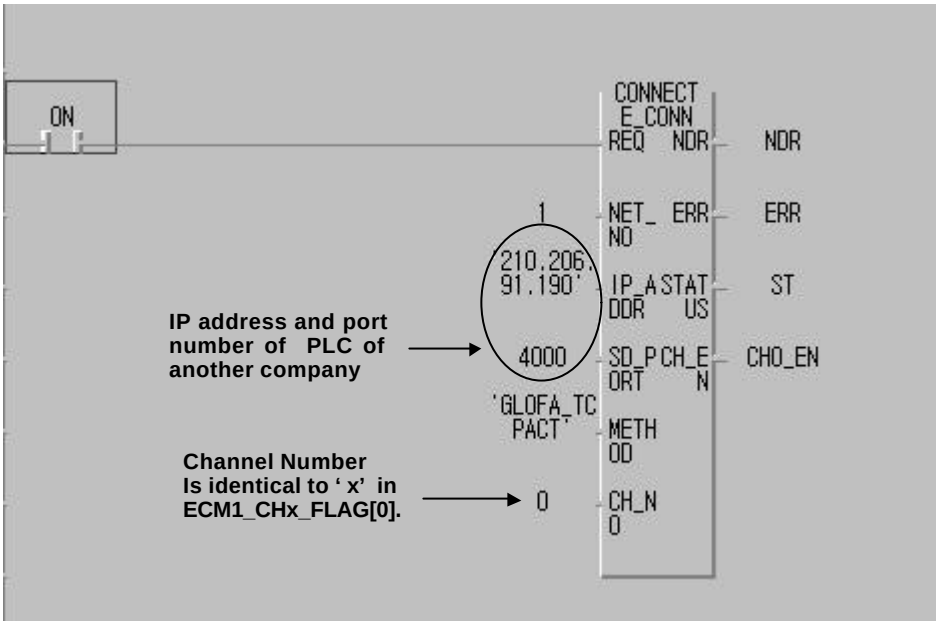
RX/TX Structure		Reading Area	Save Area	Size (byte)	Service Channel
GM1 (165.244.149.108)	Send Frame: GLOFA_SEND_FRAME	S_DATA	(MB100)	100	0
	Receive Frame: GLOFA_RCV_FRAME	(MB3000)	R_DATA	100	0

[Table 8.3.2(A)] Data Definition to Communicate

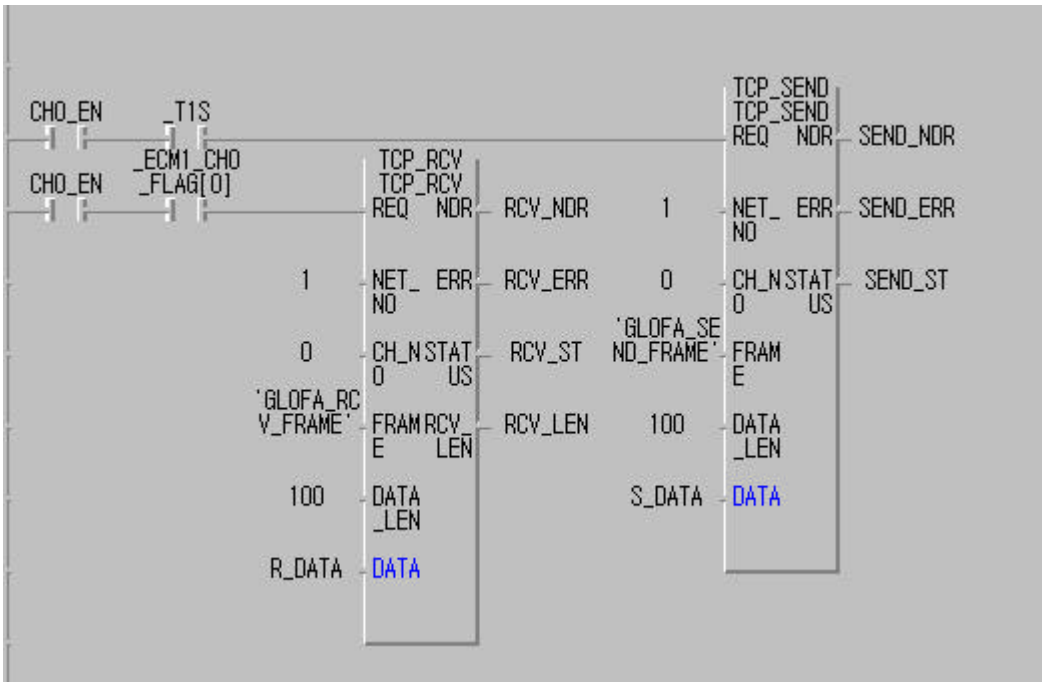
If you send data from PC(MMI) to %MB100 after setting the area of S_DATA of send data used in Function Block to ' %MB100' , PC data is directly sent to PLC of another company. If you also read data %MB3000 in PC(MMI) after setting the area of R_DATA of receive data to %MB3000, you can get the same effect in PC to if you READ directly PLC data of another company.

Program 8.3.2(A) is an example on the channel establishment of PLC of another company and general PC. For PC, establish a channel with port number 3000 of self company (PTOSIVE),

and for PLC of another company, request the channel with port number 4000 (ACTIVE). If this action is finished, CH_EN_PLC and CH_EN_PC are set to ‘ 1’ .



[Program 8.3.2(A)] An Example of Channel Establishment with PLC of Another Company. (GM1)



[Program 8.3.2(C)] A Program Example for RX/TX with PLC of Another Company

In Program 8.3.2(B), if normal data is sent from PC, _ECM1_CH0_FLAG[0] (When Enet module is installed in slot number ‘ 0’ of elementary base, and receive frame number ‘ 0’ is mormal, it turns

‘ ON’ .) is set. When the data such as PC_RCV_FRAME are received from partner station, 100 data are saved in variable ‘ R_DATA’ , and it sets ‘ RCV_NDR. TCP_SEND Function Block is used as REQ condition using the set‘ RCV_NDR’ bit if TCP_RCV Function Block is normally activating. (In the above program, it is set to communicate every one second when communication connection is done.) When this bit is set, it sends data of S_DATA as much as 100 in form of ‘ PC_RESP_FRAME’ in TCP_SEND Function Block to destination station.

(Frame name of PC_RCV_FRAM,‘ PC_RESP_FRAME’ is defined in frame editor, and it must be downloaded in Enet module as well.)

When self station is operating with server toward the destination station, you write a program, in which it should send data of self station even after confirming whether the data requested from destination station are normally received.

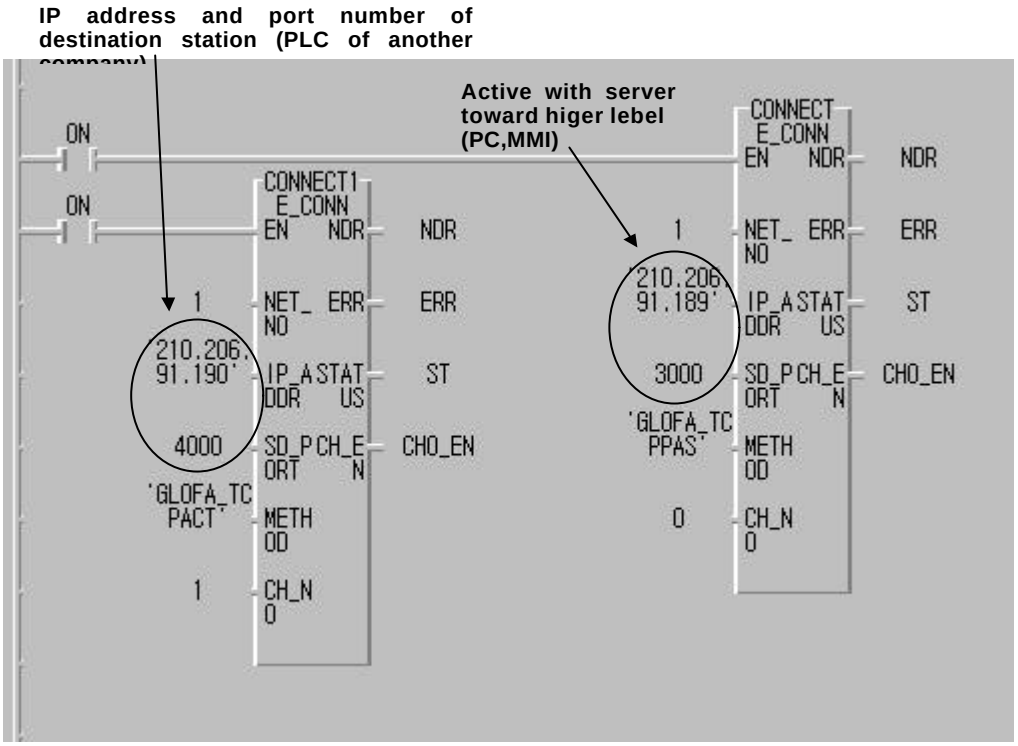
Program 8.3.2(C)] is operating with the same way as program 8.3.2(B), and if self station is activating as client toward partner station, it first sends data. When the partner station sends data normally, it writes a program in format received.

Figure 8.3.2(A)-(C) is showing a setting example of frame editor to perform the above program. Here, an example shows a kind of frame to communicate with PLC of another company.The system configured like the number 2) is described. Between M1 and PLC of another company, you establish a channel on the basis of GM1 as PLC of another company and TCP ACTIVE. For computer, data are sent and received after establishment a channel as TCP PTOSIVE. Data to communicate are like that of the table 8.3.2(A).
(For the communication with MMI device, dedicated service or Function Block can be used.)

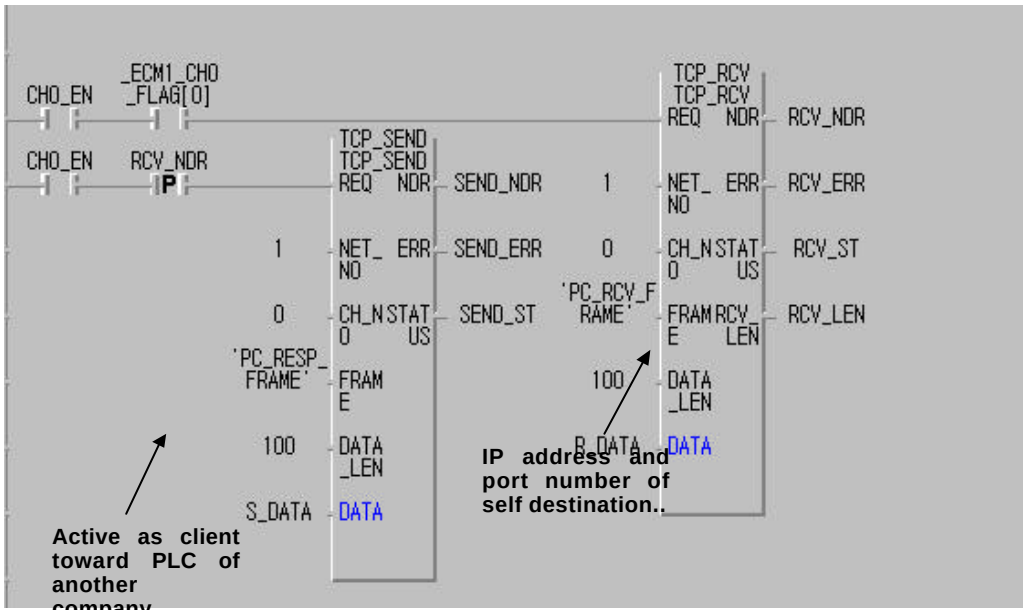
RX/TX Structure		Reading Area	Saving Area	Size (byte)	Service Channel
GM1 (165.244.149.108)	Send Frame: PC_RESP_FRAME GLOFA_SEND_FRAME	S_DATA	--	100	0
	Receive Frame: PC_RCV_FRAME GLOFA_RCV_FRAME	--	R_DATA	100	0

[Table 8.3.2(A)] Data Definition to communicate

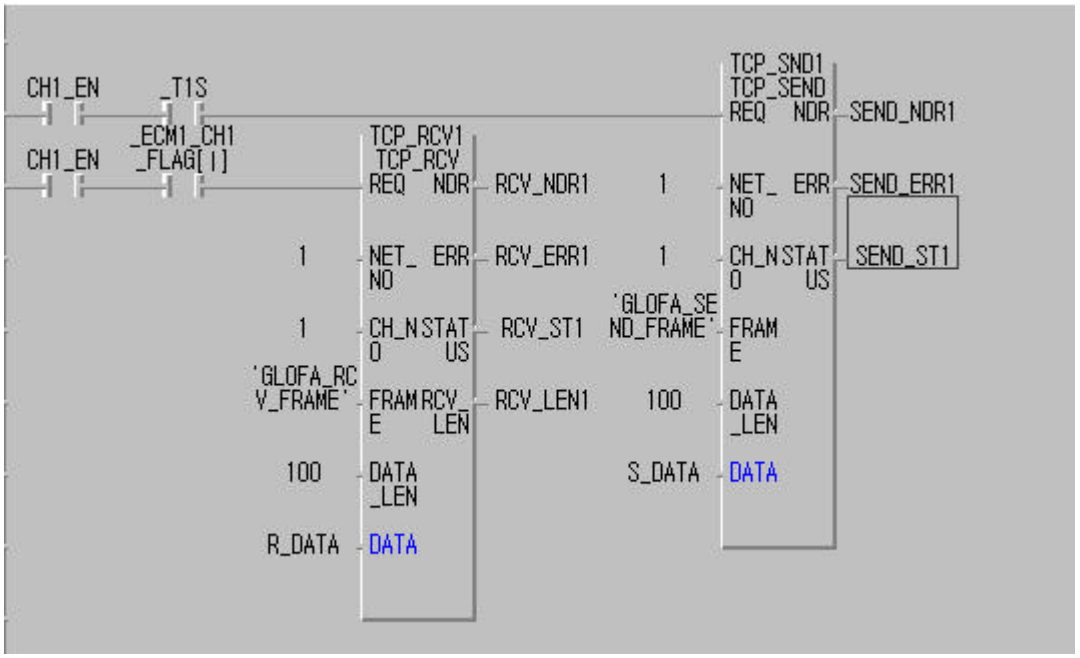
[Program 8.3.2(A) is an example on the channel establishment of PLC of another company and general PC. For PC, establish a channel with port number 3000 of self company (PTOSIVE), and for PLC of another company, request the channel with port number 4000 (ACTIVE). If this action is finished, CH_EN_PLC and CH_EN_PC are set to ‘ 1’ .



[Program 8.3.2(A)] A program Example for Channel Establishment with PLC of Another Company and PC (GM1)



[Program 8.3.2(B)] A Program Example to Send and Receive Data with PC



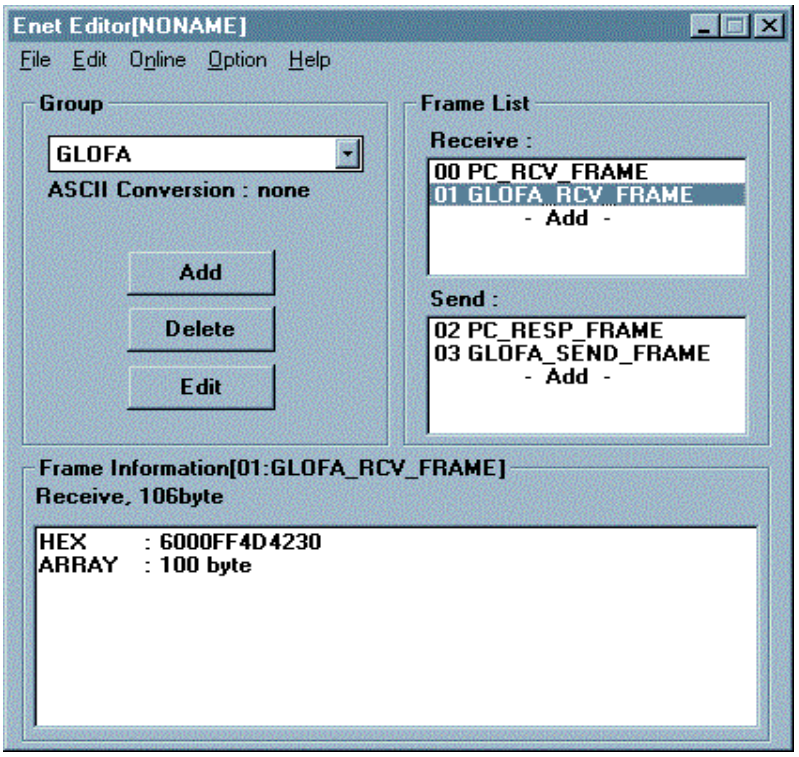
[Program 8.3.2(C)] A program Example to Send and Receive with PLC of Another Company

In Program 8.3.2(B), if normal data is sent from PC, _ECM1_CH0_FLAG[0] is set. When the data such as PC_RCV_FRAME are received from partner station, 100 data are saved in variable ‘ R_DATA’ , and it sets ‘ RCV_NDR. TCP_SEND Function Block is used as REQ condition using the set‘ RCV_NDR’ bit if TCP_RCV Function Block is normally activating. When this bit is set, it sends data of S_DATA as much as 100 in form of ‘ PC_RESP_FRAME’ in TCP_SEND Function Block to destination station. (Frame name of ‘ PC_RCV_FRAM,‘ PC_RESP_FRAME’ is defined in frame editor, and it must be downloaded in Enet module as well.)

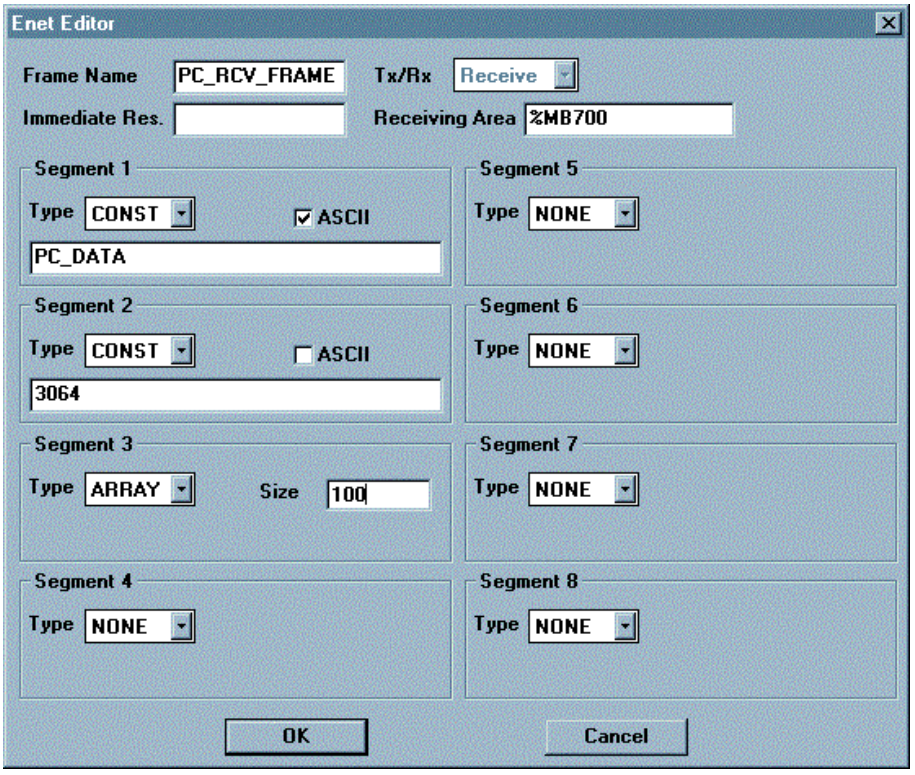
When self station is operating with server toward the destination station, you write a program, in which it should send data of self station even after confirming whether the data requested from destination station are normally received.

Program 8.3.2(C)] is operating with the same way as program 8.3.2(B), and if self station is activating as client toward partner station, it first sends data. When the partner station sends data normally, it writes a program in format received.

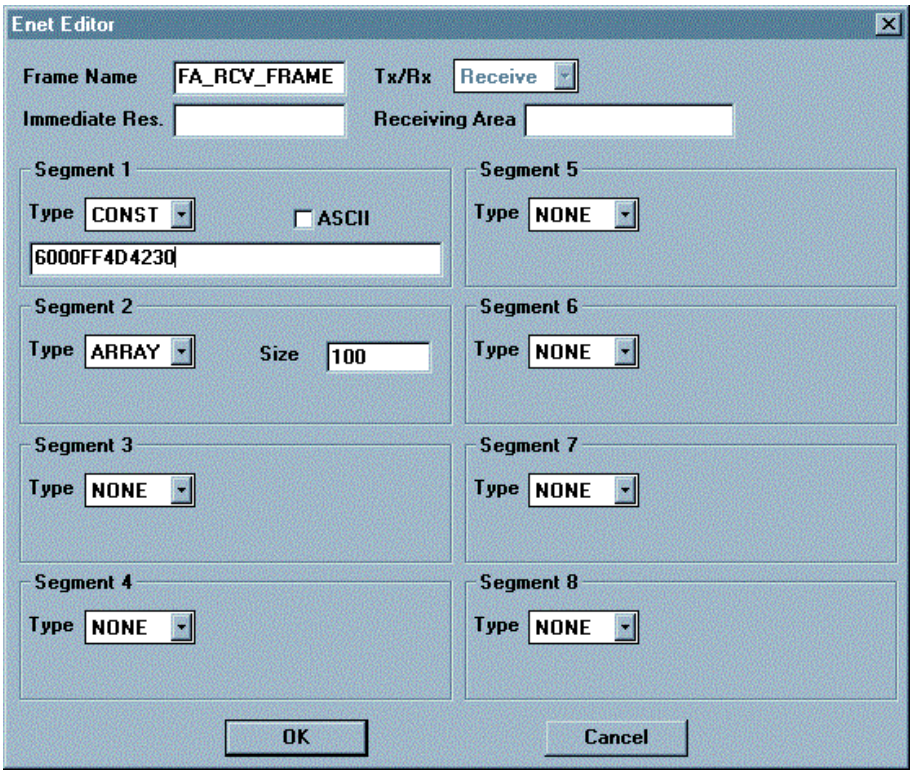
Figure 8.3.2(A)-(C) is showing a setting example of frame editor to perform the above program. Here, an example shows a kind of frame to communicate with PLC of another company.



[Figure 8.3.2(A)] Frame Editor



[Figure 8.3.2(B)] An Example of Receive Frame Registration



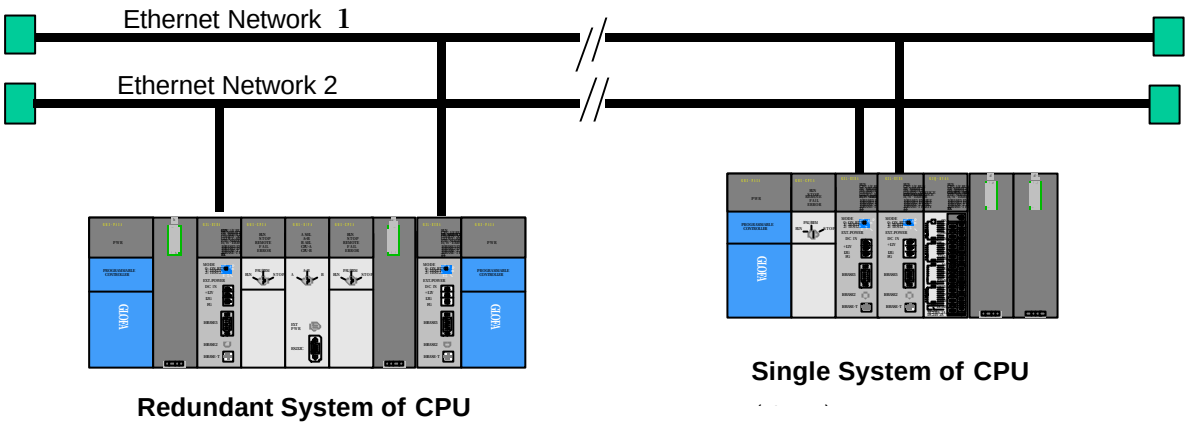
[Figure 8.3.2(C)] An Example of Receive Frame Registration

8.4 Function Block Service of Redundancy System

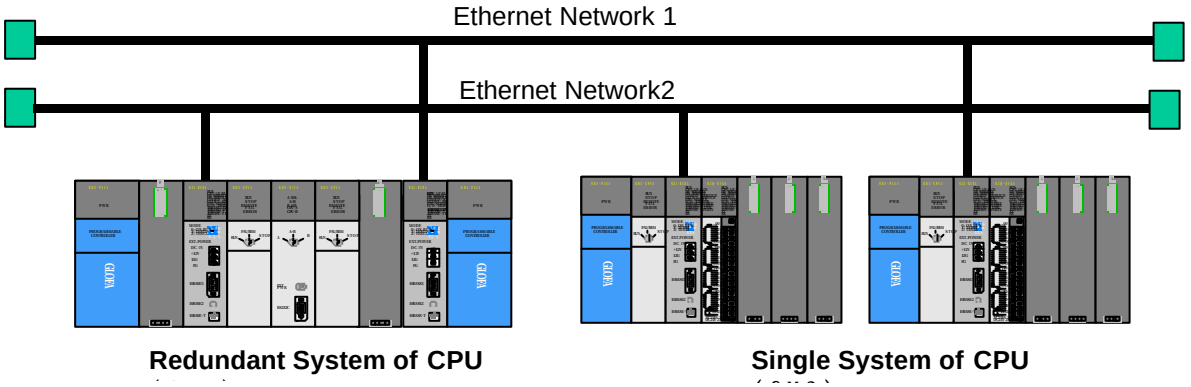
8.4.1 Introduction

1) Introduction

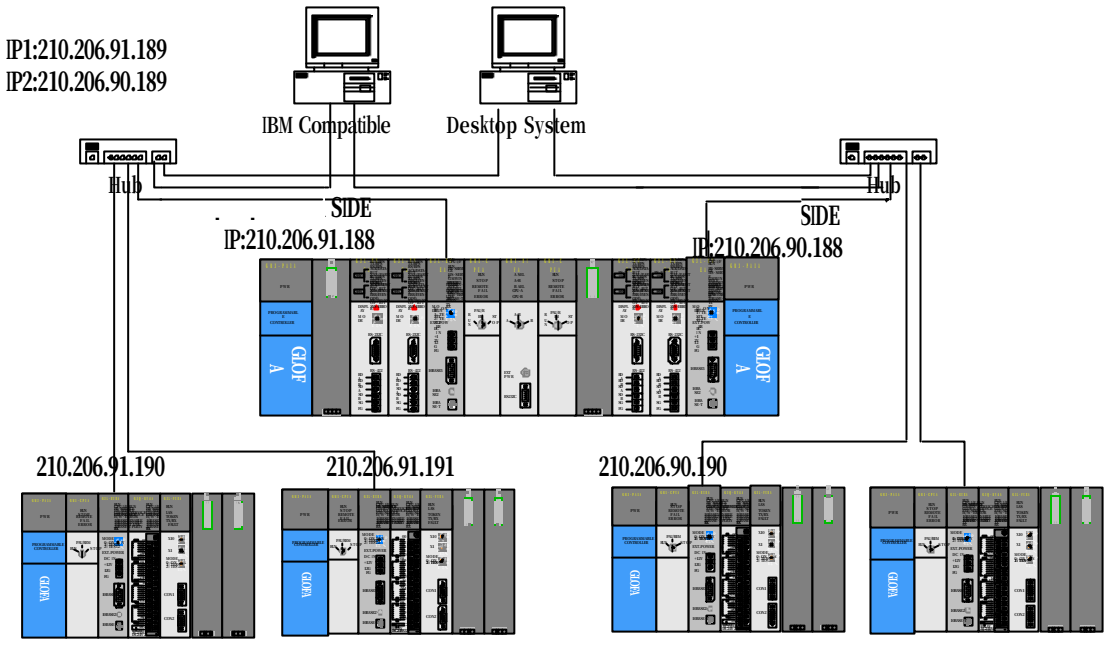
Redundant system of communication using Enet module is **Redundancy of Network** that sends and receives the same data at the same time configuring two networks like the figure 8.4.1(A).



[Figure 8.4.1(A)] An Example of Redundant System



[Figure 8.4.1(B)] An Example of redundant system



[Figure 8.4.1(C)] An Example of Redundant System

2) Characteristics of redundant Function Block

If Function Block is used in redundant system, it has the following characteristics compared with the existing Function Block.

- In redundant Function Block, 2 services perform their services with other communication path at the same time. Therefore, if one side is not in service, the other side is continuing to do the service.
- Basic I/O data is identical to the existing Function Block.
- For action results of dual Function Block, even if only the one of both path succeeds in its service, it outputs with an answer that it is normal.
- Action time of redundant Function Block is a bit loner than the existing Function Block for its data processing.
- The TX/RX size of the dual system is different from that of the single system. (See below)

Total Data Size	GMR CPU	GM1/2/3/4
READ	1024 Bytes	1400 Bytes
WRITE	400 Bytes	1400 Bytes
HS_LINK	120 Bytes	400 Byyes

- The library used when implementing the redundant system is as follows.
  (The name of redundant Function Block is Dxxx. The existing Function Block is xxx.)

Classification	GMR CPU	GM1/2 CPU	GM3 CPU	GM4 CPU
Single System	--	COMMUNI.1FB	COMMUNI.3FB	COMMUNI.4FB
Redundant System	COMMUNI.RFB	COMMUNI.1FB	COMMUNI.3FB	COMMUNI.4FB
	--	DUAL_FB.1FB	DUAL_FB.3FB	DUAL_FB.4FB

[Table 8.4.1(A)] Library of Redundant Function Block

DUAL_FB.xFB is user library edited as redundancy using the existing Function Block.

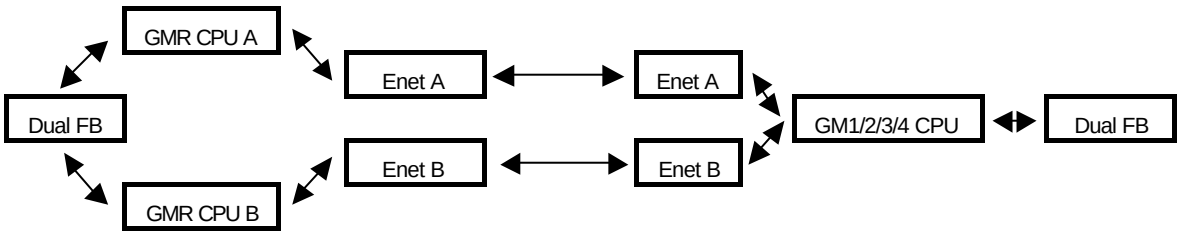
3) The Kind of Redundant Function Block

The redundant Function Block used to edit a program in redundant system is as follows. Its function, type and use are the same as the content written in chapter 8.1.1 ‘ Introduction’ .

Kind	Service
DE_CONN	When logical communication channel is established with destination station.
DTCP_SEND	Sends data of self station using TCP/IP to destination station..
DTCP_RCV	Receives data of destination station using TCP/IP.
DUDP_SEND	Sends data of self station using UDP/IP to destination station.
DUDP_RCV	Receives data of destination station using UDP/IP.

[Table 8.4.1(B)] The Kind of Redundant Function Block

4) Action of the Rredundant Function Block



[Figure 8.4.1(D)] Execution Diagram of Redundant Function Block Service

In the figure 8.4.1(D), two Enet modules are executing the same communication at the same time, but, in user program, they implement it only with dual Function Block.

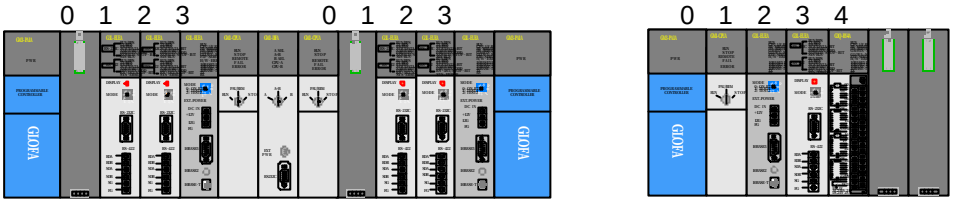
The following describes characteristics on common I/O of each Function Block.

Input

NET_NO:

It specifies slot number, in which communication module is installed, to perform this Function Block out of communication modules installed in the elementary base of PLC of self station. For slot position, slot number ‘ 0’ is next to CPU, and it increases ‘ 1’ by ‘ 1’ . Setting range is 0 to 7.

In case of GM1/2/3/4 in the following figure, slot number of the left module out of two Enet modules is specified. (Two communication modules must be **installed close** each other without fail.)



IP_ADDR, **D_PORT**, **S_PORT**, **CH_NO**:

If you input Function Block for one module of two Enet modules, both modules are applied at the same time.

Output

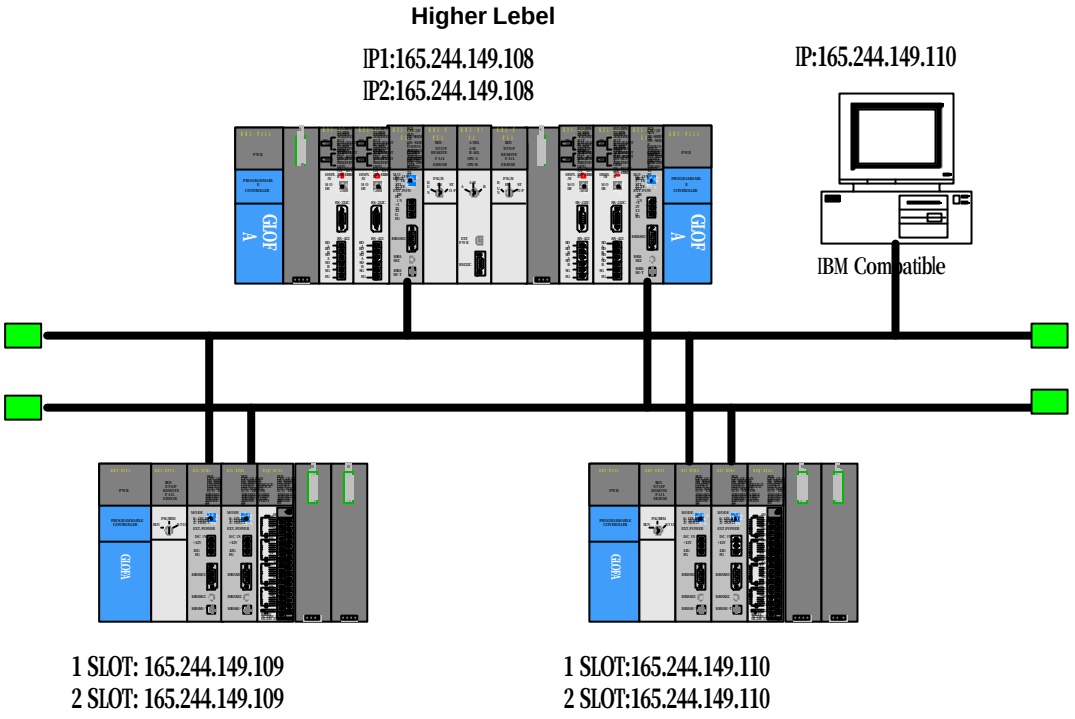
Output shows the result for the other one out of both modules, in which its service is normally performed ahead. If both is all abnormally acting, it shows its result in ERR, STATUS.

Basic operation is identical to the content in chapter 8.1.2 ‘ Kind and Use of Fuction Block’ .

8.4.2 Redundant Function Block Program

1) Redundant System 1

In the following system configured with communication redundancy, Function Block service between GLOFA PLC Enet modules is described with an example. The system configuration of the figure in 8.4.2(A) is an implementation example of network redundancy using two Enet modules in redundant CPU and GM3. (Example of Redundant System 1)



[Figure 8.4.2(A)] Redundant System

Even if programming method of redundant CPU is the same as the existing one, single CPU is programming using redundant Function Block. Now, to send data using TCP/IP is described with an example. Data content to communicate is as following table.

RX/TX Structure		Reading Area	Save Area	Size (Bytes)	Service Channel
Duples CPU (165.244.149.108)	Send Frame:SEND_100	S_DATA	--	100	0
	Receive Frame:RCV_200	--	R_DATA	200	1
GM3 CPU (165.244.149.109)	Send Frame:SEND	S_DATA	--	200	0
	Receive Frame:RCV	--	R_DATA	100	1

Path	Connection Method	Send Frame	Receive Frame
Redundancy -> GM3	TCP_ACTIVE(based on redundancy)	SEND_100	-
Redundancy <- GM3	TCP_PTOSIVE(based on redundancy)	-	RCV_200
GM3 -> Rredundancy	TCP_ACTIVE (based on GM3)	SEND	-
GM3 -> Redundancy	TCP_PTOSIVE(based on GM3)	-	RCV

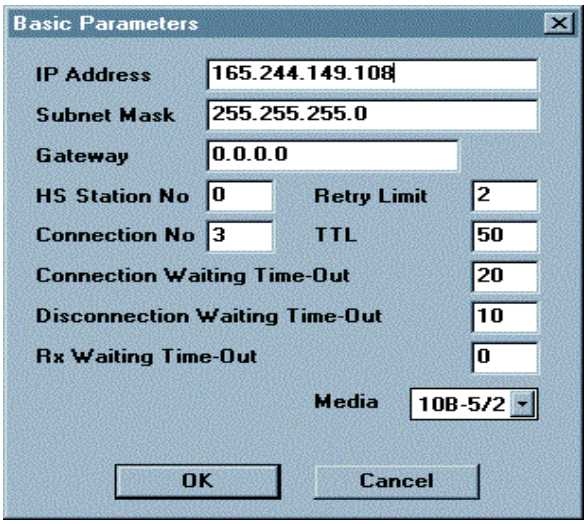
[Table 8.4.2(A)] Data Definition to Communicate

A) Program Editing on redundant CPU(GMR-CPUA) Side

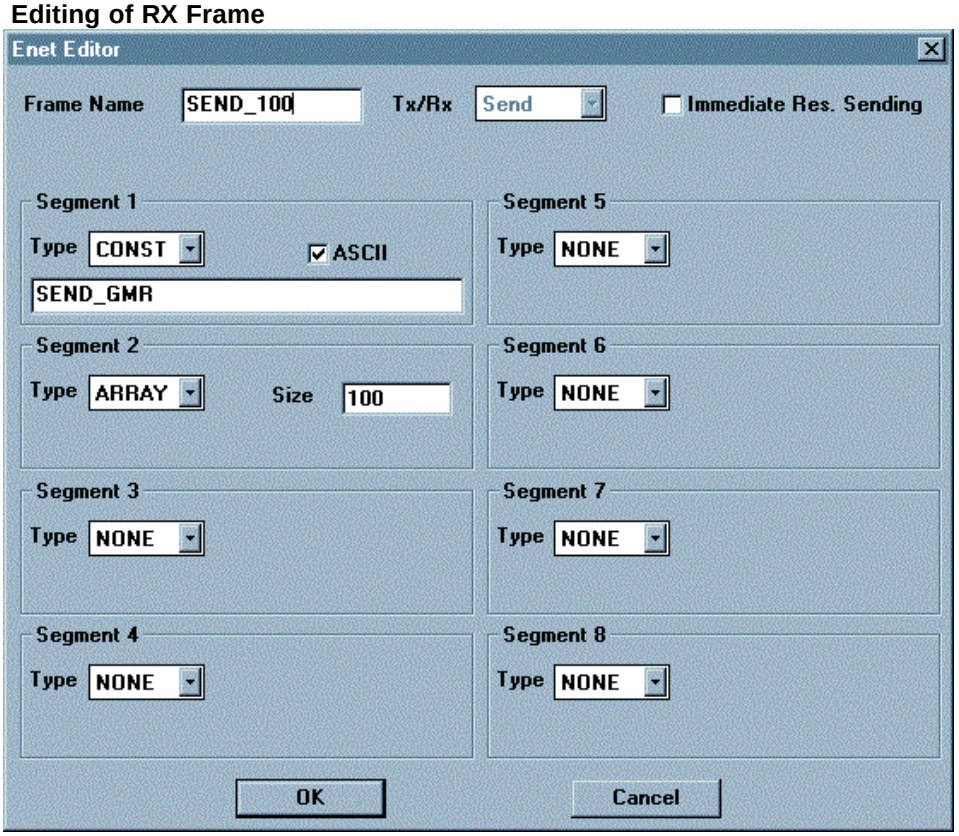
Basic using method is identical to the content written in chapter 8.1.2 ‘ Kind and Use of Function Block’ .

① Edit parameter and frame using frame editor, and write them in each Enet module. When writing them, you have to set CPU mode to ‘ Stop’ . When you finish to write, you have to turn out and then on power again.
(In redundant CPU of GMR, CPU-A and CPU-B are placed on both side. If you download parameter into any one of CPU-A and CPU-B, both CPU posses the content.)

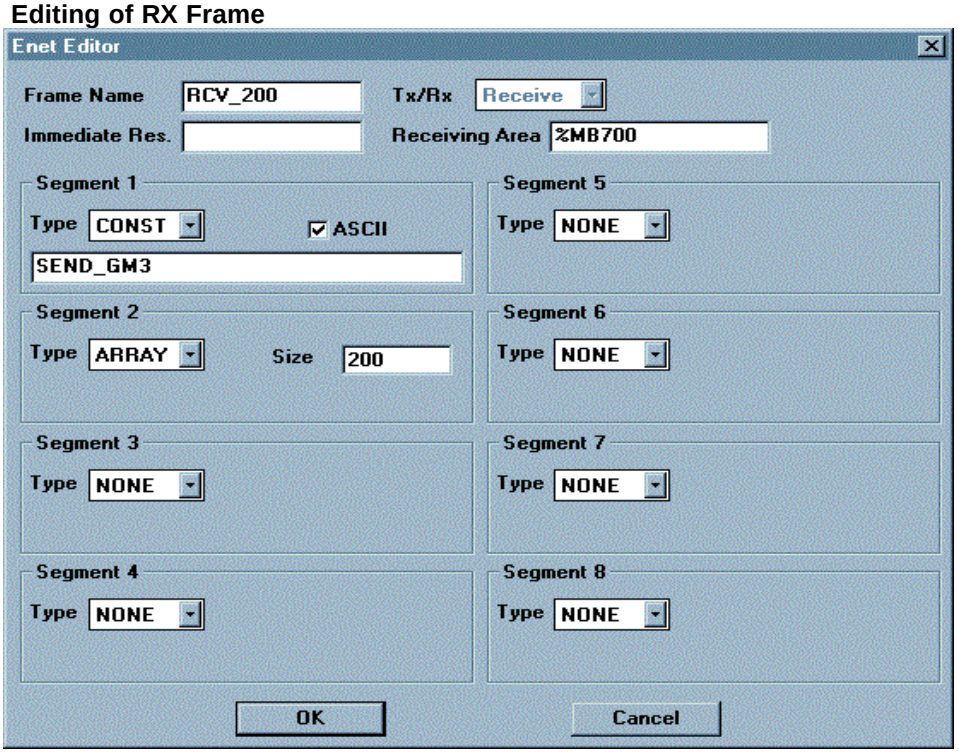
Basic Setting (Setting IP address, Station number of HS_LINK and media)



Editing of RX Frame

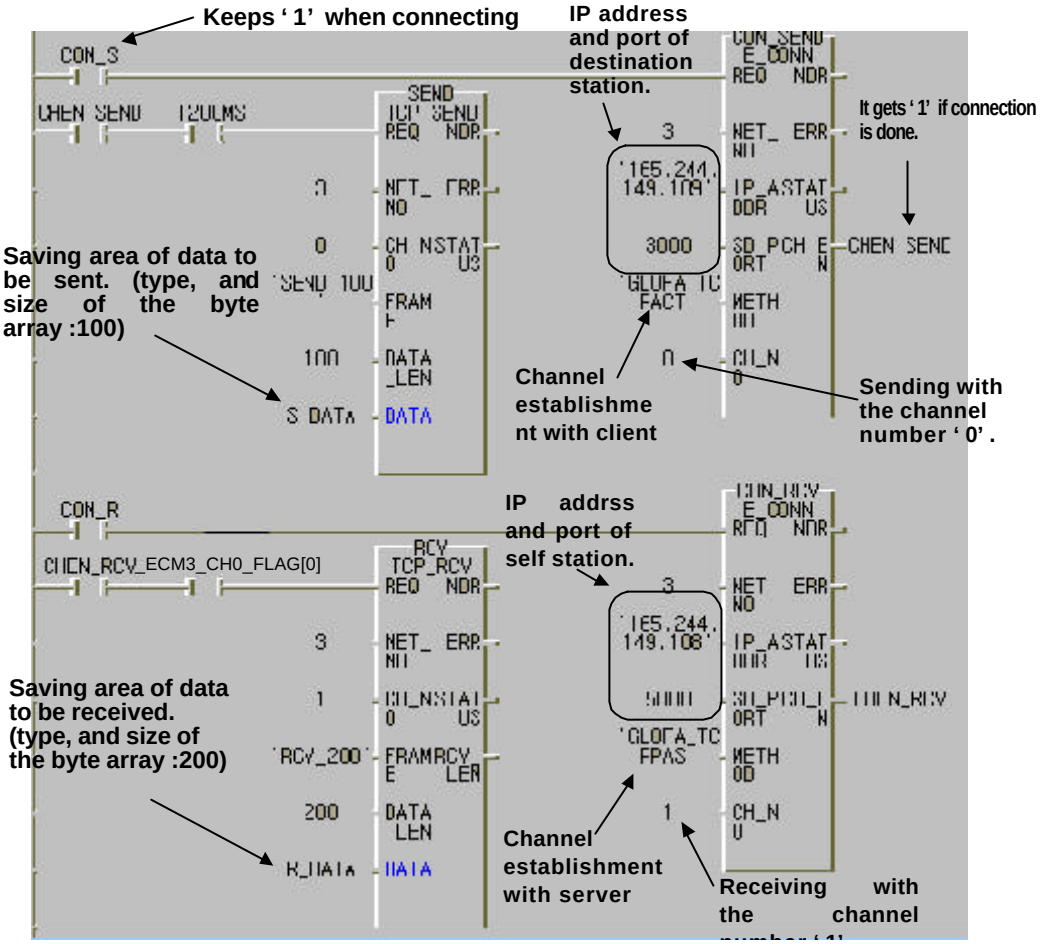


Editing of RX Frame



② Write user program.

(Please use it after you insert library ‘ COMMUNI.RFB’)



③ Write with PLC after Compile/Make.

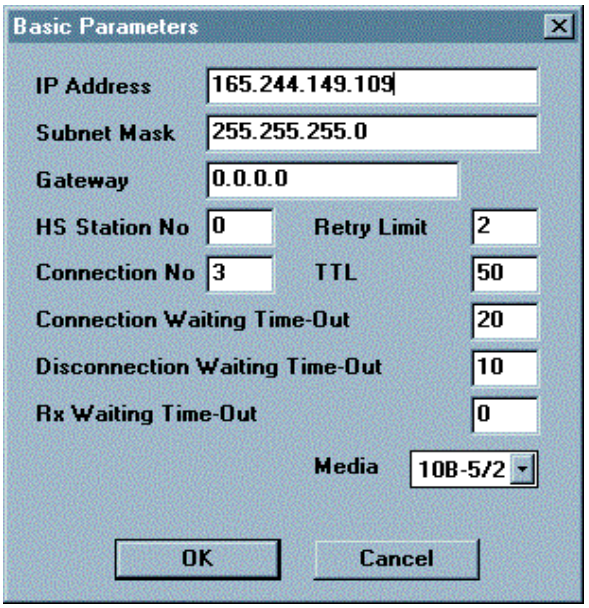
In confirmation of activation for sending, as redundant CPU (self station) acts with TCP ACTIVE toward the destination station (GM3), you should activate the connection of self station (CON_S=1) after being established toward the self station.

In confirmation of activation for receiving, on the contrary, you should activate the self station' s connection (CON_R=1), and then activate the connection of the destination station. In other words, when you do the connection, you should first operate PASSIVE (or SELECT), then ACTIVE.

B) Program editing of single CPU(GM3-CPUA) side

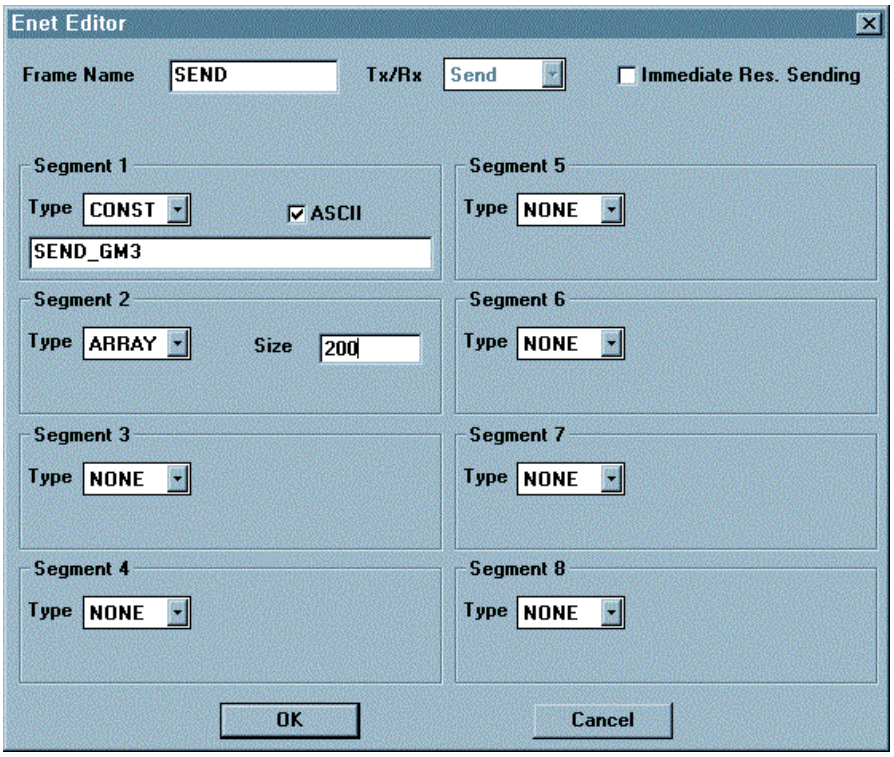
The single CPU is using redundant Function Block in programming unlikely to the existing programming method

① You write them in each Enet module after you edit parameter and frame using the frame editor. When writing, you should stop the CPU mode, and after writing all, you should turn off the power, and then turn it on again. (You should write the program for the first Enet module of two Enet modules. The communication of TX/RX through the second modeul is automatically managed within the Function Block. Two Enet modules must be equipped in Base one after the other.

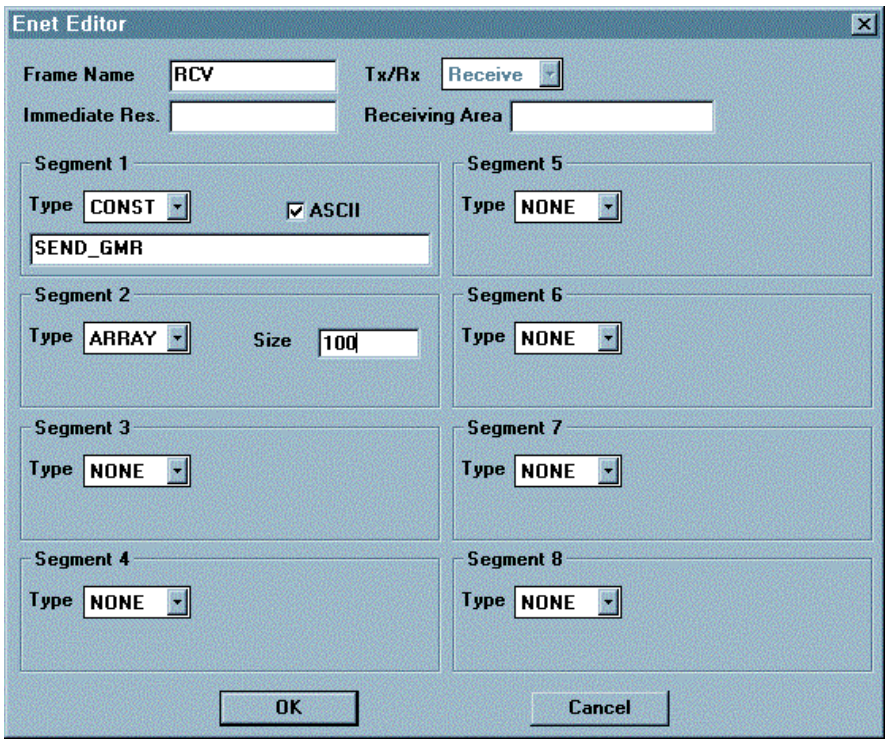


Basic Setting (Setting of IP address and HS_LINK station number and media.,)

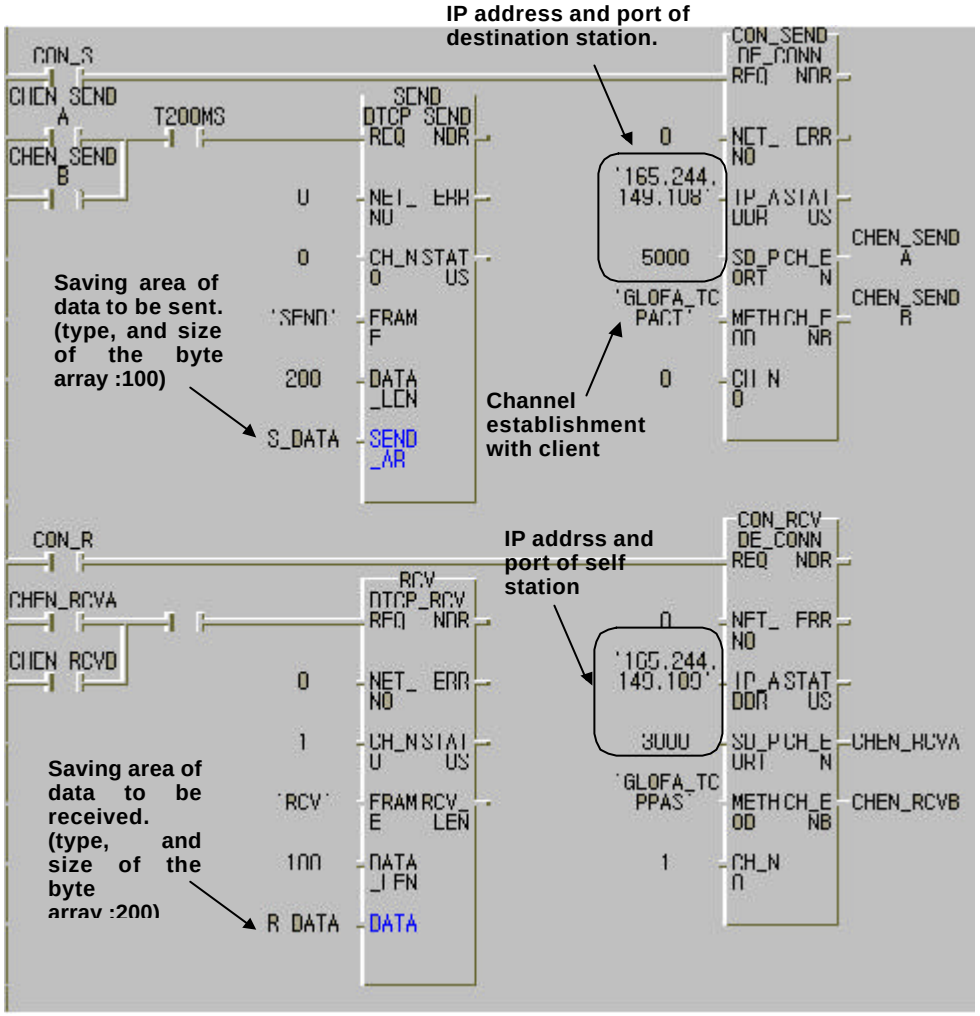
Editing of TX Frame



Editing of RX Frame



② Edit user program.



(Please use it after inserting library ‘ DUAL_FB.3FB’ .)

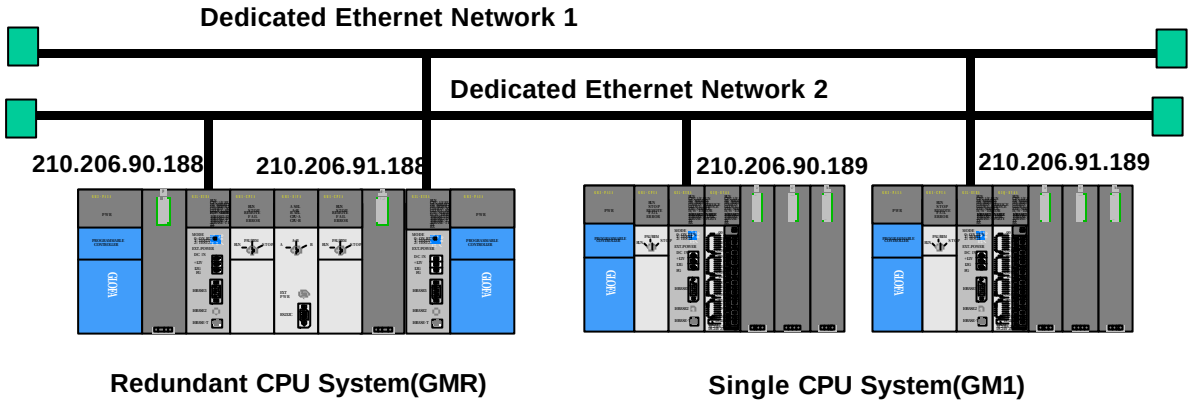
The redundant Function Block outputs ‘ Channel Enable’ in two places. That is the difference from the connection Funnction Block used in the single module. It is the result operated in two Enet mocules, and when one of them or both become ‘ Enable’ , you use it as REQ condition of RX/TX Function Block.

③ In confirmation of activation for sending, as Gm3 (self station) acts with TCP ACTIVE toward the destination station (redundant CPU), you should activate the connection of self station (CON_S=1) after being established toward the self station.

In confirmation of activation for receiving, on the contrary, you should activate the self station’ s connection (CON_R=1), and then activate the connection of the destination station. In other words, when you do the connection, you should first operate PASSIVE (or SELECT), then ACTIVE.

2) Redundant System 2

In the following system configured with communication redundancy, Function Block service between GLOFA PLC Enet modules is described with an example. The system configuration of the figure in 8.4.2(B) is an implementation example of network redundancy using two Enet modules in redundant CPU and GM3. (Example of Redundant System 1)



[Figure 8.4.2(B)] An Example of the Redundant System

Even if programming method of redundant CPU is the same as the existing one, single CPU is programming using redundant Function Block. Now, to send data using TCP/IP is described with an example. Data content to communicate is as following table.

RX/TX Structure		Reading Area	Save Area	Size (Bytes)	Service Channel
Redundant CPU (210.206.90.188) (210.206.90.189)	Send Frame:SEND_100	S_DATA	-	100	0
	Receive Frame:RCV_200	-	R_DATA	200	0
GM1 CPU (210.206.90.189)	Send Frame:SEND	S_DATA	-	200	0
	Receive Frame RCV		R_DATA	100	0
GM3 CPU (210.206.91.189)	Send Frame SEND	S_DATA	-	200	0
	Receive Frame RCV	-	R_DATA	100	0

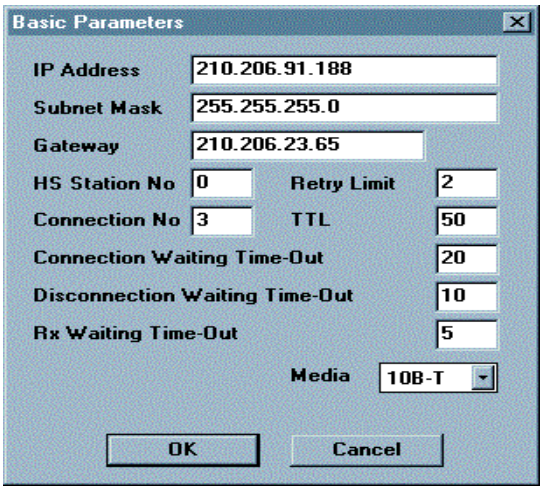
Path	Connection Method	Send Frame	Receive Frame
Redundancy -> GM-0	TCP_ACTIVE(based on redundancy)	SEND_100	RCV 200-
Redundancy <- GM1-1	TCP_ACTIVE(based on redundancy)	SEND_100-	RCV_200
GM-0 -> Redundancy	TCP_PASSIVE (based on GM1)	SEND	RCV-
GM-1 -> Redundancy	TCP_PASSIVE(based on GM1)	SEND	RCV

[Table 8.4.2(B)] Data Definition to Communicate

A) Program Editing on Redundant CPU(GMR-CPUA) Side

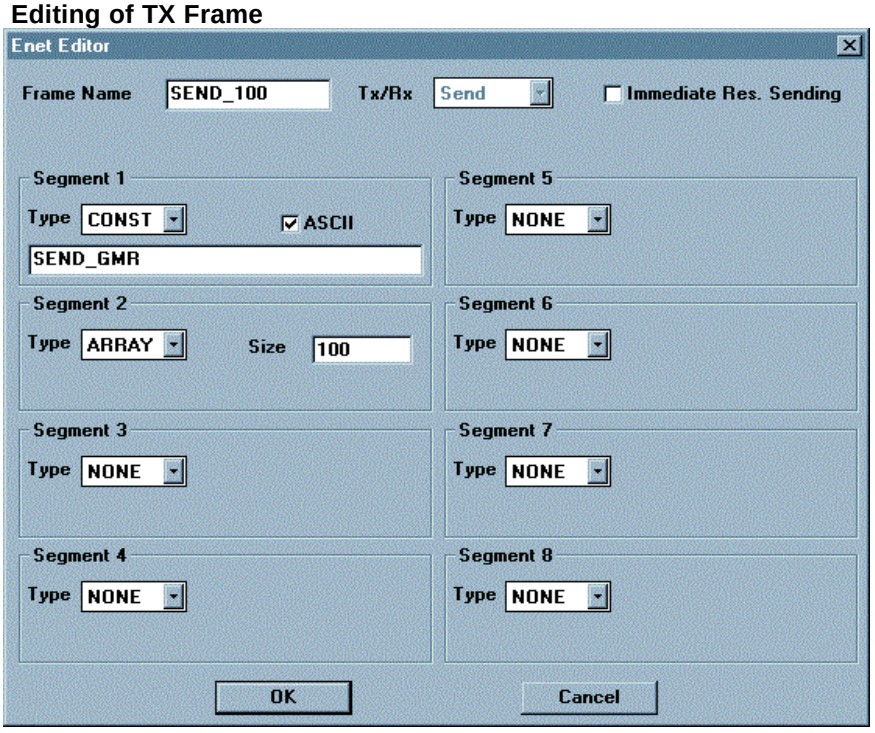
Basic using method is identical to the content written in chapter 8.1.2 ‘ Kind and Use of Function Block’ .

① Edit parameter and frame using frame editor, and write them in each Enet module. When writing them, you have to set CPU mode to ‘ Stop’ . When you finish to write, you have to turn out and then on power again. (Gateway must be set up when using public network)
(In redundant CPU of GMR, CPU-A and CPU-B are placed on both side. If you download parameter into any one of CPU-A and CPU-B, both CPU posses the content.)

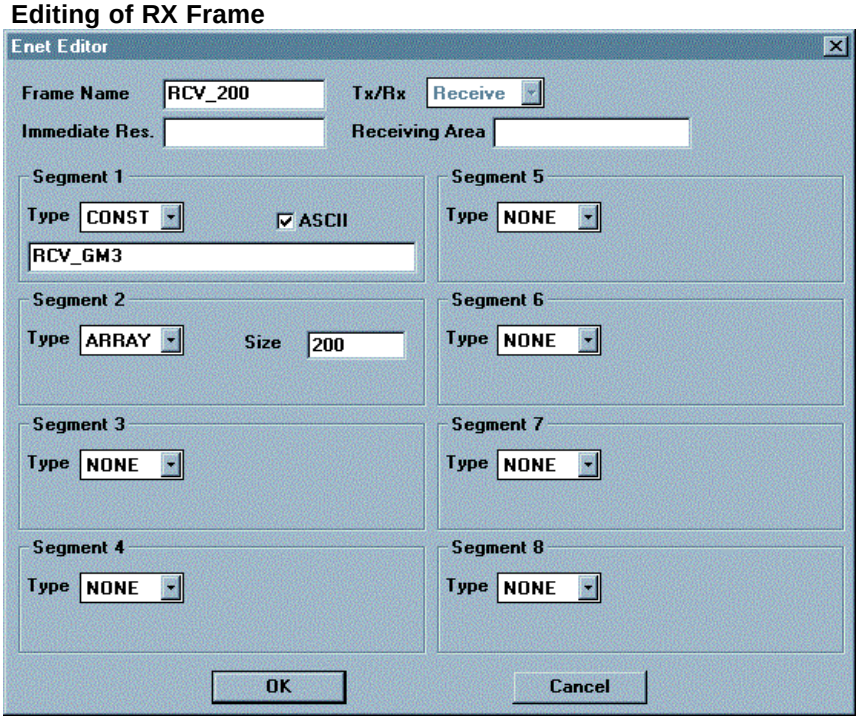


Basic Setting (Setting IP address, Station number of HS_LINK and media)

Editing of TX Frame

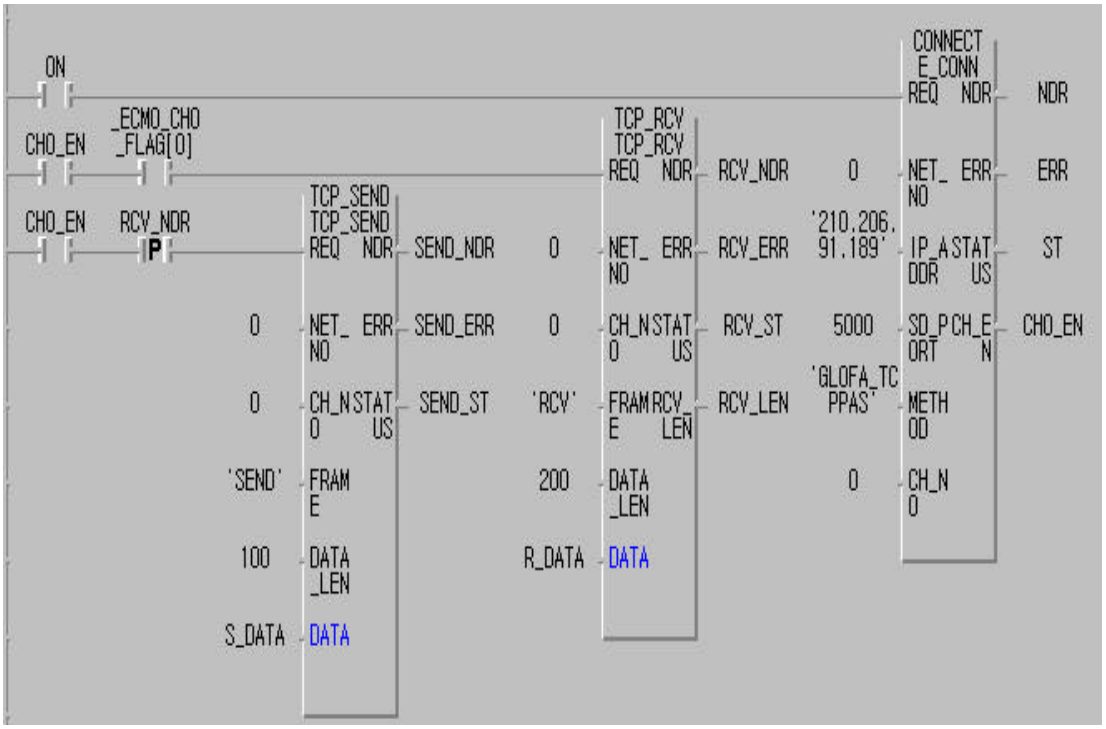


Editing of RX Frame



② Write user program.

(Please use it after you insert library ‘ COMMUNI.RFB’)



③ Write with PLC after Compile/Make.

In confirmation of activation for sending, as redundant CPU (self station) acts with TCP ACTIVE toward the destination station (GM3), you should activate the connection of self station (CON_S=1) after being established toward the self station.

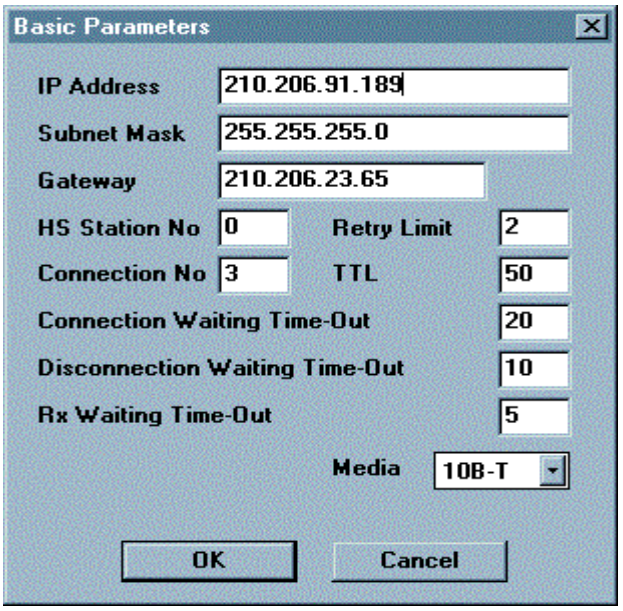
In confirmation of activation for receiving, on the contrary, you should activate the self station' s connection (CON_R=1), and then activate the connection of the destination station.

In other words, when you do the connection, you should first operate PASSIVE (or SELECT), then ACTIVE.

B) Program editing of single CPU(GM3-CPUA) side

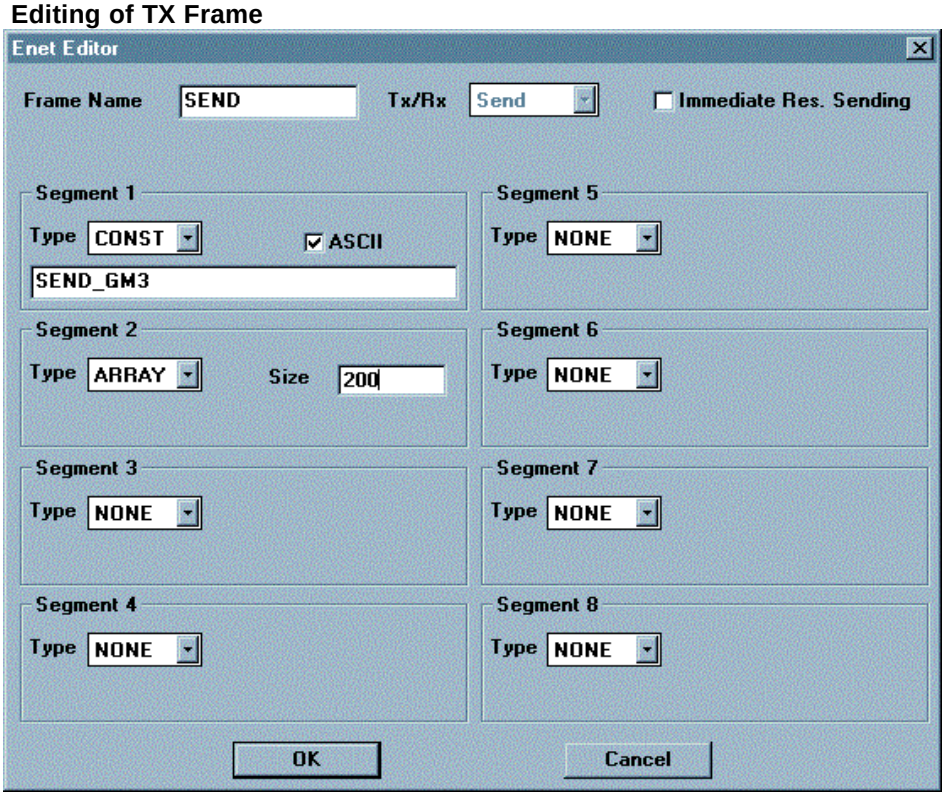
The single CPU is using redundant Function Block in programming unlikely to the existing programming method.

① You write them in each Enet module after you edit parameter and frame using the frame editor. When writing, you should stop the CPU mode, and after writing all, you should turn off the power, and then turn it on again. (You should write the program for the first Enet module of two Enet modules. The communication of TX/RX through the second modeul is automatically managed within the Function Block. Two Enet modules must be equipped in Base one after the other.

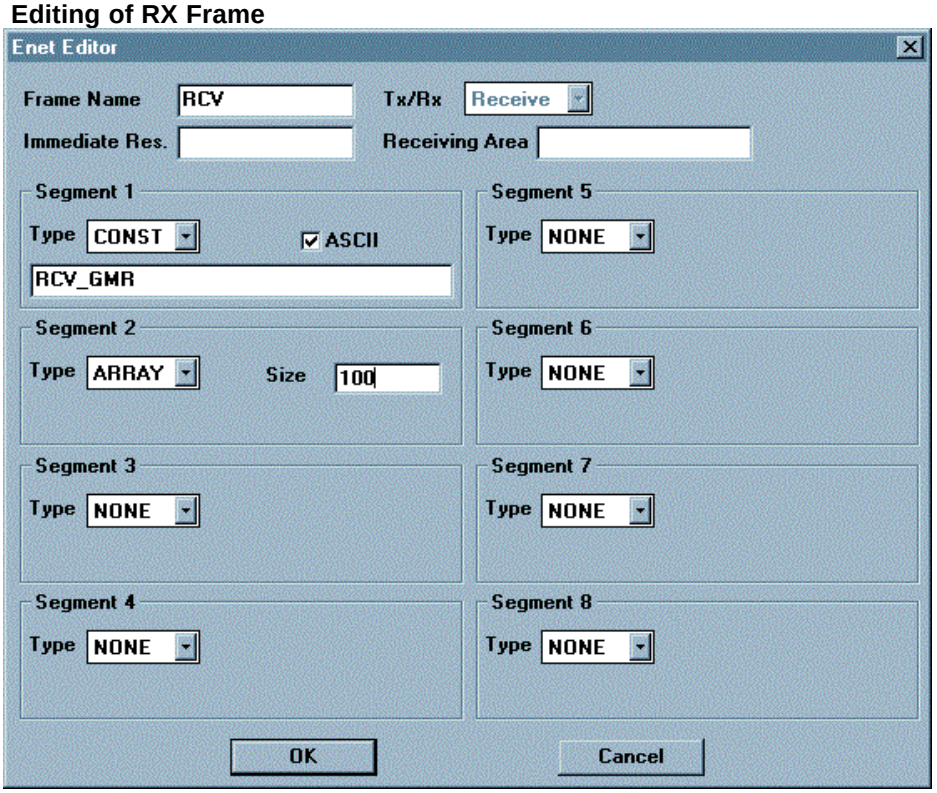


Basic Setting

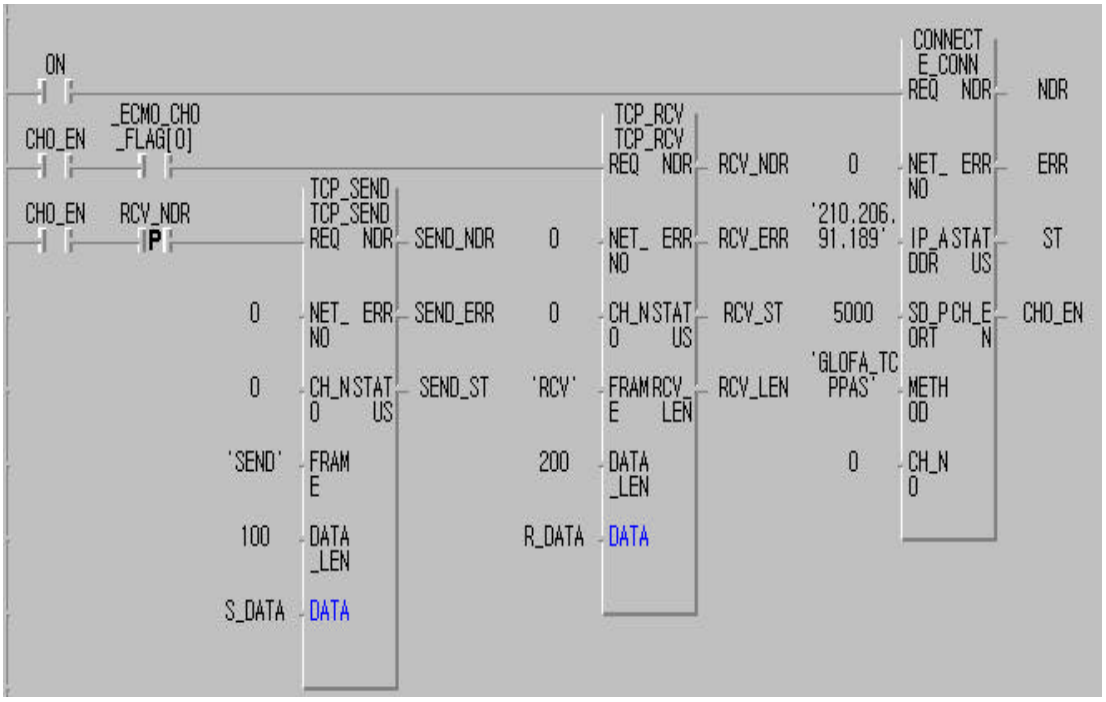
Editing of TX Frame



Editing of RX Frame



② Write user program.
(Please use it after you insert library ‘ DUAL_FB.3FB’)



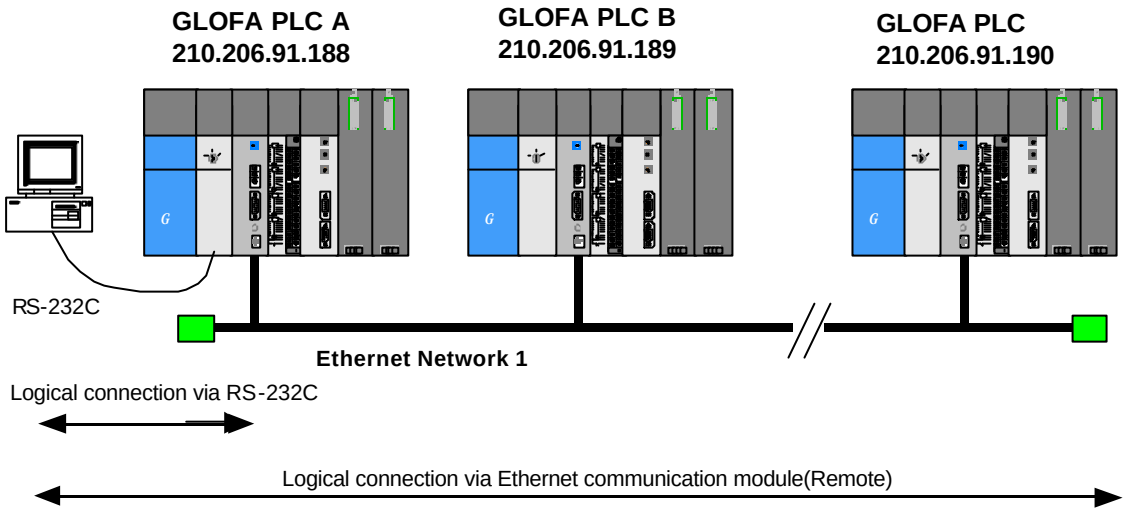
The redundant Function Block outputs ‘ Channel Enable’ in two places. That is the difference from the connection Funnction Block used in the single module. It is the result operated in two Enet mocules, and when one of them or both become ‘ Enable’ , you use it as REQ condition of RX/TX Function Block.

③ In confirmation of activation for sending, as Gm3 (self station) acts with TCP ACTIVE toward the destination station (redundant CPU, you should activate the connection of self station (CON_S=1) after being established toward the self station.
In confirmation of activation for receiving, on the contrary, you should activate the self station’ s connection (CON_R=1), and then activate the connection of the destination station. In other words, when you do the connection, you should first operate PASSIVE (or SELECT), then ACTIVE.

Chapter 9 GMWIN Communication

9.1 Introduction

This function is for programming, download of user program, program debugging, monitoring, etc in network system where PLCs are connected with each other via Ethernet by remote control without moving the physical connection status of GMWIN. Especially, convenient for easy access to each device from a place without repositioning when network-connected devices are separated far. GMWIN communication service function creates the following Logical Path to attain its purpose.



[Figure 9.1(A)] Ethernet Network System

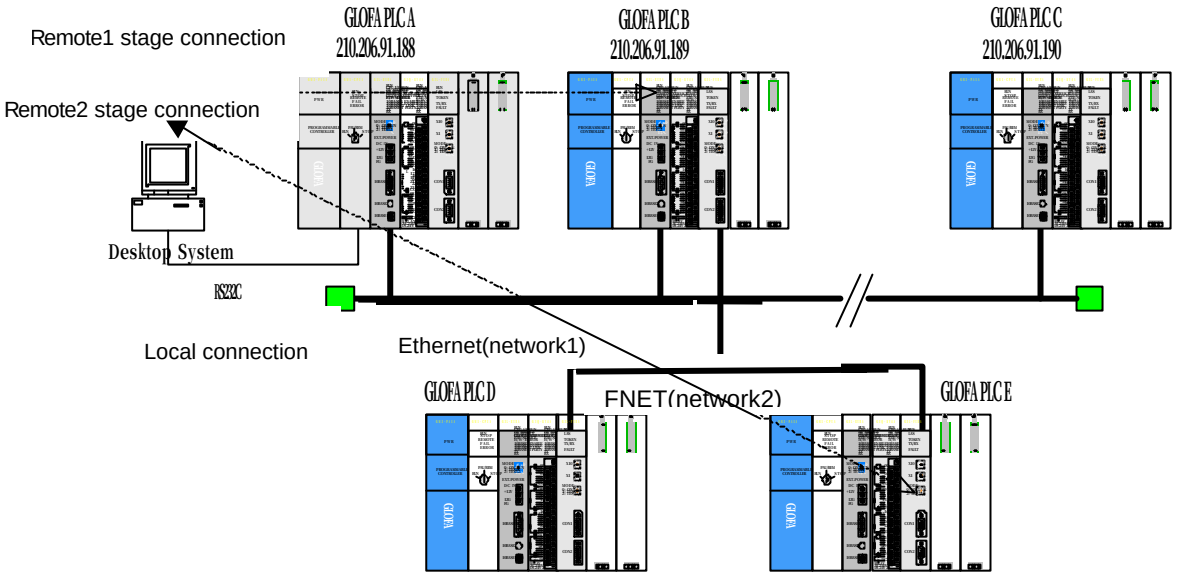
A network is supposed where RS-232C cable is connected to PLC #1 station, and PLC #1, PLC #2 and PLC #N are connected with each other via Ethernet in GMWIN of [Figure 9.1(A)]. To access the contents of PLC #1 station in the figure above, access the contents of local-connected PLC #1 station in GMWIN's online menu. Disconnect PLC #1 station through the menu to access the contents of PLC #N station after the access. Select PLC #N(Station No. : N, PLC #1's Enet slot : 2) from remote connection in the next online menu for logical connection by RS-232C and Ethernet. This status as processed identically to connection with RS-232C cable as moved to PLC #N station is available to execute all functions of programming, download, debugging and monitoring as in PLC #1.

Also, if Ethernet module is installed on PC where GMWIN is operating as connected with the identical network to PLC, 1st remote connection with PLC is available via Ethernet without local connection via RS-232C.

With the communication service of GMWIN, easy access to PLC position even if hard to reach is available from other PLC without repositioning to the remote PLC, which is useful for re-programming after installed.

9.2 GMWIN Connection

All PLCs connected via GLOFA network is available for connection by GMWIN communication service each other. GMWIN remote connection is composed of remote 1 and 2 connection as described below.

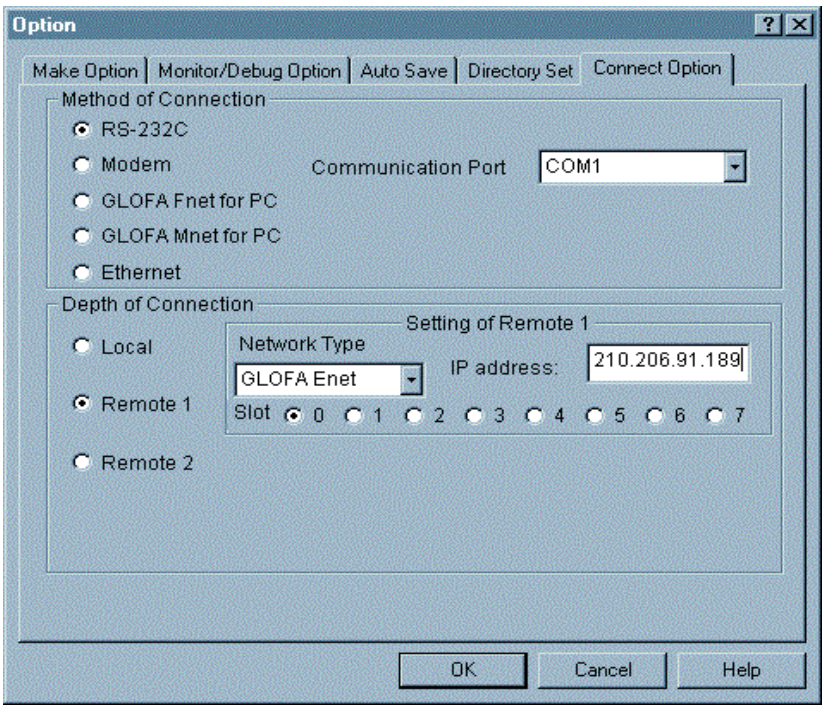


[Figure 9.2(A)] GMWIN remote connection

[Figure 9.2(A)] shows a connection example of remote 1 stage (PLC B) and 2 stage (PLC E) in the system composed of two networks.

9.2.1 Remote1 stage connection (If RS-232C cable used)

For Remote1 stage connection, GMWIN shall be in offline status. Select project option menu bar, to display the following option dialog box from Option, where to select connection option tab.



Setting of connection type It is for setting of local connection type. Local connection is applied with RS-232C in [Figure 9.2(A)]. Select the port used in PC for a communication port. The case with Ethernet will be described in the next section. Refer to user manual of each communication module for the case with other connection types.

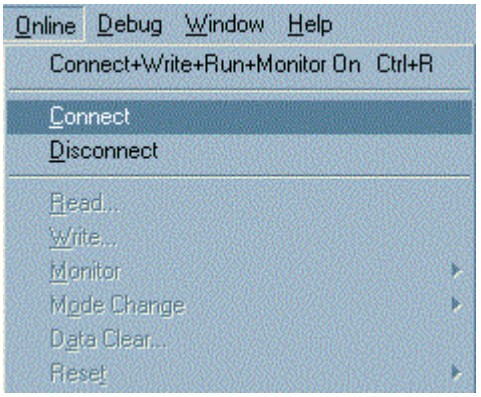
Setting of Connection stage Decide PLC Connection stage of local, remote 1 or remote 2 stage. Select remote 1 stage.

Setting of network type Select network type to be connected at first stage among GLOFA Mnet, Fnet, Cnet, Fdnet and Enet. GLOFA Enet is to be selected because remote 1 stage connection is with Enet in [Figure 9.2(A)].

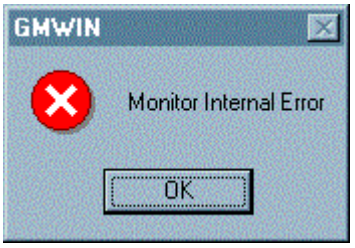
Setting of station No. Select Enet module's IP address installed on other PLC which will be connected at remote 1 stage in network 1. Use IP address, 210.206.91.189 in [Figure 9.2(A)].

Slot It indicates the position of communication module connected to network 1 in local PLC connected via RS-232C. Slect No.0 in [Figure 9.2(A)] as Enet installed on PLC A is on slot No.0.

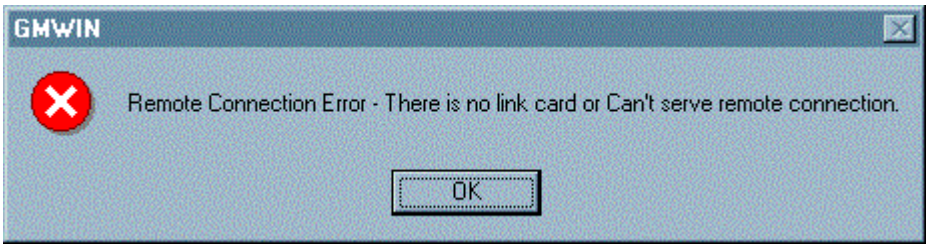
Now select OK and then Connect from online menu.



The messages as below may be displayed if connection failed.

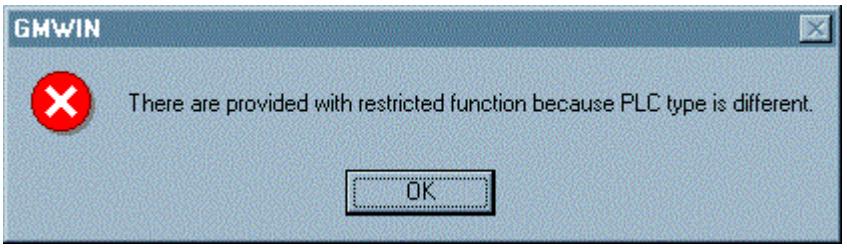


(Error on communication line or internal protocol)



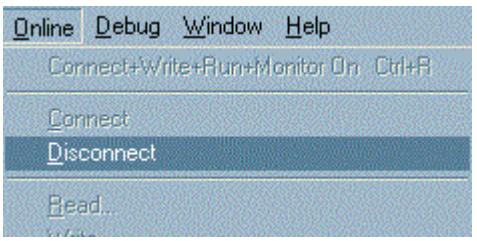
(Error on setting values if unsuitable for remote connection (Project/Option/Connection option))

The following message is displayed if CPU type between the 1 stage connected PLC and presently open project is different from each other, which means limited functions available from online menu.

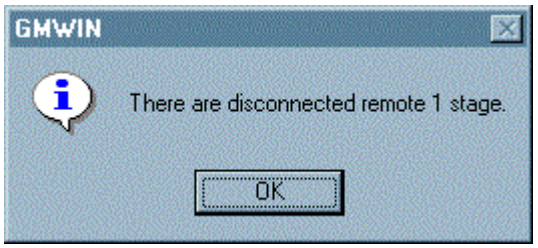


Remote 1 stage connection-completed status is the logical connection status identical to the local connection with RS-232C cable as moved, where all of online menu is available. (Except that CPU type between PLC and presently open project is disagreeable)

Select Disconnect from online menu to let it disconnected after work accomplished at remote 1 stage connection status.



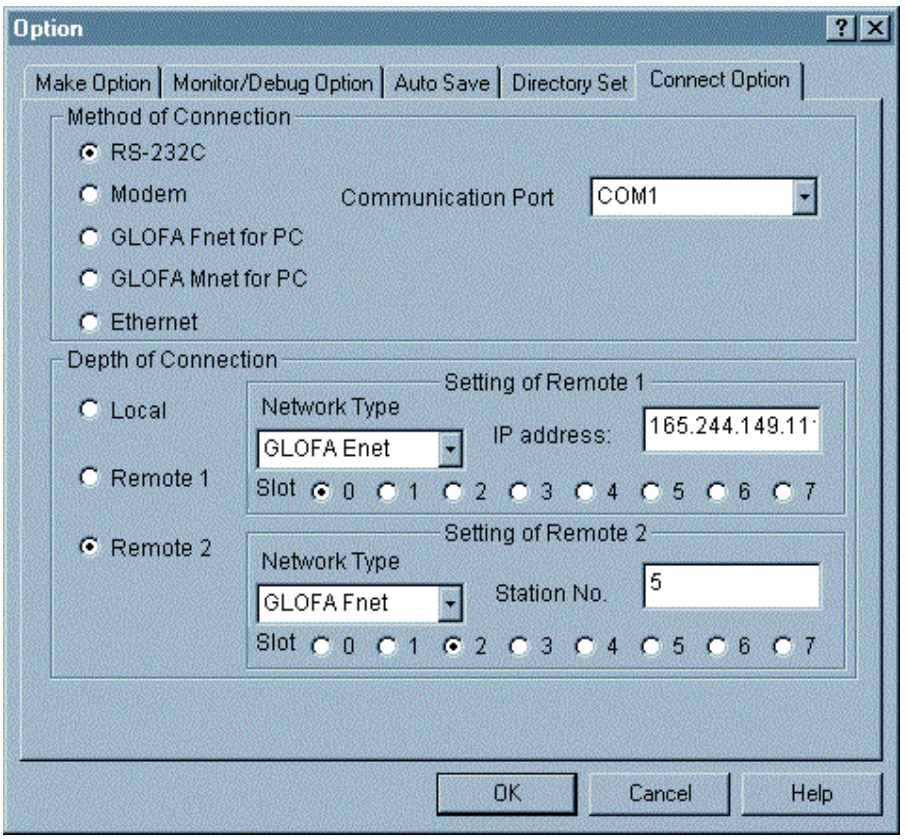
The following OK message will be displayed differently from local connection.



9.2.2 Remote 2 stage connection (If RS-232C cable used)

Select Project/Option/Connection stage from Connection option/remote 2 stage for remote 2 stage connection. [Figure 9.2(A)] shows a connection example with PLC E's Fnet module via PLC B station's Enet module in remote 2 stage connection.

Select remote 2 stage from Project/Option/Connection stage from Connection option to display the following dialog box.



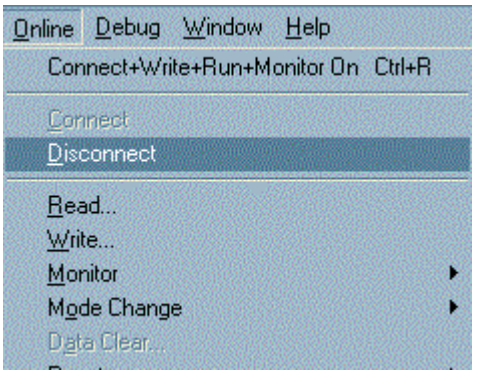
Remote 2 stage only will be described below as the others are the same in the dialog box above.

Setting of network type Select network type to be connected at remote 2 stage among GLOFA Mnet, Fnet, Enet and Fdnet. Network types of remote 1 stage connection and remote 2 stage connection bear no relation to each other. GLOFA Enet is to be selected because remote 1 stage stage connection is with Enet in [Figure 9.2(A)]. Since remote 2 stage connection is by Fnet in [Figure 9.2(A)], remote 2 stage connection shall be by GLOFA Fnet.

Setting of station No. Use the station No. of the module installed on PLC which will be connected at Remote 2 stage in network 2 for remote 2 stage. In this case of [Figure 9.2(A)], use 5 for remote 2 stage as the connection will be performed with module station No. 5 of PLC E.

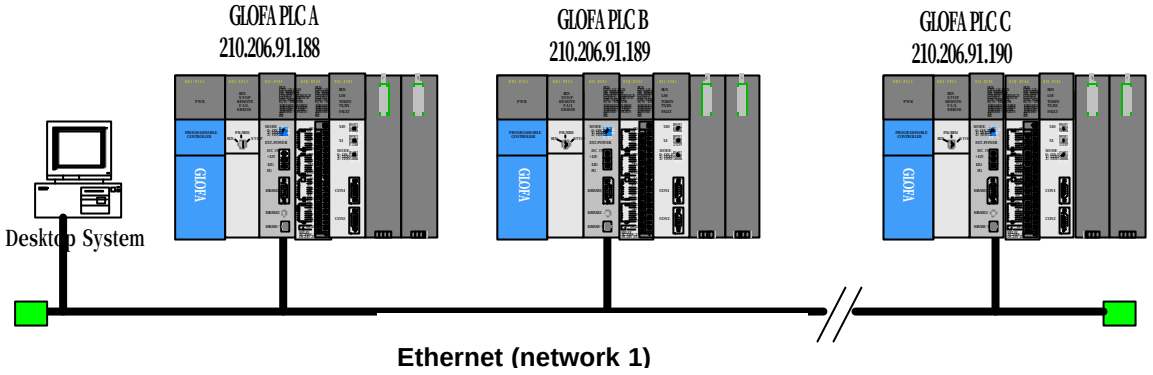
Setting of slot No. Set **the position of the module installed on self-station PLC(PLC B)** which is remote 2 stage-connected in network 2 to the slot No. Select slot No.0 in the case of [Figure 9.2(A)] as it is installed on slot No.0 of PLC B and the station No. of Fnet module is 3.

Remote 2 stage connection-completed status as above is the logical connection status identical to the connection with RS-232C cable as moved to PLC E, where all of online menu is available. Select Disconnect from the following menu to let it disconnected after work accomplished at remote 2 stage connection status.



9.2.3 Remote 1 stage connection directly from PC connected with Ethernet

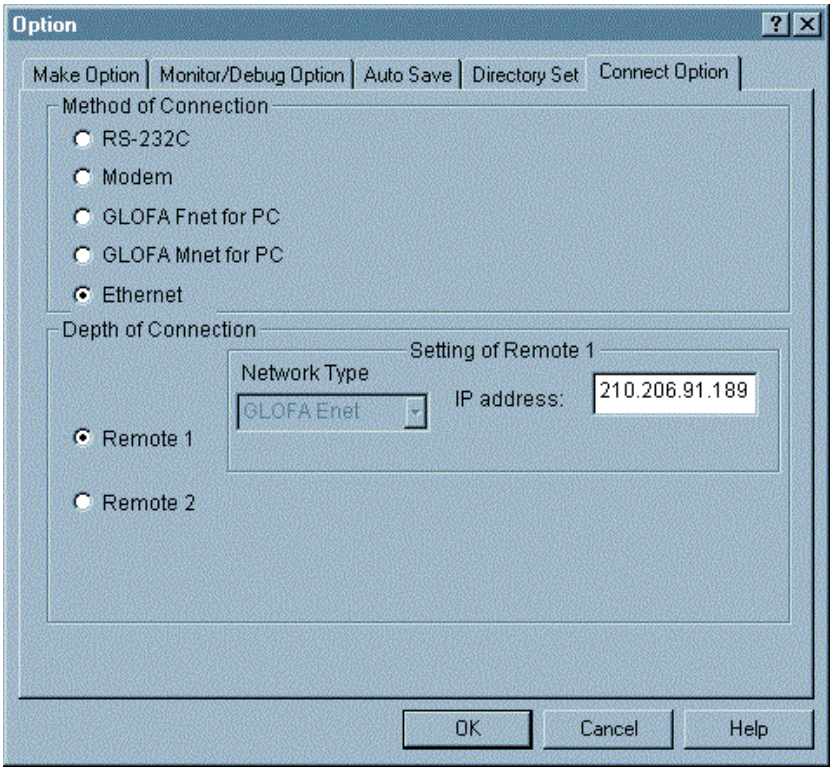
Remote 1 stage connection is available via Ethernet without connecting RS-232C with PLC CPU if PC where GMWIN is operating is connected with PLC and network.



[Figure 9.2.3(A)] Remote 1 stage connection directly from PC

[Figure 9.2.3(A)] shows the connection between PC and PLC via Ethernet, where connection to all PLCs on the network is available without RS-232C used in GMWIN. In this case local connection is omissible and remote 1 stage connection is performed with all PLCs.

Select Project/Option/Connection option and change the setting as specified in the dialog box below to perform remote 1 stage connection directly via Ethernet.

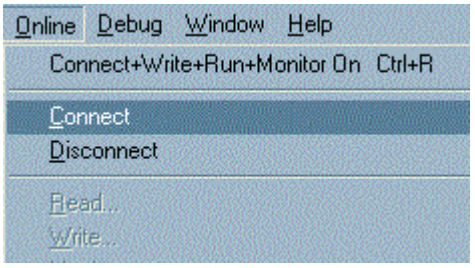


Setting of connection type Select an applicable type for connection. In the case of [Figure 9.2.3(A)], select Ethernet because the connection is performed directly via Ethernet without application of RS-232C.

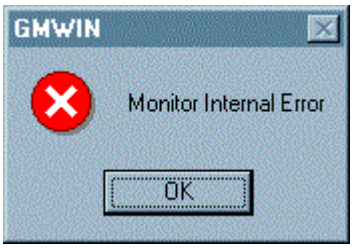
Setting of Connection stage Decide PLC Connection stage of remote 1 or remote 2. Select remote 1 stage in this case.

Setting of IP address Set IP address of Enet module to connect to. Use IP address, 150.150.42.248 to connect to PLC B in [Figure 9.2.3(A)].

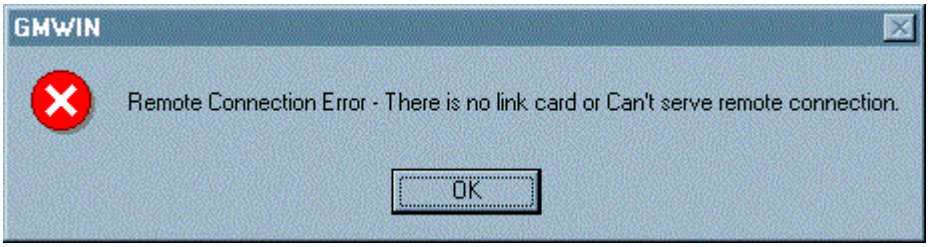
The rest procedures are the same as with RS-232C. Now select OK and then Connect from online menu.



The messages as below may be displayed if connection failed.

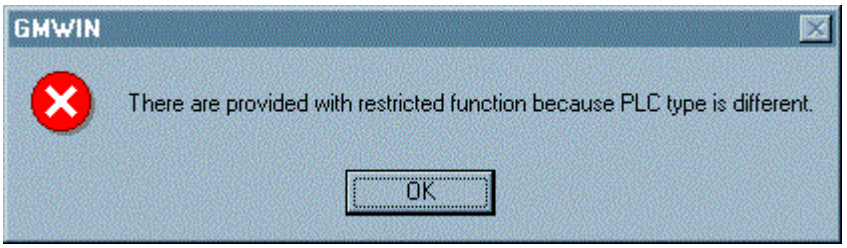


(Error on communication line or internal protocol)



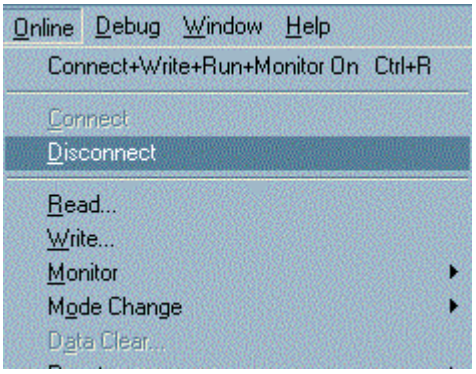
(Error on setting values if unsuitable for remote connection(Projrct/Option/Connection option))

The following message is displayed if CPU type between the 1st connected PLC and presently open project is different from each other, which means limited functions available from online menu.

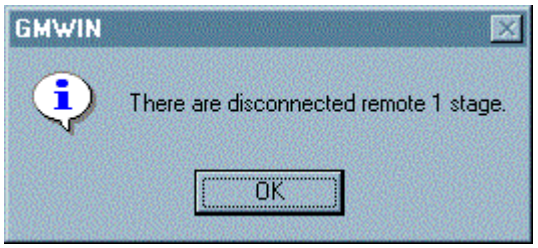


Remote 1 stage connection-completed status is the logical connection status identical to the local connection with RS-232C cable as moved, where all of online menu is available. (Except that CPU type between PLC and presently open project is disagreeable)

Select Disconnect from online menu to let it disconnected after work accomplished at remote 1 stage connection status.



The following OK message will be displayed differently from local connection.



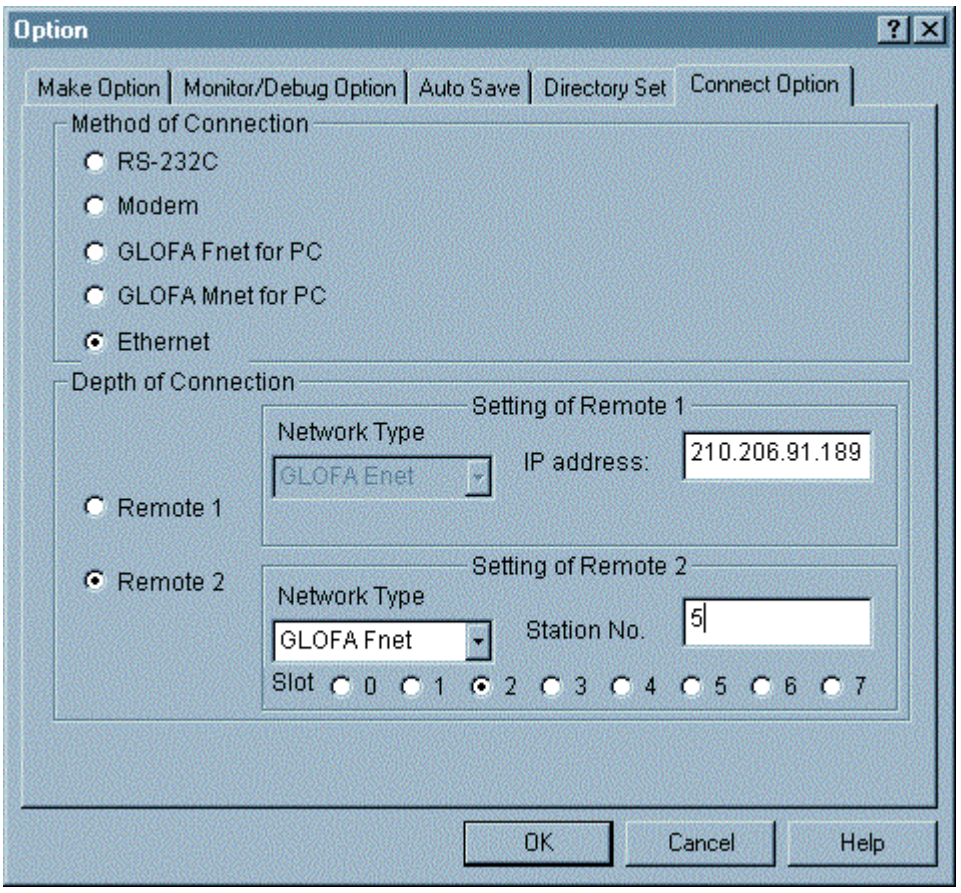
The table below shows connection relationship available between the device (client) which requests connection and the device (server) which performs connection as requested with RS-232C cable connected in GMWIN communication service of GLOFA PLC network.

Server / Client	PC-module (GMWIN)	GM1	GM2	GM3	GM4	GM5	GM3 remote I/O	GM4 remote I/O
PC(GMWIN)	×	❍	❍	❍	❍	❍	❍	❍
GM1	×	❍	❍	❍	❍	❍	❍	❍
GM2	×	❍	❍	❍	❍	❍	❍	❍
GM3	×	❍	❍	❍	❍	❍	❍	❍
GM4	×	❍	❍	❍	❍	❍	❍	❍
GM5	×	❍	❍	❍	❍	❍	❍	❍
GM3 remote I/O	×	×	×	×	×	×	×	×
GM4 remote I/O	×	×	×	×	×	×	×	×

[Table 9.2.3(A)] Relationship between GMWIN client and server functions

9.2.4 Remote 2 stage connection directly from PC connected with Ethernet

Remote 2 stage connection is available via Ethernet if PC where GMWIN is operating is connected with PLC and network in the case of [Figure 9.2(A)]. The procedures are the same as in remote 1 stage connection and setting example of connection option is as follows.



1) The following menus are not available if presently open project and remote 1 & 2 stage connected CPU are not agreed with each other in GMWIN.

Precautions for GMWIN Remote stage 1 & 2 connected operation

A) Write program and each parameter
B) Read program and each parameter
C) Monitor
D) Flash memory
E) Set link enabled
F) I/O information
G) Compulsory I/O information
H) I/O SKIP

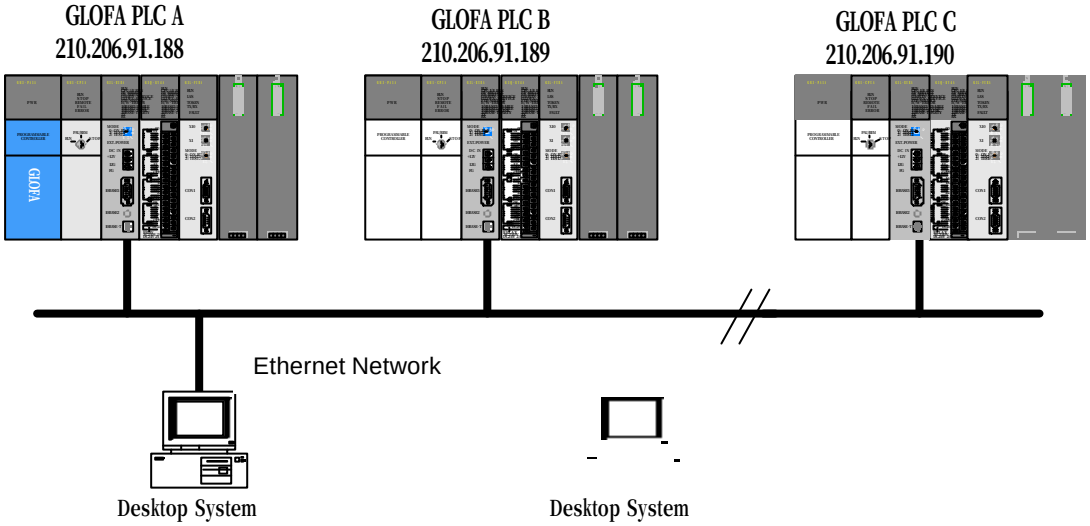
2) Execute remote connection with applicable project open of the station to connect to for GMWIN programming at remote 1 & 2 connection.

3) Remote connection is available up to Remote 2 stage only.

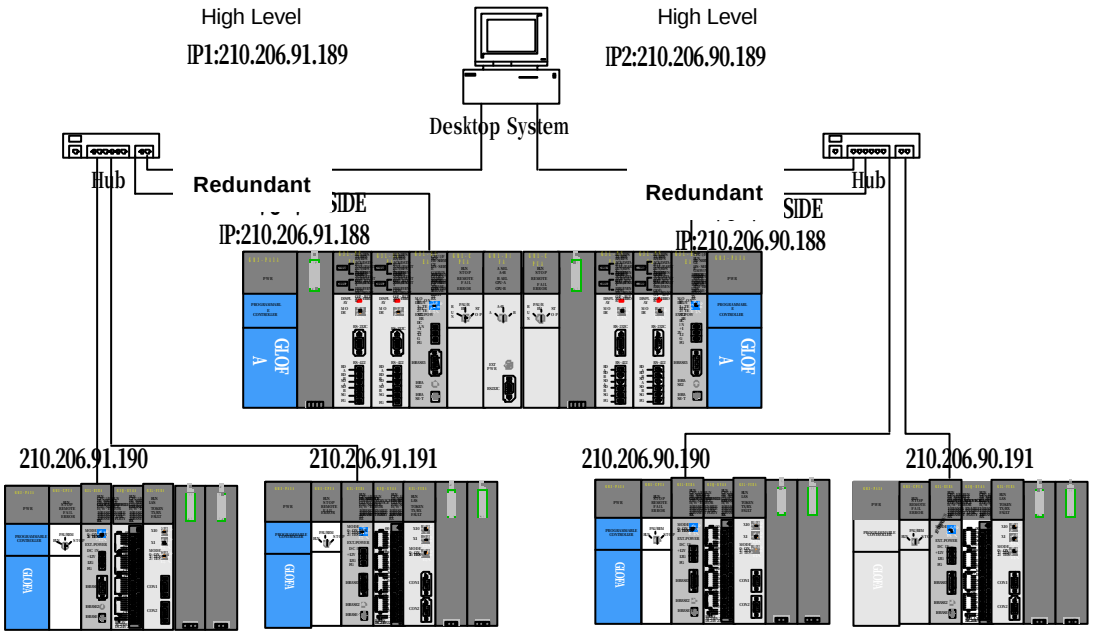
Chapter 10 Dedicated Communication

10.1 Dedicated Communication

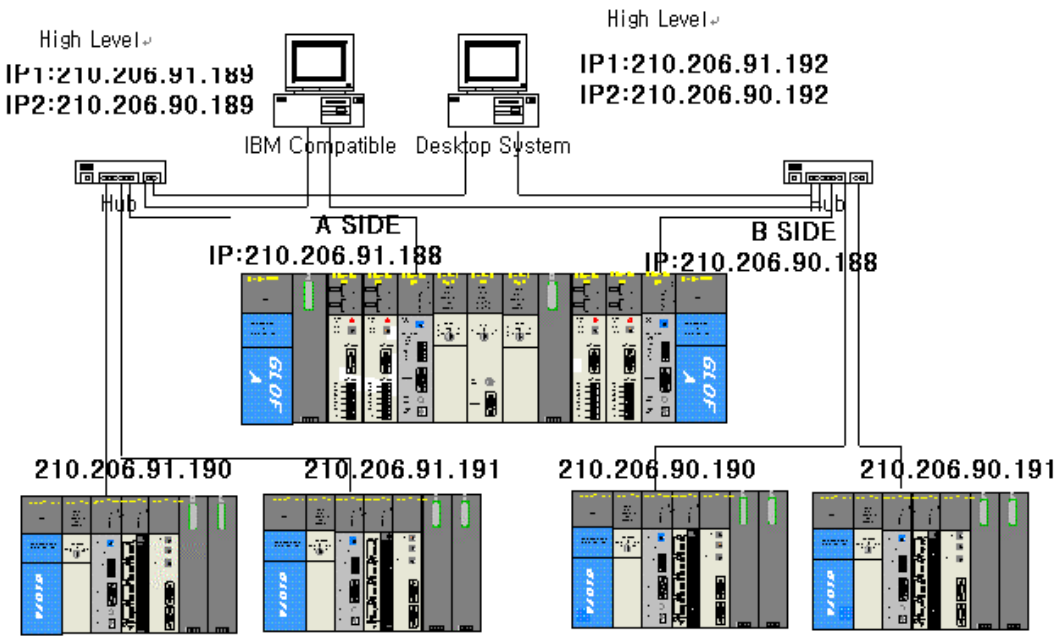
10.1.1 System Configuration



[Figure 10.1.1(A)] Ethernet System Configuration1



[Figure 10.1.1(B)] Ethernet System Configuration 2

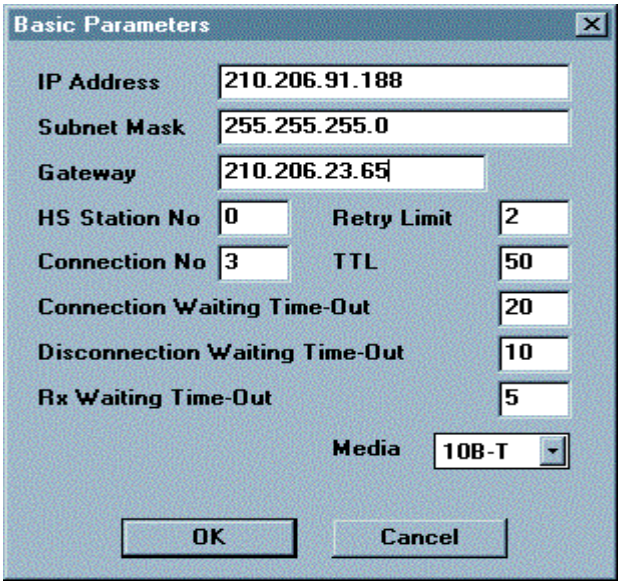


[Figure 10.1.1(C)] Ethernet System Configuration 3

10.2 Description of functions

This service is used to read and write information and data of PLC at PC and peripheral devices through the protocol built in GLOFA Enet module and to control(Run, Stop, Pause) PLC including download/upload of PLC program.
It is available using TCP port 2004 and UDP port 2005 of Enet communication module serviceably for communication between LG Ethernet modules, higher system (PC program, MMI) and LG Ethernet module.

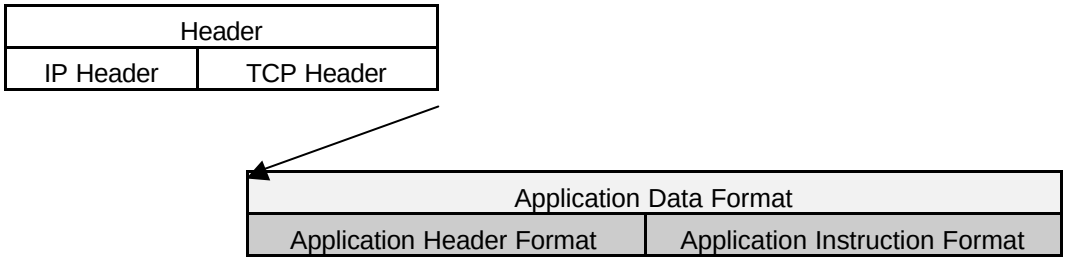
10.2.1 Basic setting of frame editor



Basic parameters shall be surely set and then downloaded for communication by exclusive service as basic parameters are surely to be downloaded and then used for Ethernet communication. The number of exclusive connections in basic parameters of frame editor means the number of channels (MMI connection) engaged via LG exclusive port(2004). Thus, the number of channels connected for LG' s exclusive communication can be modified by changing the number of exclusive connections of frame editor.

10.2.2 Frame structure

Application frame structure of LG GLOFA Ethernet module is as shown below.



1) Header structure(Application Header Format)

Item	Size (byte)	Description
Company ID	10	"LGIS-GLOFA" (ASCII CODE : 4C 47 49 53 2D 47 4C 4F 46 41)
PLC Info	2	* Client(MMI) ➔ Server(PLC) : Don' care (0x00) * Server(MMI) ➔ Client(PLC) : Bit00~05 : CPU TYPE 0(GM1), 1(GM2), 2(GM3), 3(GM4), 4(GM5), 8(GM3 Remote), 9(GM4 Remote) Bit06 : 0 (Duplex Master / single), 1(Duplex Slave) Bit07 : 0(CPU operation normal), 1(CPU operation error) Bit08~12 : System status 2(STOP), 4(RUN), 8(PAUSE), 10(DEBUG) Bit13~15 : Enet module slot No.
Reserved	1	0x00 : Reservation area
Source of Frame	1	* Client(MMI) ➔ Server(PLC) : 0x33 * Server(PLC) ➔ Client(MMI) : 0x11
Invoke ID	2	ID to distinguish between frames in order (Response frame is sent with this number as attached on)
Length	2	Byte size of application instruction
Reserved	1	0x00 : Reservation area
Reserved (BCC)	1	0x00 : Reservation area (Application Header' s Byte Sum)

2) Basic structure of the frame (Application Instruction Format)

a. Header

Company ID (' LGIS-GLOFA')	PLC information area(2)	Reserved (1)	H33 (1)	Invoke ID (2)	Length (2)	Reservation area (1)	BCC (1)

** Number in ( ) means the number of byte.

- Company ID : ASCII letters, ' LGIS-GLOFA'
- PLC Info : Information area for PLC
- Invoke ID : ID to distinguish between frames in order which can be set at random if command requested. The response frame sends again the received Invoke ID if command requested.(Error checking area at PC or MMI)
- Length : Length of data area following Header among frames.

b. Command request frame (External communication device → Enet module)

Header	Command	Data type	Reservation area (2-byte)	Structured data area

c. ACK response frame (Enet module → External communication device, if data received normally)

Header	Command	Data type	Reservation area (2byte)	Error status (2-byte h' 0000)	Structured data area

d. NAK response frame(Enet module → External communication device, if data received abnormally)

Header	Command	Data type	Reservation area (2byte)	Error status (2-byte: Not h' 0000)	Error code (1-byte)

Remark

Note1) Such ' h' ' or ' 0x' indicates that the data is hexadecimal if it is as used in front of the figures in the frame like 01, h' 12345, h' 34, 0x12 and 0x89AB.

10.2.3 Commands list

Commands used in exclusive communication service are as shown in the table below.

Command	Command code	Data type	Proceeding
Read	Request : h' 0054 Response : h' 0055	Separate	Reads data according to data type of direct variable such as Bit,Byte Word, Dword & Lword and named variable (Named variable to read is surely to be registered in access variable area).
		Continual	Reads direct variable of byte type in block unit (Max. 1,400 byte).
		Array	Reads data of array named variable. (Named variable to read is surely to be registered in access variable area)
Write	Request : h' 0058 Response : h' 0059	Separate	Writes data according to data type of direct variable such as Bit,Byte Word, Dword & Lword and named variable (Named variable to write is surely to be registered in access variable area).
		Continual	Writes direct variable of byte type in block unit (Max. 1,400 byte).
		Array	Writes data of array named variable. (Named variable to write is surely to be registered in access variable area)

[Table 10.2.3(A)] Commands list

10.2.4 Data type

Pay attention to data type of direct and named variables to read when direct and named variables are to be read and written.

1) Data type of direct variables

Memory device type of GLOFA GM PLC: M(Buffer memory), Q(Output), I(Input) Memory device type of GLOFA GK PLC: Data type of direct variables of P, M, L, K, C, D, T, S & F is to be displayed in the next place to displaying letter of direct variable, ' %' .

Data type	Application example
Bit	%MX0,%QX0.0.0 %IX0.0.0 ,%PX0,%LX0,%FX0
Byte	%MB10,%QB0.0.0 %IB0.0.0
Word	%MW10,%QW0.0.0 %IW0.0.0,%PW0,%LW0,%FW0,%DW0
Double Word	%MD10,%QD0.0.0 %ID0.0.0
Long Word	%ML10,%QL0.0.0 %IL0.0.0(GM1/2 available only)

[Table 10.2.4(A)] Data type list of direct variables

2) Data type of named variables (only for GLOFA GM)

Set data type to command type if named variables are to be read or written.

Data type	Code	Data type	Code
BIT	h' 00	UDINT	h' 0B
BYTE	h' 01	ULINT	h' 0C
WORD	h' 02	REAL	h' 0D
DWORD	h' 03	LREAL	h' 0E
LWORD	h' 04	TIME	h' 0F
SINT	h' 05	DATE	h' 10
INT	h' 06	TOD	h' 11
DINT	h' 07	DT	h' 12
LINT	h' 08	STRING	h' 13
USINT	h' 09	Continual	h' 14
UINT	h' 0A		

[Table 10.2.4(B)] Data type list of named variables

Set an applicable value to command type according to data type of each element of array for array named variable as shown below.

Data type	Code	Data type	Code
Array BIT	h' 40	Array UDINT	h' 4B
Array BYTE	h' 41	Array ULINT	h' 4C
Array WORD	h' 42	Array REAL	h' 4D
Array DWORD	h' 43	Array LREAL	h' 4E
Array LWORD	h' 44	Array TIME	h' 4F
Array SINT	h' 45	Array DATE	h' 50
Array INT	h' 46	Array TOD	h' 51
Array DINT	h' 47	Array DT	h' 52
Array LINT	h' 48		
Array USINT	h' 49		
Array UINT	h' 4A		

[Table 10.2.4(C)] Data type list of array named variables

Remark

Note1) The name shall be registered in access variable area of PLC program to read or write a named variable. Refer to user manual of GLOFA GM NETWROK or GMWIN for registration procedures.

10.3 Command execution

10.3.1 Separate Read of direct variables

1) Introduction

It is a function to read the variable as ageeable to memory data type with PLC device memory set directly. Upto 16 separate device memories can be read at a time.

2) Request format(PC -> PLC)

Read request of separate variable (MMI ➔ PLC)

Item	Size(byte)	Description	
Command	2	0x0054 : Read Request	
Data type	2	Refer to the table of Data type	
Reservation area	2	0x0000 : Don' t Care.	
Number of variables	2	Max. number of variables to read is 16	
Variable length	2	Max. length of variable is 16 letters	Repeatedly (Max.16) as many as the number of variables
Variable	Variable length	Variable name, direct variable & access variable are available.	
…	…	…	
Length of variable name	2	Max. number of variables to read is 16	
Variable	Variable length	Variable name, direct variable & access variable are available.	

1 block(setting available repeatedly upto 16 blocks)

Format name	Header	Command	Data type	Reservat-ion area	Number of blocks	Variable length	Direct variable	……
Code (Ex.)		h' 0054	h' 0002	h' 0000	h' 0001	h' 0006	%MW100	

1 block(setting available repeatedly up to 16 blocks)

* **Number of blocks** : It is to set such number of blocks composed of ' [Variable length][Direct variable]' as is in this request format upto 16 blocks. Thus, the value of [Number of blocks] shall be h' 0001 ~ h' 0010 .

* **Variable length**(Length of direct variable name) : It means the number of letters of the name indicating direct variable where upto 16 letters are allowed. The range of this value is h' 01 ~ h' 10.
* **Direct variable** : It is where the address of variable to read actually is to be input in ASCII within 16 letters. Others than figures, upper/lower case, ' %' and ' .' are not allowed as a variable name.

Direct variables available according to PLC type are as shown in the table below.

Type	Bool	Byte	Word	Double Word	Long Word
GM1	%MX,%QX, %IX	%MB,%QB, %IB	%MW,%QW, %IW	%MD,%QD,%ID	%ML,%QL,%IL
GM2	%MX,%QX, %IX	%MB,%QB, %IB	%MW,%QW, %IW	%MD,%QD,%ID	%ML,%QL,%IL
GM3	%MX,%QX, %IX	%MB,%QB, %IB	%MW,%QW, %IW	%MD,%QD,%ID	--
GM4	%MX,%QX, %IX	%MB,%QB, %IB	%MW,%QW, %IW	%MD,%QD,%ID	--
GM5	%MX,%QX, %IX	%MB,%QB, %IB	%MW,%QW, %IW	%MD,%QD,%ID	--
GM6	%MX,%QX, %IX	%MB,%QB, %IB	%MW,%QW, %IW	%MD,%QD,%ID	--
GM7	%MX,%QX, %IX	%MB,%QB, %IB	%MW,%QW, %IW	%MD,%QD,%ID	--

[Table 10.3.1(A)] Type of direct variable

Remark

Note1) Two byte shall be repositioned as changed without H in front of figures to display hexadecimal word data in the frame above when prepared.
Ex.) h' 0054 ⇒5400

Remark

Note1) Refer to GLOFA PLC technical manual for area setting of each device of GLOFA GM series.

Note2) Device data type of each block shall be surely the same. If data type of the first block is Word and data type of the second block is Double Word, error may occur.

3) Response format(PLC' s ACK response)

Read response of separate variable (PLC ➔MMI)

Item	Size(byte)	Description
Command	2	0x0055 : Read Response
Data type	2	Refer to the table of Data type
Reservation area	2	0x0000 : Don' t Care
Error status	2	Normal if 0, abnormal if not 0
Error information	2	Lower byte is error No. if the error status is abnormal
Number of variables		Number of variables read if the error status is normal.
Data size	2	Byte size of data
data	Data size	Data Read
...	...	
Data size	2	Byte size of data
Data	Data size	Data Read

Repeatedly (Max.16) as many as the number of variables (Max. 16)

Format name	Header	Comm-and	Data type	Reserv-ation area	Error status	Number of blocks	Number of data	Data	...
Code (Ex.)	...	h' 0055	h' 0002	h' 0000	h' 0000	h' 0001	h' 0002	h' 1234	

1 block(Max. 16 block)

* **Number of data** : It means **the number of HEX byte**. The number is decided by memory type(X,B,W,D,L) which is included in the direct variable name of computer requested format.

* **Number of blocks**: It is to set such number of blocks composed of ' [Number of data][Data]' as is in this request format upto 16 blocks. Thus, the value of [Number of blocks] shall be h' 0001~ h' 0010.

Classification	Direct variable available	Number of data(Byte)
Bool(X)	%MX,%QX,%IX,%(P,M,L,K,F,T)X	1 (Lowest bit only valid)
Byte(B)	%MB,%QB,%IB	1
Word(W)	%MW,%QW,%IW,%(P,M,L,K,F,T,C,D,S)W	2
Double Word(D)	%MD,%QD,%ID	4
Long Word(L)	%ML,%QL,%IL	8

[Table 10.3.1(B)] Number of data according to variables

Remark

Note1) Number of data, H04 means that 4-byte hexadecimal (HEX) data (Double Word) is in the data.
Note2) If data type is Bool, the data read is displayed in 1 byte (HEX). Namely, h' 00 is displayed if bit value is 0 and h' 01 is displayed if bit value is 1.

4) Response format(NAK response)

Format name	Header	Command	Data type	Reservation area	Error status	Error code (Hex 1 byte)
Code (Ex.)	...	h' 0055	h' 0002	h' 0000	h' FFFF (which is not 0)	h' 21

Remark

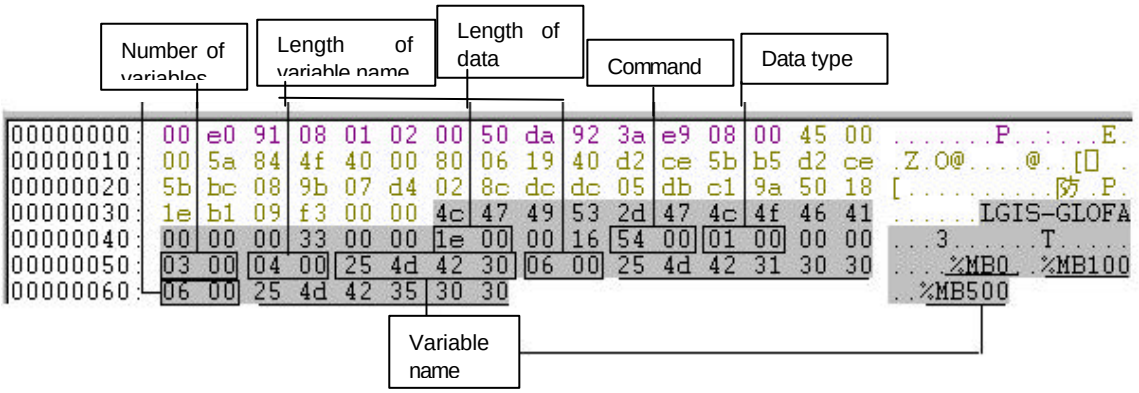
Note1) Error code displays the type of error in 1 byte (HEX).
Refer to' Appendix A3, Error codes' for details.

**** Data protocol on Ethernet**

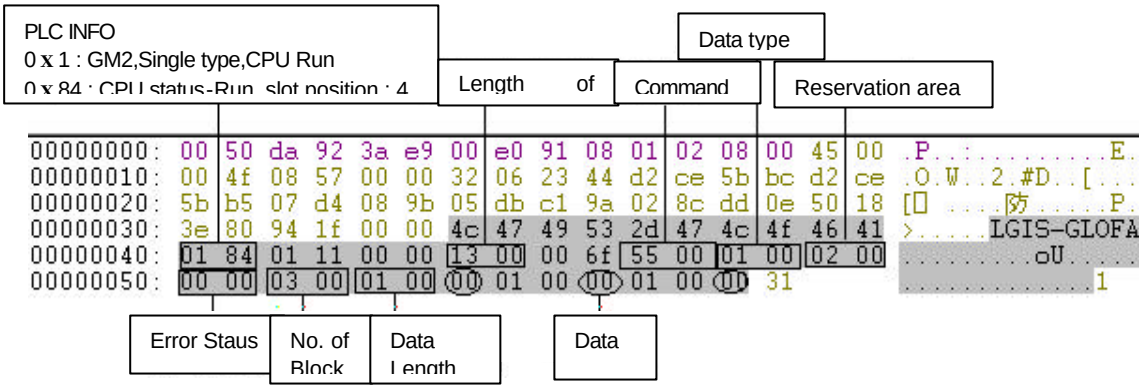
Ex.) Separate Read request frame of direct variables: (Data type:byte)

Number of variables: 3

Variables : %MB0, %MB100, %MB500



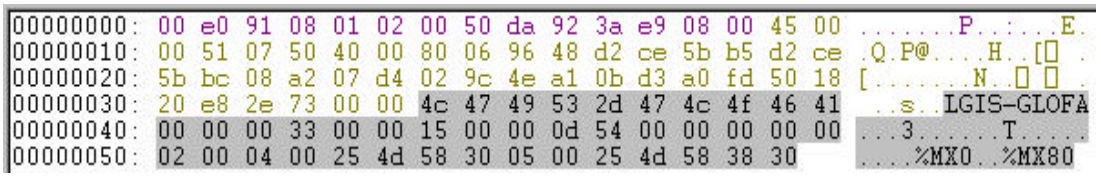
Ex.) Separate Read response frame of direct variables: (Data type:byte)



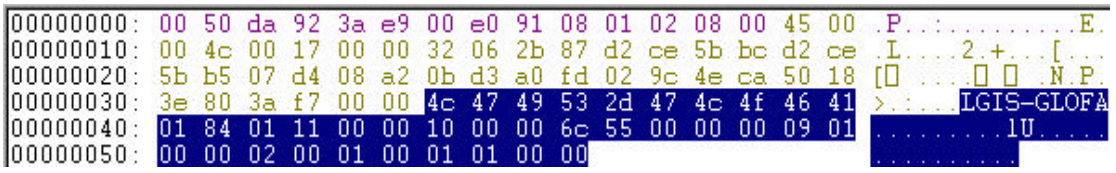
Ex.) Separate Read request frame of direct variables: (Data type : Bool-bit)

Number of variables: 2

Variables : %MX0, %MX80



Ex.) Separate Read response frame of direct variables : (Data type: Bool-bi



10.3.2 Continual Read of direct variables

1) Introduction

It is a function to continuously read data as many as set starting from the assigned address with PLC device memory set directly. However byte type of direct variables only are available.

2) Request format(PC ⇒ PLC)

Format name	Header	Command	Data type	Reserva-tion area	Number of blocks	Variable length	Direct variable	Number of data
Code (Ex.)	...	h' 0054	h' 0014	h' 0000	h' 0001	h' 0006	%MB100	h' 0006

Remark

Note1) Number of data means the number of byte in data (Max. 1,400 byte).

* **Data type** : Data type is available only in h' 0014.
* **Number of blocks** : Number of blocks is available only in h' 0001.
* **Variable length** : It means the number of letters of the name indicating direct variable where up to 16 letters are allowed. The range of this value is h' 0001 ~ h' 0010.
* **Direct variable** : It is where the address of variable to read actually is to be input in ASCII within 16 letters. Others than figures, upper/lower case, ' %' and ' .' are not allowed as a variable name. Direct variables available for continual read according to PLC type are as shown in the table below.

Classification	Byte
GM1	%MB,%QB,%IB
GM2	%MB,%QB,%IB
GM3	%MB,%QB,%IB
GM4	%MB,%QB,%IB
GM5	%MB,%QB,%IB

[Table 10.3.2(A)] Variable area available for continual read

3) Response format(PLC' s ACK response)

Format name	Header	Comm-and	Data type	Reservation area	Error status	Number of blocks	Number of data	Data
Code (Ex.)	...	h' 0055	h' 0014	h' 0000	h' 0000	h' 0001	h' 0006	h' 0123456789AB

* Number of data means the number of HEX byte.

4) Response format (PLC' s NAK response)

Format name	Header	Command	Data type	Reservation area	Error status	Error code (Hex 1 byte)
Code (Ex.)	....	h' 0055	h' 0014	h' 0000	h' FFFF	h' 21

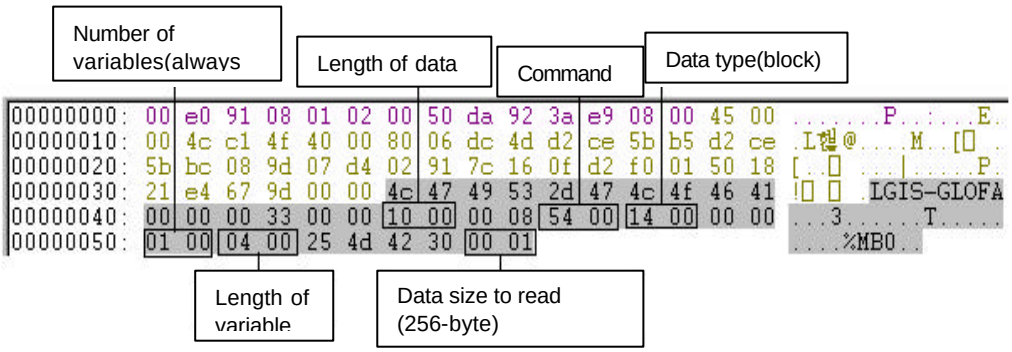
Remark

Note1) Error code displays the type of error in 1 byte (HEX).
Refer to ' Appendix A3, Error codes' for details.

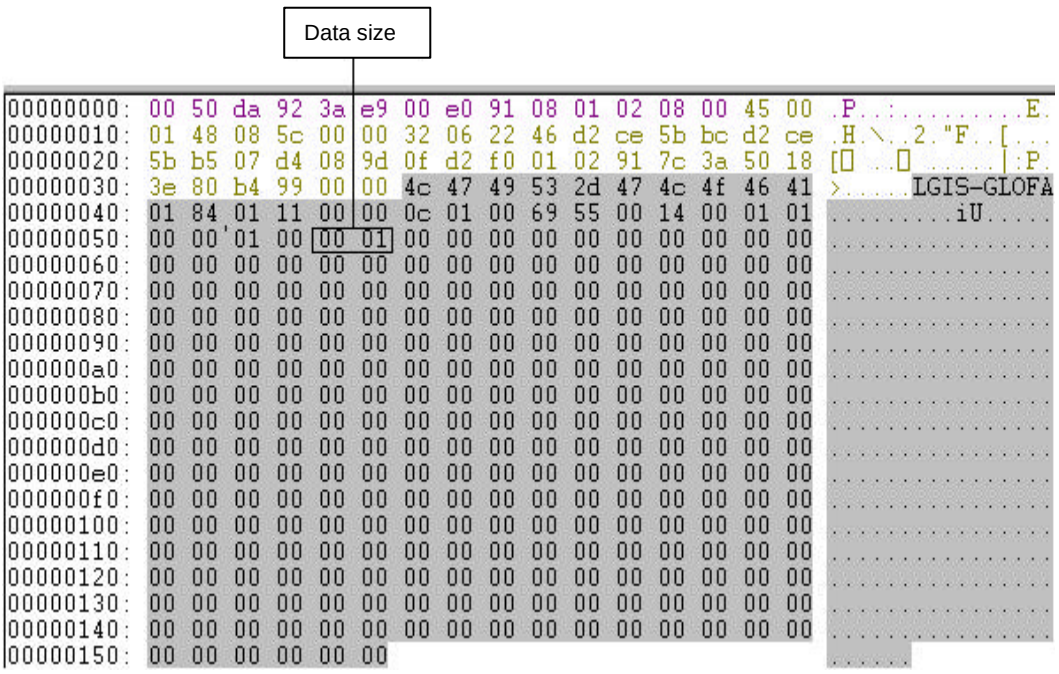
**** Data protocol on Ethernet**

Ex.) Continual Read request frame of direct variables: (Data type : block)

Variables : %MB0, data Size : 0x100(256 byte)



Ex.) Continual Read response frame of direct variables : (Data type : block)



10.3.3 Named variable Read

1) Introduction

It is a function to read data using the registered variable name in access variable area of PLC program. Refer to user manual of GLOFA-GM Fnet(Fieldbus)/Mnet(Mini-MAP) for registration procedures of variables.

2) Request format(PC ⇒ PLC)

a. Separate type

Format name	Header	Command	Data type	Reservation area	Number of blocks	Variable length	Variable name	…
Code (Ex.)	...	h' 0054	h' 0002	h' 0000	h' 0001	h' 08	OUTPUT_1	

1 block(setting available repeatedly up to 16 blocks)

* **Number of blocks** : It is to set such number of blocks composed of ' [Variable length][Variable name]' as is in this request format upto 16 blocks. Thus, the value of [Number of blocks] shall be h' 0001 ~ h' 0010 .

b. Array type (The number of blocks shall be surely 1)

Format name	Header	Command	Data type	Reservation area	Number of blocks	Variable length	Variable name	Number of data
Code (Ex.)	...	h' 0054	h' 0042	h' 0000	h' 0001	h' 000A	OUTPUT_ARR	h' 0004

* **Variable length** : It means the number of letters of the variable name registered in PLC' s access variable area where up to 16 letters are allowed. The range of this value which is converted from Hex to ASCII is h' 01 ~ h' 10.
* **Variable name** : As a variable to read actually it shall be ASCII within 16 letters. Others than figures, upper/lower case, ' %' and ' .' are not allowed as a variable name. Upper and lower cases are used as distinguished but be sure to use ***Upper case*** as PLC access variable names are all upper-cased.

3) Response format(PLC' s ACK response)

a. Separate type

Format name	Header	Comm-and	Data type	Reservat-ion area	Error status	Number of blocks	Number of data	Data	...
Code (Ex.)	...	h' 0055	h' 0002	h' 0000	h' 0000	h' OOO1	h' 0002	h' 1234	

1 block(Max. 16 blocks)

b. Array type

Format name	Header	Comm-and	Data type	Reservat-ion area	Error status	Number of blocks	Number of data	Data
Code (Ex.)	...	h' 0055	h' 0042	h' 0000	h' 0000	h' 0001	h' OOO2	h' 1234

Remark

Note1) Number of data means the number of byte in data.

Note2) If data type is Bool, the data read is displayed in 1 byte (HEX). Namely, h' 00 is displayed if bit value is 0 and h' 01 is displayed if bit value is 1.

4) Response format(PLC' s NAK response)

a. Separate type & array type common

Format name	Header	Command	Data type	Reservation area	Error status	Error code
Code (Ex.)	...	h' 0055	h' 0002	h' 0000	h' FFFF (which is not 0)	h' 21

10.3.4 Separate Write of direct variables

1) Introduction

It is a function to write the variable as ageeable to memory data type with PLC device memory set directly. Upto 16 separate device memories can be written at a time.

2) Request format(PC -> PLC)

Write request of separate variable (MMI ➔ PLC)

Item	Size(byte)	Description	
Command	2	0x0058 : Write Request	
Data type	2	Refer to the table of Data type	
Reservation area	2	0x0000 : Don' t Care.	
Number of variables	2	Max. number of variables to write is 16	
Variable length	2	Max. length of variable is 16 letters	Repeatedly (Max.16) as many as the number of variables
Variable	Variable length	Variable name.	
...	...	...	
Variable length	2	Max. length of variable is 16 letters	
Variable	Variable length	Variable name, direct variable & access variable are available.	
Data size	2	Byte size of data	Repeatedly (Max.16) as many as the number of variables
Data	Data size	Data Write.	
...	...		
Data size	2	Byte size of data	
Data	Data size	Data Write.	

Format name	Header	Com-mand	Data type	Reser-vation area	Num-ber of blocks	Varia-ble length	Direct variable	...	Number of data	Data	...
Code (Ex.)	..	h' 0058	h' 0002	h' 0000	h' 0001	h' 0006	%MW100		h' 0002	h' 1234	

1 block(setting available repeatedly up to 16 blocks)

* **Number of blocks** : It is to set such number of blocks composed of ' [Variable length][Direct variable]' as is in this request format upto 16 blocks. Thus, the value of [Number of blocks] shall be h' 01~ h' 10.

* **Variable length**(Length of direct variable name) : It means the number of letters of the name indicating direct variable where upto 16 letters are allowed. The range of this value is h' 01 ~ h' 10.

* **Direct variable** : It is where the address of variable to write actually is to be input in ASCII within 16 letters. Others than figures, upper/lower case, ' %' and ' .' are not allowed as a variable name.

Direct variables available according to PLC type are as shown in [Table 6.4.2(B)] below.

Remark

Note1) Device data type of each block shall be surely the same. If data type of the first block is Word and data type of the second block is Double Word, error may occur.
Note2) Refer to GLOFA PLC technical manual for area setting of each device of GLOFA GM series.
Note3) If data type is Bool, the data read is displayed in 1 byte (HEX). Namely, h' 00 is displayed if bit value is 0 and h' 01 is displayed if bit value is 1.

3) Response format(PLC' s ACK response)

Format name	Header	Command	Data type	Reservation area	Error status	Number of blocks
Code (Ex.)	...	h' 0059	h' 0002	h' 0000	h' 0000	h' 0001

***Number of blocks** : It indicates the number of blocks written normally.

4) Response format(NAK response)

Format name	Header	Command	Data type	Reservation area	Error status	Error code (Hex 1 byte)
Code (Ex.)	...	h' 0059	h' 0002	h' 0000	h' FFFF (which is not 0)	h' 21

Remark

Note1) Error code displays the type of error in 1 byte (HEX).
Refer to ' Appendix A3, Error codes' for details.

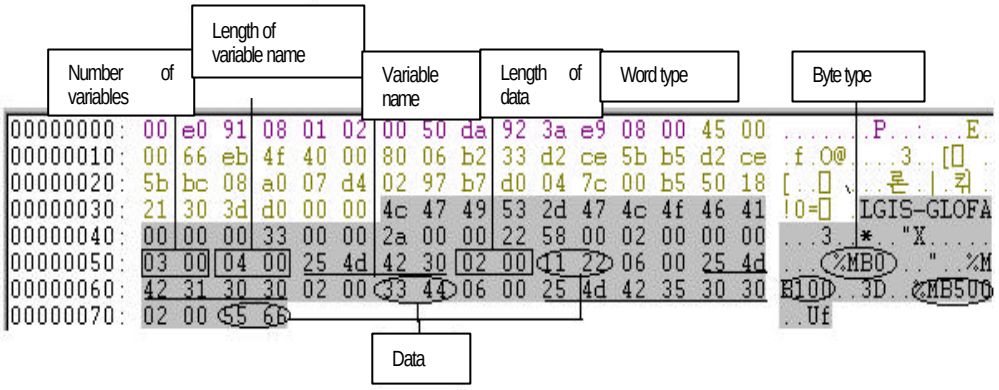
** Data protocol on Ethernet

Ex.) Separate Write request frame of direct variables: (Data type:byte)

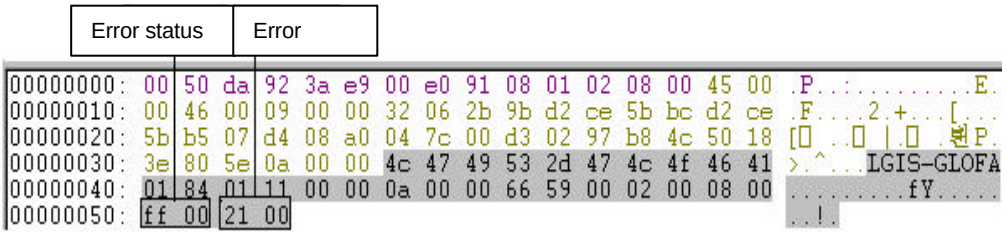
Number of variables: 3, data:0x1122, 0x3344, 0x5566

Variables : %MB0, %MB100, %MB500

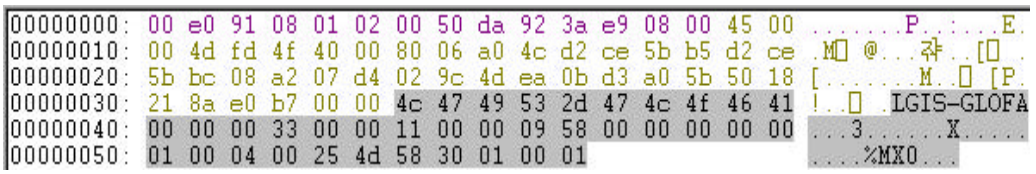
Data type is set to word type of 0x0002 as shown in the protocol below, which consequently leads to error as received. However, data can be received if only the data type is changed to byte(0x0001) in the figure below.



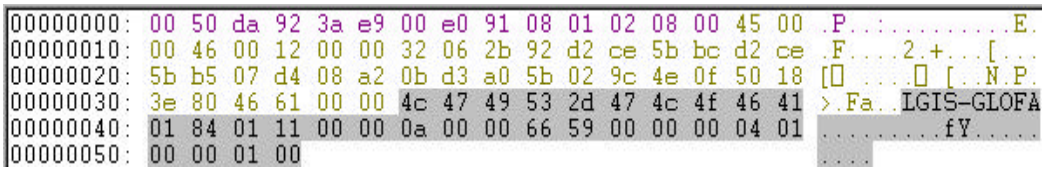
Ex.) Separate Write response frame of direct variables: (error)



Ex.) Separate Write request frame of direct variables: (Data type:Bool-bit)



Ex.) Separate Write response frame of direct variables: (Data type:Bool-bit)



10.3.5 Continual Write of direct variables

1) Introduction

It is a function to continuously read data as many as set starting from the assigned address with PLC device memory set directly. However byte type of direct variables only are available.

2) Request format

Format name	Header	Com-mand	Data type	Reservat-ion area	Number of blocks	Variable length	Variable	Number of data	Data
Code (Ex.)	...	h' 0058	h' 0014	h' 0000	h' 0001	h' 0006	%MB100	h' 0002	h' 1234

* **Number of data** means the number of byte in data (Max. 1,400 byte).
* **Number of blocks** : Number of blocks is available only in h' 0001.
* **Variable length** : It means the number of letters of the name indicating direct variable where upto 16 letters are allowed. The range of this value is h' 01 ~ h' 10.
* **Direct variable** : It is where the address of variable to write actually is to be input in ASCII within 16 letters. Others than figures, upper/lower case, ' %' and ' .' are not allowed as a variable name. Direct variables available for continual write according to PLC type are as shown in [Table 10.2.4(C)].

Remark

Note1) Refer to GLOFA PLC technical manual for area setting of each device of GLOFA GM and GK series.

3) Response format(PLC' s ACK response)

Format name	Header	Command	Data type	Reservation area	Error status	Number of blocks
Code(Ex.)	...	h' 0059	h' 0014	h' 0000	h' 0000	h' 0001

* **Data type** : Available data type is byte (%MB,%IB,%QB).
* **Number of data :** It means the number of byte(Hex).

4) Response format (PLC' s NAK response)

Format name	Header	Command	Data type	Reservation area	Error status	Error code (Hex 1 byte)
Code (Ex.)	....	h' 0059	h' 0014	h' 0000	h' FFFF	h' 21

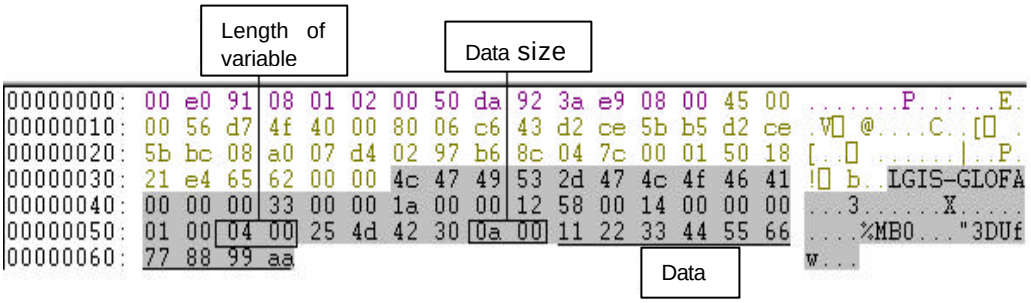
* **Error code :** Error code displays the type of error in 1 byte (HEX).
Refer to' Appendix A3, Error codes' for details.

**** Data protocol on Ethernet**

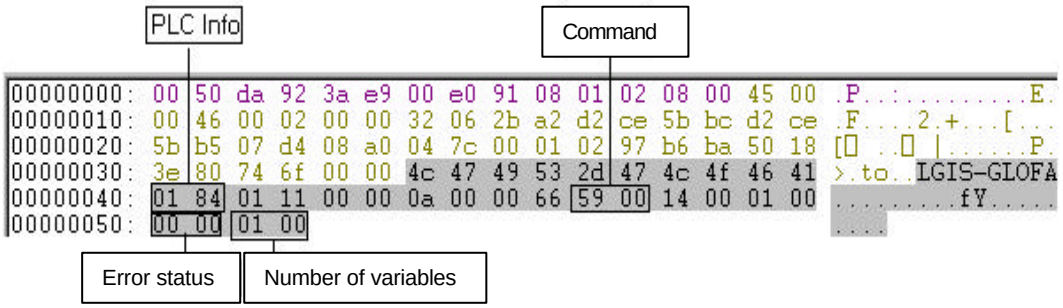
Ex.) Continual Write request frame of direct variables: (Data type:byte)

Data:0x112233445566778899aa (0x000a)

Variable : %MB0



Ex.) Continual Write response frame of direct variables: (Data type:byte)



10.3.6 Named variable Write

1) Introduction

It is a function to read data using the registered variable name in access variable area of PLC program. Refer to user manual of GLOFA-GM Fnet(Fieldbus)/Mnet(Mini-MAP) for registration procedures of variables.

2) Computer requested format

a. Separate type

Format name	Header	Com-mand	Data type	Reser-vation area	Num-ber of blocks	Variab-le length	Variab-le name	...	Data length	Data	...
Code (Ex.)	...	h' 005 8	h' 000 2	h' 000 0	h' 000 1	h' 000 8	OUTP UT_1		h' 000 2	h' 12 34	

1 block(setting available repeatedly upto 16 blocks)

* **Number of blocks** : It is to set such number of blocks composed of ' [Variable length][Variable name]' and ' [Data length][Data]' as is in this request format up to 16 blocks. Thus, the value of [Number of blocks] shall be h' 0001 ~ h' 0010 .

b. Array type

Format name	Header	Comm-and	Data type	Reserv-ation area	Number of blocks	Variable length	Variable name	Number of data	Data
Code (Ex.)	...	h' 0058	h' 0042	h' 0000	h' 0001	h' 000A	OUTPU T_ARR	h' 0004	h' 1234 5678

* **Number of blocks** : Number of blocks is available only in h' 0001

* **Variable length** : It means the number of letters of the variable name registered in PLC' s access variable area where upto 16 letters are allowed. The range of this value which is converted from Hex to ASCII is h' 01 ~ h' 10.

* **Variable name** : As a variable to write actually it shall be ASCII within 16 letters. Others than figures, upper/lower case, ' %' and ' .' are not allowed as a variable name. Upper and lower cases are used as distinguished but be sure to use ***Upper case*** as PLC access variable names are all upper-cased.

3) Response format(PLC' s ACK response)

a. Separate type

Format name	Header	Command	Data type	Reservation area	Error status	Number of blocks
Code (Ex.)	...	h' 0059	h' 0002	h' 0000	h' 0000	h' OOO1

b. Array type

Format name	Header	Command	Data type	Reservation area	Error status	Number of blocks
Code (Ex.)	...	h' 0059	h' 0042	h' 0000	h' 0000	h' 0001

* In case of array type, h' 0001 only shall be used for the number of variables.
* Data length indicates the number of byte in data.

※ If data type is Bool, the data read is displayed in 1 byte (HEX). Namely, h' 00 is displayed if bit value is 0 and h' 01 is displayed if bit value is 1.

4) Response format(PLC' s NAK response)

a. Separate type & array type common

Format name	Header	Command	Data type	Reservation area	Error status	Error code
Code (Ex.)	...	h' 0059	h' 0002	h' 0000	h' FFFF (which is not 0)	h' 21

10.3.7 Status Read request (MMI → PLC)

1) Introduction

It is a service applicable to use information and status of PLC through communication.

2) Computer requested format

Item	Size(byte)	Description
Command	2	0x00B0 : Status Request
Data type	2	0x0000 : Don' t Care
Reservation area	2	0x0000 : Don' t Care

3) Response format(PLC' s ACK response)

Item	Size(byte)	Description
Command	2	0x00B1 : Status Response
Data type	2	0x0000 : Don' t Care
Reservation area	2	0x0000 : Don' t Care
Error status	2	Normal if 0, Error code if not 0
Data size	2	0x0014
Data	20	Status Data

※ **Status Data** structure

Item	Size(byte)	Byte position	Description
Reserved	4	0	Reservation area
_CPU_TYPE	1	4	System type : Flag
_VER_NUM	1	5	OS version No. : Flag
_SYS_STATE	2	6	PLC mode & Run status : Flag
_PADT_CNF	1	8	GMWIN connection status : Flag
_DOMAIN_ST	1	9	System S/W configuration information : Flag
_CNF_ER	2	10	System error (Serious) : Flag
_CNF_WAR	2	12	System warning : Flag
Slot Info	2	14	Slot Information Bit01~Bit03 : Information on slot where local station is remote-connected with different station. Bit05~Bit07 : Information on slot remote-connected with different station. Bit09~Bit11 : Information on slot where this module is installed
Reserved	4	16	Reservation area

- Refer to *Flag description for details of each item.

※ **Flag description**

- **_CPU_TYPE (1Byte)**

  ; GM1(0x00), GM2(0x01), GM3(0x02), GM4(0x03), GM5(0x04),
  GM3_FSM(0x05), GM4_FSM(0x06), SRU(0x07), GMR(0x10),
  GK3(0x22), GK4(0x23), GK5(0x24),
  GK3_FSM(0x25), GK4_FSM(0x26)

- **_VER_NUM (1Byte)**

  ; BIT0~BIT3 : Minor Version displayed
  BIT4~BIT7 : Major Version displayed
  Ex.) If v3.1 is displayed
  ; 0x31 displayed

- **_SYS_STATE (2Byte)**

Position	Description	Indication
BIT 0	Local control	Run mode changeable status only by mode key or GMWIN displayed.
BIT 1	STOP	Displays operation status of CPU
BIT 2	RUN	Displays operation status of CPU
BIT 3	PAUSE	Displays operation status of CPU
BIT 4	DEBUG	Displays operation status of CPU
BIT 5	Operation mode change factor	Operation mode changed by key
BIT 6	Operation mode change factor	Operation mode changed by GMWIN
BIT 7	Operation mode change factor	Operation mode changed by remote GMWIN
BIT 8	Operation mode change factor	Operation mode changed by communication
BIT 9	STOP by STOP function	Stopped after scan completed by STOP function during RUN mode operation.
BIT 10	Compulsory input	Displayed during compulsory ON/OFF execution for input contact.
BIT 11	Compulsory output	Displayed during compulsory ON/OFF execution for output contact.
BIT 12	STOP by ESTOP function	Stopped immediately by ESTOP function during RUN mode operation.
BIT 13	Reservation area	
BIT 14	Monitor in execution	Displayed during external monitor execution on program and variable
BIT 15	Remote mode ON	Operation in remote mode displayed.

- **_PADT_CNF (1 Byte)**

Position	Description	Indication
BIT 0	Local GMWIN connection	Bit indicating connection status of local GMWIN.
BIT 1	Remote GMWIN connection	Bit indicating connection status of remote GMWIN
BIT 2	Remote communication connection	Bit indicating connection status of remote communication
BIT 3 ~ BIT 7	Reservation area	

- **_DOMAIN_ST (1Byte)**

Position	Description	Indication
BIT 0	Basic parameter error	Flag indicating basic parameter error as checked
BIT 1	I/O parameter error	Flag indicating I/O configuration parameter error as checked
BIT 2	Program error	Flag indicating user program error as checked
BIT 3	Access variable error	Flag indicating access variable error as checked
BIT 4	HS link parameter error	Flag indicating HS link parameter error as checked
BIT 5 ~ BIT 7	Reservation area	

- _CNF_ER (2Byte)

Position	Description [Flag]	Indication
BIT 0	CPU configuration error [_CPU_ER]	Error flag caused if error occurs on self-diagnosis function of CPU module, if installed on other position than specified for base' s CPU, or if normal operation of CPU module is unavailable due to multi-CPU configuration error (Refer to _SYS_ERR for details)
BIT 1	Module type discord error [_IO_TYER]	Typical flag to detect and display the error caused if I/O configuration parameter of each slot and the configuration of actually installed module are different from each other or if specific module is installed on an unavailable slot (Refer to _IO_TYER_N, _IOTYER[n])
BIT 2	Module installation error [_IO_DEER]	Typical flag to detect and display the error caused if module configuration of each slot is changed during Run. (Refer to _IO_DEER_N, _IO_DEER[n])
BIT 3	FUSE disconnection error [_FUSE_ER]	Typical flag to detect and display the error caused if the fuse as installed on the module among modules of slots is disconnected. (Refer to _FUSE_ER_N, _FUSE_ER[n])

Position	Description [Flag]	Indication
BIT 4	I/O module Read/Write error (trouble) [_IO_RWER]	Typical flag to display the error caused if normal Read/Write of I/O module among modules of slots. (Refer to _IP_RWER_N, _IO_RWER[n])
BIT 5	Special /communication module interface error(trouble) [_SP_IFER]	Typical flag to display the error caused if initializing of special or communication module among modules of slots fails or if normal interface is unavailable due to abnormal operation of the module. (Refer to _IP_IFER_N, _IP_IFER[n])
BIT 6	Detection error of serious error on external device [_ANNUN_ER]	Typical flag to display the error detection occurred if serious error on external device is detected and recorded in _ANC_ERR[n] by user program.
BIT 7	Reservation area	
BIT 8	SCAN WATCH-DOG error [_WD_ER]	Error caused if program scanning time exceeds over SCAN WATCH-DOG TIME set by parameters.
BIT 9	program code error [_CODE_ER]	Error caused if faced with command impossible to read while user program is executed.
BIT 10	STACK OVERFLOW error [_STACK_ER]	Error caused if program stack exceeds over normal range while program is executed.
BIT 11	Program error [_P_BCK_ER]	Error caused if program memory is crashed or if execution is unavailable due to program error. (Refer to _DOMAIN_ST)
BIT 12 ~ BIT 15	Reservation area	

- _CNF_WAR (2Byte)

Position	Description (Flag)	Indication
BIT 0	System warning(light error) RTC data error [_RTC_ERR]	Flag to display the error if occurred on RTC data
BIT 1	Data BACK_UP error [_D_BCK_ER]	Flag to indicate that cold restart is executed because normal hot or warm restart program is unavailable to execute due to data memory crashed by BACK_UP error. It is automatically reset if an applicable initializing program is complete among initializing programs.

Position	Description (Flag)	Indication
BIT 2	Hot restart unavailable [_H_BCK_ER]	Flag to indicate that restart (warm or cold) is executed because hot restart is unavailable to execute due to exceeded hot restart time when power recovered or abnormal BACK_UP of operation data necessary for hot restart while program is executed. It is automatically reset if an applicable initializing program is complete among initializing programs.
BIT 3	Abnormal operation stop (ABNORMAL SHUTDOWN) [_AB_SD_ER]	Flag used in initializing program to warn that computation error may occur on preserved data area because the computation begins again from the start of the program if warm restart is executed when powered back after the program stopped midway since powered off while the program is executed. It is automatically reset if an applicable initializing program is complete. It is also displayed if the program stopped midway by 'ESTOP' function.
BIT 4	TASK clash (Settler, External task) [_TASK_ERR]	Flag to display the task clash if both tasks identical are to be executed as requested when user program is executed. (Refer to _TC_BMAP[n], _TC_CNT[n] for details)
BIT 5	Battery error [_BAT_ERR]	Flag to detect and display the error caused if battery voltage for back-up of user program and data memory is lower than specified.
BIT 6	Light error detected on external device [_ANNUN_WR]	Typical flag to display the error detection occurred if light error on external device is detected and recorded in _ANC_WB[n] by user program.
BIT 7	Reservation area	
BIT 8	HS link parameter1 error [_HSPMT1_ER]	Typical flag to check each HS link parameter at HS link enabled and to display the error if occurred by HS link unavailable. It is reset if HS link disabled.
BIT 9	HS link parameter2 error [_HSPMT2_ER]	
BIT 10	HS link parameter3 error [_HSPMT3_ER]	
BIT 11	HS link parameter4 error [_HSPMT4_ER]	
BIT 12 ~ BIT 15	Reservation area	

Chapter 11 Diagnosis Function

Enet communication module has a function to diagnose symptoms occurred after power on, during normal operation and in test mode. Type of the diagnosis function is described in the table below.

Item	Description	Remarks
Online mode	1) Memory diagnosis of communication module 2) Diagnosis of common-used RAM 3) PLC error 4) Controller (961A) error during communication 5) Error on physical layer during communication 6) Error on program execution during operation	Diagnosed during Run after powered.
Test mode	1) System/common-used RAM error & physical layer error in test mode - System RAM error - Common-used RAM interface error - Physical layer error	

Remark

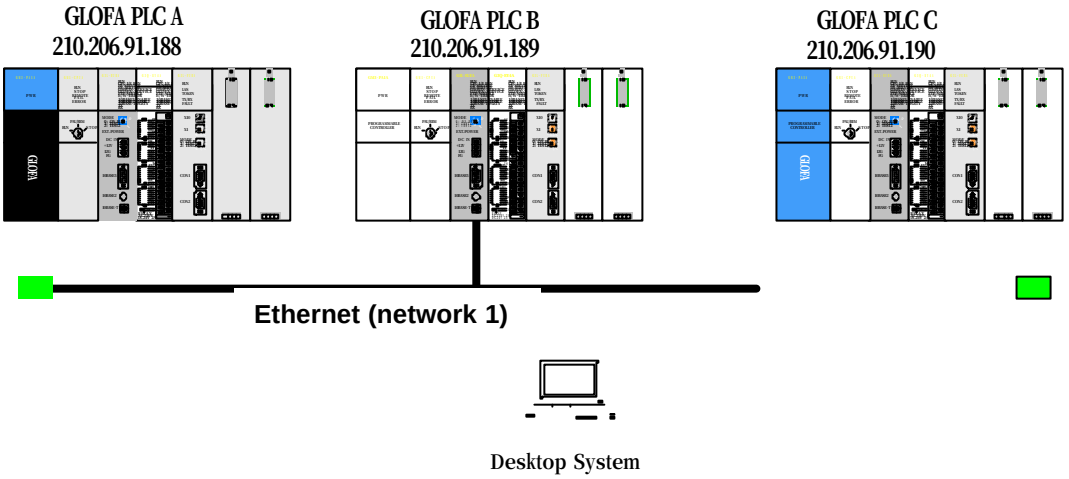
Diagnosis of Enet communication module is executed by the mode switch attached in front of communication module.

A) Online mode(communication stations connected) method : Self-diagnosis + communication diagnosis

B) Test mode method: System/common-used RAM diagnosis + physical layer diagnosis

11.1 Diagnosis Function by Online Mode

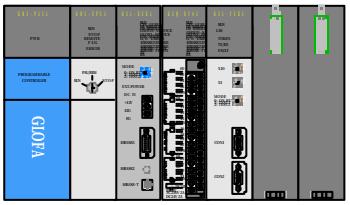
1) Prepare communication module necessary for system configuration, set the mode switch attached on communication module to online status and then perform basic setting using frame editor so to download to PLC.
2) Connect communication module with cable after system configuration as shown in [Figure 11.1].(Thick copper cable(10BASE5), Thin copper cable(10BASE2), Twist cable(10BASE-T))
3) If powered on, communication module keeping initializing self-diagnosis and communication displays the following results through LED. Refer to ‘ Appendix A1 LED display specification’ for details of LED.



[Figure 11.1] System configuration

11.2 Diagnosis Function by Test Mode

1) Prepare 1 communication module and set the mode switch attached on communication module to test mode and then perform basic setting using frame editor so to download to PLC.
2) Let the system configured as in [Figure 11.2] without cable connected.
3) If powered on, communication module keeping physical layer diagnosis and interface diagnosis displays the following results through LED.



[Figure 11.2] System configuration

Error and symptoms occurred during the test above are described in the table below.

Class	Error type	LED Status								Description
		0	1	2	3	4	5	6	7	
ECM_01	If powered ON	❍	❍	❍	❍	❍	❍	❍	❍	Program Start
ECM_02		❍	❍	❍	❍	❍	❍	●	❍	System RAM test
ECM_03		●	❍	❍	❍	❍	●	❍	❍	Common-used RAM test
ECM_04		●	●	❍	❍	❍	❍	❍	❍	CPU I/F run
ECM_05		●	●	❍	❍	❍	❍	❍	❍	Controller 961A initializing
ECM_06		●	●	❍	❍	❍	❍	❍	❍	Task complete -> Communication start
ECM_07	During normal operation	●	●	❉	❍	❍	❍	❍	❍	Function Block in service
ECM_08		●	●	❍	●	❍	❍	❍	❍	HS link in service
ECM_09		●	●	❍	❍	●	❍	❍	❍	GMWIN being connected
ECM_10		●	●	❍	❍	❍	●	❍	❍	Exclusive communication in service(On if in TCP communication, Flickering if in UDP communication)
ECM_11		LEDs turned On simultaneously if various services are executed.								
ECM_12	Error when initialized	❍	❍	❍	❍	❍	❍	●	●	System test error
ECM_13		●	❍	❍	❍	❍	●	❍	●	Common used RAM error
ECM_14		●	●	❍	❍	●	❍	❍	●	Controller initializing error
ECM_15		❍	❍	❍	❍	●	❍	❍	❍	Poles of 10BASE-T cable incorrect
ECM_16	Error during Run	●	●	❍	❍	❍	❍	●	●	Controller 961A re-initializing error
ECM_17		●	●	❍	❍	❍	❍	●	❍	Socket error
ECM_18		●	❍	❍	❍	❍	❍	❍	❍	CPU error

Class	Error type	LED Status								Description
		8	9	10	11	12	13	14	15	
ECM_19	During Run	❍	❍	●	❍	❍	❍	❉	❉	During 10BASE5 operation
ECM_20		❍	❍	❍	●	❍	❍	❉	❉	During 10BASE2 operation
ECM_21		❍	❍	❍	❍	●	●	❉	❉	During 10BASE-T operation
ECM_22	Error(Note1) during Run	❍	❍	●	❍	❍	❍	●	●	Communication module or 961A error (10BASE5)
ECM_23		❍	❍	●	❍	❍	❍	❍	❍	Communication module or 961A error
ECM_24		❍	❍	❍	●	❍	❍	●	●	Communication module or 961A error (10BASE2)
ECM_25		❍	❍	❍	●	❍	❍	❍	❍	Communication module or 961A error
ECM_26		❍	❍	●	❍	❍	❍	❍	❍	Single 10BASE-T on network
ECM_27		❍	❍	❍	❍	●	●	●	●	Communication module or 961A error (10BASE5)
ECM_28		❍	❍	❍	❍	●	●	❍	❍	Communication module or 961A error (10BASE5)

● : On ❍ : Off ❉ : Flickering

* Note1) If LED is displayed as above by error occurred in program, it means abnormal status though it may be

misunderstood as normal operation.

Chapter 12 Installation and Pre-operation

12.1 Installation

12.1.1 Precautions for installation

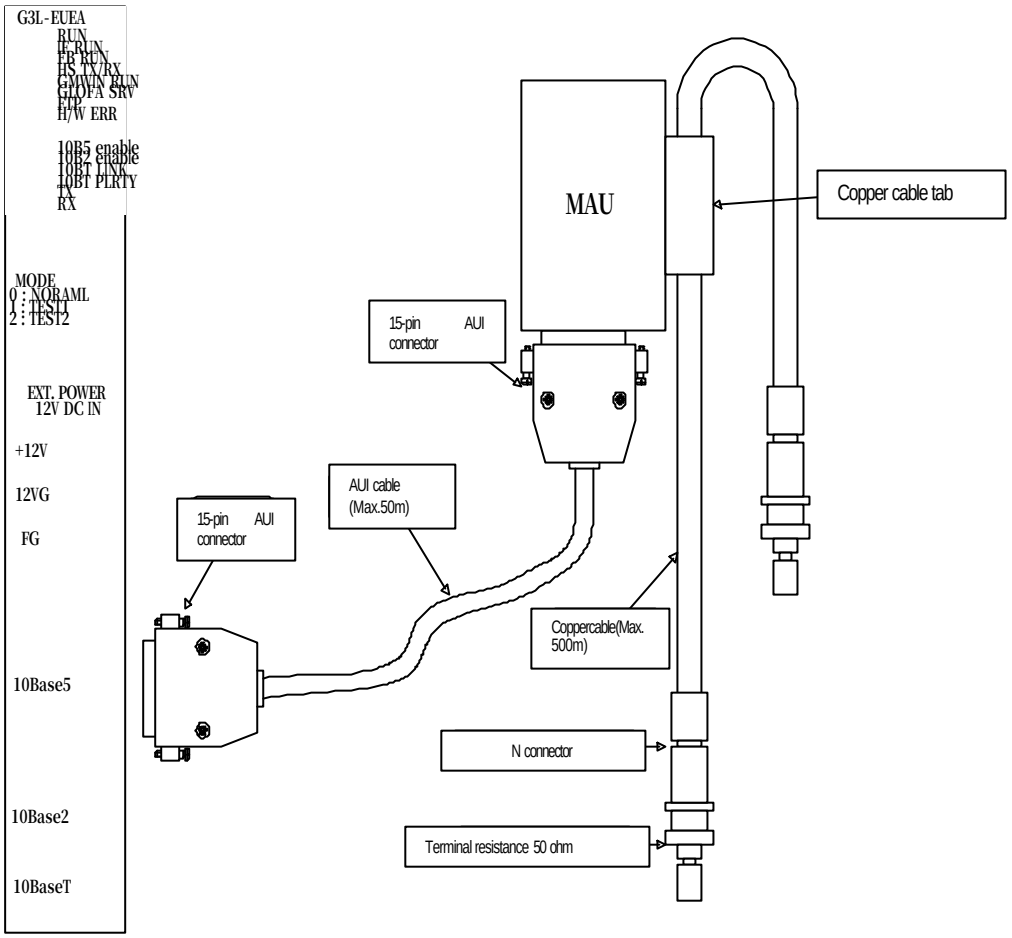
Max.4 Enet communication modules can be mountable on PLC basic base of GM1,GM2 orGM3.

1) Check basic factors as required for system configuration and select communication module as agreeable for the unit.
2) Select the cable to be used in this communication module(only one type among 10BASE5, 10BASE2 and 10BASE-T).
3) If thin cable(10B2) was selected for the communication module, select the jumper placed inside the module(Default:10B5 , 10B5 & 10B-T use default) to install on the base while PLC is powered Off.
4) Check for any foreign substance on the base connector where module is to be mounted on prior to installation of the communication module and verify if any connector pin of this module is damaged.
5) All communication modules cannot be mounted on extended base but surely on basic base at the slot positioned nearest to CPU..
6) With communication cable not connected, insert the protuberant at bottom of the module correctly into the groove of the base board and then apply force enough until the upper is engaged completely in locking device of the base board. If the locking device is not tightly engaged in, error may occur to interfacing with CPU.
7) One type of cable among 10BASE5, 10BASE2 and 10BASE-T shall be used in this communication module
8) Hub and cable necessary for Ethernet communication shall be as specified.

12.1.2 Materials necessary for installation

Materials	10BASE5	10BASE2	10BASE-T
Copper cable (impedance50Ω)	With AUI	RG-58-A/U 3D-2V	N/A
AUI cable	Yellow Cable N connector (female) both ends	N/A BNC connector(male) both ends	N/A
Twist pair Cable(impedance100Ω)	N/A	N/A	4-pair twist pair (8-pole plug both ends)
Transceiver	Used	10BASE-2' s MAU needed if AUI used	10BASE-2' s MAU needed if AUI used
Terminal resistance(50Ω)	N connector(male)	BNC connector(male)	N/A
T connector	N/A	Used	N/A
Hub	N/A	N/A	Used

12.1.3 Installation of 10BASE5



[Figure 12.1.3] Installation of 10BASE5

Surely supply outer power (12V DC, consumption of 300mA or more) if 10BASE5 is to be used. Be careful that correct poles and voltage shall be used for outer power supply.

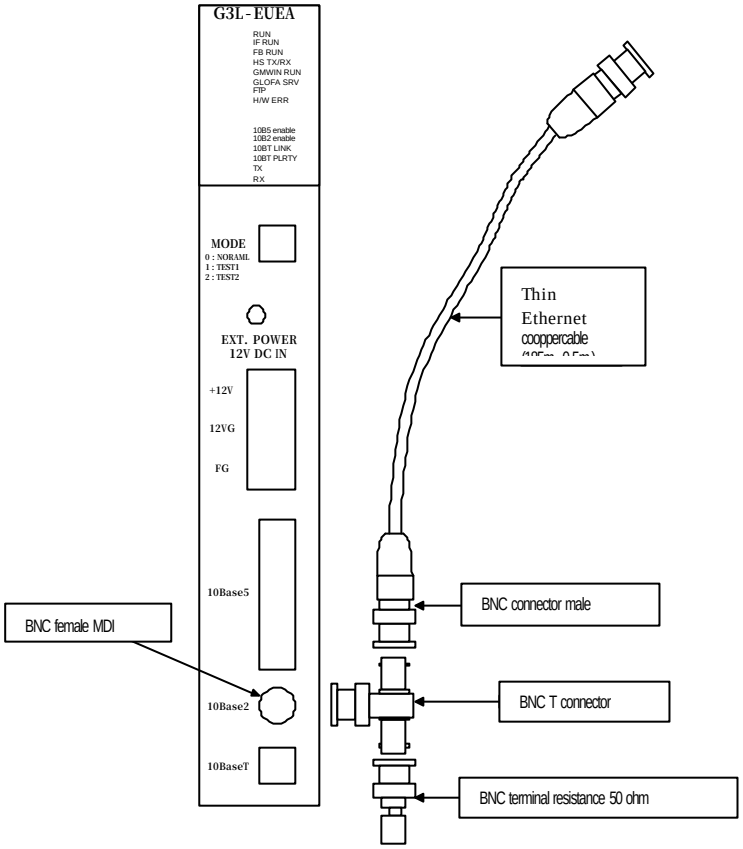
FG as of Class 3 connection shall be connected inside the board. If communication is abnormal due to FG connection inside the board, noise seems inducted in FG line. Remove the cause of noise or do not connect with FG of this communication module.

Remark

Note1) The cable shall be installed min. 50 mm away from high current line such as power line, etc.

Note2) Contact an expert for terminal work, manufacture and installation of cable.

12.1.4 Installation of 10BASE2



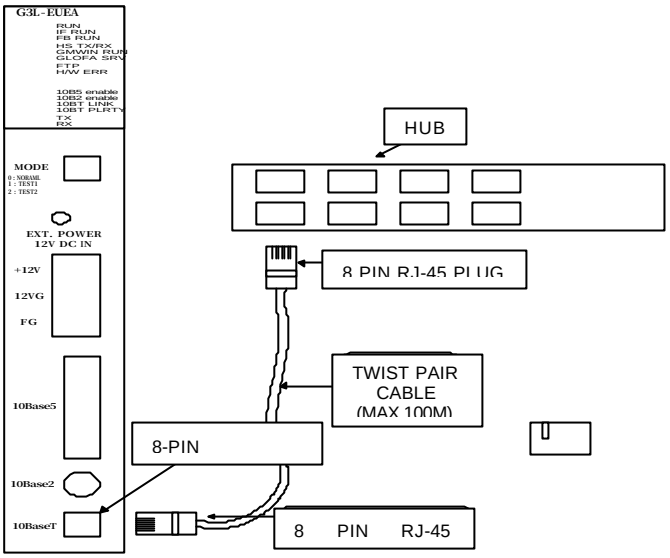
[Figure 12.1.4] Installation of 10BASE2

Use copper cable in RG-58/3D-2V for 10BASE2. For circuit divergence, use BNC T connector to connect with several stations. Connect terminal resistance of 50Ω with network terminal.

Remark

Note1) The cable shall be installed min. 50 mm away from high current line such as power line, etc.
Note2) Contact an expert for terminal work, manufacture and installation of cable.

12.1.5 Installation of 10BASE-T



[Figure 12.1.5] Installation of 10BASE-T

Max. segment length of 10BASE-T is 100m(between this module and the hub). Generally the straight cable is used which is made as twisted with TD and RD inside. If only 2 communication modules are connected 1 to 1, the cross cable type shall be applied.

Pin No.	Sign	Straight cable between Hub & Module	1:1 cross cable
1	TD+	1 —1	1 —3
2	TD-	2 —2	2 —6
3	RD+	3 —3	3 —1
6	RD-	6 —6	6 —2
4, 5, 7, 8	N/A		

Remark

Note1) Since 10 BASE-T cable structure is week in external noise, the cable of No.1 & 2 which are TD+ & TD- and No.3 & 6 which are RD+ & RD shall be twisted respectively to be strong against noise.

Note2) Hub power shall be with countermeasures against noise as separated from PLC power.

Note3) The cable shall be installed min. 50 mm away from high current line such as power line, etc.

Note4) Contact an expert for terminal work, manufacture and installation of cable.

12.2. Pre-Operation

Terminals of 10BASE5 and 10BASE2 cable shall be surely connected in terminal resistance. If there is no terminal resistance, communication error may occur. Check LED operation status if operation is normal as powered on after communication cable is connected. If normal, download the applicable program to PLC via GMWIN so to execute the program.

12.2.1 Precautions for system configuration

1) IP addresses shall be surely different from each other including this module. If connected via the repeated addresses, communication error may occur leading to communication trouble. HS link station No. of all stations also shall be different from each other to use HS_Link service.
2) In case of normal communication operation, mode switch shall be surely set to RUN mode. If this module's mode switch is set to TEST mode as powered at the status that other stations connected with the network perform communication, serious error may occur on communication of the other stations.
3) Use the communication cable as specified only. If not, serious error may occur to communication
4) Check communication cable if disconnected or shorted prior to installation.
5) Tighten up communication cable connector until connected firmly. If cable connection is unstable, serious error may occur to communication.
6) If remote communication cable is connected, keep the cable far away from power line or conductible noise.
7) Since the copper cable is not flexible, it is to be diverged min. 30cm away from the connector in communication module. If the cable is bent at a right angle or transformed compulsorily, cable disconnection or connector damage in communication module will be caused.
8) If LED operation is abnormal, refer to Chapter 9 Troubleshooting to check for causes and take actions against. Contact Service center if error occurs as before.

12.2.2 Checklist prior to pre-operation

Check items are described below prior to pre-operation of communication module.

1) Communication module on PLC

Check items	Description
Installation and inspection of Basic S/W	- Is installation and operation of GMWIN normal? - Is installation and operation of frame editor normal?
Communication cable connection (If cable is connected)	- Is connection and tab status of communication cable normal? - Is each cable connected in open loop type?
Module mounting	- Is the communication module installed correctly on basic base?
Switch setting	- Is the operation mode switch set to 0:RUN(switch value: 0)?

2) Pre-operation sequence

It shows the sequence starting from PLC installation completed to pre-operation.

Start

Power on :

1) Confirm input power
2) Check communication cable connection
3) Power on.
4) Check if power LED of power module is turned on
5) Check LED status of CPU module
   ⇨ If abnormal, refer to Troubleshooting in user manual of each PLC model.
6) Check if LED status of communication module is normal or not
   ⇨ If abnormal, refer to Chapter 9. Troubleshooting in this user manual.
7) Set system parameters correctly so to download.

▼

Programming : Perform programming in GMWIN and write to CPU module.

▼

Sequence check : Confirm the operation of communication module according to program

▼

Program modification : If abnormal in sequence program, modify it.

▼

Program preservation:

1) Save program to floppy or hard disk.
2) Print circuit drawing and list with printer.
3) Save program to memory module as required.

End

12.3 Repair and Check

12.3.1 Daily check

Daily check to perform is as described as below.

Check item		Check contents	Criteria	Action
Cable connection status		Cable loosened	Shall not be loosened	Tighten cable
Terminal connection status		Terminal screw loosened	Shall not be loosened	Tighten terminal screw
		Compressed terminals adjacent to each other	As distanced suitably	Modify
LED	RUN	On checked	On (Off means error)	See Appendix A1
	CPU I/F RUN	On checked	On (Off means error)	
	FB-SERVICE	Flickering checked during function block service	Flickering	
	HS-SERVICE	Flickering checked during function block service	Flickering	
	H/W ERROR	Off checked	Off (On or Flickering means error)	
	10BASE5 ENABLE	On if 10BASE5 selected	On	
	10BASE2 ENABLE	On if 10BASE2 selected	On	
	10BASE-T LINK	On if 10BASE-T cable installed	On	
	10BASE-T PLRTY	On if 10BASE-T is wired correctly	On (Surely On if 10BASE-T used	
	TX	Flickering at TX	Flickering	
	RX	Flickering at RX	Flickering	

[Table 12.3.1] Daily check items

12.3.2 Regular check

Check the following items for 1~2 times every 6 months and take actions as required.

Check item		How to check	Criteria	Action to take
Ambient conditions	Ambient temperature	Measure with thermometer/ hygrometer	0~55℃	Adjust as specified in general spec. (If used in panel, as based on ambient criteria in panel)
	Ambient moisture		5~95%RH	
	Ambient pollution	Measure corrosive gas	No corrosive gas allowed	
Module status	Loosening, shaking	Move communication module	As mounted firmly	Tighten screw
	Dust, foreign matters	By the naked eye	Shall not be attached	
Connection status	Terminal screw loosened	Tighten with driver	Shall not be loosened	Tighten
	Compressed terminals close	By the naked eye	As distanced suitably	Correct
	Connector loosened	By the naked eye	Shall not be loosened	Tighten connector locking screw
Power voltage check		Measure voltage between AC 110/220V terminals	AC 85~132V AC 170~264V	Modify power supply

[Table 12.3.2] Regular check items

Chapter 13 Troubleshooting

This chapter is to describe various errors that may occur in system, their causes and actions to take against. See chapter 13.1 Abnormal operation and 9.2 Troubleshooting for details of errors and actions to take.

13.1 Abnormal operation

Error code	Error display	Description
E00-01	ECM_12~ECM_15(See Chapter 7)	H/W self-diagnosis error
E00-02	ECM_13, ECM_18	Interfacing error with CPU

[Table 13.1(A)] H/W related error of communication module

Error code	Error display	Description
E01-01	ECM_16 ~ ECM_18 ECM_22 ~ ECM_28	Communication defect(communication not agreeable) Network error

[Table 13.1(B)] Abnormal communication status of communication module

Error code	Error display	Description
E02-01	ECM_18	Abnormal interfacing between Enet module & CPU

[Table 13.1(C)] Abnormal interfacing with communication module CPU

Error code	Error display	Description
E03-01	HS link parameter setting error	If HS link parameter set wrongly or not set or if parameter crushed after online link enabled setting.
E03-02	HS link not executed	If communication is not available as desired even though HS link parameter is normal after link enabled setting
E03-03	Contact of _HSxRLNK/_HSxTRX is not On when HS link executed	If _HSxRLNK is not On even though HS link parameter is normal after link enabled setting
E03-04	Contact of _HSxLTBL is On when HS link executed	If HSxLTBL is On due to error on PLC and communication after link enabled setting and then HS link _HSxRLNK On

[Table 13.1(D)] Abnormal operation of HS link function

Error code	Error display	Description
E04-01	Operation error on E_CONN FB	If FB' s ERR is On or FB' s NDR is not 1
E04-01	Operation error on TCP_SEND,UDP_SEND FB	If FB' s ERR is On or FB' s NDR is not 1
E04-01	Operation error on TCP_RCV,UDP_RCV FB	If FB' s ERR is On or FB' s NDR is not 1

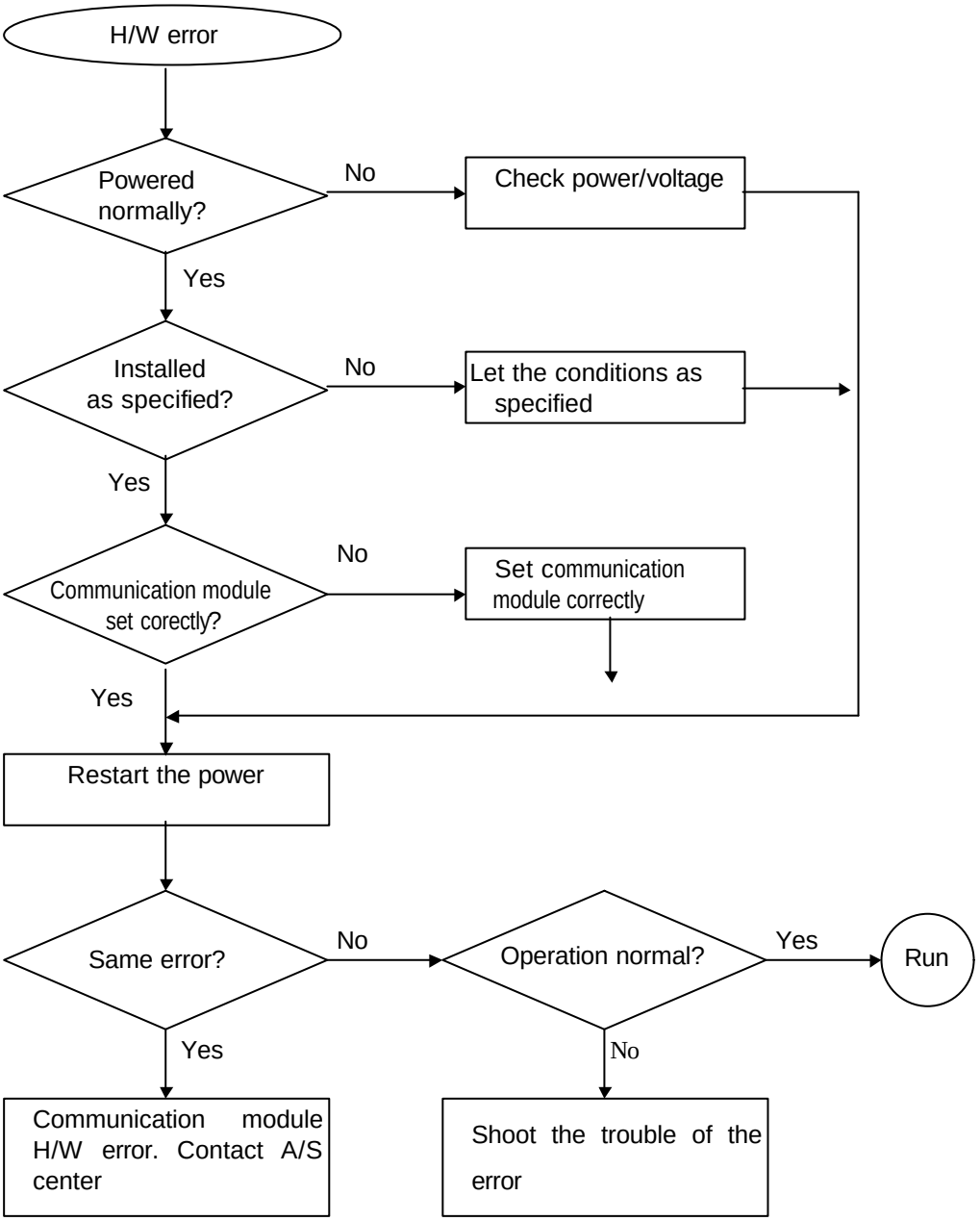
[Table 13.1(E)] Abnormal operation of FB

Error code	Error display	Description
E05-01	If [No response] message displayed when remote connection requested	If RS-232C cable not connected between GMWIN and PLC, or PLC is powered Off
E05-02	If [Other error message] displayed when remote connection requested	If service not executed normally due to unsuitable request

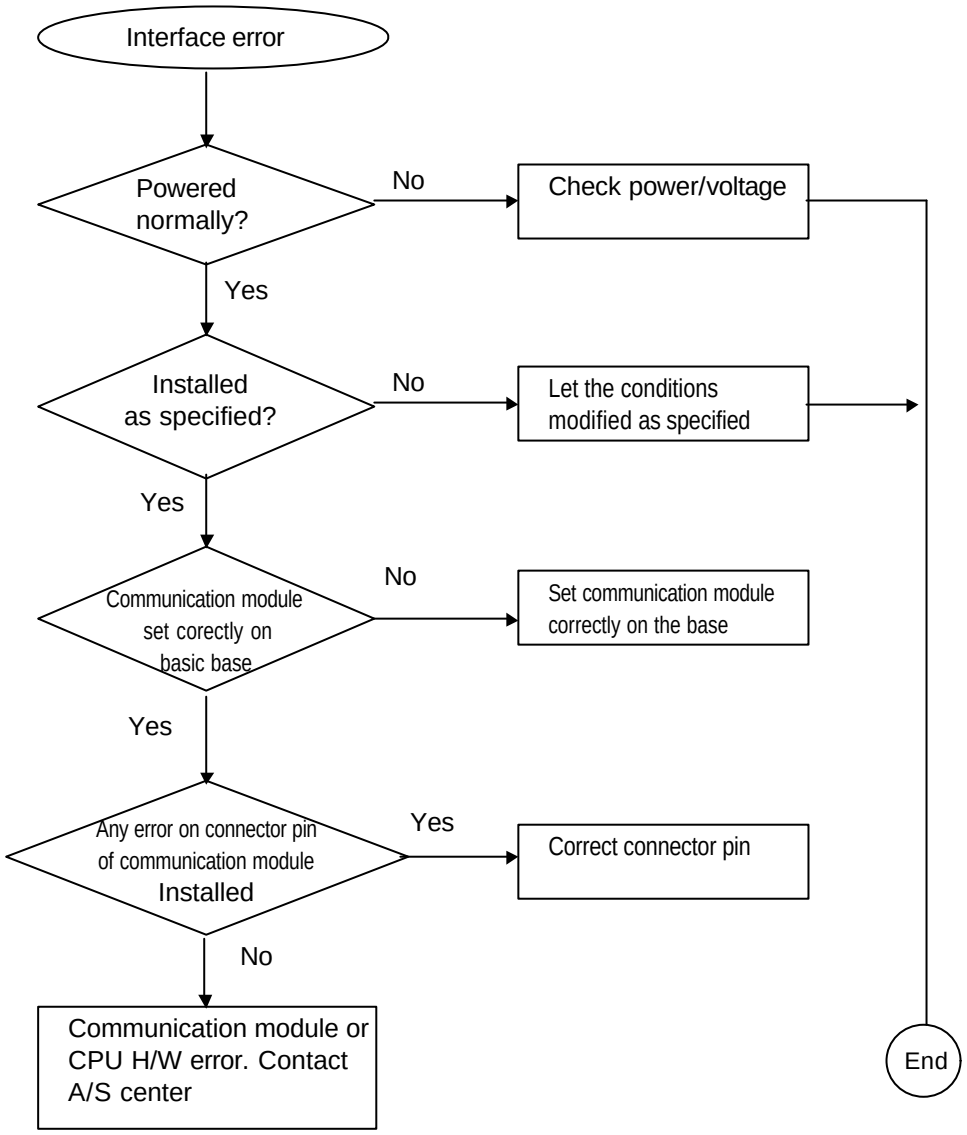
[Table 13.1(F)] Operation error of GMWIN communication service function

13.2 Troubleshooting

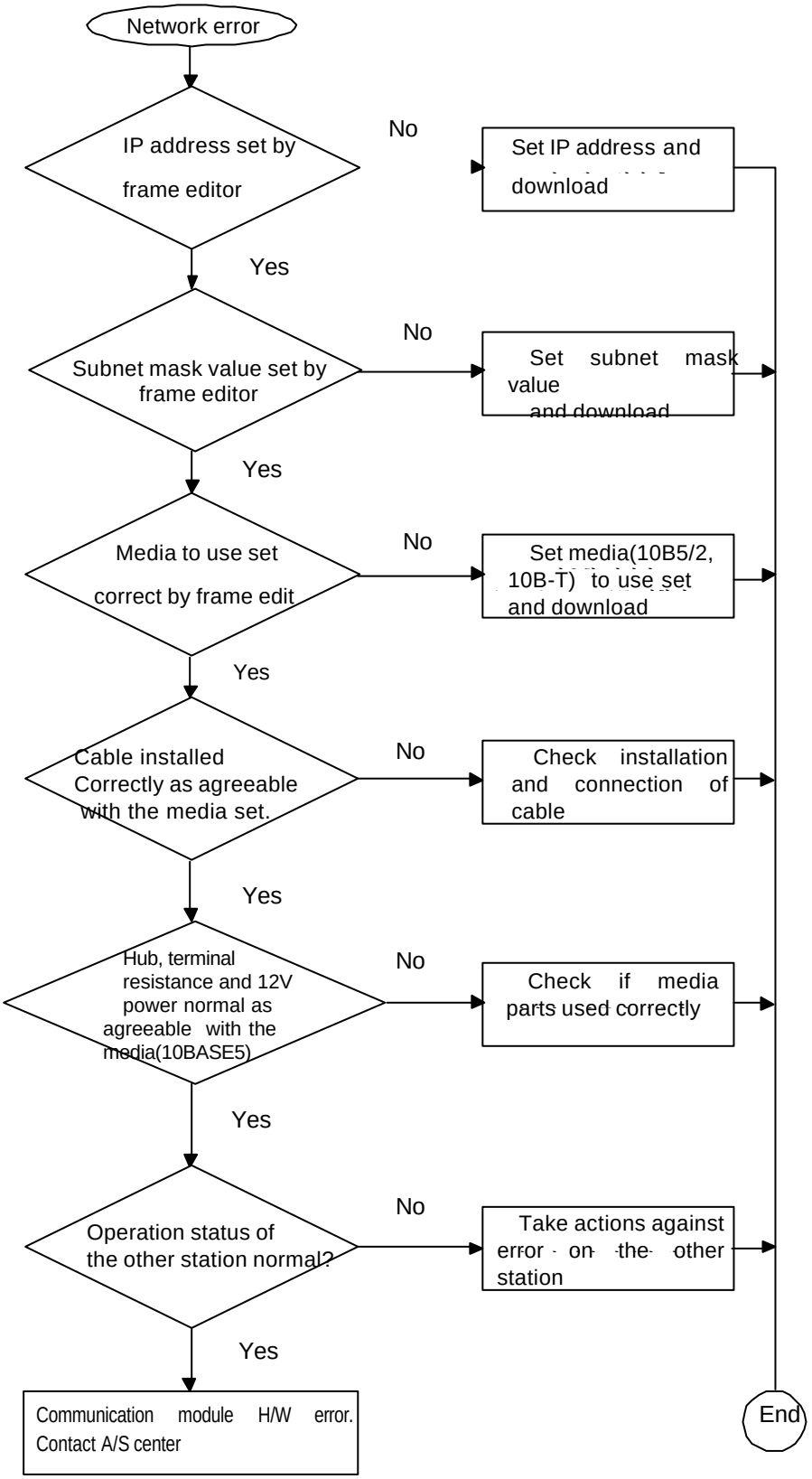
13.2.1 Error code E00-01 : H/W error



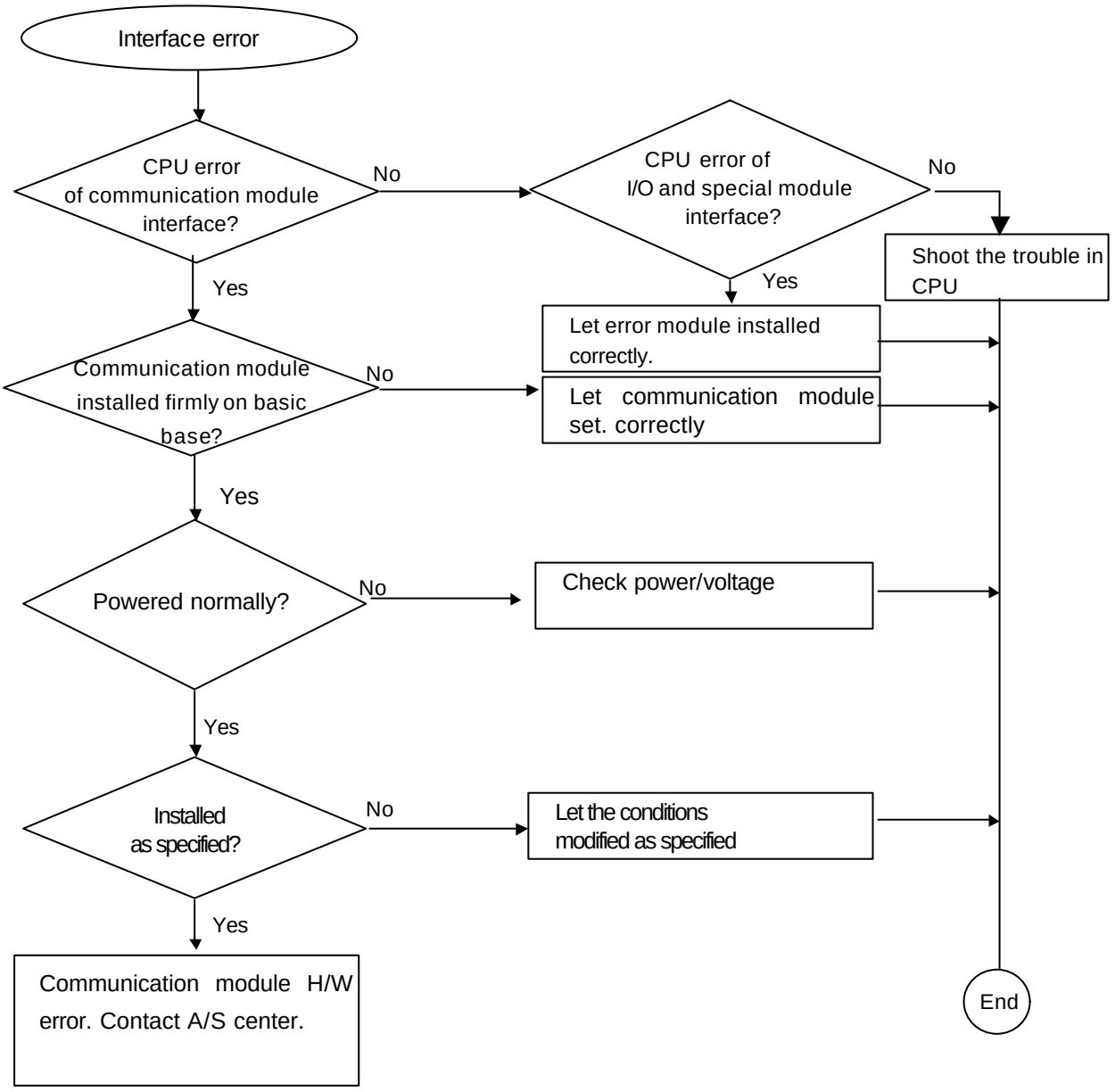
13.2.2 Error code E00-02 : Interface error



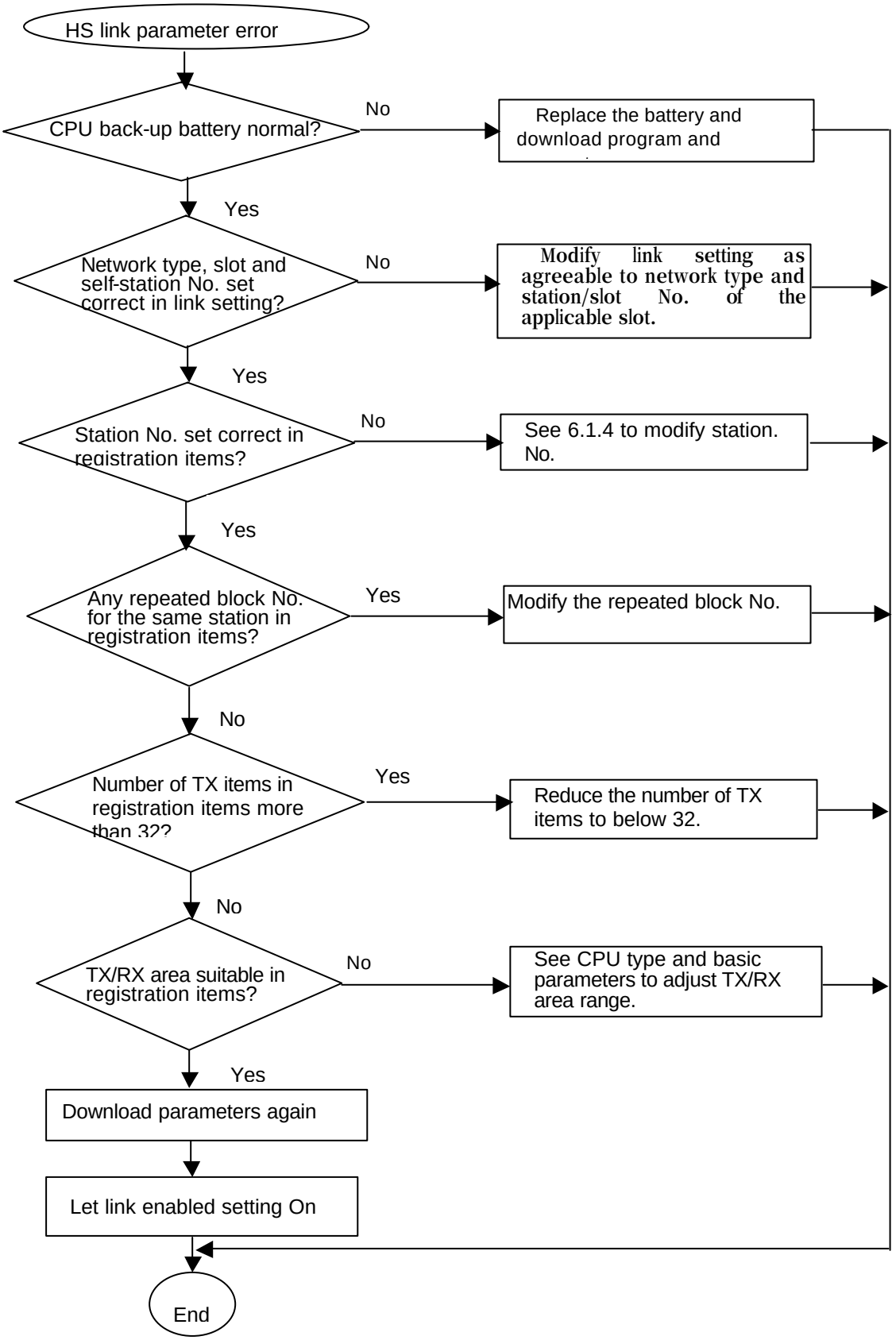
13.2.3 Error code E01-01 : Network error



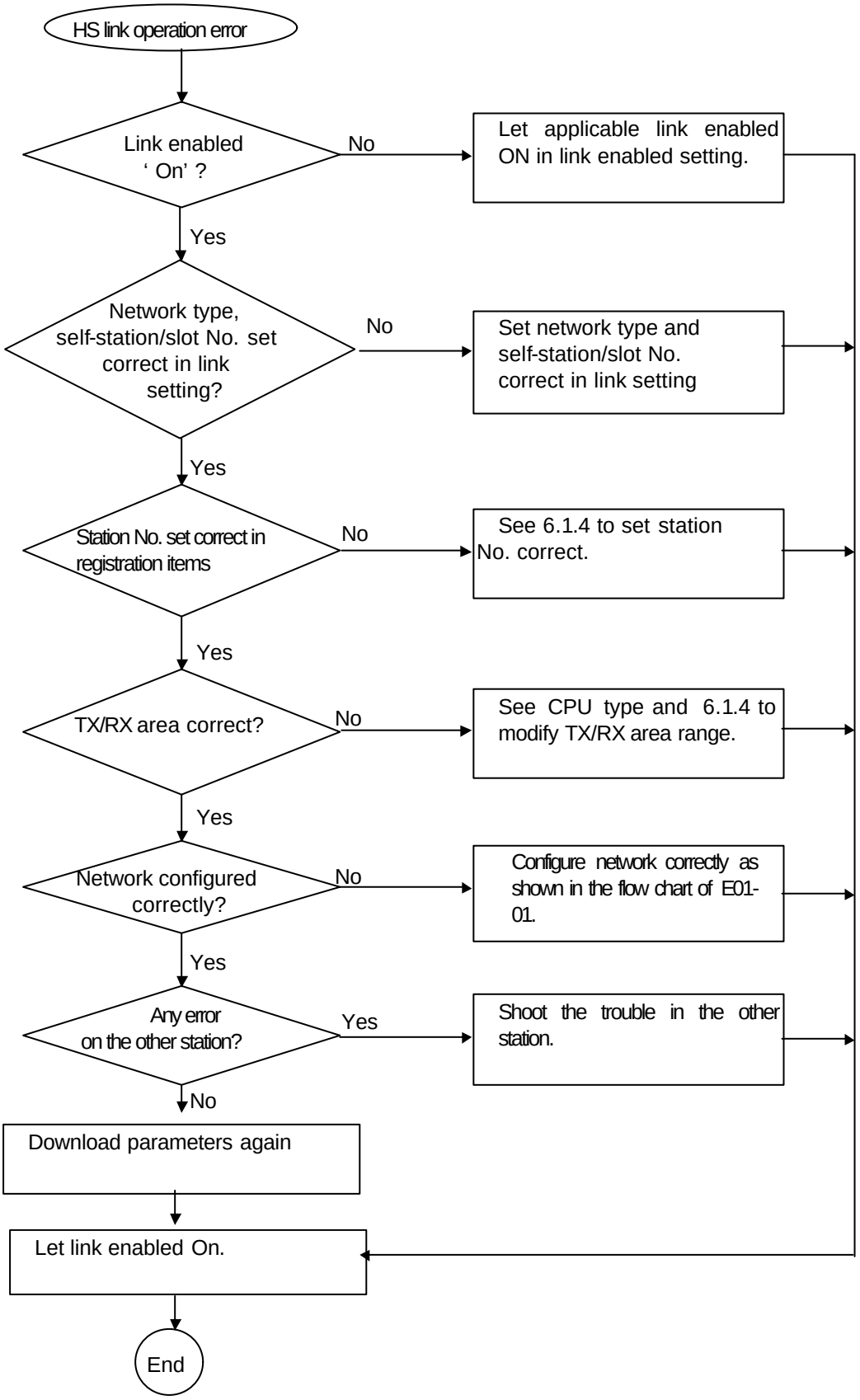
13.2.4 error code E02-01 : Interface error with CPU during operation



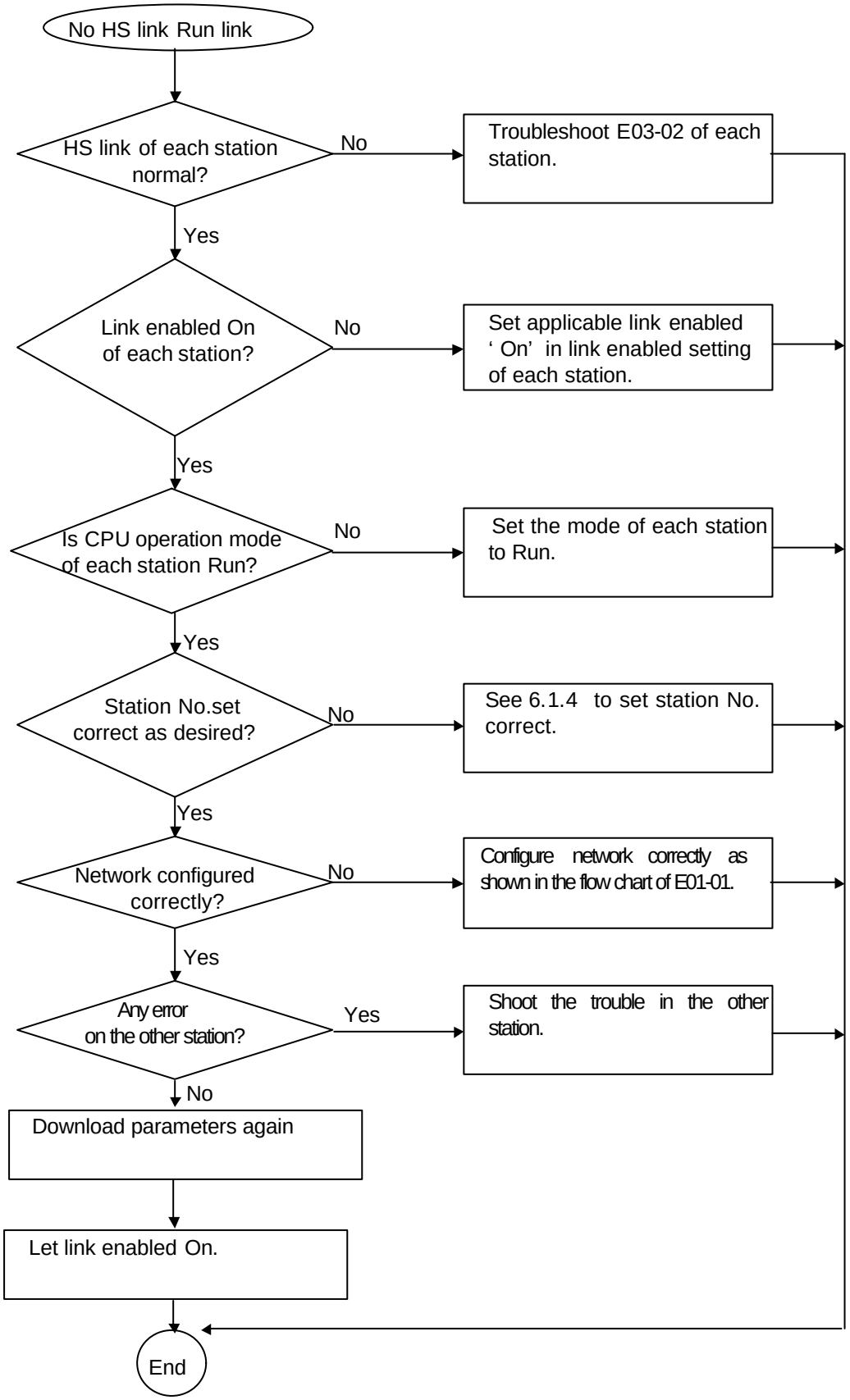
13.2.5 Error code E03-01 : HS link parameter error



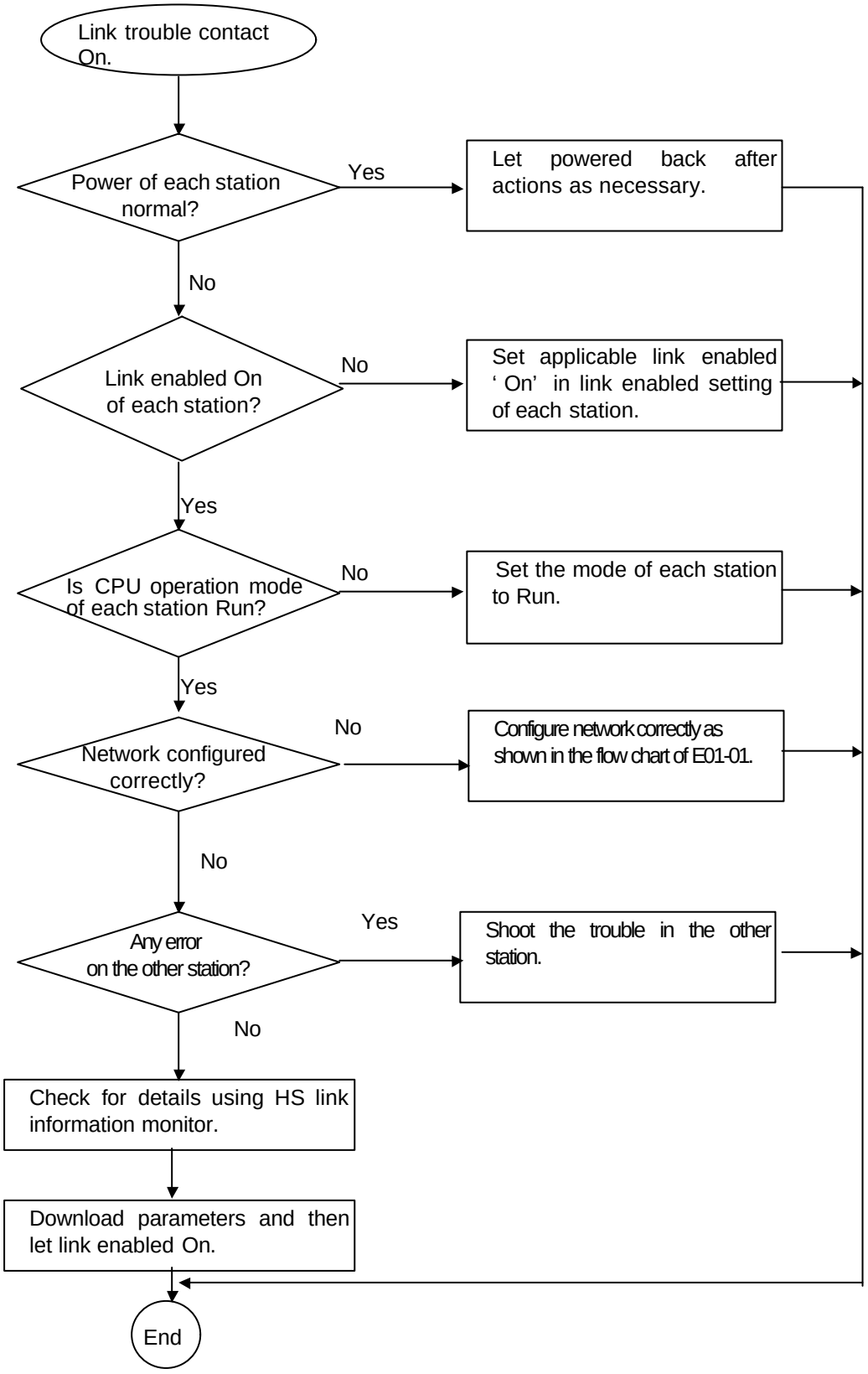
13.2.6 Error code E03-02 : HS link operation error



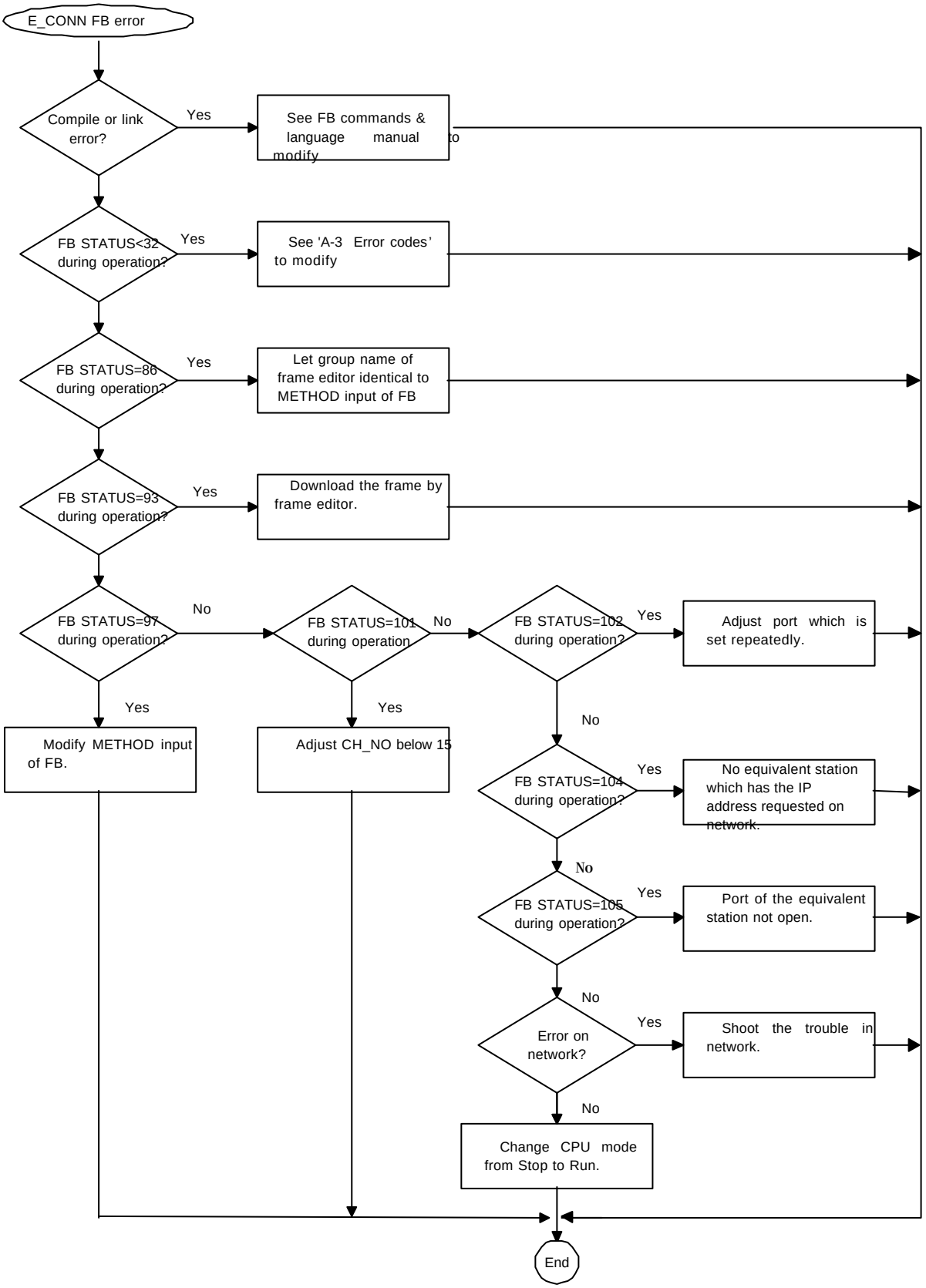
13.2.7 Error code E03-03 : HS link' s Run link contact On unavailable



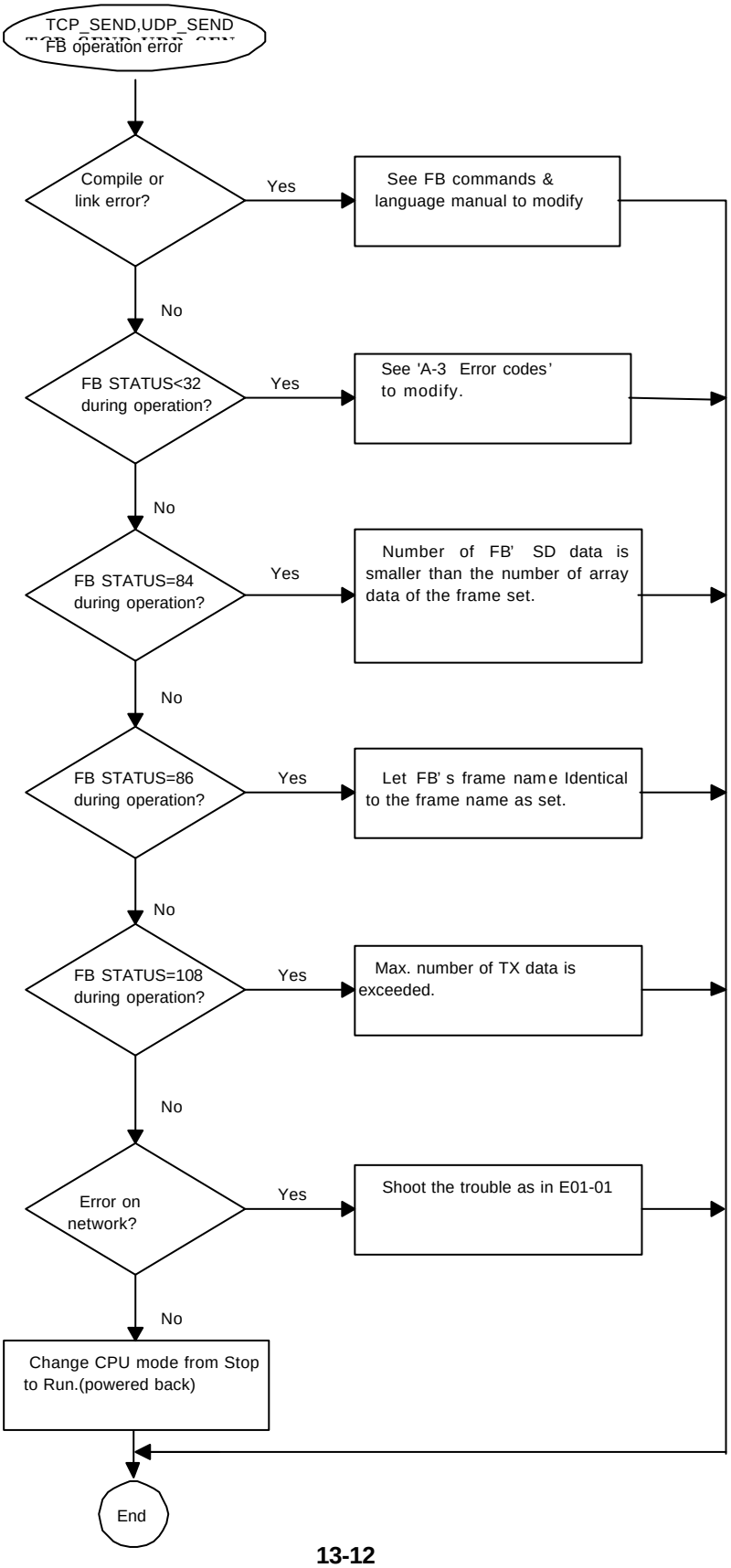
13.2.8 Error code E03-04 : HS link trouble contact On



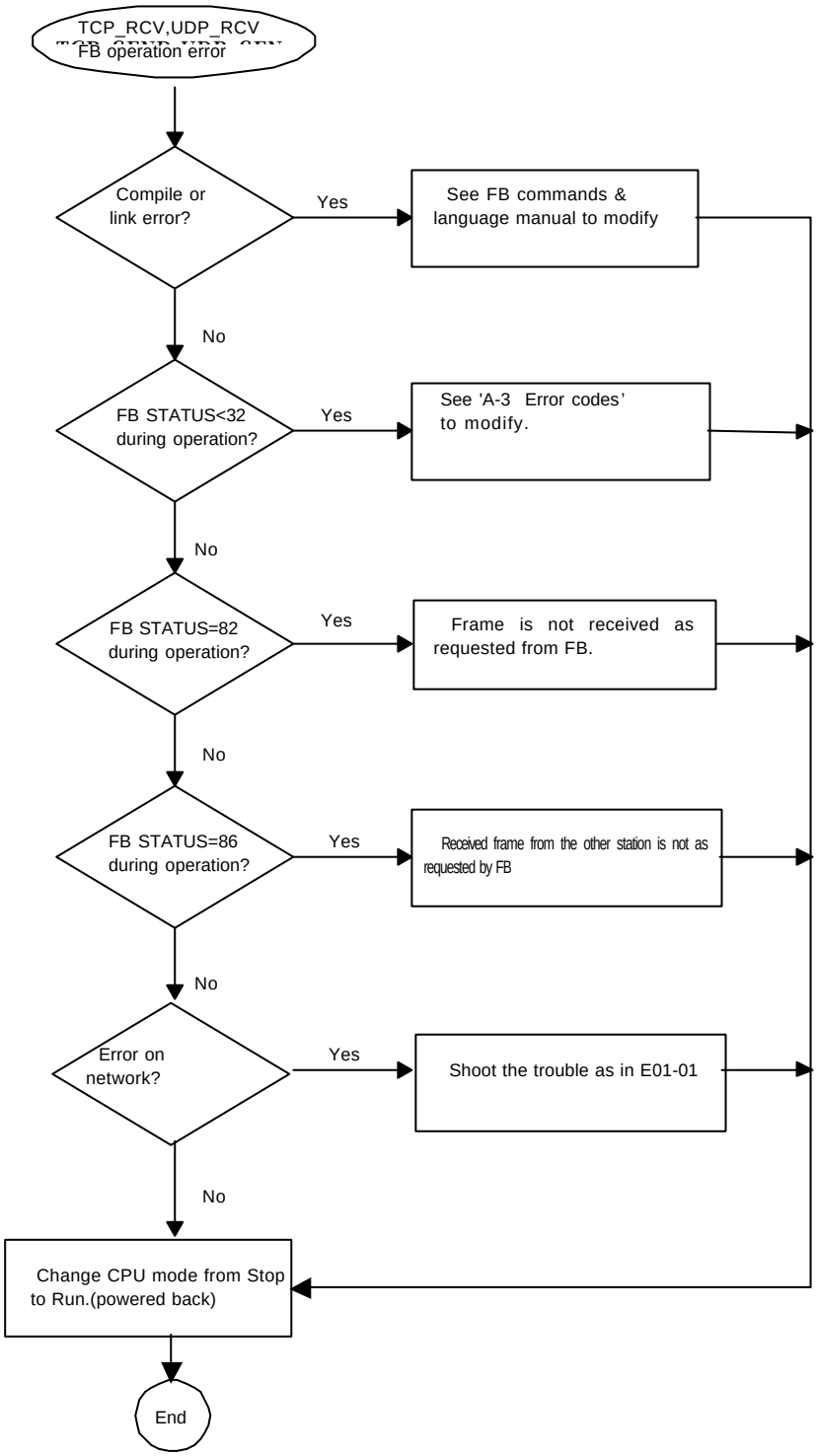
13.2.9 Error code E04-01 : E_CONN function block operation error



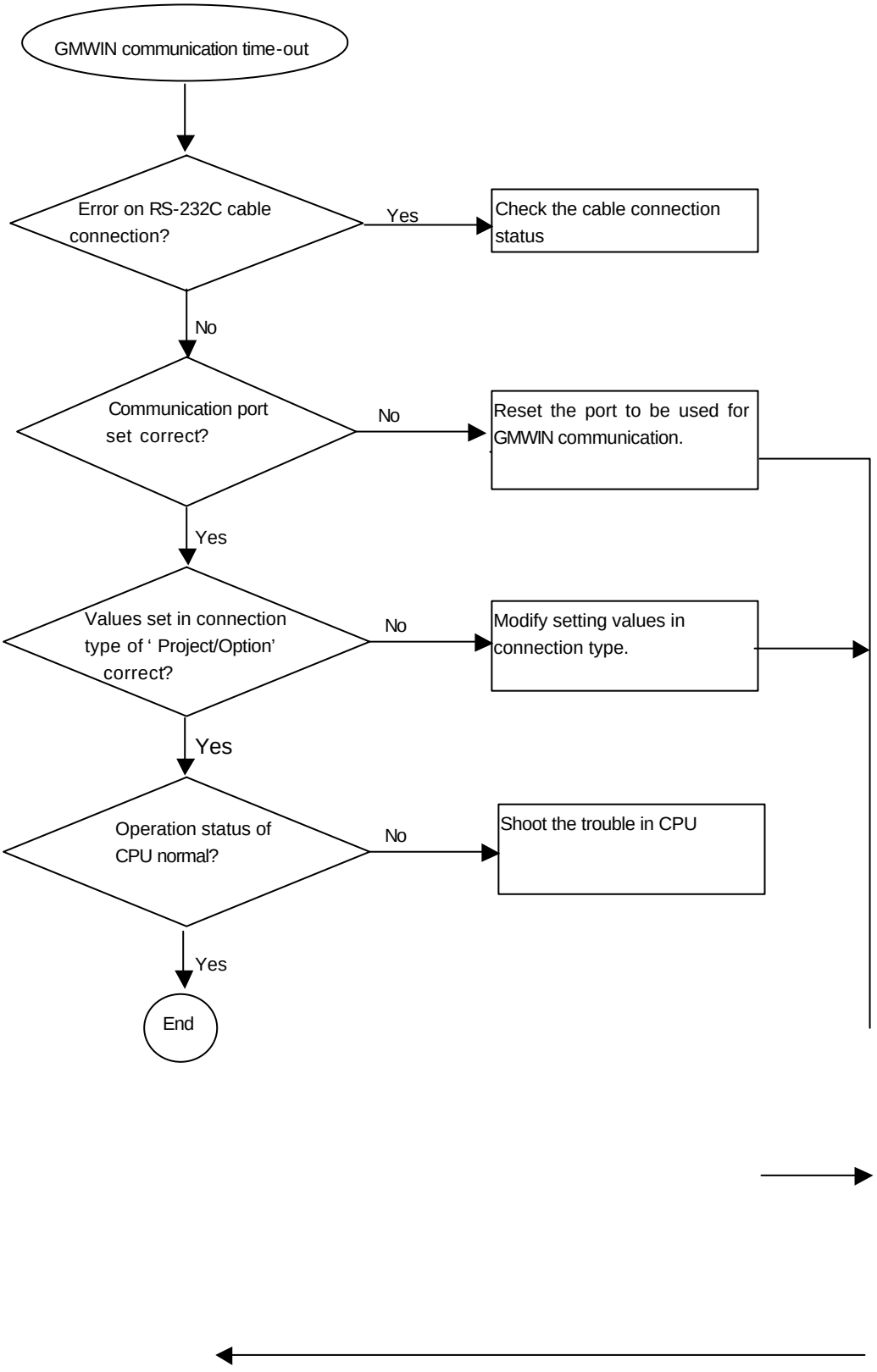
13.2.10 Error code E04-02 : TCP_SEND, UDP_SEND FB operation error



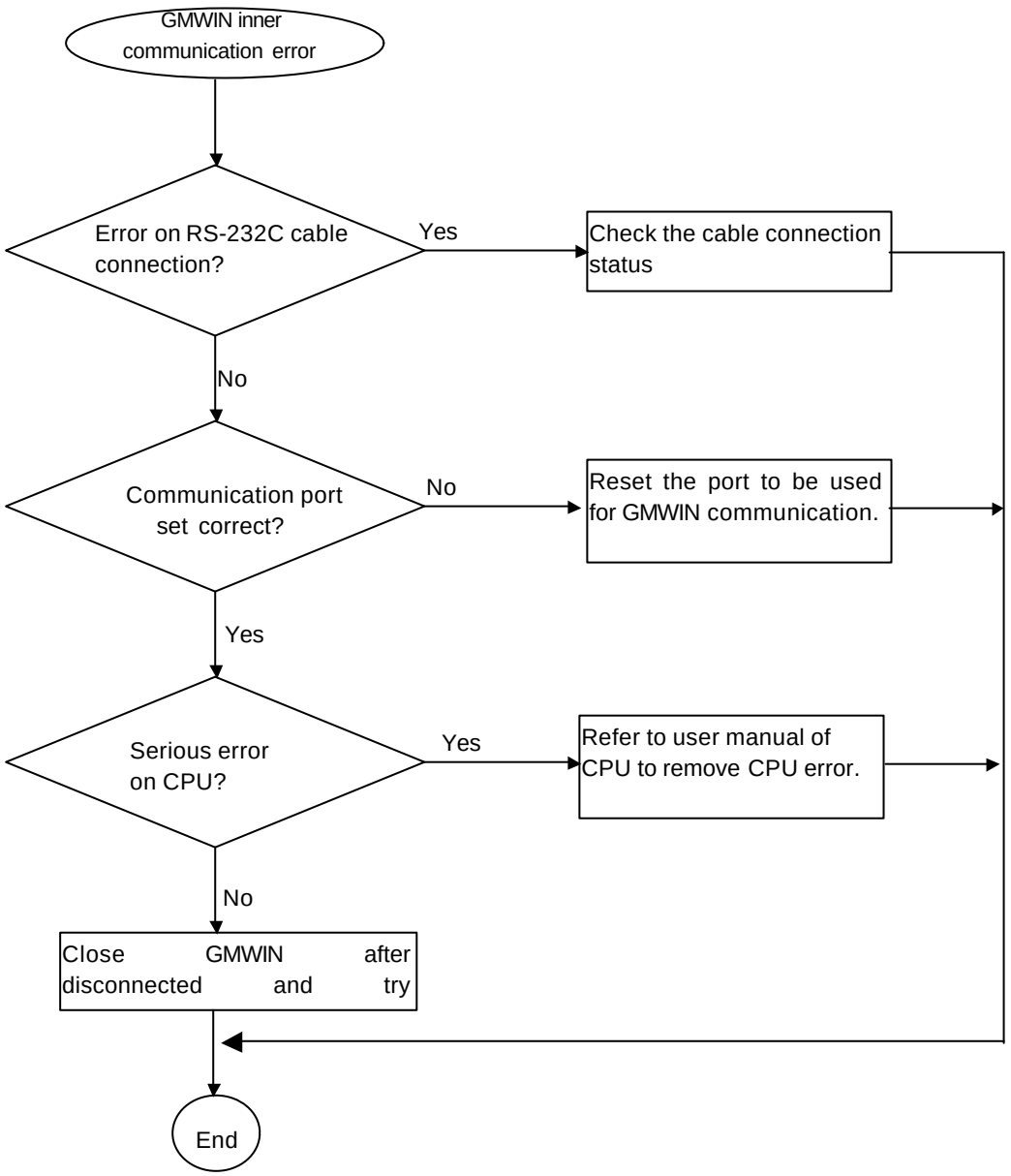
13.2.11 Error code E04-03 : TCP_RCV, UDP_RCV FB operation error



13.2.12 Error code E05-01 : GMWIN communication time-out occurred



13.2.13 Error code E05-02 : GMWIN inner communication error



Appendix

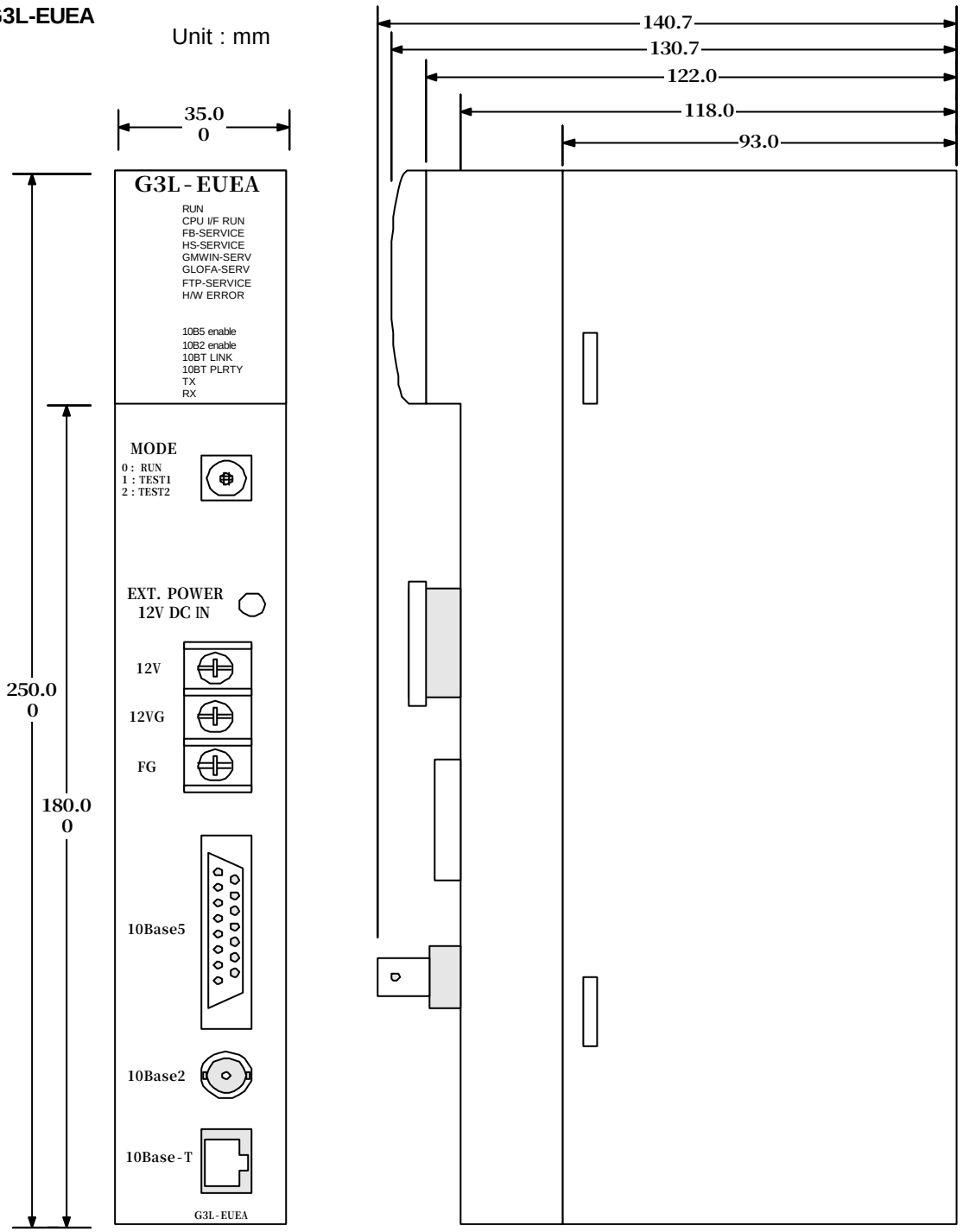
A1 LED display specification

LED No.	Display on module	Description
0	RUN	On if power is supplied normally and communication module is initialized normally.
1	CPU I/F RUN	On if normal communication is available with CPU module. Off if error occurs on common-used RAM check during initializing operation after powered.
2	FB-SERVICE	On if FB in service.
3	HS-SERVICE	Flickering if HS link in service.
4	GMWIN-SERVICE	On if GMWIN connected.
5	GLOFA-SERVICE	On if exclusive service used.
6	FTP-SERVICE	On during FTP connection. (not supported as of now)
7	H/W ERROR	On if error occurs which is impossible to recover by module itself.
8	--	N/A
9	--	N/A
10	10BASE5 Enable	On if 10BASE5 is available. (On if 10B5/2 is set in basic setting of frame editor and the jumper in communication module is set to 10BASE5)
11	10BASE2 Enable	On if 10BASE2 is available. (On if 10B5/2 is set in basic setting of frame editor and the jumper in communication module is set to 10BASE2)
12	10BASE-T LINK	On if 10BASE-T is connected. (On if 10B-T is set in basic setting of frame editor)
13	10BASE-T PLRTY	On if poles of 10BASE-T connection are normal. On if poles of 10BASE-T connection are normal.
14	TX	Flickering at TX.
15	RX	Flickering at RX.

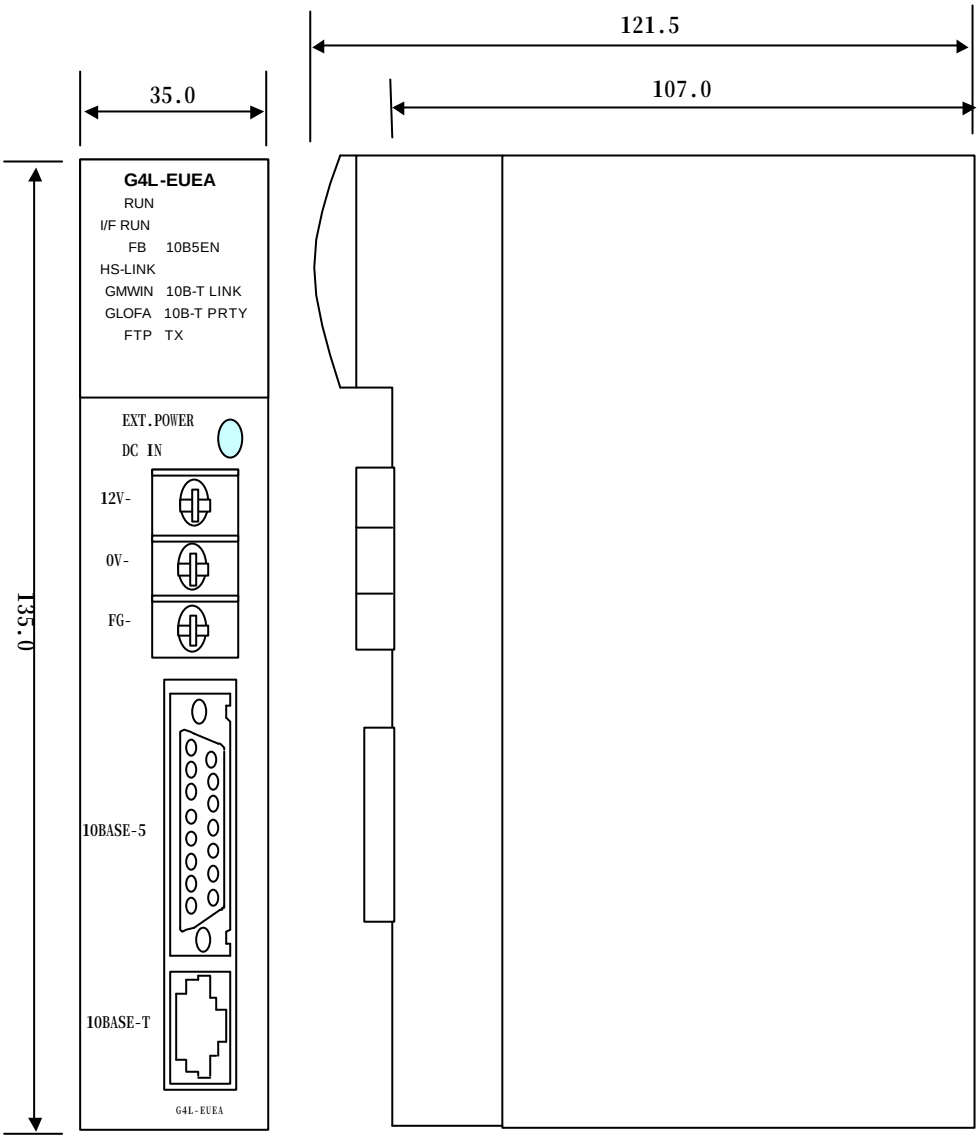
A2 External dimensions

G3L-EUEA

Unit : mm



G4L-EUEA


121.5
107.0
35.0
135.0
G4L-EUEA
RUN
I/F RUN
FB 10B5EN
HS-LINK
GMWIN 10B-T LINK
GLOFA 10B-T PRTY
FTP TX
EXT.POWER
DC IN
12V-
0V-
FG-
10BASE-5
10BASE-T
G4L-EUEA

A3 Error Codes

A3.1 Error received from communication module

Error No. (Decimal)	Description
0	Normal(no error)
1	Link' s physical layer error(TX/RX unavailable) - Self-station error and other station' s power Off, other station No. Write error/trouble.
3	FB distinguisher to receive not found in communication channel. - Not used in LG.
4	Data type disagreed
5	Reset received from other station. - Not used in LG.
6	Communication command of the other station is not ready. - Not used in LG.
7	Device status of the remote station is not as desired. - Not used in LG.
8	Object user wants is not possible to access.
9	Communication commands of the other station received too many to process. - Not used in LG.
10	Response stand-by time exceeded (Time-out) - Response not received from the other station for a specific period of time.
11	Structure error
12	Abort(only for Mnet) - Disconnected by serious error.
13	Reject(Local/Remote) - Error by disagreeable type to MMS or noise.
14	- Communication channel setting error(Connect/Disconnect) Error related with PI/DOMAIN/GEN service and logical communication channel setting necessary for communication with other company' s communication module. (only for Mini_MAP).
15	Error on HS communication and connection service
33	Parameter distinguisher not found. - Not defined within access parameter area.
34	Wrong address Error on structure assigned in the spec. of communication module/Out of range.
50	Wrong response - Requested response is not received or error occurred on the other station CPU

113	Object access unsupported - Disobedient to VMD specific and symbolic address, or max.data value exceeded.
187	Other error code received than assigned.(Other company's communication code value) - Other error code received than defined.

A3.2 STATUS displayed on CPU

Error No. (Decimal)	Description
16	If position of computer communication module is wrongly assigned.
17	Initializing error of communication module installed on SLOT_NO.
18	Input parameter setting error
19	Parameter length error
20	Wrong response received from the other station
21	Response not received from computer communication module (Stand-by time exceeded – Time out)
80	Disconnection error
82	Not received frame (Defined frame not received)
84	Data count error(Number of data used in FB input discordant with or smaller than that of data defined in the frame)
86	No match name(Frame name used in FB input is not on the frame list)
87	Not connected(Channel is not connected)
89	Im TCP Send error(Immediate response error)
90	Im UDP Send error(Immediate response error)
91	Socket error
92	Channel disconnected
93	Basic parameter & frame not set
94	Channel setting error
96	Channel already set
97	Method input error(Incorrect method used in FB input)
101	Channel No. setting error
102	Setting error of the other station (Reset)
103	Connection stand-by
104	Opposite station which has IP as set is not on the network.
105	PASSIVE port of the other station not open.
106	Channel disconnected by stand-by time.
107	Setting number of FB channels exceeded(Number of E_CONN for use exceeded) Setting number of FB channels = 16 - Exclusive connections (Basic parameters of frame editor)
108	Max. TX number exceeded (Since ASCII data = HEX data * 2, the number of ASCII data shall not exceed 1,400 byte)

117	Wrong head of frame header in exclusive service (‘ LGIS-GLOFA’)
118	Wrong length of frame header in exclusive service
119	Wrong checksum of frame header in exclusive service
120	Wrong command in exclusive service
121	Domain/PI service requested by unauthorized station in exclusive service (Error occurs if Domain/PI service is requested by the other station when Domain/PI is unavailable in UDP but already used through TCP)