User's Manual

LG Programmable Logic Controller
Cnet I/F Module

G3L-CUEA
G4L-CUEA
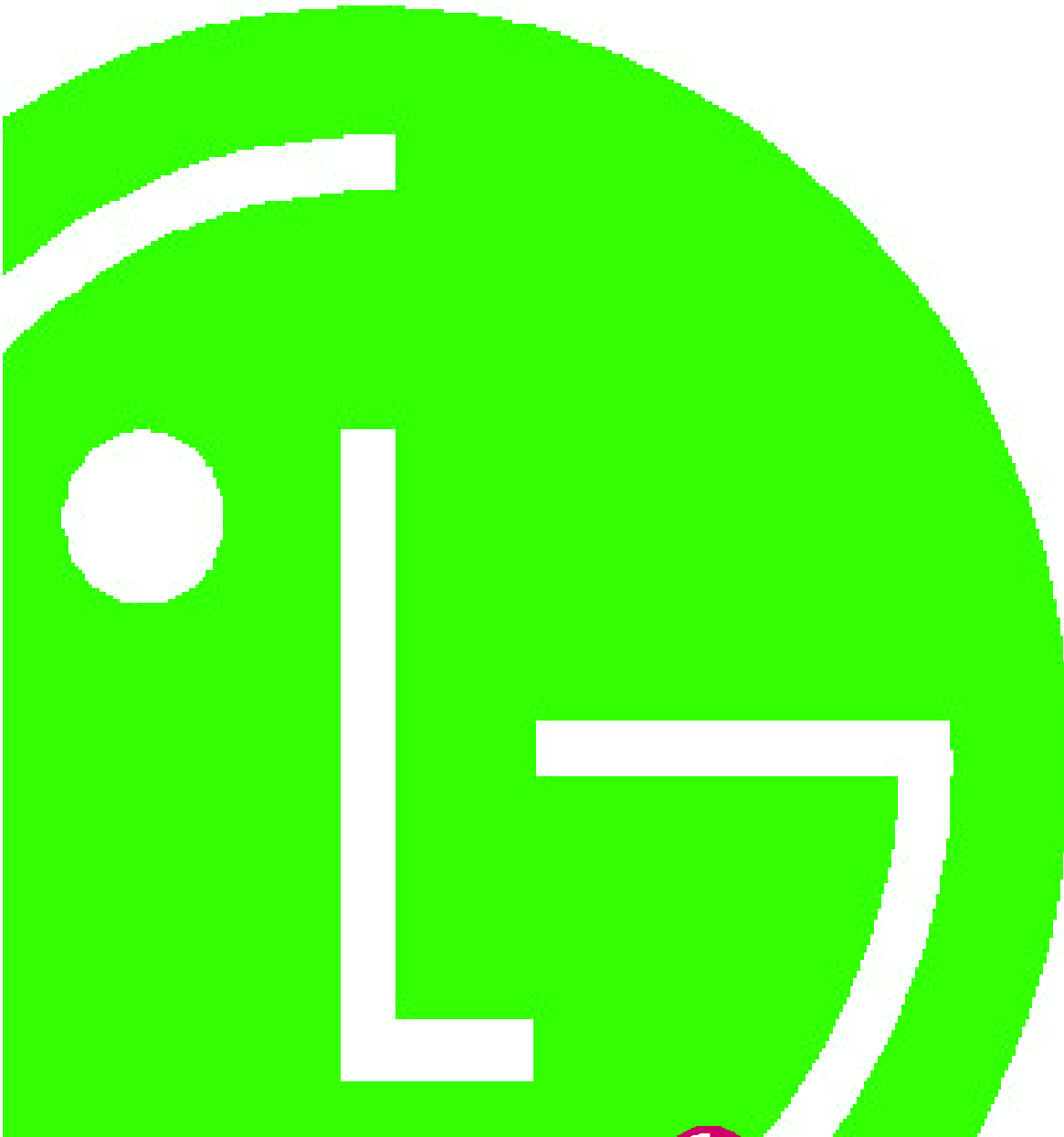**G6L-CUEB**
G6L-CUEC
G7L-CUEB
G7L-CUEC

GLOFA-GM

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
1st edition		1st print
1st revision	2000.01.10	- GM7 Cnet I/F module added - Functions of frame editor Version 2.0 added

◉ **Contents** ◉

Chapter 1 Introduction

This user's manual describes Cnet (Computer network) I/F module of GLOFA PLC network system. Cnet is GLOFA PLC network system using computer link module. Cnet has the connection function with different model to communicate with communication devices of various different type protocols such as other company's PLC and computer, etc., and the function of modem communication to control remote PLC, and it has the following characteristics.

❑ Because communication speed and communication mode (protocol, etc.) are directly controlled by user using program operative in Frame Editor of Windows environment, connection with other company's products is easy.

❑ Separate operations by channels are available through controlling each of other company's protocol for channels RS-232C and RS-422 (RS-485), and saving and using the protocol data controlled by user in internal flash memory (128kbyte) are possible.

❑ Variable reading/writing and program reading/writing are possible by using dedicated protocol.

❑ Dedicated communication function suitable to multi-drop configuration connectable up to 32 units is provided.

❑ With modem communication function built-in, remote PLC can be controlled by GMWIN connection, dedicated communication, and user defined communication.

❑ Communication port, RS-232C/RS-422 (RS-485) can be used by setting it to stand-alone or interlocking channel.

❑ Various communication speeds can be set from 300bps to 76,800bps.

❑ 1:1/1:N/N:M communication (if RS-422 channel used) is available.

❑ Communication types of full-duplex (RS-422/RS-232C) and half-duplex (RS-485) are supported.

❑ Channel RS-422 can be used as multi-drop communication channel, RS-485 by basic parameter setting.

❑ Modules can be mounted up to 8 units for GM1, GM2 and GM3, 4 units for GM4 and GM6, and 1 unit for GM7 (available only on the main base. And as linked with the basic module using an extended connector in case of GM7.)

❑ With satisfactory self-diagnosis function and Loop-Back diagnosis function, diagnosis of errors is easy to make.

❑ With private functions of other products' built-in, access is easy to such protocol as Modbus, A. B DF1. Ver.2.0

1.1 Module selection per CPU type

As 4 types of the modules are developed according to CPU types, appropriate module shall be selected for CPU type and its service. [Table1.1] describes selection guide of module per CPU type.

[Table1.1] Module selection per CPU type

CPU type	Module name	Number of channel	Configuration supported	Max. number mountable[Note2]
GLOFA-GMR[Note1]	G3L-CUEA	2	RS-422	8[Note3]
GLOFA-GM1	G3L-CUEA	2	RS-232C/RS-422	8
GLOFA-GM2	G3L-CUEA	2	RS-232C/RS-422	8
GLOFA-GM3	G3L-CUEA	2	RS-232C/RS-422	8
GLOFA-GM4	G4L-CUEA	2	RS-232C/RS-422	4
GLOFA-GM6	G6L-CUEB	1	RS-232C	4
GLOFA-GM6	G6L-CUEB	1	RS-422	4
GLOFA-GM7	G7L-CUEB	1	RS-232C	1
GLOFA-GM7	G7L-CUEC	1	RS-422	1

Remark

[Note1] RS-422 channel only is available if mounted on duplicated base.

[Note2] This module can not be mounted on an extended base but on the basic base only.

[Note3] However, it can be mounted on slots No. 0~3 of duplicated extended base (for 8 slots) with max. 8 modules.

1.2 Functions of Version 2.0

This module has been operated in various application fields at home and abroad since released along with steady increasing performance via continuous Version-Up to answer the diverse requests of customers and to reinforce the reliability. Cnet I/F module has performed functional upgrade to Ver.2.0 reflected by the diverse requests of customers on the basis of convenience, compliance and flexibility for users. Cnet I/F module Ver.2.0 has been designed so kept along with the lower versions of products for functional compliance to use the established functions as same as 100%. Thus, refer to this user's manual for only added functions.

1.2.1 Version check [Note1]

O/S versions of Cnet I/F module are classified into CPU ROM O/S Ver. and Flash Memory O/S Ver. with the differences below.

O/S Type	Class	Ver.2.0	Ver.1.7 or less[Note2]
CPU O/S	Function	Initial running and flash memory managing	Performs all module functions
	Saving location	CPU ROM	CPU ROM
	Ver. check	Using GMWIN's I/O information function	
	Ver. Up	CPU ROM change	CPU ROM change
FLASH O/S Ver.2.0	Function	Execution of all other functions than initial running	N/A
	Saving location	Flash memory	N/A
	Ver. check	Using Frame Editor	N/A
	Ver. Up	Using Frame Editor, upgrade by S/W	N/A

> **Remark**
>
> [Note1] Cnet I/F module versions are classified as based on CPU O/S Ver. Namely, functions for Ver. 2.0 or later mean that CPU O/S is of Ver.2.0 or later.
>
> [Note2] Since modules of Ver.1.7 or less have CPU O/S only, O/S upgrade via flash memory is unavailable.

1) CPU O/S Ver. check

Cnet Ver.2.0 performs the most basic functions for initial running and flash memory operation and Ver.1.7 or less performs all functions of Cnet. CPU O/S can be upgraded only by CPU change of Cnet I/F module. Versions of Cnet I/F modules are classified on the basis of CPU O/S with the following procedure for version check.

A) If [I/O info …] selected after GMWIN [Online] connection, I/O information dialog box is displayed as below.
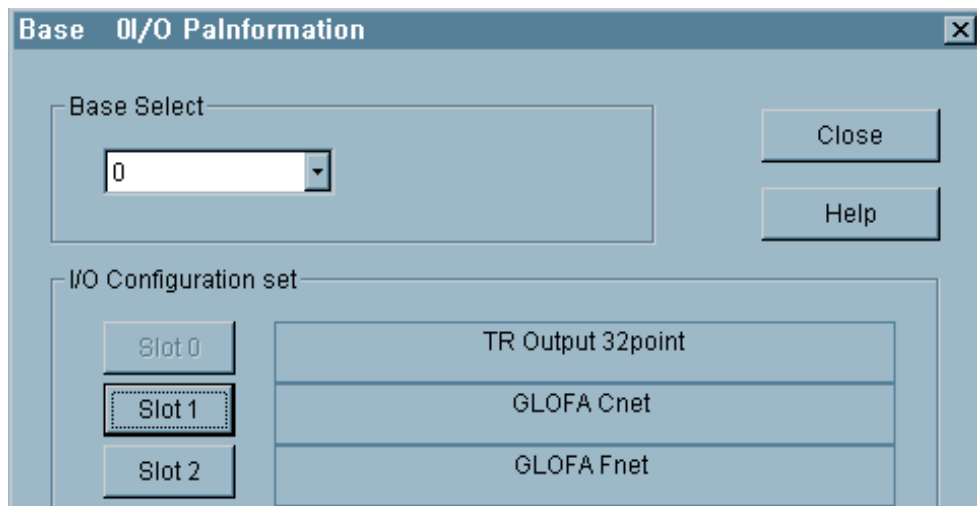
B) If applicable base is selected from I/O information dialog box, slot number in bold is displayed as a menu available to select for communication module and special module. Click equivalent slot number to 'GLOFA Cnet' to display the dialog box as in [Figure 1.1]. The succeeding figure to V in Vx.x indicates the version.

[Figure1.1] CPU O/S Ver. information
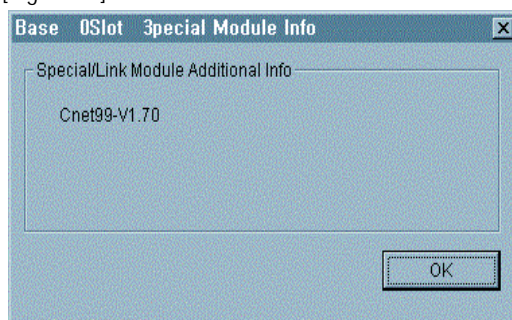
    (a) Version information of Ver.1.7　　　　　　　　(b) Version information of Ver. 2.0
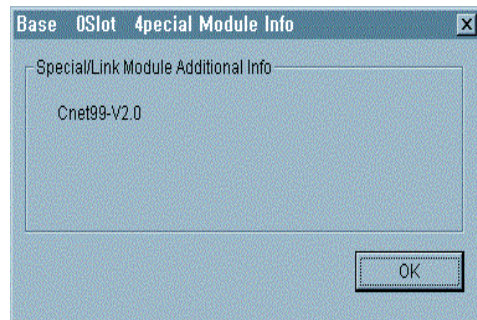
2) FLASH O/S Ver. check

For Cnet I/F module Ver. 2.0 or later, all functions to embody Cnet functions are saved in flash memory, and version check and upgrade are available through Frame Editor. Flash O/S version can be checked by Frame Editor if CPU O/S is of Ver. 2.0 or later.

A) Select flash memory information with Frame Editor after Online connection.
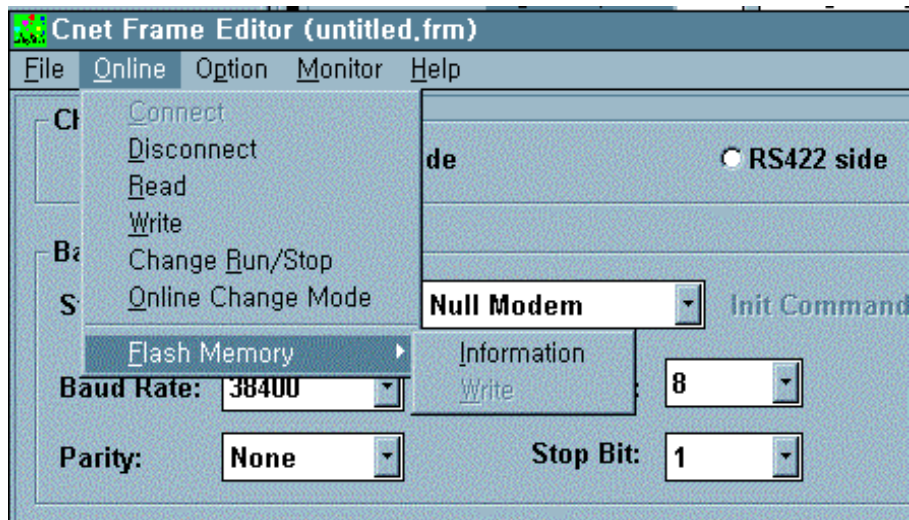
B) Select slot number and O/S on which Cnet I/F module is mounted from the system information screen, and click reading button to display the system information screen as below for version check of FLASH ROM.
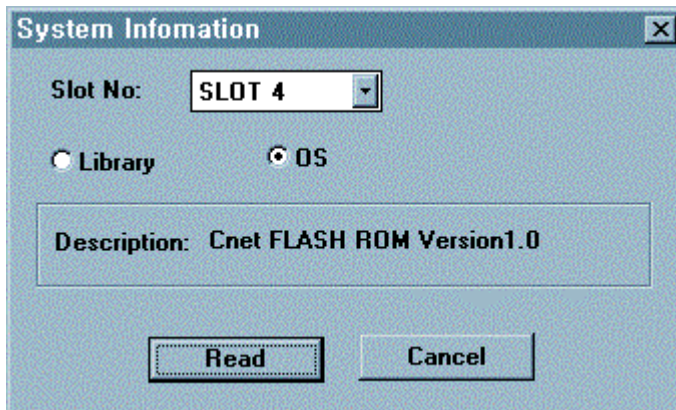
1.2.2 Added functions introduction of Version2.0

[Table1.2] shows configuration of main functions of Ver.2.0.

[Table1.2] Configuration of main functions added to Ver.2.0.

Items	Comparison between contents		Remark
	Ver.1.0 ~ 1.7	Ver.2.0 or later	
On-line Mode change	● Operating mode of module is set via H/W using switch. ● Mode change during operation is unavailable. ● No mode change function in Frame Editor	● Mode change during operation is available with On-line mode added to module. ● Mode change with Frame Editor ● Operating mode change is available by remote control via RS-232C channel.	Mode is changeable by remote control (only for RS-232C channel).
Master functions of dedicated communication	● Communication between Cnet I/F modules is inconvenient as provided only with dedicated communication slave function. ● Frame definition and GMWIN program need to be composed in user defined mode.	● Communication between Cnet I/F modules is easy with master function added to dedicated mode. ● Communication between Cnet I/F modules is available using dedicated 'Function Block' without frame definition.	Slave operation is same as established dedicated mode operation (lower Ver. of Cnet I/F module can be used).
other company's communication driver built-in	● No communication driver of main other company's protocol ● Protocol is defined and composed by user with Frame Editor in user defined mode.	● A.B DF1 server protocol driver built-in ● Modbus *ASCII*/RTU server protocol driver built-in	Service is available by downloading communication library in frame editor.
Support of HEX input for constant edit	● Only *ASCII* data can be input. ● Specified as ARRAY if HEX input.	● HEX can be set in constant area. ● Trans. data is transmitted in not *ASCII* but HEX.	Zero(00) code can't be input.
Flash memory operation	● CPU change is required as Cnet O/S uses internal ROM of built-in CPU for Ver.-Up.	● Flash memory is used by O/S. ● Other company's dedicated protocol can be used as downloaded to flash memory.	Ver.-Up easy and additional functions of other company's driver under consideration

1.2.3 Established functions

Ver. 2.0 has been designed in 100% of compliance with the established versions and hardware configuration is the same as the former versions of products as upgraded via software Ver.-Up without hardware change. Accordingly, mounting and communicating connection with PLC CPU, user defined communication, dedicated communication, GMWIN connection, modem communication function, etc. are available as same as in the established functions.

1.2.4 Frame Editor Version 2.0

To make additional configuration of Cnet Ver. 2.0 available, Frame Editor also shall be of Ver. 2.0. Since Frame Editor Ver. 2.0 has been designed to keep compliance with the established program, the service for the former versions of modules is allowed. However, the added functions in this user's manual are available only for Cnet Ver. 2.0. Select Help in the upper menu of Frame Editor to check the version. The screen below shows Frame Editor information of Ver. 2.0.
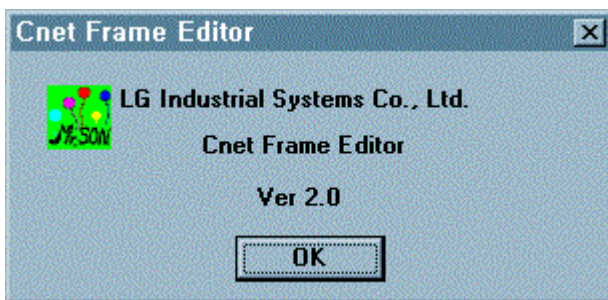
1.2.5 Added function of Version2.0

This user's manual describes the additional functions via module Ver.-Up and the established functions of Cnet functions together. The additional functions provided only in Cnet Ver. 2.0 are so displayed as with Ver.2.0, and the functions displayed with the mark above are available not in the former versions but only in Ver. 2.0.

Chapter 2 Definition of terms

This chapter describes the communication terms used in this user's manual.

1) Communication type

    A) Simplex

        This is the communication type that data is transferred in constant direction. Information can not be transferred in the reverse direction.

    B) Half-Duplex

        Data is transferred in two-way with one cable if time interval provided, though it can't be transferred simultaneously.

    C) Full-Duplex

        Data is simultaneously transferred and received in two-way with two cables.

2) Transmission type

    This is divided into the following 2 types in consideration of the speed, safety and economy on transmission in binary (bit composed of 0 and 1).

    A) Serial transmission

        This type transmits bit by bit via 1 cable. The speed of transmission is slow, but the cost of installation is low and the software is simplified.

    RS-232C, RS-422 and RS-485 are the examples.

B) Parallel transmission

This type is used in printer, etc., which transmits data in unit of 1 byte, so the speed is high and the accuracy of data is reliable. However, the longer the transmission distance is, the higher the cost of installation is geometrically.
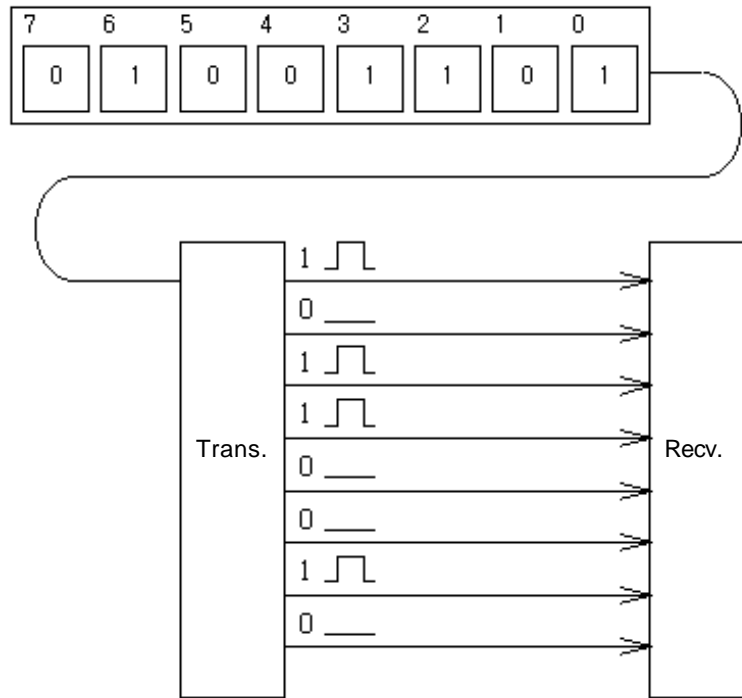
3) Asynchronous communication

This communication type transmits characters one by one synchronously in serial transmission. At this time, synchronous signal (Clock, etc.) is not transmitted. Character code is transmitted with a start bit attached to the head of 1 character, and it is finished with a stop bit attached to the tail.

* For transmitting KOREA

Transmission direction →

Stop Bit   Parity Bit   Data Bit   Start Bit
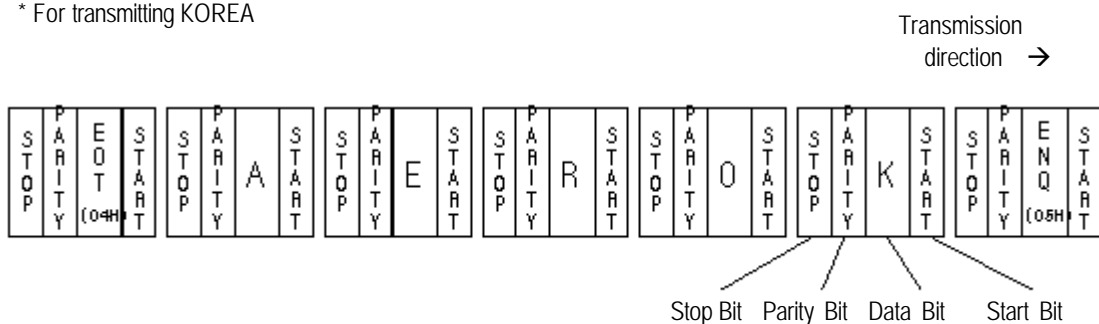
4) Protocol

This is communication rule established in relation between the transmission side and the receiving side of information in order to send and accept information between two computers/terminals or more without error, effectively, and reliably. In general, this specifies call establishment, connection, structure of message exchange form, re-transmission of error message, procedure of line inversion, and character synchronization between terminals, etc.

5) BPS(Bits Per Second) and CPS(Characters Per Second)

BPS is a unit of transfer rate that represents how many bits are transferred per second. CPS is the number of the characters transferring for a second. Generally, one character is 1Byte (8Bits), so CPS is the number of byte which can be transferred per second.

6) Node

Node is a term that means the connected nodes of the data in the network tree structure, generally network is composed of a great number of nodes, and is also expressed as the station number.

7) Packet

Packet, a compound term of package and bucket used for packet exchange type to send information as divided in a unit of packet, separates transfer data into the defined length and adds a header that presents the opposite addresses (station No., etc.) into it.

8) Port

Port is meant to be the part of the data process devices which sends or receives the data from a remote control terminal in data communications, but in Cnet serial communication is meant to be the RS-232C or RS-422 port.

9) RS-232C

RS-232C is the interface to link a modem with a terminal and to link a modem with a computer, and is also the serial communications specification established by EIA according to the recommendations of the CCITT. This is also used to link the null modem directly as well as the modem linkage. The disadvantage is that the transfer length is short and only 1 : 1 communication is available, and the specifications which recover this disadvantage are RS-422 and RS-485.

10) RS-422/RS-485

As one of the serial transmission specifications, its transfer length is long and multi (1 : N) connections are available compared to RS-232C. The difference of these two specifications is that RS-422 uses 4 signals of TX(+), TX(-), RX(+) and RX(-), while RS-485 has 2 signals of (+) & (-), where data is sent and received through the same signal line. Accordingly, RS-422 executes the full-duplex type of communication and RS-485 executes the half-duplex type of communication.

11) Half Duplex Communication

Two-way communication is available, however simultaneous communication of transmission & receiving isn′t available. This communication type is applied to RS-485 for instance. It is used a lot for multi-drop communication type which communicates via one signal line by several stations. Half Duplex Communication results from the transmission characteristic performed by stations one by one not allowing simultaneous transmission by multi stations due to the data damage of data impact caused by the simultaneous multi-transmission of the stations. The figure below shows an example of structure based on Half Duplex Communication. Each station in communication with the terminal as linked with each other can send or receive data via one line so to execute communication with all stations, where multi-master is advantageously available.

Master station

| Master station | Master station | Master station | Master station |
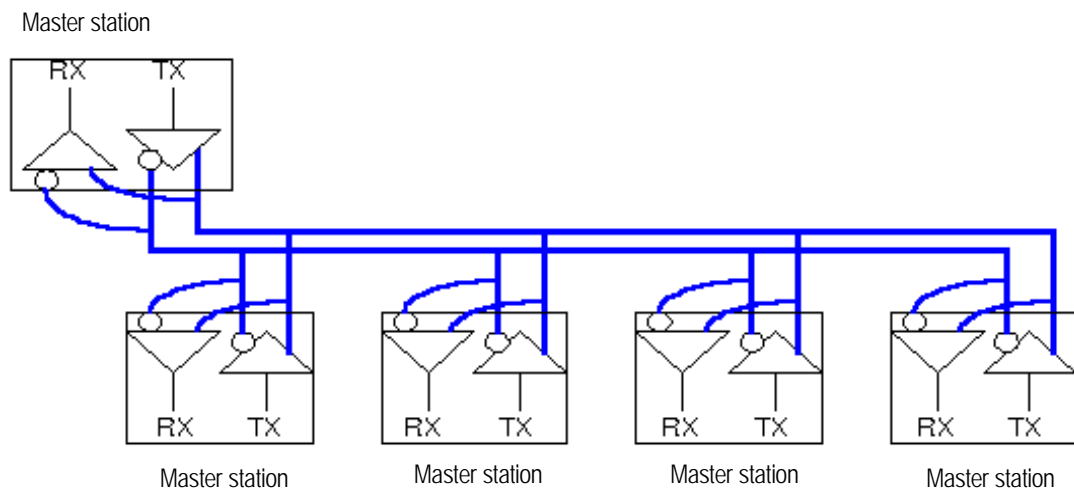
12) Full Duplex Communication

Two way-communication of simultaneous transmission & receiving is available. This communication type is applied to RS-232C & RS-422.

Master station

| Slave station | Slave station | Slave station | Slave station |
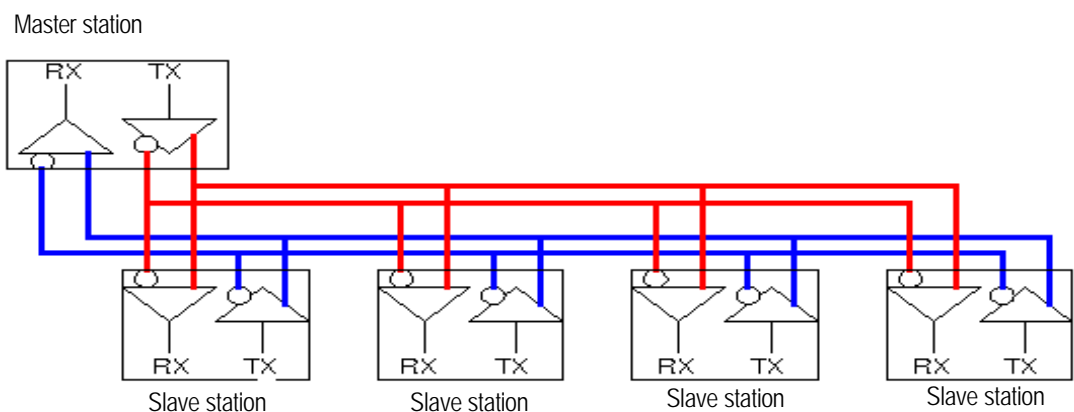
Since the transmission line is separated from the receiving line, simultaneous transmission & receiving is available without data impact, so called as Full Duplex Communication. The figure shows an example of structure based on RS-422 of Full Duplex Communication. Since transmission terminal of the master station and receiving terminals of the slave stations are connected to one line, and transmission terminals of the slave stations are linked with receiving terminal of the master station, the communication between slave stations is unavailable with the restricted function of multi-master.

13) BCC(Block Check Character)

As serial transmission may have signals distorted due to noise in transmission line, BCC is used as data to help receiving side to check the signals if normal or distorted and to detect errors in signals as compared with the received BCC after calculating BCC by receiving side itself using the data input to the front terminal of BCC.

14) GMWIN function

This is the function to remotely perform programming, reading/writing user's program, debugging, and monitor ing, etc. without moving the physical connection of GMWIN in the network system where PLC is connected to Cnet I/F module. Especially, it is convenient to control a remote PLC via modem.
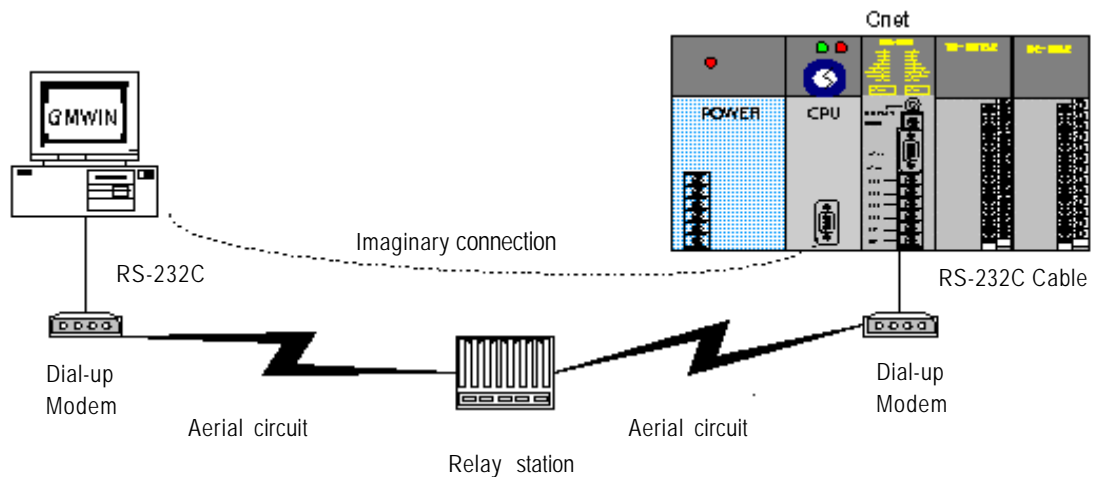
* GMWIN : Programming software of GLOFA PLC for Windows.

15) Frame

Frame is composed of transmitted and received data as in a specified form in data communication including additional information of segment [station No., commands, parameter by command], control characters [ENQ, ACK, EOT, ETX] for synchronization, parity for detecting error, and BCC. The structure of frame used for serial communication of Cnet is as follows.

[Structure of general TX / RX frame]

Required frame
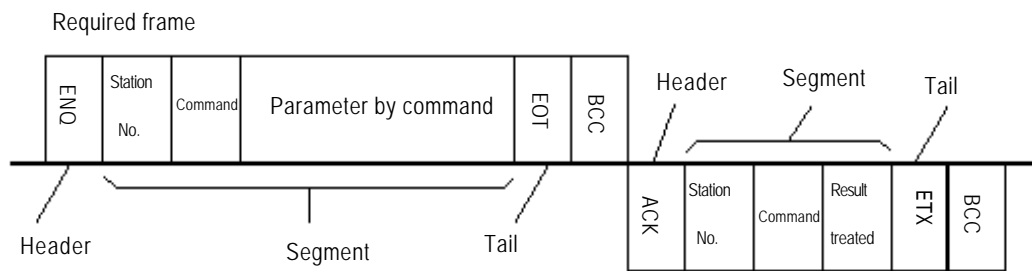
(1) Header : ASCII value indicating frame start.

(2) Tail : ASCII value indicating frame end.

(3) BCC (Block Check Character) : BCC as of check data for TX / RX frame is to inspect reliability of data with such various methods as ADD, OR, EXR and MULTIPLY.

Chapter 3 Product specification

3.1 General specification

[Table 3.1] describes the environmental, electric and mechanical specifications of this module.

[Table 3.1] General specification

No.	Item	Specification				Related specifications
1	Operating temp.	0　+55				
2	Storage temp.	-25　+70				
3	Operating moist	5　95%RH, non-condensing				
4	Storage moist	5　95%RH, non-condensing				
5	Vibration proof	For discontinuous vibration				IEC 61131-2
		Frequency	Acceleration	Amplitude	Number	
		10　f< 57	-	0.075mm	Each 10 times in X,Y,Z directions	
		57　f　150	9.8　(1G)	-		
		For discontinuous vibration				
		Frequency	Acceleration	Amplitude		
		10　f< 57	-	0.035mm		
		57　f　150	4.9　(0.5G)	-		
6	Impact proof	* Max. impact acceleration:147　(15G) * Authorized time :11 * Pulse wave : Sign half-wave pulse (Each 3 times in X,Y,Z directions)				IEC 61131-2
7	Noise proof	Square wave impulse noise		± 1,500V		Test spec. reference of LG Industrial Systems
		Static electric discharging		Voltage : 4kV(contact discharging)		IEC 61131-2,IEC 1000-4-2
		Radiation electromagnetic field noise		27 ~ 500MHz, 10 V/m		IEC 61131-2,IEC 1000-4-3
		Fast Transient / burst noise	Segment	Power module	Digital I/O (24V or more)	Digital I/O (below 24V) Analog I/O communication interface	IEC 61131-2, IEC 1000-4-4
			Voltage	2kV	1kV	0.25kV	
8	Ambient conditions	No corrosive gas or dust				
9	Operating height	2000m or less				
10	Pollution level	2 or less				
11	Cooling type	Natural air cooling				

Remark

[Note1]　IEC(International Electrotechnical Commission): International non-governmental organization, which promote international cooperation, establish international standard, and administer valuation system to its suitableness for international standards of electric and electronic tech fields.

[Note2]　Pollution level: An index indicating pollution level of the operating environment which decides insulation performance of the devices. For instance, Pollution level 2 indicates the state generally that only non-conductive pollution occurs. However, this state contains temporary conduction due to condensing.

3.2 Performance specifications

[Table 3.2] Performance specification

Item		Specification		Remark
Serial communication channel	RS-232C channel	RS-232C standards conformed		GM3/4/6/7
	RS-422/485 channel[Note1]	RS-422/485 standards conformed		GM3/4/6/7
Modem connection function		Remote communication[Note2] with external devices is available via public telephone line by connecting external modem to the module.		GM3/4/6/7
Operating mode (Operating mode can be set by operating switch for RS-232C /422 channels respectively)	Dedicated mode	Supporting multi-drop / 1:1 communication with dedicated protocol of LG Industrial Systems		GM3/4/6/7
	GMWIN mode	PLC remote control is available through GMWIN connection function		GM3/4/6/7
	User defined mode	Operated by user defined protocol (for other company's interface)		GM3/4/6/7
	On-line mode Ver. 2.0	Set by software when editing frame without change of the mode switch		GM3/4/6
	Other company's Dedicated Mode Ver.2.0	Interface[Note3] with other companies such as Modbus and A.B DF1		GM3/4/6/7
Data type	Data Bit	7 or 8	With Frame Editor, basic parameter can be selected[Note4] / GM7 is set in GMWIN communication parameter.	GM3/4/6/7
	Stop Bit	1 or 2		
	Parity	Even/Odd/None		
Channel select		Stand-alone/interlocking channels can be selected by operating mode switch [Note5]		GM3/4/6
		Set in GMWIN communication parameter.		GM7
Synchronization type		Asynchronous type		GM3/4/6/7
Transmission speed (bps)		Any speed of 300/600/1200/2400/4800/9600/19200/38400/57600/ 76800bps can be selected [Note6]		GM3/4/6
		Any speed of 1200/2400/4800/9600/19200/38400/57600bps can be selected [Note6]		GM7
Station No. setting		Setting with Frame Editor(GM7 is set in GMWIN communication parameter) is available up to 32 stations from 0 to 31 (valid only if operating mode is in the dedicated mode or other company's dedicated mode)		GM3/4/6/7

Item	Specification		Remark
Transmission distance	RS-232C : Max. 15m(extendible by using modem) RS-422 : Max. 500m		GM3/4/6/7
Diagnosis function	Loop-Back diagnosis / Indication of operation status with 16 LEDs during operation (with 8 LEDs for GM6)		GM3/4/6
Current Consumption	G3L-CUEA	160mA or less	
	G4L-CUEA	160mA or less	
	G6L-CUEB	160mA or less	
	G6L-CUEC	160mA or less	
	G7L-CUEB	100mA or less	
	G7L-CUEC	100mA or less	
Weight	G3L-CUEA	375g	
	G4L-CUEA	211g	
	G6L-CUEB	94g	
	G6L-CUEC	102g	
	G7L-CUEB	195g	
	G7L-CUEC	193g	

Remark

[Note1]   With Frame Editor, RS-422 channel of GM3/4/6 can be selected from RS-422 or RS-485. In case of GM7, auto-setting is performed by the wiring of communication module on basic unit.

[Note2]   In case of connecting channel RS-232C to modem, the modem connection is selected in setting menu of RS-232C communication type of Frame Editor. (G6L-CUEC is unavailable)

[Note3]   Regardless of Version, only Modbus interface function is supported for GM7.

[Note4]   Transmission spec. can be set according to each of RS-232C and RS-422 in case of the operating mode of the stand-alone channel.

[Note5]   Channel selection is set between operating mode by channel and stand-alone/interlocking channel by the operating mode switch. Change of channel mode is impossible during operation.

[Note6]   76,800bps is provided in RS-422 or RS-485, and can be used in Cnet I/F module Ver. 1.3 or later.

3.3 Cable specifications

When using communication channel, RS-422 or RS-485, twisted pair cable for RS-422 shall be used in consideration of communication distance and speed. [Table 3.3] describes recommended specifications of cable. Also when using other cable than recommended, the cable conformed to characteristics in [Table 3.3] shall be used.

❑ Item : Low Capacitance LAN Interface Cable
❑ Type : LIREV-AMESB
❑ Size : 2P X 22AWG(D/0.254 TA)
❑ Manufacturer : LG Cable Co., Ltd

[Table 3.3] Specifications of twisted pair cable

1) Electric characteristics

Test item	Unit	Characteristics	Test conditions
Conductor resistance	Ω / km	59 or less	Normal temp.
Withstanding voltage(DC)	V/1min	Withstands for 1 min. at 500V	In air
Insulation resistance	MΩ - km	1,000 or more	Normal temp
Static electricity capacity	Pf / M	45 or less	1kHz
Characteristics impedance	Ω	120 ± 12	10MHz

2) Characteristics of appearance

Item			Solid cable	Stranded cable
Conductor	Core number	Pair	2	2
	Size	AWG	22	22
	Composition	No. / mm	1 / 0.64	7 / 0.254
	Outer dia.	mm	0.64	0.76
Insulator	Thickness	mm	0.55	0.55
	Outer dia.	mm	1.64	1.76

[Figure 3.1] Structural drawing
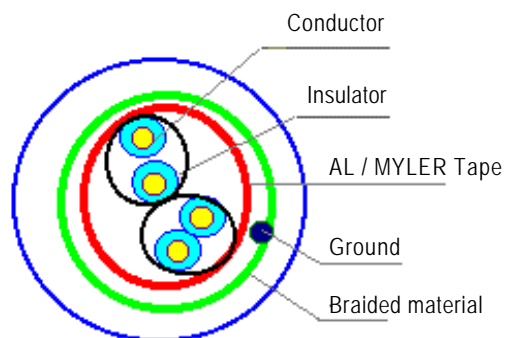
3.4 Terminating resistance

For communication via RS-422 channel, terminating resistance from external must be connected. Terminating resistance has the function to prevent distortion of signal by reflected wave of cable for long-distance communication, and the same resistance (1/2W) as characteristic impedance of cable must be connected to terminal of network.

When using the recommended cable in 3.3, connect terminating resistance of 120Ω to both ends of cable. Also when using other cable than recommended, the same resistance (1/2W) as characteristic impedance of cable must be connected to both ends of cable.

1) **How to connect terminating resistance during RS-422 connection**
   ❑ GM3/4/6 unit

| PLC #1 | PLC #2 | PLC #(N-1) | PLC #N |

   ❑ GM7 unit

| PLC #1 | PLC #2 | PLC #(N-1) | PLC #N |
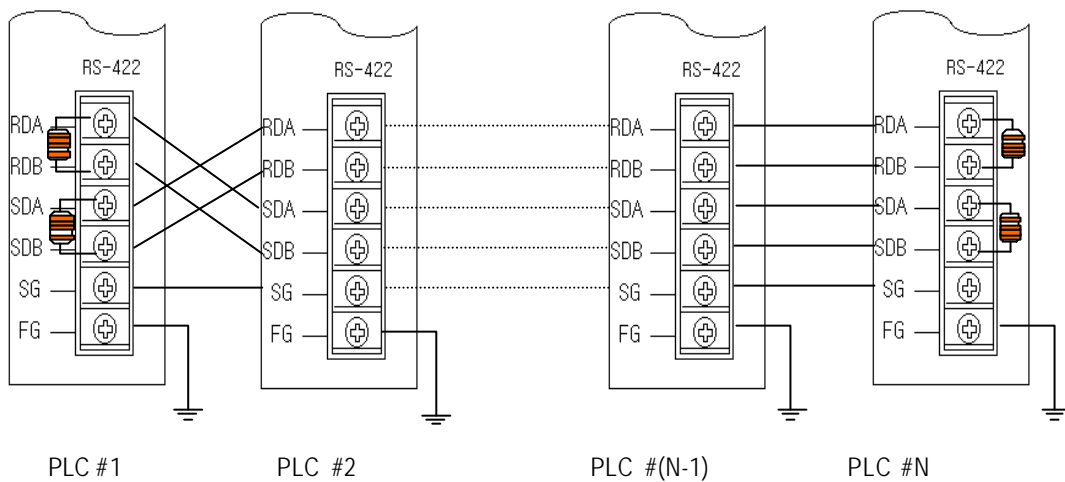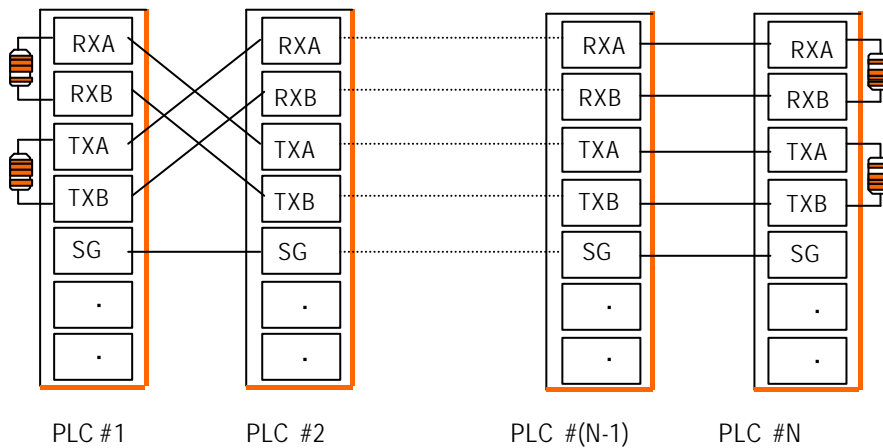
2) How to connect terminating resistance during RS-485 connection
❑ GM3/4/6 unit

PLC #1   PLC #2   PLC #(N-1)   PLC #N

❑ GM7 unit

PLC #1   PLC #2   PLC #(N-1)   PLC #N
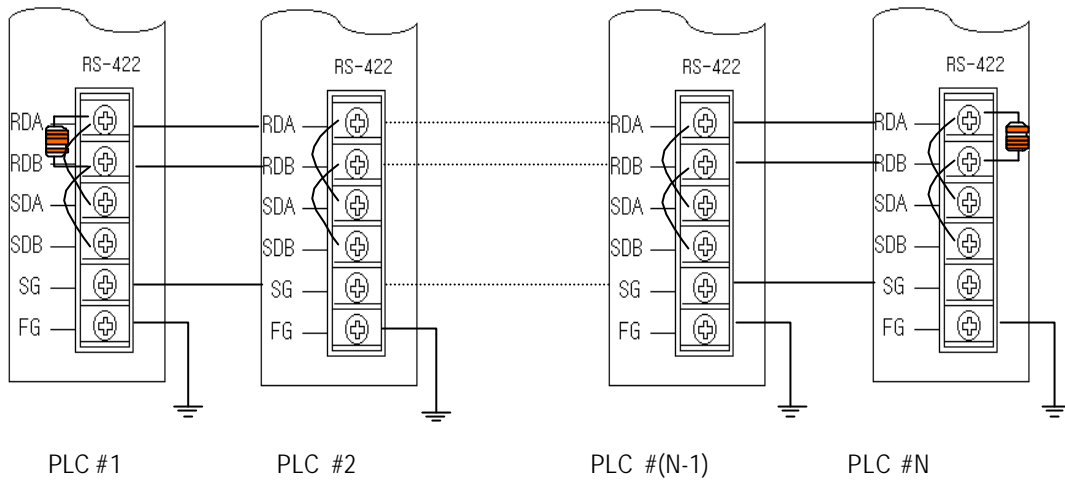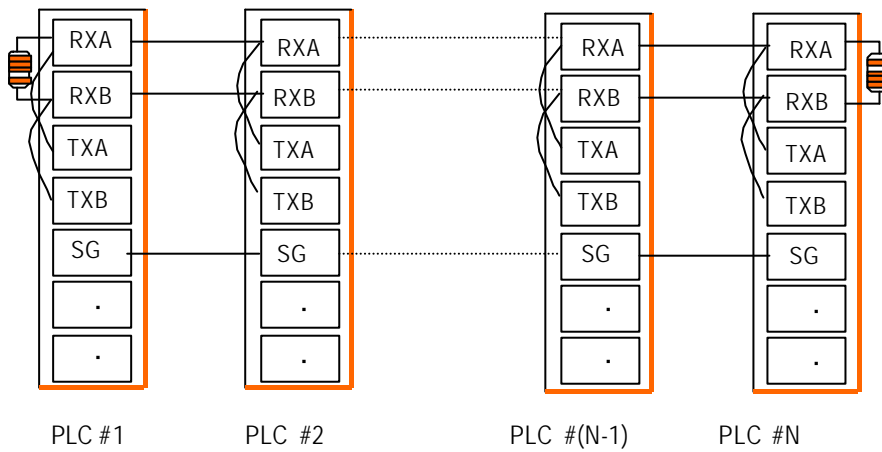
3.5 Structure

3.5.1 Part names of G3L-CUEA
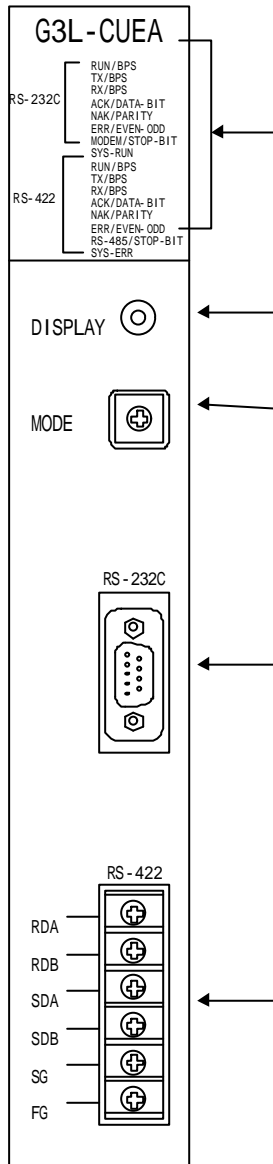
No.	Name	Contents
	LED displaying section	Indication of operating status of G3L-CUEA (see Appendix A)
	Display switch	Switch for indication of parameter and station number (see Appendix A)
	Mode switch	Setting of operation mode (see 4.1)
	RS-232C Connector	RS-232C connector for connection with external devices
	RS-422/485 Connector	RS- 422/485 connector for connection with external devices

3.5.2 Part names of G4L-CUEA
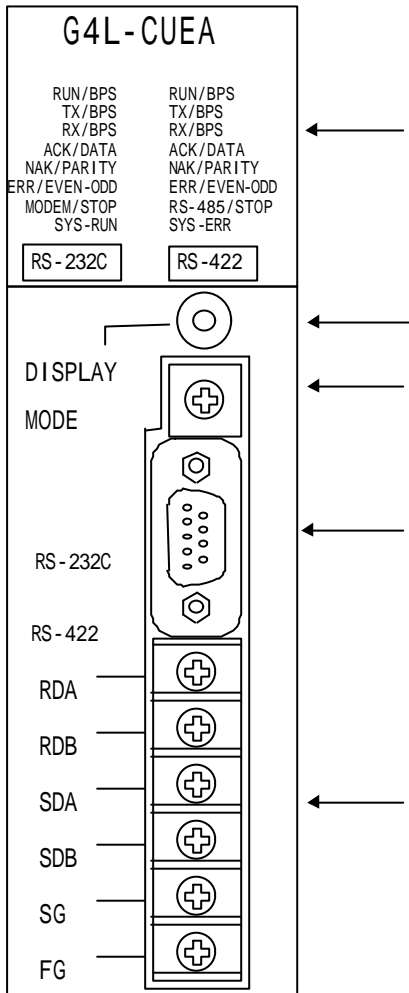
No.	Name	Contents
	LED displaying section	Indication of operating status of G4L-CUEA (see Appendix A)
	Display switch	Switch for indication of parameter and station number (see Appendix A)
	Mode switch	Setting of operation mode (see 4.1)
	RS-232C Connector	RS-232C connector for connection with external devices
	RS-422/485 Connector	RS- 422/485 connector for connection with external devices

{the below}

3.5.3 Part names of G6L-CUEB

```
RUN     NAK
TX      COM-ERROR
RX      MODEM
ACK     SYS-RUN/ERR
   G6L-CUEB


MODE      ⊕


RS-232C
```
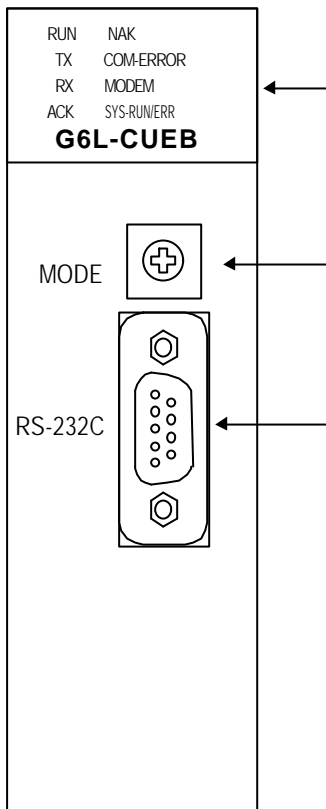
No.	Name	Contents
	LED displaying section	Indication of operating status of G6L-CUEB (see Appendix A)
	Mode switch	Setting of operation mode (see 4.1)
	RS-232C Connector	Connector for connection with external devices

3.5.4 Part names of G6L-CUEC

```
RUN     NAK
 TX    COM-ERROR
 RX    RS-485
ACK    SYS-RUN/ERR
   G6L-CUEC

MODE    ⊕

SDA     ⊕
SDB     ⊕
RDA     ⊕
RDB     ⊕
SG      ⊕
FG      ⊕

   RS-422 / 485
```
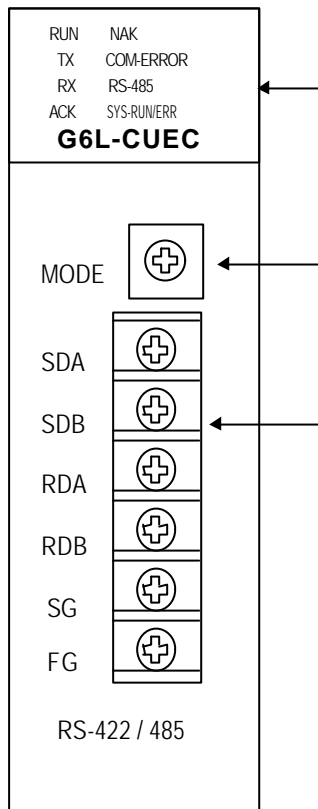
No.	Name	Contents
	LED displaying section	Indication of operating status of G6L-CUEC (see Appendix A)
	Mode switch	Setting of operation mode (see 4.1)
	RS-422/485 Connector	Connectors for connection with external devices

3.5.5 Part names of G7L-CUEB
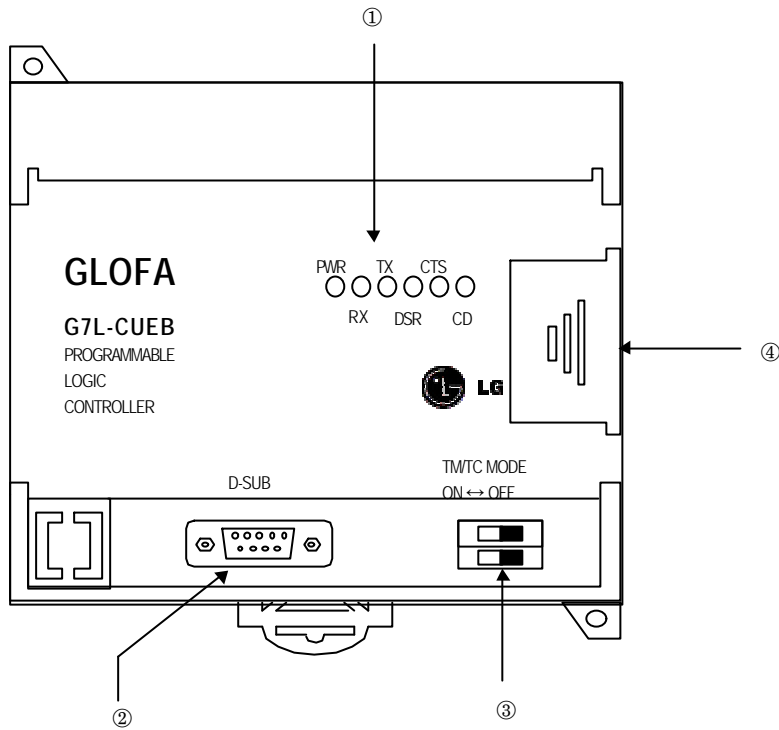
No.	Name	Contents
	LED displaying section	See LED display.
	RS-232C connector	Connectors for connection with external devices
	Mode switch	For selecting of TM/TC operation
④	For extended connector	Connectors for connection with digital I/O module and special module

3.5.6 Part names of G7L-CUEC
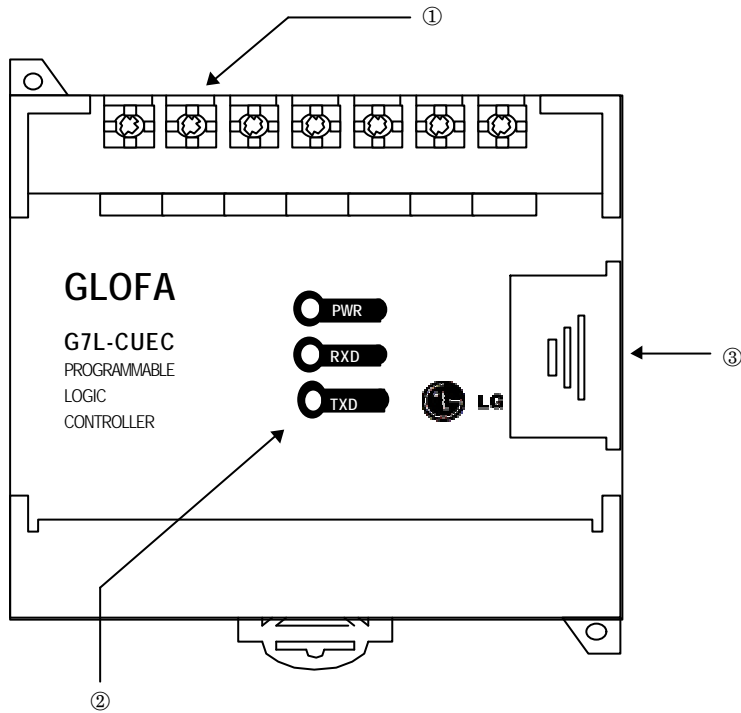
No.	Name	Contents
	RS-422/485 interface	Connectors for connection with external devices
	LED displaying section	See LED display.
	For extended connector	Connectors for connection with digital I/O module and special module
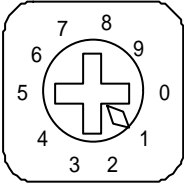
Chapter 4 Performance specification
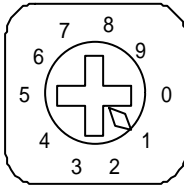
4.1 Operation mode setting

The operation mode of this module is set with operation mode switch on the front, and interlocking/stand-alone mode or operation mode for each channel is determined according to the operation mode. Setting method of operation mode is after selecting required mode adjusting switch values of operation mode with power off, set by power on. Operation mode is unchangeable even if switch values of operation mode are changed during operation, so surely after power off, change the switch values. [Table4.1] & [Table4.2] describe the operation modes according to switch values.

[Table4.1] Operation mode of G3L-CUEA/G4L-CUEA

Switch type	Switch value of operation mode	Operation mode		Remark	
		RS-232C	RS-422		
Applicable module (G3L-CUEA/G4L-CUEA)	0	User defined communication	User defined communication	Off-line mode [Note3]	Interlocking mode[Note1]
	1	Dedicated communication	Dedicated communication		
	2	User defined communication	User defined communication		Stand-alone mode[Note2]
	3	Dedicated communication	Dedicated communication		
	4	User defined communication	Dedicated communication		
	5	Dedicated communication	User defined communication		
	6	GMWIN	User defined communication		
	7	GMWIN	Dedicated communication		
	8	Loop-Back	Loop-Back	Self-diagnosis mode	
		Flash writing mode Ver. 2.0 [Note4]			
	9	On-line mode Ver. 2.0 [Note5]			

[Table4.2] Operation mode of G6L-CUEB/G6L-CUEC

Switch type	Switch value of operation mode	Operation mode		Remark
Applicable module (G6L-CUEB/CUEC)	0	User defined communication	Off-line mode	G6L-CUEC doesn't support GMWIN service (supports only G6L-CUEB)
	1	Dedicated communication		
	2	GMWIN service		
	3	Loop-Back		
	4 ~ 7	Not used		
	8	Flash writing mode Ver. 2.0		Not used in Ver.1.0[Note6]
	9	On-line mode Ver. 2.0		

4-2

Remark

[Note1]   In interlocking mode, main channel is set to RS-232C, RS-422 channel is operated as data path of channel RS-232C (channel RS-422 disabled), and transmission spec. is operated according to setting value of RS-232C.

[Note2]   RS-232C/RS-422 channels are operated separately in stand-alone mode

[Note3]   Off-line mode sets the operation mode with mode switch. (existing mode)

[Note4]   Supported only in Ver.2.0 or later and used for downloading of library file of other company's dedicated communication protocol with flash memory of Cnet I/F module.

[Note5]   Supported only in Ver.2.0 or later and used for setting the operation mode of module with Frame Editor.

[Note6]   When setting in mode not used, do not set Cnet I/F module because both channels of RS-232C/RS-422 are not operated.

[Note7]   Separate setting of operation mode for GM7 series isn't required, however, the operation is decided according to communication parameter of GMWIN.

4.1.1 Channel operation in interlocking mode

In interlocking mode, channels RS-232C and RS-422 are operated as interlocked with each other. In other words, the data received via channel RS-232C is sent via channel RS-422, and the data received via channel RS-422 is sent via channel RS-232C in reverse.

In interlocking mode, main channel is automatically set to RS-232C, data is transmitted/received via channel RS-232C only, and the data is received via channel RS-422 is automatically sent via channel RS-232C without receiving into Cnet I/F module.

[Figure4.1] Data flow in interlocking mode
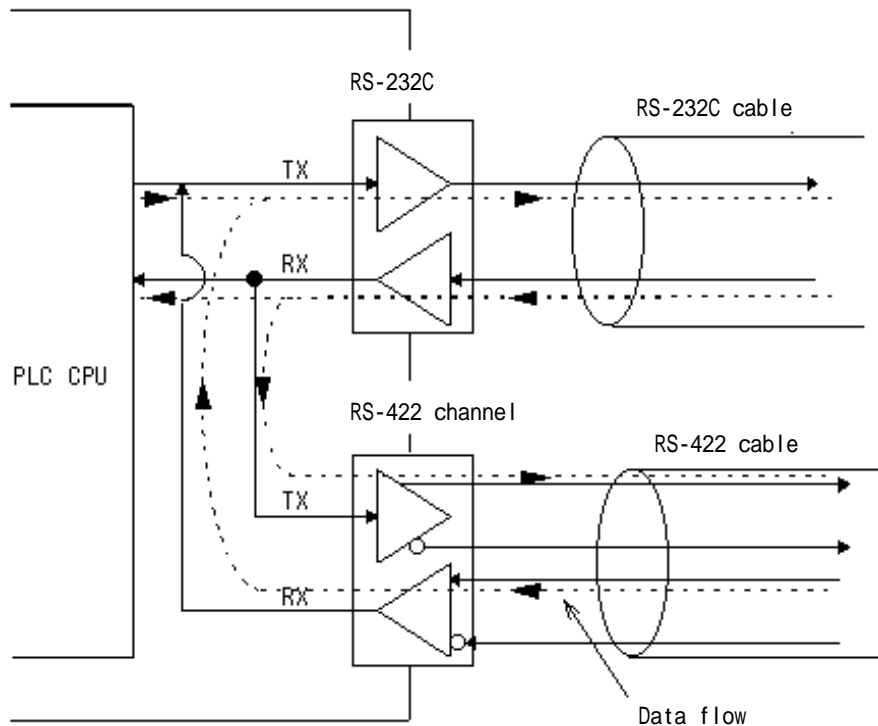
Remark
[Note1] In interlocking mode, data is transmitted/received in accordance with setting values of channel RS-232C transmission spec. and the transmission spec. of RS-422 can be ignored.
[Note2] In interlocking mode, modem can not be connected to RS-232C. During connecting modem, it must be used only after setting to the stand-alone mode. In case that modem is set to be used in interlocking mode, channel RS-232C is operated as in null modem mode.
[Note3] GM6 and GM7 series don't support interlocking mode.

4.1.2 Channel operation in stand-alone mode

In stand-alone mode, channels RS-232C and RS-422 are operated independently to allow simultaneous Tx / Rx in separate transmission specifications. Therefore, transmission specifications can be set per RS-232C and RS-422 channel, and the operation is started/stopped according to channels. Data flow of each channel in stand-alone mode is as below.

[Figure 4.2] Data flow in stand-alone mode
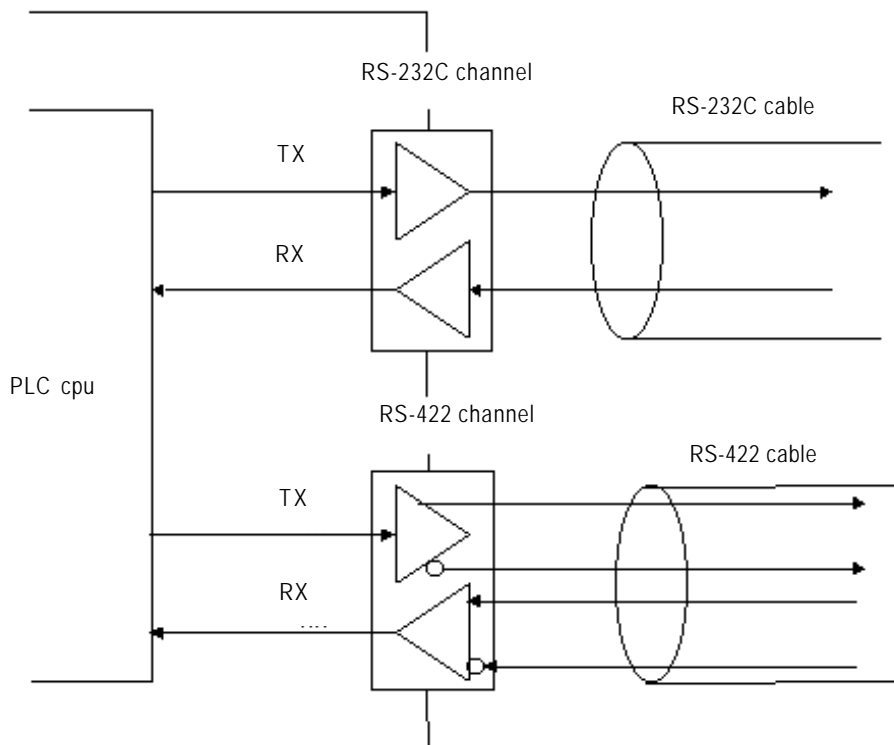
> **Remark**
>
> [Note1] Mode change during operation is unavailable. The mode switch value of the front shall be set to required position surely after power off.
>
> [Note2] Each operation per channel shall be started surely after setting transmission spec. of channels RS-232C and RS-422 and writing for each channel of RS-232C and RS-422 in Frame Editor.

4-5

4.1.3 Channel operation in self diagnosis mode(Loop-Back)

Loop-Back diagnosis is a function to check if communication channel is normally operated by itself without connection with external devices, and is operated only if the mode switch is in Loop-Back mode. For the details of operation method, see 'Chapter 9 Diagnosis function'.

4.2 Method of serial interface

4.2.1 RS-232C interface

Channel RS-232C uses 9-pin connector (Female) for communication with external devices. The names and functions of pins and data directions are as shown in the figure below.

[Figure 4.3] Pin specifications of 9-pin connector for RS-232C

Pin No.	Name	Contents	Signal direction (Cnet<-->external devices)	Description
1	CD	Carrier Detect	←	Reports carrier detection of DCE to DTE
2	RxD	Received Data	←	Received data signal
3	TxD	Transmitted Data	→	Transmitted data signal
4	DTR	Data Terminal Ready	→	Reports communication ready of DTE to DCE
5	SG	Signal Ground	←→	Ground line for signal
6	DSR	Data Set Ready	←	Reports communication ready of DCE to DTE
7	RTS	Request To Send	→	Requests data transmission from DTE to DCE
8	CTS	Clear To Send	←	Reports data transmission available from DCE to DTE
9	RI	Ring	←	Reports ringing tone received from DCE to DTE

Channel RS-232C can communicate with external devices directly and also with remote communication devices using modem. When connecting modem, communication type of RS-232C must be set to 'modem' with Frame Editor, and when not using modem, it must be set to null modem. But when the channel mode is as interlocked, modem can not be connected because it is operated as in null modem even if set to modem.

Remark
[Note1]   DTE:Data Terminal Equipment (Cnet I/F module)
[Note2]   DCE:Data Communication Equipment (external modem)

1) How to connect RS-232C connector during modem connection

Cnet I/F module can communicate with devices of long distance as connected with modem. Modem and RS-232C channel shall be connected as in [Figure4.4] below.

[Figure 4.4] Cable connection between RS-232C and modem

Cnet(9-PIN)		Connection No. and signal direction	Modem side(25-PIN)	
Pin No.	Name		Name	Pin No.
1	CD	←	CD	8
2	RXD	←	RXD	3
3	TXD	→	TXD	2
4	DTR	→	DTR	20
5	SG	—	SG	7
6	DSR	←	DSR	6
7	RTS	→	RTS	4
8	CTS	←	CTS	5
9	RI[Note]		RI	22

[Note] No. 9, RI signal is not used in Cnet I/F module.

2) How to connect connector for RS-232C in null modem mode

In null modem, connector can be connected in 7-wire (with handshake) or 3-wire (without handshake) type. [Figure 4.5] as of 7-wire connection shows connection drawing when controlling CD(Carrier Detect) signal line by external devices.

[Figure 4.5] Connection of 7-wire type (with handshake)

Cnet(9-PIN)		Connection No. and signal direction	Computer/communication devices
Pin No.	Name		Name
1	CD		CD
2	RXD		RXD
3	TXD		TXD
4	DTR		DTR
5	SG		SG
6	DSR		DSR
7	RTS		RTS
8	CTS		CTS
9	RI		RI

If CD signal is not controlled by external devices, it must be connected in 3-wire type connection as in [Figure 4.6]. Recent PC does not control CD signal line, so when connecting with PC, it must be connected in 3-wire type.

[Figure 4.6] Connection of 3-wire type (without handshake)

Cnet(9-PIN)		Connection No. and signal direction	Computer/communication devices
Pin No.	Name		Name
1	CD		CD
2	RXD		RXD
3	TXD		TXD
4	DTR		DTR
5	SG		SG
6	DSR		DSR
7	RTS		RTS
8	CTS		CTS
9	RI		RI

Remark

[Note1]   When in null modem communication via RS-232C channel, wiring without handshake shall be performed on the side of Cnet I/F module as in [Figure4.6] even if only 3 wires are used in external devices.

[Note2]   If not wired as in [Figure4.6], transmission in Cnet I/F module isn't available, however, receiving via Cnet I/F module is allowed.

4.2.2 RS-422 interface

Channel RS-422 uses 6-pin connector (Terminal Block) for communication with external devices. The names and functions of pins and data directions are as shown in [Figure 4.7] below.

[Figure 4.7] Pin specifications of 6-pin connector for RS-422

Pin No.	Name	Signal direction (Cnet<-->external devices)	Description
1	RDA(RXA)	←	Received data(+)
2	RDB(RXB)	←	Received data(-)
3	SDA(TXA)	→	Transmitted data(+)
4	SDB(TXB)	→	Transmitted data(-)
5	S.G(SG)		Ground line for signal
6	F.G		Ground line for frame

❑ Contents in ( ) of the name mean terminal specification of G7L-CUEC.

Channel RS-422 is designed as available to connect RS-422 and RS-485(multi-drop) with external devices. When RS-422 channel is used as multi-drop, set channel RS-422 to RS-485 communication in setting menu of RS-422 communication type of Frame Editor, and use the terminals of RS-422 as connected as shown in [Figure4.9].
[Figure4.8] shows an example of connecting communication cable in RS-422 communication.

[Figure 4.8] RS-422 connection

Computer link side		Signal direction	External communication device
Pin No.	Name	(Cnet<--->external devices)	
1	RDA(RXA)	←	SDA
2	RDB(RXB)	←	SDB
3	SDA(TXA)	→	RDA
4	SDB(TXB)	→	RDB
5	S.G(SG)	↔	S.G
6	F.G	↔	F.G

[Figure 4.9] RS-485 connection

Computer link side		Signal direction	External communication
Pin No.	Name	(Cnet<--->external devices)	device
1	RDA(RXA)		SDA
2	RDB(RXB)		SDB
3	SDA(TXA)		RDA
4	SDB(TXB)		RDB
5	S.G(SG)		S.G
6	F.G		F.G

[Figure4.9] shows how to connect RS-485 multi-drop communication. In case of multi-drop communication, to connect with external devices, RDA and SDA, RDB and SDB of RS-422 channel shall be connected each other. At this time half-duplex communication is run sharing Tx/Rx line, so RS-422 channel mode shall be applied as set to RS-485 in Frame Editor.

Remark

[Note1] G7L-CUEC does not use Frame Editor and is designed to be set automatically by communication parameter of GMWIN.

4.3 How to set transmission specifications

4.3.1 Setting items

Transmission specifications of transmission speed and data type of data/stop bit are set by Frame Editor in this module. Accordingly, user is required to set the following items in accordance with the transmission specifications of the system to be used. Transmission specifications set via Frame Editor are to write by Cnet I/F module. Since the contents with the writing completed are saved in flash memory of computer link inside, they are still saved as unchanged if powered off until re-written in Frame Editor.

In stand-alone mode, channels RS-232C/RS-422 shall be set separately. In interlocking mode, only RS-232C needs setting because they are operated by transmission specifications of RS-232C channel.

[Table 4.3] Transmission specifications

Item		Setting value	Basic value[Note1]	Remark
Data type	Data Bit	7 or 8	8bit	If in stand-alone mode, 2 channels of RS-232C/RS-422 operate separately, and if in interlocking mode, they are operated in RS-232C setting mode.
	Stop Bit	1 or 2	1bit	
	Start Bit	1	1bit	
	Parity	Even/Odd/None	None	
Transmission speed(bps)		300/600/1200/2400/4800/ 9600/19200/38400/76800[Note2]	38400bps	
RS-232C channel mode		Modem/null modem[Note3]/ dedicated modem	Null modem	
RS-422 channel mode		RS-422 / RS-485[Note4]	RS-422	
Station No.		0 ~ 31[Note5]	0	*Dedicated mode *Other company's dedicated mode Ver.2.0

Remark

[Note1] Basic value means the basic value as set as released from the factory.

[Note2] 76800bps is provided for RS-422/RS-485 channel and serviceable in module Ver. 1.3 or later. Speed of RS-232C channel is allowed up to 38400bps.

[Note3] Modem mode can be set only if in operation mode separate. If in interlocking mode, it is operated with null modem mode.

[Note4] If set to RS-485, RS-422 channel is converted to half-duplex communication mode.

[Note5] Station No. is valid only in dedicated mode and other company's dedicated mode and can be set differently according to each channel of RS-232C/RS-422. In user defined and GMWIN modes, station No. set is insignificant.

4.3.2 How to set

Transmission specifications are set by Frame Editor with the setting sequence as below.

1) Run Frame Editor in Windows.

2) The following initial setting screen is displayed
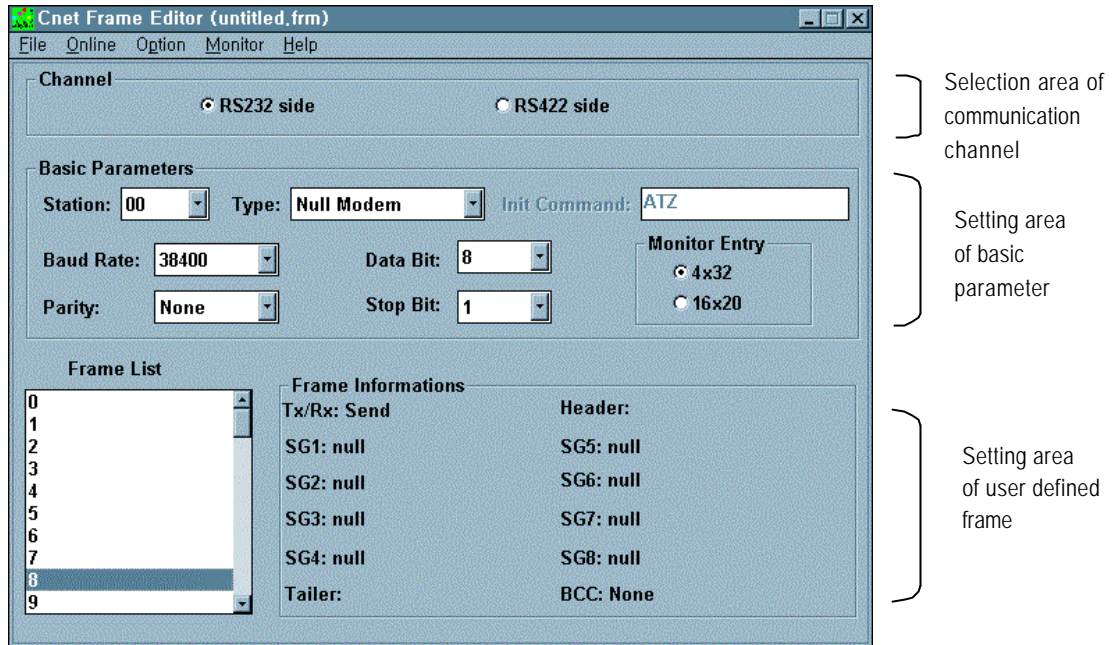
3) Select communication channel to set in the above screen.

4) Select communication type referring to the table below.

[Table 4.4] Example of criteria for selection of communication type

Communication channel	Communication type	Selection criteria
RS-232C	Modem	For communication with remote PC or remote connection with GMWIN via public line (telephone line) using dial-up modem
	Null modem	For communication with local PC or external devices as connected with cable directly. (within 15m)
	Dedicated modem	For line-dedicated communication using dedicated modem
RS-422	RS-422	For 1:N communication of full-duplex type with external devices. (within 500m)
	RS-485	For multi-drop communication of half-duplex type with external devices. (within 500m)

5) Enter station No. for dedicated mode or other company's dedicated mode. Station No. can be set from 0 to 31.

6) Set the other basic parameters(communication speed, data bit, parity, and stop bit) in accordance with the communication type.

7) If parameters have been set, write according to channels. First, connect GMWIN cable between CPU of PLC and PC.

Remark

[Note1] GMWIN cable shall be connected between RS-232C port of PLC CPU and PC. If linked with RS-232C port of Cnet I/F module, the connection via Frame Editor isn't available.

---

8) Select [Option]-[port] in Frame Editor to display the dialog box below. Continuously select serial port of PC side connected with GMWIN cable and click on the [OK] button.

.
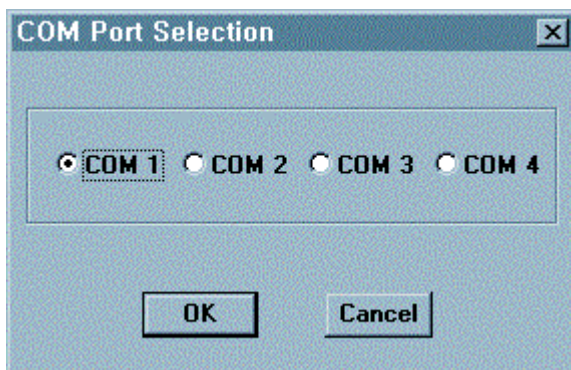
9) Select [Online]-[Connect] to connect with PLC. If the screen below is displayed, the connection is completed.
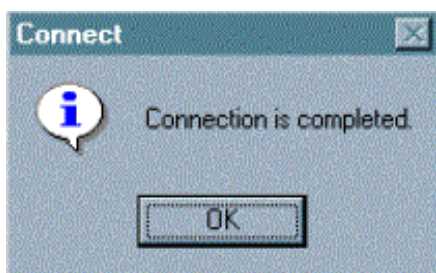
If the connection failed, two causes are expected as follows.

A) If no response in time
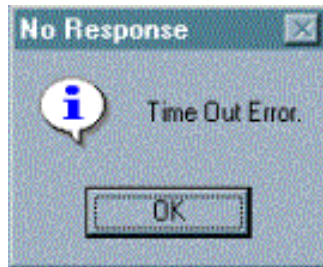
If the message above is displayed, RS-232C cable between PC and PLC may not be connected, or the connection status may be abnormal. Check the connection status of RS-232C cable to verify that RS-232C cable is correctly connected with loader port of PLC CPU.

B) If failed to open communication port

The message below is displayed as caused separately by abnormal setting of communication port.

If the message 'Can't open port' is displayed, check communication port setting in option menu of Frame Editor if set as repeated with the mouse or other devices, and then try re-connection.

Remark

[Note1] PLC connection is unavailable with Frame Editor if connected with PLC in GMWIN program. If the message above 'Can't open port' is displayed, check if GMWIN is connected in GMWIN program.

[Note2] To the contrary, connection to GMWIN as connected via Frame Editor isn't allowed

---

10) After the connection is completed, select [Online]-[Write] to write parameters.
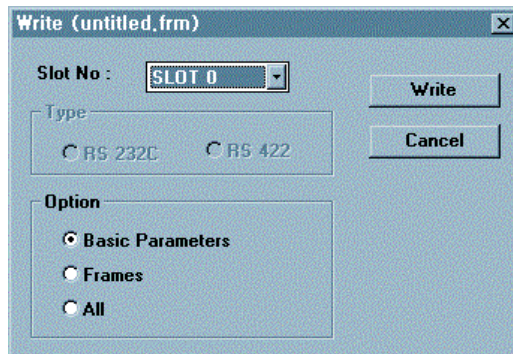
In Write dialog box as above, set the position where the module to be written is mounted with slot No., and select writing with communication option set to 'basic parameter'.

Remark

[Note1] If user defined frame has been prepared, let it set to frame in communication option to write frame only. Similarly to this, if 'All' is selected, basic parameter and frame can be written at a time.

[Note2] Check the power status of PLC prior to writing of parameter or frame. If powered off while writing, data in flash memory of Cnet I/F module may be crushed.

[Note3] Switch over PLC to STOP mode when writing parameter and frame. If writing while PLC running, writing error may occur. In this case, power off and then let it on back to perform writing again after switching over PLC to STOP mode

---

If writing of parameters is completed, the completion message as in the following figure is displayed.
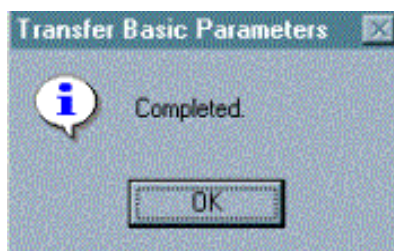
If parameter writing is performed, Cnet operation of the correspondent channel stops. Therefore, after parameter writing is completed, select [Online]-[Change RUN/STOP] to switch operation of the correspondent channel over to run.

Select the slot No. of computer link module and the channel of operation to switch over in the dialog box for operation change and click on [Run] button to start the correspondent channel.
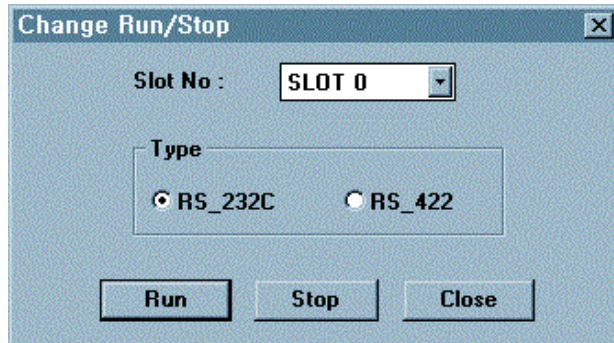
In these methods, run the correspondent channel to start operation after basic parameters are set and written according to channels RS-232C/RS-422.

4.3.3 Reading setting values

Basic parameters saved in flash memory of Cnet I/F module can be confirmed by reading through Frame Editor or checking through LED display.

How to read basic parameters through Frame Editor is specified as follows.(refer to 'Appendix A, LED indication specification' for checking through LED display.)

1) Select [Online]-[Connect] in basic screen of Frame Editor to finish the connection with PLC. How to connect is same as in 4.3.2.

2) Select [Online]-[Read] to display the dialog box below if the connection has been completed.
Enter Cnet's slot No., communication type and communication option herein and then select [Read].
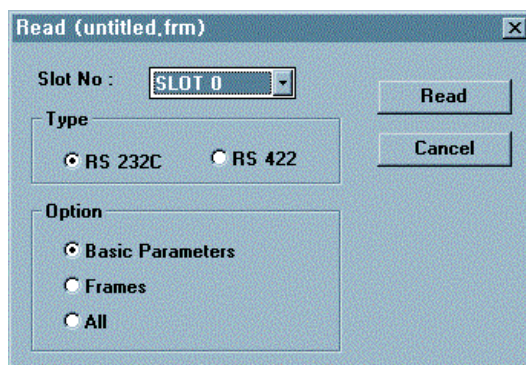
If reading is finished, the basic values which have been read are displayed in basic screen of Frame Editor and can be saved in a file.

4.3.4 Transmission specification setting of GM7 series

Transmission specification of GM7 series is composed as set inside the communication parameter of GMWIN without Frame Editor.

1) Select and execute the communication parameter after GMWIN is started.
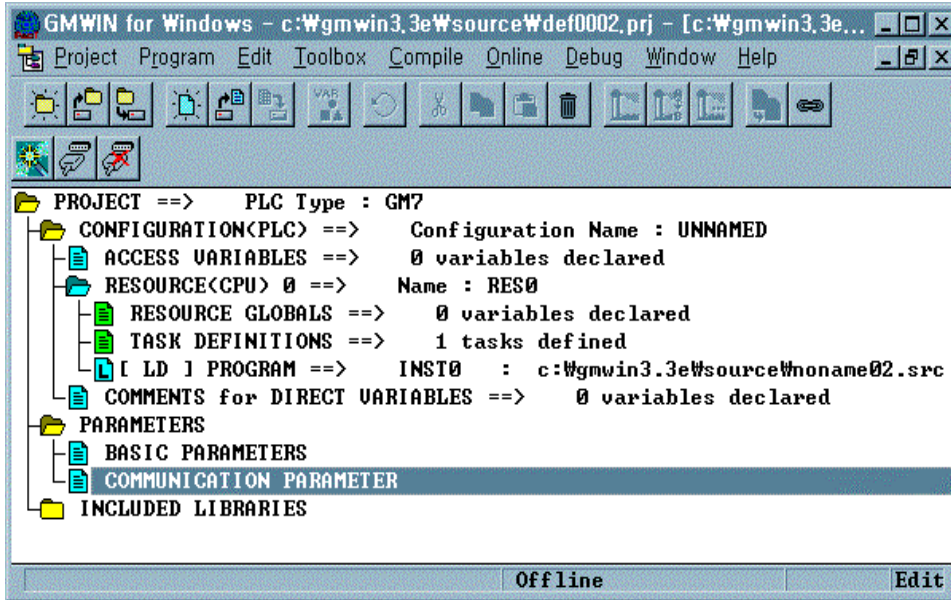
2) Select communication type of the communication parameter in accordance with the contents to set.
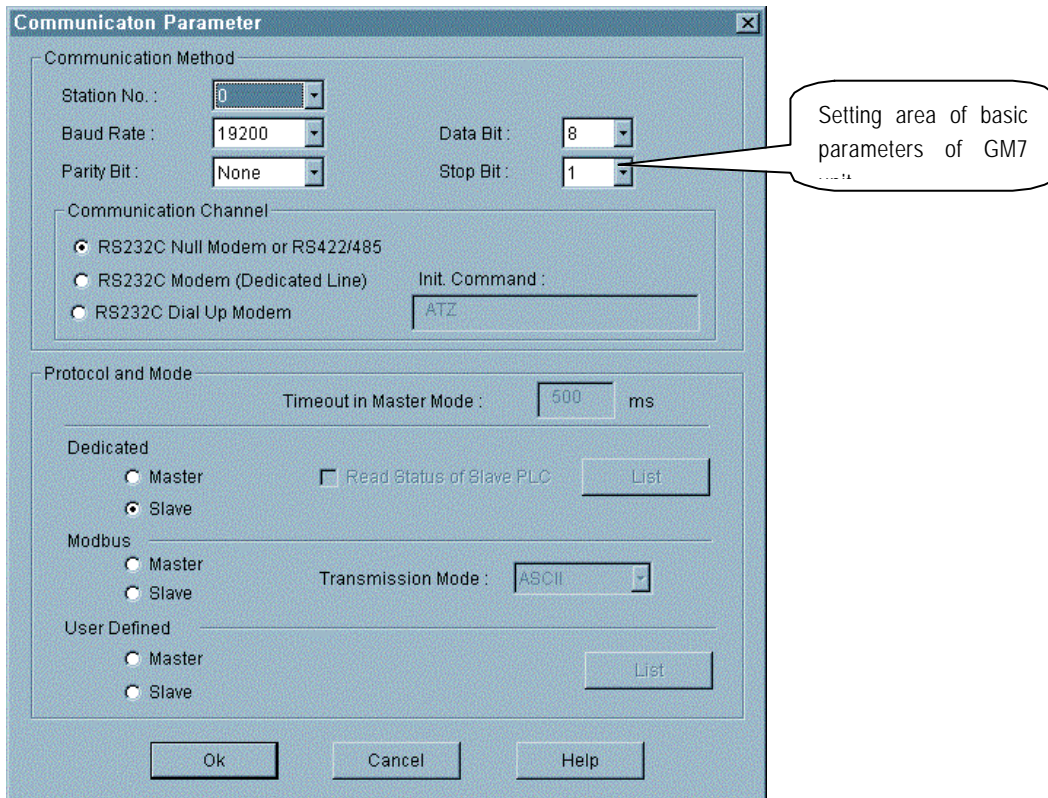
3) Select self-station number, communication speed, parity bit, data bit, stop bit and communication channel of Cnet I/F module to communicate among items in communication type.

4) If parameter setting of communication type is completed, enter protocol and transmission mode below and then select writing of communication parameter for program.
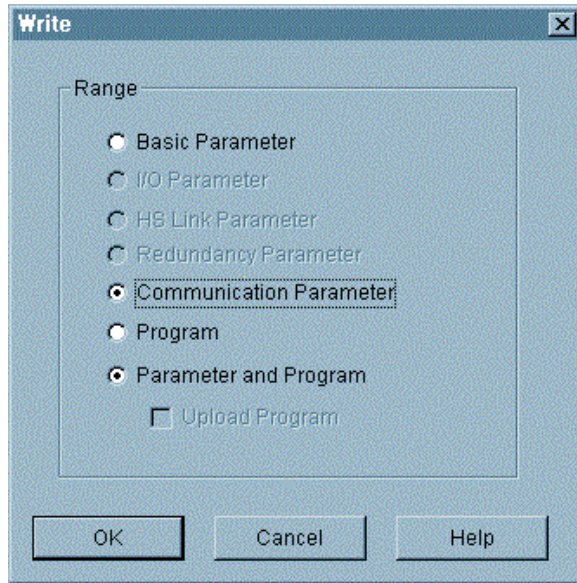
5) Start and execute the correspondent program after writing is performed.

4.4 How to connect to modem

Cnet I/F module has a function for long-distance communication via RS-232C channel using public line. How to connect to public line using Cnet I/F module is as follows

    1) Dedicated modem communication via dedicated line

    2) Dial-up modem communication via normal telephone line

Since these two types of communication differ from each other according to characteristics of the line, they shall be used with modem connection as set differently by Frame Editor. [Figure4.10] shows long-distance communication using dedicated modem.

`[Figure 4.10] Example of dedicated modem communication
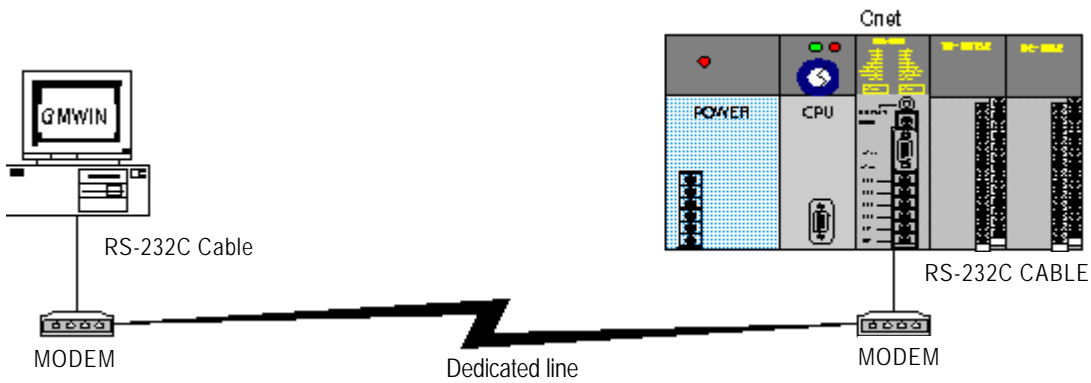
Connection sequence of this module to the modem is as below.

Set the basic parameter of Cnet I/F module as agreed with modem.

↓

Set the initial value of dedicated modem or dial-up modem.

↓

Connect modem to Cnet I/F module with modem connection cable.

↓   If abnormal

Power on Cnet I/F module and modem, and check if LED on.

→ Refer to chapter 4, for troubleshooting.

↓   If normal

Modem communication starts operation.
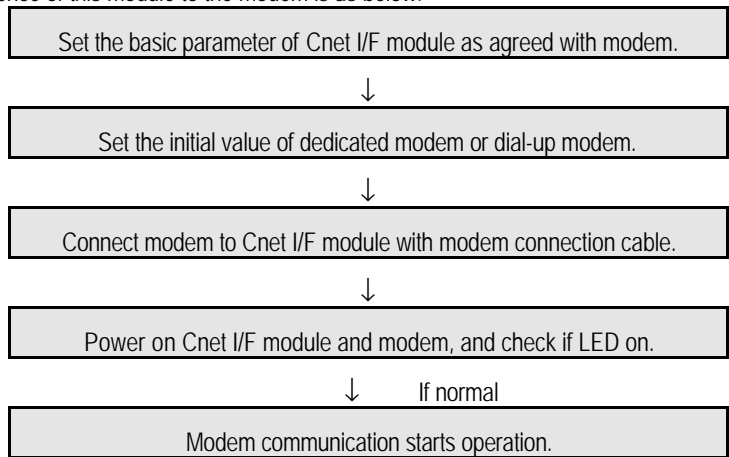
4.4.1 Connection to dedicated modem (RS-232C)

4.4.1.1 Modem selection

Performance of dedicated modem communication with Cnet I/F module depends on the condition and status of dedicated modem and dedicated line. Since low-performance modem or inferior line causes deterioration of communication, the modem as specified below is recommended for reliable communication.

Item	Specification
Communication speed	More than 2400 bps
Flow control	CTS/RTS Flow Control
Line control	Full-duplex/Half-duplex (2-line/4-line)
RTS-CTS delay	Within 500msec

4.4.1.2 How to connect dedicated modem with Cnet I/F module

Connect dedicated modem with Cnet I/F module via RS-232C channel using 9-pin cable as wired as below.

Cnet(9-PIN)		Connection No. and signal direction	Modem side(25-PIN)	
Pin No.	Name		Name	Pin No.
1	CD	←	CD	8
2	RXD	←	RXD	3
3	TXD	→	TXD	2
4	DTR	→	DTR	20
5	SG	—	SG	7
6	DSR	←	DSR	6
7	RTS	→	RTS	4
8	CTS	←	CTS	5
9	RI		RI	22

4.4.1.3 Dedicated modem setting

Most dedicated modems are designed to set operation mode via dip switch or LED display window according to modem manufacturers. Operation type needs setting as agreed with communication type with Cnet I/F module referring to user's manual for modem. The following items related to communication with Cnet I/F module shall be set.

Item	Setting contents	Remark
Communication speed	Select according to modem speed and status of communication line	Same as Cnet I/F module
Data type	Asynchronous 10 bit[Note1]	Set to basic setting values of Cnet
RTS-CTS delay	0msec	Set to the smallest value
DTR control	ON compulsorily	
Communication mode	Set according to 4-line/2-line	

Remark

[Note1] Data type needs setting agreed with communication type of Cnet I/F module as in asynchronous type as supported only by Cnet I/F module. The number of bits shall be calculated according to setting values of data bit/stop bit/parity bit of basic parameters in Cnet I/F module. Start bit of Cnet I/F module is always set to 1 and parity bit possesses 1 bit regardless of Even/Odd. The table below shows an example of setting the number of bits according to basic parameters set in Cnet.

Start	Data	Stop	Parity	Number of bits	Ex. of Data-Bit calculation
1 always	8	1	None	10 bits	1 + 8 + 1 + 0 = 10 bits
1 always	7	0	Even	9 bits	1 + 7 + 0 + 1 = 9 bits

4.4.1.4 How to set

Cnet I/F module shall be set to stand-alone channel for dedicated modem communication and is, regardless of operation mode available to communicate distantly via dedicated modem in all the modes of user defined, dedicated communication and GMWIN modes. [Table4.3] shows operation modes where modem connection is available. As in Table, modem connection is not available in interlocking mode but only in stand-alone mode. If connecting with modem after interlocking mode is set, beware of modem communication which isn't available due to null modem operation.

<div style="border:1px solid black; padding:10px;">

Remark

[Note1] This module can be connected with dedicated modem/dial-up modem only via RS-232C channel.

[Note2] For such modems as optical modem and wireless modem supporting RS-422 communication, communication via RS-422 channel is available without additional setting in Cnet I/F module.

</div>

[Table4.5] Switches available to connect with modem

Switch value	Module type			
	G3L-CUEA	G4L-CUEA	G6L-CUEB	G6L-CUEC
0	Unavailable	Unavailable	Available	Unavailable
1	Unavailable	Unavailable	Available	Unavailable
2	Available	Available	Available	Unavailable
3	Available	Available	Unavailable	Unavailable
4	Available	Available	Not used	Not used
5	Available	Available	Not used	Not used
6	Available	Available	Not used	Not used
7	Available	Available	Not used	Not used
8	Unavailable	Unavailable	Unavailable	Unavailable
9	Available if set to stand-alone channel in Ver. 2.0 Ver.2.0		G6L-CUEB module only available in Ver. 2.0 Ver.2.0	

Basic setting sequence of Cnet I/F module with Frame Editor is as follows.

1) Run Frame Editor program in Windows.

2) Select RS-232C of communication channel in basic parameter items of Frame Editor and set such transmission specifications of communication speed, data, stop bit, etc. as in transmission type set in dedicated modem.
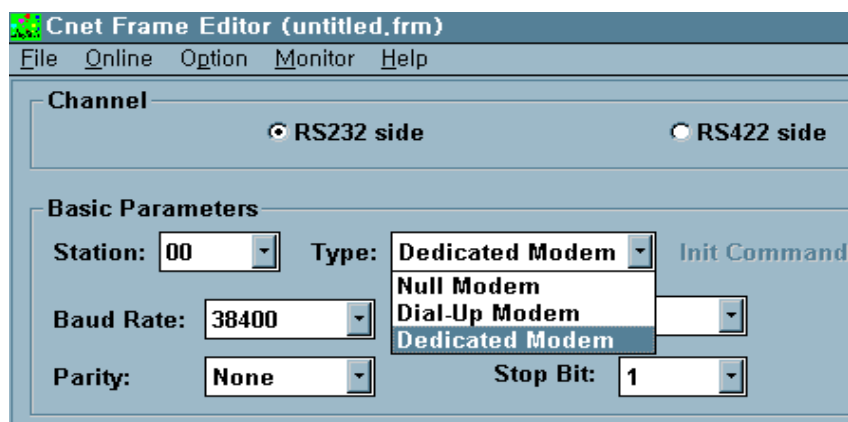
3)   Set communication type to dedicated modem in basic parameter setting in Figure above. (Basic value is set to null modem)

4)   Write basic parameters and change communication in [Online] connection of Frame Editor to switch RS-232C channel over to communication run.
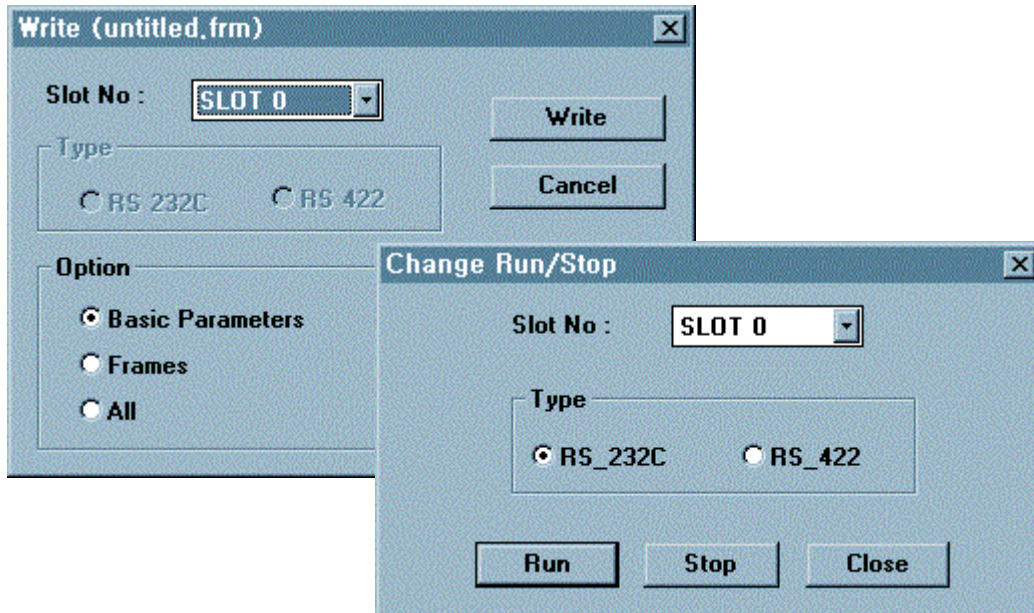
5)   If switched to communication run, operation setting of Cnet I/F module is completed and the setting contents are saved in flash memory of the module as reserved even if powered off.

4.4.1.5 Troubleshooting for dedicated modem

If basic setting of Cnet I/F module and dedicated modem is completed, connect Cnet I/F module with dedicated modem using modem connection cable and start normal communication with power on. At this moment communication can be checked if normal or not through LED display of Cnet I/F module and dedicated modem. Only LED of RS-232C channel in Cnet I/F module is related with modem operation. In dedicated modem, user's manual for dedicated modem shall be referred to according to makers due to different specification of LED display.

1) Module's LED status before communication starts
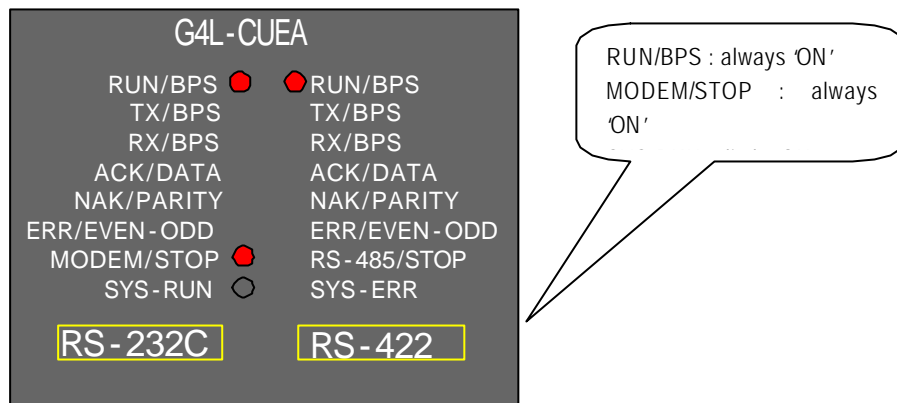
2) Module's LED status during normal communication
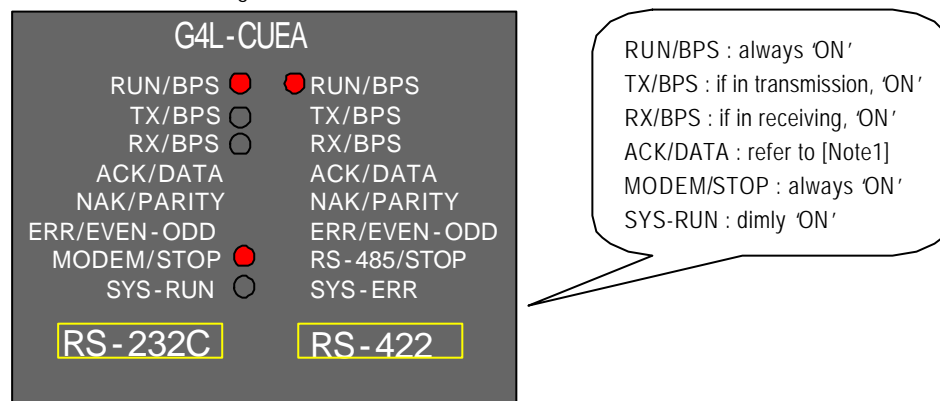
Remark

[Note1] ACK and NAK are turned ON if normal response is transmitted when communicating in dedicated mode. Refer to Chapter 7 for details of dedicated mode in this user's manual.

3) Troubleshooting for module: If module's LED status is abnormal differently as above, refer to checklist in [Table4.4] to shoot the trouble.

[Table4.6] Checklist for module's LED

LED type	If normal	If abnormal	Action to take
RUN	ON	OFF	1) Run RS-232C channel operation using Frame Editor
TX	Flash if in transmission	No flash	1) Check cable connection between module and dedicated modem 2) Check setting of mode program and station number based on module operation mode
RX	Flash if in receiving	No flash	1) Check connection of dedicated line 2) Check status of dedicated line 3) Check cable connection between module and dedicated modem 4) Check if data is transmitted from the other station's dedicated modem
ERROR	OFF	Flash	1) Check if communication speeds of dedicated modem and module are identical 2) Check if data bit setting of dedicated modem is identical with calculated basic-setting values of module 3) Check connection of cable
MODEM	ON	OFF	1) Download communication type of RS-232C channel as set to dedicated modem via Frame Editor 2) Let channel operation mode set to stand-alone mode

4) LED display & Troubleshooting for dedicated modem: Since LED specification for dedicated modem differs according to makers, user's manual for modem shall be referred to. [Table4.5] describes how to troubleshoot in dedicated modem based on common specification of LED display.

[Table4.7] Checklist for dedicated module's LED

LED type	If normal	If abnormal	Action to take
TXD	Flash	OFF	1) If module's TX LED doesn't flash, follow LED Checklist to troubleshoot 2) If module's TX LED flashes, check cable connection between module and dedicated modem

LED type	If normal	If abnormal	Action to take
RXD	Flash	OFF	1) Check if data is transmitted from the other station's dedicated modem 2) Check status of dedicated line 3) Check connection status of dedicated line
RTS	1) Flash if in transmission 2) ON always	OFF	1) If TXD LED doesn't flash either, follow the action for TXD LED to troubleshoot 2) Check cable connection between module and dedicated modem 3) If RTS control is set to ON compulsorily, always 'ON' operated normally 4) If RTS control is set to EIA control, it shall flash along with TXD LED to be normal
CTS	1) Flash if in transmission 2) ON always	OFF	1) Check if RTS LED flashes (CTS will flash only if RTS flashes) 2) Shoot the trouble of RTS LED to let RTS flash 3) Check cable connection between module and dedicated modem 4) If RTS control is set to ON compulsorily, always 'ON' operated normally 5) If RTS control is set to EIA control, it shall flash along with TXD LED to be normal
DTR	ON always	OFF	1) Check if module is set to dedicated modem mode 2) Check status of cable connection between module and dedicated modem
DSR	ON always	OFF	1) Check if module is set to dedicated modem mode 2) Check status of cable connection between module and dedicated modem
DCD	ON always	OFF	1) Check status of dedicated line 2) Check connection status of dedicated line

4.4.2 Connection to dial-up modem (RS-232C)

Cnet I/F module has a function for long-distance communication using public line. This function allows the long-distance communication by connecting external modem to module in PC or remote devices equipped with telephoning function via public line. In connection of dial-up modem and Cnet I/F module not equipped with telephoning function, connection shall be performed by telephoning via external modem linked with this module in PC or external devices. [Figure4.11] shows an example of system structure using dial-up modem and public line.

[Figure4.11] System structure of dial-up modem communication
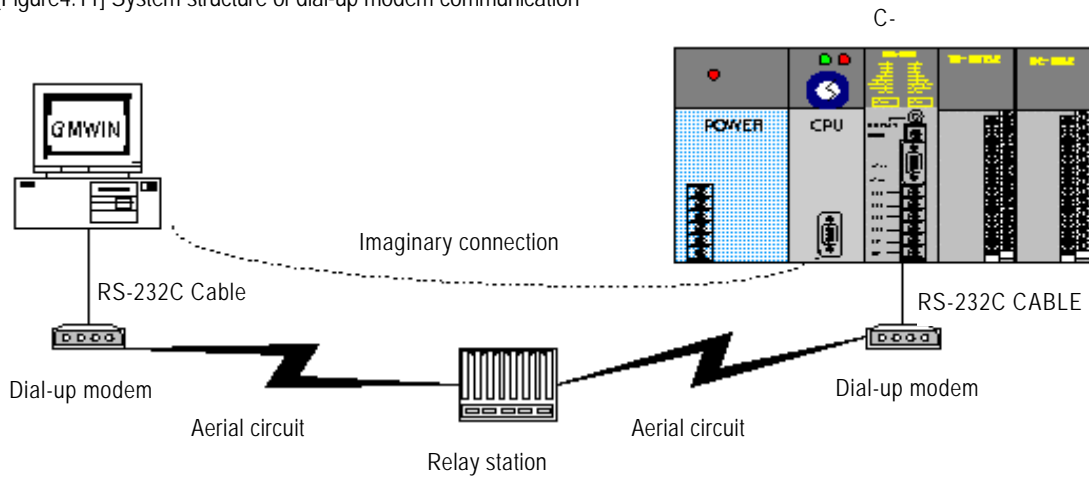
4.4.2.1 Dial-up modem selection

In communication with modem, line may not be connected depending on performance of modem and status of public line, and line connection may be released while exchanging data even after once connected, due to great influences on quality of data communication caused by quality of public line, status of relay station and performance of dial-up modem. Therefore, selection of such a reliable modem as specified and recommended in the table below is most important.

Item	Specification
Communication speed	More than 14400 BPS
Flow control	CTS/RTS Flow Control
Command	Hayes complied, AT Command supported
Error correction	Error correction function in data transmission
Carrier wave control	Control function of carrier wave transmission

4.4.2.2 How to connect the modem with this module

Dial-up modem and Cnet I/F module are connected with 9-pin cable via RS-232C channel as wired as below.

Cnet (9-PIN)		Connection No. and Signal direction[Note1]	Mode side (25-PIN)	
Pin No.	Name		Name	Pin No.
1	CD	←	CD	8
2	RXD	←	RXD	3
3	TXD	→	TXD	2
4	DTR	→	DTR	20
5	SG	—	SG	7
6	DSR	←	DSR	6
7	RTS	→	RTS	4
8	CTS	←	CTS	5
9	RI		RI	22

Remark

[Note1] Dial-up modem if purchased is usually provided with DTE connection cable built-in as an accessory, however this cable for connection between PC and modem can be connected to Cnet I/F module. Since most external modems are provided with DTE connection cable to connect to PC along with 9-pin female connector on DTE as reversed in connection, the built-in cable is not allowed to use. The connection cable is to be manufactured separately according to the wiring above.

4.4.2.3 Initial setting of module

Follow the sequence below via Cnet I/F module after modem is selected and connection cable is wired, to initialize dial-up modem and set to connection stand-by mode.

1) Operation mode setting : Set mode switch value of module correctly to desired position. Operation mode can be set only in the range shown in [Table4.3] (Modem connection is unavailable in interlocking mode)

Connect interface cable linked as specified in 4.4.2.2 for pin connection, to RS-232C port of this module and DTE connection terminal of the modem.

    A) Connect the phone line to line terminal of modem.

    B) Let modem and PLC powered on.

    C) Run Frame Editor to set communication type of RS-232C channel to modem and input initializing command.[Note1]

Remark

[Note1] Each maker provides modem with various functions while communication control mode is to be set by user. Mode setting of modem operation shall be set by initializing command of modem like this, and the operation modes between 2 modems to use shall be set surely identical. The basic value of initializing command is 'ATZ'. And since the initializing command differs according to modems, AT command specified in user's manual for modem shall be input.

2) Set transmission specification of communication speed, data and stop bit in basic parameter items.[Note1]

Remark

[Note1] Beware of the following items when setting basic parameters.

    1) Communication speed and setting values of data and stop bit in setting items of basic parameters are the transmission specification not between modem and modem but between DTE(Cnet I/F module) and DCE(modem).

    2) Set basic parameters to basic values and communication speed to max. speed of modem

    3) If modem is used supporting communication speed of more than 56kbps, set communication speed of Cnet I/F module to 38400bps as of max. speed.

3) Write basic parameters and change communication in [Online] connection of Frame Editor to switch RS-232C channel over to communication run.
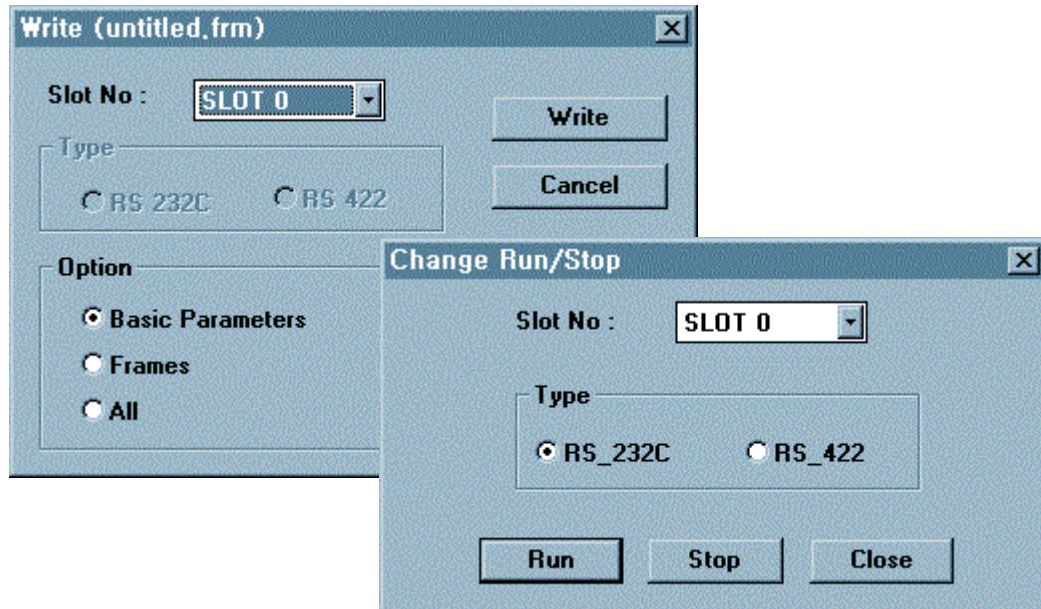
4) If switched to communication run, operation setting of Cnet I/F module is completed and the setting contents are saved in flash memory of the module as reserved even if powered off.

5) If setting of the module is completed with all the items above input, initialize modem by powering PLC and dial-up modem 'OFF' and then 'ON' again. If modem is initialized normally, initial LED status is as below.

LED status of modem initialized
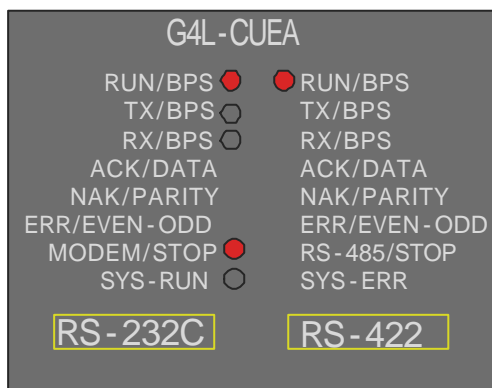
RUN/BPS : always 'ON'
TX/BPS : once 'ON' [Note]
RX/BPS : once 'ON' [Note]
MODEM/STOP : always 'ON'

> **Remark**
>
> [Note1] TX LED of module flashes in a cycle of 1 second until modem is completely initialized.
>
> If modem is initialized normally, TX LED and RX LED flash almost simultaneously indicating that normal response of modem to initializing request of modem is performed. In this case, TX/RX LEDs are no more flashing.

6) The case in which the initializing described in (9) is completed normally indicates that modem and Cnet I/F module are normally standing by with the following LED status kept until communication starts via telephoning from the other PC or communication devices.

LED status in stand-by mode

G4L·CUEA	
RUN/BPS ●	● RUN/BPS
TX/BPS	TX/BPS
RX/BPS	RX/BPS
ACK/DATA	ACK/DATA
NAK/PARITY	NAK/PARITY
ERR/EVEN- ODD	ERR/EVEN- ODD
MODEM/STOP ●	RS- 485/STOP
SYS- RUN ○	SYS- ERR
RS- 232C	RS- 422

RUN/BPS : always 'ON'
MODEM/STOP : always 'ON'
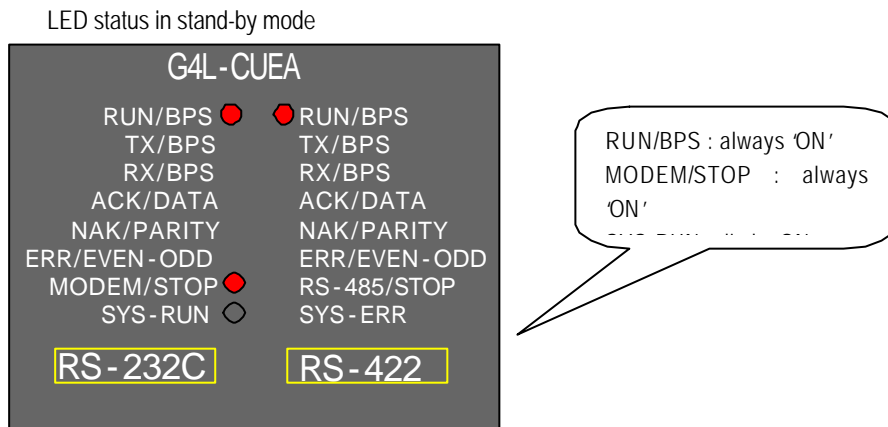
7) After modem is initialized normally, modem and Cnet I/F module in stand-by status wait for RING signal until received from the other modem.

8) If telephoned by the other modem prior to modem initializing, the module doesn't respond out of normal communication.

4.4.2.4 Answering to telephone and modem communication

If modem in local connection is initialized normally, communication with PLC is available by telephoning via the other modem. However, this module supports not telephoning via Cnet but only answering function to telephone. If in the state of on-line connection by telephoning, data communication in long distance is allowed via modem and the on-line state is maintained as it is until the telephone is hung up by the other station compulsorily or by communication error. LED display of Cnet I/F module in normal communication status is described as follows.

LED status during normal communication


```
         G4L CUEA

RUN/BPS  ●    ● RUN/BPS
 TX/BPS  ◐      TX/BPS
 RX/BPS  ◐      RX/BPS
 ACK/DATA       ACK/DATA
 NAK/PARITY     NAK/PARITY
ERR/EVEN- ODD   ERR/EVEN- ODD
MODEM/STOP ●    RS- 485/STOP
 SYS- RUN ○     SYS- ERR

 [RS- 232C]    [RS- 422]
```
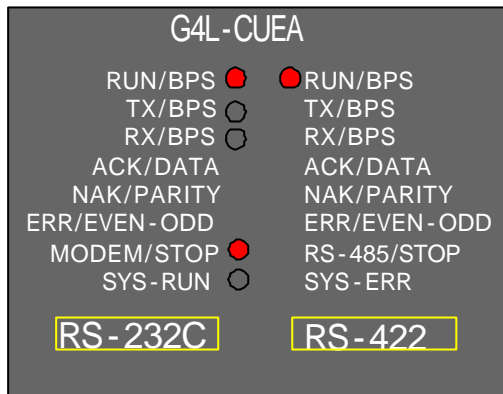
RUN/BPS : always 'ON'
TX/BPS : if in transmission, 'ON'
RX/BPS : if in receiving, 'ON'
MODEM/STOP : always 'ON'

4.4.2.5 Troubleshooting for dial-up modem communication

1) Modem communication of module can be checked if operated normally through LED display. Refer to Checklist in [Table4.6] to shoot the trouble.

[Table4.8] Checklist for module's LED

LED type	If normal	If abnormal	Action to take
RUN	ON	OFF	1) Run RS-232C channel operation using Frame Editor
TX	Flash once initially	Flash continuously in a cycle of 1 second	1) Check cable connection between module and modem 2) Reset modem initializing command referring to modem manual 3) Tx/Rx LEDs shall initially flash once to be normal
	Flash if in Transmission	No flash	1) Check cable connection between module and modem 2) If in user mode, check setting of PLC program and frame 3) If in dedicated mode, check setting of station No.
RX	Flash if in receiving	No flash	1) Check if phone line is connected to line terminal of modem 2) Check status of public line 3) Check if data is transmitted from the other station's modem 4) Check cable connection between module and modem if RX LED of modem flashes while LED of module doesn't flash.

LED type	If normal	If abnormal	Action to take
ERROR	OFF	Flash	1) Check cable connection 2) Check if modem is deficient
MODEM	ON	OFF	1) Download communication type of RS-232C channel as set to modem via Frame Editor 2) Check if channel operation mode is set to stand-alone mode

2) LED display & Troubleshooting for dial-up modem : Since LED specification for dial-up modem differs according to makers, user's manual for modem shall be referred to. [Table4.7] describes how to troubleshoot in dial-up modem based on common specification of LED display.

[Table4.9] Checklist for dial-up module's LED

LED type	If normal	If abnormal	Action to take
TXD	Flash	OFF	1) If module's TX LED doesn't flash, follow LED Checklist to troubleshoot 2) If module's TX LED flashes, check cable connection between Cnet and modem
RXD	Flash	OFF	1) Check if phone line is connected to line terminal 2) Check if data is transmitted from the other station's modem 3) Check public line
RTS	Flash if in transmission	OFF	1) If TXD LED doesn't flash either, follow the action for TXD LED to troubleshoot 2) Check cable connection between module and modem
CTS	Flash if in transmission	OFF	1) Check if RTS LED flashes (CTS will flash only if RTS flashes) 2) Shoot the trouble of RTS LED to let RTS flash 3) Check cable connection between module and modem
DTR	ON always	OFF	1) Check if module is set to modem mode 2) Check cable connection between module and modem
DSR	ON always	OFF	1) Check if module is set to modem mode 2) Check cable connection between module and modem
CD	ON after telephoned	OFF	1) Check status of public line 2) Check connection status of phone line to line terminal

Chapter 5 Frame Editor

5.1 Basic functions

Frame Editor is a WINDOWS application to set basic operation mode of Cnet I/F module and to operate Run/Stop frame download, etc. Frame Editor is also upgraded to Ver.2.0 to fit the functions of module Ver.2.0 and is developed to be in 100% compliance with former versions of Frame Editors along with additional functions to support supplemented features of Cnet Ver.2.0. Updated version of Frame Editor can be used through downloads in Internet Home Page of LG Industrial Systems(http://www.lgis.lg.co.kr/fa). This manual is based on Frame Editor Ver.2.0 for instruction of its functions. Basic functions of Frame Editor are as follows.

- ❑ Setting of basic parameters
- ❑ Frame edit for user mode
- ❑ Reading/Writing of frame and basic parameters
- ❑ Switching of module operation
- ❑ Monitoring of TX/RX frame
- ❑ Saving of frame and parameter files Ver. 2.0
- ❑ Change of online mode Ver. 2.0
- ❑ Management of flash memory Ver. 2.0

Frame Editor can be used with its execution program of FEDIT20.EXE as copied to desired folder and run without additional installation.

Remark
[Note1] GM7 series doesn't use Frame Editor. Parameter and protocol required for communication can be composed in communication parameters inside GMWIN.

5.2 Screen configuration and menu

[Figure 5.1] shows the initial screen when Frame Editor is run for setting of communication channel, basic parameters and frame.
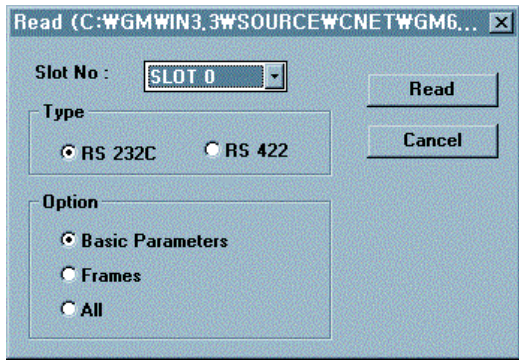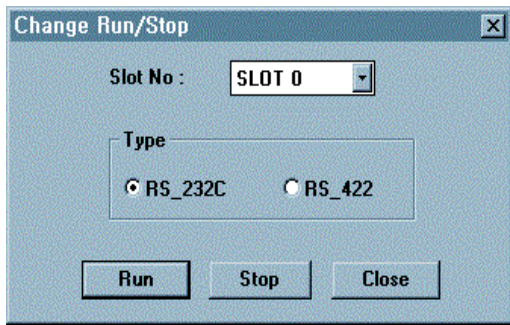
[Figure 5.1] Basic screen of Frame Editor
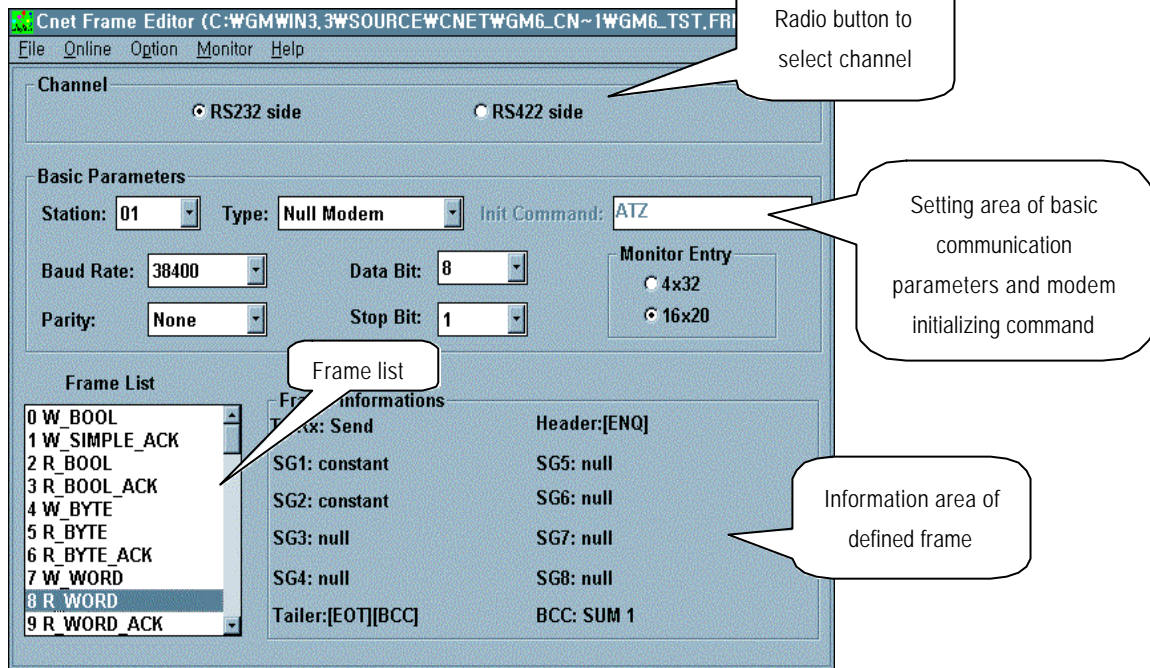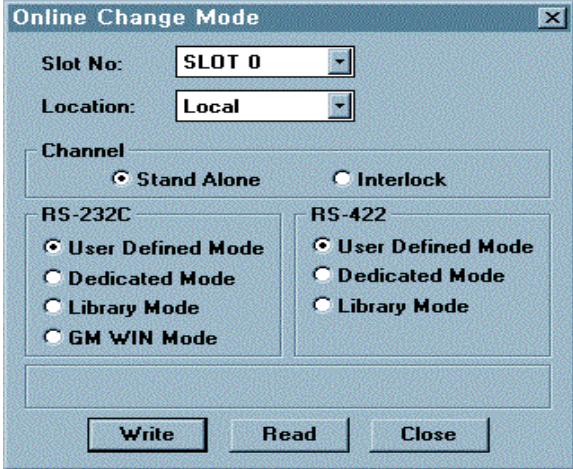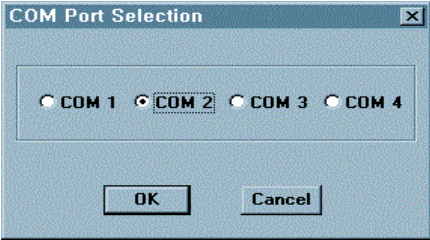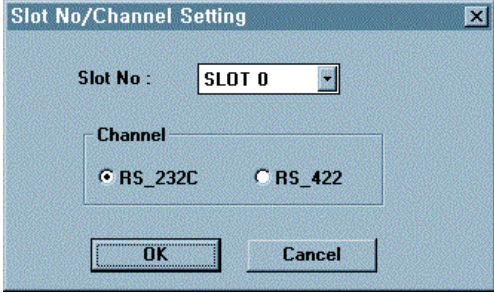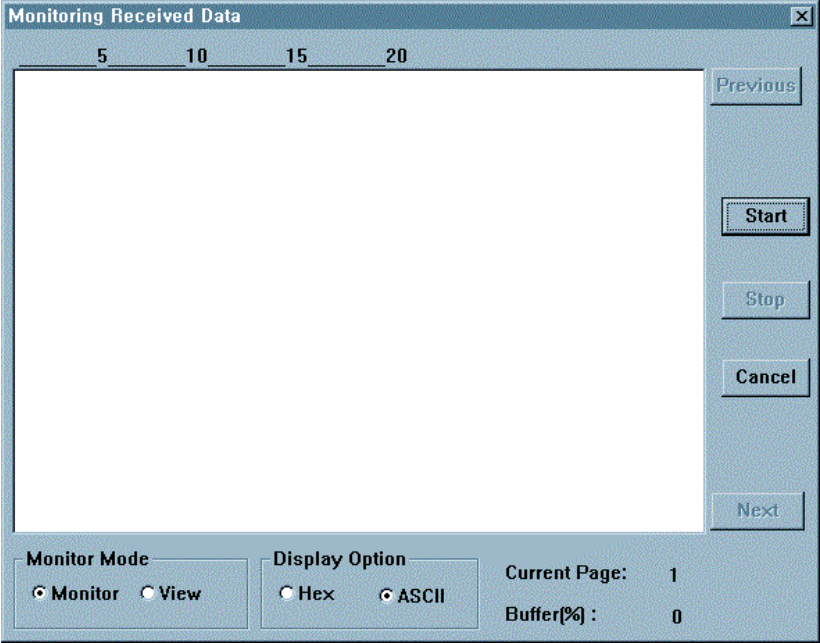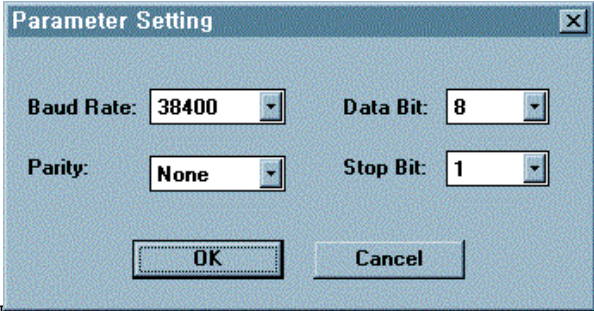
The upper menu bar of Frame Editor has functions described in [Table 5.1]

[Table5.1] Menus

Type	Menu	Function
File	New	Creat new frame file
	Open	Open existing frame file
	Save	Save edited frame current in file
	Save as	Save edited frame current in new file
	Open Lib	Open library file for other company's dedicated driver(Added to Ver.2.0)
	Exit	End Frame Editor
Online	Connect	Connect to PLC(Connected via GMWIN port of CPU module)

Type	Menu	Function
Online	Disconnect	Disconnect to PLC
	Read	Read parameters and frame in module ![Read dialog box] Read (C:\GMWIN3.3\SOURCE\CNET\GM6...) Slot No : SLOT 0 Type: ○ RS 232C ○ RS 422 Option: ● Basic Parameters ○ Frames ○ All Read / Cancel
	Write	Write parameters and frame in module. Communication channel to perform Write with depends on communication channel setting in the basic screen ![Write dialog box] Write (C:\GMWIN3.3\SOURCE\CNET\GM6...) Slot No : SLOT 0 Type: ○ RS 232C ○ RS 422 Option: ● Basic Parameters ○ Frames ○ All Write / Cancel
	Change Run/Stop	Run or Stop the operation of each channel ![Change Run/Stop dialog box] Change Run/Stop Slot No : SLOT 0 Type: ● RS_232C ○ RS_422 Run / Stop / Close

Type	Menu	Function
Online	Online change mode	Change operation mode of module in online. Ver. 2.0 **Online Change Mode** Slot No: SLOT 0 Location: Local Channel ⦿ Stand Alone ○ Interlock RS-232C ⦿ User Defined Mode ○ Dedicated Mode ○ Library Mode ○ GM WIN Mode RS-422 ⦿ User Defined Mode ○ Dedicated Mode ○ Library Mode Write Read Close
	Flash memory	Write/Read other company's dedicated driver saved in flash memory and check Cnet O/S version of flash memory. Ver. 2.0
Option	Port	Select communication port to use among COM1 ~ COM4. **COM Port Selection** ○ COM 1 ⦿ COM 2 ○ COM 3 ○ COM 4 OK Cancel
Monitor	Receive frame	Display receiving monitor screen indicating data received by module. It is activated after connected with PLC Dialog box for selecting port to monitor **Slot No/Channel Setting** Slot No : SLOT 0 Channel ⦿ RS_232C ○ RS_422 OK Cancel

Type	Menu	Function
Monitor	Receive frame	② Receiving monitor screen **Monitoring Received Data** 5 10 15 20 Previous / Start / Stop / Cancel / Next Monitor Mode: ● Monitor ○ View Display Option: ○ Hex ● ASCII Current Page: 1 Buffer[%]: 0
	Send frame	Display data transmitted via this module on the screen by reading through Frame Editor **Parameter Setting** Baud Rate: 38400 Data Bit: 8 Parity: None Stop Bit: 1 OK Cancel Transmission monitor can use RS-232C channel only.

5.2.1 Basic parameter setting

Basic parameters are for setting communication specification of communication module to decide communication speed, parity, data bit, stop bit and modem service as required. If modem communication is applied, command for initializing modem shall be input. (Command for initializing modem may depend on makers, however, mostly set to 'ATZ'.) [Table 5.2] describes items of basic parameters which are to be set basically. Basic parameters are set respectively according to channels of RS-232C and RS-422 with setting values saved respectively per communication channel. [Figure 5.2] shows setting screen of each item in basic parameter screen.

[Table5.2] Setting items of basic parameters

Setting item	Contents	Remark
Station	Set module station No. used in dedicated mode and other company's dedicated mode	stations 0~31
Type	If communication channel is RS-232C, set to communication type of RS-232C channel	Null modem / Modem / Dedicated modem
	If communication channel is RS-422, set to communication type of RS-422 channel	RS-422/RS-485
Baud Rate	Set communication speed per channel	300~76800 bps[Note1]
Data bit	Number of data bits in asynchronous communication type	7~8 bits
Stop bit	Number of stop bits required for asynchronous communication type	1~2 bits
Parity	Number of parity bits for checking data error	None/Even/Odd
Init command	Initializing command of dial-up modem if modem used	Default value is ATZ
Monitor Entry	Number of monitors registerable in dedicated mode	4X32 or 16X20

Remark

[Note1] Communication speeds can be set up to 38400bps for RS-232C channel and up to 76800bps for RS-422 channel

5.2.2 Frame setting

Frame setting is for definition of protocol to allow Cnet I/F module to communicate as agreed with protocol of the other's device if used in user defined mode. Frame is a basic setting item surely required for user defined communication and TX/RX program using this shall be composed in GMWIN. Frame edit can be set up to 64 respectively according to types of frames.

[Figure5.2] shows the main screen when 3 frames are registered. Frame edit screen is composed of two screens for frame list and frame information. Frame list displays registered frame names and registration No., and frame information displays summarized information for selected frames.

[Figure 5.2] Registration screen of frames
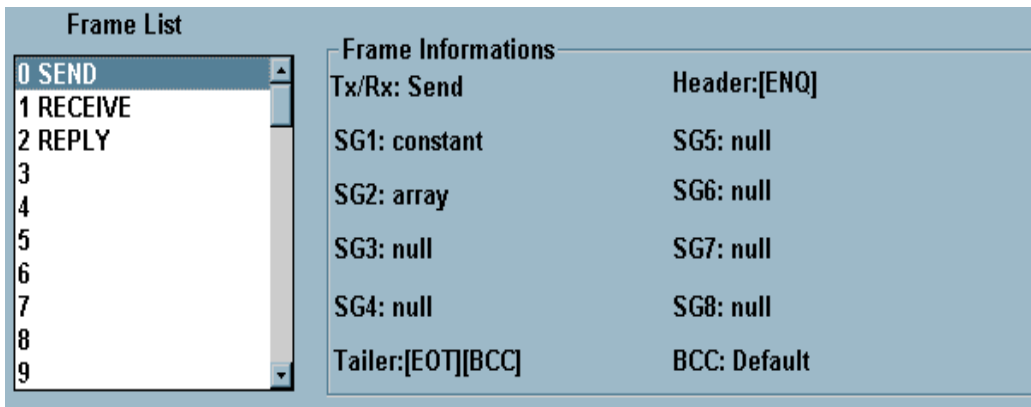
Frame type can be set for transmission and receiving. [Figure5.3] describes how to register frames with 3 examples of frame registration.

1) Transmitted frame setting (SEND)

[Figure 5.2] describes how to register 'SEND' frame as of No.1 transmitted frame in frame list. No.1 frame is supposed to be transmitted frame in the structure as below.

Trans. sequence	Header <-- Tail						
Frame type	Header	Frame body				Tail	BCC
		Command (CONST)			Data (ARRAY)		
Trans. frame	ENQ	0	0	W	B	Variable data (4-byte)	EOT	
ASCII code	H05	H30	H30	H57	H42		H04	

❏ Transmission sequence means sequence of such data transmitted in serial communication as Header, Constant, Array, Tail and BCC in order.

❏ Frame type according to method when transmitted frame is registered in Frame Editor is divided usually into header, tail and frame body.

❏ Header and tail are used to tell the start from the end of frame mainly with special characters. Occasionally header and tail are not provided for some protocols, however, they are recommended to use for reliable communication along with special codes like STX, EOT and ETX.

❏ Frame body is divided into Array where Tx / Rx data is set and Constant area of station No. and command.

❏ Transmitted frame means transmitted data via communication channel.

❏ ASCII codes displayed in HEX of transmitted data with 'H' in front of each figure which is indicating HEX unit of HEXdecimal figures do not contain actually transmitted data.

Register the transmitted data above in Frame Editor as in sequence below.

A) Double-click on frame No. to edit in frame list of [Figure 5.2] with mouse to display frame edit screen as below. It is a blank space before initial registration.

B) Frame name : Input frame name. Max. 16 characters of English letters and figures can be input as a frame name, and registered name shall be the same as used for PLC programming in GMWIN.[Note1]

Remark

[Note1] When inputting name, do not use '_UDATA_SEND' or '_UDATA_RCV', which performs special function. Refer to 7.1 User defined communication for more information. If identical frame name is used as repeated, normal communication is not available.

C) TX/RX : Input Send for transmission and Receive for receiving.

D) Header : As of an area indicating the start of data frame, such control characters as ENQ (Enquiry,ASCII code of H05), STX (Start of Text, ASCII code of H02) and ACK (Acknowledge, ASCII code of H06) can be applied, and in addition, signs of (:, ;, {, . . . } and figures can be selected at user's option. Max. 8 control characters are allowed for use as continued. Header shall be surely set bound up with '[' and ']' like '[ENQ]'. The following example is for header setting.
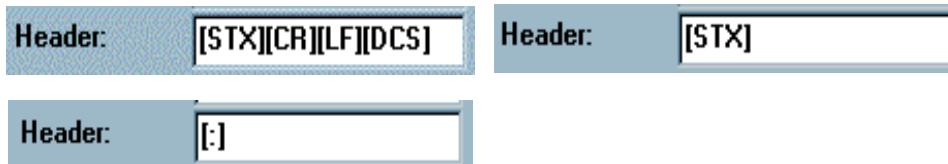
E) Frame body setting : Frame body is used for area setting to which actual data including commands are to be transmitted. For sorting out these, setting according to max. 8 segments is available in Frame Editor. To input per segment is to sort constantly transmitted data area (CONST) from variable data area (ARRAY).

Since CONST area and ARRAY area may be used as mixed, setting shall be performed as agreed with those respectively in several segments. Segments shall be applied from No. 1 as in transmission sequence of frames. Do not insert a segment unused in the middle.

❑ CONST : Set data which is constant with invariable features to Constant. Fixed area like command or station number of frame is applicable for this. CONST data shall be set as classified into HEX. or ASCII with max.30 byte available.

❑ ARRAY : Variable area which is changeable data whose contents are variable like TX/RX data is applicable for this. If set to ARRAY, TX/RX data is meant to be changeable based on frame, thus specified number of data can be transmitted and received by setting the number of data. The size set in ARRAY size area shall be the same as the actual number of data to be transmitted and received. The number of data on the basis of ASCII code's length can be set up to 240 byte with total length of frame limited to 256 byte.

[Table 5.3] describes setting items of frame body.

[Table 5.3] Setting of data type

Setting item	Data type	Contents	Remark
CONST	HEX	• Used if set figures are transmitted/received as they are • HEX. figures only available. • Setting of the even number of data only available[Note1] • Data of '00' is unavailable.[Note2] • Setting up to 30 byte available	Ver.2.0 Used for communication in HEX. figures
	ASCII	• Used if set figures or ASCII codes in characters are transmitted/received • Character setting available. • Setting up to 15 byte available	Used for communication in characters
ARRAY [Note3]	Convert	• SD area data of PLC program F/B is converted into ASCII code when transmitted. • Data if received is sent to RD area of PLC program F/B as converted into HEX. • HEX. figures only available. • Setting up to 120 byte of data available.	Communication in figures only available. ASCII data out of HEX. range is regarded as an error.

Setting item	Data type	Contents	Remark
ARRAY [Note3]	None	● SD area data of PLC program F/B is not converted into ASCII code when transmitted. ● Data if received is sent to RD area of PLC program F/B as not converted into HEX. ● TX/RX of data in figures and characters are available. ● Setting up to 120 byte of data available.	Communication available In characters and figures

Remark

[Note1] It means that the number of data shall be set in unit of byte

　Ex.　HEX. input : 0123456789 → setting available (The number of data is 10)

　　　HEX. input : 012345678 → setting unavailable (The number of data is 9)

[Note2] If data is '00', it shall be set to Array.

[Note3] Array setting up to 4 of 8 segments is available.

[Table 5.4] shows transmitted data flow when data type is set to Convert or None. It is supposed that 4 byte data of '12 34 56 78 ' is transmitted in PLC.

[Table5.4] Example of transmitted data conversion based on data type setting

Classification	If Convert selected	If None selected
Data of PLC side	'1 2 3 4 5 6 7 8'	'1 2 3 4 5 6 7 8'
Data conversion	ASCII conversion	No ASCII conversion
Correspondent device	'31 32 33 34 35 36 37 38'	'1 2 3 4 5 6 7 8'

As for [Table5.4], if not converted into ASCII, data of PLC transmission area is transmitted as it is causing data to be sent in HEX. to the other device.

[Table 5.5] Example of received data conversion based on data type setting

Classification	If Convert selected	If None selected
Data of PLC side	'1 2 3 4 5 6 7 8'	'31 32 33 34 35 36 37 38'
Data conversion	ASCII conversion	No ASCII conversion
Correspondent device	'31 32 33 34 35 36 37 38'	'31 32 33 34 35 36 37 38'

[Table5.5] shows that desired HEX data can be received by setting the data type to Convert in Cnet when ASCII code is transmitted by the correspondent device. If None is selected, ASCII code is directly sent to PLC as received. In case of communication in character data, receiving of character data is available if the data type 'None' is selected.

Input the right data area as described below after setting CONST and ARRAY in segment type.

❑ If segment type is CONST, input fixed area of frame
❑ If segment type is ARRAY transmission, set one of SD1, SD2, SD3 and SD4.
❑ If segment type is ARRAY receiving, set one of RD1, RD2, RD3 and RD4.

Data size needs setting only for ARRAY up to 120 byte per segment. As max. length of one frame is limited to 256 byte, the total data length of 8 segments shall be set not more than 256 byte. The figure below describes for the details.
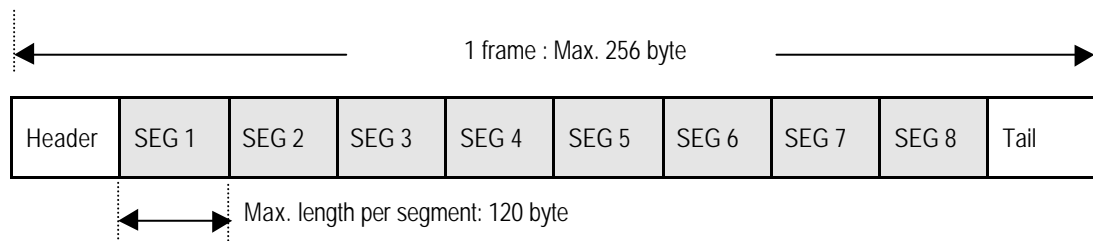
[Figure 5.4] shows the frame edit screen where ASCII data '00WB' of CONST type is input in segment 1 and CONVERT is set to ARRAY type in segment 2 in accordance with the setting method above.

[Figure5.4] Transmitted frame setting

(a) CONST data input (00WB)

(b) ARRAY data input (4-byte)

Since the structure of transmitted data is classified into fixed data area of '00WB' and variable data area of '12345678', '00WB' of ASCII type is input in CONST area and Convert is selected in ARRAY area for transmission of variable data area with 4 byte of transmission data designated as in [Figure5.4]. 2 segments are used for CONST and ARRAY data in the figure.

F) Set tail : Tail as of an area to sort out the end of frame can be set with control character, signal, figure, etc. as in header. If several characters are used with signals of '[' and ']' available to be set as in header, max.8 can be continued as applied. In addition, BCC is serviceable for detection of errors in tail. [BCC] shall be surely set for BCC service. For BCC service, press [BCC setting] button on the right to select calculation method and range of BCC.

G) BCC setting : BCC provides check information on frame error by setting [BCC] to tail for BCC check. If BCC check is selected, BCC data is transmitted along with for transmitted frame and only correct BCC value of received data is received for received frame according to setting method. The next figure is BCC setting screen when BCC setting button is pressed with BCC type and mode available to be set. Exercising of basic setting is shown as in [Figure 5.5].

[Figure 5.5] Example of BCC basic setting
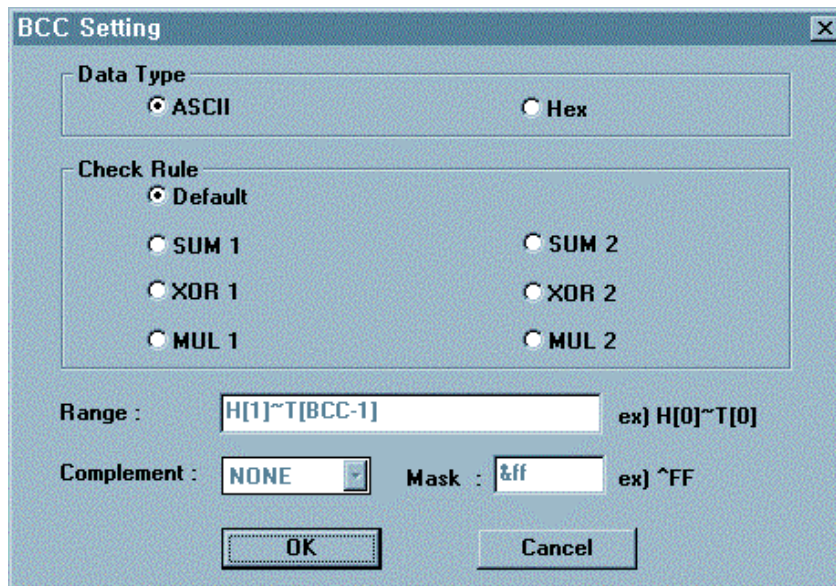
① Data Type : Set selecting type of BCC calculation result to ASCII or HEX in frame.

❑ ASCII : Insert BCC calculation result as converted into ASCII data in BCC area with 2 byte of BCC value available to be transmitted and received.

❑ HEX. : Insert BCC calculation result as converted into HEX. data in BCC area with 1 byte of BCC value available to be transmitted and received.

② Check Rule : As of menu to set BCC calculation type, it can specify calculation types of Default, Sum, Multiplication or Exclusive OR, and range. Regardless of calculation types, calculation is performed based on ASCII code values if the frame is of ASCII, and based on frame HEX values if the frame is of HEX.

Example of BCC calculation according to BCC calculation type set is described below with ASCII communication frame.

Frame type	Header		Frame body								Tail	
Frame contents	STX	ENQ	0	0	R	S	B	2	0	0	EOT	BCC
ASCII code	H02	H05	H30	H30	H52	H53	H42	H32	H30	H30	H04	As
BCC calculation range	H[0]	H[1]	S[0]	S[1]	S[2]	S[3]	S[4]	S[5]	S[6]	S[7]	T[0]	set

DEFAULT
Insert lower 1 byte of the HEX decimal-summing results of data from 2nd to [BCC] except the 1st date into [BCC] area. Summing area is fixed. (H[1] ~ [BCC-1])
Calculation Ex.
In exercising frame, add ASCII codes in calculation range of H[1] ~ T[0] in HEX. (05 + 30 + 30 + 52 + 53 + 42 + 32 + 30 + 30 + 04) = 1E2 Use only lower byte in result 1E2 for BCC BCC value = (HEX.:E2 / ASCII:4532)

SUM 1
User can set summing area in BCC range area. The other sections are the same as Default. (Ex. : Set H[0] ~ T[0] in the range if BCC range is to be from the 1st data of header to tail)
Calculation Ex.
In exercising frame, add ASCII codes in calculation range of H[0] ~ T[0] in HEX. (02 + 05 + 30 + 30 + 52 + 53 + 42 + 32 + 30 + 30 + 04) = 1E4 Use only lower byte in result 1E4 for BCC BCC value = (HEX.:E4 / ASCII:4534)

SUM 2
Function for data mask of BCC calculation results in SUM 1 is added. Masks are classified into &(AND), |(OR), and ^(Ex-OR). (Ex : In case the mask is set to [& F0] with the setting range of H[0] ~ T[0] by SUM 1 of BCC type)
Calculation Ex.
In exercising frame, add ASCII codes in calculation range of H[0] ~ T[0] in HEX. (02 + 05 + 30 + 30 + 52 + 53 + 42 + 32 + 30 + 30 + 04) = 1E4 Use the result from AND calculation between lower byte 'E4' and 'F0' in result 1E4 for BCC. BCC value = (HEX.:E0 / ASCII:4530)

XOR 1
Use the result from Exclusive-OR calculation of all data in setting area for BCC. Range setting is same as in SUM 1. (Ex. : In case the range is set to H[0] ~ T[0] with BCC type of XOR 1)
Calculation Ex.
In exercising frame, perform XOR calculation of ASCII codes in calculation range of H[0] ~ T[0]. (02 ^ 05 ^ 30 ^ 30 ^ 52 ^ 53 ^ 42 ^ 32 ^ 30 ^ 30 ^ 04) = 72 BCC value = (HEX.:72 / ASCII: 3732)

XOR 2
Function for data mask of BCC calculation results in XOR 1 is added. Masks are classified into &(AND), |(OR), and ^(Ex-OR). (Ex : In case the mask is set to [& F0] with the setting range of H[0] ~ T[0] by XOR 2 of BCC type)
Calculation Ex.
In exercising frame, perform Ex-OR calculation of ASCII codes in calculation range of H[0] ~ T[0]. (02 ^ 05 ^ 30 ^ 30 ^ 52 ^ 53 ^ 42 ^ 32 ^ 30 ^ 30 ^ 04) = 72 Use the result from AND calculation between the result '72' and 'F0' for BCC. BCC = (HEX.:70 / ASCII:3730)

MUL 1
Use the result from Multiplication calculation of all data in setting area for BCC. Range setting is same as in SUM 1. (Ex. : In case the range is set to H[0] ~ T[0] with BCC type of MUL 1)
Calculation Ex.
In exercising frame, perform Multiplication calculation of ASCII codes in calculation range of H[0] ~ T[0]. (02 X 05 X 30 X 30 X 52 X 53 X 42 X 32 X 30 X 30 X 04) = 00 BCC value = (HEX.:00 / ASCII: 3030)

MUL 2
Function for data mask of BCC calculation results in MUL 1 is added. Masks are classified into &(AND), |(OR), and ^(Ex-OR). (Ex : In case the mask is set to [| F0] with the setting range of H[0] ~ T[0] by MUL 2 of BCC type)

Calculation Ex.

In exercising frame, multiply ASCII codes in calculation range of H[0] ~ T[0].

(02 X 05 X 30 X 30 X 52 X 53 X 42 X 32 X 30 X 30 X 04) = 00

Use the result from OR calculation between the result '00' and 'F0' for BCC.

BCC = (HEX.:F0 / ASCII:4630)

③ Mask : If BCC calculation is set to SUM2 / XOR2 / MUL2, masking option of calculation result to specified data is

available with the 3 following methods.

❑ & : Use the result from AND calculation with data behind the signal for BCC.

❑ | : Use the result from OR calculation with data behind the signal for BCC.

❑ ^ : Use the result from Exclusive OR calculation with data behind the signal for BCC.

[Figure 5.6] shows the result of frame registration from frame name to BCC in sequence as above, and the frame name is registered via 'SEND'.

[Figure 5.6] Completed transmitted frame.

2) Received frame setting (RECEIVE)

It describes how to register 'RECEIVE' frame as of No.2 received frame in frame list in [Figure5.2]. No.2 frame is supposed to be received frame in the structure as below. Received data of 6 byte means variable data of 6 byte.

Trans. sequence	Header <--- Tail							
Frame type	Header	Frame body				Tail	BCC	
		Command (CONST)			Data (ARRAY)			
Trans. frame	ACK	0	0	R	B	Variable data (6 byte)	ETX	
ASCII code	H06	H30	H30	H52	H42		H03	

User can define the frame in the sequence below in the [Figure 5.2] if communication frame Cnet I/F module is to receive is as above and if the figure of 6 byte behind '00RB' is the contact data (variable area) which is transmitted from the other station.

A) Double-click on frame No.2 to edit in [Figure 5.2] with mouse.

B) If frame setting screen as in [Figure 5.7] is displayed, input frame name to be received and TX/RX along with [ACK] in header, while the name and header setting are same as in transmission. In this case, input frame name as of 'RECEIVE'.

Remark

[Note1] When inputting name, do not use '_UDATA_SEND' or '_UDATA_RCV', which performs special function.
Refer to 7.1 User defined communication for more information.

[Figure5.7] Setting of received frame type

C) If set to Receive, frame name of immediate response can be set by 'REPLY' input. Immediate response function is used in protocol which informs the other station that the frame if received is normally received. Once if the immediate response is selected and transmitted frame just like the response frame name is registered, the transmitted frame which is registered as immediate response frame is transmitted automatically even though SEND function block isn't used in PLC. [Figure 5.8] describes the immediate response function.

[Figure 5.8] How to use immediate response
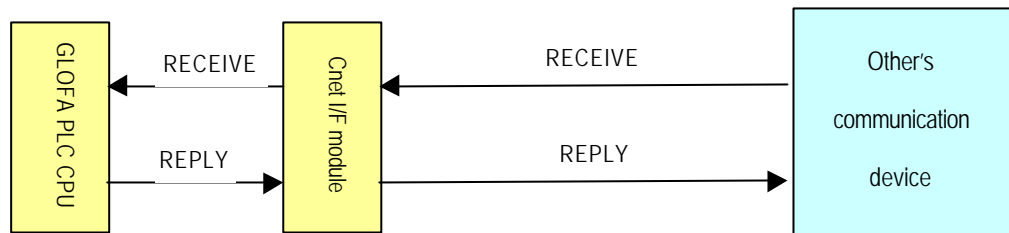
(a) Immediate response if not selected: transmits response frame by PLC programming for transmission.
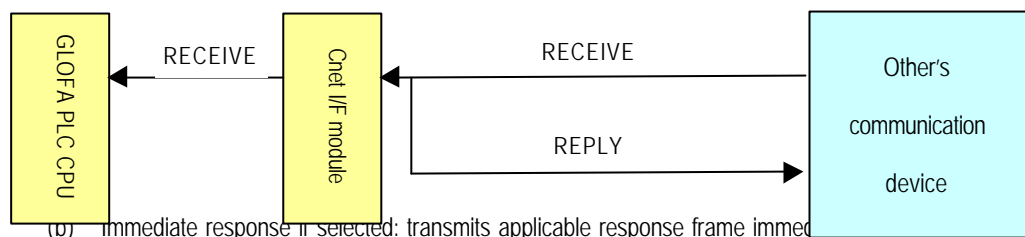
(b) Immediate response if selected: transmits applicable response frame immediately by the only Cnet I/F module. (Programming in PLC is unnecessary)

If immediate response frame has been set, the same transmitted frame as the setting name shall be defined. ARRAY data cannot be transmitted in the transmitted frame of immediate response.

D) Set received frame per segment. Setting is same as in transmitted frame, however such ARRAY variable names in variable data area shall be surely used as RD1, RD2, RD3 and RD4. When PLC programming, data entering variable data area is received in RD1~RD4 while RCV_MSG function block is being input. It means that the data in setting area to RD1 array of Frame Editor among the received frames from the other station is let saved in ARRAY variable set to RD1 of RCV_MSG function block in user program. If CONVERT is selected in Frame Editor, ASCII data is saved as converted to figures, and as of characters as they are if NONE is selected.

[Figure 5.9] Processing of received data
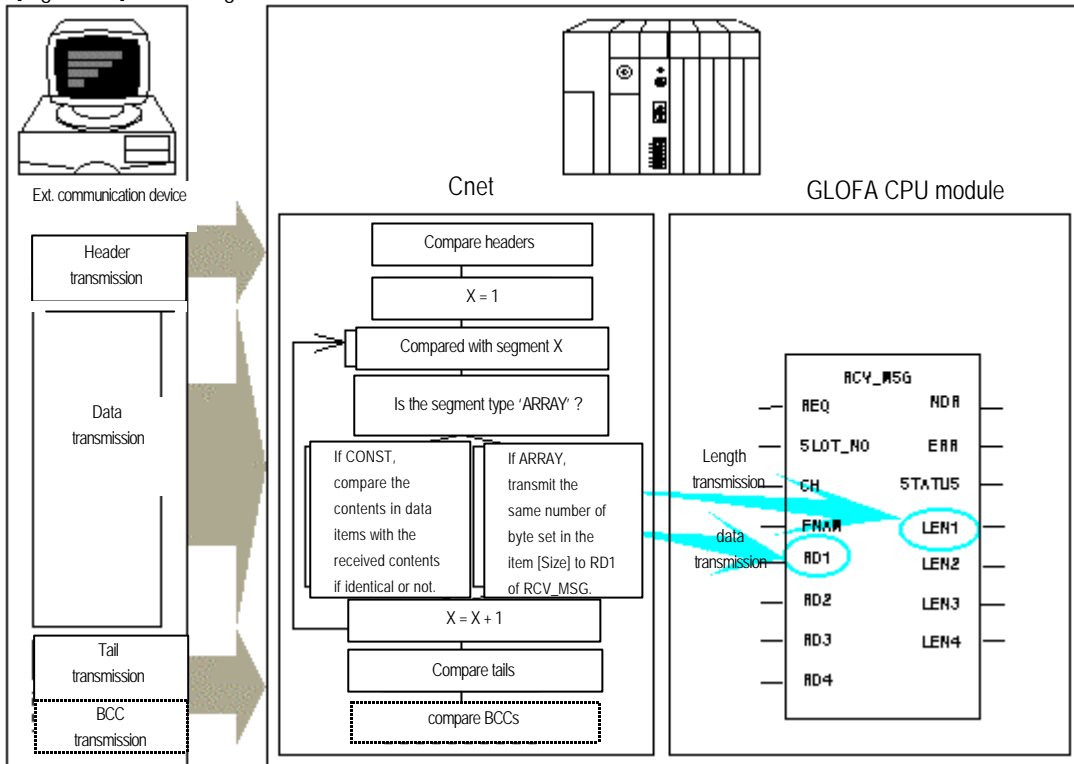
[Figure 5.10] shows the input result of CONST and ARRAY to frame segment in received frame for exercising.

[Figure 5.10] Input result for received frame

E) If segment input is completed, input [ETX] into tail and apply basic setting to [BCC] as below to complete received frame input.

F) The following screen is for Frame Editor when received frame is registered.
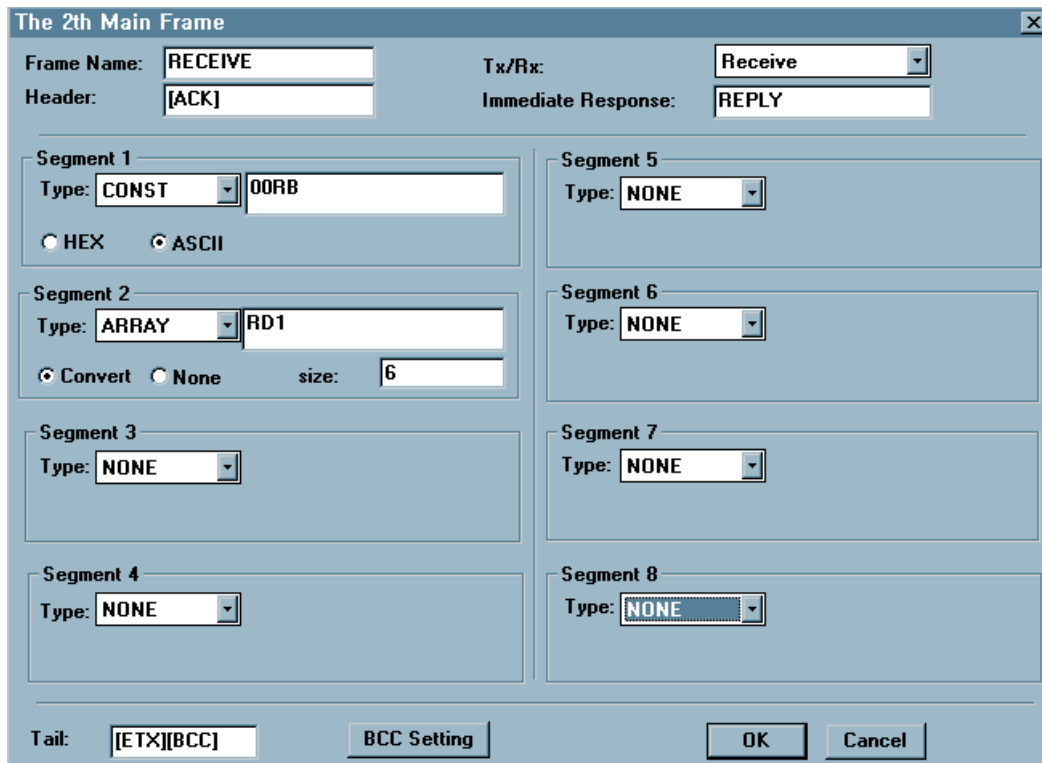
G) As the immediate response frame is set to 'REPLY' in received frame setting, the transmitted frame as of 'REPLY' shall be composed as below.

3) Setting of immediate response frame (REPLY)

If 'RECEIVE' frame is received, automatic transmission of response frame is available without PLC programming by setting of the next transmitted frame because 'REPLY' frame has been set to immediate response frame of RECEIVE frame.

Trans. sequence	Header <-- Tail									
Frame type	Header	Frame body						Tail	BCC	
		Command (CONST)								
Trans. frame	DLE	R	C	V	-	O	K	ETX	F	7
ASCII code	H10	H52	H43	H56	H5F	H4F	H4B	H03	H46	37

Double-click on frame No.3 area in frame list of [Figure 5.2] to register transmitted frame 'REPLY'. Registration procedure is same as in 'SEND' frame and Registration result is as below.
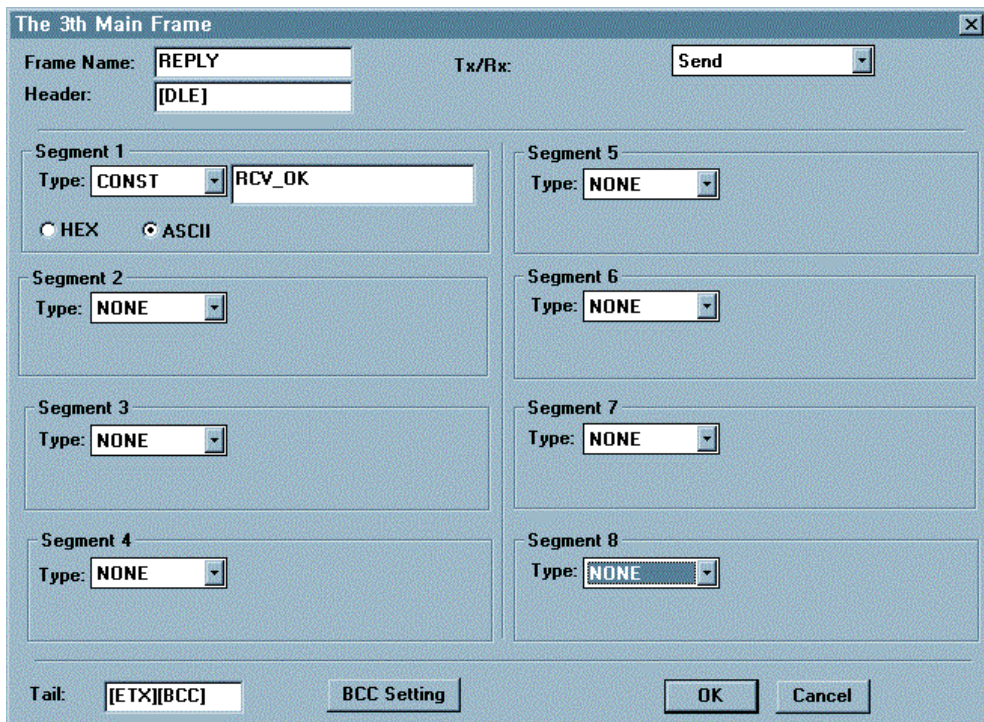
4) Frame information

If frame in frame list is once clicked after frame registration, frame information screen is displayed on the right introducing information briefly about the frame selected. Frame information provides TX/RX type, header/tail type, BCC setting and also the number of CONST and ARRAY per segment. Next figure shows 'SEND' frame information registered via transmitted frame.
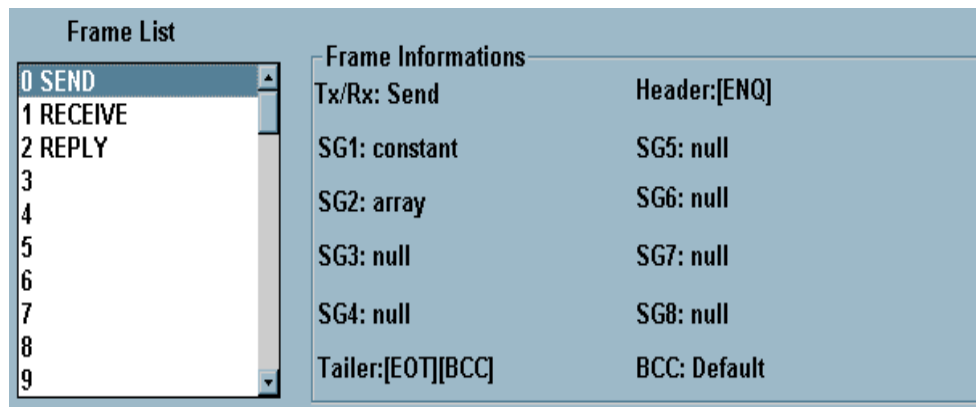
5.2.3 Frame writing/reading

Basic parameters and frame set by using Frame Editor can be written (downloaded) to Cnet I/F module or read (uploaded) from Cnet I/F module.

1) Writing (download)

A) First, connect GMWIN cable to COM terminal of PLC CPU module equipped on Cnet I/F module. PC and COM terminal of PLC shall be connected.

[Figure 5.11] Connection diagram of GMWIN cable

Cable connection of RS-232C
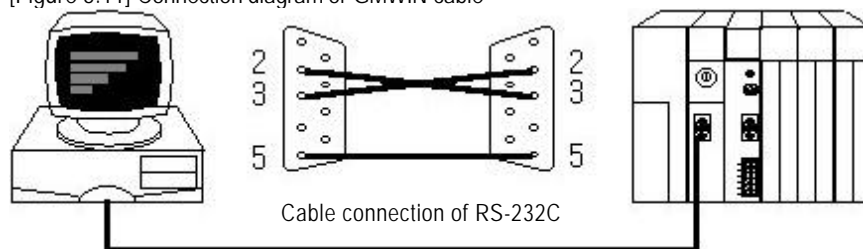
B) Select [Online]-[Connect] in Frame Editor and connect to CPU to display connection completed message. [Note1]
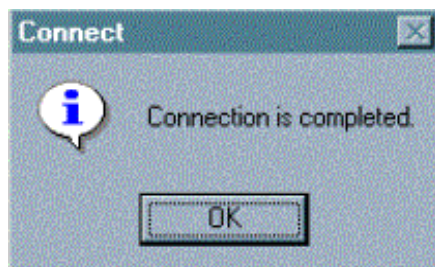
Remark

[Note1] Online connection via Frame Editor is unavailable if GMWIN program is connected. If GMWIN program is in service, try the connection after GMWIN is disconnected surely switch PLC CPU over to STOP before basic parameters or frame is downloaded. If downloaded in PLC run mode, writing error may occur.

C) Select [Online]-[Write] in Frame Editor to display the dialog box as below.

D) Select communication channel to use among RS-232C/RS-422 in basic screen of Frame Editor.

E) Select menu [Online] [Write] to display the Write dialog box as below and set slot number where Cnet is equipped. Communication option to download is for selecting option among basic parameters and frame. Select 'All' to download basic parameters and frame at a time.
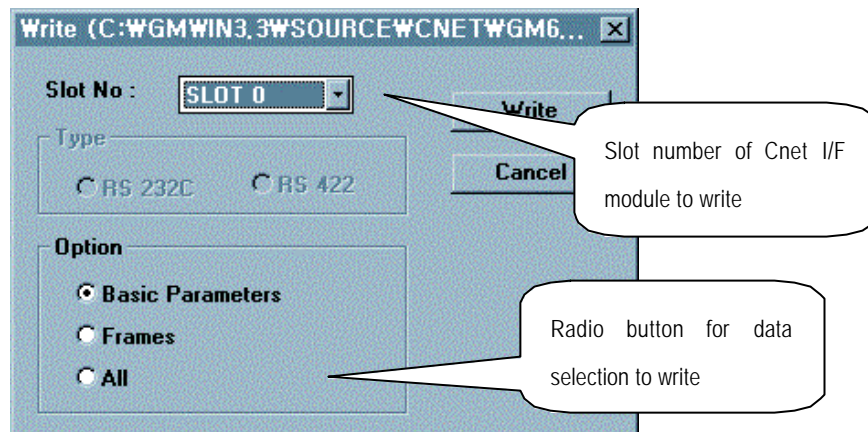
F) Select communication option and [Write] button to display the dialog box of Write OK as below. Herein, select OK to start writing.
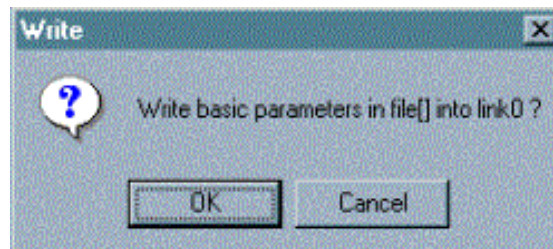
G) If download is completed, the following completion message is displayed to indicate download completed. [Note1]
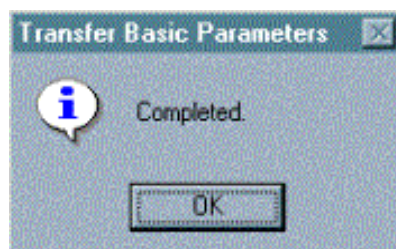
Remark

[Note1] If frame or basic parameters are downloaded, the communication of downloaded channel stops. In this case, switch the channel to Run mode via Change Run/Stop. It is caused by changed basic setting for communication to stop the operation of the channel.

H) Since downloaded channel is in communication stop status, select menu [Online][Change Run/Stop] and open the dialog box of Change Run/Stop to re-start communication.
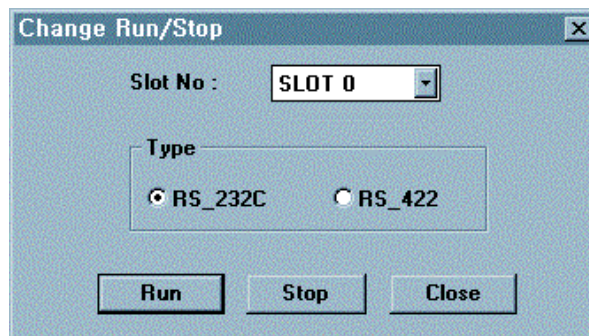
I) The dialog box of Change Run/Stop is to stop or run the operation of the appropriate channel. Since the channel operation stopped due to downloading, select Cnet's slot number and appropriate channel, and press [Run] button to switch over to communication run status and re-start the operation in communication mode downloaded. If [Run] button is selected, the message below is displayed.
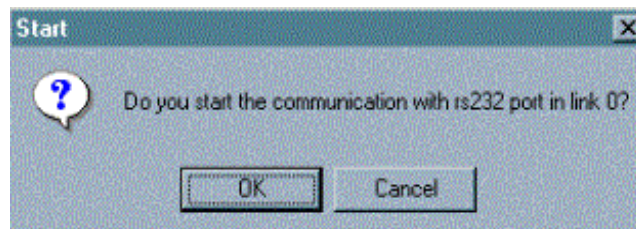
Remark

[Note1] The status of communication run or stop per channel can be checked through LED display in Cnet module. RUN-LED if turned on means communication run, and communication stop if off per channel. Even when PLC reset or powered back, communication is switched over to Run mode.

---

2) Reading (upload)

Basic parameters and frame data downloaded in Cnet I/F module are saved in flash memory as kept inside Cnet I/F module even if powered off. And these data can be also saved in file by reading via Frame Editor. The following describes the sequence of frame reading.

A) Select [Online]-[Connect] in Frame Editor and connect to PLC.

B) If connected, select [Online]-[Read] to display the Read dialog box as below and then select channel and Read type via slot No., communication type and communication option.
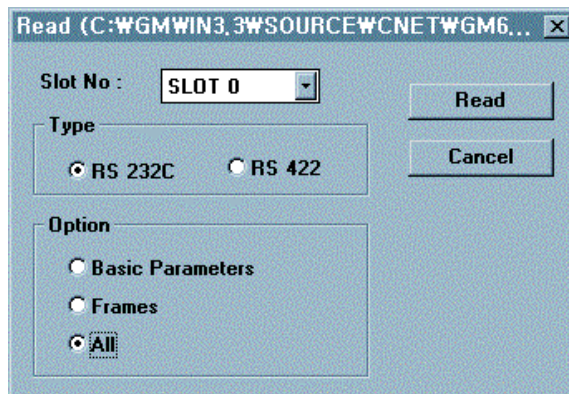
C) After required items are selected, select menu [Read] to display the status in which basic parameters and frame are read.
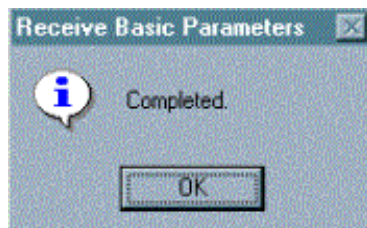
D) The data read can be saved in file via file saving menu.
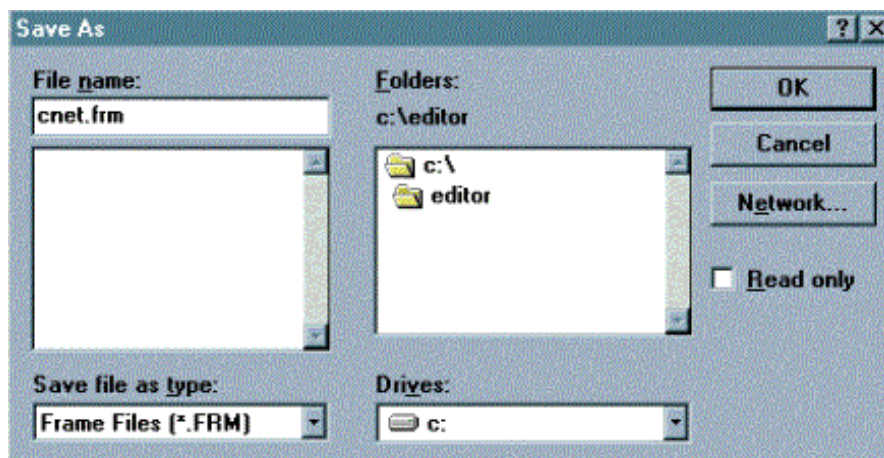
5.2.4 Monitor function

When data is transmitted or received via this communication module, it needs checking if actually transmitted well or what kind of data is received. Usually, protocol analyzer has been used for checking the data in spite of the troublesome procurement. However, to shoot the trouble, receiving monitor function is provided for Frame Editor to view the data received by the other station along with transmission monitor function to view the data transmitted from self-station.

1) Receiving monitor

Receiving monitor views the data transmitted from external devices via Cnet I/F module using Cnet module. If basic parameters of Cnet I/F module are set correctly as agreed with communication type, the receiving monitor can fill the role of monitoring regardless of different frame definition or station number setting to inspect communication status as required.

A) First, run Frame Editor and select [Online]-[Connect] to connect with CPU.

B) Select menu [Monitor]-[Receive Frame] to display dialog box for selecting channel to monitor as below.
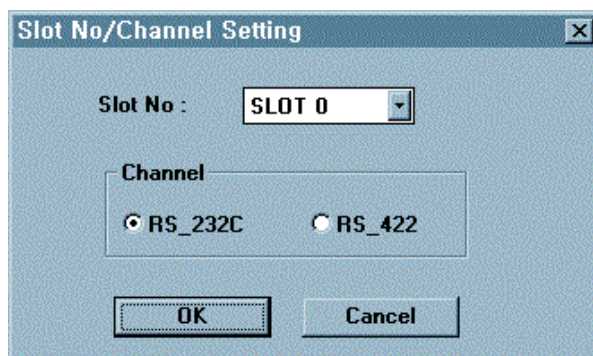
C) Select slot No. and Channel where module is inserted, and click on [OK] button.

D) If the receiving monitor screen as below is displayed, press [Start] button to start monitor.

Monitoring Received Data

View previous page
(available only in view mode)

Start monitor

Stop monitor

Close screen

View next page
(available only in view mode)

Monitor Mode
○ Monitor ○ View

Display Option
○ Hex ◉ ASCII

Current Page: 1

View option
1.HEX. : View data in HEX.
2.ASCII : View data in characters

Mode selection button
1. Monitor : View currently received data
2. View : Stop monitor to analyze received
    data closely

E) If data is received by Cnet I/F module, the received data is monitored in the screen as below.

Monitoring Received Data

```
0 1 0 4 ex ak 0 0 R S S 0 1 0 1 0 8 ex ak 0
0 R S S 0 1 0 1 1 0 ex ak 0 0 R S S 0 1 0
1 2 0 ex ak 0 0 R S S 0 1 0 1 4 0 ex ak 0 0
R S S 0 1 0 1 8 0 ex ak 0 0 R S S 0 1 0 1
0 1 ex ak 0 0 R S S 0 1 0 1 0 2 ex ak 0 0 R
S S 0 1 0 1 0 4 ex ak 0 0 R S S 0 1 0 1 0
8 ex ak 0 0 R S S 0 1 0 1 1 0 ex ak 0 0 R S
S 0 1 0 1 2 0 ex ak 0 0 R S S 0 1 0 1 4 0
ex ak 0 0 R S S 0 1 0 1 8 0 ex ak 0 0 R S S
0 1 0 1 0 1 ex ak 0 0 R S S 0 1 0 1 0 2 ex
ak 0 0 R S S 0 1 0 1 0 4 ex ak 0 0 R S S 0
1 0 1 0 8 ex ak 0 0 R S S 0 1 0 1 1 0 ex ak
0 0 R S S 0 1 0 1 2 0 ex ak 0 0 R S S 0 1
0 1 4 0 ex ak 0 0 R S S 0 1 0 1 8 0 ex ak 0
0 R S S 0 1 0 1 0 1 ex ak 0 0 R S S 0 1 0
1 0 2 ex
```

Monitor Mode
◉ Monitor ○ View

Display Option
○ Hex ◉ ASCII

Current Page: 3
Buffer[%] : 0

2) Transmission monitor

Transmission monitor is used to check and monitor data if actually transmitted from Cnet I/F module via null modem cable connecting PC with RS-232C communication channel of Cnet I/F module as in [Figure 5.12].

A) First, connect RS-232C cable to RS-232C port of Cnet I/F module to monitor..

[Figure 5.12] How to connect transmission monitor cable

Cable connection of RS-232C
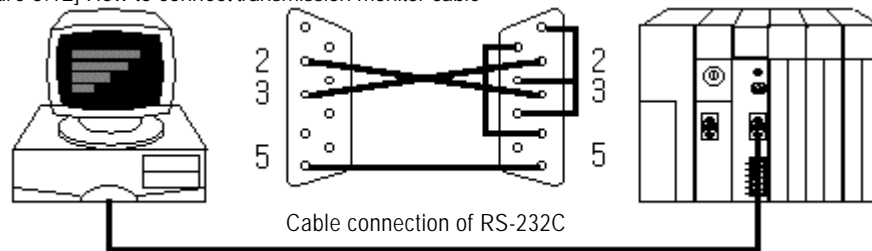
B) If [Monitor]-[Send Frame] is selected in Frame Editor, the following dialog box for parameter setting is shown, herein, input basic parameters of Cnet I/F module as communication speed, number of data bits, parity bits and stop bits, and then press [OK] button.
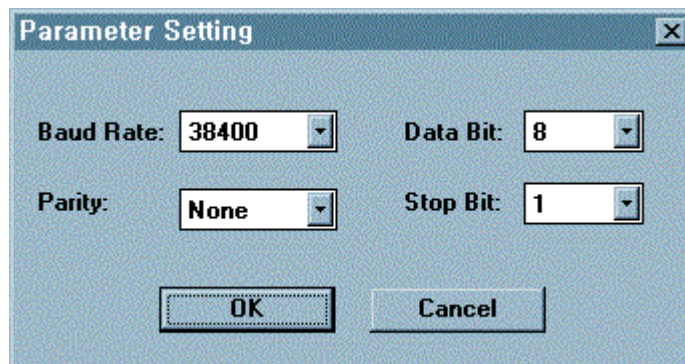
C) Set communication parameters as of RS-232C channel in Cnet I/F module.

D) Press [Start] button in transmission monitor screen as the figure below to display data which is in transmission.
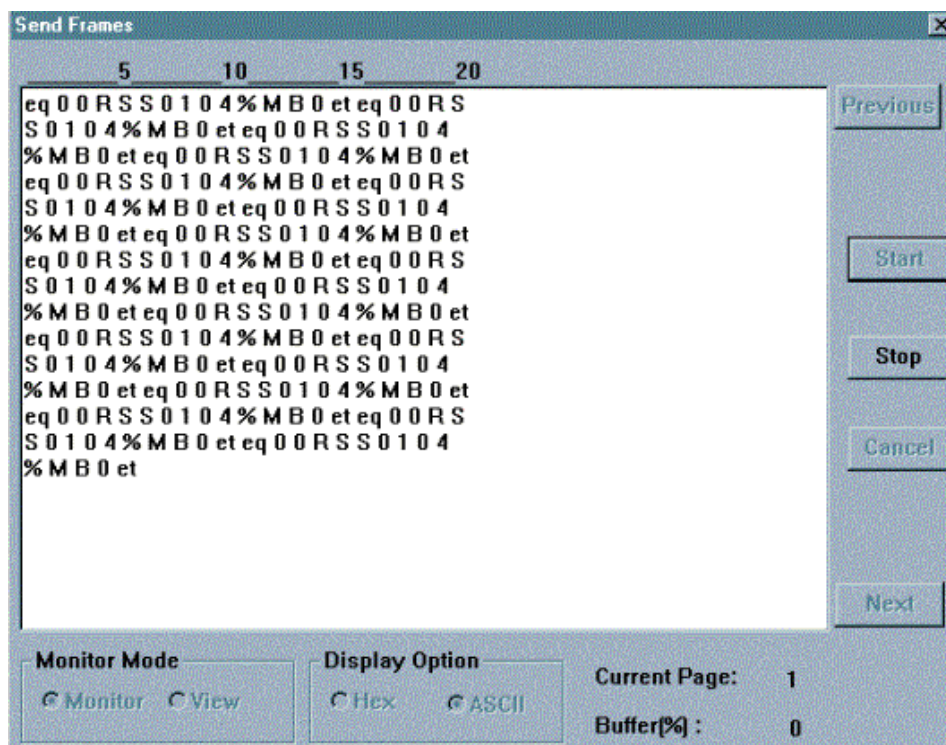
E) To analyze transmitted data closely, press [Stop] button as in the receiving monitor and then switch monitor mode to 'View'. By changing of View option, data can be viewed in HEX or ASCII.

Remark

[Note1] Transmission monitor is available only for RS-232C channel. For receiving monitor of RS-422 channel, RS-232C to RS-422 converter shall be used.

5.3 Managing function of flash memory | Ver.2.0

Cnet O/S can be upgraded and other company's driver also can be downloaded through flash memory of Cnet I/F used as an area for Cnet O/S and other company's dedicated driver. Via flash memory used as an O/S rom area, Version Up is available by user in person, however for Cnet Ver.2.0 or later only, along with additional function to manage flash memory for Frame Editor.

5.3.1 Write flash memory

Set Cnet mode switch to flash writing mode, supply power and open the required driver file via Frame Editor to download Write flash memory to Cnet I/F module as below.

1) Setting of Cnet operation mode: If PLC is powered on after Cnet mode switch is set to flash writing mode, No.'0' LED of Cnet I/F module flashes in a cycle of 1 second. Refer to Chapter 4 Operation mode setting for details of flash writing mode setting of Cnet I/F module.

2) Run Frame Editor and select [Open Lib] in [File] to display the dialog box for opening library file. Select the directory where driver is saved and then choose the applicable library file to confirm. File description shows the contents and the version of the library file where the version of the library can be checked.
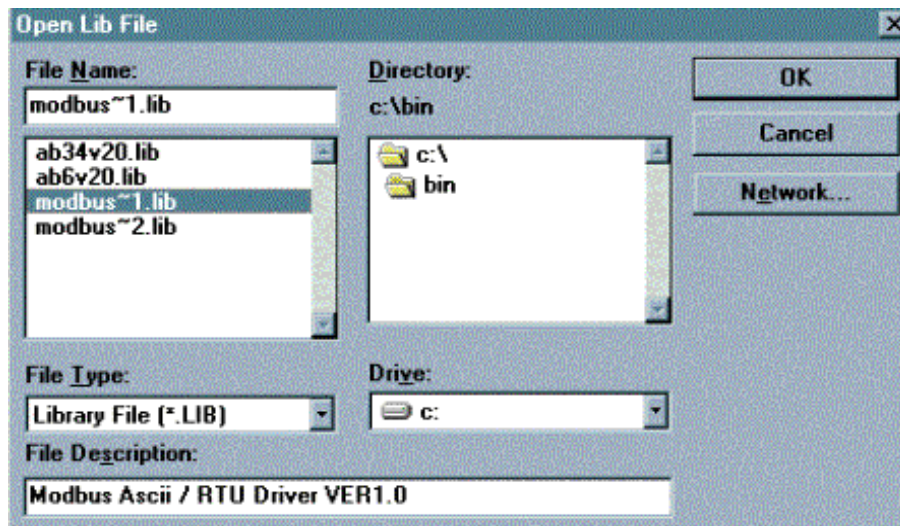
3) Library files of AB DF1 and MODBUS are provided via downloads per Cnet I/F module respectively. Library file names per Cnet I/F module are described in [Table 5.6].

[Table 5.6] Other company's driver file description

File name	Description
AB34.LIB	AB DF1 Driver for G3L-CUEA/G4L-CUEA
AB6.LIB	AB DF1 Driver for G6L-CUEB/G6L-CUEC
MODBUS34.LIB	Modbus Driver for G3L-CUEA/G4L-CUEA
MODBUS6.LIB	Modbus Driver for G6L-CUEB/G6L-CUEC

4) After online connected, select [Write] via [Flash memory] in menu [Online] as below.
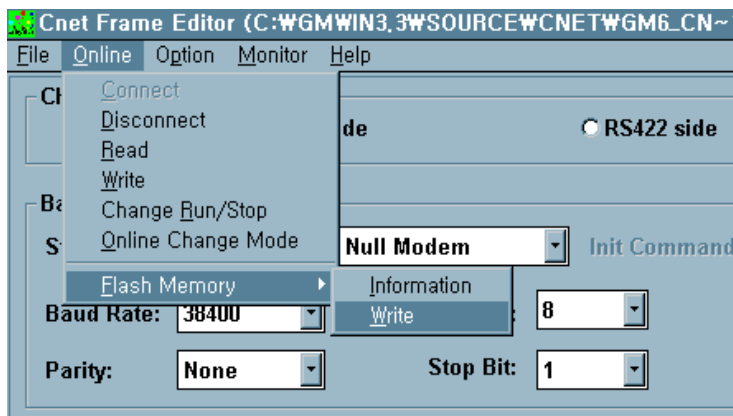
5) If Write flash memory is selected, the following dialog box for library writing is displayed. Select slot number therein and then choose Write button
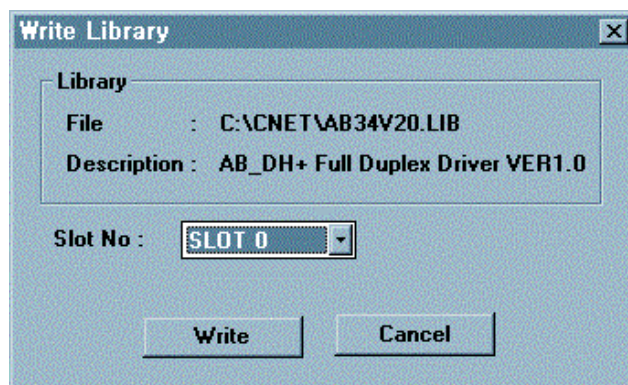
> **Remark**
>
> [Note1] Do not let program operation escaped from Frame Editor while downloading to flash memory or from Windows program, nor let PC or PLC powered off. If OS data of flash memory is ever damaged, normal operation of Cnet I/F module is unavailable. A/S shall be requested in this case.

6) If library writing is completed, the following message will be displayed.

7) If the message below is displayed, check operation mode or slot number in Cnet I/F module.
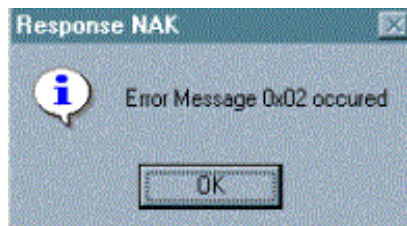
5.3.2 Reading of flash memory

Read flash memory is for checking the type and the version of O/S and other company's driver saved in flash memory of Cnet I/F module. Reading is allowed in all modes except Loop-Back mode with the following procedure as below.

1) Select Read flash memory of sub-menu in flash memory from online menu of menu bar to display the following screen where to read flash memory information. Herein, select applicable slot and library and then press Read to check the type and the version of driver downloaded in Cnet I/F module.
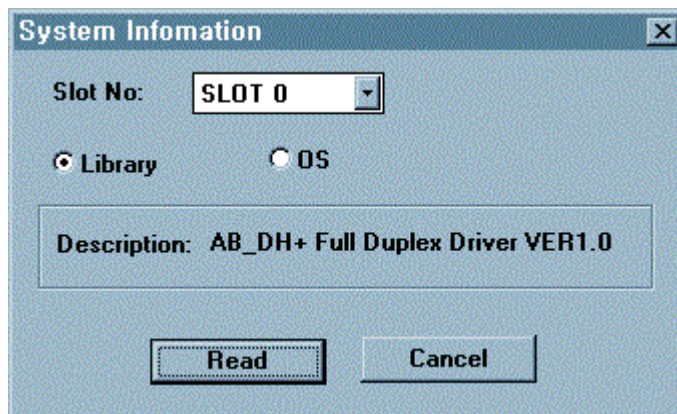
2) Select OS in system information and run Read to read the version of Cnet Flash ROM.
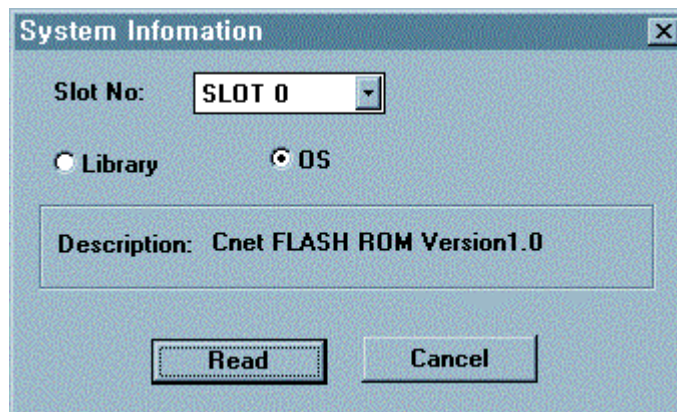
5.4 Changing of online mode | Ver.2.0

In Cnet Ver.2.0, the operation mode can be changed during operation by setting via Frame Editor besides via mode switch. With online mode changeable all for local/remote Cnet I/F modules, the operation mode of Cnet module placed distantly can be also changed. No.9 online mode is added to mode switch for this function, however, mode change is available using Frame Editor only in online mode with features as below.

❑ Online mode is changeable by adding No.9 online mode to mode switch.

❑ Setting of each operation mode is available for channels RS-232C/RS422 respectively.

❑ Mode changeable for local/remote stations.

❑ Mode change for remote station is available only via RS-232C channel.

❑ Set operation mode is saved in flash memory as kept even if powered off.

❑ Reading mode available via Frame Editor.

❑ Other company's dedicated mode can be set only in online mode.

5.4.1 Changing of local operating mode

The operation mode of Cnet I/F module mounted on PLC which is local-connected to Frame Editor is changeable by virtue of this function. If mode switch is set to No.9 online mode, its setting is allowed via the changing menu of online mode of Frame Editor. As for changing local mode, all operation modes supported in Cnet can be set per channel also to stand-alone or interlocking channel.

[Figure 5.13] shows structure of Cnet I/F module in local connection. Operation mode switch of Cnet I/F module mounted on No.'0' slot is set to No.9 and Frame Editor is connected with PLC CPU.

[Figure 5.13] Changing of local operation mode
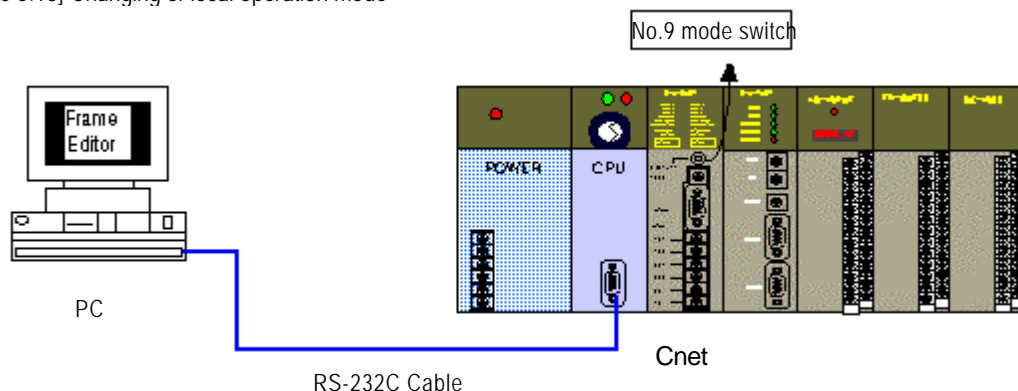
The following is how to change online mode of Cnet I/F module in the structure of [Figure5.13].

1) Select No.9 mode switch of Cnet I/F module continuously with power on and perform online connection via Frame Editor.

2) Select change items of online mode in online menu to enter mode change menu.
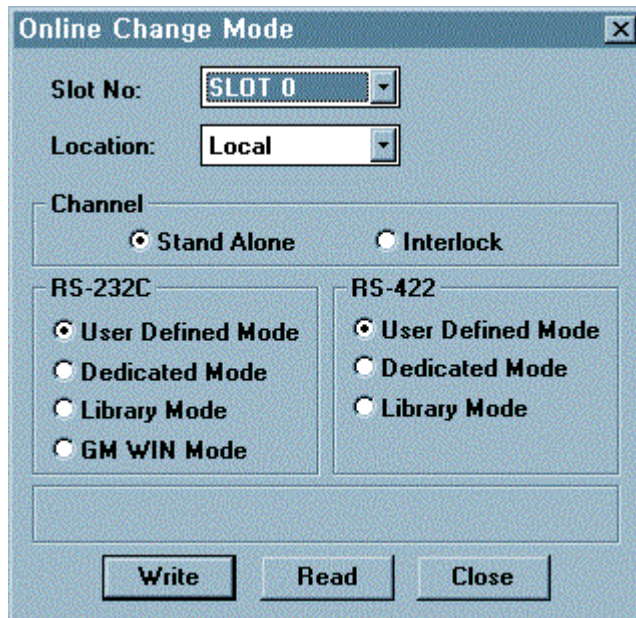
3) Set slot No.0 where Cnet I/F module is mounted and connection stage to local in online mode change box.

4) Select desired type of channel operation from channels of interlocking and stand-alone. [Note]

Remark

[Note1] Setting values are valid only in RS-232C channel for G6L-CUEB and only in RS-422 channel for G6L-CUEC. In case of two types of modules, the operation isn't available in interlocking mode. Basic value if not set is user mode all for RS-232C/RS-422 in stand-alone channel.

---

5) If mode is set as required, select Write button to change modes. If modes are changed, the following message will be displayed to indicate operation mode completed.
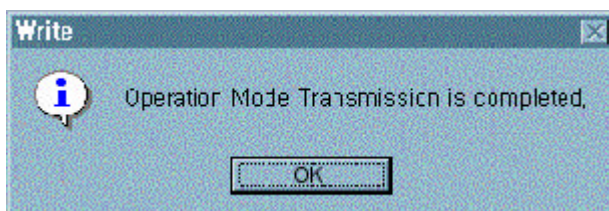
Remark

> Note1] If mode change is written, communication of RS-232C/RS-422 channel is disconnected for approx. 1 second to convert operation into newly changed mode and then is automatically operated in changed mode after mode change is completed.

6) If the message below is shown, the mode switch of Cnet I/F module is not No.9 online mode. Change mode switch of Cnet I/F module to No.9 online mode, reset PLC and execute again from No. (1).

7) If the message below is shown, version of Cnet I/F module is below Ver.2.0 and online mode change is unavailable.
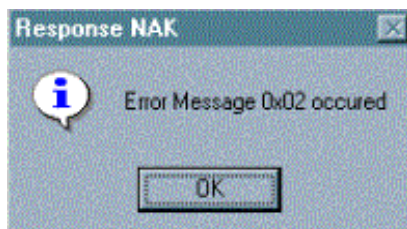
8) The changed mode is saved in flash memory of Cnet I/F module as kept even if powered off.

9) Operation mode in online mode set is valid only in online mode. If mode switch is selected in off-line mode from 0 to 7, the operation mode is decided according to each mode switch.

10) Operation mode of Cnet module can be also read via Frame Editor even though Cnet module is not in online mode. Select Read button with slot number and connection stage set to local in online mode change menu as below.[Note1]
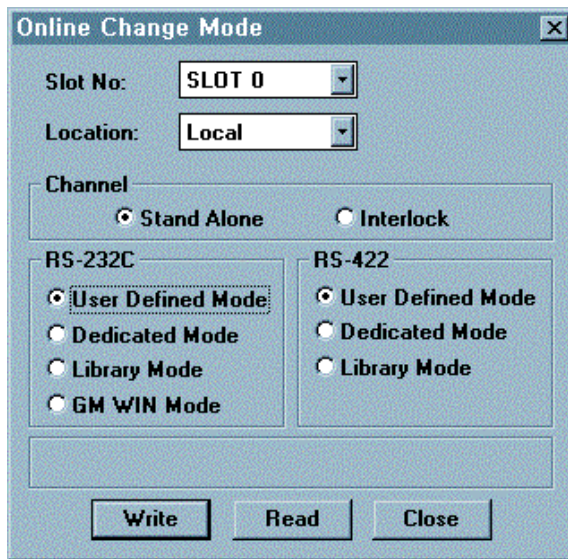
Remark

[Note1] Operation mode can be read in the other modes than LOOP-BACK mode and flash writing mode.

---

11) The figure above shows the screen for operation mode which has been read with online/off-line information and operation mode displayed.

Read screen of operation mode in online mode

Read screen of operation
mode in off-line mode
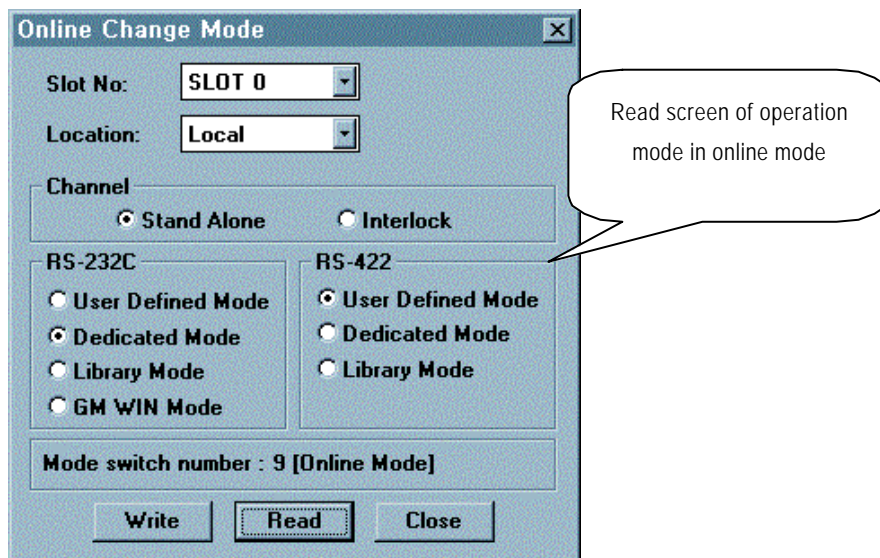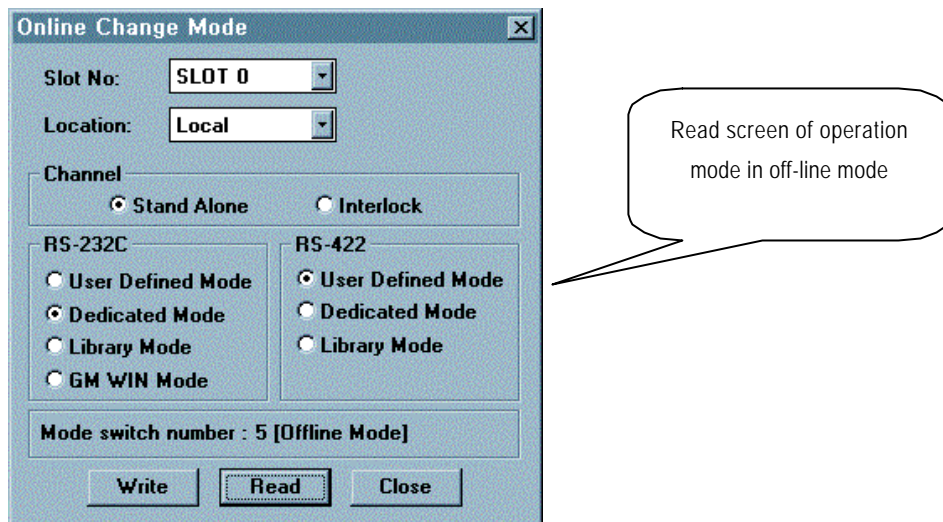
12) The figure above shows the screen for operation mode which has been read with online/off-line information and operation mode displayed.

13) Changing and reading the operation mode are unavailable for below Cnet Ver.2.0.

14) If operation mode is changed during normal operation, RS-232C/RS-422 channel stops operation for approx. 1 second and communication with the outside is disconnected, however, automatically it starts operation again after operation change is completed.

5.4.2 Changing of remote operating mode

Setting of remote operation mode is for changing the operation mode of Cnet I/F module which is remote-connected via RS-232C channel of local PLC Cnet I/F module. It is convenient for such remote communication via Cnet I/F module and dedicated modem mainly between two PLCs as continued converted to desired operation mode again with program modification by GMWIN remote connection to remote PLC after changing Cnet operation mode to GMWIN mode.

Main features of changing remote operation mode are as follows.

❑ Setting of operation mode for Cnet I/F module of remote PLC is available.

❑ Both local / remote Cnet I/F modules are available only in online mode.

❑ Remote operation setting via RS-422 channel is unavailable.

❑ Communication of Cnet I/F module if its operation mode is being changed is disconnected for approx.1 second and then is run as started again in the changed mode after the operation change.

❑ All local / remote Cnet I/F modules shall be of Ver. 2.0 or later to allow operation change.

❑ Communication mode in RS-232C channel of two Cnet I/F modules shall be set identical.

❑ As for remote operation change, setting channel operation to interlocking channel is unavailable.

❑ Operation mode of remote Cnet I/F module can be read.

❑ In case of G6L-CUEC module equipped with RS-422 channel only, changing of the remote operation mode is not allowed.

[Figure 5.14] shows an example of system structure where operation mode of remote Cnet I/F module is changed.
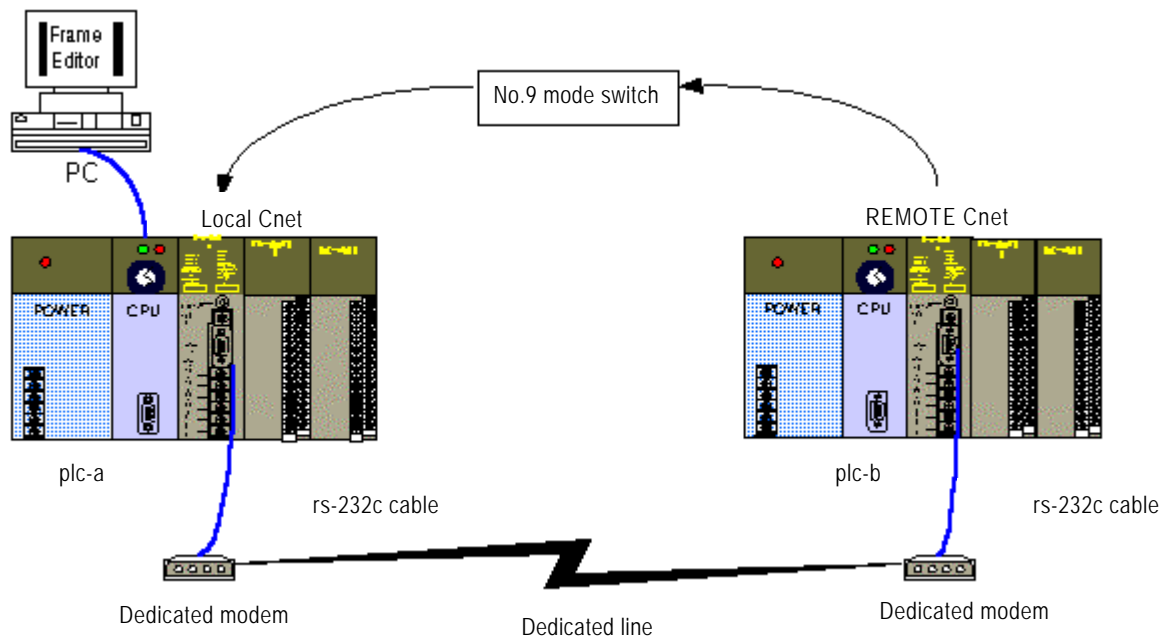
[Figure5.14] System structure where remote operation mode is changeable

The following describes how to change PLC-B mode, and how to change and download program via Cnet in the system as shown in [Figure 5.14] below.

1) Set local/remote Cnet to No.9 online mode and supply power.
2) Change local PLC-A to STOP mode.
3) Check if communication of RS-232C channel between PLC-A/B is normal and then connect Frame Editor to local PLC-A. Successively, select change menu of operation mode to display setting screen of operation mode as in the figure.
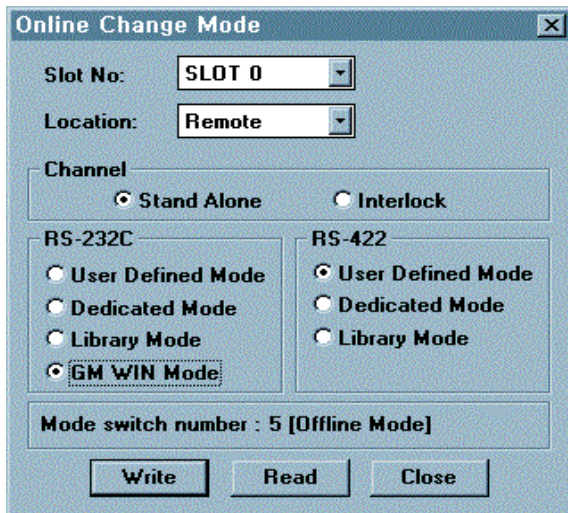
4) Set slot No.'0' where Cnet I/F module is mounted and connection stage to remote in online mode change.

5) Select desired type of channel operation from channels of interlocking and stand-alone. [Note]

Remark

[Note1] Setting values are valid only in RS-232C channel for G6L-CUEB and only in RS-422 channel for G6L-CUEC. In case of two types of modules, the operation isn't available in interlocking mode. Basic value if not set is user mode all for RS-232C/RS-422 in stand-alone channel.

---

6) If mode is set as required, select Write button to change modes. If modes are changed, the following message will be displayed to indicate operation mode completed. [Note1]
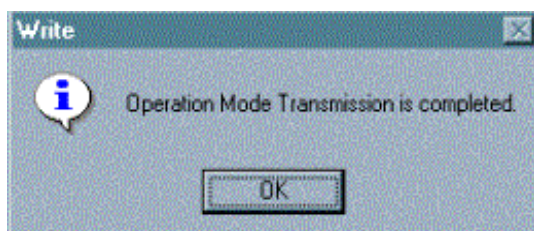
Remark

[Note1] If mode change is written, communication of RS-232C/RS-422 channel is disconnected for approx. 1 second to convert operation into newly changed mode and then is automatically operated again in changed mode after mode change is completed.

---

7) If the message below is shown, the mode switch of one Cnet I/F module is not No.9 online mode. Change mode switch of Cnet I/F module to No.9 online mode, reset PLC and execute again from No. (1)[Note]

```
Response NAK                    ⊠

   🛈    Error Message 0x02 occured

          ┌──────────┐
          │    OK    │
          └──────────┘
```
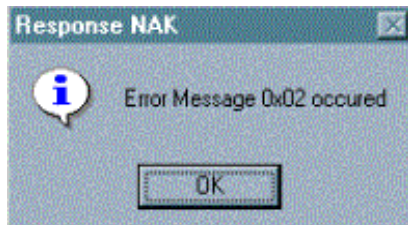
Remark

[Note1] Both Cnet I/F modules of PLC-A/PLC-B shall be set to No.9 online mode.

---

8) If the message below is shown, version of Cnet I/F module is below Ver.2.0. Online mode change is unavailable.

```
Response NAK         ⊠

   🛈    NAK occured !!

          ┌──────────┐
          │    OK    │
          └──────────┘
```
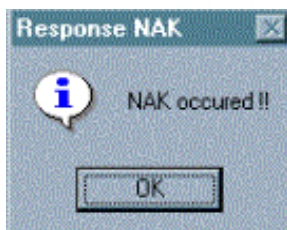
Remark

[Note1] Both Cnet modules of PLC-A/PLC-B shall be of Ver.2.0.

[Note2] Error above may occur where communication error is expected in status of modem communi-cation.

[Note3] If communication in a cycle of within 20msec is overloaded, set CPU mode of PLC to Stop and then change the operation mode. Where communication is overloaded, error in mode change may occur.

---

9) The changed mode is saved in flash memory of module as kept even if powered off.

10) Operation mode of remote Cnet I/F module can be read via Frame Editor even though Cnet I/F module is not in online mode. Select Read button with slot number and connection stage set to remote in online mode change menu to display operation mode of remote Cnet I/F module as below.

11) The figure above shows that RS-232C is in GMWIN mode and RS-422 is set to user mode with Cnet I/F module of PLC-B in No.9 online mode.

Chapter 6 System configuration

Various communication systems can be configured via this module in accordance with application fields. This chapter describes examples of system configurations which are available or unavailable for the application fields.

6.1 System configuration available

6.1.1 1:1 Connection (no modem) to PC

PC and Cnet are connected via RS-232C or RS-422 channel in 1:1 connection system with PC or PLC not through modem. Most PCs are operated as master stations and Cnet I/F modules are operated as slave stations that respond the request of PC. Since no modem is applied, communication distance is max.15m via RS-232C channel and max.500m via RS-422 channel. Operation mode of Cnet I/F module shall be set as agreed with communication type of PC.

[Figure 6.1] 1:1 communication system with PC
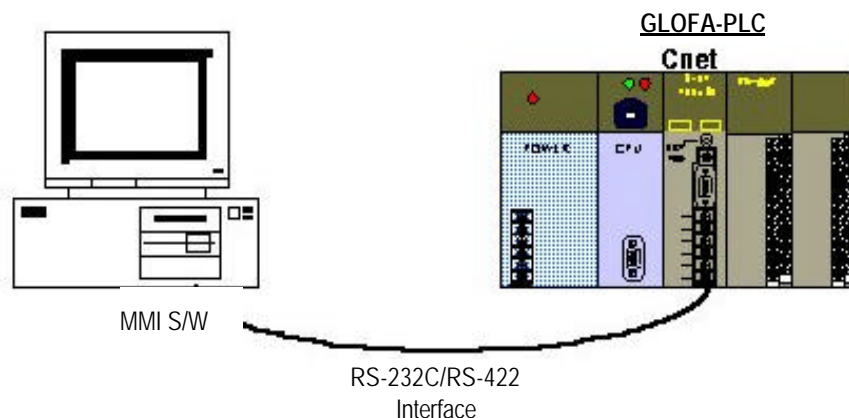
Type	Module setting			
	RS-232C	RS-422	Channel mode	Station No.
GLOFA PLC Cnet	Dedicated mode	Dedicated mode	Stand-alone channel	0 ~ 31
	Other company's dedicated mode	Other company's dedicated mode		

6.1.2 1:1 Dedicated modem connection to PC

PC and the module are connected through dedicated modem via RS-232C channel in 1:1 connection system. Most PCs are operated as master stations and Cnet I/F modules are operated as slave stations that respond the request of PC. Since modem is applied to go through, RS-232C channel shall be set to dedicated modem for long-distance communication. Operation mode of this module shall be set as agreed with communication type of MMI PC.

[Figure 6.2] Dedicated modem communication with PC
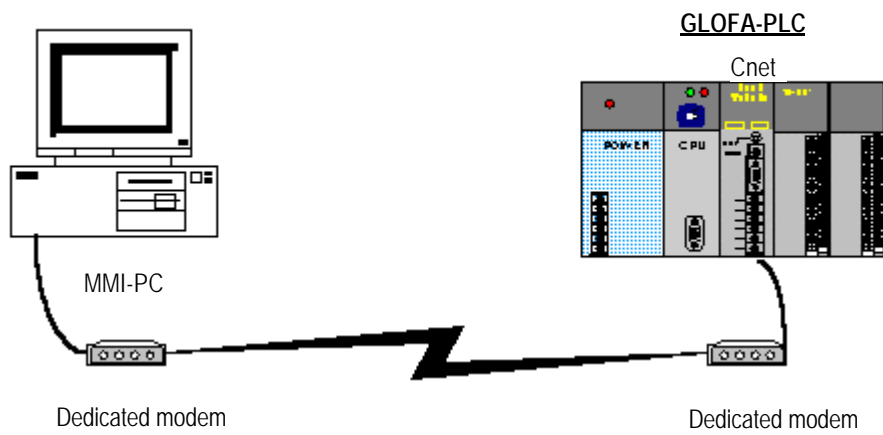
Cnet I/F module can be operated in dedicated mode or other company's dedicated mode.

Type	Module setting			
	RS-232C	RS-422	Channel mode	Station No.
GLOFA PLC Cnet	Not used	Dedicated mode	Stand-alone channel	0 ~ 31
		Other company's dedicated mode		

6.1.3 Modem connection to PC & Communication between Cnet I/F modules

❑ PC and Cnet #1 station are connected through modem via RS-232C channel

❑   Cnet #1 station ~ N station carry out communication between Cnets via RS-422 channel

❑ PC is operated via master station of Cnet #1 station

❑   Cnet I/F module can connect with max. 32 stations (RS-422/485 communication)

❑ 1 station of Cnet I/F modules is set to master station.

❑ Dedicated modem or dial-up modem is available to use.

❑   Cnet I/F module is set to stand-alone mode

[Figure 6.3] Dedicated modem communication with PC
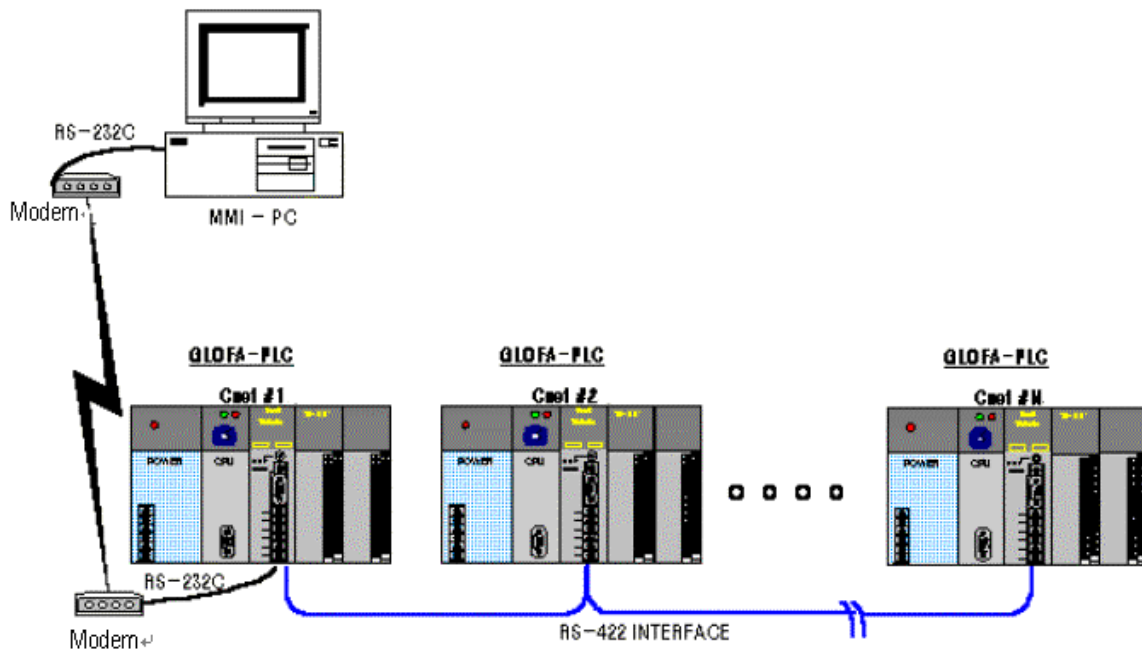
Type	Module setting			
	RS-232C	RS-422	Channel mode	Station No.
PLC Cnet #1	Dedicated mode	Dedicated master	Stand-alone channel	1
		User defined		
Cnet #1~#31	Not used	Dedicated mode	Stand-alone channel	2~31

6.1.4 Communication between PC and Cnet using interlocking channel

❑ PC is operated as a master station of Cnet #1 ~ #N station.

❑ PC and Cnet #1 station carry out communication through null modem via RS-232C channel.

❑ PC as a master station carry out RS-422 communication with Cnet #2 ~ #N station via Cnet #1 station in interlocking channel.

❑ PC and Cnet #1 station perform RS-232C channel communication.

❑ Communication between Cnet I/F modules is unavailable.

❑ Cnet I/F module can connect with max. 32 stations (RS-422 communication).

❑ Cnet #1 station is set to interlocking mode and Cnet # 2 ~ #N station are set to stand-alone mode.

❑ All Cnet I/F modules shall be set to idedntical communication speed and operation mode.

[Figure 6.4] Dedicated modem communication with PC
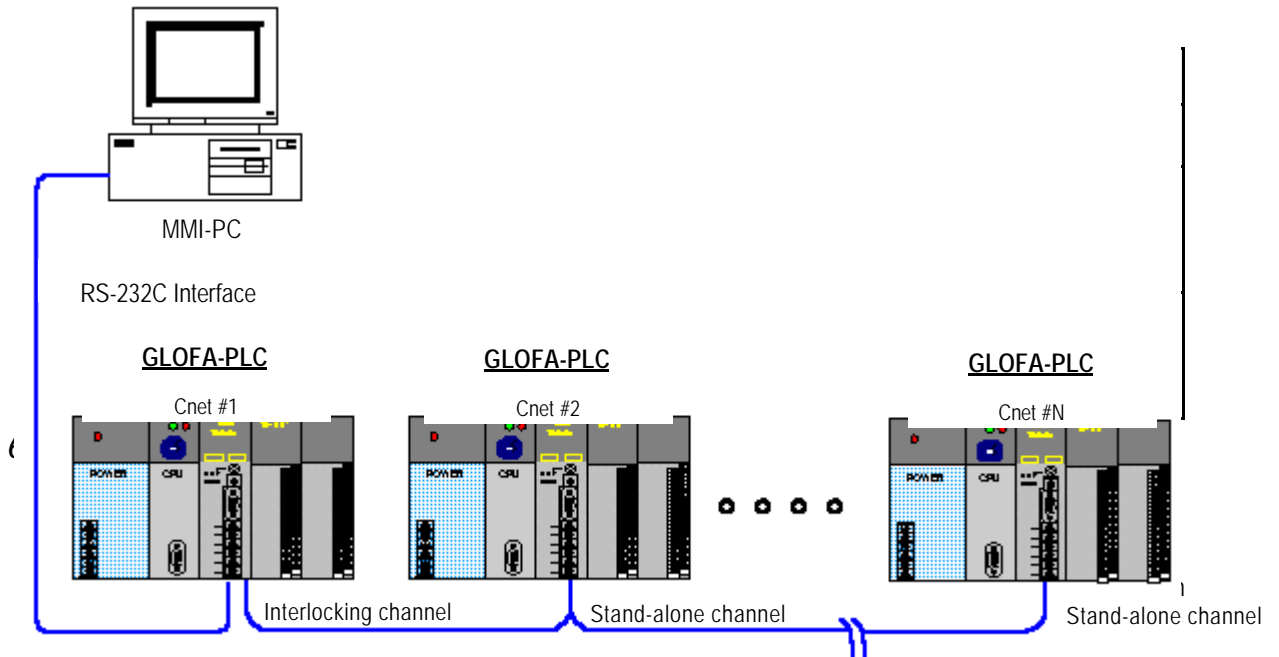
❑ PC and Cnet #1 station perform RS-232... RS-422 Interface

❑ Communication between Cnet I/F modules is unavailable.

❑ Cnet I/F module can connect with max. 32 stations (RS-422 communication).

❑ Cnet #1 station is set to interlocking mode and Cnet#2 ~ #N station are set to stand-alone mode.

❑ All Cnet I/F module RS-422 channels shall be set to identical communication speed and operation mode.

❑ Cnet I/F module #2 ~ #N station communicate with PC via RS-422 channel and with monitoring device and printer via RS-232C channel.

❑ If monitoring device is GP or PMU, RS-232C of Cnet #N station can be set to dedicated mode

[Figure 6.5] Compound system of interlocking and stand-alone channels
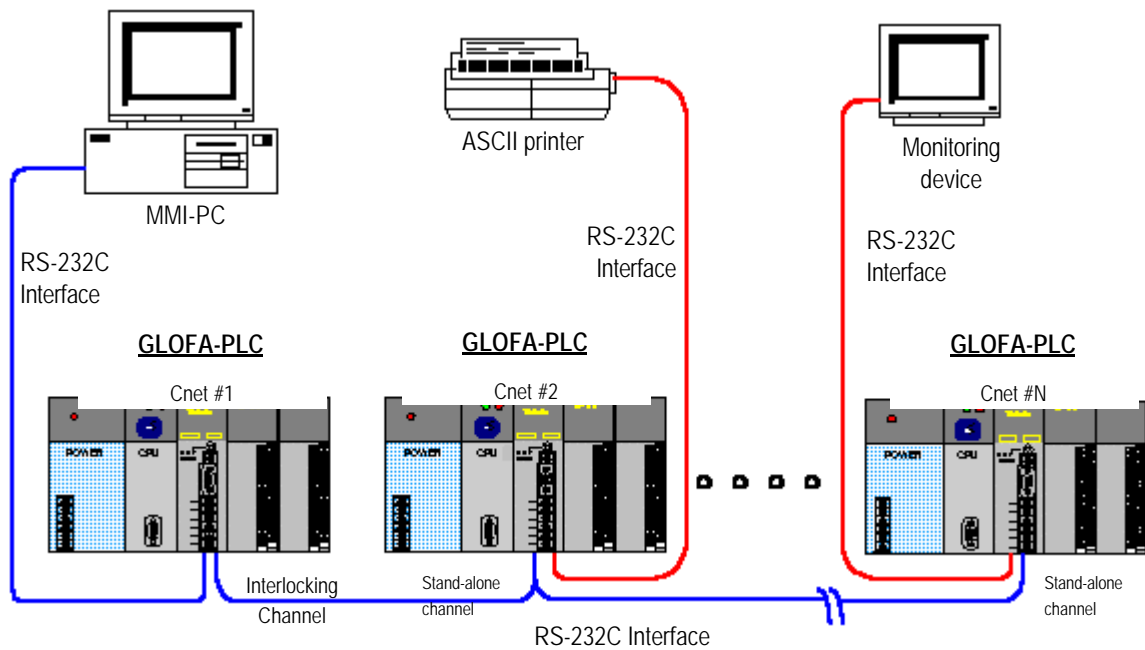
Type	Module setting			
	RS-232C	RS-422	Channel mode	Station No.
PLC Cnet #1	Dedicated mode	Not used	Interlocking channel	1
	Other company's dedicated mode			
Cnet #2~#31	Dedicated mode	Dedicated mode	Stand-alone channel	2~31
	User mode	Other company's dedicated mode		

6.1.6 Dedicated communication with PC & Other company's RS-422 communication

❑ Null-modem communication with PC via RS-232C channel is available.

❑ PC is operated as a master station and Cnet I/F module RS-232C channel is operated as a dedicated slave.

❑ Cnet I/F module RS-422 channel is operated in user defined mode.

❑ Display data is transmitted to display modules of mosaic panel via Cnet RS-422 channel.

❑ Display transmission data can be read in PC.

[Figure 6.6] Operation system of 7-segment for RS-422
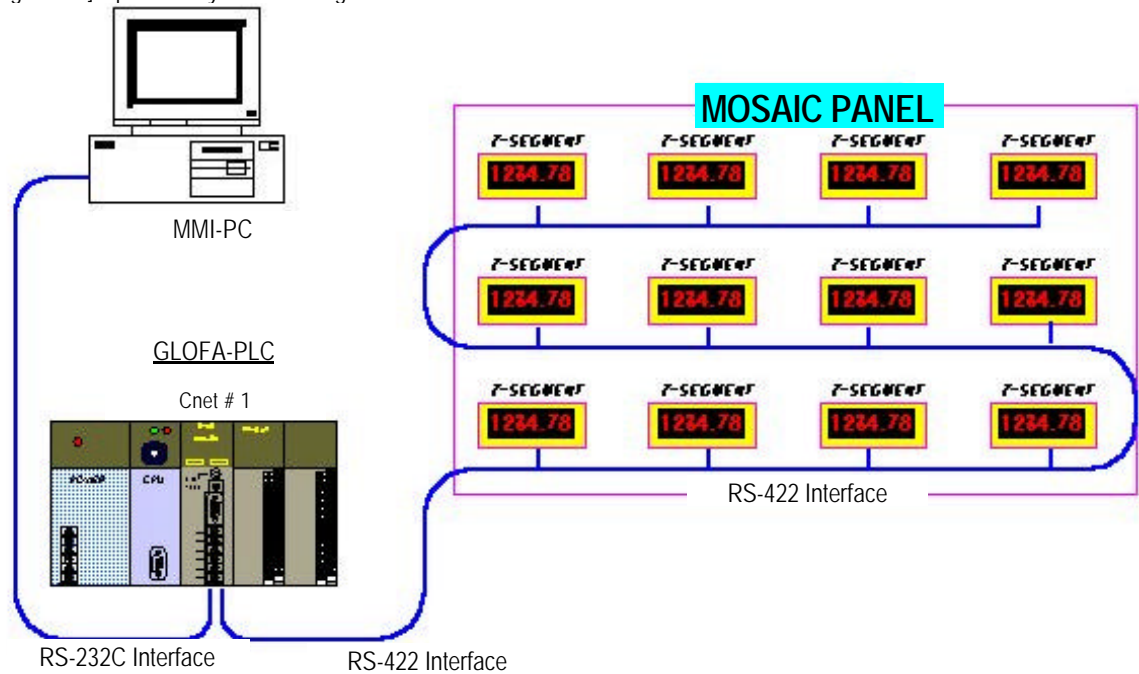
Type	Module setting			
	RS-232C	RS-422	Channel mode	Station No.
PLC Cnet #1	Dedicated mode	User mode	Stand-alone channel	1
	Other company's dedicated mode			

6.1.7 Optical modem communication for mobile communication

❑ Optical modem communication system for Cnet communication on body in lineal motion.

❑ Dedicated mode communication or user defined communication with monitoring device.

❑ RS -232C/RS-422 communication with optical modem.

❑ Dedicated master/slave communication between Cnet I/F modules. Ver.2.0

❑ User defined communication between Cnet I/F modules in former version than Cnet Ver. 2.0.

❑ Optical modem connected with Cnet I/F module on mobile body can communicate with the other optical modem only when positioned in communication available.

❑ Main application: Parking tower

[Figure 6.7] Optical modem communication system.
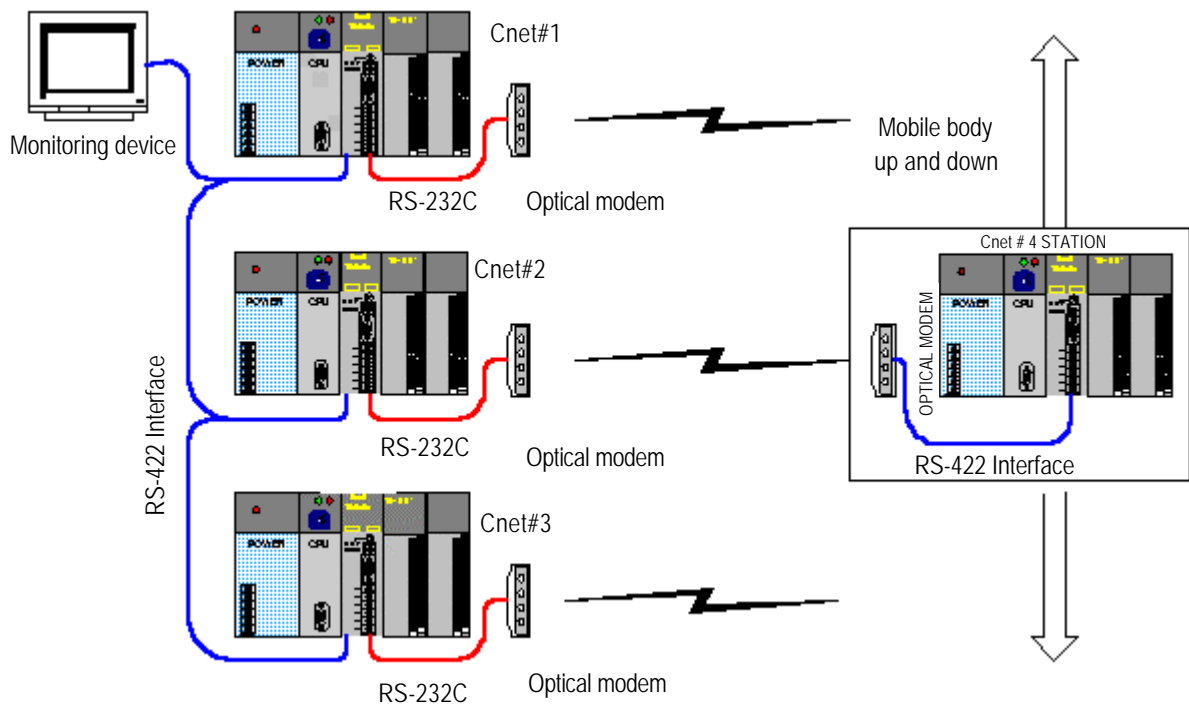
6.1.8 Wireless modem communication between revolution bodies

❑ Wireless modem communication system for Cnet communication on body in revolution motion.

❑ RS-232C communication with wireless modem.

❑ Dedicated master/slave communication between Cnet I/F modules. Ver.2.0

❑ User defined communication between Cnets in former version than Cnet Ver. 2.0.

❑ RS-232C channel of Cnet I/F module is dedicated modem mode.

[Figure 6.8] Wireless modem communication system.
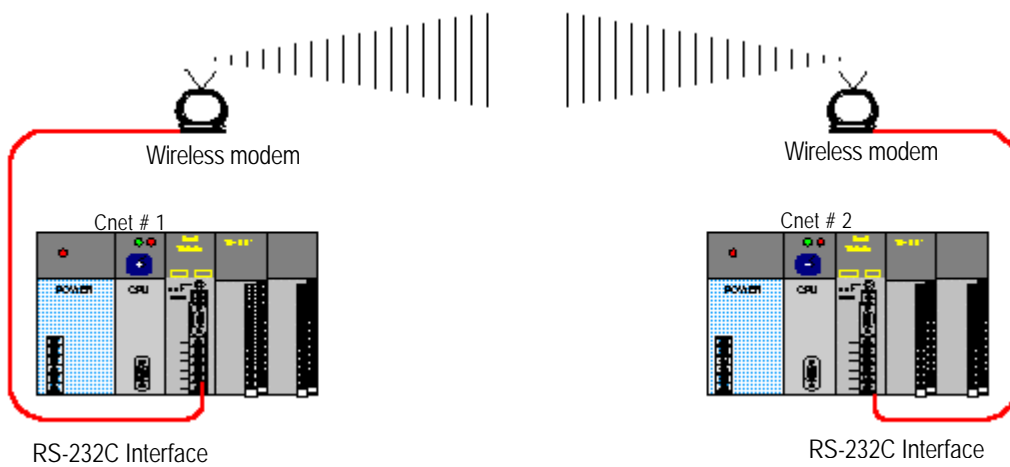
Type	Module setting			
	RS-232C	RS-422	Channel mode	Station No.
Cnet #1~#2	Dedicated mode	Not used	Stand-alone channel	
	User mode			

6.1.9 TM/TC communication system

❑ Long-distance communication with remote slave PLC via dedicated modem.

❑ Dedicated modem communication via RS-232C channel set to dedicated modem mode.

❑ Dedicated master/slave communication between Cnet I/F modules. Ver.2.0

❑ User defined communication between Cnets in former version than Cnet Ver. 2.0.

❑ Max.8 Cnet I/F modules can be mounted on TM master PLC using GM1/2/3.

[Figure 6.9] TM/TC dedicated modem system
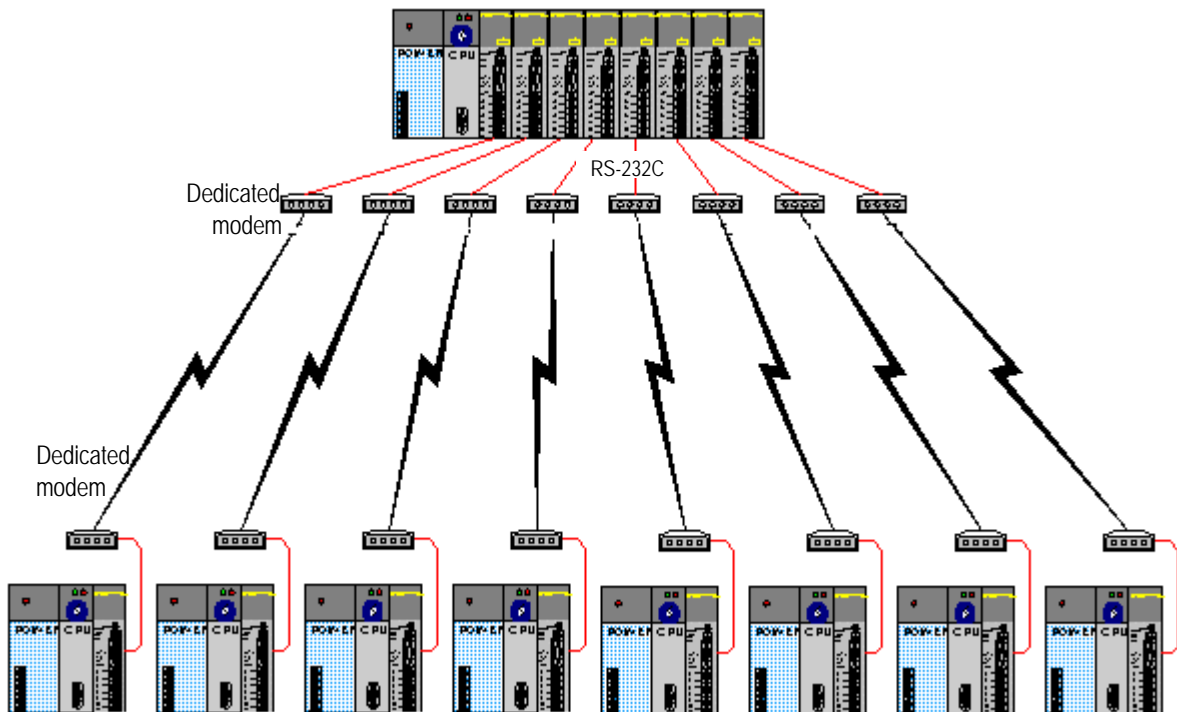
6.2 System configuration unavailable

6.2.1 Dial-up modem communication between Cnet I/F modules

❑ Cnet I/F module has no function to make telephone calls.

❑ Cnet I/F module has only function to answer telephone calls.

❑ Dial-up modem communication between Cnet I/F modules is unavailable.

[Figure 6.10] Dial-up modem communication between Cnet I/F modules
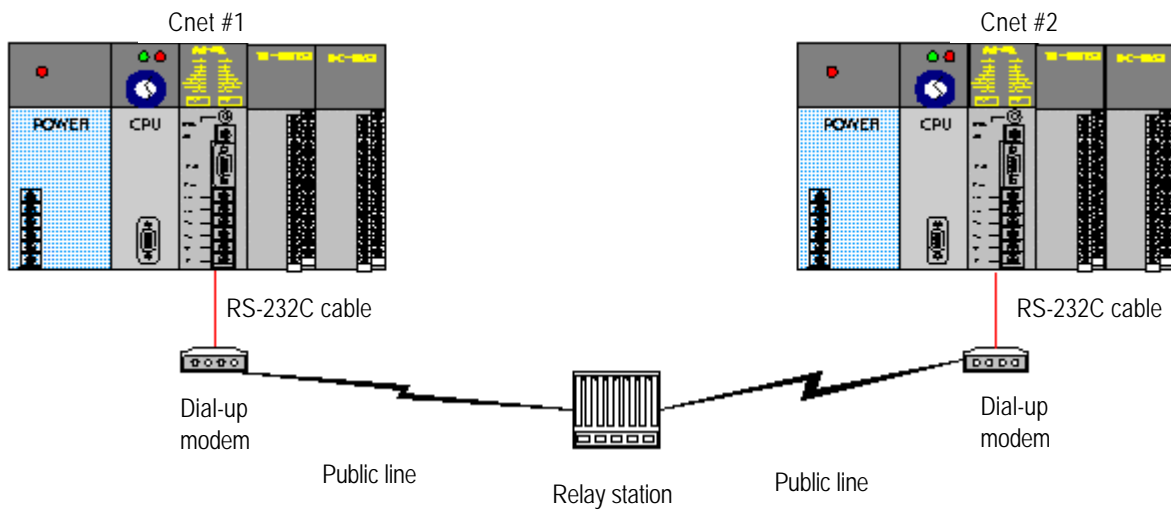
6.2.2 GMWIN connection using RS-422 channel of Cnet I/F module

❑ GMWIN service of Cnet I/F module supports only RS-232C channel.

❑ GMWIN connection via RS-422 channel is unavailable.

❑ Setting of Cnet's station number in GMWIN remote connection is unavailable.

❑ GMWIN connection is available only for Cnet #1 station as shown in [Figure 6.11].

[Figure 6.11] GMWIN connection via RS-422 channel
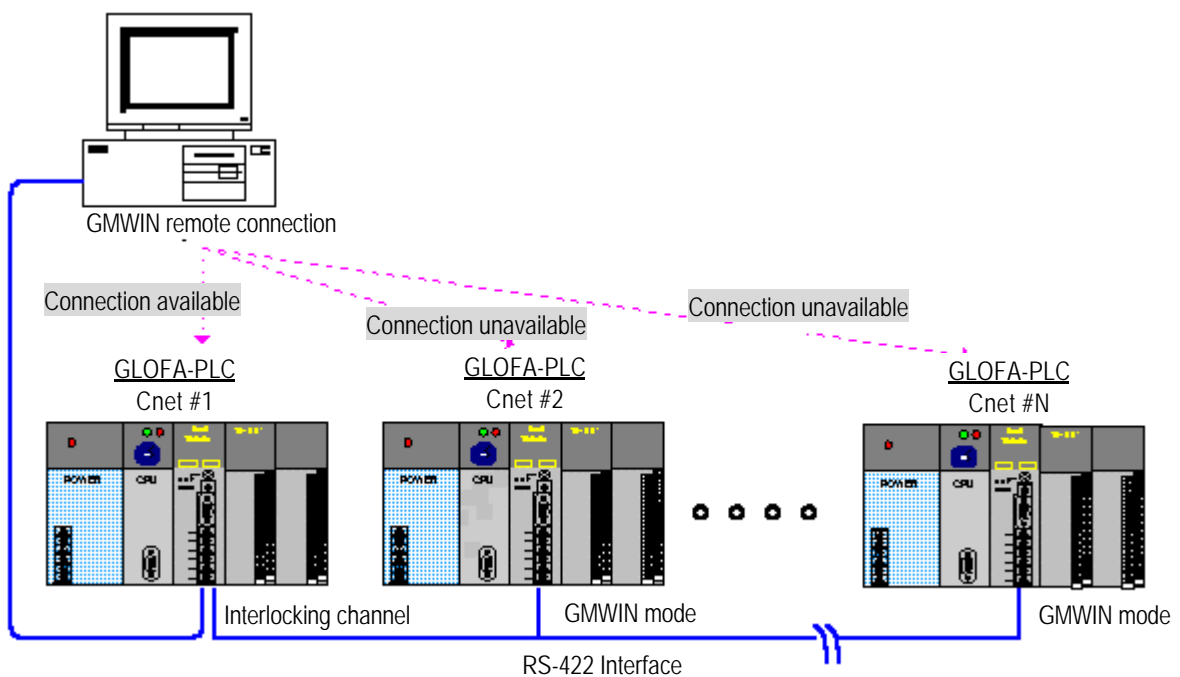
Chapter 7 Communication function

7.1 User defined communication

7.1.1 Introduction

User defined communication is the mode with which user can define other company's protocols in GLOFA PLC for communication between Cnet I/F module and other company's devices. Since lots of different communication protocols produced by various makers of communication devices are used, all the different protocols can't be built in communication module. Thus, user is to define protocol and to configure program in accordance with its application field in order to communicate with other company's devices on the basis of the defined protocol in Cnet I/F module. Such a tool to define protocol frame shall be used for this as Frame Editor provided along with Cnet I/F module to compose and edit other company's protocol. For user defined mode, exact contents of protocol to use shall be known to communicate exact data. User-defined protocol frame can be downloaded or uploaded via Frame Editor to Cnet I/F module and the saved contents are kept indelibly inside Cnet I/F module for use even though powered off. In addition to frame edit, programming by Function Block which controls transmission/receiving in PLC shall be performed for user defined mode service. This chapter describes the communication specification of user defined mode and the way to use. **As Gm7 Cnet series is different from the other Cnet I/F modules in its application, please read the user definition in 7.1.5 G7L-CUEC carefully.**

[Table 7.1] Operation mode of Cnet I/F module that is operated in user defined mode

Module name	Mode switch	Operation mode		Remark
		RS-232C	RS-422	
G3L-CUEA G4L-CUEA	0	User defined communication	User defined communication	Interlocking mode[Note 1]
	2	User defined communication	User defined communication	Stand-alone mode[Note 2]
	4	User defined communication	Dedicated communication	
	5	Dedicated communication	User defined communication	
	6	GMWIN	User defined communication	
	9	On-line mode Ver. 2.0		Set by Frame Editor
G6L-CUEB G6L-CUEC	0	User defined communication		
	9	On-line mode Ver. 2.0		Set by Frame Editor
G7L-CUEB G7L-CUEC	N/A	User defined communication		Set by GMWIN

> **Remark**
>
> [Note 1] In interlocking mode, RS-232C and RS-422 channels are operated via identical protocol.
>
> [Note 2] In stand-alone mode, RS-232C and RS-422 channels are operated via different protocols respectively.

7.1.2 User defined operation

[Figure7.1] describes operation procedure for user defined communication. User defined communication shall be set according to the sequence below because configuration of Frame Editor and GMWIN program is required.

1) **Sequence of user defined programming**

[Figure7.1] Setting sequence of user defined program

Set Cnet user mode with mode switch

▼

Edit protocol via Frame Editor [Note]

▼

Write frame and basic parameter via Cnet

▼

Compose PLC program via GMWIN TX/RX Function Block

▼

Download PLC program and Switch to run mode

▼

Start normal communication
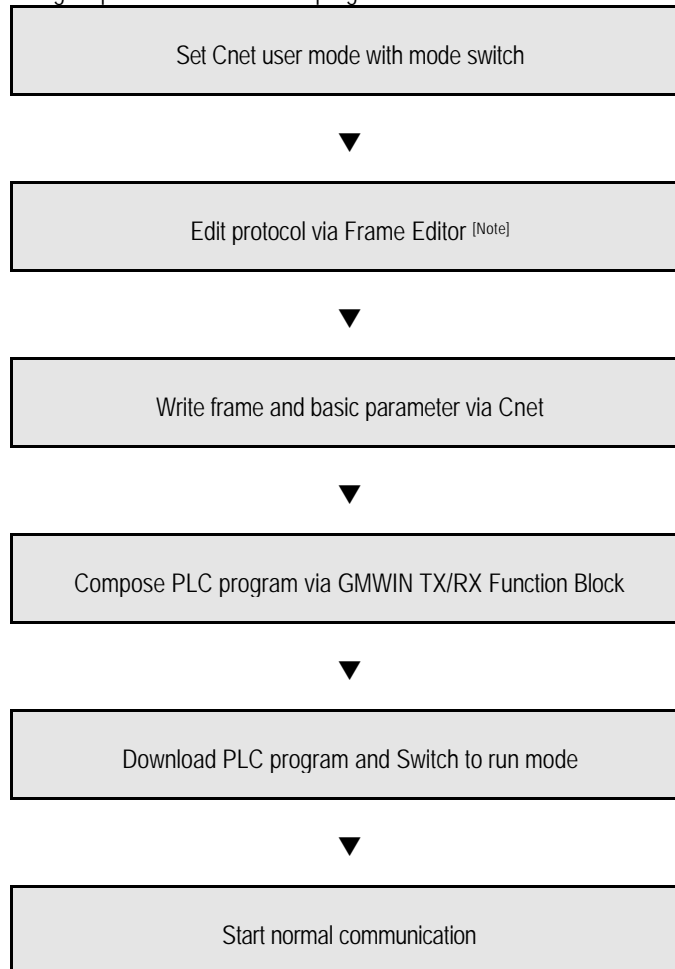
Remark

[Note 1] Analysis of operation method of protocol to communicate with shall be made ahead for user defined communication. Please, be well informed of protocol operation prior to configuration of frame and program.

---

2) Introduction of transmission operation

User defined mode is normally operated when TX / RX frame list written via Frame Editor and TX / RX Function Block of GMWIN program are agreed with each other.

[Figure7.2] Setting example of transmitted data
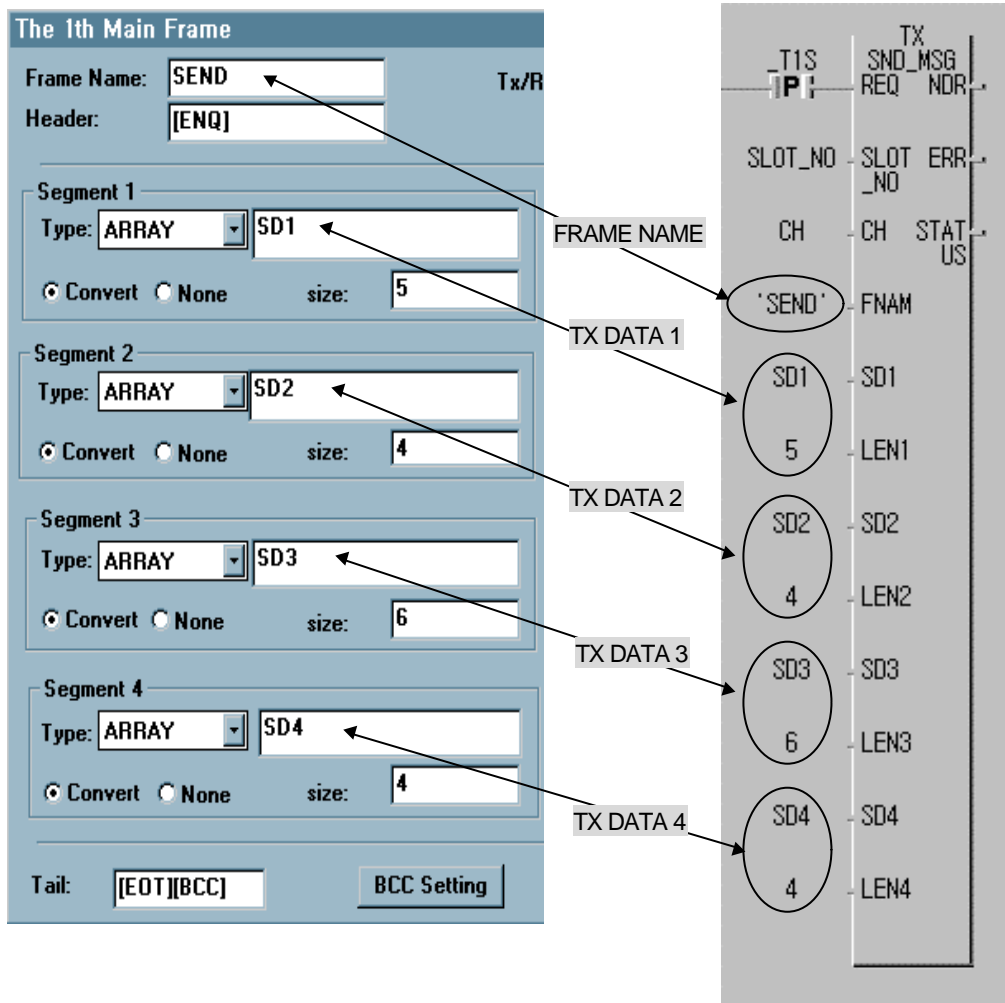
(a) Frame writing of Frame Editor   (b) Ex. of GMWIN program

[Figure7.2] shows an example of writing Frame Editor and transmission Function Block of GMWIN program for setting of transmission frame. If transmission frame is edited in Frame Editor, the frame name and the number of transmitted data shall be written identically in SND_MSG(transmission Function Block) of GMWIN program for the applied frame transmission. The frame written in Frame Editor takes the role of matching transmission protocol and the transmission Function Block of GMWIN program takes the role of sending transmission data. Data set in transmission Function Blocks of SD1~SD4 is transmitted as included in ARRAY area of the frame registered in Frame Editor, thus transmission Function Blocks agreed with the number of transmission frames shall be written also with the number of data and the frame name as exactly agreed in order to perform transmission.

3) Introduction of receiving operation

[Figure 7.3] Setting example of received data

(a) Frame writing of Frame Editor   (b) Ex. of GMWIN program
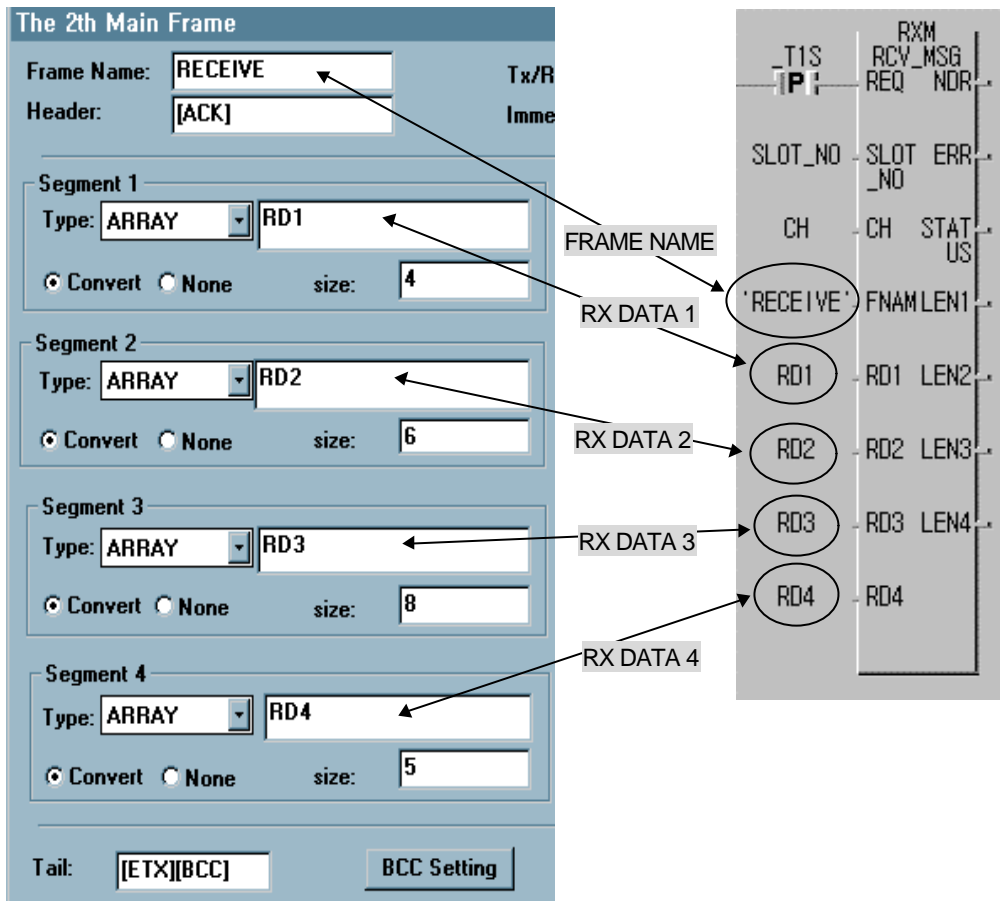
[Figure 7.3] shows a setting example for frame receiving. Frame name and saving area of received data shall be set in RCV_MSG(receiving Function Block) of GMWIN program also for data receiving similar to transmission. The frame written in Frame Editor takes the role of matching receiving protocol and the receiving Function Block of GMWIN program takes the role of saving data of the applied frame received via Cnet I/F module to receiving data areas of RD1 ~ RD4. RD data saving area of receiving Function Block as of ARRAY variable has no setting for data length differently from the transmission Function Block and defines data receiving area by setting the number of ARRAYs identically to the number of received data.

7.1.3 User defined Function Block (SND_MSG, RCV_MSG)

Users are required to use Cnet's dedicated TX/RX Function Blocks for the definition of communication frames via Frame Editor and for communication in PLC program via the defined frames. SND_MSG Function Block is applied for transmitting and RCV_MSG Function Block is applied for receiving. Insert the communication library first into GMWIN project as in the case of other communication Function Blocks, in order to use Function Block for user definition. [Figure 7.4] shows how to insert the communication library in the project screen. Choose file of COMMUNI.*FB per CPU type to insert into its correspondent project.

[Figure 7.4] library insertion into project
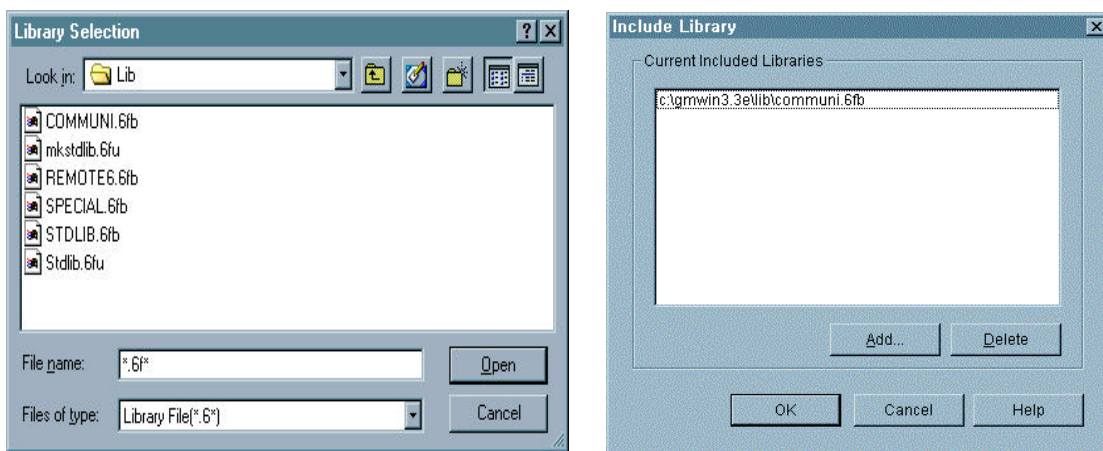
1) Transmission Function Block : SND_MSG(Send Message)

Figure on the right shows transmission Function Block, SND_MSG to transmit frames composed for transmission along with user's input data to variable via a defined channel of Cnet I/F module. The same frame name in 'FNAM' area in the Function Block must be downloaded to Cnet I/F module prior to execution of the receive Function Block. Since the frames are classified in accordance with their names by the Function Block when transmission frames are being composed in Frame Editor, normal communication can not be possible if names of the frames are identical. Besides, same number of SDx with the number of ARRAY variables is required if ARRAY variables are used in the Frame Editor. [Table 7.2] shows how to use I/O variables of SND_MSG Function Block.
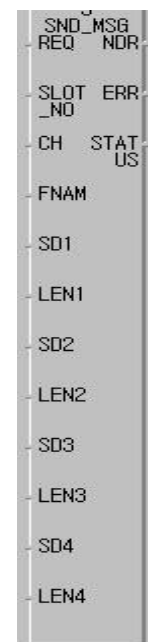
[Table 7.2] I/O specification of SND_MSG Function Block.

Input	Data type	Description
REQ	BOOL	Function Block starts service at rising edge (0 to 1) and decides point of transmission time. (If Function Block is in-service, alteration of 0 -> 1 can be ignored)
SLOT_NO	SINT	Selects slot the number of Cnet I/F module to be transmitted to Function Block
CH	BOOL	Specifies one of RS-232C channel/RS-422channel in Cnet I/F module to perform this service. 1.CH = 0 : transmitted to RS-232C side 2.CH = 1 : transmitted to RS-422 side
FNAM [Note 1]	STRING	As set via Frame Editor, it displays frame name (with up to 16 characters) to be transmitted by this Function Block among downloaded frames via Cnet I/F module.
SDx (x=1,2,3,4)	USINT Array	USINT Array is an input variable specifying the area of transmitted data for segment set to ARRAY in transmission frame. Same number of SD areas shall be specified as the number of ARRAY segments. Figures (1,2,3,4) behind SD mean sequence of segments set to ARRAY and areas for direct variables or indirect variables of PLC of Unsigned Short Integer Array can be specified. ARRAY number of SDx shall be at least the same as the ARRAY number set in Frame Editor. Even if there is no data to be transmitted, in other words, no segment set to ARRAY in Frame Editor, SD values shall be input as automatic variables. If input value is not set, compile error is expected.
LENx (x=1,2,3,4)	USINT	As a variable specifying the number of transmitted data, USINT specifies the number of data to be transmitted from the area set in SDx. If there is no data to be transmitted, in other words, no segment set to ARRAY in Frame Editor, LENs shall be all set to '0'. If input value is not set, compile error is expected.

Output	Data type	Description
NDR	BOOL	Be turned On after Function Block service is finished without error and keeps On until the next Function Block is called.

Output	Data type	Description
ERR	BOOL	Turned On when the Function Block is called but not executed successfully and keeps On until re-called. If error occurs, error information is displayed on output STATUS
STATUS	USINT	If ERR is 1 as the result of execution of Function Block, error code is output by identification code for the error. If ERR is vanished, STATUS is also vanished to 0. For details of error codes, refer to [Table 7.4] Error codes in user defined Function Block.

Remark

[Note 1] If '_Udata_SEND' is used for FNAM specifying frame name in SND_MSG Function Block, the data specified in SD1,SD2,SD3,SD4 only are transmitted directly irrelevant to the frame list downloaded to Cnet I/F module. This function is used to transmit all the frames to be sent as written in PLC program, especially to transmit frames prepared in PLC program for the protocol which is hard to write via Frame Editor. If '_Udata_SEND' is used, no procedure to write and download frame via Frame Editor is required.

2) Receiving Function Block : RCV_MSG(Send Message)

Figure on the right shows receiving Function Block, RCV_MSG, to receive frames composed for receiving. The received data via specified channel of Cnet I/F module can be received to areas of RD1 ~ RD4. The same frame name in 'FNAM' area in the Function Block must be downloaded to Cnet I/F module prior to execution of the receive Function Block. In addition, if ARRAY variables are used in Frame Editor, the same number of RDx shall be set as the number of ARRAY variables. Differently from transmission, receiving Function Blocks need setting with names and structures also as distinguishable from each other. For receiving, the received data is saved in RD area only if the received frame is identical with the registered frame when compared. if several frames of an identical structure are defined, the data is received via the receiving frame registered foremost and the data will not be received via the frame registered behind.

```
         RX
       RCV_MSG
    REQ      NDR

    SLOT     ERR
    _NO

    CH      STAT
             US

    FNAM    LEN1

    RD1     LEN2

    RD2     LEN3

    RD3     LEN4

    RD4
```
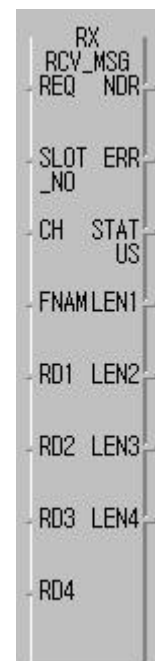
Consequently, for registery received data, be careful not to register the identical formatted data.

[Table 7.3] shows how to use I/O variables of RCV_MSG Function Block.

[Table7.3] I/O variables specification of RCV_MSG

Output	Data type	Description
REQ	BOOL	Function Block starts service at rising edge (0 to 1). (If Function Block is in-service, alteration of 0 -> 1 can be ignored)
SLOT_NO	SINT	Selects slot the number of Cnet I/F module to be transmitted to Function Block
CH	BOOL	Specifies one of RS-232C channel/RS-422channel in Cnet I/F module to perform this service. 1.CH = 0 : transmitted to RS-232C side 2.CH = 1 : transmitted to RS-422 side
FNAM [Note1]	STRING	As set via Frame Editor, it displays frame name (with up to 16 characters) to be received by this Function Block among downloaded frames via Cnet I/F module
RDx (x=1,2,3,4)	USINT Array	USINT Array is an input variable specifying the area of received data for segment set to ARRAY in receiving frame. Same number of RD areas shall be specified as the number of ARRAY segments. Figures (1,2,3,4) behind RD mean sequence of segments set to ARRAY and areas for direct variables or indirect variables of PLC of Unsigned Short Integer Array can be specified. ARRAY number of RDx shall be at least the same as the ARRAY number set in Frame Editor. Even if there is no data to be received, in other words, no segment set to ARRAY in Frame Editor, RD values shall be input as automatic variables. If input value is not set, compile error is expected.

Output	Data type	Description
NDR	BOOL	Be turned On after Function Block service is finished without error as kept On until the next Function Block is called.

Output	Data type	Description
ERR	BOOL	Turned On when the Function Block is called but not executed successfully and keeps On until re-called. If error occurs, error information is displayed on output STATUS
STATUS	USINT	If ERR is 1 as the result of execution of Function Block, error code is output by identification code for the error. If ERR is vanished, STATUS is also vanished to 0. For details of error codes, refer to [Table 7.4] Error codes in user defined Function Block.
LENx (x=1,2,3,4)	USINT	Outputs the received data length of the set segment in a unit of byte.

Remark

[Note 1] If '_Udata_RCV' is used for FNAM specifying frame name in RCV_MSG Function Block, all the data received to the specified area in RD1 of RCV_MSG Function Block are saved irrelevantly to the frame list downloaded to Cnet I/F module. In this case, LEN1 displays the number of received data. (savable up to 256 byte). This function is especially used to receive all the data prepared by the protocol which is hard to write via Frame Editor. If '_Udata_RCV' is used, all the data to be received are received without frame searching so it cannot be used with theother different receiving frames. Besides, several '_Udata_RCVs' can't be used at the same time, so is available for one module.

3) Receiving flag (_RCVx_232[i], _RCVx_422[i])

If the frame agreed with the downloaded frame via Cnet I/F module is received, Cnet I/F module lets the flag 'ON' indicating the receiving completed to inform user of the receiving status of the required data for program. Differently from transmission, execution time of receiving Function Block can't be known because the receiving point of time can't be decided in PLC program for receiving data. Receiving flag indicating receiving time of data has a function to receive the required data as sorted out when various receiving frames are applied as registered. The receiving flag displays 3 data of RS-232C/RS-422 channel data, frame entry number and slot number of Cnet I/F module altogether. The receiving flag is turned 'ON' if the applicable data is received and turned 'OFF' if the received frame is being read via RCV_MSG Function Block. [Table 7.4] describes the details of the receiving flag.

[Table7.4] Description of the receiving flag

Flag name	Item	Description
_RCVx_232[i] / _RCVx_422[i]	x (x=0~7)	Selects slot number of Cnet I/F module available to be set from 0 up to 7.
	232	Specifies RS-232C channel
	422	Specifies RS-422C channel
	i (i=0~63)	This is the entry number of the receiving frame registered in Frame Editor. Desired frame among the receiving frames registered from 0 up to 63 can be selected.

Remark

[Note 1] Receiving flag can be used only in Cnet I/F module O/S Ver. 1.1 or more.

4) Error codes

If error occurs as the result of execution of Function Block, 'ERR' output is On and error code information is displayed on 'STATUS'. STATUS output is maintained only for one SCAN. Error codes for various cases are described in [Table 7.5].

[Table 7.5] User defined error codes

STATUS value		Description
HEX.	Dec.	
H10	16	Cnet I/F module is incorrectly positioned.
H14	20	1) Incorrect library is used. 2) Wrong response frame is received.
H15	21	Response from Cnet I/F module isn't received. (waiting time exceeded)
H40	64	Operation of RS-232C/422 channel is not run.

STATUS value		Description
HEX.	Dec.	
H41	65	Frame names used in Frame Editor and in Function Block do not fit each other.
H42	66	Frame name can not be found due to abnormal CPU during operation. (during transmission)
H43	67	Frame specified in FNAM has not been received from the other station.
H44	68	Frame has not been downloaded from Frame Editor.
H45	69	Error occurs during conversion ASCII HEX
H46	70	Array size specified in Frame Editor and data size(specified in LENx) used in Function Block do not fit each other.
H64	100	Array type specified in SDx or RDx is incorrect.
H67	103	Incorrect frame definition.
H68	104	Frame has not been downloaded from Frame Editor.
H73	115	Operation mode is not user defined communication mode.

7.1.4 Example of user defined programming

[Figure 7.5] shows the example of communication system and frame structure between GLOFA PLC and other company's PLC. With the example in [Figure7.5], programming method of user defined communication will be described. The example is for the case when writing 18 byte data of %MB0 area in GLOFA-PLC via other company's PLC and reading 24 byte data of other company's PLC to save to area address of %MB100 in GLOFA-PLC.

[Figure 7.5] Example of communication system with other company's PLC

Other company's PLC

GLOFA-PLC

POWER   CPU

RS-422 literface

[A] SYSTEM CONFIGURATION

GLOFA PLC Cnet

Other company's PLC

(A) WRITE REQUEST FRAME

| [BCC] | [EOT] | Data(18-byte) | 8 | 1 | R | W | [ENQ] |

(B) READ DATA FRAME

| [STX] | R | D | 2 | 4 | Data(24-byte) | [ETX] | [BCC] |

(C) IMMEDIATE RESPONSE FRAME

| [EOT] | 4 | 2 | D | R | [ACK] |
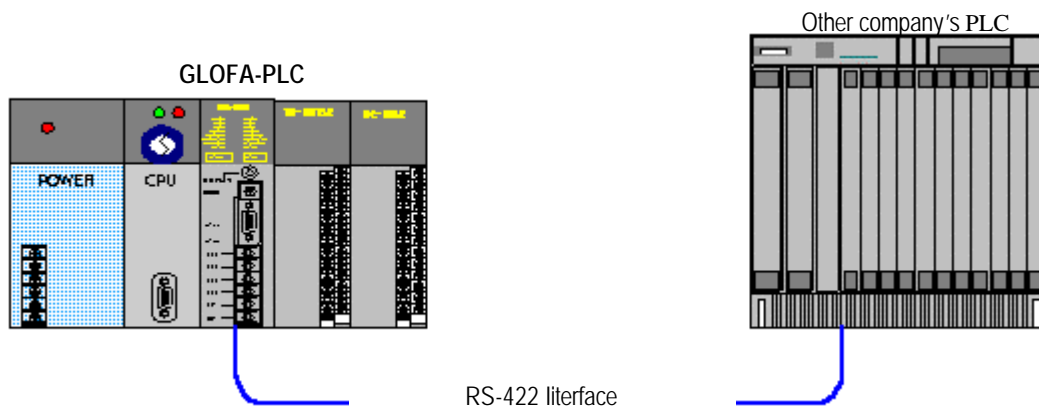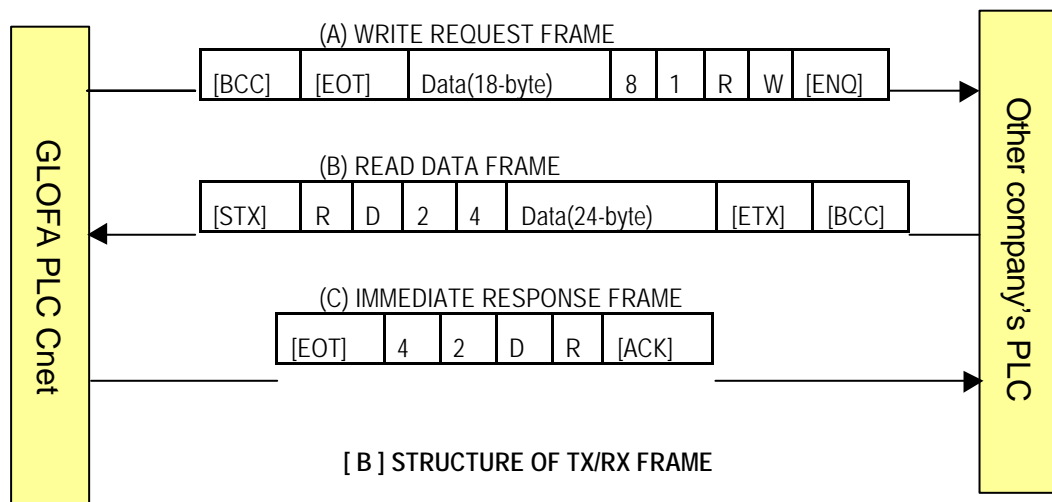
[B] STRUCTURE OF TX/RX FRAME

In [Figure7.5], 18 byte data shall be transmitted in format of (A) Write request frame from GLOFA PLC to other company's PLC, and (B) Read data frame along with 24 byte data is transmitted from other company's PLC to GLOFA-PLC. If Read data frame is received, correspondent response frame to this is transmitted in format of (C) Immediate response frame in this protocol.

[Figure 7.5] shows data flow according to transmission sequence of frames. BCC check data is transmitted as attached to the ends of Write/Read frames. Next is how to prepare frame and program in order to embody the protocol above in

user defined mode.

1) Description of protocol

A) Frame structure and contents of Write request frame are as shown in [Table7.6]

[Table7.6] Structure of Write request frame

Trans. sequence	Header						Tail
Frame type	Header	Frame body				Tail	BCC
		Command(CONST)			Data (ARRAY)		
Transmission frame	ENQ	W	R	1	8	Variable data (18-byte)	EOT	
ASCII code [Note]	H05	H57	H52	H31	H38		H04	

❑ ENQ/ EOT as of control characters of ASCII code are used for Header and Tail.

❑ 'WR' command is used as Write command.

❑ 18 byte of Write data is displayed using '18' in data length area.

❑ 18 byte data is sent to transmission data area.

❑ BCC calculates ASCII code values from Header to Tail as added in HEX., however changeable with the variable data area per frame.

Remark

[Note] ASCII code value displays the transmission data in HEX. And 'H' in front of each figure is a signal indicating HEX unit of HEX decimal figures, not included in actually transmitted data.

B) [Table7.7] shows the structure of Read data frame.

[Table7.7] Structure of Read data frame

Trans. sequence	Header						Tail
Frame type	Header	Frame body				Tail	BCC
		Command (CONST)			Data (ARRAY)		
Transmission frame	STX	R	D	2	4	Variable data(24 byte)	ETX	
ASCII code [Note]	H02	H52	H44	H32	H34		H03	

❑ STX/ETX as of control characters of ASCII code are used for Header and Tail.

❑ 'RD' command is used as Read command.

❑ 24 byte of Read data is displayed using '24' in data length area.

❑ 24 byte data is sent to data area.

❑ BCC calculates ASCII code values from Header to Tail as added in HEX., however changeable with the variable data area per frame.

C) [Table7.8] shows the structure of Immediate response frame. Immediate response frame as of response frame correspondent to Read frame responds to the received command without data.

[Table7.8] Structure of Immediate response frame

Trans. sequence	Header			⟵		Tail
Frame type	Header	Frame body				Tail
		Command(CONST)				
Transmission frame	ACK	R	D	2	4	ETX
ASCII code [Note]	H10	H52	H44	H32	H34	H03

❑ ACK/ETX as of control characters of ASCII code are used for Header and Tail.

❑ Received command 'RD' is sent again.

❑ Received data length '24' is sent again.

❑ No BCC.

2) User defined programming

Procedure sequence in GLOFA-PLC for communication via the protocol of other company's PLC in user mode is as follows.

Set Cnet I/F module to user defined mode.

Define TX/RX frame via Frame Editor as agreed with other company's protocol. And set basic parameters as communication speed, etc. also to be agreed with the specification of other company's communication.

If Frame Editor is prepared, let it downloaded to Cnet I/F module and then run communication.

Prepare program which can transmit/receive frame via GMWIN, let it downloaded to PLC CPU and then check the result via program monitor.

3) Preparing frame

Prepare basic parameters and frames first via Frame Editor according to programming sequence. As it is communication system via RS-422 channel, set communication channel to RS-422 as shown in [Figure7.6] and then set communication speed, data/stop bits, etc. to basic parameters. Station number in basic parameters doesn't need setting as it is not used in user defined mode. The default value is No.'0'. When preparing frame, frame name shall be set for 3 types of frames as below.

A)   Write request frame : 'WR_REQ'

B)   Read data frame : 'RD_DATA'

C)   Immediate response frame : 'IMM_RESPONSE'

[Figure7.6] shows basic screen where 3 frames are registered.

[Figure7.6] Basic screen of Frame Editor
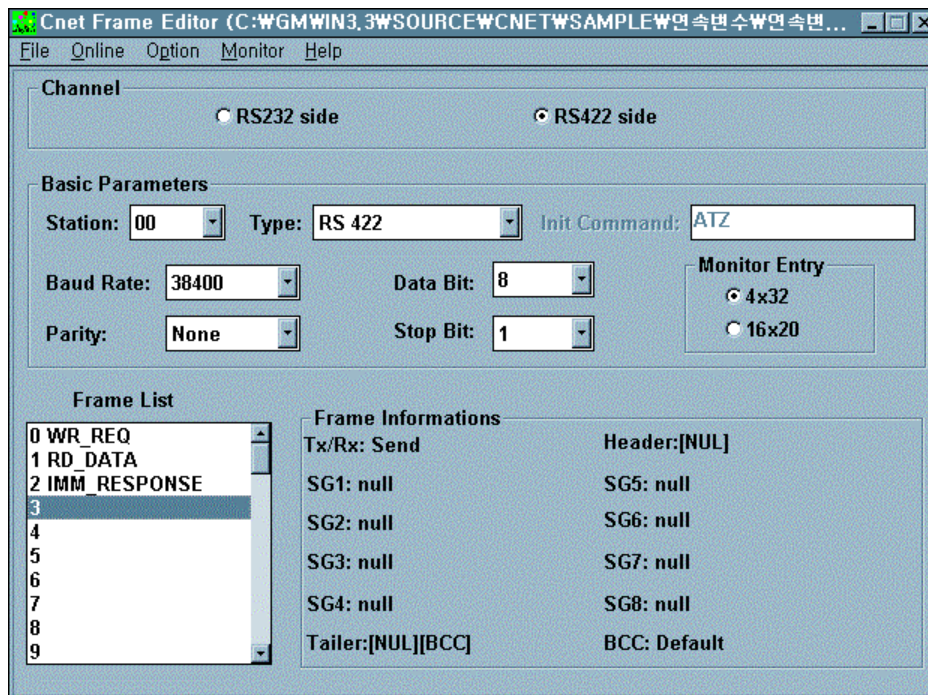
[Figure7.6] is the result screen after basic parameters and TX/RX frames are all defined. Refer to Chapter 5 Frame Editor for details of preparing basic parameters and frames.

Next is how to prepare 3 types of frames.

(1)   Registration of Write request frame : Write request frame of frame structure as in [Table 7.6] is registered according to the sequence below.

Select the 1st item of frame list in the basic screen of Frame Editor and input 'WR_REQ' to frame name. And then select SEND in TX/RX and input data to Header as below.

The 1th Main Frame				
Frame Name:	WR_REQ	Tx/Rx:		Send
Header:	[ENQ]			

Input segment : Since 'WR18' in transmission frame body area of [Table 7.6] is unchanged constant area, set it to CONST and input 'WR18'. And since data area is variable area changeable per frame, set type to ARRAY, input 'SD1' and input 18, the number of transmission data to size. As for transmission data, which is figure, select Convert to convert HEX data to ASCII code for transmission. Next is the input result of segment area.

Set 2 segments of CONST and ARRAY.

Segment 1	
Type: CONST	WR18
○ HEX ● ASCII	

Segment 2	
Type: ARRAY	SD1
● Convert ○ None size:	18

Set Tail and BCC. : Select BCC setting button and set the range of SUM1 in dialog box for BCC setting to H[0] ~ T[0] in order to set BCC as added from Header to Tail. Refer to Chapter 5 Frame Editor for details of BCC setting.

Check Rule	
○ Default	
● SUM 1	○ SUM 2
○ XOR 1	○ XOR 2
○ MUL 1	○ MUL 2

Range :	H[0]~T[0]	ex) H[0]~T[0]

Transmission frame where setting of Header, Tail and Segment is completed is shown in [Figure 7.7]. To transmit transmission frame along with data, a transmission program is to be prepared in GMWIN program via SND_MSG Function Block.

[Figure7.7] Setting screen of Write request frame.

(2) Registration of Read data frame: Read data frame of frame structure as in [Table 7.7] is registered according to the sequence below.

Select the 2nd item of frame list in Frame Editor and input 'RD_DATA' to frame name. And then select RECEIVE in TX/RX, input 'IMM_RESPONSE' in immediate response frame and data below to Header. Next is the input result.

Input segment : Since 'RD24' in receiving frame body area of [Table 7.7] is constant area unchanged, set it to CONST and input 'RD24'. Since data area is variable area changeable per receiving frame, set type to ARRAY, input 'RD1' and input 24, the number of receiving data to size. As for receiving data which is ASCII figure, select Convert to convert ASCII data to HEX.

Set only 2 segments because the frame of [Table 7.7] is composed of either CONST or ARRAY. Next is the setting result screen.

Set Tail and BCC. : Select BCC setting button and set the range of SUM1 in dialog box for BCC setting to H[0] ~ T[0] in order to set BCC as added from Header to Tail. Refer to Chapter 5 Frame Editor for details of BCC setting. Next is BCC setting screen.

Registration result of Read data frame data is shown in [Figure 7.8]. To receive the frame prepared as in the figure, a program is to be prepared in GMWIN program via RCV_MSG Function Block so to save the received data to optional area of PLC.

[Figure7.8] Setting screen of Read data frame

(3) Registration of Immediate response frame: Immediate response frame of the structure as in [Table 7.8] is registered according to the sequence below.

Select the 3rd item of frame list in Frame Editor and input the identical 'IMM_RESPONSE' with the input name as an immediate response frame when setting the received frame in frame name. And then select SEND in TX/RX and input data below to Header. Next is the input result.

The 3th Main Frame				X
Frame Name:	IMM_RESPONSE	Tx/Rx:	Send	▾
Header:	[ACK]			

Input segment : Since frame body of [Table 7.8] is composed of CONST only, set it to CONST and input 'RD24'. As it is ASCII transmission, select ASCII. Next is the input result of segment. [Note].

Segment 1
Type: CONST ▾ RD24
○ HEX   ⦿ ASCII

Remark

[Note 1] In immediate response frame, ARRAY type of segment can't be used.

Input [ETX] to Tail as below. As [BCC] is not applied, no setting is needed.

Tail: [ETX]   BCC Setting

[Figure7.9] shows registration screen of the immediate response frame. Immediate response frame as registered with an identical name of immediate response frame in receiving frame differently from other transmission frames, needs no preparing of additional transmission program in GMWIN program. Immediate response frame, if frame set to 'RD_DATA' is received, searches for 'IMM_RESPONSE' frame set to immediate response frame and transmits the frame in specified format automatically in Cnet I/F module.

[Figure 7.9] Setting screen of Immediate response frame
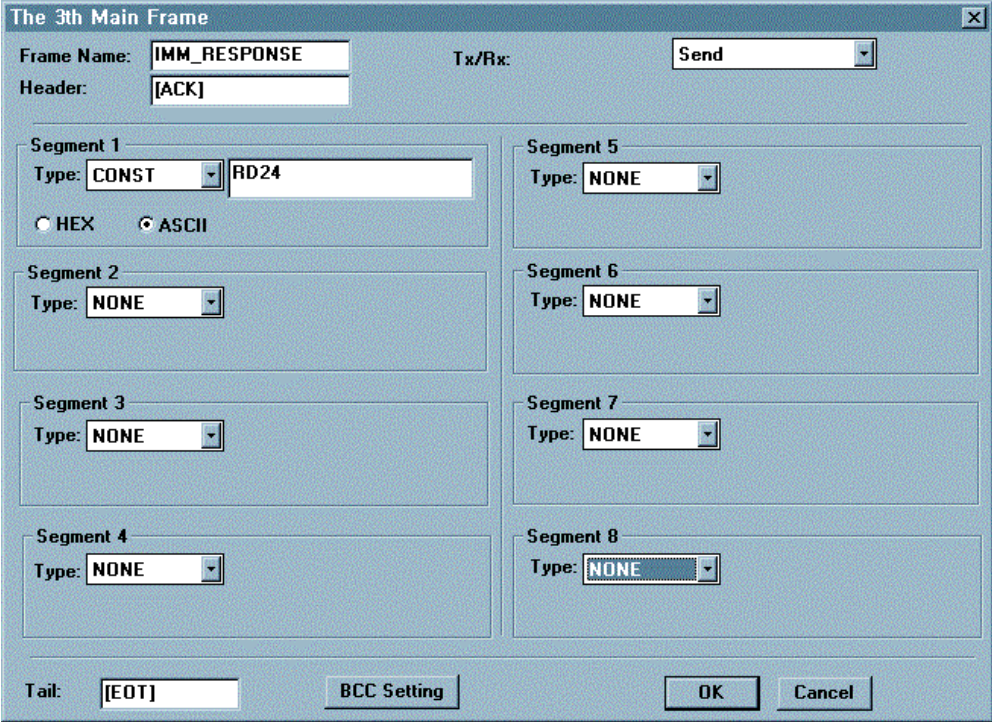
If preparing of TX/RX frame is completed as above, download frames and basic parameters to Cnet I/F module and switch RS-422 channel to Operation Run to finish preparation of Cnet I/F module operation. To operate actual transmitting and receiving after frames are prepared, a program shall be prepared in GMWIN and downloaded to PLC. Next is how to prepare GMWIN program.

4) Preparing of GMWIN program

Frame prepared via Frame Editor creates transmission frame in Cnet and receives receiving frame as compared. To transmit/receive frame prepared via Frame Editor, TX/RX program shall be prepared in GMWIN using Function Block. Next is how to program in GMWIN to run communication system of [Figure 7.5].

A) Transmission program : [Figure 7.10] shows an programming example to transmit Write request frame(WR_REQ).

[Figure7.10] Example of transmission programming
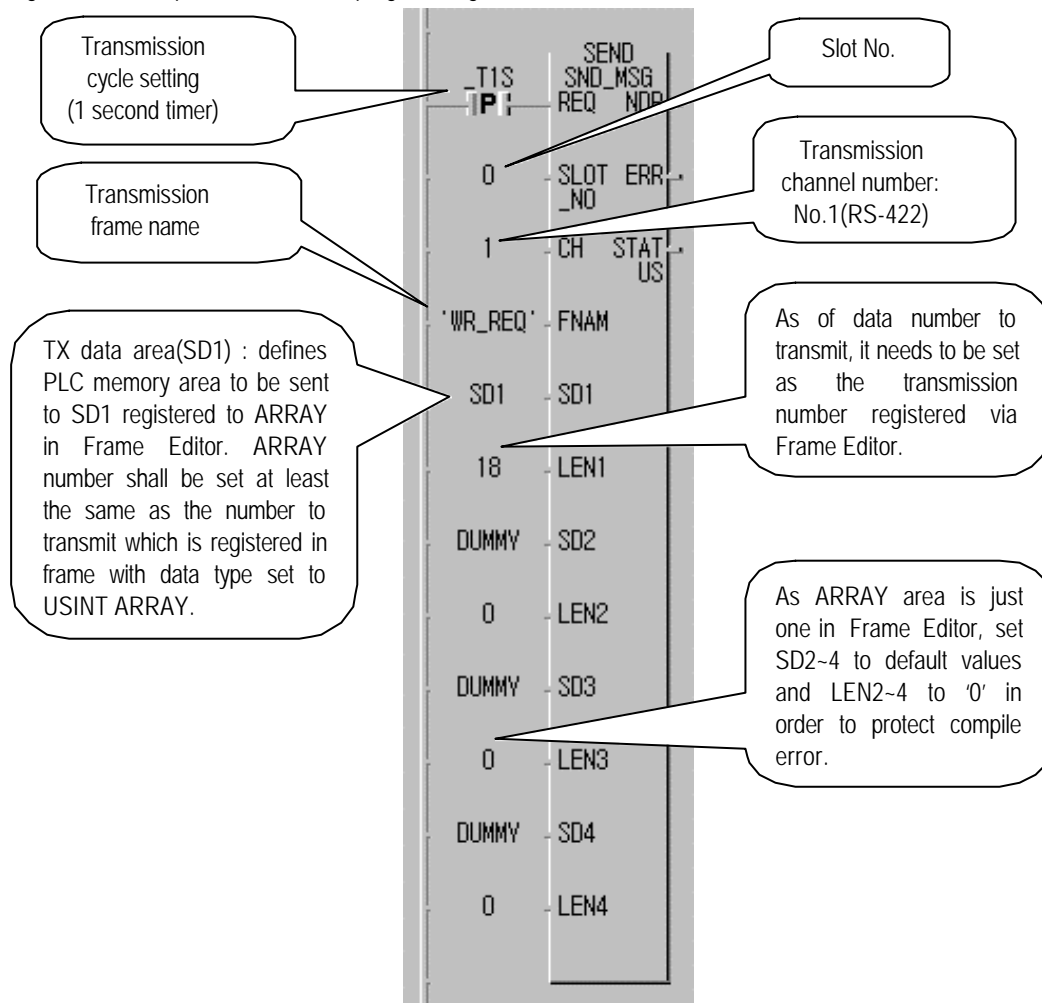
[Figure 7.10] is an example of transmission programming via 'SND_MSG' Function Block. As for transmission, if data is to be transmitted, in other words, if segment is applied set to ARRAY in frame registration, PLC area where data is to be transmitted to SD area of transmission Function Block shall be set to USINT ARRAY with the number set as many as required for the transmission.

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SD registration number shall be set the same as the number set to ARRAY segment in frame. If input variable in Function Block remains blank, compile error may occurs. Thus, unused SD area as of DUMMY variable shall set memory allocation to Auto and LENGTH to '0'. If no data is to be transmitted, in other words, ARRAY segment registration is not applied in frame registration, set all areas of SD1 ~ SD4 to DUMMY variables with LENGTH all set to '0'.

[Figure7.11] shows an example of variable setting of SD area. The system of [Figure 7.5] has set %MB0 area of GLOFA-PLC to transmit 18 byte, thus memory allocation is allocated to %MB0 as user-defined and ARRAY number is set to 18 from 0 to 17 the same as the number to be transmitted.

[Figure 7.11] Setting example of transmission data variable

Through the variable setting of transmission data as above, 18 byte data is transmitted from %MB0 via Write request frame.

B) Receiving program : [Figure 7.12] shows an programming example to receive Read data frame(RD_DATA).

[Figure 7.12] Receiving program of Read data frame
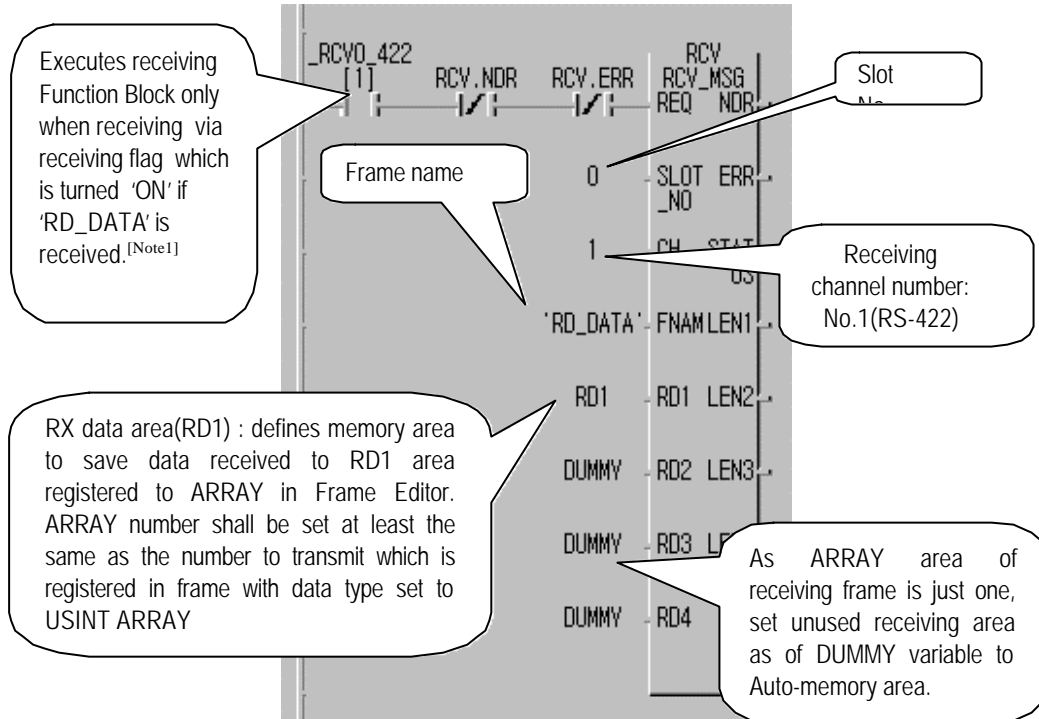
Remark

[Note 1] Receiving flag is available only in Cnet Ver.1.1 or later. If Cnet version is below Ver. 1.1, use a faster timer than transmission cycle in transmission station instead of the receiving flag.

If RD_DATA frame is received via RS-422 channel in the program of [Figure7.12], 24 byte data same as the number of received data set in receiving Frame Editor is saved to %MB100 area set to 'RD1' and 24 is output to LEN1 among LEN1~LEN4 indicating receiving data length.

[Figure7.13] shows variable setting screen of saving area RD1 of receiving data. 24 ARRAY variables are allocated to %MB100 area with USINT ARRAY type. If ARRAY number is lower than RD1 number of receiving frame registered, transmission is not available, thus it shall be at least the same.

Figure below shows an example of setting as same as the number of receiving data.

[Figure7.13] Setting of receiving variable

C)Transmission of Immediate response frame: GMWIN program needs not to be prepared additionally for transmission of immediate response frame. Since IMM_RESPONSE is registered as immediate response frame of receiving frame 'RD_DATA' in Frame Editor and IMM_RESPONSE is registered to transmission frame, Cnet I/F module transmits previously registered IMM_RESPONSE frame if RD_DATA frame is received.

7.1.5 User defined communication for Gm7 series

GM7 Cnet I/F module sets mode and defines protocol in GMWIN(Ver.3.3 or later) differently from other Cnet I/F modules. For user defined protocol communication, the contents of the protocol to use shall be exactly informed to communicate data. User-prepared protocol frame can be downloaded to GM7 basic unit via GMWIN(Ver.3.3 or later) and the saved data is kept inside GM7 basic unit indelibly for use even if powered off. However, when communication parameters are downloaded as changed, or when data can be no more backup due to lowered voltage of backup battery than average, damage on protocol frame may occur. For user-defined mode service, programming via Function Block to control TX/RX in PLC is needed in addition to frame edit.

1) **Parameter setting**

   A) Communication parameters setting

   Open new project file in GMWIN.

   ✓ Be sure to select GM7 of PLC type.

   ✓ Creat new project file respectively for master and slave.

   Select communication parameters in GMWIN parameter and double-click on it to display the figure below.

Perform setting as below.

Item	Setting contents
Selt-station No.	0 to 31 station can be set.
Communication speed	1200, 2400, 4800, 9600, 19200, 38400 or 57600 bps is available for setting.
Data bit	7 or 8 bit can be set.
Parity bit	No, Even or Odd is available for setting.
Stop bit	1 or 2 bit can be set.
Communication channel	• RS232C null modem or RS422/485 : selected for communication via GM7 basic unit's built-in function and Cnet I/F module(G7L-CUEC). • RS232C dedicated modem : selected for dedicated modem communication via Cnet I/F module(G7L-CUEB). • RS232C dial-up modem : selected for normal modem communication by phone-connection with other station via Cnet I/F module(G7L-CUEB). Note) RS232C dedicated modem communication and RS232C dial-up modem communication are available only in Cnet I/F module(G7L-CUEB) supporting RS232C while unavailable in Cnet I/F module(G7L-CUEC) supporting RS422/485.
Time-out when setting master	• Waiting time for response frame after request frame is transmitted to GM7 basic unit set to master. • Default value is 500ms. • It needs setting in consideration of max. cycle of TX/RX in master PLC. • If the value which is smaller than max. cycle of TX/RX is set, communication error may occur.
User defined master/slave	If set to master, it can be main body in communication system and if set to slave, it just responds to request frame of master.

B) Frame setting

If one of user defined items of protocol and transmission mode in communication parameters is selected, registration list button is activated.

User Defined
- ○ Master
- ● Slave
- List

Press registration list button to display the figure below.

User Defined

Frame List
- 0 Not defined
- 1 Not defined
- 2 Not defined
- 3 Not defined
- 4 Not defined
- 5 Not defined
- 6 Not defined
- 7 Not defined
- 8 Not defined
- 9 Not defined
- 10 Not defined
- 11 Not defined
- 12 Not defined
- 13 Not defined
- 14 Not defined
- 15 Not defined

Frame Information
- Tx/Rx:
- Header:
- SG1:
- SG2:
- SG3:
- SG4:
- SG5:
- SG6:
- SG7:
- SG8:
- Tailer:
- BCC:

Ok   Cancel
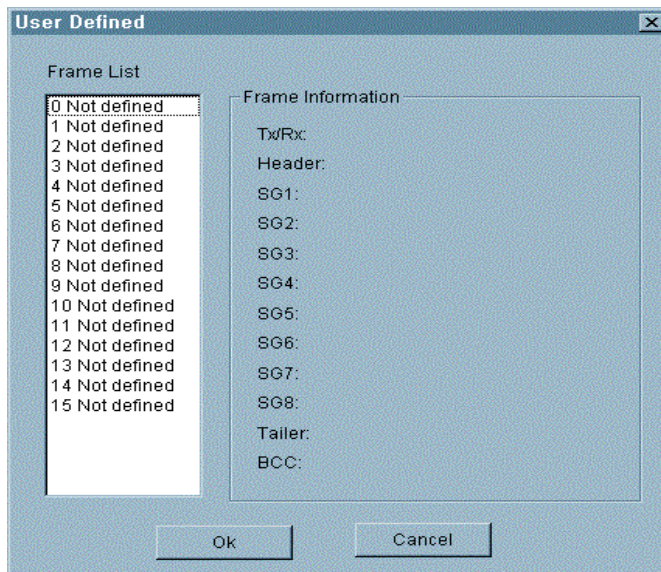
Select item(0 ~ 15) of frame list and double-click on it to display the figure below.

Frame 0

Header: Tx/Rx: Not defined

Segment 1
Type: ● Hex Input   ○ ASCII Input   Size: Byte

Segment 2
Type: ● Hex Input   ○ ASCII Input   Size: Byte

Segment 3
Type: ● Hex Input   ○ ASCII Input   Size: Byte

Segment 4
Type: ● Hex Input   ○ ASCII Input   Size: Byte

Segment 5
Type: ● Hex Input   ○ ASCII Input   Size: Byte

Segment 6
Type: ● Hex Input   ○ ASCII Input   Size: Byte

Segment 7
Type: ● Hex Input   ○ ASCII Input   Size: Byte

Segment 8
Type: ● Hex Input   ○ ASCII Input   Size: Byte

Tailer: BCC Setting   Ok   Cancel

- ✓ Frame specification
  - ➢ Header
    - Use the form of [Header].
    - What is available for Header is 1 English character, 1 figure or "NUL(H00)", "STX(H02)", "ETX(H03)", "EOT(H04)", "ACK(H06)", "NAK(H15)", "SOH(H01)", "ENQ(H05)", "BEL(H07)", "BS(H08)", "HT(H09)", "LF(H0A)", "VT(H0B)", "FF(H0C)", "CR(H0D)", "SO(H0E)", "S1(H0F)", "DLE(H10)", "DC1(H11)", "DC2(H12)", "DC3(H13)", "DC4(H14)", "SYN(H16)", "ETB(H17)", "CAN(H18)", "EM(H19)", "SUB(H1A)", "ESC(H1B)", "FS(H1C)", "GS(H1D)", "RS(H1E)", "US(H1F)" or "DEL(H7F)" only as of control character.

      Ex.1)   [NUL], [ENQ]   (   )
      Ex.2)   NUL, ENQ   (× : [ ] wasn't used.)

    - Up to 3 are allowed continuously.

      Ex.1)   [ENQ][STX][NUL]   (   )
      Ex.2)   [A][NUL][ENQ][STX]   (× : 4 were used continuously.)

  - ➢ Transmission/Receiving
    - Not defined : Default value where frame type is not declared.
    - Transmission : Transmission frame is declared.
    - Receiving : Receiving frame is declared.

    - If frame 0 window is activated, TX/RX item is set to "Not defined" with all segments displayed as inactivated.

  - ➢ Segments(1 ~ 8) : Let segments input respectively to sort out fixed transmission data area(CONST) and variable data area(ARRAY).

Items	Contents
Type: NONE Type: CONST Type: ARRAY	Setting items for segment type are NONE(no setting), CONST(fixed data area) and ARRAY(variable data area). CONST is used to declare & input commands and fixed data to be used in communication frame, and ARRAY is used to input & save data required for mutual communication. ARRAY type shall be set always in byte unit only. Ex.1) %MB0, %QB0.0.0 ( ) Ex.2) %MX0, %MW0, %MD0, %QX0.0.0, %QW0.0.0 (×)
(input field)	Field to input & declare commands and fixed data to be used in communication frame. ASCII input is within 10 characters and HEX input is within 20 characters per segment. For the exceeding number, set the same type of segments and then input continuously. Ex.1) 10RSB06%MW10006 Segment 1 Type: CONST 10RSB06 ○ Hex Input ⦿ ASCII Input Size: Byte Segment 2 Type: CONST %MW10006 ○ Hex Input ⦿ ASCII Input Size: Byte If segment is defined to ARRAY type, its related area shall be set in byte even though word type of data is declared in CONST type. Ex.2) 10RSB06%MW10006 is execution frame of reading 6-word data via dedicated protocol communication from %MW100 in 16 slave station. At this time, saving area to save the read data shall be set to ARRAY with its size set to 6 words, namely, 12 byte. Segment 3 Type: ARRAY %MB0 □ Send by ASCII Converting Size: 12 Byte
○ Hex Input ⦿ ASCII Input	Radio button to select input type of command with 2 types of HEX & ASCII. Ex.1) ASCII: 1 0 R S B 0 6 % M W 1 0 0 Ex.2) HEX : 31 30 52 53 42 30 36 25 57 44 31 30 30
□ Send by ASCII Converting □ Receive by Hex Converting	Checking item to decide transmission of data by ASCII converting in transmission frame or receiving of data by HEX converting in receiving frame if set to ARRAY(variable data area).
Size: Byte	If set to ARRAY(variable data area), area size is set in byte unit. **Unit is byte.**

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> Tail

- Use the form of [Tail].

- What is available for Tail is 1 English character, 1 figure or "NUL(H00)", "STX(H02)", "ETX(H03)", "EOT(H04)", "ACK(H06)", "NAK(H15)", "SOH(H01)", "ENQ(H05)", "BEL(H07)", "BS(H08)", "HT(H09)", "LF(H0A)", "VT(H0B)", "FF(H0C)", "CR(H0D)", "SO(H0E)", "S1(H0F)", "DLE(H10)", "DC1(H11)", "DC2(H12)", "DC3(H13)", "DC4(H14)", "SYN(H16)", "ETB(H17)", "CAN(H18)", "EM(H19)", "SUB(H1A)", "ESC(H1B)", "FS(H1C)", "GS(H1D)", "RS(H1E)", "US(H1F)", "DEL(H7F)" or "BCC(HFE)" only as of control character.

  Ex.1) [NUL], [EOT]   (   )

  Ex.2) NUL, EOT   (× : [ ] wasn't used.)

- Up to 3 are allowable continuously.

  Ex.1) [EOT][ETX][NUL] (   )

  Ex.2) [A][NUL][EOT][ETX]   (× : 4 were used continuously.)

- BCC can be used in Tail to detect errors. BCC can be available only when [BCC] is surely set. For detailed contents of BCC setting, press "BCC setting" button on the right for the selection.

Tailer: [EOT][BCC]   BCC Setting
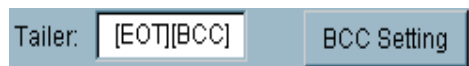
> BCC setting: Set BCC if required.

BCC Setting

Data Type
  C ASCII   ⊙ Hex

Check Rule
  C Default
  C SUM 1   C SUM 2
  C XOR 1   C XOR 2
  C MUL 1   C MUL 2

Range : [   ]   ex) H[0]~T[0]

Complement : None   ▾   Mask : [   ]   ex) ^FF |FF
                                              &FF

        Ok   Cancel
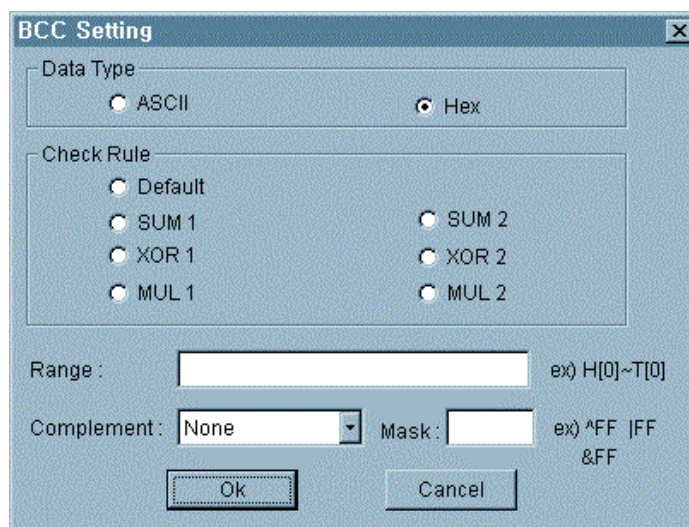
Item		Setting contents
Type		For ASCII, attach BCC value of 2 byte in ASCII type to frame. For HEX, attach BCC value of 1 byte in HEX type to frame.
How to set	Basic setting	The result data summed up from 2nd data to the data in [BCC] except 1st data is inserted into [BCC] area.
	SUM 1	BCC method can be performed by sum as in basic setting, however, section of BCC area can be set by user.
	SUM 2	BCC method is same as SUM 1 but this is used when the user masks random value to final BCC value.
	XOR 1	BCC method is exclusive OR(EXCLUSIVE OR).
	XOR 2	BCC method is same as XOR 1 but this is used when the user masks random value to final BCC value.
	MUL 1	BCC method is MULTIPLY, namely, multiplication.
	MUL 2	BCC method is same as MUL 1 but this is used when the user masks random value to final BCC value.
Range		H stands for Header, S for segment and T for Tail. Ex.1) For setting of BCC creation range from [STX] to [ETX] with Header set to [ENQ][STX] and Tail to [EOT][ETX], let the below set H[1]~T[1]
Complement		Setting item to decide to adopt complement of 1 or 2, or not to BCC creation value. If mask has been set after adoption of complement, let it masked to random value user has set.
Mask		Set random value used in mask and masking method. Ex.1) When masking with random value HFF by XOR method : ^FF Ex.2) When masking with random value HFF by OR method : |FF Ex.3) When masking with random value HFF by AND method : &FF

Keyboard position of setting characters of mask method

> Frame size
>> - ASCII communication : Max. 126 byte
>> - HEX communication : Max. 256 byte

> Flag(_RCV[n] : n means frame list number)

- indicates that user defined frame is received per setting number.

- as of boolean type with size of 16 in array form.

- If received frame is agreed with No.3 frame list, _RCV[3] is blinking.(0   1   0)

> After frame is received, GM7 basic unit checks if any is agreed with received frame in its frame list . If the frame is in existence, applicable address of _RCV[n] flag is blinked and if received data is in existence, it is saved in the applicable area.

2) Function Block

A) SND_MSG

Function Block	Description
SND_MSG BOO — RE ND — BOO USINT — FL_ ID ER — BOO STAT — USINT US	**Input** REQ : Executes Function Block at 1(rising edge). FL_ID : Field number of frame list to transmit. **Output** NDR : If executed without error, 1 is output as kept until next Function Block is called. ERR : If error occurs, 1 is output as kept until next Function Block is called. STATUS : If error occurs, error code is output.

Function

Function Block to transmit the frame registered in frame list.

Error

Error code is output to output STATUS. Refer to Error codes for details.

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B) Error codes (status of Function Block)

Code	Error type	Meaning
06	Slave Device Busy	During TX//RX or Waiting for receiving
09	Parameter Error	Setting error of communication parameters or Setting error of link permission
10	Frame Type Error	Frame is not in transmission or not set.

C) Error flag

Errors related with frame list

✓ Saved to _UD_ERR[n].

Bit No.	Error type	Meaning	Remark
Bit 0	Frame Length Over	Error occurs if frame is over 128 byte(HEX : 256 byte)	Error flag on transmission side
Bit 1	Device Area Over	Error occurs if I/Q area(128 byte) or M area is exceeded	
Bit 2	BCC Setting Error	BCC setting error	
Bit 8	BCC Check Error	If received BCC value is incorrect	Error flag on receiving side
Bit 9	Mismatch Error	If received frame isn't agreed with registered frame	
Bit 10	HEX Change Error	Error occurs on HEX converting	
Bit 11	Frame List Error	Frame setting error or link permission setting error	

7.2 Dedicated communication slave

7.2.1 Introduction

Dedicated communication function as of a protocol built in computer communication module is used to read or write information and data inside PLC of PC and supplementary devices without additional programming in GLOFA-PLC, and also used to download/upload PLC program and control PLC (Run/Stop/Pause). Dedicated communication service can be available independently both for RS-232C and RS-422 according to modes, while operated by slave only in the system composed of master and slave to respond only when requested by external devices. All frames used in dedicated communication mode shall not exceed 256 byte with characters of ASCII code used for all the frames. For multi-drop service, max. 32 stations can be connected. Be careful not to allow repeated station No. to be set to the same network when setting station No. Communication speed/Stop Bit/Parity Bit/Data Bit of all the Cnet I/F modules in network shall be surely identical when used in multi-drop.

[Table 7.9] Switch value of Cnet mode which can be set to dedicated communication mode

Module name	Mode switch	Operation mode		Remark
		RS-232C	RS-422	
G3L-CUEA G4L-CUEA	1	Dedicated mode	Dedicated mode	Interlocking mode[Note 1]
	3	Dedicated mode	Dedicated mode	Stand-alone mode[Note 2]
	4	User defined communication	Dedicated communication	
	5	Dedicated communication	User defined communication	
	7	GMWIN	Dedicated mode	
	9	On-line mode Ver. 2.0		Frame Editor
G6L-CUEB G6L-CUEC	1	Dedicated mode		
	9	On-line mode Ver. 2.0		Frame Editor
G7L-CUEB G7L-CUEC	N/A	Dedicated communication slave mode		Set by GMWIN

Remark

[Note 1] In interlocking mode, RS-232C and RS-422 channels are operated via identical station set to RS-232C channel.

[Note 2] In stand-alone mode, RS-232C and RS-422 channels are operated via different station numbers res-pectively.

7.2.2 Frame structure

1) Basic structure

A) Request frame (External communication devices ▶ Cnet I/F module)

(Max. 256 Byte)

Header (ENQ)	Station No.	Command	Command type	Structured data area	Tail (EOT)	Frame check (BCC)

B) ACK Response frame(Cnet I/F module ▶ External communication devices, if data is received normally)

(Max. 256 Byte)

Header (ACK)	Station No.	Command	Command type	structured data area or NULL	Tail (ETX)	Frame check (BCC)

C) NAK Response frame(Cnet I/F module ▶ External communication devices, if data is received abnormally)

Header (NAK)	Station No.	Command	Command type	Error code(ASCII 4 byte)	Tail (ETX)	Frame check (BCC)

D) Control codes of dedicated communication: [Table7.10] shows arranged control codes used as Header& Tail of frame in dedicated communication as arranged. Other control codes than those are not used..

[Table7.10] ASCII control characters

Code	HEX. value	Abbreviation	Contents
ENQ(Header)	H05	Enquiry	Start code of request frame
ACK(Header)	H06	Acknowledge	Start code of ACK response frame
NAK(Header)	H15	Not Acknowledge	Start code of NAK response frame
EOT(Tail)	H04	End of Text	End ASCII code of request frame
ETX(Tail)	H03	End Text	End ASCII code of response frame

> ### Remark
>
> [Note1] Figure data of all frames is of ASCII code to HEX figure unless specified additionally. What are displayed in
>   HEX figures are shown in the list below.
>
>   1. Station No.(Be careful that station No. is set in decimal figure in Frame Editor but is displayed in HEX figure
>   in dedicated communication frame)
>   2. Command type as in figures (= data type) when main command is R(r) and W(w)
>   3. All items indicating total data size in structured data area.
>   4. Command type(registration number) for monitor registration and execution command, M(m)
>   5. All contents in data.
>   6. Frame number of Domain.
>
> 'H' is attached in front of all data from now to display HEX data. This 'H' isn't included in actual frame, though.

> ### Remark
>
> [Note1] If HEX data is applied in front of figures in frame, type of data is indicated to be HEX by 'H' like
>   H01,H12345,H34,H12 & H89AB.

E) BCC : When main command is one of lower case, only one lower byte of the value resulted by adding 1 byte each
to ASCII values from Header to Tail is converted into ASCII and added to BCC which is checking data of frame
error. If lower case command is used in request frame, response frame responds also via the same lower case
command, namely, if requested by BCC applied frame, Cnet I/F module responds also via BCC applied frame.
Next is an example of BCC calculation with individual reading frame of direct variables.

[Example of BCC calculation] ASCII values from Header to Tail added in HEX

Frame(Ex.)	ENQ	H20	R	SS	H01	H06	%MW100	EOT	BCC
ASCII value	H05	H3230	H72	H5353	H3031	H3036	H254D57313030	H04	H4134

ASCII value adding : 05+32+30+72+53+53+30+31+30+36+25+4D+57+31+30+30+04) = H3A4

Lower byte ASCII converting : 'A4' → ASCII value H4134

BCC value : H4134

2) Sequence of command frame

A) Sequence of command request frame

ENQ	Station No.	Command	Formatted data	EOT	BCC

(PLC ACK response)

ACK	Station No.	Command	Data or null	ETX	BCC

(PLC NAK response)

NAK	Station No.	Command	Error code	ETX	BCC
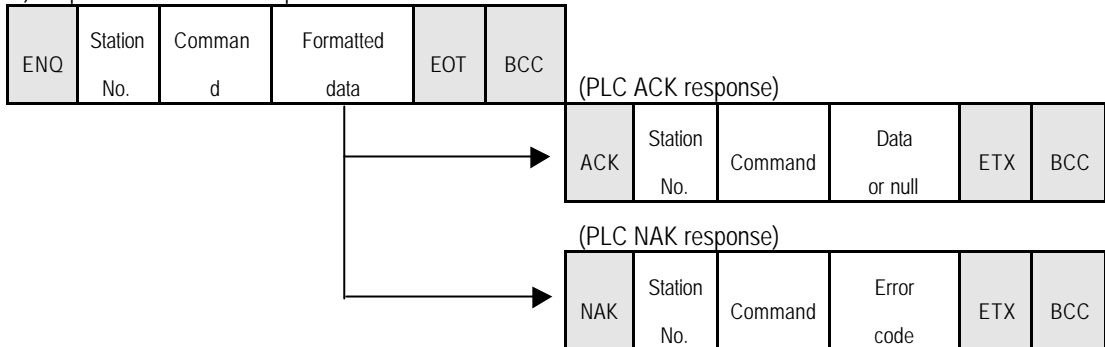
B) Sequence of download/upload frame

ENQ	Station No.	Start command	data	EOT	BCC

(Down/upload start command)

ACK	Station No.	Command	Data or null	ETX	BCC

ENQ	Station No.	Command	Formatted data	EOT	BCC

(Down/upload command frame number H0001)

ACK	Station No.	Command	Data or null	ETX	BCC

ENQ	Station No.	Command	Formatted data	EOT	BCC

(Down/upload end command

Frame number H′FFFF)

ACK	Station No.	Command	Data or null	ETX	BCC
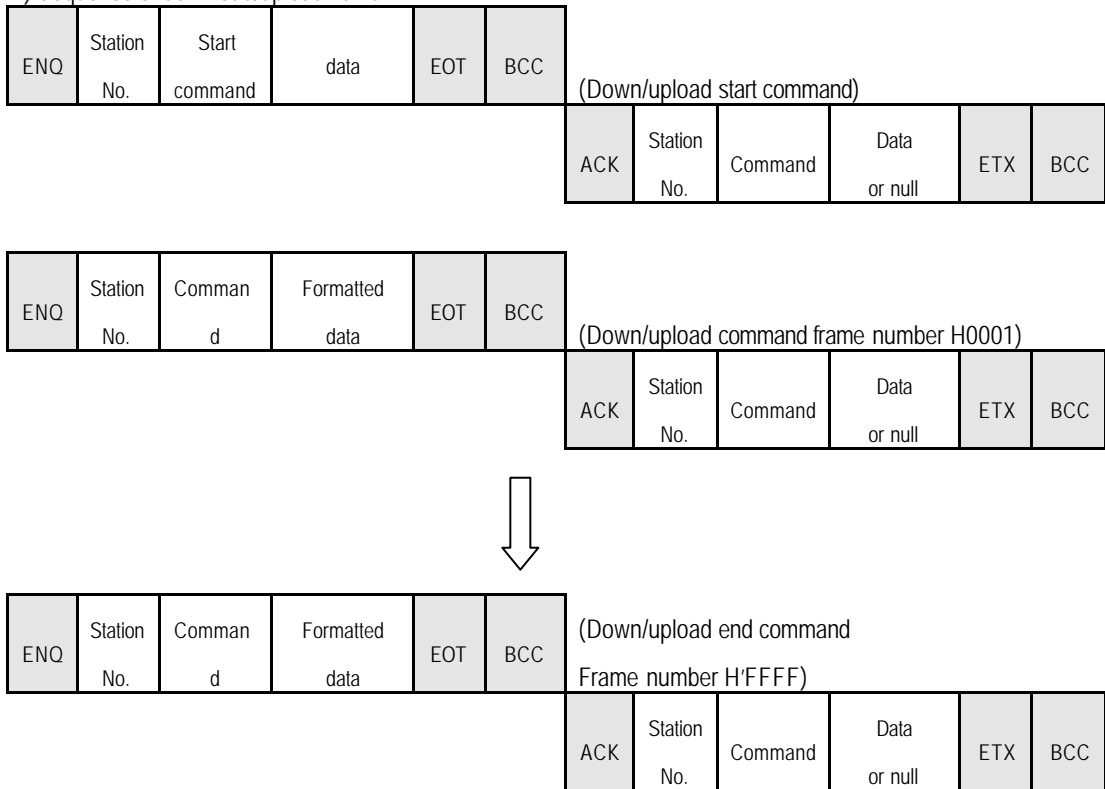
7.2.3 List of commands

[Table 7.11] describes commands used in dedicated communication service.

[Table 7.11] List of commands

Classification		Command				Contents
		Main Command		Command type		
		Sign	ASCII code	Sign	ASCII code	
Direct variables . reading	Individual reading.	r(R)	H72 (H52)	SS	H5353	Reads direct variables of Bit, Byte, Word, Dword and Lword types.
	Continuous reading.	r(R)	H72 (H52)	SB	H5342	Reads direct variables of Byte, Word, Dword and Lword types in block unit.(Continuous reading of Bit is unavailable)
Named variables . reading	Continuous reading	r(R)	H72 (H52)	H00 ~ H14	H3030~ H3134	Reads data according to data type of named variable. (Variable to be read must be registered in access variable area)
	Array reading	r(R)	H72 (H52)	H15 ~ H27	H3135~ H3237	Reads data of array named variable. (Variable to be read must be registered in access variable area)
Direct variables . writing	Individual writing.	w(W)	H77 (H57)	SS	H5353	Writes data to direct variables of Bit, Byte, Word, Dword and Lword types.
	Continuous writing	w(W)	H77 (H57)	SS	H5353	Writes data to direct variables of Bit, Byte, Word, Dword and Lword types.
Named variables . writing	Individual writing	w(W)	H77 (H57)	H00 ~ H14	H3030~ H3134	Writes variables of each data type using variable names. (Variable to be written must be registered in access variable area)
	Array writing	w(W)	H77 (H57)	H15 ~ H27	H3135~ H3237	Writes data to array named variable. (Variable to be written must be registered in access variable area)
Monitor	Register	x(X)	H78 H58	H00 ~ H31	H3030~ H3331	Register variable to be monitored. If registered variable is named one, variable to be read must be registered in access variable area.
	Execution	y(Y)	H79 (H59)	H00 ~ H31	H3030~ H3331	Executes the registered variable to monitor.

Classification	Command				Contents
	Main command		Command type		
	Sign	ASCII code	Sign		ASCII code	
CPU start-up	m(M)	H6D (H4D)	R	N	H524E	Starts-up CPU with RUN mode
				D	H5244	
CPU pause	m(M)	H6D (H4D)	P	N	H504E	Switches CPU to PAUSE mode.
				D	H5044	
CPU restart	m(M)	H6D (H4D)	E	N	H454E	Restart CPU in PAUSE mode.
				D	H4544	
CPU stop	m(M)	H6D (H4D)	S	N	H534E	Switches CPU from PAUSE mode to program mode.
				D	H5344	
PI create	m(M)	H6D (H4D)	C	N	H434E	Creates PI.
				D	H4344	
PI delete	m(M)	H6D (H4D)	D	N	H444E	Deletes PI.
				D	H4444	
CPU status reading	r(R)	H72 (H52)	ST		H5354	Reads the status of CPU. (refer to Flag in PLC technical spec. for the details)
Download initialization	p(P)	H70 (H50)	D	N	H444E	Executes initialization command to download program. Download command is available only if this command is successfully carried out.
				D	H4444	
Download	p(P)	H70 (H50)	DX		H4458	Downloads program. File to be downloaded must be the one created by compile of GMWIN.
Upload initialization	p(P)	H70 (H50)	U	N	H554E	Executes initialization command to upload program. Upload command is available only if this command is successfully carried out.
				D	H5544	
Upload	p(P)	H70 (H50)	UX		H5558	Uploads program.
Program delete	p(P)	H70 (H50)	E	N	H454E	Deletes program. If program is deleted, it can be started-up until downloaded again.
				D	H4544	

Remark

[Note 1]   When N is used in command type, user defined name is used.

[Note 2]   When D is used in command type, it is treated as Default. If, therefore D is used, do not insert name.

[Note 3]   BCC isn't applied if upper case is used in main command, while is applied if lower case is used.

[Note 4]   In Gm7 series, only the commands such as **individual reading of direct variables, continuous reading of direct variables, individual writing of direct variables, continuous writing of direct variables, monitor registration, monitor execution and PLC status reading** are supported.

7.2.4 Data type

When direct variables and named variables are read/written, attention must be paid to data type of direct and named variables to be read.

1) **Data type of direct variables**

Memory device type of GLOFA-GM PLC : M(Internal memory), Q(Output), I(input)

Data type for direct variables is displayed next to '%', an indicating character of direct variable.

[Table7.12] List of data types of direct variables

Data type	Ind. character		Example
	Sign	ASCII	
Bit	X	H58	%MX0, %QX0.0.0,%IX0.0.0
Byte	B	H42	%MB10,%QB0.0.0,%IB0.0.0
WORD	W	H57	%MW10,%QW0.0.0,%IW0.0.0
DOUBLE WORD	D	H44	%MD10,%QD0.0.0,%ID0.0.0
LONG WORD	L	H4C	%ML10,%QL0.0.0,%IL0.0.0

2) **Data type of named variables**

To read/write named variables, data type is specified by command type.

[Table7.13] List of data types of named variables

Data type	Command type		Data type	Command type	
	Figure	ASCII value		Figure	ASCII value
BIT	H00	H3030	UDINT	H0B	H3042
BYTE	H01	H3031	ULINT	H0C	H3043
WORD	H02	H3032	REAL	H0D	H3044
DWORD	H03	H3033	LREAL	H0E	H3045
LWORD	H04	H3034	TIME	H0F	H3046
SINT	H05	H3035	DATE	H10	H3130
INT	H06	H3036	TOD	H11	H3131
DINT	H07	H3037	DT	H12	H3132
LINT	H08	H3038	STRING	H13	H3133
USINT	H09	H3039	BLOCK	H14	H3134
UINT	H0A	H3041			

Array named variables specify values of command type according to data type of each array element as below.

[Table7.14] List of data types of array named variables

Data type	Command type		Data type	Command type	
	Figure	ASCII value		Figure	ASCII value
Array BIT	H15	H3135	Array UINT	H1F	H3146
Array BYTE	H16	H3136	Array UDINT	H20	H3230
Array WORD	H17	H3137	Array ULINT	H21	H3231
Array DWORD	H18	H3138	Array REAL	H22	H3232
Array LWORD	H19	H3139	Array LREAL	H23	H3233
Array SINT	H1A	H3141	Array TIME	H24	H3234
Array INT	H1B	H3142	Array DATE	H25	H3235
Array DINT	H1C	H3143	Array TOD	H26	H3236
Array LINT	H1D	H3144	Array DT	H27	H3237
Array USINT	H1E	H3145			

Remark

[Note 1] To read/write named variables, the name as of the identical data type must be registered to access variables of PLC program. Refer to user's manual of GMWIN for the registration.

[Note 2] In Gm7 series, **reading/writing commands of long-word direct variables, named variables and array variables are unavailable.**

7.2.5 Execution of commands (Ex.)

□ Individual reading of direct variables (RSS)

This is a function to read PLC device memory directly specified in accord with memory data type.

Separate device memories can be read up to 4 at a time.

1) Request format(PC -> PLC)

FORMAT NAME	Header	Station No.	Comm-and	Command type	Number of blocks	Variable length	Variable name	Repea-ted block	Tail	Frame check
Frame(Ex.)	ENQ	H20[Note 1]	R(r)	SS	H01	H06	%MW100	block	EOT	BCC
ASCII value	H05	H3230	H52(72)	H5353	H3031	H3036	H254D57 313030		H04	H4134

1 block(Setting can be repeated up to 4 blocks)

✓ Number of blocks: This specifies the number of the blocks composed of '[Variable length][Variable name]' in this request format. This can be set up to 4 blocks. Therefore, the value of [Number of blocks] must be H01(ASCII value:3031)-H04(ASCII value:3034).

✓ Variable length(name length of direct variable) : This indicates the number of name's characters that means direct variable, which is allowed up to 16 characters. This value is one of ASCII converted from HEX type, and the range is from H01(ASCII value:3031) to H10(ASCII value:3130).

✓ Variable name : Input address of variable to be read actually in ASCII value within 16 characters. Others than figure, upper/lower cases, '%' and '.' are not allowed for variable name.

✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ENQ to EOT is converted into ASCII and added to BCC.

Remark

[Note 1] Numerical data of frame(Ex.) is HEX value, and 'H' is unnecessary during preparing real frame.

Direct variables available according to PLC type are as follows.

[Table 7.15] Type of direct variables

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	-
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	-

Refer to technical spec. of GLOFA PLC for details to specify the area of each device in GLOFA GM.

Remark

[Note 1] Device data type of each block shall be surely identical. If the 1st block is WORD and the 2nd block is DOUBLE
WORD in data type, error occurs.

---

2)　Response format(for PLC of ACK response)

FORMAT NAME	Header	Station No.	Command	Command type	Number of blocks	Number of Data	Data	Repeated block	Tail	Frame check
Frame(Ex.)	ACK	H20	R(r)	SS	H01	H02	HA9F3	block	ETX	BCC
ASCII value	H06	H3230	H52(72)	H5353	H3031	H3032	H41394633		H03	

1 block(Max. 4 blocks)

✓　Station number, commands, type of command, and number of blocks are the same as in computer request format.

✓　BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to
ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

✓　Number of data means Byte number of HEX. type and is converted into ASCII. This number is determined
according to memory type(X,B,W,D,L) included in direct variable name of computer request format.

[Table 7.16] Number of data according to variables

Classification	Direct variable available	Number of data (Byte)
BOOL(X)	%MX,%QX,%IX,%(P,M,L,K,F,T)X	1(only lowest bit of these is effective)
Byte(B)	%MB,%QB,%IB, %(P,M,L,K,F,T,C,D,S)W	1
WORD(W)	%MW,%QW,%IW,%(P,M,L,K,F,T,C,D,S)W	2
DOUBLE WORD(D)	%MD,%QD,%ID, %(P,M,L,K,F,T,C,D,S)W	4
LONG WORD(L)	%ML,%QL,%IL	8

 * Values of ASCII code converted from HEX data are in data area.

Ex.1

Data number of H04(ASCII code value:H3034) indicates that 4-byte data in HEX. is in the data(DOUBLE WORD).

HEX data of 4 bytes is converted into ASCII code in data.

Ex.2

If the number of data is H04 and the data is H12345678, ASCII converted code value of this is "31 32 33 34 35 36 37

38", which is input in data area. Namely, the highest value comes first and the lowest last.

Remark

[Notes] If data type is BOOL, data read is indicated by one byte of HEX. Namely, if bit value is 0, it is indicated by H00

 and if 1, it is indicated by H01.

---

3) Response format(for PLC of NAK response)

Format / Name	Header	Station No.	Command	Command type	Error code (HEX 2 Byte)	Tail	Frame check
Frame(Ex.)	NAK	H20	R(r)	SS	H1132	ETX	BCC
ASCII value	H15	H3230	H52(72)	H5353	H31313332	H03	

 ✓ Station number, commands, and type of command are the same as in computer request format.

 ✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each
 to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

 ✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see
 Appendix 'B. Error Code Table'.

4) Example of use

In case 1 WORD from %MW20 of station No.1 and 1 WORD from %QW0.2.1 address are read supposing that data of H1234 is in %MW20 and data of H5678 is in %QW0.2.1.

(Computer request format)

Format \ Name	Header	Station No.	Command	Command type	Number of blocks	Variable Length	Variable name	Variable length	Variable name	Tail	Frame check
Frame(Ex)	ENQ	H01	R(r)	SS	H02	H05	%MW20	H08	%QW0.2.1	EOT	BCC
ACSII value	H05	H3031	H52(72)	H5353	H3032	H3035	H254D573230	H3038	H255157302E322E31	H04	

(For PLC ACK response after execution of command)

Format \ Name	Header	Station No.	Command	Command type	Number of blocks	Variable length	Variable name	Variable length	Variable name	Tail	Frame check
Frame(Ex.)	ACK	H01	R(r)	SS	H02	H02	H1234	H02	H5678	ETX	BCC
ACSII value	H06	H3031	H52(72)	H5353	H3032	H3032	H31323334	H3032	H35363738	H03	

(For PLC NAK response after execution of command)

Format \ Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame(Ex.)	NAK	H01	R(r)	SS	Error code(2)	ETX	BCC
ACSII value	H15	H3031	H52(72)	H5353	Error code(4)	H03	

☐ **Continuous reading of direct variables (RSB)**

This is a function to read PLC device memory directly specified in accord with memory data type.

It is convenient command to continuously read data up to 120 bytes in continuous areas from the specified address.

1) Request format(PC -> PLC)

Format\Name	Header	Station No.	Command	Command type	Variable length	Variable name	Number of data (Max.120 byte)	Tail	Frame check
Frame(Ex.)	ENQ	H10	R(r)	SB	H06	%MD100	H05	EOT	BCC
ASCII value	H05	H3130	H52(72)	H5342	H3036	H254D44 313030	H3035	H04	

Remark

[Note 1] Number of data specifies the number according to the type of direct variable. Namely, if data type of direct variable is double word and the number of data is 5, it means that 5 double words shall be let read.

✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ENQ to EOT is converted into ASCII and added to BCC.

✓ Name length of direct variable : This indicates the number of name's characters that means direct variable, which is allowable up to 16 characters. This value is one of ASCII converted from HEX type, and the range is from H01(ASCII value:3031) to H10(ASCII value:3130).

✓ Direct variable : It means address of variable to be read actually in ASCII value within 16 characters. Others than figure, upper/lower cases, '%' and '.' are not allowed for this variable name. Variable type available for continuous reading of direct variables is as follows according to PLC type.

[Table7.17] Continuous variable area available to read

Classification	BOOL	Byte	WORD	DOUBLE WORD	LONG WORD
GM1	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL
GM2	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL
GM3	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	-
GM4	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	-
GM6	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	-
GM7	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	-

Remark

[Note 1] Refer to technical spec. of GLOFA PLC for details to specify the area of device in GLOFA GM.

[Note 2] Data type of LONG WORD isn't supported in GM3,GM4,GM6 and GM7.

[Note 3] Continuous reading function of direct variables has not [Number of blocks] item in protocol.

---

2) **Response format(for PLC of ACK response)**

Format Name	Header	Station No.	Command	Command type	Number of blocks	Number of data	Data	Tail	Frame check
Frame(Ex)	ACK	H10	R(r)	SB	01	H14	H1122334455667788 99AA BBCCDDEEFF1122334455	ETX	BCC
ASCII value	H06	H3130	H52 (72)	H5342	H3031	H3134	H313132323333343435 3536363 737383839394141424243434444 454546463131323233333434353 5	H03	

✓ Station number, main commands and type of command are the same as in computer request format.

✓ For continuous reading response, insert H01to [Number of blocks] to transmit.

✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

✓ Number of data means Byte number of HEX type and is converted into ASCII. This number is determined by multiplying the data number of computer request format by the data size (in below table) according to memory type(X,B,W,D,L) included in direct variable name of computer request format. Namely, the result from multiplying the data type and the request length together is to be the data length of response frame as in a unit of byte differently from the data length of reading request frame.

> Data length of request frame : H05 (Double Word)

> Data length of response frame : 05 X 4 = 20 (H14 in HEX.)

[Table7.18] Direct variable available

Data type	Direct variable available	Data size(Byte)
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

Ex.1

If memory type included in direct variable name of computer request format is W(WORD) and the data number of computer request format is 03, the data number of PLC ACK response after execution of command is indicated by H06(2*03 = 06 Byte)Byte, which is entered in ASCII code value 3036.

 * Values of ASCII code converted from HEX data are in data area.

Ex.2

In just above example, if data contents of 3 WORDs data are 1234, 5678 and 9ABC in order, actual ASCII code converted value are 31323334 35363738 39414243, and the contents are to be entered in data area.

3) Response format(for PLC of NAK response)

Format \ Name	Header	Station No.	Command	Command type	Error code (HEX 2 Byte)	Tail	Frame check
Frame (Ex.)	NAK	H10	R(r)	SB	H1132	ETX	BCC
ASCII value	H15	H3130	H52(72)	H5342	H31313332	H03	

✓ Station number, commands, and type of command are the same as in computer request format.

✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

4) Example of use

In case 2 DOUBLE WORDs from %MD0 address of station No.10 are read supposing that data below are in %MD0 and %MD1.

%MD0 = H12345678 , %MD1 = H9ABCDEF0

(Computer request format)

Format \ Name	Header	Station No.	Command	Command type	Variable length	Variable name	Number of data	Tail	Frame check
Frame(Ex.)	ENQ	H0A	R(r)	SB	H04	%MD0	H02	EOT	BCC
ASCII value	H05	H3041	H52(72)	H5342	H3034	H254D4430	H3032	H04	

(For PLC ACK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Number of blocks	Number of data	Data	Tail	Frame check
Frame (Ex.)	ACK	H0A	R(r)	SB	01	H08	12345678 9ABCDEF0	ETX	BCC
ASCII value	H06	H3041	H52(72)	H5342	H3031	H3038	H3132333435363738 3941424344454630	03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame(Ex.)	NAK	H0A	R(r)	SB	Error code(2)	ETX	BCC
ASCII value	H15	H3041	H52(72)	H5342	Error code(4)	H03	

□ **Reading of named variables(R##)**

This is a function to read data by using the name registered by registering variable name in access variable of PLC program. Refer to technical spec. of GLOFA GMWIN for the registration of variables.

1) **Request format(PC -> PLC)**

A) For command type of non-array

Format Name	Header	Station No.	Command	Command type[Note]	Number of blocks	Variable length	Variable name		Tail	Frame check
Frame(Ex)	ENQ	H10	R(r)	H02	H01	H08	OUTPUT_1	Repeated block	EOT	BCC
ASCII value	H05	H3130	H52(72)	H3032	H3031	H3038	H4F555450555 5F31		H04	

1 block(Setting can be repeated up to max. 4 blocks)

B) For array type (for 1 block only)

Format Name	Header	Station No.	Command	Command type[Note 1]	Number of blocks	Variable length	Variable name	Number of elements	Tail	Frame check
Frame (Ex)	ENQ	H10	R(r)	H17	H01	H0A	OUTPUT_ARR	H0A	EOT	BCC
ASCII value	H05	H3130	H52(72)	H3137	H3031	H3041	H4F55545055 545F415252	H3041	H04	

Remark

[Note 1] Data type of variable to be read is specified in command type. For the details, see [Table 7.13] and [Table 7.14].

✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ENQ to EOT is converted into ASCII and added to BCC.

✓ Number of blocks: This specifies the number of the blocks composed of [Direct variable name][Direct variable] in this request format. This can be set up to 4 blocks. Therefore, the value of [Number of blocks] 3 must be H01(ASCII value:3031)-H04(ASCII value:3034).

✓ Variable name length : This indicates the number of name's characters registered in access variable of PLC, which is allowable up to 16 characters. This value is one of ASCII converted from HEX type, and the range is from H01(ASCII value:3031) to H10(ASCII value:3130)..

✓ Variable name: This is a name of variable to be read actually in ASCII value within 16 characters. Others than figure, upper/lower cases, '%', '.' and '_' are not allowed for variable name. Upper/lower cases are separately used, but all access variable names of PLC are composed of upper cases. Therfore, use upper cases only.

Remark

[Note 1] Device data type of each block must be same. Namely, since data type of variable in each block is determined by data type of ##, all variables of 4 blocks must be the ones of the data type specified by ##.

[Note 2] If ## specifies array data, only 1 block is allowed.

[Note 3] The number of elements means the number of the elements in array. Namely, if global array variable XX is specified up to array[0]~[5], the number of elements becomes H06.

---

2) **Response Format(for PLC ACK response)**

A) For command type of non-array

Format Name	Header	Station No.	Command	Command type(##)	Number of blocks	Number of data(**)	Data		Tail	Frame check
Frame (Ex)	ACK	H10	R(r)	H02	H01	H02	H23A0	Repeated block	ETX	BCC
ASCII value	H06	H3130	H52(72)	H3032	H3031	H3032	H32334130		H03	

1 block(Max. 4 blocks)

B) For command type of array

Format Name	Header	Station No.	Command	Command type(##)	Number of blocks	Number of data(**)	Data	Tail	Frame check
Frame Ex.)	ACK	H10	R(r)	H17	H01	H14	H23A0112233445566778899 AABBCCDDEEFF001122	ETX	BCC
ASCII value	H06	H3130	H52 (72)	H3137	H3031	H3134	H32334130313132323333334 34353536363737383839 3941 41424243434444454546 4630 3031313232	03	

Remark

[Note 1] If response format from PLC when data type of array variable is WORD and variable's name and element number is 'OUTPUT_ARR[0]~[9]' is as above, the number of data is the element number data*2 = 20(H14) Bytes.

✓ Station number, commands, type of command, and number of blocks are the same as in computer request format.

✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

✓ Number of data means Byte number of HEX. type and is converted into ASCII. This number is determined according to command type, ## of computer request format.

[Table7.19] Number of data according to variable data type

Data type	Command type(##)	Data number(**)	Data type	Command type (##)	Number of data(**)
BIT	H00	1	UDINT	H0B	4
BYTE	H01	1	ULINT	H0C	8
WORD	H02	2	REAL	H0D	4
DWORD	H03	4	LREAL	H0E	8
LWORD	H04	8	TIME	H0F	8
SINT	H05	1	DATE	H10	8
INT	H06	2	TOD	H11	8
DINT	H07	4	DT	H12	8
LINT	H08	8	STRING	H13	10
USINT	H09	1	BLOCK	H14	Max. 60 Bytes
UINT	H0A	2	ARRAY	H15-H27	Max. 60 Bytes

Ex.1

Data number of H04(ASCII code value:H3034) indicates that 4-byte data in HEX. is in the data(DOUBLE WORD).

HEX data of 4 bytes is as converted into ASCII code in data.

  * Values of ASCII code converted from HEX data are in data area.

Ex.2

If the number of data is H04 and the data is H12345678, ASCII code converted value of this is "31 32 33 34 35 36 37 38", which is input in data area. Namely, the highest value comes first and the lowest last.

Remark

[Note 1] If data type is BOOL, data read is indicated by one byte of HEX. Namely, if bit value is 0, it is indicated by H00 and if 1, it is indicated by H01.

[Note 2] If command type is array(H15-H27), upper nibble of lower byte of the data is first and lower nibble of lower byte is last in the data area except the case that data type of array is BOOL and data size is 1 byte(BYTE,USINT,SINT).

Ex. 3

For example, it is supposed that in the variable ABC[2] of which data type is DINT and array size is 2, data is entered as below.

    ABC[0] = H12345678   ABC[1]=9ABCDEF0

At this time, the followings are in the data area of ACK response frame.

    HEX CODE = H78563412   F0DEBC9A

    ASCII CODE = 3737353633343132 4630444542433941

---

3)   Response format(for PLC of NAK response) : For command types of array/non-array in common

Format\Name	Header	Station No.	Command	Command type	Error code (HEX 2 Byte)	Tail	Frame check
Frame (Ex.)	NAK	H10	R(r)	H02(H17)	H1132	ETX	BCC
ASCII value	H15	H3130	H52(72)	H3032(3137)	H31313332	H03	

✓ Station number, commands, type of command, and number of blocks are the same as in computer request format.

✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

4) Example of use

In case data type of station No.10 is WORD and variable names of 'OUTPUT_A' and 'OUTPUT_B' are read, supposing that H1234 is entered in 'OUTPUT_A' and HA302 is entered in 'OUTPUT_B'.

(Computer request format)

Format / Name	Header	Station No.	Command	Command type	Number of blocks	Variable name length	Variable name	Variable name length	Variable name	Tail	Frame check
Frame (Ex.)	ENQ	H0A	R(r)	H02	H02	H08	OUTPUT_A	H08	OUTPUT_B	EOT	BCC
ASCII value	H05	H3041	H52 (72)	H3032	H3032	H3038	H4F55545055 545F41	H3038	H4F55545055 545F42	H04	

(For PLC ACK response after execution of command)

Format / Name	Header	Station No.	Command	Command type	Number of blocks	Number of data	Data	Number of data	Data	Tail	Frame check
Frame(Ex.)	ACK	H0A	R(r)	H02	H02	H02	H1234	H02	HA302	ETX	
ASCII value	06	H3041	H52(72)	H3032	H3032	H3032	H31323334	H3032	H41333032	H03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame(Ex.)	NAK	H0A	R(r)	H02	Error code(2)	ETX	BCC
ASCII value	H15	H3041	H52(72)	H3032	Error code(4)	H03	

□ **Reading of PLC STATUS (RST)**

This is a function to read flag list such as operation status and error information of PLC.

1) **Request format(PC -> PLC)**

Format name	Header	Station No.	Command	Command type	Tail	Frame check
Frame(Ex.)	ENQ	H0A	R(r)	ST	EOT	BCC
ASCII value	H05	H3041	H52(72)	H5354	H04	

✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ENQ to EOT is converted into ASCII and added to BCC.

2) **Response format(for PLC of ACK response)**

Format name	Header	Station No.	Command	Command type	STATUS data (HEX 20 Byte)	Tail	Frame check
Frame(Ex.)	ACK	H0A	R(r)	ST	STATUS data format	ETX	BCC
ASCII value	H06	H3041	H52(72)	H5354	[ ]	H03	

✓ Station number, commands, and type of command are the same as in computer request format.
✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.
✓ STATUS data format : This status format is converted into ASCII code of total 20 bytes in HEX. And Its contents after converted to HEX data from ASCII code are composed as below.

[Table7.20] STATUS data Format

Data type	Flag name	Status data sequence(HEX data)
UINT	PC_DEVICE_IDENTIFIER;[Note 1]	H00(L) ~ H01(H)
Byte	Logical; [Note 1]	H02(Offset)
Byte	Physical; [Note 1]	H03
Byte	_CPU_TYPE;	H04
Byte	_VER_NUM;	H05

Data type	Flag name	Status data sequence(HEX data)
WORD	_SYS_STATE;	H06(L) ~ H07(H)
Byte	_PADT_CNF;	H08
Byte	_Domain_ST;	H09
WORD	_CNF_ER;	H0a(L) ~ H0b(H)
WORD	_CNF_WR;	H0c(L) ~ H0d(H)
WORD	Reserved	H0e(L) ~ H0f(H)
WORD	Reserved	H10(L) ~ H11(H)

Remark

[Note 1]   For the details on each flag, see flag list in technical spec. of GLOFA PLC CPU. Do not process
PC_DEVICE_IDENTIFIER and Logical/Physical which are used as dedicated to system

3)   Response format(for PLC of NAK response)

Format Name	Header	Station No.	Command	Command type	Error code (HEX 2 Byte)	Tail	Frame check
Frame(Ex.)	NAK	H0A	R(r)	ST	H1132	ETX	BCC
ASCII value	15	3041	5272	5354	31313332	03	

- ✓ Station number, commands, and type of command are the same as in computer request format.
- ✓ BCC : When command is one of lower case(r), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.
- ✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

4) Example of use

When the STATUS of PLC with station No.1 is read.

(Computer request format)

Format \ Name	Header	Station No.	Command	Command type	Tail	Frame check
frame(Ex.)	ENQ	H01	R(r)	ST	EOT	BCC
ASCII value	H05	H3031	H52(72)	H5354	H04	

(For PLC ACK response after execution of command)

Format \ Name	Header	Station No.	Command	Command type	STATUS data	Tail	Frame check
frame(Ex.)	ACK	H01	R(r)	ST	See STATUS FORMAT	ETX	BCC
ASCII value	H06	H3031	H52(72)	H5354		H03	

(For PLC NAK response after execution of command)

Format \ Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame(Ex.)	NAK	H01	R(r)	ST	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H52(72)	H5354	Error code(4)	H03	

☐ **Individual writing of direct variables (WSS)**

This is a function to write PLC device memory directly specified in accord with memory data type.

Separate device memories can be written up to 4 at a time.

1) Request format(PC -> PLC)

Format Name	Header	Station No.	Command	Command type	Number of blocks	Variable length	Variable name	Data		Tail	Frame check
frame(Ex)	ENQ	H20	W(w)	SS	H01	H06	%MW10 0	H00E2	Repe ated block	EOT	BCC
ASCII value	H05	H3230	H57(77)	H5353	H3031	H3036	H254D5 731303 0	H30304 532		H04	

1block(Setting can be repeated up to 4 blocks)

✓ BCC : When command is one of lower case(w), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ENQ to EOT is converted into ASCII and added to BCC.

✓ Number of blocks: This specifies the number of the blocks composed of '[Variable length][Variable name]' in this request format. This can be set up to 4 blocks. Therefore, the value of [Number of blocks] must be H01(ASCII value:3031)-H04(ASCII value:3034).

✓ Variable length(name length of direct variable) : This indicates the number of name's characters that means direct variable, which is allowable up to 16 characters. This value is one of ASCII converted from HEX type, and the range is from H01(ASCII value:3031) to H10(ASCII value:3130).

✓ Direct variable : Input address of variable to be read actually in ASCII value within 16 characters. Others than figure, upper/lower cases, '%' and '.' are not allowed for variable name.

✓ Data : If the value to be written in %MW100 area is H A, the data format must be H000A. If the value to be written in %MD100 area is H A, the data format must be H0000000A. In data area, ASCII value converted from HEX data is entered.

Direct variables available according to PLC type are as follows.

Type	BOOL	Byte	WORD	Double WORD	Long WORD
GM1/2	%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	-
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	-

Remark

[Note 1] Refer to technical spec. of GLOFA PLC for details to specify the area of each device in GLOFA GM.

Ex.)

If the data type to write presently is DOUBLE WORD and the data to write is H12345678, its ASCII code converted value is 3132333435363738, which shall be input in data area. Namely, the highest value shall be transmitted first and the lowest last.

Remark

[Notes1] Device data type of each block shall be surely identical.

[Notes2] If data type is BOOL, data to write is indicated by one byte of HEX. Namely, if bit value is 0, it is indicated by H00(3030) and if 1, it is indicated by H01(3031).

---

2)   Response format(for PLC of ACK response)

Format / Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H20	W(w)	SS	ETX	BCC
ASCII value	H06	H3230	H57(77)	H5353	H03	

- ✓   Station number, commands, and type of command are the same as in computer request format.
- ✓   BCC : When command is one of lower case(w), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

3)   Response format(for PLC of NAK response)

Format / Name	Header	Station No.	Command	Command type	Error code (HEX 2 Byte)	Tail	Frame check
Frame (Ex.)	NAK	H20	W(w)	SS	H4252	ETX	BCC
ASCII value	H15	H3230	H57(77)	H5353	H34323532	H03	

- ✓   Station number, commands, and type of command are the same as in computer request format.
- ✓   BCC : When command is one of lower case(w), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

4) Example of use

In case "HFF" is written in %MW230 address of station No.1.

(Computer request format)

Format Name	Header	Station No.	Command	Command type	Number of blocks	Variable name length	Variable name	data	Tail	Frame check
Frame (Ex.)	ENQ	H01	W(w)	SS	H01	H06	%MW230	H00FF	EOT	BCC
ASCII value	H05	H3031	H57(77)	H5353	H3031	H3036	H254D57323330	H30304646	H04	

(For PLC ACK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H01	W(w)	SS	ETX	BCC
ASCII value	H06	H3031	H57(77)	H5353	H03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	W(w)	SS	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H57(77)	H5353	Error code(4)	H03	

☐ **Continuous writing of direct variables (WSB)**

This is a function to directly specify PLC device memory and continuously write data from specified address as long as specified.

1) Request format(PC -> PLC)

Format Name	Header	Station No.	Command	Command type	Variable length	variable name	Number of data (Max.120Byte)	Data	Tail	Frame check
Frame(Ex)	ENQ	H10	W(w)	SB	H06	%MD100	H01	H11112222	EOT	BCC
ASCII value	H05	H3130	H57(77)	H5342	H3036	H254D44431303 0	H3031	H3131313132323232	H04	

> ### Remark
>
> [Note 1] Number of data specifies the number according to the type of direct variable. Namely, if data type of direct variable is double word and the number of data is 5, it means that 5 double words shall be witten.

- ✓ BCC : When command is one of lower case(w), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ENQ to EOT is converted into ASCII and added to BCC.
- ✓ Number of blocks : The protocol of continuous writing function of direct variables has not [Number of blocks].
- ✓ Name length of direct variable : This indicates that the number of name's characters that means direct variable, is allowable up to 16 characters. This value is one of ASCII converted from HEX type, and the range is from H01(ASCII value:3031) to H10(ASCII value:3130).
- ✓ Direct variable : It means address of variable to be read actually in ASCII value within 16 characters. Others than figure, upper/lower cases, '%' and '.' are not allowed for this variable name. Variable type available for continuous writing of direct variables is as follows according to PLC type.

Classification	BOOL	Byte	WORD	DOUBLE WORD	LONG WORD
GM1	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL
GM2	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL
GM3	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	-
GM4	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	-
GM6	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	-
GM7	-	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	-

Remark

[Note 1] Refer to technical spec. of GLOFA PLC for details to specify the area of each device in GLOFA GM.

[Note 2] Data type of LONG WORD isn't supported in GM3,GM4,GM6 and GM7.

2) **Request format(for ACK response)**

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H10	W(w)	SB	ETX	BCC
ASCII value	H06	H3130	H57(77)	H5342	H03	

✓ Station number, commands, and type of command are the same as in computer request format.

✓ BCC : When command is one of lower case(w), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

3) **Response format(for PLC of NAK response)**

Format Name	Header	Station No.	Command	Command type	Error code (HEX 2Byte)	Tail	Frame check
Frame (Ex.)	NAK	H10	W(w)	SB	H1132	ETX	BCC
ASCII value	H15	H3130	H57(77)	H5342	H31313332	H03	

✓ Station number, commands, and type of command are the same as in computer request format.

✓ BCC : When command is one of lower case(w), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see

Appendix 'B. Error Code Table'.

4) Example of use

In case 4 bytes of HAA15056F are written in %QD0.0.0 of station No.1.

(Computer request format)

Format Name	Header	Station No.	Command	Command type	Variable length	Variable name	Number of data	data	Tail	Frame check
Frame(Ex.)	ENQ	H01	W(w)	SB	H08	%QD0.0.0	H04	HAA15056F	EOT	BCC
ASCII value	H05	H3031	H57(77)	H5342	H3038	H254442302E302E30	H3034	H4141313530353646	H04	

(For PLC ACK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H01	W(w)	SB	ETX	BCC
ASCII value	H06	H3031	H57(77)	H5342	H03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	01	W(w)	SB	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H57(77)	H5342	Error code(4)	H03	

☐ **Writing of named variables (W##)**

This is a function to write data by using the name registered by registering variable name in access variable of PLC program. Refer to technical spec. of GLOFA GMWIN for the registration of variables.

1) **Request format(PC -> PLC)**

A) For data type of non-array

Format / Name	Header	Station No.	Command	Command type[Note]	Number of blocks	Variable length	Variable name	data		Tail	Frame check
frame(Ex)	ENQ	H10	W(w)	H02	H01	H08	OUTPUT_1	H0002	Repeated block	EOT	BCC
ASCII value	H05	H3130	H57(77)	H3032	H3031	H3038	H4F555450555545F31	H303032341		H04	

```
                                        1 block(Setting can be repeated up to max. 4 blocks)
```

B) For data type of array (for 1 block only)

Format / Name	Header	Station No.	Command	Command type[Note]	Number of blocks	Variable length	Variable name	Number of elements	Data	Tail	Frame check
Frame(Ex)	ENQ	H10	W(w)	H17	H01	H0A	OUTPUT_ARR	H05	H11223344556 6778899AA	EOT	BCC
ASCII value	H05	H3130	H57 (77)	H3137	H3031	H3041	H4F5554 5055545 F415252	H3035	H3131323233 33343435353 63637373838 39394141	H04	

```
                                        1 block(for 1 block only)
```

Remark

[Note 1] Data type of variable to be written is specified in command type. For the details, see [Table 7.13] and [Table 7.14].

✓ BCC : When command is one of lower case(w), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ENQ to EOT is converted into ASCII and added to BCC.

✓ Number of blocks: This specifies the number of the blocks composed of [Direct variable name][Direct variable] in this request format. This can be set up to 4 blocks. Therefore, the value of [Number of blocks] must be H01(ASCII value:3031)-H04(ASCII value:3034).

✓ Variable length : This indicates the number of variable name's characters registered in access variable of PLC, which is allowable up to 16 characters. This value is one of ASCII converted from HEX type, and the range is from H01(ASCII value:3031) to H10(ASCII value:3130).

✓ Variable name: Where the name of variable to be written actually is positioned in ASCII value within 16 characters. Others than figure, upper/lower cases, '_' and '.' are not allowed for variable name. Upper/lower cases are separately used, but all access variable names of PLC are composed of upper cases. Therefore, use upper cases only..

Remark

[Note1] Device data type of each block must be same.

✓ If this array data is to be specified, only 1 block is allowed.(Number of blocks can be omitted this time.)

✓ The number of elements means the number of the elements in array. Namely, if global array variable, XX is specified up to array[0]~[5], the number of elements becomes H06.

2) Response format(for PLC of ACK response)

Form at Name	Header	Station No.	Command	Command type(##)	Tail	Frame check
Frame (Ex.)	ACK	H10	W(w)	H02(H17)	ETX	BCC
ASCII value	06	3130	57(77)	3032(3137)	03	

✓ Station number, commands, and type of command are the same as in computer request format.

✓ BCC : When command is one of lower case(w), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

3) Response format(for PLC of NAK response)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H10	W(w)	H02(H17)	H1132	ETX	BCC
ASCII value	H15	H3130	H57(77)	H3032(3137)	H31313332	H03	

    ✓   Station number, commands, and type of command are the same as in computer request format.

    ✓   BCC : When command is one of lower case(w), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

    ✓   Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

4) Example of use

In case HAABBCC is written in variable name of "AAARESW" with data type of Array byte[0] ~ [2] in station No.1.

(Computer request format)

Format Name	Header	Station No.	Command	Command type	Number of block	Variable length	Variable name	Number of elements	Data	Tail	Frame check
Frame (Ex.)	ENQ	H01	W(w)	H16	H01	H07	AAARESW	H03	HAABBCC	EOT	BCC
ASCII value	H05	H3031	H57(77)	H3136	H3031	H3037	H41414152455357	H3033	H41414242 4343	H04	

(For PLC ACK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	01	W(w)	H16	ETX	BCC
ASCII value	H06	H3031	H57(77)	H3136	H03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	W(w)	H16	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H57(77)	H3136	Error code(4)	H03	

☐ **Monitor registration(X##)**

Monitor can be registered separately up to 32 combinations with reading command of actual variables and has a function to monitor the applicable variable value through the number registered by monitor command after the registration. The max. number available for monitor registration depends on the version of Cnet I/F module. The max. number and registration variable number can be set via Frame Editor.

1) **Selection of the monitor registration number of Frame Editor**

   Setting screen of basic parameters in Frame Editor has a function to set the size of monitor registration to 4X32 or 16X20. 16X20 is only for Cnet I/F module Ver. 1.4 or later with the following differences.
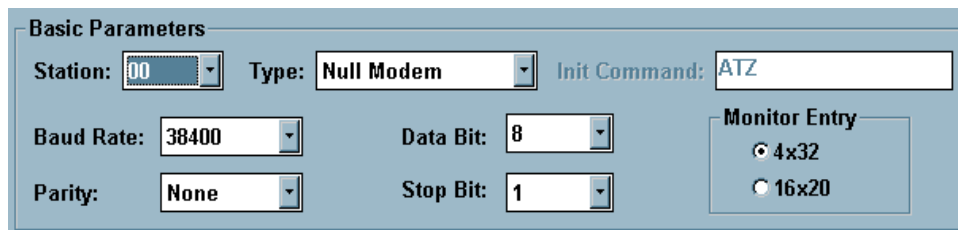
   ✓ 4 X 32 : Registration number up to 32 is supported with max.4 variables available per monitor registration and with max.'4X32=128' as the variable number available for the registration in all Cnet versions not below than Ver.1.0.

   ✓ 16 X 20 : Registration number up to 20 is supported with max.16 variables available per monitor registration and with max.'16X20=320' as the variable number available for the registration in Cnet version 1.4 or later only.

   ✓ G7L-CUEC : Registration number up to 10 is supported with max.16 variables available per monitor registration and with max.'16X10=160' as the variable number available for the registration, however NAMED variables are not supported..

2) **Request format(PC -> PLC)**

Format Name	Header	Station No.	Command	Registration No.	Registration format	Tail	Frame check
Frame (Ex.)	ENQ	H10	X(x)	H1F	See registration format	EOT	BCC
ASCII value	H05	H3130	H58(78)	H3146	[ ]	H04	

   ✓ BCC : When command is one of lower case(x), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ENQ to EOT is converted into ASCII and added to BCC.

  ✓ Registration number can be registered up to 32 or up to 20 (0~31, H00~H1F) according to setting value of monitor registration number in Frame Editor, and if the already registered number is registered again, currently executed one is registered.

  ✓ Registered format is used from command to EOT among formats of individual reading of direct variables, continuous reading and reading of named variables with the format setting as below.

Registered format : The registered format among request formats can choose only one out of 3 services below.

(1) Individual reading of direct variables

RSS	Number of blocks(2 Bytes)	Variable length(2 Bytes)	Variable name(16 Bytes)	...

1 block(Max. 4~16 blocks [Note])

(2) Continuous reading of direct variables

RSB	Variable length (2 Bytes)	Variable name (16 Bytes)	Number of data

1block only can be set.

(3) Named variable reading

R##	Number of blocks(2 Bytes)	Variable length(2 Bytes)	Variable name (16 Bytes)	...

1 block(Max. 4~16 blocks[Note])

Remark

[Note 1] The number of blocks can be set up to 16 blocks from 4 blocks according to setting condition of monitor registration number. However, setting up to 16 blocks is available only in Ver.1.4 or later.

---

3) Response format(for PLC of ACK response)

Format Name	Header	Station No.	Command	Registration No.	Tail	Frame check
Frame (Ex.)	ACK	H10	X(x)	H1F	ETX	BCC
ASCII value	H06	H3130	H58(78)	H3146	H03	

  ✓ Station number, commands, and register No. are the same as in computer request format.

  ✓ BCC : When command is one of lower case(x), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

4) Response format(for PLC NAK response)

Format Name	Header	Station No.	Command	Registration No.	Error code(HEX 2Byte)	Tail	Frame check
Frame(Ex.)	ACK	H10	X(x)	H1F	H1132	ETX	BCC
ASCII value	H06	H3130	H58(78)	H3146	H31313332	H03	

✓   Station number, commands, and register No. are the same as in computer request format.

✓   BCC : When command is one of lower case(x), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓   Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

5) Example of use

In case of monitor registration of No.1 in station No.1 with data type of uint and variable name of "ASDF".

(Computer request format)

Format Name	Header	Station No.	Command	Registration No	Registered format				Tail	Frame check
					R##	Number of blocks	Variable length	Variable name		
Frame (Ex.)	ENQ	H01	X(x)	H01	R0A	H01	H04	ASDF	EOT	BCC
ASCII value	H05	H3031	H58(78)	H3031	H523041	H3031	H3034	H41534446	H04	

(For PLC ACK response after execution of command)

Format Name	Header	Station No.	Command	Registration No	Tail	Frame check
Frame (Ex.)	ACK	H01	X(x)	H01	ETX	BCC
ASCII value	H06	H3031	H58(78)	H3031	H03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	X(x)	H01	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H58(78)	H3031	Error code(4)	H03	

☐ **Monitor execution (Y##)**

This is a function to execute the reading of variable registered by monitor registration This also specifies registered No. and execute the reading of variable registered in that number.

1) Request format(PC -> PLC)

Format Name	Header	Station No.	Command	Registration No	Tail	Frame check
Frame(Ex.)	ENQ	H10	Y(y)	H1F	EOT	BCC
ASCII value	H05	H3130	H59(79)	H3146	H04	

✓ Registration No. is to be the same as the registered No. during monitor registration for monitor execution.

✓ BCC : When command is one of lower case(y), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ENQ to EOT is converted into ASCII and added to BCC.

✓ In computer request format, registration No. can be set to 00 ~ 31(H00 ~ H1F).

2) Response format(for PLC of ACK response)

A) In case registration format of registration No. is the individual reading of direct variables

Format Name	Header	Station No.	Command	Registration No	Number of blocks	Number of data	Data	Tail	Frame check
Frame (Ex.)	ACK	H10	Y(y)	H1F	H01	H04	H9183AABB	ETX	BCC
ASCII value	H06	H3130	H59(79)	H313F	H3031	H3034	H393138334141 4242	H03	

B) In case registration format of registration No. is the continuous reading of direct variables

Format Name	Header	Station No.	Command	Registration No	Number of data	Data	Tail	Frame check
Frame (Ex.)	ACK	H10	Y(y)	H1F	H04	H9183AABB	ETX	BCC
ASCII value	H06	H3130	H59(79)	H313F	H3034	H3931383341414242	H03	

In case registration format of registration No. is the reading of named variables

Format Name	Header	Station No.	Command	Registration No	Number of blocks	Number of data	Data	Tail	Frame check
Frame (Ex.)	ACK	H10	Y(y)	H1F	H01	H04	H9183AABB	ETX	BCC
ASCII value	H06	H3130	H59(79)	H313F	H3031	H3034	H3931383341 414242	H03	

✓ Data format such as the number of blocks and number of data is the same as in variable reading.

✓ Station number, commands, and register No. are the same as in computer request format.

✓ BCC : When command is one of lower case(y), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

3) response Format(for PLC NAK response)

Format Name	Header	Station No.	Command	Registration No	Error code (HEX 2Byte)	Tail	Frame check
Frame (Ex.)	NAK	H10	Y(y)	H1F	H1132	ETX	BCC
ASCII value	H15	H3130	H59(79)	H3146	H31313332	H03	

✓ Station number, commands, and register No. are the same as in computer request format.

✓ BCC : When command is one of lower case(y), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

4) Example of use

In case reading of variable registered in registration No. 1 of station No.1 is executed, supposing that 1 block is registered by named variable reading in data type of DINT.

(Computer request format)

Format Name	Header	Station No.	Command	Registration No	Tail	Frame check
Frame (Ex.)	ENQ	H01	Y(y)	H01	EOT	BCC
ASCII value	H05	H3031	H59(79)	H3031	H04	

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(For PLC ACK response after execution of command)

Format Name	Header	Station No.	Command	Registration No	Number of blocks	Number of data	Data	Tail	Frame check
Frame (Ex.)	ACK	H01	Y(y)	H01	H01	H04	H23422339	ETX	BCC
ASCII value	H06	H3031	H59(79)	H3031	H3031	H3034	H3233343232333339	H03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Registration No	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	Y(y)	H01	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H59(79)	H3031	Error code(4)	H03	

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☐ **PLC control command(M##)**

The control of PLC operation with computer communication module is the same as the control with FAM4.0 in GLOFA Fnet and Mnet. The control command of PLC operation with computer communication module has a path specified for operation according to PLC mode. PI(Program Invocation) is an execution program(object) that has the start condition and status at start-up, stop, and temporary stop of user program.

PI is created/deleted by user and PLC can be controlled by PI name.

</div>

[Figure 7.14] Relation between PI and PLC control
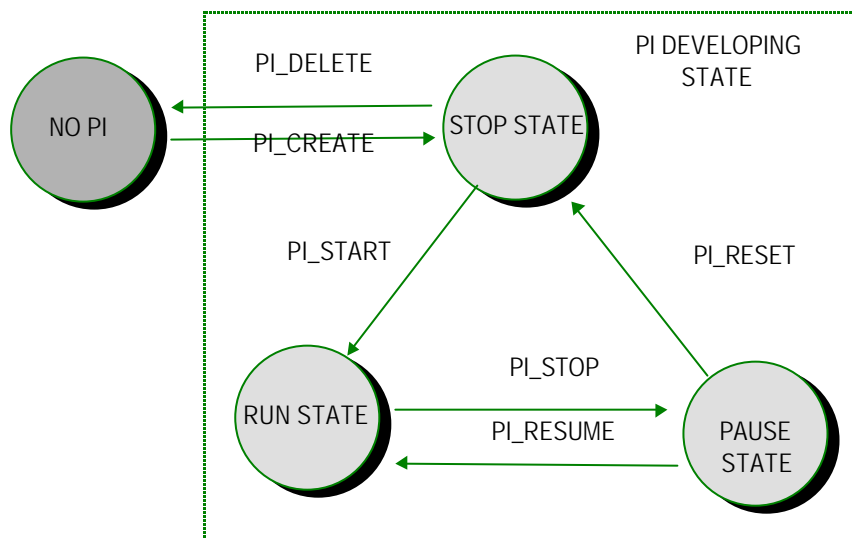
List of commands to change operation status of PLC into PI command is as follows.

[Table 7.21] PI related commands

Operation sign	Main command and Command type	Operation contents
PI_create	MCN(D)	Create PI object
PI_start	MRN(D)	Starts the created PI(RUN execution)
PI_resume	MEN(D)	Restarts at temporary stop status
PI_stop	MSN(D)	Temporarily stops at run status
PI_reset	MPN(D)	Completely stops at temporary stop status
PI_delete	MDN(D)	Deletes the created object

✓ PI_create and PI_delete of commands above are specially used in system, so don't use them at ordinary times. N in command type specifies PI name to execute PI command, and D in parentheses execute PI name with default value. Therefore, when D is used, don't specify PI name.

1) **Request format(PC -> PLC)**

Format Name	Header	Station No.	Command	Command type	PI_N_LEN	PI_N_NAME	Tail	Frame check
Frame (Ex.)	ENQ	H10	M(m)	RN	H04	LGIS	EOT	BCC
ASCII value	H05	H3130	H4D(6D)	H524E	H3034	H4C474953	H04	

- ✓ PI_N_LEN is where the number of PI name's characters is displayed.

- ✓ PI_N_NAME is where PI name is displayed.

- ✓ When PI name is executed as specified, the max.number of characters is 16.

- ✓ If no name is required, use D instead of N in command type. If D has been used, PI_N_LEN and PI_N_NAME are unnecessary.

- ✓ PI_N_NAME shall be the name to specify or default name of 'P_Program'.

- ✓ BCC : When command is one of lower case(m), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

[Table 7.22] Command type

RN(D)	Starts PLC start-up(RN = PI name, RD= Default)
PN(D)	Temporarily stops what is in operation. (PN = PI name, PD= Default)
SN(D)	Switches temporarily stopped PLC to program mode (stops it). SN = PI name, SD = Default
EN(D)	Restarts temporarily stopped PLC. (EN = PI name, ED= Default)

2) **Response format(for PLC of ACK response)**

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H10	M(m)	RN	ETX	BCC
ASCII value	H06	H3130	H4D(6D)	524E	H03	

- ✓ Station number, commands, and type of command are the same as in computer request format.

- ✓ BCC : When command is one of lower case(m), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

3) Response format(for PLC of NAK response)

Format \ Name	Header	Station No.	Command	Command type	Error code (HEX 2 Byte)	Tail	Frame check
Frame (Ex.)	NAK	H10	M(m)	RN	H1132	ETX	BCC
ASCII value	H15	H3130	H4D(6D)	H524E	H31313332	H03	

✓   Station number, commands, and type of command are the same as in computer request format.

✓   BCC : When command is one of lower case(m), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓   Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

4) Example of use

In case of default name wuth excution of PI_start

(Computer request format)

Format \ Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ENQ	H01	M(m)	RD	EOT	BCC
ASCII value	H05	H3031	H4D(6D)	H5244	H04	

(For PLC ACK response after execution of command)

Format \ Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H01	M(m)	RD	ETX	BCC
ASCII value	06	3031	4D(6D)	5244	03	

(For PLC NAK response after execution of command)

Format \ Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	M(m)	RD	Error code(2)	ETX	BCC
ASCII value	15	3031	4D(6D)	5244	Error code(4)	03	

□ **PI Creation MCN, MCD)**

This is a function to create PI which can operate PLC. This command can be executed in the state that PI does not exist in PLC and Domain(PLC Program) has been downloaded.

1) Request format(PC -> PLC)

Format \ Name	Header	Station No.	Command	Command type	PI_N_LEN	PI_N_NAME	DM_LEN	DM_NAME	Tail	Frame check
Frame (Ex.)	ENQ	H10	M(m)	CN	H08	LGIS_PLC	H06	PRGRAM	EOT	BCC
ASCII value	H05	H3130	H4D (6D)	H434E	H3038	H4C474953 5F504C43	H3036	H505247 524D	H04	

- ✓ PI_N_LEN is where the number of PI name's characters is displayed.
- ✓ PI_N_NAME is where PI name is located..
- ✓ When PI name is executed as specified, the max.number of characters is 16.
- ✓ If no name is required, use D instead of N in command type. If D has been used, PI_N_LEN and PI_N_NAME are unnecessary.
- ✓ PI_N_NAME shall be the name to specify or default name of 'P_Program'.
- ✓ BCC : When command is one of lower case(m), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.
- ✓ DM_NAME shall be the name at that time when downloaded or default name of 'P_Domain'.
- ✓ PI_N_LEN and DM_LEN are allowable within H01 - H10.

2) Response format(for PLC of ACK response)

Format \ Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H10	M(m)	CN	ETX	BCC
ASCII value	H06	H3130	H4D(6D)	H434E	H03	

- ✓ Station number, commands, and type of command are the same as in computer request format.
- ✓ BCC : When command is one of lower case(m), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

3) Response format(for PLC of NAK response)

Format / Name	Header	Station No.	Command	Command type	Error code (HEX 2 Byte)	Tail	Frame check
Frame (Ex.)	NAK	H10	M(m)	CN	H1132	ETX	BCC
ASCII value	H15	H3130	H4D(6D)	H434E	H31313332	H03	

✓ Station number, commands, and type of command are the same as in computer request format.

✓ BCC : When command is one of lower case(m), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

4) Example of use

In case PI name is executed as specified to PLC_RUN in the state that Domain name has been downloaded in PGM of PLC.

(Computer request format)

Format / Name	Header	Station No.	Command	Command type	PI_N_ LEN	PI_N_NAME	DM_LEN	DM_NAME	Tail	Frame check
Frame (Ex.)	ENQ	H01	M(m)	CN	H07	PLC_RUN	H03	PGM	EOT	BCC
ASCII value	H05	H3031	H4D(6D)	H434E	H3037	H504C435F52554E	H3033	H50474D	H04	

(For PLC ACK response after execution of command)

Format / Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H01	M(m)	CN	ETX	BCC
ASCII value	H06	H3031	H4D(6D)	H434E	H03	

(For PLC NAK response after execution of command)

Format / Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	M(m)	CN	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H4D(6D)	H434E	Error code(4)	H03	

□ PI_DELETE(cancel)command(MDN, MDD)

For updating PI, the existing PI shall be surely deleted first with the service of PI_Delete .

This command is executed only when PI has been created by PI_Create service.

1) Request format(PC -> PLC)

Format Name	Header	Station No.	Command	Command type	PI_N_LEN	PI_N_NAME	Tail	Frame check
Frame (Ex.)	ENQ	H10	M(m)	DN(D)	H04	LGIS	EOT	BCC
ASCII value	H05	H3130	H4D(6D)	H444E(44)	H3034	H4C474953	H04	

- ✓ PI_N_LEN is where the number of PI name's characters is displayed.
- ✓ PI_N_NAME is where PI name is located..
- ✓ When PI name is executed as specified, the max. number of characters is 16.
- ✓ If no name is required, use D instead of N in command type. If D has been used, PI_N_LEN and PI_N_NAME are unnecessary.
- ✓ PI_N_NAME shall be the name to specify or default name of 'P_Program'.
- ✓ BCC : When command is one of lower case(m), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.
- ✓ PI_N_LEN is allowable within H01 - H10.

2) Response format(for PLC of ACK response)

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H10	M(m)	DN(D)	ETX	BCC
ASCII value	H06	H3130	H4D(6D)	H444E(44)	H03	

- ✓ Station number, commands, and type of command are the same as in computer request format.
- ✓ BCC : When command is one of lower case(m), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

3) **Response format(for PLC of NAK response)**

Format Name	Header	Station No.	Command	Command type	Error code (HEX 2 Bytes)	Tail	Frame check
Frame (Ex.)	NAK	H10	M(m)	DN(D)	H1132	ETX	BCC
ASCII value	H15	H3130	H4D(6D)	H444E(44)	H31313332	H03	

✓ Station number, commands, and type of command are the same as in computer request format.

✓ BCC : When command is one of lower case(m), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

4) **Example of use**

In case PI name is set to PLC_RUN.

(Computer request format)

Format Name	Header	Station No.	Command	Command type	PI_N_LEN	PI_N_NAME	Tail	Frame check
Frame (Ex.)	ENQ	H01	M(m)	DN	H07	PLC_RUN	EOT	BCC
ASCII value	H05	H3031	H4D(6D)	H444E	H3037	H504C435F52554E	H04	

(For PLC ACK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H01	M(m)	DN	ETX	BCC
ASCII value	H06	H3031	H4D(6D)	H444E	H03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	M(m)	DN	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H4D(6D)	H444E	Error code(4)	H03	

□ Program download start command(PDN, PDD)

GLOFA Gm series have user program of compile type, so they can not partly perform download by specifying step address of the existing PLC. Therefore, download/upload of program have the entire process with the initialization of start command and using download/upload commands. GLOFA Gm series call user program with PI command the Domain. This domain has similar characteristics to the existing PLC program. But it is different that the domain may be deleted and has several domains.

Program download start command is an initialization service when it performs domain(program) download service. If this service is successful, download the program by using program download command. The program to be downloaded is a file(extension name, .BN0) created by execution of [Make] of [Compile] menu in PADT.

Remark

[Note 1] The delay time between this command and program download command must be within 1 sec.

1) Request format(PC -> PLC)

Format Name	Header	Station No.	Command	Command type	DM_LEN	DM_NAME	FILE_SIZE (Dec 4 Bytes)	Tail	Frame check
Frame(Ex.)	EQN	H10	P(p)	DN(D)	H05	LGPLC	00038000	EOT	BCC
ASCII value	H05	H3130	H50(70)	H444E(44)	H3035	H4C47504C43	H30303033338303030	H04	

✓ DM_LEN displays the number of Domain name's characters in the range of H01 - H10.

✓ DM_NAME displays Domain name which is allocated when it is saved to PLC. If the name is unknown, use 'P_DOMAIN'.

✓ FILE_SIZE means the file size (execution file output to PADT ***.BN0 and ***.ROM of GK) to be downloaded. This size shall be displayed in decimal.

   Ex.) If size of ***.BN0(***.ROM) is 38Kbytes, FILE SIZE is Dec 00038000.

✓ If D has been used instead of N in command type, DM_LEN and DM_NAME are unnecessary.

✓ If no name is required, use D instead of N in command type.

✓   BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

2) Response format(for PLC of ACK response)

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H10	P(p)	DN	ETX	BCC
ASCII value	H06	H3130	H50(70)	H444E	H03	

✓   Station number, commands, and type of command are the same as in computer request format.

✓   BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

✓   Surely perform download command within 1 sec. after PLC ACK response, or start command will be invalid. Consequently, start command shall be executed again to download again.

3) Response format(for PLC of NAK response)

Format Name	Header	Station No.	Command	Command type	Error CODE (HEX 2 Bytes)	Tail	Frame check
Frame Ex.)	NAK	H10	P(p)	DN(D)	H1132	ETX	BCC
ASCII value	H15	H3130	H50(70)	H444E(44)	H31313332	H03	

✓   Station number, commands, and type of command are the same as in computer request format.

✓   BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓   Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error.

4) Example of use

In case Domain name is set to PLC_pgm and FILE SIZE of ***.BN0 is 123456 Bytes.

(Computer request format)

Format Name	Header	Station No.	Command	Command type	DM_LEN	DM_NAME	FILE_SIZW	Tail	Frame check
Frame (Ex.)	ENQ	H01	P(p)	DN	H07	PLC_pgm	00123456	EOT	BCC
ASCII value	H05	H3031	H50(70)	H444E	H3037	H504C435F52570676D	H3030313233343536	H04	

(For PLC ACK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H01	P(p)	DN	ETX	BCC
ASCII value	H06	H3031	H50(70)	H444E	H03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	P(p)	DN	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H50(70)	H444E	Error code(4)	H03	

✓ Surely perform download command within 1 sec. after receiving PLC ACK response as a result of the execution of this command service, or start command will be invalid. Consequently, start command shall be executed again to download again.

□ **Program download start command(PDN, PDD)**

This downloads the program data after receiving ACK response as a result of execution of program download start command. This service must be performed within 1 sec. after response of program download start command. Also, the delay time of each program download sequence service must be within 1 sec.

1) **Request Format(PC -> PLC)**

Format Name	Header	Station No.	Command	Command type	frame NO (HEX 4 Bytes)	Number of data (HEX 1Bytes)	data	Tail	Frame check
Frame (Ex.)	ENQ	H01	P(p)	DX	H0001	H10		EOT	BCC
ASCII value	H05	H3031	H50(70)	H4458	H30303031	H3130		H04	

✓ Frame No. indicates the current frame number (4 Bytes) to be downloaded in the entire download sequence. This number must be incremental in sequence until the download finishes completely. Frame No. increases in sequence from 0001.

✓ This indicates the number of data included in this frame. It can include up to 120 Bytes.

✓ Data shall be set as agreed with the max. size(120 Bytes) if possible.

✓ For the last frame, surely set frame No. to HFFFF(46,46,46,46).

✓ If the last frame No. isn't set to HFFFF, download execution is regarded as finished abnormally without download completed.

✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

2) **Response Format(When PLC response ACK)**

Format Name	Header	Station No.	Command	Command type	Frame NO (HEX 4 Bytes)	Number of data (HEX 1 Byte)	Tail	Frame check
Frame (Ex.)	ACK	H01	P	DX	H0001	H10	ETX	BCC
ASCII value	H06	H3031	H50	H4458	H30303031	H3130	H03	

✓ Station number, commands, type of command, frame No., and number of data are the same as in computer request format.

✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

✓ If frame No. is not HFFFF after receiving the frame, the next frame shall be sent within 1 sec.

3) **Response format(for PLC of NAK response)**

Format / Name	Header	Station No.	Command	Command type	Frame No (HEX 4 Bytes)	Number of data (HEX 1 Byte)	Error code (HEX 2 Bytes)	Tail	Frame check
Frame (Ex.)	NAK	H01	P(p)	DX	H0001	H10	H1132	ETX	BCC
ASCII value	H15	H3031	H50(70)	H4458	H30303031	H3130	H31313332	H03	

✓ Station number, commands, type of command, frame No., and number of data are the same as in computer request format.

✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error. For the details, see Appendix 'B. Error Code Table'.

✓ If this response is received, re-start is required from the first with start command.

4) **Example of use**

In case frame NO is 255 and the number of data is H17 in station No.1.

(Computer request format)

Format / Name	Header	Station No.	Command	Command type	Frame No.	Number of data	Data	Tail	Frame check
Frame (Ex.)	ENQ	H01	P(p)	DX	H00FF	H17	H1055 40FA	EOT	BCC
ASCII value	H05	H3031	H50(70)	H4458	H30304646	H3137	H31303535 34304641	H04	

Remark

[Note 1] Frame No. and the number of data are indicated in HEX value.

(For PLC ACK response after execution of command)

Format / Name	Header	Station No.	Command	Command type	Frame No.	Number of data	Tail	Frame check
Frame (Ex.)	ACK	H01	P(p)	DX	H00FF	H17	ETX	BCC
ASCII value	H06	H3031	H50(70)	H4458	H30304646	H3137	H03	

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(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Main command	Command type	Frame No.	Number of data	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	P(p)	DX	H00FF	H17	Error code	ETX	BCC
ASCII value	H15	H3031	H50(70)	H44(64)	H30304646	H3137		H03	

□ program upload start command(PUN, PUD)

GLOFA GM series have user program of compile type, so they can not partly perform upload by specifying step address. Therefore, the upload must be entirely peformed from start command in sequence. GLOFA GM series call user program with PI command the Domain. This domain has similar characteristics to the existing PLC program. But it is different that the domain may be deleted and has several domains are available.

Program upload start command is an initialization service when it performs domain(program) upload service. If this service is successful, upload the program by using program upload command.

Remark

[Note 1] The delay time between this command and program upload command must be within 1 sec.

1) Request format(PC -> PLC)

Format Name	Header	Station No.	Command	Command type	DM_LEN	DM_NAME	Tail	Frame check
Frame (Ex.)	EQN	H10	P(p)	UN(D)	H05	LGPLC	EOT	BCC
ASCII value	H05	H3130	H50(70)	H554E(44)	H3035	H4C47504C43	H04	

- ✓ DM_LEN displays the number of Domain name's characters in the range of H01 - H10.
- ✓ DM_NAME displays Domain name which is allocated when saved to PLC. If the name is unknown, use 'P_Domain'.
- ✓ If D has been used instead of N in command type, DM_LEN and DM_NAME are unnecessary.
- ✓ If no name is required, use D instead of N in command type.
- ✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.
- ✓ When uploading, the extension name of the file to be uploaded/saved shall be ***.BN0(for GK, ***.ROM).

2) **Response format(for PLC of ACK response)**

Format Name	Header	Station No.	Command	Command type	DOMAIN_SIZE (Dec 4 Bytes)	Tail	Frame check
Frame(value)	ENQ	H01	P(p)	UN(D)	00001298	ETX	BCC
ASCII value	H05	H3031	H50(70)	H554E(44)	H3030303031323938	H03	

- ✓ DOMAIN_SIZE means the size of the domain saved in PLC. This size is of ASCII code converted from decimal. Station number, commands, and type of command are the same as in computer request format.
- ✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent. Surely send upload command within I sec. after receiving this frame.

3) **Response format(for PLC of NAK response)**

Format Name	Header	Station No.	Command	Command type	Error code (HEX 2 Bytes)	Tail	Frame check
Frame (Ex.)	NAK	H10	P(p)	UN	H1132	ETX	BCC
ASCII value	H15	H3130	H50(70)	H554E	H31313332	H03	

- ✓ Station number, commands, and type of command are the same as in computer request format.
- ✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.
- ✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error.

4) **Example of use**

In case Domain name is set to PLC_pgm.

(Computer request format)

Format Name	Header	Station No.	Command	Command type	DM_LEN	DM_NAME	Tail	Frame check
Frame (Ex.)	ENQ	H01	P(p)	UN	H07	PLC_pgm	EOT	BCC
ASCII value	H05	H3031	H50(70)	H554E	H3037	H504C435F52570676D	H04	

(For PLC ACK response after execution of command)

In case DOMAIN_SIZE is 12345 Bytes.

Format Name	Header	Station No.	Command	Command type	DOMAIN_SIZE	Tail	Frame check
Frame (Ex.)	ACK	H01	P(p)	UN	00012345	ETX	BCC
ASCII value	H06	H3031	H50(70)	H444E	H3030303132333435	H03	

✓ Surely perform upload command within 1 sec. after receiving PLC ACK response as a result of the execution of this command service, or start command will be invalid. Consequently, start command shall be executed again to upload again.

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	P(p)	UN	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H50(70)	H554E	Error code(4)	H03	

□ **Program upload command(PUX)**

This uploads the program data after initialization of program upload. This service must be performed within 1 sec. after program upload initialization service.

1) Request format(PC -> PLC)

Format / Name	Header	Station No.	Command	Command type	Frame No (HEX 2 Bytes)	Tail	Frame check
Frame (Ex.)	ENQ	H01	P(p)	UX	H0001	EOT	BCC
ASCII value	H05	H3031	H50(70)	H5558	H30303031	H04	

- ✓ Frame No. indicates the number of frame in current proceeding.
- ✓ Frame No. indicates the current frame number (4 Bytes) to be uploaded in the entire upload sequence. This number must be incremental in sequence until the upload finishes completely. Frame No. increases in sequence from 0001.
- ✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

2) Response format(for PLC of ACK response)

Format / Name	Header	Station No.	Command	Command type	Frame No (HEX 2 Bytes)	Number of data (HEX 1 Byte)	Data	Tail	Frame check
Frame (Ex.)	ACK	H01	P(p)	UX	H0001	H1A		ETX	BCC
ASCII value	H06	H3031	H50	H5558	H30303031	H3141		H03	

- ✓ Number of data indicates the number of data included in this frame.
- ✓ Number of data can be included up to 120 Bytes in one frame.
- ✓ For the last frame, frame No. is to be HFFFF(46, 46, 46, 46). If the last frame is responded, all upload processes are finished.
- ✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.
- ✓ If frame No. is not HFFFF after receiving this frame, the upload command shall be sent within 1 sec.

3) Response format(for PLC of NAK response)

Format　Name	Header	Station No.	Command	Command type	Frame No (HEX 2 Bytes)	Error code (HEX 2 Bytes)	Tail	Frame check
Frame (Ex.)	NAK	H01	P(p)	UX	H0001	H1132	ETX	BCC
ASCII value	H15	H3031	H50(70)	H5558	H30303031	H31313332	H03	

   ✓   Station number, commands, type of command, and frame No. are the same as in computer request format.

   ✓   BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

   ✓   Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error.

   ✓   If this response is received, re-start is required from the first with start command.

4) Example of use

In case frame No is 255 in station No.1.

(Computer request format)

Format　Name	Header	Station No.	Command	Command type	Frame No	Tail	Frame check
Frame (Ex.)	ENQ	H01	P(p)	UX	H00FF	EOT	BCC
ASCII value	H05	H3031	H50(70)	H5558	H30304646	H04	

   ✓   Frame No is indicated in HEX value.

(For PLC ACK response after execution of command) In case the number of data is H17.

Format　Name	Header	Station No.	Command	Command type	Frame No	Number of data	Sequence program data	Tail	Frame check
Frame (Ex.)	ACK	H01	P(p)	UX	H00FF	H17	H1055　40FA	ETX	BCC
ASCII value	H06	H3031	H50(70)	H5558	H30304646	H3137	H31303535 34304641	H03	

   ✓   If frame No. is not HFFFF, within 1 second after receiving this frame, the upload command must be sent with the current frame No. increased by 1.

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(For PLC NAK response after execution of command)

Format \\ Name	Header	Station No.	Command	Command type	Frame No	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	P(p)	UX	H00FF	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H50(70)	H5558	H30304646	Error code(4)	H03	

☐ **Domain(Program) Delete(PEN, PED)**

This command deletes Domain(Program) in PLC. This service is not to delete program contents simply but to set up a state where no program is in existence. To perform this service, PI shall be surely deleted first (via MDN command) in stopping state of PLC mode.

1) Request format(PC -> PLC)

Format Name	Header	Station No.	Command	Command type	DM_LEN	DM_NAME	Tail	Frame check
Frame (Ex.)	ENQ	H10	P(p)	EN(D)	H05	LGPLC	EOT	BCC
ASCII value	H05	H3130	H50(70)	H454E(44)	H3035	H4C47504C43	H04	

- ✓ If D(Default) has been used instead of N in command type, DM_LEN and DM_NAME are unnecessary.
- ✓ DM_LEN displays the number of Domain name's characters in the range of H01 - H10.
- ✓ DM_NAME shall specify Domain(Program) name up to HEX 8 Bytes which is currently saved in PLC. If the name is unknown, use 'P_DOMAIN'.
- ✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

2) Response format(for PLC of ACK response)

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (value)	ENQ	H01	P(p)	EN(D)	ETX	BCC
ASCII value	H05	H3031	H50(70)	H454E(44)	H03	

- ✓ Station number, commands, and type of command are the same as in computer request format.
- ✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from ACK to ETX is converted into ASCII, added to BCC, and sent.

3) Response format(for PLC of NAK response)

Format Name	Header	Station No.	Command	Command type	Error code(HEX 2 Bytes)	Tail	Frame check
Frame (Ex.)	NAK	H10	P(p)	EN	H1132	ETX	BCC
ASCII value	H15	H3130	H50(70)	H454E	H31313332	H03	

✓ Station number, commands, and type of command are the same as in computer request format.

✓ BCC : When command is one of lower case(p), only one lower byte of the value resulted by adding 1 byte each to ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.

✓ Error code is HEX and 2 bytes(ASCII code, 4 bytes), which indicates type of error.

4) Example of use

In case Domain name is set to PLC_pgm

(Computer request format)

Format Name	Header	Station No.	Command	Command type	DM_LEN	DM_NAME	Tail	Frame check
Frame (Ex.)	ENQ	H01	P(p)	EN	H07	PLC_pgm	EOT	BCC
ASCII value	H05	H3031	H50(70)	H454E	H3037	H504C435F52570676D	H04	

(For PLC ACK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Ex.)	ACK	H01	P(p)	EN	ETX	BCC
ASCII value	H06	H3031	H50(70)	H454E	H03	

(For PLC NAK response after execution of command)

Format Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	P(p)	EN	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H50(70)	H454E	Error code(4)	H03	

7.3 Dedicated communication master (communication between Cnets) Ver.2.0

7.3.1 Introduction

Dedicated communication master provides Function Block service for communication between Cnet I/F modules available only for Cnet Ver.2.0 or later. Dedicated mode in the former Cnet I/F modules than Ver.2.0 has only slave function, thus, for communication between GLOFA Cnets, one Cnet I/F module shall be set to user mode and the other shall be set to dedicated mode to define the frame in Frame Editor by setting the user mode station to master station and to additionally prepare program via SEND/RCV Function Block in GMWIN program inconveniently.

However, without user's additional protocol definition during the communication between GLOFA Cnets dedicated communication master function allows communication between Cnets using only Function Block for dedicated communication with master function added to dedicated mode and it has following characteristics.

❑ Master function added to dedicated mode slave function.

❑ Same mode switch in dedicated mode is used with Function Block added for master function.

❑ No need to prepare frame via Frame Editor after setting the dedicated mode. Communication is available by preparing program via dedicated communication Function Block in GMWIN.

❑ Programming available for each RS-232C/RS-422 channel.

❑ Cnet I/F module available for communication in dedicated mode slave can be used in a former module than Ver.2.0.

❑ Reading/Writing of continuous data of max. 110 bytes are allowed via one Function Block using Reading/Writing commands of continuous blocks of dedicated communication protocol.

❑ Service result can be checked via NDR/ERR output of Function Block.

❑ For communication with multi-stations in RS-422 channel, programming is necessary to allow communication in order in GMWIN program so to protect the crash error of data.

❑ All Cnet I/F modules operated as master/slave are set to dedicated mode.

❑ Module operated as master is allowed only for 1 station.[Note 1]

Remark
[Note 1] Only one station among Cnet I/F modules connected via dedicated mode must be set to master station. Namely, Function Block for dedicated communication shall be used only in one station. If several masters are applied, normal communication is unavailable due to data crash in communication line.

7.3.2 Function Block for dedicated communication

[Figure 7.15] shows Function Block used for dedicated reading/writing. Function Blocks for dedicated communication are classified into GM_RD to read data and GM_WR to write data of the other station.

[Figure 7.15] Function Block for dedicated communication
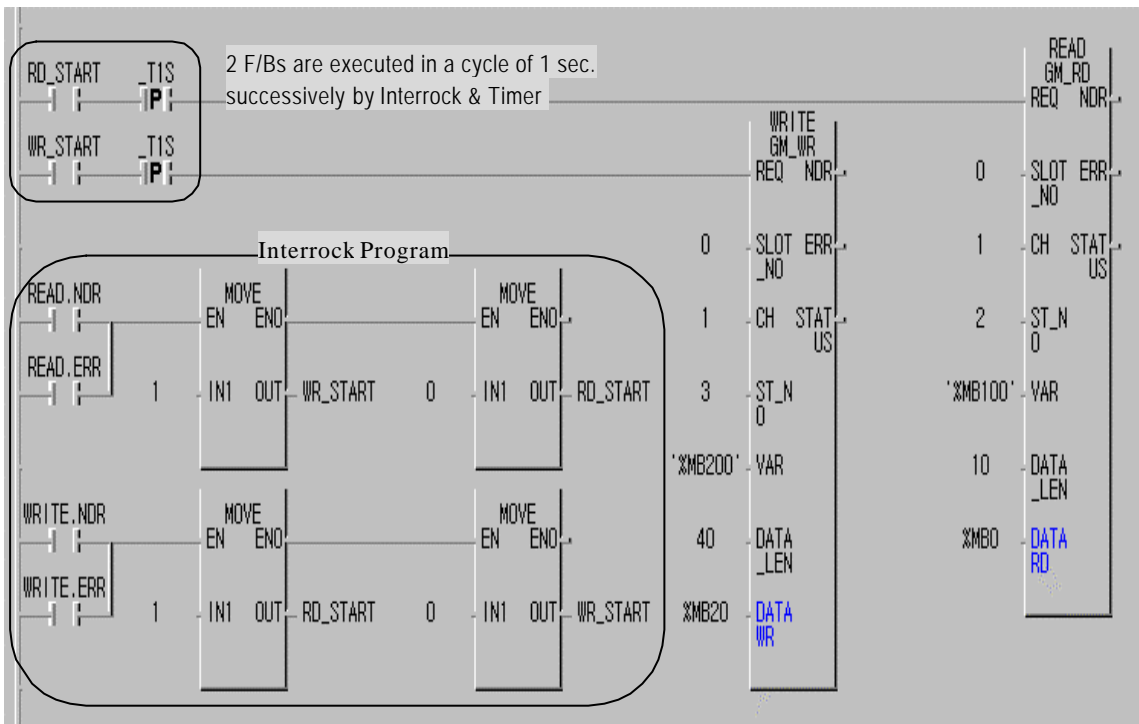
Figure above shows an example of Function Block for dedicated communication master function. Select COMMUNI.*fb in library selection dialog box shown as below to insert communication library in GMWIN project for Function Block service.
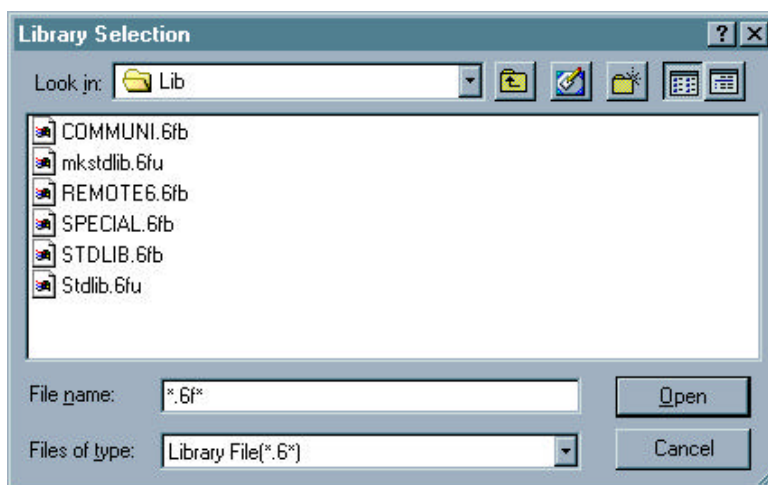
[Table 7.23] describes I/O specification of dedicated Function Block.

[Table 7.23] I/O specification of dedicated Function Block

Class	I/O	Type	Description
input	REQ	BOOL	Function Block starts service at rising edge (0 to 1). (If Function Block is in-service, alteration of 0 -> 1 may be ignorable)
	SLOT	USINT	Selects slot number of self station's Cnet I/F module to be transmitted to this Function Block.
	CH	UDINT	Specifies communication channel in Cnet I/F module to perform this service. (0 : RS-232C / 1 : RS-422)
	ST_NO	UDINT	The other station No. to communicate via this Function Block is input in decimal (0~31).
	VAR	STRING	Displays the other station's memory area to read or write via Function Block with the string characters input as surrounded by quotation mark. Max.16 characters can be input for direct variables while BYTE area only is available for the display. Ex.) '%MB100', '%QB20', '%IB50'.....
	data_LEN	USINT	Unit length of data to read or write is input. (Max. 110 Bytes)
	data_WR	USINT ARRAY	Specifies start address of local PLC in direct variable byte type where data to write to the other station is saved (used for GM_WR FB). Ex.) %MB40, %MB1000
	data_RD	USINT ARRAY	Specifies start address of local PLC in direct variable byte type where data to read from the other station is saved (used for GM_RD FB). Ex.) %MB40, %MB1000
output	NDR	BOOL	Turned On after the service is finished without error as kept On until the next Function Block is called.
	ERR	BOOL	Turned On when error occurs as a result of execution of the Function Block as kept On until the next Function Block is called. If ERR is set, error code is displayed on STATUS
	STATUS	USINT	Error code If ERR is 1. If NDR is 1, it is '0'

In dedicated Function Block, frame definition is unnecessary in Frame Editor differently from user defined mode and data of the other station can be read or written via only Function Block above, however, Cnet I/F module operated as a master station shall be surely of Ver.2.0 or later, though slave Cnet I/F module operated as the other station is of the former version. The other station No. shall be as specified via Frame Editor, if the station number is different, slave Cnet I/F

module does not respond.

7.3.3 How to use dedicated Function Block

Ex.1 describes how to communicate between Cnets via dedicated Function Block.

1) Example of use

Ex.1 describes how to program for communication between station 1 as master and 2 & 3 stations as slaves via RS-485 channel between Cnet I/F modules in the system configuration shown as in [Figure 7.16]. It is supposed that master station 1 reads/saves 10 bytes of %MB100 area data of station 2 to its %MB0 area, and reads/writes 40 bytes of data from its %MB20 to %MB200 area of station 3. Next is for this mapping data TX/RX.

Master station	Slave station	Class	Master area	Slave area	Data length
Station 1	Station 2	Reading	%MB0	%MB100	10 Bytes
Station 1	Station 3	Writing	%MB20	%MB200	40 Bytes

[Figure 7.16] RS-485 communication structure between Cnet I/F modules
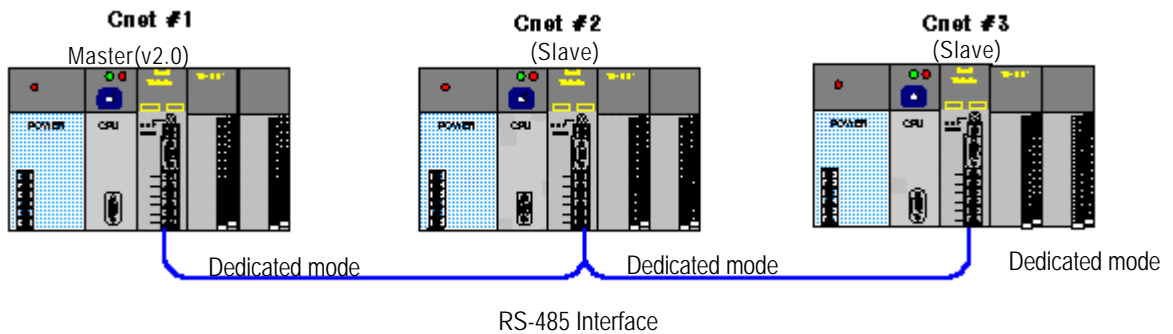
2) Basic setting items

[Figure 7.16] shows system configuration composed of RS-485 multi-drops between Cnets. For the system communication between Cnet I/F modules, RS-422 operation mode of 3 stations shall be set to dedicated mode with the stations numbers set to station No. 1,2,3 respectively as not repeated. Since all 3 stations are in communication via the same communication line, all basic parameters such as communication speed, data, stop bit, etc. shall be set identical. Next is basic setting items for communication between 3 stations.

Station No.	Cnet Ver.	Mode switch	Basic parameters	Master/Slave
Station1	Surely Ver.2.0	3(dedicated stand-alone mode)	RS-422 basic parameters of 3 stations shall be set identical	Master operation
Station2	Irrelevant to Ver.	3(dedicated stand-alone mode)		Slave operation
Station 3	Irrelevant to Ver.	3(dedicated stand-alone mode)		Slave operation

3) PLC programming

[Figure 7.17] shows communication program prepared by dedicated Function Block. GM_RD and GM_WR Function Blocks are so prepared as to be executed in order via interlock program and in a cycle of 1 second through 1 sec. timer to prevent communication overload.

[Figure 7.17] Dedicated Function Block program
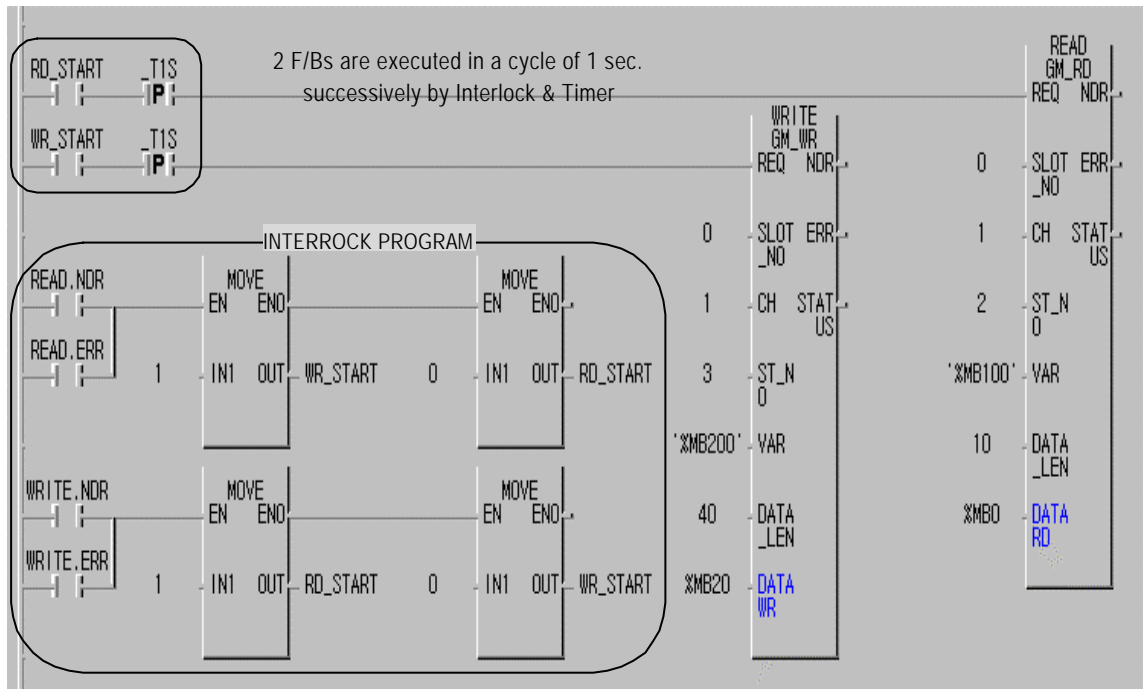
[Table 7.24] describes I/O setting values of Function Block in program of [Figure 7.17].

[Table 7.24] I/O variable setting of Function Block

Input name	GM_RD	GM_WR
REQ	After GM_WR FB operation is completed, let it started. Set 'RD_START' variable's initial value to '1' so for preparing start condition at first scan.	After GM_RD FB operation is completed, let it started.
SLOT_NO	0 : Input slot No. where LOCAL Cnet I/F module is mounted on.	
CH	1 : RS-422 channel	
ST_NO	2 : Other's station No.	3 : Other's station No.
VAR	'%MB100' : Area of the other station to read from.	'%MB200' : Area of the other station to write in.
DATA_LEN	10 : Data number to read (BYTE)	40 : Data number to write (BYTE)
DATA	%MB0 : RX data area of master station	%MB20 : TX data area of master station

✓ In program of [Figure 7.17], RD_START is a contact point to start READ F/B and is set after WRITE F/B is executed. An initial value of it is set to operate READ F/B at the first scan of program. WR_START is a contact point to start WRITE F/B and is set after READ F/B is executed to run WRITE FB. All two variables are allocated to auto-variables. After one dedicated Function Block is executed through the contact point and 1 sec. timer above, operation in order by the next Function Block is available in a cycle of I sec. 1 sec. timer is used to prevent unnecessary communication overload by setting the min. execution cycle of Function Block to 1 second. This timer is adjustable based on application conditions of user's.

✓ If program of [Figure 7.17] is downloaded to PLC set to master station, programming for 3 stations communication in [Figure 7.16] is completed. No need to prepare communication program or to set frame in slave PLC. Communication will be started if PLC program is switched to operation Run by setting Cnet I/F module to dedicated mode as connected with RS-422 cable. If communication is normal, NDR output of 'GM_RD' & 'GM_WR' Function Blocks is turned ON in accordance with the execution cycle of Function Block, and if communication is not normal, ERR output is ON with error code displayed on STATUS. [Table 7.25] describes error status according to output STATUS values in case error occurs. Refer to those actions to take to check for the cause of errors.

[Table 7.25] Error codes and Actions to take when dedicated F/B is executed

STATUS value(dec.)	Meaning	Action to take
10	No response from correspondent station.	1) Check setting of correspondent station No. 2) Check dedicated mode for operation of correspondent station. 3) Check communication basic parameters
17	Position of Cnet I/F module is incorrectly specified.	1) Check if SLOT_NO value is correct.
21	No response from Cnet I/F module	1) Check operation mode of local Cnet I/F module 2) Check channel No.
35	NAK from correspondent station has been received.	1) Check variable name (%MB,%QB,%IB – BYTE only available)
37	Input parameter setting is incorrect	2) Check data length

4) Why is the interlock program used

Slave station in dedicated mode responds to only one request at a time. Thus, even if later different request frame is received before an earlier request frame is processed by the slave station, the slave station dose not answer to the later request frame until the earlier request frame is processed. In case that several request frames are transmitted at the same time prior to the response of the slave, later request frames are ignored by the slave station causing data loss. [Figure 7.18] describes the principles of this operation.

[Figure 7.18] Example of data loss

Master station requests data in order to respond normally without data loss in slave stations.

If master station requests data continuously without waiting for the response of slave station, thus, parts of the request frames are lost in slave stations, normal response to No.3, 4 or 6 frame is impossible with data abandoned.
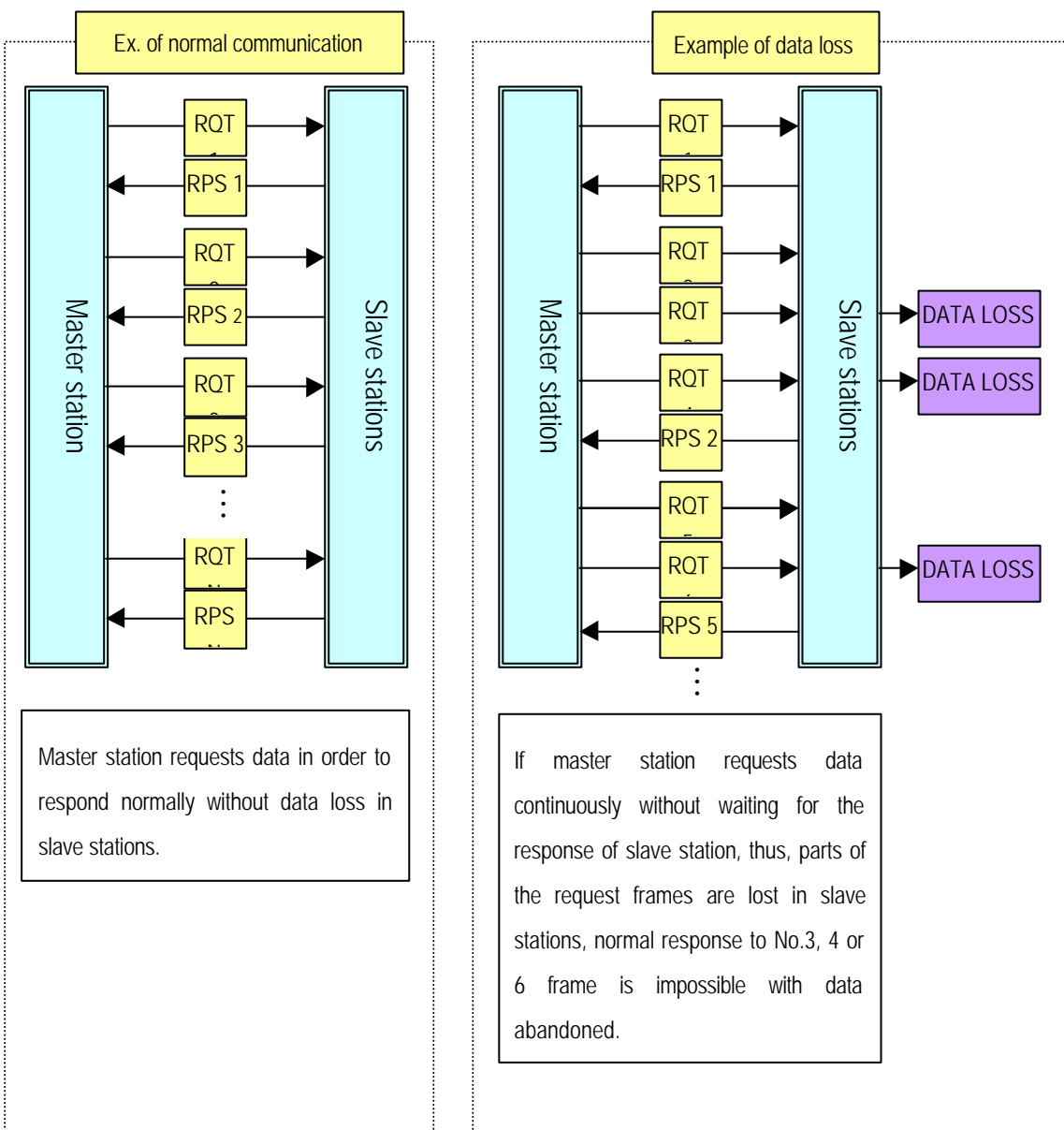
✓ In RS-422/485 communication system especially linked with many slave stations as in Ex.1, since transmission channels of slave stations are connected to receiving channel of master station via one line, normal transmission/receiving of data is impossible if orderly communication is not performed. Thus, surely prepare the program for master station to request orderly transmission/receiving of data. [Figure 7.19] describes the case that data crash occurs in multi-drop communication system. Because TX/RX lines of communication devices applied in communication share one communication cable as in the figure, normal communication can't be performed due to data crash if simultaneous transmission is applied by several stations. [Figure 7.19] shows an example of data crash in communication line when transmission is applied by slave stations 2 & 3 at a time.

[Figure 7.19] Data crash in multi-drop system
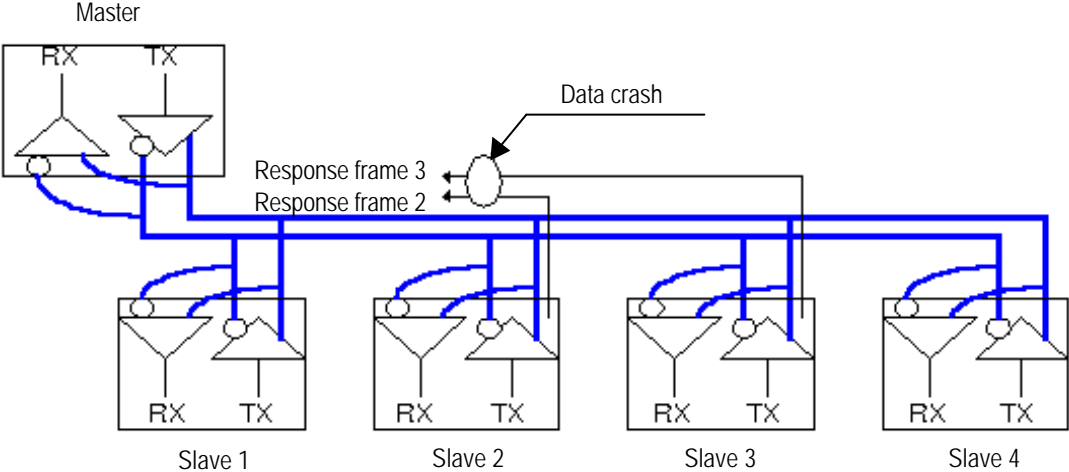
(a)Data crash in RS-485 system.

7.3.4 Dedicated communication master for G7L-CUEC

1) Introduction

This system can be configured easily by setting of basic parameters and communication parameters in GMWIN. Main functions are as follows.

❑ Setting of total 64 data access blocks and communication time-out interval of each block is available in a unit of WORD for input(I), output(Q) and internal memory(M) areas.

❑ Renews the flag related with operation mode and error code of slave PLC according to parameter setting.

❑ Renews the flag related with the number of TX/RX error and error code of each parameter.
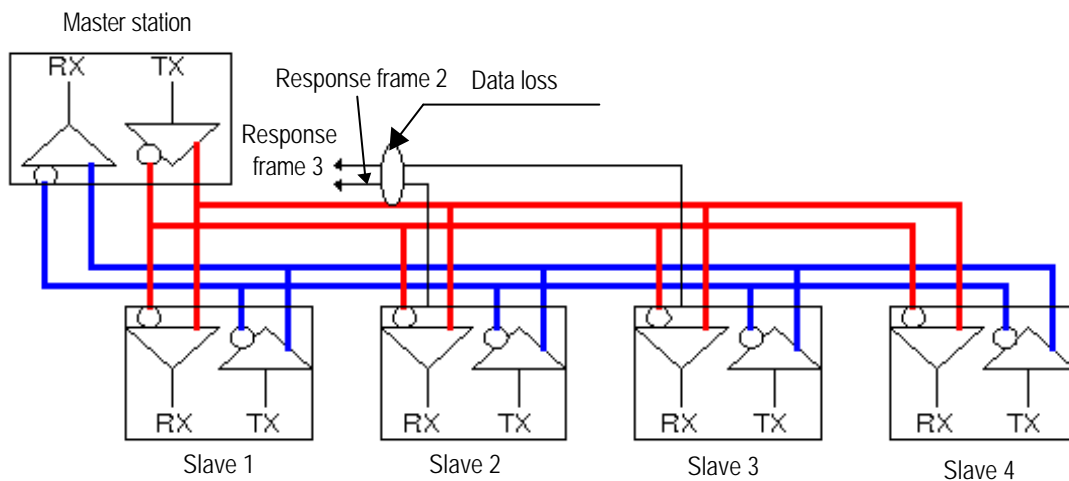
(b)Data crash in RS-422 system.

❑ Monitors communication status according to parameters through monitor function of GMWIN.

2) Parameter setting

A) Setting of communication parameters

❑ Open new project file in GMWIN.

✓ Select surely PLC type of GM7.

✓ Create new project files for master and slave respectively.

❑ Select communication parameter in GMWIN parameter and double-click on it to display the figure below.

❑ Setting contents as below.

Item	Setting contents
Self-station No.	Setting is available from 0 to 31 station.
Communication speed	1200, 2400, 4800, 9600, 19200, 38400 or 57600 bps can be set.
Data bit	7 or 8 Bits are available.
Parity bit	None, Even or Odd can be set.
Stop bit	1 or 2 Bits are available.
Communication channel	• RS232C null modem or RS422/485 : Channel to select for communication via built-in function of GM7 basic unit and Cnet I/F module(G7L-CUEC). • RS232C dedicated modem : Selected for dedicated modem communication via Cnet I/F module(G7L-CUEB). • RS232C dial-up modem : Selected for normal modem communication by telephoning to the other station via Cnet I/F module(G7L-CUEB). Note) RS232C dedicated modem and RS232C dial-up modem communication is available only in Cnet I/F module(G7L-CUEB) supporting RS232C, not in Cnet I/F module(G7L-CUEC) supporting RS422/485.
Time-out for master setting	• Waiting time for response frame after request frame is transmitted from GM7 basic unit set to master. • Default value is 500ms. • Setting shall be applied in consideration of the max.TX/RX period of master PLC. • If lower value than the max.TX/RX period is set, communication error may occur.
Dedicated master / slave	If set to master, writing/reading of data to GM7 basic unit set to slave are available.
Reading of slave status	In case GM7 basic unit status specified to slave is read. If not for monitoring of slave status specially, do not select it. It may cause communication speed to be decreased.

B) Setting of entry list

❑ Select master in dedicated item of protocol and tansmission mode in communication parameter to activate entry list button.

```
┌─ Protocol and Mode ─────────────────────────────────────────┐
│                        Timeout in Master Mode :   [ 500 ]  ms │
│                                                               │
│   Dedicated                                                   │
│      ⦿ Master     ☐ Read Status of Slave PLC      [  List  ] │
│      ○ Slave                                                  │
└───────────────────────────────────────────────────────────────┘
```
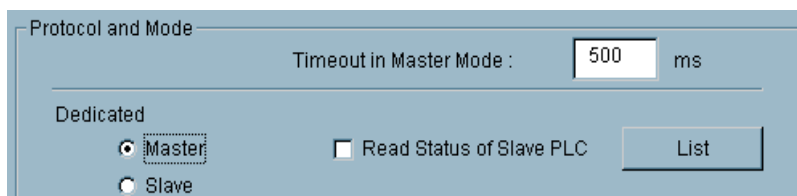
❑ Click on entry list button to display the screen below.

```
┌ Private1 ─────────────────────────────────────────── [×] ┐
│ ┌─ Entry List ──────────────────────────────────────────┐ │
│ │  No.   Type              Read Area  Store Area  Size  │ │
│ │  ┌────────────────────────────────────────────────┐▲ │ │
│ │  │0                                               │  │ │
│ │  │1                                               │  │ │
│ │  │2                                               │  │ │
│ │  │3                                               │  │ │
│ │  │4                                               │  │ │
│ │  │5                                               │  │ │
│ │  │6                                               │  │ │
│ │  │7                                               │  │ │
│ │  │8                                               │  │ │
│ │  │9                                               │  │ │
│ │  │10                                              │  │ │
│ │  │11                                              │  │ │
│ │  │12                                              │  │ │
│ │  │13                                              │  │ │
│ │  │14                                              │  │ │
│ │  │15                                              │  │ │
│ │  │16                                              │  │ │
│ │  │17                                              │  │ │
│ │  │18                                              │▼ │ │
│ │  │19                                              │  │ │
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│ │            [ Delete... ]  [ Copy... ]  [ Edit... ]   │ │
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│                             [ Close ]     [ Help ]        │
└───────────────────────────────────────────────────────────┘
```
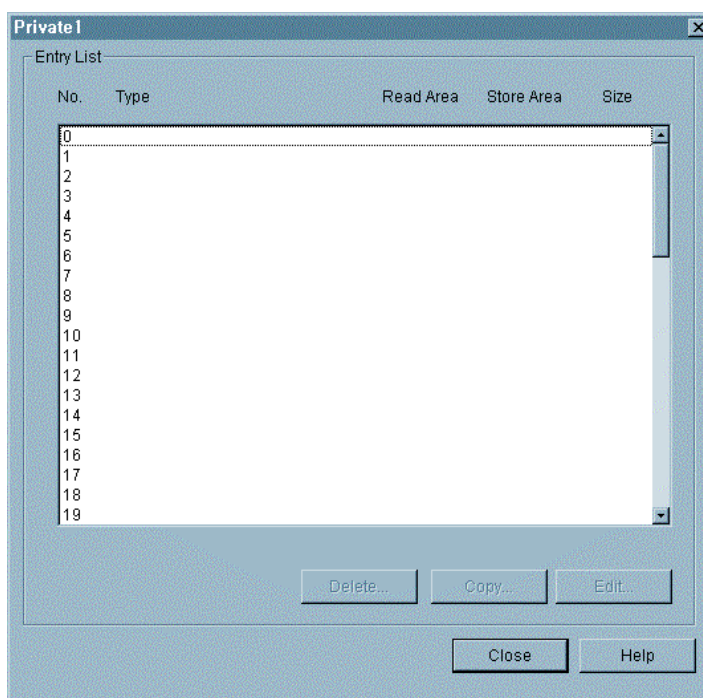
✓ Total 64 data blocks can be set without setting of block No.

✓ TX/RX data size can be set up to 60 WORDs without TX/RX period.

❑ Area setting

✓ Transmission : Area to read I/Q/M, Saving area Q/M

✓ Receiving   : Area to read I/Q/M, Saving area Q/M

❑ The screen below shows altered items of private 1.
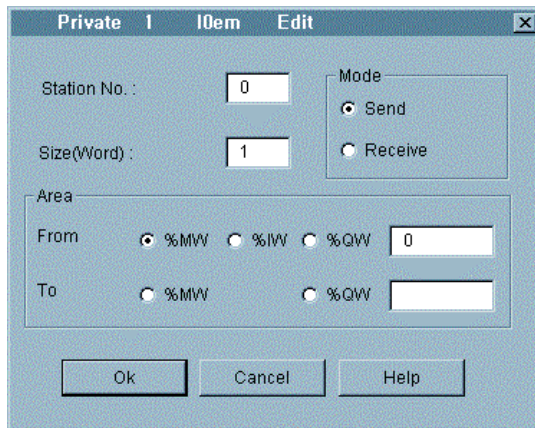
✓ Other's station No. : Set slave (other station) station No.

✓ Mode : Let Send checked to write data in slave station.

Let Receive checked to read data from slave station.

✓ Size : Unit is WORD with max.60 WORDS available for the definition of data size to read/write in master station.

✓ Area

Class	Send mode	Receive mode	How to enter
Area to read	Area in master station where data to write is saved.	Area in slave station to read data.	· To select %MW0 : Select %MW and input '0' in the next blank space.
Saving area	Area in slave station to write data.	Area in master station where data read is saved.	· To select %QW0.1.0 : Select %QW and input '0.1.0' in the next blank space.

3) **Setting of Communication Enable**

For dedicated communication master after communication parameter setting and programming, connect surely GM7 basic unit which is set to master station with GMWIN to execute 'Connect' from menu 'Online(O)' and then specify again 'Communication Enable Setting' from menu 'Online(O)'.

Connect+Write+Run+Monitor On Ctrl+R	Connect+Write+Run+Monitor On Ctrl+R
Connect	Connect
Disconnect	Disconnect
Read...	Read...
Write...	Write...
Monitor ▶	Monitor ▶
Mode Change ▶	Mode Change ▶
Data Clear...	Data Clear...
Reset ▶	Reset ▶
Flash Memory ▶	Flash Memory ▶
Communication Enable(L)...	**Communication Enable(L)...**
PLC Info. ▶	PLC Info. ▶
I/O Info...	I/O Info...
I/O Forcing ▶	I/O Forcing ▶
Link Info...	Link Info...
Comm Info...(Y)	Comm Info...(Y)
Mnet Parameter...	Mnet Parameter...
Mnet Info...	Mnet Info...
I/O Skip(K)...	I/O Skip(K)...
Fault Mask...	Fault Mask...
Initialize Special Modules...	Initialize Special Modules...
Start Online Edit(Q)	Start Online Edit(Q)
Write for Online Edit(V)	Write for Online Edit(V)
Cancel Online Edit(U)	Cancel Online Edit(U)
Data Share(X)...	Data Share(X)...

4) Operation status related flag

A) TX/RX error count per station No. (Total 32stations)

❑ Flag name : _MRS_ERR_CNT[n] (n = 0 ~ 31)

❑ Data type : Array byte

❑ Contents : Number of errors is renewed per station No.

In other words, the number of TX/RX errors to station 0 is renewed in _MRS_ERR_CNT[0] and

the number of TX/RX errors to station 31 is renewed in _MRS_ERR_CNT[31].

B) (Total 32 stations) Contents of TX/RX error

❑ Flag name : _MRS_ERR[n] (n = 0 ~ 31)

❑ Data type : Array byte

❑ Contents : Error code 1 : Exceeded response time error to TX/RX.

Error code 2 : Error for NAK

C) (Total 32 stations) Mode and error contents of slave PLC

❑ Flag name : _SRS_STATE[n] (n = 0 ~ 31)

❑ Data type : Array byte

❑ Contents: 0 Bit : Error status of PLC set to slave (error: 1, normal: 0)

1-3 Bits : Reserved

4-7 Bits : Operation mode of PLC set to slave

4 Bits: STOP

5 Bits: RUN

6 Bits : PAUSE

7 Bits : DEBUG

D) Status flag of master PLC side

❑ Flag name : _MRS_STATE25

❑ Data type : Array byte

❑ Contents: 2 Bits : M area exceeded in communication parameter setting

E) Max.& Min. & Current cycles of TX/RX of parameter setting

❑ Flag name : (Time Type) _MRS_SCAN_MAX

(Time Type) _MRS_SCAN_MIN

(Time Type) _MRS_SCAN_CUR

❑ Contents: Time elapsed from prior transmission of the first set parameters until the next transmission.

7.4 Other company's dedicated mode Ver.2.0

7.4.1 Introduction

Other company's dedicated mode enables user to communicate with other company's devices by having the most useful protocol as selected among communication protocols used in industrial devices built in GLOFA PLC Cnet I/F module without preparing additional communication program, which is added in Ver.2.0. Asynchronous Link Full Duplex Protocol for serial communication made by AB(ALLEN-BRADLEY) and MODBUS ASCII/RTU Protocol made by MODICON PLC among other company's protocols are supported in Cnet Ver.2.0. Other company's dedicated communication driver supports only server function without master operation available. [Figure 7.20] shows an example of system configuration for communication in other company's dedicated mode. Cnet I/F module operates as a server and executes response function to data request from higher PC or DCS when in AB or MODBUS's dedicated mode communication as shown in the figure.

[Figure 7.20] Example of communication system in other company's dedicated mode
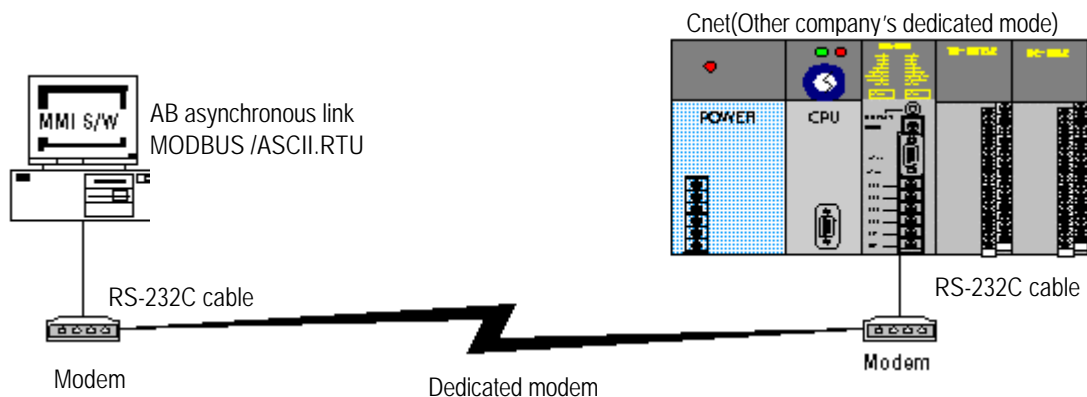
Other company's dedicated mode has the following features.

❏ AB Asynchronous Link Full Duplex protocol supported.

❏ MODBUS ASCII/RTU protocol supported.

❏ Other company's communication driver can be used as downloaded in Frame Editor.

❏ Other company's dedicated mode can be set in On-line mode,.

❏ Operation available for RS-232C/RS-422 in stand-alone or interlocking mode.

❏ Operation available always as a server, however, unavailable as a master.

❏ PLC programming is unnecessary.

❏ Extension available for protocols which will be added in future.

❏ Access available to %M area of direct variable area in PLC.

7.4.2 Operating mode & downloading of communication driver

1) **Type of communication drivers**

   Other company's dedicated mode can be set by mode change from On-line mode of mode switch '9' via Frame Editor to other company's dedicated mode, and can be operated via AB Asynchronous Link Full Duplexor MODBUS protocol by downloading of communication driver file to Cnet I/F module. Communication driver file as an OS file to perform operation of specified protocol among other company's dedicated modes is to download just one Cnet I/F module for the service. Communication driver is saved in Cnet I/F module's built-in flash memory as kept even if powered OFF. Communication drivers are classified as specified in Table 7.26] according to protocol type and Cnet I/F module type with extension name of *.LIB.

   [Table 7.26] Type of communication drivers

File name	Description	Applicable module
AB34.LIB	AB Asynchronous Link Full Duplex communication driver	G3L-CUEA/G4L-CUEA
AB6.LIB		G6L-CUEB/G6L-CUEC
MODBUS34.LIB	MODBUS ASCII/RTU communication driver	G3L-CUEA/G4L-CUEA
MODBUS6.LIB		G6L-CUEB/G6L-CUEC

   Communication driver file agreed with the service shall be downloaded, however, the number of downloads is not restricted. In other words, a module used in AB Asynchronous Link Full Duplex can be used in MODBUS communication mode if MODBUS communication driver has been downloaded.

2) **How to download communication driver**

   Correspondent communication driver file is to be downloaded for the service in other company's dedicated mode as selected among the files in [Table 7.26]. If incorrect file is selected and downloaded, normal operation of Cnet I/F module isn't allowed. Next is how to download other company's communication driver via Cnet I/F module.

   A) If Cnet mode switch is set to Write flash mode and then PLC is powered on, LED No.'0' of Cnet I/F module flashes in a cycle of 1sec.

B) If 'Open library file' menu is selected from higher file menu after On-line connection with Frame Editor executed, the following screen to Open library file is displayed, where applicable directory and desired LIB file is selected to display information about the applicable file in File Information. The figure below shows the case that AB34.LIB file is selected.
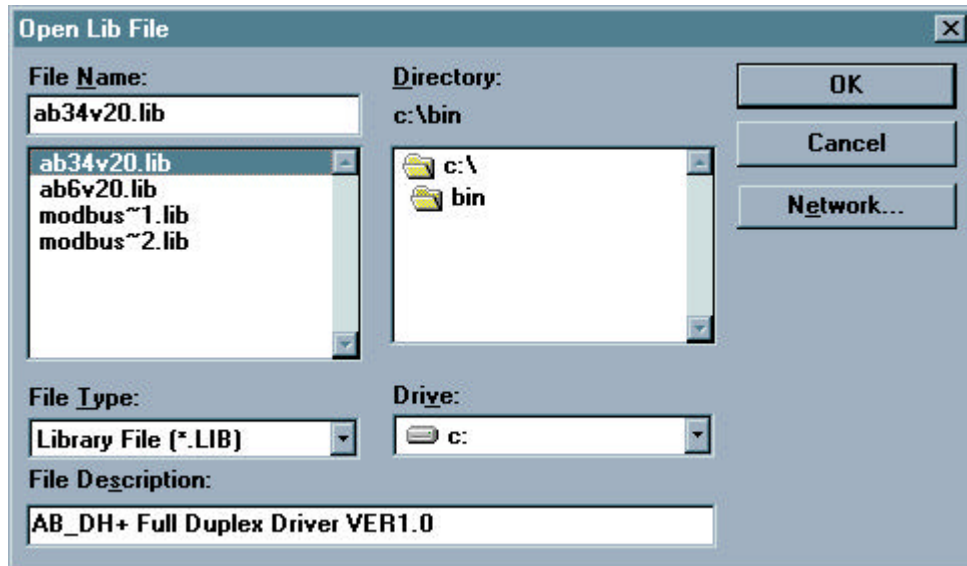
C) Select AB34.LIB file in the figure and then click on OK.

D) Select Write flash memory from sub-menu of flash memory in On-line menu of menu bar to display the following screen to Write library, where slot number Cnet I/F module is mounted on is to be selected and Write button is to be selected to download library selected to flash memory.
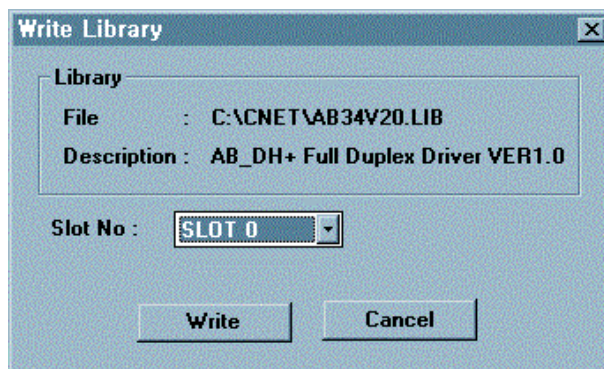
Remark

[Note 1] Do not operate program such as escaping from Frame Editor while downloading to flash memory or from Windows program, nor let PC or PLC powered off. If OS data of flash memory is once damaged, normal operation of Cnet I/F module is unavailable. A/S shall be requested in this case.

E) If library writing is completed, the following message will be displayed.
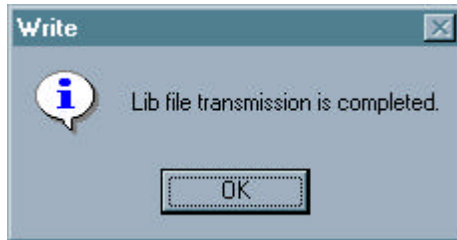
F) If the message below is displayed, check operation mode or slot number in Cnet I/F module.
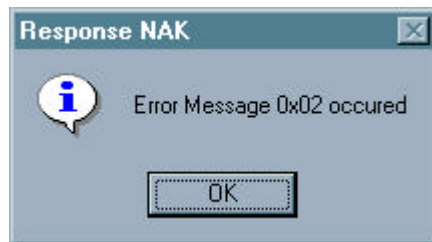
G) If library writing has been previously established, library file information of Cnet I/F module can be read. Select Read flash memory of sub-menu in flash memory from on-line menu of menu bar to display the following screen where to read flash memory information. Herein, select applicable slot and library and then press Read to check the type and the version of driver downloaded in Cnet I/F module.
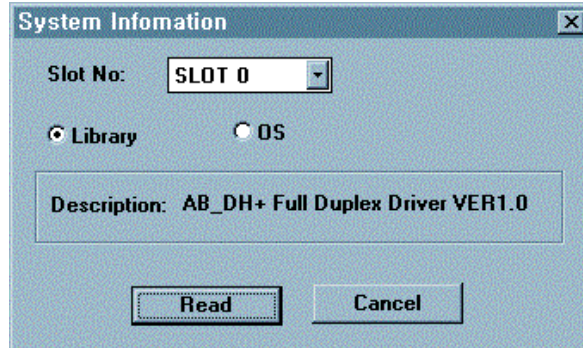
3) **How to set other company's communication mode**

A) Release On-line connection and let PLC powered off after library writing to Cnet I/F module is completed.

B) Change Cnet I/F module's mode switch to No. 9 On-line mode and then let PLC powered on for On-line connection.

C) Select On-line mode change from On-line menu of menu bar to display the following screen for On-line mode change, where other company's dedicated mode for RS-232C or RS-422 channel is to be set and then channel operation and connection steps are to be exactly selected with Write button clicked on to complete mode change and to start operation in other company's dedicated mode. if set to stand-alone mode Other company's dedicated mode can be operated separately for RS-232C / RS-422 channel with the individual operation available according to selected mode.
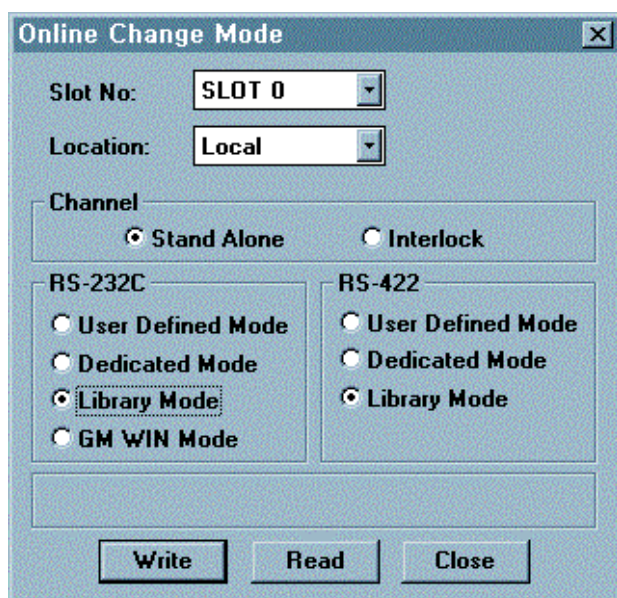
D) In case that operation is switched to other company's dedicated mode, if LED No.0,1,2 of Cnet I/F module is On and LED No.15 (No.7 in Gm6 Cnet) flashes in a cycle of 1 sec., library has not been downloaded to flash memory. Check if communication driver is downloaded.

E) In normal running, set and write basic parameters such as station No., communication speed, etc.

F) Now the operation in other company's dedicated mode is completed as ready to enable communication in other company's dedicated mode via cable connection with applicable channel.

G) Because other company's dedicated mode is to be operated as a slave only like dedicated mode, it just responds to request of master station.

H) Other company's communication mode can perform communication via %M direct variable area of GLOFA-PLC. Since address MAPPING used in service depends on type of communication driver, please refer to protocol communication spec. for that.

7.4.3 Specifications of A.B communication driver

It is communication specifications for communication via AB Asynchronous Link Full Duplex protocol through GLOFA PLC of Cnet Ver. 2.0 set to other company's dedicated mode for the service.

❑ Operation of AB Asynchronous Link protocol is available only in Cnet I/F module Ver.2.0 or later.

❑ Cnet I/F module operates as a server only, so client operation is unavailable.

❑ Cnet I/F module supports AB Asynchronous Link Full Duplex protocol.

❑ Cnet I/F module uses AB PLC-5 commands set.

❑ AB34.lib/AB6.lib files shall be downloaded to Cnet I/F module for AB protocol operation.

❑ Operation mode of Cnet I/F module is to be set to other company's dedicated mode in On-line mode.

❑ Basic parameters such as communication speed, station No., etc shall be set as agreed with the communication specification of MMI devices via Frame Editor.

❑ Separate operation for each RS-232C/RS422 channel is available.

1) Basic specification

❑ AB Asynchronous Link Full Duplex(DF1) protocol supported(Server only supported)

❑ Character protocol : Start/Stop/Data/Parity setting available(using Frame Editor)

❑ Communication speed : 300 ~ 38400 BPS available

❑ Channel operation : Stand-alone/Interlocking operation available for RS-232C/RS-422 channels

❑ Communication mode : HEX communication

❑ Frame check: BCC 1 byte(complement of double the sum data except for message start/end symbols)

❑ Station No.area : 0 ~ 31 station available

❑ Command supported : AB PLC-5 commands set compliant

❑ Max. data length : 110 bytes

2) Cnet supported control code

[Table 7.27] Control code for AB Asynchronous Link service

Symbol	Type	Meaning
DLE STX	Control	Transmission station's message start symbol
DLE ETX BCC/CRC	Control	Transmission station's message end symbol
DLE ACK	Control	Receiving station's receiving success symbol
DLE NAK	Control	Receiving station's receiving failure symbol
DLE ENQ	Control	Transmission station's re-transmission request symbol of response frame
APP data	Data	User data value between 00~0f and 11~ff
DLE DLE	Control	Means HEX data of 0x10(one DLE may be ignored)

3) Cnet supported PLC-5 Family Command

Cnet's AB Asynchronous Link communication driver supports 4 AB PLC-5 commands among PLC-5 commands necessary for communication with GLOFA-PLC. The following table describes the commands supported in Cnet AB Asynchronous Link communication driver.

[Table7.28] Cnet I/F module supported PLC-5 Command set

Message:	CMD	FNC	Meaning
Word Write Range	0f	00	Block Word data writing
Word Read Range	0f	01	Block Word data reading
Read Modify Write	0f	26	Bit data writing
Diagnostic Status	06	03	Self-diagnosis reading

Other commands than described in [Table7.28] shall not be used as not responded in Cnet I/F module.

4) Response status code to commands

If the response is in error , Cnet I/F module sends error response and transmits error code to EXT STS area. [Table7.29] shows error codes in error response.

[Table7.29] Error codes in AB Asynchronous Link

STS Code	EXT STS Code	Meaning
0xF0	0x7	File is too long
	0x9	Data or file is too large
	0xA	Transaction size plus word address is too large
	0x11	Illegal data type
	0x12	Invalid parameter or invalid data

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5) **GLOFA PLC Address Mapping**

Direct variable areas of GLOFA PLC are %M, %Q and %I areas. AB Asynchronous Link communication driver has access to 2K-bytes of %M area which is an internal memory area, and B3 area & N7 area of AB PLC-5 are mapped to %M area. Only Bit area, B3 and Integer area, N7 among PLC-5 file types are accessible. Because bit command is mapped to %MX area and word command is to %MW area, access to different area is not allowed. [Table4-30] describes data memory mapping between AB PLC-5 and GLOFA PLC.

[Table 7.30] GLOFA PLC Address Mapping of AB communication driver

Type	AB PLC-5 Address	GLOFA-PLC Address	Support	Remark
Output	O:xxx(xxx is octal)	Not Available	NO	Not supported in AB communication driver.
Input	I:xxx(xxx is octal)	Not Available	NO	
Bit	Word: B3:xxx ⟺	%MWxxx	YES	xxx = 0 ~ 999(Word value) yy = 0 ~ 15 (Bit value)
	Bit: B3:xxx/yy ⟺	%MWxxx.yy		
Integer	N7:xxx ⟺	%MWxxx	YES	
Added file for extension	File number (9 ~ 999)	Not Available	NO	Not supported in AB communication driver.

Remark

[Note 1] In Cnet I/F module, access to other areas than Bit & Integer areas of AB PLC-5 is not allowed. Error is responded to the other areas than set to support allowed in the table.

As described in [Table 7.30], AB PLC-5 B3 area & N7 area are mapped together in %MW area of GLOFA PLC. Namely, AB PLC-5 B3 : 0 area & N7 : 0 area are mapped in %MW0 area of GLOFA PLC in the range of %MW0 ~ %MW999 which is the range of B3/N7areas of AB PLC-5. [Figure 7.21] describes GLOFA-PLC address mapping for WORD area.

[Figure 7.21] WORD area mapping of AB communication driver

AB PLC-5 Address   GLOFA-PLC Address

B3:0		%MW0
B3:1		%MW1
:		:
:		:
B3:998		%MW998
B3:999		%MW999

| N7:0 |
| N7:1 |
| : |
| : |
| N7:998 |
| N7:999 |
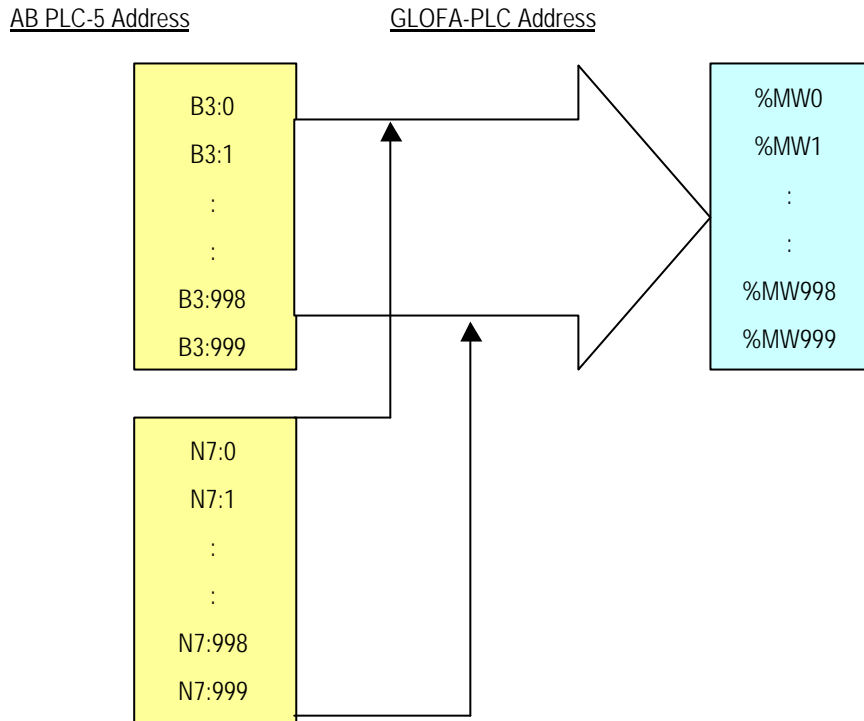
[Figure 7.22] describes mapping of GLOFA PLC and AB communication driver for access to BIT area.

[Figure 7.22] MAPPING BIT area of AB communication driver

AB PLC-5 Address   GLOFA-PLC Address

B3:0/00		%MW0.00
B3:0/01		%MW1.01
:		:
:		:
B3:999/14		%MW999.14
B3:999/15		%MW999.15
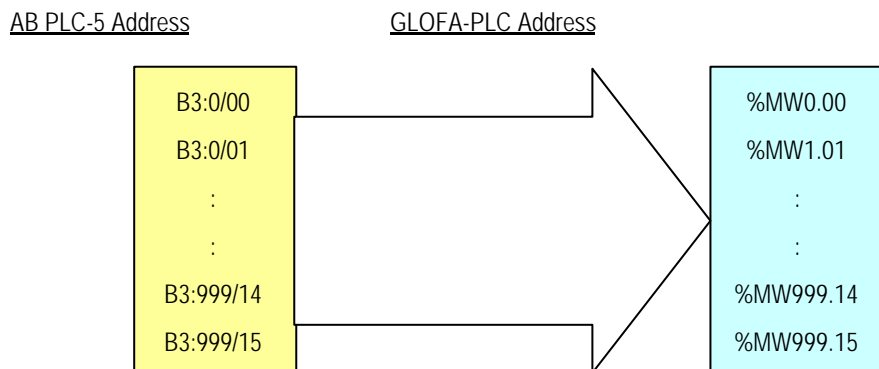
As shown in [Figure 7.21] & [Figure 7.22], access to BIT area and WORD area of GLOFA PLC via AB communication driver is available in the range of %MW0 ~ %MW999 for WORD area and %MW0.0 ~ %MW999.15 for BIT area.

Remark
[Note 1] In Cnet I/F module, access to other areas than Bit & Integer areas of AB PLC-5 is not allowed. Error is responded to the other areas than set to support allowed in the table

Because B3 area & N7 area of AB PLC-5 mean the same %M area in GLOFA PLC, access to repeated area may be applied.

Ex.) B3:100 = %MW100, N7:100 = %MW100 (same area in GLOFA-PLC)

7.4.4 Specifications of MODBUS communication driver

It is communication specifications for communication via MODBUS protocol through GLOFA PLC of Cnet Ver. 2.0 set to other company's dedicated mode for the service. Application of MODBUS communication in Gm7 series from other models of Cnet I/F modules. Please refer to **8.3 MODBUS protocol communication in GM7 series manual** for details.

❑ MODBUS communication function is available only in Cnet I/F module Ver.2.0 or later.

❑ Cnet I/F module operates as a server only in MODBUS, however, client operation is unavailable.

❑ For MODBUS operation, download MODBUS.lib file first to Cnet I/F module via Frame Editor.

❑ Operation mode of Cnet I/F module is to be set to other company's dedicated mode.

❑ ASCII/RTU modes among MODBUS protocols are supported simultaneously.

❑ Basic parameters such as communication speed, station No., etc shall be set as agreed with the communication specification of external devices.

❑ Separate operation for each RS-232C/RS422 channel is available.

1) Basic specification

❑ Character protocol: Start/Stop/Data/Parity setting available(using Frame Editor)

❑ Communication speed : 300 ~ 38400 BPS available

❑ Channel operation : Stand-alone/Interlocking operation available for RS-232C/RS-422 channels.

❑ Communication mode: HEX communication(RTU Mode), ASCII communication(ASCII Mode)

❑ Frame check: CRC check(RTU Mode), LRC check(ASCII Mode)

❑ Station No.area : 1 ~ 31 station available (station 0 unavailable)

❑ Data length : Reading/Writing of max.120 bytes available.

❑ ASCII mode : Communication via ASCII data.

- Error check through LRC

- Frame structure(ASCII data)

Type	Start (:)	Address	Function	Data	LRC	End(CR LF)
Size	1 byte	2 bytes	2 bytes	n bytes	2 bytes	2 bytes

❑ RTU mode : Communication via HEX data.

- Error check through 16 bit CRC

- Frame structure(HEX data)

Type	Start	Address	Function	Data	CRC	End
Size	T4 idle	1 byte	1 bytes	n bytes	2 bytes	T4 idle

2) **Cnet supported MODBUS Command**

Cnet's MODBUS communication driver supports reading/writing commands of Bit & Word areas among commands used in MODBUS Controller. [Table 7.31] describes the commands supported in Cnet MODBUS communication driver. Other function codes than described in [Table 7.31] are not responded to.

[Table 7.31] MODBUS communication driver supported function code

Function code	Name	Address [Note1]	GLOFA-PLC address mapping	Remark
01	Read Coil Status	0xxxx(bit-output)	%MX8~%MX9999	Bit Read
02	Read Input Status	1xxxx(bit-input)	%MX8~%MX9999	Bit Read
03	Read Holding Reg.	4xxxx(word-output)	%MW1~%MW4999	Word Read
04	Read Input Reg.	3xxxx(word-input)	%MW1~%MW4999	Word Read
05	Force Single Coil	0xxxx(bit-output)	%MX1~%MX4999	Bit Write
06	Preset Single Reg	4xxxx(word-output)	%MW1~%MW4999	Word Write
16	Presel Multi Reg.	4xxxx(word-output)	%MW1~%MW4999	Word Write

Remark

[Note 1] Address area of MODICON Controller has the range of 1~9999. Namely, standard of address start is set to '1, thus, %M area of GLOFA-PLC is mapped in MODBUS memory from %MW1. 1~9999 can be set in MODBUS, however, 1~4999 is available for %M area memory as of 10 K-bytes open to MODBUS in Cnet's MODBUS communication driver.

3) **GLOFA PLC Address Mapping**

Direct variable areas of GLOFA PLC are %M, %Q and %I areas. MODBUS communication driver has access to 10K-bytes(%MW1 ~ %MW4999) of %M area which is an internal memory area, and all areas of MODBUS are mapped to %M area. As for data type as agreed with function code of MODBUS Protocol, bit command is mapped to %MX area and word command is to %MW area, however, access to different area is not allowed.

If bit of MODBUS is read, namely, if Read Coil Status & Read Input Status are read, start address shall be started in a multiple of 8 (Ex. : 00008, 10008, 00016, 10048…). It is because communication module of GLOFA PLC dose not allow continuous reading of BIT address to direct variable. Continuous reading command of bit in MODBUS is processed as changed into reading command of byte block.

[Table 7.32] describes data memory mapping between MODBUS and GLOFA Cnet.

[Table 7.32] MODBUS communication driver supported function code

| MODICON controller address | | Address mapping | GLOFA-PLC Address | | Remark |
Name[Note 1]	Address[Note 2]		Device[Note 3]	Address[Note4]	
(0)Read Coil Status	8 ~ 9992	⟺	%MX	8 ~ 9992	Bit Read
(1)Read Input Status	8 ~ 9992	⟺	%MX	8 ~ 9992	Bit Read
(4)Read Holding Reg	1 ~ 4999	⟺	%MW	1 ~ 4999	Word Read
(3)Read Input Reg	1 ~ 4999	⟺	%MW	1 ~ 4999	Word Read
(0)Force Single Coil	1 ~ 9999	⟺	%MX	1 ~ 9999	Bit Write
(4)Preset Single Reg	1 ~ 4999	⟺	%MW	1 ~ 4999	Word Write
(4)Presel Multi Reg	1 ~ 4999	⟺	%MW	1 ~ 4999	Word Write

Remark

[Note 1] Figures in ( ) of each item are reference values of MODICON Controller.

[Note 2] For reading of Coil Status & Input Status, the address shall be set in a multiple of 8.

  (Ex.) 8, 16, 32, 8000 ➔ OK

      3, 5, 27, 9991 ➔ ERROR

[Note 3] All addresses of MODICON Controller are mapped in %MX / %MW areas of GLOFA-PLC causing repeated area.

(pay attention to setting)

  (Ex.) Read Holding Reg 100 ➔ %MW100 = Read Input Reg 100 ➔ %MW100 (same area)

[Note 4] Since start address of MODICON Controller is '1', access to GLOFA PLC '0' address is unavailable, however, access to addresses staring from 1 is available. As for Word areas, max.4999 addresses only are accessible.(10 kbytes)

7.5 GMWIN remote connection

7.5.1 Introduction

If PC executed by GMWIN is located far from GLOFA-PLC, remote PLC program can be controlled for download, upload, debugging, monitorering, etc. through GMWIN remote connection function of Cnet I/F module. Especially in case that GMWIN is located far away from PLC, PLC CPU can be conveniently accessible through telephoning, remote connecting and computer linked modem connecting functions in GMWIN via public line. Remote connection which is supported in Fnet, Mnet, Enet and Cnet of GLOFA PLC communication modules allows connection between networks to control remote PLC program via multi-steps connection conveniently. GMWIN remote connection via Cnet I/F module are available all for 2 cases of remote connection between Cnet I/F modules where GMWIN and PLC are directly connected via RS-232C and modem connection between GMWIN and PLC.

7.5.2 GMWIN remote connection

[Figure 7.23] shows an example of remote connection between GMWIN and PLC via modem. As shown in the figure, this structure is required for connection with PLC via phone line, dedicated line modem or wireless modem if GMWIN operated PC is located far from PLC. In this case, GMWIN shall be connected via direct modem with Cnet I/F module and the modem shall be set to connection type in connection option. Modem connection has two types of dedicated modem connection via dedicated line and dial-up modem connection via public line.

1)   Dial-up modem connection

[Figure 7.23] shows an example of dial-up modem connection. Dial-up modem connection is to connect dial-up modem with PC and Cnet I/F module via telephoning for remote connection through added function services to start/stop phone call. Namely, make a phone call first in GMWIN to apply remote connection after phone is connected, via PC linked modem of external or internal dial-up type, and via external modem for Cnet side.

Refer to 4.4 How to connect to modem in this manual for selection of dial-up modem connected with module and connection/initial setting of dial-up modem of Cnet I/F module.

[Figure 7.23] Example of GMWIN remote connection via dial-up modem
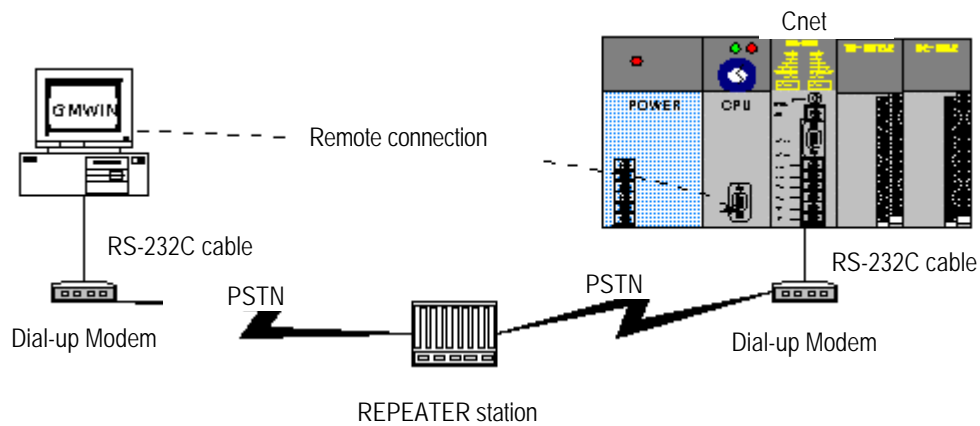
Remote connection sequence via dial-up modem is as follows.

A) Set operation mode of RS-232C channel in Cnet I/F module to GMWIN mode.

B) Set RS-232C channel operation of Cnet I/F module to dial-up modem and input modem initializing command. Run GMWIN program and select connection from project option to specify connection type.
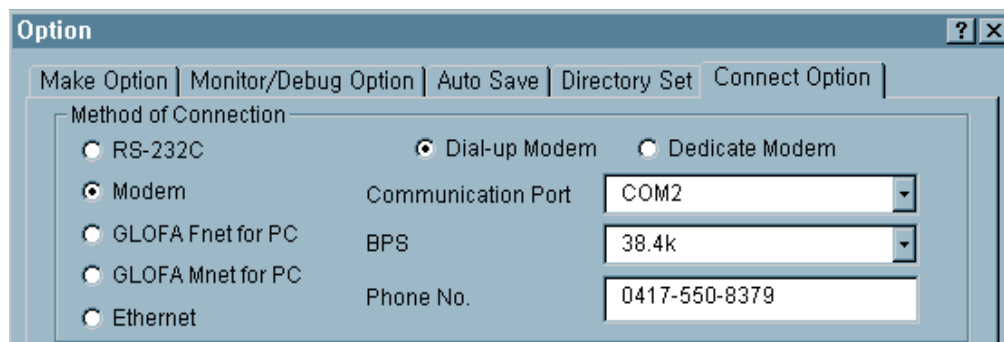
Set connection type to modem and dial-up modem, and communication port and transmission speed which are set in internal or external modem linked with PC. Communication speed as is related with dial-up modem performance shall be set similar to that of modem.

Remark

[Note 1] Communication speed set in connection option is not for that of modem but for that between PC and modem. Communication speed of modem means the communication speed between modems which is automatically set as agreed with the telephoning quality of public line and speed of the other station modem.

C) Phone number shall be input as of the number of modem side linked to Cnet. Extension No. and ',' are available if flowed out from local via the extension.

    (Ex.) If extension No. is '9' : Set to 9, 0343-398-xxxx.

Remark

[Note 1] If modem connected with Cnet I/F module which is set to the other station is via central exchanger, normal communication is unavailable. Namely, if separate extension No. is applied in receiving station, dial-up modem communication is not allowed.

D) Select Remote 1 of connection stages and set the station number. Number set in Cnet I/F module shall be input . Ver.2.0
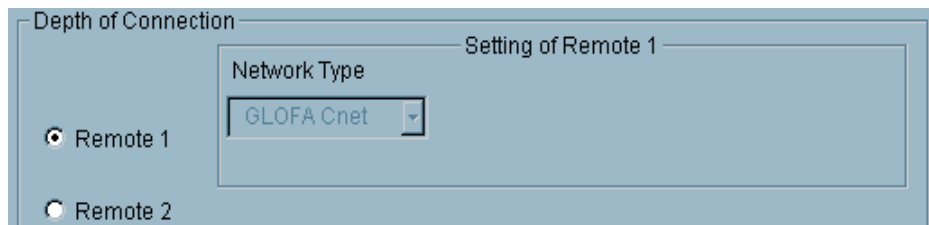
Remark

[Note 1] Station No. shall be input in Cnet Ver2.0 or later.

    In case of earlier Ver, setting of Station No is unnecessary Station No shall be set in frame editor

---

E) Select Connect in Online after connection option setting to display dialog box for modem initializing.
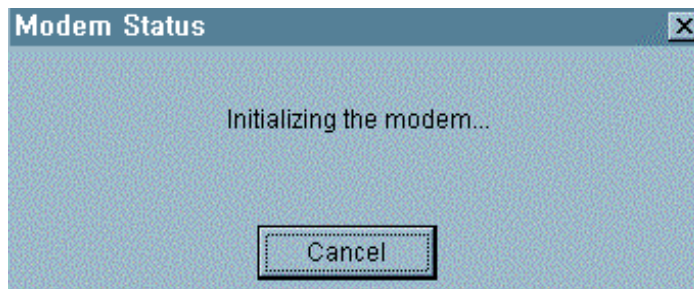
F) If COM port of modem is incorrectly set or connection with modem is abnormal, the following error message is displayed. In this case, inspect COM port or modem connection.
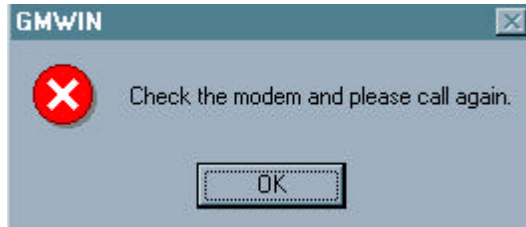
G) If telephoning is completed, GMWIN tries remote connection automatically and if remote connection is completed, program Write and Run/Stop icon menus are activated as below.

H) This means that remote 1 stage connection is completed just like the connection status that RS-232C cable is connected as moved, where all functions in On-line menu are available.

Remark

[Note 1] For application of GMWIN after remote connection, Online menu can be used as in local connection. Functions for program download/upload/monitor are available.

[Note 2] PLC control via modem depends much on modem performance and phone line status. If phone line is in deficient status, connection may be released. In this case, try re-connection not immediately but in approx. 30 seconds starting from (1).

H) To release connection in remote connection status, select Disconnect on On-line menu to display Disconnect menu box as in the figure below indicating Disconnected.

I) If connection is released , GMWIN hangs up the phone automatically to disconnect it.

J) If the phone is hung up normally, local and remote modem is restored to initial status to allow remote connection again via telephoning.

2) Dedicated modem connection

[Figure 7.24] shows dedicated modem connection between PC and Cnet I/F module via dedicated line, where Cnet I/F module can be set to dedicated modem without telephoning stage differently from dial-up modem.

[Figure 7.24] Connection diagram via dedicated modem
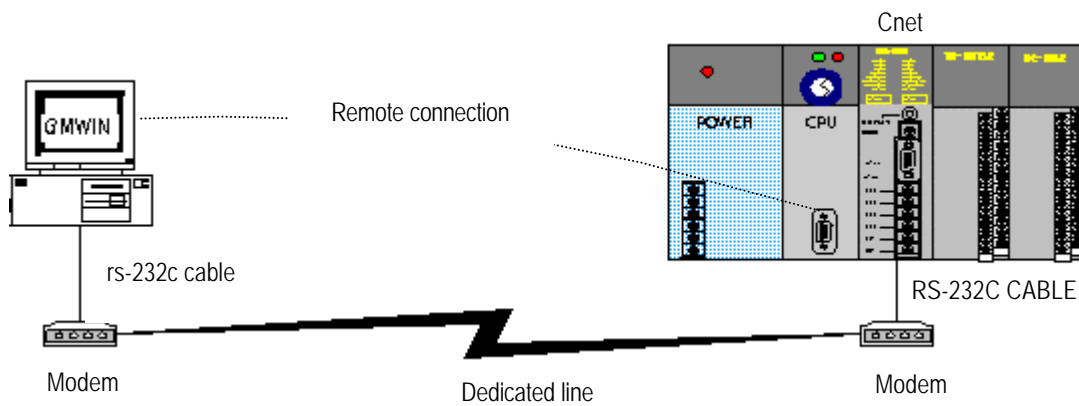
[Figure 7.24] shows an example of dedicated modem connection via dedicated line or wireless modem / optical modem available also. Modem without public line shall be set as in dedicated modem as follows. Refer to 4.4 How to connect to modem in this manual for selection of dedicated modem connected with Cnet I/F module and connection/setting of dedicated modem of Cnet I/F module.

Remote connection sequence via dedicated modem is as follows.

A) Connect dedicated modem between PC and Cnet I/F module.

B) Set RS-232C channel of Cnet I/F module to GMWIN mode.

C) Set RS-232C channel operation of Cnet I/F module to dedicated modem.

D) Run GMWIN program and select connection from project option to specify connection type. Set connection type to modem and dedicated modem, and communication port and transmission speed which are set in dedicated modem linked with PC. Communication speed shall be set same as in dedicated modem.
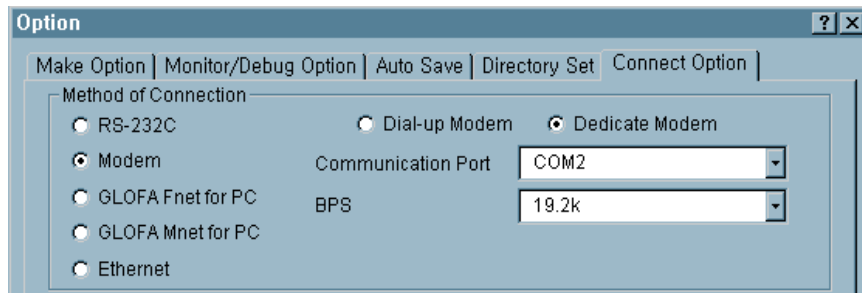
E) Select Remote 1 of connection stages.
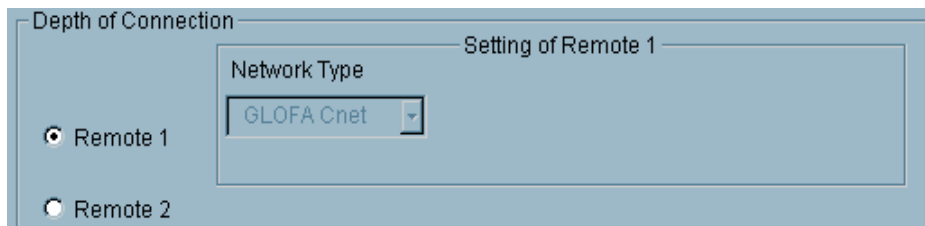
F) GMWIN tries remote connection and if remote connection is completed, the following screen is displayed.

G) This means that remote 1 stage connection is completed just like the connection status that RS-232C cable is connected as moved, where all functions in On-line menu are available.

H) To release connection in remote connection status, select Disconnect on On-line menu to display Disconnect menu box as in the figure below indicating Disconnected.

I) If connection is released normally, Cnet I/F module and GMWIN are changed to initial mode to allow re-connection when tried again starting from clause No.(1).

G) In addition to dedicated modem, optical modem and wireless modem also can be used equally for connection between GMWIN and Cnet, though communication medium between modems differs from each other.

7.5.3 Remote connection between Cnet I/F modules

[Figure 7.25] shows an example of remote connection to PLC located far away when GMWIN and local PLC are connected to CPU via RS-232C cable, and RS-232C channel of Cnet I/F module mounted on local PLC communicates with Cnet I/F module of remote PLC via dedicated modem. As shown in the figure, GMWIN can control remote PLC program via remote connection through modem communication function between Cnet I/F modules.

[Figure 7.25] Remote connection between Cnet I/F modules
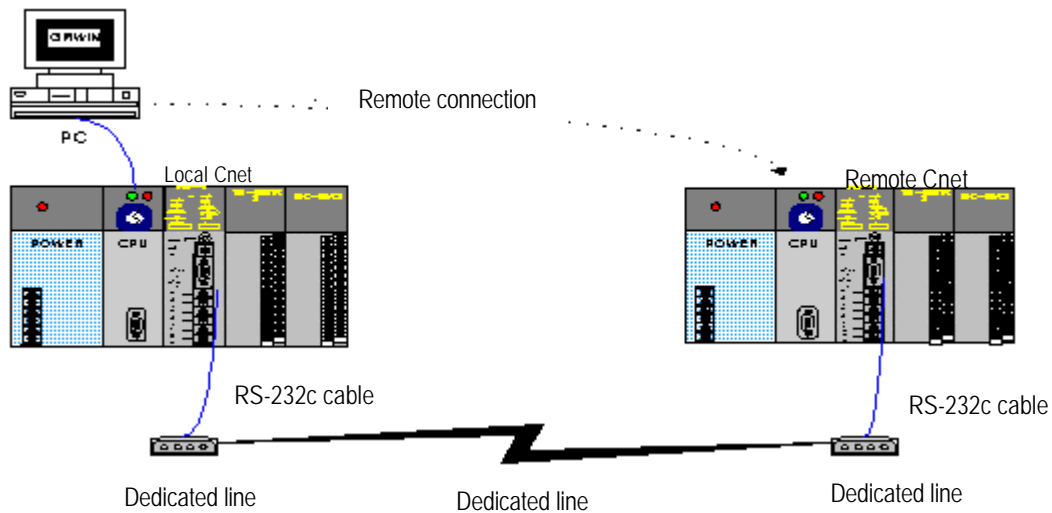
Remote connection via communication between Cnet I/F modules as in [Figure 7.25] is applied according to the following sequence.

    A) Set RS-232C channel operation of Cnet I/F module to dedicated modem.
    B) Set RS-232C channel of Cnet I/F module to GMWIN mode.[Note]

Remark

[Note 1] If both Cnets are of Ver.2.0 or later, operation mode of remote Cnet I/F module can be changed to GMWIN mode through On-line mode change function of Frame Editor. Refer to Chapter 5.6 for On-line mode change.

[Note 2] If Cnet I/F module is of Ver.2.0 or later and communication is in dedicated mode, no need to change to GMWIN mode. GMWIN connection is also available in dedicated mode.

C) Switch local connected PLC to stop mode.[Note]

Remark

[Note 1] If communication is overloaded, remote connection may fail. Surely switch PLC to STOP to stop communication
prior to remote connection.

D) Run GMWIN program and select connection type from project option to specify connection type. Select connection
type of RS-232C and communication port as in local connection.

```
Method of Connection
  ⊙ RS-232C
  ○ Modem              Communication Port    COM2          ▼
  ○ GLOFA Fnet for PC
  ○ GLOFA Mnet for PC
  ○ Ethernet
```
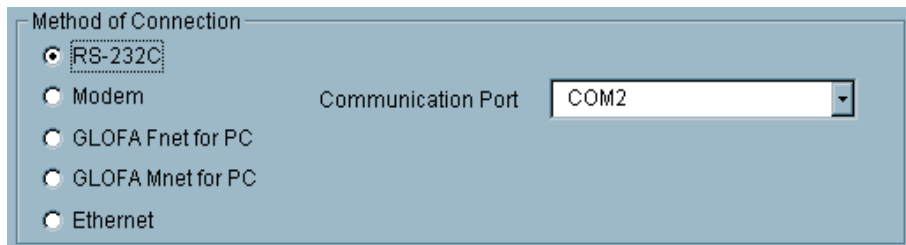
E) Select Remote 1 of connection stages and set Station No. Station No set in Cnet I/F module shall be input.
Remote Cnet is set No 22 in the figure below.
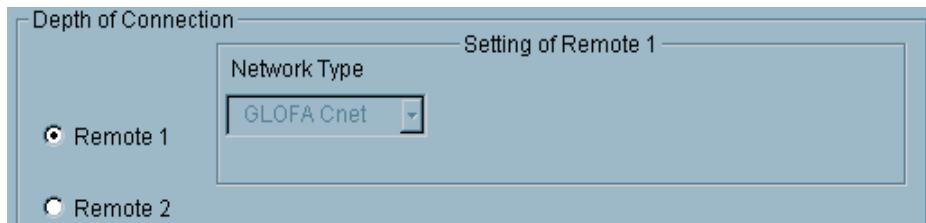
```
Depth of Connection
                                        Setting of Remote 1
                   Network Type
                   GLOFA Cnet    ▼
  ⊙ Remote 1

  ○ Remote 2
```


Remark

[Note 1] Station No shall be input in Cnet Ver2.0 or later.
In case of earlier Ver, setting of Station No is unnecessary Station No shall be set in frame editor

---

F) GMWIN tries remote connection and if remote connection is completed, connection completed message is displayed
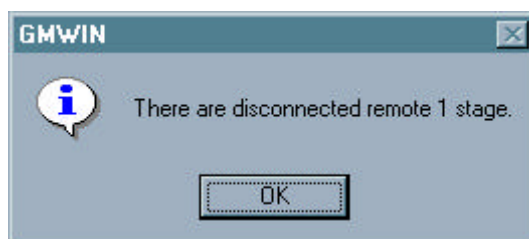as below.

G) This means that remote 1 stage connection is completed just like the connection status that RS-232C cable is
connected as moved, where all functions in On-line menu are available.

<div style="border:1px solid black; padding:10px;">

Remark

[Note 1] For application of GMWIN after remote connection, On-line menu can be used as in local connection. Functions for program download/upload/monitor are available.

[Note 2] PLC control via modem depends much on modem performance and phone line status. If phone line is in deficient status, connection may be released. In this case, try re-connection not immediately but in approx. 30 seconds starting from (1).

</div>

H) To release connection in remote connection status, select Disconnect in On-line menu to display Disconnect menu box as in the figure below indicating Disconnected.


I) If connection is released normally, Cnet I/F module and GMWIN are changed to initial mode to allow re-connection when tried again starting from clause No.(1).

G) In addition to dedicated modem, optical modem and wireless modem also can be used equally for remote connection, though communication medium between modems differs from each other.

[Figure 7.26] shows an example of remote connection via wireless modem. Connection method is same as in the remote connection via communication between Cnet I/F module. When wireless modem is applied, remote connection in 1 : N system where several remote Cnet I/F module stations are in existence is also available.

[Figure 7.26] Remote connection via wireless modem
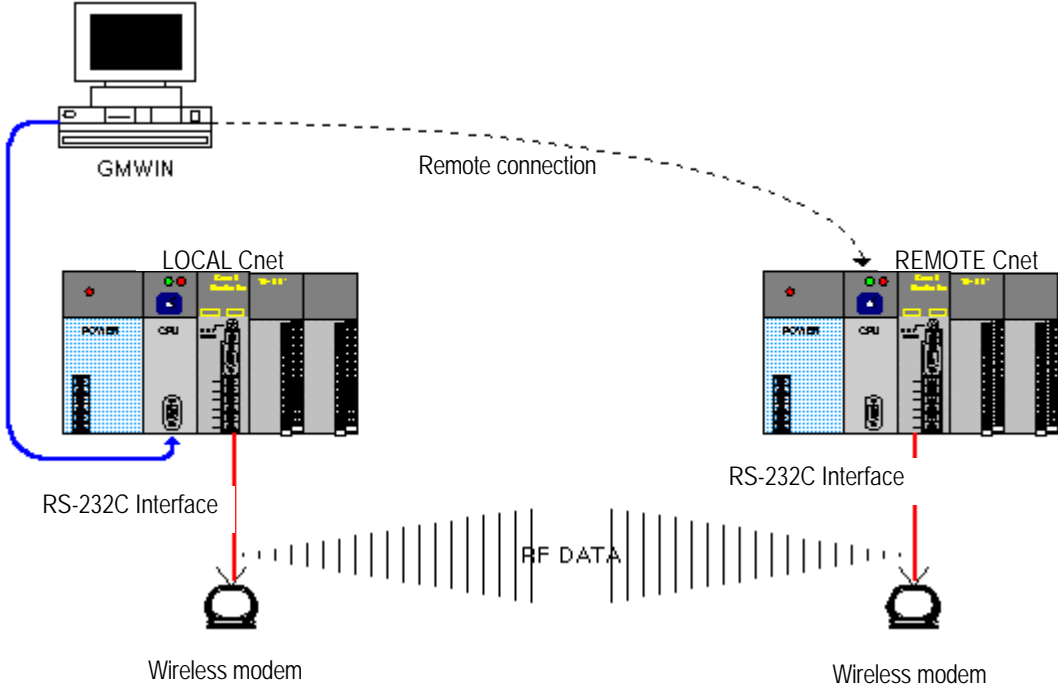
Chapter 8 Exercising program

Communication system using Cnet I/F module can be variously configured according to application fields. This chapter describes system configuration and exercise programming with various application fields supposed.

8.1 TM (Tele Metering) system using dedicated modem

In TM master/slave communication system with dedicated modem configured as in [Figure 8.1] through GLOFA Cnet I/F module, higher TM master on which 8 Cnet I/F modules are mounted performs data communication with 8 lower TM slave stations via dedicated modem. TM master uses GM2 CPU and TM slave uses GM4 CPU. And in this system, Cnet I/F module of slot No.0~7 in TM master inputs and outputs data through dedicated modem communication with 8 stations of slave station No.0~7.

[Figure 8.1] TM/TC dedicated modem system
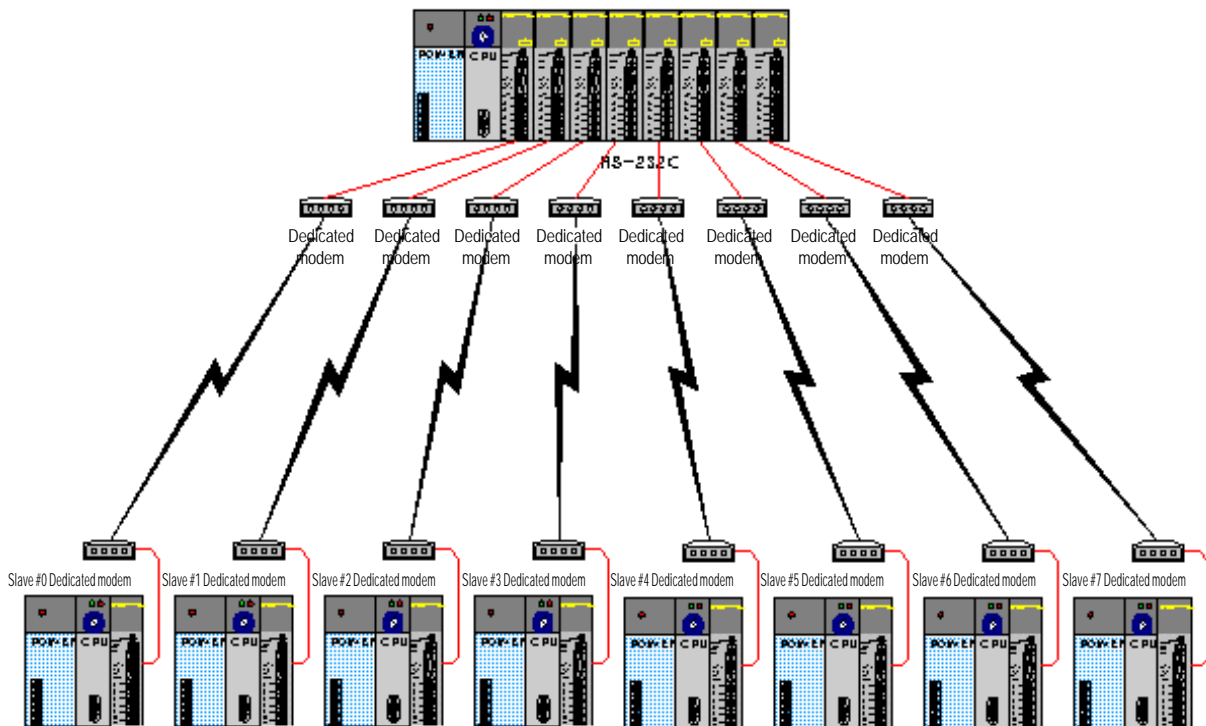
[Table 8.1] describes TX/RX data mapping between TM master station and 8 slave stations. In master station as shown in [Table 8.1], 20 bytes data from %MB0 area is written to %MB200 area of slave station and 50 bytes data from %MB100 area of slave station is saved in starting %MB400 area of master station. TX/RX areas of slave stations are all the same in 8 stations and TX/RX area of master station is specified to Offset as much as the size of TX/RX data.

[Table 8.1] TX/RX data map

Area Station No.	Master station memory				Slave station memory			
	TX Area	Length	RX area	Length	TX area	Length	RX area	Length
Station 0	%MB0	20bytes	%MB400	50bytes	%MB100	50bytes	%MB200	20bytes
Station 1	%MB20	20bytes	%MB450	50bytes	%MB100	50bytes	%MB200	20bytes
Station 2	%MB40	20bytes	%MB500	50bytes	%MB100	50bytes	%MB200	20bytes
Station 3	%MB60	20bytes	%MB550	50bytes	%MB100	50bytes	%MB200	20bytes
Station 4	%MB80	20bytes	%MB600	50bytes	%MB100	50bytes	%MB200	20bytes
Station 5	%MB100	20bytes	%MB650	50bytes	%MB100	50bytes	%MB200	20bytes
Station 6	%MB120	20bytes	%MB700	50bytes	%MB100	50bytes	%MB200	20bytes
Station 7	%MB140	20bytes	%MB750	50bytes	%MB100	50bytes	%MB200	20bytes

8.1.1 Exercising program

As Ex.8.1.1 is 1:1 communication system via dedicated modem for TM master/slave communication, setting for dedicated modem communication in Cnet I/F module and 1:1 communication programming between Cnet I/F modules shall be prepared. Next is the procedure to follow the above in order. Basic parameters related communication should be identical between master/slave stations, and set as agreed with modem specification as below.

❏ Communication Speed : 9600 BPS

❏ Data bit : 8 bits

❏ Start/Stop bit : 1 bit

❏ Parity : None

1) Dedicated modem connection

Connect 9-pin cable with dedicated modem and Cnet I/F module via RS-232C channel. Refer to 4.4 How to connect to dedicated modem for connection type prior to connection between Cnet I/F module and dedicated modem.

2) Dedicated modem setting

Refer to user's manual for setting of operation type of dedicated modem as agreed with communication type with Cnet I/F module. Related items to communication with Cnet I/F module are to be set as follows. Dedicated modem shall be set identical between master/slave sides

.

Item	Setting contents	Remark
Communication speed	9600 BPS	Identical to Cnet I/F module
Data type	Asynchronous 10 bits	Data-8bits/Start-1bit/Stop-1bit
RTS-CTS delay	0 msec	Set to the smallest value
DTR control	Forced ON	
Comm mode	4-line type	As agreed with the dedicated line spec.

3) Setting of basic parameters

Mode and basic parameters need setting for TM master slave communication. [Table 8.2] describes setting items for this. For dedicated modem communication, apply setting to RS-232C channel.

[Table 8.2] Setting items

Setting item	TM master module	TM slave module	Remark
Module name	G3L-CUEA	G4L-CUEA	
Channel mode	Stand-alone mode	Stand-alone mode	
Operation mode[Note1]	'3' : dedicated mode Ver.2.0	'3' : dedicated mode	
RS-232C station No.	Basic value(Not used)	0 ~ 7 station available	RS-232C channel setting only valid
RS-232C communication type	Dedicated modem		
RS-232C communication speed	9600 BPS/DATA 8 bits/START 1 bit/STOP 1 bit		

Remark
[Note1] Cnet I/F module in TM master side shall be of Ver.2.0 or later as is in dedicated master mode to communicate. TM slave side as used in dedicated mode slave is available regardless of the version.

Next is setting screen of Frame Editor to be set as in [Table 8.2].
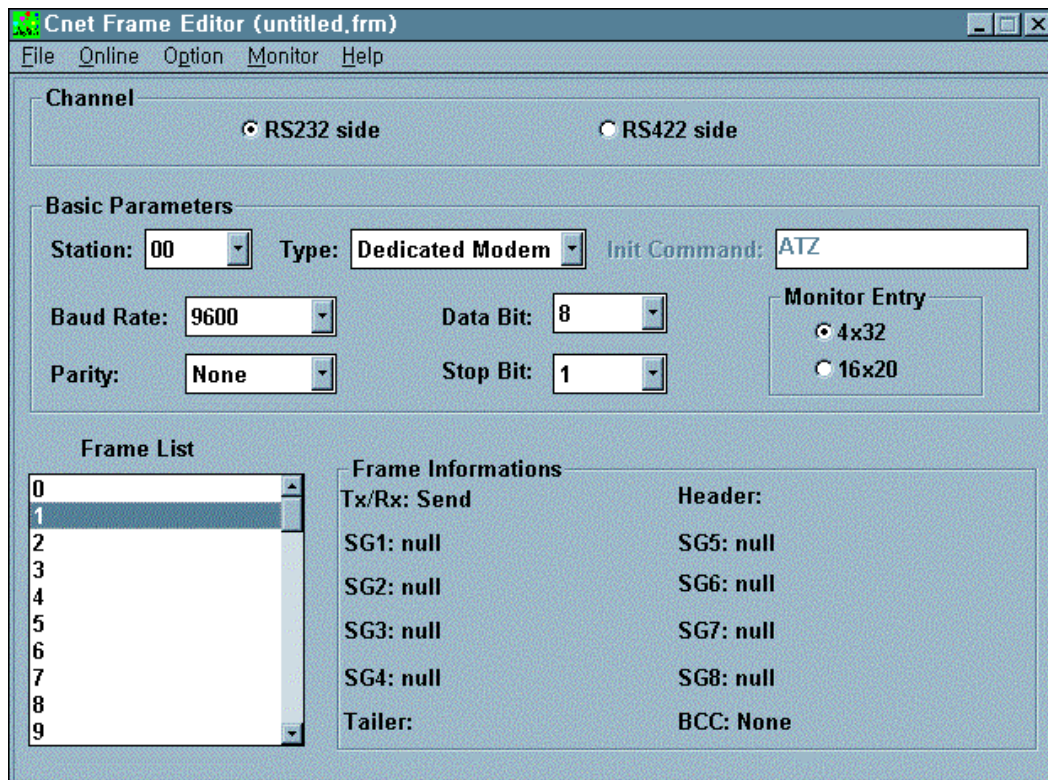
Download setting values of Frame Editor via each RS-232C channel for basic setting.

4) GMWIN programming

If dedicated modem and Cnet I/F module have been set, GMWIN program shall be prepared in TM master station for master operation in dedicated communication. For master function service in dedicated communication, GM_RD/GM_WR Function Blocks shall be used, with library insertion selected from project menu prior to programming to add the communication library to project. Since TM master station is GM2, insert COMMUNI.1FB. Each dedicated master program is to be prepared for 8 TM master Cnet I/F modules. [Figure 8.2] shows a program for Cnet I/F module of master station slot 0. The program in [Figure 8.2] is composed of two parts of 2 Function Block programs and interlock program to allow communication in order through the interlock engaged in execution of Function Block.

[Figure 8.2] Dedicated master program
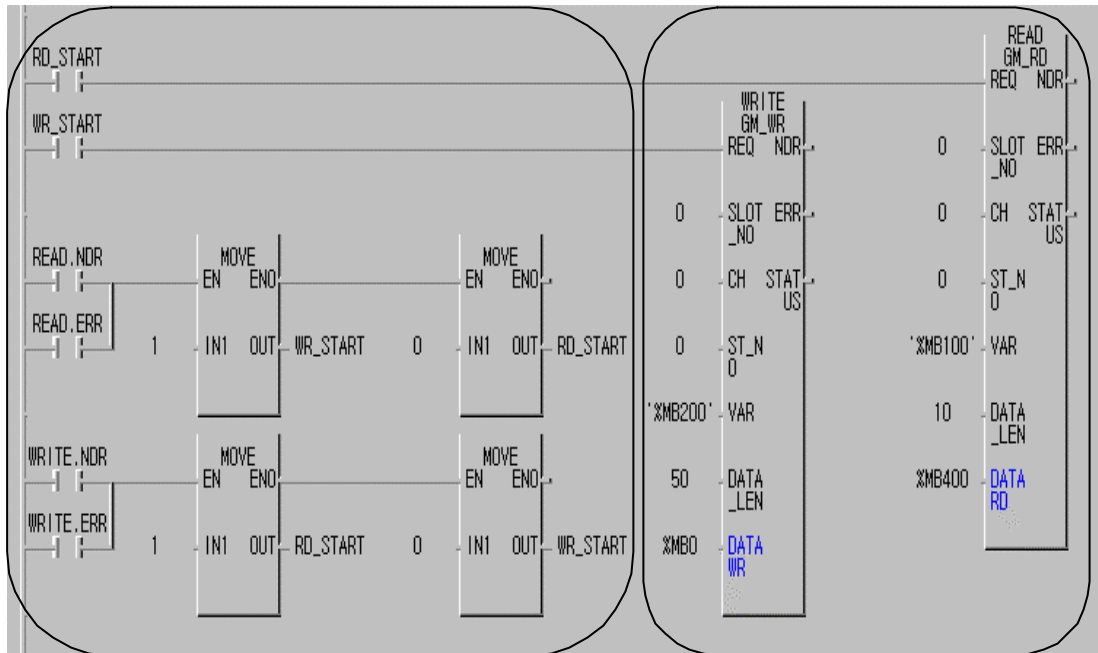
Interlock program:

Connect the contact point adjusting execution condition of READ/WRITE Function Blocks to Function Block's REQ' input to allow two Function Blocks executed in order.

- RD_START: As an auto-variable, exe-cuted in the first scan by READ Function Block as initially set to '1'.
- WR_START: Auto-variable, initial value '0'
- OR-connect READ.NDR/READ.ERR to execute READ F/B first and then WRITE F/B with WR_START ON.
- OR-connect WRITE.NDR/WRITE.ERR to execute WRITE F/B first and then READ F/B with RD_START ON.

Function Block program for dedicated commu-nication master:

Specify input variables as below with GM_RD Function Block for READ and GM_WR Function Block for WRITE.

- SLOT_NO : Where the module is mounted
- CH : Channel setting
- ST_NO : Slave station No.
- VAR : Slave memory area
- DATA_LEN : Data length
- DATA_RD : RX data saving area
- DATA_WR : TX data saving area

Setting values of RD_START variables used in interlock contact point are as follows. Initial value as an auto-variable is set to '1' to execute GM_RD Function Block in the first scan.
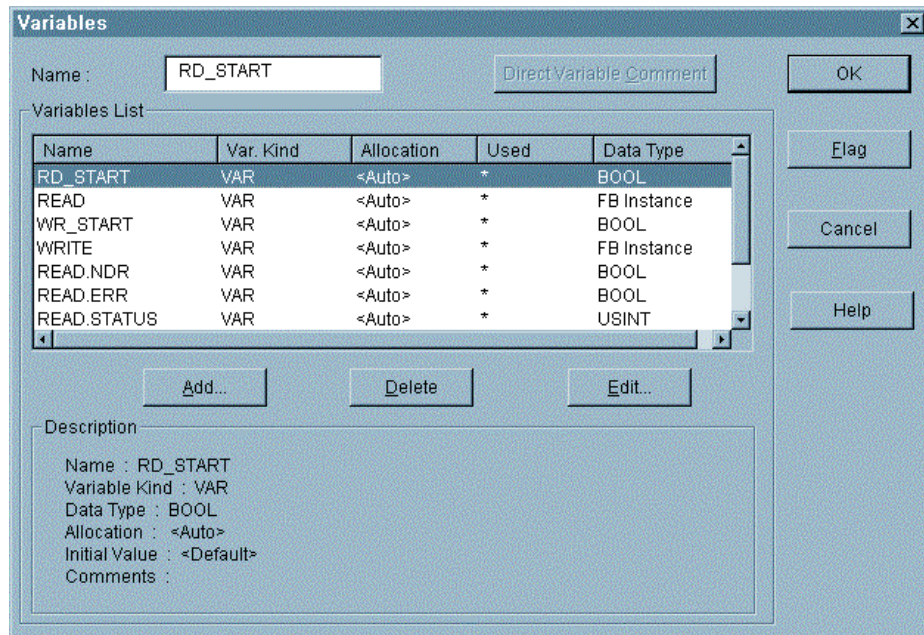
Setting values of WR_START variables are as follows. Initial value is set to '0' in auto-variable after GM_RD Function Block is executed by interlock program to allow GM_WR Function Block executed.
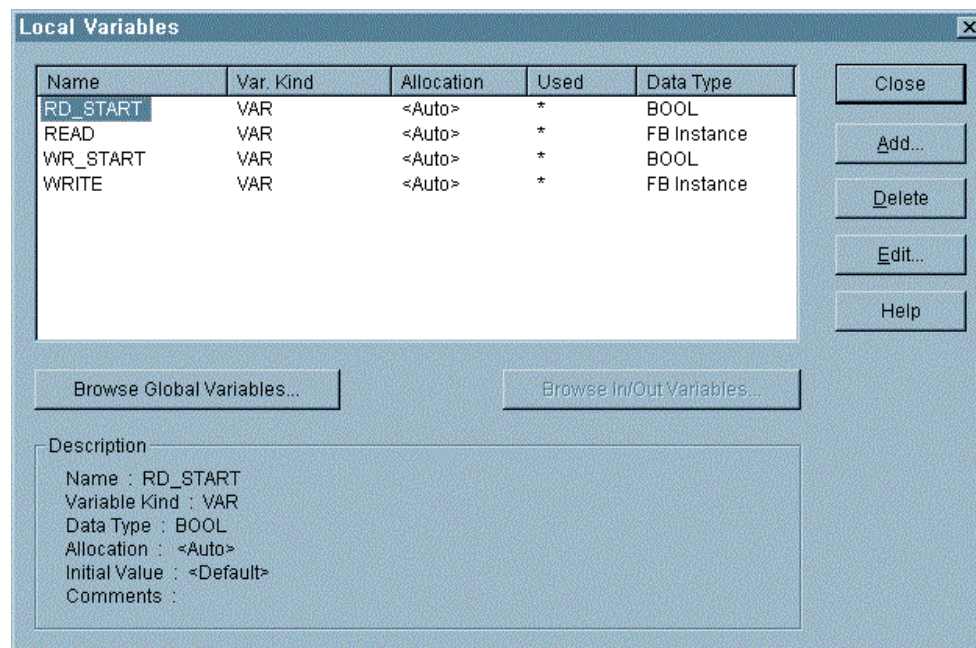
Program in [Figure 8.2] has used GM_RD Function Block to read data and GM_WR Function Block to write data of slave station No.0. To communicate the program in [Figure 8.2] with slave station No.0~7, prepare each program with slot No. and memory address set as agreed with [Table 8.1] to complete communication programming of dedicated communication master. [Figure 8.3] shows dedicated communication program of master station slot No.5 to communicate with slave station No.5.

[Figure 8.3] Communication program with slave station 5
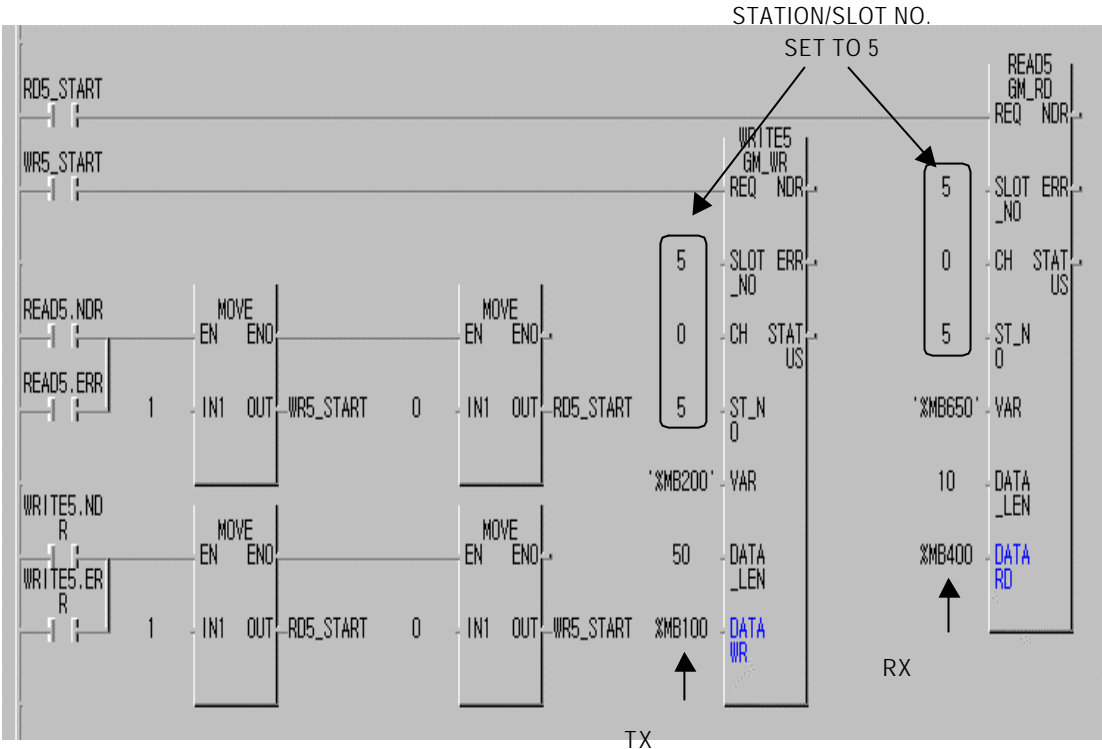
8.2 Communication system between Cnet I/F modules using optical modem

Optical modem is mainly used in communication with mobile body which is hard to communicate with via communication cable. For communication with GLOFA PLC on mobile body in lineal motion like parking tower or GLOFA PLC which is fixed, RS-232C/RS-422 channel of the module shall be connected with optical modem. [Figure 8.4] shows communication system between GLOFA PLCs and with monitoring device via optical modem.

[Figure 8.4] Optical modem communication system
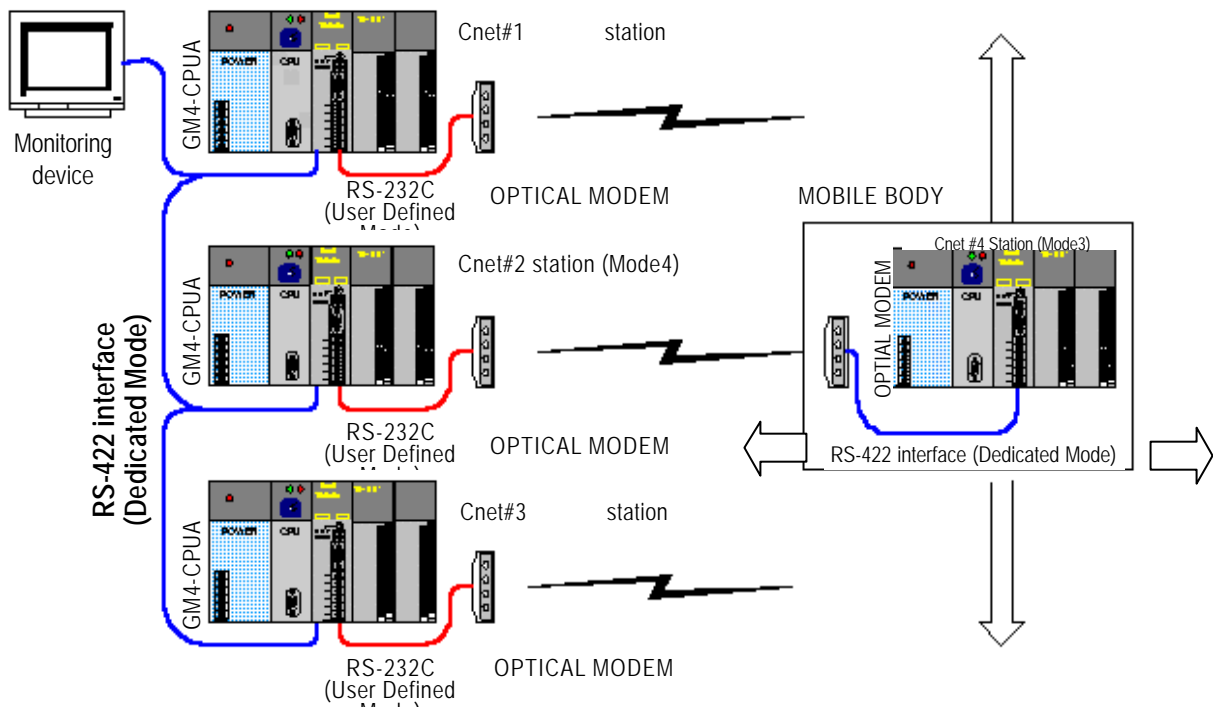
1~3 stations in [Figure 8.4] as of the module mounted on the fixed PLCs installed respectively at 1~3 floors in the parking tower communicate with monitoring device via RS-422 channel, and RS-232C channel communicates with station 4 on mobile body via optical modem. Module on mobile body moves vertically and horizontally as mounted on flatcar for car lift. Communication is performed with station 1 at 1st fl., station 2 at 2nd fl. and station 3 at 3rd fl. via optical modem. And only when horizontal position is in the specified allowance from other station's optical modem, communication is available in accordance with the communication characteristics of optical modem. Thus, communication is not allowed during vertical movement, while allowed during horizontal movement in the horizontal allowance as not changed from the fixed optical modem. Along with this method, information about mobile body's location and vehicles, and commands for loading/unloading vehicles can be transferred from monitoring device to mobile bodies. Monitoring device communicates in station 1 with station 3 via RS-422 communication, with dedicated communication master functions available.

8.2.1 Exercising program

RS-422 channel of 1~3 stations responds to reading/writing request of monitoring device through dedicated mode slave, thus, communication programming is not required for RS-422 channel in GLOFA-PLC. However, user defined program shall be prepared in user mode for RS-232C channel which operates as a master station to communicate with the module on mobile body. Because the module on mobile body operates as a dedicated mode slave, communication programming isn't necessary. In system as in [Figure 8.4], communication between monitoring device and module on mobile body is unavailable, thus, memory of PLC 1~3 stations shall be shared to change data with station 4 and monitoring device. [Table 8.3] describes communication with monitoring device and data TX/RX map between Cnet I/F modules for this.

[Table 8.3] Data TX/RX map

Area Station No.		TX/RX map with monitoring device				TX/RX map between Cnet I/F modules			
		TX area	Length	RX area	Length	TX area	Length	RX area	Length
Fixed body	Station 1	%MB0	80bytes	%MB100	50bytes	%MB140	40bytes	%MB0	20bytes
	Station 2	%MB0	80bytes	%MB100	50bytes	%MB140	40bytes	%MB0	20bytes
	Station 3	%MB0	80bytes	%MB100	50bytes	%MB140	40bytes	%MB0	20bytes
Mobile body	Station 4	Direct communication with monitoring device unavailable (data change via Cnet 1~3 stations)				%MB0	20bytes	%MB100	40bytes

[Figure 8.5] Data TX/RX path
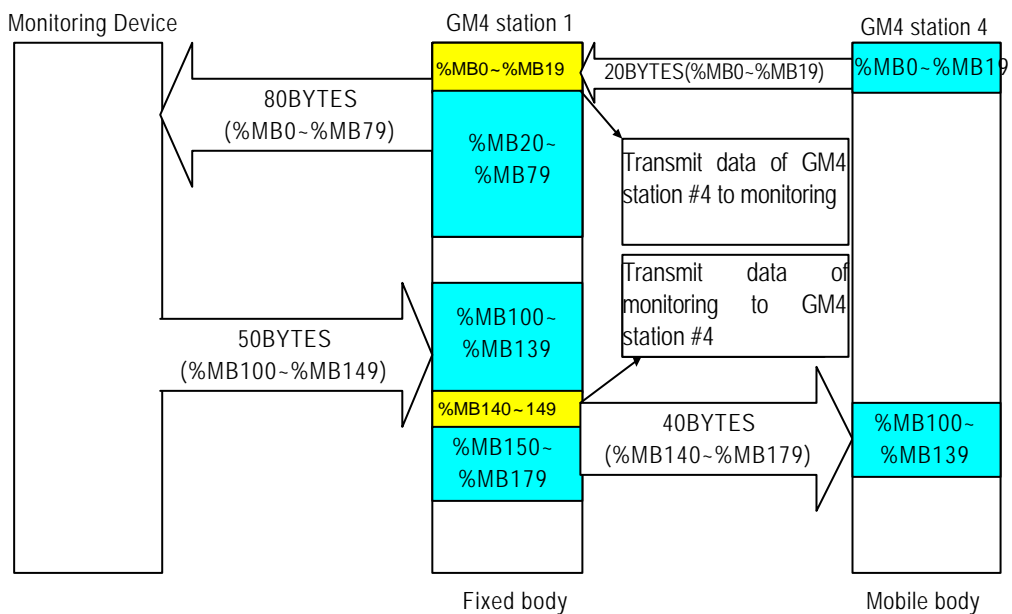
[Figure 8.5] describes TX/RX data path according to data TX/RX map in [Table 8.3] with the example of Cnet stations 1 & 4 and monitoring device. Cnet stations 2 & 3 are the same case as in communication via the identical path. Direct communication between monitoring device and station 4 on mobile body is unavailable in the figure, thus, data will be changed through station 1. As shown in [Figure 8.4], 20 bytes from %MB0 of station 1 is the saving area of data read from station 4 of mobile body, and via this area monitoring device starts reading data of station 4. To the contrary, when data is written from monitoring device to station 4, 50 bytes data is written from %MB100 address of station 1 and 10 bytes data of 50 bytes starting from %MB140 address is re-transmitted to station 4 to change data between monitoring device and station 4.

1) Optical modem connection

Connect 9-pin cable with Cnet stations 1,2,3 and optical modem via RS-232C channel. Since optical modem connection is same as in dedicated modem, refer to 4.4 How to connect to modem for connection between Cnet I/F module and dedicated modem. Optical modem on mobile body is connected with Cnet I/F module station 4 via RS-422 cable, thus, use optical modem which supports RS-422 communication for connection in accordance with RS-422's standard connection method.

2) Setting of basic parameters

Identical basic parameters shall be set in RS-422 channel of Cnet stations 1,2,3 for communication with monitoring device, and RS-232C channel shall be set to dedicated modem mode in operation of user mode to operate as a communication master station of Cnet station 4. [Table 8.4] describes setting items of Cnet I/F module for this. Set operation mode switch as specified in the table and prepare basic parameters through Frame Editor to download to Cnet I/F module and then to complete basic setting.

[Table 8.4] Setting items of Cnet I/F module

Setting item		Cnet on fixed body	Cnet on mobile body	Remark
Operation mode switch		'4'	'3'	
RS-232C	Operation mode	User defined communication[Note]	Not used	Parameters in RS-232C channel of Cnet stations 1,2,3 shall be set identical.
	Station No.	Basic value(Not used)		
	Communication speed	19200bps		
	Data/Stop	Data-8/Start-1/Stop-1		

Setting item		Cnet on fixed body	Cnet on mobile body	Remark
RS-422	Operation mode	Dedicated communication	Dedicated communication	Communication parameters shall be agreed with monitoring device.
	Station No.	Set 1,2,3 stations in order	Station 4	
	Communi-cation speed	19200 BPS	19200 BPS	
	Data/Stop	Data-8/Start-1/Stop-1	Data-8/Start-1/Stop-1	

> **Remark**
>
> [Note1] If module Ver.2.0 is used, set RS-232C channel to dedicated mode for dedicated master mode service so to simplify programming. Refer to 7.3 Dedicated communication master in the manual for programming procedure.

[Table 8.4] describes setting items of the module. Communication method and specification shall be set identical also for monitoring device and optical modem. Refer to user's manual of the applied product for setting of optical modem and monitoring device.

3) Programming

GMWIN program shall be prepared for user defined communication via RS-232C channel of Cnet stations 1,2,3 in system of [Figure 8.4], and frame for communication via dedicated communication protocol shall be also prepared in Frame Editor. RS-422 channel of Cnet 1,2,3 stations needs no additional communication programming because the monitoring device operates as a master station. Cnet station 4 needs no communication programming either because it operates as a dedicated mode slave. Data memory mapping is all identical for communication of Cnet 1,2,3 stations, thus, the same program may be shared in those 3 stations. Next is how to prepare the program in station 1.

A) Dedicated communication protocol to be used: Cnet station 1 shall prepare frame in user defined mode for communication through dedicated communication protocol of Cnet station 4. Use continuous reading/writing commands of direct variables in dedicated communication protocol to allow communication between station 1 and station 4 through TX/RX map between Cnet I/F modules in [Table 8.3]. Next is for protocol of dedicated communication slave to communicate through the map in [Table 8.3]. Refer to 7.2 in this manual for details.

8- 12

① Continuous writing request of direct variables (writing 40 bytes to %MB100 of station 4)

Classification	Header	Station No.	Command	Variable length	Variable name	Number of data	Data	Tail	BCC
Frame	ENQ	H04	wSB	H06	%MB100	H28	40 bytes data	EOT	BCC

② Response format to continuous writing request of direct variables (ACK response)

Classification	Header	Station No.	Command	Tail	BCC
Frame	ACK	H04	wSB	ETX	BCC

③ Continuous reading request of direct variables (reading 20 bytes from %MB0 of station 4)

Classification	Header	Station No.	Command	Variable Length	Variable Name	Number of data	Tail	BCC
Frame	ENQ	H04	rSB	H04	%MB0	H14	EOT	BCC

④ Response to continuous reading request of direct variables (ACK response)

Classification	Header	Station No.	Command	Number of blocks	Number of data	Data	Tail	BCC
Frame	ACK	H04	rSB	01	H14	20 bytes data	ETX	BCC

Remark

[Note1] Number of data in frame is in HEX unit

B) Frame edit : Edit and download 4 frames above to module using Frame Editor. Enter 4 frames as below. Next is frame entry screen.

●   Write request frame : GM_WR_REQ (TX frame)

Frame name above is 'GM_WR' entered as TX frame. Station No., command and variable as of CONST are registered in segment 1 and data TX area of ARRAY type is specified in segment 2. As is in ASCII communication, select Convert to convert TX data to ASCII figures. [BCC] is added behind the tail as the lower case 'w' is used in command with BCC type set as below. BCC type is identical all for dedicated communication frames.

● Response frame to Write request: GM_WR_ACK (RX frame)

The 2th Main Frame

Frame Name: GM_WR_ACK   Tx/Rx: Receive
Header: [ACK]   Immediate Response:

Segment 1
Type: CONST   04wSB
○ HEX ● ASCII

Segment 2
Type: NONE

Segment 3
Type: NONE

Segment 4
Type: NONE

Segment 5
Type: NONE

Segment 6
Type: NONE

Segment 7
Type: NONE

Segment 8
Type: NONE

Tail: [ETX][BCC]   BCC Setting   OK   Cancel

Frame name is 'GM_WR_ACK'. Response frame to Write request has no data, thus, enter only RX frame as of CONST in segment 1.

● Read request frame : GM_RD (TX frame)

The 3th Main Frame

Frame Name: GM_RD   Tx/Rx: Send
Header: [ENQ]

Segment 1
Type: CONST   04rSB04%MB014
○ HEX ● ASCII

Segment 2
Type: NONE

Segment 3
Type: NONE

Segment 4
Type: NONE

Segment 5
Type: NONE

Segment 6
Type: NONE

Segment 7
Type: NONE

Segment 8
Type: NONE

Tail: [EOT][BCC]   BCC Setting   OK   Cancel

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Frame name is 'GM_RD'. And as of TX frame, it requests reading of 14 bytes data in HEX.

● Response frame to Read request: GM_RD_ACK (RX frame)

Frame name is 'GM_RD_ACK'. Since RX frame has a data, enter CONST in segment 1 and allocate 20 bytes of data RX area in ARRAY to segment 2. As in ASCII communication, select Convert to convert received ASCII data to HEX to allow receiving in figures.

● Total screen of frame entry: Next is the basic screen of Frame Editor where 4 frames are registered showing frames 0 ~ 3 are entered in frame list.
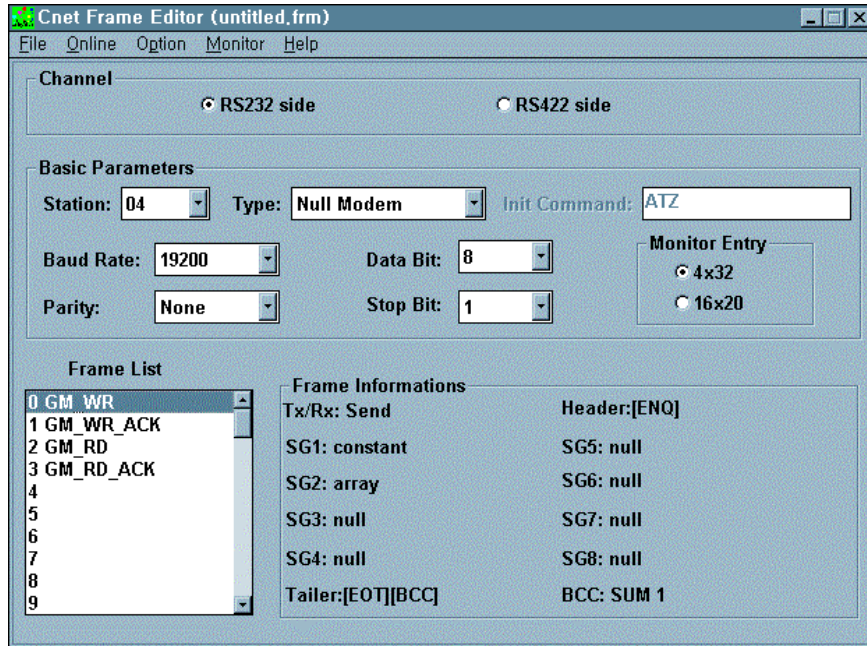
After frame edit above is finished, save the file and download the frame to Cnet I/F module to run RS-232C channel for preparation of operation. TX sequence of 4 frames is as shown in [Figure 8.6]. User defined program shall be prepared in GMWIN to allow TX/RX in order as in the figure.

[Figure 8.6] TX sequence of TX/RX frames
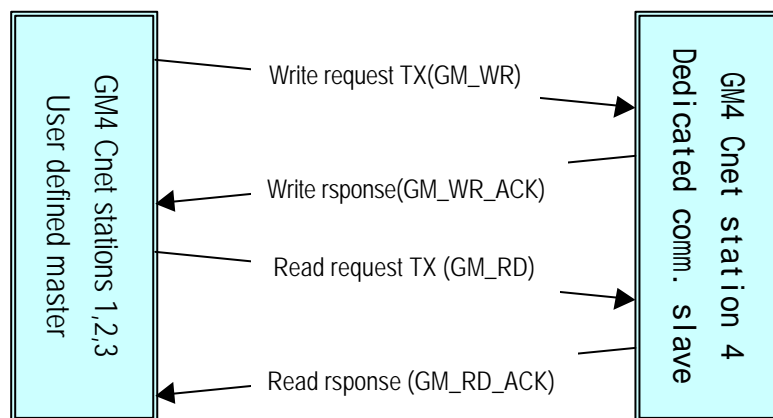
C) GMWIN programming : After frame edit is completed, prepare program via GMWIN to allow TX/RX in sequence as in [Figure 8.6]. Use SND_MSG/RCV_MSG Function Blocks to allow Cnet 1,2,3 stations in user defined mode to communicate with Cnet station 4 which is dedicated communication slave station, with library insertion selected from project menu prior to programming to insert COMMUNI.4FB. User defined TX/RX programs shall be set respectively for 1,2,3 stations. Data mapping is all identical for 3 stations, thus, the same program may be used.

[Figure 8.7] shows program for data writing and its response frame receiving.

[Figure 8.7] Function Block program for data writing
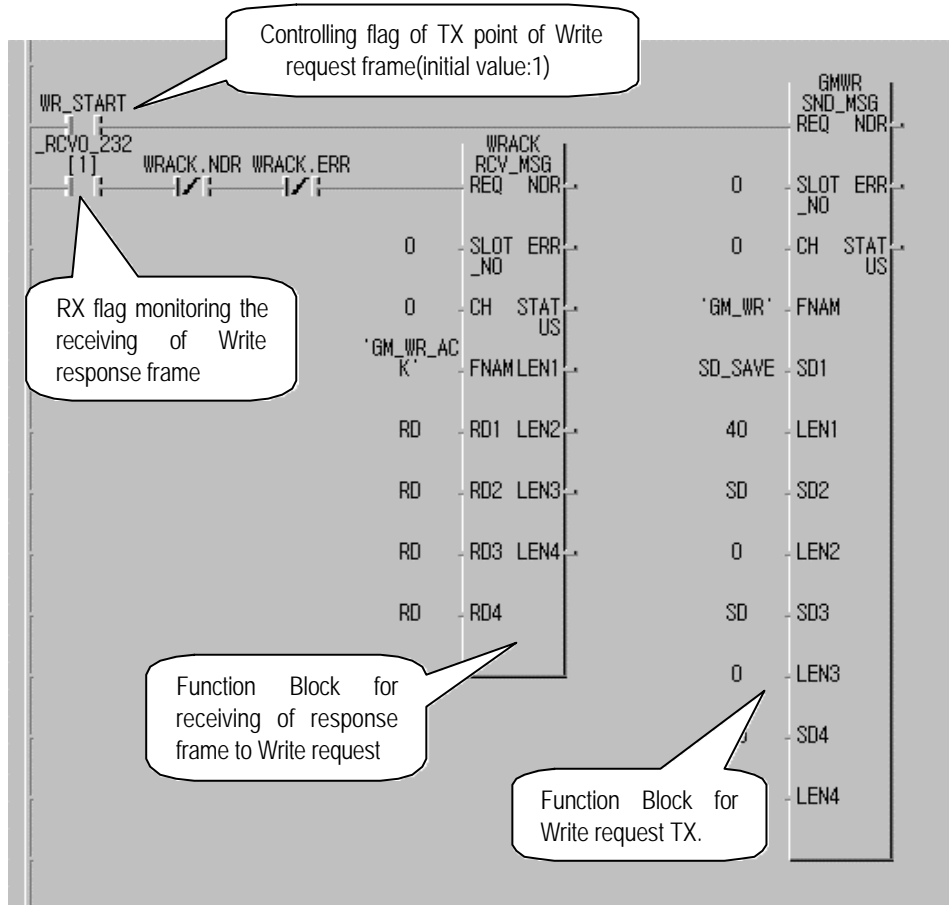
Use SND_MSG Function Block in the figure to send 40 bytes of TX data to 'GM_WR' frame via RS-232C channel. TX point of time is controlled through 'WR_START'. In case of normal response after GM_WR frame is sent, execute RCV_MSG Function Block if 'GM_WR_ACK' frame is received with '_RCV0_232[1]' flag turned 'ON' among received flags in RS-232C channel. TX data is saved in SD1 area of SND_MSG Function Block, while 40 bytes data in variable area of 'SD_SAVE' is transmitted as in [Figure 8.7].

Next is setting screen of SD_SAVE variables. Memory of 41bytes is allocated to %MB140 address starting. Data size of TX variable shall be set at least identical to the data size to be sent.

[Figure 8.8] shows Function Block program for transmission of Read data.

[Figure 8.8] Function Block to read data

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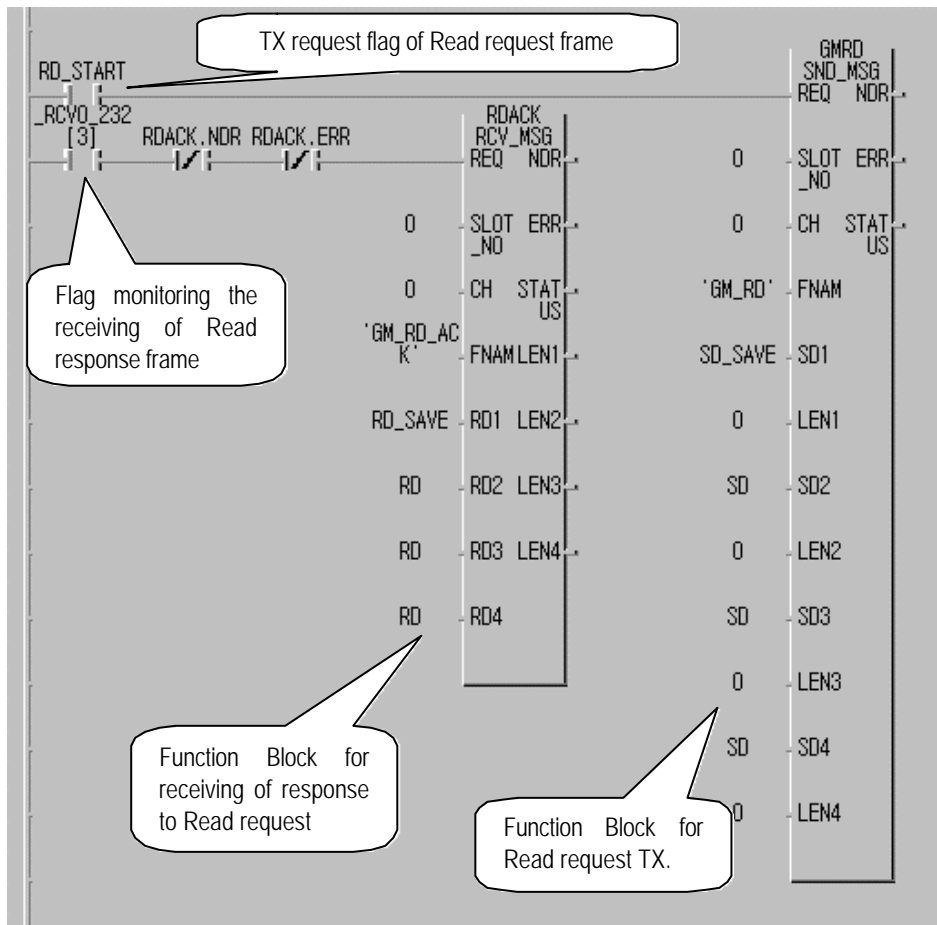
In [Figure 8.8], Read is requested via SND_MSG Function Block to read data and to respond to this, 20 bytes data is sent to GM_RD_ACK frame from dedicated slave station. If GM_RD_ACK frame is received, _RCV0_232[3] is 'ON' to execute RCV_MSG Function Block and save the received data to RD_SAVE area set to RX data variable. Memory for RD_SAVE is allocated to %MB0 area as below and data size shall be set at least identical to the size of the received data. Next is variable setting screen of RD_SAVE which is a saving variable of RX data.
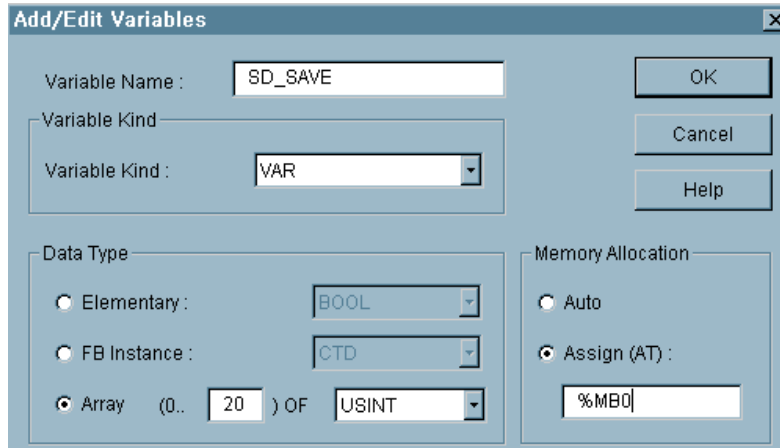
[Figure 8.9] shows interlock program of Write data Function Block. If in normal communication, it allows TX/RX as in sequence shown in [Figure 8.6] and even in abnormal communication, it allows communication in the following sequence after waiting for response 1 sec.

[Figure 8.9] Interlock program to Write data
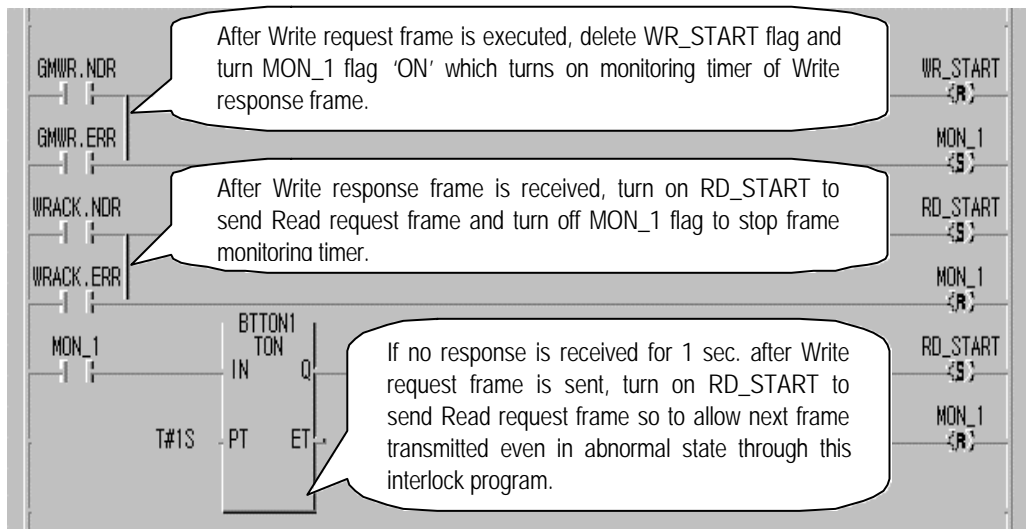
[Figure 8.10] shows interlock program of Read data Function Block. If in normal communication, it allows TX/RX as in sequence shown in [Figure 8.6] and even in abnormal communication, it allows communication in the following sequence after waiting for response 1 sec..

[Figure 8.10] Interlock program to Read data
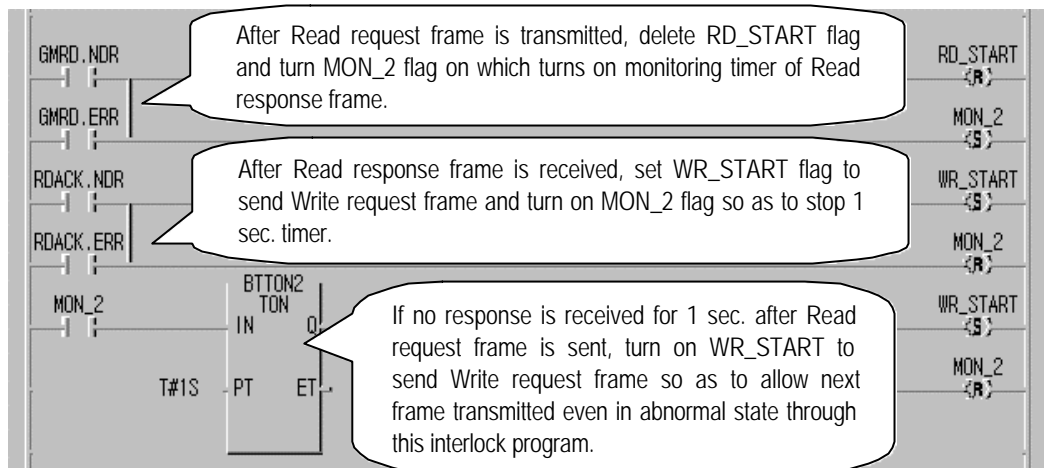
Prepare one program integrated by 4 programs above and let it downloaded to PLC through compile process, and then run the program to allow communication with dedicated communication slave station in user defined mode. Identical frame list and program can be also used in Cnet station 2 & 3. And if the program is run via compile and download, identical communication is available in station 2 & 3.

Remark
[Note1] Waiting time for response shall be set larger enough than max. response time estimated in consideration of frame length and data transmission speed.

8.3 GMWIN connection using dial-up modem

Cnet I/F module has a remote communication function via telephone line. With this function in the system as shown in [Figure 8.11], connect external modem to module and apply GMWIN connection via dial-up modem in PC to change programs and to monitor variables as described below. [Figure 8.11] shows an example of system configuration through dial-up modem and telephone line.

[Figure 8.11] GMWIN connection via dial-up modem
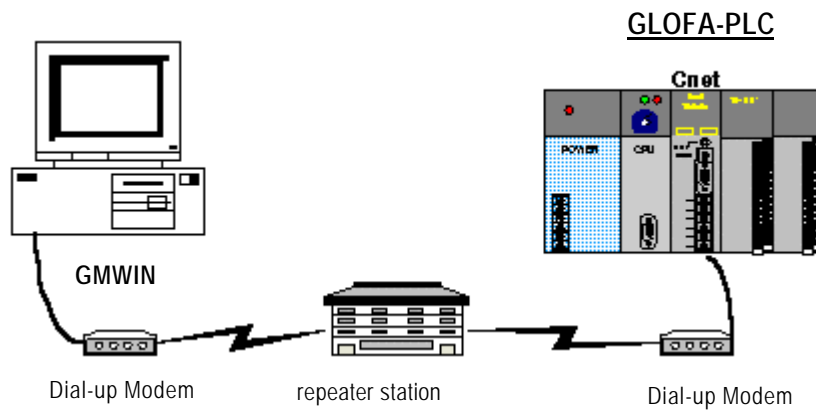
8.3.1 Exercising program

For GMWIN connection via dial-up modem, set operation mode of this module to GMWIN mode and dial-up modem connection mode, and connect modem with Cnet I/F module through modem setting and RS-232C cable.

1) Operation setting

For dial-up modem connection with Cnet I/F module, set basic parameters as specified in [Table 8.5].

[Table 8.5] Setting items

Setting item	TM master Cnet I/F module	Remark
Module name	G3L-CUEA	
Channel mode	Stand-alone mode	
RS-232C operation mode	GMWIN mode	
RS-232C station No.	Station 0	Setting available only in Ver.2.0
RS-232C communication type	Dial-up modem	
Modem initializing command	Set initial value as in the user's manual	Basic value, 'ATZ'
RS-232C communication speed	38400 BPS / DATA 8 bits / START 1 bit / STOP 1 bit	As agreed with the speed of dial-up modem

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2) Operation setting

Connect 9-pin to 25-pin cable with dial-up modem and Cnet I/F module via RS-232C channel in the following type.

[Table 8.6] Modem connection with Cnet I/F module

Cnet (9-pin) male		Connection No. and signal direction	Modem side(25-pin) male	
Pin No.	Name		Pin No.	Name
1	CD	←	CD	8
2	RXD	←	RXD	3
3	TXD	→	TXD	2
4	DTR	→	DTR	20
5	SG	←	SG	7
6	DSR	←	DSR	6
7	RTS	→	RTS	4
8	CTS	←	CTS	5
9	RI		RI	22

3) Modem initializing

If mode setting and connection between modem and Cnet I/F module via cable are completed, link phone line to modem and let PLC powered on to initialize modem. Modem initializing is accomplished by modem initializing command set previously in Cnet I/F module after powered on. If modem has been successfully initialized, Cnet LED is displayed as below.

Cnet I/F module LED status in stand-by mode
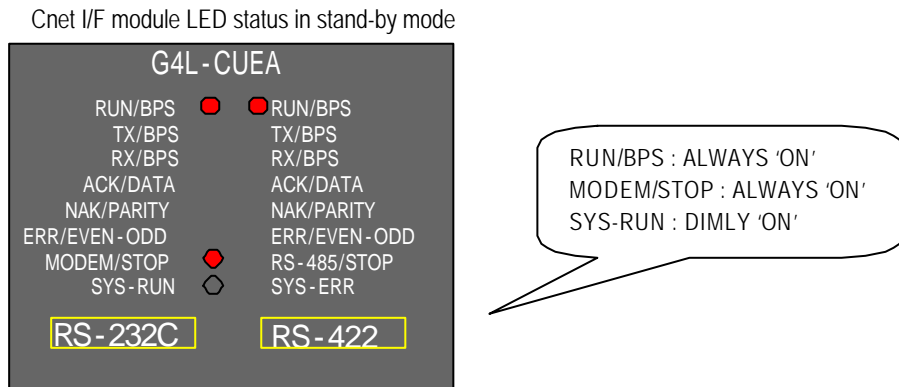
The figure above shows the case that modem has been initialized normally. If not initialized, TX LED will flash in a cycle of 1 sec. in the figure. If so, refer to Chapter 4 How to connect to dial-up modem in the manual to shoot the trouble.

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4) Telephoning and remote connection

If modem has been initialized, Cnet I/F module waits for telephoning and remote connection from GMWIN in connection stand-by status. Since Cnet I/F module has no telephoning function, install modem on PC where GMWIN is mounted on to connect through telephoning. Next is how to make a phone call in GMWIN.

A) Install modem on PC. Internal modem can be applied to PC side.

B) Run GMWIN program and select method of connection from connect option in project option. Set method of connection type to modem and dial-up modem, and communication port and transmission speed which are set in internal or external modem linked with PC. Communication speed as is related with dial-up modem performance shall be set similar to that of modem.
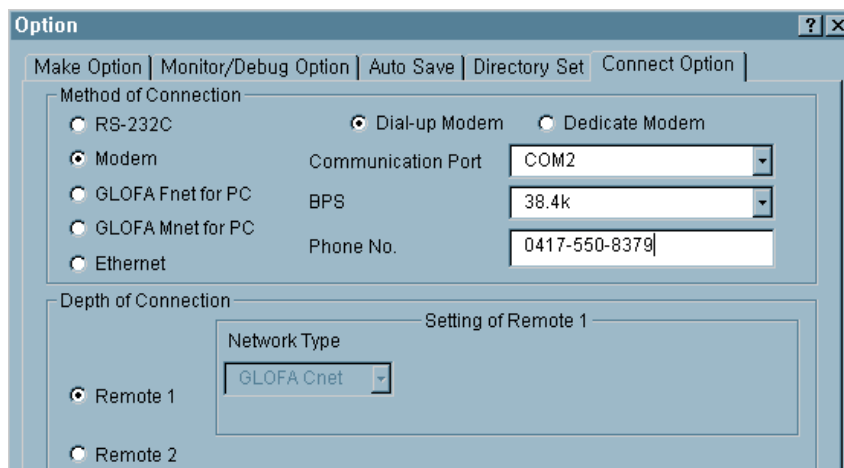
C) Select Remote 1 of depth of connection stages and set station No. as specified in Cnet I/F module. The station No. shall be surely input if the module is of Ver.2.0 or later. For the former versions, no need to set station No. because basic values are good enough for connection. Station numbers are not compared for GMWIN connection in the former versions.

D) Select Connect in On-line after connection option setting to display dialog box for modem initializing.

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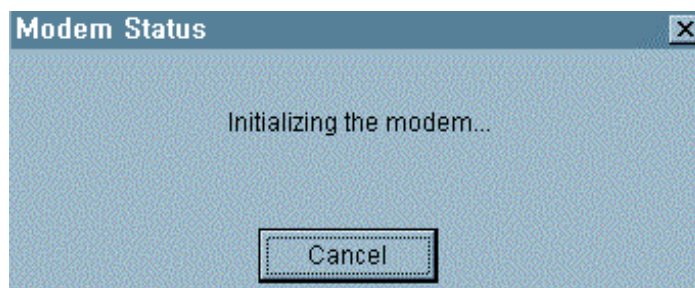
E) If COM port of modem is incorrectly set or connection with modem is abnormal, the following error message is displayed. In this case, inspect COM port or modem connection.
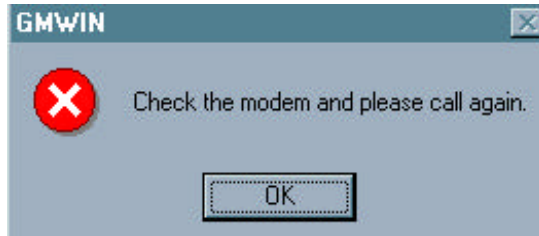
F) If telephoning is completed, GMWIN tries remote connection automatically and if remote connection is completed, program write and run/stop icon menus are activated as below.

G) This means that remote 1 stage connection is completed just like the connection status that RS-232C cable is connected as moved, where all functions in On-line menu are available.

H) To release connection in remote connection status, select Disconnect in On-line menu to display Disconnect menu box as in the figure below indicating Disconnected.
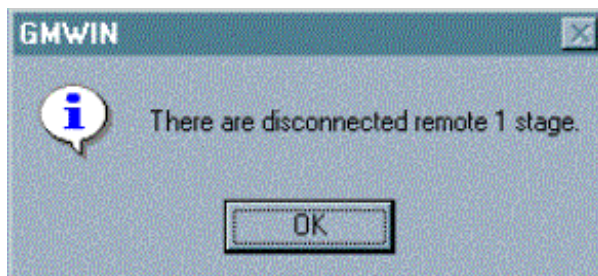
I) If connection is released, GMWIN hangs up the phone automatically to disconnect it.

J) If the phone is hung up normally, local and remote modem is restored to initial status to allow remote connection again via telephoning.

8.4 Communication with GOLDSEC MJUC24

With user defined mode in this module, communication with different model of device is available through function to define other company's protocol via Frame Editor in user defined mode. Next is how to communicate via GOLDSEC MJ71C24 computer link communication module of GOLDSEC PLC in GLOFA-PLC. [Figure 8.12] shows system configuration for communication with GOLDSEC PLC via RS-422 channel. 12-word data is read from D0100 of GOLDSEC PLC to save in starting %MW50 of GLOFA PLC in order, while GOLDSEC PLC is set to station 1.

[Figure 8.12] Communication between GLOFA PLC and GOLDSEC PLC
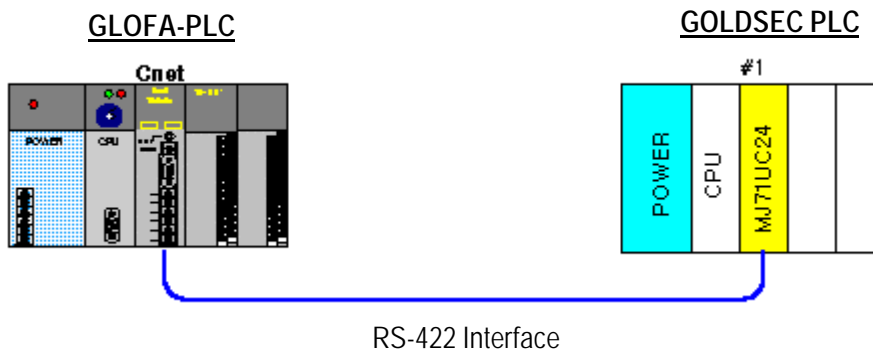
8.4.1 Exercising program

As shown in [Figure 8.12], Cnet I/F module operates as a master station in user defined mode. If total Read command of memory word unit is applied among dedicated protocols of GOLDSEC PLC, continuous reading of D area in GOLDSEC PLC is available. Set mode and basic setting items of Cnet I/F module and then prepare frame and GMWIN program for this service

1) Setting items

As in communication via RS-422 channel of Cnet I/F module, set operation mode and basic parameters for RS-422 channel. [Table 8.7] describes setting items of Cnet I/F module.

[Table 8.7] Setting items

RS-422 channel setting item	Setting contents	Remark
Operation mode	Mode '2' user defined mode	RS-232C channel not used
RS-422 station No.	Basic value (Not used)	Communication speed and basic communication spec. shall be as specified in spec. of MJ71UC24 computer link module.
Communication type	RS-422	
RS-422 basic parameters	9600 BPS / DATA 8 bits / START 1 bit / STOP 1 bit	

2) Communication protocol

Communication protocol to communicate with MJ71UC24 computer link module is as follows.

[Figure 8.13] TX sequence of TX/RX frames
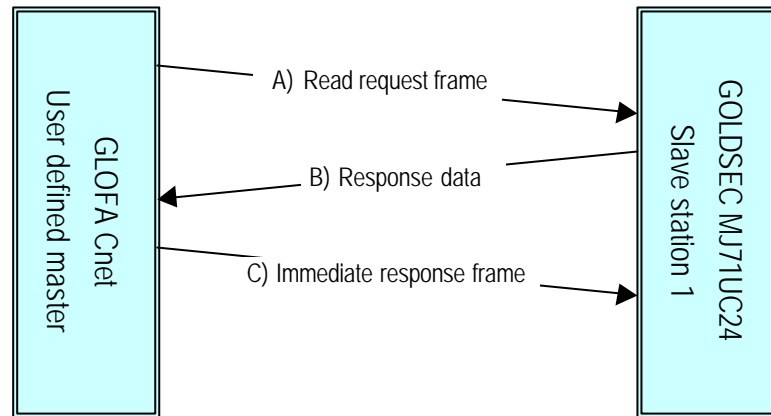
If GLOFA Cnet sends A) Read request frame first, MJ71UC24, to respond to this, reads data of applicable area to transmit B) Response data frame, and Cnet I/F module sends C) Immediately Response frame to inform MJ71UC24 of data received. Next is TX/RX frame structure.

A) Read request frame(Cnets' request : Read request of 12 words in D0100 of station 1)

Classification	Header	Station No.	PLC No.	Command	Message wait	Head device	Number of device
Frame	ENQ	01	FF	WR	0	D0100	0C

B) Response format to total Read (Response of MJ71UC24 side)

Classification	Header	Station No.	PLC No.	Data	Tail
Frame	STX	01	FF	Data (12 words) of D0100 address	ETX

C) Immediate response

Classification	Header	Station No.	PLC No.
Frame	ACK	01	FF

Next is for communication frame contents. Refer to the user's manual of GOLDSEC-M computer link unit for more information.

❑ Station No. : Station No.(station 1) of MJ71UC24

❑ PLC No. : Set to FF

❑ Command : WR (Total Read command of word unit in device memory)

❑ Message wait : Min. stand-by time until transmitted after frame is received.

❑ Head device : 5 characters as a starting address in PLC memory

❑ Number of devices: Data length to read (word unit)

❑ Data : Data appropriate for the number of devices specified.

3) Frame edit

Define 3 frames above through Frame Editor.

A) Read request frame: Read request frame as of TX frame is configured in CONST where no ARRAY type is applied.

Next is edit screen of Read request frame for transmission.

B) Total Read response frame : Response frame to Read request is defined by RX frame, while ARRAY variable is set to saving area of RX data behind PLC No.. As in ASCII communication, select Convert for data type to convert ASCII code into HEX value so to be received by PLC, and enter 24 as RX data is in byte unit.

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If RX frame is received, set IMM_ACK to immediate response to send IMM_ACK frame through immediate response from Cnet when RD_DATA is received. Immediate response frame is described below.

C) Immediate response frame : Define IMM_ACK frame as below for TX frame to send IMM_ACK frame from Cnet if RD_DATA frame is received.

The 3th Main Frame

Frame Name: IMM_ACK   Tx/Rx: Send
Header: [ACK]

Segment 1
Type: CONST | 01FF
○ HEX   ⊙ ASCII

Segment 5
Type: NONE

Frame Editor screen where frame has been defined is as below. After frame edit above is completed, write frames and basic parameters via RS-422 channel through On-line connection and then run channel operation to finish preparation of Cnet operation.

Cnet Frame Editor (untitled.frm)
File Online Option Monitor Help

Channel
○ RS232 side   ⊙ RS422 side

Basic Parameters
Station: 00   Type: RS 422   Init Command: ATZ
Baud Rate: 9600   Data Bit: 8
Parity: None   Stop Bit: 1
Monitor Entry
⊙ 4x32
○ 16x20

Frame List
0 RD_REQ
1 RD_DATA
2 IMM_ACK
3
4
5
6
7
8
9

Frame Informations
Tx/Rx: Send   Header:
SG1: null   SG5: null
SG2: null   SG6: null
SG3: null   SG7: null
SG4: null   SG8: null
Tailer: BCC: None

4) GMWIN programming

After frame edit and download are completed, prepare program in GMWIN to save TX/RX data of TX frames. Next figure shows GMWIN program for TX/RX communication with MJ71UC24. With 1 sec. timer, 'RD_REQ' frame is transmitted in a cycle of 1 sec. and 24 bytes of data received are saved in variable area of 'RD1' if 'RD_DATA' frame is received.
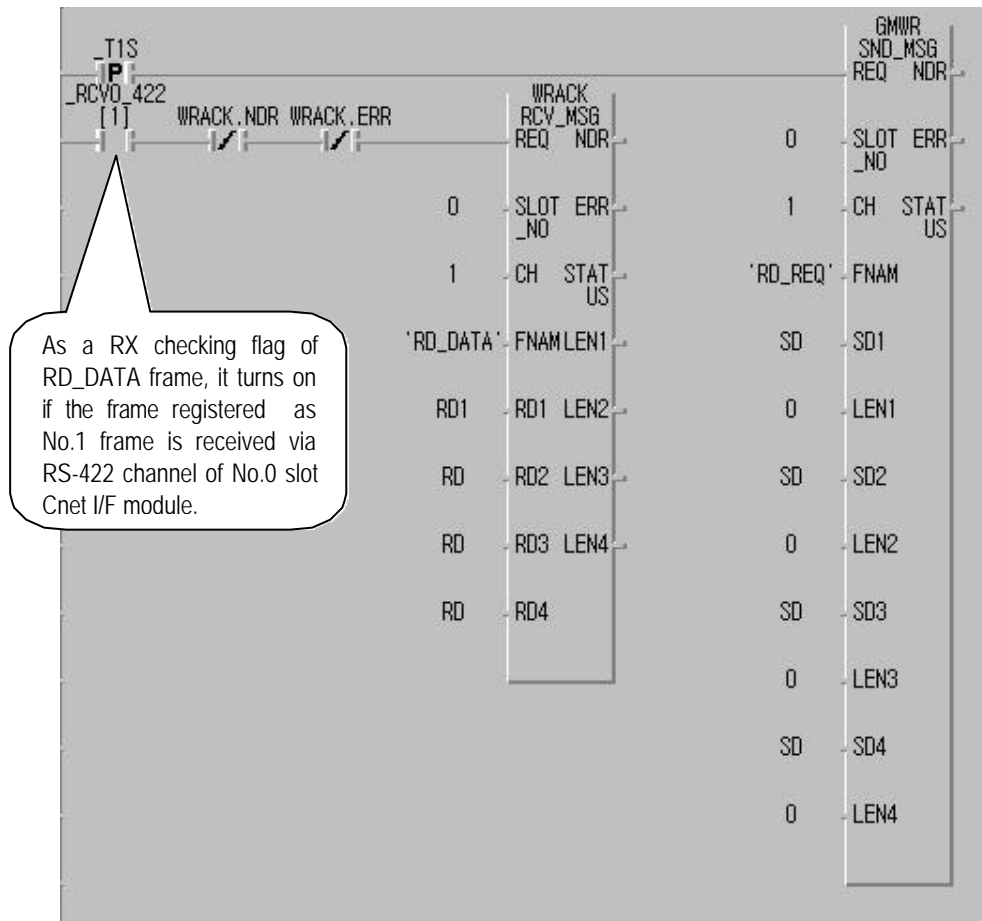
RX data is saved in variable defined to RD1 of RCV_MSG Function Block with variable allocation set to %MB100 and with 25 ARRAY variables reserved to receive 24 bytes data.
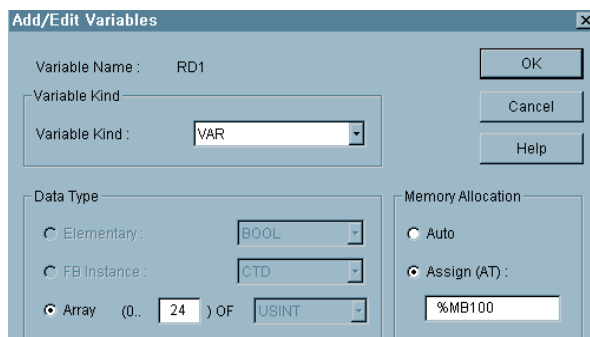
8.5 Communication with MASTER-K 1000H

Communication between GLOFA-PLC and MASTER-K 1000H PLC will be described below. [Figure 8.14] shows the system where this module is connected with CPU communication port of MASTER-K 1000H via RS-232C. Programming for Cnet I/F module as of a master station to write data in MASTERK-K1000H output area in accordance with MASTER-K 1000H's dedicated communication protocol is described in the figure. It's an example for Read 10-word data from %MW100 address of GLOFA PLC and Write 10-word data to output areas of 5 cards from output card P00 of MASTER-K 1000H.

[Figure 8.14] Communication system between GLOFA PLC and MASTER-K PLC
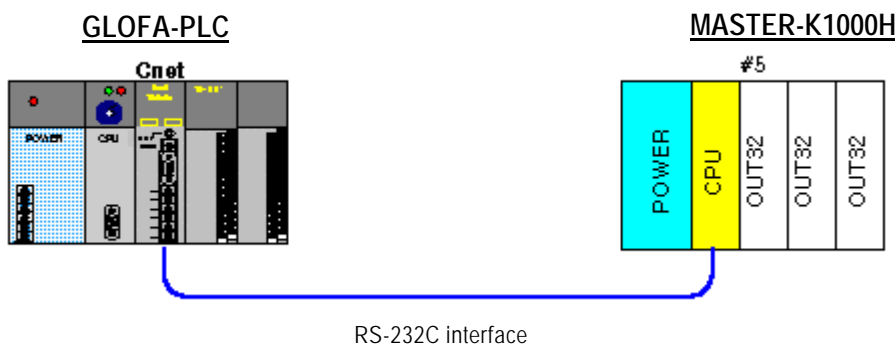
8.5.1 Exercising program

Cnet I/F module operates as a master station in user defined mode, and writes data to MASTER-K 1000H via CPU port of MASTER-K 1000H PLC through dedicated protocol and WORD WRITE command among MASTER-K dedicated communication protocols, while MASTER-K 1000H operated as a slave station processes Write data request of GLOFA-Cnet to respond to the following result in the structure as shown in [Figure 8.14]. Prepare frame and GMWIN program for this after setting of Cnet I/F module mode and basic setting items.

1) Setting items

As in communication via RS-232C channel of Cnet I/F module, set operation mode and basic parameters for RS-232C channel. [Table 8.8] describes setting items of Cnet.

[Table 8.8] Setting items of Cnet I/F module

RS-232C channel setting item	Setting contents	Remark
Operation mode	Mode '2' user defined mode	RS-422 channel not used
RS-232C station No.	Basic value(Not used)	Communication speed and basic communication spec. shall be as specified in spec. of MASTER-K 1000H communication.
Communication type	Null modem	
RS-232C basic parameters	9600 BPS/DATA 8 bits /START 1 bit/STOP 1 bit	

2) Communication cable connection and basic setting

Connect Cnet with computer communication port in MASTER-K 1000H CPU as shown in [Figure 8.15]. Handshake-free type of null modem connection in RS-232C communication is applied with MASTER-K 1000H communication type set to RS-232C communication and 9600 BPS/Data 8 bits/Start 1 bit/Stop 1 bit through DIP switch along with station No. set to station 5. Refer to the user's manual for MASTER-K series communication to set MASTER-K 1000H communication.

[Figure 8.15] 3-line connection between Cnet and MASTER-K 1000H (Handshake-free)

Cnet(9-pin)		Connection No. and Signal direction	MASTER-K1000 CPU	
Pin No.	Name		Pin No.	Name
1	CD		CD	8
2	RXD		RXD	3
3	TXD		TXD	2
4	DTR		DTR	20
5	SG		SG	7
6	DSR		DSR	6
7	RTS		RTS	4
8	CTS		CTS	5
9	RI		RI	22

3) TX/RX sequence of communication frame

TX/RX procedure to communicate in MASTER-K 1000H computer communication type is as follows. Cnet I/F module operates as a master station and MASTER-K 1000H operates as a slave to respond to Cnet's request as shown in the figure.

[Figure 8.16] TX sequence of TX/RX frames

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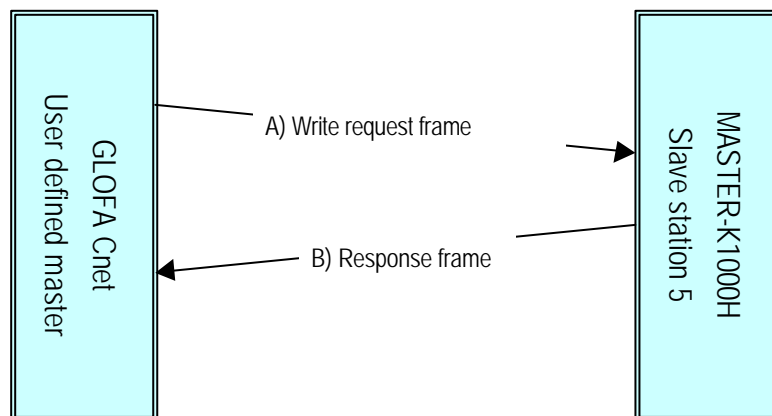
When GLOFA Cnet sends A) Write request frame first, MASTER-K 1000H to respond to this, writes data to applicable area and sends B) Response frame. Next is TX/RX frame structure.

A) Word Write frame (Cnet's request : Write request of 10 words in P00 of station 1)

Classification	Header	Station No.	Command	Address	Number	Data	Tail	BCC
Frame	ENQ	05	w	P00	0A	20 bytes Data	EOT	

BCC calculation range

B) Response format to Word Write (Response of MASTER-K 1000H)

Classification	Header	Station No.	Command	Tail	BCC
Frame	ACK	05	w	EOT	E0

BCC calculation range

Next is for communication frame contents. Refer to the user's manual of MASTER-K 1000H for more information.

❑ Station No. : Station No. 5 (station No. of MASTERK-1000H)

❑ Command : w (BCC checked in WORD WRITE with the lower case of command)

❑ Address : P00 (P area of MASTER-K 1000H)

❑ Number : 0A (number of HEX data to write in word unit)

❑ Data : Data to write in specified device

❑ BCC : ASCII code sum of HEX data from station No. to tail.

3) Frame edit

Define 2 frames above through Frame Editor.

A) Write request frame : Write request frame as of TX frame is configured to send data via segment in ARRAY type to defined protocol. Next is Frame Editor screen of transmission frame edited. MK_WR is used for frame name, and the number of TX data is set to 20 bytes with station No. and constant command in CONST input to segment 1 and ARRAY variable to segment 2. ARRAY type is set to Convert to convert TX data to ASCII. As is TX frame, set TX/RX to Send.

B) Response frame: To respond to Write frame, MASTER-K 1000H sends the response frame below. RX frame
to receive this is defined as below. Set frame name to MK_ACK and enter '05w' of RX frame CONST data for
station No. and command. RX frame has no data, thus, no need to set ARRAY segment. Set [BCC] behind the
tail to let BCC checked. Since BCC uses lower case command in Cnet's request frame, let BCC checked in all
TX/RX frames.

C) BCC checking : BCC sends / receives HEX data sum from station No. to tail with ASCII converted result attached to the tail. BCC setting is as follows.
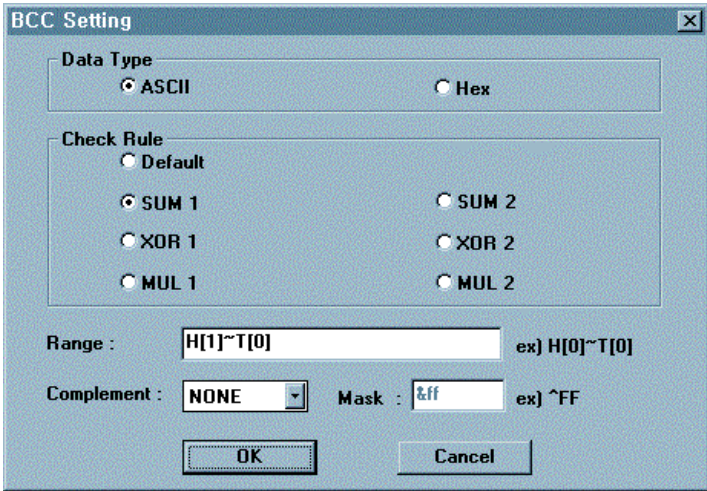
D) Frame download : Download the prepared frame and basic parameters as above to Cnet I/F module and run RS-232C channel to complete basic setting for Cnet I/F module. Subsequently, prepare PLC program through GMWIN program.

4) GMWIN programming

After frame edit and download are completed, prepare TX/RX program with SND_MSG/RCV_MSG in GMWIN for TX/RX by the prepared frame. Program for frame transmission and RX data saving shall be also prepared in GMWIN. [Figure 8.17] shows GMWIN program for communication with MASTER-K 1000H. With 1 sec. timer, 'MK_WR' frame is transmitted in a cycle of 1 sec. and TX area of %MB200 is allocated in SD1 area of TX frame to transmit 20 bytes starting from %MW100 address. Download the program shown in [Figure 8.17] to PLC and run program to allow TX/RX through Cnet.

[Figure 8.17] MASTER-K 1000H communication program
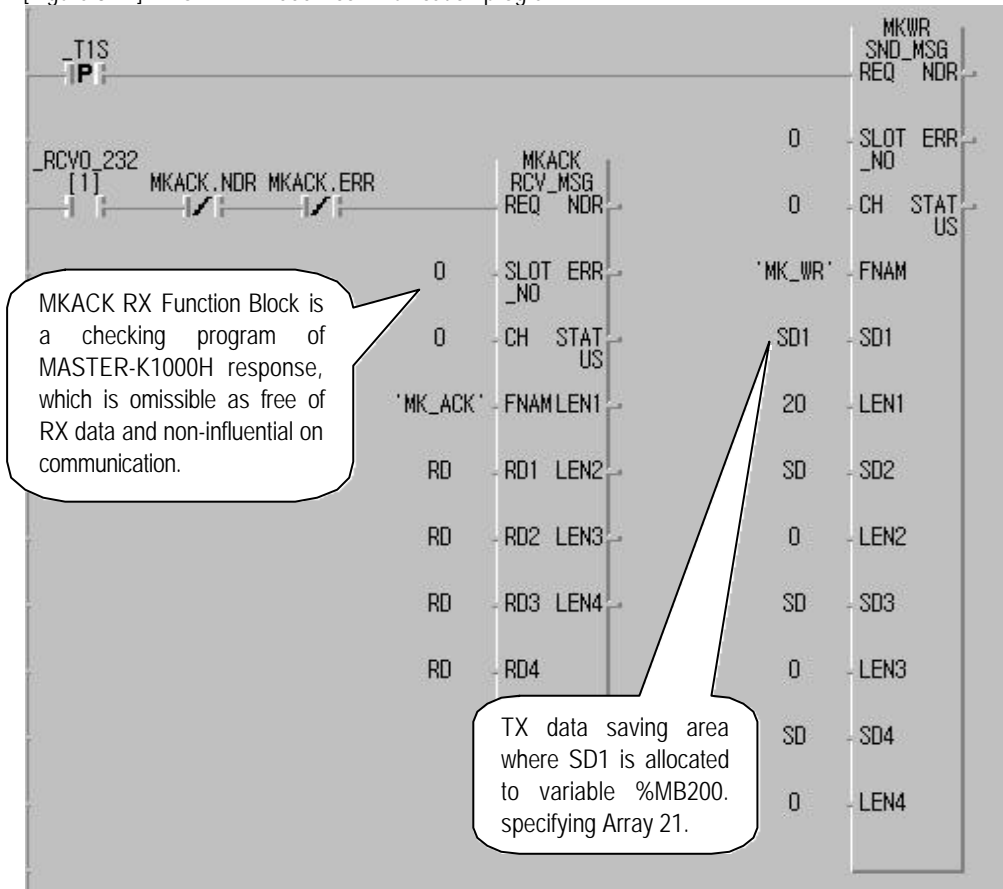
8.6 Communication with HEX communication equipment

Communication with devices which communicate with GLOFA-PLC through HEX protocol is described as below.   HEX communication needs only half amount of ASCII communication data, so it enables double speed communication comparatively even in the same communication speed. The figure shows an example of user defined mode communication of Cnet I/F module as a master station, with temperature controller which performs HEX communication. 12-word data per channel of temperature input 12 channels of temperature controller are read one by one and saved to %MB300 address of GLOFA PLC, and if No.0 bit input value of slot No.1 input module in GLOFA PLC is turned on, 24 bytes data is read from %MB1000 address and output to 12 channels of D/A output module of temperature controller in this program example. GLOFA Cnet I/F module and temperature controller perform 1:1 communication via RS-232C channel in the system configuration as shown in [Figure 8.18].

[Figure 8.18] Communication system of GLOFA-PLC with temperature controller
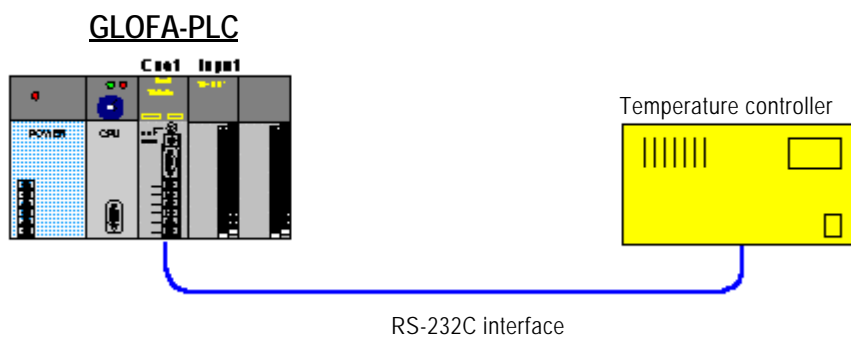
8.6.1 Exercising program

Cnet I/F module operates as a master station in user defined mode, and temperature controller operated as a slave responds to Read/Write data requests of GLOFA Cnet I/F module via RS-232C communication port in [Figure 8.18]. For this service, set mode and basic items of Cnet I/F module and then prepare frame and GMWIN program. As communication protocol of temperature controller is in HEX communication here, HEX value is to be defined in the frame of Cnet I/F module, which is supported only in Cnet Ver.2.0 or later. Ver.2.0

Remark

[Note1]   When setting of constant in Frame Editor, HEX value can't be input, thus, former modules than Cnet Ver.2.0 are unavailable for the service. Frame Editor also shall be of Ver. 2.0 or later for the service.

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1) Setting items

As in communication via RS-232C channel of Cnet I/F module Ver.2.0, set operation mode and basic parameters for RS-232C channel. [Table 8.9] describes setting items of Cnet I/F module.

[Table 8.9] Setting items of Cnet I/F module

RS-232C channel setting item	Setting contents	Remark
Operation mode	Mode '2' user defined mode	RS-422 channel not used.
RS-232C station No.	Basic value (Not used)	Communication speed and basic
Communication type	Null modem	communication spec. shall be as specified
RS-232C basic parameters	38400 BPS / DATA 8 bits / START 1 bit / STOP 1 bit	in spec. of temperature controller communication.

2) Communication cable connection and basic setting

RS-232C communication channel of temperature controller is connected with Cnet RS-232C channel. If Handshake-free type of null modem communication is applied to temperature controller, perform connection as shown in [Figure 8.19]. After that, set communication type of temperature controller identical to the communication type of Cnet I/F module in [Table 8.9] to complete basic setting for communication. Refer to the user's manual of temperature controller to set temperature controller.

[Figure 8.19] 3-line connection between Cnet and temperature controller (Handshake-free)

Cnet(9-pin)		Connection No. and signal direction	Temperature controller	
Pin No.	Name		Pin No.	Name
1	CD			
2	RXD		RXD	2
3	TXD		TXD	3
4	DTR			
5	SG		SG	7
6	DSR			
7	RTS			
8	CTS			
9	RI			

3) Communication protocol of temperature controller

For communication between Cnet I/F module and temperature controller, communication type of temperature controller is to be informed of. The example describes how to prepare program supposing that communication protocol is as shown in [Figure 8.20].

[Figure 8.20] Communication protocol of temperature controller
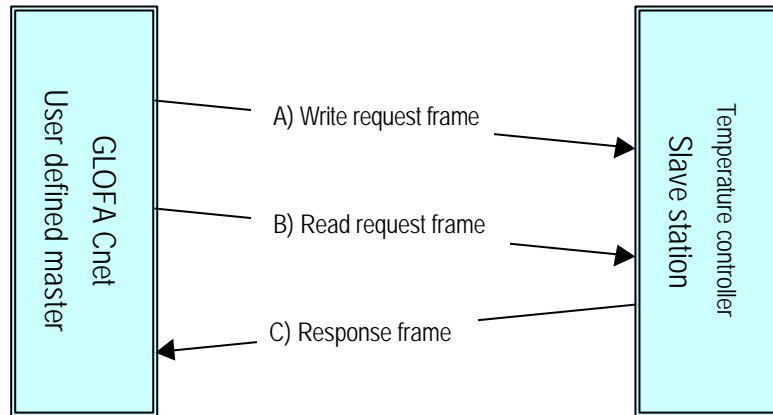
A) Write request frame(Cnet's request : Write data of 12 channels in temperature controller)

Classification	Header	Device ID	Command	Address	Channel number	Data
Frame	[DLE][STX]	01	01	30	0c	12-word data

BCC calculation range

BCC	Tail
	[DLE][ETX]

B) Read request frame(Cnet's request : Read temperature value of 12 channels in temperature controller)

Classification	Header	Device ID	Command	Address	Channel number	BCC	Tail
Frame	[DLE][STX]	01	02	80	0c		[DLE][ETX]

BCC calculation range

C) Read response frame (Temperature controller's response : sends temperature value of 12 channels)

Classification	Header	Device ID	Command	Status	Channel number	Data
Frame	[DLE][ACK]	01	02	00	0c	12 word data

BCC calculation range

BCC	Tail
	[DLE][EOT]

Communication protocol in [Figure 8.20] is a protocol for HEX communication with data areas all in HEX except header and tail.

Communication frame is described next.

❑ Header   : Indicates start of frame with [DLE][STX] in request frame and continuous control characters of [DLE][ACK] in response frame.

❑ Tail   : Indicates end of frame with [DLE][ETX] in request frame and continuous control characters of [DLE][EOT] in response frame.

❑ Device ID : Means temperature controller No. with '01' used in.

❑ Command : Dependent on Read/Write commands, '01' for Write and '02' for Read command.

❑ Address : Memory address of temperature controller.

❑ Channel number : I/O channels number of temperature controller.

❑ Data : I/O channel data of temperature controller.

❑ Status : Indicates the status of response frame. '00' if displayed means response successful.

❑ BCC : HEX data sum from Device-ID next to header to BCC prior.

4) Frame edit

   Define 3 frames above through Frame Editor to download to Cnet I/F module.

   A) Write request frame : Write request frame as of TX frame is configured to send data to specified protocol through segment of ARRAY type. Next is Frame Editor screen of TX frame edited. CON_WR is entered in frame name, CONST in segment 1, HEX for channel number in Device-ID, ARRAY variable in segment 2 and 24 bytes for TX number of data.

Enter None for Array type to send TX data in HEX without ASCII conversion. As is TX frame, set TX/RX to Send. Enter [BCC] in tail and set BCC as below with data only inside segment added to send 1 byte BCC data in HEX value together. Set the range of S[0]~S[27] as the data length of segment is 28 bytes.

B) Read request frame: It is TX frame to read channel data through temperature controller in Cnet. TX frame for Read request shall be registered as follows. Input CON_RD for frame name. Because TX frame has no data area, use just one segment set to Constant. Set [BCC] in front of tail and let [BCC] checked. BCC checking range and calculation method are same as in Write request frame.

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C) Read response frame : Set RX frame to receive TX frame which responds to Read request in temperature controller. The right figure shows setting screen of RX frame. CON_ACK is entered in frame name, ARRAY segment in RX data area of temperature controller's response frame, HEX in command, CONST where is out of '00' and ARRAY in STATUS area as RX data is HEX '00' with STATUS value checked in PLC program.[Note1]   Set RX data area to ARRAY and conversion option to None in order to allow RX data to be received in HEX value by PLC program.

The 3th Main Frame

Frame Name: CON_ACK   Tx/Rx: Receive
Header: [DLE][ACK]   Immediate Response:

Segment 1
Type: CONST   0102
⦿ HEX   ○ ASCII

Segment 2
Type: ARRAY   RD1
○ Convert ⦿ None   size: 1

Segment 3
Type: CONST   0C
⦿ HEX   ○ ASCII

Segment 4
Type: ARRAY   RD2
○ Convert ⦿ None   size: 24

Segment 5
Type: NONE

Segment 6
Type: NONE

Segment 7
Type: NONE

Segment 8
Type: NONE

Tail: [BCC][DLE][ET   BCC Setting   OK   Cancel

Remark

[Note1] HEX data of CONST segment can be set in an even number unit in frame edit. If '00' is in CONST data, setting is unavailable. In this case, set only '00' area to ARRAY.

---

5) GMWIN programming

After frame edit and download are completed, prepare TX/RX program via SND_MSG/RCV_MSG in GMWIN for TX/RX of the prepared frames. [Figure 8.21] shows TX/RX program to read data of temperature controller. It requests Read by transmission of 'Temperature' Function Block in a cycle of 1 sec. and receives its response frame to 'Response' Function Block to save HEX data of STAUTS and temperature data of 24 bytes among RX data to RD_DATA area temporally. Temporal data of RD_DATA if STATUS value is '0' saves 24 bytes of RX data in starting %MB300 address in order through this program.

[Figure 8.21] Read data program of temperature controller
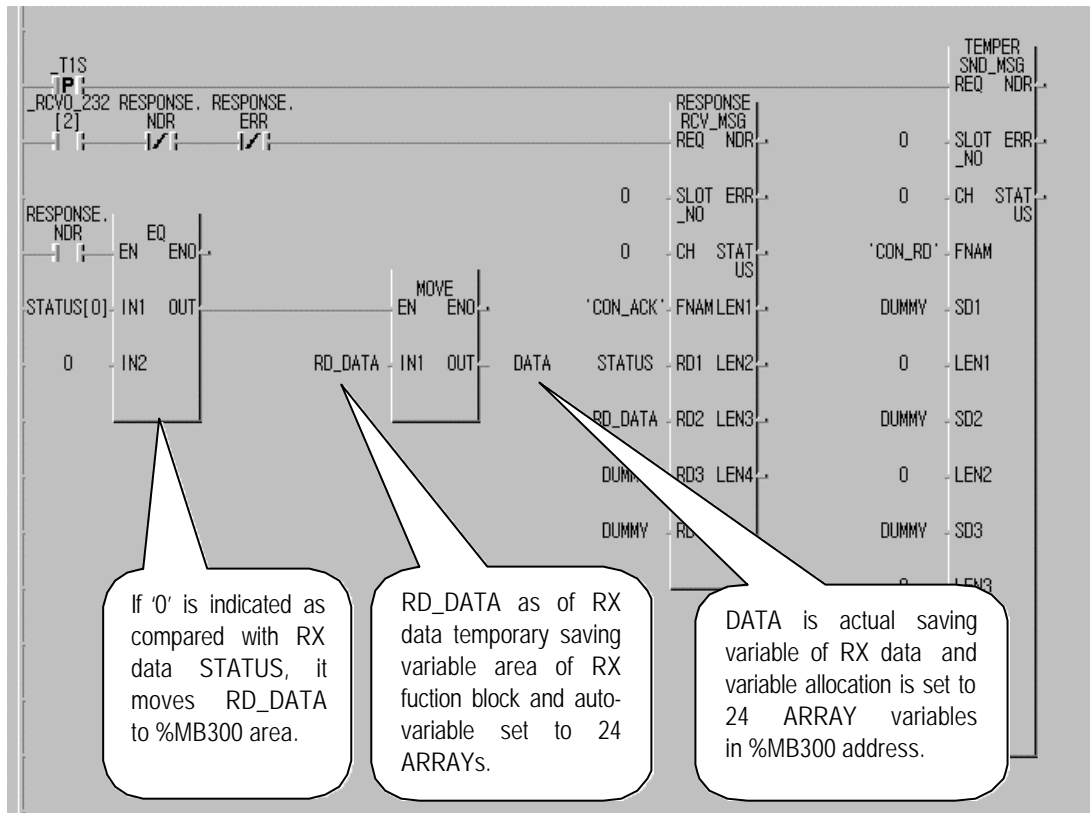
STATUS set to RD1 of 'Response' Function Block is auto-variable to save data set to ARRAY segment in Frame Editor to save RX data received in '00' of RX frame, and checks normal response as compared with this area.

[Figure 8.22] shows a program to write data with temperature controller. 'TX button' as of variable allocated to %IX0.1.0, sends TX data if 'ON' entered. TX data allocates 'DA_DATA' to %MB1000 to send 24 bytes data from %MB1000.

[Figure 8.22] Write data program of temperature controller

After compile and link of programs in [Figure 8.21] and [Figure 8.22], let them downloaded to PLC CPU and run to start communication through the defined protocol.

8.7 Example of using G7L-CUEC

8.7.1 Dedicated communication master

RS-422/485 COMMUNICATION CABLE

G7E-DR10A   G7L-CUEC

GM7 BASIC UNIT   G7L-CUEC
(SLAVE : STATION NO.31)
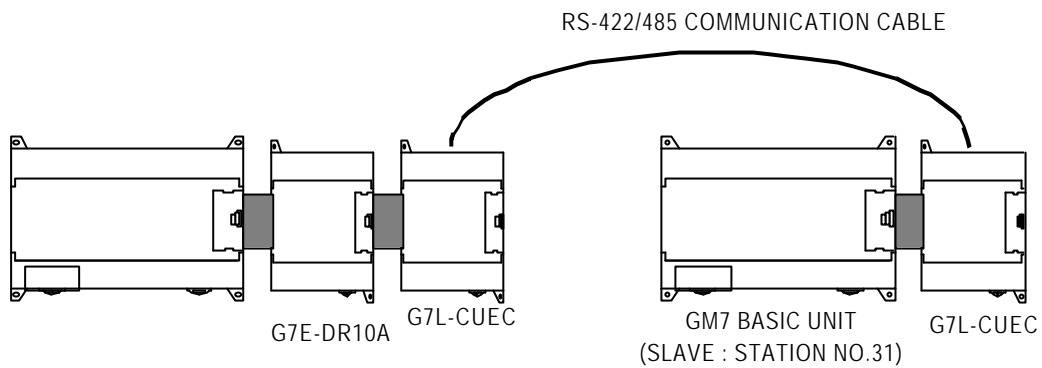
The following describes the example of system configuration as above with GM7 basic unit operation.

- In master GM7 basic unit, data is changed through ROL Function and MOV Function in M area, written to output contact of slave GM7 basic unit, and then read again in master GM7 basic unit finally to be written to output contact of G7E-DR10A which is extended digital I/O module.

1) Communication parameter setting and program of slave station

   A) Perform operations in slave station No.31.

   B) Create new project file and new program for slave station.
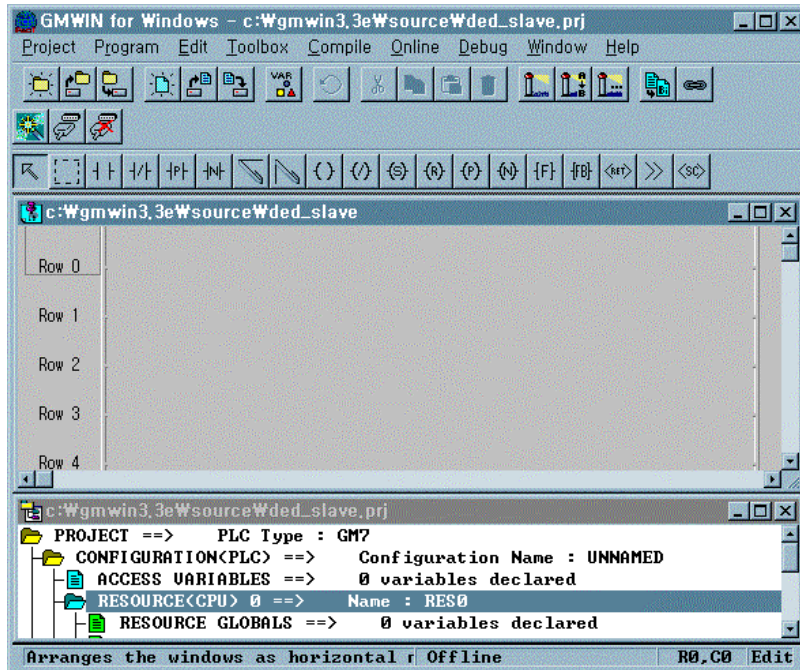
C) Select communication parameter in GMWIN parameters and double-click on it to open communication parameter menu window.
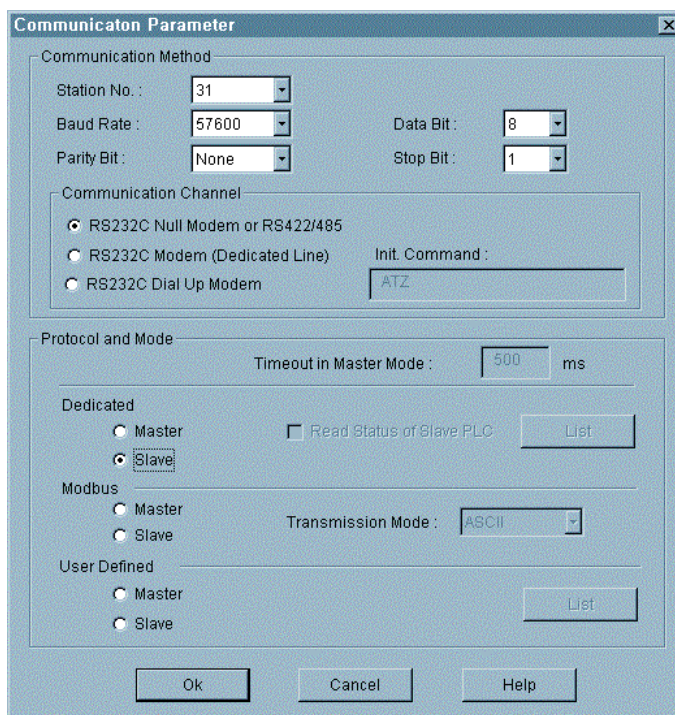
- Set parameters as below and click on OK button.

Communication method						Protocol and mode
Station No.	Baud rate	Data bit	Parity bit	Stop bit	Communication channel	Dedicated
31	57600	8	None	1	RS232C null modem or RS422/485	Slave

D) Prepare program as in the figure below and let it downloaded to GM7 basic unit of slave station. Refer to user's manual of GMWIN for the details of programming and downloading.
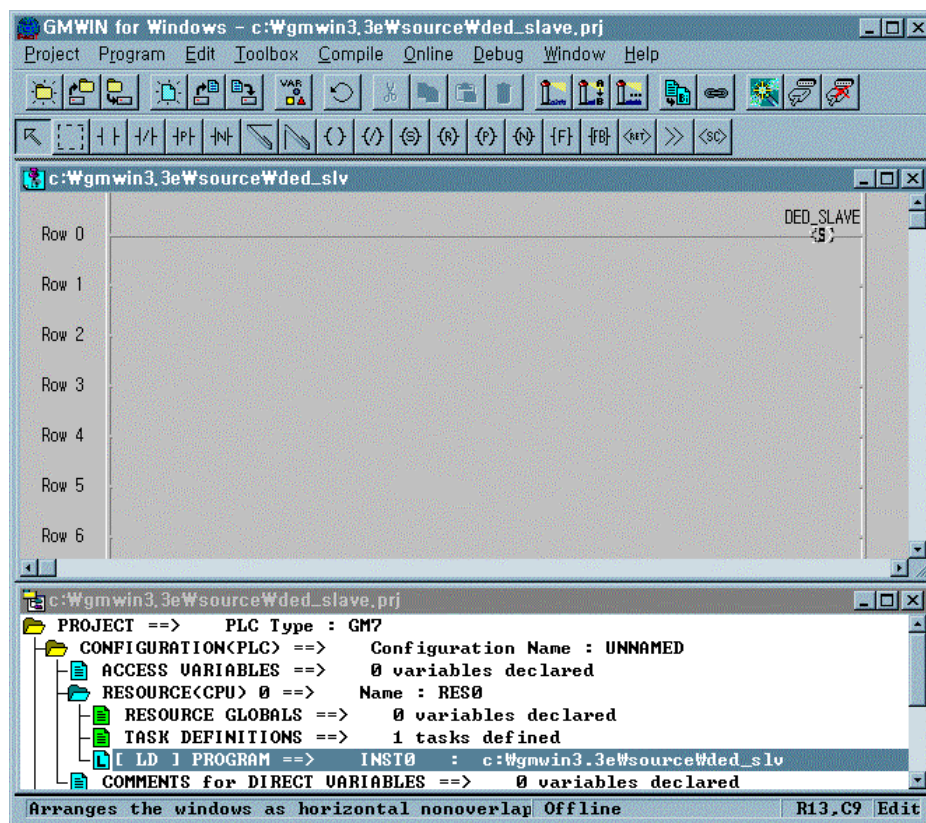
2) Communication parameter setting and program of master station

A) Perform operations in master station No.1.

B) Create new project file and new program for master station.
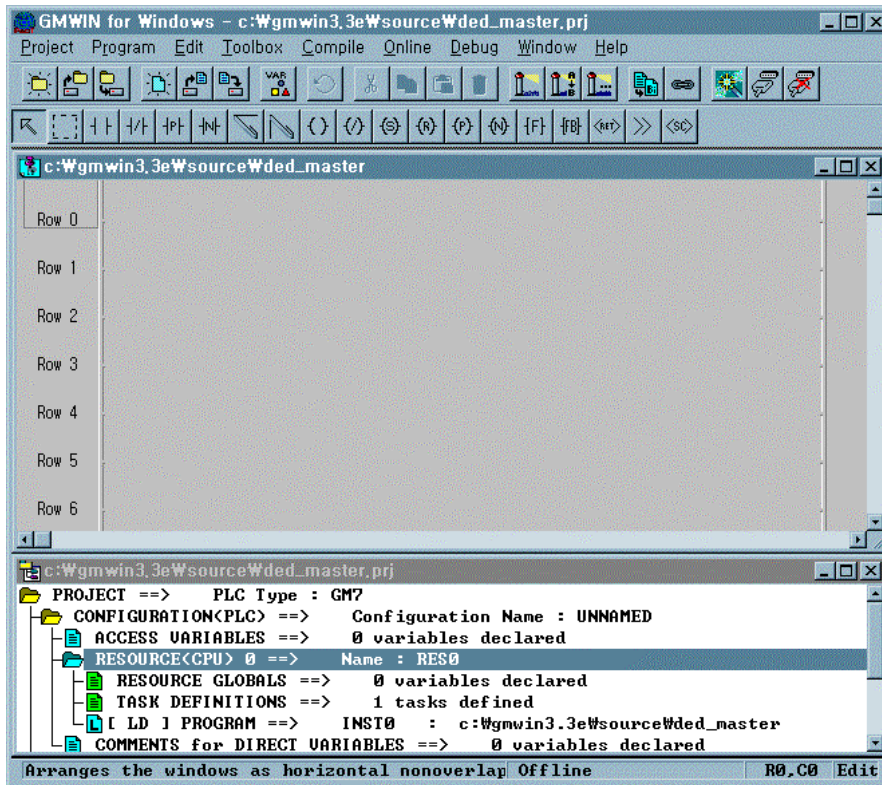
C) Select communication parameter in GMWIN parameters and double-click on it to open communication parameter menu window.
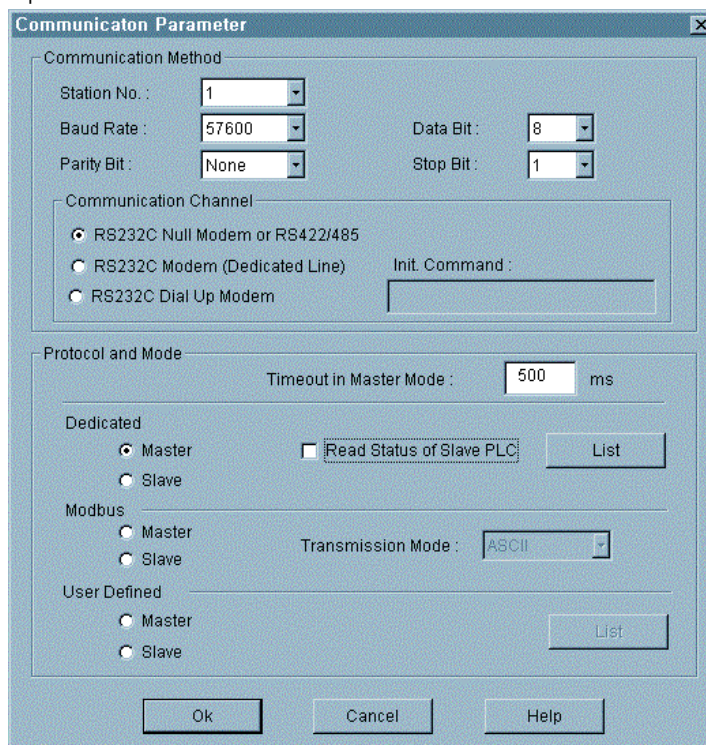
- Set parameters as below and click on entry list button.

Communication method						Protocol and mode	
Station No.	Baud rate	Data bit	Parity bit	Stop bit	Communication channel	Dedicated	Read status of slave PLC
1	57600	8	None	1	RS232C null modem or RS422/485	Master	Not selected

D) Press entry list button to activate entry list window.
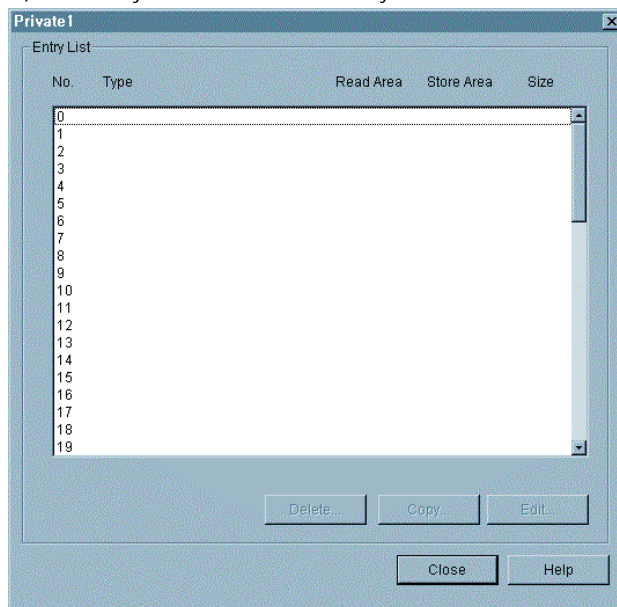
E) Double-click on entry list 0 in entry list with mouse to open the window showing Private 1 Item 0 Edit.
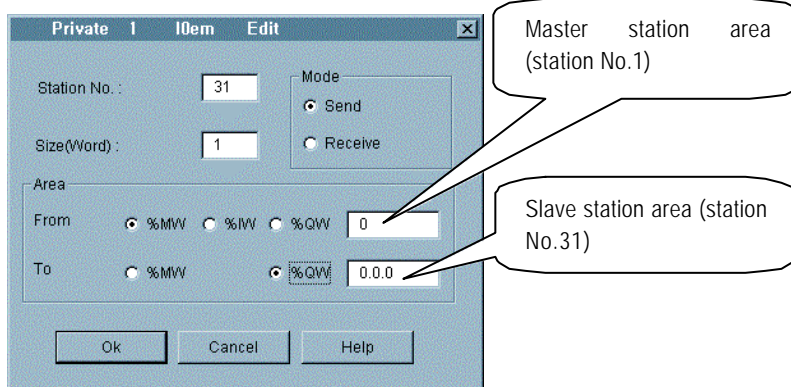
Master station area (station No.1)

Slave station area (station No.31)

- Set parameters as below and click on OK button.

Other station No.	Size	Mode	Area to read	Saving area
31	1	TX	%MW0 (Refer to the figure above)	%QW0.0.0 (Refer to the figure above)

F) Entry list 0 can be confirmed as registered in entry list as in the figure below.
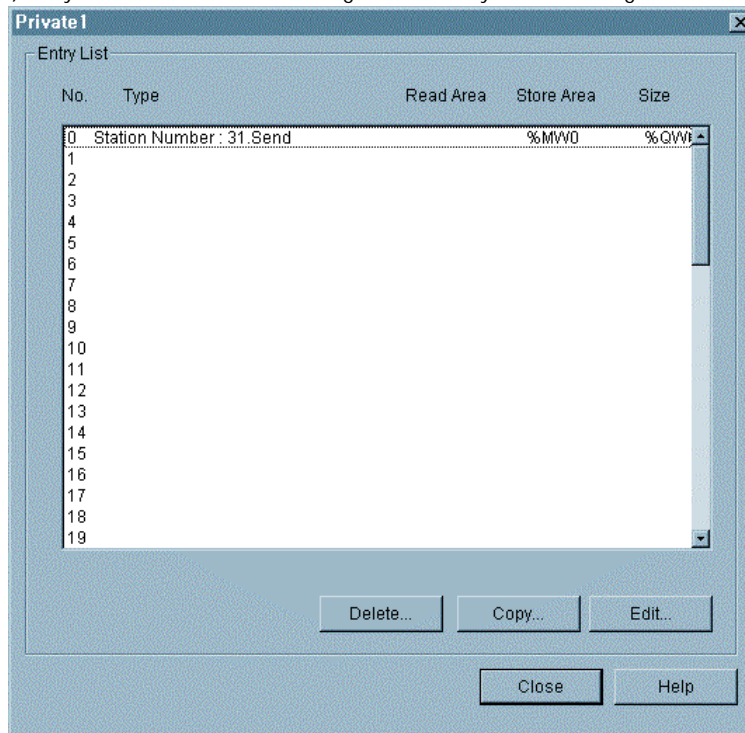
G) Double-click on entry list 1 with mouse again to enter entry list 1 as below.
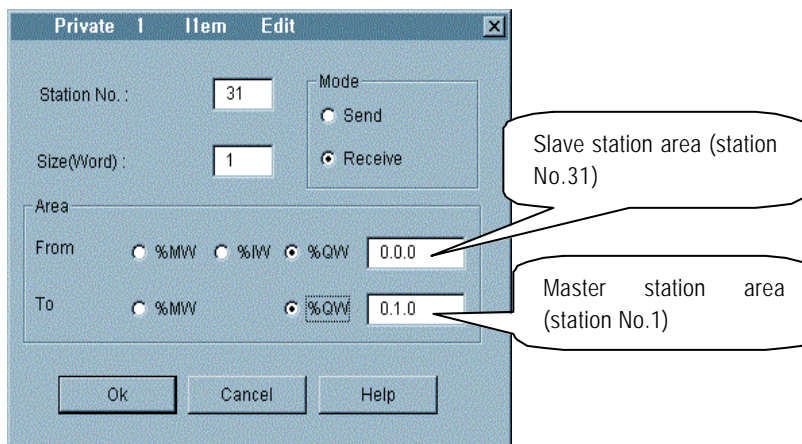
Slave station area (station No.31)

Master station area (station No.1)

- Set parameters as below and click on OK button.

Other station No.	Size	Mode	Area to read	Saving area
31	1	RX	%QW0.O.O (Refer to the figure above)	%QW0.1.0 (Refer to the figure above)

H) Check if entry list 0 and entry list 1 are registered as in the figure below and then press Close button to go to communication parameter window.
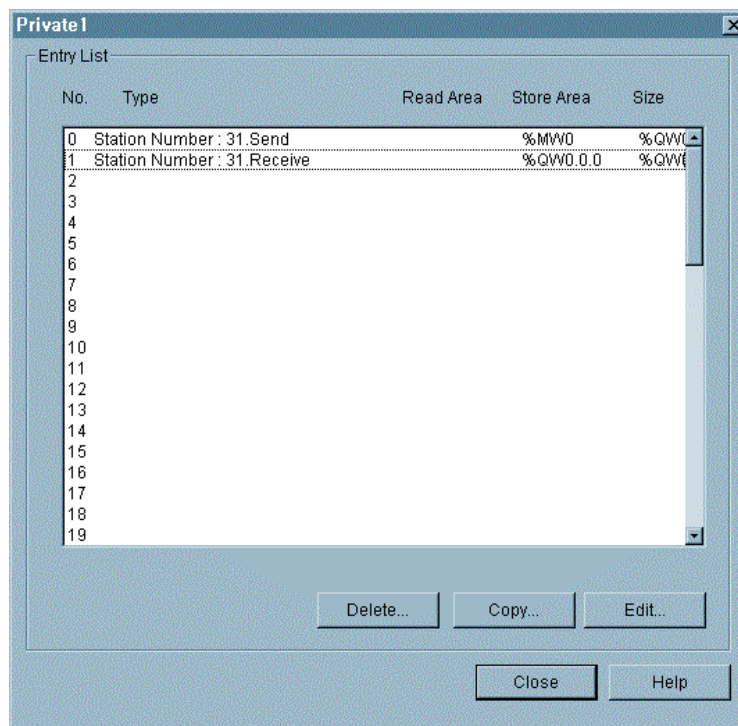
I) Click on OK button in communication parameter window to complete parameter setting input.

J) Prepare program as in the figure below and let it downloaded to GM7 basic unit of master station. Refer to user's manual of GMWIN for the details of programming and downloading.

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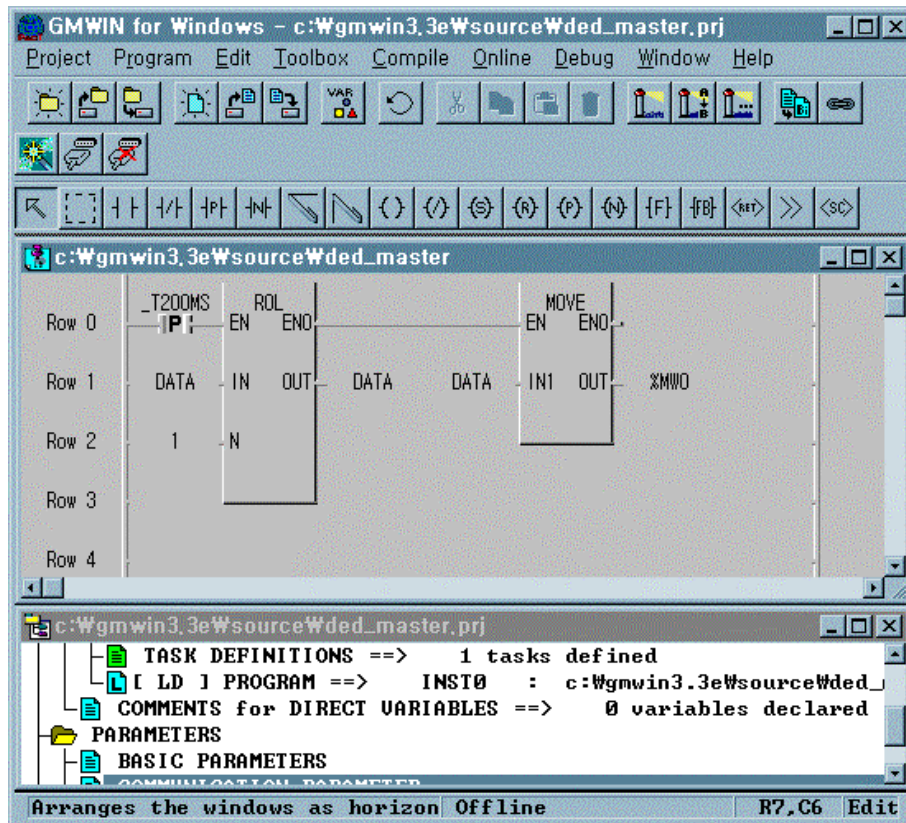
K) 'DATA', variable of program is HFF in HEX as an initial value with WORD type as in the figure below.
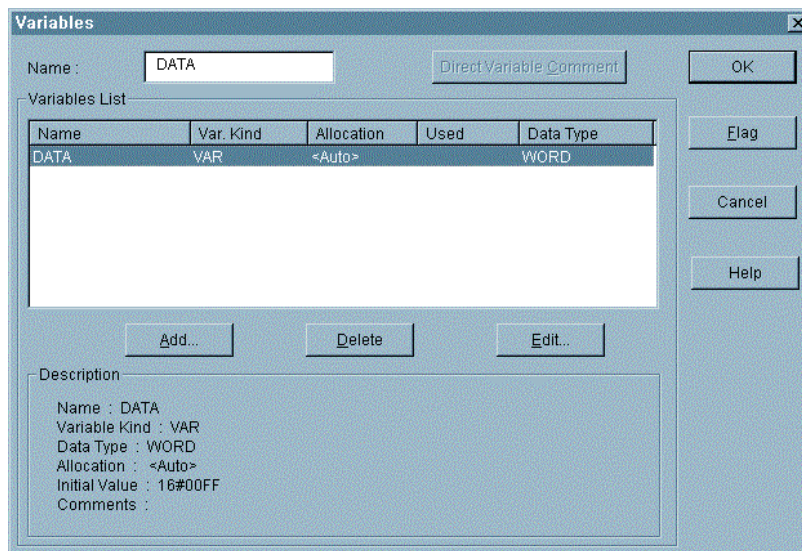
L) Set 'Enable Communication' in On-line status to execute master function in dedicated communication between LG GM7 basic units.

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8.7.2 User's definition

Example of protocol-defined communication between GM7 basic units is described in system configuration as below.

RS-422/485 communication cable

GM7 basic unit   G7E-DR10A   G7L-CUEC   GM7 basic unit   G7L-CUEC

(Master : station No.0)   (Slave : station No.1)
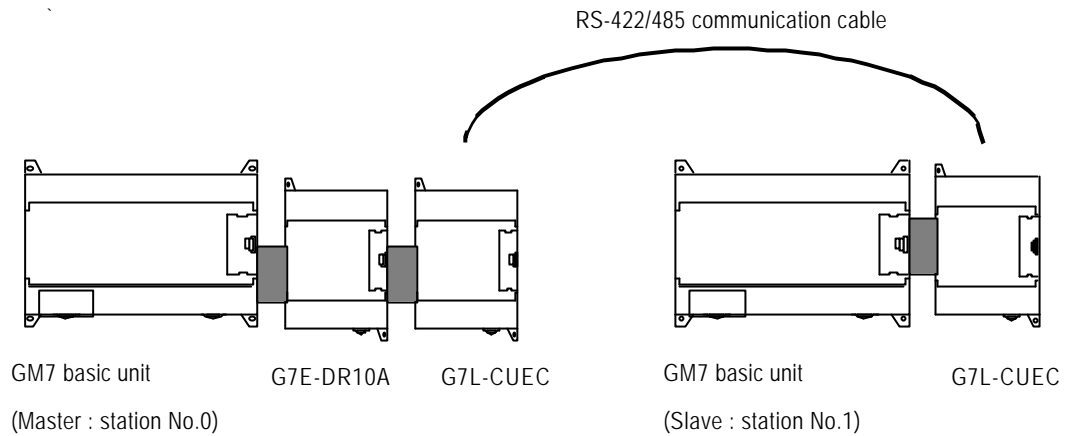
Data in M area of master station is sent to slave station, successively saved in M area as received by slave station, output to direct variable, and then transmitted to the master station again as processed.

Master saves the received data to M area again, outputs to direct variable, processes and then sends the data to slave station again repeatedly.

1) Communication parameter setting and program of slave station

   A) Perform operations in slave station No.1.

   B) Create new project file and new program for slave station..
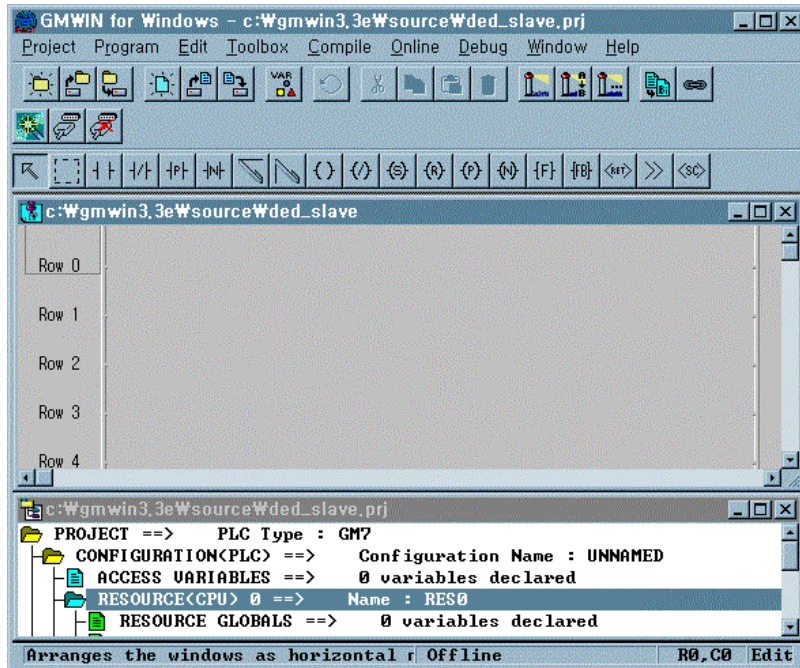
   C) Select communication parameter in GMWIN parameters and double-click on it to open communication parameter
      menu window.
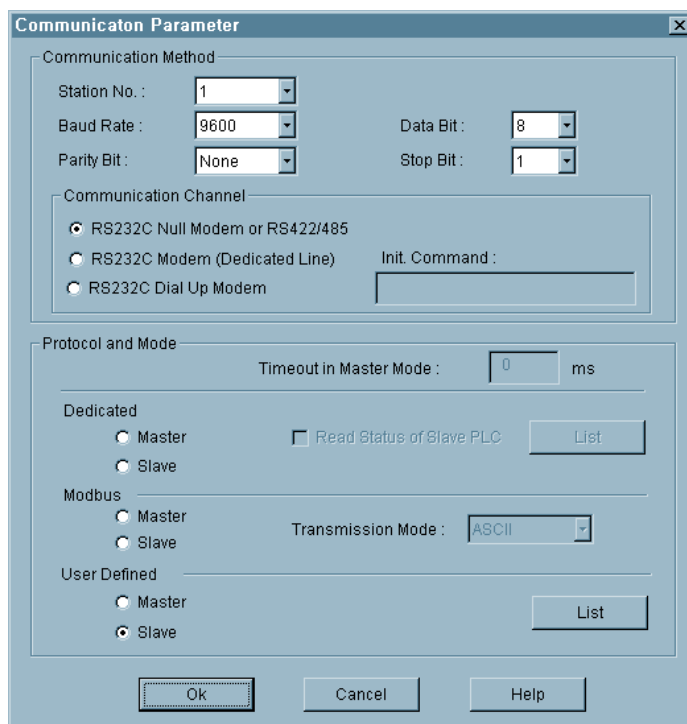
● Set parameters as below and click on OK button.

Communication method						Protocol and mode
Station No.	Baud rate	Data bit	Parity bit	Stop bit	Communication channel	User defined
1	9600	8	None	1	RS232C null modem or RS422/485	Slave

D) Click on entry list button to display the figure below.
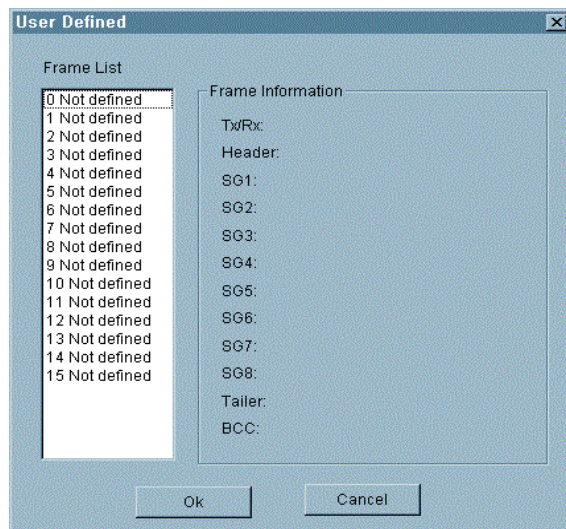
E) Double-click on frame list 0 to activate Frame 0 window and set as shown in the figure below.
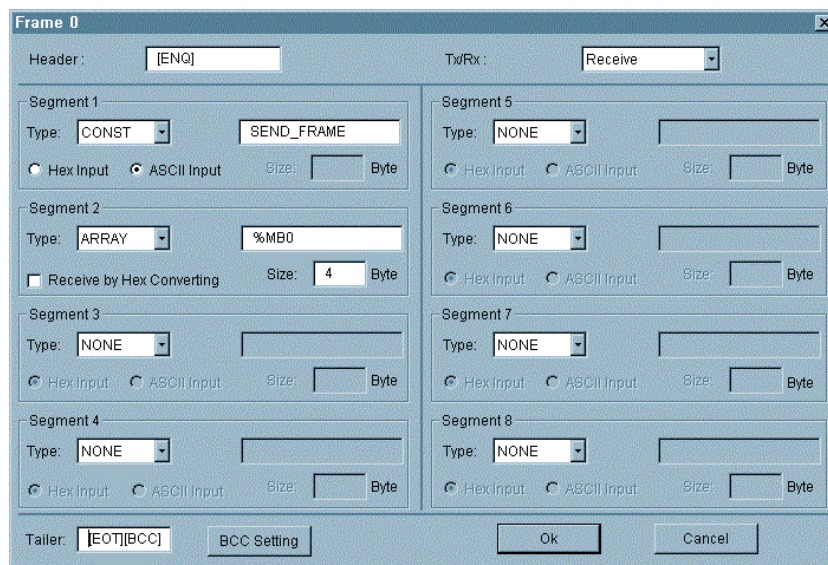
Item	Setting value
Header	[ENQ]
TX/RX	RX
Segment 1	Type : CONST, Field : SND_FRAME, ASCII input selection button
Segment 2	Type : ARRAY, Field : %MB0, Size : 4 bytes
Tail	[EOT][BCC]

F) After setting, press BCC setting button as "[BCC]" is set to tail, and set BCC as in the figure below if BCC

setting window is activated and then click on OK button.

Item	Setting value
Type	ASCII
Type	SUM 2
Range	H(0)~T(0), namely, from Head [ENQ] to Tail [EOT].
Complement	None
Mask	Apply masking with HFF through XOR.

G) After BCC setting, click on OK button in Frame 0 window to register the frame as in the figure below.

H) Double-click on the following frame list 1 and activate Frame 1 window to set as in the figure below.

Item	Setting value
Header	[STX]
TXRX	TX
Segment 1	Type : CONST, Field : RCV_FRAME, ASCII input selection button
Segment 2	Type : ARRAY, Field : %MB10, Size : 4 bytes
Tail	[ETX]

I) After frame setting, click on OK button in Frame 1 window to register the frame as in the figure below.

J) Click on OK button to go to communication parameter setting and then click on OK button again to complete setting.

K) Prepare program as in the figure and let it downloaded to GM7 basic unit of slave station.
Refer to user's manual of GMWIN for the details of programming and downloading.

● In the program, Function Block is used. Prior to Function Block service, double-click on the item of GMWIN 'Included libraries' to open Include Library window as below. Click on 'Add(A)... ' button to add COMM.7FB library and then press OK button.

- If Frame 0 of RX frame is received, the value is saved in %MB0 of slave station. (Refer to frame setting of Frame 0.) The saved value of %MB0 at this time is output to direct variable, %QB0.0.0 and value output to direct variable, %QB0.0.0 is saved again to %MB10. If all the procedure is completed without error, Frame 1 in frame list is sent from Function Block. Frame 1 is the TX frame of 4 bytes data saved in %MB10.
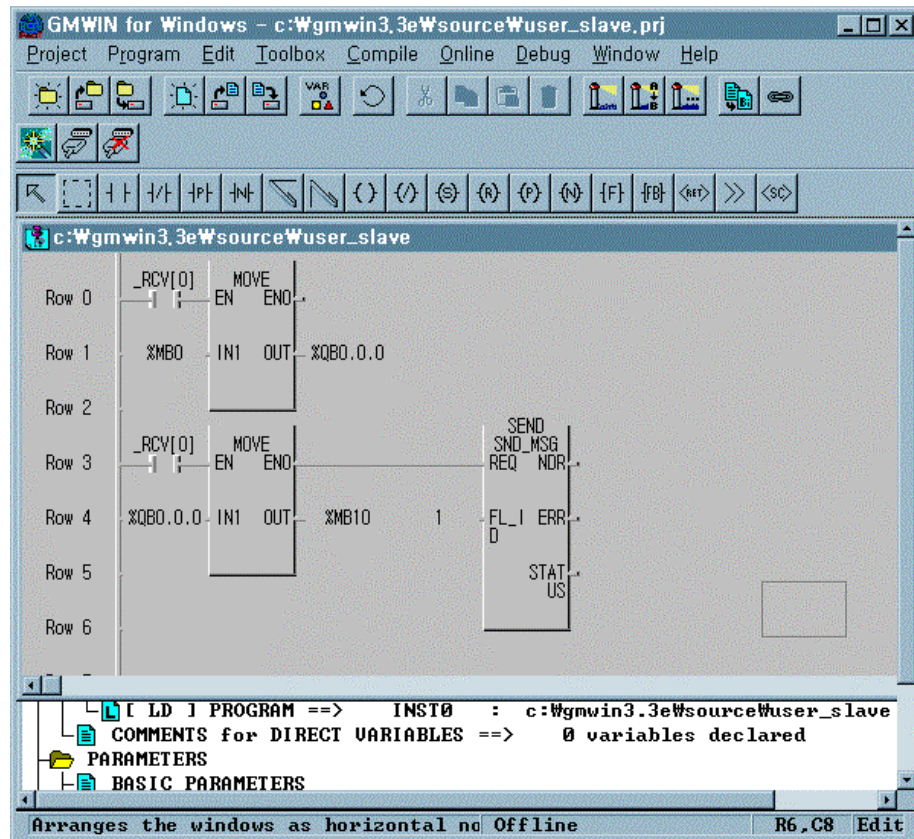
- If Frame 0 of RX frame is not received, this program operates never.
- **Surely set both master / slave stations to "Communication Enable" to start communication.**

2) Communication parameter setting and program of master station

    A) Perform operations in master station No.0.

    B) Create new project file and new program for master station.
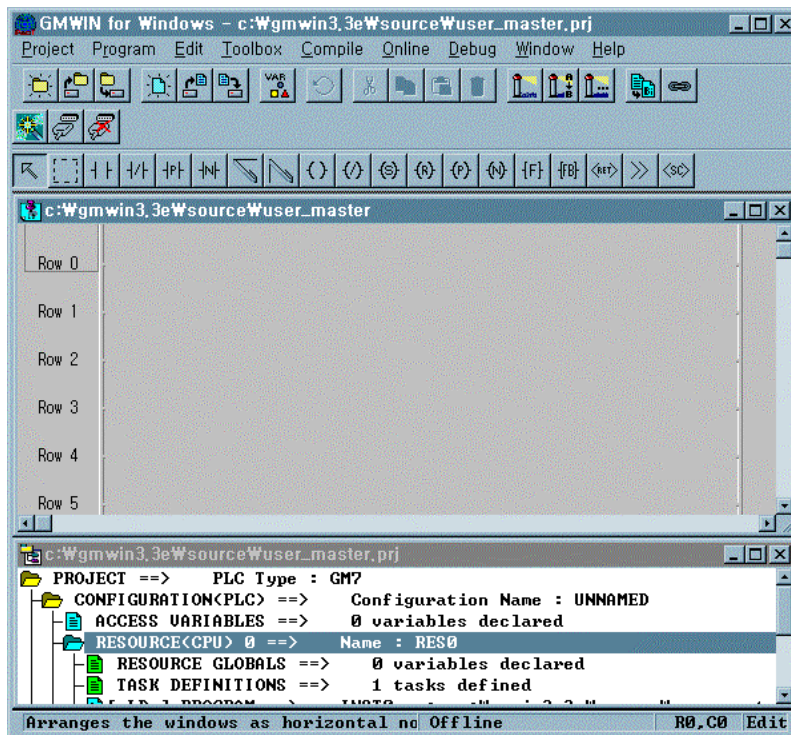
C) Select communication parameter in GMWIN parameters and double-click on it to open communication parameter menu window.
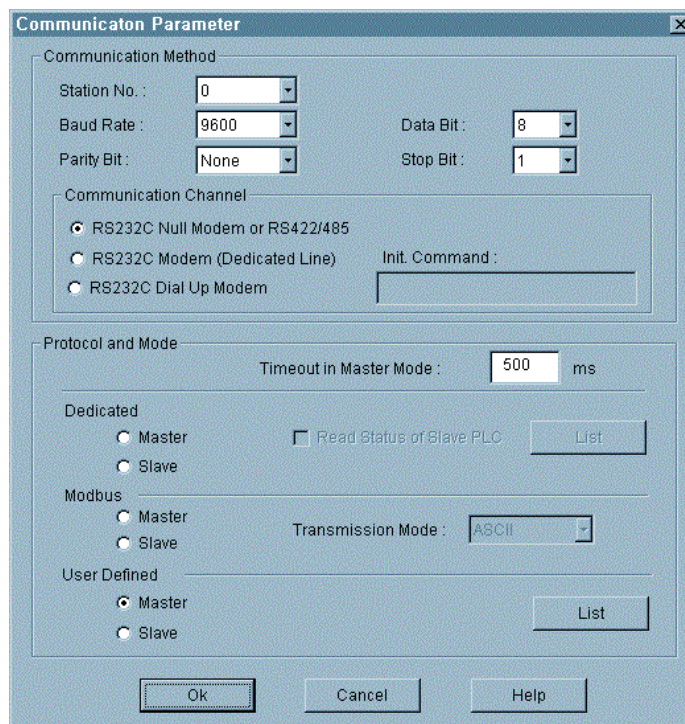
● Set parameters as below and click on OK button.

Communication method						Protocol and mode
Station No.	Baud rate	Data bit	Parity bit	Stop bit	Communication channel	User defined
0	9600	8	None	1	RS232C null modem or RS422/485	Master

D) Click on entry list button to display the figure below.
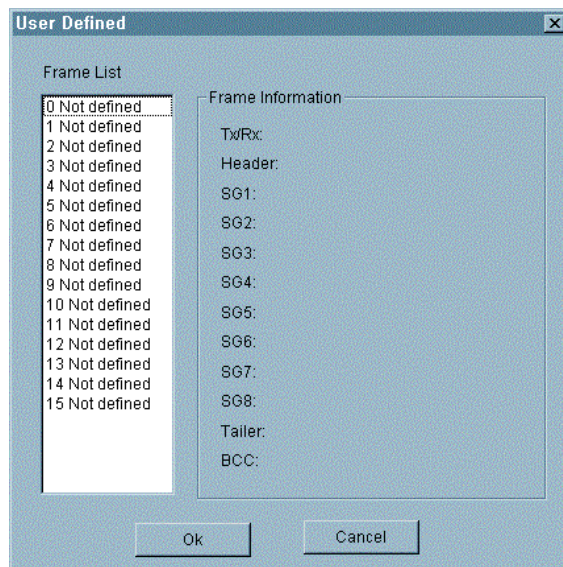
E) Double-click on frame list 0 to activate Frame 0 window and set as shown in the figure below .

Item	Setting value
Header	[ENQ]
TX/RX	TX
Segment 1	Type : CONST, Field : SND_FRAME, ASCII input selection button
Segment 2	Type : ARRAY, Field : %MB0, Size : 4 bytes
Tail	[EOT][BCC]

F) After setting, press BCC setting button as "[BCC]" is set to tail, and set BCC as in the figure below if BCC setting window is activated and then click on OK button.

Item	Setting value
Type	ASCII
Type	SUM 2
Range	H(0)~T(0), namely, from Head [ENQ] to Tail [EOT].
Complement	None
Mask	Apply masking with HFF through XOR.

G) After BCC setting, click on OK button in Frame 0 window to register the frame as in the figure below.

H) Double-click on the following frame list 1 and activate Frame 1 window to set as in the figure below.

Item	Setting value
Header	[STX]
TX/RX	RX
Segment 1	Type : CONST, Field : RCV_FRAME, ASCII input selection button
Segment 2	Type : ARRAY, Field : %MB10, Size : 4 bytes
Tail	[ETX]

I) After frame setting, click on OK button in Frame 1 window to register the frame as in the figure below.

J) Click on OK button to go to communication parameter setting and then click on OK button again to complete setting.

k) Prepare program as in the figure and let it downloaded to GM7 basic unit of slave station.

Refer to user's manual of GMWIN for the details of programming and downloading.

● In the program, Function Block is used. Prior to Function Block service, double-click on the item of GMWIN 'Included libraries' to open Include Library window as below. Click on 'Add(A)… ' button to add COMM.7FB library and then press OK button.

- Operate Function Block every 200ms to transmit Frame 0.
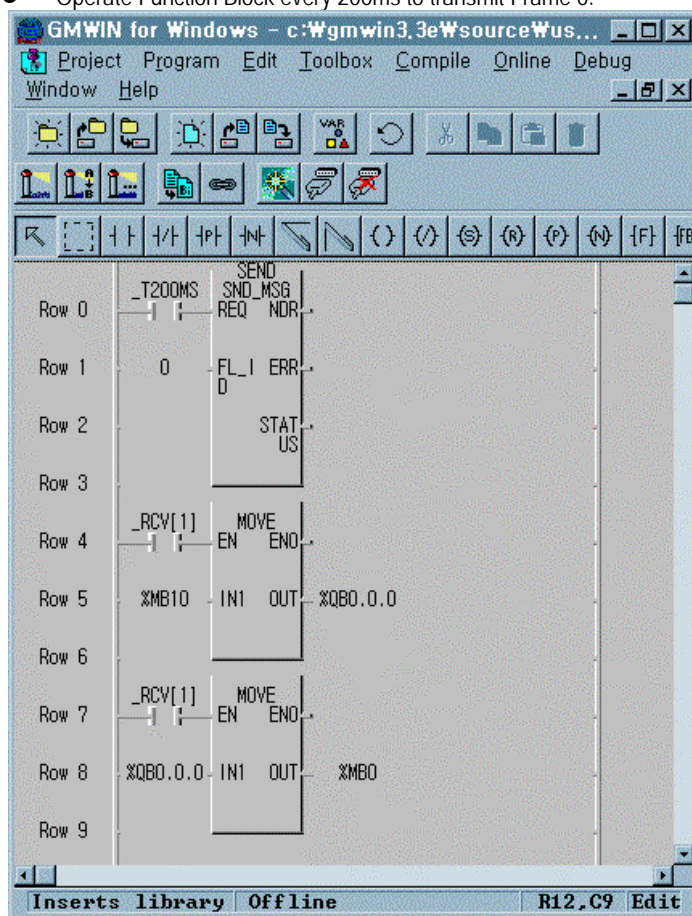
- Frame 0 transmits 4 bytes value from %MB0 of master station to slave station.
- If Frame 1 is sent from slave station, the value is saved in %MB10. (Refer to frame setting of Frame 1.)
  The saved value of %MB10 at this time is output to direct variable, %QB0.0.0 as reversed logically,
  and the output value to direct variable, %QB0.0.0 is saved again to %MB0.

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- Consequently, If 8 LEDs of master station are turned on, 8 LEDs of slave station are turned off. And if 8 LEDs of master station are turned off again, 8 LEDs of slave station are turned on.
- **Surely set both master / slave stations to "Communication Enable" to start communication.**

Chapter 9 Diagnosis function

9.1 Loop-Back self diagnosis

Loop-Back self diagnosis is a checking function if this module operates normally by itself as not connected with external devices via communication cable. Through this function, self-diagnosis is available for all hardware of Cnet I/F module except for external communication line and RS-232C/RS-422 channels also can be tested simultaneously. For Loop-Back self diagnosis, set operation mode switch of the module to test mode.

Remark

[Note1] GM7(G7L-CUEB/G7L-CUEC) series isn't provided with the diagnosis function.

9.1.1 Principle of operation

Loop-Back test sends test data from computer link itself without external cable connection to RS-232C/RS-422 channels and receives the data to display the diagnosis result on LED as compared with the sent data. [Figure 9.1] shows data flow in Loop-Back mode.

[Figure 9.1] Data flow chart in Loop-Back mode
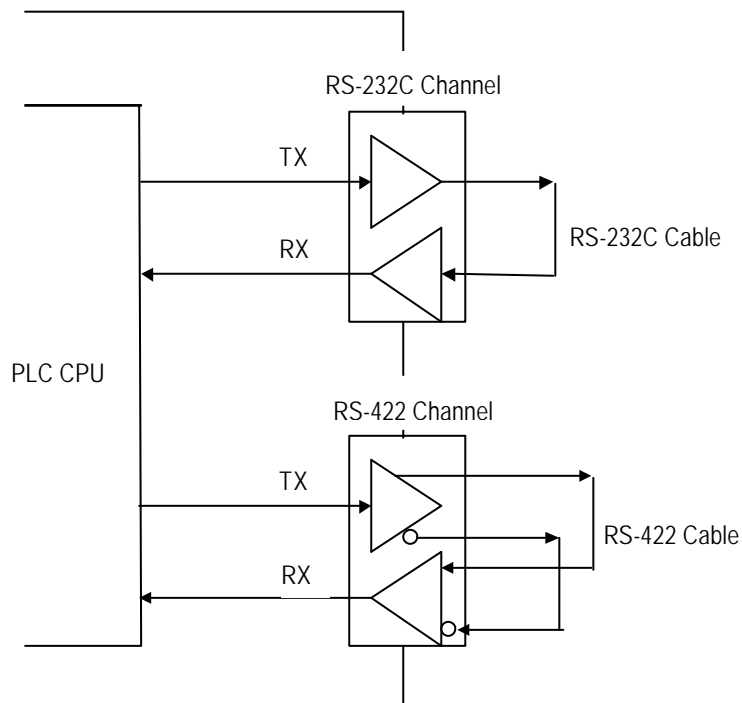
9.1.2 Procedure of Loop-Back self diagnosis

Procedure of Loop-Back self diagnosis is as follows.

1) Let RS-232C/RS-422 channels connected respectively as shown in [Figure 9.2] & [Figure 9.3].

2) Set operation mode setting switch to Loop-Back Test mode.

3) After self-diagnosis is started as powered on, check LED display per channel if normal or not

4) Self-diagnosis will be repeated until powered off.

[Figure 9.2] RS-232C cable connection

Cnet (9-PIN)		Connection No. and Signal direction
Pin No.	Name	
1	CD	
2	RXD	
3	TXD	
4	DTR	
5	SG	
6	DSR	
7	RTS	
8	CTS	
9	RI	

[Figure 9.3] RS-422 cable connection

Cnet		Cable connection
Pin No.	Name	
1	RDA	
2	RDB	
3	SDA	
4	SDB	
5	S.G	
6	F.G	

9.1.3 Operation of Loop-Back test LED

This module sends itself Loop-Back test data applied as changed and receives the data to display the result compared on LED. LED status represents the such two cases below of the front LED display switch as pushed and not pushed.

1) Next is LED display status when normal and abnormal in case LED display switch is not pushed. [Table 9.1] describes LED display items of G3L-CUEA/G4L-CUEA modules, and [Table 9.2] describes LED display items of G6L-CUEB/G6L-CUEC modules when normal and abnormal.

[Table 9.1] LED status depending on operation contents (G3L-CUEA/G4L-CUEA)

LED No.		Name	LED status normal		LED status abnormal	
0		RUN	On	Operating	OFF	Operation stopped
1		TX	Flash	Sending	OFF	No transmission
2	RS - 232C channel	RX	Flash	Receiving	OFF	No receiving
3		ACK	On	ACK responding	OFF	No ACK response
4		NAK	OFF	No NAK response	On	No NAK response
5		ERR	OFF	No error	Flash	Communication error occurred
6		MODEM	OFF	Not used	OFF	Not used
7		SYS-RUN	Dimly ON	CPU & I/F executed	OFF	CPU& I/F stopped
8		RUN	On	Operating	OFF	Operation stopped
9		TX	Flash	Sending	OFF	No transmission
10	RS - 422 channel	RX	Flash	Receiving	OFF	No receiving
11		ACK	On	ACK responding	OFF	No ACK response
12		NAK	OFF	No NAK response	On	No NAK response
13		ERR	OFF	No error	Flash	Communication error occurred
14		RS-485	OFF	Not used	OFF	Not used
15		SYSTEM-ERR	OFF	Normal	Flash	Communication module in abnormal operation

If in normal operation, the following status will be displayed for RS-232C/RS-422 channels when display switch is not pushed.
❑ RUN/ACK LED is ON and TX/RX LEDs flash in a cycle of 1 sec.
❑ No.8 SYS-RUN LED is dimly ON.
❑ Other LEDs than those above are OFF.

If displayed as above, module operation is normal including communication.

[Table 9.2] LED status depending on operation contents (G6L-CUEB/G6L-CUEC)

LED No.	Name		LED status normal		LED status abnormal	
0	G6L-CUEB	RUN	On	Operating	OFF	Operation stopped
1		TX	Flash	Sending	OFF	No transmission
2		RX	Flash	Receiving	OFF	No receiving
3		ACK	On	ACK responding	OFF	No ACK response
4		NAK	OFF	No NAK response	On	No NAK response
5		ERR	OFF	No error	Flash	Communication error occurred
6		MODEM	OFF	Not used	OFF	Not used
7		SYS-RUN	Dimly ON	CPU & I/F executed	OFF	CPU & I/F stopped
0	G6L-CUEC	RUN	On	Operating	OFF	Operation stopped
1		TX	Flash	Sending	OFF	No transmission
2		RX	Flash	Receiving	OFF	No receiving
3		ACK	On	ACK responding	OFF	No ACK response
4		NAK	OFF	No NAK response	On	No NAK response
5		ERR	OFF	No error	Flash	Communication error occurred
6		RS-485	OFF	Not used	OFF	Not used
7		SYSTEM-ERR	OFF	Normal	Flash	Communication module in abnormal operation

2) LED display in case LED display switch is pushed (Except for G6L-CUEB/G6L-CUEC)

If LED display switch is pushed during Loop-Back diagnosis, the result from comparison between the sent test data and the received data through Loop-Back is displayed on LED. Cnet I/F module creates/sends test data in a cycle of 1 sec. and checks the data if received exactly through Loop Back channel and then displays the result on LED. If normal, all LEDs shall be OFF when LED display switch is pressed down. If abnormal in communication, the number of errors per channel is displayed on LED display of LED No. 0~7 for the test result of RS-232C channel and LED No. 8~15 for the test result of RS-422 channel. [Table 9.3] describes how to calculate the number of errors on the basis of the displayed value on LED.

[Table 9.3] Error counter value when LED display switch is pushed

RS-232C error counter value (HEX)			RS-422 error counter value (HEX)		
LED #	BIT value	Conversion method	LED #	BIT value	Conversion method
0	D0	Counter values calculated by converting binary into HEX regarding D0 as lower bit, and D7 as upper bit.	8	D0	Counter values calculated by converting binary into HEX regarding D0 as lower bit, and D7 as upper bit.
1	D1		9	D1	
2	D2		10	D2	
3	D3		11	D3	
4	D4		12	D4	
5	D5		13	D5	
6	D6		14	D6	
7	D7		15	D7	

(Example of calculation)
- Calculation of the number of errors when LED No.D0, D2 & D5 are turned ON.
  $2^0 + 2^2 + 2^5 = 1 + 4 + 64 = 69$
- Calculation of the number of errors when LED No D1, D5 & D7 are turned ON.
  $2^1 + 2^5 + 2^7 = 2 + 32 + 128 = 162$

Remark
[Note1] If Cnet I/F module is normal and connection of Loop-Back Test is correctly applied, the number of errors shall be '0', and if displaying button is pushed, all LEDs are to be OFF.   [Note2] Communication of the test data shall be as specified in Tx/Rx specification user has set.

9.2 Diagnosis during power on

Cnet I/F module performs self-diagnosis test and checking of PLC CPU & interface as in the sequence below.

[Table 9.4] Checking sequence when powered on

CHECKING SEQUENCE	CHECKING ITEM	LED LIGHTING SEQUENCE
1	LED display check	All LEDs ON/OFF as executed
2	Self-memory check	LED '0' On
3	Flash memory check	LED '1' On
4	UART check	LED '2' On
5	Common memory check	LED '3' On
6	PLC interface check	LED '4' On
7	Operation mode check	LED '5' On

1) Upon being powered on, all module′s LEDs are turned ON for approx. 1 sec. and then OFF to check LED display. The LED if not turned on during the first lighting ON is in error.

2) After LED check, LEDs from No.1 to No.5 are turned ON by turns to execute self-diagnosis and checking of PLC CPU & interface.

3) LED display during self-diagnosis and PLC Interface test is turned ON according to the sequence below.

   0 → 1 → 2 → 3 → 4 → 5

4) After self-diagnosis is over in the sequence above, it is switched to the LED display status of normal operation mode according to operation mode and basic setting to start normal operation.

5) If not agreed with the displaying specification of self-diagnosis, check connection & installation status of base slot and then supply power again.

6) If still operated as not agreed with the LED display items above even for normal installation of module, the applied module hardware seems in error. Please contact service station.

Remark

[Note1] When [Operation mode check] in sequence7 of self-diagnosis checking sequence is applied as powered on, LED No.5 is turned On-Off in a twinkling, which may be hard to recognize by naked eye, however, this is not indicating that Cnet I/F module is in error if switched to normal operation mode later.

Chapter 10 Installation and Testing operation

10.1 Installation and testing operation

4 types of Cnet I/F modules are available according to CPU types. An appropriate unit shall be selected for CPU type and applicable service. [Table 10.1] guides module selection in accordance with CPU types.

[Table 10.1] How to select appropriate module for CPU type [Note1]

CPU type	Module name	Number of channels	Supported specification	Max. number of units mountable [Note2]
GLOFA-GMR[Note3]	G3L-CUEA	2	RS-422	8[Note4]
GLOFA-GM1	G3L-CUEA	2	RS-232C/RS-422	8
GLOFA-GM2	G3L-CUEA	2	RS-232C/RS-422	8
GLOFA-GM3	G3L-CUEA	2	RS-232C/RS-422	8
GLOFA-GM4	G4L-CUEA	2	RS-232C/RS-422	4
GLOFA-GM6	G6L-CUEB	1	RS-232C	4
GLOFA-GM6	G6L-CUEB	1	RS-422	4
GLOFA-GM7[Note5]	G7L-CUEB	1	RS-232C	1
GLOFA-GM7[Note5]	G7L-CUEC	1	RS-422	1

Remark

[Note1] Max. number of units mountable means all communication modules. If used with Fnet / Enet / Dnet I/F module, etc., the number of all communication modules is limited by [Table 10.1]. For example, max. 2 Cnet I/F modules only can be mounted on GM4 where 2 Fnet I/F modules have been installed in.

[Note2] If mounted on dual base, only RS-422 channel is available.

[Note3] Cnet can be mounted not on extended base but on I/O basic base only.

[Note4] Mountable on slot No.0~3 of dual extended 8-base up to 8 Cnet I/F modules including dual basic base.

[Note5] As for GM7 unit, 1 communication module can be mounted on via extension connector in addition to basic unit. (Refer to user's manual of GM7)

10.1.1 Mounting and installation

[Figure 10.1] shows an example case that max. 4 Cnet I/F modules are mounted on GM4 CPU. As shown in the figure, Cnet I/F module can be mounted on basic base only as nearest as possible to CPU for reliable communication. As for GMR dual-CPU, however, single-extended base is mountable on.

[Figure 10.1] Mounting on GM4 CPU
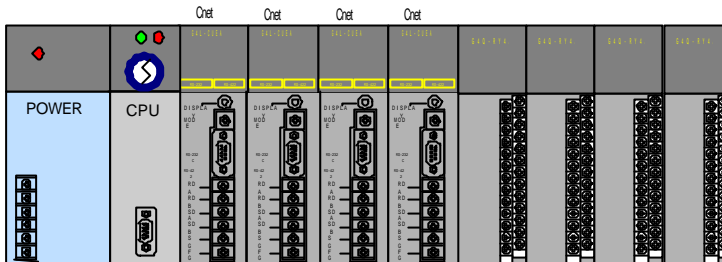
Installation sequence is as follows.

1)   Prepare basic system configuration required for system configuration

2)   Prior to installation work of this communication module, let PLC kept as powered off.

3)   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 bent or damaged.

4)   Communication module except for dual CPU cannot be mounted on extended base, but surely be mounted on basic base at the slot positioned nearest to CPU.

5)   Max. number of units mountable per CPU is 8, which shall be mounted as specified in [Table 10.1].

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)   Set operation mode as desired through the switch in front of communication module. Refer to general specification for operation mode.

8)   Tighten up the connection cable of electric module with cable connecting screw until connected firmly.

9)   After communication cable is connected, supply power and check LED operation status if normal or not. If normal, download and execute frame and program through frame definition and GMWIN. (User defined mode)

10.1.1.1 Installation of Gm7 series

1) As GM7 is provided basically with DIN (Rail width of 35mm) railing hook in addition to basic unit and extended module, DIN rail inlet is available.

2) Connection of Gm7 series with basic unit is as described below.

    A) Open extension connector cover of the basic unit.

    B) Insert connector of communication module into extension connector of the basic unit.

① Basic unit

② Extension connector cover

③ Communication module

④ Extension cable
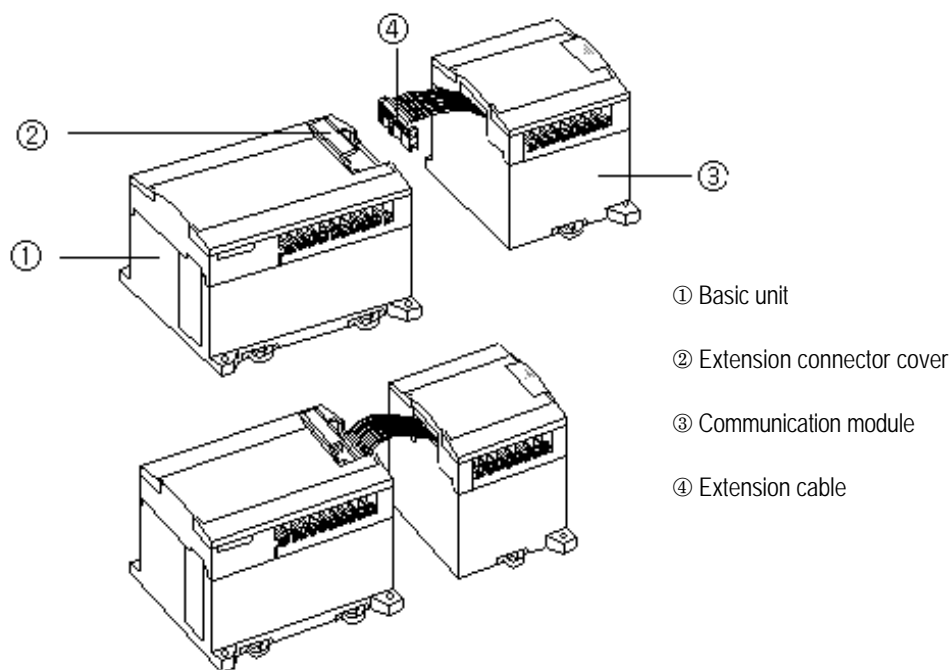
    C) Insert connector of communication module into extension connector of the basic unit.
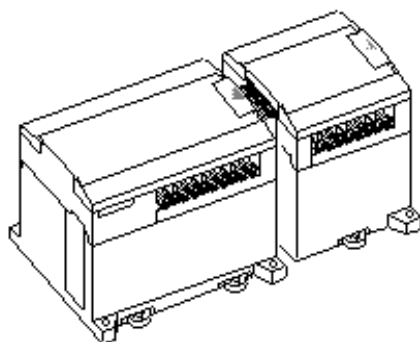
10.1.2 Cautions during system configuration

1) Correctly select which operation mode may be used by user for Cnet I/F module service, and let operation mode set accordingly. Beware, if the operation mode is incorrectly set, operation failure may occur!

2) Set station No. for the channels used in dedicated communication mode. Cnet I/F modules of identical station No. shall not be applied in one network for RS-422/485 communication system in dedicated communication mode. If repeated station No. is applied for RS-422 communication, normal communication is not allowed as in error.

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) RS-422/485 cables must be connected correctly for TX/RX. If several stations are connected, TX and RX shall be connected with each other between the first 2 stations, and TX to TX, RX to RX shall be connected between other stations than those.(RS-422 communication)

7) If in RS-485 communication, TX and RX of Cnet I/F module is to be connected with each other. Refer to Chapter 3 in the manual for details.

8) If communication cable is twisted as shown below or connected incorrectly, communication error may occur.
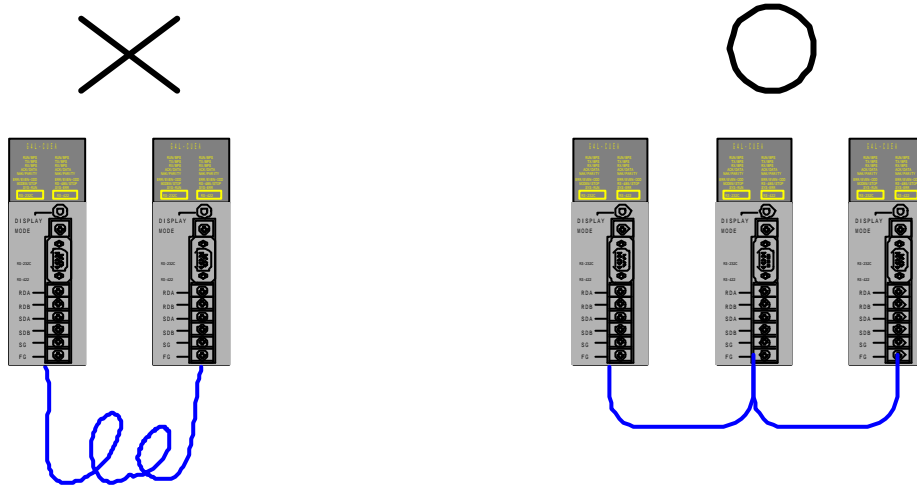
9) Cable bifurcation for RS-422 communication is not allowable.
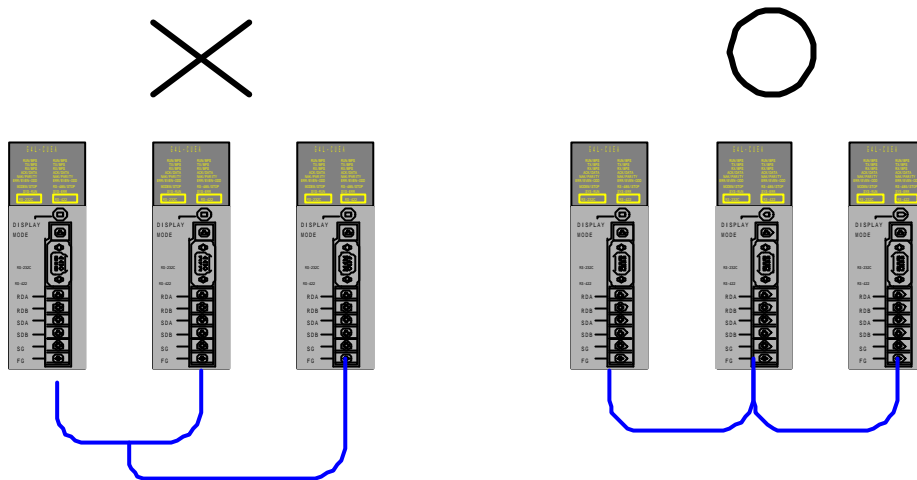
10) If remote communication cable is connected, keep the cable away from power line or conductible noise, or let it sheltered if necessary.

11) For connection with Cnet I/F module on rotative or mobile body, previously check communication cable if possibly disconnected due to repetitive motion. And if danger of disconnection is ever expected, let system configured to allow communication via optical modem or wireless modem. The figure below shows system configuration via RF modem.
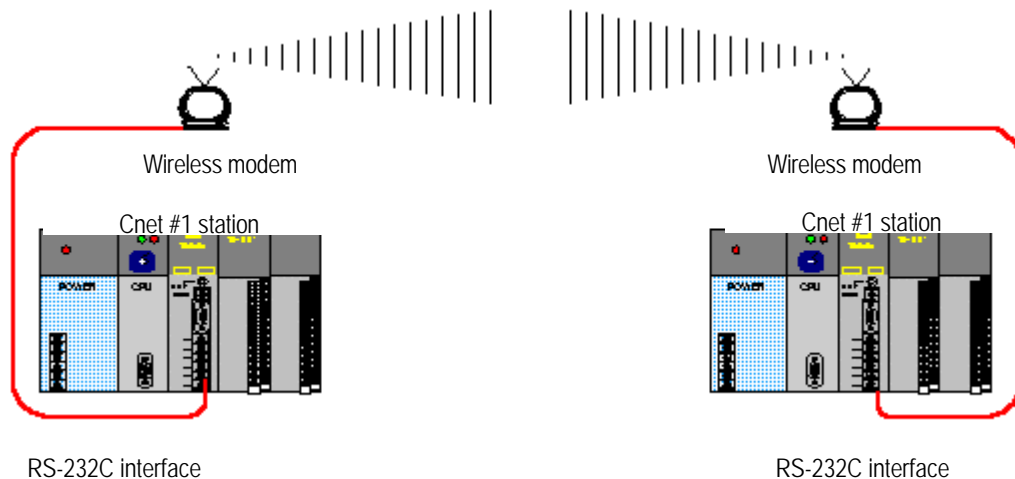
12) If in modem communication, connect Cnet module with modem via modem connection cable and then with dedicated line or public line.

13) If LED operation is not normal, refer to Chapter 11 Troubleshooting in this manual to inspect the cause and take action based on action items. If yet not normal, contact service station.

10.1.3 Testing operation

This describes the preparations to be confirmed before and after the testing operation.

1) Check items until testing operation is started

Checking items prior to testing operation of communication module, are introduced below.

[Table 10.2] Check items for testing operation

Check item	Contents
Basic module mounting	- Is the applied voltage of power module as in its specification? - Is the battery of CPU module connected? - Is entire basic module mounted desirably? ⇨ Refer to user's manual of each PLC type.
Communication cable connection (only if cable is connected)	- Is the connection status of communication cable normal? - Is each cable connected in open loop type? ⇨ Refer to 10.1.2 Cautions during system configuration.
Module mounting	- Is the mounting status of communication module on basic base normal? ⇨ Refer to 10.1.1 Mounting and installation.
Switch setting	- Is the mode switch set correct? - Is the frame defined as set correct?

2) Sequence of testing operation

Next is the sequence starting from PLC installation completed to testing operation.

START

Power on :
 	
   A) Confirm input power
 	
   B) Check communication cable connection
 	
   C) Power on
 	
   D) Check if power LED of power module is turned on
 	
   E) Check LED status of CPU module
 	
         ⇨ If abnormal, refer toTroubleshooting in user's manual of each PLC type.
 	
   F) Check if LED status of communication module is normal or not
 	
         ⇨ If abnormal, refer to Chapter 11. Troubleshooting in this user's manual

▼

Frame definition: Define frame with frame definition and download to communication module.

▼

Programming : Perform programming in GMWIN and download 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) Write program to memory module as required.

END

10.2 Maintenance and Check

To keep this communication module always as optimized, perform daily and regular check.

10.2.1 Daily check

Daily check to perform is as described as below.

[Table 10.3] Daily check items

Check item		Check contents	Criteria	Action to take
Cable connection status		Cable loosened	Shall not be loosened	Tighten cable
Module connection status		Module tightening screw loosened	Shall not be loosened	Tighten module screw
LED display	System operation LED (7: SYS-RUN)	Dimly On checked	Abnormal if Off or flashing brightly -while interfacing with CPU	See Appendix
	Channel operation LED (0: RS-232C RUN 8: RS-422/485 RUN)	On checked	Only if channel active LED lights On, data is normally sent/received (If Off, communication stopped)	See Appendix
	Communication error LED (5: RS-232C ERR 13: RS-422/485 ERR)	Off checked	Abnormal if flashing (parameter setting or cable abnormal)	See Appendix
	TX/RX LED (1/2: RS-232C TX/RX 9/10:RS-422/485 TX/RX)	Flash checked	Abnormal if Off (hardware of module abnormal)	See Appendix
	System error LED (15:SYS-ERROR)	Off checked	System abnormal if flashing	See Appendix

10.2.2 Regular check

Check the below items for 1~2 times half-yearly and take actions as below if required.

[Table 10.4] Regular check items

Check item		How to check	Criteria	Action to take
Ambient conditions	Ambient temperature		0~55	Adjust as specified in general spec. (If used in panel, as based on ambient criteria in panel)
	Ambient moisture	Measure with thermometer/ hygrometer	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 terminal close	By the naked eye	As distanced suitable	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

Chapter 11 Troubleshooting

This chapter describes various error contents expected in system operation and their causes to make diagnoses on and take action against. Tables in Section 11.1 below show the case the module is in abnormal operation. The troubleshooting will be guided in Section 11.2 according to each error code of the tables.

11.1 Abnormal operations

[Table 11.1] Hardware and system error (Refer to Appendix 'LED indication during abnormal operation')

Error code	Error indication	Error contents
ERR-1	Error code (1-11) of LED converted into decimal value.	Hardware error
ERR-2	Error code (5, 7) of LED converted into decimal value.	System

[Table 11.2] Communication command operation abnormal (Refer to Appendix 'LED indication during abnormal operation')

Error code	Error indication	Error contents
ERR-3	Error contact of GMWIN function block command for user-defined communi-cation becomes On, and status value is not 0.	User-defined function block error becomes On, or NDR of communication command dose not become 1.

[Table 11.3] Error during RX monitor operation of frame editor

Error code	Error indication	Error contents
ERR-4	[No received data] message occurs from the beginning during requesting of RX monitor start	Incorrect frame definition by frame editor, or disagreement between communication command and frame, or incorrectly connected cable.
ERR-5	Monitor data is not correctly received during RX monitor operation	Bad cable connection, or disagreement of basic parameters between communication stations.

[Table 11.4] Error during TX monitor operation of frame editor

Error code	Error indication	Error contents
ERR-6	[No sent data] message occurs from the beginning during requesting of TX moni-tor start	Incorrect frame definition by frame editor, or disagreement between communication command and frame, or incorrectly connected cable. (Bad connection with communication module) CPU or communication module error
ERR-7	Monitor data is not correctly received during TX monitor operation	• Bad cable connection. • Disagreement of basic parameters between PC and communication module.

[Table 11.5] NAK transmission during slave communication in dedicated mode

Error code	Error indication	Error contents
ERR-8	NAK frame is sent to as response to request frame of other station. (NAK LED(4,12) of Cnet I/F module flashes)	• Protocol disagreement of dedicated communication frame. • Bad cable connection. • Disagreement of communication basic parameters

[Table 11.6] No response during slave communication in dedicated mode

Error code	Error indication	Error contents
ERR-9	No response is sent to request frame of other station.	• Incorrectly specified station No. of frame editor. • Bad cable connection.

[Table 11.7] GMWIN connection error

Error code	Error indication	Error contents
ERR-10	Modem connection and initialization are not performed.	• Operation mode setting error in Cnet I/F module. • Disagreeable initialization command of modem. • Bad connection with cable and telephone line.

11.2 Troubleshooting by each error code

11.2.1 Error code ERR-1, ERR-2 : Hardware & System error

```
                    ┌──────────────────────────┐
                    │   Hardware/System error  │
                    └──────────────────────────┘
                                 │
                                 ▼
              ╱─────────────────────╲          Y        ┌───┐
             ╱  Is LED error code '5' ? ╲ ──────────────▶│ A │
              ╲─────────────────────╱                   └───┘
                                 │ N
                                 ▼
              ╱─────────────────────╲          Y        ┌──────────────────────────────────┐
             ╱  Is LED error code '7' ? ╲ ──────────────▶│ Operation mode switch is set     │
              ╲─────────────────────╱                    │ incorrect. Correct the setting   │
                                 │ N                      │ and then supply power.           │
                                 ▼                        └──────────────────────────────────┘
              ╱─────────────────────╲          Y        ┌───┐
             ╱  Is LED error code '8' ? ╲ ──────────────▶│ B │
              ╲─────────────────────╱                   └───┘
                                 │ N
                                 ▼
              ╱──────────────────────────╲     N        ┌──────────────────────────────────┐
             ╱ Is LED error code '3' or '4' ? ╲ ────────▶│ Contact service station          │
              ╲──────────────────────────╱              └──────────────────────────────────┘
                                 │ Y
                                 ▼
              ╱─────────────────────╲          Y        ┌──────────────────────────────────┐
             ╱   Dose CPU error occur? ╲ ───────────────▶│ CPU error occurred. See Trouble- │
              ╲─────────────────────╱                    │ shooting of CPU.                 │
                                 │ N                      └──────────────────────────────────┘
                                 ▼
              ╱─────────────────────╲          N        ┌──────────────────────────────────┐
             ╱  Is connection status of ╲ ──────────────▶│ Check/correct connection status  │
             ╲ Cnet I/F module normal? ╱                 │ of Cnet I/F module and supply     │
              ╲─────────────────────╱                    │ power again.                     │
                                 │ Y                      └──────────────────────────────────┘
                                 ▼
                    ┌──────────────────────────┐
                    │ Contact Service station. │
                    └──────────────────────────┘
```

```
        ( A )                              ( B )
          │                                  │
          ▼                                  ▼
┌──────────────────────────┐    ┌──────────────────────────┐
│ Set Cnet I/F module to   │    │ Set Cnet I/F module to   │
│ dedicated mode and       │    │ dedicated mode and       │
│ supply power.            │    │ supply power.            │
└──────────────────────────┘    └──────────────────────────┘
          │                                  │
          ▼                                  ▼
┌──────────────────────────┐    ┌──────────────────────────┐
│ Download basic parameters│    │ Download other company's │
│ & frame through frame    │    │ dedicated driver file    │
│ editor to 2 channels.    │    │ through frame editor.    │
└──────────────────────────┘    └──────────────────────────┘
          │                                  │
          ▼                                  ▼
┌──────────────────────────┐    ┌──────────────────────────┐
│ Restore mode switch to   │    │ Restore mode switch to   │
│ the original value and   │    │ the original value and   │
│ then supply power again. │    │ then supply power again. │
└──────────────────────────┘    └──────────────────────────┘
          │                                  │
          ▼                                  ▼
    ◇ Dose the same ◇              ◇ Dose the same ◇
    ◇ error occur?  ◇              ◇ error occur?  ◇
          │ Y                                │ Y
          ▼                                  ▼
┌──────────────────────────┐    ┌──────────────────────────┐
│  Contact service station │    │  Contact service station │
└──────────────────────────┘    └──────────────────────────┘
```

11.2.2 Error code ERR-3 : Communication command error

```
                    ╭─────────────────────────────╮
                    │ Communication command error │
                    ╰─────────────────────────────╯
                                  │
                                  ▼
                             ╱─────────╲                  Y    ┌──────────────────────────────┐
                    Any error in communication command ────────│ See commands and user's manual to │
                            or link ?                           │ correct it.                  │
                             ╲─────────╱                        └──────────────────────────────┘
                                  │ N
                                  ▼
                             ╱─────────╲                  Y        ╭───╮
                    Is STATUS value in operation ─────────────────│ A │
                            64,66 or 73?                           ╰───╯
                             ╲─────────╱
                                  │ N
                                  ▼
                             ╱─────────╲                  Y    ┌──────────────────────────────┐
                    Is STATUS value in operation 16? ──────────│ Check if desired communication module is │
                             ╲─────────╱                        │ mounted on slot entered in function block │
                                  │ N                           │ program                      │
                                  ▼                             └──────────────────────────────┘
                             ╱─────────╲                  Y        ╭───╮
                    Is STATUS value in operation 67? ─────────────│ B │
                             ╲─────────╱                           ╰───╯
                                  │ N
                                  ▼
                             ╱─────────╲                  Y    ┌──────────────────────────────┐
                    Is STATUS value in operation 68? ──────────│ Defined frame data has not been │
                             ╲─────────╱                        │ downloaded to communication module. Let │
                                  │ N                           │ frame downloaded.            │
                                  ▼                             └──────────────────────────────┘
                             ╱─────────╲                  Y    ┌──────────────────────────────┐
                    Is the error code(16~32) inside ───────────│ See communication command error codes │
                       communication command?                  │ to correct it.               │
                             ╲─────────╱                        └──────────────────────────────┘
                                  │ N
                                  ▼
                    ┌─────────────────────────────┐
                    │ CPU internal error occurred. │
                    │ Contact Service station.     │
                    └─────────────────────────────┘
```

A

Is STATUS value in operation 66?

Y → Frame name used in communication command is not in existence. Define frame correctly to register

N

Is STATUS value in operation 64?

Y → Array HEX value is not defined correctly. Correct array type.

N

Check mode switch and RUN status of communication module.

B

Frame definition and communication command correct?

N → Check communication command and frame editor.

Y

Are basic parameters agreed between communication stations?

N → Let basic parameters agreed.

Y

Is cable connection correct?

N → Connect cable correctly.

Y

Contact Service station.

11.2.3 Error code ERR-4, ERR-5 : Receive monitor data error

```
                    ┌─────────────────────────────┐
                    │      RX monitor data error   │
                    └─────────────────────────────┘
                                   │
                                   ▼
     Y        ╱───────────────────────────────────╲
    ◄─────────  Isn't the received data monitored
              ╲  from the beginning?               ╱
               ╲─────────────────────────────────╱
                                   │ N
                                   ▼
              ╱───────────────────────────────────╲     N    ┌──────────────────────────────┐
              ╲  Are communication command        ╱─────────►│ Let communication command &  │
              ╲  & frame definition set correct?  ╱          │ frame definition set correct.│
               ╲─────────────────────────────────╱           └──────────────────────────────┘
                                   │ Y
                                   ▼
              ╱───────────────────────────────────╲     Y    ┌──────────────────────────────┐
              ╲  No error in cable connection ?    ╱────────►│ Check cable if connected      │
               ╲─────────────────────────────────╱          │ securely or not.             │
                                   │ N                        └──────────────────────────────┘
                                   ▼
              ╱───────────────────────────────────╲     Y    ┌──────────────────────────────┐
              ╲  Any serious error in CPU?         ╱────────►│ See user's manual of CPU to   │
               ╲─────────────────────────────────╱          │ remove CPU error.            │
                                   │ N                        └──────────────────────────────┘
                                   ▼
              ╱───────────────────────────────────╲     Y    ┌──────────────────────────────┐
              ╲  Any error in communication module?╱────────►│ Check error code and perform  │
               ╲─────────────────────────────────╱          │ trouble-shooting.            │
                                   │ N                        └──────────────────────────────┘
                                   ▼
              ┌─────────────────────────────────┐
              │ Close monitor screen & frame     │
              │ editor screen and then execute   │
              │ RX monitor screen again.        │
              └─────────────────────────────────┘
```

11.2.4 Error code ERR-6, ERR-7 : Transmission monitor data error

```
         ( TX monitor data error )
                    |
                    v
Y   < Isn't the sent data monitored from
<----     the beginning? >
|                   | N
|                   v
|   < Any error in communication module? > --Y--> [ Check error code and perform
|                   | N                              troubleshooting. ]
|                   v
|   < Are communication command &       --N--> [ Let communication command &
|     frame definition set correct? >            frame definition set correct. ]
|                   | Y
-------------------->
                    v
    < No error in cable connection? > --Y--> [ Check cable if connected securely or
                    | N                         not. ]
                    v
    < Any serious error in CPU? > --Y--> [ See user's manual of CPU to remove
                    | N                     CPU error. ]
                    v
    < Any error in communication module? > --Y--> [ Check error code and perform
                    | N                               troubleshooting. ]
                    v
[ Close monitor screen & frame editor screen
  and then execute TX monitor screen again. ]
```

11.2.5 Error code ERR-8, ERR-9 : Error on dedicated communication

```
            ┌─────────────────────────────┐
            │ Dedicated communication RX error │
            └─────────────────────────────┘
                          │
                          ▼
                  ╱ No response from ╲        Y      ┌───┐
                 ╱  other station at  ╲──────────────│ A │
                 ╲      all?          ╱              └───┘
                  ╲                  ╱
                          │ N
                          ▼
                  ╱ No error in cable ╲      Y    ┌──────────────────────────┐
                 ╱   connection?       ╲─────────│ Check cable if connected   │
                 ╲                      ╱         │ securely or not.           │
                          │ N                     └──────────────────────────┘
                          ▼
                  ╱ Is station No.    ╲     N    ┌──────────────────────────┐
                 ╱  correct in protocol ╲────────│ Let station No. agreed     │
                 ╲      area?           ╱        │ through frame editor.      │
                          │ Y                     └──────────────────────────┘
                          ▼
                  ╱ Any error in       ╲    Y    ┌──────────────────────────┐
                 ╱  communication module?╲───────│ Check error code and       │
                 ╲                       ╱        │ perform troubleshooting.   │
                          │ N                     └──────────────────────────┘
                          ▼
            ┌──────────────────────────┐
            │ Contact Service station. │
            └──────────────────────────┘
```

```
                              ┌─────┐
                              │  A  │
                              └──┬──┘
                                 │
                                 ▼
                            ╱─────────╲                    N      ┌──────────────────────────────┐
                          ╱  Is the applied ╲ ─────────────────▶  │ Let the protocol applied as agreed with │
                          ╲  protocol agreed ╱                     │ dedicated protocol spec.     │
                          ╱ with dedicated   ╲                     └──────────────────────────────┘
                          ╲ protocol spec.?  ╱
                            ╲─────────╱
                                 │ Y
                                 ▼
                            ╱─────────╲                    N      ┌──────────────────────────────┐
                          ╱ Is communication ╲ ────────────────▶  │ Let the parameter agreed through │
                          ╲ parameter agreed? ╱                    │ frame editor.                │
                            ╲─────────╱                            └──────────────────────────────┘
                                 │ Y
                                 ▼
                            ╱─────────╲                    N      ┌──────────────────────────────┐
                          ╱ Any error in cable ╲ ──────────────▶  │ Contact Service station.     │
                          ╲   connection?      ╱                   └──────────────────────────────┘
                            ╲─────────╱
                                 │ Y
                                 ▼
                  ┌───────────────────────────────────┐
                  │ Check cable if connected securely or not. │
                  └───────────────────────────────────┘
```

11.2.6 Error code ERR-10 : Error on GMWIN connection

```
                    ╭─────────────────────────╮
                    │  Modem connection error  │
                    ╰─────────────────────────╯
                              │
                              ▼
                         ╱          ╲                    N      ┌─────────────────────────────┐
                  ╱  Is operation mode of Cnet I/F  ╲──────────▶│ Correct operation mode of Cnet I/F │
                  ╲     module correct?          ╱             │ module and supply power again. │
                         ╲          ╱                          └─────────────────────────────┘
                              │ Y
                              ▼
                         ╱          ╲                    Y      ┌─────────────────────────────┐
                  ╱  No error in cable connection with ╲───────▶│ Check cable connection with modem and │
                  ╲        modem?                ╱             │ take action against.          │
                         ╲          ╱                          └─────────────────────────────┘
                              │ N
                              ▼
                         ╱          ╲                    N      ┌─────────────────────────────┐
                  ╱  Is modem initializing command ╲───────────▶│ Input the initializing command correctly │
                  ╲      entered correctly?       ╱             │ through frame editor.         │
                         ╲          ╱                          └─────────────────────────────┘
                              │ Y
                              ▼
                  ┌─────────────────────────────┐
                  │ Check modem if applied as specified in │
                  │ user's manual prior to making contact with │
                  │ Service station.             │
                  └─────────────────────────────┘
```

Appendix

A.1 LED indication specification

A.1.1 Applicable type

G3L-CUEA, G4L-CUEA, G6L-CUEB, G6L-CUEC, G7L-CUEB, G7L-CUEC

A.1.2 LED indication specification during normal operation

1) Operation status indication (when LED display switch not pushed)

[Table A.1] G3L-CUEA/G4L-CUEA

LED No.	Name		Normal LED status	Remark
0	RS - 232C channel	RUN	On during RS-232C channel operation/ Flash in Flash Memory Write Mode Ver.2.0	Flash Write Mode Flash per cycle of 1sec
1		TX	On during transmission via RS-232C	Flash if in communication
2		RX	On during receive via RS-232C	Flash if in communication
3		ACK	On during ACK transmission/Off after NAK transmission	
4		NAK	On during NAK transmission/Off after ACK transmission	
5		ERR	Protocol error/On during SIO-error	Flash if in error
6		MODEM	On during setting modem communication mode	
7		SYS-RUN	On dimly during interfacing with CPU of PLC	
8	RS - 422 channel	RUN	On during setting channel to RS-422	
9		TX	On during transmission via RS-422	Flash if in communication
10		RX	On during receive via RS-422	Flash if in communication
11		ACK	On during ACK transmission/Off after NAK transmission	
12		NAK	On during NAK transmission/Off after ACK transmission	
13		ERR	Protocol error/On during SIO-error	Flash if in error
14		RS-485	On during RS-485 setting/Off during RS-422 setting	
15		SYS-ERROR	Flash during serious error occurrence	H/W error

> **Remark**
>
> [Note1] It flashes if system H/W error or serious S/W error occurs, and the error status is indicated with upper 5 Bit (LED '0'~'4'). For the details, see 'A.1.3 LED indication specification during abnormal operation'.

[Table A.2] G6L-CUEB/G6L-CUEC

LED No.	Name			Normal LED status	Remark
0	G6L-CUEB		RUN	On during RS-232C channel operation/ Flash in Flash Memory Write Mode Ver.2.0	Flash Write Mode Flash per cycle of 1sec
1			TX	On during transmission via RS-232C	Flash if in communication
2			RX	On during receive via RS-232C	Flash if in communication
3			ACK	On during ACK transmission/Off after NAK transmission	
4			NAK	On during NAK transmission/Off after ACK transmission	
5			ERR	Protocol error/On during SIO-error	Flash if in error
6			MODEM	On during setting modem communication mode	
7			SYS-RUN /ERR	On dimly during interfacing with CPU of PLC Flash per cycle of 1sec if serious error occurs	Flash if H/W in error[Note1]
0	G6L-CUEC		RUN	On during setting channel to RS-422/ Flash in Flash Memory Write Mode Ver.2.0	Flash Write Mode Flash per cycle of 1sec
1			TX	On during transmission via RS-422	Flash if in communication
2			RX	On during receive via RS-422	Flash if in communication
3			ACK	On during ACK transmission/Off after NAK transmission	
4			NAK	On during NAK transmission/Off after ACK transmission	
5			ERR	Protocol error/On during SIO-error	Flash if in error
6			RS-485	On during RS-485 setting/Off during RS-422 setting	
7			SYS-RUN/ ERR	On dimly during interfacing with CPU of PLC Flash per cycle of 1sec if serious error occurs	Flash if H/W in error[Note1]

Remark

[Note1] It flashes if system H/W error or serious S/W error occurs, and the error status is indicated with upper 4 Bit (LED '0'~'3'). For the details, see 'A.1.3 LED indication specification during abnormal operation'.

[Table A.3] G7L-CUEB/G7L-CUEC

Name	LED name	Normal LED status	Remark
G7L-CUEB			
G7L-CUEC	PWR	On if power is normally approved	On if power approved
	RXD	On during receive via RS-422	Flash in communication
	TXD	On during transmission via RS-422	Flash in communication

2) Station No./transmission specifications indication (when LED display switch pushed)

Station No. and transmission specifications are indicated through the LED on the top of module by On/Off of LED display switch in the front of computer link module. When switch first pushed, station No. is displayed, and when the switch pushed again after switch release, transmission specifications is displayed. According to this sequence, station No. and transmission specifications are repeatedly displayed in sequence whenever the switch pushed by once. For distinguishing LED indications of station No. and transmission specifications, No '15' LED is used. When indicating station No., No.'15' LED becomes On, when indicating transmission specifications, it becomes Off, and the remaining LED indicates transmission specifications.

LED for station No. indication (with display switch pushed once)

If LED display switch is pushed once, No.'15' LED becomes On as below table, LEDs of No. 0~4 indicate the station No. for RS-232C channel and LEDs of No. 8~12 indicate the station No. for RS-422 channel in binary value.

LED No.	Bit value	Indication contents	Remark
0	d0		
1	d1	Range (0~31) of RS-232C channel station No. indication	Station No. can be recognized by converting binary to HEXdecimal value [Note1].
2	d2		
3	d3		
4	d4		
5	Not used		
6	Not used	Off during station No. indication	
7	Not used		
8	d0		
9	d1	Range (0 ~31) of RS-422 channel station No. indication	Station No. can be recognized by converting binary to HEXdecimal value [Note1].
10	d2		
11	d3		
12	d4		
13	Not used	Off during station No. indication	
14	Not used		
15		On during station No. indication	

Remark

[Note1] Example of station No. calculation

❑ Station No. calculation if LEDs of No.D0, D1, D4D are ON : $2^0+2^1+2^4=1+2+16=19$

❑ Station No. calculation if LEDs of No.D1, D3 are ON : $2^1+2^3=2+8=10$

[Note2] Function of station No. indication isn't supported separately for GM7.

LED for transmission specifications indication (with display switch pushed twice)

If LED display switch is released and pushed again after pushed once, transmission specifications are displayed on LED. At this time, because No. 15 LED becomes 'Off', user can know that it is indicating transmission specifications. Transmission specifications are separately indicated according to RS-232C channel and RS-422 channel as below table.

LED No.	Bit value	Indication contents	Remark
0	d0	Communication speed of	
1	d1	RS-232C channel	Binary value[Note1]
2	d2	(300~38400 bps)	
3		Data Bit	On : 8Bit / Off : 7Bit
4		Parity Being/None	On : Being / Off : None
5	-	Even/Odd Parity	On : Even / Off : Odd
6		Stop Bit	On : 2Bit / Off : 1Bit
7	Not used	'Off' during transmission specifications indication	
8	d0	Communication speed of	
9	d1	RS-422 channel	Binary value
10	d2	(300 ~ 76800 bps)	
11		Data Bit	On : 8Bit / Off : 7Bit
12		Parity Being/None	On : Being / Off : None
13	-	Even/Odd Parity	On : Even / Off : Odd
14		Stop Bit	On : 2Bit / Off : 1Bit
15	-	'Off' during transmission specifications indication	

Transmission speed is converted from 3-Bit values of d0 ~ d2 to HEX, of which value is shown as below table. (see below table.) But, 76800 bps is provided in RS-422, and is available in Ver. 1.3 or later version of Cnet I/F module.

LED value	LED lighting indication	RS-232C/RS-422 channel
0	All Off	300, 76800 bps
1	d0	600 bps
2	d1	1200 bps
3	d0,d1	2400 bps
4	d2	4800 bps
5	d0,d2	9600 bps
6	d1,d2	19200 bps
7	d0,d1,d2	38400 bps

A.1.3 LED indication specifications during abnormal operation

LED operations if abnormal are divided into two cases.

1) When in state of SYS-ERROR LED Off, the communication error LED flashes at intervals, it means that installation of communication cable or basic parameter setting is abnormal. At this time, it can be solved by seeing chapter 11, Troubleshooting.

2) When serious H/W error occurs, No.15 LED (SYS-ERROR) flashes in period of 1 sec, and the error state is indicated by LED No. 0 – 3. When serious H/W failure occurs, the various errors are indicated by LED No. 0 - 3, of which LED No. 0 is lower Bit (d0), LED No. 3 is upper Bit (d3), and these values are converted from binary into decimal values to indicate error code.

[Table A.4] Error codes during serious failure occurence

Error code[Note1]	Error contents	Remark
1	Internal memory diagnosis error	H/W error
2	Common use memory reading/writing error	
3	Common use memory access error	
4	PLC CPU interface stop	
5	Flash memory reading/writing error	
6	UART (NS-16550) access error	
7	Operation mode setting error	Mode setting abnormal
8	Reserved	Not used
9	Address error	Other error
10	Invalid instruction	
11	Zero divide	
12 ~ 15	Reserved	Not used

If an error code is indicated except error codes of No.'5' & '7', Cnet I/F module is seriously damaged. Contact our company's service station to solve the problem. For errors of No. '5' & '7', refer to chapter 11, Troubleshooting.

Remark

[Note1] If in serious failure, SYS-ERROR LED flashes in period of 1 sec and the error code is indicated by LED No.

0~3. Example of error code calculation is as below.

❏ If LED No.0,1,2 are ON, error code value calculation : $2^0+2^1+2^2=1+2+4=7$

❏ If LED No.1,3 are ON, error code value calculation : $2^1+2^3=2+8=10$

A-6

A.1.4 LED indication specification during power on

This module performs self-diagnosis through self-H/W check and CPU and interface of PLC.

When self and PLC CPU interface checks are OK, after LED '0' - '5' become On in sequence, RS-232C channel LED and RS-422 channel LED become On, and 'RUN' LED becomes On, then normal operation starts. If after power on error occurs during the self-diagnosis, SYS-ERROR LED blinks, and LED of error occurrence item lights according to error code. For the details, see '9.2 Diagnosis during power on'.

A.2 Error code table

A.2.1 Error code for user defined communication

If error occurs in execution of function block with SND_MSG & RCV_MSG function block for user defined communication, the error code is indicated on status output of function block. The following table is for error codes occurred in execution of function

STATUS value		Meaning	Action to take
HEX	Dec		
H0E	14	Input to FNAM isn't present or more than 16 figures	Verify input to FNAM.
H10	16	Position of Cnet I/F module is incorrectly specified.	Enter SLOT_NO value correctly.
H11	17	Cnet I/F module isn't applied to the slot assigned to SLOT_NO, or is out of order.	Check operation status of Cnet I/F module of assigned slot.
H12	18	Input parameter of function block is incorrect (Ex.: CH, LEN1,…)	Check input parameter.
H14	20	Response frame not requested has been received.	Verify receive frame of self station or transmission frame of other station again.
H15	21	Response frame from Cnet I/F module has not been received.(waiting time excceded)	Verify whether Cnet I/F module is user defined communication mode.
H40	64	Operation of RS-232C/422 channel is not RUN.	Perform operation RUN with frame editor.. (Menu: [Online Run/Stop])
H41	65	Frame names used in frame editor and in communication command do not fit each other.	Reconcile frame names in frame editor and frame entered in FNAM.
H42	66	Frame name can not be found due to abnormal CPU during operation. (during transmission)	1) Download frame again. 2) Check if CPU is normal or not.
H43	67	Frame specified in FNAM has not been received from other station.	1) Verify receive frame again. 2) Verify other station's transmission frame again.
H44	68	Frame has not been downloaded from frame editor.	Download frame.

| STATUS value | | Meaning | Action to take |
HEX	Dec		
H0E	14	Input to FNAM isn't present or more than 16 figures	Verify input to FNAM.
H45	69	Error occurs during conversion ASCII ⇄ HEX	Verify whether received data is ASCII or HEX again.
H46	70	Array size specified in frame editor and data size(specified in LEN) used in commu-nication command do not fit each other.	Confirm data size again and fit it. (Data size is Byte value)
H67	103	Incorrect frame definition.	1) Verify contents of appropriate frame again with frame editor. 2) Download frame again.
H68	104	Frame has not been downloaded from frame editor.	Download frame.
H73	115	Operation mode is not user defined commu-nication mode.	Correctly fit mode switch. User defined communication mode For the details, see '4.1 Operating mode setting.'

A.2.2 Error code for dedicated slave communication

For dedicated mode communication, the station operated by slave responds via ACK or NAK frame. And NAK responds including error code in NAK frame to distinguish error types. The following table is for error codes for NAK response used in slave station of dedicated communication.

Error code	Error type	Contents	Action to take
0001	PLC system error	Interface with PLC impossible	Power On/Off
0011	Data error	Error occurred when ASCII data value is converted into digits	Check if other character than upper/lower cases ('%','.','_','.'), and digits has been used as variable name or data, correct and execute again.
1132	Device memory error	Wrong device memory specified	Inspect device type
1232	Data size error	Execution data number exceeding 120 Bytes	Correct data length
1332	Data type error	Data types mismatch between variables	Equalize data types
1432	Data value error	Data value not digits	Inspect data value
2432	Data type error	Data type mismatch with actual variable	Equalize variable and data type of PLC program
1152	Remote control not allowed	'Remote Acdess Right' not allowed in PLC parameter.	Set Remote Acdess Right to allowed, and then execute again.
7252	PLC not operated	No PI to operate PLC	Create PI with PI creation command.
2652	PI not created	No Domain in PLC	Download Domain to PLC.
4252	1) Operation mode change error 2) PI created already	1) Mode status .RUN => PI_STOP Only .PAUSE=>PI_RESET,PI_RESUME .STOP=>PI_START Only .DEBUG<-->PI_RESET Only Other errors when changing operation mode 2) Execute PI creation in state of PI created already	1) Execute again with changeable operation mode. 2) Execute after PI deleted

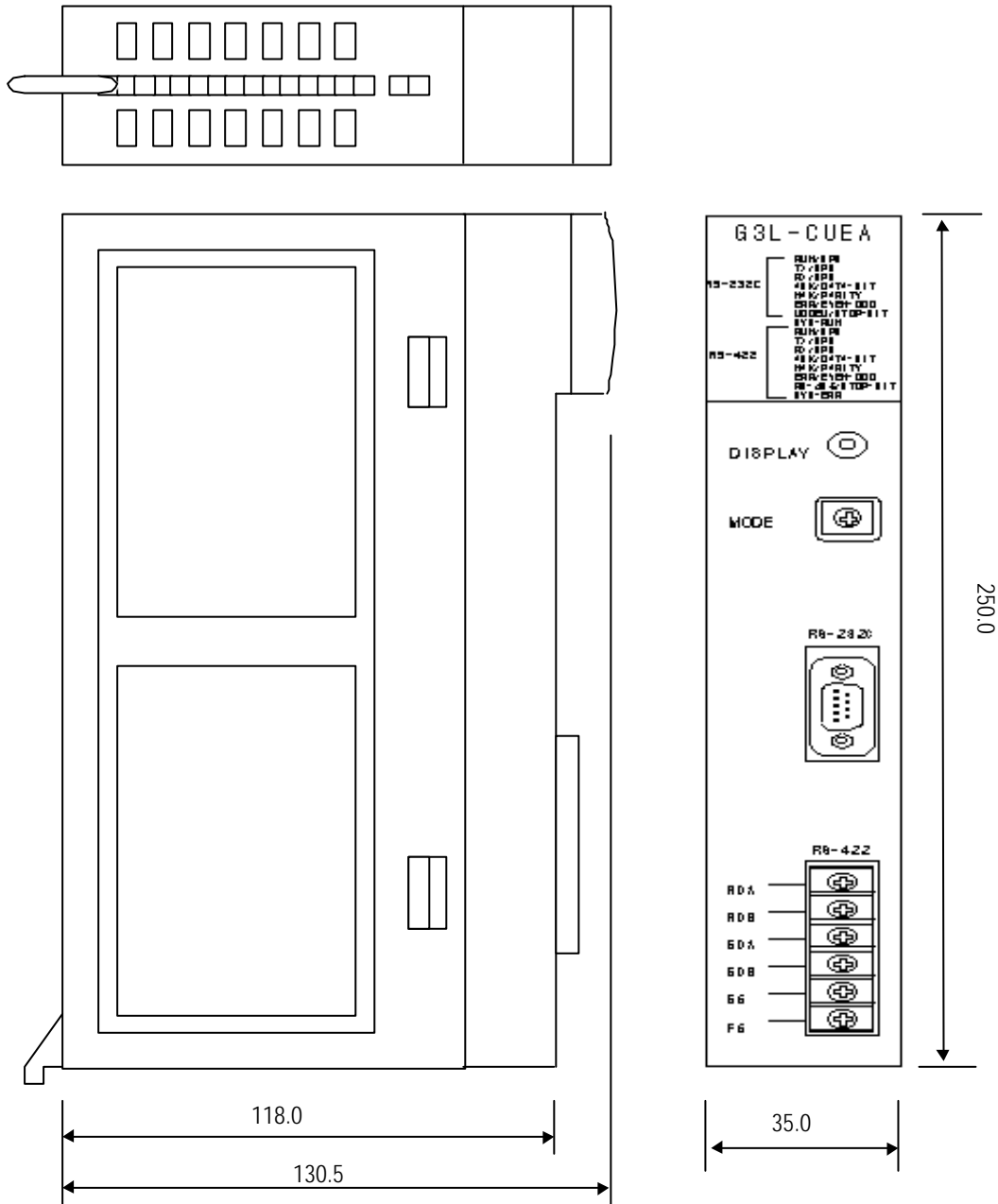| Error code	Error type	Contents	Action to take
4201 4202 4203 4204	Operation mode change error	4201: Present operation mode RUN 4202: Present operation mode STOP 4203: Present operation mode PAUSE 4204: Present operation mode Debug	Execute again with changeable operation mode. (indicated in Cnet V1.5 or later)
4142	Download initialization error	When downloading with Domain not deleted	Check if Domain deleted or not. Set remote control by PLC basic parameter communication in GMWIN to allowed, and then execute again.
4200	Domain Delete impossible	When executing Domain Delete with PI not deleted	Delete PI and then execute again.
4242	Upload initialization error	* Domain not downloaded * Domain name mismatch	Check if Domain deleted or not Execute again after checking domain name.
4342	Down/upload sequence error	Frame number mismatch	Execute again from beginning after adjusting frame number.
4442	Down/upload initialization error	Initialization command not executed	Execute again down/upload after executing initialization command.
0090	Monitor execution error	Registration number of appropriate monitor not registered.	Execute again after registering monitor.
0190	Monitor execution error	Registered number exceeding range	Execute again after adjusting monitor registration number to 31 or less.
0290	Monitor registration error	Registered number exceeding range.	Execute again after adjusting monitor registration number to 31 or less.
No response.	No response	* Station No. error/ BCC error * Main command/command type error * Header and tail character error * Cable error * Operation mode error. * Communication speed/stop/data/ parity bit error. * PLC error.	Check and take actions for error contents that may occur.

A.2.3 Error code for dedicated master communication

As for the station operated in dedicated master communication mode and required to compose master program using GM_RD/GM_WR function block, error information is indicated by output error code on status output of the function block if error resulted by execution of function block occurs. The following table is for error codes for the function block of dedicated communication. Error code is displayed in a decimal unit

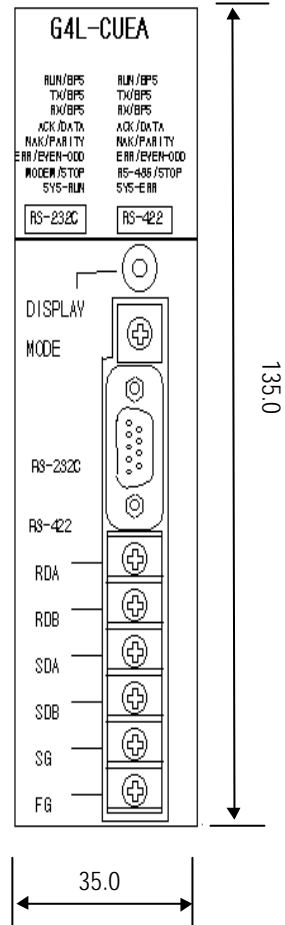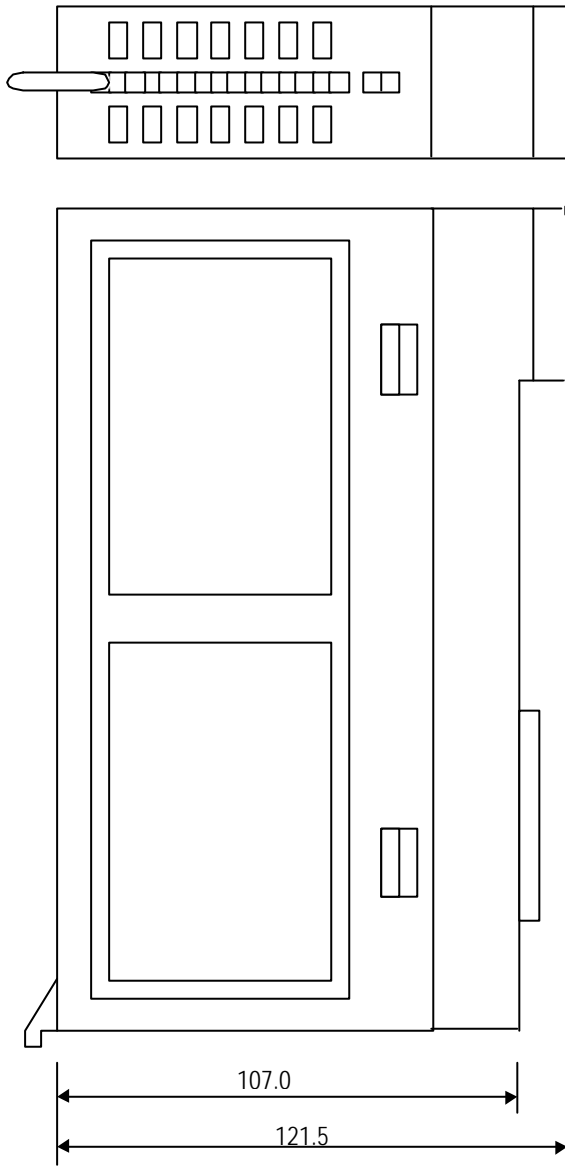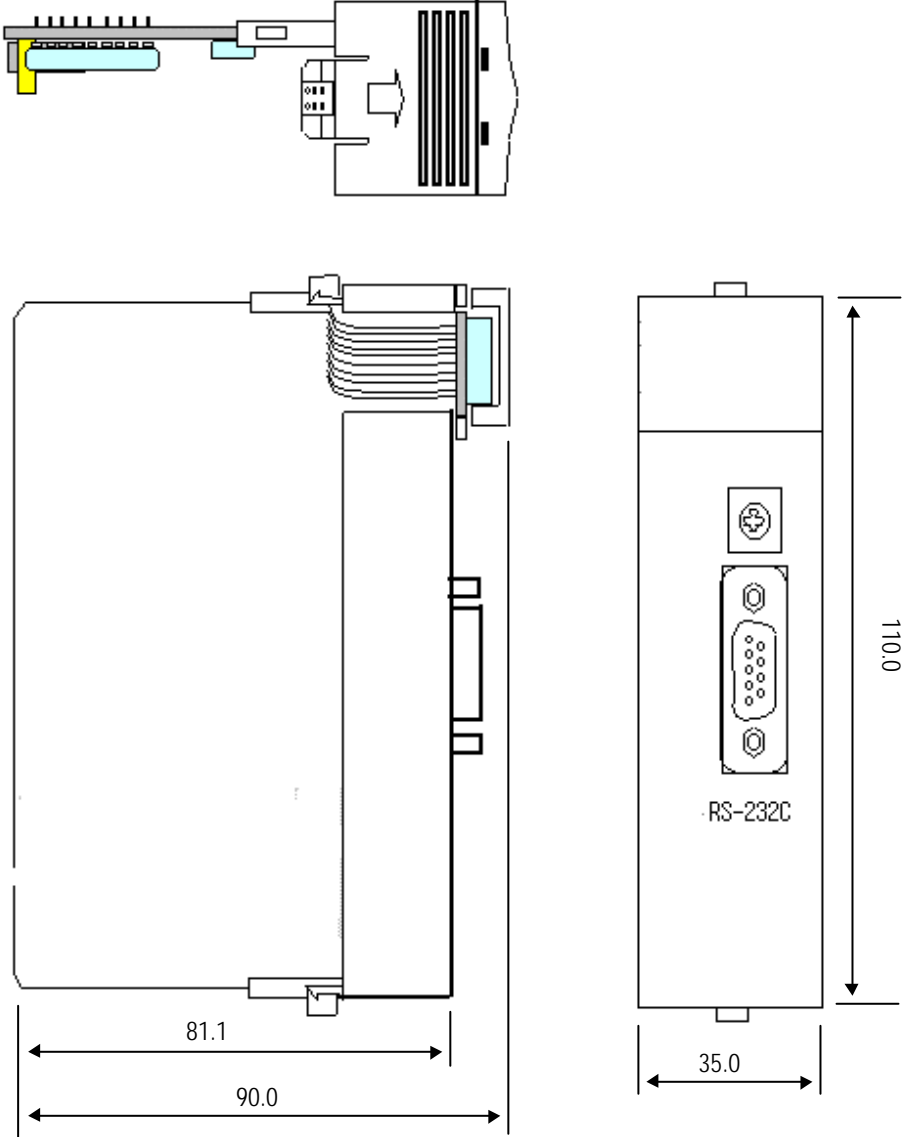| STATUS value	Meaning	Action to take
10	No response from correspondent station.	1) Check setting of correspondent station No. 2) Check dedicated mode for operation of correspondent station. 3) Check communication basic parameter
17	Position of Cnet I/F module is incorrectly specified.	Check if SLOT_NO value is correct.
21	No response from Cnet I/F module	1) Check operation mode of local Cnet module 2) Check channel No.
35	NAK from correspondent station has been received.	Check variable name (%MB,%QB,%IB– BYTE only available)
37	Input parameter setting is incorrect	Check data length

A.3 Dimensions of appearance

• **G3L-CUEA**

Unit: mm

118.0

130.5

35.0

250.0

• G4L-CUEA

G4L-CUEA

RUN/BPS	RUN/BPS
TX/BPS	TX/BPS
RX/BPS	RX/BPS
ACK/DATA	ACK/DATA
NAK/PARITY	NAK/PARITY
ERR/EVEN-ODD	ERR/EVEN-ODD
MODEM/STOP	RS-485/STOP
SYS-RUN	SYS-ERR
RS-232C	RS-422

DISPLAY
MODE

RS-232C

RS-422

RDA
RDB
SDA
SDB
SG
FG

135.0

107.0

121.5

35.0

• **G6L-CUEB/G6L-CUEC**

Dimensions of G6L-CUEB & G6L-CUEC are identical with each other.

81.1

90.0

110.0

35.0

RS-232C

• **G7L-CUEB/G7L-CUEC**

G7L-CUEB and G7L-CUEC has the same dimensions.

4 5

GLOFA

G7L-CUEC
PROGRAMMABLE
LOGIC
CONTROLLER

P
R
T

LG

95.0

105.0

115.0

5

73.0

95.0