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	0	User defined communication		
G6L-CUEC	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.

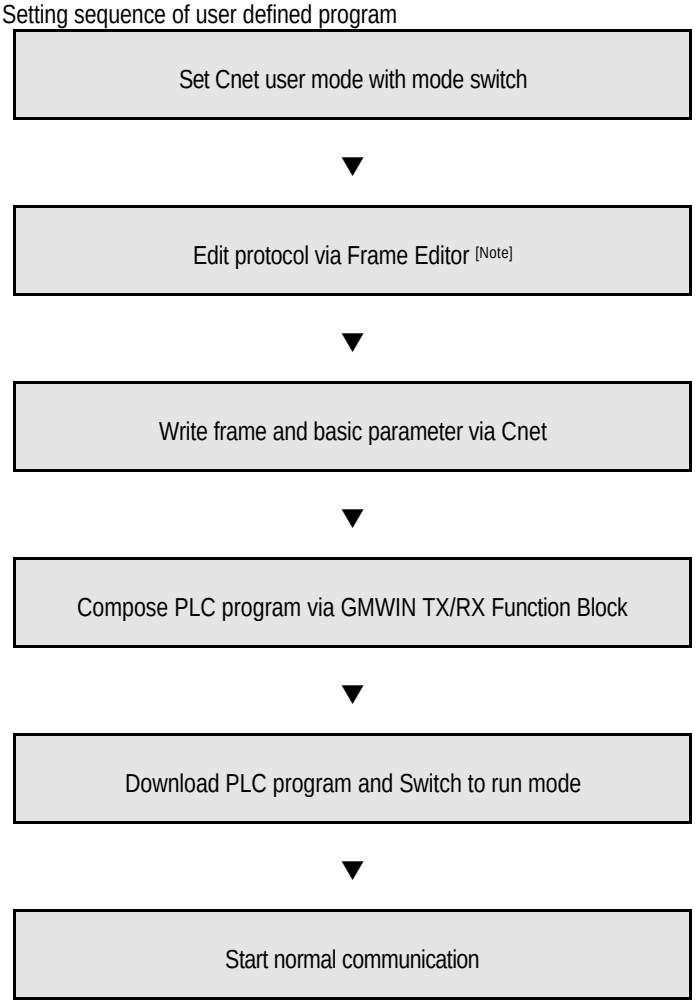
[Note 2] In stand-alone mode, RS-232C and RS-422 channels are operated via different protocols respectively.

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



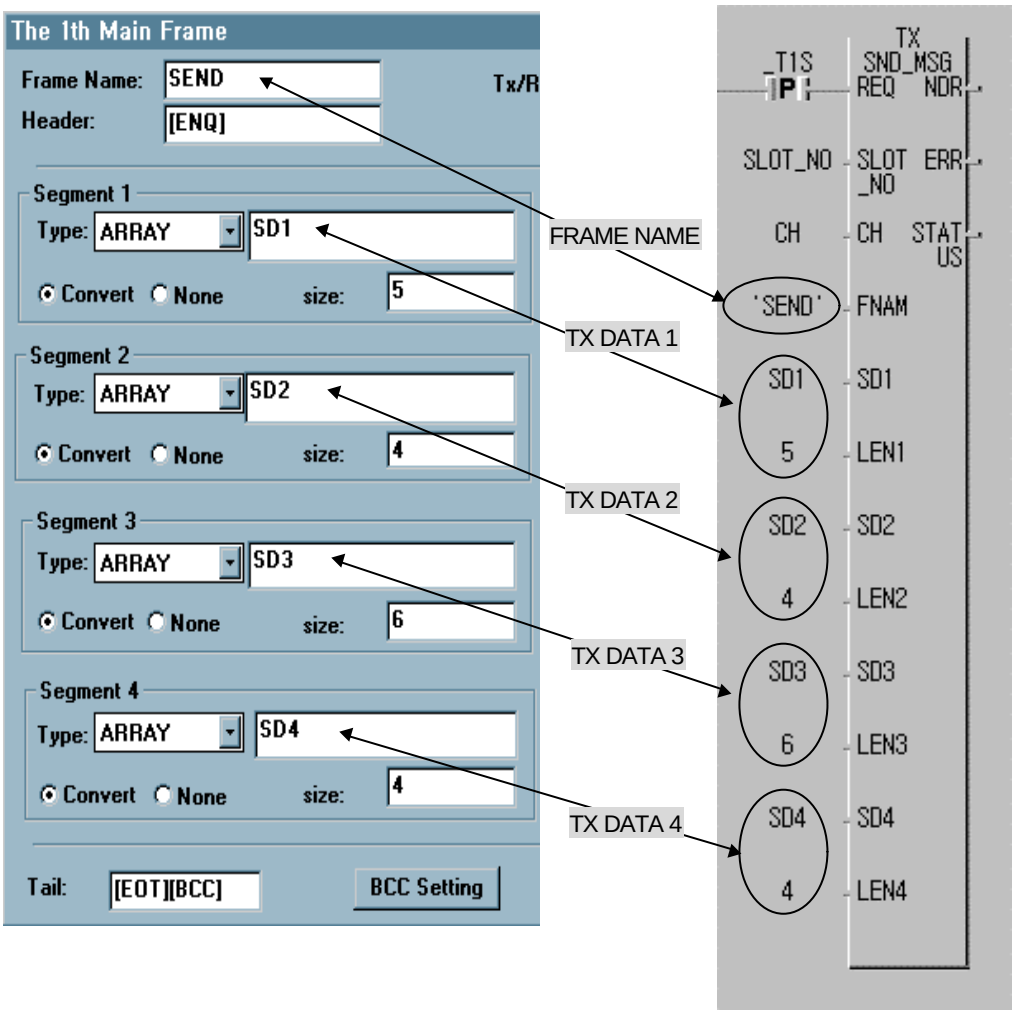
Remark

[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

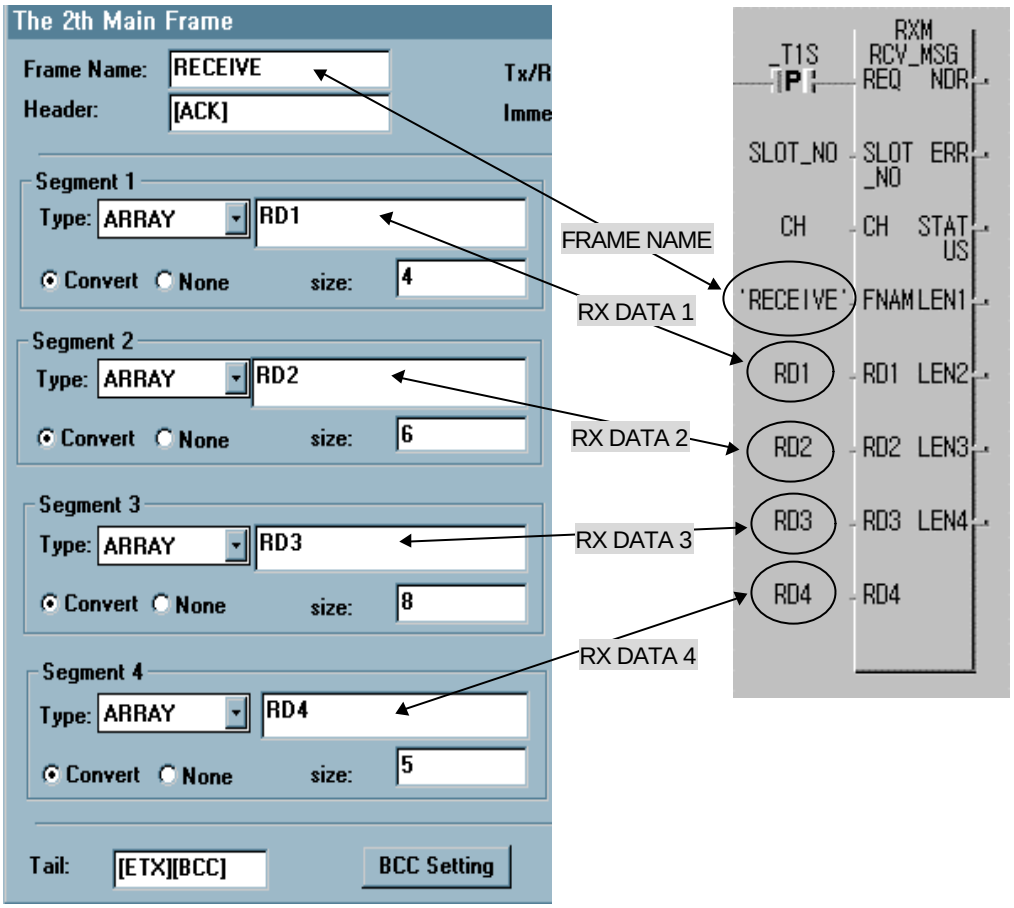


(a) Frame writing of Frame Editor (b) Ex. of GMWIN program

[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



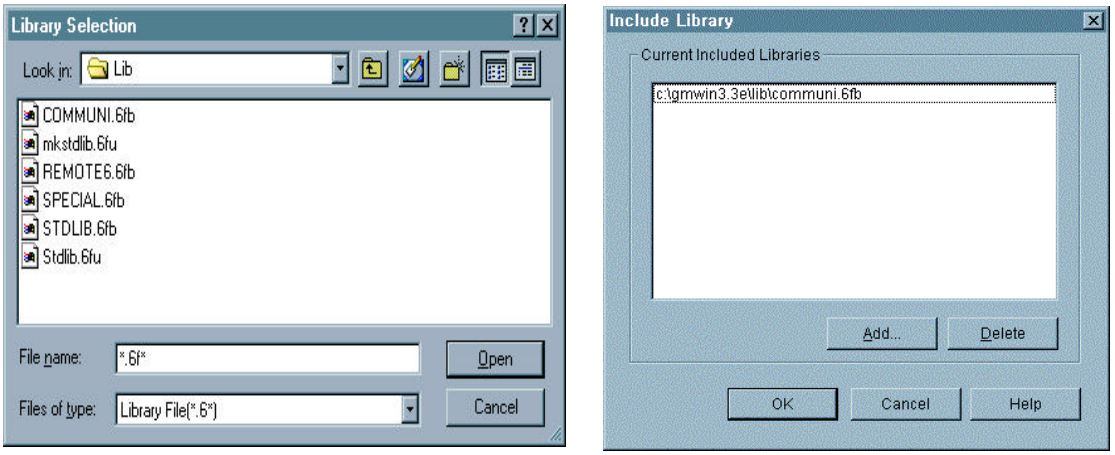
(a) Frame writing of Frame Editor (b) Ex. of GMWIN program

[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)

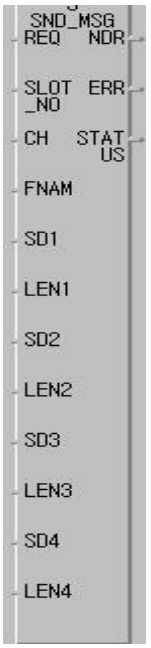
Users are required to use Cnet's dedicated TX/RX Function Blocks for the definition of communication frames via Frame Editor and for communication in PLC program via the defined frames. SND_MSG Function Block is applied for transmitting and RCV_MSG Function Block is applied for receiving. Insert the 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.

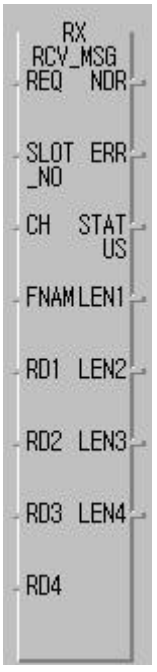
Output	Data type	Description
ERR	BOOL	Turned On when the Function Block is called but not executed successfully and keeps On until re-called. If error occurs, error information is displayed on output STATUS
STATUS	USINT	If ERR is 1 as the result of execution of Function Block, error code is output by 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.



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

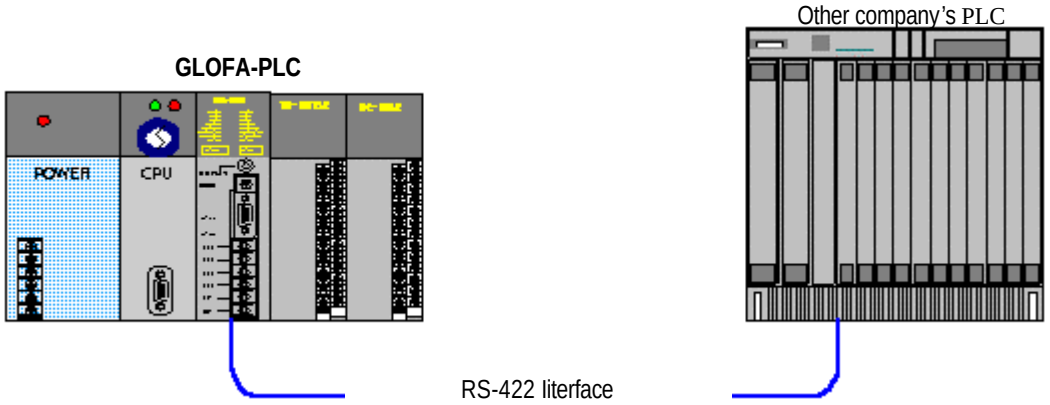
STATUS value		Description
HEX.	Dec.	
H10	16	Cnet I/F module is incorrectly positioned.
H14	20	1) Incorrect library is used. 2) Wrong response frame is received.
H15	21	Response from Cnet I/F module isn't received. (waiting time exceeded)
H40	64	Operation of RS-232C/422 channel is not run.

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.

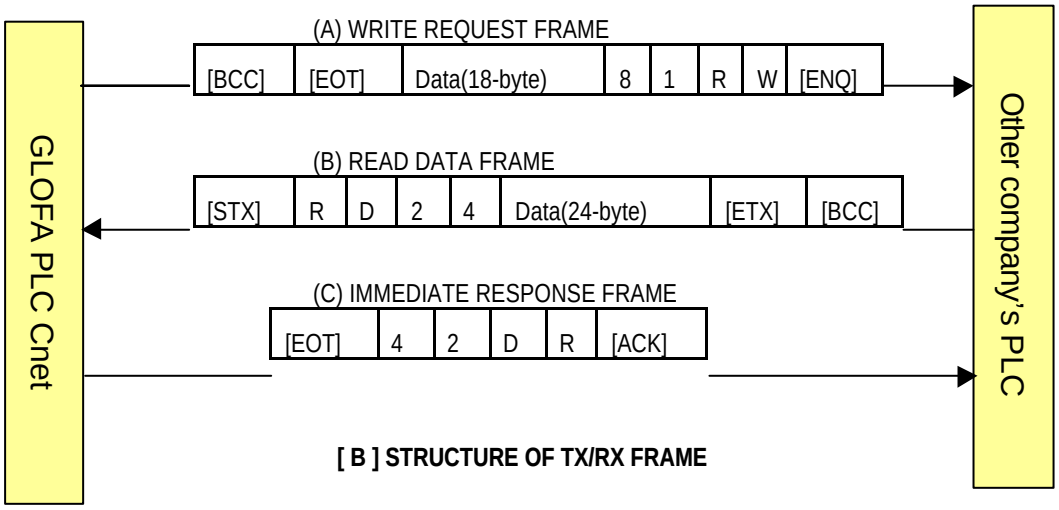
7.1.4 Example of user defined programming

[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



[A] SYSTEM CONFIGURATION



[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.

① Set Cnet I/F module to user defined mode.

② 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.

③ If Frame Editor is prepared, let it downloaded to Cnet I/F module and then run communication.

④ 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.

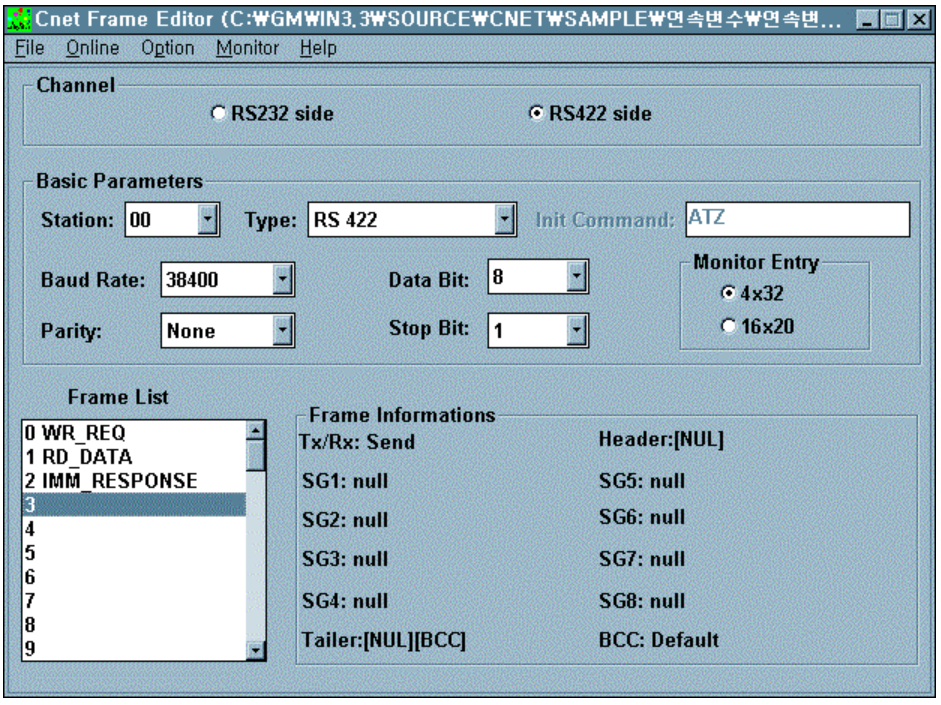
A) Write request frame : 'WR_REQ'

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

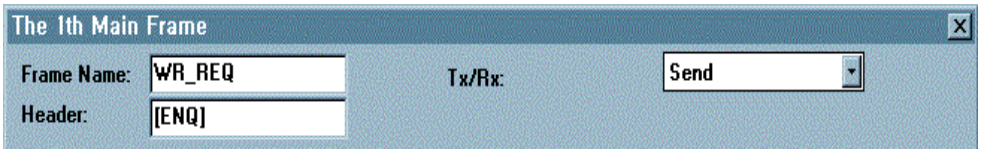


[Figure7.6] is the result screen after basic parameters and TX/RX frames are all defined. Refer to Chapter 5 Frame Editor for details of preparing basic parameters and frames.

Next is how to prepare 3 types of frames.

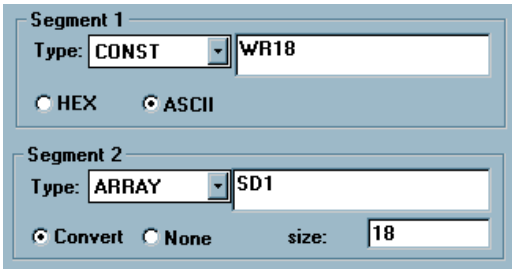
(1) Registration of Write request frame : Write request frame of frame structure as in [Table 7.6] is registered according to the sequence below.

① 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.

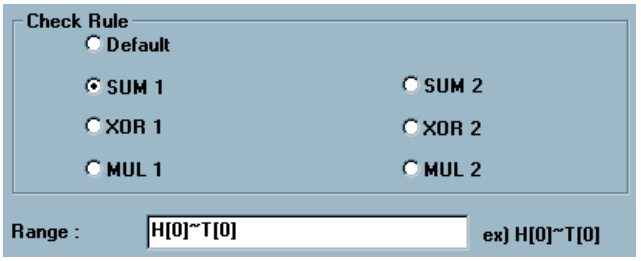


② Input segment : Since 'WR18' in transmission frame body area of [Table 7.6] is unchanged constant area, set it to CONST and input 'WR18'. And since data area is variable area changeable per frame, set type to ARRAY, input 'SD1' and input 18, the number of transmission data to size. As for transmission 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.

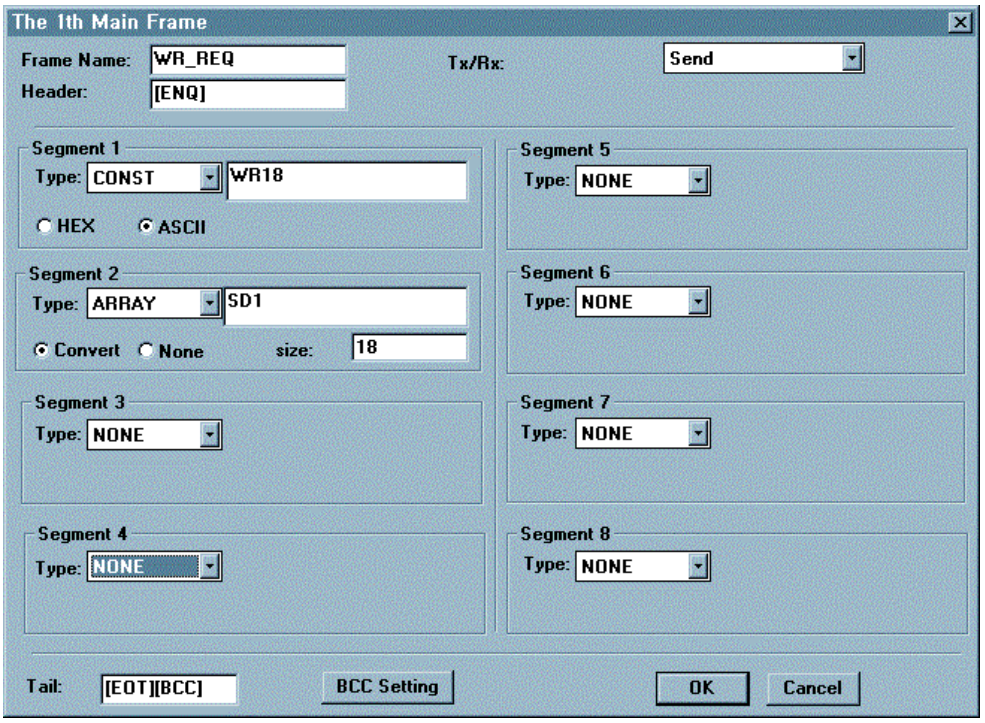


③ Set Tail and BCC. : Select BCC setting button and set the range of SUM1 in dialog box for BCC setting to H[0] ~ T[0] in order to set BCC as added from Header to Tail. Refer to Chapter 5 Frame Editor for details of BCC setting.



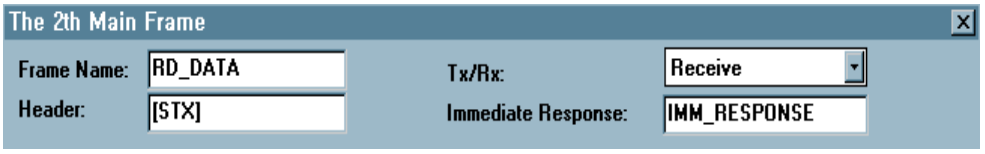
④ Transmission frame where setting of Header, Tail and Segment is completed is shown in [Figure 7.7]. To transmit transmission frame along with data, a transmission program is to be prepared in GMWIN program via SND_MSG Function Block.

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



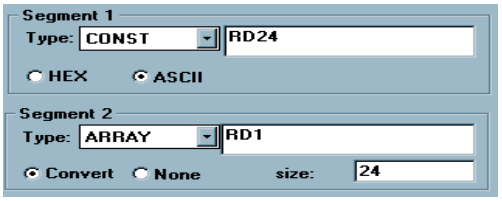
(2) Registration of Read data frame: Read data frame of frame structure as in [Table 7.7] is registered according to the sequence below.

① 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.

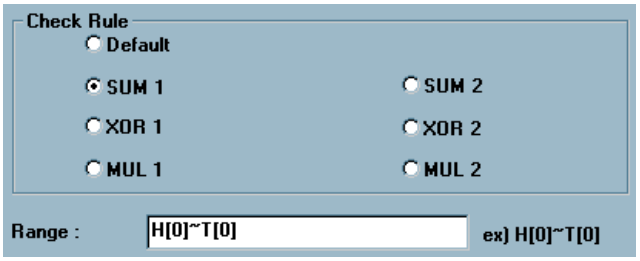


② Input segment : Since 'RD24' in receiving frame body area of [Table 7.7] is constant area unchanged, set it to CONST and input 'RD24'. Since data area is variable area changeable per receiving frame, set type to ARRAY, input 'RD1' and input 24, the number of receiving data to size. As for receiving 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.

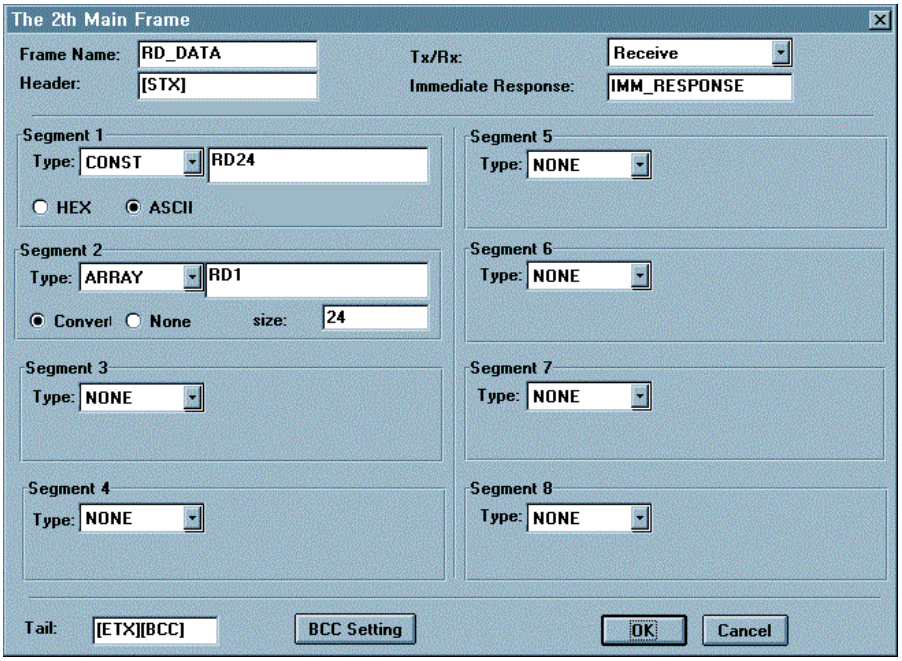


③ Set Tail and BCC. : Select BCC setting button and set the range of SUM1 in dialog box for BCC setting to H[0] ~ T[0] in order to set BCC as added from Header to Tail. Refer to Chapter 5 Frame Editor for details of BCC setting. Next is BCC setting screen.



④ 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.

① 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.

② 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].

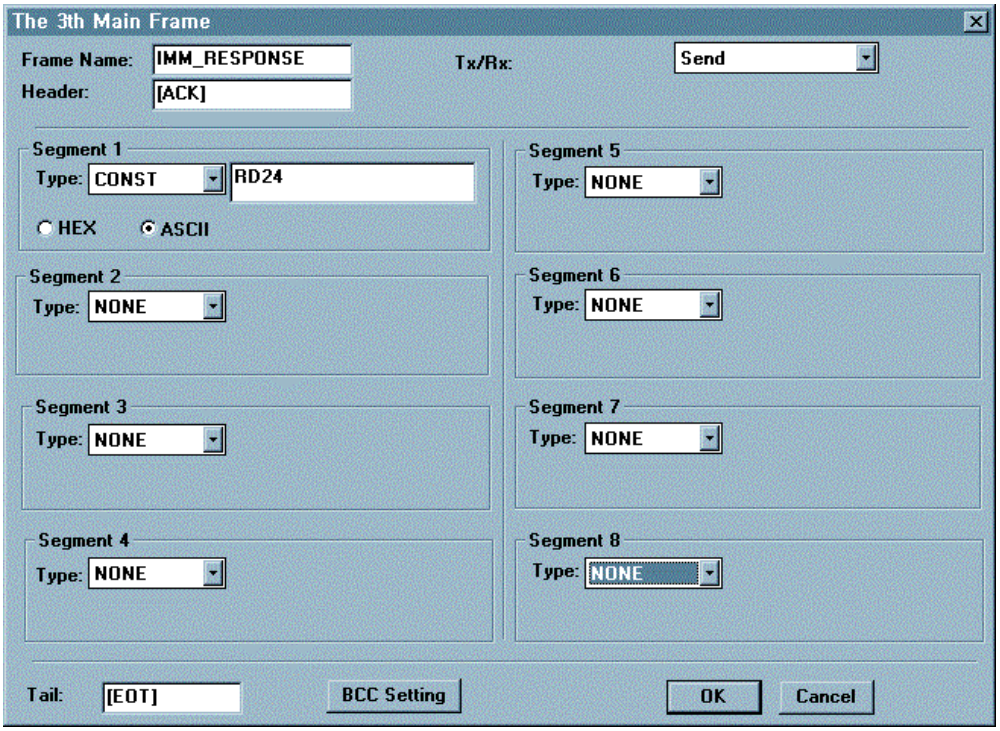
Remark

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

③ Input [ETX] to Tail as below. As [BCC] is not applied, no setting is needed.

④ [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



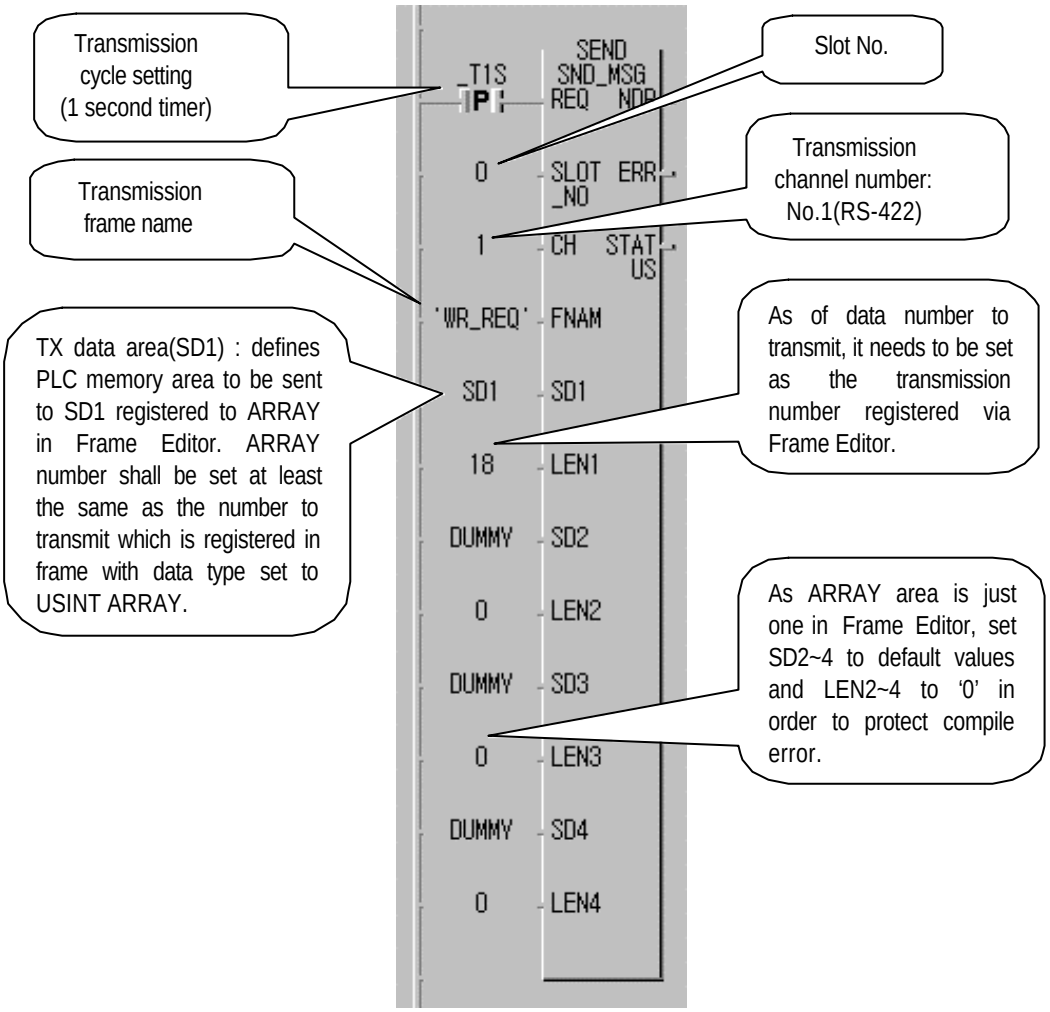
If preparing of TX/RX frame is completed as above, download frames and basic parameters to Cnet I/F module and switch RS-422 channel to Operation Run to finish preparation of Cnet I/F module operation. To operate actual transmitting and receiving after frames are prepared, a program shall be prepared 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

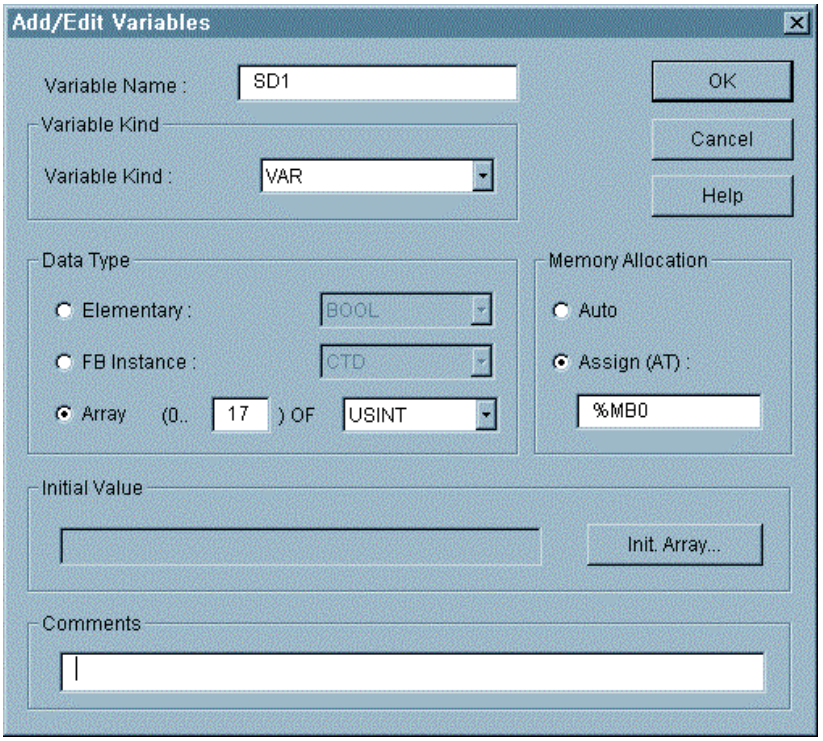


[Figure 7.10] is an example of transmission programming via 'SND_MSG' Function Block. As for transmission, if data is to be transmitted, in other words, if segment is applied set to ARRAY in frame registration, PLC area where data is to be transmitted to SD area of transmission Function Block shall be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

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.

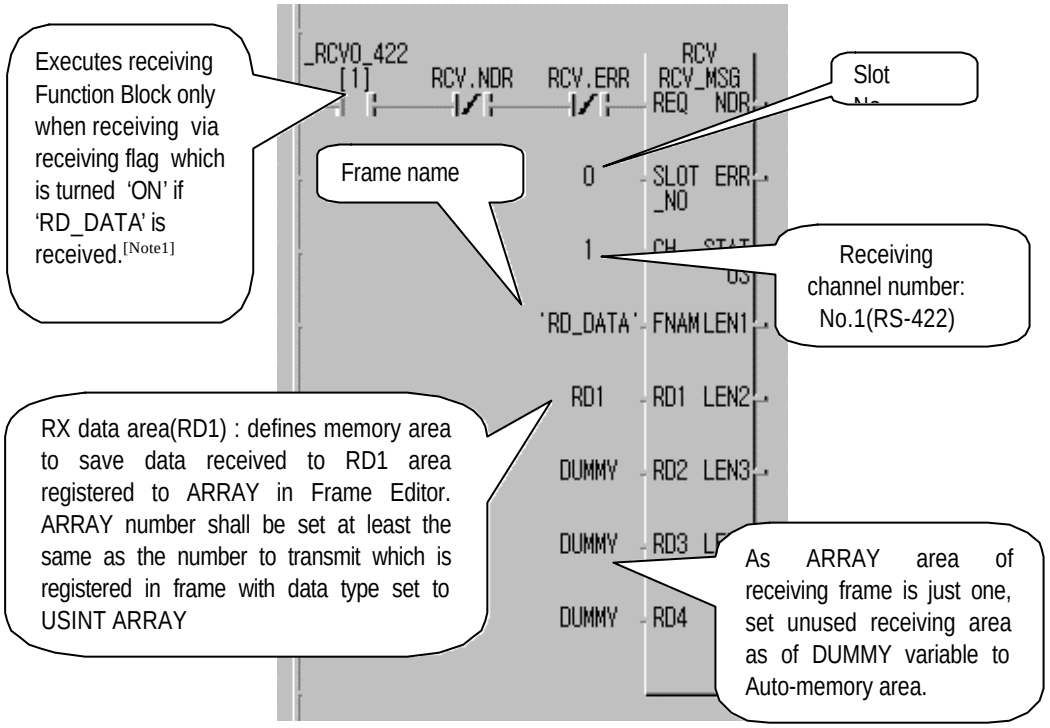
[Figure 7.11] Setting example of transmission data variable



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

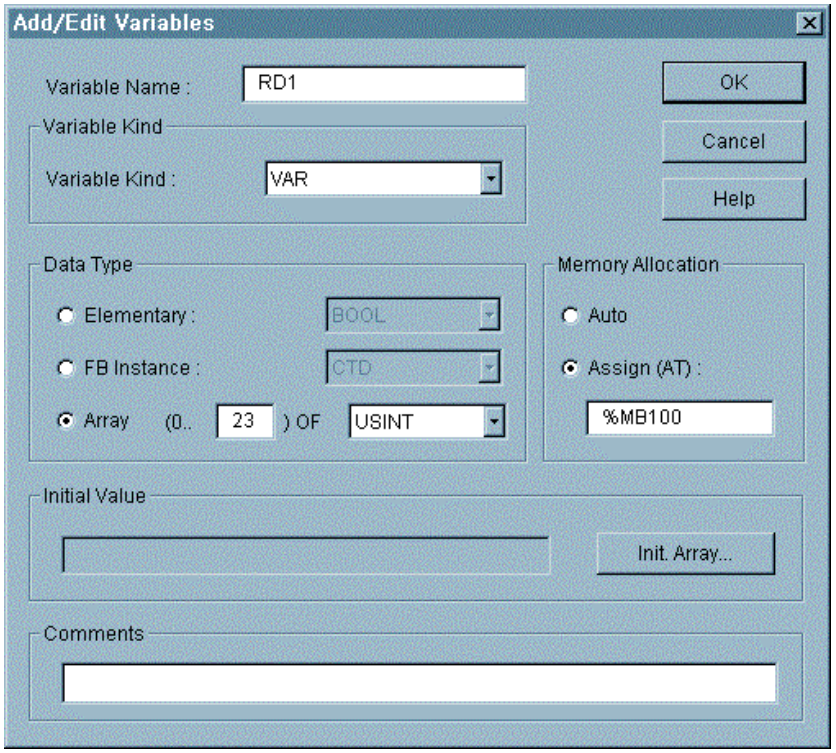
[Note 1] Receiving flag is available only in Cnet Ver.1.1 or later. If Cnet version is below Ver. 1.1, use a faster timer than transmission cycle in transmission station instead of the receiving flag.

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.

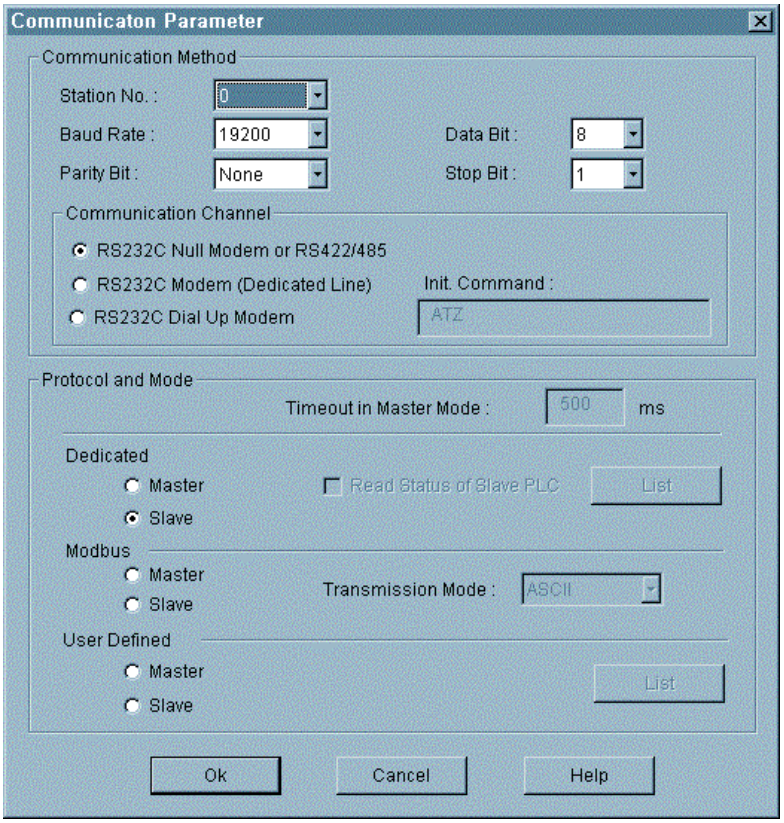
1) Parameter setting

A) Communication parameters setting

① Open new project file in GMWIN.

- ✓ Be sure to select GM7 of PLC type.
- ✓ Creat new project file respectively for master and slave.

② Select communication parameters in GMWIN parameter and double-click on it to display the figure below.



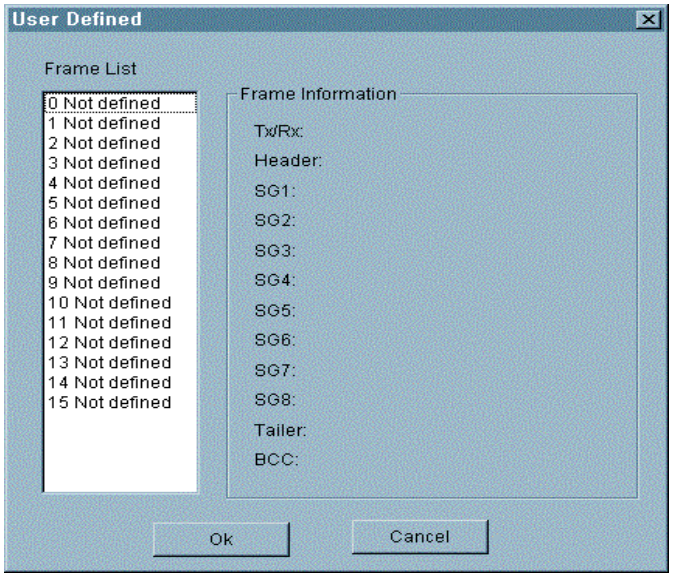
③ Perform setting as below.

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.

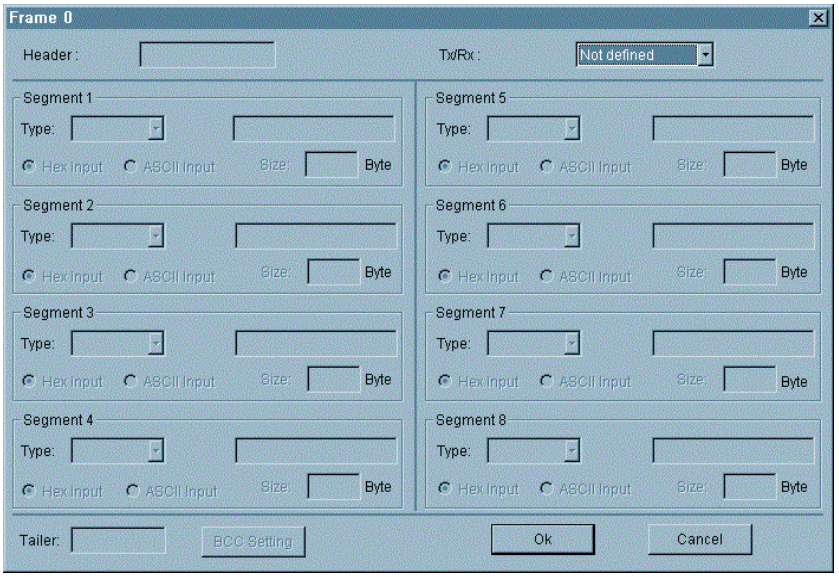
B) Frame setting

① If one of user defined items of protocol and transmission mode in communication parameters is selected, registration list button is activated.

② Press registration list button to display the figure below.



③ Select item(0 ~ 15) of frame list and double-click on it to display the figure below.



✓ 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] (← ○)

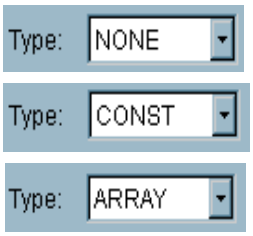
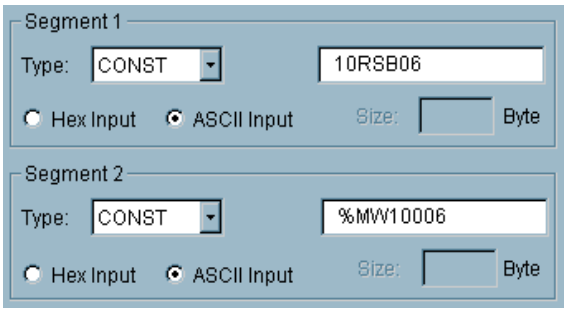
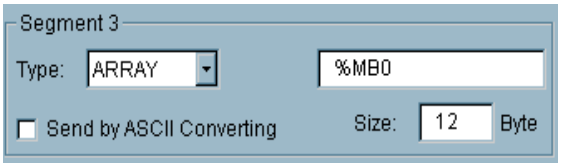
Ex.2) [A][NUL][ENQ][STX] (← × : 4 were used continuously.)

➢ 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
	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 (← ×)
	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  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. 
	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
	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).
	If set to ARRAY(variable data area), area size is set in byte unit. **Unit is byte.**

➢ 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] (← ○)

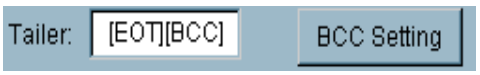
  Ex.2) NUL, EOT (← × : [ ] wasn’t used.)

- Up to 3 are allowable continuously.

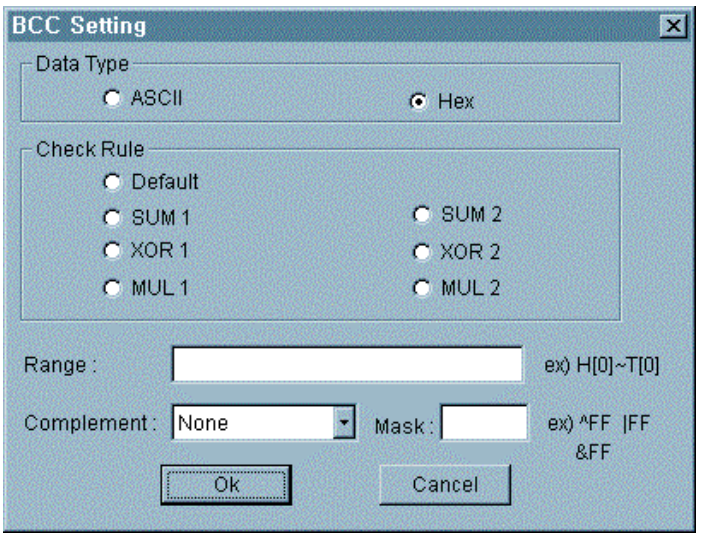
  Ex.1) [EOT][ETX][NUL] (← ○)

  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.



➢ BCC setting: Set BCC if required.



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 →

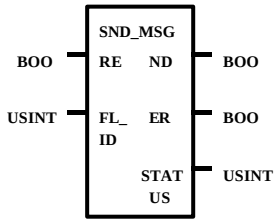
- Frame size
  - ASCII communication : Max. 126 byte
  - HEX communication : Max. 256 byte

- 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
	**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.

① Function

Function Block to transmit the frame registered in frame list.

② Error

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

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

① 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

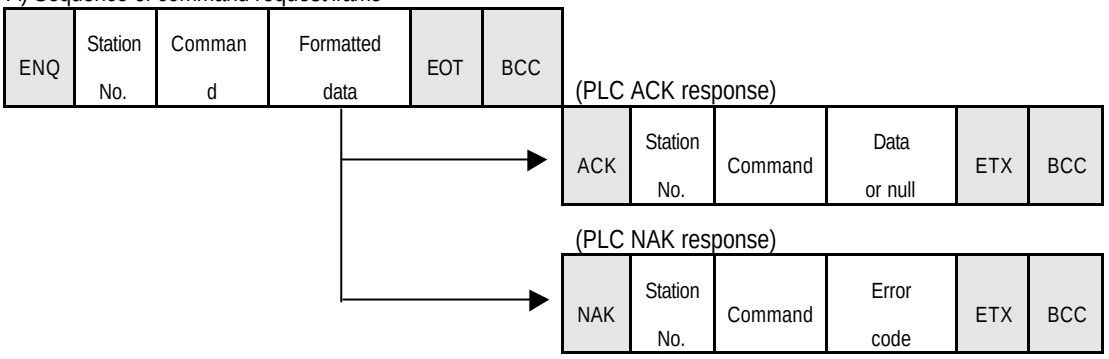
ASCII value adding : 05+32+30+72+53+53+30+31+30+36+25+4D+57+31+30+30+04) = H3A4

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

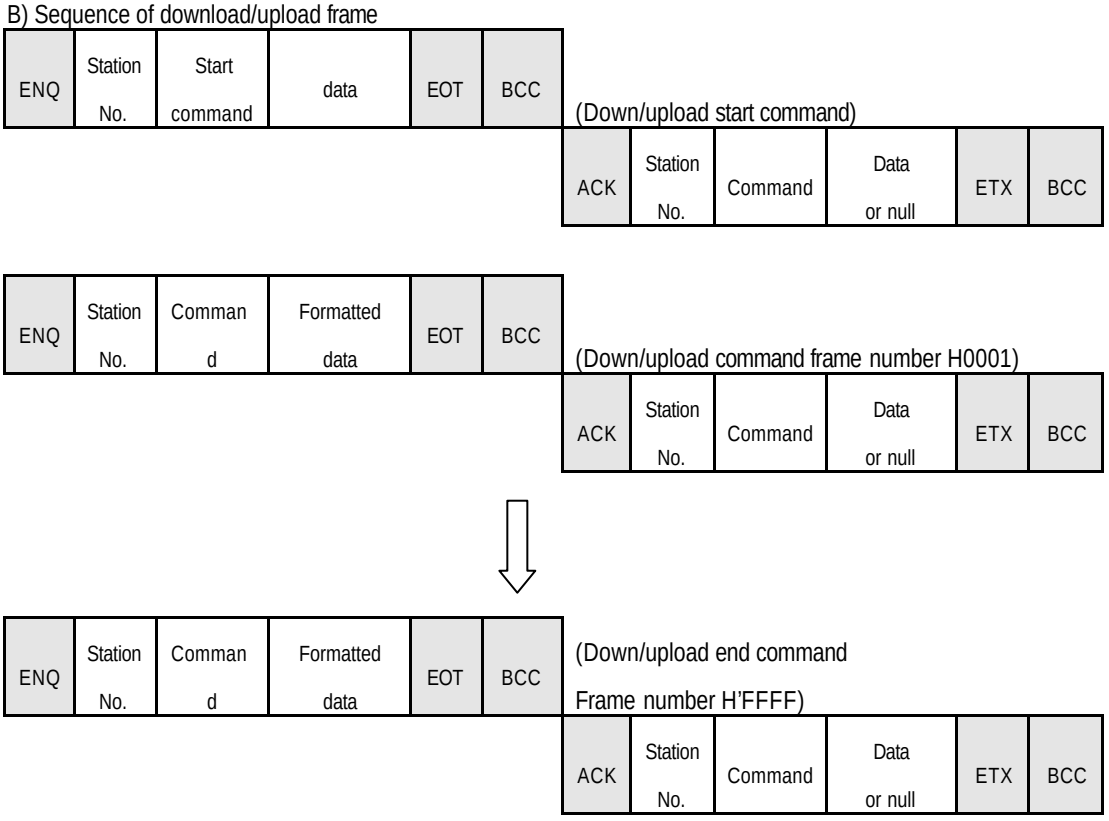
BCC value : H4134

2) Sequence of command frame

A) Sequence of command request frame



B) Sequence of download/upload frame



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		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		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 99AABBCCDDEEFF1122334455	ETX	BCC
ASCII value	H06	H3130	H52 (72)	H5342	H3031	H3134	H31313232333334343535363637373838393941414242434344444545464631313232333334343535	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	H4F55545055545F31		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	H4F55545055545F415252	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	H313 0	H52 (72)	H3137	H3031	H3134	H3233413031313232333334 343535363637373838393941 414242434344444545464630 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)

Form at / 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	%MW100	H00E2	Repeated block	EOT	BCC
ASCII value	H05	H3230	H57(77)	H5353	H3031	H3036	H254D5731303 0	H30304532		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	H254D5732 3330	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	H254D4431303 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	H4F555450555 45F31	H30303241		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	H112233445566778899AA	EOT	BCC
ASCII value	H05	H3130	H57 (77)	H3137	H3031	H3041	H4F55545055545F415252	H3035	H313132323333343435353636373738383939394141	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	H4141415245 5357	H3033	H414142424 343	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)

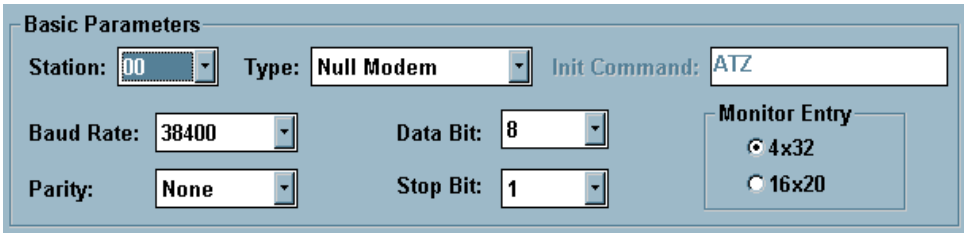
Format / Name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	W(w)	H16	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H57(77)	H3136	Error code(4)	H03	

☐ 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)

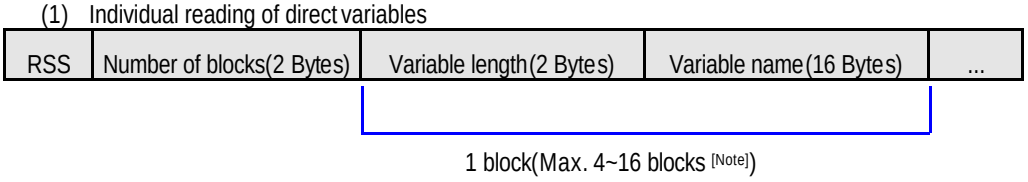
Format / Name	Header	Station No.	Command	Registration No.	Registration format	Tail	Frame check
Frame (Ex.)	ENQ	H10	X(x)	H1F	See registration format	EOT	BCC
ASCII value	H05	H3130	H58(78)	H3146	[※]	H04	

- ✓ 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.

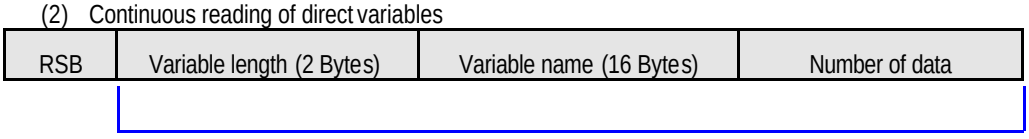
- ✓ Registration number can be registered up to 32 or up to 20 (0~31, H00~H1F) according to setting value of monitor registration number in Frame Editor, and if the already registered number is registered again, currently executed one is registered.
- ✓ Registered format is used from command to EOT among 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.

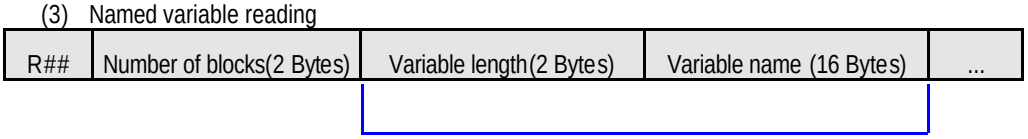
(1) Individual reading of direct variables



(2) Continuous reading of direct variables



(3) Named variable reading



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	H3931383341414242	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	

(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)

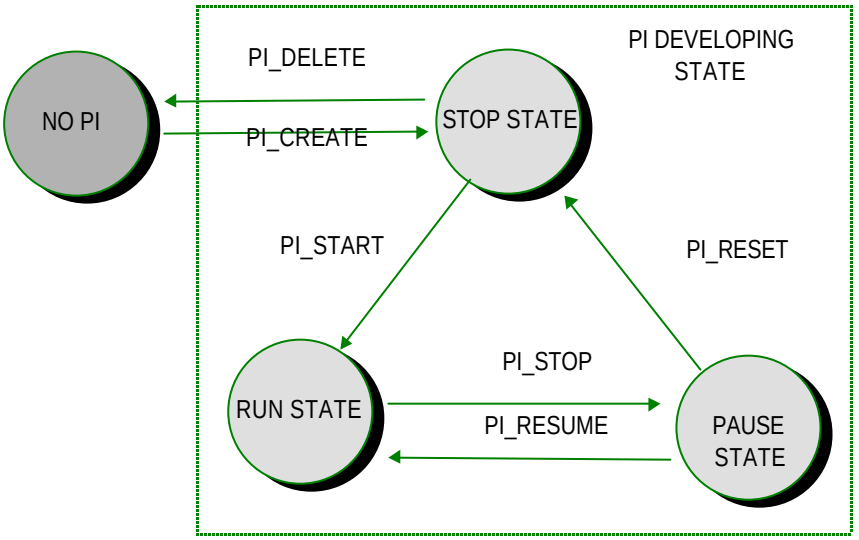
Format / Name	Header	Station No.	Command	Registration No	Error code	Tail	Frame check
Frame (Ex.)	NAK	H01	Y(y)	H01	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H59(79)	H3031	Error code(4)	H03	

☐ 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.

[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	H3030303338303030	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	

(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.

Form at / 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.

(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

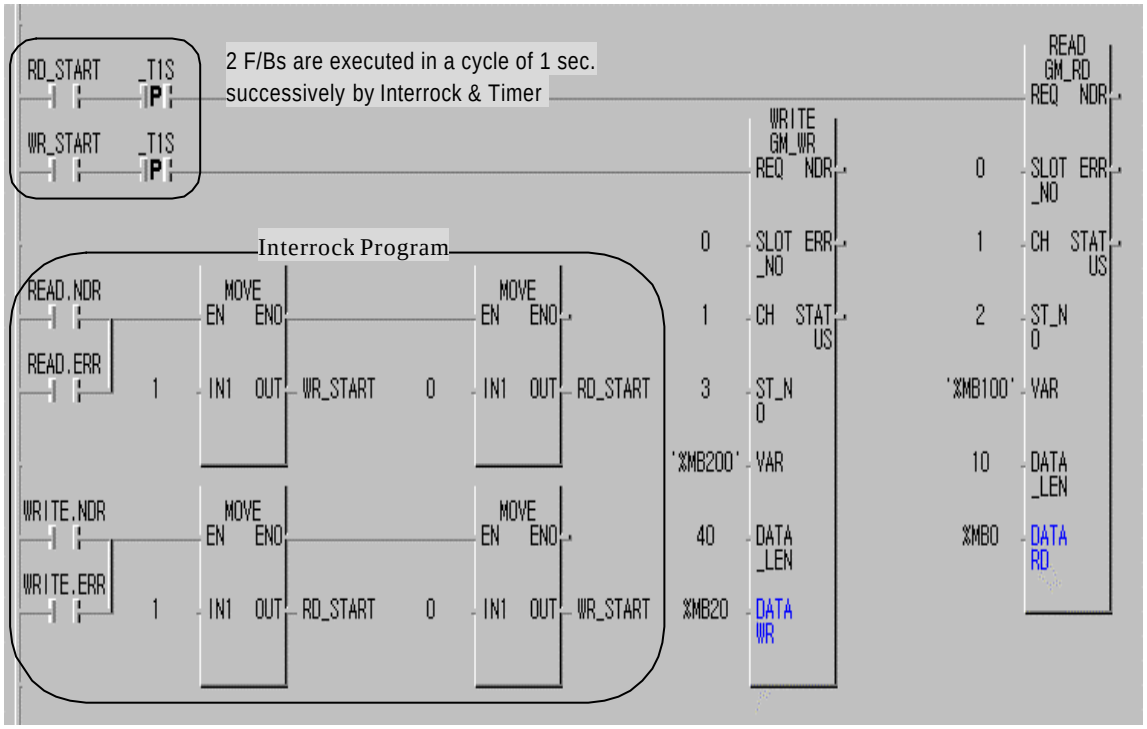
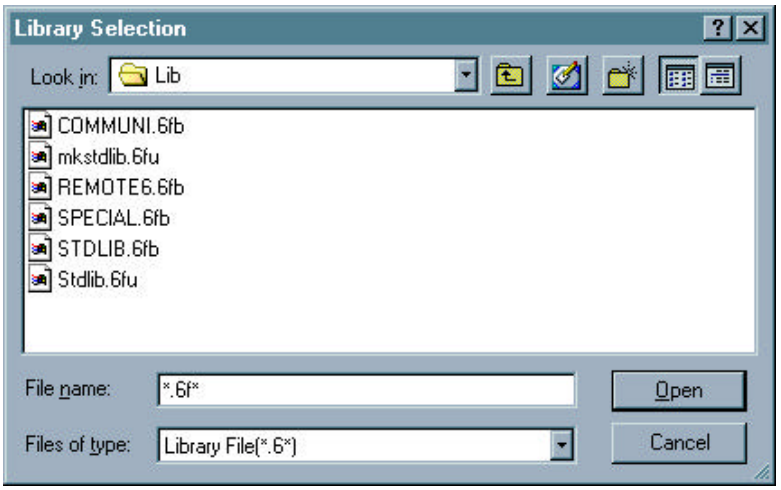


Figure above shows an example of Function Block for dedicated communication master function. Select COMMUNI.*fb in library selection dialog box shown as below to insert communication library in GMWIN project for Function Block service.



[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

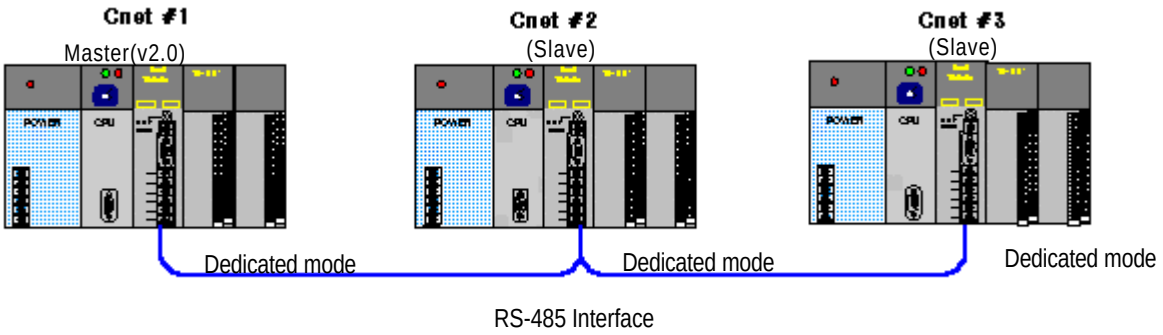
Ex.1 describes how to communicate between Cnets via dedicated Function Block.

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

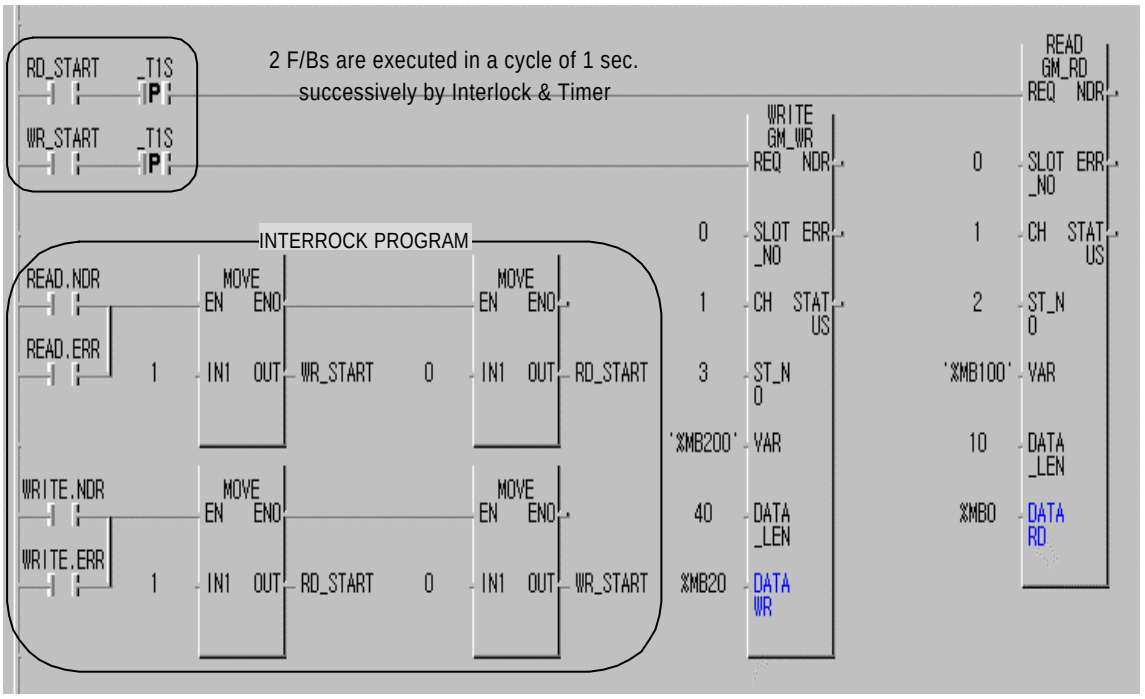
[Figure 7.16] shows system configuration composed of RS-485 multi-drops between Cnets. For the system communication between Cnet I/F modules, RS-422 operation mode of 3 stations shall be set to dedicated mode with the stations numbers set to station No. 1,2,3 respectively as not repeated. Since all 3 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.

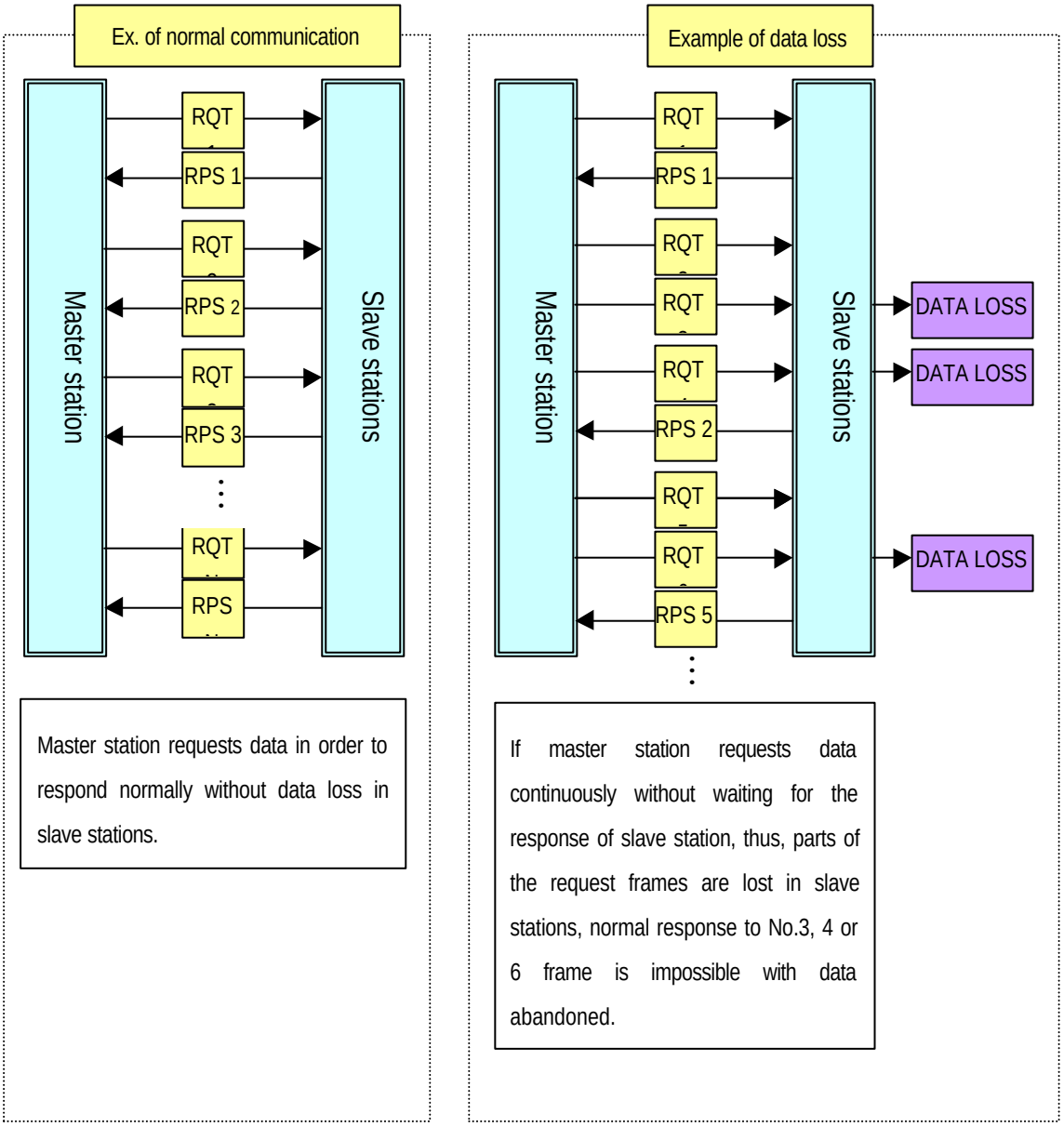
[Table 7.25] Error codes and Actions to take when dedicated F/B is executed

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

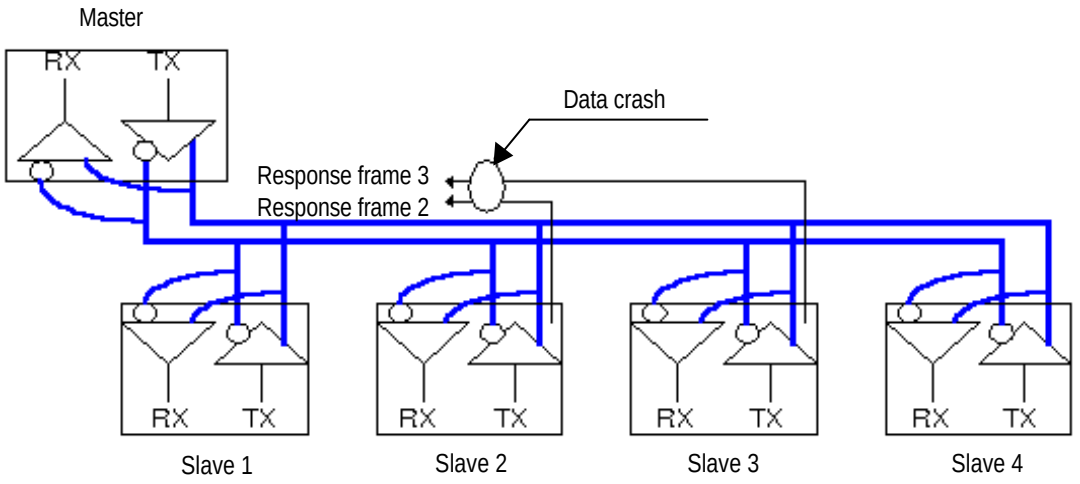
Slave station in dedicated mode responds to only one request at a time. Thus, even if later different request frame is received before an earlier request frame is processed by the slave station, the slave station dose not answer to the later request frame until the earlier request frame is processed. 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



✓ 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



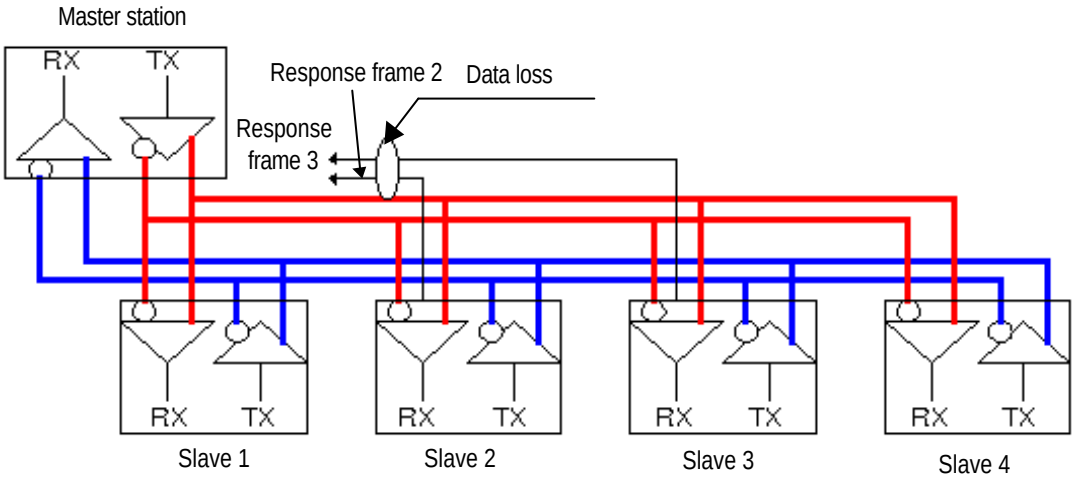
(a)Data crash in RS-485 system.

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.

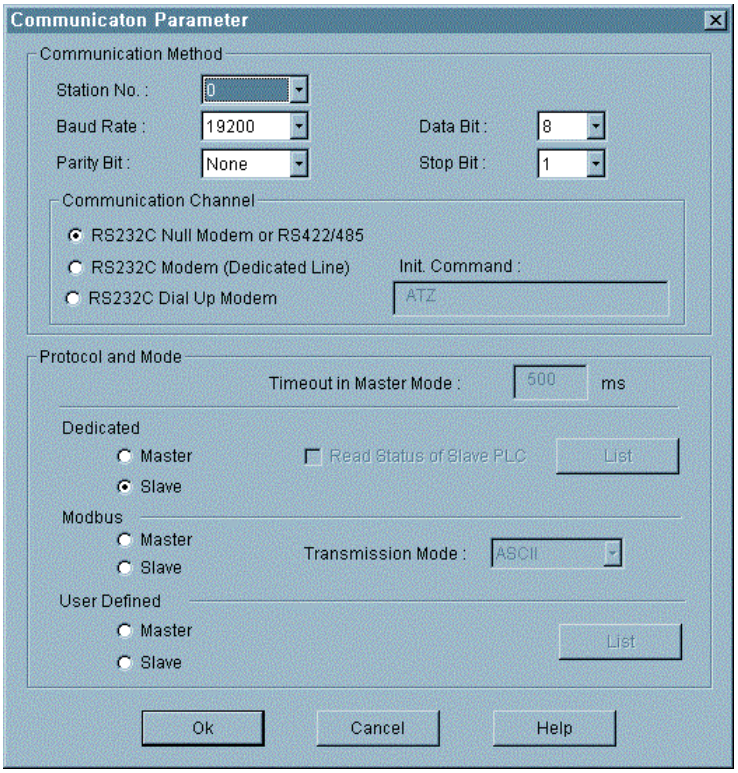
- ❑ Monitors communication status according to parameters through monitor function of GMWIN.

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.

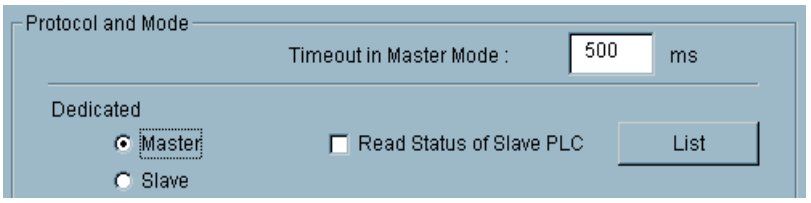


❑ Setting contents as below.

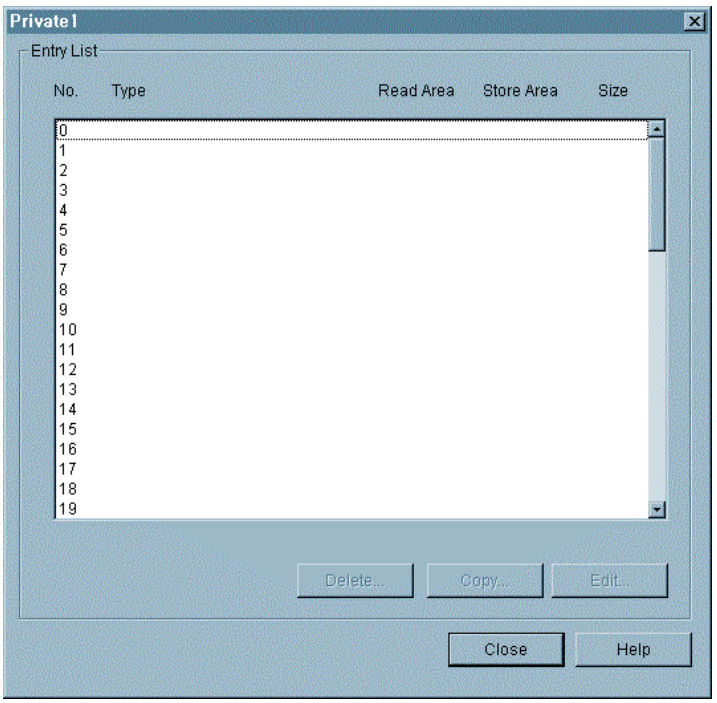
Item	Setting contents
Self-station No.	Setting is available from 0 to 31 station.
Communication speed	1200, 2400, 4800, 9600, 19200, 38400 or 57600 bps can be set.
Data bit	7 or 8 Bits are available.
Parity bit	None, Even or Odd can be set.
Stop bit	1 or 2 Bits are available.
Communication channel	• 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.



❑ Click on entry list button to display the screen below.



✓ Total 64 data blocks can be set without setting of block No.

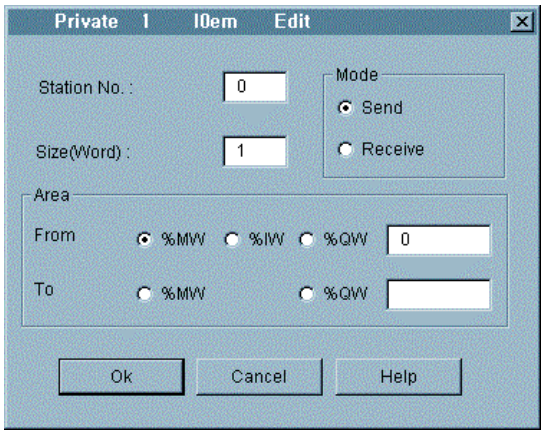
✓ TX/RX data size can be set up to 60 WORDs without TX/RX period.

❑ 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.

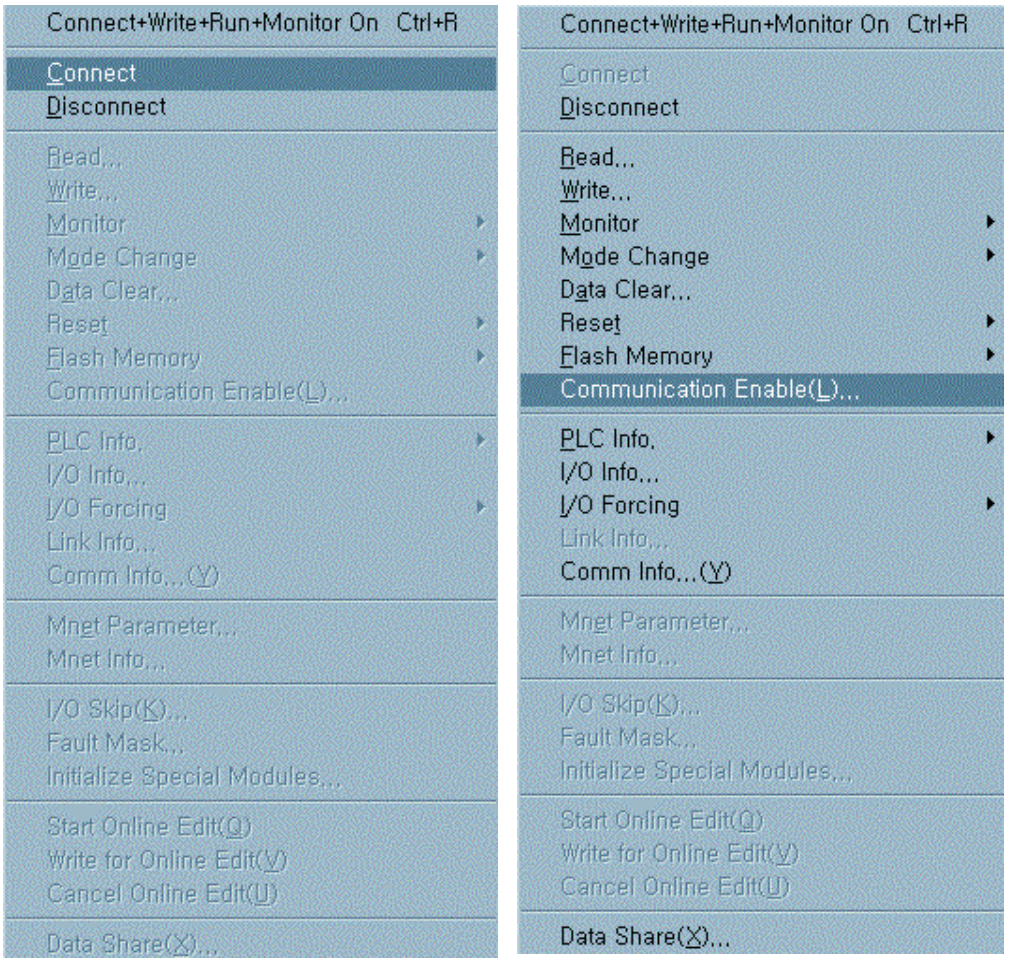


- ✓ Other's station No. : Set slave (other station) station No.
- ✓ Mode : Let Send checked to write data in slave station.
  Let Receive checked to read data from slave station.
- ✓ Size : Unit is WORD with max.60 WORDS available for the definition of data size to read/write in master station.
- ✓ Area

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. ·To select %QW0.1.0 : Select %QW and input '0.1.0' in the next blank space.
Saving area	Area in slave station to write data.	Area in master station where data read is saved.	

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)'.



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

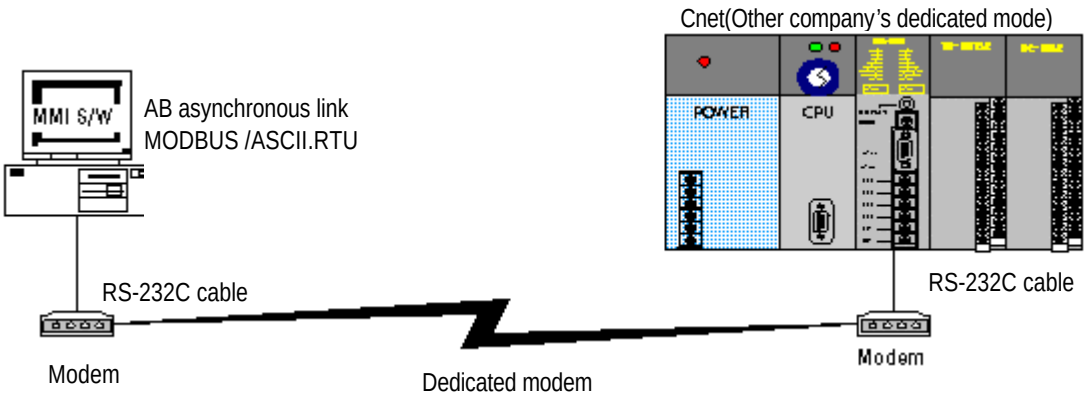
❑ Contents: Time elapsed from prior transmission of the first set parameters until the next transmission.

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

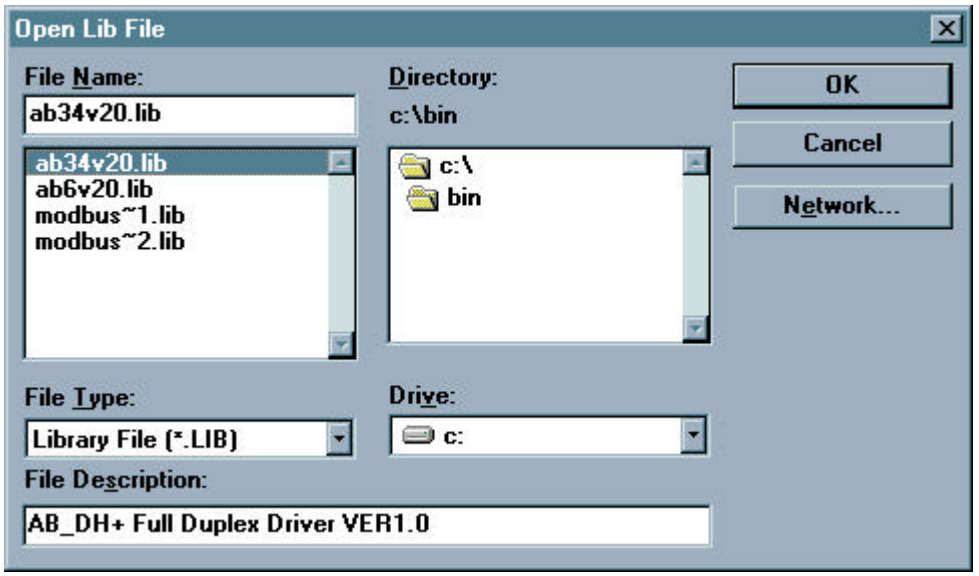
Communication driver file agreed with the service shall be downloaded, however, the number of downloads is not restricted. In other words, a module used in AB Asynchronous Link Full Duplex can be used in MODBUS communication mode if MODBUS communication driver has been downloaded.

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.

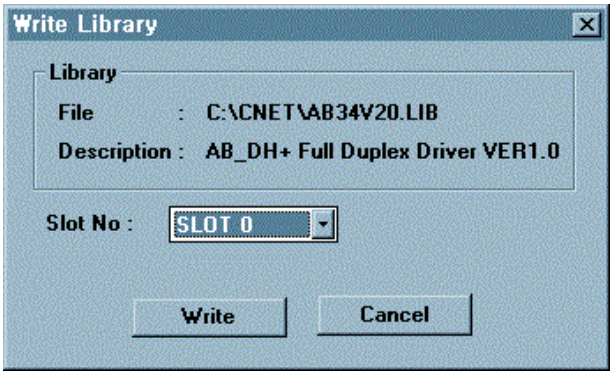
A) If Cnet mode switch is set to Write flash mode and then PLC is powered on, LED No.'0' of Cnet I/F module flashes in a cycle of 1sec.

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.

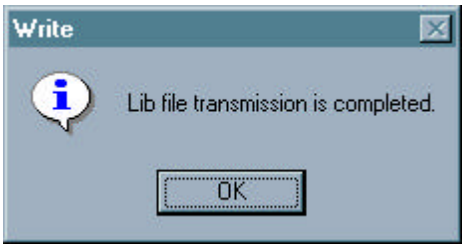
D) Select Write flash memory from sub-menu of flash memory in On-line menu of menu bar to display the following screen to Write library, where slot number Cnet I/F module is mounted on is to be selected and Write button is to be selected to download library selected to flash memory.



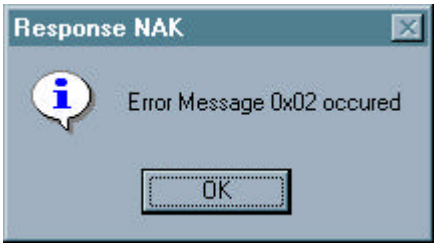
Remark

[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.

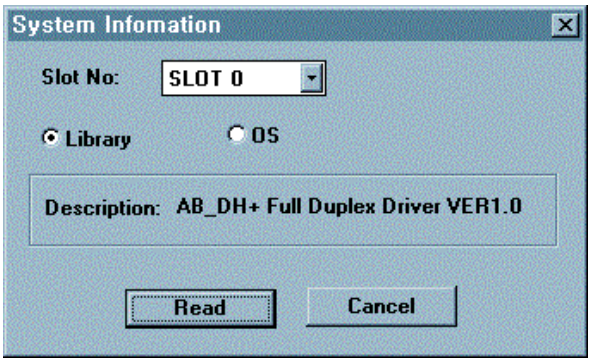
E) If library writing is completed, the following message will be displayed.



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.

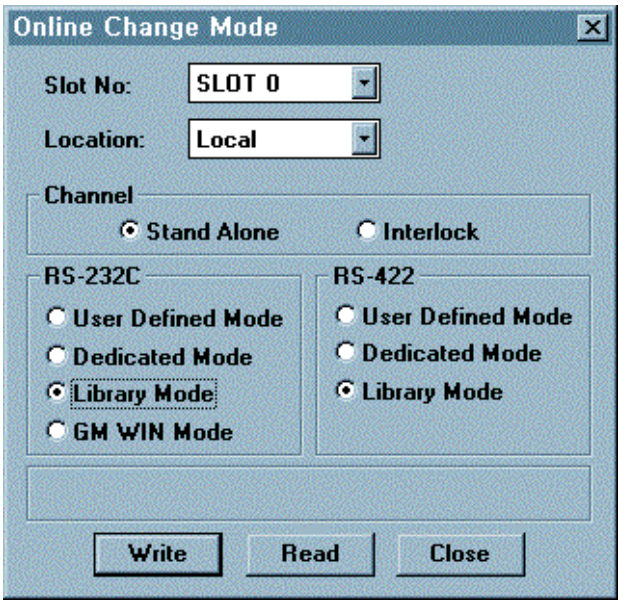


3) How to set other company's communication mode

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

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

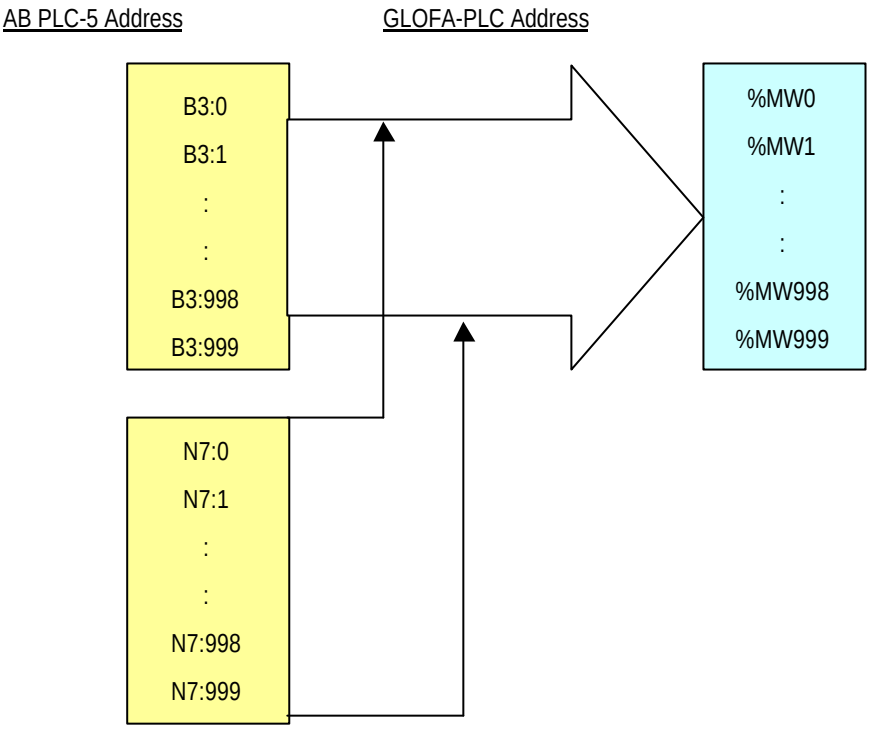
Type	AB PLC-5 Address	GLOFA-PLC Address	Support	Remark
Output	O:xxx(xxx is octal)	Not Available	NO	Not supported in AB communication driver.
Input	I:xxx(xxx is octal)	Not Available	NO	
Bit	Word: B3:xxx ⟺	%MWxxx	YES	xxx = 0 ~ 999(Word value) yy = 0 ~ 15 (Bit value)
	Bit: B3:xxx/yy ⟺	%MWxxx.yy		
Integer	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.

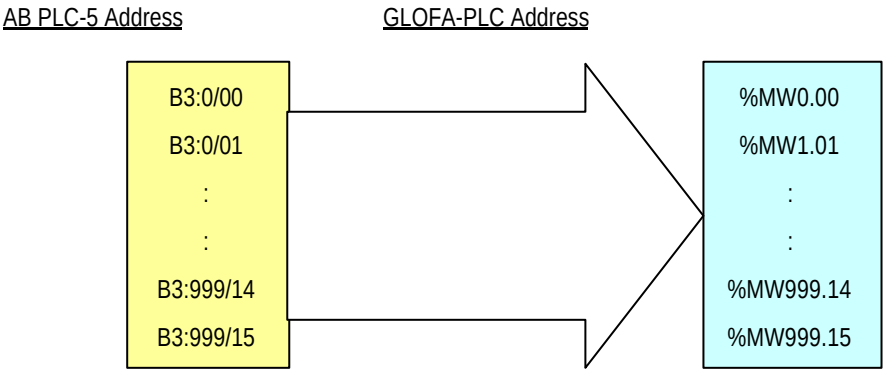
As described in [Table 7.30], AB PLC-5 B3 area & N7 area are mapped together in %MW area of GLOFA PLC. Namely, AB PLC-5 B3 : 0 area & N7 : 0 area are mapped in %MW0 area of GLOFA PLC in the range of %MW0 ~ %MW999 which is the range of B3/N7areas of AB PLC-5. [Figure 7.21] describes GLOFA-PLC address mapping for WORD area.

[Figure 7.21] WORD area mapping of AB communication driver



[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



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

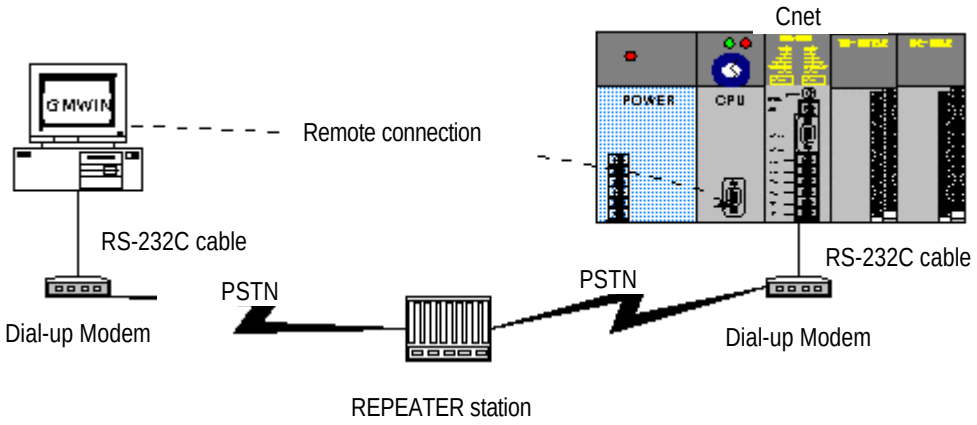
[Figure 7.23] shows an example of remote connection between GMWIN and PLC via modem. As shown in the figure, this structure is required for connection with PLC via phone line, dedicated line modem or wireless modem if GMWIN operated PC is located far from PLC. In this case, GMWIN shall be connected via 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.

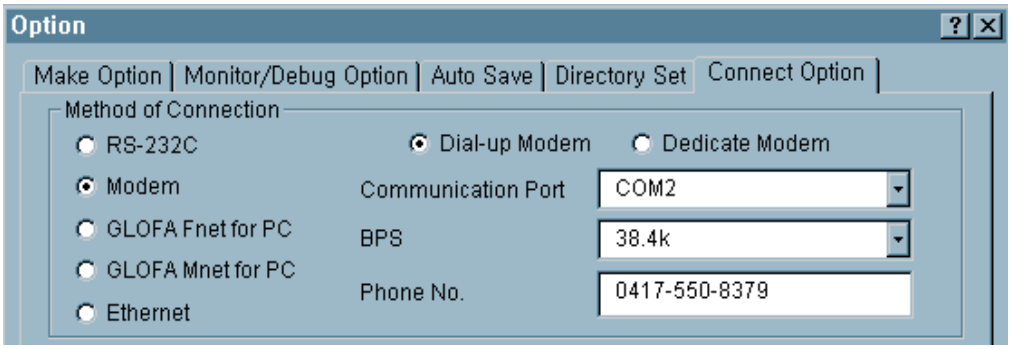
[Figure 7.23] Example of GMWIN remote connection via dial-up modem



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.

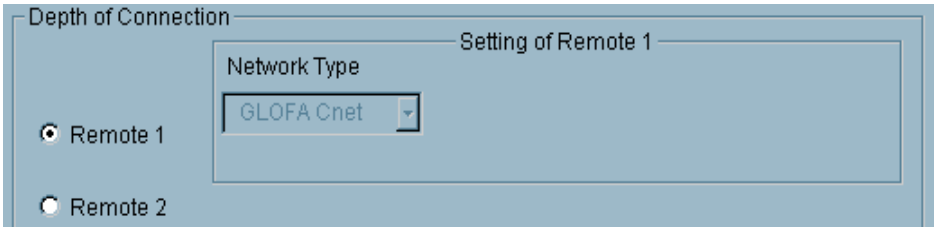
C) Phone number shall be input as of the number of modem side linked to Cnet. Extension No. and ',' are available if flowed out from local via the extension.

(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

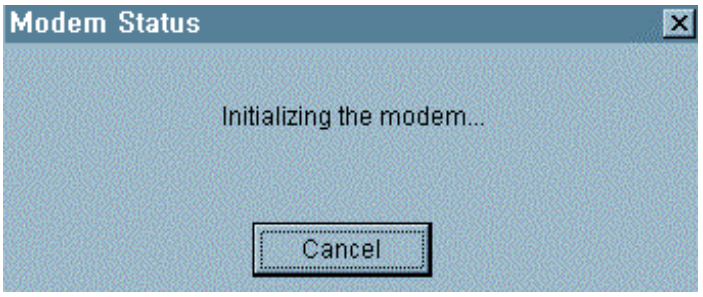


Remark

[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.

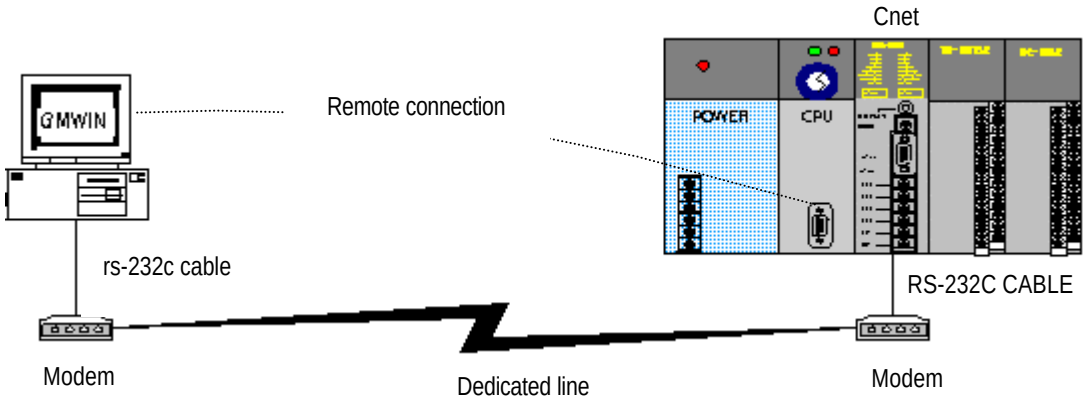
I) If connection is released , GMWIN hangs up the phone automatically to disconnect it.

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.

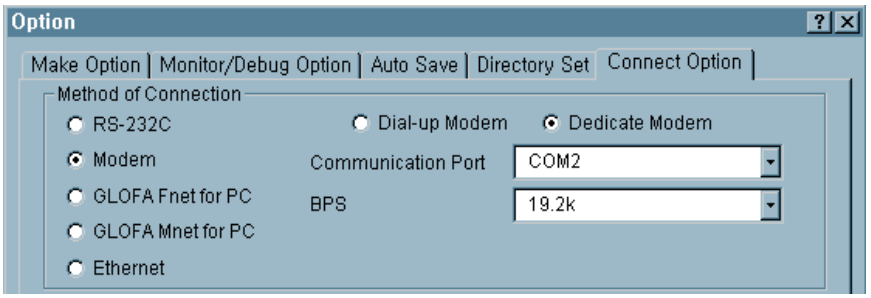
Remote connection sequence via dedicated modem is as follows.

A) Connect dedicated modem between PC and Cnet I/F module.

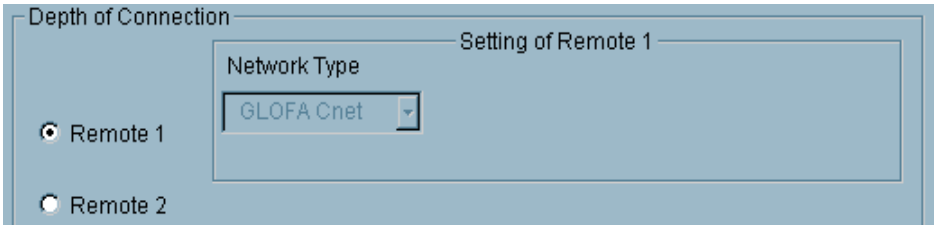
B) Set RS-232C channel of Cnet I/F module to GMWIN mode.

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.



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, 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.

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).

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.

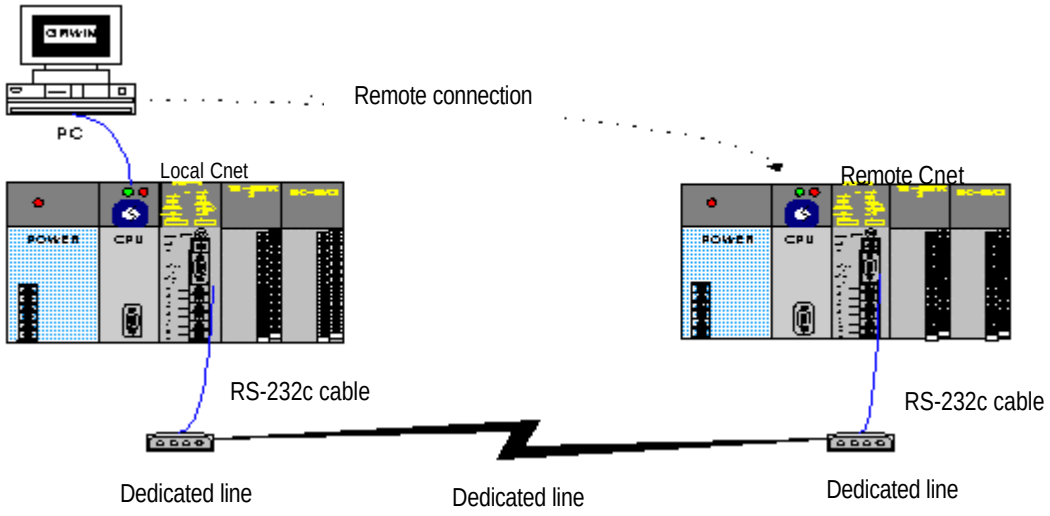
I) If connection is released normally, Cnet I/F module and GMWIN are changed to initial mode to allow re-connection when tried again starting from clause No.(1).

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.

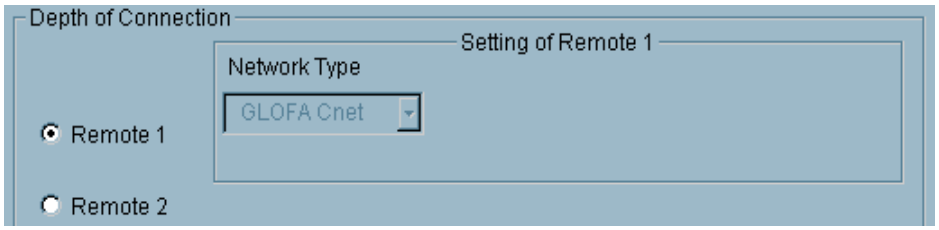
C) Switch local connected PLC to stop mode.[Note]

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.

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.



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.

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).

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