Chapter 8 Communication Function

8.1 Dedicated Protocol Communication

8.1.1 Introduction

GM7's built-in Cnet communication uses only GM7 base unit for a dedicated communication. That is, it doesn't need a separate Cnet I/F module to facilitate the user-intended communication system by utilizing reading or writing of any area in CPU, and monitoring function.

GM7 base unit serves as follows:

- Individual/continuous reading of direct variable
- Individual/continuous writing of direct variable
- Reading CPU status
- Monitor variables registration
- Executing monitoring
- 1:1 connection(link between GLOFA's) system configuration (GM7 base unit: RS-232C)

Remark

GM7 built-in communication function supports Cnet communication without any separate Cnet module. It must be used under the following instructions.

1) GM7 base unit supports 1:1 communication only. for 1:N system having master-slave Format, use GM7 base unit with G7L-CUEC module connected. G7L-CUEC module supports RS-422/485 protocol.
2) RS-232C communication cable for GM7 base unit is different from RS-232C cable for GMWIN in pin arrangement and from the cable for Cnet module, too. The cable can't be used without any treatment. For the detailed wiring method, refer to 8.1.2.
3) It's possible to set baud rate type and M area size in GMWIN. For the detailed information, refer to the appendix or GMWIN manual.

8.1.2 System configuration method

According to the method of connection, the system using GM7 built-in communication can be composed.

1) Connecting system configuration (link between GLOFA's)

(1) 1:1 connection with general PC

① Communication program made by C or BASE computer language on the user's computer, or
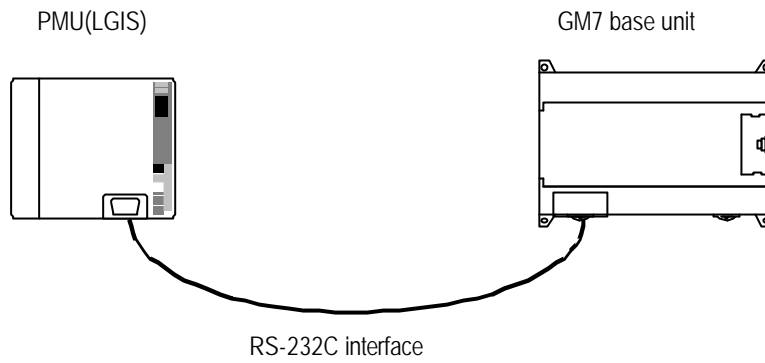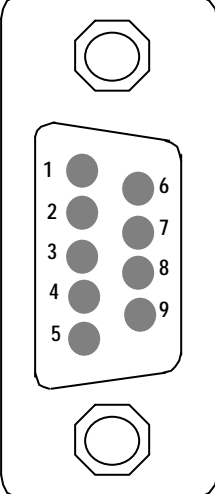
utility program like MMI software can be used.

GM7 base unit

RS-232C interface

② Wiring method

	PC	Pin assignment And direction	GM7 base unit	
	Pin No.		Pin No.	Signal
	1		1	CD
	2		2	RXD
	3		3	TXD
	4		4	DTR
	5		5	SG
	6		6	DSR
	7		7	RTS
	8		8	CTS
Female Type	9		9	RI

(2) 1:1 connection with a monitoring device like PMU
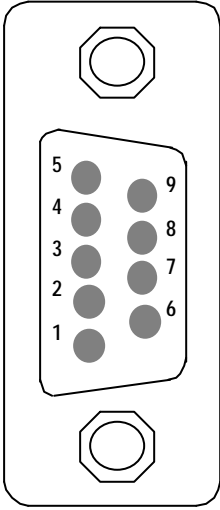
PMU(LGIS)   GM7 base unit

RS-232C interface

	PMU	Pin assignment and direction	GM7 base unit	
	Pin No.		Pin no.	Signal
	1		1	CD
	2		2	RXD
(pin diagram 1-9, Female Type)	3		3	TXD
	4		4	DTR
	5		5	SG
	6		6	DSR
	7		7	RTS
	8		8	CTS
	9		9	RI

.

(3) 1:1 connection with other GM7

For the detailed inFormation, refer to 8.1.7 " 1:1 Dedicated Protocol Communication."

GM7 base unit   GM7 base unit
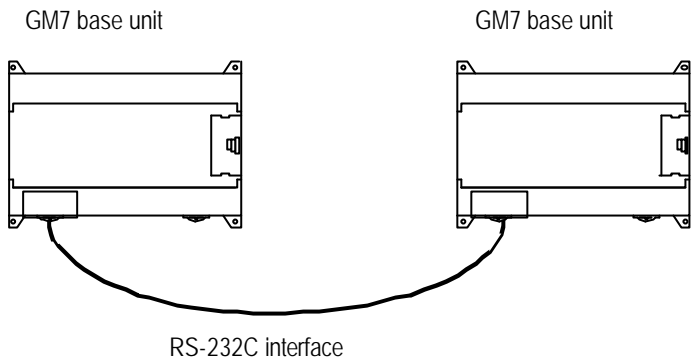
RS-232C interface

	GM7 base unit	Pin assignment and direction	GM7 base unit	
	Pin no.		Pin no.	Signal
	1		1	CD
	2		2	RXD
	3		3	TXD
	4		4	DTR
	5		5	SG
	6		6	DSR
	7		7	RTS
	8		8	CTS
Male Type	9		9	RI

8.1.3 Frame Structure

1) Base Format

(1) Request frame(external communication device   GM7 base unit)

(Max. 256 Bytes)

Header (ENQ)	Station	Command	Command type	Structurized data area	Tail (EOT)	Frame check (BCC)

(2) ACK Response frame (GM7 base unit   external communication device, when receiving data normally)

(max. 256 Bytes)

Header (ACK)	Station	Command	Command type	Structurized data area or null code	Tail (ETX)	Frame check (BCC)

(3) NAK Response frame (GM7 base unit   external communication device, when receiving data abnormally)

(max. 256 Bytes)

Header (NAK)	Station	Command	Command type	Error code (ASCII 4 Byte)	Tail (ETX)	Frame check (BCC)

Remark

1) Used control codes are as follows. Be familiar with the following control codes. Because they are importantly used for communication.

[Control codes]

Codes	Hex value	Name	Contents
ENQ	H05	Enquire	Request frame initial code
ACK	H06	Acknowledge	ACK response frame initial code
NAK	H15	Not Acknowledge	NAK response frame initial code
EOT	H04	End of Text	Request frame ending ASCII code
ETX	H03	End Text	Response frame ending ASCII code

8-6

> **Remark**
>
> 1) The numerical data of all frames are ASCII codes equal to hexadecimal value, if there's no clear
>
> statement. The terms in hexadecimal are as follows.
>
> • Station No.
>
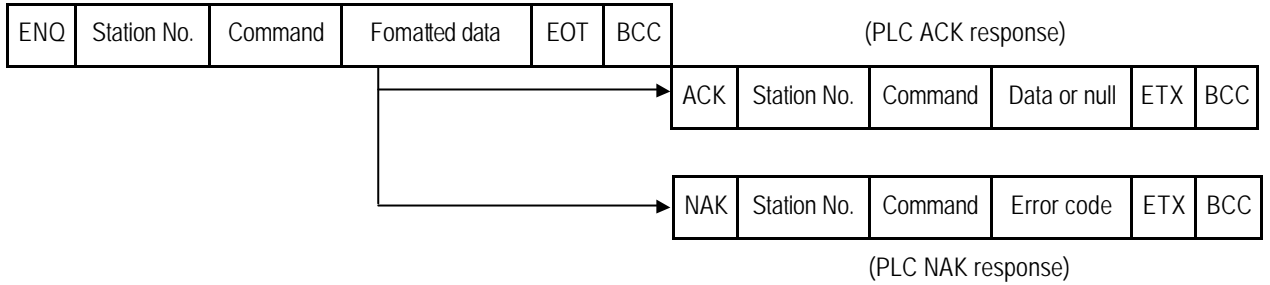> • When the main command is R(r) or W (w) and the command type is numerical (means a data type)
>
> • All of the terms indicating size of all data in the Formatted data area.
>
> • Monitoring registration and command registration number of execution commands.
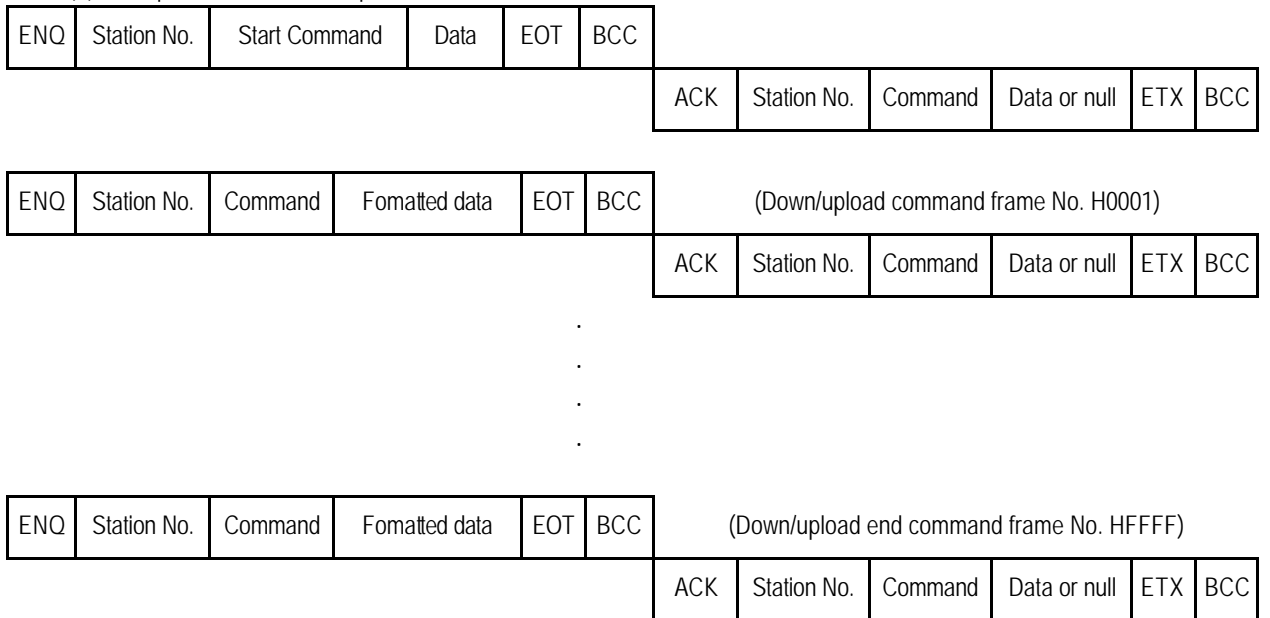>
> • All contents of data

> **Remark**
>
> 1) If it is hexadecimal, H is attached in front of the number of frames like H01, H12345, H34, H12, and H89AB.

1) Sequence of command frame

(1) Sequence of command request frame

ENQ	Station No.	Command	Fomatted data	EOT	BCC

(PLC ACK response)

ACK	Station No.	Command	Data or null	ETX	BCC

NAK	Station No.	Command	Error code	ETX	BCC

(PLC NAK response)

(2) Sequence of Download/upload frame

ENQ	Station No.	Start Command	Data	EOT	BCC

ACK	Station No.	Command	Data or null	ETX	BCC

ENQ	Station No.	Command	Fomatted data	EOT	BCC

(Down/upload command frame No. H0001)

ACK	Station No.	Command	Data or null	ETX	BCC

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.
.
.

ENQ	Station No.	Command	Fomatted data	EOT	BCC

(Down/upload end command frame No. HFFFF)

ACK	Station No.	Command	Data or null	ETX	BCC

8.1.4 List of commands

Command list for direct communication.

Division		Command				Treatment
		Main command		Command type		
Item		Code	ASCII code	Code	ASCII code	
Reading direct variable	Indivisual reading	r(R)	H72 (H52)	SS	5353	Reads direct variables of Bit, Byte, Word and Dword type.
	Continuos reading	r(R)	H72 (H52)	SB	5342	Reads direct variables of Byte, Word and Dword type in block unit.(Continuous reading Bit is unavailable)
Writing direct variable	Indivisual writing	w (W)	H77 (H57)	SS	5353	Writes data to direct variable of Bit, Byte, Word and Dword type.
	Continuos writing	w(W)	H77 (H57)	SB	5342	Writes data to direct variable of Byte, Word and Dword type in block unit. (Continuous reading Bit is unavailable)
CPU Status reading		r(R)	H73 (H53)	ST	5354	Reads flag list like PLC operation status and error inFormation. (For detailed flag contents, refer to GM7 manual).

Division		Command				Treatment
		Main command		Register No.		
Item		Code	ASCII code	Register no.	ASCII code	
Monitoring variable register		x(X)	H78 H58	H00~H09	3030 ~ 3039	Register variables to monitor.
Execution of monitoring		y(Y)	H79 (H59)	H00~H09	3030 ~ 3039	Execute registered variables to monitor.

Remark

1) GM7 base unit identifies capitals or small letters for main commands, but not for the others.

2) If it s a main command in capitals, it calculates BCC value. But if it s not, it doesn t. Therefore, when BCC for frame check is used, main commands must be in small letters.

3) Commands to read/write symbolic variable or array variable can't be used in built-in communication

8.1.5 Data type

It's possible to read and write direct variable in built-in communication. When direct variable is used, be aware of data type.

1) Data type of direct variable

- Available types of device: M (internal memory), Q (output), I (input)
- When direct variable is used, attach '%' (25H) in front of the marking characters.

Data type	Marking characters	Examples
Bit	X(58H)	%MX0, %QX0.0.0, %IX0.0.0
Byte	B(42H)	%MB10, %QB0.0.0, %IB0.0.0
Word	W(57H)	%MW10, %QW0.0.0, %IW0.0.0
Double Word	D(44H)	%MD10, %QD0.0.0, %ID0.0.0

Remark

1) Commands to read/write symbolic variable can't be used in built-in communication.

2) Memory address 100 in '%MB100' indicates decimal value.

3) Long word among data types can't be used.

8.1.6 Execution of commands(Ex.)

1) Individual reading of direct variable(RSS)

(1) Introduction

This is a function that reads PLC device memory directly specified in accord with memory data type. Separate device memory can be read up to 16 at a time.

(2) PC request format

Format name	Header	Station No.	Command	Command type	Number of blocks	Variable length	Variable name	……	Tail	Frame check
Ex. of frame	ENQ	H20	R(r)	SS	H01	H06	%MW100		EOT	BCC
ASCII value	H05	H3230	H52(72)	H5353	H3031	H3036	H254D57313030		H04	

1 block(setting can be repeated up to max. 16 blocks)

Item	Explanation
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. For example, the BCC of the above frame is gotten as below: H05+H32+H30+H72+H53+H53+H30+H31+H30+H36+H25+H4D+H57+H31+H30+H30+H04 =H03A4 Therefore BCC is A4.
Number of Blocks	This specifies how much of the blocks composed of "[Variable length][Variable name]" are in this request Format. This can be set up to 16. Therefore, the value of [Number of blocks] must be set between H01(ASCII value:3031)-H10(ASCII value:3030).
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). For example, if the variable name is %MWO, it has 4 characters to be H04 as its length. If %QW0.0.0, 8 characters to be H08.
Variable name	Address to be actually read is entered. This must be ASCII value within 16 characters, and in this name, digits, upper/lower case, '%' and '.' only are allowable to be entered.

Remark

1) Numerical data of frame(Ex.) is hex value, and "H" is unnecessary during preparing real frame.

2) Device data type of each must be same. If data type of the first block is WORD, and the second block is DOUBLE WORD, error occurs.

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(3) Response format (ACK response)

Format name	Header	Station No.	Command	Command type	Number of blocks	Number of data	data	......	Tail	Frame check
Ex. of frame	ACK	H20	R(r)	SS	H01	H02	HA9F3		ETX	BCC
ASCII value	H06	H3230	H52(72)	H5353	H3031	H3032	H41394633		H04	

1 block(max. 16 blocks)

Item	Explanation
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 and added to BCC, and sent.
Number of data	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) included in direct variable name of computer request Format. Number of data in accordance with its variable type is as follows: 	Data type	Available direct variable	Number of data	 |---|---|---| 	BOOL(X)	%MX,%QX,%IX	1	 	Byte(B)	%MB,%QB,%IB	1	 	WORD(W)	%MW,%QW,%IW	2	 	DOUBLE WORD(D)	%MD,%QD,%ID	4	
Data	• In data area, there are the values of hex data converted to ASCII code saved.

<u>Ex.1</u>

The fact that number of data is H04(ASCII code value:H3034) means that there is hex data of 4 bytes in data(DOUBLE WORD). Hex data of 4 bytes is converted into ASCII code in data.

Ex.2

If 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," and this contents is entered in data area. Namely, highest value is entered first, lowest value last.

Remark

1) If data type is BOOL, data read is indicated by bytes of hex. Namely, if Bit value is 0, it indicated by H00, and if 1, by H01.

(4) Response format (NAK response)

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

Item	Explanation
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 and added to BCC.
Error code	Hex and 2 bytes(ASCII code, 4 bytes) indicate error type. For the details, see 8.1.8 Error codes.

(5) Example

GM7 base unit

This example supposes when 1 WORD from %MW20 and 1 WORD from %QW0.2.1 address of station No.1 are read and BCC value is checked. Also it is supposed that H1234 is entered in %MW20, and data of H5678 is entered in %QW0.2.1.

① Computer request format (PC → GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Number of blocks	Variable length	Format name	Variable length	Format name	Tail	Frame check
Ex. of frame	ENQ	H01	r	SS	H02	H05	%MW20	H08	%QW0.0.1	EOT	BCC
ASCII value	H05	H3031	H72	H5353	H3032	H3035	H254D57 3230	H3038	H25515730 2E322E31	H04	

② For ACK response after execution of command(PC → GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Number of blocks	Number of data	Data	Number of data	Data	Tail	Frame check
Ex. of frame	ACK	H01	r	SS	H02	H02	H1234	H02	H5678	ETX	BCC
ASCII value	H06	H3031	H72	H5353	H3032	H3032	H31323334	H3032	H35363738	H03	

③ For NAK response after execution of command(PC → GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Ex. of frame	NAK	H01	r	SS	Error code (2)	ETX	BCC
ASCII value	H15	H3031	H72	H5353	Error code (4)	H03	

Frame check BCC is automatically calculated internally.

2) Continuous reading(RSB) of direct variable

(1) Introduction

This is a function that reads the PLC device memory directly specified in accord with memory data type. With this, data is read from specified address as much as specified continuously.

(2) PC request format

Format name	Header	Station No.	Command	Command type	Number of blocks	Variable length	Number of data (Max. 128 Bytes)	Tail	Frame check
Ex. of frame	ENQ	H10	R(r)	SB	H06	%MW100	H05	EOT	BCC
ASCII value	H05	H3130	H52(72)	H5342	H3036	H255744313030	H3035	H04	

Remark

1) Number of data specifies the number according to the type of direct variable. Namely, if the data type of direct variable is double word, and number is 5, it means that 5 DOUBLE WORDs should be read.

2) Max. of %MB in number of data can be used up to 128 . %MW up to 64 and %MD, 32.

3) Protocol of RSB doesn't have number of blocks.

Item	Explanation
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.
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).
Variable name	Address to be actually read is entered. This must be ASCII value within 16 characters, and in this name, digits, upper/lower case, '%' and '.' only are allowable to be entered.

(3) GM7 Base Unit response format (GM7 of ACK response)

Format name	Header	Station No.	Command	Command type	Number of blocks	Number of data	data	Tail	Frame check
Ex. of frame	ACK	H10	R(r)	SB	H01	H02	H1122	EOT	BCC
ASCII value	H06	H3130	H52(72)	H5342	H3031	H3134	H31313232	H03	

Item	Explanation
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 and 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(B,W,D) included in direct variable name of computer request Format. 	Data type	Available direct variable	Data size	 |---|---|---| | 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	
Data	.In data area, there are the values of hex data converted to ASCII code saved.

Ex.1

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

Ex.2

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

(4) Response format(NAK response)

Format name	Header	Station No.	Command	Command type	Error code (Hex 2 Byte)	Tail	Frame check
Ex. of frame	NAK	H10	r	SB	H1132	ETX	BCC
ASCII value	H15	H3130	H72	H5342	H31313332	H03	

Item	Explanation
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 and added to BCC, and sent.
Error code	Hex and 2 bytes(ASCII code, 4 bytes) indicate error type. For the details, see 8.1.8 Error codes.

(5) Example

This example supposes that 2 DOUBLE WORDs from %MDO of station NO. 10 is read and BCC value is

checked. Also it is supposed that data in %MDO and in %MD1 is as follow:

%MDO = H12345678

%MD1 = H9ABCDEF0

Computer request format (PC ⟶ GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Data length	Variable name	Number of data	Tail	Frame check
Frame (Example)	ENQ	H0A	r	SB	H04	%MD0	H02	EOT	BCC
ASCII value	H05	H3041	H72	H5342	H3034	H254D4430	H3032	H04	

For ACK response after execution of command(PC ⟶ GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Number of data	data	Tail	Frame check
Frame (Example)	ACK	H0A	r	SB	H08	12345678 9ABCDEF0	ETX	BCC
ASCII value	H06	H3041	H72	H5342	H3038	H31323334353637383941424344454630	03	

For NAK response after execution of command(PC ⟶ GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Error code	Tail	BCC
Frame (Example)	NAK	H0A	r	SB	Error code (2)	ETX	BCC
ASCII value	H15	H3041	H72	H5342	Error code (4)	H03	

3) Individual writing of direct variable(W(w)SS)

(1) Introduction

This is a function that writes the PLC device memory directly specified in accord with memory data type.

(2) PC request format

Format name	Header	Station No.	Command	Command type	Number of blocks	Variable Length	Variable Name	Data	.....	Tail	Frame check
Frame (Example)	ENQ	H20	W(w)	SS	H01	H06	%MW100	H00E2		EOT	BCC
ASCII value	H05	H3230	H57(77)	H5353	H3031	H3036	H254D57313030	H303045 32		H04	

1 block(setting can be repeated up to max. 16 blocks)

Item	Explanation
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 how much of the blocks composed of "[Variable length][Variable name]" are in this request Format. This can be set up to 16. Therefore, the value of [Number of blocks] must be set between H01(ASCII value:3031)-H10(ASCII value:3030).
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	Address to be actually read is entered. This must be ASCII value within 16 characters, and in this name, digits, upper/lower case, '%' and '.' only are allowable to be entered.
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, the ASCII value converted from hex data is entered.

Ex.1

If type of data to be currently written is DOUBLE WORD, the data is H12345678, ASCII code converted value of this is "3132333435363738," and this content must be entered in data area. Namely, most significant value must be sent first, least significant value last.

Remark

1) Device data types of each block must be the same.

2) If data type is BOOL, the data to be written is indicated by bytes of hex. Namely, if Bit value is 0, it must be indicated by H00(3030), and if 1, by H01(3031).

(3) Response format (ACK response)

Format name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Example)	ACK	H20	W(w)	SS	ETX	BCC
ASCII value	H06	H3230	H57(77)	H5353	H03	

Item	Explanation
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 and added to BCC, and sent.

(4) Response format (NAK response)

Format name	Header	Station No.	Command	Command type	Error code (Hex 2 Byte)	Tail	Frame check
Frame (Example)	NAK	H20	W(w)	SS	H4252	ETX	BCC
ASCII value	H15	H3230	H57(77)	H5353	H34323532	H03	

Item	Explanation
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 and added to BCC, and sent.
Error code	Hex and 2 bytes(ASCII code, 4 bytes) indicate error type. For the details, see 8.1.8 Error codes.

(5) Example

This example supposes that "HFF" is written in %MW230 of station No. 1 and BCC value is checked.

Computer request format (PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Number of blocks	Variable Length	Variable Name	Data	Tail	Frame check
Frame (Example)	ENQ	H01	w	SS	H01	H06	%MW230	H00FF	EOT	BCC
ASCII value	H05	H3031	H77	H5353	H3031	H3036	H254D57323330	H30304646	H04	

For ACK response after execution of command(PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Example)	ACK	H01	w	SS	ETX	BCC
ASCII value	H06	H3031	H77	H5353	H03	

For NAK response after execution of command(PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Example)	NAK	H01	w	SS	Error code (2)	ETX	BCC
ASCII value	H15	H3031	H77	H5353	Error code (4)	H03	

4) Continuous writing of direct variable(WSB)

(1) Introduction

This is a function that directly specifies PLC device memory and continuously writes data from specified address as much as specified length.

(2) Request format

Format name	Header	Station No.	Command	Command type	Number of blocks	Variable Length	Number of data (Max.128 Byte)	Data	Tail	Frame check
Frame (Example)	ENQ	H10	W(w)	SB	H06	%MD100	H01	H11112222	EOT	BCC
ASCII value	H05	H3130	H57(77)	H5342	H3036	H254D44313030	H3031	H3131313132323232	H04	

Remark

1) Number of data specifies the number according to the type of direct variable. Namely, if the data type of direct variable is DOUBLE WORD, and number of data is 5, it means that 5 DOUBLE WORDs should be written.

2) Max. of %MB in number of data can be used up to 128, %MW, 64, and %MD, 32.

Item	Explanation
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.
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	Address to be actually read. This must be ASCII value within 16 characters, and in this name, digits, upper/lower case, '%' and '.' only are allowable to be entered.

Remark

1) Protocol of WSB doesn't have the number of blocks.

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(3) Response Format (ACK response)

Format name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Example)	ACK	H10	W(w)	SB	ETX	BCC
ASCII value	H06	H3130	H57(77)	H5342	H03	

Item	Explanation
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 and added to BCC, and sent.

(4) Response Format(NAK response)

Format name	Header	Station No.	Command	Command type	Error code (Hex 2 Byte)	Tail	Frame check
Frame (Example)	ENQ	H10	W(w)	SB	H1132	EOT	BCC
ASCII value	H05	H3130	H57(77)	H5342	H31313332	H03	

Item	Explanation
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 and added to BCC, and sent.
Error code	Hex and 2 bytes(ASCII code, 4 bytes) indicate error type. For the details, see 8.1.8 Error codes.

(5) Example

   This example supposes that 4 byte HAA15056F is written in %QD0.0.0 of station NO. 1 and BCC value is checked.

   Computer request Format(PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Variable Length	Variable Name	Number of data	Data	Tail	Frame check
Frame (Example)	ENQ	H01	w	SB	H08	%QD0.0.0	H01	HAA15056F	EOT	BCC
ASCII value	H05	H3031	H77	H5342	H3038	H254442302E302E30	H3031	H41413135 0353646	H04	

   For ACK response after execution of command(PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Tail	Frame check
Frame (Example)	ACK	H01	W	SB	ETX	BCC
ASCII value	H06	H3031	H77	H5342	H03	

   For NAK response after execution of command(PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Error code	Tail	Frame check
Frame (Example)	NAK	01	W	SB	Error code (2)	ETX	BCC
ASCII value	H15	H3031	H77	H5342	Error code (4)	H03	

5) Monitor register (X##)

(1) Introduction

Monitor register can separately register up to 10 in combination with actual variable reading command, and carries out the registered one through monitor command after registration.

(2) PC request Format

Format name	Header	Station No.	Command	Registration No.	Registration Format	Tail	Frame check
Frame (Example)	ENQ	H10	X(x)	H09	Refer to registration Format	EOT	BCC
ASCII value	H05	H3130	H58(78)	H3039	[ ]	H04	

Item	Explanation
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, added to BCC.
Register No.	This can be registered up to 10(0 to 9, H00-H09), and if an already registered No. is registered again, the one currently being executed is registered.
Register Format	This is used to before EOT in command of Formats of separate reading of direct variable, continuous reading, and named variable reading.

Register Format: Register Format of request Formats must select and use only one of the followings.

① Individual reading of direct variable

RSS	Number of blocks(2 Byte)	Variable length (2 Byte)	Variable name (16 Byte)	...

1 block(max. 16 blocks)

② Continuous reading of direct variable

RSB	Variable length (2 Byte)	Variable name (16 Byte)	Number of data

(3) Response Format(ACK response)

Format name	Header	Station No.	Command	Registration No.	Tail	Frame check
Frame (Example)	ACK	H10	X(x)	H09	ETX	BCC
ASCII value	H06	H3130	H58(78)	H3039	H03	

Item	Explanation
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 and added to BCC, and sent.

(4) Response Format (NAK response)

Format name	Header	Station No.	Command	Registration No.	Error code (Hex 2Byte)	Tail	Frame check
Frame (Example)	ACK	H10	X(x)	H09	H1132	ETX	BCC
ASCII value	H06	H3130	H58(78)	H3039	H31313332	H03	

Item	Explanation
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 and added to BCC, and sent.
Error code	Hex and 2 bytes(ASCII code, 4 bytes) indicate error type. For the details, see 8.1.8 Error codes.

(5) Example

This example supposes that direct variable %MWO of station NO. 1 is monitor registered.

Computer request Format (PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Registration No.	Registration Format				Tail	Frame check
					R##	Number of blocks	Variable length	Variable name		
Frame (Example)	ENQ	H01	x	H01	RSS	H01	H04	%MW0	EOT	BCC
ASCII value	H05	H3031	H78	H3031	H525353	H3031	H3034	H41534446	H04	

For ACK response after execution of command(PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Registration No.	Tail	Frame check
Frame (Example)	ACK	H01	x	H01	ETX	BCC
ASCII value	H06	H3031	H78	H3031	H03	

For NAK response after execution of command (PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Registration No.	Error code	Tail	Frame check
Frame (Example)	NAK	H01	x	H01	Error code (2)	ETX	BCC
ASCII value	H15	H3031	H78	H3031	Error code (4)	H03	

6) Monitor execution(Y##)

(1) Introduction

This is a function that carries out the writing of the variable registered by monitor register. This also specifies a registered number and carries out writing of the variable registered by the number.

(2) PC request Format

Format name	Header	Station No.	Command	Registration No.	Tail	Frame check
Frame (Example)	ENQ	H10	Y(y)	H09	EOT	BCC
ASCII value	H05	H3130	H59(79)	H3039	H03	

Item	Explanation
Register No.	Register No. uses the same number registered during monitor register for monitor execution. It is possible to set from 00-09(H00-H09).
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, added to BCC.

(3) Response Format(ACK response)

① In case that the register Format of register No. is the Individual reading of direct

Format name	Header	Station No.	Command	Registration No.	Number of Blocks	Number of data	Data	Tail	Frame check
Frame (Example)	ACK	H10	Y(y)	H09	H01	H04	H9183AABB	ETX	BCC
ASCII value	H06	H3130	H59(79)	H3039	H3031	H3034	H3931383341 414242	H03	

② In case that the register Format of register No. is the continuous reading of direct

Format name	Header	Station No.	Command	Registration No.	Number of data	Data	Tail	Frame check
Frame (Example)	ACK	H10	Y(y)	H09	H04	H9183AABB	ETX	BCC
ASCII value	H06	H3130	H59(79)	H3039	H3034	H3931383341414242	H03	

(4) Response Format (NAK response)

Format name	Header	Station No.	Command	Registration No.	Error code (Hex 2Byte)	Tail	Frame check
Frame (Example)	NAK	H10	Y(y)	H09	H1132	ETX	BCC
ASCII value	H15	H3130	H59(79)	H3039	H31313332	H03	

Item	Explanation
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 and added to BCC, and sent.
Error code	Hex and 2 bytes (ASCII code, 4 bytes) indicate error type. For the details, see 8.1.8 Error codes.

(5) Example

This example supposes that registered variable No. 1 of station NO. 1 is read. and BCC value is checked.

And it is supposed that direct variable %MWO is registered and the number of blocks is 1.

① Computer request Format (PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Registration No.	Tail	Frame check
Frame (Example)	ENQ	H01	y	H01	EOT	BCC
ASCII value	H05	H3031	H79	H3031	H04	

② For ACK response after execution of command (PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Registration No.	Number of Blocks	Number of data	Data	Tail	Frame check
Frame (Example)	ACK	H01	y	H01	H01	H04	H23422339	ETX	BCC
ASCII value	H06	H3031	H79	H3031	H3031	H3034	H3233343232 333339	H03	

③ For NAK response after execution of command (PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Registration No.	Error code	Tail	Frame check
Frame (Example)	NAK	H01	y	H01	Error code (2)	ETX	BCC
ASCII value	H15	H3031	H79	H3031	Error code (4)	H03	

7) Reading PLC Status (RST)

(1) Introduction

This is a function that reads flag list including operating status of PLC and error information.

(2) PC request Format

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

Item	Explanation
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.

(3) Response Format (ACK response)

Format name	Header	Station No.	Command	Command type	PLC status data (Hex 20 Byte)	Tail	Frame check
Frame (Example)	ACK	H0A	R(r)	ST	Status data Format	ETX	BCC
ASCII value	H06	H3041	H52(72)	H5354	[ ]	H03	

Item	Explanation
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 and added to BCC, and sent.

Item	Explanation
PLC status data	PLC status data: data Format is 20 bytes in hex Format and converted into ASCII code. Its contents are constituted as below table after converting ASCII code into hex data. Status data Format | Data type	Flag name	Status data order (Hex data)
---	---	---
UINT	PC_DEVICE_IDENTIFIER;	H00(L) ~ H01(H)
Byte	Logical;	H02(Offset)
Byte	Physical;	H03
Byte	_CPU_TYPE;	H04
Byte	_VER_NUM;	H05
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)
WORD	Reserved	H12(L) ~ H13(H)	

Remark

1) For the details of each flag, refer to GM7 User's Manual "Appendix 2, list of flag".

2) PC_DEVICE_IDENTIFIER, Logical, and Physical are dedicated to be used only for system, that it should not be processed.

(4) Response Format (NAK response)

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

Item	Explanation
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 and added to BCC, and sent.
Error code	Hex and 2 bytes(ASCII code, 4 bytes) indicate error type. For the details, see 8.1.8 Error codes.

(5) Example

This example supposes that the status of GM7 Base Unit of station NO. 1 is read.

Computer request Format (PC   GM7 Base Unit)

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

For ACK response after execution of command (PC   GM7 Base Unit)

Format name	Header	Station No.	Command	Command type	Status data	Tail	Frame check
Frame (Example)	ACK	H01	R(r)	ST	See status data Format	ETX	BCC
ASCII value	H06	H3031	H52(72)	H5354		H03	

For NAK response after execution of command (PC   GM7 Base Unit)

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

8.1.7 1:1 Built-in communication between GM7's

1) Introduction

1:1 built-in communication between GM7's is that which constitutes a built-in communication system with the method of 1(master):1(slave). Setting Base parameter and communication parameter in GMWIN can easily constitute this system. Communication protocol currently applied is the same with Cnet I/F used for GLOFA. Main functions are following.

- It can organize input(I), output(Q), and internal memory(M) area into 64 data access blocks by WORD unit, and set a communication time-out limit for each block.
- It can reestablish flag in relation with error codes and slave PLC operating mode according to parameter setting.
- It can reset flag related with error codes and sending/receiving error frequency of each parameter.
- It monitors communication status, using monitoring function of GMWIN.

GM7 base unit   GM7 base unit
(Master: station no. 1)   (Slave: station No. 31)

G7E-DR10A

1:1 built-in communication between GM7's
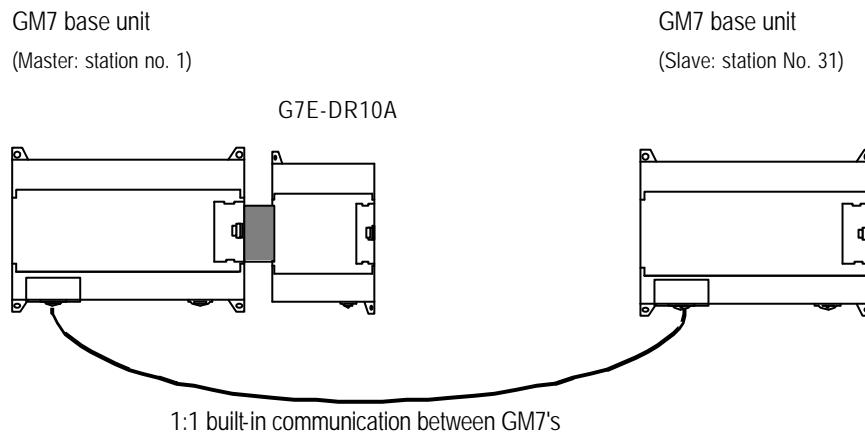
This communication cabling map is the same for (3) 1:1 Connecting between GM7's in 8.1.2 "System configuration method using built-in communication."

2) Parameter setting

(1) Communication Parameter Setting

◆ Open a new project file from GMWIN

-GM7 must be selected as PLC type.

-Open a new project file for each of the master and the slave.

◆ After selecting communication parameter from GMWIN and clicking twice, this window comes up.

◆ Set according to the following table

Item	Contents
Station No.	Sets one of station from 0 to 31.
Baud rate	Sets one of 1200, 2400, 4800, 9600, 19200, 38400, 57600 bps
Data bit	Sets one of 7 or 8 Bits
Parity bit	Sets one of none, Even, Odd
Stop bit	Sets one of 1 or 2 Bit(s)
Communication channel	• RS232C null modem or RS422/485: can be selected as a communication channel when communication is processed by built-in functions of GM7 Base Unit or Cnet I/F module (G7L-CUEC). • RS232C dedicated modem: can be selected when communication is processed by Cnet I/F module (G7L-CUEC). • RS232C dial-up modem: can be selected when common modem communication calling the opponent station is processed by Cnet I/F module (G7L-CUEC). * Notes: RS232C dedicated modem and RS232C dial-up modem communication can be processed only by Cnet I/F module (G7L-CUEC) supporting RS-232C, not Cnet I/F module (G7L-CUEC) supporting RS-422/485.
Timeout in Master Mode	• It's an interval waiting after sending request frame from Master GM7 before receiving a response. • default value is 500ms. • Setting must be done in consideration of maximum interval of sending and receiving cycle of a master PLC. • If the time out is less than the maximum interval of the s/r cycle, error can occur.
Dedicated Master/Slave	Master GM7 can read from and write on Slave GM7.
Read status of slave PLC	can be select especially when you read Slave GM7 for monitoring, but not for the other purposes, lest it may cause decreasing communication speed.

(2) Setting registration list

◆ If you click 'master' from 'exclusive use' in 'protocol and sending mode,' 'registration list' button will be

activated.
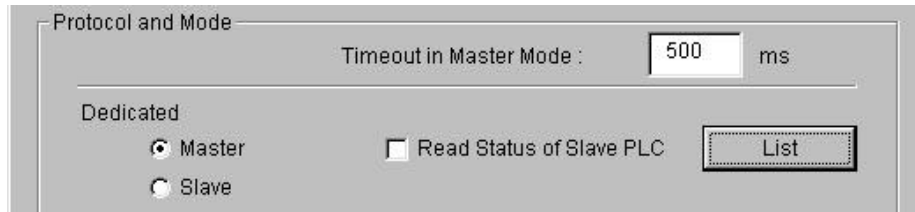
◆ Click the button to open the registration list window.
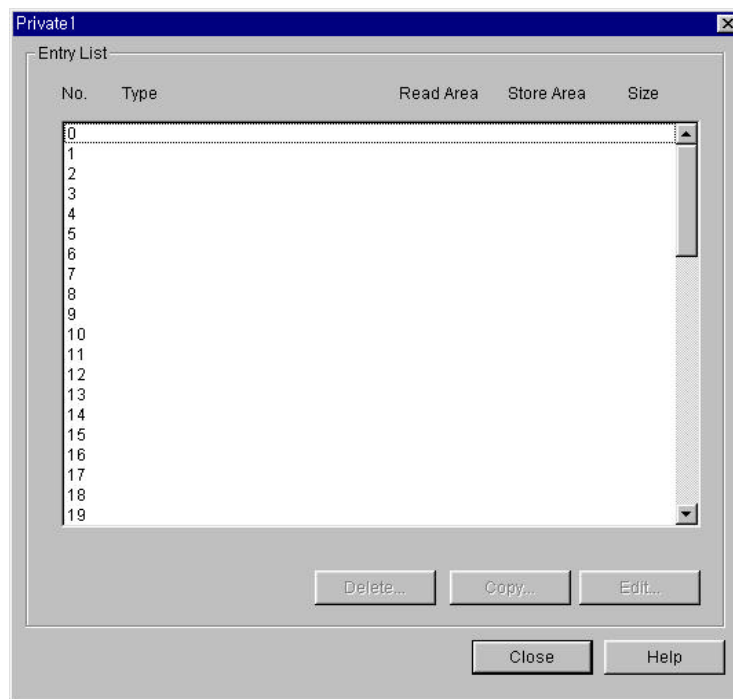
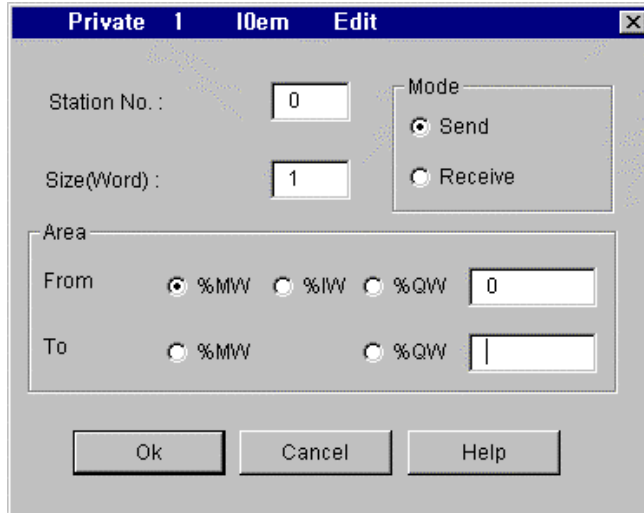(3) Total 64 data blocks can be assigned. But it's not possible to set a register number.

(4) Sending and receiving data size can be set up to 60 WORDs. There's no cycle for sending

and receiving.

◆ Setting area

-Sending: reading area I/Q/M, saving area Q/M

-Receiving: reading area I/Q/M, saving area Q/M

(6) This is a window you can change 'exclusive use 1' setting.

◆ Station number: set the number of the slave or opponent station.

◆ Mode: click 'send' for writing data on the slave station, or 'receive' for reading from it.

◆ Size: data size for reading and writing of the master station can be specified up to 60 WORDs. A WORD is a unit.

◆ Area:

Item	Send mode	Receive mode	Indication
Area(from)	that is in the master station to temporarily save the data to be written.	that is in the slave station for the data to be read.	When selecting %MW0, click '%MW' and enter '0' in the blank next to it.
Area(to)	that is in the slave station to write the data.	that is in the master station to temporarily save the data to be read.	when selecting %QW0.1.0, click '%QW' and enter '0.1.0' in the blank next to it.

3) Setting Communication Enable

To process 1:1 built-in communication between GM7's, after setting communication parameter and constituting program, you must access the master GM7 through GMWIN, click 'connect(C)' of ʻ online (O)' in menu bar, and set 'Communication Enable(L)' of ʻ online (O)' in the same menu bar.

Connect+Write+Run+Monitor On Ctrl+R	Connect+Write+Run+Monitor On Ctrl+R
Connect	Connect
Disconnect	Disconnect
Read...	Read...
Write...	Write...
Monitor ▶	Monitor ▶
Mode Change ▶	Mode Change ▶
Data Clear...	Data Clear...
Reset ▶	Reset ▶
Flash Memory ▶	Flash Memory ▶
Communication Enable(L)...	**Communication Enable(L)...**
PLC Info. ▶	PLC Info. ▶
I/O Info...	I/O Info...
I/O Forcing ▶	I/O Forcing ▶
Link Info...	Link Info...
Comm Info...(Y)	Comm Info...(Y)
Mnet Parameter...	Mnet Parameter...
Mnet Info...	Mnet Info...
I/O Skip(K)...	I/O Skip(K)...
Fault Mask...	Fault Mask...
Initialize Special Modules...	Initialize Special Modules...
Start Online Edit(Q)	Start Online Edit(Q)
Write for Online Edit(V)	Write for Online Edit(V)
Cancel Online Edit(U)	Cancel Online Edit(U)
Data Share(X)...	Data Share(X)...

4) Flag related with operating status

    (1) Sending/receiving error count for each station (total 32 stations)

        ◆ Flag name: _MRS_ERR_CNT [n] (n=0-31)

        ◆ Data type: array byte

        ◆ Contents: each station can renew number of errors. Namely, the number of s/r errors of the station no.

          1 is renewed at _MRS_ERR_CNT [0], and the number of the station no. 31, at _MRS_ERR_CNT [31].

    (2) Sending/receiving error contents of each station (total 32 stations)

        ◆ Flag name: _MRS_ERR [n] (n=0-31)

        ◆ Data type: array byte

        ◆ Contents:

       -Error code 1: error of time overrun responding time for s/r.

       -Error code 2: error of NAK time

    (3) Slave PLC mode and error contents of each station (total 32 stations)

        ◆ Flag name: _SRS_STATE [n] (n=0-31)

        ◆ Data type: array byte

        ◆ Contents:

       -0 bit: error status of the slave PLC (1: error, 0: normal)

       -1-3 bit: reserved

       -4-7 bit: operating mode of the slave PLC

       4 Bits: STOP/ 5 Bits: RUN/ 6 Bits: PAUSE/ 7 Bits: DEBUG

    (4) Status flag of the master PLC

        ◆ Flag name: _MRS_STATE [n] (n=0-31)

        ◆ Data type: array byte

        ◆ Contents:

       -2 Bit: overextending M area when setting communication parameter

    (5) Max/min/current sending/receiving cycle of set parameter

        ◆ Flag name:

       -(Time Type) _MRS_SCAN_MAX

       -(Time Type) _MRS_SCAN_MIN

       -(Time Type) _MRS_SCAN_CUR

        ◆ Contents: the interval between after sending and before receiving

5) Example

GM7 base unit
(Master:
Station No. 1)

G7E-DR10A

GM7 base unit
(Slave:
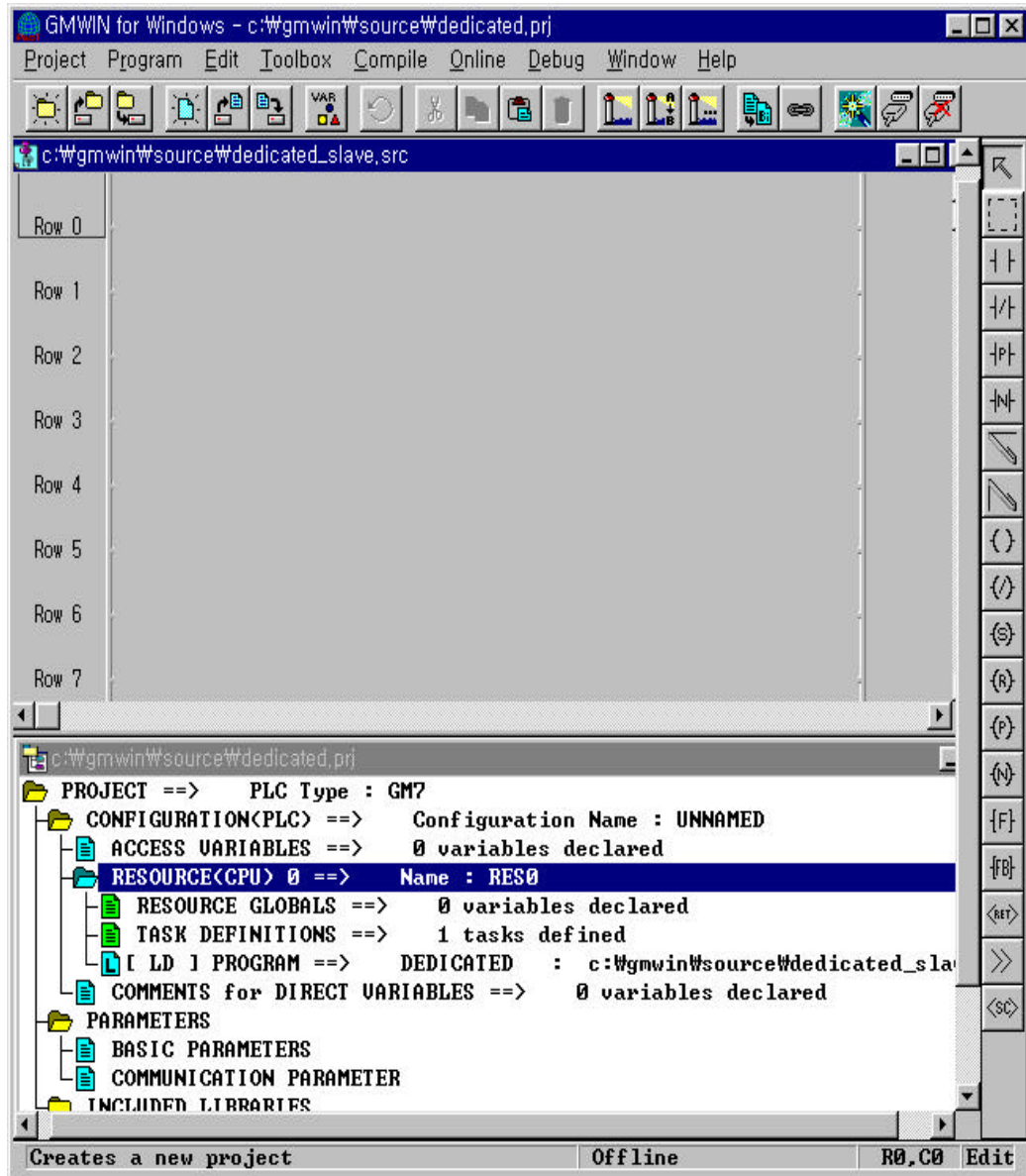Station No. 31)

1:1 built-in communication between GM7's
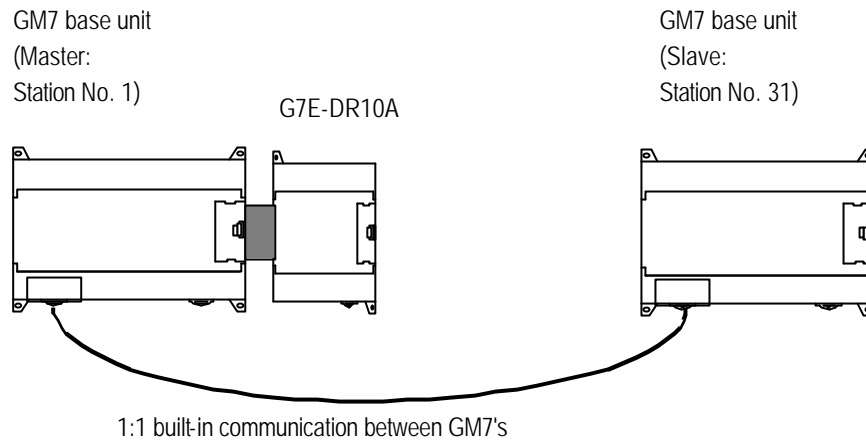
The following example uses the above diagram to explain the operation of GM7 Base Unit.

- The data of the master GM7 Base Unit is converted by ROL F/B and MOV F/B and sent to be written on the output contact point of the slave GM7 Base Unit. And in return, the master GM7 Base Unit reads the data that is written on the output contact point of the slave GM7 to write them on the output contact point of extended digital input/output module, G7E-DR10A.

(1) Setting communication parameter of the slave station and its program

Work on the slave station 31.

Open a new project file and a new program for the slave station.

If you double click the 'communication parameter' window in GMWIN, you can see the following

window of the 'communication parameter.'
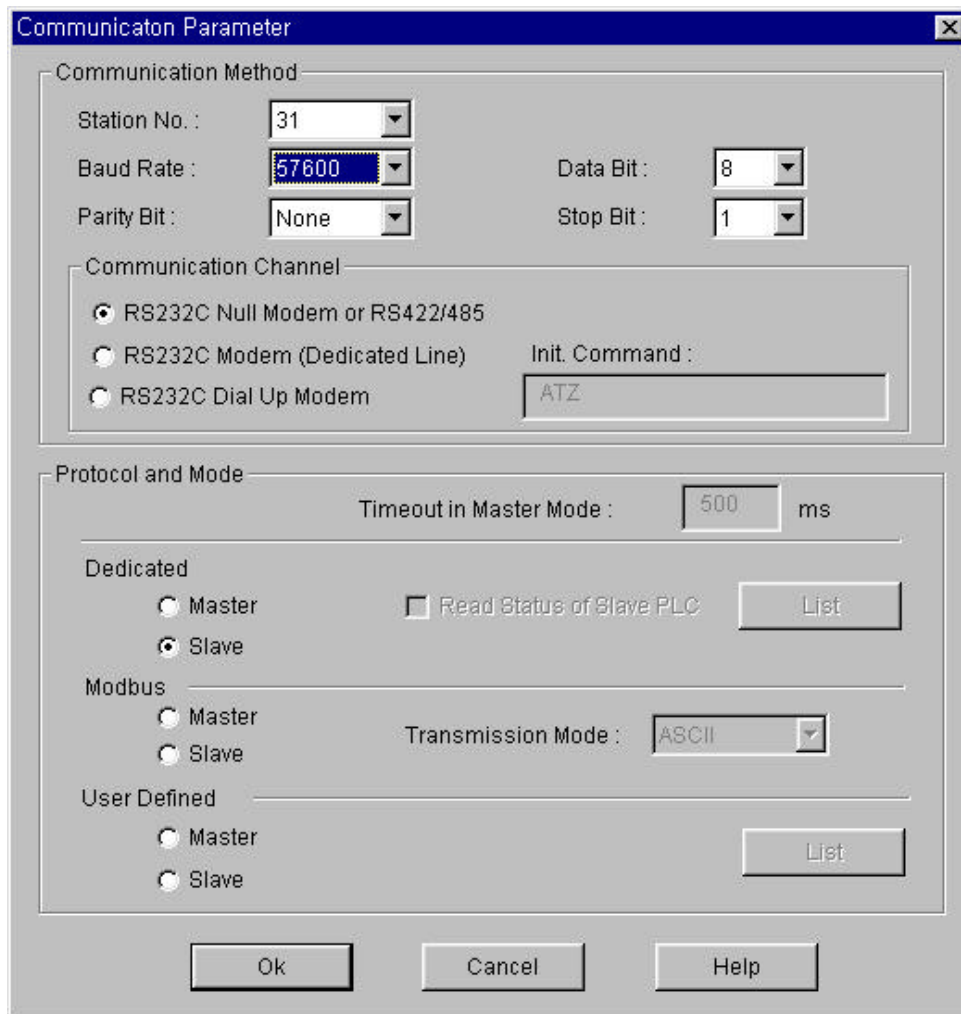
-Set parameters as the following table.

Communication Method						Protocol and mode
Station no.	Baud rate	Data bit	Parity bit	Stop bit	Communication channel	Dedicated
31	57600	8	None	1	RS232C null modem or RS422/485	Slave

Program like the following screen and download to the slave GM7 Base unit. For programming and

downloading, refer to GMWIN User's Manual.
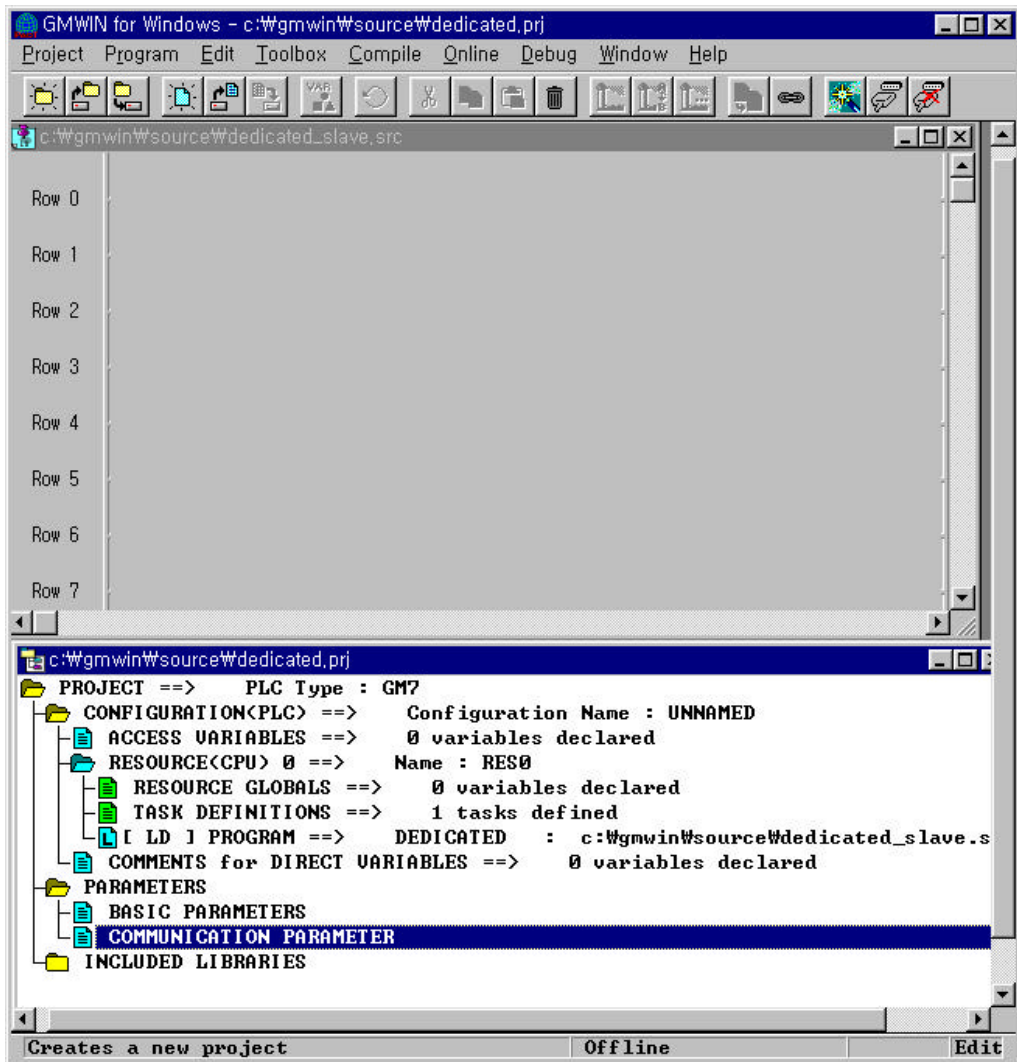
(2) Setting communication parameters for the master station and programming

Work at the master station no. 1

Open a new project file and a new program for the master station.
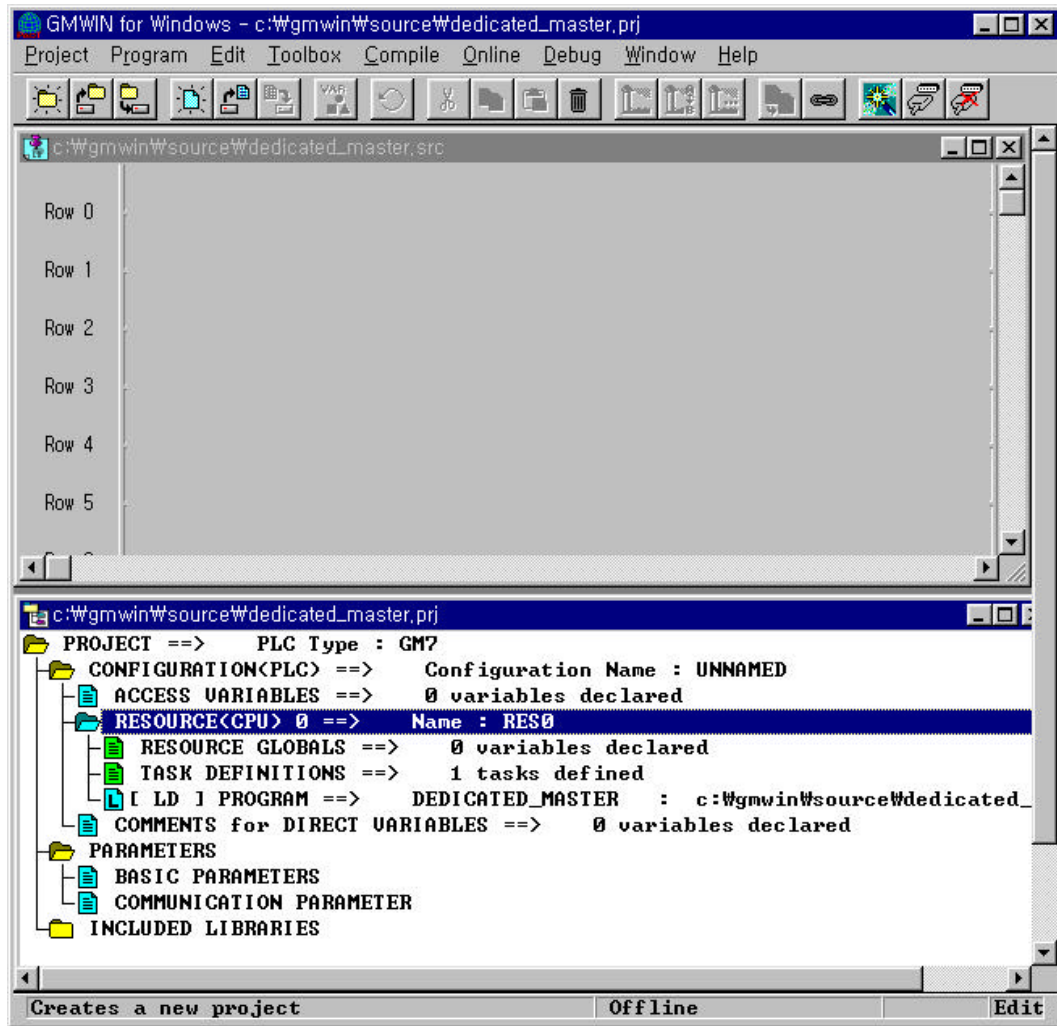
Select a communication parameter from the GMWIN parameter and double-click to open the communication parameter menu window.
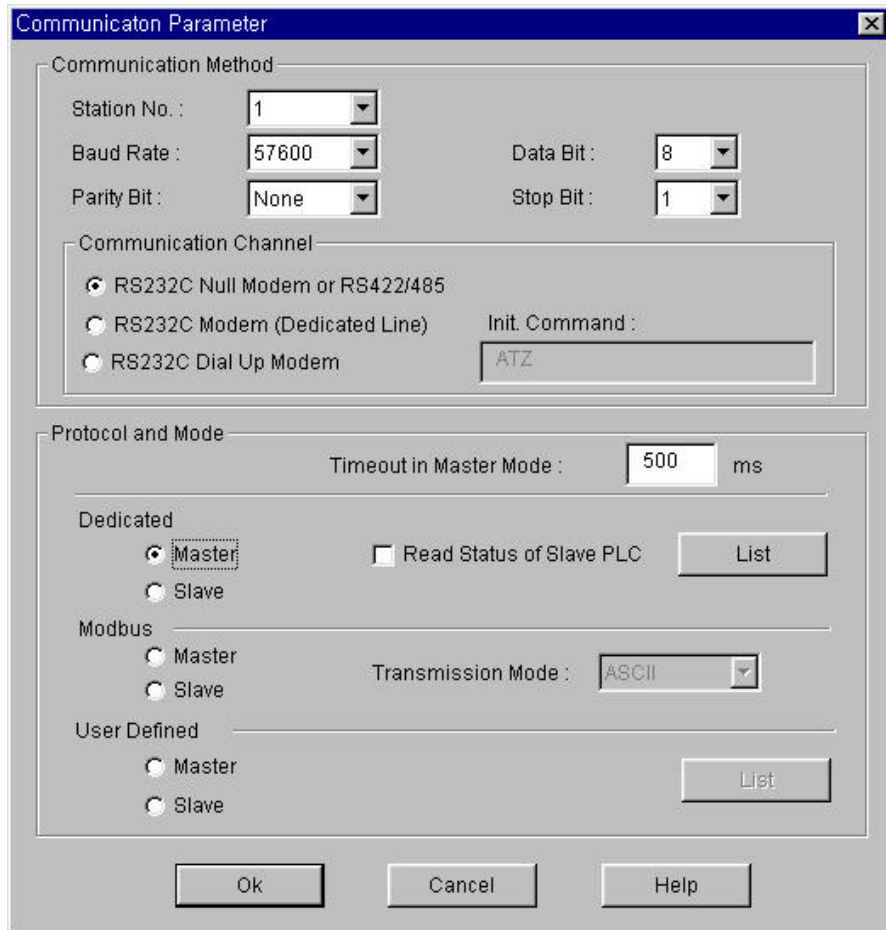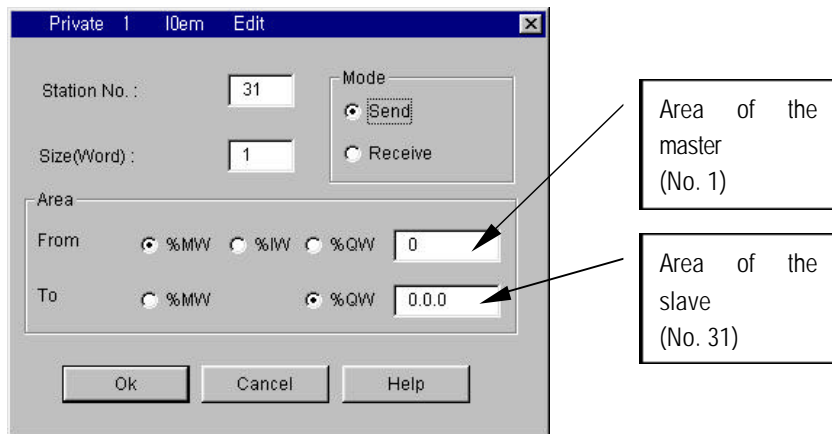

- Set parameters like the following table and click 'OK' button.

Communication method						Protocol and mode	
Station no.	Baud rate	Data bit	Parity bit	Stop bit	Communication channel	Dedicated	Read status of slave
1	57600	8	None	1	RS232C null modem or RS422/485	Master	Not selected

Click ' List' button to activate registration list window.
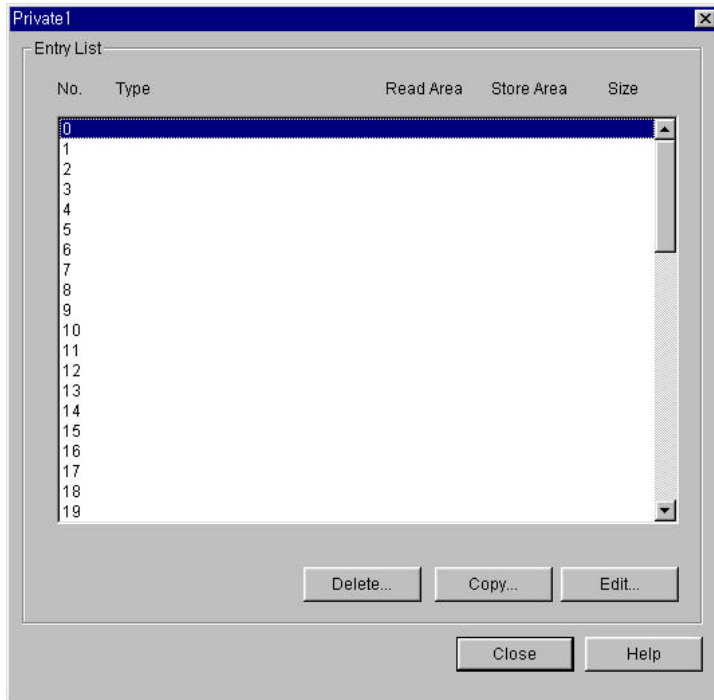
If the list number ' 0' in ' List window is double clicked, another window for ' Private 1 item 0 edit is open.
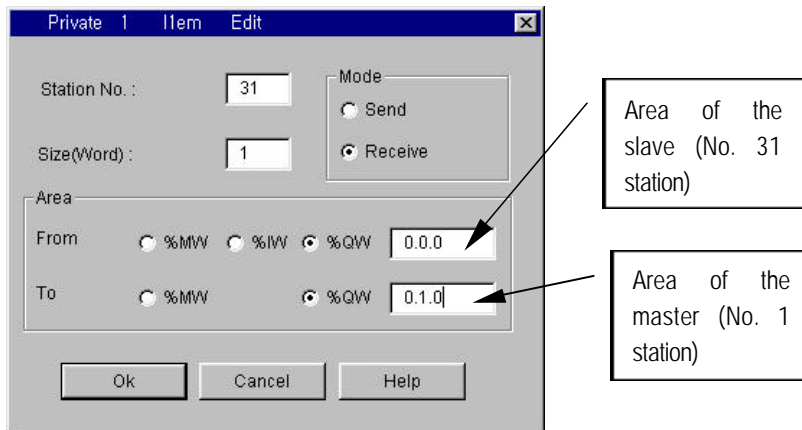

- - Set parameters like the following table and click ' OK' button.

Station No.	Size	Mode	Area to read(From)	Area to save(to)
31	1	Send	%MW0 (See the above)	% QW0.0.0 (See the above)

The registration list '0' registered in the registration list can be confirmed through a window like the following.
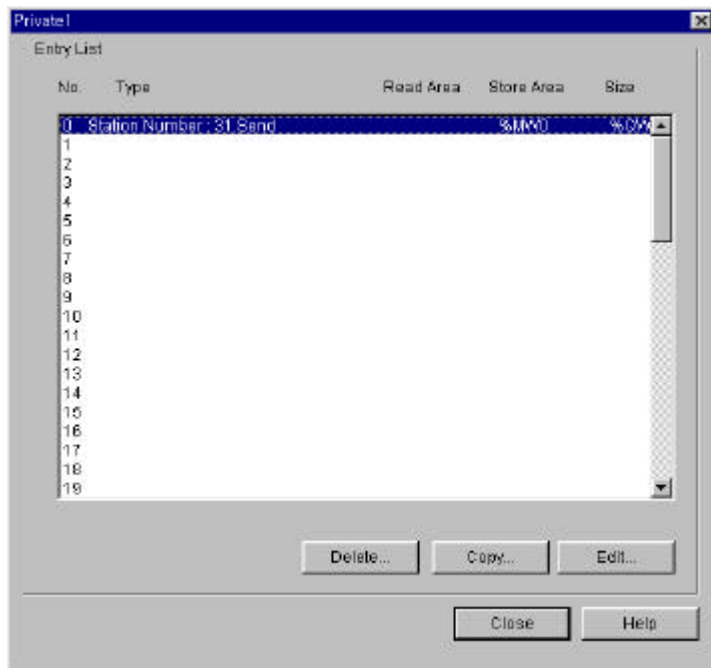

Double click 'entry list 1' to be registered like the following

Area of the slave (No. 31 station)

Area of the master (No. 1 station)

- Set parameters like the following table and click 'OK' button.

Station No.	Size	Mode	Area to read(From)	Area to save(To)
31	1	Receive	%QW0.O.O (See the above)	%QW0.1.0 (See the above)

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Confirm the registration of the ' List 0 and 1 through a window like the following and close this window to go back to communication parameter window.
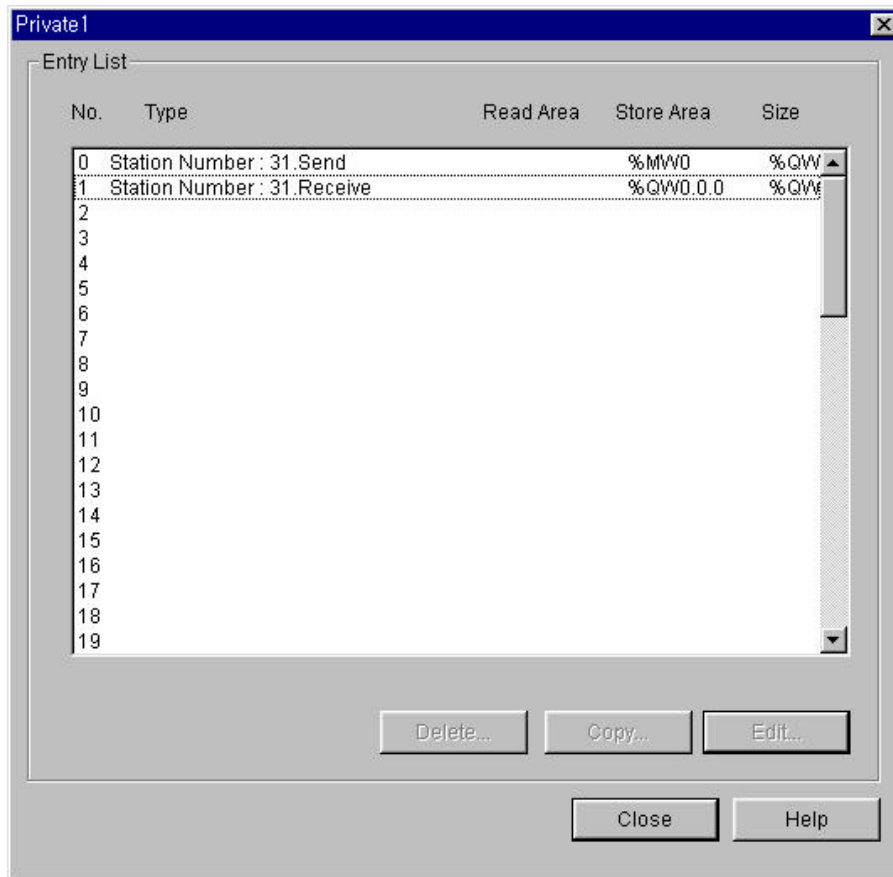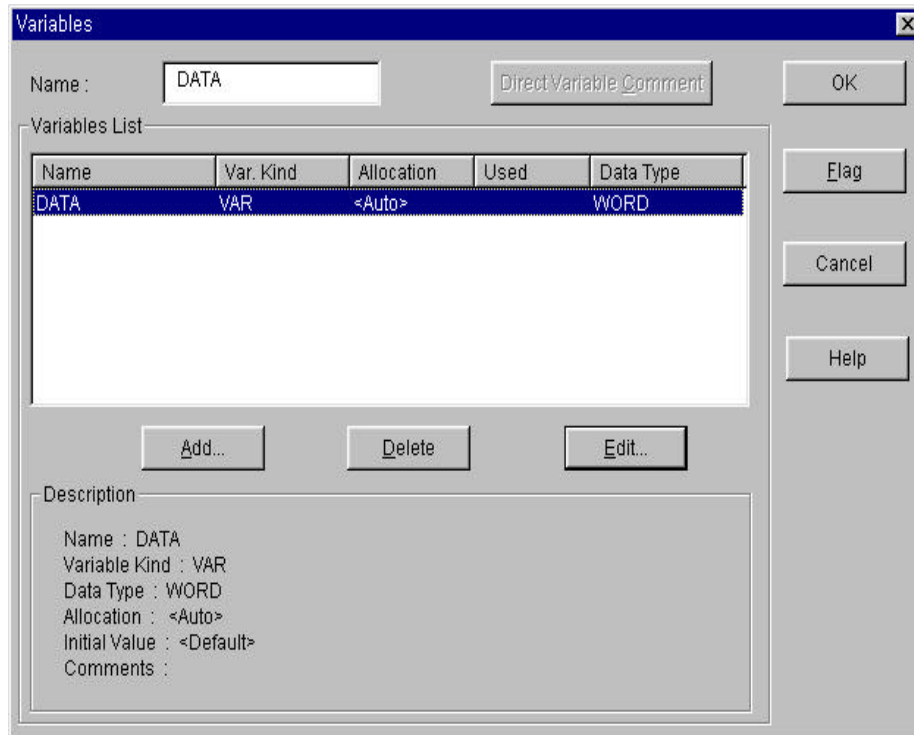

Close setting parameters by clicking ' Close' button in the communication parameter window.

Program like the following screen and download to the slave GM7 Base unit. For programming and downloading, refer to GMWIN User's Manual.
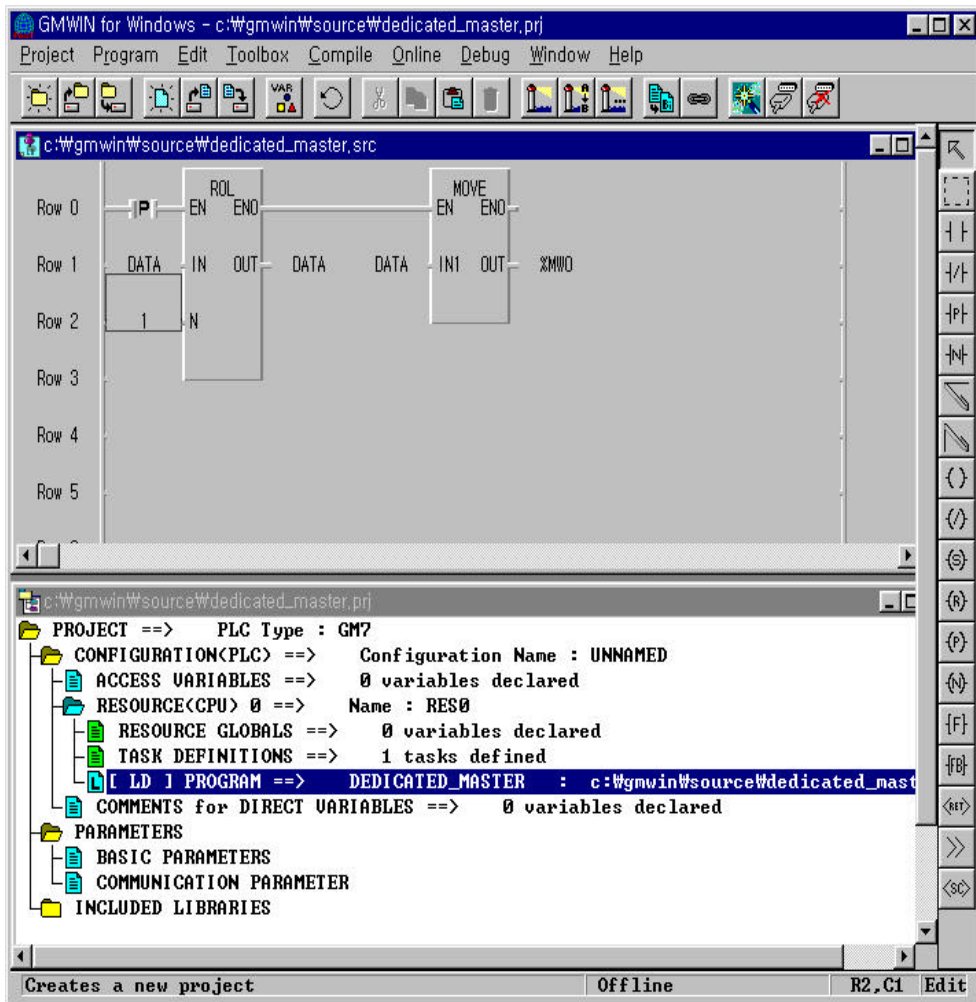
Variable of the program, 'DATA' is WORD type and its first value is H'FF.

Click 'Communication Enable' to start 1:1 built-in communication between GM7 Base Units on line.

Remove RS-232C communication cable for GMWIN and connect GM7 Base Units for 1:1 built-in communication between GM7 Base Units.

8.1.8 Error code

Error code	Error type	Error condition and causes	Treatment
H0001	PLC system error	* Interface with PLC is impossible.	* On/Off the power
H0011	Data error	* Errors occurred when exchanging ASCII data to numbers.	* Check if other letters than capitals/small letters, numbers, and ('%','_','.') in variable and data, correct and execute again.
H0021	Command error	* Set a wrong device memory that is to use commands other than w (W), r(R), x (X), y (Y), s (S)	* Check commands.
H0031	Command type error	* Wrong command type that is to use characters like wSS, wSB using other letters from "SS" or "SB"	* Check command type
H1132	Device memory error	* Set wrong device memory other than m (M), q (Q), I (I) at GM7.	* Check device type
H1232	Data size error	* The number of data in execution is 0 or bigger than 128 bytes.	* Correct length of data (If data type is bite, the number of data must be from 1 ~ 128.
H2432	Data type error	* When use other characters than x (X), b (B), w (W), d (D) at GM7. * When use b (B), d (D) at GM7. Ex1) Use commands like %db or %dd.	* Check data type and execute again.
H7132	Variable request Format error	* When omit %. * When omit '.' in Qx commands.	* Check Format, correct and execute again.

H2232	Area exceeding error	* When exceed assigned area.
		Ex1) %QX0.0.64 → Area exceeding error
		        %MB0.0.8 → Area exceeding error
		Ex2) When an address isn't decimal,
		        like %MX00A, %MB00A.
		Ex3) When set M area size as 2Kbytes in GMWIN, but exceed over 2 Kbytes like %MB400.
			* Correct the size within the assigned area and execute again.

Error code	Error type	Error condition and causes	Treatment
H0190	Monitor execution error	* Exceeding limit of register No.	* Rearrange the monitor register no. not to go over than 9 and reset.
H0290	Monitor register error	* Exceeding limit of register No.	* Rearrange the monitor register no. not to go over than 9 and reset.
H6001	Syntax error	* When use commands that aren't supported. Ex1) When use variables like %MX100, %QX0.0.0 in RSB command	* Be familiar with the manual. * Check if the system stopped. * Off/on the power to restart.
H6010	Syntax error	* OVER-RUN, FRAME error	* Be familiar with the manual.
H6020	Syntax error	* TIME_OUT error	* Confirm the setting of the communication ports of RS-232C. * Off/on the power to restart.
H6030	Syntax error	* Syntax error in commands	* Check if each sends frame has ENQ, EOT.
H6040	Syntax error	When a FRAME text exceeds over 256 bytes.	* Rearrange send frame not to go over 256 bytes.
H6050	Syntax error	* BCC error	* Check if BCC is right.