Chapter 13. Dedicated Cnet communication for GM6

13.1 Introduction

The GM6 CPU module provides some basic Cnet communication functions without Cnet module. Although all functions of Cnet module are not supported, it will be very useful functions for users to perform simple Cnet communication. If your needs are read/write variables (I,Q,M devices) and Monitoring, you don't need to buy Cnet module. It will save your money and slot for Cnet module.

The Cnet functions provided by CPU (A-type) module are as following;

- Individual read instruction
- Continuous read instruction
- Individual write instruction
- Continuous write instruction
- Monitoring variables registration
- Monitoring execution
- 1:1 communication only (dedicated protocol)
- RS-232 communication only

Note Because the dedicated Cnet communication for GM6 does not support all functions of Cnet module, there are some limitations as following comparison with using Cnet module.

1) At the pressing time, the RS-422 protocol is not supported. Only RS-232C protocol is supported. (RS422 protocol will be available with the next version of GM6 CPU.)

2) Only the 1:1 communication is available. The 1:N communication (multi-drop) which have Master & Slave station will be available with the next version of GM6 CPU.

3) Because the GM6 CPUA module has only one serial port supports RS-232C, the general RS-232C cable can not be used. Also the cable for Cnet module can not be used with GM6 CPUA module. See the chapter 13.3 of this manual for the detailed pin assign for GM6 CPUA module.

13.2 The example of system configuration

Generally, the system configuration have two types; the 1:1 communication with PC and the connection with monitoring device (like PMU).

The configuration when connected to PC

: With this configuration, the communication program of PC can be a user's own program (written in C or other programming language) or a commercial software like FAM or CIMON.

GLOFA PLC(GM6)
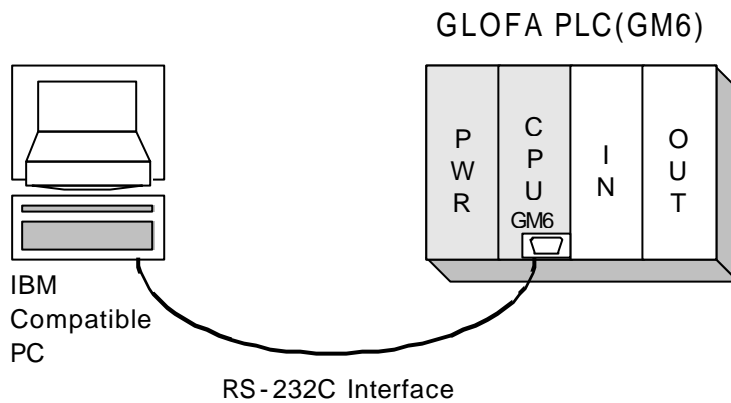
The example of 1:1 connection

(Cnet connection with PC)

The configuration when connected to PMU

GLOFA PLC(GM6)
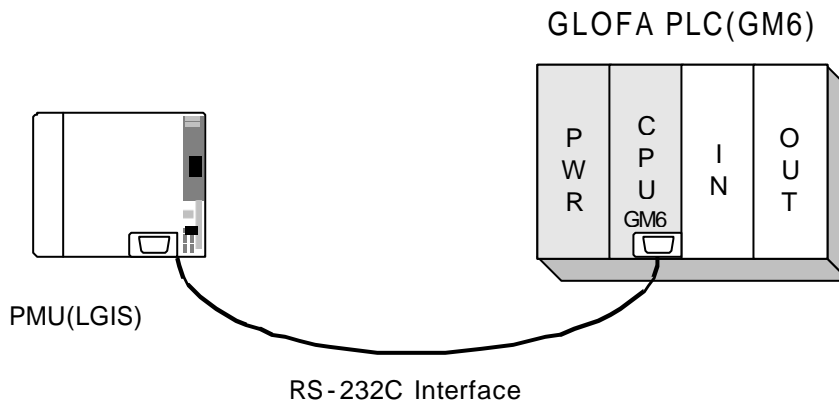
The example of 1:1 connection with LGIS protocol

(Cnet connection with PMU)

13.3 The pin assignment of RS-232C connector of the GM6 dedicated Cnet communication

The 1:1 connection with PC

<The pin assignment of RS232C connector which are used the connection of PC and GM6 CPU>
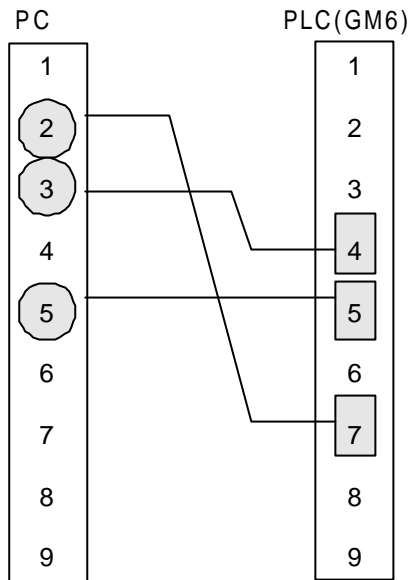
The 1:1 connection with the monitoring unit like PMU

<The pin assignment of RS232C connector which are used the connection of PMU and GM6 CPU>

13.4   Frame structure

1)   Basic structure of frame

(1)   Request frame(external communication devices   Cnet module)

(Max. 256 Bytes)

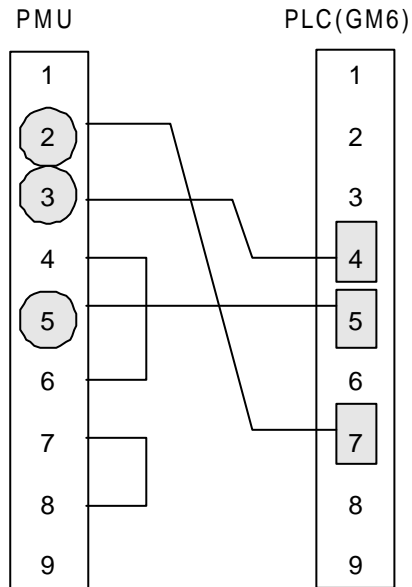| Header (ENQ)	Station No.	Command	Type of command	Structurized data area	Tail (EOT)	Frame check(BCC)

(2)   ACK response frame(Cnet module   external communication devices, when data is normally received)

(Max. 256 Bytes)

Header (ENQ)	Station No.	Command	Type of command	Structurized data area or null	Tail (ETX)	Frame check(BCC)

(3)   NAK response frame(Cnet module   external communication devices, when data is abnormally received)

(Max. 256 Bytes)

Header (NAK)	Station No.	Command	Type of command	Error code (ASCII 4 Bytes)	Tail (ETX)	Frame check(BCC)

Remark

The contents of the code used are as below Table. Control characters are importantly used during serial communication, so they must be well acquainted.

Table 13.1   Control characters

Code	Hex value	Original word	Contents
ENQ(Header)	H05	Enquire	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

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Numerical data of all frames is ASCII code of hex value as long as there is not any definition. The contents that is

indicated into hex-decimals are as follows :

- Station number

- Command type in case that command type is numerical(means data type) when main commands are R(r) and W(w).

- All items indicating data size of data area structurized.

- Command type(register number) for monitor register and execution command M(n).

- All contents of data

- Frame number of domain

Remark

For hex-decimal data, 'H' such as H01, H12345, H34, H12, or H89AB indicates that the data is a type of hex-decimal.

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2) Sequence of command frame

(1) Sequence of command request frame

ENQ	Station No.	Command	Formatted data	EOT	BCC	(PLC ACK response)

ACK	Station No.	Command	Data or null	ETX	BCC

NAK	Station No.	Command	Error code	ETX	BCC

(PLC NAK response)
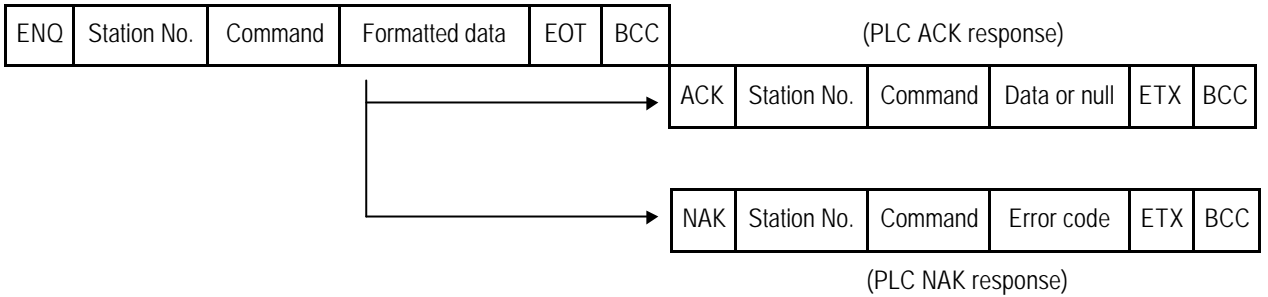
(2) Sequence of Download/upload frame

ENQ	Station No.	Start Command	Data	EOT	BCC

ACK	Station No.	Command	Data or null	ETX	BCC

ENQ	Station No.	Command	Formatted 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	Formatted data	EOT	BCC	(Down/upload end command frame No. HFFFF)

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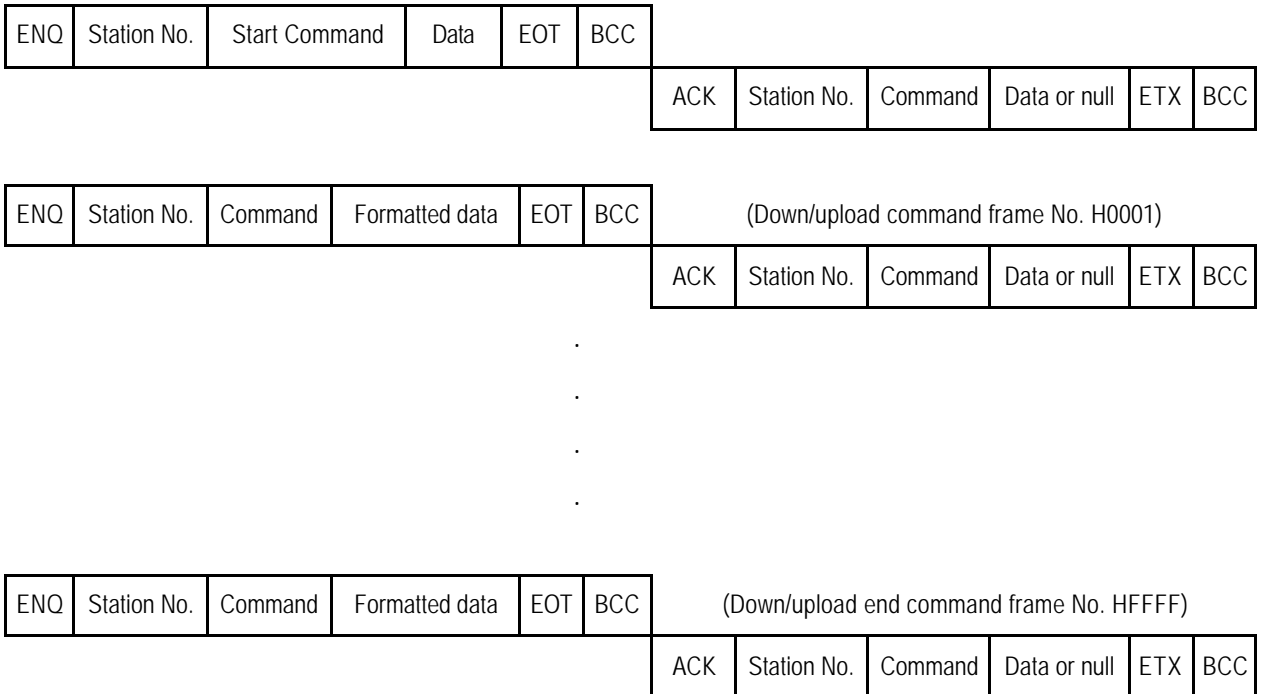
13.5 List of commands

Commands used in dedicated communication service are as below Table :

[Table 13.2 List of commands]

		Command				Contents
		Main command		Command type		
		Sign	ASCII code	Sign	ASCII code	
Direct var. Reading	Indivi.	r (R)	H72 (H52)	SS	5353	Reads direct variables of Bit, Byte, Word, Dword, and Lword type.
	Contin.	r (R)	H72 (H52)	SB	5342	Reads direct variables of Byte, Word, Dword, and Lword type in block unit. (Continuous reading Bit is unavailable)
Named Var. Reading[1]	Indivi.	r (R)	H72 (H52)	H00-H14	3030-3134	Reads data according to data type of named variable. (Variable to be read must be one registered in access variable area.)
	Array	r (R)	H72 (H52)	H15-H27	3135-3237	Reads data of array named variable. (Variable to be read must be one registered in access variable area.)
Direct var. Writing	Indivi.	w(W)	H77 (H57)	SS	5353	Writes data to direct variable of Bit, Byte, Word, Dword, Lword type.
	Contin.	w(W)	H77 (H57)	SB	5342	Writes data to direct variable of Byte, Word, Dword, Lword type in block unit. (Continuous reading Bit is unavailable)
Named Var. Writing[2]	Indivi.	w(W)	H77 (H57)	H00-H14	3030-3134	Writes variable of each data type using variable name. (Variable to be read must be one registered in access variable area.)
	Array	w(W)	H77 (H57)	H15-H27	3135-3237	Writes data to array named variable. (Variable to be read must be one registered in access variable area.)
Monitor Var. Register	x(X)		H78 (H58)	H00-H31	3030-3331	Register variable to be monitored. If registered variable is named one, variable to be read must be one registered in access variable area.
Monitor Execution	y(Y)		H79 (H59)	H00-H31	3030-3331	Carries out the registered variable to monitor.

Remark

In the main command, the capital and small letter have different meaning. In other field, however, it doesn't care letters

are capital or small. For example, %mW100 and %mw100 are exactly same command.

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[1] The CPU-A type does not support this function.

13.6   Data type

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

1)   Data type of direct variables

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

Memory device type of GLOFA GK PLC : P, M, L, K, C, D, T, S, F

Data type for direct variables is indicated next to direct variable indicating character '%'.

Table 13.3   List of data types of direct variables

Data type	Ind. charac..	Example of use
BIT	X(58H)	%MX0, %QX0.0.0, %IX0.0.0, %PX0, %LX0, %FX0
BYTE	B(42H)	%MB10, %QB0.0.0, % IB0.0.0
WORD	W(57H)	%MW10, %QW0.0.0, % IW0.0.0, %PW0, %LW0, %FW0, %DW0
DOUBLE WORD	D(44H)	%MD10, %QD0.0.0, % ID0.0.0

Remark

1) The read/write of named variables will be available with the next version of CPU-A type.

[2] The CPU-A type does not support this function.

13.7 Execution of commands(Ex.)

1) Separately reading(RSS) direct variables

(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 4 at a time.

(2) Request format(PC-->PLC)

Format name	Header	Station No.	Command	Command type	Number of blocks	Variable length	Variable name	....	Tail	Fame check
Frame (Ex.)	ENQ	H20 [1)	R(r)	SS	H01	H06	%MW100		EOT	BCC
ASCII value	H05	H3230	H52 (72)	H5353	H3031	H3036	H254D5731 30 30		H04	

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

- 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 4. 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 variables : 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.

Direct variables available according to PLC type are as follows :

Table 13.4   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	--
GM5	%MX,%QX,%IX	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	--
GM6	%MX,%QX,%IX	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	--

For how to specify the area of each device in GLOFA GM and GK series, see GLOFA PLC technical data.

Remark

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(for PLC of ACK response)

Format name	Header	Stati-on No.	Command	Comma-nd type	Number of blocks	Variable length	Data	....	Tail	Fame check
Frame (Ex.)	ACK	H20	R(r)	SS	H01	H02	HA9F3		ETX	BCC
ASCII value	H06	H3230	H52(72)	H5353	H3031	H3032	H41394633		H04	

1 block(Max. 4 blocks)

- Station number, commands, type of command, and number of blocks are the same as 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 13.5   Number of data according to variables

	Available direct variable	Number of data
BOOL(X)	%MX,%QX,%IX,%(P,M,L,K,F,T,C,D,S)X	1(Only lowest bit of these is available)
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

- In data area, there are the values of hex data converted to ASCII code.

Ex.1

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 first, lowest value is last.

Remark

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

H01.

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(4)   Response format(for 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 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'.

(5)   Example of use

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

(Computer request format)

Format name	Header	Statio n No.	Command	Comma- nd type	Number of blocks	Variabl e length	Variable name	Variable length	Variable name	Tail	BCC
Frame (Ex.)	ENQ	H01	R(r)	SS	H02	H05	%MW20	H08	%QW0.2.1	EOT	BCC
ASCII value	H05	H3031	H52(72)	H5353	H3032	H3035	H254D5 73230	H3038	H255157 302E322 E31	H04	

(For PLC ACK response after execution of command)

Format name	Header	Station No.	Comman d	Comman d type	Number of blocks	Numbe r of data	Data	Number of data	Data	Tail	BCC
Frame (Ex.)	ACK	H01	R(r)	SS	H02	H02	H1234	H02	H5678	ETX	BCC
ASCII value	H06	H3031	H52(72)	H5353	H3032	H3032	H3132 3334	H3032	H3536 3738	H03	

(For PLC NAK response after execution of command)

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

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.

(2) Request format

Format name	Header	Station No.	Command	Command type	Variable length	Variable name	Number of data (Max.120 Bytes)	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

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 read 5 DOUBLE WORDs.

- 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, 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 variables :   Address to be actually read is entered in this. This must be ASCII value within 16 characters, and in this name, digits, upper/lower case, '%' and '.' only are allowable to be entered. Continuous reading of direct variables available according to PLC type are as follows :

Table 13.6   Readable continuous variable area

	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	%ML,%QL,%IL
GM4	--	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL
GM5	--	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL
GM6	--	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL

(3) For PLC ACK response after execution of command

Format name	Header	Station No.	Command	Command type	Number of data	Data	Tail	Frame check
Frame (Ex.)	ACK	H10	R(r)	SB	H14	H1122334455667788 99AABBCCDDEEFF1122334455	EOT	BCC
ASCII value	H06	H3130	H52(72)	H5342	H3134	H3131323233333434353536 3637373838393941414242434 444454546463131323233333434 343535	H03	

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

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

   When main command is upper case(like 'r'), BCC is not used.

- 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,L) included in direct variable name of computer request format.

Table 13.7 Available direct variables

	Available direct variable	Number of data
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

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

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- In data area, the value converted from hex data to ASCII code is entered.

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 is to be entered in data area.

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(4) Response format(for PLC NAK response)

Format name	Header	Station No.	Command	Command type	Error code (Hex 2 Bytes)	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 computer request format.
- *BCC : When main command is lower case(like 'r'), only one lower byte of the value resulted by adding ASCII values from NAK to ETX is converted into ASCII, added to BCC, and sent.*
  When main command is upper case(like 'r'), BCC is not used.
- 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

This example supposes when 2 DOUBLE WORDs from %MD0 of station No.10 are read. Also it is supposed

that the following data are entered 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	BCC
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	BCC
Frame (Ex.)	ACK	H0A	R(r)	SB	H01	H08	12345678 9ABCDEF0	ETX	BCC
ASCII value	H06	H3041	H52(72)	H5342	H3031	H3038	H3132333435363738 39 41424344454630	03	

(For PLC NAK response after execution of command)

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

3) Separate writing of direct variable (WSS)

(1) Introduction

This is a function that directly specifies PLC device memory and writes in accord with data type. Device memory can be separately written up to 4 memories at a time.

(2) Request format

Format name	Headr	Statin 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		EOT	BCC
ASCII value	H05	H3230	H57 (77)	H5354	H3031	H3036	H254D57 313030	H3030 4532		H04	

1 blocks(can be repeatedly set 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, added to BCC, and sent.

- Number of blocks : This specifies how much of the blocks composed of '[Variable length][Variable name]' are in this request format. This can 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 the name's characters that registered in direct 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).

- Direct variable : This is an address of variable 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.

- 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.

The following shows direct variables available according to PLC type.

Type	BOOL	Byte	WORD	DOUBLE WORD
GM1/2	%MX,%QX,%IX	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID
GM3/4/5	%MX,%QX,%IX	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID
GM4	%MX,%QX,%IX	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID
GM5	%MX,%QX,%IX	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID
GM6	%MX,%QX,%IX	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID

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 must be last.

Remark

1) Device data types of each blocks must be same.

2) If data type is BOOL, the data to be written is indicated by 1 Byte of hex. Namely, if Bit value is 0, it must be

   indicated by H00(3030), and if 1, by H01(3031).

(3)   Response format(for 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 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.

(4)   Response format(for NAK response)

Format name	Header	Station No.	Command	Command type	Error code (Hex 2 Bytes)	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 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'.

(5)   Example of use

This supposes that "H00FF" is written in %MW230 address.

(Computer request format)

Format name	Head-er	Station No.	Command	Command type	Number of blocks	Variable name length	Variable name	Data	Tail	BCC
Frame (Ex.)	ENQ	H01	W(w)	SS	H01	H06	%MW230	H00FF	EOT	BCC
ASCII value	H05	H3031	H57(77)	H5353	H3031	H3036	H254D57323330	H3030464 6	H04	

(For PLC ACK response after execution of command)

Format name	Header	Station No.	Command	Command type			Tail	BCC
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	BCC
Frame (Ex.)	NAK	H01	W(w)	SS	Error code(2)	ETX	BCC
ASCII value	H15	H3031	H57(77)	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

Form-at name	Head-er	Stat-ion No.	Comm-and	Comm-and type	Variable length	Variable name	Number of data (Max.120 Bytes)	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	H254D44 313030	H3031	H3131313 132323232	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 write 5 DOUBLE WORDs.

- 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, added to BCC.
- Protocol of continuous writing function of direct variable has not [Number of blocks].
- 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 variables : Address to be actually read is entered in this. This must be ASCII value within 16 characters, and in this name, digits, upper/lower case, '%' and '.' only are allowable to be entered. Direct variables available according to PLC type are as follows :

	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	%ML,%QL,%IL
GM4	--	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL
GM5	--	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL
GM6	--	%MB,%QB,%IB	%MW,%QW,%IW	%MD,%QD,%ID	%ML,%QL,%IL

(3) 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, command and command type are the same as 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.

(4) Response format(for PLC NAK response)

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

- Station number, command and command type are the same as 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.
- 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

This supposes that HAA15056F is written in %QD0.0.0 of No.1 address.

(Computer request format)

Format name	Head-er	Station No.	Comm-and	Command type	Variable length	Variable name	Number of data	Data	Tail	Frame check
Frame (Ex.)	ENQ	H01	W(w)	SB	H08	%QD0.0.0	H01	HAA150 56F	EOT	BCC
ASCII value	H05	H3031	H57(77)	H5342	H3038	H254442302 E302E30	H3031	H414131 3503536 46	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	

5)   Monitor register(X##)

(1)   Introduction

Monitor register can separately register up to 32 in combination with actual variable reading command, and carries out the registered one through monitor command after registration.

(2)   Request format

Format name	Header	Station No.	Command	Register No.	Register format	Tail	Frame check
Frame (Ex.)	ENQ	H10	X(x)	H1F	See register 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, added to BCC, and sent.
- Register No. : This can be registered up to 32(0-31, H00-H1F), and if an already registered No. is registered again, the one of current execution 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.

Separate reading of direct variable

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

1 block(Max. 4 blocks)

Continuous reading of direct variable

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

1 block(Max. 4 blocks)

(3)   Response format(for PLC ACK response)

Format name	Header	Station No.	Command	Register No.	Tail	Frame check
Frame(Ex.)	ACK	H10	X(x)	H1F	ETX	BCC
ASCII value	H06	H3130	H58(78)	H3146	H03	

- Station number, command and resister No. are the same as 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	Register No.	Error code(Hex 2 Bytes)	Tail	Frame check
Frame (Ex.)	ACK	H10	X(x)	H1F	H1132	ETX	BCC
ASCII value	H06	H3130	H58(78)	H3146	H31313332	H03	

- Station number, main commands, and resister No. are the same as 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 'A2. Error Code Table'.

(5)   Example of use

This supposes that the variable which data type of station No.'1' is UINT and the variable name is "ASDF" is monitor-registered with No.'1'.

(Computer request format)

Format name	Header	Station No.	Command	Register No.	Register 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	Register 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 (Hex 2 Bytes)	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	

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 registered No. and carries out the writing of the variable registered in the No.

(2)   Request format

Format name	Header	Station No.	Command	Register No.	Tail	Frame check
Frame(Ex.)	ENQ	H10	Y(y)	H1F	EOT	BCC
ASCII value	H05	H3130	H59(79)	H3146	H03	

- Register No. uses the same No. as the No. registered during monitor register for monitor execution.
- BCC : When main 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, and sent.
- In computer request format, register No. can be set to 00-31(H00-H1F).

(3)   Response format(for PLC ACK response)

① In case that the register format of register No. is the separate reading of direct variable

Format name	Header	Station No.	Command	Register 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	

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

Format name	Header	Station No.	Command	Register 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	

③ In case that the register format of register No. is the reading of named variable

Format name	Header	Station No.	Command	Register 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 number of blocks and number of data is the same as the contents of variable writing.

- Station number, commands, and register No. are the same as computer request format.

- BCC : When main 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.

(4)   Response format(for PLC NAK response)

Format name	Header	Station No.	Command	Register No.	Error code (Hex 2 Bytes)	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 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

    'A2. Error Code Table'.

(5)　Example of use

This supposes that reading the variable registered with register No.' 1' in station No.' 1' is carried out. It is also supposed that the one registered is a named variable reading, the number of blocks is 1, and the data type is DINT.

(Computer request format)

Format name	Header	Station No.	Command	Register 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	Register 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	H3233343232 333339	H03	

(For PLC NAK response after execution of command)

Format name	Header	Station No.	Command	Register 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	

13.8 Error code during NAK occurrence(for GM6 dedicated communication)

Error code	Error type	Contents	Action to take
H0001	PLC system error	Interface with PLC impossible	Power On/Off
H0011	Data error	* Error occurred when ASCII data value is converted into digits	Check whether another character than upper and lower cases('%','−','.'), and digits has been used, correct, and execute again.
H0021	Instruction error	* Using wrong instruction	Inspect instruction
H0031	Instruction type error	* Instruction is used in wrong type	Inspect instruction type
H1132	Device memory error	* Wrong specified device memory	Inspect device type
H1232	Data size error	* Execution data number ex-ceeding 120 Bytes	Correct data length
H2432	Data type error	* Data type mismatch with actual variable	Equalize variable and data type of PLC program
H7132	Variable request format error	*'%' is missing	Inspect format, correct, and then execute again.
H2232	Area exceeding error	* M,I,Q area exceeding error	Inspect area difinition and execute again
H0190	Monitor execution error	Registered number exceeding range	Execute again after adjusting monitor registration number to 31 or less.
H0290	Monitor registration error	Registered number exceeding range	Execute again after adjusting monitor registration number to 31 or less.
H6001	Syntax error_6001	Not available instruction is used	
H6010	Syntax error_6010	Over-run, Frame error	Check the system is in stop mode
H6020	Syntax error_6020	Time out error	Check the connection of RS-232C port
H6030	Syntax error_6030	Instructino syntax error	Check each frame has ENQ, EOT
H6040	Syntax error_6040	Text of one frame exceed 256byte	Devide the text into several frames as a text does not exceed 256 byte
H6050	Syntax error_6050	BCC error	Check the BCC is correct