Appendix 1. System Definitions
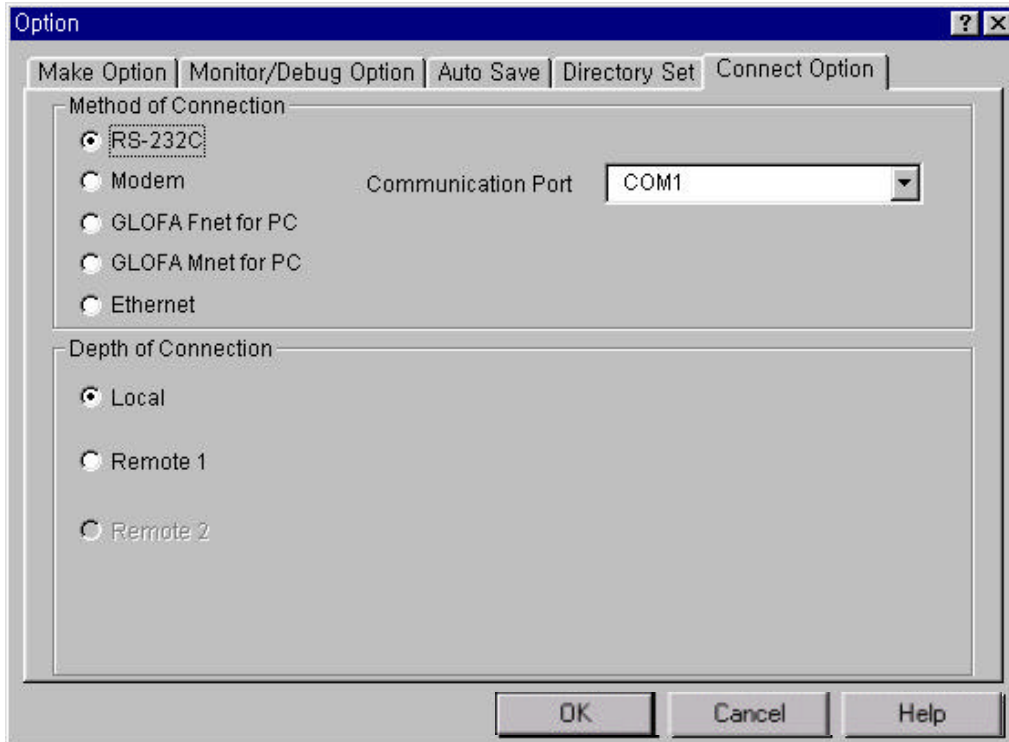
1) Option

    (1)   Connect Option

         You should set the communication port (COM1   4) to communicate with PLC.

            Select the *Project-Option-Connect Option* in menu.

            Default Connection is RS-232C interface.

         For the detail information about **Connect Option**, refer to GMWIN Manual.

(2)   Set the Directory of GMWIN

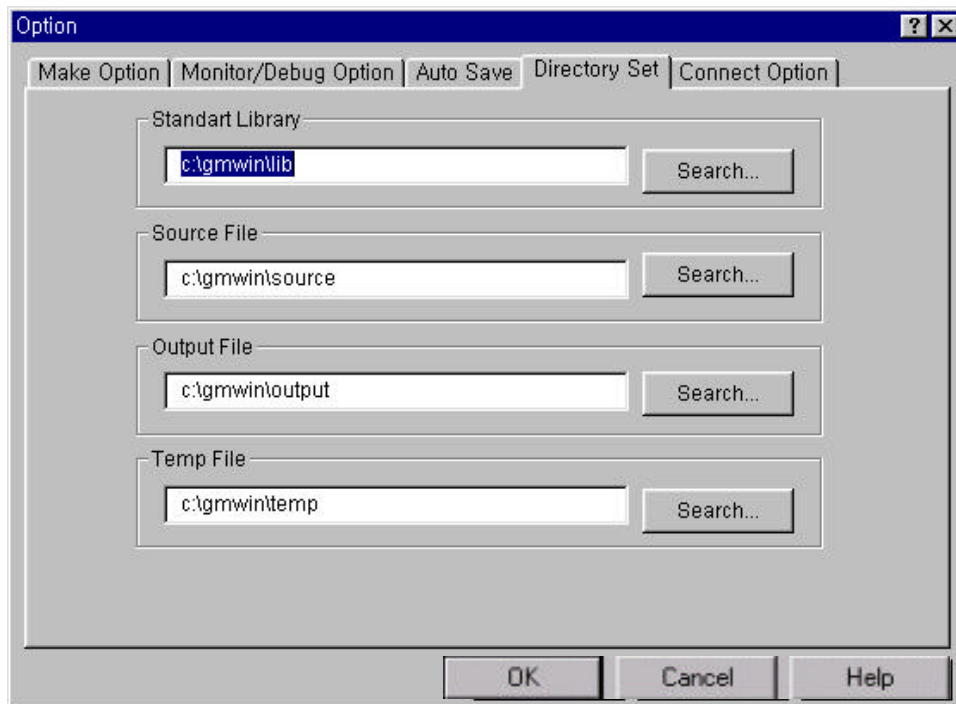You can set directories for the files to be created in GMWIN.

Standard Library Directory : Libraries for GMWIN are located in this directory, and User Defined Libraries also do.

Source File Directory : In Source File Directory, GMWIN saves source program files of program, function, function block and etc.

Output File Directory : Object files are saved in this directory, which are created when source file is compiled.

Temporary File Directory : GMWIN saves temporary file in this directory during the execution. For detailed descriptions refers to GMWIN manual.

For the detail information about **Directory Option**, refer to GMWIN Manual.
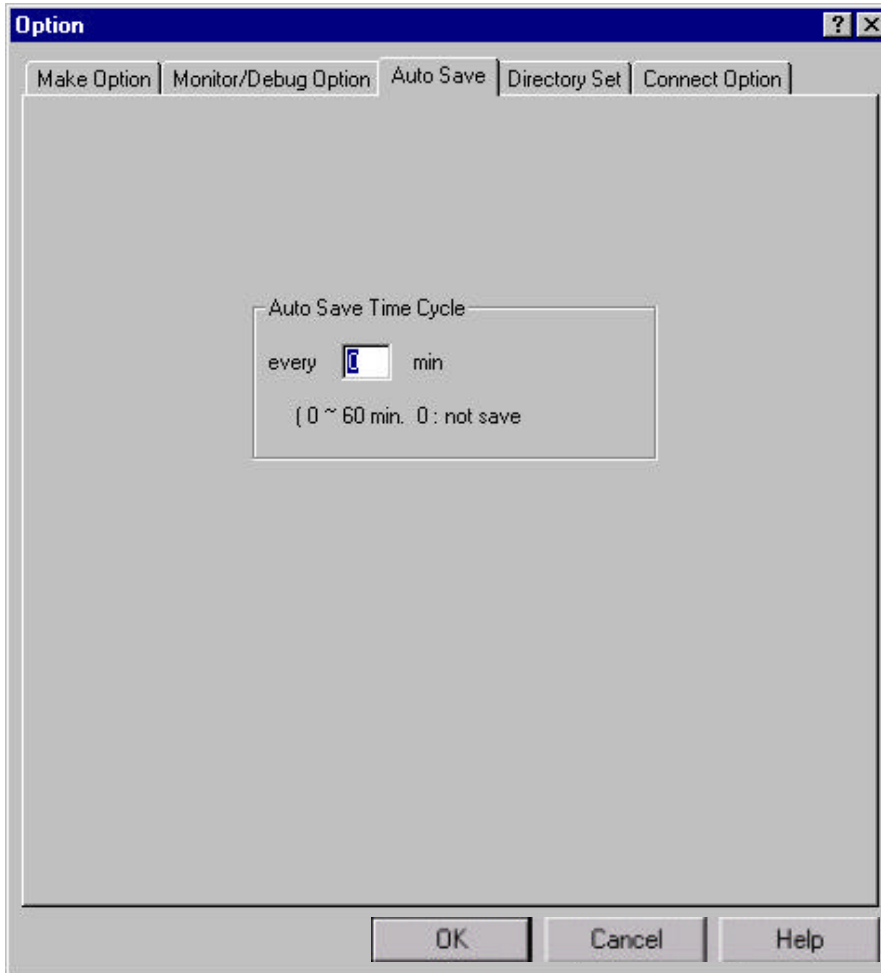
(3) Auto Save

This function is to set the time interval for Auto saving.

Automatically saved file is saved with ".ASV" file in the current directory. The file is automatically deleted when the program window is closed. Therefore if a program cannot be saved by "Program Error" before program is not saved, you can recover some program by loading auto saved file.

Select the *Project-Option-Auto Save* in menu.

Enter the time interval for auto saving.(1 to 60 minutes is available, and if you enter ' 0' , auto save function is disabled.)

Click *OK* button.

```
Option                                              [?] [X]

 Make Option | Monitor/Debug Option | Auto Save | Directory Set | Connect Option |


            ┌─Auto Save Time Cycle────────────────┐
            │                                      │
            │   every   [0]   min                  │
            │                                      │
            │     ( 0 ~ 60 min.  0 : not save      │
            └──────────────────────────────────────┘




                          [   OK   ]   [ Cancel ]   [  Help  ]
```
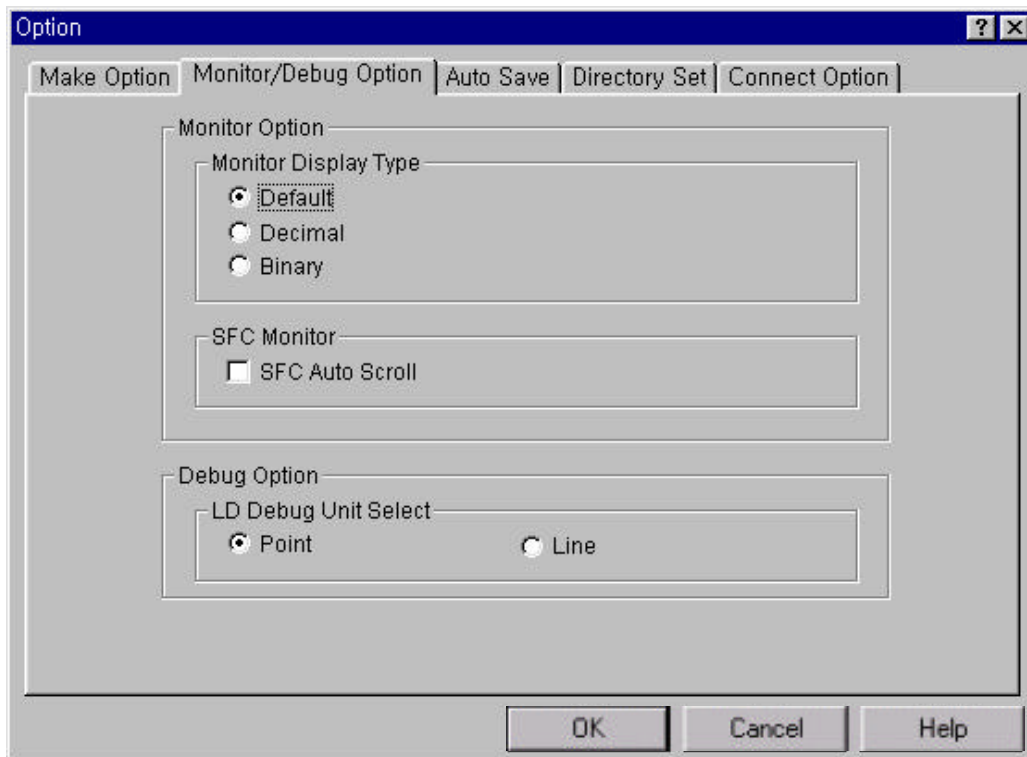
(4)   Monitor/Debug option

To set the whole options for monitoring,

Select the ***Project-Option-Monitor/Debug Option*** in menu.
In monitoring mode, it allows you to change the display type of monitoring variable.
Select the ***Project-Option-Monitor/Debug Option*** in menu.
Select the desired display type in the ***Monitor Display Type***, click ***OK*** button.

Example) If you select the ***Default*** in ***Monitor Display Type***,
The value of variable monitoring is displayed as hexadecimal type like "16#*".

SFC Auto Scroll Option

If you check the ***SFC Auto Scroll***, it scrolls automatically with monitoring position.

Debug Option

When you debug LD, you can select the ***Point*** or ***Line*** in ***Debug Option*** menu.
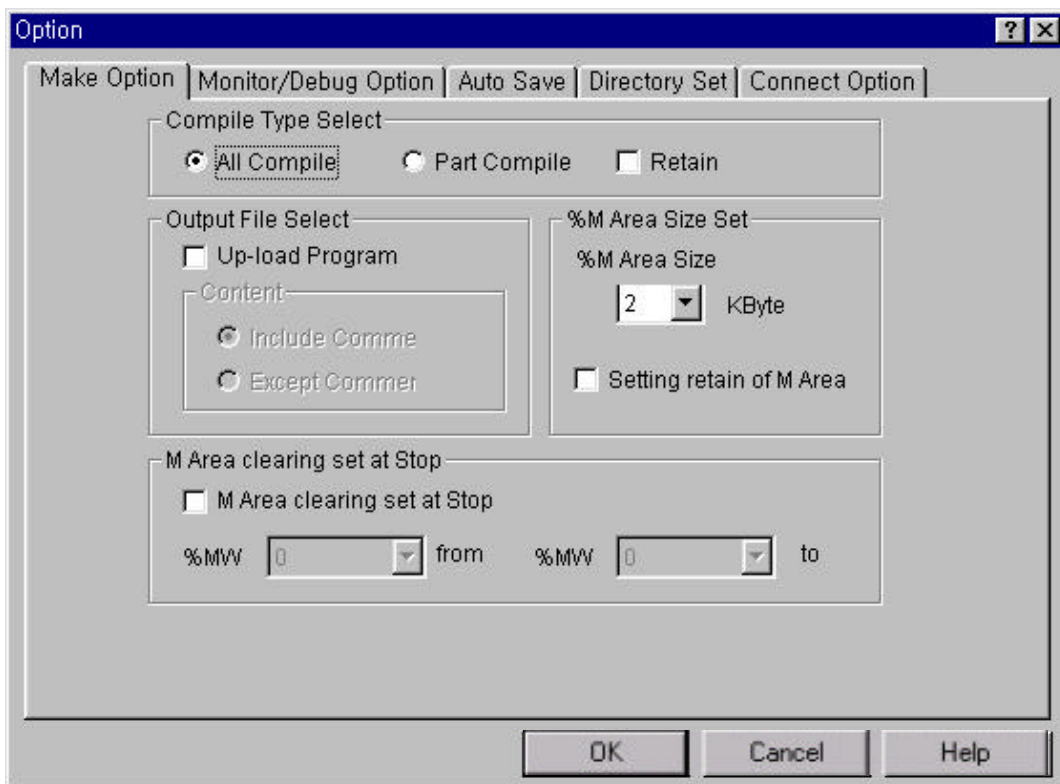If you select ***Point*** option, the debugging for the program is executed by one point.
If you select ***Line*** option, the debugging for the program is executed by one line.

(5)   Make option

It allows you to select compile type, to select output file and to set the size of %M area in *Make* option.

Select the *Project-Option-Make Option* in menu.

*Compile Type Select* allows you to set the method of compile for the source program.

If you select the *Compile All* in the *Compile Type Select*, GMWIN compiles again from the first line regardless editing a source program.

If you select the *Part Compile* in the *Compile Type Select*, GMWIN compiles the updated part.

You can select making variable table or upload program for the output file in *Output File Select* .

You can select the size of %M in *the %M Area   Size Set*.

2) Basic Parameters
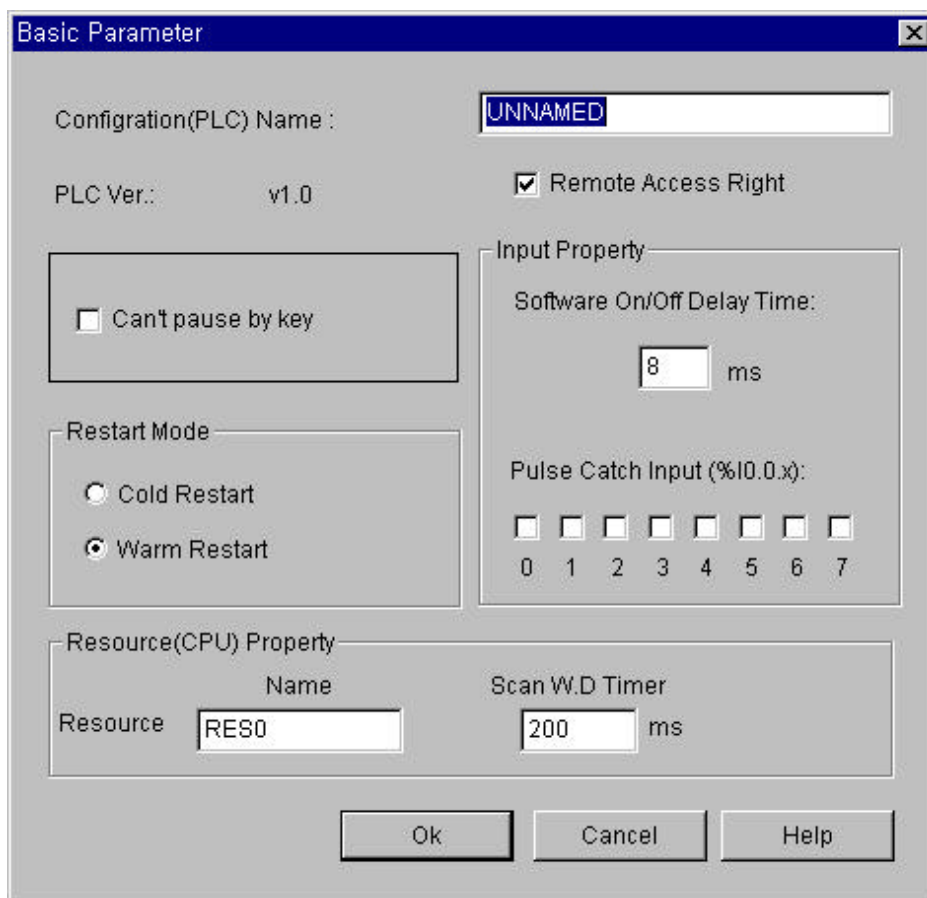
The basic parameters are necessary for operation of the PLC and used to allocate memory, set the restart mode and set the scan watch dog time, etc.

(1) Configuration (PLC) Name
   - It is a representative name for the PLC system. It is used to designate this PLC system when a network system is configured using communication modules.

(2) Enabling/Disabling the control of the PLC via communications
   - This parameter is used to enable or disable the remote control of this PLC system through the FAM or computer link module, etc. except for the GMWIN. If this parameter has been set to enable, change of the operation mode and download of programs are available via communications.

(3) Restart Mode
   - This parameter is used to set the restart mode in the PLC system.
     When the system re-starts, one of the 'cold restart' or 'warm restart' is selected in compliance with the parameter setting.

(4) Resource (CPU) Name
   - Resource Name is the name that each CPU module configuring the PLC has. When configuring a network system the name is used to designate each CPU module that is used the system.
   - Only one CPU module can be mounted in the GM7 series, therefore, only the resource 0 is valid.

(5) Scan Watch Dog Time
- This parameter is used to set the maximum allowable execution time of a user program in order to supervis or its normal or abnormal operation.
- Only one CPU module can be mounted in the GM7 series, therefore, scan watch dog is valid to only the r esource 0.

(6) Input Property
- It's used to select contact point that will be used for setting input filter or as input pulse catch.

3) Communication parameter

This is a communication parameter to set regular sending/receiving stations, data and cycles to send and receive r epeatedly.

(For the detail information about Communication parameter, refer to 7.1.7 "Communication parameter setting")

(1) Station number(Station No.): 0 to 31

(2) Communication speed(Baud Rate): 1200,2400,4800,9600,19200,38400,57600bps.

(3) Data bit: 7 or 8 bits

(4) Parity bit: None, Even, odd

(5) Stop bit: 1 or 2 bit(s)

(6)   Communication Channel
- RS232C null modem or RS422/485: Select this channel to communicate through GM7 base unit or Cnet I/F module (G7L-CUEC).
- RS232C modem(Dedicated Line): Select this channel to communicate through Cnet I/F module (G7L-CUEB).
- RS232C dial-up modem: Select this channel to communicate dial-up modem for modem communication, using Cnet I/F module (G7L-CUEB)

Remark

RS-232C modem(Dedicated Line) and RS232C dial up modem communication can be executed under
RS-232C I/F module(G7L-CUEB)

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(7) Master/slave: Select master to be major in the communications system.
(8) Time out
- The value of default is 500ms.
- Set the maximum cycle time for sending and receiving of the master PLC.
- It may cause of communication error that lower setting value than maximum cycle time for sending and receiving.
(9) Reading slave PLC status.
- Select to read GM7 base unit status as slave designated. But do not choose this except for the monitoring of the slave status. It may cause to drop down the communication speed.

Appendix 2. Flag List

1) User Flag List

Keyword	Type	Write	Name	Description
_LER	BOOL	Enable	Operation error latch flag	Operation error latch flag by the program block(BP). Error indication occurred while executing a program block
_ERR	BOOL	Enable	Operation error latch flag	Operation error flag by the operation function (FN) or function block(FB). It is newly changed whenever an operation is executed.
_T20MS *	BOOL	–	20 ms Clock	These clock signals are used in the user programs, toggles on/off every half cycle. The clock signal can be delayed or distorted in accordance with program execution time as the signal toggles after scan has been finished, therefore, it is recommended that clock of enough longer than scan time be used. Clock signals starts from Off when the initialization program or scan program starts
_T100MS *	BOOL	–	100 ms Clock	
_T200MS *	BOOL	–	200 ms Clock	
_T1S *	BOOL	–	1s Clock	
_T2S *	BOOL	–	2s Clock	
_T10S *	BOOL	–	10s Clock	
_T20S *	BOOL	–	20s clock	
_T60S *	BOOL	–	60s Clock	• Example : _T100MS clock
_ON *	BOOL	–	Always On	Usable in user programs.
_OFF *	BOOL	–	Always Off	Usable in user programs.
_1ON *	BOOL	–	First scan On	Turn On only during the first scan after the operation has started.
_1OFF *	BOOL	–	First scan Off	Turn Off only during the first scan after the operation has started.
_STOG *	BOOL	–	Scan Toggle	Toggles On/Off at every scan while a user program is being executed. (On at the first scan)
_INT_DONE	BOOL	Enable	Initialization Program Complete	If this flag is set to on in the initialization program in an user program, the initialization program stop its operation and the scan program will starts.
_INT_DATE	DATE	–	RTC present date	Date Data of standard format (Reference date – Jan. 1, 1984)
_RTC_TOD	TOD	–	RTC present time	Time Data(Reference time – 00:00:00)
_RTC_WEEK	UNIT	–	RTC present day	Day data (0: Monday, 1:Thuesday, 2: Wednesday , 3: Thursday, 4: Friday, 5: Saturday, 6:Sunday)

Remark

1) Flags with the mark ' * are initialized when the initialization program starts, and after its execution has been competed the flags will change in accordance with the restart mode set.
2) RTC related flags could be used if only the optional module for RTC is installed.

2) Representative System Error Flag List

Keyword	Type	Bit No.	Name	Description
_CNF_ER	WORD	Represent--ative keyword	System error (fatal error)	This flag handles the following operation stop error flags in batch.
_IO _DEER	BOOL	Bit 2	Module loading/unloading error	This representative flag indicates that module configuration of each slot has been changed during operation. (Refer to _IO_DEER_N and _IO_DEER[n])
_IO _RWER	BOOL	Bit 4	I/O module read/write error	This representative flag indicates that a I/O module does normally executes read/write. (Refer to _IP_RWER_N and _IP_IFER[n])
_SP _IFER	BOOL	Bit 5	Special/communicat-ions module interface error	This representative flag indicates that special or communications module has failed in initialization or normal interface is impossible due to module malfunction. (Refer to _IP_IFER_N and _IP_IFER[n])
_ANNUN_ER	BOOL	Bit 6	External device fatal fault detection error	This representative flag indicates that an external device has fatal error. The error code has been written to _ANC_ERR[n].
–	–	Bit 7	–	–
_WD_ER	BOOL	Bit 8	Scan watch dog error	This flag indicates that the scan time of a program has overrun the scan watchdog time specified by the parameter.
_CODE_ER	BOOL	Bit 9	Program code error	This flag indicates that an unreadable instruction has been met while executing an user program.
_STACK_ER	BOOL	Bit 10	Stack overflow error	This flag indicates that the stack is used out of its capacity(Overflow)
_P_BCK_ER	BOOL	Bit 11	Program error	This flag indicates that program execution is impossible due to destroyed memory or program error.

3) Representative System Warning Flag List

Keyword	Type	Bit No.	Name	Description
_CNF _WAR	WORD	Represent-ative keyword	System warning	This flag treats the below warning flags relating to continuous operation in batch.
_RTC_ERR	BOOL	Bit 0	RTC data error	This flag indicates that RTC DATA error.
_D_BCK_ER	BOOL	Bit 1	Data backup error	This flag indicates
_AB_SD_ER	BOOL	Bit 3	Abnormal shutdown	This flag indicates that the program had been stopped during restore from power failure due to causes such as power off, and then cold restart has been executed and the continuous operation which retains the data is impossible. Usable in the initialization program. Automatically reset when the initialization program has finished. (The same things given above will be applied when the program has been stopped by the 'ESTOP' function)
_TASK_ERR	BOOL	Bit 4	Task collision (plus cycle and external tasks)	This flag indicates that task collision has occurred as execution request for a same task had been repeatedly invoked. (Refer to the flag _TC_BMAP[n] and _TC_CNT[n])
_BAT_ERR	BOOL	Bit 5	Battery fault	This flag detects and indicates that the voltage of the battery, which is used to backup user programs and data memory, is lower than the defined value.
_ANNUN_WR	BOOL	Bit 6	External device warning detection	This representative flag indicates that the user program has detected an ordinary fault of external devices and has written it to the flag _ANC_WB [n].
–	–	Bit 7	–	–
_HSPMT1_ER	BOOL	Bit 8	Communication Parameter 1 error	This representative flag detects error of each Communication parameter when the Communication has been enabled and indicates that Communication cannot be executed. It will be reset when the Communication is disabled.

4) Detailed System Error and Warning Flag List

Keyword	Type	Data setting range	Name	Description
_IO_RWER_N	UINT	0 to 15	The number of slot where I/O module read/write occurred.	This flag detects that input modules of a slot cannot be normally read from or written to, and indicates the lowest slot No. of the detected slot numbers.
_ANC_ERR[n]	UINT	n : 0 to 7	External device fatal error	This flag detects fatal error of external devices and its content is written to this flag. A number that identifies error type will be written to each of the sixteen locations. (The number 0 is not allowed)
_ANC_WAR[n]	UINT	n : 0 to 7	External device ordinary error	If the user program indicates a warning on the flag _ANC_WB[n], the bit locations are sequentially written to _ANC_WAR[n] from _ANC_WAR[0] complying with their occurrence sequence.
_ANC_WB[n]	BIT	n: 0 to 127	External device ordinary error bit map	The user program detects ordinary error of external device and the errors are indicated on a bit map. (The number 0 is not allowed)
_TC_BMAP[n]	BIT	n : 0 to 7	Task collision bit map	The flag detects that task collision has occurred because, while a task was being executed or ready for execution, an execution request has occurred for the same task, indicates the errors on a bit map.
_TC_CNT[n]	UINT	n : 0 to 7	Task collision counter	This flag detects task collision occurrence time for each task when executing a user program, indicates the task collision occurrence time.
_BAT_ER_TM *	DATE & TIME	__	Batter voltage drop time	The first detection date and time of battery voltage drop are written to this flag. It will be reset if the battery voltage has been restored
_AC_F_CNT	UINT	0 to 65535	Momentary power failure occurrence count	The accumulated momentary power failure occurrence times during operation in the RUN mode is written to this flag.
_AC_F_TM[n]*	DATE & TIME	n : 0 to 15	Momentary power failure history	The times of the latest sixteen momentary power failures are written.
_ERR_HIS[n]*		n : 0 to 15	Error history	The times and error codes of the latest sixteen errors are written to this flag. • Stop time : DATE & TIME (8 bytes) • Error code : UINT (2 bytes)
_MODE_HIS[n]*		n : 0 to 15	Operation mode change history	The times, operation modes and restart modes of the latest sixteen operation mode changes are written to this flag • Change time : DATE & TIME (8 bytes) • Operation mode : UINT (2 bytes) • Restart : UINT (2 bytes)

* Marked flags are loaded while RTC option module is used..

5) System Operation status Information Flag List

Keyword	Type	Data setting range	Name	Description
_CPU_TYPE	Unit	0 to 16	System type	GM1 : 0, GM2 : 1, (GM3 : 2, GM4 : 3) (FSM : 5,6)
_VER_NUM	Unit	-	O/S version No.	System O/S version No.
_MEM_TYPE	Unit	1 to 5	Memory module type	Type of program memory module (0: Unloading state, type : 0 to 5)
_SYS_STATE	Word	Represent-ative keyword	PLC mode and operation status	System operation mode and operation state information
		Bit 0	Local control	Operation mode change is possible only by mode change switch or GMWIIN
		Bit 1	STOP	CPU module operation state
		Bit 2	RUN	
		Bit 3	PAUSE	
		Bit 4	DEBUG	
		Bit 5	Operation mode change factor	Operation mode change by mode change switch
		Bit 6	Operation mode change factor	Operation mode change by GMWIN
		Bit 7	Operation mode change factor	Operation mode change by remote GMWIN
		Bit 8	Operation mode change factor	Operation mode change by communications
		Bit 9	STOP by STOP function	Operation in the RUN mode is stopped by STOP function after the scan has finished
		Bit 10	Force input	Input junction force On/Off is being executed.
		Bit 11	Force output	Output junction force On/Off is being executed
		Bit 12	STOP by ESTOP function	Operation in the RUN mode is directly stopped by ESTOP function.
		Bit 13	-	-
		Bit 14	During monitoring	External monitoring is being executed for programs or variables
		Bit 15	Remote mode ON	Operation in the remote mode
_GMWIN_CNF	Byte	Representative keyword	GMWIN connection state	Connection state between CPU module and GMWIN
		Bit 0	Local GMWIN connection	Local GMWIN connection state
		Bit 1	Remote GMWIN connection	Remote GMWIN connection state
		Bit 2	Remote communications connection	Remote communications connection state

5) System Operation status Information Flag List (continued)

Keyword	Type	Data setting range	Name		Description
_RST_TY	Byte	Representative keyword	Restart mode information		Restart type of program which is being executed in present. (History)
		Bit 0	Cold restart		See the Section 4.5.1
		Bit 1	Warm restart		
		Bit 2	Hot restart		
_INIT_RUN	Bool	-	During initialization		An initialization program written by the user is being executed
_SCAN_MAX	Unit	-	Maximum scan time (ms)		Maximum scan time is written during operation.
_SCAN_MIN	Unit	-	Minimum scan time (ms)		Minimum scan time is written during operation.
_SCAN_CUR	Unit	-	Present scan time (ms)		Present scan time is continuously updated during operation.
_RTC_TIME[n]*	BCD	N : 0 to 7	Present time		BCD data of present time of RTC (Example : 96-01-12-00-00-00-XX) _RTC _TIME[0] : year, _RTC _TIME[1] : month, _RTC _TIME[2] : day, _RTC _TIME[3] : hour, _RTC _TIME[4] : minute, _RTC_TIME[5] : second, _RTC _TIME[6] : day of the week, _RTC _TIME[7] : unused Day of the week : 0 : Mon., 1: Tue., 2: Wed., 3:Thur., 4:Fri., 5: Sat., 6:Sun.
_SYS_ERR	Unit	Error code	Error type		See the Section 12.5 Error Code List

* Marked flags are loaded while RTC option module is used.

6) System Configuration status Information Flag

(1) User Program Status Information

Keyword	Type	Data setting range	Name	Description
_DOMAN_ST	BYTE	Representative keyword	System S/W configuration information	GM1 : 0, GM2 : 1, (GM3 : 2, GM4 : 3, GM% : 4) (FSM : 5,6), Twofold : 16
		Bit 0	Basic parameter error	Checks and indicates Basic parameter error
		-	-	-
		Bit 2	Program error	Checks and indicates Program error
		-	-	-
		Bit 4	Communication parameter error	Checks and indicates High speed link parameter error

(2) Operation Mode change switch Status Information

Keyword	Type	Data Setting range	Name	Description
_KEY_STATE	BYTE	Representative keyword	Mode setting switch position	Indicates the state mode setting switch of CPU module
		Bit 0	KEY_STOP	Indicates that the mode setting switch is in the STOP state.
		Bit 1	KEY_RUN	Indicates that the mode setting switch is in the RUN state.
		Bit 2	KEY_PAUSE/REMOTE	Indicates that the mode setting switch is in the PAUSE/REMOTE state.

Appendix 3. Function / Function Block List

1) Function List

Name	Function	Size of PB (Byte) *1	Size of library (Byte) *2	Processing speed (μs) *3 GM7
ABS (int)	Absolute value operation	36	-	2.0
ADD (int)	Addition	24	-	1.5
AND (word)	Logical multiplication	16	-	1.0
DIV (int)	Division	24	-	2.5
DIV (dint)	Division	24	-	3.3
EQ (int)	Equality' comparison	20	-	1.3
LIMIT (int)	To output upper and lower limits	24	848	4.8
MAX (int)	To output the maximum input value	24	1076	5.9
MOVE	To cop data	8	-	0.5
MUL (dint)	Multiplication	24	-	3.3
MUL (int)	Multiplication	24	-	2.5
ROL	To rotate left	20	136	3.7
BCD_TO_DINT	Conversion of BCD type into DINT	12	264	8.5
BCD_TO_INT	Conversion of BCD type into INT type	12	160	6.9
BCD_TO_SINT	Conversion of BCD type into SINT type	12	108	5.3
BYTE_TO_SINT	Conversion of BYTE type into SINT type	8	-	0.5
DATE_TO_STRING	Conversion of DATE type into string	32	314	20.8
DINT_TO_INT	Conversion of DINT pe into INT type	48	-	2.2
DINT_TO_BCD	Conversion of DINT type into BCD type	12	156	8.8
DT_TO_DATE	Conversion of DT type into DATE type	16	4	1.1
DT_TO_TOD	Conversion of DT type into TOD type	16	12	1.4
DT_TO_STRING	Conversion of DT type into string	36	620	21.0
DWORD_TO_WORD	Conversion of DWORD type into WORD	8	-	0.5
INT_TO_DINT	Conversion of INT type into DINT type	12	-	0.7
INT_TO_BCD	Conversion of INT type into BCD type	12	100	7.2
NUM_TO_STRING (int)	Conversion of number into string	24	580	15.9
SINT_TO_BCD	Conversion of SINT type into BCD type	12	76	5.9
STRING_TO_INT	Conversion of string info NT type	12	1264	28.9
CONCAT	To concatenate strings	48	172	5.9
DELETE	To delete string	40	172	6.9
EQ (str)	'Equality' comparison	32	948	8.3
FIND	To find a string	24	220	7.9
INSERT	To insert a string	48	160	8.9
LEFT	To obtain the left part of a string	36	100	6.4
LEN	To obtain the length of a string	12	40	4.5
LIMIT (str)	To output upper or lower limits	60	794	8.9
MAX (str)	To output the maximum input value	52	1076	8.4
MID	To obtain the middle part of a string	40	188	7.1
REPLACE	To replace a string with another	52	288	7.9
RIGHT	To obtain the hr part of a scan	36	164	6.9
ADD_TIME (time)	Time addition	20	148	5.6
DIV_TIME (i1=time)	Time division	20	152	6.9

Appendix 3 Function Block List

> **Remark**
>
> 1) The items marked with ' * ' has following meaning.
>   * 1: The size of the program memory which a program occupies when it uses the function once
>   * 2: The size of the program memory which a program occupies only one time though it uses the function many times
>   * 3: of IL programs (2 input variables, 10 strings)
> 2) The above shows the function lists when programs are written with IL (instruction List) language.
>   If programs are written with LD (Ladder diagram), the following differences occur.
>   (1) 16 bytes will be added to the size of the PB.
>   (2) In non-execution, 0.4 will be added to the processing speed. In execution, 0.8 sec will be added.

2) Function Block List

Name	Function	Size of PB (Byte)*2	Size of library		Processing speed (µs) *4
			Size (Byte)*3	Size of Instance memo*3	GM7
CTU	Addition counter	24	92	6	3.8
CTUD	Addition/subtraction counter	32	168	6	4.4
F_TRIG	Descending edge detection	16	28	1	2.6
RS	Preference reset table	20	44	2	3.2
TON	ON delay timer	20	182	20	4.8

> **Remark**
>
> 1) The items marked with ' *' has following meaning.
>   * 1: The size of the program memory which a program occupies when it uses the function once
>   * 2: The size of the program memory which a program occupies only one time though it uses the friction many times
>   * 3: The size of the program memory which a program occupies whenever it uses the function block once
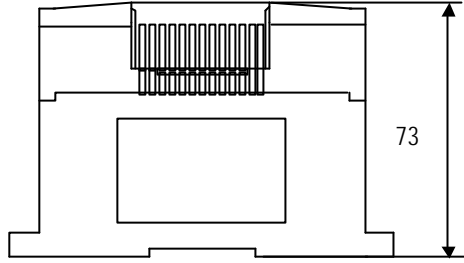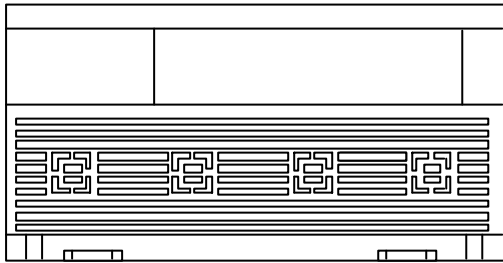> 2) The occupied memory size and processing speed of IL programs are same as LD programs.

Appendix 4 External Dimensions (unit: mm)

1) Base unit
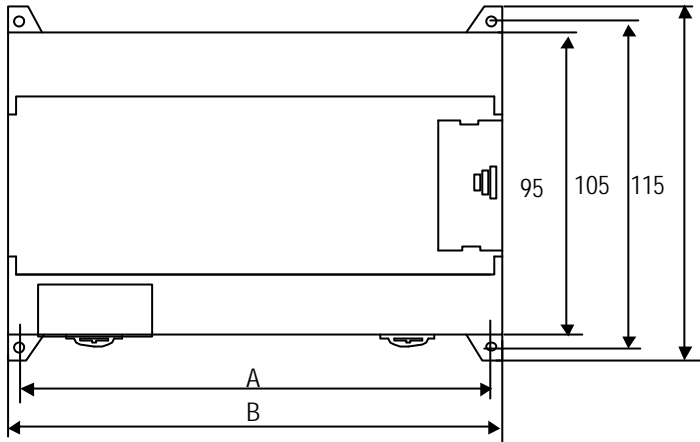
	A	B
10points	85	95
20 points	135	145
30points	135	145
40points	165	175
60points	215	225

2) Extension / Option modules