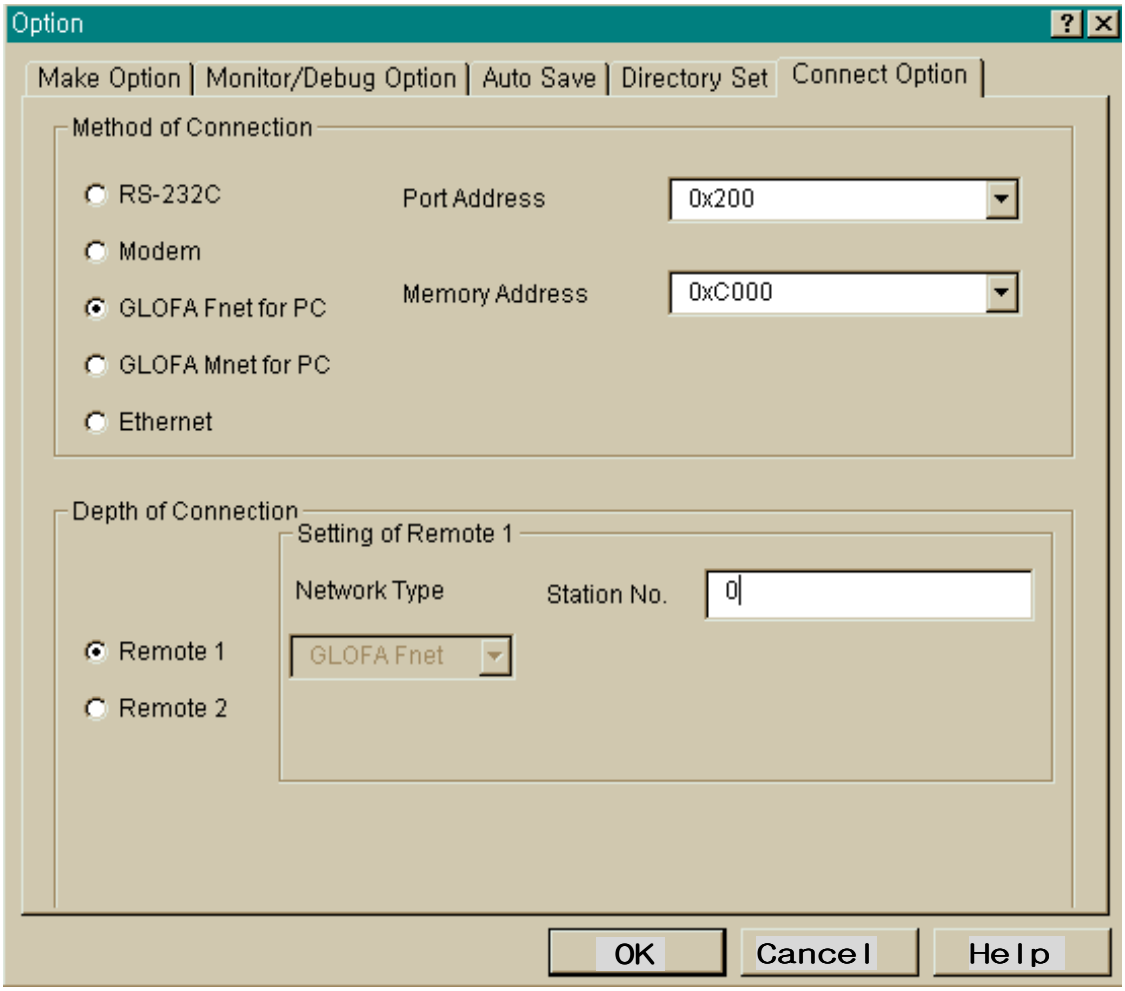
Table 6.4.2 Relation of roles between client and server of GMWIN

Client \ Server	PC-module (GMWIN)	GM1	GM2	GM3	GM4	GM5	GM3 remote I/O	GM4 remote I/O
PC-module (GMWIN)	X	O	O	O	O	O	O	O
GM1	X	O	O	O	O	O	O	O
GM2	X	O	O	O	O	O	O	O
GM3	X	O	O	O	O	O	O	O
GM4	X	O	O	O	O	O	O	O
GM5	X	O	O	O	O	O	O	O
GM6	X	O	O	O	O	O	O	O
GM3 remote I/O	X	O	O	O	O	O	O	O
GM4 remote I/O	X	X	X	X	X	X	X	X

There is connector for RS-232C connection in GM3 remote I/O. Namely, GMWIN can be connected to PLC of GM1 ~ GM5 from GM3 remote I/O station (This is not available in GM4 remote).
If GMWIN is used for PC module(G0L-FUEA for Fnet, G0L-MUEA for Mnet), user should specify as following in option menu of GMWIN project, according to network to be used.



For port and memory setting of PC module, see Appendix A3

Caution when remote 1 and 2 connection in GMWIN

1) If currently opened project in GMWIN is different from CPU type connected with remote 1 and 2, following items are not supported:

   (1) Writing of program and each parameter
   (2) Reading of program and each parameter
   (3) Monitor
   (4) Flash memory
   (5) Link enable setting
   (6) I/O information
   (7) Forced I/O information
   (8) Mnet parameter, Mnet information
   (9) I/O skip

2) When GMWIN is programmed by connecting remote 1 and 2, user should open corresponding project of station to be connected and perform remote connection.

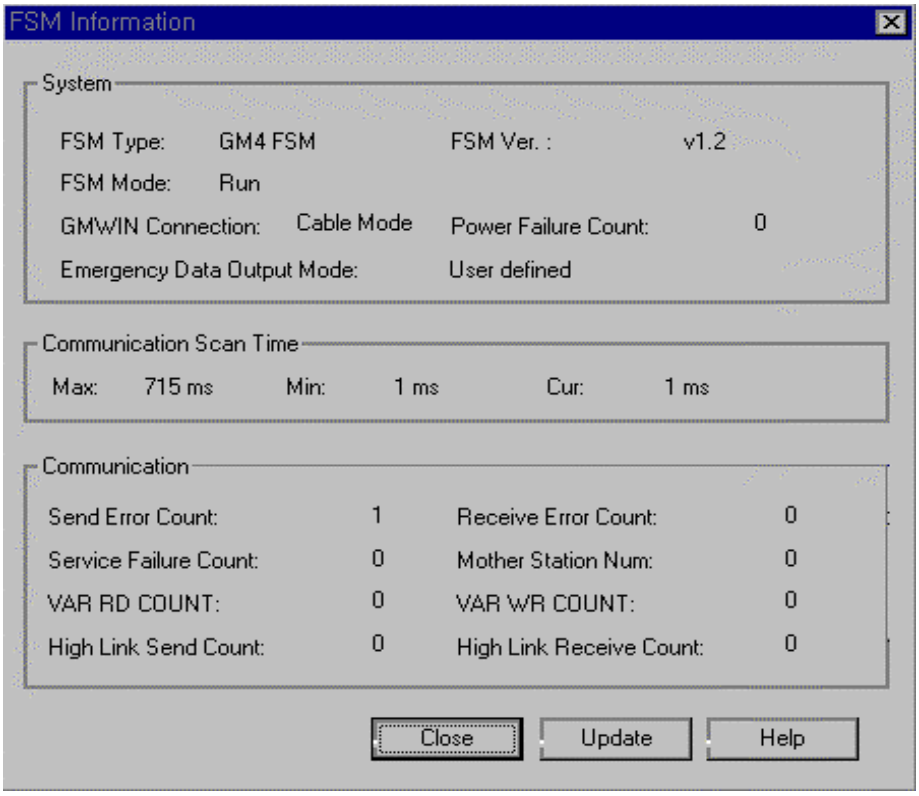
3) If remote connection is made with GM3/GM4 remote I/O, following items are not performed :

   (1) Writing of program and each parameter
   (2) Reading of program and each parameter
   (3) Operation performed with direct relation to program
      * Time chart monitor of monitor
      * Link parameter of monitor
      * *High speed link* monitor
      * Forced I/O information
      * Link enable setting
      * Flash memory
      * Link information
      * Mode conversion
   (4) Flash memory
   (5) Link enable setting
   (6) Mnet parameter, Mnet information
   (7) I/O skip

4) Remote connection is supported up to remote 2. Remote connection of more than 2 is impossible.

6.4.3 Remote module information

If connection is made with remote module by local or remote 1 or 2 connection, user can see entire information of remote module. If user choose PLC information → System information in On-line menu, following screen is displayed :



PLC version : O/S version number of remote module station.

PLC mode : Operation status of remote module station (RUN / STOP).
RUN : Normal operation.
STOP : I/O module error, self diagnosis error, and power error.

GMWIN connection status :
Remote : GMWIN remote connection from other station to remote module station.
Local : Remote connection from remote module station to other station.

Count of power cut off : Count of instantaneous power failure.

Emergency data output mode : Sets output data type when communication is impossible.
Latch : Maintains current output data.
User setting : Outputs the value set in emergency data.

Communication scan time : Time that token circulates network once.

Count of Transmission/Receive error :

Count of frame error that transmitted from communication cable during communication. If a lot of error is occurred, this means that communication line has problem. So check the communication line.

Count of service error:

This is increased when other station sends NAC response during execution of *function block* service.

Master station setting number :

This is master station number of PLC, which transmits and receives data with remote I/O station.

VAR_RD_CNT / VAR_WR_CNT :

When *function block* service is executed, VAR_RD_CNT is increased for RD service and VAR_WR_CNT is increased for WR service.

Transmission/Receive Count of *high speed link* :

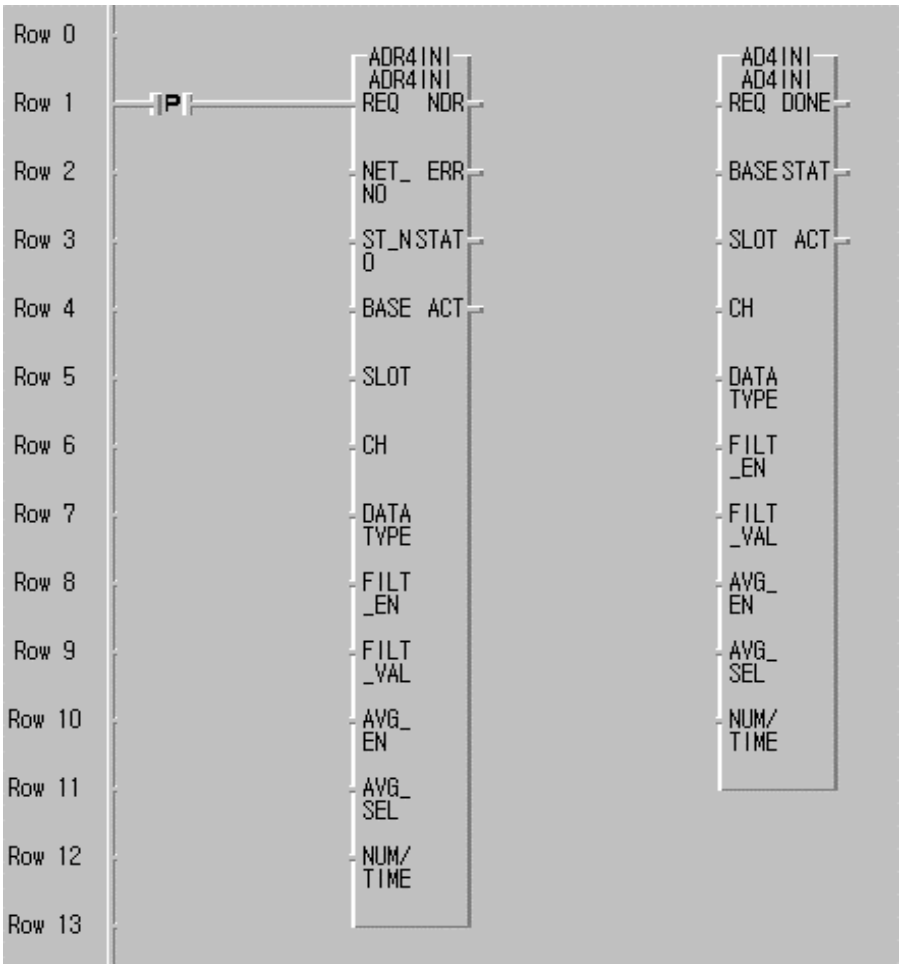
High speed link receive count is increased if *high speed link* data is received, and *high speed link* transmission count is increased if *high speed link* data is transmitted.

6.5 *Function block* service for FSM(Fnet Slave Module)

Fnet slave module is remote I/O control device that has communication function and I/O control function of PLC CPU. This doesn't have program execution capability, but this module is used to control remote I/O of CPU through communication. This module supports communication function of *high speed link* service, *function block* service, and remote connection service, and the others. This chapter explains slave control method using *function block* service.

6.5.1 *Function blocks* of special slave module

Special module can be mounted in slave, and mountable special modules are D/A conversion module, A/D conversion module, temperature conversion module, and high speed counter module, and types of mountable module are shown in Table 8.1.2 of Chap. 8 Installation and testing operation. Special module *function block* of slave is the *function block* to control special module mounted in slave. Values of NET_NO and ST_NO for input, and values of ERR and NDR for output are added to existing special *function block*. Fig. 6.5.1(A) explains the difference between A/D initialization *function block* of CPU and A/D initialization *function block* of slave by using initialization *function block* of A/D conversion module.



(A) Special module *function block* of FSM (B) Special module *function block* of CPU

Fig. 6.5.1(A) Ex. of A/D initialization *function block*

In Fig. 6.5.1(A), special module *function block* of CPU means *function block* to initialize special module when special module is mounted in CPU, and special module *function block* of slave means *function block* of slave to initialize special module mounted in slave. Added I/Os in slave *function block* as shown in figure are communication I/Os to communicate with slave, and Table 6.5.1(A) explains I/O contents that are added in slave *function block* and I/O that is commonly used in slave *function block*.

Table 6.5.1(A) I/O of special module *function block* for slave

Name	Contents	Segments
REQ (Input)	Input contact, which operates *function block*. *Function block* is operated when input value is changed from '0' to '1'.	Rising edge (Bool)
NET_NO (Input)	Slot No. of communication module to execute *function block* service among communication module mounted in PLC of self station. I.e., mounting location of master in slave.	0 ~ 7
ST_NO (Input)	Station number of other station. Sets station number of slave that special module is mounted.	0 ~ 63
NDR (Output)	Operation result of *function block*. This is set to 'On' when operation is normally executed, and maintains 'On' until next scan is executed.	On/Off
ERR (Output)	Operation result of *function block*. On when error occurred.	On/Off
BASE (Input)	Input that sets mounting location of special module mounted in slave. This means base number that the module is mounted.	0 ~ 3
SLOT (Input)	Input that sets mounting location of special module mounted in slave. This means slot number that the module is mounted.	0 ~ 7

I/Os that is not explained in Table 6.5.1(A) are different I/O variable according to special module, and they have the same I/O characteristics as *function block* of special module used.
Refer to user's manual for each special module.

Table 6.5.1(B) **Types of special module *function block* in slave**

Function block[Remark] \ CPU ype[Remark]		GM1, GM2	GM3	GM4	GM5	GM6	Remark
ADRxINI	ADR2INI	X	X	O	X	X	4 Channel
(x = 2, 4)	ADR4INI	O	O	X	X	X	16 Channel
ADRxRD	ADR2RD	X	X	O	X	X	4 Channel
(x = 2, 4)	ADR4RD	O	O	X	X	X	16 Channel
DARxINI	DAR1INI	X	X	O	X	X	2 Channel
(x = 1, 4)	DAR4INI	O	O	X	X	X	16 Channel
DARxWR	DAR1WR	X	X	O	X	X	2 Channel
(x = 1, 4)	DAR4WR	O	O	X	X	X	16 Channel
HSCRx_RD	HSCR0RD	X	X	O	X	X	1 Channel
(x = 0, 1)	HSCR1RD	O	O	X	X	X	2 Channel
HSCRx_SET	HSCR0SET	X	X	O	X	X	1 Channel
(x = 0, 1)	HSCR1SET	O	O	X	X	X	2 Channel
HSCRx_WR	HSCR0WR	X	X	O	X	X	1 Channel
(x = 0, 1)	HSCR1WR	O	O	X	X	X	2 Channel
RTDxINI	RTDR2INI	X	X	O	X	X	4 Channel
(x = 2, 3)	RTDR3INI	O	O	X	X	X	8 Channel
RTDxRD	RTDR2RD	X	X	O	X	X	4 Channel
(x = 2, 3)	RTDR3RD	O	O	X	X	X	8 Channel
TCRxINI	TCR2INI	X	X	O	X	X	4 Channel
(x = 2, 4)	TCR4INI	O	O	X	X	X	16 Channel
TCRxRD	TCR2RD	X	X	O	X	X	4 Channel
(x = 2, 4)	TCR4RD	O	O	X	X	X	16 Channel

Remark

1. CPU type indicates the CPU type that can use special module *function block* in slave, and GM5 PLC can't access special module of slave as shown in Table.

2. In *function block* name, 'R' of next to special module, as shown in ADRxINI and ADRxRD, indicates remote(slave) block, and 'x' indicates channel number of special module and channel number is determined by '2^x'.

How to use

1) Master station setting

Slave doesn't have user program of itself, and it is remote I/O device using user program of PLC CPU and communication function. Slaves transmit and receive data by one master station, so master station of slave should be set before system configuration. The same value as master station number should be set for master station of slave using decimal switch located inside of slave, and this master station is operated as a master station when *high speed link* and access *function block* service of special module are executed.

Table 6.5.1(C) shows whether slave service is operated or not according to PLC mode of master station. Slave is operated according to mode of master station as shown in Table, so special module access should be made by master station because abnormal operation may occur if special module access of slave is made by other than master station.

Table 6.5.1(C) Slave operation according to PLC mode of master station

CPU MODE	*High speed link* of slave [Remark]	Special module access of slave	I/O refresh
RUN	O	O	O
STOP	O	X	O
PAUSE	O	O	O
DEBUG	O	O	O

Remark

Operation of *high speed link* is determined according to enabling link of master station.

2) Program

Communication function of master and slave, different from PLC, is used for special module control through slave. Therefore, special module *function block* program of slave needs, different from access program of special module *function block* of PLC, program preparation which reliability of communication is considered.

Fig. 6.5.1(B) is system configuration drawing which suppose that special module of slave two station is accessed through one master. In the figure, A/D input module(4 channel) is mounted in slot 1 of slave station 3, and D/A output module(2 channel) is mounted in slot 2 of slave station 4.

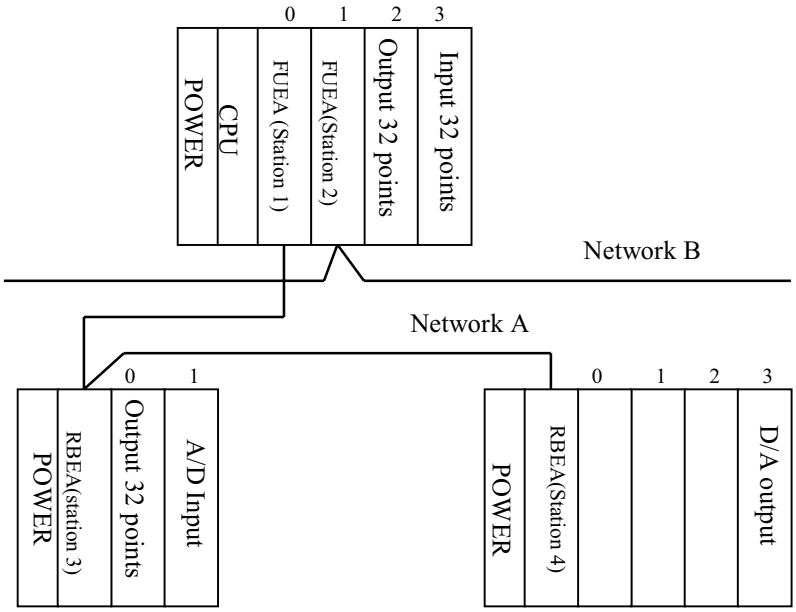
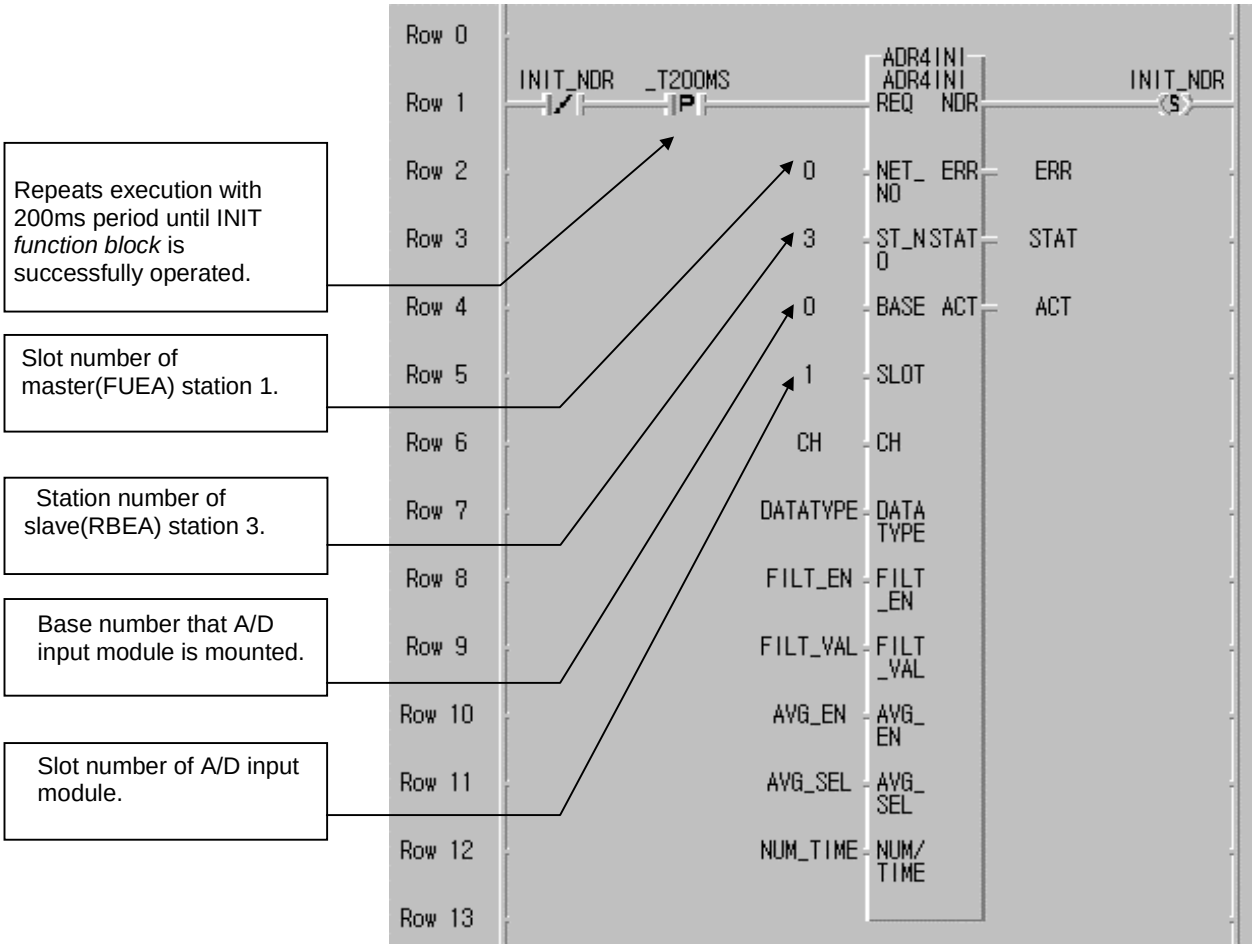


Fig. 6.5.1(B) Configuration of special module access system for slave

To access special module of slave in a system as shown in Fig. 6.5.1(B), master station should be set by adjusting master station setting switches of slave 3 and 4 station to station 1. After master station setting is finished, *function block* service program of slave special module should be prepared using GMWIN program. Fig. 6.5.1(C) and Fig. 6.5.1(D) show example of program preparation.



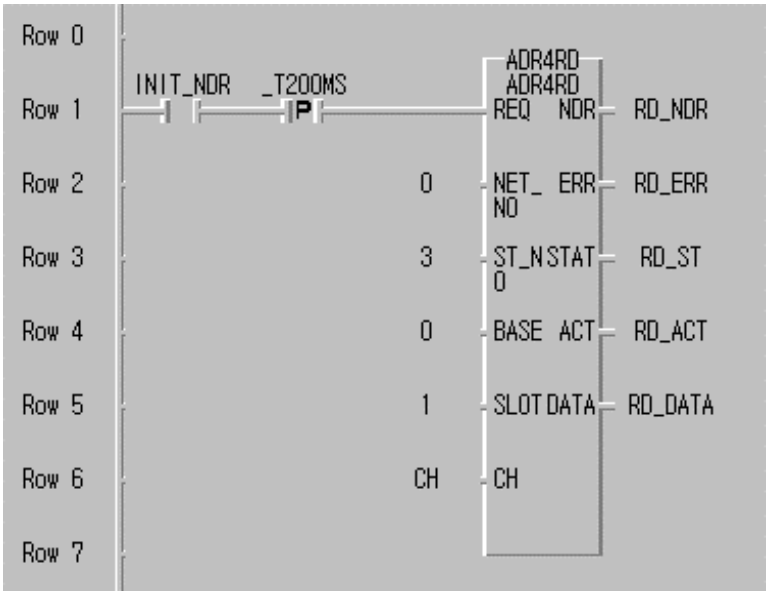
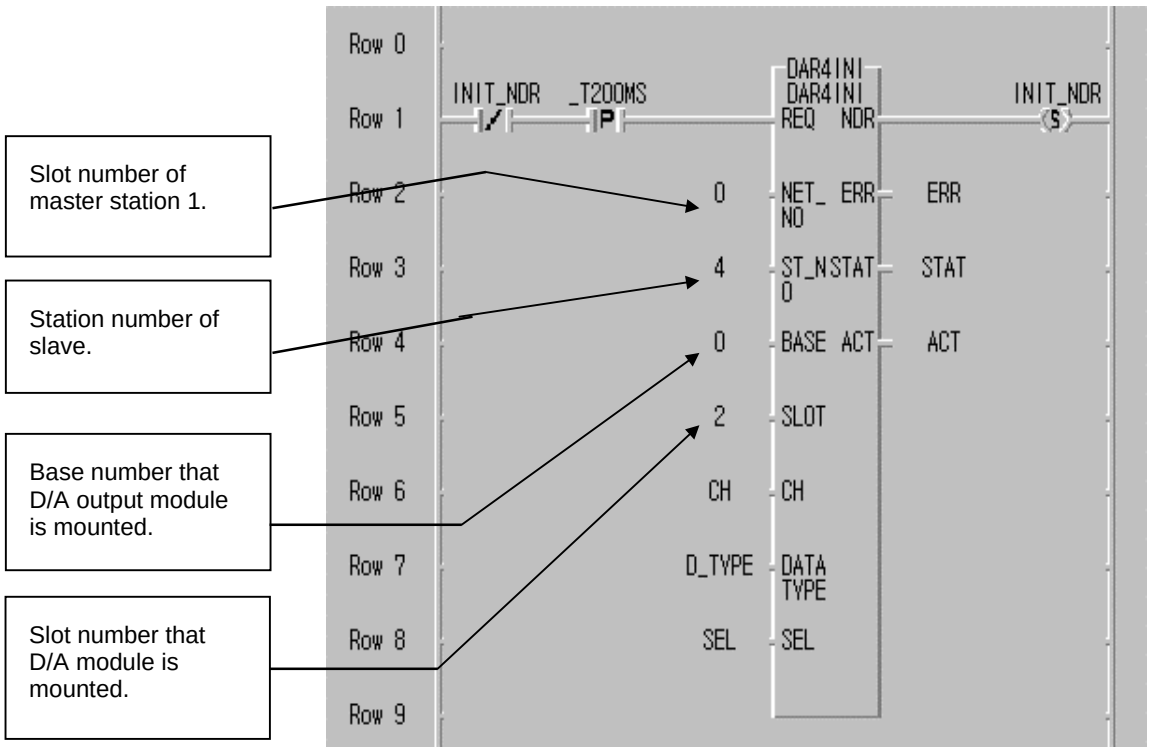


Fig. 6.5.1(C) Ex. of A/D input access program for slave

In Fig., AD_INIT *function block* is repeatedly operated with 200ms period until NDR is set to 'On', because initialization of special module, different from *function block* of CPU, may not be finished within 1 scan in slave (Because power of slave is supplied late or error is occurred by the problem of communication line). Therefore, program should be prepared to execute next operation after execution result of *function block* is checked, using NDR output contact as shown in example. This is identically applied to other special module access program.



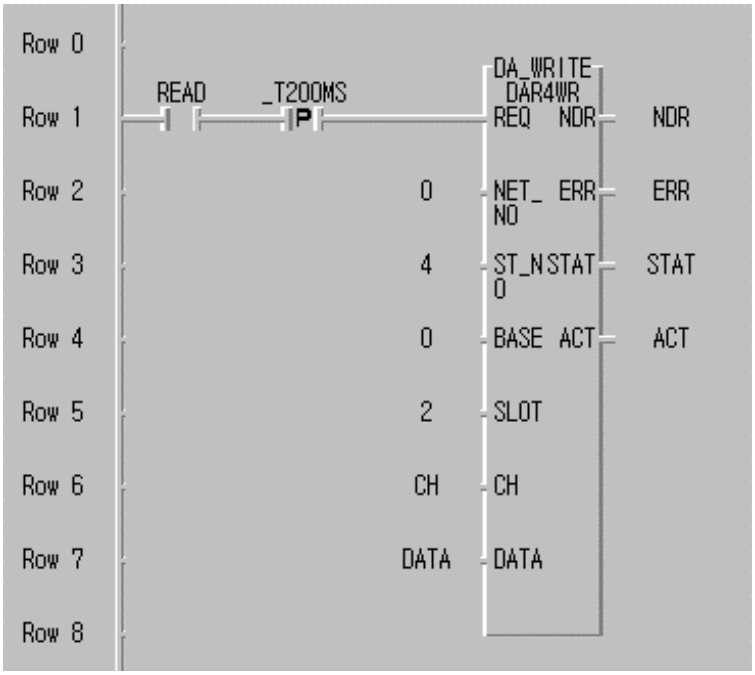


Fig. 6.5.1(D) Ex. of D/A output access program for slave

Above figure is D/A output module access program. In figure, initialization *function block* is repeatedly executed with 200ms period until NDR contact is set to 'On', and ST_NO, BASE, and SLOT number are set to location of D/A module and station number of slave 4.

3) STATUS information

Execution result of special *function block* using slave module is indicated by output contact of NDR and ERR. If result of *function block* execution is normal, NDR output is set to 'On' and ERR output is set to 'Off'. If result of *function block* execution is abnormal, ERR output is set to 'On' and NDR output is set to 'Off'. At this time, error type is indicated through output value of STAT(For details about access error of slave special module, see Appendix A3).

6.5.2 *Function block* of Reading / Writing in slave module

Slave supports *function block* service explained Chap. 6.3 of this user's manual, and special area like I/O area and emergency data area of slave can be read and written using *function block* service. Slave, different from CPU, is a module operated without user program, so this can use part of CPU *function block*. Table 6.5.2(A) shows type of *function block* supported by slave.

Table 6.5.2(A) *Function block* type of slave

***Function block* type**		**Data type**	**Access area**	**Read / Write**	**Size**
Standa-rd type	RD_Bool	Bool	%1W0 ~ %1W127 (256 byte) %QW0 ~ %QW127 (256 byte)	Read	
	RD_Byte	Byte			
	RD_Word	Word			
	RD_DWord	Double Word			
	RD_Lword	Long Word			
	WR_Bool	Bool		Write	
	WR_Byte	Byte			
	WR_Word	Word			
	WR_DWord	Double Word			
	WR_Lword	Long Word			
	RD_Block	Byte		Read	Max. 120 byte
	WR_Block	Byte		Write	
Reserv-ed access variable type	_BASE0_DATA	Word Array	Emergency output data of BASE 0	Read/Write enable	64 byte for 1 BASE
	_BASE1_DATA	Word Array	Emergency output data of BASE 1		
	_BASE2_DATA	Word Array	Emergency output data of BASE 2		
	_BASE3_DATA	Word Array	Emergency output data of BASE 3		
	_CARD_INFO	Byte Array	Module information area	Read only	32 byte
	_FSM_FLAG	Word Array	Flag area of slave system	Read only	44 byte

In slave, different from CPU, user cannot register access variable. Therefore, using name is reserved as key word, and user can read and write appropriate area by entering reserved name like '_BASE0_DATA' and '_CARD_INFO' into VAR input of *function block* with string type. In Table 6.5.2(B), slave _FSM_Flag shows entire information of slave operation status and its size is totally 44 byte, and this can be read through GMWIN remote connection service or *function block* service explained in Chap. 6.5.2(B). Table 6.5.2(B) explains detailed contents of slave system flag.

Table 6.5.2(B) Contents of slave system flag

Variable name (Key word)	Contents	Start address (Hexadecimal)	Data type	Size	Remark
_CPU_Type	Remote CPU Type	h0000	Word	2 Byte	
_VER_NUM	O/S Version Number	h0002	Word	2 Byte	
_SYS_STATE	System State	h0004	Word	2 Byte	
_FSMTXECNT	TX Error Count	h0006	Word	2 Byte	
_FSMRXECNT	RX Error Count	h0008	Word	2 Byte	
_FSMSVCFCNT	Service Fail Count	h000A	Word	2 Byte	
_FSMScanMX	Max. Scan TIME	h000C	Word	2 Byte	
_FSMScanAV	Average Scan TIME	h000E	Word	2 Byte	
_FSMScanMI	Min. Scan TIME	h0010	Word	2 Byte	
_MOTHSTNO	Master station NO.	h0012	Word	2 Byte	
_FSMVRCNT	Variable RD Count	h0014	Word	2 Byte	
_FSMVWCNT	Variable WR Count	h0016	Word	2 Byte	
_FSMHSTXCNT	HS-Link TX Count	h0018	Word	2 Byte	
_FSMHSRXCNT	HS-Link RX Count	h001A	Word	2 Byte	
_AC_Fail_CNT	Power Fail Counter	h001C	Word	2 Byte	
_CNF_ER d0 : _CPU_ER d1 : IO_TYER d2 : _IO_DEER d3 : _FUSE_ER d4 : _IO_RWER d5 : _IP_IFER d6 : _PWR_ERR	Representative flag CPU hardware error Module setting error Module mounting error Fuse disconnection error I/O access error I/P access error SUB power error	h001E	Word Byte 0 Byte 1 Byte 2 Byte 3 Byte 4 Byte 5 Byte 6	2 Byte	Byte information (d7 ~ d15 are reserved byte)
_IO_TYER_N	Module setting error	H0020	Word	2 Byte	
_IO_DEER_N	Mounting error	h0022	Word	2 Byte	
_FUSE_ER_N	Fuse error	h0024	Word	2 Byte	
_IO_RWER_N	I/O error	h0026	Word	2 Byte	
_IP_IFER_N	Special module error	h0028	Word	2 Byte	
_PADT_CNF d0 : local connection d1 : remote connection	GMWIN connection status	h002A	Byte	1 Byte	
_E_DATA_OPTION	Emergency data output type	h002B	Byte	1 Byte	0:Output latch 1:User defined

Slave read/write using *function block* can be executed by the same method as Chap. 6.3 *Function block* service, and see Chap. 6.3 for details.

6.6 Use of communication module flag

6.6.1 Types of flag

1) Flag which checks that this station is normally communicating with other station.

(1) _NETx_LIV[n] (Range n = 0 ~ 63 : station number of other station)
'Alive information' of other station. This shows that power of other station is normal and data is normally transmitted and received with other station through communication cable.

(2) _NETx_RST[n]
Power recovery information of other station. When other station becomes down and recovered because of power failure or cable dismounting, this is set to 'On' and indicates that other station has recovered.

2) Flag that resets remote I/O module

(1) _FSMx_RESET
This resets all of special module and digital I/O module of the base that remote module is located. If user need to reset all output of FSM when emergency occurred, user can reset remote station by entering station number of appropriate remote station to _FSM_ST_NO, and setting _FSMx_RESET flag to 'On'. This flag is level input, and they are reset while this flag is set to 'On'.

(2) _FSMx_IO_RESET
This resets all digital I/O module except special module in the base that remote module is located. If user need to reset FSM digital output when emergency occurred, user can reset remote station by entering station number of appropriate remote station to _FSM_ST_NO, and setting _FSMx_IO_RESET flag to 'On'. This flag is level input, and they are reset while this flag is set to 'On'.

Remark

The character of 'x' used in flag is slot number that communication module(FMM) is mounted(range : 0~7).

3) *High speed link* flag of instantaneous power failure recovery for remote module

(1) _FSMx_HS_RESET

If power failure of remote station is occurred and then power is recovered, link-trouble is set to 'On' to check recovered information and _HS_MODE is set to 'Off'(User can know instantaneous power failure of other station using this flag). At this time, *high speed link* is normally executed but _HS_MODE is not RUN state(On). Therefore, set _HS_MODE to RUN state(On) by setting _FSMx_HS_RESET to 'On'. To set this, enter station number of appropriate remote station into _FSMx_ST_NO, and set _FSMx_HS_RESET FLAG to 'On'. Then, _HS_MODE is set to '1' and link-trouble is set to 'Off'.

4) Flag that indicates other station number

_FSMx_RESET, _FSMx_IO_RESET, and _FSMx_HS_RESET are used to flag that specify remote station number. If station number is set to 255(16#FF), all remote stations that master station is set to self station are operated by _FSMx_RESET, _FSMx_IO_RESET, and _FSMx_HS_RESET.

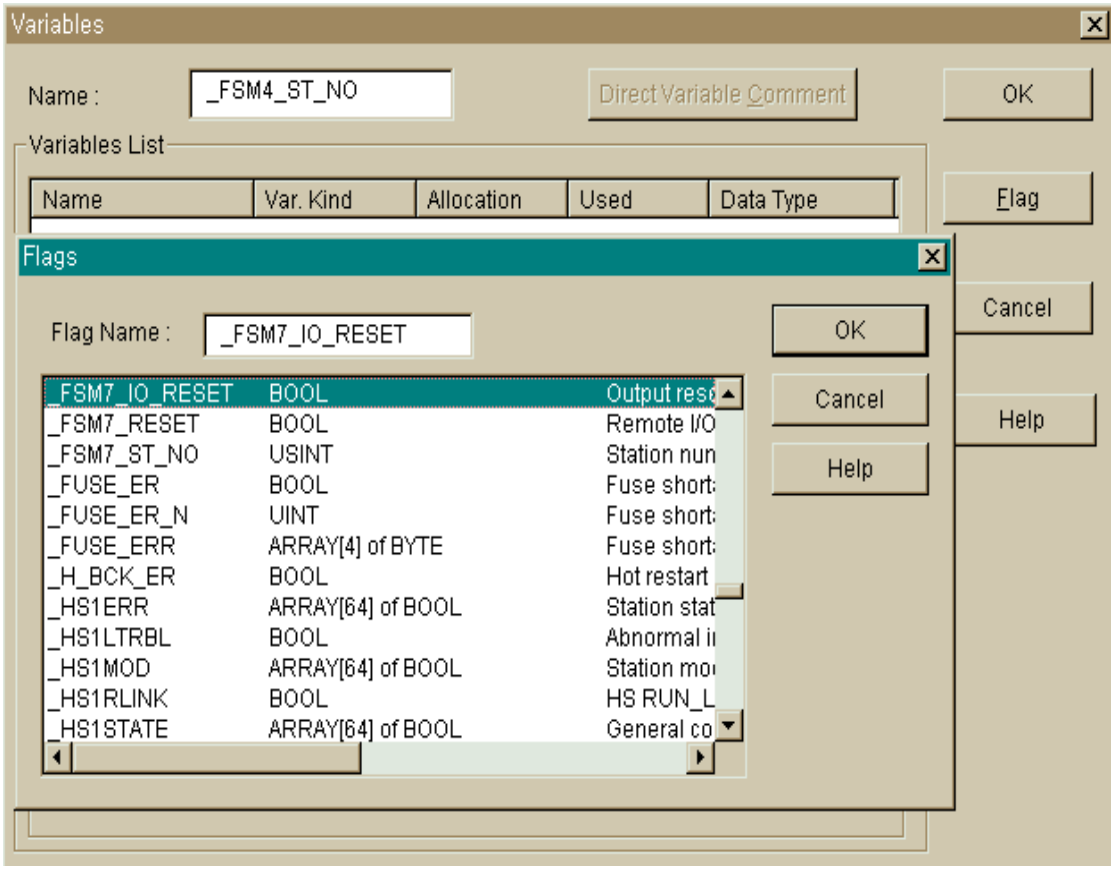
6.6.2 Major flag types used in Fnet

Segments	Data type	Access allowance	Remark
_FSMx_ST_NO Range : 0 ~ 63 (If 255, specifies all station)	USINT	READ / WRITE	Flags for FSM
_FSMx_RESET	BOOL	READ / WRITE	
_FSMx_IO_RESET	BOOL	READ / WRITE	
_FSMx_HS_RESET	BOOL	READ / WRITE	
_NETx_LIV[n] (Range : n = 0 ~ 63)	USINT	READ ONLY	Flags for FSM and FMM
_NETx_RST[n] (Range : n = 0 ~ 63)	USINT	READ / WRITE	

6.6.3 How to use Flag in GMWIN

If user selects 'Flag' in variable list of GMWIN, following 'Flag list' screen is displayed, then user can select appropriate flag.

GMWIN screen for Flag list



6.6.4 Example of remote I/O reset program using _FSMx_RESET/_FSMx_IO_RESET

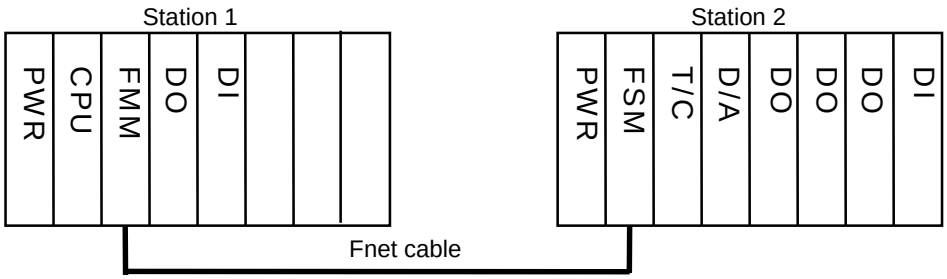


Fig. 6.6.4(A) Ex. of remote I/O system

Fig. 6.6.4(A) is configuration drawing of remote I/O system, which consist of PLC CPU, FMM, and FSM.

1) _FSMx_IO_RESET flag application program

Fig. 6.6.4(B) explains a program that resets output of remote I/O using emergency input contact of PLC CPU.

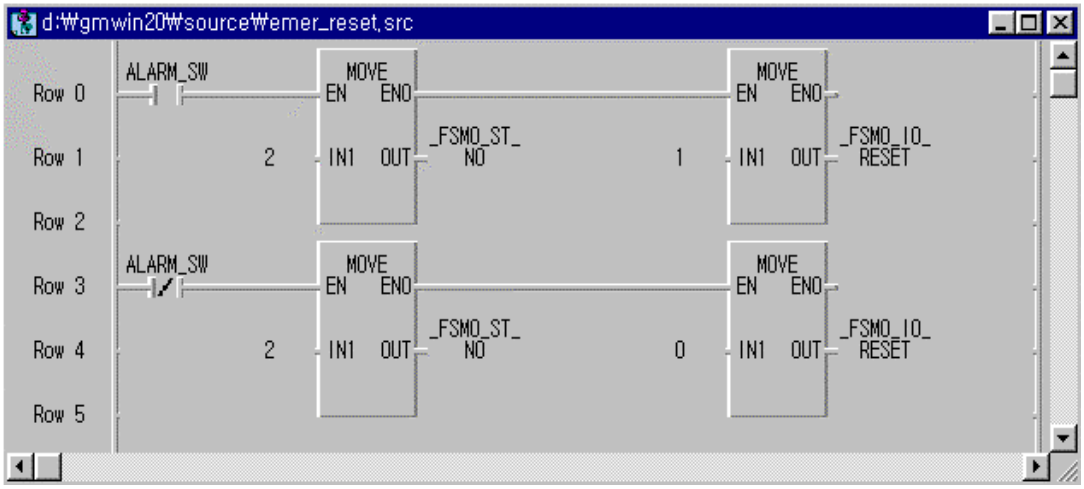


Fig. 6.6.4(B) Reset program of remote I/O output when emergency occurred

This is an example of program that clears digital output of remote I/O when emergency occurred. If user set ALARM_SW contact to 'On' in the figure, digital output of remote I/O can be cleared by entering remote I/O station number 2 into '_FSM0_ST_NO' flag and setting _FSM0_IO_RESET to '1'. At this time, '0' of _FSM0_ST_NO and _FSM0_IO_RESET means slot number which FMM is mounted, and output is cleared only in the FSM of station number specified by _FSM0_ST_NO. _FSM0_IO_RESET is level input, so output of remote I/O is cleared while it is set to '1', and remote I/O performs normal output when _FSM_IO_RESET is set to '0'.

In the figure, if the value of ALARM_SW is set to 'Off', _FSM0_IO_RESET is '0' and normal output is performed. Digital output of _FSM0_IO_RESET is cleared, but special is not cleared.

Remark

If user enters '255' into '_FSM0_ST_NO', outputs of all remote I/O connected in FMM are simultaneously set to 'Off'.

2) Application program of _FSMx_RESET flag

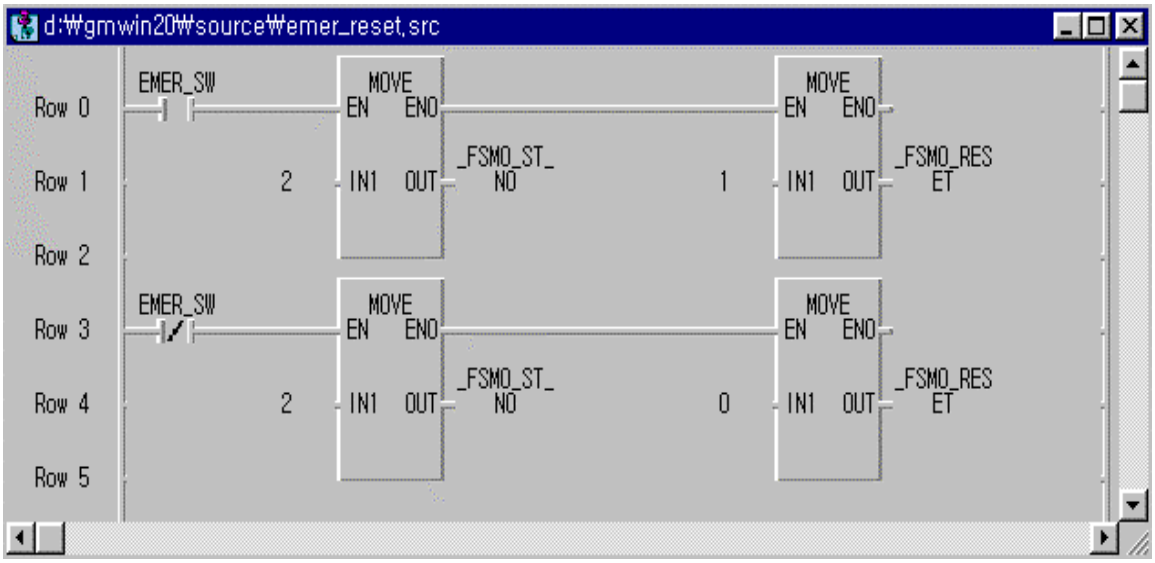


Fig. 6.6.4(C) Reset program of all output in appropriate remote station when emergency occurred

Fig. 6.6.4(C) is an example of program that simultaneously resets digital and special module output of remote I/O when EMER_SW contact of PLC CPU is set to 'On' in remote system of Fig. 6.6.4(A). To reset all I/O while it is set to 'On' as level input and to perform normal operation, special module initialization should be performed again using initialization *function block* of special module.
If _FSM_RESET is '1', only output is set to 'Off' and communication maintains normal operation.

Table 6.6.4 Remote I/O operation relation according to _FSMx_RESET/_FSMx_IO_RESET

Flag type	Communication service	Digital output	Special module output	Special module access
_FSMx_IO_RESET	Normal operation	Off	Normal output	Possible
_FSMx_RESET	Normal operation	Off	Reset	Impossible

6.6.5 Example of application program for restoring instant power off in the remote module

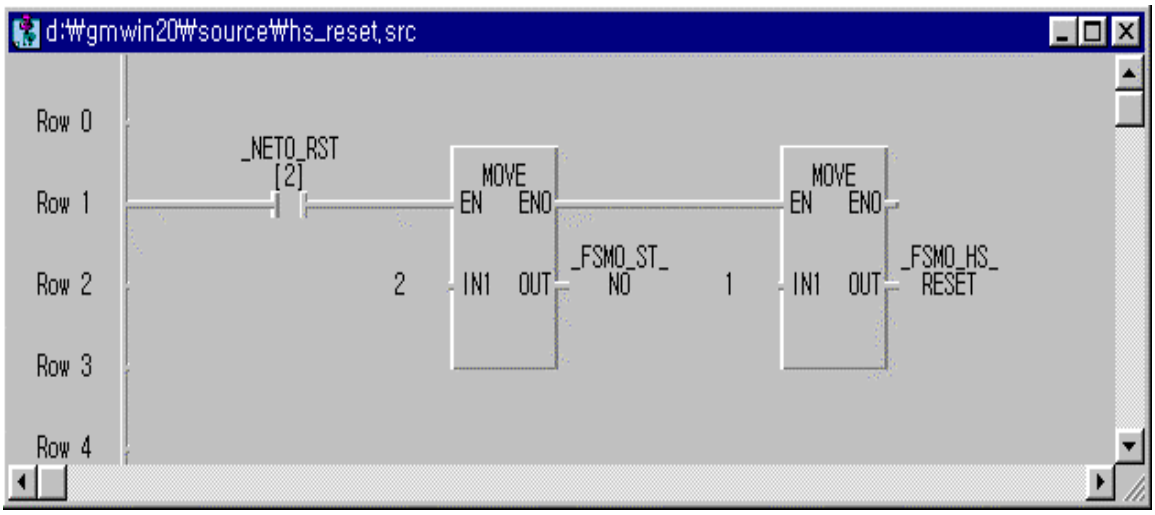


Fig. 6.6.5(A) Ex. of program using _FSMx_HS_RESET

Fig. 6.6.5(A) is an example of program that recovers *high speed link* flag to normal state when remote I/O station is recovered after power failure. In the figure, _NET0_RST[2] is a flag that is set to 'On' when power of station 2 becomes down and recovered during performing communication between communication module mounted in slot 0 and station 2 of other station(remote station). If power becomes down and recovered in remote station, _HS_MODE is set to 'Off' and link-trouble maintains 'On'. To clear this information, enter appropriate remote station into _FSM0_ST_NO, and set _FSM0_HS_RESET FLAG to 'On'. Then, _HS_MODE is set to '1' and link-trouble is set to 'Off'. If link-trouble maintains '1' after recovering power failure, this means that remote I/O has error, so user can handle it according to system configuration.

Remark

High speed link of remote I/O station performs normal operation even if link trouble is set to 'On'.

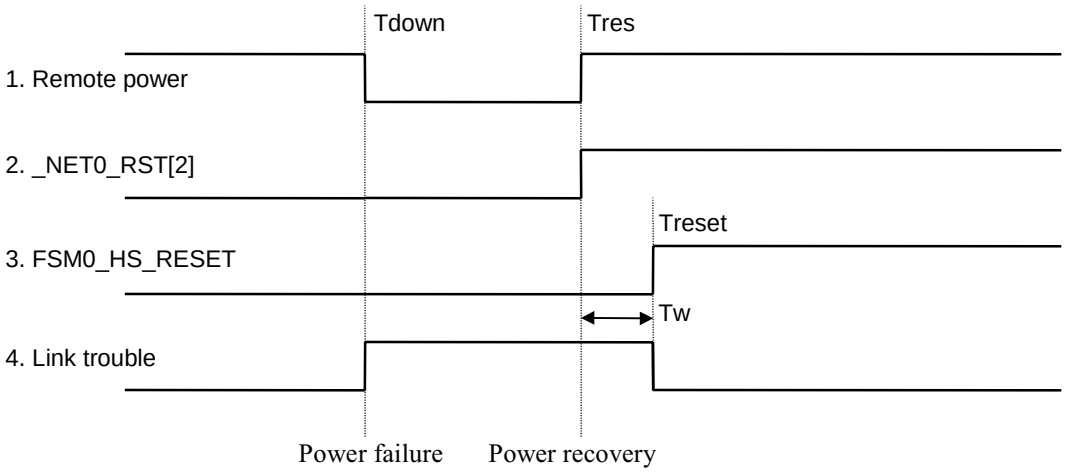


Fig. 6.6.5(B) Power recovery timing drawing of remote I/O

If power of remote station becomes down at the point of 'Tdown' in Fig. 6.6.5(B), link-trouble information is set to 'On' to indicate power error. This maintains '1' during the time of 'Tw' to indicate instantaneous power failure of remote station until user sets _FSM0_HS_RESET flag to '1' at 'Treset' even if power is recovered at 'Tres'.

6.6.6 Special module access by using _NETx_LIV[n] and _NETx_RST[n]

This explains how to control special module of remote I/O station using _NETx_LIV[n] and _NETx_RST[n] in remote system of Fig. 6.6.4(A).

Special module control of remote I/O has following differences between special module mounted in CPU.

1) Initialization *function block* is made through communication. Therefore, the program that retries until initialization is finished is needed, because initialization may not be made at a time by communication error and the others.

2) Power monitor program is needed, because initialization should be performed again when power of remote station becomes down and recovered during operation.

3) Rising input should be made, because read/write *function block* of special module is performed at rising edge of 'Request input'.

4) Program can be effectively performed if flag that monitors operation of other station is used, because communication may be impossible by power failure or communication cable dismounting of remote station.