

Chapter 6 Communication function

6.1 Programming method

In Fnet communication module, programming methods are divided into three :

– High speed link

High speed link is used when other station's data or information is exchanged in each given time and cyclically. Self or other station's data being in changing can be effectively used for operating system through cyclically referring, and the communication can be performed only through setting parameters.

For how to set, specify other station area and self area to be sent/received in parameter of KGLWIN, specify data size, speed, and station number, and then perform communication.

For data size, 1(16 points)~12,800 words for Mnet, and 1~3,840 words for Fnet can be communicated, and for communication cycle, 20ms~10sec. can be set according to communicating contents. Because simple parameter setting enables communication with other station, it is easy to use, and internal data processing is also high speed, thus many data can be cyclically processed at a time.

– Programming

High speed link is a cyclic communication, but the communication through function block is a service that communicates when special event occurs to perform communication with other station. It can be used when other station has error, which is sent to another station, or special contact is entered to communicate. For how to prepare programming, using function block according to data type previously created in KGLWIN program mode, specify the enable conditions, the module position in which communication module is mounted, station number, data area of self station, and other station area, and then prepare it.

– Simultaneous use of high speed link and programming

For some data, high speed link and program can be simultaneously used for program when the appropriate contents is sent if Tx/Rx of data are cyclically performed, and special event occurs.

Table 6.1 Difference between *high speed link* operation and operation through *function block*

Contents	<i>High speed link</i>	<i>Function block</i>
Basic unit of Tx/Rx data	1 word(16 points)	Available according to data type Ex.) Bit, Byte, Word...
Communication cycle	20ms~10sec.	Used whenever <i>function block</i> enable condition is started up.
Specifying station number	Used by setting station number of the front of communication module in parameter	Fnet uses the station number of the front of communication module, and Mnet uses MAC address.
How to operate	Parameter setting→downloading to PLC→ <i>high speed link</i> allowed→RUN	Compiling→downloading to PLC→RUN
Control through CPU operation mode key	Used if <i>high speed link</i> is allowed even in state that CPU module is RUN, STOP, and PAUSE.	Performs operation according to operation mode of CPU module.

6.2 High speed link

6.2.1 Introduction

High speed link is a communication service which transmits data by setting link parameter, and a high speed data transmitting service that can exchange data after setting size of Tx/Rx(Transmission and Receive) data, period of Tx/Rx, area of Tx/Rx, and area of storage with parameter using KGLWIN or KLD-150S. The function is as follows :

□ Function of high speed link block setting :

- 1) If there are many Tx/Rx areas, max. 64 blocks of each 32 of Tx/Rx can be set.
- 2) MASTER-K-Fnet can be set up to 60 word per block.
- 3) Max. link point can be used up to 3840 word in MASTER-K Fnet module.

□ Function of Tx/Rx period setting :

User can set the period of Tx/Rx according to each block, and period of Tx/Rx can be set from 20ms to 10sec according to the area that quick Tx/Rx is specially needed or not, so entire communication efficiency can be improved.

□ Function of Tx/Rx area setting :

Tx/Rx area can be set according to data block.

□ Function of high speed link information :

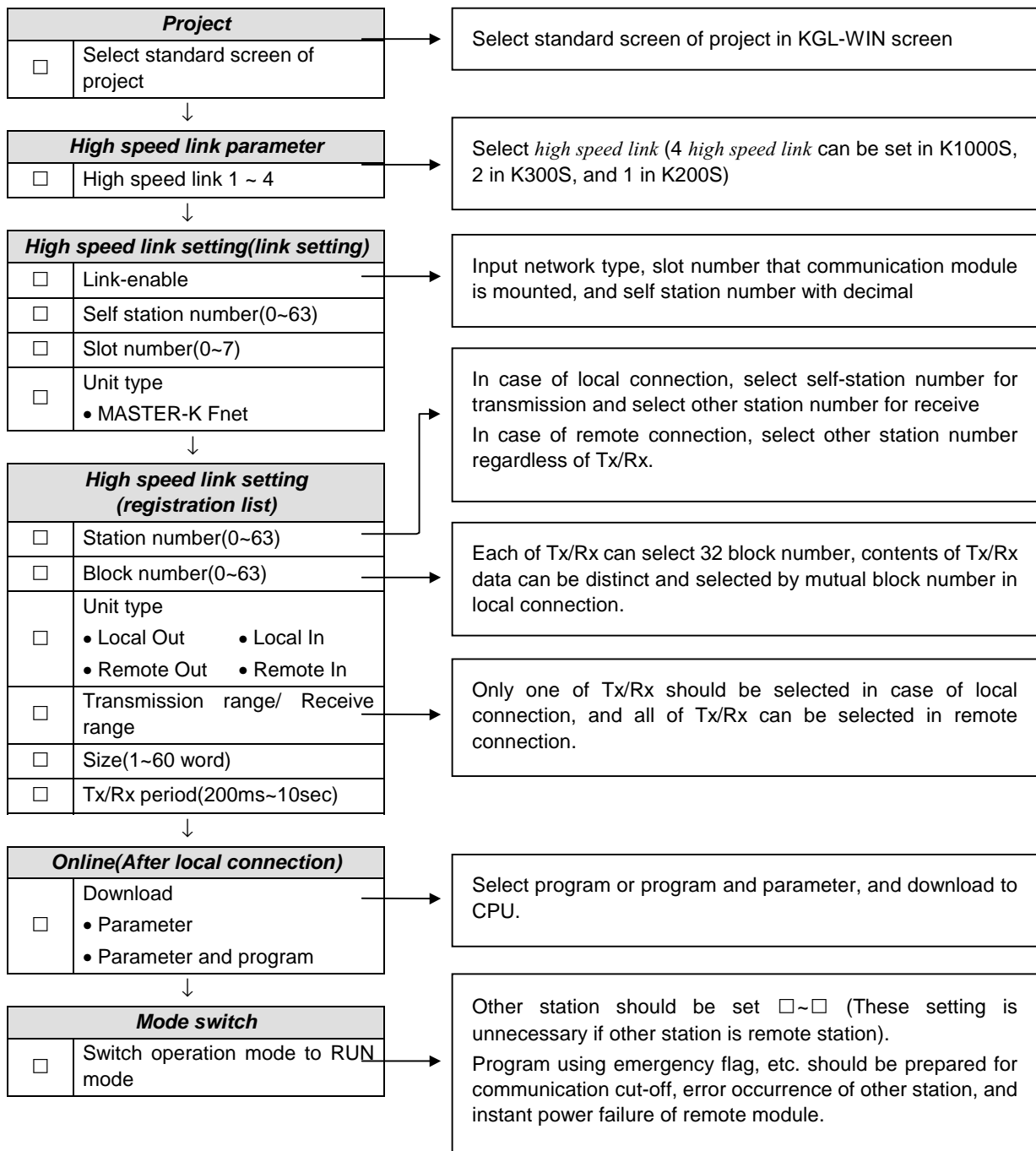
High speed link information is provided in special data register(D), so reliable communication system can be composed easily.

Table 6.2.1 shows *high speed link* point. Standard number of point for link is 1 word.

Table 6.2.1 Max. communication point according to device type

Item		Max. number of points for communication	Max. number of points for transmission	Max. number of blocks	Max. number of points per block	Remarks
Fnet communication module	K7F-FUEA/FUOA	3840 words	1920 words	64 blocks	60 words	Identical value for electric and optical
	K3L-RBEA/RBOA					
	K4F-FUEA					
	K4L-RBEA					
	K3F-FUEA					
	G0L-FUEA					

6.2.2 Setting sequence of *high speed link*



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6.1.3 Parameter setting of *high speed link*

Selecting link parameter in project screen of KGL can set *high speed link* parameter. Setting sequence and functions according to each item are as follows:

- (1) Preparing project of KGL

Fig. 6.1.1 is standard screen of project, and if user opens a project, it is displayed at the lower area of screen.

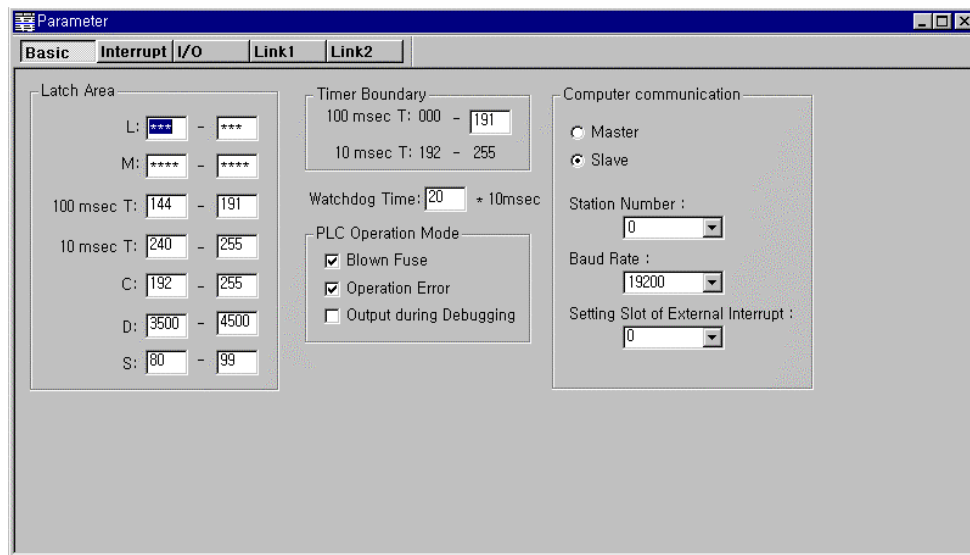


Fig. 6.1.1 Standard screen of KGL project(for K200S)

- (2) Standard setting of link parameter

If user selects Link Parameter or High Speed Link1 in standard screen of KGL project as Fig. 6.1.1, standard screen of Link Parameter as Fig. 6.1.2 is displayed.

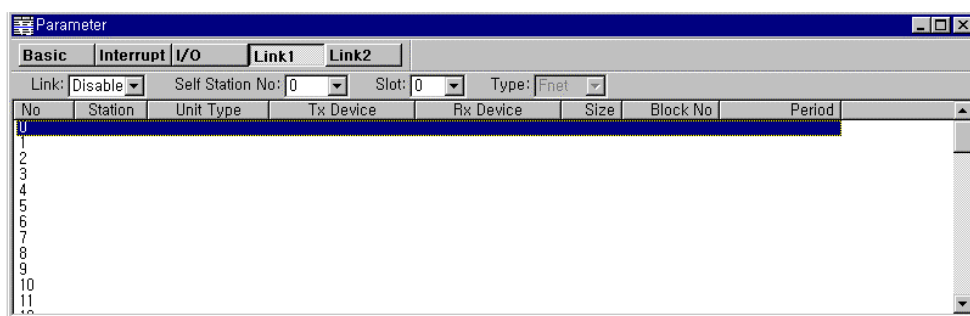


Fig. 6.1.2 Standard screen of link parameter

☐ **High speed link1 :**

This shows types of *high speed link* to modify, and max. 4 communication modules can be mounted in MASTER-K100S CPU, max. 2 can be mounted in MASTER-K300S, and 1 can be mounted in MASTER-K200S. High speed link number has nothing to do with slot number mounted, and only one *high speed link* parameter setting is possible for one communication module. Table 6.1.2 shows communication device type and max. number of mounting device according to MASTER-K CPU type.

Table 6.1.2 Mounting of communication module according to CPU type

Item	Communication module	Max. number of mounting devices	Remarks
MASTER-K100S	K7F-FUEA, K7F-FUOA	4	Each of communication module can be combined.
MASTER-K300S	K4F-FUEA	2	
MASTER-K200S	K3F-FUEA	2	

☐ **Link Enable :**

Sets link permission of communication module, it will be enabled if item of Enable [] is selected with [X].

☐ **Self Station Number :**

Self station number can be set from 0 to 63 by using the switch for station number setting located at front part of communication module, and self station number should not be duplicated because it is peculiar number which distinguishes communication module of the same network.

☐ **Slot No :**

Slot number that communication module is mounted. A number can be selected with the range of 0 to 7.

☐ **No(Registration number) :**

Registration number is the serial number which shows sequence of registration of each parameter, and it can be set up to max. 64 with the number from 0 to 63, and it has nothing to do with the sequence of Tx/Rx.

(3) Detailed settings of link parameters

If user selects No.1 of *high speed link* registration number as Fig. 6.1.2, and clicks in Modify button or presses Enter key, Link Parameter Modify or Insert screen is displayed as Fig. 6.1.3.

Fig. 6.1.3 Screen of Link Parameter Modify or Insert (for register No.1 of *high speed link* 1)

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□ Station No :

If user transmits data of setting item, self station number should be set, and if user receives them, other station number should be set. If the station type is slave, slave station number should be set for all of Tx/Rx. Setting method of station number is as Table 6.1.3.

Table 6.1.3 Setting method of station number

Unit Type	Station No	Station Range
Local Out	Self station number	0 ~ 63
Local In	Other(Local) station number	
Remote Out	Other(Remote) station number	
Remote In		

□ Block No :

This is set to transmit and receive many data of several area from one station, and distinguishes data of many block each other. Station number and block number configured from transmission station is transmitted with transmission data. Block number and station number should be set for all of Tx/Rx station. Because storing the data in Receive Area can be made if the block No. is the same with other station No. of High Speed link Receiving parameter. Transmission block number can be set up to 32 and receive block number also can be set up to 32 for one station, so max. of each Tx/Rx block number is limited to 32. In this time, the same block No. setting with same station No. is impossible.

□ Unit Type :

Types of other station or self station can be determined. If other station is slave, 'Remote Out' and 'Remote In' can be set. Setting of 'Remote Out' and 'Remote In' is impossible in Mnet system.

- Local Out : When data of self station is transmitted to other(local) station.
- Local In : When self station receives data of other(local) station.
- Remote Out : When data of self station is transmitted to remote slave module.
- Remote In : When self station receives data of remote slave module.

□ Tx/Rx Device Name :

Tx/Rx Device Name means transmission and receive area, see Table 6.2.4 for setting.

Table 6.1.4 Setting area according to station type

Unit Type	Mode	Available setting area	Remarks
Local Out	Tx	All area of P,M,L,K,F,D,T,C	Transmission area of self station
	Rx	Setting is unnecessary	
Local In	Tx	Setting is unnecessary	
	Rx	Area of P,M,L,K,D,T,C	Receive area of self station
Remote Out	Tx	All area of P,M,L,K,F,D,T,C	Transmission area of self station
	Rx	P area	Receive area of remote station
Remote In	Tx	P area	Transmission area of remote station
	Rx	Area of P,M,L,K,D,T,C	Receive area of self station

□ No :

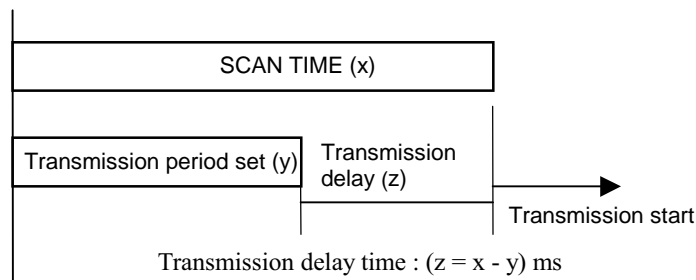
This means size of Tx/Rx data(unit is 1 word(16 points)), module type of Fnet system can be set up to 60 word and Mnet system can be set up to 200 word. If data size configured in receive mode is smaller than received data size, only the size of data configured in receive mode will be stored in storage area, so receive data can be selected according to the size of transmitted data.

□ Tx/Rx Period :

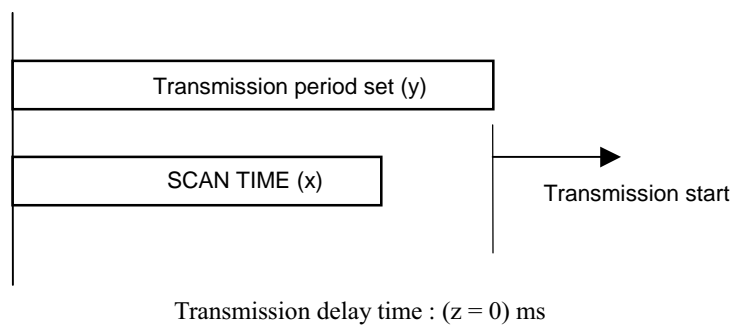
High speed link executes transmission and receive at that time when PLC program is finished by the parameter which user previously configured. If scan time of PLC program is short(within several ms), communication module transmits data according to program scan, and the increase of communication quantity with this causes reduction of communication efficiency. To prevent this, user can set communication period from 20ms to 10sec. Tx/Rx period means transmission period if selected block is set to transmission, and this means data receive checking period of selected block if it is set to receive. Transmission period determines data transmission period. For example, if transmission data is set to 200ms(standard value), it will be transmitted every 200ms. If scan time of PLC program is longer than transmission period previously set, it will be transmitted when program scan is finished, and transmission period will be the same as scan time of PLC program.

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Fig. 6.1.4 shows the relation between transmission period and scan time.



(a) Delay time of data transmission if scan of PLC program is longer than transmission period



(b) Delay time of data transmission if scan of PLC program is shorter than transmission period

Fig 6.1.4 Scan of PLC program and transmission period

In case of data reception, it should be checked whether data of selected block is received exactly according to setting time, and RUN_LINK and LINK_TROUBLE contact can be made by setting selected TRX_MODE flag to 'On' when the data is received, and setting it to 'Off' when the data is not received. When user sets receive period, user must set bigger value than transmission period of other station to check whether transmission is normal.

6.1.4 Operation of high speed link

If user executes parameter download, after setting high speed link parameter and choosing OK, service of high speed link is started. At this time, selected link for standard screen of link parameter as shown Fig. 6.1.2 should be set to 'Enable'. Fig. 6.1.5 is screen of parameter download, and if user selects On-line menu and selects Download as shown in Fig. 6.1.2, Fig. 6.1.5 is displayed.

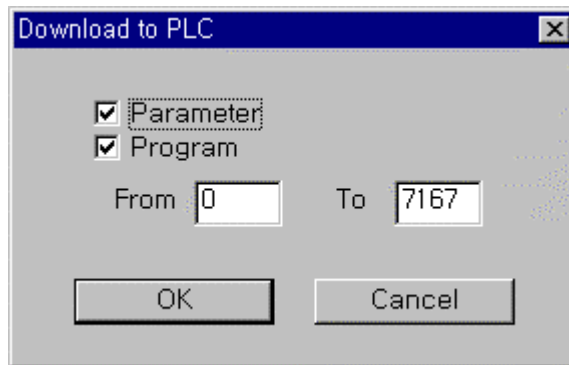


Fig. 6.1.5 Screen of parameter download

Like program, Download of high speed parameter is possible only if PLC is STOP mode. If *high speed link* is set to enable, it executes *high speed link* regardless of PLC operation mode. Battery is backed up in PLC CPU, and parameter and information of link-enable is preserved even if the power is cut off.

Operation relationship between PLC mode and *high speed link* is explained in Table 6.1.5.

Table 6.1.5 Relation between PLC mode and *high speed link*

Mode	Parameter download	Operation of <i>high speed link</i>	Remarks
RUN	X	O	If <i>high speed link</i> is allowed, <i>high speed link</i> will be operated regard less of PLC mode.
STOP	O	O	
PAUSE	X	O	
DEBUG	X	O	

6.1.5 Information of *high speed link*

(1) Function of *high speed link* information

High speed link exchanges data among communication station of two or more. To confirm the reliability of data read from other station, it provides user with the information, which can check the state of *high speed link* service. Namely, there are entire information of RUN_LINK and LINK_TROUBLE, and individual information of HS_STATE, TRX_MODE, DEVICE_MODE, and DEV_ERROR, which shows communication state according to 64 registered item of in parameter. User can use device(see communication flag list of appendix) corresponding to the key word used in preparing program, monitor the state of *high speed link* using information monitor function of *high speed link*. Interlock operation with many PLC using *high speed link* should be performed, after confirming reliability of Tx/Rx data using *high speed link* by *high speed link* information like Run-Link, Link-Trouble.

Functions and definition of *high speed link* information are as Table 6.1.6.

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Table 6.1.6 High speed link information

Segment	RUN_LINK	LINK-TROUBLE	Tx/Rx status (TRX_MODE)	Operation mode (DEV_MODE)	Error (DEV_ERROR)	High speed link status (HS_STATE)
Type of information	Entire information	Entire information	Individual information	Individual information	Individual information	Individual information
KEYWORD (=number of parameter, 1~4)	_HS□ RLINK	_HS□ LTRBL	_HS□TRX[n] (n=0..63)	_HS□MOD[n] (n=0..63)	_HS□ERR[n] (n=0..63)	_HS□ STATE[n] (n=0..63)
Monitor	Available					
Use of program						

(a) RUN_LINK(_HS□RLINK)

This is entire information indicates whether *high speed link* is made using parameter configured by user. This parameter can be set to 'On', if link-enable is 'On' and registered list setting of parameter is set to normal and all data which are appropriate to registered list setting of parameter are transmitted and received according to Tx/Rx period setting and the state of all other station's parameter setting is RUN and there is no error simultaneously. This is entire information contact, and if this is set to 'On' once, maintains 'On' until link-enable is set to 'Off'.



(a) Configuration of *high speed link* system

Station 1	Station 2	Station 3	Station 4	Station 5
Transmission : 2 word Receive : 2 word (Station No. 2) Receive : 2 word (Station No. 2)	Transmission : 2 word Receive : 2 word (Station No. 1) Receive : 2 word (Station No. 4)	Transmission : 2 word Receive : 2 word (Station No. 1) Receive : 2 word (Station No. 5)	Transmission : 2 word	Transmission : 2 word

(b) Example of *high speed link* parameter setting

Fig. 6.1.6 Condition of RUN_LINK On

Fig. 6.1.6 shows configuration of *high speed link* system to explain the conditions that RUN_LINK set to 'On'. It is explained considering that 5 station communication Module is connected with network as Fig.(a) and *high speed link* is made with the parameter set as Fig.(b).

In this system, the conditions that RUN_LINK of station 1 turns 'On' are as follows :

- ☐ Link-enable of self station(station 1) is 'On'
- ☐ State of self station(station 1) is RUN
- ☐ Self station(station 1) has no error
- ☐ Data configured with transmission parameter of self station(station 1) are transmitted according to transmission period.
- ☐ Receive data of station 2 or 3 are received according to receive period
- ☐ Operation mode of other station(station 2 or 3) which receives from self station(station 1) is RUN mode and has no error, and transmits and receives according to Tx/Rx period
- ☐ State of all station is RUN, data block is communicated normally, and the parameter configured in each station itself is communicated normally

If above 7 items are contented, RUN_LINK of station 1 is set to 'On'. If many PLC performs interlock operation through *high speed link*, user can verify reliability using RUN_LINK contact. Once RUN_LINK contact is set to 'On', it maintains the state until link-enable is set to 'Off'. User can use LINK_TROUBLE information contact for abnormal state monitoring like communication error.

(b) LINK_TROUBLE(_HS□LTRBL)

If RUN_LINK is 'On' and the case that doesn't comply with the condition of RUN_LINK to be 'On' is occurred, LINK_TROUBLE is set to 'On', and if the condition is removed, it is set to 'Off'.

(c) State of Tx/Rx(_TRX□STATE[0..63])

If Tx/Rx operation for registered item is performed exactly according to Tx/Rx period, appropriate bit is set to 'On' and if Tx/Rx operation for registered item is not performed according to Tx/Rx period, appropriate bit is set to 'Off'.

(d) Operation mode(_HS□MODE[0..63])

This mode shows operation mode information of max.64 according to registered list. If the station configured in registered items is RUN mode, appropriate bit is set to 'On'. In STOP/PAUSE/DEBUG mode, appropriate bit is set to 'Off'.

(e) Error(_HS□ERR[0..63])

This mode shows error mode information of max.64 according to registered list. Error shows overall situation that PLC can't operate user program normally. Other station performs normal operation if this is set to 'Off', and other station performs abnormal operation if this is set to 'On'.

(f) State of *high speed link*(_HS□STATE[0..63])

This shows overall information for registered list by overall of individual item information. Namely, This is set to 'On' if Tx/Rx state of selected list is normal, operation mode is RUN, and has no error. This is set to 'Off' if Tx/Rx state of selected list doesn't comply with above items.

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Remark

Among keyword name used in items of (a)~(f)

☐ : Shows number of *high speed link* used in parameter setting(If communication module is 1 unit, 1 is normally used).

[0..63] : Shows registered number of individual parameter(This can be used to monitor communication state according to each parameter of 0~63 or this can be used in program).

(2) Information monitor of *high speed link*

High speed link information can be monitored using Monitoring Window and Read Information menu after online connection of KGL. There are two monitoring method. First, selects flag to monitor from Flag Monitor menu of Monitoring Window and monitors individual or entire information. Second, selects *High speed link* parameter menu of Read information and monitors entire information.

(a) Flag Monitor

With this function, user can monitor by choosing flag using appropriate Flag Monitor menu of KGL. If user selects Flag Monitor in Monitoring Window of On-line menu, Flag Monitor screen is displayed as Fig. 6.1.7, and if user presses Enter key, Register Flag screen is displayed. User can register flag by choosing appropriate high speed information flag from Register Flag screen. See flag list of appendix for flag information. If user registers in Fig. 6.1.7, monitoring is started in Flag Monitor screen as Fig. 6.1.8. If monitoring is not performed, check if monitoring is on.

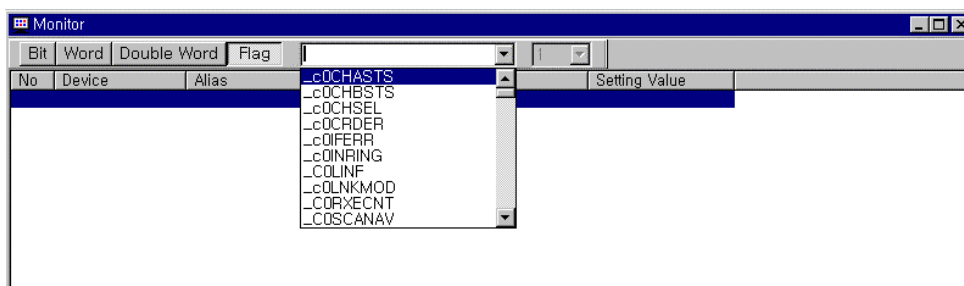


Fig. 6.1.7 Flag Monitor screen and Register Flag screen

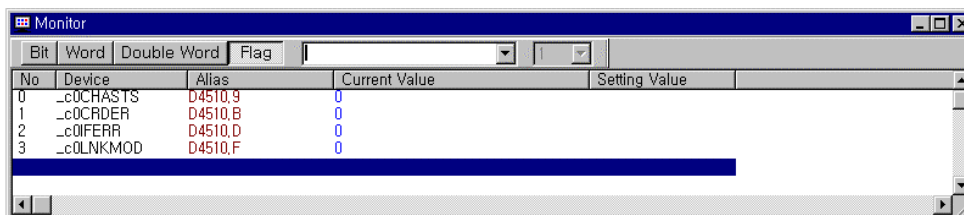
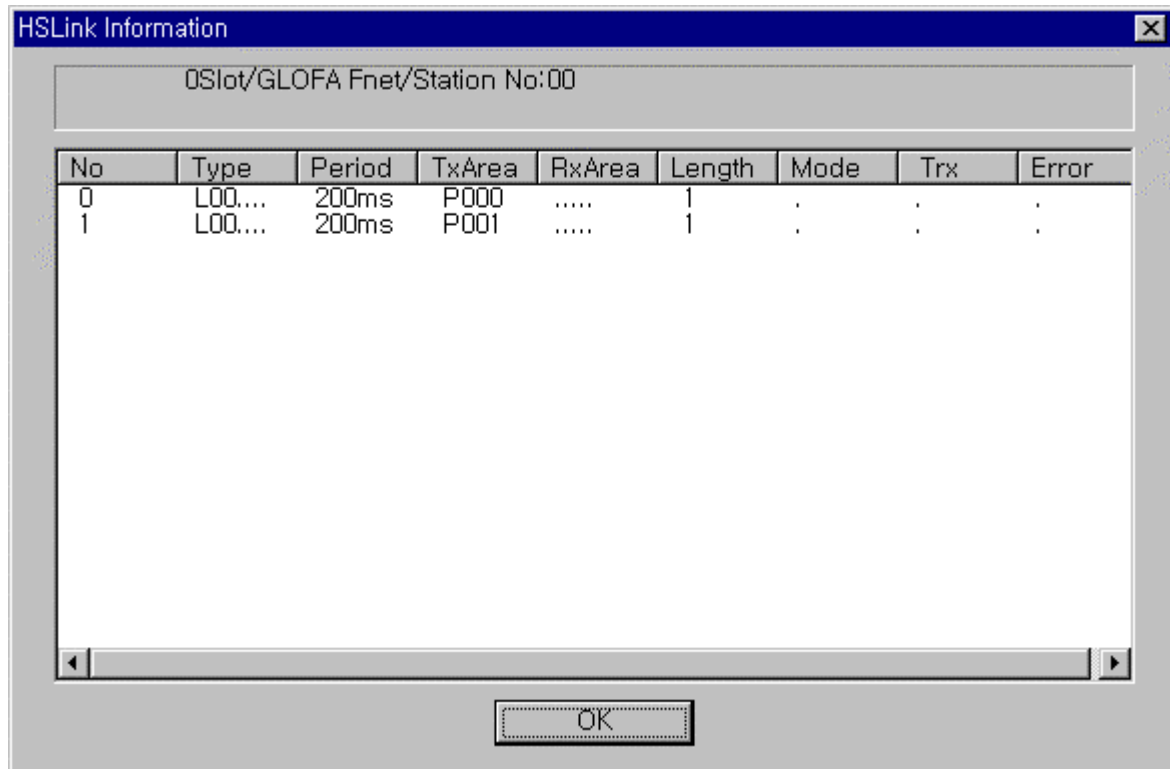


Fig. 6.1.8 Flag Monitor screen(the state that flag is registered)

(b) Monitor in Read Information

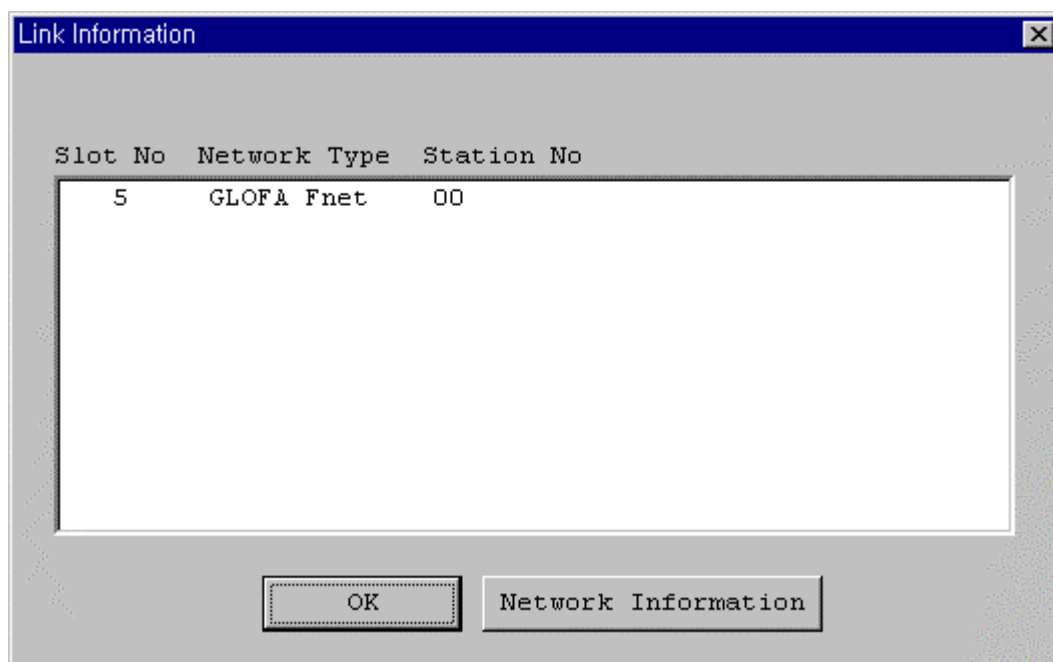
If user selects High speed link parameter in Read Information of On-line menu, detailed information for *high speed link* parameter is shown in Fig. 6.1.9. L00.S00 of type item means local 00 station and send 00 block, data(P1) of self station is transmitted to local station of station number 0 through No.0 block. L01.R01 means local 01 station and receive 01 block, transmission data of local station which is number 1 is received in P2.



No	Type	Period	TxArea	RxArea	Length	Mode	Trx	Error
0	L00....	200ms	P000	1	:	:	:
1	L00....	200ms	P001	1	:	:	:

Fig. 6.1.9 High Speed Link Parameter

(c) Monitoring 'link information' in read information menu.



Slot No	Network Type	Station No
5	GLOFA Fnet	00

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6.1.6 Speed calculation of *high speed link*

(1) Introduction

Transmission speed of *high speed link* data can be determined by many factors. Because one data block of a station is stored in receive area of other station through the path as Fig. 6.1.10.

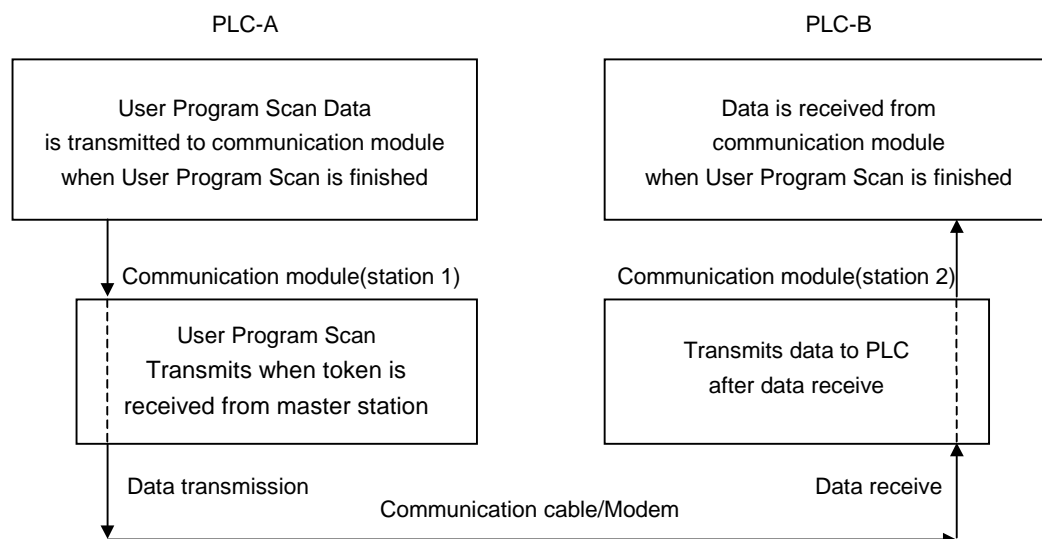


Fig. 6.1.10 Data transmission path through communication module

Three paths should be passed to transmit data to other station through communication as Fig. 6.1.10, and transmission time is determined by the time taken according to each path. Main path of data transmission and the elements which affect the time taken according to each path are as Table 6.1.7.

Table 6.1.7 Data transmission path and time elements

Path	Time affecting elements
PLC CPU(A) → Com. module(station 1)	Scan time of PLC-A program
Comm. module(station 1) → Com. module(station 2)	Scan time of comm. + Scan time of comm. O/S
Comm. module(station 2) → PLC CPU(B)	Scan time of PLC-B program

Data from PLC CPU to communication module or from communication module to PLC CPU is transmitted when PLC user program is finished. Therefore, scan time of PLC user program is main element of data transmission, and if user selects PLC information of KGL On-line menu, user can know max./min./current scan time of program. Communication module should obtain communication right, namely, token to transmit data of itself, and this is determined according to token rotation time.

Fig. 6.1.11 shows transmission point according to the scan time of PLC program and communication.

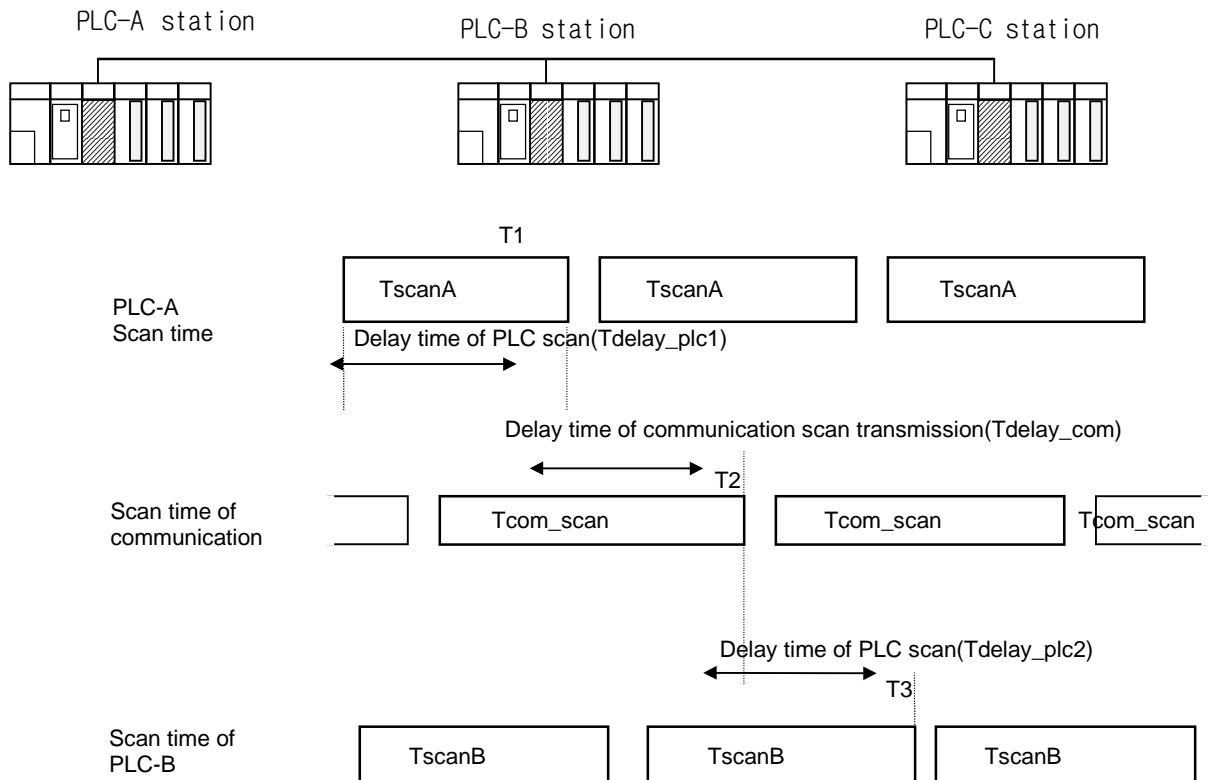


Fig. 6.1.11 Relation between PLC and communication in scan time

In Fig. 6.1.11, PLC-A station transmits data from T1 to communication module when program of PLC-A station finishes, so the time according to T_{delay_plc1} is delayed. Communication module receives data from PLC, waits during delay time of communication scan (T_{delay_com}), and transmits data, max. delay time is T_{com_scan} 1. Communication module, also in PLC-B, transmits receive data to PLC after waiting for the time of T_{delay_plc2} , so max. delay time is T_{scanB} 2. Delay time of communication is determined according to many factors, i.e. entire number of communication station, program size, and O/S scan time of communication module.

(2) Speed calculation method of *high speed link*

High speed link is max. time that data of one block is transmitted from PLC-A to PLC-B. Speed of *high speed link* is calculated with two different cases. One is applied to complex system that number of station is 10 or more and number of data exceeds 512 byte, and the other is applied to simple system. The calculation is as follows :

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(a) Simple system

In a simple system that the number of entire communication station is less than 10 and the size of transmission data is below 512 byte, speed of *high speed link* is calculated with a simple equation as Equation 6-1.

$$St = P_scanA + C_scan + P_scanB \dots\dots\dots \text{Equation 6.1}$$

St = max. transmission time of *high speed link*

P_scanA = max. program scan time of PLC A

P_scanB = max. program scan time of PLC B

C_scan = max. communication scan time

$$Cscan = Th \times Sn \dots\dots\dots \text{Equation 6.2}$$

Th = Token hold time : token using time per 1 station

Sn = Total station number

(b) Complex system

In a complex system that the number of entire communication station is 10 or more and the size of transmission data is 512 byte or more, speed of *high speed link* is calculated as Equation 6-3.

$$St = Et \times To \times Ntx + Mf \dots\dots\dots \text{Equation 6.3}$$

Et = Effective Tx ratio

To = Octel time(transmission time of one byte)

Ntx = Total Tx number

Mf = Margin factor, and each item is determined as follows :

$$\square Et = St \times Nf \dots\dots\dots \text{Equation 6.4}$$

St = total number of communication station

Nf = Network factor, constant value according to characteristic of communication system

Fnet system : 1.5, Mnet system : 1.2

- ☐ To = Octel time, time taken in transmitting one byte data as a serial data,
and this is determined as follows :

Fnet : 8 us, Mnet : 1.6 us

- ☐ Ntx = Number of total receive data including number of variable service,
and this is determined as follows by Fnet system and Mnet system :

– Fnet : Sum of transmission byte number of *high speed link* + Number of variable f/b \times 256

– Mnet : Sum of transmission byte number of *high speed link* + Number of variable f/b \times 1024

- ☐ Mf = Margin factor for elements which don't be expressed with above expressions, like O/S scan time of communication module, etc., and this is determined as follows :

– Fnet : 16ms, Mnet : 50ms

6.1.7 Ex. 1) : High speed link between PLCs of Fnet

This explains setting method of *high speed link* parameter for data communication with I/O structure as Fig. 6.1.6, in master system of MASTER-K Fnet as Fig. 5.2.2.

Table 6.1.6 I/O configuration and Tx/Rx flow

Tx/Rx structure		I/O configuration	Transmission area	Receive area
K1000S (station 0)	TX : → K1000S(station 1)	Slot 0 : Master Slot 1 : OUT 32 points Slot 2 : IN 32 points	P3, P4	-
	RX : ← K1000S(station 2)		-	D0100
K1000S (station 1)	TX : → K1000S(station 2)		P3, P4	-
	RX : ← K1000S(station 0)		-	D0100
K1000S (station 2)	TX : → K1000S(station 0)		P3, P4	-
	RX : ← K1000S(station 1)		-	D0100

All K1000S CPUs transmits input value of input module in self slot 2 with 2 word, saves receive data from other station at D0100 and D0101, and outputs it output module(P1, P2) of slot 1. Configuration and program of *high speed link* parameter for these data exchange is explained in Fig. 6.1.15 and Fig. 6.1.16. The same program can be used in each of them, but link parameter should be set differently(In Fnet communication of K300S, the same program and parameter can be used. With K200S, the address of D area should be changed).

(a) Preparing user program

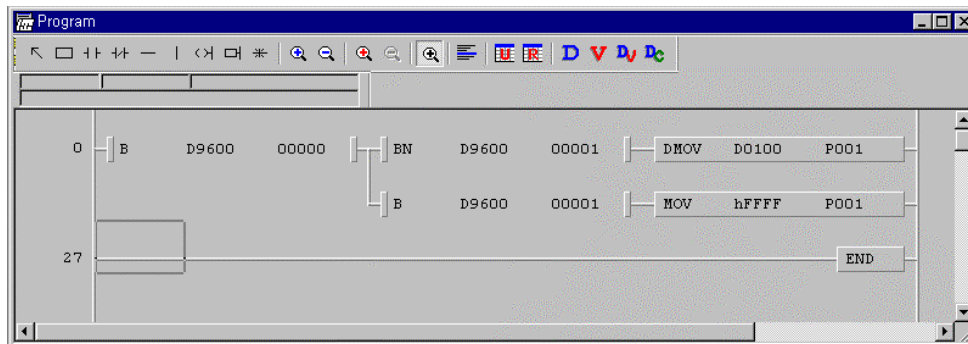


Fig. 6.1.15 User program of Ex.1

Fig. 6.1.15 is user program of Ex.1. If *high speed link* is normal(RUN_LINK=1, LINK_TROUBLE=0), it outputs receive data, D0100 and D0101, to output module of P001and P002. If *high speed link* is abnormal(LINK_TREBLE=1), it outputs emergency data, value of hFFFF, to P001. See *high speed link* information of 6.1.6 for link information(RUN_LINK, LINK_TROUBLE).

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(b) Parameter setting of *high speed link*

To exchange data of station 1, 2, and 3 as Table 6.1.6 in a system as Fig. 5.2.2, user should prepare user program as Fig. 6.1.15 and data Tx/Rx map as Table 6.1.6. For data Tx/Rx as Table, user should make parameter of *high speed link* and download PLC. Operation of *high speed link* is made as following sequence :

- 1) Assign station number and connect communication cable
- 2) Prepare user program(for each station)
- 3) Prepare data Tx/Rx map
- 4) Set parameter in the item for parameter setting of *high speed link* of KGL
- 5) Execute download of program and parameter in On-line menu
- 6) Change mode to RUN in On-line menu
- 7) Check the state of *high speed link* through flag monitor
- 8) Execute these procedure again from No. 1) if error occurred

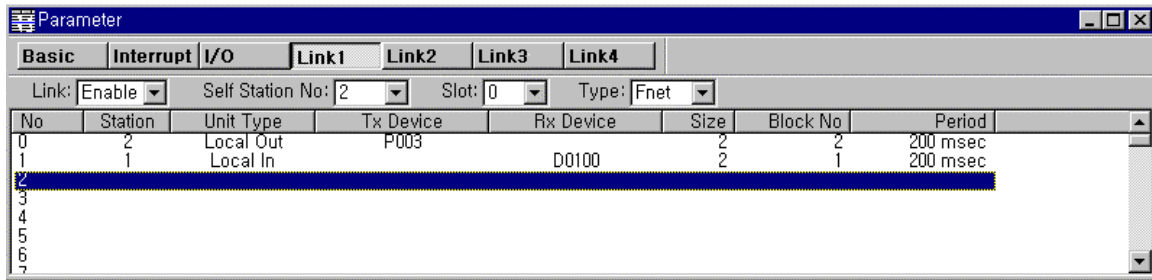
Parameter setting of *high speed link* for the system of Ex. 1 is as follows :

No	Station	Unit Type	Tx Device	Rx Device	Size	Block No	Period
0	0	Local Out	P001		2	1	200 msec
1	2	Local In		D0100	2	2	200 msec

(A) High speed link parameter of K1000S(station 0)

No	Station	Unit Type	Tx Device	Rx Device	Size	Block No	Period
0	1	Local Out	P003		2	1	200 msec
1	0	Local In		D0100	2	0	200 msec

(B) High speed link parameter of K1000S(station 1)



(C) High speed link parameter of K1000S(station 2)

Fig. 6.1.16 Example of link parameter setting

(c) Speed determination method of *high speed link*

The system of Ex. 1 is simple system that communication module transmits and receives 2 word data per each station. Therefore, Tx/Rx period setting of link parameter can be easily calculated using speed calculation expression of simple system in speed calculation method of 6.1.5.

Namely, in equation $St = P_scanA + C_scan + P_scanB$

St = max. transmission time of *high speed link*

P_scanA = max. program scan time of plc A

P_scanB = max. program scan time of plc B

C_scan = max. communication scan time,

P_scanA and P_scanB are scan time of K1000S PLC, and each of them in above program is 5ms(user can check this through PLC information of KGL).

$$Cscan = Th \times Sn$$

(Th = Token hold time : token using time per 1 station

Sn = Total station number)

$$= 8ms \times 3$$

$$= 24ms$$

$$St = P_scanA(=5ms) + P_scanB(=5ms) + Cscan(24ms) = 34ms$$

Therefore, Tx/Rx period should be set 34ms or more.

6. Communication Function

6.1.9 Ex. 3) : High speed link between master + slave + single remote I/O stations of Fnet

(a) System configuration

Fig. 6.1.18 explains parameter setting method for *high speed link* communication, which connects slave with single remote I/O through master of network-A/B PLC in slave class system of MASTER-K Fnet.

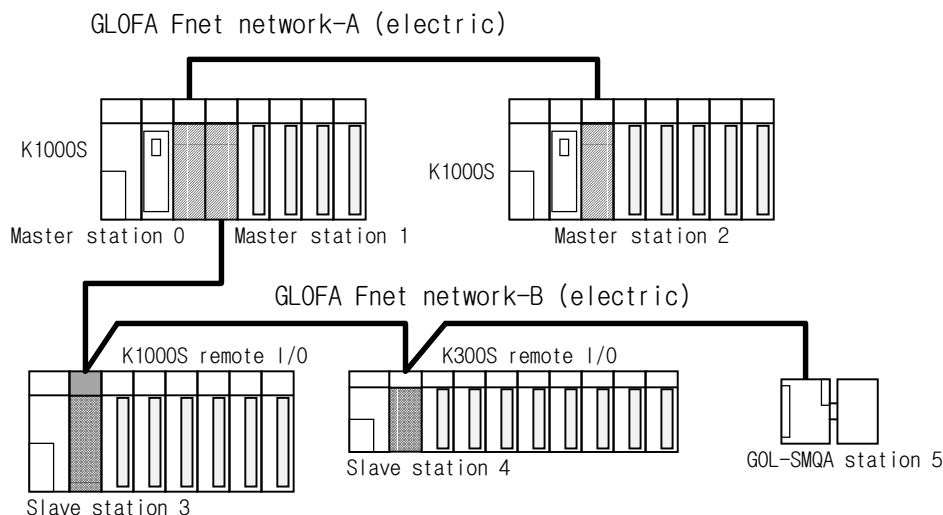


Fig. 6.1.18 Combined class system of MASTER-K Fnet master/slave

In this figure, network A is master class network, which configured with 2 master station. Network B is slave network which configured by master, slave, and single remote I/O. In the figure, master station 0 and 1 are master communication module of network-A, and they transmit receive data of master station 1 from K1000S-CPU(master station 0) to K1000S-CPU(master station 2). Master station 1 is master station of network-B, slave station 3 and 4, and single remote station 5, this controls I/O value of station 3, 4, and 5 through master station setting(master station 1). To do this, station 1 should be previously set to master station using dip switch in slave station 3 and 4, and single remote station 5. Setting of master station should be done previously before power on, and the station operates with the setting of power-on even if user change master station after power is on.

Table 6.1.8 explains station number assignment, I/O configuration, and mutual relation of data communication between two stations in system.

Table 6.1.8 I/O configuration and Tx/Rx flow

PLC type	I/O configuration	Tx/Rx relation of Local/Remote	Transmission area	Receive area
K1000S CPU	Slot 0:master(station 0) → network A Slot 1: master(station 1) → network B	Local transmission : master(station 2) Remote Tx/Rx : slave 3(station 3) Remote Tx/Rx : slave 4(station 4) Remote transmission : stand-alone remote(station 5)	D1000 D1100 D0000 D0010 D0200	D1000 D1100
K1000S CPU	Slot 0:master(station 2) → network A	Local receive : master(station 0)		D0000
K1000S slave	Slot 0:OUT 32 points Slot 1:IN 32points	Local : K1000S(station 1)	P0, P1	P2, P3
K300S slave	Slot 0:OUT 16 points Slot 1:IN 16 points	Local : K1000S(station 1)	P0, P1	P2, P3
Single Remote	OUT 16 points	Local : K1000S(station 1)	P0, P1	

(b) Preparation of program and *high speed link* parameter

In Fig. 6.1.18, station 1 is master station, and this uses slave station 3, 4, and 5 as remote I/O. This station transmits self-station data of D0000, D0100, and D0200 area to P0 and P1 area of K1000S-slave, K300S-slave, and single remote I/O. This station receives data of P2 and P3 area of K1000S-slave and K300S-slave into D1000 and D1100 area, and transmits this data to master station 2 of K1000S-CPU through network A. To do this, station 1 should be set to master station in K1000S-slave, K300S-slave, and single remote I/O. This sets master station of remote I/O station, and remote station receives data of master station only which is set in self-station and transmits data of self-station to master station. After setting master station, parameter setting is needless in remote station, and *high speed link* operates according to parameter setting of master station (K1000S-CPU station 1). After setting parameter of each of network A and B as Fig. 6/1/19, download it to CPU, verify whether data in transmission area of K1000S is outputted to remote station and input value of slave station is received into receive area of K1000S. Verify the state of *high speed link* by monitoring RUN_LINK, LINK_TROUBLE (_HS0RLINK, _HS0LTRBL) through flag monitor in On-line menu.

Fig. 6.1.19 is example of link parameter setting according to each station of Ex. 3.

6. Communication Function

No	Station	Unit Type	Tx Device	Rx Device	Size	Block No	Period
0	0	Local Out	D1000		2	0	200 msec
1	0	Local Out	D1100		2	1	200 msec
2							
3							
4							
5							
6							
7							

(a) High speed link parameter of master station 0 in network A

No	Station	Unit Type	Tx Device	Rx Device	Size	Block No	Period
0	0	Local In		D0000	2	0	200 msec
1	0	Local In		D0100	2	1	200 msec
2							
3							
4							
5							
6							
7							

(b) High speed link parameter of master station 2 in network A

No	Station	Unit Type	Tx Device	Rx Device	Size	Block No	Period
0	3	Remote Out	D0000	P000	2	0	200 msec
1	3	Remote In	P002	D1000	2	1	200 msec
2	4	Remote Out	D0100	P000	2	0	200 msec
3	4	Remote In	P002	D1100	2	1	200 msec
4	5	Remote Out	D0200	P000	2	0	200 msec
5							
6							
7							
8							
9							
10							

(c) High speed link parameter of master station 3 in network A

Fig. 6.1.19 Example of parameter setting

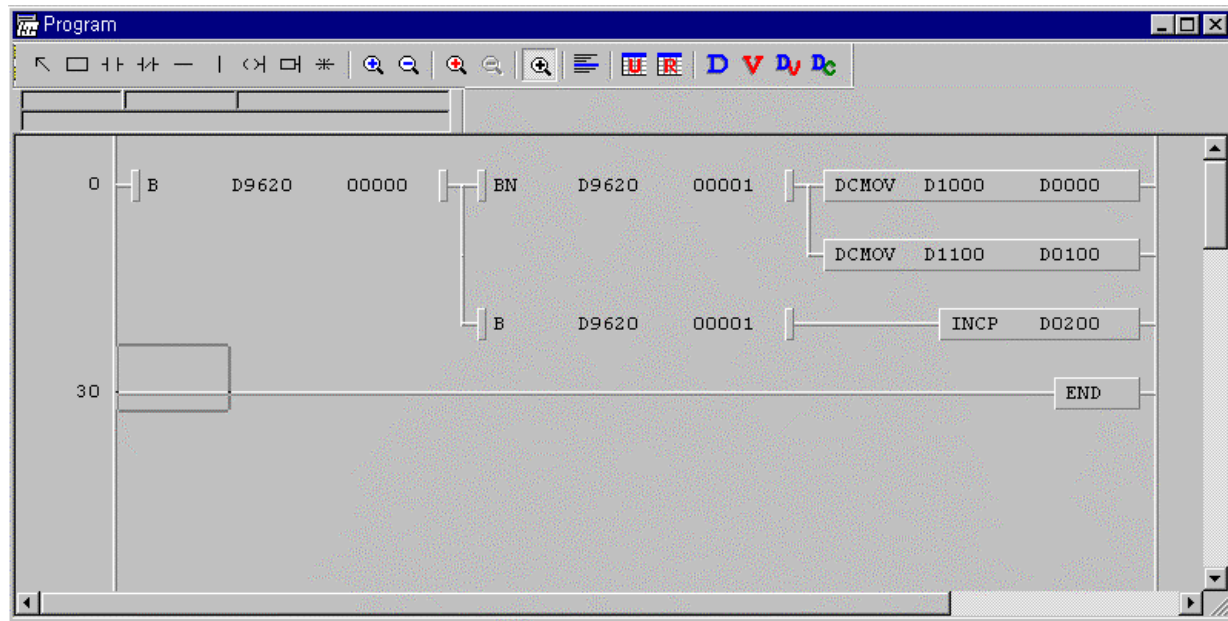


Fig. 6.1.20 Slave Tx/Rx program

Fig. 6.1.20 is K1000S PLC(Master 0 section) program of example 3. In normal operating, it converts input value received at slave 3 and slave 4, sends back them to output area of slave 3 and slave 4, counts error occurring frequency and stores it at D0200 area by monitoring link trouble contact point, sends it to the output area of slave 5. Run-link and link trouble contact point should use the value of high-speed link 2, and monitoring the status of high-speed link and identifying data reliability of the other part should use these two informations.

(c) Preparation of restarting program when slave power failure occurred

Fig. 6.1.21 is restarting program when power failure of slave station 3 occurred. Slave doesn't have self-program area, and Tx/Rx parameter is automatically set by hardware.

6. Communication Function

Therefore, when the power is cut off and recovered instantaneously in slave, slave monitors RUN_LINK information of mother station. If RUN_LINK is 'On', slave doesn't perform I/O refresh and stands by with the state of which waiting reset command of master station, and output module of slave maintains reset state. This is a function to prevent instantaneous output failure of system, which caused by instantaneous power failure of slave during interlocking operation of network. Slave restarts *high speed link* at that time when master station resets corresponding station using _FSMn_RESET flag as Fig. 6.1.21 in case of power failure.

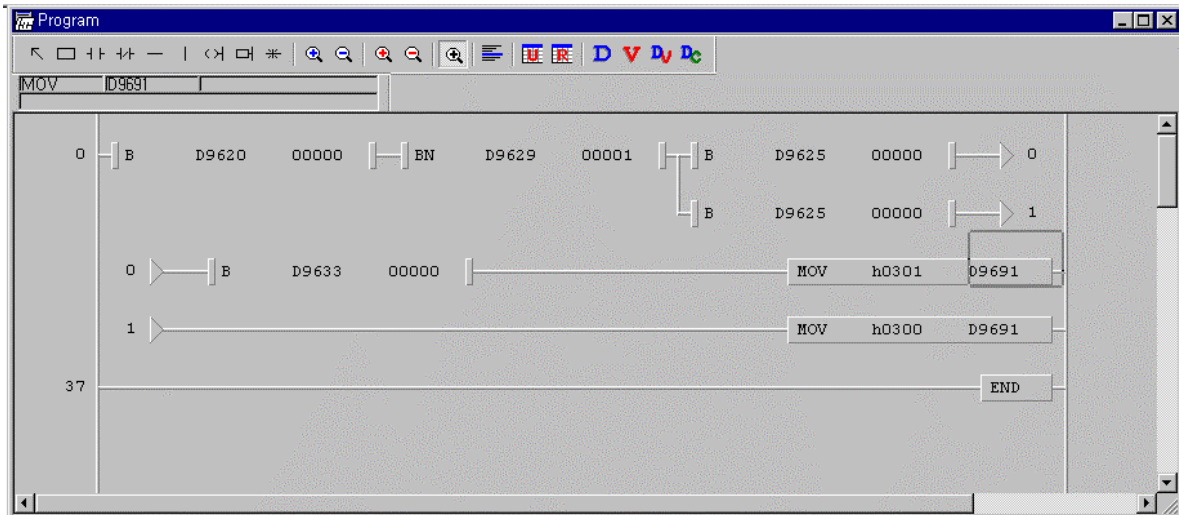


Fig. 6.1.21 SLAVE3 POWER OFF START PROGRAM

In the figure, _FSMn_ST_NO is number of slave, and _FSMn_RESET resets corresponding station. If this is '1', corresponding station is reset, and if this is '0', the station is restored to normal operation. Here, 'n' is slot number that master station is mounted, and this can be set from 0 to 7. This is reset program of slave 3, if RUN_LINK is '1', _HS2TRX is '1', and _HS2MODE and _HS2ERR are '0', this means that power of slave is cut off and recovered. Therefore, slave 3 is moved to _FSM1_ST_NO, and slave station is reset by setting _FSM1_RESET to '1'. If _HS2MODE and _HS2TRX are '1', slave station is recovered by setting _FSM1_RESET to '0'. Array values of *high speed link* individual information(values in []) should be identical with parameter registration number of corresponding slave. If many numbers are registered, user can select one of them.

In Fig. 6.1.21, '[1]' is used between registration number 0 and 1.

Fig. 6.1.22 is example of slave4 power off start program. If program like this is set to all of slave station, reliable interlocking operation of entire network can be guaranteed.

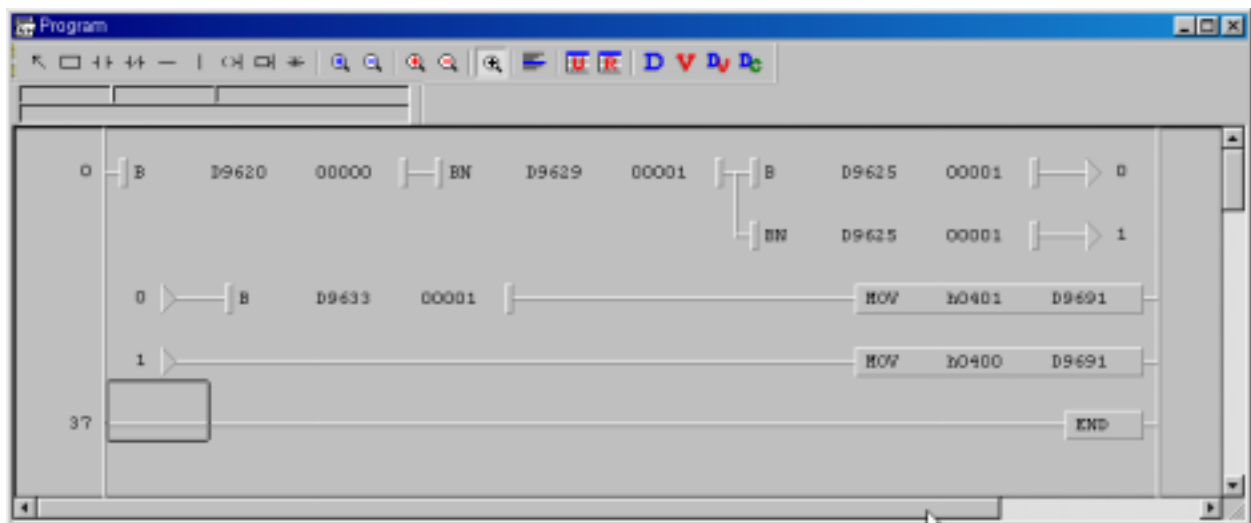


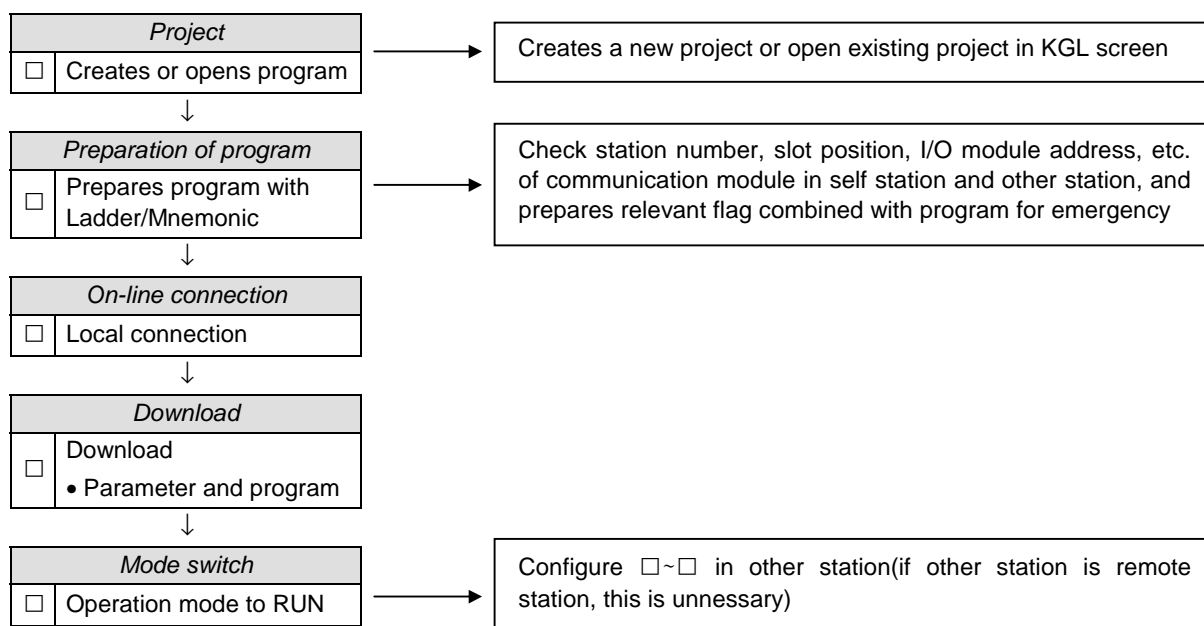
Fig. 6.1.22 SLAVE4 POWER OFF START PROGRAM

6.2 Communication instructions

6.2.1 Introduction

Communication instruction can be used to write data of self station to an area of other station or to read data of an area of other station. They can also be used to check the PLC state of other station, or to establish logical communication channel which may be used for communication with PLC of other company, or to access special module. This chapter explains type and using method of communication commands provided to user.

6.2.2 Using sequence of communication instructions



6.2.3 Type of communication commands

Commands that are used in preparing program are classified to 4 commands according to usage. READ and WRITE can be used in Fnet and Mnet, and CONNECT can be used in Mnet only. RPUT and RGET is remote only command, and this can be used in RBEA and RBOA only. Table 6.2.1 shows type and usage of communication commands.

Table 2.2.1 Type of communication command

Type	Usage	Available unit
READ, WRITE	Reads data of other station or writes data to other station	FUEA, FUOA, MUEA
STATUS	Checks present status of MASTER-K PLC	
RPUT, RGET	Reads or writes data in internal memory of special module	RBEA, RBOA

(a) READ

This is used to read data of indicated area in other station, min. data unit is 1 word, and setting of operand is as follows:

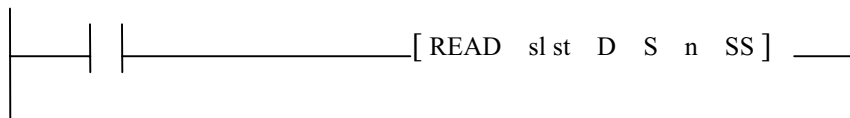


Table 6.2.2 Operand setting of READ command

Operand	Contents	Available area
sl	Slot number of FUEA to read	Integer from 0 to 7
st	Other station number to read	M, P, K, L, F, T, C, D, #D(see Remark)
D	Area of self station to store data which is read	M, P, K, L, T, C, D, #D
S	Other station area to read	M, P, K, L, F, T, C, D
n	Word number of data to read	Integer, D
SS	Indication of link status information(see Remark)	M, P, K, L, T, C, D, #D

Remark

Area of st can't be set with decimal and occupies 4 word, and this shouldn't be duplicated, so user should note this.

- Structure of SS(Link status information area) is as follows:

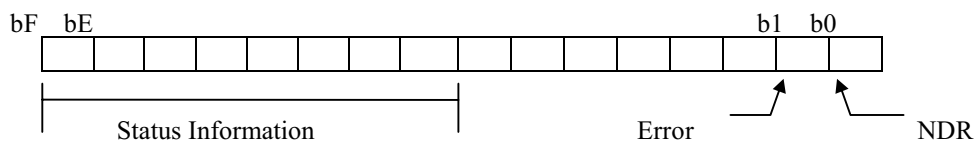


Fig. 6.2.1 Structure of SS

6. Communication Function

- ☐ NDR : The lowest bit of SS, this is 'On' for 1 scan after receiving data normally, and maintains 'Off' until receiving new data.
- ☐ Error : If error occurred after executing communication command, this is 'On' for 1 scan. Data is not transmitted or received, when error occurred.
- ☐ Status : If error bit is 'On', this expresses detailed code value of error, and maintains this value until NDR is set to 'On' normally or Error Bit is set to 'On'.

(b) WRITE

This is used to write data of self station to area of other station. Format is as follows:

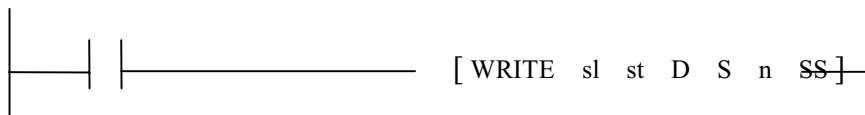


Table 6.2.3 Operand setting of WRITE command

Operand	Contents	Available area
sl	Slot number of FUEA to write	Integer from 0 to 7
st	Other station number to write	M, P, K, L, F, T, C, D, #D
D	CPU area of self station to write	M, P, K, L, T, C, D, #D
S	Other station area to store data which is written	M, P, K, L, F, T, C, D
n	Number of data words to write	Integer, D
SS	Indication of link status information	M, P, K, L, T, C, D, #D

- ☐ Specifications of st is identical with READ command, and specifications of SS is as follows:

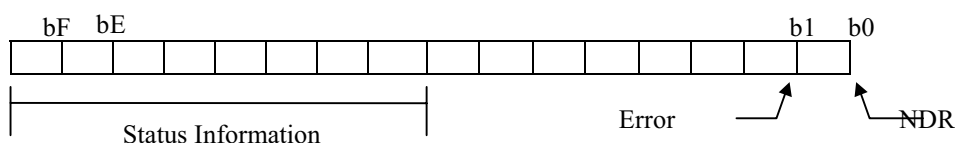


Fig. 6.2 Structure of SS

- ☐ DONE : If data is transmitted normally after executing communication command, this bit is set to 'On'. This is 'On' for 1 scan like NDR.
- ☐ Status, Error : These are identical with specifications of READ.

(c) STATUS

This is used to check the state of other station for control and monitor of the system. Operand setting is as follows:

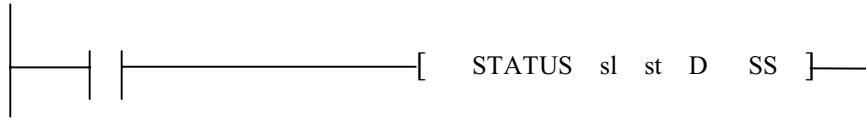


Table 6.2.4 Operand setting of STATUS command

Operand	Contents	Available area
Sl	Slot number of FUEA to read information	Integer from 0 to 7
St	Other station number to read information	M, P, K, L, F, T, C, D, #D
D	Area of self station(10word) to store data which is read	M, P, K, L, T, C, D, #D
SS	Indication of link status information	M, P, K, L, F, T, C, D

- ☐ The specifications of sl, st, and SS are identical with READ command, and the information of other station is shown in D through 10 word. See Appendix A3.3 for detailed information of 'D'.

(d) RGET

This is used to read the data of special module mounted in remote station, and this stores contents of internal memory in special module of remote station into area of self station. Setting of operand is as follows:

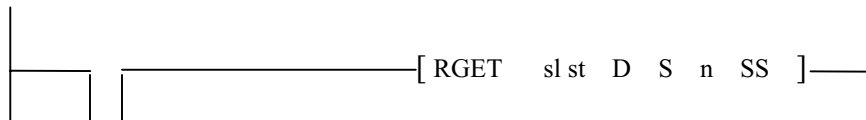


Table 6.2.6 Operand setting of RGET instruction

Operand	Contents	Available area
sl	See Remark	Integer (Hexadecimal)
St	See Remark	Integer (Hexadecimal)
D	Area of self station to store data which is read	M, P, K, L, T, C, D, #D
S	Internal memory area of special module in remote station to read	Integer
n	Number of data word to read	Integer, D
SS	Indication of link status information	M, P, K, L, T, C, D, #D

Remark

Structure of sl	h	A B	C D	Structure of st	h	A B	C D
Upper(AB) : Type of special module in remote station.				Upper(AB) : Slot number that special module is mounted			
Lower(CD) : Slot number of FUEA				Lower(CD) : Station number of RBEA			

h	A B	C D
---	-----	-----

h	A B	C D
---	-----	-----

Upper(AB) : Slot number that special module is mounted

Lower(CD) : Slot number of FUEA

Lower(CD) : Station number of RBEA

- ☐ Code value of special module as Table 6.2.6 can be inputted for the value used in sl structure.

Table 6.2.7 Code value of special module

Module (K1000S)	K7F-AD4A	K7F-AD3A	K7F-AD4B	K7F-DI4A	K7F-DI3A	K7F-DV4A	K7F-DV3A	K7F-TC4A	K7F-RD3A
Code value	h00	h40	h0A	h01	h41	h02	h42	h03	h04
Module (K300S/200S)	K4F-AD2A	K4F-AD3A	K4F-DA1A	K4F-DV2A	K4F-DV3A	K4F-DI2A	K4F-DI3A	K4F-TC2A	K4F-RD2A
Code value	h80	hC0	h81	hC3	hC4	hC1	hC2	h83	h84

(e) RPUT

This is used to write data to common memory of special card mounted in remote station, and setting of

11

operand is as follows (specifications of sl, st, and SS are identical with RGET):

_____ [RPUT sl st D S n SS] _____

Table 6.2.8 Operand setting of RPUT command

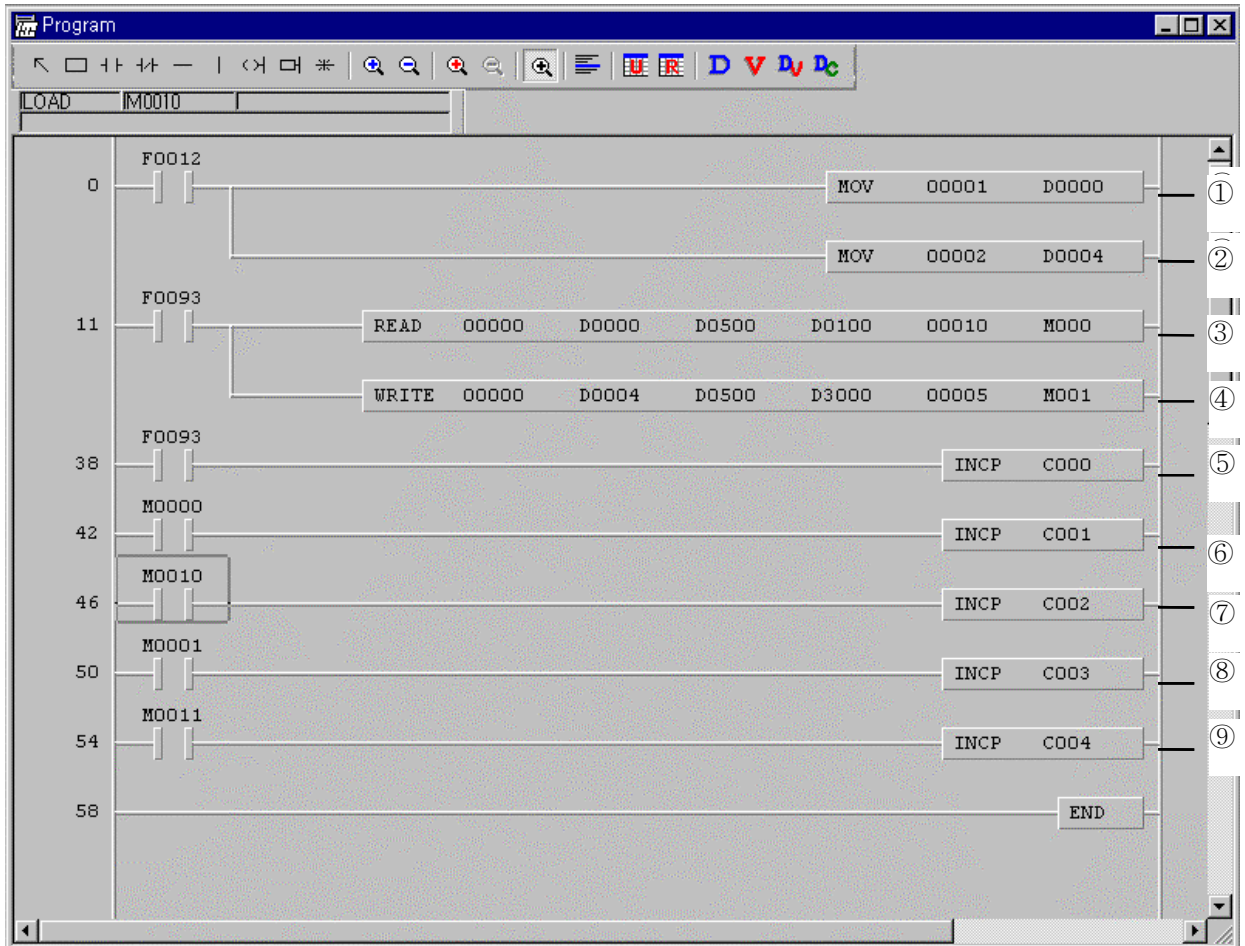
Operand	Contents	Available area
D	Area of self station to store data which is written	M, P, K, L, T, C, D, #D
S	Internal memory area of special module in remote station to write	Integer
N	Number of data words to write	Integer, D
SS	Indication of link status information	M, P, K, L, T, C, D, #D

6.2.4 Usage of read/write commands in Fnet PLC + PLC system

This chapter explains an example of program to be downloaded for communication with K1000S CPU(station 0) shown in Chapter 5.2.2 structure of MASTER-K Fnet master system(optical network).

This program is made to communicate together with K1000S CPU(station 1) and K1000S CPU(station 2) through Fnet communication module which is mounted in main board of self station using READ, WRITE command in K1000S CPU(station 0)

After creating or opening a project, edit a program as following :

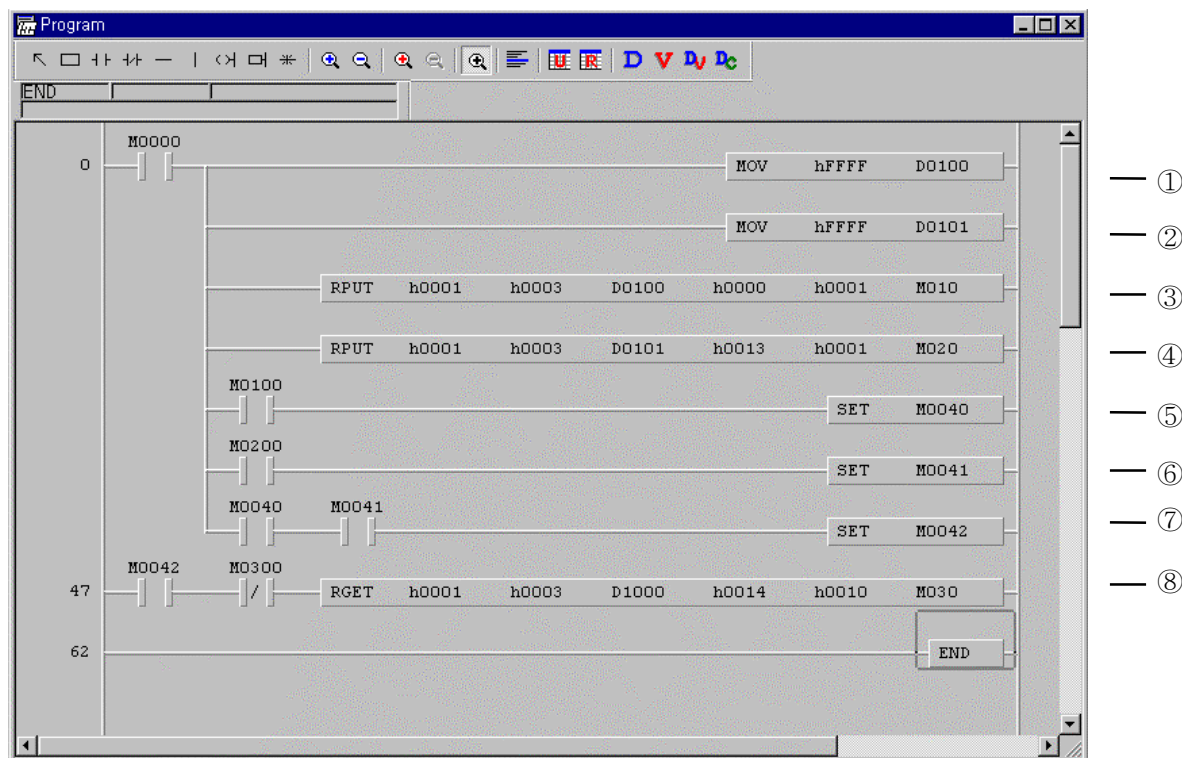


- ☐ : Stores 1 to D0000 to set station number of K1000S(station 1)
- ☐ : Stores 2 to D0004 to set station number of K1000S(station 2) (4 word of D0000 ~ D0003 are devices for station 1, and D0004 ~ D0007 are devices for station 2)
- ☐ : Reads 10 word from D0100 of FUEA which has station number 1 and is set to D0000 through FUEA of slot 0, and stores them from D0500 to D0509 of self station (M000 shows the condition whether READ instruction executed communication or not)
- ☐ : Writes 5 word from D0500 of self station area which is set through FUEA of slot 0 into 5 word, from D3000 to 3004, of FUEA which has station number 3 (M001 shows the condition whether WRITE instruction executed communication or not)
- ☐ : Checks READ and WRITE instruction
- ☐ : Checks NDR of READ instruction
- ☐ : Checks DONE of WRITE instruction
- ☐ : Checks error of READ instruction
- ☐ : Checks error of WRITE instruction

6. Communication Function

6.2.5 Usage of RGET/RPUT in Fnet PLC + remote I/O(special module)

This chapter explains an example of program to be downloaded to K1000S CPU(station 0) shown in Chapter 5.2.4 structure of MASTER-K Fnet slave system(electric network). This program initializes special module(A/D) mounted in remote I/O that local station is connected with network, and stores internal memory information of special module(A/D) to self station.



- ☐/ ☐ : Writes data setting
- ☐/ ☐ : Writes D0100 and D0101 areas of self station to No. 0 and No. 13 of common memory in special module(A/D) mounted in slot 0 of RBEA which has station number 3 through FUEA mounted in slot 1.
- ☐/ ☐ : Checks whether normal communication is possible or not(M010, M020 are DONE)
- ☐ : Finishes normal communication of RPUT command
- ☐ : Stores 10 word from No. 14 of common memory in special module(A/D) mounted in slot 0 of RBEA which has station number 3 through FUEA mounted in slot 1 into 10 word from D1000 of self station.

6.3 KGLWIN communication service

6.3.1 Introduction

This function enables remote control of programming, download of user program, program debugging, and monitor in network system that PLCs are connected each other in Fnet, without moving physical connection of KGLWIN. Especially, user can access each device at one location without moving location when devices connected in network are apart distant. KGLWIN communication service generates following path to accomplish the function.

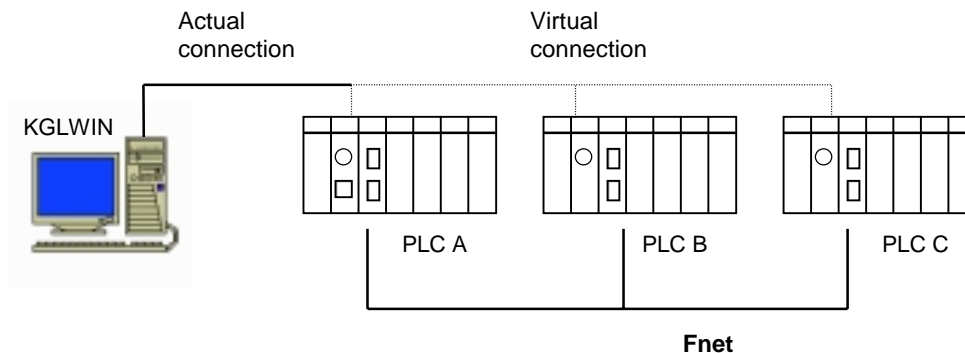


Fig. 6.3.1 KGLWIN communication connection (virtual connection)

In KGLWIN connection of Fig. 6.3.1, let us suppose a network that RS232C cable is connected to PLC A station and PLC A, PLC B, and PLC C are connected each other with Fnet or Mnet. To access PLC A, selects local connection in On-line menu of KGLWIN and accesses contents of PLC A station. After finishing access, disconnects the connection of PLC A station using disconnection menu to access contents of PLC C station. In remote connection of On-line menu, makes a connection by choosing communication module station number of PLC C (other station number to connect) and slot number of PLC A (slot number that communication module is mounted in PLC A which currently connected with KGLWIN). Then logical connection by RS232C and Fnet is made. This state is identical with the connection that RS232C cable is connected to PLC C station, and functions of program preparation, download, debugging, and monitor are possible in PLC C as in PLC A. This communication service of KGLWIN can be use to connect to the content of remote PLC. Connection from other PLC is possible even if a PLC is located at a location that physical access is hard, so this eliminates difficulty of re-programming. This function reduces time and effort for installation and change.

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6.3.2 KGLWIN remote connection

All PLC, K1000S remote I/O station, and K300S remote I/O station that are connected with MASTER-K network can be connected each other by KGLWIN communication service. KGLWIN remote connection consists of remote 1 connection and remote 2 connection continuously.

Connection method of remote 1 and remote 2 is as follows:

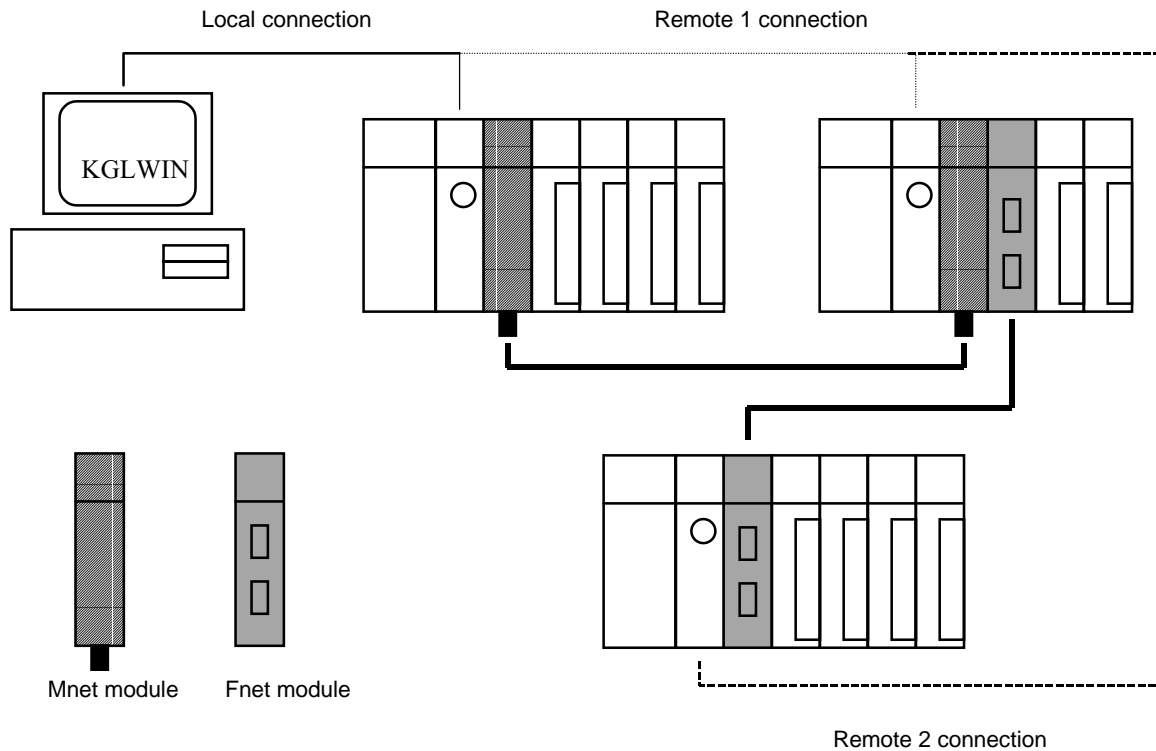
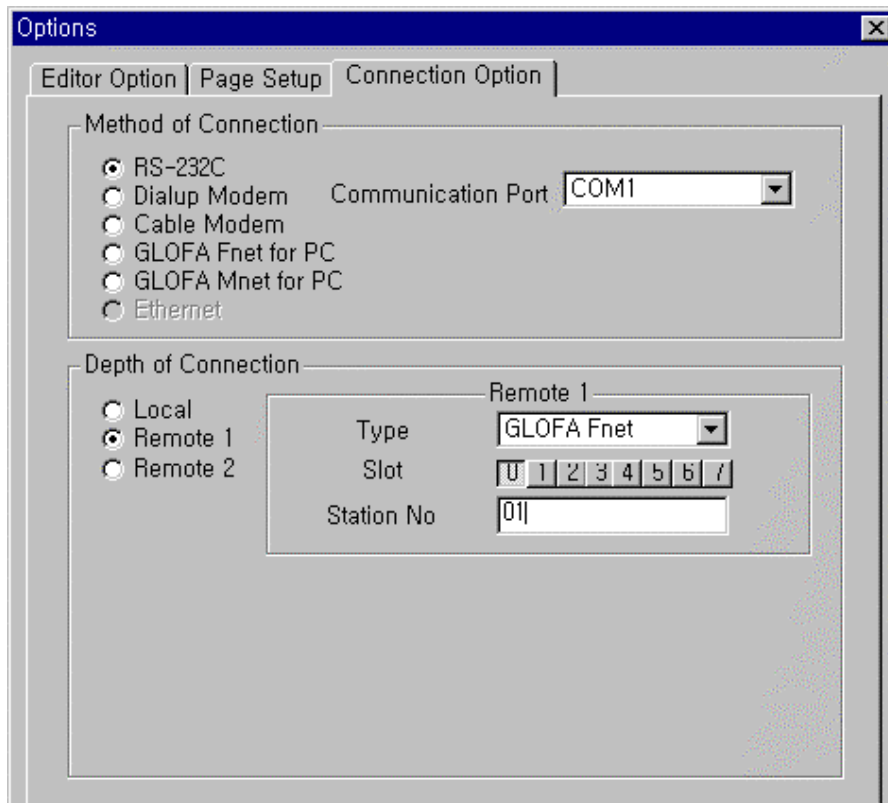


Fig. 6.3.2 KGL remote connection(remote 1 and 2)

Fig. 6.3.2 shows the connection of remote 1(PLC A, PLC B) and remote 2(PLC C) in a system configured with two network.

For making remote 1 connection should be in off-line state. In this state, select 'Connection option' at the 'Project – Option' menu.



For setting of slot number, input slot number of communication module mounted in PLC of self station which makes remote 1 connection.

Slot number of Fig. 6.1.2 is 0.

For setting of station number, input station number of communication module mounted in PLC which makes remote 1 connection, and input module number of PLC B, h00E091000001, in Fig. 6.1.2. Station number is written on the case of module for MASTER-K Mnet, and the value is set on station number switch in front of module can be used for MASTER-K Fnet. When user inputs station number, the type of 'h00E09100****' is used for hexadecimal, and decimal figure without 'h' is used for decimal.

For setting of password, input password of PLC which makes remote 1 connection.

Select 'OK' in this status.

If remote 1 connection is made, following message is displayed in lower part of KGL:

REMOTE 1 \ K200S \ REMOTE STOP

6. Communication Function

If connection is failed, following message is displayed:



(Communication line error / internal protocol error)

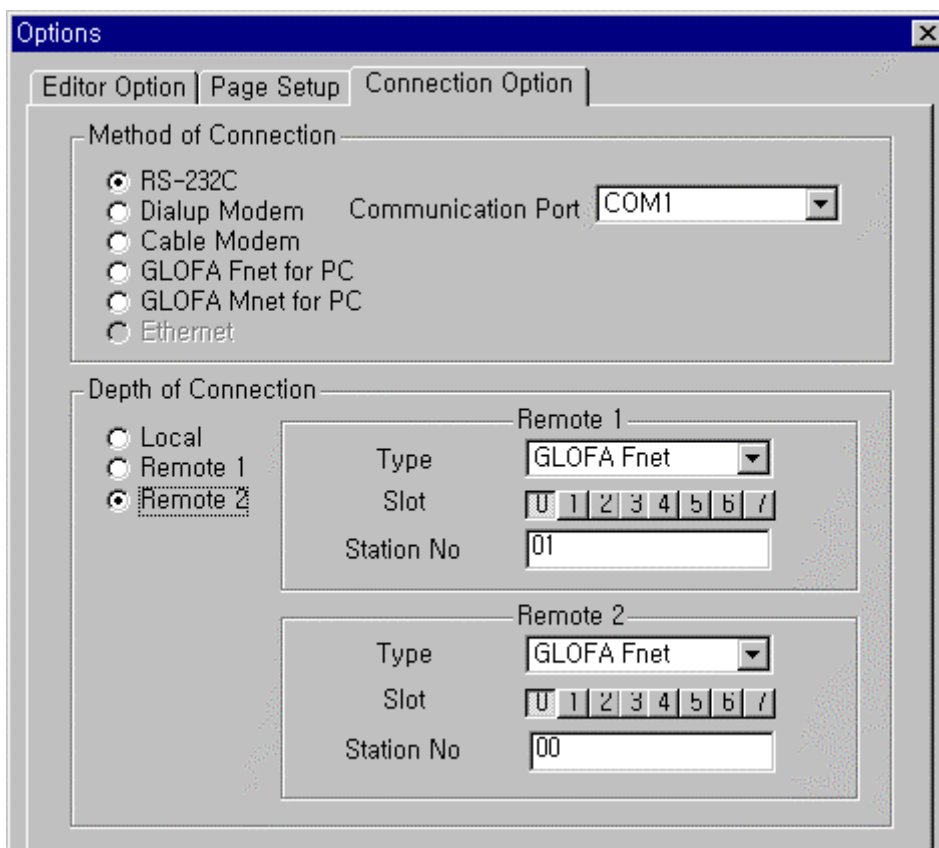
If the type of PLC that remote 1 connection is made and the CPU type of project which currently opened are mismatched, remote connection is failed. If user changes PLC type then, remote connection can be possible.

The state that remote 1 connection is finished is state of the same logical connection, and this is identical with connection of RS232C cable. All menu of On-line menu can be used.

Remote 2 connection executes remote 2 connection menu in On-line menu. In Fig. 6.1.2, remote 2 connection is made through following sequence:

KGL ► Mnet of PLC A ► Mnet of PLC B ► Fnet of PLC B ► Fnet module of PLC C

For remote 2 connection, select Connect of On-line menu and select Remote 2 menu as follows:



To set slot number in Slot No 1, input slot number 0 that communication module of PLC A is mounted for connection of PLC A ► PLC B. In slot No 2, input slot number 1 that communication module of PLC B is mounted for remote 2 connection of PLC B ► PLC C.

For setting of station number, specify station number of remote 1 connection and remote 2 connection respectively. Input h00E091000001, station number of PLC B, for remote 1 connection, input station number 5 of PLC C for remote 2 connection. Station number is set on station number switch in front of module can be used for MASTER-K Fnet. When user inputs station number, the type of 'h?????' is used for hexadecimal, and decimal figure without 'h' is used for decimal.

If user sets network type, station number, and slot number as the following with the value explained above, and click OK of dialog box, then following message is displayed in the lower screen part of KGL.

REMOTE2 \ K200S \ REMOTE STOP

Remote 2 connection is finished, and this is status of logical connection and this is the same as the connection that RS232C cable is connected to PLC E. User can use all menu of On-line menu.

Table 6.3.1 shows relations connectable between connection requesting device(Client) that RS232C cable is connected in KGLWIN communication service and connecting device(Server) which connects it according to the request of communication from Mnet/Fnet.

Table 6.3.1 Relation of roles between client and server of KGLWIN

Server Client	PC-module (KGLWIN)	K1000S	K300S	K200S	K1000S remote I/O	K300S remote I/O
PC-module(KGL)	X	O	O	O	O	O
K1000S	X	O	O	O	O	O
K300S	X	O	O	O	O	O
K200S	X	O	O	O	O	O
K1000S remote I/O	X	O	O	O	O	O
K300S remote I/O	X	X	X	X	X	X

There is the connector that RS232C can be connected, in K1000S remote I/O. Namely, KGLWIN can be connected to PLC of K1000S ~ K200S in K1000S remote I/O(This is not available in K300S remote).

Cautions when operated with remote 1 and remote 2 connection in KGLWIN

- 1) When project which is currently opened in KGLWIN and CPU type which is connected with remote 1 and 2 are not identical, remote connection is not possible.
- 2) When programming is made by connection of remote 1 and 2, user should open corresponding project of station to be connected and execute remote connection.

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- 3) Remote connection is supported up to 2. Remote connection of more than 2 is impossible.

6.3.3 Functions on connecting KGLWIN to remote I/O station

This explains how to use the function with connecting remote I/O by KGL remote connection. When remote connection is made by remote I/O station, only restricted menu can be selected.

Available function list when connecting remote I/O station of KGLWIN

- * Slave(PLC) information monitor in On-line menu
- * I/O information monitor in On-line menu
- * Flag monitor
- * Setting of emergency output data
- * Setting of forced I/O(P area only)

- (a) Slave(PLC) information monitor

This function shows internal status in slave of remote I/O, and the following screen is displayed if user selects PLC information in On-line menu.

FSM Information			
Fsm Type	:	GK3-FSM	
Fsm Version	:	Ver 1.0	
Mother Station No	:	10	
Fsm Mode	:	RUN	
Connection	:	Local	
Emergency Output	:	Latch Data	
Ac Fail Count	:	0	
Max Scan Time	:	4 ms	Tx Err Count : 1
Avg Scan Time	:	1 ms	Rx Err Count : 1
Min Scan Time	:	0 ms	Svc Err Count : 0
Read Count	:	0	Hs Tx Count : 0
Write Count	:	0	Hs Rx Count : 0
OK			

In the dialog box,

Fsm Type ☐ Slave type of remote I/O station.

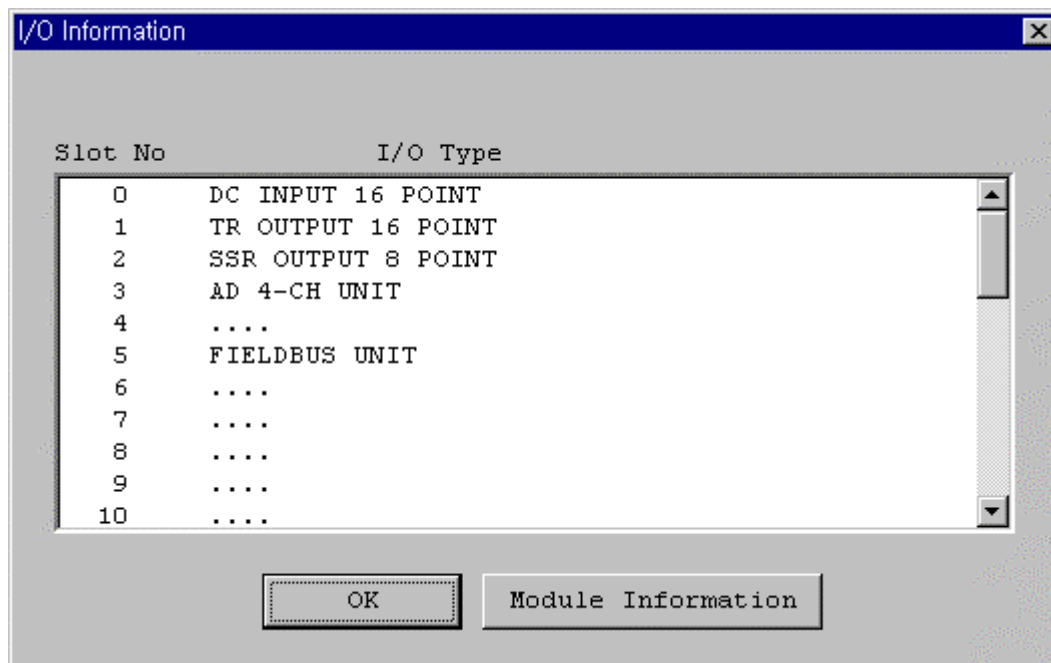
Fsm Version ☐ O/S version No. of remote I/O station.

Mother station No ⇒ Communication module station No. of PLC which transmits and receives data with remote I/O Station.

- | | |
|---------------------------|---|
| Fsm Mode | <input type="checkbox"/> Operation status of remote I/O station (RUN/STOP)
RUN : normal operation
STOP : I/O module error, self diagnosis error, and power error. |
| Connection | <input type="checkbox"/> Connection status between KGL and remote I/O
Remote : remote connection of KGL from other station to remote I/O station
Local : remote connection from remote I/O to other station. |
| Emergency Output | <input type="checkbox"/> Sets output data in case of communication failure
Latch : maintains current output data
User setting : outputs setting value in emergency data. |
| AC Fail Count | <input type="checkbox"/> Count of instantaneous power failure. |
| Max Scan Time | <input type="checkbox"/> Max. time that token goes round network once. |
| Avg Scan Time | <input type="checkbox"/> Average time that token goes round network once. |
| Min Scan Time that | <input type="checkbox"/> Min. time that token goes round network once. |
| Read Count | <input type="checkbox"/> Counts No. that read command is executed. |
| Write Count | <input type="checkbox"/> Counts No. that write command is executed. |
| Tx/Rx Err Count | <input type="checkbox"/> Count of error occurrence in frame transmitted from cable, this indicates stability of current network. If there are many errors, communication line, has problem and management is needed to prevent error. |
| Svc Err Count | <input type="checkbox"/> Counts No. of NAK response from other station during execution of communication command. |
| Hs Tx/Rx Count | <input type="checkbox"/> Increases receive count of <i>high speed link</i> if <i>high speed link</i> data is received, and increases transmission count of <i>high speed link</i> if <i>high speed link</i> data is transmitted. |

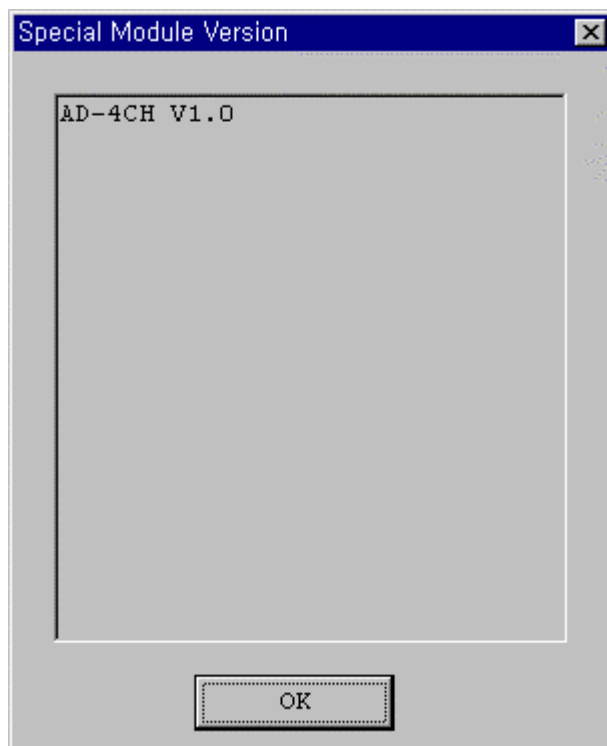
(b) I/O monitor

I/O monitor function provides information for the module mounted in FSM slot, the following dialog box is displayed if user selects I/O information of On-line menu.



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Here, when user want to monitor the information for special module except I/O module, version of special module is displayed as the following if user puts cursor to special module to be monitored and selects Special Module Information.



- (c) Flag monitor
This monitors slave system flags stored in buffer memory of FSM. If user selects flag monitor in Monitoring of On-line menu and selects flag to be monitored, then monitor can be performed. See appendix A4.3 for slave system flag.
- (d) Emergency output data
Emergency output data exist remote I/O station only. If communication is failed by any cause during *high speed link* communication, sets emergency output data for the cause to maintain stable status of external devices. If user selects Write Information in On-line menu and selects P area that emergency output data is to be chosen and clicks Edit Item, then dialog box that user can set emergency output is displayed.

In the dialog box, input as [☐] for the bit that output is to be On and click OK.

If user inputs the value with emergency output data service, the data which is set when power on/off of remote module is will be eliminated(remote module doesn't have battery which can remember values). Therefore, if user want to give emergency data regardless of power on/off, program should be made using the flag for remote module monitoring in KGLWIN.

- (e) P area monitor and forced setting
P area monitor function monitors current value of I/O module, and this is used to verify output data of communication and input data which is read from external device. Select Monitoring in On-line menu and select Word, Bit, Dword, Complex monitor, and input P area to be monitored. For forced setting, value of P area can be set from Change Current I/O of Debug menu.
- (f) If remote connection is made with K1000S/K300S remote I/O station, the following items are not executed :
 - a) Write of program and parameter

- b) Read of program and parameter
- c) Operation executed directly according to program
 - * Time chart monitor of monitor
 - * Link parameter of monitor
 - * High speed link monitor
 - * Forced I/O information
 - * Setting link enable
 - * Flash memory
 - * Link information
 - * Mode switch
- d) Flash memory
- e) Setting of link enable
- f) Mnet parameter, Mnet information
- g) I/O skip

6.3.4 Slave system flag

Information stored in internal memory of slave module can be monitored through flag monitor of FSM, and execution information of *high speed link* and communication instruction can easily be recognized through flag. See slave system flag of Appendix