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Programmable Logic Controller

FDEnet I/F Module

XGT Series

User's Manual

XGL-EDMT
XGL-EDMF

Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.
- Keep this manual within easy reach for quick reference.

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Safety Instructions

Safety Instructions should always be observed in order to prevent accident or risk with the safe and proper use the product.

Instructions are separated into “Danger”, “Warning” and “Caution”, and the meaning of the terms is as follows;

Danger	This symbol indicates that serious injury or death may be caused in a moment if some applicable instructions are violated.
Warning	This symbol indicates the possibility of serious injury or death if some applicable instructions are violated.
Caution	This symbol indicates the possibility of slight injury or damage to products if some applicable instructions are violated.

■ The marks displayed on the product and in the user’s manual have the following meanings.

This mark is to call a user's attention to actions and operations which may cause dangerous situation. Instructions with this mark shall be carefully read and observed to keep from dangerous situation.

This mark is to call a user's attention to possibility of electric shock under the special conditions.

■ Safety Instructions when designing

Caution

- I/O signal or communication line shall be designed at least 100mm away from a high-voltage cable or power line to be kept from influence of noise or magnetic field changing . If not, it may cause abnormal operation.
- Let the product installed free from direct vibration if lots of vibration is expected.
- Be sure to install the product free from metallic dust which may cause abnormal operation if lots metallic dust is expected.

■ Safety Instructions when installing

Caution

- Use PLC only in the environment specified in general standard. If not, electric shock, fire, abnormal operation of the product or flames may be caused.
- Be sure that the module is correctly secured. If the module is not installed correctly, abnormal operation, error or dropping may be caused.

■ Safety Instructions when wiring

Caution

- Surely use the ground wire of Class 3 for FG terminals, which is exclusively used for PLC. If the terminals not grounded correctly, abnormal operation may be caused.
- Prior to wiring and connection in PLC, check the rated voltage and terminal arrangement of the product. If other power than rated is connected or wiring is incorrect, it may cause fire or defect.
- Secure the screws of terminals tightly with specified torque when wiring. If the screws of terminals get loose, short circuit or abnormal operation may be caused.
- Don’t let any foreign materials such as wiring waste inside the module

■ Safety Instructions for test-operation or repair

Warning

- Don’t touch the terminal when powered. Abnormal operation or electric shock may occur.
- Prior to cleaning or tightening the terminal screws, let the power off.

Caution

- Don’t remove PCB from the module case nor remodel the module. Defect, abnormal operation, product damage or fire may occur. Prior to installing or disassembling the module, let the power off.
- The battery shall be exchanged only when the power is On. If it is exchanged while the power is Off, the program may be lost.

■ Safety Instructions for waste disposal

Caution

- Product waste shall be processed as industrial waste.

Revision History

Version	Data	Remark	Page
V 1.0	’05.03	First Edition	-
V 1.1	’05.05	Description of function is added.	A-5
V1.2	’06.06	Terminologies are edited	
V 1.3	’07.03	1) Individual reset function is added 2) XG-PD Version up	
V 1.4	’11.01	How to enable link through flag added	CH 5.2.3
V 1.5	’14.09	Integrated Tool UI Updated	-

※ The number of User’s manual is indicated right part of the back cover.

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Thank you for purchasing PLC of LSIS Co.Ltd.

Before use, make sure to carefully read and understand the User's Manual about the functions, performances, installation and programming of the product you purchased in order for correct use and importantly, let the end user and maintenance administrator to be provided with the User's Manual.

The following user's manuals are related with this product.
The User's Manual describes the product. If necessary, you may refer to the following description and order accordingly. In addition, you may connect our website (http://eng.lsis.biz/) and download the information as a PDF file.

Relevant User's Manuals

Title	Description	Manual number
XG5000 User's Manual (for XGK, XGB)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGK, XGB CPU	10310000512
XG5000 User's Manual (for XGI, XGR)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGI, XGR CPU	10310000834
XGK/XGB Instructions & Programming User's Manual	User's manual for programming to explain how to use instructions that are used PLC system with XGK, XGB CPU.	10310000510
XGI/XGR Instructions & Programming User's Manual	User's manual for programming to explain how to use instructions that are used PLC system with XGI, XGR CPU.	10310000833
XGK CPU User's Manual (XGK-CPUA/CPUE/CPUH/CPUS/CPUU)	XGK-CPUA/CPUE/CPUH/CPUS/CPUU user manual describing about XGK CPU module, power module, base, IO module, specification of extension cable and system configuration, EMC standard	10310000508
XGI CPU User's Manual (XGI-CPUU)	XGI-CPUU user manual describing about XGK CPU module, power module, base, IO module, specification of extension cable and system configuration, EMC standard	10310000832
XGR redundant series User's Manual	XGR-CPUU user manual describing about XGR CPU module, power module, extension drive, base, IO module, specification of extension cable and system configuration, EMC standard	10310001059

FDEnet I/F module user's manual has been written based on the following version

[List of relevant product OS version]

Product	OS version(recommend)
XGK-CPUH, CPUS, CPUA, CPUE, CPUU	V2.0
XGI-CPUU, CPUH	V2.0
XGR-CPUH/F, CPUH/T	V2.3
XG5000	V4.0

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Chapter 6 High-speed Link

Chapter 7 P2P Service

Chapter 8 Remote Communication Control

Chapter 9 Program Example

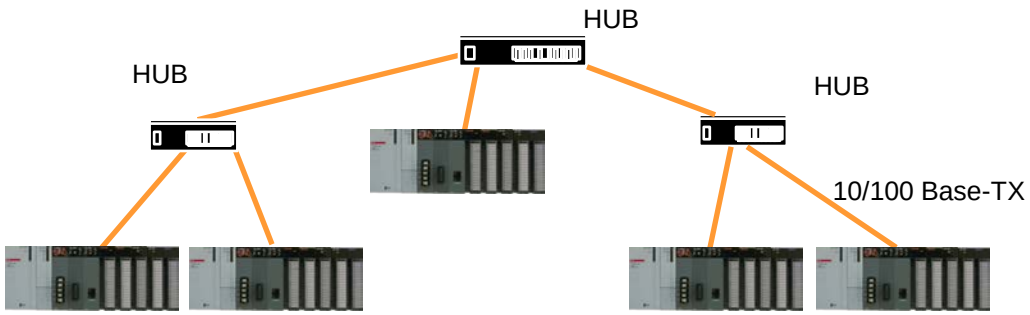
Chapter 10 Troubleshooting

Appendix

Chapter 1 Introduction

1.1 Introduction

This user's manual is prepared to describe Dedicated Ethernet Interface Module of XGT series (**F**ast **D**edicated **E**thernet I/F module, hereinafter referred to as FDEnet I/F module). With the method of Ethernet-based Token Ring, communication can be controlled along with convenient network established in addition to the great amount of data collection available at high speed. FDEnet I/F module as an interface module uses 10/100BASE-TX and 100BASE-FX according to media type to transfer between PLCs.



Product configuration of XGT FDEnet I/F module is as follows;

Model	Description	Remarks
XGL-EDMT	10/100BASE-TX	Category 5
XGL-EDMF	100BASE-FX	Fiber Optic

1.2 Characteristics

XGT FDEnet I/F module has the following characteristics;

- ▶ Conforms to IEEE 802.3 standard.
- ▶ HS link supported for HS data communication between LS modules:100Mbps
- ▶ Both 10/100BASE-TX and 100BASE-FX media supported.
- ▶ P2P service communication
- ▶ Network status monitored, information collected (LS communication module).
- ▶ Up to 12 units can be installed on 1 CPU module (up to 24 communication modules available)
- ▶ Installed on the basic base and the added base
- ▶ Various system configurations available through basic parameters change

Chapter 2 Specifications

2.1 General Specifications

General specifications of XGT series are as shown in Table 2.1.

No.	Item	Specification				Related specifications
1	Operating temp.	0 ℃ ~ +55℃				
2	Storage temp.	-25 ℃ ~ +70℃				
3	Operating humidity	5 ~ 95%RH, no dew allowed				
4	Storage humidity	5 ~ 95%RH, no dew allowed				
5	Vibration proof	For discontinuous vibration				
		Frequency	Acceleration	Amplitude	Number	IEC 61131-2
		5 ≤ f < 8.4 Hz	-	3.5 mm	Each 10 times in X,Y,Z directions	
		8.4 ≤ f ≤ 150 Hz	9.8 ㎨ (1G)	-		
		For continuous vibration				
		Frequency	Acceleration	Amplitude		
		10 ≤ f < 57 Hz	-	1.75 mm		
		57 ≤ f ≤150 Hz	4.9 ㎨ (0.5G)	-		
6	Impact proof	* Max. impact acceleration:147 ㎨(15G) * Authorized time :11 ㎳ * Pulse wave : Signal half-wave pulse (Each 3 times in X,Y,Z directions)				IEC 61131-2
7	Noise proof	Square wave impulse noise			AC: ±1,500V DC: ±900V	Test spec of LSIS
		Static electric discharging			4.0kV (Contact discharge)	IEC 61131-2, IEC 61000-4-2
		Radiation electromagnetic field noise			80 ~ 1000 MHz, 10V/m	IEC 61131-2, IEC 61000-4-3
		Fast Transient /Burst noise	Class	Power module	Digital/Analog I/O communication interface	IEC 61131-2, IEC 61000-4-4
			Voltage	2 kV	1 kV	
8	Operation ambience	Free from corrosive gases and excessive dust				
9	Altitude	Less than 2,000m				
10	Pollution degree	Less than 2				
11	Cooling method	Air-cooling				

[Table 2.1] General Specifications

Remark

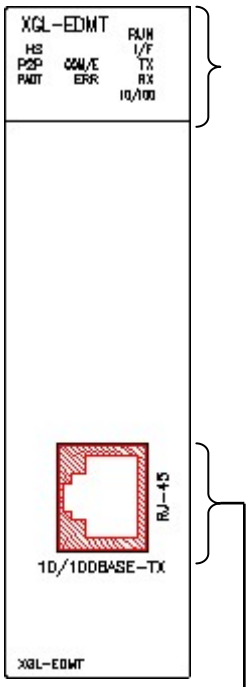
1) IEC (International Electrotechnical Commission
: An international nongovernmental organization which promotes internationally cooperated standardization in electric/electronic fields, publishes international standards and manages applicable estimation system related with.
2) Pollution level
: An index indicating pollution level of the operating environment which decides insulation performance of the devices. For instance, Pollution level 2 indicates the state generally that only non-conductive pollution occurs. However, this state contains temporary conduction due to dew produced.

2.2 Performance Specifications

Specifications for system configuration are as described below according to media of FDEnet I/F module. Refer to the table below for system configuration.

Item		Specifications	
		100BASE-FX	10/100BASE-TX
Transmission Specification	Transmission Speed	100 Mbps	10/100 Mbps
	Transmission Type	Base Band	
	Max. extended length between nodes	2 km	100 m
	Max. segment length	-	100 m (Node ↔ Hub)
	Max. number of nodes	64	Hub 4-stage connection available
	Distance between nodes	Integer multiple of 0.5m	-
	Max. protocol size	1,500 Byte	
	Access method to service zone	Token Bus, CSMA/CD	
	Check method of frame error	CRC 16 = $X^{15} + X^{14} + X^{13} + ,,,,, + X^2 + X + 1$	
	Max. units available	12	
	Location available	Basic base ~ Added base 7 stages (CPUH) Basic base ~ Added base 3 stages (CPUS)	
Basic Specification	Consumption (mA)	410	
	Weight (g)	105	

2.3 Designation of Parts



LED display

SILK display	LED status	Details
RUN	On	Module initialization normal after powered on.
	Off	Module initialization error after powered on
I/F (**I**nter**f**ace)	Blinks	Normal interface with CPU module
	Off or On	I/F error with CPU module
HS (**H**igh **S**peed)	On	If HS link service enabled
	Off	If HS link service disenabled.
P2P	On	If P2P service enabled
	Off	If P2P service disenabled.
PADT	On	During XG5000 remote-connected
	Off	During XG5000 remote-disconnected
COM/E	Off	N/A
ERR	Off	Module error in itself not recoverable
TX	On	When packets sent to media (Hardware connected)
RX	On	When packets received from media (Hardware connected)
10/100	On(100Mbps)	Connection speed of media displayed

Communication connector

2.4 Cable Specifications

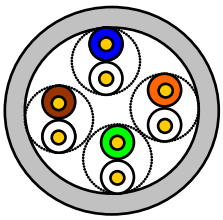
2.4.1 UTP cable

UTP cable is classified into 3 types based on the following standards.

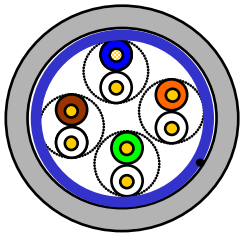
① Shield existence: classified into 3 (UTP, FTP, STP)
② Frequency band used: classified into 7 (Category 1 ~ 7)
③ Incombustibility grade : classified into 4 (CMX, CM, CMR, CMP)

1) Type of cables based on shield existence

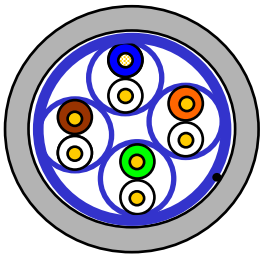
Classification	Details	Purpose
UTP(or U.UTP)	So called unshielded cable used for HS signal	Max. 200MHz Phonetic + Data + Low grade of video signal
FTP(or S.UTP)	Cable with cable core only shielded solely *Shield material : AL/Plastic complex foil or Copper Braid	Max.100MHz Electronic impediment (EMI) and electric stability considered Phonetic + Data + Low grade of video signal
STP(or S.STP)	Double-shielded structure, pair shielded and core shielded cable *Pair shield material : AL/Plastic complex foil * Core shield material : AL/Plastic complex foil or Copper Braid	Max. 500MHz Phonetic + Data + Video signal Substitute for 75Ω coaxial cable



UTP



FTP



STP

Remark

1) UTP : Unshielded Twisted Paired Copper Cable
FTP : (Overall) Foiled Twisted Paired Copper Cable
STP : (Overall) Shielded (and Shielded Individually Pair) Twisted Paired Copper Cable

2) Patch Cable(or Patch Cord)
Stranded Conductor composed of stranded cable instead of solid conductor may be used to increase the flexibility of UTP 4-pair cable. Material and specification of stranded cable used are specified by UL444, and the representative specification and material are Un-coated AWG 24 (7/0203A).
In other words, the diameter of a single cable is 0.203mm, and this cable is of 1+6 structure as standardized with annealed copper cable.

2) Classification based on frequency used

Classification	Frequency used (MHz)	Transmission Speed (Mbps)	Purpose
Category 1	Phonetic Frequency	1	Phone network (2-Pair)
Category 2	4	4	Multi-Pair communication cable
Category 3	16	16	Phone network + Computer network
Category 4	20	20	1) Computer network transmission speed Up 2) Low-loss communication cable
Category 5 & Enhanced Category 5	100	100	1) Digital Phone network + Computer network 2) Low-loss, broadband cable

Remark

1) Presently classified items are Category 3, 5, Enhanced Category 5 & Category 6 inside and outside of the country, where Category 4 has been replaced by Category 5 and Category 7 is being under development all over the world as STP structure.

3) Classification based on incombustibility grade (based on UL criteria)

Classification	Heat applied	Time applied	Combustion length	Smoke	Remarks
CMP	88(kW)	20 minutes	73m/min or less	Controlled	• For ceiling with no duct • Plenum Cable • UL 910 (Plenum Test)
CMR	150(kW)	30 minutes	3.6m or less	Not controlled	• For vertical application • Non-Plenum Cable • UL 1666(Riser Test)
CM	21(kW)	20 minutes	2.4m or less	Not controlled	• General type • Non-Plenum Cable • UL 1581(VTFT Test)
CMX	1(kW)	1 minute	0.5m or less	Not controlled	• Limited application • Non-Plenum Cable • UL 1581 (VW-1 Test)

Remark

1) As a rule, CMG between CM and CMR grades is not applied to LAN cable such as UTP cable.

Ex) CMG: As CAS FT4 (VTFT Test), it is similar to CM of UL 1581.

→ Different between burner angle (horizontal→45°upward) and sample condition (arranged 1/2 distance →Bundle of 6 x 6).

4) Example of Category 5 Twisted Pair Cable (UTP)(CTP-LAN5)

Item	Unit		Value
Conductor resistance (max.)	Ω/km		93.5
Insulation resistance (min.)	MΩ/km		2500
Voltage resistance	V/min		AC 500
Characteristic impedance	Ω(1~100MHz)		100 ± 15
Decrement	dB/100m or less	10MHz	6.5
		16MHz	8.2
		20MHz	9.3
Near-end crosstalk decrement	dB/100m or less	10MHz	47
		16MHz	44
		20MHz	42

2.4.2 Fiber Optic Cable

Item	Value
Cable Type	Twin strands of Multimode fiber(MMF)
Connector	SC Type Connector
Diameter of optical fiber	62.5/125um (62.5um fiber optic core and 125um outer cladding)
Wavelength used	1350 nm
Decrement	2dB/1000m or less
Near-end crosstalk decrement	11dB or less

Remark

1) Since the type of the connection cable used for communication module differs from each other based on the system configuration and its environment, applicable professional advice will be required prior to installation.
2) The optical cable may have communication errors due to natural decrement in its characteristics if any fingerprint or contamination is stuck on the sectional end of the cable during its treatment.

Chapter 3 Installation and Test Operation

3.1 Precautions for Installation

3.1.1 Precautions for Installation

For system configuration through FDEnet I/F module, carefully make sure of the following items prior to installation.

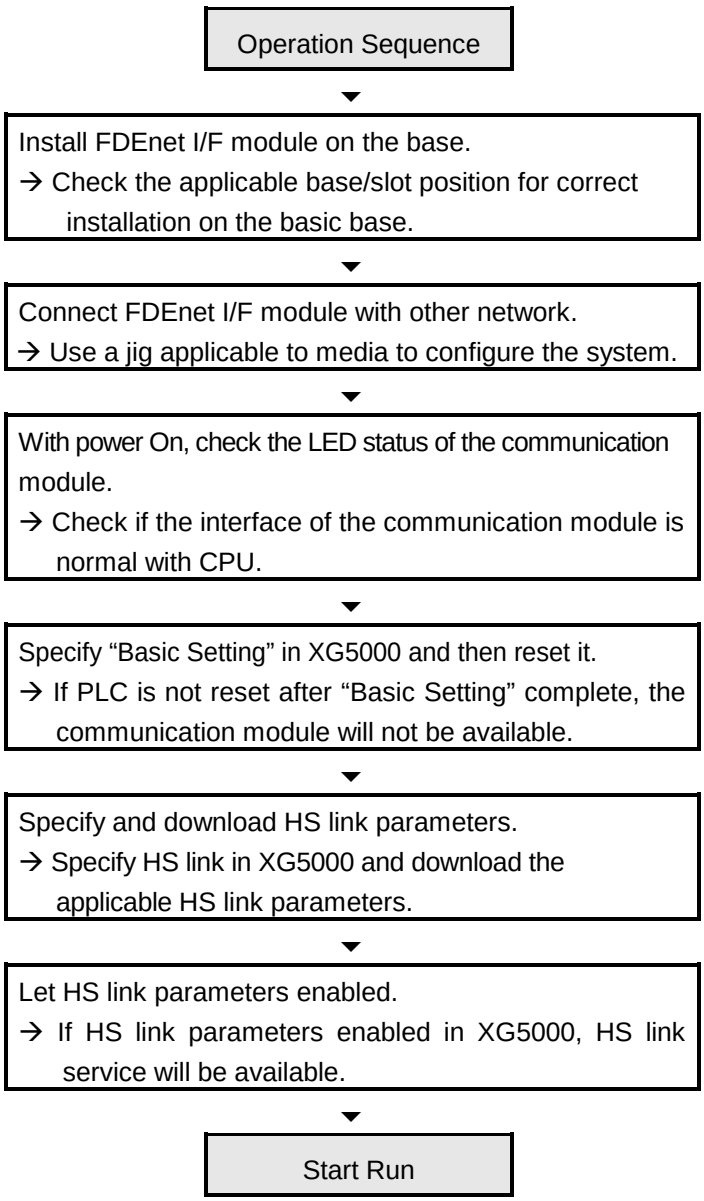
1) Check the basic factors necessary for system configuration so to select an appropriate communication module.
2) Select the cable to be used for this communication module (only one is available between 10/100 BASE-TX and 100BASE-FX).
3) Before the communication module is installed, check for any foreign material on the base connector the module will be installed on and any damage on the connector pin of the module.
4) All the communication modules can be installed on the basic base ~ added base 7 stages (XGK-CPUH), the basic base ~ added base 3 stages (XGK-CPUS).
5) For installation of the module, exactly insert the protuberant part at the bottom of the module with the communication cable disconnected into the base groove and then apply enough strength until its top is locked up with the locking device of the base. If the lock is not applied, it may cause an error on the interface with CPU.
6) The cable available for the communication module shall be installed with one type only between 10/100BASE-TX and 100BASE-FX.
7) Select standard products of switching hub and cable, which are necessary for communication with FDEnet I/F module

3.1.2 Materials necessary for installation

Materials necessary	10/100BASE-TX
Coaxial cable (impedance 50Ω)	Not available
AUI cable	Not available
Twisted pair cable (impedance 100Ω)	4 twisted pairs (8-pole plug at both ends)
Transceiver	MAU necessary if AUI used
Terminal resistance (50Ω)	Not available
T type connector	Not available
Hub	Used
Optic cable	62.5/125um MMF(Multi Mode Fiber) Cable SC Type connector
Hub/Switch	Optic switch necessary

3.2 From Setting to Operation

The sequence of the product from installation to operation will be described below. After the product installation is complete, install and configure the system to be operated as specified in the following sequence.

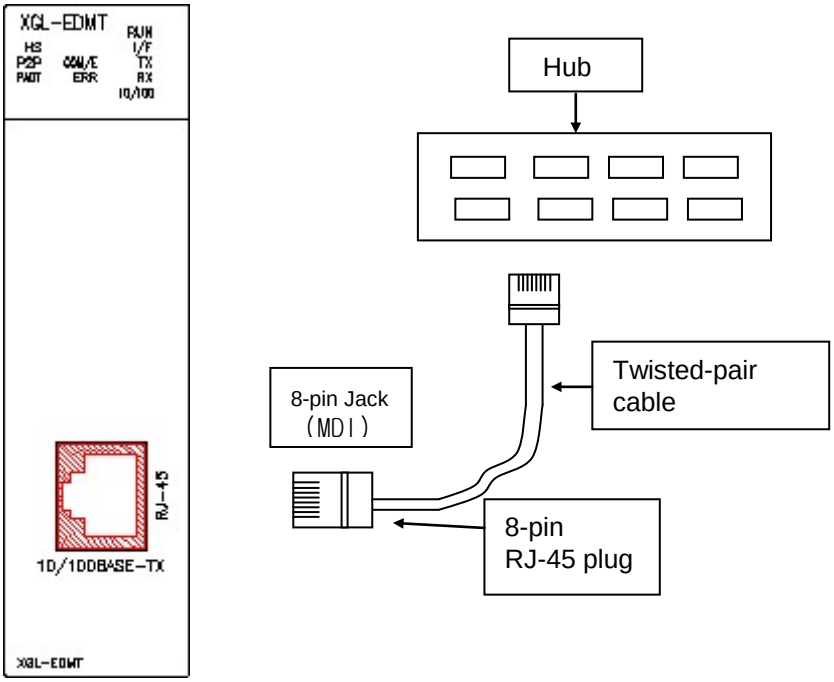


Remark

1) After station No. is specified in XG5000, surely reset the applicable module. The value read from the communication module will be kept on when the first station No. is initialized. Any changed details during communication will not be applied during Run.

3.3 Installation of the Product

3.3.1 Installation of 10/100BASE-TX



[Fig. 3.3.1] Installation of 10/100BASE-TX

The max. segment length of 10/100BASE-TX is 100m (distance from this module to the hub). The hub is in general use straight cable with TD and RD stranded inside.
If only 2 of these communication modules are connected 1 to 1, cross-cable form may be used.

Pin No.	Signal	Straight cable between the hub and this module	1 to 1 cross-cable
1	TD+	1-1	1-3
3	RD+	3-3	3-1
6	RD-	6-6	6-2
4,5,7,8	N/A	-	-

Remark

1) Since the structure of 10/100BASE-TX cable is vulnerable to external noise, the cable needs to be stranded as twisted (two lines twisted with each other) between cables of the pin No.1 and 2 of TD+ and TD- and between cables of the pin No.3 and 6 of RD+ and RD- so to be strong against noise.
2) Hub power shall be separated from PLC power to be used against the noise.
3) Contact professional manufacturers for processing cable terminal, manufacture and installation.

1) UTP installation

(1) In order to transmit reliable 100Mbps sign with UTP cable, characteristics of patch cord, line cord, patch panel and DVO (Data Voice Outlet) shall conform to the Category 5 Spec. (EIA/TIA-568A).

(2) Be careful not to allow the length of patch cord to exceed 7m in cross-connect system. If 7m is exceeded, such subtraction as long as exceeded is required within the allowable value of 90m in Horizontal Distribution System.

(3) The length of line cord shall not exceed 3m in the workstation. If 3m is exceeded, such subtraction as long as exceeded is required within the allowable value of 90m in Horizontal Distribution System.

(4) When wiring between patch panel and DVO, the pair pitch of UTP cable shall not be loosened over the following measurements.

* Max. pair pitch loosened: Category 5: 13 mm
Category 3: 26 mm

(5) Use the jumper wire in IDC cross-connect system, and the pair pitch shall not be loosened over the above-specified measurements either at this time. Especially, be careful not to bend the cable intensely, which may cause not only damage but also distance between pairs.

* Max. radius of curvature: 4-pair cable : 4 times of external diameter
Cable with 25 or more pairs: 10 times of external diameter

(6) Max. tension strength during wiring shall not exceed 110 N (11.3 Kgf), based on 4-pair cable.

(7) Jumper wire and patch code shall be wired rather loosely. If wired too tight, the characteristics of Category 5 may be deteriorated. If Tie-wrap is used, be careful not to apply stress on the cable.

(8) When UTP cable is installed, a suitable distance shall be maintained between EMI source and UTP cable.

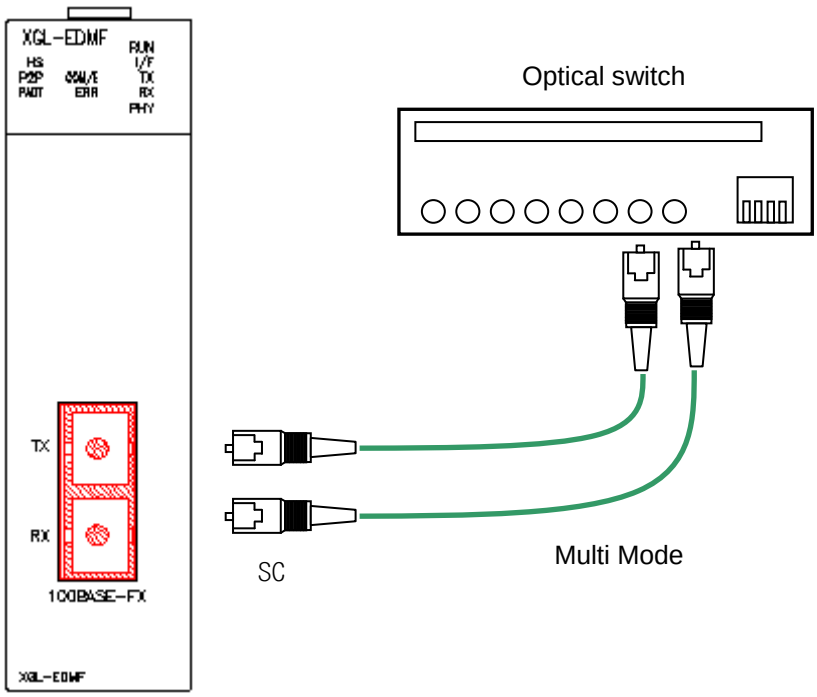
The suitable distance for each case is as specified in the table below;

Condition	Min. separation distance		
	2.0 kVA or less	2.5 kVA	5.0 kVA or more
Power line unshielded, or electric facility open or near to nonmetallic pipe	127 mm	305 mm	610 mm
Power line unshielded, or electric facility near to metallic pipe buried	64 mm	152 mm	305 mm
Power line inside metallic pipe buried (or equivalently shielded) near to metallic pipe buried	-	76 mm	152 mm

Remark

1) If voltage is 480 V, rated power is 5 kVA or more, separate calculation is needed.

3.3.2 Installation of 100BASE-FX



[Fig. 3.3.2] Installation of 100BASE-FX

The max. segment length of 100BASE-FX is 2000 m (distance from this module to the optical switch). Let the module's Tx cross-connected with the optical switch's Rx, and the module's Rx with the optical switch's Tx.

Remark

1) Since the optical cable is vulnerable to impact, pressure, folding and pulling, pay good attention to its treatment.
The optical contact between the connector and the end of the cable may have communication errors if contaminated, which may result in unavailable communication.
If the cable is installed outdoors, additional countermeasures are required to protect the cable suitably for the installation environment.

3.4 Test Operation

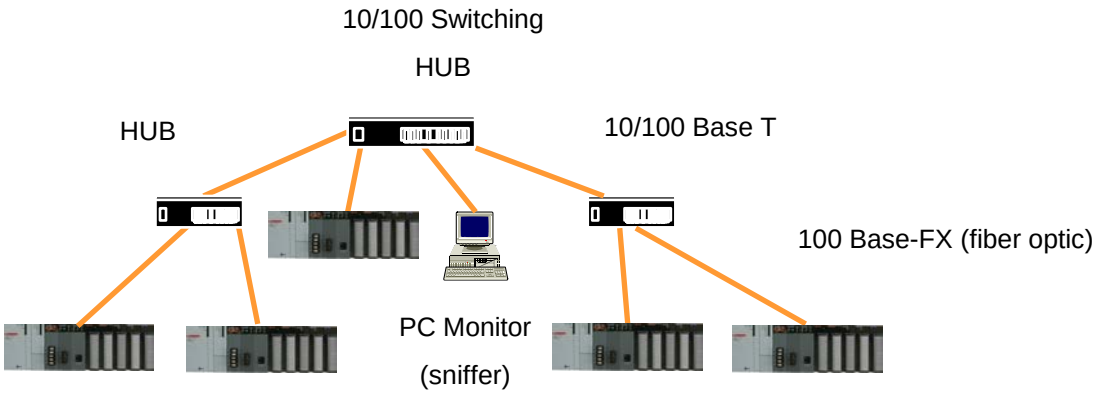
3.4.1 Precautions for system configuration

1) HS link station No. of all stations shall be different from each other including this module in order to use HS link service.
2) Use the communication cable as specified only. If not, serious error may occur to communication.
3) Check communication cable if disconnected or shorted prior to installation.
4) Tighten up communication cable connector until connected firmly. If cable connection is unstable, serious error may occur to communication.
5) If remote communication cable is connected, keep the cable far away from power line or inductive noise.
6) Since the coaxial cable is not flexible, it is to be diverged min. 30cm away from the connector in communication module. If the cable is bent at a right angle or transformed compulsorily, cable disconnection or connector damage in communication module will be caused.
7) If LED operation is abnormal, refer to Chapter 10 Troubleshooting to check for causes and take actions against. Contact Customer Service center if the error is as before.

Chapter 4 System Configuration

4.1 System Configuration of Network

4.1.1 Dedicated network system



[Fig. 4.1.1] Dedicated Network System

Chapter 5 Communication Program

There are two communication functions available in FDEnet I/F module as described below.

5.1 Communication Program

5.1.1 Type of communication program

1) HS link

HS link as a communication method between XGT PLC communication modules is used to exchange data or information with correspondent station periodically for a specific time, through which the changed data of self station or the correspondent station can be referred to for each other periodically for efficient application to the operation system and execution of communication only with simple parameters setting.

Parameters can be specified by setting Tx/Rx correspondent station area and self station area as well as data size, speed and station No. on XG5000's HS link parameters in order to execute communication.

Data size is available from the min. 1 word (16 points) up to 200 words for the communication, communication cycle from the min. 20 ms up to 10 sec. based on the communication details. It is easy to use since communication with correspondent station is available only through simple parameters setting. And it is also useful for periodic process of lots of data at a time thanks to high processing speed of the internal data.

2) P2P

HS link is of periodic communication, however, P2P communication is a service used for communication with the correspondent station only when a specific event happens.

P2P can be used if any error occurs on the correspondent station and its details are to be sent to other correspondent station or specific contact is to be input for communication. Data size for HS link communication is of word unit (16 points). However, the data types of Bit, Byte, Word, etc. can be used respectively for communication with the correspondent station in P2P.

5.1.2 Differences between HS link and P2P

Differences between HS link and P2P service are as described in the table below;

Differences are described as simply as below between specific data Tx/Rx periodically with the correspondent station (HS link) and transmission service of necessary data due to a specific event (P2P).

Description	HS link	P2P
Tx/Rx data basic unit	1 word (16 bits)	Available for each data type Ex) Bit, Byte, Word
Communication cycle	20ms, 50 ms, 100 ms, 200 ms, 500ms, 1s, 5s, 10s	Executed whenever P2P enable (REQ) condition is operated (timer)
Available communication module	Between FDEnet I/F communication modules	Between FDEnet I/F communication modules
Station No. setting	Specify HS link station No. in XG5000 and download it onto FDEnet I/F module	Specify the station No. in XG5000 and download it onto FDEnet I/F module

[Table 5.1] Differences between HS link operation and P2P operation

5.2 XG5000

In order to use FDEnet I/F module, specify standard setting and parameters and then download the specified parameters onto FDEnet I/F module for application, which is available through the tool, so-called XG5000.

5.2.1 Introduction

This is a tool used to specify basic system parameters and basic communication setting so to control and manage the network in FDEnet I/F communication.

In XG5000, there are HS link and P2P communication used to decide communication system parameters for FDEnet I/F communication module.

Use-defined parameters can be written (downloaded) onto FDEnet I/F communication module and can be also read (uploaded) from FDEnet I/F communication module.

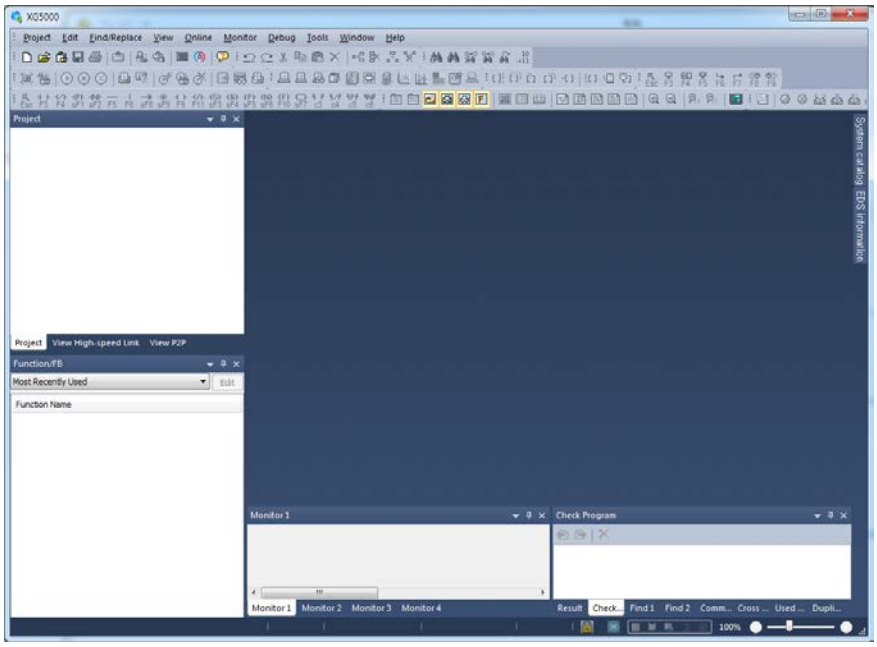
5.2.2 Standard setting

In order to operate FDEnet I/F module, the following standard setting shall be surely specified.

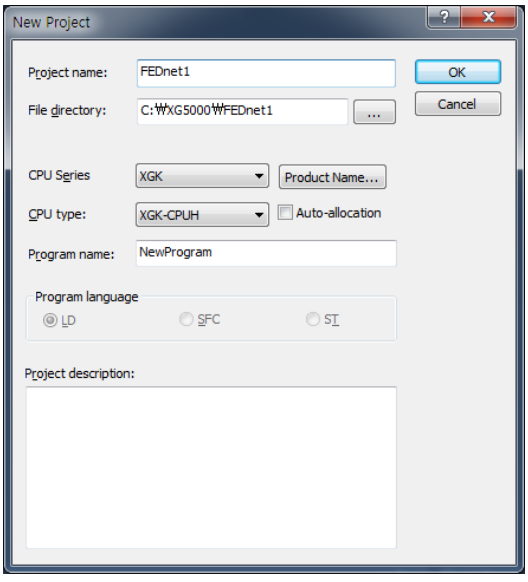
1) Set PLC type

For XG5000 connect to PLC, set the PLC type first.

Select the [Project]-[New Project] in XG5000. Set the project name, CPU Series and type in New Project window as [Figure 5.2.1]. The [Figure 5.2.1] is initial screen of XG5000.



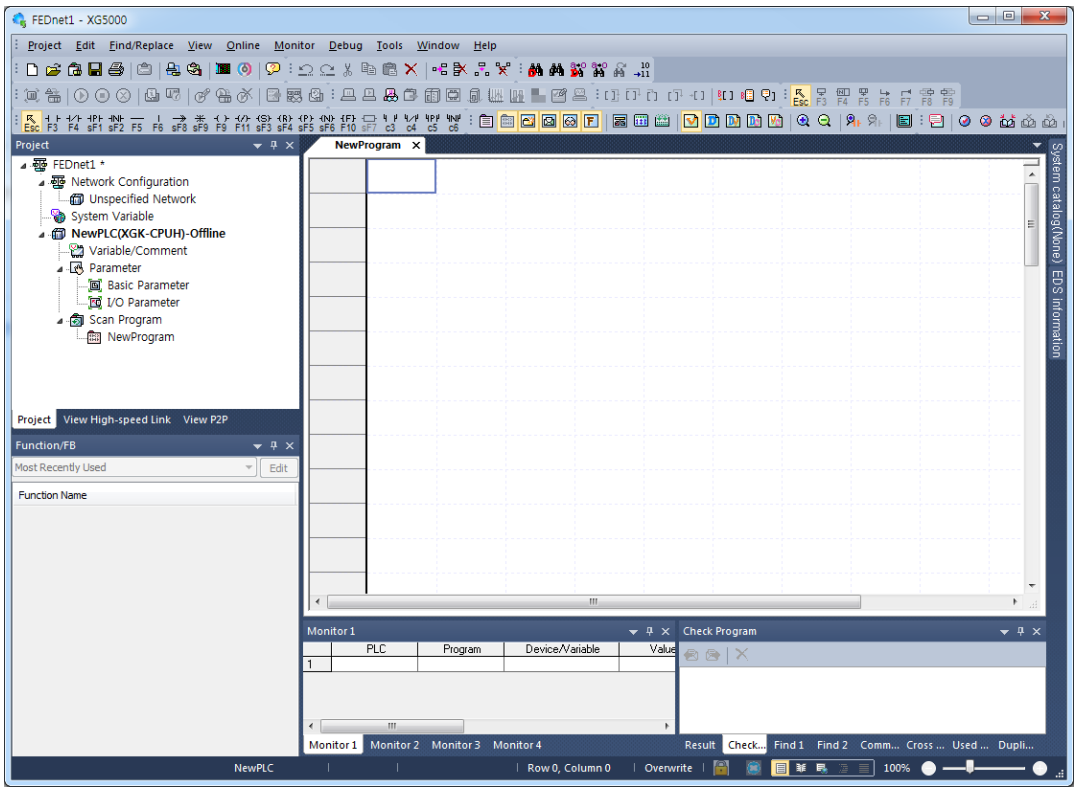
[Figure 5.2.1] Initial screen of XG5000



[Figure 5.2.2] New Project window

There are four PLC series as XGK, XGB, XGI and XGR. Please refer to the User's manual of each type for detailed information. This manual describes XGK example. CPU type of XGK series are XGK-CPUH, XGK-CPUA, XGK-CPUS, XGK-CPUE and others.

Complete the PLC type setting for connect to XG5000. Then project tree will be displayed as the [Figure 5.2.3].



[Figure 5.2.3] Created new project in XG5000

2) Add Communication Module

Describes the basic setting that necessary to operation of FDEnet module.

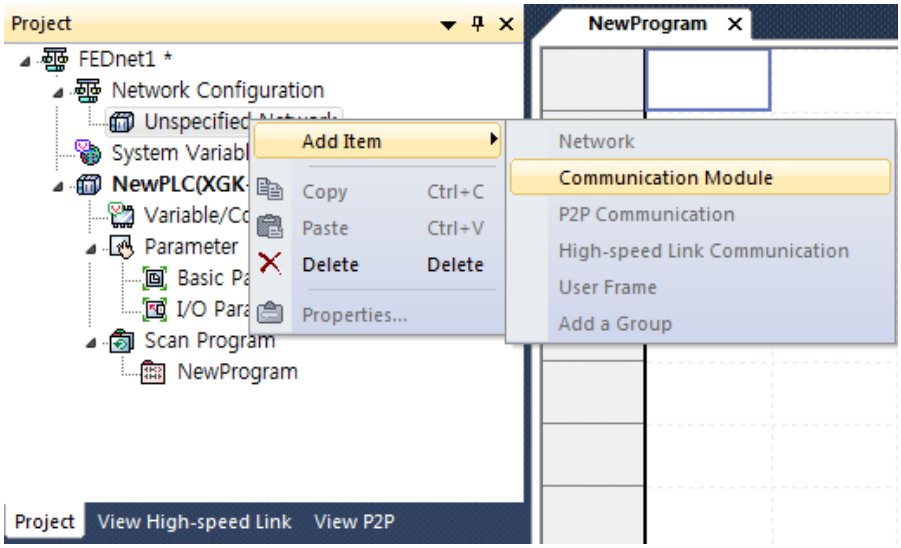
(1) Communication module selection and operation

Set the base, slot in basic setting window of XG5000 for basic setting of communication module. Communication module can be installed in ON/OFF status.

a) Offline status

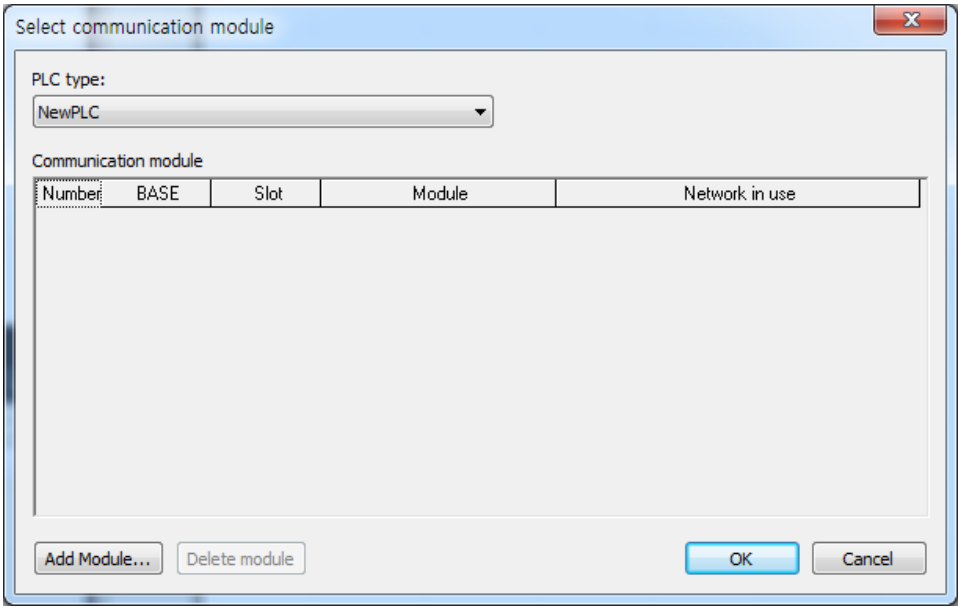
In case of install the communication module without connect to XGT, using "Communication module setting" window.

b) Right click on the "Unspecified Network" of project tree. Then select the [Add Item]-[Communication Module].



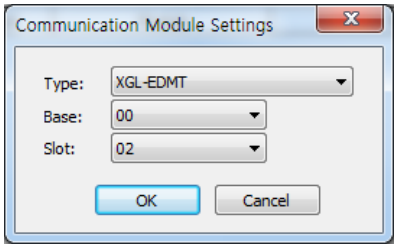
[Figure 5.2.4] Adding communication module

c) Click “Add module” in select communication module window



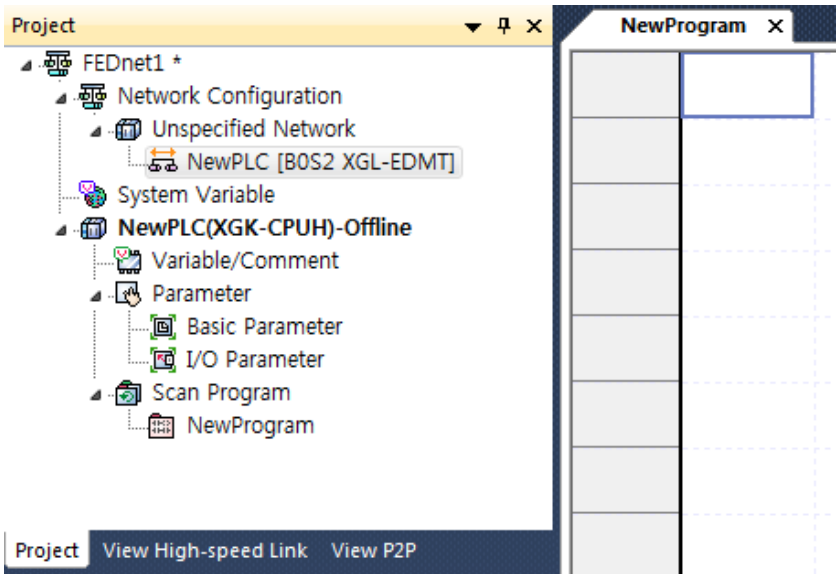
[Figure 5.2.5] Select communication module window

d) Set the type, base and slot at communication module settings window



[Figure 5.2.6] Communication module settings window

The screen of added FEDnet in slot2 of base0 is as follows.

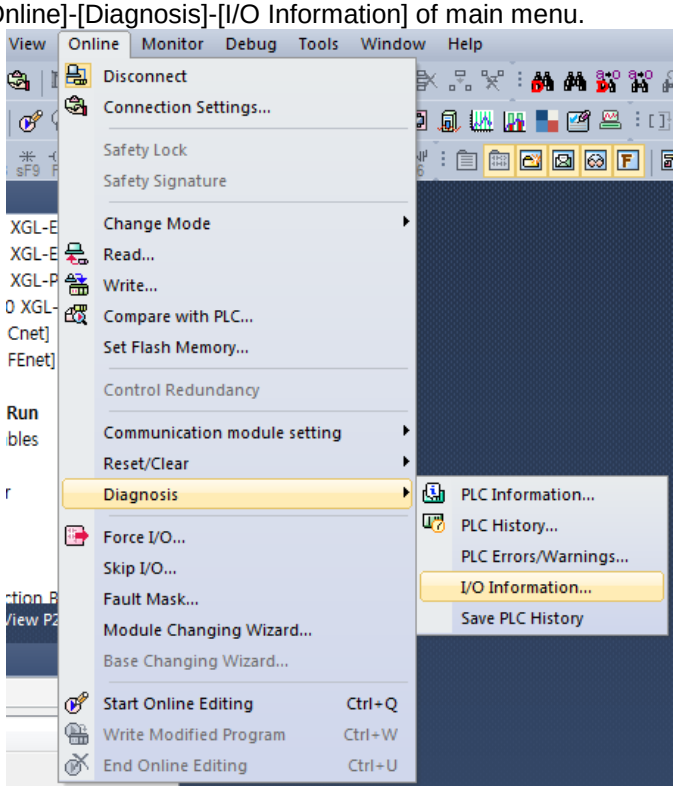


[Figure 5.2.7] XG5000 screen that added communication module

(2) Online staus

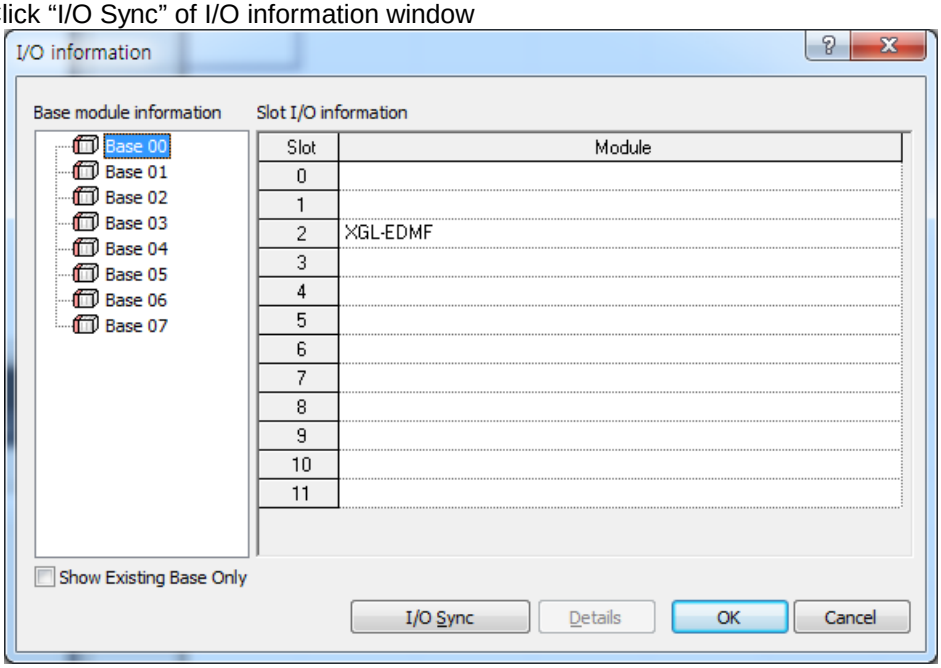
If communication module installed CPU module of XGT is connected, communication module that installed at XGT can be registered to the project tree by the following way.

a) Select the [Online]-[Diagnosis]-[I/O Information] of main menu.



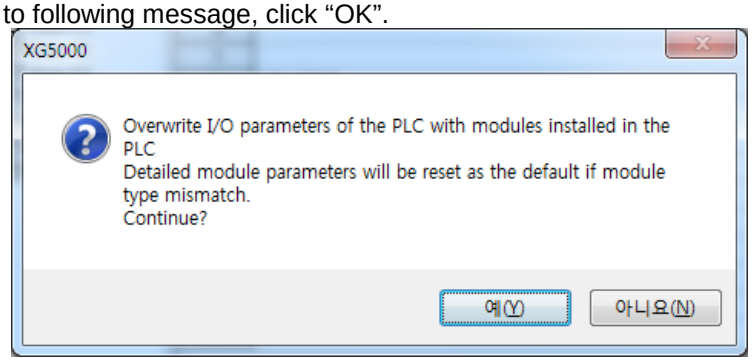
[Figure 5.2.8] I/O Information

b) Click “I/O Sync” of I/O information window



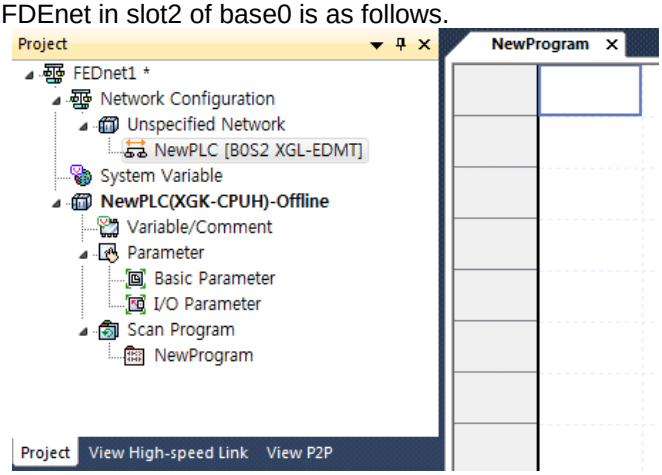
[Figure 5.2.9] I/O Sync

c) If agreed to following message, click “OK”.



[Figure 5.2.10] I/O sync warning message

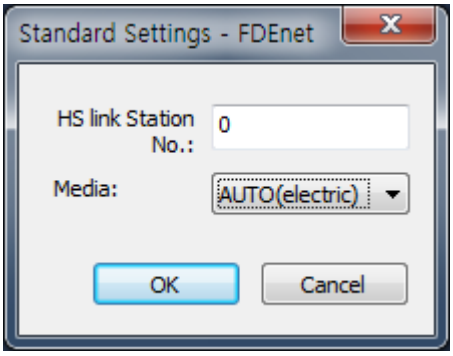
The screen of added FDEnet in slot2 of base0 is as follows.



[Figure 5.2.11] XG5000 screen that added communication module

3) Basic Settings

Basic setting is set the communication system parameter for control and manage the FDEnet I/F module. Set the HS link station No. and media in the setting window that pop-up by double click on the FDEnet module of project tree. After complete the basic setting, please reset the module.



[Figure 5.2.12] Basic settings window

Details of [Figure 5.2.12] are as follows.

Among those below, **HS link station No. and Media** need to be reset applicably to application environment.

Classification	Description
HS link station No.	Set station No. for HS link communication.
Media	Select media desired to use. ▷ AUTO (electric): presently installed module is recognized and adjusted automatically. ▷ 10M/FULL : 10MBps Full Duplex, electric ▷ 100M/FULL : 100MBps Full Duplex , electric ▷ FX/100M/FULL : 100MBps Full Duplex, optic

5.2.3 Connect to communication module and download

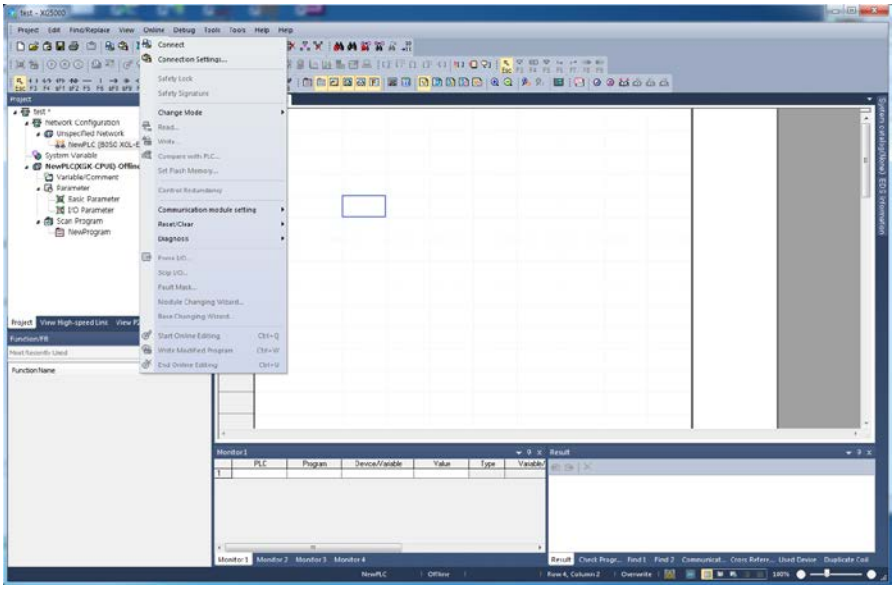
1) Standard setting download/upload

XGT PLC's communication module can read/write parameters and link enable by means of CPU module's Loader Port.

(1) Write (download)

While CPU is running, stop CPU to write. Writing while CPU is running will make a serious effect on communication.

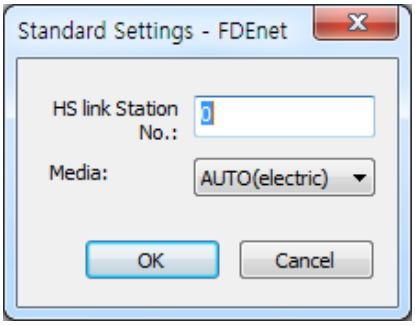
A) Use on-line connection to connect with CPU.



[Figure 5.2.13] Connect screen

B) Standard setting screen after connected

(Double-click 'Default' of the slot installed on the base, select communication module type of FDEnet, and then click [OK], and there double-click the left mouse button again to open the standard setting screen.)

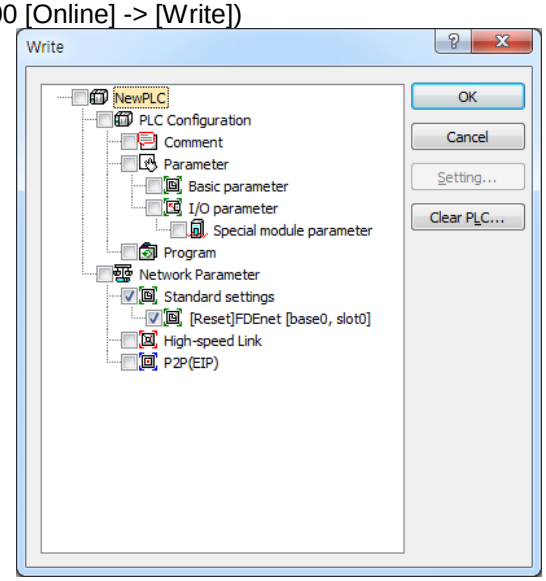


[Figure 5.2.14] Standard Settings screen

Classification	Description
HS link station No.	Set station No. of this module.
Media	Set communication media of this module.

C) After standard setting is complete as specified in B), download the parameters.

(XG5000 [Online] -> [Write])

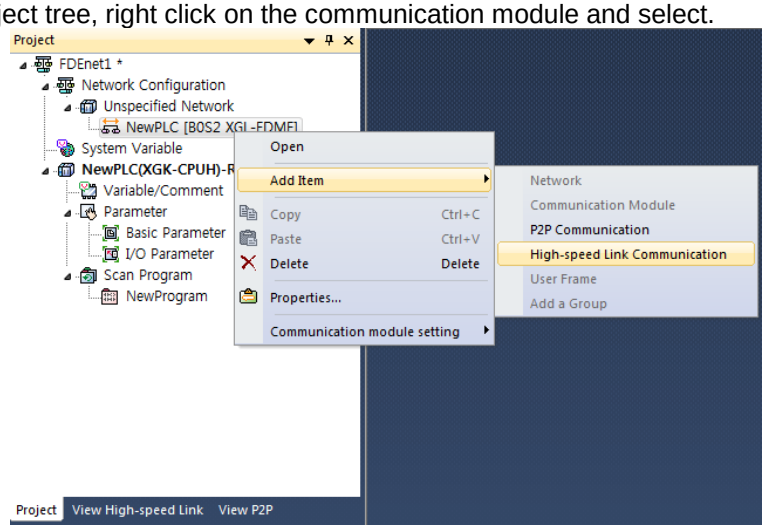


[Figure 5.2.15] Check screen of standard setting

D) After standard setting is downloaded, **surely let it powered back or reset.** If not, operation will continue with the old setting value.

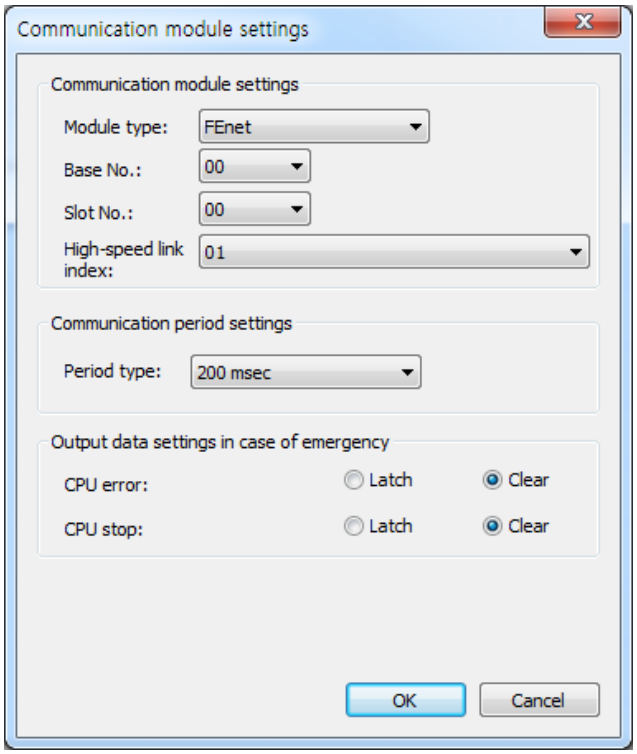
2) HS link parameters setting

(1) In the project tree, right click on the communication module and select.



[Figure 5.2.16] Select the High-speed link communication of the Project tab

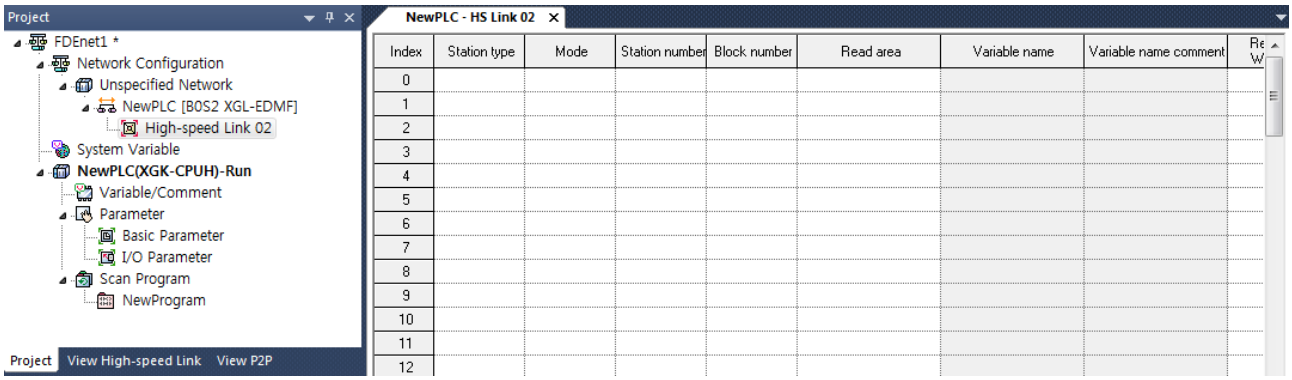
(2) Communication module setting



[Figure 5.2.17] Setting of communication module and communication cycle

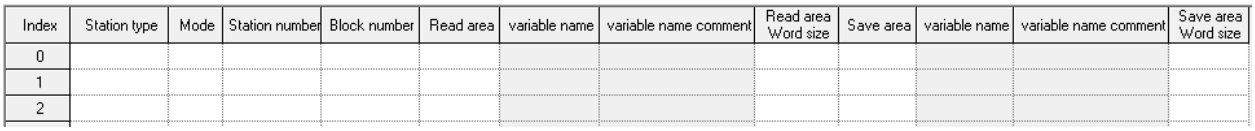
Classification		Details
Communication module setting	Module type	Select FDEnet.
	Base no.	Select base no. the module is installed on.
	Slot no.	Select slot no. the module is installed on.
Communication period setting	Period type	Set data Tx cycle.
Output data settings in case of emergency	Latch	Send the data that received from CPU.
	Clear	Ignore the received data from CPU and send 0.

(3) Screen after communication module specified



[Figure 5.2.18] Communication module setting

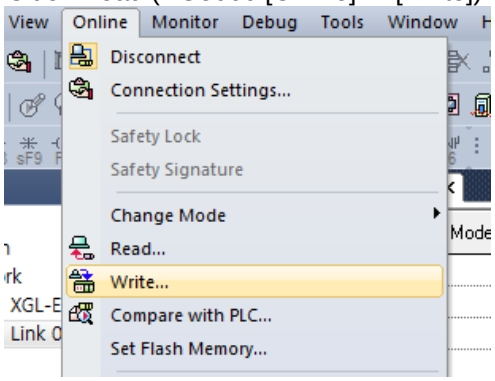
(4) HS link parameters setting (double-click the index No. on 'HS link 5' screen)



[Figure 5.2.19] HS link block setting

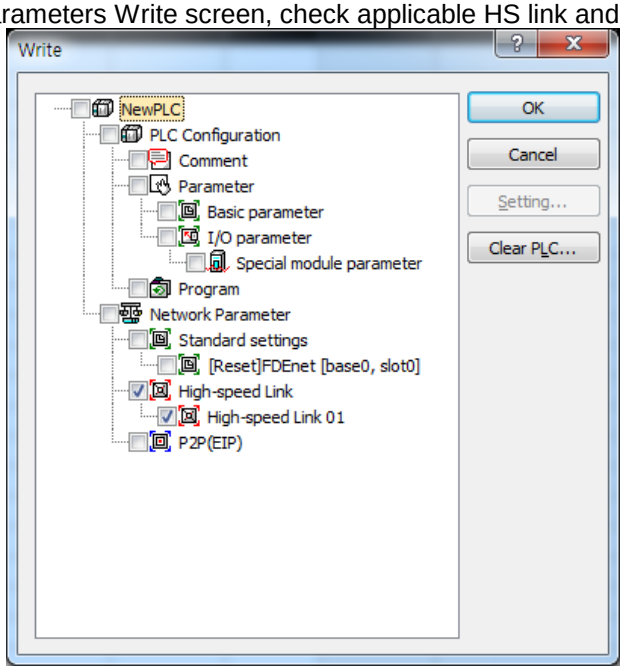
Classification		Details
Station type	Master	Set FDEnet to master or slave as applicable
	Slave	
Mode	Send	Transmits data.
	Receive	Receives data.
Station No.	Station	Set this module for Tx, correspondent module for Rx
Block no.	Block	Specify Tx/Rx blocks.
Read area	Address	Memory area of this module.
	Size(Word)	Specify the data size to transmit.
Save area	Address	Area to save the data received from correspondent station.
	Size(Word)	Specify the data size to receive.

(5) HS link parameters download (XG5000 [Online] -> [Write])



[Figure 5.2.20] Write

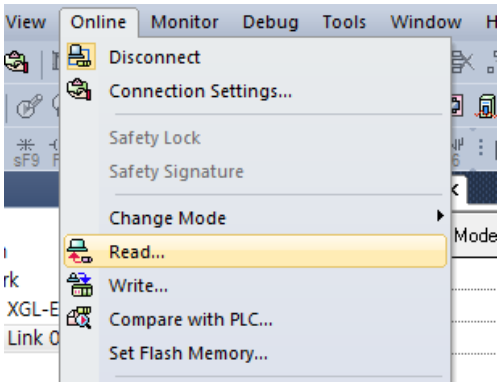
On the HS link parameters Write screen, check applicable HS link and click [OK].



[Figure 5.2.21] Write High-speed link parameter

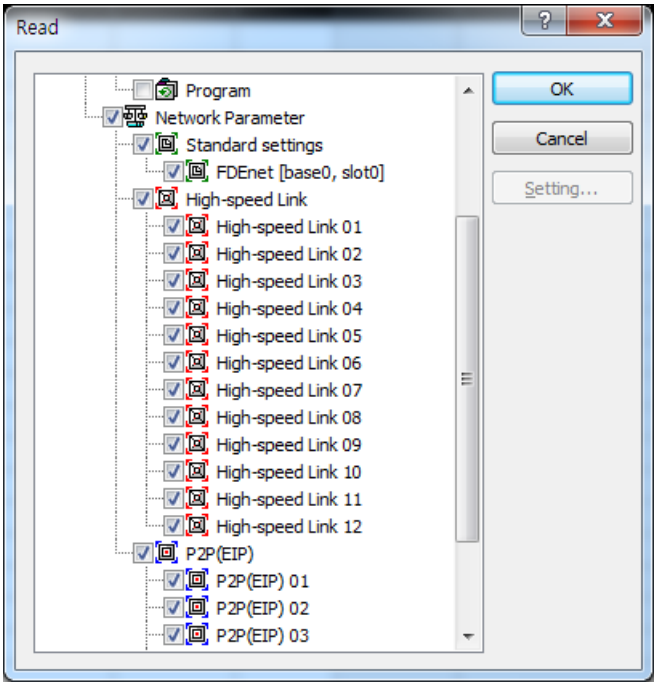
(6) Read HS link parameters

A) Select the [Online]-[Read] of main menu.



[Figure 5.2.22] Read

B) Check the applicable parameters in the “Read” window and click [OK] to read standard setting and specified HS link parameters.



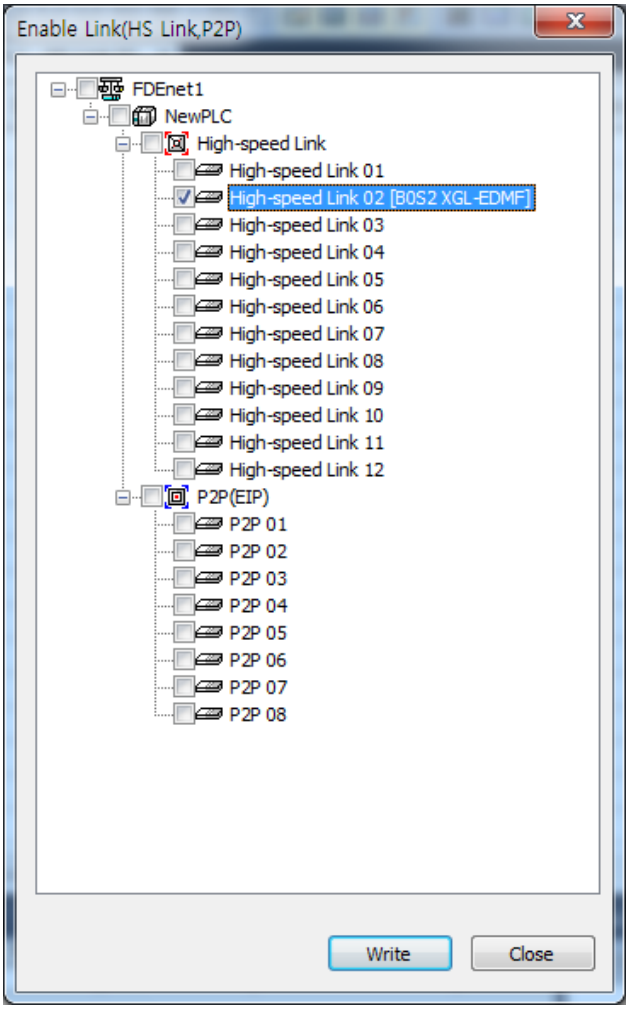
[Figure 5.2.23] Read High-speed link parameter

5.2.4 Enable Link

1) Enable Link

(1) Connect to CPU

(2) Select the [Online]-[Communication module settings]-[Enable Link]. Then [Figure 5.2.12] will be appeared. Check the parameter to run and click “Write”.



[Figure 5.2.24] Enable Link window

* Enable Link through flag
It describes “Enable Link” method through flag. The following XG5000 version, CPU OS version is needed.

Item	Version
XG5000	V3.61 or above
XGR CPU	V1.91 or above
XGI CPU	V3.4 or above
XGK CPU	V3.7 or above

Flag list related with “Enable Link”

-XGR

Flag	Data type	Device	Description
_HS_ENABLE_STATE	ARRAY[0..11] OF BOOL	%FX19040	HS link enable/disable current state
_HS_REQ	ARRAY[0..11] OF BOOL	%FX31520	HS link enable/disable request
_HS_REQ_NUM	ARRAY[0..11] OF BOOL	%FX31536	HS link enable/disable setting
_P2P_ENABLE_STATE	ARRAY[0..7] OF BOOL	%FX19072	P2P enable/disable current state
_P2P_REQ	ARRAY[0..7] OF BOOL	%FX31552	P2P enable/disable request
_P2P_REQ_NUM	ARRAY[0..7] OF BOOL	%FX31568	P2P enable/disable setting

-XGI

Flag	Data type	Device	Description
_HS_ENABLE_STATE	ARRAY[0..11] OF BOOL	%FX15840	HS link enable/disable current state
_HS_REQ	ARRAY[0..11] OF BOOL	%FX16480	HS link enable/disable request
_HS_REQ_NUM	ARRAY[0..11] OF BOOL	%FX16496	HS link enable/disable setting
_P2P_ENABLE_STATE	ARRAY[0..7] OF BOOL	%FX15872	P2P enable/disable current state
_P2P_REQ	ARRAY[0..7] OF BOOL	%FX16512	P2P enable/disable request
_P2P_REQ_NUM	ARRAY[0..7] OF BOOL	%FX16528	P2P enable/disable setting

-XGK

Flag	Data type	Device	Description
_HS1_ENABLE_STATE	BIT	F09600	HS link 1 enable/disable current state
_HS2_ENABLE_STATE	BIT	F09601	HS link 2 enable/disable current state
_HS3_ENABLE_STATE	BIT	F09602	HS link 3 enable/disable current state
_HS4_ENABLE_STATE	BIT	F09603	HS link 4 enable/disable current state
_HS5_ENABLE_STATE	BIT	F09604	HS link 5 enable/disable current state
_HS6_ENABLE_STATE	BIT	F09605	HS link 6 enable/disable current state
_HS7_ENABLE_STATE	BIT	F09606	HS link 7 enable/disable current state
_HS8_ENABLE_STATE	BIT	F09607	HS link 8 enable/disable current state
_HS9_ENABLE_STATE	BIT	F09608	HS link 9 enable/disable current state
_HS10_ENABLE_STATE	BIT	F09609	HS link 10 enable/disable current state
_HS11_ENABLE_STATE	BIT	F0960A	HS link 11 enable/disable current state
_HS12_ENABLE_STATE	BIT	F0960B	HS link 12 enable/disable current state
_HS1_REQ	BIT	F10300	HS link 1 enable/disable request
_HS2_REQ	BIT	F10301	HS link 2 enable/disable request
_HS3_REQ	BIT	F10302	HS link 3 enable/disable request
_HS4_REQ	BIT	F10303	HS link 4 enable/disable request
_HS5_REQ	BIT	F10304	HS link 5 enable/disable request
_HS6_REQ	BIT	F10305	HS link 6 enable/disable request
_HS7_REQ	BIT	F10306	HS link 7 enable/disable request
_HS8_REQ	BIT	F10307	HS link 8 enable/disable request
_HS9_REQ	BIT	F10308	HS link 9 enable/disable request
_HS10_REQ	BIT	F10309	HS link 10 enable/disable request
_HS11_REQ	BIT	F1030A	HS link 11 enable/disable request

Flag	Data type	Device	Description
_HS12_REQ	BIT	F1030B	HS link 12 enable/disable request
_HS1_REQ_NUM	BIT	F10310	HS link 1 enable/disable setting
_HS2_REQ_NUM	BIT	F10311	HS link 2 enable/disable setting
_HS3_REQ_NUM	BIT	F10312	HS link 3 enable/disable setting
_HS4_REQ_NUM	BIT	F10313	HS link 4 enable/disable setting
_HS5_REQ_NUM	BIT	F10314	HS link 5 enable/disable setting
_HS6_REQ_NUM	BIT	F10315	HS link 6 enable/disable setting
_HS7_REQ_NUM	BIT	F10316	HS link 7 enable/disable setting
_HS8_REQ_NUM	BIT	F10317	HS link 8 enable/disable setting
_HS9_REQ_NUM	BIT	F10318	HS link 9 enable/disable setting
_HS10_REQ_NUM	BIT	F10319	HS link 10 enable/disable setting
_HS11_REQ_NUM	BIT	F1031A	HS link 11 enable/disable setting
_HS12_REQ_NUM	BIT	F1031B	HS link 12 enable/disable setting
_P2P1_ENABLE_STATE	BIT	F09620	P2P1 enable/disable current state
_P2P2_ENABLE_STATE	BIT	F09621	P2P2 enable/disable current state
_P2P3_ENABLE_STATE	BIT	F09622	P2P3 enable/disable current state
_P2P4_ENABLE_STATE	BIT	F09623	P2P4 enable/disable current state
_P2P5_ENABLE_STATE	BIT	F09624	P2P5 enable/disable current state
_P2P6_ENABLE_STATE	BIT	F09625	P2P6 enable/disable current state
_P2P7_ENABLE_STATE	BIT	F09626	P2P7 enable/disable current state
_P2P8_ENABLE_STATE	BIT	F09627	P2P8 enable/disable current state
_P2P1_REQ	BIT	F10320	P2P1 enable/disable request
_P2P2_REQ	BIT	F10321	P2P2 enable/disable request
_P2P3_REQ	BIT	F10322	P2P3 enable/disable request
_P2P4_REQ	BIT	F10323	P2P4 enable/disable request
_P2P5_REQ	BIT	F10324	P2P5 enable/disable request
_P2P6_REQ	BIT	F10325	P2P6 enable/disable request
_P2P7_REQ	BIT	F10326	P2P7 enable/disable request
_P2P8_REQ	BIT	F10327	P2P8 enable/disable request
_P2P1_REQ_NUM	BIT	F10330	P2P1 enable/disable setting
_P2P2_REQ_NUM	BIT	F10331	P2P2 enable/disable setting
_P2P3_REQ_NUM	BIT	F10332	P2P3 enable/disable setting
_P2P4_REQ_NUM	BIT	F10333	P2P4 enable/disable setting
_P2P5_REQ_NUM	BIT	F10334	P2P5 enable/disable setting
_P2P6_REQ_NUM	BIT	F10335	P2P6 enable/disable setting
_P2P7_REQ_NUM	BIT	F10336	P2P7 enable/disable setting
_P2P8_REQ_NUM	BIT	F10337	P2P8 enable/disable setting

▶ How to enable link
  -HS link/P2P enable/disable setting flag ON → HS link/P2P enable/disable request flag ON
▶ How to disable link
  -HS link/P2P enable/disable setting flag OFF → HS link/P2P enable/disable request flag ON
▶ You can monitor the Enable/Disable state of the each link through “enable/disable current states” flag.

Chapter 6 High-speed Link

6.1 Introduction

High-speed link (HS Link) is a communication method between XGT PLC communication modules to send and receive data with HS link parameters setting, which can also allow the user to use XG5000 to exchange data with parameters setting of Tx/Rx data size, Tx/Rx period, Tx/Rx area and area to save through its data transmission service function.
However, since HS link service uses the subnet broad service, it may have an influence on other communication modules which use the identical network. Thus, setting as near to the max. Tx/Rx size (200 words) as available per HS link block is recommended for the user to obtain the greatest communication efficiency with the lowest influence on other modules so to reduce the sum of blocks. In order to make use of all functions, surely specify the basic communication parameters in the status of communication available.

HS link functions are as specified below;

1) HS link block setting function
   (1) If there are many Tx/Rx areas, up to 96 blocks can be set (32 for Tx and 64 for Rx respectively).
   (2) 200 words are available for a block.
   (3) Max. link points available are 19,200 words.
2) Tx/Rx period setting function
   Tx/Rx period can be set per block by user for the areas where especially fast Tx/Rx is required and not required respectively in a Tx/Rx period of 20ms to 10 sec.
3) Tx/Rx area setting function
   Tx/Rx area can be set per data block by user according to I/O address specified.
4) HS link information providing function
   Reliable communication system can be easily configured by providing HS link information for user via the user keyword.

[Table 6.1.1] shows communication HS link points whose basic unit is 1 word.

Classification	Max. communication points	Max. Tx points	Max. blocks	Max. points per block
XGK-CPUS	12,800	6,400	64 (0-63)	200
XGK-CPUH	12,800	6,400	64 (0-63)	200

[Table 6.1.1] Max. communication points

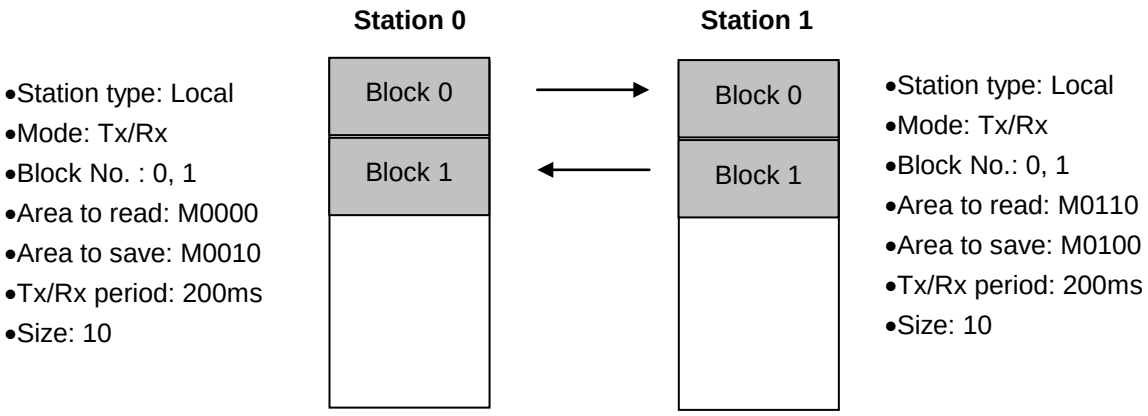
6.2 HS link Tx/Rx Data Processing

HS link application will be described below with the example where FDEnet I/F modules of the stations No.0 and No.1 are to send and receive the data between each other.

Its setting sequence is as follows;

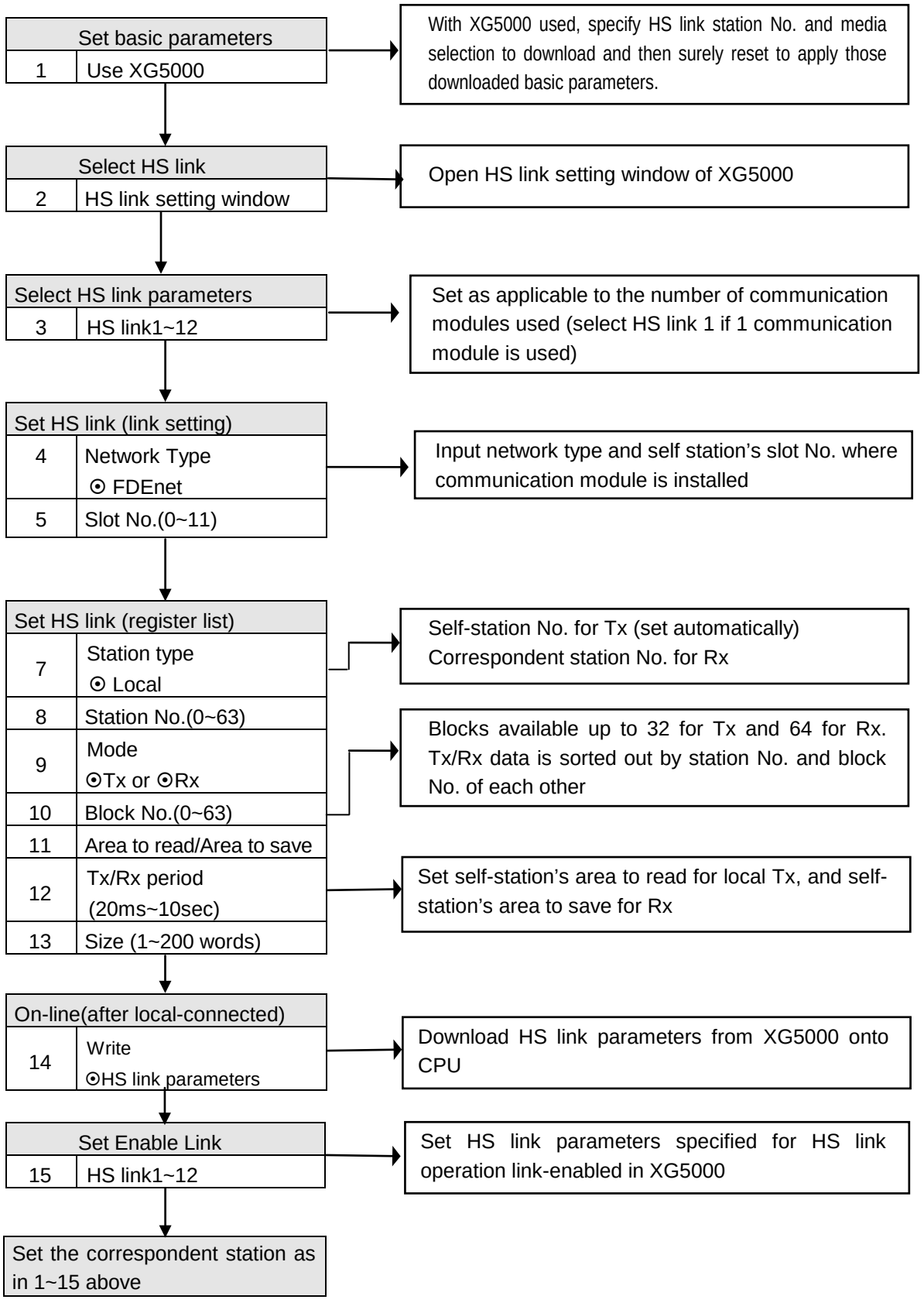
1) The station No.0 transmits M0000 data of 10 words to No.0 block.
2) The data received by the station No.1 is saved on M0010.
3) The station No.1 receives M0000 data of 10 words from the station No.0 to save on M0100.
4) M0110 data of 10 words is transmitted to No.1 block.

There are 32 blocks for Tx data and 64 blocks for Rx data in the HS link parameters. The block number can be set 0~31 for transmission or 0~63 for receiving. The Tx side needs only to decide which data to read and which block to send to without setting the correspondent station No. when transmitting the data



[Table 6.2.1] Diagram of HS link processing blocks

6.3 Operation Sequence through HS link



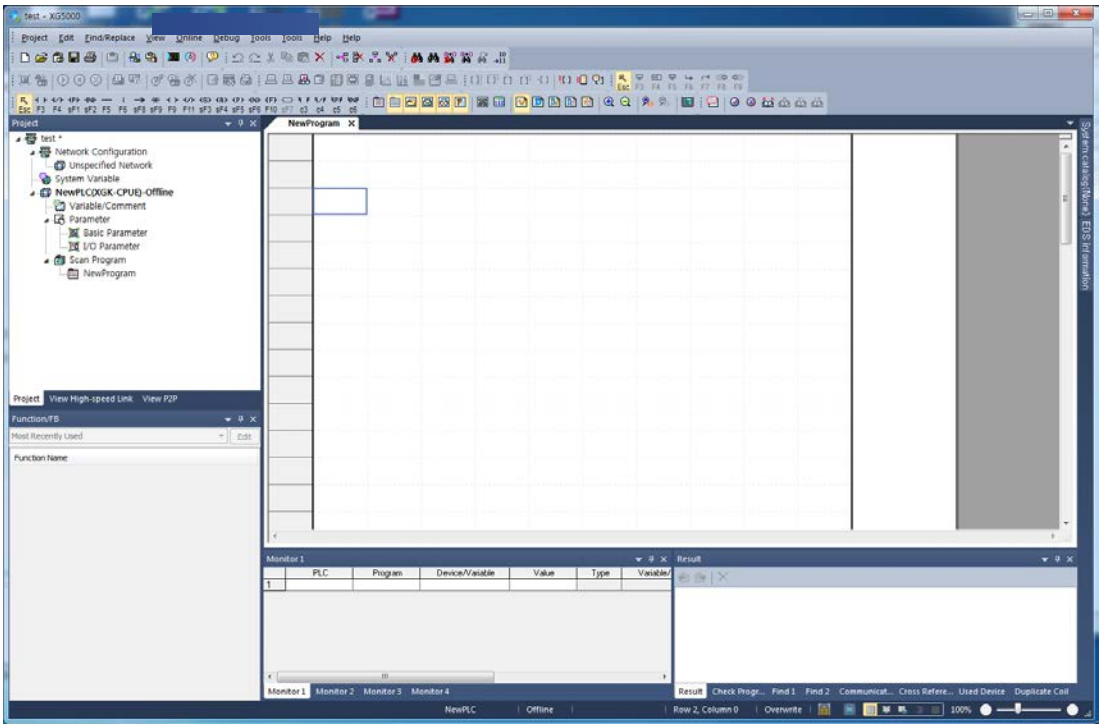
6.4 HS link parameters setting

HS link parameters can be specified as selected on the XG5000's HS link screen for applicable items, whose setting sequence and respective functions are as follows.

6.4.1 HS link parameters setting of XG5000

1) Execution of XG5000

If XG5000 is executed for the first time, the screen will be displayed as shown in [Fig. 6.4.1]. Click XG5000 icon.



[Fig. 6.4.1] Basic screen of XG5000

2) Basic setting

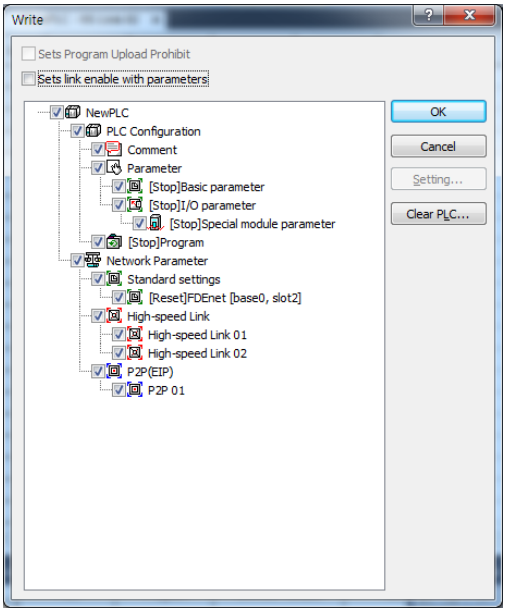
(1) How to set the communication module

Communication module can be registered online or offline. If you want to detailed information, please refer to the Chapter 5 XG5000 program.

(2) Basic setting download

In the [Figure 6.4.1] of XG55000, select the [Online]-[Write]. Then window of [Figure 6.4.4] will be opened. Check the basic setting and click "OK".

After download the basic settings, turn OFF/ON the power of PLC or reset. If you don't reset the communication module, XG5000 will not recognize it as a communication module.

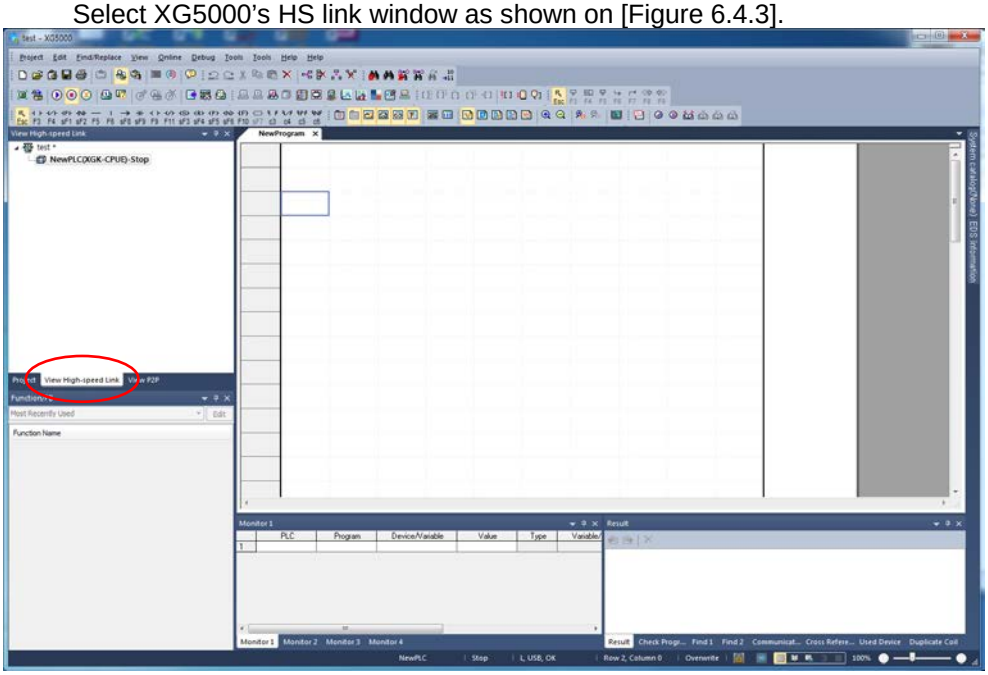


[Figure 6.4.2] Write window

3) HS Link parameters setting

(1) Initial screen setting of HS link parameters

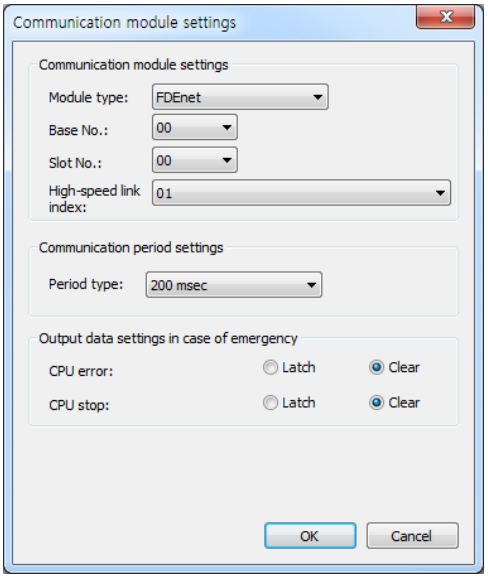
Select XG5000's HS link window as shown on [Figure 6.4.3].



[Figure 6.4.3] Initial setting screen of HS link

(2) Setting of communication module and communication period

Double-click one of the HS links 01~12 on the [Figure 6.4.4] screen to open the setting screen of communication module and communication period where communication module and communication period can be specified.



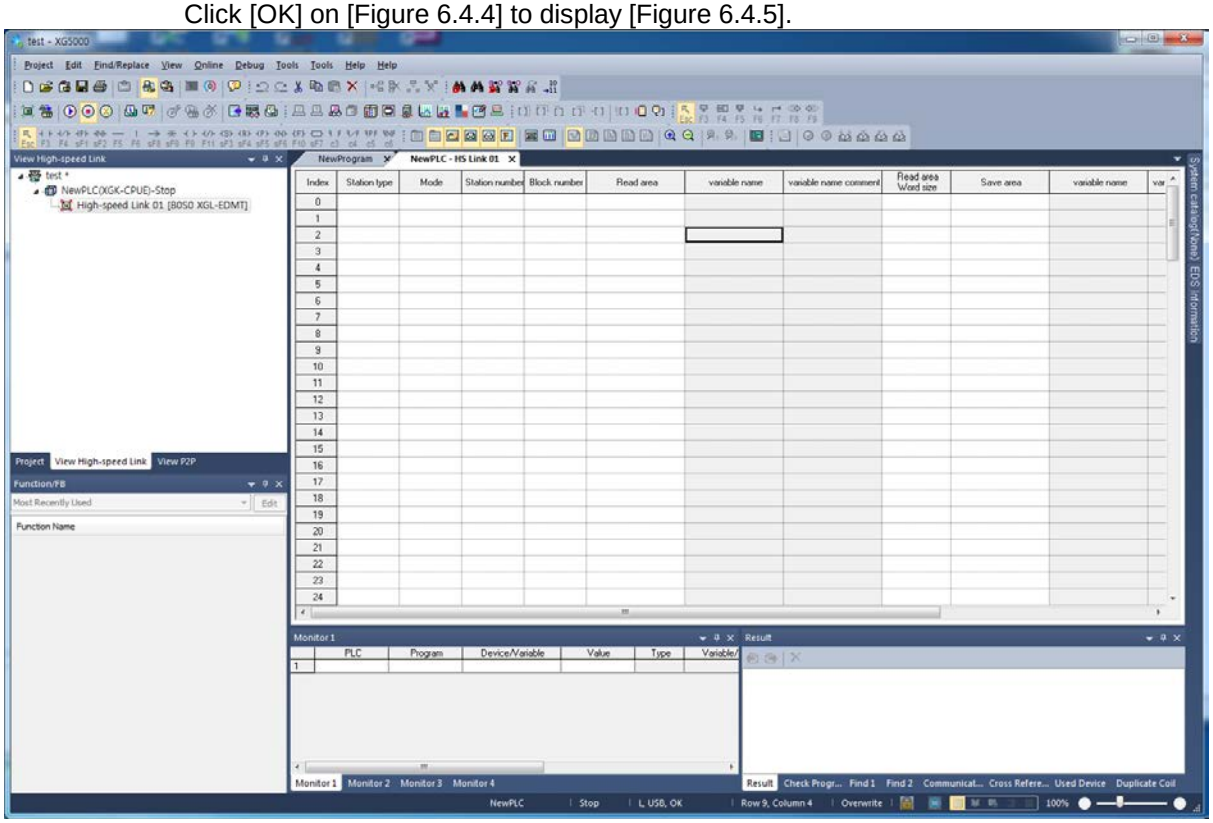
[Figure 6.4.4] Initial setting screen of HS link

Item		Details
Communication module setting	Module type	Specify the communication module installed.
	Base no.	Specify the base position the module is installed on (max. 7 stages can be added). Setting range: 0 ~ 7
	Slot no.	Specify the slot position the module is installed on (max. 12 units can be added). Setting range: 0 ~ 11
Communication period setting	Period type	- Set data Tx at periodic intervals. - Setting range; 20 ㎳, 50 ㎳, 100 ㎳, 200 ㎳, 500 ㎳, 1s, 5s, 10s (default is 200 ㎳) - However, Rx data will update the data whenever scanned regardless of the communication period. - The communication period will be applied identically to the whole Tx/Rx blocks. - Up to 4 blocks of data can be sent at a time. Even if this is exceeded, the data will be divided into 4-block unit for transmission, with which the data size of a block has noting to do.
Output data settings in case of emergency	Latch	Send the data that received from CPU.
	Clear	Ignore the received data from CPU and send 0.

[Table 6.4.2] Setting of communication module and communication period

(3) HS link parameters setting

Click [OK] on [Figure 6.4.4] to display [Figure 6.4.5].



[Figure 6.4.5] Initial setting screen of HS link

(4) Setting of HS link blocks

Double-click ‘Block’ on [Figure 6.4.5] to open [Figure 6.4.6].

Index	Station type	Mode	Station number	Block number	Read area	variable name	variable name comment	Read area Word size	Save area	variable name	variable name comment	Save area Word size
0												
1												
2												

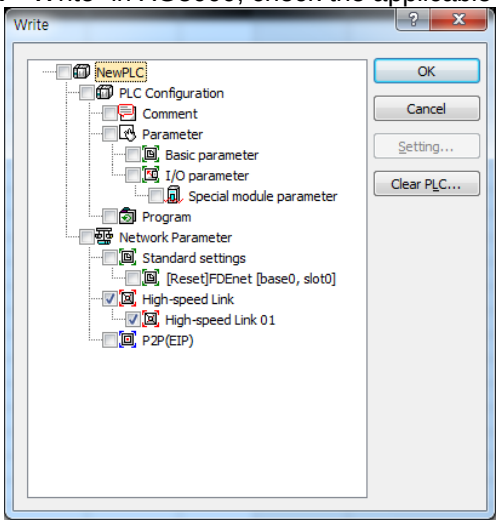
[Figure 6.4.6] Setting screen of HS link blocks

Classification		Details
Station type	Master	Area to set the module application to master or slave
	Slave	
Station No.	Self-station No.	Setting condition: 1) If station No. is for master with block type of Rx 2) If station No. is for slave Setting range: 0 ~ 63 If identical station No. is set, normal communication is not available.
Read area	Address	Area to set the start address of device used for Tx. Setting device : P, M, L, K, D, T, C (It shall not be duplicated with the device address being used in program)
	Size (Word)	Set data size to transmit. Setting unit : Word Setting range :1 ~ 200
Block type	Tx	Transmits data
	Rx	Receives data.
Block No.	Block No.	Set Tx/Rx blocks Tx blocks: up to 32 (setting range: 0 ~ 31) Rx blocks: up to 64 (setting range: 0 ~ 31)
Save area	address	Area to set the start address of device used for Rx. Setting device : P, M, L, K, D, T, C (It shall not be duplicated with the device address being used in program)
	Size (Word)	Set data size to receive. Setting unit : Word Setting range :1 ~ 200

[Table 6.4.3] HS link setting

(5) How to download HS link parameters

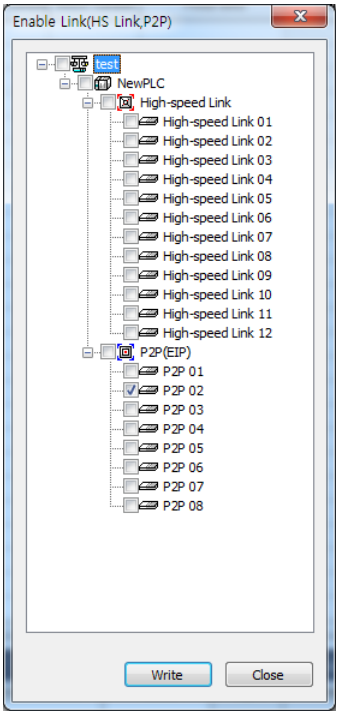
Click “Online” → “Write” in XG5000, check the applicable HS link and then click [OK].



[Figure 6.4.7] Parameters Write Screen

(6) HS link parameters enable

Click “Online” → “Enable Link” in XG5000, check the applicable HS link and then click [Write]. If HS link is enabled, on the module’s LED display HS LED will be On, when HS link starts.



[Figure 6.4.8] Link Enable Screen

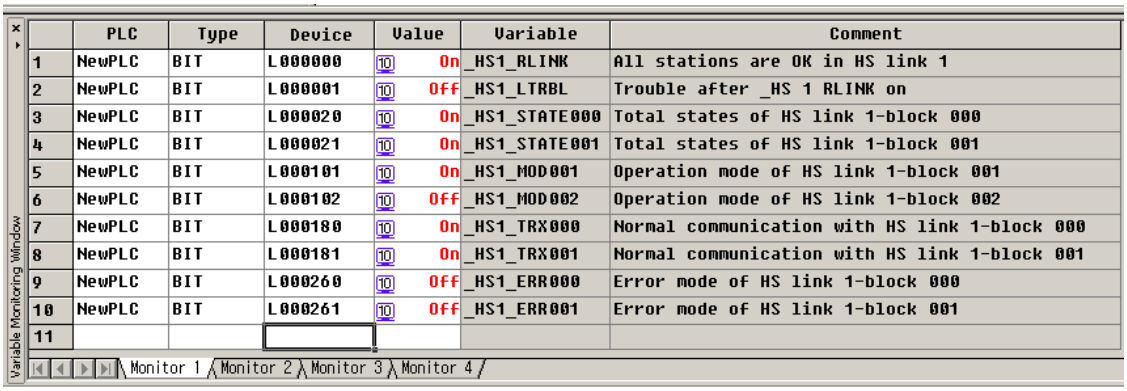
6.5 HS Link Information

With HS link service used to exchange data between communication modules of two or more stations, it provides a checking method of HS link service status for the user through HS link information so to confirm reliability of the data read from the correspondent station via the HS link. In other words, the communication module synthesizes the data received up to that time at intervals of a specific time and lets the user know if HS link operates as in parameters specified by the user through HS link information where the whole information of Run-link(_HSxRLINK) and Link-trouble(_HSxLTRBL) to provide the whole information of the communication network, and the individual information of _HSxSTATE, _HSxTRX, _HSxMOD and _HSxERR to provide communication status for 64 register items in the parameters are contained. The user can use the information in keyword format when programming, and also monitor the HS link status using the monitor function of the HS link information. Prior to its application, the user is requested to check the reliability of the Tx/Rx data through HS link information of Run-link and Link-trouble when operating several PLCs with HS link used. [Table 6.5.1] below shows functions and definition of the HS link information.

Classification	Run-link	Link-trouble	Tx/Rx status	Operation Mode	Error	HS link status
Information type	Whole information	Whole information	Individual information	Individual information	Individual information	Individual information
Keyword name (x=HS link No.)	_HSxRLINK	_HSxLTRBL	_HSxTRX[n] (n=0..63)	_HSxMOD[n] (n=0..63)	_HSxERR[n] (n=0..63)	_HSxSTATE [n](n=0..63)
Data type	Bit	Bit	Bit-Array	Bit-Array	Bit-Array	Bit-Array
Monitor	Available	Available	Available	Available	Available	Available
Program	Available	Available	Available	Available	Available	Available

[Table 6.5.1] HS link information function

Double-click [Variable/Comment] on the XG5000 project screen to display the flags view screen as shown below on [Fig. 6.5.1]. From this screen drag the applicable device on to the variable monitor window.



	PLC	Type	Device	Value	Variable	Comment
1	NewPLC	BIT	L000000	On	_HS1_RLINK	All stations are OK in HS link 1
2	NewPLC	BIT	L000001	Off	_HS1_LTRBL	Trouble after _HS 1 RLINK on
3	NewPLC	BIT	L000020	On	_HS1_STATE000	Total states of HS link 1-block 000
4	NewPLC	BIT	L000021	On	_HS1_STATE001	Total states of HS link 1-block 001
5	NewPLC	BIT	L000101	On	_HS1_MOD001	Operation mode of HS link 1-block 001
6	NewPLC	BIT	L000102	Off	_HS1_MOD002	Operation mode of HS link 1-block 002
7	NewPLC	BIT	L000180	On	_HS1_TRX000	Normal communication with HS link 1-block 000
8	NewPLC	BIT	L000181	On	_HS1_TRX001	Normal communication with HS link 1-block 001
9	NewPLC	BIT	L000260	Off	_HS1_ERR000	Error mode of HS link 1-block 000
10	NewPLC	BIT	L000261	Off	_HS1_ERR001	Error mode of HS link 1-block 001
11						

[Fig. 6.5.1] Variable Monitoring Window

A) Run-link (_HSxRLINK)

As the whole information it shows whether HS link is normally executed through the user defined parameters, whose contact will be kept 'On' if once 'On' until Link Enable is 'Off', and also will be 'On' under the conditions specified below.

① If Link Enable is 'On'.

② If all the register list settings of parameters are specified normally.

③ If all the data applicable to the parameters register list is transmitted and received as specified in the period.

④ If the status of all the correspondent stations specified in the parameters is Run and with no error at the same time.

B) Link-trouble (_HSxLTRBL x=HS link No.(1~12))

As the whole information it shows whether HS link is normally executed through the user defined parameters, which will be 'On' if Run-link 'On' condition is violated when Run-link is On, and will be off if the condition is recovered.

C) Tx/Rx status (_HSxTRX[0..63] x=HS link No.(1~12))

As individual information it shows the operation status of HS link parameters on the register list up to 64 registered items'Tx/Rx information. If the Tx/Rx operation of the registered items is agreeable to the Tx/Rx period, the applicable bit will be On, and if not, it will be Off.

D) Operation mode(_HSxMODE[0..63] x=HS link No.(1~12))

As individual information it shows the operation status of HS link parameters on the register list up to 64 registered items' operation mode information just like the max. register number. If the station specified in the register item is in Run mode, the applicable bit will be On, and if in Stop/Pause/Debug mode, it will be Off.

E) Error (_HSxERR[0..63] x=HS link No.(1~12))

As individual information it shows the operation status of HS link parameters on the register list up to 64 registered items' error information just like the max. register number. The error displays the general status of the PLC which fails to execute the user program. If the correspondent station PLC is normal, it will be Off, and if abnormal, it will be On.

F) HS link status (_HSxSTATE[0..63] x=HS link No.(1~12))

As individual information it shows the operation status of HS link parameters on the register list up to 64 registered items' HS link status just like the max. register number, which synthesizes the information of the individual items to display the general information of the registered items. In other words, if the applicable list's Tx/Rx status is normal with the operation mode of Run and with no error, it will be On, and if the conditions above are violated, it will be Off.

6.5.1 Monitor of HS link information

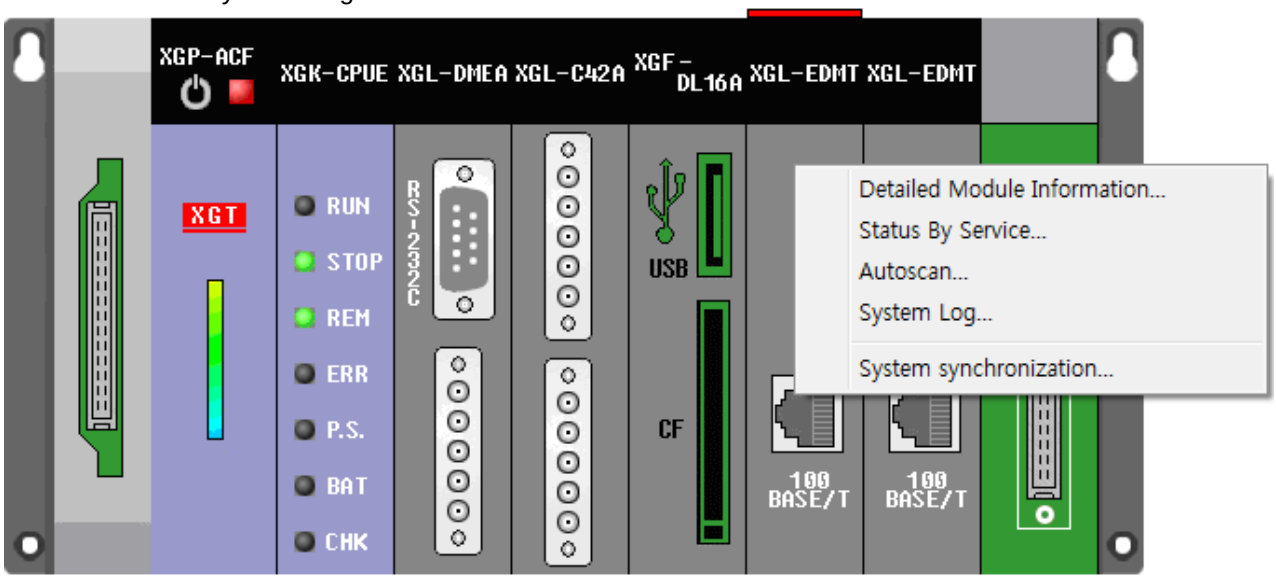
HS link information can be checked through the variable monitor on the monitor menu after XG5000 is on-line connected, or through the XG5000 diagnosis service.

A) Variable monitor

Variable monitor is a function used to select an item only necessary to monitor by means of XG5000's flag monitor function. Select [View] [Variable Monitor Window] to display the variable register screen as shown on [Fig. 6.5.1] , and there select [Flag] directly to select and register HS link information flag one by one on the screen of the variable flags list. At this time, since _HSxSTATE[n], _HSxERR[n], _HSxMOD[n] and _HSxTRX[n] are the flags of array type, the user needs directly to select the array numbers which stand for the register numbers inside the parameters.

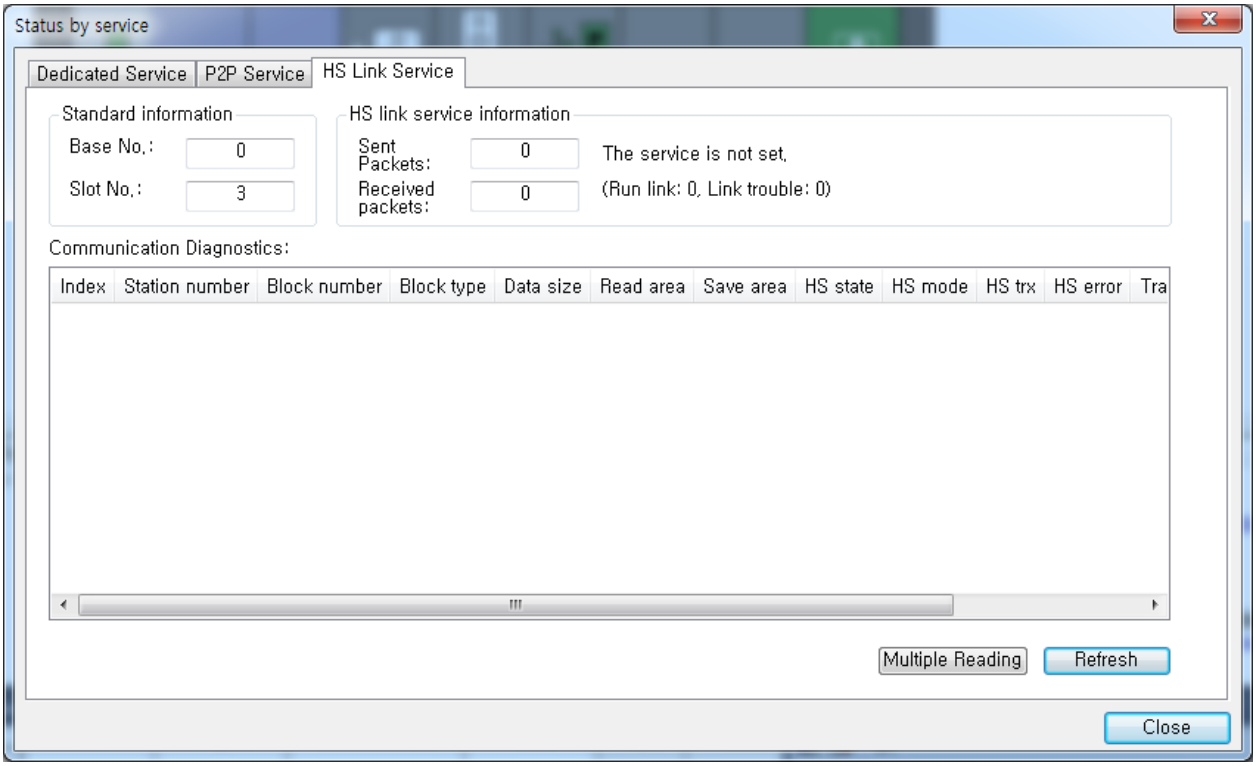
B) HS link monitor from the XG5000 diagnosis services

① Select XG5000 → 'Connect' → 'Online' → 'Communication module setting' → 'System Diagnosis'



[Fig. 6.5.2] System Diagnosis

② With the mouse cursor placed on XGL-EDMT, click the right mouse button and select ‘Status by Service’ to open [Fig. 6.5.3] screen as shown below;

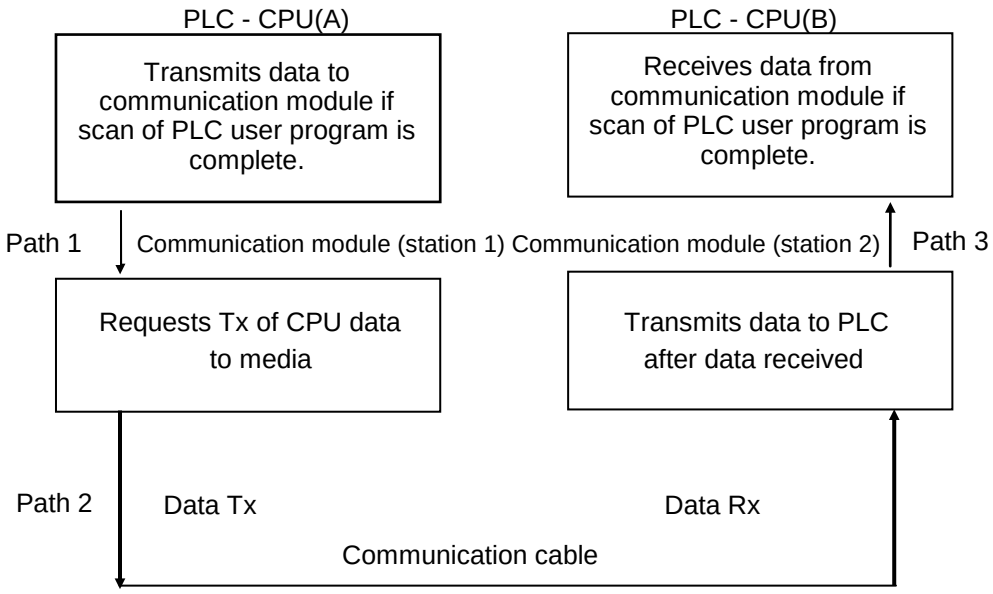


[Fig. 6.5.3] XG5000 diagnosis service

6.6 Calculation of HS Link Speed

6.6.1 Introduction

Data Tx speed of HS link can be decided by various factors, which will be through the following route as in [Fig. 6.6.1] until the data of a block is saved from one station onto the other station's Rx area.



[Fig. 6.6.1] Data Tx path through communication module

The data shall be through mainly 3 paths to be sent to other station via the communication as shown in [Fig. 6.6.1], and the time required for the respective paths will decide the Tx time.

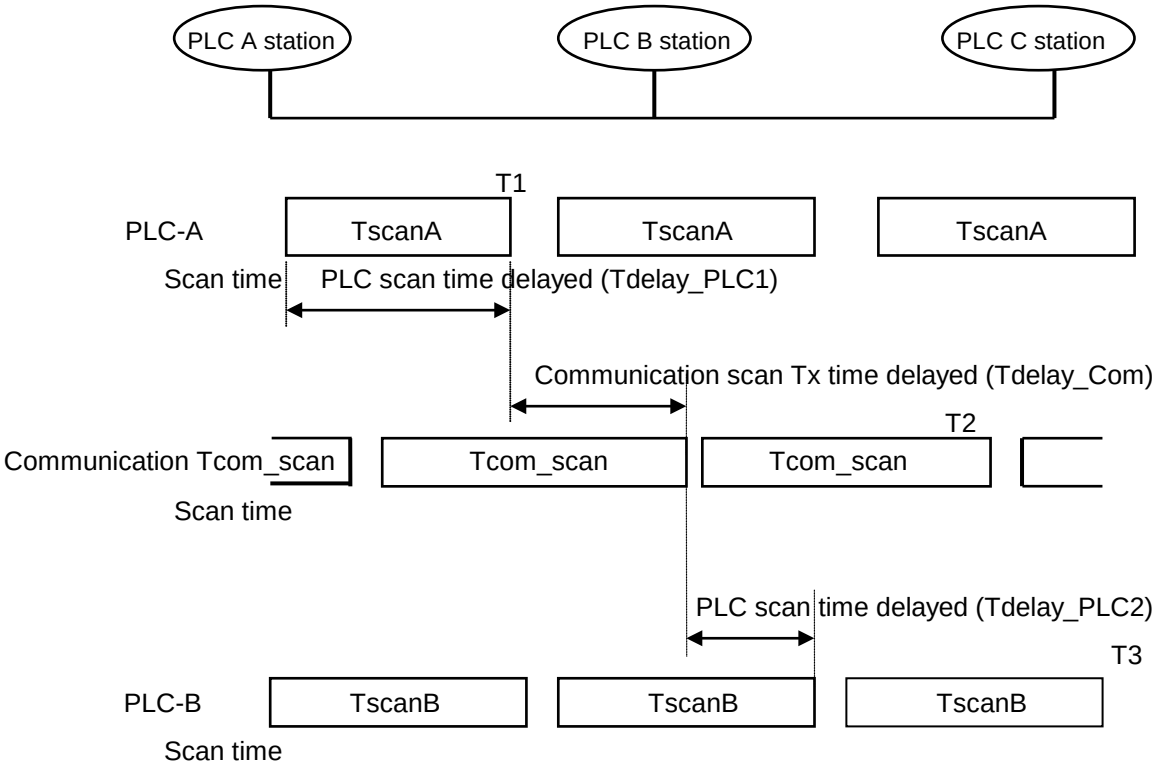
Main paths to transmit data through and factors which have an influence on the time for the respective paths are as described below in [Table 6.6.1]

Item	Path	Factor influencing time
1	PLC CPU(A) --> Communication module (station No.1)	PLC-A Program scan time
2	Communication module (station No.1) --> Communication module (station No.2)	Communication scan time + Communication O/S scan time
3	Communication module (station No.2) --> PLC CPU(B)	PLC-B Program scan time

[Table 6.6.1] Data Tx path and time factor

Since PLC CPU executes data Tx at the moment when PLC user program ends from or in the communication module to PLC CPU, the scan time of PLC user program is a important factor of data Tx. Select PLC information on XG5000 on-line menu to display the max./min./present program scan time. In addition, the communication module needs to detect the empty time of the communication cable to send its data, which will be decided by the standard of IEEE 802.3.

Tx point of time is as shown below in [Fig.6.6.2] based on PLC program scan time and communication scan time.



[Fig. 6.6.2] Relationship between PLC scan time and communication scan time

As shown in [Fig.6.6.2], PLC-A station sends Tx data from T1 to the communication module when PLC-A station's program ends. Thus, time as much as Tdelay_PLC1 will be delayed. The communication module can send the data after waiting for the communication scan time delayed (Tdelay_Com) after data received from PLC. The max. delayed time can be as much as Tcom_Scan1.

In the case of PLC-B, the communication module also sends the received data to PLC after waiting for the time as much as Tdelay_PLC2, thus the max. delayed time can be as much as Tscan2. Accordingly, the communication time delayed is decided by various variables such as the total number of communication stations, program size and communication module's O/S scan time as shown in [Fig.6.6.2]. Since these variables are difficult to calculate, here a convenient and simple method is provided for user.

6.6.2 Calculation of HS Link speed

HS link speed is defined as the max. time required to sent the data of a block from PLC-A to PLC-B as shown above in [Fig.6.6.2]. And the calculation of HS link speed will be classified into the complicated system with the data of 512 bytes or more to be sent to 10 or more communication stations, and the simple system with the data less than to be sent to the communication stations less than accordingly, as described below;

(A) Simple system

HS link speed can be calculated with the simple formula for the system with the data less than 512 bytes to be sent to the communication stations less than 10 as below;

St = P_ScanA + C_Scan + P_ScanB ---------- [Formula 6.6.1(A)]

(St = Max. Tx time of HS link
P_ScanA = plc A's max. program scan time
P_ScanB = plc B's max. program scan time
C_Scan = Max. communication scan time)

In the [Formula 6.6.1(A)], C_Scan can be calculated as simple as below;

C_Scan = Th × Sn ---------- [Formula 6.6.1(B)]

(Th = Data Tx time from media per station number (IEEE 802.3 standard)
Sn = Total Station Number : Total number of communication stations)

(B) Complicated system

HS link speed can be calculated as in [Formula 6.6.1(C)] for the system with the data of 512 bytes or more to be sent to 10 or more communication stations in total.

St = Et ×To ×Ntx + Mf ---------- [Formula 6.6.1(C)]

Where, { Et = Effective Tx Ratio (effective Tx rate)
To = Octet time (Tx time of 1 byte)
Ntx = Total Tx number
Mf = Margin Factor(marginal) }

And the respective items will be decided as below;

① Et = St × Nf ---------- [Formula 6.6.1(D)]

{St = Total number of communication stations

Nf = Network Factor, constant based on characteristics of communication system, which will be 1.5 in FDEnet system}

② To = {octet time, required to send a byte of data by serial data, which will be as follows;

- FDEnet : 0.8 ㎲}

③ Ntx = Total transmitted data, number of variable services included, which will be decided based on the system as follows;

- FDEnet : Sum of HS link Tx bytes + function blocks + number of LS service data × 1,024

④ Mf = Marginal value for the factors unavailable to display in the formula above, such as O/S scan time of communication module, which will be decided as follows;

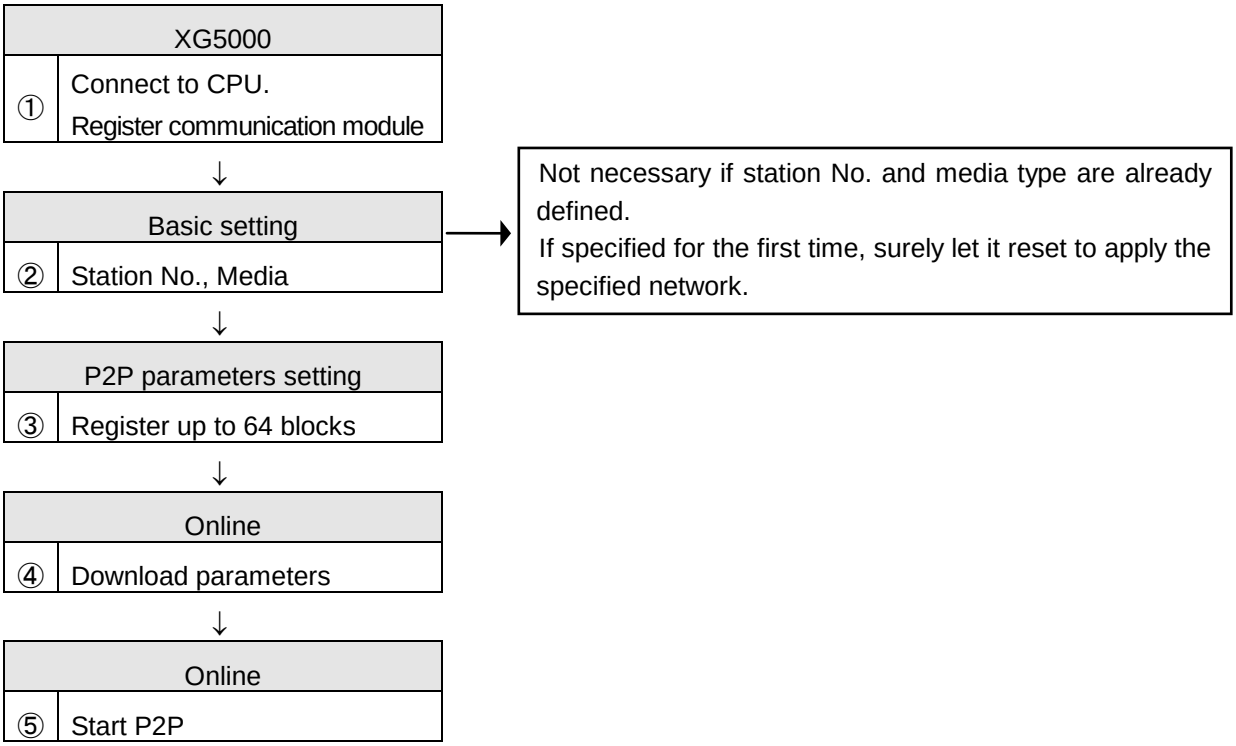
- FDEnet : 25 ㎳

Chapter 7 P2P Service

7.1 Introduction

This service is used to write the self-station's data on a specific area of the correspondent station, or to read the data from a area of the correspondent station.

Type and application of P2P provided for users will be described.
Programming sequence with P2P used is as follows;



7.2 P2P Instructions

1) P2P Instructions

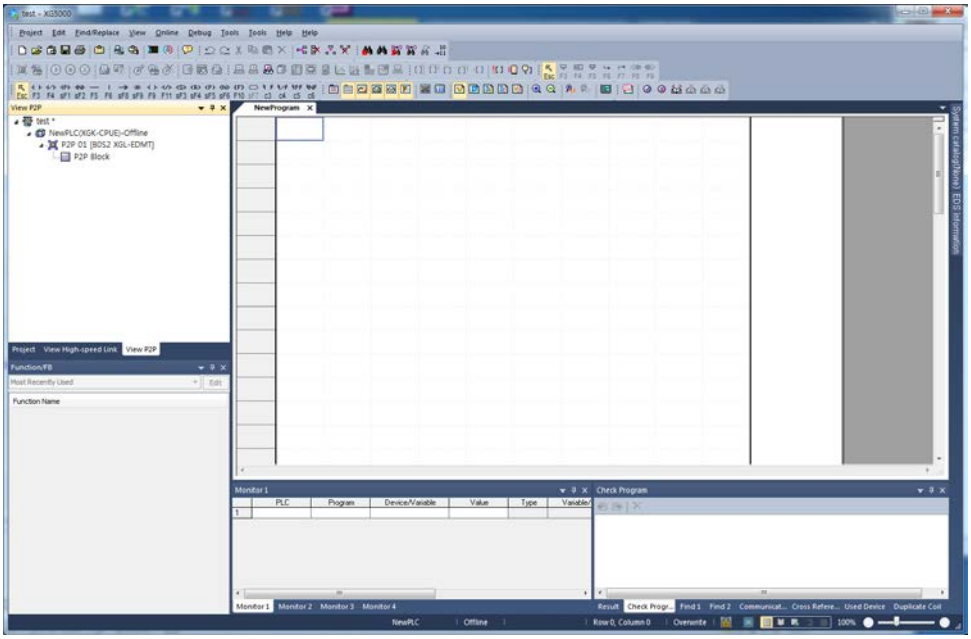
There are two P2P Instructions used for user to prepare programs.

Type	Purpose
Read	Reads the specified area of the correspondent station to save.
Write	Saves the specified area data of the self-station on the specified area of the correspondent station.

[Table 7.2.1] P2P type

7.3 P2P Application

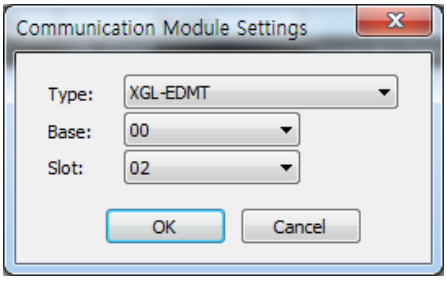
In order to execute P2P service, register communication modules on the XG5000's P2P register window, where up to 64 P2P blocks can be set.



[Fig. 7.3.1] P2P parameters screen

First, register the communication modules to execute P2P service so to set P2P blocks on the empty P2P register window as above.

In order to define P2P service for FDEnet installed on Base 0, Slot 2 to execute, select one among P2P 0~7 first.

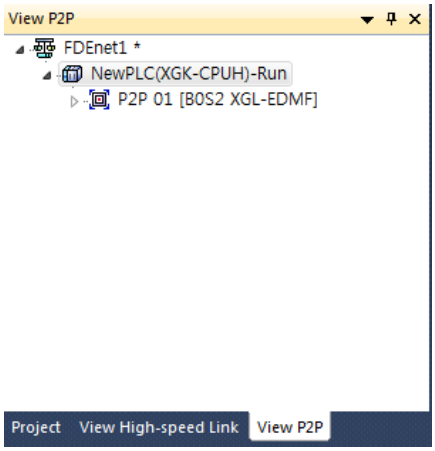


[Fig. 7.3.2] Setting screen of communication module

Item	Details
Type	Select a module desired to use.
Base	active
Slot	active

[Table 7.3.1] Description of Communication module settings

Register type, base and slot positions in [Fig. 7.3.2] and click [OK] to display the screen as shown in [Fig. 7.3.3].



[Fig. 7.3.3] P2P parameters screen

Double-click P2P block in [Fig. 7.3.3] to display the 'P2P block setting' screen as shown in [Fig. 7.3.4].

Index	P2P function	Conditional flag	Command type	Data type	No. of variables	Data size	Destination station	Destination station number	Setting	Variable setting contents
0									Setting	
1									Setting	
2									Setting	
3									Setting	
4									Setting	
5									Setting	
6									Setting	
7									Setting	
8									Setting	
9									Setting	
10									Setting	
11									Setting	
12									Setting	
13									Setting	
14									Setting	
15									Setting	

[Fig. 7.3.4] P2P block setting

Item	Details
Index	P2P setting block where up to 0~63 can be set.
Command	Specified Instruction displayed.
Detailed information	Execution condition of Instruction displayed.
N address	Reference address of P2P service.

[Table 7.3.2] P2P block settings

7.3.1. Functions and setting of P2P

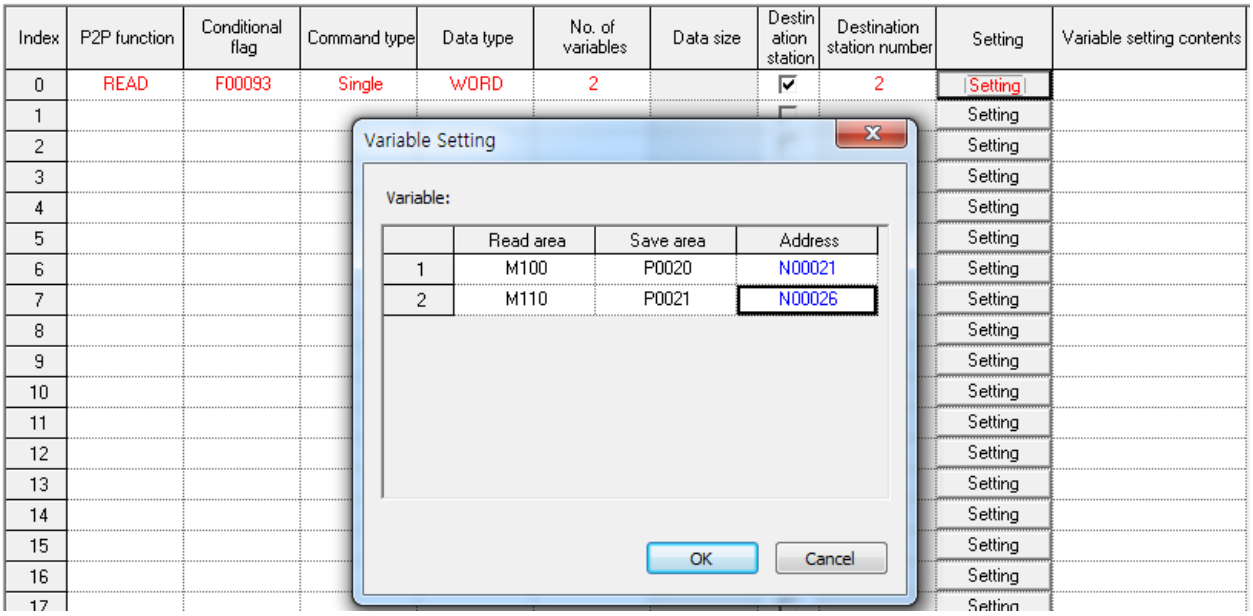
On the [Fig. 7.3.4] P2P block setting screen, double-click an optional index number among 0~63 to display the P2P function screen as shown below in [Fig. 7.3.5].

Index	P2P function	Conditional flag	Command type	Data type	No. of variables	Data size	Destination station	Destination station number	Setting	Variable setting contents
0							☐		Setting	
1							☐		Setting	

[Fig. 7.3.5] P2P function screen

1) READ

It is used to read the specified area of the correspondent station to save on the specified area of the self-station when the defined event happens. If Bit No.1 of P0004 is set, data of correspondent station No.2's MW100 and MW110 will be read word by word to be saved on P0020 and P0021 of the self-station with the following setting;



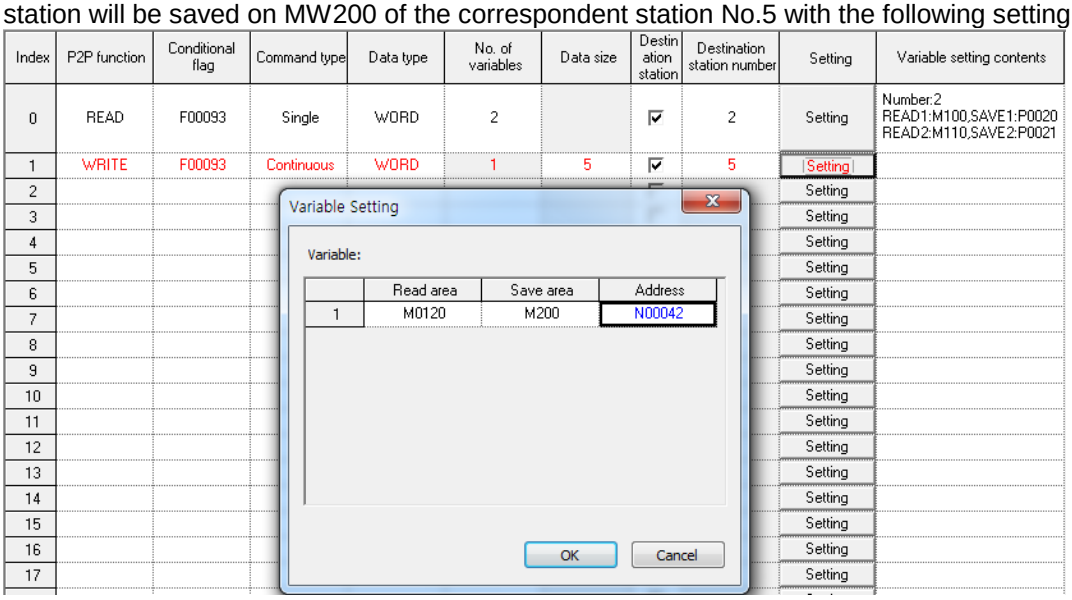
[Fig. 7.3.6] READ screen

Item		Details
Standard Operating Settings	Condition flag	1) Decides the point of time READ function starts. 2) It will operate if P0004's Bit No.1 is set for P00041.
	Command type	1) Decides the type of Read operation. 2) Single/Continuous available. ① Single: reads individual areas. ② Continuous: reads data as specified from the defined start position to save.
	Data type	1) If Read operation executed, define data type of the area used in P2P block. 2) Word and Bit available.
	No. of variables	1) Available only for Single Read. 2) Number of areas used to execute Single Read.
	Destination Station No.	Correspondent station No. to read from.
Memory settings	Read area	Area address of correspondent station to read from.
	Save area	Area address of self-station to save the read data on

[Table 7.3.3] Read settings

1) WRITE

It is used to write the data of the self-station on an optional area of the correspondent station when the defined event happens. If Bit No.0 of P0030 is set, 5 words from MW120 of the self-station will be saved on MW200 of the correspondent station No.5 with the following setting.



[Figure 7.3.7] Block settings screen

Details of respective items are as follows;

Item		Details
Standard Operation Settings	Condition flag	1) Decides the point of time WRITE function starts. 2) It will operate if P0030's Bit No.0 is set for P00300.
	Command type	1) Single/Continuous available. ① Single: reads individual areas. ② Continuous: reads data as specified from the defined start position to save.
	Data type	1) If Write operation executed, define data type of the area used in P2P block. 2) Word and Bit available.
	Number of variables	1) Available only for Single Write. 2) Number of areas used to execute Single Write.
	Destination Station Number	Correspondent station No. to write to.
Memory settings	Read area	Address of correspondent station to send the data of self-station to.
	Save area	Area address of correspondent station to save the data on.

[Table 7.3.4] Write settings

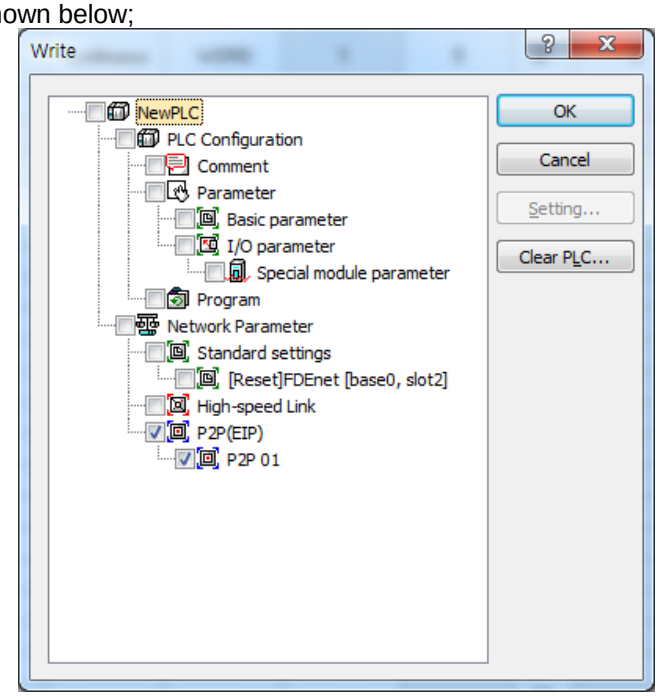
7.4 Operation Sequence of P2P Service

After P2P setting is complete, download the P2P parameters and start the P2P service to make the service available.

1) P2P parameters download

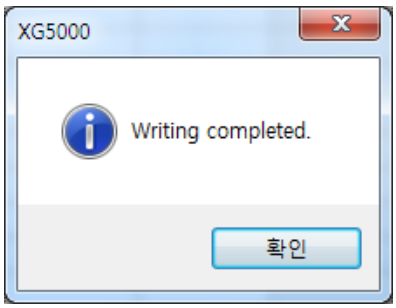
In order to download the P2P parameters after registered, first connect XG5000 to CPU.

Select [Online] - [Write Parameter] to arrange and display the P2P parameters registered among P2P parameters 0~7 as shown below;



[Fig. 7.4.1] Parameters setting screen

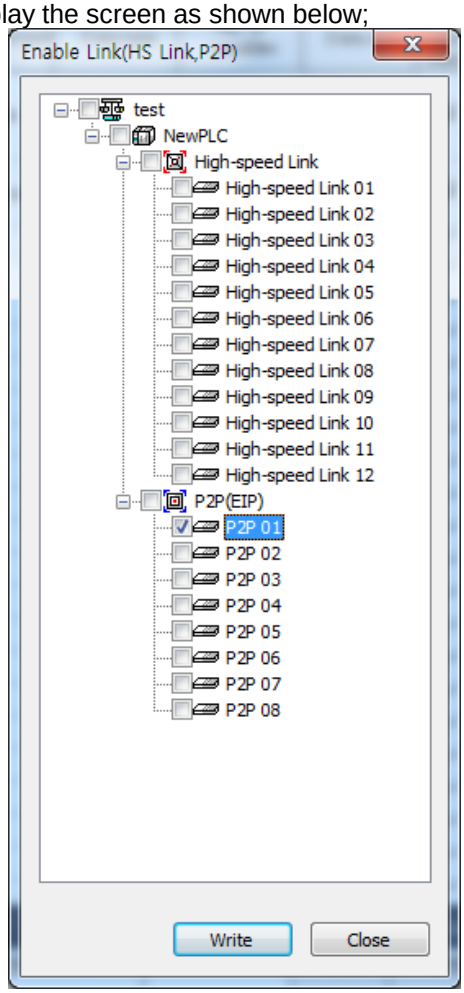
Select desired P2P parameters and click [OK] to start to download.



[Fig. 7.4.2] Write complete

2) P2P service start

P2P parameters after downloaded shall be enabled by user to start P2P service. Select “Online – Enable Link” to display the screen as shown below;



[Fig. 7.4.3] Parameters setting screen

Among P2P parameters 0~7, presently operation P2P parameters are checked, among which check P2P parameters to be enabled and click [OK] to execute the service for the applicable P2P parameters.

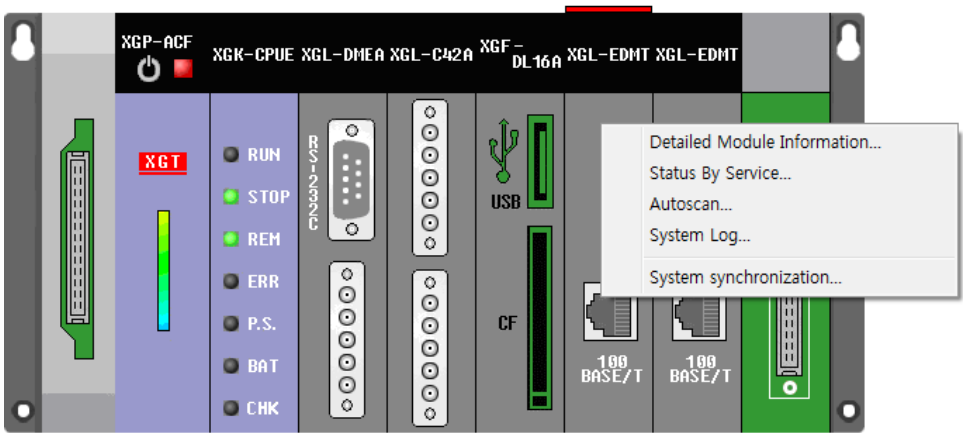
In order to stop P2P service, cancel the check mark of the applicable P2P parameters on the link enable screen and then click [OK].

7.5 P2P Service Information

P2P service information provides P2P related data through XG5000.

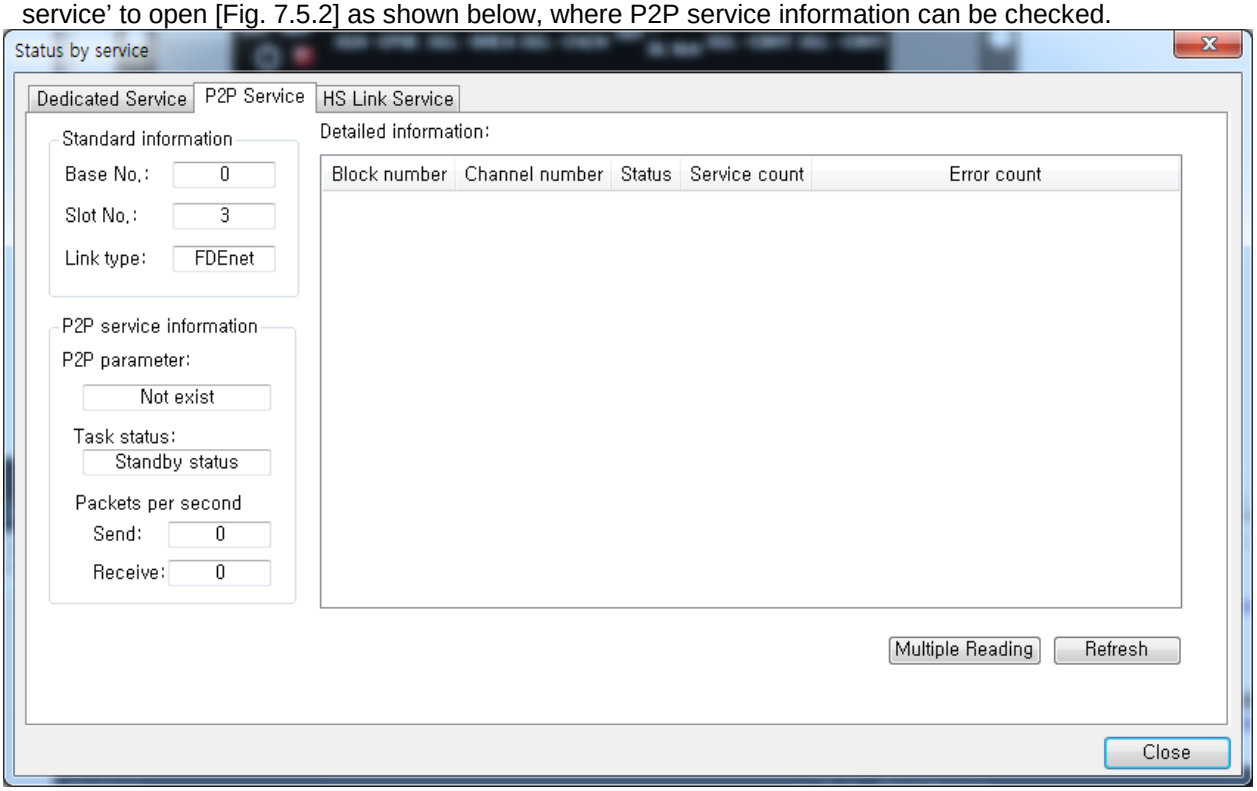
1) P2P service from the XG5000 system diagnosis

① Select XG5000 → 'Connect' → 'Online' → 'Communication module setting' → 'System Diagnosis'.



[Fig. 7.5.1] System Diagnosis

② With the mouse cursor placed on XGL-EDMT, click the right mouse button and select 'Status by service' to open [Fig. 7.5.2] as shown below, where P2P service information can be checked.

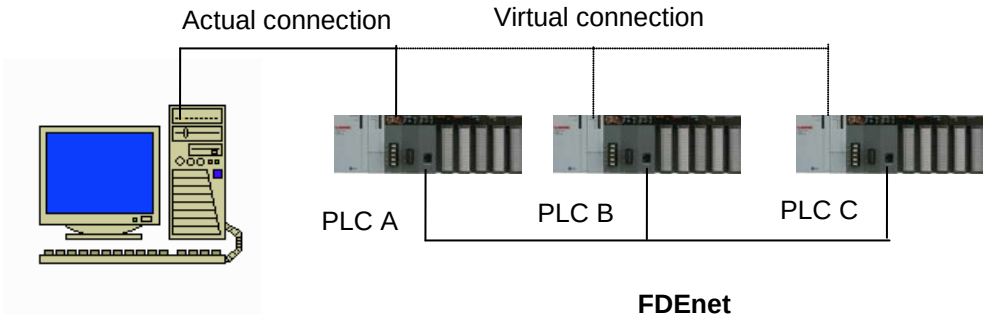


[Fig. 7.5.2] P2P status for respective services

Chapter 8 Remote Communication Control

8.1 Introduction

This function is for programming, download of user program, program debugging, monitoring, etc in network system where PLCs are connected with each other via FDEnet by remote control without moving the physical connection status of program tool (XG-5000). Especially it is convenient for easy access to each device from a place without repositioning when network-connected devices are separated far. Communication service function creates the following path to attain its purpose.



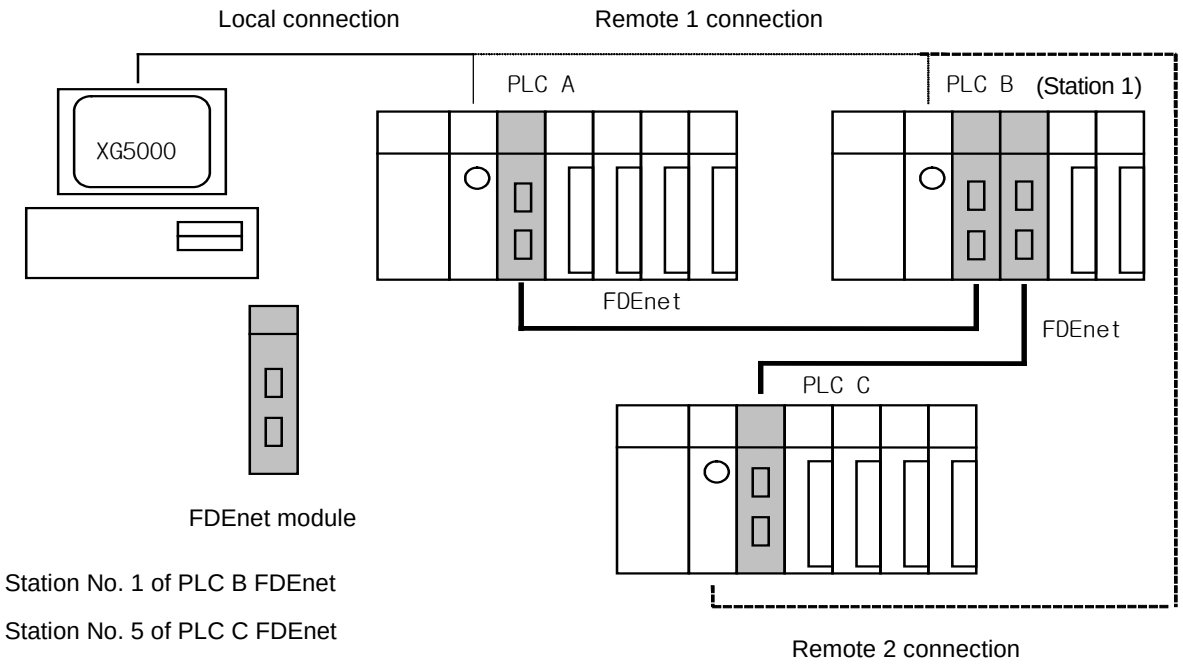
[Fig. 8.1.1] Example of remote connection network

A network is supposed where RS-232C cable is connected to CPU module of PLC A station, and PLC A, PLC B and PLC C are connected with each other via FDEnet in the program tool (XG-5000) of the computer. In order to access the contents of PLC C station in the figure above, select the station No. of PLC C's communication module (correspondent station No. to connect to) and the slot No. of PLC A (slot No. where PLC A's communication module presently connected is installed) to remote-connect with RS-232C via FDEnet with remote 1/2 connection of the program tool.

This status as processed identically to connection with RS-232C cable as moved to PLC C station is available to execute all functions of programming, download, debugging and monitoring as in PLC A. With this remote communication service, easy access to PLC position in the distance is available without moving thereto, which is useful for maintenance of PLC system.

8.2 Remote connection example of XG5000

Remote connection between PLCs through FDEnet is available with remote 1 or 2 connection.

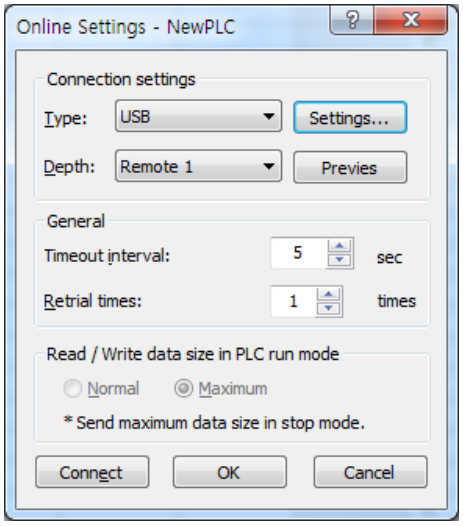


[Fig. 8.2.1] Remote 1/2 connection

[Fig. 8.2.1] shows a connection example of remote 1 (PLC A, PLC B) and remote 2 (PLC C) in the system composed of two networks.

1) Remote 1 connection

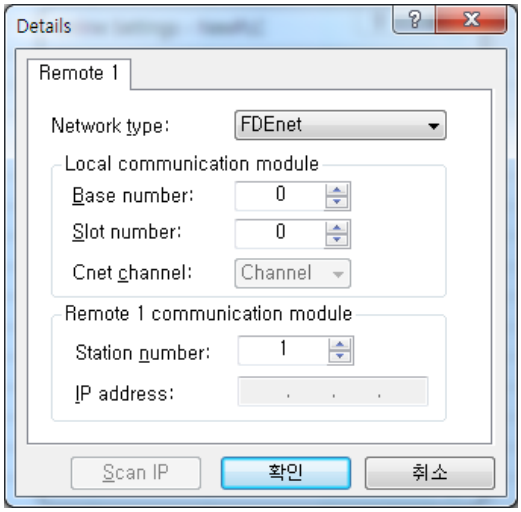
For remote 1 connection, XG-5000 shall be in off-line status. In this status, select “Online – Connection Settings” from the menu on the upper of the program.



[Fig. 8.2.2] Communication setting screen

Item		Details
Communication option setting	Connection Type	Select connection media (RS-232C or USB)
	Connection Depth	1) Local : connection between computer and CPU 2) Remote 1 : connection remote 1 through communication module 3) Remote 2 : connection remote 2 through communication module
General	Timeout interval	Timeout time setting if CPU connected (1~9 sec.)
	Retrial times	Retries setting if CPU connected (0~9)

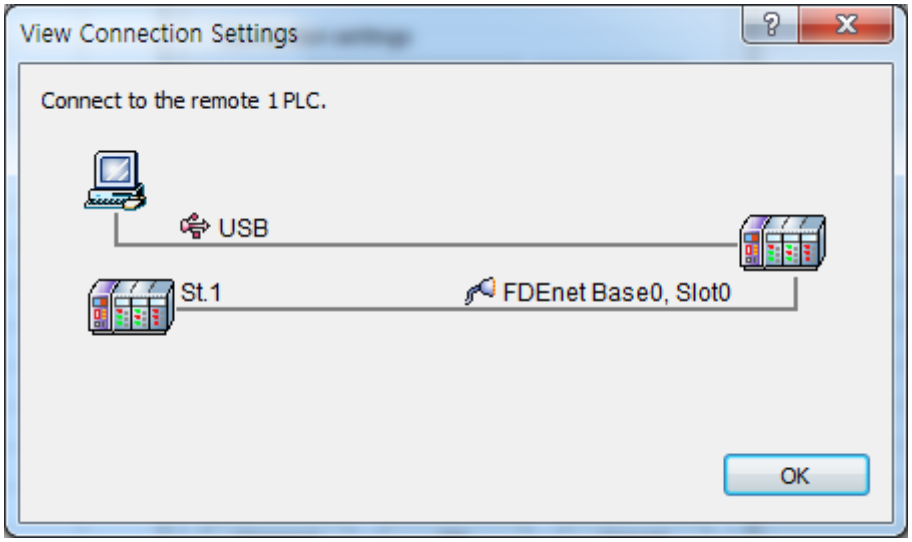
On the communication setting menu, set “Connection Depth” to remote 1, and select “Setting button” to specify each option on the “Details” screen.



[Fig. 8.2.3] Details screen

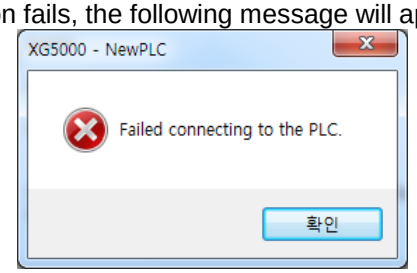
Item		Details
Network type		Select the type of network where remote 1 connection is performed.
Local communication module	Base number	Base No. of the communication module installed on self-station's PLC to be connected with correspondent station by remote 1 connection
	Slot number	Slot No. of the communication module installed on self-station's PLC to be connected with correspondent station by remote 1 connection
Remote 1 communication module	Station number	Select the station No. of the communication module installed on correspondent station's PLC to be connected by remote 1 (PLC B module's station No.1 in [Fig. 8.2.1]).
	IP address	Select the IP address of the communication module installed on correspondent station's PLC to be connected by remote 1 (PLC B module's station No.1 in [Fig. 8.2.1]). (only for Fast Ethernet)

Click [View] on the communication setting window in order to confirm settings of remote 1 connection.



[Fig. 8.2.4] View screen of connection setting

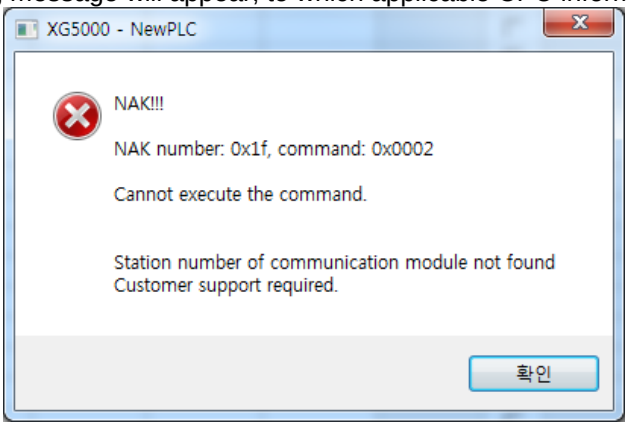
After setting, click [OK] to escape from the option screen, and then execute the on-line connection. If connection fails, the following message will appear.



[Fig. 8.2.5] Connection failed screen

(Displayed if connection setting or communication cable is abnormal.)

If the type is different between PLC with remote 1 connected and CPU of the project presently open, the following message will appear, to which applicable CPU information needs to be modified.



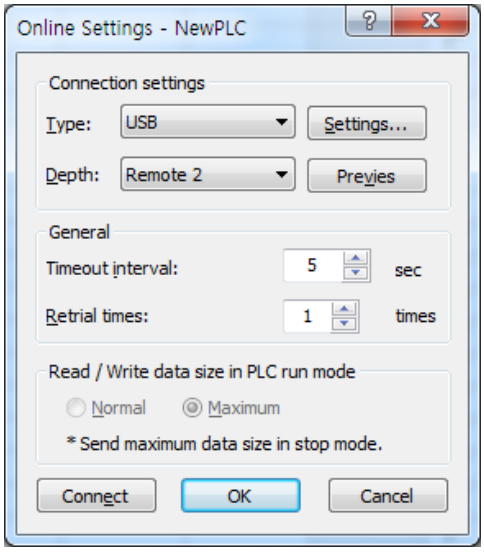
[Fig. 8.2.6] PLC type discordant screen

The status of remote 1 connection complete is identical to that of connection with RS-232C cable repositioned, where all the on-line menus can be used.

2) Remote 2 connection

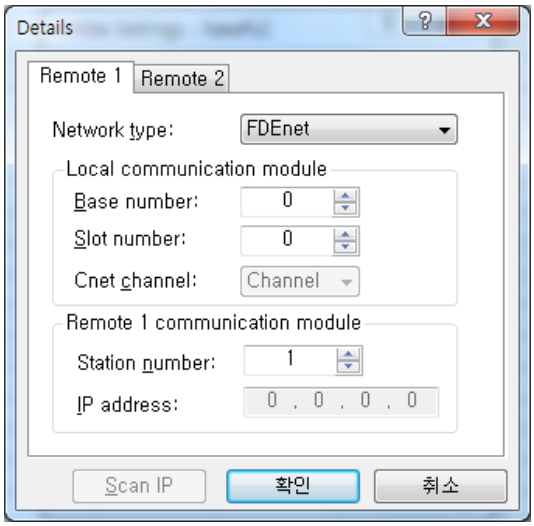
Pass through XG-5000 ▶ PLC A's F

▶PLC C's FDEnet module in order to execute the remote 2 connection, for which XG-5000 shall be in off-line status. In this status, select "Online – Connection Settings" from the menu on the upper of the program and "Remote 2" on the connection depth menu.



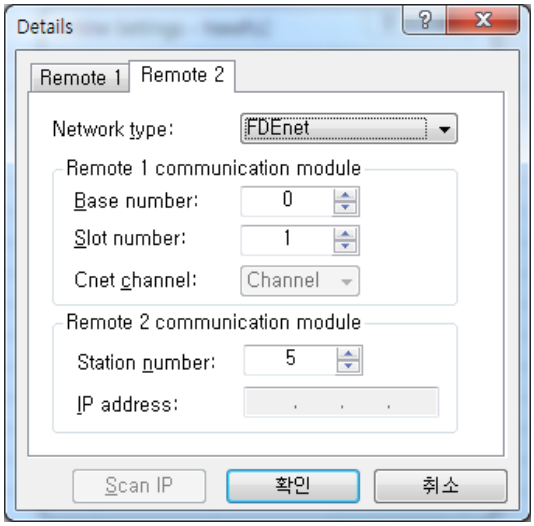
[Fig. 8.2.7] Communication setting screen

With the remote 2 selected, click [Settings].



[Fig. 8.2.8] Screen of details (Remote 1)

Perform settings on the remote 1 screen first.



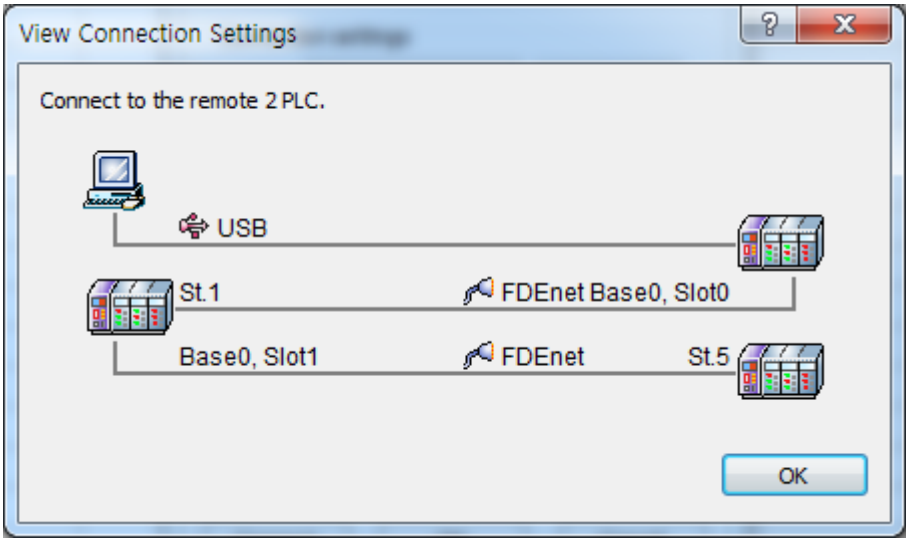
[Fig 8.2.9] Screen of details (Remote 2)

And then perform settings on the remote 2 screen.

Item		Details
Network type		Select the type of network where remote 1 or 2 connection is performed.
Remote 1 communication module	Base No.	Base No. of the communication module installed on remote 1.
	Slot No.	Slot No. of the communication module installed on remote 1.
Remote 2 communication module	Station No.	Station No. the communication module installed on remote 2.
	IP address	Station No. the communication module installed on remote 2. (only for Fast Ethernet)

[Table 8.2.3] Remote 2 communication

In order to check if settings above are correct, select [Preview] on [Fig. 8.2.8]. If the remote 2 connection is selected, it will be as below;



Select the network type, station No. and slot No. as shown above and click [OK] on the dialog box for online connection to perform the remote 2 connection.

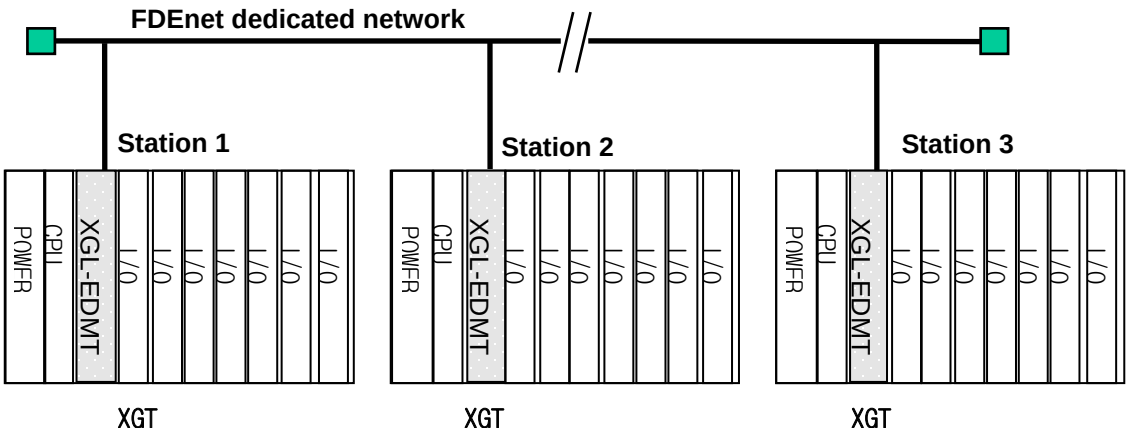
At this time, the status of remote 2 connection complete is identical to that of connection with RS-232C cable repositioned to PLC C, where all the online menus can be used.

Chapter 9 Program Examples

9.1 HS Link Program

9.1.1 HS link service between PLCs

How to set HS link parameters in FDEnet system below will be described.



[Fig. 9.1.1] I/O configuration and Tx/Rx data

Tx/Rx structure		I/O configuration (identical to all stations)	Tx area	Rx area
XGT (station 1)	TX	Slot0: FDEnet Slot1: output 32-point Slot2: input 32 -point	%PW8 (2 words)	--
	RX:<--XGT station 2		--	%MW0(2 words)
XGT (station 2)	TX		%PW8 (2 words)	--
	RX:<--XGT station 3		--	%MW0(2 words)
XGT (station 3)	TX		%PW8 (2 words)	--
	RX:<--XGT station 1		--	%MW0(2 words)

[Table 9.1.1] I/O configuration and Tx/Rx data

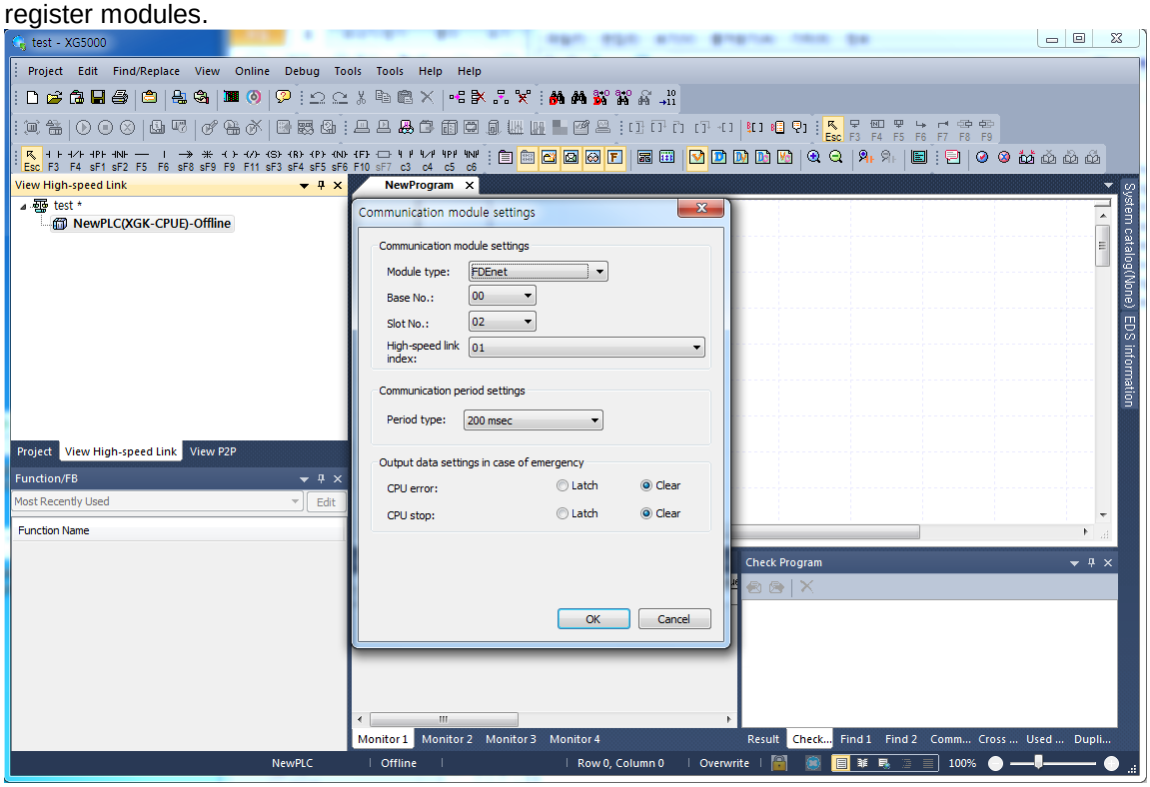
In the example, all XGT CPUs transmit 2 words of input value of Slot No.2 and save the data received from the correspondent station on %MW0.

1) HS link parameters setting

In the system shown in [Fig. 9.1.1], user is to prepare data Tx/Rx map in order to let the stations 1,2 and 3 exchange data as in [Table 9.1.1]. And for data Tx/Rx as in [Table 9.1.1], HS link parameters shall be prepared and downloaded onto PLC as in the sequence described below so to start HS link.

(1) Local-connect XG5000 with XGT CPU, and set basic communication parameters.
(2) Prepare data Tx/Rx map.
(3) On XG5000's HS link parameters setting option, set applicable parameters.
(4) Write parameters on the On-line menu.
(5) Select link enable setting on the On-line menu to set HS link enable applicable to setting No.
(6) Use XG5000's system diagnosis service to check HS link status.
(7) If any error occurs on HS link service of system diagnosis, execute again from A.

HS link parameters for example system shall be set as described below.
On the HS link setting screen as shown in [Fig.9.1.2], select one among 12 HS link parameters to register modules.

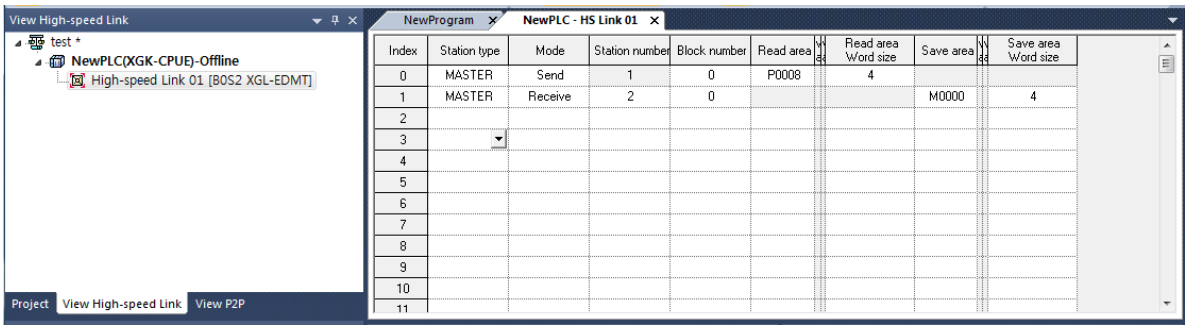


[Fig. 9.1.2] Setting of communication module and communication cycle

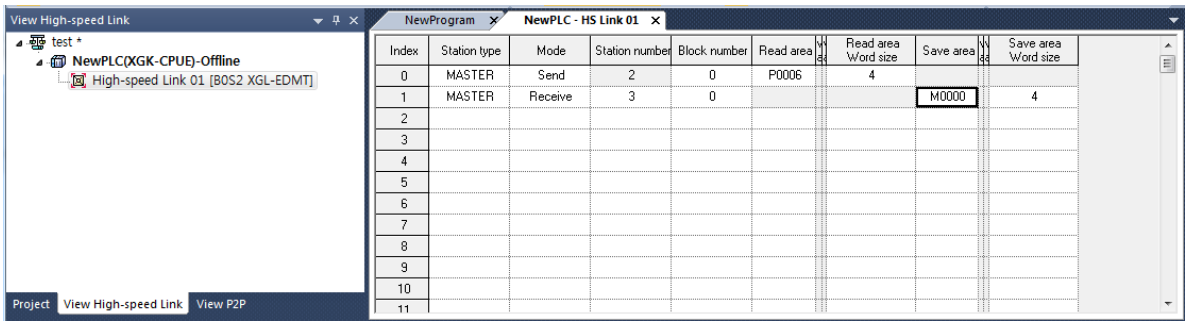
Select the type of FDEnet and base/slot positions identical to communication module to be used.

After HS link setting complete, specify Tx/Rx parameters on the [Fig.9.1.3] register list screen staring from item No.0 one by one. For example, as XGT station 1's type is local, composed of Tx 0 block and Rx 0 block, 1 parameter will be defined for Tx and Rx respectively. After Tx/Rx area is set based on the Tx/Rx data map, calculate Tx/Rx time based on calculation of HS link speed to specify Tx/Rx cycle.

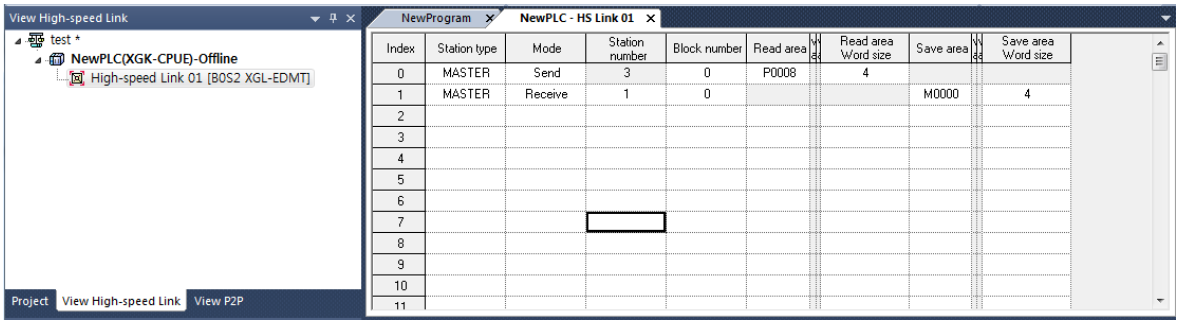
Basic value of 200 ㎳ is applied in this example. [Fig.9.1.3] ~ [Fig. 9.1.5] show the result of parameters setting in XG5000 through the method as described above.



[Fig. 9.1.3] Setting of HS link register list



[Fig. 9.1.4] Setting of HS link register list



[Fig. 9.1.5] Setting of HS link register list

If HS link parameters are downloaded during operation of HS link, Link enabled will be automatically disenabled, and then enabled after downloading is complete.

2) How to decide HS link speed

The example shows a simple system where 4-word data is transmitted and received respectively by communication modules of the 3 stations. Thus, Tx/Rx cycle of link parameters can be easily calculated through the calculation method of speed in “6.4.2 Calculation of HS link speed” by means of the simple calculation formula of system speed.

That is, formula St = P_ScanA + C_Scan + P_ScanB

(St = HS link max. Txtime

P_ScanA = PLC A’s max program scan time

P_ScanB = PLC B’s max program scan time

C_Scan = Max communication scan time)

Where, P_ScanA and P_ScanB is XGT PLC’s scan time, thus, in the program above if 5 ㎳ is supposed respectively (select XG-5000’s ‘On-line/PLC information/System information’ to check)

Formula CScan = Th × Sn

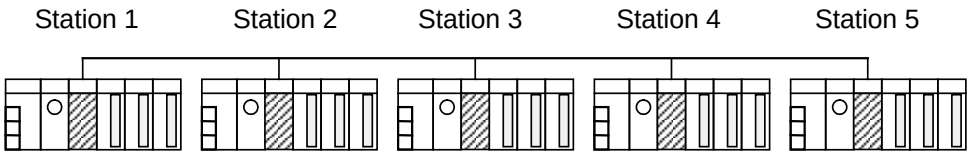
(Th = Data Tx time for 1 station in the media (IEEE 802.3 standard)

Sn = Total Station Number : Number of total communication stations)

Where, Sn = 3, Th is 2.3 ㎳ in FDEnet, thus CScan = 6.9 ㎳ and, St = P_ScanA(=5 ㎳) + P_ScanB(=5 ㎳) + CScan(6.9 ㎳) = 16.9 ㎳, accordingly Tx/Rx cycle shall be set to 17 ㎳ at least.

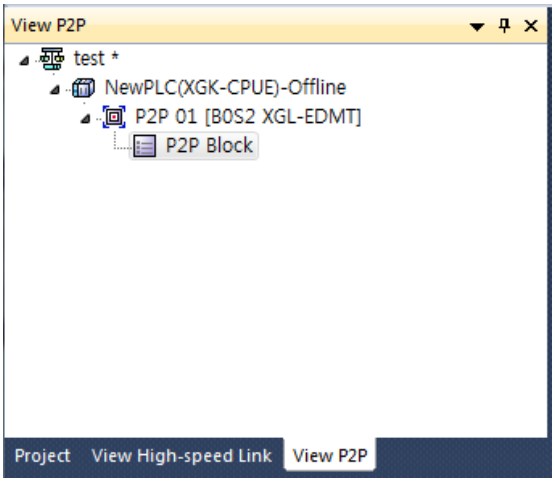
9.1.2 P2P service between PLCs of FDEnet

In the XGT FDEnet system configured as below, P2P parameters setting shall be as described below for the master station 1 to perform data communication with the I/O structure shown below.
However, it is supposed that setting of the basic communication parameters is complete and that all the stations operate normally.



	Correspondent station No.	Operation point of time (Set)	Operation	Details
1	2	M0300's Bit No.2	READ	Reads %M0010, M0020, M0030 to save on %M000, M001, M002.
2	3	M0300's Bit No.3	READ	Reads 10 words from %M0100 to save on %M0010.
3	4	M5's Bit No.0	WRITE	Reads %M0000, 0001, 0002 to save on correspondent station's %M0010, 0020, 0030.
4	5	M6's Bit No.3	WRITE	Reads 10 words from %M0010 to save on correspondent station's %M0100.

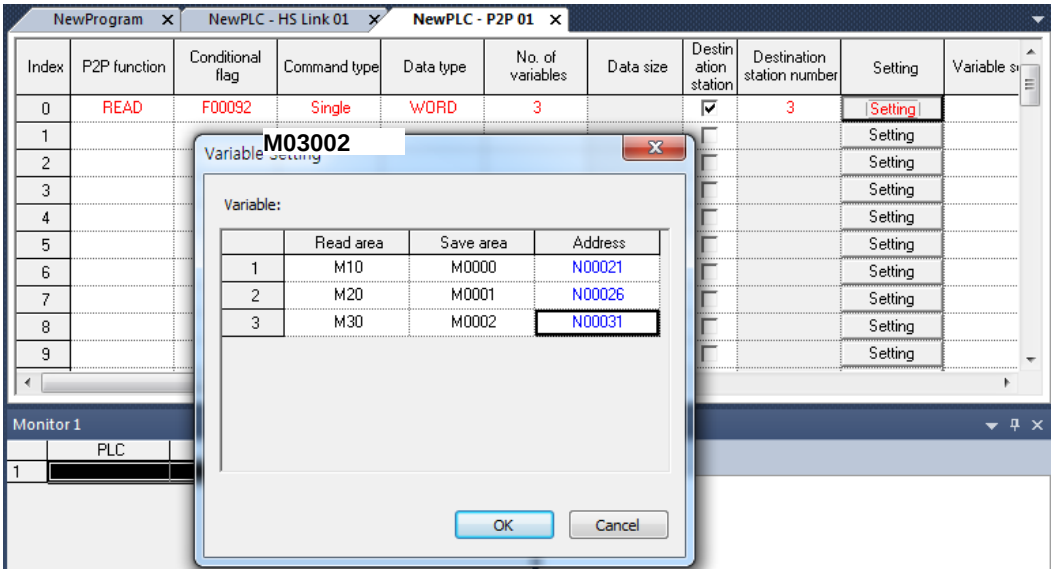
1) Execute XG5000 to connect to XGT CPU the station 1 is installed on.
2) Use "Online – Read IO Information" to register the station 1's FDEnet I/F communication module for P2P service register.
3) Select P2P parameters window to register FDEnet on P2P 1.



[Fig. 9.1.6] P2P project setting window

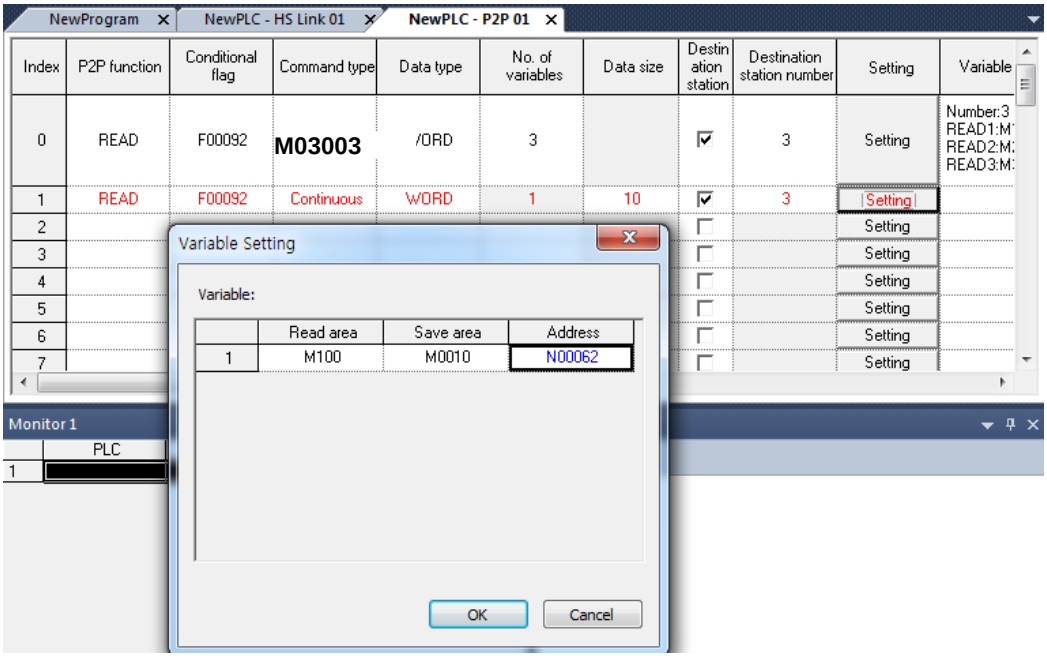
4) Register P2P Function defined on P2P block setting window.

(1) No.1: When M0300's Bit No.2 is set, read the correspondent station 2's %M0010, M0020 and M0030 to save on the self-station's %M0000, 0001 and 0002.



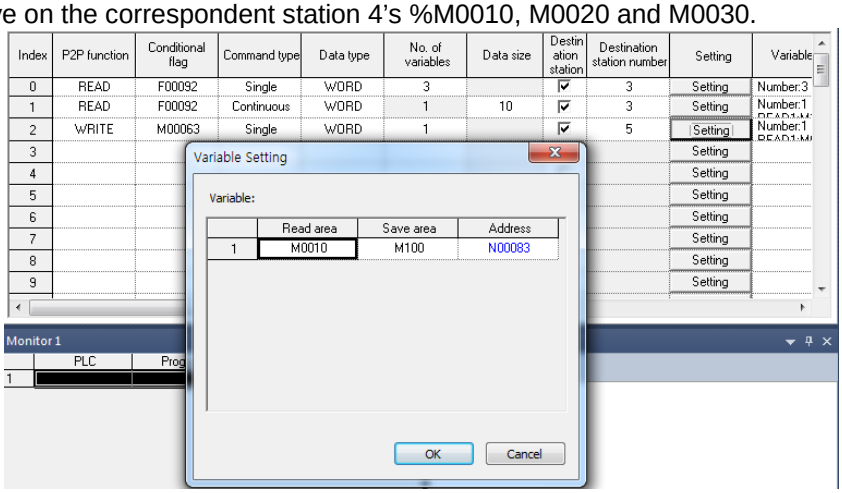
[Fig. 9.1.7] Setting of P2P block No.1

(2) No.2: When M0300's Bit No.3 is set, read 10 words from the correspondent station 3's %M0100 to save on the self-station's %M0010.



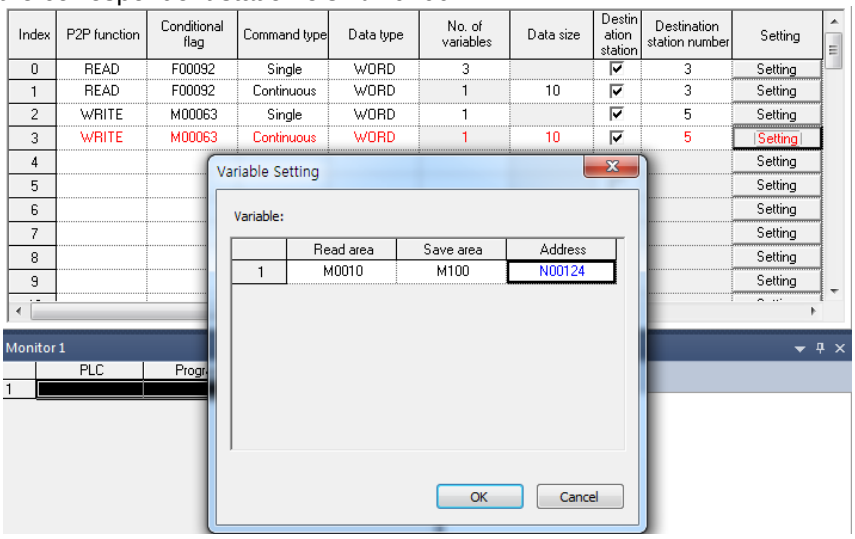
[Fig. 9.1.8] Setting of P2P block No.2

(3) No.3: When M0005's Bit No.0 is set, read the self-station's %M000, M0001 and M0002 to save on the correspondent station 4's %M0010, M0020 and M0030.



[Fig. 9.1.9] Setting of P2P block No.3

(4) No.4: When M0006's Bit No.3 is set, read 10 words from the self-station's %M0010 to save on the correspondent station 5's %M0100.



[Fig. 9.1.10] Setting of P2P block No.4

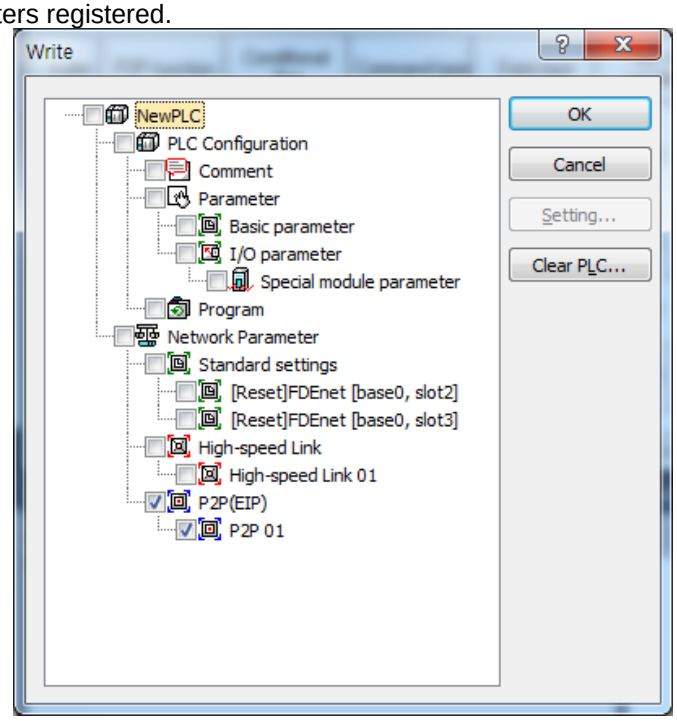
The figure below shows the result of 4 functions registered as above.

Index	P2P function	Conditional flag	Command type	Data type	No. of variables	Data size	Destination station	Destination station number	Setting
0	READ	F00092	Single	WORD	3		☑	3	Setting
1	READ	F00092	Continuous	WORD	1	10	☑	3	Setting
2	WRITE	M00063	Single	WORD	1		☑	5	Setting
3	WRITE	M00063	Continuous	WORD	1	10	☑	5	Setting

[Fig. 9.1.11] P2P setting screen

5) Prepare P2P parameters download

Select XG5000's "Online – Write" on the menu to download P2P parameters so to start the service among P2P parameters registered.



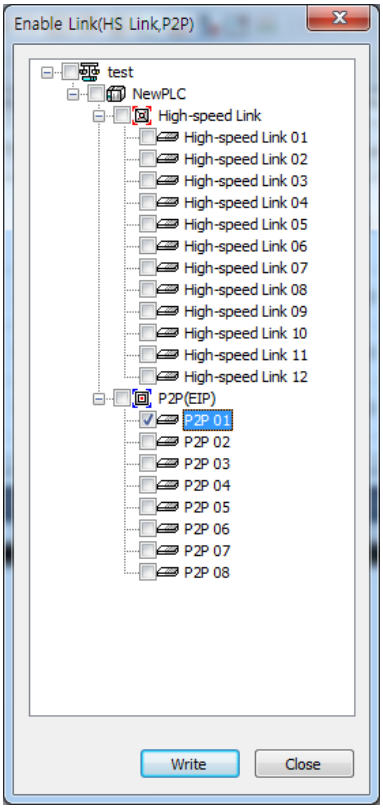
[Fig. 9.1.12] Write screen of P2P parameters

The downloaded P2P parameters will be back up regardless of power On/Off.

6) Start P2P service.

Even if P2P parameters are downloaded completely, P2P service will not start until requested so by user.

Use XG5000's "Online – Communication module setting - Enable Link" on the menu to start the P2P service.



[Fig. 9.1.13] P2P link enabled

The status of the started P2P service will be kept as the same even if powered off or reset.

7) Check normal operation of P2P service

Use "Online – Communication moduel setting - System Diagnosis" on the menu to check the status of the P2P service being operated.

Chapter 10 Troubleshooting

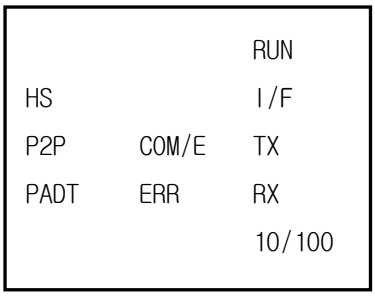
This chapter is to describe defects and errors that may occur in system operation, their causes and actions to take against. If any error occurs on FDEnet I/F module, its related details can be checked through the procedures below. Surely follow the troubleshooting procedures in the sequence as specified to check for abnormal module state. And any discretionary repair or disassembly is not allowed.

10.1 Diagnosis through communication module LED

The status of communication module can be checked for defects on the module through LED display.

10.1.1 Display of abnormal operation

Diagnosis is available through LED in front of XGL-EDMT module.



<LED of XGL-EDMT>

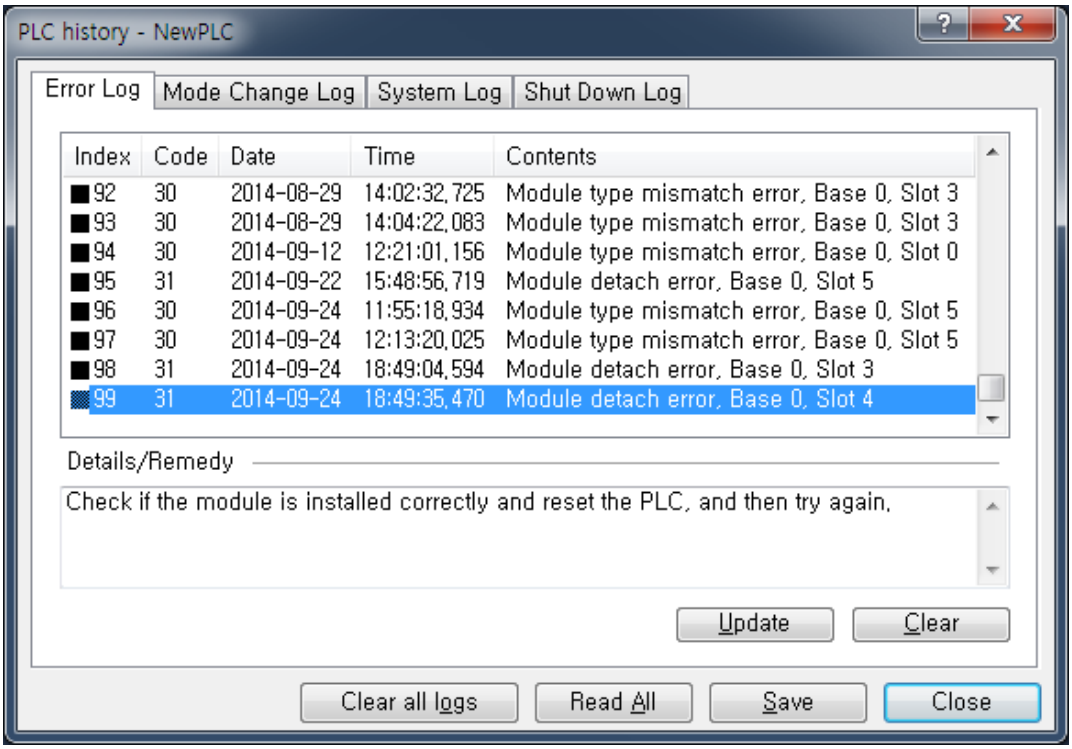
[Fig. 10.1.1] LED structure of FDEnet I/F module

LED	Error Details	Action
RUN	Off after module powered on	1) Installation error of EDMT I/F communication module - Check for errors on power module's DC 5V power supply. - Check if communication module is installed correctly on the base. 2) Contact Customer Service center.
I/F RUN	LED On or Off during normal communication	1) Check if CPU is normal. 2) Check if communication module is installed correctly on the base. 3) Check if module information is correctly recognized through PADT S/W 4) If abnormal after through 1)~3), Contact Customer Service center.

LED	Error Details	Action
P2P	Off during command service	1) Check if the command is input correctly. 2) Check if connection is normal.
HS	Off during HS link service	1) Check if HS link setting is correct. 2) Check if link enable is On.
PADT	Off during remote connection service	1) Check if the station No. is correct for remote (PADT) connection. 2) Check if PADT program's remote connection is released.
COM/E	-	N/A
H/W ERR	On during normal communication	1) Check if media is correctly selected through XG5000. 2) Check for any error on interface with CPU.
TX	Off during transmitting data	1) Check if request frame is normally input from the client.
RX	Off during receiving data	1) Check for any error on the receiving program. 2) Check XG5000's parameters received.
10/100	Off during normal communication	1) Check if media is configured with 100Mbps. (Auto-Negotiation)

10.2 Diagnosis of Communication Module through XG5000

XG5000 program can be used to monitor the communication module simply to check for any error thereon. Connect RS-232C connector with CPU port and then select [Online] → [Diagnosis] → [PLC History] -> [Error Log] in XG5000.



[Fig. 10.2.1] PLC History

If a hardware error or a CPU interface error occurs on the module, LED of the communication module itself operates abnormally in general, whose status can be monitored simply through its dedicated program.

[Fig. 10.2.1] shows error/warning information through PLC History on the XG5000 [Online] menu, which can be resolved by referring to “Details/Remedy”.

Appendix

A.1 Terminology

General terms of FDEnet I/F module will be described below to help the user understand the product prior to its application. Refer to Ethernet-related technical books for more details.

1) IEEE 802.3

IEEE 802.3 specifies standards for CSMA/CD based Ethernet. Exactly it is a LAN based on CSMA/CD (Carrier Sense Multiple Access with Collision Detection) Ethernet designed by IEEE 802.3 group, which is classified into detailed projects as specified below;

A) IEEE P802.3 - 10G Base T study Group
B) IEEE P802.3ah - Ethernet in the First Mile Task Force
C) IEEE P802.3ak - 10G Base-CX4 Task Force

Both IEEE 802.3 and Ethernet are the broadband network using CSMA/CD method and both are also realized on the network interface card H/W in common.

2) ARP (Address Resolution Protocol)

Protocol to search for MAC address by means of correspondent IP address on the Ethernet LAN

3) Bridge

A device used to connect two networks so to be operated as one network. Bridge is used not only to connect two different types of networks but also to divide one big network into two small networks in order to increase the performance

4) Client

A user of the network service, or a computer or program (mainly the one requesting services) using other computer's resource.

5) CSMA/CD (Carrier Sense Multiple Access with Collision Detection)

Each client checks if there is any sign prior to transmission of data to the network (Carrier Sense) and then sends its data when the network is empty. At this time, all the clients have the equal right to send (Multiple Access). If two or more clients send data, collision may occur. The client who detects the collision tries to send again in a specific time.

6) DNS (Domain Name System)

A method used to convert alphabetic Domain Name on the Internet to its identical Internet number (namely, IP address)

7) Dot Address

Shows IP address of '100.100.100.100', where each figure is displayed in decimal with 1 byte occupied respectively for 4 bytes in total.

8) E-mail Address

The address of the user with login account for the specific machine connected via the Internet. Usually user's ID @ domain name (machine name) is assigned. In other words, it will be like hjjee@microsoft.com, where @ is called as 'at' displayed with shift+2 pressed on the keyboard. The letters at the back of @ are for the domain name of specific company (school, institute,..) connected with the Internet, and the letters in front of @ are for the user ID registered in the machine. The last letters of the domain name are for the highest level. USA generally uses the following abbreviation as specified below, and Korea uses .kr to stand for Korea. .com : usually for companies) / .edu : usually for educational organizations such as universities. / .ac(academy) is mostly used in Korea / .gov : for governmental organizations. For example, nasa.gov is for NASA (government) / .mil : military related sites. For example, af.mil is for USA air force (military)/ .org : private organizations / .au : Australia / .uk : the United Kingdom / .ca : Canada / .kr : Korea / .jp : Japan / .fr : France / .tw : Taiwan, etc.

9) Ethernet

A representative LAN connection system (IEEE 802.3) developed by Xerox, Intel and DEC of America which can send about 10Mbps and use the packet of 1.5kB. Since Ethernet can allow various types of computers to be connected as one via the network, it has been called a pronoun of LAN as a universal standard with various products available, not limited to some specific companies.

10) FTP (File Transfer Protocol)

An application program used to transfer files between computers among application programs providing TCP/IP protocol. If an account is allowed to the computer to log in, fast log in the computer is available wherever the computer is so to copy files.

11) Gateway

Software/Hardware used to translate for two different protocols to work together, which is equivalent to the gateway necessary to exchange information with the different system.

12) Header

Part of the packet including self station No., correspondent station No. and error checking area.

13) HTML

Hypertext Markup Language, standard language of WWW. In other words, it is a language system to prepare Hypertext documents. The document made of HTML can be viewed through the web browser

14) HTTP

Hypertext Transfer Protocol, standard protocol of WWW. It is a protocol supporting the hypermedia system.

15) ICMP (Internet Control Message Protocol)

An extended protocol of IP address used to create error messages and test packets to control the Internet.

16) IP (Internet Protocol)

Protocol of network layers for the Internet

17) IP Address

Address of respective computers on the Internet made of figures binary of 32 bits (4 bytes) to distinguish the applicable machine on the Internet. Classified into 2 sections, network distinguishing address and host distinguishing address. The network address and the host address is respectively divided into class A, B and C based on the bits allotted. IP address since it shall be unique all over the world, shall be decided not optionally but as assigned by NIC(Network Information Center) of the applicable district when joining the Internet. In Korea, KRNIC(Korea Network Information Center) is in charge of this work. Ex.) 165.244.149.190

18) ISO (International Organization for Standardization)

A subsidiary organization of UN, establishing and managing the international standards.

19) LAN (Local Area Network)

Called also as local area communication network or district information communication network, which allows lots of computers to exchange data with each other as connected though communication cable within a limited area such as in an office or a building

20) MAC (Medium Access Control)

A method used to decide which device should use the network during given time on the broadcast network

21) Node

Each computer connected with the network is called Node

22) Packet

A package of data which is the basic unit used to send through the network. Usually the package is made of several tens or hundreds of bytes with the header attached in front to which its destination and other necessary information are added

23) PORT number

Used to classify the applications on TCP/UDP.

Ex.) 21/tcp : Telet

24) PPP (Point-to-Point Protocol)

Phone communication protocol which allows packet transmission in connecting with the Internet. In other words, normal phone cable and modem can be used for the computer to connect through TCP/IP with this most general Internet protocol.

Similar to SLIP, however with modern communication protocol factors such as error detection and data compression, it demonstrates more excellent performance than SLIP.

25) Protocol

Contains regulations related with mutual information transmission method between computers connected with each other through the network. The protocol may specify detailed interface between machines in Low level (for example, which bit/byte should go out through the line) or high level of message exchange regulations as files are transferred through the Internet.

26) Router

A device used to transfer the data packet between the networks. It sends the data packet to its final destination, waits if the network is congested, or decides which LAN is good to connect to at the LAN junction. Namely, it is a special computer/software used to control the two or more networks connected.

27) Server

The side which passively responds to the client's request and shares its resources.

28) TCP (Transmission Control Protocol)

A transport layer protocol for the Internet

- Data Tx/Rx through connection
- Multiplexing
- Transmission reliable
- Emergent data transmission supported

29) TCP/IP (Transmission Control Protocol/Internet Protocol)

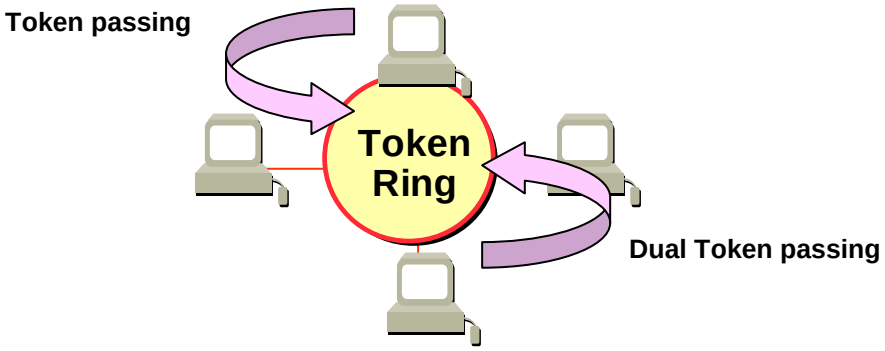
Transmission protocol used for communication among different kinds of computers, which makes the communication available between general PC and medium host, IBM PC and MAC, and medium or large-sized different types of computer. It is also used as a general term for information transmission protocol between computer networks including FTP, Telnet, SMTP, etc. TCP divides data into packets to send through IP and the packets sent will be united back together through TCP.

30) Telnet

Remote Login is allowed from one host to another host through the Internet. Although a login account shall be generally registered to log in the remote host through Telnet, some hosts providing several public services (white page directory provided) are available to connect to without personal account.

31) Token Ring

As one of the node connection methods on the network, it is a local communication network using a token to access to communication network with physical ring structure. If the transmission node obtains a token and its control, it transfers the message packet. Actually realized examples are IEEE 802.5, ProNet-1080 and FDDI. The term of Token Ring is occasionally used in substitute for IEEE 802.5.



32) UDP (User Datagram Protocol)

A transport layer protocol for the Internet

- Since data Tx/Rx is allowed without connection, communication is available at high speed
- Multiplexing
- Unreliable transmission compared with TCP (resending unavailable even if the data does not arrive at the correspondent station)

33) Auto-Negotiation

Fast Ethernet process is used to allow Ethernet device to exchange performance information such as operation speed and duplex mode.

1. Detects the cause of denied connection
2. Decides performance of network equipment
3. Changes the connection speed

34) FDDI (Fiber Distributed Data Interface)

Based on the optical cable, it provides a speed of 100Mbps with its Shared Media Network system applied to allow Token Passing in both directions through Dual Ring method. The maximum distance of the whole network is 200Km, the maximum distance between nodes is 2km, and the maximum number of nodes is 500(1000). Generally it is used as a Backbone Network.

A.2 List of Flags

A.2.1 HS link flags

No.	Keyword	Type	Detail	Description
L000000	_HS1_RLINK	Bit	HS link parameter No.1's all stations normally operated	Displays all stations normally operated as specified in HS link parameter, which will be On if. 1. There is no error with all stations specified in parameter in RUN mode. 2. All data block is in normal communication as specified in parameter. 3. The parameter specified in each station itself is in normal communication. Run_link will be kept On if once On until stopped by link disenable.
L000001	_HS1_LTRBL	Bit	After _HS1RLINK is ON, abnormal status displayed	This flag will be On if the station specified in parameter and the data block's communication status are as described below with _HSmRLINK flag On,. 1. When the station specified in parameter is not in RUN mode, 2. When the station specified in parameter is in error, 3. When data block's communication status specified in parameter is unstable, The link trouble will be On if one of those conditions 1, 2 and 3 above occurs. And if such a condition is back to normal, it will be Off.
L000020 ~ L00009F	_HS1_STATE[k] (k=000~127)	Bit Array	HS link parameter No.1, Block No.k's general status displayed	Displays the general status of the communication information for the specified parameter's respective data blocks. HS1STATE[k]=HS1MOD[k]&_HS1TRX[k]&(~_HSmERR[k])
L000100 ~ L00017F	_HS1_MOD[k] (k=000~127)	Bit Array	HS link parameter No.1, Block No.k station's Run operation mode	Displays the operation mode of the station specified in parameter's data block k.
L000180 ~ L00025F	_HS1_TRX[k] (k=000~127)	Bit Array	Normal communication displayed with HS link parameter No.1, Block No.k station	Displays the communication status of parameter's data block k to check if normal as specified.
L000260 ~ L00033F	_HS1_ERR[k] (k=000~127)	Bit Array	HS link parameter No.1, Block No.k station's Run error mode	Displays the communication status of parameter's data block k to check for any error.
L000340 ~ L00041F	_HS1_SETBLOCK[k]	Bit Array	HS link parameter No.1, Block No.k setting displayed	Displays the setting status of parameter's data block k.

[Table 1] List of communication flags based on HS link number (HS link No. 1 ~ 12)

Remark

HS link No.	L area address	Remarks
2	L000500~L00099F	Compared with HS link of 1 in [Table 1], other HS link station number's flag address will be simply calculated as follows; ∗ Calculation formula: L area address = L000000 + 500 x (HS link No. – 1) In order to use HS link flag for program and monitoring, use the flag map registered in XG5000 for convenient application.
3	L001000~L00149F	
4	L001500~L00199F	
5	L002000~L00249F	
6	L002500~L00299F	
7	L003000~L00349F	
8	L003500~L00399F	
9	L004000~L00449F	
10	L004500~L00499F	
11	L005000~L00549F	

Ex.) K as a block number is displayed through 8 words by 16 for 1 word for the information of 128 blocks from 000 to 127. For example, block information of 16~31, 32~47, 48~63, 64~79, 80~95, 96~111, 112~127 will be displayed in L00011, L00012, L00013, L00014, L00015, L00016, L00017 from block 0 to block 15 for mode information (_HS1MOD). Thus, the mode information of the block No. 55 will be displayed in L000137.

No.	Keyword	Type	Detail	Description
L006250	_P2P1_NDR00	Bit	P2P parameter No.1, block No.00 service complete normally	P2P parameter No.1, block No.0 service complete normally.
L006251	_P2P1_ERR00	Bit	P2P parameter No.1, block No.00 service complete abnormally	P2P parameter No.1, block No.0 service complete abnormally.
L00626	_P2P1_STATUS00	Word	Error code if P2P parameter No.1, block No.00 service complete abnormally	Error code displayed if P2P parameter No.1, block No.0 service complete abnormally.
L00627	_P2P1_SVCCNT00	DWord	P2P parameter No.1, block No.00 service normal execution times	P2P parameter No.1, block No.0 service normal execution times displayed.
L00629	_P2P1_ERRCNT00	DWord	P2P parameter No.1, block No.00 service abnormal execution times	P2P parameter No.1, block No.0 service abnormal execution times displayed.
L006310	_P2P1_NDR01	Bit	P2P parameter No.1, block No.01 service complete normally	P2P parameter No.1, block No.1 service complete normally.
L006311	_P2P1_ERR01	Bit	P2P parameter No.1, block No.01 service complete abnormally	P2P parameter No.1, block No.1 service complete abnormally.
L00632	_P2P1_STATUS01	Word	Error code if P2P parameter No.1, block No.01 service complete abnormally	Error code displayed if P2P parameter No.1, block No.1 service complete abnormally.
L00633	_P2P1_SVCCNT01	DWord	P2P parameter No.1, block No.01 service normal execution times	P2P parameter No.1, block No.1 service normal execution times displayed.
L00635	_P2P1_ERRCNT01	DWord	P2P parameter No.1, block No.01 service abnormal execution times	P2P parameter No.1, block No.1 service abnormal execution times displayed.

[Table 2] List of communication flags based on P2P service setting (P2P parameter: 1~8, P2P block: 0~63)

A.2.2 Link devices (N)

No.	Keyword	Type	Detail	Description
N00000	_P1B00SN	Word	P2P parameter No.1, block No.00's correspondent station No.	P2P parameter No.1, block No.00's correspondent station No. saved. Use P2PSN command to modify during Run if correspondent station number is used in XG5000.
N00001 ~ N00004	_P1B00RD1	Device structure	P2P parameter No.1, block No.00 area device 1 to read	P2P parameter No.1, block No.00 area device 1 to read saved.
N00005	_P1B00RS1	Word	P2P parameter No.1, block No.00 area size 1 to read	P2P parameter No.1, block No.00 area size 1 to read saved.
N00006 ~ N00009	_P1B00RD2	Device structure	P2P parameter No.1, block No.00 area device 2 to read	P2P parameter No.1, block No.00 area device 2 to read saved.
N00010	_P1B00RS2	Word	P2P parameter No.1, block No.00 area size 2 to read	P2P parameter No.1, block No.00 area size 2 to read saved.
N00011 ~ N00014	_P1B00RD3	Device structure	P2P parameter No.1, block No.00 area device 3 to read	P2P parameter No.1, block No.00 area device 3 to read saved.
N00015	_P1B00RS3	Word	P2P parameter No.1, block No.00 area size 3 to read	P2P parameter No.1, block No.00 area size 3 to read saved.
N00016 ~ N00019	_P1B00RD4	Device structure	P2P parameter No.1, block No.00 area device 4 to read	P2P parameter No.1, block No.00 area device 4 to read saved.
N00020	_P1B00RS4	Word	P2P parameter No.1, block No.00 area size 4 to read	P2P parameter No.1, block No.00 area size 4 to read saved.
N00021 ~ N00024	_P1B00WD1	Device structure	P2P parameter No.1, block No.00 saved area device 1	P2P parameter No.1, block No.00 saved area device 1 saved.
N00025	_P1B00WS1	Word	P2P parameter No.1, block No.00 saved area size 1	P2P parameter No.1, block No.00 saved area size 1 saved.
N00026 ~ N00029	_P1B00WD2	Device structure	P2P parameter No.1, block No.00 saved area device 2	P2P parameter No.1, block No.00 saved area device 2 saved.
N00030	_P1B00WS2	Word	P2P parameter No.1, block No.00 saved area size 2	P2P parameter No.1, block No.00 saved area size 2 saved.
N00031 ~ N00034	_P1B00WD3	Device structure	P2P parameter No.1, block No.00 saved area device 3	P2P parameter No.1, block No.00 saved area device 3 saved.
N00035	_P1B00WS3	Word	P2P parameter No.1, block No.00 saved area size 3	P2P parameter No.1, block No.00 saved area size 3 saved.
N00036 ~ N00039	_P1B00WD4	Device structure	P2P parameter No.1, block No.00 saved area device 4	P2P parameter No.1, block No.00 saved area device 4 saved.
N00040	_P1B00WS4	Word	P2P parameter No.1, block No.00 saved area size 4	P2P parameter No.1, block No.00 saved area size 4 saved.

[Table 3] List of communication devices based on P2P number (P2P No. : 1~8, P2P block : 0~63)

No.	Keyword	Type	Detail	Description
N00041	_P1B01SN	Word	P2P parameter No.1, block No.01 correspondent station No.	P2P parameter No.1, block No.01's correspondent station No. saved. Use P2PSN command to modify during Run if correspondent station number is used in XG5000.
N00042 ~ N00045	_P1B01RD1	Device structure	P2P parameter No.1, block No.01 area device 1 to read	P2P parameter No.1, block No.01 device area 1 to read saved.
N00046	_P1B01RS1	Word	P2P parameter No.1, block No.01 area size 1 to read	P2P parameter No.1, block No.01 area size 1 to read saved.
N00047 ~ N00050	_P1B01RD2	Device structure	P2P parameter No.1, block No.01 area device 2 to read	P2P parameter No.1, block No.01 area device 1 to read saved.
N00051	_P1B01RS2	Word	P2P parameter No.1, block No.01 area size 2 to read	P2P parameter No.1, block No.01 area size 2 to read saved.
N00052 ~ N00055	_P1B01RD3	Device structure	P2P parameter No.1, block No.01 area device 3 to read	P2P parameter No.1, block No.01 area device 3 to read saved.
N00056	_P1B01RS3	Word	P2P parameter No.1, block No.01 area size 3 to read	P2P parameter No.1, block No.01 area size 3 to read saved.
N00057 ~ N00060	_P1B01RD4	Device structure	P2P parameter No.1, block No.01 area device 4 to read	P2P parameter No.1, block No.01 area device 4 to read saved.
N00061	_P1B01RS4	Word	P2P parameter No.1, block No.01 area size 4 to read	P2P parameter No.1, block No.01 area size 4 to read saved.
N00062 ~ N00065	_P1B01WD1	Device structure	P2P parameter No.1, block No.01 saved area device 1	P2P parameter No.1, block No.01 saved area device 1 saved.
N00066	_P1B01WS1	Word	P2P parameter No.1, block No.01 saved area size 1	P2P parameter No.1, block No.01 saved area size 1 saved.
N00067 ~ N00070	_P1B01WD2	Device structure	P2P parameter No.1, block No.01 saved area device 2	P2P parameter No.1, block No.01 saved area device 2 saved.
N00071	_P1B01WS2	Word	P2P parameter No.1, block No.01 saved area size 2	P2P parameter No.1, block No.01 saved area size 2 saved.
N00072 ~ N00075	_P1B01WD3	Device structure	P2P parameter No.1, block No.01 saved area device 3	P2P parameter No.1, block No.01 saved area device 3 saved.
N00076	_P1B01WS3	Word	P2P parameter No.1, block No.01 saved area size 3	P2P parameter No.1, block No.01 saved area size 3 saved.
N00077 ~ N00080	_P1B01WD4	Device structure	P2P parameter No.1, block No.01 saved area device 4	P2P parameter No.1, block No.01 saved area device 4 saved.
N00081	_P1B01WS4	Word	P2P parameter No.1, block No.01 saved area size4	P2P parameter No.1, block No.01 saved area size 4 saved

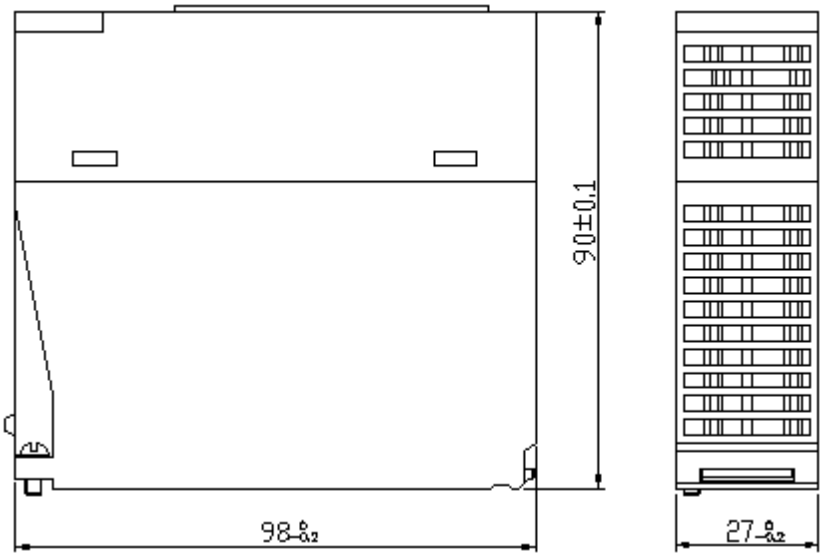
[Table 3] List of communication devices based on P2P number (P2P No. : 1~8, P2P block : 0~63)

Remark

1) If P2P parameters are to be specified with XG5000 used for N area, the setting will be performed automatically. And its modification during Run is also available by P2P dedicated command.
2) Since the addresses of N area available are classified according to P2P parameter setting No. and block index No., the area not used for P2P service can be used as an internal device.

A.3 External Dimensions

Unit : mm



Warranty

1. Terms of warranty
   LSIS provides an 18-month warranty starting from the date of production.

2. Range of warranty
   For problems within the terms of the warranty, LSIS will replace the entire PLC or repair the defective parts free of charge except for the following cases.

   (1) Problems caused by improper conditions, environment or treatment.
   (2) Problems caused by external devices.
   (3) Problems caused by the user remodeling or repairing the PLC.
   (4) Problems caused by improper use of the product.
   (5) Problems caused by circumstances where the expectations exceed that of the science and technology level when LSIS produced the product.
   (6) Problems caused by natural disaster.

3. This warranty is limited to the PLC itself only. It is not valid for the system which the PLC is attached to.

Environmental Policy

LSIS Co., Ltd supports and observes the environmental policy as below.

Environmental Management

LSIS considers the environmental preservation as the preferential management subject and every staff of LSIS use the reasonable endeavors for the pleasurably environmental preservation of the earth.

About Disposal

LSIS PLC unit is designed to protect the environment. For the disposal, separate aluminum, iron and synthetic resin (cover) from the product as they are reusable.

www.lsis.com

LS IS

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