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Programmable Logic Controller

Fnet I/F Module

XGT Series

User's Manual

XGL-FMEA



Safety Instructions

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

LS Industrial Systems

<http://eng.lsis.biz>

Safety Instructions

Before using the product ...

For your safety and effective operation, please read the safety instructions thoroughly before using the product.

- ▶ Safety Instructions should always be observed in order to prevent accident or risk with the safe and proper use the product.
- ▶ Instructions are divided into “Warning” and “Caution”, and the meaning of the terms is as follows.





This symbol indicates the possibility of serious injury or death if some applicable instruction is violated



This symbol indicates the possibility of severe or slight injury, and property damages if some applicable instruction is violated

Moreover, even classified events under its caution category may develop into serious accidents relying on situations. Therefore we strongly advise users to observe all precautions properly just like warnings.

- ▶ The marks displayed on the product and in the user’s manual have the following meanings.
 -  Be careful! Danger may be expected.
 -  Be careful! Electric shock may occur.
- ▶ The user’s manual even after read shall be kept available and accessible to any user of the product.

Safety Instructions

Safety Instructions for design process

Warning

- ▶ **Please install a protection circuit on the exterior of PLC so that the whole system may operate safely regardless of failures from external power or PLC.** Any abnormal output or operation from PLC may cause serious problems to safety in whole system.
 - Install protection units on the exterior of PLC like an interlock circuit that deals with opposite operations such as emergency stop, protection circuit, and forward/reverse rotation or install an interlock circuit that deals with high/low limit under its position controls.
 - If any system error (watch-dog timer error, module installation error, etc.) is detected during CPU operation in PLC, all output signals are designed to be turned off and stopped for safety. However, there are cases when output signals remain active due to device failures in Relay and TR which can't be detected. Thus, you are recommended to install an addition circuit to monitor the output status for those critical outputs which may cause significant problems.

- ▶ **Never overload more than rated current of output module nor allow to have a short circuit.** Over current for a long period time may cause a fire .

- ▶ **Never let the external power of the output circuit to be on earlier than PLC power,** which may cause accidents from abnormal output or operation.

- ▶ **Please install interlock circuits in the sequence program for safe operations in the system when exchange data with PLC or modify operation modes using a computer or other external equipments**
Read specific instructions thoroughly when conducting control operations with PLC.

Safety Instructions

Safety Instructions for design process

Caution

- ▶ **I/O signal or communication line shall be wired at least 100mm away from a high-voltage cable or power line.** Fail to follow this instruction may cause malfunctions from noise

Safety Instructions on installation process

Caution

- ▶ **Use PLC only in the environment specified in PLC manual or general standard of data sheet.** If not, electric shock, fire, abnormal operation of the product may be caused.
- ▶ **Before install or remove the module, be sure PLC power is off.** If not, electric shock or damage on the product may be caused.
- ▶ **Be sure that every module is securely attached after adding a module or an extension connector.** If the product is installed loosely or incorrectly, abnormal operation, error or dropping may be caused. In addition, contact failures under poor cable installation will be causing malfunctions as well.
- ▶ **Be sure that screws get tighten securely under vibrating environments.** Fail to do so will put the product under direct vibrations which will cause electric shock, fire and abnormal operation.
- ▶ **Do not come in contact with conducting parts in each module,** which may cause electric shock, malfunctions or abnormal operation.

Safety Instructions

Safety Instructions for wiring process

Warning

- ▶ **Prior to wiring works, make sure that every power is turned off.** If not, electric shock or damage on the product may be caused.
- ▶ **After wiring process is done, make sure that terminal covers are installed properly before its use.** Fail to install the cover may cause electric shocks.

Caution

- ▶ **Check rated voltages and terminal arrangements in each product prior to its wiring process.** Applying incorrect voltages other than rated voltages and misarrangement among terminals may cause fire or malfunctions.
- ▶ **Secure terminal screws tightly applying with specified torque.** If the screws get loose, short circuit, fire or abnormal operation may be caused. Securing screws too tightly will cause damages to the module or malfunctions, short circuit, and dropping.
- *
 - ▶ **Be sure to earth to the ground using Class 3 wires for FG terminals which is exclusively used for PLC.** If the terminals not grounded correctly, abnormal operation or electric shock may be caused.
 - ▶ **Don't let any foreign materials such as wiring waste inside the module while wiring,** which may cause fire, damage on the product or abnormal operation.
 - ▶ **Make sure that pressed terminals get tighten following the specified torque. External connector type shall be pressed or soldered using proper equipments.**

Safety Instructions

Safety Instructions for test-operation and maintenance

Warning

- ▶ **Don't touch the terminal when powered.** Electric shock or abnormal operation may occur.
- ▶ **Prior to cleaning or tightening the terminal screws, let all the external power off including PLC power.** If not, electric shock or abnormal operation may occur.
- ▶ **Don't let the battery recharged, disassembled, heated, short or soldered.** Heat, explosion or ignition may cause injuries or fire.

Caution

- ▶ **Do not make modifications or disassemble each module.** Fire, electric shock or abnormal operation may occur.
- ▶ **Prior to installing or disassembling the module, let all the external power off including PLC power.** If not, electric shock or abnormal operation may occur.
- ▶ **Keep any wireless equipment such as walkie-talkie or cell phones at least 30cm away from PLC.** If not, abnormal operation may be caused.
- ▶ **When making a modification on programs or using run to modify functions under PLC operations, read and comprehend all contents in the manual fully.** Mismanagement will cause damages to products and accidents.
- ▶ **Avoid any physical impact to the battery and prevent it from dropping as well.** Damages to battery may cause leakage from its fluid. When battery was dropped or exposed under strong impact, never reuse the battery again. Moreover skilled workers are needed when exchanging batteries.

Safety Instructions

Safety Instructions for waste disposal

 **Caution**

- ▶ **Product or battery waste shall be processed as industrial waste.**
The waste may discharge toxic materials or explode itself.

Revision History

Version	Date	Details	Page
V 1.0	'10. 5	First Edition	-

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

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Thank you for purchasing PLC of LS Industrial System 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 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
XG5000 User's Manual	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGK, XGB CPU
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
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.
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.
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
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
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

This manual is written based on the following version.

OS version of related product

Product name	OS version
XGK-CPUH, CPUS, CPUA, CPUE, CPUU	V2.2
XGI-CPUU, CPUH	V2.1
XGR-CPUH/F, CPUH/T	V1.8
XG5000(XG-PD)	V3.3

© Contents ©

Chapter 1 Overview 1-1 ~ 1-3

1.1 Overview	1-1
1.2 Characteristics of XGT Fnet I/F Module and difference from GM/MK Fnet.....	1-2
1.2.1 Characteristics of XGT Fnet I/F Module	1-2
1.2.2 Difference from GM/MK Fnet	1-2
1.3 Product Information	1-3
1.3.1 Models	1-3
1.3.2 Maximum Number of Mounting per CPU	1-3

Chapter 2 Product Specification 2-1 ~ 2-5

2.1 General Specifications	2-1
2.2 Performance Specifications	2-2
2.3 Structure and Features.....	2-3
2.4 Cable Specification	2-4
2.4.1 Electric Cable (LS Cable).....	2-4
2.4.2 Cable Joint Method	2-4
2.4.3 Terminating Resistor	2-5

Chapter 3 Product Installation and Test-Run 3-1 ~ 3-10

3.1 Cautions for Handling.....	3-1
3.1.1 Cautions for Handling.....	3-1
3.2 Product Setting for Operation	3-2
3.3 Registration of Communication Module	3-3
3.3.1 Off-line Registration	3-3
3.3.2 Online Registration	3-4
3.3.3 Reading Parameters from PLC.....	3-6
3.3.4 Module Setting Procedure	3-8

Chapter 4 System Configuration..... 4-1 ~ 4-2

4.1 Network System Configuration..... 4-1

Chapter 5 High Speed Link Service 5-1 ~ 5-14

5.1 Outline of High Speed Link 5-1
5.2 Using XG-PD 5-2
5.3 Setting-up High Speed Link 5-5
5.4 Read and Write High Speed Link..... 5-10
5.5 System Diagnosis..... 5-11
5.6 High Speed Link (HSL) Information 5-14

Chapter 6 Sample Program 6-1 ~ 6-4

6.1 Application Sample in XGK-CPU..... 6-1
6.2 Example using XGI-CPU 6-3

Chapter 7 Max. Guarantee Time for Data Communication 7-1 ~ 7-3

7.1 Maximum guarantee time for communication between stations..... 7-1
7.2 Calculation of the Max. Guarantee Time for Data Communication between Stations..... 7-2
7.3 Master Switching Time..... 7-3

Appendix App-1 ~ App-5

Appendix 1 Terms and Definitions App-1
Appendix 2 Flag Alarm App-3
Appendix 3 Dimensions..... App-5

Chapter 1 Overview

1.1 Overview

This User's Manual describes the Fnet Module (hereinafter, shall be referred to "XGT Fnet I/F") which is a fieldbus network of XGT series exclusively for LS Industrial Systems. While the XGT Fnet I/F module operates in the same principle as the Fnet system of the conventional GM/MK series, only a portion of the functions are supported. The Fnet system enables efficient data exchange between our PLCs, therefore, can conveniently connect existing GM/MK system and XGT system with high speed link communication. The Fnet I/F module, exclusive LSIS network, supports maximum 64 stations including master, and it enables parameter setting using XG-PD for data communication, providing the users with convenience. The Fnet system normally uses electric cables, however, electrical/optic repeaters are provided for long distance systems and high reliability. This enables the users to construct system of diversified configuration.

In the programming work, please refer to following documents in addition.

- XG5000 User's Manual
- XGK Instruction List
- XGK User's Manual
- XGK/XGR Instruction List
- XGI User's Manual
- XGR User's Manual

Following basic specifications apply to the configuration of a XGT Fnet I/F module system.

- XGT PLC XG5000 Programming Tool: V3.3 or newer
- XG-PD: V3.3 or newer
- XGT Fnet I/F Module O/S : V1.0 or newer

1.2 Characteristics of XGT Fnet I/F Module and difference from GM/MK Fnet

1.2.1 Characteristics of XGT Fnet I/F Module

The XGT Fnet I/F module has following features.

- ▶ Exclusive network
- ▶ Convenience due to high speed link parameter setting
- ▶ Electrical/optic repeater option provided
- ▶ Reduced wiring/installation work
- ▶ Up to 12 units on one base
- ▶ Network compatibility with GM/MK series

1.2.2 Difference from GM/MK Fnet

The XGT Fnet I/F module has following differences in its functions from those of the conventional GM/MK Fnet I/F module.

Function	XGT Fnet I/F	GM/MK Fnet	Remark
High speed link	Supported	Supported	Refer to XGT Fnet Detail Specifications : 2.2
Function block service	Not supported	Supported	
Remote access service	Not supported	Supported	
Available communication station	Local	Local/Remote	
Communication setting method	XG-PD	GMWIN / KGL-WIN	

1.3 Product Information

1.3.1 Models

Classification	Connection Cable	Model	Description	Remark
Master Module	Twist pair (Electric)	XGL-FMEA	Fnet Master Module for XGT	Mountable on base for XGT
	Twist pair (Electric)/ Optic	G3L-FUEA	GM3/K1000S Fnet (Electric)	Mountable on the base for GM3/K1000S
		G3L-FUOA	GM3/K1000S Fnet (Optic)	
		G4L-FUEA	GM4/K300S Fnet (Electric)	Mountable on the base for GM4/K300S
		G4L-FUOA	GM4/K300S Fnet (Optic)	
		G6L-FUEA	GM6/K200S Fnet (Electric)	Mountable on the base for GM6/K200S
		G7L-FUEA	GM7 Fnet (Electric)	Connect with GM7 using extension cable
Repeater	GOL-FREB	Cable extension (750m) module	Can be used independently	
Signal Converter	GOL-FOEA	Optic↔Electric signal converter module	Can be used independently	
Optic Splitter (Active Coupler)	GOL-FABA	Base module	-	
	GOL-FAPA	Power module	-	
	GOL-FACA	Optic I/F Module	-	
	GOL-FADA	Dummy module	-	

1.3.2 Maximum Number of Mounting per CPU

Maximum 12 Fnet I/F Modules can be mounted regardless of main or expansion base. To implement the best performance of communication module, it is recommended to mount on the main base. The table below presents the services available based on CPU type. Apply the specification in system configuration considering the number of the communication modules.

Classification	XGK					XGI			XGR	
	CPUH	CPUU	CPUA	CPUS	CPUE	CPUU	CPUH	CPUS	CPUH/T	CPUH/F
High speed Link Modules Used (Max.)	12 modules					12 modules			12 modules	

note

- (1) Optic splitters are also called active couplers.
- (2) Since 8 GOL-FACA units can be installed to an optic splitter, 3 GOL-FADAs (dummy module) are required to install 5 GOL-FACA units.
- (3) Mounting position of Fnet I/F module according to the CPU type
 - For the XGK/XGI CPU series, the Fnet I/F module can be mounted on both main and extension base.
 - For the XGR CPU series, the Fnet I/F module can be mounted on an extension base only.

Chapter 2 Product Specification

2.1 General Specifications

Table 2.1 presents the general specifications of the XGT series.

[Table 2.1.1] General Specifications

No.	Items	Specifications	Related standards					
1	Ambient temperature	0~55 °C						
2	Storage temperature	-25~+70 °C						
3	Ambient humidity	5~95%RH (Non-condensing)						
4	Storage humidity	5~95%RH (Non-condensing)						
5	Vibration resistance	Occasional vibration			-	10 times each directions (X, Y and Z)	IEC61131-2	
		Frequency	Acceleration	Amplitude	times			
		$10 \leq f < 57\text{Hz}$	-	0.075mm				
		$57 \leq f \leq 150\text{Hz}$	$9.8\text{m/s}^2(1\text{G})$	-				
		Continuous vibration						
		Frequency	Acceleration	Amplitude				
		$10 \leq f < 57\text{Hz}$	-	0.035mm				
$57 \leq f \leq 150\text{Hz}$	$4.9\text{m/s}^2(0.5\text{G})$	-						
6	Shock resistance	<ul style="list-style-type: none"> • Peak acceleration: $147\text{m/s}^2(15\text{G})$ • Duration: 11ms • Half-sine, 3 times each direction per each axis 	IEC61131-2					
7	Noise resistance	Square wave impulse noise	$\pm 1,500\text{V}$	LSIS standard				
		Electrostatic discharge	4kV (Contact discharge)	IEC61131-2 IEC61000-4-2				
		Radiated electromagnetic field noise	80 ~ 1,000 MHz, 10V/m	IEC61131-2, IEC61000-4-3				
		Fast transient/burst noise	<table border="1"> <thead> <tr> <th>Segment</th> <th>Power supply module</th> <th>Digital/analog input/output communication interface</th> </tr> </thead> <tbody> <tr> <td>Voltage</td> <td>2kV</td> <td>1kV</td> </tr> </tbody> </table>	Segment	Power supply module	Digital/analog input/output communication interface	Voltage	2kV
Segment	Power supply module	Digital/analog input/output communication interface						
Voltage	2kV	1kV						
8	Environment	Free from corrosive gasses and excessive dust						
9	Altitude	Up to 2,000 ms						
10	Pollution degree	2 or less						
11	Cooling	Air-cooling						

Note

1) IEC (International Electrotechnical Commission):

An international nongovernmental organization which promotes internationally cooperated standardization in electric/electronic field publishes international standards and manages applicable estimation system related with.

2) Pollution degree:

An index indicating pollution degree of the operating environment which decides insulation performance of the devices. For instance, Pollution degree 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

The specifications for the Fnet I/F Module system configuration are as follows.

Please refer to Table 2.2.1 below for system configuration.

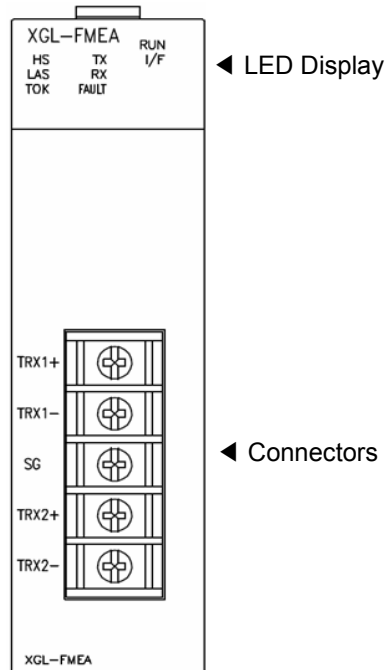
[Table 2.2.1] Performance Specifications

Classification		Specification
Baudrate		1Mbps
Max. Transmission Distance	Segment	Max. 750m
	Network	Max. 750m + 6 repeaters (750m*6)= 5.25km - Repeater expansion length: 750m
Cable		Twist pair shield cables. - LIREV-AMESB 1Px22AWG (7/0.254): LS Cable
Max. No. Stations	Network	64 stations
	Segment	32 stations - Use repeaters for 32 or more stations
Diagnostics Function		XG-PD: high speed monitoring
Terminating Resistance (Ω)		110(5%, 1/2W)
Master/Slave Function		Available for master only
XG-PD (High Speed Link)	Data Process Unit	Byte
	Communication Intervals	Select one of:20ms, 50ms, 100ms, 200ms, 500ms, 1s, 5s, 10s - Default setting is 200ms
	Max. Communication Points	3780 words
	Max. No. of Blocks	64 (Transmission: 32, Reception: 64)
	Max. Point per Block	120 bytes (60 words)
	Max. No. of Transmission Blocks	32 blocks
	No. of high speed link usage	Max. 12
Station Numbering		Set up in the basic setting window of XG-PD
Basic Specifications	Max. No. of Modules	12 units (mountable on basic and expansion base)
	Module Position	XGK/XGI: mountable at any position. XGR: available for expansion bases only.
	Internal Power Consumption (mA)	410
	Weight (g)	115

Note

1) XGR System is available for expansion base only, not for basic base.

2.3 Structure and Features



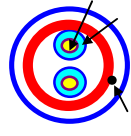
[Table 2.3.1] LED Display Specification

LED Display	LED Status	Description
RUN	On	Normal
	Off	A/S inspection required
I/F	Blink	Normal
	On/Off	A/S inspection required
HS	On	High speed link communication in service
	Blink	Link trouble error, or any one of the set-up communication block fails to perform normal service
	Off	High speed link communication service has stopped
LAS	On	The Link is acting as an Active Scheduler (master) - normal
	Off	Normal
TX	On	Transmitting data
RX	On	Receiving data
TOK	On	Token in possession
FAULT	On	Data collision during communication

2.4 Cable Specification

2.4.1 Electric Cable (LS Cable)

[Table 2.4.1] Electric Cable Specifications

Classification	LIREV-AMESB 2 *0.64mm 22AWG	Structure
Manufacturer	LS Cable	 <p>Conducto Insulator Earth Wire</p>
Cable Type	Twisted pair, shielded	
Conductor Resistance	59Ω/km (room temperature)	
Withstand Voltage (DC)	500 V/Min (room temperature)	
Insulation Resistance	1,000MΩ/km min.	
Capacitance	45 pF/m max. (1kHz)	
Characteristics Impedance	120±12Ω (10MHz)	
No. of Conductor Cores	2 Cores	

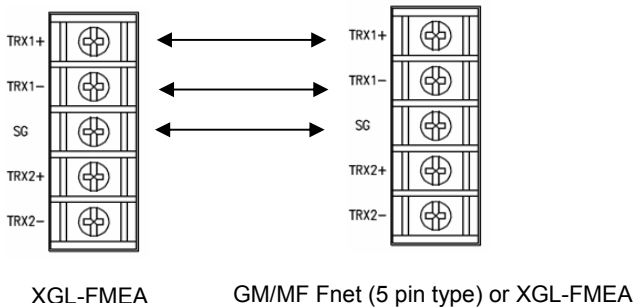
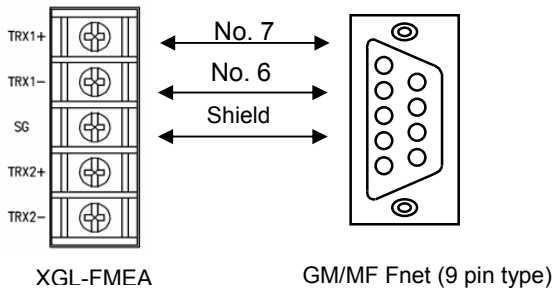
2.4.2 Cable Joint Method

1) Connection between XGL-FMEA and GM/MK Fnet I/F nodule (take care of polarity and pin No.)

XGL-FMEA	GM/MK Fnet I/F (9 pin type)	GM/MK Fnet I/F (5 pin type)
TRX1+/TRX2+	No. 7	TRX1+/TRX2+
TRX1-/TRX2-	No. 6	TRX1-/TRX2-
SG	9Pin Shield	SG

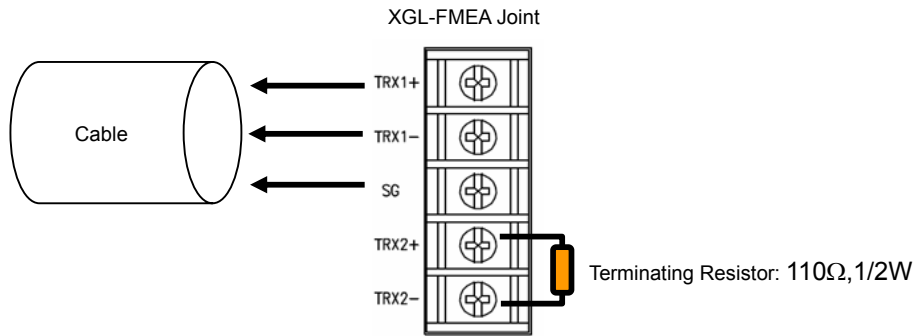
2) Cable connection (XGT Fnet ↔ GM/MF Fnet (9 pin type))

3) Cable connection (XGT Fnet ↔ GM/MF Fnet (5 pin type) or XGT Fnet ↔ XGT Fnet)



2.4.3 Terminating Resistor

Install terminating resistor at both ends of line. Install terminating resistors to TRX2+ and TRX2-.



Chapter 3 Product Installation and Test-Run

3.1 Cautions for Handling

3.1.1 Cautions for Handling

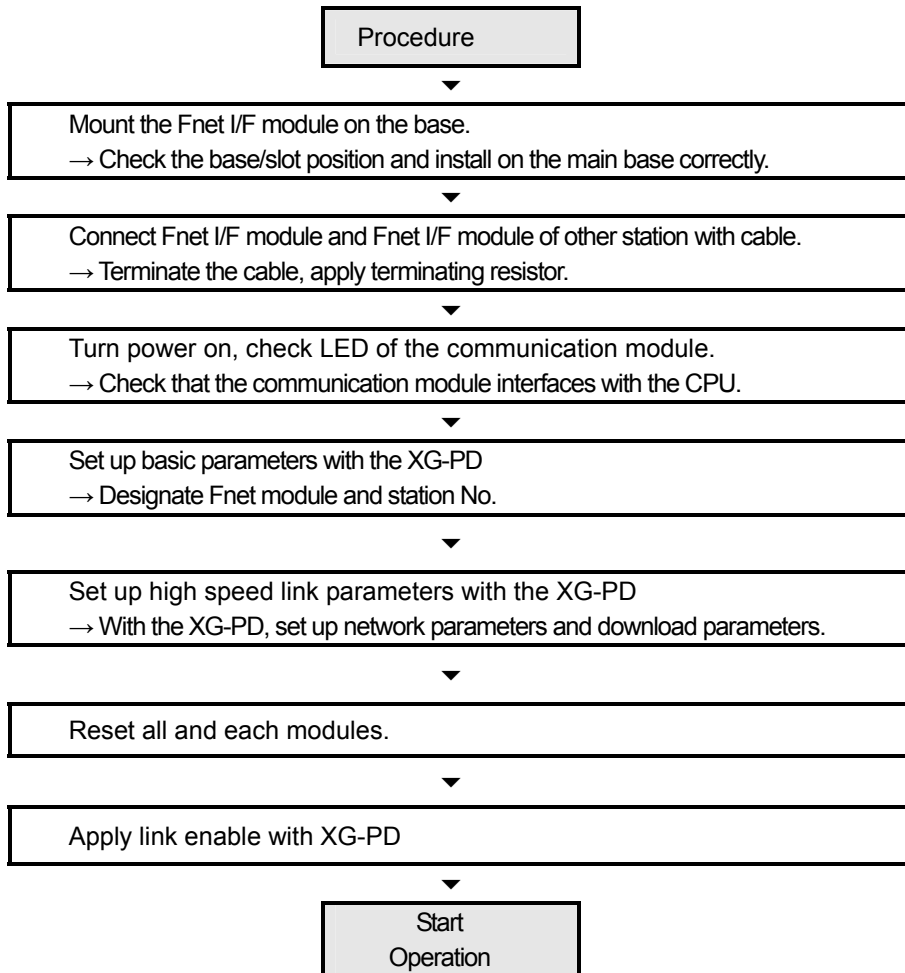
Following basic specifications apply to the construction of Fnet I/F module systems.

- 1) Check the system requirements and select appropriate communication module.
- 2) Select the cable for the communication module (make sure to use standard cable).
- 3) Before mounting, check that the base connector is clean without foreign material and the module connector pins are not damaged.

- 4) Before connecting the communication cable, match the protrusion on the bottom of the module to the groove on the base, and push in until the top is fully engaged with the lock device of the base. If the lock device is not engaged, interface with CPU may fail.

3.2 Product Setting for Operation

This section describes the installation and operation of the product. When the product has been installed, configure and set the system with the following procedures.



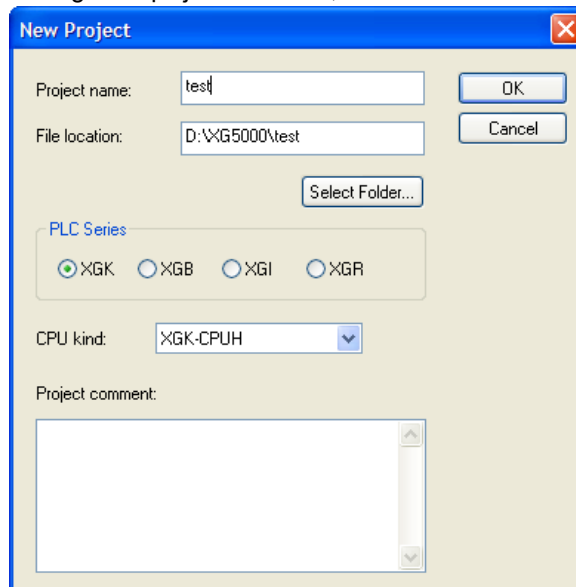
3.3 Registration of Communication Module

To use an XGT Fnet I/F module, set up communication parameters with XG-PD, and register the module on the XG-PD for system setting-up of the XGT Fnet I/F module. The registration procedures of the XGT Fnet I/F XGnet I/F modules are as follows, according to the online or off-line status.

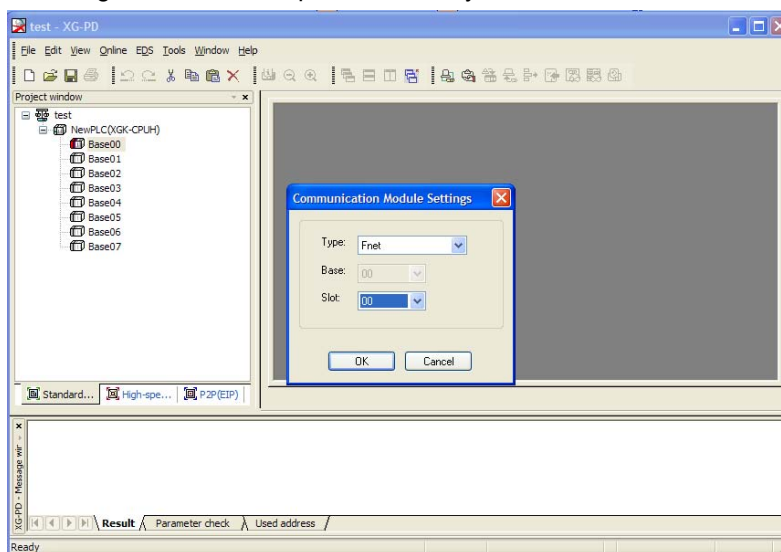
3.3.1 Off-line Registration

This method is applied for communication module setting and preparing communication related parameters while not in connection with PLC.

- 1) Run XG-PD, select File → New File, or click () icon.
- 2) Enter the project name for saving in the project name field, and select the CPU series and CPU type.




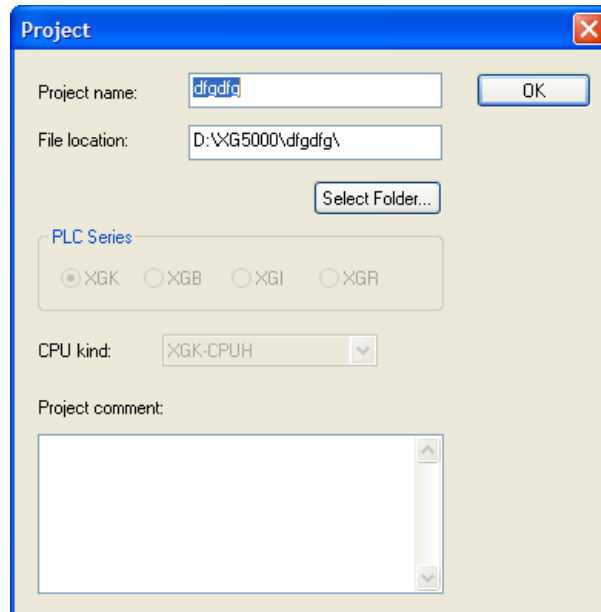
- 3) In the basic setting window of the XG-PD, select the location of the base in which the XGT Fnet I/F module will be registered. Click mouse right button and set up the slot where you want install the Fnet module.




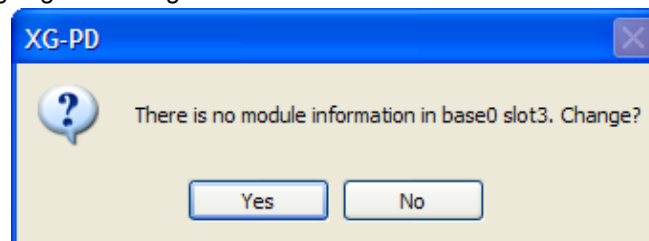
3.3.2 Online Registration

To register communication module using XG-PD in online status, conduct the steps No. 1 and 2 of the off-line registration for XGT FnetI/F module, and conduct following steps.

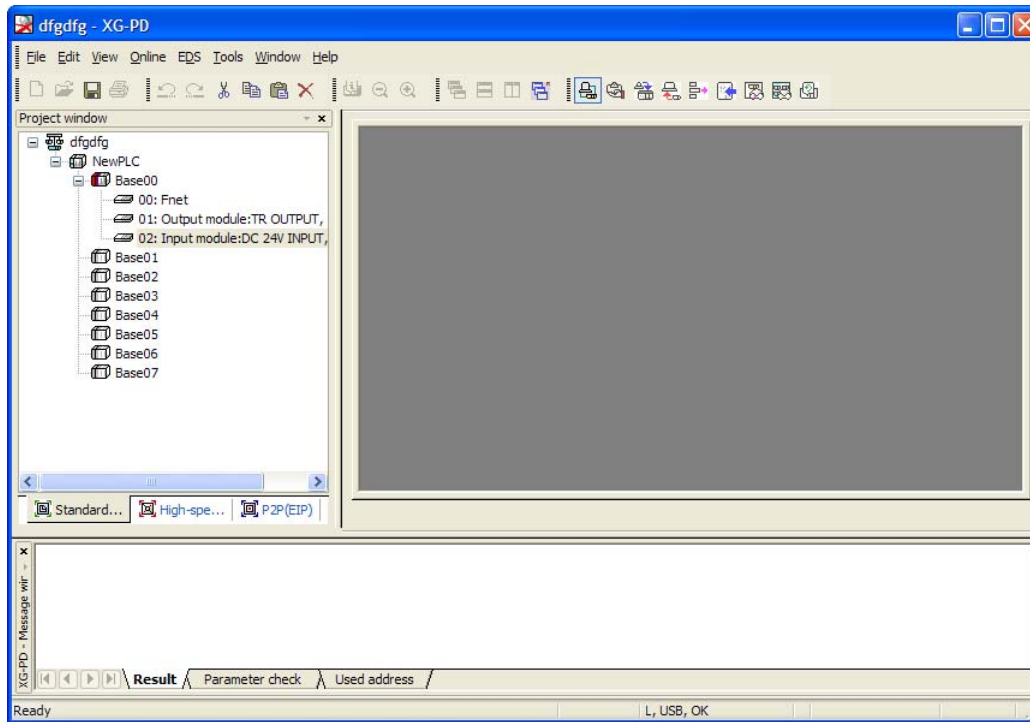
- 1) Enter project name in the project name field, select PLC series and CPU type
- 2) If unable to connect, check the connectivity with the PLC, select Online → Connect Settings or click () icon to select connection method. Available connection methods are RS-232C cable, USB cable, Ethernet module and EtherNet/IP module. For the connection step, select Local for direct access to the PLC. Remote access will be described in section 7.3 Remote Access



- 3) When normally connected, the submenus of the online menus are enabled.
- 4) To check the module currently installed in the base, select Online → Read IO Information, or click the () icon. All the communication modules on the main and expansion bases are searched and their information is displayed on the project window. If a module registered in off-line status has different information than the currently connected PLC information or different from the type of the communication module worked in the previous project, the change will be checked after giving the message below.



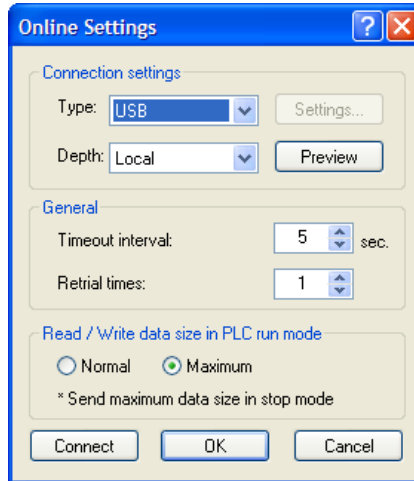
5) The list of the communication modules installed in the product is created in the project window.



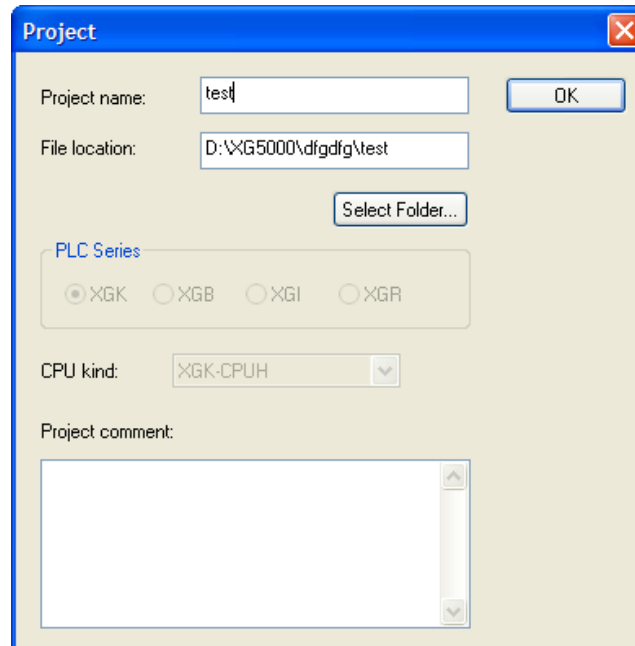
3.3.3 Reading Parameters from PLC

The default setting values and high speed link setting values saved in PLC can be loaded with following procedures.

- 1) From file menu, select Open from PLC.

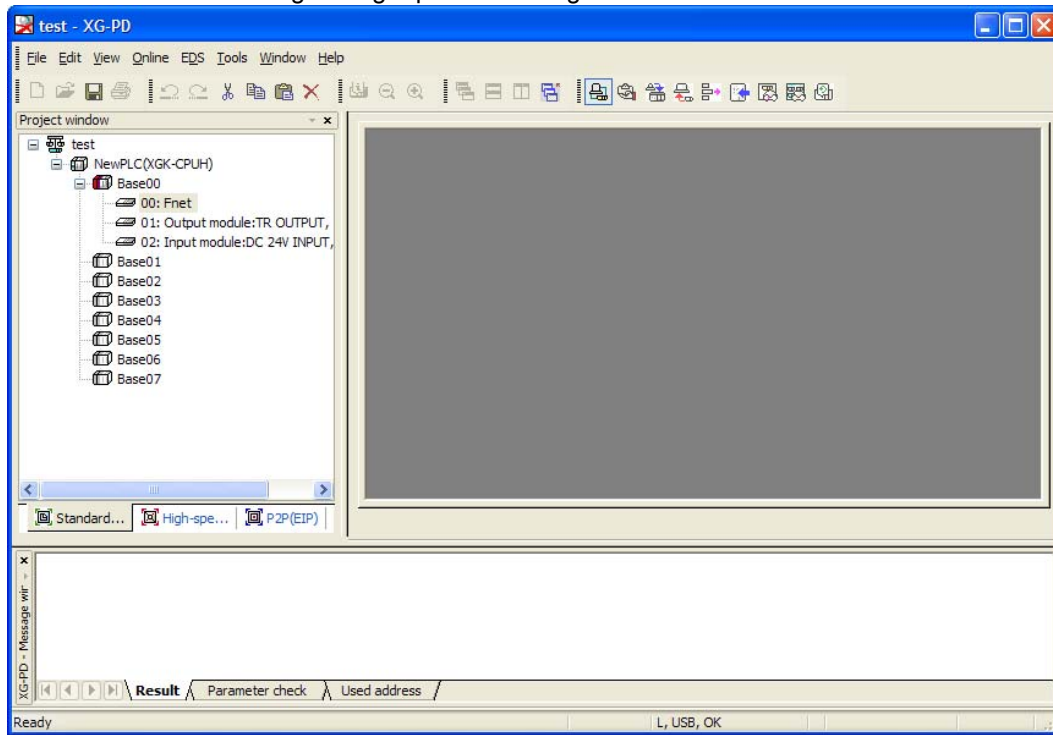


- 2) Set up connection method and step, click Connect or OK.



- 3) Enter the project name and folder path for save, click Confirm.

4) You can view the default setting and high speed link setting values stored in the PLC.



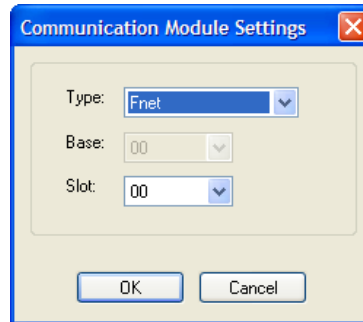
3.3.4 Module Setting Procedure

Set up the XGT Fnet I/F module as follows for operation.

1) Procedure

(1) Direct input in project window


Select Online → Project Window → the base to be installed with the module, click mouse right button to set up the type and position of the XGT Fnet I/F module.



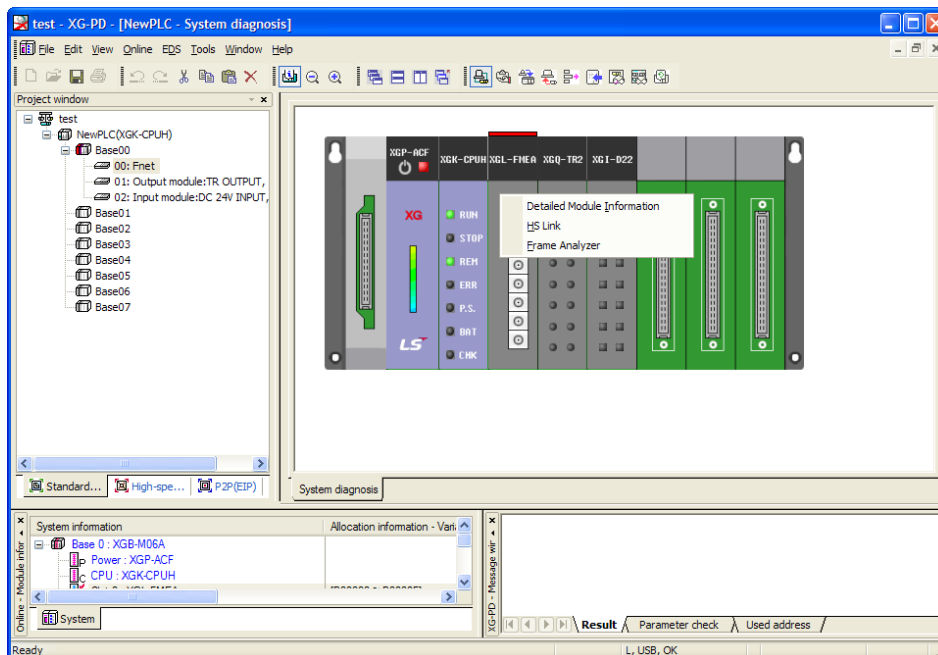
(2) Read I/O Information

Select Online → Connect and Online → Read I/O Information to read the information of the modules installed in the current base.

2) Operation Check

(1) Select Online → System Diagnosis, or click () icon.

(2) Click mouse right button on the pertinent module of the system diagnosis window, then click the detailed items to check normal communication.

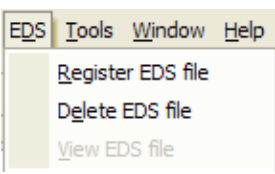
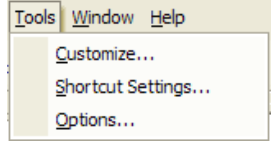
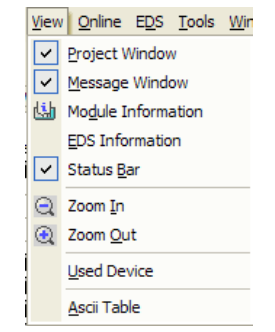
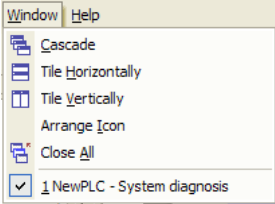



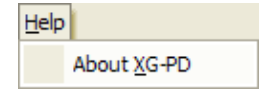


3.3.5 Relation between the Menu Bar and Shortcut Icons of XG-PD

The relation between the menu bar and shortcut icons of the XG-PD are as follows.

	Menu bar	Menu	Icon	Description
File		New File		Create a new file
		Open		Open a saved file
		Open from PLC	-	Load a file stored in PLC
		Save		Save edited or created file
		Save As	-	Save file in a different name
		Print		Print a file
		Print Preview	-	View document to be printed in advance
		Project Print	-	Print setting parameters
		Print Setup	-	Set up printer and printing direction
		Edit		Undo
Redo				During parameter set up, cancel Undo and return to the previous state
Cut				Delete object and paste it to another position
Copy				Copy an object or text
Paste				To add copied content
Delete				Delete an object or test
Online				Connect
		Connection Settings		Set up connection parameters between PLC and computer
		Read IO Information		Read PLC system information
		Write Parameter		Write the parameters edited in XG-PD
		Read Parameter		Read parameters stored in PLC
		Enable Link		Allow communication to communication module set up as high speed link or P2P
		Download /Upload	-	Download communication module O/S
		SyCon Upload		Read data set up in SyCon (Dnet, Pnet)
		System Diagnosis		Monitor operation of communication module
		Reset	Reset PLC	-
Reset Individual Module			Reset the pertinent communication module	

Chapter 3 Installation and Test-Run

Menu bar		Menu	Icon	Description
EDS		Register EDS File		Register an EDS file
		Delete EDS File		Delete an EDS file (Delete EDS of the module active in EIP configuration window)
		View EDS File		View EDS file in memo (Information of the module active in EIP configuration window)
Tool		User Defined	-	Select/reset tool related menu user
		Shortcut Key Setting	-	Set/reset shortcut key of each menu item
		Project Option	-	Apply/Cancel project related option
View		Project Window	-	Show Project window in XG-PD
		Message Window	-	Show message window
		Module Information Window	-	Show Module Information Window
		EDS Information Window	-	Show EDS information Window
		Status Bar	-	Show status bar
		Used Device	-	Show Used Device Window
		ASCII Table	-	Show ASCII
		Window		Cascade
Tile Horizontal		Arrange edit windows in horizontal layout		
Tile Vertical		Arrange edit windows in vertical layout		
Arrange Icon		Arrange icons		
Close All		Close all open windows		
Help		XG-PD Information		To view XG-PD version information

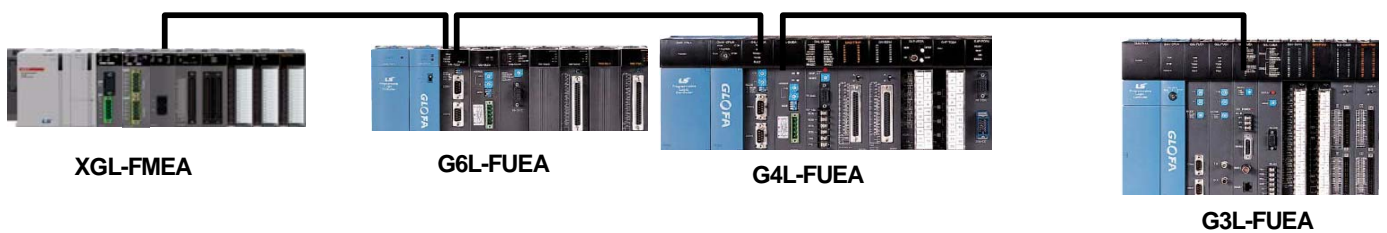
Chapter 4 System Configuration

4.1 Network System Configuration

Systems using Fnet I/F module can be configured with the XGT Fnet I/F modules only or with XGT Fnet I/F module and GMMK Fnet I/F module. Therefore, additional configuration can be implemented to the existing systems consisted with GMMK Fnet I/F modules. In this case, if the total number of stations is more than 32 or total line length is longer than 750m, repeater is required for normal performance.

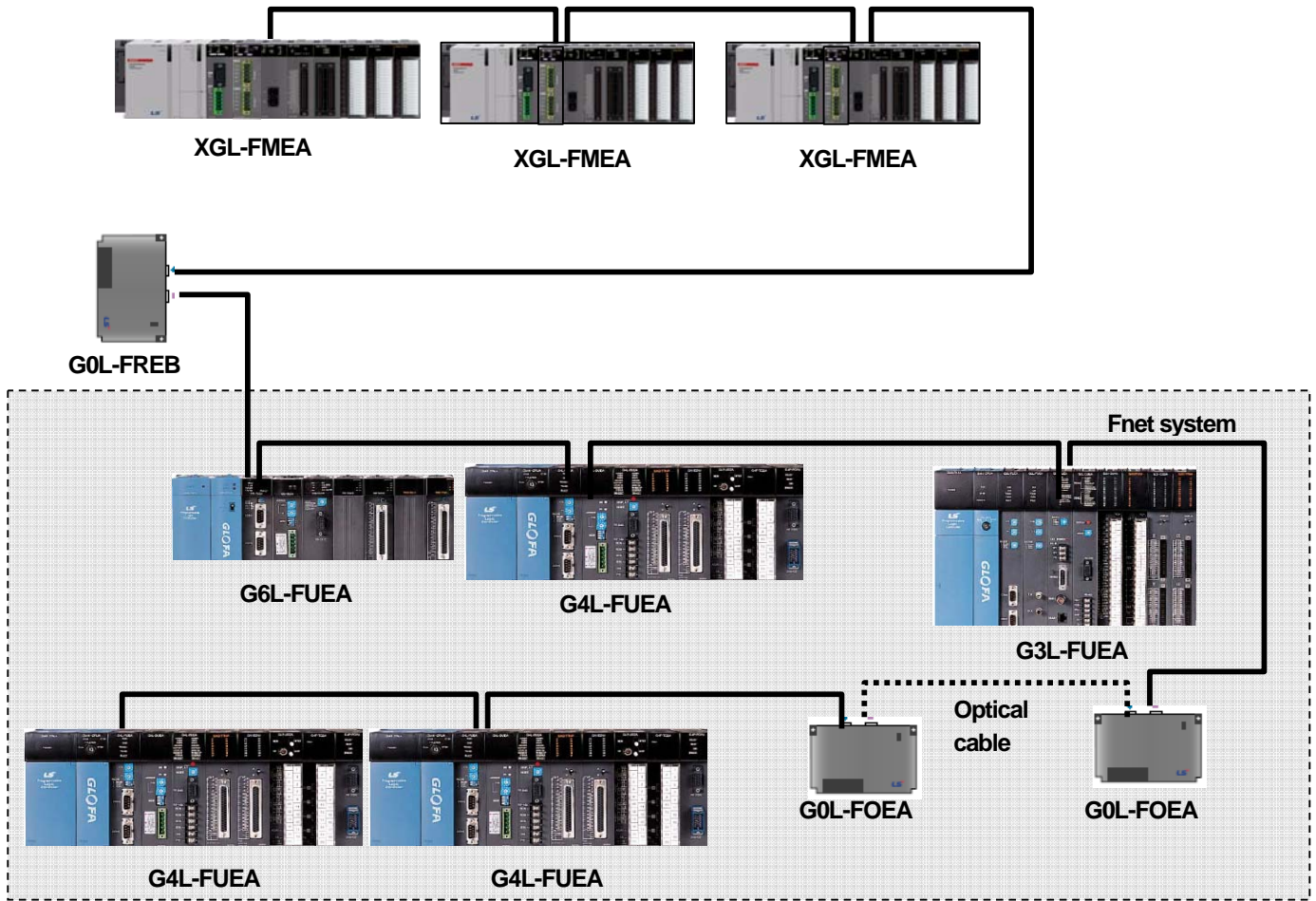


[Fig. 4.1.1] System comprised of XGT Fnet only



[Fig. 4.1.2] System comprised of XGT Fnet + GMMK Fnet

Chapter 4 System Configuration



[Fig. 4.1.3] System with existing GM/MK Fnet added with XGT Fnet

Chapter 5 High Speed Link Service

5.1 Outline of High Speed Link

High speed link is a communication method between XGT PLC communication modules, which can communicate data periodically by high speed link parameter setting. It is a data communication service where the user can set up the communication parameters for the data size, intervals, area and storage area of communication using XG-PD. The detail information of the high speed link setting is presented in the Table 5.2.1 below.

[Table 5.2.1] High speed link setting

Classification		High Speed Link			
Communication Module Setting	Communication Module Setting	Module Type	Select Fnet		
		Base No.	Max.: 0 ~ 7 setting range according to CPU module		
		Slot No.	Max.: 0 ~ 11 setting range according to the base type		
	Communication Interval Setting (cycle type)	Select one of 20ms, 50ms, 100ms, 200ms, 500ms, 1s, 5s, 10s - Default setting is 200ms			
	Emergency Output Data Setting	CPU Error	Latch	Maintain the previous output status	
Clear			Clear all output		
CPU Stop		Latch	Maintain the previous output status		
		Clear	Clear all output		
High Speed Link Block Setting	Station Type	Fix to local			
	Block Type	Send: data sent from master to slave module			
		Receive: data sent from slave module to master module			
	Station No.	Slave station No. (range: 0 ~ 63)			
	Block No.	No. of the blocks available for communication (0 ~ 63)			
	Read Area	Address	XGK	Head address of the device to transmit. Available device: P, M, K, T, C, L, U, N, D, R, ZR	
			XGI/XGR	Head address of the device to transmit. Available device: M, I, Q, R, W	
		Size (word)	Word expression of the data size to be transmitted		
	Save Area	Address	XGK	Head address of the device to receive. Available device: P, M, K, T, C, L, U, N, D, R, ZR	
			XGI/XGR	Head address of the device to transmit. Available device: M, I, Q, R, W	
Size (word)		Word expression of the data size to be received			
PLC Connection		RS-232C or USB Port of CPU module			
Control Condition		Controllable regardless of the position of the operation mode (Run, Stop) switch of the CPU module			
Max. Communication Points		61440 points 64 block * 120 byte)			
Max. Block No.		64 (Setting range: 0~63)			
Max. Points per Block		120 byte (960 points)			

Note

- 1) If high speed link setting is to be changed, download the parameters again.
- 2) Only one high speed link can be set-up and used per each communication module.

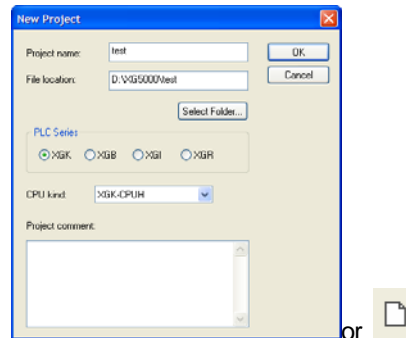
5.2 Using XG-PD

For using the Fnet I/F module, the XG-PD has to be set up in following procedures.

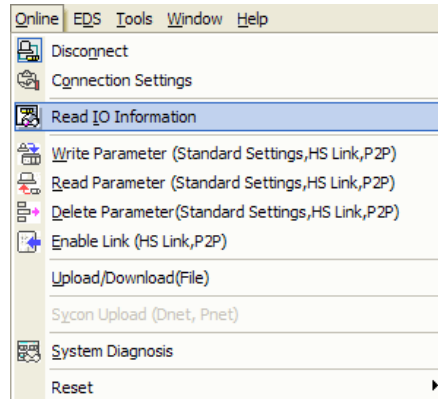
Run XG-PD

- 1) File -> New File
 - (1) Project Name
 - A) Enter Project name
 - (2) Select PLC Series
 - (3) Select CPU Type

Create a new XG-PD file for the Fnet I/F module

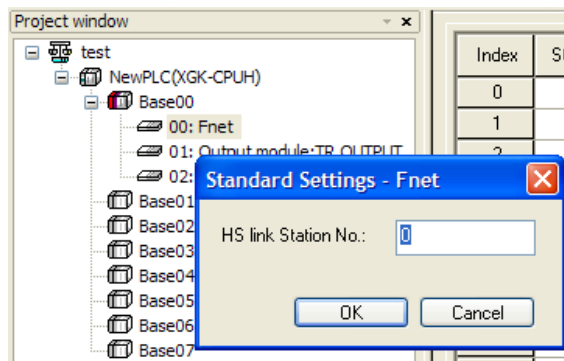


2) Read I/O Information



3) Set up station No.

Set up station No. of the communication module



4) Set up HS link communication

module in the project window

A) Set up communication module:
Fnet

- Module type, base, slot

B) Set up communication intervals

C) Set up emergency output data -
CPU module error, CPU module stop



High-speed Link 01 [BOS0 Fnet]

U	Local	Send
1	Local	Send

Communication Module Settings

Communication module settings

Module type: Fnet

Base Number: 00

Slot Number: 00

Communication period settings

Period type: 20 msec

Output data setup in case of emergency

CPU error: Latch Clear

CPU stop: Latch Clear

5) Set up HSL Block in Project Window

A) Set up Read/Save Area Address



Index	Station type	Mode	Station number	Block number	Read area	variable name	variable name comment	Read area Valid size
0	Local	Send	0	1	D00000			2
1	Local	Send	0	2	D00100			2
2	Local	Receive	3	3				
3	Local	Receive	4	4				
4								
5								
6								
7								
8								
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10								
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6) Write Parameter



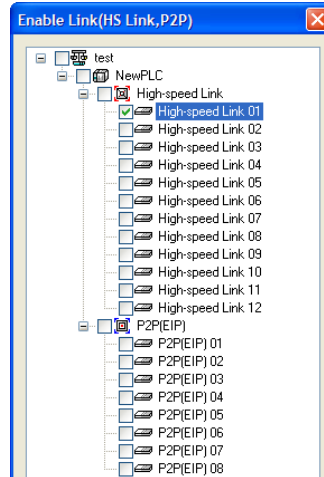
Select "Online – Write Parameter," select the standard settings and the module related information of the HS Link, and click OK

Write parameter (standard settings, HS link, P2P)

- test
 - NewPLC
 - Standard settings
 - Fnet (base0, slot0)
 - High-speed Link
 - High-speed Link 01
 - P2P(EIP)

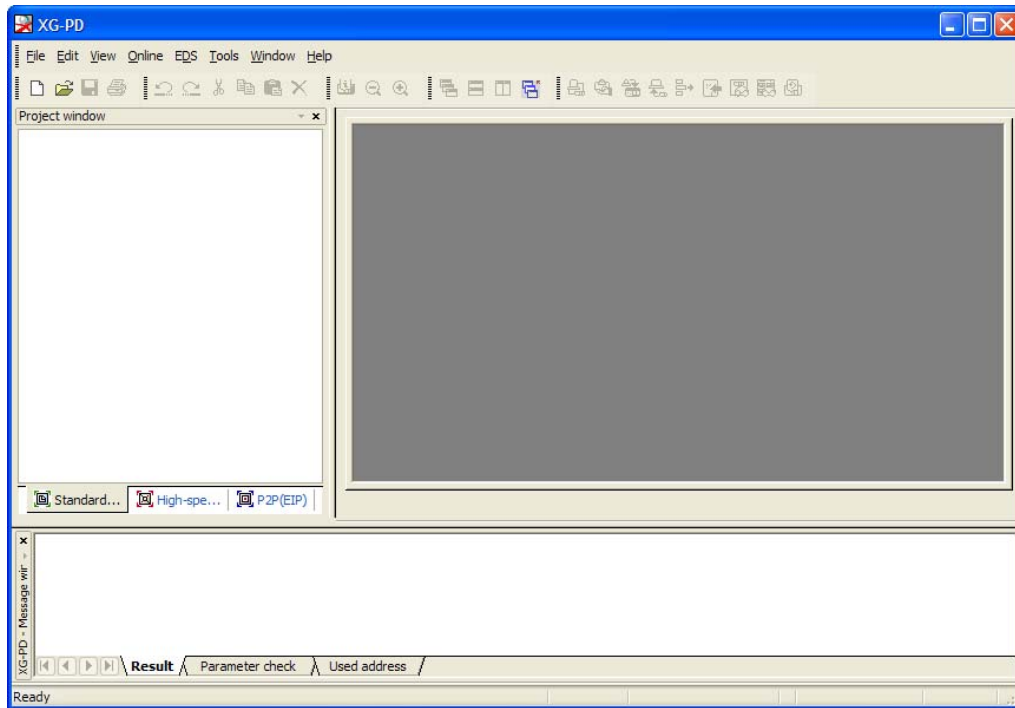
7) Enable Link

Allow communication for the installed Fnet I/F module
Select "Online – Enable Link" and the pertinent HS Link, and click OK.



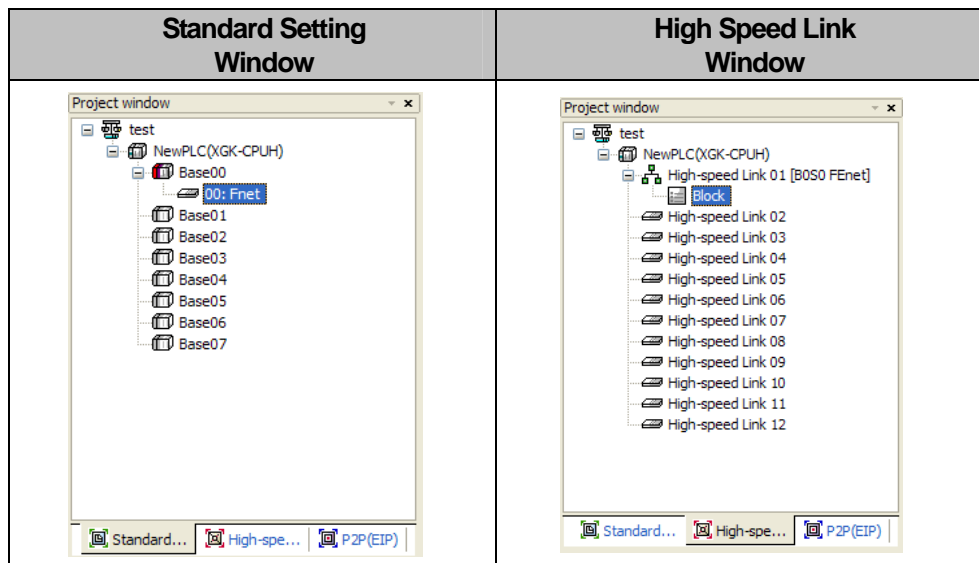
5.3 Setting-up High Speed Link

When the XG-PD is loaded, the screen below will appear.



[Initial Window]

The parameters which can be set up in XG-PD are as follows.



Chapter 5 High Speed Link Service

The window used by Fnet I/F module is high speed link window.

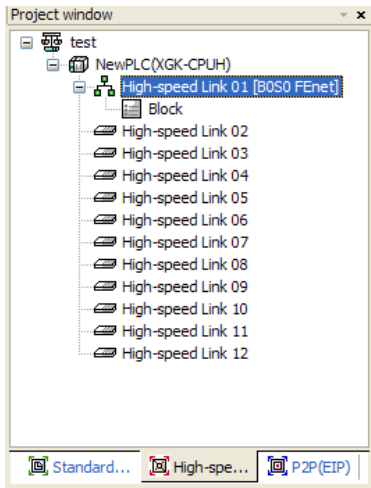
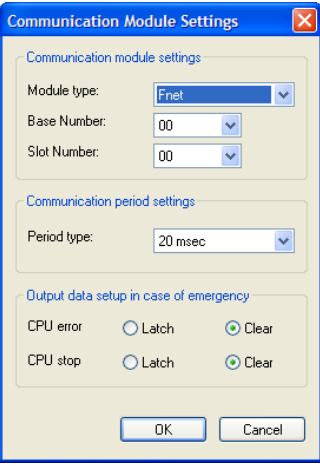
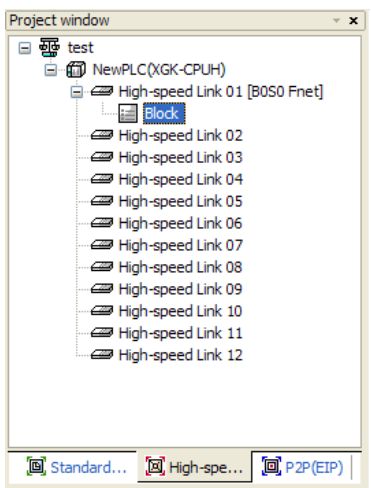
Up to 12 high speed links can be used.

Each Fnet I/F module can make use of one high speed link.

1) Using high speed link window

Select the high speed link window where the user can set up following parameters.

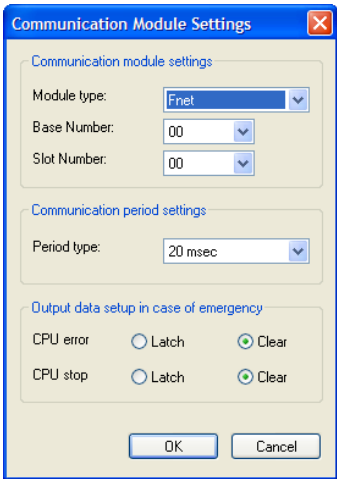
Two windows are available: communication module setting and high speed link block setting windows.

High Speed Link Window	Parameter Setting Window																																																																																																		
	<p>To set up communication module, double click the high speed link between 01~12.</p> 																																																																																																		
	<p>After setting up communication module, double click the block to set up parameters.</p> <table border="1" data-bbox="619 1339 1358 1704"> <thead> <tr> <th>Index</th> <th>Station type</th> <th>Mode</th> <th>Station number</th> <th>Block number</th> <th>Read area</th> <th>variable name</th> </tr> </thead> <tbody> <tr><td>0</td><td>Local</td><td>Send</td><td>0</td><td>1</td><td>D00000</td><td></td></tr> <tr><td>1</td><td>Local</td><td>Send</td><td>0</td><td>2</td><td>D00100</td><td></td></tr> <tr><td>2</td><td>Local</td><td>Receive</td><td>3</td><td>3</td><td></td><td></td></tr> <tr><td>3</td><td>Local</td><td>Receive</td><td>4</td><td>4</td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>12</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Index	Station type	Mode	Station number	Block number	Read area	variable name	0	Local	Send	0	1	D00000		1	Local	Send	0	2	D00100		2	Local	Receive	3	3			3	Local	Receive	4	4			4							5							6							7							8							9							10							11							12						
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Note High speed link 1 [B0S1 Fnet] has following meanings;

- 1) High speed link 1: serial No. of high speed link.
- 2) B0: base No. (E.g., expansion base stack 2: B2, expansion base stack 5: B5)
- 3) S0: slot No. (E.g., slot No. 5: S5, slot No. 11: S11)

- 2) Communication module setting parameter
 Communication module parameters can be set up as follows.

Parameter Window		Item	Description	
	Comm. Module Setting	Module Type	Select Fnet	
		Base No.	Setting range: 0 ~ 7 Range may vary by CPU module	
		Slot No.	Setting range: 0 ~ 11 Range may vary by base type	
	Communication interval settings (Period Type)		Select one from: 20ms, 50ms, 100ms, 200ms, 500ms, 1s, 5s, 10s - Default setting is 200ms. - Applicable to transmission data only. - Receiving data is processed at the end of scan program.	
	Emergency Output Data Setting	CPU Error	Latch	Maintain previous output status
			Clear	Clear all outputs
Emergency Output Data Setting	CPU Stop	Latch	Maintain previous output status	
		Clear	Clear all outputs	

Note

1. Cautions for communication interval setting
 - 1) The communication intervals setting value is pertinent to the transmission data (CPU module data -> Fnet I/F module). If the interval is longer than the rapidly changing data time in the scan program, the data sent to other local module may be different at a moment.
 - 2) High speed link communication interval must be set up taking into consideration of the No. of the transmission blocks and the No. of the Fnet I/F modules participating in the communication. For further information, refer to Section 7.1, Communication Interval Setting.

Chapter 5 High Speed Link Service

3) High speed link block setting parameter

Following parameters can be set up in high speed link block.

Item	Description		
Station Type	Fix to Local		
Mode	Transmission: outbound data flow reception: inbound data flow		
Station No.	Internal/External station No. (range: 0 ~ 63): automatically set to internal station no. at transmission		
Block No.	No. of the block which can be set up in communication (0 ~ 63)		
Read Area	Address	XGK	Head address of the device to transmit. Available device: P, M, K, T, C, L, N, D, R, ZR
		XGI/XGR	Head address of the device to transmit. Available device: M, I, Q, R, W
	Size (word)	Word expression of the data size to be transmitted	
Save Area	Address	XGK	Head address of the device to receive. Available device: P, M, K, T, C, L, N, D, R, ZR
		XGI/XGR	Head address of the device to transmit. Available device: M, I, Q, R, W
	Size (word)	Word expression of the data size to be received	

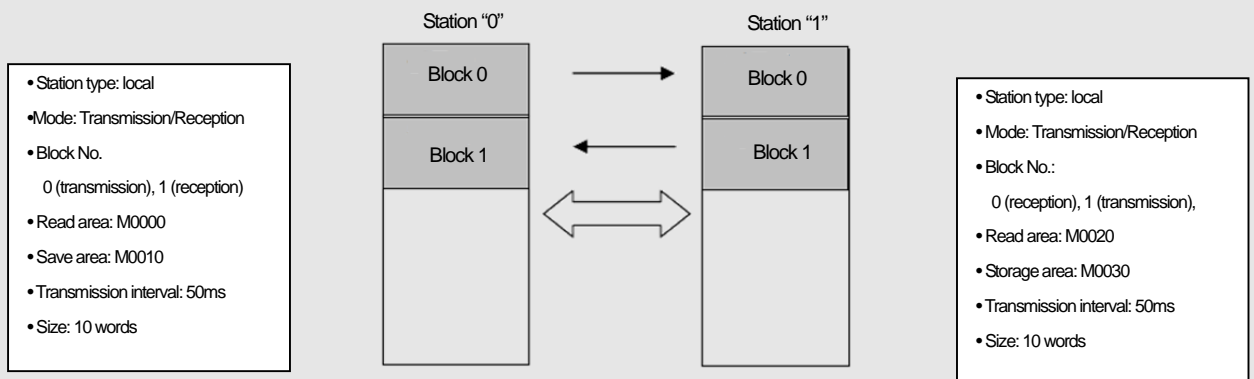
Note

1. How to use high speed link: an exemplary setting for communication between the Fnet I/F modules of "0" and "1" stations

- 1) "0" sends 10 words of M0000 data to "No. 0" block, and save the data received from "1" in M0010.
- 2) "1" receives 10 words of M0000 data from "0" to save it in M0030 and sends 10 words of M0020 data to "No. 1" block.

High speed link parameter has 64 blocks for data communication, of which up to 32 are available for transmission and 64 available for reception. (Block No. can be set up between 0~63)

- The transmitter side needs only to decide to read what data and sent it to which block, no need to designate the station No. of the receiver.



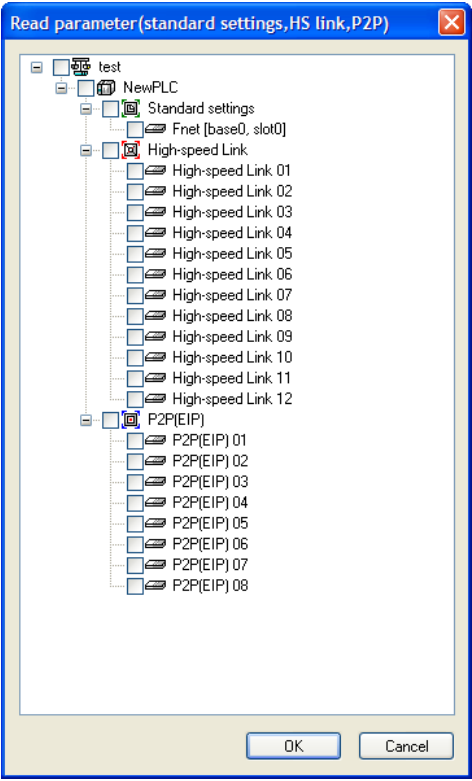
4) Edit tools for high speed link block

The edit tools and their use are presented in the table below.

Item		Description																																																																																													
<table border="1" style="width: 100%; border-collapse: collapse; margin: 0 auto;"> <thead> <tr> <th>Index</th> <th>Station type</th> <th>Mode</th> <th>Station number</th> <th>Block number</th> <th>Read area</th> <th>variable name</th> <th>variable name comment</th> <th>Read area Word size</th> <th>Save area</th> <th>variable name</th> <th>val</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Local</td> <td>Send</td> <td>0</td> <td>1</td> <td>D00000</td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>Local</td> <td>Send</td> <td>0</td> <td>2</td> <td>D00100</td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>Local</td> <td>Receive</td> <td>3</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td>D00200</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>Local</td> <td>Receive</td> <td>4</td> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td>D00400</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>												Index	Station type	Mode	Station number	Block number	Read area	variable name	variable name comment	Read area Word size	Save area	variable name	val	0	Local	Send	0	1	D00000			2				1	Local	Send	0	2	D00100			2				2	Local	Receive	3	3					D00200			3	Local	Receive	4	4					D00400			4												5											
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5.4 Read and Write High Speed Link

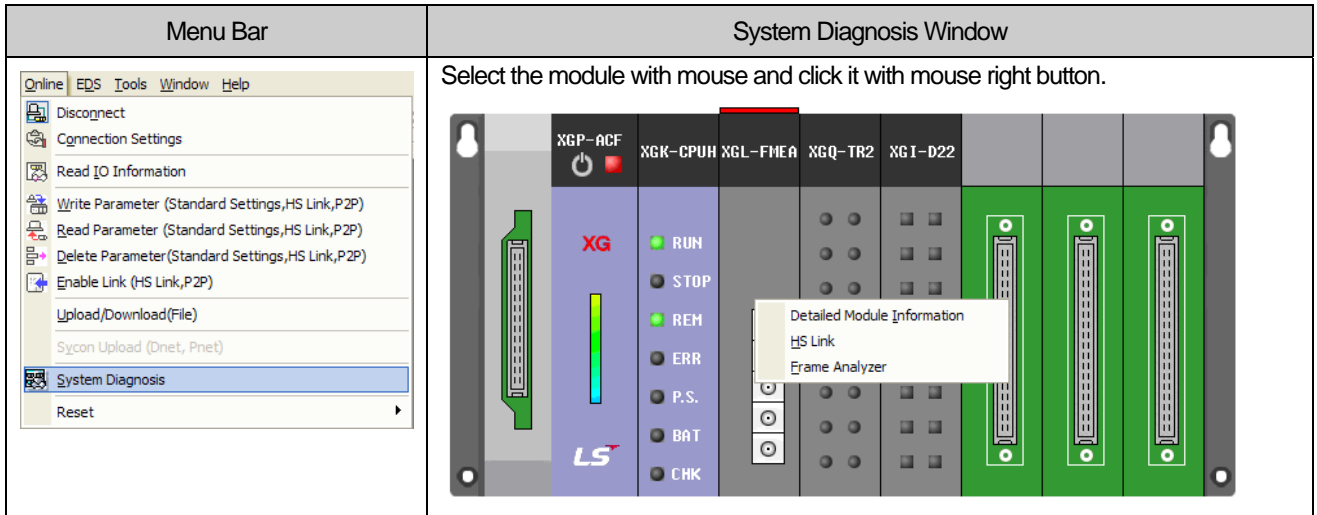
“Online -> Connect -> Online -> Read/Write Parameter” is used to read or write high speed link parameters. The window is described below.

Window Configuration	Description
	<ol style="list-style-type: none"> 1) For Fnet I/F module, up to 12 high speed links can be set up. <ul style="list-style-type: none"> - Max, 12 are available including other communication module using high speed link. 2) Each high speed link parameter can be read or written. <ul style="list-style-type: none"> - Click the check box left of the high speed link to set up. 3) Read/write high speed link parameter is not influenced by the operation mode of the CPU.

If high speed link parameter is written with the CPU module, the data is backed-up by the CPU module. Therefore, when replacing a CPU module, read the high speed link parameters from the CPU module and back-it-up, and then write it in the new CPU module.

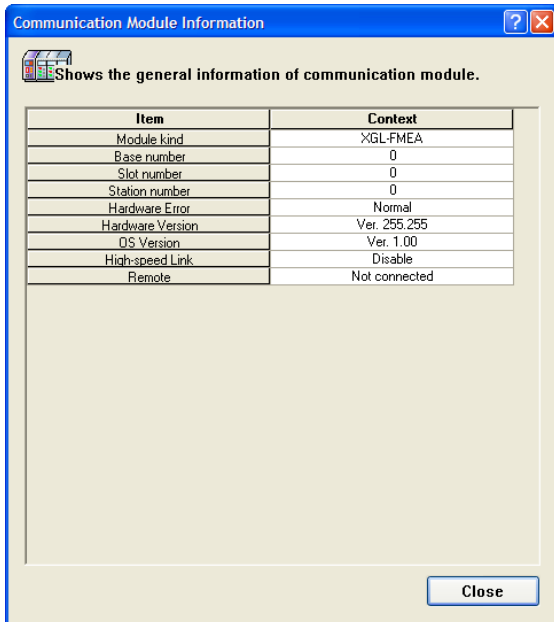
5.5 System Diagnosis

System diagnosis provides the comprehensive information on the system consists of Fnet I/F module. The system diagnosis window and its content are presented below.



The menu for system diagnosis is as follows.

1) Communication Module Information



Window Configuration and Content	
Communication module type	Communication module model
Base No.	Base position of module
Slot No.	Slot position of module
Station No.	Station No. of module
Hardware error state	Hardware state of module
Hardware version	Hardware version of module
OS version	OS version of module
HS link	Enabled status of module
Remote	Not supported

Chapter 5 High Speed Link Service

2) High speed link (HSL)

Screen and configuration

HS Link
✕

Standard Information

Base No.:

Slot No.:

Total HS link information

In normal communication

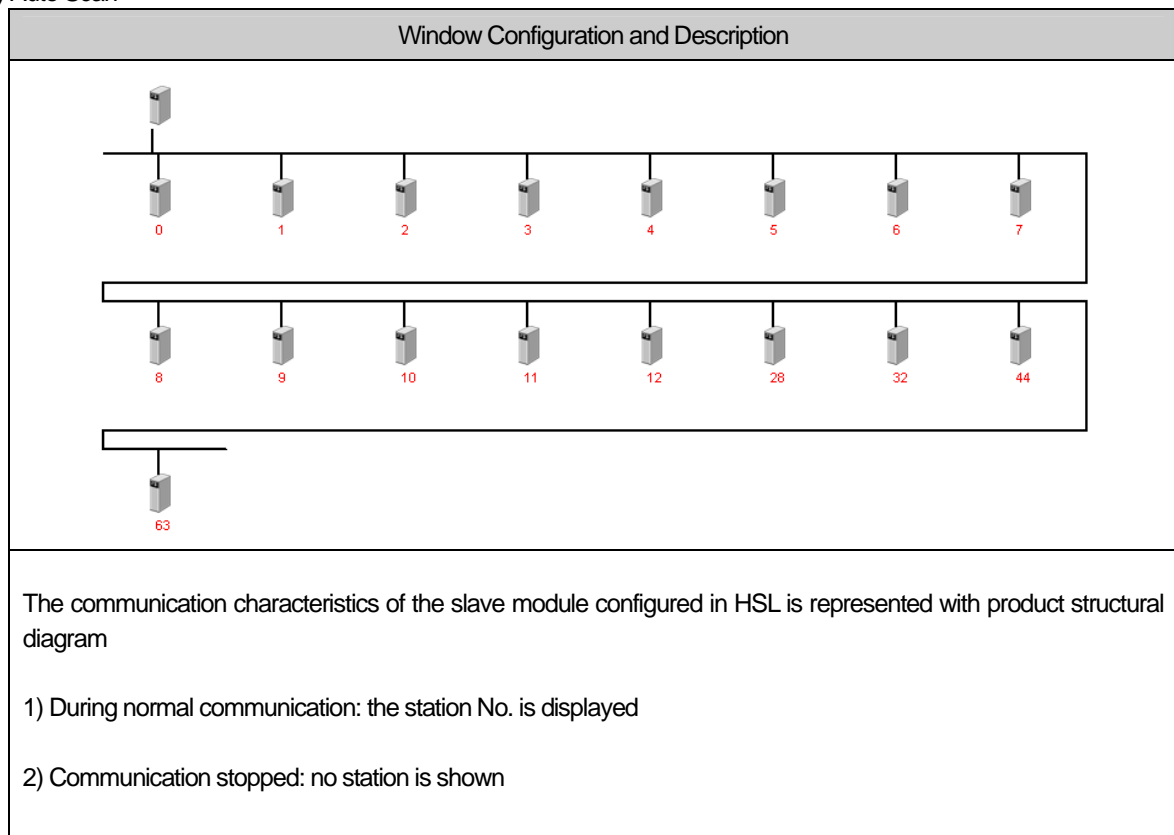
(Run link: 1, Link trouble: 0)

Individual HS link information:

Index	Station number	Module type	Block number	Data size	Read area	Save area	HS state	HS mo
00	00	Master Packet sent	01	02	D00000		Error	Stop
01	00	Master Packet sent	02	02	D00100		Error	Stop
02	03	Master Packet received	03	02		D00200	Error	Stop
03	04	Master Packet received	04	02		D00400	Error	Stop

Standard Info.	Base No.	No. of the base mounted with the product connected with HSL
	Slot No.	No. of the slot mounted with the product connected with HSL
Total HS link Info.	Run Link	1: after power On, HSL parameter operates normally at initial phase 0: after power On, HSL parameter fails to operate normally
	Link Trouble	1: after RUN link became normal, error occurred in external station 0: after RUN link became normal, no error occur in external station
Individual Info.	Index	Serial No.
	Station No.	No. of the local station on the network
	Module Type	Type of the module used by being set up with HSL parameter
	Data Size	Size (word) of the data communicated with external station
	Read Area	A device about to transmit data to other station
	Save Area	A device to save the data received from other station
	Hs State	Show general status of HSL
	Hs Mode	RUN: when the pertinent station is in RUN mode STOP: when the pertinent station is in STOP/PAUSE mode
	Hs Trx	Indicate transmission or reception of the station
Hs Error	Indicate error or not of the station	

3) Auto Scan



5.6 High Speed Link (HSL) Information

HSL communicates data between stations. The information of its normal operation-or-not is provided by flag on station basis or for all the stations. This information can be used to check the reliability of communication data or cause of error of the system. The types and application of the flags are as follows.

[Table 5.6.1] HSL Information Function

Classification	Run-Link	Link-Trouble	Comm. Status	Operation Mode	Error	HSL State
Information Type	Whole		Individual			
Flag Name (x=HSL 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
Monitoring/ or not	Available	Available	Available	Available	Available	Available
Program Applicability	Available	Available	Available	Available	Available	Available

Chapter 6 Sample Program

6.1 Application Sample in XGK-CPU

In this section, high speed link parameter setting method is provided with sample programs for an XGT Fnet system as shown below. Here, the high speed link parameter settings are in accordance with the XGK #1.



Mode	Read Area	Send Size (word)	Save Area (XGK#1)	Receive Size (Word)	Remark
Transmission	D00100	6	-	-	Data sent to GM4 #2
Reception	-	-	M200	6	Data received from GM4 #2
Transmission	D00106	4	-	-	Data sent to XGT #3
Reception	-	-	M300	10	Data received from XGT #4

1) HSL Parameter Setting

For system data communication, it is convenient to prepare a data communication map.

Prepare HSL parameter related with data communication and download it to the PLC. Run HSL in the following procedure.

- (1) Prepare data communication map
- (2) Connect XG-PD to XGT CPU locally
- (3) Set up parameter in the HSL parameter setting items of the XG-PD
- (4) Conduct Write Parameter in online menu
- (5) From online menu, select Enable Link and enable link suitable for the setting No.
- (6) Check HSL status using diagnosis service
- (7) In the event of an error occurs in above step (6), repeat from step (1) again

Chapter 6 Sample Program

In the exemplary system, the high speed link parameter can be set as follows.

The screenshot displays the XG-PD software interface for a new PLC system. The main window shows a table of high speed link parameters. Below the table, there are tabs for 'System diagnosis' and 'HS Link 01'. The bottom section of the interface shows 'System information' and 'Allocation information'.

Index	Station type	Mode	Station number	Block number	Read area	Read area Word size	Save area	Save area Word size
0	Local	Send	0	1	D00100	6		
1	Local	Receive	3	2			M0100	6
2	Local	Send	0	3	D00106	4		
3	Local	Receive	7	4			M0200	10
4								
5								
6								
7								
8								
9								
10								
11								

System information

- Base 0 : XGB-M06A
- Power : XGP-ACF
- CPU : XGK-CPUH
- Slot 0 : XGL-FMEA
- Slot 1 : XGQ-TR2A/B
- Slot 2 : XGI-D22A/B

Allocation information

- [P00000 ~ P000
- [P00010 ~ P000
- [P00020 ~ P000

The bottom status bar shows 'Ready' and 'L, USB, OK'.

6.2 Example using XGI-CPU

In this section, high speed link parameter setting method is provided with sample programs for an XGT Fnet system as shown below. Here, the high speed link parameter settings are in accordance with the XGI #1.

With the Fnet system below, high speed link parameter setting method is described as below.



Mode	Read Area	Send Size (word)	Save Area (XGI#1)	Receive Size (Word)	Remark
Transmission	MW0	6	-	-	Data sent to K300S #2
Reception	-	-	Mw10	6	Data received from K300S #2
Transmission	Mw100	4	-	-	Data sent to XGI #3
Reception	-	-	MW200	10	Data received from GM4C #4

1) HSL Parameter Setting

For system data communication, it is convenient to prepare a data communication map.

Prepare HSL parameter related with data communication and download it to the PLC. Run HSL in the following procedure.

- (1) Prepare data communication map
- (2) Connect XG-PD to XGT CPU locally
- (3) Set up parameter in the HSL parameter setting items of the XG-PD
- (4) Conduct Write Parameter in online menu
- (5) From online menu, select Enable Link setting and enable link suitable for the setting No.
- (6) Check HSL status using diagnosis service
- (7) In the event of an error occurs in above step (6), repeat from step (1) again

Chapter 6 Sample Program

The result of parameter setting in the XG-PD is as follows.

The screenshot shows the XG-PD software interface for a new PLC configuration. The main window displays a table with the following data:

Index	Station type	Mode	Station number	Block number	Read area	Read area Word size	Save area	Save area Word size
0	Local	Send	0	1	%MW0	6		
1	Local	Receive	3	2			%MW10	6
2	Local	Send	0	3	%MW100	4		
3	Local	Receive	7	4			%MW200	10
4								
5								
6								
7								
8								
9								

Below the table, the connection is identified as "HS Link 01". The status bar at the bottom indicates "Ready" and "OFFLINE".

Chapter 7 Max. Guarantee Time for Data Communication

7.1 Maximum guarantee time for communication between stations

The maximum guarantee time for data communication between stations is the maximum time which may be required for a sender station to transmit data to a receiver station. Therefore, the data which change by shorter cycle than this time cannot be guaranteed for reliability. The maximum guarantee time for data communication between stations depends upon the No. of stations in the communication network, No. of transmission parameters of the stations, and the program scan time of the communication PLC.

- 1) Transmission PLC Delay Time (sender station)
(2 times the max. scan time) + 20msec (time for data move from CPU to FNET module)

- 2) Reception PLC Delay Time (receiver station)
(2 times the max. scan time) + 20msec (time for data move from CPU to FNET module)

- 3) Transmission time (max. token guarantee time * No. of tokens required for the sender)
The max. token guarantee time is the total time of the token holding time of the station, calculated by $1.6 + 1.5 * Nm^{(note1)}$ per station. The No. of the tokens required for transmission is calculated by dividing the No. (N) of transmission blocks of the sender station with No. of the process blocks^(note2) per token plus one if there is remainder (add 2 instead of 1 as safety factor).
E.g.) In an XGT series with 20 transmission blocks, the 3 tokens are required for data transmission.

- 4) Max. Guarantee Time for Inter-Station Data Communication
Transmission PLC delay time + reception PLC delay time + transmission time

If the No. of transmission blocks of the stations is not available, assume the token holding time of the station to be the maximum value, which is $1.6 + 1.5 * 7 = 12.1$ (msec) for XGT and $1.6 + 1.5 * 10 = 16.6$ (msec)^(note3) for GM/MK. However, of all the stations, the No. of the transmission blocks of the sender station must be known.

Notes

[1] Nm is the No. of the transmission blocks set up for each station. The maximum of XGT and GMMK shall be 7 and 10, respectively.

[2] No. of processed blocks per token

-XGT: 7

-GMMK: 10

[3] Constant for calculating token holding time

- 1.6 msec: time required for processing token

- 1.5 msec: time required for sending a 60 word frame

7.2 Calculation of the Max. Guarantee Time for Data Communication between Stations

The case below is based on; an XGT series having the station numbers and transmission blocks as presented below; program scan of each station is 10msec, and; the time required for the station 4 transmitting data to the station 1.

Station No.	No. of Blocks
1	3
2	5
3	10
4	20
5	32

- 1) For max. token guarantee time, calculate the token holding time of the stations as shown below, and add up.

Station No.	No. of Blocks	Token holding time (sec)
1	3	$1.6 + 1.5 \times 3 = 6.1$
2	5	$1.6 + 1.5 \times 5 = 9.1$
3	10	$1.6 + 1.5 \times 7 = 12.1$
4	20	$1.6 + 1.5 \times 7 = 12.1$
5	32	$1.6 + 1.5 \times 7 = 12.1$

- 2) Since the max. token guarantee time is the sum of the token holding time of the stations;
 $6.1 + 9.1 + 12.1 + 12.1 + 12.1 = 51.4$ (msec)

- 3) The time required for the station 4 to send data to the station 1

Station No.	No. of Blocks	No. of tokens required for station 4	Transmission Time (msec)
4	20	$20/7=28.5=3$	$3 \times 51.4 = 154.2$ When add 1 to the No. of tokens for safety, the result is 205.6

- 4) Delay time of the sender (station 4): $2 * 10\text{msec} + 20 \text{ msec} = 40 \text{ msec}$
 5) Delay time of the receiver (station 1): $2 * 10\text{msec} + 20 \text{ msec} = 40 \text{ msec}$
 6) Max. guaranteed data communication time between stations = (Sender PLC delay time) + (receiver PLC delay time) + (transmission time), therefore,
 $40 + 40 + 154.2(205.6) = 234.2$ or 285.6 (msec)

Therefore, the signals changing at the cycle longer than 234.2 or 285.6 msec can guarantee reliable communication. In particular, correct data communication can be guaranteed when the communication cycle is set to be longer than the maximum guarantee time for inter-station data communication.

7.3 Master Switching Time

Any station in the FNET can be a master station through competition for master. The station then acts as the LAS station and other stations act as slave stations. If the master is disabled for any reason, other stations compete for the mastership. This takes a little time which can be calculated as follows.

- ① (Station No. + 0x10) * 2 * 128 (usec)
- ② (Station No. + 0x10) * 128 (usec)
- ③ (0 ~ 63) * 128 (usec)
- ④ 1msec (RT frame transmission time)

The master switching time is determined by the sum of the above four factors. Due to the factor ③, the switching time becomes uncertain. The max./min. switching time for the stations are as follows.

Station No.	Min. Time (μs)	Max. Time (μs)	Station No.	Min. Time (μs)	Max. Time (μs)
0	7144	15208	32	19432	27496
1	7528	15592	33	19816	27880
2	7912	15976	34	20200	28264
3	8296	16360	35	20584	28648
4	8680	16744	36	20968	29032
5	9064	17128	37	21352	29416
6	9448	17512	38	21736	29800
7	9832	17896	39	22120	30184
8	10216	18280	40	22504	30568
9	10600	18664	41	22888	30952
10	10984	19048	42	23272	31336
11	11368	19432	43	23656	31720
12	11752	19816	44	24040	32104
13	12136	20200	45	24424	32488
14	12520	20584	46	24808	32872
15	12904	20968	47	25192	33256
16	13288	21352	48	25576	33640
17	13672	21736	49	25960	34024
18	14056	22120	50	26344	34408
19	14440	22504	51	26728	34792
20	14824	22888	52	27112	35176
21	15208	23272	53	27496	35560
22	15592	23656	54	27880	35944
23	15976	24040	55	28264	36328
24	16360	24424	56	28648	36712
25	16744	24808	57	29032	37096
26	17128	25192	58	29416	37480
27	17512	25576	59	29800	37864
28	17896	25960	60	30184	38248
29	18280	26344	61	30568	38632
30	18664	26728	62	30952	39016
31	19048	27112	63	31336	39400

APPENDIX

A.1 Terms and Definitions

1) Self station

The Fnet I/F modules currently connected with XG-PD. Usually, of the Fnet I/F modules installed in the current PLC, those which are connected to XG-PD and monitored and diagnosed.

2) Destination station

Other F-net I/F modules connected with the self station via Fnet. Usually refers to the Fnet I/F modules installed in other PLCs, the Fnet I/F modules installed in other slots of the current PLC may in this category.

3) Local Station

The module type which can act as a master (LAS) in the Fnet. The XGL-FMEA I/F module acts as a master only.
- GM/MK series has remote stations in addition.

4) Remote Station

The opposite concept of the local station. As a partner station for communication with local station, a remote stations cannot conduct the role of LAS which controls token.

5) Fnet

Fieldbus is a middle/lower tier network which connects controllers and measuring instruments, or between controller. The specification adopts 3 tiers of the tiers of OSI. The 3 tiers are; the physical layer including H2 (1Mbps Electric), H1 (31.23Kbbs Electric), optic, wireless, etc.; data link layer adopting Scheduled and Circulated Token bus, and; the application layer which processes applications, and further, added with a user layer. Difference from R-net, Peer to Peer communication is supported.

6) Token

The authority of transmitting data by controlling the access to physical medium.

7) Repeater

Used to extend cables in communication networks by regeneration and amplification of electric signals.

8) Manchester Biphase-L

A data modulation method used in Rnet. Data are encoded using Manchester-I Code and transmitted. The data received by encoded with Manchester is decoded.

9) Individual Module Reset

A function used for system initialization in the event of an error in communication module.

In the XG-PD, select [Online] → [Rest] → [Reset individual Module] to conduct reset.

When this function is executed, the communication module restarts.

10) Active Coupler

A module connecting the optic modules in a network. An optic splitter which can regenerate and amplify optic signals.

11) E.O.C (Electric/Optic Converter)

A module converting optic signals into electric signals and vice versa, in addition to signal regeneration and amplification

12) CRC (Cyclic Redundancy Check)

A method of error detection widely used in synchronous communication.

13) Terminating Resistor

The resistor used for impedance matching between the transmitter and receiver on a physical layer. The terminating resistor of Fnet is 110Ω, 1/2 W

14) HS (High Speed) Link

A communication method applicable for Fnet communication modules only. Used for high speed data communication by HIGH SPEED LINK link parameter setting of XG-PD and GMWIN/KGL-WIN.

15) Segment

A local network where all the stations are connected using the same token, not using any connection device such as gateway, EOC or repeater.

16) Network

A communication system comprising one or more segments and using the same token.

17) LAS Creation and Transfer Method

LAS is created in FMM communication modules in following cases.

- (1) Of all the stations connected to the network, the FMM communication module whose power is turned on earlier than all others acquires the LAS
- (2) If two or more stations are powered on at the same time, the station of the lower station number gets the LAS.
- (3) If the LAS station fails during normal communication, the LAS is transferred to the FMM station having the lowest station number.
- (4) Only one LAS exists in a network

A.2 Flag Alarm

A.2.1 HIGH SPEED LINK Flag

[Table A.2.1] Communication flag according to HSL No. (HSL No. 1 ~ 12)

No.	Key word	Type	Description	Detail Explanation
L000000	_HS1_RLINK	Bit	All the stations of HSL parameter #1 are operating normally	All the stations are working normally according to the parameters set up in the HSL. This flag is ON under following conditions. - all the stations set up in the parameter are in RUN mode without error, - all the data blocks conduct normal communication, and - when the parameters set up in the stations themselves are normally communicated, the RUN_link, if once turned on, keeps on unless interrupted by link disable.
L000001	_HS1_LTRBL	Bit	After _HS1_RLINK ON, abnormal state is indicated	This flag is on when the _HSm_RLINK flag is on and the communication between the stations set up in the parameters and data block are as follows; - the station set up in the parameter is not in RUN mode, - the station has an error, or -if the data block's communication is not smooth, the link trouble will turn on if the above conditions 1, 2, or 3 occurs, and turns off when the above conditions are corrected.
L000020 ~ L00009F	_HS1_STATE[k] (k=000~127)	Bit Array	Show comprehensive condition of the HSL parameter #1&k blocks	Indicates the general status of the communication information of the data block set up in the parameter. _HS1_STATE[k]=_HS1_MOD[k]&_HS1_TRX[k]&(~_HSm_ERR[k])
L000100 ~ L00017F	_HS1_MOD[k] (k=000~127)	Bit Array	RUN operation mode of the HSL parameter #1&k block stations	Indicates the operation mode of the station set up in the K-data block of the parameter
L000180 ~ L00025F	_HS1_TRX[k] (k=000~127)	Bit Array	Normal communication with the HSL parameter #1&k block stations	Indicates whether the communication of the K-data block of the parameter is normal.
L000260 ~ L00033F	_HS1_ERR[k] (k=000~127)	Bit Array	Operation error mode of the of the HSL parameter #1&k block stations	Indicates if there is error in the communication of the K-data block of the parameter
L000340 ~ L00041F	_HS1_SETBLOC K[k]	Bit Array	Block setting of the HSL parameter #1&k blocks	Indicates whether the K-data block is set up in the parameter

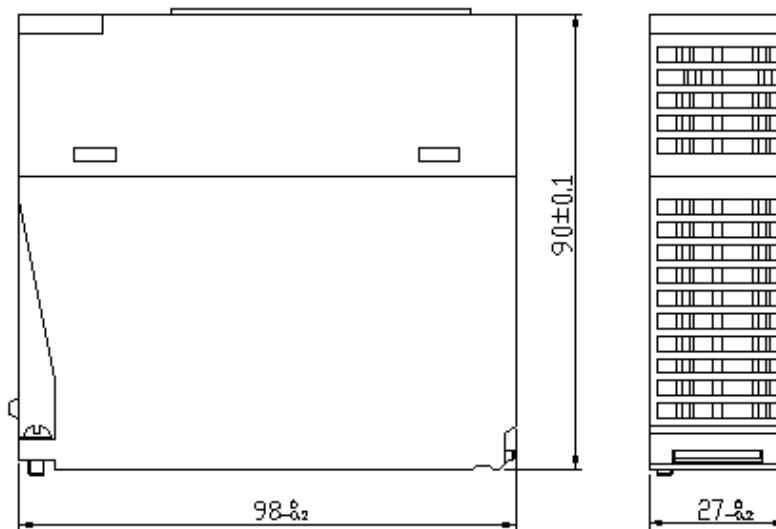
Note

HSL No.	L Area Address	Remark
2	L000500~L00099F	Comparing to the HSL #1 of the [Table 1], the flag address No. of other HSL station No. can be calculated with the formula below.
3	L001000~L00149F	
4	L001500~L00199F	* L Area Address No. = L000000 + 500 x (HSL No. – 1)
5	L002000~L00249F	
6	L002500~L00299F	
7	L003000~L00349F	To use HSL flag for programming and monitoring, it is convenient to use the flag map registered in the XG5000.
8	L003500~L00399F	
9	L004000~L00449F	
10	L004500~L00499F	
11	L005000~L00549F	

E.g.) k is the block number, which shows the information of the 128 (1~127) blocks with 8 words (16 blocks per word). For example, the mode information (_HS1_MOD) shows from block 0 to block 15, blocks 16~31, 32~47, 48~63, 64~79, 80~95, 96~111, and 112~127 in the L00010, L00011, L00012, L00013, L00014, L00015, L00016, and L00017, respectively. For example, the mode information of the block #55 is in the L000137.

A.3 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

LS Industrial Systems Co., Ltd supports and observes the environmental policy as below.

Environmental Management

LS Industrial Systems considers the environmental preservation as the preferential management subject and every staff of LS Industrial Systems use the reasonable endeavors for the pleasurable environmental preservation of the earth.

About Disposal

LS Industrial Systems' 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.



LS values every single customers.
Quality and service come first at LSIS.
Always at your service, standing for our customers.

<http://eng.lsis.biz>

LS Industrial Systems

10310001070

■ **HEAD OFFICE**

LS tower, Hogye-dong, Dongan-gu, Anyang-si, Gyeonggi-do 1026-6,
 Korea <http://eng.lsis.biz>
 Tel : (82-2)2034-4870/Fax : 82-2-2034-4648 e-mail : cshwang@lsis.biz

■ **LS Industrial Systems Tokyo Office _ Tokyo, Japan**

Address: 16FL, Higashi-Kan, Akasaka Twin Tower 17-22,
 Akasaka, Monato-ku Tokyo 107-8470, Japan
 Tel : 81-3-3582-9128/Fax : 81-3-3582-2667 e-mail : jschuna@lsis.biz

■ **LS Industrial Systems(ME) FZE _ Dubai, U.A.E.**

Address : Jafza View Tower Lob 19, Room 205 Along Sheikh Zayed
 Road Jebel Aali Free Zone Dubai, United Arab Emirates
 Tel : 971-4-886-5360/Fax : 971-4-886-5361 e-mail : jungyongl@lsis.biz

■ **LS Industrial Systems Shanghai Office _ Shanghai, China**

Address : Room E-G, 12FL Hiamin Empire Plaza, No.726, West,
 Yan'an Road Shanghai 200050, P.R. China e-mail : liyong@lsis.com.cn
 Tel : 86-21-5237-9977(609)/Fax : 89-21-5237-7189

■ **LS Industrial Systems Beijing Office _ Beijing, China**

Address : B-Tower 17FL, Beijing Global Trade Center B/D, No. 36,
 East Beisanhuan-Road, DongCheng-District, Beijing 100013, P.R. China
 Tel : 86-10-5825-6027(666)/Fax : 86-10-5825-6028 e-mail : xunmj@lsis.com.cn

■ **LS Industrial Systems Guangzhou Office _ Guangzhou, China**

Address : Room 1403.14FL, New Poly Tower,
 2 Zhongshan Liu Road, Guangzhou, P.R. China
 Tel : 86-20-8328-6754/Fax : 86-20-8326-6287 e-mail : chenxs@lsis.com.cn

■ **LS Industrial Systems Chengdu Office _ Chengdu, China**

Address : 12FL, Guodong Buiding, No.52 Jindun
 Road Chengdu.610041, P.R. China
 Tel : 86-28-8612-9151(9226)/Fax : 86-28-8612-9236 e-mail : comysb@lsis.biz

■ **LS Industrial Systems Qingdao Office _ Qingdao, China**

Address : YinHe Bldg, 402 Room No. 2P Shandong Road,
 Qingdao-City, Shandong-province 266071, P.R. China
 Tel : 86-532-8501-6068/Fax : 86-532-8501-6057 e-mail : wangzy@lsis.com.cn

■ **LS Industrial Systems Europe B.V. , Netherlands**

Address : 1st Floor, Tupolevlaan 48, 1119NZ, Schiphol-Rijk, The Netherlands
 Tel : +31 (0)20 654 1420/Fax : +31 (0)20 654 1429 e-mail : junshickp@lsis.biz

■ **Wuxi LS Industrial Systems Co., Ltd _ Wuxi, China**

Address : 102-A, National High & New Tech Industrial Development Area,
 Wuxi, Jiangsu, 214028, P.R. China
 Tel : 86-510-8534-6666/Fax : 86-510-8534-4078 e-mail : caidx@lsis.com.cn

■ **Dalian LS Industrial Systems Co., Ltd. _ Dalian, China**

Address : No. 15, Liaohexi 3-Road, Economic and Technical Development zone,
 Dalian 116600, China
 Tel : 86-411-273-7777/Fax : 86-411-8730-7560 e-mail : cuibx@lsis.com.cn

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