The right choice for the ultimate yield!

LS ELECTRIC strives to maximize your profits in gratitude for choosing us as your partner.

Programmable Logic Control

Cnet I/F Module

XGT Series

User Manual

XGL-C22A
XGL-C22B
XGL-CH2A
XGL-CH2B
XGL-C42A
XGL-C42B

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 ELECTRIC

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.

⚠ Warning WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury

⚠ Caution CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices

- 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 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 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 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 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

⚠ 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 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	Data	Remark	Page
V 1.0	2005.03	First Edition	-
V1.1	2005.05	Add function description	-
V1.2	2005.09	Change available CPU device address	-
V2.0	2007.01	Change XG-PD description	-
V 2.1	2008.02	1. Adding contents (1) Production Configuration (2) Software to use the product (3) Operation Sequence (4) I/O assignment and Device Information (5) General of Communication Parameter (6) Transmission Standard (7) How to set transmission Standard (8) Menu bar and shortcut of XG-PD (9) Operation Start (10) Diagnosis Function of XG-PD <Ch.7 XGT Dedicated Communication> (11) Summary of Protocol (12) Frame Structure (13) XGT Communication Function (14) Remote Connection (15) Modem Communication (16) Communication Command <Ch.8 Modbus Communication> (17) General (18) Modbus Protocol (19) Structure of Frame (20) Modbus Server (21) Modbus RTU/ASCII Client (22) Frame Monitor <Ch.9 User-defined Communication> (23) General (24) Structure of user definition frame (25) Frame Monitor (26) Trouble shooting	1-3 1-4 ~ 1-5 4-3 4-6 ~ 4-13 6-1 6-2 6-25 6-27 ~ 6-28 6-35 ~ 6-37 6-42 ~ 6-48 7-1 ~ 7-47 8-1 ~ 8-31 9-1 ~ 9-11 11-9 ~ 11-11

Version	Data	Remark	Page
		(27) User interface using Visual Basic	A-18 ~ A-29
		(28) Dimension	A-30
		(29) Index	A-31 ~ A-32
		2. Fixing the contents	
		(1) Introduction	1-1
		(2) Characteristics	1-2
		(3) Performance Specifications	2-2
		(4) Designation of Parts	2-3
		(5) Cable Specifications	2-4
		(6) Terminal Resistance	2-5
		(7) Channel Operation during Normal Run	3-2
		(8) Method of Serial Interface	3-4
		(9) P2P setting parameter	4-5
		(10) Available System Configurations	5-1~ 5-6
		(11) Unavailable System Configurations	5-7 ~ 5-8
		(12) Communication Module Registration	6-20 ~ 6-24
		(13) Safety Instructions	
V2.2	2008.07	1. Head office address change	Back cover
		2. Adding contents	
		(1) How to configure XGR basic system	4-8
		(2) Available device area per CPU	4-12
		3. Fixing the contents	
		(1) Introduction	1-1,1-3
		(2) Product Specification	2-3
		(3) Installation and Test Operation	4-4, 4-9
		(4) Communication Parameter	6-1, 6-47
		(5) XGT dedicated communication	7-3, 7-5
		(6) Modbus communication	8-18, 8-24
		(7) User defined communication	9-3
		(8) Example program	10-7
		(9) Diagnosis	11-4
		(10) Standard setting window modification	Entire
V2.3	2010.03	1. Characteristics modified	Ch1.2
		2. CPU added	Ch1.3.2
		3. Content on the remote connection modified	Ch7.4.2
V2.4	2010.06	1. Change general specification	2-1
		2. Change Null modem connection cable	3-4
		3. Back cover address update	Back cover
V2.5	2011.05	1. How to enable link through flag added	CH6.7.2

Version	Data	Remark	Page
V2.6	2014.01	1. Delete XGR main base module description 2. Add RS-485 communication cable direction 3. Not usable system configuration 4. Add parity bit Ignore function 5. Add UDATA instruction 6. Add example UDATA function	CH1.3.2, CH2.2, CH4.5.1 CH3.4.2 CH5.2.1 CH6.1.1, CH6.2.1 CH9.5 CH10.6
V2.8	2014.11	XG5000 V4.0 UI Updated	Entire
V3.0	2016.02	1. Add Cnet V5.0 related feature 2. Add Ch.8 LS bus protocol (for Cnet V5.0) 3. Add appearance drawing of XGL-Cx2B 4. Add repeater mode	Ch1,2,3,4,6,9,10,11,12 Ch8 Appendix CH3
V3.1	2019.06	1. Edit phrase	Entire
V3.2	2020.05	Format and contents modification according to the change of company name(LSIS -> LS ELECTRIC)	-
V3.3	2023.05	1. Add Diagnosis function(Media information, View communication module log, Save communication module log) 2. RAPIEnet+ remote Cnet service 3. Communication module object data send and receive function	CH12 CH13 CH13
V3.4	2024.06	Change in warranty period	-

Thank you for purchasing PLC of LS ELECTRIC 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://www.lselectric.co.kr/) 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-CPUU/CPUH/ CPUA/CPUS/CPUE)	XGK-CPUU/CPUH/CPUA/CPUS/CPUE 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/D,CPUU, CPUH,CPUS,CPUE)	XGI-CPUU/D,CPUU,CPUH,CPUS,CPUE user manual describing about XGI CPU module, power module, base, IO module, specification of extension cable and system configuration, EMC standard
XGR redundant series User's Manual	XGR- CPUH/F, CPUH/T user manual describing about XGR CPU module, power module, extension drive, base, IO module, specification of extension cable and system configuration, EMC standard

Current user manual of XGL-C22A, C22B, CH2A, CH2B, C42A, C42B is written based on the following version.

Related OS version list

Product name	OS version
XGK-CPUU, CPUH, CPUA, CPUS, CPUE	V4.5
XGI-CPUU/D, CPUU, CPUH, CPUS, CPUE	V3.9
XGR-CPUH/F, CPUH/T, CPUH/S	V2.6
XG5000	V4.07

◎ Contents ◎

Chapter 1 Overview

Chapter 2 Product Specifications

Chapter 3 Performance Specifications

Chapter 4 Installation and Test Operation

Chapter 5 System Configuration

Chapter 6 Communication Parameter

Chapter 7 XGT Dedicated Communication

Chapter 8 LS Bus Protocol

Chapter 9 Modbus Communication

Chapter 10 User-defined Communication

Chapter 11 Program Examples

Chapter 12 Diagnosis

Chapter 13 Additional functions

Appendix

Chapter 1 Overview

1.1 Overview

This user's manual provides a description of contents related to the Computer Link interface module (Cnet I/F module) used in the XGK/I/R PLC system. You can connect to other company's PLC or general-purpose computer, exchange data or control the PLC remotely by using the Cnet I/F module. The Cnet I/F module includes six products including XGL-C22A, XGL-CH2A, XGL-C42A, XGL-C22B, XGL-CH2B and XGL-C42B.

Refer to the following user manuals according to the applied system when using this product.

- XG5000 user manual
- XGK instructions and programming user manual
- XGK CPU module user manual
- XGI/XGR instructions and programming user manual
- XGI CPU module user manual
- XGR CPU module user manual

Be sure to check the following items when applying the Cnet I/F module to the system.

- Does the XG5000 version you are using fit for the product type?

Classification	XG5000 version
A Type (XGL-C22A, CH2A, C42A)	V4.0 or higher
B Type (XGL-C22B, CH2B, C42B)	V4.07 or higher

- Is a correct O/S version applied according to the product type?

Classification	(a) OS Version
A Type (XGL-C22A, CH2A, C42A)	V2.3 or higher
B Type (XGL-C22B, CH2B, C42B)	V5.0 or higher

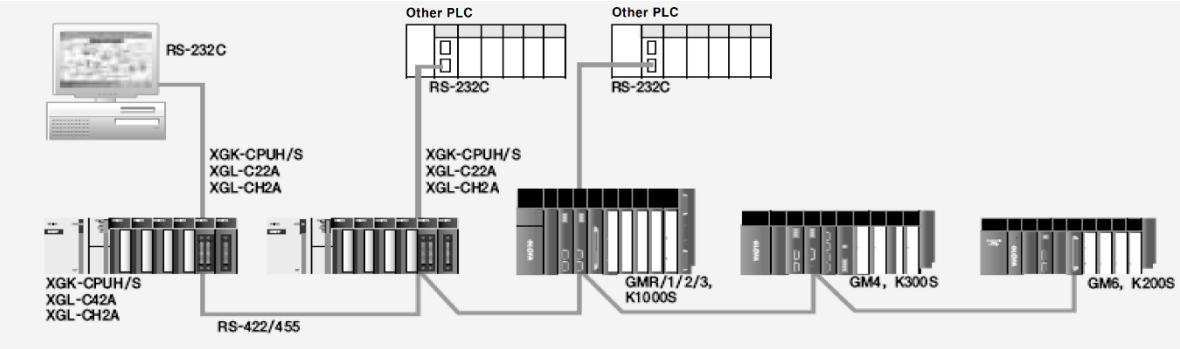
Notes

• The XG5000 version applied for writing this user manual is V4.25. If the version of the XG5000 you use is different, the menus or the method to write a parameter may be different.

1.2 Features

The Cnet I/F module is the serial communication module that supports the RS-232C and RS-422(485) protocols, and it has the following features.

(1) Since you can specify the communication speed and communication mode directly using the XG5000, you can connect to other companies' devices easily.
(2) Various products equipped with RS-232C and RS-422(485) ports according to each usage are provided.
(3) Each channel is configured independently, so they operate separately, and the protocol data created by the user is managed by the CPU module. So, even if the communication module is replaced, you can use the product immediately by installing it on the base.
(4) You can read and write a variable using the dedicated protocol.
(5) By using RS-422/485, you can connect up to 32 communication modules using the multi-drop method.
(6) It is equipped with the modem communication function, so it can control a PLC which is far away.
(7) Various communication speeds can be set.
• RS-232C : 300bps ~ 115,200bps, • RS-422/485 : 300bps ~ 115,200bps
(8) 1-to-1, 1-to-N and N-to-1 communications (if the RS-422 channel is used) are available.
(9) The full-duplex communication and the half-duplex communication methods are supported.
(10) It provides the self-diagnosis function as well as the loop-back diagnosis function, so you can check for failure easily.
(11) It provides dedicated communication (user defined communication and XGT client/server communication), and Modbus client/server functions.
(12) Remote connection is possible when XGT Cnet I / F module is communicating with each other. Note 1)
(13) It provides a client mode (LS bus) for dedicated communication for LS ELECTRIC Inverter. Note 2)
(14) Smart server automatically recognizes the protocol (LS ELECTRIC dedicated protocol, Modbus RTU/ ASCII) and operates. Note 2)
(15) It provides the repeater mode, so you can convert the RS-232C to RS-422/485 or use it as the isolated repeater. Note 2)
(16) It has a built-in terminating resistance, so the terminating resistance can be set from the basic parameter. Note 2)



Notes

Note 1) The remote connection between the Cnet I/F modules can be used only when the OS version of the Cnet I/F module is V2.5 or higher. Matters related to remote connection are as follows.

(1) This function is supported only when the RS-232C or RS-422 communication methods are used. However, in case of the RS-485 communication method, remote connection is available only when P2P enable (✓) is deselected from the XG5000 online menu.

(2) The remote connection is supported regardless of operation mode of the Cnet I/F module.

(3) Remote connection during communication is affected by the transmission and reception cycle and the amount of data. If the transmission and reception cycle is short or the amount of data is excessive, disconnection may occur.

Note 2) This function is supported only for B-type products (XGL-C22B, CH2B, C42B).

1.3 Product configuration

1.3.1 Product type

The type of Cnet I/F module is as follows.

Model name	Specifications	Note
XGL-C22A/C22B	RS-232C, two ports	Twist pair shield cable
XGL-CH2A/CH2B	RS-232C one port, RS-422 one port	
XGL-C42A/C42B	RS-422, two ports	

1.3. 2 Number of units that can be installed for each CPU

Up to 24 Cnet I/F modules can be installed regardless of the main base and the extension base. However, it is recommended to install the module on the main base in order to gain maximum product performance. The following table shows the number of products according to the service that each CPU module can use. Refer to this table at the time of configuring the system.

Classification	XGK					XGI					XGR		
	CPUE	CPUS CPUSN	CPUA	CPUH CPUHN	CPUU CPUUN	CPUE	CPUS	CPUH	CPUU/D	CPUU CPUUN	CPUH/F	CPUH/S	CPUH/T
High Speed link,	The Cnet I/F module does not use this function.												
P2P service	Maximum number of modules to be used: 8 modules												
Dedicated service	Maximum number of modules to be used: 24 modules												

1.4 Checklist before using the product

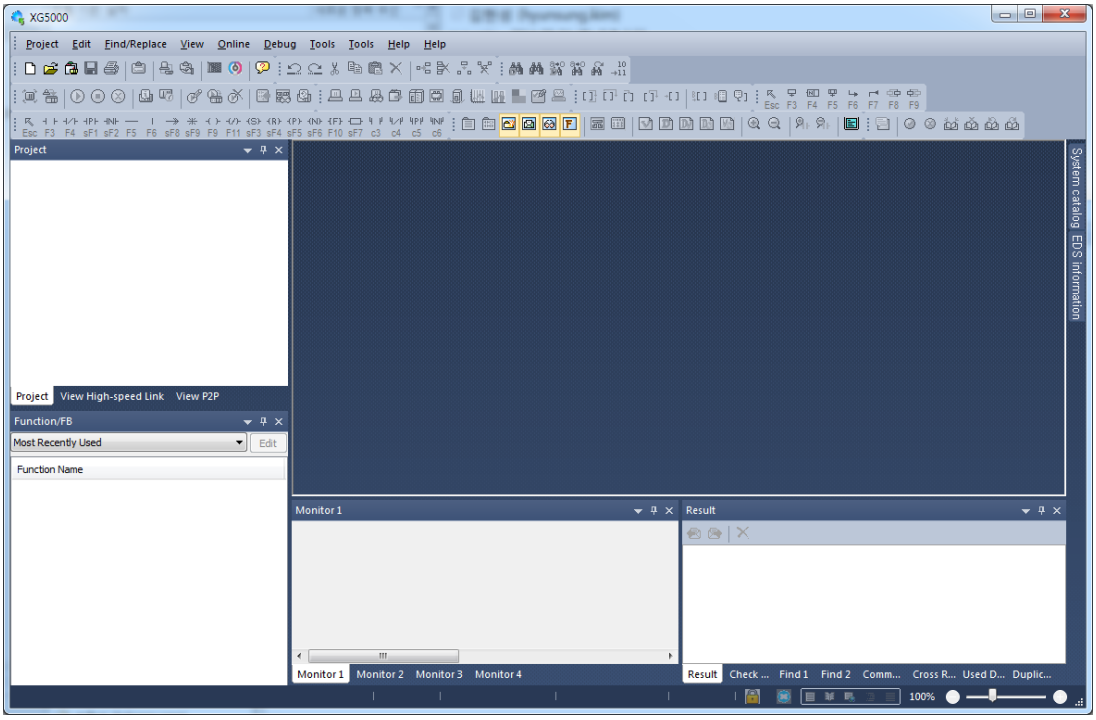
It is necessary to prepare a number of items in advance in order to use the Cnet I/F module. Check the following items for correct use of the product.

1.4.1 Preparation in advance

(1) (1) Please download the XG5000 from LS Industrial Systems website below.
Website address: http://www.ls-electric.com/
(2) Prepare the cable necessary for connecting the XG5000 and the CPU module. The model name of the cable is as follows.
• For USB: USB-301A,• For RS-232C: K1C-050A

1.4.2 XG5000 Installation

The XG5000 is the software tool that is necessary for using all communication modules, including the Cnet I/F module.
The following figure shows the default screen of the XG5000.



1.4.3 Checking the product version

Be sure to check the version of the relevant product before using the Cnet I/F module.

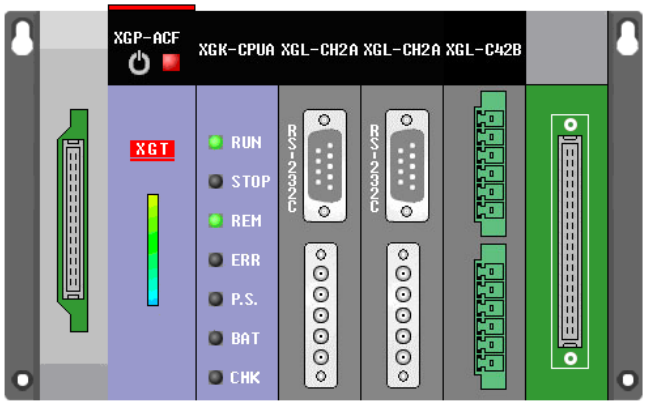
(1) Method to check the version using XG5000

This is the method to connect to the CPU module and read the product information of the Cnet I/F module. The checking sequence is as follows.

(a) Run XG5000.

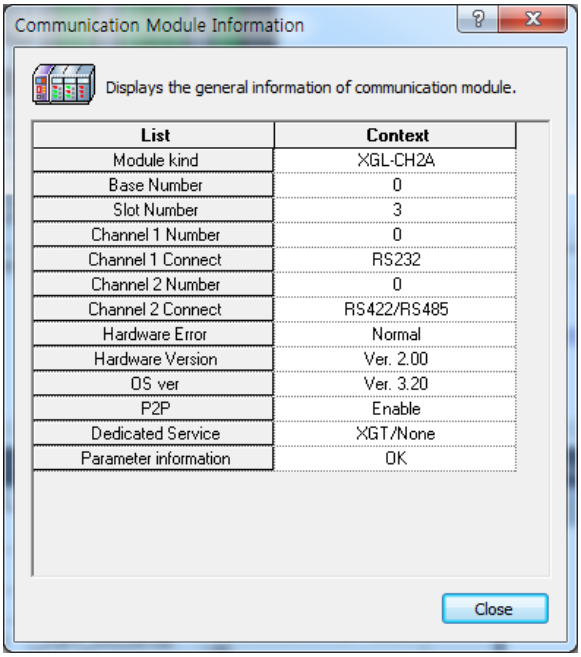
(b) Connect to the CPU module by selecting [Online]→[Connect]

(c) When you select [Online]→[Communication module setting and Diagnosis]→[System Diagnosis] after connecting to the CPU module, the following screen will be appears.



(d) When you double click the Cnet I/F module you wish to check the product information from the above figure, the [Communication module information] screen will be appears as follows.

(e) Check the product version shown at the bottom right side of this screen.



(2) Method to check the version using the product label

The label is attached to the external case of the Cnet I/F module. In this label, the model name and version information of the product are stated. If XG5000 cannot be used, check the version information by reading the product label.

Chapter 2 Product Specifications

2.1 General Specifications

The general specifications of the XGT series are as follows.

<table>
<tr><th>No</th><th>Item</th><th colspan="6">Specifications</th><th>Relevant specifications</th></tr>
<tr><td>1</td><td>Ambient temperature</td><td colspan="6">0℃~+55℃</td><td></td></tr>
<tr><td>2</td><td>Storage temperature</td><td colspan="6">-25℃~+70℃</td><td></td></tr>
<tr><td>3</td><td>Ambient humidity</td><td colspan="6">5~ 95%RH (Non-condensing)</td><td></td></tr>
<tr><td>4</td><td>Storage humidity</td><td colspan="6">5~ 95%RH (Non-condensing)</td><td></td></tr>
<tr><td rowspan="9">5</td><td rowspan="9">Vibration resistance</td><td colspan="6">In case of occasional vibration</td><td></td></tr>
<tr><td>Frequency</td><td colspan="2">Acceleration</td><td colspan="2">Amplitude</td><td>Times</td><td rowspan="8">IEC 61131-2</td></tr>
<tr><td>5≤f< 8.4 Hz</td><td colspan="2">-</td><td colspan="2">3.5mm</td><td rowspan="5">10 times for each direction of X, Y and Z</td></tr>
<tr><td>8.4≤f≤150 Hz</td><td colspan="2">9.8 ㎨(1G)</td><td colspan="2">-</td></tr>
<tr><td colspan="6">In case of continuous vibration</td></tr>
<tr><td>Frequency</td><td colspan="2">Acceleration</td><td colspan="2">Amplitude</td></tr>
<tr><td>5≤f< 8.4 Hz</td><td colspan="2">-</td><td colspan="2">1.75mm</td></tr>
<tr><td>8.4≤f≤150 Hz</td><td colspan="2">4.9 ㎨(0.5G)</td><td colspan="2">-</td></tr>
<tr><td>6</td><td>Vibration resistance</td><td colspan="6">* Maximum shock acceleration: 147 ㎨ (15G)
* Duration: 11ms
* Pulse waveform: Half-sine (3 times for each direction of X, Y and Z)</td><td>IEC 61131-2</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Shock resistance</td><td colspan="3">Square wave impulse noise</td><td colspan="2">AC:±1,500V
DC:±900V</td><td>Test standard of LS ELECTRIC</td></tr>
<tr><td colspan="3">Electrostatic discharge</td><td colspan="2">4kV (Contact discharge)</td><td>IEC 61131-2,
IEC 61000-4-2</td></tr>
<tr><td colspan="3">Radiated electromagnetic field noise</td><td colspan="2">80 ~ 1000MHz, 10 V/m</td><td>IEC 61131-2,
IEC 61000-4-3</td></tr>
<tr><td rowspan="2">Fast transient/ Burst Noise</td><td>Classification</td><td>Power module</td><td colspan="2">Digital/Analog Input/Output, Communication Interface</td><td rowspan="2">IEC 61131-2,
IEC 61000-4-4</td></tr>
<tr><td>Voltage</td><td>2kV</td><td colspan="2">1kV</td></tr>
<tr><td>8</td><td>Operating atmosphere</td><td colspan="6">Free from corrosive gases and excessive dust</td><td></td></tr>
<tr><td>9</td><td>Altitude</td><td colspan="6">Up to 2,000m</td><td></td></tr>
<tr><td>10</td><td>Pollution degree</td><td colspan="6">Less than equal to 2</td><td></td></tr>
<tr><td>11</td><td>Cooling</td><td colspan="6">Air cooling</td><td></td></tr>
</table>

Notes

(1) IEC(International Electro-technical Commission): An international nongovernmental organization which promotes internationally cooperated standardization in electric/electronic field, publishes international standards and manages applicable estimation system related with.

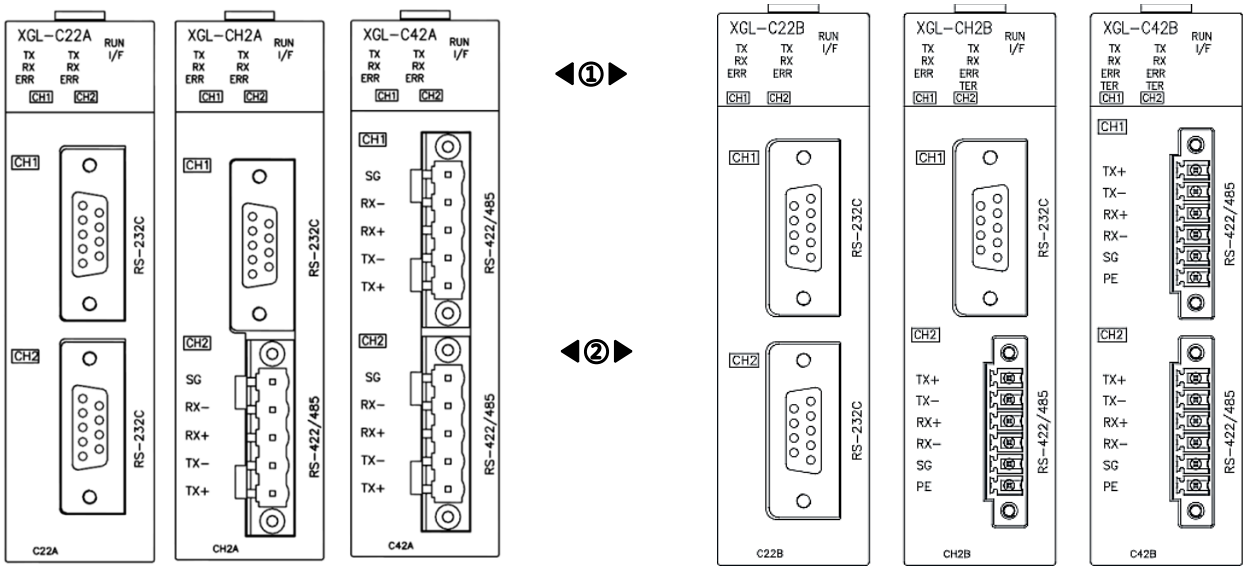
(2) Pollution degree: It is an index indicating the degree of pollution of the service environment that determines the insulation performance of a device, and pollution degree 2 indicates the state in which only non-conductive pollution occurs. However, temporary conduction occurs in this state due to dew formation.

2.2 Performance Specification

<table>
<tr><td colspan="2" rowspan="2">Item</td><td colspan="6">Specifications</td></tr>
<tr><td colspan="2">XGL-C22A/C22B</td><td colspan="2">XGL-CH2A/CH2B</td><td colspan="2">XGL-C42A/C42B</td></tr>
<tr><td rowspan="5">Serial communication channel</td><td rowspan="2">RS-232C
(D-Sub 9P)</td><td colspan="2">2 channels</td><td colspan="2">1 channels</td><td colspan="2" rowspan="3">-</td></tr>
<tr><td colspan="4">The RS-232C standard specifications apply.</td></tr>
<tr><td>Line configuration</td><td colspan="4">1:1</td></tr>
<tr><td rowspan="2">RS-422/485
(5 pin connector)</td><td colspan="2" rowspan="3">-</td><td colspan="2">1 channels</td><td colspan="2">2 channels</td></tr>
<tr><td colspan="4">The RS-422/485 standard specifications apply.</td></tr>
<tr><td>Line configuration</td><td colspan="4">1:1, 1:n, n:1</td></tr>
<tr><td colspan="2">Modem connection function</td><td colspan="4">Connect an external modem to the module and carry out long distance communication with an external device through the public telephone network.</td><td colspan="2">-</td></tr>
<tr><td rowspan="2">Operation mode
(Define separate operation for each port)</td><td>P2P</td><td colspan="6">XGT client, Modbus ASCII/RTU client, user definition communication</td></tr>
<tr><td>Server</td><td colspan="6">XGT server, Modbus ASCII/RTU server</td></tr>
<tr><td rowspan="4">Data type</td><td>Start bit</td><td colspan="6">1</td></tr>
<tr><td>Data bit</td><td colspan="6">7 or 8</td></tr>
<tr><td>Stop bit</td><td colspan="6">1 or 2</td></tr>
<tr><td>Parity</td><td colspan="6">Even/Odd/None</td></tr>
<tr><td colspan="2">Synchronization type</td><td colspan="6">Asynchronous type</td></tr>
<tr><td colspan="2">Error detection</td><td colspan="6">BYTE SUM, WORD SUM, BYTE XOR, DLE AB, DLE SIEMENS,LSIS CRC, CRC 16, BYTE SUM 2’S COMP, BYTE SUM 1’S COMP 7BIT SUM, 7BIT XOR, CRC 16 IBM, CRC 16 CCITT</td></tr>
<tr><td colspan="2">Transmission speed</td><td colspan="6">Possible to select among 300/600/1,200/1,800/2,400/3,600/4,800/7,200/9,600 /19,200/38,400/57,600/64,000/76,800/115,200 bps</td></tr>
<tr><td colspan="2">Station No. setting</td><td colspan="6">Setting range: 0 to 3
Maximum number of stations including clients: 32</td></tr>
<tr><td colspan="2" rowspan="2">Transmission distance(m)</td><td colspan="4">RS-232C : Up to 15 (can be extended if a modem is used)</td><td colspan="2">-</td></tr>
<tr><td colspan="2">-</td><td colspan="4">RS-422/485: Up to 1,200</td></tr>
<tr><td colspan="2">Diagnostics function</td><td colspan="6">• Check operation according to LED status.
• XG5000 Diagnosis Service: Frame monitor, service status, loopback test, PLC history.</td></tr>
<tr><td colspan="2">Dimensions (mm)</td><td colspan="6">98(H) X 27(W) X 90(D)</td></tr>
<tr><td colspan="2" rowspan="2">Power consumption (mA)</td><td>C22A</td><td>C22B</td><td>CH2A</td><td>CH2B</td><td>C42A</td><td>C42B</td></tr>
<tr><td>310</td><td>420</td><td>310</td><td>480</td><td>300</td><td>520</td></tr>
<tr><td colspan="2">Weight(g)</td><td colspan="2">121</td><td colspan="2">119</td><td colspan="2">116</td></tr>
</table>

2.3 Name and Usage of each part

(1) Front view of the product



[A type Cnet I/F module] [B type Cnet I/F module]

(2) Name and usage of each part

	Name	Usage
①	Indicator LED	Refer to Paragraph (3) below.
②	Communication Connector	RS-232C or RS-422/485 connector for serial communication with the opposing device

(3) Usage of LED

Name of LED	Usage	LED status	Contents
RUN	Indicates the operation status of the Cnet I/F module.	ON	Cnet is operating normally.
		Off	Cnet is not operating normally.
I/F	Indicates the communication status with the CPU.	ON	If the communication with the CPU module is not normal
		Off	An error has occurred while initializing the communication module.
		Flickering	Cnet is operating normally.
TX	Indicates that the frame is being transmitted	ON	While transmitting the frame
		Off	When the frame transmission has been completed
RX	Indicates that the frame is being received	ON	While receiving the frame
		Off	When the frame reception has been completed
ERR	Indicates a frame error	ON	An frame error has occurred.
		Off	If the frame is normal
TER	Indicates the setting of terminating resistance of RS-422/485 communication port	ON	If the terminating resistance is set (XGL-CH2B/C42B)
		Off	If the terminating resistance is canceled (XGL-CH2B/C42B)

2.4 Cable Specifications

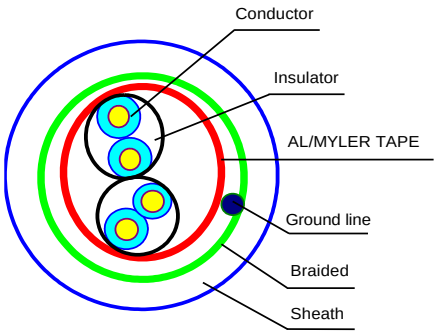
When the RS-422 or RS-485 channel is used, the twist pair cable for RS-422 should be used by considering the communication distance and speed. The following table shows the cable specifications recommended by LS ELECTRIC. In case of using any other cables, be sure to apply a cable that meets the characteristics shown in the following table.

(a) Item name: Low capacitance LAN interface cable
(b) Type: LIREV-AMESB
(c) Specification: 2P X 22AWG(D/0.254 TA)
(d) Manufacturer: LS Cable & System.

	Test item	Unit	Characteristics	Test condition
Electrical characteristics	Conductor resistance	Ω/km	59	Room temperature
	Withstand voltage(DC)	V/1min	Withstand 500V for 1 minute.	In the air
	Insulation resistance	MΩ/km	1,000	15.6℃
	Capacitance	pF/M	Less than equal to 45	1kHz
	Characteristic impedance	Ω	120 ± 12	10MHz

	Item			Solid
Exterior characteristics	Conductor	Number of core wires	Pairs	2
		Specifications	AWG	22
		Configuration	NO./mm	1/0.643
		External diameter	mm	0.643
	Insulator	Thickness	mm	0.59
		External diameter	mm	1.94

[Specifications of twisted pair cable]



[Structure drawing]

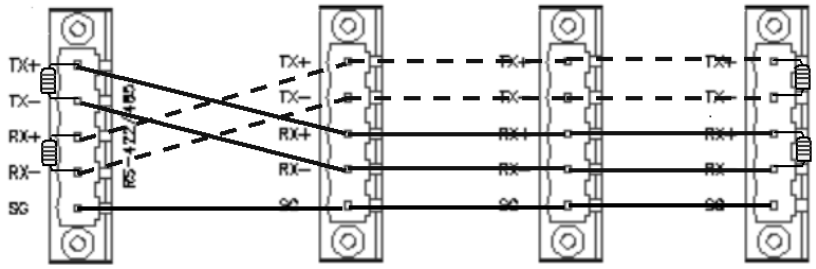
2.5 Terminating resistance

When the RS-422 or RS-485 channel of the A type Cnet I/F module (XGL-CH2A, C42A) is used, the terminating resistance should be connected to the outside. In case of long-range communication, signal distortion occurs due to the reflected wave of the cable, and the terminating resistance prevents it.

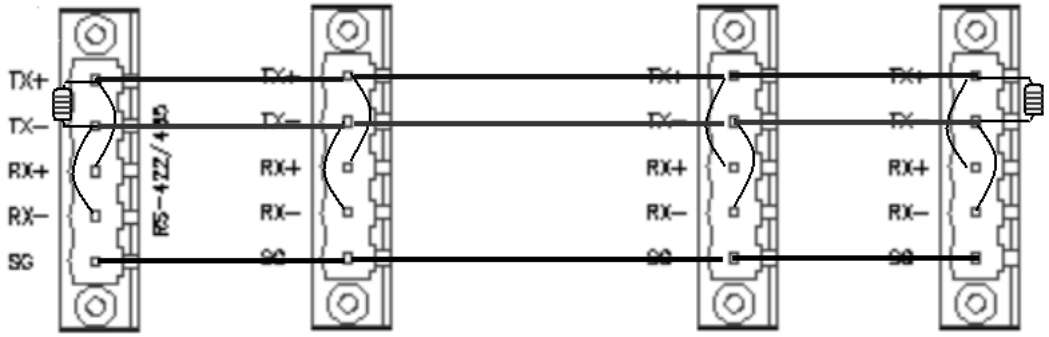
In case the cable recommended in Paragraph 2.4 is used, connect the 1/2W, 120Ω resistance to both ends of the line. In case a different cable is used, connect the 1/2W resistance that has the same value as the characteristic impedance of the applied cable to both ends of the line.

* Specifications of the terminating resistance in case the recommended cable is used: 1/2W, 120Ω, 5% error

(1) How to connect the terminating resistance in case the RS-422 is connected



(2) How to connect the terminating resistance in case the RS-485 is connected



Notes

• The B type Cnet I/F module (XGL-CH2B, C42B) has a built-in terminating resistance, so the termination can be set from the [Standard Settings-Cnet] menu of the XG5000 (V4.07 or higher).

Chapter 3 Performance Specifications

3.1 Operation Mode

The operation mode of the Cnet I/F module is decided according to the contents of parameter setting in the XG5000. Each communication port operates independently and the supported operation mode is as follows.

3.1.1 Server Mode

It operates as the server in the network, and either the XGT server or the Modbus server can be selected.

(1) XGT server: It supports the LS ELECTRIC 's dedicated communication protocol and it operates according to the client's request.

(2) Modbus server: It supports the Modbus protocol, and the RTU/ASCII type can be selected.

(3) Setting for mapping the start address of the Modbus protocol to the XGT memory area is necessary.

(4) The XG5000 service (remote 1-stage, 2-stage connection) function is supported at the same time.

(5) This is the mode that analyzes the smart server: XGT protocol and Modbus (RTU/ASCII) protocol automatically and operates as the relevant server (B type Cnet I/F module: XGL-C22B, CH2B, C42B).

3.1.2 P2P Client Mode

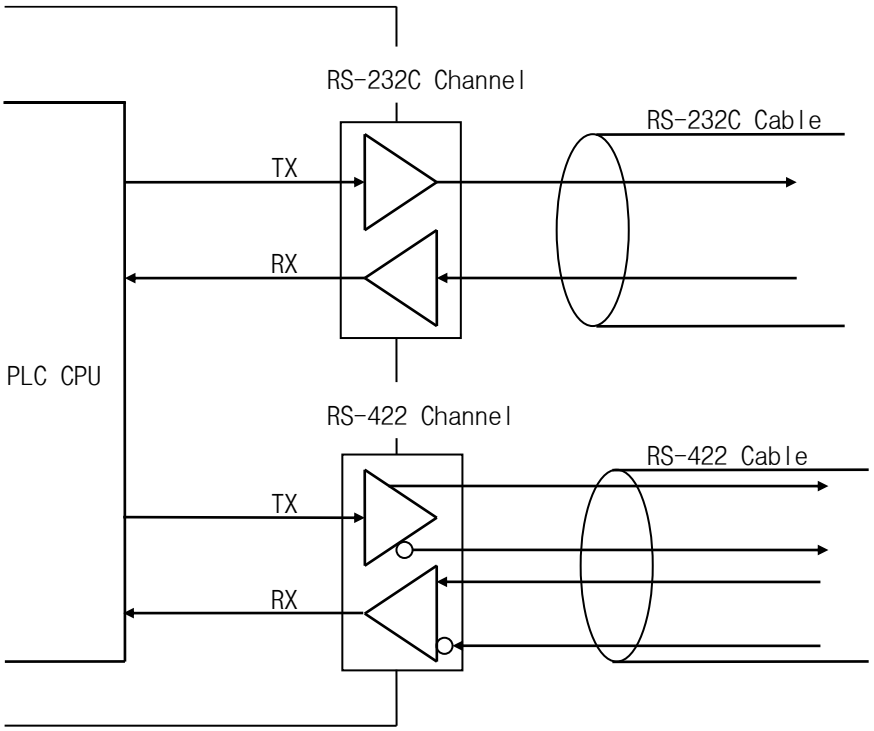
(1) It operates as the client in the network.
(2) Support dedicated communication protocol , Modbus protocol and LS inverter dedicated communication(LS BUS client).

(3) It is possible to set up to 64 communication blocks for each communication channel of the Cnet I/F module and define each block to operate independently.

3.2 Operation by channel

Since each communication port operates independently, it can carry out transmission and reception simultaneously. Therefore, it is possible to set the transmission specifications separately for RS-232C and RS-422 channel and start and stop the operation for each channel.

The data flow of each channel is as shown in the figure below.



Notes

[1] While in operation, mode change is not available. If you change the mode, download the default communication parameter to the CPU module and reset the communication module.
(2) The B type Cnet I/F module (XGL-CH2B, C42B) supports the isolated repeater mode.

3.3 Additional Functions

3.3.1 Repeater Mode

The repeater mode is the function to transmit data received from each channel to another channel.

(1) The repeater mode is only supported in the B type Cnet I/F module (XGL-CH2B, XGL-C42B).

(2) The repeater mode does not support auto speed.

(3) When the repeater mode is enabled, communication service will not be provided, and the same communication setting (speed, data/stop/parity bit) will apply to channels 1 and 2. The modem type is fixed to the null modem.

(4) The mode cannot be changed during operation. If you change the mode, download the default communication parameter to the CPU module and reset the communication module.

3.3.2 Loop Back Diagnosis

The loop-back diagnosis is the function to check internally whether the channel operates normally or not without connecting the communication channel to an external device, and it can be used when carrying out the diagnosis service.

For detailed information, refer to the [12.1 XG5000 Diagnosis function] item.

3.4 Serial Connection Method

3.4.1 RS-232C Connection

The RS-232C channel communicates with an external device using the 9-pin connector. The specifications of the RS-232C interface are as follows.

Pin No.	Signal name	Direction of signal (Cnet ↔ External device)	Contents
1	DCD(CD)	←	Notifies to Cnet that the external device has detected a carrier.
2	RXD(RD)	←	Notifies to Cnet that the external device has received data.
3	TXD(SD)	→	Notifies to Cnet that the external device has transmitted data.
4	DTR(ER)	→	Notifies to the external device that Cnet is ready to communicate.
5	SG	↔	Grounding for signal
6	DSR(DR)	←	Notifies to Cnet that the external device is ready to communicate.
7	RTS(RS)	→	Cnet requests the external device to transmit data.
8	CTS(CS)	←	Notifies to Cnet that the external device can transmit data.
9	RI(CI)	←	Notifies to Cnet that the external device was called.

The RS-232C channel can communicate with an external device directly or communicate with an external device which is remote using the modem. When connecting a modem, use XG5000 to set the RS-232C communication method to ‘modem', and when not using a modem, set it to ’null modem'.

(1) How to connect the RS-232C connector when connecting the modem

The Cnet I/F module can be used for long-range communication by connecting the modem as shown in the figure below.

Cnet (9-pin)		Pin No. and direction of signal	Modem side (25-pin)	
Pin No.	Signal Name		Signal Name	Pin No.
1	DCD	←	DCD	8
2	RXD	←	RXD	3
3	TXD	→	TXD	2
4	DTR	→	DTR	20
5	SG	—	SG	7
6	DSR	←	DSR	6
7	RTS	→	RTS	4
8	CTS	←	CTS	5
9	R1*Note 1)		RI	22

[Note 1] No. 9 RI signal is not used in the Cnet I/F module.

(2) How to connect the RS-232C connector if the null modem mode is used

If the null modem mode is used, connect in three lines as follows (no handshake).

Cnet (9-pin)		Pin No. and direction of signal	Computer/communication device
Pin No.	Signal Name		Signal Name
1	DCD		DCD
2	RXD		RXD
3	TXD		TXD
4	DTR		DTR
5	SG		SG
6	DSR		DSR
7	RTS		RTS
8	CTS		CTS
9	RI		RI

3.4.2 RS-422 / 485 Connection

The RS-422 channel communicates with an external device using the 5-pin connector for the A type module and the 6-pin connector for the B type module. The specifications of the RS-422 interface are as follows.

Pin No.	Signal Name	Direction of signal (Cnet<-->External device)	Contents
1	TX+	→	Transmitted data (+)
2	TX-	→	Transmitted data (-)
3	RX+	←	Received data (+)
4	RX-	←	Received data (-)
5	SG	—	Signal grounding
6	PE	—	Frame grounding (XGL-CH2B/C42B)

(1) The RS-422 channel may connect to an external device using the RS-422 or RS-485 (multi drop) method. In case the RS-422 method is used, connect as shown in the figure below.

A type Cnet (5 pin) B type Cnet (6 pin)		Direction of signal (Cnet<--->External device)	External communication device
Pin No.	Signal Name		
1	TX+	→	RX+
2	TX-	→	RX-
3	RX+	←	TX+
4	RX-	←	TX-
5	SG	—	SG
6(B type)	PE	—	PE

(2) If the RS-422 channel is used as multi drop, set' RS-485' for the communication type for each channel from the [Standard Settings - Cnet] window of the XG5000 and connect as shown in the figure below.

A type Cnet (5 pin) B type Cnet (6 pin)		Direction of signal (Cnet<--->External device)	External communication device
Pin No.	Signal Name		
1	TX+	↔	RX+
2	TX-		RX-
3	RX+	↔	TX+
4	RX-		TX-
5	SG		SG
6(B type)	PE		PE

In case of communicating in the multi drop method as shown in the figure above, TX+ and RX+ should be connected and RX- and TX- should be connected. Therefore, the transmission and reception lines are shared by the Cnet I/F module and the external device, data will be exchanged-duplex communication method.

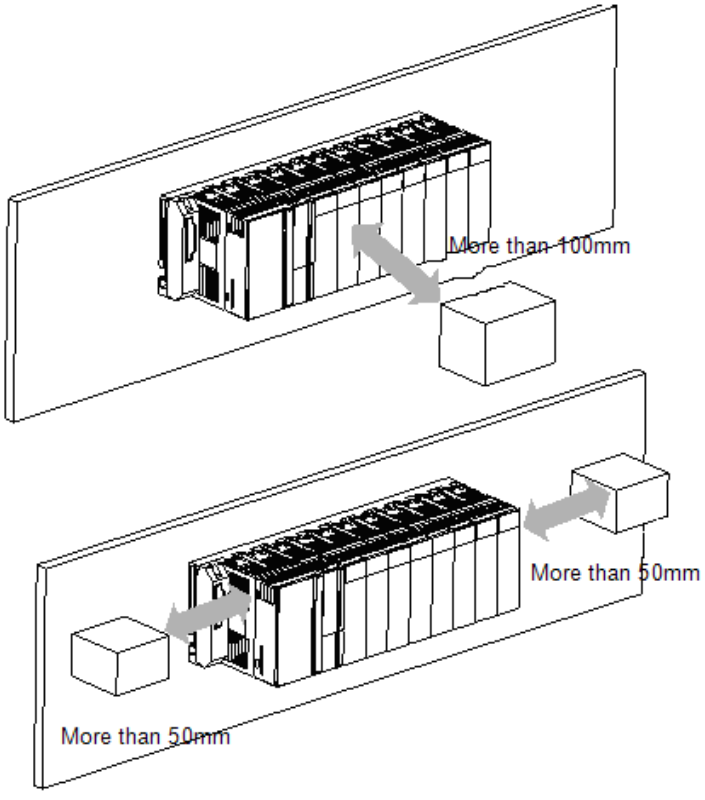
Chapter 4 Installation and Test Operation

4.1 Installation Environment

High quality level of the Cnet I/F module has been secured in order for it to be used in various environments. However, the following contents should be observed in order to guarantee the reliability and stability of this product.

(1) Environmental conditions
- (a) Install it in a waterproof and vibration proof control panel.
- (b) Install it in a place free from continuous impact or vibration.
- (c) Install it in a place with no direct sunlight.
- (d) Install it in a place where the ambient temperature does not change rapidly.
- (e) Install it in a place where the range of ambient temperatures does not exceed between 0 and 50°C.

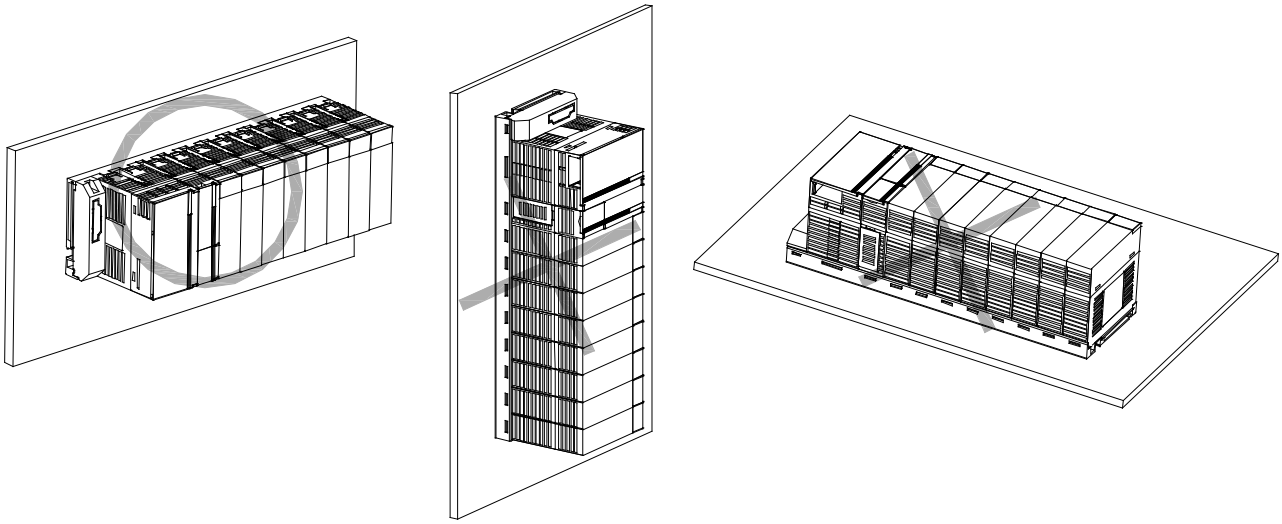
(2) Installation work
- (a) In case of processing the screw hole or wiring, do not allow wiring waste to enter the product.
- (b) Install it in a place where it can be operated easily.
- (c) Do not install it inside of the same panel as a high voltage device.
- (d) Install it more than 100mm away from a device which is placed in front of the PLC and more than 50mm away from a device which is placed on the left or right side of the PLC.
- (e) Ground to a low surrounding noise environment.



4.2 Caution in handling

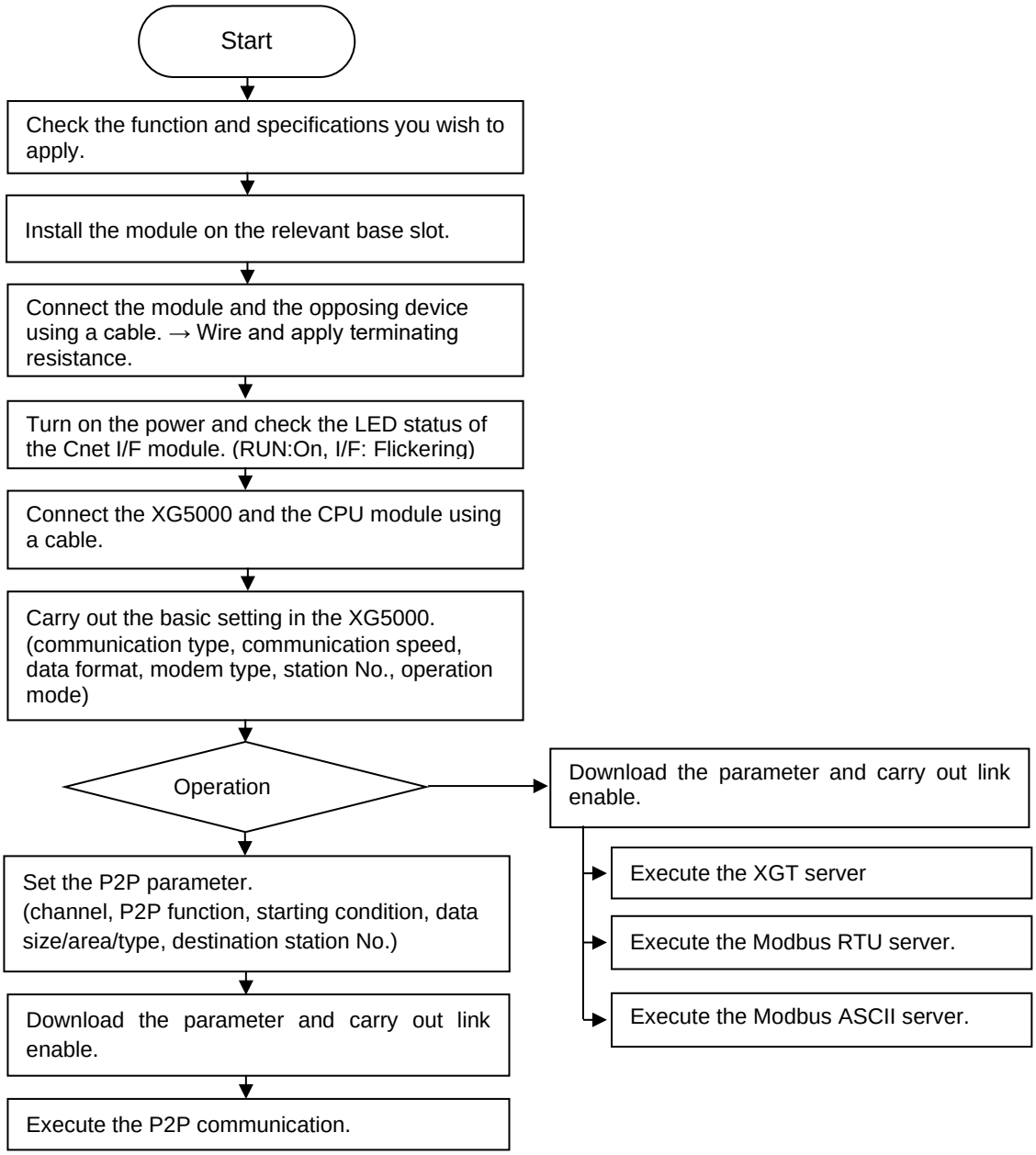
A description of matters requiring caution when handling the product is provided.

(1) Do not drop or impact the product.
(2) Do not open the product case or disassemble the product arbitrarily.
(3) When wiring, make sure that wiring waste does not enter the product.
(4) Do not install or separate the module while the power is on.
(5) Use the prescribed cable for wiring and observe the specifications of transmission distance.
(6) Wire the communication cable at least 100mm away from the high voltage line ensuring the power line is not affected by surge or induction noise.



4.3 Product Operation Method

A description of contents to be executed for operating the product is provided. Operate and set the product according to the following procedure to ensure correct product operation.



Notes

- Station number of Cnet I/F module is set by software. Set the station address using the XG5000 and carry out the basic setting necessary for Cnet communication.

4.4 Contents of parameters for each communication mode

Parameters that should be set in XG5000 according to the communication mode are as follows.

4.4.1 Standard setting parameters

Parameter	Sub menu	Setting item	Setting range and contents	Setting availability		Note
				Client	Server	
Standard settings	Connection setting	Communication type	RS-232C RS-422 RS-485	Possible	Possible	
		Communication speed(bps)	300 ~ 115,200	Possible	Possible	
		Terminating resistor	Enable/disable	Possible	Possible	*Note 6)
		STATION NO.	XGT communication: 0~31 Modbus: 0~255	Possible	Possible	When setting the client, the station number is meaningless.
	Operation mode	Use P2P	Select one mode	Possible	-	
		XGT server		-	Possible	
		Modbus ASCII server		-	Possible	
		Modbus RTU server		-	Possible	
		Smart server		-	Possible	*Note 6)
	Repeater mode	-	Enable/disable	-	-	Stop all services when the repeater mode is set *Note 6)
Advanced Settings	Connection setting	Data bit	7, 8	Possible	Possible	When communicating Modbus ASCII mode, the number of data bits is 7.
		Stop bit	1, 2	Possible	Possible	*Note 5)
		Parity bit	NONE,ODD,EVEN	Possible	Possible	
		Parity receive error *Note4)	Enable/Disable	Possible	Possible	
		Modem type	Null modem Dedicated line modem Dial up modem	Possible	Possible	
		Modem initialization	-	Possible	Possible	It can be set only in case of dial-up modem.
	Setting of time	Response waiting time	0~50 (x 100ms)	Possible	-	*Note 1)
		Delay time	0~255 (x 10ms)	Possible	Possible	*Note 2)
		Inter-character waiting time	0~255 (x 10ms)	Possible	Possible	*Note 3)

Notes

Note 1) Response waiting time: It means the time to receive the response frame after transmitting a frame.
(1) It can be set when P2P is set for the operation mode.
(2) Response waiting time
= Basic response waiting time + (response waiting time setting value x 100ms) + Inter-character waiting time
(3) Basic response waiting time for each communication speed
(a) 9,600~115,200bps: 100ms
(b) 7,200~2,400bps: 200ms
(c) 1,800~1,200bps: 400ms
(d) 600bps: 800ms
(e) 300bps: 1,200ms

Note 2) Delay time: It refers to the time set by the user when he/she wishes to delay the time to transmit a frame.
(1) Client operation setting: It can be set if the communication type is RS-422/485.
(2) Server operation setting: You can set the service to transmit a frame after the time set by the user frame has passed (It can be used in the B type Cnet I/F module).

Note 3) Inter-character waiting time: It indicates the time interval between characters received within the set time from one frame, and it can be set regardless of operation mode.

Note 4) Parity receive error: When [Enable] is selected, data can be received even if an error occurs in the received parity bit.
• This function can be used for Cnet V3.1 or later and XG5000 V4.0 or later.

Note 5) Stop bit This bit indicates that the single packet ends. Check the set stop bit when data is received. If the stop bit of the received data is smaller than the set stop bit the data can not be received normally. In order to receive data normally, the stop bit should be configured identically.

Note 6) Terminating resistance, repeater mode, smart server
:This function is provided by the B type Cnet I/F module (XGL-C22B, CH2B, C42B).

4.4.2 P2P Setting Parameters

Parameter	Sub menu	Setting item	Setting range and contents	Possibility of settings(client)				
				XGT	Modbus ASCII	Modbus RTU	Inverter dedicated	User frame definition
P2P	Communication module setting	Base	0~7	Possible	Possible	Possible	Possible	Possible
		Slot	0~11	Possible	Possible	Possible	Possible	Possible
	P2P channel	P2P driver	User frame definition	-	-	-	-	Possible
			XGT client	Possible	-	-	-	-
			Modbus ASCII client	-	Possible	-	-	-
			Modbus RTU client	-	-	Possible	-	-
			LS bus client*Note 5)	-	-	-	Possible	-
	P2P block	Channel	1, 2	Possible	Possible	Possible	Possible	Possible
		P2P function	READ	Possible	Possible	Possible	Possible	-
			WRITE	Possible	Possible	Possible	Possible	-
			SEND	-	-	-	-	Possible
			RECEIVE	-	-	-	-	Possible
		Starting condition*Note1)	-	Possible	Possible	Possible	Possible	Possible
		Command type	single	Possible	Possible	Possible	-	-
			Continuous	Possible	Possible	Possible	Possible	-
		Data type	Bit	Possible	Possible	Possible	-	-
			WORD	Possible	Possible	Possible	Possible	-
			1 Byte	Possible	-	-	-	-
			2 Byte	Possible	-	-	-	-
			4 Byte	Possible	-	-	-	-
			8 Byte	Possible	-	-	-	-
		No. of variables*Note2)	1~4	Possible	Possible	Possible	-	-
		Data size *Note2)	In accordance with the protocol	Possible	Possible	Possible	Possible	-
		Destination station number	0~63	Possible	Possible	Possible	Possible	-
		Frame	Select in case of user frame definition	-	-	-	-	Possible
		Setting*Note 3)	-	Possible	Possible	Possible	Possible	Possible
	User frame definition	Adds Group	Group name	-	-	-	-	
			Type of frame: Send	-	-	-	-	Possible
			Type of frame: Receive	-	-	-	-	Possible
	Frame *Note 4)	Edit group	Group name	-	-	-	-	Possible
		Delete group	-	-	-	-	-	Possible
		Add frame	Head	-	-	-	-	Possible
			Tail	-	-	-	-	Possible
			Body	-	-	-	-	Possible

Notes

Note 1) Starting condition in user-defined frame communication is selectable only when the P2P function is SEND.

Note 2) The number of variables and data size can be set only in the case of continuous mode in XGT client and Modbus ASCII/RTU client.

Note 3) Settings in user-defined frame communication can be established only when the fixed size parameter or variable size parameter is selected.

Note 4) Frame settings can be entered after the frame type and group name of the user frame definition are set.

Note 5) LS Bus client is a function provided by the B type Cnet I/F module.

4.5 I/O Assignment and Device Information

4.5.1 I/O Assignment

(1) When the XGK CPU is used

(a) Basic system configuration method

The features of Basic system consisted by connecting the main base and expanded base by a cable are as follows. There is a restriction in the number of stages in the extension base according to the type of CPU module. And the either the fixed type or the variable type can be selected from the basic parameter and assigned to the I/O number.

Classification	XGK-CPUE	XGK-CPUS XGK-CPUSN	XGK-CPUA	XGK-CPUH XGK-CPUHN	XGK-CPUU XGK-CPUUN
Maximum number of extension stages	1 stages	3 stages	3 stages	7 stages	7 stages
Maximum No. of I/O modules installation	24 module	48 module	48 module	96 module	96 module
Maximum I/O score	1,536 points	3,072 points	3,072 points	6,144 points	6,144 points
Maximum extension distance	15m				

(b) Assignment of I/O number (fixed type)

1) The fixed type is the method to assign 64 points to each slot in the base regardless of other conditions.
2) The I/O number for 16 slots is assigned to one base. In other word, the start number of No. 1 base is P00640.
3) The case of assigning the I/O number in the system that uses the 12-slot base is as follows.

Slot No.		0	1	2	3	4	5	6	7	8	9	10	11
PWR	CPU	Input 16	Input 16	Input 32	Input 64	Output 16	Output 32	Output 32	Output 64	Input 32	Output 16	Output 32	Output 32
		P000 ~ P03F	P040 ~ P07F	P080 ~ P11F	P120 ~ P15F	P160 ~ P19F	P200 ~ P23F	P240 ~ P27F	P280 ~ P31F	P320 ~ P35F	P360 ~ P39F	P400 ~ P43F	P440 ~ P47F

(c) Assignment of I/O number (variable-type)

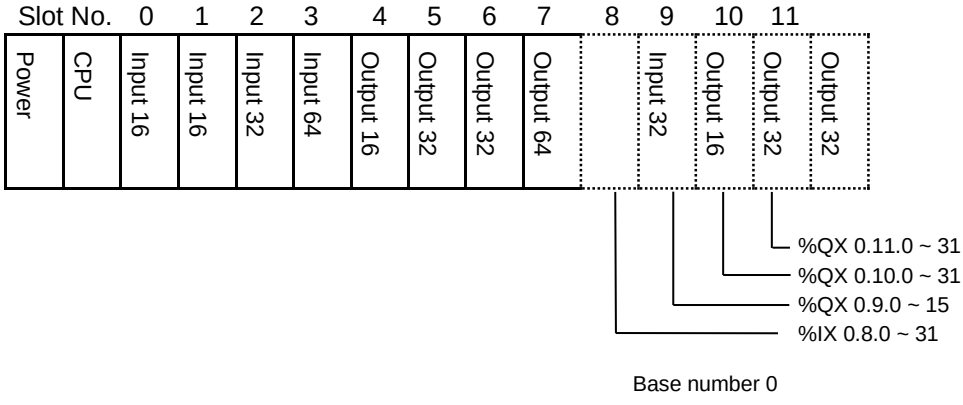
1) The variable type is the method to assign the score according to the module installed on the base slot.
2) When a module installed as the I/O parameter is specified, the score will be assigned.
3) For a slot which is not specified as the I/O parameter, the score corresponding to the module which is actually installed will be assigned automatically (16 points are assigned to the 8-point module.).
4) For an empty slot which is not specified as the I/O parameter, 16 points will be assigned.
5) The reserved assignment using the I/O parameter is also available. At this time, only the score is assigned regardless of module type.
6) For a slot where the special module or communication module is installed, 16 points will be assigned.
7) The case of assigning the I/O number in the system that uses the 12-slot base is as follows.

Slot No.		0	1	2	3	4	5	6	7	8	9	10	11
PWR	CPU	Input 16	Input 16	Input 32	Input 64	Output 16	Output 32	Output 32	Output 64	Input 32	Output 16	Output 32	Output 32
		P000 ~ P00F	P010 ~ P01F	P020 ~ P03F	P040 ~ P07F	P080 ~ P08F	P090 ~ P10F	P110 ~ P12F	P130 ~ P16F	P170 ~ P18F	P190 ~ P19F	P200 ~ P21F	P220 ~ P23F

(2) When XGI CPU is used

(a) Basic system configuration method

Classification	XGI-CPUU / CPUH / CPUU/D CPUUN	XGI-CPUS	XGI-CPUE
Maximum number of extension stages	7 stages	3 stages	1 stages
Maximum No. of I/O modules installation	96 module	48 module	24 module
Maximum I/O score	• In case the 16-point module is installed: 1,536 points • In case the 32-point module is installed: 3,072 points • In case the 64-point module is installed: 6,144 points	• In case the 16-point module is installed: 768 points • In case the 32-point module is installed: 1,536 points • In case the 64-point module is installed: 3,072 points	• In case the 16-point module installed: 384 points • In case the 32-point module installed: 768 points • In case the 64-point module installed: 1,536 points
Maximum extension distance	15m		
	• I/O number is constantly allocated to 64 points per slot of the base. • 64 points are assigned to each slot in the base regardless of module installation or module type. • There is no restriction in the installation position of special module and the number of modules to be used. •A fixed I/O number is not assigned to the special module digital I/O module. • The special module is controlled by dedicated function block, and memory is assigned automatically. • The case of assigning the I/O number in the system that uses the 12-slot base is as follows.		



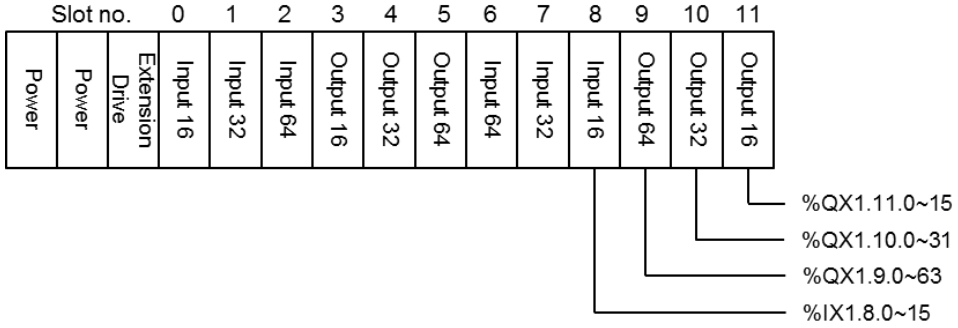
Notes

(1) Main base number is fixed to '0', but the extension base number varies by the switch that sets the base number.

(2) The operation will start only when the type of module set as the I/O parameter and the type of actually installed module are the same.

(3) When XGR CPU is used

(a) Basic system configuration method

Classification	Description
Configuration of main base	• Install two basic bases in the same configuration in duplicate.
Maximum extension base	• Up to 31 extension bases can be installed.
Maximum No. of I/O modules installation	• Up to 372 I/O modules can be installed on the extension base.
Maximum I/O score	• If the 16-point module is installed: 5,952 points • If the 32-point module is installed: 11,904 points • If the 64-point module is installed: 23,808 points
Maximum extension distance	• Between bases - Optical: 2 ㎞ - Electric:100 m • Maximum distance - Optical: 64 ㎞ (In case 31 extension bases are configured) - Electric: 3.2 ㎞ (In case 31 extension bases are configured) case 31 extension bases are configured)
Assignment of I/O number in the extension base	• The starting I/O number of each base is decided by the base number set for the extension driver module (Set 1~31). • In the base, 64 points are assigned constantly to each slot for the I/O number. 64 points are assigned to each slot regardless of module installation status or module type. • Unlike digital I/O module, the special module does not use input/output number for control. U device and the dedicated function block are used. • The case of assigning the I/O number in the system that uses the 12-slot base is as follows. 
Main base I/O number	• Only the communication module is installed on the main base, so it is unrelated to I/O number. • The main base is base number 0 which is positioned in front of I/O number.

Notes

(1) Dual main base number is fixed to '0', but the extension base number varies by the switch that sets the base number.
(2) Dual CPU module can be installed only on the main base.
(3) Dual CPU module occupies 2 slots.
(4) The operation will start only when the type of module set as the I/O parameter and the type of actually installed module are the same.
(5) In case of remote connection using the Cnet I/F module, the station number of extension driver that can be connected is limited to 1~31.

4.5.2 Device Information

(1) Standard settings

Communication type	Communication speed	Data bit	Stop bit	Parity bit	Modem type	Modem initialization	Station No.	Response waiting time	Delay time	Inter-character waiting time
RS-232C	300 ~ 115,200	7~8	1~2	NONE~ODD	Null modem	Disable(space)	0~31	0~50	0~255	0~255
					Dedicated modem	Disable(space)	0~31	0~50	0~255	0~255
					Dial modem	Enable	0~31	0~50	0~255	0~255
RS-485	300 ~ 115,200	7~8	1~2	NONE~ODD	Null modem	Disable(space)	0~31	0~50	0~255	0~255
					Dedicated modem	Disable(space)	0~31	0~50	0~255	0~255
					Dial modem	Disable(space)	0~31	0~50	0~255	0~255
RS-422	300 ~ 115,200	7~8	1~2	NONE~ODD	Null modem	Disable(space)	0~31	0~50	0~255	0~255
					Dedicated modem	Disable(space)	0~31	0~50	0~255	0~255
					Dial modem	Disable(space)	0~31	0~50	0~255	0~255

(2) Modbus setting

Channel	Modbus Usage status	Setting	Item	Default value per CPU		
				XGK	XGI	XGR
Channel 1	Use P2P	Disable	-	-	-	-
	XGT server	Disable	-	-	-	-
	Modbus ASCII server	Enable	Bit read area start address:	P00000	%IX0.0.0	%IX0.0.0
			Bit write area start address:	P01000	%QX0.0.0	%QX0.0.0
			Word read area start address:	P0200	%MW0	%MW0
			Word write area start address:	P0300	%MW100	%MW100
	Modbus RTU server	Enable	Bit read area start address:	P00000	%IX0.0.0	%IX0.0.0
			Bit write area start address:	P01000	%QX0.0.0	%QX0.0.0
			Word read area start address:	P0200	%MW0	%MW0
			Word write area start address:	P0300	%MW100	%MW100
Channel 2	Use P2P	Disable	-	-	-	-
	XGT server	Disable	-	-	-	-
	Modbus ASCII server	Enable	Bit read area start address:	P04000	%IX0.0.0	%IX0.0.0
			Bit write area start address:	P05000	%QX0.0.0	%QX0.0.0
			Word read area start address:	P0600	%MW0	%MW0
			Word write area start address:	P0700	%MW100	%MW100
	Modbus RTU server	Enable	Bit read area start address:	P04000	%IX0.0.0	%IX0.0.0
			Bit write area start address:	P05000	%QX0.0.0	%QX0.0.0
			Word read area start address:	P0600	%MW0	%MW0
			Word write area start address:	P0700	%MW100	%MW100

(3) P2P channel setting

Channel	Operation mode	P2P driver	TCP/UDP	Client/server	Port of destination station	IP address of destination station
1	XGT server	-	-	-	-	-
2	Use P2P	XGT client	-	-	-	-
		User frame definition	-	-	-	-
		LS bus client (B type Cnet I/F Module)	-	-	-	-
		Modbus ASCII client				
		Modbus RTU client	-	-	-	-

(4) P2P block setting

Operation mode	P2P driver	P2P function	Condition flag	Command type	Data type	No. of variables	Data size	Destination station number	Read area	Save area	Address
XGT server	-	-	-	-	-	-	-	-	-	-	-
Use P2P	XGT client	Read	XGT device	single	BIT	1 ~ 4	Disable (space)	0~32	XGT device	XGT device	N device calculation method
				single	1/2/4/8 (XGK) B/W/D/L (XGI)	1 ~ 4					
				Continuous	1/2/4/8 (XGK) B/W/D/L (XGI)	Disable (1)	1 ~ 120				
		Write		single	BIT	1 ~ 4	Disable (space)				
				single	1/2/4/8 (XGK) B/W/D/L (XGI)	1 ~ 4					
				Continuous	1/2/4/8 (XGK) B/W/D/L (XGI)	Disable (1)	1 ~ 120				
	Modbus ASCII client	Read		single	BIT		Disable (space)		00000~19999		
				single	WORD				30000~49999		
				Continuous	BIT		1 ~ 976		00000~19999		
				Continuous	WORD		1 ~ 61		30000~49999		
		Write		single	BIT		Disable (space)		XGT device	00000~09999	
				single	WORD					40000~49999	
				Continuous	BIT		1~944			00000~09999	
				Continuous	WORD		1~59			40000~49999	
	Modbus RTU client	Read		single	BIT		Disable (space)		00000~19999	XGT device	
				single	WORD				30000~49999		
				Continuous	BIT		1~ 2000		00000~19999		
				Continuous	WORD		1~ 125		30000~49999		
		Write		single	BIT		Disable (space)		XGT device	00000~09999	
				single	WORD					40000~49999	
				Continuous	BIT		1~1968			00000~09999	
				Continuous	WORD		1~123			40000~49999	
	User frame definition	SEND		Transmission body	-	-	1~ 1024		XGT device variable-sized variable	-	
		RECEIVE	-	Receive body	-	-	-		-	Memory specification	
	LS bus client	Read	XGT device	Continuous	WORD	1	1 ~ 8	0~255	Inverter address value	XGT device	
		Write							XGT device	Inverter address value	

(5) User frame definition setting

Group	Frame	Segment	Note
Send 1	HEAD	Numerical constant	Up to 10 bytes 12345678901234567890
		String constant	1234567890 (Internally registered as 3132..30)
	TAIL	Numerical constant	Up to 10 bytes 12345678901234567890
		String constant	1234567890 (Internally registered as 3132..30)
		BCC	-
	BODY	Numerical constant	Up to 10 bytes 12345678901234567890
		String constant	1234567890 (Internally registered as 3132..30)
		Variable-sized variable	Up to 4 variables are available.
Send 1	HEAD	Numerical constant	Up to 10 bytes 12345678901234567890
		String constant	1234567890 (Internally registered as 3132..30)
	TAIL	Numerical constant	Up to 10 bytes 12345678901234567890
		String constant	1234567890 (Internally registered as 3132..30)
		BCC	-
	BODY	Numerical constant	Up to 10 bytes 12345678901234567890
		String constant	1234567890 (Internally registered as 3132..30)
		Fix-sized variable	Up to 4 variables are available.
		Variable-sized variable	Only one variable-sized variable can be set. Therefore, a segment cannot be added at the back of the variable-sized variable.
There is no restriction in the number of group, frame and segment, and there is restriction only in the maximum data size (0x4B00).			-

4.5.3 Available device areas for each CPU type

CPU type	Area	Range	Size(word)	Note
XGK (based on CPUE)	P	P0~P2047	2,048	Possible to read, write and monitor
	M	M0~M2047	2,048	Possible to read, write and monitor
	K	K0~K2047	2,048	Possible to read, write and monitor
	F	F0~F2047	2,048	Possible to read and monitor (write: possible from 1025 words)
	T	T0~T2047	2,048	Possible to read, write and monitor
	C	C0~2047	2,048	Possible to read, write and monitor
	L	L0~L11263	11,264	Possible to read, write and monitor
	N	N0~N21503	21,504	Possible to read, write and monitor
	D	D0~D19999	20,000	Possible to read, write and monitor
	R	R0~R32767	32,768	Possible to read, write and monitor
	ZR	ZR0~ZR65535	65,536	Possible to read, write and monitor (Provided only for XGK-CPUH)
XGK (based on CPUH)	I	IW0.0.0~IW127.15.3	8,192	Possible to read, write and monitor
	Q	QW0.0.0~QW127.15.3	8,192	Possible to read, write and monitor
	M	MW0~MW131071	131,072	Possible to read, write and monitor
	R	RW0~RW32767	32,768	Possible to read, write and monitor
	W	WW0~WW65535	65,536	Possible to read, write and monitor
XGR	I	IW0.0.0~IW127.15.3	8,192	Possible to read, write and monitor
	Q	QW0.0.0~QW127.15.3	8,192	Possible to read, write and monitor
	M	MW0~MW131071	131,072	Possible to read, write and monitor
	R	RW0~RW32767	32,768	Possible to read, write and monitor
	W	WW0~WW65535	65,536	Possible to read, write and monitor
Common	U	U0~U4095	4,096	Possible to monitor

Notes

(1) ZR device is provided only in XGK-CPUH.
(2) W" should be used in order to use ZR device for XGT communication frame as XGK CPU.
Example) When requesting the word size from ZR0,"% WW000" should be requested.
(3) The bit monitoring address in the U device is a hexadecimal (Hex) value and the monitoring area in the word area is a decimal value.

Chapter 5 System Configuration

Up to 24 Cnet I/F modules including the main base and the extension base can be installed regardless of the CPU module. Among these modules, up to 8 modules can be used for the P2P service, and all 24 modules can be used in the server mode. You can establish various systems according to the usage by using the Cnet I/F module. In this chapter, an explanation of applicable systems using various cases is provided. And the explanation of a system that cannot be established using the Cnet I/F module is provided additionally for your reference.

5.1 Applicable System Configuration

5.1.1 Configuration Case 1

(1) This system connects the HMI (PC) and the PLC in one to one through the RS-232C or RS-422 channel without the modem.

(2) The HMI (PC) operates as the client station and the Cnet I/F module operates as the server station that responds to the request of the HMI (PC).

(3) Since the modem is not used, the communication distance is up to 15m in the case where the RS-232C channel is used, and up to 500m in the case where the RS-422 channel is used.

(4) The operation mode of the Cnet I/F module should be set according to the communication method of the HMI(PC).

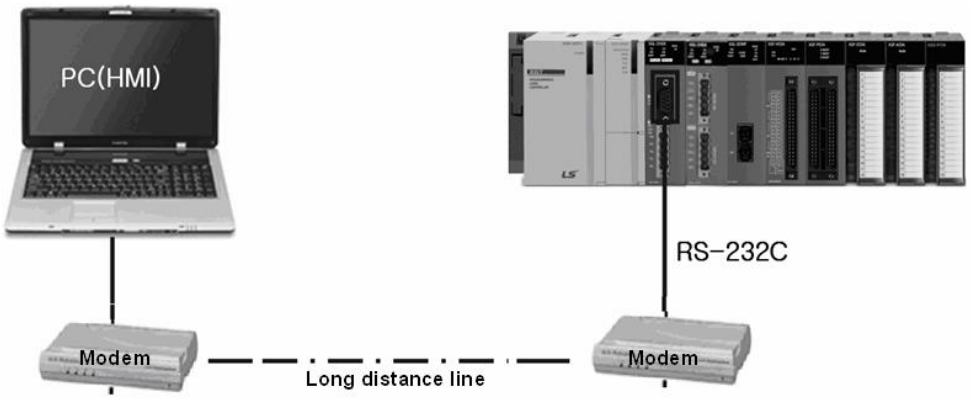
5.1.2 Configuration Case 2

(1) This system connects the PC (HMI) and the PLC in one to one through the dedicated line modem.

(2) The PC (HMI) operates as the client station and the Cnet I/F module operates as the server station that responds to the request of the PC (HMI).

(3) Since the connection is made through the modem, long distance communication is available only when the dedicated line modem is set for the RS-232C channel.

(4) The Operation mode of the Cnet I/F module should be set according to the communication method of the PC(HMI).



5.1.3 Configuration Case 3

(1) This system connects the PC(HMI) and the PLC through the modem and PLCs communicate to each other through the Cnet I/F module.

(2) PC and Cnet #1 station are connected using the modem through the RS-232C channel.

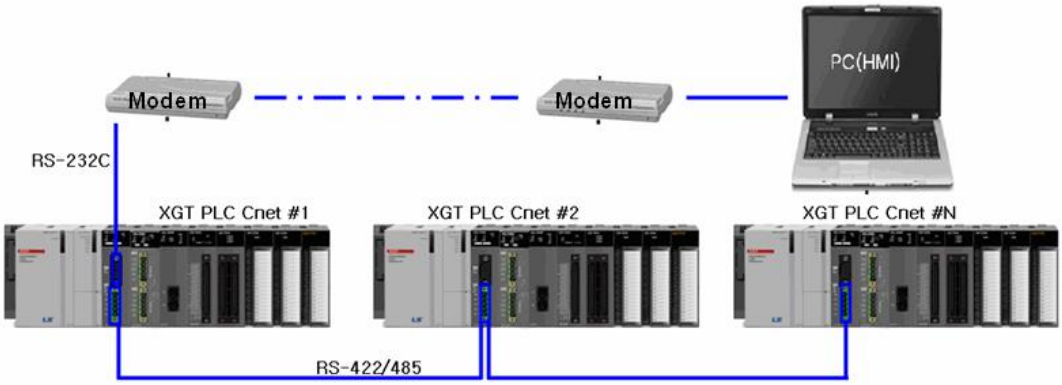
(3) Cnet #1 station ~ N station carry out the communication between Cnet I/F modules through the RS-422 channel.

(4) PC operates as the client station of the Cnet #1 station RS-232C channel.

(5) The Cnet I/F module can connect to up to 32 stations (RS-422/485 communication).

(6) Set Cnet #1 station as the client.

(7) The dedicated line modem or dial-up modem can be used.



Type	Module setting		
	RS-232C	RS-422	Station No
PLC Cnet #1 station	XGT server	P2P	1
		XGT client	
Cnet #2 ~ #32 station	Disable	XGT server	2~32

[Module setting table for each station]

5.1.4 Configuration Case 4

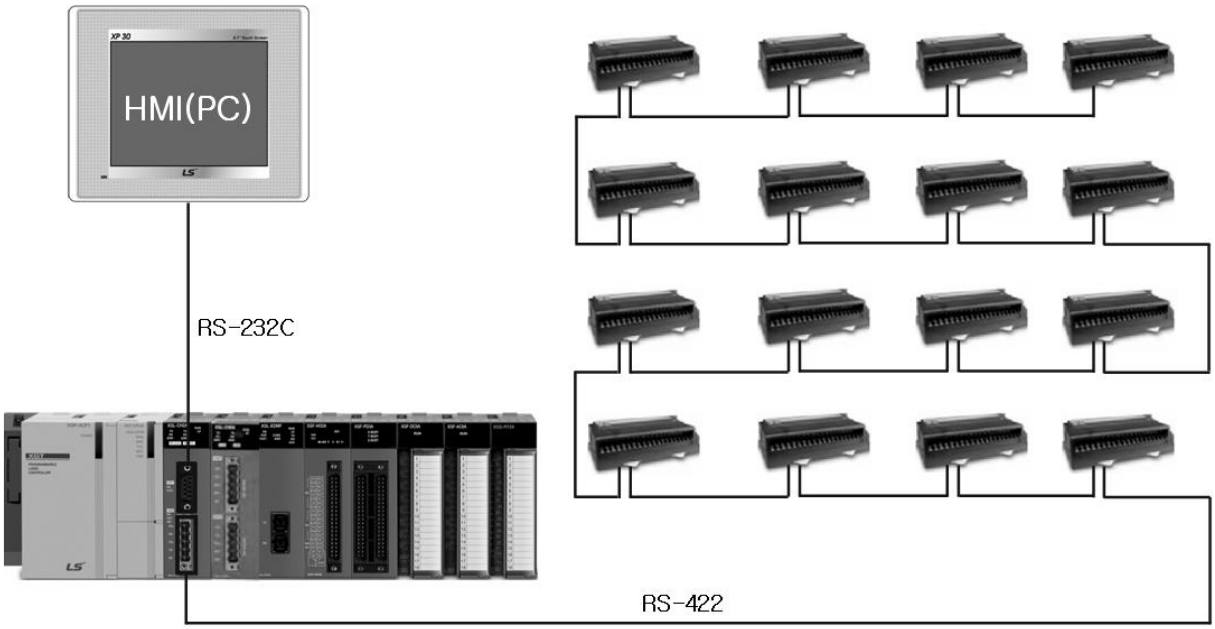
(1) HMI(PC) and PLC carry out the null-modem communication using the RS-232C channel and PLC is the system that connects Smart I/O through the RS-422 channel.

(2) HMI(PC) operates as the client station and the Cnet I/F module operates as the server station. At this time, the module is set as RS-232C XGT server.

(3) The RS-422 channel of Cnet I/F module operates in P2P mode.

(4) Data is transmitted to GSL-TR4A(Smart I/O transistor output 32 points for Modbus) through the RS-422 channel of the Cnet I/F module.

(5) Data transmitted to GSL-TR4A can be read with HMI(PC).



Type	Module setting		
	RS-232C	RS-422	Station No
PLC Cnet #1 station	XGT server	P2P	1

[Module setting table for each station]

5.1.5 Configuration Case 5

(1) This is the system that communicates using the wireless modem in an application field where an object which carries out a rectilinear motion is handled.

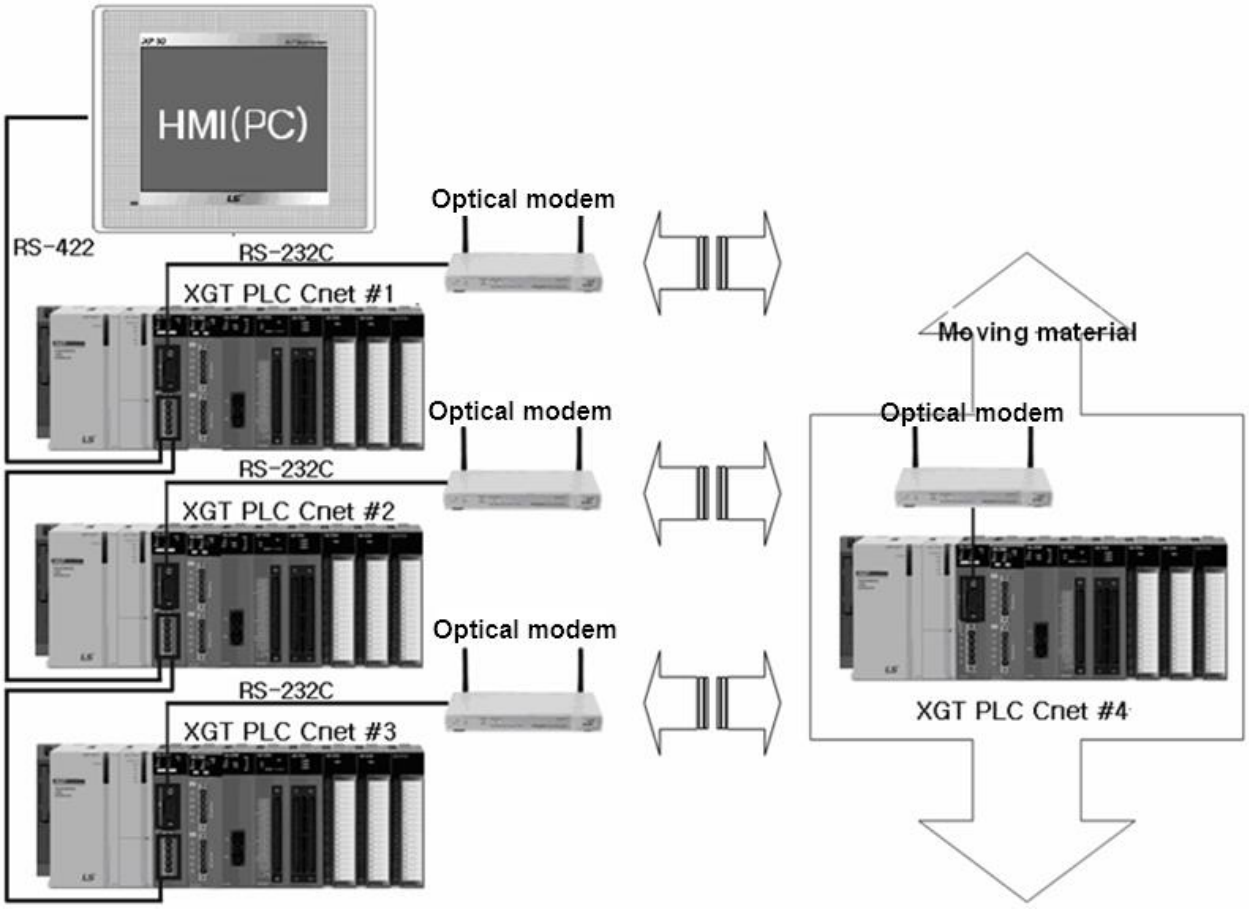
(2) HMI and PLC can carry out the dedicated mode communication or P2P communication.

(3) Cnet I/F module can carry out RS-232C/RS-422 communication with the optical modem.

(4) The XGT server/client communication is carried out between Cnet I/F modules.

(5) A moving object connected to the Cnet I/F module communicates with the Cnet I/F module in each floor through the optical modem while moving up and down.

(6) Main application field: Parking tower, etc.



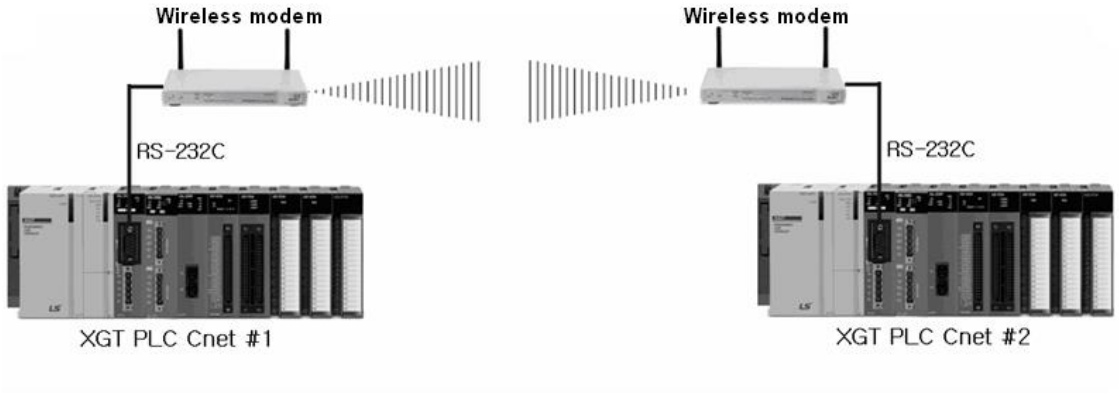
5.1.6 Configuration Case 6

(1) This is the system that communicates using the wireless modem in an application field where a rotating object is handled.

(2) Wireless modem and PLC carry out the RS-232C communication.

(3) Cnet I/F modules carry out the dedicated server/client communication.

(4) The RS-232C channel of the Cnet I/F module uses the dedicated modem mode.



Type	Module setting		
	RS-232C	RS-422	Station No
XGL-CH2A	Dedicated mode	Disable	1,2 Station
	User mode		

[Setting content between communication modules]

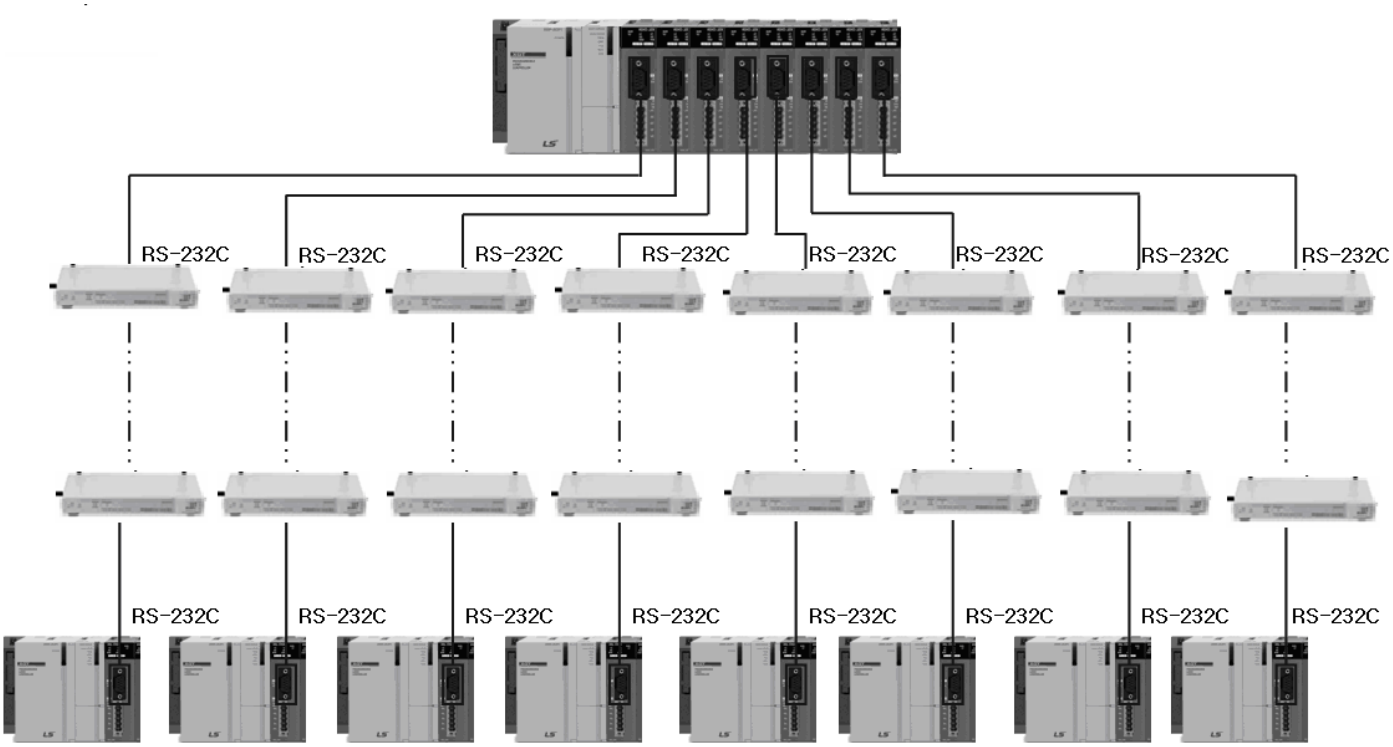
5.1.7 Configuration Case 7

(1) This is the TM/TC communication system that carries out long distance communication with the client PLC remotely using the dedicated line modem.

(2) The RS-232C channel is set for the dedicated line modem mode and dedicated modem communication is carried out.

(3) Cnet I/F modules carry out the dedicated server/client communication.

(4) Up to 8 Cnet I/F modules can be installed on the PLC of the TM server.

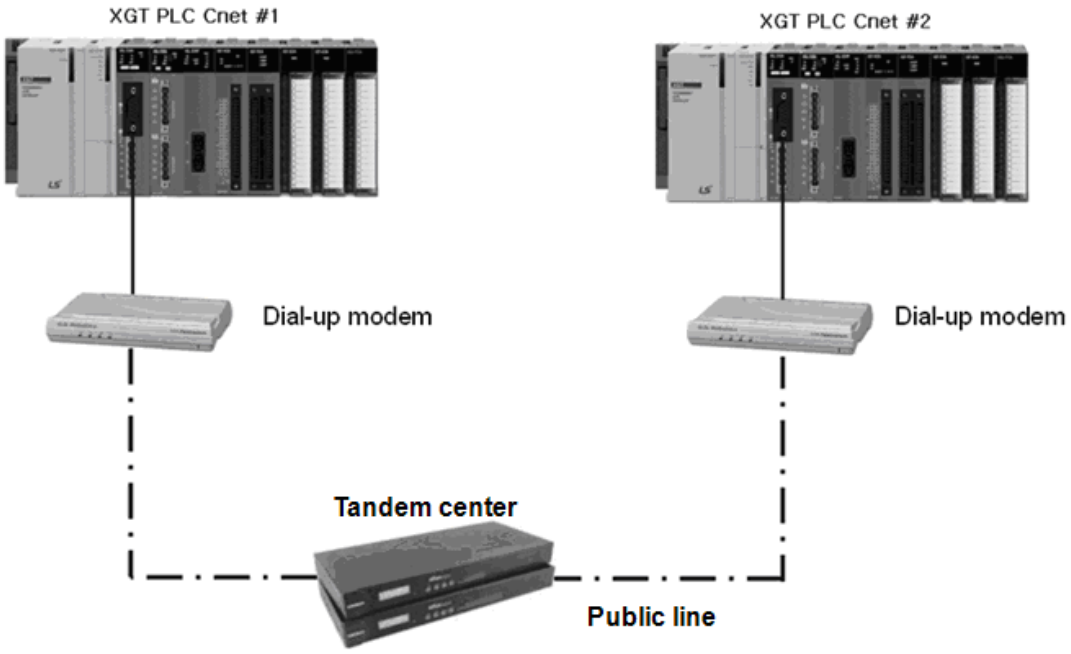


5.2 System configuration that cannot be applied

5.2. 1 Dial-up modem communication between Cnet I/F modules (conditional)

(1) The Cnet I/F module has the function to answer the phone but it does not have the dialing function.

(2) Therefore, the Cnet I/F modules cannot communicate with each other using the dial-up modem. However, communication is available through the flow control according to the program by using UDATA.(refer to section 10.5)

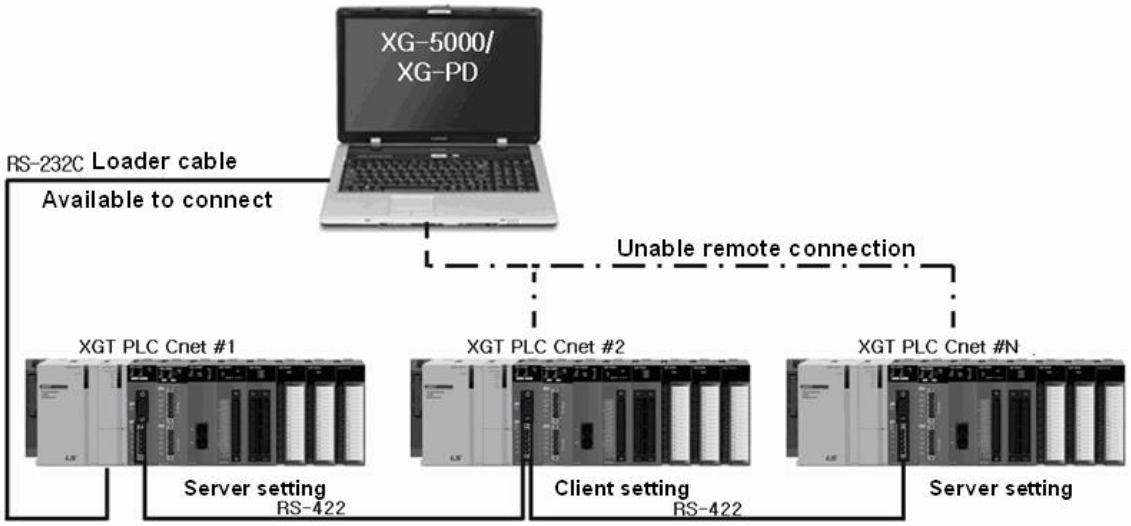


5.2. 2 XG5000 Connection Using the RS-422 channel of Cnet I/F module

(1) The XG5000 service of the Cnet I/F module is supported only for the RS-232C channel. Therefore, XG5000 cannot be connected using the RS-422 channel.

(2) The remote connection of the XG5000 has no function to set the station address of the Cnet.

(3) In the following figure, only Cnet #1 station can connect to XG5000.



Chapter 6 Communication Parameter

6.1 Overview

The communication parameters can be classified into the default setting parameters and the P2P setting parameter.

6.1.1 Standard Setting Parameters

This is the part where the media information, H/W information and basic protocol information of the Cnet I/F module are set.

Parameter	Sub menu	Setting item	Setting range and contents	Setting availability		Note
				Client	Server	
Standard settings	Connection setting	Communication type	RS-232C RS-422 RS-485	Possible	Possible	
		Communication speed(bps)	300 ~ 115,200	Possible	Possible	
		Terminating resistor	Enable/disable	Possible	Possible	
		STATION NO	XGT communication : 0~31 Modbus communication : 0~255	Possible	Possible	When setting the client, the station number is meaningless.
	Operation mode	Use P2P	Select one mode	Possible	-	
		XGT server		-	Possible	
		Modbus ASCII server		-	Possible	
		Modbus RTU server		-	Possible	
		Smart server		-	Possible	
	Repeater mode	-	Enable/disable	-	-	Stop all services when the repeater mode is set
Advanced Settings	Connection setting	Data bit	7, 8	Possible	Possible	When communicating Modbus ASCII mode, the number of data bits is 7.
		Stop bit	1, 2	Possible	Possible	
		Parity bit	NONE,ODD,EVEN	Possible	Possible	
		Parity receive error	Enable/Disable	Possible	Possible	
		Modem type	Null modem Dedicated line modem Dial up modem	Possible	Possible	
		Modem initialization	-	Possible	Possible	It can be set only in case of dial-up modem.
	Setting of time	Response waiting time	0~50 (x 100ms)	Possible	-	
		Delay time	0~255 (x 10ms)	Possible	Possible	
		Inter-character waiting time	0~255 (x 10ms)	Possible	Possible	

(1) P2P service
  (a) This service allows the Cnet I/F module to act as a client on the network.
  (b) If a event occurs, it is possible to read or write the memory of the destination station (It can operate as the XGT client and the Modbus client.).
  (c) It is used for communicating with another company's equipment that does not support XGT or Modbus protocol or transmitting and receiving a frame desired by the user.
  (d) Up to 64 P2P blocks that operate independently can be defined for each channel.

(2) Dedicated service(XGT server, Modbus ASCII server, Modbus RTU server)
  (a) This service allows PC and peripheral devices to read and write information and data without the creation of a separate program in the PLC.
  (b) The operation as the XGT server that supports the XGT protocol and the Modbus server that supports the Modbus RTU/ASCII protocol is possible.

6.1.2 P2P Setting Parameters

This is the part for setting the communication frame.

Parameter	Sub menu	Setting item	Setting range and contents		Contents
P2P	Communication Module setting	Base	0~7(0~31:XGR)		Set the module installation position
		Slot	0~11		
	P2P channel	P2P driver	User frame definition		Set the communication method
			XGT client		
			Modbus ASCII client		
			Modbus RTU client		
			LS bus client		
	P2P block	Channel	1, 2		Set the communication port
		P2P function	READ		Set data transmission and reception (SEND and RECEIVE are used in the user frame definition.)
			WRITE		
			SEND		
			RECEIVE		
		Start condition	-		Set frame operation condition (When communicating user frame definition, the starting condition can be selected only when the P2P function is SEND.)
		Command type	single		Set data transmission method
			Continuous		
		Data type	BIT		Set the data unit of the frame
			WORD		
			1 BYTE		
			2 BYTE		
			4 BYTE		
			8 BYTE		
		No. of variables	1~4		Set the number of data in the frame
		Data size	In accordance with the protocol		Set the data size in the frame
		Destination station	-		Set in case the destination station is necessary
		Destination station number	0~63		Set the station address of the destination station
		Frame	Select in case of user frame definition communication		Set the name of the bodies in the case of user frame definition communication
		Setting	-		In the case of user frame definition communication,' Contents of variable setting' item can be entered only when the fixed-sized variable or variable-sized variable for the frame body is selected.
	User frame definition	Adds Group	Group name		Set the name of frame group
			Type of frame	Send	Set transmission-related frame
				Receive	Set reception-related frame
	Frame	Edit group	Group name		Frame setting can be entered after setting the group name and frame type of the user frame definition.
		Delete group	-		
		Add frame	HEAD		
			TAIL		
			BODY		

6.1.3 Transmission Specifications

In order to use the Cnet I/F module correctly, the various specifications including the communication speed and data format on the [Basic setting] item of the registered Cnet I/F module should be set. Basic setting value is saved to the CPU module of the PLC, and this value is maintained continuously even if the power is turned off; it will not change until it is written again.

(1) Communication type

You need to check the type of Cnet I/F module you wish to apply and set the basic parameters for each channel accurately. If the communication type set as the parameter is different from the communication type of the actually installed product, the CPU module recognizes the communication type of the installed product, so the system will not operate normally.

(2) Parity bit

There are three parity bits that can be set for the Cnet I/F module, and the content of each parity bit is as shown in the following table. If you select[Allow] for the parity reception error, you can receive data even if an error occurs in the reception parity bit.

Parity	Contents	Note
None	Parity bit is not used.	
Even	Transmits 0 to the parity bit if the number of 1 in one byte is an even number	
Odd	Transmits 0 to the parity bit if the number of 1 in one byte is an odd number	

(3) Operation mode

The operation mode of each channel is specified separately, so the operation is carried out independently for each channel. Each channel operates as the server or the client.

The type of operation mode that can be selected for each channel is as follows.

Driver type	Contents	Note
P2P	The relevant port operates as the client and carries out the communication through P2P parameter setting.	Refer to P2P setting
XGT server	It supports the XGT dedicated communication and operates as the XGT server.	For dedicated service
Modbus ASCII server	Operates as the Modbus ASCII server.	
Modbus RTU server	Operates as the Modbus RTU server.	
Smart server	After analyzes the protocol automatically, act as XGT/Modbus ASCII/Modbus RTU server.	

When the XGT server or Modbus server is selected as the operation mode, the dedicated service, as well as the loader service,
will be supported at the same time.

(a) XGT server

It only supports memory read/write of the dedicated service.

(b) Modbus ASCII/RTU server

1) It is selected when it consists of the Modbus protocol, and the Cnet I/F module should operate as the server.
2) The value for mapping the memory area and XGT memory area defined in Modbus should be entered in the [Modbus setting] window.
3) For memory mapping, refer to‘9.4 Modbus server’.

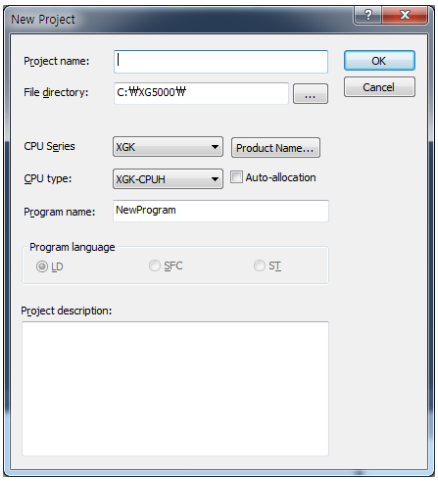
6.2 Module Register Method

In order to use the Cnet I/F module, the communication parameter should be set using XG5000, and the system setting can be carried out only when the relevant module is registered to the XG5000. The method to register the Cnet I/F module is as follows according to online and offline status.

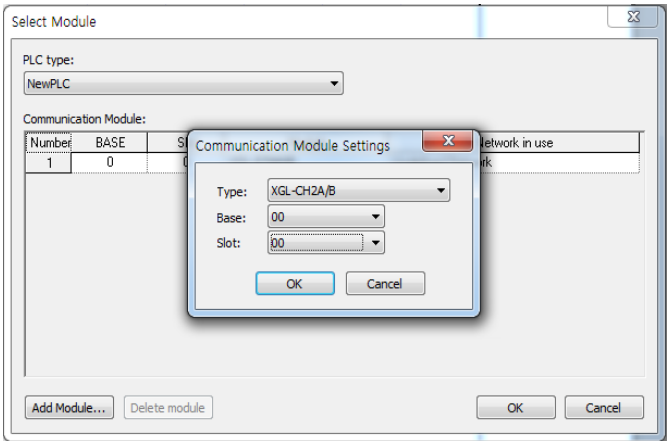
6.2. 1 Registering in Offline Status

The method to set the module and communication parameter while not connected to the PLC is as follows.

(1) Execute XG5000, select [Project] → [New project] or click the icon ( ).
(2) Enter the project name you wish to save on [Project name], select the CPU module to use, and click [OK].



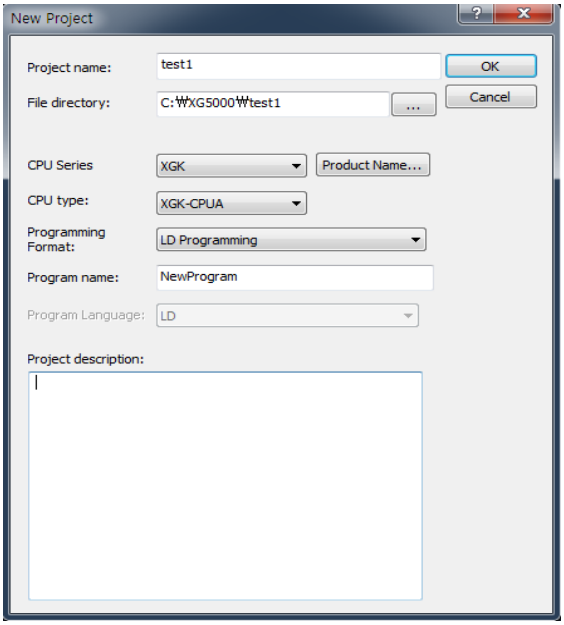
(3) In the Project window, select [Undefined Network], click the right mouse button and select [Add item]→[Communication module]. When the following window appears, click [Add module] and select the module type, base number and slot number.



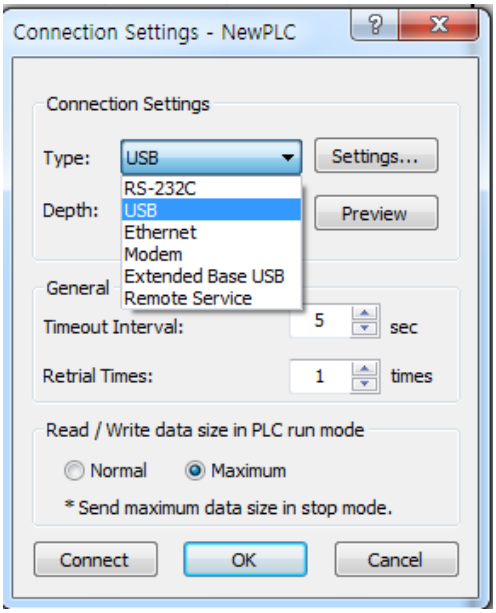
6.2. 2 Registering in Online Status

The method to set the module and communication parameter while connected to the PLC is as follows.

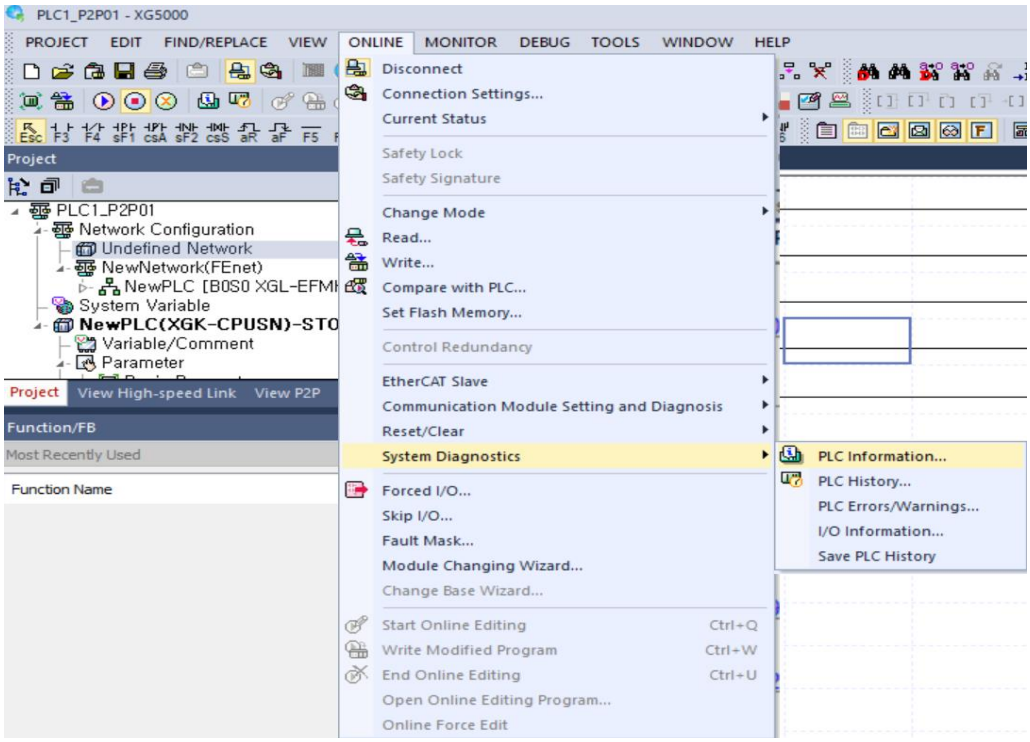
(1) As explained in 6.2.1, click [New project] and specify the project name, file location and CPU type.



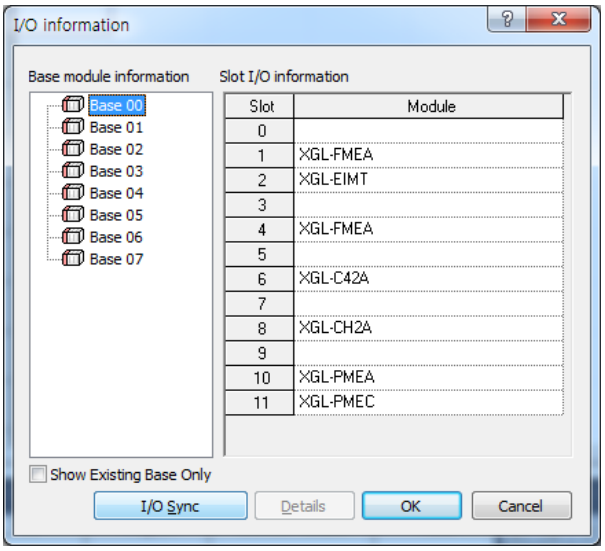
(2) If the connection to the PLC is not made properly, check the connection status and select [Online]→[Connection setting] or click the icon( ) and select the connection method. The connection method includes the method to use the RS-232C cable, the method to use the USB cable, and the method to use Ethernet and modem. For the connection step, select Local in case of connecting to PLC directly, or select Remote 1-stage or Remote 2-stage in case of connecting using the remote method. For the remote connection method, refer to 7.3.



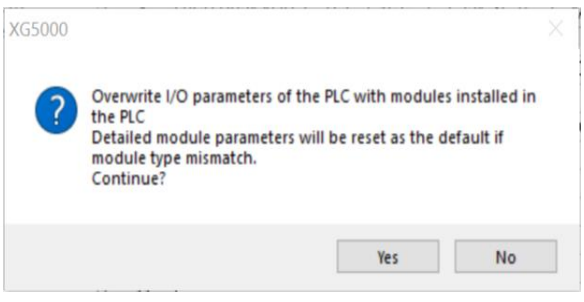
(3) When the connection is made normally, select [Online]→[System Diagnostics]→[I/O information] during the CPU module is in stop mode.



(4) Click the [I/O Sync] button.



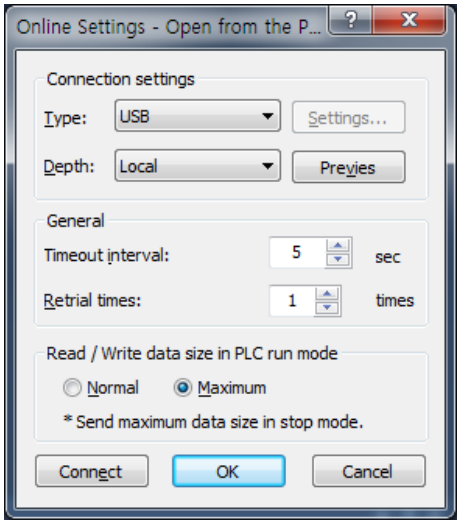
(5) Check the contents shown in the Message window, and if there is no problem click[Yes].



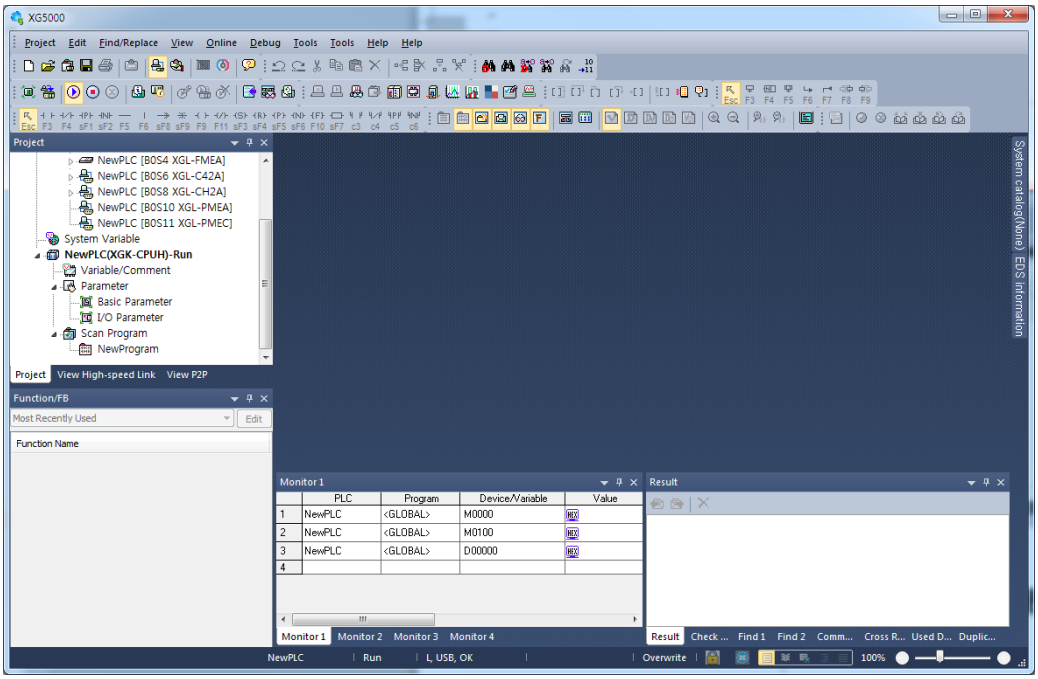
6.2.3 Reading Parameter value saved on PLC

The method to read the basic setting value of communication module and P2P setting value saved on PLC is as follows.

(1) Select [Project] → [Open from PLC].



(2) Set [Type] and [Depth] and click [Connect] or [OK].
(3) Now, you can check the basic setting value and P2P setting value saved on PLC.

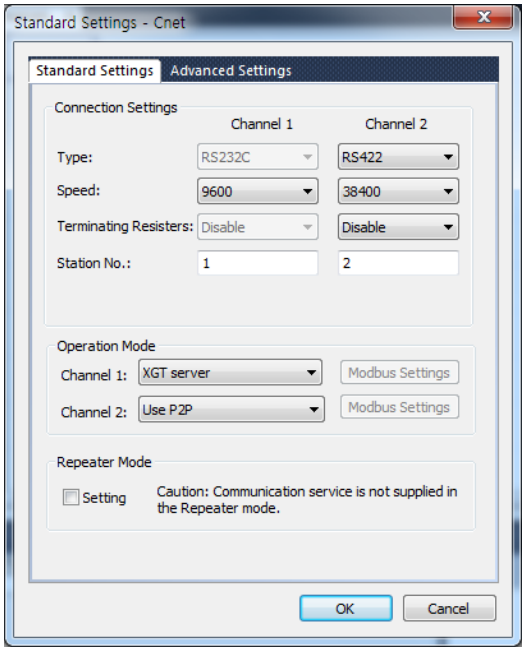


6.3 Transmission Specifications Setting Method

In order to operate the Cnet I/F module properly, the communication parameter should be set according to the applied specifications. It can be explained as follows by considering XGL-CH2A(RS232 1port, RS422 1port) installed on No. 0 base and No. 0 slot 0 as an example.

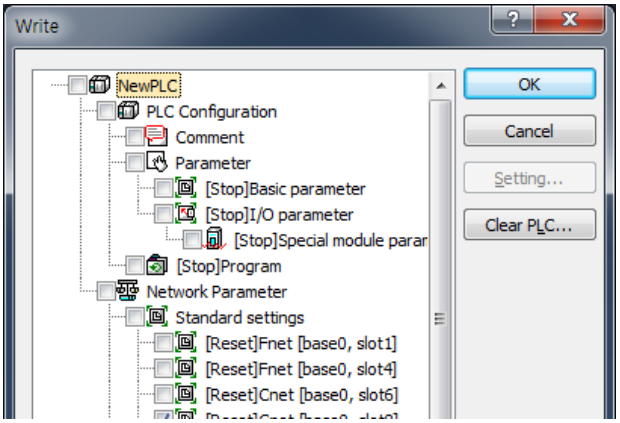
(1) Channel setting
(a) Channel 1: RS-232C, 9,600 bps, 8/1/None, null modem, XGT server, station 1
(b) Channel 2: RS-422, 38,400 bps, 8/1/Odd, null modem, use P2P, station 2

(2) Execution sequence
(a) Read I/O Information
Select [Online]→[Connect], click [I/O Sync] in [Online]→[System Diagnostics]→[I/O information] window and read the information of the module currently installed on the base.
(b) Standard settings
When you double click XGL-CH2A installed on No. 0 module, the [Standard setting] window will appear. Select the [Connection setting] item as follows.



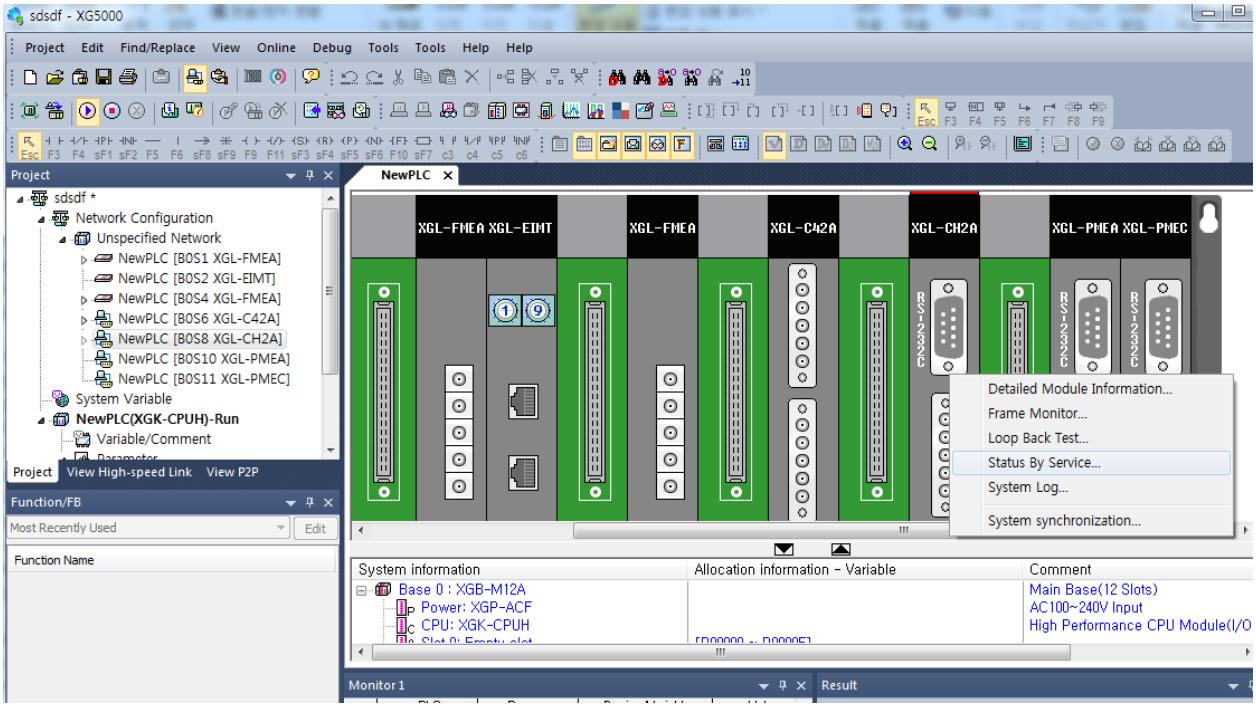
(3) Write parameter

1) Select [Online] → [Write] or click the icon ( ).
2) Check (✓)the module whose basic setting is completed and click the [OK] button.



(b) Check operation

1) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).
2) Click a communication module you wish to diagnose from the [System Diagnostics] window and click the right mouse button.
3) When the following screen appears, click [Frame Monitor] or [Status by Service] to check the operation status.



6.4 Parameter Setting Method by Service

6.4.1 Dedicated Service

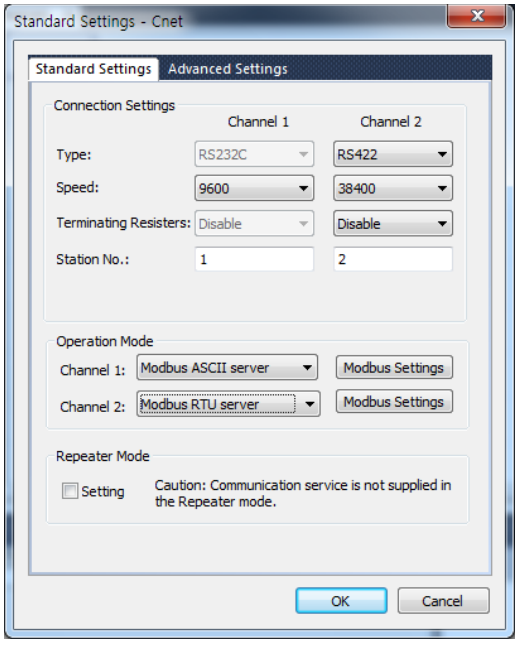
The dedicated service is function of Cnet I/F module to read or write PLC information or data using PC or an external device without a separate program in PLC. When this function is used, the Cnet I/F module operates as the server, and when PC or an external device requests for read/write memory, it responds. In order to use the dedicated service, you need to select a channel you wish to use as the server between channel 1 and channel 2. This operation mode supports the XGT server and the Modbus server, and the Modbus server supports both the RTU and ASCII types. Since each channel of the Cnet I/F module operates independently, it can be set as a different server respectively. For the method to check and diagnose the operation of dedicated service, refer to Chapter 12.

(1) XGT server

All frames used in the XGT server should not exceed 256 bytes, and a character used in all frames is configured in ASCII code. In case of using in multi drop method, the service can connect to up to 32 stations (including the client). Be careful not to use the same number again for setting the station address. The communication speed, stop bit, parity bit and data bit of all Cnet I/F modules connected to the network should be the same. The XGT server only supports XGT dedicated protocol memory read and write functions.

(2) Modbus Server

This function is used when the destination device you wish to communicate with operates as the Modbus client. It supports both RTU mode and ASCII mode of Modbus and can be defined in the operation mode of the [Standard settings] window.



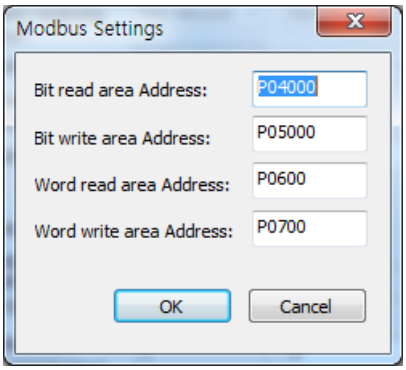
[Standard settings window of Modbus server]

The Modbus commands and the maximum number of response data supported by the Modbus RTU/ASCII driver are as shown below the following table. The opposing client device is used within the range shown in this table. For example, Read bit can be requested for up to 2000 bits, and Write bit can be requested for up to 1968 bits (When the Modbus RTU is used).

Hex	Usage	Available area	Address	Maximum response data
01	Read bit individually/continuously	Output bit	0XXXX	2000 Coils
02	Read bit individually/continuously	Input bit	1XXXX	2000 Coils
03	Read word individually/continuously	Output word	4XXXX	125 Registers
04	Read word individually/continuously	Input word	3XXXX	125 Registers
05	Write bit individually	Output bit	0XXXX	1 Coil
06	Write word individually	Output word	4XXXX	1 Register
0F	Write bit continuously	Output bit	0XXXX	1968 Coils
10	Write word continuously	Output word	4XXXX	120 Registers

[Modbus command code]

The area corresponding to the command code shown in the table above should be set to the XGT PLC memory. When you select the Modbus ASCII server or Modbus RTU server as the operation mode from the [Basic setting] window, the [Modbus setting] button will be enabled. When you click this button, the [Modbus setting] window will be displayed as shown in the figure below. Set the start address from this window.



[Modbus server memory setting]

The contents of each setting item are as follows.

Item	Contents	Note
Start address of read bit area	Address of XGT that corresponds to the bit input area	Bit address
Start address of write bit area	Address of XGT that corresponds to the bit output area	Bit address
Start address of read word area	Address of XGT that corresponds to the word input area	Word address
Start address of write word area	Address of XGT that corresponds to the word output area	Word address

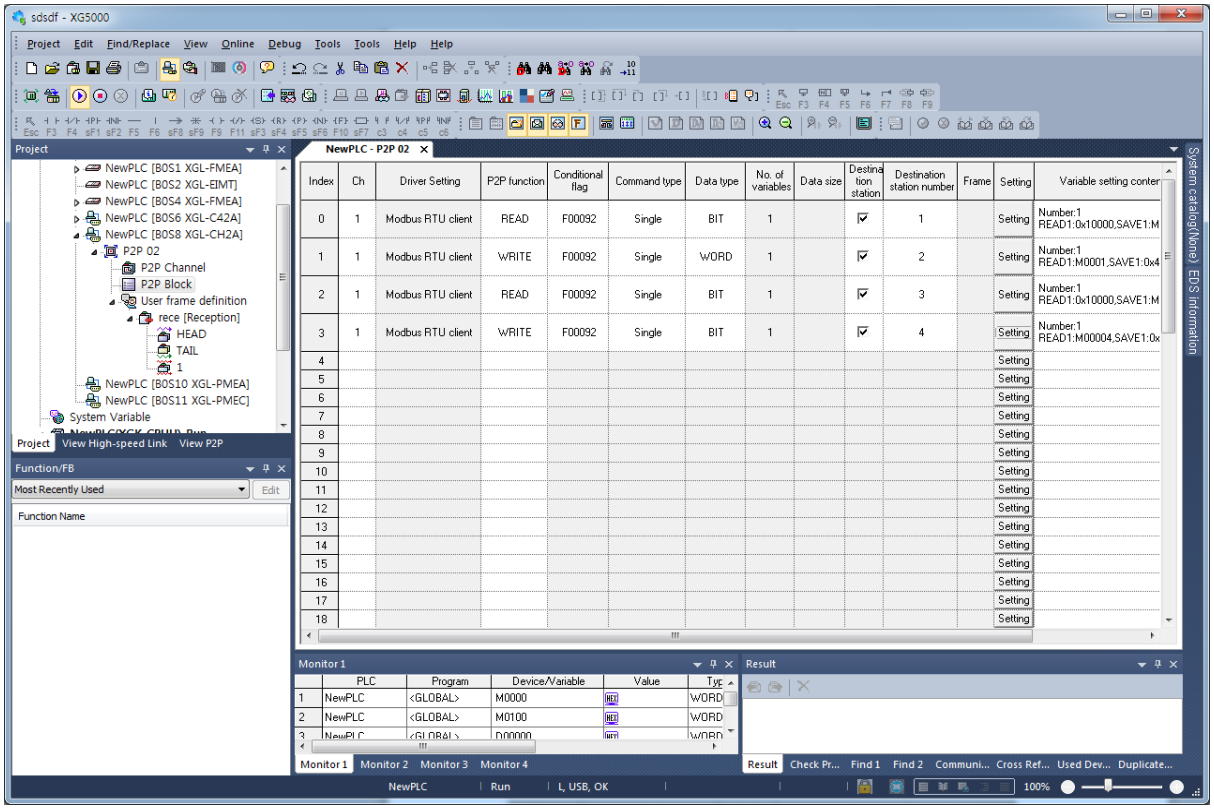
[Meaning of Modbus area]

(a) The address value set for each item is the start address of the relevant area.
(b) The above figure shows that the start address of the read bit area is assigned, starting from the 0th bit of M0000 word and the start area of the write word area is assigned, starting from M300.
(c) The input value of the start address should be in a valid range, such as M and P.
(d) Since the Modbus address is 1 ~ 9999 (decimal number), the size of bit I/O area will be 9999/8 =1249.875 (in other words, 1249, bytes should be an integer) bytes.
(e) The size of word I/O area is 9999*2 = 19998 bytes.
(f) If the CPU is XGK series, the read/write bit address is word+bit.
(g) Example in case the 1st bit of the second word in the read area is the start address: 0x10020
(h) If the CPU is XGI series, the read/write bit address is bit.
(i) Example in case the 10th bit in the read area is the start address: 0x10009

6.4.2 P2P Service

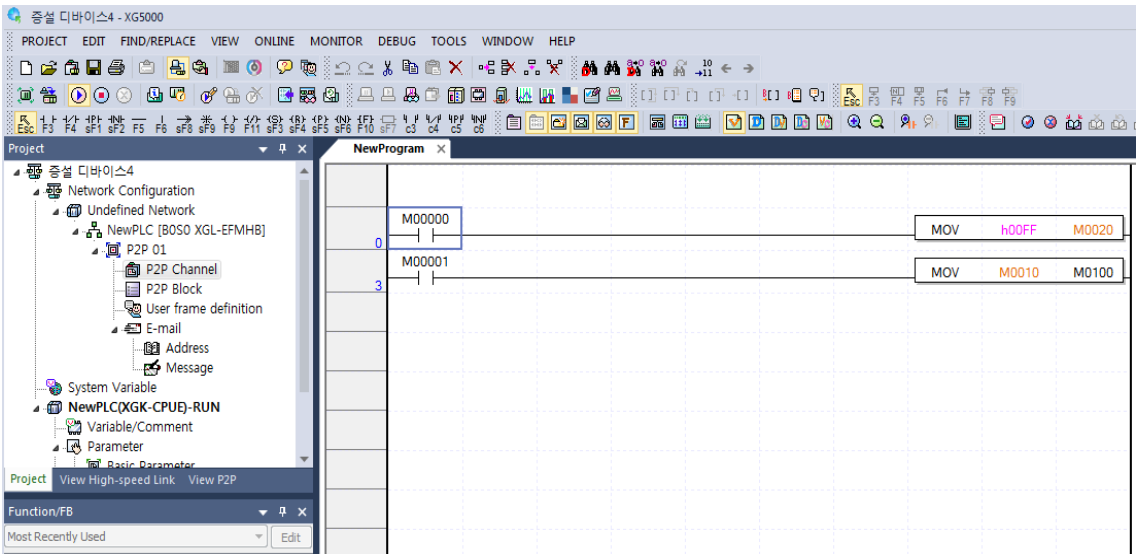
The P2P service is the function to operate the Cnet I/F module as the client. In GLOFA series and MASTER-K series, the parameters were set using the command block, but in XGT series, the parameters can be set simply from the [P2P parameter setting] window. The P2P commands that can be used in the Cnet I/F module are four commands including Read, Write, Send and Receive. Among these commands, Send and Receive are used for writing a frame using [User frame definition], and Read and Write are used in case of operating as [XGT dedicated client] or [Modbus RTU/ASCII client].

Registering and editing the P2P service can be done in XG5000 and up to 8 P2P parameters can be set. Each P2P parameter consists of up to 64 P2P blocks. The below figure is an example of setting parameters in the [P2P parameter setting] window of the XG5000.



(1) P2P parameter configuration

In order to use the P2P service, each parameter should be set in the P2P parameter window. The P2P parameter consists of three pieces of information as shown below.



(a) P2P channel

1) Define a communication protocol for carrying out the P2P service.
2) Supported protocols: XGT client, Modbus ASCII client, Modbus RTU client, LS bus client, user frame definition communication
3) Set the parameter for each channel independently. (It applies only when 'Use P2P' is selected for the operation mode in the [Standard settings] window)

(b) P2P block

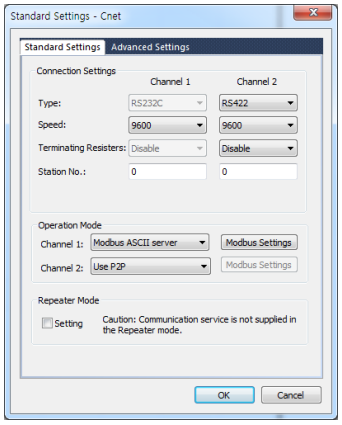
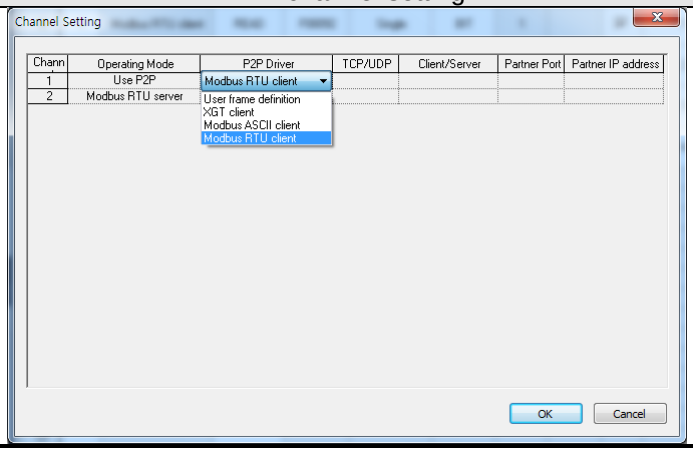
Set 64 P2P blocks that operate independently

(c) User frame definition

Register a parameter for the user frame definition communication.

(2) P2P channel setting

The Cnet I/F module provides two communication channels that operate independently, and the to the driver type for carrying out the P2P service can be defined for each channel. However, in order for the P2P channel to operate as the client,' Use P2P' should be selected for the operation mode in the [Standard setting] window. The P2P channel setting according to the operation mode is as follows.

Operation mode	P2P channel setting
	

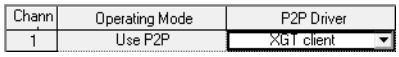
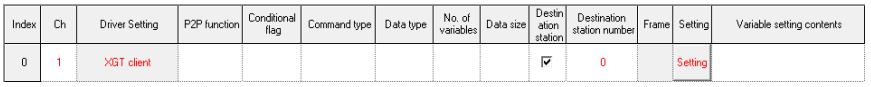
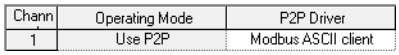
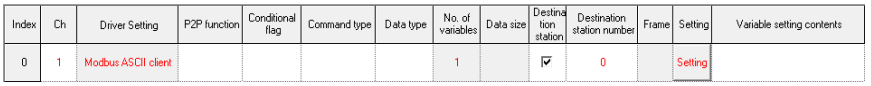
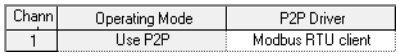
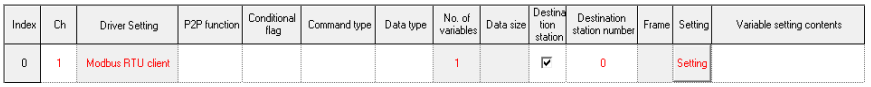
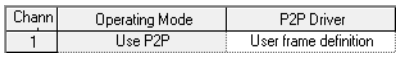
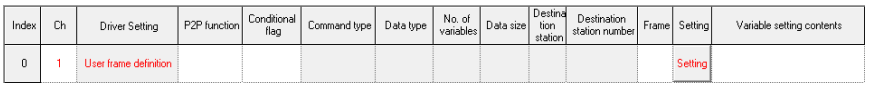
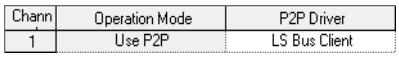
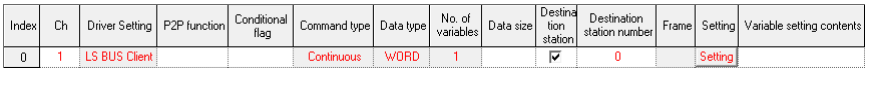
The drivers that can be selected when' Use P2P' is selected for the operation mode are as follows.

Driver	Usage
User frame definition	It is used when it sends/receives the desired user frame definition.
XGT client	It is used for reading or writing XGT CPU memory.
LS bus client	It is used for the dedicated communication with the LS inverter
Modbus ASCII client	It is used for operating as the Modbus client and used as the ASCII mode.
Modbus RTU client	It is used for operating as the Modbus client and used as the RTU mode.

When the XGT or Modbus is selected for the P2P driver, the user frame definition cannot be used.

(3) P2P block setting

When the P2P block of the relevant parameter is selected in the [P2P Channel setting] window, the [P2P block setting] window will be displayed. The block setting window for all protocols is as shown in the figure below, and a different area which is enabled according to the protocol selected from P2P channel is displayed.

P2P driver	P2P block setting
	
	
	
	
	

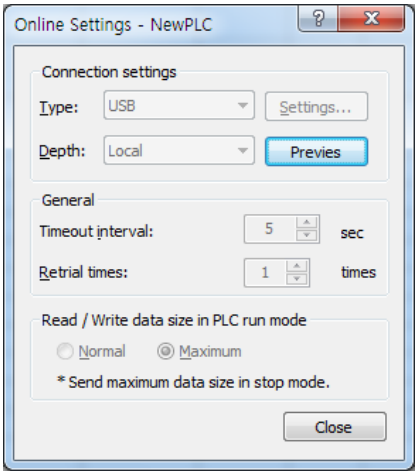
6.5 Operation Start

The operation mode of the Cnet I/F module can be divided into the P2P service and the server function. The method to use each mode is as follows.

6.5.1 When Operating as the server

(1) Connection setting

(a) Select [Online] → [Connection Settings] or click the icon ( ).
(b) Set the connection option that fits the user environment and click [Connect].



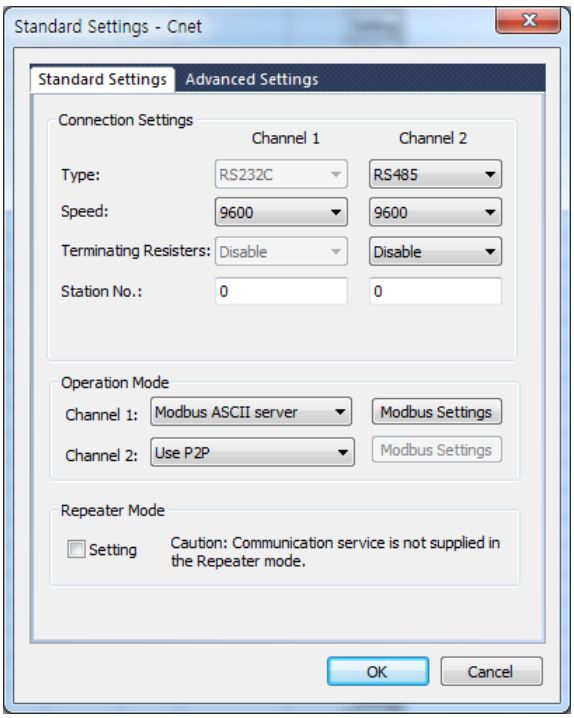
(2) Read I/O Information

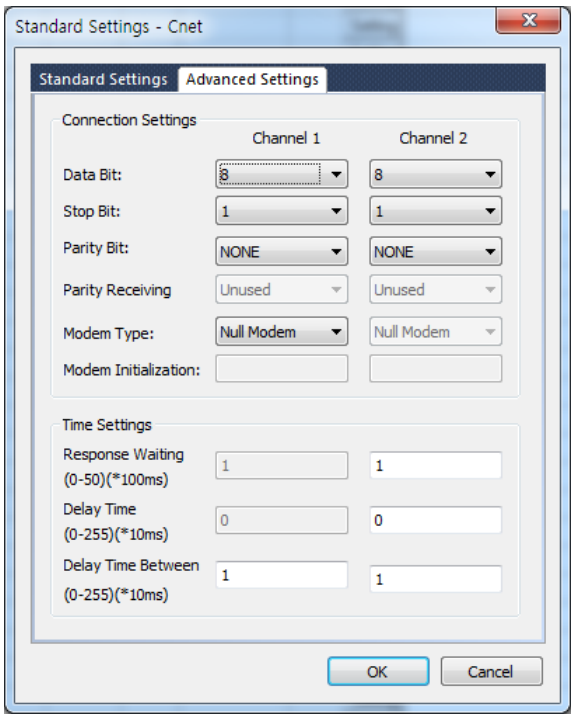
Click [I/O Sync] from the [Online] → [System Diagnostics] → [I/O information] window and read the information from the module currently installed on the base.

(3) Standard settings

(a) In the Project window, open the [Standard setting] window by double clicking the relevant Cnet I/F module, and set the communication type, communication speed, modem type, data bit, stop bit and station address from the connection setting menu.
(b) The modem can be initialized only when the modem type is the dial-up modem.
(c) The delay time can be set only for RS-422/485 and the response waiting time can be set only when P2P is used as the operation mode for RS-422/485 communication.
(d) The terminating resistance setting and repeater mode can be used in the B type Cnet I/F module.

* When using as a Modbus ASCII server, the data bit is 7.





(4) Selecting the operation mode

(a) Select the operation mode of using server.

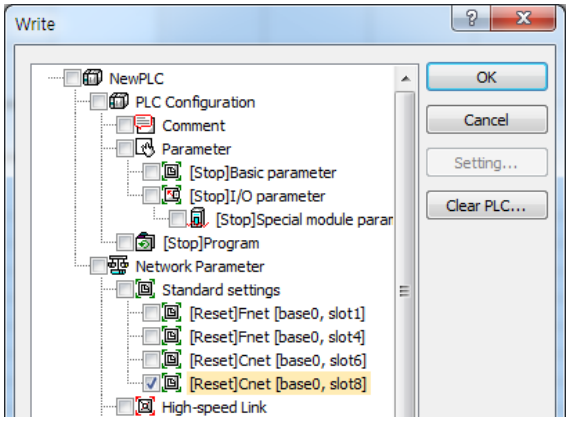
(b) The Cnet I/F module supports the XGT server, Modbus ASCII server and Modbus RTU server.

(5) Write parameter

(a) Select [Online] → [Write] or click the icon ( ).

(b) Check (✓) the module with the default settings and click [OK].

(c) Click the [OK] button, and after writing the parameter, reset each relevant module.

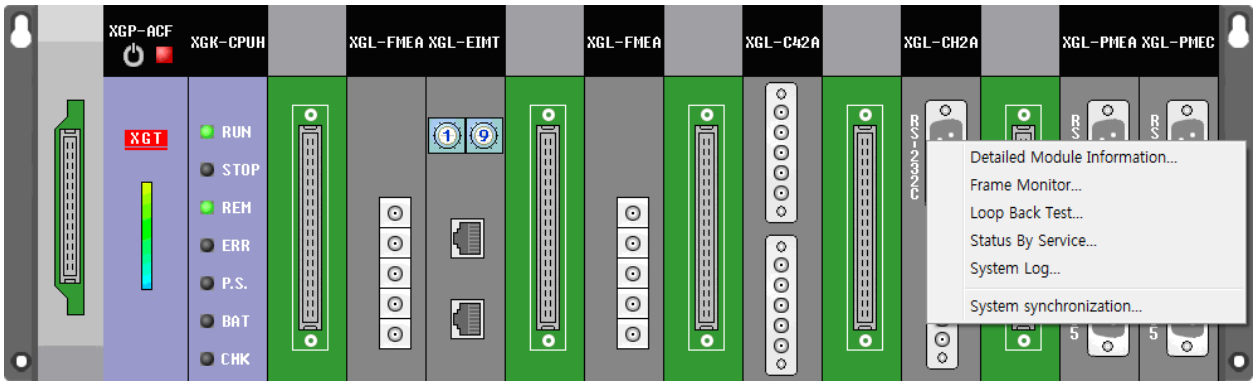


(6) Check operation

(a) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).

(b) Click the communication module whose status you want to diagnose and press the right mouse button.

(c) When the following screen appears, click [Frame Monitor] or [Status by Diagnosis] to check the operation status.



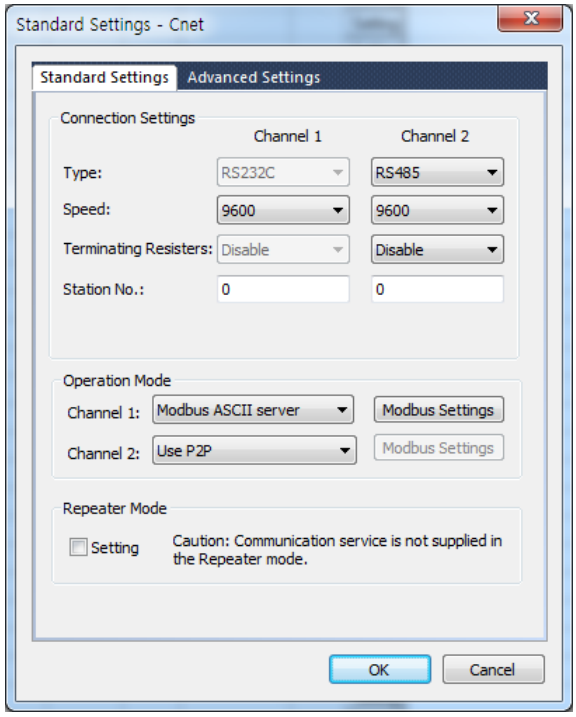
6.5.2 When operating as a P2P service(client)

(1) Standard settings

(a) 6.6.1 The contents of (1)~(3) in section 1 are the same.

* Set 7 for the data bit in case of operating as the Modbus ASCII client.

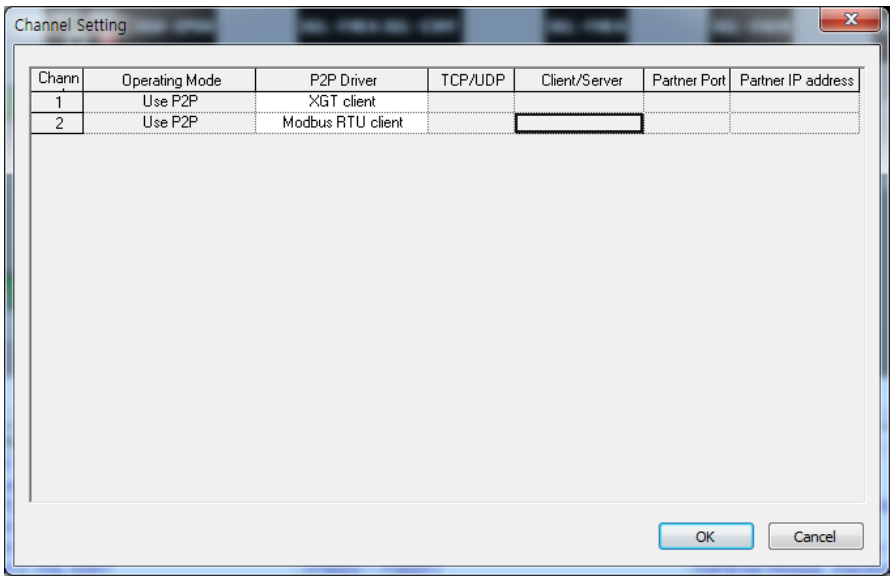
(b) Select' Use P2P' for the operation mode.



(2) P2P channel setting

(a) In the [P2P Channel setting] window, double click P2P channel and select the protocol for each channel.

(b) The user frame definition, XGT client, LS bus client, Modbus RTU client and Modbus ASCII client are supported for the P2P driver.

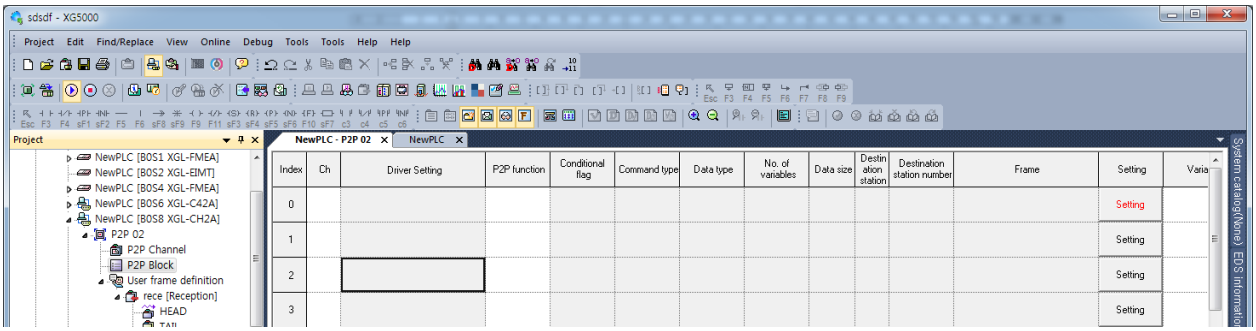


(3) P2P block setting

(a) Depending on the type of client selected in the channel setting, the P2P block setting value will be activated differently.

(b) Write the content of the enabled cell according to the protocol type.

* The user frame definition can be used only when the frame is written in the user frame definition.

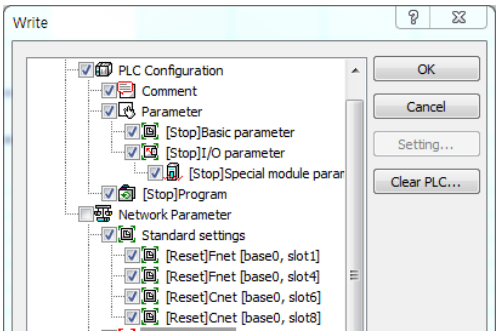


(4) Write parameter

(a) Select [Online] → [Write] or click the icon ( ).

(b) Check (✓) the module after completing settings and click [OK].

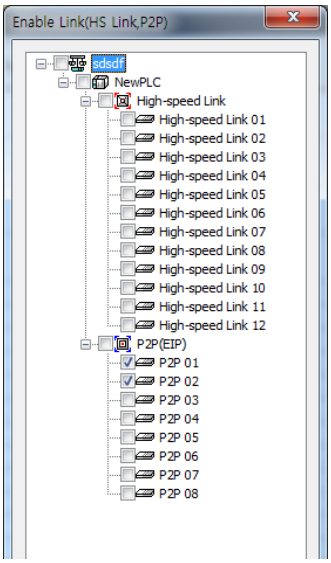
(c) Click the [OK] button, and after writing the parameter, reset each the module.



(5) Link enable

(a) Select [Online] → [Communication module settings and Diagnosis] → [Enable Link/Services] or click the icon ( )

(b) Check (✓) the configured P2P and click [Write].



1) Link enable through a flag

The following is the method to enable the link using a flag. In order to use this function, the software version of XG5000 and CPU module should satisfy the following condition.

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

2) List of flags related to link enable

a) XGR

Flag	Data type	Device	Contents
_HS_ENABLE_STATE	ARRAY[0..11] OF BOOL	%FX19040	HS enable/disable current status
_HS_REQ	ARRAY[0..11] OF BOOL	%FX31520	HS enable/disable request
_HS_REQ_NUM	ARRAY[0..11] OF BOOL	%FX31536	Setting enable/disable for high speed link
_P2P_ENABLE_STATE	ARRAY[0..7] OF BOOL	%FX19072	P2P enable/disable current status
_P2P_REQ	ARRAY[0..7] OF BOOL	%FX31552	P2P enable/disable request
_P2P_REQ_NUM	ARRAY[0..7] OF BOOL	%FX31568	Setting P2P enable/disable

b) XGI

Flag	Data type	Device	Contents
_HS_ENABLE_STATE	ARRAY[0..11] OF BOOL	%FX15840	HS enable/disable current status
_HS_REQ	ARRAY[0..11] OF BOOL	%FX16480	HS enable/disable request
_HS_REQ_NUM	ARRAY[0..11] OF BOOL	%FX16496	Setting enable/disable for high speed link
_P2P_ENABLE_STATE	ARRAY[0..7] OF BOOL	%FX15872	P2P enable/disable current status
_P2P_REQ	ARRAY[0..7] OF BOOL	%FX16512	P2P enable/disable request
_P2P_REQ_NUM	ARRAY[0..7] OF BOOL	%FX16528	Setting P2P enable/disable

c) XGK

Flag	Data type	Device	Contents
_HS1_ENABLE_STATE	BIT	F09600	Current enable/disable status of high speed link NO. 1
_HS2_ENABLE_STATE	BIT	F09601	Current enable/disable status of high speed link NO. 2
_HS3_ENABLE_STATE	BIT	F09602	Current enable/disable status of high speed link NO. 3
_HS4_ENABLE_STATE	BIT	F09603	Current enable/disable status of high speed link NO. 4
_HS5_ENABLE_STATE	BIT	F09604	Current enable/disable status of high speed link NO. 5
_HS6_ENABLE_STATE	BIT	F09605	Current enable/disable status of high speed link NO. 6
_HS7_ENABLE_STATE	BIT	F09606	Current enable/disable status of high speed link NO. 7
_HS8_ENABLE_STATE	BIT	F09607	Current enable/disable status of high speed link NO. 8
_HS9_ENABLE_STATE	BIT	F09608	Current enable/disable status of high speed link NO. 9
_HS10_ENABLE_STATE	BIT	F09609	Current enable/disable status of high speed link NO. 10
_HS11_ENABLE_STATE	BIT	F0960A	Current enable/disable status of high speed link NO. 11
_HS12_ENABLE_STATE	BIT	F0960B	Current enable/disable status of high speed link NO. 12
_HS1_REQ	BIT	F10300	Request enable/disable for high speed link No. 1

Flag	Data type	Device	Contents
_HS2_REQ	BIT	F10301	Request enable/disable for high speed link No. 2
_HS3_REQ	BIT	F10302	Request enable/disable for high speed link No. 3
_HS4_REQ	BIT	F10303	Request enable/disable for high speed link No. 4
_HS5_REQ	BIT	F10304	Request enable/disable for high speed link No. 5
_HS6_REQ	BIT	F10305	Request enable/disable for high speed link No. 6
_HS7_REQ	BIT	F10306	Request enable/disable for high speed link No. 7
_HS8_REQ	BIT	F10307	Request enable/disable for high speed link No. 8
_HS9_REQ	BIT	F10308	Request enable/disable for high speed link No. 9
_HS10_REQ	BIT	F10309	Request enable/disable for high speed link No. 10
_HS11_REQ	BIT	F1030A	Request enable/disable for high speed link No. 11
_HS12_REQ	BIT	F1030B	Request enable/disable for high speed link No. 12
_HS1_REQ_NUM	BIT	F10310	Set enable/disable for high speed link No. 1
_HS2_REQ_NUM	BIT	F10311	Set enable/disable for high speed link No. 2
_HS3_REQ_NUM	BIT	F10312	Set enable/disable for high speed link No. 3
_HS4_REQ_NUM	BIT	F10313	Set enable/disable for high speed link No. 4
_HS5_REQ_NUM	BIT	F10314	Set enable/disable for high speed link No. 5
_HS6_REQ_NUM	BIT	F10315	Set enable/disable for high speed link No. 6
_HS7_REQ_NUM	BIT	F10316	Set enable/disable for high speed link No. 7
_HS8_REQ_NUM	BIT	F10317	Set enable/disable for high speed link No. 8
_HS9_REQ_NUM	BIT	F10318	Set enable/disable for high speed link No. 9
_HS10_REQ_NUM	BIT	F10319	Set enable/disable for high speed link No. 10
_HS11_REQ_NUM	BIT	F1031A	Set enable/disable for high speed link No. 11
_HS12_REQ_NUM	BIT	F1031B	Set enable/disable for high speed link No. 12
_P2P1_ENABLE_STATE	BIT	F09620	P2P1 enable/disable current status
_P2P2_ENABLE_STATE	BIT	F09621	P2P2 enable/disable current status
_P2P3_ENABLE_STATE	BIT	F09622	P2P3 enable/disable current status
_P2P4_ENABLE_STATE	BIT	F09623	P2P4 enable/disable current status
_P2P5_ENABLE_STATE	BIT	F09624	P2P5 enable/disable current status
_P2P6_ENABLE_STATE	BIT	F09625	P2P6 enable/disable current status
_P2P7_ENABLE_STATE	BIT	F09626	P2P7 enable/disable current status
_P2P8_ENABLE_STATE	BIT	F09627	P2P8 enable/disable current status
_P2P1_REQ	BIT	F10320	Request enable/disable for P2P No. 1
_P2P2_REQ	BIT	F10321	Request enable/disable for P2P No. 2
_P2P3_REQ	BIT	F10322	Request enable/disable for P2P No. 3
_P2P4_REQ	BIT	F10323	Request enable/disable for P2P No. 4
_P2P5_REQ	BIT	F10324	Request enable/disable for P2P No. 5
_P2P6_REQ	BIT	F10325	Request enable/disable for P2P No. 6
_P2P7_REQ	BIT	F10326	Request enable/disable for P2P No. 7
_P2P8_REQ	BIT	F10327	Request enable/disable for P2P No. 8
_P2P1_REQ_NUM	BIT	F10330	Set enable/disable for P2P No. 1
_P2P2_REQ_NUM	BIT	F10331	Set enable/disable for P2P No. 2
_P2P3_REQ_NUM	BIT	F10332	Set enable/disable for P2P No. 3
_P2P4_REQ_NUM	BIT	F10333	Set enable/disable for P2P No. 4
_P2P5_REQ_NUM	BIT	F10334	Set enable/disable for P2P No. 5
_P2P6_REQ_NUM	BIT	F10335	Set enable/disable for P2P No. 6
_P2P7_REQ_NUM	BIT	F10336	Set enable/disable for P2P No. 7
_P2P8_REQ_NUM	BIT	F10337	Set enable/disable for P2P No. 8

3) Link enable method

Set On for high speed link/P2P enable/disable setting flag → high speed link/P2P enable/disable request flag On

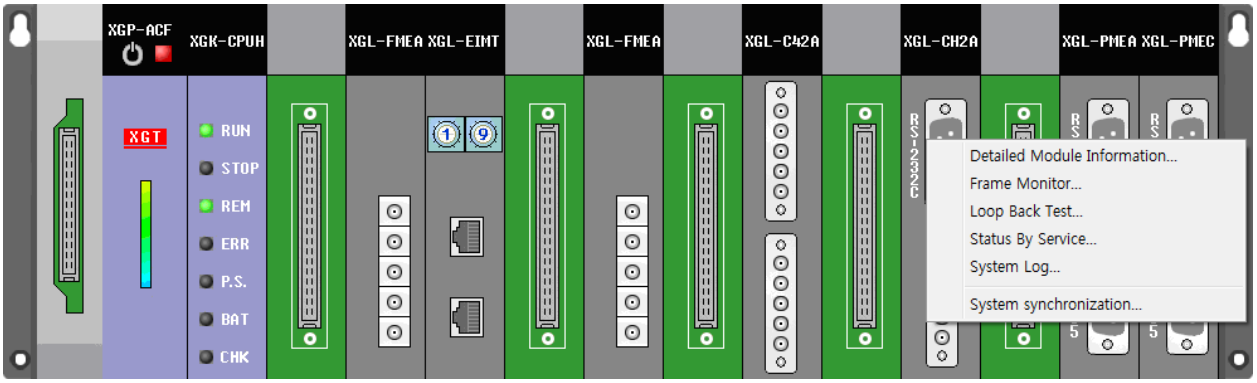
4) Link disable method
   Set Off for high speed link/P2P enable/disable setting flag → high speed link/P2P enable/disable request flag On
5) The enable/disable status of the relevant link can be monitored through current Enable/disable status flag.

(6) Check operation

(a) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).

(b) Click a communication module whose status you wish to diagnose and click the right mouse button.

(c) When the following screen appears, click [Frame Monitor] or [Status by Service] to check the operation status.



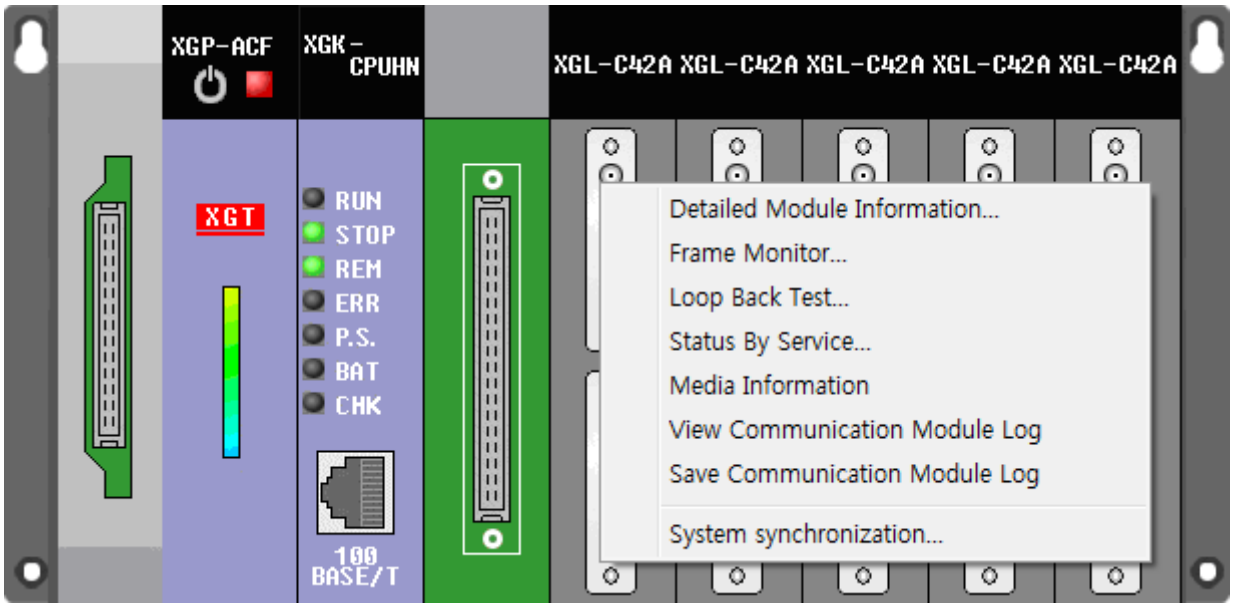
6.6 XG5000 Diagnosis Function

6.6.1 Type of Diagnosis Function

Check the system and network status using the diagnosis function of the XG5000. Main items that can be diagnosed are as follows.

- CPU status
- Communication Module Information
- Frame monitor
- Loopback test
- Status By Service
- Media information(Cnet O/S V5.0 or higher)

(1) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).
(2) Click a module whose status you wish to diagnose and click the right mouse button.
(3) When the following screen appears, click [Loopback test] or [Status by Service] to check the operation status.



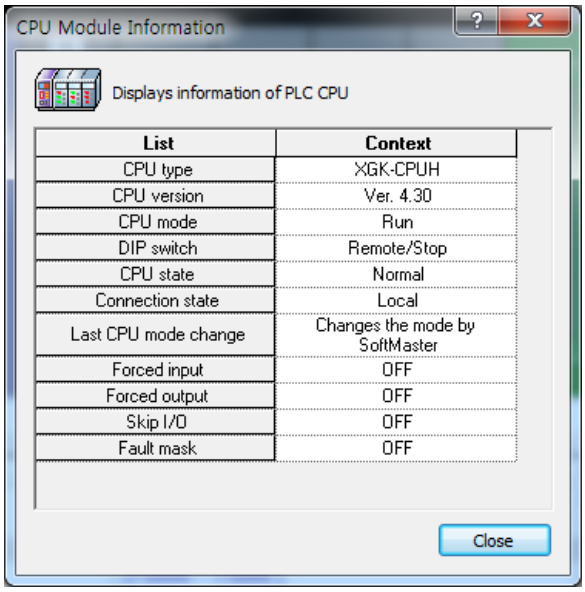
6.6.2 Checking CPU Status

(1) CPU module information

(a) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).

(b) Click the CPU module and click the right mouse button.

(c) When you click [CPU module information], the screen where you can check the status of CPU module will be displayed as follows.



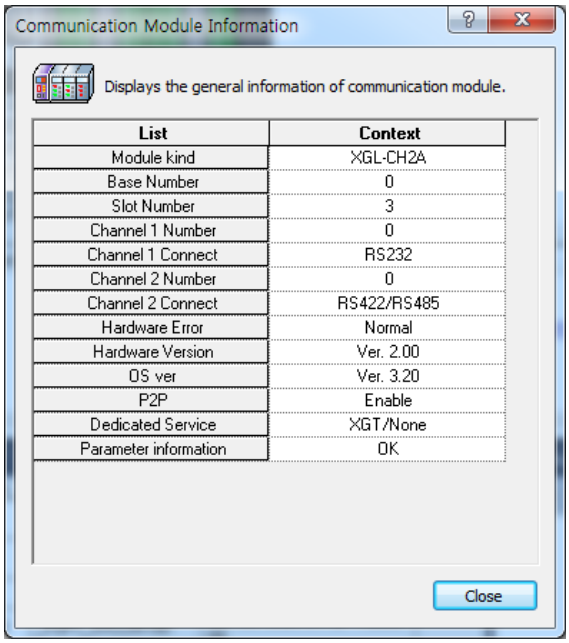
6.6.3 Communication Module Information

(1) Communication Module Information

(a) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).

(b) Click the Cnet I/F module and click the right mouse button.

(c) When you click [Communication module information], the screen where you can check the status of communication module will be displayed as follows.



(2) Contents for each communication module information item

Item			Content
Standard information	Base No.		Indicate the base information of the communication module currently being diagnosed.
	Slot No.		Indicate the slot number of the communication module currently being diagnosed.
	Module type		Type of communication module which is being diagnosed
Link information	Station No		Station address of the relevant channel used in the dedicated service and P2P
	Selection of option		Communication type(RS-232C, RS-422) information
Hardware/software information	Hardware version		Hardware version of communication module
	Hardware status		Whether the hardware of the communication module is normal or not
	Software version		O/S version of communication module
RUN mode/additional information	RUN mode		Display service information carried out among dedicated service and P2P
	Additional information	P2P	Display enable or disable
		Dedicated service	Display the type of driver operating as the server
		PADT	Display whether remote 1-stage or 2-stage connection
System parameter setting information			Information for confirming whether basic communication parameters have been downloaded or not. Indicates standard communication parameter error information

6.6.4 Frame Monitor

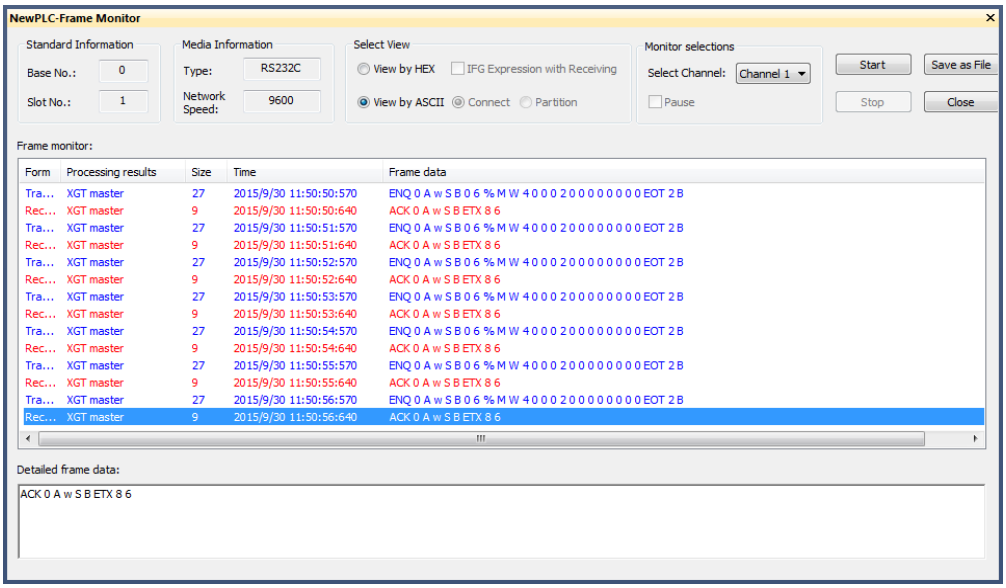
Check whether a frame transmitted or received through Cnet I/F module is normal or not by using the frame monitor of XG5000.

(1) Frame monitor

(a) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).

(b) Click the Cnet I/F module and click the right mouse button.

(c) When you click [Frame monitor], the screen where you can monitor the communication status will be displayed as follows.

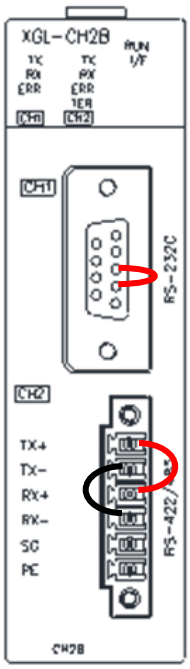


(2) Detailed contents of frame monitor

Item		Contents
Standard information	Base No.	Indicate the base information of the communication module currently being diagnosed.
	Slot No.	Indicate the slot number of the communication module currently being diagnosed.
Media information	Communication type	Communication type of the channel which is being monitored
	Communication speed	Communication speed of the channel which is being monitored
Select view	View as HEX	Displays frame data in Hex value
	View as ASCII	Displays frame data in ASCII value
	View IFG during reception (connect)	If the reception frame has been received in multiple parts, displays the time interval between frames in 0.1ms and view on one line.
	View IFG during reception (Split)	If the reception frame has been received in multiple parts, displays the time interval between frames in 0.1ms and view as the split frame unit.
Monitor options	Channel selection	Select a channel you wish to Monitoring
Frame monitor window	Type	Indicates the transmitted and received frames
	Process result	Indicates the protocol type 1) XGT server 2) XGT client 3) Modbus server 4) Modbus client 5) User frame definition 6) Unknown: Frame that cannot be processed
	Size	Length of monitored frame
	Time	Indicates the time of transmission/reception
	Frame data	Indicates the data of transmitted/received frame
File save		Save the frame monitoring contents to an Excel file format
Start		Start frame monitoring
Stop		Stop monitoring

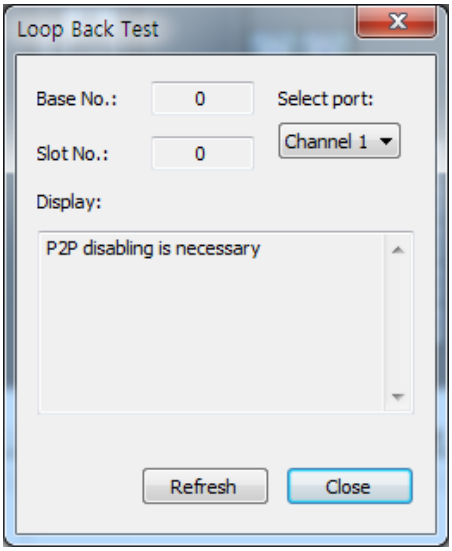
6.6.5 Loopback Test

(1) Prior preparation
  (a) Be sure to set the server operation mode for the relevant module.
  (b) Disable the P2P link enable of the relevant module (uncheck).
  (c) Wire according to each communication port as shown in the figure below.
    1) RS-232C communication: Connect No. 2 and No. 3 pin of the port.
    2) RS-422 communication: connect the TX+ and RX+ pins and the TX- and RX- pins of the port.



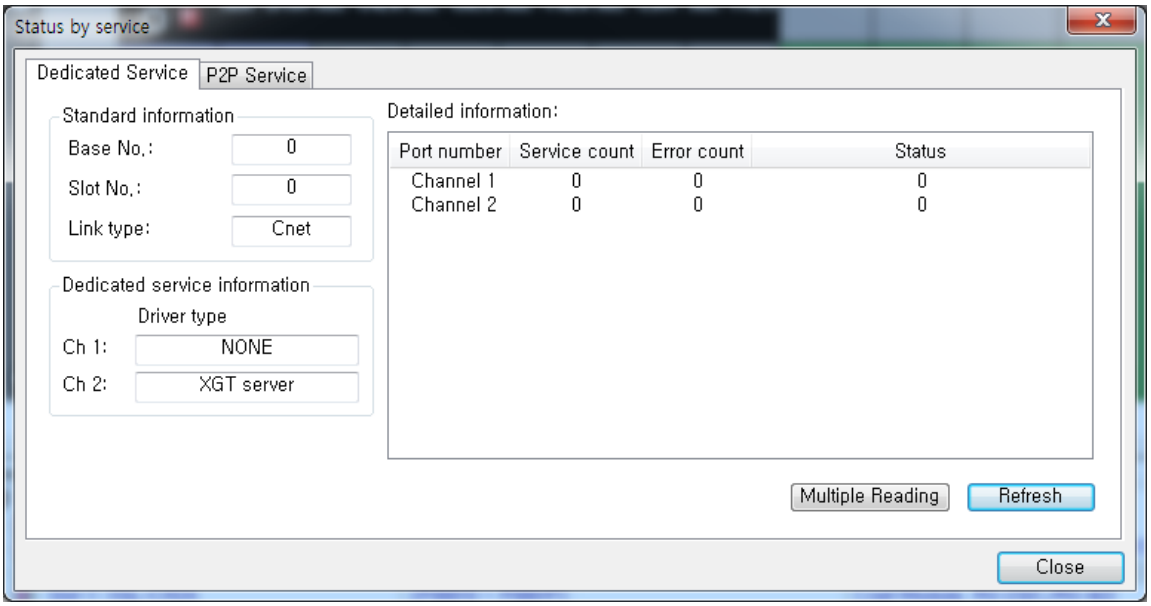
<XGL-CH2B>

(2) Test method
  (a) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).
  (b) Click the Cnet I/F module and click the right mouse button.
  (c) When you click [Loop-back test], the following screen will be displayed. Select a channel you wish to test and click [Redo].

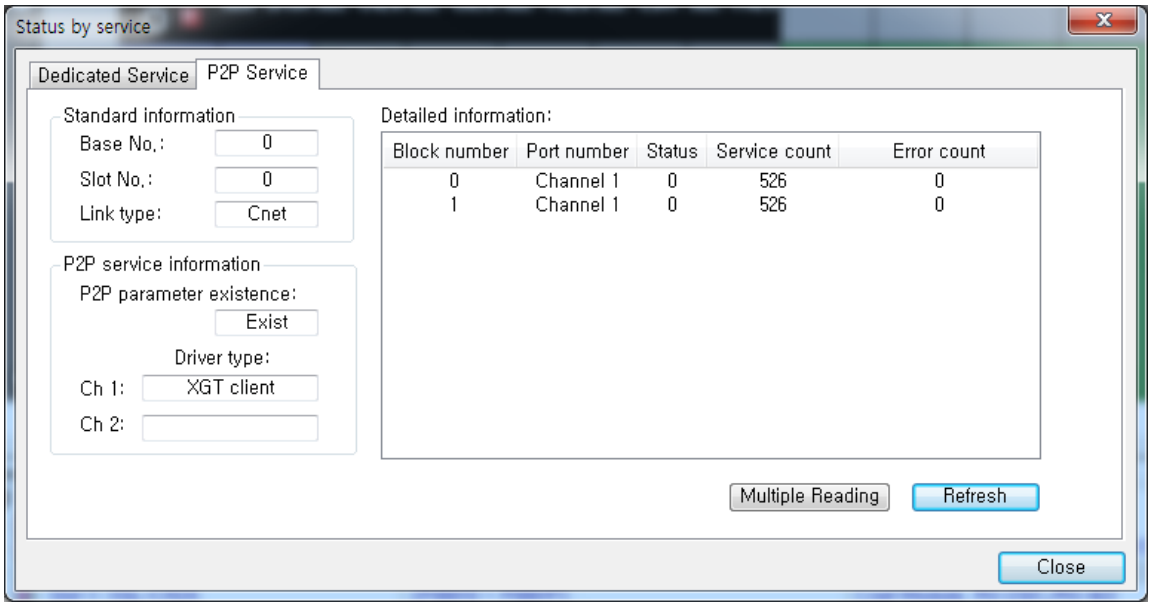


6.6.6 Status by Service

(1) Dedicated service
(a) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).
(b) Click Cnet I/F module and click the right mouse button.
(c) Click [Status by service], and when the following screen is displayed, select [Dedicated service].
(d) Click [Multiple Reading] and check Status by Service.



(2) P2P service
(a) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).
(b) Click Cnet I/F module and click the right mouse button.
(c) Click [Status by service], and when the following screen is displayed, select [P2P service].
(d) Click [Multiple Reading] and check the status of each service.



(3) Detailed contents of each service

Classification	Item		Contents
Dedicated service	Standard information	Base No.	Base position of the relevant module that uses the dedicated service
		Slot No.	Slot position of the relevant module that uses the dedicated service
		Module types	Type of communication module which is being used
	Dedicated service information		Indicates the type of driver used for each channel
	Detailed information window	Port number	Displaying the channel number
		Service count	Displays the number of dedicated service communication
		Error count	Displays the number of errors that occurred during dedicated service communication
		Status	Indicates the communication status of the dedicated service
P2P service	Standard information	Base No.	Base position of the relevant module that uses the dedicated service
		Slot No.	Slot position of the relevant module that uses the dedicated service
		Module type	Type of communication module which is being used
	P2P service information	Status of P2P parameter existence	Indicates whether the P2P parameter has been downloaded or not
		Driver type	P2P driver setting information for each port XGT/Modbus/user frame definition available
	Detailed information	Block No.	Available range 0 ~ 63 Displays only a registered block that is operating
		Port number	Displaying the channel number
		Status	Indicates the information regarding the service execution status by block
		Service count	Indicates the number of executions for each block from the time when the P2P service is executed
		Error count	Displays the number of errors occurring during service
Multiple reading/ Refresh	Continuous reading		Checks P2P service status information every 1 second
	Refresh		Checks the P2P service status information at the selected time

(4) Error according to the status code by service

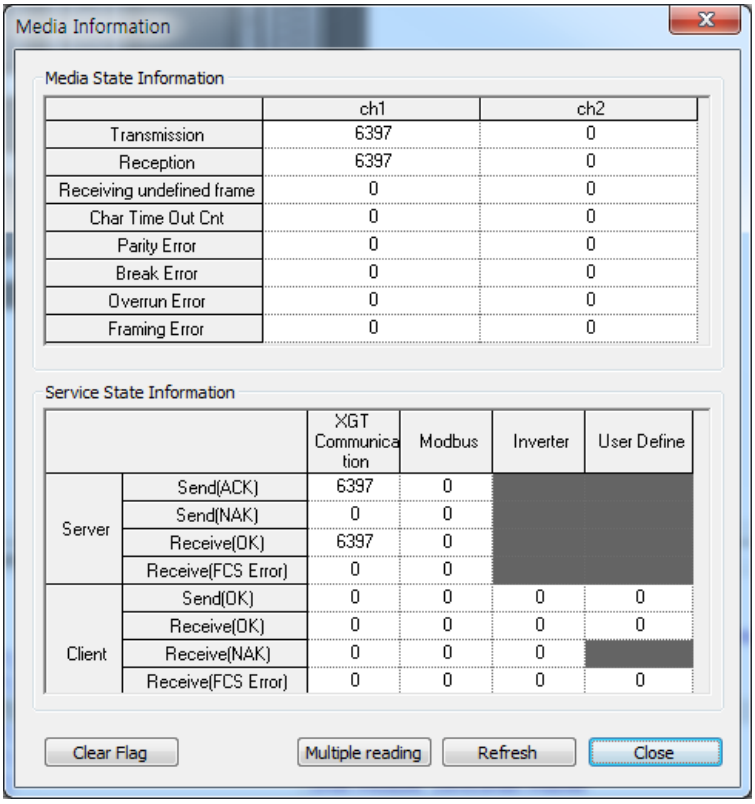
It is used for identifying the communication status of the Cnet I/F module.

Dedicated service		P2P service	
Status	Contents	Status	Contents
0	Normal communication	0	Normal communication
1	Receive frame header error (there is no ACK/NAK)	4	Max. station setting error(When set more than 31 stations have been set)
2	Receive frame tail error.(there is no tail)	5	Time out
3	Reception frame BCC error	FFFE	1. Modbus address error 2. If a command other than 2.Read/Write is used
9	Station number of RX frame is different with self-station number (Self station number = 0)	-	
0A	If no response is received from CPU		
0B	RX frame size exceeds the Modbus max. frame size		
0C	If the received frame is not Modbus ASCII/Modbus RTU		
0D	In case of HEX conversion error in Modbus		

6.6.7 Media Information

It is used to determine whether communication is normal or not by providing the media status and service status statistics of the Cnet I/F module. This function is provided by the B type Cnet I/F module.

(a) Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis] or click the icon ( ).
(b) Click Cnet I/F module and click the right mouse button.
(c) When you click [Media information], the following screen will be displayed.



• Detailed contents of media information field

Classification	Item	Contents
Media status information	Send	Transmission count per channel
	Receive	Reception count per channel
	Undefined frame reception	Undefined frame reception count per channel
	Char time out count	Received split frame count per channel
	Parity Error	Parity error count per channel
	Break Error	Break error count per channel
	Overrun Error	Overrun error count per channel
	Framing Error	Framing error count per channel
Service status information	Send	Transmission count per communication service
	Receive	Reception count per communication service
	FCS Error	Frame check sequence (FCS) error count per communication service
	Time Out	Response time out count per communication service client

Chapter 7 XGT Communication

7.1 Overview of XGT Protocol

The XGT protocol is a Cnet I/F module dedicated protocol developed by LS ELECTRIC. By using this protocol, you can connect to the PLC, read or write data, register a monitor variable and carry out monitoring, and connect to a PLC a long distance away remotely, and read or write in the program. You can also check whether communication status is normal or not by monitoring actual protocols exchanged with the opposing device using the frame monitoring of the XG5000. The XGT protocol is classified into the XGT client that requests read/write data to the opposing device and the XGT server that processes the contents requested by the XGT client.

(1) Read and write data

This is the function to connect to a PLC, read or write data and carry out monitoring.

(2) Read and write a file

This is the function to read or write a program or a parameter saved on a PLC a long distance away while connecting using remote 1-stage or 2-stage using the Cnet I/F module.

(3) Frame monitor

The frame monitoring of the XG5000 is the function to check an actual frame which the XGT client and server exchange with the opposing device. By using this function, you can analyze data and check if an error exists, so a problem that occurs during communication can be solved.

(4) XGT client/server

The XGT client carries out the task to request read/write data to the opposing device. And, the XGT server carries out the task to analyze data sent by the XGT client, and when a frame that meets the XGT protocol specifications is received, the XGT server processes the command requested, along with the ACK response, and if a frame that does not meet the specifications is received, the XGT server transmits the NAK response, including the error code to the XGT client.

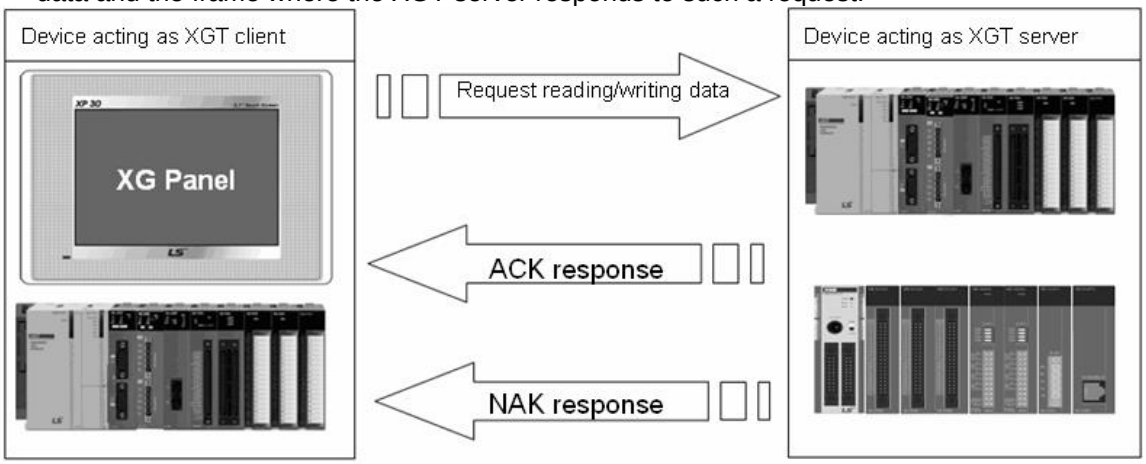
(5) Functions provided by the Cnet I/F module when the XGT protocol is used.

(a) Operate as an independent channel of RS-232C, RS-422 and RS-485.
(b) Write device individually/continuously.
(c) Read device individually/continuously.
(d) Register a variable to monitor.
(e) Execute monitor.
(f) 1:1 connection (own link) system configuration. (Cnet I/F module: RS-232C)

7.2 Frame Structure

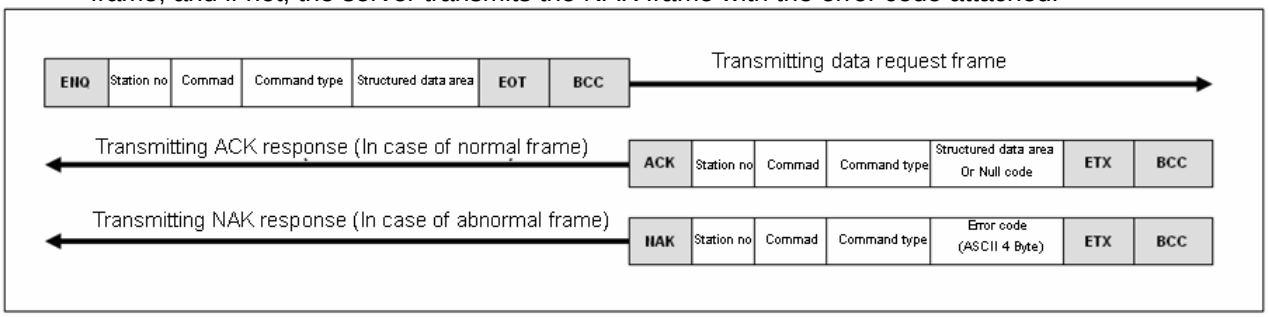
7.2.1 Frame Structure

The frame of the XGT protocol is classified into the frame where the XGT client requests read/write data and the frame where the XGT server responds to such a request.



(1) Command frame sequence

When the client transmits a request frame to the server, the server analyzes the received frame. As a result, if the frame conforms to the protocol rule, the server transmits the ACK response frame, and if not, the server transmits the NAK frame with the error code attached.



(2) Basic frame structure of XGT protocol

(a) Request frame (Equipment which operates as the XGT client)

Head	Destination station number	Command	Command type	Data area	Tail (EOT)	Frame check(BCC)

(b) Response frame (Equipment which operates as the XGT server)

1) ACK response frame (received frame according to the XGT protocol rule)

Head(ACK)	Self-station	Command	Command type	Data area or null code	Tail (ETX)	Frame check(BCC)

2) NAK response frame (received frame against the XGT protocol rule)

Head(NAK)	Self-station	Command	Command type	Error code (ASCII type 4 byte)	Tail (ETX)	Frame check(BCC)

(3) Characteristics of frame

(a) In case of numeric data of all frames, a Hex value is expressed in ASCII code, unless specified otherwise.

(b) Items expressed as a Hex value are as follows.

1) Station No

2) Command type in case the command type is a number (indicates the data type) when the main command is R(r) and W(w)

3) Whole items that indicate the size of all data in the structured data area

4) Command registration number for monitor registration and execution command

5) Whole content of data

(c) In the case of hexadecimal data, 'h' is attached to the number as in h01, h12345, h34, h12 and h89AB, etc. to indicate that this data is hexadecimal.

(d) Up to 256 bytes can be used for the frame.

(e) The contents of a control code used are as follows.

Code	Hex	Name	Contents of control
ENQ	05	Enquire	Start code of request frame
ACK	06	Acknowledge	Start code of the ACK response frame
NAK	15	Not Acknowledge	Start code of the NAK response frame
EOT	04	End of Text	End ASCII code of request frame
ETX	03	End Text	End ASCII code of response frame

(f) If the command is lowercase, the BCC value is added to the frame check, and if it is uppercase, the BCC value is not added.

Example) Read device command R(r)

- In case of lowercase r: Add BCC
- In case of uppercase R: BCC is not added.

7.2.2 XGT Communication Commands

(1) Type of command

The types of commands used in the dedicated communication are as follows.

Classification / Item		Command				Contents of process
		Main command		Command type		
		ASCII	Hex	ASCII	Hex	
Read device	Read individually	r(R)	h72(h52)	SS	h5353	Read bit and word-type variable directly
	Read continuously	r(R)	h72(h52)	SB	h5342	Read direct variables of word type in block unit*Note 1)
Device write	Write individually	w(W)	h77(h57)	SS	h5353	Write data on bit and word-type direct variable
	Write continuously	w(W)	h77(h57)	SB	h5342	Write direct variables of word type in block unit*Note 2)

Classification / Item	Command				Contents of process
	Main command		Registration number		
	Example of frame	Hex	Registration number	Hex	
Register monitor variable	x(X)	h78(h58)	00~09	h3030~3039	Register a variable to Monitoring
Execute monitor	y(Y)	h79(h59)	00~09	h3030~3039	Execute monitor of a registered variable

(2) Data type

Data type	Example of displayed frame	Example of usage
Bit	X(58h)	%PX000,%MX000,%LX000,%KX000,%CX000,%TX000,%FX000, %IX0.0.0,%QX0.0.0 ,%UX00.00.0, etc
Byte	B(42h)	%PB000,%MB000,%LB000,%KB000,%CB000,%TB000,%FB000, %IB0.0.0,%QB0.0.0,etc
WORD	W(57h)	%PW000,%MW000,%LW000,%KW000,%CW000,%TW000,%FW000, %DW000,%IW0.0.0,%QW0.0.0,%MW0,%RW0,%WW0,%UW00.00,etc
Double word*Note 3)	D(44h)	%PD000,%MD000,%LD000,%KD000,%CD000,%TD000,%FD000,%DD000,%SD000,%ID0.0.0,%QD0.0.0,%MD0,%RD0,%WD0,etc
Long word*Note 4)	L(4Ch)	%PL000,%ML000,%LL000,%KL000,%CL000,%TL000,%FL000,%DL000, %SL000,%IL0.0.0,%QL0.0.0,%ML0,%RL0,%WL0,etc

Notes

Note 1) Bit continuous read is not allowed in the case of continuous read.
Note 2) Bit continuous write is not allowed in the case of continuous write.
Note 3) Double word: When converting into byte, 1 double word is 4 bytes.
Note 4)Long word: When converting into byte, 1 long word is 8 bytes.

(3) Available device area

CPU type	Area	Range	Size(word)	Note
XGK (based on CPUE)	P	P0~P2047	2,048	Possible to read, write and monitor
	M	M0~M2047	2,048	Possible to read, write and monitor
	K	K0~ K2047	2,048	Possible to read, write and monitor
	F	F0~ F2047	2,048	Possible to read and monitor (write: possible from 1025 words)
	T	T0~T2047	2,048	Possible to read, write and monitor
	C	C0~2047	2,048	Possible to read, write and monitor
	L	L0~L11263	11,264	Possible to read, write and monitor
	N	N0~N21503	21,504	Possible to read, write and monitor
	D	D0~D19999	20,000	Possible to read, write and monitor
	R	R0~R32767	32,768	Possible to read, write and monitor
	ZR	ZR0~ZR65535	65,536	Possible to read, write and monitor (Provided only for XGK-CPUH)
XGI (based on CPUH)	I	IW0.0.0~IW127.15.3	8,192	Possible to read, write and monitor
	Q	QW0.0.0~QW127.15.3	8,192	Possible to read, write and monitor
	M	MW0~MW131071	131,072	Possible to read, write and monitor
	R	RW0~RW32767	32,768	Possible to read, write and monitor
	W	WW0~WW65535	65,536	Possible to read, write and monitor
XGR	I	IW0.0.0~IW127.15.3	8,192	Possible to read, write and monitor
	Q	QW0.0.0~QW127.15.3	8,192	Possible to read, write and monitor
	M	MW0~MW131071	131,072	Possible to read, write and monitor
	R	RW0~RW32767	32,768	Possible to read, write and monitor
	W	WW0~WW65535	65,536	Possible to read, write and monitor
Common	U	U0~U4095	4,096	Possible to monitor

Notes

(1) ZR device is provided only in XGK-CPUH.
(2) W" should be used in by to use ZR device for XGT communication frame as XGK CPU.
Example) When requesting the word size from ZR0,"% WW000" should be requested.
(3) The bit monitoring address in the U device is a hexadecimal (Hex) value and the monitoring area in the word area is a decimal value.

7.2.3 Write direct variable individually (W(w)SS)

This function is used to directly specify the PLC device memory to be used and write it according to the memory data type.

(1) Example of the XGT client's request frame for write individually

Classification	Header	Station No	Command	Command type	Number of block	Variable size	Variable name	Data	...	Tail	Frame check
Frame	ENQ	20	W(w)	SS	01	06	%MW100	00E2	...	EOT	BCC
Hex	h05	h3230	h57(77)	h5353	h3031	h3036	h254D57313030	h30304532	...	h04	

(2) Example of XGT server's response frame

(a) In case the ACK responds

Classification	Header	Station No	Command	Command type	Tail	Frame check
Frame	ACK	20	W(w)	SS	ETX	BCC
Hex	h06	h3230	h57(77)	h5353	h03	

(b) In case the NAK responds

Classification	Header	Station No	Command	Command type	Error code(2 bytes)	Tail	Frame check
Frame	NAK	20	W(w)	SS	4252	ETX	BCC
Hex	h15	h3230	h57(77)	h5353	h34323532	h03	

(c) Contents of each item

Classification	Contents
Number of blocks	▶ The number of blocks consisting of variable size + variable name - Maximum setting:16 blocks - Setting range:01(Hex values:3031) ~ 10(Hex values:3130)
Variable size	▶ Number of characters in the variable name - Maximum setting:16 - Setting range:01(Hex values:3031) ~ 10(Hex values:3130) Example) If the variable name is %MW0, the variable size is h04 since the number of characters is 4. If the variable name is %MW000, the variable size is h06 since the number of characters is 6.
Variable name	▶ Address of write device - Setting range: enter within 12 characters - Caution: Not allowed except for digits, upper case/lower case, and '%'
Data	▶If the value you want to write in the %MW100 area is h A, the format of the data should be h000A. - Example) If the data type you want to write is word, and the data to be written is h1234, its ASCII code conversion value is 31323334, and this content should be contained in the data area. In other words, the most significant value is transmitted first, and the least significant value is transmitted later.
Frame check	▶If the command is lowercase frame, for example, w, the BCC value will be added, and if the command is uppercase frame, for example, W, the BCC value will not be added. ▶If the command is lowercase frame, the value from ENQ to EOT is converted into a Hex value, and only lower 1 byte value in the result value of adding one byte each is added to BCC and judged whether the frame is normal or not.

Notes

(1) The device data type of each block should be same.

(2) If the data type is a bit, the data to be written should be represented by 1 byte in hexadecimal.

In other word, h00(3030) should be set if the bit value is 0, and h01(3031) should be set if the bit value is 1.

(3) Example

This example supposes that ‘ hFF’ is written in M0230 of station No. 1

(a) XGT client's write individually request frame

Classification	Header	Station No	Command	Command type	Number of block	Variable size	Variable name	Data	Tail	Frame check
Frame	ENQ	01	W(w)	SS	01	06	%MW230	00FF	EOT	BCC
Hex	h05	h3031	h57(77)	h5353	h3031	h3036	h254D57 323330	h30304646	h04	

(b) Response frame of the XGT server

1) In case the ACK responds

Classification	Header	Station No	Command	Command type	Tail	Frame check
Frame	ACK	01	W(w)	SS	ETX	BCC
Hex	h06	h3031	h57(77)	h5353	h03	

2) In case the NAK responds

Classification	Header	Station No	Command	Command type	Error code	Tail	Frame check
Frame	NAK	01	W(w)	SS	Error code (2 Byte)	ETX	BCC
Hex	h15	h3031	h57(77)	h5353	Error code (4 Byte)	h03	

7.2.4 Read direct variable individually (R(r)SS)

This is the function to specify and read the PLC device according to the data type. 16 independent device memories can be read at a time.

(1) Example of XGT client's read individually request frame

Classification	Header	Station No	Command	Command type	Number of blocks	Variable size	Variable name	・・・	Tail	Frame check
Frame	ENQ	20	R(r)	SS	01	06	%MW100	・・・	EOT	BCC
Hex	h05	h3230	h52(72)	h5353	h3031	h3036	h254D57313030	・・・	h04	

(2) Example of XGT server's response frame

(a) In case the ACK responds

Classification	Header	Station No	Command	Command type	Number of blocks	The number of data	Data	.....	Tail	Frame check
Frame	ACK	20	R(r)	SS	01	02	A9F3		ETX	BCC
Hex	h06	h3230	h52(72)	h5353	h3031	h3032	h41394633		h03	

(b) In case the NAK responds

Classification	Header	Station No	Command	Command type	Error code (2 Byte)	Tail	Frame check
Frame	NAK	20	R(r)	SS	1132	ETX	BCC
Hex	h15	h3230	h52(72)	h5353	h31313332	h03	-

(3) Contents of each item

Classification	Contents
Number of blocks	▶ The number of blocks consisting of variable size + variable name Maximum setting : 16 ▷ Setting range: 01(ASCII code:3031) ~ 10(ASCII code:3130)
Variable size	▶ The number of characters in the variable name. ▷Maximum setting :16 ▷Setting range:01(ASCII code:3031) ~ 10(ASCII code:3130) ▷Ex) If the name of the variable is %MW0, the number of characters is 4, so the size of the variable is h04, and if the name of the variable is %MW000, the number of characters is 6, so the size of the variable is h06.
Variable name	▶It is the address of the read device. ▷ Setting range: Enter within 12 characters ▷Caution: Not allowed except for digits, upper case/lower case, and '%'

<table>
<tr><th>Classification</th><th>Contents</th></tr>
<tr><td>The number of data</td><td>▶It means the number of bytes of Hex type and is converted into ASCII.
▶ The number is determined by the data type(X,B,W,D,L) contained in the direct variable name of the external communication device request format
▷ The number of data according to the type of variable is as follows.

<table>
<tr><th>Data type</th><th>Available direct variable</th><th>The number of data</th></tr>
<tr><td>Bit(X)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)X</td><td>1</td></tr>
<tr><td>Byte(B)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)B</td><td>1</td></tr>
<tr><td>Word(w)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)W</td><td>2</td></tr>
<tr><td>Double word(D)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)D</td><td>4</td></tr>
<tr><td>Long word(L)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)L</td><td>8</td></tr>
</table>
</td></tr>
<tr><td>Data</td><td>▶ The value obtained by converting the data of area hexadecimal into ASCII code is stored
▷ Example 1)
If the number of data is h04 (ASCII code: H3034), it is indicated that 4 bytes hex data exists in Data. In Data, 4 bytes hex data is saved after being converted into ASCII code.

▷ Example 2)
If the number of data is h04 and the value is h12345678, this value will be‘31 32 33 34 35 36 37 38’ when it is converted into ASCII code, so‘31 32 33 34 35 36 37 38’ will be entered on the data area. In other words, the most significant value comes first, and the least significant value comes later.</td></tr>
</table>

Notes

• If the data type is a bit, the read data is displayed in the form of a byte. In other words, if the bit value is 0, h00 will be displayed, and if the bit value is 1, h01 will be displayed.

(4) Example

This example supposes that 1 word is read from M0001 and M0020 of station No. 1,
(At this time, assume that h1234 is in M0020 and h5678 data is in P0001.)

(a) XGT client's read individually request frame

Classification	Header	Station No	Command	Command type	Number of blocks	Variable size	Variable name	Variable size	Variable name	Tail	Frame check
Frame	ENQ	01	R(r)	SS	02	06	%MW020	06	%PW001	EOT	BCC
Hex	h05	h3031	h52(72)	h5353	h3032	h3036	h254D57 303230	h3036	h2550573 0303031	h04	

(b) Response frame of the XGT server

1) In case the ACK responds

Classification	Header	Station No	Command	Command type	Number of blocks	The number of data	Data	The number of data	Data	Tail	Frame check
Frame	ACK	01	R(r)	SS	02	02	1234	02	5678	ETX	BCC
Hex	h06	h3031	h52(72)	h5353	h3032	h3032	h31323334	h3032	h35363738	h03	

2) In case the NAK responds

Classification	Header	Station No	Command	Command type	Error code	Tail	Frame check
Frame	NAK	01	R(r)	SS	Error code(2 bytes)	ETX	BCC
Hex	h15	h3031	h52(72)	h5353	Error code(4 bytes)	h03	

7.2.5 Write direct variable continuously (W(w)SB)

This is the function to write continuously as much data as the specified size, starting from the specified address of the device.

(1) Example of XGT client's write continuously request frame

Classification	Header	Station No	Command	Command type	Variable size	Variable name	The number of data	Data	Tail	Frame check
Frame	ENQ	10	W(w)	SB	06	%MW100	02	11112222	EOT	BCC
Hex	h05	h3130	h57(77)	h5342	h3036	h254D57 313030	h3034	h31313131 32323232	h04	

(2) Example of XGT server response frame

(a) In case the ACK responds

Classification	Header	Station No	Command	Command type	Tail	Frame check
Frame	ACK	10	W(w)	SB	ETX	BCC
Hex	h06	h3130	h57(77)	h5342	h03	

(b) In case the NAK responds

Classification	Header	Station No	Command	Command type	Error code (Hex 2 bytes)	Tail	Frame check
Frame	ENQ	10	W(w)	SB	1132	ETX	BCC
Hex	h05	h3130	h57(77)	h5342	h31313332	h03	

(3) Contents of each item

Classification	Contents
Variable name	It indicates the start address of the device where write continuously will be carried out.
The number of data	Specify the number of data according to the type of direct variable for Number of data. In other words, if the data type of the device is word and the number of data is 5, it indicates Write 5 words. The maximum number of data is 120 bytes in hex value, and it is 240 bytes when converted into ASCII value.

(4) Example

This example supposes that 2 bytes of hAA15 is written in M000 of station No. 1.

(a) XGT client's continuous writing request frame

Classification	Header	Station No	Command	Command type	Variable size	Variable name	Data Quantity	Data	Tail	Frame Check
Frame	ENQ	01	W(w)	SB	06	%DW000	01	AA15	EOT	BCC
Hex	h05	h3031	h57(77)	h5342	h3036	h254457 303030	h3031	h41413135	h04	

(b) Response frame of the XGT server

1) In case the ACK responds

Format name	Header	Station No	Command	Command type	Tail	Frame check
Frame	ACK	01	W(w)	SB	ETX	BCC
Hex	h06	h3031	h57(77)	h5342	h03	

2) In case the NAK responds

Format name	Header	Station No	Command	Command type	Error code	Tail	Frame check
Frame	NAK	01	W(w)	SB	Error code(2)	ETX	BCC
Hex	h15	h3031	h57(77)	h5342	Error code(4)	h03	

7.2.6 Read direct variable continuously (R(r)SB)

This is the function to read continuously as much data as the specified quantity, starting from the specified address of the PLC device.

(1) Example of XGT client's read continuously request frame

Classification	Header	Station No	Command	Command type	Variable size	Variable name	Data Count (Max. 240 bytes)	Tail	Frame check
Frame	ENQ	10	R(r)	SB	06	%MW100	05	EOT	BCC
Hex	h05	h3130	h52(72)	h5342	h3036	h254D57313030	h3035	h04	

(2) Example of XGT server response frame

(a) In case the ACK responds

Classification	Header	Station No	Command	Command type	Number of blocks	The number of data	Data	Tail	Frame check
Frame	ACK	10	R(r)	SB	01	02	1122	ETX	BCC
Hex	h06	h3130	h52(72)	h5342	h3031	h3032	h31313232	h03	

(b) In case the NAK responds

Classification	Header	Station No	Command	Command type	Error code (Hex 2 bytes)	Tail	Frame check
Frame	NAK	10	R(r)	SB	1132	ETX	BCC
Hex	h15	h3130	h52(72)	h5342	h31313332	h03	

(3) Contents of each item

<table>
<tr><th>Classification</th><th>Contents</th></tr>
<tr><td>The number of data</td><td>►It means the number of bytes of Hex type and is converted to ASCII.
►The number indicates the number of bytes.
<table>
<tr><th>Data type</th><th>Available direct variable</th><th>The number of data</th></tr>
<tr><td>Bit(X)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)X</td><td>1</td></tr>
<tr><td>Byte(B)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)B</td><td>1</td></tr>
<tr><td>Word(w)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)W</td><td>2</td></tr>
<tr><td>Double word(D)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)D</td><td>4</td></tr>
<tr><td>Long word(L)</td><td>%(P,M,L,K,F,T,C,I,Q,W,R)L</td><td>8</td></tr>
</table></td></tr>
<tr><td>Data</td><td>►The data area contains the value obtained by converting Hex data to ASCII code
▷ Example 1)
If the memory type included in the name of the direct variable in the format requested by PC is W (word) and the number of data is 03, the number of data which PLC provides ACK response after the command is executed is h06 (2*03 = 06 bytes) bytes, and 3036 which is this value converted into ASCII code will be entered in the data area.
▷ Example 2)
If the contents of data in Example 1 are 1234, 5678 and 9ABC in order, 31323334, 35363738 and 39414243 that are these values converted into ASCII code are entered in the data area.</td></tr>
</table>

(4) Example

This example supposes that 2 words is read from M000 of station No. 10(h0A).
(Assume that the following data is in M000 and M001.)

M000 = h1234
M001 = h5678

(a) XGT client's read continuously request frame

Classification	Header	Station No	Command	Command type	Variable size	Variable name	The number of data	Tail	Frame check
Frame	ENQ	0A	R(r)	SB	06	%MW000	02	EOT	BCC
Hex	h05	h3041	h52(72)	h5342	h3036	h254D303030	h3032	h04	

(b) Response frame of the XGT server

1) In case the ACK responds

Classification	Header	Station No	Command	Command type	The number of data	Data	Tail	Frame check
Frame	ACK	0A	R(r)	SB	04	12345678	ETX	BCC
Hex	h06	h3041	h52(72)	h5342	h3034	h313233343 5363738	03	

2) In case the NAK responds

Classification	Header	Station No	Command	Command type	Error code	Tail	BCC
Frame	NAK	0A	R(r)	SB	Error code(2 bytes)	ETX	BCC
Hex	h15	h3041	h52(72)	h5342	Error code(4 bytes)	h03	

7.2.7 Registration and execution monitor variables

(1) Registering the monitor variable (X##)

Up to 32 monitor variables (from No. 0 to No. 31) can be registered individually in combination with actual read variable command, and when the variables are registered, the registered contents can be executed using the monitor command.

(a) Example of XGT client's monitor Variable setting frame

Structure	Header	Station No	Command	Registration number	Registration format	Tail	Frame check
Frame	ENQ	01	X(x)	09	Refer to the registration format.	EOT	BCC
Hex	h05	h3031	h58(78)	h3039	*Note 1)	h04	

(b) Example of XGT server's monitor Variable response frame

1) In case the ACK responds

Structure	Header	Station No	Command	Registration number	Tail	Frame check
Frame	ACK	01	X(x)	09	ETX	BCC
Hex	h06	h3031	h58(78)	h3039	h03	

2) In case the NAK responds

Structure	Header	Station No	Command	Registration No.	Error code (Hex 2 bytes)	Tail	Frame check
Frame	NAK	01	X(x)	09	h1132	ETX	BCC
Hex	h15	h3031	h58(78)	h3039	h31313332	h03	

(c) Contents of each item

Classification	Contents
Registration number	Up to 32 numbers can be registered (0~31 , h00~h1F). If an already registered number is registered again, the number that is executed currently will remain registered.
Registration format	It is used in the commands including read device individually and read continuously format until EOT.

Notes

Note1) Please be sure to select one of the following registration formats for request formats.

▶ Read device individually

RSS	Number of block (2 byte)	Variable size (2 bytes)	Variable name (16 bytes)	...

1 block(Max. 16 blocks)

▶ Read device continuously

RSB	Variable size(2 bytes)	Variable name(16 bytes))	The number of data

(d) Example

This example supposes that the device M0000 of station No. 1 is registered as No. 01.

1) XGT client's monitor variable registration frame

Classification	Header	Station No	Command	Registration number	Registration format				Tail	Frame check
					Command Type	Number of blocks	Variable size	Variable name		
Frame	ENQ	01	X(x)	01	RSS	01	06	%MW000	EOT	BCC
Hex	h05	h3031	h58(78)	h3031	h525353	h3031	h3036	h25545730 3030	h04	

2) Monitor Variable response frame of XGT server

a) In case the ACK responds

Classification	Header	Station No	Command	Registration number	Tail	Frame check
Frame	ACK	01	X(x)	01	ETX	BCC
Hex	h06	h3031	h58(78)	h3031	h03	

b) In case the NAK responds

Classification	Header	Station No	Command	Registration number	Error code	Tail	Frame check
Frame	NAK	01	X(x)	01	Error code(2)	ETX	BCC
Hex	h15	h3031	h58(78)	h3031	Error code(4)	h03	

(2) Monitor execution(Y##)

Monitor execution is the function to execute reading a device that is registered as the monitor. For monitor execution, specify the registered number and execute Read registered device with such number.

(a) Example of XGT client's monitor execution frame

Classification	Header	Station No	Command	Registration number	Tail	Frame check
Frame	ENQ	10	Y(y)	09	EOT	BCC
Hex	h05	h3130	h59(79)	h3039	h03	

(b) Example of XGT server's monitor execution response frame

1) In case the ACK responds

a) If the registered format of the registration number is read device individually

Classification	Header	Station No	Command	Registration number	Number of blocks	The number of data	Data	Tail	Frame check
Frame	ACK	10	Y(y)	09	01	02	9183	ETX	BCC
Hex	h06	h3130	h59(79)	h3039	h3031	h3032	h39313833	h03	

b) If the registered format of the registration number is read direct variable continuously

Classification	Header	Station No	Command	Registration number	The number of data	Data	Tail	Frame check
Frame	ACK	10	Y(y)	09	04	9183AABB	ETX	BCC
Hex	h06	h3130	h59(79)	h3039	h3034	h39313833 41414242	h03	

2) In case the NAK responds

Classification	Header	Station No	Command	Registration number	Error code (Hex 2 bytes)	Tail	Frame check
Frame	NAK	10	Y(y)	09	1132	ETX	BCC
Hex	h15	h3130	h59(79)	h3039	h31313332	h03	

(c) Example

This example supposes that the reading of device registered as registration No. 1 in station No.1. Assume that one block is registered as device M000.

1) Monitor execution frame of XGT client

Classification	Header	Station No	Command	Registration number	Tail	Frame check
Frame	ENQ	01	Y(y)	01	EOT	BCC
Hex	h05	h3031	h59(79)	h3031	h04	

2) Monitor execution response frame of XGT server

a) In case the ACK responds

Classification	Header	Station No	Command	Registration number	Number of blocks	The number of data	Data	Tail	Frame check
Frame	ACK	01	Y(y)	01	01	02	2342	ETX	BCC
Hex	h06	h3031	h59(79)	h3031	h3031	h3032	h32333432	h03	

b) In case the NAK responds

Classification	Header	Station No	Command	Registration number	Error code	Tail	Frame check
Frame	NAK	01	Y(y)	01	Error code(2)	ETX	BCC
Hex	h15	h3031	h59(79)	h3031	Error code(4)	h03	

7.2.8 Error Code

When the XGT client transmits the request frame to the server, the server analyzes the received request frame, and if the frame is normal, the server transmits the ACK response frame, and if the frame is abnormal, the server transmits the NAK frame with the error code attached. At this time, the error code included in the NAK response is as follows. The error code is Hex 2 bytes and it indicates the error. The error which occurred can be checked through the frame monitor, and you can see the contents displayed as ASCII code as shown in the table below.

Error code	Type of error	Contents and cause of error	Example of frame with an error
0003	Block number excess error	If the number of blocks is larger than 16 when read/write individually is requested	01rSS1105%MW10…
0004	Variable size error	If the variable size is higher than 12 which is the maximum size	01rSS010D%MW10000000000..
0007	Data type error	If the data type other than X, B, W, D and L has been received	01rSS0105%MK10
0011	Data error	If data size area information is incorrect	01rSB05%MW10%4
		If not starting with %	01rSS0105$MW10
		If the area value of the variable is incorrect	01rSS0105%MW^&
		In the case of bit writing, 00 or 01 should be written, but other values are written	01wSS0105%MX1011
0090	Monitor execution error	If the execution of a monitor which is not registered is requested	
0190	Monitor execution error	If the range of the registration numbers has been exceeded	
0290	Monitor registration error	If the range of the registration numbers has been exceeded	
1132	Device memory error	If a device which is not a device in use is entered	
1232	Data size error	Up to 60 words can be read or written at a time, but in case more than 60 words are requested	01wSB05%MW1040AA5512,..
1234	Spare frame error	If unnecessary additional content exists.	01rSS0105%MW10000
1332	Data type mismatch error	In the case of read/write individually, the same data type should be requested for all blocks, but in case a different data type is requested	01rSS0205%MW1005%MB10
1432	Data value error	If the data value cannot be converted to Hex value	01wSS0105%MW10AA%5
7132	Variable request area excess error	It is required beyond the area supported by each device.	01rSS0108%MWFFFFF

7.3 XGT Communication Function

7.3.1 Overview

The XGT communication operates as either XGT server or P2P service depending on what is set for the operation mode of the Cnet I/F module. XG5000 is set for each mode.

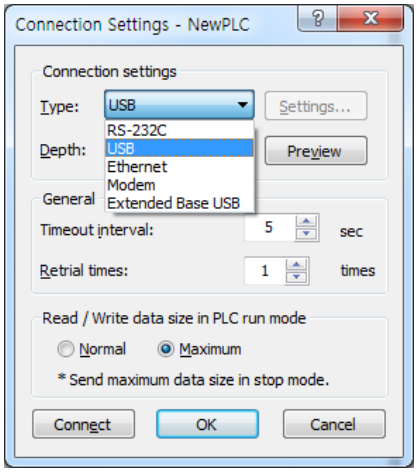
(1) XGT server
(a) It allows you to read or write PLC information or data from/to PC or peripheral equipment without writing a separate program in PLC.
(b) XGT client responds to the request frame.

(2) P2P service
(a) This service makes the Cnet I/F module operate as the client in the network.
(b) If a predefined event occurs, it is possible to read or write the memory of the destination station.
(c) Up to 64 P2P blocks that operate independently can be defined for each P2P service.

(3) Loader service
You can monitor PLC at a remote distance or download the program using the remote 1-stage or 2-stage connection.

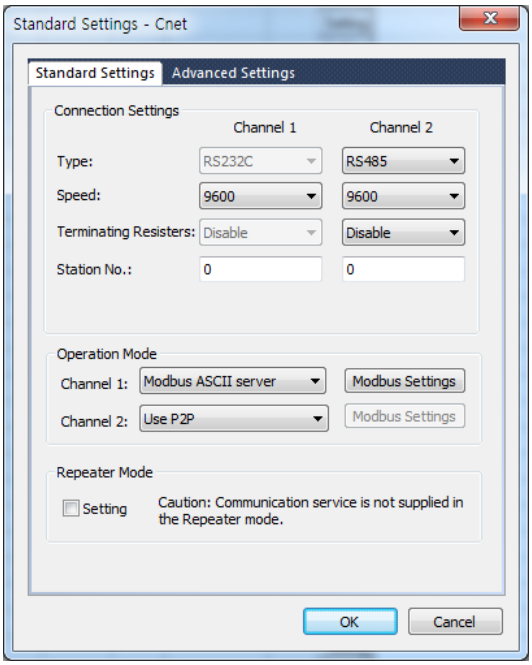
7.3.2 Setting parameters in case of using as the XGT server

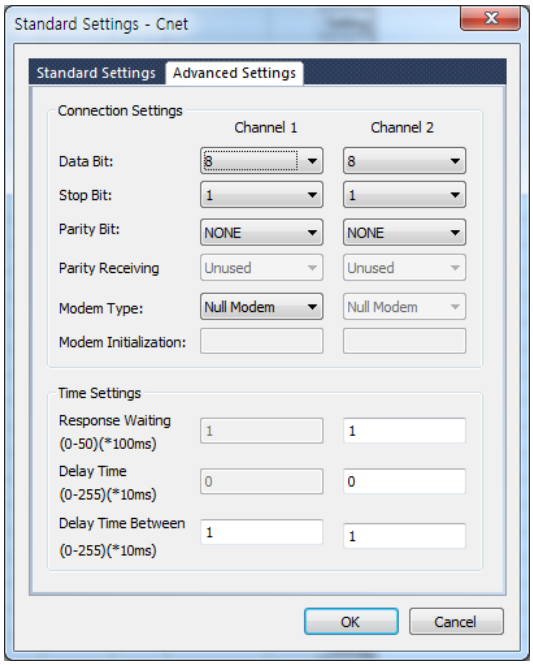
(1) Connection setting
(a) Select [Online]→[Connection setting].
(b) Set the connection option that fits the user environment and click [Connect].



(2) Reading I/O information
Click [I/O Sync] from the [Online] → [System Diagnostics] → [I/O information] window and read the information from the module currently installed on the base.

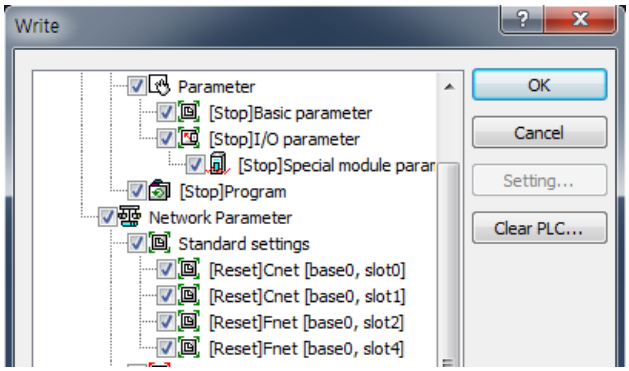
(3) Standard settings
(a) Open the [Basic setting] window by double clicking the relevant Cnet I/F module, and set the communication type, communication speed, modem type, data bit, stop bit and station address from the connection setting menu.
(b) The modem can be initialized only when the modem type is the dial-up modem. It cannot be applied in case of null modem.
(c) The delay time can be set only when the communication type is RS422 or RS485, and the response waiting time can be set only when the communication type is RS422 or RS485 and the operation mode is P2P.
(d) The terminating resistance setting and repeater mode can be used in the B type Cnet I/F module.



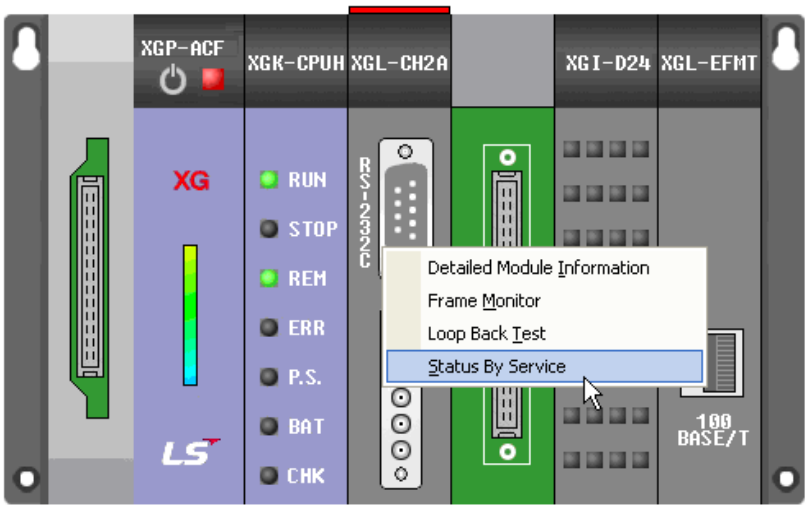


(4) Select operation mode
Select XGT server.

(5) Writing parameter
(a) Select [Online]→[Write].
(b) Put a check mark on the module whose basic setting is completed from [Standard setting] and click [OK].
(c) Reset the module.



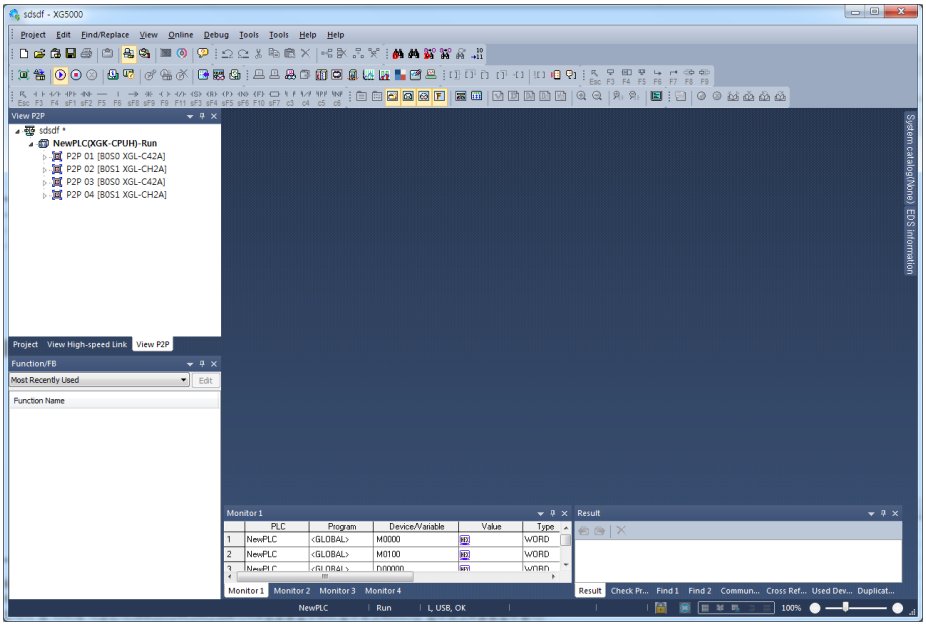
(6) Check operation
(a) Select [Online]→[Communication module setting and Diagnosis]→[System diagnosis].
(b) Click the relevant module and click the right mouse button.
(c) Click [Frame monitor] or [Status by service] and check operation status.
(d) For detailed contents regarding the status by service, refer to '2.1 Diagnosis function of XG5000.



7.3.3 Setting parameters in case of using as the XGT client

(1) P2P parameter configuration

In order to use the P2P service, necessary contents for operation should be set in the P2P parameter window. As shown in the figure below, the P2P parameter consists of three pieces of information.



(a) P2P channel

1) Define a communication protocol for carrying out the P2P service.
2) XGT client, Modbus ASCII client, Modbus RTU client, LS bus client, user frame definition communication
3) Set the parameter for each channel independently. (It applies only when 'Use P2P' is selected for the operation mode in the [Standard setting] window)

(b) P2P block

Set 64 P2P blocks that operate independently.

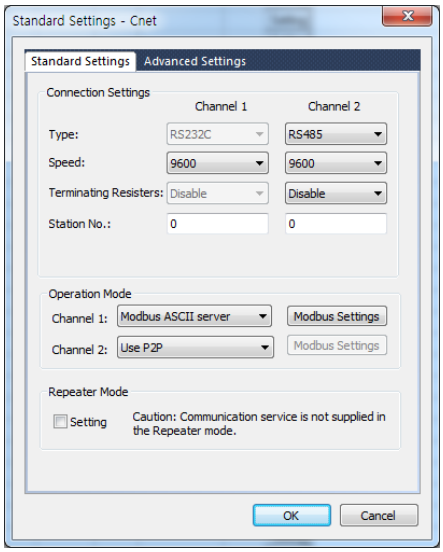
(c) User frame definition

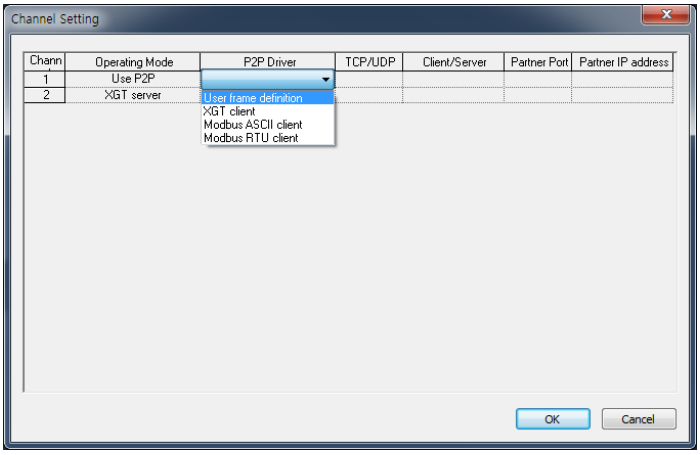
Register a parameter for the user frame definition communication.

(2) P2P channel setting

The Cnet I/F module provides two communication channels that operate independently, and the driver type for carrying out the P2P service can be defined for each channel. However, in order for the P2P channel to operate as the client,' Use P2P' should be selected for the operation mode in the [Standard setting] window. The P2P channel setting according to the operation mode is as follows.

(a) Operation mode





The drivers that can be selected when' Use P2P' is selected for the operation mode are as follows.

Driver	Usage
User frame definition	It is used when it sends/receives the desired user frame definition.
XGT client	It is used for reading or writing XGT CPU memory.
LS bus client	It is used for the dedicated communication with the LS inverter.
Modbus ASCII client	It is used for operating as the Modbus client and used as the ASCII mode.
Modbus RTU client	It is used for operating as the Modbus client and used as the RTU mode.

When the XGT or Modbus is selected for the P2P driver, the user defined frame cannot be used.

(3) P2P block setting

When the P2P block of the relevant parameter is selected in the [P2P Channel setting] window, the [P2P block setting] window will be displayed. The block setting window for all protocols is as shown in the figure below, and a different area which is enabled according to the protocol selected from P2P channel is displayed.

P2P driver	P2P block setting
Chann 1 / Operating Mode: Use P2P / P2P Driver: XGT client	Index 0 / Ch 1 / Driver Setting: XGT client / Destination station number: 0 / Setting
Chann 1 / Operating Mode: Use P2P / P2P Driver: Modbus ASCII client	Index 0 / Ch 1 / Driver Setting: Modbus ASCII client / No. of variables: 1 / Destination station number: 0 / Setting
Chann 1 / Operating Mode: Use P2P / P2P Driver: Modbus RTU client	Index 0 / Ch 1 / Driver Setting: Modbus RTU client / No. of variables: 1 / Destination station number: 0 / Setting
Chann 1 / Operating Mode: Use P2P / P2P Driver: User frame definition	Index 0 / Ch 1 / Driver Setting: User frame definition / Setting
Chann 1 / Operation Mode: Use P2P / P2P Driver: LS Bus Client	Index 0 / Ch 1 / Driver Setting: LS BUS Client / Command type: Continuous / Data type: WORD / No. of variables: 1 / Destination station number: 0 / Setting

(4) Parameter setting method

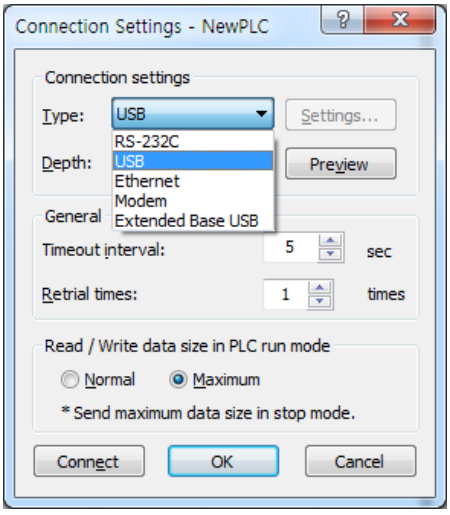
The XGT client is classified into the operation to read data from any area of the opposing device using the Read command and the operation to write data on any area of the opposing device using the Write command. The setting method is as follows.

(a) Setting the basic parameter

1) Connection setting

a) Select [Online]→[Connection setting].

b) Set connection options for your environment and click Connect.



2) Reading I/O information

Click [I/O Sync] from the [Online] → [System Diagnostics] → [I/O information] window and read the information from the module currently installed on the base.

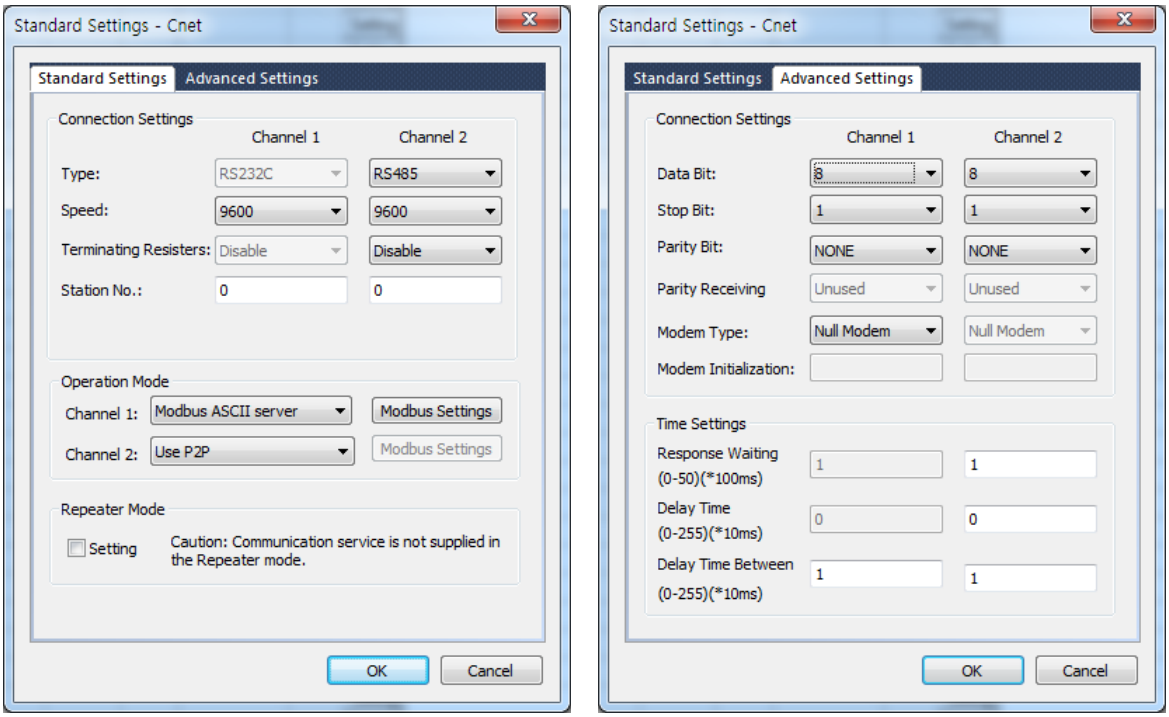
3) Standard settings

a) Open the [Standard settings] window by double clicking the relevant Cnet I/F module, and set the communication type, communication speed, modem type, data bit, stop bit and station address from the connection setting menu.

b) The modem can be initialized only when the modem type is the dial-up modem. It cannot be applied in case of null modem.

c) The delay time can be set only when the communication type is RS422 or RS485, and the response waiting time can be set only when the communication type is RS422 or RS485 and the operation mode is P2P.

d) The terminating resistance setting and repeater mode can be used in the B type Cnet I/F module.

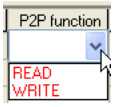
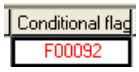
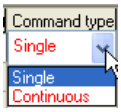
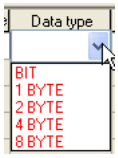
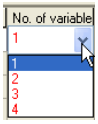
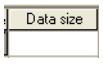
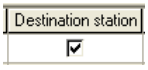
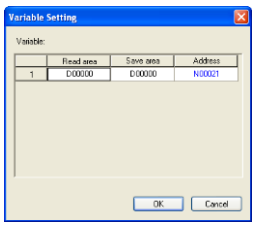


4) Operation mode

'Select' Use P2P'.

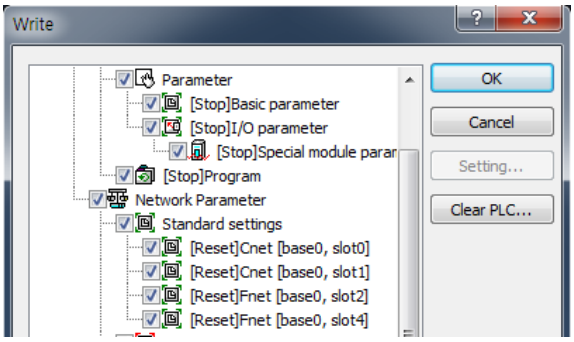
a) Setting the P2P parameter

Index	Ch.	Driver Setting	P2P function	Conditional flag	Command type	Data type	No. of variable	Data size	Destina	Destination sta	Frame	Setting
0	1	XGT client		F00092	Single		1		☑	0		Setting
	①		②	③	④	⑤	⑥	⑦	⑧	⑨		⑩

No.	Type	Block type	Content
1	Channel		The name of the setting driver changes according to the driver set in the P2P driver.
2	P2P function		1.Read: It is used for reading any data from the destination station. 2.Write: It is used for writing any data on the destination station.
3	Start condition		1.Enter special flag or bit contact to select the time when data is transmitted and received 2.Example in case of XGK type: F90 (Operates in 20ms intervals), M01 3.Example in case of XGI type: _T 20MS (Operates in 20ms intervals), % MX01
4	Command type		1.Individual: It is used for reading or writing data up to 4 memory areas. (Ex: M01, M10, M20, M30) 2.Continuous: It is used for reading or writing data continuously.(Example : M01~M10)
5	Data type		1. If individual is selected for the type: Data types are divided into five types: bit, 1 byte, 2 byte, 4 byte and 8 byte. 2. If continuous is selected for the type: Data types are divided into four types: 1 byte, 2 byte, 4 byte and 8 byte
6	No. of variables		1. This function is enabled only when the individual mode is selected, and the number of data to be transmitted and received is selected. However, the maximum number of permitted data is 4. 2. If continuous mode is selected, it is fixed to 1.
7	Data size		This function is enabled only when Continuous is selected for Type, and up to 120 bytes can be set based on 1 byte for the data type.
8	Destination station		1. If checked: Specifies as the destination station. 2. If not checked :The P2P SN command is specified as the destination station of the P2P SN specified previously.
9	Destination station number		It means the station address of the destination station, and the setting range is 0 to 31 stations, and up to 32 stations
10	Setting		1. If the P2P function is Read (1) Read area: Device area where data of the destination station (server) is saved (2) Storage area: Device area of the self-station (client) where data read from the destination station will be saved If the 2.P2P function is Write (1) Read area: Device area where data of the self-station is saved (2) Storage area: Device area of the destination station where data of the self-station will be saved

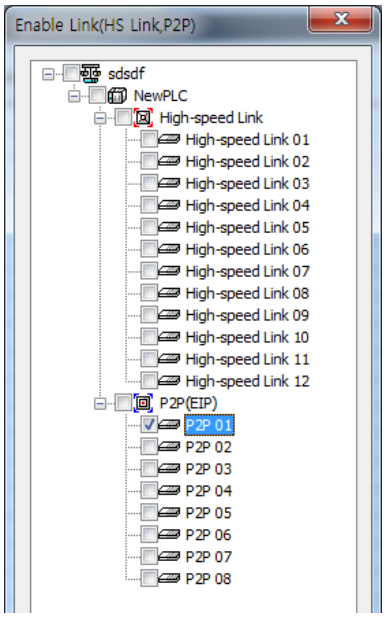
(b) Writing parameter

1) Select [Online]→[Write].
2) Put a check mark on basic setting and P2P (✓) for the module set as the XGT client and click the [OK] button.
3) Click the [OK] button, and after writing the parameter, reset the relevant module.



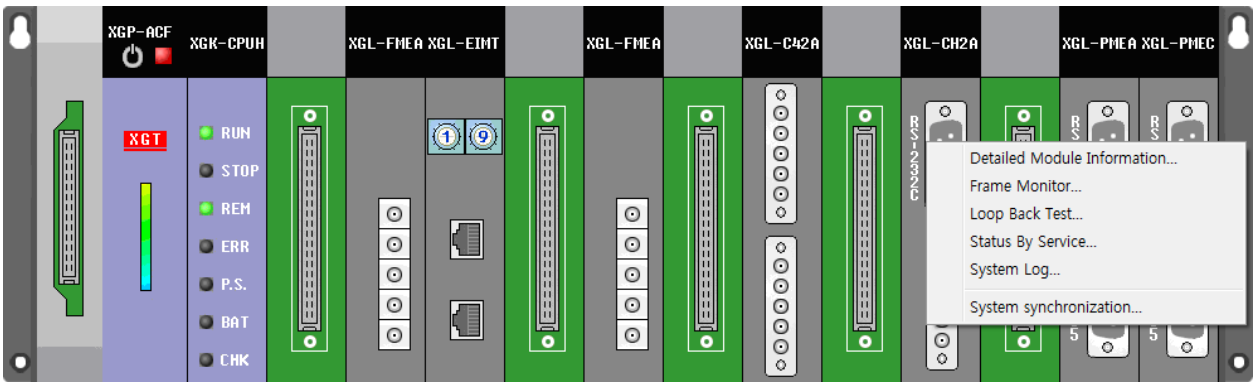
(c) Link enable

1) Select [Online]→[Communication module setting and Diagnosis]→[Link enable].
2) Put a check mark on the P2P block you wish to use and click[Write].



(d) Check operation

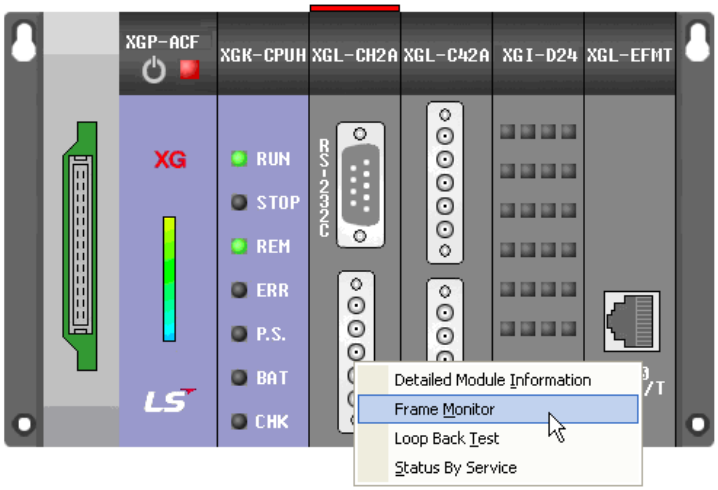
1) Select [Online]→[Communication module setting and Diagnosis]→[System diagnosis].
2) Click the relevant module and click the right mouse button.
3) Click [Frame monitor] or [Status by service] and check operation status.



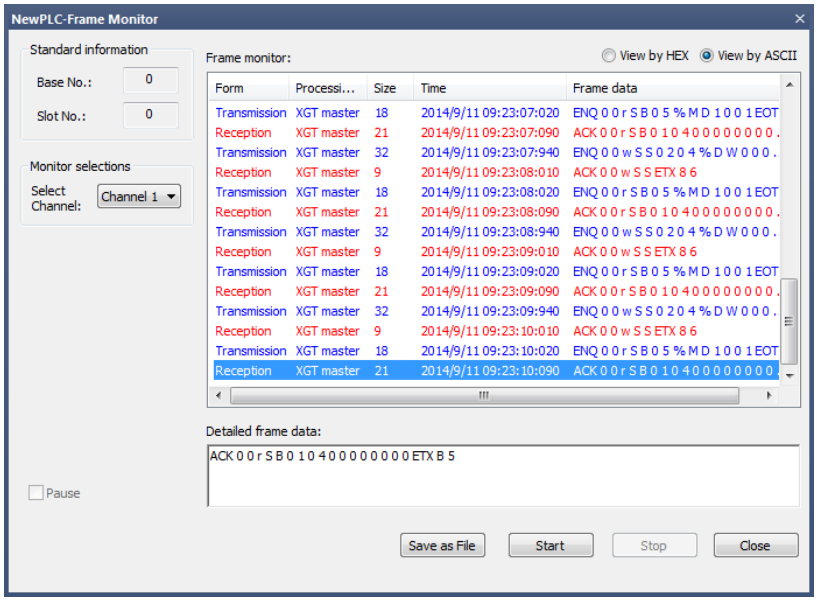
7.3.4 Frame Monitor

When you use the frame monitoring function provided by the XG5000, you can check a frame which is actually exchanged by the client and the server.

(1) Check operation
(a) Select [Online]→[Communication module setting and Diagnosis]→[System diagnosis].
(b) Click the relevant module and click the right mouse button.
(c) When the screen as shown below appears, click [Frame monitor].



(2) Frame monitor
(a) Select a channel you wish to monitor.
(b) Select View as ASCII since the XGT protocol is ASCII communication.
(c) Click [Start] to check the sending / receiving frame.



7.3.5 Parameter Setting Case

(1) Setting example in case of using as the XGT client

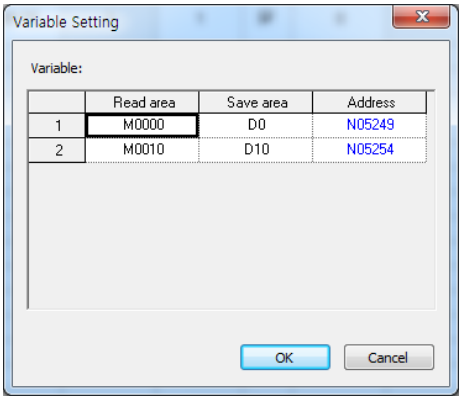
This is an example that data in the P0200 address of the XGT server is read and the frame where 1 word is saved on the M200 address of the self-station PLC as the P2P parameter of XG5000 when the M00001 contact point becomes On. You can check using the XG5000 whether data has been transmitted normally or not.

- Analyze and check the response frame on the server side through the frame monitor of the XG5000.
- Execute [monitor] → [device monitor] and check if data is saved on the area which is set to save data.

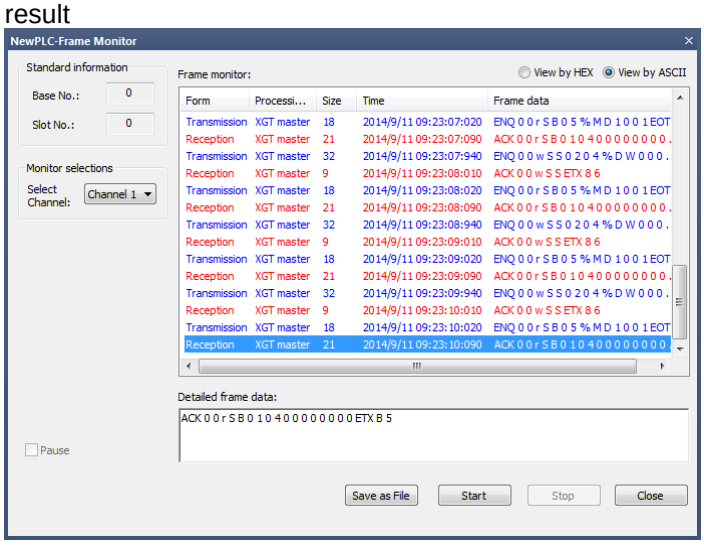
(a) Parameter setting detail

Index	Ch.	Driver Setting	P2P function	Conditional flag	Command type	Data type	No. of variable	Data size	Destina	Destination sta	Frame	Setting
0	1	XGT client	READ	M00001	Single	2 BYTE	1		☑	1		Setting
1												Setting

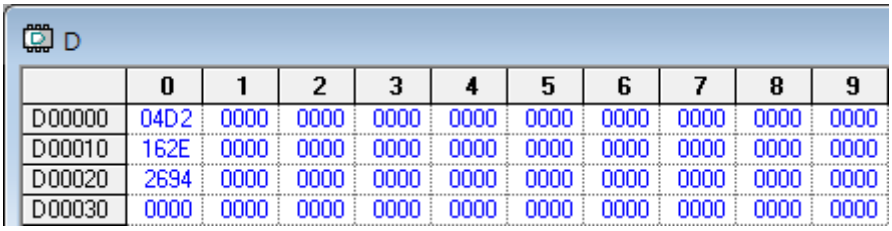
(b) Variable setting detail



(c) Frame monitor result



(d) Device monitor



7.4 Remote Connection

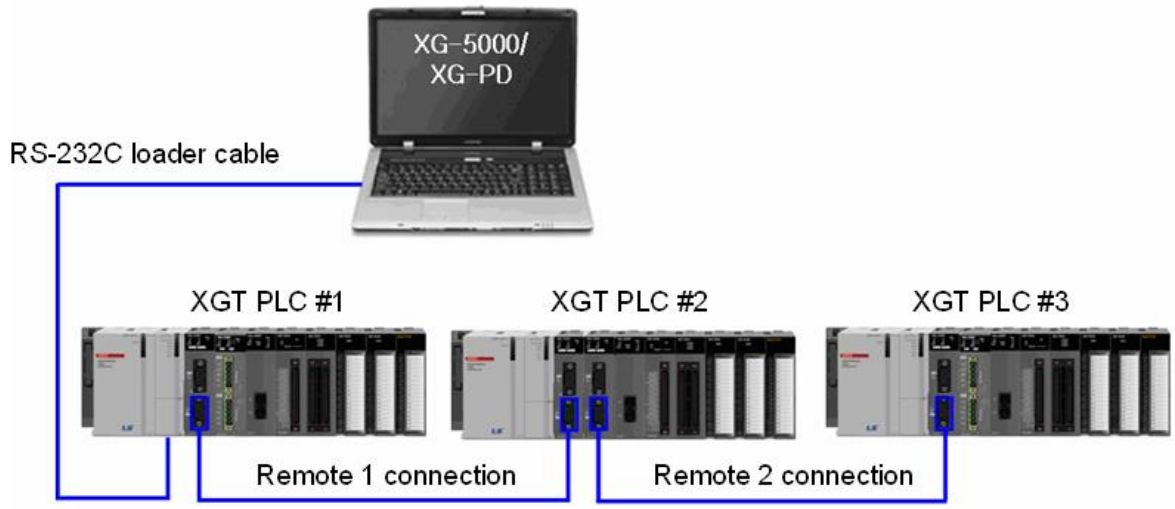
7.4.1 Overview

If the PLC is remote, you can carry out program download, upload, program debugging and monitoring remotely by using the remote connection function of the Cnet I/F module. You can access PLC wherever it is by using the Cnet I/F module and the XG5000 effectively. The remote connection function can be used in a system where PLCs are connected using the Cnet I/F module and a system where the XG5000 and PLC are connected through the modem. For the remote connection through the modem, refer to‘7.5 Modem communication’.

7.4.2 Restrictions in case of remote connection between Cnet I/F modules

There are several restrictions if the remote connection function is used in a system where PLCs are connected using the Cnet I/F module as shown in the figure below.

(1) RS-232C and RS-422 should be set for the communication type.[Note 1)]
(2) The maximum number of stages in case of remote connection is 2 stages.
(3) The basic setting between the Cnet I/F modules that use the remote connection should be the same.
(4) In case of XGR, the remote connection is available only when the station address of the extension driver module is set between No. 1 and No. 15.
(5) Two channels of the Cnet I/F module cannot be used as remote connection channels at the same time.



Notes

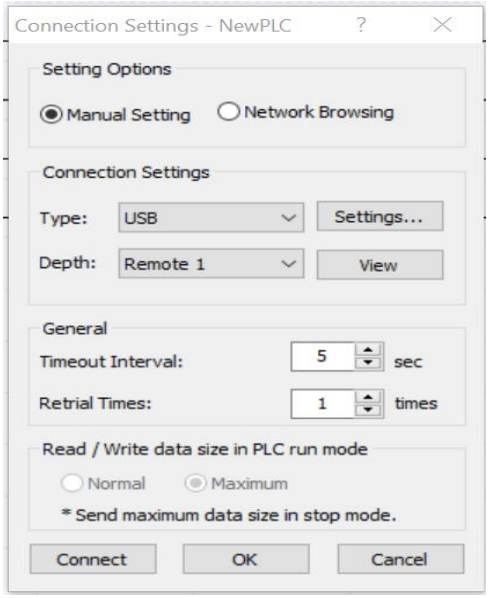
Note 1) The remote connection between the Cnet I/F modules can be used only when the O/S version of the Cnet I/F module is V2.5 or higher. The characteristics related to the remote connection are as follows.

(1) Only RS-232C and RS-422 types are supported for the communication type. However, if the remote connection using RS-485 is carried out, it is possible only when a check mark from P2P enable in [Online]→[Communication module setting and Diagnosis]→[Enable Link/Services] menu of the XG5000 is removed.
(2) The remote connection is supported regardless of operation mode.
(3) The remote connection during communication is affected by the transmission and reception cycle and the amount of data. If the transmission and reception cycle is short, or the amount of data is excessive, disconnection may occur.

7.4.3 Remote 1-stage connection

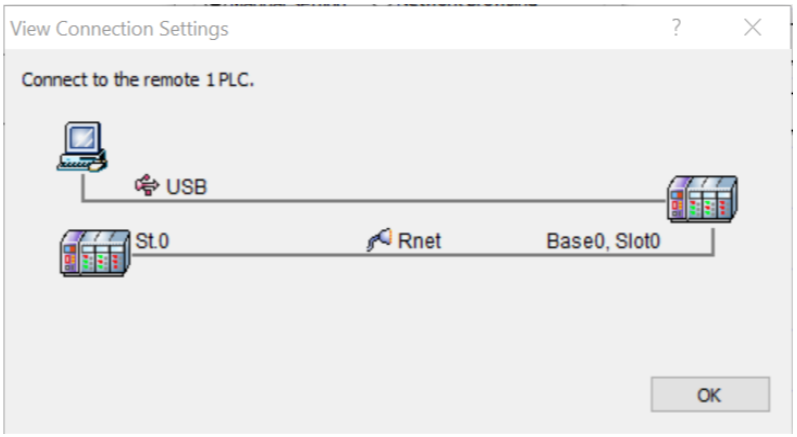
Remote 1-stage connection refer to the connection to PLC2 station in case of a system configured as shown in the figure in Paragraph 7.4.2, and the connection method is as follows.

(1) Click Connection setting and select Remote 1-stage for the connection stage.

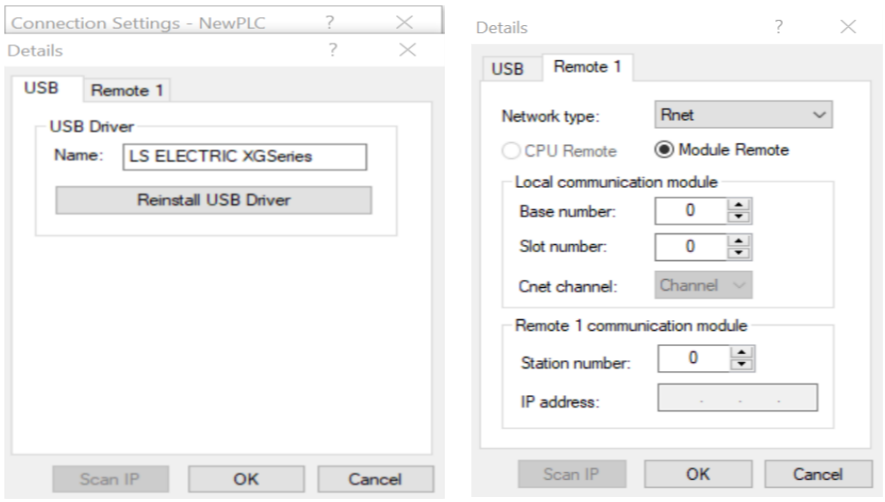


(2) General
  (a) Timeout time in case communication failed: It indicates the time taken until the timeout process when there is no response from the PLC even though the connection to PLC has been attempted.
  (b) Retry count in case communication failed: It indicates the number of communication attempts when communication fails.

(3) Connection option setting
  (a) When you click [View], the following screen will be displayed.



(b) Click [Setting] and set the detailed information of the RS-232C and the remote 1-stage.



(c) Detail setting of RS-232C

1) Communication port: Indicates the communication port of the computer where XG5000 is installed.
2) Communication speed: 38,400 bps and 115,200 bps are supported for the communication speed.

(d) Detail setting of remote 1-stage

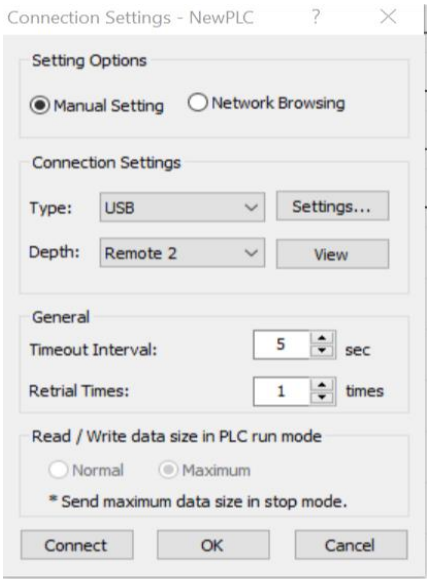
1) Network type: Indicates the communication means remote connection and select Cnet.
2) Local communication module: Select the installation position of the Cnet I/F module operating as local and the channel to be used.
3) Remote 1-stage communication module: Select the station address of the Cnet I/F module that carries out the remote connection.

(4) When you set detailed items and click [Connect], connection to the PLC 2 station will be made.

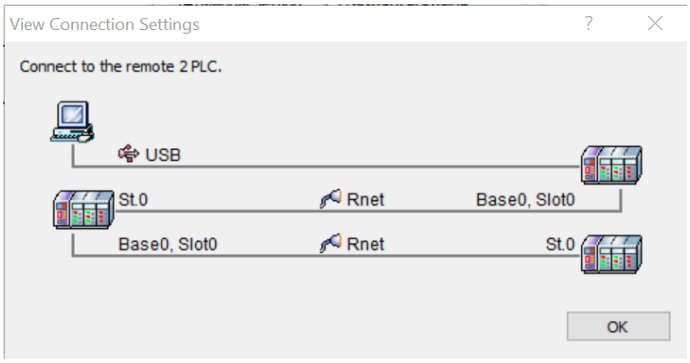
7.4.4 Remote 2-stage connection

Remote 2-stage connection refers to the connection to PLC3 station in case of a system configured as shown in the figure in Paragraph 7.4.2, and the connection method is as follows.

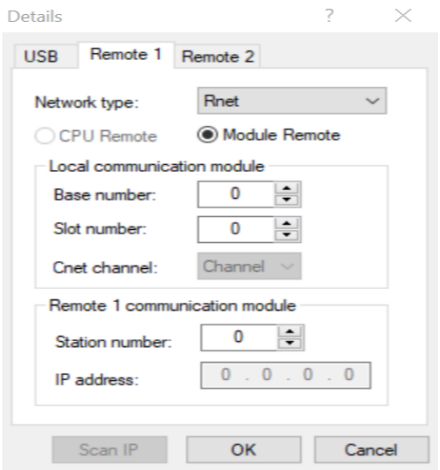
(1) Click Connection setting and select Remote 2-stage for the connection stage.

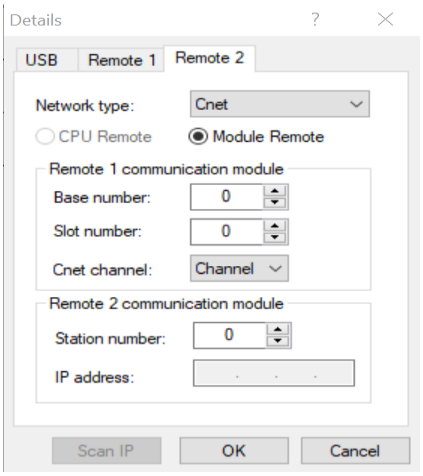


(2) When you click [View], the following screen will be displayed.



(3) Click [Setting] and set the detailed information of the remote 1-stage and remote 2-stage.





(a) Detail setting of remote 1-stage
1) Network type: Indicates the communication module for remote connection. Select XGT Cnet.
2) Local communication module: Select the installation position of the Cnet I/F module operating as local and the channel to be used.
3) Remote 1-stage communication module: Select the station address of the Cnet I/F module that carries out the remote connection.

(b) Detail setting of remote 2-stage
1) Network type: Indicates the communication module for remote connection and select Cnet.
2) Remote 1-stage communication module: Select the installation position of the Cnet I/F module set as the remote 1-stage and the channel to be used.
3) Remote 2-stage communication module: Select the station address of the Cnet I/F module that carries out the remote connection.

(4) When you set detailed items and click [Connect], connection to the PLC 3 station will be made.

7.5 Modem communication

7.5.1 Overview of Modem communication

The Cnet I/F module has a restriction in the transmission distance according to each communication type. (RS-232C: 15m, RS 422/485: A type 500m, B type 1,200m). However, you can control a PLC at great distance by using the modem.

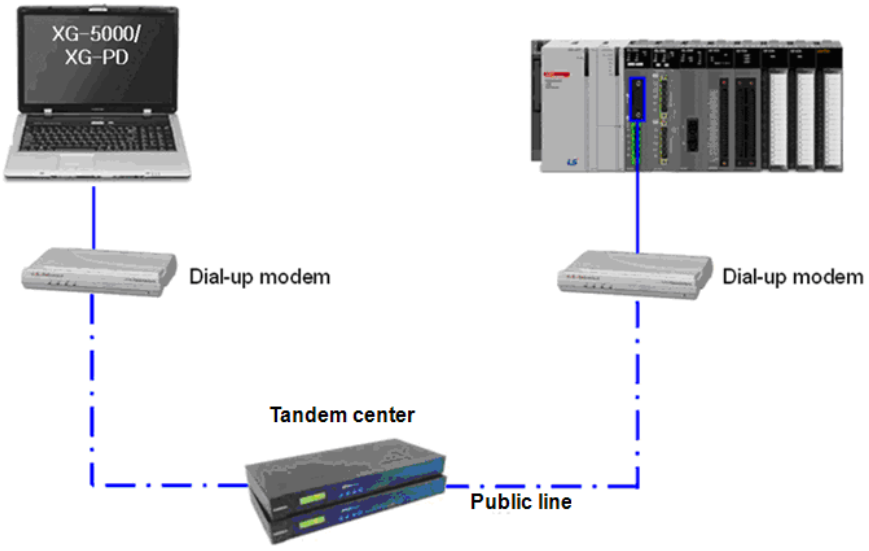
7.5. 2 Remote connection through the modem

The following figure shows a case of the remote connection system where the XG5000 and the PLC are connected through the modem. This is the configuration necessary for connecting the computer where XG5000 is installed and the PLC using the telephone line, dedicated line modem or wireless modem. In case of using in this way, the Cnet I/F module should be connected through the modem and the modem should be set for the connection method in the connection option.

There are two connection methods using the modem, including the dedicated modem connection that uses the dedicated line, and the dial-up modem connection using the public network.

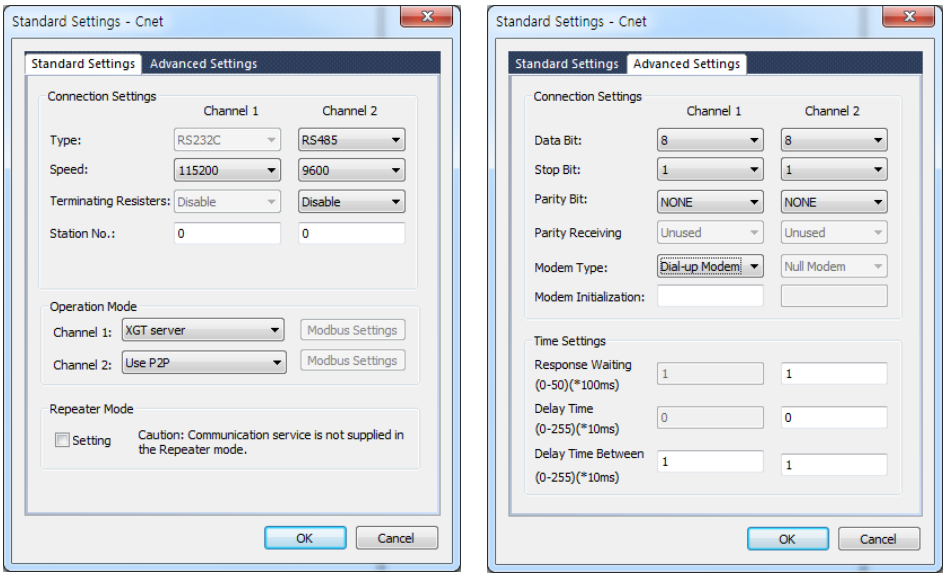
(1) Connection method through the modem

The following figure shows the case of configuration using the dial-up modem. The dial-up modem connection is the connection method to connect the PC and the Cnet I/F module by connecting them to the dial-up modem, and the dialing function and hang up functions are supported. This method establishes remote connecting using the dialing function of the XG5000, and the modem connected to the PC uses the external or internal dial-up modem and the modem connected to the Cnet I/F module uses the external modem.



The connection method using the modem is as follows.

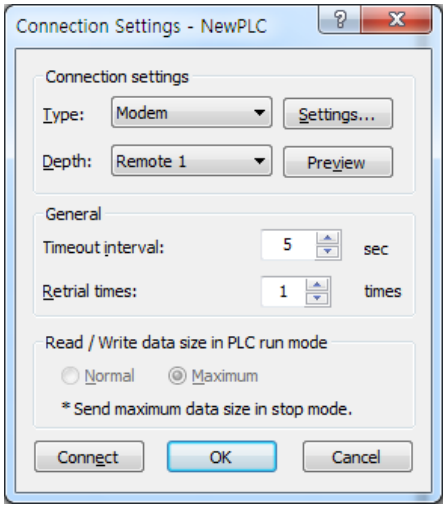
(a) Set XGT server for the operation mode of the RS-232C channel in the Cnet I/F module.



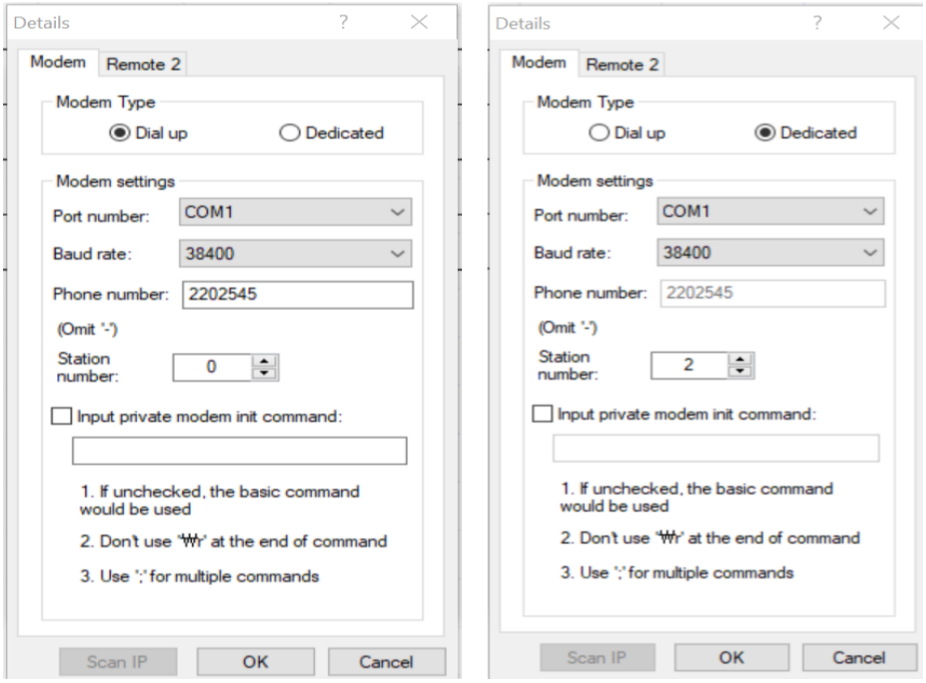
1) Modem type
   a) Dial-up modem : It is selected if the public telephone network is used.
   b) Dedicated modem: It is selected in case of 1:1 connection to the modem using the dedicated line.

2) Modem initialization
   Enter the command to initialize the modem. The modem initialization command varies by manufacturer. Enter it by referring to the relevant user's manual.

(b) Set dial-up modem for RS-232C channel operation and enter the modem initialization command.
(c) Executing XG5000 and select [Online] → [Connection setting]. Here, set modem for [Type]→[Depth].



(d) Select the [Setting] button and set the modem-related detailed information.



1) Modem
   a) Dial up: It is selected if the public telephone network is used.
   b) Dedicated: It is selected in case of 1:1 connection to the modem using the dedicated line.

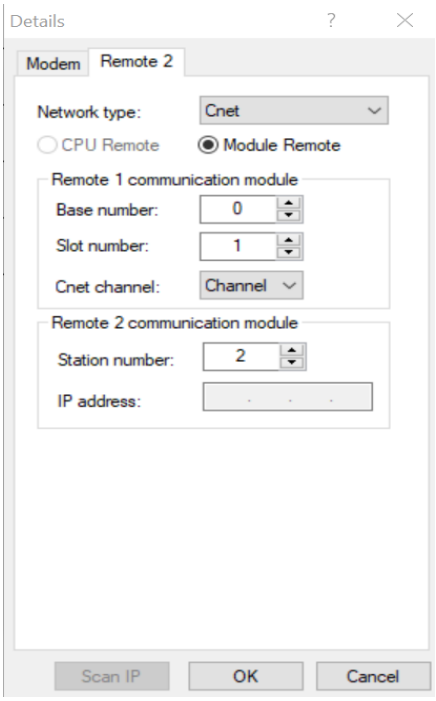
2) Modem setting
   a) Port number: It indicates the communication port of the modem that is used.
   b) Transmission speed: It indicates the transmission speed of the modem.
   c) Telephone No.: The telephone number of the modem connected to the Cnet I/F module is entered, and in the case of moving from the local to the outside using an extension, the extension number and',' symbol can be used.
      Example) If the extension number is'9': Set 9, 0343-398-xxxx

Notes

• In the case where the modem connected to the Cnet I/F module which is specified as the destination station is via local exchange, communication is impossible. In other words, if there is a separate extension number on the reception station, the dial-up modem communication cannot be used.

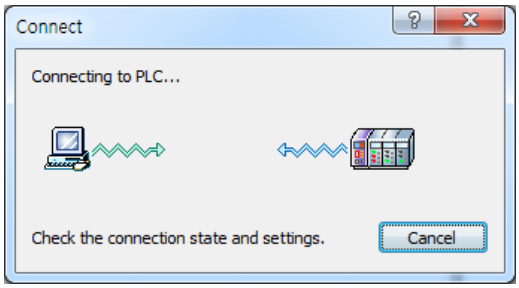
   d) Station address: It indicates the station address of the destination station.

   e) If the remote 2-stage is selected for the connection step, select the base and slot number of the remote 1-stage communication module from the detailed items as shown in the figure below, and set the communication module station address of remote 2-stage. For the station address, enter the station address set for the Cnet I/F module. In case of Cnet channel, select the communication channel of remote 2-stage.



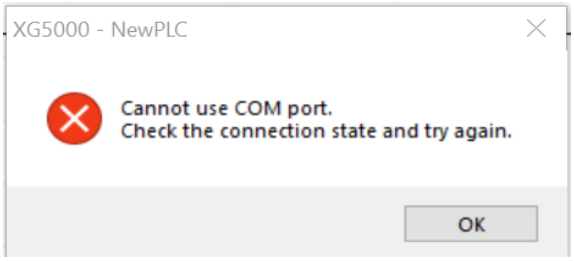
[Modem remote 2-stage setting screen]

f) When you select the connection from Online after setting the connection option, the modem initialization dialog box will be displayed, initializing the modem.



[Telephone connect screen]

g) If the port number of the modem is set incorrectly, or the connection to the modem is not made correctly, the following error message will be displayed. At this time, check the port number or modem connection.



[Screen for telephone connection error]

h) When dialing is completed, the XG5000 attempts remote connection automatically. When the remote connection is made, Write program and Run Stop icon menu will be enabled.
i) The remote 1-stage connection is made, becoming the status just as removing and connecting the RS-232C cable. Now, all functions of the online menu can be used.
j) When you terminate the remote connection status, select Disconnect from the online menu.
k) When the connection is terminated, the XG5000 hangs up the phone automatically, terminating the telephone connection.
l) When hanging up is completed normally, the local modem and remote modem will return to the initial state. Therefore, you can establish remote connection by dialing.

Notes

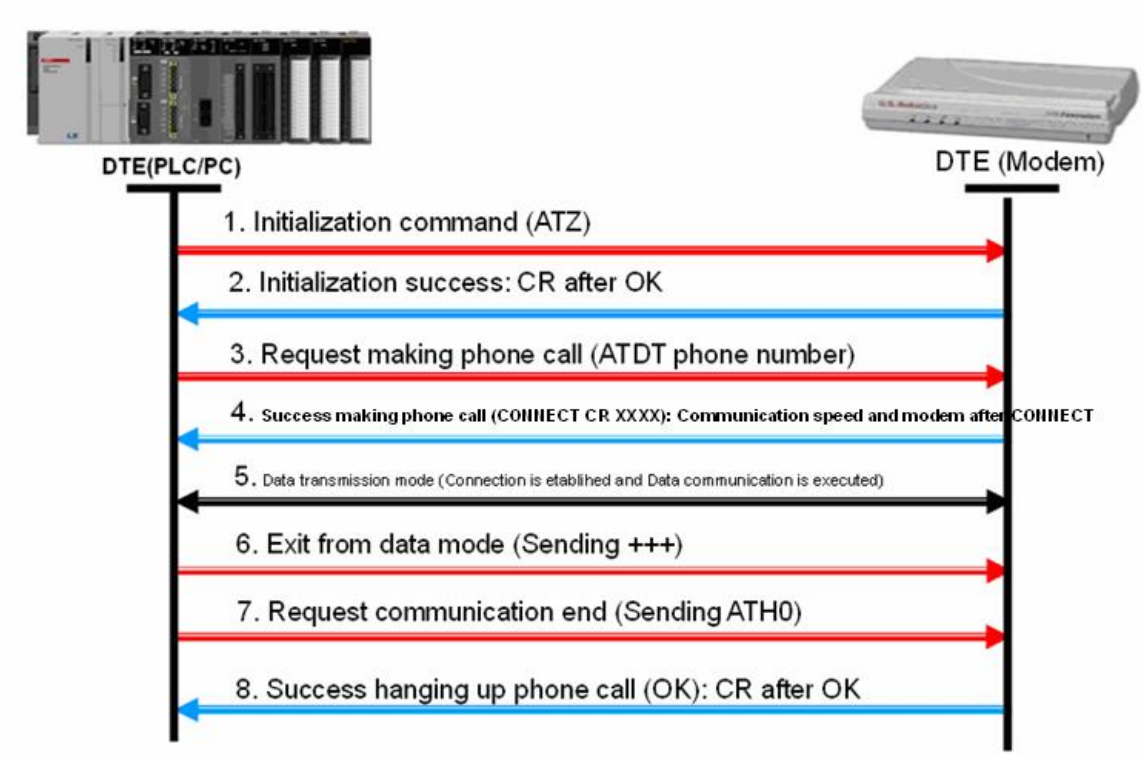
(1) The transmission speed set from the connection option is not the communication speed of the modem, but the communication speed between the PC and the modem. The communication speed of the modem refers to the communication speed between modems, and it is set automatically according to the call quality of the public network line and the speed of the destination station modem.

(2) When you establish remote connection using the XG5000, you need to use the RS-232C channel, so use the channel after setting‘RS-232C dial-up modem’ from the standard settings f the XG5000, writing it on Cnet I/F module and resetting the module.

(3) When the remote connection is made, the XG5000 operates in the same way with the local connection, so all online functions including download/upload program and monitor can be used. The system that controls the PLC using the modem is significantly affected by the modem performance and telephone line status, so if the telephone line status is poor, the connection may be terminated. At this time, do no attempt reconnection immediately, wait 30 seconds and carry out the procedure again from the beginning.

7.5. 3 Communication procedure between PLC and dial-up modem

The Communication procedure between the PLC (PC) and the dial-up modem is as shown in the figure below.



Notes

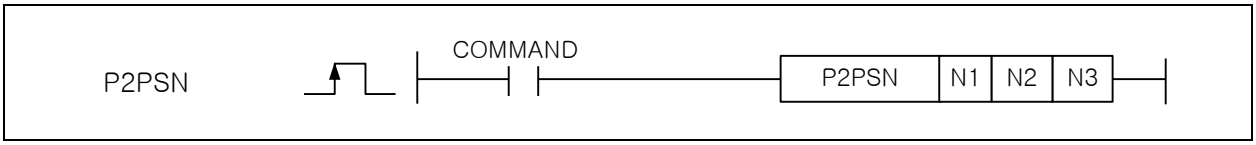
- Dial up modem initialization command may vary by modem manufacturer. Check the relevant user's manual.

7.6 Communication commands

7.6.1 XGK commands

(1) P2PSN

Command		Available area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
P2PSN	N1	O	-	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	N2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



(a) Area setting

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number (0 ~ 63)	WORD
N3	Station No.(0 ~ 63)	WORD

(b) Flag Set

Flag	Content	Device number
Error	If the value of N1, N2 and N3 goes outside the relevant range	F110

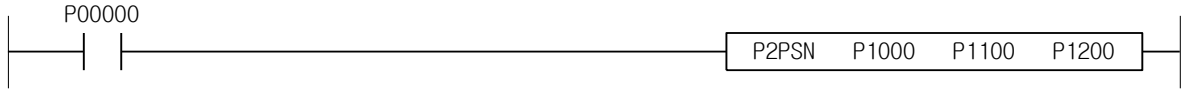
(c) Function

1) You can change the station address of the P2P opponent during run using the P2PSN command.
2) Change No. N2 block remote station address of No. N1 P2P to N3.
3) Relevant communication module: FDEnet, Cnet

(d) Error

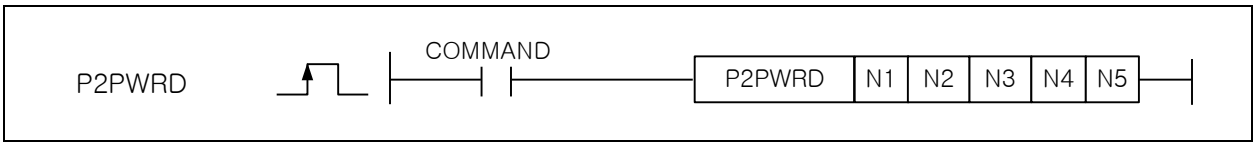
If the value of N1(1~8), N2(0~63) and N3(0~63) goes outside the relevant range, set the error flag (F110).

(e) Program example



(2) P2PWRD

Command		Available area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	Error (F110)	Zero (F111)	Carry (F112)
P2PWRD	N1	O	-	O	O	O	-	O	-	-	O	O	O	O	O	O	-	-
	N2	O	-	O	O	O	-	O	-	-	O	O	O	O	O			
	N3	O	-	O	O	O	-	O	-	-	O	O	O	O	O	4~6		
	N4	O	-	O	O	O	-	O	-	-	O	O	O	O	O			
	N5	O	-	O	O	O	-	O	-	-	-	O	O	O	O			



(a) Area setting

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number (0 ~ 63)	WORD
N3	Variable number (1 ~ 4)	WORD
N4	Variable size [n byte](0 ~ 1400)	WORD
N5	Device	WORD

(b) Flag Set

Flag	Content	Device number
Error	If the value of N1, N2, N3 and N4 goes outside the relevant range	F110

(c) Function

1) P2PWRD command changes the variable size and word READ device area of the relevant P2P parameter block.
2) Specify the relevant P2P parameter, block and variable using N1, N2 and N3, and change the variable size and device to N4 and N5 respectively.
3) Relevant communication module: FEnet, FDEnet, Cnet

(d) Error

If the value of N1(1~8), N2(0~63), N3(1~4) and N4(0~1400) goes outside the relevant range, set the error flag (F110).

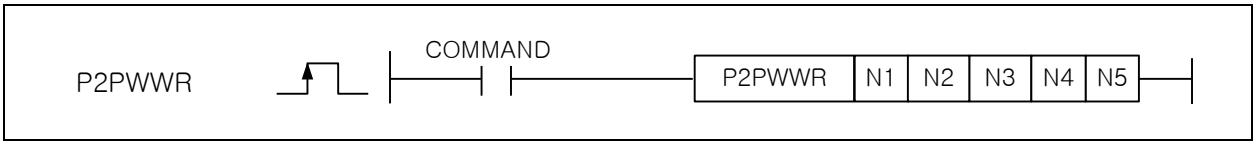
(e) Program example

Notes

(1) In case of separate command, a value between 1 and 4 is used for the variable number (N3) and the size of valuable (N4) does not apply.
(2) In case of continuous command, 1 is always used for the variable number (N3) and the size of variable (N4) applies.
(3) The size of variable (N4) is used in byte.

(3) P2PWWR

Command		Available area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
P2PWWR	N1	O	-	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	N2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N4	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N5	O	-	O	O	O	-	O	-	-		O	O	O	O				



(a) Area setting

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number (0 ~ 63)	WORD
N3	Variable number (1 ~ 4)	WORD
N4	Variable size (0 ~ 1400)	WORD
N5	Device	WORD

(b) Flag Set

Flag	Content	Device number
Error	If the value of N1, N2, N3 and N4 goes outside the relevant range	F110

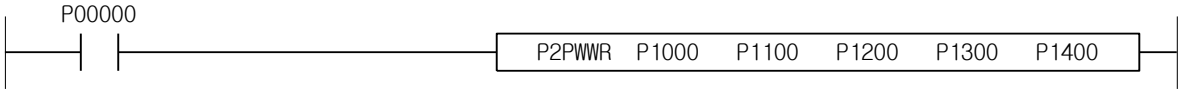
(c) Function

1) P2PWWR command changes the variable size and word WRITE device area of the relevant P2P parameter block.
2) Specify the relevant P2P parameter, block and variable using N1, N2 and N3, and change the variable size and device to N4 and N5 respectively.
3) Relevant communication module: FEnet, FDEnet, Cnet

(d) Error

If the value of N1(1~8), N2(0~63), N3(1~4) and N4(0~1400) goes outside the relevant range, set the error flag (F110).

(e) Program example

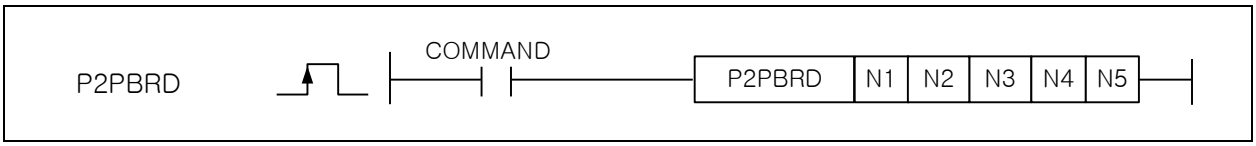


Notes

(1) In case of separate command, a value between 1 and 4 is used for the variable number (N3) and the size of valuable (N4) does not apply.
(2) In case of continuous command, 1 is always used for the variable number (N3) and the size of variable (N4) applies.
(3) The size of variable (N4) is used in byte.

(4) P2PBRD

Command		Available area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
P2PBRD	N1	O	-	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	N2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N4	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N5	O	-	O	O	O	-	-	O	O	-	O	-	-	-				



(a) Area setting

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number (0 ~ 63)	WORD
N3	Variable number (1 ~ 4)	WORD
N4	Variable size (0 ~ 2000)	WORD
N5	Device	WORD

(b) Flag Set

Flag	Content	Device number
Error	If the value of N1, N2, N3 and N4 goes outside the relevant range	F110

(c) Function

1) P2PBRD command changes the variable size and bit READ device area of the relevant P2P parameter block.
2) Specify the relevant P2P parameter, block and variable using N1, N2 and N3, and change the variable size and device to N4 and N5 respectively.
3) Relevant communication module: FEnet, FDEnet, Cnet

(d) Error

If the value of N1(1~8), N2(0~63), N3(1~4) and N4(0~1400) goes outside the relevant range, set the error flag (F110).

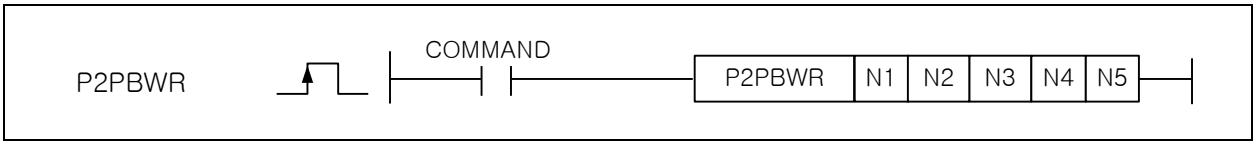
(e) Program example

Notes

(1) In case of separate command, a value between 1 and 4 is used for the variable number (N3) and the size of valuable (N4) does not apply.
(2) In case of continuous command, 1 is always used for the variable number (N3) and the size of variable (N4) applies.
(3) The size of variable (N4) is used in byte.

(5) P2PBWR

Command		Available area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
P2PBWR	N1	O	-	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	N2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N4	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	N5	O	-	O	O	O	-	-	O	O	-	O	-	-	-				



(a) Area setting

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number (0 ~ 63)	WORD
N3	Variable number (1 ~ 4)	WORD
N4	Variable size (0 ~ 2000)	WORD
N5	Device	WORD

(b) Flag Set

Flag	Content	Device number
Error	If the value of N1, N2, N3 and N4 goes outside the relevant range	F110

(c) Function

1) P2PBWR command changes the variable size and bit WRITE device area of the relevant P2P parameter block.
2) Specify the relevant P2P parameter, block and variable using N1, N2 and N3, and change the variable size and device to N4 and N5 respectively.
3) Relevant communication module: FEnet, FDEnet, Cnet

(d) Error

If the value of N1(1~8), N2(0~63), N3(1~4) and N4(0~1400) goes outside the relevant range, set the error flag (F110).

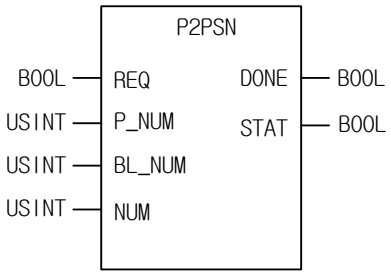
(e) Program example

Notes

(1) In case of separate command, a value between 1 and 4 is used for the variable number (N3) and the size of valuable (N4) does not apply.
(2) In case of continuous command, 1 is always used for the variable number (N3) and the size of variable (N4) applies.
(3) The size of variable (N4) is used in byte.

7.6.2 XGI commands

(1) P2PSN

Function block	Description
	Input REQ : Request the execution of function block P_NUM : P2P No. BL_NUM : Block No. NUM : Station No. Output DONE : Maintain 1(on) after initial operation STAT : Complete and ERR information

(a) Function

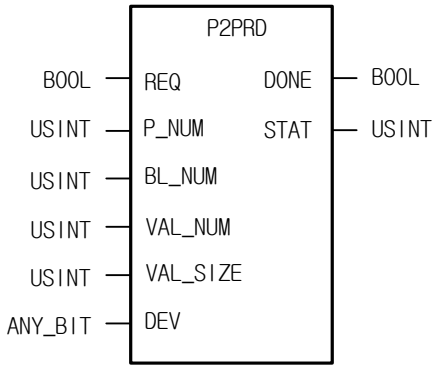
1) You can change the station address of the P2P opponent during run using the P2PSN command.
2) Change the remote station address of No. BL_NUM block in No. P_NUM P2P to NUM.
3) Relevant communication module: FDEnet, Cnet.

(b) Error

It indicates the relevant error number on STAT when an error occurs.

STAT_NUM	Contents	Detailed description
1	P2P number setting	It occurs when a value other than P_NUM(1~8) is set
2	Block number setting	It occurs when a value other than BL_NUM(0~63) is set
4	Slot does not exist.	-
5	Module mismatch	It is not the communication module.
6	Module mismatch	Communication module which cannot be used for the relevant command
7	Station number setting error	It occurs when a value other than NUM(0~63) is set. However, (0~31) in the case of Cnet.

(2) P2PRD

Function block	Description
	Input REQ : Request the execution of function block P_NUM : P2P No. BL_NUM : Block No. VAL_NUM : Variable number VAL_SIZE : Variable size DEV : Device(Only a direct valuable can be entered) Output DONE : Maintain 1(on) after initial operation STAT : Complete and ERR information

ANY type Description of variable	Variable name	BOOL	BYTE	WORD	DWORD	LWORD	SINT	INT	DINT	LINT	USINT	UINT	UDINT	ULINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
	DEV	○	○	○	○	○															

(a) Function

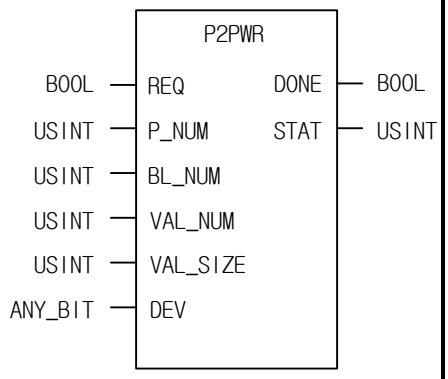
1) P2PRD command changes the variable size and READ device area of the relevant P2P parameter block. (Both individual and continuous read can be changed.)
2) Specify the relevant P2P parameter, block and variable Using the P_NUM, BL_NUM and VAL_NUM and change the variable size and device to VAL_SIZE (In case of continuous, VAL_SIZE means variable size and it is the size by variable type in case of individual) and DEV respectively. Here, only variable can be entered for DEV. (Ex, %MW100)
3) Relevant communication module: FEnet, FDEnet, Cnet.

(b) Error

If contents that out of the permissible range of the P2P parameters set from the XG5000 are set, the relevant error number appears.

STAT_NUM	Contents	Detailed description
1	P2P number setting error	It occurs when a value other than P_NUM(1~8) is set
2	Block number setting error	It occurs when a value other than BL_NUM(0~63) is set
3	Variable number setting error	It occurs when a variable number which is not permitted in the P2P parameters set in XG5000 is entered.
4	Slot does not exist	-
5	Module mismatch	It is not the communication module.
6	Module mismatch	Communication module which cannot be used for the relevant command
10	Modbus setting error	The Modbus offset cannot be entered (example, 0x10000) because only a direct variable can be entered for DEV.
11	Variable size setting error	It occurs when the size of a variable which is not permitted for the P2P parameter set in XG5000 is entered.
12	Data type setting error	It occurs when a variable type which is not permitted in the P2P parameter set in XG5000 is entered.

(3) P2PWR

Function block	Description
	Input REQ : Request the execution of function block P_NUM : P2P No. BL_NUM : Block No. VAL_NUM : Variable number VAL_SIZE : Variable size DEV : Device(Only a direct valuable can be entered) Output DONE : Maintain 1(on) after initial operation STAT : Complete and ERR information

ANY type Description of variable	Variable name	BOOL	BYTE	WORD	DWORD	LWORD	SINT	INT	DINT	LINT	USINT	UINT	UDINT	ULINT	REAL	LREAL	TIME	DATE	TOD	DT	STRING
	DEV	○	○	○	○	○															

(a) Function

1) The P2PRD command changes the variable size and WRITE device area of the relevant P2P parameter block. (Both read individually/continuously can be changed.)
2) The P_NUM, BL_NUM and VAL_NUM are used to specify the P2P parameters, blocks and variables and change the variable size and device to VAL_SIZE(In the case of continuous writing, VAL_SIZE means variable size, and it is the size of variable type in the case of individual writing) and DEV, respectively. Here, only variable can be entered for DEV. (Ex, %MW100)
3) Relevant communication module: FEnet, FDEnet, Cnet.

(b) Error

If contents that out of the permissible range of the P2P parameters set from the XG5000 are set, the relevant error number appears.

STAT_NUM	Contents	Detailed description
1	P2P number setting error	It occurs when a value other than P_NUM(1~8) is set
2	Block number setting error	It occurs when a value other than BL_NUM(0~63) is set
3	Variable number setting error	It occurs when a variable number which is not permitted in the P2P parameters set in XG5000 is entered.
4	Slot does not exist	-
5	Module mismatch	It is not the communication module.
6	Module mismatch	Communication module which cannot be used for the relevant command
10	Modbus setting error	The Modbus offset cannot be entered(Example: 0x10000) because only a direct variable can be entered for DEV.
11	Variable size setting error	It occurs when the size of a variable which is not permitted for the P2P parameter set in XG5000 is entered.
12	Data type setting error	It occurs when a variable type which is not permitted in the P2P parameter set in XG5000 is entered.

Chapter 8 LS Bus Protocol

8.1 LS bus protocol

LS Bus protocol communication is a protocol that is applied when communicating with the inverter of its company. The PLC and inverter manufactured by LS ELECTRIC can be connected easily using the data read and write function in various internal device areas and the monitoring function without special settings.

The LS bus protocol functions provided in the Cnet I/F module are as follows.

- Device continuous read
- Device continuous write

8.1.1 Frame Structure

(1) Basic structure

(a) Request frame (external communication device → Cnet)

Head (ENQ)	Station No.	Command	Structured data area	Frame check(BCC)	Tail (EOT)

(b) ACK response frame (Cnet → external communication device, when data is received normally)

Head (ACK)	Station No.	Command	Structured data area	Frame check(BCC)	Tail (EOT)

(c) NAK response frame (Cnet → external communication device, when data is not received normally)

Head (NAK)	Station No.	Command	Error code(ASCII 4 Byte)	Frame check(BCC)	Tail (EOT)

Notes

(1) In case of numeric data of all frames, a Hex value is expressed in ASCII code, unless specified otherwise. Items expressed as a Hex value are as follows.
- Station No.
- R (read) and W (write) are supported for the command type.
- Whole content of data

(2) For hex data, 'H' is attached in front of number in the frame such as H01, H12345, H34, H12 and H89AB, indicating that this data is hex data.

(3) Up to 256 bytes can be used for the frame.

(4) The contents of a control code used are as follows.

Code	Hex values	Name	Contents of control
ENQ	H05	Enquire	Start code of request frame
ACK	H06	Acknowledge	Start code of the ACK response frame
NAK	H15	Not Acknowledge	Start code of the NAK response frame
EOT	H04	End of text	End ASCII code of requested frame

(2) Command frame sequence

▪ Sequence of command request frame

ENQ	Station No.	Com mand	Formatted data	BCC	EOT

ACK	Station No.	Com mand	Formatted data	BCC	EOT

(Inverter ACK response)

NAK	Station No.	Com mand	Formatted data	BCC	EOT

(Inverter NAK response)

8.1.2 List of commands

The type of command used in the LS bus protocol is as follows.

Classification / Item	Command		Contents of process
	Command type		
	Symbol	ASCII code	
Read continuously	R	H52	Word type inverter variables are read in word units.
Write continuously	W	H57	Writes word type inverter variable in word unit.

8.2 Details of Command

8.2.1 Write inverter continuously(W)

This is the command to specify an address to the inverter address directly and write data in word units.

(1) Request format of LS bus client

Format name	Header	Station No.	Command	Inverter address	Data size	Data	…	Frame check	Tail
Frame(Ex)	ENQ	H20	W	0100	H6	H00E2		BCC	EOT
ASCII values	H05	H3230	H57	H30313030	H36	H30304532		`	H04

Classification	Description
BCC	Only one low-order byte of the value obtained by adding one byte each to the ASCII value excluding the values of ENQ and EOT is converted into ASCII and added to BCC.
Data size	Specify the number of words to write. When converted to ASCII, it ranges from H01(ASCII value:3031)to H08(ASCII value:3038).
Inverter address	The inverter address to be read is entered. It should be up to 4-digit ASCII value, and characters other than numbers are not permitted.
Data	If the value to be written in the inverter address 0100 area is H'A, the data format should be H000A.

- Example
  If the data type you wish to use is words and the value is H1234, this value will be 31323334 when it is converted into ASCII code, so 31323334 will be saved on the data area. In other words, the most significant value is transmitted first, and the least significant value is transmitted later.

Notes

• Only words are supported for the device data type.

(2) Inverter response format (when the ACK responds)

Format name	Header	Station No.	Command	Data	…	Frame check	Tail
Frame(Ex)	ACK	H20	W	H00E2		BCC	EOT
ASCII values	H06	H3230	H57	H30304532			H04

Classification	Description
BCC	Only one low-order byte of the value obtained by adding one byte each to the ASCII value excluding the values of ENQ and EOT is converted into ASCII and added to BCC.

(3) Inverter response format (when the NAK responds)

Format name	Header	Station No.	Command	Error Code (ASCll Byte)	Frame check	Tail
Frame(Ex)	NAK	H20	W	H12	BCC	EOT
ACSII values	H15	H3230	H57	H3132		H04

Classification	Description
BCC	Only one lower byte of the value obtained by adding the ASCII value excluding ENQ and EOT values by one byte is converted into ASCII and added to BCC.
Error code	This is the content of 1 byte (2 bytes in ASCII code) in Hex and it indicates the type of error. For detailed contents, refer to the error code of the relevant inverter.

(4) Example

This example supposes that “H00FF” is written in 1230 of inverter station No. 1.

(a) Requested format by Cnet (Cnet → inverter)

Format name	Header	Station No.	Command	Data size	Inverter address	Data	Frame check	Tail
Frame(Ex)	ENQ	H01	W	H1	1230	H00FF	BCC	EOT
ASCII values	H05	H3031	H57	H3031	H31323330	H30304646		H04

(b) When the ACK responds after the command is executed (Cnet ← inverter)

Format name	Header	Station No.	Command	Data	Frame check	Tail
Frame(Ex)	ACK	H01	W	H00FF	BCC	EOT
ASCII values	H06	H3031	H57	H30304646		H04

(c) When the NAK responds after the command is executed (Cnet ← inverter)

Format name	Header	Station No.	Command	Error code	Frame check	Tail
Frame(Ex)	NAK	H01	W	H12	BCC	EOT
ASCII values	H15	H3031	H57	Error code(2 bytes)		H04

8.2.2 Read inverter continuously(R)

This is the function to read continuously as much data as the specified quantity, starting from the specified address of the device.

(1) Format requested by PLC

Format name	Header	Station No.	Command	Inverter address	The number of data	Frame check	Tail
Frame Example)	ENQ	H10	R	0100	H5	BCC	EOT
ASCII values	H05	H3130	H52	H30313030	H35		H04

Classification	Description
BCC	Only one lower byte of the value obtained by adding the ASCII value excluding ENQ and EOT values by one byte is converted into ASCII and added to BCC.
Data size	Specify the number of words to write. When converted to ASCII, it ranges from H01(ASCII value:3031)to H08(ASCII value:3038).
Inverter Address	The inverter address to be read is entered. It should be up to 4-digit ASCII value, and characters other than numbers are not permitted.

Notes

• Only words are supported for the device data type.

(2) Inverter response format (when the ACK responds)

Format name	Header	Station No.	Command	Data	…	Frame check	Tail
Frame(Ex)	ACK	H20	R	H00E2	…	BCC	EOT
ASCII values	H06	H3230	H52	H30304532	…		H04

Classification	Description
BCC	Converts only one lower byte of the value obtained by adding one byte of ASCII value excluding ENQ and EOT values into ASCII.

(3) Inverter response format (when the NAK responds)

Format name	Header	Station No.	Command	Error code (ASC 2 Byte)	Frame check	Tail
Frame(Ex)	NAK	H20	R	H12	BCC	EOT
ACSII values	H15	H3230	H52	H3132		H04

Classification	Description
BCC	Only one lower byte of the value obtained by adding the ASCII value excluding ENQ and EOT values by one byte is converted into ASCII and added to BCC.
Error code	The types of errors are indicated by the contents of 1Byte in Hex(2 Byte in ASCII code). For detailed contents, refer to the error code of the relevant inverter.

(4) Example

The following is an example to read 1 word data of address 1230 of inverter station number 1.

(a) Requested format by Cnet (Cnet → inverter)

Format name	Header	Station No.	Command	Inverter address	Data size	Frame check	Tail
Frame(Ex)	ENQ	H01	R	1230	H1	BCC	EOT
ASCII values	H05	H3031	H52	H31323330	H31		H04

(b) When the ACK responds after the command is executed (Cnet ← inverter)

Format name	Header	Station No.	Command	Data	Frame check	Tail
Frame(Ex)	ACK	H01	R	H1234	BCC	EOT
ASCII values	H06	H3031	H52	H31323334		H04

(c) When the NAK responds after the command is executed (Cnet ← inverter)

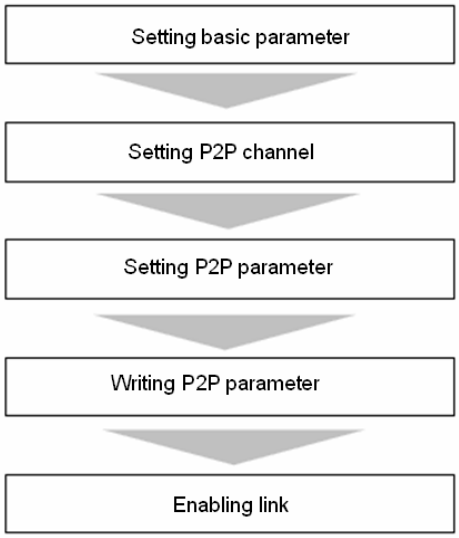
Format name	Header	Station No.	Command	Error code	Frame check	Tail
Frame(Ex)	NAK	H01	R	H12	BCC	EOT
ASCII values	H15	H3031	H52	H3132		H04

Chapter 9 Modbus Communication

9.1 Overview

The Modbus protocol is the open type protocol used when the client and the server communicate with each other. It functions to read or write data according to the function code. The inter-device communication using the Modbus protocol uses client-server function that is processed by only one client

The sequence to transmit and receive data using the Modbus communication is as follows.



9.2 Modbus Protocol

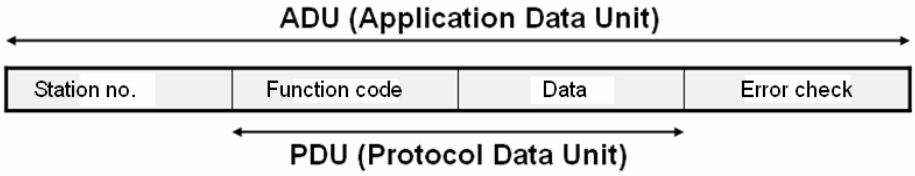
9.2.1 Protocol type

There are two Modbus communication modes including ASCII and RTU.

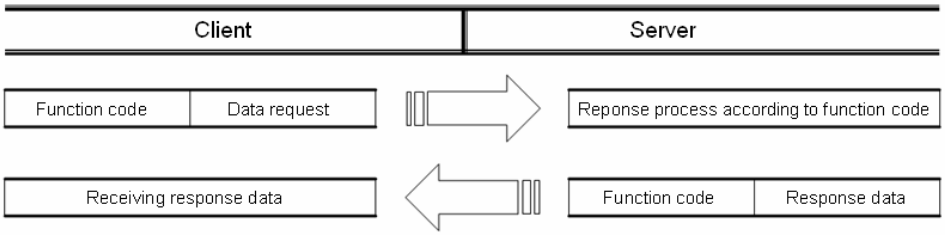
Characteristics		ASCII mode	RTU mode
Code system		ASCII code	8 bit binary code
Number of data per character	Start bit	1	1
	Data bit	7	8
	Parity bit	Even, Odd, None	Even, Odd, None
	Stop bit	1 or 2	1 or 2
Error check		LRC (Longitudinal Redundancy Check)	CRC (Cyclical Redundancy Check)
Frame start		Colon(:)	3.5 Character non-response time

9.2.2 Protocol structure

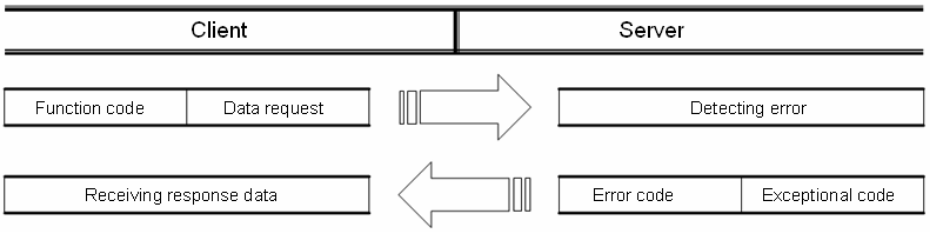
The Modbus protocol consists of the PDU which consists of the function code and data, and the ADU where the destination station address and error check are added to the PDU.



If the Modbus communication is normal, the server operates as follows.



If the Modbus communication is abnormal, the server transmits the response, including the error code, to the client, as shown in the figure below.



When an abnormal frame is received, the server transmits the error code and the exception code to the client. The error code is the value of the function code plus 80(Hex) value, and the exception code indicates the error details. The contents of each code are as follows.

Code	Name	Contents
01	Function code error	If the function code does not match
02	Address error	If the address has exceeded the permissible range
03	Data setting error	If a data value which is not permitted has been set
04	Server station abnormality error	If an abnormality has occurred in the server (slave) station
05	Server station retry request	When the server requests the client to make a request again later as processing is not currently available
06	Server station processing time delay	This is the case when it takes time for the server station to process the request, and the master should repeat the request.

9.3 Frame Structure

9.3.1 Frame structure in case of ASCII mode

The frame structure in case of Modbus ASCII mode is as follows.

Classification	Start	Station No.	Function code	Data	Error check	End
Size(byte)	1	2	2	N	2	2

(1) Characteristics
(a) The start of the frame is a colon (:) which is 1 byte ASCII code and the end of the frame is 'CRLF'.
(b) Up to a 1 second interval is permitted between characters.
(c) The frame decides whether an error exists or not using the LRC (Longitudinal Redundancy Check).

(2) Address area
(a) It is configured in 2 bytes.
(b) A station address from 0 to 31 can be set.
(c) Station 0 is used as the client station address.
(d) The server responds by including its own address in the response frame so that the client will know.

(3) Data area
(a) Data is transmitted using ASCII data; the data structure varies according to each function code.
(b) When a normal frame is received, response data will be transmitted.
(c) When an abnormal frame is received, an error code will be transmitted.

(4) Error check area
Decides whether an error exists or not using LRC.

9.3.2 Frame structure in case of RTU mode

The frame structure in case of Modbus RTU mode is as follows.

Classification	Start	Station No.	Function code	Data	Error check	End
Size(byte)	Idle time	1	1	N	2	Idle time

(1) Characteristics
(a) Communicates using a Hex number.
(b) The start of the frame is the station address and the end of the frame is CRC error check.
(c) The start and end of the frame are distinguished by adding 1 bit idle time to the start and end of the frame.
(d) At least a 3.5 character time interval exists between frames, and when more than 1.5 character time has passed between characters, it is recognized as an independent frame.

(2) Address area
(a) It is configured in 1 bytes.
(b) A station address from 0 to 31 can be set.
(c) Station 0 is used as the client station address.
(d) The server responds by including its own address in the response frame so that the client will know.

(3) Data area
(a) Data is transmitted using Hex data and the data structure varies according to each function code.
(b) When a normal frame is received, response data will be transmitted.
(c) When an abnormal frame is received, an error code will be transmitted.

(4) Error check area
The frame decides whether an error exists or not using the CRC (Cyclical Redundancy Check).

(5) Modbus address rule
An address in data begins from 0 and it is the same as the value of Modbus memory subtracted by 1. In other words, Modbus address 2 is same as address 1 in the data.

9.3. 3 Data and address expression method

The method to express data and the address of Modbus protocol is as follows.

(1) Hex data is used as the default type.
(2) In ASCII mode, hex data is used after it is converted into ASCII code.
(3) In RTU mode, hex data is used.
(4) The type of function code is as follows.

Code(hex)	Usage	Available area	Address	Max. response data
01	Read bit individually/continuously	Output bit	0XXXX	2000 bit
02	Read bit individually/continuously	Input bit	1XXXX	2000 bit
03	Read word individually/continuously	Output word	4XXXX	125 words
04	Read word individually/continuously	Input word	3XXXX	125 words
05	Write bit individually	Output bit	0XXXX	1 bit
06	Write word individually	Output word	4XXXX	1 words
0F	Write bit continuously	Output bit	0XXXX	1968 bit
10	Write word continuously	Output word	4XXXX	123 words

9.3.4 Read bit data from bit output area (01)

(1) Reading bit of output area(function code: 01)
The frame structure in the case of reading bit data from the bit output area is as follows.
Tail of the frame only applies in the case of ASCII mode.

(a) Request frame

Frame	Station No.		Function code(01)	Address	Data size	Frame error check	Tail (CRLF)
Size(byte)	1		1	2	2	2	2

(b) Response frame (When a normal frame is received)

Frame	Station No.	Function code(01)	Number of bytes	Data	Frame error check	Tail (CRLF)
Size(byte)	1	1	1	N	2	2

(c) Response frame (When an abnormal frame is received)

Frame	Station No.	Error code	Exception code	Tail (CRLF)
Size(byte)	1	1	1	2

(2) Frame detail
(a) Station address: It indicates the station address of the relevant server.
(b) Function code: '01' which indicates read bit data from the bit output area continuously/individually
(c) Address: It represents the starting address of the data to be read from the server and consists of 2 bytes. At start address time, the Modbus address rule applies for the start address.
(d) Data size: It represents the size of data to be read and consists of 2 bytes.
(e) Frame error check: In ASCII mode, it uses LRC, in RTU mode, it uses CRC and consists of 2 bytes.
(f) Tail: It applies only in the case of the ASCII mode, and CRLF is added after LRC.
(g) Number of bytes: It means the number of bytes of data that responds.
(h) Data: Transmit data in byte units with the address of the request frame as the start address.
(i) Error code: The error code is expressed as the function code plus 80 (Hex) value, and in the case of reading bit data in the bit output area, 81 (Hex) will be transmitted.
(j) Exception code: It represents detailed error details and consists of 1 byte.

(3) Example of frame

This is an example in the case of reading bit data from 20 to 38 from No. 1 server that operates in Modbus RTU mode.

(a) Request frame

Classification	Station No.	Function code	Address		Data size		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	01	00	13	00	13	CRC

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code	Number of bytes	Data			Error check
Frame	01	01	03	12	31	05	CRC

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Function code	Exception code	Error check
Frame	01	81	02	CRC

9.3.5 Read bit data from bit Input area (02)

(1) Read bit from the input area

The frame structure in the case of reading bit data from the bit input area is as follows.
The tail of the frame is applied only in the case of ASCII mode.

(a) Request frame

Classification	Station No.	Function code(02)	Address	Data size	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	2	2

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code(02)	Number of bytes	Data	Frame error check	Tail (CRLF)
Size(byte)	1	1	1	N	2	2

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Error code	Exception code	Tail (CRLF)
Size(byte)	1	1	1	2

(2) Frame detail

(a) Station address: It indicates the station address of the relevant server.
(b) Function code: '02' which indicates read bit data from the bit input area continuously/individually.
(c) Address: It represents the starting address of the data to be read from the server and consists of 2 bytes. At this time, the Modbus address rule applies for the start address.
(d) Data size: It represents the size of data to be read and consists of 2 bytes.
(e) Frame error check: In ASCII mode, it uses LRC, in RTU mode, it uses CRC and consists of 2 bytes.
(f) Tail: It applies only in the case of the ASCII mode, and CRLF is added after LRC.
(g) Number of bytes: It means the number of bytes of data that responds.
(h) Data: Transmit data in byte units with the address of the request frame as the start address.
(i) Error code: The error code is expressed as the function code plus 80 (Hex) value, and in the case of reading bit data in the bit input area, 82 (Hex) will be transmitted.
(j) Exception code: It means the detailed error description and consists of 1 byte.

(3) Example of frame

This is an example of reading bits from 20 to 39 in server station No. 1 that operates in Modbus RTU mode.

(a) Request frame

Classification	Station No.	Function code	Address		Data size		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	02	00	13	00	13	CRC

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code	Number of bytes	Data			Error check
Frame	01	02	03	12	31	05	CRC

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Function code	Exception code	Error check
Frame	01	82	02	CRC

9.3.6 Read word data from word output area (03)

(1) Read words from the output area

The frame structure in the case of reading word data from the word output area is as follows. The tail of the frame is applied only in the case of ASCII mode.

(a) Request frame

Classification	Station No.	Function code(03)	Address	Data size	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	2	2

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code(03)	Number of bytes	Data	Frame error check	Tail (CRLF)
Size(byte)	1	1	1	N*2	2	2

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Error code	Exception code	Tail (CRLF)
Size(byte)	1	1	1	2

(2) Frame detail

(a) Station address: It indicates the station address of the relevant server.
(b) Function code: '03' which indicates read word data from the word output area continuously/individually
(c) Address: It represents the starting address of the data to be read from the server and consists of 2 bytes At this time, the Modbus address rule applies for the start address.
(d) Data size: It is the size of data to read and consists of 2 bytes.
(e) Frame error check: In ASCII mode, it uses LRC, in RTU mode, it uses CRC and consists of 2 bytes.
(f) Tail: It applies only in the case of the ASCII mode, and CRLF is added after LRC.
(g) Number of bytes: It means the number of bytes of data that responds.
(h) Data: Transmit data in byte units with the address of the request frame as the start address. At this time, data is word type, so it is same as the size of doubling the number of bytes.
(i) Error code: The error code is expressed as the function code plus 80 (Hex) value, and in the case of reading word data in the word output area, 83(Hex) will be transmitted.
(j) Exception code: It means the detailed error description and consists of 1 byte.

(3) Example of frame

This is an example in the case of reading word data from 108 to 110 from No. 1 server station that operates in Modbus RTU mode.

(a) Request frame

Classification	Station No.	Function code	Address		Data size		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	03	00	6B	00	03	CRC

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code	Number of bytes	Data						Error check
Frame	01	03	06	13	12	3D	12	40	4F	CRC

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Function code	Exception code	Error check
Frame	01	83	04	CRC

9.3.7 Read word data from word Input area (04)

(1) Read words from the input area

The frame structure in the case of reading word data from the word input area is as follows. The tail of the frame is applied only in the case of ASCII mode.

(a) Request frame

Classification	Station No.	Function code(04)	Address	Data size	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	2	2

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code(04)	Number of bytes	Data	Frame error check	Tail (CRLF)
Size(byte)	1	1	1	N*2	2	2

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Error code	Exception code	Tail (CRLF)
Size(byte)	1	1	1	2

(2) Frame details

(a) Station address: It indicates the station address of the relevant server.
(b) Function code: '04' which indicates read word data from the input area continuously/individually
(c) Address: It indicates the start address of data to be read from the relevant server. It consists of 2 bytes. At this time, the Modbus address rule applies for the start address.
(d) Data size: It is the size of data to read and consists of 2 bytes.
(e) Frame error check: In ASCII mode, it uses LRC, in RTU mode, it uses CRC and consists of 2 bytes.
(f) Tail: It applies only in the case of the ASCII mode, and CRLF is added after LRC.
(g) Number of bytes: It means the number of bytes of data that responds.
(h) Data: Transmit data in byte units with the address of the request frame as the start address. At this time, data is word type, so it is same as the size of doubling the number of bytes.
(i) Error code: It is represented by adding 80 (Hex) values to the function code and transmitted in 84(Hex) for the bit reading of output area.
(j) Exception code: It means the detailed error description and consists of 1 byte.

(3) Example of frame

This is an example in the case of reading word data saved to Input area No. 9 from No. 1 server that operates in Modbus RTU mode.

(a) Request frame

Classification	Station No.	Function code	Address		Data size		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	04	00	08	00	01	CRC

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code	Number of bytes	Data		Error check
Frame	01	04	02	00	0A	CRC

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Function code	Exception code	Error check
Frame	01	84	04	CRC

9.3.8 Write bit data on bit output area individually (05)

(1) Write bit on the output area individually

The frame structure in case of writing bit data on the bit output area individually is as follows. The tail of the frame is applied only in the case of ASCII mode.

(a) Request frame

Classification	Station No.	Function code(05)	Address	Output value	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	2	2

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code(05)	Address	Output value	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	2	2

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Error code	Exception code	Tail (CRLF)
Size(byte)	1	1	1	2

(2) Frame details

(a) Station address: It indicates the station address of the relevant server.
(b) Function code: '05' which indicates write bit data on the bit output area individually
(c) Address: It indicates the start address of data to write on the relevant server. It consists of 2 bytes. At this time, the Modbus address rule applies for the start address.
(d) Output value: It is the bit value of address set in the address operates On, it is indicated by FF00(Hex), whereas if it operates Off, it is indicated by 0000(Hex).
(e) Frame error check: In ASCII mode, it uses LRC, in RTU mode, it uses CRC and consists of 2 bytes.
(f) Tail: It applies only in the case of the ASCII mode, and CRLF is added after LRC.
(g) Number of bytes: It means the number of bytes of data that responds.
(h) Error code: The error code is expressed as the function code plus 80 (Hex) value, and in the case of writing bit data on the bit output area, 85 (Hex) will be transmitted.
(i) Exception code: It means the detailed error description and consists of 1 byte.

(3) Example of frame

This is an example of turning the 9th bit of the output area On in server station No. 1 that operates Modbus RTU mode.

(a) Request frame

Classification	Station No.	Function code	Address		Output value		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	05	00	08	FF	00	CRC

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code	Address		Output value		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	05	00	08	FF	00	CRC

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Function code	Exception code	Error check
Frame	01	85	04	CRC

9.3.9 Write word data on word output area individually (06)

(1) Write word on the output area individually

The frame structure in the case of writing word data on the word output area individually is as follows.

The tail of the frame is applied only in the case of ASCII mode.

(a) Request frame

Classification	Station No.	Function code(06)	Address	Output value	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	2	2

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code(06)	Address	Output value	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	2	2

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Error code	Exception code	Tail (CRLF)
Size(byte)	1	1	1	2

(2) Frame details

(a) Station address: It indicates the station address of the relevant server.
(b) Function code: '06' which indicates write word data on the word output area individually
(c) Address: It indicates the start address of data to write on the relevant server. It consists of 2 bytes. At this time, the Modbus address rule applies for the start address.
(d) Output value: It means the data value to be written in address set in the address.
(e) Frame error check: In ASCII mode, it uses LRC, in RTU mode, it uses CRC and consists of 2 bytes.
(f) Tail: It applies only in the case of the ASCII mode, and CRLF is added after LRC.
(g) Number of bytes: It means the number of bytes of data that responds.
(h) Error code: It is represented by adding 80 (Hex) values to the function code and transmitted in 86(Hex) for the bit reading of output area.
(i) Exception code: It means the detailed error description and consists of 1 byte.

(3) Example of frame

This is an example of writing 0003(hex) in the 9th output area of word type in server station No. 1 that operates in Modbus RTU mode.

(a) Request frame

Classification	Station No.	Function code	Address		Output value		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	06	00	08	00	03	CRC

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code	Address		Output value		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	06	00	08	00	03	CRC

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Function code	Exception code	Error check
Frame	01	86	02	CRC

9.3.10 Write bit data on bit output area continuously (0F)

(1) Write bit on the output area continuously

The frame structure in the case of writing bit data on the bit output area continuously is as follows. The tail of the frame is applied only in the case of ASCII mode.

(a) Request frame

Classification	Station No.	Function code (0F)	Address	Number of output	Data Size	Output value	Frame Error check	Tail (CRLF)
Size(byte)	1	1	2	2	1	N	2	2

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code(0F)	Address	Number of output	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	2	2

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Error code	Exception code	Tail (CRLF)
Size(byte)	1	1	1	2

(2) Frame details

(a) Station address: It indicates the station address of the relevant server.
(b) Function code: '0F' which indicates write bit data on the bit output area continuously
(c) Address: It indicates the start address of data to write on the relevant server. It consists of 2 bytes. At this time, the Modbus address rule applies for the start address.
(d) Number of output: It means the number of data to be written and consist of 2 bytes. Example) If the address writes 10 data continuously from No. 20, the number of outputs is 00A (Hex).
(e) Data size: It indicates the number of output in byte value. In other words, if the data size is 1, the number of data for continuously write is 8. Example) In case of writing 10 bits of data continuously, the data size will be 2.
(f) Output value: It means the data value to be written in address set in the address.
(g) Frame error check: In ASCII mode, it uses LRC, in RTU mode, it uses CRC and consists of 2 bytes.
(h) Tail: It applies only in the case of the ASCII mode, and CRLF is added after LRC.
(i) Number of bytes: It means the number of bytes of data that responds.
(j) Error code: The error code is expressed as the function code plus 80 (Hex) value, and in the case of continuous writing bit data on the bit output area, 8F (Hex) will be transmitted.
(k) Exception code: It means the detailed error description and consists of 1 byte.

(3) Example of frame

This is an example in the case of writing 10 bit values continuously, beginning with 20th address in No. 1 server that operates in Modbus RTU mode.

(a) Data value to write continuously

Bit value	1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	1
Hex	C				D				0				1			
Address	27	26	25	24	23	22	21	20	-	-	-	-	-	-	29	28

(b) Request frame

Classification	Station No.	Function code	Address		Number of output		Data size	Output value		Error check
			Upper byte	Lower byte	Upper byte	Lower byte		Upper byte	Lower byte	
Frame	01	0F	00	13	00	0A	02	CD	01	CRC

(c) Response frame (When a normal frame is received)

Classification	Station No.	Function code	Address		Number of output		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	0F	00	13	00	0A	CRC

(d) Response frame (When an abnormal frame is received)

Classification	Station No.	Function code	Exception code	Error check
Frame	01	8F	01	CRC

9.3.11 Write word data on word output area continuously (10)

(1) Write word on output area continuously

The frame structure in the case of writing word data on the word output area continuously is as follows.

The tail of the frame is applied only in the case of ASCII mode.

(a) Request frame

Classification	Station No.	Function code(10)	Address	Number of output	Data size	Output value	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	1	N*2	2	2

(b) Response frame (When a normal frame is received)

Classification	Station No.	Function code(10)	Address	Number of output	Frame error check	Tail (CRLF)
Size(byte)	1	1	2	2	2	2

(c) Response frame (When an abnormal frame is received)

Classification	Station No.	Error code	Exception code	Tail (CRLF)
Size(byte)	1	1	1	2

(2) Frame details

(a) Station address: It indicates the station address of the relevant server.
(b) Function code: '10' which indicates write word data on the word output area continuously
(c) Address: It indicates the start address of data to write on the relevant server. It consists of 2 bytes. At this time, the Modbus address rule applies for the start address.
(d) Number of output: It means the number of data to be written and consist of 2 bytes. Example) If the address writes 10 data continuously from No. 20, the number of outputs is 00A (Hex).
(e) Data size: It indicates the number of output in byte value. Since the data format is word type, in case of writing 1 word of data, the data size will be 2.
(f) Output value: It means the data value to be written in address set in the address.
(g) Frame error check: In ASCII mode, it uses LRC, in RTU mode, it uses CRC and consists of 2 bytes.
(h) Tail: It applies only in the case of the ASCII mode, and CRLF is added after LRC.
(i) Number of bytes: It means the number of bytes of data that responds.
(j) Error code: The error code is expressed as the function code plus 80 (Hex) value, and in the case of continuous writing word data on the word output area continuously, 90(Hex) will be transmitted.
(k) Exception code: It means the detailed error description and consists of 1 byte.

(3) Example of frame

This is an example in the case of writing 2 words continuously, beginning with 20th address in No. 1 server that operates in Modbus RTU mode.

(a) Data value to write continuously

Hex	C	D	0	1	0	0	0	A
Address	20				21			

(b) Request frame

Classification	Station No.	Function code	Address		Number of output		Data size	Output value				Error check
			Upper byte	Lower byte	Upper byte	Lower byte						
Frame	01	10	00	13	00	02	04	CD	01	00	0A	CRC

(c) Response frame (When a normal frame is received)

Classification	Station No.	Function code	Address		Number of output		Error check
			Upper byte	Lower byte	Upper byte	Lower byte	
Frame	01	10	00	13	00	02	CRC

(d) Response frame (When an abnormal frame is received)

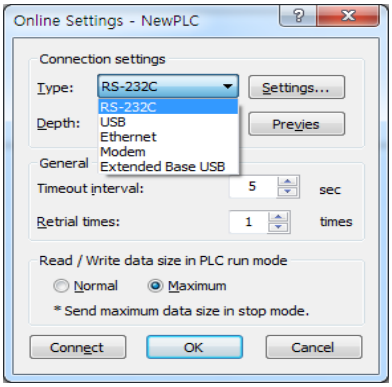
Classification	Station No.	Function code	Exception code	Error check
Frame	01	90	01	CRC

9.4 Modbus server

It is used when the destination device you wish to communicate with operates as the Modbus client. Both the ASCII mode and RTU mode of Modbus are supported, and each operation mode can be set from the [Basic setting] window.

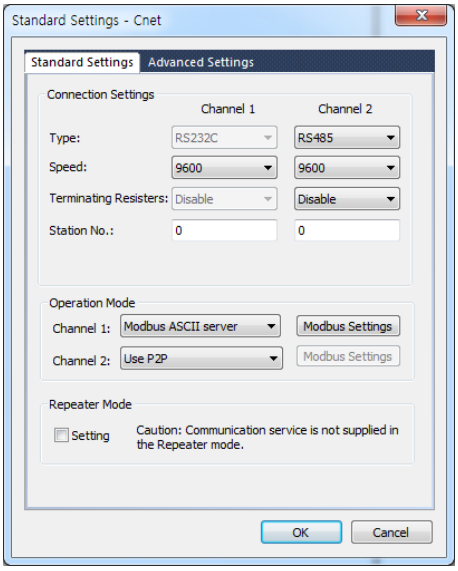
9.4.1 How to use the Modbus ASCII server in the XGK system

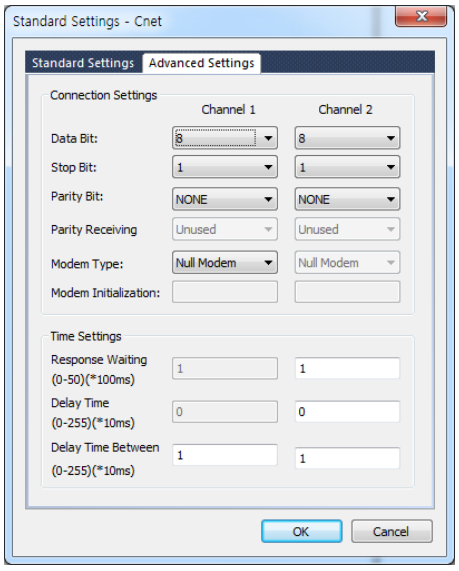
(1) Connection setting
(a) Select [Online]→[Connection setting].
(b) Set the connection option that fits the user environment and click [Connect].



(2) Reading I/O information
Click [I/O Sync] from the [Online] → [System Diagnostics] → [I/O information] window and read the information from the module currently installed on the base.

(3) Standard settings
(a) Open the [Standard settings] window by double clicking the relevant Cnet I/F module, and set the communication type, communication speed modem type, data bit, stop bit and station address from the connection setting menu. At this time, 7 should be set for the data bit.
(b) The modem can be initialized only when the modem type is the dial-up modem.
(c) The delay time can be set only for RS-422/485 and the response waiting time can be set only when P2P is used as the operation mode for RS-422/485 communication.
(d) The terminating resistance setting and repeater mode can be used in the B type Cnet I/F module.





(4) Selecting the operation mode
Select Modbus ASCII server.

(5) Modbus setting

(a) When you select Modbus ASCII server for the operation mode, [Modbus setting] will be enabled.

(b) Start address of read bit area: Indicates the start address of the bit read area and consists of 5 digits. The first four digits represent the word value, and the remaining digits represent the bit value.

Ex) M00000: It is in the case where the 0th bit of the 0th word in the M device area is set as the start address of the read bit area.

(c) Start address of write bit area: Indicates the start address of the bit write area and consists of 5 digits. At this time, the first 4 digits indicate the word value and the last digit indicates the bit value.

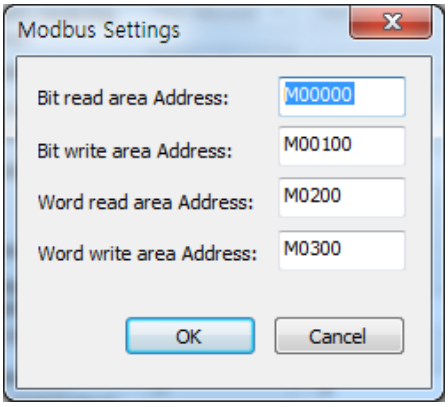
Ex) M00100: It is in the case where the 0th bit of the 0th word in the M device area is set as the start address of the read bit area.

(d) Word read area start address: It indicates the start address of the word read area and consists of 4 digits.

Ex) M00200: It is in the case where the 200th word in the M device area is set as the start address of the read word area.

(e) Start address of write word area: It is the start address of the word write area and consists of 4 digits.

Ex) M00300: It is the case that the 300th word of the M device area is set as the start address of the word write area.

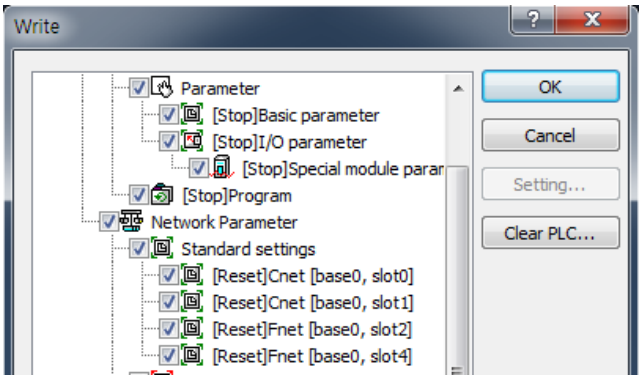


(6) Writing parameter

(a) Select [Online]→[Write].

(b) Put a check mark on the module whose basic setting is completed from standard settings and click[OK].

(c) Click the [OK] button, and after writing the parameter, reset each relevant module.

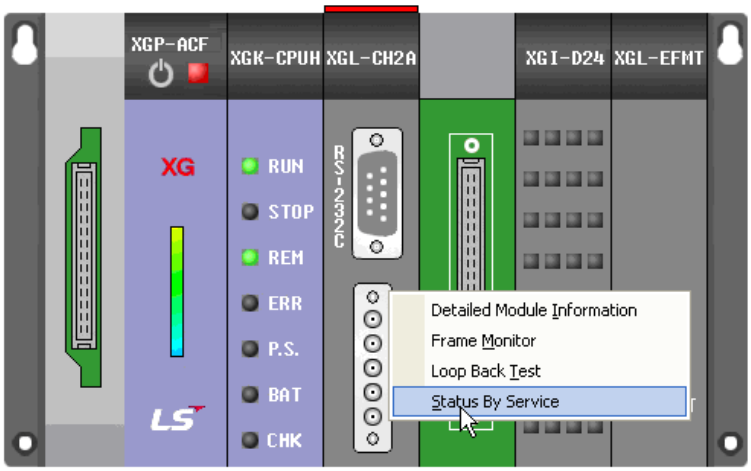


(7) Check operation

(a) Select [Online]→[Communication module setting and Diagnosis]→[System diagnosis].

(b) Click the relevant module and click the right mouse button.

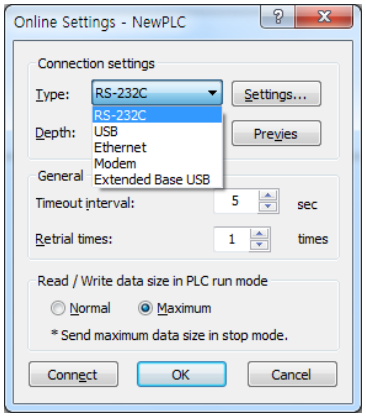
(c) When the following screen is displayed, click [Frame monitor] or [Status by service] and check the operation status.



9.4.2 How to use the Modbus ASCII server in the XGI/XGR system

(1) Connection setting

(a) Select [Online]→[Connection setting].
(b) Set the connection option that fits the user environment and click [Connect].

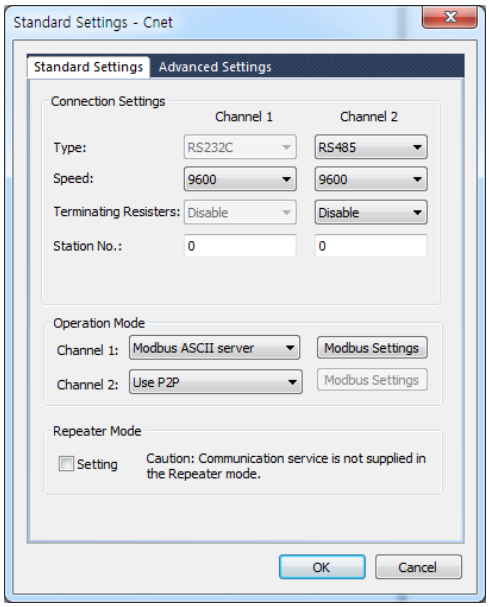


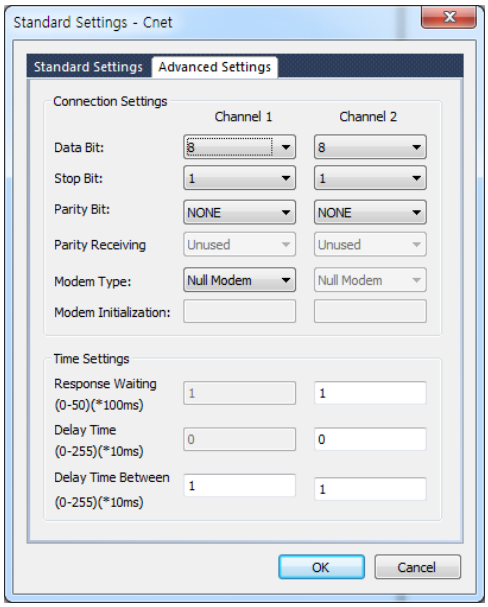
(2) Reading I/O information

Click [I/O Sync] from the [Online] → [System Diagnostics] → [I/O information] window and read the information from the module currently installed on the base.

(3) Standard settings

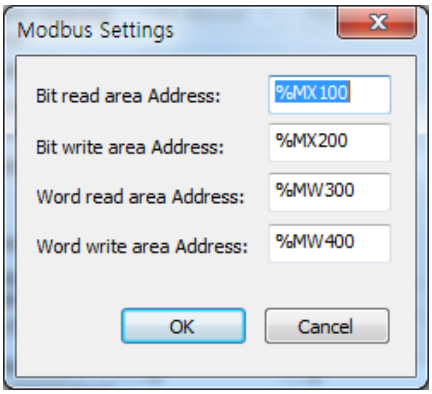
(a) Open the [Standard settings] window by double clicking the relevant Cnet I/F module, and set the communication type, modem type, data bit, stop bit and station address from the connection setting menu. At this time, 7 should be set for the data bit.
(b) The modem can be initialized only when the modem type is the dial-up modem.
(c) The delay time can be set only for RS-422/485 and the response waiting time can be set only when P2P is used as the operation mode for RS-422/485 communication.
(d) The terminating resistance setting and repeater mode can be used in the B type Cnet I/F module.



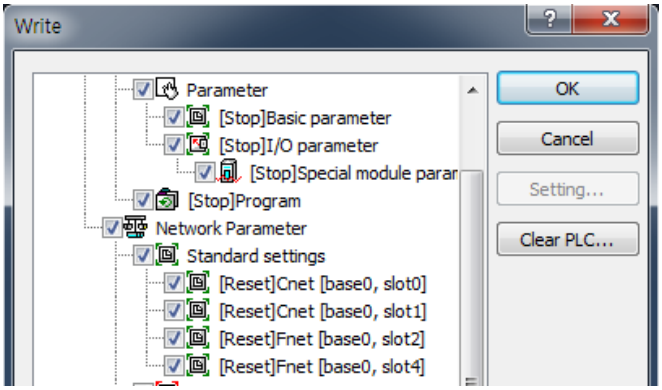


(4) Selecting the operation mode
Select Modbus ASCII server.

(5) Modbus setting
(a) When you select Modbus ASCII server for the operation mode, [Modbus setting] will be enabled.
(b) Start address of read bit area: It indicates the start address of the read bit area.
Ex) %MX100: It is in the case where the 100th bit in the M device area is set as the start address of the read bit area.
(c) Start address of write bit area: It indicates the start address of the write bit area.
Ex) %MX200: It is in the case where the 200th bit in the M device area is set as the start address of the read bit area.
(d) Word read area start address: It indicates the start address of the read word area.
Ex) %MW300: It is in the case where the 300th word in the M device area is set as the start address of the read word area.
(e) Word read area start address: It indicates the start address of the write word area.
Ex) %MW400: It is the case that the 400th word of the M device area is set as the start address of the word write area.



(6) Writing parameter
(a) Select [Online]→[Write].
(b) Put a check mark on the module whose basic setting is completed from standard settings and click[OK].
(c) Click the [OK] button, and after writing the parameter, reset each relevant module.

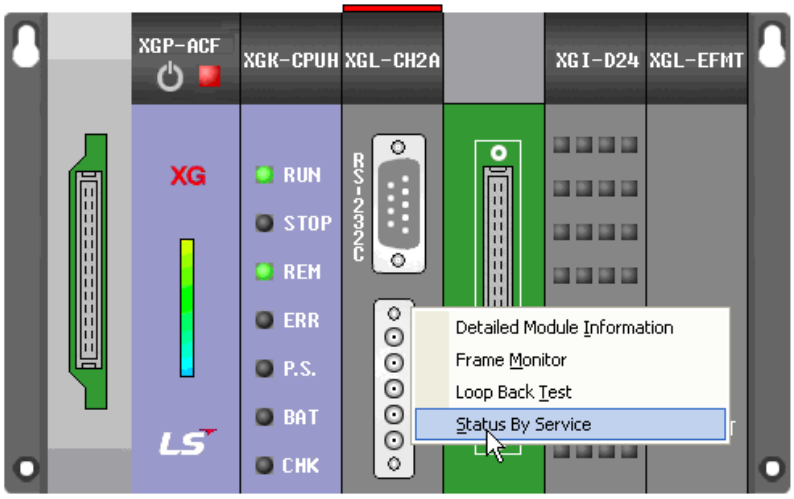


(7) Check operation

(a) Click [Online] → [Communication module setting and Diagnosis] → [System diagnosis].

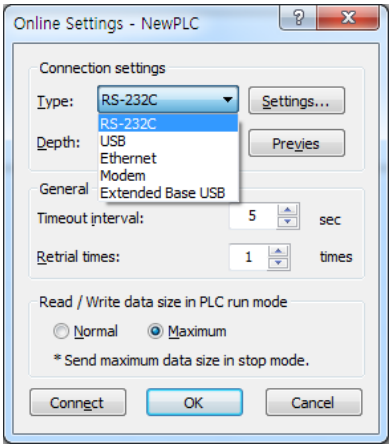
(b) Click the relevant module and click the right mouse button.

(c) When the following screen is displayed, click [Frame monitor] or [Status by service] and check the operation status.



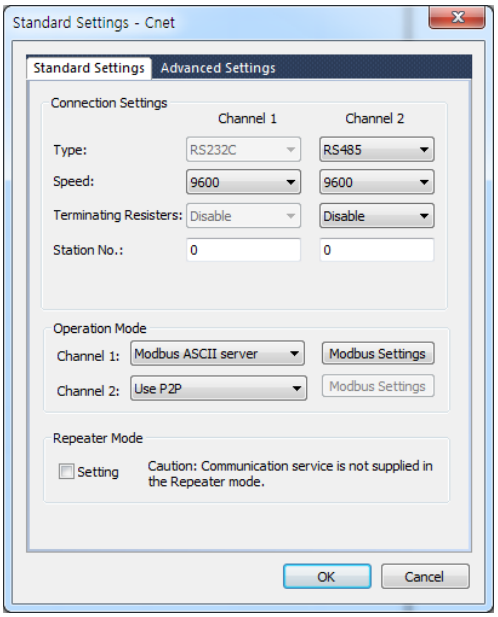
9.4.3 How to use the Modbus RTU server in the XGK system

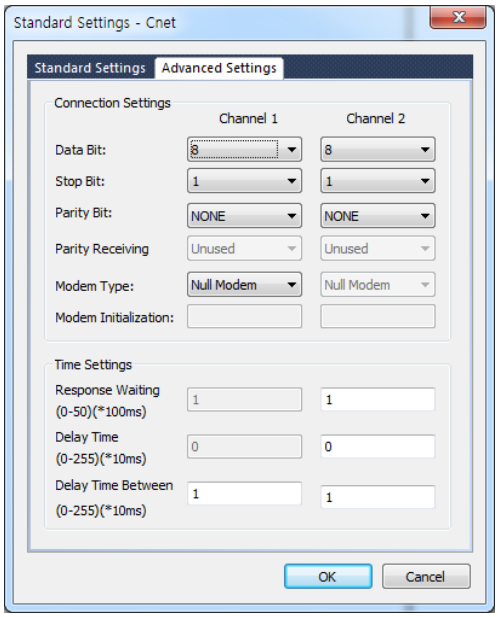
(1) Connection setting
(a) Select [Online]→[Connection setting].
(b) Set the connection option that fits the user environment and click [Connect].



(2) Reading I/O information
Click [I/O Sync] from the [Online] → [System Diagnostics] → [I/O information] window and read the information from the module currently installed on the base.

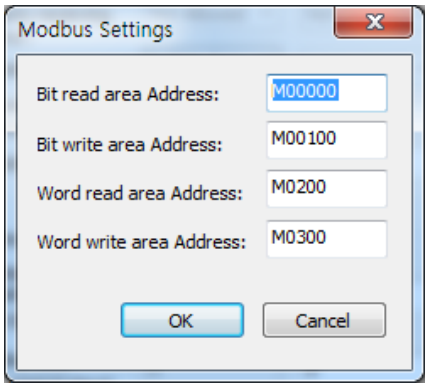
(3) Standard settings
(a) Open the [Standard settings] window by double clicking the relevant Cnet I/F module, and set the communication type, communication speed modem type, data bit, stop bit and station address from the connection setting menu. At this time, 8 should be set for the data bit.
(b) The modem can be initialized only when the modem type is the dial-up modem.
(c) The delay time can be set only for RS-422/485 and the response waiting time can be set only when P2P is used as the operation mode for RS-422/485 communication.
(d) The terminating resistance setting and repeater mode can be used in the B type Cnet I/F module.



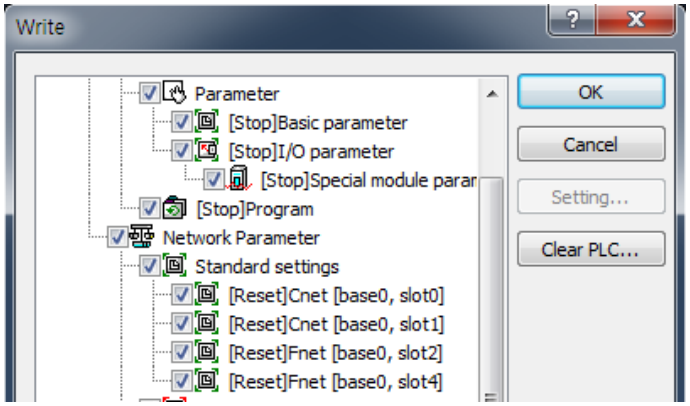


(4) Select operation mode
Select Modbus RTU server.

(5) Modbus setting
(a) When you select Modbus RTU server for the operation mode, [Modbus setting] will be enabled.
(b) Start address of read bit area: Indicates the start address of the bit read area and consists of 5 digits. The first four digits represent the word , and the remaining digits represent the bit value.
Ex) M00000: It is in the case where the 0th bit of the 0th word in the M device area is set as the start address of the read bit area.
(c) Start address of write bit area: Indicates the start address of the bit write area and consists of 5 digits. At this point, first four digits represent the word , and the remaining digits represent the bit value.
Ex) M00100: It is in the case where the 0th bit of the 10th word in the M device area is set as the start address of the read bit area.
(d) Word read area start address: Indicates the start address of the word read area and consists of 4 digits.
Ex) M00200: It is in the case where the 200th word in the M device area is set as the start address of the read word area.
(e) Start address of write word area: Indicates the start address of the word write area and consists of 4 digits.
Ex) M00300: It is the case that the 300th word of the M device area is set as the start address of the word write area.



(6) Writing parameter
(a) Select [Online]→[Write].
(b) Click the module whose standard settings is completed from Basic setting and click[OK].
(c) Click the [OK] button, and after writing the parameter, reset each relevant module.

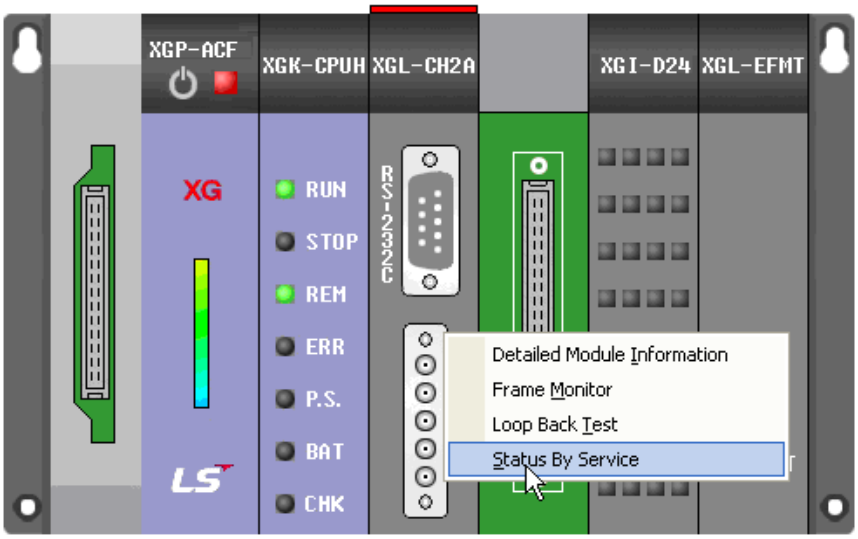


(7) Check operation

(a) Select [Online]→[Communication module setting and Diagnosis]→[System diagnosis].

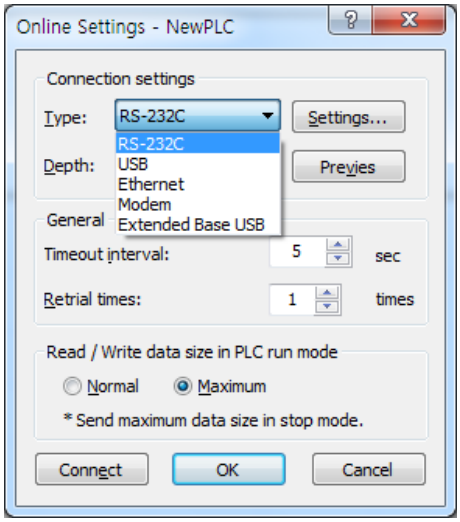
(b) Click the relevant module and click the right mouse button.

(c) When the following screen is displayed, click [Frame monitor] or [Status by service] and check the operation status.



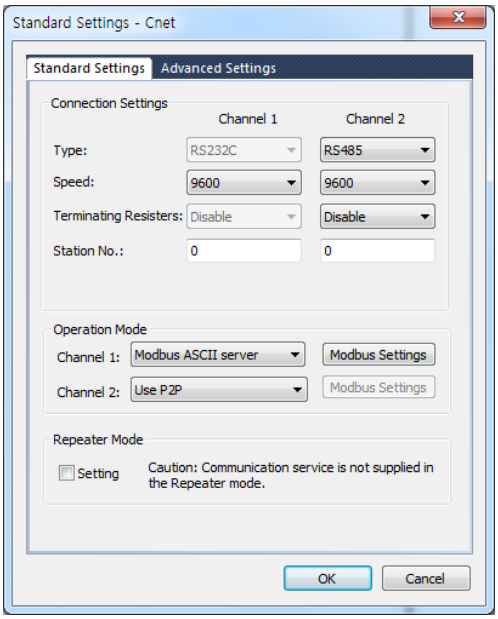
9.4.4 How to use the Modbus RTU server in the XGI/XGR system

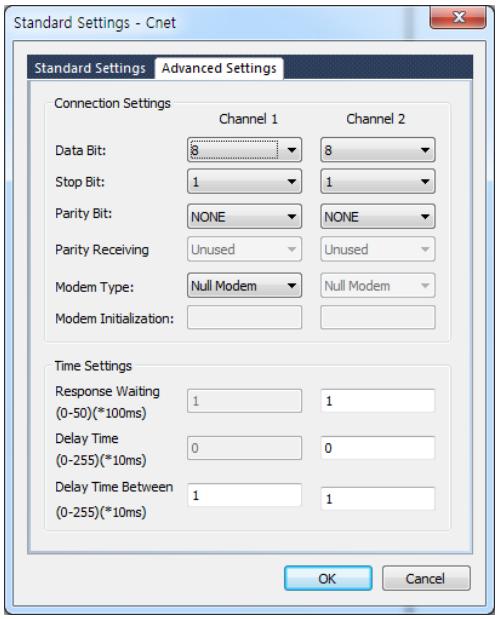
(1) Connection setting
(a) Select [Online]→[Connection setting].
(b) Set the connection option that fits the user environment and click [Connect].



(2) Reading I/O information
Click [I/O Sync] from the [Online] → [System Diagnostics] → [I/O information] window and read the information from the module currently installed on the base.

(3) Standard settings
(a) Open the [Standard settings] window by double clicking the relevant Cnet I/F module, and set the communication type, communication speed, modem type, data bit, stop bit and station address from the connection setting menu. At this time, 8 should be set for the data bit.
(b) The modem can be initialized only when the modem type is the dial-up modem.
(c) The delay time can be set only for RS-422/485 and the response waiting time can be set only when P2P is used as the operation mode for RS-422/485 communication.
(d) The terminating resistance setting and repeater mode can be used in the B type Cnet I/F module.





(4) Selecting the operation mode
Select Modbus RTU server.

(5) Modbus setting

(a) When you select Modbus RTU server for the operation mode, [Modbus setting] will be enabled.

(b) Start address of read bit area: It indicates the start address of the read bit area.

(c) Ex) %MX100: It is in the case where the 100th bit in the M device area is set as the start address of the read bit area.

(d) Start address of write bit area: It indicates the start address of the write bit area.

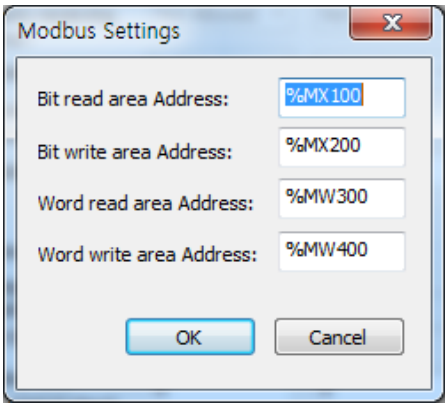
Ex) %MX200: It is in the case where the 200th bit in the M device area is set as the start address of the write bit area.

(e) Word read area start address: It indicates the start address of the read word area.

Ex) %MW300: It is in the case where the 300th word in the M device area is set as the start address of the read word area.

(f) Word read area start address: It indicates the start address of the write word area.

Ex) %MW400: It is the case that the 400th word of the M device area is set as the start address of the word write area.

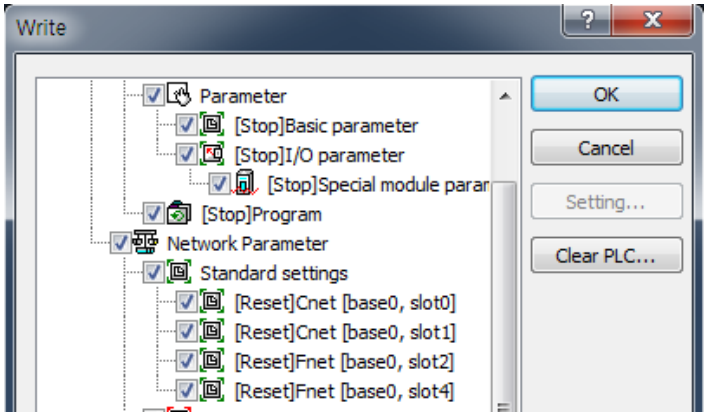


(6) Writing parameter

(a) Select [Online]→[Write].

(b) Put a check mark on the module whose basic setting is completed from standard settings and click[OK].

(c) Click the [OK] button, and after writing the parameter, reset each relevant module.

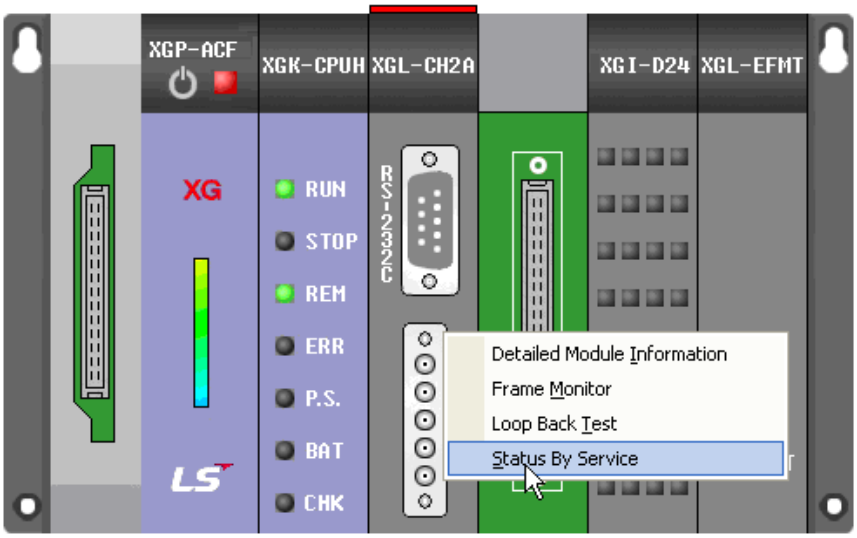


(7) Check operation

(a) Select [Online]→[Communication module setting and Diagnosis]→[System diagnosis].

(b) Click the relevant module and click the right mouse button.

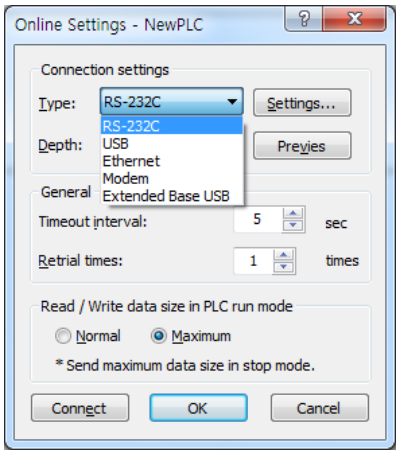
(c) When the following screen is displayed, click [Frame monitor] or [Status by service] and check the operation status.



9.5 Modbus RTU/ASCII client

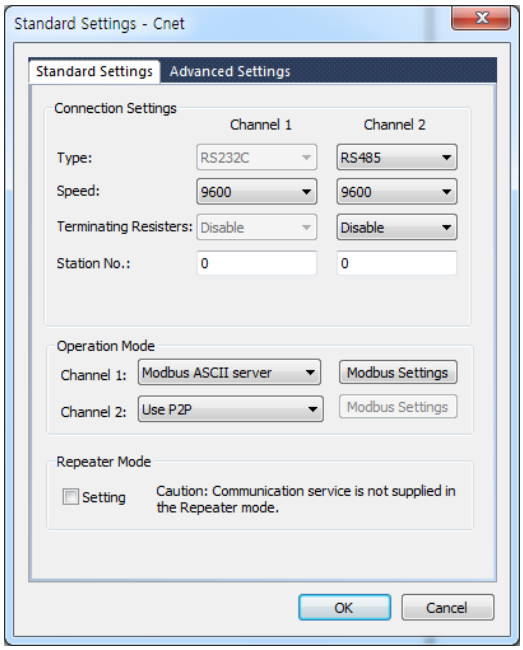
9.5.1 Standard settings

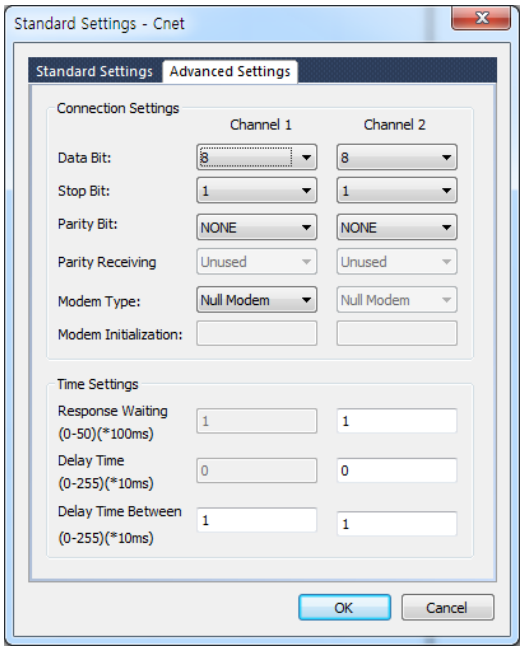
(1) Connection setting
(a) Select [Online]→[Connection setting]
(b) Set the connection option that fits the user environment and click 'Connect'.



(2) Reading I/O information
Click [I/O synchronization] from the [Online]→[System Diagnosis]→[I/O information] window and read the information on the module currently installed on the base.

(3) Standard settings
(a) Open the [Standard settings] window by double clicking the relevant Cnet I/F module, and set the communication type, communication speed, modem type, data bit, stop bit and station address from the connection setting menu. Set 7 for the data bit in the case of operating in the ASCII mode.
(b) The modem can be initialized only when the modem type is the dial-up modem.
(c) The delay time can be set only for RS-422/485 and the response waiting time can be set only when P2P is used as the operation mode for RS-422/485 communication.
(d) The terminating resistance setting and repeater mode can be used in the B type Cnet I/F module.



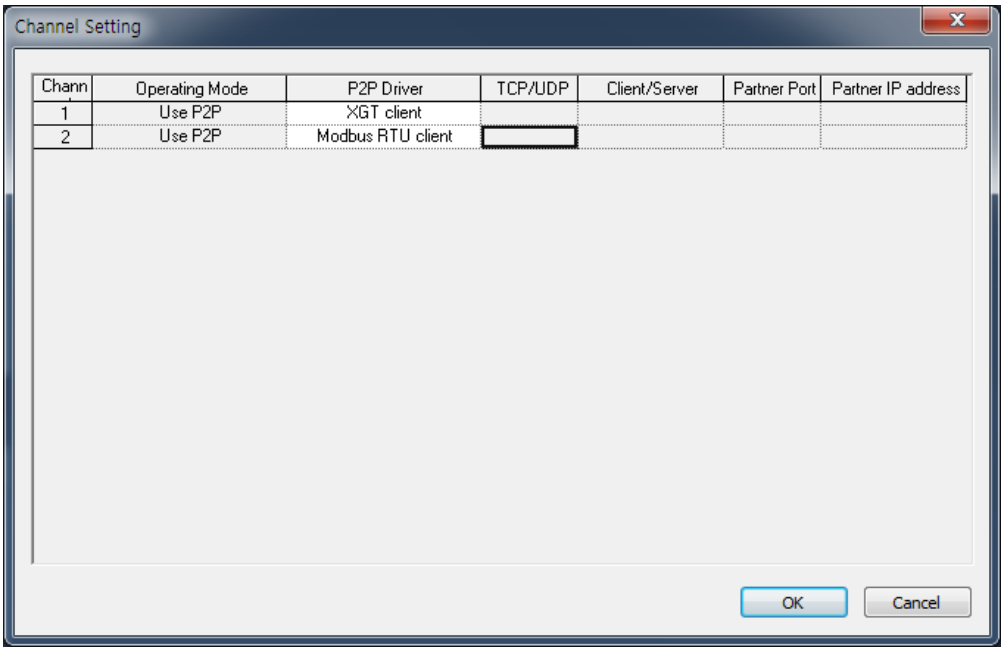


(4) Selecting the operation mode
When using as a client, be sure to select 'Use P2P'.

(5) P2P channel setting

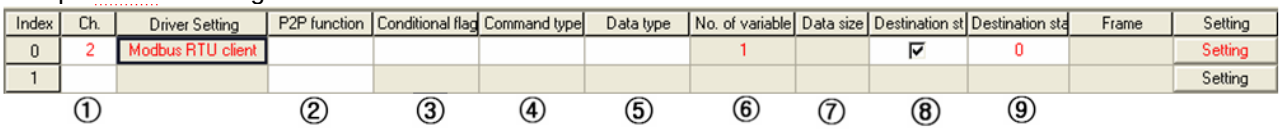
(a) Double click the P2P channel and select the protocol for each channel.

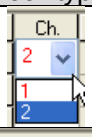
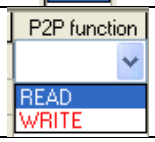
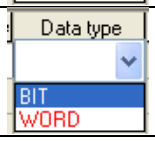
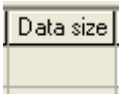
(b) User frame definition, XGT client, LS bus client and Modbus RTU/ASCII client are supported for the P2P driver.

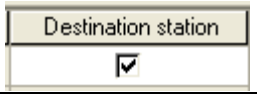
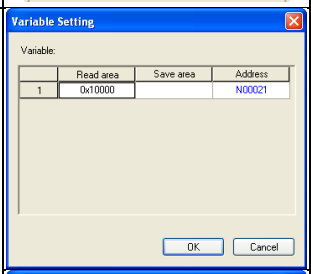
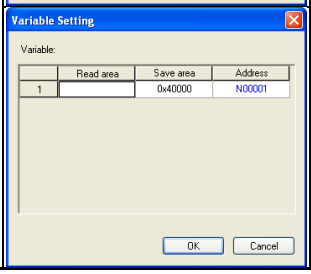


9.5.2 P2P Parameter setting

The Modbus RTU/ASCII client provides the Read command which is used for reading the data of the destination station, and the Write command which is used for writing data on the destination station. The parameter setting methods for the Modbus RTU client and Modbus ASCII client are the same.

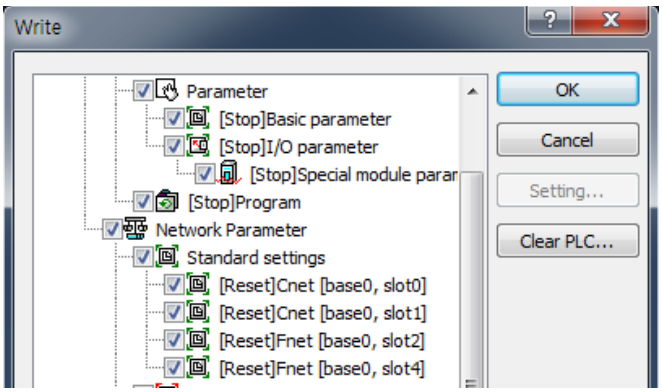


No.	Type	Block type	Contents
1	Channel		The name of the setting driver changes according to the driver set in the P2P driver.
2	P2P function		(1)Read: It is used for reading the data of the destination station. (2)Write: It is used for writing data on the destination station.
3	Start condition		(1) Enter special flag or bit contact to select the time when data is transmitted and received (2) Example In case of XGI type :F90 (Operates in 20ms intervals), M01 (3) Example In case of XGI type : _T20MS (operates in 20ms intervals),%MX01
4	Command type		(1)Individual: It is used when reading or writing up to 4 data. (example: M01, M10, M20, M30) (2)Continuous: It is used for reading or writing data continuously.(Example : M01~M10)
5	Data Type		Bit and word can be selected for the data type.
6	Data Size		It indicates the size of transmission and reception data and it is enabled only in case of the continuous method. (1) If the P2P function is Read (a) Modbus RTU client 1)Bit type:1~2000 2)Word type:1~125 (b) Modbus ASCII client 1)Bit type:1~976 2)Word type:1~61 (3) If the P2P function is Write (a) Modbus RTU client 1)Bit type:1~1968 2)Word type:1~120 (b) Modbus ASCII client 1)Bit type:1~944 2)Word type:1~59

No.	Type	Block type	Contents
7	Destination station		It is checked automatically. If you click it one more time to remove the check mark, the relevant block will not operate.
8	Destination station number		It indicates the station address of the destination station. The setting range is 0 to 31 stations; the station address can be set for up to 32 stations.
9	Setting		▶ If the P2P function is Read (1) Read area: It indicates the start address of data area in the destination station (server). (a)Bit: Bit input(0x10000), Bit output(0x00000) (b)Word: Word input(0x30000), word output(0x40000) (2) Storage area: It indicates the area to save data in the self station (client).
			▶ If the P2P function is Write (1) Read area: It indicates the data area of the self-station. (2) Storage area: It indicates the start address of data save area in the destination station. (a)Bit: Bit input(0x10000), Bit output(0x00000) (b)Word: Word input(0x30000), word output(0x40000)

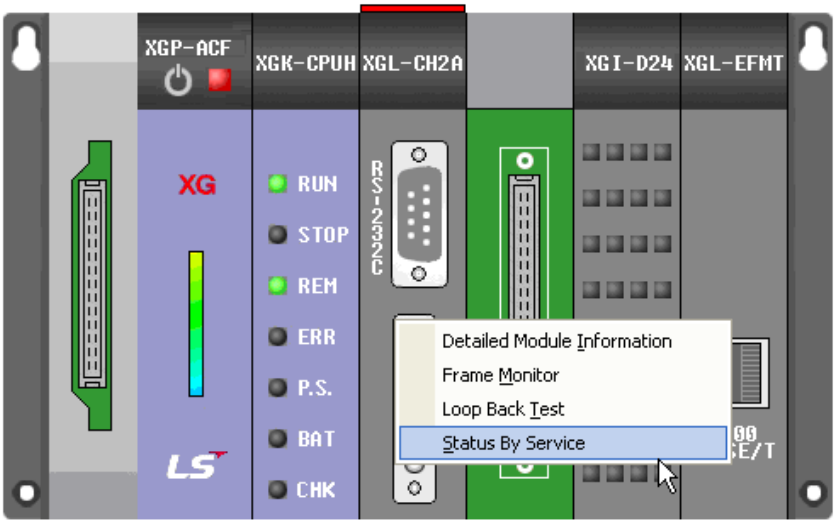
9.5.3 Write Parameter

(1) Writing parameter
  (a) Select [Online]→[Write].
  (b) Click the module and P2P whose basic setting and P2P parameter setting are completed, and click[OK].
  (c) Click the [OK] button, and after writing the parameter, reset each relevant module.



(2) Link enable
  (a) Select [Online]→[Communication module setting and Diagnosis]→[Enable Link/Services].
  (b) Put a check mark on the set P2P block set and click Write.

(3) Check operation
  (a) Select [Online]→[Communication module setting and Diagnosis]→[System diagnosis].
  (b) Click the relevant module and click the right mouse button.
  (c) When the following screen is displayed, click [Frame monitor] or [Status by service] and check the operation status.



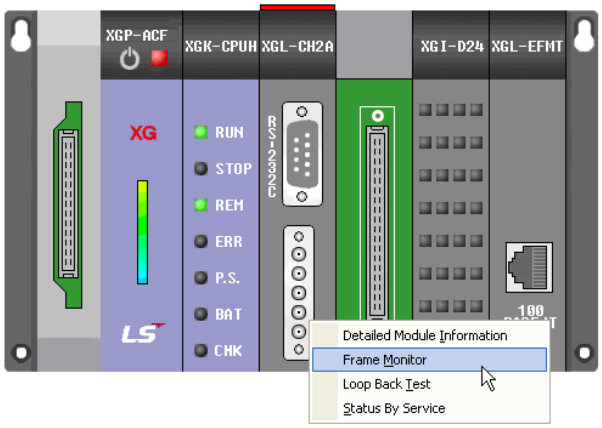
9.6 Frame Monitor

When you use the frame monitor function of the XG5000, you can check a frame which has actually been exchanged by the client and the server.

(1) Check operation

(a) Select [Online]→[Communication module setting and Diagnosis]→[System diagnosis].

(b) Click the relevant module and click the right mouse button.



(c) When the screen as shown in the figure above appears, click [Frame monitor].

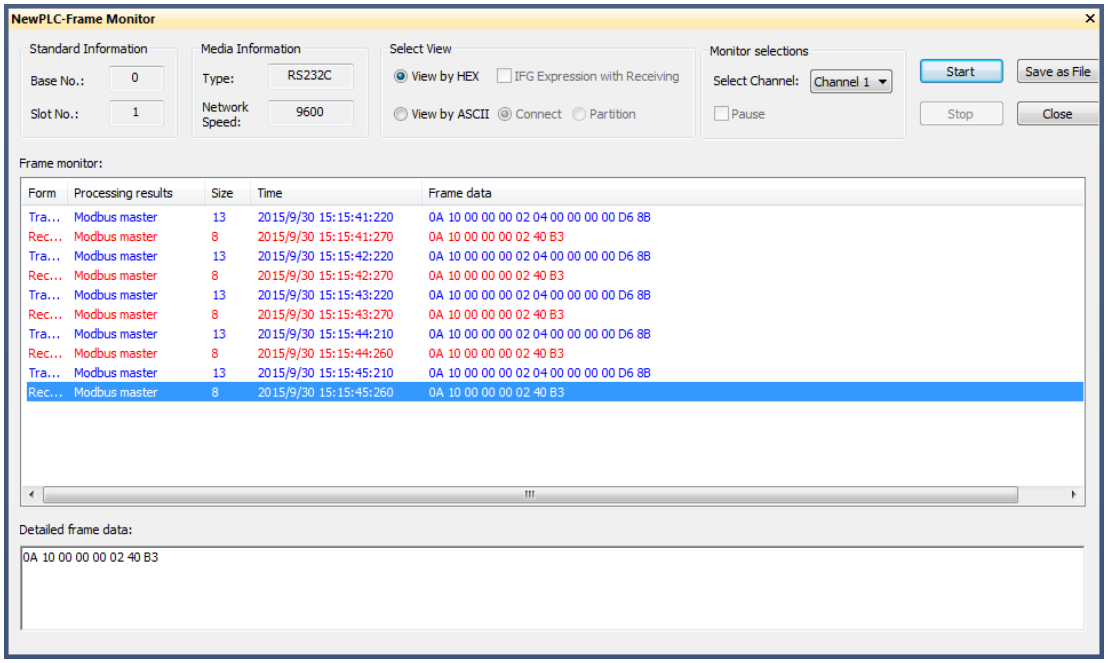
(2) Frame monitor

(a) Select the channel you want to monitor.

(b) Select View as ASCII if the protocol is Modbus ASCII mode.

(c) Select View as HEX if the protocol is Modbus RTU mode.

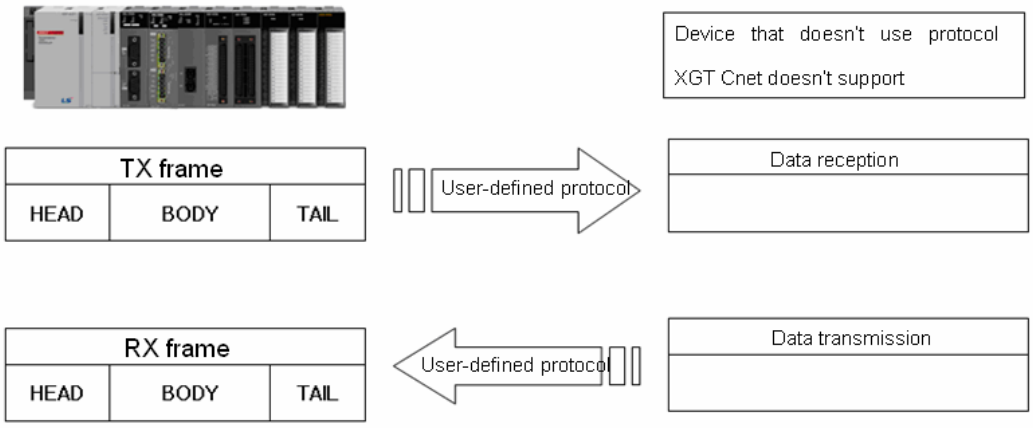
(d) Click [Start] to check the sending / receiving frame.



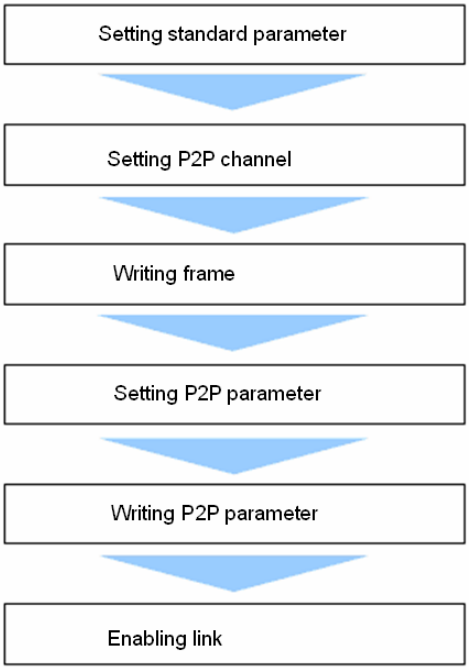
Chapter 10 User Frame Definition Communication

10.1 Overview

Since there are various types of communication protocol, it is impossible to load all protocols on one communication module. Therefore, the Cnet I/F module provides the user frame definition communication function for solving such problems. By using this function, the user can write a protocol that fits his/her purpose for communication when connecting to another device that does not use the XGT protocol or Modbus protocol. At this time, the user can transmit or receive data only when writing the same transmission frame and the receive frame as the protocol of the destination device.



When using the user frame definition communication, please follow the sequence shown below.



10.2 Frame configuration

The frame used in the user frame definition communication is divided into Head, which indicates the beginning of the frame, Tail, which indicates the end, and Body, which is the data area. Head, Tail and bodies consist of each segment. One frame should be less than 1024 bytes.

Frame		
HEAD	BODY	TAIL
Segment 1	Segment 1	Segment 1
Segment 2	Segment 2	Segment 2
Segment 3	Segment 3	Segment 3
Segment N	Segment N	Segment N

(1) Header

The input type of segments composing Head is divided into the numerical constant and the string constant. The numerical constant indicates a Hex number and the string constant indicates an ASCII character. The number of segments that can be configured in Head is limited to 16 or less.

(2) Tail

The input types of the segments that consist of the tail include numerical constants, string constants and BCC to check frame errors. The numerical constant and the string constant are the same as the contents mentioned for Head above. BCC is the segment used for testing an error in transmitted and received frames, and only one BCC can be set for Tail. The number of segments that can be configured in Tail is limited to 16 or less.

(a) BCC error check

When BCC is used, the transmitted or received frame is operated. If it is different from the operation result, the relevant frame will be ignored, so the communication quality can be improved. The contents related to each error detection method are as follows.

Classification	BCC method	Contents
Universal communication error detection method	Byte SUM	Use the lower byte value of the result where data in the specified area is added in 1 byte
	Word SUM	Use the lower word value of the result where data in the specified area is added in 1 word
	Byte XOR	Use lower byte of the exclusive OR operation result of data in a specified area by byte
	7 bit SUM	Uses the value excluding the most significant bit of the byte SUM result value
	7 bit XOR	Uses the value excluding the most significant bit of the byte XOR result value
	Byte SUM 2'S COMP	Takes two's complement of byte SUM result
	Byte SUM 1'S COMP	Take 1's complement with respect to the byte SUM result
	CRC 16	16-bit CRC error detection method
	CRC 16 IBM	16-bit IBM CRC error detection method
	CRC 16 CCITT	16-bit CCITT CRC error detection method
Dedicated Communication error detection method	LSIS CRC	Error detection method used in LS ELECTRIC PLC
	DLE AB	Allen Bradley's DF1 Protocol error detection method
	DLE SIEMENS	Error detection method used for the Siemens 3964R communication

If BCC is classified as the dedicated communication method when setting it, it is not necessary to set the BCC setting range and display method, but if it is classified as universal communication, the BCC setting range and display method should be set.

Item		Content
Start position	Area	Specify among head/body/tail where BCC calculation will begin
	Segment	Specify the position of segment in head/body/tail where BCC calculation will begin 0 is included in BCC calculation from the beginning of the frame.
End position	Before BCC	Includes the range from the start position to before BCC in the calculation
	End of area	Includes the range from the start position to the end of the specified area in the calculation
	Setting	Include the range from the start position to the position of segment in the specified area in the calculation
ASCII conversion		Converts the result value into ASCI and the size will double.
Initial value 0		The initial value of BCC calculation is 0.

(3) **Body**

The input type of segment that configures body varies according to the transmission and receive. The transmission is classified into numerical constant, string constant and variable-sized variable, the contents related to the numerical constant and string constant are the same as in the explanation given for Head. The number of segments that can be configured in Body is limited to 100 or less.

(a) Variable-sized variable (in case of receive frame)

The part of the frame that changes in size and content is defined as a variable size parameter segment. A variable-sized variable can be set only for body. In addition, unlike other segments, the additional segment cannot be set after the variable size parameter segment. When the variable size segment is used, there should be head or tail. If a frame is registered only using a variable-sized variable without head or tail, an error may occur when the frame is received. In order to improve the communication quality, at least one among Head and Tail should be set. Even if a variable-sized variable is used in the transmission frame, the size of variable-sized variable is specified in the P2P block setting, so the function and characteristics are the same as those of a fixed sized variable of the receive frame.

(b) Fixed-sized variable (In the case of a receive frame)

The size in the middle of the frame is fixed, but the part that changes when the data contents are received is defined as a fixed-sized variable segment. This can be set only for body. Up to four fixed-sized variables can be set for one body.

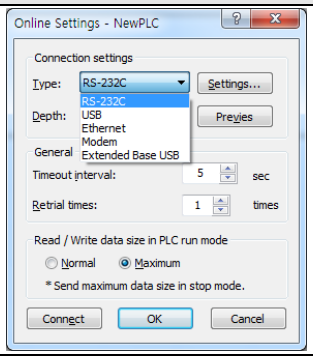
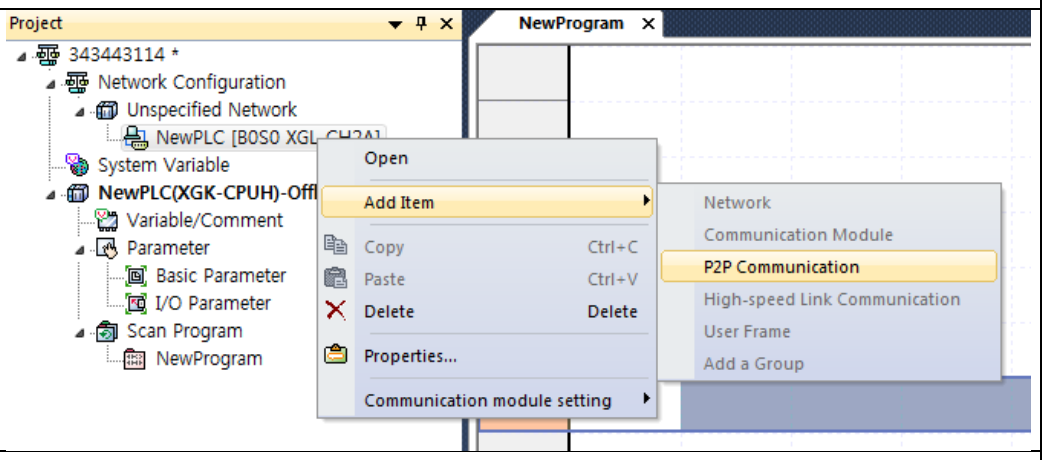
(4) The specification of transmission and reception frame supported in the user frame definition communication is as follows.

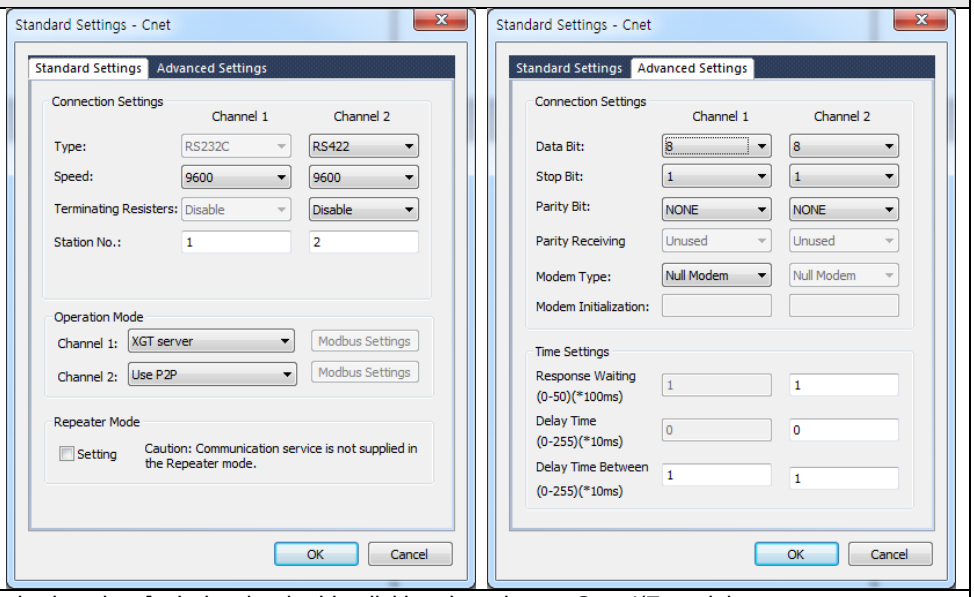
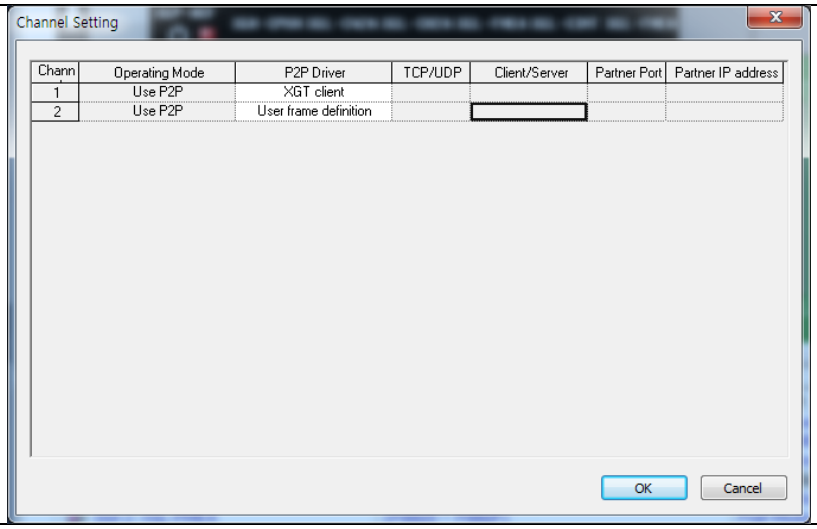
Group	Frame	Segment	Contents
Send Frame	HEAD	Numerical constant	Up to 10 bytes
		String constant	Up to 10 bytes
	TAIL	Numerical constant	Up to 10 bytes
		String constant	Up to 10 bytes
		BCC	Only one BCC can be applied.
	BODY	Numerical constant	Up to 10 bytes
		String constant	Up to 10 bytes
		Variable-sized variable	Up to 4 variables are available.
Receive Frame	HEAD	Numerical constant	Up to 10 bytes
		String constant	Up to 10 bytes
	TAIL	Numerical constant	Up to 10 bytes
		String constant	Up to 10 bytes
		BCC	Only one BCC can be applied.
	BODY	Numerical constant	Up to 10 bytes
		String constant	Up to 10 bytes
		Fix sized variable	Up to 4 variables can be set. Fixed-size 3, variable-size 1 available.
		Variable-sized variable	Only one variable-sized variable can be set. A segment cannot be added at the back of the variable-sized variable.

10.3 Writing Frame

10.3.1 Standard settings

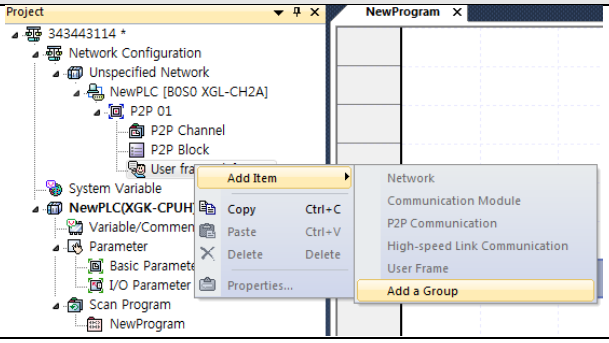
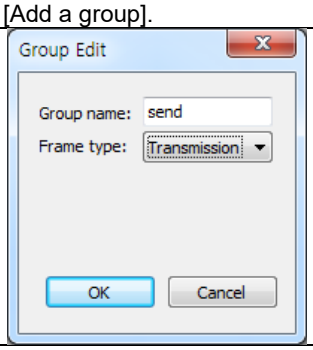
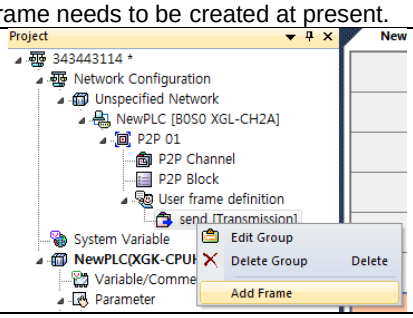
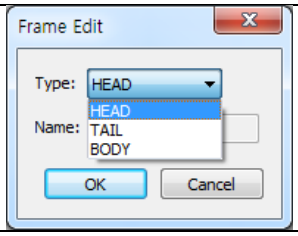
In order to carry out the user frame definition communication,' Use P2P' should be set for the operation mode just as operating as the client.

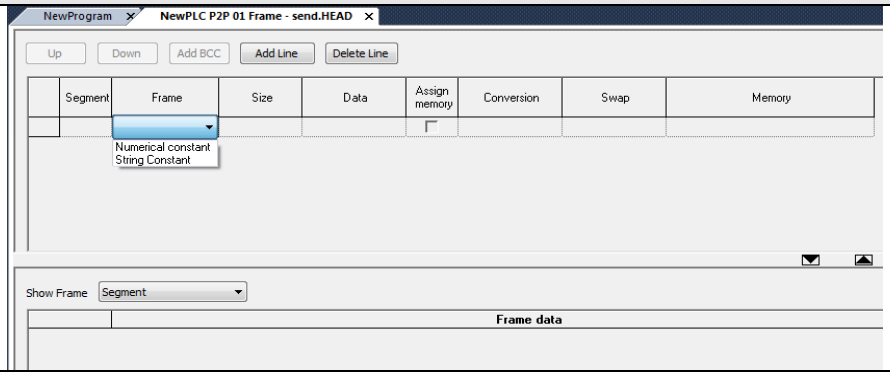
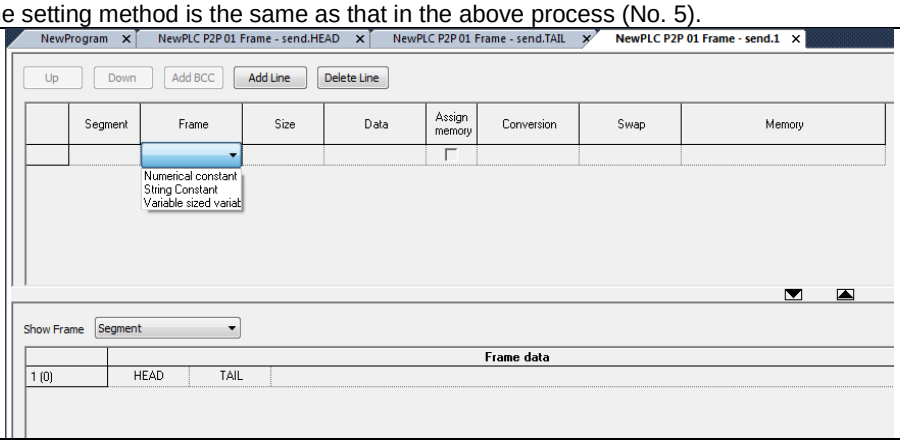
<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Connection setting</td><td> 
</td></tr>
<tr><td colspan="2">1. Select [Online]→[Connection setting].
2. Set the connection option suitable for user's environment and click the Connect.</td></tr>
<tr><td>2</td><td>Read I/O information</td><td colspan="2">Select [I/O Sync] from [Online] → [System Diagnostics] → [I/O information] window and read the information from the module currently installed on the base.</td></tr>
<tr><td rowspan="2">3</td><td>Adds P2P communication</td><td> 
</td></tr>
<tr><td colspan="2">1. In the project window, click Cnet I/F module with the right mouse button and select [Add item]→[P2P communication].
1.Set the 2.P2P number.</td></tr>
</table>

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">4</td><td>Standard setting</td><td> 
</td></tr>
<tr><td colspan="2">1. Open the [Standard settings] window by double clicking the relevant Cnet I/F module.
2. Set the communication type, communication speed, modem type, data bit, stop bit and station address from the basic setting menu.
3. Model initialization is only possible when the modem type is a dial-up modem.
4. The delay time can be set only for RS-422/485 and the response waiting time can be set only when P2P is used as the operation mode for RS-422/485 communication.
5. Terminating resistance setting and the repeater mode can be used when the OS version of the Cnet I/F module is V5.0 or higher.</td></tr>
<tr><td>5</td><td>Select operation mode</td><td>Use P2P should be selected.</td></tr>
<tr><td rowspan="2">6</td><td>P2P channel setting</td><td> 
</td></tr>
<tr><td colspan="2">1. Double click the P2P channel and select protocols for each channel.
Select the user frame definition for the 2.P2P driver.</td></tr>
</table>

10.3.2 Writing Send Frame

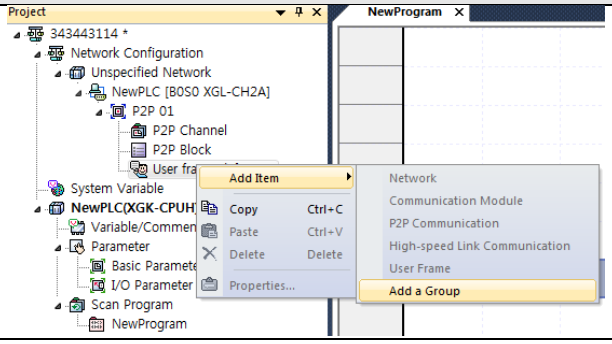
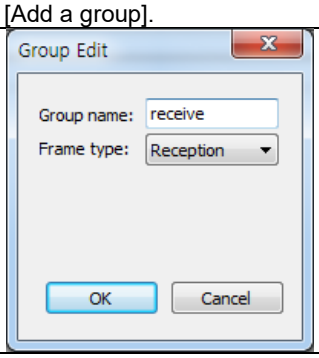
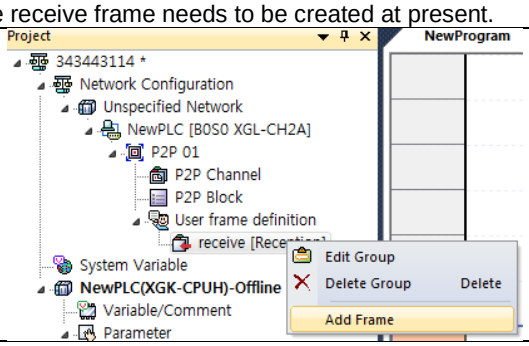
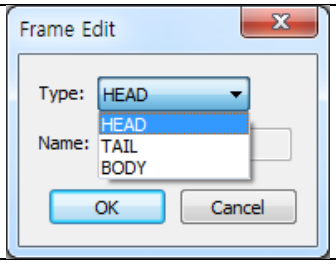
The method to write a send frame is as follows.

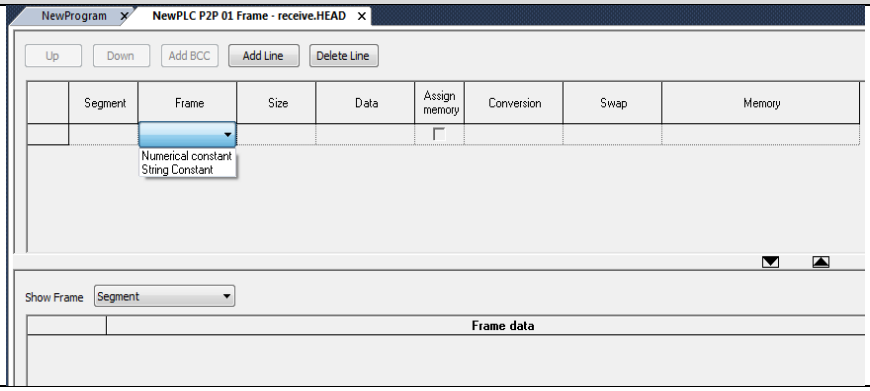
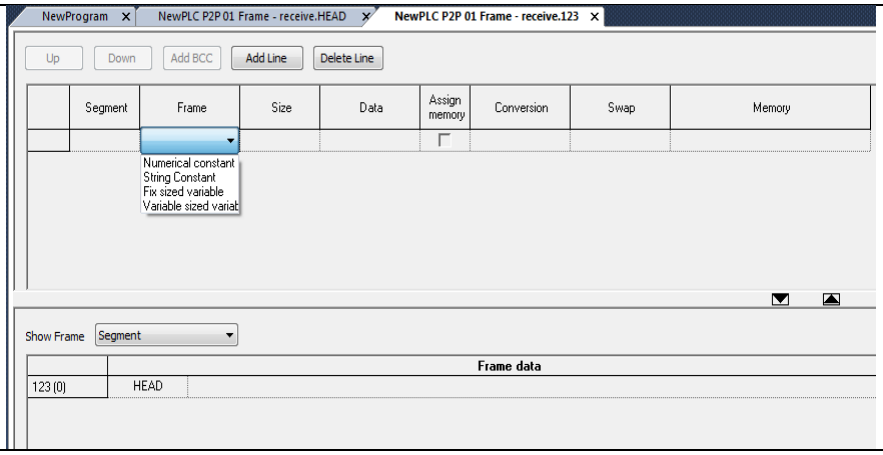
<table>
<tr><th>Sequence</th><th>Initial setting content</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Create a user frame</td><td> 
</td></tr>
<tr><td colspan="2">1. Select user frame definition.
2. Click the right mouse button and select [Add item] → [Add a group].</td></tr>
<tr><td rowspan="2">2</td><td>Edit group</td><td> 
</td></tr>
<tr><td colspan="2">1. The group name is the name of the frame a user wants to create.
2. Select send as a frame type because the send frame needs to be created at present.</td></tr>
<tr><td rowspan="2">3</td><td>Add frame</td><td> 
</td></tr>
<tr><td colspan="2">1. Check if the frame has been created.
2. Select the frame name and click the right mouse button.
3. Click [Add frame].
4. Edit group: It is used for changing the frame name.
5. Delete group: It is used for deleting a frame.</td></tr>
<tr><td rowspan="2">4</td><td>Edit frame</td><td> 
</td></tr>
<tr><td colspan="2">1.Click Add Frame and then select the type of frame to be created.
2. Types: HEAD, TAIL, BODY
3. Select HEAD.
4. Repeat the above process (No.3) to create tail and body.
5. The name of the frame editing window is enabled only when the type is BODY.
6. A number of BODY's can be created by using a different name</td></tr>
</table>

<table>
<tr><th>Sequence</th><th>Setting content</th><th>Setting method</th></tr>
<tr><td rowspan="2">5</td><td>Register HEAD</td><td> 
</td></tr>
<tr><td colspan="2">1. Double click HEAD to create an editor screen.
2. Select type
(1) Numerical constant
(a) Define the fixed part of the frame as a constant
(b) The value of data item is Hex
(2) String constant
(a) Register string constant in frame
(b) The value of data item is ASCII
3. Enter the value on Data.
Example) Type: Numerical constant, data: 5(ENQ)
* By clicking the right mouse button on the created segment, you can edit, delete, insert and copy the segment.</td></tr>
<tr><td>6</td><td>Register TAIL</td><td colspan="2">1. Double click TAIL to create an editor screen.
2. The setting method is the same as that in the above process (No. 5).</td></tr>
<tr><td rowspan="2">7</td><td>Register BODY</td><td> 
</td></tr>
<tr><td colspan="2">1. Double click BODY to enable the editor screen and select the data type.
(1) The meaning of numerical and string constants is the same as that in the header registration.
(2) Variable-sized variable
(a) It is used for changing the size of frame.
(b) Up to 4 parameters can be set in one body
(c) Memory specification is automatically checked
(3) Control in byte
(3) Conversion
▶Hex To ASCII: Convert the data read from the PLC memory into ASCII to configure the send frame
▶ASCII To Hex: Convert the data read from the PLC memory into Hex to configure the send frame
(4) Swap
▶2 byte swap: 2-byte swap of data value(Example:0x1234->0x3412)
▶4 byte swap: 4-byte swap of data value(Example:0x12345678->0x78563412)
▶8 byte swap: 8-byte swap of data value
* Only XGL-C22B, XGL-CH2B and XGL-C42B support the swap function.</td></tr>
</table>

10.3.3 Writing a receive frame

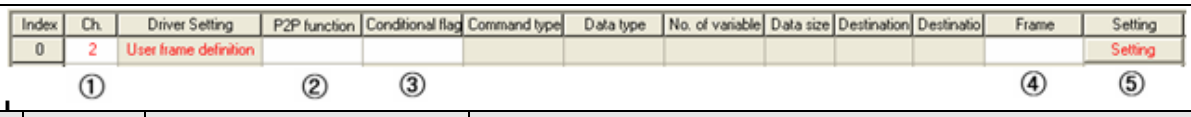
The method to write a receive frame is as follows.

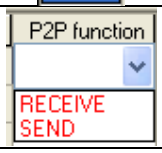
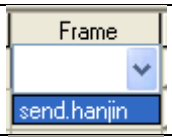
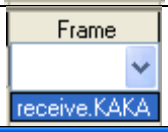
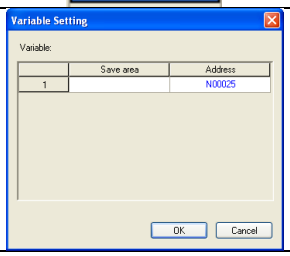
<table>
<tr><th>Sequence</th><th>Setting content</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Create a user frame</td><td> 
</td></tr>
<tr><td colspan="2">1. Select user frame definition.
2. Click the right mouse button and select [Add item] → [Add a group].</td></tr>
<tr><td rowspan="2">2</td><td>Edit group</td><td> 
</td></tr>
<tr><td colspan="2">1. The group name is the name of the frame a user wants to create.
2. Select receive as a frame type because the receive frame needs to be created at present.</td></tr>
<tr><td rowspan="2">3</td><td>Add frame</td><td> 
</td></tr>
<tr><td colspan="2">1. Check if the frame has been created.
2. Select the frame name and click the right mouse button.
3. Click Add frame.
4.Edit group: It is used for changing the frame name.
5. Delete group: It is used for deleting a frame.</td></tr>
<tr><td rowspan="2">4</td><td>Edit frame</td><td> 
</td></tr>
<tr><td colspan="2">1.Click Add Frame and then select the type of frame to be created.
2. Type: HEAD, TAIL, BODY
3. Select HEAD.
4. Repeat the above process (No.3) to create tail and body.
5. The name of the frame editing window is enabled only when the type is BODY.
6. A number of BODY's can be created by using a different name</td></tr>
</table>

<table>
<tr><th>Sequence</th><th>Setting content</th><th>Setting method</th></tr>
<tr><td rowspan="2">5</td><td>Register HEAD</td><td> 
</td></tr>
<tr><td colspan="2">1. Double click HEAD to create an editor screen.
2. Double click the editor screen or click the right mouse button to select Add Segment.
3. Select the shape (The contents by type are the same as the explanation given in the paragraph above).
4. Enter the value on Data.</td></tr>
<tr><td>6</td><td>Register TAIL</td><td>1. Double click TAIL to create an editor screen.
2. The setting method is the same as that in the above process (No. 5).</td></tr>
<tr><td rowspan="2">7</td><td>Register BODY</td><td> 
</td></tr>
<tr><td colspan="2">1. Double click BODY to enable the editor screen and select the data type.
(1) The meaning of numerical and string constants is the same as that in the header registration.
(2) Variable-sized variable: It is used when changing the frame size.
(a) One variable size parameter can be set, and segment cannot be added
(b) When you put a check on [Memory setting], it is possible to save to PLC memory (control by byte unit)
(3) Fix sized variable: It is used when fixing the frame size to a certain size.
(a) Up to 4 parameters can be set in one body
(b) When you put a check on [Memory setting], it is possible to save to PLC memory.
4) Specify Memory: Checked when the device area to be saved in PLC is set.
(5) Conversion
►Hex To ASCII: Configure the receive frame by converting received data into ASCII
►ASCII To Hex: Configure the receive frame by converting received data into Hex
(6) Swap
►4 byte swap: Swap upper and lower data values in 2 bytes (Example: 0x1234->0x3412)
►4 byte swap: Swap upper and lower data values in 4 bytes (Example: 0x12345678->0x78563412)
►8 byte swap: Swap upper and lower data values in 8 bytes
* Only XGL-C22B, XGL-CH2B and XGL-C42B support the swap function.</td></tr>
</table>

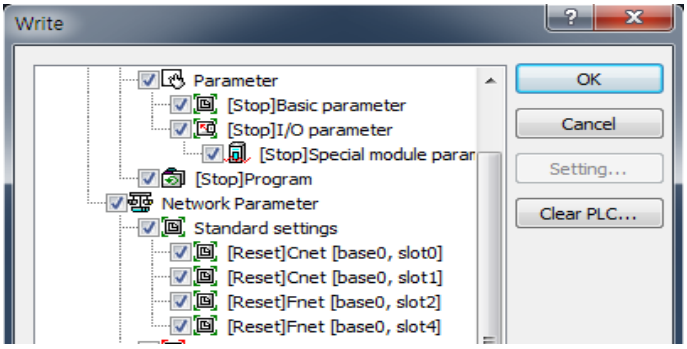
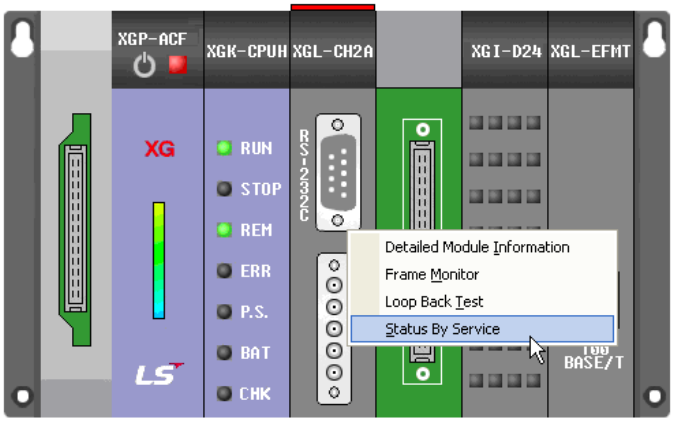
10.3.4 Setting Parameters

Parameters should be set through the P2P block in order to transmit or receive data using the frame written using the XG5000. The setting method is shown below.



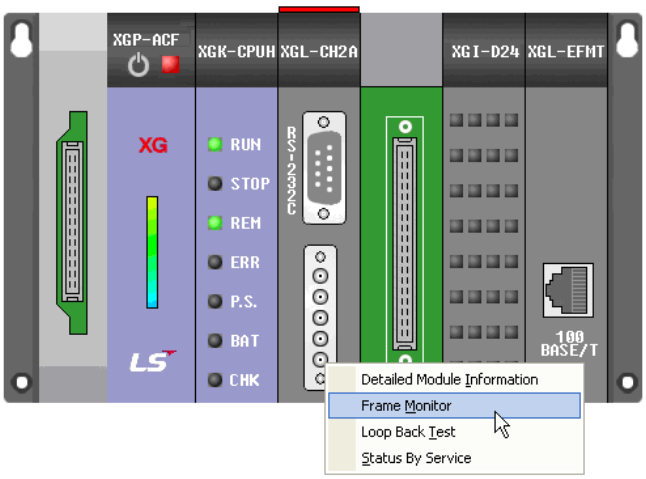
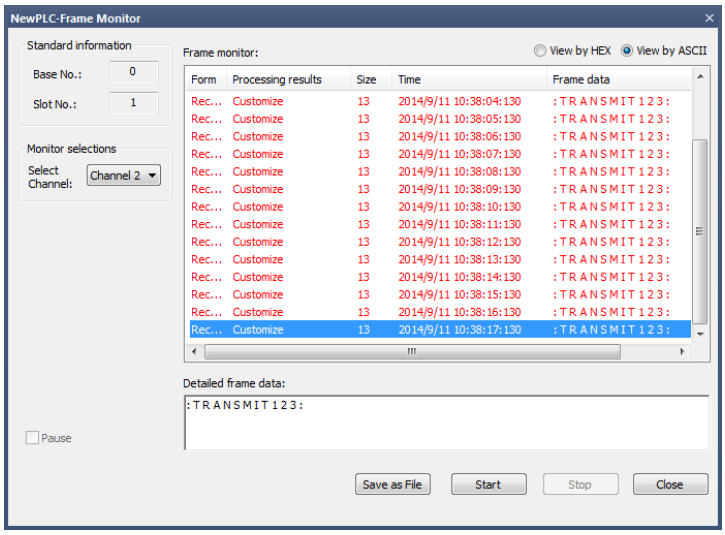
No.	Type	Block type	Contents
1	Channel		The name of the setting driver changes according to the driver set in the P2P driver.
2	P2P function		• Receive: It is used for receiving data using a frame written according to the destination station's protocol. • Send: It is used for sending data using a frame written according to the destination station's protocol.
3	Start condition		• Enter special flag or bit contact and select the point of time when data is transmitted and received. • In the user frame definition, it is enabled only when the P2P function is send. • Example In case of XGK type) F90 (Operates in 20ms intervals), M01 • Example in case of XGI type) _T20MS (operates in 20ms intervals),%MX01
4	Frame		If [Send] is selected in the P2P function, select the body of the send frame created in the user frame.
			If [RECEIVE] is selected in the P2P function, select the body of the receive frame created in the user frame.
5	Setting		• The setting in the P2P block of the user frame definition can be done only when Specify Memory of the fixed size parameter and variable size parameter created by a user is checked. • Save area: Indicates the head address of the areas where data received from the destination station will be saved.

10.3.5 Write Parameters

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Write parameter</td><td> 
</td></tr>
<tr><td colspan="2">1. Select [Online] → [Write].
2.Click the module and P2P whose basic setting and P2P parameter setting are completed, and click 'OK'.
3. Click the [OK] button, and when the parameter writing finishes, reset each module.</td></tr>
<tr><td rowspan="2">2</td><td>Check operation</td><td> 
</td></tr>
<tr><td colspan="2">1. Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis].
2. Select the relevant module and click the right mouse button
3. Click [Frame Monitor] or [Status by Service] to check the operation status.</td></tr>
</table>

10.4 Frame Monitor

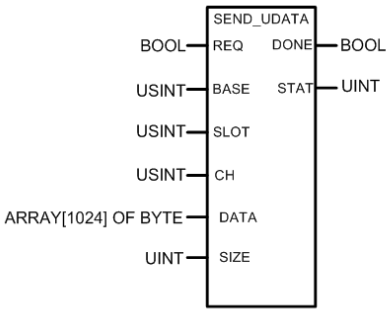
When you use the frame monitor function of the XG5000, you can check a frame which has actually been exchanged by the client and the server.

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Check operation</td><td> 
</td></tr>
<tr><td colspan="2">1. Select [Online] → [Communication Module Settings and Diagnosis] → [System Diagnosis].
2. Click the module, press the right mouse button.
3. When the screen as shown in the figure above appears, click [Frame monitor].</td></tr>
<tr><td rowspan="2">2</td><td>Frame monitor</td><td> 
</td></tr>
<tr><td colspan="2">1. Select the channel you want to monitor.
2. When the protocol is in Modbus ASCII mode, select View as ASCII.
3. When the protocol is in Modbus RTU mode. Select Hex View
4. Click [Start] to check the sending / receiving frame.
5. You can save and utilize the frame monitor result to a text file by clicking [Save to file].</td></tr>
</table>

10.5 UDATA Commands

10.5.1 XGI Commands

(1) SEND_UDATA

SEND_UDATA	Availability	Flags
User defined data send	XGI, XGR	-
Function Block	Description	
	Input REQ: requires to execute the function block BASE : base number SLOT: slot number CH: channel(1 or 2) DATA: data area to send SIZE: data size to send Output DONE: maintains 1 after operation STAT: completion and ERR info	

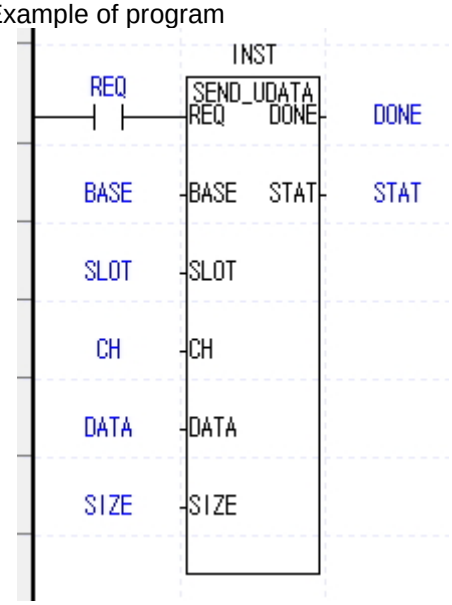
(a) Function

1) This command is used to transmit user-defined data (hereafter referred to as UDATA).
2) Enter the base number and the slot number where the Cnet I/F module is installed currently on BASE and SLOT respectively.
3) CH means the channel number and only 1 or 2 should be set.
4) DATA should be declared as ARRAY OF BYTE type.
5) The size of array declared as SIZE is 1~1024.(Unit: Byte)
6) Saves data as many as SIZE, starting from DATA[0], to the transmission buffer. (The data size that can be transmitted at one time is limited to 1024)
7) When it is executed normally, 1 will be outputted on DONE and STAT, and if an error occurs, the status information will be displayed on STAT.

(b) Error

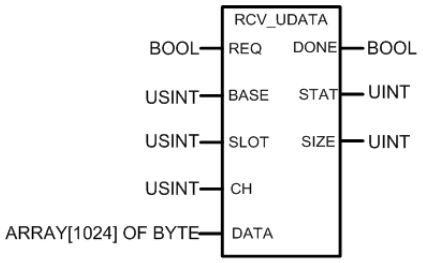
STAT	Status Information	Contents
0	Initial status	Status before a command is executed
1	No error	Normal operation
2	Module setting error	If the module is not installed on the relevant base slot or it is not the Cnet I/F module
3	Channel setting error	If the input range (1, 2) has been exceeded
4	Array size error	If the size of transmitted data exceeds 1024
5	Communication parameter setting error	If the user frame definition is not set for the communication parameter of the Cnet I/F module or link enable is not set
6	Command timeout error	If there is no response from the module or the maximum scan time (10 scans) has exceeded
7	Version compatibility error	If the XGI CPU version is below V3.9, if the XGR CPU version is below V2.6 or if the Cnet version is below V3.2

(c) Example of program



Command that transmits up to 1024 bytes using the Cnet I/F module installed on BASE and SLOT

(2) RCV_UDATA

RCV_UDATA	Availability	Flags
User defined data receive	XGI, XGR	-
Function Block	Description	
	Input REQ: requires to execute the function block BASE : base number SLOT: slot number CH: channel(1 or 2) DATA: data area to save Output DONE: maintains 1 after operation STAT: completion and ERR info SIZE: received data size	

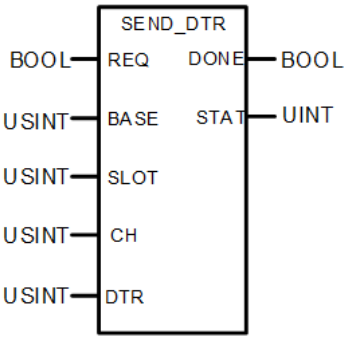
(a) Function

1) This command saves data of the relevant frame received through the Cnet I/F module.
2) Enter the base number and the slot number where the Cnet I/F module is installed currently on BASE and SLOT respectively.
3) CH means the channel number and only 1 or 2 should be set.
4) DATA should be declared as ARRAY OF BYTE type.
5) The size of array declared as SIZE is 1~1024.(Unit: Byte)
6) Size indicates the size of received data.
7) When it is executed normally, 1 will be outputted on DONE and STAT, and if an error occurs, the status information will be displayed on STAT.

(b) Error

STAT	Status Information	Contents
0	Initial status	Status before a command is executed
1	No error	Normal operation
2	Module setting error	If the module is not installed on the relevant base slot or it is not the Cnet I/F module
3	Channel setting error	If the input range (1, 2) has been exceeded
4	There is no received data	If no data has been received
5	Communication parameter setting error	If the user definition is not set for the communication parameter of the Cnet I/F module or link enable is not set
6	Command timeout error	If there is no response from the module or the maximum scan time (10 scans) has exceeded
7	Version compatibility error	If the XGI CPU version is below V3.9, if the XGR CPU version is below V2.6 or if the Cnet version is below V3.2

(3) SEND_DTR

SEND_DTR	Availability	Flags
DTR signal send	XGI, XGR	-
Function Block	Description	
	Input REQ: requires to execute the function block BASE : base number SLOT: slot number CH: channel(1 or 2) DTR: 0 or 1 Output DONE: maintains 1 after operation STAT: completion and ERR info	

(a) Function

1) This command sends the DTR (Data Terminal Ready) signal indicating that the preparation for communication is completed.
2) When it is executed normally, 1 will be outputted on DONE and STAT, and if an error occurs, the status information will be displayed on STAT.

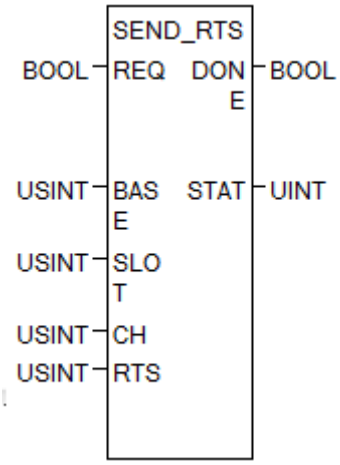
(b) Error

STAT	Status Information	Contents
0	Initial status	Status before a command is executed
1	No error	Normal operation
2	Module setting error	If the module is not installed on the relevant base slot or it is not the Cnet I/F module
3	Channel setting error	If the input range (1, 2) has been exceeded
4	DTR setting error	If the input range (0, 1) has been exceeded
5	Communication parameter setting error	If the user definition is not set for the communication parameter of the Cnet I/F module or link enable is not set
6	Command timeout error	If there is no response from the module or the maximum scan time (10 scans) has exceeded
7	Version compatibility error	If the XGI CPU version is below V3.9, if the XGR CPU version is below V2.6 or if the Cnet version is below V3.2

Notes

• 7 is outputted for State during a certain period of time in which the module initialization is completed.

(4) SEND_RTS

SEND_RTS	Availability	Flags
RTS signal send	XGI, XGR	-
Function Block	Description	
	Input REQ: requires to execute the function block BASE : base number SLOT: slot number CH: channel(1 or 2) RTS: 0 or 1 Output DONE: maintains 1 after operation STAT: completion and ERR info	

(a) Function

1) This command sends RTS (Request To Send) which is a signal that indicates its own receive buffer status
2) When it is executed normally, 1 will be output and the occurs, the status information will be displayed on STAT.

(b) Error

STAT	Status Information	Contents
0	Initial status	Status before a command is executed
1	No error	Normal operation
2	Module setting error	If the module is not installed on the relevant base slot or it is not the Cnet I/F module
3	Channel setting error	If the input range (1, 2) has been exceeded
4	RTS setting error	If the input range (0, 1) has been exceeded
5	Communication parameter setting error	If the user definition is not set for the communication parameter of the Cnet I/F module or link enable is not set
6	Command timeout error	If there is no response from the module or the maximum scan time (10 scans) has exceeded
7	Version compatibility error	If the XGI CPU version is below V3.9, if the XGR CPU version is below V2.6 or if the Cnet version is below V3.2

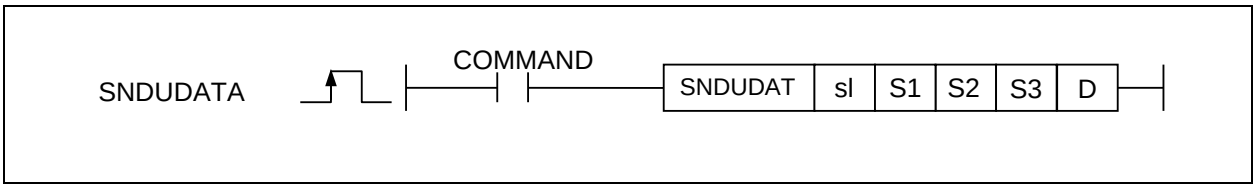
Notes

• 7 is outputted for State during a certain period of time in which the module initialization is completed.

10.5.2 XGK Commands

(1) SNDUDATA

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	Error (F110)	Zero (F111)	Carry (F112)
SNDUDATA	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O			
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7		
	S3	O	-	O	-	-	-	O	-	-	-	O	O	O	O			
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O			



[Area setting]

Operand	Description	Data type
sl	Base number and slot number where the Cnet I/F module is installed	WORD
S1	Channel information (1 or 2)	WORD
S2	Start device number where data to be sent is saved	WORD
S3	Size of data to be sent (up to 1024 bytes)	WORD
D	Temporary device number to be used internally in the command	WORD

[Flag Set]

Flag	Contents	Device number
Error	If sl value does not match with base number and slot number where the Cnet I/ F module is installed	F110

(a) Function

1) This command send the user definition data (UDATA).
2) Enter the base number and the slot number where the Cnet I/F module is installed currently on sl.
3) S1 indicates the channel number and only 1 or 2 should be set.
4) S2 indicates the address of start area where UDATA is saved.
5) S3 indicates the size of UDATA to be sent and data as many as S3, starting from the area specified as S2, is transmitted. Up to 1024 data can be transmitted the unit is byte.
6) D is the temporary area to save command information, and a value to be saved is as follows. All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D	WORD	Status code
D+1	WORD	Reserved area (Usage prohibited)
D+2	WORD	Reserved area (Usage prohibited)
D+3	WORD	Reserved area (Usage prohibited)

(b) Error

If sl value does not match with base number and slot number where the Cnet I/ F module is installed, the error flag (F110) will be set.

(c) Status Information

Status code	Status Information	Contents
00	Initial status	Status before a command is executed
01	Complete	If the command has been executed normally
02	Module setting error	If sl value is set for the base or slot where the Cnet I/F module is not installed
03	Channel setting error	If the S1 channel information value is not 1 or 2
04	Transmitted data size setting error	If the transmitted data size is less than 0 or exceeds 1024
05	Communication parameter setting error	If the user definition is not set for the communication parameter of the Cnet I/F module or link enable is not set
06	Timeout error	If there is no response to the command due to Cnet I/F module error
07	Version compatibility error	If the Cnet version is below V3.2 and the relevant command is not supported (If the CPU version is below V4.2, program download will not be available.)

(d) Program example

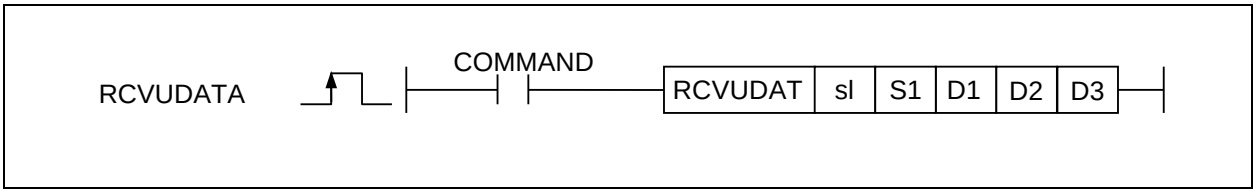
This command transmits data as many as SIZE, starting from the service area defined as DATA to CH slot when REQ which is the status of the input signal is changed from Off to On (positive edge).

Notes

•Device D+1~D+3 specified to D is the space where various information used in the command is saved. Therefore, the user should not change the value of the relevant area arbitrarily. If the value of the relevant area is changed arbitrarily, the command will not operate normally.

(2) RCVUDATA

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
RCVUDATA	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O				
	D1	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D3	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
sl	Base number and slot number where the Cnet I/ F module is installed	WORD
S1	Channel information (1 or 2)	WORD
D1	Start device number where data to be sent is saved	WORD
D2	Size of data to be sent (up to 1024 bytes)	WORD
D3	Temporary device number to be used internally in the command	WORD

[Flag Set]

Flag	Contents	Device number
Error	If sl value does not match with base number or slot number where the CNET module is installed	F110

(a) Function

1) This command receives the user definition data (UDATA).
2) Enter the base number and the slot number where the Cnet I/F module is installed for sl.
3) S1 indicates the channel number and only 1 or 2 should be set.
4) D1 indicates the address of the start area where received UDATA will be saved.
5) D2 indicates the size of received UDATA and the unit is byte.
6) D3 is the temporary area to save command information, and a value to be saved is as follows. All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D3	WORD	Status code
D3+1	WORD	Reserved area (Usage prohibited)
D3+2	WORD	Reserved area (Usage prohibited)
D3+3	WORD	Reserved area (Usage prohibited)

(b) Error

If sl value does not match with base number and slot number where the Cnet I/F module is installed, the error flag (F110) will be set.

(c) Status Information

Status code	Status Information	Contents
00	Initial status	Status before a command is executed
01	Complete	If the command has been executed normally
02	Module setting error	If sl value is set for the base or slot where the Cnet I/F module is not installed
03	Channel setting error	If the S1 channel information value is not 1 or 2
04	There is no received data	If no data has been received
05	Communication parameter setting error	If the user definition is not set for the communication parameter of the Cnet I/F module or link enable is not set
06	Timeout error	If there is no response to the command due to Cnet I/ F module error
07	Version compatibility error	If the Cnet version is below V3.2 and the relevant command is not supported (If the CPU version is below V4.2, program download will not be available.)

(d) Program example

When the status of REQ, which is the input signal, is changed from Off to On (positive edge), save data as many as SIZE received from the device area specified as DATA on the CH slot if there is received data.

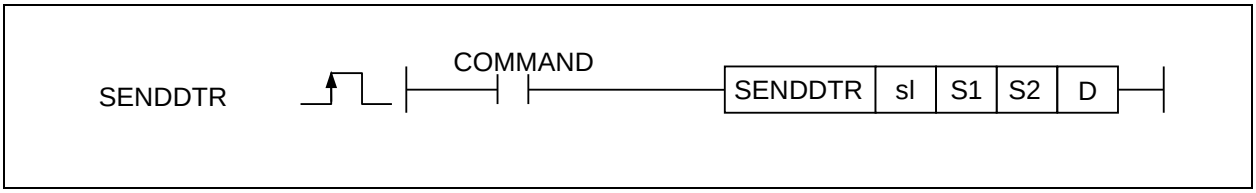
Notes

(1) device D3 +1~ D3 +3 specified to D is the space where various information used in the command is saved. Therefore, the user should not change the value of the relevant area arbitrarily. If the value of the relevant area is changed arbitrarily, the command will not operate normally.

(2) The maximum size of received data is 1024 bytes and the device number set as D2 should be smaller than (End area of the relevant device– 1024 bytes).

(3) SENDDTR

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
SENDDTR	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O				
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
sl	Base number and slot number where the CNET module is installed	WORD
S1	Channel information (1 or 2)	WORD
S2	DTR (0 or 1)	WORD
D	Temporary device number to be used internally in the command	WORD

[Flag Set]

Flag	Contents	Device number
Error	If sl value does not match with base number and slot number where the Cnet I/F module is installed	F110

(a) Function

1) This command is a command to send DTR (Data Terminal Ready) signal to communicate that communication ready is completed.
2) Enter the base number and the slot number where the Cnet I/F module is installed for sl.
3) S1 indicates the channel number and only 1 or 2 should be set.
4) S2 indicates the RTS value and only 0 or 1 should be set.
5) D is the temporary area to save command information, and a value to be saved is as follows. All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Status type
D	WORD	Status code
D+1	WORD	Reserved area (Usage prohibited)
D+2	WORD	Reserved area (Usage prohibited)
D+3	WORD	Reserved area (Usage prohibited)

(b) Error

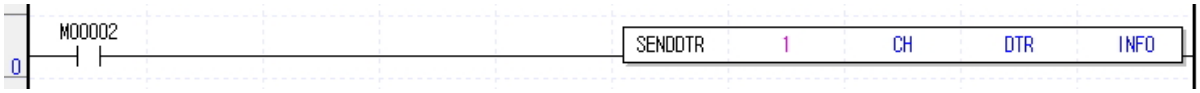
If sl value does not match with base number and slot number where the Cnet I/F module is installed, the error flag (F110) will be set.

(c) Status Information

Status code	Status Information	Contents
00	Initial status	Status before a command is executed
01	DONE	If the command has been executed normally
02	Module setting error	If sl value is set for the base or slot where the Cnet I/F module is not installed
03	Channel setting error	If the S1 channel information value is not 1 or 2
04	DTR level setting error	If the S2 DTR setting value is not 0 or 1
05	Communication parameter setting error	If the user definition is not set for the communication parameter of the Cnet I/F module or link enable is not set
06	Timeout error	If there is no response to the command due to Cnet I/ F module error
07	Version compatibility error	If the Cnet version is below V3.2 and the relevant command is not supported (If the CPU version is below V4.2, program download will not be available.)

(d) Program example

When you change REQ, which is the input signal, from Off to On (positive edge) a DTR (Data Terminal Ready) signal that indicates the preparation for communication is completed will be sent to the set CH slot.

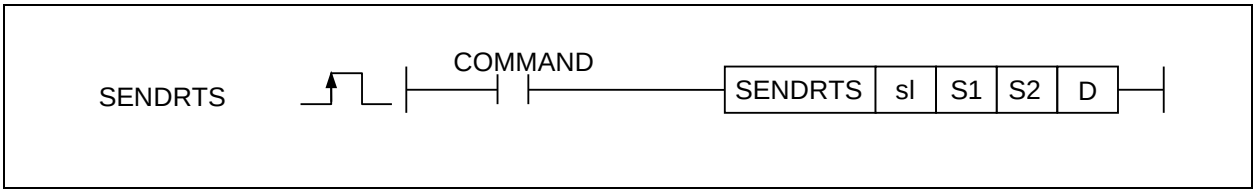


Notes

- Device D+1~D+3 specified to D is the space where various information used in the command is saved. Therefore, the user should not change the value of the relevant area arbitrarily. If the value of the relevant area is changed arbitrarily, the command will not operate normally.

(4) SENDRTS

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
SENDRTS	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O				
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
sl	Base number and slot number where the Cnet I/F module is installed	WORD
S1	Channel information (1 or 2)	WORD
S2	RTS setting (0 or 1)	WORD
D	Temporary device number to be used internally in the command	WORD

[Flag Set]

Flag	Contents	Device number
Error	If sl value does not match with base number and slot number where the Cnet I/F module is installed	F110

(a) Function

1) This command sends RTS (Request To Send) which is a signal that indicates its own receive buffer status.
2) Enter the base number and the slot number where the Cnet I/F module is installed for sl.
3) S1 indicates the channel number and only 1 or 2 should be set.
4) S2 indicates the RTS value and 0 or 1 can be set. 1 should be set if you wish to receive data from the modem.
5) D is the temporary area to save command information, and a value to be saved is as follows. All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D	WORD	Status code
D+1	WORD	Reserved area (Usage prohibited)
D+2	WORD	Reserved area (Usage prohibited)
D+3	WORD	Reserved area (Usage prohibited)

(b) Error

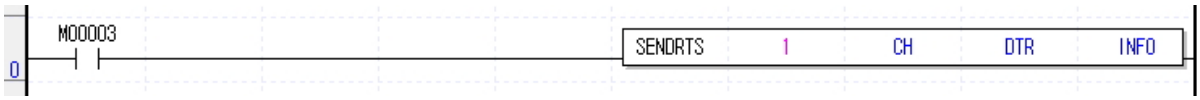
If sl value does not match with base number and slot number where the Cnet I/F module is installed, the error flag (F110) will be set.

(c) Status Information

Status code	Status Information	Contents
00	Initial status	Status before a command is executed
01	Complete	If the command has been executed normally
02	Module setting error	If sl value is set for the base or slot where the Cnet I/F module is not installed
03	Channel setting error	If the S1 channel information value is not 1 or 2
04	DTR level setting error	If the S2 DTR setting value is not 0 or 1
05	Communication parameter setting error	If the user definition is not set for the communication parameter of the Cnet I/F module or link enable is not set
06	Timeout error	If there is no response to the command due to Cnet I/ F module error
07	Version compatibility error	If the Cnet version is below V3.2 and the relevant command is not supported (If the CPU version is below V4.2, program download will not be available.)

(d) Program example

When you change REQ, which is the input signal, from Off to On (positive edge), an RTS (Request To Send) which is the signal that indicates the own receive buffer status will be sent to CH slot.



Notes

- Device D+1~D+3 specified to D is the space where various information used in the command is saved. Therefore, the user should not change the value of the relevant area arbitrarily. If the value of the relevant area is changed arbitrarily, the command will not operate normally.

Chapter 11 Example program

11.1 Setting method for each operation mode

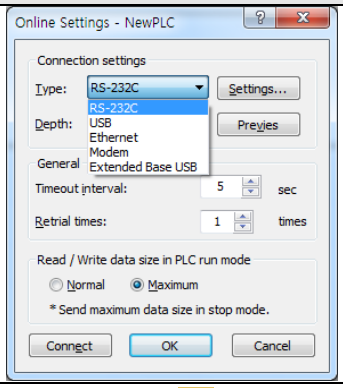
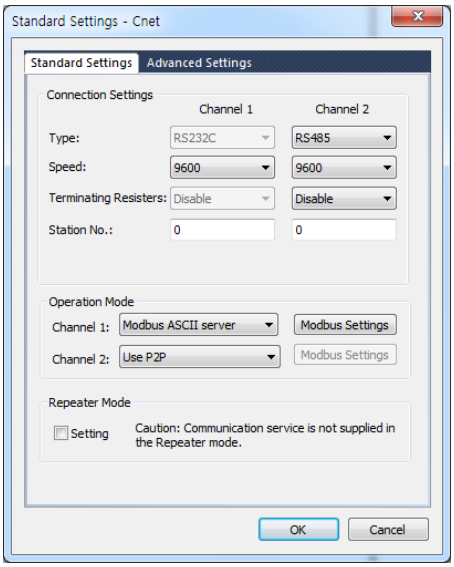
The operation mode of the Cnet I/F module is classified into the P2P service and the server function.

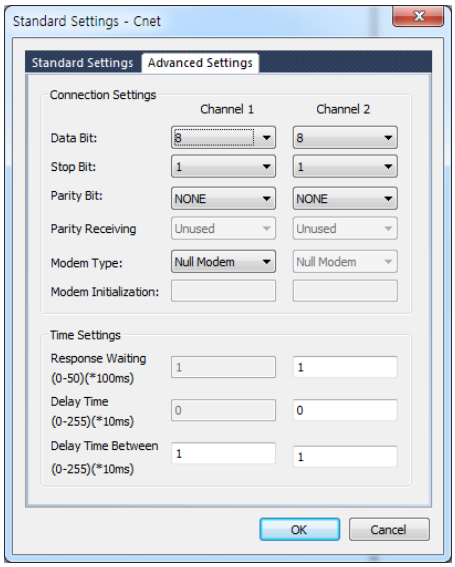
▶ P2P service: It operates as a client (master) and makes a request to read/write data from the destination station.
- ▷ XGT client
- ▷ LS bus client
- ▷ Modbus RTU/ASCII client
- ▷ User frame definition communication

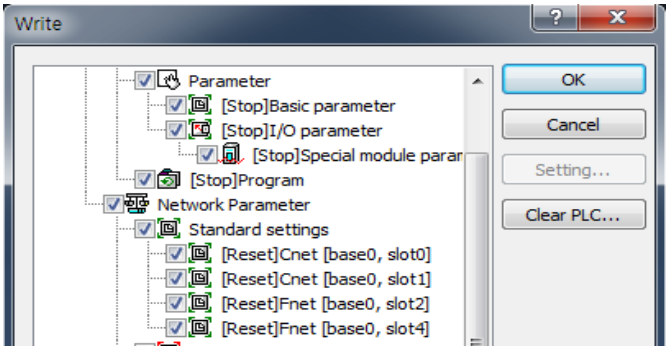
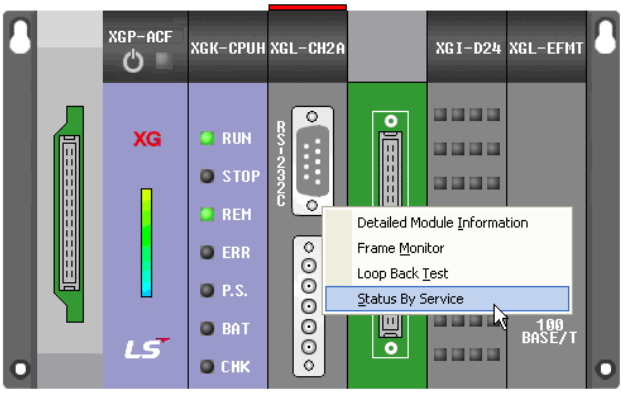
▶ Server function: It operates as a server (slave) and responds according to the protocol type when requested by the client.
- ▷ XGT server
- ▷ Modbus RTU server
- ▷ Modbus ASCII server

The setting method for each operation mode is as follows.

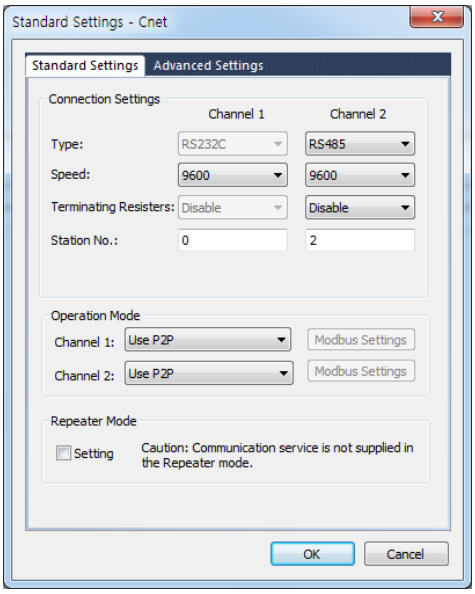
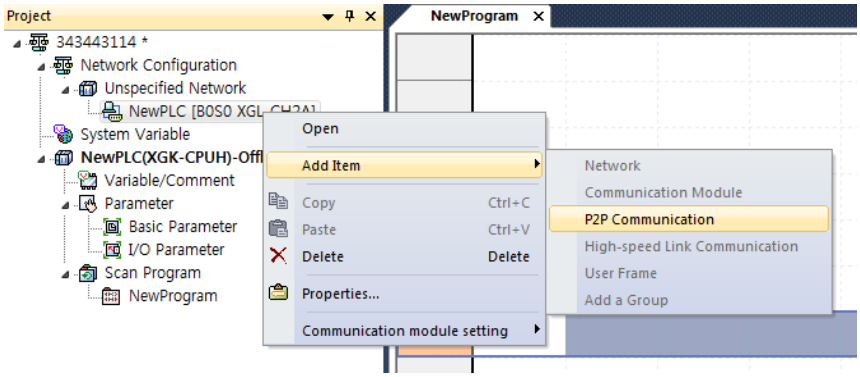
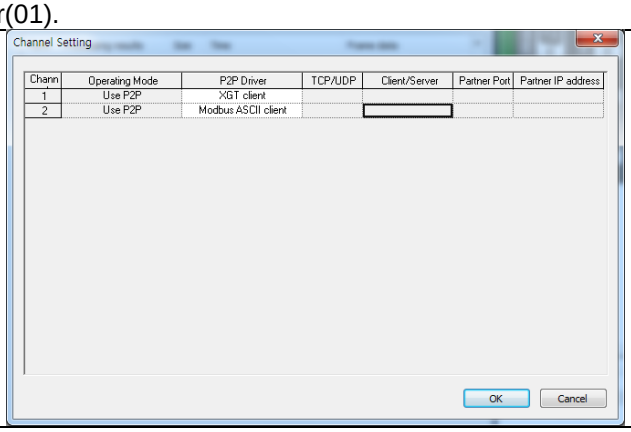
11.1.1 When Operating as the server

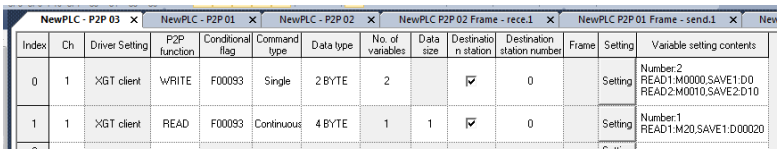
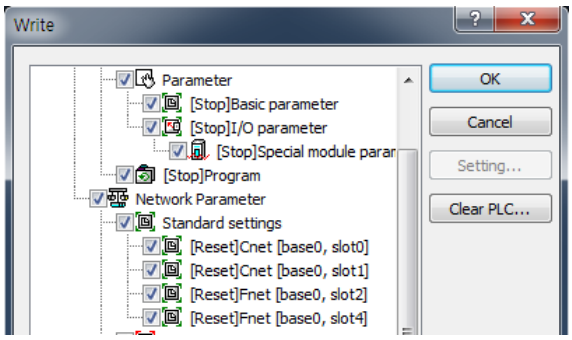
<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Connection setting</td><td> 
</td></tr>
<tr><td colspan="2">1. Select [Online] ->[Connection Settings] or click the icon ( ).
2. Set the connection option suitable for user's environment and click the [Connect].</td></tr>
<tr><td>2</td><td>Read I/O Information</td><td colspan="2">Click the [I/O Sync] button from the [Online]→[System Diagnostics]→[I/O information] menu, read the information of the module currently installed on the base and add it to the project. It operates only when the CPU module is in stop mode.</td></tr>
<tr><td rowspan="2">3</td><td>Standard settings</td><td> 

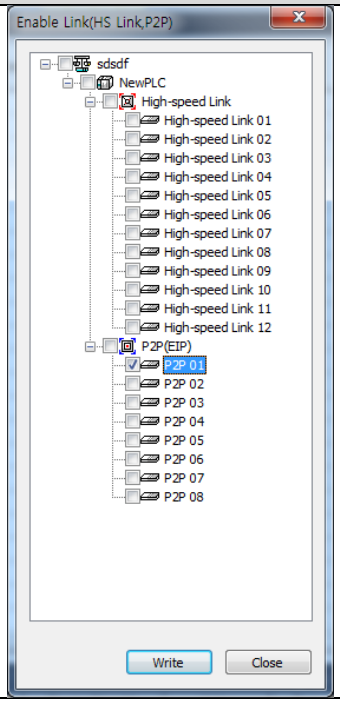
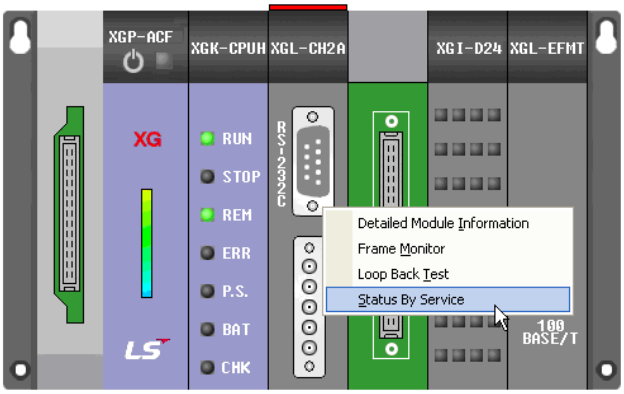

</td></tr>
<tr><td colspan="2">1. Open the [Standard settings] window by double clicking the Cnet I/F module, and set the communication type, communication speed, modem type, data bit, stop bit and station address from the setting menu.
2. Model initialization is only possible when the modem type is a dial-up modem.
3. Response waiting time: This is the time to wait until a frame is received after transmitting it.
(1) Operation setting: It can be set when the operation mode is in P2P use during the RS-422/485 communication.
(2) Response waiting time = Basic response waiting time + (response waiting time setting value X 100ms) + inter-character waiting time setting value
4. Delay time setting: It is used for transmitting a frame after the time delay set by the user.
(1) Operation setting: It can be set when the communication type is RS-422/485.
(2) Server operation setting: You can set the server to transmit a frame after a set time delay. (It can be used in the B type Cnet I/F module)
5. Inter-character waiting time: A number of characters received within a set time are processed as one frame. It means the interval between characters in one frame, and it can be set regardless of operation mode.
6. Terminating resistance setting, repeater mode and smart server function can be used in the B type Cnet I/F module.
* In the case of using as the Modbus ASCII server, the data bit is 7.</td></tr>
</table>

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td>4</td><td>Selecting the operation mode</td><td>1.Select the operation mode of a server to be used by a user.
2.Cnet I/ F module supports XGT server, Modbus ASCII server and Modbus RTU server.</td></tr>
<tr><td rowspan="2">5</td><td>Write parameter</td><td> 
</td></tr>
<tr><td colspan="2">1.Select [Online] ->[Write] or click the icon ( ).
2.Put a check mark on the module whose basic setting is completed from standard settings and click[OK].
3. Click the [OK] button, and when the parameter writing finishes, reset each module.</td></tr>
<tr><td rowspan="2">6</td><td>Check operation</td><td> 
</td></tr>
<tr><td colspan="2">1.Slect [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ).
2. Click the module, press the right mouse button.
3. Click [Frame Monitor] or [Status by Service] to check the operation status.</td></tr>
</table>

11.1.2 When operating as a P2P service(client)

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td>1</td><td>Standard setting</td><td>The steps 1 to 3 are the same as those in the above case.
*When set to Modbus ASCII client, the data bit is set to 7</td></tr>
<tr><td rowspan="2">2</td><td>Operation mode</td><td> 
</td></tr>
<tr><td colspan="2">Select Use P2P.</td></tr>
<tr><td rowspan="2">3</td><td>P2P setting</td><td> 
</td></tr>
<tr><td colspan="2">1. Right-click the Cnet module in the project tree and select [Add Item] → [P2P Communication].
2.. Select P2P number(01).</td></tr>
<tr><td rowspan="2">4</td><td>P2P channel setting</td><td> 
</td></tr>
<tr><td colspan="2">1.Double click the P2P channel and select protocols for each channel.
2.User frame definition, XGT client, LS bus client and Modbus RTU/ASCII client are supported for the P2P driver.</td></tr>
</table>

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">5</td><td>P2P block setting</td><td> 
</td></tr>
<tr><td colspan="2">1.P2P block setting values are enabled differently according to the type of client selected in the channel settings.
2.Create the frame in the enabled cell according to the protocol type.
*In the case of user frame definition, it is available only when the frame is created in the user frame definition.</td></tr>
<tr><td rowspan="2">6</td><td>Write parameter</td><td> 
</td></tr>
<tr><td colspan="2">1.Select [Online] ->[Write] or click the icon ( ).
2.In the Standard settings, check the standard settings and P2P that have been set up, and then click the [OK] button.
3.Click the [OK] button, and when the parameter writing finishes, reset each module.</td></tr>
</table>

Sequence	Setting process	Setting method
7	Link enable	
	1.Select [Online] ->[Communication Module Settings and Diagnosis] ->[Enable Link/Services] or click the icon( ). 2.Check the P2P whose setting is completed and click [Write].	
8	Check operation	
	1.Slect [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ). 2. Click the module, press the right mouse button. 3. Click [Frame Monitor] or [Status by Services] to check the operation status.	

11.2 XGT Communication

What is the XGT communication service?
▶ It is a protocol defied by LS ELECTRIC and is classified into XGT client and XGT server.
▶ XGT client: requests the server to read/write data Requests read/write date to the server side.
▶ XGT server: Responds to the request of the client.

The method to use the XGT dedicated communication using the XGT protocol is explained as an example.

▶ System configuration

▶ Install XGL-CH2A on No. 0 slot of each PLC.
▶ Dedicated service in channel 1
▶ Client side setting

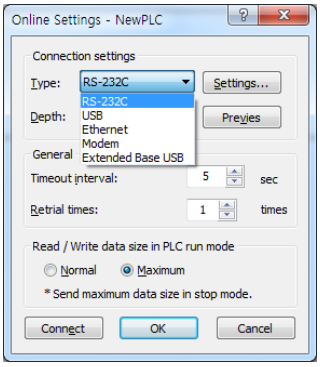
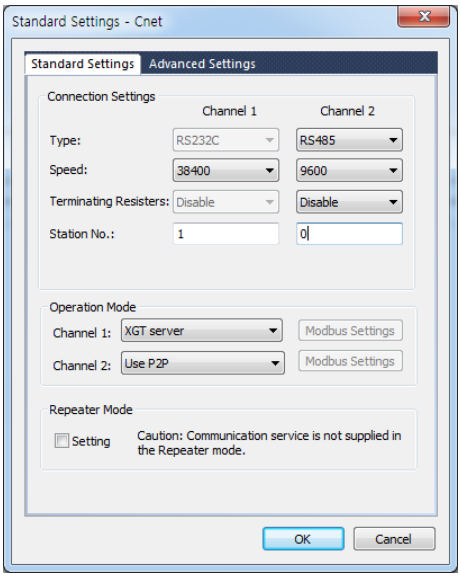
Type		Setting content
CPU		XGK-CPUH
Communication type		RS-232C
Communication speed		38,400
Data bit		8
Stop bit		1
Parity bit		None
Modem type		Null modem
Operation cycle		200ms
Operation status	Write	Save 1 word from M100 address to M100 address on the server side
	Read	Save 1 word of D100 address on the server side to M1100 address on the client side

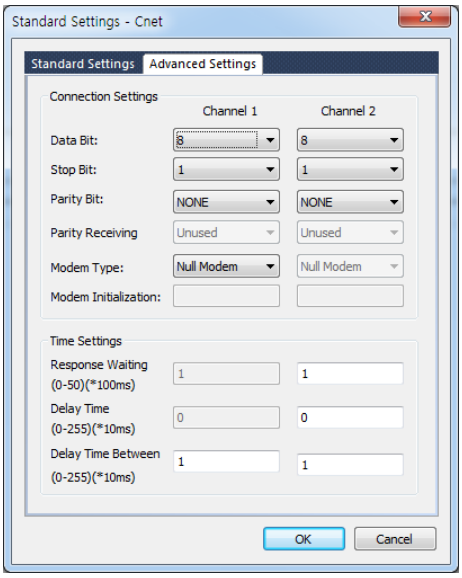
▶ Server side setting

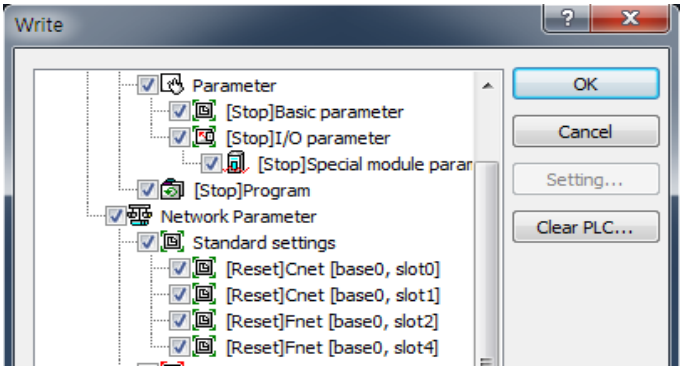
Type	Setting content
CPU	XGK-CPUH
Communication type	RS-232C
Communication speed	38,400
Data bit	8
Stop bit	1
Parity bit	None
Modem type	Null modem
Station No	1

11.2.1 Server side setting

Set the server in the system shown above as follows.

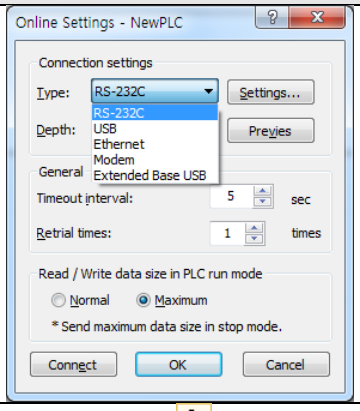
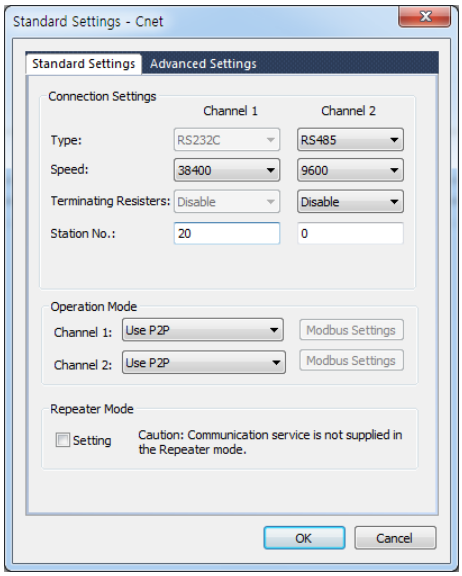
<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Connection setting</td><td> 
</td></tr>
<tr><td colspan="2">1. Select [Online] ->[Connection Settings] or click the icon ( ).
2. Set the connection option suitable for user's environment and click [Connection].</td></tr>
<tr><td>2</td><td>Read I/O Information</td><td colspan="2">Click the [I/O Sync] button from the [Online]→[System Diagnostics]→[I/O information] window, read the information of the module currently installed on the base and add it to the project. It operates only when the CPU module is in stop mode.</td></tr>
<tr><td rowspan="2">3</td><td>Standard setting</td><td> 


</td></tr>
<tr><td colspan="2">1.Write on channel 1 according to the setting standard of the example system
2.Operation mode is set as XGT server since it operates as a dedicated communication server.</td></tr>
</table>

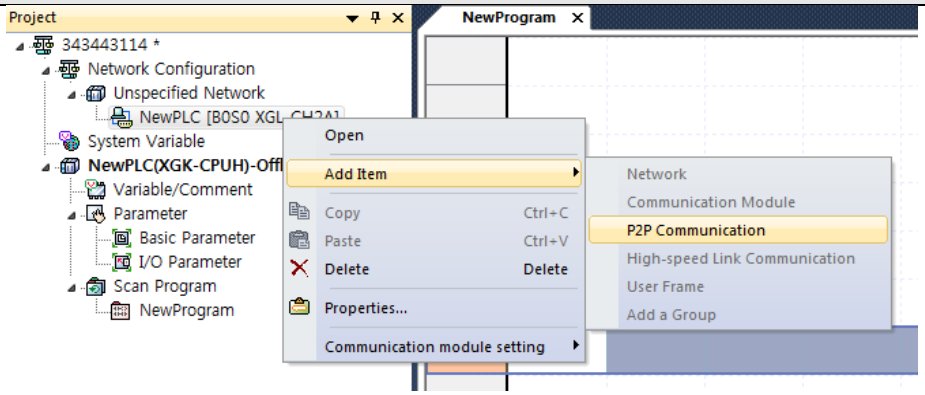
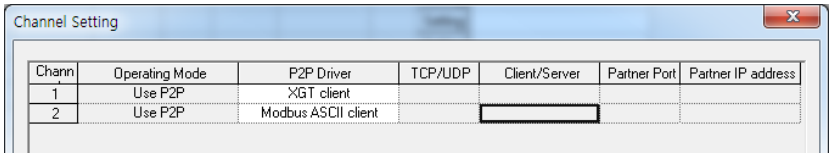
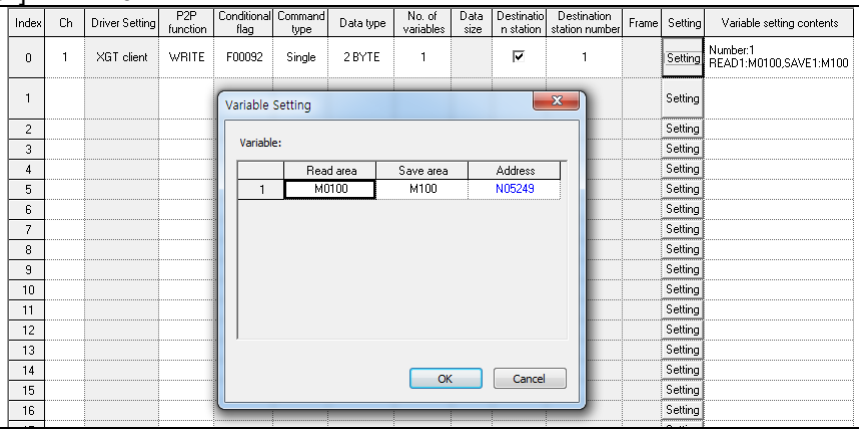
Sequence	Setting process	Setting method
4	Write parameter	
	1.Select [Online] ->[Write] or click the icon ( ). 2.In the Standard settings, check the basic settings and P2P that have been set up, and then click the [OK] button. 3.Click the [OK] button, and when the parameter writing finishes, reset each module.	

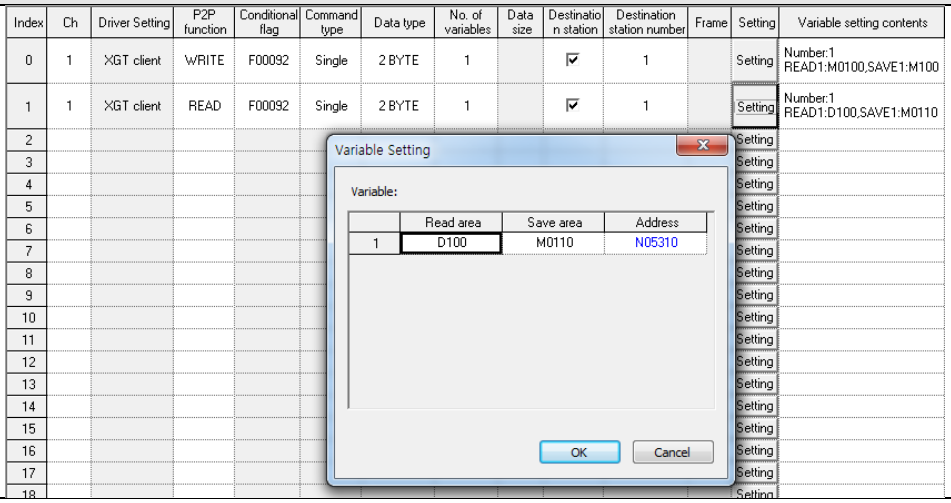
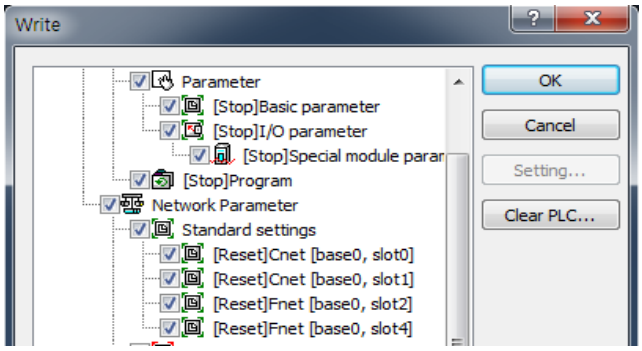
11.2.2 Client side setting

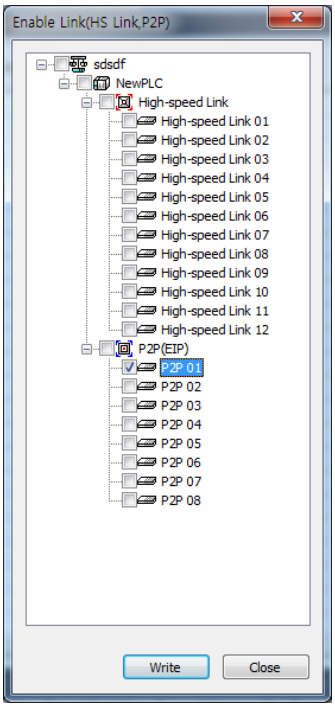
Set the client in the system shown above as follows.

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Connection setting</td><td> 
</td></tr>
<tr><td colspan="2">1.Select [Online] ->[Connection Settings] or click the icon ( ).
2.Set the connection option suitable for user's environment and click the [Connect].</td></tr>
<tr><td>2</td><td>Read I/O Information</td><td colspan="2">Click the [I/O Sync] button from the [Online]→[System Diagnostics]→[I/O information] window, read the information of the module currently installed on the base and add it to the project. It operates only when the CPU module is in stop mode.</td></tr>
<tr><td rowspan="2">3</td><td>Standard settings</td><td> 
</td></tr>
<tr><td colspan="2">1.Write on channel 1 according to the setting standard of the example system
2.Set it to an arbitrary station number (0~31) since the station number setting is meaningless when operating as a client.
3. Operation mode should always be set to [P2P use] when operating as a client.</td></tr>
</table>

When [Standard setting] is completed, [P2P channel] and [P2P block] should be set. The setting method is shown below.

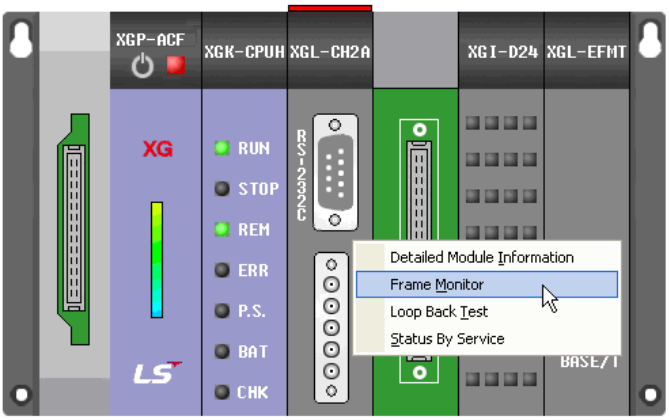
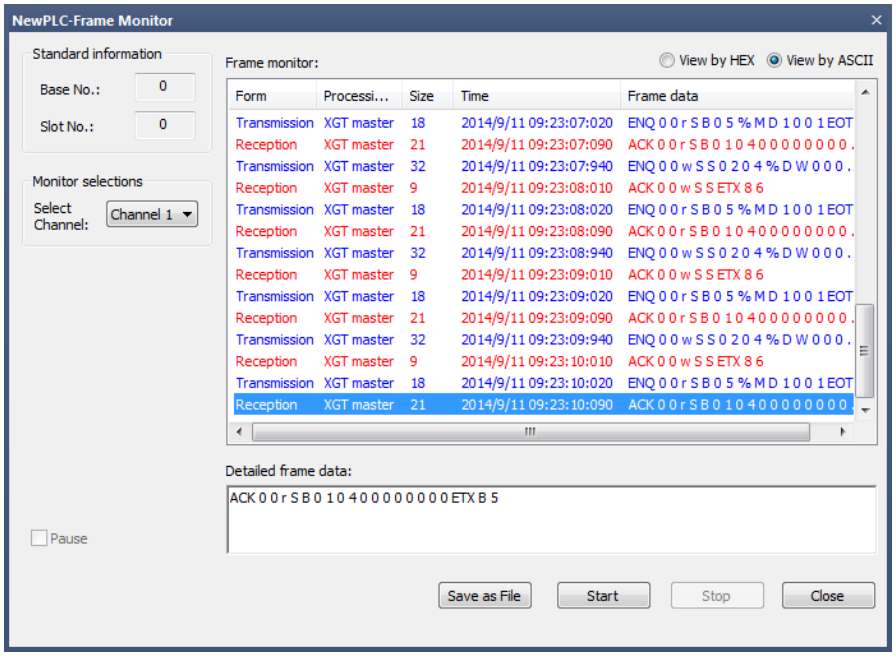
<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Communication module setting</td><td> 
</td></tr>
<tr><td colspan="2">1.In the project window, click Cnet I/F module with the right mouse button and select [Add item]→[P2P communication].
2.Select P2P number(01) and click [OK].</td></tr>
<tr><td rowspan="2">2</td><td>P2P channel setting</td><td> 
</td></tr>
<tr><td colspan="2">Double click [P2P channel] of P2P 01, set [XGT client] for the P2P driver of channel 1 and click[OK].</td></tr>
<tr><td>3</td><td colspan="2">Double click [P2P block] in P2P 01.</td></tr>
<tr><td rowspan="2">4</td><td>Write operation setting</td><td> 
</td></tr>
<tr><td colspan="2">1. Channel: Select channel 1 which is set as the XGT client in the P2P channel setting.
2. Select WRITE to perform the write operation.
3. Operation condition: Use special flag F92 in order to transmit a frame every 200ms.
4. Method, data type: Select 2 bytes which means individual and word since it is write 1 word.
5. Number of variables: Select 1 for the number of variables since there is one word.
6. Destination station number: Select the station address of the server side.
7. Setting: Set the read area and the save area and click[OK].
1) Read area: Device address where the client side data will be saved
2) Save area: Device address where the server side data is saved
* When all the settings are completed, the font color of the relevant index will change to black.</td></tr>
</table>

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">5</td><td>Read operation setting</td><td> 
</td></tr>
<tr><td colspan="2">1.Channel, start condition, method, data type, number of variables and destination station number: It is the same as setting the write operation.
2.P2P function Select READ since the reading operation is carried out.
3.Setting: Set the read area and the save area and click[OK].
1) Read area: Device address where the server side data is saved
2) Save area: Device address where the client side data will be saved</td></tr>
<tr><td rowspan="2">6</td><td>Write parameter</td><td> 
</td></tr>
<tr><td colspan="2">1.Select [Online] ->[Write] or click the icon ( ).
2.Put a check mark on basic setting and P2P for the module set as the XGT client and click the [OK] button.
3.Click the [OK] button, and when the parameter writing finishes, reset each module.</td></tr>
</table>

Sequence	Setting process	Setting method
7	Link enable	
8	1.Select [Online] ->[Communication Module Settings and Diagnosis] ->[Enable Link/Services] or click the icon( ). 2. Check the P2P whose setting is completed and click [Write].	

11.2.3 Checking the operation status

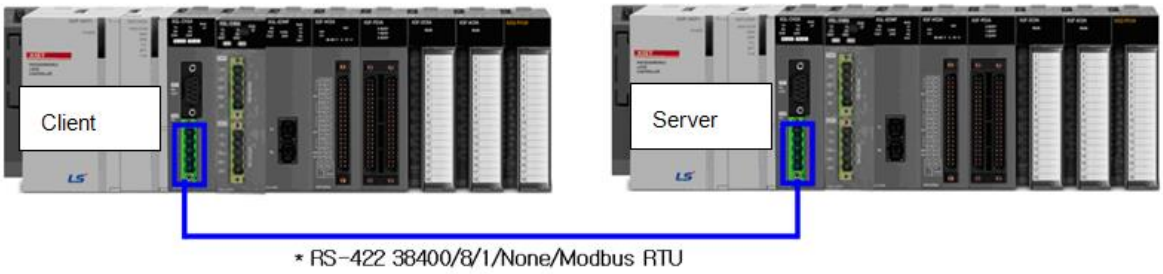
The communication status of the Cnet I/F module can be checked through the frame monitoring of XG5000. The frame monitoring method is the same as follows regardless of protocol type.

Sequence	Setting process	Setting method
1	System diagnosis	
	1.Slect [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ). 2.Click the module, press the right mouse button. 3.When the screen as shown in the figure above appears, click [Frame monitor].	
2	Frame monitor	
	1.Select Channel 1 from Select channel and click [Start]. 2.Since the dedicated service is ASCII communication, the frame that operates normally can be checked by selecting [View as ASCII]. * Select [View as Hex] for Modbus RTU and select [View as ASCII] for Modbus ASCII.	

11.3 Modbus Communication

The method to use the Modbus RTU mode is explained as an example.

▶ System configuration



▶ Install XGL-CH2A on No. 0 slot of each PLC.

▶ Modbus communication in channel 2 of the Cnet I/F module which is installed on each PLC

▶ Client side setting

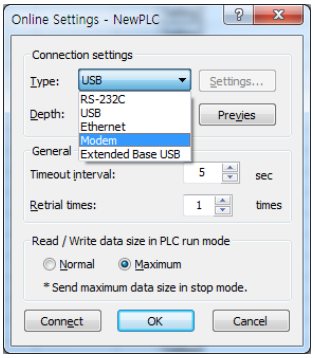
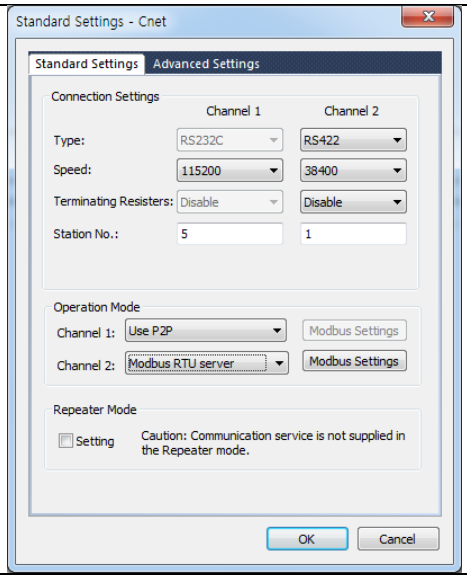
CPU		XGK-CPUH
Communication type		RS-422
Communication speed		38,400
Data bit		8
Stop bit		1
Parity bit		None
Modem type		None
Operation period		200ms
Operation Status	Write	▶Save 1 word from the client side M100 address to the M1 address of server size write word area ▶Save 4 words from the D0 address on the client side to the write word area from the M2 address to M5 address. ▶Save the 15th bit value from the M1 address on the client side to the 2nd bit of the M20 address on the server size write bit area. ▶Save the value from the 0th bit value to the 15th bit value from the M2 address on the client side to the bits from the 0th bit to the 15th bit of the M21 address on the server size write bit area.
	Read	▶Save 1 word value of M2 in the read area on the server side in M160 on the client side ▶Save 4 words from P0 of the read area on the server side in M150 to M153 on the client side ▶Save the 1st bit value of the P2 address in the read bit area on the server side to the 1st bit of the M170 address on the client side. ▶Save bit values from 0th bit to 15th bit of the M10 address on the server side write bit area to bits from the 0th bit to the 15th bit of the client side 180 address.

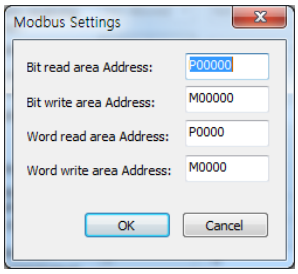
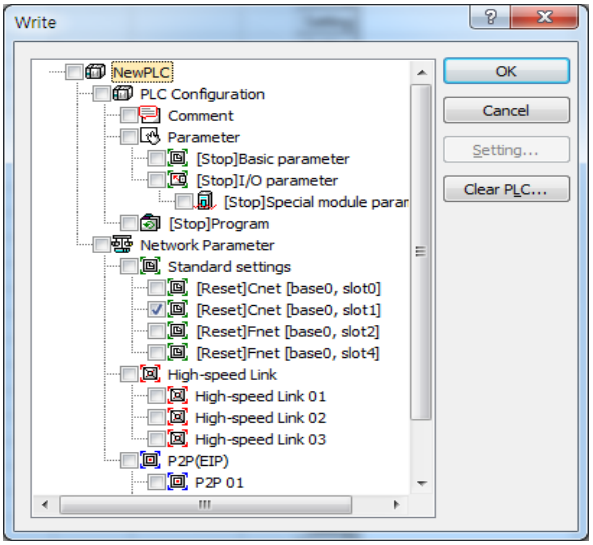
▶Server side setting

CPU		XGK-CPUH
Communication type		RS-422
Communication speed		38,400
Data bit		8
Stop bit		1
Parity bit		None
Modem type		None
Station No		1
Start address	Read bit	P0
	Bit write	M0
	Word read	P0
	Word write	M0

11.3.1 Server side setting

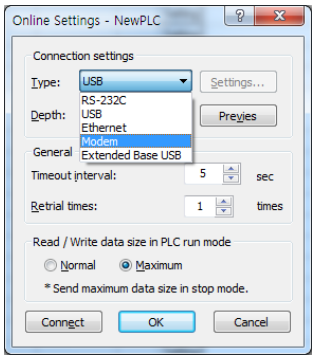
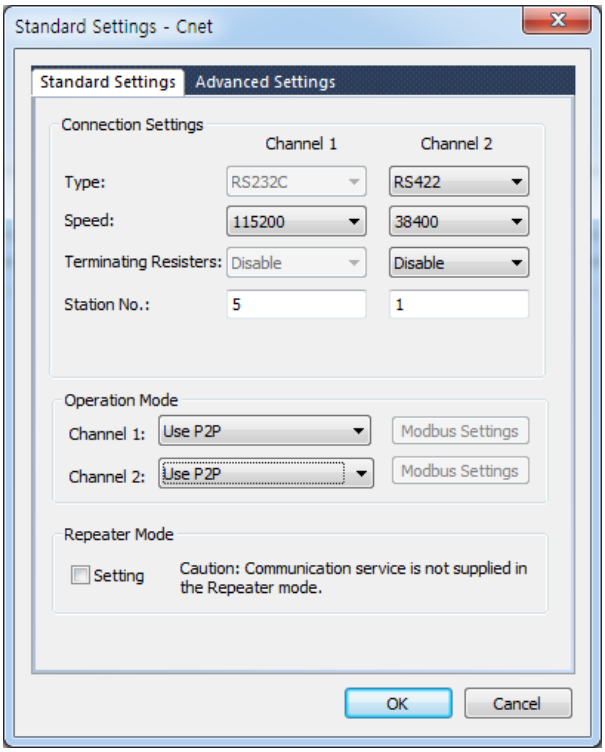
Set the server in the system shown above as follows.

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Connection setting</td><td> 
</td></tr>
<tr><td colspan="2">1.Select [Online] ->[Connection Settings] or click the icon ( ).
2. Set the connection option suitable for user’s environment and click [Connection].</td></tr>
<tr><td>2</td><td>Read I/O Information</td><td colspan="2">Click the [I/O Sync] button from the [Online]→[System Diagnostics]→[I/O information] window, read the information of the module currently installed on the base and add it to the project. It operates only when the CPU module is in stop mode.</td></tr>
<tr><td rowspan="2">3</td><td>Standard setting</td><td> 
</td></tr>
<tr><td colspan="2">1.Write on channel 2 according to the setting standard of the example system.
2.Set Modbus RTU server for the operation mode since it operates as the dedicated communication server.</td></tr>
</table>

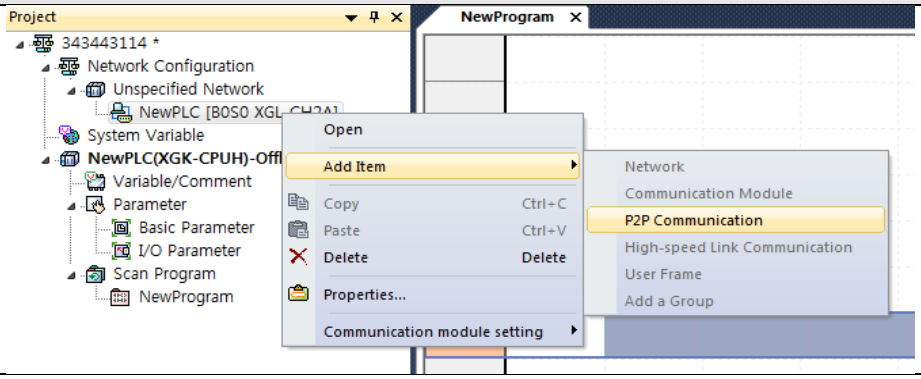
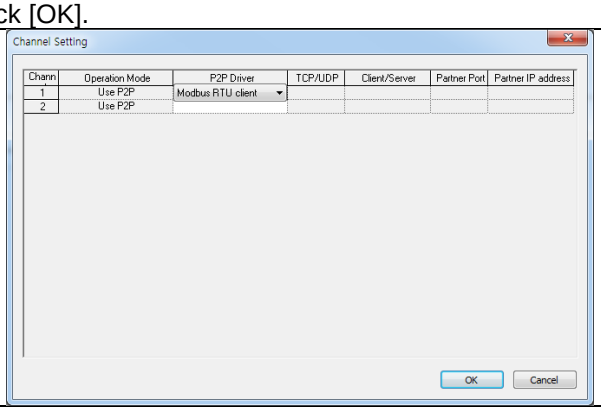
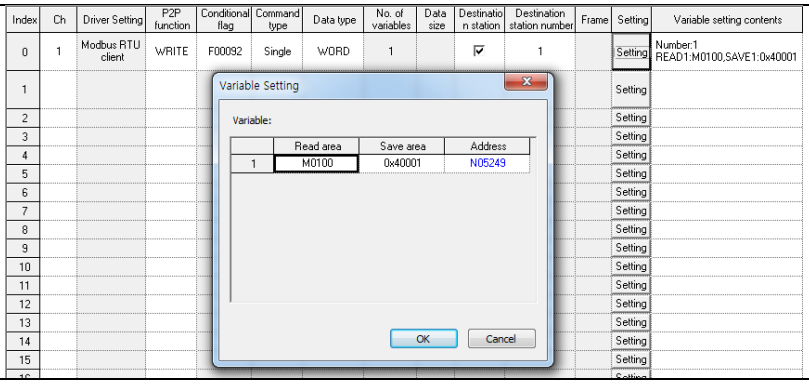
<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">4</td><td>Modbus setting</td><td> 
</td></tr>
<tr><td colspan="2">1.Start address of bit read area: M00000 2.Start address of bit write area: M00000
3.Start address of word read area: M00000 4.Start address of write word area: M0000
*If the XGK CPU is used, the top 4 digits from the address on Read/Write bit area is the word address, and the bottom digit is the bit address.(P00110:0th bit of P11th word)</td></tr>
<tr><td rowspan="2">5</td><td>Parameter write</td><td> 
</td></tr>
<tr><td colspan="2">1.Select [Online] ->[Write] or click the icon ( ).
2.In the Standard settings, check the basic settings and P2P that have been set up, and then click the [OK] button.
3.Click the [OK] button, and when the parameter writing finishes, reset each module.</td></tr>
</table>

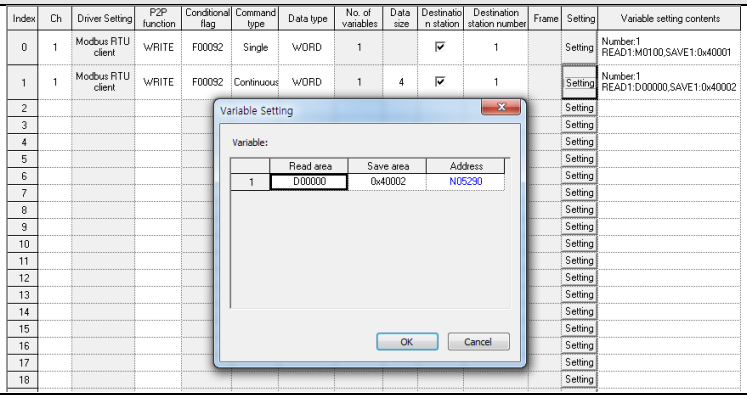
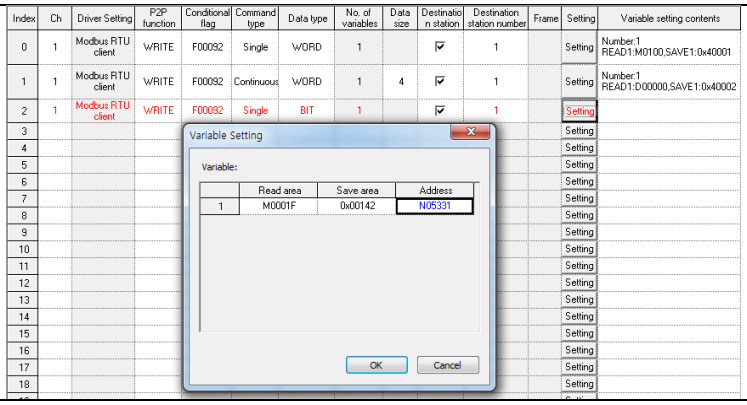
11.3.2 Client side setting

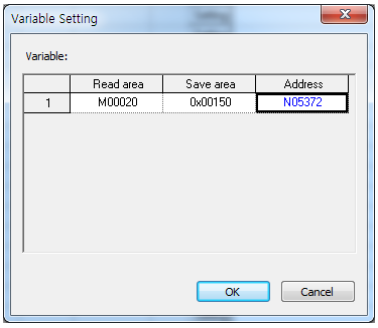
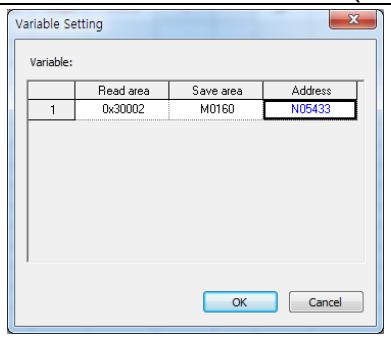
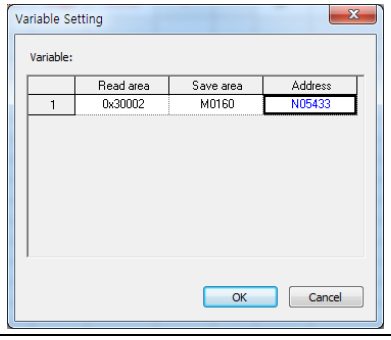
Set the client in the system shown above as follows.

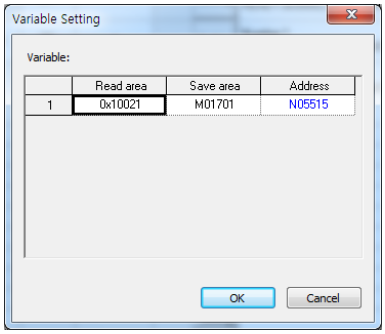
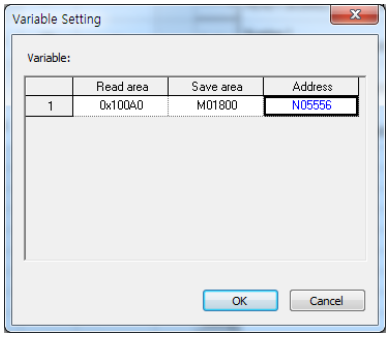
<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>Connection setting</td><td> 
</td></tr>
<tr><td colspan="2">1.Select [Online] ->[Connection Settings] or click the icon ( ).
2.Set the connection option suitable for user's environment and click the [Connect].</td></tr>
<tr><td>2</td><td>Read I/O Information</td><td>Click the [I/O Sync] button from the [Online]→[System Diagnostics]→[I/O information] window, read the information of the module currently installed on the base and add it to the project. It operates only when the CPU module is in stop mode.</td></tr>
<tr><td rowspan="2">3</td><td>Standard setting</td><td> 
</td></tr>
<tr><td colspan="2">1.Write on channel 2 according to the setting standard of the example system.
2.In the case of operating as the client, the station address setting becomes meaningless. Set any station address (0~31).
3.Operation mode should always be set to [P2P use] when operating as a client.</td></tr>
</table>

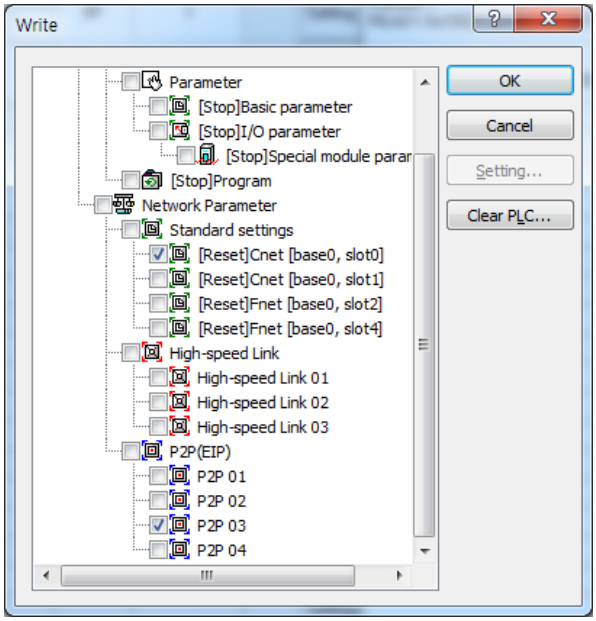
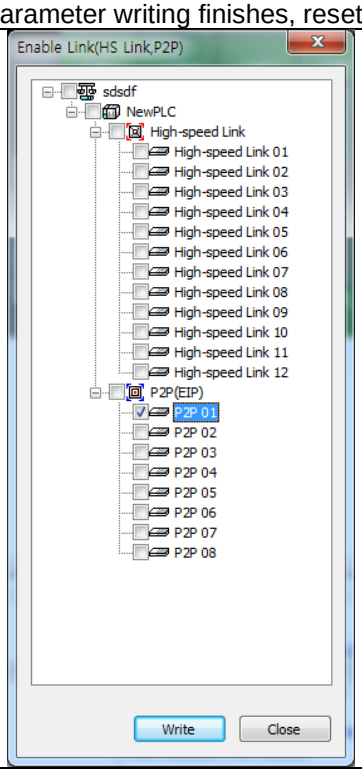
When [Standard setting] is completed, [P2P channel] and [P2P block] should be set. The setting method is shown below.

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Communication module setting</td><td> 
</td></tr>
<tr><td>1.In the project window, click Cnet I/F module with the right mouse button and select [Add item]→[P2P communication].
2.Select P2P number(01) and click [OK].</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">P2P channel setting</td><td> 
</td></tr>
<tr><td>Double click [P2P channel] of P2P 01, set [Modbus RTU client] for the P2P driver of channel 1 and click[OK].</td></tr>
<tr><td>3</td><td>Double click [P2P block] in P2P 01.</td><td></td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Write operation settings(1)</td><td> 
</td></tr>
<tr><td>▶Save 1 word from the client side M100 address to the M1 address of server size write word area
1. Channel: Select Channel 2 which is set as the Modbus RTU client in the P2P channel setting.
2.P2P function: Select WRITE since the writing operation is carried out.
2. Operation condition: Use special flag F92 in order to transmit a frame every 200ms.
4.Method, data type: Select individual and word since it is 1 word.
5.Destination station number: Select Station address 1 of the server side.
6.Setting: Set the read area and the save area and then click[OK].
(1) Read area: address of the device on client side where data is saved (M100)
(2) Storage area: Device address where the server side data is saved(0x40001:M1 address)
* When all the settings are completed, the font color of the relevant index will change to black.</td></tr>
</table>

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">5</td><td>Write operation settings(2)</td><td> 
</td></tr>
<tr><td colspan="2">▶Save 4 words from the D0 address on the client side to the write word area from the M2 address to the M5 address on the server side
1.Channel, P2P function, start address and partner station number: The sequence is the same as No. 4.
2.Method, data type: select continuous and word since it is continuous 4 word write.
3.Size of data: enter 4 since it is 4 words.
4.Setting: set the read area and the save area and then click[OK].
(1) Read area: start address of the device on client side where data is saved (D0)
(2) Storage area: start address of the device on server side where data will be saved(0x40002:M2 address).</td></tr>
<tr><td rowspan="2">6</td><td>Write operation settings(3)</td><td> 
</td></tr>
<tr><td colspan="2">▶ Save the 15th bit value from the M1 address on the client side to the 2nd bit of the M20 address on the server size write bit area.
1.Channel, P2P function, start condition, method, and destination station number: The sequence is the same as No. 5.
2.Data type: select bit
3.Setting: set the read area and the save area and then click[OK].
(1) Read area: device address where the client side data is saved (M1.F: 15th bit of M1)
(2) Storage area: device address where the server side data will be saved (0x00142: 2nd bit of M20 address)
* When M1F is entered, it will be converted to M0001F automatically in XG5000.
* The device address which will be saved on the server side is a Hex number.</td></tr>
</table>

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">7</td><td>Write operation settings(4)</td><td> 
</td></tr>
<tr><td colspan="2">▶Save the value from the 0th bit value to the 15th bit value from the M2 address on the client side to the bits from the 0th bit to the 15th bit of the M21 address on the server size write bit area.
1.Channel, P2P function, start condition, data type: the sequence is the same as No. 6
2. Method: Select Continuous.
3.Setting: set the read area and the save area and then click[OK].
(1) Read area: start address of the device on client side where data is saved (M2.0)
(2) Save area: device address where the server side data is saved(0x00150)</td></tr>
<tr><td rowspan="2">8</td><td>Read setting(1)</td><td> 
</td></tr>
<tr><td colspan="2">▶ Save 1 word value of the M2 address in the server side write word area to the client side M160
1) Channel, start condition, method, data type and destination station number: the sequence is the same as No. 4.
2.P2P function: Select READ.
3.Setting: set the read area and the save area and then click[OK].
(1) Read area: device address where the server side data is saved(0x40002).
(2) Save area: device address where the client side data is saved((M0160)</td></tr>
<tr><td rowspan="2">9</td><td>Read setting(2)</td><td> 
</td></tr>
<tr><td colspan="2">▶ Save 4 words from P0 address on the server side read word area to the M150 address on the client side
1.Channel, start condition, method, data type and destination station number: the sequence is the same as No. 5.
2.P2P function: Select read.
3.Setting: set the read area and the save area and then click[OK].
(1) Read area: device address where the server side data is saved(0x30000).
(2) Save area: device address where the client side data is saved((M0150)</td></tr>
</table>

<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">10</td><td>Read setting(3)</td><td> 
</td></tr>
<tr><td colspan="2">▶Save the 1st bit value of the P2 address in the read bit area on the server side to the 1st bit of the M170 address on the client side.
1.Channel, start condition, method, data type and destination station number: the sequence is the same as No. 6.
2.P2P function: Select read. Select READ.
3.Setting: set the read area and the save area and then click[OK]. Set the read area and the save area and then click[OK].
(1) Read area: device address where the server side data is saved(0x00021).
(2) Save area: device address where the client side data is saved((M170.1)</td></tr>
<tr><td rowspan="2">11</td><td>Read setting(4)</td><td> 
</td></tr>
<tr><td colspan="2">Save bit values from 0th bit to 15th bit of the M10 address on the server side write bit area to bits from the 0th bit to the 15th bit of the client side M180 address.
1.Channel, start condition, method, data type and destination station number: the sequence is the same as No. 7.
2.P2P function: Select read.
3.Setting: set the read area and the save area and then click[OK]. Set the read area and the save area and then click[OK].
(1) Read area: device address where the server side data is saved(0x100A0).
(2) Save area: device address where the client side data is saved((M180.0)</td></tr>
</table>

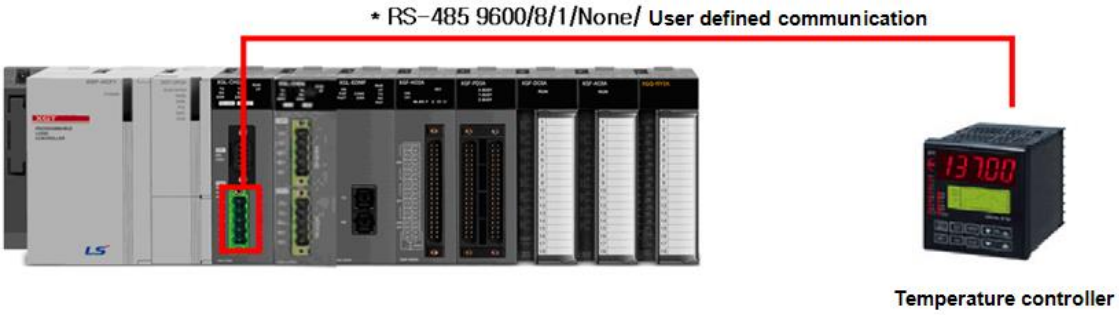
<table>
<tr><th>Sequence</th><th>Setting process</th><th>Setting method</th></tr>
<tr><td rowspan="2">12</td><td>Parameter write</td><td> 
</td></tr>
<tr><td colspan="2">1.Select [Online] ->[Write] or click the icon ( ).
2. Put a check mark on basic setting and P2P for the module set as the Modbus RTU client and click the [OK] button.
3.Click the [OK] button, and when the parameter writing finishes, reset each module.</td></tr>
<tr><td rowspan="2">13</td><td>Link enable</td><td> 
</td></tr>
<tr><td colspan="2">1.Select [Online] ->[Communication Module Settings and Diagnosis] ->[Enable Link/Services] or click the icon( ).
2. Check the P2P whose setting is completed and click [write].</td></tr>
</table>

11.4 User frame definition communication

11.4. 1 In case of communicating with another company's product

The communication method using the user frame definition communication is explained as an example.

▶ System configuration



▶ Connect the PLC and the temperature controller using the Cnet I/F module

Device name	CPU module	XGI-CPUU	Temperature controller of Hanyoung PX7*Note2
	Communication module	XGL-CH2A	
Operation mode	Client		Server
Protocol	User frame definition		PC Link
Communication type	RS-485		RS-485
Communication speed	9,600		9,600
Data bit	8		8
Stop bit	1		1
Parity bit	None		None
Station number	0		1
Delay time*Note 1)	100ms		-
Operation	Read the current value and set temperature value of the temperature controller at 1 second intervals and save the current value to the %MB200 address and the set temperature value to the %MB210 address		

Note 1) Delay time is set in RS-422/485 communication and is designed to prevent the frame from being broken when communicating with the other device with slow response. The setting value varies by the destination device and distance, and a value between 50ms and 100ms is generally set.

Note 2) For the contents related to the temperature controller, refer to the user's manual of Hanyoung temperature controller (http://hynux.com).

▶ PC Link frame structure

The frame of the temperature controller is configured with ASCII string and you can read and write the contents of the defined D and I registers.

The protocol includes the STD standard protocol and SUM protocol where check sum is added to the standard protocol, and each protocol is selected as the parameter. The standard protocol is “STD”, and its structure starts with the start character STX(0x02) and ends with the termination character CR(0x0D) LF(0x0A). The following table shows the frame structure of the standard protocol and Sum protocol.

Please refer to the PLC communication example of HANYOUNG NUX (http://hynux.com) for details on the command and data structure.

STX	Station no.	Command	Data	CR	LF
0x02	1~99			0x0D	0x0A

[Standard protocol structure]

STX	Station no.	Command	Data	Error code	CR	LF
0x02	1~99			Check Sum	0x0D	0x0A

[SUM protocol structure]

▶ Writing an example frame

This example is the case of saving the current value and set value of the temperature controller on the M device area of the PLC. The following table shows the frame that requests reading data from the continuous area and the frame that responds to the request for reading data.

Frame	STX	Station no.	DRS	,	No. of data	Start address of D register	CR	LF
(Byte)	1	2	3	1	2	4	1	1

[Request frame]

Frame	STX	Station no.	DRS	,	OK	,	Data 1	,	Data N	CR	LF
Size (Byte)	1	2	3	1	2	1	4	1	4	1	1

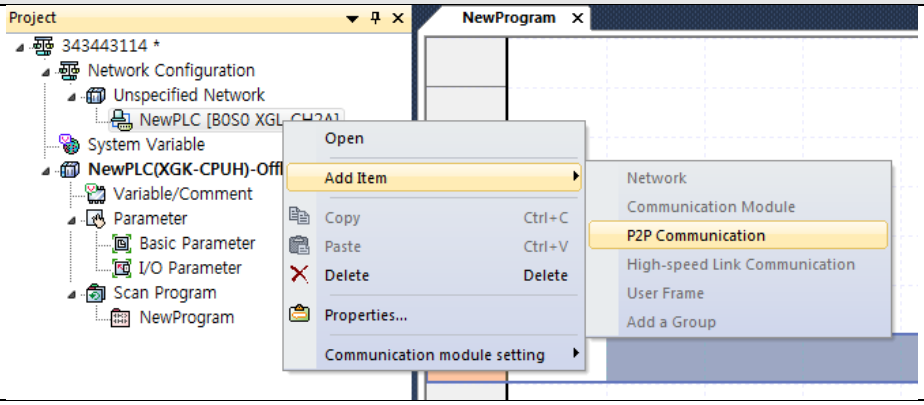
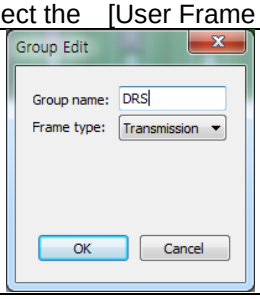
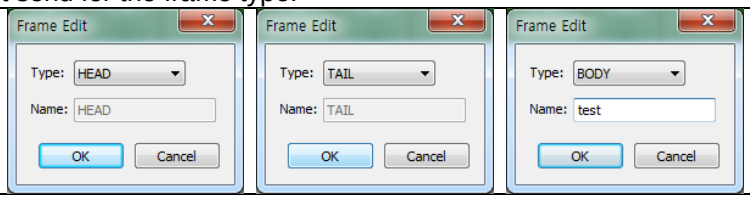
[Response frame]

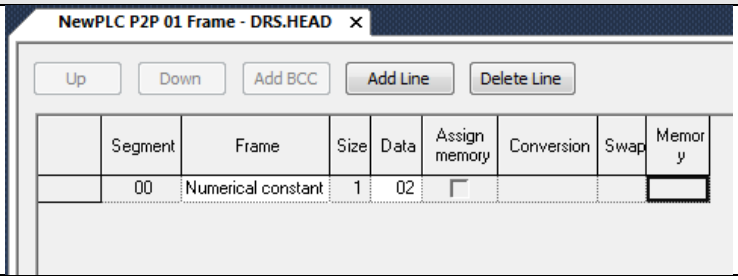
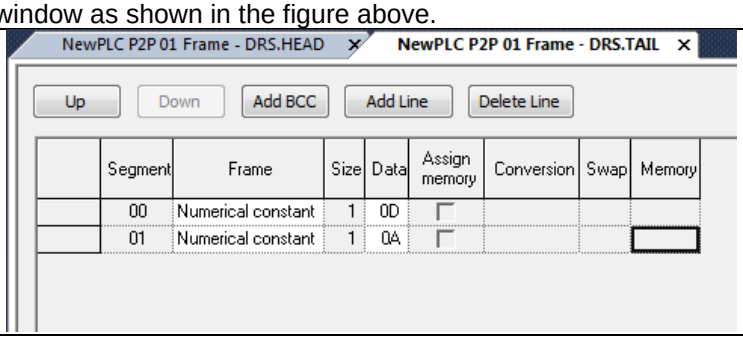
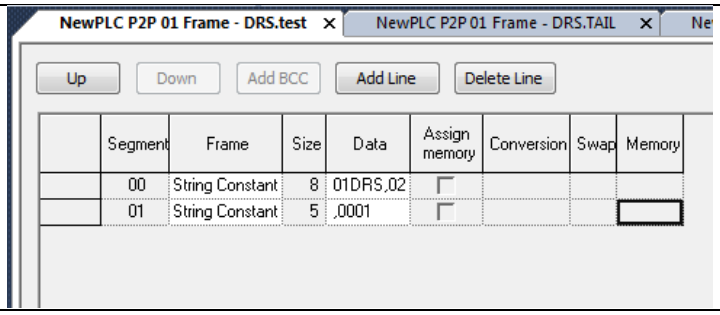
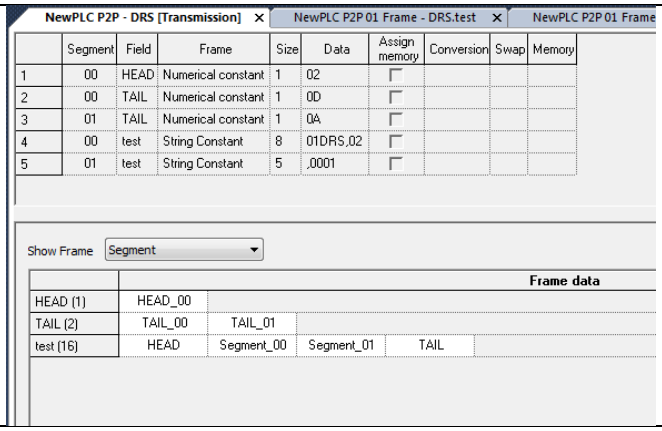
▷ DRS: It is a command to read the consecutive values of D register, and the number of data to be read on the frame and the start address of D register should be set.

▷ In the example, enter 2 for the number of data and 01 for the start address of the current value.

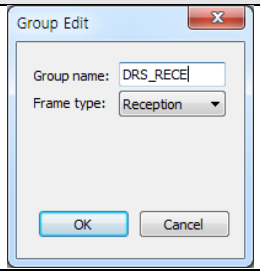
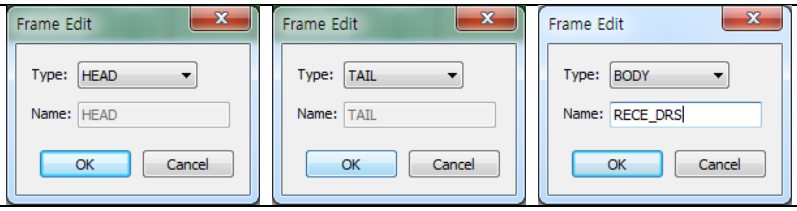
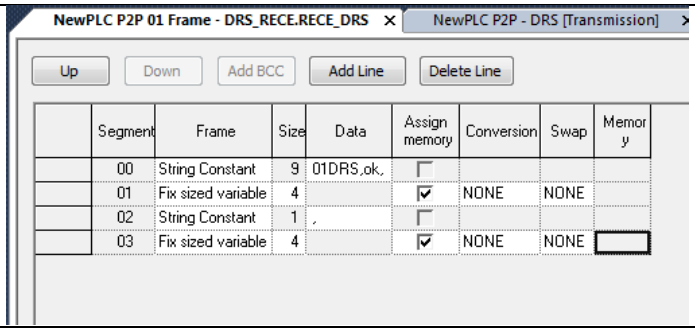
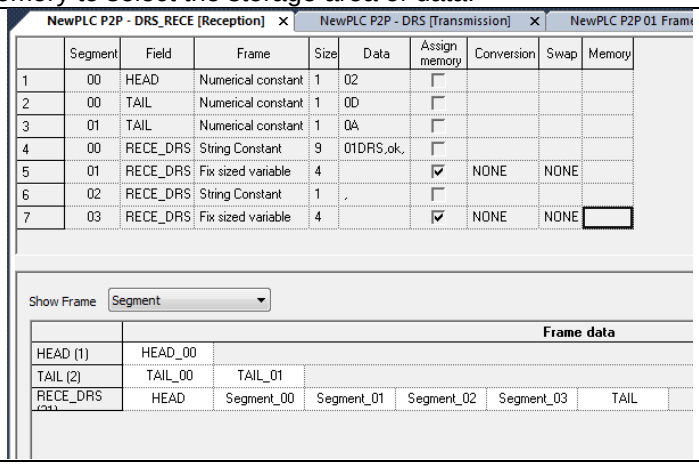
▶ Standard setting
Carry out the basic setting according to this system by referring to 11.1.2.

▶ Writing read data request frame
The method to write a frame in XG5000 is as follows.

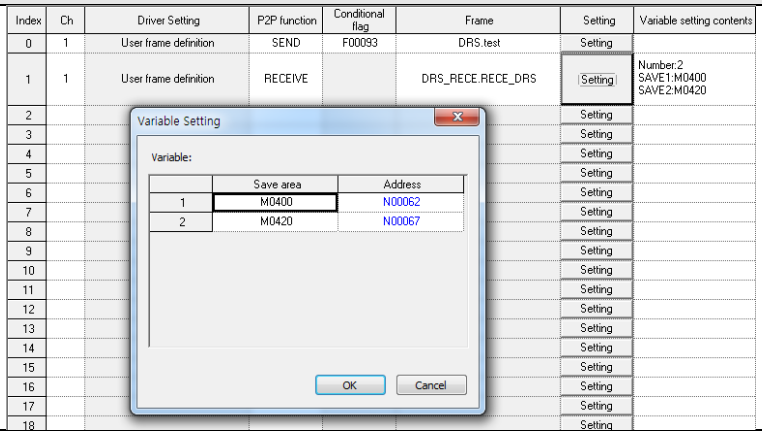
<table>
<tr><th colspan="2">Writing request frame (transmission frame)</th></tr>
<tr><th>Sequence</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td> 
</td></tr>
<tr><td>1.In the project window, click Cnet I/F module with the right mouse button and select [Add item]→[P2P communication].
2.Select P2P number(01).
3.Double click [P2P channel] and select the [User Frame Definition]in [Channel 2].</td></tr>
<tr><td rowspan="2">2</td><td> 
</td></tr>
<tr><td>1.Click the User frame definition and press the right mouse button.
2.Click [Add item]→[Add group], enter the frame name (DRS) you wish to write on the group name and select send for the frame type.</td></tr>
<tr><td rowspan="2">3</td><td> 
</td></tr>
<tr><td>1.Click “Add frame" and add HEAD, TAIL and BODY.
2. In this example, test is entered as the name of the BODY.</td></tr>
</table>

Sequence	Setting method
4	
	1.When you double click HEAD, the setting screen for the segment called DRS.HEAD will be displayed. 2.Name of segment setting screen varies by frame.(frame name. name of head/tail/body) 3.Select [numerical constant] for the type and select Hex value [02] that indicates STX for Data in the segment setting window as shown in the figure above.
5	
	1.When you double click TAIL, the setting screen for the segment called DRS.TAIL will be displayed. 2.Select [numerical constant] for the type and enter [0D] and [0A] which are Hex values indicating CR and LF for Data on the above figure and segment setting window.
6	
	1.When you double click BODY, the setting screen for the segment called DRS.test will be displayed. 2.Write a frame that makes a request to read data value of two continuous areas with No. 1 station address as the start address. 3.When writing a frame through the segment setting window, the size of each segment is 10 or less.
7	
	This is the result of writing the whole frame to request read data.

▶Write temperature controller response receive frame

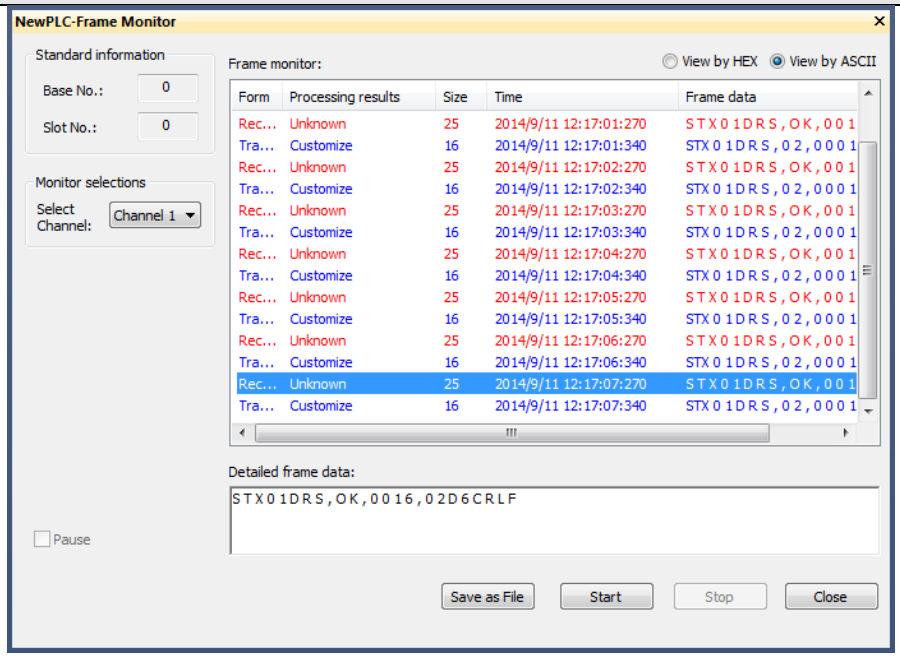
<table>
<tr><th colspan="2">Writing response frame (Receive frame)</th></tr>
<tr><th>Sequence</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td> 
</td></tr>
<tr><td>1.Write the frame in the same way as writing sequence 2 of read data request frame.
2.The frame name is DRS_RECE.</td></tr>
<tr><td rowspan="2">2</td><td> 
</td></tr>
<tr><td>1.Click 'Add frame' and add HEAD, TAIL and BODY.
2.In this example, RECE_DRS is entered as the name of the BODY.</td></tr>
<tr><td>3</td><td>The method to write HEAD and TAIL is same as writing sequence No 4 and 5 of the read data request frame.</td></tr>
<tr><td rowspan="2">4</td><td> 
</td></tr>
<tr><td>1.Since the current temperature value set for MB200 should be saved to MB210, as the description of operation in the system configuration above, the save area for data 1 and data 2 should be set.
2.Since the size of data 1 and 2 is 4 byes as identified in the structure of the response frame in the exemplary frame creation, the type is a fixed size variable, and the size is 4 when entered in the segment.
3.Check the Specify Memory to select the storage area of data.</td></tr>
<tr><td rowspan="2">5</td><td> 
</td></tr>
<tr><td>This is the result of writing the whole frame of response that receives data response by the temperature controller.</td></tr>
</table>

▶Frame write

Sequence	Setting method
1	 1.Double click the [P2P block] of P2P 01. 2.Enter the channel (user frame definition) selected from the P2P channel. 3.Select SEND in the case of the transmission frame or select RECEIVE in the case of the reception frame for the P2P function. 4.Start condition is enabled only when the P2P function is SEND. 5.Use [_T1S] which indicates 1 second for the starting condition since data is read once a second. 6.Click the reception frame settings to set the save area of the current temperature value and setting value.
2	Download the parameter and carry out link enable.

▶Checking data

Checks if the written frame transmits and receives normally.

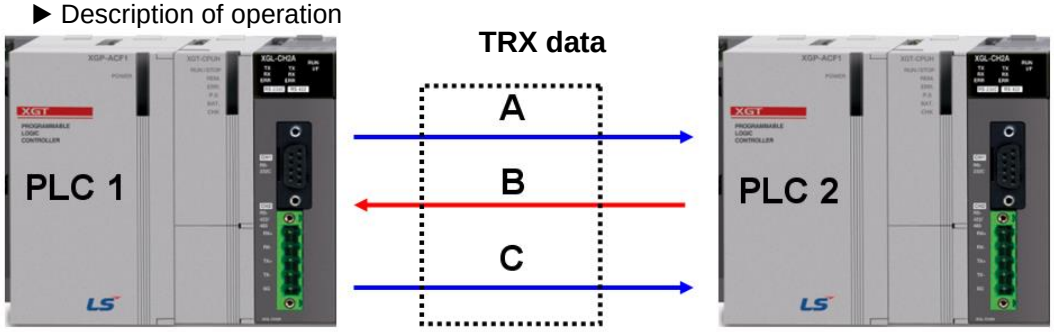
Sequence	Setting method
1	 1.Slect [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ). 2.Click the module, press the right mouse button. 3.Click [Frame Monitor] or [Status by Service] to check the operation status. 4.If the frame is erroneously written, the message [unknown] is displayed in the processing result.
2	Check the data of device area set through the device monitoring of XG5000.

11.4. 2 In case of communication using P2P complete flag as the start condition

▶ P2P flag?

The P2P flag is the flag created when Use P2P is set for the operation mode and the frame reception according to each block of 8 P2P has been completed. Since the P2P flag remains in the On state when the reception is completed, it is necessary to reset the reception completed flag when the P2P flag is used as the starting condition.

▶ Description of operation



▷ PLC 1 sends the frame called "A" at 2 second intervals.
▷ PLC 2 sends the frame called ‘B’ immediately when it receives the frame called ‘A’.
▷ PLC 1 sends the frame called "C" immediately when it receives the frame called "B".

▶ System configuration

The system configuration and operation method used are explained using an example.

	PLC 1	PLC 2	Note
CPU	XGK-CPUH	XGK-CPUH	-
Communication module	XGL-CH2A	XGL-CH2A	-
Operation mode	Use P2P	Use P2P	-
Protocol	User frame definition	User frame definition	-
Communication type	RS-232C	RS-232C	-
Communication speed	115,200	115,200	-
Data bit	8	8	-
Stop bit	1	1	-
Parity bit	None	None	-
Station number	0	0	-
P2P number	P2P 02	P2P 03	-
Operation	1.PLC 1 sends the frame called "A" at 2 second intervals. 2.PLC 2 sends the frame called ‘B’ immediately when it receives the frame called ‘A 3.PLC 1 sends the frame called "C" immediately when it receives the frame called "B".		

▶P2P flag number

P2P 02		P2P 03	
Name of flag	Device address	Name of flag	Device address
_P2P2_NDR00	L10090	_P2P3_NDR00	L13930
_P2P2_NDR01	L10150	_P2P3_NDR01	L13990
_P2P2_NDR02	L10210	_P2P3_NDR02	L14050

▶Frame structure

The user frame definition communication is available only when the transmission frame and the reception frame have the same structure.

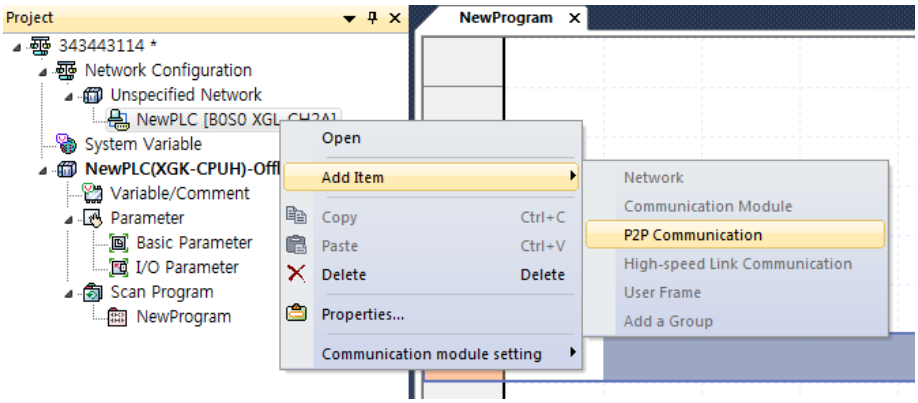
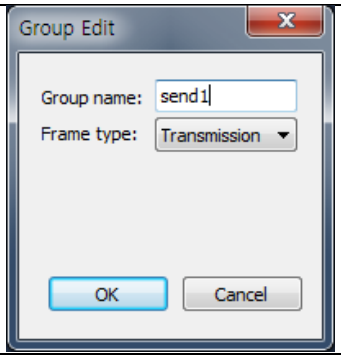
PLC 1			PLC 2		
Name of frame	Operation	Data	Name of frame	Operation	Data
Send 1	Send	A	Rece1	Receive	A
Rece1	Receive	B	Send 1	Send	B
Send 1	Send	C	Rece1	Receive	C

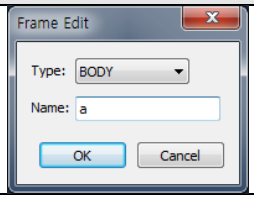
▶Basic setting

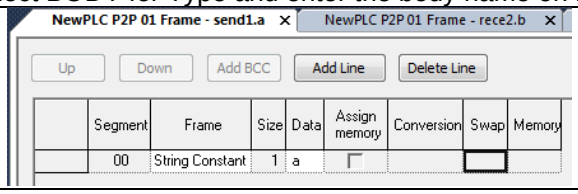
Carry out the basic setting according to this system by referring to 11.1.2.

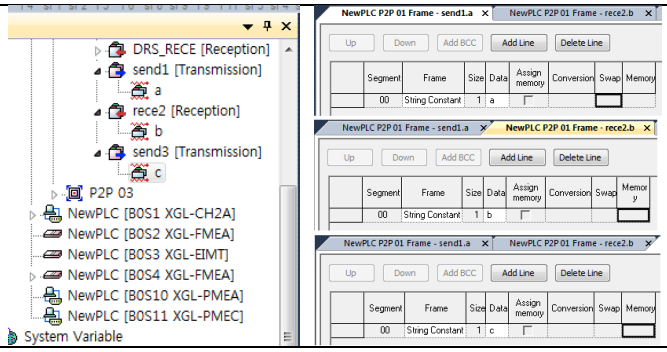
▶Frame write

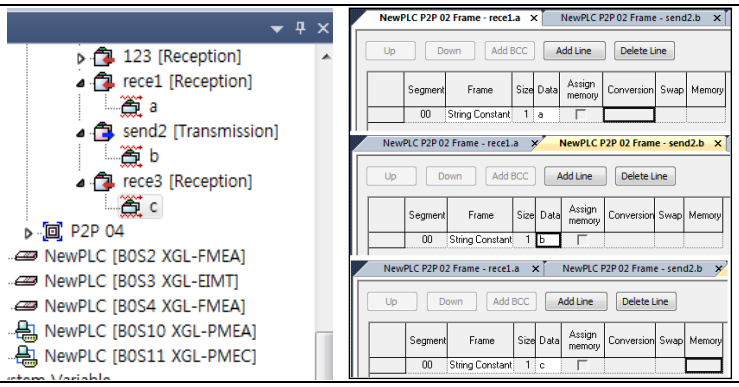
The method to write a frame in XG5000 is as follows.

Sequence	Setting method
1	 1.In the Project window, click Cnet module with the right mouse button and select [Add item]→[P2P communication]. 2.Select P2P number(02) and click [OK]. 3.Double click [P2P channel] and select the [User Frame Definition]in [Channel 1].
2	 1.Click the User frame definition and press the right mouse button. 2.Click [Add item]→[Add group], enter the frame names to write on the group name and select transmission for the frame type.

<table>
<tr><th>Sequence</th><th>Setting method</th></tr>
<tr><td>3</td><td> 

1.Click send1[Transmission] and click the right mouse button.
2. Click Add frame, select BODY for Type and enter the body name on Name.</td></tr>
<tr><td>4</td><td> 

1.When you double click Body, the setting screen for the segment called send1.a will be displayed.
2.Name of segment setting screen varies by frame.(frame name. name of head/tail/ bodies)
3.From the segment setting screen, select [String constant] for Type and enter [a] which is the data of the above frame structure on Data.</td></tr>
<tr><td>5</td><td> 

In the same way with NO. 2~4, enter PLC 1 side frame name, operation method and data of frame structure.</td></tr>
<tr><td>6</td><td> 

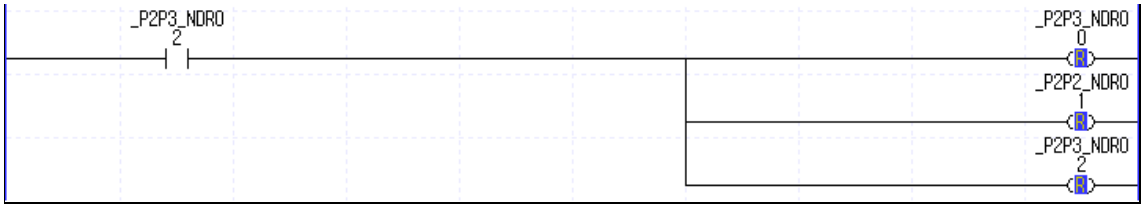
In the same way with NO. 1.5, enter PLC 2 side frame name, operation method and data of frame structure.</td></tr>
</table>

▶P2P block setting

<table>
<tr><th colspan="2">Setting from PLC 1 side</th></tr>
<tr><th>Sequence</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td>
<table>
<tr><th>Index</th><th>Ch</th><th>Driver Setting</th><th>P2P function</th><th>Conditional flag</th><th>Frame</th></tr>
<tr><td>0</td><td>1</td><td>User frame definition</td><td>SEND</td><td>F00094</td><td>send1.a</td></tr>
<tr><td>1</td><td>1</td><td>User frame definition</td><td>RECEIVE</td><td></td><td>rece2.b</td></tr>
<tr><td>2</td><td>1</td><td>User frame definition</td><td>SEND</td><td>L010150</td><td>send3.c</td></tr>
<tr><td>3</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>1.Double click the [P2P block] of P2P 02.
2.Enter the channel (user frame definition) selected from the P2P channel.
3.Select [SEND] in the case of the send frame or select [RECEIVE] in the case of the receive frame for the 3.P2P function.
4.Start condition is enabled only when the P2P function is[SEND].
5.Enter [F92] since the first frame (A) of PLC 1 sends data every two seconds.
6.Select the frame by referring to the PLC 1 side frame name from the above frame structure.
7.The starting condition of the frame called send3.c is transmitted after data called [b] is received from PLC 2, so enter L010150 which is the device address of the flag indicating that 1st data reception of P2P No. 2 is completed on the starting condition.</td></tr>
<tr><th colspan="2">Setting from PLC 2 side</th></tr>
<tr><td rowspan="2">2</td><td>
<table>
<tr><th>Index</th><th>Ch</th><th>Driver Setting</th><th>P2P function</th><th>Conditional flag</th><th>Frame</th></tr>
<tr><td>0</td><td>2</td><td>User frame definition</td><td>RECEIVE</td><td></td><td>rece1.a</td></tr>
<tr><td>1</td><td>2</td><td>User frame definition</td><td>SEND</td><td>L013930</td><td>send2.b</td></tr>
<tr><td>2</td><td>2</td><td>User frame definition</td><td>RECEIVE</td><td></td><td>rece3.c</td></tr>
<tr><td>3</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Enter P2P block in the same way with No. 1 by referring to the above frame structure.</td></tr>
<tr><td>3</td><td colspan="2">Download the parameter and carry out link enable.</td></tr>
</table>

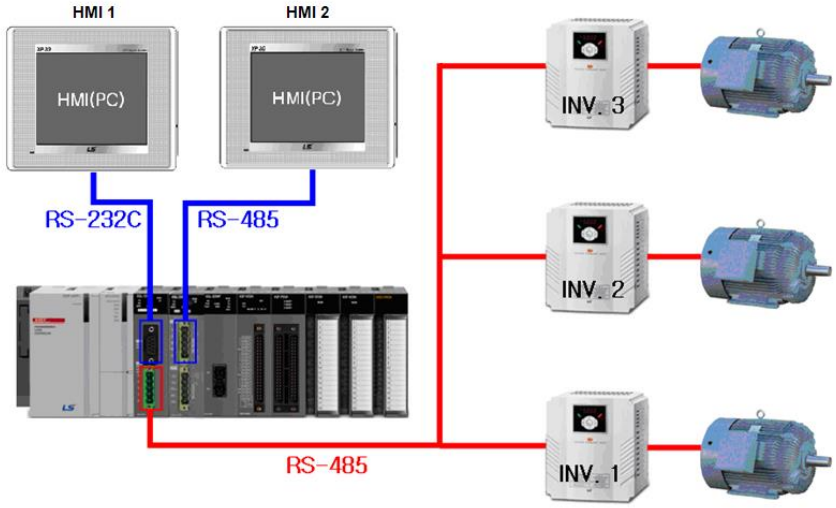
▶Writing 2P flag reset program

The P2P flag is On when the data transmission or reception is completed, so the P2P flag should be reset for every scan in order to transmit or receive continuously. Therefore, the program that resets the device address of the P2P flag set as the starting condition in the P2P block using the reset coil after the last reception flag is On should be inserted.

<table>
<tr><th>Program</th></tr>
<tr><td> 
</td></tr>
<tr><td>1.Reset P2P flag set as the starting condition in the P2P block in order when the second block of P2P 03 which is the P2P flag received last is On.
2.The flag of the second block in P2P 03 is also reset, so each flag remains in the Off state when the next frame is transmitted or received. Therefore, positive edge (changing from 0 to 1) that occurs when the P2P flag is On is recognized as the starting condition and data will be transmitted or received.</td></tr>
</table>

11.5 Inverter communication with HMI through Cnet I/F module

The system that controls HMI and the inverter using the Cnet I/F module that operates as the XGT server and Modbus client is explained as an example.



◆ In the above system, LS ELECTRIC Co.,Ltd.'s XP50 and SV-iG5A are used for the HMI and inverter.

▶ It is possible to request HMI(XP50) to monitor the status of a sub device through the Cnet I/F module. HMI always operates as the client (master) and the Cnet I/F module operates as the server that responds to XP50's request.

▶ Inverter (SV-iG5A) takes instructions through the Cnet I/F module. At this time, the Cnet I/F module operates as the client (master) and the inverter operates as the server.

▶ The communication parameter values are as follows.

	HMI 1	HMI 2	INV
Communication type	RS-232C	RS-485	RS-485
Communication speed	38,400	38,400	19,200
Data bit	8	8	8
Stop bit	1	1	1
Parity bit	None	None	None
Modem type	None	None	None
Station number*Note 1	1	1	1~3

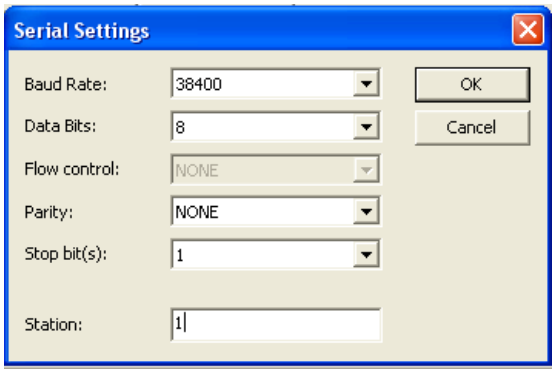
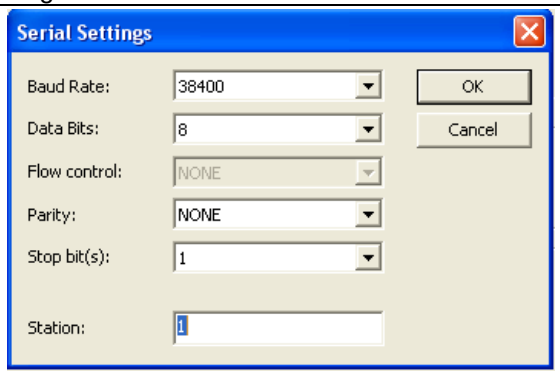
Note 1)If the channel of the Cnet I/F module is different, there is no effect on the system operation even if the station address is duplicated.

▶ Each device operates as follows.

Device name	Contents
HMI 1	Write M1 bit: inverter 1 forward Write M2 bit: inverter 2 forward Write M3 bit: inverter 3 forward Write M4 bit: inverter 1 reverse Write M5 bit: inverter 2 reverse Write M6 bit: inverter 3 reverse Write M7 bit: Inverter 1 stop Write M8 bit: Inverter 2 stop Write M9 bit: Inverter 3 stop
HMI 2	Write M20 bit: inverter 1 speed increase Write M24 bit: inverter 2 speed increase Write M27 bit: inverter 3 speed increase Write M121 bit: inverter 1 speed decrease Write M125 bit: inverter 2 speed decrease Write M128 bit: inverter 3 speed decrease
XGL-CH2A(channel 1)	Execute the command requested by HMI 1
XGL-CH2A(channel 2)	Operates as the Modbus RTU client that controls the inverter
XGL-C42A(channel 1)	Execute the command requested by HMI 2
INV	Operates as the Modbus RTU server that executes a command requested by XGL-CH2A (channel 2)

▶ Set each item of the XP builder as follows.

Sequence	Setting method
1	
	1.Select XP50 for [XP Panel model]. 2.Set LSIS-XGT(LINK) for the controller which operates as the communication module and click [Close]. 3.For contents related to creation setting, refer to the user's manual of XP builder.

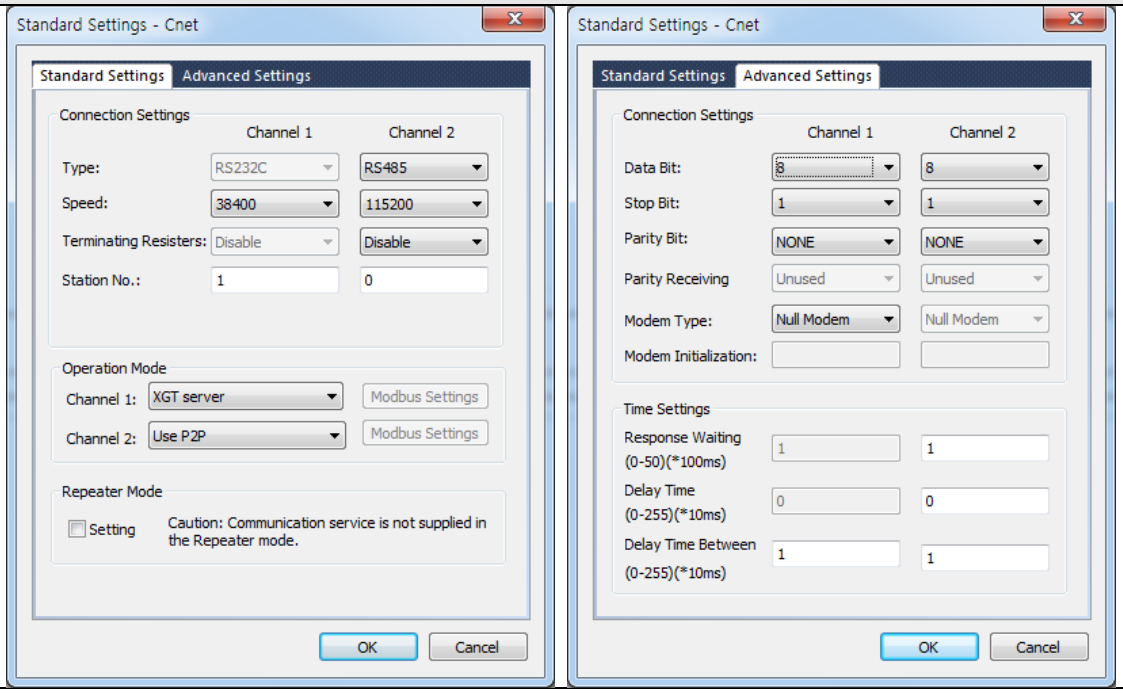
Sequence	Setting method
2	
	1.Set HMI 1 as follows. (1) Select [Common]→[Project property]→[Device setting]. (2) Select RS-232C for the protocol. (3) Select detailed setting connection and set as shown in the screen.
3	
	1.Set HMI 2 as follows. (1) Select [Common]→[Project property]→[Device setting]. (2) Select RS-422 / 485 for the protocol. (3) Select detailed setting connection and set as shown in the screen.

▶ Set the inverter as follows.

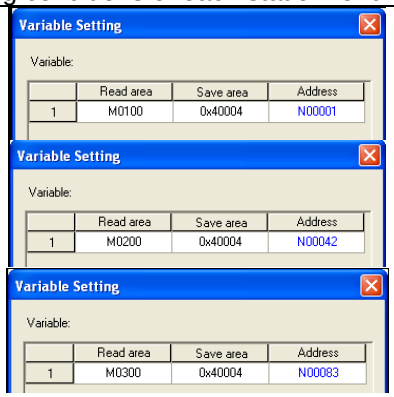
Sequence	Setting method
1	(1)Drv setting (Operation command method): No. 3 (Operate through the RS-485 communication) (2)Frq setting (Frequency setting method): No. 7 (Operate through the RS-485 communication)
2	(1)I59 (communication protocol setting): 0 (Modbus RTU) (2)I60 (inverter station number setting): 1~3 stations (One station per inverter) (3)I61 (communication speed setting): No. 4 (19,200[BPS]) (4)I65 (parity/stop bit setting): 0 (no parity), stop bit (1))

For detailed contents related to the inverter, refer to the user's manual for SV-iG5A from the download center of our homepage.http://www.ls-electric.com/

▶ Set XGL-CH2A as follows.

<table>
<tr><th>Sequence</th><th>Setting method</th></tr>
<tr><td>1</td><td>


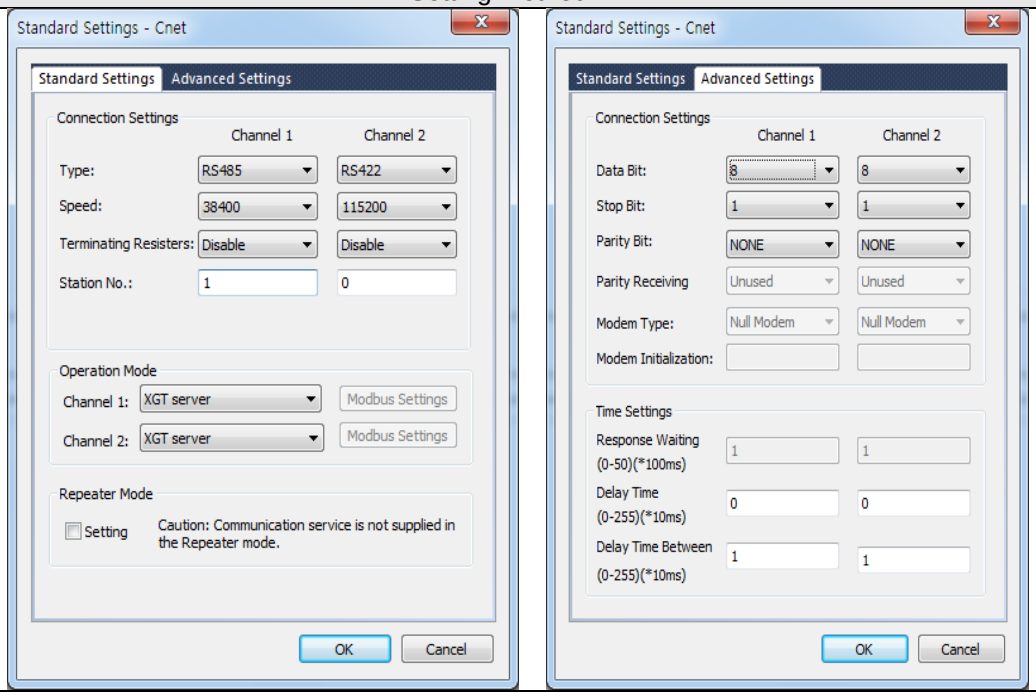
1.Set Channel 1 according to the operation standard of the example system.
2.Set Channel 2 according to the operation standard of the example system.</td></tr>
<tr><td>2</td><td>


Enter K1, K2 and K3 that are the starting conditions of each station for the inverter.</td></tr>
<tr><td>3</td><td>


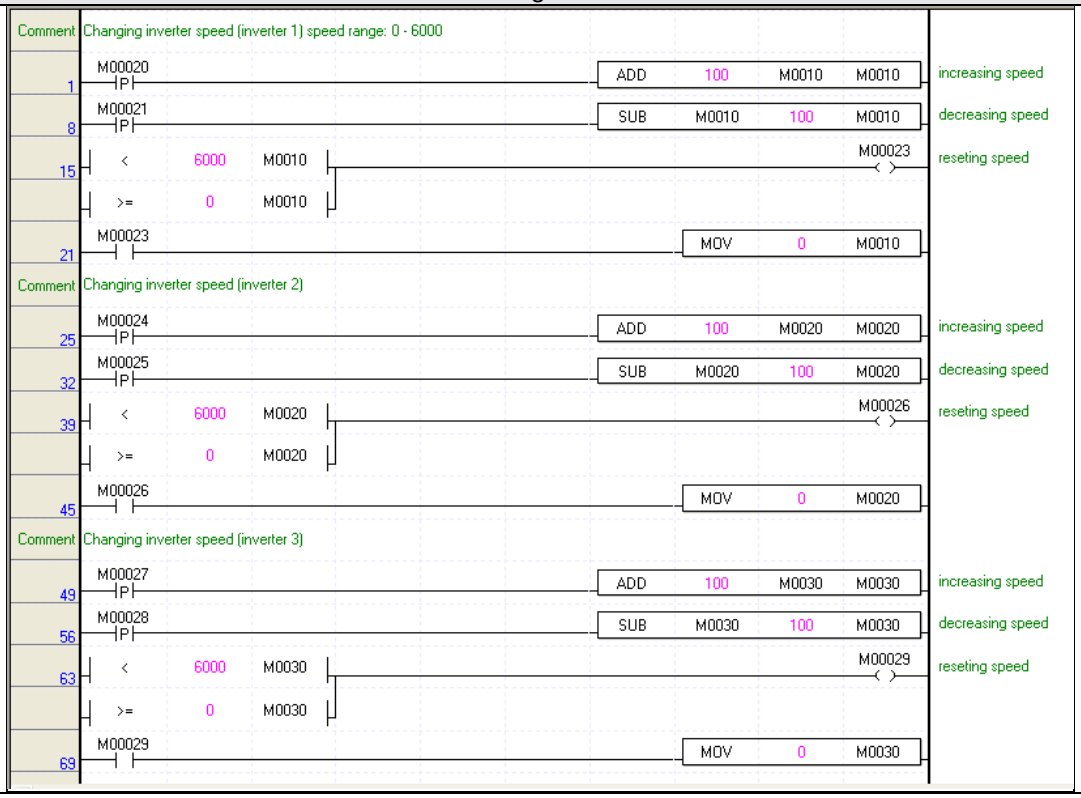
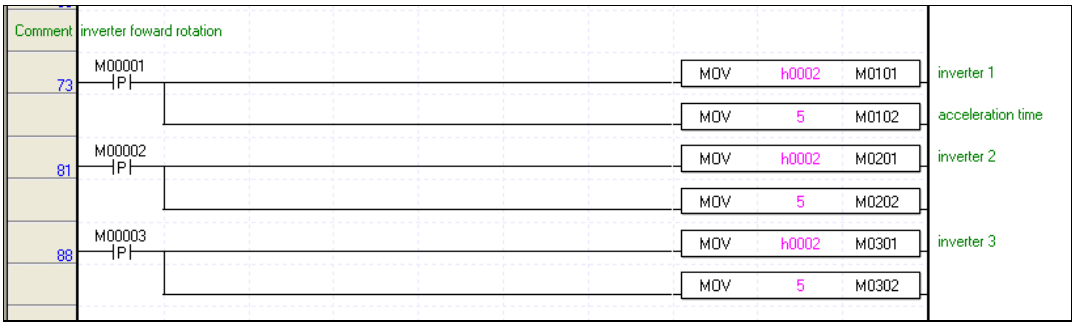
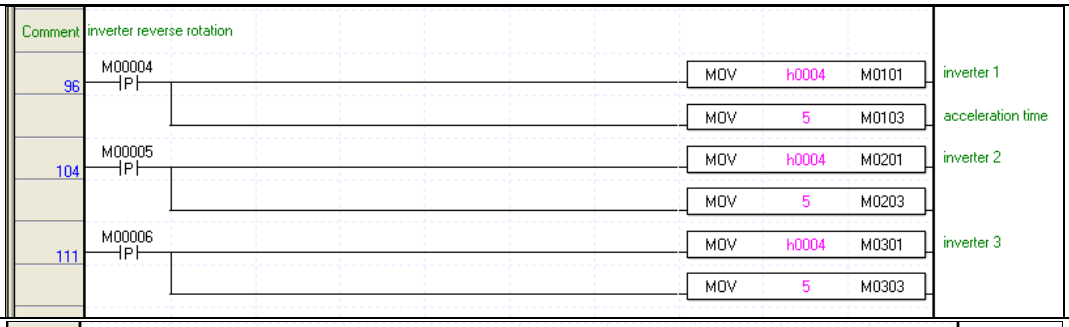
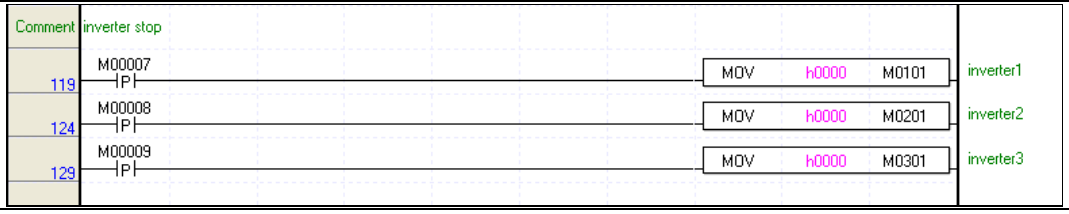
1.The start address of the area where control data of inverter No. 1 is M100 and the start address of the inverter where this data is saved is 0x40004 address. *Note 1)
2.The start address of the area where control data of inverter No. 2 is M200 and the start address of the inverter where this data is saved is 0x40004 address.
3.The start address of the area where control data of inverter No. 3 is M300 and the start address of the inverter where this data is saved is 0x40004 address.</td></tr>
</table>

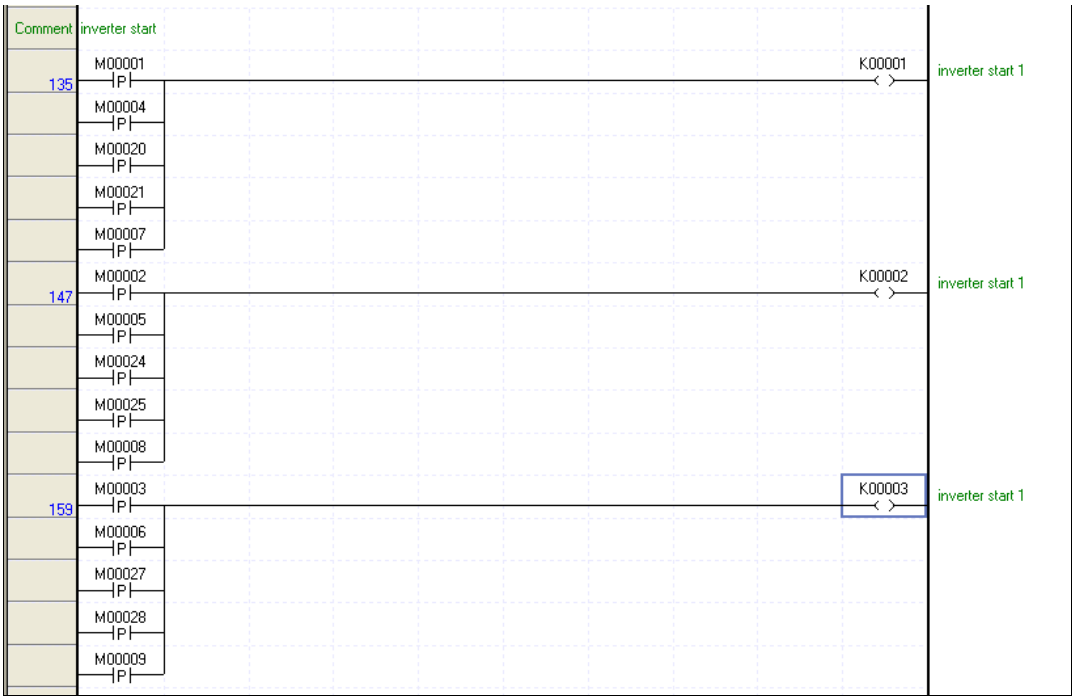
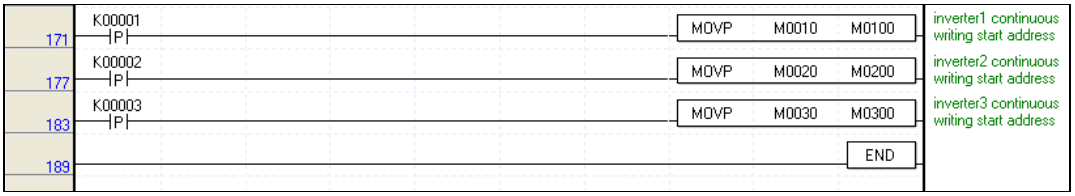
Note 1) For the contents related to the Modbus address area when controlling SV-iG5A using the Modbus communication, refer to Chapter 9.

▶ Set XGL-C42A as follows

Sequence	Setting method
1	 Set Channel 1 according to the operation standard of the example system.

▶ The PLC program written using the XG5000 is as follows.

Sequence	Program
1	
2	
3	
4	

Sequence	Program
5	
6	

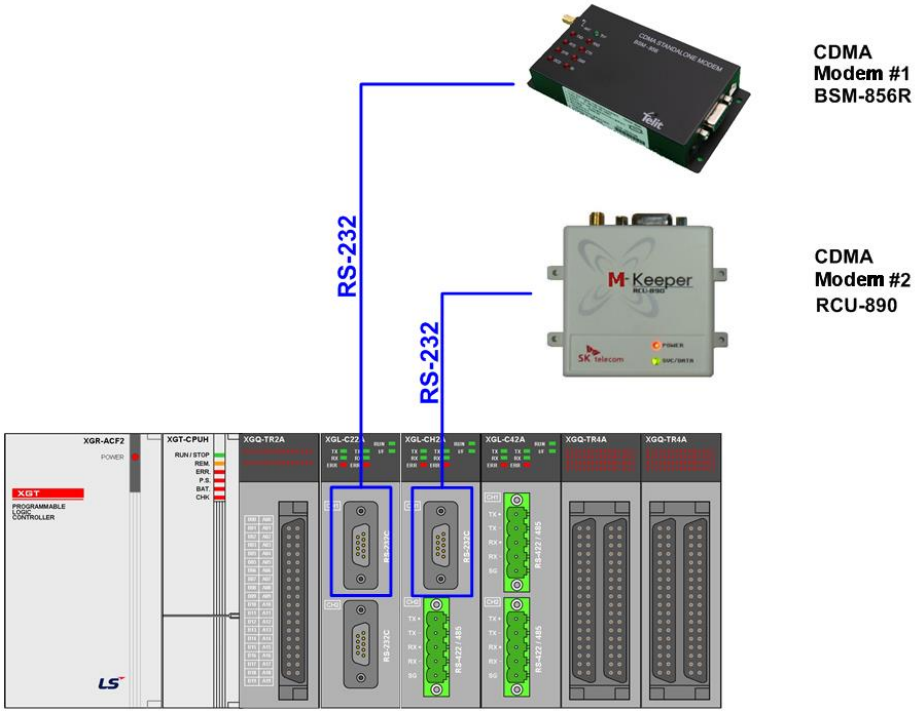
11.6 SMS transmission method using the CDMA modem

SMS can be transmitted using the CDMA modem by using the UDATA function of the Cnet I/F module. This function can be used when the OS version satisfies the following condition.

- Cnet I/F module: V3.2 or higher
- XGK CPU module: V4.3 or higher
- XGI CPU module: V3.9 or higher
- XGR CPU module: V2.6 or higher
- XG5000: V3.7 or higher

This example is the case of transmitting a message using the BSM-856R and RCU-890 CDMA modem.

▶ System configuration



▶ The Cnet I/F module controls the CDMA modem using the RS-232 communication. AT command is used for controlling the CDMA modem.

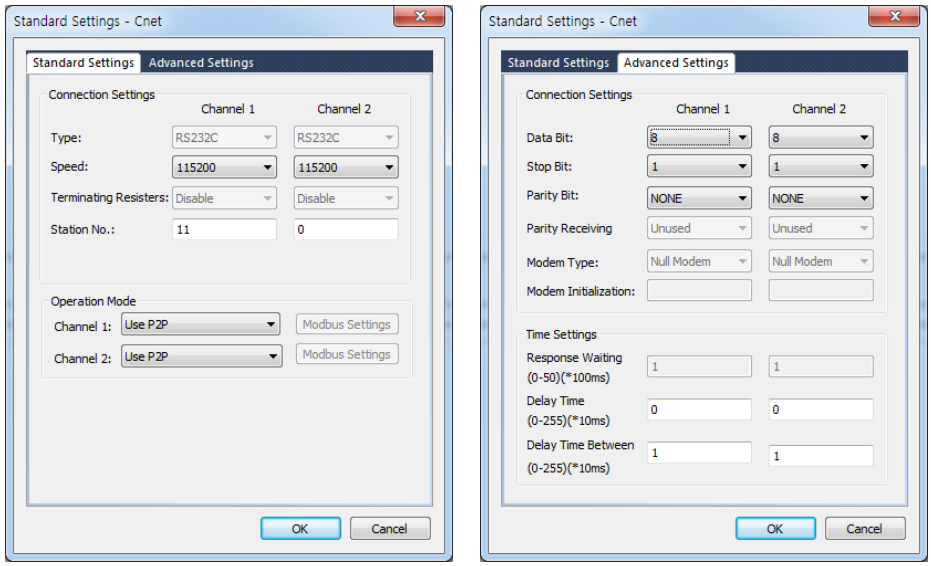
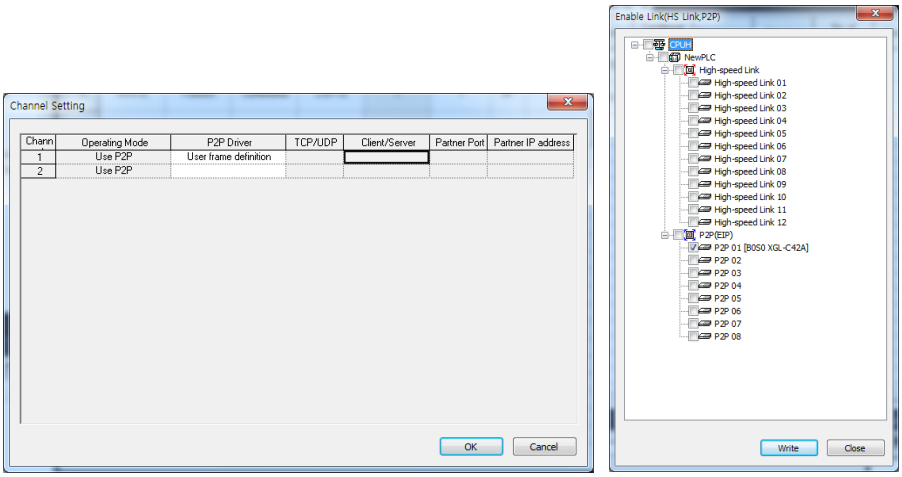
▶ The CDMA modem receives the AT command sent by the Cnet I/F module and carries out the functions including modem setting, making a call, SMS send and receive and M2M modem connection. Since the AT command varies by modem manufacturer, refer to the user's manual related to the relevant product when using the modem. In case the modem uses RS-232C DTR/RTS, the DTR/RTS signal can be controlled using SEND_DTR and SRND_RTS among the UDATA commands for normal communication.

▶ The communication parameter values are as follows.

Classification	BSM-856R	RCU-890
Communication type	RS-232C	RS-232C
Communication speed	115,200	115,200
Data bit	8	8
Stop bit	1	1
Parity bit	None	None

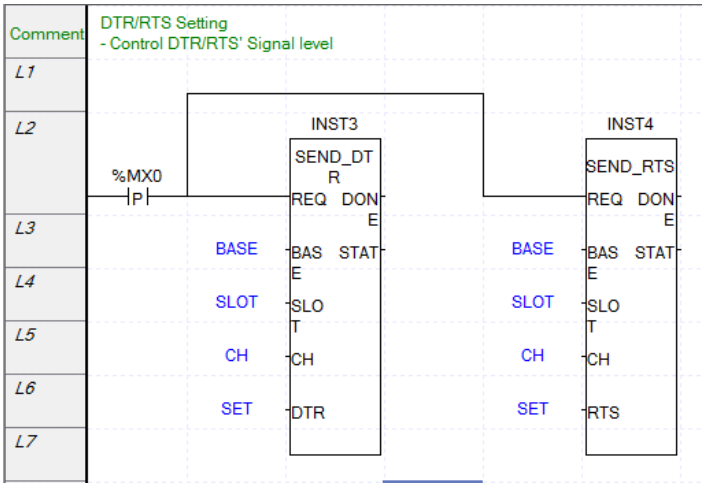
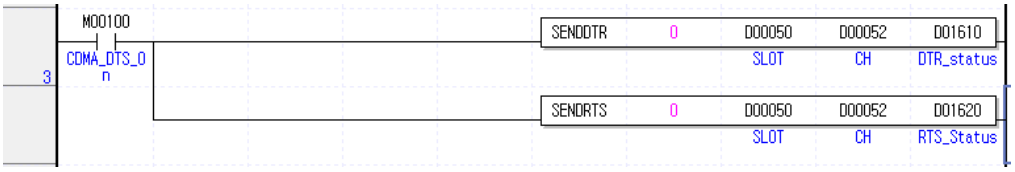
Note 1) 115,200 is set as the default communication speed of the BSM-856R and RCU-890 at the time of shipping. Change the communication speed according to the usage. For detailed contents, refer to the user's manual related to the relevant modem.

▶ Set XGL-C22A as follows.

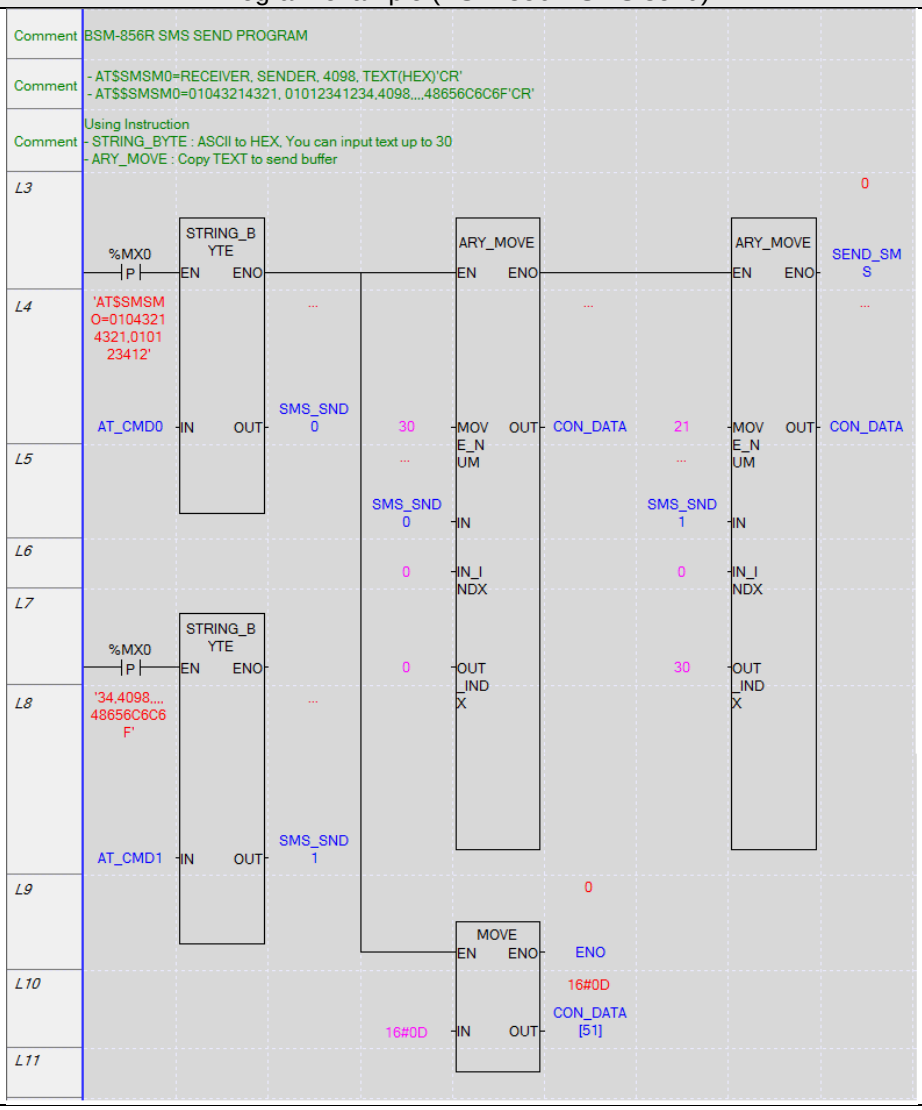
<table>
<tr><th>Sequence</th><th>Setting method</th></tr>
<tr><td rowspan="2">1</td><td> 
</td></tr>
<tr><td>1.Set the communication parameter of the channel (channel 1) connected to the CDMA modem. Set the communication speed (115,200), data bit (8), stop bit (1) and parity bit (NONE).
2.Set P2P usage for the operation mode of the channel to be used.</td></tr>
<tr><td rowspan="2">2</td><td> 
</td></tr>
<tr><td>1.Set User frame definition for the P2P driver in the P2P channel setting.
2.Enable the relevant P2P block from Link Enable.</td></tr>
</table>

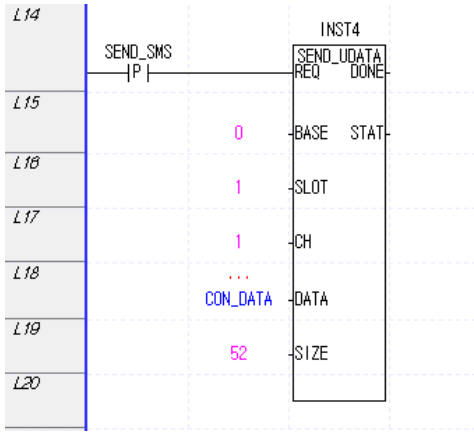
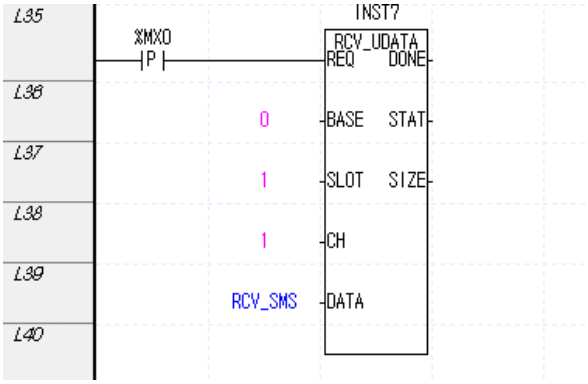
▶ Set DTR/RTS as follows.

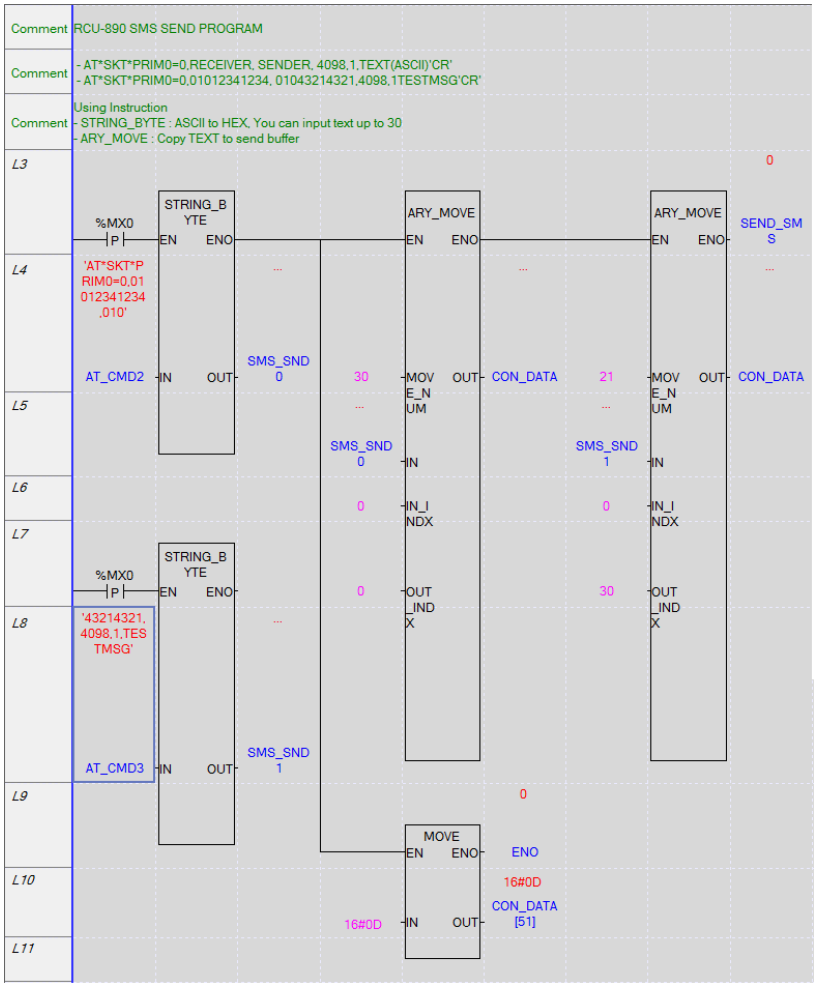
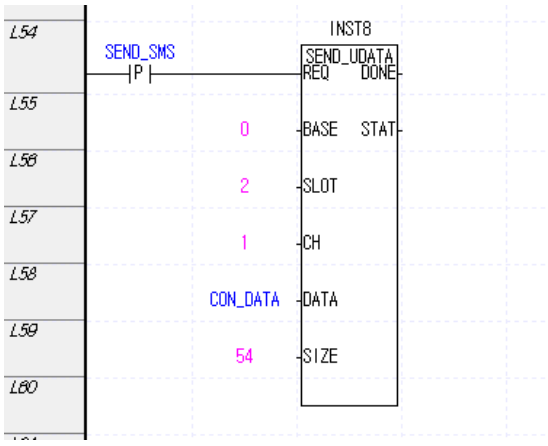
Some CDMA modems use a modem signal for the RS-232 communication. Therefore, in case of communicating with the modem, DTR/RTS should be set. For detailed contents, refer to the user's manual related to the relevant CDMA modem.

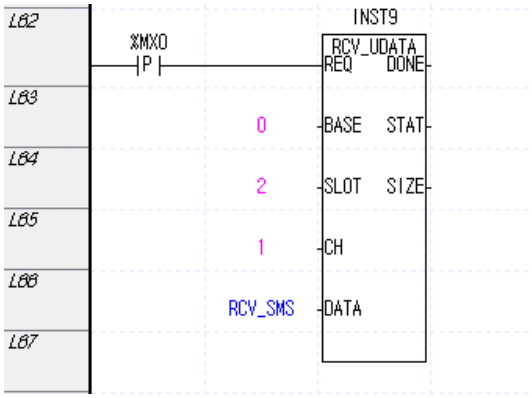
Sequence	DTR/RTS setting
1	 [XGI Instruction]  [XGK Instruction]
	1.Control the DTR/RTS signal level of the modem connection port using SEND_DTR/SEND_RTS. 2.If BSM-856R and RCU-890 are used, set SET(1, Maintain connection) for the signal of DTR and RTS.

▶ The program that sends SMS using the XGI command is as follows.

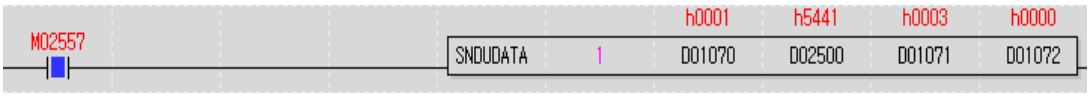
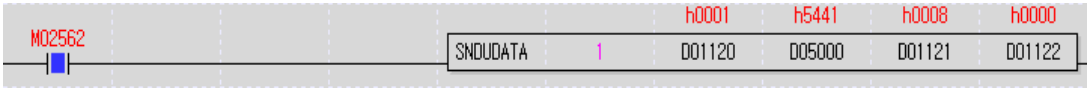
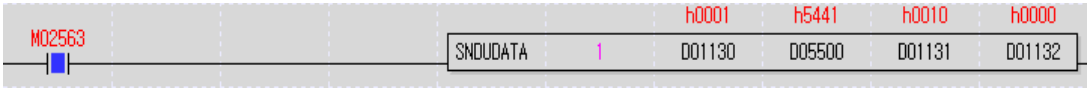
Sequence	Program example (BSM-856R SMS send)
1	
	1 Create an AT command for SMS send of BSM-856R as shown above. (4098,,,,'at the back of the caller's number is the BSM-856R modem command for SMS send.) 2.The example program is the command to send the string‘ Hello’. BSM-856R should enter the string to be transmitted after converting it into a hex number. A command may be added according to the string to be sent. (String Hello ➔ Hex : 48656C6C6F) 3.30 data of SMS_SND0 and 21 data of SND1 are saved to variable CON_DATA[51] in bytes.

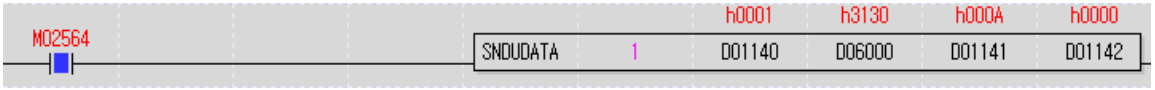
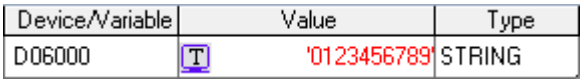
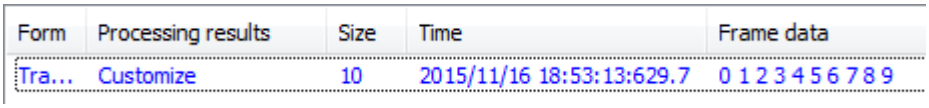
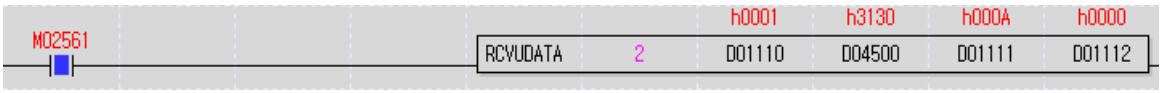
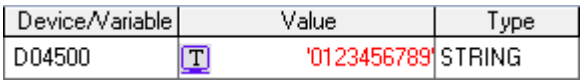
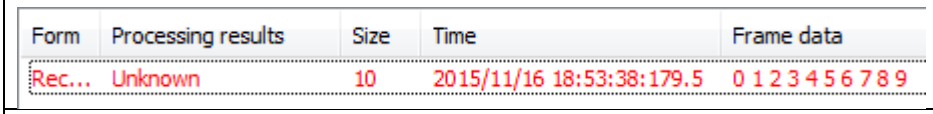
Sequence	Program example (BSM-856R SMS send)
2	
	Transmit the created AT command through the CDMA modem connection port.
3	
	1.Receive'OK' string using RCV_UDATA. When the AT command is delivered to the modem successfully using SEND_UDATA, the modem will send 'OK'. 2.Execute the RCV_UDATA command again and receive the'$006' string. When it is received normally, the SMS transmission completed will be displayed. If it is not received normally, the connection status of the modem to the communication network should be checked.

Sequence	Program example (RCU-890 SMS send)
1	
	1.Create the AT command for RCU-890 SMS transmission just as the example program in Sequence 1. 2.The example program is the command to send the string‘ TESTMSG’. Enter the string to be transmitted in ASCII value for RCU-890. A command may be added according to the string to be transmitted.
2	
	Transmit the created AT command through the CDMA modem connection port.

Sequence	Program example (RCU-890 SMS send)
3	
	1.Receive"*SKT*PRIMO:0' and "OK" string through RCV_UDATA. When the AT command is delivered to the modem normally using SEND_UDATA, the modem will send '*SKT*PRIMO:0' and 'OK'. 2.Execute the RCV_UDATA command again and receive the "*SKT*MOACK:0,1' string. When it is received normally, the SMS transmission completed will be displayed. 'If '*SKT*MOACK:0,0' is received, the connection status of the modem to the communication network should be checked.

▶ The program that sends SMS using the XGK command is as follows.

Sequence	Program example (BSM-856R SMS send)
1	 Device/Variable / Value / Type: D02500 'AT STRING; D02501 h000D WORD Form / Processing results / Size / Time / Frame data: Tra... Customize 3 2015/11/16 18:44:39:053.6 A T CR Rec... Unknown 9 2015/11/16 18:44:40:702.2 A T CR CR LF O K CR LF Check if the modem is normal. “AT”+ 0x0D(ASCII character CR): 3 bytes
2	 Device/Variable / Value / Type: D05000 'AT+CRM=129 STRING; D05005 h000D WORD Form / Processing results / Size / Time / Frame data: Tra... Customize 11 2015/11/16 18:46:05:685.4 A T + C R M = 1 2 9 CR Rec... Unknown 17 2015/11/16 18:46:07:035.6 A T + C R M = 1 2 9 CR CR LF O K CR LF Set 129 which is the data mode for the modem mode. “AT + CRM = 129”+0x0D(ASCII character CR): 11 bytes
3	 Device/Variable / Value / Type: D05500 'ATDT01094714031 STRING; D05507 h0D31 WORD Form / Processing results / Size / Time / Frame data: Tra... Customize 16 2015/11/16 18:52:26:049.1 A T D T 0 1 0 9 4 7 1 4 0 3 1 CR Rec... Unknown 16 2015/11/16 18:52:27:355.2 A T D T 0 1 0 9 4 7 1 4 0 3 1 CR Rec... Unknown 11 2015/11/16 18:52:35:884.0 CR LF C O N N E C T CR LF 1.Making as call: Connect to 010-9471-4031 “ATDT01094714031”+ 0x0D(ASCII character CR): 16 bytes 2.If [CONNECT] character is received, it indicates that the phone connection is completed.

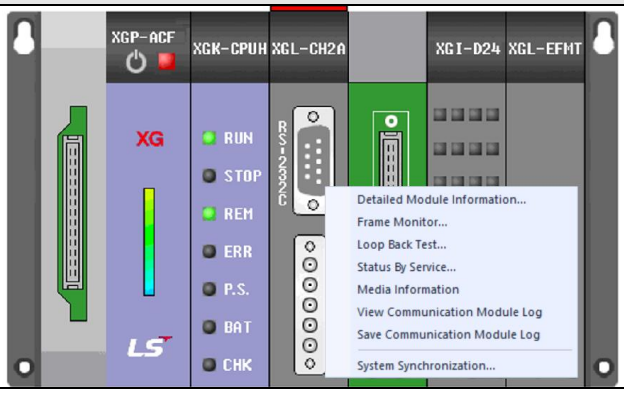
Sequence	Program example (BSM-856R SMS send)
4	<Send from Slot 1>    < Receive from Slot 2>   
	Data send and receive: send“0123456789” 10 bytes from Slot 1 and check if it is received by Slot 2.

Chapter 12 Diagnosis function

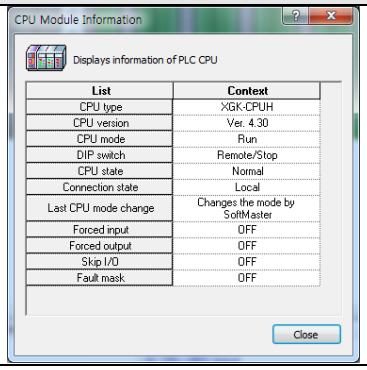
You can check the system and network status using the diagnosis function of the XG5000. Main items that can be diagnosed are as follows.

▶ CPU status
▶ Communication module Information
▶ Frame monitor
▶ Loop-back test
▶ Status by service
▶ Media Information
▶ View Communication Module Log
▶ Save Communication Module Log

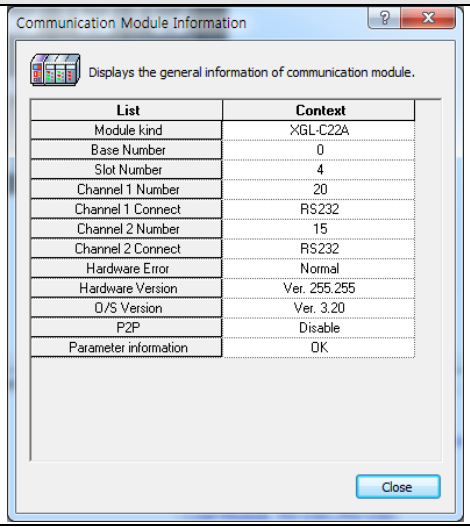
12.1 XG5000 Diagnosis Function

Setting content	Setting method
System diagnosis	
1.Slect [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ). 2.Click the relevant module and click the right mouse button. 3.When the above screen is displayed, you can check the status by clicking [Frame monitor] or [Status by service].	

▶Check CPU status

Contents to check	Detail result
CPU module information	
1.Select [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ). 2.Click the CPU module and click the right mouse button. 3.When you click [CPU module information], you can check the status of the CPU module.	

▶ Communication module Information

Contents to check	Detail result
Communication Module Information	

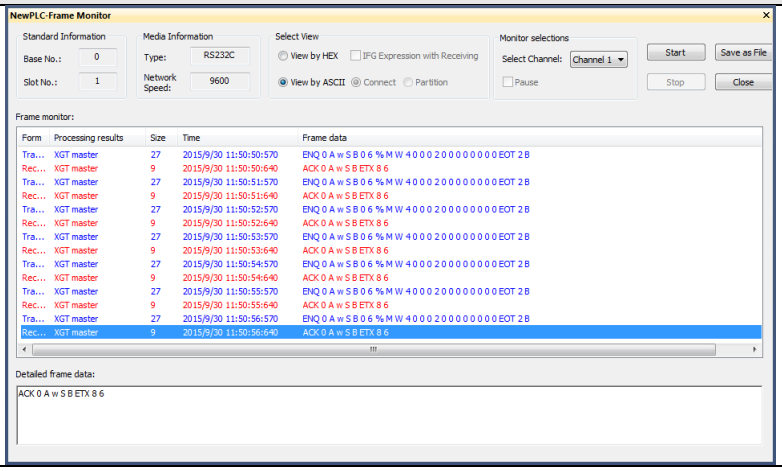
1.Select [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ).
2.Click the Cnet I / F module and click the right mouse button.
3.Click [Communication module information] to check the status of communication module.

▶ Contents of communication module information item

Item	Contents
Module type	Type of communication module which is being diagnosed
Base Number	Indicate the base information of the communication module currently being diagnosed.
Slot No.	Indicate the slot number of the communication module currently being diagnosed.
Station number of channel 1	Station number used in the dedicated service and P2P of channel 1
Channel 1 connection method	Information communication type (RS-232C, RS-422) of channel 1
Station number of channel 2	Station number used in the dedicated service and P2P of channel 2
Channel 2 connection method	Information communication type (RS-232C, RS-422) of channel 2
Hardware error status	Whether the hardware of the communication module is normal or not
Hardware version	Hardware version of communication module
OS Version	OS version of communication module
P2P	Displays enable/disable
Parameter information	Indicates basic communication parameter error information

▶ Frame monitor

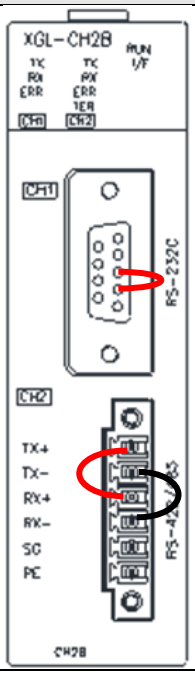
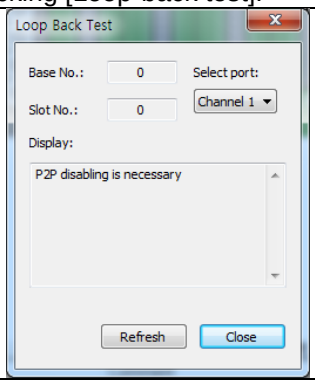
Check whether a frame transmitted or received through Cnet I/F module is normal or not by using the frame monitor of XG5000.

Contents to check	Detail result
Frame monitor	
1.Select [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ). 2.Click the Cnet I / F module and click the right mouse button. 3.Click [Frame Monitor] to monitor the communication status.	

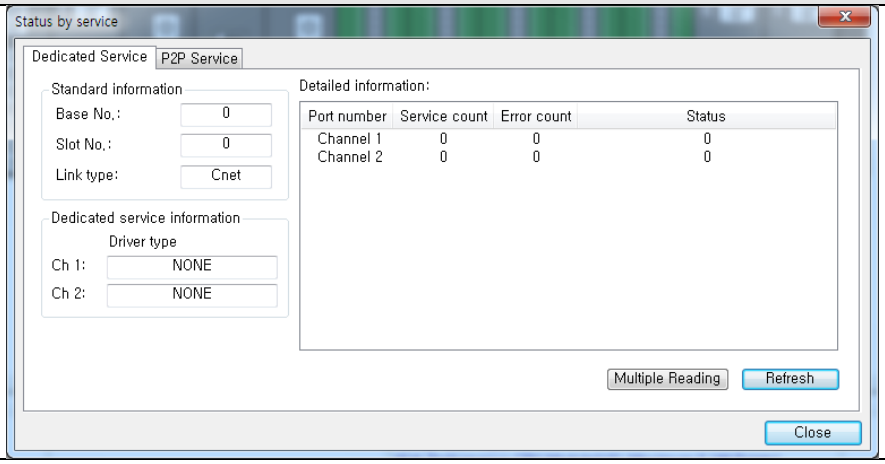
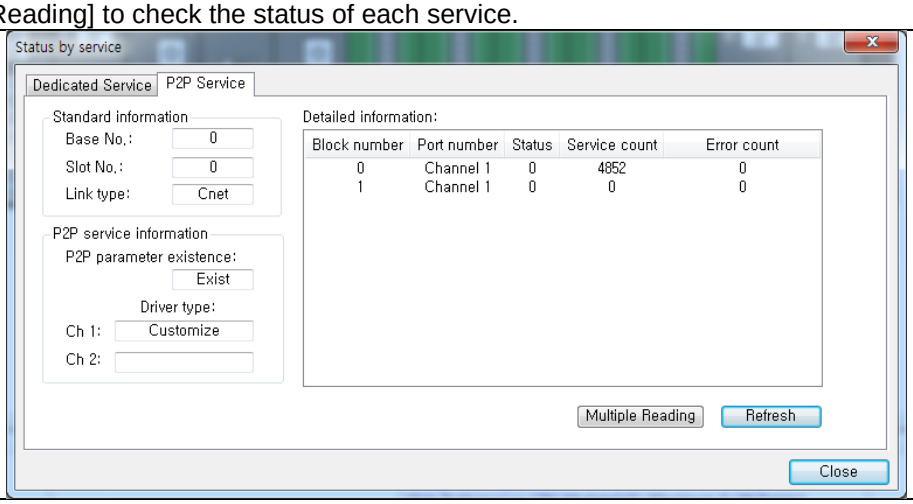
▶ Detailed contents of frame monitor

Item		Contents
Standard information	Base No.	Indicate the base information of the communication module currently being diagnosed.
	Slot No.	Indicate the slot number of the communication module currently being diagnosed.
Media information	Communication type	Communication type of the channel which is being monitored
	Communication speed	Communication speed of the channel which is being monitored
Select view	View as HEX	Displays frame data in Hex value
	View as ASCII	Displays frame data in ASCII value
	View IFG during reception (connect)	If the reception frame has been received in multiple parts, display the time interval between frames in 0.1ms and view on one line
	View IFG during reception (Split)	If the reception frame has been received in multiple parts, display the time interval between frames in 0.1ms and view as the split frame unit.
Monitor options	Select channel	Select a channel you wish to monitor
Frame monitor window	Type	Indicates the transmitted and received frames
	Process result	Indicates the protocol type 1) XGT server 2) XGT client 3) Modbus server 4) Modbus client 5) User frame definition 6) Unknown: Frame that cannot be processed
	Size	Length of monitored frame
	Time	Indicates the time of send/receive
	Frame data	Indicates the data of transmitted/received frame
File save		Save the frame monitoring contents to an Excel file format
Start		Start frame monitoring
Stop		Stop monitoring

▶ Loop-back test

Contents to check	Detail result
Module wiring method (XGL-CH2B)	
1.Be sure to set the server operation mode for the module you wish to test. 2.In case of RS-422 -422/485 communication, set RS-422 for the basic parameter. 3.The P2P link enable of the module you wish to test should be disabled (delete the check mark). 4.Wire according to each communication port as shown in the figure above. (1) RS-232C Communication: Connect No. 2 and No. 3 pin of the port. (2) RS-422 Communication: Connect the TX+ and RX+ pins and the TX- and RX- pins of the port. 5.Select [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ). 6.Click the Cnet I / F module and click the right mouse button. 7. You can check the module status by clicking [Loop-back test].	
Loop-back test	
Select a channel you wish to test and click [Reflesh].	

▶ Status by service

Contents to check	Detail result
Dedicated service	
1.Select [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ). 2.Click the Cnet I / F module and click the right mouse button. 3.Click [Status by Services], and then click [Dedicated Service]. 4.Click [Multiple Reading] to check the status of each service.	
P2P service	
1.Select [Online] ->[Communication Module Settings and Diagnosis] ->[System Diagnostics] or click the icon( ). 2.Click the Cnet I / F module and click the right mouse button. 3.Click [Status by Service], and then click [P2P Service]. 4.Click [Multiple Reading] to check the status of each service.	

▶ Detailed contents of each service

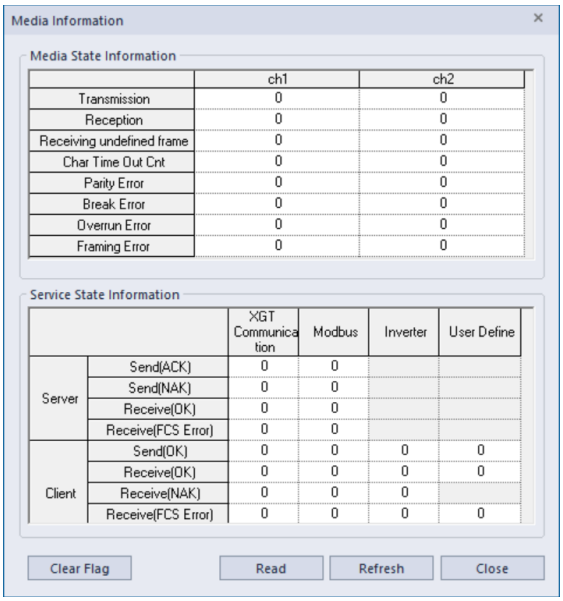
Classification	Item		Contents
Dedicated service	Standard information	Base No.	Base position of the relevant module that uses the dedicated service
		Slot No.	Slot position of the relevant module that uses the dedicated service
		Link Type	Type of communication module which is being used
	Dedicated service information		Indicates the type of driver used for each respective channels
	Detailed information window	Port number	Displaying the channel number
		Service count	Displays the number of dedicated service communication
		Error count	Displays the number of errors that occurred during dedicated service communication
		Status	Indicates the communication status of the dedicated service
P2P service	Standard information	Base No.	Base position of the relevant module that uses the dedicated service
		Slot No.	Slot position of the relevant module that uses the dedicated service
		Link Type	Type of communication module which is being used
	P2P service information	Status of P2P parameter existence	Indicates whether the P2P parameter has been downloaded or not
		Driver type	• P2P driver setting information for each port • XGT/ MODBUS/user frame definition available
	Detailed information	Block No.	• Available range 0 ~ 63 • Displays only a registered block that is operating
		Port number	Displaying the channel number
		Status	Indicates the information regarding the service execution status by block
		Service count	Indicates the number of executions for each block from the time when the P2P service is executed
		Error count	Displays the number of errors occurring during service
Multiple reading/Refresh	Continuous reading		Checks P2P service status information every 1 second
	Refresh		Checks the P2P service status information at the selected time

▶Error according to the status code by service

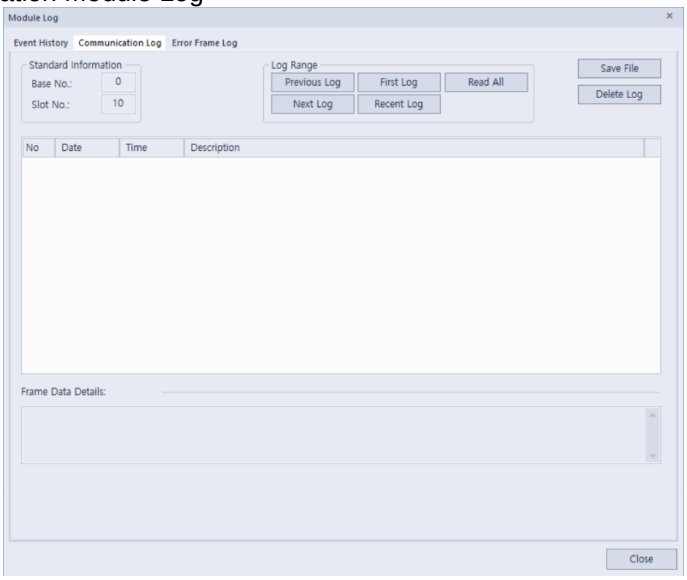
It is used for identifying the communication status of the Cnet I/F module.

Dedicated service		P2P service	
Status	Contents	Status	Contents
0	Normal communication	0	Normal communication
1	Receive frame header error (there is no ACK/NAK)	4	Max. station set error (When set more than 31 stations have been set)
2	Reception frame tail error (there is no tail)	5	Time out
3	Reception frame BCC error	FFFE	1. Modbus address error 2. If a command other than Read/Write is used
9	Station number of RX frame is different with self-station number (Self station number = 0)	-	
0A	If no response is received from CPU		
0B	If the received frame is longer than the maximum Modbus frame		
0C	The received frame is not Modbus ASCII / Modbus RTU		
0D	In case of HEX conversion error in Modbus		

▶Media Information



▶View Communication Module Log



12.2 Error code by protocol

The following contents are related to the error code according to the protocol

▶XGT client/ server

Error code	Type of error	Contents and cause of error	Example of frame with an error
0003	Block number excess error	If the number of blocks is larger than 16 when read/write individually is requested	01rSS1105%MW10…
0004	Variable size error	If the variable size is higher than 16 which is the maximum size	01rSS0113%MW10000000…
0007	Data type error	If the data type other than X, B, W, D and L has been received	01rSS0105%MK10
0011	Data error	If data size area information is incorrect	01rSB05%MW10%4
		If not starting with %	01rSS0105$MW10
		If the area value of the variable is incorrect	01rSS0105%MW^&
		In the case of bit writing, 00 or 01 should be written, but other values are written	01wSS0105%MX1011
0090	Monitor execution error	If the execution of a monitor which is not registered is requested	-
0190	Monitor execution error	If the range of the registration numbers has been exceeded	-
0290	Monitor registration error	If the range of the registration numbers has been exceeded	-
1132	Device memory error	If a character which is not a device in use is entered	-
1232	Data size error	The size of data exceeds 60 words that can be read or written at a time	01wSB05%MW1040AA5512,.
1234	Spare frame error	If unnecessary additional content exists.	01rSS0105%MW10000
1332	Data type mismatch error	In the case of read/write individually, the same data type should be requested for all blocks, but in case a different data type is requested	01rSS0205%MW1005%MB10
1432	Data value error	If the data value cannot be converted to Hex value	01wSS0105%MW10AA%5
7132	Variable request area excess error	It is required beyond the area supported by each device.	01rSS0108%MWFFFFF

▶ Modbus ASCII, Modbus RTU client /server

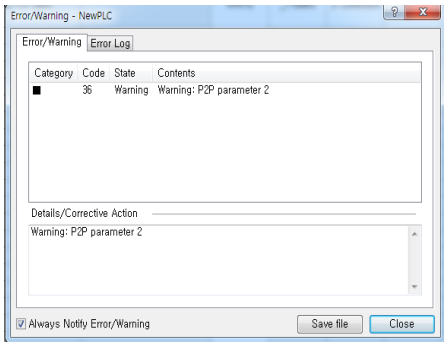
Error code	Name of error	Contents
01	Function code error	If the function code does not match
02	Address error	If the address has exceeded the permissible range
03	Data setting error	If a data value which is not permitted has been set
04	Server station abnormality error	If an abnormality has occurred in the server (slave) station
05	Server station retry request	When the server requests the client to make a request again later as processing is not currently available
06	Server station processing time delay	This is the case when it takes time for the server station to process the request, and the Master should repeat the request.

▶Error code which occurs the PLC

Error code	Name of error	Contents
0x15	Timeout error	When 5 seconds have passed after the P2P starting condition
0x16	Address error	In case of accessing an incorrect device area

12.3 Troubleshooting by the symptoms of an error

12.3.1 In case P2P parameter setting error warning occurs when connecting to XG5000

Symptom	Cause	Solution
P2P setting error warning occurred when connecting to XG5000. 	If the Cnet I/F module whose P2P setting is completed is detached	1.Check if the module has been detached or not after power off. 2.Connect to the XG5000 and check the status.
	If the P2P number whose P2P setting was not carried out is selected when carrying out link enable of the XG5000.	1.Check the P2P setting number in Link Enable' of 1.XG5000, delete the check of the wrong selected P2P number, and click[Write] 2.After disconnecting, reconnect and check whether it is normal

12.3.2 If the P2P setting is completed when operating as the client but the communication is not available

Symptom	Cause	Solution
Communication setting is completed, but Tx/Rx of LED of Cnet I/F does not blink	If the CPU is in stop mode	Connect to XG5000. If the CPU mode is in stop mode, change it to Run mode.
	If the communication basic parameters do not match between the client and server	Connect to XG5000, select [File]→[Open from PLC] and check the basic communication setting of the module that operates as the client.
	If a link enable setting error has occurred	Set the P2P parameter, select Link enable of the relevant P2P and click [Write].

12.3.3 If the communication type is set to RS-485, and the response frame is missing when operating as a client

Symptom	Cause	Solution
Frame monitoring after completing the settings of multiple P2P parameters in P2P block results in missing response frames	If the P2P starting condition is faster than the communication time	1.Change the P2P start condition of P2P block setting in consideration of communication time 2. Communication time= Transmission time + reception time (1)Transmission time= Start condition + CPU Scan time + communication module response time + Data transfer time (2)Receive time= CPU Scan time + communication module response time + Data transfer time

	If the response time of the communication module that operates as the server is slow	1.Increase the delay time from the basic setting of the XG5000. - Since the response time varies by module that operates as the server, set 3~8 generally.

12.3.4 If two response frames are processed as unknown for one request frame during frame monitoring

Symptom	Cause	Solution
Two response frames are processed as unknown during frame monitoring.  Transmission XGT master 17 2007/12/4 ... ENQ 0 1 r S S 0 1 0 4 % M W 0 EOT 4 0 Reception Unknown 17 2007/12/4 ... ENQ 0 1 r S S 0 1 0 4 % M W 0 EOT 4 0 Reception Unknown 17 2007/12/4 ... ACK 0 1 r S S 0 1 0 2 0 0 0 0 ETX 0 5 Transmission XGT master 17 2007/12/4 ... ENQ 0 1 r S S 0 1 0 4 % M W 0 EOT 4 0	If RS-422 is selected for the communication type in the basic setting of the XG5000 but the output terminal is wired to RS-485	Change the communication type to RS-485 in the basic setting and write basic setting.

12.3.5 If individual reset is not available

Symptom	Cause	Solution
Automatic reset is not available after writing the basic parameters in the XG5000.	If the O/S version of the Cnet I/F module is 2.0 or lower	Upgrade the OS of the Cnet I/F module to 2.0 or higher.

12.3.6 If data whose frame cannot be analyzed is transmitted or received

Symptom	Cause	Solution
If data whose frame cannot be analyzed is sent or received	If a frame is sent from a number of servers	1.Check if 1 to 1 communication with a device which operates as the server is carried out properly. 2.Apply interlock to prevent a frame from being send at the same time.
	Parity bit setting is not matched	Set the same parity bit.
	size of the stop bit is not set correctly	Set the same size of stop bit.
	If the communication speed is set incorrectly	Set the same communication speed.
	If the terminating resistance was not installed when configuring multi drop	Install the terminating resistance.

12.3.7 If it is unclear whether the error is caused by the client or the server

Symptom	Cause	Solution
If it is not clear whether a communication problem is attributable to the client or the server.	-	1.Check Cnet I/F module (1)Check the installation status of the module (2)Check the wiring status 2. Carry out the loop-back test. 3. Check the CPU status

12.3.8 If normal communication status and abnormal communication status occur repeatedly in turn

Symptom	Cause	Solution
Normal or abnormal communication repeatedly occurs.	If a number of servers transmit a frame in case of multi-drop connection.	1. Check if 1 to 1 communication with a device which operates as the server is carried out properly. 2. Apply interlock to prevent a frame from being transmitted at the same time.
	If the wiring status of the communication line is faulty.	Replace the cable or connect the cable firmly.
	If the timing of received and transmitted signals does not match during the RS-485 communication.	Increase the delay time of the device which operates as the client and the server.
	1.When the next send is requested while the transmit process is not completed. 2.When receive is not complete, it requests next process of receive.	Make sure to use handshake when writing the program.

12.3.9 If the error code“E000”for the status by service has occurred

Symptom	Cause	Solution
The status of P2P service is E000.	If the station addresses of the P2P parameter set for the module operating as the server and the module operating as the client are different.	Check the station address of the module operating as the server and modify the station address of the P2P parameter.

12.3.10 If the error code“E001”for the status by service has occurred

Symptom	Cause	Solution
The status of P2P service is E001.	If the CRC error check value is different.	Check the CRC calculation result by referring to the frame.

Chapter 13 Additional functions

13.1 RAPIEnet+ Remote Cnet service

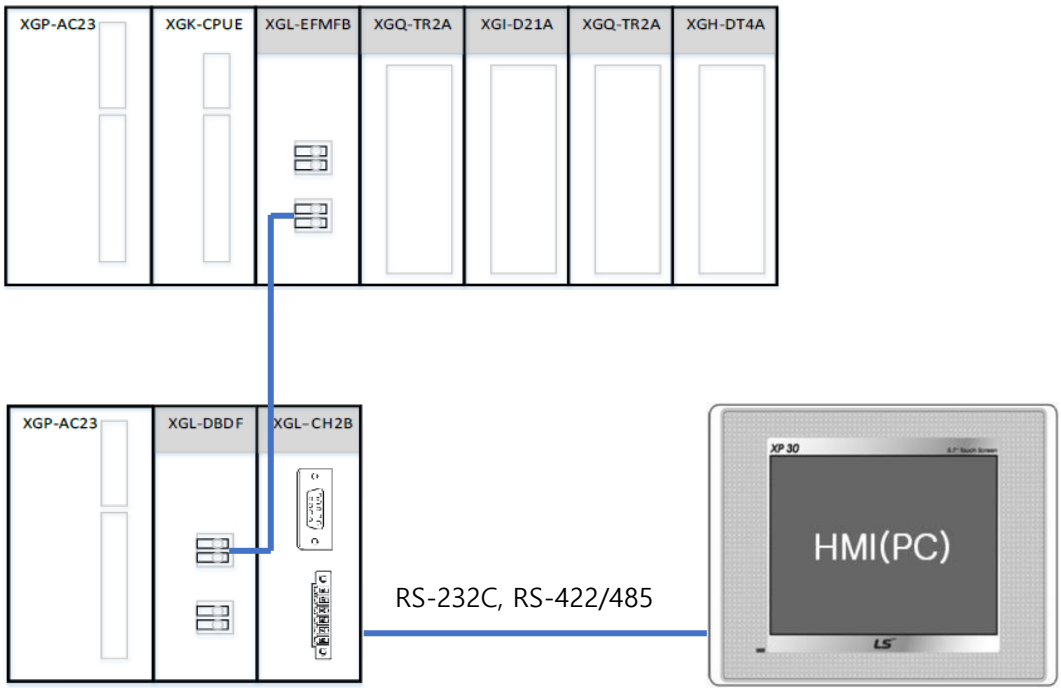
This feature is a service that allows remote use of Cnet communication using the Ethernet extension driver(XGL-DBDT/F/H). To use it, please refer to the supported version information below and apply it to your system.

(1) Supported version information

No.	Item	S/W version
1	XG5000	V4.70 or higher
2	XGL-DBDT/F/H	V1.40 or higher
3	XGL-C22B/CH2B/C42B	V6.00 or higher

13.1.1 Installation and Operation

By installing the Cnet communication module onto the extension driver, it is possible to remotely use server and client Cnet communication.

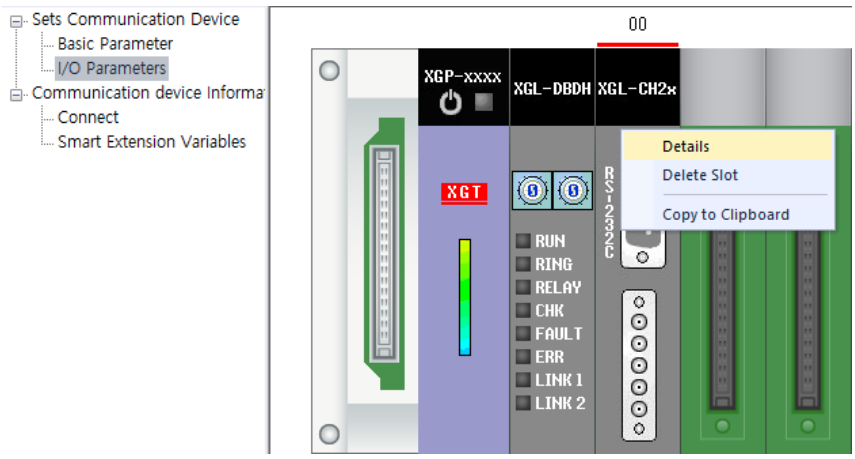


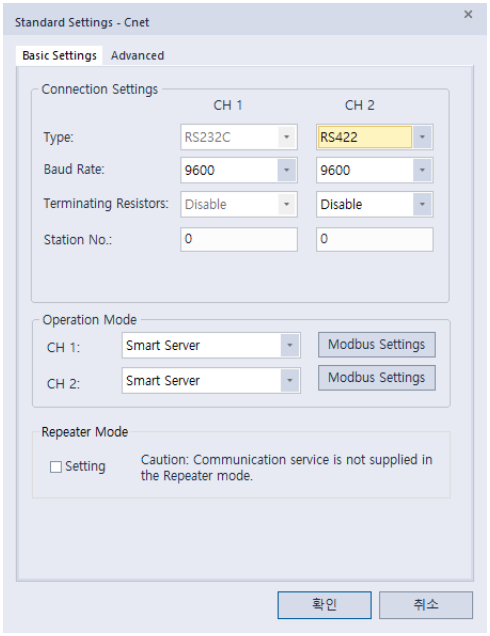
<Example of using the Cnet module installed on the extension driver>

(1) Server communication

Register the Smart Extension service using the Ethernet Master module (XGL-EFMxB) connected to the local PLC. Click on the I/O parameters on the corresponding device for Smart Expansion. When you right-click on the Cnet module, Detailed Module information appears and clicking it will bring up the module's information window.

(Please refer to section 11.1.1 for setting the Cnet server.)





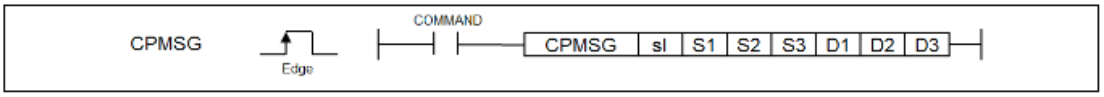
Notes

- Please refer to the XGT Ethernet Module User Manual for using smart extension.

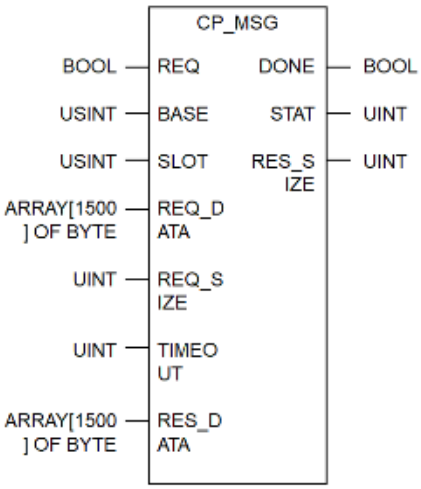
(2) Client communication

You can use P2P client communication by using CP MSG function block. Please refer to the Instruction Help for the usage of CP MSG function block, and consult chapter 13.2 on communication module object data transmission functions for setting up P2P client.

1) XGK CPU CPMSG function block

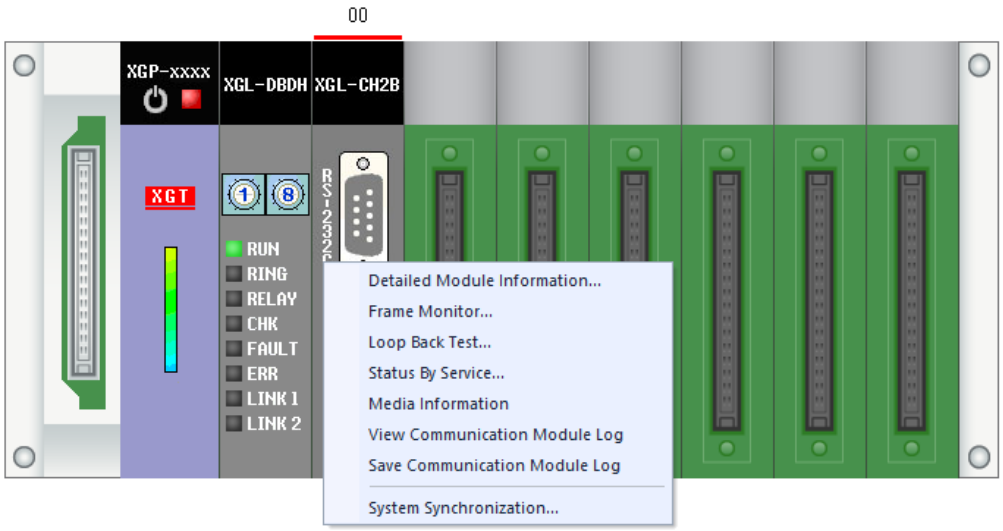


2) XGI CPU CP_MSG function block



3) Extension Cnet module Diagnosis function
By connecting to the expansion driver, you can use the diagnostic function of the XG5000 to check the status of the Cnet module's system and network. The key items that can be diagnosed include the following: (For detailed information on the diagnostic function, please refer to Chapter 12 - Diagnostic Function.)

▶ Communication module Information
▶ Frame monitor
▶ Loop-back test
▶ Status by service
▶ Media Information
▶ View Communication Module Log
▶ Save Communication Module Log



13.2 Communication module object data send and receive function

This function is to send/receive object data of communication module. In order to use it, please refer to the supported version information below and apply it to the system.

(1) Supported S/W version information

No.	XGL-Cx2B Version	Object ID	Description
1	V6.00	3	P2P
2	V6.00	4	Diagnosis

No.	CPU Type	CPU Version
1	XGI-CPUUN	V1.80
2	XGK-CPUHN	V1.80
3	XGK-CPUSN	V1.80
4	XGK-CPUUN	V1.80

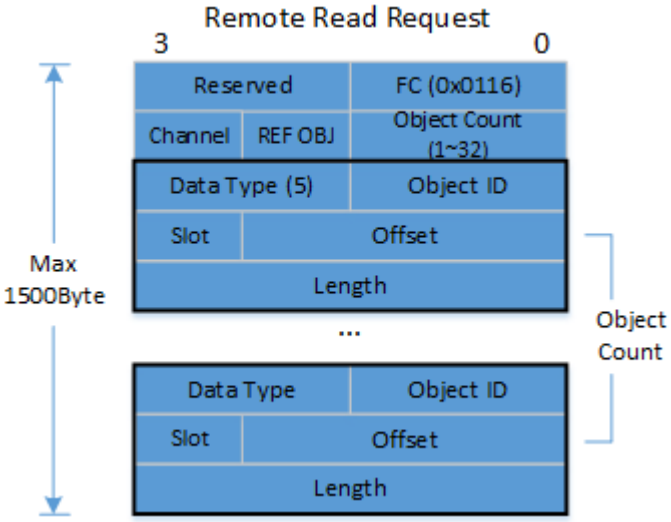
(2) Command: CP_MSG

No.	XGL-Cx2B Version	XG5000 Version	CP_MSG Function	Description
1	V6.00	V4.61	Communication module object read communication module object write. Communication module object write ,read.	Access to Local object(SNTP, Smart extension, P2P)
2	V6.00	V4.70	Read remote communication module object. Write remote communication module object.	Communication module object access of smart extension slave

For detailed instruction usage, refer to “XGK / XGB instruction user manual” or “XGI/XGR/XEC/XMC instruction user manual”.

13.2.1 Reading remote communication module object.

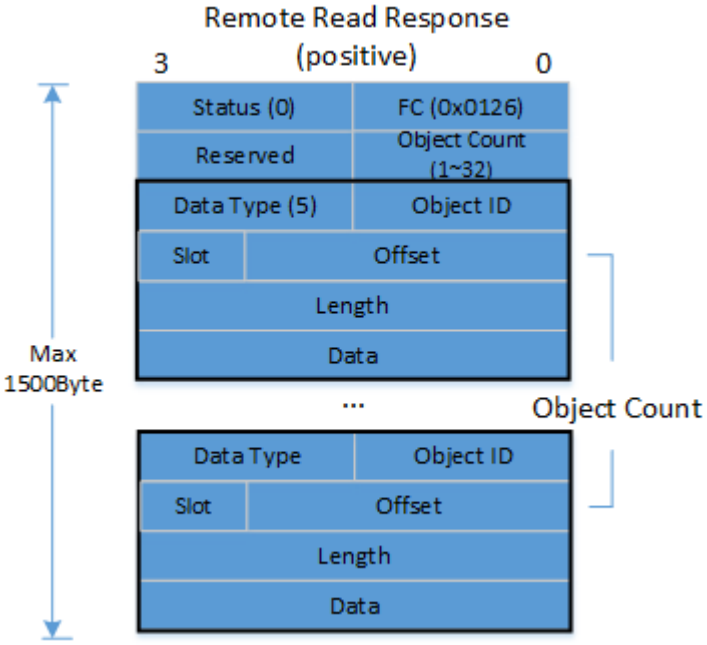
(1) Remote read request
The message structure for the “read” operation of the communication module object located in the remote is as follows.



1) FC (Frame Command): 0x0116 (Remote Read)
2) Object Count: Number of objects to be read (up to 32)
3) REF OBJ: The reference object holds channel information for remote operations.
   Example: To access a Smart Extension Slave, you need to specify the Smart Extension object (Object ID: 2).
4) Channel: Channel number managed by the reference object.
   Example: To access the object of Smart Extension Slave EB#5, you need to specify channel number 5.
5) Object ID: Unique number of the object to be read (refer to the corresponding object's user manual).
6) Data Type: Data type of the data to be read, supports only bytes.
7) Offset: Offset of the data within the object to be read (refer to the corresponding object's user manual).
8) Slot (0~12): Slot number used to access the communication module object installed on the Smart Extension Slave.
   Example: To access the communication module installed in Slot 0, set the slot field value to 0. To access the communication module installed in Slot 9, set the slot field value to 9. To access the Extension Slave, set the slot field value to 12.
9) Length: Number of reads based on the data type.

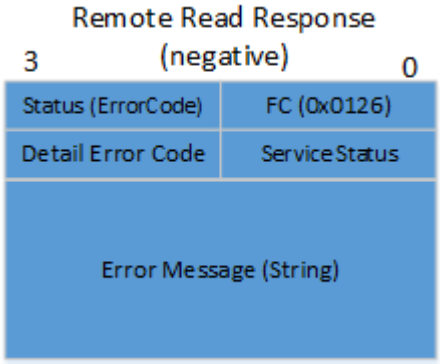
Note: The maximum size of the data to be read, including the header, cannot exceed 1400.

(2) Remote read response(positive)



1) FC (Frame Command): 0x0126 (Remote Read Response)
2) Status: Status value after the read operation. 0 indicates normal operation.
3) Object Count: Number of objects read.
4) Object ID: Unique number of the object read (refer to the corresponding object's user manual).
5) Data Type: Data type, only supports bytes. Bytes: 5
6) Offset: Offset address of the data read within the object.
7) Slot (0~12): Slot number used to access the communication module object installed on the Smart Extension Slave.
8) Length: Count based on the data type.

(3) Remote read response(negative)

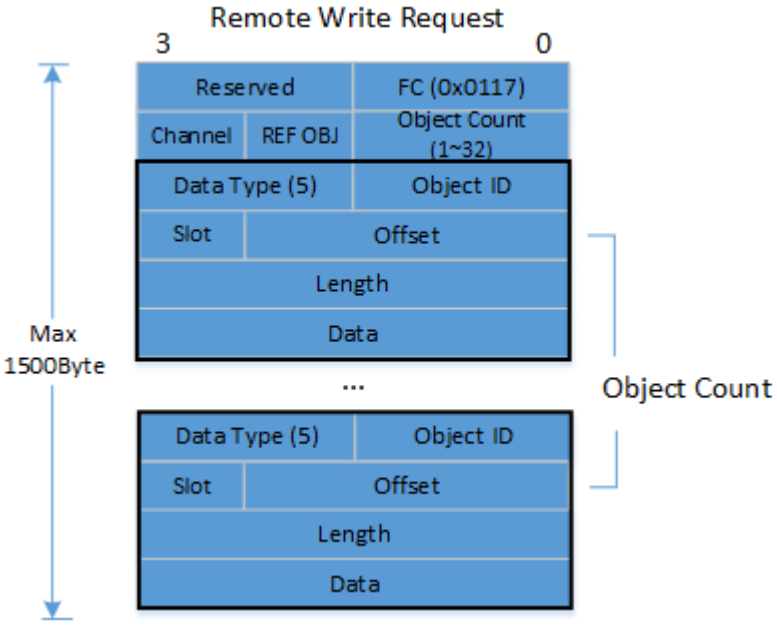


1) FC (Frame Command): 0x0126 (Read Response)
2) Status: Status value after the read operation. If there is an error, it contains an error code. (If the code value is less than 20, refer to the command set; if it is 20 or greater, refer to the error code of the corresponding communication module.)
3) Remote Read Service Status: Service status value in case of read service response error.
4) Remote Read Status Code: Detailed status code for the read service response.
5) Error Message (String): If an error occurs, this field provides an error message. It is displayed as a string (ASCII), so it can be viewed as ASCII.

   Example: If the first object in the read request format has an unknown object ID (100):
   - FC: 0x0126
   - Status: 0x0116 (INVALID_OBJ)
   - Error Position Offset: 8 (offset position of the first object's unique ID)
   - Error Data: 100
   - Eror Message: "Invalid Object"

13.2.2 Writing remote communication module object

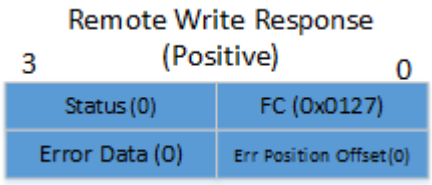
(1) Remote write request
The message structure for the “write” operation of the communication module object located in the remote is as follows.



1) FC (Frame Command): 0x0117 (Write Request)
2) Object Count: Number of objects.
3) REF OBJ: The reference object holds channel information for remote operations. Example: To access a Smart Extension Slave, you need to specify the Smart Extension object (Object ID: 2).
4) Channel: Channel number managed by the reference object.
5) Object ID: Unique number of the object. (Refer to the corresponding user manual for details)
6) Data Type: Data type, supports only bytes.
   - Bytes: 5
7) Offset: Offset of the data within the object.
8) Slot (0~12): Slot number used to access the communication module object installed on the Smart Extension Slave.
9) Length: Count based on the data type.
10) Data: Data to be written to the communication module's corresponding object.

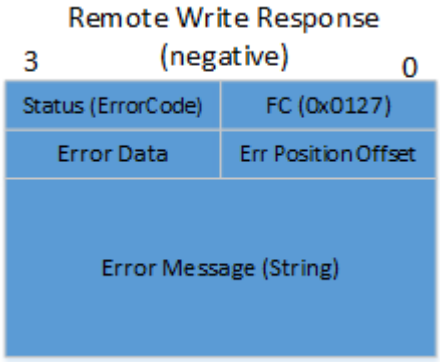
Note: The maximum size of the request message cannot exceed 1400

(2) Remote write response(positive)



1) FC (Frame Command): 0x0127 (Remote Write Response)
2) Status: Status value after the write operation. 0 indicates successful operation.
3) Error Position Offset: 0.
4) Error Data: 0.

(3) Remote write response(negative)



1) FC (Frame Command): 0x0127 (Remote Write Response)
2) Status: Status value. If there is an error, it contains an error code. (If the code value is less than 20, refer to the command set; if it is 20 or greater, refer to the error code of the corresponding communication module.)
3) Error Position Offset: If an error occurs in the request format, the offset value where the error in the read request format occurred. If the offset cannot be determined, it is 0xFFFF.
4) Error Data: If an error occurs in the request format, the value that caused the error in the read request format.
5) Error Message (String): If an error occurs, this field provides an error message. It is displayed as a string (ASCII), so it can be viewed as ASCII.

   Example: If the first object in the request format has an unknown object ID (100):
   - FC: 0x0127
   - Status: 0x0116 (INVALID_OBJ)
   - Error Position Offset: 8 (offset position of the first object's unique ID)
   - Error Data: 100
   - Error Message: "Invalid Object"

13.2.3 CP MSG common error code

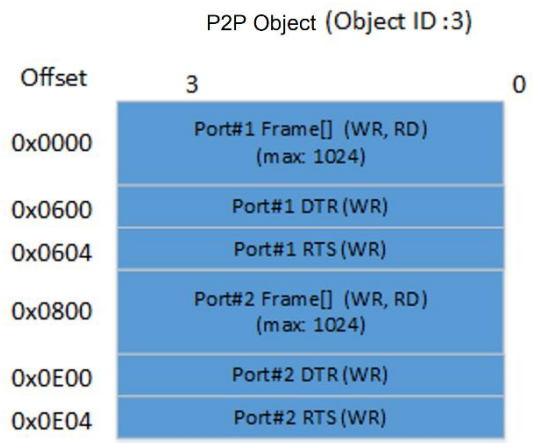
The error code that indicates the cause of an error encountered during the interpretation of CP MSG by the communication modue.

Code (hex)	Name	Description
0x0110	UNIV_ERR_INVALID_PRM	Parameter error
0x0111	UNIV_ERR_INVALID_EXT_TYPE	EXT field error of FC
0x0112	UNIV_ERR_INVALID_MSG_TYPE	MSG field error of FC
0x0113	UNIV_ERR_INVALID_PDU_TYPE	PDU field error of FC
0x0114	UNIV_ERR_INVALID_SVC_TYPE	SVC field error of FC
0x0115	UNIV_ERR_INVALID_DATA_TYPE	Unsupported data type
0x0116	UNIV_ERR_INVALID_OBJ	Unknown object ID
0x0117	UNIV_ERR_REQ_SIZE_SHORT	The size of the request message is smaller than the minimum size.
0x0118	UNIV_ERR_REQ_SIZE_LONG	The size of the request message exceeds the maximum size.
0x0119	UNIV_ERR_REQ_OFFSET	Unsupported offset for the given objedt.
0x011A	UNIV_ERR_REQ_OBJ_CNT_ZERO	Object count in the request message is 0.
0x011B	UNIV_ERR_REQ_OBJ_CNT_EXCEEDS	Object count in the request message exceeds 64.

0x011C	Reserved	
0x011D	UNIV_ERR_REQ_OBJ_ACCESS_DENIED	The object in the request message is inaccessible. (Please check if the object is allowed to be accessed by communication module parameters, etc.)
0x011E	UNIV_ERR_REQ_ALIGN_LEN	The size of the request message or the read/write size of the object is not aligned to 4 bytes.
0x011F	UNIV_ERR_TIME_OUT	Timeout occurred in the request message. (Occurred within the communication module)
0x0120	UNIV_ERR_MEM_ALLOC_FAIL	Insufficient internal memory in the communication module to process the request message.
0x0121	UNIV_ERR_OBJ_RESOURCE_BUSY	The resources of the requested object are currently in use, and it is unable to provide a response at the moment.
0x0122	UNIV_ERR_NO_ITEM	There are no items in the object being read, so there is no data available to respond with.
0x0123	UNIV_ERR_REMOTE_TX_FAIL	Remote transmission failed. Refer to the received message for detailed error information.
0x0124	UNIV_ERR_RX_ERR_MSG	Received remote error message. Refer to the received message for detailed error information.

13.2.4 P2P object(Object ID: 3)

The structure of the P2P object (Object ID: 3) in Cnet is as follows.



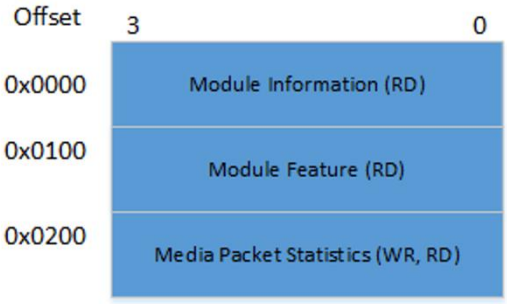
1) Sending User-Defined Frame using CP_MSG regardless of P2P parameter settings (Write)
   - When sending a user-defined frame on Cnet port 1, write the user-defined frame to offset 0x0000 of P2P object.
   - When sending a user-defined frame on Cnet port 2, write the user-defined frame to offset 0x0800 of P2P object.
2) Receiving User-Defined Frame using CP_MSG regardless of P2P parameter settings (Read)
   - When sending a user-defined frame on Cnet port 1, read the user-defined frame from offset 0x0000 of P2P object.
   - When sending a user-defined frame on Cnet port 2, read the user-defined frame from offset 0x0800 of P2P object.
   - If no frame is received, respond with UNIV_ERR_REQ_OBJ_CNT_ZERO (0x011A).
3) Controlling DTR of RS232 Port using CP_MSG regardless of P2P parameter settings (Write)
   - When sending a user-defined frame on Cnet port 1, write the control command to offset 0x0600 of P2P object.
   - When sending a user-defined frame on Cnet port 2, write the control command to offset 0x0E00 of P2P object.
   - Control commands
     Disable: 0x0D
     Enable: 0x0E

4) Controlling RTS of RS232 Port using CP_MSG regardless of P2P parameter settings (Write)
   - When sending a user-defined frame on Cnet port 1, write the control command to offset 0x0604 of P2P object.
   - When sending a user-defined frame on Cnet port 2, write the control command to offset 0x0E04 of P2P object.
   - Control commands
     Disable: 0x0D
     Enable: 0x0E

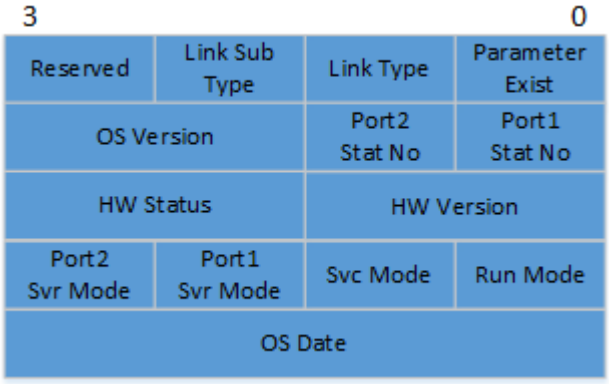
13.2.5 Diagnostic object(Object ID: 4)

The structure of the Diagnostic Information Object (Object ID: 4) in Cnet is as follows.

General Information (Object ID :4)



1) Read module information using CP_MSG (Read)

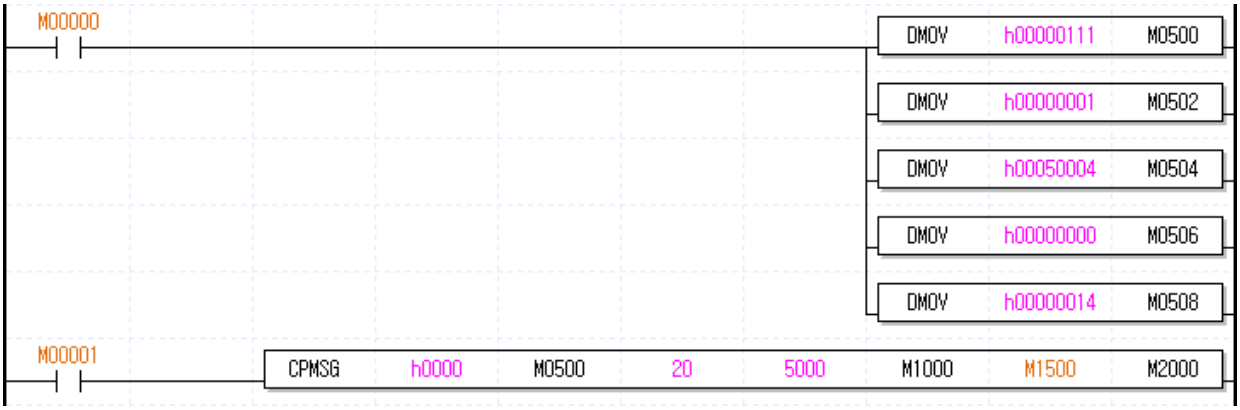


The detail value of the module information is as follows.

Member name	Value
Parameter Exist	0x00: Default parameters are normal. 0x01: Default parameters are error. 0x02: Default parameters are nothing. 0x04: Option information mismatch. 0x08: Station information error 0x10: Module type errro (It is not cnet parameter)
Link Type	0x40: Cnet
Link Sub Type	0x00: XGL-C42B 0x01: XGL-C22B 0x02: XGL-CH2B 0x03: XBL-C21A 0x04: XBL-C41A
Reserved	
Port1 Station No	Port1 station number.
Port2 Station No	Port2 station number.
OS Version	OS Version
HW Version	HW Version
HW Status	HW Status

Run Mode	Currently active service list in Cnet configuration. (Note: Multiple data items are displayed as 'OR') 0x01: P2P service configuration is avaliable. 0x04: Remote Loader service 0x08: Server service
Service Mode	Current Cnet service status (Note: Multiple data items are displayed as 'OR') 0x01: P2P service RUN 0x04: Remote Loader Connected 0x08: Server Connected (This information will turn off if there is no communication with the client for 10 seconds).
Port1 server mode	0x00: P2P 0x02: XGT Server 0x03: Modbus ASCII 0x04: Modbus RTU 0x07: Smart Server
Port2 server mode	0x00: P2P 0x02: XGT Server 0x03: Modbus ASCII 0x04: Modbus RTU 0x07: Smart Server
OS Date	OS Date

- Example ladder program(XGK)



- Data

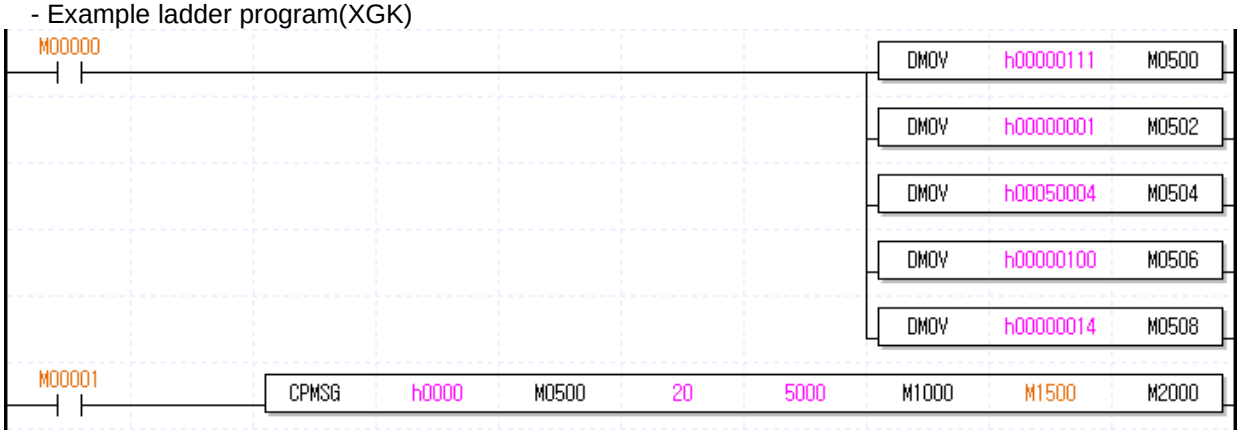
	0	1	2	3	4	5	6	7	8	9
M1000	0121	0000	0001	0000	0004	0005	0000	0000	0014	0000
M1010	4000	0002	0000	0600	0400	0000	0000	0002	0217	2022

2) Read Feature List of Cnet module

- It responds with the Feature List supported by Cnet. The Feature List has assigned meanings to each bit, where a bit value of 1 indicates support and 0 indicates non-support.

Feature name	Bit Position	Feature 설명
BPSC LARGE RAM SUPPORT	b'0	Support for large-capacity shared RAM for backplane.
RAPIENET PLUS SUPPORT	b'1	Compatible with RAPIEnet+ slave module.
Reserved	b'2 ~ b'32	
PASS THRU SUPPORT	b'33	Support for Message Pass through

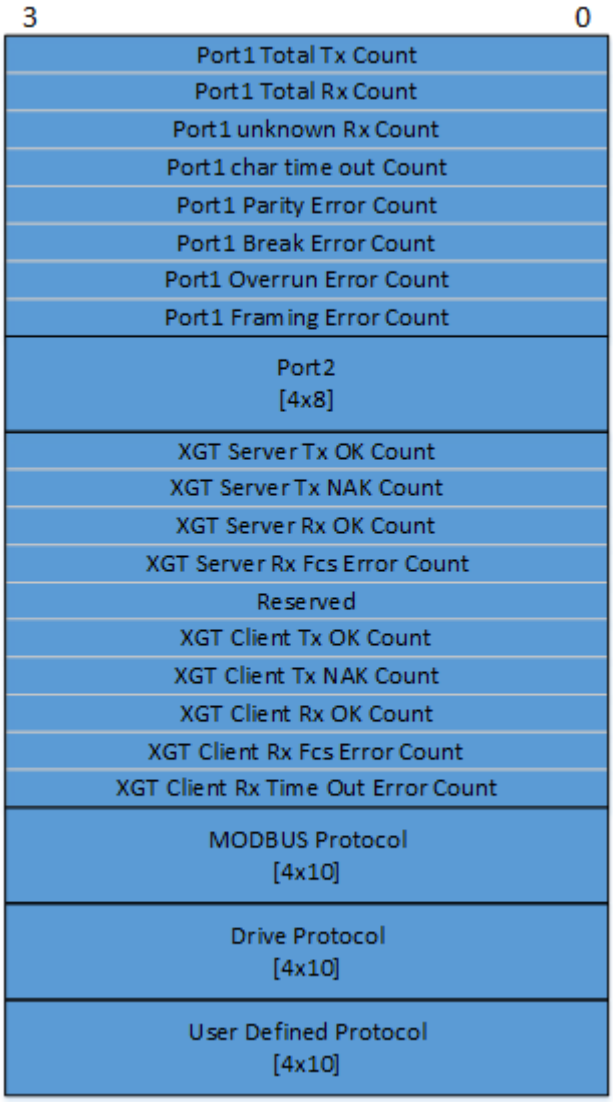
- Example ladder program(XGK)



- Data

	0	1	2	3	4	5	6	7	8	9
M1000	0121	0000	0001	0000	0004	0005	0100	0000	0014	0000
M1010	0002	0000	0000	0000	0000	0000	0000	0000	0000	0000

3) Read Media Packet information of Cnet(Read)
(Maximum 224 byte)

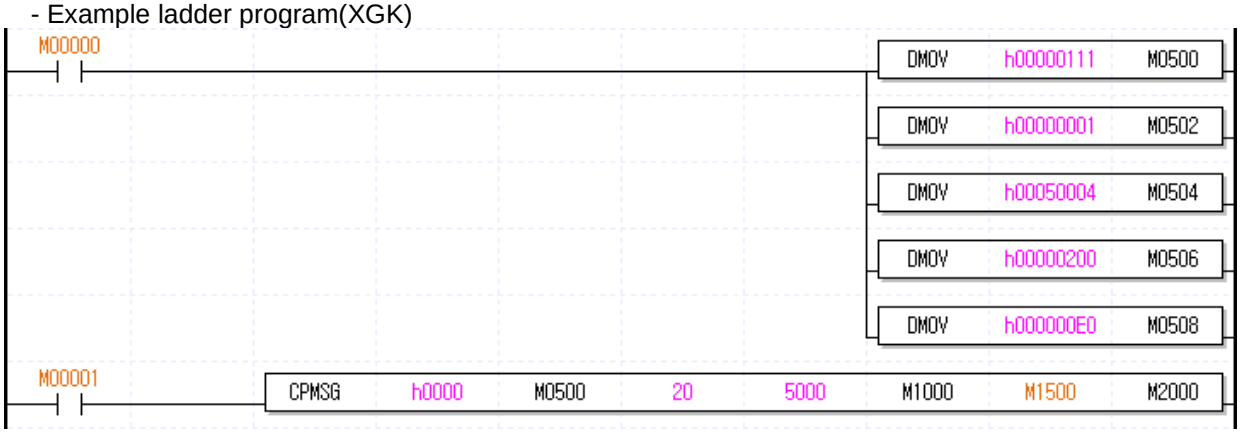


The description for each count item is as follows.

Member name	Value
Total tx count	Transmission count per port.
Total rx count	Reception count per port.
Unkown rx count	Unknown frame reception count per port.
Char time out count	Character interval timeout count per port.
Parity error count	UART parity error count per port
Break error count	UART break error count per port
Overrun error count	UART RX overrun error count per port
Framming error count	UART RX framming error count per port
Server tx ok count	tx ok count per server mode
Server tx nak count	tx nak count per server mode
Server rx ok count	rx ok count per server moce

Server rx fcs error count	rx frame check sequence error count per server mode
Reserved	
Clinet tx ok count	tx ok count per client mode
Client tx nak count	tx nak count per client mode
Client rx ok count	rx ok count per client mode
Client rx fcs error count	rx frame check sequence error count per client mode
Client rx time out count	rx tiem out count per client mode

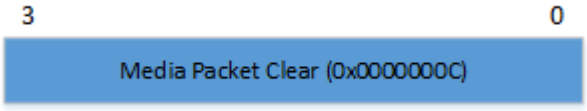
- Example ladder program(XGK)



- Data

	0	1	2	3	4	5	6	7	8	9
M1000	0121	0000	0001	0000	0004	0005	0200	0000	00E0	0000
M1010	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
M1020	0000	0000	0000	0000	0000	0000	0BC9	0000	0B9B	0000
M1030	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
M1040	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
M1050	0000	0000	0BC9	0000	0B9B	0000	0000	0000	0000	0000
M1060	002E	0000	0000	0000	0000	0000	0000	0000	0000	0000
M1070	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
M1080	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
M1090	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
M1100	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000

4) Reset Media Packet information of Cnet(Write)



If you write 0x0000000C to the media packet information offset(0x0200), the media packet information will be initialized to 0.

Appendix

1. Description of terms

(1) Communication method

(a) Simplex communication

This is the communication method to transmit information in only one predefined direction. Information cannot be transmitted in the opposite direction.

(b) Half-duplex communication

One cable is used in this communication method, so when one side is transmitting, the other side can only receive. Information cannot be transmitted in both directions at the same time, but it is possible after an interval of time.

(c) Full-duplex communication

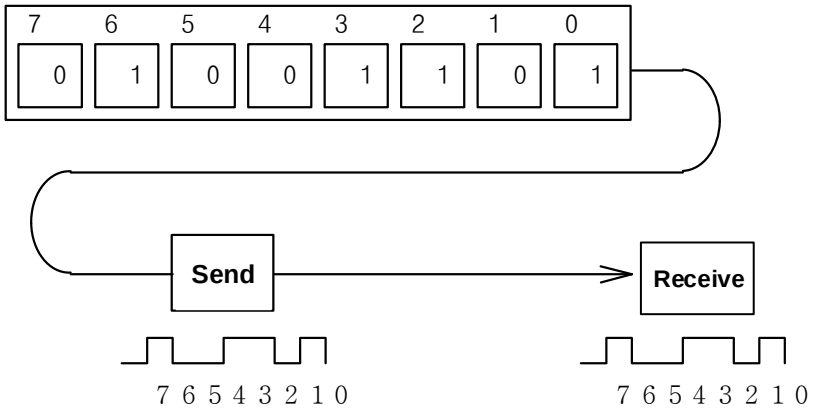
Two cables are used in this communication method, so information can be transmitted and received at the same time.

(2) Transmission method

The transmission method can be classified into two methods as follows by considering the speed, stability and economic feasibility when transmitting data as a binary value.

(a) Serial transmission

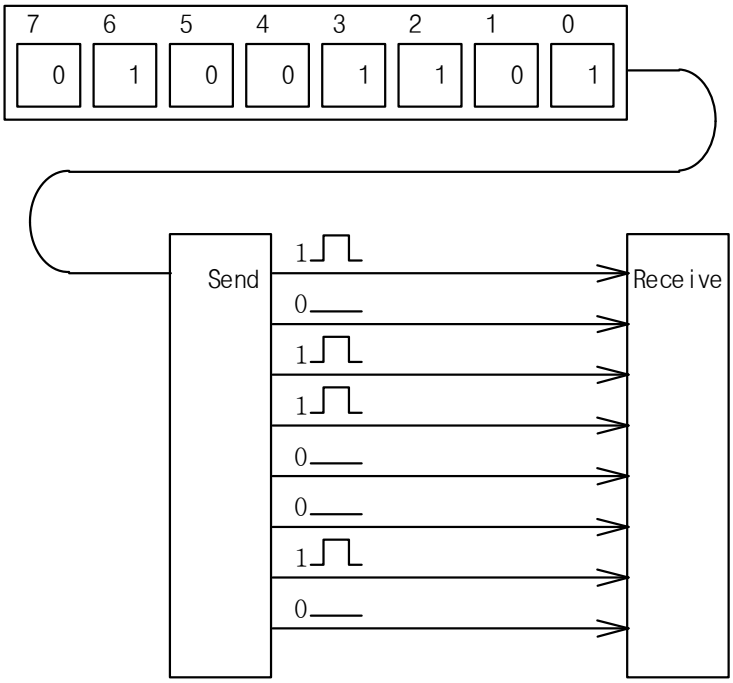
This is the method to transmit data by 1 bit through one cable. The transmission speed is slow, but the installation cost is low and software becomes simple.



RS-232C, RS-422 and RS-485 correspond to this transmission method.

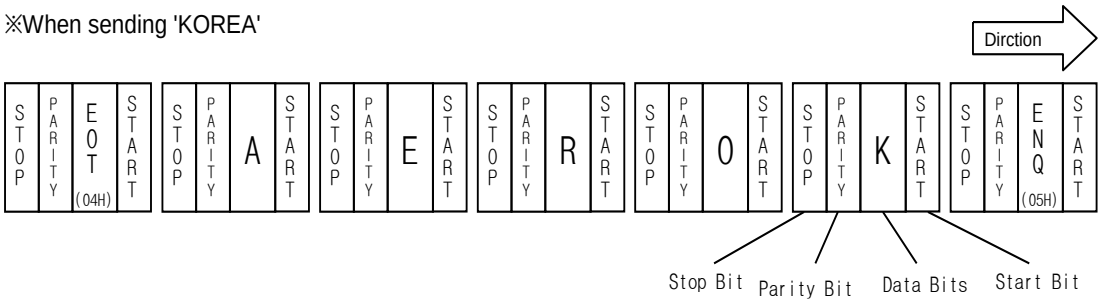
(b) Parallel transmission

This is the method to transmit data by 1 byte, and the transmission speed is fast and the data accuracy is high, but the installation cost increases significantly as the transmission distance increases. This method is frequently used in printers.



(3) Asynchronous communication

This is the method to synchronize and transmit data by a character during serial transmission. At this time, a sync signal (Clock, etc.) will not be transmitted. Attach the start bit in front of 1 character, send the character code, attach the stop bit at the end and finish.



(4) Protocol

This is the communication rule that prescribes connection method, transmission and reception method to enable smooth exchange of information between computers or a computer and a terminal.

(5) bps (Bits per second) and cps (Characters per second)

bps is the unit that indicates bit number transmitted in 1 second, and cps is the unit that indicates the number of characters transmitted in 1 second. Generally, 1 character is 1 byte (8 bit), so cps is the number of bytes that can be transmitted in one second.

(6) Node

This term indicates the connection joint of data in the network tree structure, and the network is configured with numerous nodes. It is also expressed as the station address.

(7) Packet

This is the compound word of the package which indicates small parcel and the bucket which indicates mass, and transmission data id divided by a predefined length and header which indicates the opposing address (station address, etc.).

(8) Port

This indicates a part of data processing equipment that receives or sends data in data communication, and in Cnet serial communication, it refers to the RS-232C or RS-422 ports.

(9) RS-232C

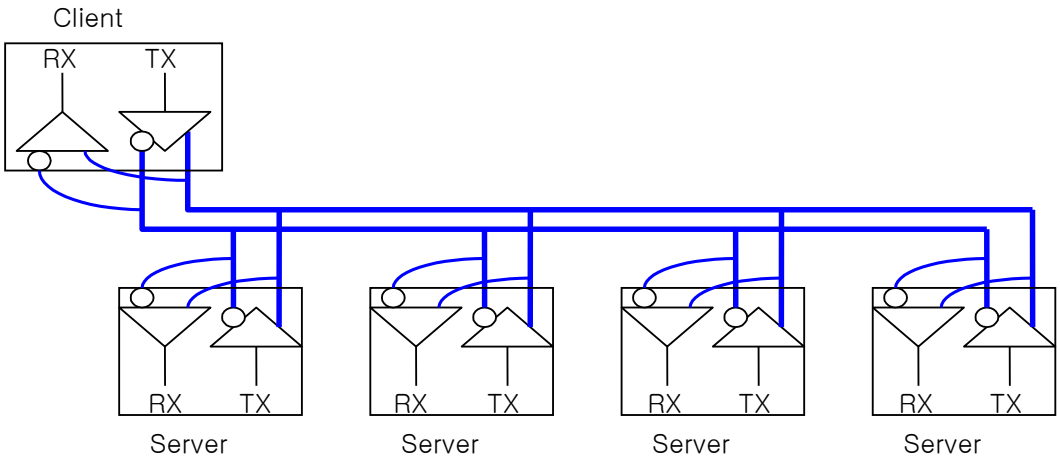
This is the interface for connecting a modem and a terminal, or a modem and a computer, and these are the specifications of serial communication established by EIA according to the CCITT's recommendation. It is used also for direct connection using a null modem in addition to the modem connection. It has disadvantages, including that the transmission distance is short and only 1 to 1 communication is possible. The specifications that improved such disadvantages are RS-422 and RS-485.

(10) RS-422/RS-485

RS-422/RS-485 is one of serial transmission specifications, and the transmission distance is longer than that of RS-232C, and 1 to N connection is available. However, there is a difference in that RS-422 carries out full-duplex communication since it uses four signal lines including TX(+), TX(-), RX(+) and RX(-), and RS-485 carries out half-duplex communication since it uses two signal lines including (+) and (-).

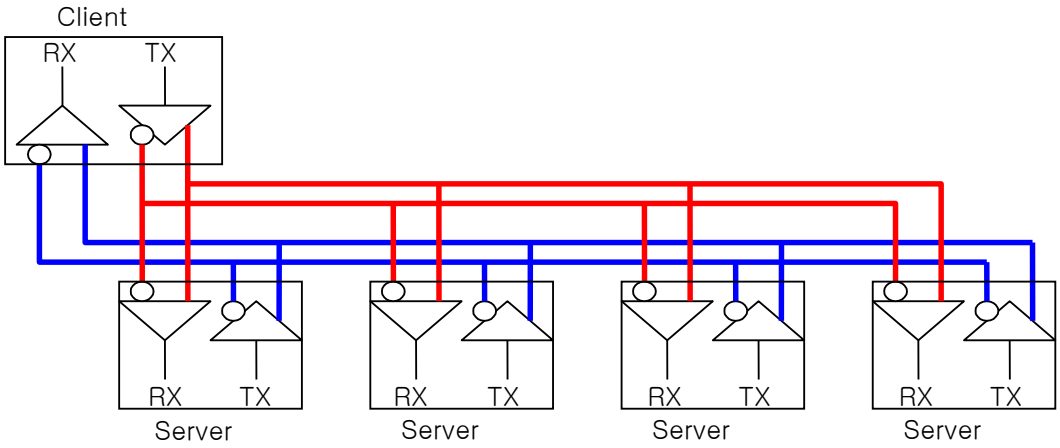
(11) Half-duplex communication

This is the communication method in which bidirectional communication is available, but transmission and reception cannot be carried out at the same time. The RS-485 method falls under this communication method. Since transmission and reception are carried out using one signal line, it is frequently used for the multi-drop communication method. If a number of stations transmit at the same time, data may conflict, causing a data loss, so the transmissions should be carried out by one station at a time. The following figure shows an example of configuration in half-duplex communication method. The transmission and reception terminals of each station are connected to each other and they can communicate with each other through one line, so the multi server function can be used.



(12) Full-duplex communication

This is the communication method that can carry out transmission and reception in both directions at the same time, and RS-232C and RS-422 fall under this method. The transmission line and the reception line are separated so that transmission and reception can be carried out at the same time without data conflict. The following figure shows an example of configuration in the full-duplex communication method. The transmission terminal of the server station is connected to the client station and the reception terminal of the server station is connected to the transmission terminal of the client station, so the server stations cannot communicate with each other. Therefore, the multi server function cannot be used.

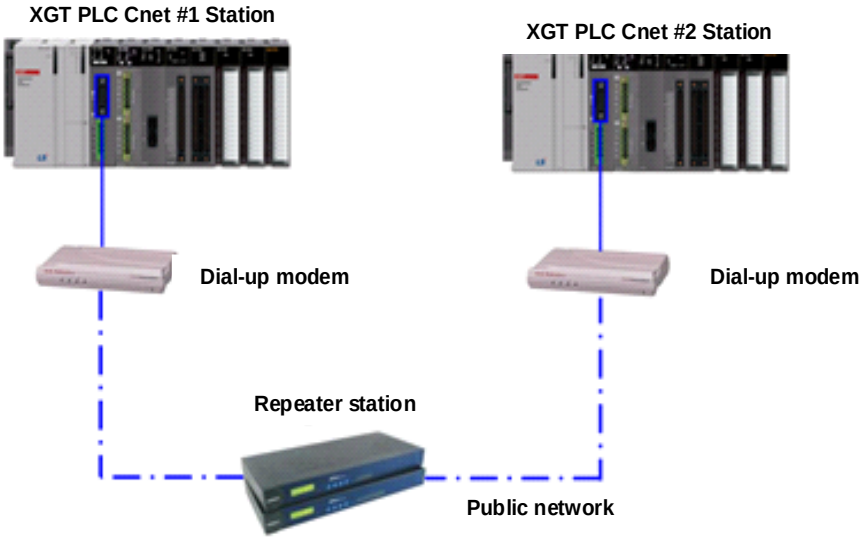


(13) BCC(Block Check Character)

In serial transmission, an incorrect signal may be delivered since the communication line is affected by noise, so the reception side needs a method in order to detect an error. BCC is the character added to allow the reception side to judge whether the received signal is normal or not. The reception side can calculate BCC by itself using the data received by the front terminal of BCC and check for an abnormality by comparing it with the received BCC.

(14) XG5000 modem function

This function allows PLC to carry out writing a program, reading/writing a user program, debugging and monitoring remotely using XG5000 in the network system connected to the Cnet I/F module. This function can be used conveniently for controlling a PLC which is remote using the modem.



* XG5000: This is the programming software tool for XGT PLC.

2. List of flags

2.1 List of system flags (F)

Word/double word	Bit	Variable	Function	Description
F0000	-	_SYS_STATE	Mode and state	Display PLC mode and operation state.
	F00000	_RUN	RUN	RUN status.
	F00001	_STOP	STOP	Stop state.
	F00002	_ERROR	ERROR	Error status.
	F00003	_DEBUG	DEBUG	Debug state.
	F00004	_LOCAL_CON	Local control	Local control mode.
	F00005	_MODBUS_CON	Modbus mode	Modbus control mode.
	F00006	_REMOTE_CON	Remote mode	Remote control mode.
	F00008	_RUN_EDIT_ST	Edit during RUN	Downloading the editing program during RUN.
	F00009	_RUN_EDIT_CHK	Edit during RUN	Internal edit processing during RUN.
	F0000A	_RUN_EDIT_DONE	Edit done during RUN	Edit done during RUN.
	F0000B	_RUN_EDIT_END	Edit done during RUN	Edit done during RUN.
	F0000C	_CMOD_KEY	Operation mode	The operation mode has been changed by key.
	F0000D	_CMOD_LPADT	Operation mode	Operation mode changed by local PADT.
	F0000E	_CMOD_RPADT	Operation mode	Operation mode changed by remote PADT.
	F0000F	_CMOD_RLINK	Operation mode	Operation mode changed by remote communication module.
	F00010	_FORCE_IN	Forced input	Forced input state.
	F00011	_FORCE_OUT	Forced output	Forced output state.
	F00012	_SKIP_ON	I/O SKIP	I / O SKIP is running.
	F00013	_EMASK_ON	Error mask	Error mask is running.
	F00014	_MON_ON	Monitor	The monitor is running.
	F00015	_USTOP_ON	STOP	Stopped by stop function.
	F00016	_ESTOP_ON	ESTOP	Stopped by EStop function.
	F00017	_CONPILE_mode	Compiling	Compiling is in progress.
	F00018	_INIT_RUN	Initializing	Initialization task is running.
	F0001C	_PB1	Program code 1	Program code 1 is selected.
	F0001D	_PB2	Program code 2	Program code 2 is selected.
	F0001E	_CB1	Compile code 1	Compilation code 1 is selected.
	F0001F	_CB2	Compile code 2	Compilation code 2 is selected.

Word/double word	Bit	Variable	Function	Description
F0002	-	_CNF_ER	System error	Reports the status of a system failure.
	F00020	_CPU_ER	CPU error	There is an error in the CPU configuration.
	F00021	_IO_TYER	Module type error	The module type does not match.
	F00022	_IO_DEER	Module detachment error	The module has been detached.
	F00023	_FUSE_ER	Fuse error	The fuse has blown.
	F00024	_IO_RWER	Module I/O error	A problem occurred in the module I/O.
	F00025	_IP_IFER	Module interface error	There was a problem with the special / communication module interface.
	F00026	_ANNUM_ER	External device malfunction	A fault has been detected in the external device.
	F00028	_BPRM_ER	Basic parameter	There is a basic parameter error.
	F00029	_IOPRM_ER	IO parameter	There is a I/O configuration parameter error.
	F0002A	_SPPRM_ER	Special module parameter	The special module parameter is abnormal.
	F0002B	_CPPRM_ER	Communication module parameter	The communication module parameter is abnormal.
	F0002C	_PGM_ER	Program error	There is an error in the program.
	F0002D	_CODE_ER	Code error	There is an error in the program code.
	F0002E	_SWDT_ER	System watchdog	System watchdog worked.
	F0002F	_BASE_POWER_ER	Power error	The base power supply is error.
	F00030	_WDT_ER	Scan watchdog	The scan watchdog worked.
F0004	-	_CNF_WAR	System warning	Reports the minor error status of the system.
	F00040	_RTC_ER	RTC error	RTC data error.
	F00041	_DBCK_ER	Backup error	There was a problem with the data backup.
	F00042	_HBCK_ER	Restart error	Hot restart is unavailable.
	F00043	_ABSD_ER	Abnormal operation stop	It stops due to abnormal operation.
	F00044	_TASK_ER	Task conflict	The task is in conflict.
	F00045	_BAT_ER	Battery error	Battery condition is abnormal.
	F00046	_ANNUM_WAR	External device malfunction	An external device minor error has been detected.
	F00047	_LOG_FULL	Memory full	Log memory is full.
	F00048	_HS_WAR1	High speed link 1	High speed link - parameter 1 or more
	F00049	_HS_WAR2	High speed link 2	High speed link– parameter 2 or more
	F0004A	_HS_WAR3	High speed link 3	High speed link– parameter 3 or more
	F0004B	_HS_WAR4	High speed link 4	High speed link– parameter 4 or more
	F0004C	_HS_WAR5	High speed link 5	High speed link– parameter 5 or more
	F0004D	_HS_WAR6	High speed link 6	High speed link– parameter 6 or more
	F0004E	_HS_WAR7	High speed link 7	High speed link– parameter 7 or more

Word/double word	Bit	Variable	Function	Description
F0004	F0004F	_HS_WAR8	High speed link 8	High speed link– parameter 8 or more
	F00050	_HS_WAR9	High speed link 9	High speed link– parameter 9 or more
	F00051	_HS_WAR10	High speed link 10	High speed link - parameter 10 or more
	F00052	_HS_WAR11	High speed link 11	High speed link - parameter 11 or more
	F00053	_HS_WAR12	High speed link 12	High speed link - parameter 12 or more
	F00054	_P2P_WAR1	P2P parameter 1	P2P - parameter 1 error
	F00055	_P2P_WAR2	P2P parameter 2	P2P– parameter 2 error
	F00056	_P2P_WAR3	P2P parameter 3	P2P– parameter 3 error
	F00057	_P2P_WAR4	P2P parameter 4	P2P– parameter 4 error
	F00058	_P2P_WAR5	P2P parameter 5	P2P– parameter 5 error
	F00059	_P2P_WAR6	P2P parameter 6	P2P– parameter 6 error
	F0005A	_P2P_WAR7	P2P parameter 7	P2P– parameter 7 error
	F0005B	_P2P_WAR8	P2P parameter 8	P2P– parameter 8 error
	F0005C	_CONSTANT_ER	Constant error	Constant error
F0009	-	_USER_F	User contact point	Timer that can be used by the user.
	F00090	_T20MS	20ms	Clock of 20ms cycle.
	F00091	_T100MS	100ms	Clock of 100ms cycle.
	F00092	_T200MS	200ms	Clock of 200ms cycle.
	F00093	_T1S	1s	Clock of 1s cycle.
	F00094	_T2S	2s	Clock of 2s cycle.
	F00095	_T10S	10s	Clock of 10s cycle.
	F00096	_T20S	20s	Clock of 20s cycle.
	F00097	_T60S	60s	Clock of 60s cycle.
	F00099	_ON	Always On	This bit is always On.
	F0009A	_OFF	Always Off	This bit is always Off.
	F0009B	_1ON	1scan On	Only the first scan is On.
	F0009C	_1OFF	1scan Off	Bit with only first scan Off state.
	F0009D	_STOG	Reversal	Reverses every scan.
F0010	-	_USER_CLK	User CLOCK	Customizable Clock.
	F00100	_USR_CLK0	Repeat specified scan	Specified scan On/Off Clock 0
	F00101	_USR_CLK1	Repeat specified scan	Specified scan On/Off Clock 1
	F00102	_USR_CLK2	Repeat specified scan	Specified scan On/Off Clock 2
	F00103	_USR_CLK3	Repeat specified scan	Specified scan On/Off Clock 3
	F00104	_USR_CLK4	Repeat specified scan	Specified scan On/Off Clock 4
	F00105	_USR_CLK5	Repeat specified scan	Specified scan On/Off Clock 5
	F00106	_USR_CLK6	Repeat specified scan	Specified scan On/Off Clock 6
	F00107	_USR_CLK7	Repeat specified scan	Specified scan On/Off Clock 7

Word/double word	Bit	Variable	Function	Description
F0011	-	_LOGIC_RESULT	Logic result	Indicates the logical result.
	F00110	_LER	Operation error	On operation error On during 1 scan
	F00111	_ZERO	Zero flag	If the operation result is On.
	F00112	_CARRY	Carry flag	On when a carry occurs during operation
	F00113	_ALL_OFF	All output OFF	On when all outputs are Off
	F00115	_LER_LATCH	Operation error latch	Continue On when operation error occurs
F0012	-	_CMP_RESULT	Comparison result	Indicates the comparison result.
	F00120	_LT	LT flag	If “less than” to On
	F00121	_LTE	LTE flag	If “less than or equal” to On
	F00122	_EQU	EQU flag	If “equal” to On
	F00123	_GT	GT flag	If “larger than” to On
	F00124	_GTE	GTE flag	If “If “larger than or equal” to On
	F00125	_NEQ	NEQ flag	If it is “not equal” to On
F0013	-	_AC_F_CNT	Instantaneous interruption	Indicates the number of instantaneous interruption occurrences.
F0014	-	_FALS_NUM	FALS number	Displays the number of FALS.
F0015	-	_PUTGET_ERR0	PUT/GET error 0	Main base PUT / GET error
F0016	-	_PUTGET_ERR1	PUT/GET error 1	Extension base 1-stage PUT/GET error
F0017	-	_PUTGET_ERR2	PUT/GET error 2	Extension base 2-stage PUT/GET error
F0018	-	_PUTGET_ERR3	PUT/GET error 3	Extension base 3-stage PUT / GET error.
F0019	-	_PUTGET_ERR4	PUT/GET error 4	Extension base 4-stage PUT/GET error
F0020	-	_PUTGET_ERR5	PUT/GET error 5	Extension base 5-stage PUT/GET error
F0021	-	_PUTGET_ERR6	PUT/GET error 6	Extension base 6-stage PUT/GET error
F0022	-	_PUTGET_ERR7	PUT/GET error 7	
F0023	-	_PUTGET_NDR0	PUT/GET complete 0	Main base PUT / GET completed
F0024	-	_PUTGET_NDR1	PUT/GET complete 1	Extension base 1-stage PUT/GET completion
F0025	-	_PUTGET_NDR2	PUT/GET complete 2	Extension base 2-stage PUT/GET completion
F0026	-	_PUTGET_NDR3	PUT/GET complete 3	Extension base 3-stage PUT/GET completion
F0027	-	_PUTGET_NDR4	PUT/GET complete 4	Extension base 4-stage PUT/GET completion
F0028	-	_PUTGET_NDR5	PUT/GET complete 5	Extention base 5-stage PUT/GET completion
F0029	-	_PUTGET_NDR6	PUT/GET complete 6	Extension base 6-stage PUT/GET completion
F0030	-	_PUTGET_NDR7	PUT/GET complete 7	
F0044	-	_CPU_TYPE	CPU type	It informs the CPU type information.
F0045	-	_CPU_VER	CPU version	Indicates CPU version.
F0046	-	_OS_VER	OS version	Indicates OS version.
F0048	-	_OS_DATE	OS date	Indicates the OS distribution date.

Word/double	Bit	Variable	Function	Description

word				
F0050	-	_SCAN_MAX	Maximum scan time	Indicates maximum scan time.
F0051	-	_SCAN_MIN	Minimum scan time	Indicates minimum scan time.
F0052	-	_SCAN_CUR	Current scan time	Indicates current scan time.
F0053	-	_MON_YEAR	Month / Year	Indicates month and year data of PLC.
F0054	-	_TIME_DAY	Time / Day	Indicates time and day data of PLC.
F0055	-	_SEC_MIN	Second / Minute	Indicates second and minute data of PLC.
F0056	-	_HUND_WK	Hundred years / Weekday	Indicates hundred years and weekday data of PLC.
F0057	-	_FPU_INFO	FPU operation result	Represents floating-point operation result.
	F00570	_FPU_LFLAG_I	Incorrect error latch	Latch on inaccurate error.
	F00571	_FPU_LFLAG_U	Underflow latch	Latch when underflow occurs.
	F00572	_FPU_LFLAG_O	Overflow latch	Latch when overflow occurs.
	F00573	_FPU_LFLAG_Z	Zero divide latch	Latch on zero divide.
	F00574	_FPU_LFLAG_V	Invalid operation latch	Latch on invalid operation.
	F0057A	_FPU_FLAG_I	Inaccurate error	Reports an inaccurate error occurrence.
	F0057B	_FPU_FLAG_U	Underflow	Reports underflow occurrences.
	F0057C	_FPU_FLAG_O	Overflow	Reports overflow occurrences.
	F0057D	_FPU_FLAG_Z	Divide by zero	It reports when the divide is zero.
	F0057E	_FPU_FLAG_V	Invalid operation	Report on invalid operation.
	F0057F	_FPU_FLAG_E	Input of irregular value	Reports when input of irregular value.
F0058	-	_ERR_STEP	Error step	Saves error step.
F0060	-	_REF_COUNT	Refresh	Increase when module Refresh.
F0062	-	_REF_OK_CNT	Refresh OK	Increase when module Refresh is normal.
F0064	-	_REF_NG_CNT	Refresh NG	Increase when module refresh is abnormal
F0066	-	_REF_LIM_CNT	Refresh LIMIT	Increase when module refresh is abnormal (Time Out)
F0068	-	_REF_ERR_CNT	Refresh ERROR	Increase when module refresh is abnormal
F0070	-	_MOD_RD_ERR_CNT	Module READ ERROR	It increases when the module 1 word is read abnormally.
F0072	-	_MOD_WR_ERR_CNT	Module WRITE ERROR	It increases when the module 1 word is write abnormally.
F0074	-	_CA_CNT	Block service	Increase in module's block data service
F0076	-	_CA_LIM_CNT	Block service LIMIT	Increase in block data abnormal service
F0078	-	_CA_ERR_CNT	Block service ERROR	Increase in block data abnormal service
F0080	-	_BUF_FULL_CNT	Buffer FULL	Increase when CPU internal buffer is full.
F0082	-	_PUT_CNT	PUT count	It increases when performing PUT.
F0084	-	_GET_CNT	GET count	It increases when performing GET.
F0086	-	_KEY	Current key	Indicates the current state of the local key.
F0088	-	_KEY_PREV	Previous key	Indicates the previous state of the local key.

Word/double word	Bit	Variable	Function	Description
F0090	-	_IO_TYER_N	Mismatch slot	Module type mismatch slot number display
F0091	-	_IO_DEER_N	Detached slot	Display the slot number where the module has been detached
F0092	-	_FUSE_ER_N	Fuse disconnection slot	Indicates the slot number where the fuse blows
F0093	-	_IO_RWER_N	RW error slot	Module read / write error slot number display
F0094	-	_IP_IFER_N	IF error slot	Module interface error slot number display
F0096	-	_IO_TYER0	Module type 0 error	Main base module type error.
F0097	-	_IO_TYER1	Module type 1 error	Extension base 1-stage module type error
F0098	-	_IO_TYER2	Module type 2 error	Extension base 2-stage module type error
F0099	-	_IO_TYER3	Module type 3 error	Extension base 3-stage module type error
F0100	-	_IO_TYER4	Module type 4 error	Extension base 4-stage module type error
F0101	-	_IO_TYER5	Module type 5 error	Extension base 5-stage module type error
F0102	-	_IO_TYER6	Module type 6 error	Extension base 6-stage module type error
F0103	-	_IO_TYER7	Module type 7 error	Extension base 7-stage module type error
F0104	-	_IO_DEER0	Module detachment 0 error	Main base module Detach error.
F0105	-	_IO_DEER1	Module detachment 1 error	Extension base 1-stage module detach error.
F0106	-	_IO_DEER2	Module detachment 2 error	Extension base 2-stage module detach error.
F0107	-	_IO_DEER3	Module detachment 3 error	Extension base 3-stage module detach error.
F0108	-	_IO_DEER4	Module detachment 4 error	Extension base 4-stage module detach error.
F0109	-	_IO_DEER5	Module detachment 5 error	Extension base 5-stage module detach error.
F0110	-	_IO_DEER6	Module detachment 6 error	Extension base 6-stage module detach error.
F0111	-	_IO_DEER7	Module detachment 7 error	Extension base 7-stage module detach error.
F0112	-	_FUSE_ER0	Fuse disconnection 0 error	Main base fuse disconnection error
F0113	-	_FUSE_ER1	Fuse disconnection 1 error	Extension base 1-stage fuse disconnection error
F0114	-	_FUSE_ER2	Fuse disconnection 2 error	Extension base 2-stage fuse disconnection error
F0115	-	_FUSE_ER3	Fuse disconnection 3 error	Extension base 3-stage fuse disconnection error
F0116	-	_FUSE_ER4	Fuse disconnection 4 error	Extension base 4-stage fuse disconnection error
F0117	-	_FUSE_ER5	Fuse disconnection 5 error	Extension base 5-stage fuse disconnection error
F0118	-	_FUSE_ER6	Fuse disconnection 6 error	Extension base 6-stage fuse disconnection error
F0119	-	_FUSE_ER7	Fuse disconnection 7 error	Extension base 7-stage fuse disconnection error
F0120	-	_IO_RWER0	Module RW 0 error	Main base module read / write error
F0121	-	_IO_RWER1	Module RW 1 error	Expansion base 1-stage module read / write error

Word/double	Bit	Variable	Function	Description

word				
F0122	-	_IO_RWER2	Module RW 2 error	Extension base 2-stage module read/ write error.
F0123	-	_IO_RWER3	Module RW 3 error	Extension base 3-stage module read/ write error.
F0124	-	_IO_RWER4	Module RW 4 error	Extension base 4-stage module read/ write error.
F0125	-	_IO_RWER5	Module RW 5 error	Extension base 5-stage module read/ write error.
F0126	-	_IO_RWER6	Module RW 6 error	Extension base 6-stage module read/ write error.
F0127	-	_IO_RWER7	Module RW 7 error	Extension base 7-stage module read/ write error.
F0128	-	_IO_IFER_0	Module IF 0 error	Main base module interface error.
F0129	-	_IO_IFER_1	Module IF 1 error	Extension base 1-stage module interface error.
F0130	-	_IO_IFER_2	Module IF 2 error	Extension base 2-stage module interface error.
F0131	-	_IO_IFER_3	Module IF 3 error	Extension base 3-stage module interface error.
F0132	-	_IO_IFER_4	Module IF 4 error	Extension base 4-stage module interface error.
F0133	-	_IO_IFER_5	Module IF 5 error	Extension base 5-stage module interface error.
F0134	-	_IO_IFER_6	Module IF 6 error	Extension base 6-stage module interface error.
F0135	-	_IO_IFER_7	Module IF 7 error	Extension base 7-stage module interface error.
F0136	-	_RTC_DATE	RTC date	Displays the current date .
F0137	-	_RTC_WEEK	RTC weekday	Displays the current day of week
F0138	-	_RTC_TOD	RTC time	Current time in RTC (ms unit)
F0140	-	_AC_FAIL_CNT	Save the number of power off.	Saves the number of times the power cutoff.
F0142	-	_ERR_HIS_CNT	Save the number of error count.	Saves the number of times an error occurred.
F0144	-	_MOD_HIS_CNT	Save the number of mode change.	Saves the number of times the mode change.
F0146	-	_SYS_HIS_CNT	History occurrence count	Saves the number of system history occurrences.
F0148	-	_LOG_ROTATE	Log rotate	Saves log locate information.
F0150	-	_BASE_INFO0	Slot information 0	Main base slot information
F0151	-	_BASE_INFO1	Slot information 1	Extension base 1-slot information
F0152	-	_BASE_INFO2	Slot information 2	Extension base 2-slot information
F0153	-	_BASE_INFO3	Slot information 3	Extension base 3-slot information
F0154	-	_BASE_INFO4	Slot information 4	Extension base 4-slot information
F0155	-	_BASE_INFO5	Slot information 5	Extension base 5-slot information
F0156	-	_BASE_INFO6	Slot information 6	Extension base 6-slot information
F0157	-	_BASE_INFO7	Slot information 7	Extension base 7-slot information
F0158	-	_RBANK_NUM	Block number in use	Block number which is currently being used
F0159	-	_RBLOCK_STATE	Flash state	Flash block state
F0160	-	_RBLOCK_RD_FLAG	Flash read	ON when reading data of flash N block

Word/do	Bit	Variable	Function	Description

uble word				
F0162	-	_RBLOCK_WR_FLAG	Write on flash	On when writing flash N block data
F0164	-	_RBLOCK_ER_FLAG	Flash error	An error occurred during flash N block service.
F1024	-	_USER_WRITE_F	Available contact point	Contact point available in program.
	F10240	_RTC_WR	RTC RW	Writing and reading data in RTC
	F10241	_SCAN_WR	Scan WR	Initializing the value of scan.
	F10242	_CHK_ANC_ERR	External critical error request	Request of fatal error detection from external device
	F10243	_CHK_ANC_WAR	External light error request	Request of minor error detection from external device
F1025	-	_USER_STAUS_F	User contact point	User contact point
	F10250	_INIT_DONE	Initialization completed	Indicates completion of initialization task
F1026	-	_ANC_ERR	External critical error information	Displays fatal error information of external devices
F1027	-	_ANC_WAR	External light error warning	Displays minor error information of external devices
F1034	-	_MON_YEAR_DT	Month / Year	Clock information data (month / year)
F1035	-	_TIME_DAY_DT	Time / Day	Clock information data (hour/day)
F1036	-	_SEC_MIN_DT	Second / Minute	Clock information data (second/minute)
F1037	-	_HUND_WK_DT	Hundred years / Weekday	Clock information data (hundred year/week)

2.2 List of communication relay (L)

(1) List of communication flags according to high speed link number: High speed link number 1~12

Number	Keyword	Type	Content	Description
L000000	_HS1_RLINK	Bit	All stations of high speed link parameter No. 1 operate normally.	Indicates that all stations operate normally as per the parameter set from the high speed link. It becomes On in the following conditions. 1. When all stations set for the parameter are in RUN mode and there is no error 2. When all data blocks set for the parameter communicate normally 3. When the parameter set for each station set for the parameter communicates normally When Run_link becomes On, it will be maintained until it is stopped using link disable.
L000001	_HS1_LTRBL	Bit	Indicates abnormal state after _HS1RLINK ON	This flag becomes On when the communication status between the station set for the parameter and the data block while _HSmRLINK flag is On. 1. If a station set for the parameter is not in RUN mode 2. If a station set for the parameter has an error 3. If the communication status of the data block set for the parameter is unstable Link trouble becomes On when a condition falling under 1,2 and 3 above occurs, and it becomes Off when the condition returns to normal.
L000020 ~ L00009F	_HS1_STATE[k] (k=000~127)	Bit Array	Indicates the overall status of No. k block in high speed link parameter No. 1	Indicates the overall status of communication information for each data block of the set parameter. HS1STATE[k]=HS1MOD[k]&_HS1TRX[k]&(~_HSmERR[k])
L000100 ~ L00017F	_HS1_MOD[k] (k=000~127)	Bit Array	Run operation mode of No. K block station in high speed link parameter No. 1	Indicates the operation mode of the station set for k data block of the parameter.
L000180 ~ L00025F	_HS1_TRX[k] (k=000~127)	Bit Array	Display of normal communication with No. k block station in high speed link parameter No. 1	Indicates whether the communication status of k data block in the parameter is carried out smoothly, as it is set, or not.
L000260 ~ L00033F	_HS1_ERR[k] (k=000~127)	Bit Array	Operation error mode of No. K block station in high speed link parameter No. 1	Indicates whether an error occurred in the communication status of k data block in the parameter or not.
L000340 ~ L00041F	_HS1_SETBLOCK [k=000~127]	Bit Array	Display of No. k block setting in high speed link parameter No. 1	Indicates the k data block setting status in the parameter.

k is the block number and the information of 128 blocks from 000 to 127 is shown as a total of 8 words, including 1 word for every 16 blocks.
For example, in case of mode information (_HS1MOD), the information of block 0 to block 15 is shown in L00010, and the information of block 16~31, 32~47, 48~63, 64~79, 80~95, 96~111 and 112~127 is shown in L00011, L00012, L00013, L00014, L00015, L00016 and L00017 respectively. Therefore, the mode information of block number 55 is shown in L000137.

(2) Relationship between the high speed link and L device area

High speed link number	Address in L area	Note
2	L000500~L00099F	Flag address of another high speed link station address can be calculated using the following calculation formula by comparing with the case of high speed link 1. ∗Calculation formula:Address in L area = L000000 + 500 x (high speed link number – 1) If a high speed flag is used for the program and monitoring, use the flag map registered to XG5000.
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	

(3) List of communication flags according to P2P service setting: P2P parameter: 1~8, P2P block: 0~63

No.	Keyword	Type	Content	Description
L006250	_P2P1_NDR00	Bit	P2P parameter No.1 block 0 service normal completion	P2P parameter No.1 block 0 service has been completed normally
L006251	_P2P1_ERR00	Bit	P2P parameter No. 1 completed No. 00 block service abnormally	P2P parameter No. 1 has not completed No. 0 block service normally.
L00626	_P2P1_STATUS 00	Word	Error code in the case where P2P parameter No. 1 completed No. 00 block service abnormally	Displays the error code in the case where P2P parameter No. 1 has not completed No. 0 block service normally.
L00627	_P2P1_SVCCN T00	Double word	Number of No. 00 block service normal execution by P2P parameter No. 1	Displays the number of No. 0 block service executed normally by P2P parameter No. 1.
L00629	_P2P1_ERRCN T00	Double word	Number of No. 00 block service abnormal execution by P2P parameter No. 1	Displays the number of No. 0 block service not executed normally by P2P parameter No. 1.
L006310	_P2P1_NDR01	Bit	P2P parameter No. 1 completed No. 01 block service normally	P2P parameter No. 1 has completed No. 1 block service normally.
L006311	_P2P1_ERR01	Bit	P2P parameter No. 1 completed No. 01 block service abnormally	P2P parameter No. 1 has not completed No. 1 block service normally.
L00632	_P2P1_STATUS 01	Word	Error code in the case where P2P parameter No. 1 completed No. 01 block service abnormally	Displays the error code in the case where P2P parameter No. 1 has not completed No. 1 block service normally.
L00633	_P2P1_SVCCN T01	Double word	Number of No. 01 block service normal execution by P2P parameter No. 1	Displays the number of No. 1 block service executed normally by P2P parameter No. 1.
L00635	_P2P1_ERRCN T01	Double word	Number of No. 01 block service abnormal execution by P2P parameter No. 1	Displays the number of No. 1 block service not executed normally by P2P parameter No. 1.

2.3 List of link devices (N)

This device specifies the size and contents of P2P number and block number.
P2P number: 1~8, P2P block: 0~63

No.	Keyword	Type	Content	Description
N00000	_P1B00SN	Word	P2P parameter No. 1 block No. 0 destination station number	Save the destination station number Of block No. 0 of P2P parameter 1. If the destination station address is used in XG5000, it can be modified during Run using P2PSN command.
N00001 ~ N00004	_P1B00RD1	Device structure	P2P parameter No. 1 block No. 0 read area device 1	Save the read area device 1 Of block No. 0 of P2P parameter 1.
N00005	_P1B00RS1	Word	P2P parameter No.1 block No.0 read area size 1	Saves the area size 1 to be read in block No.0 of P2P parameter No. 1.
N00006 ~ N00009	_P1B00RD2	Device structure	P2P parameter No.1 block No.0 read area device 2	Saves the read area device 2 in block No.0 of P2P parameter No. 1.
N00010	_P1B00RS2	Word	P2P parameter No.1 block No.0 read area size 2	Saves the read area size 2 in block No.0 of P2P parameter No. 1.
N00011 ~ N00014	_P1B00RD3	Device structure	P2P parameter No.1 block No.0 read area device 3	Saves the read area device 3 in block No.0 of P2P parameter No. 1.
N00015	_P1B00RS3	Word	P2P parameter No.1 block No.0 read area size 3	Saves the read area size 3 in block No.0 of P2P parameter No. 1.
N00016 ~ N00019	_P1B00RD4	Device structure	P2P parameter No.1 block No.0 read area device 4	Saves the read area device 4 in block No.0 of P2P parameter No. 1.
N00020	_P1B00RS4	Word	P2P parameter No.1 block No.0 read area size 4	Saves the read area size 4 in block No.0 of P2P parameter No. 1.
N00021 ~ N00024	_P1B00WD1	Device structure	P2P parameter No.1 block No.0 save area device 1	Saves the save area device 1 in block No.0 of P2P parameter No. 1.
N00025	_P1B00WS1	Word	P2P parameter No.1 block No.0 save area size 1	Saves the save area size 1 in block No.0 of P2P parameter No. 1.
N00026 ~ N00029	_P1B00WD2	Device structure	P2P parameter No.1 block No.0 save area device 2	Saves the save area device 2 in block No.0 of P2P parameter No. 1.
N00030	_P1B00WS2	Word	P2P parameter No.1 block No.0 save area size 2	Saves the save area size 2 in block No.0 of P2P parameter No. 1.
N00031 ~ N00034	_P1B00WD3	Device structure	P2P parameter No.1 block No.0 save area device 3	Saves the save area device 3 in block No.0 of P2P parameter No. 1.
N00035	_P1B00WS3	Word	P2P parameter No.1 block No.0 save area size 3	Saves the save area size 3 in block No.0 of P2P parameter No. 1.
N00036 ~ N00039	_P1B00WD4	Device structure	P2P parameter No.1 block No.0 save area device 4	Saves the save area device 4 in block No.0 of P2P parameter No. 1.
N00040	_P1B00WS4	Word	P2P parameter No.1 block No.0 save area size 4	Saves the save area size 4 in block No.0 of P2P parameter No. 1.
N00041	_P1B01SN	Word	P2P parameter No. 1 block No. 1 destination station number	Save destination station number Of block No. 1 of P2P parameter 1. If the destination station address is used in XG5000, it can be modified during Run using P2PSN command.
N00042 ~ N00045	_P1B01RD1	Device structure	P2P parameter No. 1 block No. 1 read area device 1	Saves the read area device 1 in block No.1 of P2P parameter No. 1.
N00046	_P1B01RS1	Word	P2P parameter No.1 block No.0 read area size 1	Saves the read area size 1 in block No.1 of P2P parameter No. 1.

Number	Keyword	Type	Content	Description
N00047 ~ N00050	_P1B01RD2	Device structure	P2P parameter No.1 block No.1 read area device 2	Save the read area device 1 Of block No. 1 of P2P parameter 1.
N00051	_P1B01RS2	Word	P2P parameter No. 1 No. 01 block area to read size 2	Saves the read area size 2 in block No.1 of P2P parameter No. 1.
N00052 ~ N00055	_P1B01RD3	Device structure	P2P parameter No.1 block No.1 read area device 3	Saves the read area device 3 in block No.1 of P2P parameter No. 1.
N00056	_P1B01RS3	Word	P2P parameter No. 1 No. 01 block area to read size 3	Saves size 3 on No. 01 block area to read of P2P parameter No. 1.
N00057 ~ N00060	_P1B01RD4	Device structure	P2P parameter No. 1 No. 01 block area to read device 4	Saves device 4 on No. 01 block area to read of P2P parameter No. 1.
N00061	_P1B01RS4	Word	P2P parameter No. 1 block No. 1 read area size 4	Saves the read area size 4 in block No.1 of P2P parameter No. 1.
N00062 ~ N00065	_P1B01WD1	Device structure	P2P parameter No.1 block No.1 save area device 1	Saves the save area device 1 in block No.1 of P2P parameter No. 1.
N00066	_P1B01WS1	Word	P2P parameter No.1 block No.1 save area size 1	Saves save area size 1 in block No.1 of P2P parameter No. 1.
N00067 N00070	_P1B01WD2	Device structure	P2P parameter No.1 block No.1 save area device 2	Saves save area device 2 in block No.1 of P2P parameter No. 1.
N00071	_P1B01WS2	Word	P2P parameter No.1 block No.1 save area size 1	Saves save area size 2 in block No.1 of P2P parameter No. 1.
N00072 N00075	_P1B01WD3	Device structure	P2P parameter No.1 block No.1 save area device 3	Saves save area device 3 in block No.1 of P2P parameter No. 1.
N00076	_P1B01WS3	Word	P2P parameter No.1 block No.1 save area size 3	Saves save area size 3 in block No.1 of P2P parameter No. 1.
N00077 ~ N00080	_P1B01WD4	Device structure	P2P parameter No.1 block No.1 save area device 4	Saves area device 4 in block No.1 of P2P parameter No. 1.
N00081	_P1B01WS4	Word	P2P parameter No.1 block No.1 save area size 4	Saves save area size 4 in block No.1 of P2P parameter No. 1.

Notes

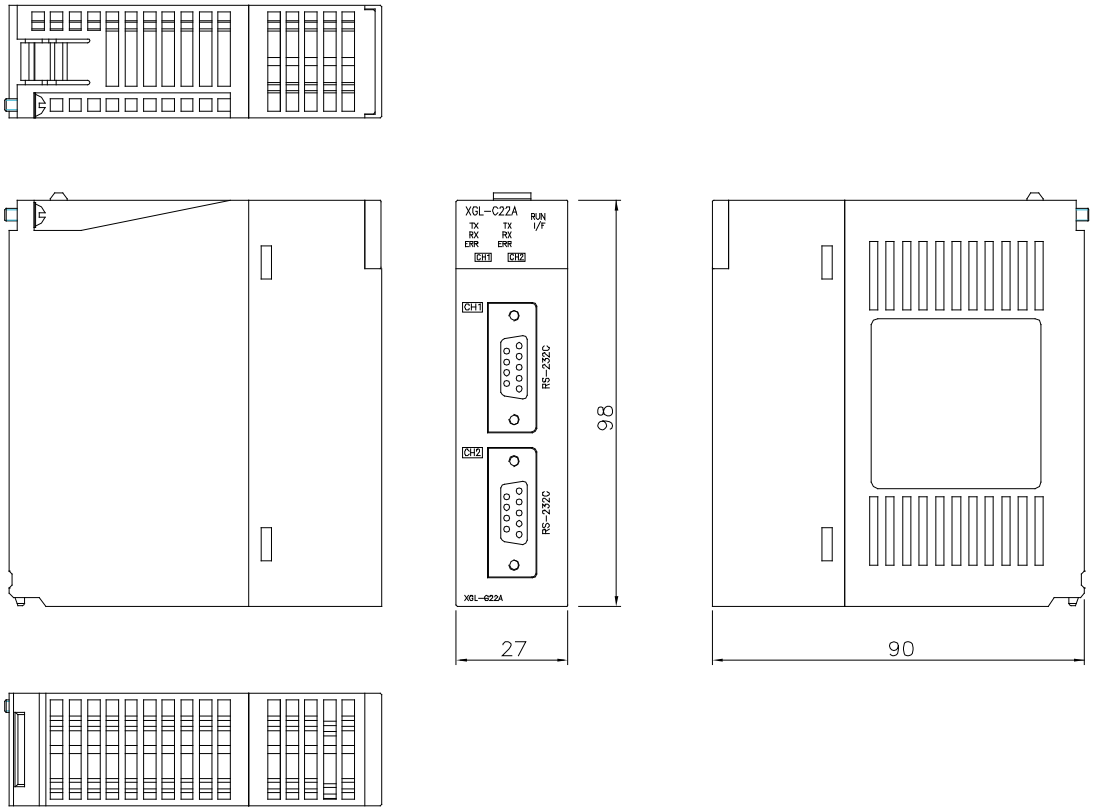
(1) N area will be set automatically when the P2P parameters are set using the XG5000, and it can be edited during RUN using the P2P dedicated command.

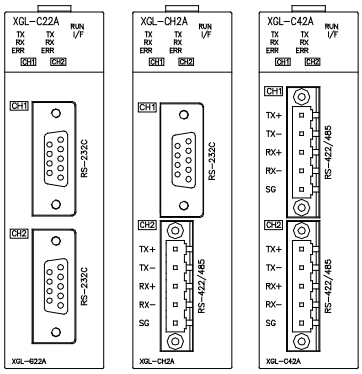
(2) In case of N area, addresses are classified according to the P2P parameter setting number and block index number, so an area which is not used as the P2P service can be used with the internal device.

3. External dimension

(Dimension unit: mm)

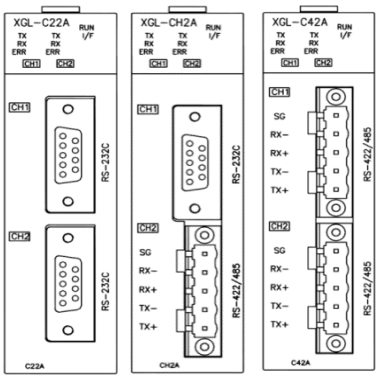
• XGL-C22A/C22B/CH2A/CH2B/C42A/C42B





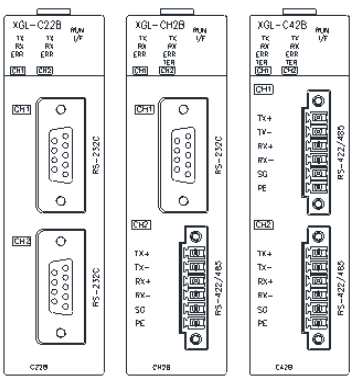
<A type Cnet I/F module>

(H/W below V2.0)



<A type Cnet I/F module>

(H/W V2.0)



<B type Cnet I/F module>

Warranty

1. Warranty Period
   The product you purchased is guaranteed for 36 months from the date of manufacture.

2. Scope of Warranty
   (1) The initial diagnosis of faults is basically conducted by your company. However, upon your request, our company or our service network can undertake this task for a fee. If the cause of the fault lies with our company, this service will be provided free of charge.
   (2) This warranty only applies if the product is used under normal conditions according to the specifications and precautions described in the handling instructions, user manuals, catalogs, and caution labels.
   (3) Even within the free warranty period, the following cases will be subject to paid repairs:
   1) Replacement of consumable and life-limited parts (e.g., relays, fuses, electrolytic capacitors, fans, LCDs, batteries, etc.)
   2) Failures or damages caused by improper storage, handling, negligence, or accidents by the customer
   3) Failures resulting from the customer's hardware or software design
   4) Failures due to modifications without our consent
   (Repairs will be refused, even for a fee, if recognized as modified or repaired outside our company)
   5) Failures that could have been avoided if the customer's equipment, in which our product is incorporated, had safety devices required by legal regulations or common industry standards
   6) Failures that could have been prevented if maintenance and replacement of consumable parts were performed normally according to the handling instructions or user manuals
   7) Failures and damages to the product caused by using connected equipment or inappropriate consumables
   8) Failures caused by external factors such as fire, abnormal voltage, force majeure, and natural disasters such as earthquakes, lightning, salt damage, wind, and flood damage
   9) Failures due to reasons that could not be predicted with the scientific and technical standards at the time of our shipment
   10) Other failures, damages, or defects recognized as the responsibility of your company

Environmental Policy

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

Environmental Management

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

About Disposal

LS ELECTRIC' 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.ls-electric.com

LS ELECTRIC Co., Ltd.

■ Headquarter
LS-ro 127(Hogye-dong) Dongan-gu, Anyang-si, Gyeonggi-Do, 14119, Korea
■ Seoul Office
LS Yongsan Tower, 92, Hangang-daero, Yongsan-gu, Seoul, 04386, Korea
Tel: 82-2-2034-4033, 4888, 4703 Fax: 82-2-2034-4588
E-mail: automation@ls-electric.com

■ Overseas Subsidiaries
• LS ELECTRIC Japan Co., Ltd. (Tokyo, Japan)
Tel: 81-3-6268-8241 E-Mail: japan@ls-electric.com
• LS ELECTRIC (Dalian) Co., Ltd. (Dalian, China)
Tel: 86-411-8730-6495 E-Mail: china.dalian@lselectric.com.cn
• LS ELECTRIC (Wuxi) Co., Ltd. (Wuxi, China)
Tel: 86-510-6851-6666 E-Mail: china.wuxi@lselectric.com.cn
• LS ELECTRIC Middle East FZE (Dubai, U.A.E.)
Tel: 971-4-886-5360 E-Mail: middleeast@ls-electric.com
• LS ELECTRIC Europe B.V. (Hoofddorp, Netherlands)
Tel: 31-20-654-1424 E-Mail: europartner@ls-electric.com
• LS ELECTRIC America Inc. (Chicago, USA)
Tel: 1-800-891-2941 E-Mail: sales.us@lselectricamerica.com
• LS ELECTRIC Turkey Co., Ltd.
Tel: 90-212-806-1225 E-Mail: turkey@ls-electric.com

■ Overseas Branches
• LS ELECTRIC Tokyo Office (Japan)
Tel: 81-3-6268-8241 E-Mail: tokyo@ls-electric.com
• LS ELECTRIC Beijing Office (China)
Tel: 86-10-5095-1631 E-Mail: china.auto@lselectric.com.cn
• LS ELECTRIC Shanghai Office (China)
Tel: 86-21-5237-9977 E-Mail: china.auto@lselectric.com.cn
• LS ELECTRIC Guangzhou Office (China)
Tel: 86-20-3818-2883 E-Mail: china.auto@lselectric.com.cn
• LS ELECTRIC Chengdu Office (China)
Tel: 86-28-8670-3201 E-Mail: china.auto@lselectric.com.cn
• LS ELECTRIC Qingdao Office (China)
Tel: 86-532-8501-2065 E-Mail: china.auto@lselectric.com.cn
• LS ELECTRIC Nanjing Office (China)
Tel: 86-25-8467-0005 E-Mail: china.auto@lselectric.com.cn
• LS ELECTRIC Bangkok Office (Thailand)
Tel: 66-90-950-9683 E-Mail: thailand@ls-electric.com
• LS ELECTRIC Jakarta Office (Indonesia)
Tel: 62-21-2933-7614 E-Mail: indonesia@ls-electric.com
• LS ELECTRIC Moscow Office (Russia)
Tel: 7-499-682-6130 E-Mail: info@lselectric-ru.com
• LS ELECTRIC America Western Office (Irvine, USA)
Tel: 1-949-333-3140 E-Mail: america@ls-electric.com

2024.06