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Programmable Logic Control

XGB Main unit(XEC-H Type)

XGT Series **User Manual**

XEC-DN32H
XEC-DN64H
XEC-DP32H
XEC-DP64H
XEC-DR32H
XEC-DR64H
XEC-DN32H/DC
XEC-DR32H/D1
XEC-DR64H/D1

Safety Instructions

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

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

⚠ **Warning**	This symbol indicates the possibility of serious injury or death if some applicable instruction is violated
⚠ **Caution**	This symbol indicates the possibility of slight injury or damage to products if some applicable instruction is violated

- 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 when designing

⚠ Warning

- **Please, install protection circuit on the exterior of PLC to protect the whole control system from any error in external power or PLC module.** Any abnormal output or operation may cause serious problem in safety of the whole system.
  - Install applicable protection unit on the exterior of PLC to protect the system from physical damage such as emergent stop switch, protection circuit, the upper/lowest limit switch, forward/reverse operation interlock circuit, etc.
  - If any system error (watch-dog timer error, module installation error, etc.) is detected during CPU operation in PLC, the whole output is designed to be turned off and stopped for system safety. However, in case CPU error if caused on output device itself such as relay or TR can not be detected, the output may be kept on, which may cause serious problems. Thus, you are recommended to install an addition circuit to monitor the output status.

- **Never connect the overload than rated to the output module nor allow the output circuit to have a short circuit**, which may cause a fire.

- **Never let the external power of the output circuit be designed to be On earlier than PLC power**, which may cause abnormal output or operation.

- **In case of data exchange between computer or other external equipment and PLC through communication or any operation of PLC (e.g. operation mode change), please install interlock in the sequence program to protect the system from any error**. If not, it may cause abnormal output or operation.

Safety Instructions when designing

⚠ Caution

- **I/O signal or communication line shall be wired at least 100mm away from a high-voltage cable or power line.** If not, it may cause abnormal output or operation.

Safety Instructions when designing

⚠ 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 or flames may be caused.
- **Before installing the module, be sure PLC power is off.** If not, electric shock or damage on the product may be caused.
- **Be sure that each module of PLC is correctly secured.** If the product is installed loosely or incorrectly, abnormal operation, error or dropping may be caused.
- **Be sure that I/O or extension connecter is correctly secured.** If not, electric shock, fire or abnormal operation may be caused.
- **If lots of vibration is expected in the installation environment, don't let PLC directly vibrated.** Electric shock, fire or abnormal operation may be caused.
- **Don't let any metallic foreign materials inside the product**, which may cause electric shock, fire or abnormal operation..

Safety Instructions when wiring

⚠ Warning

- **Prior to wiring, be sure that power of PLC and external power is turned off.** If not, electric shock or damage on the product may be caused.

- **Before PLC system is powered on, be sure that all the covers of the terminal are securely closed.** If not, electric shock may be caused

⚠ Caution

- **Let the wiring installed correctly after checking the voltage rated of each product and the arrangement of terminals.** If not, fire, electric shock or abnormal operation may be caused.

- **Secure the screws of terminals tightly with specified torque when wiring.** If the screws of terminals get loose, short circuit, fire or abnormal operation may be caused.

*

- **Surely use the ground wire of Class 3 for FG terminals, which is exclusively used for PLC**. If the terminals not grounded correctly, abnormal operation may be caused.

- **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.

Safety Instructions for test-operation or repair

⚠ Warning

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

⚠ Caution

- **Don't remove PCB from the module case nor remodel the 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 installations or cell phone at least 30cm away from PLC**. If not, abnormal operation may be caused.

Safety Instructions for waste disposal

⚠ Caution

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

Revision History

Version	Date	Remark	Chapter
V 1.0	2009.2	1. First Edition	-
V 1.1	2009.6	1. Add detailed description on High Speed Counter specification	Ch8.1.1
V 1.2	2009.10	1. Add DC power unit	Ch2.1, Ch2.2 Ch4.1, Ch4.3 Ch7.2.1, Ch7.2.2 Ch8.1.1, Ch8.1.2 Appendix2
V1.5	2010.10	1. Add new module 2. Error in consumption current calculation fixed 3. Error in Momentary power failure and watch dog fixed 4. Error in program execution fixed 5. Error in memory unit fixed 6. Error in remote function fixed 7. RTC flag, setting method modified 8. Input speciation of main unit fixed 9. Contents related with XGI deleted 10. Voltage reference fixed 11. Contents related with STOP LED deleted 12. APM_SSSB modified 13. XEC-DP32H/DP64H added	Ch2.1, Ch2.2, Ch2.3.1, Ch4.1 Ch4.3, Ch4.4 Ch5.1.2, Ch5.1.4 Ch5.2.2 Ch5.4.1 Ch6.4 Ch6.12 Ch7.2.1, Ch7.2.2 Ch10.2 Ch10.3 Ch.11 Appendix4 Ch4.1, Ch4.3 Ch7.3.4, Ch7.3.6 Appendix2
V1.6	2014.2	1. Domain Of Homepage Changed 2. Add XEC-DN32H/DC	Front/Back Cover Ch2.1, Ch2.2 Ch4.1, Ch4.3 Ch7.2.1, Ch7.3.3 Ch8.1.1 Appendix2
V1.7	2015.7	1. Address & phone number changed 2. Add new module 3. Vibration Specification modified	Back Cover Ch2.1, Ch2.2, Ch2.3.3, Ch2.3.4 Ch3.1
V1.8	2016.11	1. . Add new module - XBE-DN32A	Ch7
V 1.9	2020.06	LSIS to change its corporate name to LS ELECTRIC	Entire
V 2.0	2022.08	XEC-H Type Renewal content added	Entire
V2.1	2023.06	1. Module added (1)XBE-AC08A 2. Ferrule specification contents added	Ch7

V2.2	2024.06	1. Warranty period, scope changed	Cover_Back

About User's Manual

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 Use's Manual describes the product. If necessary, you may refer to the following description and order accordingly. In addition, you may connect our website(https://www.ls-electric.com/) and download the information as a PDF file.

Relevant User's Manual

Title	Description	No. of User Manual
XG5000 User's Manual (XGI/XGR/XEC)	It describes how to use XG5000 software especially about online functions such as programming, printing, monitoring and debugging by using XGB (IEC language)	10310000512
XGI/XGR/XEC Series Instruction & Programming	It describes how to use the instructions for programming using XGB (IEC language) series.	10310000510
XGB Main unit User's Manual (XEC-H)	It describes how to use the specification of power/input /output/expansion modules, system configuration and built-in High-speed counter for XGB main unit.	10310000983
XGB Analog User's Manual	It describes how to use the specification of analog input/analog output/temperature input module, system configuration and built-in PID control for XGB main unit.	10310000920
XGB Position User's Manual	It describes how to use built-in positioning function for XGB main unit.	10310000927
XGB Cnet I/F User's Manual	It describes how to use built-in communication function for XGB main unit and external Cnet I/F module.	10310000816
XGB Fast Ethernet I/F User's Manual	It describes how to use XGB FEnet I/F module.	10310000873
CANopen Commnunication Module	It describes how to use XGB CANopen Commnunication Module	10310001245
EtherNet/IP Commnunication Module	It describes how to use XGB EtherNet/IP Communication module	10310001159
XGB Profibus-DP I/F (Master) User's Manaual	It describes how to use XGB Profibus-DP I/F (Master) Commnunication Module	10310001310

XGB Profibus-DP I/F (Slave) User's Manaual	It describes how to use XGB Profibus-DP I/F (Slave) Commnunication Module	10310001410
XGB DeviceNet I/F (Slave) User's Manaual	It describes how to use XGB DeviceNet I/F (Slave) Commnunication Module	10310001414
XGB High speed counter module User's Manual	It describes how to use High speed counter(XBF-HO02A, XBF-HD02A)	10310001240

◎ Contents ◎

Chapter 1 Introduction

1.1 Guide to Use This Manual

This manual includes specifications, functions and handling instructions for the XGB series PLC.
This manual is divided up into chapters as follows.

No.	Title	Contents
Chapter 1	Introduction	Describes configuration of this manual, unit's features and terminology.
Chapter 2	System Configurations	Describes available units and system configuration in the XGB series.
Chapter 3	General Specifications	Describes general specifications of units used in the XGB series.
Chapter 4	CPU Specifications	Describes performances, specifications and operations.
Chapter 5	Program Configuration and Operation Method	
Chapter 6	CPU Module Functions	
Chapter 7	Input/Output Specifications	Describes operation of basic and input/output.
Chapter 8	Built-in High-speed Counter Function	Describes built-in high-speed counter functions.
Chapter 9	Installation and Wiring	Describes installation, wiring and handling instructions for reliability of the PLC system.
Chapter 10	Maintenance	Describes the check items and method for long-term normal operation of the PLC system.
Chapter 11	Troubleshooting	Describes various operation errors and corrective actions.
Appendix 1	Flag List	Describes the types and contents of various flags.
Appendix 2	Dimension	Shows dimensions of the main units and expansion modules.
Appendix 3	Compatibility with GLOFA	Describes the compatibility with GLOFA.
Appendix 4	Instruction List	Describes the special relay and instruction list.

1.2 Features

The features of XGB system are as follows.

(1) The system secures the following high performances.

(a) High Processing Speed

(b) Max. 384 I/O control supporting small & mid-sized system implementation

Item	Specification (XEC-DxxxH)	
	O/S Version: Less than V5.00	O/S Version: V5.00 or later
Operation processing speed	83ns / Step	60ns / Step
Max IO contact point	384 points	384 points
Program capacity	200KB	250KB
Max. no. of expanded base	10 stages	10 stages

(c) Enough program capacity

(d) Expanded applications with the support of floating point.

Remark

▪The memory usage difference occurs even if the same program is used because the program compilation method is different between the O/S version under V5.00 and the version higher than V5.00. Considering these compatibility issues, from O/S version V5.00, the program capacity increased by 25% compared to the previous version. The actual program level available to the user is the same.

▪The details of compatibility between versions are described in Section 1.4.

(2) Compact : the smallest size comparing to the same class model of competitors.

(a) Compact panel realized through the smallest size.

Item	Type	Size (W * H * D)	Reference
Main unit	XEC-Dx32H	114 * 90 * 64	
	XEC-Dx64H	180 * 90 * 64	
Extension module	XBE-,XBF-,XBL-	20 * 90 * 60	Basis of minimum size

(3) Easy attachable/extensible system for improved user convenience.

(a) Easy attachable to European terminal board and convenient-to-use MIL connector method improving convenient wiring. (“S” type main unit and expanded module)

(b) By adopting a removable terminal block connector (M3 X 6 screw), convenience of wiring may be increased.

(c) By adopting connector coupling method, modules may be easily connected and separated.

(4) Improved maintenance ability with kinds of register, built-in RTC (“H” type), comment backup and etc

(a) Convenient programming environment by providing analogue register, array and structure.

(b) Improved maintenance ability by operating plural programs and task program through module program.

(c) Built-in Flash ROM enabling permanent backup of program without any separate battery.

(d) Improved maintenance ability by types of comment backup.

(e) Built-in RTC function enabling convenient history and schedule management

(5) Optimized communication environment.

(a) With max. 2 channels of built-in COM (excl. loader), up to 2 channel communication is available without any expanded of module.

(b) Supporting various protocols to improve the convenience (dedicated, Modbus, user-defined communication)

(c) Communication module may be additionally increased by adding modules (up to 2 stages such as Cnet, Enet and etc).

(d) Convenient network-diagnostic function through network & communication frame monitoring.

(e) Convenient networking to upper systems through Enet or Cnet.

(f) High speed program upload and download by USB Port

(6) Applications expanded with a variety of I/O modules.

(a) 8, 16, 32 points modules provided (if relay output, 8/16 points module).

(b) Single input, single output and combined I/O modules supported.

(7) Applications expanded through analog-dedicated register design and full attachable mechanism.

(a) All analogue modules can be attachable on extension base. (H type: up to 10 stages available)

(b) With analog dedicated register(U) and monitoring dedicated function, convenient use for I/O is maximized (can designate operations using easy programming of U area and monitoring function)

(8) Through XG5000, it provides an integrated programming environment such as enhanced program convenience and various monitoring, diagnosis, and editing functions.

(9) Built-in high speed counter function

(a) Providing High-speed counter 1phase, 2phase and more additional functions.

(b) Providing parameter setting, diverse monitoring and diagnosis function using XG5000.

(c) Monitoring function in XG5000 can inspect without program, inspecting external wiring, data setting and others.

(10) Built-in position control function

(a) Supporting max 100Kpps 2 axes.

(b) Providing parameter setting, operation data collection, diverse monitoring and diagnosis by using XG5000.

(c) Commissioning by monitoring of XG5000, without program, inspecting external wiring and operation data setting.

(11) Built-in PID

(a) Supporting max. 16 loops.

(b) Setting parameters by using XG5000 and supporting loop status monitoring conveniently with trend monitor.

(c) Control constant setting through the improved Auto-tuning function.

(d) With many other additional functions including PWM output, ΔMV, ΔPV and SV Ramp, improving the control preciseness.

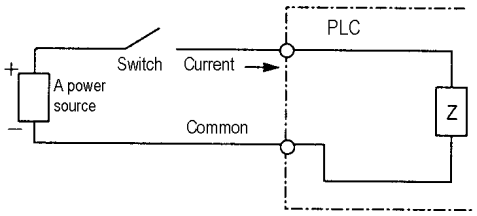
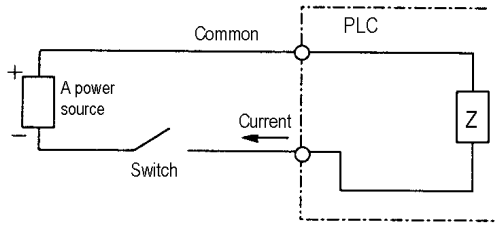
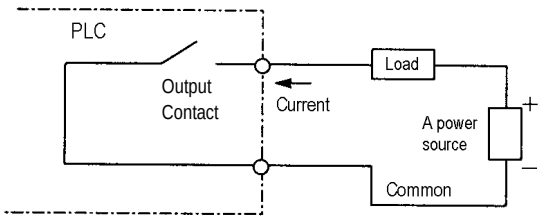
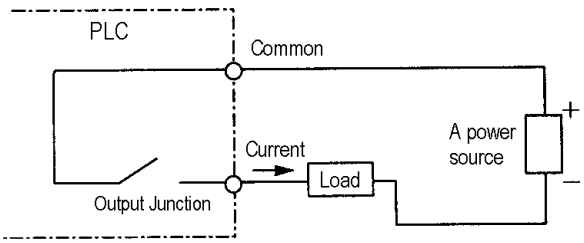
(e) Supporting types of control modes such as forward/backward mixed operation, 2-stage SV PID control, cascade control and etc.

(f) A variety of warning functions such as PV MAX and PV variation warning securing the safety.

1.3 Terminology

The following table gives definition of terms used in this manual.

Terms	Definition	Remark
Module	A standard element that has a specified function which configures the system. Devices such as I/O board, which inserted onto the mother board.	Example) Expansion module, Special module, Communication module
Unit	A single module or group of modules that perform an independent operation as a part of PLC systems.	Example) Main unit, Expansion unit
PLC System	A system which consists of the PLC and peripheral devices. A user program can control the system.	-
XG5000	A program and debugging tool for the MASTER-K series. It executes program creation, edit, compile and debugging. (PADT: Programming Added Debugging Tool)	-
I/O image area	Internal memory area of the CPU module which used to hold I/O status.	
Cnet	Computer Network	-
FEnet	Fast Ethernet Network	-
RAPIEnet	RAPIEnet Network	
CANopen	Controller Area Network	
Pnet	Profibus-DP Network	-
Dnet	DeviceNet Network	-
RTC	Abbreviation of 'Real Time Clock'. It is used to call general IC that contains clock function.	-
Watchdog Timer	Supervisors the pre-set execution times of programs and warns if a program is not competed within the pre-set time.	-

Terms	Definition	Remark
Sink Input	Current flows from the switch to the PLC input terminal if a input signal turns on. 	Z: Input impedance
Source Input	Current flows from the PLC input terminal to the switch after a input signal turns on. 	-
Sink Output	Current flows from the load to the output terminal and the PLC output turn on. 	-
Source Output	Current flows from the output terminal to the load and the PLC output turn on. 	-

1.4 Usage notes according to compatibility and O/S version

Describes matters that require attention for use depending on the product O/S version.

(1) XG5000 - CPU module (XEC-H)

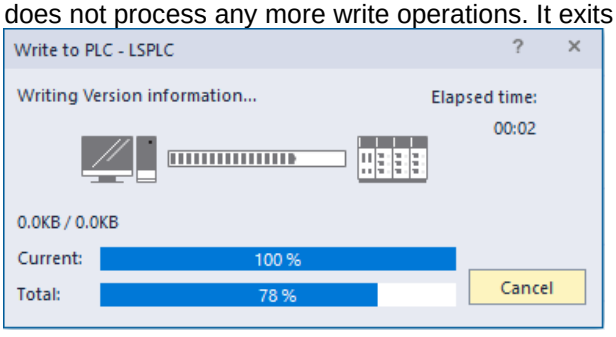
In case of CPU O/S V5.00 or higher, you must download the program using XG5000 V4.71 or higher version.

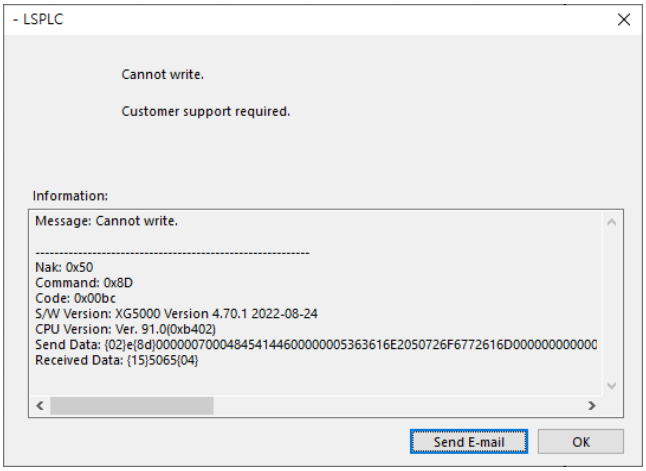
CPU O/S Version	Function	XG5000 Version	
		Less than V4.71	V4.71 or later
Less than V5.00	Read program	○	○
	Monitor	○	○
	Write program	○	○
	Online editing	○	○

CPU O/S Version	Function	XG5000 Version	
		Less than V4.71	V4.71 or later
V5.00 or higher (Renewal)	Read program	○	○
	Monitor	○	○
	Write program	X (not supported)	○
	Online editing	X (not supported)	○

Remark

▪ If an unsupported operation is attempted, the XG5000 outputs a NAK message window and does not process any more write operations. It exits on failure, leaving the old program intact.





▪The details of compatibility between versions are described in Section 1.4.

(2) XG5000 – Memory module (XBO-M2MB)

It is possible to write code of version less than V5.00 to the memory module of version less than V1.60.

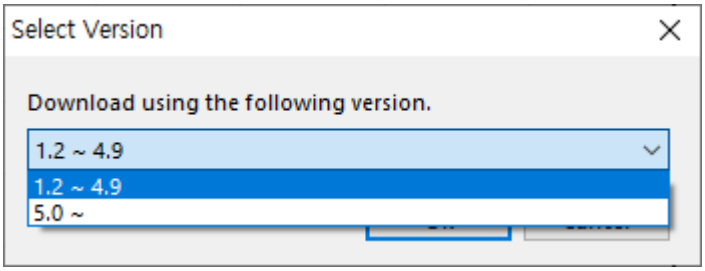
Versions from V1.60 or later can be selected when writing.

Memory module O/S version	Function	XG5000 Version	
		Less than V4.71	V4.71 or later
Less than V1.60	Write to memory module	○	○
	Open from memory module	○	○

Memory module O/S version	Function	XG5000 Version	
		Less than V4.71	V4.71 or later
V1.60 or higher	Write to memory module	○	○ (Writing version can be selected less than V5.00 or more than V5.00)
	Open from memory module	○	○

Remark

▪ In XG5000 V4.71 or later version, if [Write to Memory Module] function is executed for memory module O/S V1.60 or later version, the version selection window is displayed as shown below. It is downloaded to the memory module in the form of a program suitable for the selected version.
Example 1) When CPU module O/S version is V2.30: Select items 1.2 to 4.9 in the version selection window
Example 2) When CPU module O/S version is V5.00: Select 5.0 ~ item in the version selection window



▪ In versions below XG5000 V4.71, regardless of the memory module version, the program is downloaded in the form of a program that can only be used under XEC-H O/S version V5.00.

(3) CPU module (XEC-H) - Memory module (XBO-M2MB)

For CPU O/S version V5.00 or higher, you must use memory module version V1.60 or higher.

CPU O/S version	Function	Memory module O/S version	
		Less than V1.60	V1.60 or later
Less than V5.00	Write to memory module	○	○
	Open from memory module	○	○

CPU O/S version	Function	Memory module O/S version	
		Less than V1.60	V1.60 or later
V5.00 or higher (Renewal)	Write to memory module	X (not supported)	○
	Open from memory module	X (not supported)	○ (If you have V5.00 or higher version of the program)

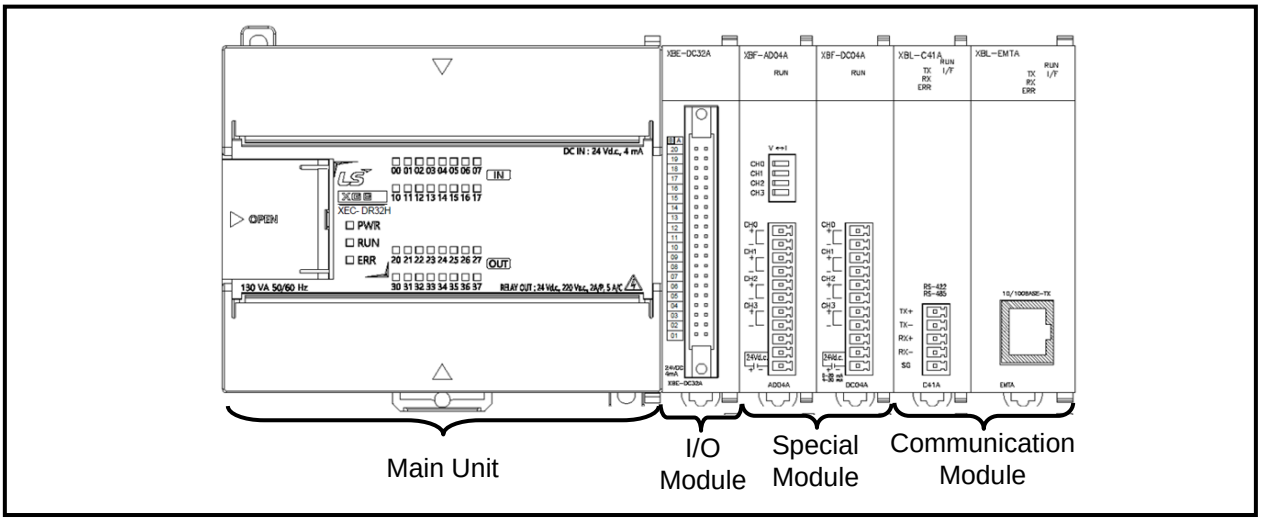
Chapter 2 System Configuration

The XGB series has suitable to configuration of the basic, computer link and network systems.

This chapter describes the configuration and features of each system.

2.1 XGB System Configuration

XGB series System Configuration is as follows. Expanded I/O module and special module are available to connect maximum 7 stages for “S” type and 10 stages for “H” type. Expanded communication module is available to connect maximum 2 stages.



Item			Description
Total I/O points			• XEC-DxxxH : 32~384 points
Maximum number of expansion modules		Digital I/O module	• Max. 10
		Special module	• Max. 10
		Comm. I/F module	• Maximum 2
Items	Main unit		• refer to 2.2 Product List
	Expansion module	Digital I/O module	
		Special module	
		Communication I/F module	
	Option module	Memory module	

* XG5000 V3.00 or above is required for XEC(OS version less than V5.00)
* XG5000 V4.71 or above is required for XEC(OS version V5.00 or later)

2.2 Product List

XGB series' product list is as follows.

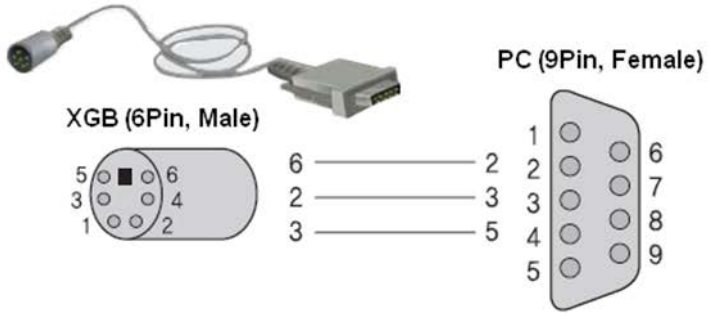
Types	Model	Description	Remark
Main Unit	XEC-DR32H	AC 100V~240V power, DC24V input 16 points, relay output 16 points	-
	XEC-DN32H	AC 100V~240V power, DC24V input 16 points, TR output 16 points	-
	XEC-DN32H/DC	DC 24V power, DC24V input 16 points, TR output 16 points	
	XEC-DR64H	AC 100V~240V power, DC24V input 32 points, relay output 32 points	-
	XEC-DN64H	AC 100V~240V power, DC24V input 32 points, TR output 32 points	-
	XEC-DR32H/D1	DC 12/24V power, DC12V input 16 points, relay output 16 points	
	XEC-DR64H/D1	DC 12/24V power, DC12V input 32 points, relay output 32 points	
Digital I/O module	XBE-DC08A	DC24V Input 8 point	-
	XBE-DC16A	DC24V Input 16 point	-
	XBE-DC32A	DC24V Input 32 point	-
	XBE-AC08A	AC110V Input 8 point	
	XBE-RY08A	Relay output 8 point	-
	XBE-RY08B	Relay output 8 point (independent point)	
	XBE-RY16A	Relay output 16 point	-
	XBE-TN08A	Transistor output 8 point (sink type)	-
	XBE-TN16A	Transistor output 16 point (sink type)	-
	XBE-TN32A	Transistor output 32 point (sink type)	-
	XBE-TP08A	Transistor output 8 point (source type)	-
	XBE-TP16A	Transistor output 16 point (source type)	-
	XBE-TP32A	Transistor output 32 point (source type)	-
	XBE-DR16A	DC24V Input 8 point, Relay output 8 point	-
	XBE-DN32A	DC24V Input 16 point, Transistor output 16 point (sink type)	
Special Module	XBF-AD04A	Current/Voltage input 4 channel	Analog In/Out
	XBF-AD04C	Current/Voltage input 4 channel, High resolution	
	XBF-AD08A	Current/Voltage input 8 channel	
	XBF-DC04A	Current output 4 channel	
	XBF-DC04C	Current output 4 channel, High resolution	
	XBF-DV04A	Voltage output 4 channel	
	XBF-DV04C	Voltage output 4 channel, High resolution	
	XBF-AH04A	Current/Voltage input 2 channel, Current/Voltage output 2 channel,	
	XBF-RD04A	RTD (Resistance Temperature Detector) input 4 channel	Temperature
	XBF-RD01A	RTD (Resistance Temperature Detector) input 1 channel	
	XBF-TC04S	TC (Thermocouple) input 4 channel	
	XBF-PD02A	Position 2Axis, Line Drive type	Position

Types	Model	Description	Remark
	XBF-HD02A	High Speed Counter 2 channel, Line Drive Type	Counter
	XBF-HO02A	High Speed Counter 2 channel, Open Collector Type	
	XBF-TC04RT	Temperature controller module (RTD input, 4 roof)	Temperature
	XBF-TC04TT	Temperature controller module (TC input, 4 roof)	
	XBF-LD02S	Loadcell input 2 Channels	Loadcell

Types	Model	Description	Remark
Communication Module	XBL-C21A	Cnet (RS-232C/Modem) I/F	-
	XBL-C41A	Cnet (RS-422/485) I/F	-
	XBL-EMTA	Enet I/F	-
	XBL-EIMT	RAPIEnet I/F 2 UTP cable	-
	XBL-EIPT	EtherNet I/P Module	
	XBL-CMEA	CANopen MasterI/F	-
	XBL-CSEA	CANopen Slave I/F	-
	XBL-PMEC	Profibus-DP Master	-
	XBL-PSEA	Profibus-DP Slave	
	XBL-DSEA	DeviceNet	
	XBL-RMEA	Rnet Master	
Option module	XBO-M2MB	Memory module	-
Download Cable	PMC-310S	Connection cable (PC to PLC), 9pin(PC)-6pin(PLC)	-
	USB-301A	Connection cable (PC to PLC), USB	-

Note

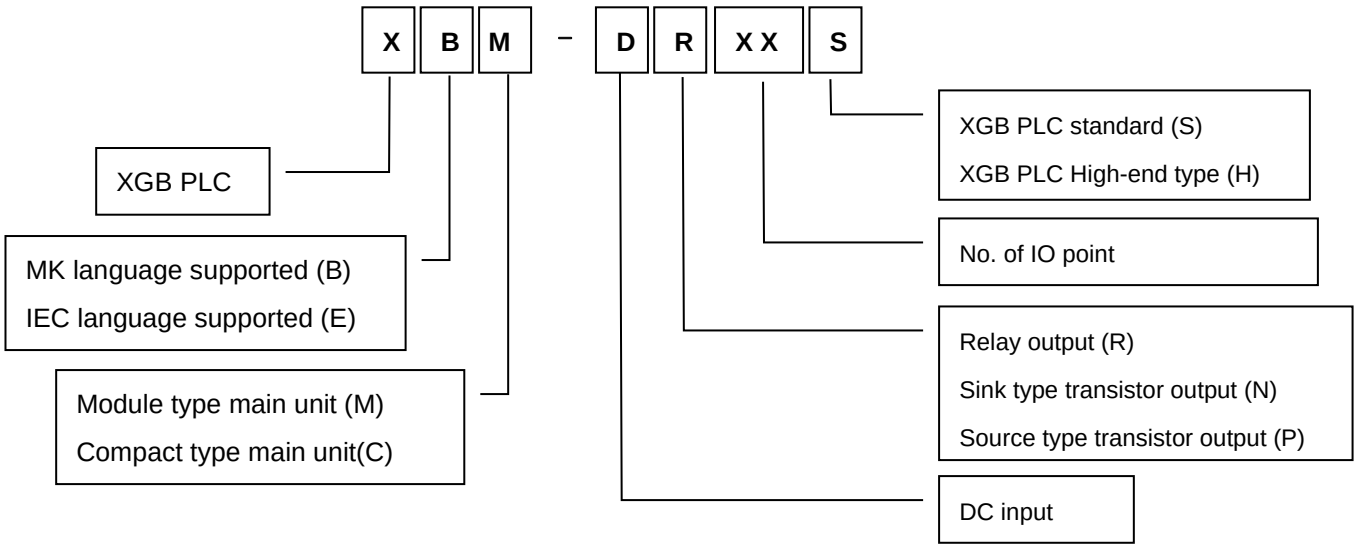
Download Cable (PMC-310S) Diagram



2.3 Classification and Type of Product Name

2.3.1 Classification and type of main unit

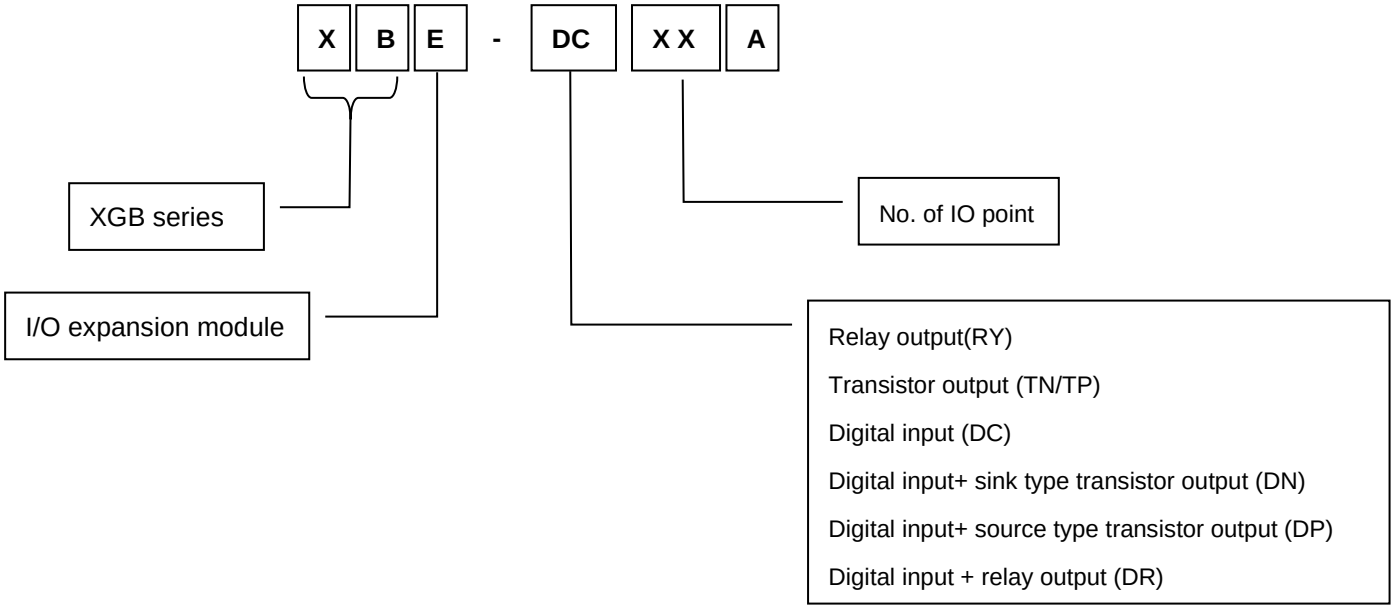
Name of main unit is classified as follows.



Classification	Name	DC input	Relay output	Transistor output	Power
Module type Main unit	XBM-DR16S	8 point	8 point	None	DC24V
	XBM-DN16S	8 point	None	8 point	
	XBM-DN32S	16 point	None	16 point	
Compact type Main unit (MK language)	XBC-DR32H	16 point	16 point	None	AC100V~240V
	XBC-DN32H	16 point	None	16 point	
	XBC-DR64H	32 point	32 point	None	
	XBC-DN64H	32 point	None	32 point	
	XBC-DR32H/DC	16 point	16 point	None	DC24V
	XBC-DN32H/DC	16 point	None	16 point	
	XBC-DR64H/DC	32 point	32 point	None	
	XBC-DN64H/DC	32 point	None	32 point	
Compact type main unit (IEC language)	XEC-DR32H	16 point	16 point	None	AC110V~220V
	XEC-DN32H	16 point	None	16 point	
	XEC-DR64H	32 point	32 point	None	
	XEC-DN64H	32 point	None	32 point	
	XEC-DP32H	16 point	None	16 point	
	XEC-DP64H	32 point	None	32 point	
	XEC-DR32H/D1	16 point	16 point	None	DC 12/24V
	XEC-DR64H/D1	32 point	32 point	None	

2.3.2 Classification and type of expansion module

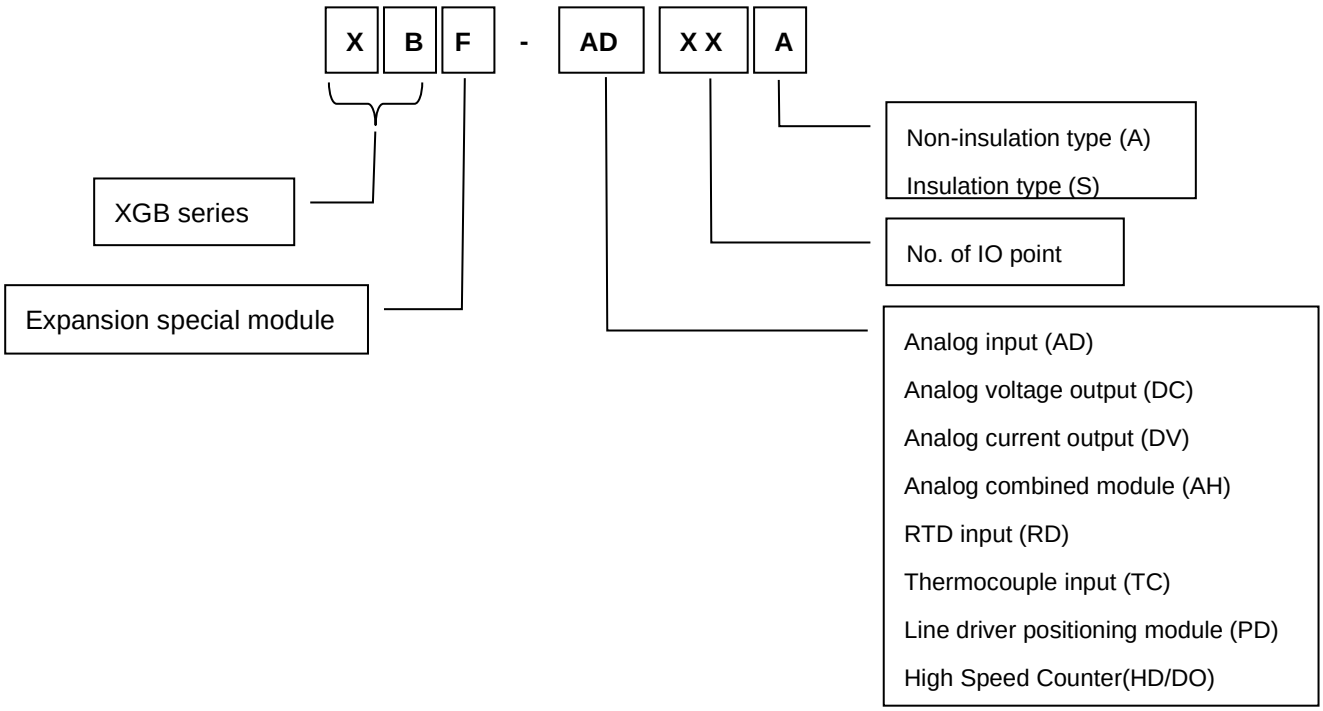
Name of expansion module is classified as follows.



Name	DC input	Relay output	Transistor output	Reference
XBE-DC08A	8 point	None	None	Input
XBE-DC16A/B	16 point	None	None	
XBE-DC32A	32 point	None	None	
XBE-AC08A	8 point (AC)	None	None	
XBE-RY08A/B	None	8 point	None	Relay Output
XBE-RY16A	None	16 point	None	
XBE-TN08A	None	None	8 point (sink type)	Sink type Output
XBE-TN16A	None	None	16 point (sink type)	
XBE-TN32A	None	None	32 point (sink type)	
XBE-TP08A	None	None	8 point (source type)	Source type Output
XBE-TP16A	None	None	16 point (source type)	
XBE-TP32A	None	None	32 point (source type)	
XBE-DR16A	8 point	8 point	None	In/Output
XBE-DN32A	16 point	None	16 point (sink type)	

2.3.3 Classification and type of special module

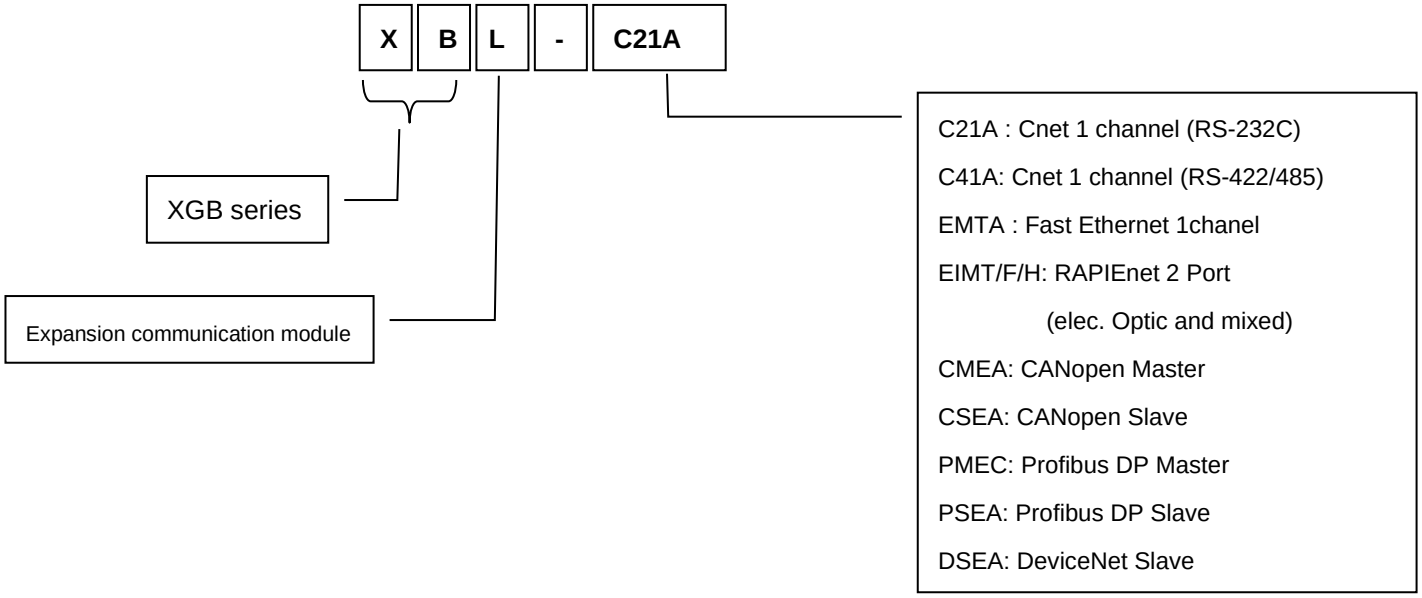
Special module is classified as follows.



Classification	Name	No. of input ch.	Input type	No. of output ch.	Output type
Analog input	XBF-AD04A	4	Voltage/Current	None	-
	XBF-AD08A	8	Voltage/Current	None	
Analog output	XBF-DC04A	None	-	4	Current
	XBF-DC04B	None	-	4	Current
	XBF-DV04A	None	-	4	Voltage
	XBF-AH04A	2	Voltage/Current	2	Voltage/Current
RTD input	XBF-RD04A	4	PT100/JPT100	None	-
	XBF-RD01A	1	PT100/JPT100	None	-
TC input	XBF-TC04S	4	K, J, T, R	None	-
	XBF-TC04RT	4	PT100/JPT100	4	Transister
	XBF-TC04TT	4	K, J, T, R	4	Transister
Positioning module	XBF-PD02A	-	Line Driver	2	Voltage
High Speed Counter	XBF-HD02A	2	Line Driver		
	XBF-HO02A	2	Open Collector		
Loadcell	XBF-LD02A	2	Volatage	-	-

2.3.4 Classification and type of communication module

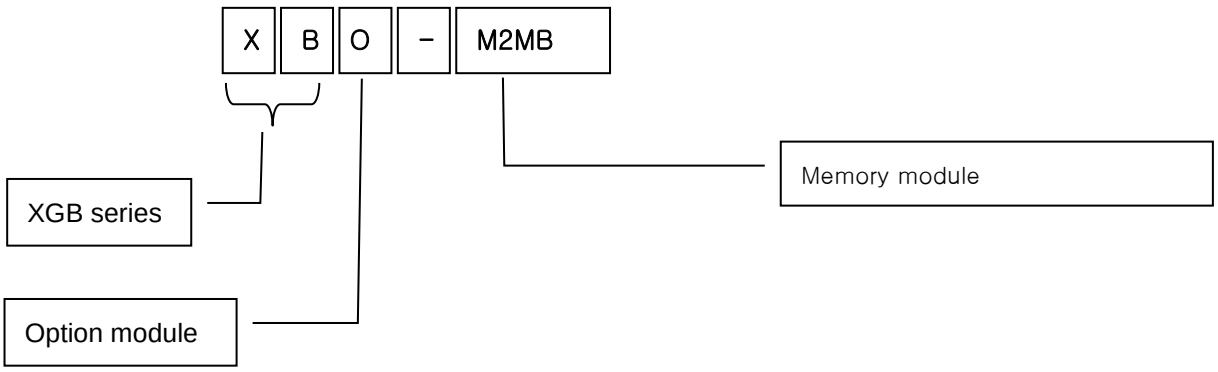
Name of communication module is classified as follows.



Classification	Name	Type
Cnet Comm. Module	XBL-C21A	RS-232C, 1 channel
	XBL-C41A	RS-422/485, 1 channel
FEnet Comm. Module	XBL-EMTA	Electricity, open type Ethernet
RAPIEnet Comm. Module	XBL-EIMT/EIMF/EIMH	Comm. Module between PLCs, electric media, 100 Mbps industrial Ethernet supported
EtherNet Comm. Module	XBL-EIPT	Open EtherNet I/P
CANopen Comm. Module	XBL-CMEA	CANopen Master
	XBL-CSEA	CANopen Slave
Pnet Comm. Module	XBL-PMEC	Profibus-DP Master
	XBL-PSEA	Profibus-DP Slave
DeviceNet Comm. Module	XBL-DSEA	DeviceNet Slave
Rnet Comm. Module	XBL-RMEA	RemoteNet Master

2.3.5 Classification and Type of Option Module

Name of option module is classified as follows.



Classification	Name	Type
Memory module	XBO-M2MB	Memory module

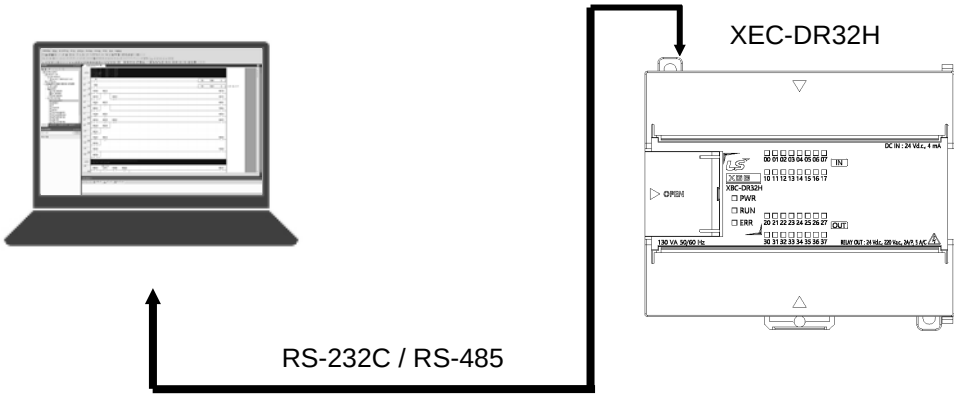
2.4 System Configuration

2.4.1 Cnet I/F system

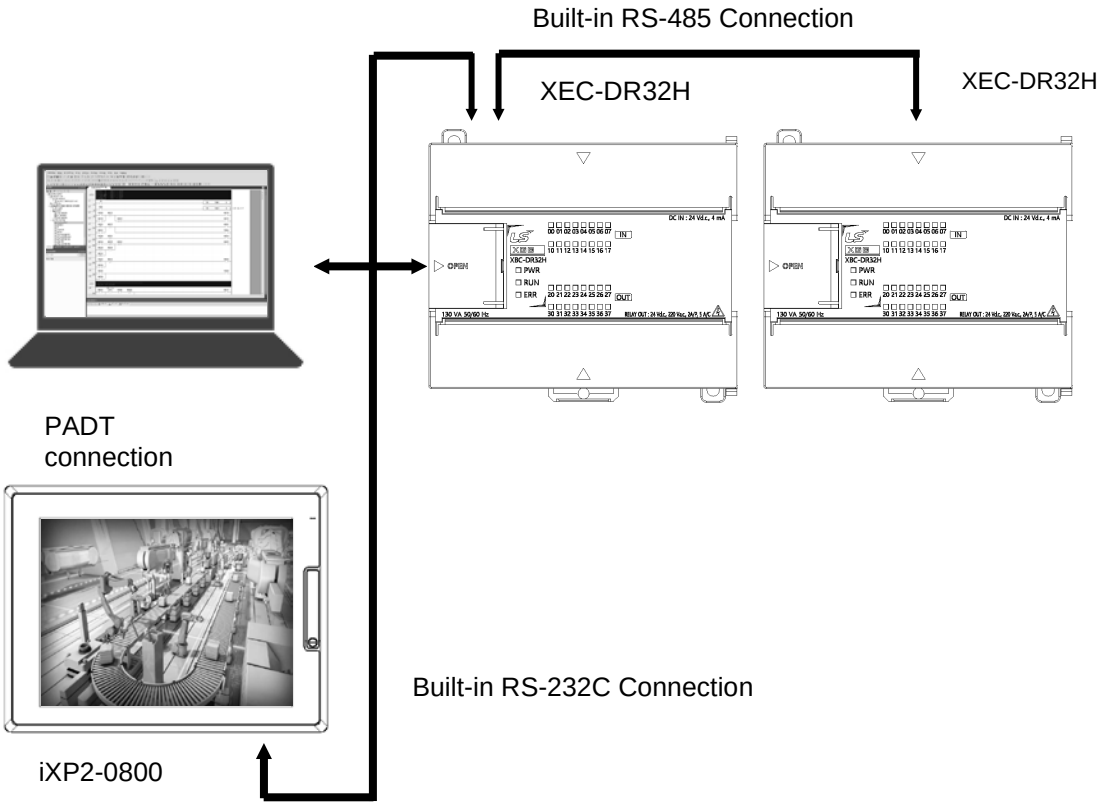
Cnet I/F System is used for communication between the main unit and external devices using RS-232C/RS-422 (485) Interface. The XGB series has a built-in RS-232C port, RS-485 port and has also XBL-C21A for RS-232C, XBL-C41A for RS-422/485. It is possible to construct communication systems on demand.

(1) 1:1 communication system

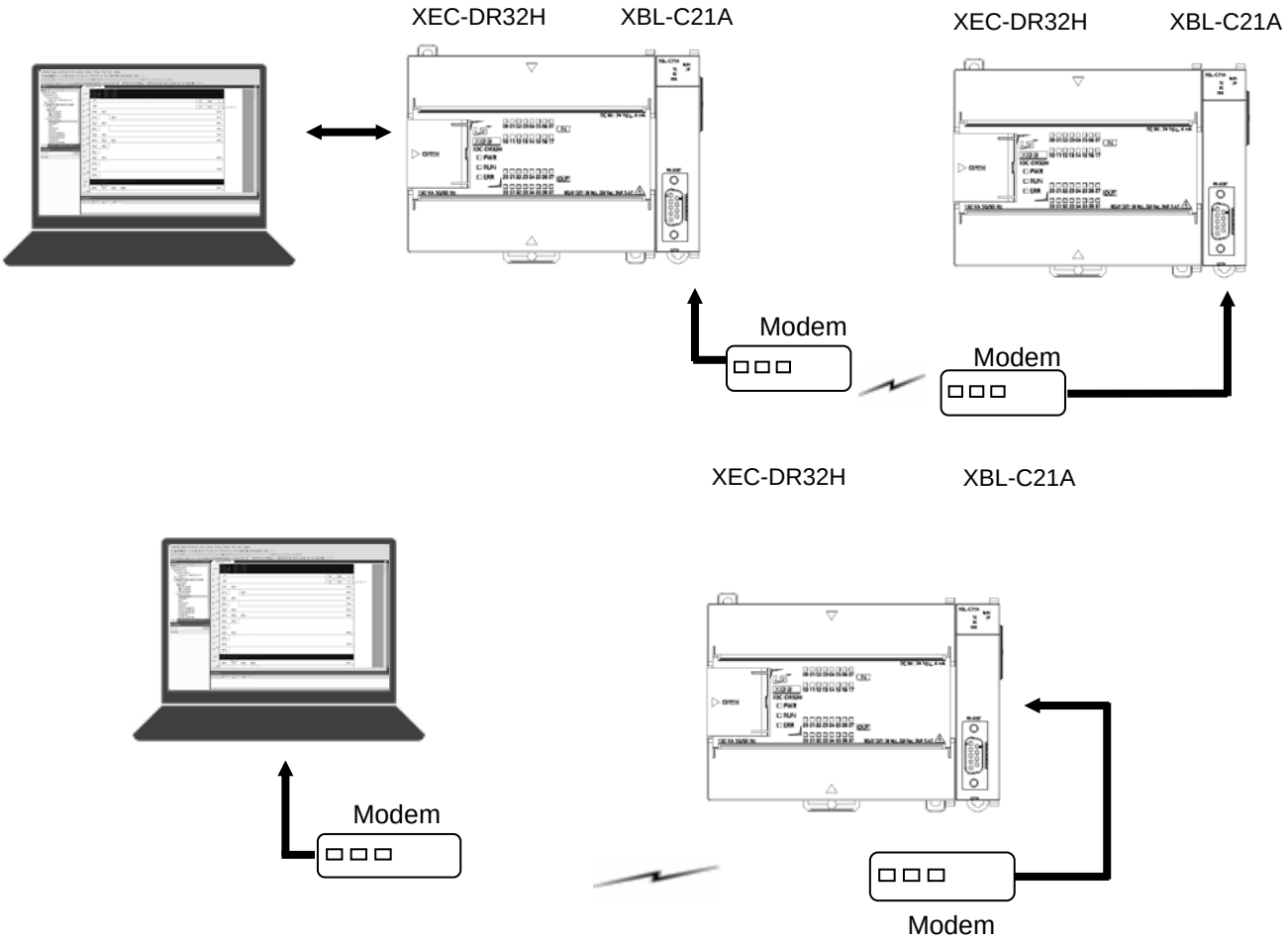
(a) 1:1 communication of an external device (computer) with main unit using a built-in port (RS-232C/RS-485)



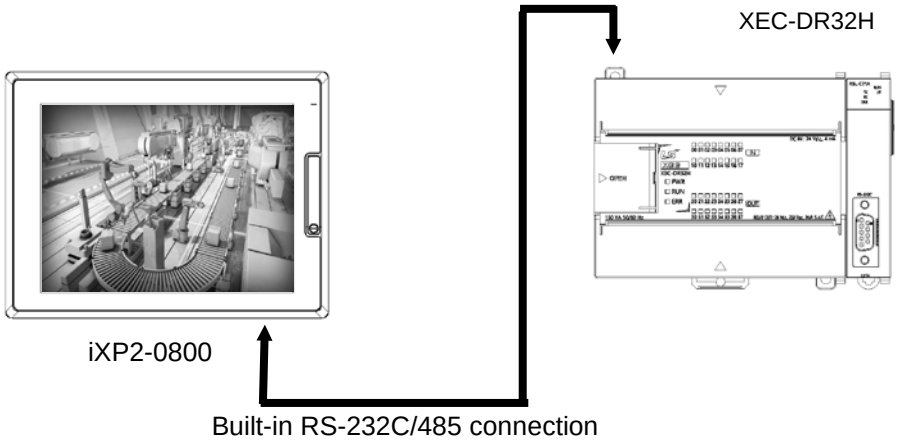
(b) 1:1 communication with main unit using a built-in RS-485 port
(In case of built-in RS-232C,it is for connecting to HMI device.)



(c) 1:1 RS-232C Communication with remote device via modem by Cnet I/F modules

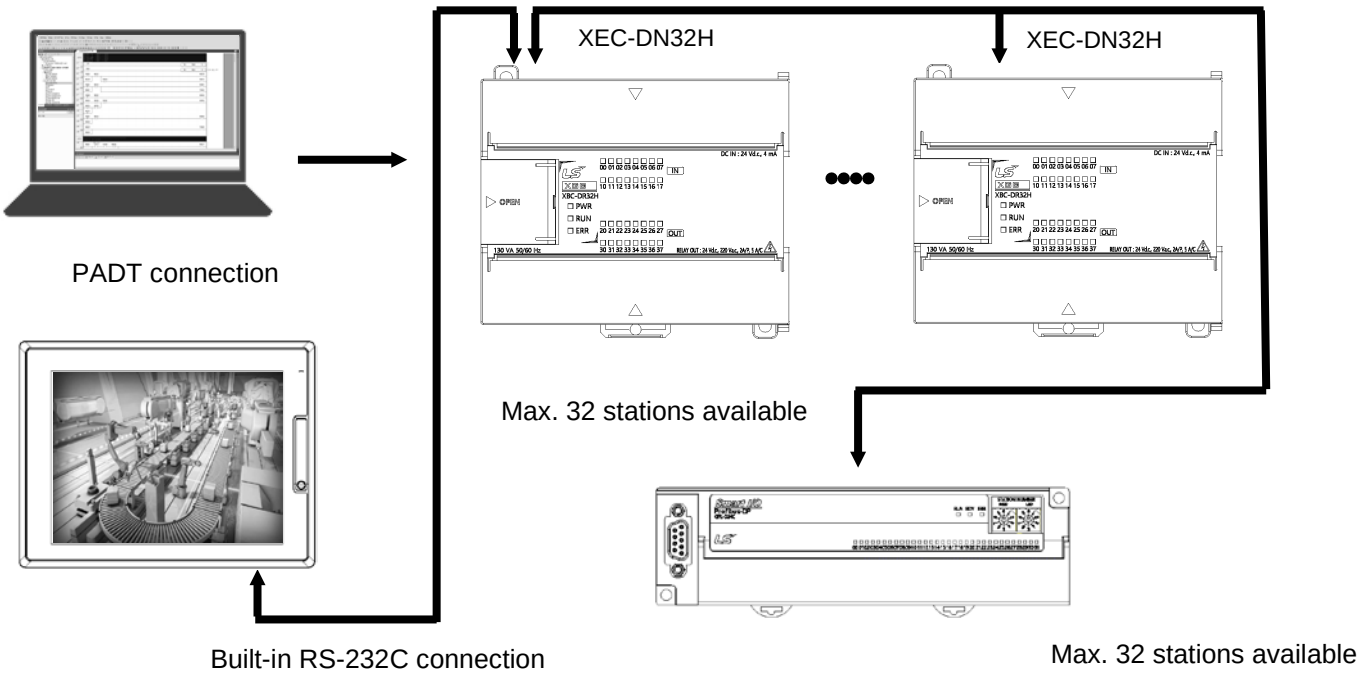


(d) 1:1 communication of an external device (monitoring unit) with main unit using a built-in RS-232C/485 port.

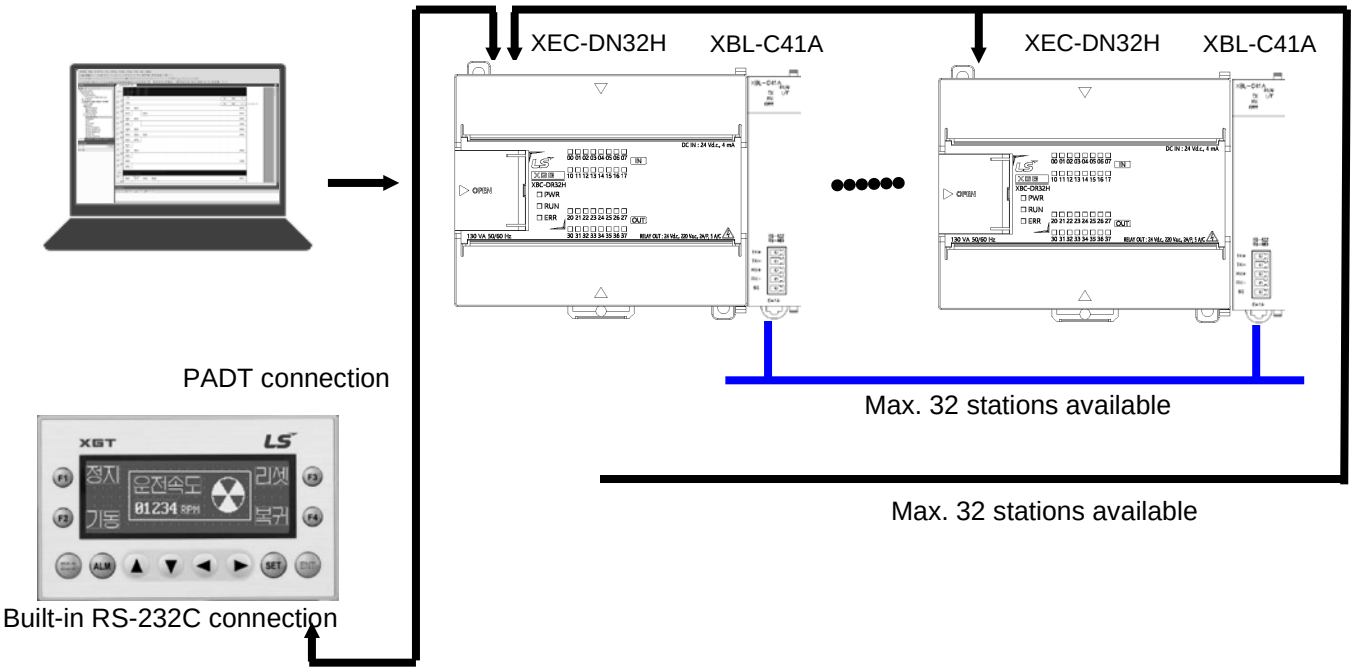


(2) 1:n Communication system

(a) Using RS-485 built-in function can connect between one computer and multiple main units for up to 32 stations.



(b) Using RS-485 built-in function/expansion Cnet I/F module can be connect for up to 32 stations.

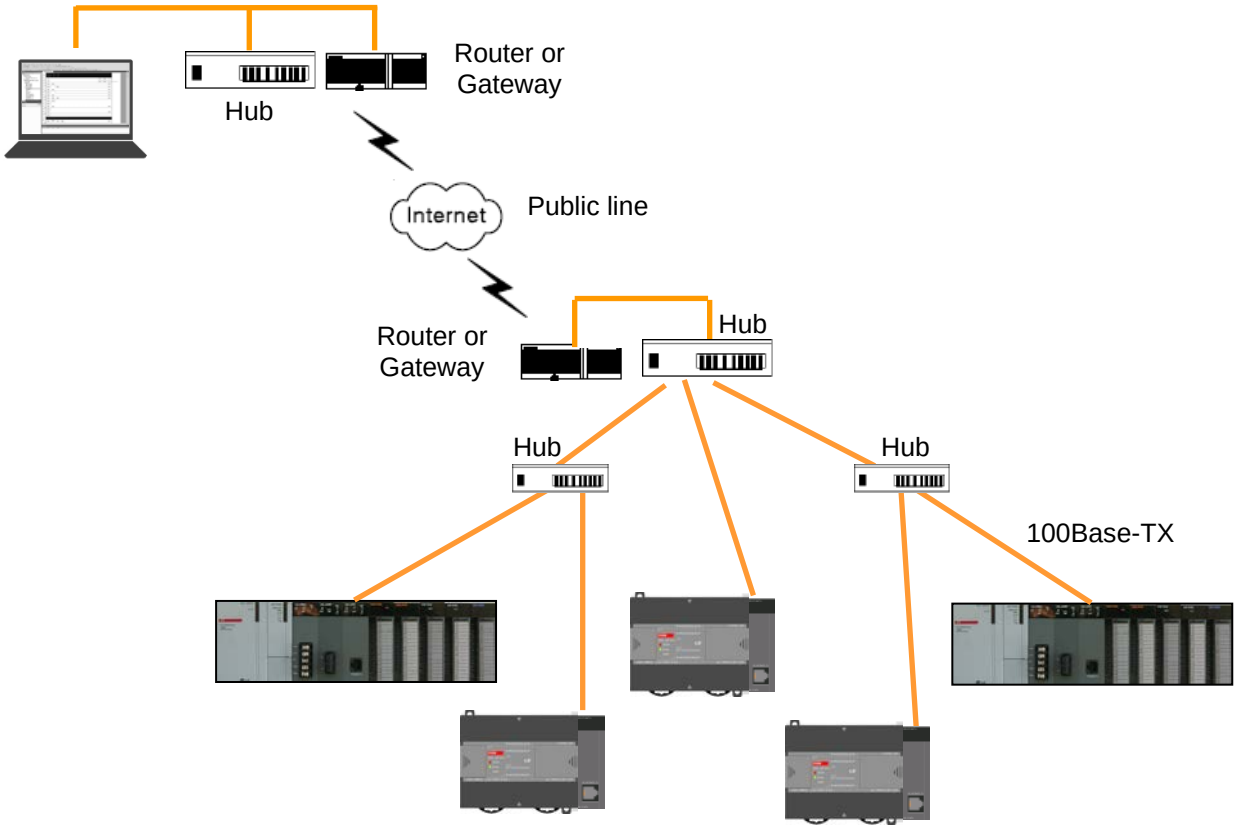


Note

1) Refer to 'XGB Cnet I/F user manual' for details

2.4.2 Ethernet system

Ethernet made by cooperation of Xerox, Intel, DEC is standard LAN connection method (IEEE802.3), which is network connection system using 1.5KB packet with 100Mbps transmission ability. Since Ethernet can combine a variety of computer by network, it is called as standard specification of LAN and diverse products. By adopting CSMA/CD method, it is easy to configure the network and collect large capacity data.



Note

1) Refer to 'XGB FEnet I/F user manual' for details

Chapter 3 General Specifications

3.1 General Specifications

The General specification of XGB series is as below.

<table>
<tr><th>No.</th><th>Items</th><th colspan="6">Specifications</th><th>Related standards</th></tr>
<tr><td>1</td><td>Ambient temperature</td><td colspan="6">0 ~ 55 °C</td><td rowspan="4">-</td></tr>
<tr><td>2</td><td>Storage temperature</td><td colspan="6">–25 ~ +70 °C</td></tr>
<tr><td>3</td><td>Ambient humidity</td><td colspan="6">5 ~ 95%RH (Non-condensing)</td></tr>
<tr><td>4</td><td>Storage humidity</td><td colspan="6">5 ~ 95%RH (Non-condensing)</td></tr>
<tr><td rowspan="9">5</td><td rowspan="9">Vibration resistance</td><td colspan="5">Occasional vibration</td><td>-</td><td rowspan="9">IEC61131-2</td></tr>
<tr><td colspan="2">Frequency</td><td colspan="2">Acceleration</td><td>Amplitude</td><td>times</td></tr>
<tr><td colspan="2">5 ≤ f < 8.4Hz</td><td colspan="2">–</td><td>3.5mm</td><td rowspan="5">10 times each directions (X, Y and Z)</td></tr>
<tr><td colspan="2">8.4 ≤ f ≤ 150Hz</td><td colspan="2">9.8m/s^2 (1G)</td><td>–</td></tr>
<tr><td colspan="6">Continuous vibration</td></tr>
<tr><td colspan="2">Frequency</td><td colspan="2">Acceleration</td><td>Pulse width</td></tr>
<tr><td colspan="2">5 ≤ f < 8.4Hz</td><td colspan="2">–</td><td>1.75mm</td></tr>
<tr><td colspan="2">8.4 ≤ f ≤ 150Hz</td><td colspan="2">4.9m/s^2 (0.5G)</td><td>–</td></tr>
<tr><td>6</td><td>Shock resistance</td><td colspan="6">• Peak acceleration: 147 m/s^2(15G)
• Duration: 11ms
• Half-sine, 3 times each direction per each axis</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Noise resistance</td><td>Square wave Impulse noise</td><td colspan="4">AC: ±1,500 V
DC: ±900 V</td><td>LS ELECTRIC standard</td></tr>
<tr><td>Electrostatic discharge</td><td colspan="4">4kV (Contact discharge)</td><td>IEC61131-2
IEC61000-4-2</td></tr>
<tr><td>Radiated electromagnetic field noise</td><td colspan="4">80 ~ 1,000 MHz, 10V/m</td><td>IEC61131-2,
IEC61000-4-3</td></tr>
<tr><td rowspan="2">Fast transient/bust noise</td><td>Segment</td><td>Power supply module</td><td colspan="2">Digital/analog input/output communication interface</td><td rowspan="2">IEC61131-2
IEC61000-4-4</td></tr>
<tr><td>Voltage</td><td>2kV</td><td colspan="2">1kV</td></tr>
<tr><td>8</td><td>Environment</td><td colspan="6">Free from corrosive gasses and excessive dust</td><td></td></tr>
<tr><td>9</td><td>Altitude</td><td colspan="6">Up to 2,000 ms</td><td></td></tr>
<tr><td>10</td><td>Pollution degree</td><td colspan="6">2 or less</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 Electrotechnical Commission)
: An international civil community that promotes international cooperation for standardization of electric/ electro technology, publishes international standard and operates suitability assessment system related to the above.

2) Pollution Degree
: An index to indicate the pollution degree of used environment that determines the insulation performance of the device. For example, pollution degree 2 means the state to occur the pollution of non-electric conductivity generally, but the state to occur temporary electric conduction according to the formation of dew.

Chapter 4 CPU Specifications

4.1 Performance Specifications

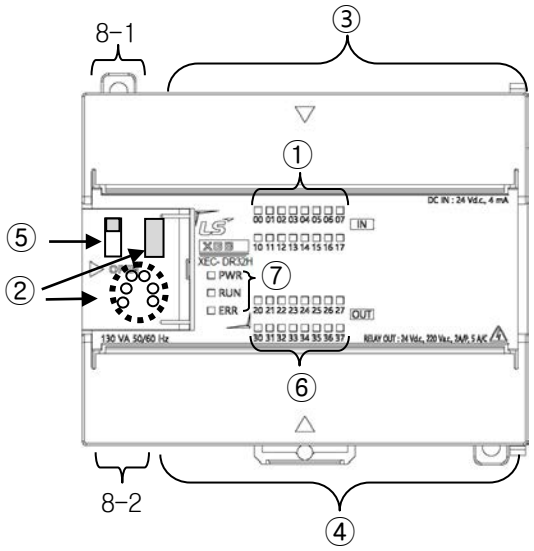
The following table shows the general specifications of the XGB main module type

Items			Specifications						Remark
			XEC-DR32H(/D1)	XEC-DR64H(/D1)	XEC-DN32H(/DC)	XEC-DN64H	XEC-DP32H	XEC-DP64H	
Number of instructions	Operator		18						
	Basic function		136 + Real number operation function						
	Basic function block		43						
	Dedicated function block		Special function dedicated function						
Processing speed (Basic instruction)			OS Version less than V5.00 : 83ns/step OS Version V5.00 or later : 60ns/step						
Program memory capacity			OS Version less than V5.00 : 200KB, OS Version V5.00 or later: 250KB (Equivalent to XGI 110KB based on maximum capacity)						
Max. I/O points			352	384	352	384	352	384	
Data memory	Automatic variable (A)		32KB (Max. 16KB retain setting available)						
	Input variable (I)		2 KB (%IX15.15.63)						
	Output variable (Q)		2 KB (%QX15.15.63)						
	Direct variable	M	16KB (Max. 8KB retain setting available)						
		R	20KB (1block)						
		W	20KB						Same area with R
	Flag variable	F	2KB						System flag
		K	8KB						Built-in special flag
		L	4KB						High speed link flag
		N	10KB						P2P flag
		U	1KB						Analog flag
Flash area			20KB, 2 block						R device used
Timer			No limit to the number of point (time range: 0.001s ~ 4,294,967,295s)						20 byte automatic variable area occupied per r point
Counter			No limit to the number of point (count range: 64 bit expression range)						
Operation mode			RUN, STOP, DEBUG						
Restart mode			Cold, Warm						
Total number of program block			128						
Task	Initialization		1						
	Fixed period		8						
	External input		8 (%IX0.0.0 ~ %IX0.0.7)						
	Internal device		8						
Self diagnosis			Detecting operation delay, memory error, I/O error						
Data reserved in case of power cut			Setting retain area at basic parameter						
Number of max. extension stage			10 stage						
Internal consumption current			660mA	1,040mA	260mA	330mA	300mA	380mA	
Weight			600g	900g	500g	800g	500g	800g	

Items			Specifications	Remark
Built-in function	PID control function		Controlled by instructions, Auto-tuning, PWM output, Manual output, Adjustable operation scan time, Anti Windup, Delta MV function, SV-Ramp function	-
	Cnet I/F function		Dedicated protocol support MODBUS protocol support User defined protocol support } RS-232C 1 port RS-485 1 port	
	High-speed counter	Capacity	AC type: 1 phase: 100 kHz 4 channel, 20kHz 4 channel 2 phase: 50 kHz 2 channel, 10kHz 2 channel	
			D1 type: 1 phase : 100 kHz 4 channel, 10 kHz 4 channel 2 phase : 50 kHz 2 channel, 5 kHz 2 channel	
		Counter mode	4 different counter modes according to input pulse and addition/subtraction method • 1 phase pulse input: addition/subtraction counter • 1 phase pulse input: addition/subtraction counter by B phase • 2 phase pulse input: addition/subtraction counter • 2 phase pulse input: addition/subtraction by phase differences	
		Additional function	• Internal/External preset function • Latch counter function • Comparison output function • Revolution number per unit time function	
	Positioning function	Basic function	No. of control axis: 2 axes Control method: position/speed control Control unit: pulse Positioning data: 80 data/axis (operation step No. 1~80) Operation mode: End/Keep/Continuous Operation method: Single, Repeated operation	TR output type support
		Positioning function	Positioning method: Absolute / Incremental Address range: -2,147,483,648 ~ 2,147,483,647 Speed: Max. 100Kpps(setting range 1 ~ 100,000pps) Acceleration / Deceleration method : trapezoidal method	
		Return to Origin	Origin detection when approximate origin turns off Origin detection when approximate origin turns on Origin detection by approximate origin.	
		JOG operation	Setting range: 1~100,000 (High / Low speed)	
		Additional function	Inching operation, Speed synchronizing operation, Position synchronizing operation, linear interpolation operation etc.	
	Pulse catch		10 ㎲ 4 points (%IX0.0.0~%IX0.0.3), 50 ㎲ 4points (%IX0.0.4 ~ %IX0.0.7)	-
	External interrupt		10 ㎲ 4points (%IX0.0.0~%IX0.0.3), 50 ㎲ 4 points (%IX0.0.4 ~ %IX0.0.7)	
	Input filter		Select among 1,3,5,10,20,70,100 ㎳ (Adjustable)	

4.2 Names of Part and Function

XGB Compact type main unit (IEC language)



No.	Name		Description
①	Input indicator LED		▪ Input indicator LED
②	PADT connecting connector		▪ PADT connecting USB (USB 1.1 supported) 1 channel, RS-232C 1 channel connector
③	Input connector and terminal block		▪ Input connector and terminal block
④	Output connector and terminal block		▪ Output connector and terminal block
⑤	Key switch		▪ RUN / STOP Key switch In case of STOP mode, Remote mode changeable.
⑥	Output indicator LED		▪ Output indicator LED
⑦	Status indicator LED		It indicates CPU module's status. ▪ PWR(Red): Power status ▪ RUN(Green): RUN status STOP mode: Off/ RUN mode : On ▪ Error(Red): In case of error, it is flickering.
⑧	8-1	Built-in RS-232C / RS-485 Connecting connector	• Built-in RS-485 connecting connector "+" , "-" terminal connecting connector in RS-485 communication ▪Built-in RS-232C connecting connector "TxD" , "RxD" , "GND" connecting connector in RS-232C
	8-2	Power supply connector	▪ AC100~240V power supply connector

4.3 Power Supply Specifications

Describes power specification of main unit

Items			Specification				
			XEC-DR32H XEC-DN32H XEC-DP32H	XEC-DR64H XEC-DN64H XEC-DP64H	XEC-DN32H/DC	XEC-DR32H/D1	XEC-DR64H/D1
Input	Rated voltage (UL warranty voltage)		AC 100 ~ 240 V		DC24V	DC 12/24V	
	Input voltage range		AC85~264V(-15%, +10%)		DC19.2~28.8V (-20%,+20%)	DC 9.5~30V	
	Inrush current		50A$_{Peak}$ or less		50APeak or less	50A$_{Peak}$ or less	
	Input current		AC 220V : 0.5A or less, AC 110V : 1A or less		0.7A or less	DC 12V : 1.4 A or less DC 24V : 0.7 A or less	DC 12V : 2.1 A or less DC 24V : 1.0 A or less
	Efficiency		65% or more			60% or more	
	Permitted momentary power failure		Less than 10 ㎳			DC 12V : less than 2 ㎳ DC 24V : less than 10 ㎳	
Output	Rated output	DC5V	2A	3A	2A	2A	3A
		DC24V	0.4A	0.6A	-	-	-
	Output voltage ripple		DC5V (±2%)			DC4.9~5.15V	
Power supply status indication			LED On when power supply is normal				
Cable specification			0.75 ~ 2 mm^2				

* Use the power supply which has 4 A or more fuse for protecting power supply.

(1) Consumption current (DC 5V)

Type	Model	Consumption current (Unit : mA)
Main unit	XEC-DR32H	510
	XEC-DR64H	970
	XEC-DN32H	180
	XEC-DN64H	240
	XEC-DP32H	220
	XEC-DP64H	230
	XEC-DR32H/D1	510
	XEC-DR64H/D1	970
Expansion I/O module	XBE-DC32A	50
	XBE-DC16A/B	40
	XBE-DC08A	30
	XBE-AC08A	30
	XBE-RY16A	420
	XBE-RY08A/B	230
	XBE-TN32A	120
	XBE-TN16A	60
	XBE-TN08A	40
	XBE-TP32A	120
	XBE-TP16A	60
	XBE-TP08A	40
	XBE-DR16A	280
	XBE-DN32A	60
Expansion special module	XBF-AD04A	120
	XBF-AD08A	105
	XBF-AH04A	120
	XBF-DV04A	110
	XBF-DC04A	110
	XBF-RD04A	100
	XBF-RD01A	100
	XBF-TC04S	100
	XBF-PD02A	500
	XBF-HO02A	270
	XBF-HD02A	330
	XBF-AD04C	105
	XBF-DC04C	70
	XBF-DV04C	70
	XBF-TC04RT	120

	XBF-TC04TT	120

Type	Model	Consumption current (Unit : mA)
Expansion special module	XBF-TC04RT	120
	XBF-TC04TT	120
	XBF-LD02S	110
Expansion communication module	XBL-C21A	110
	XBL-C41A	110
	XBL-EMTA	190
	XBL-EIMT/F/H	280/670/480
	XBL-EIPT	400
	XBL-CMEA	150
	XBL-CSEA	150
	XBL-PMEC	300
	XBL-PSEA	230
	XBL-DSEA	100
	XBL-RMEA	250
Memory module	XBO-M2MB	40

4.4 Calculation Example of Consumption Current/Voltage

Calculate the consumption current and configure the system not to exceed the output current capacity of main unit.

(1) XGB PLC configuration example 1
Consumption of current/voltage is calculated as follows.

Type	Model	Unit No.	Internal 5V consumption current (Unit : mA)	Remark
Main unit	XEC-DN32H	1	180	In case contact points are On. (Maximum consumption current)
Expansion module	XBE-DC32A	2	50	
	XBE-TN32A	2	120	
	XBF-AD04A	1	120	All channel is used. (Maximum consumption current)
	XBF-DC04A	1	110	
	XBL-C21A	1	110	
Consumption current	1,200 mA			-
Consumption voltage	6.0 W			1.20A x 5V = 6.0W

In case system is configured as above, since 5V consumption current is total 870 mA and 5V output of XGB 32 points main unit is maximum 2A, normal system configuration is available.

(2) XGB PLC configuration example 2

Type	Model	Unit No.	Internal 5V consumption current (Unit : mA)	Remark
Main unit	XEC-DR32H	1	510	In case all contact points are On. (Maximum consumption current)
Expansion module	XBE-DR16A	5	280	
	XBE-TN32A	2	120	
	XBF-AD04A	1	120	All channel is used. (Maximum consumption current)
	XBL-C21A	1	110	
Consumption current	2,380mA			-
Consumption voltage	11.9W			2.38* 5V = 11.9W

If system is configured as above, total 5V current consumption is exceeded 2,310mA and it exceeds the 5V output of XGB 32 points main unit. Normal system configuration is not available. Although we assume the above example that all contact points are on, please use 64 points main unit which 5V output capacity is higher than standard type main unit.

(3) XGB PLC configuration example 3

Type	Model	Unit No.	Internal 5V consumption current (Unit : mA)	Remark
Main unit	XEC-DR64H	1	970	In case of all contact points are On. (Maximum consumption current)
Expansion module	XBE-DR16A	5	280	
	XBE-TN32A	2	120	
	XBF-AD04A	1	120	All channel is used. (Maximum consumption current)
	XBL-C21A	1	110	
Consumption current	2,840mA			-
Consumption voltage	14.2W			2.84A x 5V = 14.2W

The above system is an example using XEC-DR64H, 64 points main unit, about system (2). Unlike (2) example, 5V output capacity of XEC-DR64H is maximum 3A, normal configuration is available.

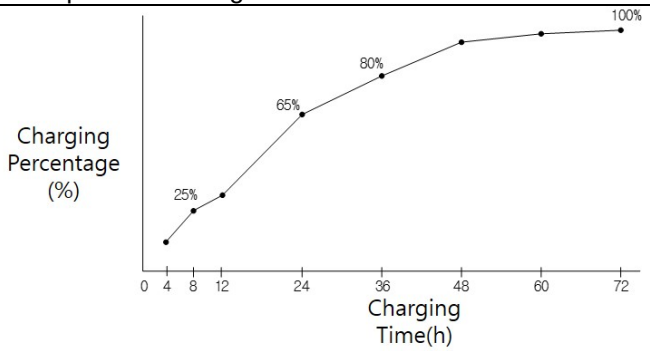
Remark

Calculating of consumption current is based on maximum consumption current. In application system, the consumption current is consumed less than above calculation.

4.5 Battery

Battery is inserted in XGB PLC compact main unit (XEC-DR32/64H, XEC-DN32/64H, XEC-DP32/64H)

4.5.1 Battery specification

<table>
<tr><th>Items</th><th>Specifications</th></tr>
<tr><td>Nominal voltage / current</td><td>DC 3.0V / 6.5 mAh</td></tr>
<tr><td>Warranty term</td><td>3 years(at room temperature)</td></tr>
<tr><td>Purpose</td><td>RTC operation during the blackout</td></tr>
<tr><td>Charging time</td><td> 
</td></tr>
<tr><td>Backup time</td><td>About 6 months(25℃)
<table>
<tr><th>surrounding temperature</th><th>Back-up time</th></tr>
<tr><td>70℃</td><td>about 195 days</td></tr>
<tr><td>25℃</td><td>about 183 days</td></tr>
<tr><td>-25℃</td><td>about 133 days</td></tr>
</table></td></tr>
</table>

4.5.2 Instruction for Use

The built-in battery of the XEC high-end type can be replaced through a service center.

4.5.3 Battery Life

Battery's life may be different depending on the conditions of blackout time, service temperature, etc.
Battery can be charged when power is on, and be used for RTC function.
If the battery voltage is discharged below 2V due to not using the PLC for a long time, the battery may not be charged. Recharge within 6 months (when stored at 25℃) after fully charged. If the battery is not charged, replace the battery through a service center. In this case, the PLC clock must be set again, but the program and backed up data are maintained and preserved regardless of whether the battery is discharged or not.

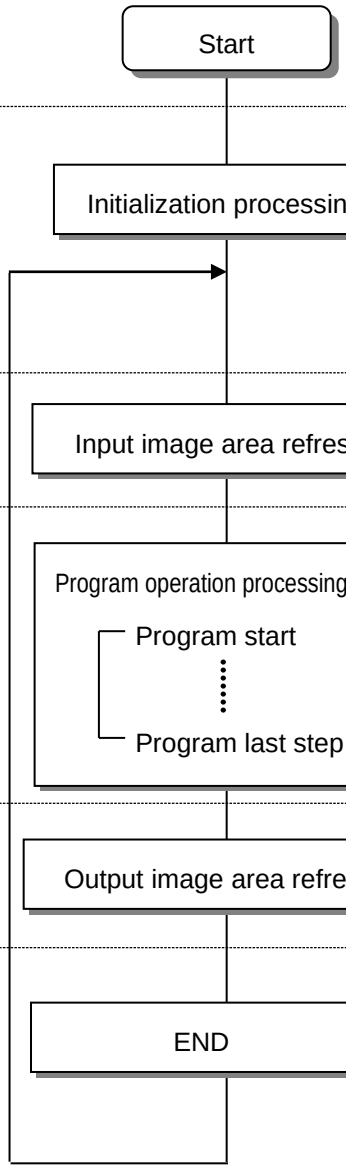
Chapter 5 Program Configuration and Operation Method

5.1 Program Instruction

5.1.1 Program execution methods

(1) Cyclic operation method (Scan)

This is a basic program proceeding method of PLC that performs the operation repeatedly for the prepared program from the beginning to the last step, which is called 'program scan'. The series of processing like this is called 'cyclic operation method'. The processing is divided per stage as below.

Stage	Processing description
	-
	• A stage to start the scan processing which is executed once when power is applied or Reset is executed, as below. ▸ Self-diagnosis execution ▸ Data clear ▸ Address allocation of I/O module and type register • If initializing task is designated, Initializing program is executed.
	• Reads the state of input module and saves it in input image area before starting the operation of program.
	• Performs the operation in order from the program start to last step.
	• Performs the operation in order from the program start to last step.
	• A processing stage to return to the first step after CPU module completes 1 scan processing and the processing performed is as below. ▸ Update the current value of timer and counter etc. ▸ User event, data trace service ▸ Self-diagnosis ▸ High speed link, P2P e-Service ▸ Check the state of key switch for mode setting

(2) Interrupt operation (Cycle time, Internal device)

This is the method that stops the program operation in proceeding temporarily and carries out the operation processing which corresponds to interrupt program immediately in case that there occurs the status to process emergently during PLC program execution.

The signal to inform this kind of urgent status to CPU module is called 'interrupt signal'. There is a Cycle time signal that operates program every appointed time and external interrupt signal that operates program by external contact point (%IX0.0.0~%IX0.0.7). Besides, there is an internal device start program that starts according to the state change of device assigned inside.

(3) Constant Scan (Fixed Period)

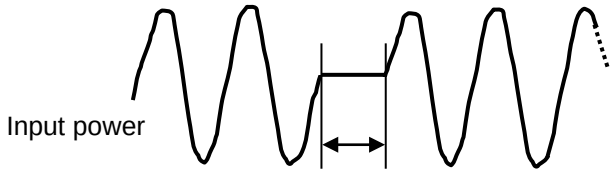
This is the operation method that performs the scan program every appointed time. This stands by for a while after performing all the scan program, and starts again the program scan when it reaches to the appointed time. The difference from constant program is the update of input/output and the thing to perform with synchronization. At constant operation, the scan time indicates the net program processing time where the standby time is deducted. In case that scan time is bigger than 'constant', %FX92 (_CONSTANT_ER) flag shall be 'ON'.

5.1.2 Operation processing during momentary power failure

CPU module detects the momentary power failure when input power voltage supplied to power module is lower than the standard. If CPU module detects the momentary power failure , it carries out the operation processing as follows.

If momentary power failure within 10 ms is occurred, main unit (CPU) keeps the operation. But, if momentary power failure above 10 ㎳, the operation is stop and the output is Off. Restart processing like at power input shall be performed.

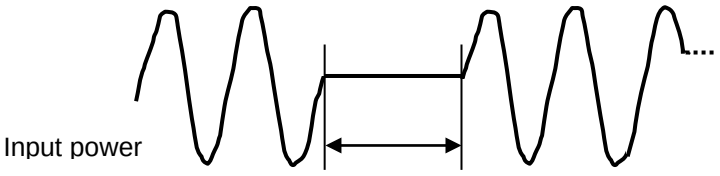
(1) Momentary power failure within 10 ms



Momentary power failure within 10 ms

(1) When momentary power failure occurs, PLC holds its output status and stop operation.
(2) If momentary power failure is canceled, operation continues.
(3) Output voltage of power module keeps value is specification.
(4) Though momentary power failure occurs and operation stops, timer measurement and timer measurement for interrupt is conducted normally.

(2) Momentary power failure exceeding 10 ms



Momentary power failure exceeding 10 ms

• Restart processing like at power input shall be performed.

Remark

1) Momentary power failure?

This means the state that the voltage of supply power at power condition designated by PLC is lowered as it exceeds the allowable variable range and the short time (some ms ~ some dozens ms) interruption is called 'momentary power failure').

5.1.3 Scan time

The processing time from program step 0 to the next step 0 is called 'Scan Time'.

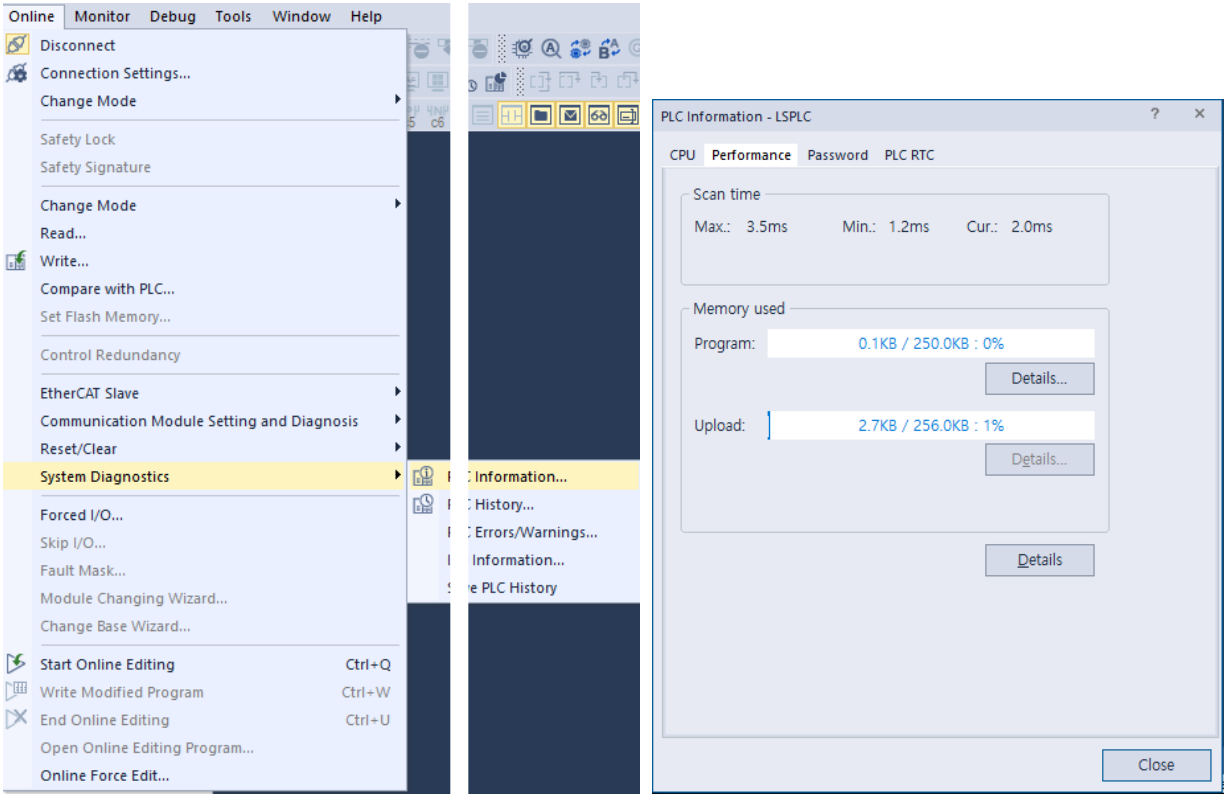
(1) Scan time calculation expression
Scan time is the sum of the processing time of scan program and interrupt program prepared by the user and PLC internal time, and is distinguished by the following formula.

(a) Scan time = Scan program processing time + Interrupt program processing time + PLC internal processing time

- Scan program processing time = processing time of user program not saved as interrupt program
- Interrupt program processing time = Sum of interrupt program proceeding time processed during 1 scan
- PLC internal processing time = Self-diagnosis time + I/O refresh time + Internal data processing time + Communication service processing time

(b) Scan time depends on whether to execute interrupt program and communication processing.

(2) Scan time monitor
(a) Scan time can be monitored 『Online』-『PLC Information』-『Performance』.



(b) Scan time is save in special relay (F) area as follows.
- %FW50: max. value of scan time (unit: 0.1 ms)
- %FW51: min. value of scan time (unit: 0.1 ms)
- %FW52: current value of scan time (unit: 0.1 ms)

5.1.4 Scan Watchdog timer

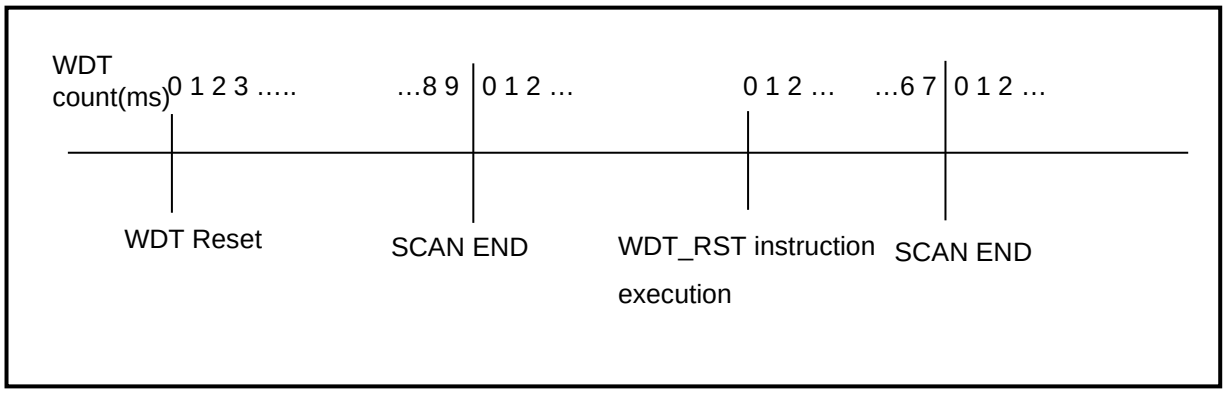
WDT (Watchdog Timer) is the function to detect the program congestion by the error of hardware and software of PLC CPU module.

(1) WDT is the timer used to detect the operation delay by user program error. The detection time of WDT is set in Basic parameter of XG5000.

(2) If WDT detects the excess of detection setting time while watching the elapsed time of scan during operation, it stops the operation of PLC immediately and keeps or clears the output according to parameter setting

(3) If the excess of Scan Watchdog Time is expected in the program processing of specific part while performing the user program (FOR ~ NEXT instruction, CALL instruction), clear the timer by using 'WDT_RST' Function 'WDT_RST' Function initializes the elapsed time of Scan Watchdog Timer and starts the time measurement from 0 again.
(For further information of WDT_RST Function, please refer to Instruction.)

(4) To clear the error state of watchdog, we can use the following method : power re-supply, PLC reset, mode conversion to STOP mode.



Remark

1) The setting range of Watchdog Timer is 10 ~ 1000ms (Unit: 1ms).

5.2 Program Execution

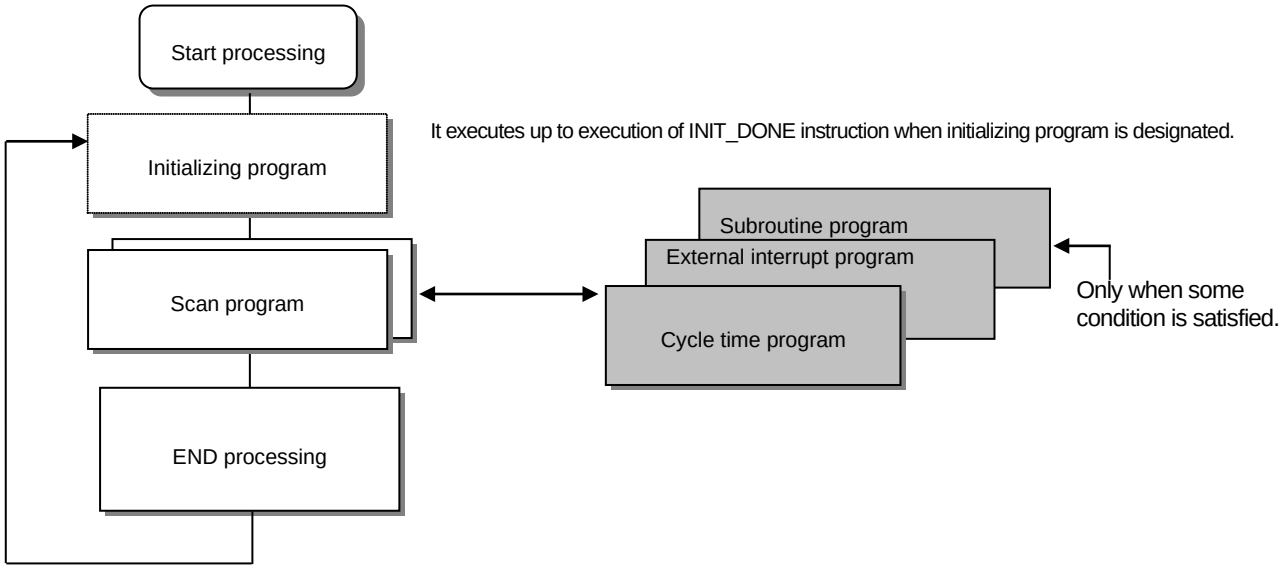
5.2.1 Configuration of program

All functional elements need to execute a certain control process are called as a 'program'. Program is stored in the built-in RAM mounted on a CPU module or flash memory of a external memory module. The following table shows the classification of the program.

Program type	Description
Initializing program	• It will be executed till the specific Flag 'INIT_DONE' is On. And while the initialization task is executed, several of initializing program is programmed. (If INIT_DONE instruction is executed, scan program is executed.)
Scan program	• The scan program is executed regularly in every scan.
Cycle time interrupt program	• The program is performed according to the fixed time interval in case that the required processing time condition is as below. ▸ In case that the faster processing than 1 scan average processing time is required ▸ In case that the longer time interval than 1 scan average processing time is required ▸ In case that program is processed with the appointed time interval
External interrupt program	• The external interrupt program is performed process on external interrupt signal.
Subroutine program	• Only when some condition is satisfied.(in case that input condition of CALL instruction is On)

5.2.2 Program execution methods

Here describes the program proceeding method that is executed when the power is applied or key switch is 'RUN'. The program performs the operation processing according to the configuration as below.



(1) Scan program

(a) Function

- This program performs the operation repeatedly from 0 step to last step in order prepared by the program to process the signal that is repeatedly regularly every scan.

- In case that the execution condition of interrupt by task interrupt or external input while executing program is established, stop the current program in execution and perform the related interrupt program.

(2) Interrupt program

(a) Function

- This program stops the operation of scan program and then processes the related function in prior to process the internal/external signal occurred periodically/non-periodically.

(b) Type

- Task program is divided as below.
  - Cycle time task program: available to use up to 8.
  - Internal device task program: available to use up to 8.
  - I/O (External contact task program): available to use up to 8. (%IX0.0.0~%IX0.0.7)

- Cycle time task program
  - Performs the program according to the fixed time internal.

- Internal device task program
  - Performs the corresponding program when the start condition of internal device occurs.
  - The start condition detection of device shall be performed after processing of scan program.

- I/O (External contact task program)
  - Performs the program according to the input external signal (%IX0.0.0~%IX0.0.7).

Remark

(1) Write the interrupt program as shortly as possible. In case same interrupt occurs repeatedly before completion of interrupt, program is not executed and O/S watch dog error may occur.

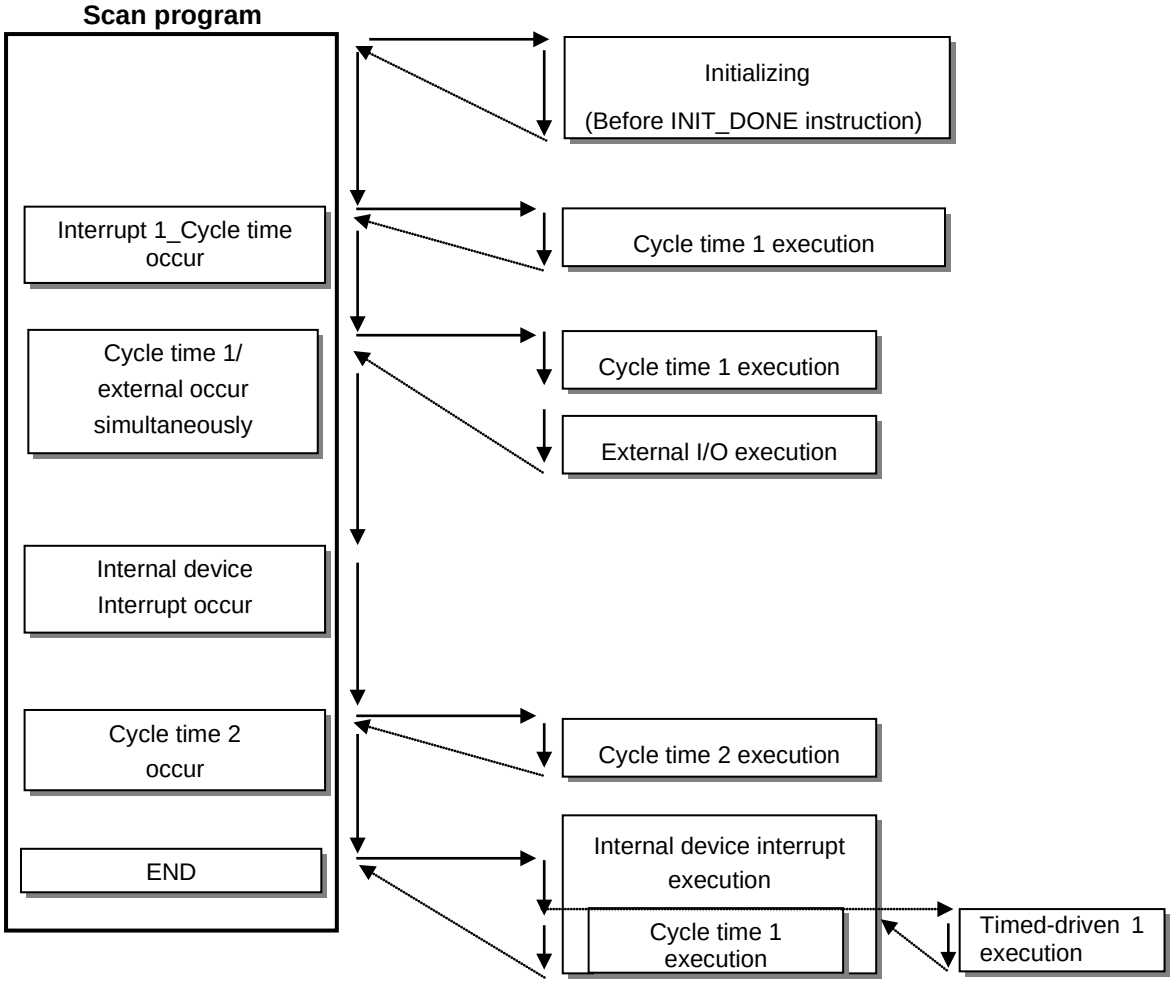
(2) Though interrupt which has lower priority occurs many times during execution of interrupt which has higher priority, interrupt which has lower priority occurs only one time.

5.2.3 Interrupt

For your understanding of Interrupt function, here describes program setting method of XG5000 which is an XGB programming S/W. Example of interrupt setting is as shown bellows.

- Interrupt setting

Interrupt source	Interrupt name	priority	Task No.	Program
Initializing	Interrupt 0_	-	-	-
Cycle time 1	Interrupt 1_cycle time	2	0	Cycle time 1
External	Interrupt 2_external	2	8	External
Internal device	Interrupt 3_internal	3	16	Internal
Cycle time 2	Interrupt 4_cycle time	3	1	Cycle time 2



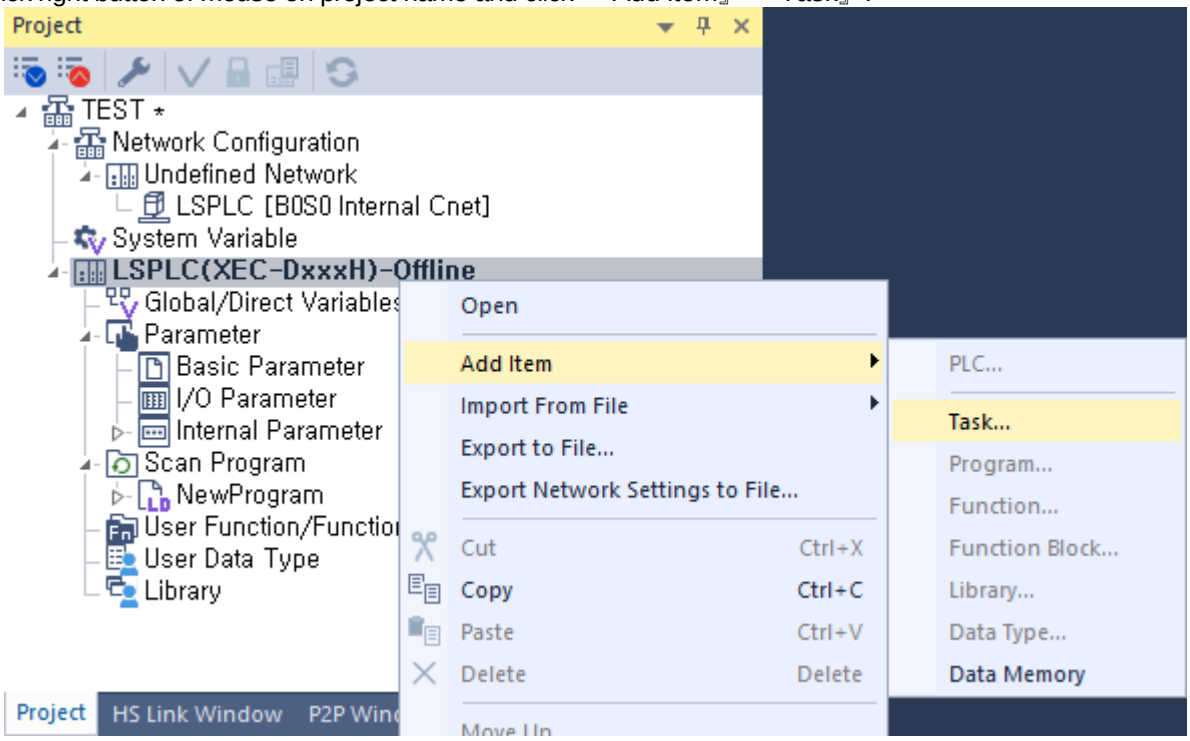
Remark

- In case that several tasks to be executed are waiting, execute from the highest Task Program in priority. When the same priority tasks are waiting, execute from the order occurred.
- While interrupt executing, if the highest interrupt is occurred, the highest interrupt is executed earliest of all.
- When power On, All interrupts are in the state 'Enable'.
- Internal device interrupt is executed after END instruction.

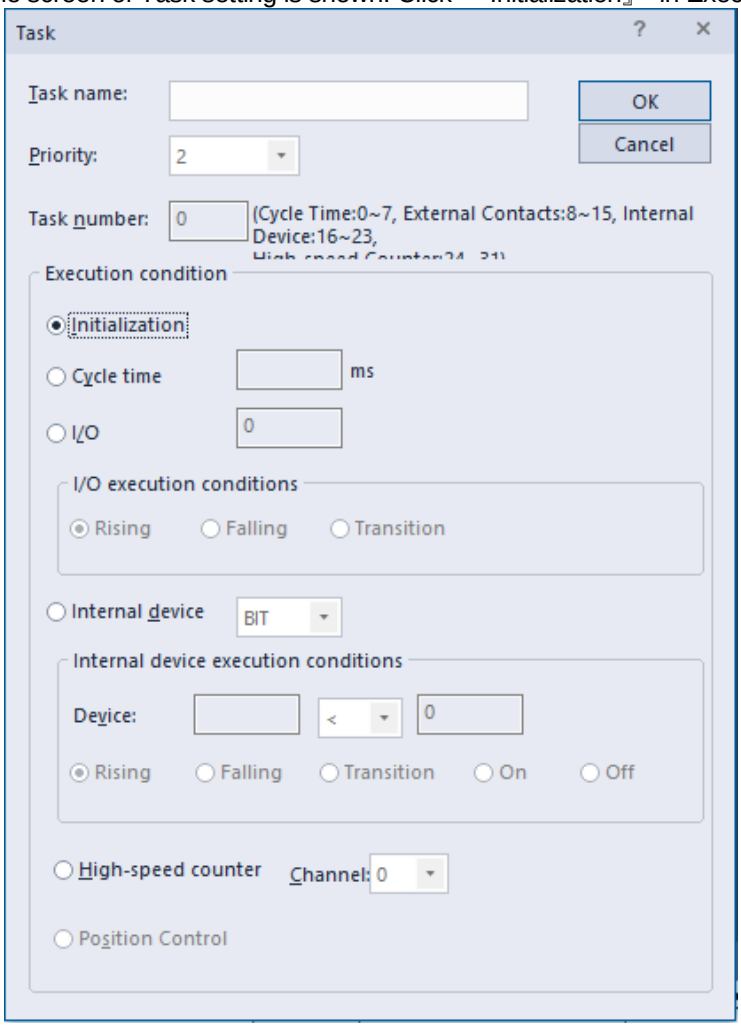
(1) How to prepare interrupt program

Generate the task in the project window of XG5000 as below and add the program to be performed by each task. For further information, please refer to XG5000 user's manual.
(It can be additional when XG5000 is not connected with PLC.)

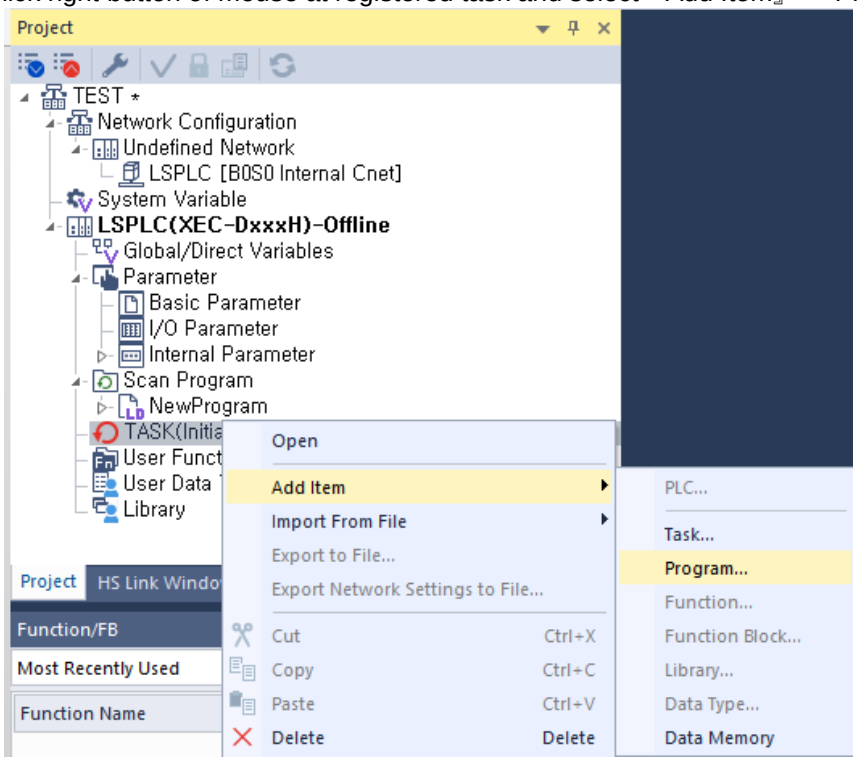
(a) Click right button of mouse on project name and click 『Add item』-『Task』.



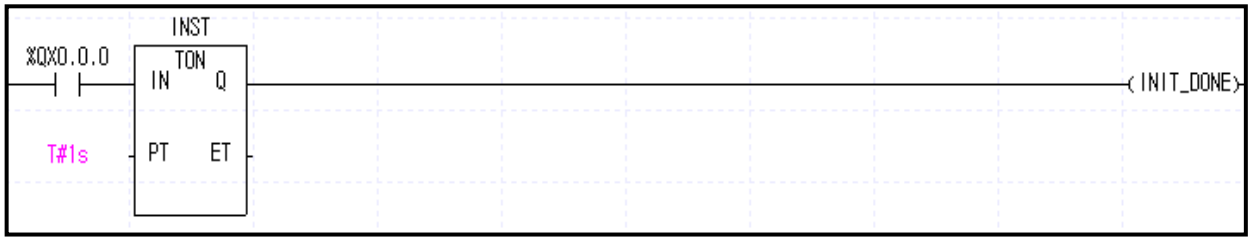
(b) The screen of Task setting is shown. Click 『Initialization』 in Execution condition and make a Task name.



(c) Click right button of mouse at registered task and select『Add Item』-『Program』.



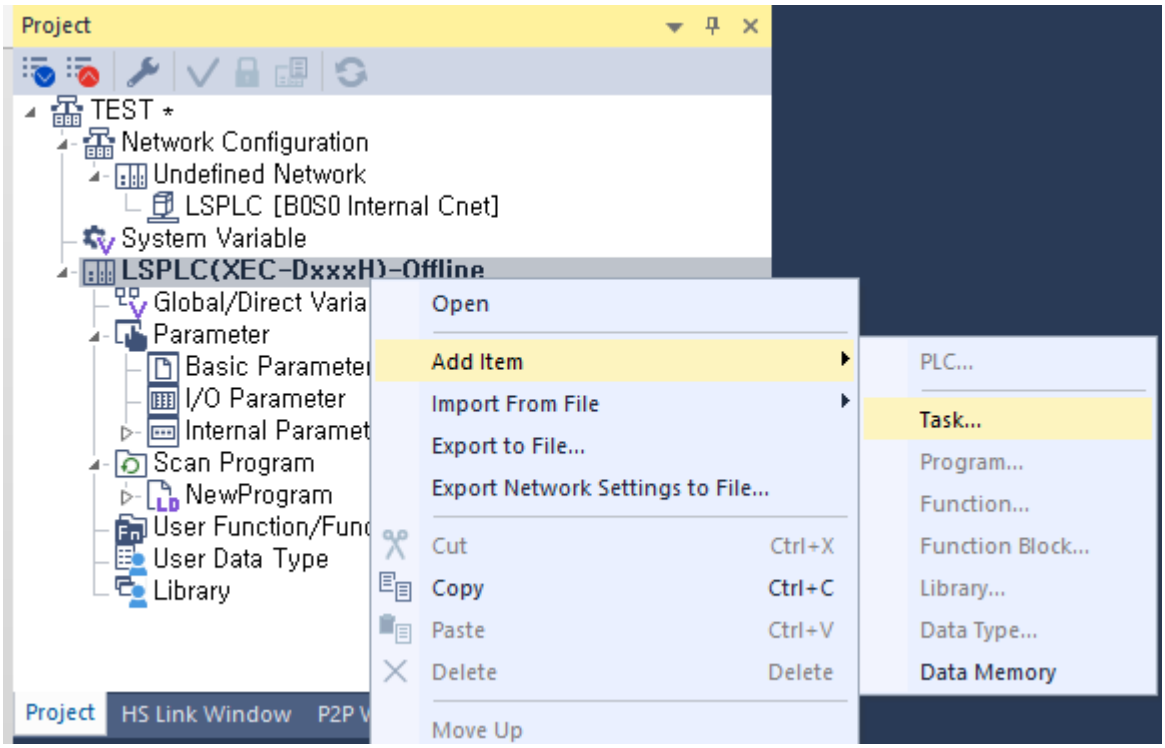
(d) Make initializing program. In initializing program, INIT_DONE instruction must be made. If not, Scan program is not executed.



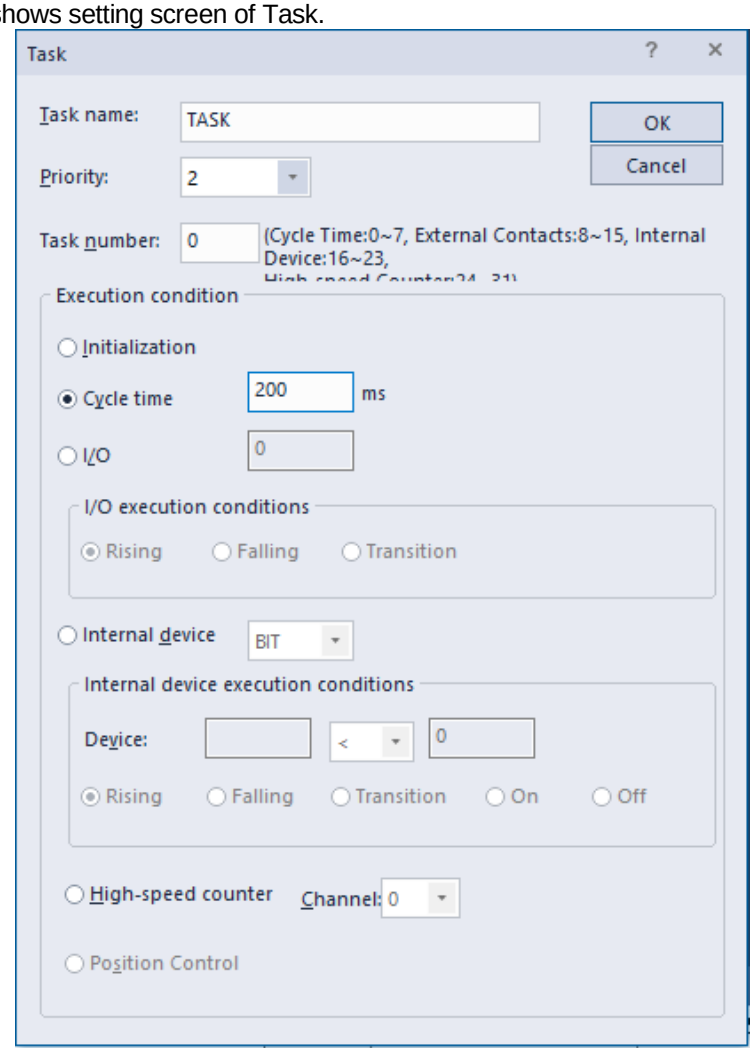
(2) How to prepare Cycle interrupt program

Generate the task in the project window of XG5000 as below and add the program to be performed by each task. For further information, please refer to XG5000 user's manual.
(It can be additional when XG5000 is not connected with PLC)

(a) Click right button of mouse at registered task and select『Add Item』-『Task』.



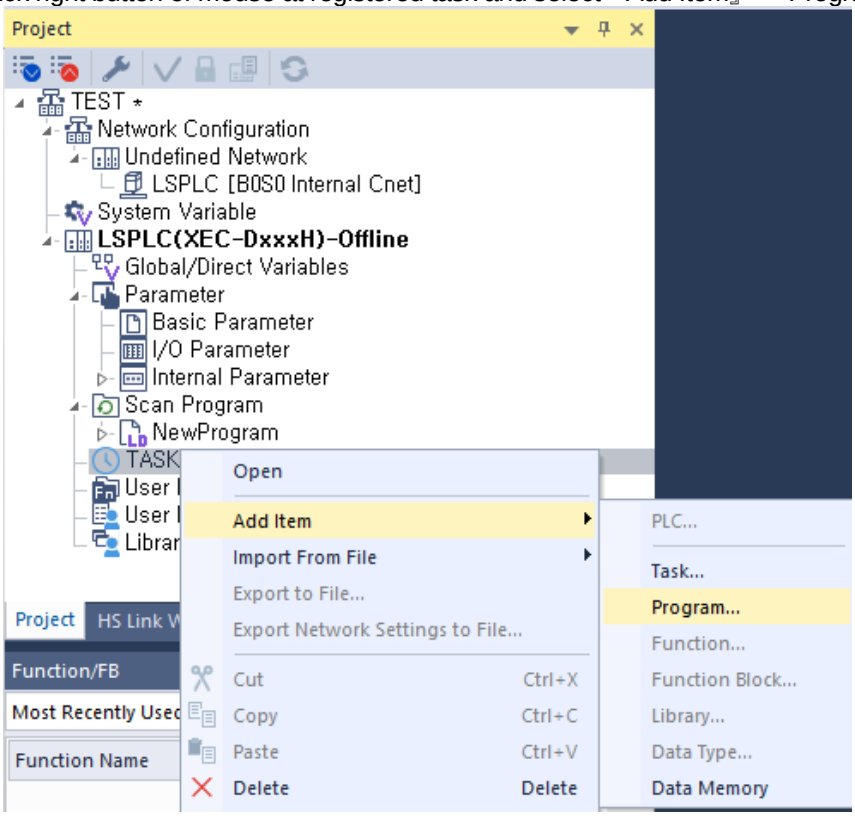
• It shows setting screen of Task.



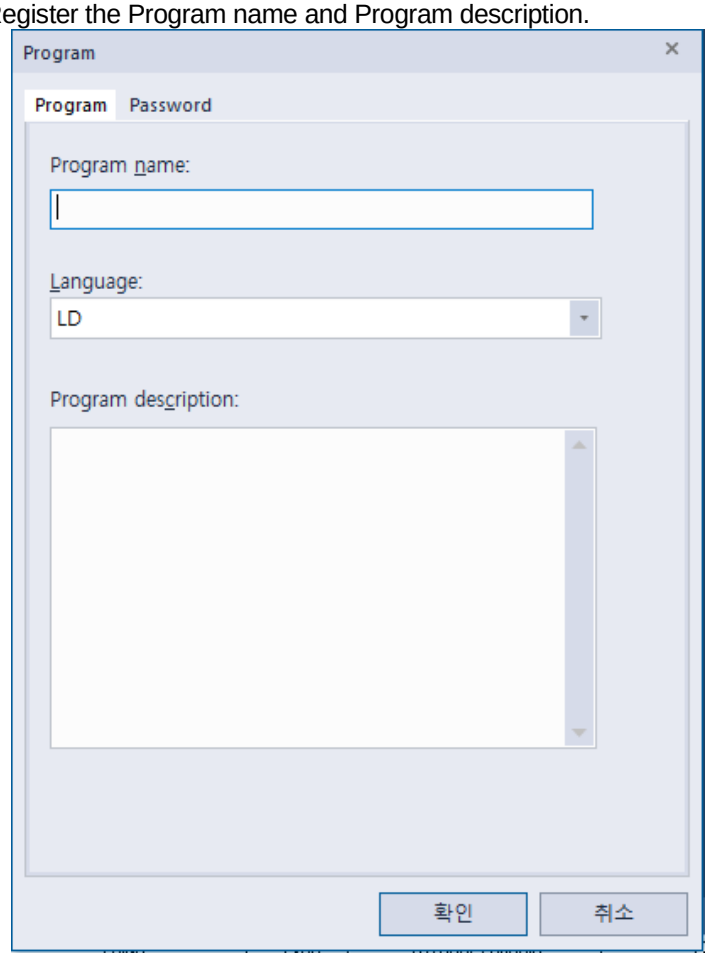
(b) Task type

Classification		Description	Remark
Task name		Make Task name.	Character, number available
Priority		Set the priority of task. (2~7)	“2” is the highest priority number.
Task number		Set the Task number. • Cycle time task (0 ~ 7): 8 • External I/O task (8 ~ 15): 8 • Internal device task (16 ~ 23): 8	-
Execution condition	Initialization	Set the initial program when running the project.	Till the execution of INIT_DONE instruction
	Cycle time	Set the cyclic interrupt.	0~4294967295 ms available
	I/O	Set the external I/O.	%IX0.0.0~%IX0.0.7 available
	Internal device	Set the internal device to interrupt execution. • Bit: Among Rising, Falling, Transition, On, Off • Word: Among >,>=,<,<=	-

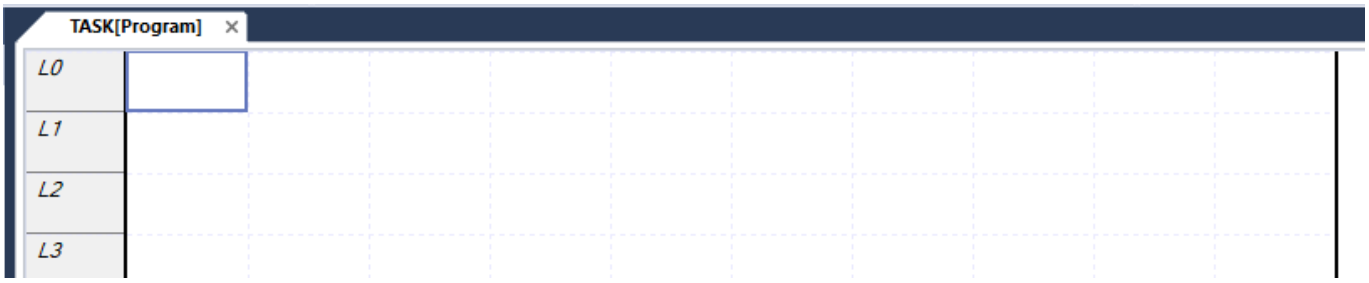
(c) Click right button of mouse at registered task and select『Add Item』-『Program』.



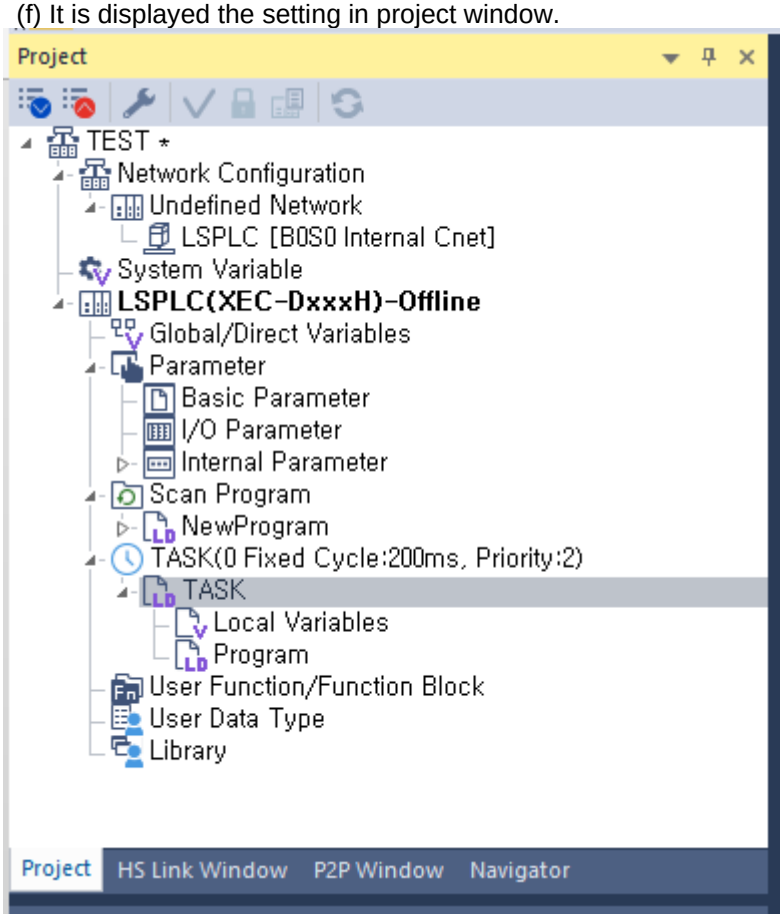
(d) Register the Program name and Program description.



(e) It is displayed the program window to write task program.



(f) It is displayed the setting in project window.



(3) Task type

Task type and function is as follows.

Type / Spec.	Cycle time task (Interval task)	I/O task (Interrupt task)	Internal device task (Single task)
Max. Task number	8	8	8
Start condition	Cyclic (setting up to max. 4,294,967.295 sec. by 1ms unit)	Rising or falling edge of main unit's contact (%IX0.0.0~%IX0.0.7)	Internal device execution condition
Detection and execution	Cyclic execution per setting time	Immediate execution at the edge of main unit's contact (%IX0.0.0~%IX0.0.7)	Retrieve the condition and execute after completing Scan Program
Detection delay time	Max. 1 ms delay	Max. 0.05 ms delay	Delay as much as max. scan time
Execution priority	2~7 level setting (2 level is highest in priority)	2~7 level setting (2 level is highest in priority)	2~7 level setting (2 level is highest in priority)
Task no.	Within 0~7 range without user duplication	With 8~15 range without user duplication	Within 16~23 range without user duplication

(4) Processing methods of task program

Here describes common processing method and notices for Task program.

(a) Feature of task program

1) Task Program is executed only when execution condition occurs without every scan repeat processing. When preparing Task Program, please consider this point.
2) For example, if a timer and counter were used in cyclic task program of 10 second cycle, this timer occurs the tolerance of max. 10 seconds and the counter and the timer and as the counter checks the input status of counter per 10 seconds, the input changed within 10 seconds is not counted up.

(b) Execution priority

1) In case that several tasks to be executed are waiting, execute from the highest Task Program in priority. When the same priority tasks are waiting, execute from the order occurred.
2) In case Cycle time task and external I/O task is occurred concurrently, execute from the highest task program. (In sequence of XG5000 setting)
3) The task program priority should be set considering the program features, importance and the emergency when the execution requested.

(c) Processing delay time

There are some causes for Task Program processing delay as below. Please consider this when task setting or program preparation.

1) Task detection delay (Refer to detailed description of each task.)
2) Program proceeding delay caused by Priority Task Program proceeding

(d) Relationship of initialize, Scan Program and Task Program

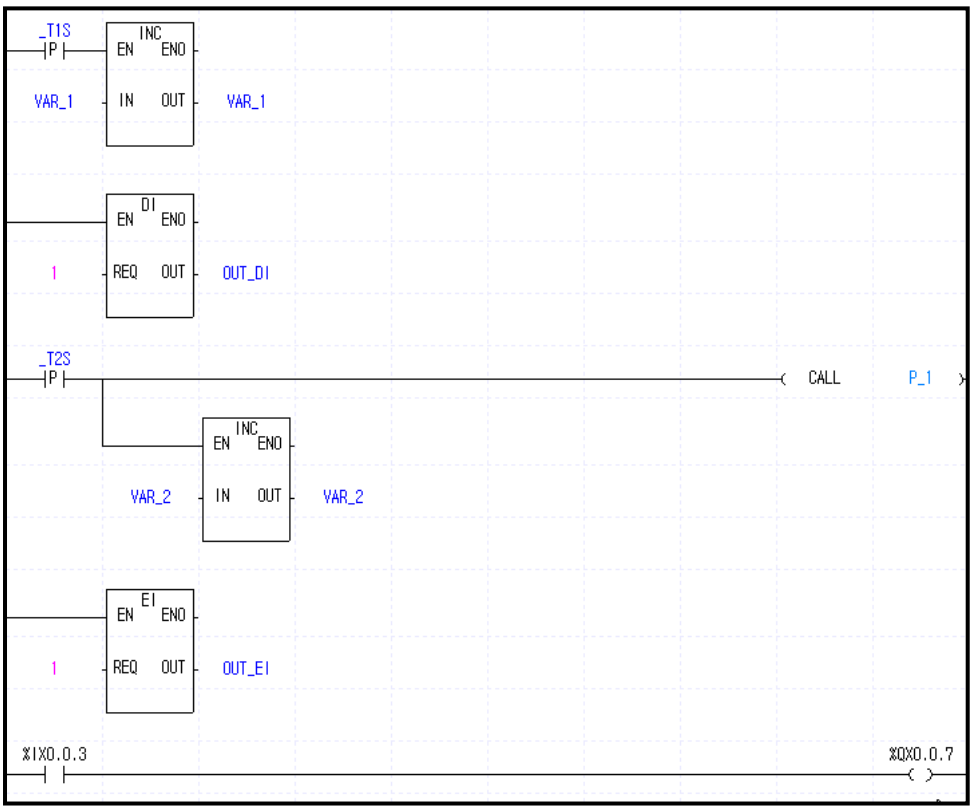
1) ser identification task does not start while performing Initialization Task Program.
2) As Scan Program is set as lowest priority, if task occurs, stop Scan Program and process Task Program in advance. Accordingly, if task occurs frequently during 1 scan or concentrates intermittently, scan time may extend abnormally. Cares should be taken in case of task condition setting.

(e) Protection of Program in execution from Task Program

1) In case that the continuity of program execution is interrupted by high priority Task Program during program execution, it is available to prohibit the execution of Task Program partially for the part in problem. In this case, it is available to perform the program protection by ' DI (Task Program Start Disabled) and 'EI (Task Program Start Enabled)' Function

2) Insert 'DI' Function in the start position of the part requiring the protection and insert 'EI' Function in the position to release. Initialization Task is not influenced by 'DI', 'EI' Function.

3) If interrupt is occurred while 'CALLP' instruction executing, interrupt program is executed after 'CALLP' instruction execution.



(5) Cyclic task program processing method

Here describes the processing method in case that task (start condition) of Task program is set as Cycle time.

(a) Items to be set in Task

Set the execution cycle and priority which are the start condition o f Task program to execution. Check the task no. to manage the task.

(b) Cyclic task processing

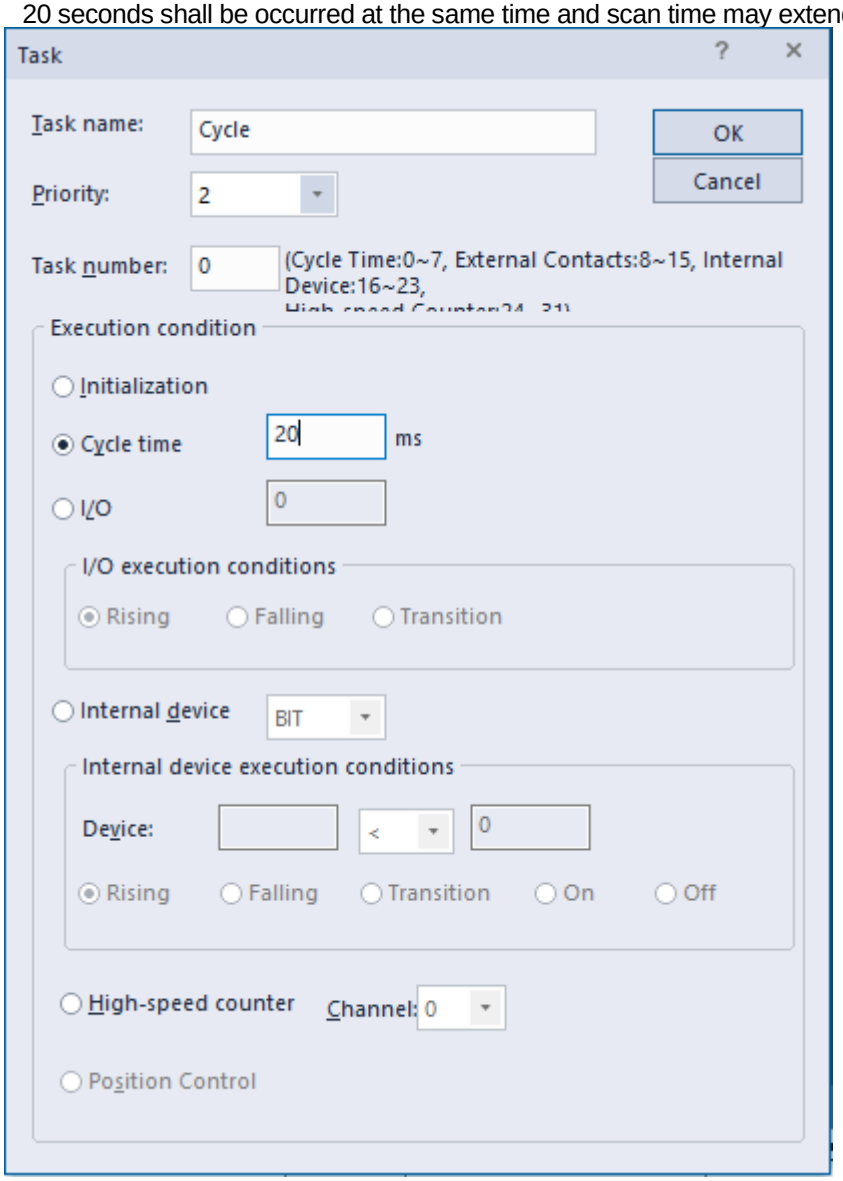
Performance the corresponding cyclic task program per setting time interval (execution cycle).

(c) Notice in using cyclic task program

1) When cyclic task program is in execution currently or waiting for execution, if the demand to execute the same task program occurs, the new occurred task shall be disregarded.

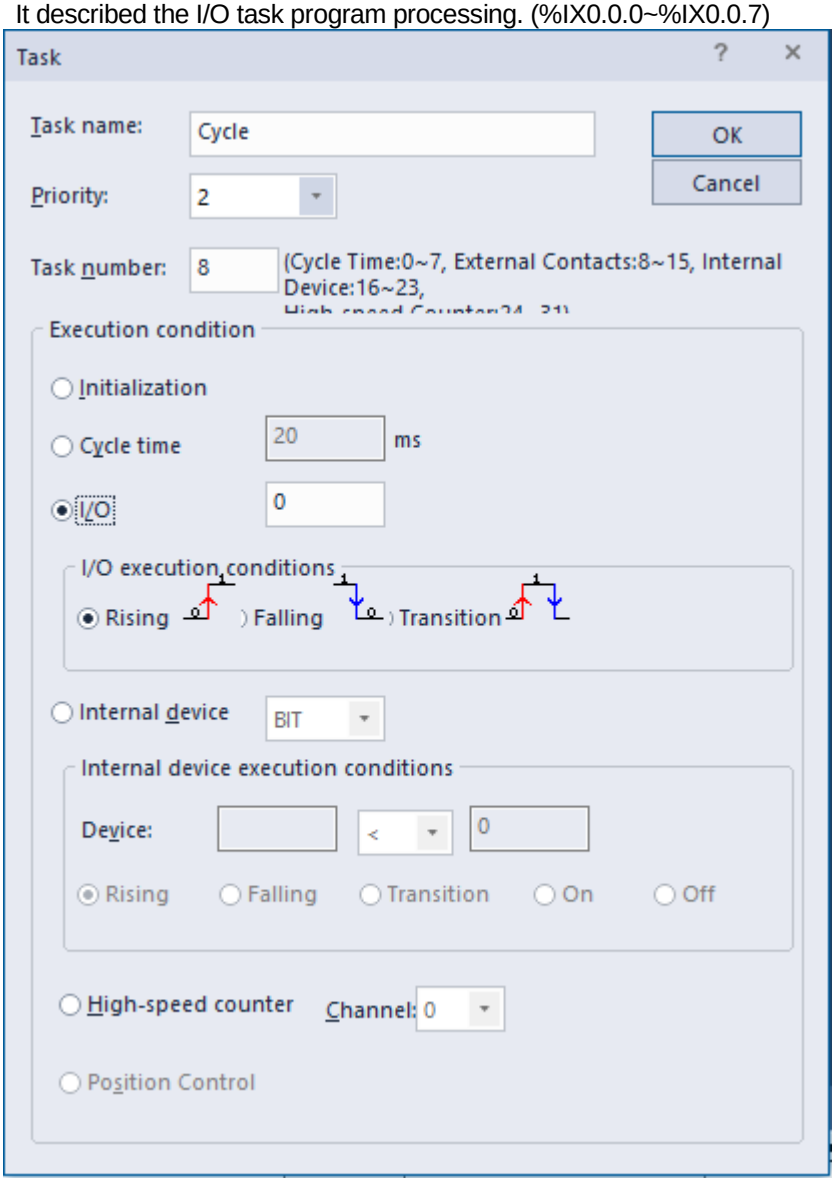
2) Timer that makes a demand to execute cyclic task program only while operation mode is Run mode, shall be added. The shutdown time shall be all disregarded.

3) When setting the execution cycle of cyclic task program, consider the possibility that the demand to execute several cyclic task program at the same time occurs.
If 4 cyclic task programs that the cycle is 2sec, 4sec, 10sec and 20sec are used, 4 demands of execution per 20 seconds shall be occurred at the same time and scan time may extend instantaneously.



(6) I/O task program processing

It described the I/O task program processing. (%IX0.0.0~%IX0.0.7)



(a) Items to be set in Task

- Set the execution condition and priority to the task being executed. Check the task no. to manage the task.

(b) I/O task processing

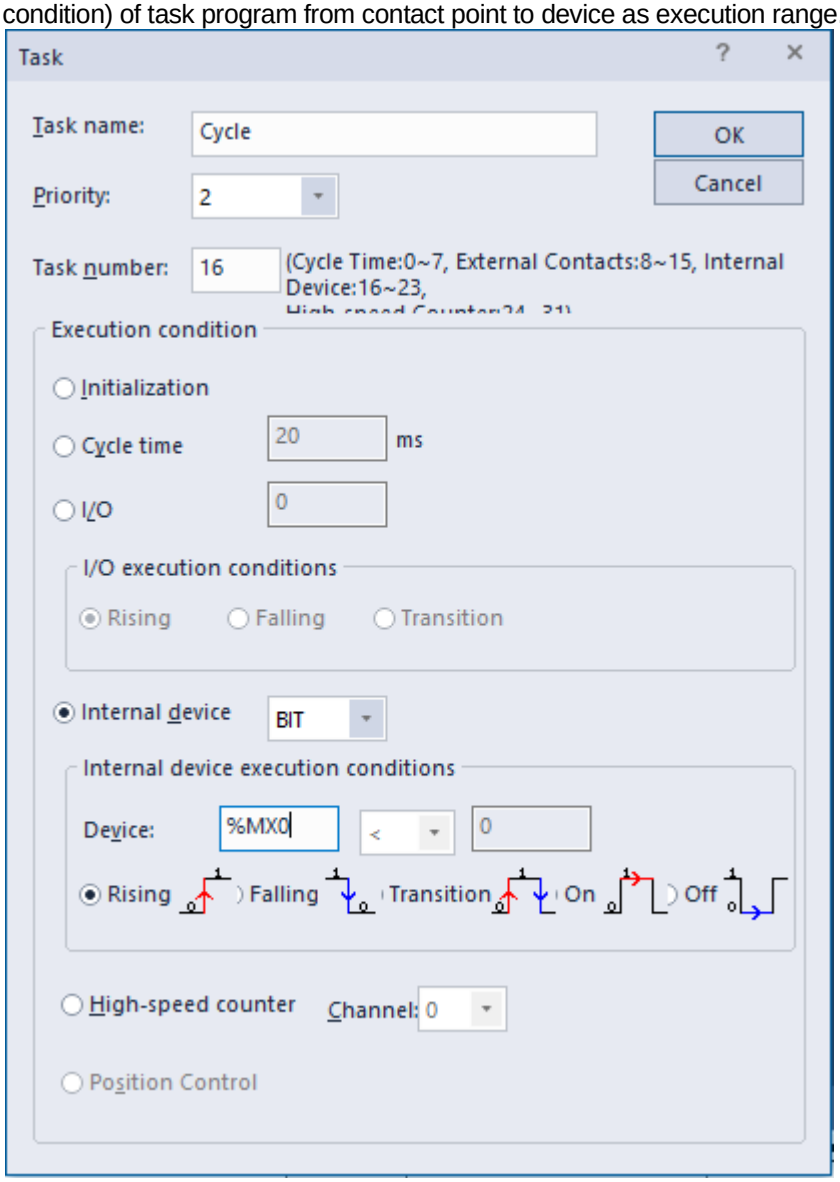
- If interrupt signal from external signal (I/O) is occurred on main unit (%IX0.0.0~%IX0.0.7), task program is executed by external (I/O) signal.

(c) Precaution in using I/O task program

1) If task program which is executed by interrupt signal is on execution or standby status, new task program which is requested by identical I/O is ignored.
2) Only operation mode is Run mode, execution request of task program is recognized. Namely, execution request of task program is ignored when operation mode is Stop mode.

(7) Internal device task program processing

Here describes the processing method of international device task program which extended the task (start condition) of task program from contact point to device as execution range.



(a) Items to be set in Task

Set the execution condition and priority to the task being executed. Check the task no. for task management.

(b) Internal device task processing

After completing the scan program execution in CPU module, if the condition that becomes the start condition of internal device task program is met, according to the priority, it shall be executed.

(c) Precautions in using internal device task program

1) Accordingly, even if the execution condition of internal device task program occurs in Scan Program or Task Program (Cycle time, I/O), it shall not be executed immediately but executed at the time of completion of Scan Program.

2) If the demand to execute Internal Device Task Program occurs, the execution condition shall be examined at the time of completion of Scan Program. Accordingly, if the execution condition of Internal Device Task occurs by Scan Program or Task Program (Cycle time) during '1 scan' and disappears, the task shall not be executed as it is not possible to detect the execution at the time of examination of execution condition.

(8) Verification of task program

(a) Is the task setting proper?
If task occurs frequently more than needed or several tasks occur in one scan at the same time, scan time may lengthen or be irregular. In case not possible to change the task setting, verify max. scan time.

(b) Is the priority of task arranged well?
The low priority task program shall be delayed by the high priority task program, which results in disabling the processing within the correct time and even task collision may occur as next task occurs in the state that the execution of previous task is delayed. Consider the emergency of task and execution time etc when setting the priority.

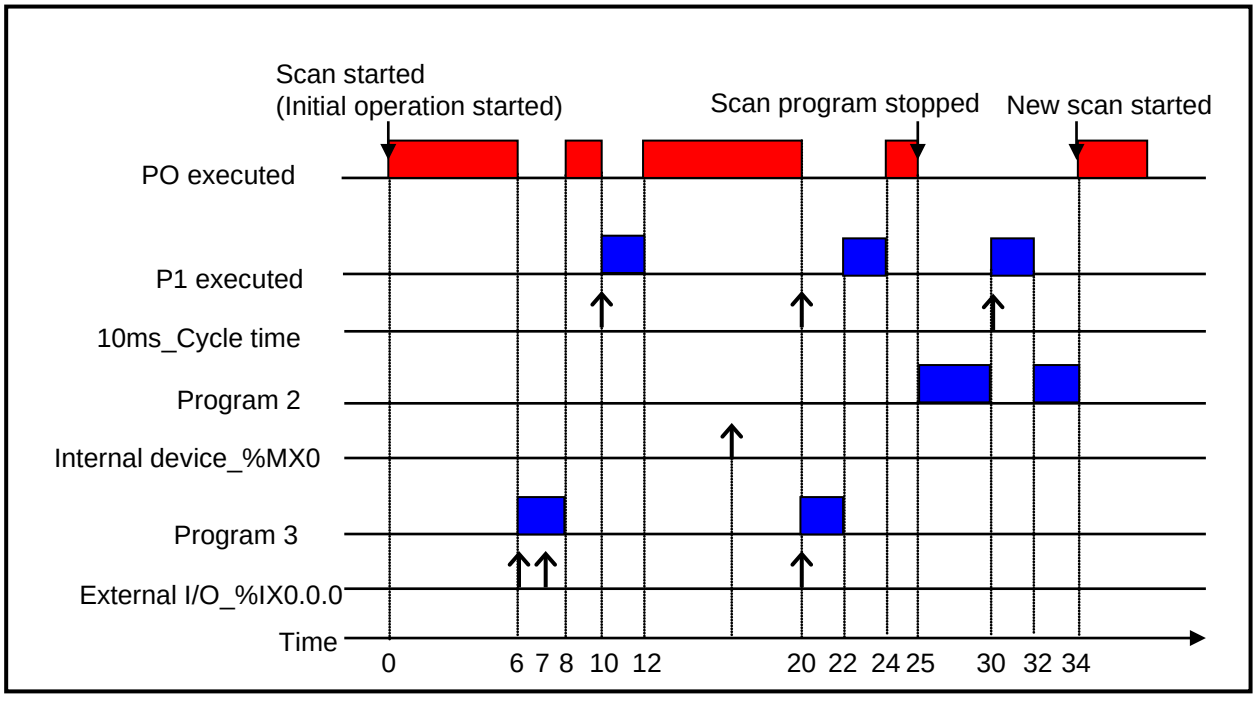
(c) Is the Task Program written in shortest?
If the execution time of Task Program is longer, scan time may lengthen or be irregular. Even it may cause the collision of task program. Write the execution time as short as possible. (Especially, when writing the cyclic task program, write the execution time so that the task program can be executed within 10% cycle of the shortest task among several tasks.)

(d) Is program protection for the high priority task needed during program execution?
If other task is inserted during task program execution, complete the task in execution and operate the standby tasks in the order of high priority. In case that it is not allowed to insert other task in Scan Program, prevent the insert partially by using 'DI' and 'EI' application instruction. The problem may occur while processing the global variables used commonly with other program or special or communication module.

(9) Program configuration and processing example
If task and program are registered as below.

Interrupt type	Interrupt name	Priority	Task No.	Program
Cycle time	10 ㎳_cycle time	3	0	Program 1
Internal device	Internal device_%MX0	5	16	Program 2
I/O	I/O_%IX0.0.0	2	8	Program 3

1) Scan program name: " Scan Program"
2) Execution time respective program: Scan program = 17 ㎳, Program 1 = 2 ㎳, Program 2= 7 ㎳, Program 3 = 2 ㎳



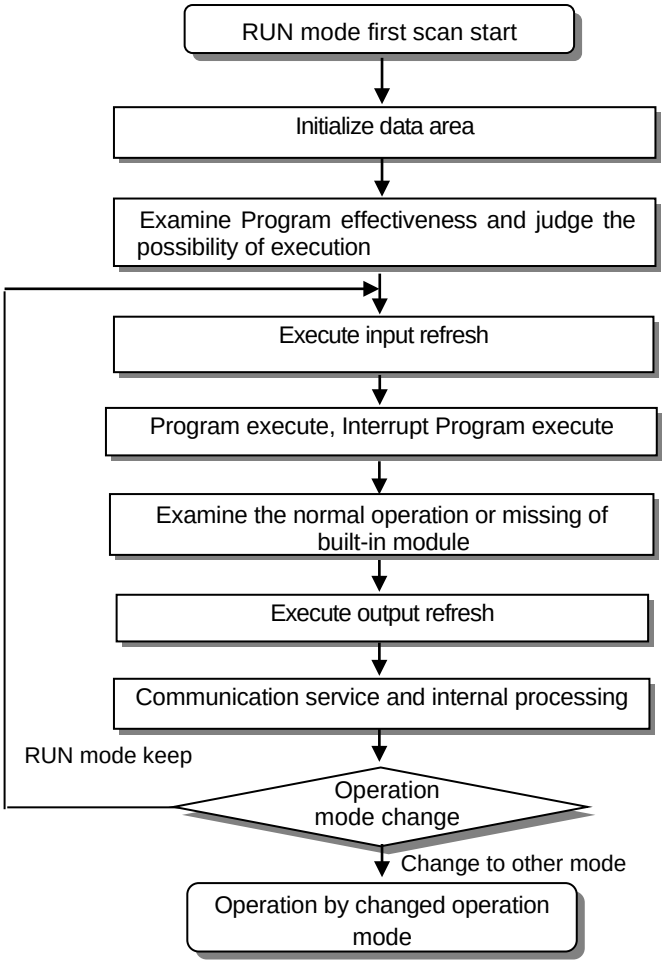
Process per time	
Time (㎳)	Process
0	Scan started and scan program started to execute.
0~6	Scan program is executed.
6~8	Scan program is stop because execution external I/O (P000) is requested. And program 3 is executed. Request of execution at 7[ms] is ignored because program 3 has been executing.
8~10	Program 3 is finished and Scan program is continued.
10~12	Scan program is stop by request of '10 ㎳_Cycle time' interrupt signal and execute program 1.
12~20	Program 1 is finished and Scan program is continued.
20	Request of 'Cycle time' interrupt signal and 'External I/O (P000)' signal is occurred concurrently but priority of 'External I/O' signal is higher than 'Cycle time' interrupt signal so program 3 is executed and program 1 is standby.
20~22	Program 3 is finished and Scan program is continued.
22~24	After program 3 is completed, program 1 (the program of '10ms_Cycle time' is executed.
24~25	P1 execution completed and the stopped scan program execution finished
25	At the finished point of scan program, check the request of Internal device 'M000' execution and execute program 2.
25~30	Program P2 is executed.
30~32	When '10 ㎳_Cycle time' interrupt signal is occurred, the priority of that is higher than Internal device 'M000' though program 2 is stopped and program 1 is executed.
32~34	P1 executed completed and the stopped P2 execution finished
34	New scan starts (Start scan program execution)

5.3 Operation Mode

For operation mode of CPU module, there are 3 types such as RUN mode, STOP mode and DEBUG mode..
Here describes the operation processing of each operation mode.

5.3.1 RUN mode

This is the mode to executed program operation normally.



(1) Processing at mode change
At the beginning, execute initialization of data area and examine the effectiveness of program and judge the possibility of execution.

(2) Operation processing contents
Execute I/O refresh and program operation.
(a) Detects the start condition of Interrupt Program and executes Interrupt Program.
(b) Examines the normal operation or missing of built-in module.
(c) Communication service and other internal processing.

5.3.2 STOP mode

This is the mode in stop state without Program operation. It is available to transmit the program through XG5000 only in Remote STOP mode.

(1) Processing at Mode Change
Clear the output image area and execute output refresh.

(2) Operation Processing Contents
(a) Executes I/O refresh.
(b) Examines the normal operation or missing of built-in module.
(c) Communication service or other internal processing.

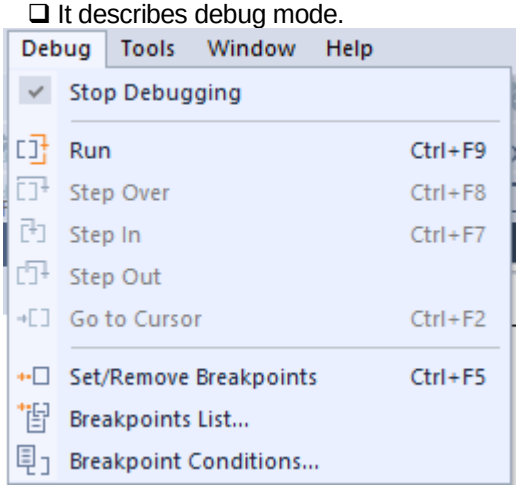
5.3.3 DEBUG mode

This is the mode to detect Program error or trace the operation process and the conversion to this mode is available only in STOP mode. This is the mode to check the program execution state and the contents of each data and verify the program.

(1) Processing at mode change
(a) Initializes the data area at the beginning of mode change.
(b) Clears the output image area and execute input refresh.

(2) Operation processing contents
(a) Executes I/O refresh.
(b) Debug operation according to setting state.
(c) After finishing Debug operation by the end of Program, execute output refresh.
(d) Examine the normal operation or missing of built-in module.
(e) Executes communication service or other service.

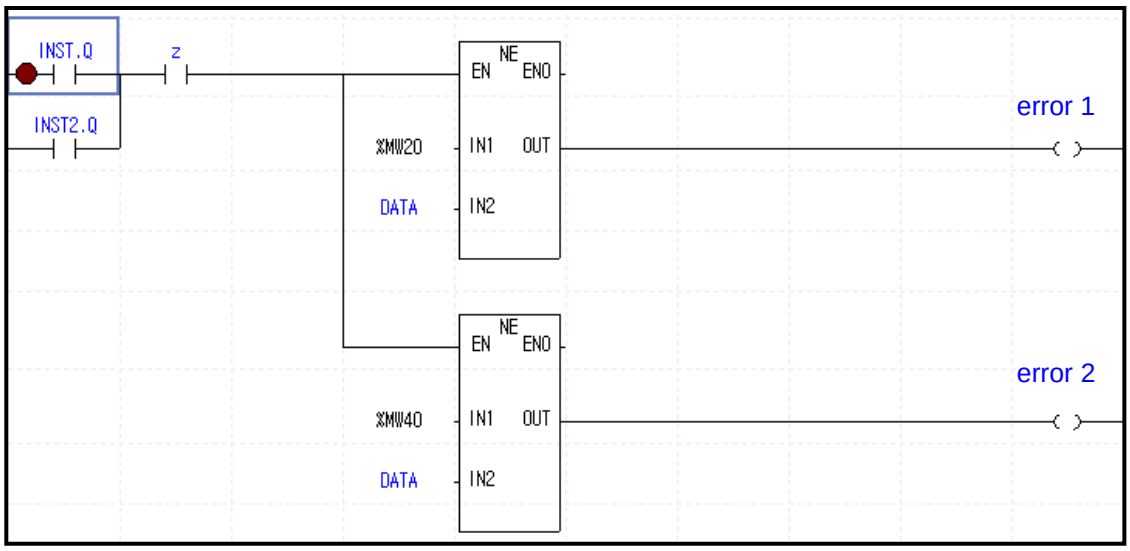
(3) Debug operation
❑ It describes debug mode.



Item	Description	Remark
Start/Stop Debugging	Change the debug ↔ stop mode	
Go	It starts debug operation.	
Step Over	It operates by 1 step.	
Step Into	It starts the subroutine program.	Other operation is identical to Step Over.
Step Out	It finished the subroutine program.	
Go to Cursor	It operates to current cursor position.	
Set/Remove Breakpoints	Set/Removes current cursor position to break points.	
Breakpoints List	It displays list of breakpoints.	
Breakpoint Conditions	It specifies device value and number of scan.	

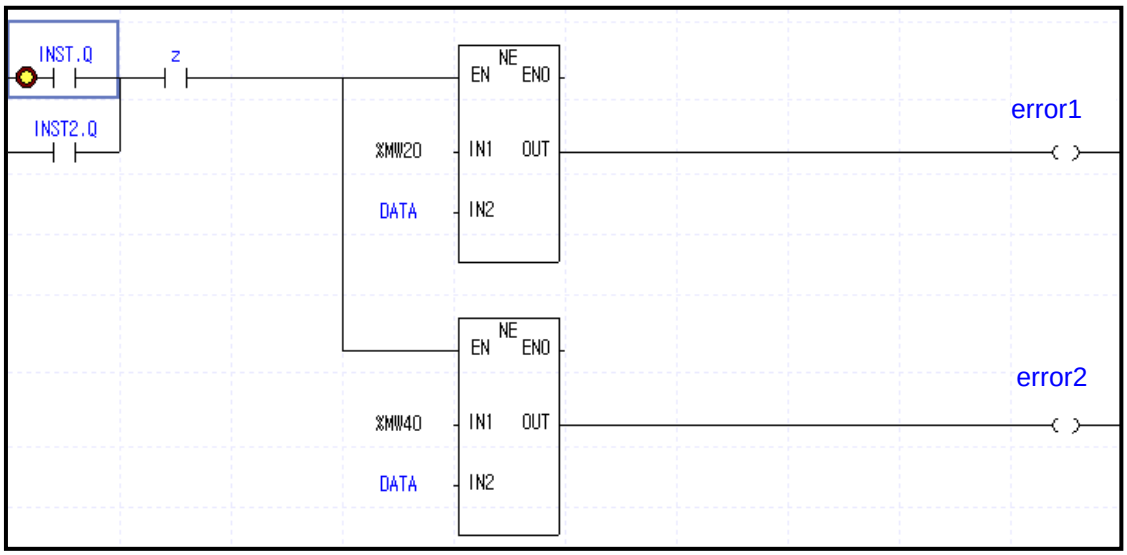
(a) Set/Remove Breakpoints

▪ Sets breakpoint at current cursor position. After breakpoint setting, (breakpoint setting indicator) is displayed.



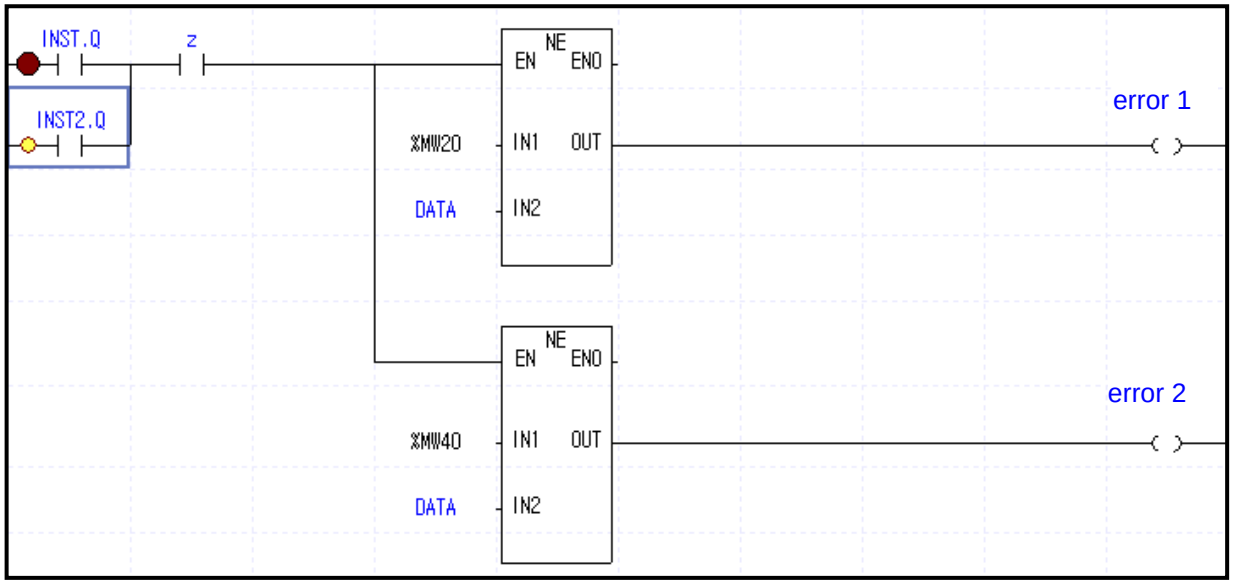
(b) Go

▪ Run the program to breakpoint. At break-pointer (stop indicator) is displayed.



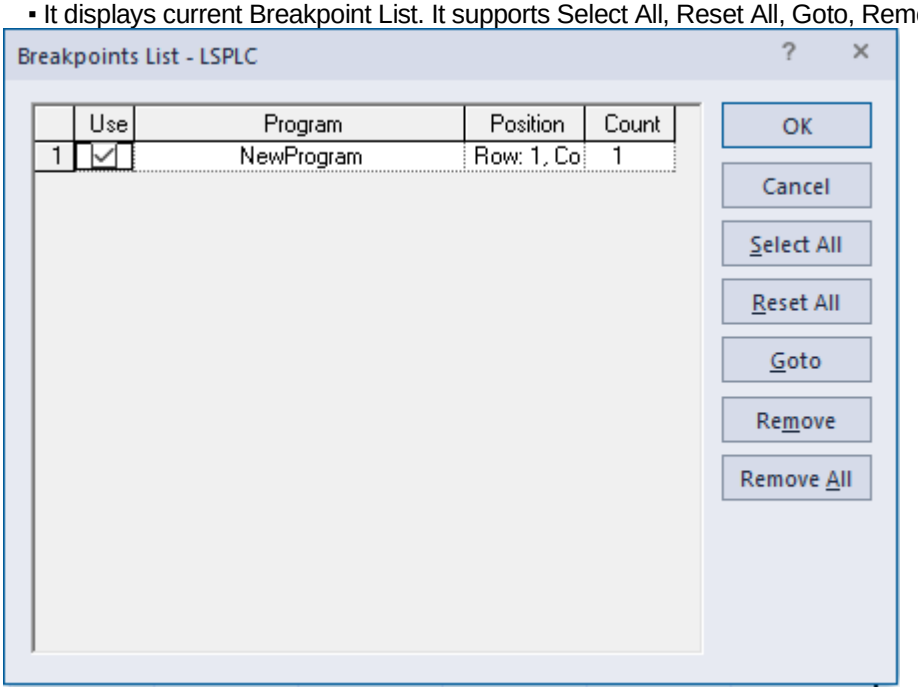
(c) Step Over

▪ Run the program to next step. At break point, Step over indicator is displayed.



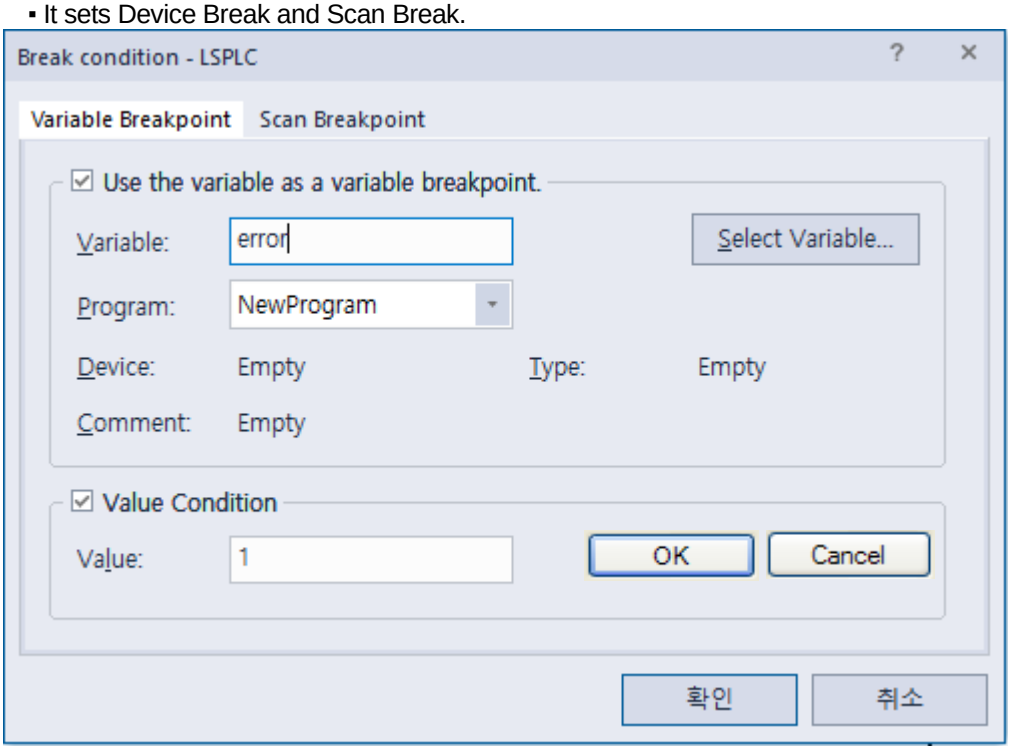
(d) Breakpoint List

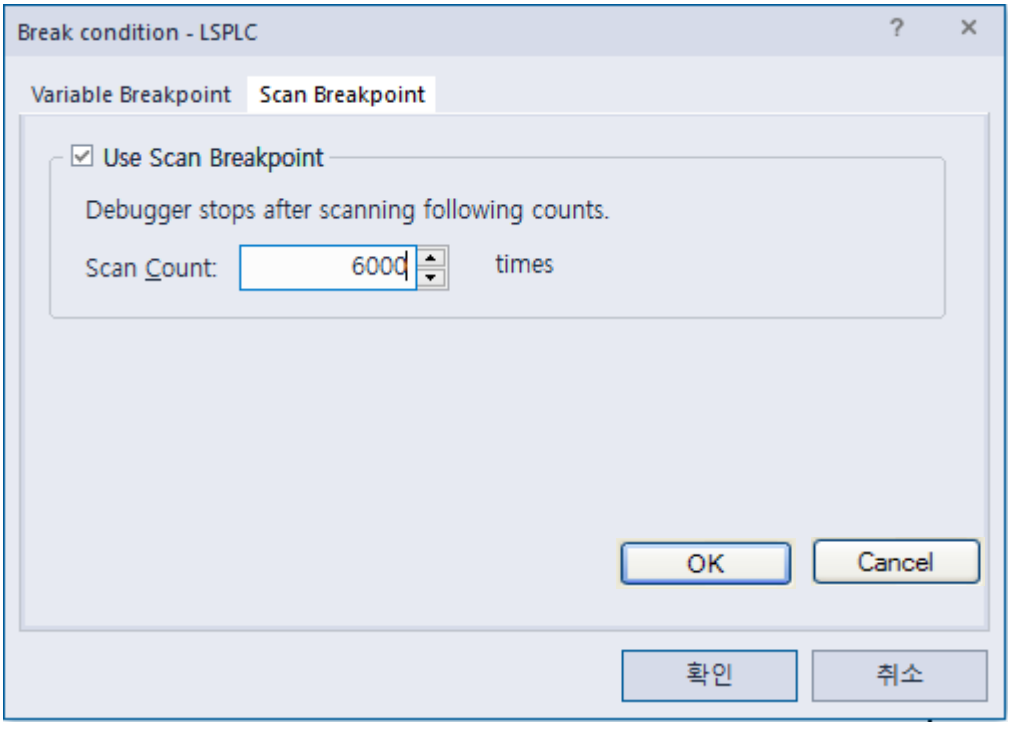
▪ It displays current Breakpoint List. It supports Select All, Reset All, Goto, Remove, Remove All.



(e) Break condition

▪ It sets Device Break and Scan Break.





Remark

1) Refer to XG5000 Users Manual 'Chapter 12 Debugging' for detailed information.

5.3.4 Change operation mode

(1) Operation Mode Change Method

The method to change operation mode are as follows.

(a) By mode key of CPU module
(b) By connecting the programming tool (XG5000) to communication port of CPU
(c) By changing the operation mode of other CPU module connected to network by XG5000 connected to communication port of CPU.
(d) By using XG5000, HMI, computer link module connected to network
(e) By 'STOP' instruction during program execution

(2) Type of operation mode

The operation mode setting is as follows.

Operation mode switch	XG5000 command	Operation mode
RUN	-	Run
STOP	RUN	Remote Run
	STOP	Remote Stop
	Debug	Debug Run
	Mode change	Previous operation mode
RUN -> STOP	-	Stop

(a) Remote mode conversion is available only in the state of **'Remote Enabled: On'**, **'Mode switch: Stop'**.

In case of changing the Remote 'RUN' mode to 'STOP' by switch, operate the switch as follows.
(STOP) → RUN → STOP .

Warning

In case of changing Remote RUN mode to RUN mode by switch, PLC operation continues the operation without interruption.

It is available to modify during RUN in RUN mode by switch but the mode change operation by XG5000 is limited. This should be set only in case that remote mode change is not allowed.

5.4 Memory

There are two types of memory in CPU module that the user can use. One is Program Memory that saves the user program written by the user to build the system, and the other is Data Memory that provides the device area to save the data during operation.

5.4.1 Program memory

Contents and size of program memory are as follows.

Item	Size
Program memory entire area	1.76 MB
System area: • System program area • Backup area	512 KB
Parameter area: • Basic parameter area • I/O parameter area • High speed link parameter area • P2P parameter area • Interrupt setting information area • Reserved area	48 KB
Execution program area: • Scan program area • Task program area	200 KB
Program reserved area • Scan program backup area • Task program area • Upload area • User defined function/function block area • Variable initialization information area • Reserved variable assignment information area • Reserved area	1 MB

5.4.2 Data memory

Contents and size of data memory are as follows.

Item		Size
Data memory entire area		256 KB
System area : • I/O information table • Forced I/O table • Reserved area		143 KB
Flag area	System flag (F)	2 KB
	Analog image flag (U)	1 KB
	Internal special flag (K)	8 KB
	High speed link (L)	4 KB
	P2P flag (N)	10 KB
Input image area (%I)		2 KB
Output image area (%Q)		2 KB
R area (%R)		20 KB
Direct variable area (%M)		16 KB
Symbolic variable area (maximum)		32 KB
Stack area		16 KB

5.4.3 Data retain area setting

In case you want to keep the data necessary for operation and the data made during operation when PLC stops and restarts, Default(automatic) Variable Retain is used and some area of M area can be set as Retain area through parameter setting

The following is characteristic table about the device available for Retain setting

Device	Retain setting	Characteristic
Default	O	As for automatic variable area, Retain setting is available
M	O	As for internal contact point area, Retain setting is available at parameter
K	X	In case of power failure, contact point is kept
F	X	System flag area
U	X	Analog data register (Retain is not available)
L	X	High speed link/P2P service status contact point of communication module (Retain is available)
N	X	P2P service address area of communication module (Retain is available)
R	X	Flash memory dedicated area (Retain is available)

Remark

1) K, L, N, R devices are retained basically.
2) K, L, N devices can be deleted through “Clear PLC” of XG5000 online menu.

1) Initialization of data according to restart mode

There are three variable related with restart mode (Default, initialization and retain variable). Initialization method about each variable in case of executing restart mode is as follows.

Mode / Variable assignment	COLD	WARM
Default	Initialized as '0'	Initialized as '0'
Retain	Initialized as '0'	Hold previous value
Initialization	Initialized as user defined value	Initialized as user defined value
Retain & Initialization	Initialized as user defined value	Hold previous value

2)

2) Operation of data retain area

Method on deleting the Retain data is as follows.

- RESET through XG5000 (Overall Reset)
- Execute "Clear PLC" through XG5000 at STOP mode
- Writing by program (Initialization program recommended)
- Writing '0' FILL etc at XG5000 monitor mode

For holding of retain area data or reset (clear) operation according to PLC operation, refer to the following table.

Classification	Retain	M area Retain	R area
Reset	Hold previous value	Hold previous value	Hold previous value
Overall reset	Initialized as '0'	Initialized as '0'	Hold previous value
STOP→RUN	Hold previous value	Hold previous value	Hold previous value

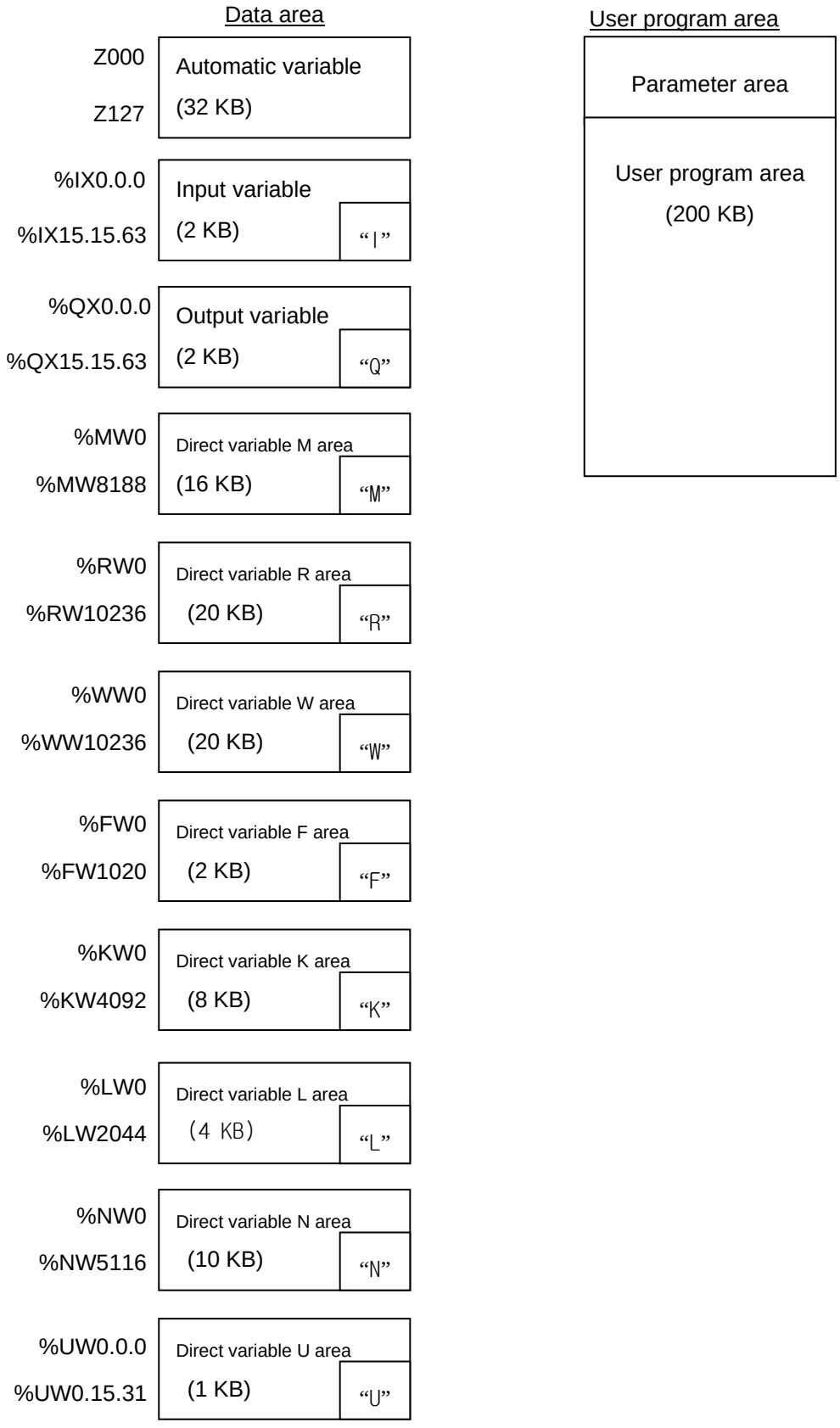
Remark

1) Terms on three types of variable are as follows.
(1) Default variable : variable not set as INIT or Retain variable
(2) INIT variable : initial value is set
(3) Retain variable : Holds previous value

3) Initialization of data

If PLC becomes 'Cleat Memory' status, memory of all devices are deleted as '0'. When you want to specify initial value, use initialization task. At CPU module, there are two types of built-in memory. One is program memory to save program made by user, for user to structure system, Another is data memory providing device area saving data during operation.

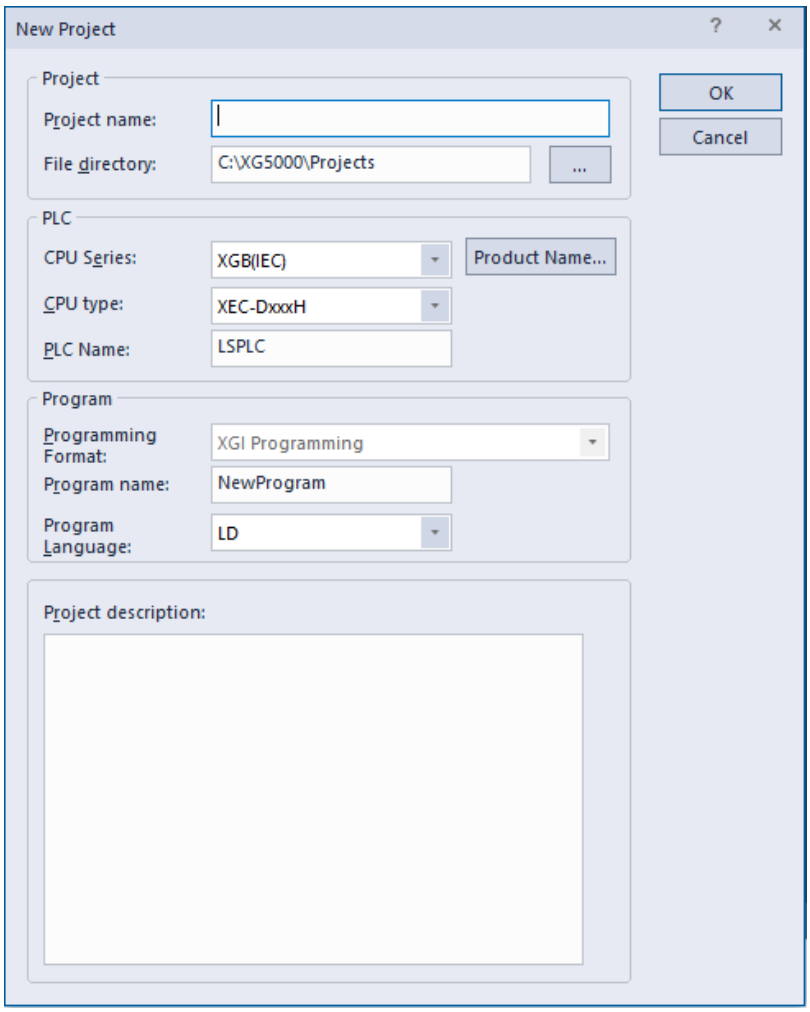
5.4.4 Data Memory Map



Chapter 6 CPU Functions

6.1 Type Setting

It describes setting of XGB PLC type.



PLC Series	CPU type	Language	Description	Reference
XGB	XGB-DR16C3	MK language	Dedicated product	Module type
	XGB-XBMS	MK language	“S” type : XBM-DN16/32S , XBM-DR16S	Module type
	XGB-XBCH	MK language	“H” type : XBC-DR32/64H , XBC-DN32/64H	Compact type
	XGB-XECH	IEC language	“H” type : XEC-DR32/64H , XEC-DN32/64H, XEC-DP32/64H	Compact type

Remark

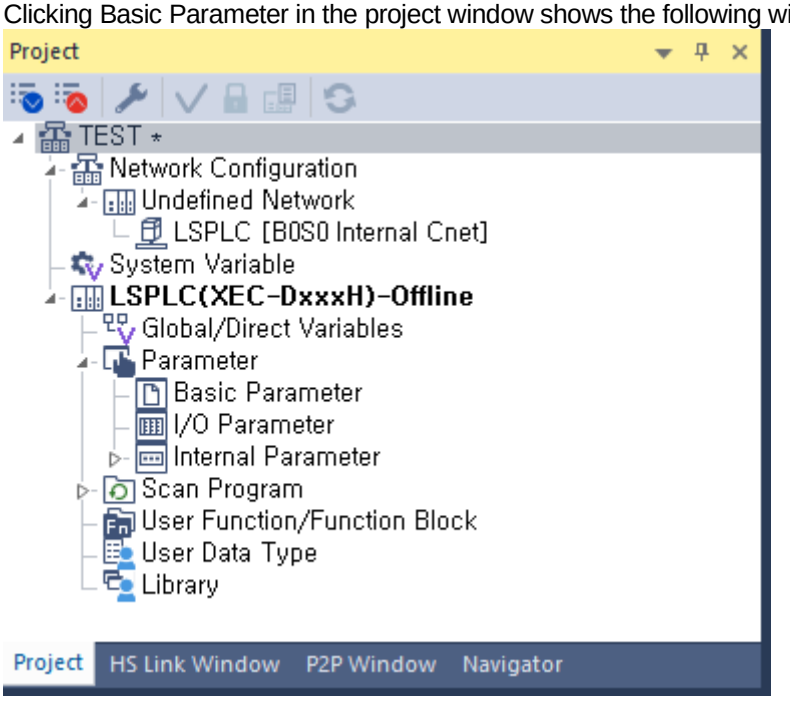
▪ In case type is different, connection is not available.

6.2 Parameter Setting

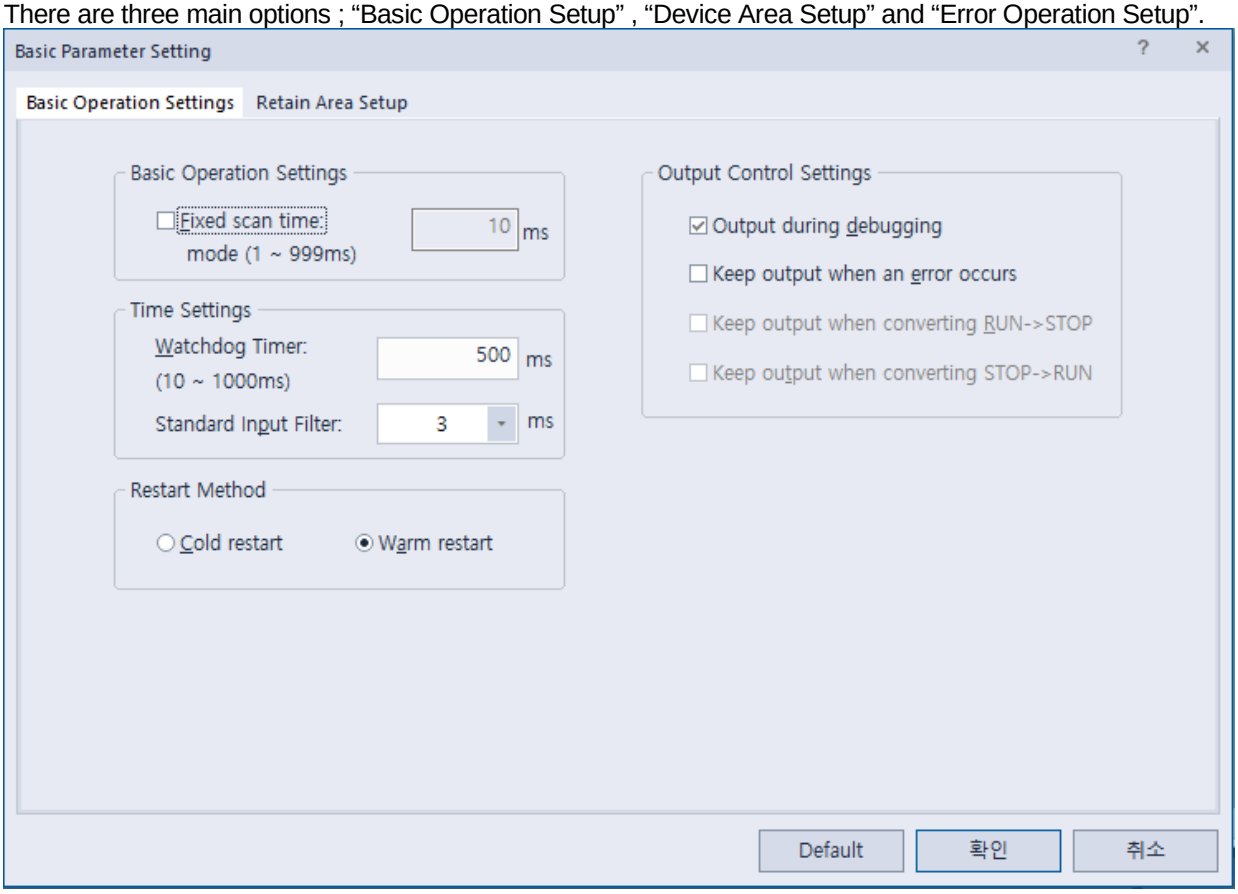
This paragraph describes how to set parameters.

6.2.1 Basic parameter setting

Clicking Basic Parameter in the project window shows the following window.



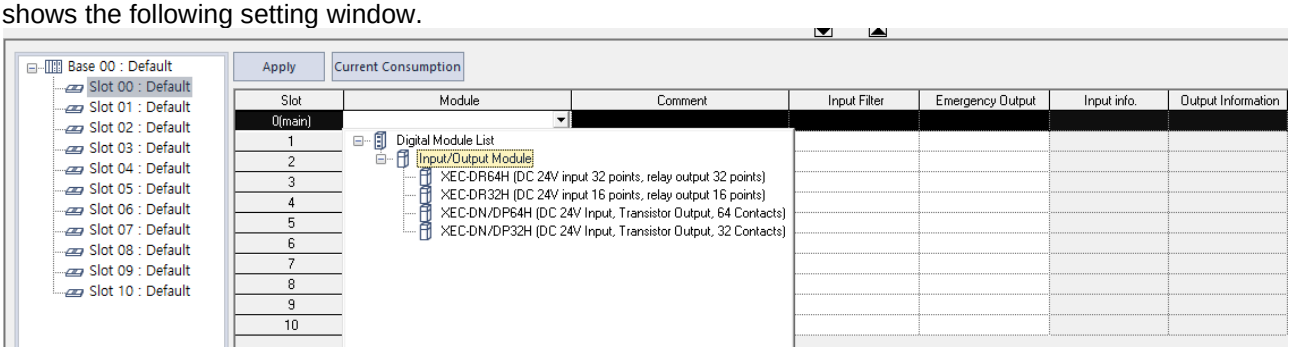
There are three main options ; “Basic Operation Setup” , “Device Area Setup” and “Error Operation Setup”.



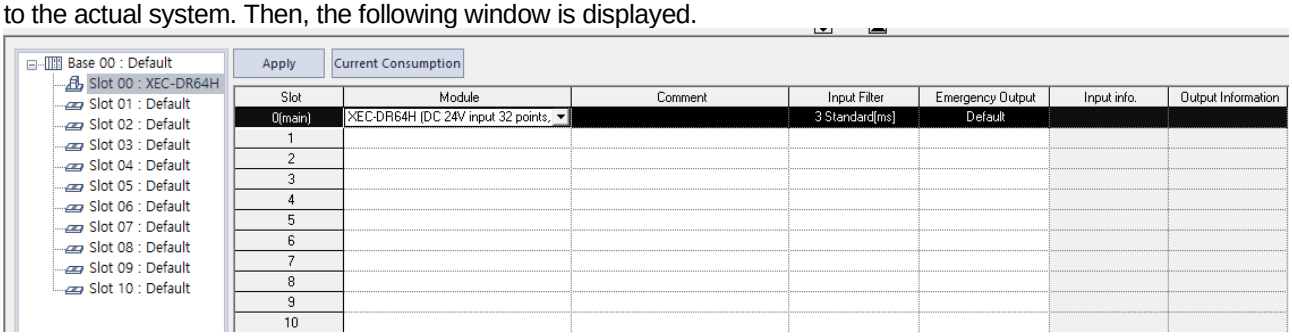
Category	Item	Description	Note
Basic operations	Fixed period operation	Set the time of fixed period operation.	1~999 ㎳
	Watchdog timer	Set the time of scan watchdog.	10~1000 ㎳
	Standard input filter	Set the time of standard input filter.	1,3,5,10,20,70,100 ㎳
	Restart mode	Set restart mode	Allowance/Prohibition
	Output during debugging	Set whether to allow output actually during debugging operation.	Allowance/Prohibition
	Keep output when an error occurs	Set whether to preserve output holding function set in I/O parameter in case of error.	Allowance/Prohibition
Memory area setting	Select latch area	Set Retain range about M area	Pause/Resume

6.2.2 I/O parameter setting

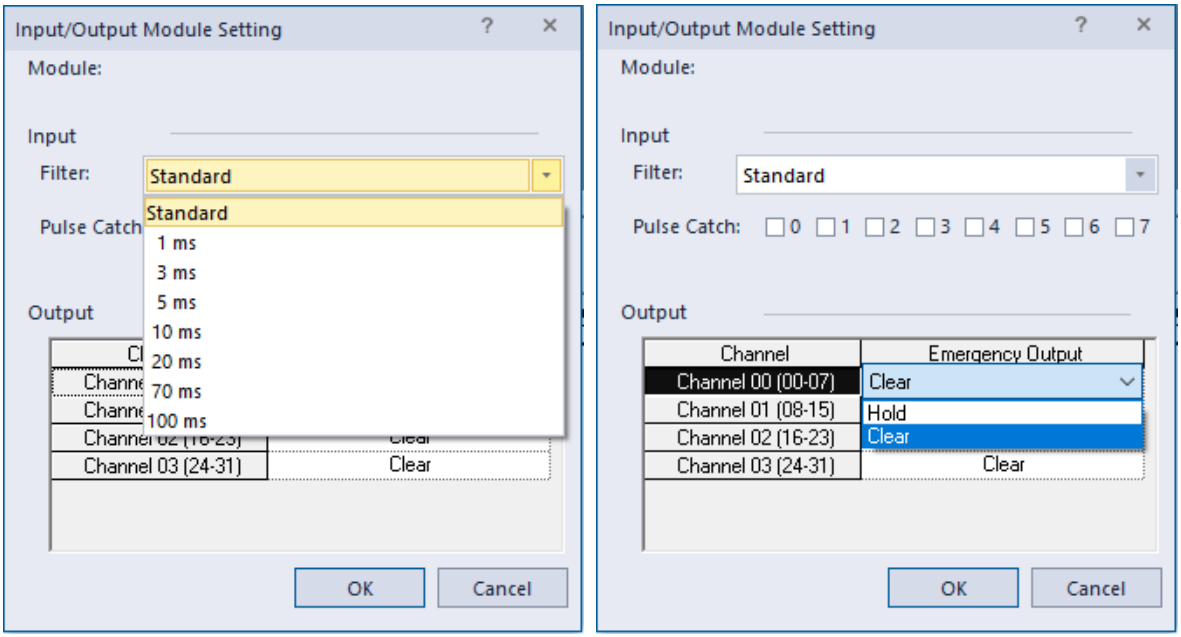
This setting is to set and reserve each I/O information. Clicking 『I/O Parameter』 in the project window shows the following setting window.



Clicking 『Module』 in 『Slot Position』 indicates a list of modules, in which you may set I/O corresponding to the actual system. Then, the following window is displayed.



Clicking 『Details』 in 『Slot Position』 shows the following window to set filter and emergency output.



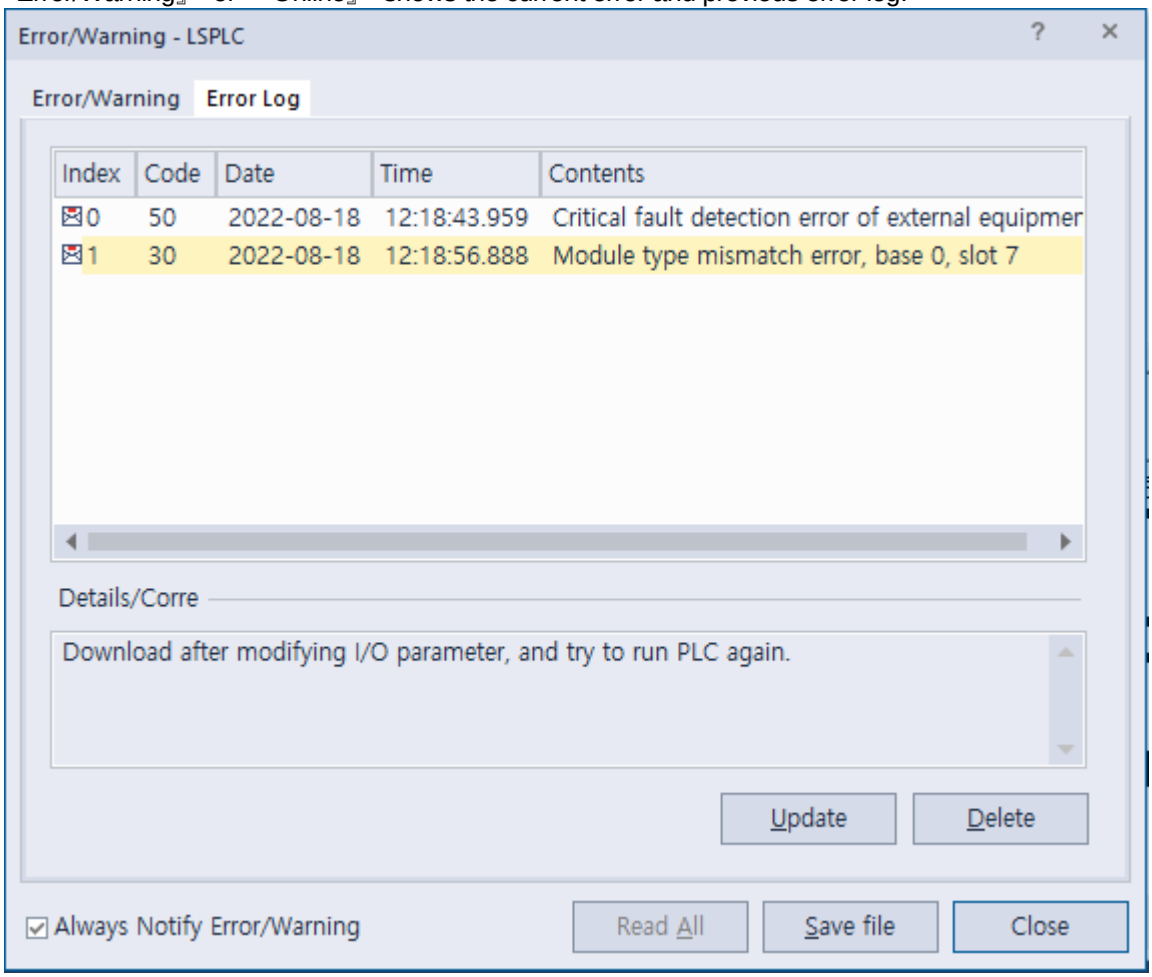
Remark

(1) If settings are different with I/O module actually accessed, “Inconsistent module type error” occurs, displaying error.
(2) Without settings, CPU reads each I/O module information and operates.

6.3 Self-diagnosis Function

6.3.1 Saving of error log

CPU module logs errors occurred so that the causes will be identified and fixed easily. Clicking 『Error/Warning』 of 『Online』 shows the current error and previous error log.



Item	Description	Remarks
Error/Warning	Display the current error/warning.	-
Error Log	Display a log of error/warning occurred.	Saving up to 100

Remark

(1) Saved data are not deleted until selecting a menu of XG5000 and clicking “Delete”.
(2) “H” type displays Data and Time.

6.3.2 Troubleshooting

(1) Trouble types

Trouble occurs due to PLC itself, system configuration error or abnormal operation result detected. Trouble is divided into trouble mode stopping operation for the safety and warning mode generating alert to user with a mode in trouble.

The causes troubling PLC system are as follows.

(a) PLC hardware trouble
(b) System configuration error
(c) Operation error while operating user program
(d) Error detected owing to external device in trouble

(2) Operation mode if trouble occurs

PLC system logs any trouble occurred in flag and determines whether to stop or resume operation depending on trouble mode.

(a) PLC hardware trouble

In case an error occurs so that PLC such as CPU module and power module may not work normally, the system is halted, but any warning may not interfere with the operation.

(b) Operation error while operating user program

Representing an error occurred during operation of user program, in case of numeric operation error, it displays the error in error flag but the system resumes operating. However, if the operation time exceeds by the operation monitoring time limit and I/O module does not control it normally, the system is halted.

(c) Error detected owing to external device in trouble

Representing the detection of external device to be controlled by users program of PLC, if an error is detected, the system is halted, but any warning may not interfere with the operation.

Remark

(1) If any trouble occurs, the trouble content is saved in a special relay %FD1.
(2) For details of flag, refer to the appendix 1 Flag List.

6.4 Remote Functions

CPU module may change operation by communication as well as by key switches mounted on the module. To operate it remotely, it is necessary to set 'RUN/STOP' switch to 'STOP'.

(1) Remote operations are as follows.
(a) Operable by accessing to XG5000 through RS-232C port mounted on CPU module.
(b) Can operate other PLC connected to PLC network with CPU module connected to XG5000.

(2) Remote RUN/STOP
(a) Remote RUN/STOP is the externally controlled RUN/STOP function.
(b) It is convenient when CPU module is located at a position hard to control or when CPU module within control panel is to control RUN/STOP function remotely.

(3) Remote DEBUG
(a) it manages debugging remotely when remote mode is STOP. Namely, DEBUG operation is to execute program operation depending on designated operation conditions.
(b) Remote DEBUG is a convenient function when confirming program operation status or data during system debugging.

(4) Remote Reset
(a) Remote reset is to reset CPU module remotely if an error occurs at a place hard to directly control CPU module.
(b) Like operation by switches, it supports 'Reset' and 'Overall Reset'.

Remark

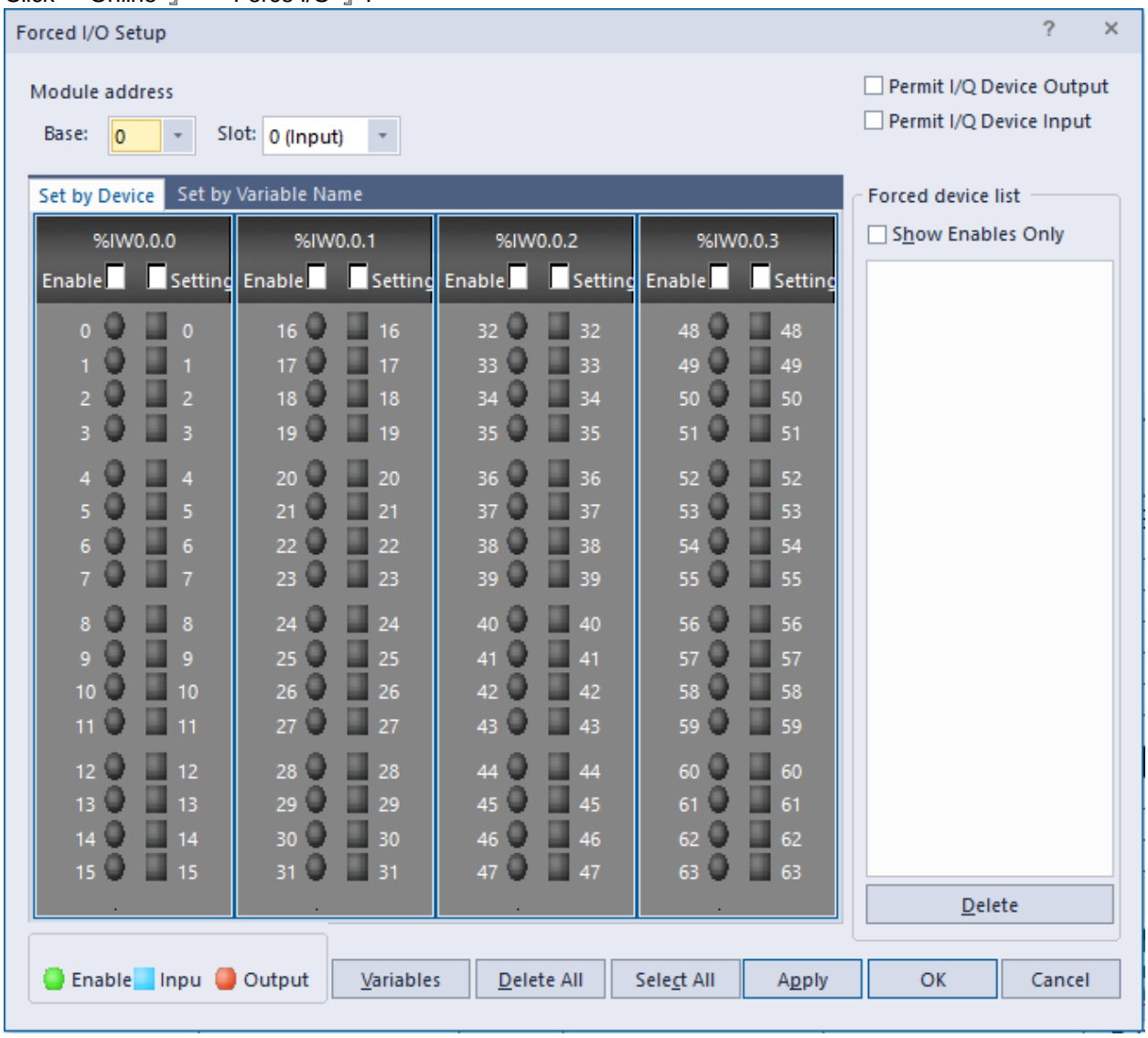
For details regarding remote functions, refer to 'Online' of XG5000 Users Manual.

6.5 Forced Input/Output On and Off Function

Force I/O function is used to force to turn I/O areas on or off, regardless of program results.

6.5.1 Force I/O setup

Click 『 Online 』- 『 Force I/O 』.



Item		Description
Move address		Select base and slot
Application		Set whether to allow or not Force I/O
Single	Flag	Set whether to allow or not Force I/O by bits.
	Data	Set Force I/O data on or off by bits.
Select All		Set to allow Force I/O with all I/O area on
Delete All		Delete to allow Force I/O with all I/O area off.
Setting device		Display I/O area set as a bit.

6.5.2 Processing time and processing method of Force Input/Output On and Off

(1) Forced Input
Regarding input, at the time of input refresh it replaces the data of contact set as Force On/Off among data read from input module with the data as Force and updates input image area. Therefore, user program executes operations with actual input data while Force input area is operated with data set as Force.

(2) Forced Output
Regarding output, at the time of output refresh upon the execution user program operation, it replaces the data of contact set as Force On/Off among data of output image area containing operation results with data set as Force and outputs the data in output module. Unlike (Force) input, the output image area is not changed by Force On/Off setting.

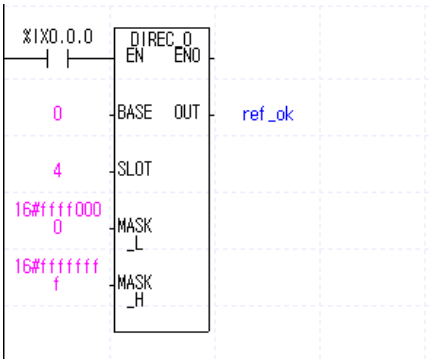
(3) Cautions when using Force I/O function
(a) It operates from the time when I/O is individually set as 'Allow' after setting Force data.
(b) It is possible to set Force input although I/O module is not actually mounted.
(c) Despite of the power changed Off -> On, operation mode changes or any operation by pressing reset key, the data of which On/Off is set before is kept in CPU module.
(d) Even in STOP mode, Force I/O data is not removed.
(e) To set new data from the beginning, it is necessary to deselect all settings of I/O by using 'Delete All' option.

6.6 Direct Input/Output Operation

Refreshing I/O operates after completion of scan program. If data of I/O is changed while program is scanned, it does not refreshed at the changed moment. Refreshed I/O data is applied after 'END' instruction on program.

In order to refresh I/O data during program execution, use 'DIREC_IN, DIREC_OUT' function to read input contact point immediately and use it for operation, or output operation result immediately.

Program outputting data 2#0111_0111_0111_0111 to 32 point transistor output model equipped at extension module slot 4 during scan.



(1) Input base number 0 and slot number 4 where output module is equipped
(2) Since data to output is 16 bit during scan, enable lower 16 bit among value of MASK_L (16#FFFF0000)
(3) If execution condition (%IX0.0.0) is On, DIREC_O (Immediate refresh of output module) is executed and data of output module is set as 2#0111_0111_0111_0111.

Remark

1) For detail of DIREC_IN,DIREC_OUT function, refer to XGI/XGR/XEC instruction manual
2) In case of using DIREC_IN,DIREC_OUT function, the value is applied immediately. They have higher priority than forced I/O.

6.7 Diagnosis of External Device

This flag is provided for a user to diagnose any fault of external device and, in turn, execute halt or warning of the system. Use of this flag displays faults of external device without any complicated program prepared and monitors fault location without any specific device (XG5000 and etc) or source program.

1) Detection and classification of faults in external device

(1) The trouble (fault) of external device may be detected by user program and largely divided, depending on the type, into error and warning; the former requires halt of PLC operation and the latter simply displays the status while PLC keeps working.

(2) 'Heavy trouble' uses ' _ANC_ERR' flag and 'Light trouble' uses '_ANC_WB' flag.

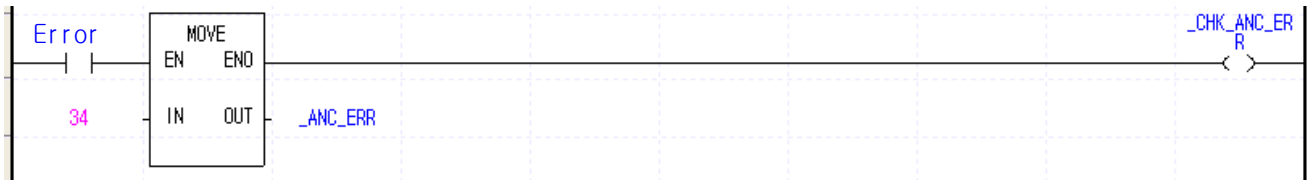
2) Heavy trouble of external device

(1) In case of detecting heavy trouble of external device at user program, write error code defined by user at system flag 'ANC_ERR' and turn on _CHK_ANC_ERR flag. If _CHK_ANC_ERR flag is on, at the end of scan, '_ANNUN_ER' bit of '_CNF_ER', system error representative flag, is on and PLC turns off all output of output module (it can be different according to the setting of basic parameter) and becomes error status (Error LED flickers with 1s cycle)

(2) In case of heavy trouble, you can know the reason by checking '_ANC_ERR' flag.

(3) To turn off the ERR LED caused by flag detecting heavy trouble of external device, reset or restart PLC

■ Example)



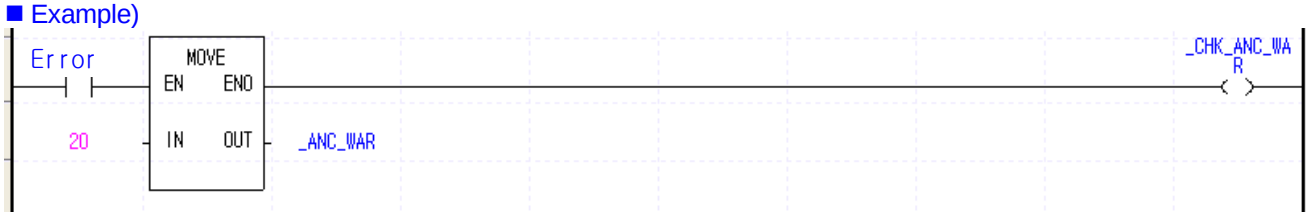
3) Light trouble of external device

(1) In case of detecting heavy trouble of external device at user program, write error code defined by user at system flag 'ANC_WAR' and turn on _CHK_ANC_WAR flag. If _CHK_ANC_WAR flag is on, at the end of scan, '_ANNUN_WAR' bit of '_CNF_WAR', system warning representative flag, is on. When light trouble occurs, LED flickers with 2s cycle.

(2) In case of heavy trouble, you can know the reason by checking '_ANC_WAR' flag.

(3) If _CHK_ANC_WAR is off, light trouble status is canceled and Error LED is off.

■ Example)

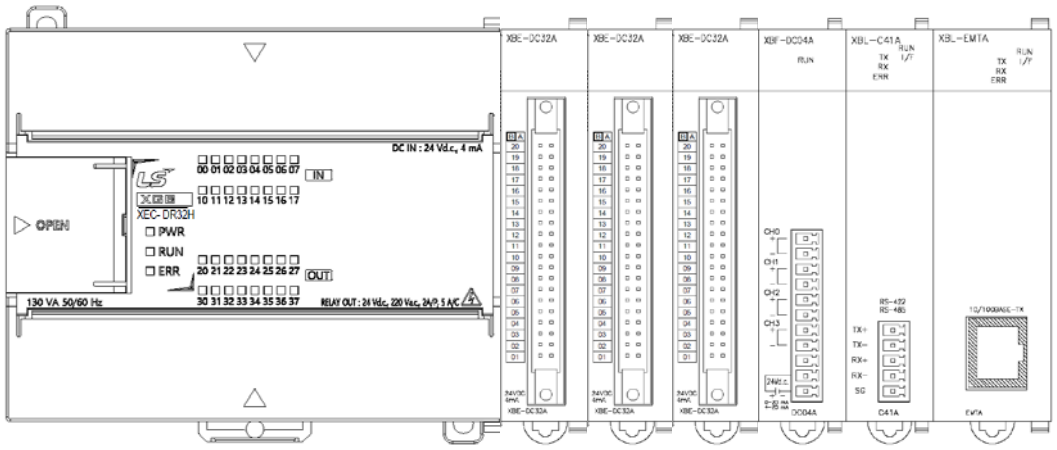


6.8 Allocation of Input/Output Number

Allocation of I/O number is to allocate an address to every I/O of each module to read data from input module and output data to output module when it executes operations.
XGB series adopts each I/O 64 points occupation to every module.

(1) Allocation of I/O number
64 points are allocated to every module (incl. special, communication).

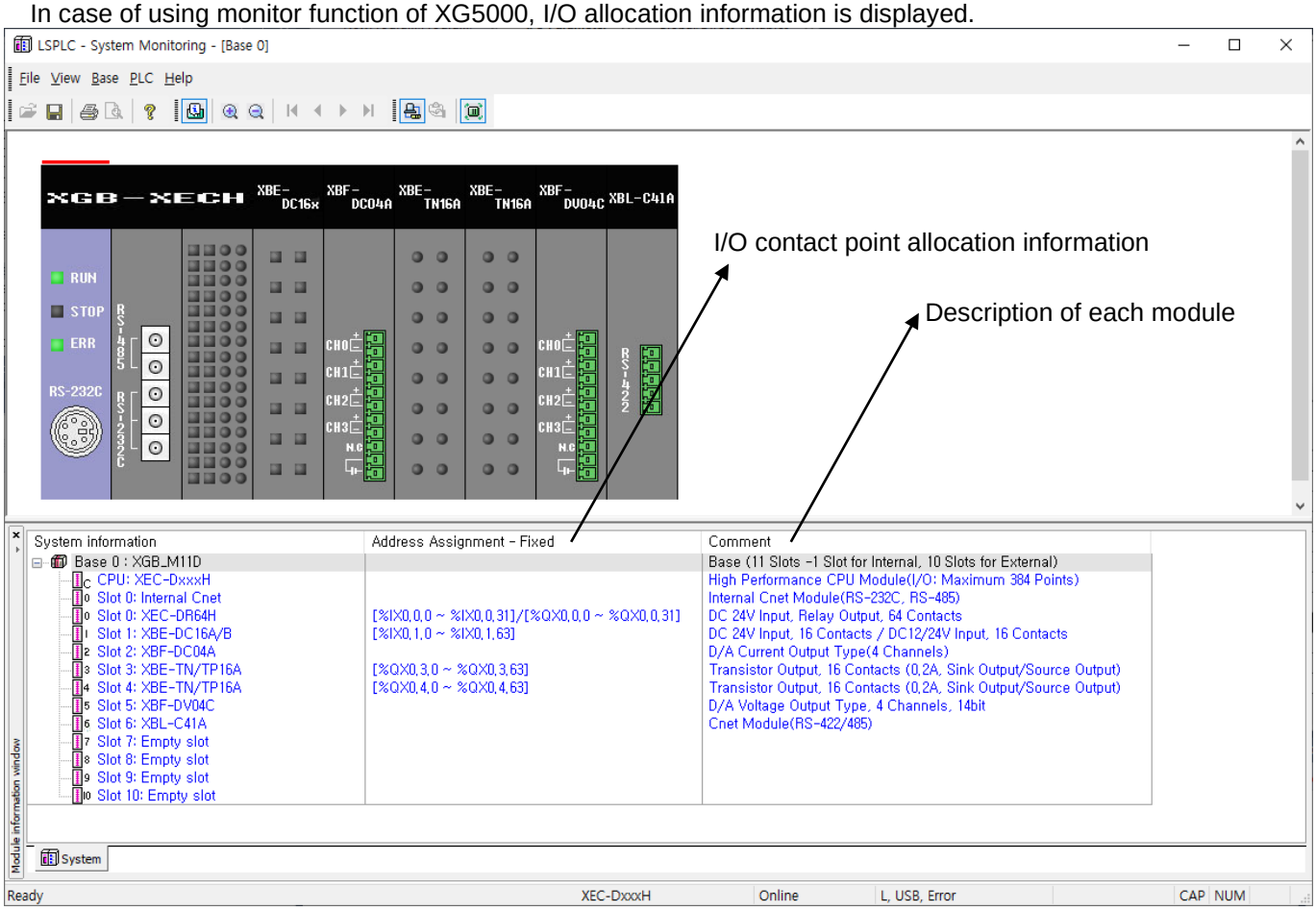
System Configuration



Number of Connection stage	Type	I/O allocation	Remarks
0	XEC-DN32H	Input : %IX0.0.0 ~ %IX0.0.63 Output: %QX0.0.0 ~ %QX0.0.63	Real input : %IX0.0.0 ~ %IX0.0.15 Real output: %QX0.0.0 ~ %QX0.0.15
1	XBE-DC32A	Input : %IX0.1.0 ~ %IX0.1.63 Output: %QX0.1.0 ~ %QX0.1.63	Real input : %IX0.1.0 ~ %IX0.1.31
2	XBE-DC32A	Input : %IX0.2.0 ~ %IX0.2.63 Output: %QX0.2.0 ~ %QX0.2.63	Real input : %IX0.2.0 ~ %IX0.2.31
3	XBE-DC32A	Input : %IX0.3.0 ~ %IX0.3.63 Output: %QX0.3.0 ~ %QX0.3.63	Real input : %IX0.3.0 ~ %IX0.3.31
4	XBF-DC04A	Input : %IX0.4.0 ~ %IX0.4.63 Output: %QX0.4.0 ~ %QX0.4.63	-
5	XBL-C41A	Input : %IX0.5.0 ~ %IX0.5.63 Output: %QX0.5.0 ~ %QX0.5.63	-
6	XBL-EMTA	Input : %IX0.6.0 ~ %IX0.6.63 Output: %QX0.6.0 ~ %QX0.6.63	-

Empty I/O point is available for internal relay.

In case of using monitor function of XG5000, I/O allocation information is displayed.



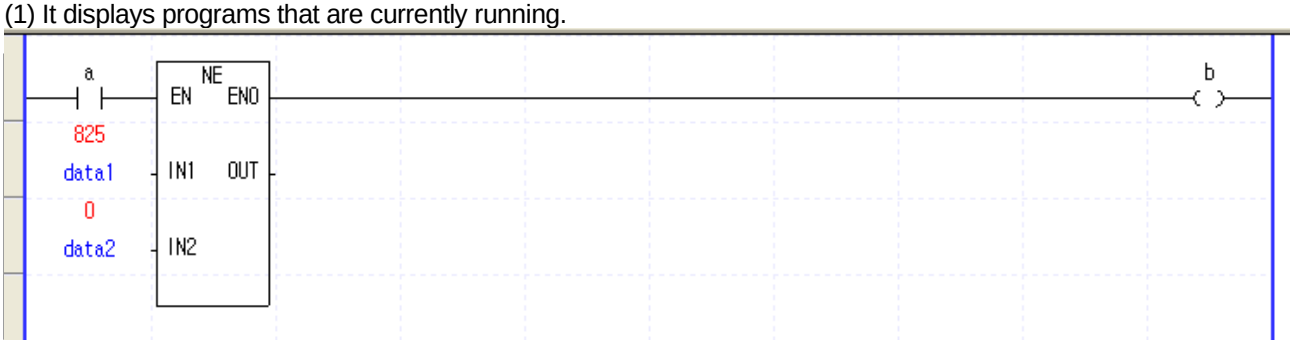
6.9 Online Editing

It is possible to modify program and communication parameter during operation of PLC without control operation stopped. The following describes basic modification. For details of modifying program, refer to XG5000 Users Manual.

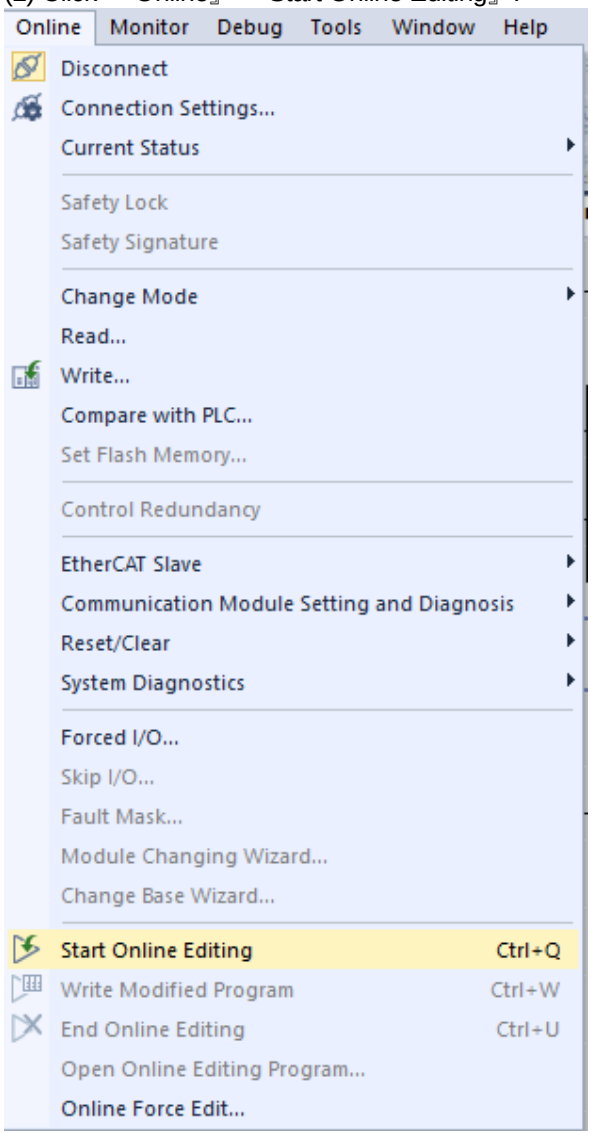
Items to be modified during operation are as follows.

- Program
- Communication parameter

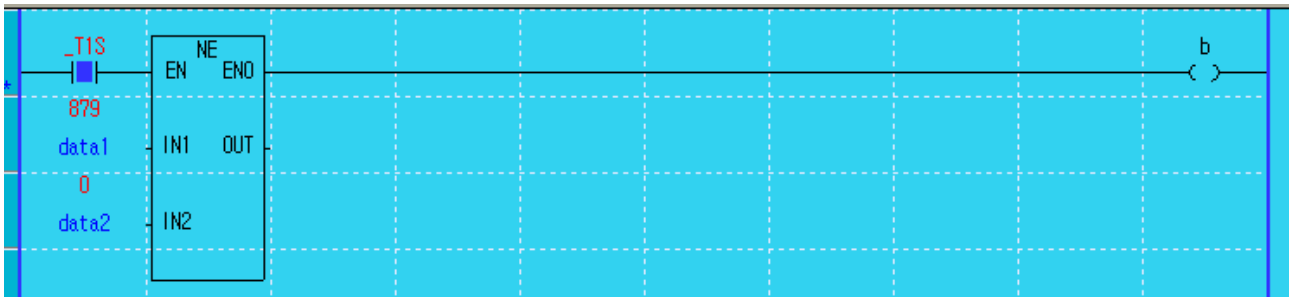
(1) It displays programs that are currently running.



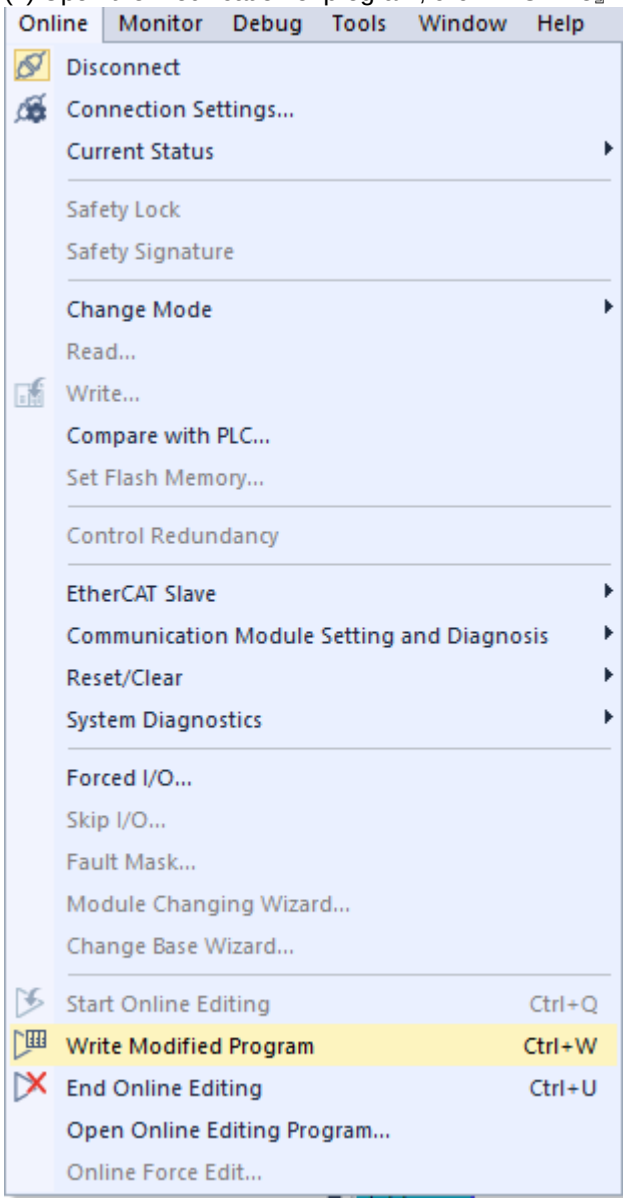
(2) Click 『Online』-『Start Online Editing』.

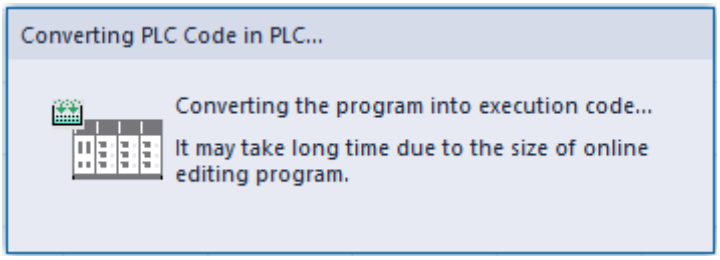


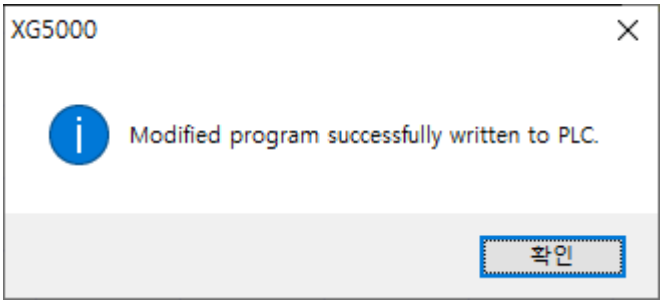
(3) If you modify program, background color changes to indicates start of online editing.



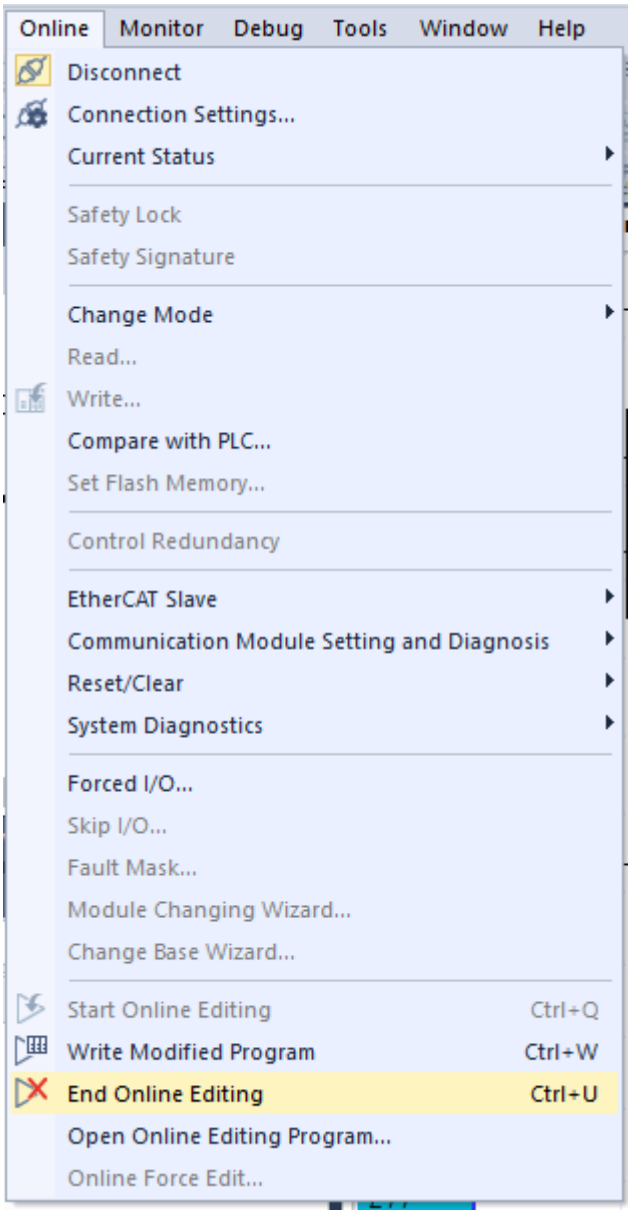
(4) Upon the modification of program, click 『Online』- 『Write Modified Program』.

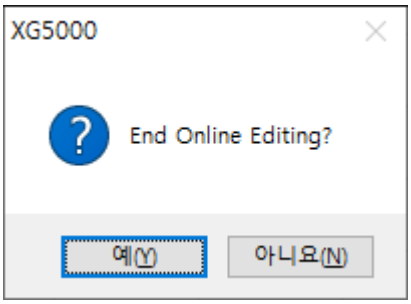




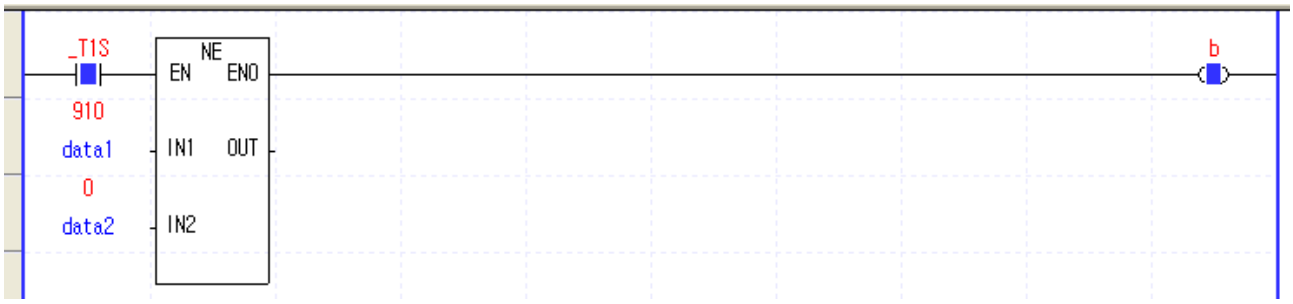


(5) Upon the writing of program, click 『Online』-『End Online Editing』.





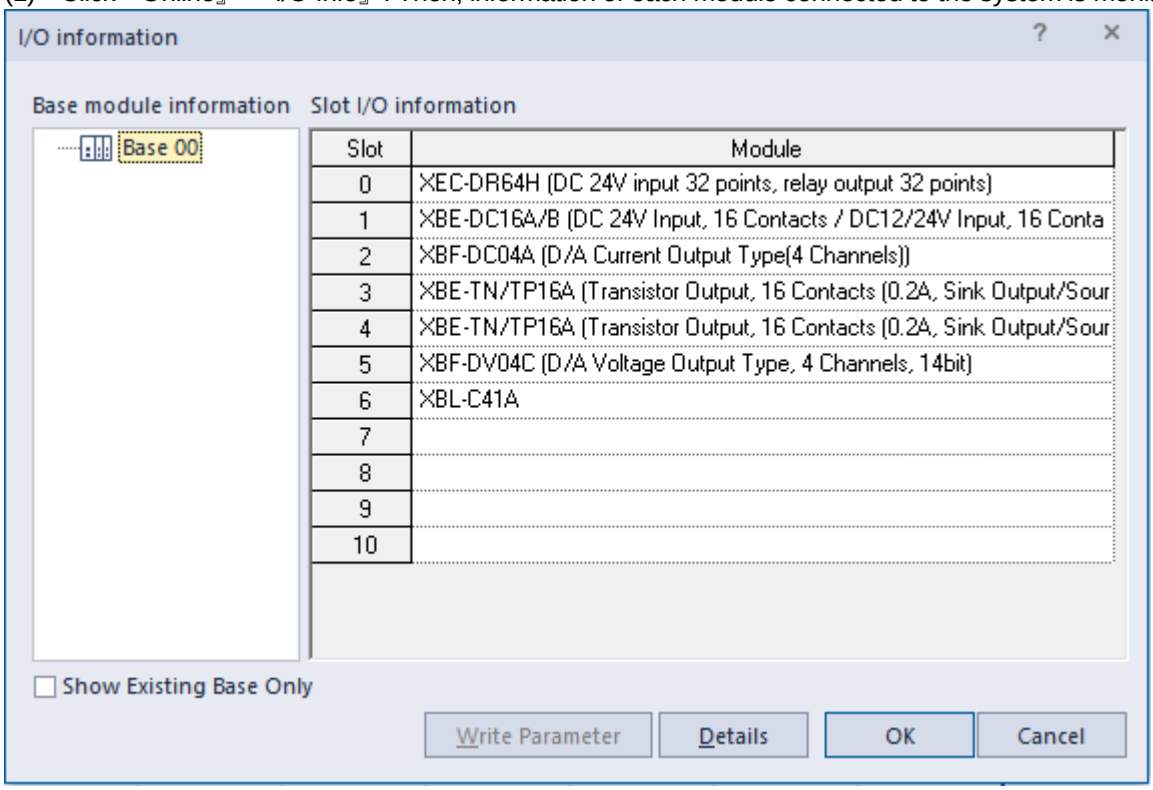
(6) The program background returns and the program modification during run is completed.



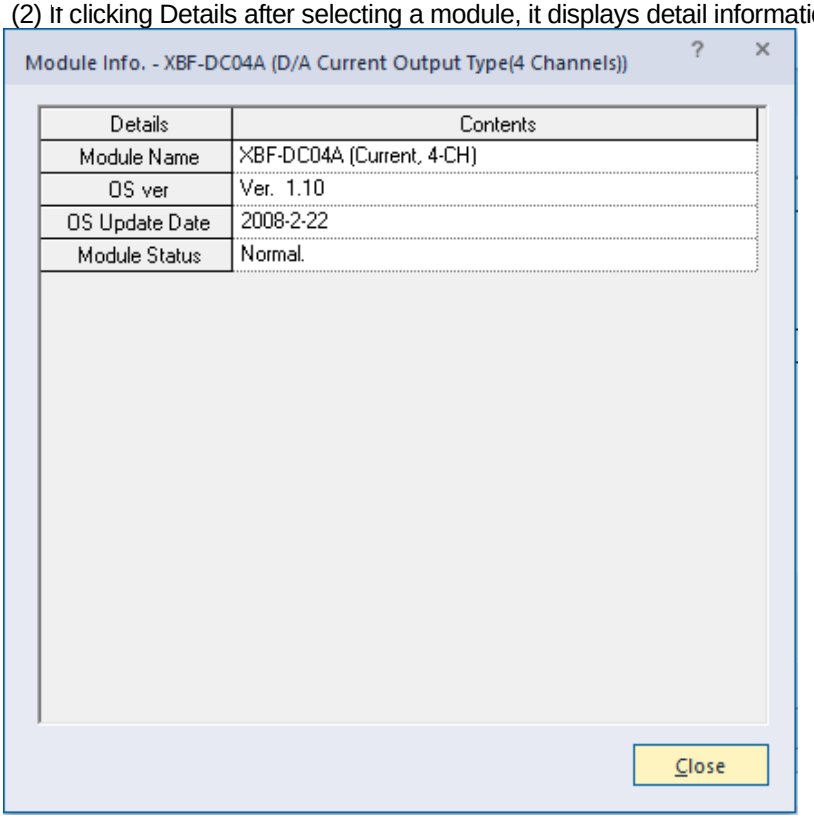
6.10 Reading Input/Output Information

It monitors information of individual modules consisted of XGB series system.

(1) Click『Online』-『I/O Info』. Then, information of each module connected to the system is monitored.



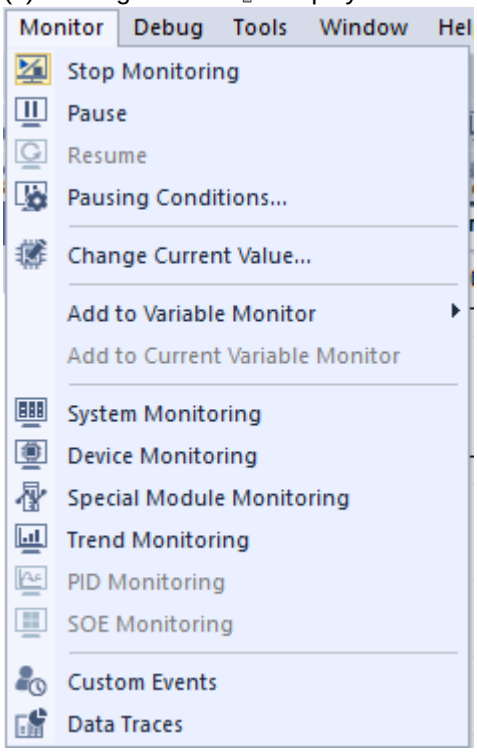
(2) If clicking Details after selecting a module, it displays detail information of a selected module.



6.11 Monitoring

It monitors system information of XGB series system.

(1) Clicking 『Monitor』 displays the following sub-menus.

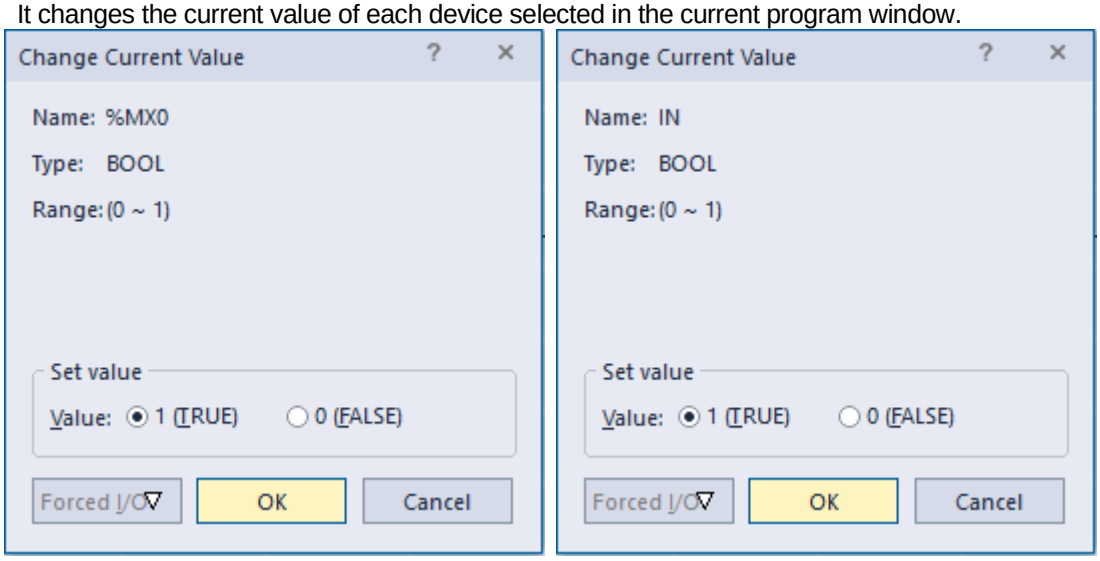


(2) Items and descriptions

Item	Description	Remarks
Start/Stop Monitoring	Designate the start and stop of monitor.	Click for reverse turn.
Pause	Pause monitoring.	-
Resume	Resume paused monitor.	-
Pausing Conditions	Pause monitoring if a preset value of device corresponds to condition.	Monitor resumes; clicking for resume.
Change Current Value	Change the present value of currently selected device.	-
System Monitoring	Monitor general system information.	-
Device Monitoring	Monitor by device (type).	-
Trend Monitoring	Monitor trend of device set in the system.	For details, refer to XG5000 Users Manual.
Custom Events	Monitor the value of device set when an event set by a user occurs.	
Data Traces	Trace the value of device.	

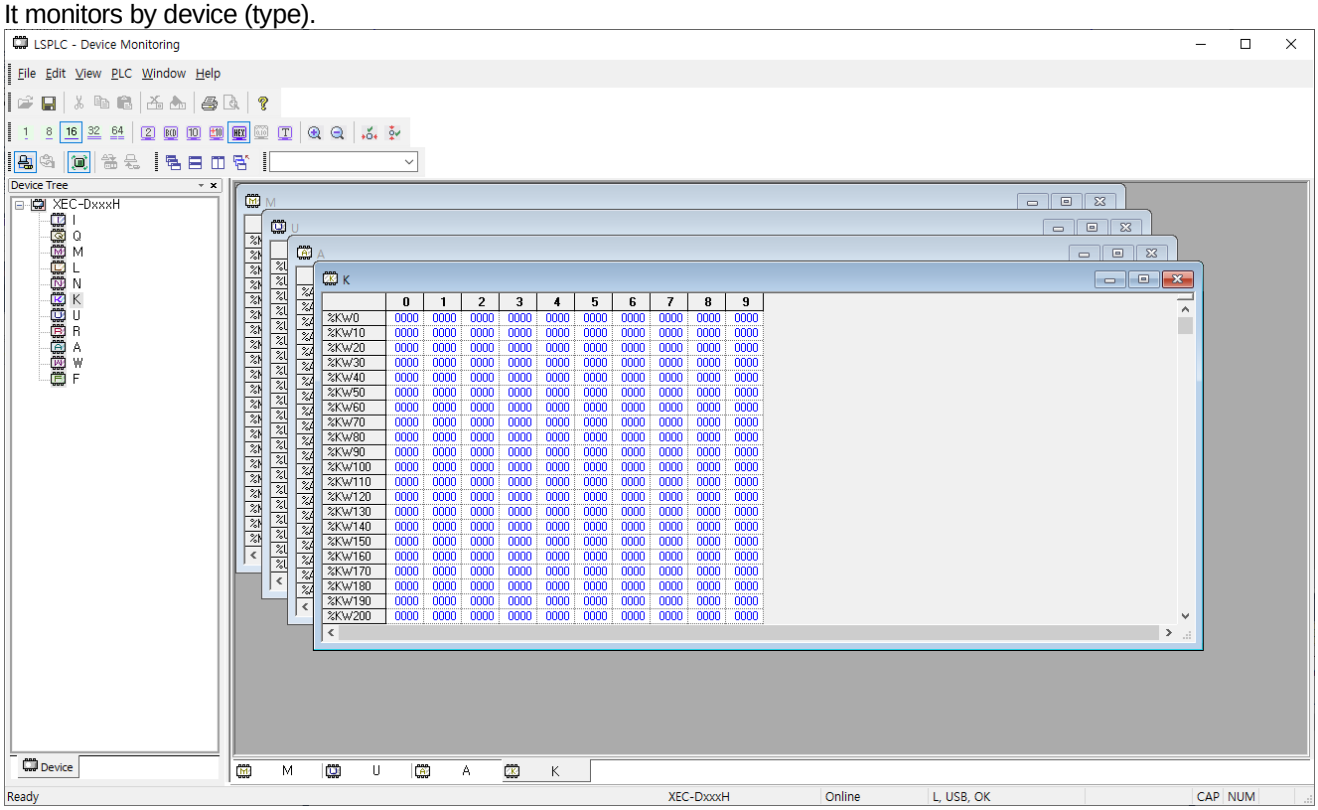
(a) Change current value

It changes the current value of each device selected in the current program window.



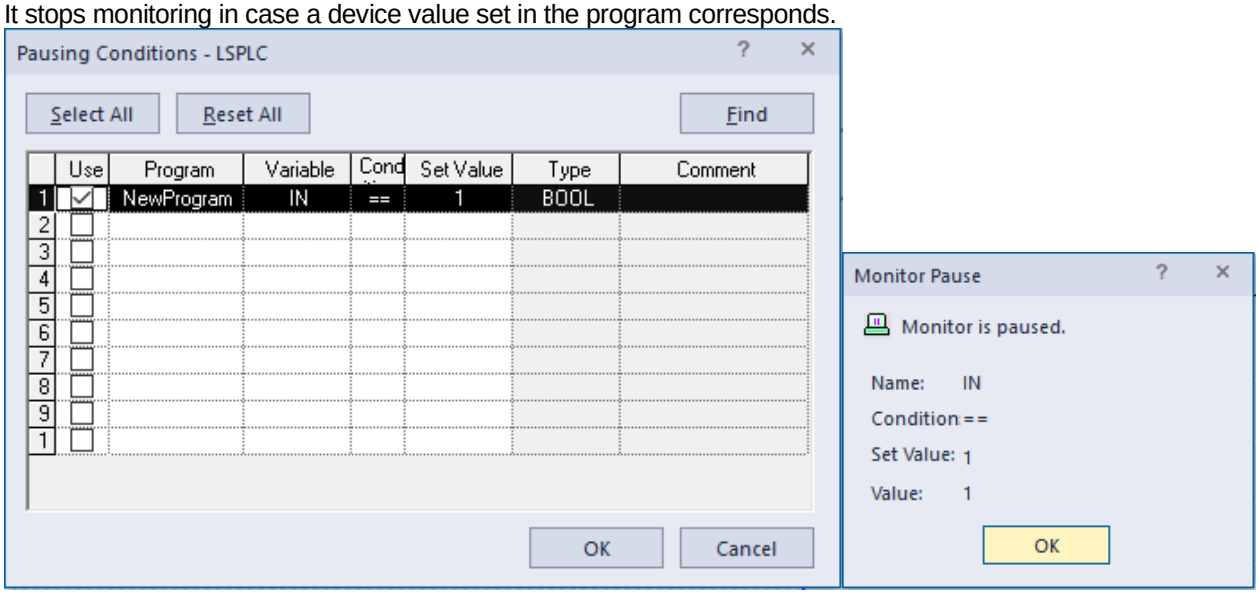
(b) Device monitoring

It monitors by device (type).



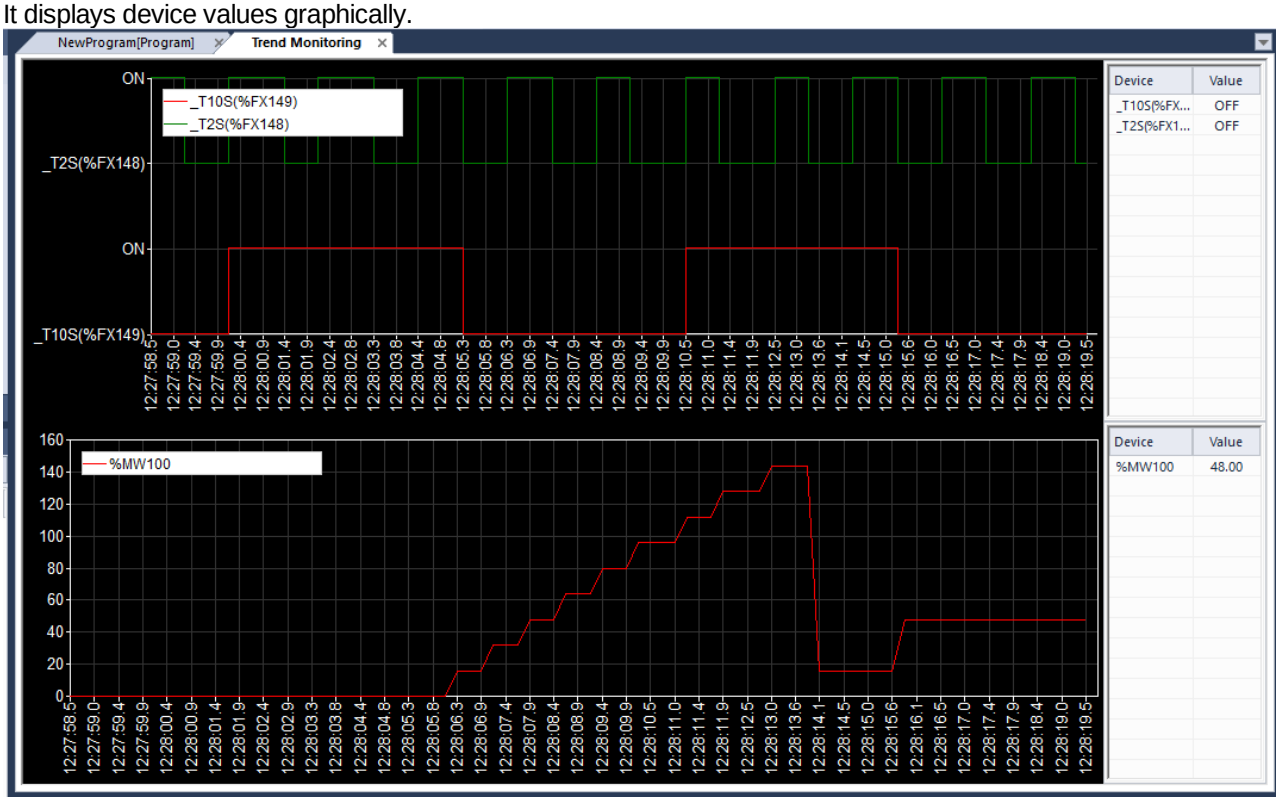
(c) Pausing conditions

It stops monitoring in case a device value set in the program corresponds.



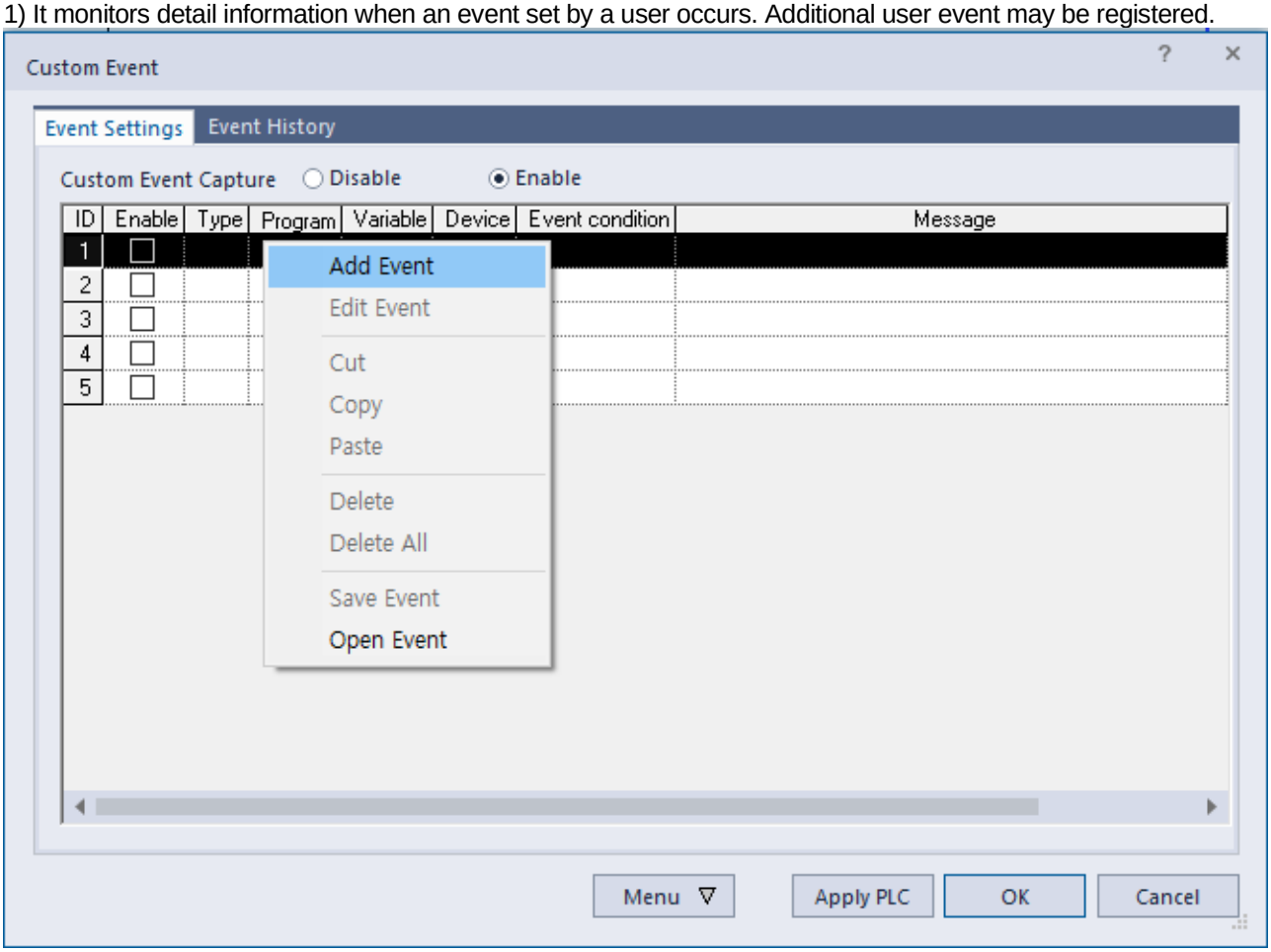
(d) Trend monitoring

It displays device values graphically.

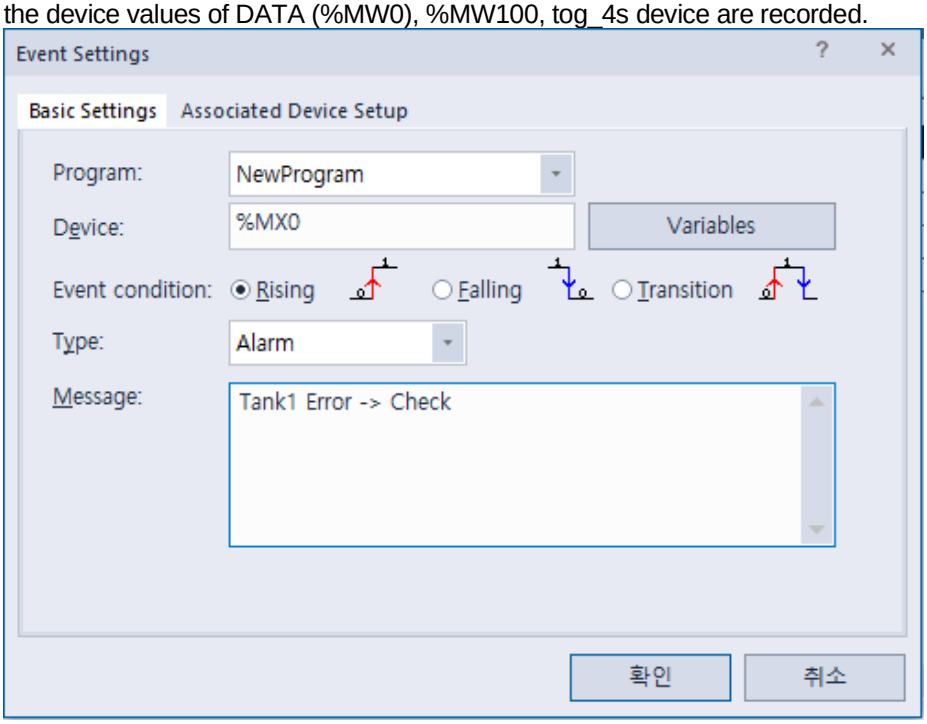


(e) Custom events

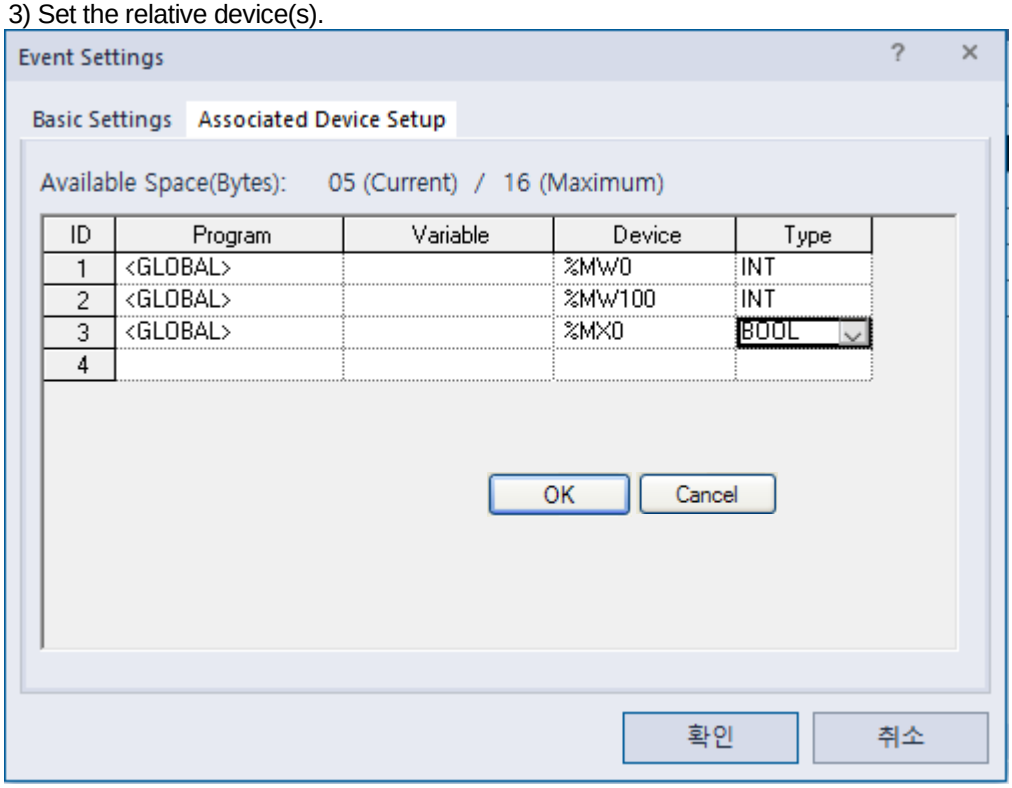
1) It monitors detail information when an event set by a user occurs. Additional user event may be registered.



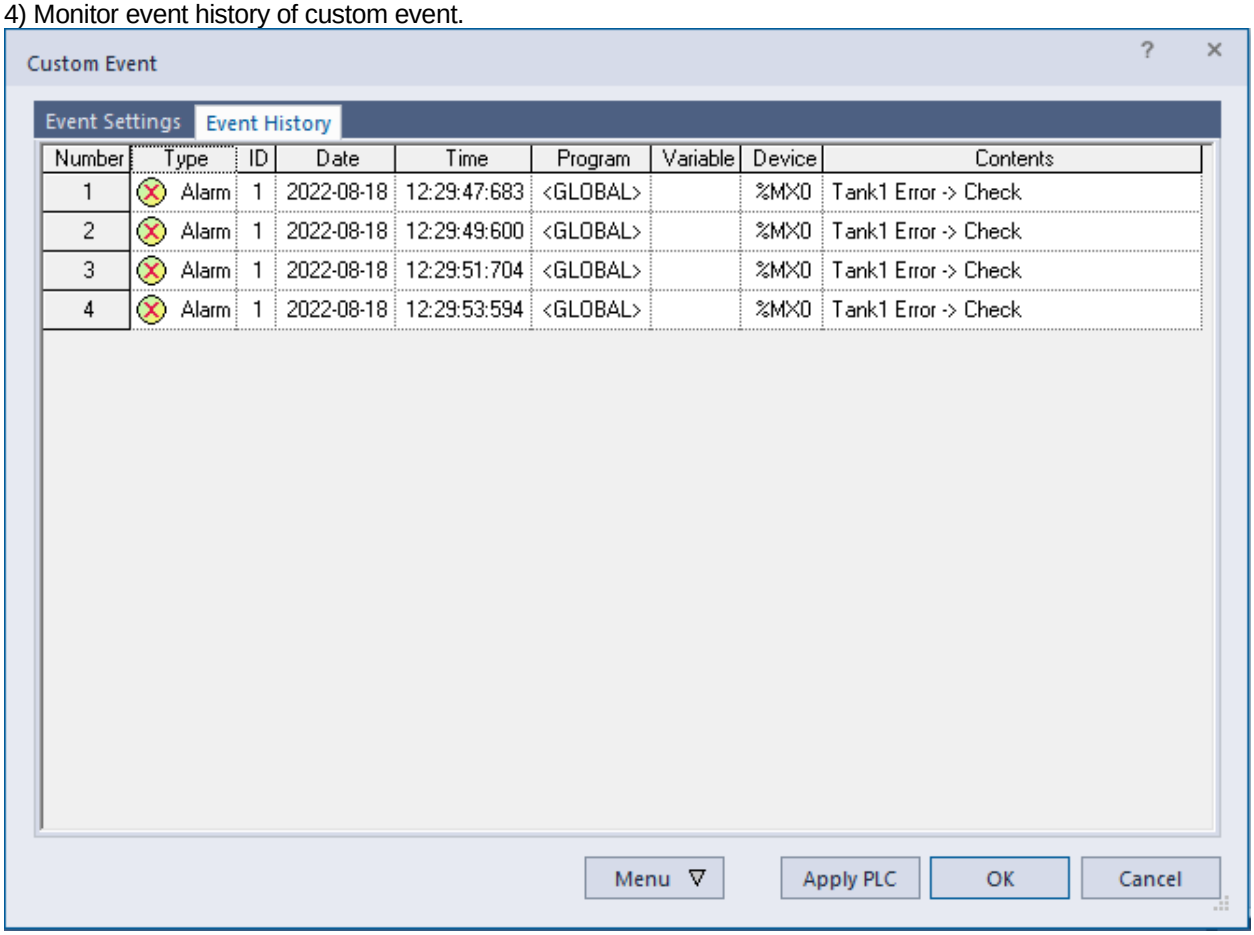
2) It sets basic setting and relative device.
If rising edge of %MX0 device occurs, it records the message of an alarm, “Out of order Water Tank 1” and the device values of DATA (%MW0), %MW100, tog_4s device are recorded.



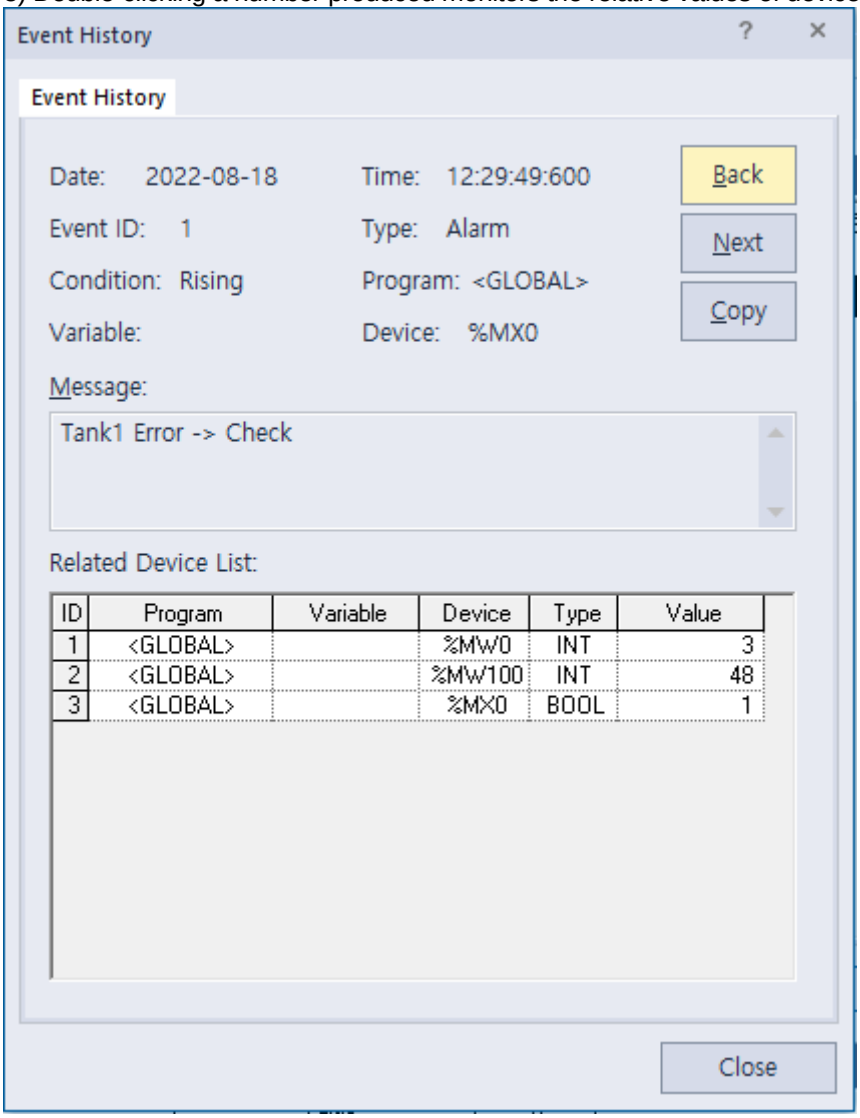
3) Set the relative device(s).



4) Monitor event history of custom event.



5) Double-clicking a number produced monitors the relative values of device and the detail message as follows.



Remark

▪For details of monitor, refer to XG5000 Users Manual.

6.12 RTC function

XGB PLC supports the RTC (clock) function and user can use this function for time management of system or error log. RTC function is executed steadily when power is off or instantaneous power cut status. Current time of RTC is renewed every scan by system operation status information flag.

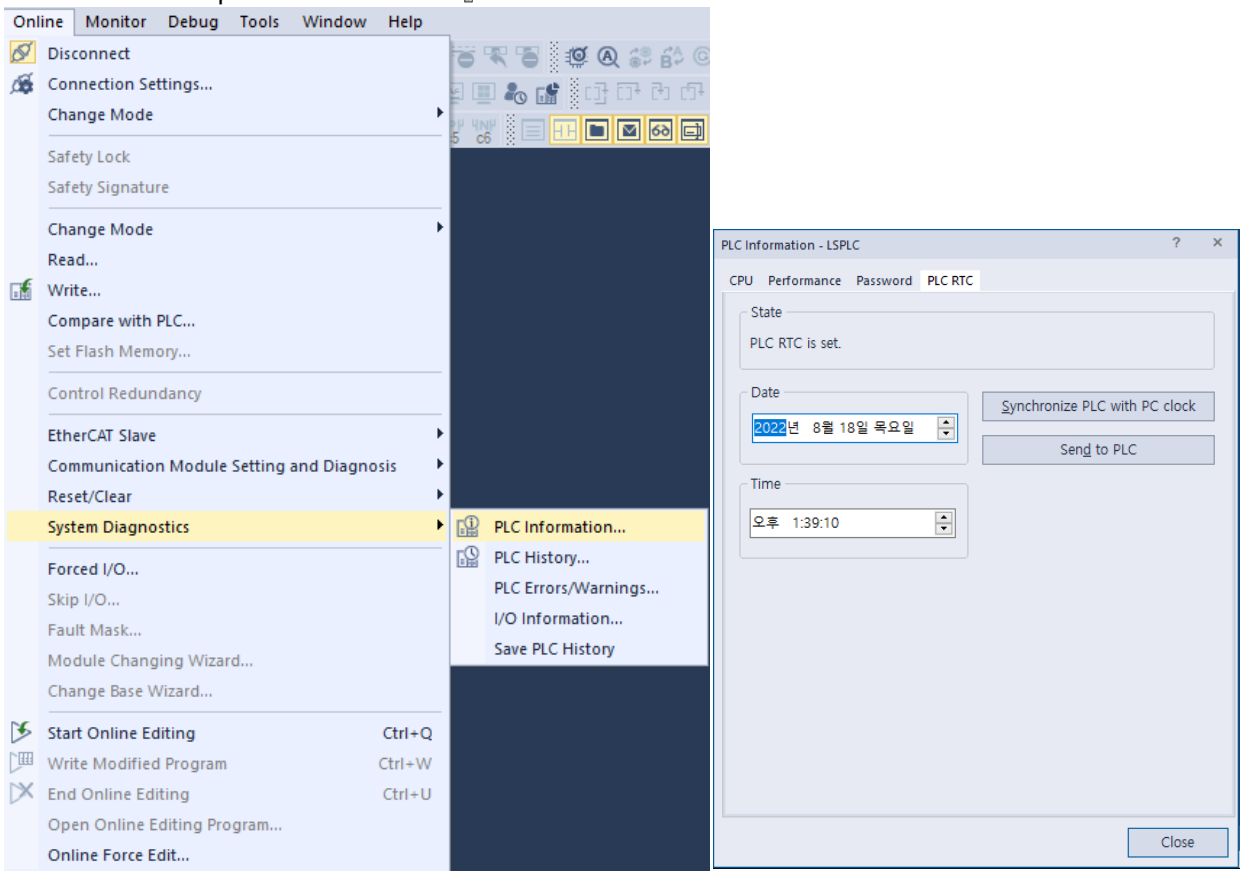
6.12.1 How to use

(1) Reading/setting clock data

(a) Reading or setting from XG5000

1) Click『Online』의『PLC Information』.

2) Click PLC RTC tap of PLC Information』.



3) In case the user wants to send the clock of PC to PLC, press 'Synchronize PLC with PC clock'.

4) In case the user wants to send the clock the user wants, change the setting value of Time box and press 'Send to PLC'.

(b) Reading by flag

The user can monitor as follows by flag

Flag for RTC	Data	Contents
_MON_YEAR	h0599	99 year 5 month
_TIME_DAY	h1512	12 date 15 hour
_SEC_MIN	h4142	42 minute 41 second
_HUND_WK	h2001	20xx year, Monday

Time data of _TIME_DAY is indicated as 24 hour type.

(c) Modification of clock data by program

You can set clock data by program.
It is used when you make system to set clock manually by external Digit switch or modify clock periodically through network.

'RTC-SET' function block is used to write the clock data to a clock. If you input the clock data and execute the function block, it writes the clock data to a clock at the scan end. For further information, refer to an instruction manual.

There is another method not using a function block. Input the clock data at the following area and turn ON '_RTC_WR'.

Flag for writing clock	Content	Setting range
_MON_YEAR_DT	Month/Year	1984 ~ 2163 year, 1 ~12 month
_TIME_DAY_DT	Hour/day	1 ~ 31 day, 0 ~ 23 hour
_SEC_MIN_DT	Second/Minute	0 ~ 59 minute, 0 ~59 second
_HUND_WK_DT	Hundred year/date	0 ~ 6

You can write clock data without using function block. Write clock data at the above area and turn on '_RTC_WR'.

- When form of clock data is wrong, the value is not written.
  (But when date is wrong, error is not detected and written itself.)
- After writing clock data, monitor clock-related device for check

(d) How to express the date

Number	0	1	2	3	4	5	6
Date	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

(2) Deviation of clock data
±2.2s / 1 d

Remark

(1) Initially, RTC may not have any clock data.
(2) When using the CPU module, first make sure to set the accurate clock data.
(3) If any data out of the clock data range is written into RTC, it does not work properly.
i.e.) 14M 32D 25H
(4) RTC may stop or have an error due to abnormal battery and other causes. The error is released if a new clock data is written.

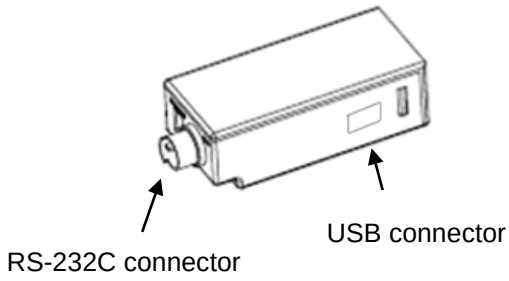
6.13 External Memory Module

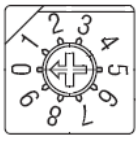
You can save the user program safely and download the program into the system when program is damaged without special manipulation by using external memory module.

6.13.1 Memory module specification

Item	XBO-M2MB	Ref.
Memory capacity	2MByte	
Memory type	Flash Memory	
Specification	USB supported, Program Read/Write	
Indicator	LED	1. RUN 2. WRITE 3. READ
Operating mode setup	Mode setup by rotary switch	
Operating power supply	RS-232C communication connecter, USB connector	5V
Purpose	For moving	
Version	CPU O/S V5.00 or higher: use memory module V1.60 or higher. CPU O/S less than V5.00: No restriction.	

6.13.2 Memory module structure





1 : READ mode
3 : WRITE mode
5 : PADT I/F mode

Note

-.Memory module can be used for XGB (not supported for XGK/I/R)
-.Memory module is not supported at the version below
(XBMS: V2.5 or less, XBCH: V1.8 or less, XECH: V1.2 or less)

6.13.3 How to use memory module

(1) Save program, parameter, communication parameter at external memory module

(a) Set the switch of memory module as 1

(b) Install memory module at the RS-232C port of main unit

- After installation, program and parameter (including communication) is saved into memory module and READ LED is on
- If Saving program and parameter is complete, READ LED is off

(c) Separate memory module from main unit

(2) Save user program of external memory module at main unit

(a) Set the operating mode of main unit as STOP

- In RUN mode, you can't save program

(b) Set the switch of memory module as 3

(c) Install the memory module

- Install it at the RS-232C port of the main unit.
- PLC program and parameter (including communication) is written and WRITE LED is on
- If saving program and parameter is complete, WRITE LED is off.

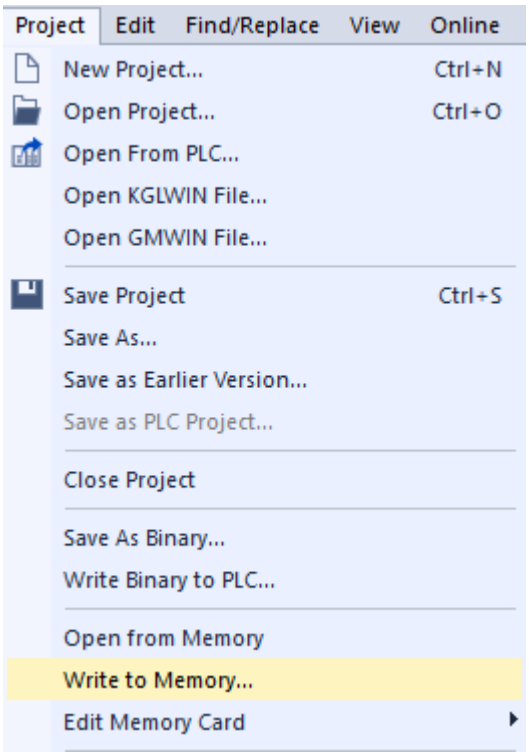
(d) If you change operation mode of PLC into RUN, PLC operates with program and parameter saved in memory module.

With the above handling, you can run PLC with program saved in memory module

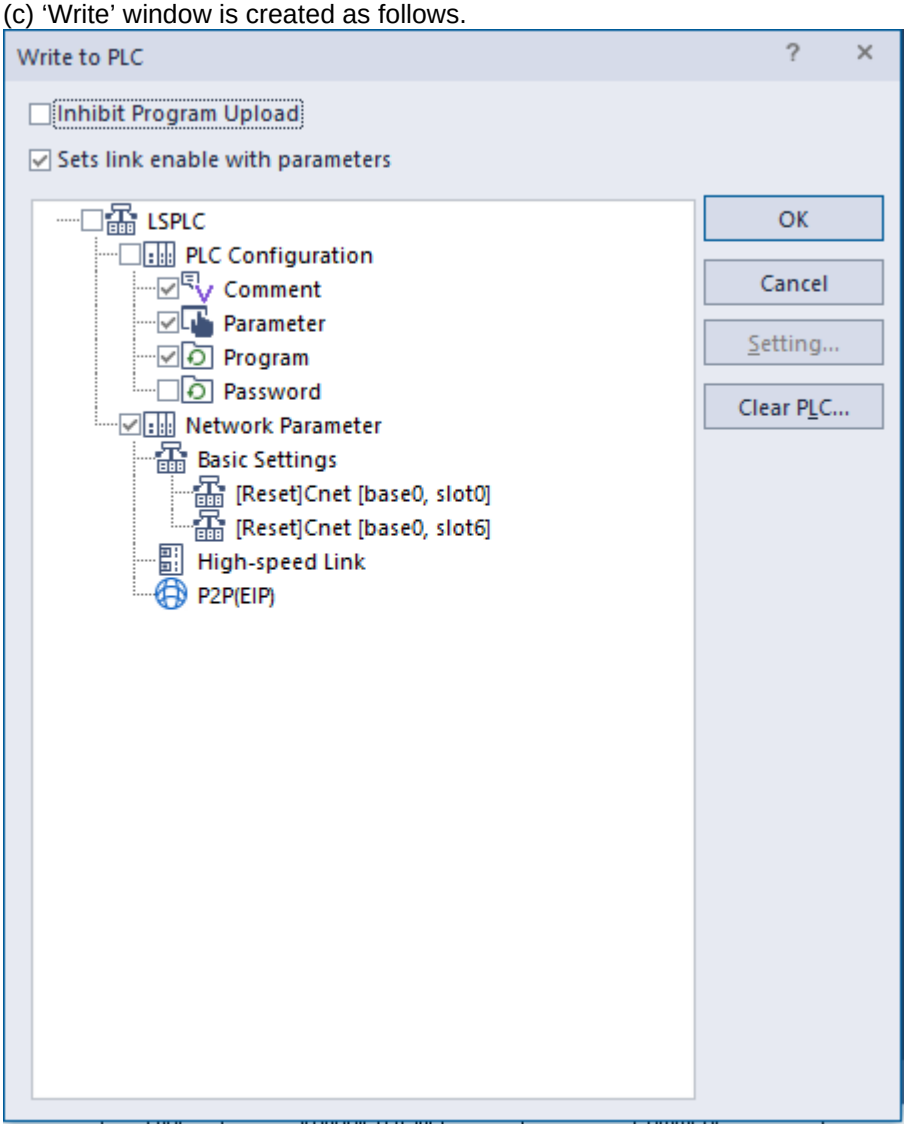
(3) Save program of XG5000at the memory module

(a) Set the mode switch of XBO-M2MB as "5" and connect XBO-M2MB to USB port of PC

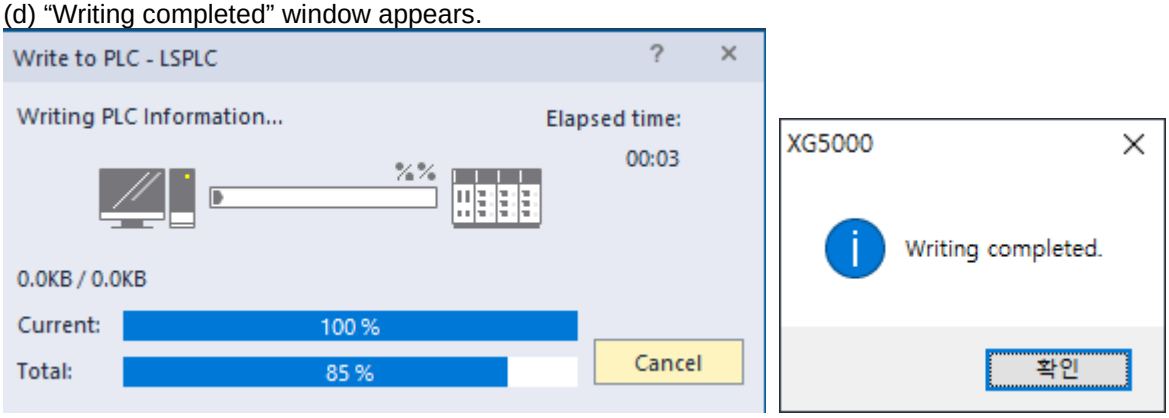
(b) Select Project → Write to Memory on XG5000 menu.



(c) 'Write' window is created as follows.



(d) "Writing completed" window appears.

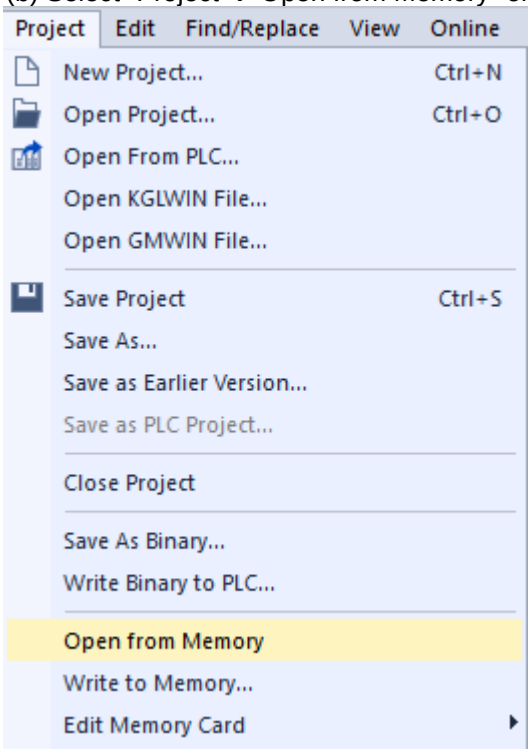


(e) With above method, through PADT, you can save program, parameter, communication parameter at XBO-M2MB

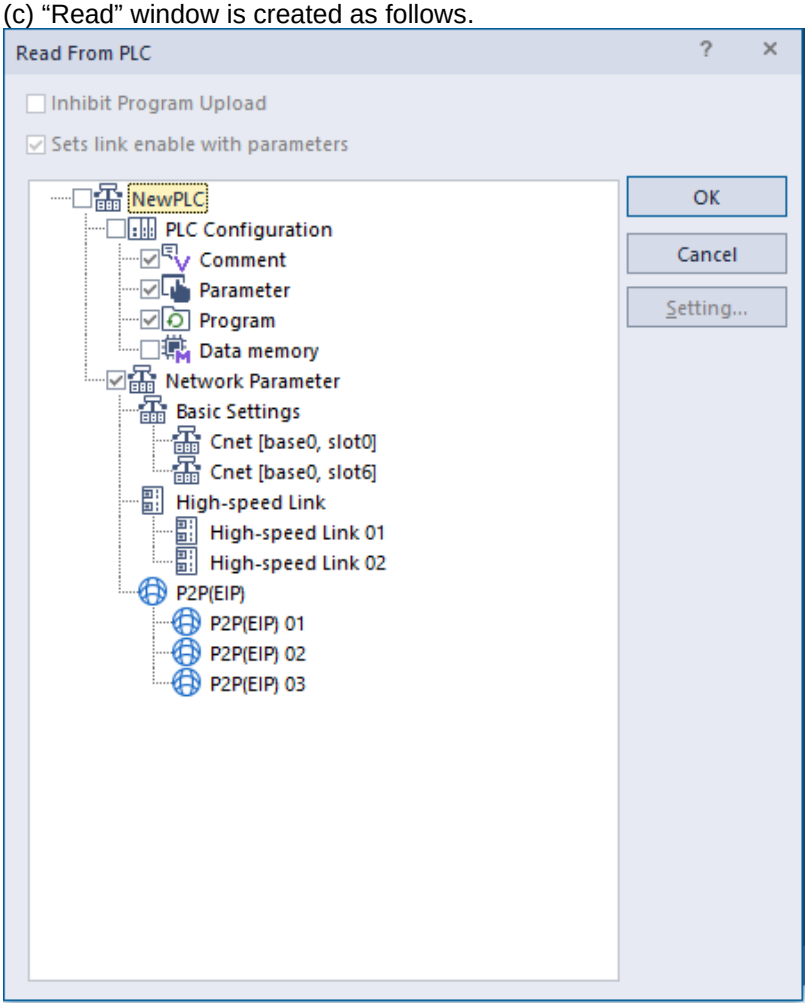
(4) Open from memory module

(a) Set the mode switch of XBO-M2MB as “5” and connect XBO-M2MB to USB port of PC

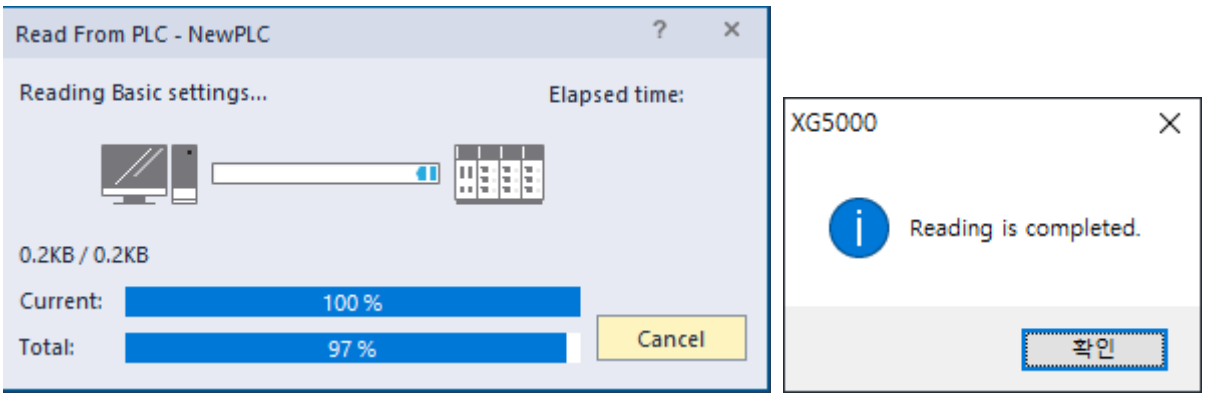
(b) Select “Project → Open from Memory” on XG5000 menu



(c) “Read” window is created as follows.



(d) “Reading is completed” window appears.



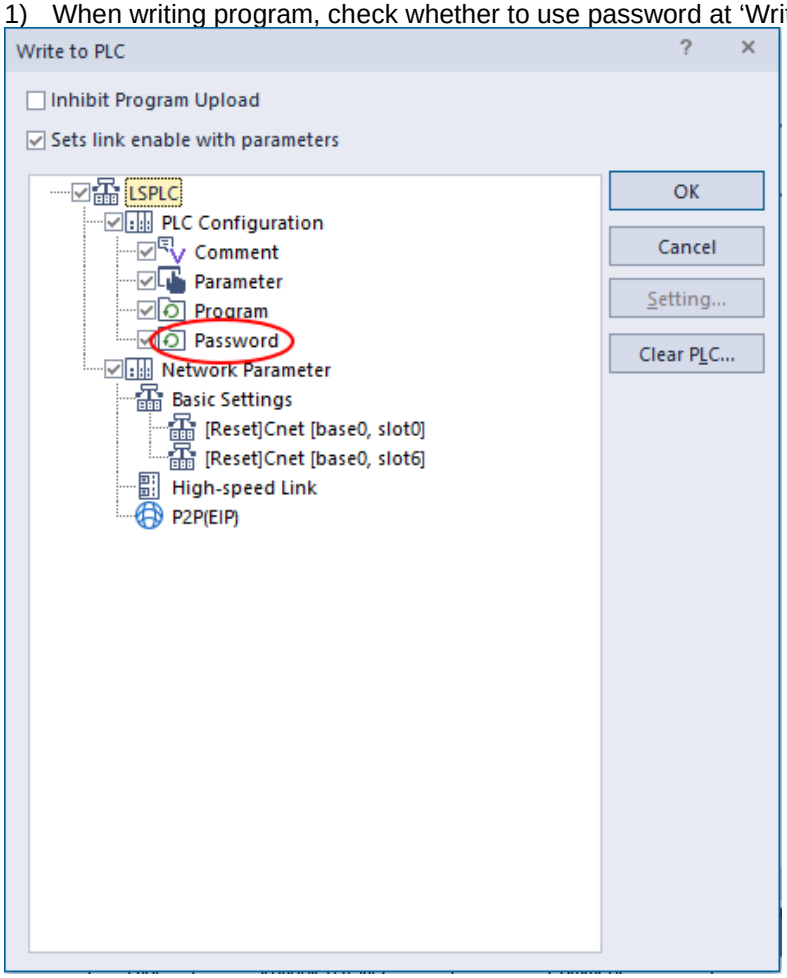
(e) With above method, through PADT, you can save program, parameter, communication parameter from XBO-M2MB

6.13.4 How to use when password is set

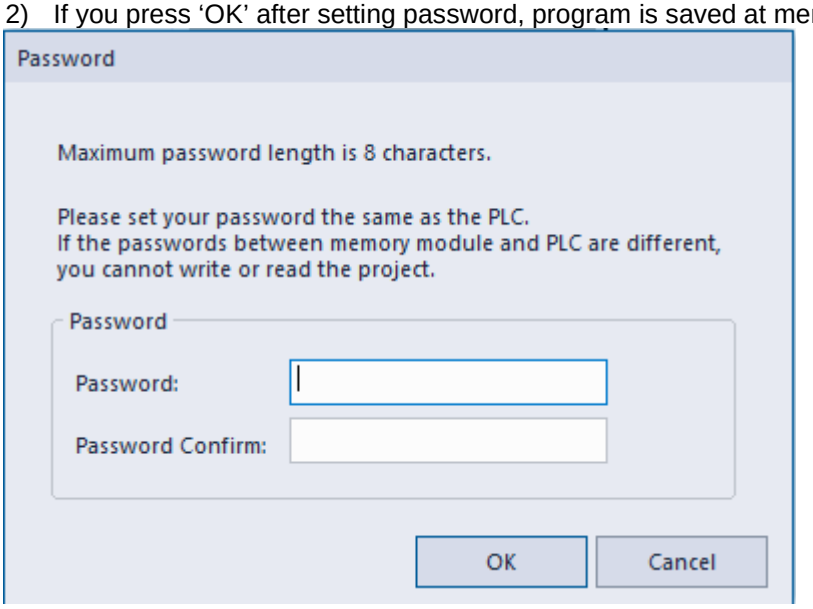
(1) When connecting PADT with memory module

(a) When setting password at program and writing program to memory module, it is saved according to rotary switch operating mode without functions cancelling the password

1) When writing program, check whether to use password at 'Write' window.

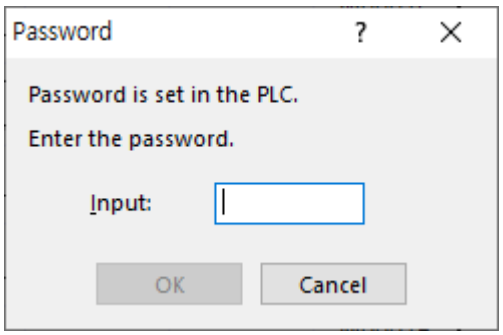


2) If you press 'OK' after setting password, program is saved at memory module with that password.

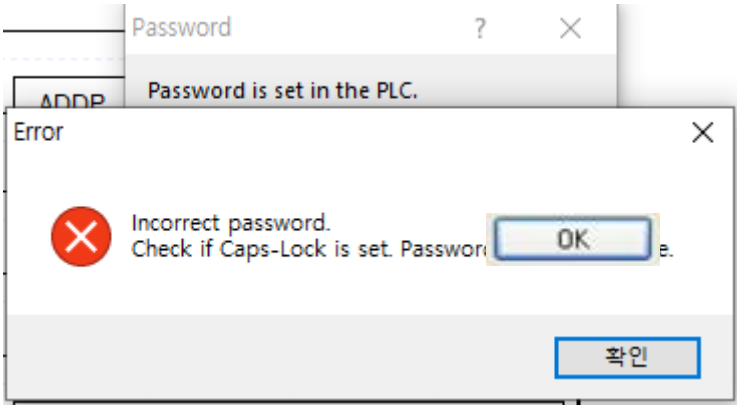


(b) When reading password-set program to PADT, screen appears, which is same as when password is set in PLC.

1) "Password" window is created.



2) If you input password same as that in memory module, it reads program.
3) When password is incorrect, error message appears as follows.



(2) Write to PLC by memory module

(a) When password of program in memory module is not set
1) When no password is set in PLC
- Saves program of the memory module in PLC
2) When password is set in PLC
- Writing is not executed

(b) When password of program in memory module is set
1) When no password is set in PLC
- Writing to PLC is executed
But, password of the memory module is not written to PLC.
2) When password is set in PLC
- When PLC password is same as that of the memory module, writing is executed.
- When PLC password is not same as that of the memory module, writing is not executed.
(WRITE LED flickers)

(3) Reading program in PLC to memory module

(a) When password of program in PLC is not set
1) When no password is set in the memory module
- Reads program from PLC
2) When password is set in the memory module
- After reading, it clears password of the memory module

(b) When password of program in PLC is set
1) When no password is set in the memory module
- Writing is not executed
2) When password is set in the memory module
- When PLC password is same as that of the memory module, writing is executed.
- When PLC password is not same as that of the memory module, writing is not executed.

(4) When LED flickers

	Condition	LED
1	PLC type is not XGB	RUN LED flickers
2	Operating mode changes while being connected to PADT or PLC	RUN LED flickers
3	Connected to PADT while mode switch is “1”	READ LED flickers
4	PLC program upload is prohibited	READ LED flickers
5	You execute reading when password is set in PLC (when password is not same as that of memory module)	READ LED flickers
6	Connected to PADT while mode switch is “3”	WRITE LED flickers
7	You execute writing the memory module when PLC mode is RUN	WRITE LED flickers
8	Connected to the different type of PLC with the type set in the memory module	WRITE LED flickers
9	You executes writing when PLC password is not same as that of memory module	WRITE LED flickers

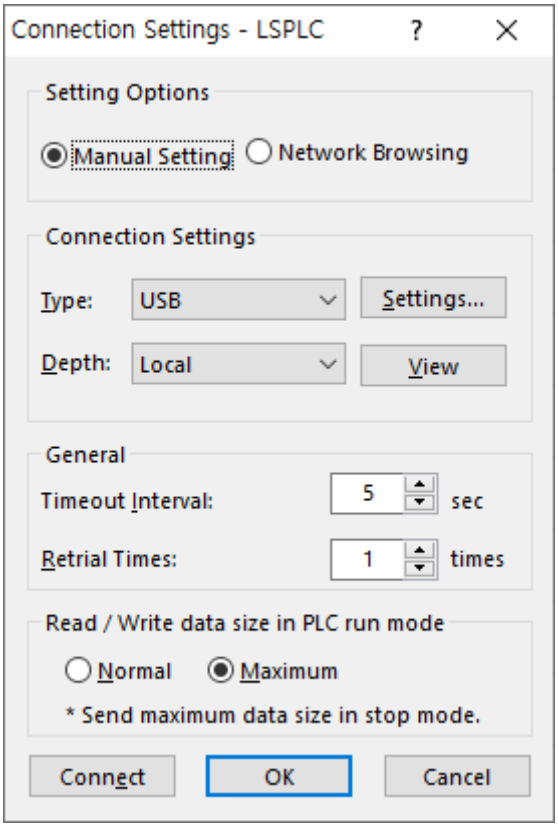
Note

-. Memory module can cancel PLC password and read/write but can’t set, delete and change the password.
-. Do not run PLC while external memory module is connected to.
-. Do not remove memory module while READ/WRITE LED is on.

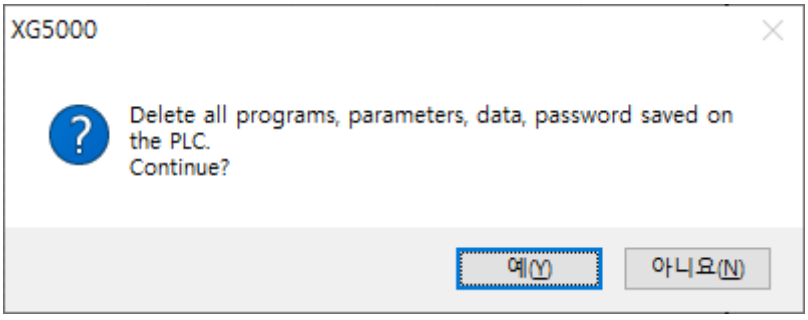
6.14 Clear All PLC

Clear All PLC function clears parameter, program, data, password saved on PLC

(1) How to clear all PLC
(a) Click 『Online』-『Clear All PLC』.



(b) After selection connection method, click 『Connect』 or 『OK』.



(c) If you select 『Yes』 on the dialog box, PLC program, parameter, data, password will be deleted.

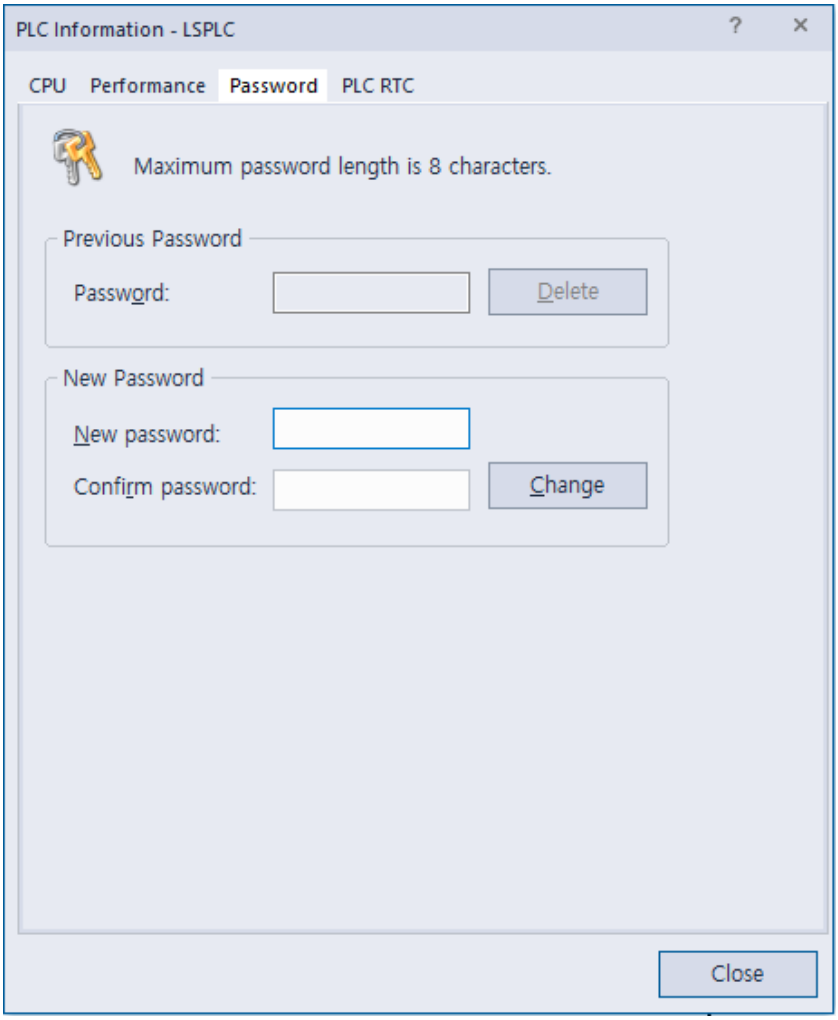
Note

- Clear All PLC function can be executed though not connected.
- If you use Clear All PLC function, password will be deleted. So be careful.
- In case you lose password, use this function to clear password.

6.15 Password Setting per Program Block

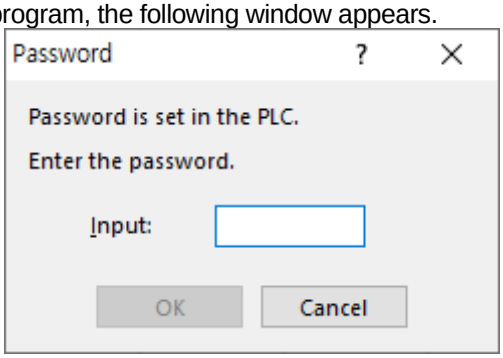
Password Setting per Program Block function sets password for each program block. You should input password to open program.

(1) How to set program block password
(a) Click 『Properties』 after selecting program in project window.
(b) Click password tap.



(c) Click 『OK』 after inputting new password.

(2) Opening password-set program
(a) When you open password-set program, the following window appears.

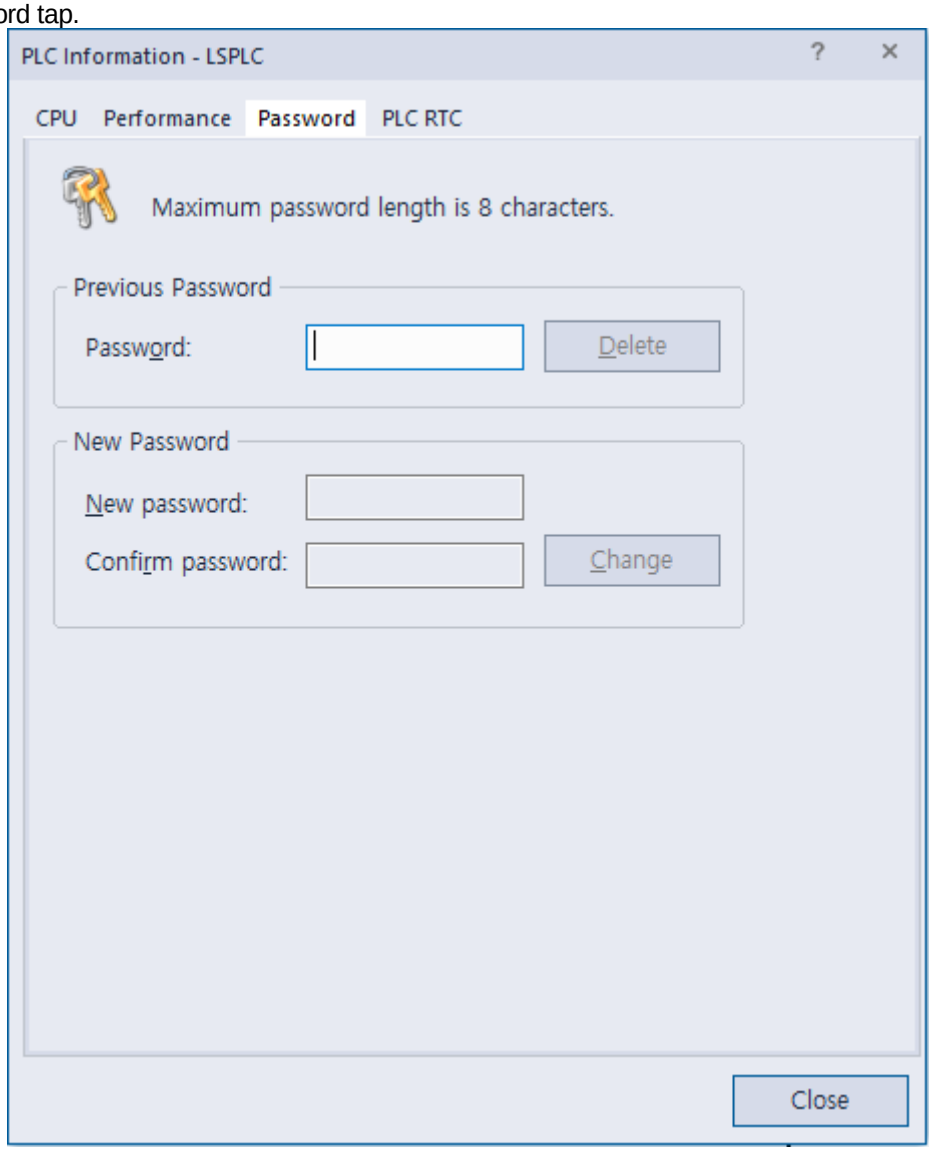


(b) After inputting correct password, click 『OK』 to open program.

(3) How to delete program block password

(a) After program in project window, click 『Properties』.

(b) Click password tap.



(c) After inputting previous password, click 『Delete』.

(d) Click 『OK』.

Chapter 7 Input/Output Specifications

7.1 Introduction

Here describes the notices when selecting digital I/O module used for XGB series.

(1) For the type of digital input, there are two types such as current sink input and current source input.

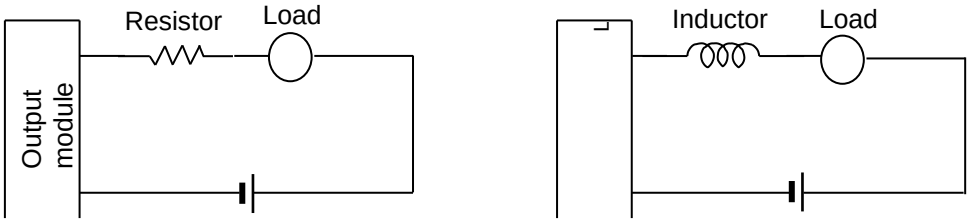
(2) The number of max. Simultaneous input contact point is different according to module type. It depends on the input voltage, ambient temperature. Use input module after checking the specification.

(3) When response to high speed input is necessary, use interrupt input contact point. Up to 8 interrupt points are supported.

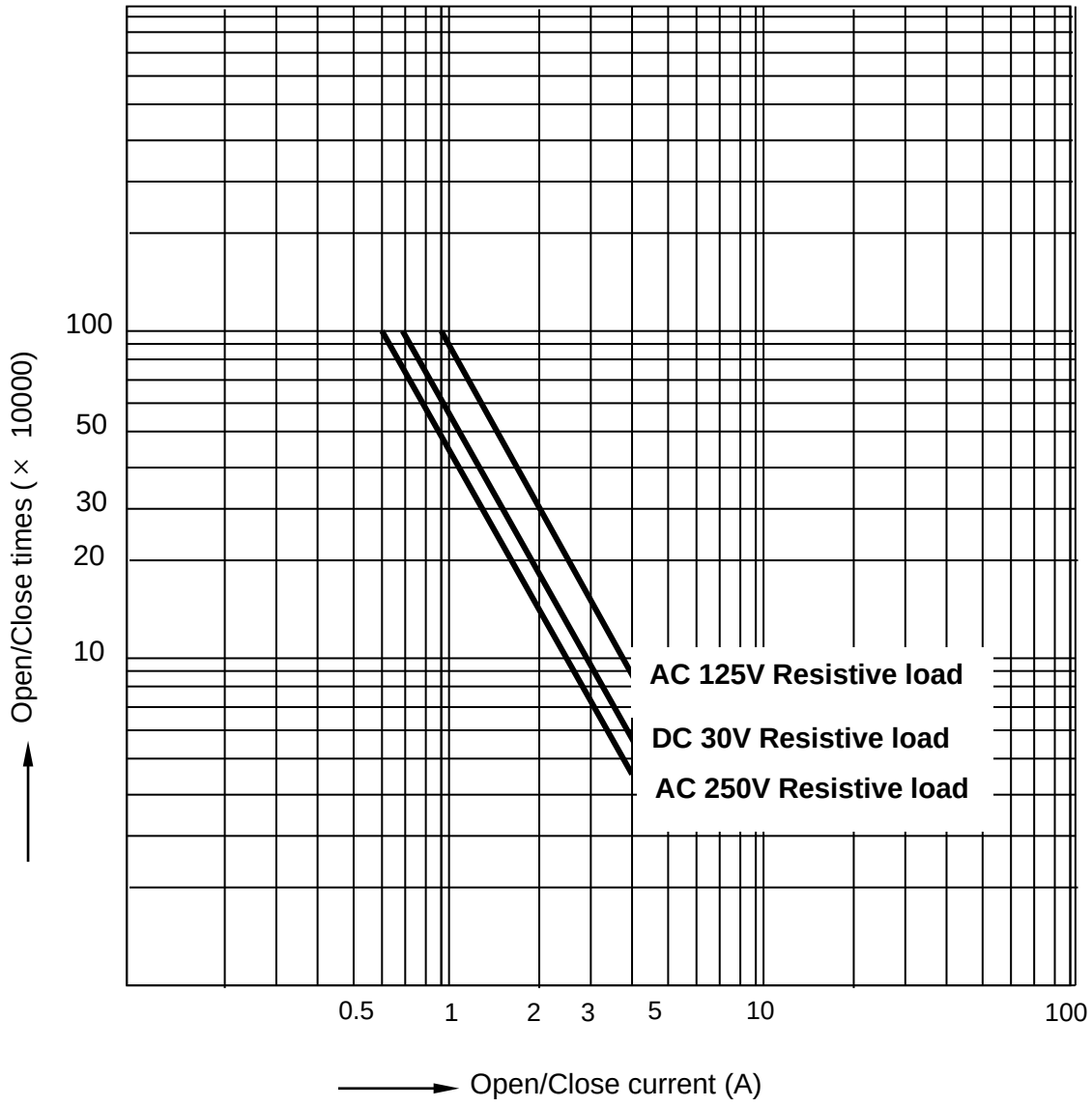
(4) In case that open/close frequency is high or it is used for conductive load open/close, use Transistor output module or triac output module as the durability of Relay Output Module shall be reduced.

(5) For output module to run the conductive (L) load, max. open/close frequency should be used by 1second On, 1 second Off.

(6) For output module, in case that counter timer using DC/DC Converter as a load was used, Inrush current may flow in a certain cycle when it is ON or during operation. In this case, if average current is selected, it may cause the failure. Accordingly, if the previous load was used, it is recommended to connect resistor or inductor to the load in serial in order to reduce the impact of Inrush current or use the large module having a max. load current value.

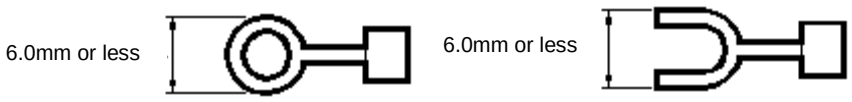


(7) Relay life of Relay output module is shown as below.
Max. life of Relay used in Relay output module is shown as below.



(8) Terminal blocks are of barrier type and pluggable type, and pluggable terminal blocks have screw type and push-in type depending on the connection method.

1) Barrier terminal block
As a terminal block mainly applied to the XGB compact type basic unit, crimp terminals with insulation sleeves cannot be used. Crimp terminals suitable for connection to terminal blocks are as follows.



For the size of the wire connected to the terminal block, use a stranded wire of 0.3 to 0.75 ㎟ and a thickness of 2.8 mm or less. Please note that the allowable current may differ depending on the insulation thickness of the wire.

The tightening torques of the module fixing screws and terminal block screws must be within the following ranges.

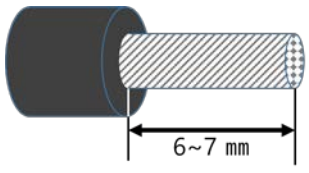
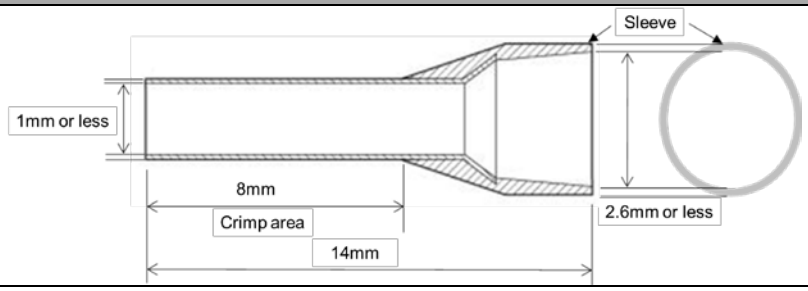
Coupling position	Coupling torque range
IO module terminal strip screw (M3 screw)	42 ~ 58 N·㎝
IO module terminal strip fixation screw (M3 screw)	66 ~ 89 N·㎝
IO module external connector(M2 screw)	18 22 N·㎝

2) Screw connection type plug (PCB plug, Screw connection):XBE-xx08A, XBE-xx16A
As a terminal block mainly applied to the XGB compact type basic unit, crimp terminals with insulation

① Wire size

Number of wires per contact	single wire	stranded wire	When using ferrules with plastic sleeves	When using ferrules without plastic sleeves
1	0.2 ~ 1.5 ㎟	0.2 ~ 1.5 ㎟	0.25 ~ 0.5 ㎟	0.25 ~ 1.5 ㎟
2	0.75 ㎟	0.75 ㎟	0.5 ㎟ (Twin Ferrules)	0.25 ~ 0.34 ㎟

② Ferrule size

Stripping Dimensions of Wires	penhole
	

③ Recommended ferrule

Manufacturer	model name	line size	crimping tool
GLW GmbH	DN00508D	0.5 ㎟	CO225 Or CAP4
	DN00308D	0.34 ㎟	
	DN00208D	0.25 ㎟	

Peel off about 6-7 mm of the sheath from the end of the wire and connect it to the ferrule. Excessive

stripping of the sheath can result in poor contact with the crimp area of the ferrule. Tighten the terminal block screws as follows.

Screw thread	M2
Flat screwdriver size	0.4 x 2.5
Tightening torque	0.2 N · m

(9) Relay life graph is not written based on real use. (This is not a guaranteed value). So consider margin. Relay life is specified under following condition.

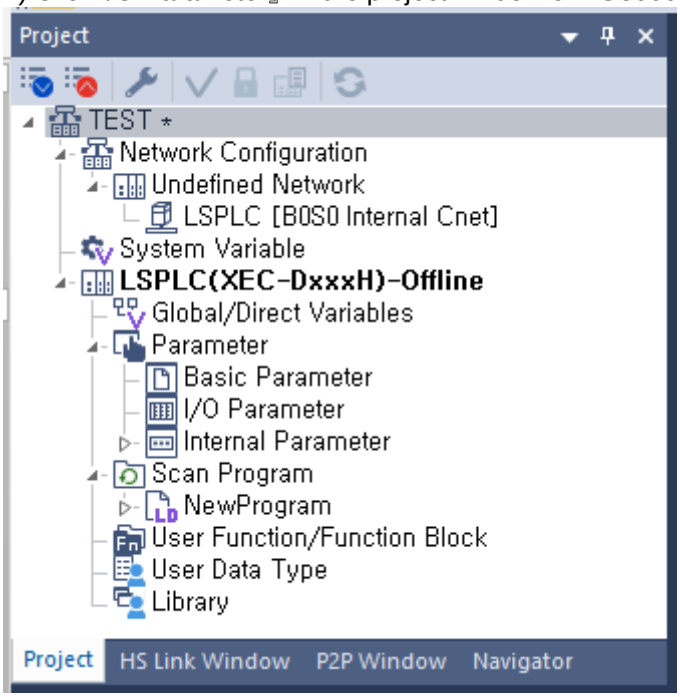
(a) Rated voltage, load: 3 million times: 100 million times
(b) 200V AC 1.5A, 240V AC 1A (COS¢ =0.7): 1 million times
(c) 200V AC 0.4A, 240V AC 0.3A (COS¢ =0.7): 3 million times
(d) 200V AC 1A, 240V AC 0.5A (COS¢ =0.35): 1 million times
(e) 200V AC 0.3A, 240V AC 0.15A (COS¢ =0.35): 3 million times
(f) 24V DC 1A, 100V DC 0.1A (L/R=7ms): 1million times
(g) 24V DC 0.3A, 100V DC 0.03A (L/R=7ms): 3million times

(10) Noise can be inserted into input module. To prevent this noise, the user can set filter for input delay in parameter. Consider the environment and set the input filter time.

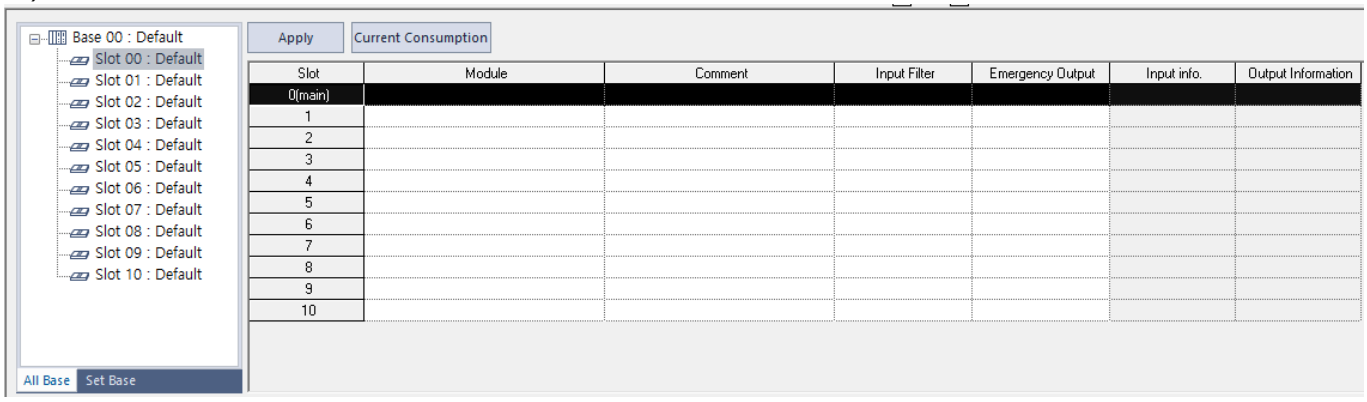
Input filter time (ms)	Noise signal pulse size (ms)	Reference
1	0.3	
3	1.8	Initial value
5	3	
10	6	
20	12	
70	45	
100	60	

(a) Setting input filter

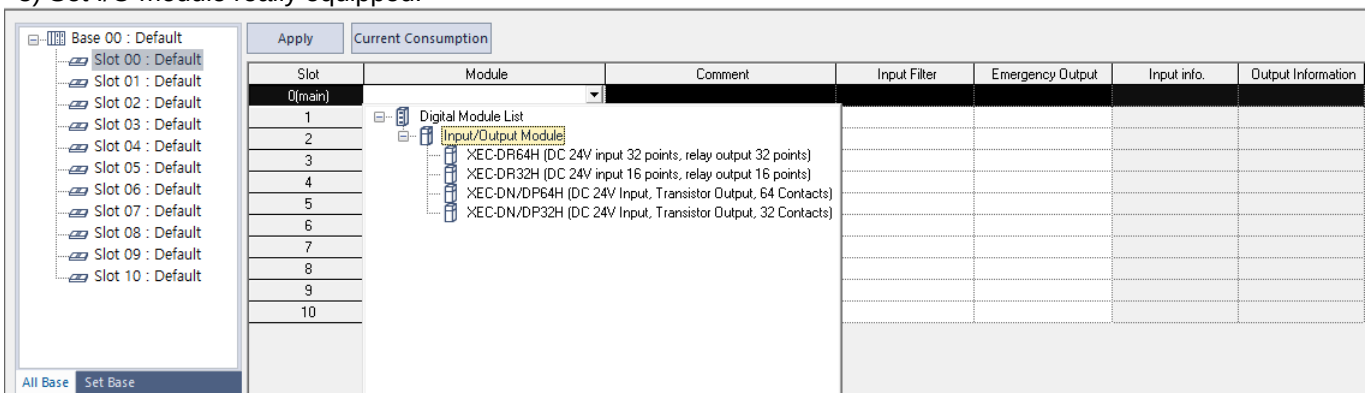
1) Click I/O Parameter』 in the project window of XG5000



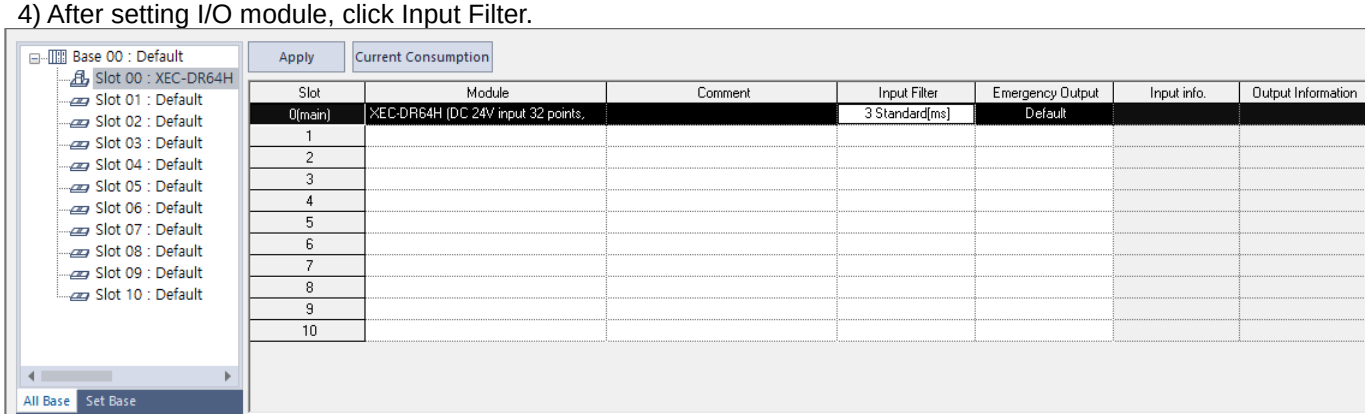
2) Click『Module』 at the slot location.



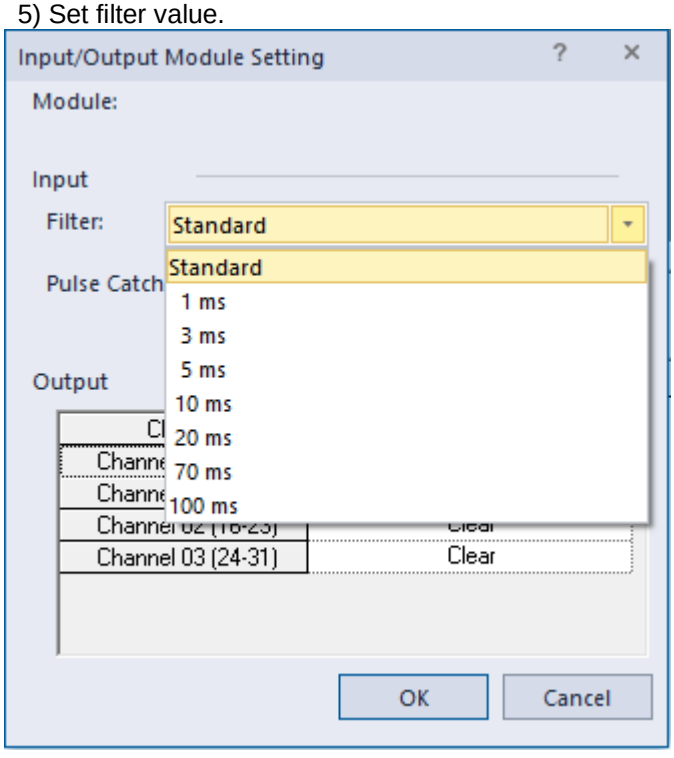
3) Set I/O module really equipped.



4) After setting I/O module, click Input Filter.

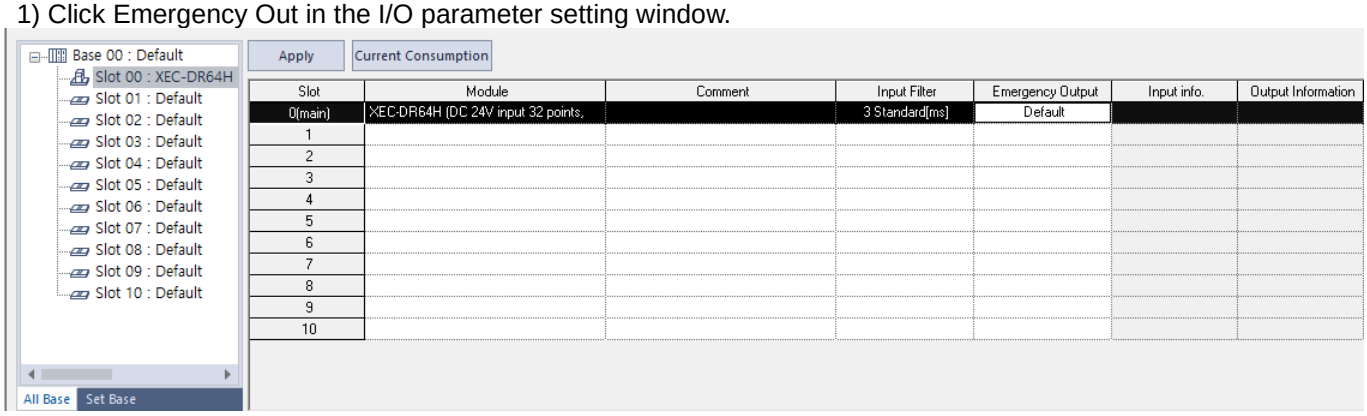


5) Set filter value.

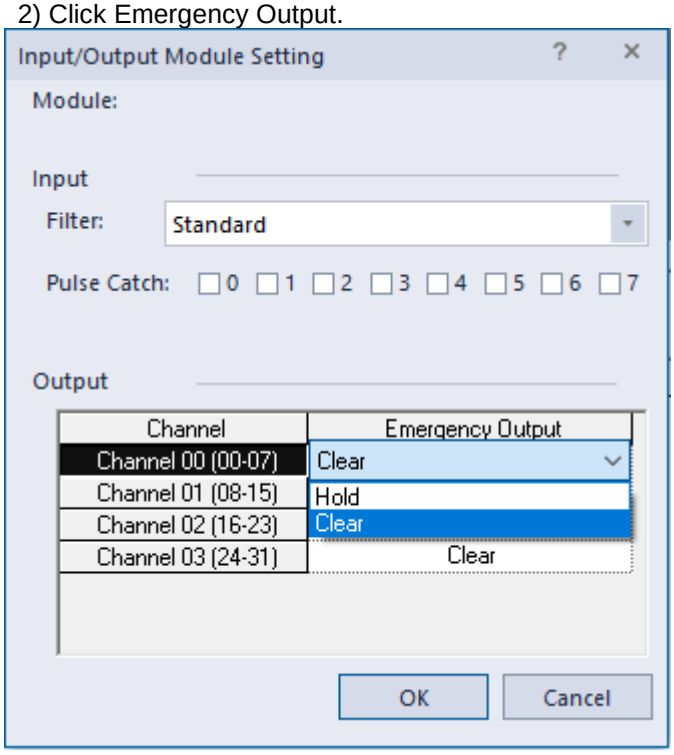


(b) Setting output status in case of error

1) Click Emergency Out in the I/O parameter setting window.



2) Click Emergency Output.



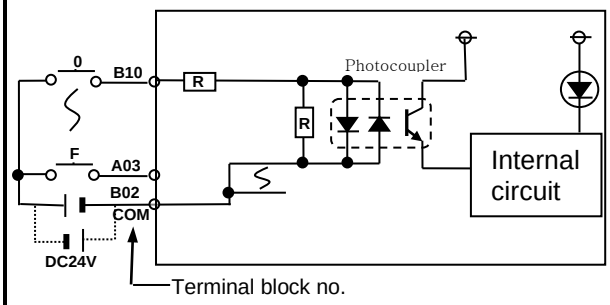
If it is selected as Clear, the output will be Off and if Hold is selected, the output will be kept.

7.2 Digital Input Specifications of Main Unit

7.2.1 XEC-DR32H / XEC-DN32H input unit (Source/Sink type)

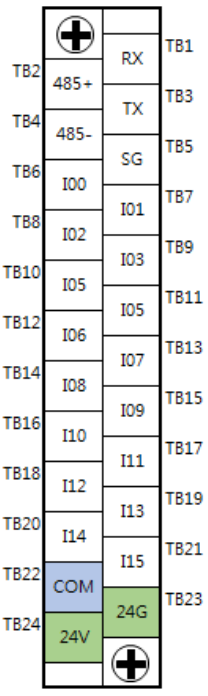
Specification \ Model	Main unit		
	XEC-DN32H(/DC) XEC-DP32H	XEC-DR32H	XEC-DR32H/D1
Input point	16 point		
Insulation method	Photo coupler insulation		
Rated input voltage	DC24V		DC12/24V
Rated input current	About 4 ㎃ (point 0~7: About 10 ㎃)		About 5/10mA (point 0~7: about 7/15mA)
Operation voltage range	DC20.4~28.8V (ripple rate < 5%)		DC9.5~30V (ripple rate < 5%)
On Voltage/Current	DC19V or higher / 3 ㎃ or higher		DC9V or higher / 3 ㎃ or higher
Off Voltage/Current	DC6V or less / 1 ㎃ or less		DC 5V or less / 1 ㎃ or less
Input resistance	About 5.6 ㏀ (%IX0.0.0~%IX0.0.7: About 2.7 ㏀)		About 2.7 ㏀ (%IX0.0.0 ~%IX0.0.7: About 1.8 ㏀)
Response time: Off → On / On → Off	1/3/5/10/20/70/100 ㎳ (set by CPU parameter) Default: 3 ㎳		
Insulation pressure	AC560Vrms / 3Cycle (altitude 2000m)		
Insulation resistance	10 ㏁ or more by Mega ohmmeter		
Common method	16 point / COM		
Proper cable size	0.3 ㎟		
Current consumption	200 ㎃ (when all point On)		
Operation indicator	Input On, LED On		
External connection method	24 points connecting connector (M3 X 6 screw)		
Weight	500g	600g	

Circuit configuration



No.	Contact	No.	Contact
TB2	485+	TB1	RX
TB4	485-	TB3	TX
TB6	00	TB5	SG
TB8	02	TB7	01
TB10	04	TB9	03
TB12	06	TB11	05
TB14	08	TB13	07
TB16	10	TB15	09
TB18	12	TB17	11
TB20	14	TB19	13
TB22	**COM**	TB21	15
TB24	24V	TB23	24G

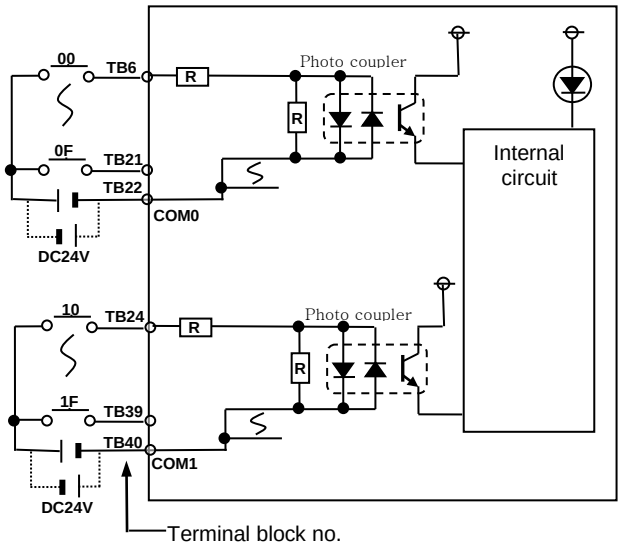
Type



7.2.2 XEC-DR64H / XEC-DN64H input unit (Source/Sink Type)

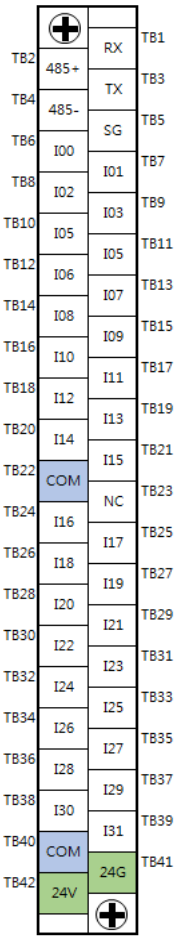
Specification \ Model	Main unit		
	XEC-DN64H	XEC-DR64H	XEC-DR64H/D1
Input point	32 point		
Insulation method	Photo coupler insulation		
Rated input voltage	DC24V		DC 12/24V
Rated input current	About 4 ㎃ (point 0~7: About 10 ㎃)		About 5/10 ㎃ (point 0~7: About 7/15 ㎃)
Operation voltage range	DC20.4~28.8V (ripple rate < 5%)		DC 9.5~30V (ripple rate < 5%)
On Voltage/Current	DC19V or higher / 3 ㎃ or higher		DC9V or higher / 3 ㎃ or higher
Off Voltage/Current	DC6V or less / 1 ㎃ or less		DC5V or less / 1 ㎃ or less
Input resistance	About 5.6 ㏀ (%IX0.0.0~%IX0.0.7: About 2.7 ㏀)		About 2.7 ㏀ (%IX0.0.0 ~%IX0.0.7: About 1.8 ㏀)
Response time Off → On / On → Off	1/3/5/10/20/70/100 ㎳ (set by CPU parameter) Default: 3 ㎳		
Insulation pressure	AC560Vrms / 3Cycle (altitude 2000m)		
Insulation resistance	10 ㏁ or more by Mega ohmmeter		
Common method	16 point / COM		
Proper cable size	0.3 ㎟		
Current consumption	200 ㎃ (when all point On)		
Operation indicator	Input On, LED On		
External connection method	42 point connecting connector (M3 X 6 screw)		
Weight	800g	900g	

Circuit configuration



No.	contact	No.	contact
		TB1	RX
TB2	485+	TB3	TX
TB4	485-	TB5	SG
TB6	00	TB7	01
TB8	02	TB9	03
TB10	04	TB11	05
TB12	06	TB13	07
TB14	08	TB15	09
TB16	10	TB17	11
TB18	12	TB19	13
TB20	14	TB21	15
TB22	**COM**	TB23	NC
TB24	16	TB25	17
TB26	18	TB27	19
TB28	20	TB29	21
TB30	22	TB31	23
TB32	24	TB33	25
TB34	26	TB35	27
TB36	28	TB37	29
TB38	30	TB39	31
TB40	**COM**	TB41	24G
TB42	24V		

type

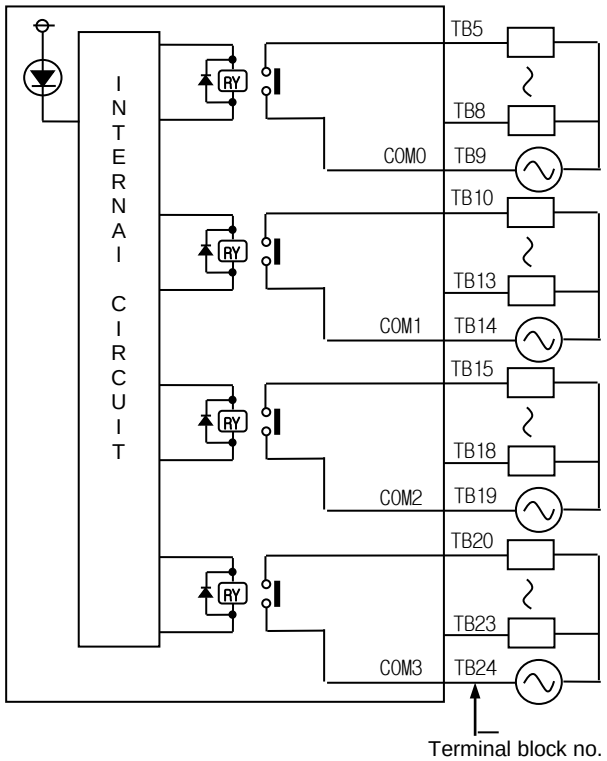


7.3 Digital Output Specification of Main Unit

7.3.1 XEC-DR32H output unit

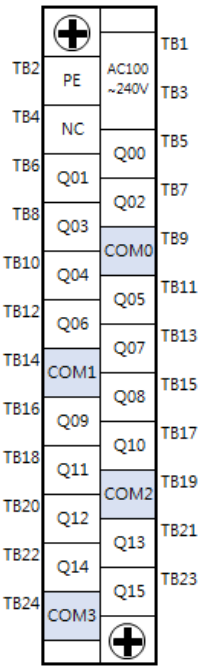
Model / Specification		Main unit
		XEC-DR32H
Output point		16 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A (Resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1 ㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1 ㎃ (AC220V, 60 ㎐)
Max. on/off frequency		3,600 times / hour
Surge killer		None
Life	Mechanical	20 million or above
	Electrical	Rated load voltage / current one hundred thousand or above
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) one hundred thousand or above
		AC200V / 1A, AC240V / 0.5A (COSΦ = 0.35) one hundred thousand or above
		DC24V / 1A, DC100V / 0.1A (L / R = 7 ㎳) one hundred thousand or above
Response time	Off → On	10 ㎳ or less
	On → Off	12 ㎳ or less
Common method		4 point / COM
Proper cable size		Strand wire 0.3~0.75 ㎟ (External diameter 2.8 ㎜ or less)
Internal consumption current		360 ㎃ (When all output are on)
Operation indicator		Output On, LED On
External connection method		24 point connecting connector (M3 X 6 screw)
Weight		600g

Circuit configuration



No.	contact	No.	Contact
		TB1	AC100 ~ 240V
TB2	PE	TB3	
TB4	NC	TB5	00
TB6	01	TB7	02
TB8	03	**TB9**	**COM0**
TB10	04	TB11	05
TB12	06	TB13	07
TB14	**COM1**	TB15	08
TB16	09	TB17	10
TB18	11	**TB19**	**COM2**
TB20	12	TB21	13
TB22	14	TB23	15
TB24	**COM3**		

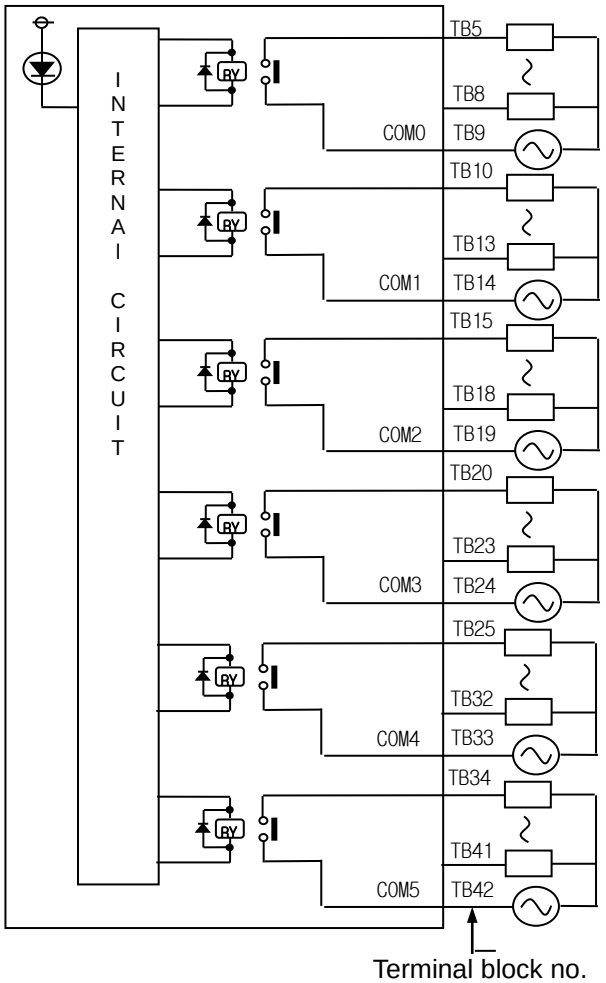
Type



7.3.2 XEC-DR64H output unit

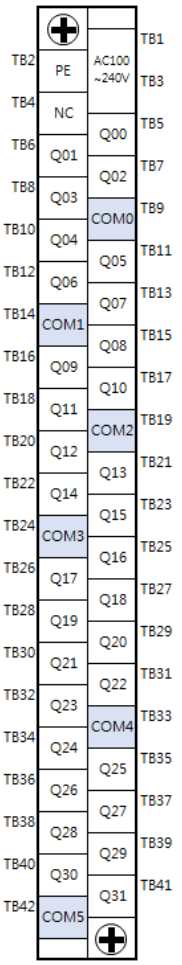
Specification \ Model		Main unit
		XEC-DR64H
Output point		32 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1 ㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1 ㎃ (AC220V, 60 ㎐)
Max. on/off frequency		3,600 times / hour
Surge killer		None
Life	Mechanical	20 million or above
	Electrical	Rated load voltage / current one hundred thousand or above
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) one hundred thousand or above
		AC200V / 1A, AC240V / 0.5A (COSΦ = 0.35) one hundred thousand or above
		DC24V / 1A, DC100V / 0.1A (L / R = 7 ㎳) one hundred thousand or above
Response time	Off → On	10 ㎳ or less
	On → Off	12 ㎳ or less
Common method		4 point / COM (COM0~COM3), 8 point / COM (COM4~COM5)
Proper cable size		Strand wire 0.3~0.75 ㎟ (External diameter 2.8 ㎜ or less)
Internal consumption current		720 ㎃ (When all output are on)
Operation indicator		Output On, LED On
External connection method		42 point connecting connector (M3 X 6 screw)
Weight		900g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	NC	TB3	
TB6	01	TB5	00
TB8	03	TB7	02
TB10	04	**TB9**	**COM0**
TB12	06	TB11	05
TB14	**COM1**	TB13	07
TB16	09	TB15	08
TB18	11	TB17	10
TB20	12	**TB19**	**COM2**
TB22	14	TB21	13
TB24	**COM3**	TB23	15
TB26	17	TB25	16
TB28	19	TB27	18
TB30	21	TB29	20
TB32	23	TB31	22
TB34	24	**TB33**	**COM4**
TB36	26	TB35	25
TB38	28	TB37	27
TB40	30	TB39	29
TB42	**COM5**	TB41	31

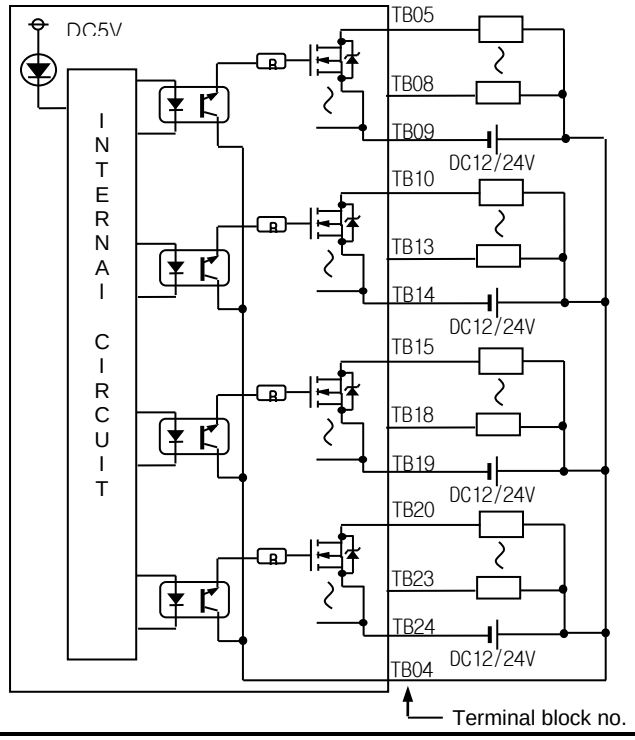
type



7.3.3 XEC-DN32H output unit (Sink type)

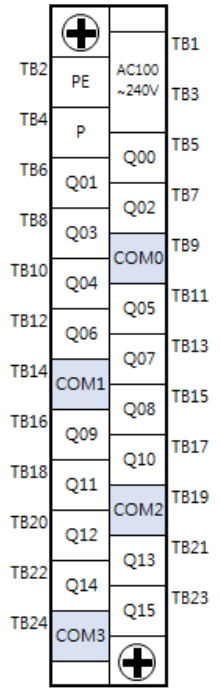
Specification \ Model		Main unit
		XEC-DN32H(/DC)
Output point		16 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Range of load voltage		DC 10.2 ~ 26.4V
Max. load current		General output : 0.5A / 1 point, 2A / 1COM Output for positioning (%QX0.0.0~%QX0.0.3), 0.1A/1 point, 0.4A / 1COM
Off leakage current		0.1 ㎃ or less
Max. inrush current		4A / 10 ㎳ or less
On max. voltage drop		DC 0.4V or less
Surge killer		Zener diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, resistive load)
Common method		4 point / COM
Proper cable size		Strand wire 0.3~0.75 ㎟ (external diameter 2.8 ㎜ or less)
Internal consumption current		400 ㎃ (When all output are on)
External power supply	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		Output On, LED On
External connection method		24 point connecting connector (M3 X 6 screw)
Weight		500g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	P	TB3	
TB6	01	TB5	00
TB8	03	TB7	02
TB10	04	**TB9**	**COM0**
TB12	06	TB11	05
TB14	**COM1**	TB13	07
TB16	09	TB15	08
TB18	11	TB17	10
TB20	12	**TB19**	**COM2**
TB22	14	TB21	13
TB24	**COM3**	TB23	15

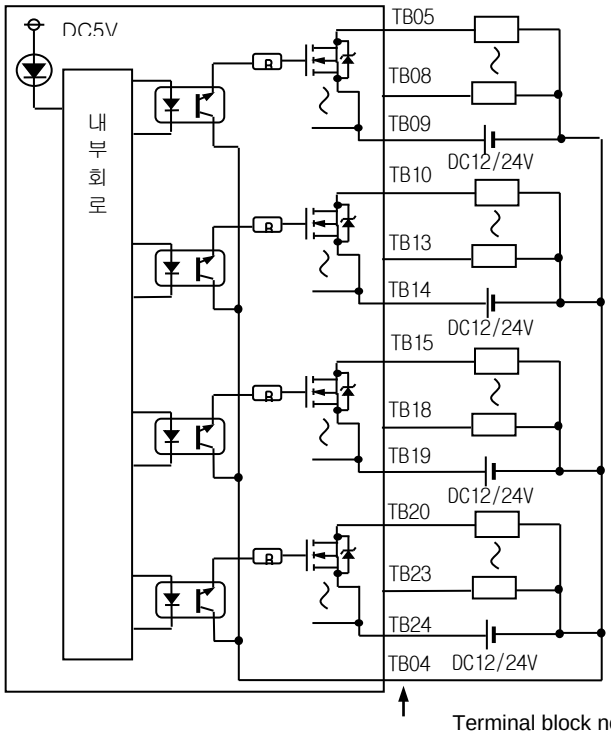
Type



7.3.4 XEC-DP32H output unit (Source type)

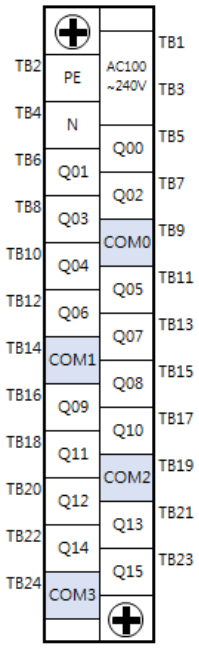
Model / Specification		Main unit
		XEC-DP32H
Output point		16 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Range of load voltage		DC 10.2 ~ 26.4V
Max. load current		General output: 0.5A/1 point, 2A / 1COM Output for positioning (%QX0.0.0 ~ %QX0.0.3): 0.1A/1point, 0.4A/1COM
Off leakage current		0.1 ㎃ or less
Max. inrush current		4A / 10 ㎳ or less
On max. voltage drop		DC 0.4V or less
Surge killer		Zenner diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, resistive load)
Common method		4 point / COM
Proper cable size		Strand wire 0.3~0.75 ㎟ (external diameter 2.8 ㎜ or less)
Internal consumption current		410 ㎃ (When all output are on)
External power supply	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		Output On, LED On
External connection method		24 point connecting connector (M3 X 6 screw)
Weight		500g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
		TB3	
TB4	N	TB5	00
TB6	01	TB7	02
TB8	03	**TB9**	**COM 0**
TB10	04	TB11	05
TB12	06	TB13	07
TB14	**COM1**	TB15	08
TB16	09	TB17	10
TB18	11	**TB19**	**COM 2**
TB20	12	TB21	13
TB22	14	TB23	15
TB24	**COM3**		

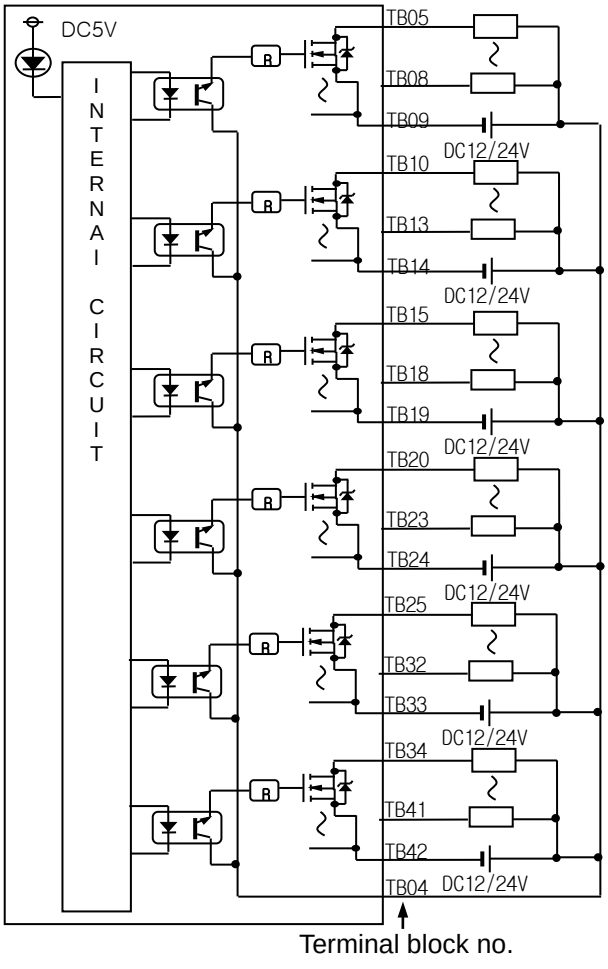
Type



7.3.5 XEC-DN64H output unit (Sink type)

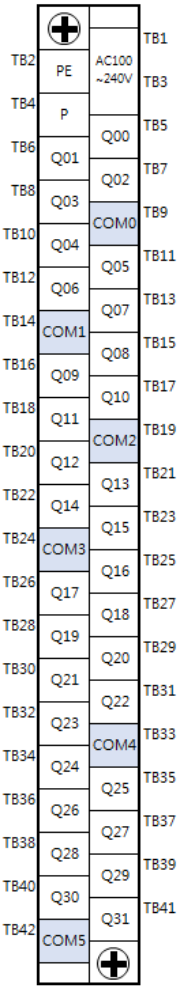
Specification \ Model		Main unit XEC-DN64H
Output point		32 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load current		General output : 0.5A / 1 point, 2A / 1COM Output for positioning (%QX0.0.0~%QX0.0.3), 0.1A/1 point, 0.4A / 1COM
Off leakage current		0.1 ㎃ or less
Max. inrush current		4A / 10 ㎳ or less
On max. voltage drop		DC 0.4V or less
Surge killer		Zener diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, Resistive load)
Common method		4 point / COM (COM0~COM3), 8 point / COM (COM4~COM5)
Proper cable size		Strand wire 0.3~0.75 ㎟ (external diameter 2.8 ㎜ or less)
Internal consumption current		500 ㎃ (When all output are on)
External power supply	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (when connecting DC24V)
Operation indicator		Output On, LED On
External connection method		42 point connecting connector (M3 X 6 screw)
Weight		800g

Circuit configuration



No.	contact	No.	contact
TB2	PE	TB1	AC100 ~240V
TB4	P	TB3	
TB6	01	TB5	00
TB8	03	TB7	02
TB10	04	TB9	COM0
TB12	06	TB11	05
TB14	COM1	TB13	07
TB16	09	TB15	08
TB18	11	TB17	10
TB20	12	TB19	COM2
TB22	14	TB21	13
TB24	COM3	TB23	15
TB26	17	TB25	16
TB28	19	TB27	18
TB30	21	TB29	20
TB32	23	TB31	22
TB34	24	TB33	COM4
TB36	26	TB35	25
TB38	28	TB37	27
TB40	30	TB39	29
TB42	COM5	TB41	31

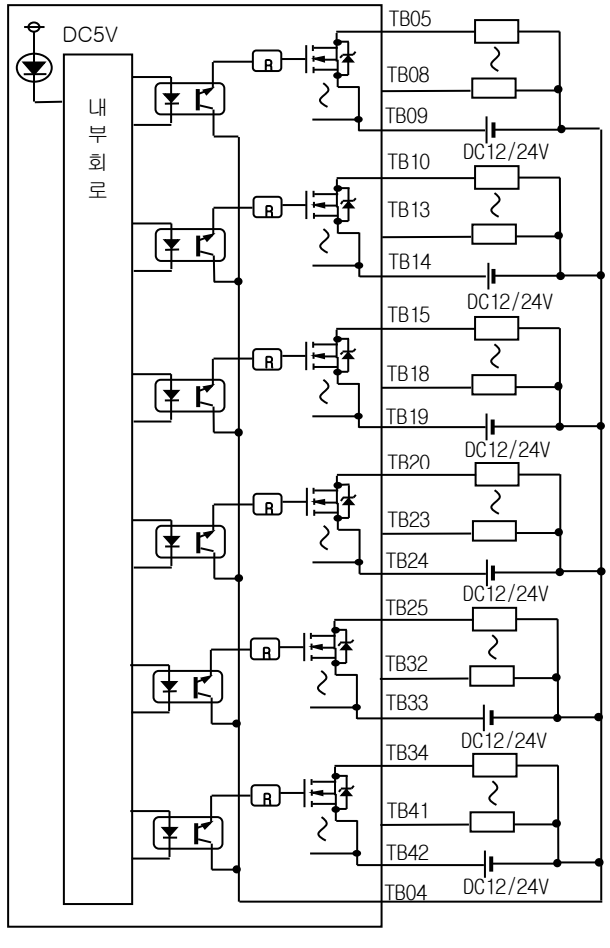
Type



7.3.6 XEC-DP64H Output unit (Source type)

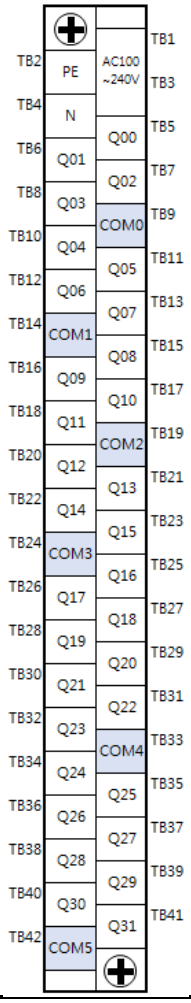
Specification \ Model		Main unit XEC-DP64H
Output point		32 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load current		General output: 0.5A/1 point, 2A / 1COM Output for positioning (%QX0.0.0 ~ %QX0.0.3): 0.1A/1 point, 0.4A/1COM
Off leakage current		0.1 ㎃ or less
Max. inrush current		4A / 10 ㎳ or less
On max. voltage drop		DC 0.4V or less
Surge killer		Zener diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, Resistive load)
Common method		4 point / COM (COM0~COM3), 8 point / COM (COM4~COM5)
Proper cable size		Strand wire 0.3~0.75 ㎟ (external diameter 2.8 ㎜ or less)
Internal consumption current		510 ㎃ (When all output are on)
External power supply	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (when connecting DC24V)
Operation indicator		Output On, LED On
External connection method		42 point connecting connector (M3 X 6 screw)
Weight		800g

Circuit configuration



No.	contact	No.	contact
		TB1	AC100 ~240V
TB2	PE	TB3	
TB4	N		
TB6	01	TB5	00
TB8	03	TB7	02
TB10	04	**TB9**	**COM 0**
TB12	06	TB11	05
TB14	**COM1**	TB13	07
TB16	09	TB15	08
TB18	11	TB17	10
TB20	12	**TB19**	**COM 2**
TB22	14	TB21	13
TB24	**COM3**	TB23	15
TB26	17	TB25	16
TB28	19	TB27	18
TB30	21	TB29	20
TB32	23	TB31	22
TB34	24	**TB33**	**COM 4**
TB36	26	TB35	25
TB38	28	TB37	27
TB40	30	TB39	29
TB42	**COM5**	TB41	31

Type

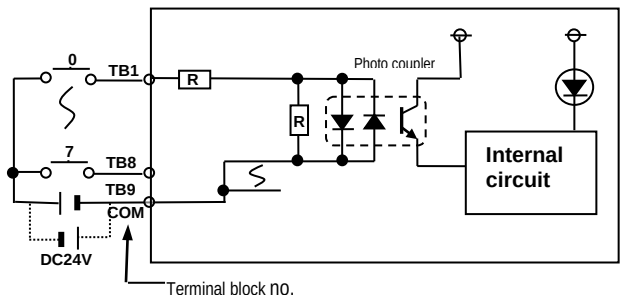


7.4 Digital Input Module Specification

7.4.1 8 point DC24V input module (Source/Sink type)

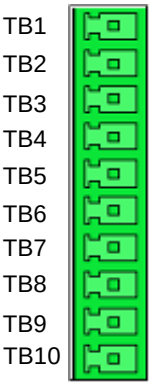
Specification \ Model		DC input module
		XBE-DC08A
Input point		8 point
Insulation method		Photo coupler insulation
Rated input voltage		DC24V
Rated input current		About 4 ㎃
Operation voltage range		DC20.4~28.8V (ripple rate < 5%)
On Voltage/Current		DC19V or higher / 3 ㎃ or higher
Off Voltage/Current		DC6V or less / 1 ㎃ or less
Input resistance		About 5.6 ㏀
Response time	Off → On	1/3/5/10/20/70/100 ㎳(set by CPU parameter) Default: 3 ㎳
	On → Off	
Insulation pressure		AC560Vrms / 3Cycle (altitude 2000m)
Insulation resistance		10 ㏁ or more by Megohmmeter
Common method		8 point / COM
Proper cable size		Stranded pair 0.3~0.75 ㎟ (External diameter 2.8 ㎜ or less)
Current consumption		30 ㎃ (when all point On)
Operation indicator		Input On, LED On
External connection method		10 point terminal block connector
Weight		52 g

Circuit configuration



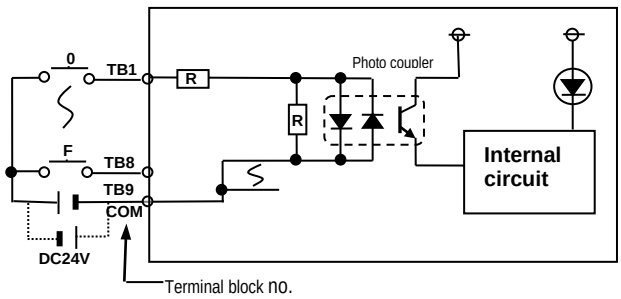
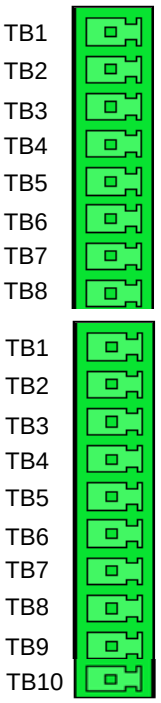
No.	Contact
TB2	0
TB2	1
TB3	2
TB4	3
TB5	4
TB6	5
TB7	6
TB8	7
TB9	COM
TB10	COM

Type



7.4.2 16 point DC24V input module (Sink/Source type)

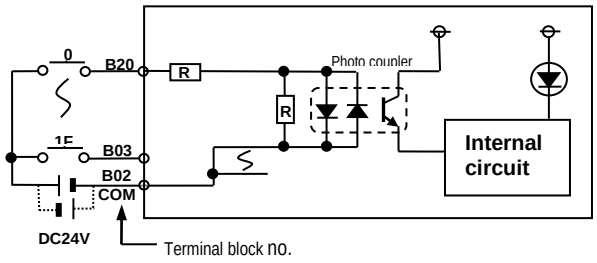
Specification \ Model		DC input module	
		XBE-DC16A	XBE-DC16B
Input point		16 point	
Insulation method		Photo coupler insulation	
Rated input voltage		DC24V	DC 12/24V
Rated input current		About 4 ㎃	About 4/8mA
Operation voltage range		DC20.4~28.8V (ripple rate < 5%)	DC 9.5V~30V (ripple rate< 5%)
On Voltage/Current		DC19V or higher / 3 ㎃ or higher	DC9V or higher / 3 ㎃ or higher
Off Voltage/Current		DC6V or less / 1 ㎃ or less	DC5V or less / 1 ㎃ or less
Input resistance		About 5.6 ㏀	About 2.7 ㏀
Response time	Off → On	1/3/5/10/20/70/100 ㎳ (set by CPU parameter) Default: 3 ㎳	
	On → Off		
Insulation pressure		AC560Vrms / 3Cycle (altitude 2000m)	
Insulation resistance		10 ㏁ or more by Mega ohmmeter	
Common method		16 point / COM	
Proper cable size		Stranded cable 0.3~0.75 ㎟ (External diameter 2.8 ㎜ or less)	
Current consumption		40 ㎃ (when all point On)	
Operation indicator		Input On, LED On	
External connection method		8 pin terminal block connector + 10 pin terminal block connector	
Weight		53 g	

Circuit configuration	No.	Contact	Type
	TB1	0	
	TB2	1	
	TB3	2	
	TB4	3	
	TB5	4	
	TB6	5	
	TB7	6	
	TB8	7	
	TB1	8	
	TB2	9	
	TB3	A	
	TB4	B	
	TB5	C	
	TB6	D	
	TB7	E	
	TB8	F	
	TB9	COM	
	TB10	COM	

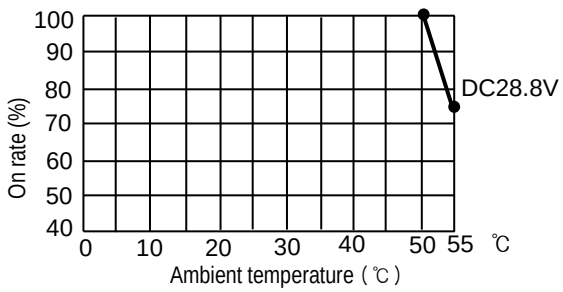
7.4.3 32 point DC24V input module (Source/Sink type)

Specification \ Model		DC input module
		XBE-DC32A
Input point		32 point
Insulation method		Photo coupler insulation
Rated input voltage		DC24V
Rated input current		About 4 ㎃
Operation voltage range		DC20.4~28.8V (ripple rate < 5%)
Input Derating		Refer to Derating diagram
On Voltage/Current		DC 19V or higher / 3 ㎃ or higher
Off Voltage/Current		DC 6V or less / 1 ㎃ or less
Input resistance		About 5.6 ㏀
Response time	Off → On	1/3/5/10/20/70/100 ㎳ (set by CPU parameter) Default:3 ㎳
	On → Off	
Insulation pressure		AC 560Vrms / 3 Cycle (altitude 2000m)
Insulation resistance		10 ㏁ or more by Mega ohmmeter
Common method		32 point / COM
Proper cable size		0.3 ㎟
Current consumption		50 ㎃ (when all point On)
Operation indicator		Input On, LED On
External connection method		40 pin connector
Weight		60g

Circuit configuration

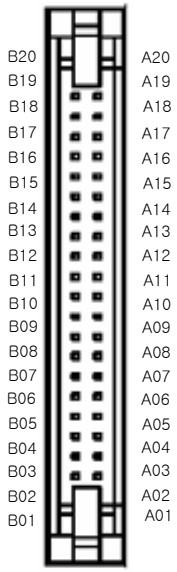


Input Derating diagram



No.	Contact	No.	Contact
B20	00	A20	10
B19	01	A19	11
B18	02	A18	12
B17	03	A17	13
B16	04	A16	14
B15	05	A15	15
B14	06	A14	16
B13	07	A13	17
B12	08	A12	18
B11	09	A11	19
B10	0A	A10	1A
B09	0B	A09	1B
B08	0C	A08	1C
B07	0D	A07	1D
B06	0E	A06	1E
B05	0F	A05	1F
B04	NC	A04	NC
B03	NC	A03	NC
B02	COM	A02	COM
B01	COM	A01	COM

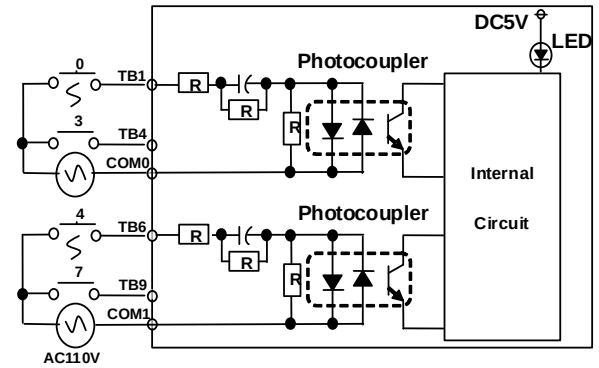
Type



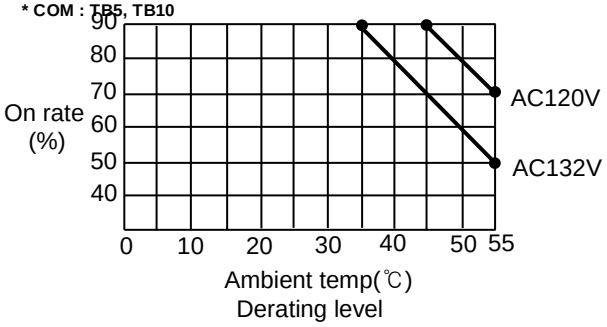
7.4.4 8point AC110V input module

Model / Specification		AC input module
		XBE-AC08A
Input point		8 point
Insulation method		Photo coupler insulation
Rated input voltage		AC100-120V(+10/-15%) 50/60 Hz(±3 Hz) (distortion rate < 5%)
Rated input current		About 8 mA(AC100,60 Hz), About 7mA(AC100, 50 Hz)
Inrush current		Max. 200 mA 1 ms (AC132V)
Input Derating		Refer to the below Derating diagram.
On Voltage/Current		AC80V or higher / 5 mA or higher (50 Hz, 60 Hz)
Off Voltage/Current		AC30V or lower / 1 mA or lower (50 Hz, 60 Hz)
Input resistance		About 12 kΩ(60 Hz), About 15 kΩ(50 Hz)
Response time	Off → On	20 ms or less (AC100V 50 Hz, 60 Hz)
	On → Off	25 ms or less (AC100V 50 Hz, 60 Hz)
Insulation pressure		AC3000Vrms / 3Cycle (altitude 2000m)
Insulation resistance		10 MΩ or more by Megohmmeter
Common method		4 point / COM
Proper cable size		Twisted pair 0.3~0.75 ㎟ (external diameter 2.8mm or less)
Current consumption		30 mA (when all point On)
Operation indicator		Input On, LED On
External connection method		10 point terminal block connector
Weight		70 g

Circuit configuration

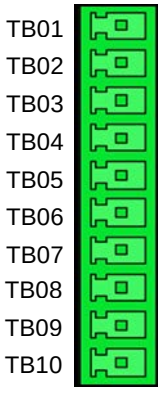


* COM : TB5, TB10



No.	Contact
TB1	0
TB2	1
TB3	2
TB4	3
TB5	COM0
TB6	4
TB7	5
TB8	6
TB9	7
TB10	COM1

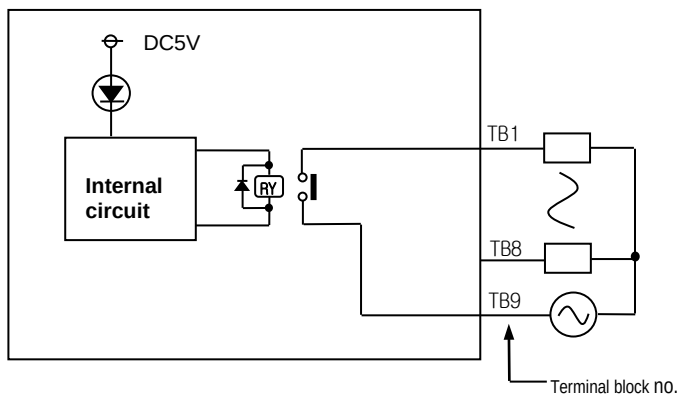
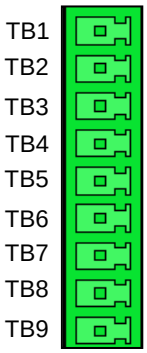
Type



7.5 Digital Output Module Specification

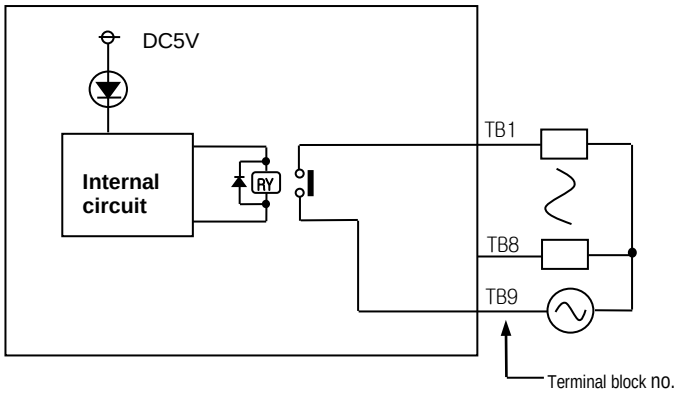
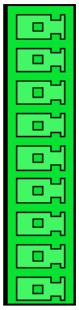
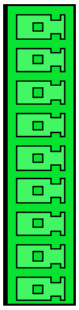
7.5.1 8 point relay output module

Model / Specification		Relay output module
		XBE-RY08A
Output point		8 point
Insulation method		Relay insulation
Rated load voltage / Current		DC24V 2A (Resistive load) / AC220V 2A (COSΨ = 1), 5A/COM
Min. load voltage/Current		DC5V / 1 ㎃
Max. load voltage/Current		AC250V, DC125V
Off leakage current		0.1 ㎃ (AC220V, 60 ㎐)
Max. On/Off frequency		3,600 times/hr
Surge absorber		None
Service life	Mechanical	20 millions times or more
	Electrical	Rated load voltage / current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΨ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΨ = 0.35) 100,000 times or more
		DC24V / 1A, DC100V / 0.1A (L / R = 7 ㎳) 100,000 times or more
Response time	Off → On	10 ㎳ or less
	On → Off	12 ㎳ or less
Common method		8 point / COM
Proper cable size		Twisted pair0.3~0.75 ㎟ (External diameter 2.8 ㎜ or less)
Current consumption		230 ㎃ (when all point On)
Operation indicator		Output On, LED On
External connection method		9 point terminal block connector
Weight		80g

Circuit configuration	No.	Contact	Type
	TB1	0	
	TB2	1	
	TB3	2	
	TB4	3	
	TB5	4	
	TB6	5	
	TB7	6	
	TB8	7	
	TB9	COM	

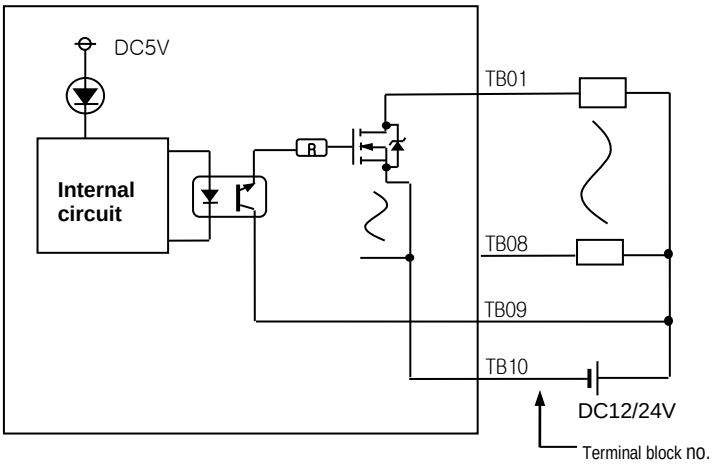
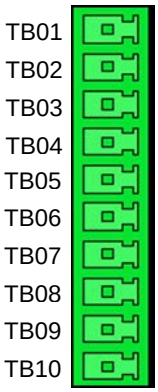
7.5.2 16 point relay output module

Model / Specification		Relay output module
		XBE-RY16A
Output point		16 point
Insulation method		Relay insulation
Rated load voltage/ current		DC24V 2A (Resistive load) / AC220V 2A (COSΨ = 1), 5A/COM
Min. load voltage/current		DC5V / 1 mA
Max. load voltage/current		AC250V, DC125V
Off leakage current		0.1 mA (AC220V, 60 Hz)
Max. On/Off frequency		3,600 times/hr
Surge absorber		None
Service life	Mechanical	20 millions times or more
	Electrical	Rated load voltage / current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΨ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΨ = 0.35) 100,000 times or more
		DC24V / 1A, DC100V / 0.1A (L / R = 7 ms) 100,000 times or more
Response time	Off → On	10 ms or less
	On → Off	12 ms or less
Common method		8 point / COM
Proper cable size		Twisted pair0.3~0.75 ㎟ (External diameter 2.8 mm or less)
Current consumption		420 mA (when all point On)
Operation indicator		Output On, LED On
External connection method		9 point terminal block connector x 2 ea
Weight		130g

Circuit configuration	No.	Contact	Type
	TB1	0	
	TB2	1	
	TB3	2	
	TB4	3	
	TB5	4	
	TB6	5	
	TB7	6	
	TB8	7	
	TB9	COM	
	TB1	8	
	TB2	9	
	TB3	A	
	TB4	B	
	TB5	C	
	TB6	D	
	TB7	E	
	TB8	F	
	TB9	COM	

7.5.3 8 point transistor output module (Sink type)

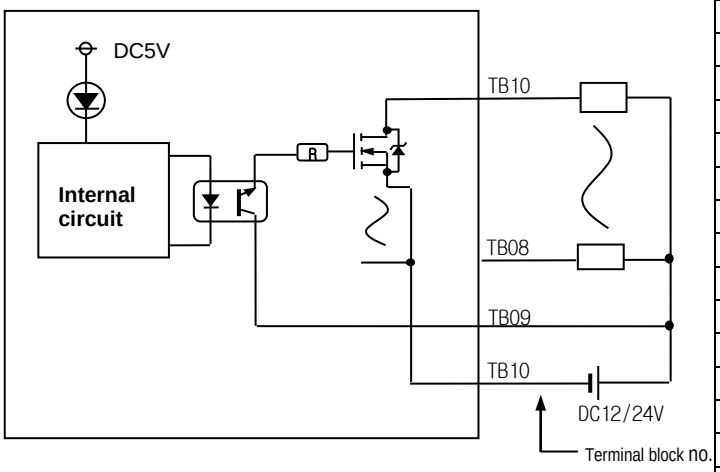
Specification \ Model		Transistor output module
		XBE-TN08A
Output point		8 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.5A / 1 point
Off leakage current		0.1 ㎃ or less
Max. inrush current		4A / 10 ㎳ or less
Max. voltage drop (On)		DC 0.4V or less
Surge absorber		Zener Diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, resistive load)
Common method		8 point / COM
Proper cable size		Stranded pair 0.3~0.75 ㎟ (External diameter 2.8 ㎜ or less)
Current consumption		40 ㎃ (when all point On)
External power supply	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	10 ㎃ or less (DC24V connection)
Operation indicator		Output On, LED On
External connection method		10 point terminal block connector
Weight		53

Circuit configuration	No.	Contact	Type
	TB01	0	
	TB02	1	
	TB03	2	
	TB04	3	
	TB05	4	
	TB06	5	
	TB07	6	
	TB08	7	
	TB09	DC12 /24V	
	TB10	COM	

7.5.4 16 point transistor output module (Sink type)

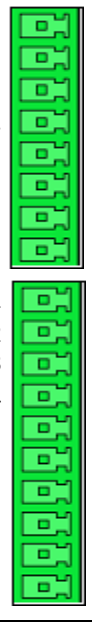
Model / Specification		Transistor output module
		XBE-TN16A
Output point		16 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1 ㎃ or less
Max. inrush current		4A / 10 ㎳ or less
Max. voltage drop (On)		DC 0.4V or less
Surge absorber		Zener Diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, resistive load)
Common method		16 point / COM
Proper cable size		Stranded pair 0.3~0.75 ㎟ (External diameter 2.8 ㎜ or less)
Current consumption		60 ㎃ (when all point On)
External power supply	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	10 ㎃ or less (DC24V connection)
Operation indicator		Output On, LED On
External connection method		8 pin terminal block connector + 10 pin terminal block connector
Weight		54 g

Circuit configuration



No.	Contact
TB01	0
TB02	1
TB03	2
TB04	3
TB05	4
TB06	5
TB07	6
TB08	7
TB01	8
TB02	9
TB03	A
TB04	B
TB05	C
TB06	D
TB07	E
TB08	F
TB09	DC12 /24V
TB10	COM

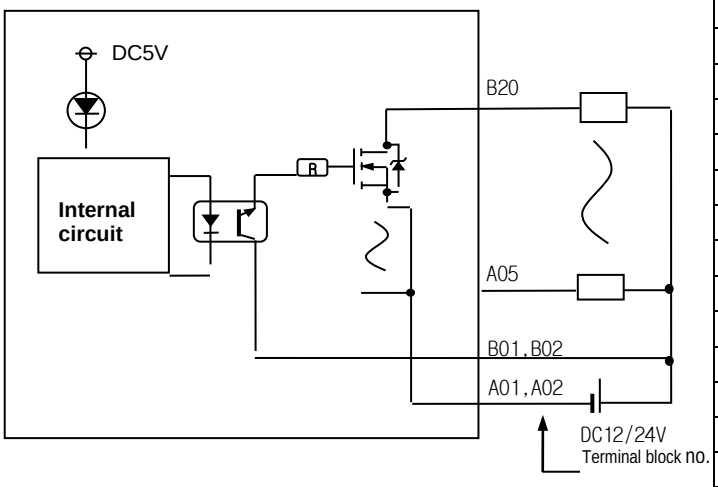
Type



7.5.5 32 point transistor output module (Sink type)

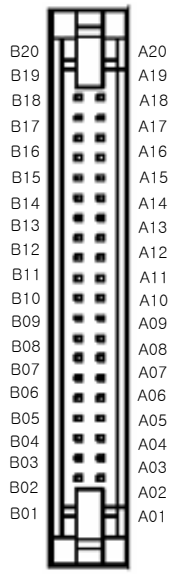
Model / Specification		Transistor output module
		XBE-TN32A
Output point		32 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.2A / 1 point, 2A / 1COM
Off leakage current		0.1 ㎃ or less
Max. inrush current		0.7A / 10 ㎳ or less
Max. voltage drop (On)		DC 0.4V or less
Surge absorber		Zener Diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, resistive load)
Common method		32 point / COM
Proper cable size		0.3 ㎟
Current consumption		120 ㎃ (when all point On)
External power supply	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	20 ㎃ or less (DC24V connection)
Operation indicator		Output On, LED On
External connection method		40 pin connector
Weight		60g

Circuit configuration



No.	Contact	No.	Contact
B20	00	A20	10
B19	01	A19	11
B18	02	A18	12
B17	03	A17	13
B16	04	A16	14
B15	05	A15	15
B14	06	A14	16
B13	07	A13	17
B12	08	A12	18
B11	09	A11	19
B10	0A	A10	1A
B09	0B	A09	1B
B08	0C	A08	1C
B07	0D	A07	1D
B06	0E	A06	1E
B05	0F	A05	1F
B04	NC	A04	NC
B03	NC	A03	NC
B02	DC12/ 24V	A02	COM
B01		A01	

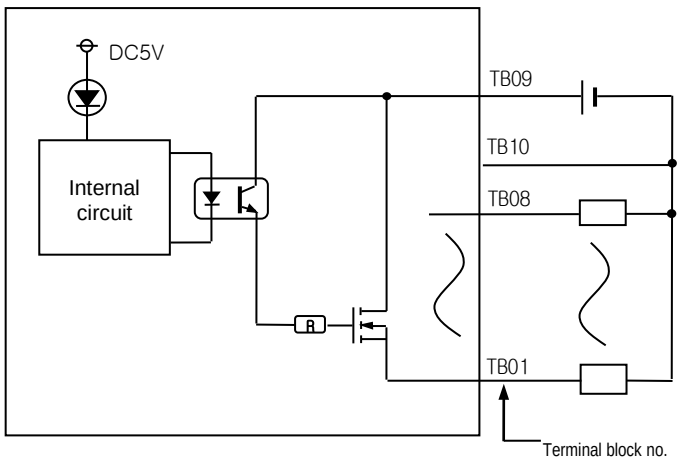
Type



7.5.6 8 point transistor output module (Source type)

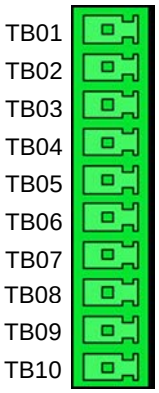
Specification \ Model		Transistor output module
		XBE-TP08A
Output point		8 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.5A / 1 point
Off leakage current		0.1 ㎃ or less
Max. inrush current		4A / 10 ㎳ or less
Max. voltage drop (On)		DC 0.4V or less
Surge absorber		Zener Diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, resistive load)
Common method		8 point / COM
Proper cable size		Stranded wire 0.3~0.75 ㎟ (external diameter 2.8 ㎜ or less)
Current consumption		40 ㎃ (when all point On)
External power supply	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	10 ㎃ or less (DC24V connection)
Operation indicator		Output On, LED On
External connection method		10 pin connector
Weight		30g

Circuit configuration



No.	Contact
TB01	0
TB02	1
TB03	2
TB04	3
TB05	4
TB06	5
TB07	6
TB08	7
TB09	COM
TB10	0V

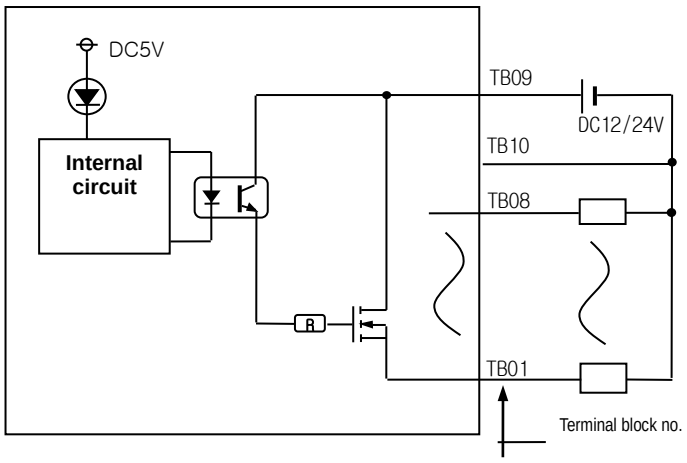
Type



7.5.7 16 point transistor output module (Source type)

Model / Specification		Transistor output module
		XBE-TP16A
Output point		16 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1 ㎃ or less
Max. inrush current		4A / 10 ㎳ or less
Max. voltage drop (On)		DC 0.4V or less
Surge absorber		Zener Diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, resistive load)
Common method		16 point / COM
Proper cable size		Stranded wire 0.3~0.75 ㎟ (external diameter 2.8 ㎜ or less)
Current consumption		60 ㎃ (when all point On)
External power supply	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	10 ㎃ or less (DC24V connection)
Operation indicator		Output On, LED On
External connection method		8 pin connector + 10 pin connector
Weight		40g

Circuit configuration

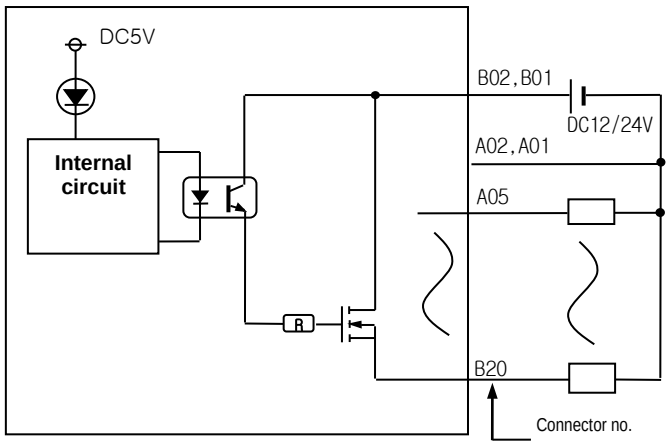


No.	Contact	Type
TB01	0	TB01
TB02	1	TB02
TB03	2	TB03
TB04	3	TB04
TB05	4	TB05
TB06	5	TB06
TB07	6	TB07
TB08	7	TB08
TB01	8	TB01
TB02	9	TB02
TB03	A	TB03
TB04	B	TB04
TB05	C	TB05
TB06	D	TB06
TB07	E	TB07
TB08	F	TB08
TB09	COM	TB09
TB10	0V	TB10

7.5.8 32 point transistor output module (Source type)

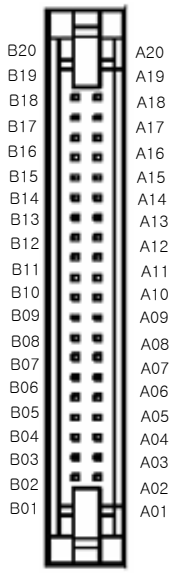
Specification \ Model		Transistor output module
		XBE-TP32A
Output point		32 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.2A / 1 point, 2A / 1COM
Off leakage current		0.1 ㎃ or less
Max. inrush current		4A / 10 ㎳ or less
Max. voltage drop (On)		DC 0.4V or less
Surge absorber		Zener diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, resistive load)
Common method		32 point / COM
Proper cable size		0.3 ㎟
Current consumption		120 ㎃ (when all point On)
External power supply	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	20 ㎃ or less (DC24V connection)
Operation indicator		Output On, LED On
External connection method		40 pin connector
Weight		60g

Circuit configuration



No.	Contact	No.	Contact
B20	00	A20	10
B19	01	A19	11
B18	02	A18	12
B17	03	A17	13
B16	04	A16	14
B15	05	A15	15
B14	06	A14	16
B13	07	A13	17
B12	08	A12	18
B11	09	A11	19
B10	0A	A10	1A
B09	0B	A09	1B
B08	0C	A08	1C
B07	0D	A07	1D
B06	0E	A06	1E
B05	0F	A05	1F
B04	NC	A04	NC
B03	NC	A03	NC
B02	COM	A02	0V
B01		A01	

Type

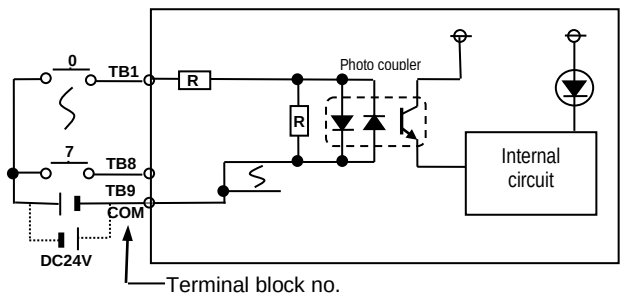


7.6 Combined Module Digital Input Specification

7.6.1 8 point DC24V input part (Source/Sink type)

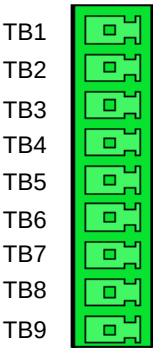
Model / Specification		DC input module
		XBE-DR16A
Input Point		8 point
Insulation method		Photo coupler insulation
Rated input voltage		DC24V
Rated input current		About 4 ㎃
Used voltage range		DC20.4~28.8V (Within ripple rate 5%)
On voltage / On current		DC19V or above / 3 ㎃ or above
Off voltage / Off current		DC6V or above / 1 ㎃ or above
Input resistor		About 5.6 ㏀
Response time	Off → On	1/3/5/10/20/70/100 ㎳(Set by CPU parameter) initial value: 3 ㎳
	On → Off	
Insulation internal pressure		AC560Vrms / 3Cycle (altitude 2000m)
Insulation resistor		10 ㏁ or above by insulation resistor meter
Common method		8 point / COM
Proper cable Size		Stranded wire0.3~0.75 ㎟ (External diameter 2.8 ㎜ or less)
Current consumption		280 ㎃ (when all point On)
Operation indication		Output On, LED On
External connection method		9 pin connector
Weight		81g

Circuit configuration



No.	Contact
TB1	0
TB2	1
TB3	2
TB4	3
TB5	4
TB6	5
TB7	6
TB8	7
TB9	COM

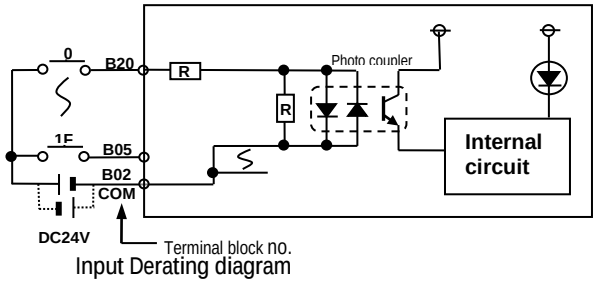
Type



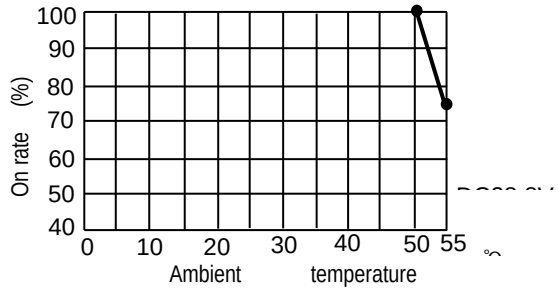
7.6.2 16 point DC24V input (Source/Sink type)

Specification \ Model		DC input module XBE-DN32A
Input point		16 point
Insulation method		Photo coupler insulation
Rated input voltage		DC24V
Rated input current		About 4 ㎃
Operation voltage range		DC20.4~28.8V (ripple rate < 5%)
Input Derating		Refer to Derating diagram
On Voltage/Current		DC 19V or higher / 3 ㎃ or higher
Off Voltage/Current		DC 6V or less / 1 ㎃ or less
Input resistance		About 5.6 kΩ
Response time	Off → On	1/3/5/10/20/70/100 ㎳ (set by CPU parameter) Default:3 ㎳
	On → Off	
Insulation pressure		AC 560Vrms / 3 Cycle (altitude 2000m)
Insulation resistance		10 ㏁ or more by Megohmmeter
Common method		16 point / COM
Proper cable size		0.3 ㎟
Current consumption		60 ㎃ (When all inputs and outputs are on)
Operation indicator		Input On, LED On
External connection method		40 pin connector
Weight		60g

Circuit configuration



Input Derating diagram



No.	Contact	No.	Contact
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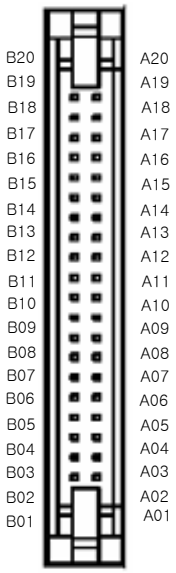
B19	01	A19	21
B18	02	A18	22
B17	03	A17	23
B16	04	A16	24
B15	05	A15	25
B14	06	A14	26
B13	07	A13	27
B12	08	A12	28
B11	09	A11	29
B10	0A	A10	2A
B09	0B	A09	2B
B08	0C	A08	2C
B07	0D	A07	2D
B06	0E	A06	2E
B05	0F	A05	2F
B04	NC	A04	P
B03	NC	A03	P
B02	IN_COM	A02	OUT_COM
B01	IN_COM	A01	OUT_COM

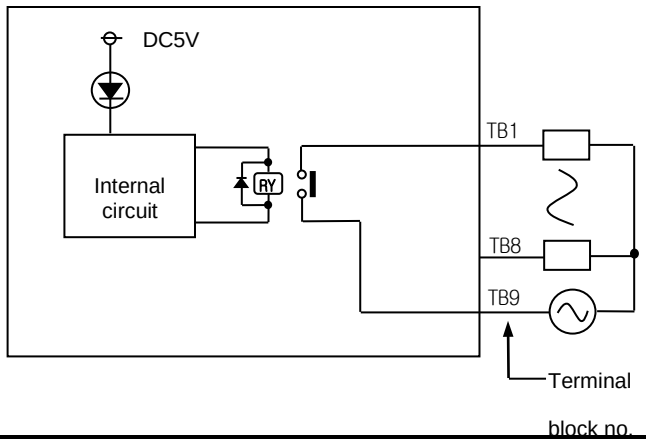
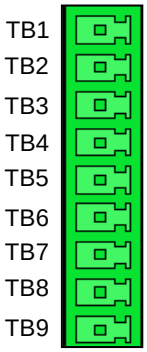
Type



7.7 Combined Module Digital Output Specification

7.7.1 8 point relay output part

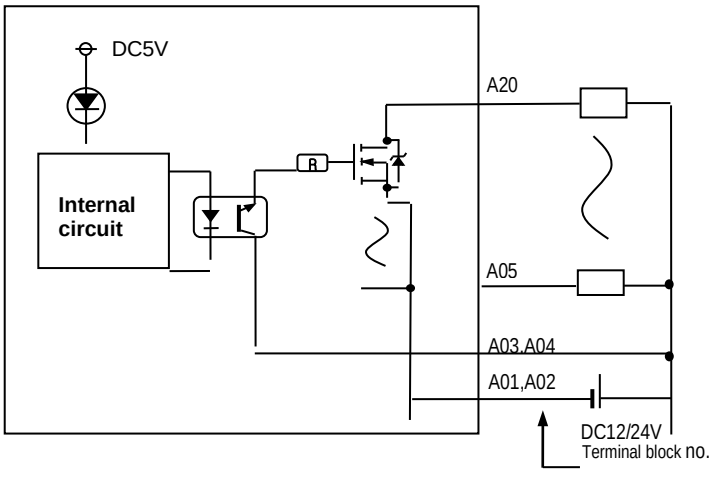
Model / Specification		Relay output module
		XBE-DR16A
Output point		8 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A(resistive load 하) / AC220V 2A(COSΨ = 1), 5A/COM
Min. load voltage/current		DC5V / 1 ㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1 ㎃ (AC220V, 60 ㎐)
Max. On off frequency		3,600 times / hour
Surge absorber		None
Life time	Mechanical	200 million or above
	Electrical	Rated load voltage / current 1 million or above
		AC200V / 1.5A, AC240V / 1A (COSΨ = 0.7) 1 million or above
		AC200V / 1A, AC240V / 0.5A (COSΨ = 0.35) 1 million or above
		DC24V / 1A, DC100V / 0.1A (L / R = 7 ㎳) 1 million or above
Response time	Off → On	10 ㎳ or less
	On → Off	12 ㎳ or less
Common method		8 점 / COM
Proper cable Size		Stranded wire 0.3~0.75 ㎟ (External diameter 2.8 ㎜ or less)
Consumption current		280 ㎃ (when all point On)
Operation indication		Output On, LED On
External connection method		9 pin connector
Weight		81g

Circuit configuration	No.	Contact	Type
	TB1	0	
	TB2	1	
	TB3	2	
	TB4	3	
	TB5	4	
	TB6	5	
	TB7	6	
	TB8	7	
	TB9	COM	

7.7.2 16 point transistor output (Sink type)

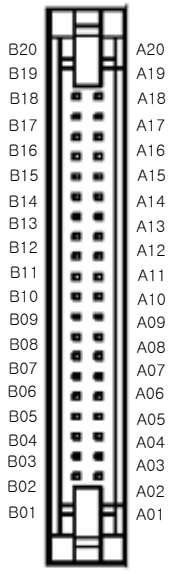
Specification \ Model		Transistor output module
		XBE-DN32A
Output point		16 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.2A / 1 point, 2A / 1COM
Off leakage current		0.1 ㎃ or less
Max. inrush current		0.7A / 10 ㎳ or less
Max. voltage drop (On)		DC 0.4V or less
Surge absorber		TVS Diode
Response time	Off → On	1 ㎳ or less
	On → Off	1 ㎳ or less (Rated load, resistive load)
Common method		16 point / COM
Proper cable size		0.3 ㎟
Current consumption		60 ㎃ (When all inputs and outputs are on)
External power supply	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	20 ㎃ or less (DC24V connection)
Operation indicator		Output On, LED On
External connection method		40 pin connector
Weight		60g

Circuit configuration



No.	Contact	No.	Contact
B20	00	A20	20
B19	01	A19	21
B18	02	A18	22
B17	03	A17	23
B16	04	A16	24
B15	05	A15	25
B14	06	A14	26
B13	07	A13	27
B12	08	A12	28
B11	09	A11	29
B10	0A	A10	2A
B09	0B	A09	2B
B08	0C	A08	2C
B07	0D	A07	2D
B06	0E	A06	2E
B05	0F	A05	2F
B04	NC	A04	P
B03	NC	A03	P
B02	IN_COM	A02	OUT_COM
B01	IN_COM	A01	OUT_COM

Type



7.8 IO Wiring by Using Smart Link Board

7.8.1 Smart link board

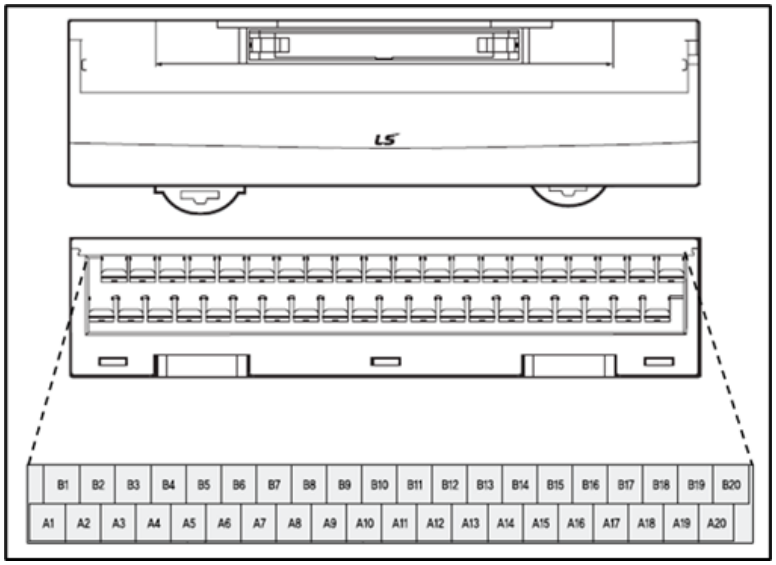
Easy wiring is available by connecting the IO connector with smart link board.
The available smart link and IO cable are as follows.

XGB		Smart link		Connection cable		
Classification	Model	Model	The no. of pin	Model	Length	Content
Extension module	XBE-DC32A	XTB-40H	40	C40HH-05SB-XBE C40HH-10SB-XBE C40HH-15SB-XBE C40HH-20SB-XBE C40HH-30SB-XBE	0.5m~ 3m	For extension module connection (40Pin)
	XBE-TN32A	XTB-40H	40			
		R32C-NS5A-40P	40			For extension module connection (40Pin) Exclusive for relay built-in SLP type

It describes wring of XGB, XTB-40H and C40HH-10SB-XBE.
For wring of other smart link boards or XGB extension module, refer to XGB user manual for hardware.

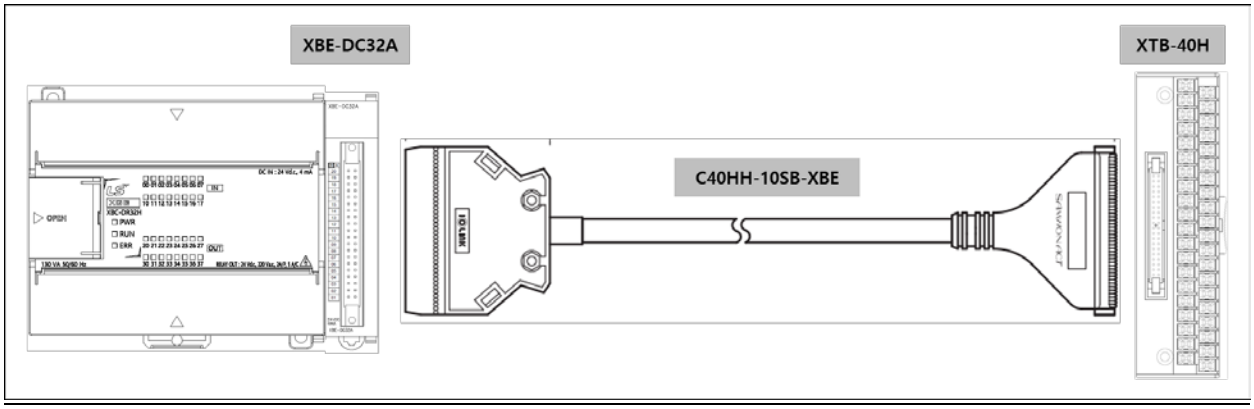
1) XTB-40H terminal array

Terminal array of SLP-T40P is as follows.

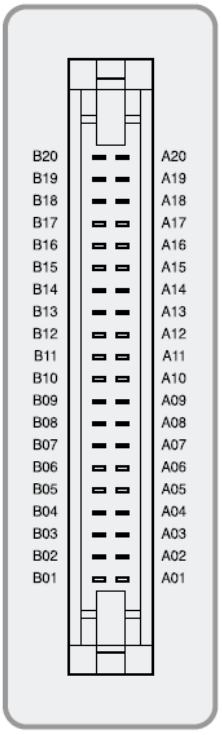


Item		Specification
Rated voltage		AC125 / DC 24[V]
Rated current		Max. 1[A]
Withstanding voltage		500V 1min
Insulation resistor		100 ㏁ (DC500V)
Cable specification		AWG22-16 (1.5mm^2 / MAX)
Terminal/screw		M3 X 8L
Torque		1.2N · m (12kgf · cm)
material	Terminal	Modifide PP0
	Cover	Polycarbonate
	PCB	Epoxy 1.6t

2) Wiring of XTB-40H and XGB extension modulet
Wiring of XGB extension module through XTB-40H and C40HH-10SB-XBE SLT-CT101-XBE is as follows.



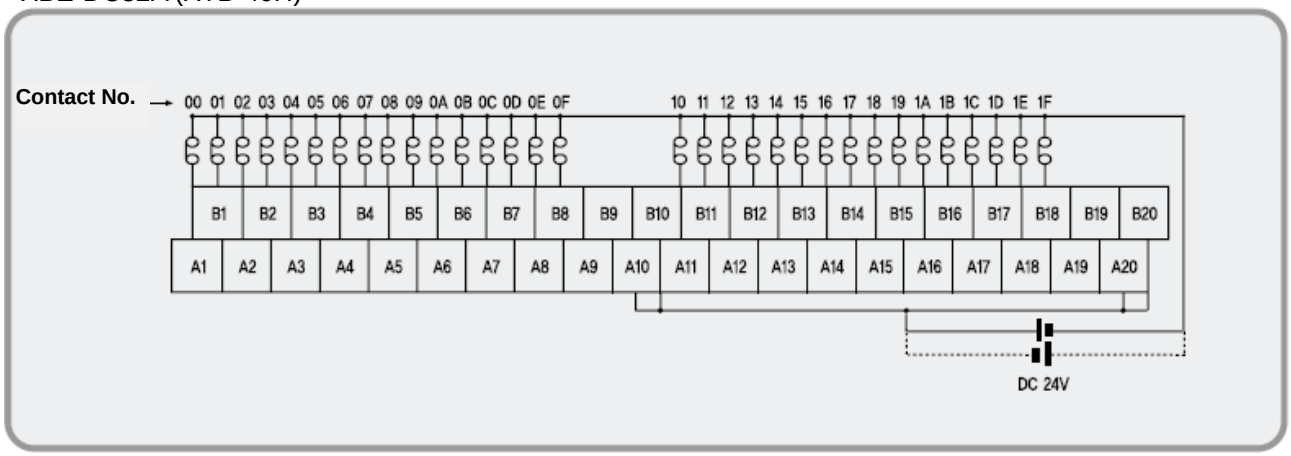
At this time, relationship of XGB IO signal and Smart link board terminal number is as follows.
The following figure describes signal allocation when C40HH-10SB -XBE is used as connection cable.
When the user makes the cable, make sure that wring is done as figure below.



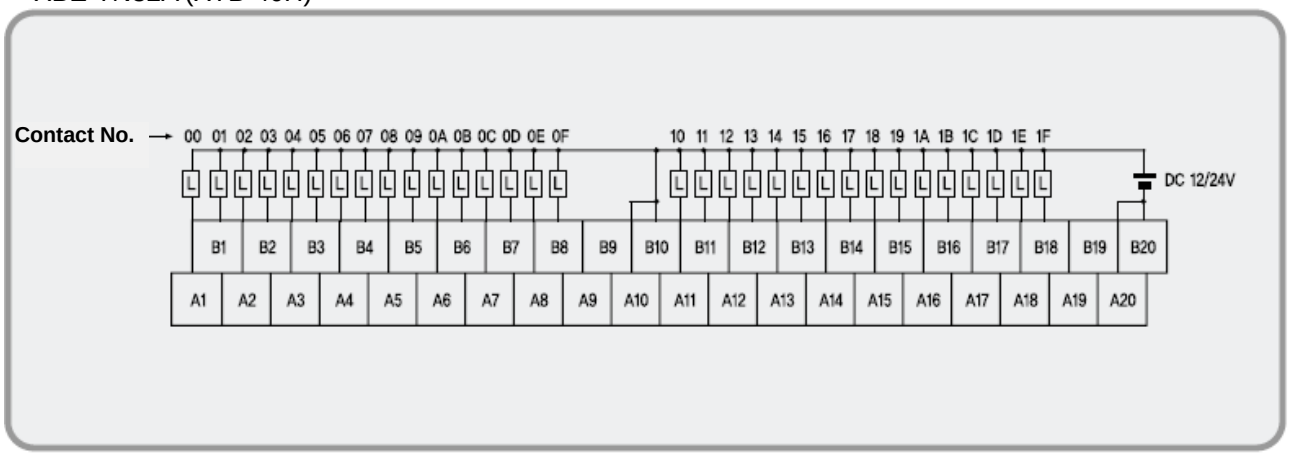
PLC								Terminal block Name	
Pin No.		XBE-DC32A		XBE-TN32A		XBE-TP32A		Terminal block board (SLP-T40P)	
B20	A20	00	10	00	10	00	10	A1	A11
B19	A19	01	11	01	11	01	11	B1	B11
B18	A18	02	12	02	12	02	12	A2	A12
B17	A17	03	13	03	13	03	13	B2	B12
B16	A16	04	14	04	14	04	14	A3	A13
B15	A15	05	15	05	15	05	15	B3	B13
B14	A14	06	16	06	16	06	16	A4	A14
B13	A13	07	17	07	17	07	17	B4	B14
B12	A12	08	18	08	18	08	18	A5	A15
B11	A11	09	19	09	19	09	19	B5	B15
B10	A10	0A	1A	0A	1A	0A	1A	A6	A16
B09	A09	0B	1B	0B	1B	0B	1B	B6	B16
B09	A08	0C	1C	0C	1C	0C	1C	A7	A17
B07	A07	0D	1D	0D	1D	0D	1D	B7	B17
B06	A06	0E	1E	0E	1E	0E	1E	A8	A18
B05	A05	0F	1F	0F	1F	0F	1F	B8	B18
B04	A04	NC	NC	NC	NC	NC	NC	A9	A19
B03	A03	NC	NC	NC	NC	NC	NC	B9	B19
B02	A02	COM	COM	DC12/24V	COM	COM	DC0V	A10	A20
B01	A01							B10	B20

3) I/O wiring

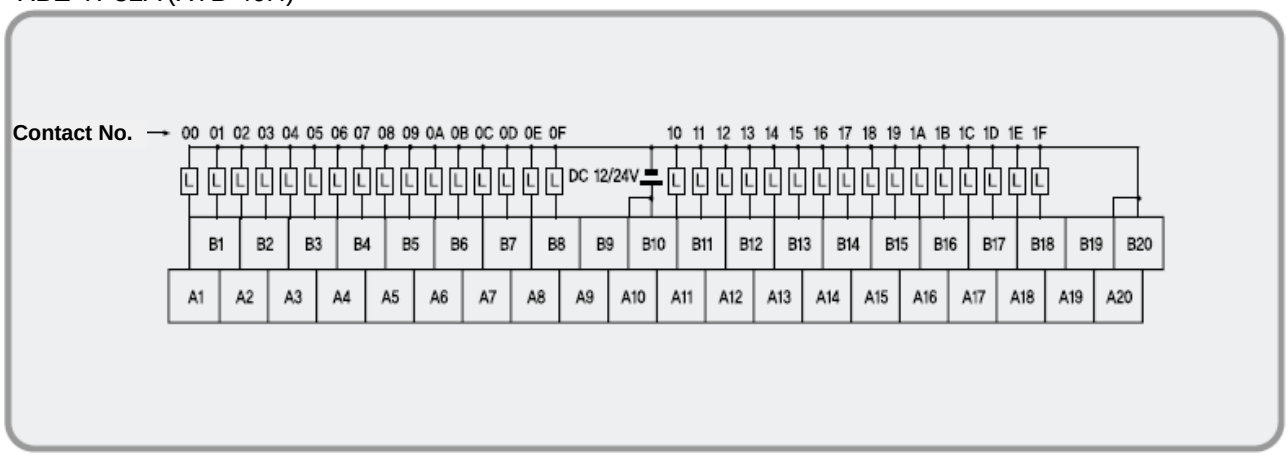
- XBE-DC32A (XTB-40H)



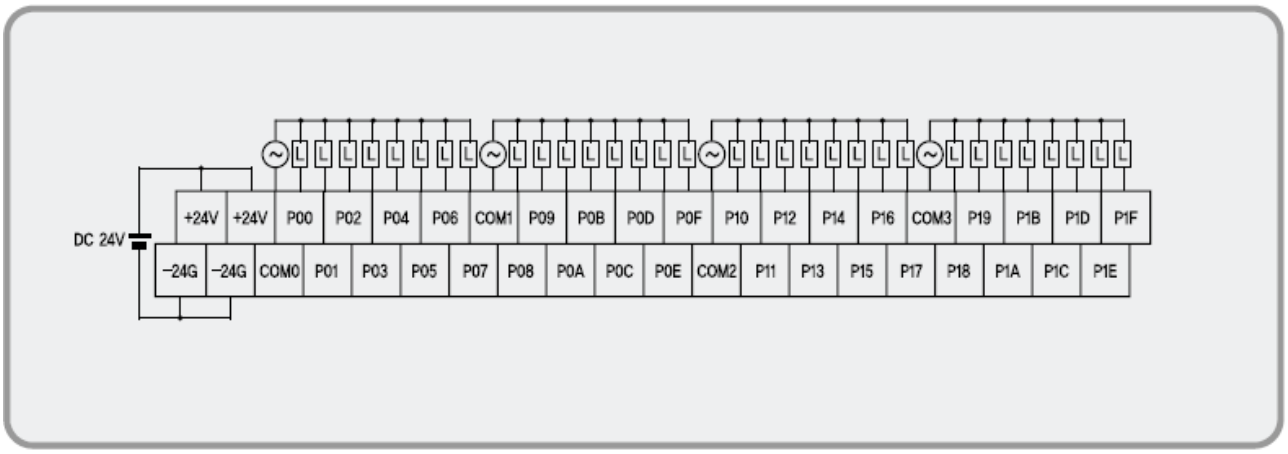
- XBE-TN32A (XTB-40H)



- XBE-TP32A (XTB-40H)



- XBE-TN32A (R32C-NS5A-40P)



Chapter 8 Built-in High-speed Counter Function

XGB series have built-in function of High-speed counter in main unit. This chapter describes specifications and usage of High-speed counter's function.

8.1 High-speed Counter Specifications

❑ It describes specifications, setting and usage of function, programming and wiring with external device of built-in main unit.

8.1.1 Performance specifications

(1) Performance specification

Classification		Description	
Count input signal	Signal	A-phase, B-phase	
	Input type	Voltage input (Open collector)	
	Signal level	DC 24V	
Max. coefficient speed		100kpps 100 kpps	
Number of channels	1 phase	8 channels	100kpps (ch0,1,2,3) / 20kpps (ch4,5,6,7) ※1
	2 phase	4 channels	50kpps (ch0,2) / 10kpps (ch4,6) ※1 But, In case of 4 multiplication: 50kpps (ch0,2) / 8kpps (ch4,6)
Coefficient range		Signed 32 Bit (-2,147,483,648 ~ 2,147,483,647)	
Count mode (Program setting)		Linear count (if 32-bit range exceeded, Carry/Borrow occurs) Counter max. and min. value is indicated	
		Ring count (repeated count within setting range)	
Input mode (Program setting)		1-phase input	
		2-phase input	
		CW/CCW input	
Signal type		Voltage	
Up/Down setting	1 phase input	Increasing/decreasing operation setting by B-phase input	
		Increasing/decreasing operation setting by program	
	2 phase input	Automatic setting by difference in phase	
	CW/CCW	A-phase input: increasing operation	
		B-phase input: decreasing operation	
Multiplication function	1 phase input	1 multiplication	
	2 phase input	4 multiplication	
	CW/CCW	1 multiplication	
Control input	Signal	Preset instruction input	
	Signal level	DC 24V input type	
	Signal type	Voltage	
External output	Output points	1 point/channel (for each channel) :output contact point of main unit available	2 point/channel (for each channel) :output contact point of main unit available
	Type	Select single-compared (>, >=, =, =<, <) or section compared output (included or excluded) (program setting)	
	Output type	Relay, Open-collector output (Sink)	
Count Enable		To be set through program (count available only in enable status)	
Preset function		To be set through terminal (contact) or program	
Auxiliary mode (program setting)		Latch counter, Count per unit time (time setting value: 1~60,000ms)	

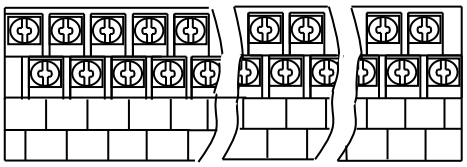
※1 : XEC-DR32(64)H/D1 unit supports 1-phase 10kpps, 2-phase 5kpps.

(2) Counter/Preset input specification

Classification	Spcification	
	XEC-DR32H/DR64H XEC-DN32H(/DC)/DN64H XEC-DP32H/DP64H	XEC-DR32H/D1 XEC-DR64H/D1
Input voltage	24V DC (20.4V ~ 28.8V)	12V DC (9.5~30V)
Input current	4㎃	4㎃
On guranteed voltage (min.)	20.4V	9V
Off guranteed voltage (max.)	6V	5V

8.1.2 Designation of parts

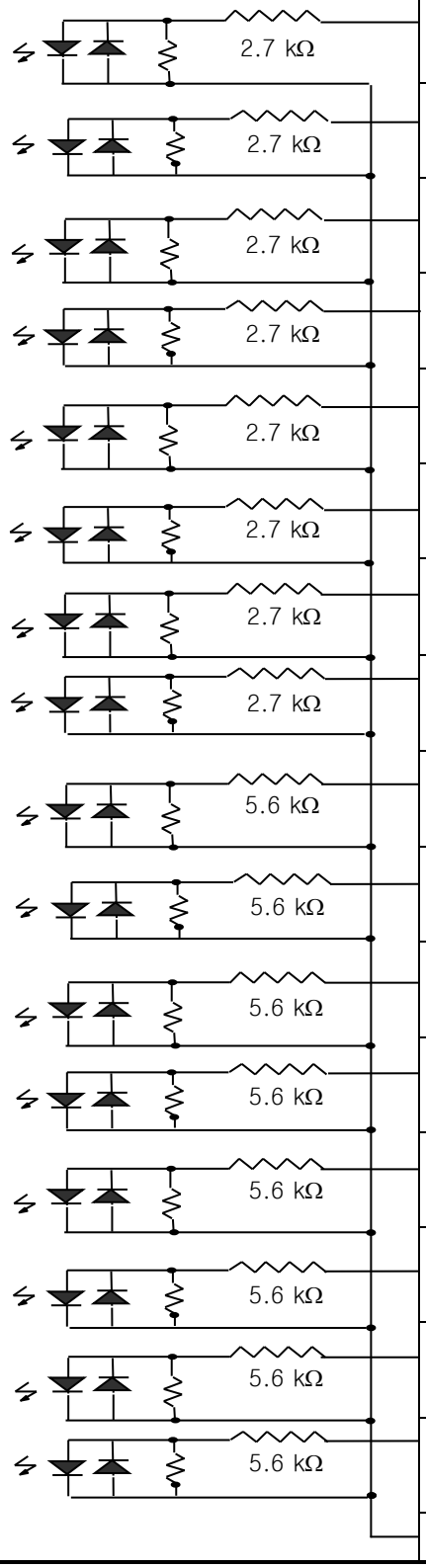
(1) Designation of parts

Structure	

Terminal No.	Names		Usage	
	1-phase	2-phase	1-phase	2-phase
IX0.0.0	Ch0 counter input	Ch0 A-phase input	Counter input terminal	A-phase input
IX0.0.1	Ch1 counter input	Ch0 B-phase input	Counter input terminal	B-phase input
IX0.0.2	Ch2 counter input	Ch2 A-phase input	Counter input terminal	A-phase input
IX0.0.3	Ch3 counter input	Ch2 B-phase input	Counter input terminal	B-phase input
IX0.0.4	Ch4 counter input	Ch4 A-phase input	Counter input terminal	A-phase input
IX0.0.5	Ch5 counter input	Ch4 B-phase input	Counter input terminal	B-phase input
IX0.0.6	Ch6 counter input	Ch6 A-phase input	Counter input terminal	A-phase input
IX0.0.7	Ch7 counter input	Ch6 B-phase input	Counter input terminal	B-phase input
IX0.0.8	Ch0 preset 24V	Ch0 preset 24V	Preset input terminal	Preset input terminal
IX0.0.9	Ch1 preset 24V	-	Preset input terminal	No use
IX0.0.10	Ch2 preset 24V	Ch2 preset 24V	Preset input terminal	Preset input terminal
IX0.0.11	Ch4 preset 24V	-	Preset input terminal	No use
IX0.0.12	Ch5 preset 24V	Ch4 preset 24V	Preset input terminal	Preset input terminal
IX0.0.13	Ch6 preset 24V	-	Preset input terminal	No use
IX0.0.14	Ch7 preset 24V	Ch6 preset 24V	Preset input terminal	Preset input terminal
IX0.0.15	Ch8 preset 24V	-	Preset input terminal	No use
COM0	Input common	Input common	Input common	Input common

(2) Interface with external devices

The following table shows list of interface with external device.

I/O	Internal circuit	Terminal No.	Signal		Operation	On/Off guaranteed voltage※2
			1-phase	2-phase		
Input		IX0.0.0	Ch 0 Pulse input	Ch 0 A-phase input	On	20.4~28.8V
					Off	6V or less
		IX0.0.1	Ch 1 Pulse input	Ch 0 B-phase input	On	20.4~28.8V
					Off	6V or less
		IX0.0.2	Ch 2 Pulse input	Ch 2 A-phase input	On	20.4~28.8V
					Off	6V or less
		IX0.0.3	Ch 3 Pulse input	Ch 2 B-phase input	On	20.4~28.8V
					Off	6V or less
		IX0.0.4	Ch 4 Pulse input	Ch 4 A-phase input	On	20.4~28.8V
					Off	6V or less
		IX0.0.5	Ch 5 Pulse input	Ch 4 B-phase input	On	20.4~28.8V
					Off	6V or less
		IX0.0.6	Ch 6 Pulse input	Ch 6 A-phase input	On	20.4~28.8V
					Off	6V or less
		IX0.0.7	Ch 7 Pulse input	Ch 6 B-phase input	On	20.4~28.8V
					Off	6V or less
		IX0.0.8	Ch 0 Preset input	Ch 0 Preset input	On	20.4~28.8V
					Off	6V or less
		IX0.0.9	Ch 1 Preset input	-	On	20.4~28.8V
					Off	6V or less
		IX0.0.10	Ch 2 Preset input	Ch 2 Preset input	On	20.4~28.8V
					Off	6V or less
		IX0.0.11	Ch 3 Preset input	-	On	20.4~28.8V
					Off	6V or less
		IX0.0.12	Ch 4 Preset input	Ch 4 Preset input	On	20.4~28.8V
					Off	6V or less
		IX0.0.13	Ch 5 Preset input	-	On	20.4~28.8V
					Off	6V or less
		IX0.0.14	Ch 6 Preset input	Ch 6 Preset input	On	20.4~28.8V
					Off	6V or less
		IX0.0.15	Ch 7 Preset input	-	On	20.4~28.8V
					Off	6V or less
		COM0	COM (input common)			

※2 : on guaranteed voltage is 9V, off guaranteed voltage is 5V for XEC-DR32(64)H/D1 unit.

8.1.3 Counter Function

(1) Counter mode

(a) High Speed counter module can count High Speed pulses which can not be processed by CPU module's counter Function Block (CTU, CTD, CTUD, etc.), up to binary value of 32 bits (-2,147,483,648 ~ 2,147,483,647).

(b) Available input is 1-phase input, 2-phase input and CW/ CCW input.

(c) Count increasing/decreasing methods are as follows;

1) For 1-phase input: a) Increasing/decreasing count operation by program setting

b) Increasing/decreasing count operation by B-phase input signal

2) For 2-phase input: setting by difference in phase between A-phase and B-phase

3) For CW/CCW input: Increasing operation if B-phase is LOW with A-phase input, and Decreasing operation if A-phase is LOW with B-phase input.

(d) Auxiliary modes are as follows;

1) Count Latch

2) Count function about the number of revolution per unit time

(e) Pulse input mode

1) 1 phase count mode

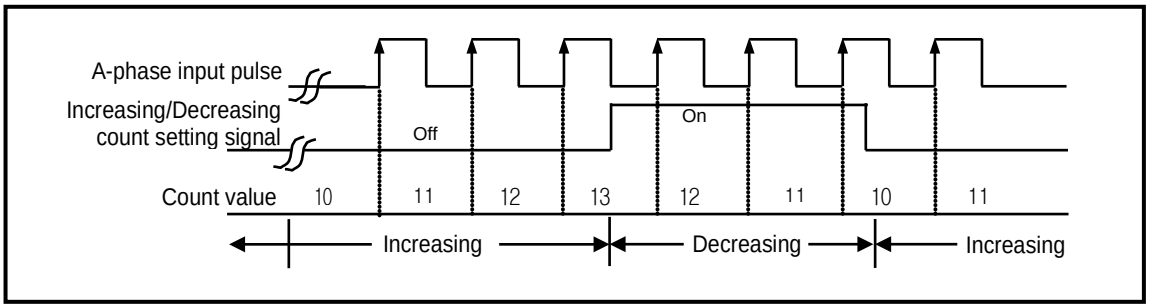
a) Increasing/decreasing count operation by program setting

● 1-phase 1-input 1-multiplication operation mode

A-phase input pulse counts at rising and increasing/decreasing will be decided by the applicable program.

Increasing/Decreasing classification	A-phase input pulse rising	A-phase input pulse falling
Increasing/decreasing count setting signal Off	Increasing count	-
Increasing/decreasing count setting signal On	Decreasing count	-

● Operation example



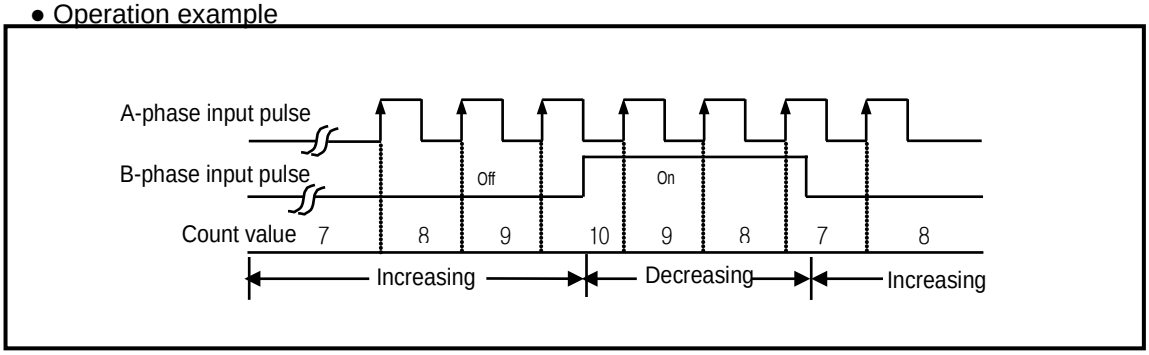
b) Increasing/decreasing count operation by B-phase input signal

● 1-phase 2-input 1-multiplication operation mode

A-phase input pulse counts at rising and increasing/decreasing will be decided by B-phase.

Increasing/Decreasing classification	A-phase input pulse rising	A-phase input pulse falling
B-phase input pulse Off	Increasing count	-
B-phase input pulse On	Decreasing count	-

● Operation example

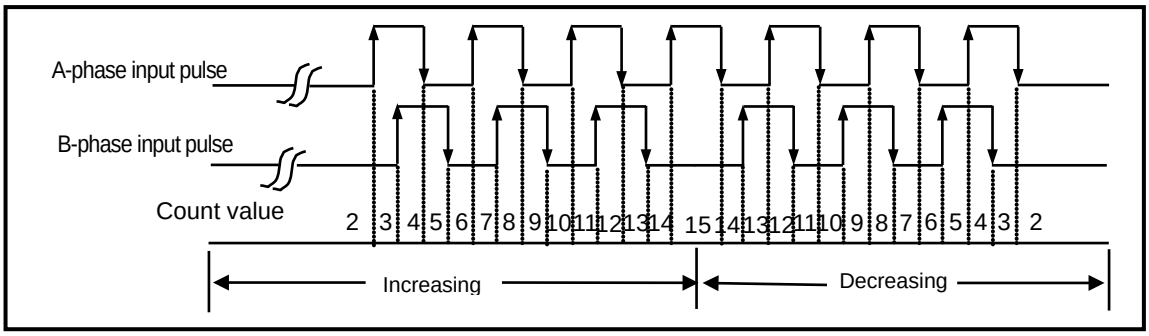


2) 2-phase count mode

a) 2-phase 4-multiplication operation mode

A-phase input pulse and B-phase input pulse count at rising/falling respectively. If A-phase input is antecedent to B-phase input, increasing operation starts, and if B-phase input is antecedent to A-phase input, decreasing operation starts.

▪ Operation example



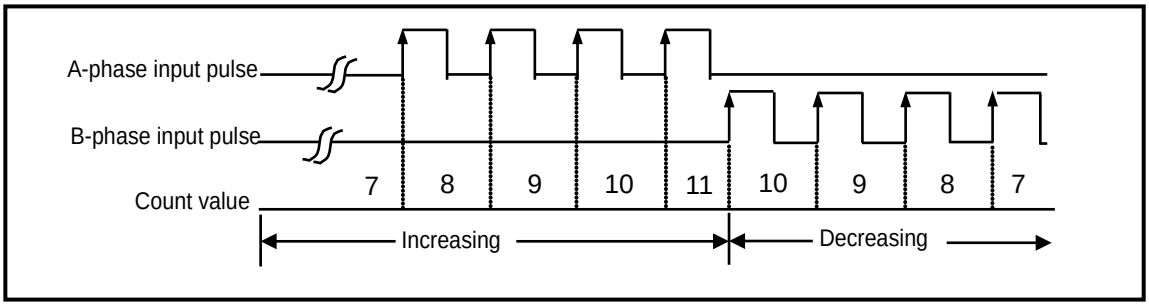
3) CW(Clockwise)/CCW(Counter Clockwise) operation mode

A-phase input pulse counts at rising , or B-phase input pulse counts at rising.

Increasing operation executed when B-phase input pulse is Low with A-phase input pulse at rising, and Decreasing operation executed when A-phase input pulse is Low with B-phase input pulse at rising.

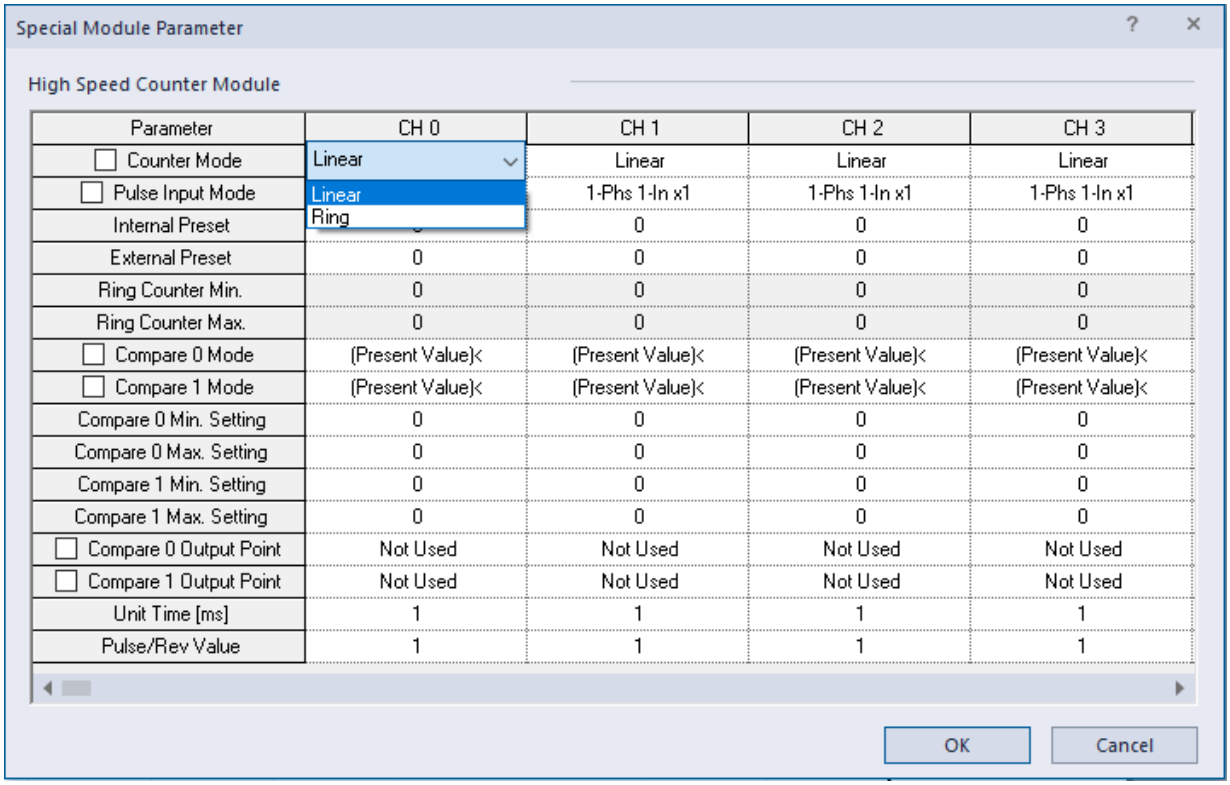
Increasing/Decreasing classification	A-phase input pulse High	A-phase input pulse Low
B-phase input pulse High	-	decreasing count
B-phase input pulse Low	Increasing count	-

▪ Operation example



(2) Counter mode

2 types of count (Linear counter, Ring counter) can be selected for the applicable use based on functions.



▪ Counter mode is saved at the following special K area.

Mode	Area per each channel (word)								Ref.
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Counter mode	%KW300	%KW330	%KW360	%KW390	%KW2220	%KW2250	%KW2280	%KW2310	0 : linear 1 : ring

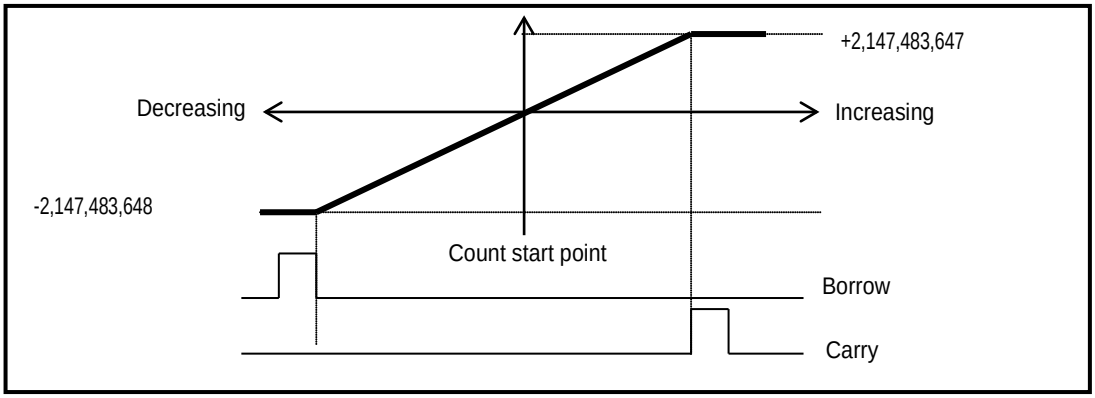
(a) Linear counter

■ Linear Count range: -2,147,483,648 ~ 2,147,483,647

■ If count value reaches the maximum value while increased, Carry will occur, and if count value reaches the minimum value while decreased, Borrow will occur.

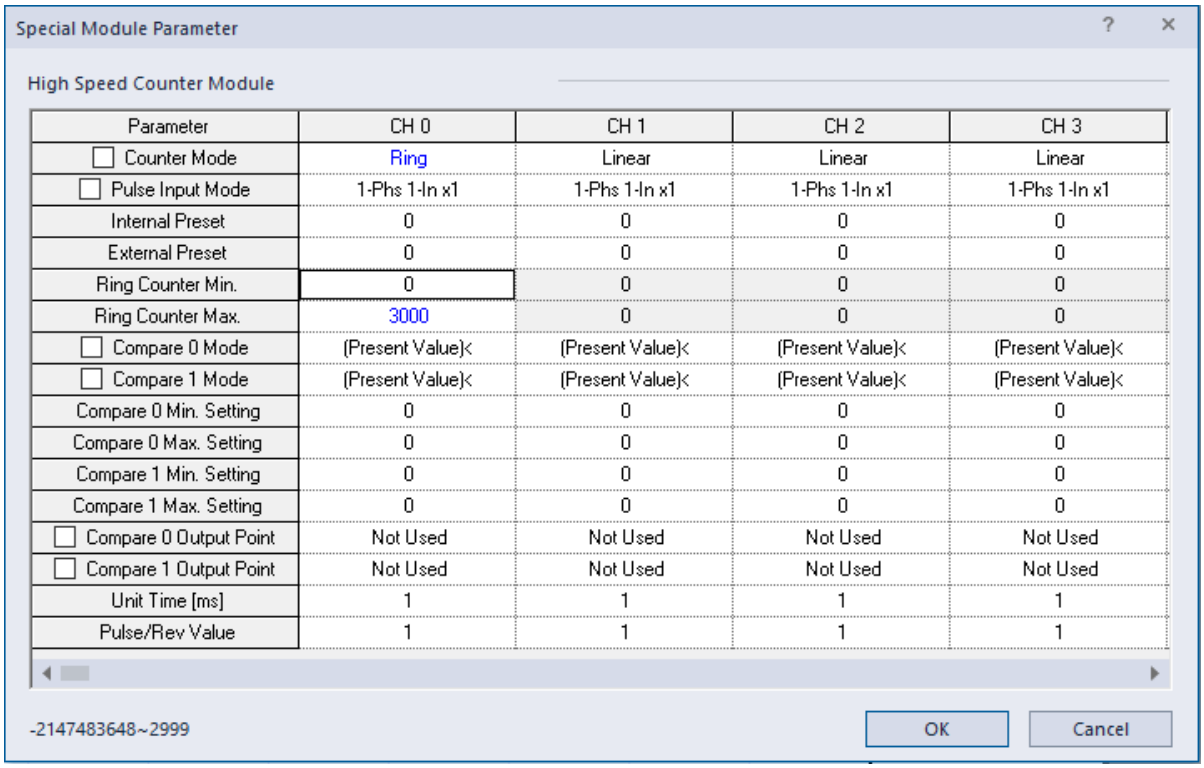
■ If Carry occurs, count stops and increasing is not available but decreasing is available.

■ If Borrow occurs, count stops and decreasing is not available but increasing is available.



(b) Ring count

Set Ring Counter Min. Value and Max. value. Preset value and compared set value should be in range of ring counter min. value and max. value.



Parameter	CH 0	CH 1	CH 2	CH 3
Counter Mode	Ring	Linear	Linear	Linear
Pulse Input Mode	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1
Internal Preset	0	0	0	0
External Preset	0	0	0	0
Ring Counter Min.	0	0	0	0
Ring Counter Max.	3000	0	0	0
Compare 0 Mode	(Present Value)<	(Present Value)<	(Present Value)<	(Present Value)<
Compare 1 Mode	(Present Value)<	(Present Value)<	(Present Value)<	(Present Value)<
Compare 0 Min. Setting	0	0	0	0
Compare 0 Max. Setting	0	0	0	0
Compare 1 Min. Setting	0	0	0	0
Compare 1 Max. Setting	0	0	0	0
Compare 0 Output Point	Not Used	Not Used	Not Used	Not Used
Compare 1 Output Point	Not Used	Not Used	Not Used	Not Used
Unit Time [ms]	1	1	1	1
Pulse/Rev Value	1	1	1	1

- Ring counter max. and min value is saved at the following special K area.

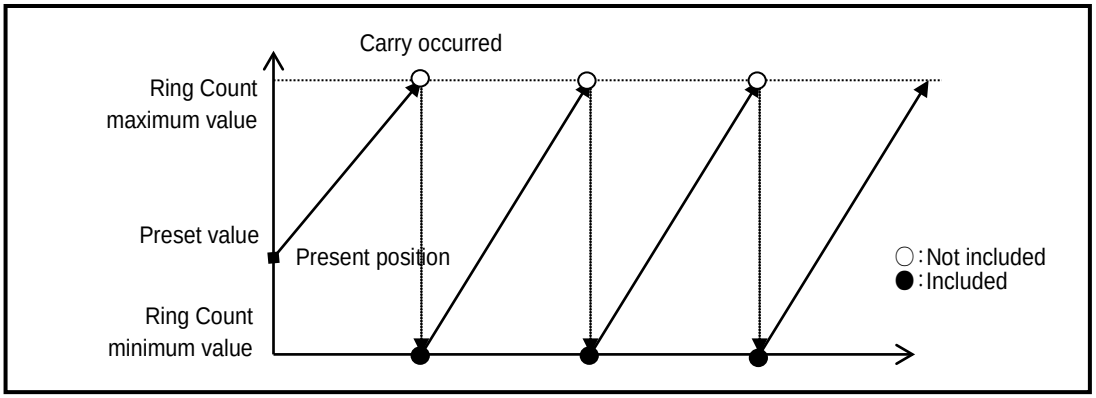
type	Area per each channel (Double word)								Ref.
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Ring counter min. value	%KD154	%KD169	%KD184	%KD199	%KD1114	%KD1129	%KD1144	%KD1159	-
Ring counter max. value	%KD155	%KD170	%KD185	%KD200	%KD1115	%KD1130	%KD1145	%KD1160	-

▪ Range of Ring counter: user defined min. value ~ user defined max. value

▪ Counter display: in case of using ring counter, user defined max. value is not displayed.

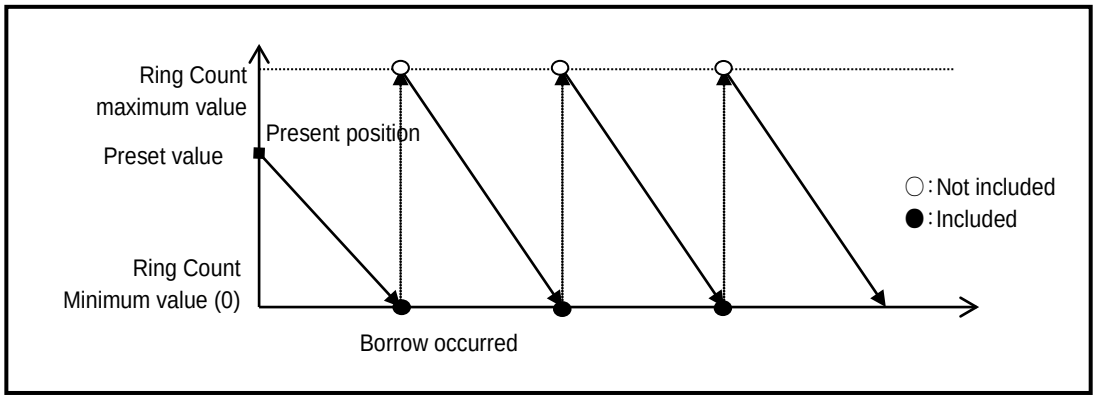
1) During increasing count

■ Even if count value exceeds user-defined maximum value during increasing count, Carry only occurs and count does not stop differently to Linear Count.



2) During decreasing count

■ Even if count value exceeds user-defined minimum value during decreasing count, Borrow only occurs and count does not stop differently to Linear Count.



3) Operation when setting Ring Count based on present count value (during increasing count)

■ When setting the ring count, the current count value is below the minimum value of the ring counter.

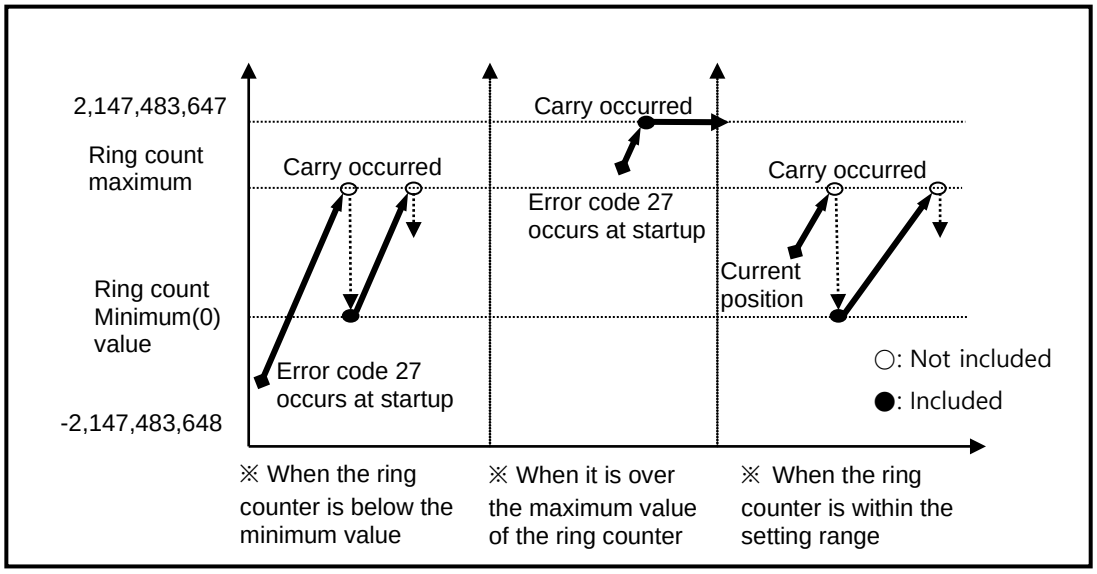
- Opens an error (Code No. 27), operates as a linear counter, and operates as a ring count when the current count value falls within the range of the ring count (error codes are not cleared).

■ When setting the ring count, the current count value is above the maximum value of the ring counter.

- Displays an error (Code No. 27), operates as a linear counter, and stops counting when the current count value reaches the maximum count value (error code is not cleared).

■ When setting the ring count, the current count value is within the user setting range

- It starts to increase from the current count value, increases to the maximum value set by the user, then becomes the minimum value set by the user and continues to count after carrying a carry.
- As shown in the figure below, the maximum value is not displayed and the count continues after displaying the minimum value.



4) Operation when setting Ring Count based on present count value

(during decreasing count)

■ When setting the ring count, the current count value is below the minimum value of the ring counter.

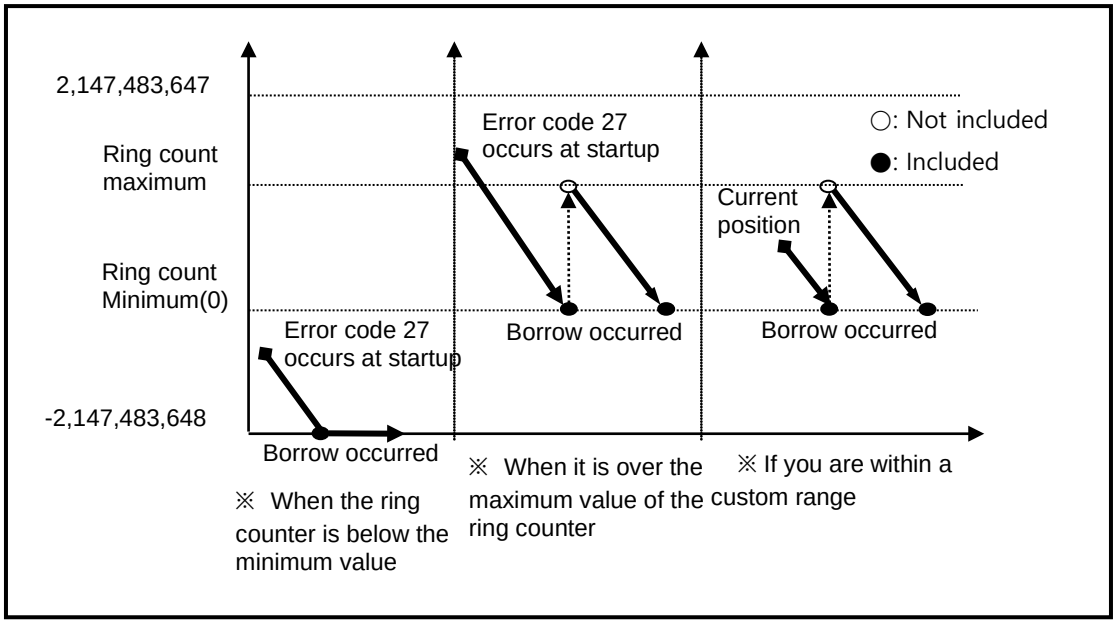
- When an error (Code No. 27) is displayed, it operates as a linear counter, and if the current count value falls within the range of the ring count, it operates as a ring count. (The error code is not cleared)

■ When setting the ring count, the current count value is above the maximum value of the link counter.

- An error (Code No. 27) is displayed, and it operates as a linear counter, but stops counting when the current count value reaches the count minimum value. (The error code is not cleared)

■ When setting the ring count, the current count value is within the user setting range

- It starts to decrease from the current count value, decreases to the minimum value set by the user, and becomes the maximum value set by the user, and then continues counting after Borrow occurs.



Remark

(1) When using a ring count, be sure to place the count value within the range using a preset or the like.

(3) Compared output

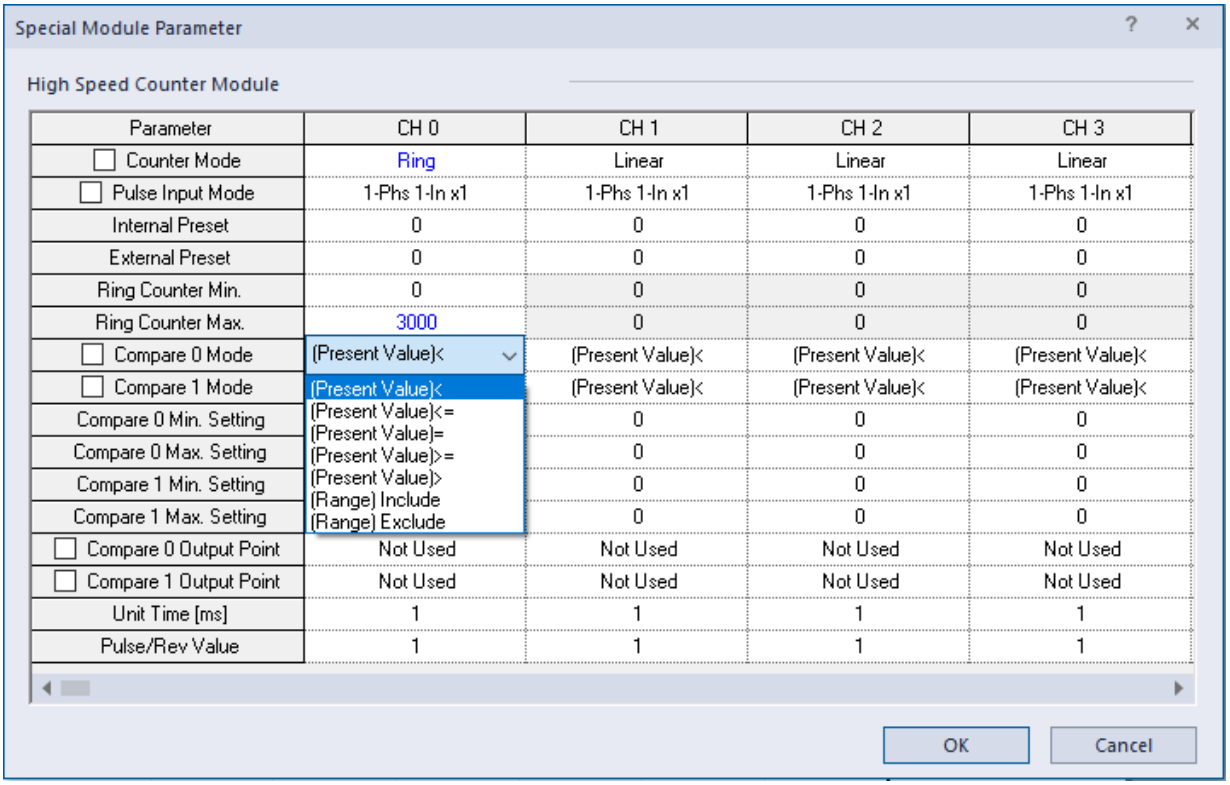
(a) High Speed counter module has a compared output function used to compare present count value with compared value in size to output as compared.

(b) Available compared outputs are 2 for 1 channel, which can be used separately.

(c) Compared output conditions are 7 associated with >, =, < .

(d) Parameter setting

■ Comp. output mode setting



■ Upper setting value is saved in special K area.

Compared output condition	Memory address (word)		Value*2)
	Comp output 0	Comp output 1	
Present Value < Compared Value	CH0: %KW302 CH1: %KW332 CH2: %KW362 CH3: %KW392 CH4: %KW2222 CH5: %KW2252 CH6: %KW2282 CH7: %KW2312	CH0: %KW303 CH1: %KW333 CH2: %KW363 CH3: %KW393 CH4: %KW2223 CH5: %KW2253 CH6: %KW2283 CH7: %KW2313	Set to “0”
Present Value ≤ Compared Value			Set to “1”
Present Value = Compared Value			Set to “2”
Present Value ≥ Compared Value			Set to “3”
Present Value > Compared Value			Set to “4”
Compared value 1 ≤ Count value ≤ Compared value 2			Set to “5”
Count value ≦ Compared value 1, Count value ≧ Compared value 2			Set to “6”

*2) If compared output mode set value is other than 0~6 at using counter, error code ‘23’ occurs.

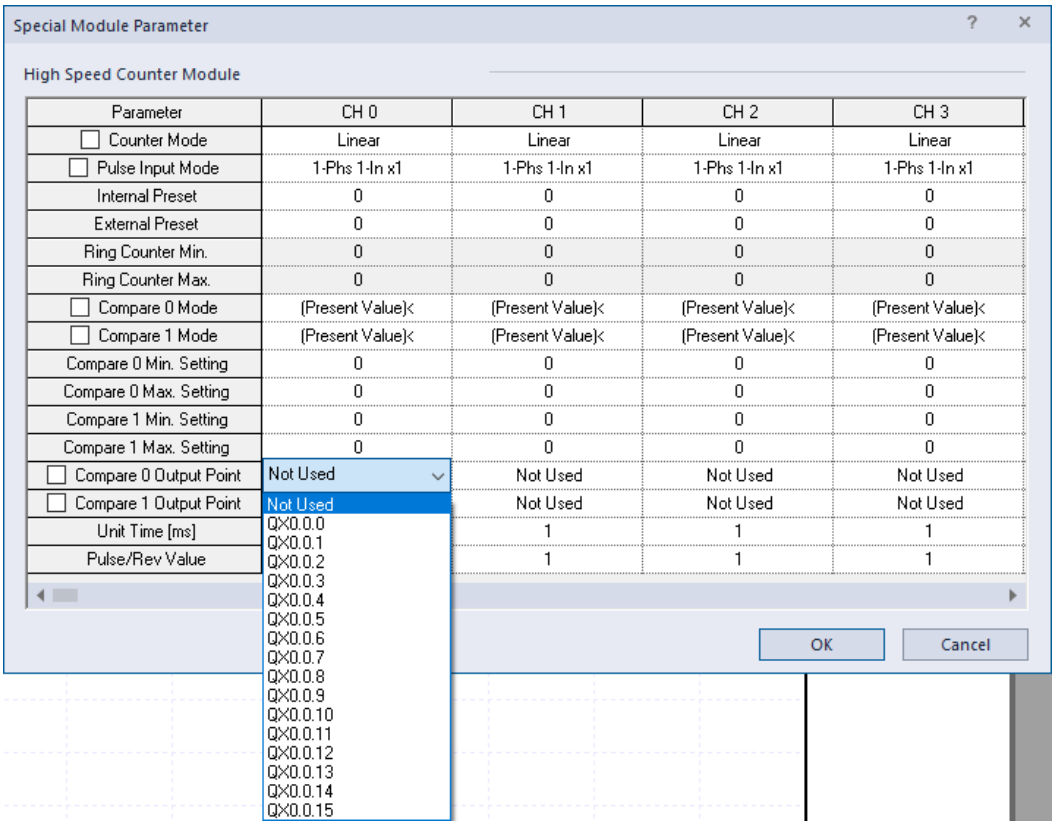
■ In order to output the compared output signal, compared output enable flag set to '1' after compared output condition set.

Classification	Area per channel								Operation
	Ch. 0	Ch. 1	Ch. 2	Ch. 3	Ch. 4	Ch. 5	Ch. 6	Ch. 7	
Count enable signal	%KX4160	%KX4320	%KX4480	%KX4640	%KX34880	%KX35040	%KX35200	%KX35360	0:disable, 1: enable
Compared 0 enable signal	%KX4164	%KX4324	%KX4484	%KX4644	%KX34884	%KX35044	%KX35204	%KX35364	0: disable, 1: enable
Compared 1 enable signal	%KX4167	%KX4327	%KX4487	%KX4687	%KX34887	%KX35047	%KX35207	%KX36367	0: disable, 1: enable

■ In order to make external output, the compared coincidence output signal (P20~P2F) must be set.
If Compared output contact is 'Off' at Special Module Parameter Setting of XG5000, Compared coincidence output signal (internal device) is only output.

Classification	Area per channel							Operation
	Ch. 0	Ch. 1	Ch. 2	Ch.4	Ch.5	Ch. 6	Ch.7	
Compared coincidence output signal 0	%KX4178	%KX4338	%KX4498	%KX4658	%KX34898	%KX35058	%KX35218	0: Compared output Off 1: Compared output On
Compared coincidence output signal 1	%KX4179	%KX4339	%KX4499	%KX4659	%KX34899	%KX35059	%KX35219	0: Compared output Off 1: Compared output On

• Comp. output point (%QX0.0.0 ~ %QX0.0.15) setting

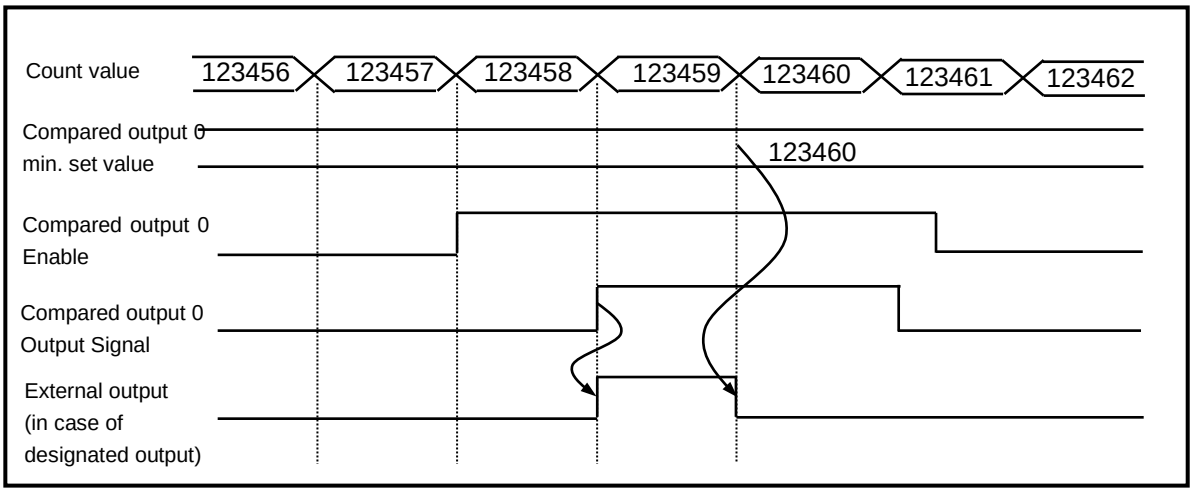


(e) Detail of comparator output

It describes detail of comparator output (based on comparator output 0)

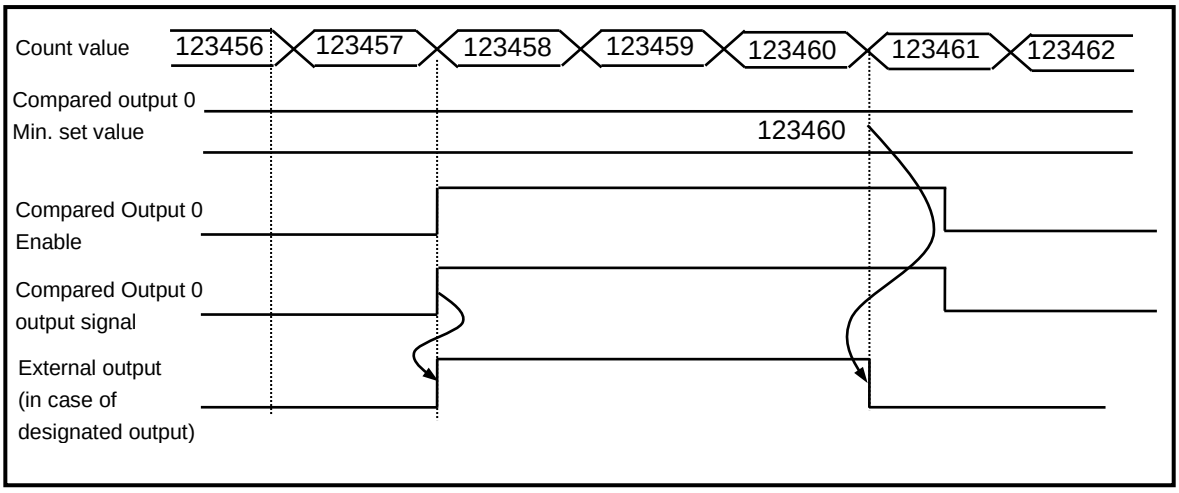
1) Mode 0 (Present value < Compared value)

If counted present value is less than the minimum value of compared output 0, output is sent out, and if present value increases to be equal to or greater than the minimum value of compared output 0, output is not sent out.



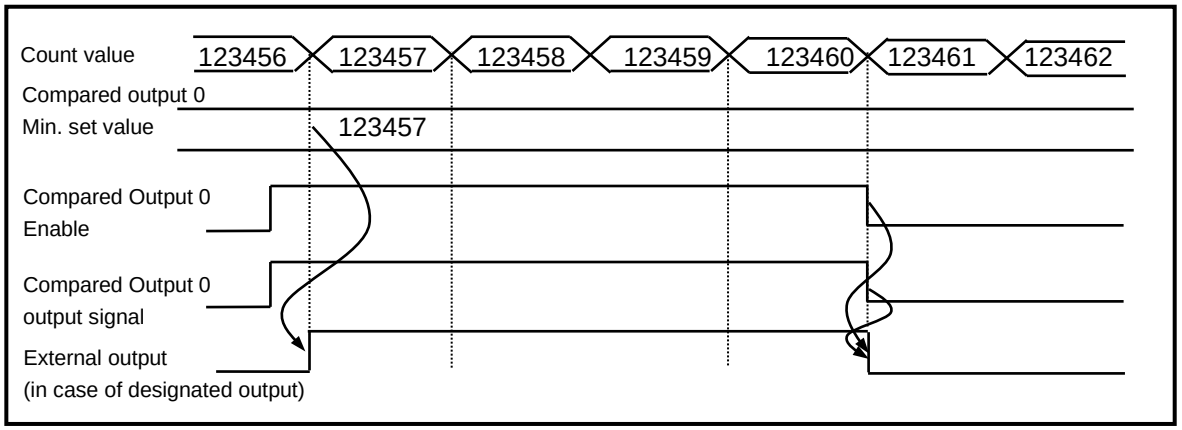
2) Mode1 (Count value ≤ Compared value)

If present count value is less than or equal to the minimum set value of compared output 0, output is sent out, and if count value increases to be greater than the minimum set value of compared output 0, output is not sent out.



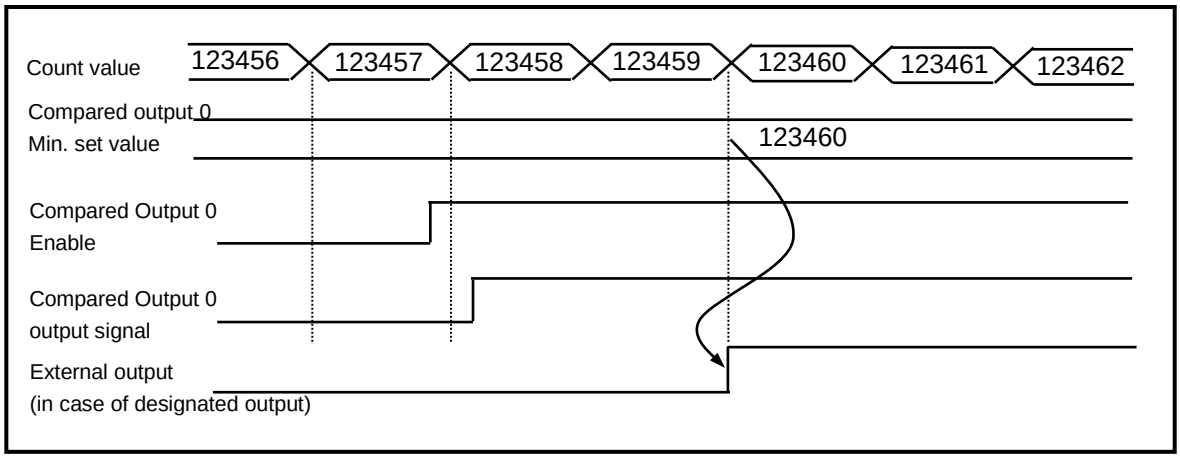
3) Mode 2 (Count value = Compared value)

If present count value is equal to the minimum set value of compared output 0, output is sent out. In order to turn the output Off, Compared output Enable signal 0 or Compared Coincidence Output Enable signal 0 is to be Off.



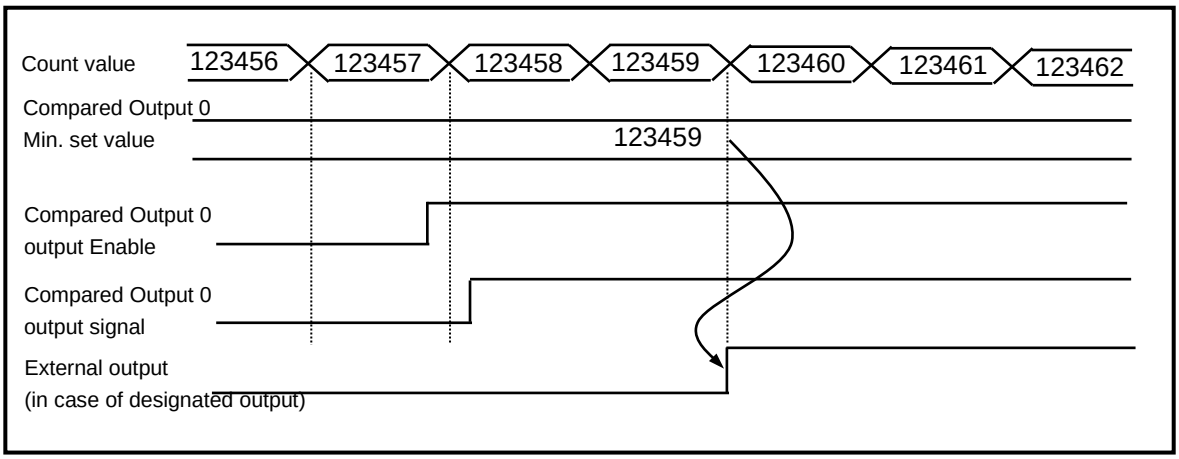
4) Mode 3 (Count value ≥ Compared value)

If present count value is greater than or equal to the minimum set value of compared output 0, output is sent out, and if count value decreases to be less than the minimum set value of compared output 0, output is not sent out.



5) Mode 4 (Count value > Compared Output value)

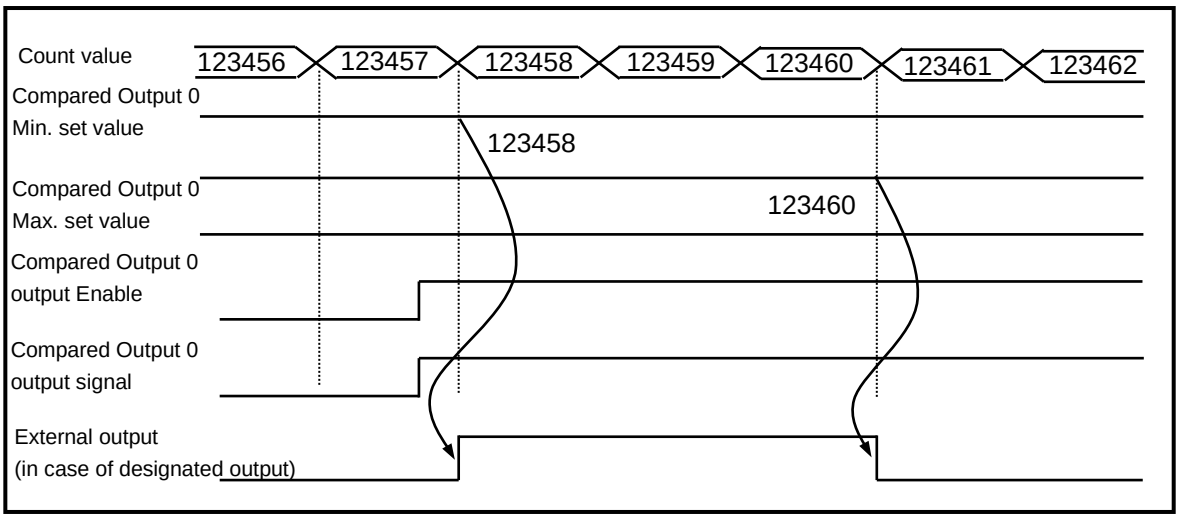
■ If present count value is greater than the minimum set value of compared output 0, output is sent out, and if count value decreases to be less than or equal to the minimum set value of compared output 0, output is not sent out.



6) Mode 5

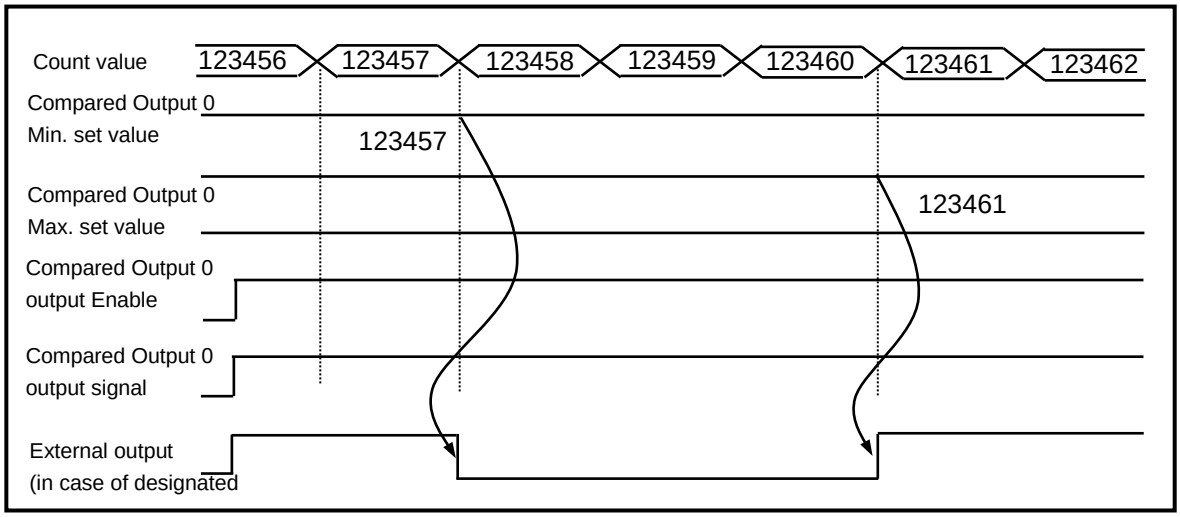
(Section comparison: Min. set value of Compared Output 0 ≤ Count value ≤ Max. set value of Compared Output 0)

■ If present count value is greater than or equal to the minimum set value of compared output 0 and less than or equal to the maximum set value of compared output 0, output is sent out, and if count value increases/decreases to exceed compared value's range, output is not sent out.



7) Mode 6 (Count value ≤ Min. set value of Compared Output 0 or Count value ≥ Max. set value of Compared Output 0)

■ If present count value is less than or equal to the minimum set value of compared 0 and greater than or equal to the maximum set value of compared 0, output is sent out, and if count value increases/decreases to exceed compared value's range, output is not sent out.



(4) Carry signal

(a) Carry signal occurs

1) When count range maximum value of 2,147,483,647 is reached during Linear Count.

2) When user-defined maximum value of Ring Count changed to the minimum value during Ring Count.

(b) Count when Carry Signal occurs

1) Count stops if Carry occurs during Linear Count.

2) Count does not stop even if Carry occurs during Ring Count.

(c) Carry reset

1) The Carry generated can be cancelled by Carry/Borrow reset signal On.

Classification	Device area per channel							
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7
Carry signal	%KX4176	%KX4336	%KX4496	%KX4656	%KX34896	%KX35056	%KX35126	%KX35376

(5) Borrow signal

(a) Borrow signal occurs

1) When count range minimum value of -2,147,483,648 is reached during Linear Count.

2) When user-defined minimum value of Ring Count changed to the maximum value during Ring Count.

(b) Count when Borrow signal occurs

1) Count stops if Borrow occurs during Linear Count.

2) Count does not stop even if Borrow occurs during Ring Count.

(c) Borrow reset

1) The Borrow generated can be cancelled by Carry/Borrow reset signal On.

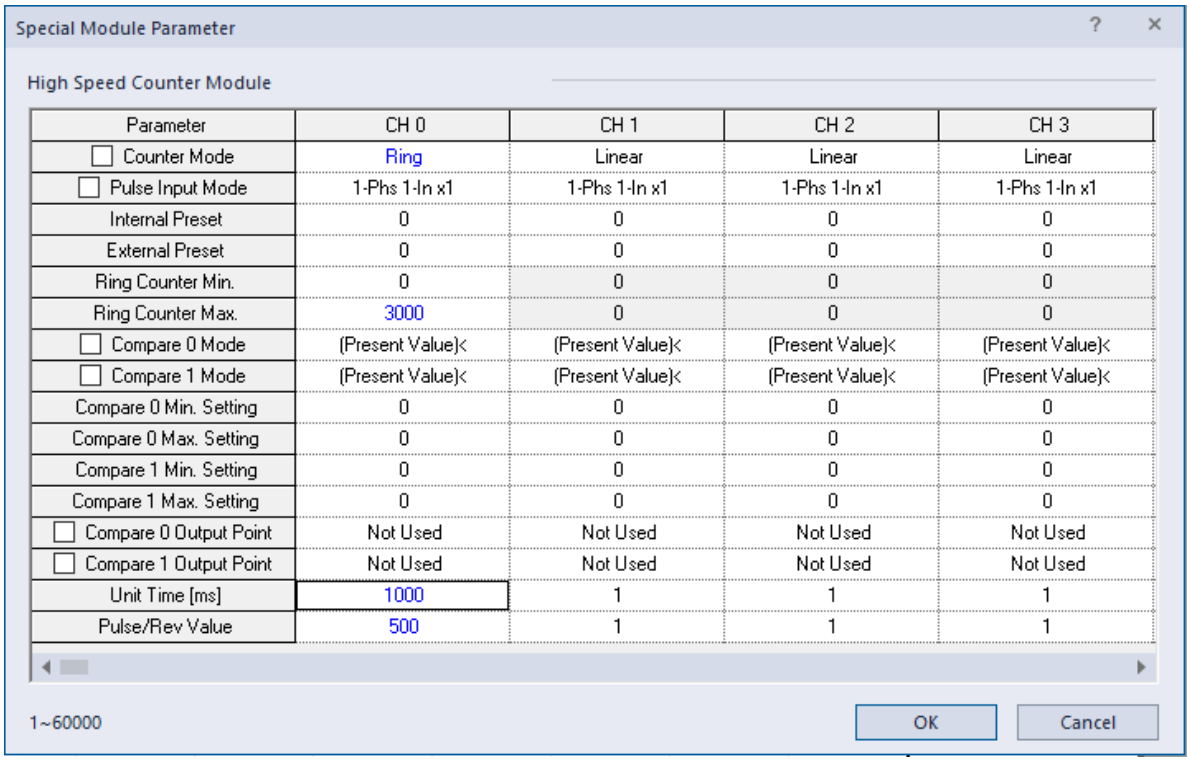
Classification	Device area per channel							
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7
Borrow signal	%KX4177	%KX4337	%KX4497	%KX4657	%KX34897	%KX35057	%KX35127	%KX35376

(6) Revolution/Unit time

While the Flag about the number of revolution per unit time is On, it counts the number of input pulses for a specified time.

(a) Setting

1) Set the unit time and the number of pulse per 1 revolution.



Setting value is saved at the following special K area and user can designate directly.

Class	Device per each channel (Word)								Setting range
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Unit time	%KW322	%KW352	%KW382	%KW412	%KW2242	%KW2272	%KW2302	%KW2332	1~60000ms
Pulse/Rev value	%KW323	%KW353	%KW383	%KW413	%KW2243	%KW2273	%KW2303	%KW2333	1~60000

2) In case of using Rev/unit time function, enable the following special K area

Class	Device per each channel (Word)								Operation
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Rev/unit time command	%KX4165	%KX4325	%KX4485	%KX4645	%KX34885	%KX35045	%KX35205	%KX35365	0: disable 1: enable

3) Rev/unit time value is saved at the following special K area.

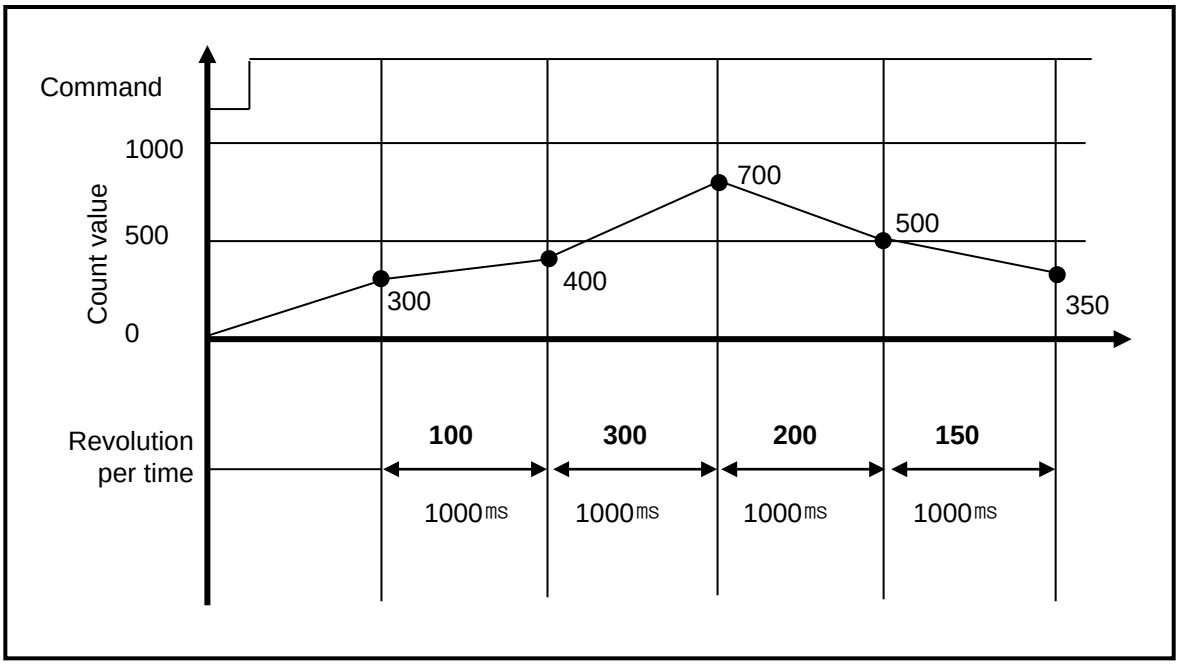
Class	Device per each channel (Word)								Ref.
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Rev/unit time	%KD132	%KD137	%KD142	%KD147	%KD1029	%KD1097	%KD1102	%KD1107	-

(b) Count function of Revolution/Unit time is used to count the number of pulses for a specified time while auxiliary mode enable signal is On.

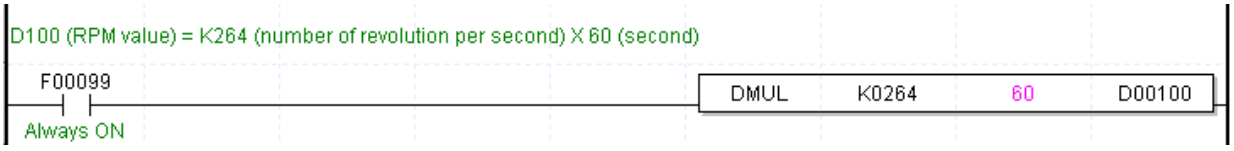
(c) With the displayed number of pulses updated for a specified time and the number of pulses per revolution input, Revolution/Unit time can be counted.

(d) Number of Revolution per 1 second is indicated after number of pulse per 1 revolution is set and time is set to 1 second (1000ms). In order to indicate by Revolutions per minute (RPM), the operation is executed in program.

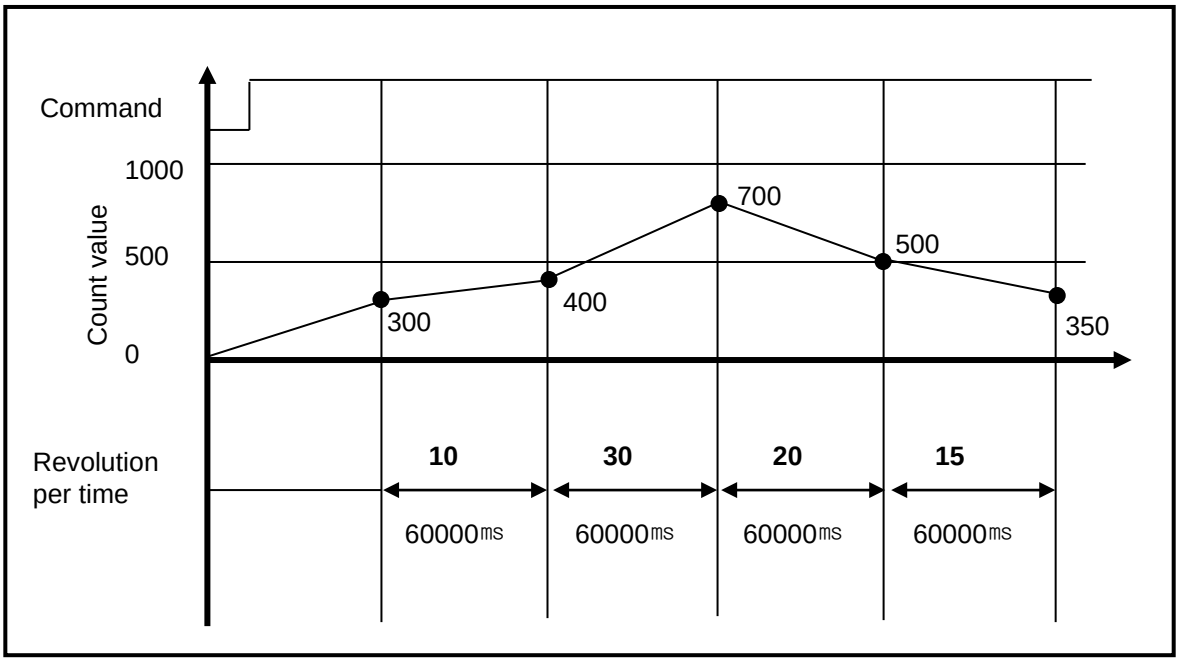
(e) The example that number of pulse per 1 revolution set to '1' and time is set to 1000 ms is as shown below. (Ch0)



(f) In order to indicate revolution per minute (RPM), the following program is necessary as shown below. Use MUL function block and save RPM value at revolution per minute (LINT type) as 64 bit. At this time, first, change revolution per second (DINT type) to LINT type.



(g) The example that number of pulse per 1 revolution set to '10' and time is set to 60,000 ms is as shown below.



(7) Count latch

When Count latch signal is On, present count value is latched.

▪ Setting

If present counter value is to latch, Count Latch function is set 'Use'.

Class	Device area per channel								Operation
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Count latch command	%KX4166	%KX4326	%KX4486	%KX4646	%KX34886	%KX35046	%KX35206	%KX35366	0: disable 1: enable

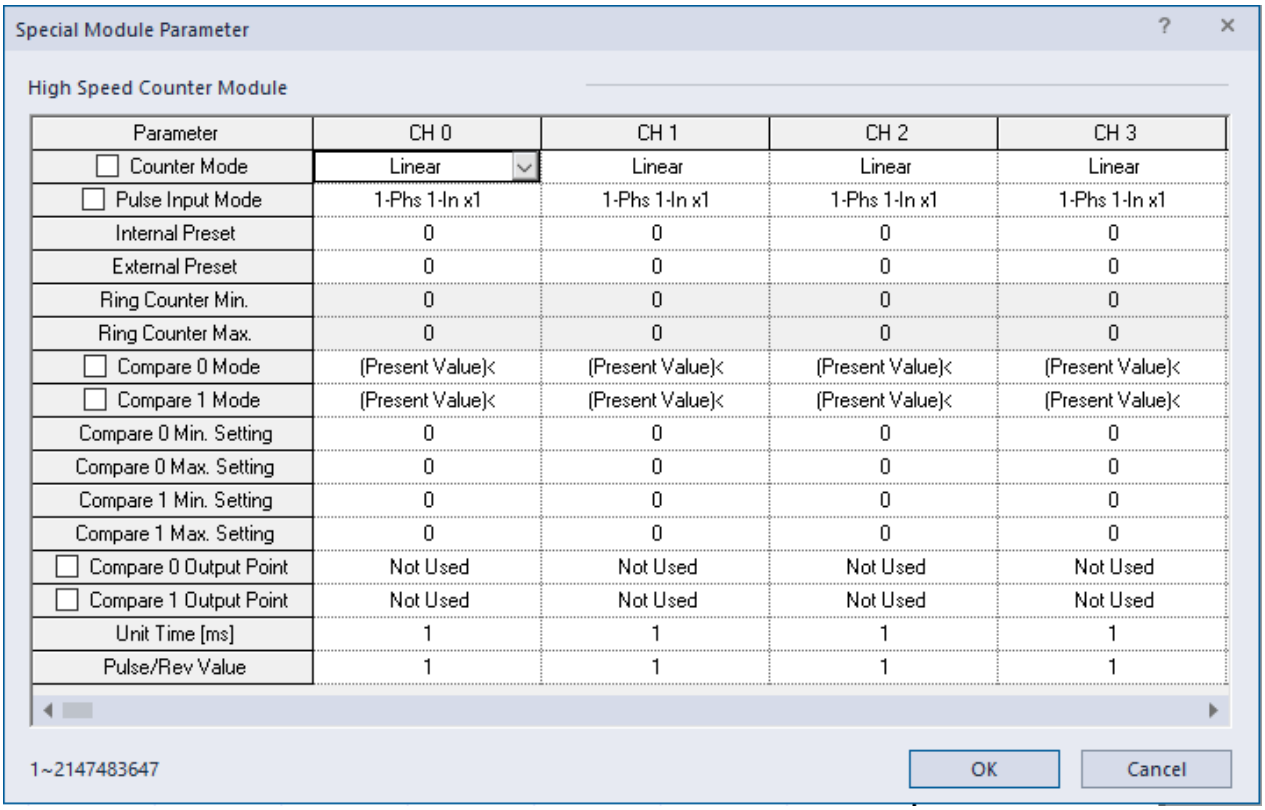
▪ Count latch function is operated when Count latch signal is On. Namely, counter value is not cleared when power supply Off =>On and mode change, it is counted from previous value.

▪ In latch counter function, internal or external preset function has to use for clearing present value.

(8) Preset function

It changes the current value into preset value.

There are two types of preset function, internal preset and external preset. External preset is fixed as input contact point.



• Preset setting value is saved at the following special K area.

Type	Area per each channel (Double word)								Ref.
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Internal preset value	%KD152	%KD167	%KD182	%KD197	%KD1112	%KD1127	%KD1142	%KD1157	–
External preset value	%KD153	%KD168	%KD183	%KD198	%KD1113	%KD1128	%KD1143	%KD1158	–

• Preset command is specified through the following special K area, external preset is used by executing the designated input contact point after allowance bit is on.

Type	Area per each channel (Bit)								Ref.
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Internal preset command	%KX4161	%KX4321	%KX4481	%KX4641	%KX34881	%KX35041	%KX35201	%KX35361	–
External preset allowance	%KX412	%KX4322	%KX4482	%KX4642	%KX34882	%KX35042	%KX35202	%KX35362	–
External preset command	%QX0.0.8	%QX0.0.9	%QX0.0.10	%QX0.0.11	%QX0.0.12	%QX0.0.13	%QX0.0.14	%QX0.0.15	–

8.2 Installation and Wiring

8.2.1 Precaution for wiring

Pay attention to the counteractions against wiring noise especially for High-speed pulse input.

(1) Surely use twisted pair shielded cable, grounded with 3 class applied.

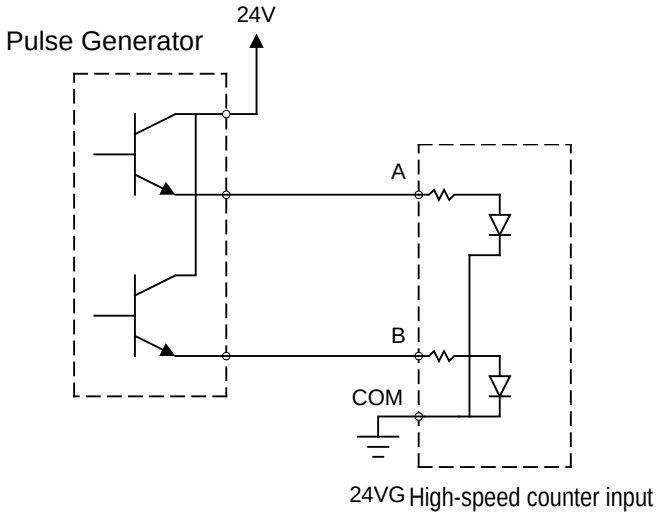
(2) Keep away from power cable or I/O line which may cause noise.

(3) Stabilized power should be used for filter.

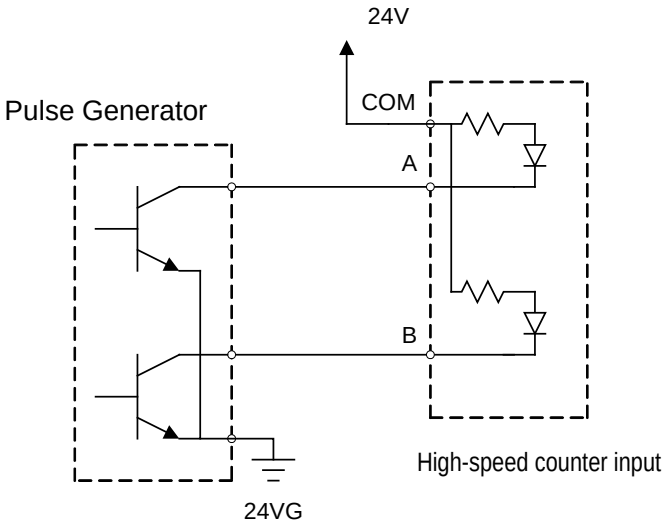
- ▶ Connect A-phase only for 1-phase input.
- ▶ Connect A-phase and B-phase for 2-phase input.

8.2.2 Example of wiring

(1) In case of pulse generator (encoder) is voltage output type



(2) In case of pulse generator is open collector type


24V
COM
Pulse Generator
A
B
High-speed counter input
24VG

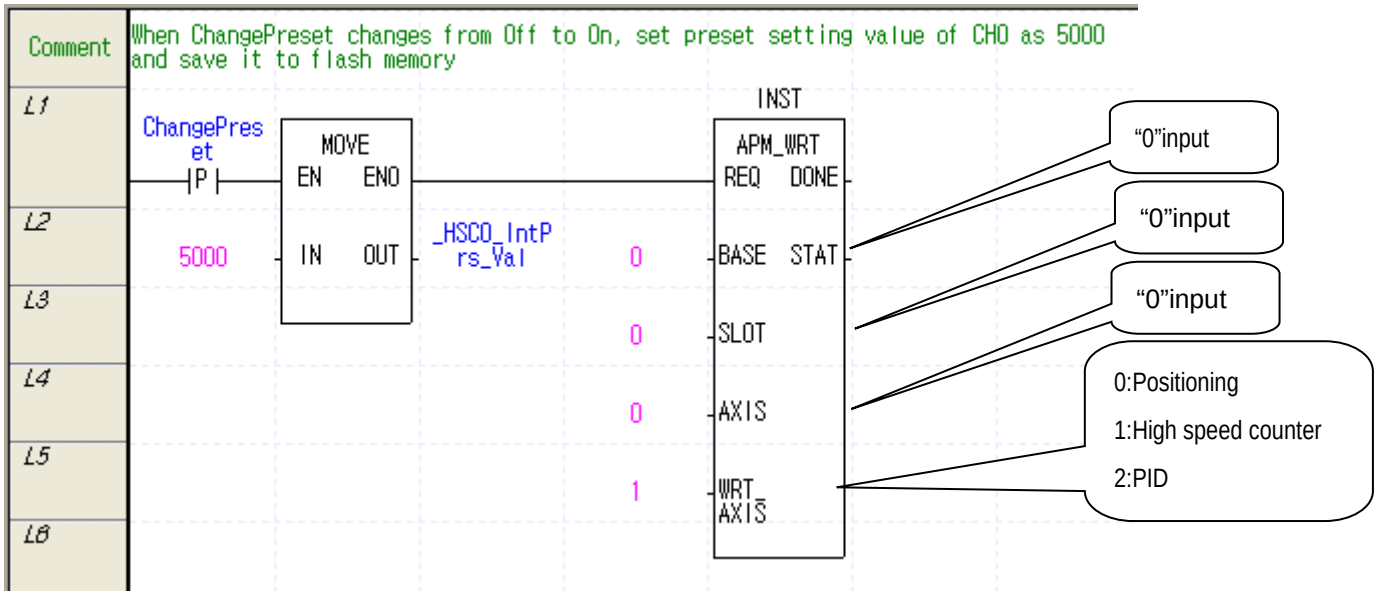
8.3 Internal Memory

8.3.1 Special area for High-speed counter

Parameter and operation command area of built-in high-speed counter use a special K device.

If values set in parameter are changed, it works with the changed values. At the moment, makes sure to use APM_WRT function to save the changed value to flash. If not saved in flash, the changed values with the power off => on and mode changed may not be maintained.

- The following example shows that the internal preset values of CH1 set in parameter are changed by program and saved in flash.
  - Receiving a command (Change Preset), it moves (MOV) the new internal preset value (5000) to the CH0 internal Preset area (%KD152) by using MOVE function.
  - To save the changed settings into flash, it uses APM_WRT command. At the moment, slot information is set to '0' in case of built-in function.



Remark

(1) In case of saving in flash memory using APM_WRT instruction, processing time of about 200~300ms is required.

(2) Turning off the PLC power while writing to the flash memory or repetitively using the APM_WRT command may damage the flash memory, so be careful when using it.

(1) Parameter setting area

Parameter	Description		Device area per channel				Remark
	Value	Setting	Ch 0	Ch 1	Ch 2	Ch 3	
			Ch 4	Ch 5	Ch 6	Ch 7	
Counter mode	h0000	Linear count	%KW300	%KW330	%KW360	%KW390	Word
	h0001	Ring count	%KW2220	%KW2250	%KW2280	%KW2310	
Pulse input mode setting	h0000	1 phase 1 input 1 multiplication	%KW301	%KW331	%KW361	%KW391	Word
	h0001	1 phase 2 input 1 multiplication					
	h0002	CW / CCW	%KW2221	%KW2251	%KW2281	%KW2311	Word
	h0003	2 phase 4 multiplication					
Comp. Output 0 mode setting	h0000	(Magnitude) <	%KW302	%KW332	%KW362	%KW392	Word
	h0001	(Magnitude) ≤					
	h0002	(Magnitude) =					
	h0003	(Magnitude) ≥					
	h0004	(Magnitude) >	%KW2222	%KW2252	%KW2282	%KW2312	
	h0005	(Range) Include					
	h0006	(Range) Exclude					
Comp. Output 1 mode setting	h0000	(Magnitude) <	%KW303	%KW333	%KW363	%KW393	Word
	h0001	(Magnitude) ≤					
	h0002	(Magnitude) =					
	h0003	(Magnitude) ≥					
	h0004	(Magnitude) >	%KW2223	%KW2253	%KW2283	%KW2313	
	h0005	(Range) Include					
	h0006	(Range) Exclude					
Internal preset value setting	-2,147,483,648 ~ 2,147,483,647		%KD152	%KD167	%KD182	%KD197	Double word
			%KD1112	%KD1127	%KD1142	%KD1157	
External preset value setting	-2,147,483,648 ~ 2,147,483,647		%KD153	%KD168	%KD183	%KD198	Double word
			%KD1113	%KD1128	%KD1143	%KD1158	

Parameter	Description		Device area per channel				Remark
	Value	Setting	Ch 0	Ch 1	Ch 2	Ch 3	
			Ch 4	Ch 5	Ch 6	Ch 7	
Ring counter min. value setting	-2,147,483,648 ~ 2,147,483,645		%KD154	%KD169	%KD184	%KD199	DWord
			%KD1114	%KD1129	%KD1144	%KD1159	
Ring counter max. value setting	-2,147,483,646 2,147,483,647		%KD155	%KD170	%KD185	%KD200	DWord
			%KD1115	%KD1130	%KD1145	%KD1160	
Comp. output min. value setting	-2,147,483,648 ~ 2,147,483,647		%KD156	%KD171	%KD186	%KD201	DWord
			%KD1116	%KD1131	%KD1146	%KD1161	
Comp. output max. value setting	-2,147,483,648 ~ 2,147,483,647		%KD157	%KD172	%KD187	%KD202	DWord
			%KD1117	%KD1132	%KD1147	%KD1162	
Comp. output 0 point designation	HFFFF	No use	%KW320	%KW350	%KW380	%KW410	Word
	h0000	%QX0.0.1					
	h0001	%QX0.0.2					
	h0002	%QX0.0.3					
	h0003	%QX0.0.4					
	h0004	%QX0.0.5					
	h0005	%QX0.0.6					
	h0006	%QX0.0.7					
	h0007	%QX0.0.8					
	h0008	%QX0.0.9	%KW2240	%KW2270	%KW2300	%KW2330	
	h0009	%QX0.0.10					
	h000A	%QX0.0.11					
	h000B	%QX0.0.12					
	h000C	%QX0.0.13					
	h000D	%QX0.0.14					
	h000E	%QX0.0.15					
	h000F	%QX0.0.16					

Parameter	Description		Device area per channel				Remark
	Value	Setting	Ch 0	Ch 1	Ch 2	Ch 3	
			Ch 4	Ch 5	Ch 6	Ch 7	
Comp. output 1 point designation	HFFFF	No use	%KW321	%KW351	%KW381	%KW411	Word
	h0000	%QX0.0.1					
	h0001	%QX0.0.2					
	h0002	%QX0.0.3					
	h0003	%QX0.0.4					
	h0004	%QX0.0.5					
	h0005	%QX0.0.6					
	h0006	%QX0.0.7					
	h0007	%QX0.0.8					
	h0008	%QX0.0.9	%KW2241	%KW2271	%KW2301	%KW2331	
	h0009	%QX0.0.10					
	h000A	%QX0.0.11					
	h000B	%QX0.0.12					
	h000C	%QX0.0.13					
	h000D	%QX0.0.14					
	h000E	%QX0.0.15					
	h000F	%QX0.0.16					
Unit time [ms]	1 ~ 60,000 ms		%KW322	%KW352	%KW382	%KW412	Word
			%KW2242	%KW2272	%KW2302	%KW2332	
Pulse/Rev.value	1 ~ 60,000		%KW323	%KW353	%KW383	%KW413	Word
			%KW2243	%KW2273	%KW2303	%KW2333	

(2) Operation command

Parameter	Device area per channel							
	Ch 0	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7
Counter enabling	%KX4160	%KX4320	%KX4480	%KX4640	%KX34880	%KX35040	%KX35200	%KX35360
Internal preset designation of counter	%KX4161	%KX4321	%KX4481	%KX4641	%KX34881	%KX35041	%KX35201	%KX35361
External preset enabling of counter	%KX4162	%KX4322	%KX4482	%KX4642	%KX34882	%KX35042	%KX35202	%KX35362
Designation of decremental counter	%KX4163	%KX4323	%KX4483	%KX4643	%KX34883	%KX35043	%KX35203	%KX35363
Comp. output 0 enabling	%KX4164	%KX4324	%KX4484	%KX4644	%KX34884	%KX35044	%KX35204	%KX35364
Comp. output 1 enabling	%KX4167	%KX4327	%KX4487	%KX4647	%KX34887	%KX35047	%KX35207	%KX35367
Enabling of revolution time per unit time	%KX4165	%KX4325	%KX4485	%KX4645	%KX34885	%KX35045	%KX35205	%KX35365
Designation of latch counter	%KX4166	%KX4326	%KX4486	%KX4646	%KX34886	%KX35046	%KX35206	%KX35366
Carry signal (Bit)	%KX4176	%KX4336	%KX4496	%KX4656	%KX34896	%KX35056	%KX35216	%KX35376
Borrow signal	%KX4177	%KX4337	%KX4497	%KX4657	%KX34897	%KX35057	%KX35217	%KX35377
Comp. output 0 signal	%KX4168	%KX4328	%KX4488	%KX4648	%KX34888	%KX35048	%KX35208	%KX35368
Comp. output 1 signal	%KX4169	%KX4329	%KX4489	%KX4649	%KX34889	%KX35049	%KX35209	%KX35369

(3) Area of monitoring

Parameter	Device area per channel							
	Ch 0	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7
Current counter value	%KD131	%KD136	%KD141	%KD146	%KD1091	%KD1096	%KD1101	%KD1106
Revolution per unit time	%KD132	%KD137	%KD142	%KD147	%KD1092	%KD1097	%KD1102	%KD1107

8.3.2 Error code

It describes errors of the built-in high-speed counter.

▪ Error occurred is saved in the following area.

Category	Device area per channel								Remark
	Ch0	Ch1	Ch2	Ch3	Ch4	Ch5	Ch6	Ch7	
Error code	%KW266	%KW276	%KW286	%KW296	%KW2186	%KW2196	%KW2206	%KW2216	Word

▪ Error codes and descriptions

Error code (Decimal)	Description
20	Counter type is set out of range
21	Pulse input type is set out of range
22	Requesting #1(3,)channel Run during the operation of #0(2) channel 2 phase(* During #0(2) channel 2 phase inputting, using #1(3)channel is not possible.
23	Compared output type setting is set out of range.
25	Internal preset value is set out of counter range
26	External present value is set out of counter range
27	Ring counter setting is set out of range * Note ring counter setting should be 2 and more.
28	Compared output min. value is set out of permissible max. input range
29	Compared output max. value is set out of permissible max. input range
30	Error of Compared output min. value>Compared output max. value
31	Compared output is set out of the default output value
34	Set value of Unit time is out of the range
35	Pulse value per 1 revolution is set out of range
36	Compared output min. value is set out of permissible max. input range (Compared output1)
37	Compared output max. value is set out of permissible max. input range (Compared output1)
38	Error of Compared output min. value>Compared output max. value (Compared output1)
39	Compared output is set out of the default output value (Compared output1)

Remark

▪ If two and more errors occur, the module saves the latter error code and removes the former one.

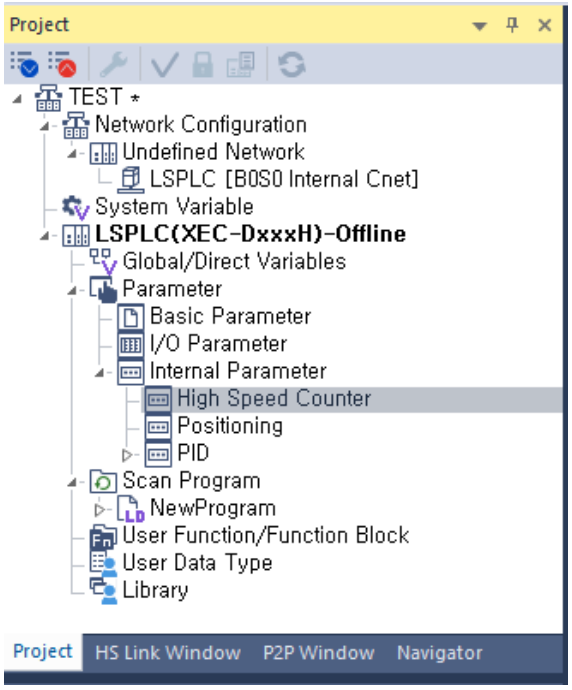
8.4 Examples: Using High-speed Counter

It describes examples of using high-speed counter.

(1) Setting high-speed counter parameter

How to set types of parameters to operate a high-speed counter is described as follows.

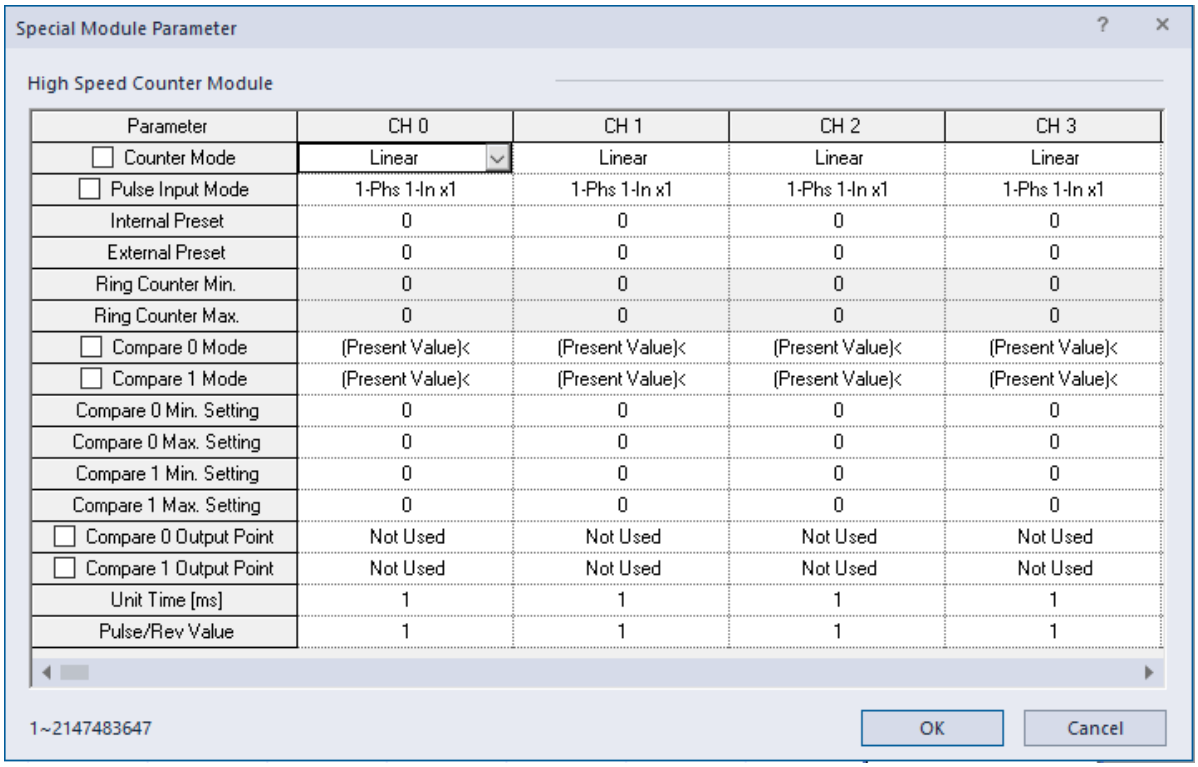
(a) Set 『Internal Parameters』 in the basic project window.



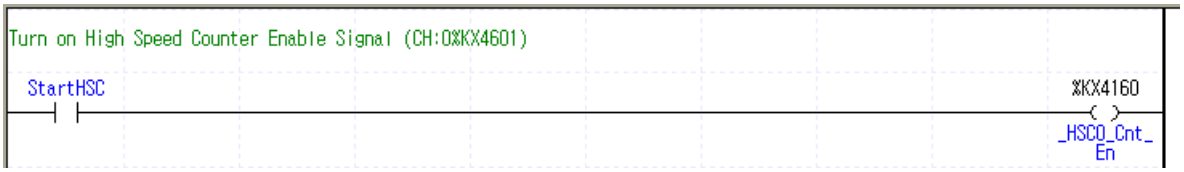
(b) Selecting high-speed counter opens a window to set high-speed counter parameters as follows.

For details regarding each parameter setting, refer to 8.1~8.3.

(Every parameter settings are saved in the special K device area.)



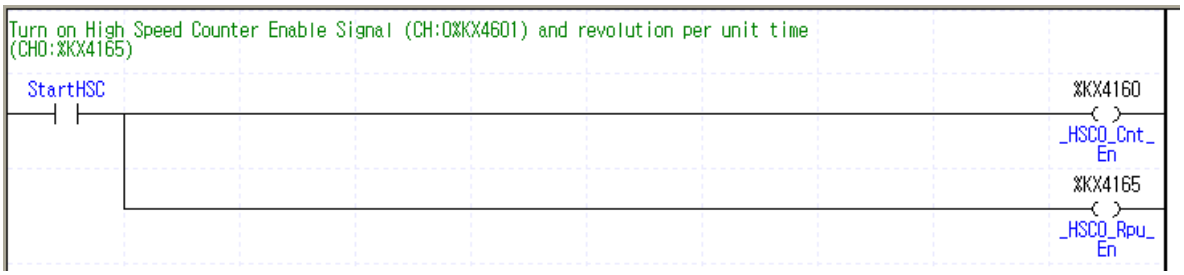
(c) Turn 'ON' the high-speed counter Enable signal (CH0:%KX4160) in the program.



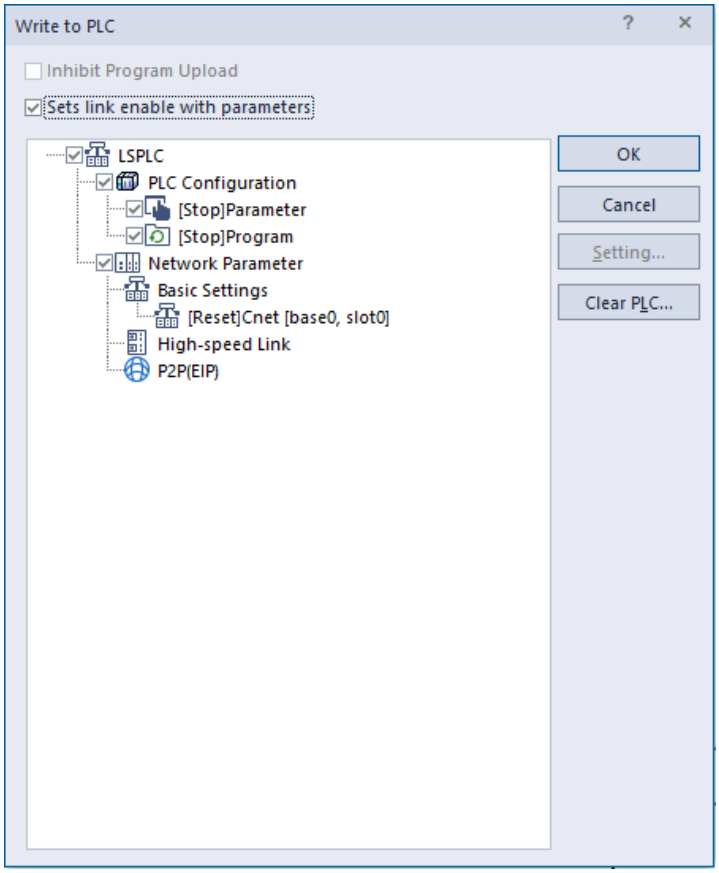
(d) To use additional functions of the high-speed counter, you needs to turn on the flag allowing an operation command.

* Refer to 2. Operation Command, <8.3.1 Special K Area for High-speed Counter>

For instance, turn on %KX4165 bit if among additional functions, rotation number function is used.



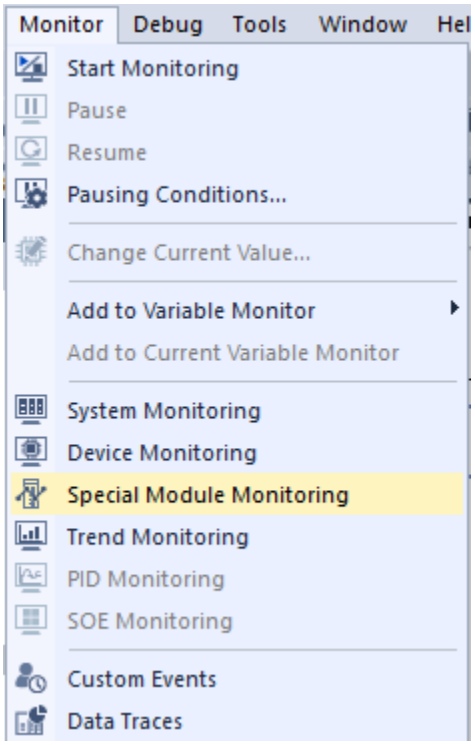
(e) Upon the setting, download program and parameter to PLC.



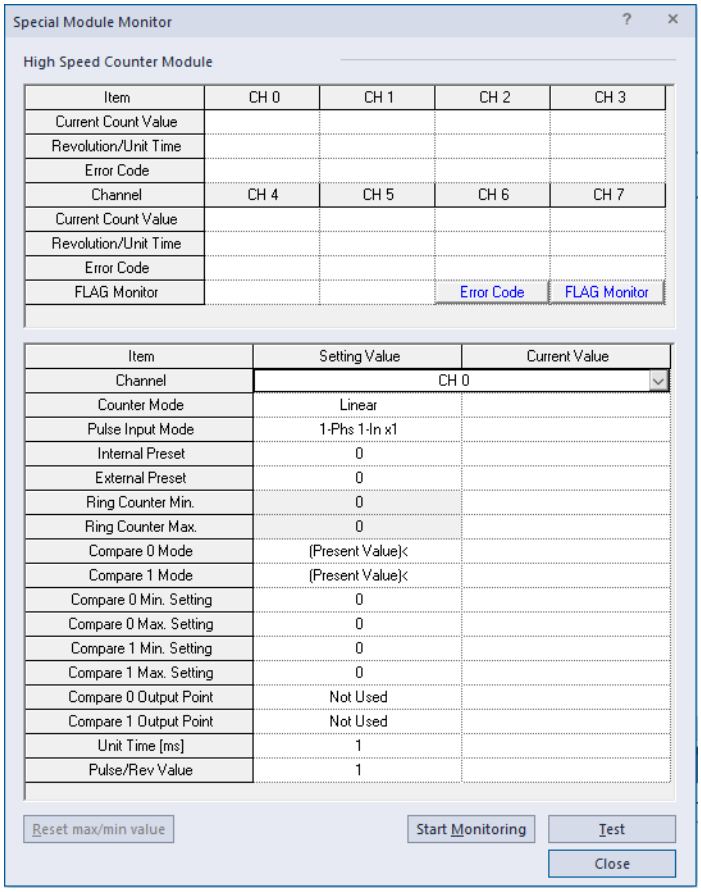
(2) Monitoring and setting command

Monitoring and command setting of high-speed counter are described as follows.

(a) If starting a monitor and clicking a Special Module Monitor, the following window is opened.

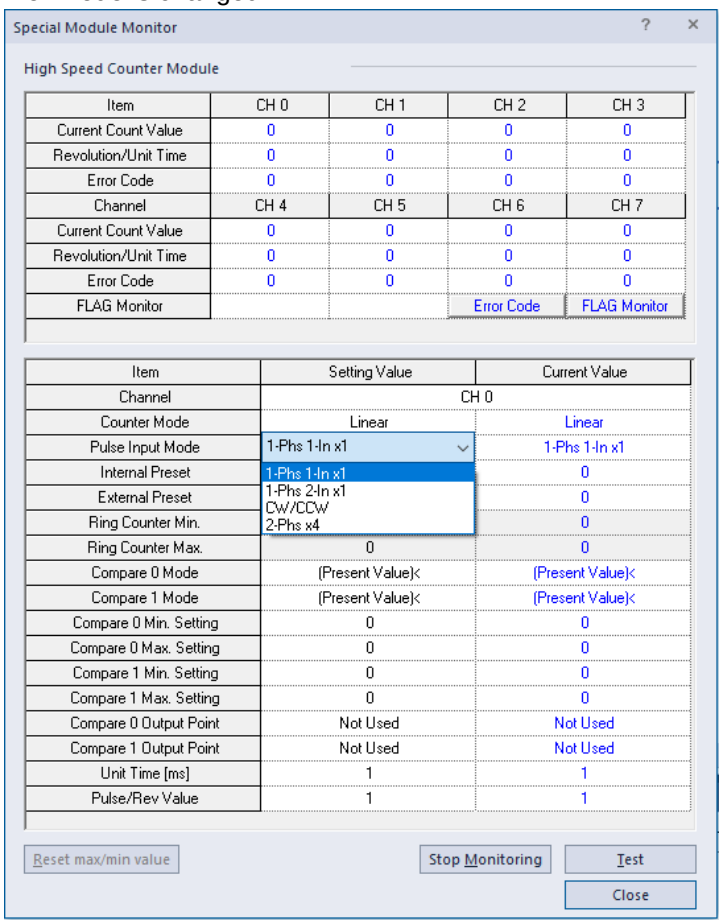


(b) Clicking 『Monitor』 shows monitor and test window of high-speed counter.

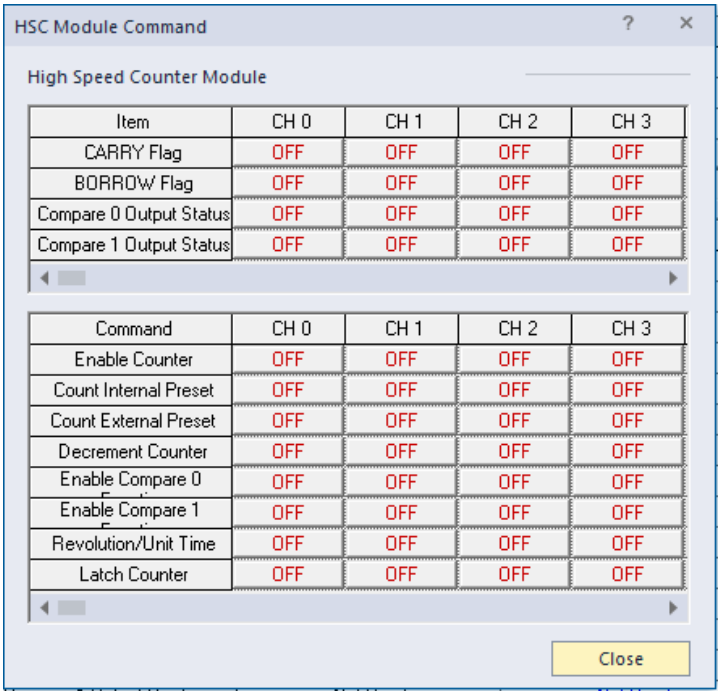


Item	Description
FLAG Monitor	Show flag monitoring and command window of high-speed counter
Start Monitoring	Start monitoring each item (special K device area monitor).
Test	Write each item setting to PLC. (Write the setting to special K device)
Close	Close monitor

(c) Clicking 『Start Monitoring』 shows the high-speed counter monitor display, in which you may set each parameter. At this moment, if any, changed values are not saved if power off=> on or mode is changed.



(d) Clicking『FLAG Monitor』 shows the monitor of each flag in high-speed counter, in which you may direct operation commands by flags (clicking commands reverse turn).



Chapter 9 Installation and Wiring

9.1 Safety Instruction

⚠ Danger

- Please design protection circuit at the external of PLC for entire system to operate safely because an abnormal output or an malfunction may cause accident when any error of external power or malfunction of PLC module.
  (1) It should be installed at the external side of PLC to emergency stop circuit, protection circuit, interlock circuit of opposition action such as forward /reverse operation and interlock circuit for protecting machine damage such as upper/lower limit of positioning.
  (2) If PLC detects the following error, all operation stops and all output is off.
  (Available to hold output according to parameter setting)
  (a) When over current protection equipment or over voltage protection operates
  (b) When self diagnosis function error such as WDT error in PLC CPU occurs
- In case of error about IO control part that is not detected by PLC CPU, all output is off.
  Design Fail Safe circuit at the external of PLC for machine to operate safely. Refer to 9.1.1 Fail Safe circuit.
  (1) Because of error of output device, Relay, TR, etc., output may not be normal. About output signal that may cause the heavy accident, design supervisory circuit to external.
- In case load current more than rating or over current by load short flows continuously, danger of heat, fire may occur so design safety circuit to external such as fuse.
- Design for external power supply to be done first after PLC power supply is done. If external power supply is done first, it may cause accident by misoutput, misoperation.
- In case communication error occurs, for operation status of each station, refer to each communication manual.
- In case of controlling the PLC while peripheral is connected to CPU module, configure the interlock circuit for system to operate safely. During operation, in case of executing program change, operation status change, familiarize the manual and check the safety status. Especially, in case of controlling long distance PLC, user may not response to error of PLC promptly because of communication error or etc.
  Limit how to take action in case of data communication error between PLC CPU and external device adding installing interlock circuit at the PLC program.

⚠ Danger

- Don't close the control line or communication cable to main circuit or power line. Distance should be more than 100mm. It may cause malfunction by noise.

- In case of controlling lamp load, heater, solenoid valve, etc. in case of Off -> On, large current (10 times of normal current) may flows, so consider changing the module to module that has margin at rated current.

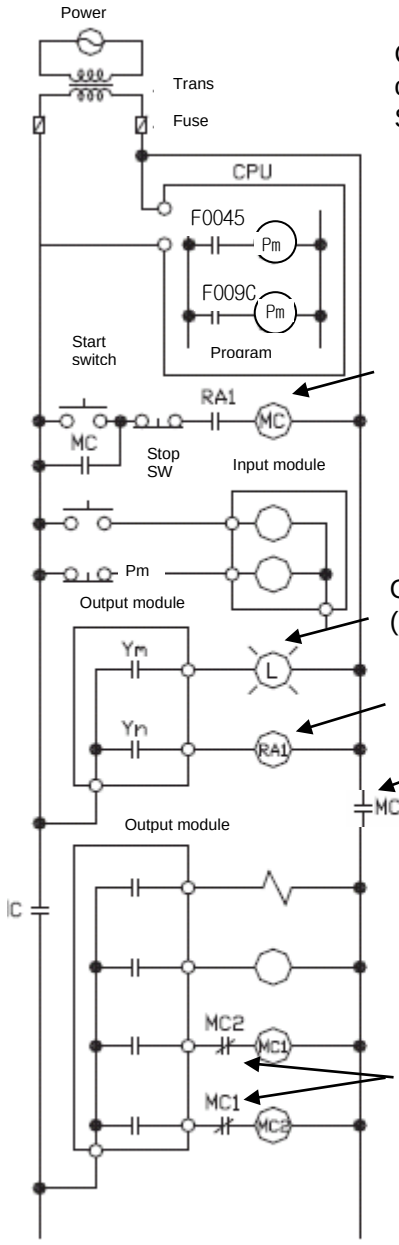
- Process output may not work properly according to difference of delay of PLC main power and external power for process (especially DC in case of PLC power On-Off and of start time.
  For example, in case of turning on PLC main power after supplying external power for process, DC output module may malfunction when PLC is on, so configure the circuit to turn on the PLC main power first
  Or in case of external power error or PLC error, it may cause the malfunction.

- Not to lead above error to entire system, part causing breakdown of machine or accident should be configured at the external of PLC

9.1.1 Fail safe circuit

(1) example of system design (In case of not using ERR contact point of power module)

In case of AC



Check direct current Signal input

PLC RUN output Start available as RA1

Output for warning (Lamp or buzzer)

RUN by F009C

Power off by output device

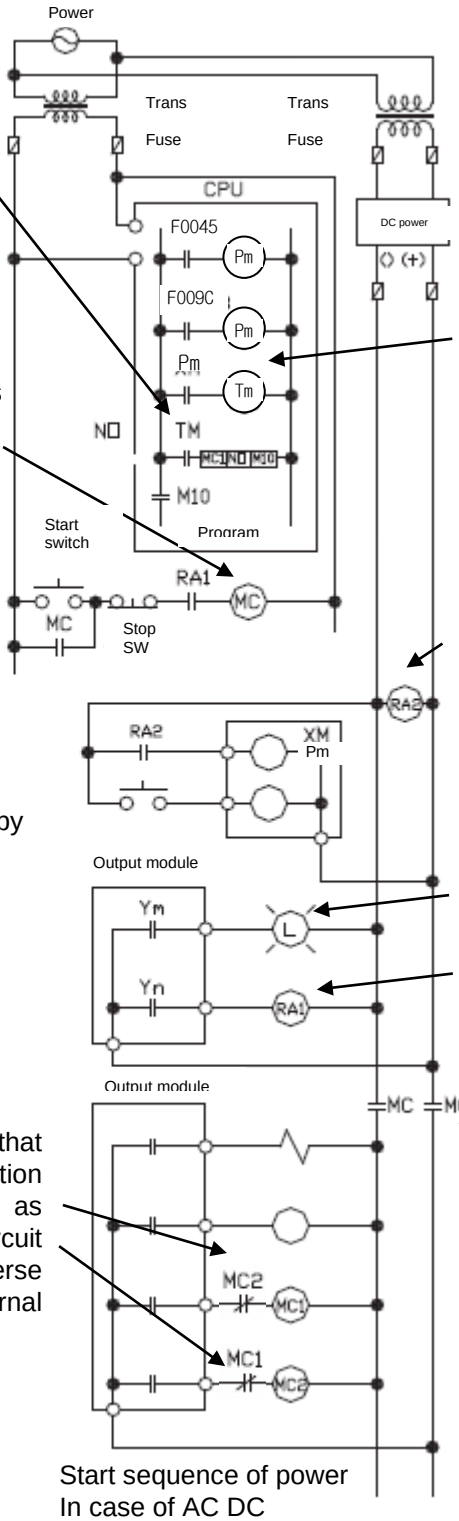
Emergency stop,

Stop by limit

Configure part that lead opposite operation or breakdown such as interlock circuit forward, reverse revolution by external interlock circuit

Start sequence of power
In case of AC
(1) Turn on power
(2) Run CPU.
(3) Turn on start switch
(4) Output device runs by program through magnetic contactor (MC) [On]

In case of AC . DC



Timer setting which DC input signal is configured.

Voltage relay equipped

utput for warning .amp or buzzer)

un by F009C

Power Off to output device

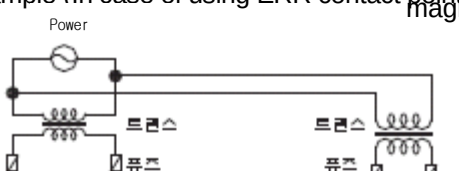
(Emergency stop,

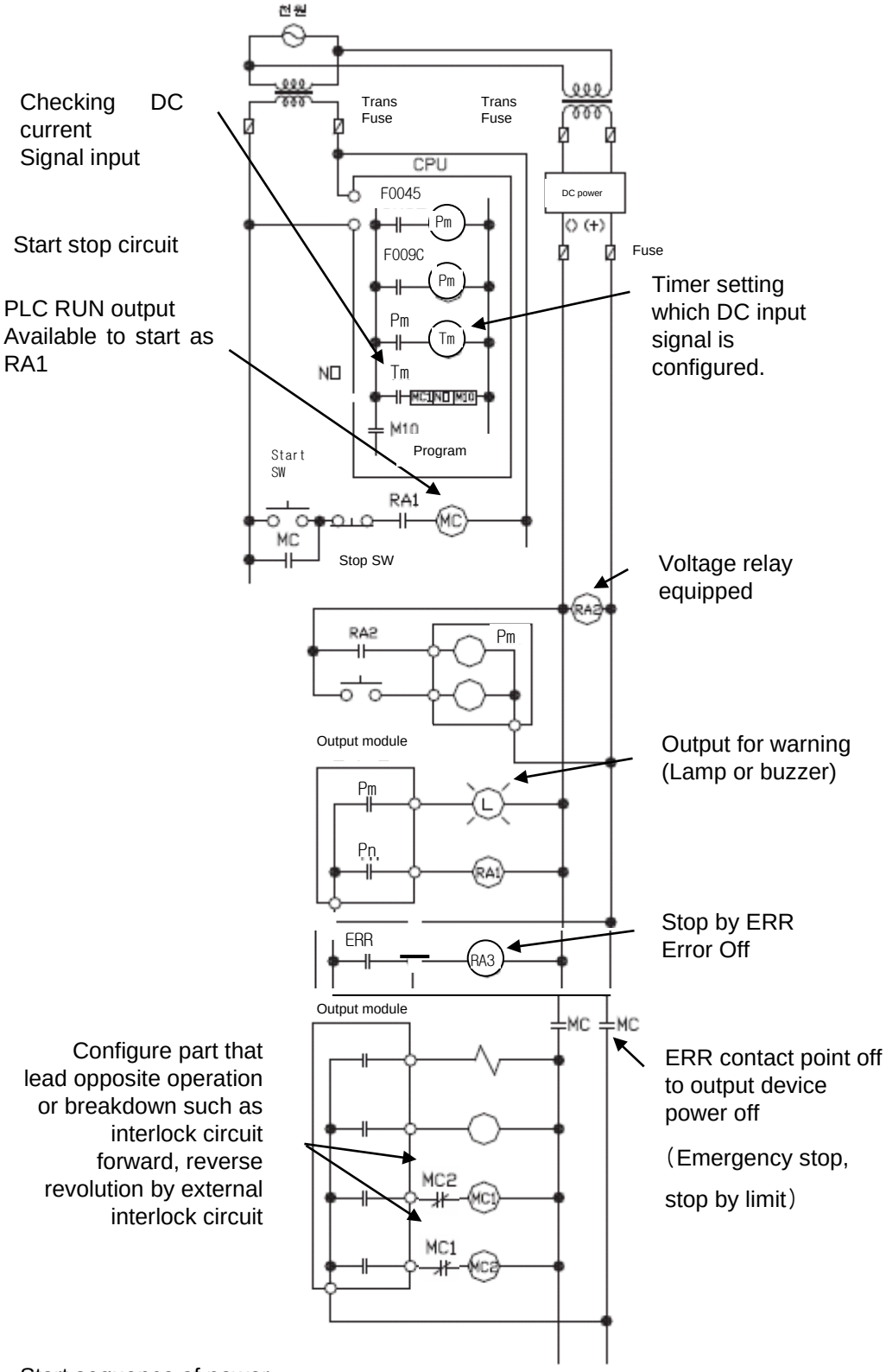
stop by limit

switch)

Start sequence of power
In case of AC DC
Run CPU after power is on
(1) Turn on power and run CPU
(2) Turn on RA2 as DC power on
(3) Turn on timer after DC power is stable.
(4) Turn on start switch
(5) Output device runs by program through magnetic contactor (MC) [On]

(2) System design circuit example (In case of using ERR contact point of power module)





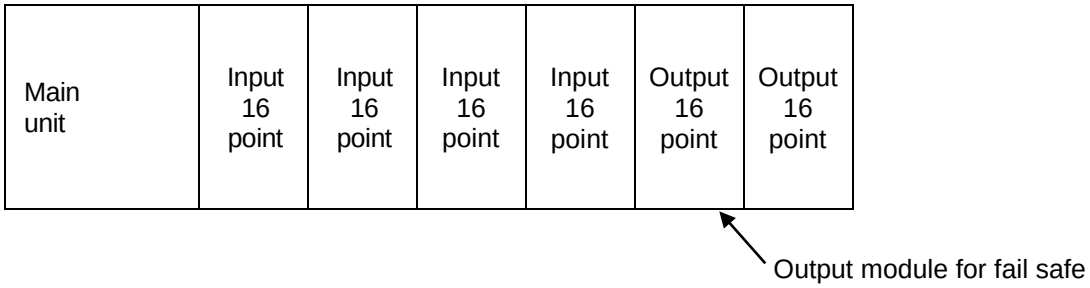
Start sequence of power
In case of AC DC

(1) Run CPU after turning on power.
(2) Turn on RA2 with DC power supplied
(3) Turn on timer after DC power is stable
(4) Turn on start switch Output device runs by program through magnetic contactor (MC) [On]

(3) Fail safe countermeasure in case of PLC error

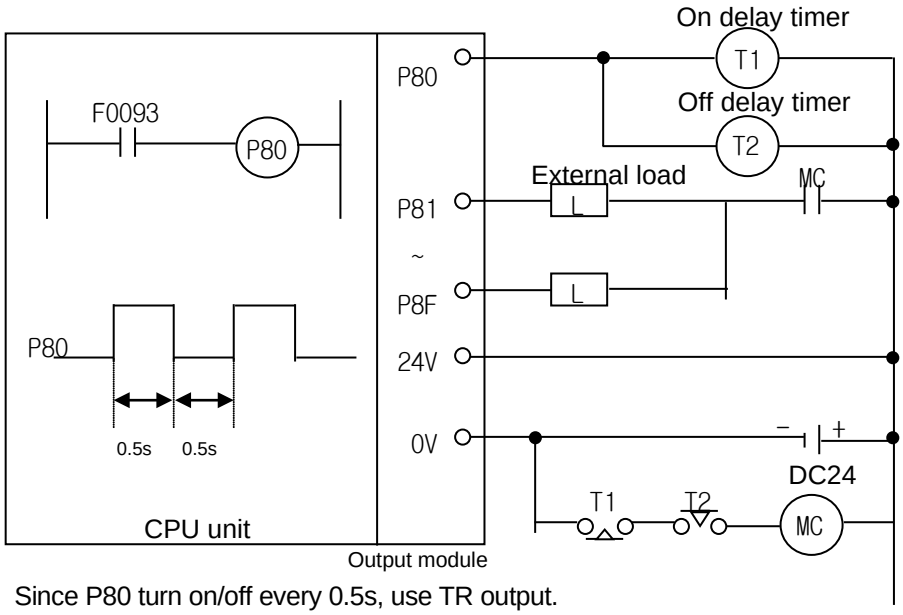
Error of PLC CPU and memory is detected by self diagnosis but in case error occurs in IO control part, etc., CPU can detect the error. At this case, though it is different according to status of error, all contact point is on or off, so safety may not be guaranteed. Though we do out best to our quality as producer, configure safety circuit preparing that error occurs in PLC and it lead to breakdown or accident.

System example



Equip output module for fail safe to last slot of system.

[Fail safe circuit example]



Since P80 turn on/off every 0.5s, use TR output.

9.1.2 PLC heat calculation

(1) Power consumption of each part

(a) Power consumption of module

The power conversion efficiency of power module is about 70% and the other 30% is gone with heat; 3/7 of the output power is the pure power consumption. Therefore, the calculation is as follows.

- $W_{pw} = 3/7 \{(I_{5V} \times 5) + (I_{24V} \times 24)\}$ (W)

I_{5V} : power consumption of each module DC5V circuit(internal current consumption)

I_{24V}: the average current consumption of DC24V used for output module (current consumption of simultaneous On point)

If DC24V is externally supplied or a power module without DC24V is used, it is not applicable.

(b) Sum of DC5V circuit current consumption

The DC5V output circuit power of the power module is the sum of power consumption used by each module.

- $W_{5V} = I_{5V} \times 5$ (W)

(c) DC24V average power consumption(power consumption of simultaneous On point)

The DC24V output circuit's average power of the power module is the sum of power consumption used by each module.

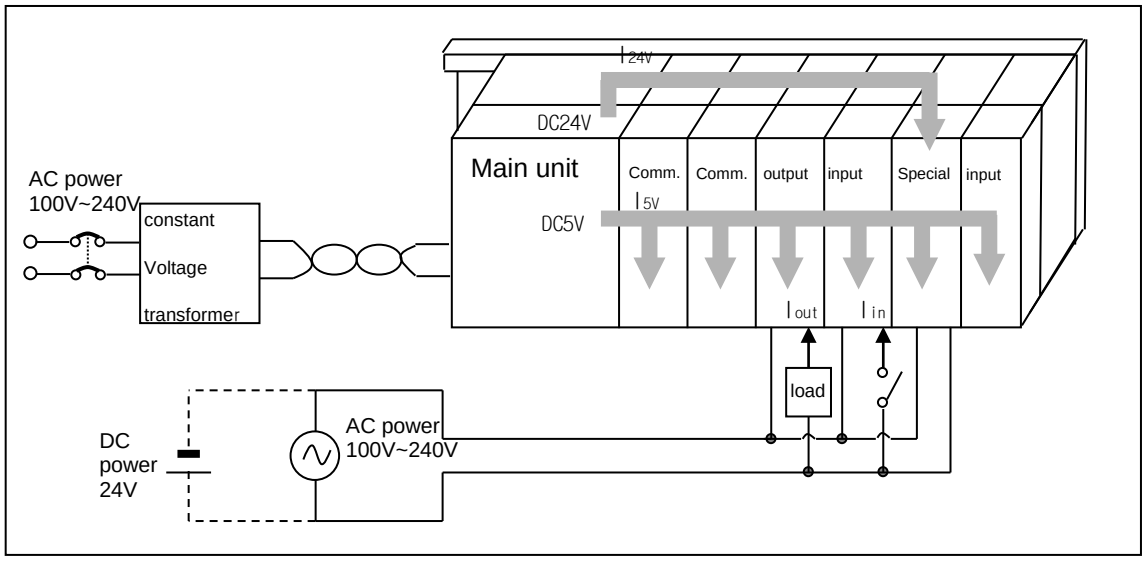
- $W_{24V} = I_{24V} \times 24$ (W)

(d) Average power consumption by output voltage drop of the output module(power consumption of simultaneous On point)

- $W_{out} = I_{out} \times V_{drop} \times$ output point X simultaneous On rate (W)

I_{out} : output current (actually used current) (A)

V_{drop}: voltage drop of each output module (V)



(e) Input average power consumption of input module
(power consumption of simultaneous On point)

- $W_{in} = I_{in}$ X E X input point X simultaneous On rate (W)

I_{in}: input current (root mean square value in case of AC) (A)
E : input voltage (actually used voltage) (V)

(f) Power consumption of special module power assembly

- $W_S = I_{5V}$ X 5 + I_{24V} X 24 + I_{100V} X 100 (W)

The sum of power consumption calculated by each block is the power consumption of the entire PLC system.

- $W = W_{PW} + W_{5V} + W_{24V} + W_{out} + W_{in} + W_s$ (W)

Calculate the heats according to the entire power consumption(W) and review the temperature increase within the control panel.

The calculation of temperature rise within the control panel is displayed as follows.
T = W / UA [°C]
W : power consumption of the entire PLC system (the above calculated value)
A : surface area of control panel [m^2]
U : if equalizing the temperature of the control panel by using a fan and others - - - 6
If the air inside the panel is not ventilated - - - - - - - - - - 4

If installing the PLC in an air-tight control panel, it needs heat-protective(control) design considering the heat from the PLC as well as other devices. If ventilating by vent or fan, inflow of dust or gas may affect the performance of the PLC system.

9.2 Attachment/Detachment of Modules

9.2.1 Attachment/Detachment of modules

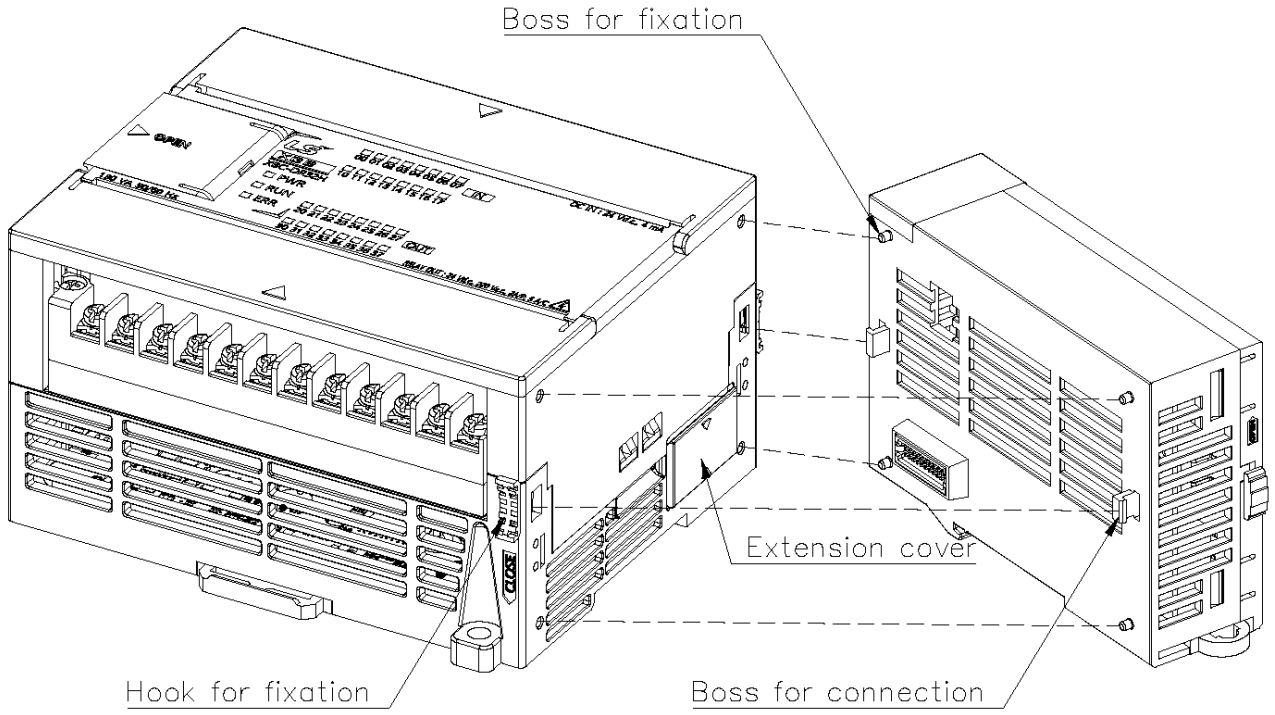
Caution in handling
Use PLC in the range of general specification specified by manual.
In case of using out of range, it may cause electric shock, fire, malfunction, damage of product.

⚠ Warning

- Module must be mounted to hook for fixation properly before its fixation. The module may be damaged from over-applied force. If module is not mounted properly, it may cause malfunction.
- Do not drop or impact the module case, terminal block connector.
- Do not separate the PCB from case.

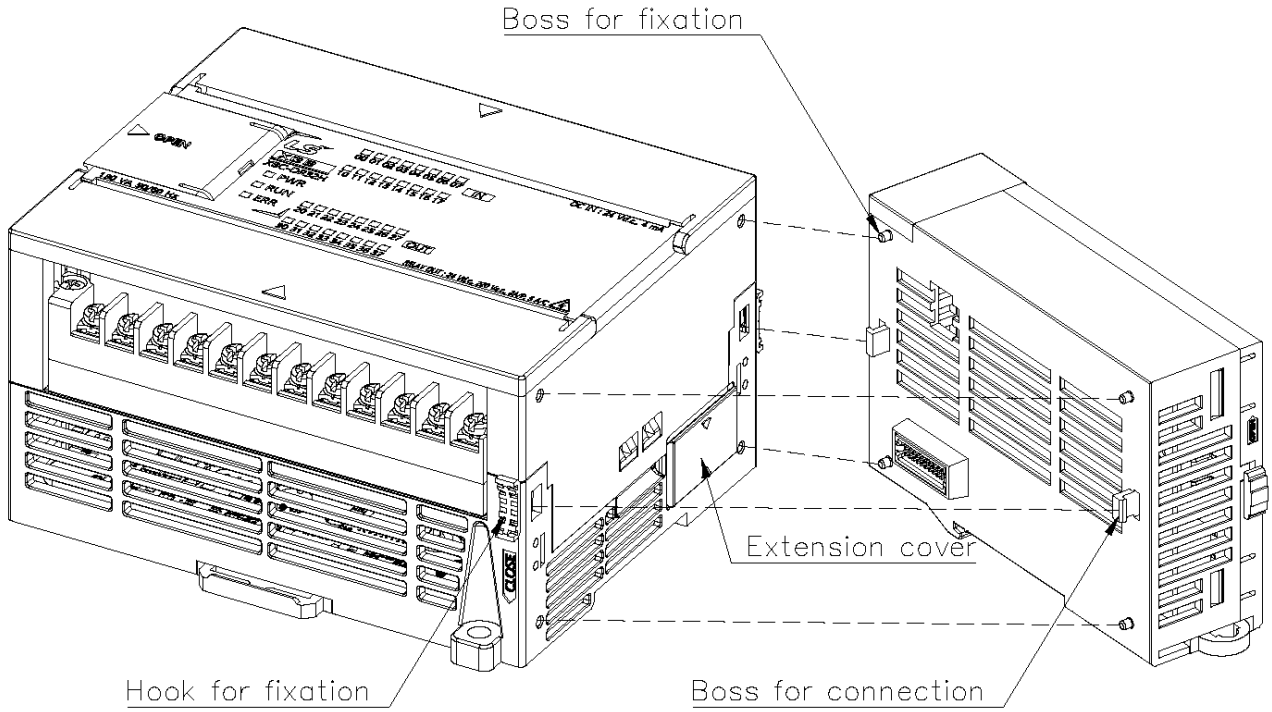
(1) Equipment of module

- Eliminate the extension cover at the upper of module.
- Push the module and connect it in agreement with hook for fixation of four edges and hook for connection at the bottom.
- After connection, get down the hook for fixation at the upper part and lower part and fix it completely.



(2) Detachment of module

- Get up the hook for fixation of upper part and lower part and disconnect it.
- Detach the module with two hands. (Don't force over-applied force.)



⚠ Caution

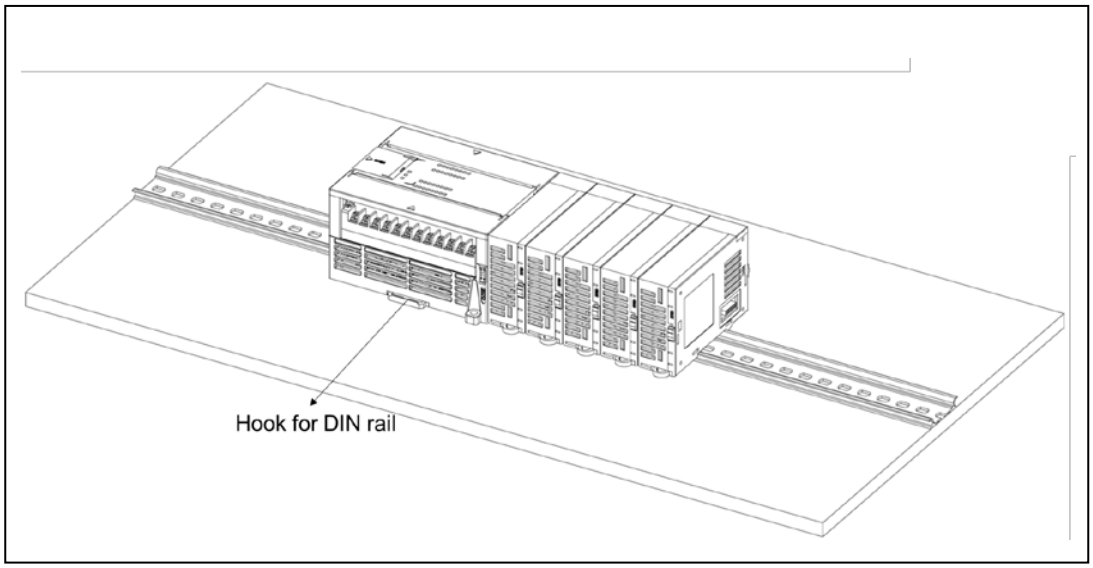
- When separating module, don't force over-applied power. If so, hook may be damaged.

(3) Installation of module

Since XGB PLC equips Hook for DIN rail (width of rail: 35mm), so XGB can be installed at DIN rail.

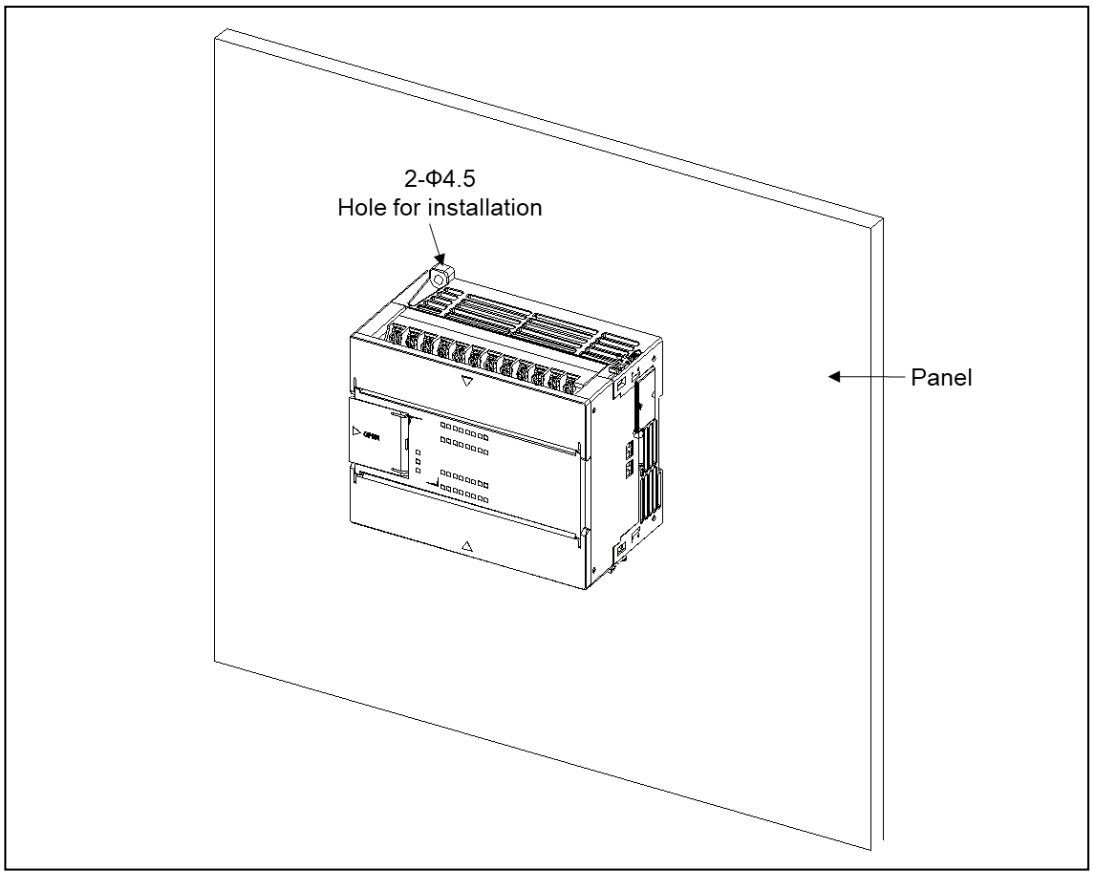
(a) When installing module at DIN rail

- Pull Hook for DIN rail and install module at DIN rail
- After installing module at DIN rail, push Hook to fix the module.



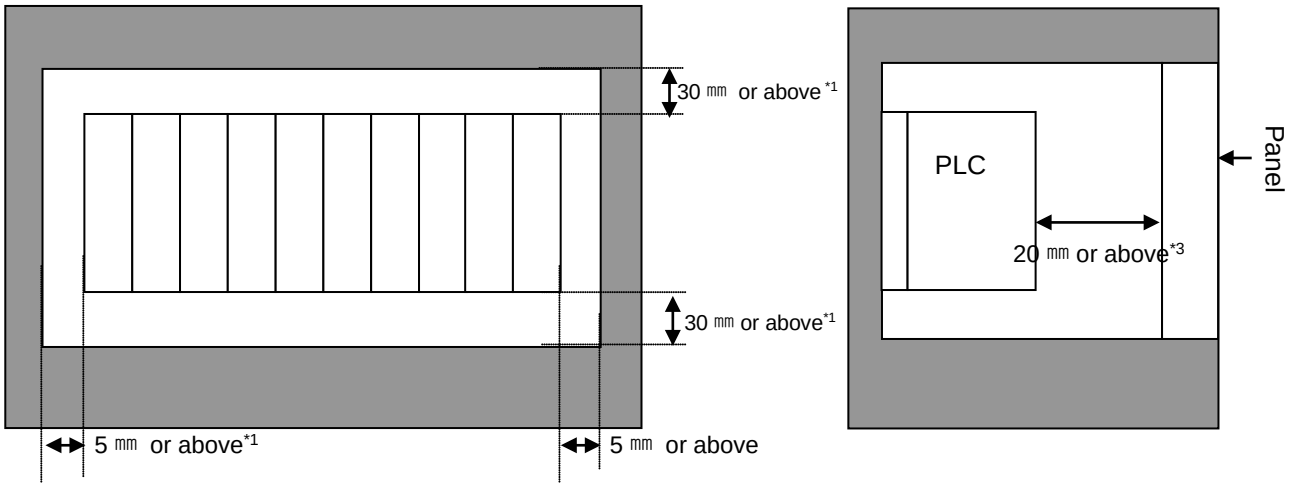
(b) When installing module at panel directly

- XGB compact type main unit can be installed at panel directly through screw hole.
- When installing module at panel, use M4 type screw.



(4) Module equipment location

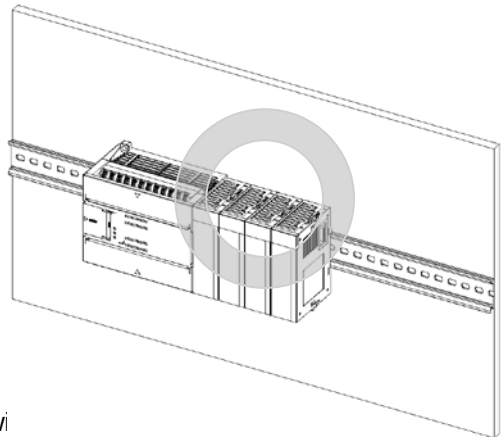
Keep the following distance between module and structure or part for well ventilation and easy detachment and attachment.



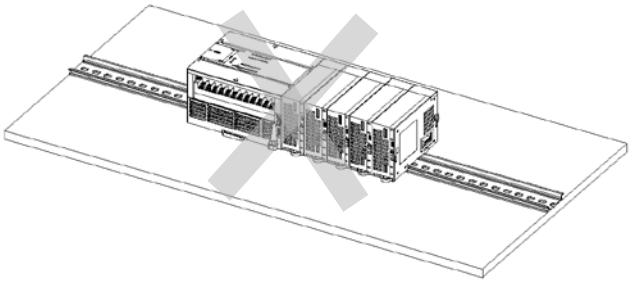
*1 : In case height of wiring duct is less than 50 mm (except this 40mm or above)
*2 : In case of equipping cable without removing near module, 20mm or above
*3 : In case of connector type, 80mm or above

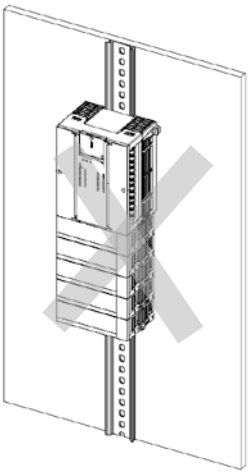
(5) Module equipment direction

(a) For easy ventilation, install like the following figure.



(b) Don't install like the followi



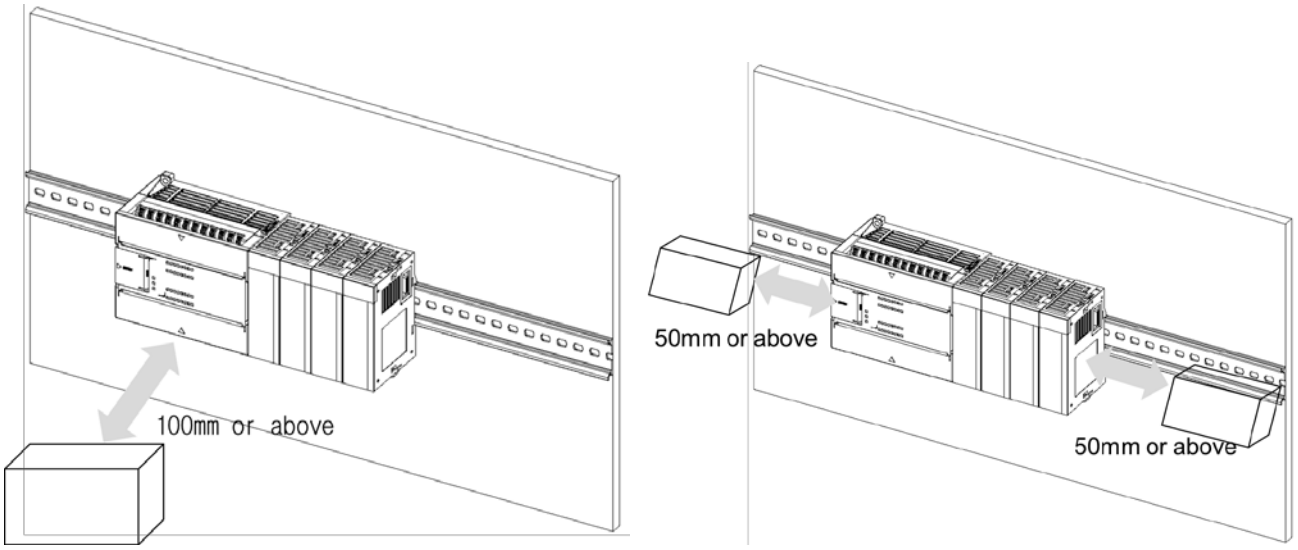


(6) Distance with other device

To avoid radiation noise or heat, keep the distance between PLC and device (connector and relay) as far as the following figure.

Device installed in front of PLC: 100 ㎜ or above

Device installed beside PLC: 50 ㎜ or above



9.2.2 Caution in handling

Here describes caution from open to install

- Don't drop or impact product.
- Don't disassemble the PCB from case. It may cause the error.
- In case of wiring, make sure foreign substance not to enter upper part of module. If it enters, eliminate it.

(1) Caution in handling IO module

It describes caution in handling IO module.

(a) Recheck of IO module specification

For input module, be cautious about input voltage, for output module, if voltage that exceeds the max. open/close voltage is induced, it may cause the malfunction, breakdown or fire.

(b) Used wire

When selecting wire, consider ambient temp, allowed current and minimum size of wire is AWG22(0.3mm^2) or above.

(c) Environment

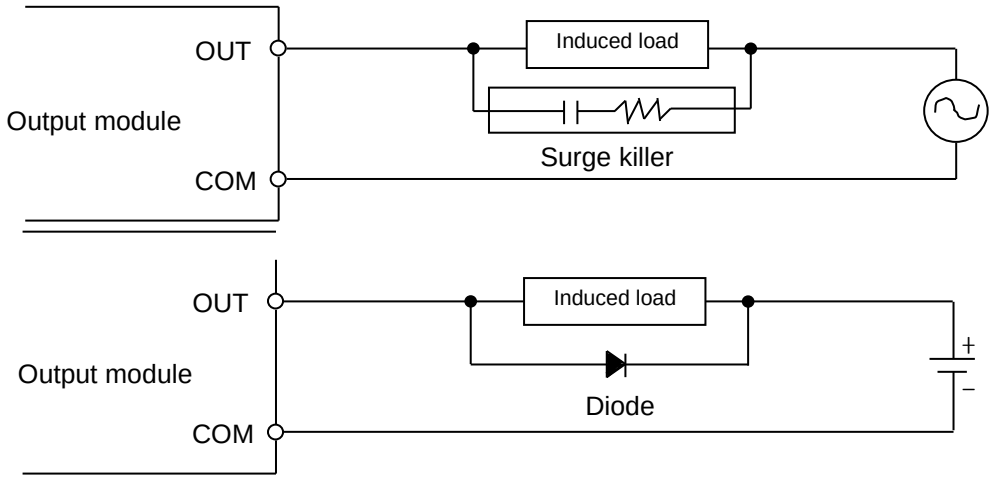
In case of wiring IO module, if device or material that induce high heat is too close or oil contacts wire too long time, it may cause short, malfunction or error.

(d) Polarity

Before supplying power of module which has terminal block, check the polarity.

(e) Wiring

- In case of wiring IO with high voltage line or power line, induced obstacle may cause error.
- Let no cable pass the IO operation indication part (LED).
  (You can't discriminate the IO indication.)
- In case induced load is connected with output module, connect the surge killer or diode load to load in parallel. Connect cathode of diode to + side of power.



(f) Terminal block

Check close adhesion status. Let no foreign material of wire enter into PLC when wring terminal block or processing screw hole. At this case, it may cause malfunction.

(g) Don't impact to IO module or don't disassemble the PCB from case.

9.3 Wire

In case using system, it describes caution about wiring.

⚠ Danger

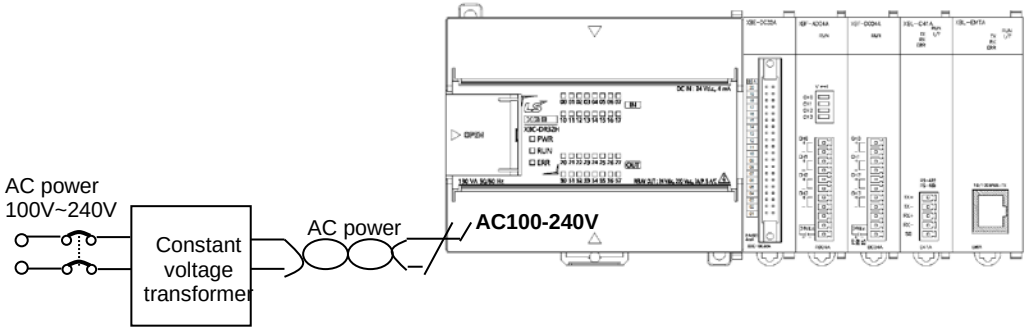
- When wiring, cut off the external power.
- If all power is cut, it may cause electric shock or damage of product.
- In case of flowing electric or testing after wiring, equip terminal cover included in product. It not, it may cause electric shock.

⚠ Caution

- Do D type ground (type 3 ground) or above dedicated for PLC for FG and LG terminal. It may cause electric shock or malfunction.
- When wiring module, check the rated voltage and terminal array and do properly.
  If rating is different, it may cause fire, malfunction.
- For external connecting connector, use designated device and solder.
  If connecting is not safe, it may cause short, fire, malfunction.
- For screwing, use designated torque range. If it is not fit, it may cause short, fire, malfunction.
- Let no foreign material enter such as garbage or disconnection part into module. It may cause fire, malfunction, error.

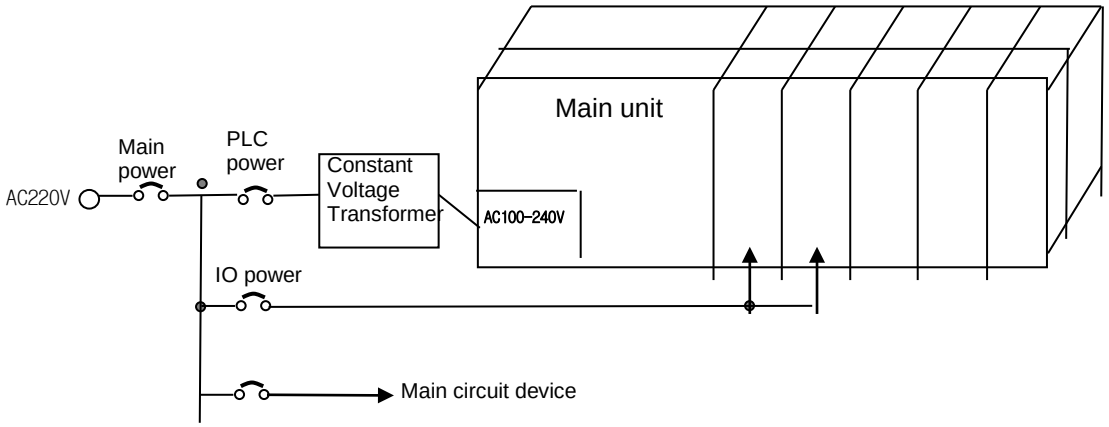
9.3.1Power wiring

(1) In case voltage regulation is larger than specified, connect constant voltage transformer.



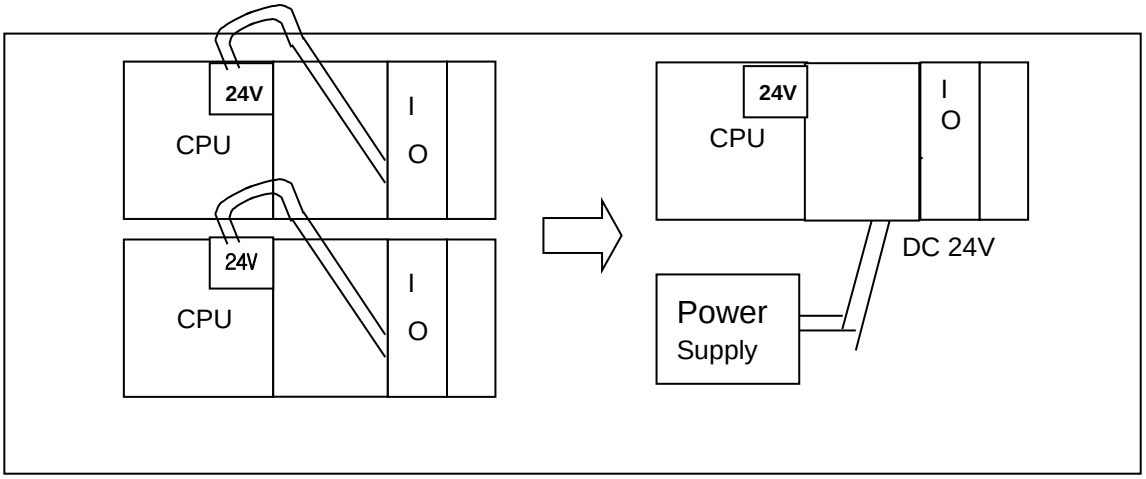
(2) Connect noise that include small noise between line and earth.
(When there are many noise, connect insulated transformer.)

(3) Isolate the PLC power, I/O devices and power devices as follows.



(4) If using DC24V of the power module

(a) Do not connect DC24V of several power modules in parallel. It may cause the destruction of a module.
(b) If a power module can not meet the DC24V output capacity, supply DC24V externally as presented below.

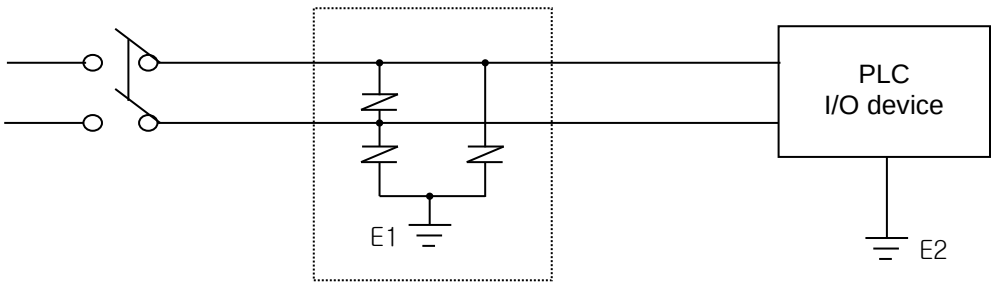


(5) AC110V/AC220V/DC24V cables should be compactly twisted and connected in the shortest distance.

(6) AC110V/AC220V cable should be as thick as possible(2mm^2) to reduce voltage drop.

(7) AC110V/ DC24V cables should not be installed close to main circuit cable(high voltage/high current) and I/O signal cable. They should be 100mm away from such cables

(8) To prevent surge from lightning, use the lightning surge absorber as presented below.



Surge absorber to prevent

Note

(1) Isolate the grounding(E1) of lightning surge absorber from the grounding(E2) of the PLC.
(2) Select a lightning surge absorber type so that the max. voltage may not the specified allowable voltage of the absorber.

(9) When noise may be intruded inside it, use an insulated shielding transformer or noise filter.

(10) Wiring of each input power should be twisted as short as possible and the wiring of shielding transformer or noise filter should not be arranged via a duct.

(11) All field-wiring connections to this unit shall be from Limited Voltage / Limited Current, below 24Vdc isolated secondary source with an output fused with a 4A fuse max. or class 2 secondary circuits as defined in UL 508, 17th Edition.

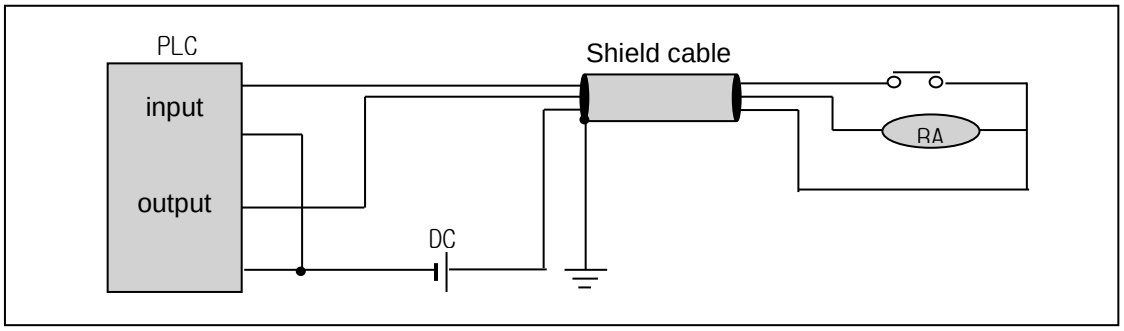
9.3.2 I/O Device wiring

(1) The size of I/O device cable is limited to 0.3~2 mm^2 but it is recommended to select a size(0.3 mm^2) to use conveniently.

(2) Please isolate input signal line from output signal line.

(3) I/O signal lines should be wired 100mm and more away from high voltage/high current main circuit cable.

(4) Batch shield cable should be used and the PLC side should be grounded unless the main circuit cable and power cable can not be isolated.



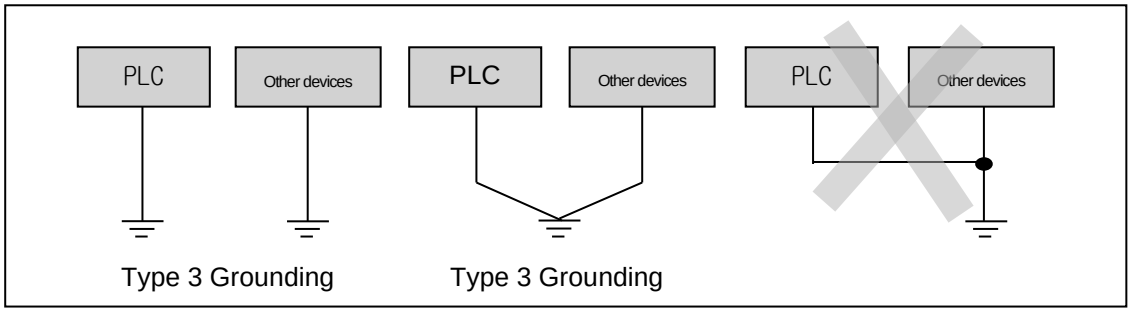
(5) When applying pipe-wiring, make sure to firmly ground the piping.

9.3.3 Grounding wiring

(1) The PLC contains a proper noise measure, so it can be used without any separate grounding if there is a large noise. However, if grounding is required, please refer to the followings.

(2) For grounding, please make sure to use the exclusive grounding.
For grounding construction, apply type 3 grounding(grounding resistance lower than 100 Ω)

(3) If the exclusive grounding is not possible, use the common grounding as presented in B) of the figure below.



A) Exclusive grounding : best B) common grounding : good C) common grounding: defective

(4) Use the grounding cable more than 2 mm^2. To shorten the length of the grounding cable, place the grounding point as close to the PLC as possible.

(5) If any malfunction from grounding is detected, separate the FG of the base from the grounding.

9.3.4 Specifications of wiring cable

The specifications of cable used for wiring are as follows.

Types of external connection	Cable specification (mm^2)		Wire Type	Temperature rating
	Lower limit	Upper limit		
Digital input	0.18 (AWG24)	1.5 (AWG16)	Cu	60℃/75℃
Digital output	0.18 (AWG24)	2.0 (AWG14)		
Analogue I/O	0.18 (AWG24)	1.5 (AWG16)		
Communication	0.18 (AWG24)	1.5 (AWG16)		
Main power	1.5 (AWG16)	2.5 (AWG12)		
Protective grounding	1.5 (AWG16)	2.5 (AWG12)		

Chapter 10 Maintenance

Be sure to perform daily and periodic maintenance and inspection in order to maintain the PLC in the best conditions.

10.1 Maintenance and Inspection

The I/O module mainly consist of semiconductor devices and its service life is semi-permanent. However, periodic inspection is requested for ambient environment may cause damage to the devices. When inspecting one or two times per six months, check the following items.

Check Items		Judgment	Corrective Actions
Change rate of input voltage		Within change rate of input voltage (Less than –15% to +20%)	Hold it with the allowable range.
Power supply for input/output		Input/Output specification of each module	Hold it with the allowable range of each module.
Ambient environment	Temperature	0 ~ + 55℃	Adjust the operating temperature and humidity with the defined range.
	Humidity	5 ~ 95%RH	
	Vibration	No vibration	Use vibration resisting rubber or the vibration prevention method.
Play of modules		No play allowed	Securely enrage the hook.
Connecting conditions of terminal screws		No loose allowed	Retighten terminal screws.
Spare parts		Check the number of Spare parts and their Store conditions	Cover the shortage and improve the conditions.

10.2 Daily Inspection

The following table shows the inspection and items which are to be checked daily.

Check Items		Check Points	Judgment	Corrective Actions
Connection conditions of Input/Output module		Check the connecting screws Check module cover.	Screws should not be loose.	Retighten Screws.
Connecting conditions of terminal block or extension cable		Check for loose mounting screws.	Screws should not be loose.	Retighten Screws.
		Check the distance between solderless terminals.	Proper clearance should be provided.	Correct.
		Connecting of expansion cable.	Connector should not be loose.	Correct.
LED indicator	PWR LED	Check that the LED is On.	On(Off indicates an error)	See chapter 5.
	Run LED	Check that the LED is On during Run.	On (flickering indicates an error)	See chapter 5.
	Input LED	Check that the LED turns On and Off.	On when input is On, Off when input is off.	See chapter 5.
	Output LED	Check that the LED turns On and Off	On when output is On, Off when output is off	See chapter 5.

10.3 Periodic Inspection

Check the following items once or twice every six months, and perform the needed corrective actions.

Check Items		Checking Methods	Judgment	Corrective Actions
Ambient environment	Ambient temperature	-. Measure with thermometer and hygrometer -. measure corrosive gas	0 ~ 55 °C	Adjust to general standard (Internal environmental standard of control section)
	Ambient Humidity		5 ~ 95%RH	
	Ambient pollution level		There should be no corrosive gases	
PLC Conditions	Looseness, Ingress	The module should be move the unit	The module should be mounted securely.	Retighten screws
	dust or foreign material	Visual check	No dust or foreign material	
Connecting conditions	Loose terminal screws	Re-tighten screws	Screws should not be loose	Retighten
	Distance between terminals	Visual check	Proper clearance	Correct
	Loose connectors	Visual check	Connectors should not be loose.	Retighten connector mounting screws
Line voltage check		Measure voltage between input terminals	AC100~240V:AC85~ 264V DC12/24V:DC9.5 ~ 30V	Change supply power

Chapter 11 Troubleshooting

The following explains contents, diagnosis and corrective actions for various errors that can occur during system operation.

11.1 Basic Procedure of Troubleshooting

System reliability not only depends on reliable equipment but also on short downtimes in the event of fault. The short discovery and corrective action is needed for speedy operation of system. The following shows the basic instructions for troubleshooting.

(1) Visual checks

Check the following points.

- Machine operating condition (in stop and operation status)
- Power On/Off
- Status of I/O devices
- Condition of wiring (I/O wires, extension and communications cables)
- Display states of various indicators (such as POWER LED, RUN LED, ERR LED and I/O LED)

After checking them, connect peripheral devices and check the operation status of the PLC and the program contents.

(2) Trouble Check

Observe any change in the error conditions during the following.

- Switch to the STOP position, and then turn the power on and off.

(3) Narrow down the possible causes of the trouble where the fault lies, i.e.:

- Inside or outside of the PLC ?
- I/O module or another module?
- PLC program?

11.2 Troubleshooting

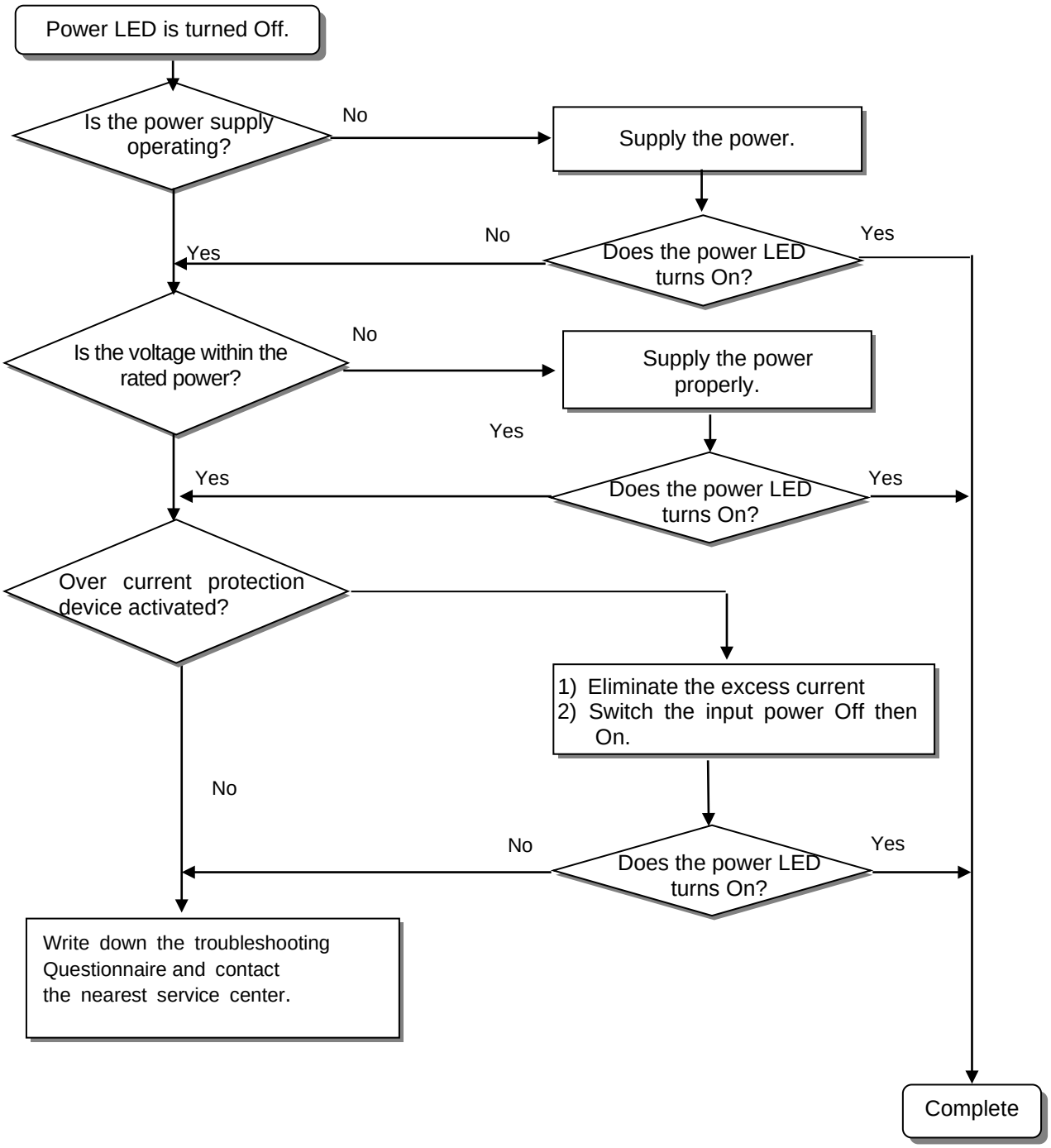
This section explains the procedure for determining the cause of troubles as well as the errors and corrective actions.

Symptoms

Is the power LED turned Off ?	Flowchart used when the POWER LED is turned Off.
Is the ERR LED flickering ?	Flowchart used when the ERR LED is flickering.
Are the RUN LED turned Off ?	Flowchart used when the RUN turned Off.
I/O module doesn't operate properly.	Flowchart used when the output load of the output module doesn't turn on.
Program cannot be written.	Flowchart used when a program can't be written to the PLC.

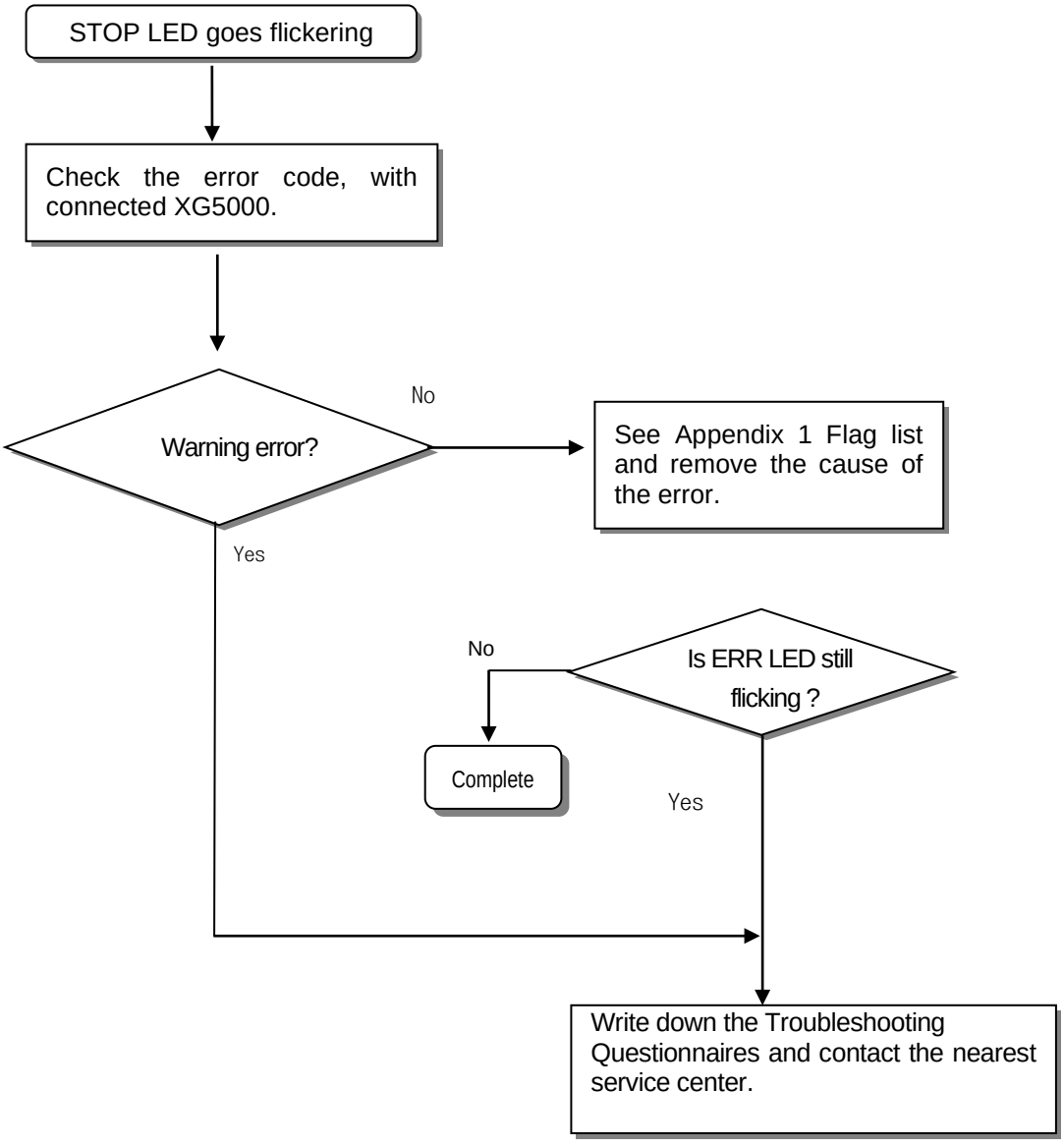
11.2.1 Troubleshooting flowchart used when the PWR (Power) LED turns Off.

The following flowchart explains corrective action procedure used when the power is supplied or the power LED turns Off during operation.



11.2.2 Troubleshooting flowchart used with when the ERR (Error) LED is flickering

The following flowchart explains corrective action procedure use when the power is supplied starts or t he ERR LED is flickering during operation.

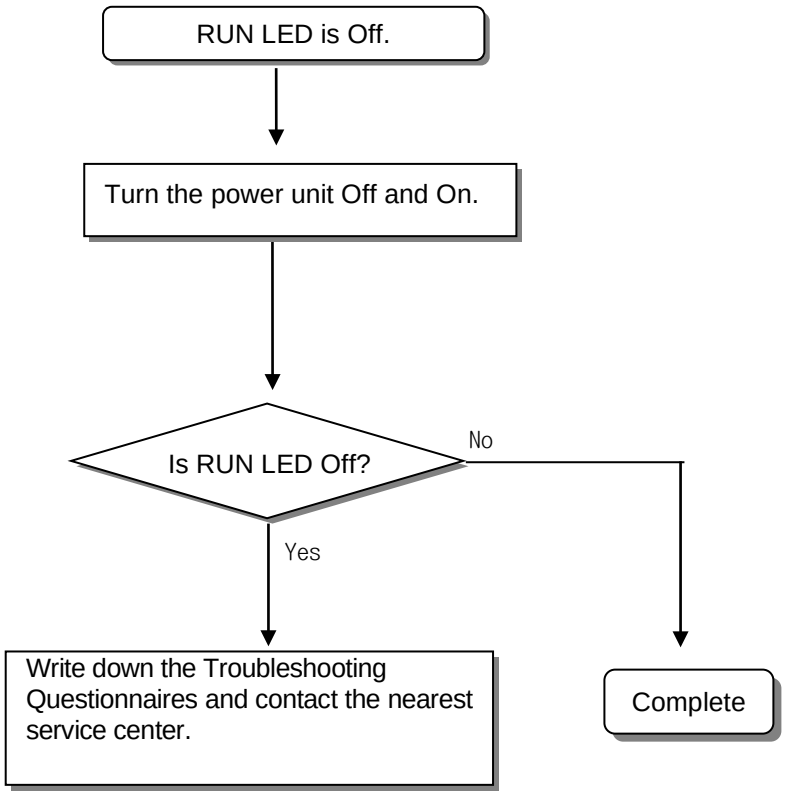


Warning

Though warning error appears, PLC system doesn't stop but corrective action is needed promptly. If not, it may cause the system failure.

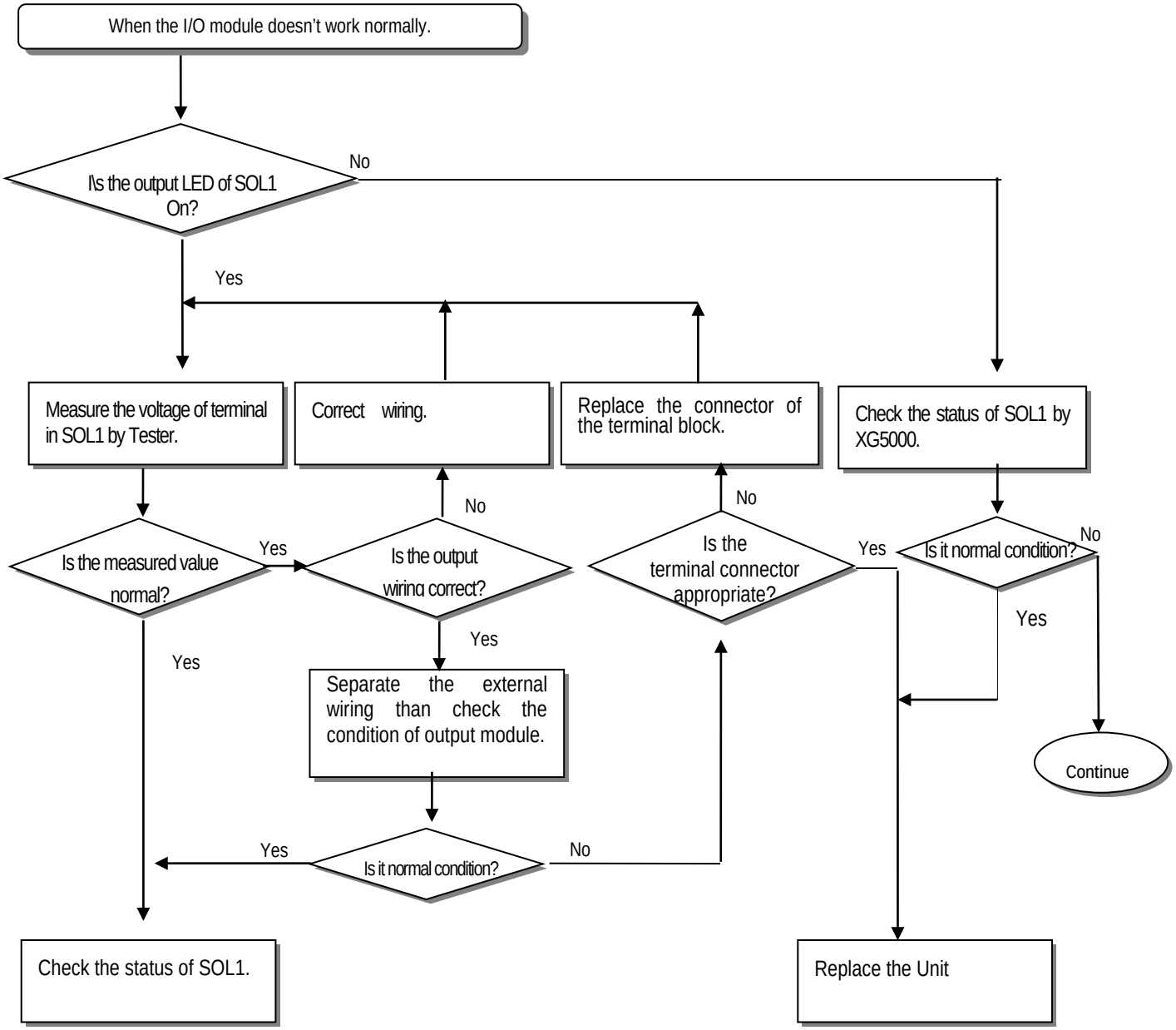
11.2.3 Troubleshooting flowchart used with when the RUN LED turns Off.

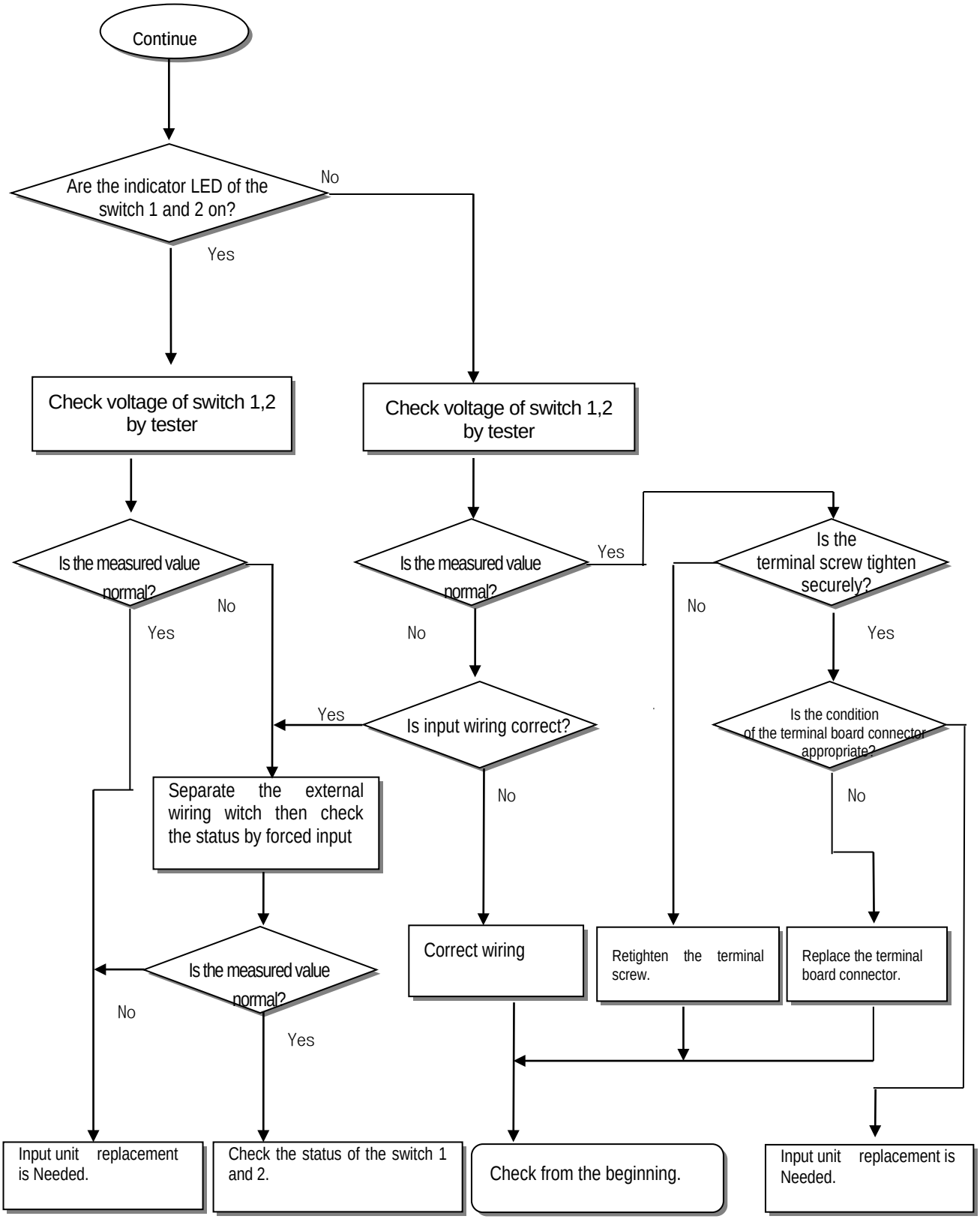
The following flowchart explains corrective action procedure to treat the lights-out of RUN LED when the power is supplied, operation starts or operation is in the process.



11.2.4 Troubleshooting flowchart used when the I/O part doesn't operate normally.

The following flowchart explains corrective action procedure used when the I/O module doesn't operate normally.




Continue
Are the indicator LED of the switch 1 and 2 on?
No
Yes
Check voltage of switch 1,2 by tester
Check voltage of switch 1,2 by tester
Is the measured value normal?
No
Yes
Is the measured value normal?
Yes
No
Is the terminal screw tighten securely?
No
Yes
Yes
Is input wiring correct?
Is the condition of the terminal board connector appropriate?
No
No
Separate the external wiring witch then check the status by forced input
Is the measured value normal?
No
Yes
Correct wiring
Retighten the terminal screw.
Replace the terminal board connector.
Input unit replacement is Needed.
Check the status of the switch 1 and 2.
Check from the beginning.
Input unit replacement is Needed.

11.3 Troubleshooting Questionnaire

When problems have been met during operation of the XGC series, please write down this Questionnaires and contact the service center via telephone or facsimile.
• For errors relating to special or communication modules, use the questionnaire included in the User's manual of the unit.

1. Telephone & FAX No
Tell) FAX)
2. Using equipment model:

3. Details of using equipment
CPU model: ( ) OS version No.:( ) Serial No.( )
XG5000 (for program compile) version No.: ( )

4.General description of the device or system used as the control object:

5. The kind of the base unit:
– Operation by the mode setting switch ( ),
– Operation by the XG5000 or communications ( ),
– External memory module operation ( ),

6. Is the ERR. LED of the CPU module turned On ? Yes( ), No( )

7. XG5000 error message:

8. History of corrective actions for the error message in the article 7:

9. Other tried corrective actions:

10. Characteristics of the error
• Repetitive( ): Periodic( ), Related to a particular sequence( ), Related to environment( )
• Sometimes( ): General error interval:

11. Detailed Description of error contents:

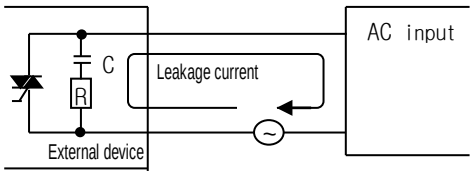
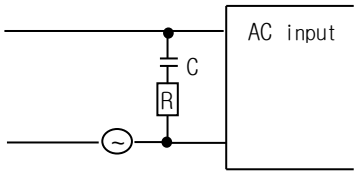
12. Configuration diagram for the applied system:

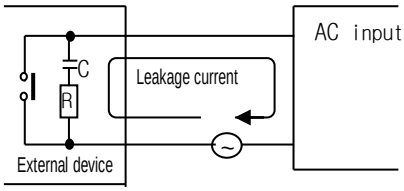
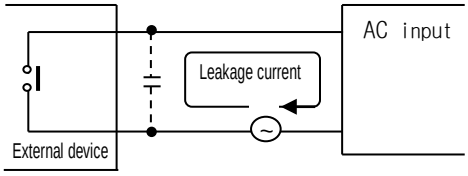
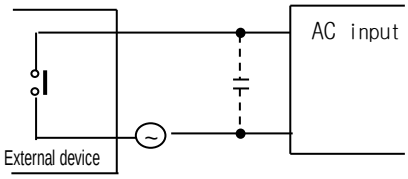
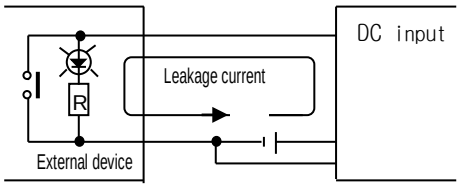
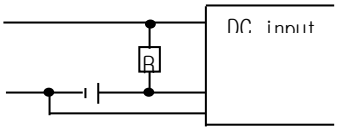
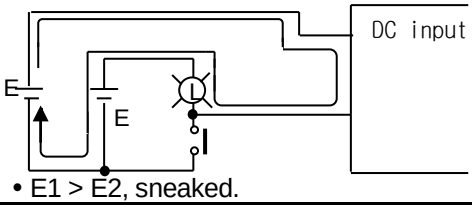
11.4 Troubleshooting Examples

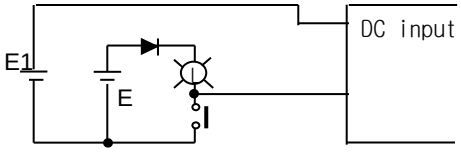
Possible troubles with various circuits and their corrective actions are explained.

11.4.1 Input circuit troubles and corrective actions

The followings describe possible troubles with input circuits, as well as corrective actions.

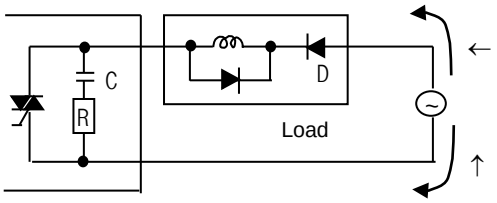
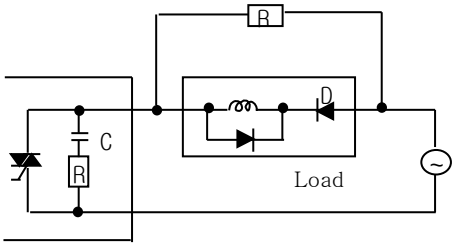
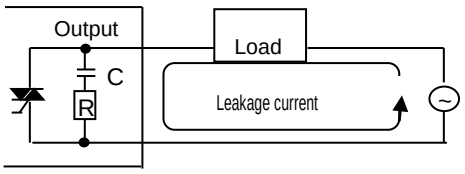
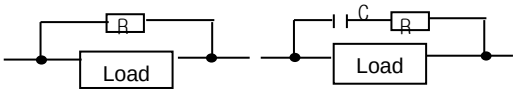
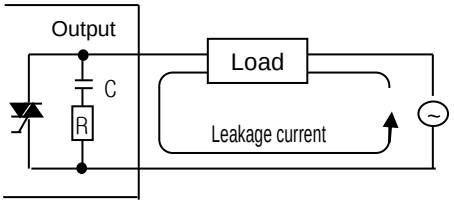
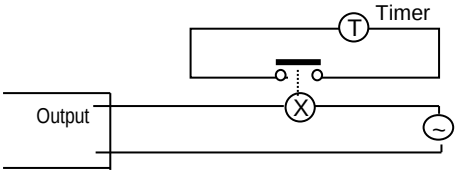
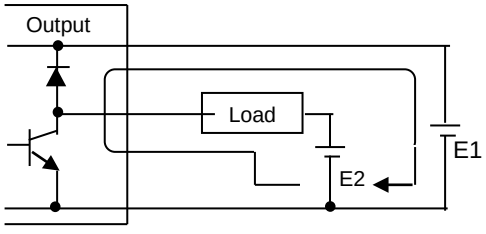
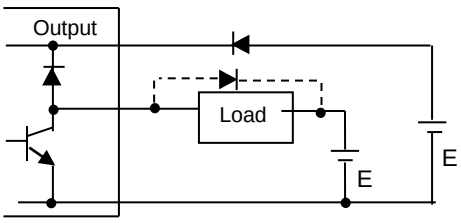
<table>
<tr><th>Condition</th><th>Cause</th><th>Corrective Actions</th></tr>
<tr><td>Input signal doesn't turn off.</td><td>Leakage current of external device
(Such as a drive by non-contact switch)
 
</td><td rowspan="2">• Connect an appropriate register and capacity, which will make the voltage lower across the terminals of the input module.
 

• CR values are determined by the leakage current value.
– Recommended value C : 0.1 ~ 0.47 ㎌
R: 47 ~ 120 Ω (1/2W)
Or make up another independent display circuit.</td></tr>
<tr><td>Input signal doesn't turn off.
(Neon lamp may be still on)</td><td>Leakage current of external device
(Drive by a limit switch with neon lamp)
 
</td></tr>
<tr><td>Input signal doesn't turn off.</td><td>Leakage current due to line capacity of wiring cable.
 
</td><td>• Locate the power supply on the external device side as shown below.
 
</td></tr>
<tr><td>Input signal doesn't turn off.</td><td>Leakage current of external device (Drive by switch with LED indicator)
 
</td><td>• Connect an appropriate register, which will make the voltage higher than the OFF voltage across the input module terminal and common terminal.
 
</td></tr>
<tr><td>Input signal doesn't turn off.</td><td>• Sneak current due to the use of two different power supplies.
 

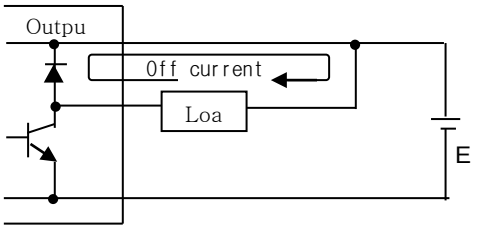
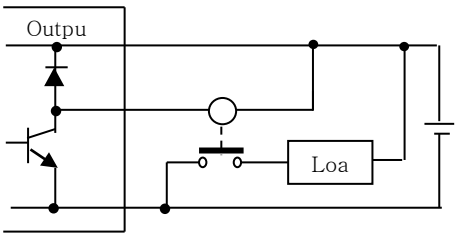
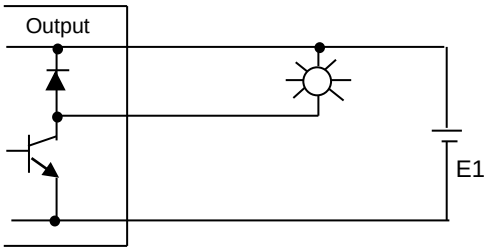
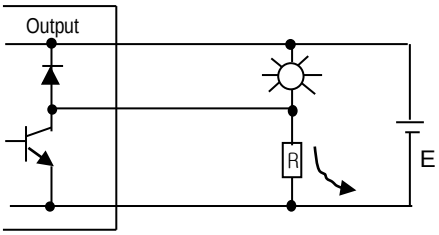
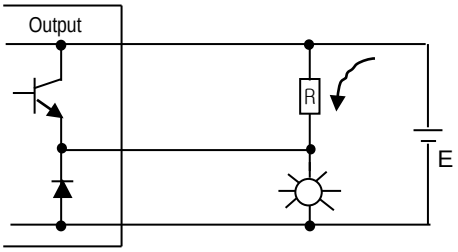
• E1 > E2, sneaked.</td><td>• Use only one power supply.
• Connect a sneak current prevention diode.
 
</td></tr>
</table>

11.4.2 Output circuit and corrective actions

The following describes possible troubles with output circuits, as well as their corrective actions.

Condition	Cause	Corrective Action
When the output is off, excessive voltage is applied to the load.	•Load is half-wave rectified inside (in some cases, it is true of a solenoid) •When the polarity of the power supply is as shown in ①, C is charged. When the polarity is as shown in ②, the voltage charged in C plus the line voltage are applied across D. Max. voltage is approx. 2√2.  *) If a resistor is used in this way, it does not pose a problem to the output element. But it may make the performance of the diode (D), which is built in the load, drop to cause problems.	• Connect registers of tens to hundreds KΩ across the load in parallel. 
The load doesn't turn off.	• Leakage current by surge absorbing circuit, which is connected to output element in parallel. 	• Connect C and R across the load, which are of registers of tens KΩ. When the wiring distance from the output module to the load is long, there may be a leakage current due to the line capacity. 
When the load is C-R type timer, time constant fluctuates.	• Leakage current by surge absorbing circuit, which is connected to output element in parallel. 	• Drive the relay using a contact and drive the C-R type timer using the since contact. • Use other timer than the C–R contact some timers have half-ware rectified internal circuits therefore, be cautious. 
The load does not turn off.	• Sneak current due to the use of two different power supplies.  E1<E2, sneaks. E1 is off (E2 is on), sneaks.	• Use only one power supply. • Connect a sneak current prevention diode.  If the load is the relay, etc, connect a counter-electromotive voltage absorbing code as shown by the dot line.

Output circuit troubles and corrective actions (continued).

Condition	Cause	Corrective actions
The load off response time is long.	• Over current at off state [The large solenoid current fluidic load (L/R is large) such as is directly driven with the transistor output.  • The off response time can be delayed by one or more second as some loads make the current flow across the diode at the off time of the transistor output.	• Insert a small L/R magnetic contact and drive the load using the same contact. 
Output transistor is destroyed.	Surge current of the white lamp  A surge current of 10 times or more when turned on.	• To suppress the surge current make the dark current of 1/3 to 1/5 rated current flow.  Sink type transistor output  Source type transistor output

11.5 Error Code List

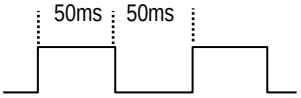
Error code	Error cause	Action (restart mode after taking an action)	Operation status	LED status	Diagnosis point
23	Program to execute is abnormal	Start after reloading the program	Warning	0.5 second Flicker	RUN mode
24	I/O parameter error	Start after reloading I/O parameter, Battery change if battery has a problem. Check the preservation status after I/O parameter reloading and if error occurs, change the unit.	Warning	0.5 second Flicker	Reset RUN mode switching
25	Basic parameter error	Start after reloading Basic parameter, Change battery if it has a problem. Check the preservation status after Basic parameter reloading and if error occurs, change the unit.	Warning	0.5 second Flicker	Reset RUN mode switching
30	Module set in parameter and the installed module does not match	modify the module or parameter and then restart.	Warning	0.5 second Flicker	RUN mode switching
31	Module falling during operation or additional setup	After checking the position of attachment/detachment of expansion module during Run mode	Warning	0.1 second Flicker	Every scan
33	Data of I/O module does not access normally during operation.	After checking the position of slot where the access error occurs by XG5000, change the module and restart (acc.to parameter.)	Heavy error	0.1 second Flicker	Scan end
34	Normal access of special/link module data during operation not available	After checking the position of slot that access error occurred by XG5000, change the module and restart (acc.to parameter).	Heavy error	0.1 second Flicker	Scan end
39	Abnormal stop of CPU or malfunction	Abnormal system end by noise or hard ware error. 1) If it occurs repeatedly when power reinput, request service center 2) Noise measures	Heavy error	0.1 second Flicker	Ordinary time
40	Scan time of program during operation exceeds the scan watchdog time designated by parameter.	After checking the scan watchdog time designated by parameter, modify the parameter or the program and then restart.	Warning	0.5 second Flicker	While running the program
41	Operation error occurs while running the user program.	Remove operation error → reload the program and restart.	Warning	0.5 second Flicker	While running the program
44	Timer index user error	After reloading a timer index program modification, start	Warning	0.5 second Flicker	Scan end
50	Heavy error of external device	Refer to Heavy error detection flag and modifies the device and restart. (Acc. Parameter)	Heavy error	1 second Flicker	Scan end
60	E_STOP function executed	After removing error causes which starts E_STOP function in program, power reinput	Heavy error	1 second Flicker	While running the program

Error code	Error cause	Action (restart mode after taking an action)	Operation status	LED status	Diagnosis point
500	Data memory backup not possible	If not error in battery, power reinput Remote mode is switched to STOP mode.	Warning	1 second Flicker	Reset
501	Abnormal clock data	Setting the time by XG5000 if there is no error	Warning	0.1 second Flicker	Ordinary time
502	Battery voltage falling	Battery change at power On status	Warning	0.1 second Flicker	Ordinary time

Appendix 1 Flag List

Appendix 1.1 Special Relay (F) List

Word	Bit	Variables	Function	Description
%FW0~1	%FD0	_SYS_STATE	Mode and state	Indicates PLC mode and operation State.
	%FX0	_RUN	Run	Run state.
	%FX1	_STOP	Stop	Stop state.
	%FX2	_ERROR	Error	Error state.
	%FX3	_DEBUG	Debug	Debug state.
	%FX4	_LOCAL_CON	Local control	Local control mode.
	%FX6	_REMOTE_CON	Remote mode	Remote control mode.
	%FX8	_RUN_EDIT_ST	Online editing	Editing program download during RUN.
	%FX9	_RUN_EDIT_CHK		Internal edit processing during RUN.
	%FX10	_RUN_EDIT_DONE		Edit is done during RUN.
	%FX11	_RUN_EDIT_NG		Edit is ended abnormally during RUN.
	%FX12	_CMOD_KEY	Change Operation Mode	Operation mode changed by key.
	%FX13	_CMOD_LPADT		Operation mode changed by local PADT.
	%FX14	_CMOD_RPADT		Operation mode changed by Remote PADT.
	%FX15	_CMOD_RLINK		Operation mode changed by Remote communication module.
	%FX16	_FORCE_IN	Forced input	Forced input state.
	%FX17	_FORCE_OUT	Forced output	Forced output state.
	%FX20	_MON_On	Monitor	Monitor on execution.
	%FX21	_USTOP_On	Stop by STOP function	PLC stops by STOP function after finishing current scan
	%FX22	_ESTOP_On	Stop by Estop function	PLC stops by ESTOP function promptly
	%FX24	_INIT_RUN	Initialize	Initialization task on execution.
	%FX28	_PB1	Program Code 1	Program Code 1 selected.
	%FX29	_PB2	Program Code 2	Program Code 2 selected.
	%FX30	_CB1	Compile Code 1	Compile Code 1 selected.
	%FX31	_CB2	Compile Code2	Compile Code 2 selected.
%FW2~3	%FD1	_CNF_ER	System error	Reports heavy error state of system.
	%FX33	_IO_TYER	Module Type error	Module Type does not match.
	%FX34	_IO_DEER	Module detachment error	Module is detached.
	%FX36	_IO_RWER	Module I/O error	Module I/O error.
	%FX37	_IP_IFER	Module interface error	Special/communication module interface error.
	%FX38	_ANNUM_ER	External device error	Detected heavy error in external Device.

Word	Bit	Variable	Function	Description
%FW2~3	%FX40	_BPRM_ER	Basic parameter	Basic parameter error.
	%FX41	_IOPRM_ER	IO parameter	I/O configuration parameter error.
	%FX42	_SPPRM_ER	Special module parameter	Special module parameter is Abnormal.
	%FX43	_CPPRM_ER	Communication module parameter	Communication module parameter is abnormal.
	%FX44	_PGM_ER	Program error	There is error in Check Sum of user program
	%FX45	_CODE_ER	Program code error	Meets instruction can not be interpreted
	%FX46	_SWDT_ER	CPU abnormal stop Or malfunction	The saved program is damaged because of CPU abnormal end or program can not be executed.
	%FX48	_WDT_ER	Scan watchdog	Scan watchdog operated.
%FW4	%FD2	_CNF_WAR	System warning	Reports light error state of system.
	%FX64	_RTC_ER	RTC data error	RTC data Error occurred
	%FX65	_DBCK_ER	Backup error	Data backup error.
	%FX66	_HBCK_ER	Restart error	Hot Restart is not available
	%FX67	_ABSD_ER	Operation shutdown error	Stop by abnormal operation.
	%FX68	_TASK_ER	Task collision	Tasks are under collision
	%FX69	_BAT_ER	Battery error	There is error in battery status
	%FX70	_ANNUM_WAR	External device error	Detected light error of external device.
	%FX72	_HS_WAR1	High speed link 1	High speed link – parameter 1 error.
	%FX73	_HS_WAR2	High speed link 2	High speed link – parameter 2 error.
	%FX84	_P2P_WAR1	P2P parameter 1	P2P – parameter 1 error.
	%FX85	_P2P_WAR2	P2P parameter 2	P2P – parameter 2 error.
	%FX86	_P2P_WAR3	P2P parameter 3	P2P – parameter 3 error.
	%FX92	_CONSTANT_ER	Constant error	Constant error.
%FW9	%FW9	_USER_F	User contact	Timer used by user.
	%FX144	_T20MS	20ms	As a clock signal available at user program, it reverses On/Off every half period. Since clock signal is dealt with at the end of scan, there may be delay or distortion according to scan time. So use clock that's longer than scan time. Clock signal is Off status at the start of scan program and task program. _T100ms clock 
	%FX145	_T100MS	100ms	
	%FX146	_T200MS	200ms	
	%FX147	_T1S	1s Clock	
	%FX148	_T2S	2 s Clock	
	%FX149	_T10S	10 s Clock	
	%FX150	_T20S	20 s Clock	
	%FX151	_T60S	60 s Clock	
	%FX153	_On	Ordinary time On	Always On state Bit.
	%FX154	_Off	Ordinary time Off	Always Off state Bit.
	%FX155	_1On	1scan On	First scan On Bit.
	%FX156	_1Off	1scan Off	First scan OFF bit.
	%FX157	_STOG	Reversal	Reversal every scan.

Appendix 1. Flag List

Word	Bit	Variable	Function	Description
%FW10	%FW10	_USER_CLK	User Clock	Clock available for user setting.
	%FX160	_USR_CLK0	Setting scan repeat	On/Off as much as set scan Clock 0.
	%FX161	_USR_CLK1	Setting scan repeat	On/Off as much as set scan Clock 1.
	%FX162	_USR_CLK2	Setting scan repeat	On/Off as much as set scan Clock 2.
	%FX163	_USR_CLK3	Setting scan repeat	On/Off as much as set scan Clock 3.
	%FX164	_USR_CLK4	Setting scan repeat	On/Off as much as set scan Clock 4.
	%FX165	_USR_CLK5	Setting scan repeat	On/Off as much as set scan Clock 5.
	%FX166	_USR_CLK6	Setting scan repeat	On/Off as much as set scan Clock 6.
	%FX167	_USR_CLK7	Setting scan repeat	On/Off as much as set scan Clock 7.
%FW11	%FW11	_LOGIC_RESULT	Logic result	Indicates logic results.
	%FX176	_ERR	operation error	On during 1 scan in case of operation error.
	%FX181	_LER	Operation error latch	Continuously On in case of operation error
%FW14	-	_FALS_NUM	FALS no.	Indicates FALS no.
%FW15	-	_PUTGET_ERR0	PUT/GET error 0	Main base Put / Get error.
%FW23	-	_PUTGET_NDR0	PUT/GET end 0	Main base Put/Get end.
%FW44	-	_CPU_TYPE	CPU Type	Indicates information for CPU Type.
%FW45	-	_CPU_VER	CPU version	Indicates CPU version.
%FD23	-	_OS_VER	OS version	Indicates OS version.
%FD24	-	_OS_DATE	OS date	Indicates OS distribution date.
%FW50	-	_SCAN_MAX	Max. scan time	Indicates max. scan time.
%FW51	-	_SCAN_MIN	Min. scan time	Indicates min. scan time.
%FW52	-	_SCAN_CUR	Current scan time	Current scan time.
%FW53	-	_MON_YEAR	Month/year	Clock data (month/year)
%FW54	-	_TIME_DAY	Hour/date	Clock data (hour/date)
%FW55	-	_SEC_MIN	Second/minute	Clock data (Second/minute)
%FW56	-	_HUND_WK	Hundred year/week	Clock data (Hundred year/week)
%FD30	-	_REF_COUNT	Refresh count	Increase when module Refresh.
%FD31	-	_REF_OK_CNT	Refresh OK	Increase when module Refresh is normal.
%FD32	-	_REF_NG_CNT	Refresh NG	Increase when module Refresh is Abnormal.
%FD33	-	_REF_LIM_CNT	Refresh Limit	Increase when module Refresh is abnormal (Time Out).
%FD34	-	_REF_ERR_CNT	Refresh Error	Increase when module Refresh is Abnormal.
%FD40	-	_BUF_FULL_CNT	Buffer Full	Increase when CPU internal buffer is full.
%FD41	-	_PUT_CNT	Put count	Increase when Put count.
%FD42	-	_GET_CNT	Get count	Increase when Get count.
%FD43	-	_KEY	Current key	indicates the current state of local key.
%FD44	-	_KEY_PREV	Previous key	indicates the previous state of local key

Word	Bit	Variable	Function	Description
%FW90	-	_IO_TYER_N	Mismatch slot	Module Type mismatched slot no.
%FW91	-	_IO_DEER_N	Detach slot	Module detached slot no.
%FW93	-	_IO_RWER_N	RW error slot	Module read/write error slot no.
%FW95	-	_IP_IFER_N	IF error slot	Module interface error slot no.
%FW96	-	_IO_TYER0	Module Type 0 error	Main base module Type error.
%FW104	-	_IO_DEER0	Module Detach 0 error	Main base module Detach error.
%FW120	-	_IO_RWER0	Module RW 0 error	Main base module read/write error.
%FW128	-	_IO_IFER_0	Module IF 0 error	Main base module interface error.
%FD69		_RTC_TOD	Current time of RTC (unit: ms)	As time data based on 00:00:00 within one day, unit is ms
%FD70	-	_AC_FAIL_CNT	Power shutdown times	Saves the times of power shutdown.
%FD71	-	_ERR_HIS_CNT	Error occur times	Saves the times of error occur.
%FD72	-	_MOD_HIS_CNT	Mode conversion times	Saves the times of mode conversion.
%FD73	-	_SYS_HIS_CNT	History occur times	Saves the times of system history.
%FD74	-	_LOG_ROTATE	Log Rotate	Saves log rotate information.
%FW150	-	_BASE_INFO0	Slot information 0	Main base slot information.
%FW158		_RBANK_NUM	Currently used block No.	Indicates currently used block no.
%FW159		_RBLOCK_STATE	Currently used block status	Indicates Currently used block status (Read/Write/Error)
%FD80		_RBLOCK_RD_FLAG	Read flash N block	When reading data of flash N block, Nth bit is on.
%FD81		_RBLOCK_WR_FLAG	Write flash N block	When writing data of flash N block, Nth bit is on.
%FD82		_RBLOCK_ER_FLAG	Flash N block error	When error occurs during flash N block service, Nth bit is on.
%FW200	-	_USER_WRITE_F	Available contact point	Contact point available in program.
	%FX3200	_RTC_WR	RTC RW	Data write and read in RTC.
	%FX3201	_SCAN_WR	Scan WR	Initializing the value of scan.
	%FX3202	_CHK_ANC_ERR	Request detection of external serious error	Request detection of external error.
	%FX3216	_CHK_ANC_WAR	Request detection of external slight error (warning)	Request detection of external slight error (warning).
%FW201	-	_USER_STAUS_F	User contact point	User contact point.
	%FX3216	_INIT_DONE	Initialization completed	Initialization complete displayed.
%FW202	-	_ANC_ERR	Display information of external serious error	Display information of external serious error
%FW203	-	_ANC_WAR	Display information of external slight error (warning)	Display information of external slight error (warning)
%FW210	-	_MON_YEAR_DT	Month/year	Clock data (month/year)
%FW211	-	_TIME_DAY_DT	Hour/date	Clock data (hour/date)
%FW212	-	_SEC_MIN_DT	Second/minute	Clock data (Second/minute)
%FW213	-	_HUND_WK_DT	Hundred year/week	Clock data (Hundred year/week)
%FW272	%FX4352	_ARY_IDX_ERR	Array –index- range exceeded- error flag	Error flag is indicated when exceeding the no. of array
%FW274	%FX4384	_ARY_IDX_LER	Array –index- range exceeded- latch-error flag	Error latch flag is indicated when exceeding the no. of array

Appendix 1.2 Communication Relay (L) List

Here describes data link communication relay(L).

(1) High-speed Link 1

Device	Keyword	Type	Description
%LX0	_HS1_RLINK	Bit	High speed link parameter 1 normal operation of all station
			Indicates normal operation of all station according to parameter set in High speed link, and On under the condition as below. 1. In case that all station set in parameter is RUN mode and no error, 2. All data block set in parameter is communicated normally, and 3. The parameter set in each station itself is communicated normally. Once RUN_LINK is On, it keeps On unless stopped by LINK_DISABLE.
%LX1	_HS1_LTRBL	Bit	Abnormal state after _HS1RLINK On
			In the state of _HSmRLINK flag On, if communication state of the station set in the parameter and data block is as follows, this flag shall be On. 1. In case that the station set in the parameter is not RUN mode, or 2. There is an error in the station set in the parameter, or 3. The communication state of data block set in the parameter is not good. LINK TROUBLE shall be On if the above 1, 2 & 3 conditions occur, and if the condition return to the normal state, it shall be OFF again.
%LX32 ~ %LX95	_HS1_STATE*** (*** = 000~063)	Bit Array	Indicates total status of High Speed Link no.1 ***th block
			Indicates total status of communication information about each data block of parameter _HS1_STATE*** = HS1MOD*** & _HS1TRX*** &(~_HS1_ERR***)
%LX96 ~ %LX159	_HS1_MOD*** (*** = 000~063)	Bit Array	RUN operation mode of High Speed Link parameter no.1 ***th block station
			Indicates operation mode of station set in *** data block of parameter
%LX160 ~ %LX223	_HS1_TRX*** (*** = 000~063)	Bit Array	Indicates normal communication with High Speed Link no.1 ***th block station
			Indicates whether communication status of *** data block of parameter is normal or not.
%LX224 ~ %LX287	_HS1_ERR*** (*** = 000~063)	Bit Array	Operation error mode of High Speed Link parameter no.1 ***th block station
			Indicates whether there is error at communication status of *** data block of parameter
%LX288 ~ %LX767	_HS1_SETBLOCK***	Bit Array	Indicates High Speed Link parameter no.1 ***th block setting
			Indicates whether *** data block of parameter is set or not.

(2) High-speed Link2

Device	Keyword	Type	Description
%LX416	_HS2_RLINK	Bit	High-speed link parameter 2 normal operation of all station.
			Indicates normal operation of all station according to parameter set in High-speed link and On under the condition as below. 1. In case that all station set in parameter is Run mode and no error 2. All data block set in parameter is communicated and 3.The parameter set in each station itself is communicated normally. Once RUN_LINK is On, it keeps On unless stopped by LINK_DISABLE.
%LX417	_HS2_LTRBL	Bit	Abnormal state after _HS2RLINK On.
			In the state of _HSmRLINK flag On, if communication state of the station set in the parameter and data block is as follows, this flag shall be On. 1. In case that the station set in the parameter is not RUN mode, or 2. There is an error in the station set in the parameter, or 3. The communication state of data block set in the parameter is not good. LINK TROUBLE shall be On if the above 1, 2 & 3 conditions occur, and if the condition return to the normal state, it shall be OFF again.
%LX448 ~ %LX511	_HS2_STATE*** (*** = 000~063)	Bit Array	Indicates total status of High Speed Link no.1 ***th block
			Indicates total status of communication information about each data block of parameter _HS2_STATE*** = HS2MOD***&_HS2TRX***&(~_HS2_ERR***)
%LX512 ~ %LX575	_HS2_MOD*** (*** = 000~063)	Bit Array	RUN operation mode of High Speed Link parameter no.1 ***th block station
			Indicates operation mode of station set in *** data block of parameter
%LX576 ~ %LX639	_HS2_TRX*** (*** = 000~063)	Bit Array	Indicates normal communication with High Speed Link no.1 ***th block station
			Indicates whether communication status of *** data block of parameter is normal or not.
%LX640 ~ %LX703	_HS2_ERR*** (*** = 000~063)	Bit Array	Operation error mode of High Speed Link parameter no.1 ***th block station
			Indicates whether there is error at communication status of *** data block of parameter
%LX704 ~ %LX767	_HS2_SETBLOCK***	Bit Array	Indicates High Speed Link parameter no.1 ***th block setting
			Indicates whether *** data block of parameter is set or not.

(3) Common area

Communication flag list according to P2P service setting.
P2P parameter: 1~3, P2P block: 0~31

Device	Keyword	Type	Description
%LX8192	_P2P1_NDR00	Bit	Indicates P2P parameter 1, 0 Block service normal end.
%LX8193	_P2P1_ERR00	Bit	Indicates P2P parameter 1, 0 Block service abnormal end.
%LW513	_P2P1_STATUS00	Word	Indicates error code in case of P2P parameter 1, 0 Block service abnormal end.
%LD257	_P2P1_SVCCNT00	DWord	Indicates P2P parameter 1, 0 Block service normal count.
%LD261	_P2P1_ERRCNT00	DWord	Indicates P2P parameter 1, 0 Block service abnormal count.
%LX8288	_P2P1_NDR01	Bit	P2P parameter 1, 1 Block service normal end.
%LX8289	_P2P1_ERR01	Bit	P2P parameter 1, 1 Block service abnormal end.
%LW519	_P2P1_STATUS01	Word	Indicates error code in case of P2P parameter 1, 1 Block service abnormal end.
%LD260	_P2P1_SVCCNT01	DWord	Indicates P2P parameter 1, 1 Block service normal count.
%LD264	_P2P1_ERRCNT01	DWord	Indicates P2P parameter 1, 1 Block service abnormal count.
%LW524~%LW529	-	Word	P2P parameter 1,2 Block service total.
%LW530~%LW535	-	Word	P2P parameter 1,3 Block service total.
%LW536~%LW697	-	Word	P2P parameter 1,4~30 Block service total.
%LW698~%LW703	-	Word	P2P parameter 1,31 Block service total.

Appendix 1.3 Network Register (N) List

Here describes Network Register for communication (N). P2P parameter: 1~3, P2P block: 0~31

Device	Keyword	Type	Description
%NW000	_P1B00SN	Word	Saves another station no. of P2P parameter 1, 00 block.
%NW0000~0004	_P1B00RD1	Word	Saves area device 1 to read P2P parameter 1, 01 block.
%NW005	_P1B00RS1	Word	Saves area size 1 to read P2P parameter 1, 01 block.
%NW0006~0009	_P1B00RD2	Word	Saves area device 2 to read P2P parameter 1, 01 block.
%NW010	_P1B00RS2	Word	Saves area size 2 to read P2P parameter 1, 01 block.
%NW0011~0014	_P1B00RD3	Word	Saves area device 3 to read P2P parameter 1, 01 block.
%NW015	_P1B00RS3	Word	Saves area size 3 to read P2P parameter 1, 01 block.
%NW0016~0019	_P1B00RD4	Word	Saves area device 4 to read P2P parameter 1, 01 block.
%NW020	_P1B00RS4	Word	Saves area size 4 to read P2P parameter 1, 01 block.
%NW0021~0024	_P1B00WD1	Word	Saves area device 1 to save P2P parameter 1, 01 block.
%NW025	_P1B00WS1	Word	Saves area size 1 to save P2P parameter 1, 01 block.
%NW0026~0029	_P1B00WD2	Word	Saves area device 2 to save P2P parameter 1, 01 block.
%NW030	_P1B00WS2	Word	Saves area size 2 to save P2P parameter 1, 01 block.
%NW0031~0034	_P1B00WD3	Word	Saves area device 3 to save P2P parameter 1, 01 block.
%NW035	_P1B00WS3	Word	Saves area size 3 to save P2P parameter 1, 01 block.
%NW0036~0039	_P1B00WD4	Word	Saves area device 4 to save P2P parameter 1, 01 block.
%NW040	_P1B00WS4	Word	Saves area size 4 to save P2P parameter 1, 01 block.
%NW0041~0081	-	Word	Saving area of P2P parameter 1, 01 block.
%NW0082~0122	-	Word	Saving area of P2P parameter 1, 02 block. P2P
%NW0123~1311	-	Word	Saving area of P2P parameter 1, 03~31 block.
%NW1312~2623	-	Word	Saving area of P2P parameter 2.
%NW2624~3935	-	Word	Saving area of P2P parameter 3.

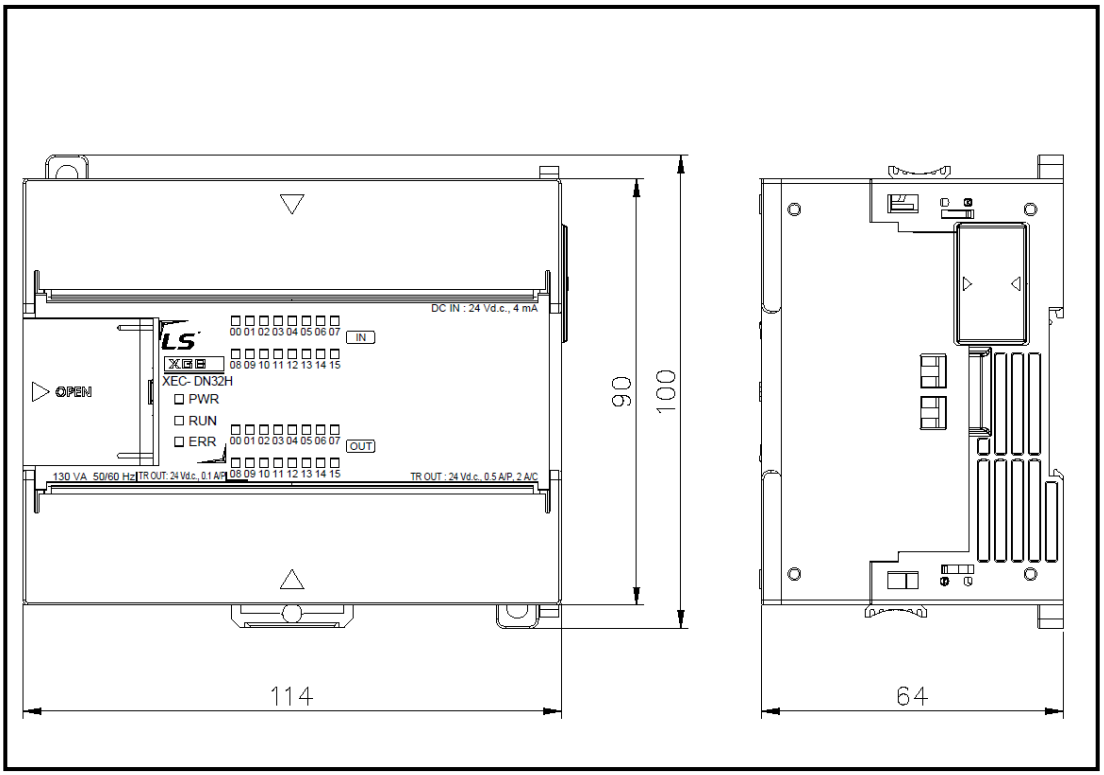
Remark

❑ In XGB series, Network register is available only monitoring. (Read Only)

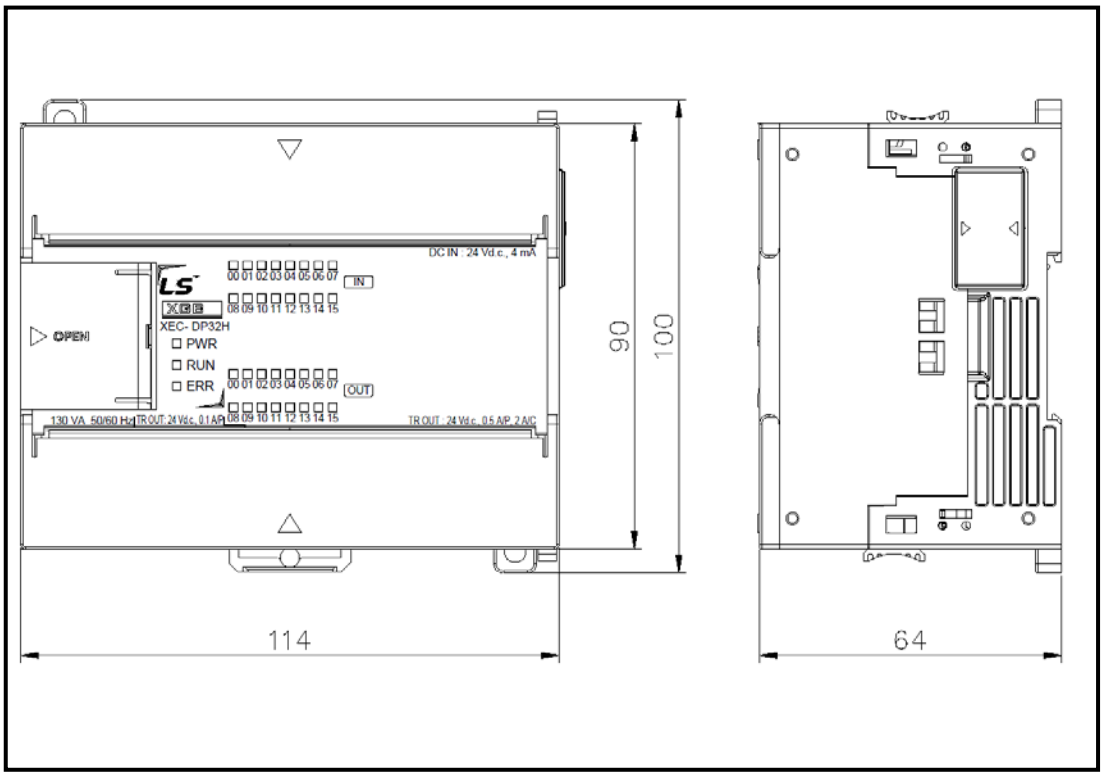
Appendix 2 Dimension (Unit: mm)

(1) Compact type main unit (IEC language)

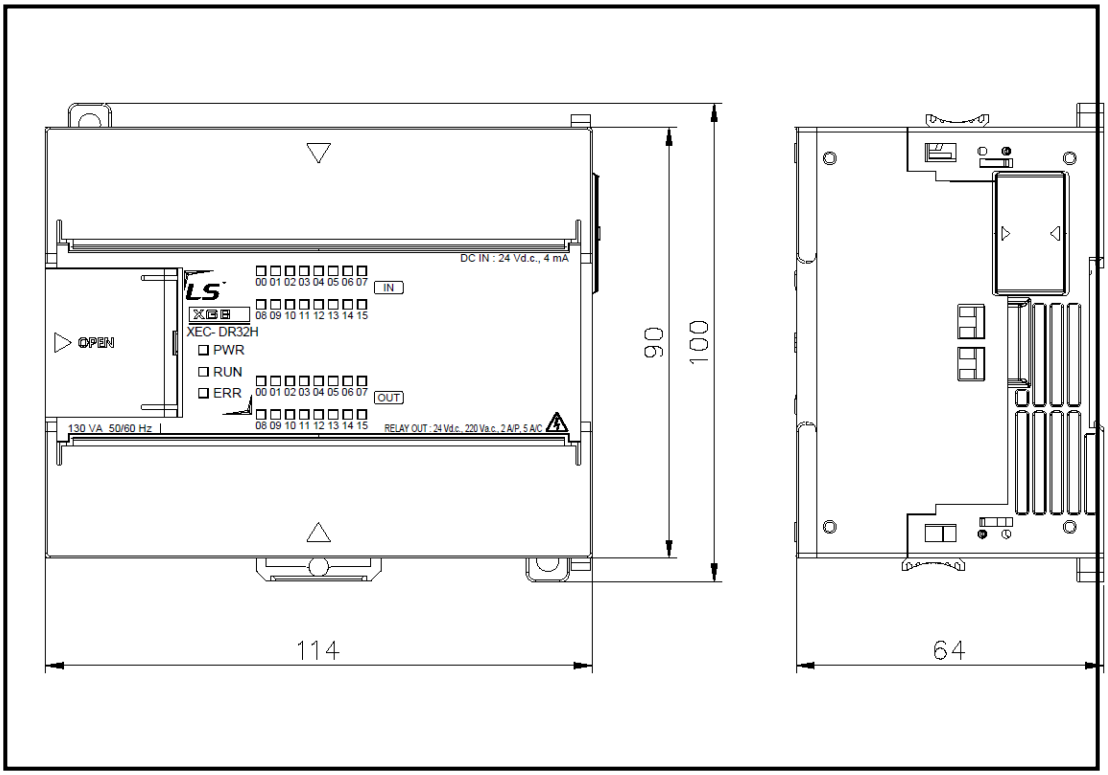
-. XEC-DN32H(/DC)



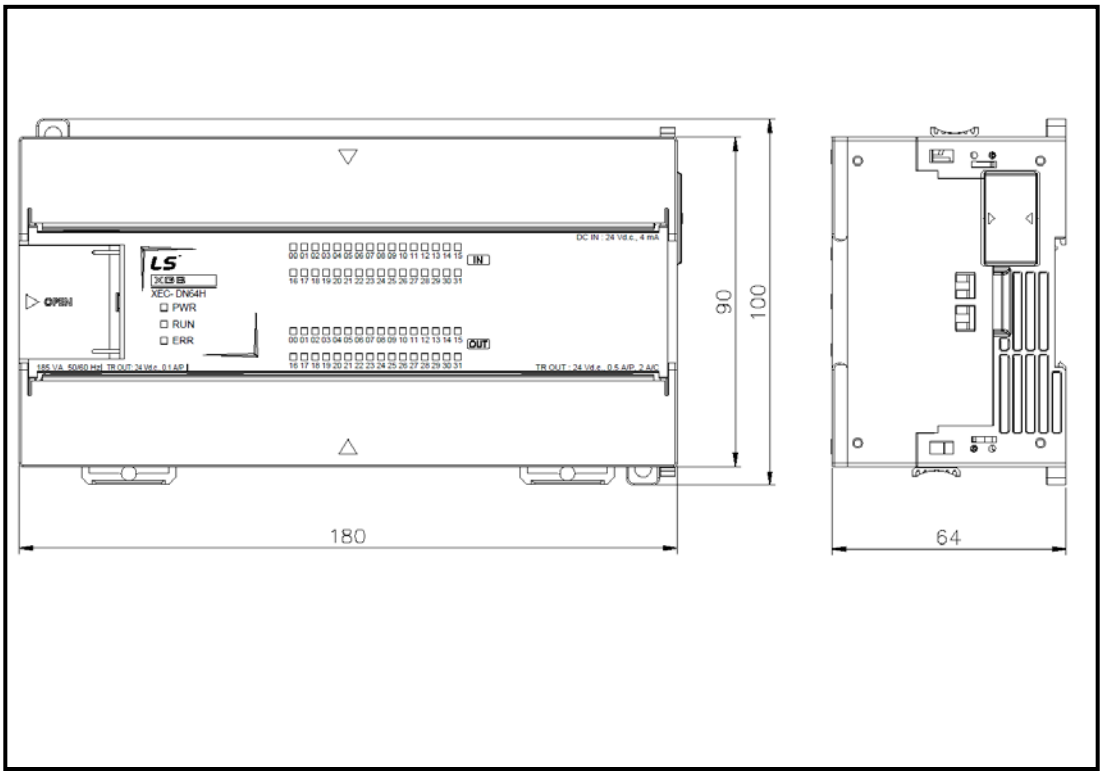
-. XEC-DP32H



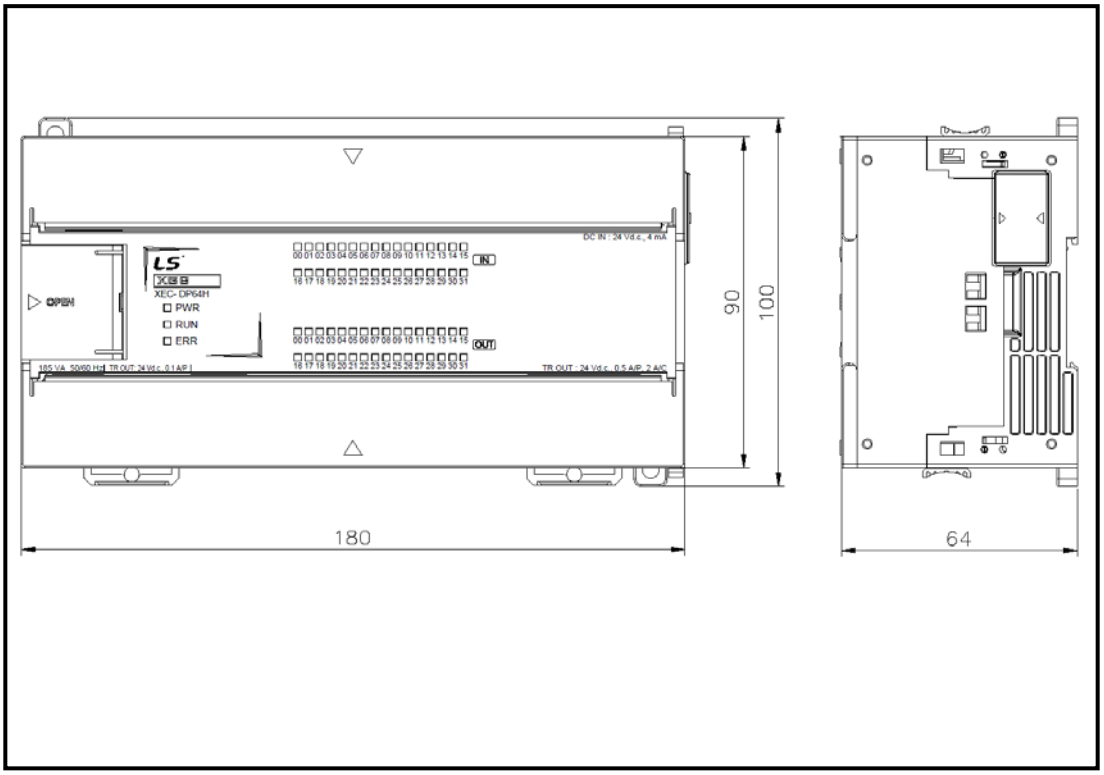
-. XEC-DR32H(/D1)


DC IN : 24 Vd.c., 4 mA
00 01 02 03 04 05 06 07
IN
08 09 10 11 12 13 14 15
XEC- DR32H
OPEN
PWR
RUN
ERR
00 01 02 03 04 05 06 07
OUT
08 09 10 11 12 13 14 15
130 VA 50/60 Hz
RELAY OUT : 24 Vd.c., 220 Va.c., 2 A/P, 5 A/C
90
100
114
64

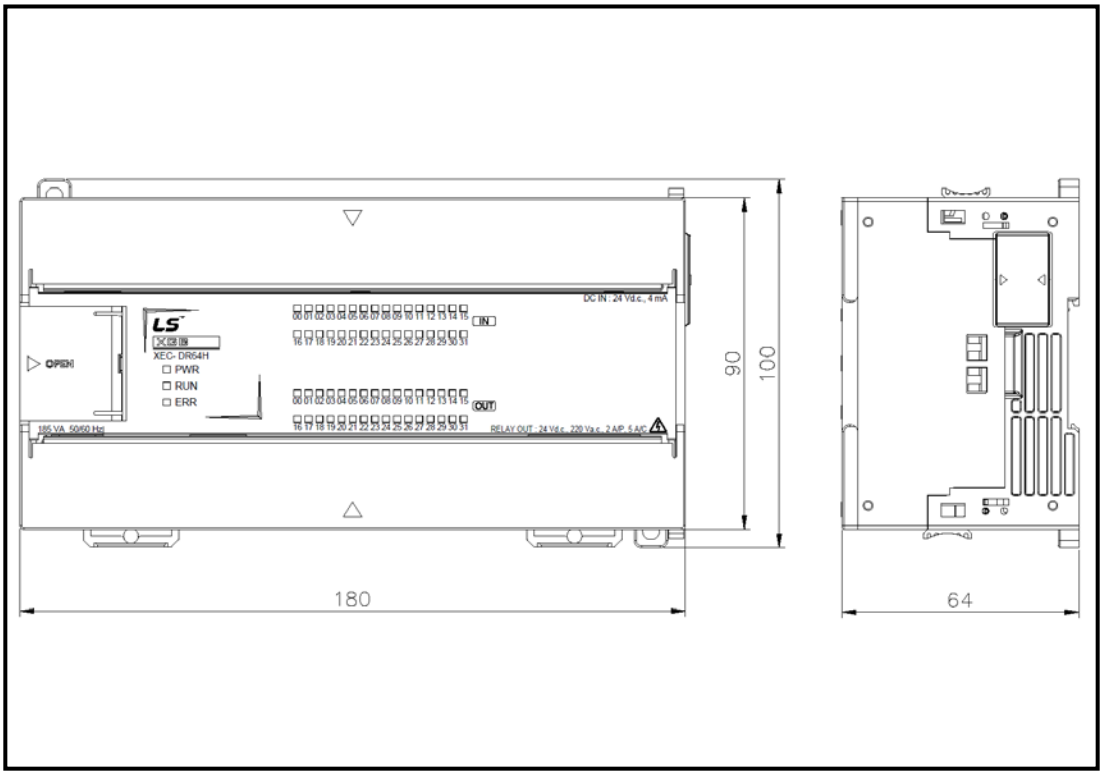
-. XEC-DN64H



-. XEC-DP64H

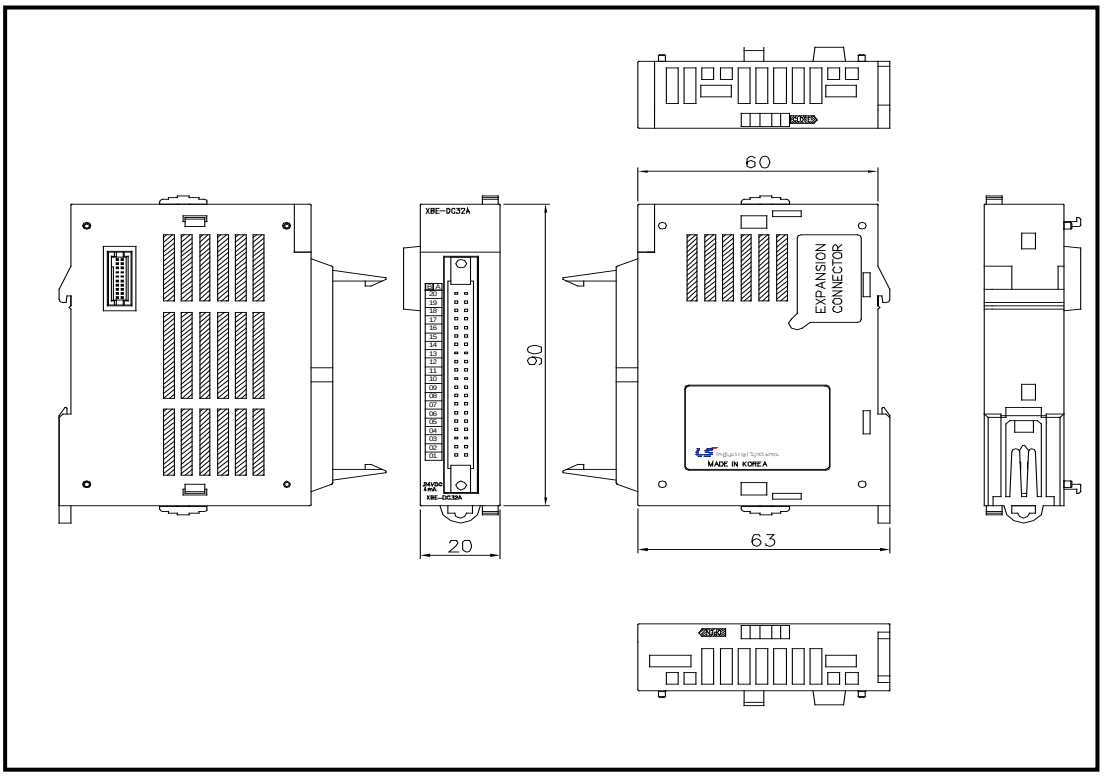


-. XEC-DR64H(/D1)

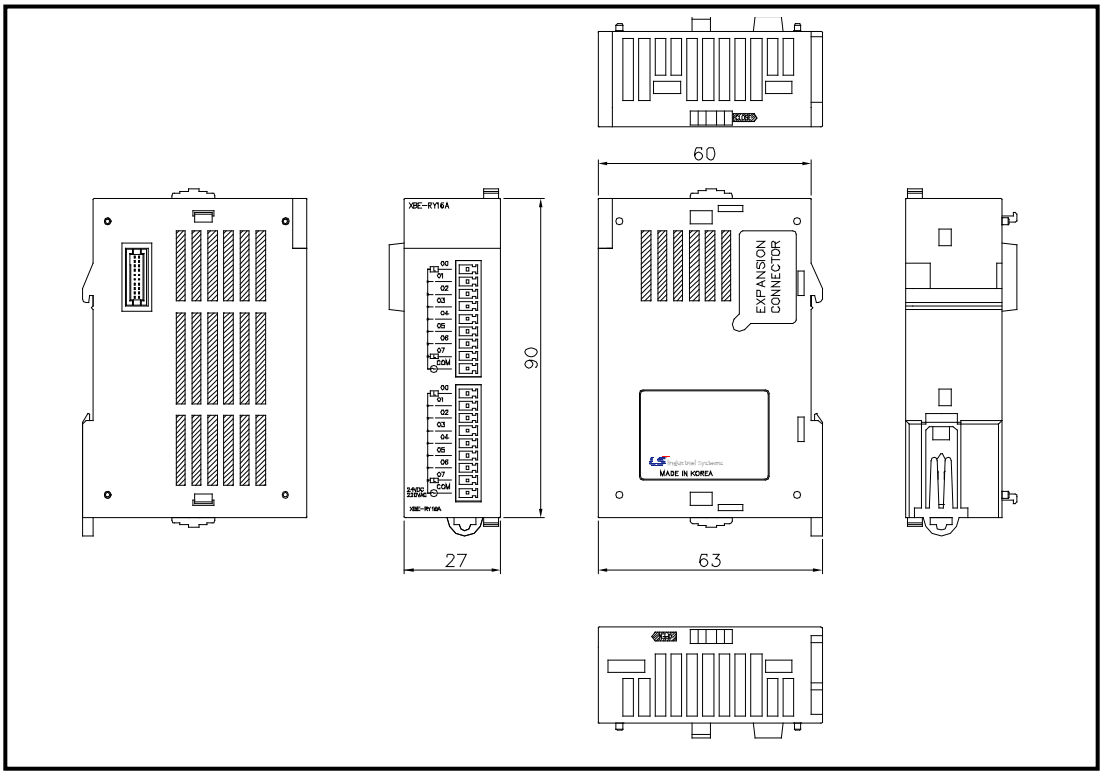


(2) Extension I/O module

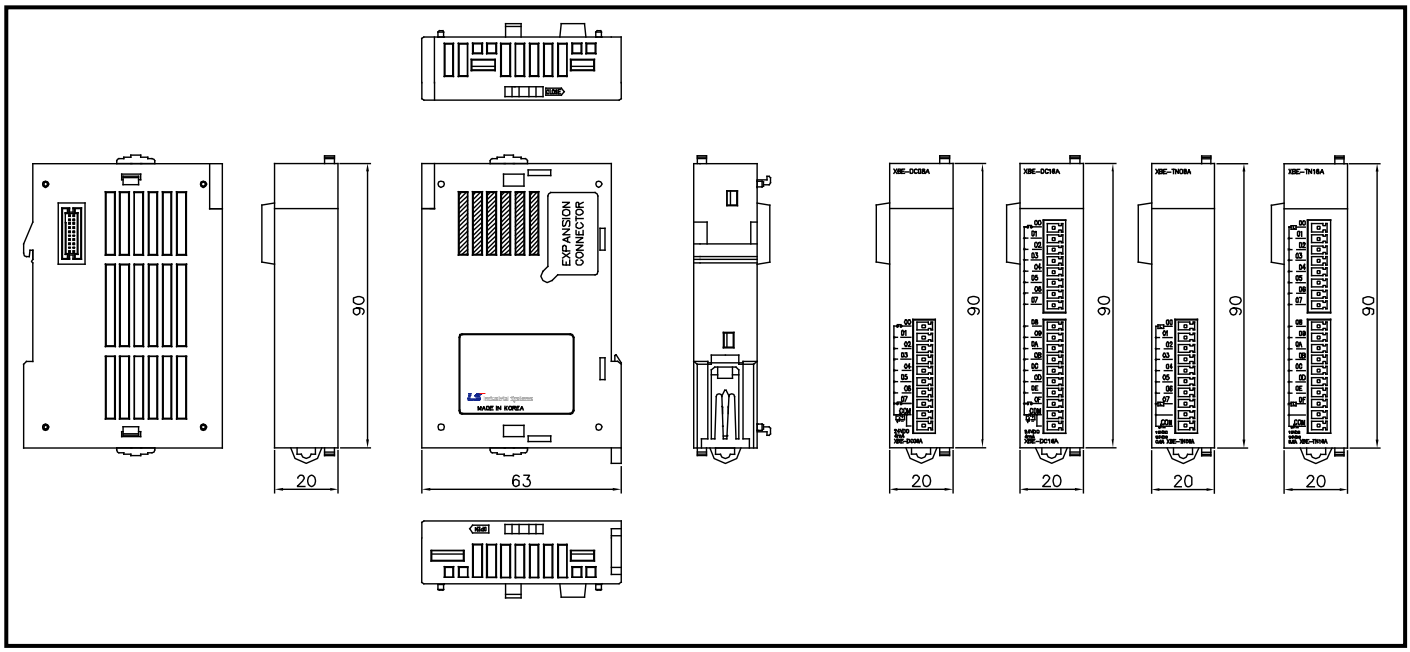
-. XBE-DC32A, XBE-TN32A, XBE-TP32A, XBE-DN32A



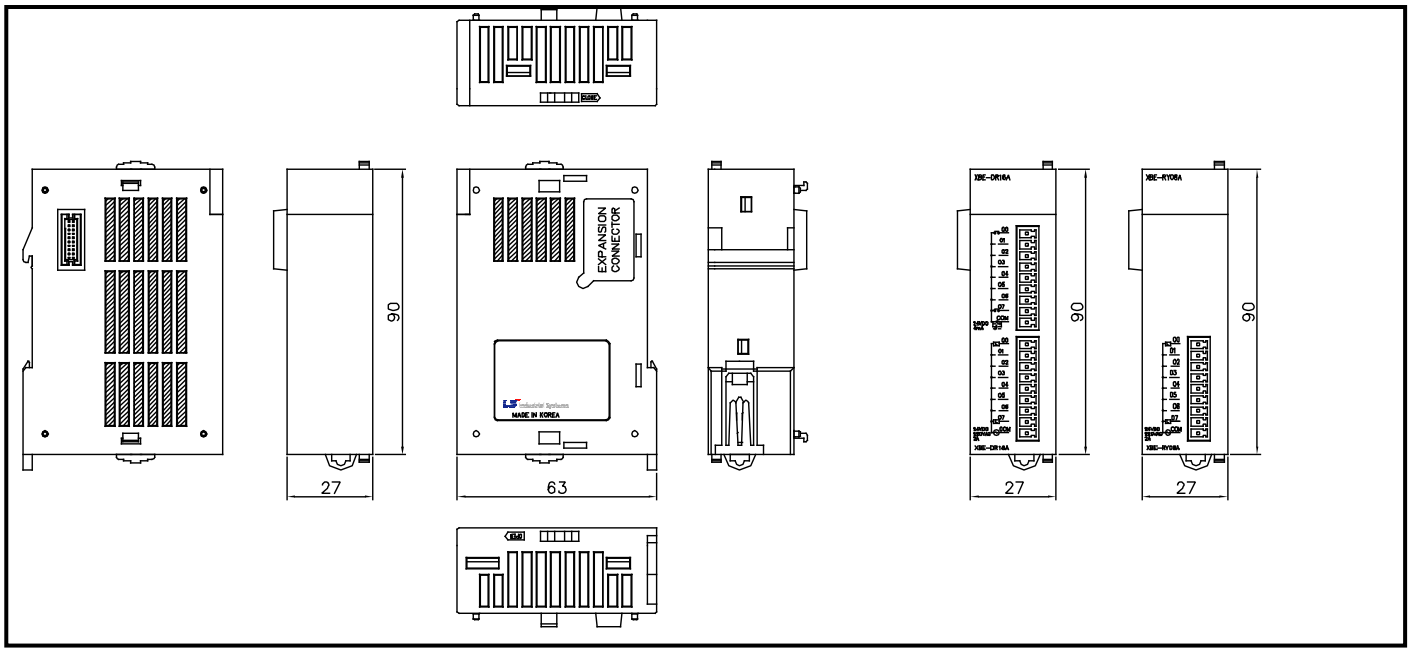
-. XBE-RY16A



-. XBE-DC08A, XBE-DC16A, XBE-DC16B, XBE-TN08A, XBE-TP08A, XBE-TN16A, XBE-TP16A, XBE-AC08A



-. XBE-DR16A, XBE-RY08A, XBE-RY08B



Appendix 3 Compatibility with GLOFA

Appendix 3.1 Compatibility of Flag

Classification	GM7	XEC	Type	Contents	Description
User Flag	_LER	_LER	BOOL	Operation error Latch flag	Operation error latch flag which is on the basis of program block (PB), the error indication which occurs while program block running keeps until the program ends. It is available to delete by a program.
	_ERR	_ERR	BOOL	Operation error flag	Operation error flag which is on the basis of operation function(FN) or function block(FB), it is renewed every time operation works.
	_T20MS	_T20MS	BOOL	20ms clock	Clock signal used in user program reverses On/Off per a half cycle Please use more enough long clock signal than PLC scan time. Clock signal starts from Off condition when initialization program starts or scan program starts.
	_T100MS	_T100MS	BOOL	100ms clock	As a clock signal available at user program, it reverses On/Off every half period. Since clock signal is dealt with at the end of scan, there may be delay or distortion according to scan time. So use clock that's longer than scan time. Clock signal is Off status at the start of scan program and task program.
	_T200MS	_T200MS	BOOL	200ms clock	
	_T1S	_T1S	BOOL	1second clock	
	_T2S	_T2S	BOOL	2second clock	
	_T10S	_T10S	BOOL	10second clock	
	_T20S	_T20S	BOOL	20second clock	
	_T60S	_T60S	BOOL	60second clock	
	_ON	_ON	BOOL	Ordinary time On	Always On state flag, used when writing a user program.
	_OFF	_OFF	BOOL	Ordinary time Off	Always Off state flag, used when writing a user program.
	_1ON	_1ON	BOOL	1'st scan On	First scan On flag, operated after starting the operation.
	_1OFF	_1OFF	BOOL	1'st scan Off	First scan Off flag, operated after starting the operation.
	_STOG	_STOG	BOOL	Reversal every scan (scan toggle)	On/Off reversed per scan when user program is working. (On state for first scan)
	_INIT_DONE	_INIT_DONE	BOOL	Complete of initial program	When this flag is set by user-written initialization program, scan program starts operation after initialization program ends.
	_RTC_DATE	_RTC_DATE	DATE	Current date of RTC	Indicates day data on the basis of 1.Jan.1984.
	_RTC_TOD	_RTC_TOD	TOD	Current time of RTC	Indicates a data for the time of the day on the basis of 00:00:00 (unit: ms)
	_RTC_WEEK	_RTC_WEEK	UINT	Current a day of the week of RTC	XGT - 0:Sun, 1:Mon, 2:Tue, 3:Wed, 4:Thu, 5:Fri, 6:Sat GLOFA - 0:Mon, 1:Tue, 2:Wed, 3:Thu, 4:Fri, 5:Sat, 6:Sun

Classification	GM7	XEC	Type	Contents	Description
System Error Rep. flag	_CNF_ER	-	WORD	System error (heavy fault)	Handles error flags about fault of operation stop as below.
	_CPU_ER	-	BOOL	CPU Configuration error	Error flag occurred when normal operation cannot be done due to diagnosis error of CPU Module. (Refer to "_SYS_ERR" for more error contents)
	_IO_TYER	_IO_TYER	BOOL	Mismatched module type error	Representative flag displayed when I/O configuration parameter for each slot is not matched with practical module configuration or a specific module is applied in the wrong location. (Refer to "_IO_TYER_N, _IO_TYER[n]")
	_IO_DEER	_IO_DEER	BOOL	Module detachment error	Representative flag displayed when the module configuration for each slot is changed while running. (Refer to "_IO_DEER_N, _IO_DEER[n]")
	_FUSE_ER	-	BOOL	Fuse error	Representative flag displayed when the fuse of module is cut off. (Refer to "_FUSE_ER_N, _FUSE_ER[n]")
	_IO_RWER	_IO_RWER	BOOL	I/O module reading/writing error(fault)	Representative flag displayed when it cannot normally read and write I/O module of each slot module. (Refer to "_IP_RWER_N, _IO_RWER[n]")
	_SP_IFER	_IP_IFER	BOOL	Special/communication module interface error(fault)	Representative flag displayed when it is impossible to interface normally due to failure to initialize special/communication module or abnormal operation of these modules. (Refer to "_IP_IFER_N, _IP_IFER[n]")
	_ANNUN_ER	-	BOOL	Heavy fault detection error in external device	Representative flag displayed when heavy error detected by user program is recorded in "_ANC_ERR[n]" .
	_WD_ER	_WDT_ER	BOOL	Scan watchdog error	Indicates that the program scan time exceeds the scan watchdog time specified by a parameter.
	_CODE_ER	_CODE_ER	BOOL	Program code error	Indicates that while user program is running, the program code can't be interpreted.
	_STACK_ER	-	BOOL	Stack overflow error	Indicates that while program running, stack of program exceeds normal limits.
	_P_BCK_ER	_PGM_ER	BOOL	Program error	Indicates that program memory is destroyed or program cannot operate normally. (Refer to "_DOMAIN_ST")
Fault Mask flag	_CNF_ER_M	-	BYTE	System error clear (heavy fault)	Handles error flags about error clear as below.
	_ANNLN_ER_M	-	BOOL	Error clear	Detects heavy fault of external device. When "_ANNLN_ER" occurs, if it is operated to ignore it, this flag is set

Classification	GM7	XEC	Type	Contents	Description
System warning Rep. Flag	_CNF_WAR	_CNF_WAR	WORD	System warning (light fault)	Handles warning flag about continuation operation as below
	_RTC_ERR	_RTC_ERR	BOOL	RTC data error	Indicates that RTC data is abnormal.
	_D_BCK_ER	_D_BCK_ER	BOOL	Data backup error	Indicates that cold restart starts operation instead of hot or warm restart program, since data memory is destroyed by backup error. It is possible to use in the initialization program and it is reset automatically after completing the initialization program.
	_H_BCK_ER	_H_BCK_ER	BOOL	Hot restart disabled error	Indicates that restart operation(warm or cold) is done according to a parameter, instead of hot restart operation, since it exceeds hot restart time during power recovery or the operation data (required for hot restart operation) is not backup normally. It is possible to use in the initialization program and it is reset automatically after completing the initialization program.
	_AB_SD_ER	_AB_SD_ER	BOOL	Abnormal Shutdown	This flag is used by initial program, and is reset automatically after initial program completion It is included to program stopping by 'ESTOP' function
	_TASK_ERR	_TASK_ERR	BOOL	Task collision (Fixed cycle, external task)	Indicates that an identical task operates in duplicate. (please refer to "_TC_BMAP[n]", "_TC_CNT[n]")
	_BAT_ERR	_BAT_ERR	BOOL	Battery error	Indicates that when battery voltage for backup of user program and data memory is below the standard.
	_ANNUN_WR	_ANNUN_WR	BOOL	Light fault detection of external device	Representative flag displayed when light fault detected by user program is recorded in "_ANC_WB[n]"
	_HSPMT1_ER	-	BOOL	High speed link-parameter 1 error	When high speed link enables, if it is abnormal to high speed link parameter, Indicates that high speed link can't be executed. This flag is reset when high speed link disables.
	_HSPMT2_ER	-	BOOL	High speed link-parameter 2 error	
	_HSPMT3_ER	-	BOOL	High speed link-parameter 3 error	
	_HSPMT4_ER	-	BOOL	High speed link-parameter 4 error	

Classification	GM7	XEC	Type	Contents	Description
System error and warning detailed flag	_IO_TYER_N	_IO_TYER_N	UINT	Mismatched module type slot number	When I/O configuration parameter for each slot is not matched with practical module configuration or a specific module is applied in the wrong location, it is displayed as the lowest slot number after detecting these mismatch error in slot locations.
	_IO_TYERR[n]	_IO_TYER0	BYTE	Mismatched module type location	When I/O configuration parameter for each slot is not matched with practical module configuration or a specific module is applied in the wrong location, it displays the detected slot location on Bit-map.
	_IO_DEER_N	_IO_DEER_N	UINT	Module detachment slot number	When slot module configuration is changed while PLC running, it is displayed as the lowest slot number after detecting these detachment error in slot locations.
	_IO_DEERR[n]	_IO_DEER0	BYTE	Module detachment location	When slot module configuration is changed while PLC running, it displays the detected slot location on bit-map.
	_IO_RWER_N	_IO_RWER_N	UINT	I/O module reading / writing error slot number	When it is not possible to read/write the I/O module each slot modules, it is displayed as the lowest slot number after detecting this error in slot locations.
	_IO_RWERR[n]	_IO_RWER0	BYTE	I/O module reading / writing error slot location	When it is not possible to read/write the I/O module each slot modules, it displays the detected slot location on bit-map.
	_SP_IFER_N	_IP_IFER_N	UINT	Special / link module interface error slot number	When it is not possible to initialize special/link module of each slot module or to interface normally due to module malfunction, it is displayed as the lowest slot number after detecting this error in slot locations.
	_SP_IFERR[n]	_IP_IFER_0	BYTE	Special / link module interface error slot location	When it is not possible to initialize special/link module of each slot module or to interface normally due to module malfunction, it displays the detected slot location on bit-map.
	_ANC_ERR[n]	-	UINT	Heavy fault detection of external device	Heavy fault of external device is detected by user program, and that error is saved at this zone as numbers which can identify 16 error types. ("0"value is not available.)
	_ANC_WAR[n]	-	UINT	Light fault detection of external device	When detecting "_ANC_WB[n]" warning by user program, the bit location of the occurred error from "_ANC_WAR[0]" is displayed as an integer in occurrence order.

Classification	GM7	XEC	Type	Contents	Description
System error and warning detailed flag	_ANC_WB[n]	-	BIT	Light fault detection bit-map of external device	Light fault of external device (detected by user program) is saved on bit-map. ("0"value is not available.)
	_TC_BMAP[n]	-	BIT	Task Collision Bit-map	Displayed on bit-map when same task is operating or is ready for operation.
	_TC_CNT[n]	-	UINT	Task Collision Counter	Displays task collision counter when task collision occurs while user program execution
	_BAT_ER_TM	-	DATE & TIME	Battery voltage drop time	Displays first battery voltage drop time. It is reset when it returns to normal condition.
	_AC_F_CNT	_AC_FAIL_CNT	UINT	Instant power cutoff count occurred	Indicates the instant power cutoff count which occurred while RUN mode operation.
	_AC_F_TM[n]	-	DATE & TIME	Instant power cutoff history	Saves instant power cutoff date/time, which can be saved up to 16 from the most recent event.
	_ERR_HIS[n]	-	-	Error occurrence history	Error occurrence time and error code are saved up to 16 from the most recent event. . Stop-time : DATE&TIME (8 Byte) . Error code : UINT (2 Byte)
	_MODE_HIS[n]	-	-	Change history of RUN mode	Run mode change time, run mode and restart mode are saved up to 16 from the most recent event. . Change time : DATE&TIME (8 Byte) . Run mode : UINT (2 Byte) . Restart : UINT (2 Byte)

Classification	GM7	XEC	Type	Contents	Description
System operation state flag	_CPU_TYPE	_CPU_TYPE	UINT	CPU type information	Indicates the type information of PLC CPU
	_VER_NUM	_OS_VER	UINT	OS Version Number	OS version number of PLC CPU
	_MEM_TYPE	-	UINT	Memory module type	Program memory module type (0:unmounted, 1~5:Type)
	_SYS_STATE	-	WORD	PLC mode and running state	Indicates operation mode and operation state of the system.
		_LOCAL_CON		Local control	Indicates that operation mode can be changed by mode key or PADT only
		_STOP		STOP	Indicates running state of CPU module.
		_RUN		RUN	
		_PAUSE-		PAUSE	
		_DEBUG		DEBUG	
		_CMOD_KEY		Running mode change factor	Change the running mode by key
		_CMOD_LPADT		Running mode change factor	Change the running mode by PADT
		_CMOD_RPADT		Running mode change factor	Change the running mode by remote PADT
		_CMOD_RLINK		Running mode change factor	Change the running mode by communication
		_USTOP_ON		Stopped by STOP function	While RUN mode operation, stopped after scan completion by STOP function
		_FORCE_IN		Forced input	Indicates that a forced On/Off for the input contact is running.
		_FORCE_OUT		Forced output	Indicates that a forced On/Off for the output contact is running.
		_ESTOP_ON		Stopped by ESTOP function	While RUN mode operation, stopped immediately by ESTOP function
		_REMOTE_CON		Remote mode On	Indicates that it is operated by remote mode.

Classification	GM7	XEC	Type	Contents	Description
System operation state flag	_PADT_CNF	-	BYTE	GMWIN connection state	Indicates the connection state of CPU module and PADT
		-		Local GMWIN connection	Bit indicated connection state of local PADT
		-		Remote GMWIN connection	Bit indicated connection state of remote PADT
		-		Remote communication connection	Bit indicated connection state of remote communication
	_RST_TY	-	BYTE	Restart mode information	-
		-		Cold restart	
		-		Warm restart	
		-		Hot restart	
	_INIT_RUN	_INIT_RUN	BOOL	Initialization is running	Indicates that user-written initialization program is running.
	_SCAN_MAX	_SCAN_MAX	UINT	Max. Scan Time (ms)	Indicates Max. scan time while running.
	_SCAN_MIN	_SCAN_MIN	UINT	Min. Scan Time(ms)	Indicates Min. scan time while running.
	_SCAN_CUR	_SCAN_CUR	UINT	Current Scan Time(ms)	Indicates current scan time data which is being renewed.
	_RTC_TIME[n]	_RTC_DATE _RTC_WEEK _RTC_TOD	BYTE	Current time	The current BCD data of RTC (1.Jan.1984 ~ 31.Dec.2083) _RTC_TIME[0] : year, _RTC_TIME[1] : month, _RTC_TIME[2] : day, _RTC_TIME[3] : time, _RTC_TIME[4] : minute, _RTC_TIME[5] : second _RTC_TIME[6] : day of the week, _RTC_TIME[7] : not used day of the week XGT - 0:Sun, 1:Mon, 2:Tue, 3:Wed, 4:Thu, 5:Fri, 6:Sat GLOFA - 0:Mon, 1:Tue, 2:Wed, 3:Thu, 4:Fri, 5:Sat, 6:Sun
	_SYS_ERR	-	UINT	Error type	-

Appendix 4 Instruction List

It's a list of function and function block. For each function and function block, please refer to XGI/XGR/XEC Insturction user manual.

Appendix 4.1 Basic Function

Appendix 4.1.1 Type Conversion Function

It converts each input data type into an output data type.

Function Group	Function	Input data type	Output data type	Remarks
ARY_ASC_TO_***	ARY_ASC_TO_BYTE	WORD(ASCII)	BYTE	
	ARY_ASC_TO_BCD	WORD(ASCII)	BYTE(BCD)	
ARY_BYTE_TO_***	ARY_BYTE_TO_ASC	BYTE	WORD(ASCII)	
ARY_BCD_TO_***	ARY_BCD_TO_ ASC	BYTE(BCD)	WORD(ASCII)	
ASC_TO_***	ASC_TO_BCD	BYTE(BCD)	USINT	
	ASC_TO_BYTE	WORD(BCD)	UINT	
BCD_TO_***	BYTE_BCD_TO_SINT	BYTE(BCD)	SINT	
	WORD_BCD_TO_INT	WORD(BCD)	INT	
	DWORD_BCD_TO_DINT	DWORD(BCD)	DINT	
	LWORD_BCD_TO_LINT	LWORD(BCD)	LINT	
	BYTE_BCD_TO_USINT	BYTE(BCD)	USINT	
	WORD_BCD_TO_UINT	WORD(BCD)	UINT	
	DWORD_BCD_TO_UDINT	DWORD(BCD)	UDINT	
	LWORD_BCD_TO_ULINT	LWORD(BCD)	ULINT	
BCD_TO_ASC	BCD_TO_ASC	BYTE(BCD)	WORD	
BYTE_TO_ASC	BYTE_TO_ASC	BYTE	ASC(BYTE)	
TRUNC	TRUNC_REAL	REAL	DINT	
	TRUNC_LREAL	LREAL	LINT	
REAL_TO_***	REAL_TO_SINT	REAL	SINT	
	REAL_TO_INT	REAL	INT	
	REAL_TO_DINT	REAL	DINT	
	REAL_TO_LINT	REAL	LINT	
	REAL_TO_USINT	REAL	USINT	
	REAL_TO_UINT	REAL	UINT	
	REAL_TO_UDINT	REAL	UDINT	
	REAL_TO_ULINT	REAL	ULINT	
	REAL_TO_DWORD	REAL	DWORD	
	REAL_TO_LREAL	REAL	LREAL	
	REAL_TO_STRING	REAL	STRING	
LREAL_TO_***	LREAL_TO_SINT	LREAL	SINT	
	LREAL_TO_INT	LREAL	INT	
	LREAL_TO_DINT	LREAL	DINT	
	LREAL_TO_LINT	LREAL	LINT	
	LREAL_TO_USINT	LREAL	USINT	
LREAL_TO_***	LREAL_TO_UINT	LREAL	UINT	
	LREAL_TO_UDINT	LREAL	UDINT	
	LREAL_TO_ULINT	LREAL	ULINT	
	LREAL_TO_LWORD	LREAL	LWORD	
	LREAL_TO_REAL	LREAL	REAL	
	LREAL_TO_STRING	LREAL	STRING	
SINT_TO_***	SINT_TO_INT	SINT	INT	
	SINT_TO_DINT	SINT	DINT	

Function Group	Function	Input data type	Output data type	Remarks
	SINT_TO_LINT	SINT	LINT	
	SINT_TO_USINT	SINT	USINT	
	SINT_TO_UINT	SINT	UINT	
	SINT_TO_UDINT	SINT	UDINT	
	SINT_TO_ULINT	SINT	ULINT	
	SINT_TO_BOOL	SINT	BOOL	
	SINT_TO_BYTE	SINT	BYTE	
	SINT_TO_WORD	SINT	WORD	
	SINT_TO_DWORD	SINT	DWORD	
	SINT_TO_LWORD	SINT	LWORD	
	SINT_TO_REAL	SINT	REAL	
	SINT_TO_LREAL	SINT	LREAL	
	SINT_TO_STRING	SINT	STRING	
INT_TO_***	INT_TO_SINT	INT	SINT	
	INT_TO_DINT	INT	DINT	
	INT_TO_LINT	INT	LINT	
	INT_TO_USINT	INT	USINT	
	INT_TO_UINT	INT	UINT	
	INT_TO_UDINT	INT	UDINT	
	INT_TO_ULINT	INT	ULINT	
	INT_TO_BOOL	INT	BOOL	
	INT_TO_BYTE	INT	BYTE	
	INT_TO_WORD	INT	WORD	
	INT_TO_DWORD	INT	DWORD	
	INT_TO_LWORD	INT	LWORD	
	INT_TO_REAL	INT	REAL	
	INT_TO_LREAL	INT	LREAL	
	INT_TO_STRING	INT	STRING	
DINT_TO_***	DINT_TO_SINT	DINT	SINT	
	DINT_TO_INT	DINT	INT	
	DINT_TO_LINT	DINT	LINT	
	DINT_TO_USINT	DINT	USINT	
	DINT_TO_UINT	DINT	UINT	
	DINT_TO_UDINT	DINT	UDINT	
	DINT_TO_ULINT	DINT	ULINT	
	DINT_TO_BOOL	DINT	BOOL	
	DINT_TO_BYTE	DINT	BYTE	
	DINT_TO_WORD	DINT	WORD	
DINT_TO_***	DINT_TO_DWORD	DINT	DWORD	
	DINT_TO_LWORD	DINT	LWORD	
	DINT_TO_REAL	DINT	REAL	
	DINT_TO_LREAL	DINT	LREAL	
	DINT_TO_STRING	DINT	STRING	
LINT_TO_***	LINT_TO_SINT	LINT	SINT	
	LINT_TO_INT	LINT	INT	
	LINT_TO_DINT	LINT	DINT	
	LINT_TO_USINT	LINT	USINT	
	LINT_TO_UINT	LINT	UINT	
	LINT_TO_UDINT	LINT	UDINT	
	LINT_TO_ULINT	LINT	ULINT	
	LINT_TO_BOOL	LINT	BOOL	
	LINT_TO_BYTE	LINT	BYTE	
	LINT_TO_WORD	LINT	WORD	
	LINT_TO_DWORD	LINT	DWORD	
	LINT_TO_LWORD	LINT	LWORD	

Function Group	Function	Input data type	Output data type	Remarks
	LINT_TO_REAL	LINT	REAL	
	LINT_TO_LREAL	LINT	LREAL	
	LINT_TO_STRING	LINT	STRING	
USINT_TO_***	USINT_TO_SINT	USINT	SINT	
	USINT_TO_INT	USINT	INT	
	USINT_TO_DINT	USINT	DINT	
	USINT_TO_LINT	USINT	LINT	
	USINT_TO_UINT	USINT	UINT	
	USINT_TO_UDINT	USINT	UDINT	
	USINT_TO_ULINT	USINT	ULINT	
	USINT_TO_BOOL	USINT	BOOL	
	USINT_TO_BYTE	USINT	BYTE	
	USINT_TO_WORD	USINT	WORD	
	USINT_TO_DWORD	USINT	DWORD	
	USINT_TO_LWORD	USINT	LWORD	
	USINT_TO_REAL	USINT	REAL	
	USINT_TO_LREAL	USINT	LREAL	
	USINT_TO_STRING	USINT	STRING	
UINT_TO_***	UINT_TO_SINT	UINT	SINT	
	UINT_TO_INT	UINT	INT	
	UINT_TO_DINT	UINT	DINT	
	UINT_TO_LINT	UINT	LINT	
	UINT_TO_USINT	UINT	USINT	
	UINT_TO_UDINT	UINT	UDINT	
	UINT_TO_ULINT	UINT	ULINT	
	UINT_TO_BOOL	UINT	BOOL	
	UINT_TO_BYTE	UINT	BYTE	
	UINT_TO_WORD	UINT	WORD	
	UINT_TO_DWORD	UINT	DWORD	
UINT_TO_***	UINT_TO_LWORD	UINT	LWORD	
	UINT_TO_REAL	UINT	REAL	
	UINT_TO_STRING	UINT	STRING	
	UINT_TO_LREAL	UINT	LREAL	
	UINT_TO_DATE	UINT	DATE	
UDINT_TO_***	UDINT_TO_SINT	UDINT	SINT	
	UDINT_TO_INT	UDINT	INT	
	UDINT_TO_DINT	UDINT	DINT	
	UDINT_TO_LINT	UDINT	LINT	
	UDINT_TO_USINT	UDINT	USINT	
	UDINT_TO_UINT	UDINT	UINT	
	UDINT_TO_ULINT	UDINT	ULINT	
	UDINT_TO_BOOL	UDINT	BOOL	
	UDINT_TO_BYTE	UDINT	BYTE	
	UDINT_TO_WORD	UDINT	WORD	
	UDINT_TO_DWORD	UDINT	DWORD	
	UDINT_TO_LWORD	UDINT	LWORD	
	UDINT_TO_REAL	UDINT	REAL	
	UDINT_TO_LREAL	UDINT	LREAL	-
	UDINT_TO_TOD	UDINT	TOD	-
	UDINT_TO_TIME	UDINT	TIME	-
	UDINT_TO_STRING	UDINT	STRING	-
ULINT_TO_***	ULINT_TO_SINT	ULINT	SINT	-
	ULINT_TO_INT	ULINT	INT	-
	ULINT_TO_DINT	ULINT	DINT	-
	ULINT_TO_LINT	ULINT	LINT	-

Function Group	Function	Input data type	Output data type	Remarks
	ULINT_TO_USINT	ULINT	USINT	-
	ULINT_TO_UINT	ULINT	UINT	-
	ULINT_TO_UDINT	ULINT	UDINT	-
	ULINT_TO_BOOL	ULINT	BOOL	-
	ULINT_TO_BYTE	ULINT	BYTE	-
	ULINT_TO_WORD	ULINT	WORD	-
	ULINT_TO_DWORD	ULINT	DWORD	-
	ULINT_TO_LWORD	ULINT	LWORD	-
	ULINT_TO_REAL	ULINT	REAL	-
	ULINT_TO_LREAL	ULINT	LREAL	-
	ULINT_TO_STRING	ULINT	STRING	-
BOOL_TO_***	BOOL_TO_SINT	BOOL	SINT	-
	BOOL_TO_INT	BOOL	INT	-
	BOOL_TO_DINT	BOOL	DINT	-
	BOOL_TO_LINT	BOOL	LINT	-
	BOOL_TO_USINT	BOOL	USINT	-
	BOOL_TO_UINT	BOOL	UINT	-
	BOOL_TO_UDINT	BOOL	UDINT	-
	BOOL_TO_ULINT	BOOL	ULINT	-
	BOOL_TO_BYTE	BOOL	BYTE	-
BOOL_TO_***	BOOL_TO_WORD	BOOL	WORD	-
	BOOL_TO_DWORD	BOOL	DWORD	-
	BOOL_TO_LWORD	BOOL	LWORD	-
	BOOL_TO_STRING	BOOL	STRING	-
BYTE_TO_***	BYTE_TO_SINT	BYTE	SINT	-
	BYTE_TO_INT	BYTE	INT	-
	BYTE_TO_DINT	BYTE	DINT	-
	BYTE_TO_LINT	BYTE	LINT	-
	BYTE_TO_USINT	BYTE	USINT	-
	BYTE_TO_UINT	BYTE	UINT	-
	BYTE_TO_UDINT	BYTE	UDINT	-
	BYTE_TO_ULINT	BYTE	ULINT	-
	BYTE_TO_BOOL	BYTE	BOOL	-
	BYTE_TO_WORD	BYTE	WORD	-
	BYTE_TO_DWORD	BYTE	DWORD	-
	BYTE_TO_LWORD	BYTE	LWORD	-
	BYTE_TO_STRING	BYTE	STRING	-
WORD_TO_***	WORD_TO_SINT	WORD	SINT	-
	WORD_TO_INT	WORD	INT	-
	WORD_TO_DINT	WORD	DINT	-
	WORD_TO_LINT	WORD	LINT	-
	WORD_TO_USINT	WORD	USINT	-
	WORD_TO_UINT	WORD	UINT	-
	WORD_TO_UDINT	WORD	UDINT	-
	WORD_TO_ULINT	WORD	ULINT	
	WORD_TO_BOOL	WORD	BOOL	
	WORD_TO_BYTE	WORD	BYTE	
	WORD_TO_DWORD	WORD	DWORD	
	WORD_TO_LWORD	WORD	LWORD	
	WORD_TO_DATE	WORD	DATE	
	WORD_TO_STRING	WORD	STRING	
DWORD_TO_***	DWORD_TO_SINT	DWORD	SINT	
	DWORD_TO_INT	DWORD	INT	
	DWORD_TO_DINT	DWORD	DINT	
	DWORD_TO_LINT	DWORD	LINT	

Function Group	Function	Input data type	Output data type	Remarks
	DWORD_TO_USINT	DWORD	USINT	
	DWORD_TO_UINT	DWORD	UINT	
	DWORD_TO_UDINT	DWORD	UDINT	
	DWORD_TO_ULINT	DWORD	ULINT	
	DWORD_TO_BOOL	DWORD	BOOL	
	DWORD_TO_BYTE	DWORD	BYTE	
	DWORD_TO_WORD	DWORD	WORD	
	DWORD_TO_LWORD	DWORD	LWORD	
	DWORD_TO_REAL	DWORD	REAL	
	DWORD_TO_TIME	DWORD	TIME	
	DWORD_TO_TOD	DWORD	TOD	
DWORD_TO_***	DWORD_TO_STRING	DWORD	STRING	
	LWORD_TO_SINT	LWORD	SINT	
	LWORD_TO_INT	LWORD	INT	
	LWORD_TO_DINT	LWORD	DINT	
	LWORD_TO_LINT	LWORD	LINT	
	LWORD_TO_USINT	LWORD	USINT	
	LWORD_TO_UINT	LWORD	UINT	
	LWORD_TO_UDINT	LWORD	UDINT	
LWORD_TO_***	LWORD_TO_ULINT	LWORD	ULINT	
	LWORD_TO_BOOL	LWORD	BOOL	
	LWORD_TO_BYTE	LWORD	BYTE	
	LWORD_TO_WORD	LWORD	WORD	
	LWORD_TO_DWORD	LWORD	DWORD	
	LWORD_TO_LREAL	LWORD	LREAL	
	LWORD_TO_DT	LWORD	DT	
	LWORD_TO_STRING	LWORD	STRING	
	STRING _TO_SINT	STRING	SINT	
	STRING _TO_INT	STRING	INT	
	STRING _TO_DINT	STRING	DINT	
	STRING _TO_LINT	STRING	LINT	
	STRING _TO_USINT	STRING	USINT	
	STRING _TO_UINT	STRING	UINT	
	STRING _TO_UDINT	STRING	UDINT	
	STRING _TO_ULINT	STRING	ULINT	
	STRING _TO_BOOL	STRING	BOOL	
STRING_TO_***	STRING _TO_BYTE	STRING	BYTE	
	STRING _TO_WORD	STRING	WORD	
	STRING _TO_DWORD	STRING	DWORD	
	STRING _TO_LWORD	STRING	LWORD	
	STRING _TO_REAL	STRING	REAL	
	STRING _TO_LREAL	STRING	LREAL	
	STRING _TO_DT	STRING	DT	
	STRING _TO_DATE	STRING	DATE	
	STRING _TO_TOD	STRING	TOD	
	STRING _TO_TIME	STRING	TIME	
	TIME_TO_UDINT	TIME	UDINT	
TIME_TO_***	TIME_TO_DWORD	TIME	DWORD	
	TIME_TO_STRING	TIME	STRING	
	DATE_TO_UINT	DATE	UINT	
DATE_TO_***	DATE_TO_WORD	DATE	WORD	
	DATE_TO_STRING	DATE	STRING	
	TOD_TO_UDINT	TOD	UDINT	
TOD_TO_***	TOD_TO_DWORD	TOD	DWORD	
	TOD_TO_STRING	TOD	STRING	

Function Group	Function	Input data type	Output data type	Remarks
DT_TO_***	DT_TO_LWORD	DT	LWORD	
	DT_TO_DATE	DT	DATE	
	DT_TO_TOD	DT	TOD	
	DT_TO_STRING	DT	STRING	
***_TO_BCD	SINT_TO_BCD_BYTE	SINT	BYTE(BCD)	
	INT_TO_BCD_WORD	INT	WORD(BCD)	
	DINT_TO_BCD_DWORD	DINT	DWORD(BCD)	
	LINT_TO_BCD_LWORD	LINT	LWORD(BCD)	
	USINT_TO_BCD_BYTE	USINT	BYTE(BCD)	
	UINT_TO_BCD_WORD	UINT	WORD(BCD)	
	UDINT_TO_BCD_DWORD	UDINT	DWORD(BCD)	
	ULINT_TO_BCD_LWORD	ULINT	LWORD(BCD)	

Appendix 4.1.2 Numerical Operation Function

(1) Numerical Operation Function with One Input

No.	Function name	Description	Remarks
General Function			
1	ABS	Absolute value operation	
2	SQRT	Square root operation	
Log function			
3	LN	Natural logarithm operation	
4	LOG	Common logarithm Base to 10 operation	
5	EXP	Natural exponential operation	
Trigonometric function			
6	SIN	Sine operation	
7	COS	Cosine operation	
8	TAN	Tangent operation	
9	ASIN	Arc sine operation	
10	ACOS	Arc Cosine operation	
11	ATAN	Arc Tangent operation	
Angle function			
12	RAD_REAL	Convert degree into radian	
13	RAD_LREAL		
14	DEG_REAL	Convert radian into degree	
15	DEG_LREAL		

(2) Basic Arithmetic Function

No.	Function name	Description	Remarks
Operation function of which input number (n) can be extended up to 8.			
1	ADD	Addition (OUT <= IN1 + IN2 + ... + INn)	
2	MUL	Multiplication (OUT <= IN1 * IN2 * ... * INn)	
Operation function of which input number is fixed.			
3	SUB	Subtraction (OUT <= IN1 - IN2)	
4	DIV	Division (OUT <= IN1 / IN2)	
5	MOD	Calculate remainder (OUT <= IN1 Modulo IN2)	
6	EXPT	Exponential operation (OUT <= $IN1^{IN2}$)	
7	MOVE	Copy data (OUT <= IN)	
Input data exchange			
8	XCHG_***	Exchanges two input data	

Appendix 4.1.3 Bit Arrary Function

(1) Bit-shift Function

No.	Function name	Description	Remarks
1	SHL	Shift input to the left of N bit(the right is filled with 0)	
2	SHR	Shift input to the right of N bit (the left is filled with 0)	
3	SHIFT_C_***	Shift input to the designated direction as much as N bit (carry)	
4	ROL	Rotate input to the left of N bit	
5	ROR	Rotate input to the right of N bit	
6	ROTATE_C_***	Rotate input to the direction as much as N bit (carry)	

(2) Bit Operation Function

No.	Function name	Description (n can be extended up to 8)	Remarks
1	AND	Logical AND (OUT <= IN1 AND IN2 AND ... AND INn)	
2	OR	Logical OR (OUT <= IN1 OR IN2 OR ... OR INn)	
3	XOR	Exclusive OR (OUT <= IN1 XOR IN2 XOR ... XOR INn)	
4	NOT	Reverse logic (OUT <= NOT IN1)	
5	XNR	Exclusive logic AND (OUT <= IN1 XNR IN2 XNR ... XNR INn)	

Appendix 4.1.4 Selection Function

No.	Function name	Description(n can be extended up to 8)	Remarks
1	SEL	Selects from two inputs (IN0 or IN1)	
2	MAX	Produces the maximum value among input IN1,...INn	
3	MIN	Produces the minimum value among input IN1,...INn	
4	LIMIT	Limits upper and lower boundaries	
5	MUX	Outputs the K-th input among input IN1,…INn	

Appendix 4.1.5 Data Exchange Function

No.	Function name	Description	Remarks
1	SWAP_BYTE	Swaps upper NIBBLE for lower NIBBLE data of BYTE.	
	SWAP_WORD	Swaps upper BYTE for lower BYTE data of WORD.	
	SWAP_DWORD	Swaps upper WORD for lower WORD data DWORD.	
	SWAP_LWORD	Swaps upper DWORD for lower DWORD data of LWORD.	
2	ARY_SWAP_BYTE	Swaps upper/lower NIBBLE of BYTE elements in array.	
	ARY_SWAP_WORD	Swaps upper/lower BYTE of WORD elements in array.	
	ARY_SWAP_DWORD	Swaps upper/lower WORD of DWORD elements in array.	
	ARY_SWAP_LWORD	Swaps upper/lower DWORD of LWORD elements in array.	

Appendix 4.1.6 Comparison Function

No.	Function name	Description (n can be extended up to 8)	Remarks
1	GT	'Greater than' comparison OUT <= (IN1>IN2) & (IN2>IN3) & ... & (INn-1 > INn)	
2	GE	'Greater than or equal to' comparison OUT <= (IN1>=IN2) & (IN2>=IN3) & ... & (INn-1 >= INn)	
3	EQ	'Equal to' comparison OUT <= (IN1=IN2) & (IN2=IN3) & ... & (INn-1 = INn)	
4	LE	'Less than or equal to' comparison OUT <= (IN1<=IN2) & (IN2<=IN3) & ... & (INn-1 <= INn)	
5	LT	'Less than' comparison OUT <= (IN1<IN2) & (IN2<IN3) & ... & (INn-1 < INn)	
6	NE	'Not equal to' comparison OUT <= (IN1<>IN2) & (IN2<>IN3) & ... & (INn-1 <> INn)	

Appendix 4.1.7 Character String Function

No.	Function name	Description	Remarks
1	LEN	Find a length of a character string	
2	LEFT	Take a left side of a string (size of L) and output it	
3	RIGHT	Take a right side of a string (size of L) and output it	
4	MID	Take a middle side of a string (size of L from the P-th character)	
5	CONCAT	Concatenate the input character string in order	
6	INSERT	Insert the second string after the P-th character of the first string	
7	DELETE	Delete a string (size of L from the P-th character)	
8	REPLACE	Replace a size of L from the P-th character of the first string by the second string	
9	FIND	Find a starting point of the first string which has a same pattern of the second string.	

Appendix 4.1.8 Date and Time of Day Function

No.	Function name	Description	Remarks
1	ADD_TIME	Add time (Time/time of day/date and time addition)	
2	SUB_TIME	Subtract time (Time/time of day/date and time subtraction)	
	SUB_DATE	Calculate time by subtracting date from date	
	SUB_TOD	Calculate time by subtracting TOD from TOD	
	SUB_DT	Calculate time by subtracting DT from DT	
3	MUL_TIME	Multiply number to time	
4	DIV_TIME	Divide time by number	
5	CONCAT_TIME	Concatenate date to make TOD	

Appendix 4.1.9 System Control Function

No.	Function name	Description	Remarks
1	DI	Invalidates interrupt (Not to permit task program starting)	
2	EI	Permits running for a task program	
3	STOP	Stop running by a task program	
4	ESTOP	Emergency running stop by a program	
5	DIREC_IN	Update input data	
6	DIREC_O	Updates output data	
7	WDT_RST	Initialize a timer of watchdog	
8	MCS	Master Control	
9	MCSCLR	Master Control Clear	
10	FALS	Self check(error display)	
11	OUTOFF	Output Off	

Appendix 4.1.10 File Function

No.	Function block name	Description	Remarks
1	RSET	Setting file register block number	
2	EBCMP	Block comparison	
3	EMOV	Reading data from the preset flash area	
4	EERRST	Flash memory related error flag clear	

Appendix 4.1.11 Data Manipulation Function

No.	Function name	Description	Remarks
1	MEQ_***	Compare whether two inputs are equal after masking	
2	DIS_***	Data distribution	
3	UNI_***	Unite data	
4	BIT_BYTE	Combine 8 bits into one BYTE	
5	BYTE_BIT	Divide one BYTE into 8 bits	
6	BYTE_WORD	Combine two bytes into one WORD	
7	WORD_BYTE	Divide one WORD into two bytes	
8	WORD_DWORD	Combine two WORD data into DWORD	
9	DWORD_WORD	Divide DWORD into 2 WORD data	
10	DWORD_LWORD	Combine two DWORD data into LWORD	
11	LWORD_DWORD	Divide LWORD into two DWORD data	
12	GET_CHAR	Get one character from a character string	
13	PUT_CHAR	Puts a character in a string	
14	STRING_BYTE	Convert a string into a byte array	
15	BYTE_STRING	Convert a byte array into a string	

Appendix 4.1.12 Stack Operation Function

No.	Function name	Description	Remarks
1	FIFO_***	First In First Out	
2	LIFO_***	Last In First Out	

Appendix 4.2 MK(MASTER-K) Function

No.	Function name	Description(n can be extended up to 8)	Remarks
1	ENCO_B,W,D,L	Output a position of On bit by number	
2	DECO_B,W,D,L	Turn a selected bit on	
3	BSUM_B,W,D,L	Output a number of On bit	
4	SEG_WORD	Convert BCD/HEX into 7-segment code	
5	BMOV_B,W,D,L	Move part of a bit string	
6	INC_B,W,D,L	Increase IN data	
7	DEC_B,W,D,L	Decrease IN data	

Appendix 4.3 Array Operation Function

No.	Function name	Description	Remarks
1	ARY_MOVE	Copy array-typed data (OUT <= IN)	
2	ARY_CMP_***	Array comparison	
3	ARY_SCH_***	Array search	
4	ARY_FLL_***	Filling an array with data	
5	ARY_AVE_***	Find an average of an array	
6	ARY_SFT_C_***	Array bit shift left with carry	
7	ARY_ROT_C_***	Bit rotation of array with carry	
8	SHIFT_A_***	Shift array elements	
9	ROTATE_A_***	Rotates array elements	

Appendix 4.4 Basic Function Block

Appendix 4.4.1 Bistable Function Block

No.	Function block name	Description	Remarks
1	SR	Set preference bistable	
2	RS	Reset preference bistable	
3	SEMA	Semaphore	

Appendix 4.4.2 Edge Detection Function Block

No.	Function block name	Description	Remarks
1	R_TRIG	Rising edge detector	
2	F_TRIG	Falling edge detector	
3	FF	Reverse output if input condition rises	

Appendix 4.4.3 Counter

No.	Function block name	Description	Remarks
1	CTU_***	Up Counter INT,DINT,LINT,UINT,UDINT,ULINT	
2	CTD_***	Down Counter INT,DINT,LINT,UINT,UDINT,ULINT	
3	CTUD_***	Up Down Counter INT,DINT,LINT,UINT,UDINT,ULINT	
4	CTR	Ring Counter	

Appendix 4.4.4 Timer

No.	Function block name	Description	Remarks
1	TP	Pulse Timer	
2	TON	On-Delay Timer	
3	TOF	Off-Delay Timer	
4	TMR	Integrating Timer	
5	TP_RST	TP with reset	
6	TRTG	Retriggerable Timer	
7	TOF_RST	TOF with reset	
8	TON_UINT	TON with integer setting	
9	TOF_UINT	TOF with integer setting	
10	TP_UINT	TP with integer setting	
11	TMR_UINT	TMR with integer setting	
12	TMR_FLK	Blink timer	
13	TRTG_UINT	Integer setting retriggerable timer	

Appendix 4.4.5 File Function Block

No.	Function block name	Description	Remarks
1	EBREAD	Read R area data from flash area	
2	EBWRITE	Write R area data to flash area	

Appendix 4.4.6 Other Function Block

No.	Function block name	Description	Remarks
1	SCON	Step Controller	
2	DUTY	Scan setting On/Off	
3	RTC_SET	Write time data	

Appendix 4.4.7 Special Function Block

No.	Function block name	Description	Remarks
1	GET	Read special module data	
2	PUT	Write special module data	
3	ARY_GET	Read special module data(array)	
4	ARY_PUT	Write special module data(array)	

Appendix 4.4.10 Positioning Function Block

No.	Function block name	Description	Remarks
1	APM_ORG	Return to original point run	
2	APM_FLT	Floating original point setting	
3	APM_DST	Direct run	
4	APM_IST	Indirect run	
5	APM_LIN	Linear interpolation run	
6	APM_SST	Simultaneous run	
7	APM_VTP	Speed/position control conversion	
8	APM_PTV	Position/speed control conversion	
9	APM_STP	Decelerating stop	
10	APM_SSP	Position synchronization	
11	APM_SSSB	Speed synchronization	
12	APM_POR	Position override	
13	APM_SOR	Speed override	
14	APM_PSO	Positioning speed override	
15	APM_INC	Inching run	
16	APM_SNS	Run step no. change	
17	APM_MOF	M code cancel	
18	APM_PRS	Present position preset	
19	APM_SIP	Input signal parameter setting	
20	APM_EMG	Emergency stop	
21	APM_RST	Error reset/output prohibition cancel	
22	APM_WRT	Saving parameter/run data	

Appendix 4.5 Expanded Function

No.	Function name	Description	Remarks
1	FOR	Repeat a block of FOR ~ NEXT n times	
2	NEXT		
3	BREAK	Escape a block of FOR ~ NEXT	
4	CALL	Call a SBRT routine	
5	SBRT	Assign a routine to be called by the CALL function	
6	RET	RETURN	
7	JMP	Jump to a place of LABLE	
8	INIT_DONE	Terminate an initial task	
9	END	Terminate a program	

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.

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