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Programmable Logic Controller

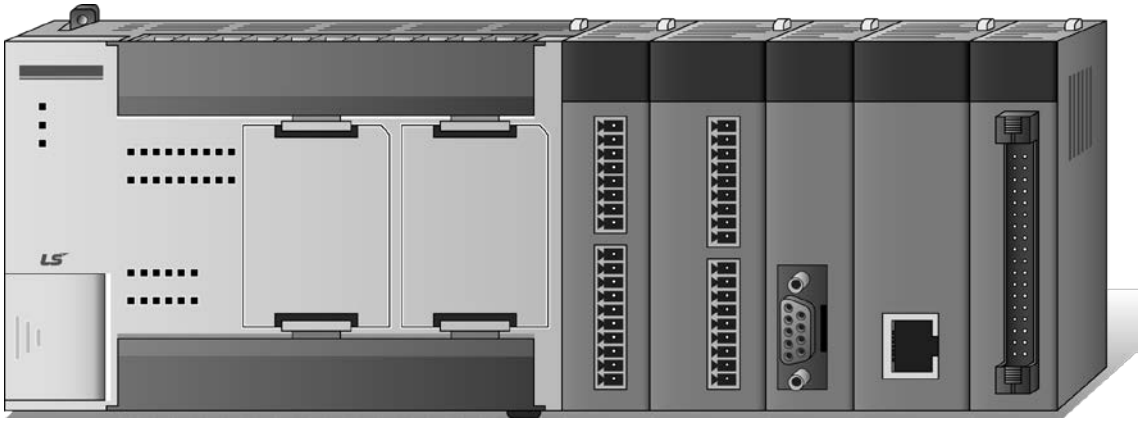
XGB Standard/Economic Type Main Unit (IEC)

XGT Series

User's Maunal

Main unit

XEC-DN20SU	XEC-DR10E
XEC-DN30SU	XEC-DN10E
XEC-DN40SU	XEC-DP10E
XEC-DN60SU	XEC-DR14E
XEC-DP20SU	XEC-DN14E
XEC-DP30SU	XEC-DP14E
XEC-DP40SU	XEC-DR20E
XEC-DP60SU	XEC-DN20E
XEC-DR20SU	XEC-DP20E
XEC-DR30SU	XEC-DR30E
XEC-DR40SU	XEC-DN30E
XEC-DR60SU	XEC-DP30E



Safety Instructions

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

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Safety Instruction

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 shall be kept available and accessible to any user of the product.

Safety Instruction

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 Instruction

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.

- **Make 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.

- **Make 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.

- **Avoid any foreign metallic materials contamination inside the product**, which may cause electric shock, fire or abnormal operation..

Safety Instruction

Safety Instructions when wiring

⚠ Warning

- **Prior to wiring, make 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, make sure that all the covers of the terminal are securely closed.** If not, electric shock may be caused

⚠ Caution

- **Install wires 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.

*

- **Make sure to 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.

- **Avoid any foreign materials such as wiring waste inside the module while wiring,** which may cause fire, damage on the product or abnormal operation.

Safety Instruction

Safety Instructions for test-operation or repair

⚠ Warning

- **Do not touch the terminal when powered on**. 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.
- **Do not recharge, disassemble, heat, short or solder the battery**. Heat, explosion or ignition may cause injuries or fire.

⚠ Caution

- **Do not 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	Page
V 1.0	2012.9	1. First Edition	-
V 1.1	2012.11	1. Software UI modified	Ch5.2, Ch5.3 Ch6.1, Ch6.2 Ch6.5, Ch6.8 Ch6.10,Ch6.11 Ch7.1, Ch8.4 Ch10.4,Ch11.2 Ch12.1
		2. XGB Special module added (XBF-AD04C,XBF-DV04C,XBF-DC04C)	-
V1.2	2013.1	1. Data Backup time modified	4-12
V1.3	2014.9	1. XGB Standard, transistor output(source) modules added (XEC-DP20, XEC-DP30, XEC-DP40, XEC-DP60SU)	4-12
		2.Domain of Homepage changed (www.lsis.biz→www.lsis.com)	Front/Back Cover
		3. RTC Option specification added(Available on slot 9)	2-2,2-3 9-4
V1.4	2015.7	1.RTC explanation added -User should change the battery periodically~ as possible. -RTC can~ 9th slot. 2. Address & phone number changed 3.I/O(Input/Output) terminal error check and modification -Input terminal block error check -Output terminal block error check, SG→PE 4.New PLC added -XBF-TC04RT/ TC04TT, XBL-PMEC/ PSEA/DSEA	 9-2 9-5 Back Cover 7-7~7-14 7-17~7-38 2-1~ 2-9,

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

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About User's Manual

Congratulations on purchasing PLC of LSIS Co.,Ltd.

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

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

Relevant User's Manual

Title	Description	Part no. of User Manual
XG5000 User's Manual	It describes how to use XG5000 software especially about online functions such as programming, printing, monitoring and debugging by using XGT series products.	10310000512
XGI/XGR/XEC Series Instruction & Programming	It describes how to use the instructions for programming using XGB (IEC language) series.	10310000510
XGB Hardware User's Manual (IEC language)	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 Module User's Manual	It describes how to use XGB FEnet I/F module.	10310000873
XGB EtherNet/IP Module User's Manual	It describes how to use XGB EtherNet/IP module.	10310001159
XGB CANopen I/F Module User's Manual	It describes how to use XGB CANopen I/F module	10310001245
XGB Position Module User's Manual	It describes the standard of positioning module, installation method, the method to use each positioning function, programming and the wiring with external equipment.	10310001008

About User's Manual

Title	Description	No. of User Manual
High Speed Counter Module User's Manual	It describes how to use High Speed Counter module	10310001242

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Chapter 1 Introduction

1.1 Guide to This Manual

This manual includes specifications, functions and handling instructions for 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. 284 I/O control supporting small & mid-sized system implementation

Item	Type		Reference
	Economy (XEC-DxxxE)	Standard (XEC-DxxxSU)	
Operation processing speed	0.24㎲ / Step	0.094㎲ / Step	-
Max IO contact point	38 points	284 points	In case of using option module 4 points
Program capacity	4Kstep	15Kstep	-
Max. no. of expanded stage	Option module 2 stages	7 stages (including option module 2 stages)	-

(c) Reasonable program capacity

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

(e) XEC-DxxxE is expressed as 'E' type and XEC-DxxxSU is expressed as "SU" type.

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

(a) Compact panel realized through the smallest size.

(Unit: mm)

Item	Type	Size (W * H * D)	Reference
Main unit	XEC-Dx20SU	135 * 90 * 64	'SU' type (x = R, N, P)
	XEC-Dx30SU		
	XEC-Dx40SU	161 * 90 * 64	
	XEC-Dx60SU	210 * 90 * 64	
	XEC-Dx10E	100*90*64	'E' type (x = R, N, P)
	XEC-Dx14E		
	XEC-Dx20E	135*90*64	
	XEC-Dx30E		
Extension module	XBE-,XBF-,XBL-	20 * 90 * 60	Basis of minimum size

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

(a) By adopting a removable terminal block connector (M3 X 6 screw), convenience of wiring may be improved ('SU' type main unit)

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

(4) Improved maintenance ability with register, RTC option, comment backup and etc

(a) Convenient programming environment by providing analog register and index register.

(b) Improved maintenance ability by operating multiple 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 (1 channel for “E” type (except load port)), communication is available without any Module expansion..

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

(c) Communication module may be increased by adding modules (up to 2 stages such as Cnet, Enet and etc). (“SU” type main unit)

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

(e) Convenient networking to upper systems through Enet or Cnet. (“SU” type main unit)

(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 analog modules can be attachable on extension base. (“SU” type: up to 7 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) Integrated programming environment

(a) XG 5000: intensified program convenience, diverse monitoring, diagnosis and editing function

(b) XG - PD: COM/network parameters setting, frame monitoring, protocol analysis function

(9) Built-in high speed counter function

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

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

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

(10) Built-in position control function (“SU” type TR output main unit)

(a) Supports max 100Kpps 2 axes.

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

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

(11) Built-in PID (“SU” type main unit)

(a) Supports max. 16 loops.

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

(c) Controls 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.

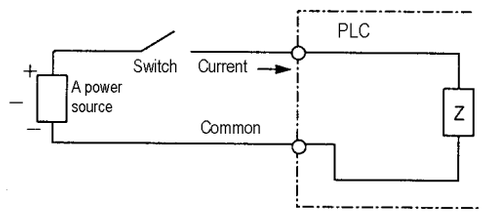
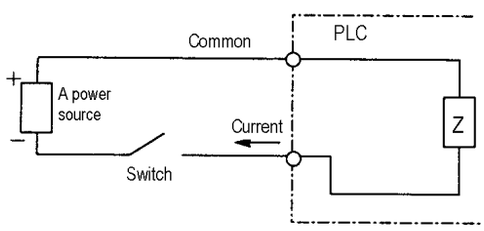
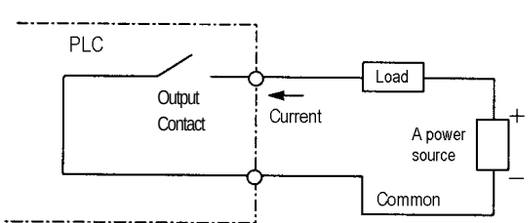
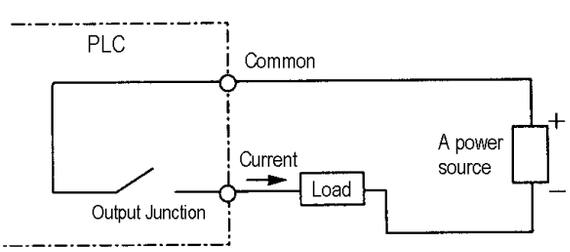
(e) Supports various types of control modes such as forward/backward mixed operation, 2-stage SV PID control, cascade control and etc.

(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, Specialmodule, 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)	-
XG - PD	Software to execute description, edition of basic parameter, high speed link, P2P parameter, and function of communication diagnosis	-
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	-
CANopen	Controller Area 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. 	Z: Input impedance
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. 	-

Chapter 2 System Configuration

The XGB series is 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

The System Configuration of XGB series is as follows.
For 'E' type, only option module can be attached
For 'SU' type, up to 7 expansion module connections are available. But in case of attaching 2 option modules, up to 5 expansion module connections are available. (For communication module, up to 2 connections are available.)

Item			Description
Total I/O points			• XEC-DxxxSU ('SU' type): 20~284 points
			• XEC-DxxxE ('E' type): 10~38 points
Maximum number of expansion modules		Digital I/O module	• 'SU' type: Max. 7
		Special module	• 'SU' type: Max. 7
		Communication I/F module	• 'SU' type: Max. 2
		Option module	• 'SU' type: Max. 2
			• 'E'type: Max. 2 (In case of 10/14 points, only one is available)
Items	Main unit	'SU' type	• XEC-DR20/30/40/60SU • XEC-DN20/30/40/60SU
		'E' type	• XEC-DR10/14/20/30E • XEC-DN10/14/20/30E • XEC-DP10/14/20/30E
	Expansion module	Digital I/O module	• XBE-DC08/16A/B/32A • XBE-TN08/16/32A • XBE-TP08/16/32A • XBE-RY08A/B/16A • XBE-DR16A
		Special module	• XBF-AD04A • XBF-DV04A • XBF-TC04RT • XBF-AD08A • XBF-DV04C • XBF-TC04TT • XBF-AD04C • XBF-AH04A • XBF-PD02A • XBF-DC04A • XBF-RD04A • XBF-HD02A • XBF-DC04C • XBF-TC04S • XBF-HO02A

Item			Description
Items	Expansion module	Communication I/F module	• XBL-C41A • XBL-C21A • XBL-EIPT • XBL-EMTA • XBL-EIMT • XBL-CMEA • XBL-CSEA • XBL-PMEC • XBL-PSEA • XBL-DSEA
	Option module	Digital I/O module	• XBO-DC04A(High speed counter is available on “SU ”type) • XBO-TN04A(Positioning is available on slot 9 of “SU ”type)
		Special module	• XBO-AD02A • XBO-DA02A • XBO-AH02A • XBO-RD01A • XBO-TC02A
		RTC module	• XBO-RTCA (Available on slot 9)
		Memory module	• XBO-M2MB

2.2 Product List

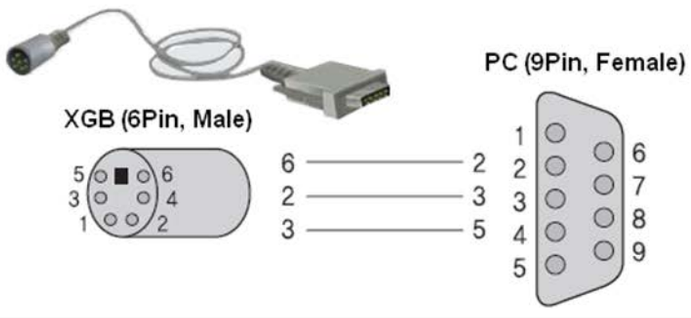
XGB series' product list is as follows.

Types	Model	Description	Remark
Main Unit	XEC-DR32H	AC100~220V power supply, DC24V input 16 point, Relay output 16 point	
	XEC-DN32H	AC100~220V power supply, DC24V input 16 point, Transistor output 16 point	
	XEC-DR64H	AC100~220V power supply, DC24V input 32 point, Relay output 32 point	
	XEC-DN64H	AC100~220V power supply, DC24V input 32 point, Transistor output 32 point	
	XEC-DR20SU	AC100~220V power supply, DC 24V input 12 point, relay output 8 point	
	XEC-DN20SU	AC100~220V power supply, DC24V input 12 point, transistor 8 point (sink type)	
	XEC-DP20SU	AC100~220V power supply, DC24V input 12 point, transistor 8 point (source type)	
	XEC-DR30SU	AC100~220V power supply, DC 24V input 18 point, relay output 12 point	
	XEC-DN30SU	AC100~220V power supply, DC 24V input 18 point, transistor output 12 point(sink type)	
	XEC-DP30SU	AC100~220V power supply, DC 24V input 18 point, transistor output 12 point(source type)	
	XEC-DR40SU	AC100~220V power supply, DC 24V input 24 point, relay output 16 point	
	XEC-DN40SU	AC100~220V power supply, DC 24V input 24 point, transistor output 16 point(sink)	
	XEC-DP40SU	AC100~220V power supply, DC 24V input 24 point, transistor output 16 point(source)	
	XEC-DR60SU	AC100~220V power supply, DC 24V input 36 point, relay output 24 point	
	XEC-DN60SU	AC100~220V power supply, DC 24V input 36 point, transistor output 24 point(sink)	
	XEC-DP60SU	AC100~220V power supply, DC 24V input 36 point, transistor output 24 point(source)	
`Expansion Module	XBE-DC08A	DC24V Input 8 point	
	XBE-DC16A/B	DC24V Input 16 point	
	XBE-DC32A	DC24V Input 32 point	
	XBE-RY08A/B	Relay output 8 point / Relay output 8 point (independent point)	
	XBE-RY16A	Relay output 16 point	
	XBE-TN08A	Transistor output 8 point	
	XBE-TN16A	Transistor output 16 point	
	XBE-TN32A	Transistor output 32 point	
	XBE-TN64A	Transistor output 64 point (sink 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	
Special Module	XBF-AD04A	Current/Voltage input 4 channel	
	XBF-DC04A	Current output 4 channel	
	XBF-DV04A	Voltage output 4 channel	
	XBF-AH04A	Current/voltage input 2 channel, output 2 channel	
	XBF-RD04A	RTD (Resistance Temperature Detector) input 4 channel	
Special Module	XBF-AD04A	Current/Voltage input 4 channel	
	XBF-AD04C	Current/Voltage input 4 channel, High resolution	
	XBF-DC04A	Current output 4 channel	
	XBF-DC04C	Voltage output 4 channel, High resolution	
	XBF-DV04A	Voltage output 4 channel	
	XBF-DV04C	Current output 4 channel, High resolution	
	XBF-AH04A	Current/voltage input 2 channel, output 2 channel	
	XBF-RD04A	RTD (Resistance Temperature Detector) input 4 channel	
	XBF-TC04S	TC (Thermocouple) input 4 channel	
	XBF-TC04RT	Temperature controller module (RTD input, 4 roof)	

Types	Model	Description	Remark
	XBF-TC04TT	Temperature controller module (TC input, 4 roof)	
	XBF-AD08A	Current/voltage input 8 channel	
	XBF-PD02A	2 axes, line driver type	
	XBF-HD02A	High Speed Counter 2channel, line driver type	
	XBF-HO02A	High Speed Counter 2channel, open collector type	
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/F/H	RAPIEnet I/F	
	XBL-EIPT	EtherNet/IP module	
	XBL-CMEA	CANopen Master	
	XBL-CSEA	CANOpen Slave	
	XBL-PMEC	Profibus-DP, Master	
	XBL-PSEA	Profibus-DP, Slave	
	XBL-DSEA	DeviceNet, Slave	
Option Module	XBO-AD02A	Current/voltage input 2channel	
	XBO-DA02A	Current/voltage output 2 channel	
	XBO-AH02A	Current/Voltage input 1 channel, output 1 channel	
	XBO-RD01A	RTD input 1 channel	
	XBO-TC02A	Thermocouple input 2 channel	
	XBO-DC04A	DC 24V input 4 point (“S” type HSC 4 channel)	
	XBO-TN04A	Sink type transistor output 4 channel (“S” type Positioning 2 axes (low speed))	
	XBO-RTCA	RTC module(Available on slot 9)	
	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	

Remark

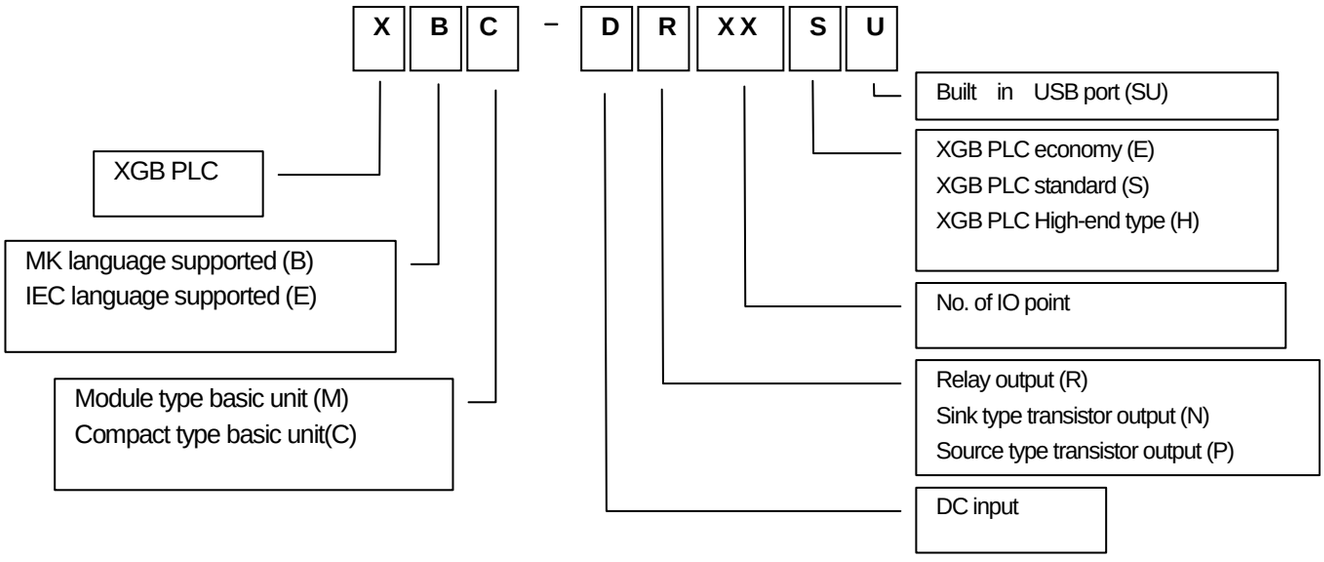
Download Cable (PMC-310S) Diagram



2.3 Classification and Type of Product Name

2.3.1 Classification and type of basic unit

Name of basic unit is classified as follows.

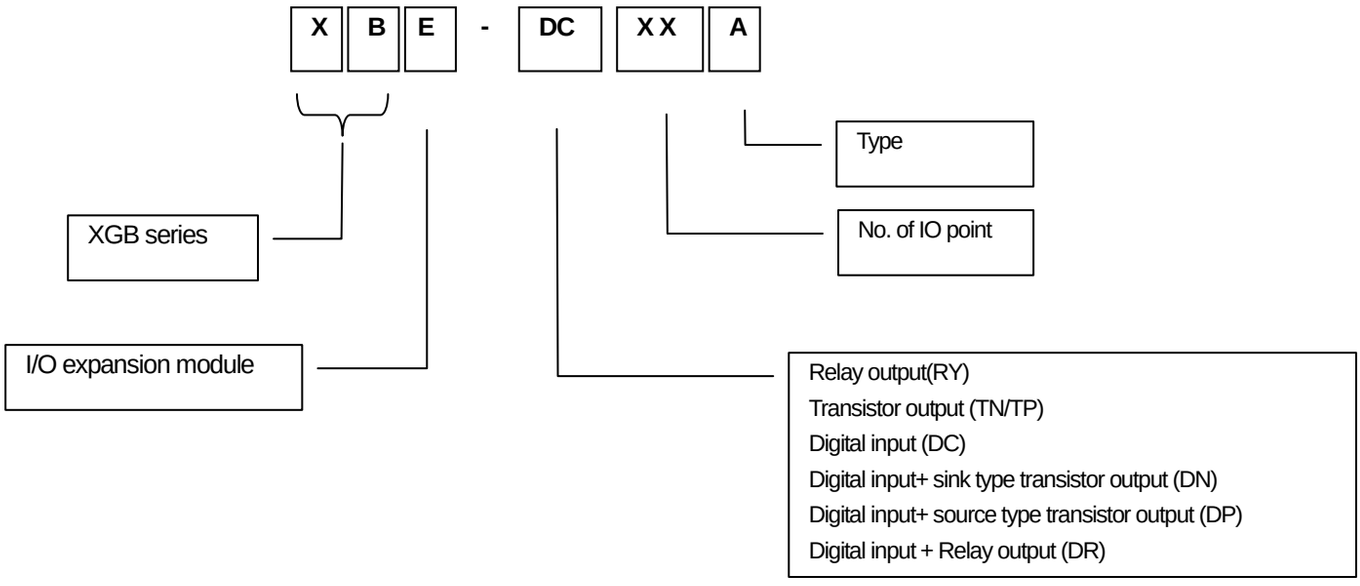


Classification	Name	DC input	Relay output	Transistor output	Power
Module type main unit (MK language)	XBM-DR16S	8 point	8 point	None	DC24V
	XBM-DN16S	8 point	None	8 point	
	XBM-DN32S	16 point	None	16 point	
Compact type main Unit (MK language)	XBC-DR32H	16 point	16 point	None	AC110V~220V
	XBC-DN32H	16 point	None	16 point	
	XBC-DR64H	32 point	32 point	None	
	XBC-DN64H	32 point	None	32 point	
	XBC-DR20SU	12 point	8 point	None	
	XBC-DR30SU	18 point	12 point	None	
	XBC-DR40SU	24 point	16 point	None	
	XBC-DR60SU	36 point	24 point	None	
	XBC-DN20SU	12 point	None	8 point	
	XBC-DN30SU	18 point	None	12 point	
	XBC-DN40SU	24 point	None	16 point	
	XBC-DN60SU	36 point	None	24 point	
	XBC-DP20SU	12 point	None	8 point	
	XBC-DP30SU	18 point	None	12 point	
	XBC-DP40SU	24 point	None	16 point	
	XBC-DP60SU	36 point	None	24 point	

Classification	Name	DC input	Relay output	Transistor output	Power
Compact type main Unit (MK language)	XBC-DR10E	6 point	4 point	None	AC110V~220V
	XBC-DR14E	8 point	6 point	None	
	XBC-DR20E	12 point	8 point	None	
	XBC-DR30E	18 point	12 point	None	
	XBC-DN10E	6 point	None	4 point	
	XBC-DN14E	8 point	None	6 point	
	XBC-DN20E	12 point	None	8 point	
	XBC-DN30E	18 point	None	12 point	
	XBC-DP10E	6 point	None	4 point	
	XBC-DP14E	8 point	None	6 point	
	XBC-DP20E	12 point	None	8 point	
	XBC-DP30E	18 point	None	12 point	
Compact type main Unit (IEC language)	XEC-DR32H	16 point	16 point	None	
	XEC-DN32H	16 point	None	16 point	
	XEC-DP32H	16 point	None	16 point	
	XEC-DR64H	32 point	32 point	None	
	XEC-DN64H	32 point	None	32 point	
	XEC-DP64H	32 point	None	32 point	
	XEC-DR20SU	12 point	8 point	None	
	XEC-DR30SU	18 point	12 point	None	
	XEC-DR40SU	24 point	16 point	None	
	XEC-DR60SU	36 point	24 point	None	
	XEC-DN20SU	18 point	None	12 point	
	XEC-DN30SU	24 point	None	16 point	
	XEC-DN40SU	24 point	None	16 point	
	XEC-DN60SU	36 point	None	24 point	
	XEC-DP20SU	18 point	None	12 point	
	XEC-DP30SU	24 point	None	16 point	
	XEC-DP40SU	24 point	None	16 point	
	XEC-DP60SU	36 point	None	24 point	
	XEC-DR10E	6 point	4 point	None	
	XEC-DR14E	8 point	6 point	None	
	XEC-DR20E	12 point	8 point	None	
	XEC-DR30E	18 point	12 point	None	
	XEC-DN10E	6 point	None	4 point	
	XEC-DN14E	8 point	None	6 point	
	XEC-DN20E	12 point	None	8 point	
	XEC-DN30E	18 point	None	12 point	
	XEC-DP10E	6 point	None	4 point	
	XEC-DP14E	8 point	None	6 point	
	XEC-DP20E	12 point	None	8 point	
	XEC-DP30E	18 point	None	12 point	

2.3.2 Classification and type of expansion module

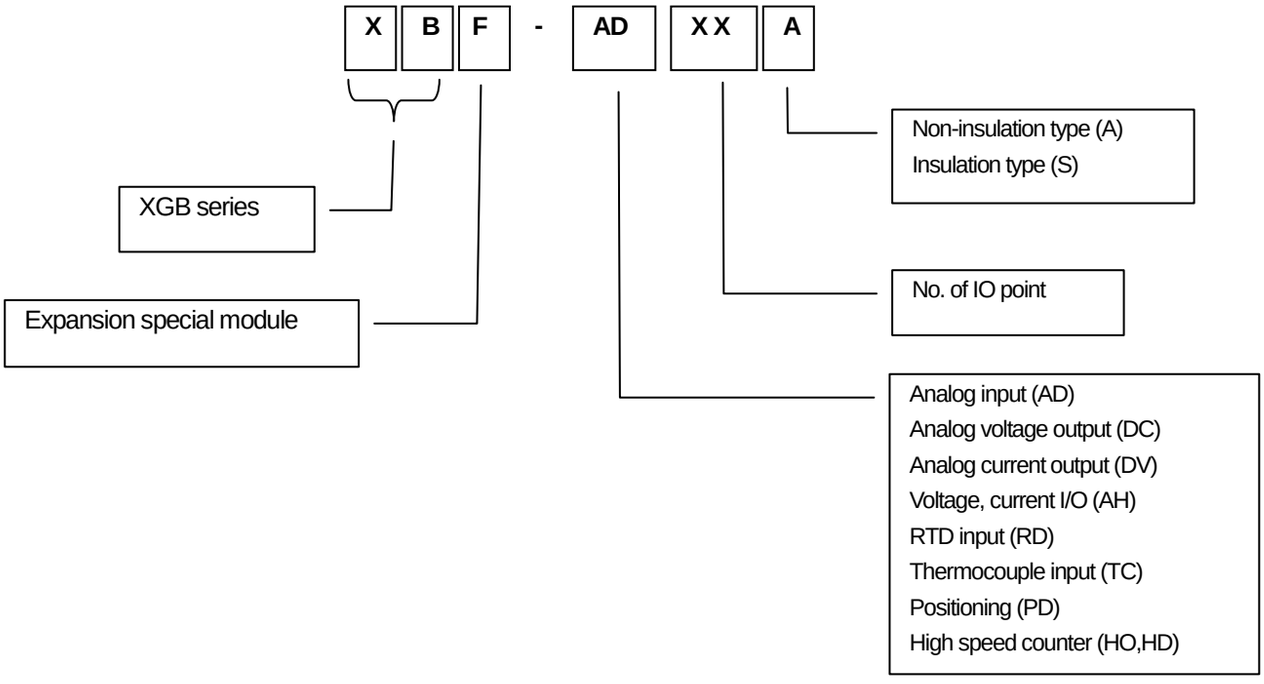
Name of expansion module is classified as follows.



Name	DC input	Relay output	Transistor output	Reference
XBE-DC08A	8 point	None	None	
XBE-DC16A/B	16 point	None	None	
XBE-DC32A	32 point	None	None	
XBE-RY08A/B	None	8 point	None	
XBE-RY16A	None	16 point	None	
XBE-TN08A	None	None	8 point	
XBE-TN16A	None	None	16 point	Sink type
XBE-TN32A	None	None	32 point	
XBE-TP08A	None	None	8 point	
XBE-TP16A	None	None	16 point	Source type
XBE-TP32A	None	None	32 point	
XBE-DR16A	8 point	8 point	None	

2.3.3 Classification and type of special module

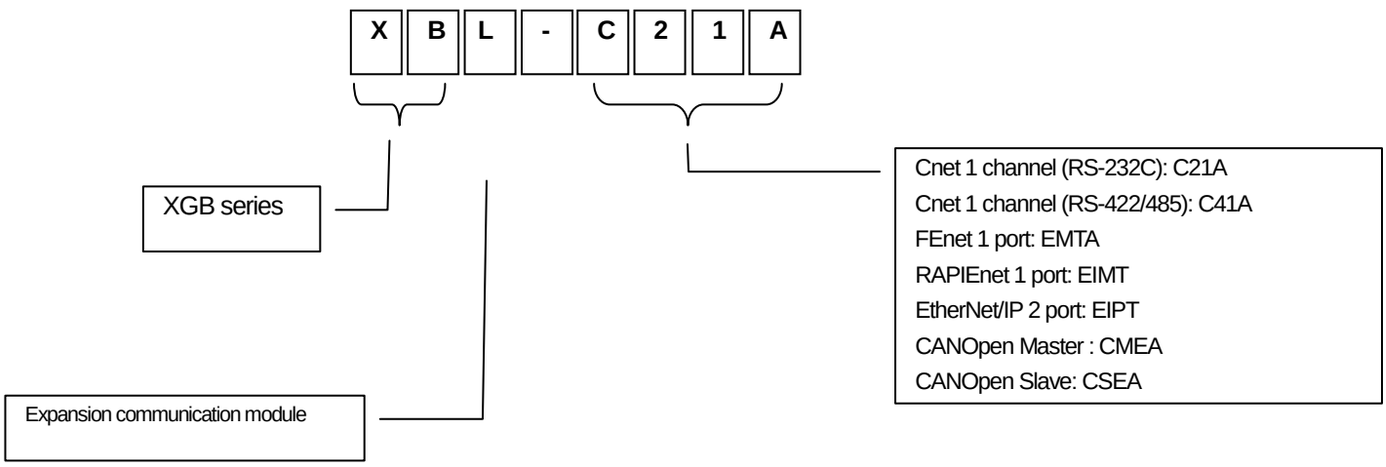
Special module is classified as follows.



Classification	Name	No. of input ch.	Input type	No. of output ch.	Output type
Analog input	XBF-AD04A/C	4	Voltage/Current	None	-
	XBF-AD08A	8	Voltage/Current	None	
Analog output	XBF-DC04A/C	None	-	4	Current
	XBF-DV04A/C	None	-	4	Voltage
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	XBF-PD02A	-	Line Driver	2	Voltage
High Speed Counter	XBF-HD02A	2	Line Driver		
	XBF-HO02A	2	Open Collector		

2.3.4 Classification and type of communication module

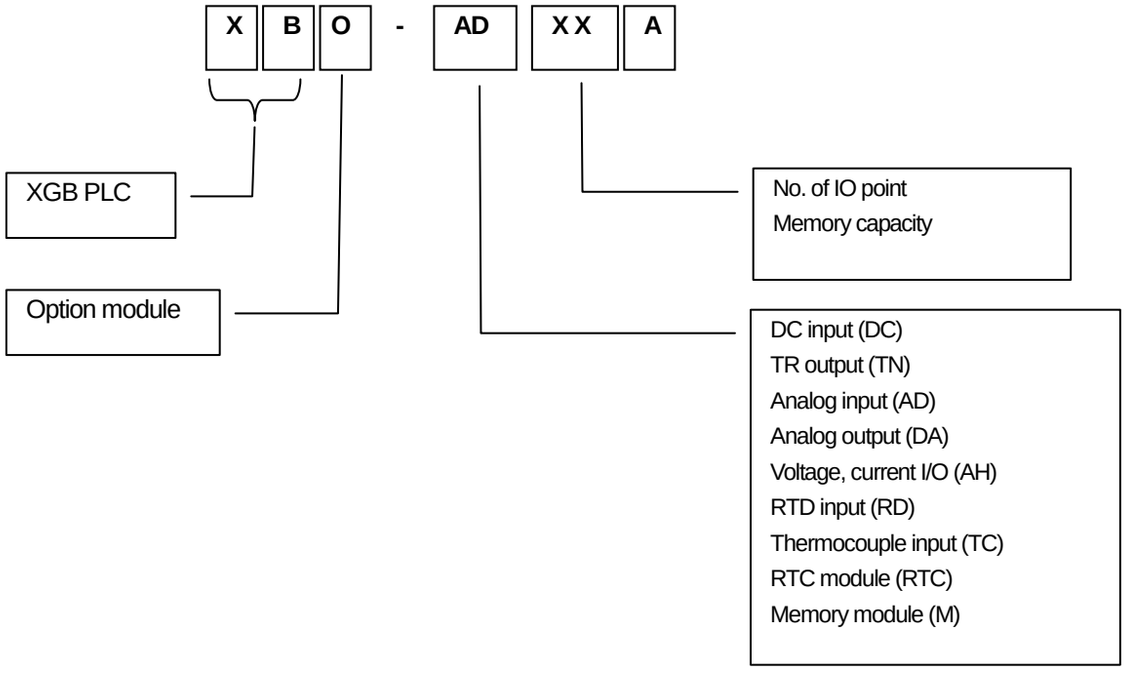
Name of communication module is classified as follows.



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
Dnet Comm. Module	XBL-DSEA	DeviceNet Slave

2.3.5 Classification and type of option module

Name of option module is classified as follows.



Classification	Name	No. of input CH	Input type	No. of output CH	Output type
DC input	XBO-DC04A	4	DC 24V	None	-
TR output	XBO-TN04A	None	-	4	Sink type
Analog input	XBO-AD02A	2	Voltage/current	None	
Analog output	XBO-DA02A	None	-	2	Voltage/current
Analog I/O	XBO-AH02A	1	Voltage/current	1	Voltage/current
RTD input	XBO-RD01A	1	PT100/JPT100	None	-
TC input	XBO-TC02A	2	K, J	None	-
RTC module	XBO-RTCA	None	-	None	-
Memory module	XBO-M2MB	None	-	None	-

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">Specification</th><th>Reference</th></tr>
<tr><td>1</td><td>Ambient Temp.</td><td colspan="6">0 ~ 55 °C</td><td rowspan="4">-</td></tr>
<tr><td>2</td><td>Storage Temp.</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="8">5</td><td rowspan="8">Vibration resistance</td><td colspan="5">Occasional vibration</td><td>-</td><td rowspan="8">IEC61131-2</td></tr>
<tr><td colspan="2">Frequency</td><td>Acceleration</td><td colspan="2">Amplitude</td><td>Times</td></tr>
<tr><td colspan="2">10 ≤ f < 57Hz</td><td>–</td><td colspan="2">0.075mm</td><td rowspan="4">10 times each direction (X,Y and Z)</td></tr>
<tr><td colspan="2">57 ≤ f ≤ 150Hz</td><td>9.8m/s^2(1G)</td><td colspan="2">–</td></tr>
<tr><td colspan="6">Continuous vibration</td></tr>
<tr><td colspan="2">Frequency</td><td>Acceleration</td><td colspan="2">Amplitude</td></tr>
<tr><td colspan="2">10 ≤ f < 57Hz</td><td>–</td><td colspan="2">0.035mm</td></tr>
<tr><td colspan="2">57 ≤ f ≤ 150Hz</td><td>4.9m/s^2(0.5G)</td><td colspan="2">–</td></tr>
<tr><td>6</td><td>Shock resistance</td><td colspan="7">• 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="5">AC: ±1,500 V
DC: ±900 V</td><td>LSIS standard</td></tr>
<tr><td>Electrostatic discharge</td><td colspan="5">Voltage: 4kV (Contact discharge)</td><td>IEC61131-2
IEC61000-4-2</td></tr>
<tr><td>Radiated electromagnetic field noise</td><td colspan="5">80 ~ 1,000 MHz, 10V/m</td><td>IEC61131-2,
IEC61000-4-3</td></tr>
<tr><td rowspan="2">Fast transient /Burst 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 gases and excessive dust</td><td rowspan="4">-</td></tr>
<tr><td>9</td><td>Altitude</td><td colspan="6">Up to 2,000 ms</td></tr>
<tr><td>10</td><td>Pollution degree</td><td colspan="6">2 or less</td></tr>
<tr><td>11</td><td>Cooling</td><td colspan="6">Air-cooling</td></tr>
</table>

Remark

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

2) Pollution degree:
An index indicating pollution degree of the operating environment which decides insulation performance of the devices. For instance, Pollution degree 2 indicates the state generally that only non-conductive pollution occurs. However, this state contains temporary conduction due to dew produced.

Chapter 4 CPU Specifications

4.1 Performance Specifications

The following table shows the general specifications of the XGB module type CPU (XEC-Dx10/14/20/30E).

Items			Specifications ('E' type)				Remark
			XEC-DR10E	XEC-DR14E	XEC-DR20E	XEC-DR30E	
			XEC-DN10E	XEC-DN14E	XEC-DN20E	XEC-DN30E	
			XEC-DP10E	XEC-DP14E	XEC-DP20E	XEC-DP30E	
Program control method			Reiterative operation, fixed cycle operation Interrupt operation, constant period scan				
I/O control method			Scan synchronized batch processing method (Refresh method) Direct method by instruction				
Program language			Ladder Diagram (LD) Sequential Function Chart (SFC) Structured Text (ST)				
Number of instructions	Operator		18				
	Basic function		136 + Real number operation function				
	Basic function block		43				
	Special function block		Special function dedicated function				
Processing speed (Basic instruction)			Basic instructions: 0.24㎲/step				
Program capacity			50KB				
Max. I/O points (Main+Option X)			14 Point (1 Option)	18 Point (1 Option)	28 Point (2 Option)	38 Point (2 Option)	
Data Memory	Automatic variable (A)		8KB(Max 8KB Available)				
	Input variable (I)		256 Byte (%IX1.15.63)				
	Output variable (Q)		256 Byte (%QX1.15.63)				
	Direct variable	M	4 KB				
		R	10 KB(1block)				
		W	10 KB				
	Flag variable	F	768 Byte				
		K	5,120 Byte				
		L	2,560 Byte				
		U	704 Byte				
Flash area			10KB, 2blocks				

Items		Specifications ('E' type)				Remark
		XEC-DR10E	XEC-DR14E	XEC-DR20E	XEC-DR30E	
		XEC-DN10E	XEC-DN14E	XEC-DN20E	XEC-DN30E	
		XEC-DP10E	XEC-DP14E	XEC-DP20E	XEC-DP30E	
Timer		No limit in points				
Counter		No limit in points (Counter range: 64 bit range)				
Operation Mode		RUN, STOP				
Restart modes		Cold, Warm				
Total number of program block		128				
Task	Initialization	1				
	Fixed period	8				
	External input	4(%IX0.0.0~%IX0.0.3)				
	Internal device	8				
Self-diagnostic functions		Watchdog Timer, Memory error detection I/O error detection, etc.				
Data keeping method at power failure		Setting to retain area at basic parameter				
Internal consumption current (mA)		250	315	355	485	
		180	190	200	210	
		180	190	200	210	
Weight (g)		330	340	450	465	
		313	315	418	423	
		313	315	418	423	

The following table shows the general specifications of the XGB compact type CPU (XEC-DN20/30/40/60SU, XEC-DR20/30/40/60SU).

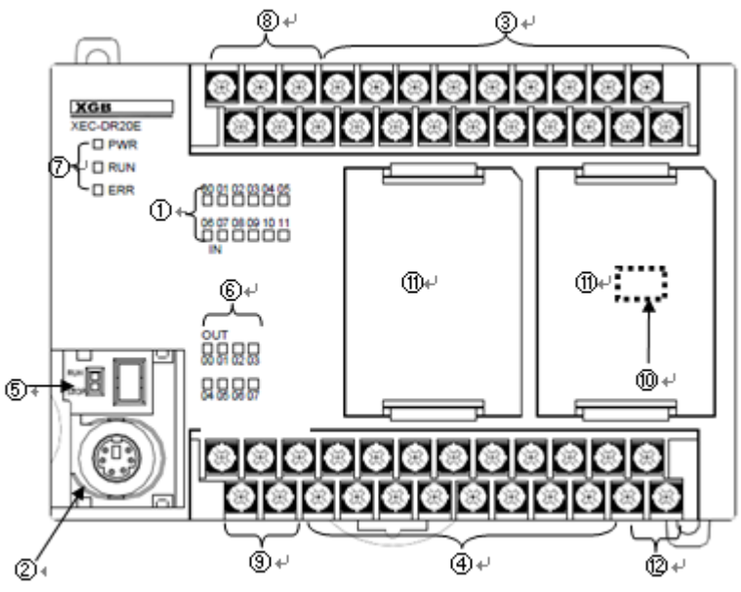
Items			Specifications ('SU' type)				Remark
			XEC-DR20SU	XEC-DR30SU	XEC-DR40SU	XEC-DR60SU	
			XEC-DN20SU	XEC-DN30SU	XEC-DN40SU	XEC-DN60SU	
			XEC-DP20SU	XEC-DP30SU	XEC-DP40SU	XEC-DP60SU	
Program control method			Reiterative operation, fixed cycle operation, constant scan				
I/O control method			Scan synchronous batch processing method (Refresh method), Directed by program instruction				
Program language			Ladder Diagram (LD) Sequential Function Chart (SFC) Structured Text (ST)				
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)			0.094 ㎲/Step				
Program capacity			200KB				
Max. I/O points (Main + Expansion 7 stages)			244 point	254 point	264 point	284 point	
Data Memory	Automatic variable (A)		16KB (Max.16KB retain setting available)				
	Input variable (I)		2 KB (%IX15.15.63)				
	Output variable (Q)		2 KB (%QX15.15.63)				
	Direct variable	M	8KB (Max.8KB retain setting available)				
		R	20KB (1Block)				
		W	20KB				
	Flag variable	F	2KB				
		K	8KB				
		L	4KB				
		U	1KB				
Flash area			20KB, 2 blocks				
Timer			No limit to the number of point (time range: 0.001s ~ 4,294,967,295s)				
Counter			No limit to the number of point (count range: 64 bit expression range)				

Items		Specifications ('SU' type)				Remark
		XEC-DR20SU	XEC-DR30SU	XEC-DR40SU	XEC-DR60SU	
		XEC-DN20SU	XEC-DN30SU	XEC-DN40SU	XEC-DN60SU	
		XEC-DP20SU	XEC-DP30SU	XEC-DP40SU	XEC-DP60SU	
Operation modes		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 keeping method at power failure		Setting retain area at basic parameter				
Internal consumption current (mA)		478	626	684	942	
		252	270	288	340	
		305	352	355	394	
Weight (g)		514	528	594	804	
		475	474	578	636	
		442	446	544	717	

Items			Specifications		Remark
			XEC-DxxxE(Economy)	XEC-DxxxSU(Standard)	
Built-in function	PID control function		Controlled by instructions, Auto-tuning, PWM output, Forced output, Adjustable operation scan time, Anti Windup, Delta MV function, SV-Ramp function,The mixed forward/reverse run, Cascade		Supported in 'SU' type
	Cnet I/F function		Dedicated protocol support MODBUS protocol support User defined protocol support		
			RS-232C 1 port, RS-485 1 port respectively		
	High-speed counter	Capacity	1 phase: 4 kHz 4 channel 2 phase: 2 kHz 2 channel	1 phase: 100 kHz 2 channel, 20kHz 6 channel 2 phase: 50 kHz 1 channel, 8kHz 3 channel	
		Counter mode	4 different counter modes according to input pulse and addition/subtraction method 1 Increasing/decreasing operation setting by program 1 Increasing/decreasing operation setting by B-phase input 2 Operating setting by rising/falling edge phase difference		
			2 phase pulse input: addition/subtraction by rising pulse phase differences	2 phase pulse input: addition/subtraction by rising/falling pulse 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		Supported in 'SU' type transistor output
		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	By Home and DOG (Off) By Home and DOG (On) By DOG		
		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		50 ㎲ 4 point (%IX0.0.0~%IX0.0.3)	10 ㎲ 2 point (%IX0.0.0 ~ %IX0.0.1) 50 ㎲ 6 point (%IX0.0.2 ~ %IX0.0.7)	-
	External interrupt		4 point: 50 ㎲ (%IX0.0.0~%IX0.0.3)	10 ㎲ 2 point (%IX0.0.0 ~ %IX0.0.1) 50 ㎲ 6 point (%IX0.0.2 ~ %IX0.0.7)	
	Input filter		Select among 1,3,5,10,20,70,100 ㎳ (Adjustable)		

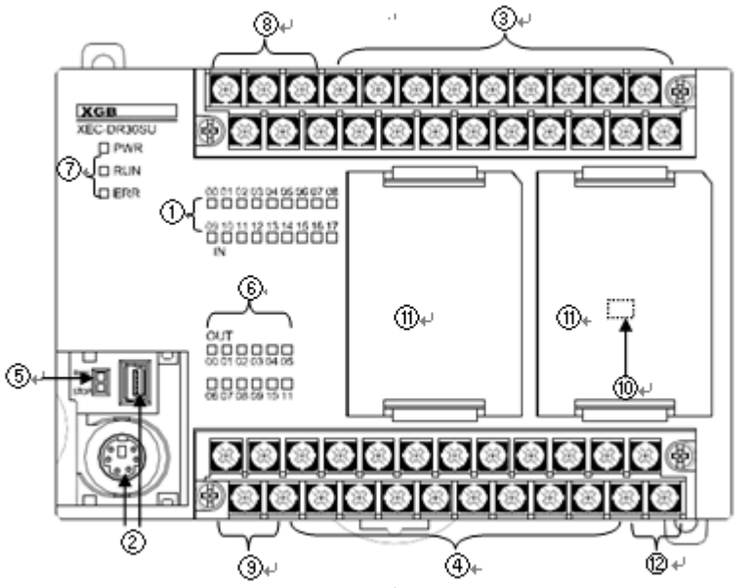
4.2 Names Of Part and Function

'E' Type



No	명 칭	용 도
①	Input indicator LED	▪ Input indicator LED
②	PADT connecting connector	▪ PADT connector -RS-232C 1 channel
③	Input terminal block	▪ Input terminal bl□ck
④	Output terminal block	▪ Output terminal block
⑤	RUN/STOP mode switch	▪ Sets the operation mode of main unit STOP → RUN: execute operation of program RUN → STOP: stop operation of program (In case of STOP, remote mode is available)
⑥	Output indicator LED	▪ Output indicator LED
⑦	Status indicator LED	It indicates CPU module's status. ▪ PWR(Red on): Power status ▪ RUN(Green on): RUN status ▪ Error(Red flickering): In case of error, it is flickering.
⑧	Built-in communication Connecting c□nnector	• Built-in RS-232C/485 connecting connector
⑨	Power supply connector	▪ AC100~240V power supply connector
⑩	OS mode dip switch	▪ Dip switch for setting O/S download/Operation mode On: Boot mode, available to download O/S Off:User mode, availab□□ to download program using PADT
⑪	Option module holder	▪For connection option module
⑫	24V Output	▪24V Output (0.2A)

'SU' Type



No.	Name	Description
①	Input indicator LED	▪ Input indicator LED
②	PADT connecting connector	▪ PADT connector RS-232C 1 channel, USB 1 channel
③	Input terminal block	▪ Input terminal block
④	Output terminal block	▪ Output terminal block
⑤	RUN/STOP mode switch	▪ Sets the operation mode of main unit STOP → RUN: execute operation of program RUN → STOP: stop operation of program (In case of STOP, remote mode is available)
⑥	Output indicator LED	▪ Output indicator LED
⑦	Status indicator LED	It indicates CPU module's status. ▪ PWR(Red on): Power status ▪ RUN(Green on): RUN status ▪ Error(Red flickering): In case of error, it is flickering.
⑧	Built-in communication Connecting connector	• Built-in RS-232C/485 connecting connector
⑨	Power supply connector	▪ AC100~240V power supply connector
⑩	OS mode dip switch	▪ Dip switch for setting O/S download/Operation mode On: Boot mode, available to download O/S Off: User mode, available to download program using PADT
⑪	Option module holder	▪For connection option module
⑫	24V Output	▪24V Output (0.3A: 20/30/40point, 0.5A: 60point)

4.3 Power Supply Specifications

It describes the power supply specification of main unit.

Items			Specification				
			XEC-DR10/14E XEC-DN10/14E XEC-DP10/14E	XEC-DR20/30E XEC-DN20/30E XEC-DP20/30E	XEC-DR20/30SU XEC-DN20/30SU XEC-DP20/30SU	XEC-DR40SU XEC-DN40SU XEC-DP40SU	XEC-DR60SU XEC-DN60SU XEC-DP60SU
Input	Rated voltage (UL warranty voltage)		AC 100 ~ 240 V				
	Input voltage range		AC85~264V(-15%, +10%)				
	Inrush current		50A$_{Peak}$ or less				
	Input current		0.5A or less (220V), 1A or less (110V)				
	Efficiency		65% or more				
	Permitted momentary power failure		Less than 10ms				
Output	Rated output	DC5V	0.5A	0.8A	1.5A	2.0A	2.5A
		DC24V	0.2A	0.2A	0.3A	0.3A	0.5A
	Output voltage ripple		DC5V (±2%)				
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 : ㎃)
Main Unit	XEC-DR32H	660
	XEC-DR64H	1,040
	XEC-DN32H	260
	XEC-DN64H	330
	XEC-DP32H	260
	XEC-DP64H	330
	XEC-DP20SU	252
	XEC-DP30SU	270
	XEC-DP40SU	288
	XEC-DP60SU	340
	XEC-DN20SU	252
	XEC-DN30SU	270
	XEC-DN40SU	288
	XEC-DN60SU	340
	XEC-DR20SU	478
	XEC-DR30SU	626
	XEC-DR40SU	684
	XEC-DR60SU	942
	XEC-DR30E	485
	XEC-DR20E	355
	XEC-DR14E	315
	XEC-DR10E	250
	XEC-DN30E	210
	XEC-DN20E	200
	XEC-DN14E	190
	XEC-DN10E	180
	XEC-DP30E	210
	XEC-DP20E	200
	XEC-DP14E	190
	XEC-DP10E	180
Expansion I/O module	XBE-DC32A	50
	XBE-DC16A/B	40
	XBE-DC08A	20
	XBE-RY16A	440
	XBE-RY08A/B	240
	XBE-TN32A	80
	XBE-TN16A	50
	XBE-TN08A	40
	XBE-DR16A	250

Type	Model	Consumption current (Unit : ㎃)
Special Expansion module	XBF-AD04A	120
	XBF-AD08A	105
	XBF-AH04A	120
	XBF-DV04A	110
	XBF-DC04A	110
	XBF-RD04A	100
	XBF-TC04S	100
	XBF-PD02A	500
	XBF-HO02A	270
	XBF-HD02A	330
	XBF-AD04C	100
	XBF-DC04C	160
	XBF-DV04C	160
Communication Expansion 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
Option module	XBO-DC04A	50
	XBO-TN04A	80
	XBO-AD02A	50
	XBO-DA02A	150
	XBO-AH02A	150
	XBO-RD01A	30
	XBO-TC02A	50
	XBO-RTCA	30
	XBO-M2MB	70

4.4 Calculation Example of Consumption Current/Voltage

Calculate the consumption current and configure the system not to exceed the output current capacity of basic 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-DN20SU	1	252	When contact points are On. (Maximum consumption current)
Expansion module	XBE-DC32A	2	50	
	XBE-TN32A	2	80	
	XBF-AD04A	1	120	All channel is used. (Maximum consumption current)
	XBF-DC04A	1	110	
	XBL-C21A	1	110	
Total Consumption current	852 mA			-
Consumption voltage	4.26 W			0.85 * 5V = 4.26W

In case system is configured as above, since 5V consumption current is total 852mA and 5V output of XGB standard type main unit is maximum 1.5A, 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-DN30SU	1	270	When all contact points are On. (Maximum consumption current)
Expansion module	XBE-DR16A	2	250	
	XBE-RY16A	2	440	
	XBF-AD04A	2	120	All channel is used. (Maximum consumption current)
	XBL-C21A	1	110	
Consumption current	2,000 mA			-
Consumption voltage	10W			2,000 × 5V = 10W

If system is configured as above, total 5V current consumption is exceeded 2,000mA and it exceeds the 5V output of XGB standard type main unit. Normal system configuration is not available. Although we assume the above example that all contact points are on, please use high-end type 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	XBC-DN32H	1	260	When of all contact points are On. (Maximum consumption current)
Expansion module	XBE-DR16A	2	250	
	XBE-RY16A	2	440	
	XBF-AD04A	2	120	All channel is used. (Maximum consumption current)
	XBL-C21A	1	110	
Consumption current	1,990 mA			-
Consumption voltage	9.95 W			1.99A × 5V = 9.95W

The above system is an example of using XBC-DN32H about the system example (2). Unlike (2) example, 5V output capacity of XBC-DN32H is maximum 2A, normal configuration is available.

4.5 Data Backup Time

When RTC module is not installed with main unit, data is kept by super capacitor. The following table shows the data backup time of the main unit.

Type	Data backup time		Remark
XEC "SU" type	backup by the Capacitor	18 Days	At normal temperature (25℃)
	RTC module installed	3 Yeas	
XEC "E" type	backup by the Capacitor	5 Days	
	RTC module installed	3 Yeas	

But super capacitor need to charge while power is on over 30 minute.

In case super capacitor is not charged enough or power is off more than data backup time, latch data is not kept and warning occurs. At this time, phenomenon and measure are as follows.

In case abnormal data backup warning occurs when turning off and turning on within data backup time, technical assistance of main unit is necessary. Be careful data backup time is getting shorter at high temperature.

Remark

Above data backup time can be different depending on temperature condition.

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'. Such series of processing is called 'cyclic operation method'. The processing is divided per stage as below.

Stage	Processing description
Start	-
Initialization processing	• A stage to start the scan processing which is executed once when power is applied or Reset is executed, as below. ▸ I/O module reset ▸ Self-diagnosis execution ▸ Data clear ▸ Address allocation of I/O module and type register • If initializing task is designated, Initializing program is executed.
Input image area refresh	• Reads the state of input module and saves it in input image area before starting the operation of program.
Program operation processing Program start ⋮ Program last step	• Performs the operation in order from the program start to last step.
Output image area refresh	• Performs the operation in order from the program start to last step.
END	• 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

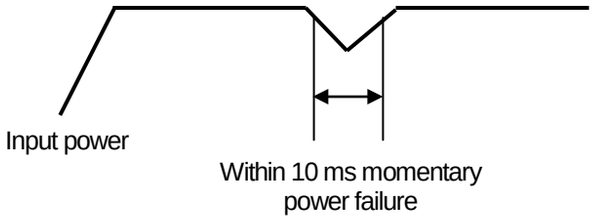
(2) Interrupt operation (Cycle time, Internal device)
This is the method that stops the program operation in proceeding temporarily and carries out the operation processing which corresponds to interrupt program immediately in case that there occurs the status to process emergently during PLC program 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 Interrupt input("SU" type: P000~P007, 'E' type: P000~P003). 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 the program scan again when it reaches to the appointed time. The difference from constant program is the update of input/output and 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

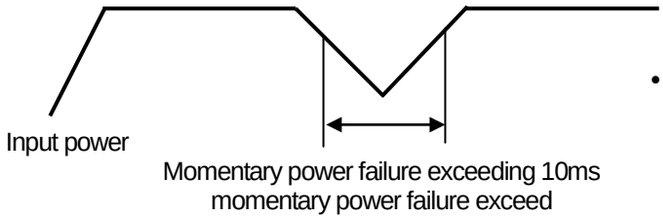
CPU module detects the momentary power failure when input power voltage supplied to power module is lower than the standard. If CPU module detects the momentary power failure , it carries out the operation processing as follows.If momentary power failure within 10 ms is occurred, main unit (CPU) keeps the operation. But, if momentary power failure above 10 ㎳, the operation stops and the output is Off. Restart processing at power input shall be performed.

(1) Momentary power failure within 10 ms



• CPU keeps the operation.

(2) 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.

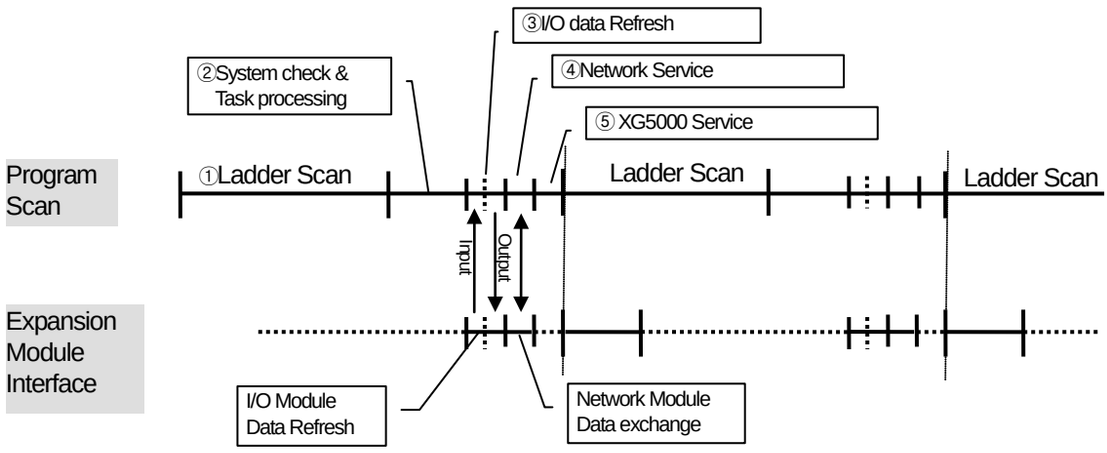
(a) Scan time = Scan program processing time + Interrupt program processing time + PLC internal processing time

- Scan program processing time = processing time of user program except 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.

Type	MPU processing time		Expansion interface processing time		
	Executing scan program	PLC internal processing time	Digital I/O module (32 point, 1 unit)	Analog module (8 channel, 1 unit)	Comm.module (main/expansion) (200 byte, 1 block)
'E' type	5.4 ㎳	1.0 ㎳	-	-	0.5 ㎳ (main)
'SU' type	3.0 ㎳	0.5 ㎳	0.3 ㎳	3.0 ㎳	0.8 ㎳ (main)

The main unit executes controls along the following steps. A user can estimate the control performance of a system that the user is to structure from the following calculation.



Scan time = ① Scan program process + ② System check & Task process + ③I/O data Refresh + ④ Network Service + ⑤ XG5000 Service + ⑥ User Task Program process

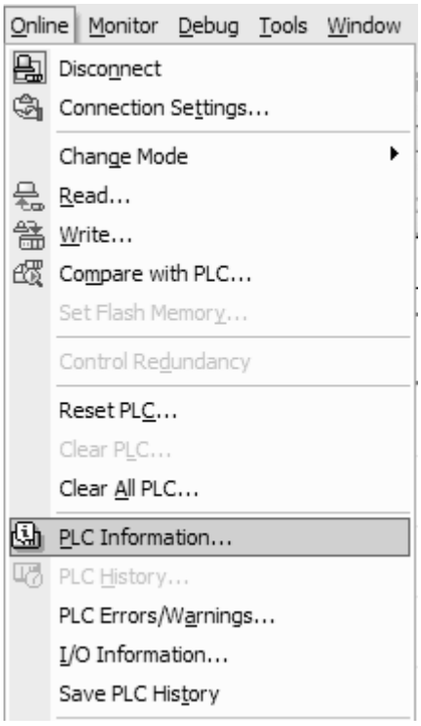
① Scan program process = no. of instruction x process speed per each instruction (refer to XGK/XGB instruction user manual)
② System check & Task process: 600 ㎲ ~ 1.0 ms [varies depending on the usage of auxiliary functions]
③ XG5000 Service process time: 100 ㎲ at the max data monitor
④ Task Program process time: sum of task processing time that occurs within a scan; the time calculation by task programs are as same as that of scan program.

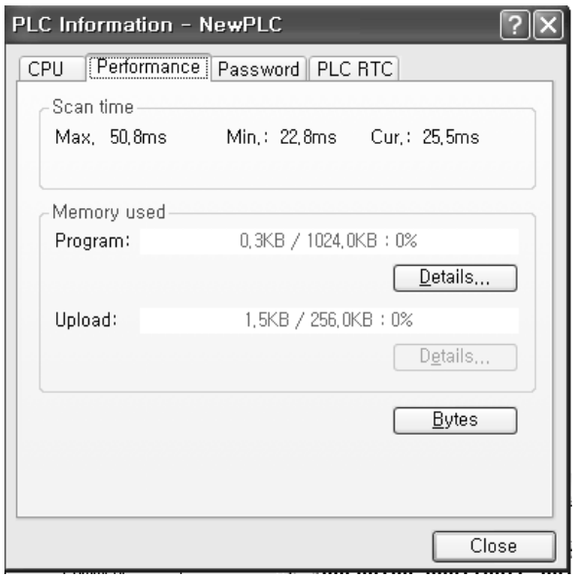
(2) Example

The scan time of a system consisting of main unit (program 4kstep) + five 32-point I/O modules + one analog module + one communication modules (200 byte 1 block)

Scan time(㎲) = Scan program process ＋ System check & Task process ＋I/O data Refresh + Network Service + XG5000 Service + User Task Program process
= (2047 x (0.67(LOAD)+ 0.80(OUT)) + (500) + (300 x 5) + (3000 x 1) + (800 x 1) + (100) ㎲
= 3009 + 500 + 1500 + 3000 + 800 + 100 ㎲ = 8909 ㎲
= 8.9 ㎳
(But, in case of online editing or writing XG-PD parameter, scan time increases temporary up to 100ms)

(3) 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

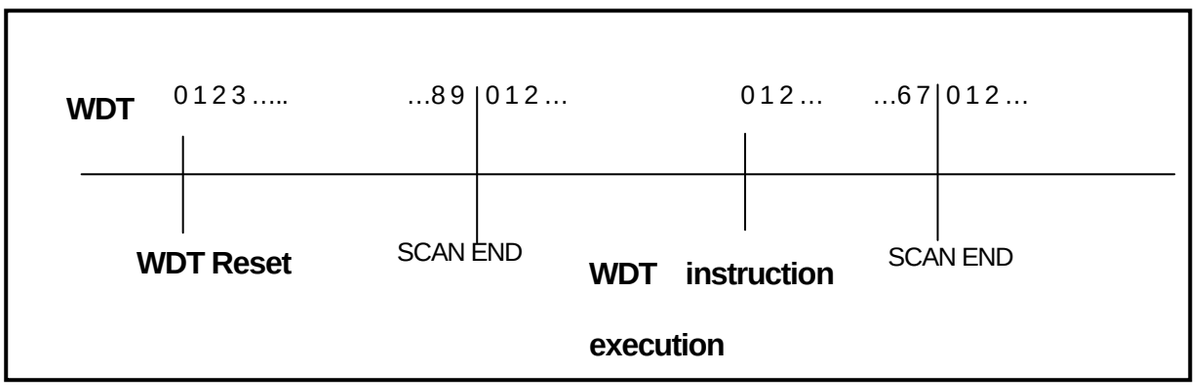
WDT (Watchdog Timer) is the function to detect the program congestion by the error of hardware and software of PLC CPU module.

(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' instruction. 'WDT' instruction initializes the elapsed time of Scan Watchdog Timer and starts the time measurement from 0 again.
(For further information of WDT instruction, please refer to Instruction.)

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



Remark

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

5.2 Program Execution

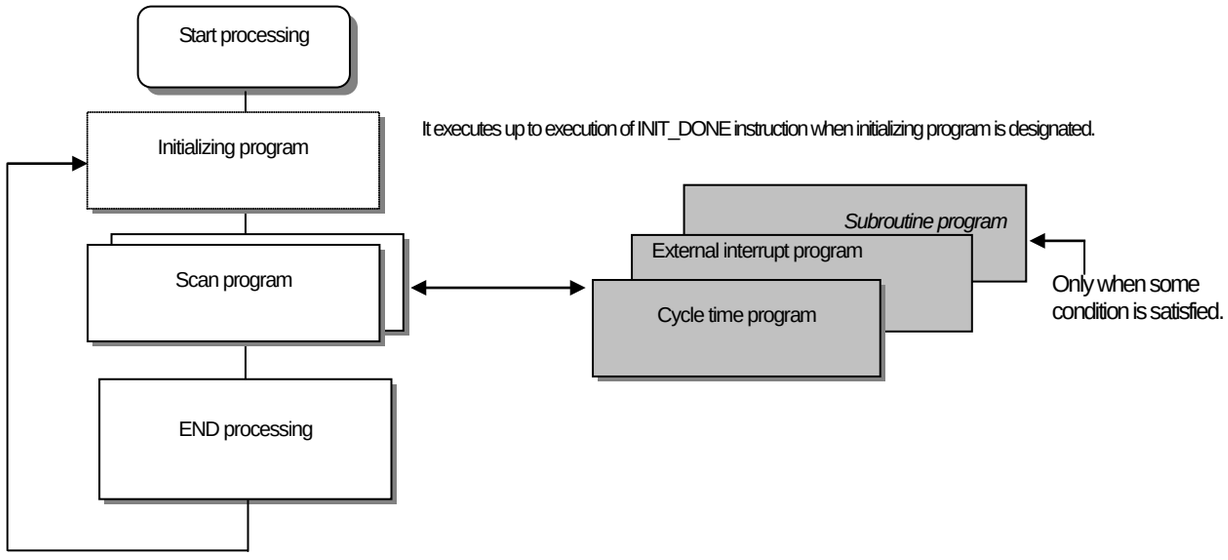
5.2.1 Configuration of program

All functional elements need to execute a certain control process which is 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, cycle task, external interrupt task and internal device task are not executed. I/O refresh, high speed counter and communication are 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

The section describes the program proceeding method that is executed when the power is applied or key switch is on 'RUN'. The programperforms 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 interrupt module 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 input task program): "SU" type available to use up to 8. (%IX0.0.0 ~ %IX0.0.7)
    'E' type available to use up to 4. (%IX0.0.0~%IX0.0.3)

- 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 ('SU' type: IX0.0.0~IX0.0.7).

Remark

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

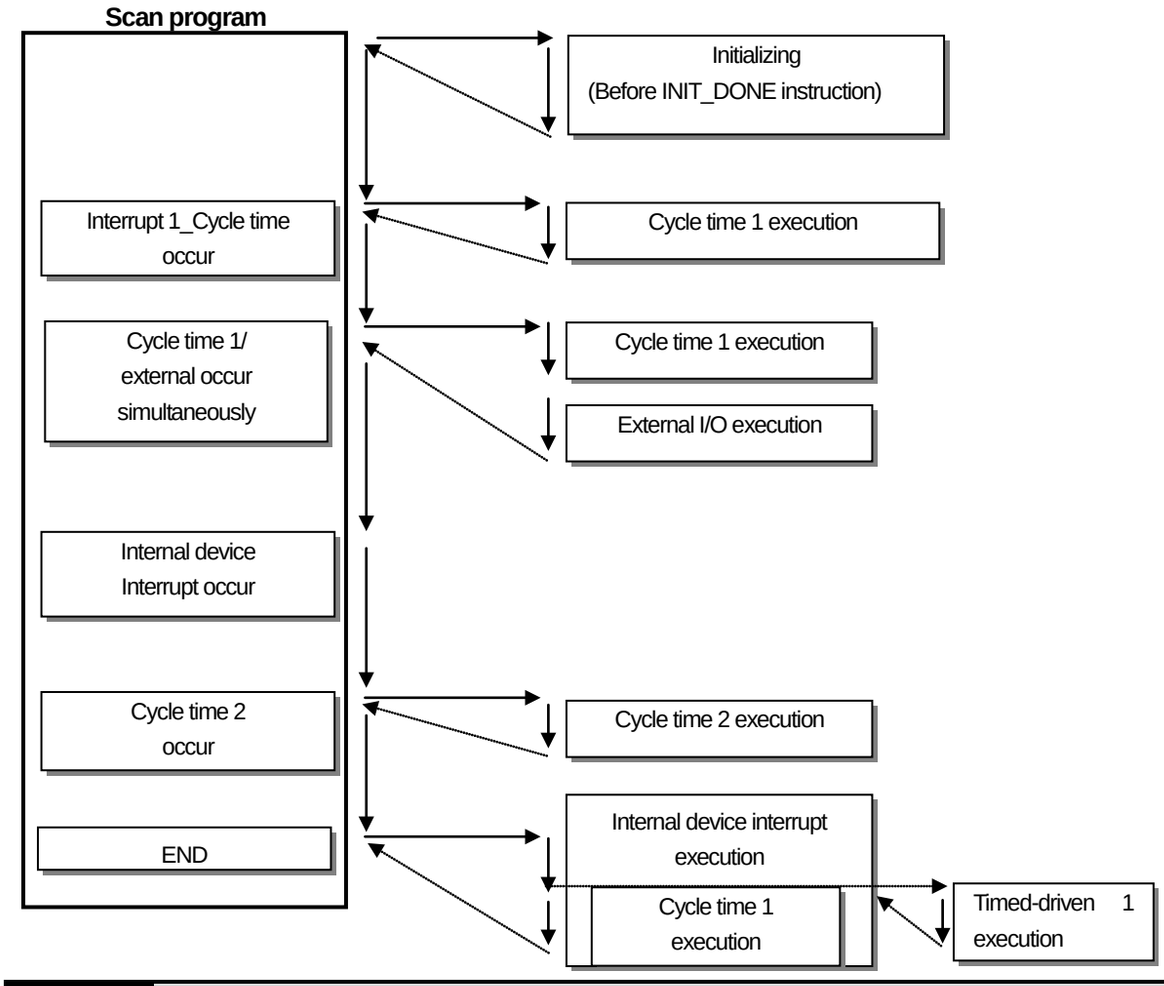
(2) Though interrupt ,which has lower priority, occurs many times during execution of interrupt which has higher priority, interrupt ,which has lower priority, occurs only one time.

5.2.3 Interrupt

For your understanding of Interrupt function, this section describes program setting method of XG5000 which is 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	14	Internal
Cycle time 2	Interrupt 4_cycle time	3	1	Cycle time 2



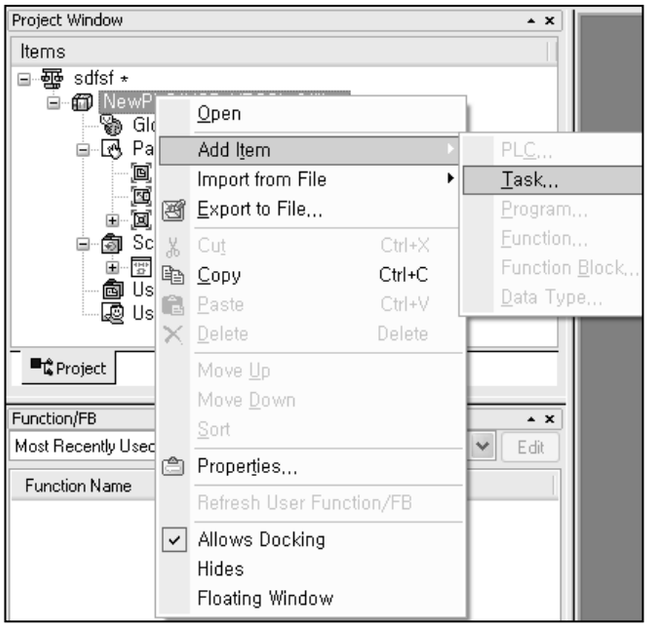
Remark

- 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 enable state. In case you don't use it, disable the interrupts by using DI instruction. If you want to use it again, enable by using EI instruction.
- Internal device interrupt is executed after END instruction.

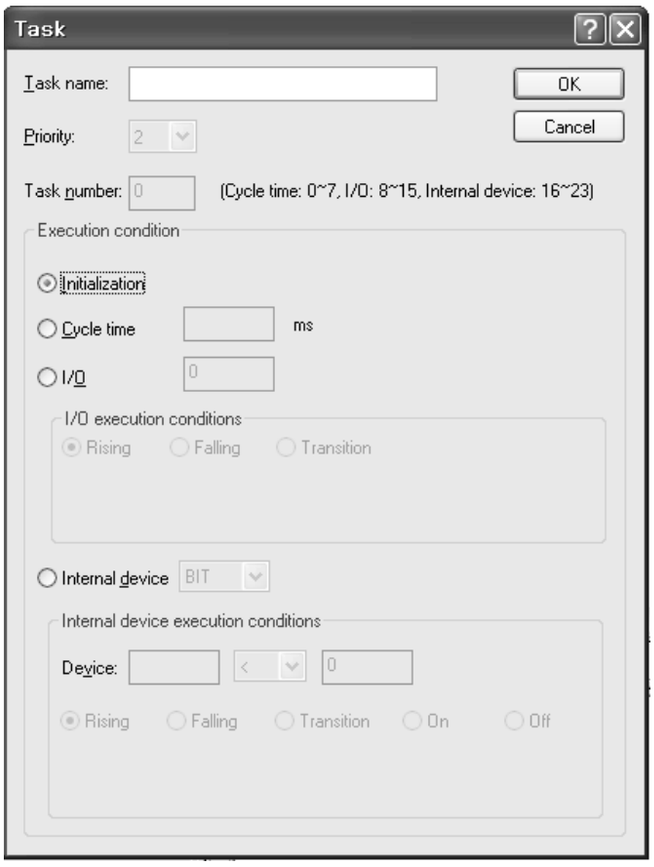
(1) How to make Initialization task program

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.)

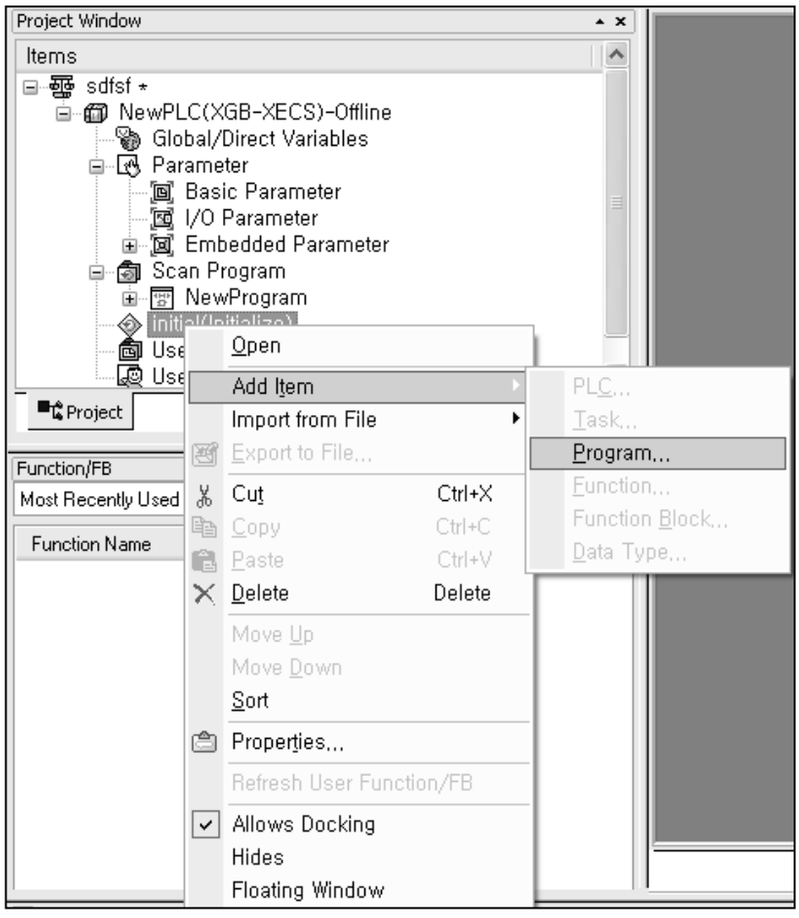
(a) Click right button of mouse on project name and click 『Add item』-『Task』.



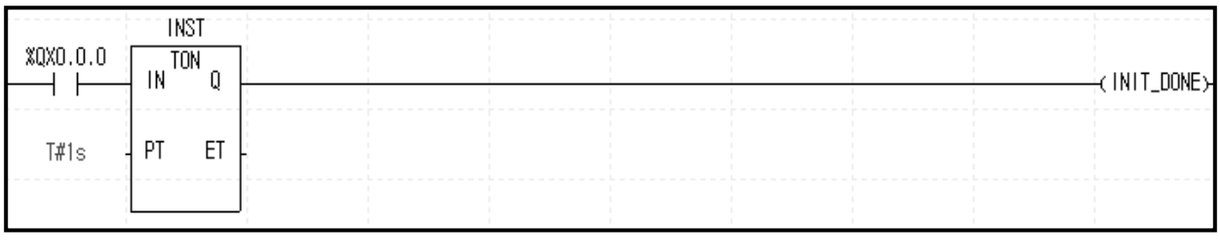
(b) The screen of Task setting is shown. Click 『Initialization』 in Execution condition and make a Task name.



(c) Right click on 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.

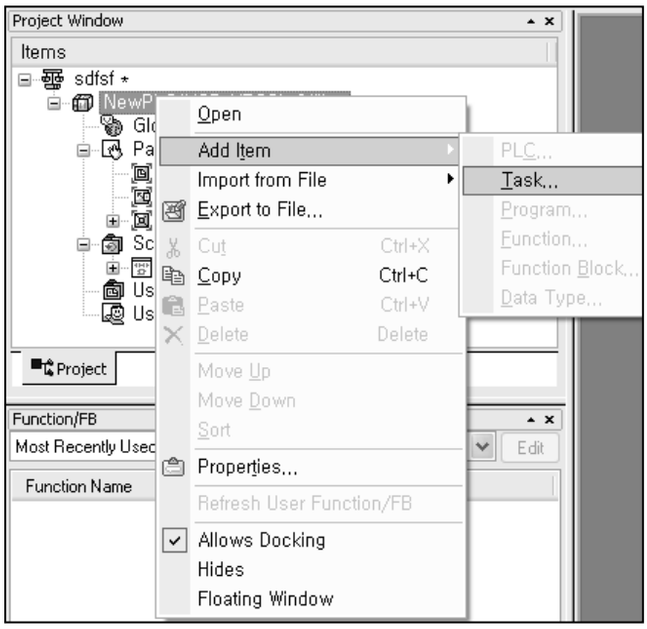


(2) How to make cycle time interrupt task program

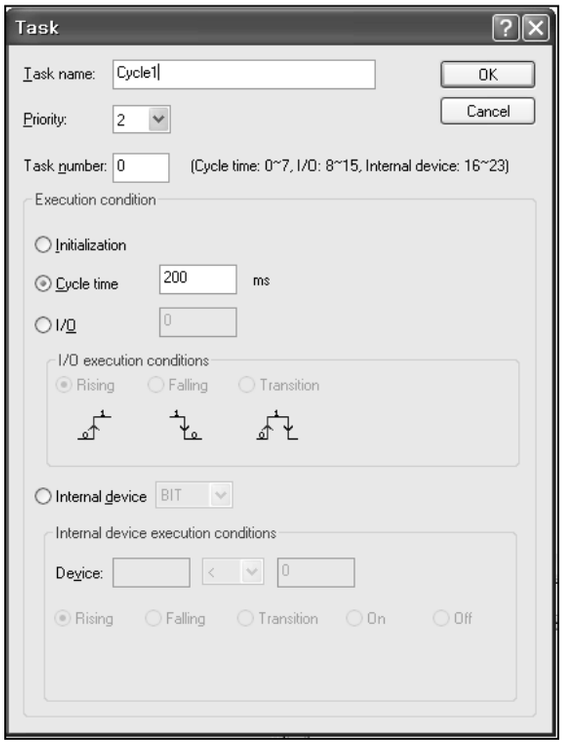
Generate the task in the project window of XG5000 as below and add the program to be performed by each task. For further information, please refer to XG5000 user's manual.

(It can be additional when XG5000 is not connected with PLC)

(a) Right click on registered task and select『Add Item』-『Task』.



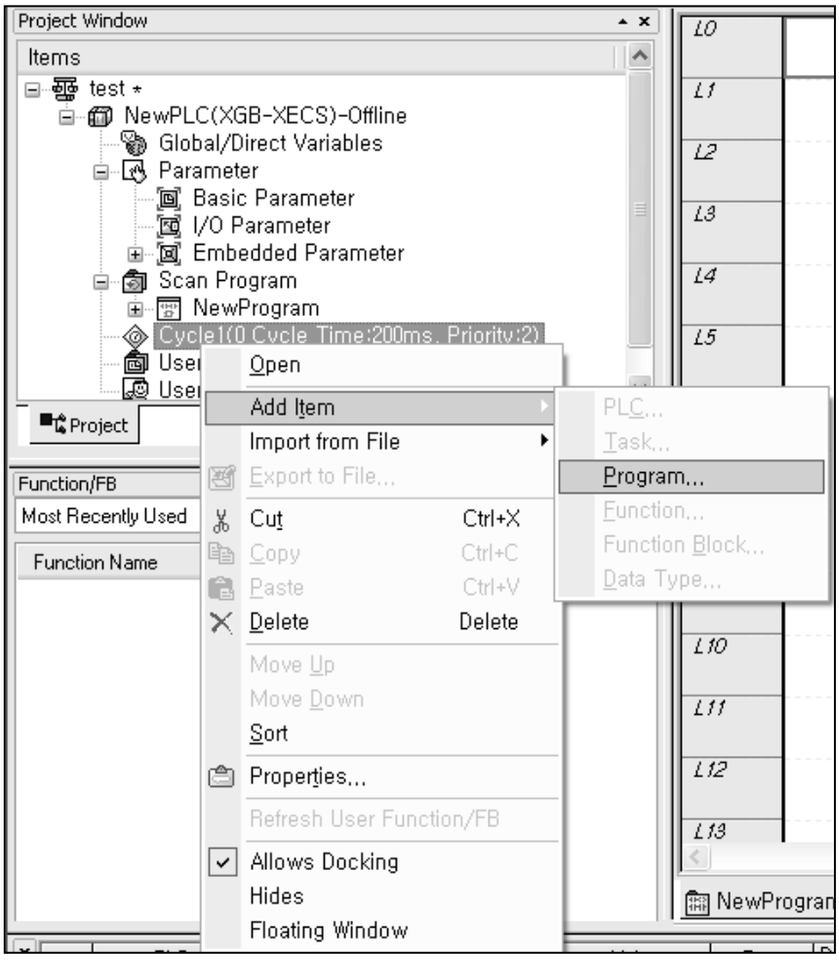
• Displays setting screen of Task.



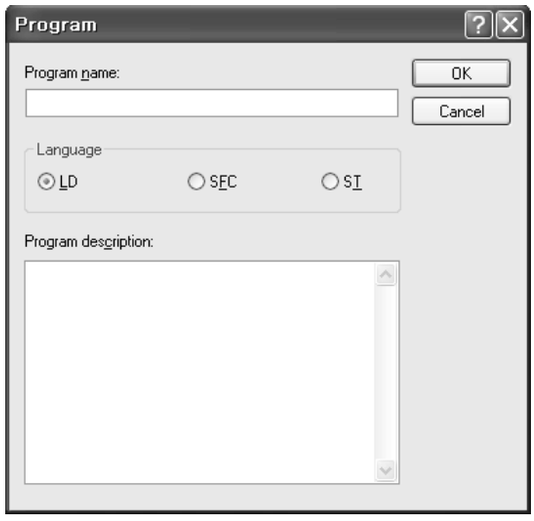
(b) Task type

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 input task (8 ~ 15): "SU" type: 8, 'E' type: 4 • 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.	0~4,294,967,295 ㎳ available
	I/O	Set the external input.	'SU':%IX0.0.0 ~ %IX0.0.7 'E': :%IX0.0.0 ~ %IX0.0.3
	Internal device	Set the internal device to interrupt execution. • Bit: Among Rising, Falling, Transition, On, Off • Word: Among >,>=,<,<=	-

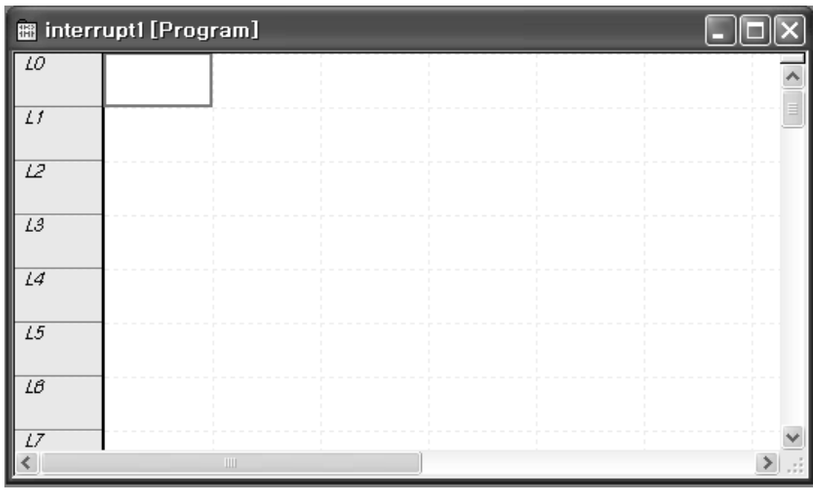
(c) Right click on registered task and select 『Add Item』-『Program』.



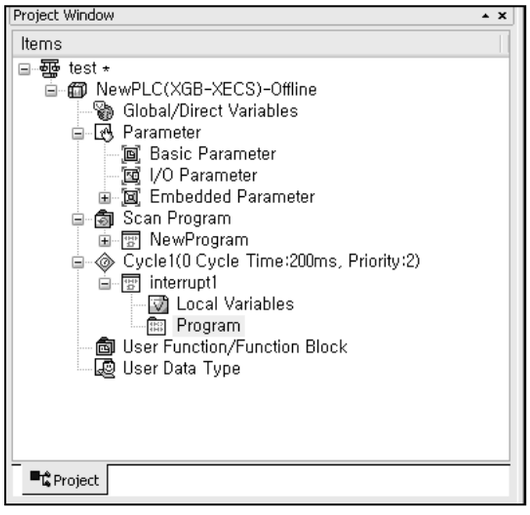
(d) Register the Program name and Program description.



(e) Displays the program window to write task program.



(f) Displays the setting in project window.



(3) Task type

Task type and function is as follows.

Spec. \ Type	Cycle time task	External input task		Internal device task
		'SU' type	'E' type	
Max. Task number	8	8	4	8
Start condition	Cyclic (setting up to max. 4,294,967.295 ms. by 1ms unit)	Rising or falling edge of main unit's contact (%IX0.0.0 ~ %IX0.0.7)	Rising or falling edge of main unit's contact (%IX0.0.0 ~ %IX0.0.3)	Select condition of Internal device
Detection and execution	Cyclic execution per setting time	Immediate execution at the edge of main unit's contact	Immediate execution at the edge of main unit's contact	Retrieve the condition and execute after completing Scan Program
Detection delay time	Max. 1 ms delay	Max. 0.05 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)	2~7 level setting (2 level is highest in priority)
Task no.	Within 0~7 range without duplication for user	With 8~15 range without duplication for user	With 8~15 range without duplication for user	Within 16~23 range without duplication for user

(4) Processing methods of task program

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.

2) 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

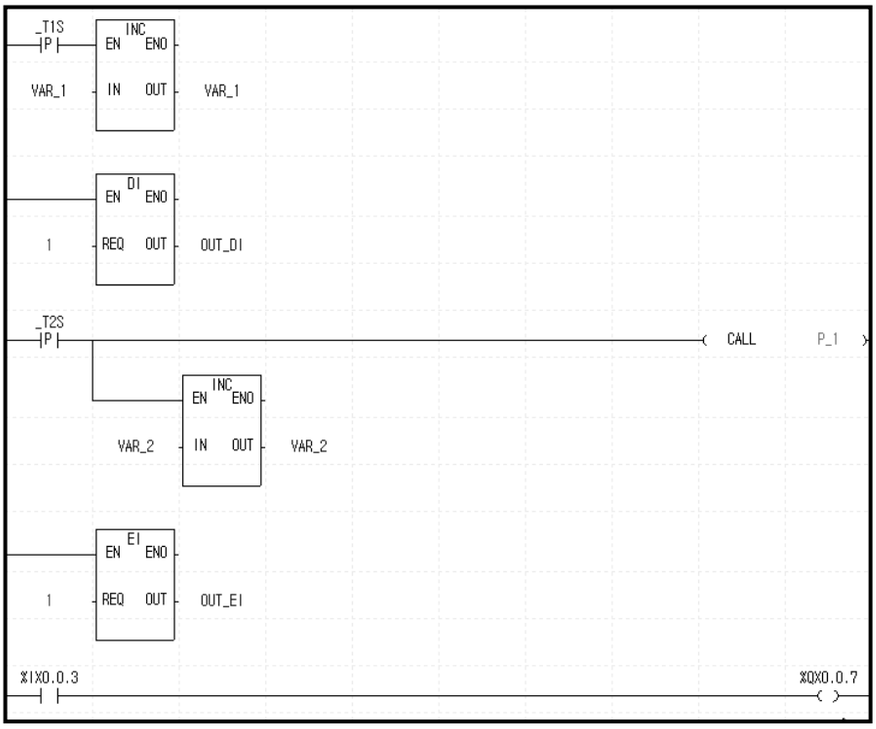
(d) Relationship of initialize, Scan Program and Task Program

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)' application instruction.
2) Insert 'DI' application instruction in the start position of the part requiring the protection and insert 'EI' application instruction in the position to release. Initialization Task is not influenced by 'DI', 'EI' application instruction.
3) If interrupt is occurred while 'CALL' instruction executing, interrupt program is executed after 'CALL' instruction execution.



(5) Cyclic task program processing method

Describes the processing method in case that task (start condition) of Task program is set to 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).

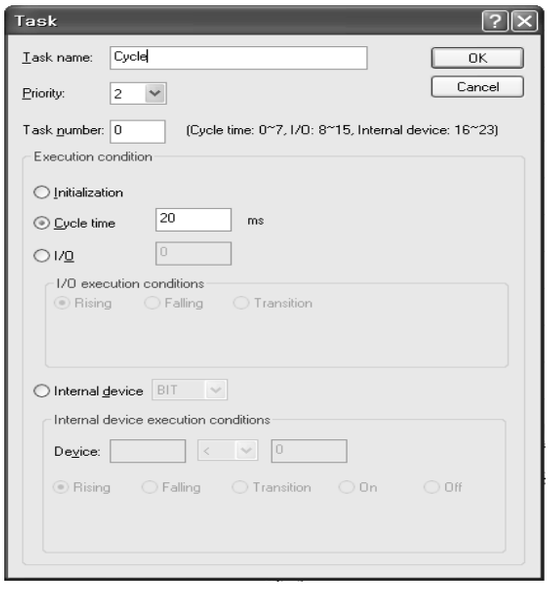
(c) Notice in using cyclic task program

1) When cyclic task program is in execution 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.

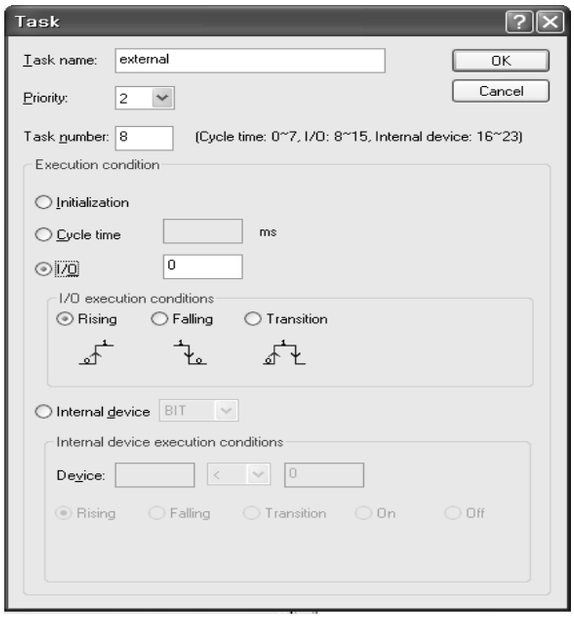
3) When setting the execution cycle of cyclic task program, consider the possibility that the demand to execute several cyclic task program at the same time occurs.

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

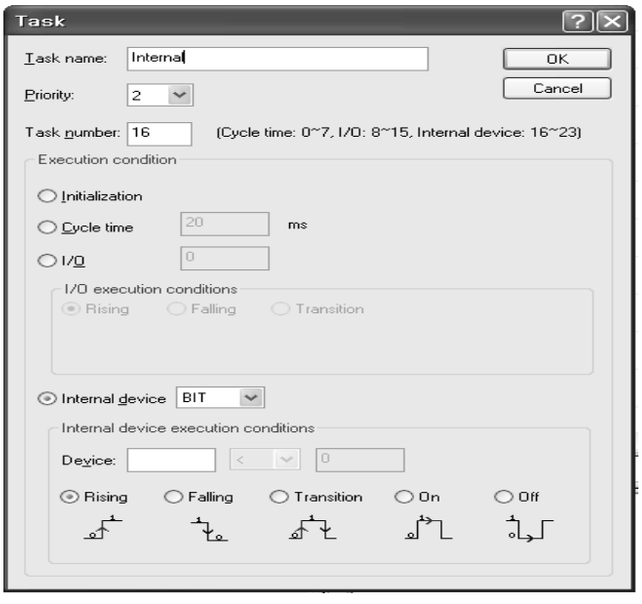
It described the I/O task program processing. ("SU" type: %IX0.0.0~%IX0.0.7, 'E' type:%IX0.0.0~%IX0.0.3)



(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 input is occurred on main unit ("SU" type: %IX0.0.0 ~ %IX0.0.7. 'E' type:%IX0.0.0~%IX0.0.3), task program is executed by external input.
(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.)

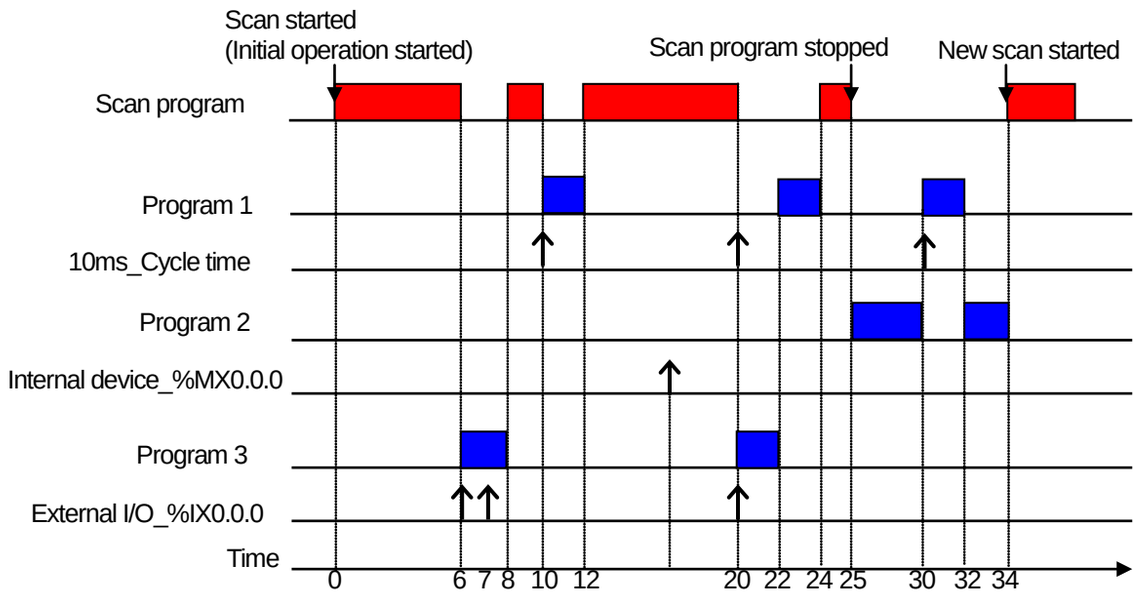
(d) Is program protection for the high priority task needed during program execution?
If other task is inserted during task program execution, complete the task in execution and operate the standby tasks in the order of high priority. In case that it is not allowed to insert other task in Scan Program, 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 orcommunication 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_%MX0.0.0	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 ㎳



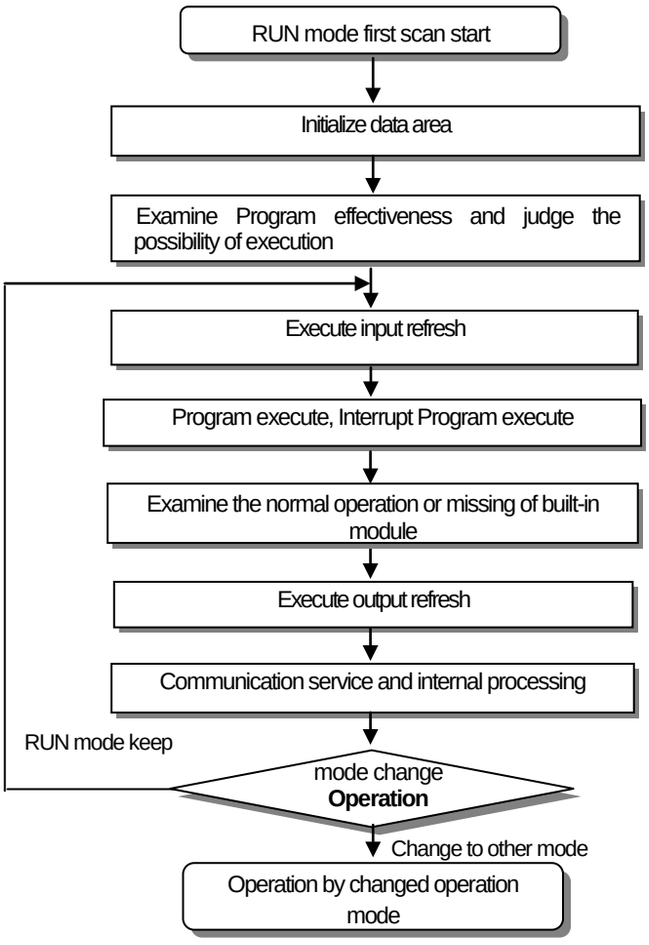
Process per time	
Time (㎳)	Process
0	Scan started and scan program started to execute.
0~6	Scan program is executed.
6~8	Scan program is stop because execution external I/O (%IX0.0.0) is requested. And program 3 is executed. Request of execution at 7[ms] is ignored because program 3 has been executing.
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 (%IX0.0.0)' 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 '%MX0.0.0' 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 '%MX0.0.0' 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..
The section 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 stop state mode without Program operation. It transmits the program through XG5000 only in 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.

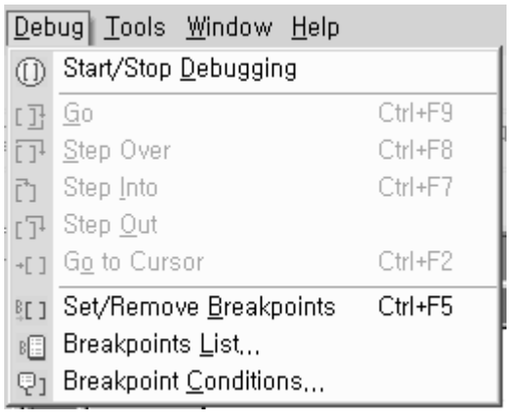
5.3.3 DEBUG mode (Supported at SU type)

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.

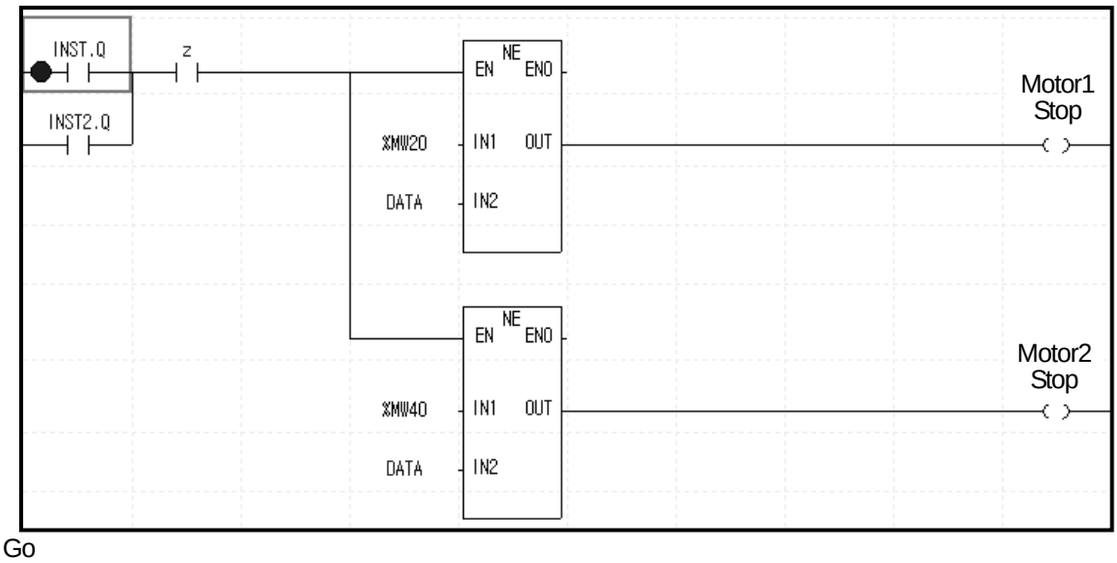
(3) Debug operation
It describes debug mode.



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 come in the subroutine program.	Other operation is identical to Step Over.
Step Out	It go out 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.	

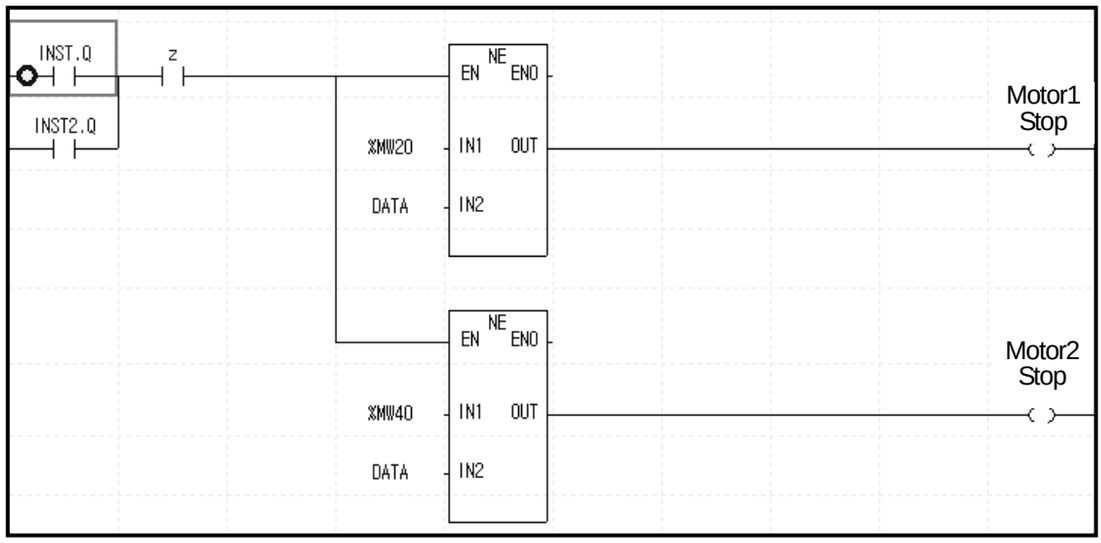
(a) Set/Remove Breakpoints

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



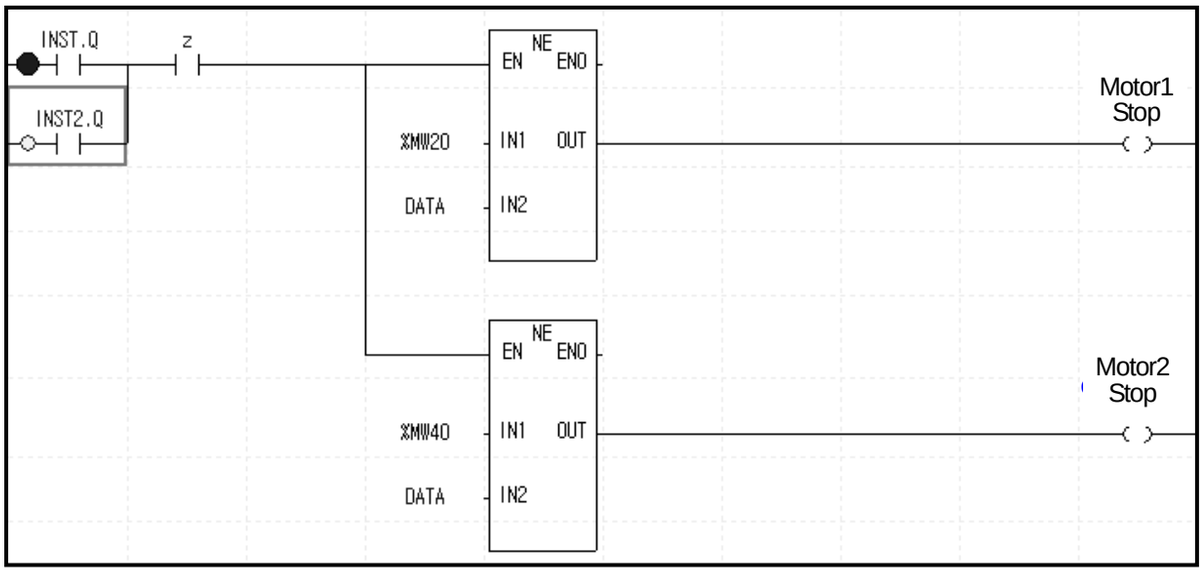
(b) Go

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



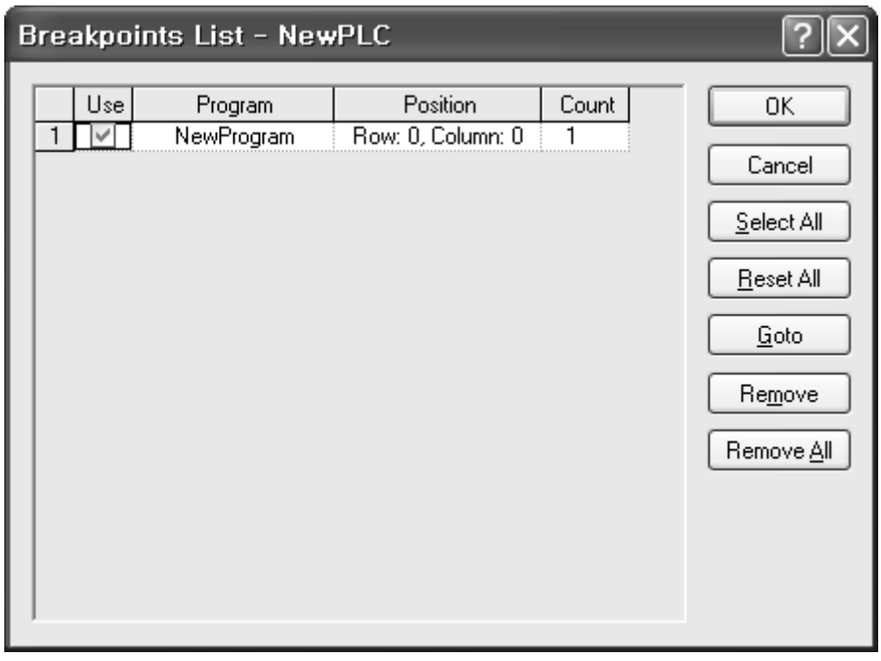
(c) Step Over

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



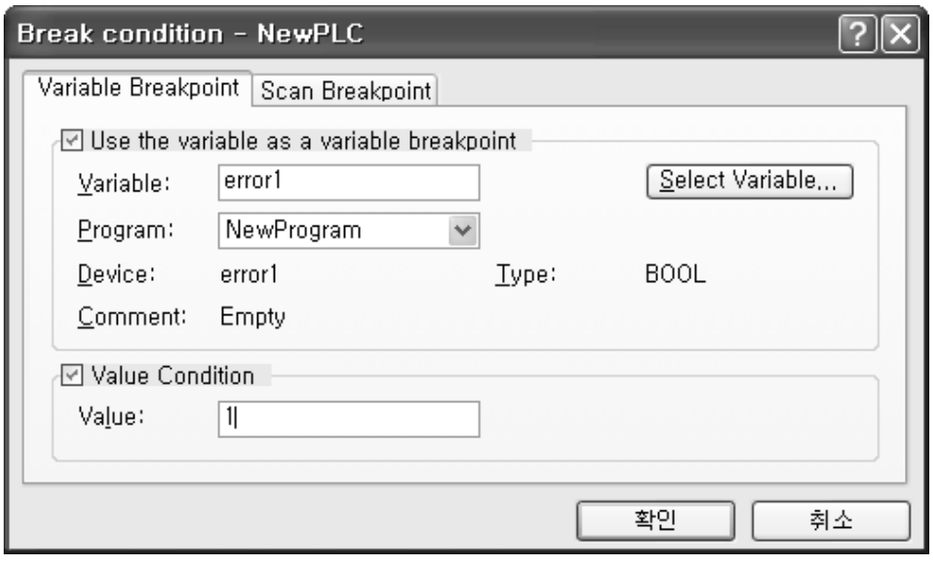
(d) Breakpoint List

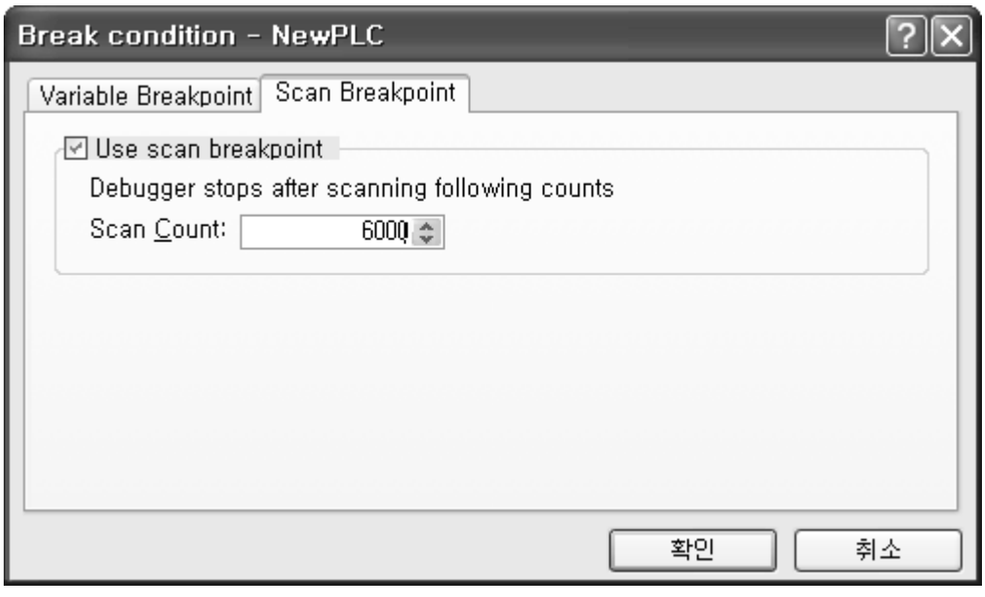
▪ It displays current Breakpoint List. It supports Select All, Reset All, Goto, Remove, Remove All.



(e) Break condition

▪ It sets Variable Break and Scan Break.





Remark

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

5.3.4 Change operation mode

(1) Operation Mode Change Method

The method change operation modes as follows.

(a) By mode key of CPU module
(b) By connecting the Programming And Debugging 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 Specific mode communication 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	unchangeable	Local 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.

Remark

When 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	
	'SU' type	'E' type
Program memory entire area	1.37 MB	482KB
System area: • System program area • Backup area	128 KB	128KB
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	48KB
Execution program area: • Scan program area • Task program area	200 KB	50KB
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	256KB

5.4.2 Data memory

Contents and size of data memory are as follows

Item		Size	
		'SU' type	'E' type
Data memory entire area		128 KB	128 KB
System area : • I/O information table • Forced I/O table • Reserved area		81 KB	105 KB
Flag area	System flag (F)	2 KB	768 B
	Analog image flag (U)	1 KB	704 B
	Internal special flag (K)	8 KB	5 KB
	High speed link (L)	4 KB	2 KB
Input image area (%I)		2 KB	256 B
Output image area (%Q)		2 KB	256 B
R area (%R)		20 KB	10 KB
Direct variable area (%M)		8 KB	4 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	Available	As for automatic variable area, Retain setting is available
M	Available	As for internal contact point area, Retain setting is available at parameter
K	Unavailable	In case of power failure, contact point is kept
F	Unavailable	System flag area
U	Unavailable	Analog data register (Retain is not available)
L	Unavailable	High speed link/P2P service status contact point of communication module (Retain is available)
W	Unavailable	Flash memory dedicated area (Retain is available)
R	Unavailable	Flash memory dedicated area (Retain is available)

Remark

1) K, L, R, W devices are retained basically.
2) K, L devices can be deleted through "Clear PLC" of XG5000 online menu.
3) For more detail, refer to "Online" of XG5000 user manual.

(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) 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 task recommended)

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

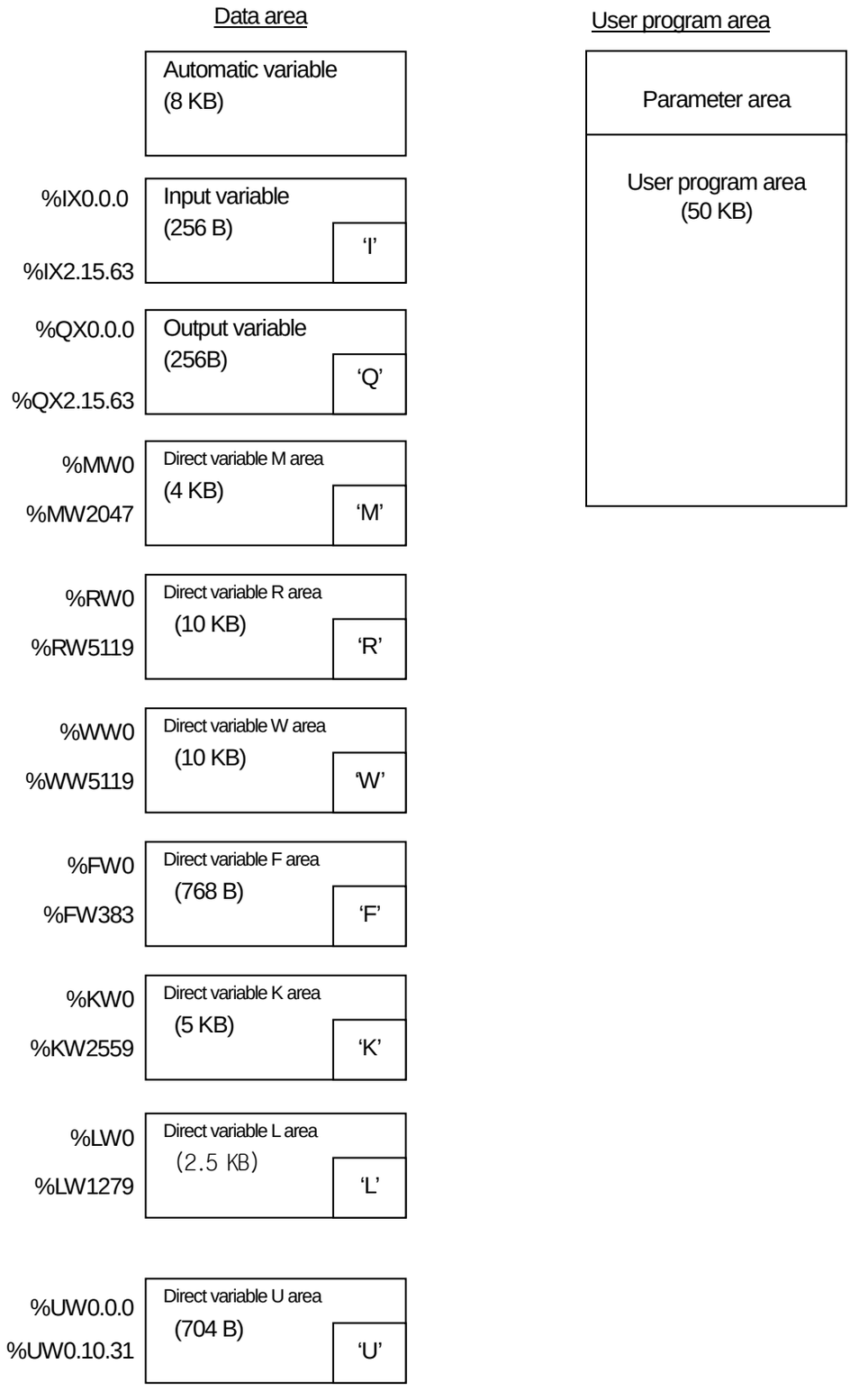
1) Terms on three types of variable are as follows.
(1) Default variable : variable not set as INIT or Retain variable
(2) INIT variable : initial value is set
(3) Retain variable : Holds previous value

(3) Initialization of data

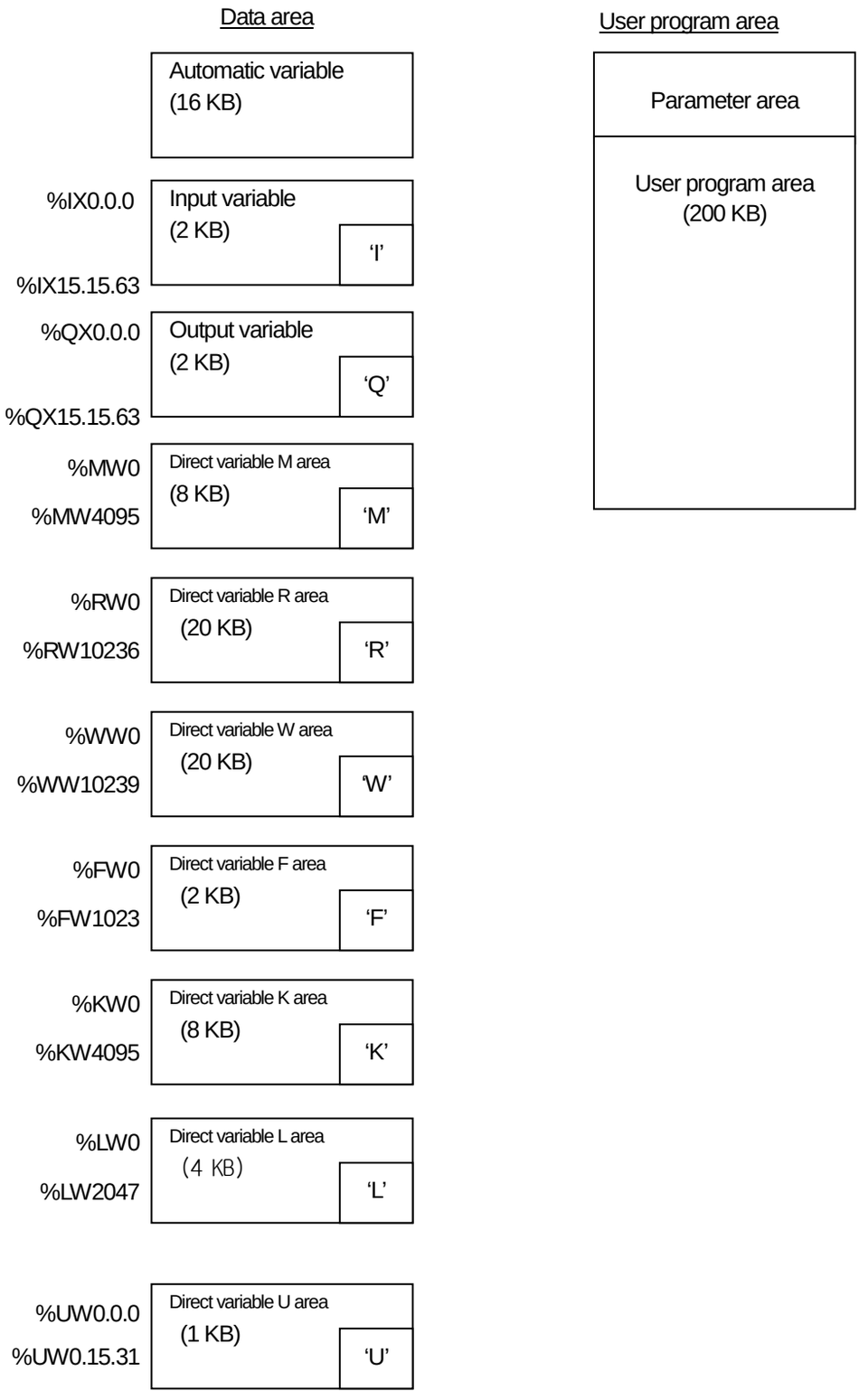
If PLC becomes 'Cleat Memory' status, memory of all devices is reset to 0. When you want to specify initial value, use initialization task. In CPU module, there are two types of built-in memory. One is program memory to save program made by user, for user to structure system. Another is data memory providing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

5.5 Data Memory Map

5.5.1 'E' type



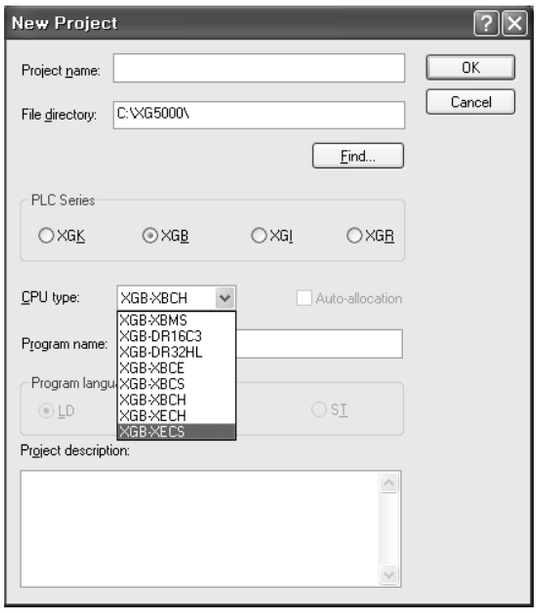
5.5.2 'SU' type


Data area
User program area
Automatic variable
(16 KB)
Parameter area
User program area
(200 KB)
%IX0.0.0
Input variable
(2 KB)
'I'
%IX15.15.63
%QX0.0.0
Output variable
(2 KB)
'Q'
%QX15.15.63
%MW0
Direct variable M area
(8 KB)
'M'
%MW4095
%RW0
Direct variable R area
(20 KB)
'R'
%RW10236
%WW0
Direct variable W area
(20 KB)
'W'
%WW10239
%FW0
Direct variable F area
(2 KB)
'F'
%FW1023
%KW0
Direct variable K area
(8 KB)
'K'
%KW4095
%LW0
Direct variable L area
(4 KB)
'L'
%LW2047
%UW0.0.0
Direct variable U area
(1 KB)
'U'
%UW0.15.31

Chapter 6 CPU Functions

6.1 Type Setting

It describes setting of XGB PLC type.



PLC Series	CPU type	Description	Reference
XGB	XGB-DR16C3	Dedicated product	Modular type
	XGB-DR32HL	Dedicated product	Modular type
	XGB-XBCE	“E” type : XBC-DR10/14/20/30E	Compact type
	XGB-XBCH	“H” type : XBC-DR32/64H , XBC-DN32/64H	Compact type
	XGB-XBCS	“S(U)” type : XBC-DR20/30/40/60SU, XBC-DN20/30S(U), XBC-DN40/60SU XBP-DN20/30/40/60SU	Compact type
	XGB-XBMS	“S” type : XBM-DN16/32S , XBM-DR16S	Modular type
	XGB-XECH	“H” type : XEC-DR32/64H, XEC-DN32/64H	Compact type
	XGB-XECSU	“SU” type : XEC-DR20/30/40/60SU, XEC-DN20/30/40/60SU, XEC-DP20/30/40/60SU,	Compact type
	XGB-XECE	“E” type : XEC-DR10/14/20/30E, XEC-DN10/14/20/30E, XEC-DP10/14/20/30E	Compact type

Remark

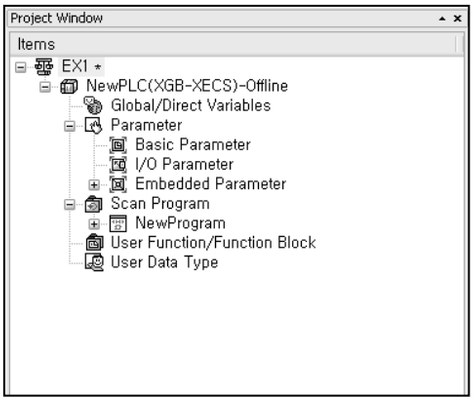
▪ In case type is different, connection is not available.

6.2 Parameter Setting

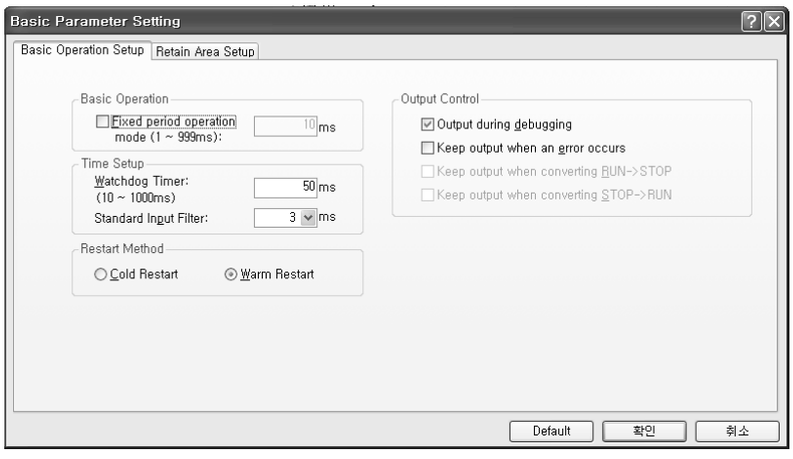
Describes how to set parameters.

6.2.1 Basic parameter setting

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



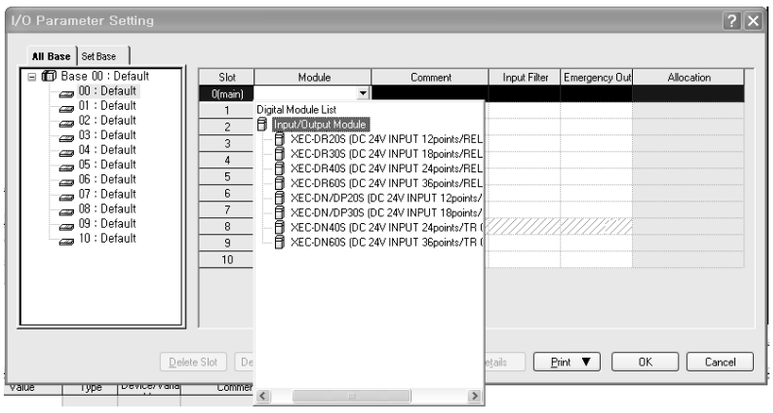
There are three main options ; “Basic Operation Setup” , “Device Area Setup” and “Error Operation Setup”.



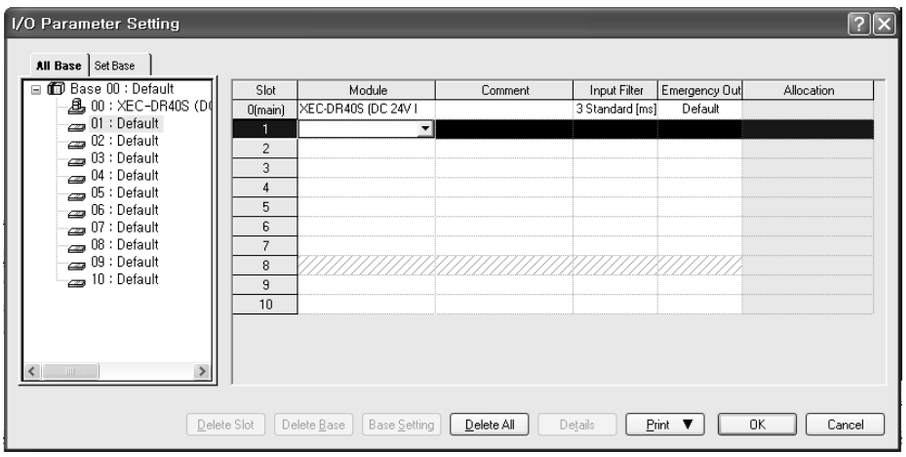
Category	Item	Description	Note
Basic operations	Fixed period operation	Set the time of fixed period operation.	1~999 ㎳
	Watchdog timer	Set the time of scan watchdog.	10~1000 ㎳
	Standard input filter	Set the time of standard input filter.	1,3,5,10,20,70,100 ㎳
	Output during debugging	Set to allow output actually during debugging operation.	Allowance/Prohibition
	Keep output when an error occurs	Set to preserve output holding function set in I/O parameter in case of error.	Allowance/Prohibition
	Delete all areas except latch when an error occurs	Set to clear each device that is not designated as a latch area in case of error	Allowance/Prohibition
Device area	Select latch area	Set the latch retain of each device.	%MW0 ~ %MW4095
Error operation	Operation resumes in case of operation error	Set to pause or resume operation in case of operation error.	Pause/Resume

6.2.2 I/O parameter setting

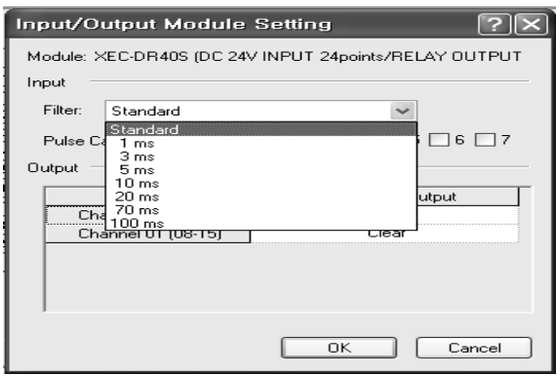
This sets and reserves each I/O information. Clicking 『I/O Parameter』 in the project window shows the following setting window.

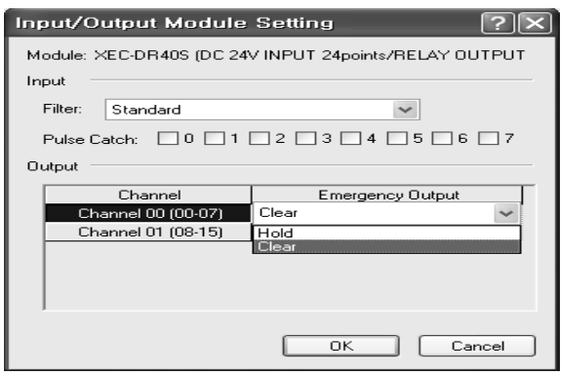


Clicking 『Module』 in 『Slot Position』 indicates a list of modules, in which you may set I/O corresponding to the actual system. Then, the following window is displayed.



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





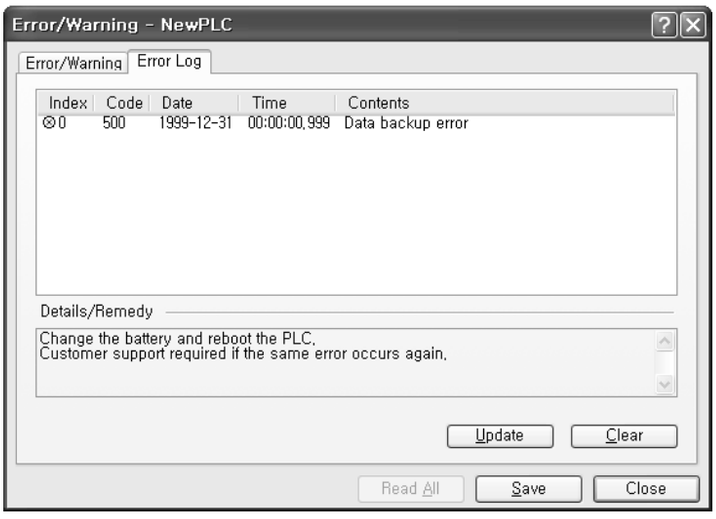
Remark

(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 stored until selecting a menu of XG5000 and clicking “Clear”.

6.3.2 Troubleshooting

(1) Trouble types

Malfunction 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 for PLC system malfunction are as follows.

- PLC hardware trouble
- System configuration error
- Operation error while operating user program
- 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 number 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

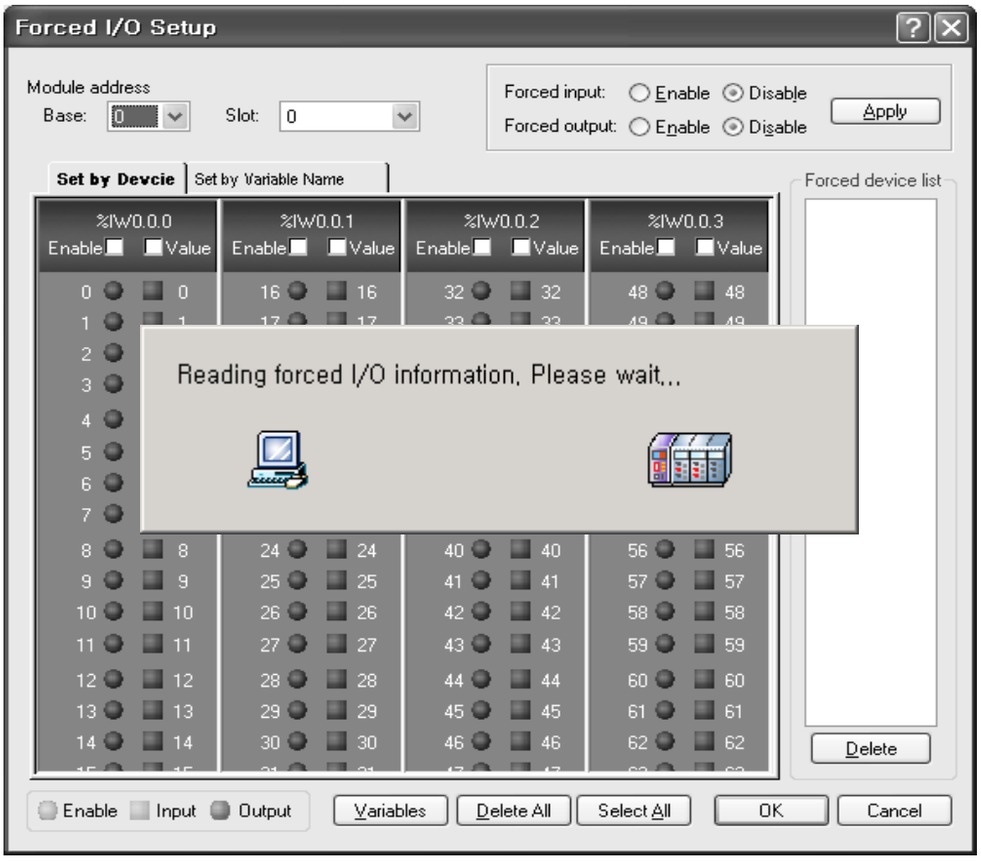
(1) For details regarding remote functions, refer to 'Ch10 Online' of XG5000 User's Manual.

6.5 Forced Input/Output On and Off Function

Force I/O function forces 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
Module address		Select Base and Slot
Application		Set whether to allow or not Force I/O
Variables	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.
Forced device list		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.

(4) Operation in case of error

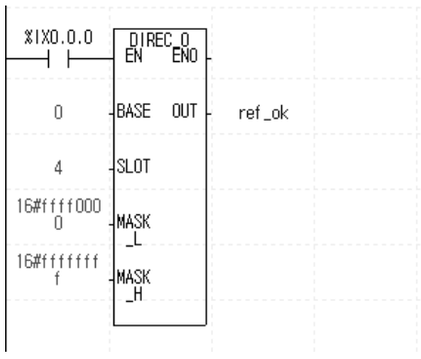
(a) If error occurs after setting forced output, PLC operates based on "Keep output when an error occurs" in Basic parameter and "Emergency output" in I/O parameter.
If you set "Emergency output" as "Clear" after setting "Keep output when an error occurs", output is cleared when an error occurs.
If you set "Emergency output" as "Hold" after setting "Keep output when an error occurs", output is held when an error occurs.
(b) If you don't set "Keep output when an error occurs", output is off when an error occurs.

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) When DIREC_IN,DIREC_OUT function is used, the value is applied immediately. They have higher priority than forced I/O.

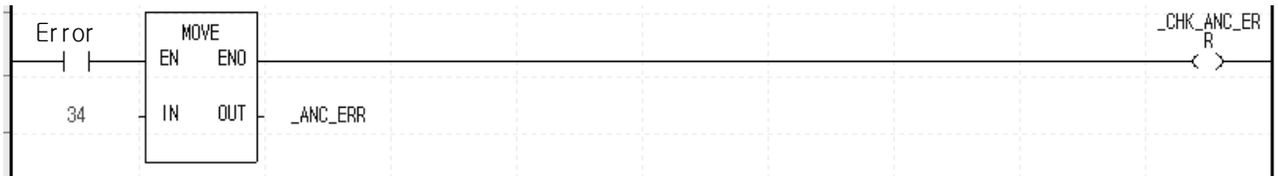
6.7 Diagnosis of External Device

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

(2) Heavy trouble of external device
(a) When 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)
(b) In case of heavy trouble, find out reason by checking '_ANC_ERR' flag.
(c) To turn off the ERR LED caused by flag detecting heavy trouble of external device, reset or restart PLC

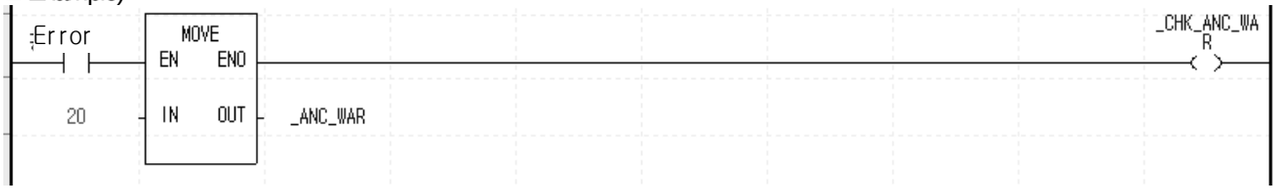
■ Example)



(3) Light trouble of external device

(a) When 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.
(b) In case of heavy trouble, find out reason by checking '_ANC_WAR' flag.
(c) 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 64 points occupation to every module.

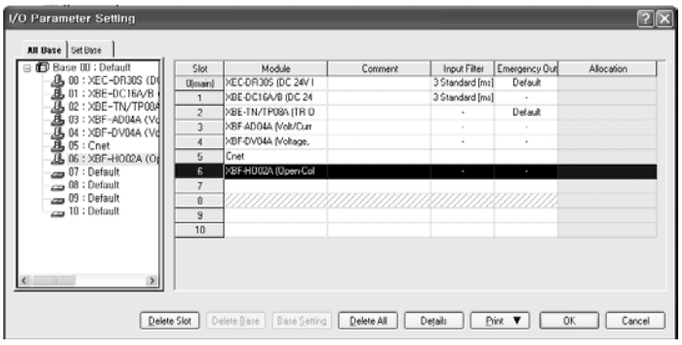
(1) Allocation of I/O number
124 points are allocated to main unit and 64 points are allocated to every module except main unit (incl. special, communication).

System Configuration

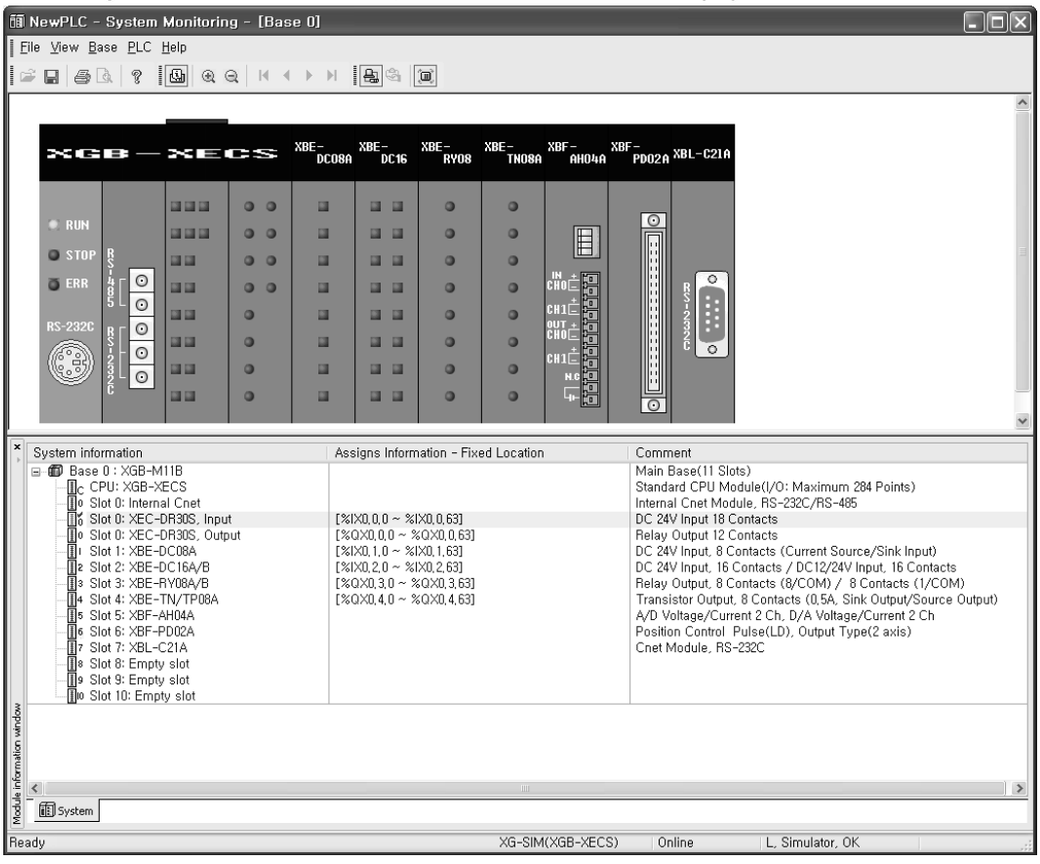
Number of Connection stage	Type	I/O allocation	Remarks
0	XEC-DN30SU	Input : %IX0.0.0 ~ %IX0.0.63 Output : %QX0.0.0 ~ %QX0.0.63	Actual Input : %IX0.0.0 ~ %IX0.0.17 Actual Output : %QX0.0.0 ~ %QX0.0.11
1	XBE-TN32A	Input : %IX0.1.0 ~ %IX0.1.63 Output : %QX0.1.0 ~ %QX0.1.63	Actual Output : %QX0.1.0 ~ %QX0.1.31
2	XBE-TN16A	Input : %IX0.2.0 ~ %IX0.2.63 Output : %QX0.2.0 ~ %QX0.2.63	Actual Output : %QX0.2.0 ~ %QX0.2.15
3	XBE-DC08A	Input : %IX0.3.0 ~ %IX0.3.63 Output : %QX0.3.0 ~ %QX0.3.63	Actual Input : %IX0.3.0 ~ %IX0.3.7
4	XBE-RY16A	Input : %IX0.4.0 ~ %IX0.4.63 Output : %QX0.4.0 ~ %QX0.4.63	Actual Output : %QX0.4.0 ~ %QX0.4.15
5	XBL-C21A	Input : %IX0.5.0 ~ %IX0.5.63 Output : %QX0.5.0 ~ %QX0.5.63	-
6	XBF-AH04A	Input : %IX0.6.0 ~ %IX0.6.63 Output : %QX0.6.0 ~ %QX0.6.63	-
7	XBL-C21A	Input : %IX0.7.0 ~ %IX0.7.63 Output : %QX0.7.0 ~ %QX0.7.63	-

Empty I/O point is available for internal relay.

(2) When allocating IO of IO parameter, allocation information is displayed.



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



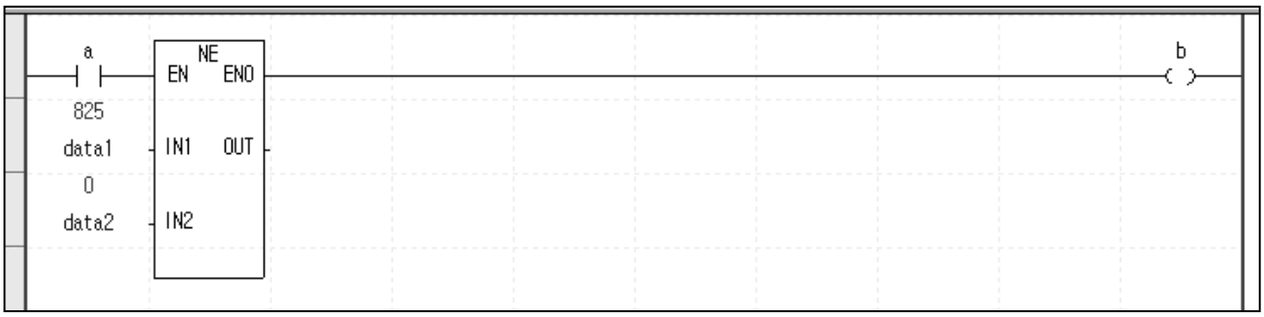
6.9 Online Editing

It is possible to modify program and communication parameter during operation of PLC during control operation The following describes basic modification. For details of modifying program, refer to XG5000 Users Manual.

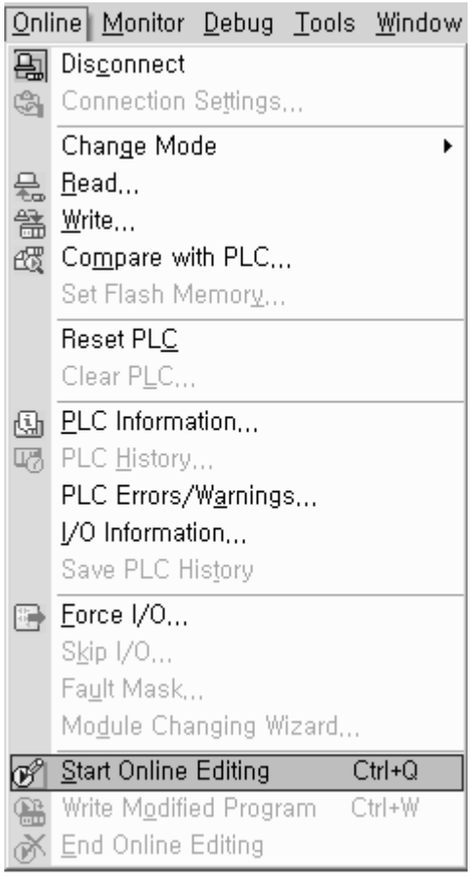
The Items to be modified during operation are as follows.

- Program
- Communication parameter

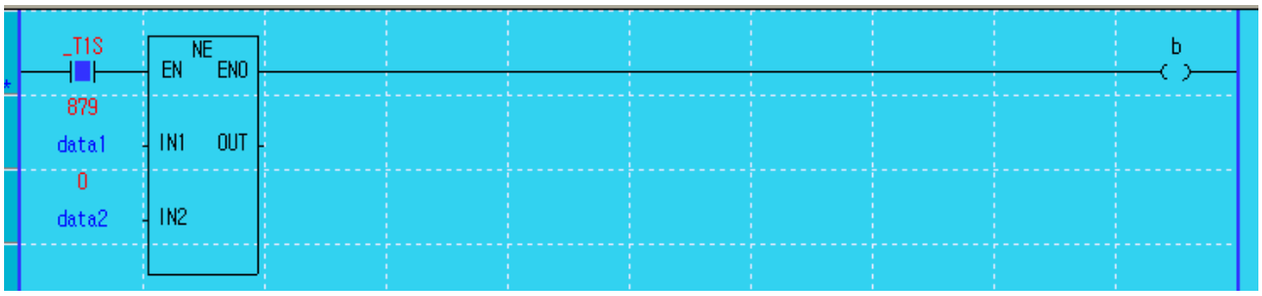
(1) It displays programs that are currently running.



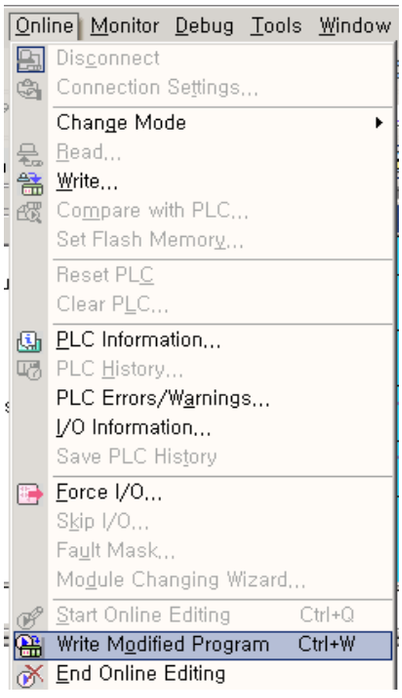
(2) Click 『Online』-『Start Online Editing』.

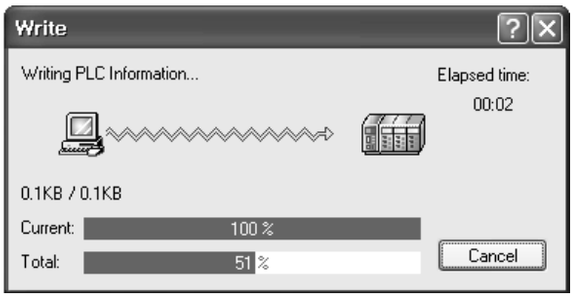


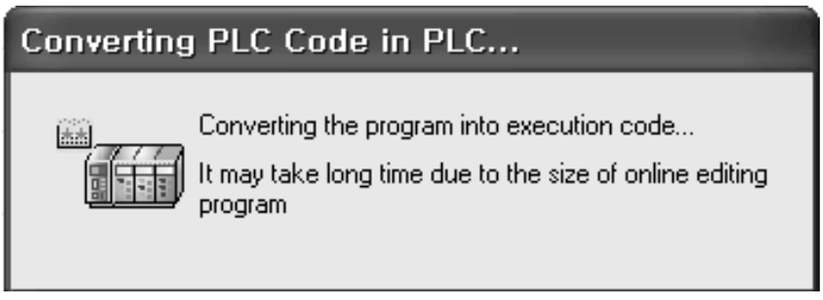
(3) If you modify program, background color changes to indicate start of online editing.



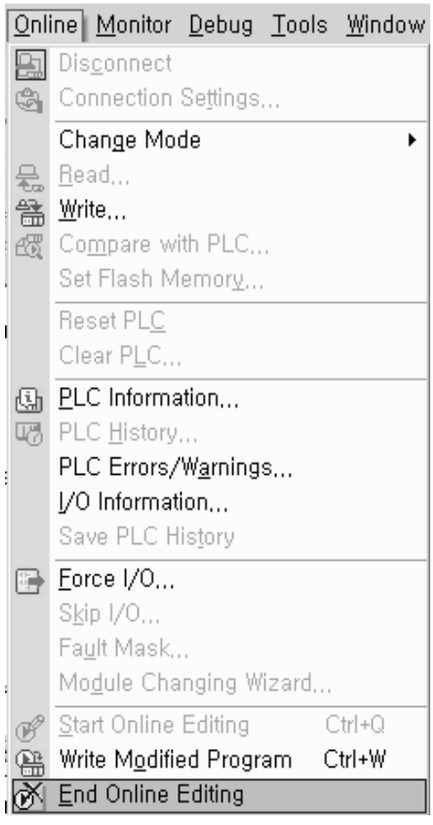
(4) Upon the modification of program, click 『Online』-『Write Modified Program』.



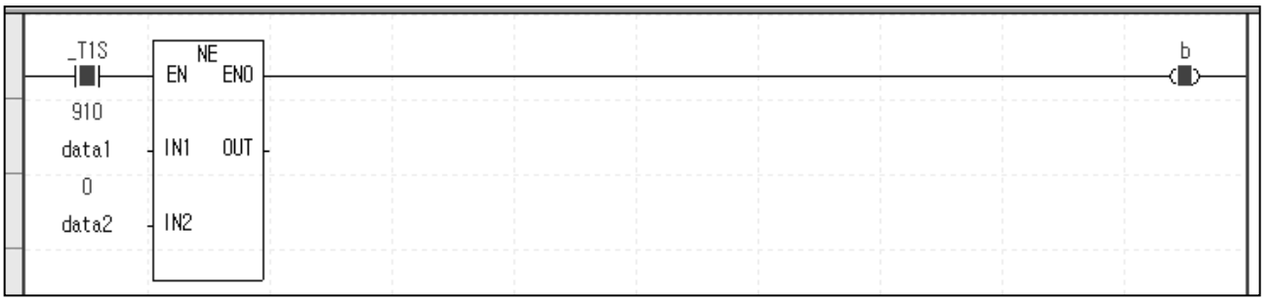




(5) Upon the writing of program, click 『Online』-『End Online Editing』.



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



Remark

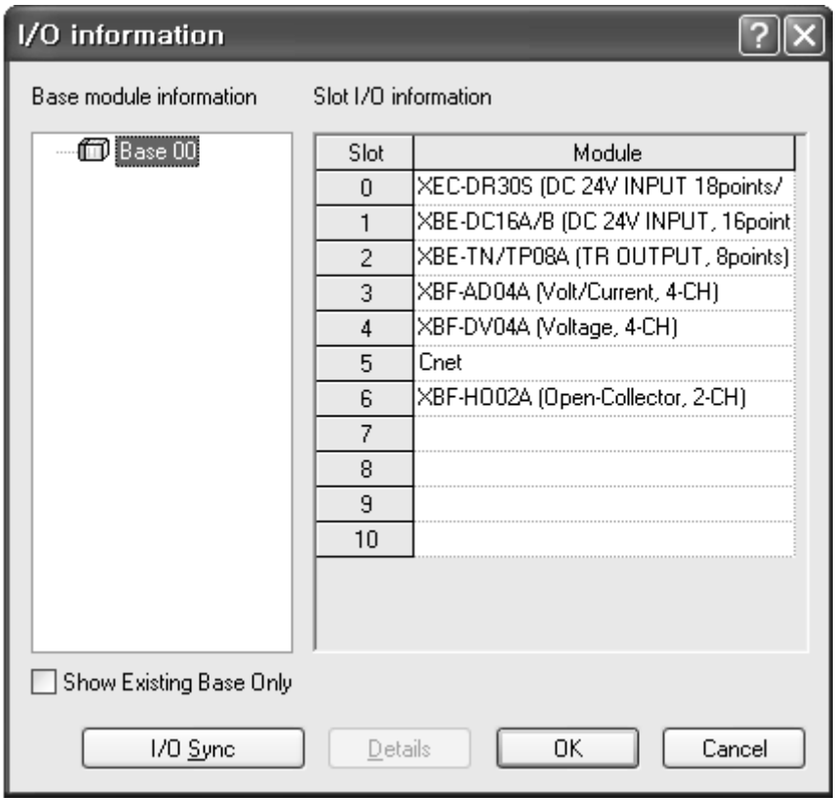
- For parameter modification during run, change each parameter on XG-PD and click『Online』-『Write Modified Program 』.
- When using 『Online』-『Write Modified Program , communication operation can be delayed
- If failed in Write Modified Program, it is necessary to rewrite the program.

,

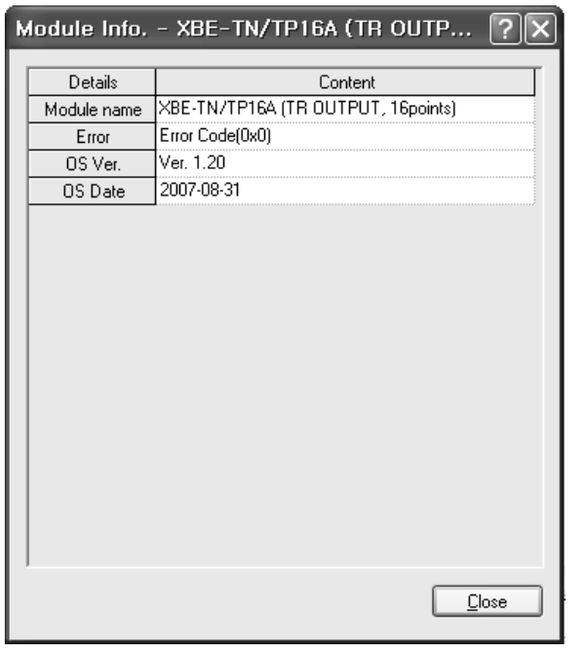
6.10 Reading Input/Output Information

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

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



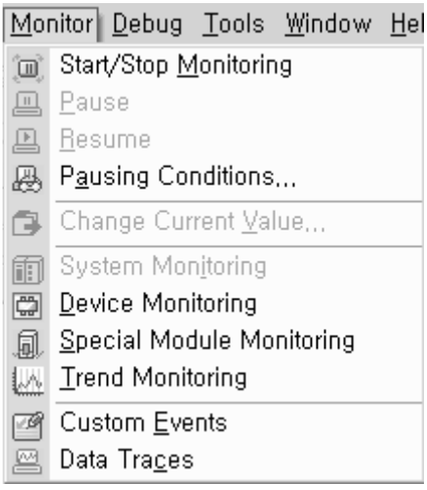
(2) When details are clicked after selecting a module, it displays detail information of a selected module.



6.11 Monitoring

It monitors system information of XGB series system.

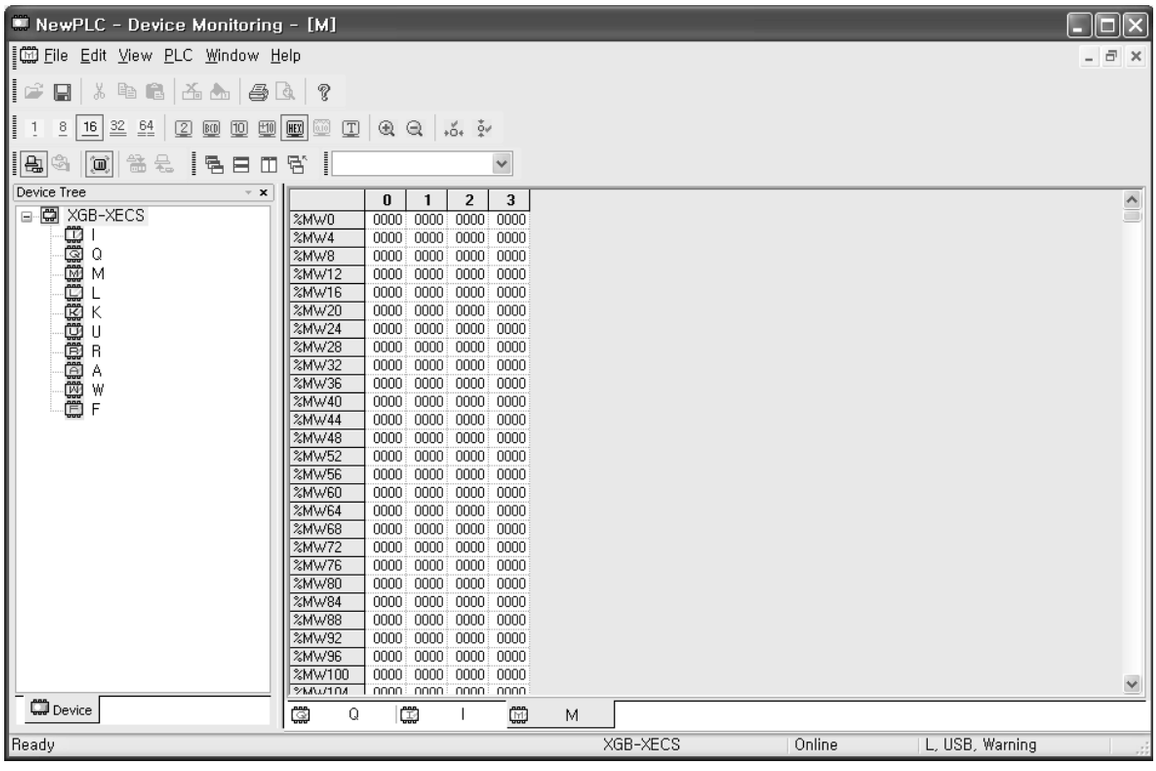
(1) Clicking 『Monitor』 displays the following sub-menus.



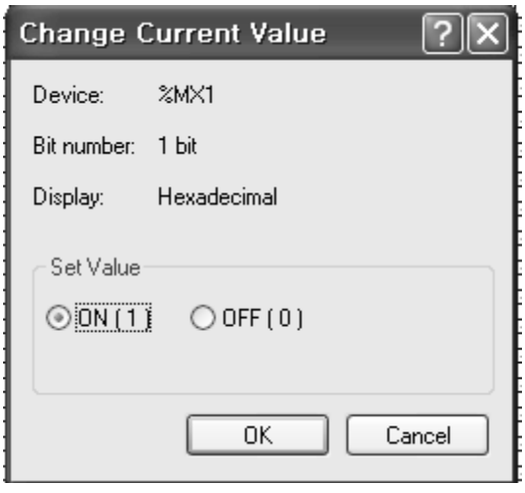
(2) Items and descriptions

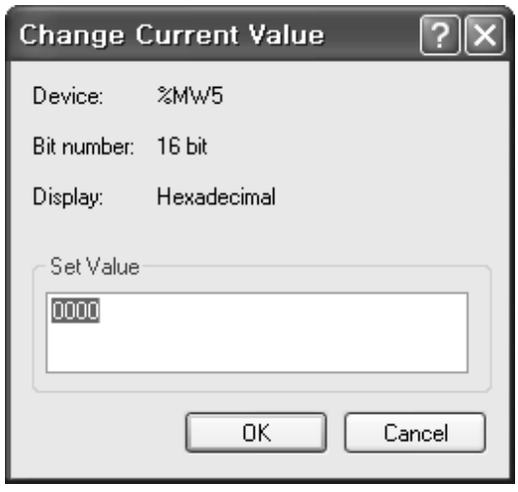
Item	Description	Remarks
Start/Stop Monitoring	Designate the start and stop of monitor.	Click for reverse turn.
Pause	Pause monitoring.	-
Resume	Resume paused monitor.	-
Pausing Conditions	Pause monitoring if a preset value of device corresponds to condition.	Monitor resumes; clicking for resume.
Change 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) Device monitoring
It displays all data in each device area



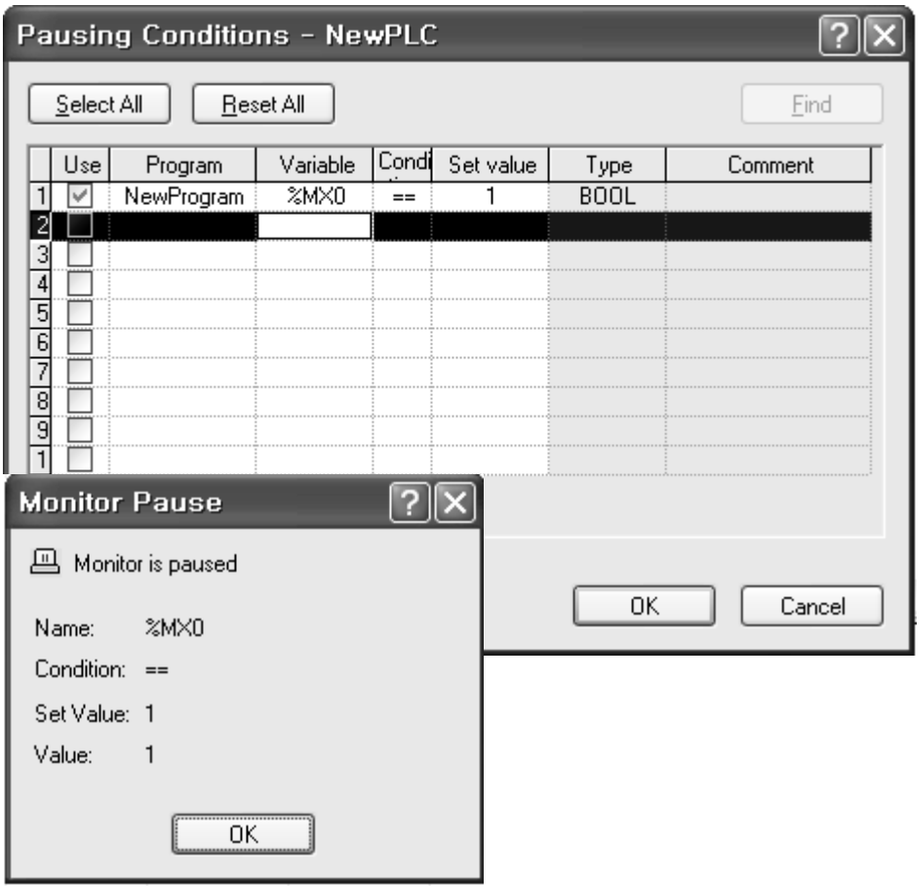
(b) Change current value
It changes the current value of each device selected in the current program window.





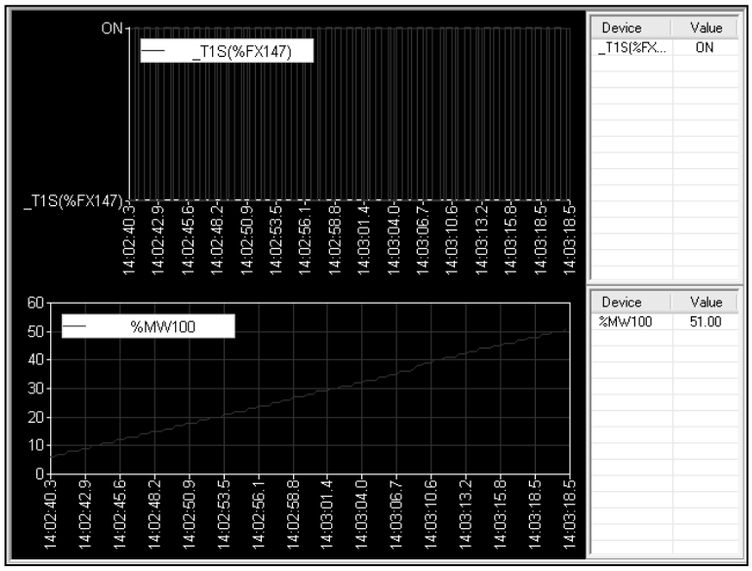
(c) Pausing conditions

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



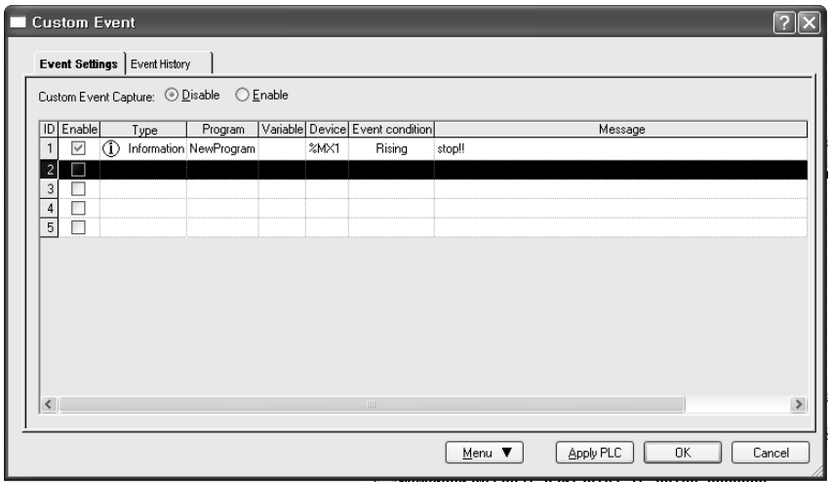
(d) Trend monitoring

It displays device values graphically.

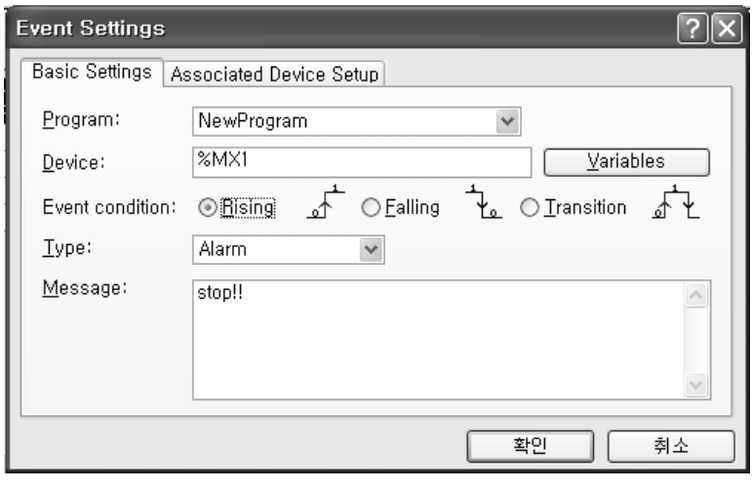


(e) Custom events

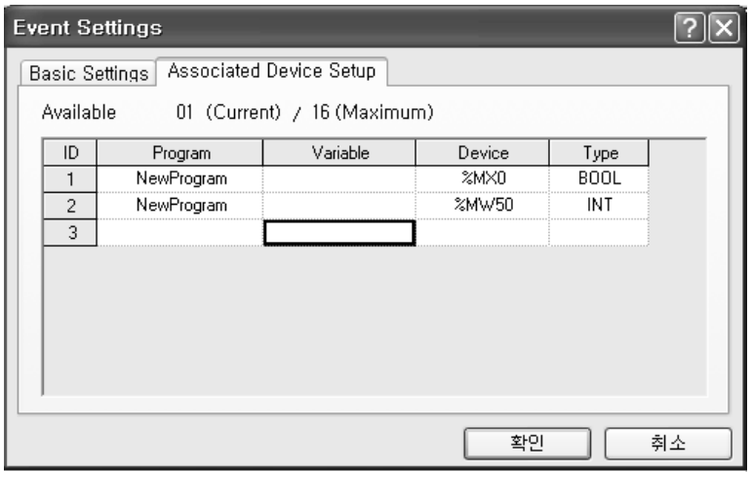
1) It monitors detail information when an event set by a user occurs. Additional user event may be registered.



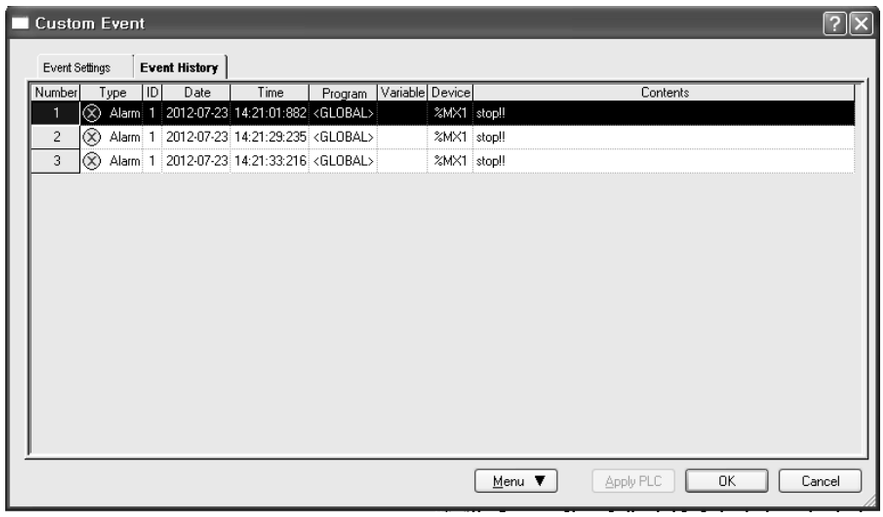
2) It sets basic setting and relative device.
If rising edge of M0000 device occurs, it records the message of an alarm, “Out of order Water Tank 1” and the device values of %MX0,%MW50 are recorded.



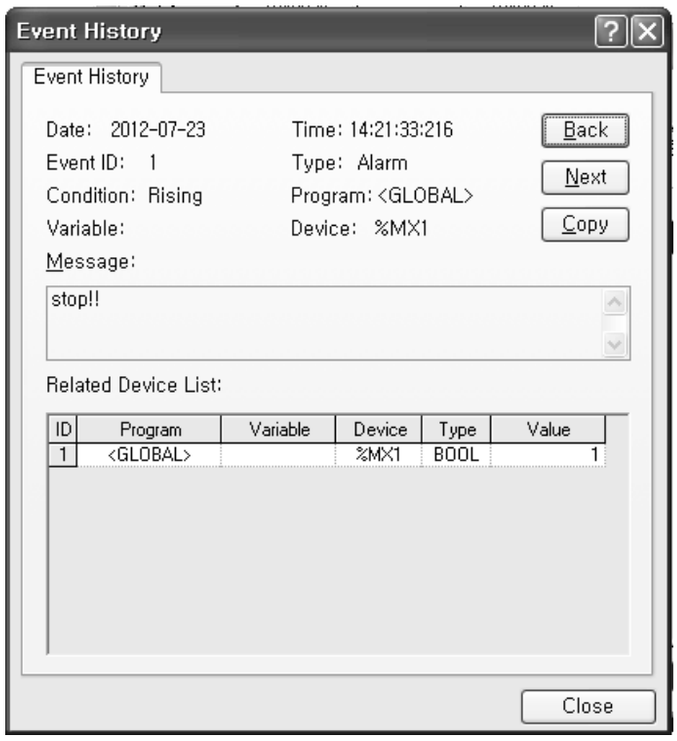
3) Set the relative device(s).



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

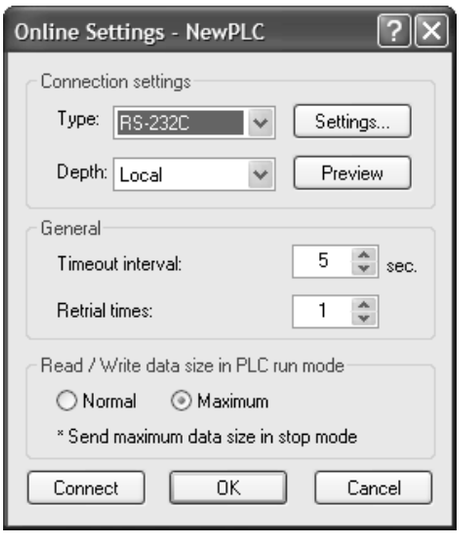
▪For details of monitor, refer to XG5000 User's Manual.

6.12 Clear All PLC

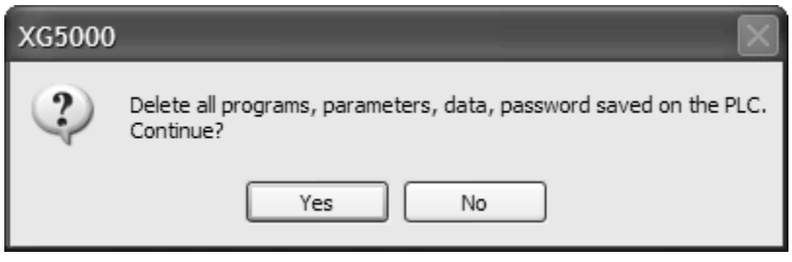
Clear All PLC function clears program, parameter, password , data saved on PLC

(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.

Remark

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

Chapter 7 Input/Output Specifications

7.1 Introduction

The section 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.

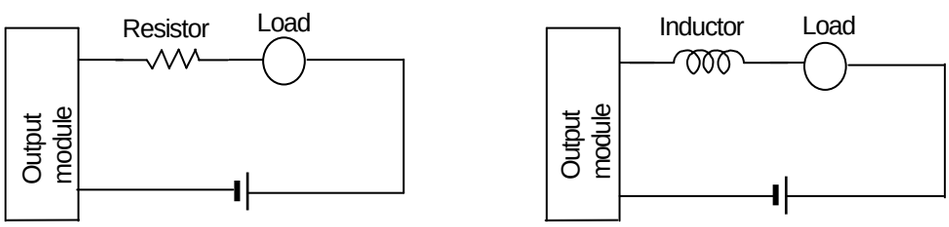
(2) The number of max. Simultaneous input contact point is different depending on module type
Use input module after checking the specification.

(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.

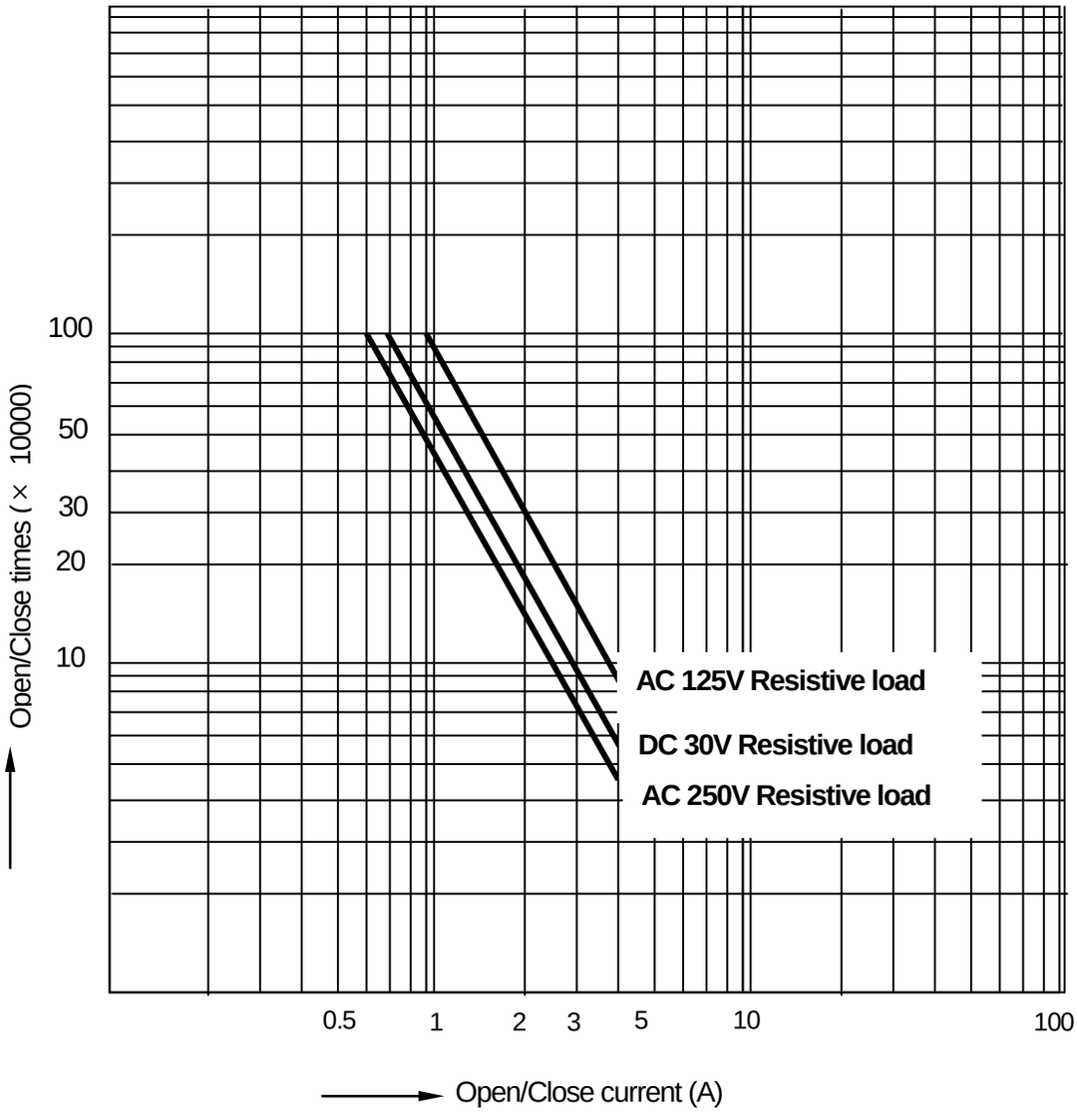
(5) For output module to run the conductive (L) load, max. open/close frequency should be used by 1second On, 1 second Off.

(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.

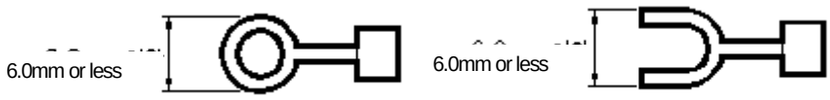


(7) Relay life of Relay output module is shown as below.

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



(8) A clamped terminal with sleeve can not be used for the XGB terminal strip. The clamped terminals suitable for terminal strip are as follows



(9) The cable size connected to a terminal strip should be 0.3~0.75㎟ stranded cable and 2.8㎜ thick. The cable may have different current allowance depending on the insulation thickness.

(10) The coupling torque available for fixation screw and terminal strip screw should follow the table below.

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·㎝

(11) Relay life graph is not written based on real use. So consider margin. Relay life is specified under following condition.

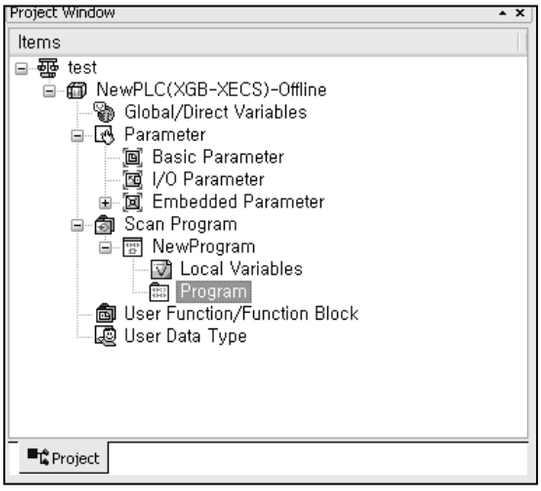
(a) Rated voltage, load: 3 million times: 100 million times
(b) 200V AC 1.5A, 240V AC 1A (COS¢ =0.7): 1 million times
(c) 200V AC 0.4A, 240V AC 0.3A (COS¢ =0.7): 3 million times
(d) 200V AC 1A, 240V AC 0.5A (COS¢ =0.35): 1 million times
(e) 200V AC 0.3A, 240V AC 0.15A (COS¢ =0.35): 3 million times
(f) 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

(12) 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.

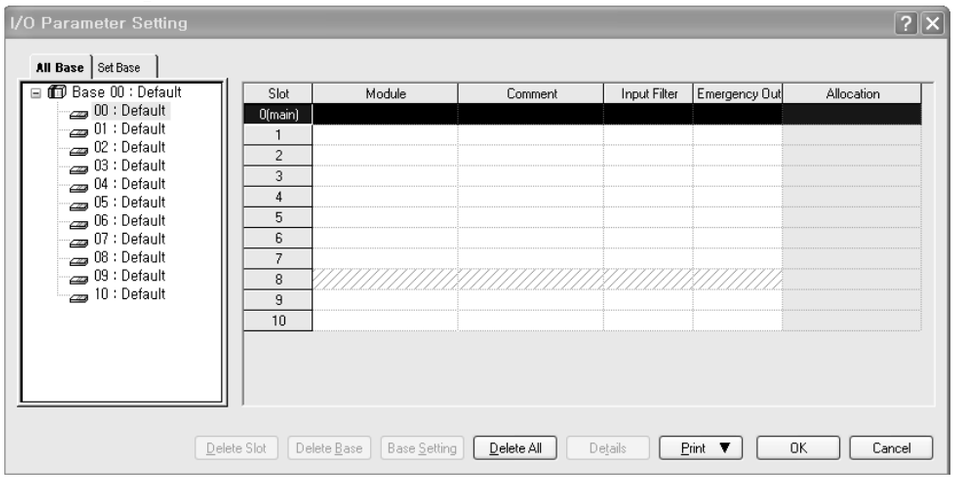
Input filter time (ms)	Noise signal pulse size (ms)	Reference
1	0.3	-
3	1.8	Initial value
5	3	-
10	6	-
20	12	-
70	45	-
100	60	-

(a) Setting input filter

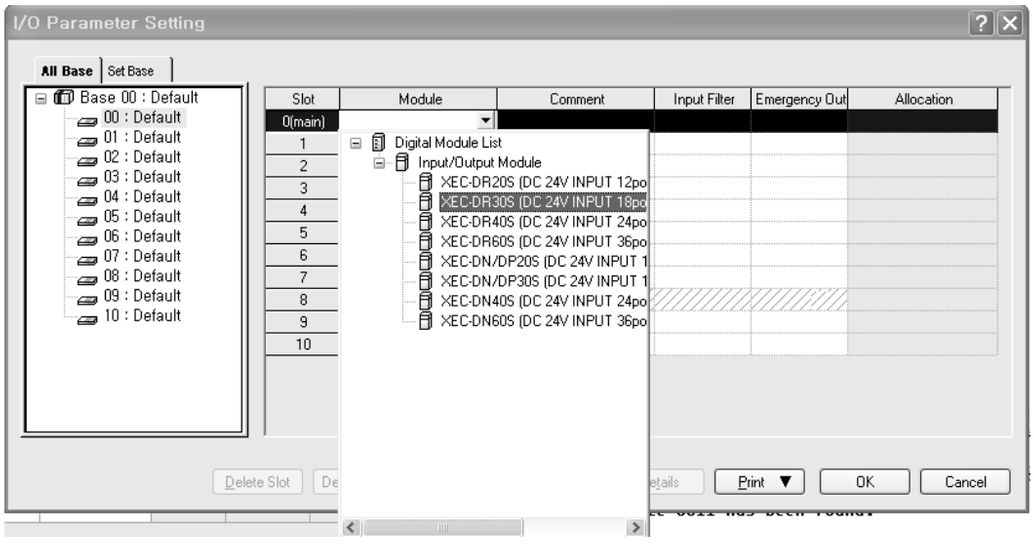
1) Click I/O Parameter』 in the project window of XG5000



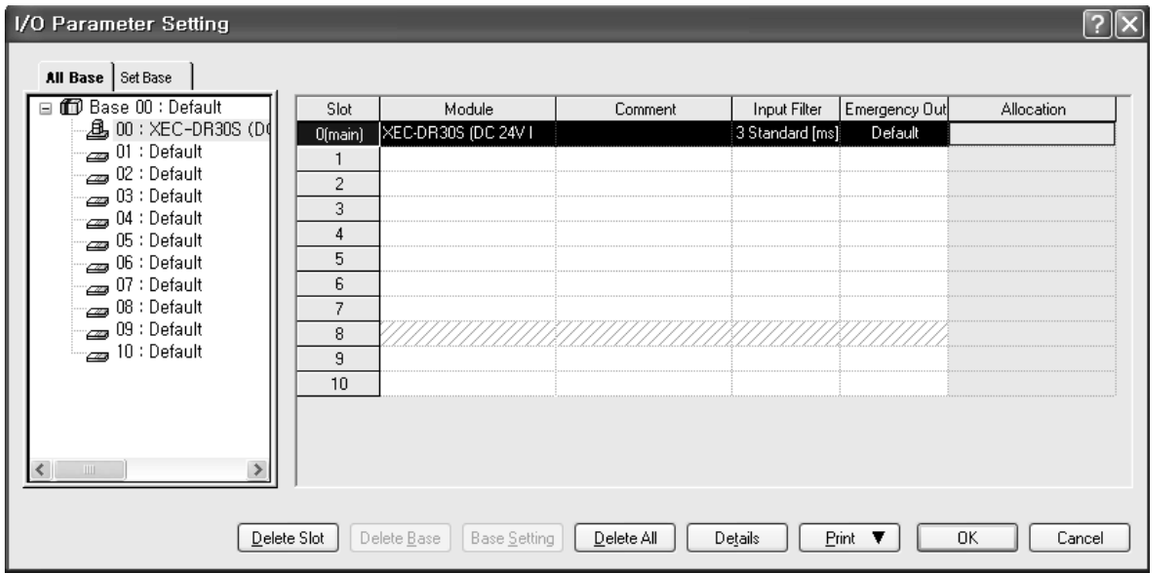
2) Click 『Module』 at the slot location.



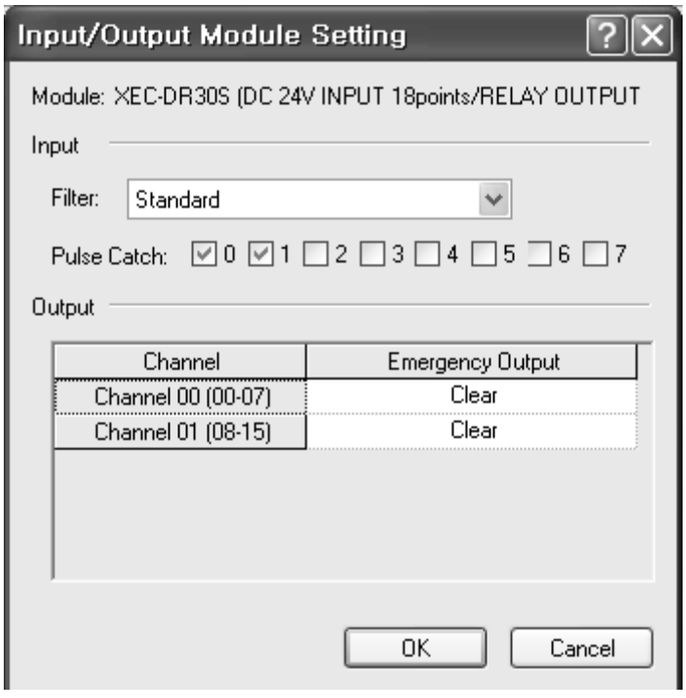
3) Set I/O module equipped.



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

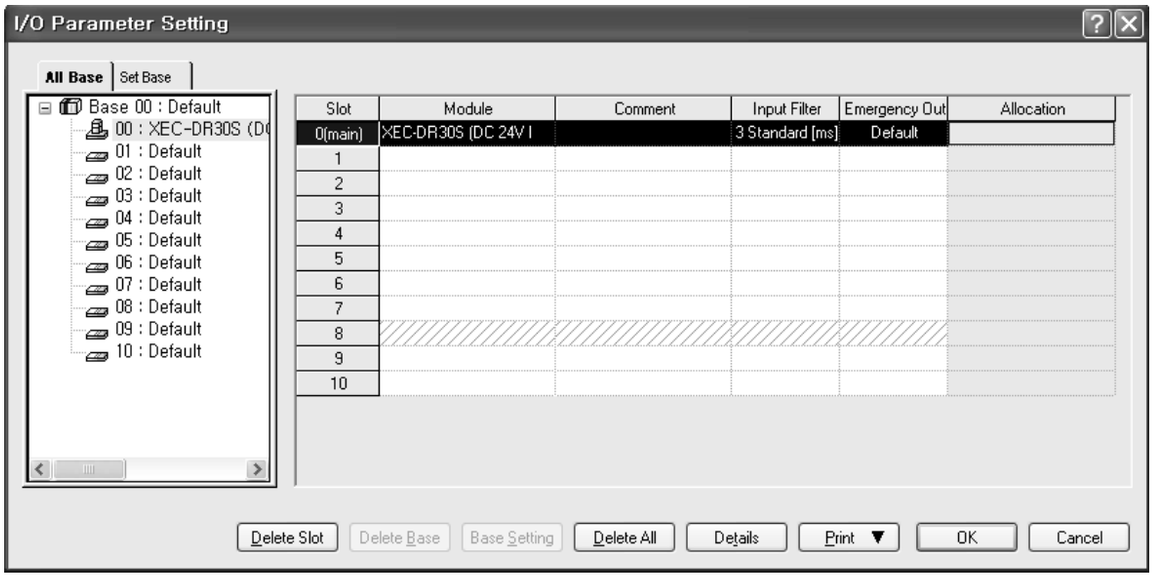


5) Set filter value.

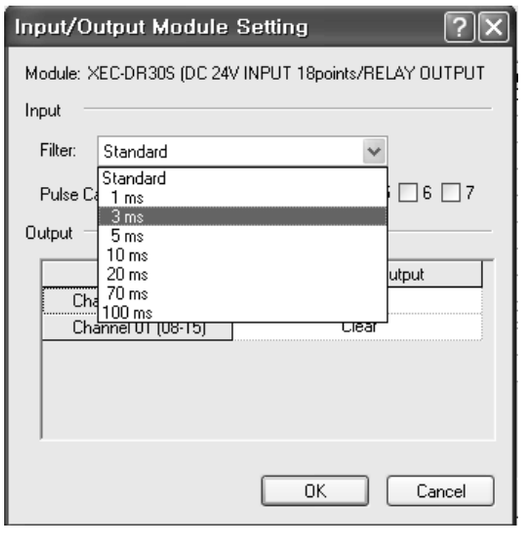


(b) Setting output status when error occurs

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



2) Click Emergency Output.



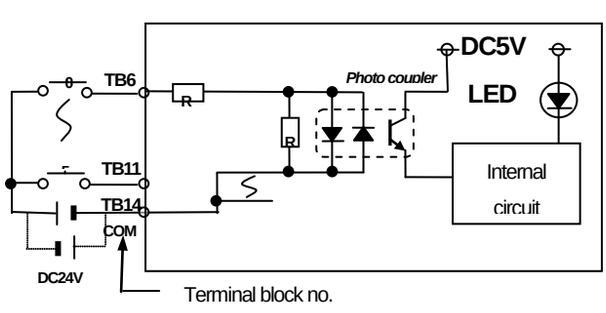
If selected as Clear, the output will be Off. And if hold is selected, the output will be kept.

7.2 Main Unit Digital Input Specifications

7.2.1 XEC-DR10E/DN10E/DP10E 6 point DC24V input (Source/Sink type)

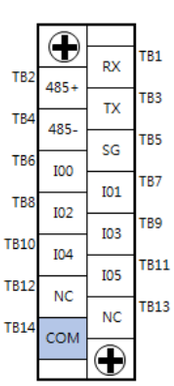
Specification \ Model		Main unit		
		XEC-DR10E	XEC-DN10E	XEC-DP10E
Input point		6 point		
Insulation method		Photo coupler insulation		
Rated input voltage		DC24V		
Rated input current		About 4㎃ (Contact point 0~3: about 7㎃)		
Operation voltage range		DC20.4~28.8V (within ripple rate 5%)		
On voltage / On current		DC19V or higher / 3㎃ or higher		
Off voltage / Off current		DC6V or lower / 1㎃ or lower		
Input resistance		About 5.6㏀ (%IX0.0.0~%IX0.0.3: about 2.7㏀)		
Response time	Off → On	1/3/5/10/20/70/100㎳ (Set by I/O parameter) Default: 3㎳		
	On → Off			
Insulation pressure		AC560Vrms / 3 cycle (altitude 2000m)		
Insulation resistance		10㏁ or more by MegOhmMeter		
Common method		6 point / COM		
Proper cable size		0.3㎟		
Operation indicator		LED On when Input On		
External connection method		14 point terminal block connector (M3 X 6 screw)		
Weight		330g	313g	313g

Circuit configuration



No.	Contact	No.	Contact
TB2	485+	TB1	RX
TB4	485-	TB3	TX
TB6	I00	TB5	SG
TB8	I02	TB7	I01
TB10	I04	TB9	I03
TB12	NC	TB11	I05
TB14	COM	TB13	NC

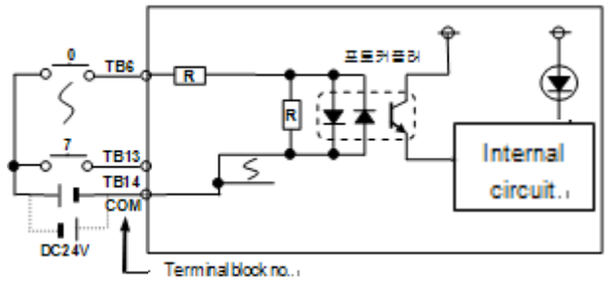
Type



7.2.2 XEC-DR14E/DN14E/DP14E 8point DC24V input (Source/Sink type)

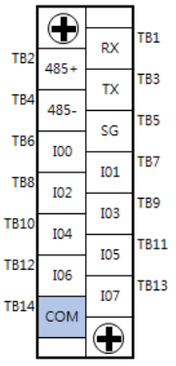
Specification \ Model		Main unit		
		XBC-DR14E	XEC-DN14E	XEC-DP14E
Input point		8 point		
Insulation method		Photo coupler insulation		
Rated input voltage		DC24V		
Rated input current`		About 4㎃ (Contact point 0~3: about 7㎃)		
Operation voltage range		DC20.4~28.8V (Within ripple rate 5%)		
On voltage / On current		DC19V or higher / 3㎃ or higher		
Off voltage / Off current		DC6V or lower / 1㎃ or lower		
Input resistance		About 5.6㏀ (%IX0.0.0~%IX0.0.3: about 2.7㏀)		
Response time	Off → On	1/3/5/10/20/70/100㎳ (set by I/O parameter) default: 3㎳		
	On → Off			
Insulation pressure		AC560Vrms / 3 cycle (altitude 2000m)		
Insulation resistance		10㏁ or more by MegOhmMeter		
Common method		8 point / COM		
Proper cable size		0.3㎟		
Operation indicator		LED On when Input On		
External connection method		14 point terminal block connector (M3 X 6 screw)		
Weight		340g	315g	315g

Circuit configuration



No.	Contact	No.	Contact
TB2	485+	TB1	RX
TB4	485-	TB3	TX
TB6	I00	TB5	SG
TB8	I02	TB7	I01
TB10	I04	TB9	I03
TB12	I06	TB11	I05
TB14	COM	TB13	I07

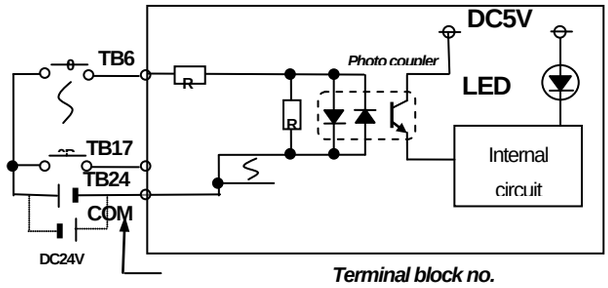
형 태



7.2.3 XEC-DR20E/DN20E/DP20E 12point DC24V input (Source/Sink type)

Specification \ Model		Main unit		
		XEC-DR20E	XEC-DN20E	XEC-DP20E
Input point		12 point		
Insulation method		Photo coupler insulation		
Rated input voltage		DC24V		
Rated input current		About 4㎃ (Contact point 0~3: about 7㎃)		
Operation voltage range		DC20.4~28.8V (within ripple rate 5%)		
On voltage / On current		DC19V or higher / 3㎃ or higher		
Off voltage / Off current		DC6V or lower / 1㎃ or lower		
Input resistance		About 5.6㏀ ((%IX0.0.0~%IX0.0.7: about 2.7㏀)		
Response time	Off → On	1/3/5/10/20/70/100㎳ (set by I/O parameter) default: 3㎳		
	On → Off			
Insulation pressure		AC560Vrms / 3 cycle (altitude 2000m)		
Insulation resistance		10㏁ or more by MegOhmMeter		
Common method		12 point / COM		
Proper cable size		0.3㎟		
Operation indicator		LED On When Input On		
External connection method		24 point terminal block connector (M3 X 6 screw)		
Weight		450g	418g	418g

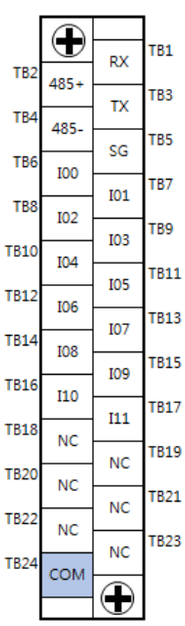
Circuit configuration



Terminal block no.

No.	Contact	No.	Contact
		TB1	RX
TB2	485+	TB3	TX
TB4	485-	TB5	SG
TB6	I00	TB7	I01
TB8	I02	TB9	I03
TB10	I04	TB11	I05
TB12	I06	TB13	I07
TB14	I08	TB15	I09
TB16	I10	TB17	I11
TB18	NC	TB19	NC
TB20	NC	TB21	NC
TB22	NC	TB23	NC
TB24	COM		

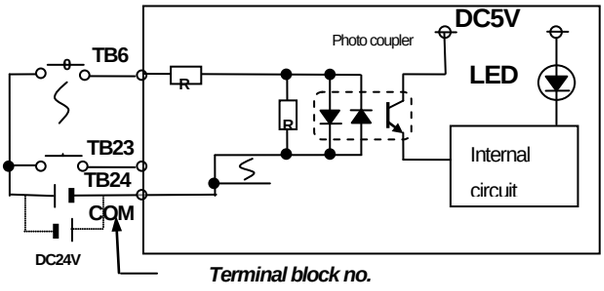
Type



7.2.4 XEC-DR30E/DN30E/DP30E 18point DC24V input (Source/Sink type)

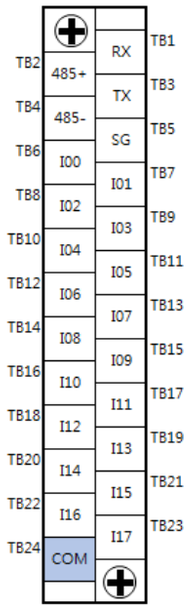
Specification \ Model		Main unit		
		XEC-DR30E	XEC-DN30E	XEC-DP30E
Input point		18 point		
Insulation method		Photo coupler insulation		
Rated input voltage		DC24V		
Rated input current		About 4㎃ (Contact point 0~3: about 7㎃)		
Operation voltage range		DC20.4~28.8V (within ripple rate 5%)		
On voltage / On current		DC19V or higher / 3㎃ or higher		
Off voltage / Off current		DC6V or lower / 1㎃ or lower		
Input resistance		About 5.6㏀ ((%IX0.0.0~%IX0.0.7: about 2.7㏀)		
Response time	Off → On	1/3/5/10/20/70/100㎳ (set by I/O parameter) default: 3㎳		
	On → Off			
Insulation pressure		AC560Vrms / 3 cycle (altitude 2000m)		
Insulation resistance		10㏁ or higher by MegOhmMeter		
Common method		18 point / COM		
Proper cable size		0.3㎟		
Operation indicator		LED on when Input On		
External connection method		24 point terminal block connector (M3 X 6 screw)		
Weight		465g	423g	423g

Circuit configuration



No.	Contact	No.	Contact
TB2	485+	TB1	RX
TB4	485-	TB3	TX
TB6	I00	TB5	SG
TB8	I02	TB7	I01
TB10	I04	TB9	I03
TB12	I06	TB11	I05
TB14	I08	TB13	I07
TB16	I10	TB15	I09
TB18	I12	TB17	I11
TB20	I14	TB19	I13
TB22	I16	TB21	I15
TB24	COM	TB23	I17

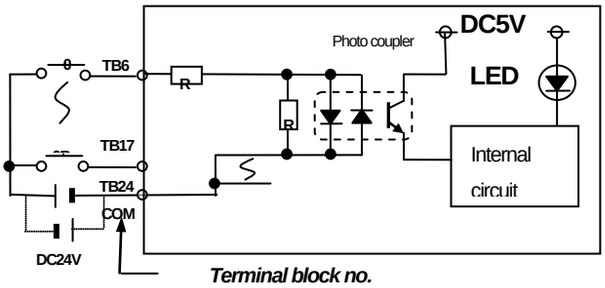
Type



7.2.5 XEC-DR20SU/DN20/DP20SU 12 point DC24V input (Source/Sink type)

Specification \ Mode		Main unit		
		XEC-DR20SU	XEC-DN20SU	XEC-DP20SU
Input point		12 point		
Insulation method		Photo coupler insulation		
Rated input voltage		DC24V		
Rated input current		About 4㎃ (Contact point 0~3: about 7㎃)		
Operation voltage range		DC20.4~28.8V (within ripple rate 5%)		
On voltage / On current		DC19V or higher / 3㎃ or higher		
Off voltage / Off current		DC6V or lower / 1㎃ or lower		
Input resistance		About 5.6㏀ (%IX0.0.0~%IX0.0.1: about 1.5㏀, %IX0.0.2~%IX0.0.7: about 2.7㏀)		
Response time	Off → On	1/3/5/10/20/70/100㎳ (set by I/O parameter) default: 3㎳		
	On → Off			
Insulation pressure		AC560Vrms / 3 cycle (altitude 2000m)		
Insulation resistance		10㏁ or higher by MegOhmMeter		
Common method		12 point / COM		
Proper cable size		0.3㎟		
Operation indicator		LED on when Input On		
External connection method		24 point terminal block connector (M3 X 6 screw)		
Weight		514g	475g	475g

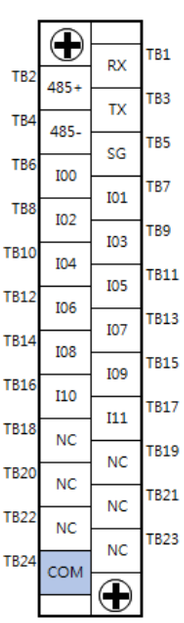
Circuit configuration



Terminal block no.

No.	Contact	No.	Contact
TB2	485+	TB1	RX
TB4	485-	TB3	TX
TB6	I00	TB5	SG
TB8	I02	TB7	I01
TB10	I04	TB9	I03
TB12	I06	TB11	I05
TB14	I08	TB13	I07
TB16	I10	TB15	I09
TB18	NC	TB17	I11
TB20	NC	TB19	NC
TB22	NC	TB21	NC
TB24	COM	TB23	NC

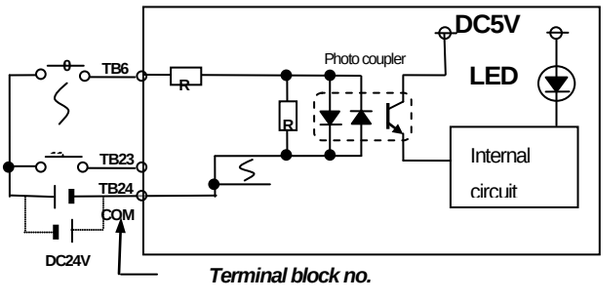
Type



7.2.6 XEC-DR30SU/DN30/DP30SU 18 point DC24V input (Source/Sink type)

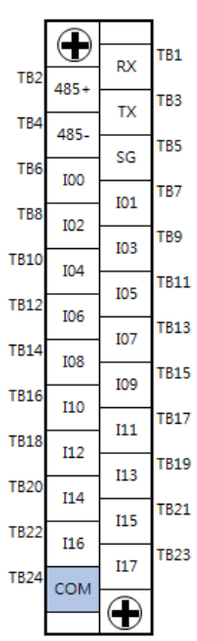
Specification \ Model		Main unit	
		XEC-DN30SU	XEC-DR30SU
Input point		18 point	
Insulation method		Photo coupler insulation	
Rated input voltage		DC24V	
Rated input current		About 4㎃ (point 0~1: about 16㎃, point 2~7: about 10mA)	
Operation voltage range		DC20.4~28.8V (within ripple rate 5%)	
On voltage / On current		DC19V or higher / 3㎃ or higher	
Off voltage / Off current		DC6V or lower / 1㎃ or lower	
Input resistance		About 5.6㏀ (%IX0.0.0~%IX0.0.1:about 1.5㏀, %IX0.0.2~%IX0.0.7: about 2.7㏀)	
Response time	Off → On	1/3/5/10/20/70/100㎳ (set by I/O parameter) default: 3㎳	
	On → Off		
Insulation pressure		AC560Vrms / 3 cycle (altitude 2000m)	
Insulation resistance		10㏁ or higher by MegOhmMeter	
Common method		18 point / COM	
Proper cable size		0.3㎟	
Operation indicator		LED on when Input On	
External connection method		24 point terminal block connector (M3 X 6 screw)	
Weight		476g	

Circuit configuration



No.	Contact	No.	Contact
TB2	485+	TB1	RX
TB4	485-	TB3	TX
TB6	I00	TB5	SG
TB8	I02	TB7	I01
TB10	I04	TB9	I03
TB12	I06	TB11	I05
TB14	I08	TB13	I07
TB16	I10	TB15	I09
TB18	I12	TB17	I11
TB20	I14	TB19	I13
TB22	I16	TB21	I15
TB24	COM	TB23	I17

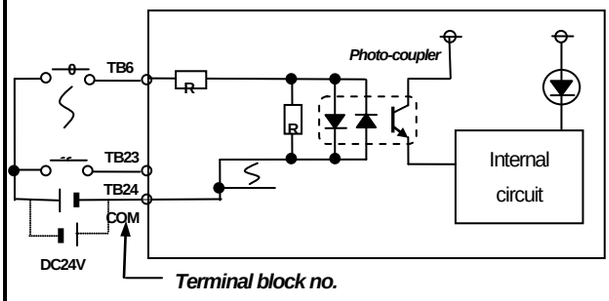
Type



7.2.7 XEC-DR40SU/DN40SU/DP40SU 24 point DC24V input (Source/Sink Type)

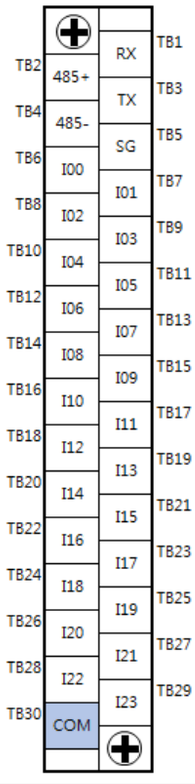
Specification \ Model		Main unit	
		XEC-DN40SU	XEC-DN40SU
Input point		24 point	
Insulation method		Photo coupler insulation	
Rated input voltage		DC24V	
Rated input current		About 4㎃ (point 0~1: about 16㎃, point 2~7: about 10㎃)	
Operation voltage range		DC20.4~28.8V (within ripple rate 5%)	
On voltage / On current		DC19V or higher / 3㎃ or higher	
Off voltage / Off current		DC6V or lower / 1㎃ or lower	
Input resistance		About 5.6㏀ (%IX0.0.0~%IX0.0.1: about 1.5㏀, %IX0.0.2~%IX0.0.7: about 2.7㏀)	
Response time	Off → On	1/3/5/10/20/70/100㎳ (set by I/O parameter) default: 3㎳	
	On → Off		
Insulation pressure		AC560Vrms / 3 cycle (altitude 2000m)	
Insulation resistance		10㏁ or higher by MegOhmMeter	
Common method		24 point / COM	
Proper cable size		0.3㎟	
Operation indicator		LED on when Input On	
External connection method		30 point terminal block connector (M3 X 6 screw)	
Weight		578g	594g

Circuit configuration



No.	Contact	No.	Contact
TB2	485+	TB1	RX
TB4	485-	TB3	TX
TB6	I00	TB5	SG
TB8	I02	TB7	I01
TB10	I04	TB9	I03
TB12	I06	TB11	I05
TB14	I08	TB13	I07
TB16	I10	TB15	I09
TB18	I12	TB17	I11
TB20	I14	TB19	I13
TB22	I16	TB21	I15
TB24	I18	TB23	I17
TB26	I20	TB25	I19
TB28	I22	TB27	I21
TB30	COM	TB29	I23

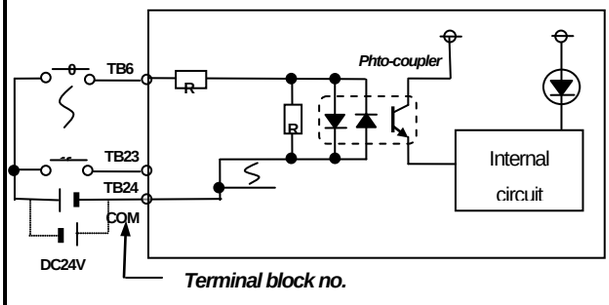
Type



7.2.8 XEC-DR60SU/DN60/DP60SU 36 point DC24V input (Source/Sink Type)

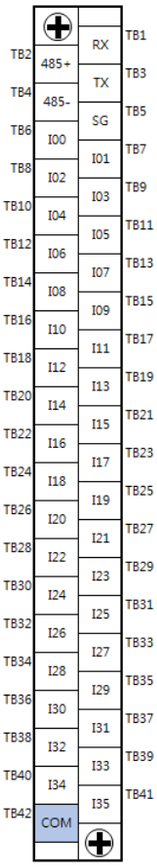
Specification \ Model		Main unit	
		XEC-DN60SU	XEC-DR60SU
Input point		36 point	
Insulation method		Photo coupler insulation	
Rated input voltage		DC24V	
Rated input current		About 4㎃ (point 0~1: about 16㎃, point 2~7: about 10㎃)	
Operation voltage range		DC20.4~28.8V (within ripple rate 5%)	
On voltage / On current		DC19V or higher / 3㎃ or higher	
Off voltage / Off current		DC6V or lower / 1㎃ or lower	
Input resistance		About 5.6㏀ (%IX0.0.0~%IX0.0.1: about 1.5㏀, %IX0.0.2~%IX0.0.7: about 2.7㏀)	
Response time	Off → On	1/3/5/10/20/70/100㎳ (set by I/O parameter) default: 3㎳	
	On → Off		
Insulation pressure		AC560Vrms / 3 cycle (altitude 2000m)	
Insulation resistance		10㏁ or higher by MegOhmMeter	
Common method		36 point / COM	
Proper cable size		0.3㎟	
Operation indicator		LED on when Input On	
External connection method		42 point terminal block connector (M3 X 6 screw)	
Weight		636g	804g

Circuit configuration



No.	Contact	No.	Contact
TB2	485+	TB1	RX
TB4	485-	TB3	TX
TB6	I00	TB5	SG
TB8	I02	TB7	I01
TB10	I04	TB9	I03
TB12	I06	TB11	I05
TB14	I08	TB13	I07
TB16	I10	TB15	I09
TB18	I12	TB17	I11
TB20	I14	TB19	I13
TB22	I16	TB21	I15
TB24	I18	TB23	I17
TB26	I20	TB25	I19
TB28	I22	TB27	I21
TB30	I24	TB29	I23
TB32	I26	TB31	I25
TB34	I28	TB33	I27
TB36	I30	TB35	I29
TB38	I32	TB37	I31
TB40	I34	TB39	I33
TB42	COM	TB41	I35

Type

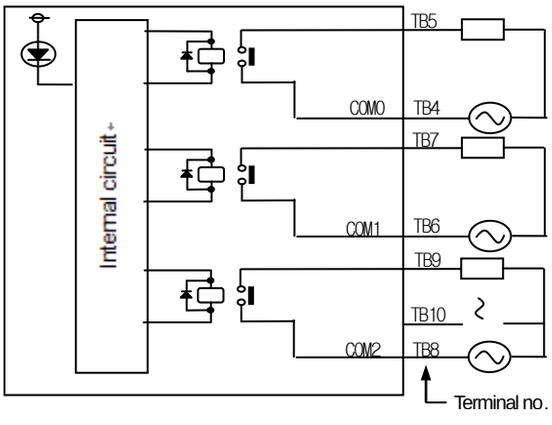


7.3 Main Unit Digital Output Specification

7.3.1 XEC-DR10E 4 point relay output

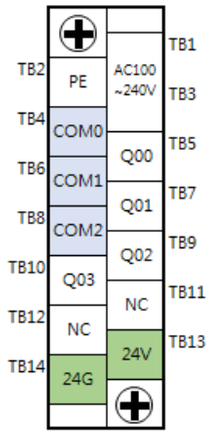
Specification \ Model		Main unit
		XEC-DR10E
Output point		4 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. On/Off frequency		3,600 times / hour
Surge absorber		None
Service life	Mechanical	20 million times or more
	Electrical	Rated load voltage / Current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΦ = 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		2 point / COM
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Operation indicator		LED On when Output On
External connection method		14 point terminal block connector (M3 X 6 screw)
Weight		330g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	NC	TB11	NC
TB14	24G	TB13	24V

Type



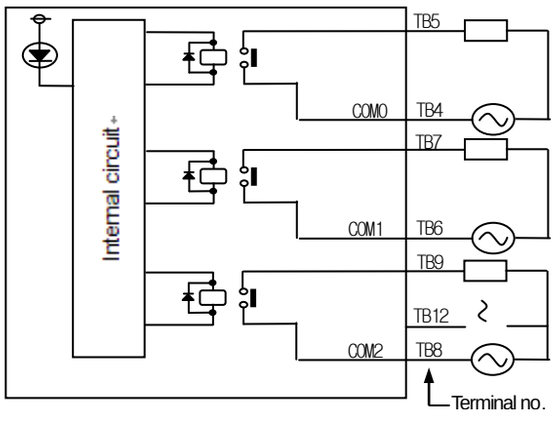
Remark

- TB13, TB14 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.2 XEC-DR14E 6 point relay output

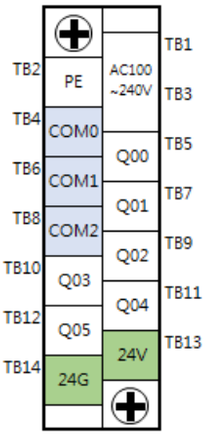
Specification \ Model		Main unit
		XEC-DR14E
Output point		6 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. On/Off frequency		3,600 times / hour
Surge absorber		None
Service life	Mechanical	20 million times or more
	Electrical	Rated load voltage / Current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΦ = 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		4 point / COM
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Operation indicator		LED On when Output On
External connection method		14 point terminal block connector (M3 X 6 screw)
Weight		340g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	Q05	TB11	Q04
TB14	24G	TB13	24V

Type



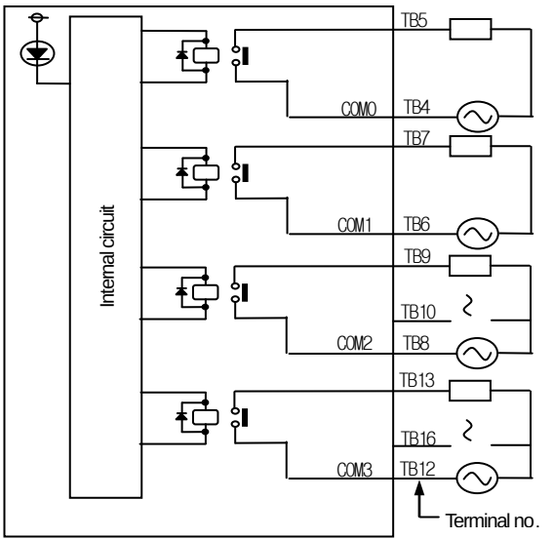
Remark

- TB13, TB14 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.3 XEC-DR20E 8 point relay output

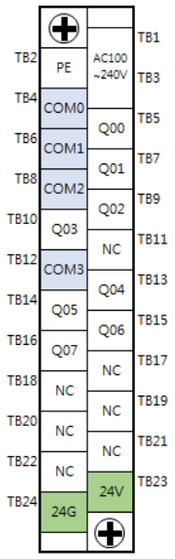
Specification \ Model		Main unit
		XEC-DR20E
Output point		8 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. On/Off frequency		3,600 times / hour
Surge absorber		None
Service life	Mechanical	20 million times or more
	Electrical	Rated load voltage / Current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΦ = 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		4 point / COM
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector (M3 X 6 screw)
Weight		450g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	NC
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	NC	TB17	NC
TB20	NC	TB19	NC
TB22	NC	TB21	NC
TB24	24G	TB23	24V

Type



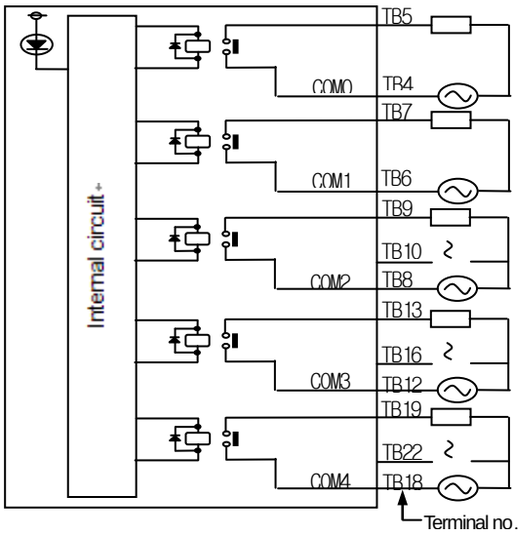
Remark

- TB23, TB24 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.4 XEC-DR30E 12 point relay output

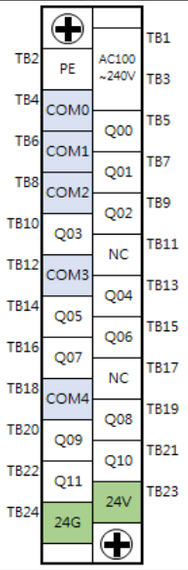
Specification \ Model		Main unit
		XEC-DR30E
Output point		12 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. On/Off frequency		3,600 times / hour
Surge absorber		None
Service life	Mechanical	20 million times or more
	Electrical	Rated load voltage / Current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΦ = 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		4 point / COM
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector (M3 X 6 screw)
Weight		465g

Circuit configuration



No.	Contact	No.	Contact
		TB1	AC100 ~240V
TB2	PE	TB3	
TB4	COM0	TB5	Q00
TB6	COM1	TB7	Q01
TB8	COM2	TB9	Q02
TB10	Q03	TB11	NC
TB12	COM3	TB13	Q04
TB14	Q05	TB15	Q06
TB16	Q07	TB17	NC
TB18	COM4	TB19	Q08
TB20	Q09	TB21	Q10
TB22	Q11	TB23	24V
TB24	24G		

Type



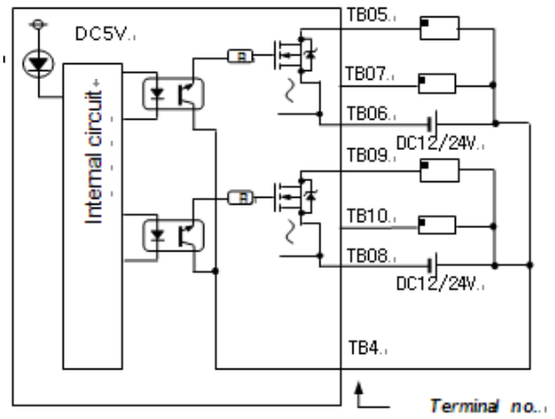
Remark

- TB23, TB24 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.5 XEC-DN10E 4 point transistor output (Sink type)

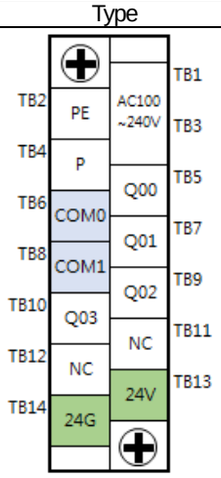
Specification \ Model		Main unit
		XEC-DN10E
Output point		4 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		14 point terminal block connector(M3 X 6 screw)
Weight		313g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	P	TB3	
TB6	COM0	TB5	Q00
TB8	COM1	TB7	Q01
TB10	Q03	TB9	Q02
TB12	NC	TB11	NC
TB14	24G	TB13	24V

Type



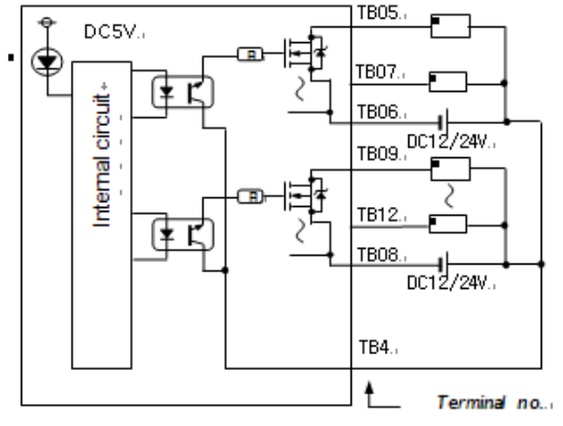
Remark

- TB13, TB14 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.6 XEC-DN14E 6 point transistor output (Sink type)

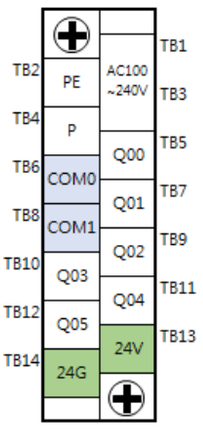
Specification \ Model		Main unit
		XEC-DN14E
Output point		6 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		14 point terminal block connector(M3 X 6 screw)
Weight		315g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	P	TB3	
TB6	COM0	TB5	Q00
TB8	COM1	TB7	Q01
TB10	Q03	TB9	Q02
TB12	Q05	TB11	Q04
TB14	24G	TB13	24V

Type



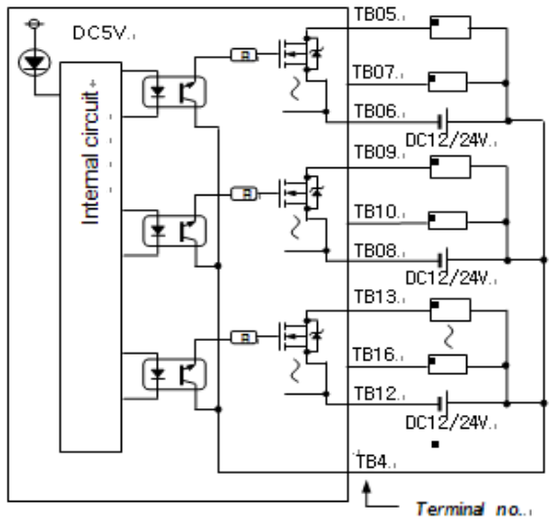
Remark

- TB13, TB14 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.7 XEC-DN20E 8 point transistor output (Sink type)

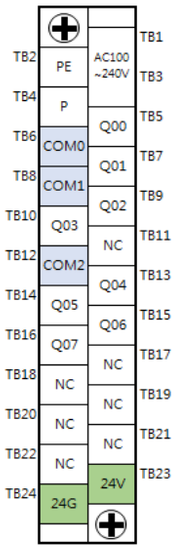
Specification \ Model		Main unit
		XEC-DN20E
Output point		8 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector(M3 X 6 screw)
Weight		418g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	P	TB3	
TB6	COM0	TB5	Q00
TB8	COM1	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM2	TB11	NC
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	NC	TB17	NC
TB20	NC	TB19	NC
TB22	NC	TB21	NC
TB24	24G	TB23	24V

Type



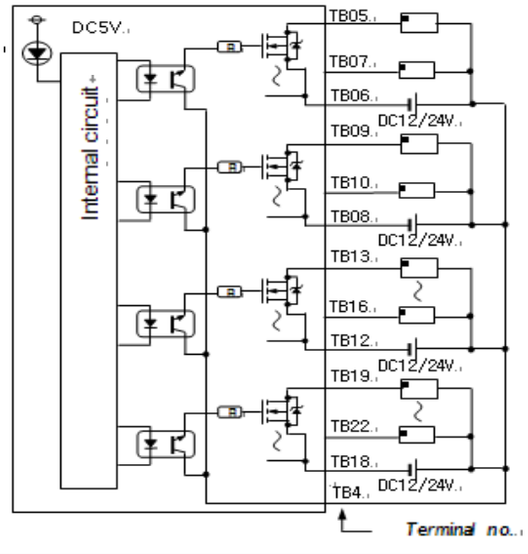
Remark

- TB23, TB24 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.8 XEC-DN30E 12 point transistor output (Sink type)

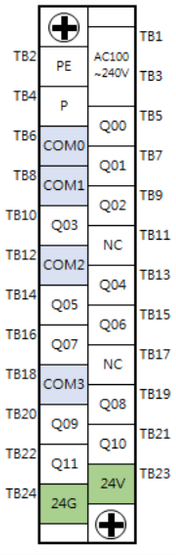
Specification \ Model		Main unit
		XEC-DP30E
Output point		12 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector(M3 X 6 screw)
Weight		423g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	P	TB3	
TB6	COM0	TB5	Q00
TB8	COM1	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM2	TB11	NC
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM3	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	24G	TB23	24V

Type



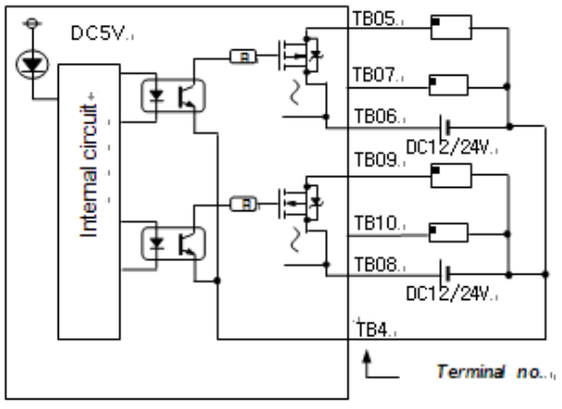
Remark

- TB23, TB24 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.9 XEC-DP10E 4 point transistor output (Source type)

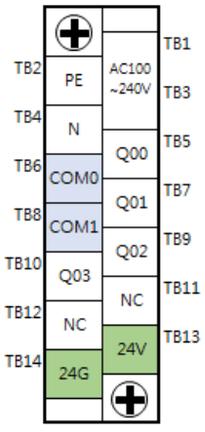
Specification \ Model		Main unit
		XEC-DP10E
Output point		4 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		14 point terminal block connector(M3 X 6 screw)
Weight		313g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	N	TB3	
TB6	COM0	TB5	Q00
TB8	COM1	TB7	Q01
TB10	Q03	TB9	Q02
TB12	NC	TB11	NC
TB14	24G	TB13	24V

Type



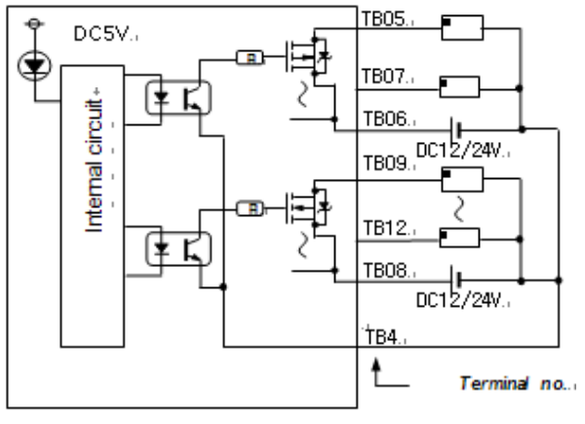
Remark

- TB13, TB14 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.10 XEC-DP14E 6 point transistor output (Source type)

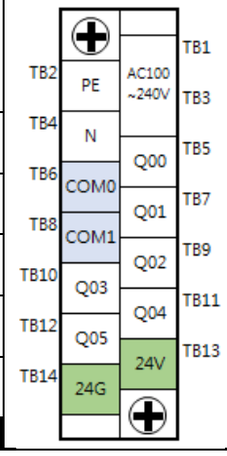
Specification \ Model		Main unit
		XEC-DP14E
Output point		6 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		14 point terminal block connector(M3 X 6 screw)
Weight		315g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	N	TB3	
TB6	COM0	TB5	Q00
TB8	COM1	TB7	Q01
TB10	Q03	TB9	Q02
TB12	Q05	TB11	Q04
TB14	24G	TB13	24V

Type



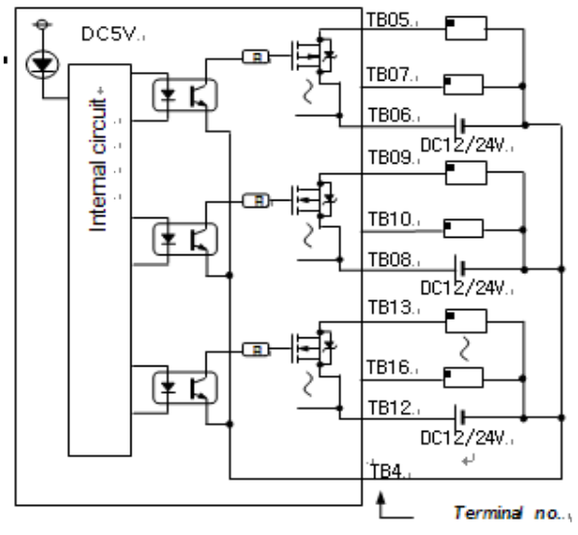
Remark

- TB13, TB14 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.11 XEC-DP20E 8 point transistor output (Source type)

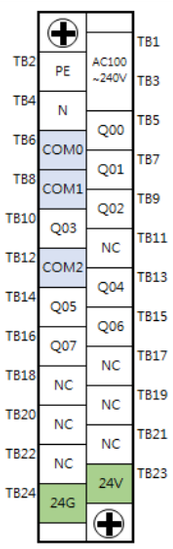
Specification \ Model		Main unit
		XEC-DP20E
Output point		8 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector(M3 X 6 screw)
Weight		418g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	N	TB3	
TB6	COM0	TB5	Q00
TB8	COM1	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM2	TB11	NC
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	NC	TB17	NC
TB20	NC	TB19	NC
TB22	NC	TB21	NC
TB24	24G	TB23	24V

Type



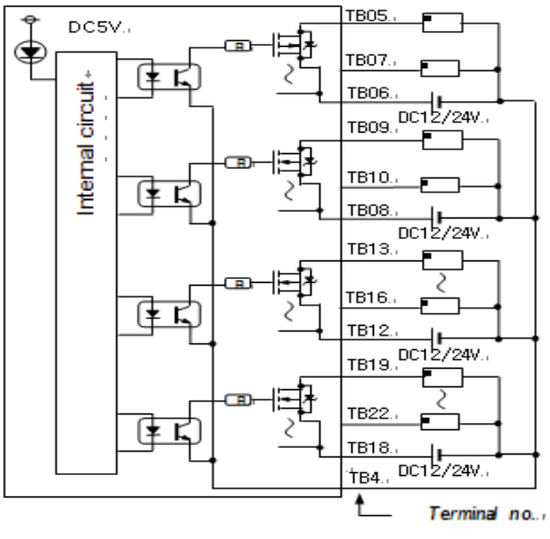
Remark

- TB23, TB24 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.12 XEC-DP30E 12 point transistor output (Source type)

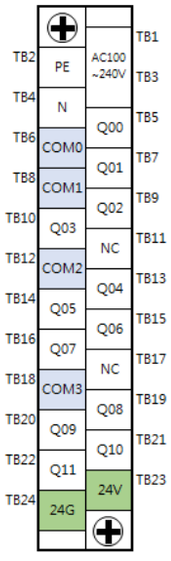
Specification \ Model		Main unit
		XEC-DP30E
Output point		12 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25 ㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector(M3 X 6 screw)
Weight		423g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	N	TB3	
TB6	COM0	TB5	Q00
TB8	COM1	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM2	TB11	NC
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM3	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	24G	TB23	24V

Type



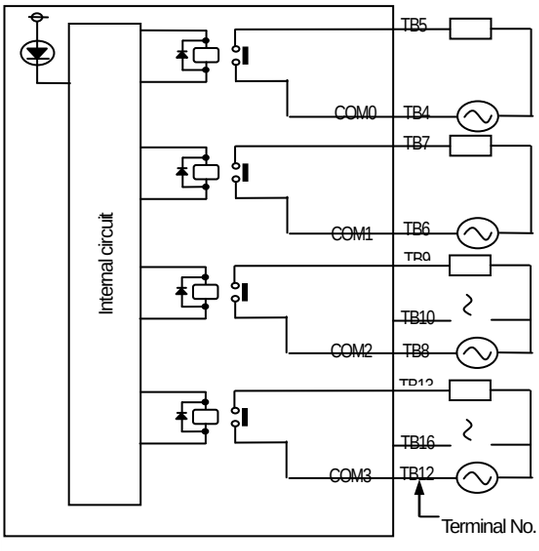
Remark

- TB23, TB24 is 24V output point. (24VDC,0.2A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.13 XEC-DR20SU 8 point relay output

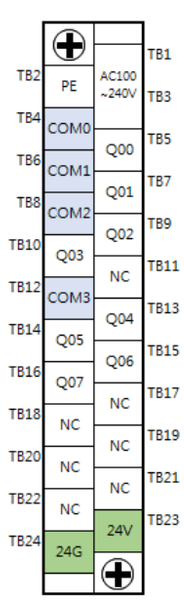
Specification \ Model		Main unit
		XEC-DR20SU
Output point		8 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. On/Off frequency		3,600 times / hour
Surge absorber		None
Service life	Mechanical	20 million times or more
	Electrical	Rated load voltage / Current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more
		DC24V / 1A, DC100V / 0.1A (L / R = 7㎳) 100,000 times or more
Response time	Off → On	10ms or less
	On → Off	12ms or less
Common method		4 point / COM (QX0.0.0, QX0.0.1: 1point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Operation indicator		LED On when Output On
External connection method		42 point terminal block connector (M3 X 6 screw)
Weight		450g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	NC
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	NC	TB17	NC
TB20	NC	TB19	NC
TB22	NC	TB21	NC
TB24	24G	TB23	24V

Type



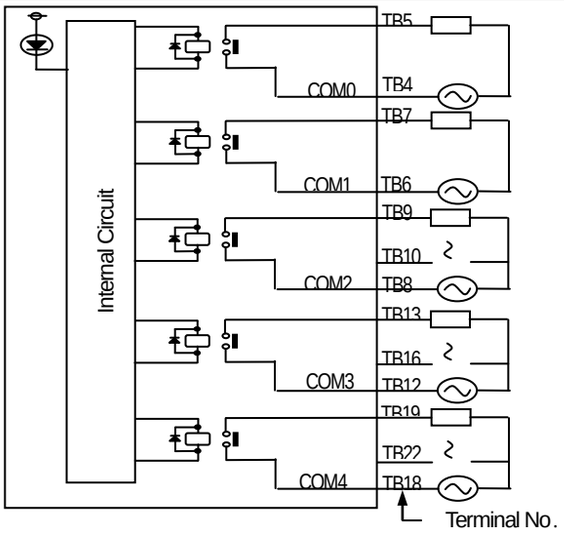
Remark

- TB23, TB24 is 24V output point. (24VDC,0.3A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.14 XEC-DR30SU 12 point relay output

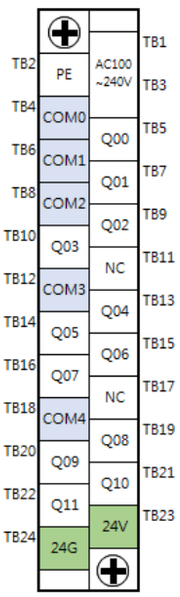
Specification \ Model		Main unit
		XEC-DR30SU
Output point		12 point
Insulation method		Relay insulation
Rated load		DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. On/Off frequency		3,600 times / hour
Surge absorber		None
Service life	Mechanical	20 million times or more
	Electrical	Rated load voltage / Current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΦ = 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		4 point / COM (QX0.0.0, QX0.0.1: 1point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Operation indicator		LED On when Output On
External connection method		42 point terminal block connector (M3 X 6 screw)
Weight		465g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	NC
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM4	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	24G	TB23	24V

Type



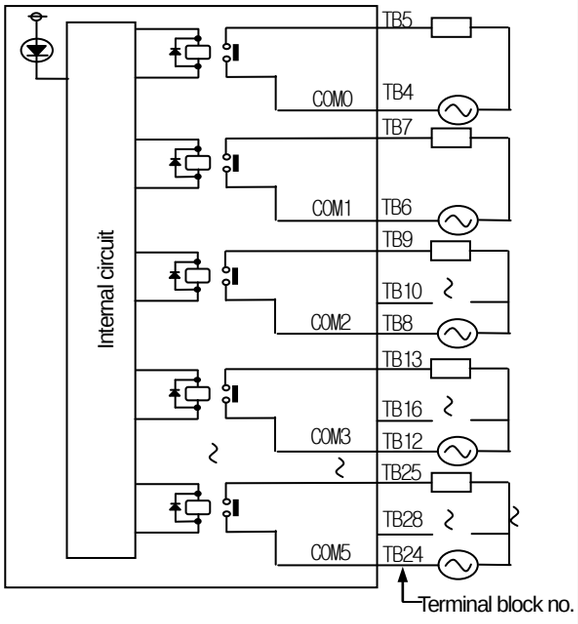
Remark

- TB23, TB24 is 24V output point. (24VDC,0.3A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.15 XEC-DR40SU 16 point relay output

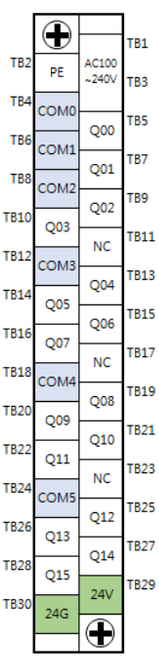
Model / Specification		Main unit XEC-DR40SU
Output point		16 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. On/Off frequency		3,600 times / hour
Surge absorber		None
Service life	Mechanical	20 million times or more
	Electrical	Rated load voltage / Current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more
		DC24V / 1A, DC100V / 0.1A (L / R = 7㎳) 100,000 times or more
Response time	Off → On	10ms or less
	On → Off	12ms or less
Common method		4 point / COM (QX0.0.0, QX0.0.1: 1point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Operation indicator		LED On when Output On
External connection method		30 point terminal block connector (M3 X 6 screw)
Weight		594g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	NC
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM4	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	COM5	TB23	NC
TB26	Q13	TB25	Q12
TB28	Q15	TB27	Q14
TB30	24G	TB29	24V

Type



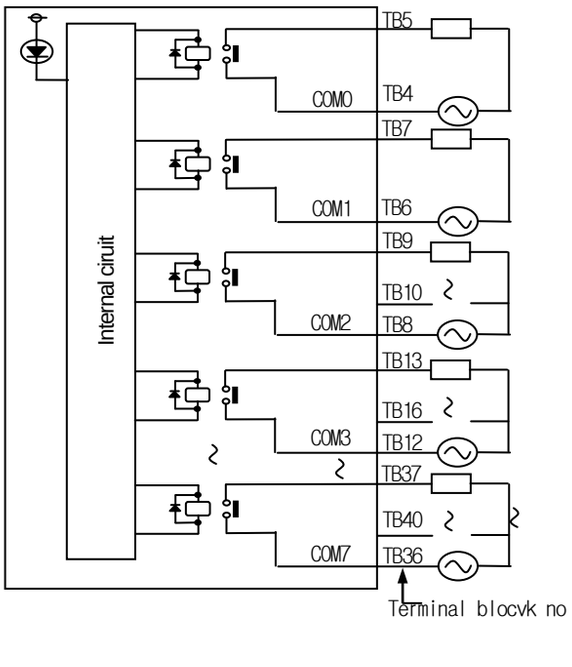
Remark

- TB29, TB30 is 24V output point. (24VDC,0.3A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.16 XEC-DR60SU 24 point relay output

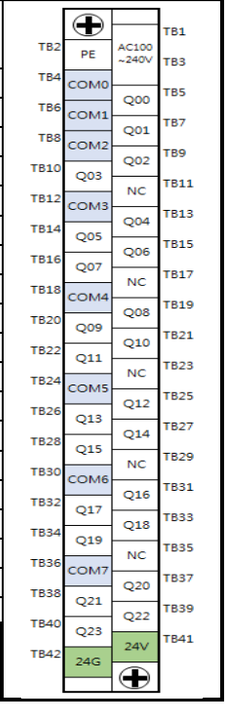
Model / Specification		Main unit XEC-DR60SU
Output point		24 point
Insulation method		Relay insulation
Rated load voltage/current		DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COM
Min. load voltage/current		DC5V / 1㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. On/Off frequency		3,600 times / hour
Surge absorber		None
Service life	Mechanical	20 million times or more
	Electrical	Rated load voltage / Current 100,000 times or more
		AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more
		AC200V / 1A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more
		DC24V / 1A, DC100V / 0.1A (L / R = 7㎳) 100,000 times or more
Response time	Off → On	10ms or less
	On → Off	12ms or less
Common method		4 point / COM (QX0.0.0, QX0.0.1: 1point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Operation indicator		LED On when Output On
External connection method		30 point terminal block connector (M3 X 6 screw)
Weight		804g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	NC
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM4	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	COM5	TB23	NC
TB26	Q13	TB25	Q12
TB28	Q15	TB27	Q14
TB30	COM6	TB29	NC
TB32	Q17	TB31	Q16
TB34	Q19	TB33	Q18
TB36	COM7	TB35	NC
TB38	Q21	TB37	Q20
TB40	Q23	TB39	Q22
TB42	24G	TB41	24V

Type



Remark

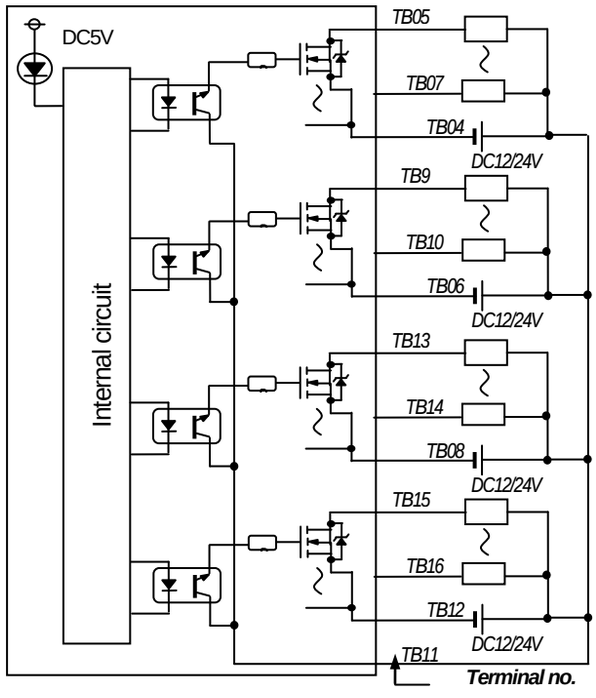
▪ TB41, TB342 is 24V output point. (24VDC,0.5A)

▪ 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.17 XEC-DN20SU 8 point transistor output (Sink type)

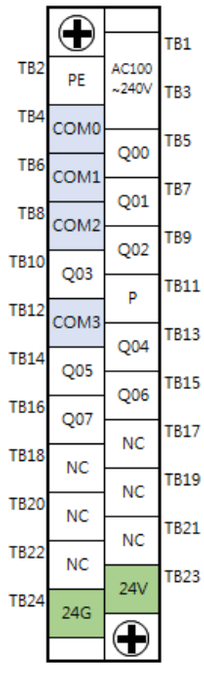
Specification \ Model		Main unit
		XEC-DN20SU
Output point		8 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM(QX0.0.0, QX0.0.1)
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM(QX0.0.0, QX0.0.1: 2point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector(M3 X 6 screw)
Weight		470g

Circuit configuration



No.	Contact	No.	Contact
		TB1	AC100 ~240V
TB2	PE	TB3	
TB4	COM0	TB5	Q00
TB6	COM1	TB7	Q01
TB8	COM2	TB9	Q02
TB10	Q03	TB11	P
TB12	COM3	TB13	Q04
TB14	Q05	TB15	Q06
TB16	Q07	TB17	NC
TB18	NC	TB19	NC
TB20	NC	TB21	NC
TB22	NC	TB23	24V
TB24	24G		

Type



Remark

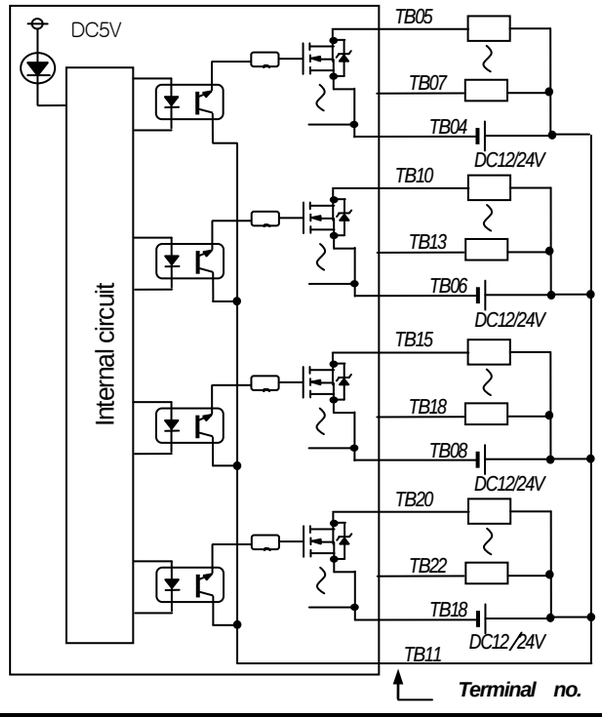
▪ TB23, TB24 is 24V output point. (24VDC,0.3A)

▪ 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.18 XEC-DN30SU 12 point transistor output (Sink type)

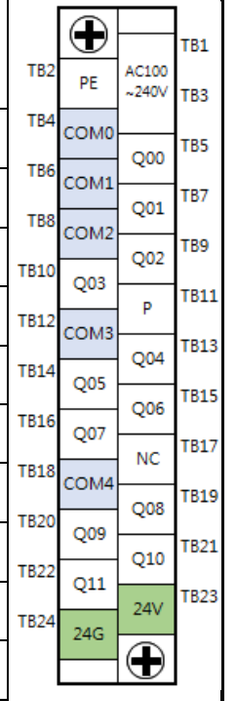
Specification \ Model		Main unit
		XEC-DN30SU
Output point		12 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM(QX0.0.0, QX0.0.1)
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM(QX0.0.0, QX0.0.1: 2point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector(M3 X 6 screw)
Weight		475g

Circuit configuration



No.	Contact	No.	Contact
		TB1	AC100 ~240V
TB2	PE	TB3	
TB4	COM0	TB5	Q00
TB6	COM1	TB7	Q01
TB8	COM2	TB9	Q02
TB10	Q03	TB11	P
TB12	COM3	TB13	Q04
TB14	Q05	TB15	Q06
TB16	Q07	TB17	NC
TB18	COM4	TB19	Q08
TB20	Q09	TB21	Q10
TB22	Q11	TB23	24V
TB24	24G		

Type



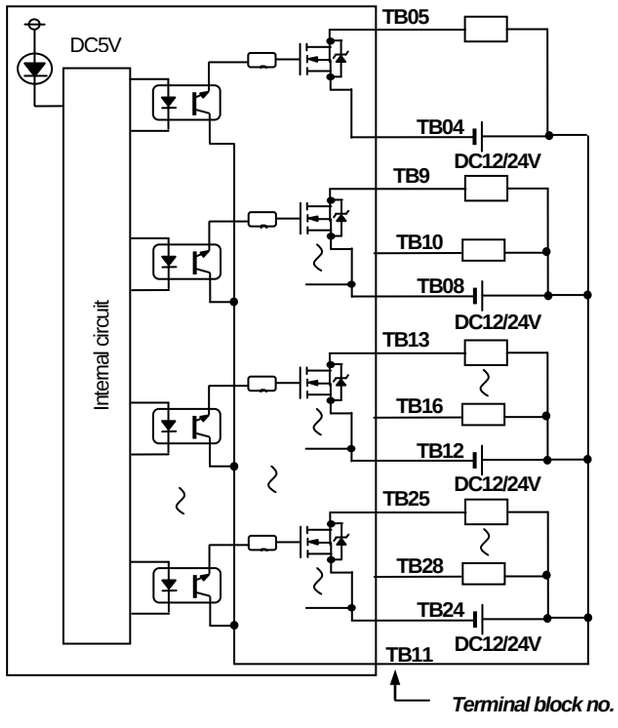
Remark

- TB23, TB24 is 24V output point. (24VDC,0.3A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.19 XEC-DN40SU 16 point TR output (Sink type)

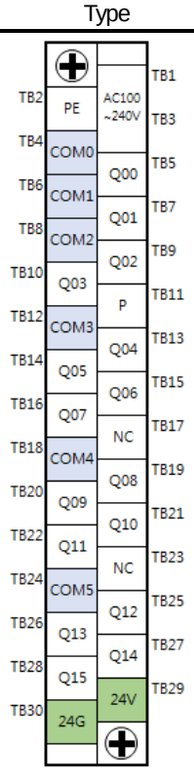
Specification \ Model		Main unit
		XEC-DN40SU
Output point		16 point
Insulation method		Photo-coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1point, 2A / 1COM (QX0.0.0, QX0.0.1)
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when On		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 (QX0.0.0, QX0.0.1: 2point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
External supply power	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	25㎃ or less (when connecting DC24V)
Operation indicator		LED On When Output On
External connection method		30 point terminal block connector (M3 X 6 screw)
Weight		578g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	P
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM4	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	COM5	TB23	NC
TB26	Q13	TB25	Q12
TB28	Q15	TB27	Q14
TB30	24G	TB29	24V

Type



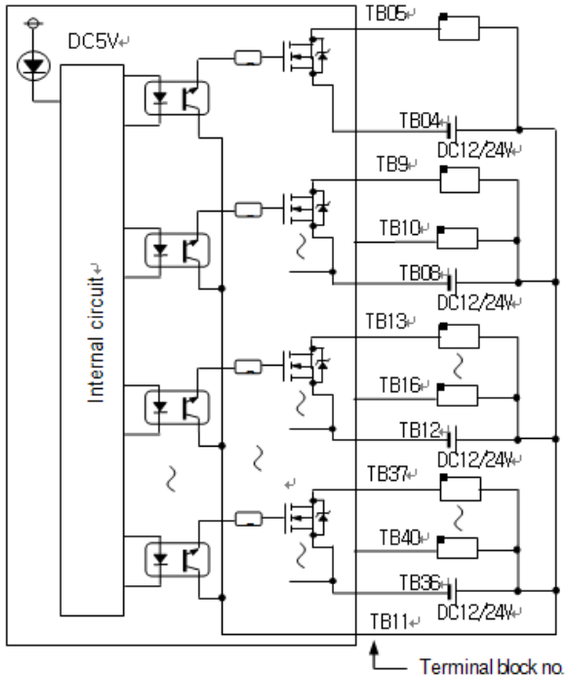
Remark

- TB29, TB30 is 24V output point. (24VDC,0.3A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.20 XEC-DN60SU 24 point TR output (Sink type)

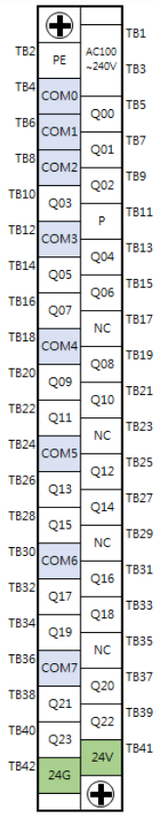
Specification \ Model		Main unit
		XEC-DN60SU
Output point		24 point
Insulation method		Photo-coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1point, 2A / 1COM (QX0.0.0, QX0.0.1)
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when On		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 (QX0.0.0, QX0.0.1: 2point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
External supply power	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	25㎃ or less (when connecting DC24V)
Operation indicator		LED On When Output On
External connection method		42 point terminal block connector (M3 X 6 screw)
Weight		636g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	P
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM4	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	COM5	TB23	NC
TB26	Q13	TB25	Q12
TB28	Q15	TB27	Q14
TB30	COM6	TB29	NC
TB32	Q17	TB31	Q16
TB34	Q19	TB33	Q18
TB36	COM7	TB35	NC
TB38	Q21	TB37	Q20
TB40	Q23	TB39	Q22
TB42	24G	TB41	24V

Type



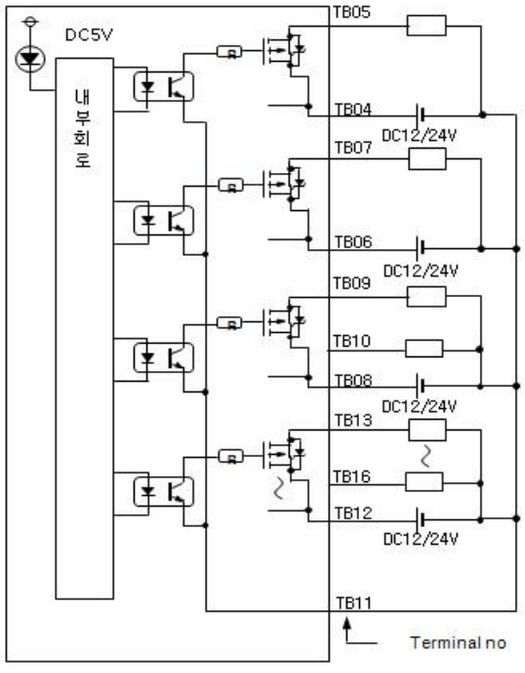
Remark

▪ TB41, TB342 is 24V output point. (24VDC,0.5A)▪ 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.21 XEC-DP20SU 8 point transistor output (Source type)

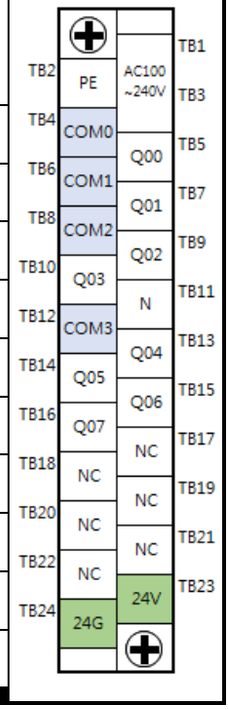
Specification \ Model		Main unit
		XEC-DP20SU
Output point		8 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM (QX0.0.0, QX0.0.1)
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM (QX0.0.0, QX0.0.1: 2point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector(M3 X 6 screw)
Weight		470g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	N
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	NC	TB17	NC
TB20	NC	TB19	NC
TB22	NC	TB21	NC
TB24	24G	TB23	24V

Type



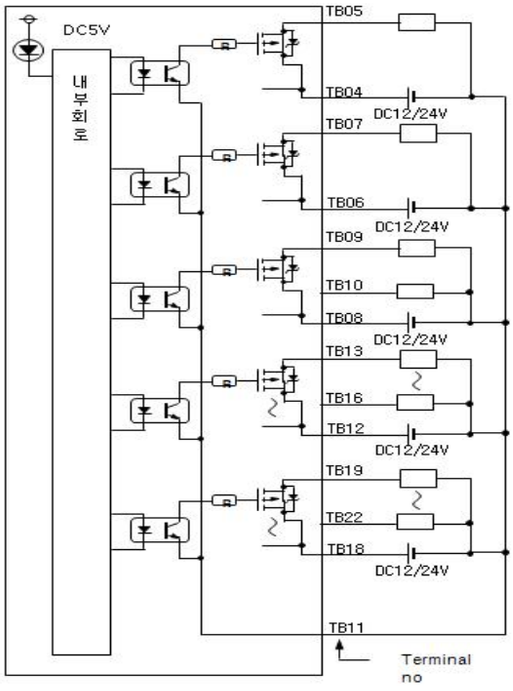
Remark

- TB23, TB24 is 24V output point. (24VDC,0.3A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.22XEC-DP30SU 12 point transistor output (Source type)

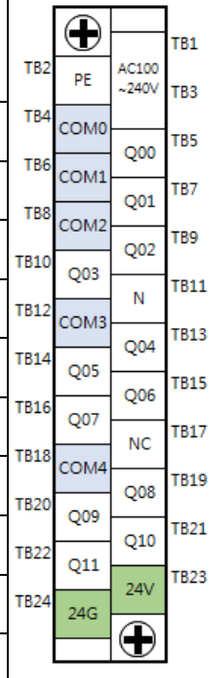
Model		Main unit XEC-DP30SU
Output point		12 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Operation load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1 point, 2A / 1COM (QX0.0.0, QX0.0.1)
Off leakage current		0.1㎃ (AC220V, 60㎐)
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when 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		4 point / COM(QX0.0.0, QX0.0.1: 2point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper wire size		Stranded wire 0.3~0.75㎟ (external diameter 2.8㎜ or less)
External power	Voltage	DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)
	Current	25㎃ or less (When connecting DC24V)
Operation indicator		LED On when Output On
External connection method		24 point terminal block connector(M3 X 6 screw)
Weight		475g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	N
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM4	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	24G	TB23	24V

Type



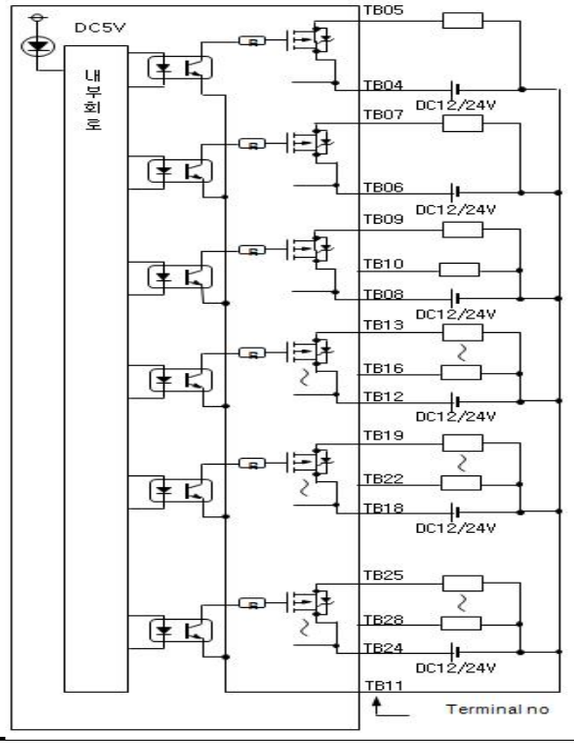
Remark

- TB23, TB24 is 24V output point. (24VDC,0.3A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.23 XEC-DP40SU 16 point TR output (Source type)

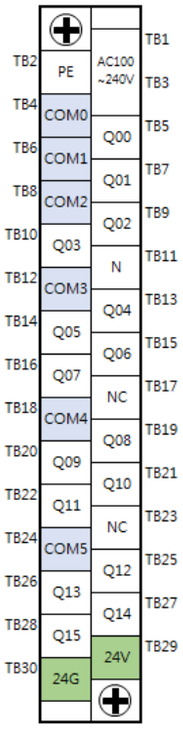
Specification \ Model		Main unit
		XEC-DP40SU
Output point		16 point
Insulation method		Photo-coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1point, 2A / 1COM (QX0.0.0, QX0.0.1)
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when On		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 (QX0.0.0, QX0.0.1: 2point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
External supply power	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	25㎃ or less (when connecting DC24V)
Operation indicator		LED On When Output On
External connection method		30 point terminal block connector (M3 X 6 screw)
Weight		578g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	N
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM4	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	COM5	TB23	NC
TB26	Q13	TB25	Q12
TB28	Q15	TB27	Q14
TB30	24G	TB29	24V

Type



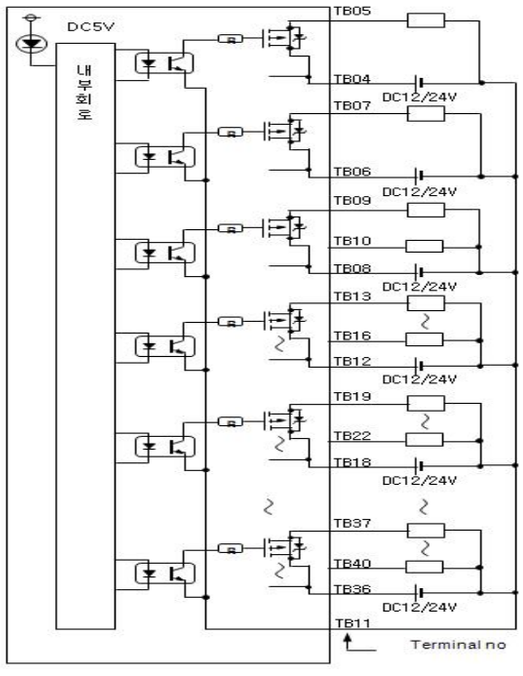
Remark

- TB29, TB30 is 24V output point. (24VDC,0.3A)
- 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.3.24 XEC-DP60SU 24 point TR output (Source type)

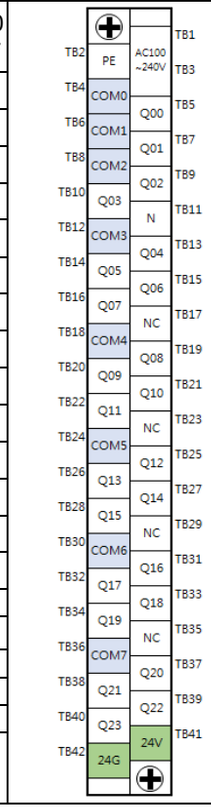
Specification \ Model		Main unit
		XEC-DP60SU
Output point		24 point
Insulation method		Photo-coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load current		0.5A / 1point, 2A / 1COM (QX0.0.0, QX0.0.1)
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. voltage drop when On		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 (QX0.0.0, QX0.0.1: 2point/COM),(QX0.0.2, QX0.0.3: 2point/COM)
Proper cable size		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
External supply power	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	25㎃ or less (when connecting DC24V)
Operation indicator		LED On When Output On
External connection method		42 point terminal block connector (M3 X 6 screw)
Weight		636g

Circuit configuration



No.	Contact	No.	Contact
TB2	PE	TB1	AC100 ~240V
TB4	COM0	TB3	
TB6	COM1	TB5	Q00
TB8	COM2	TB7	Q01
TB10	Q03	TB9	Q02
TB12	COM3	TB11	N
TB14	Q05	TB13	Q04
TB16	Q07	TB15	Q06
TB18	COM4	TB17	NC
TB20	Q09	TB19	Q08
TB22	Q11	TB21	Q10
TB24	COM5	TB23	NC
TB26	Q13	TB25	Q12
TB28	Q15	TB27	Q14
TB30	COM6	TB29	NC
TB32	Q17	TB31	Q16
TB34	Q19	TB33	Q18
TB36	COM7	TB35	NC
TB38	Q21	TB37	Q20
TB40	Q23	TB39	Q22
TB42	24G	TB41	24V

Type



Remark

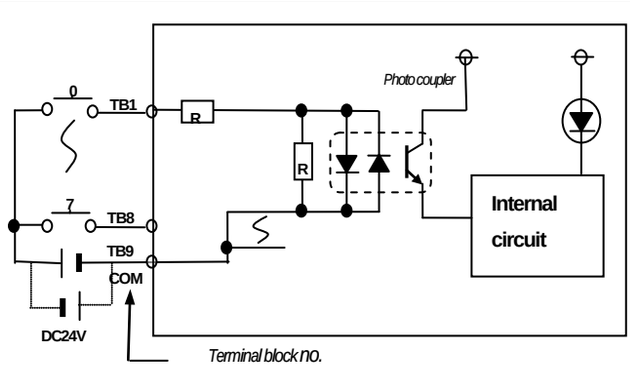
▪ TB41, TB342 is 24V output point. (24VDC,0.5A)▪ 24V ouput is on upper terminal block when it's 'H type' but it's on lower terminal block of SU type.

7.4 Digital Input Module Specification

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

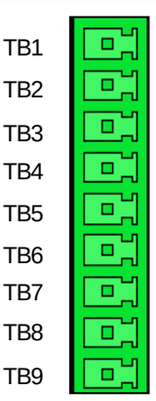
Specification \ Model		DC input module
		XBE-DC08A
Input point		8 point
Insulation method		Photo coupler insulation
Rated input voltage		DC24V
Rated input current		About 4㎃
Operation voltage range		DC20.4~28.8V (ripple rate < 5%)
On Voltage/Current		DC19V or higher / 3 ㎃ or higher
Off Voltage/Current		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		9 point terminal block connector
Weight		52 g

Circuit configuration



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

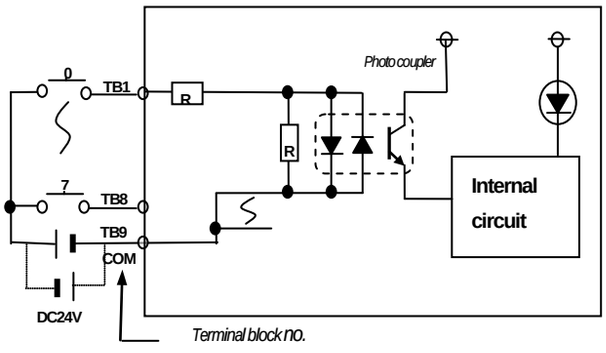
Type



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	DC12/24V
Rated input current		About 4㎃	About 4/8㎃
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	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 Megohmmeter	
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



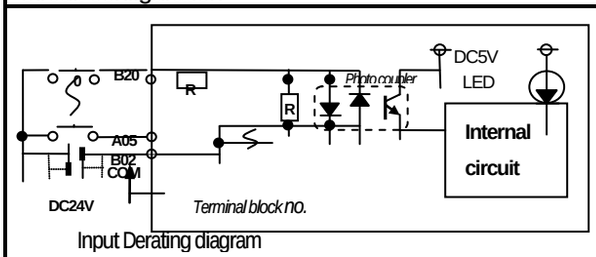
No.	Contact
TB1	0
TB2	1
TB3	2
TB4	3
TB5	4
TB6	5
TB7	6
TB8	7
TB1	8
TB2	9
TB3	A
TB4	B
TB5	C
TB6	D
TB7	E
TB8	F
TB9	COM
TB10	COM

Type

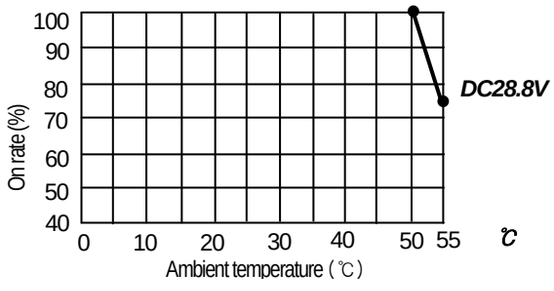
7.4.3 32 point DC24V input module (Source/Sink type)

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 Megohmmeter
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

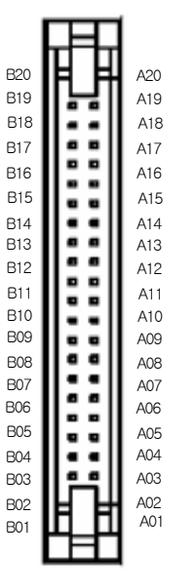


Input Derating diagram



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

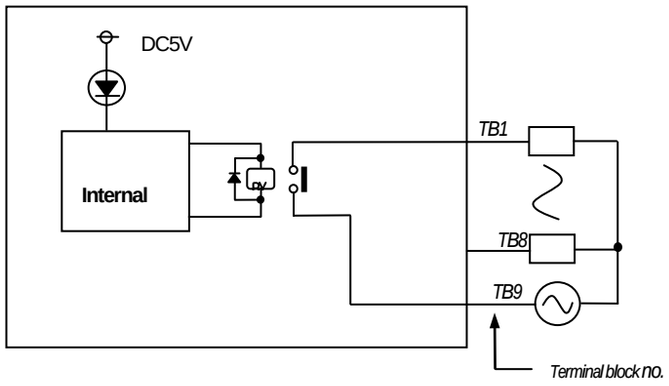
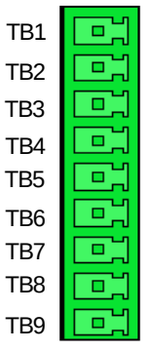
Type



7.5 Digital Output Module Specification

7.5.1 8 point relay output module

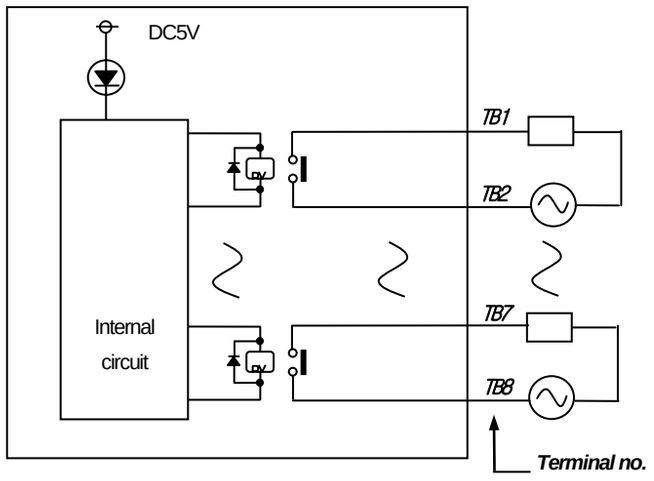
Specification \ Model		Relay output module
		XBE-RY08A
Output point		8 point
Insulation method		Relay insulation
Rated load voltage / Current		DC24V 2A (Resistive load) / AC220V 2A (COSΨ = 1), 5A/COM
Min. load voltage/Current		DC5V / 1㎃
Max. load voltage/Current		AC250V, DC125V
Off leakage current		0.1㎃ (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		Stranded cable 0.3~0.75㎟ (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	

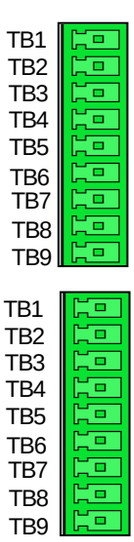
7.5.2 8 point relay output module (Independent point)

Specification \ Model		Relay output module
		XBE-RY08B
Output point		8 point
Insulation method		Relay insulation
Rated load voltage / Current		DC24V 2A (Resistive load) / AC220V 2A (COSΨ = 1), 2A/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		1 point / COM
Proper cable size		Stranded cable 0.3~0.75㎟ (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 x 2
Weight		81g

Circuit configuration



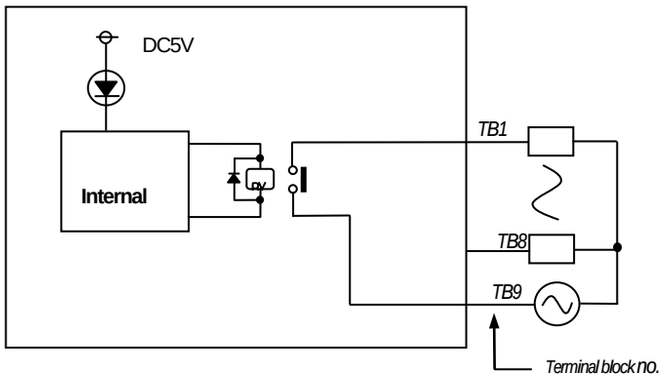
No.	Contact	No.
TB1	0	
TB2	COM0	
TB3	1	
TB4	COM1	
TB5	2	
TB6	COM2	
TB7	3	
TB8	COM3	
TB9	NC	
TB1	4	
TB2	COM4	
TB3	5	
TB4	COM5	
TB5	6	
TB6	COM6	
TB7	7	
TB8	COM7	
TB9	NC	



7.5.3 16 point relay output module

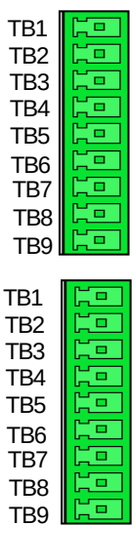
Specification \ Model		Relay output module
		XBE-RY16A
Output point		16 point
Insulation method		Relay insulation
Rated load voltage/ current		DC24V 2A (Resistive load) / AC220V 2A (COSΨ = 1), 5A/COM
Min. load voltage/current		DC5V / 1㎃
Max. load voltage/current		AC250V, DC125V
Off leakage current		0.1㎃ (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		Stranded cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Current consumption		420㎃ (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
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

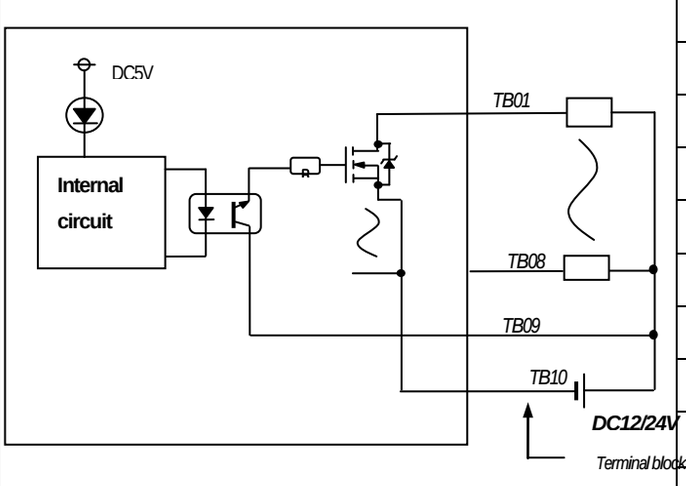
Type



7.5.4 8 point transistor output module (Sink type)

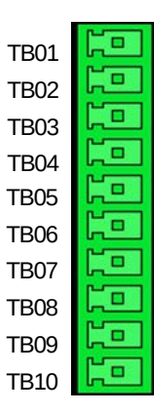
Specification \ Model		Transistor output module
		XBE-TN08A
Output point		8 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.5A / 1 point
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. 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 cable 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		52g

Circuit configuration



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

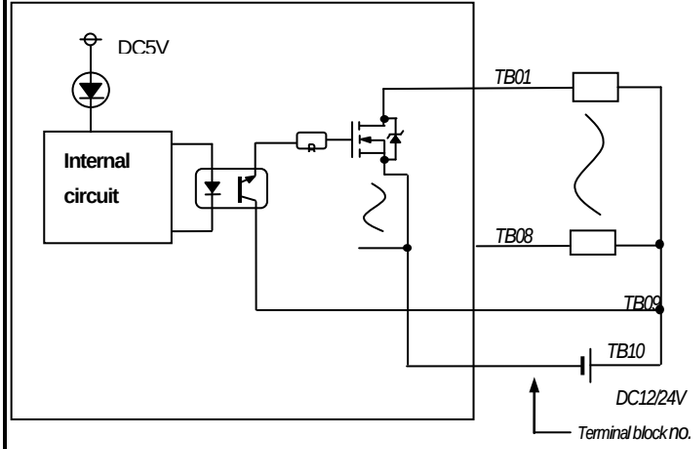
Type



7.5.5 16 point transistor output module (Sink type)

Specification \ Model		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		0.2A / 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		16 point / COM
Proper cable size		Stranded cable 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



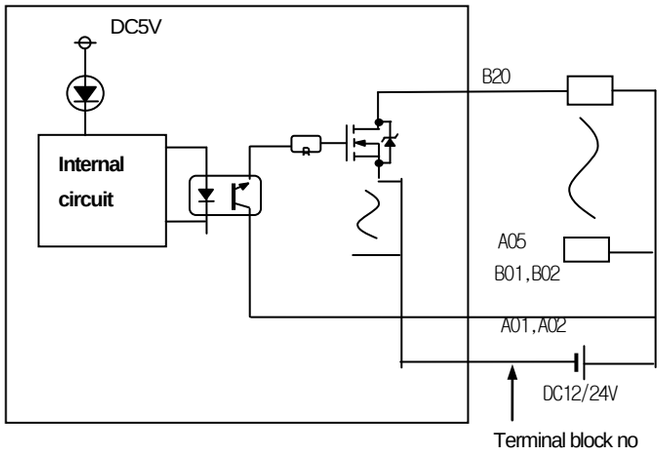
No.	Contact
TB01	0
TB02	1
TB03	2
TB04	3
TB05	4
TB06	5
TB07	6
TB08	7
TB01	8
TB02	9
TB03	A
TB04	B
TB05	C
TB06	D
TB07	E
TB08	F
TB09	DC12/24V
TB10	COM

Type

7.5.6 32 point transistor output module (Sink type)

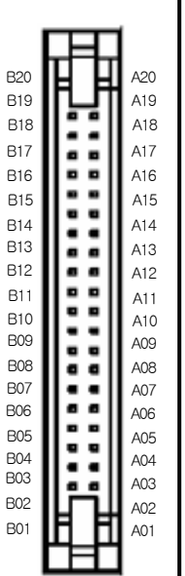
Specification \ Model		Transistor output module
		XBE-TN32A
Output point		32 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.2A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		0.7A / 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.	Contac	No.	Contac
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	

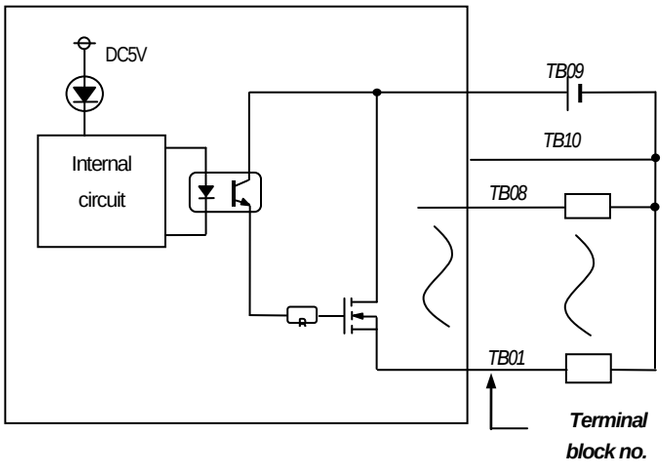
Type



7.5.7 8 point transistor output module (Source type)

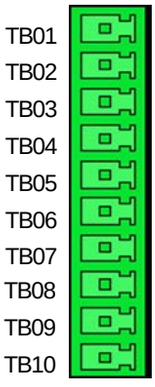
Specification \ Model		Transistor output module
		XBE-TP08A
Output point		8 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.5A / 1 point
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ or less
Max. 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 cable 0.3~0.75㎟ (external diameter 2.8㎜ or less)
Current consumption		40㎃ (when all outputs are on)
External power	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	10㎃ or less (when connecting DC24V)
Operation indicator		LED on when output on
External connection method		10 pin terminal block 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

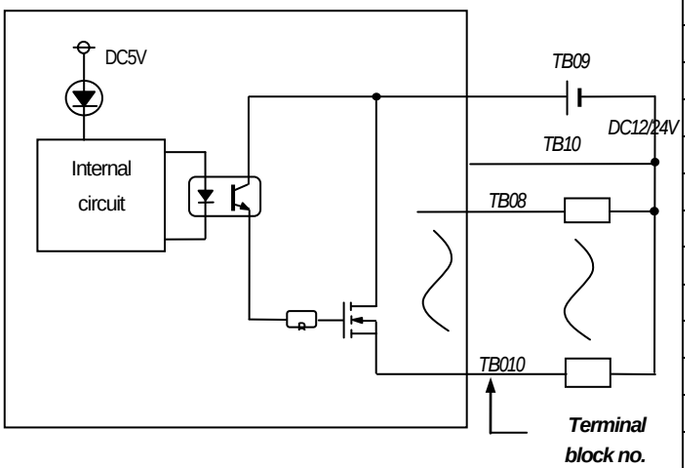
Type



7.5.8 16 point transistor output module (Source type)

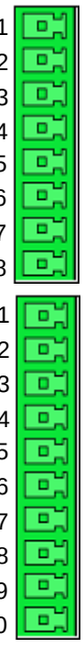
Specification \ Model		Transistor output module
		XBE-TP16A
Output point		16 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.5A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10㎳ 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 cable 0.3~0.75㎟ (external diameter 2.8㎜ or less)
Current consumption		60㎃ (When all outputs are on)
External power	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	10㎃ or less (connecting DC24V)
Operation indicator		LED On when output On
External connection method		8 pin terminal block connector + 10 pin terminal block connector
Weight		40g

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	COM
TB10	0V

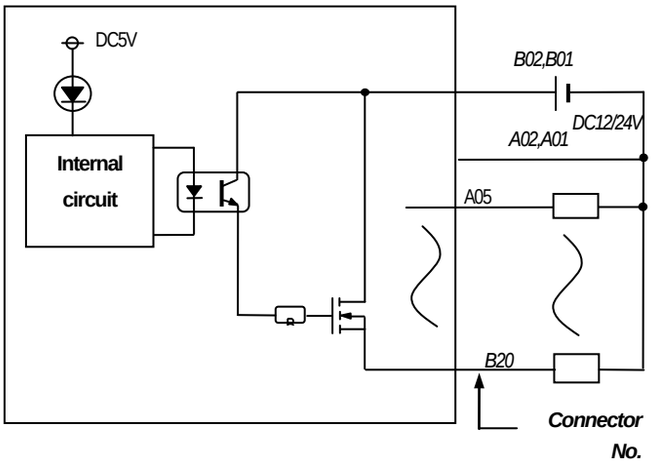
Type



7.5.9 32 point transistor output module (Source type)

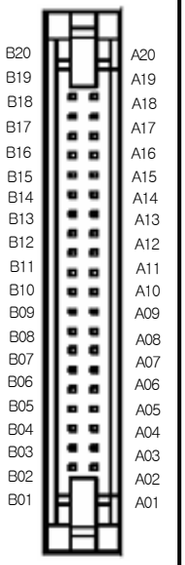
Specification \ Model		Transistor output module
		XBE-TP32A
Output point		32 point
Insulation method		Photo coupler insulation
Rated load voltage		DC 12 / 24V
Load voltage range		DC 10.2 ~ 26.4V
Max. load voltage		0.2A / 1 point, 2A / 1COM
Off leakage current		0.1㎃ or less
Max. inrush current		4A / 10 ㎳ 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 outputs are on)
External power	Voltage	DC12/24V ± 10% (ripple voltage 4 Vp-p or less)
	Current	20㎃ or less (connecting DC24V)
Operation indicator		LED On when output 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

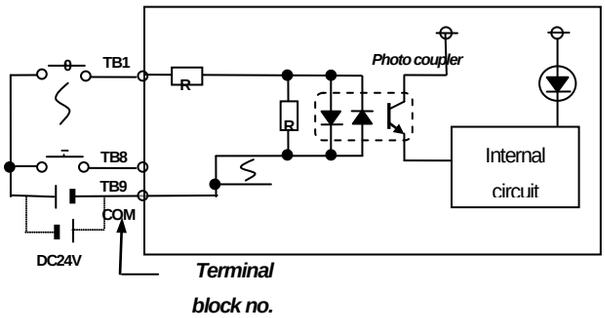


7.6 Combined Digital I/O module Input Specification

7.6.1 8 point DC24V input (Source/Sink type)

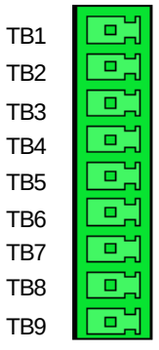
Specification \ Model		DC input module
		XBE-DR16A
Input point		8 point
Insulation method		Photo coupler insulation
Rated input voltage		DC24V
Rated input current		About 4㎃
Operation voltage range		DC20.4~28.8V (within ripple rate 5%)
On Voltage/Current		DC19V or higher / 3㎃ or higher
Off Voltage/Current		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 cable 0.3~0.75㎟ (External diameter 2.8㎜ or less)
Current consumption		280㎃ (When all inputs and outputs are on)
Operation indicator		LED on when input on
External connection method		9 pin terminal block 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

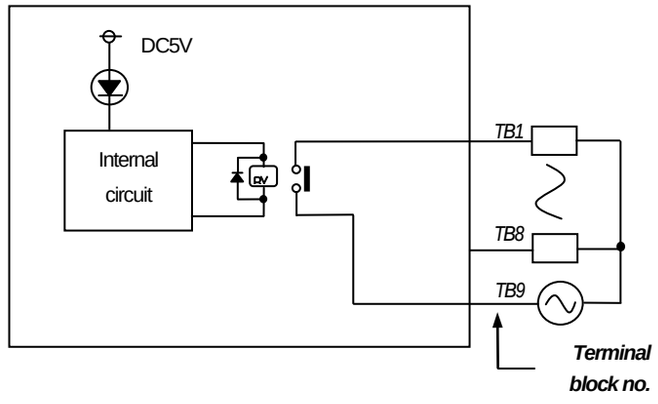


7.7 Combined Digital I/O module Output Specification

7.7.1 8 point relay output

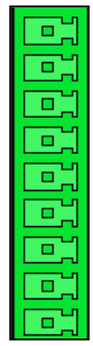
Specification \ Model		Relay output module
		XBE-DR16A
Output point		8 point
Insulation method		Relay insulation
Rated load voltage / Current		DC24V 2A(Resistive load) / AC220V 2A(COSΨ = 1), 5A/COM
Min. load voltage/Current		DC5V / 1㎃
Max. load voltage		AC250V, DC125V
Off leakage current		0.1㎃ (AC220V, 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		Stranded cable 0.3~0.75㎟ (external diameter 2.8㎜ or less)
Current consumption		280㎃ (When all inputs and outputs are on)
Operation indicator		LED on when output on
External connection method		9 pin terminal block 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



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

This section 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	
		'E' type	'SU' type
Count input signal	Signal	A-phase, B-phase	
	Input type	Voltage input (Open collector)	
	Signal level	DC 24V	
Max. count speed		4kpps	100kpps
Number of channels	1 phase	4kpps 4channels	100kpps 2 channels/ 20kpps 6 channels
	2 phase	2kpps 2channels	50kpps 1 channel / 8kpps 3 channels
Count 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	Operating setting by rising/falling edge phase difference	
	CW/CCW	A-phase input: increasing operation	
		B-phase input: decreasing operation	
Multiplication function	1 phase input	1 multiplication	
	2 phase input	2 multiplication	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) :use output contact point of main unit	2 point/channel (for each channel) :use output contact point of main unit
	Type	Selects single-compared (>, >=, =, =<, <) or section-compared output (included or excluded) (program setting)	

Classification		Description	
		'E' type	'SU' type
	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)		Count Latch Revolution per unit time (time setting value: 1~60,000ms)	

(2) Counter/Preset input specification

Classification	Spcification
Input voltage	24V DC (20.4V ~ 28.8V)
Input current	4㎃
On guranteed voltage (min.)	20.4V
Off guranteed voltage (max.)	6V

Remark

If higher pulse than high speed counter input limit is inputted, 「abnormal operation stop」 error may occur because MPU processing time increases to count fast and memory becomes full. .

8.1.2 Designation of parts

(1) Designation of parts

(a) 'E' type

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	Ch0 preset 24V	Ch0 preset 24V	Preset input terminal	Preset input terminal
IX0.0.5	Ch1 preset 24V	-	Preset input terminal	No use
IX0.0.6	Ch2 preset 24V	Ch2 preset 24V	Preset input terminal	Preset input terminal
IX0.0.7	Ch3 preset 24V	-	Preset input terminal	No use
COM0	Input common	Input common	Input common	Input common

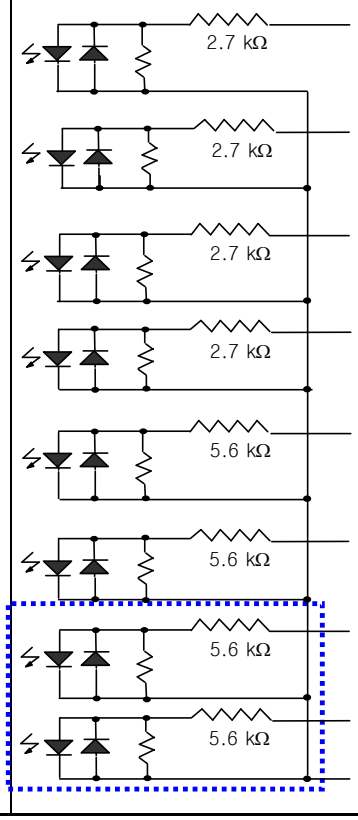
(b) 'SU' type

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	Ch3 preset 24V	-	Preset input terminal	No use
IX0.0.12	Ch4 preset 24V	Ch4 preset 24V	Preset input terminal	Preset input terminal
IX0.0.13	Ch5 preset 24V	-	Preset input terminal	No use
IX0.0.14	Ch6 preset 24V	Ch6 preset 24V	Preset input terminal	Preset input terminal
IX0.0.15	Ch7 preset 24V	–	Preset input terminal	No use
COM0	Input common	Input common	Input common	Input common

(2) Interface with external devices

The internal circuit of High-speed counter is as shown below.

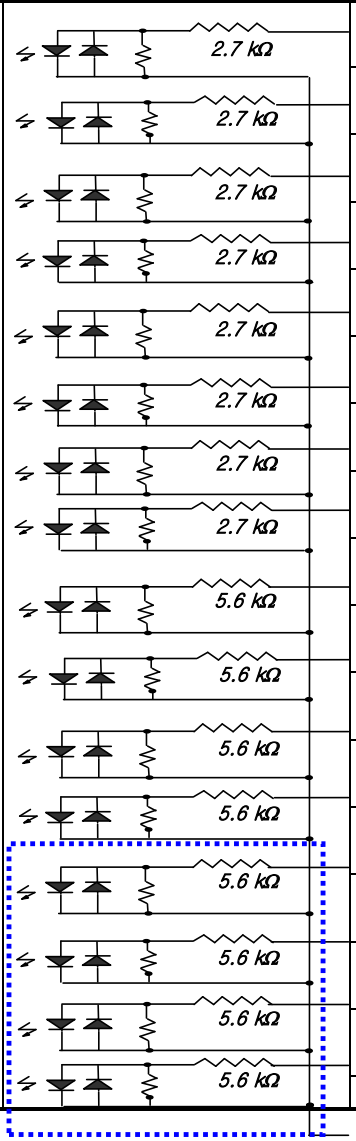
(a)'E' type

I/O	Internal circuit	Terminal No.	Signal		Operation	On/Off guaranteed voltage
			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 0 Preset input	-	On	20.4~28.8V
					Off	6V or less
		IX0.0.5	Ch 1 Preset input	Ch 1 Preset input	On	20.4~28.8V
					Off	6V or less
		IX0.0.6	Ch 2 Preset input	-	On	20.4~28.8V
					Off	6V or less
		IX0.0.7	Ch 3 Preset input	Ch 3 Preset input	On	20.4~28.8V
					Off	6V or less
		COM0	COM(input common)		–	

Remark

For XEC-DR10E, there is no physical circuit for IX0.0.6 ~ IX0.0.7. Turn on this contact point by program.

(b) 'SU' type

I/O	Internal circuit	Terminal No.	Signal		Operation	On/Off guaranteed voltage
			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)			

Remark

For XBC-DR/DN20SU, there is no physical circuit for IX0.0.12 ~ IX0.0.15. Turn on this contact point by program.

8.1.3 "E" type Functions

(1) Counter mode

(a) High Speed counter module can count High Speed pulses which can not be processed by CPU module's counter instructions (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: (1) Increasing/decreasing count operation by program setting
(2) 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) Periodic Pulse Count

(e) Pulse input mode

1) 1-phase count mode

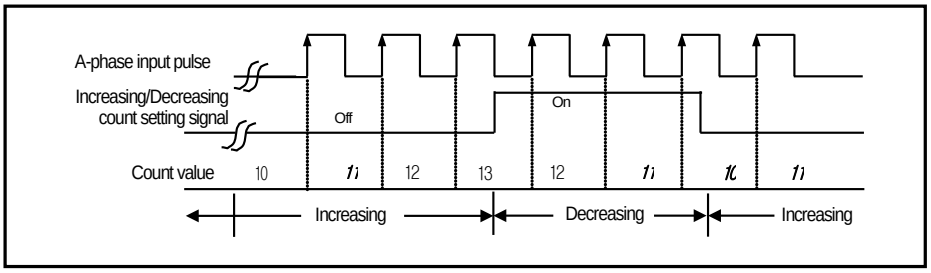
a) Increasing/decreasing count operation by program setting

● 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



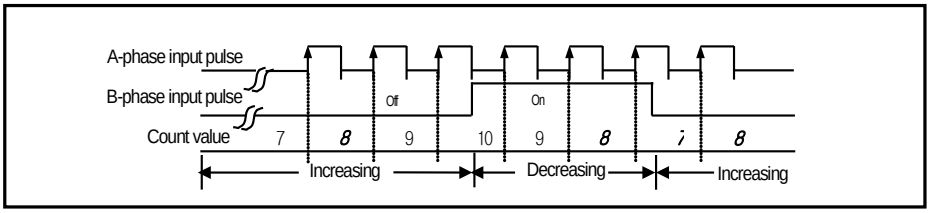
b) Increasing/decreasing count operation by B-phase input signal

● 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

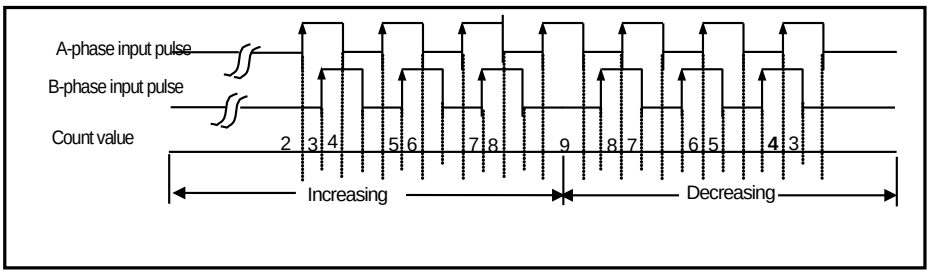


2) 2-phase count mode

a) 2-phase 2-multiplication operation mode

A-phase input pulse and B-phase input pulse count at rising. 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



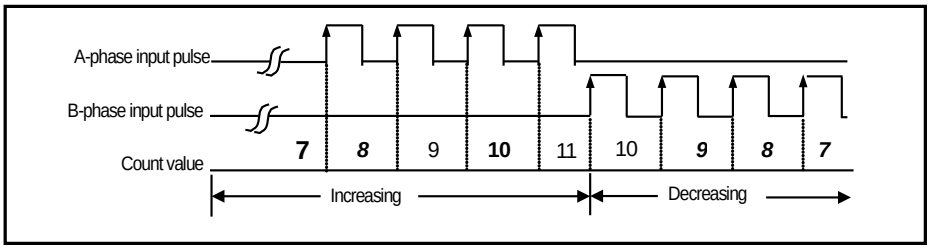
3) CW(Clockwise)/CCW(Counter Clockwise) operation mode

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.

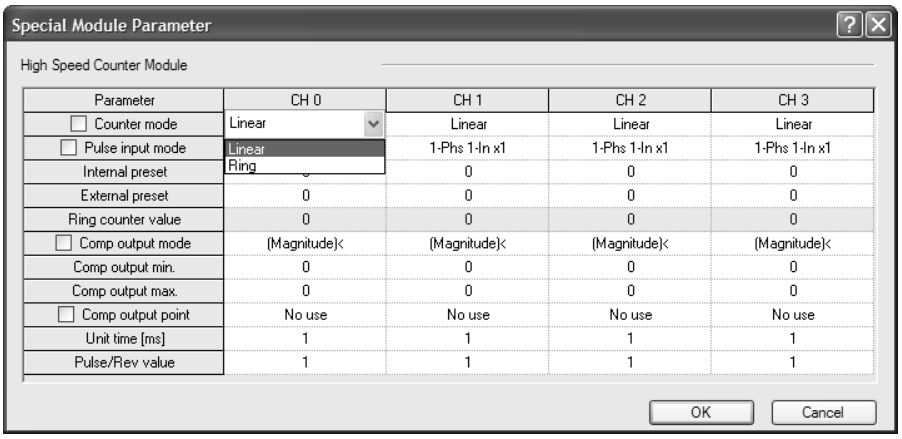
Increasing/Decreasing classification	A-phase input pulse High	A-phase input pulse Low
B-phase input pulse High	-	decreasing count
B-phase input pulse Low	Increasing count	-

▪ Operation example



(2) Counter type

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



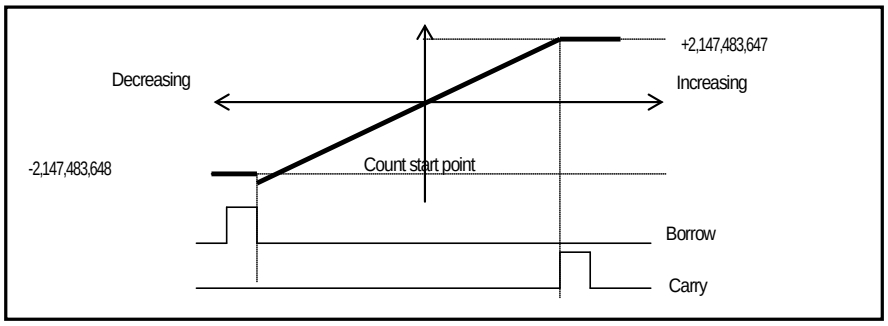
▪ Counter mode is saved in the following special K area.

Mode	Area per each channel (word)				Reference*1)
	Ch.0	Ch.1	Ch.2	Ch.3	
Counter mode	%KW300	%KW330	%KW360	%KW390	0 : linear 1 : ring

*1) If counter mode is set as value other than 0, 1, error code '20' will occur.

(a) Linear counter

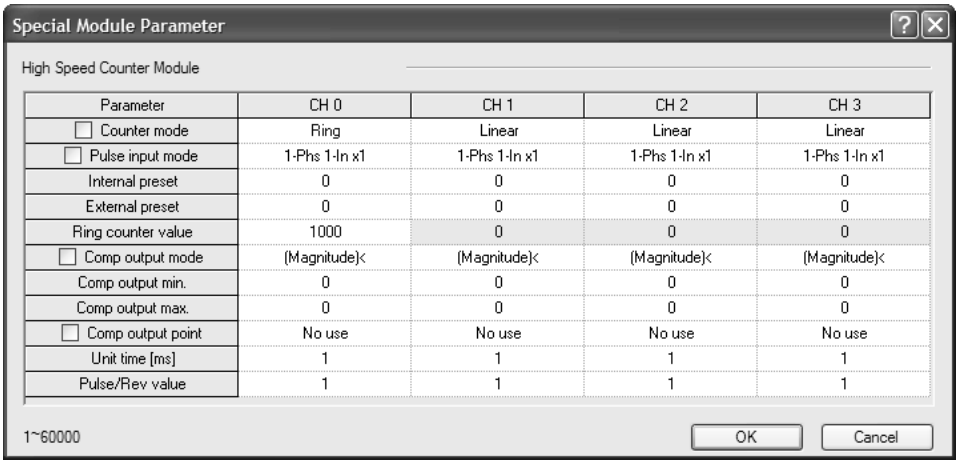
1) Linear Count range: -2,147,483,648 ~ 2,147,483,647
2) If count value reaches the maximum value while increased, Carry will occur, and if count value reaches the minimum value while decreased, Borrow will occur.
3) If Carry occurs, count stops and increasing is not available but decreasing is available.
4) If Borrow occurs, count stops and decreasing is not available but increasing is available.



(b) Ring count

■ Ring Count range: user-defined minimum value ~ user-defined maximum value
■ Count display: If Ring Counted, user-defined minimum value of Ring Count is counted and displayed, but

the value
is not displayed.

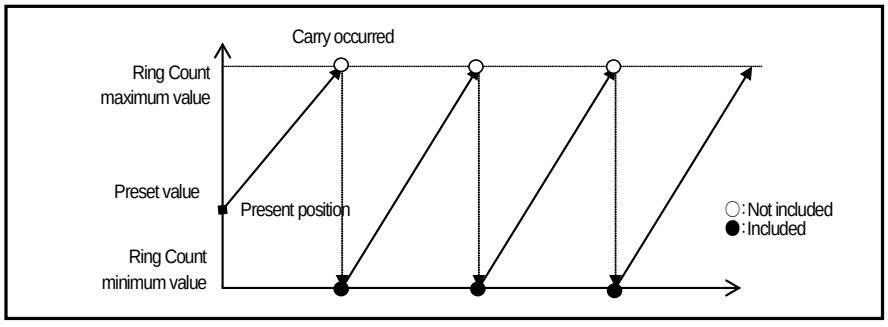


• Ring counter max and min value is saved at the following special K area.

type	Area per each channel (Double word)				Reference
	Ch.0	Ch.1	Ch.2	Ch.3	
Ring counter value	%KD155	%KD170	%KD185	%KD200	

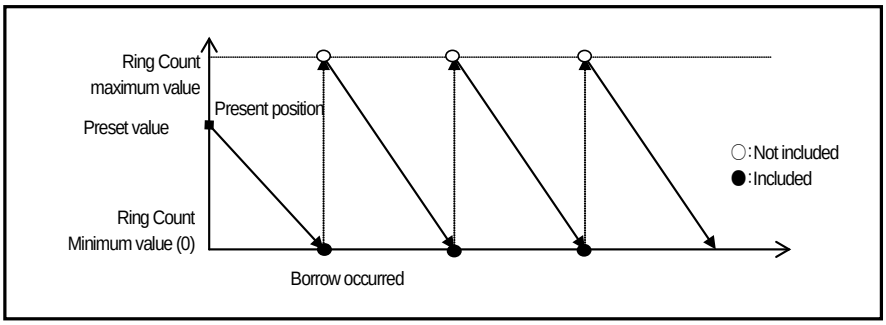
1) During increasing count

■ 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.



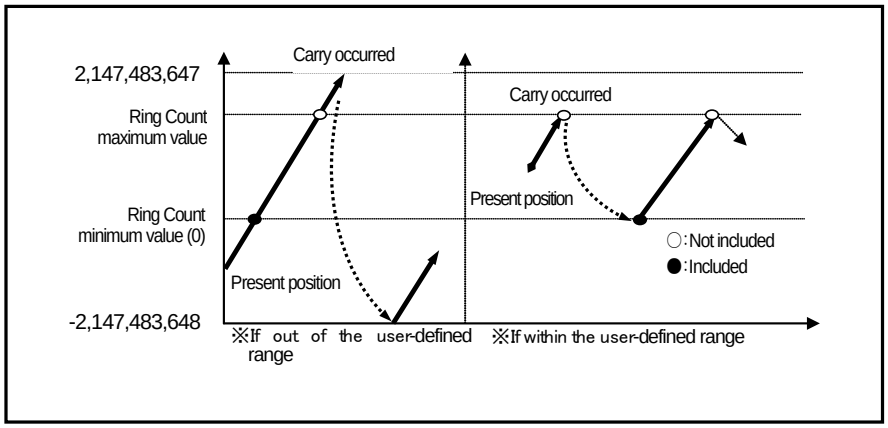
3) Operation when setting Ring Count based on present count value (during increasing count)

■ If present count value exceeds user-defined range when setting Ring Count

- Error (code no. 27) is occurred and it operates linear counter.

■ If present count value is within user-defined range when setting Ring Count

- Present count value starts to increase up to the user-defined maximum value and down to the user-defined minimum value and keeps counting after Carry occurs.
- Not the maximum but the only minimum value is displayed with count kept as shown below.



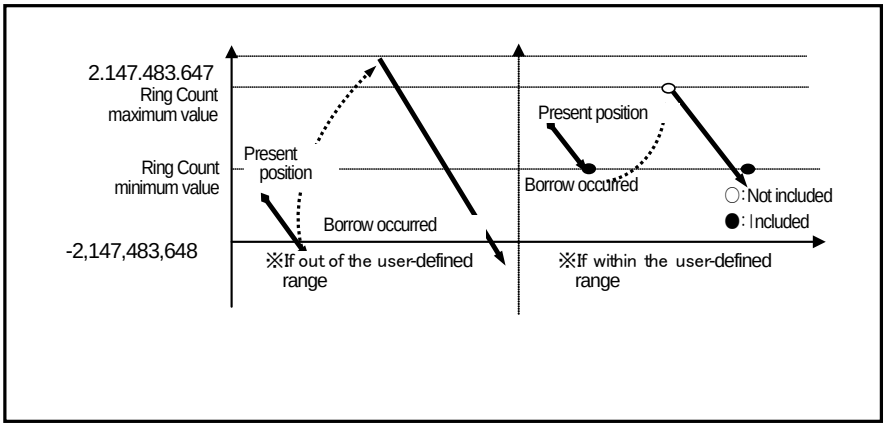
4) Operation when setting Ring Count based on present count value (during decreasing count)

■ If present count value exceeds user-defined range when setting Ring Count

- Error (code no. 27) is occurred and it operates linear counter.

■ If present count value is within user-defined range when setting Ring Count

- Present count value starts to decrease to the user-defined minimum value and increase to the user-defined maximum value and keeps counting after Borrow occurs.



Remark

(1) Based on count value within or out of user-defined range, count will be decided to be within or out of the range when setting Ring Count.

(2) Ring Count setting when count value is out of the range is regarded as user's mistake. The count is not available within the Ring Count range.

(3) Use preset function or the like when using Ring Count so to surely position the count value within the range.

(3) Compared output

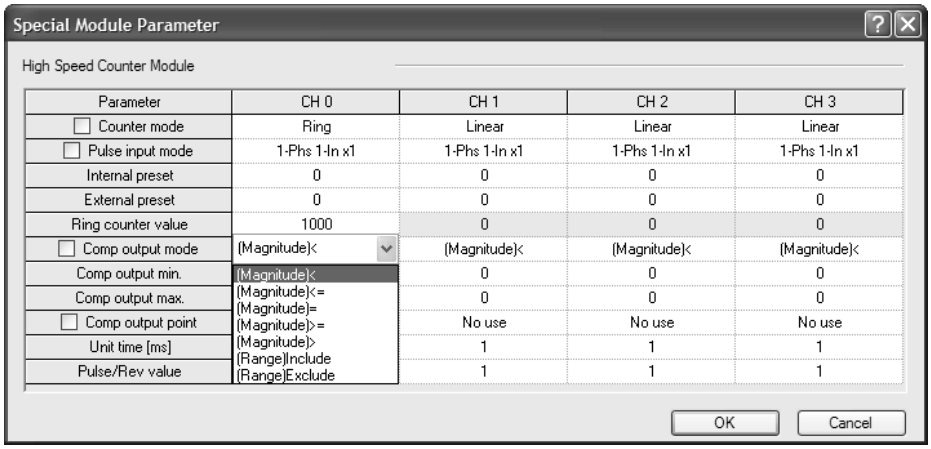
(a) High Speed counter module has a compared output function used to compare present count value with compared value in size to output as compared.

(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

■ Compared output mode setting



■ Upper setting value is saved in special K area.

Compared output condition	Memory address (word)	Value*2)
Present Value < Compared Value	Channel 0 : %KW302 Channel 1 : %KW332 Channel 2 : %KW362 Channel 3 : %KW392	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 value not set to 0~6 using counter, error code ‘23’ will be occurred.

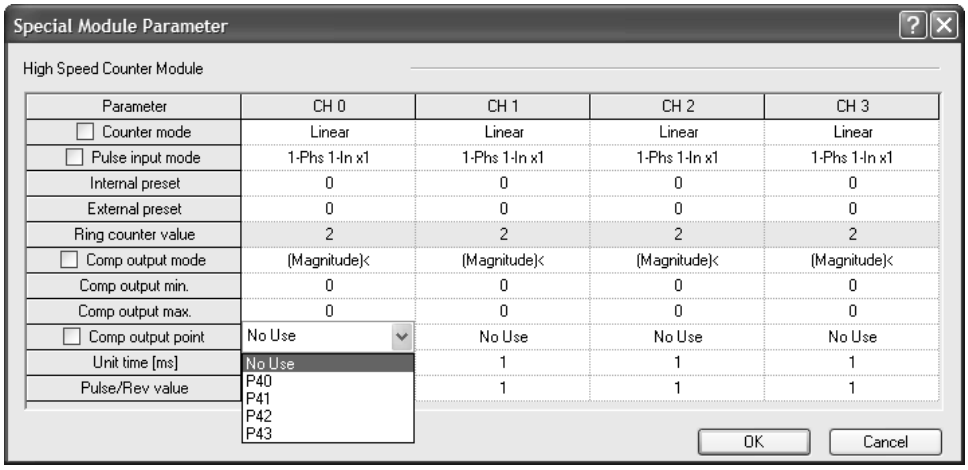
■ In order to make actual comparison enabled after compared output condition set, the compared enable signal must
be On.

Classification	Area per channel				Operation
	Ch. 0	Ch. 1	Ch. 2	Ch. 3	
Count enable signal	%KX4160	%KX4320	%KX4480	%KX4640	0: N/A, 1: enable
Compared enable signal	%KX4164	%KX4324	%KX4484	%KX4464	0: forbidden, 1: enable

▪ In order to make external output, the compared equivalent output signal (%QX0.0.0~%QX0.0.15) must be set.
If Compared output contact is Off, Compared coincidence output signal (internal device) is only output.

Classification	Area per channel				Operation
	Ch. 0	Ch. 1	Ch. 2	Ch. 3	
Compared equivalent output signal	%KX4718	%KX4338	%KX4498	%KX4658	0: Compared output not equivalent 1: Compared output equivalent

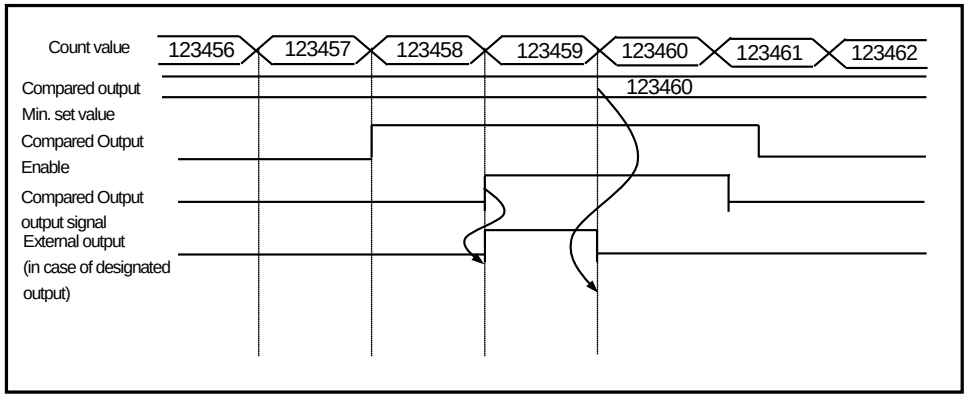
• Comp output point ((%QX0.0.0~%QX0.0.15) setting



(e) Detailed description for compared output

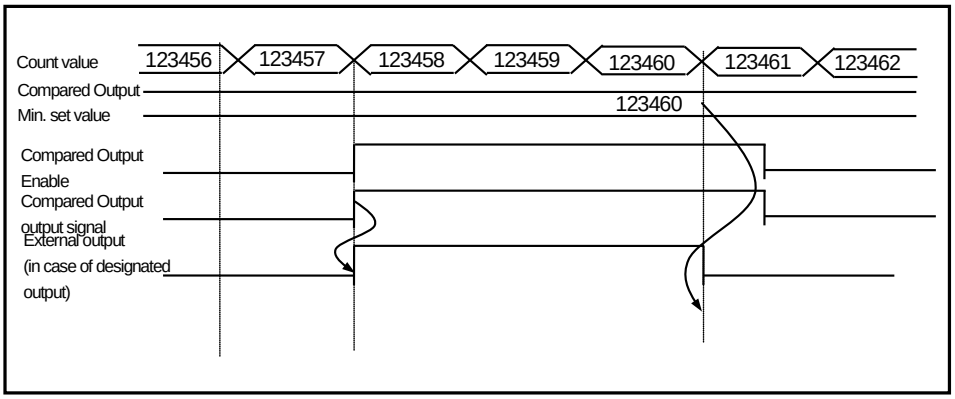
1) Mode 0 (Present value < Compared value)

■ If counted present value is less than min set value, output is sent out, and if present value increases to be equal to or greater than compared value, output is not sent out.



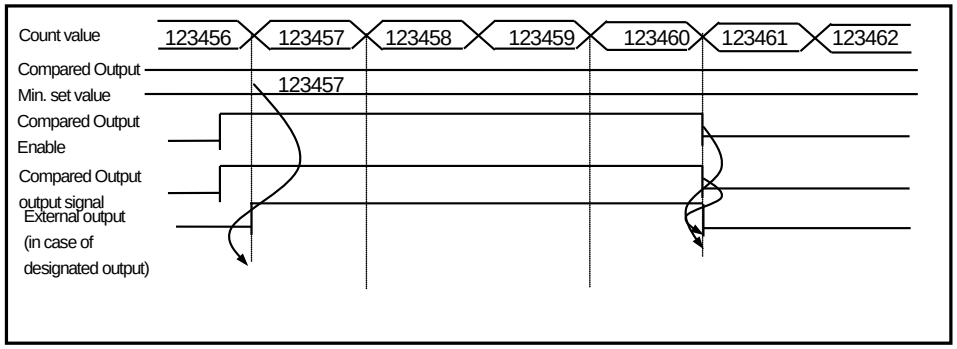
2) Mode1 (Count value ≤ Compared value)

■ If present count value is less than or equal to min set value, output is sent out, and if count value increases to be greater than compared value, output is not sent out.



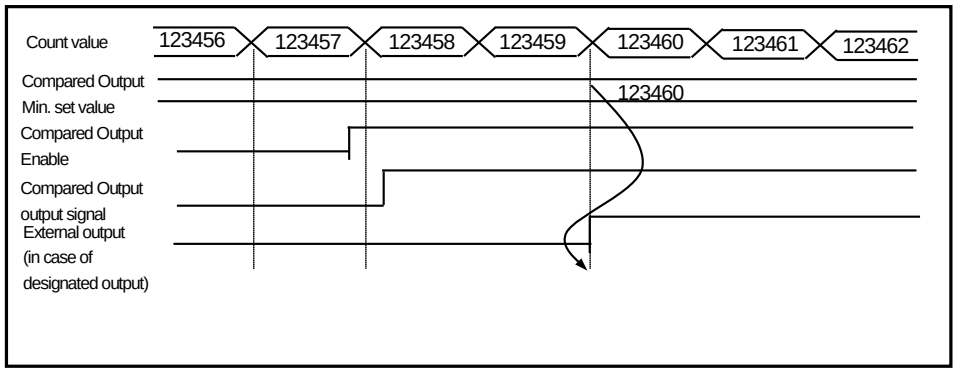
3) Mode 2 (Count value = Compared value)

■ If present count value is equal to min set value, output is sent out. In order to turn the output Off, Compared output Enable and Compared output signal is to be On.



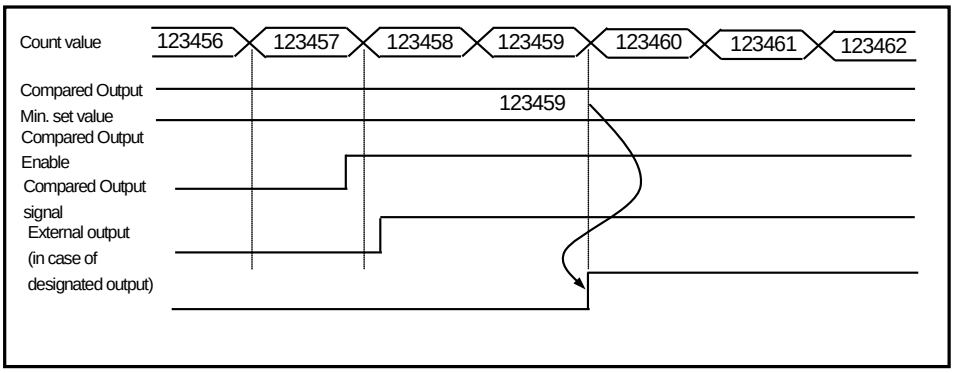
4) Mode 3 (Count value ≥ Compared value)

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



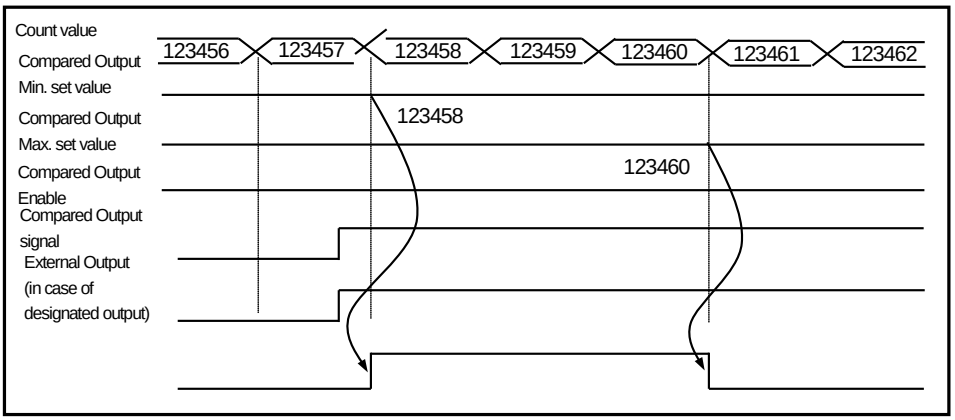
5) Mode 4 (Count value > Compared value)

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



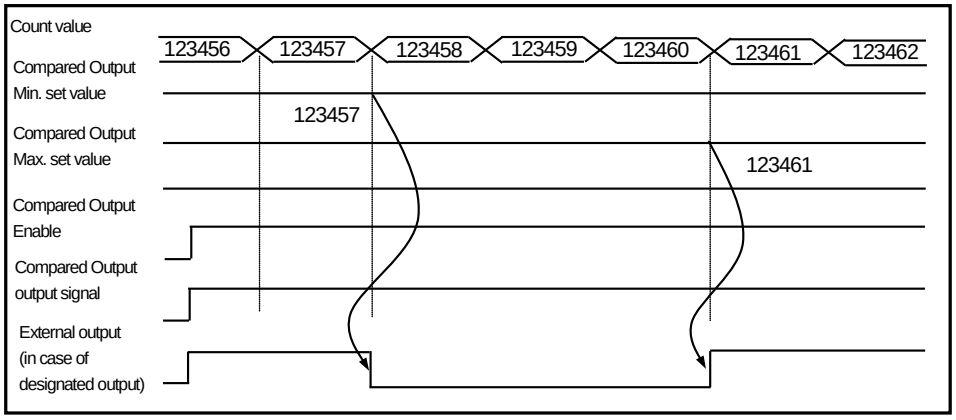
6) Mode 5 (Compared output Min. set value ≤ Count value ≤ Compared output Max. set value)

■ If present count value is greater than or equal to compared output Min. value and less than or equal to compared output Max. set value, 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 ≤ Compared output Min. value, Count value ≥ Compared output Max. value)

■ If present count value is less than or equal to compared output Min. value and greater than or equal to compared output Max. value, 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			
	Channel 0	Channel 1	Channel 2	Channel 3
Carry signal	%KX4176	%KX4336	%KX4496	%KX4656

(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..

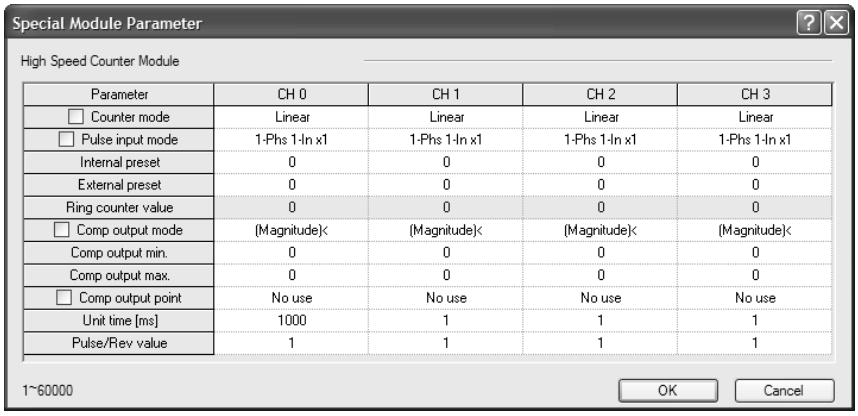
Classification	Device area per channel			
	Channel 0	Channel 1	Channel 2	Channel 3
Borrow signal	%KX4177	%KX4337	%KX4497	%KX4657

(6) Revolution/Unit time

While auxiliary mode enable signal is On, it counts the number of input pulses for a specified time.

(a) Setting

1) Input unit time and pulse number per 1 revolution



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

Classification	Device area per channel			
	Channel 0	Channel 1	Channel 2	Channel 3
Unit time (1~60000㎳)*3)	%KW322	%KW352	%KW382	%KW412

*3) If revolution per unit time is enabled and unit time value is other than 1~60000ms, error code '34' occurs.

2) Input pulse number per 1 revolution

Classification	Device area per channel			
	Channel 0	Channel 1	Channel 2	Channel 3
Pulse number /revolution (1~60000)*4)	%KW4165	%KW4325	%KW4485	%KW4645

*4) If revolution per unit time is enabled and pulse number/revolution is other than 1~60000, error code '35' occurs.

3) If Count function of revolution per unit time is used, enable signal set by On.

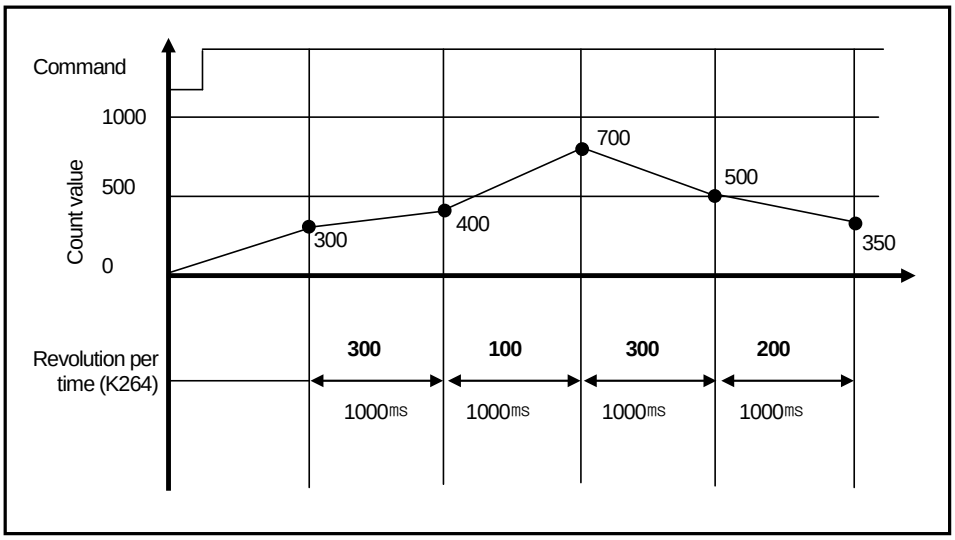
Classification	Device area per channel			
	Channel 0	Channel 1	Channel 2	Channel 3
Revolution/unit time command	%KD132	%KD137	%KD142	%KD147

(a) Count function of Revolution per Unit time is used to count the number of pulses for a specified time while Enable signal is On.

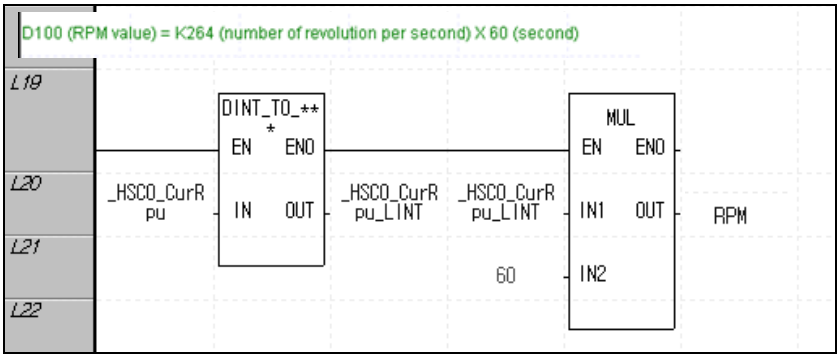
(b) With the displayed number of pulses updated for a specified time and the number of pulses per revolution input, Revolution/Unit time can be counted.

(c) 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.

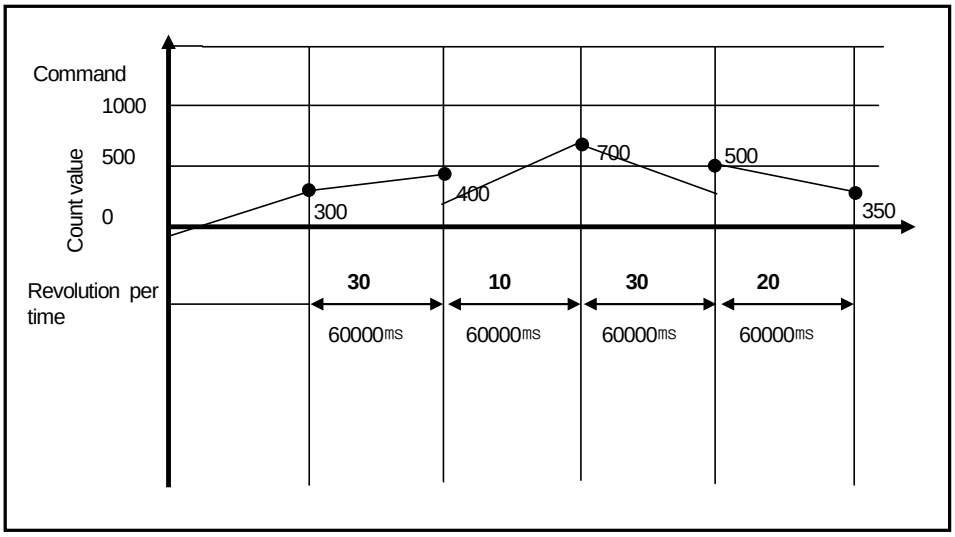
(d) The example that number of pulse per 1 revolution set to '1' and time is set to 1000 ms is as shown below. (Ch0)



(f) In order to indicate revolution per minute (RPM), the program is as shown below. During DMUL operation, RPM value is saved 64 bit in %DW100~%DW103. If operated RPM value is used, it can use to Word or Dword type according to system (case of RPM value is small number).



(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

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

(b) Setting

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

Classification	Device area per channel			
	Channel 0	Channel 1	Channel 2	Channel 3
Count latch command	%KX4166	%KX4326	%KX4486	%KX4646

(c) Count latch function is operated when Count latch signal is On. Namely, counter value is not cleared when power supply

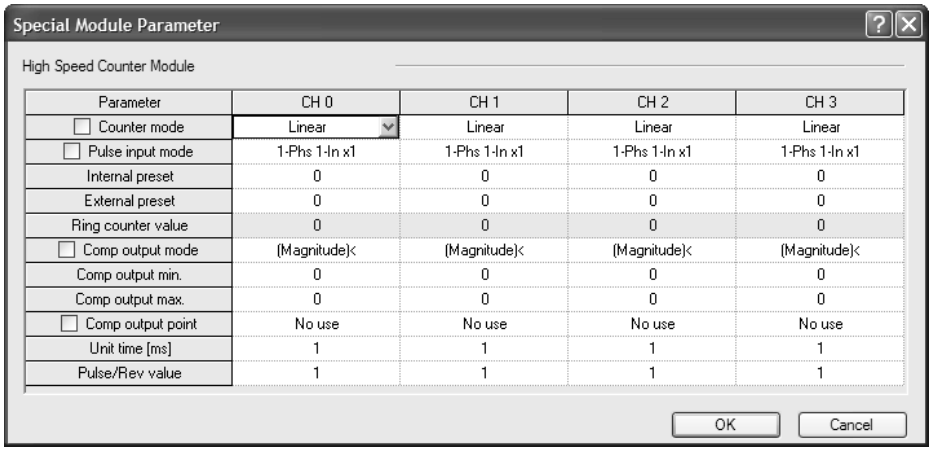
Is turned on and mode change, it is counted from previous value.

(d) 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	
Internal preset	%KD152	%KD167	%KD182	%KD197	-
External preset	%KD153	%KD168	%KD183	%KD198	-

• 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	
Internal preset command	%KX4161	%KX4321	%KX4481	%KX4641	-
External preset allowance	%KX4162	%KX4322	%KX4482	%KX4642	-
External preset command	%IX0.0.8	%IX0.0.9	%IX0.0.10	%IX0.0.11	-

8.1.4 'SU' type Functions

(1) Counter mode

(a) High Speed counter module can count High Speed pulses which can not be processed by CPU module's counter instructions (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

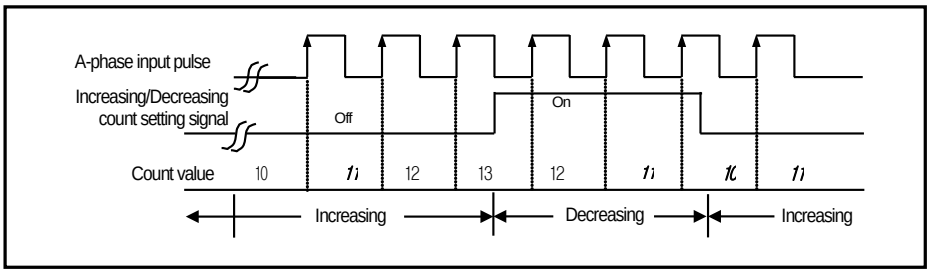
a) Increasing/decreasing count operation by program setting

● 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



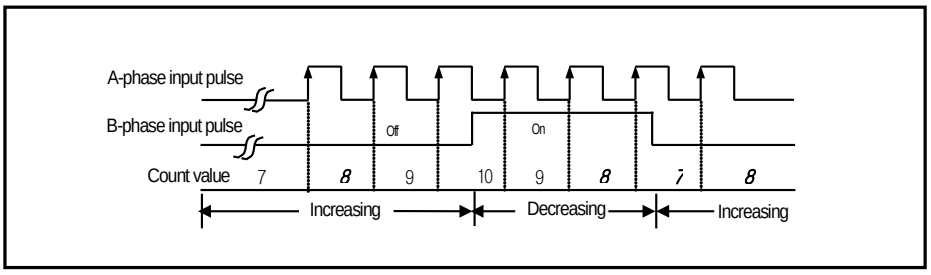
b) Increasing/decreasing count operation by B-phase input signal

● 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

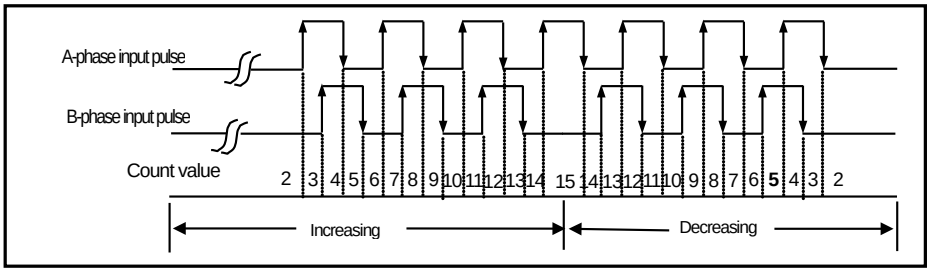


2) 2-phase count mode

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



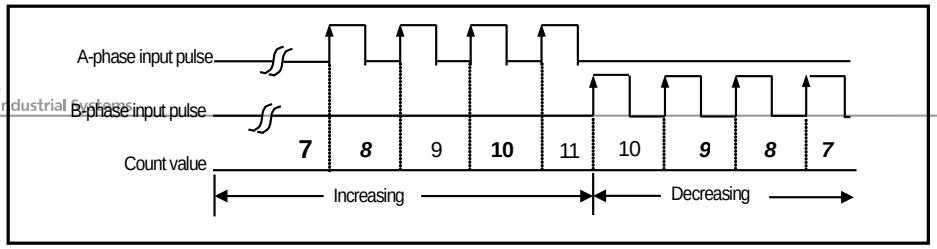
3) CW(Clockwise)/CCW(Counter Clockwise) operation mode

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.

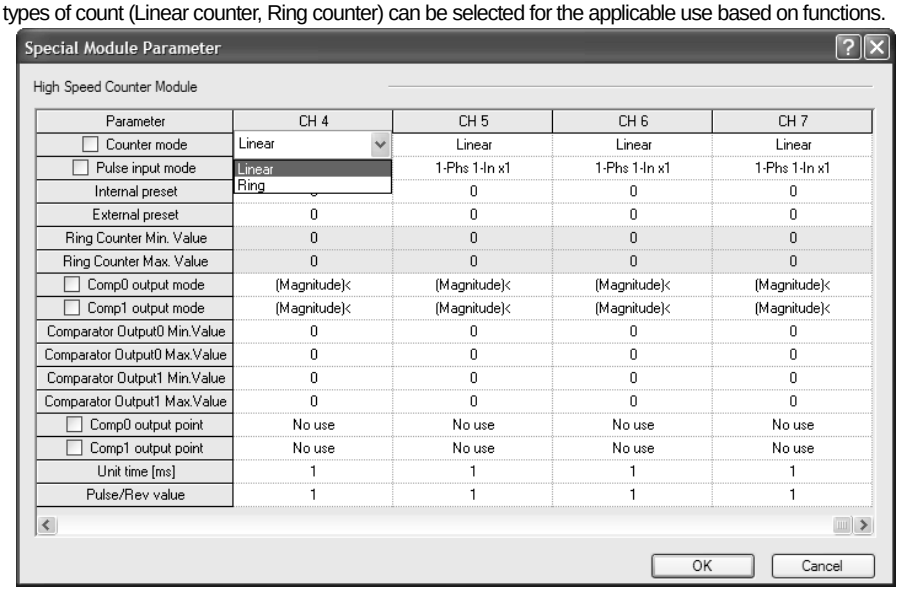
Increasing/Decreasing classification	A-phase input pulse High	A-phase input pulse Low
B-phase input pulse High	-	decreasing count
B-phase input pulse Low	Increasing count	-

▪ 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

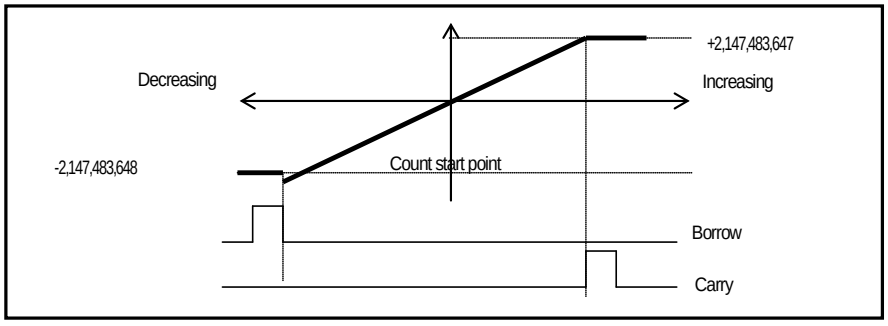
(a) Linear counter

■ 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 decreasing, Borrow will occur.

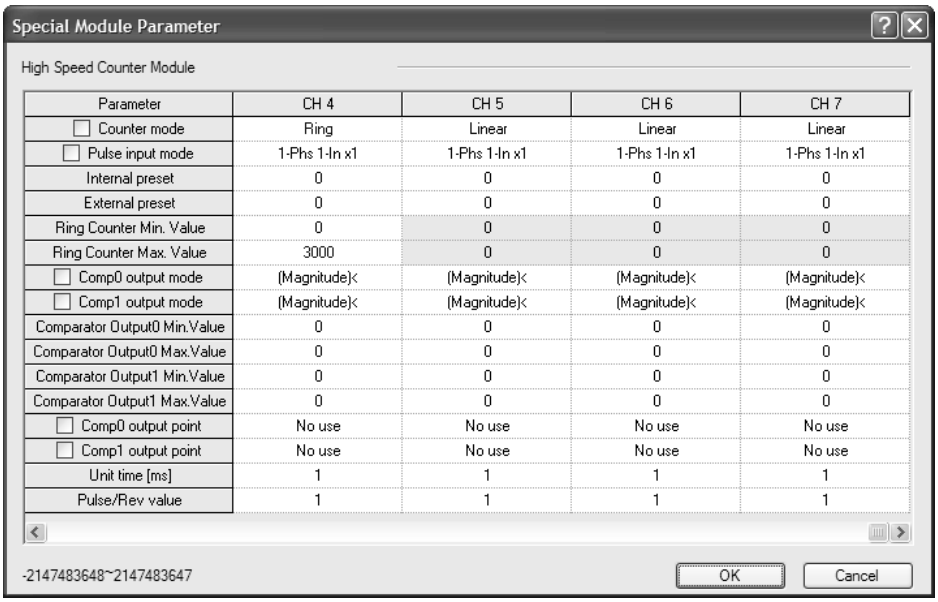
■ If Carry occurs, count stops and increasing is not available but decreasing is available.

■ 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.



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

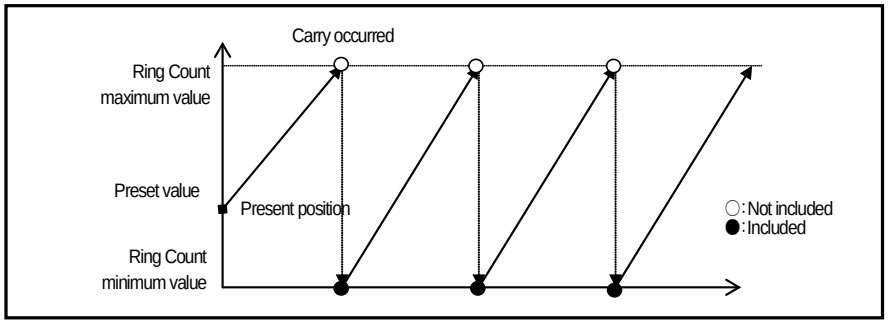
type	Area per each channel (Double word)								Ref.
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Ring counter min. value	%KD 154	%KD 169	%KD 184	%KD 199	%KD 1114	%KD 1129	%KD 1144	%KD 1159	-
Ring counter max. value	%KD 155	%KD 170	%KD 185	%KD 200	%KD 1115	%KD 1130	%KD 1145	%KD 1160	-

▪ 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.

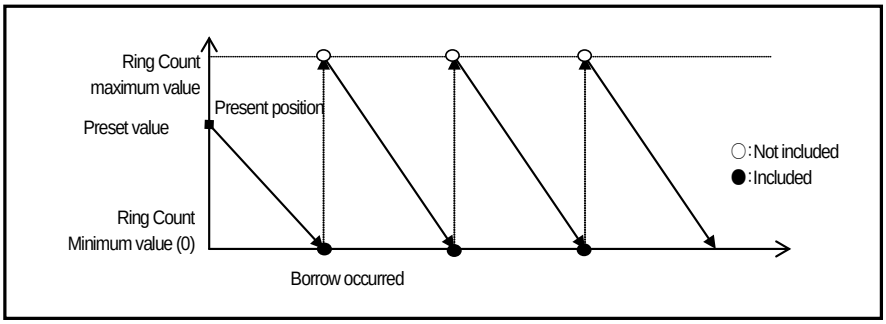
1) During increasing count

■ 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.



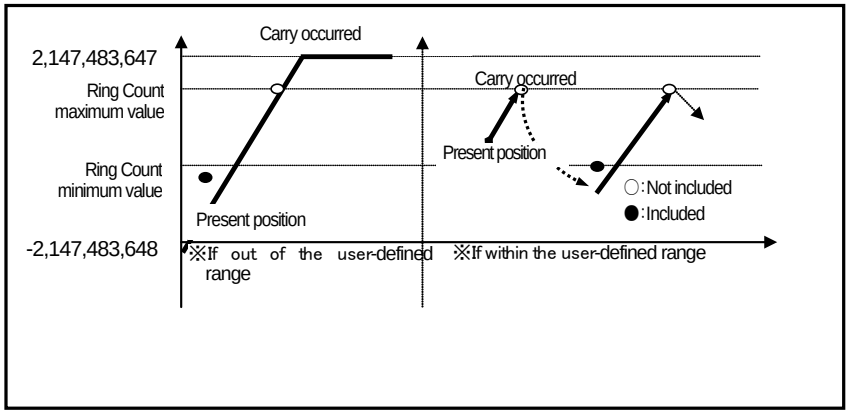
3) Operation when setting Ring Count based on present count value (during increasing count)

■ If present count value exceeds user-defined range when setting Ring Count

- Error (code no. 27) is occurred and it operates linear counter.

■ If present count value is within user-defined range when setting Ring Count

- Present count value starts to increase up to the user-defined maximum value and down to the user-defined minimum value and keeps counting after Carry occurs.
- Not the maximum but the only minimum value is displayed with count kept on as shown below.



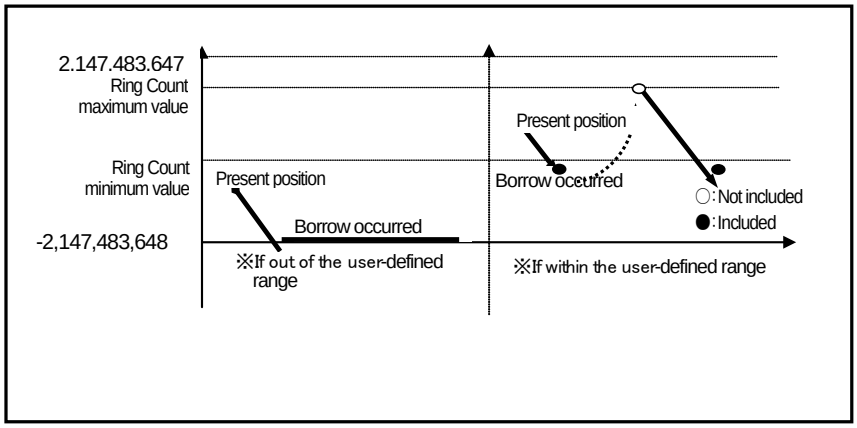
4) Operation when setting Ring Count based on present count value (during decreasing count)

■ If present count value exceeds user-defined range when setting Ring Count

- Error (code no. 27) is occurred and it operates linear counter.

■ If present count value is within user-defined range when setting Ring Count

- Present count value starts to decrease to the user-defined minimum value and increase to the user-defined maximum value and keeps counting after Borrow occurs.



Remark

(1) Based on count value within or out of user-defined range, count will be decided to be within or out of the range when setting Ring Count.

(2) Ring Count setting when count value is out of the range is regarded as user's mistake. The count is not available within the Ring Count range.

(3) Use preset function or the like when using Ring Count so to surely position the count value within the range.

(3) Compared output

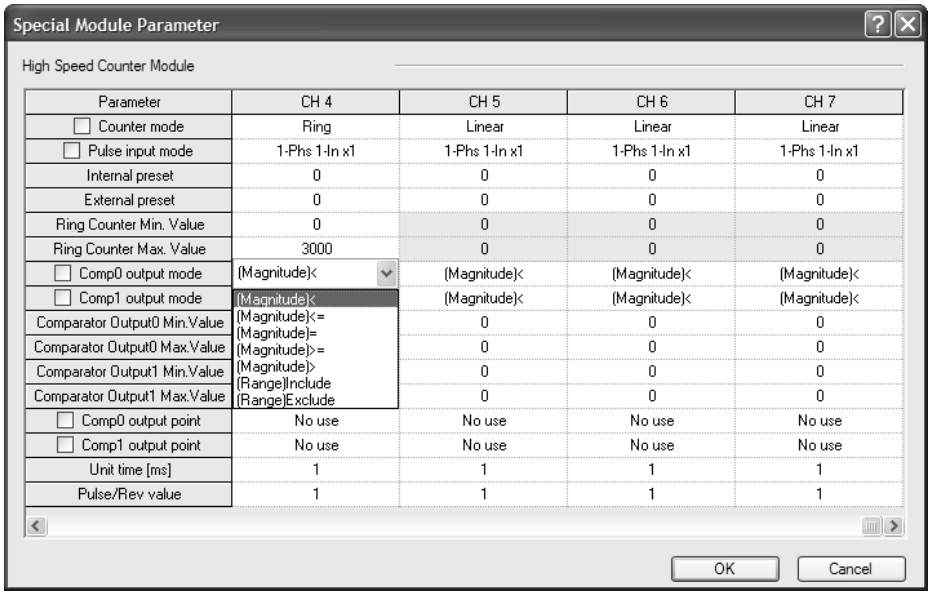
(a) High Speed counter module has a compared output function used to compare present count value with compared value in size to output as compared.

(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 Ch 1: %KW332 Ch 2: %KW362 Ch 3: %KW392 Ch 4: %KW2222 Ch 5: %KW2252 Ch 6: %KW2282 Ch 7: %KW2312	Ch 0: %KW303 Ch 1: %KW333 Ch 2: %KW363 Ch 3: %KW393 Ch 4: %KW2223 Ch 5: %KW2253 Ch 6: %KW2283 Ch 7: %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.

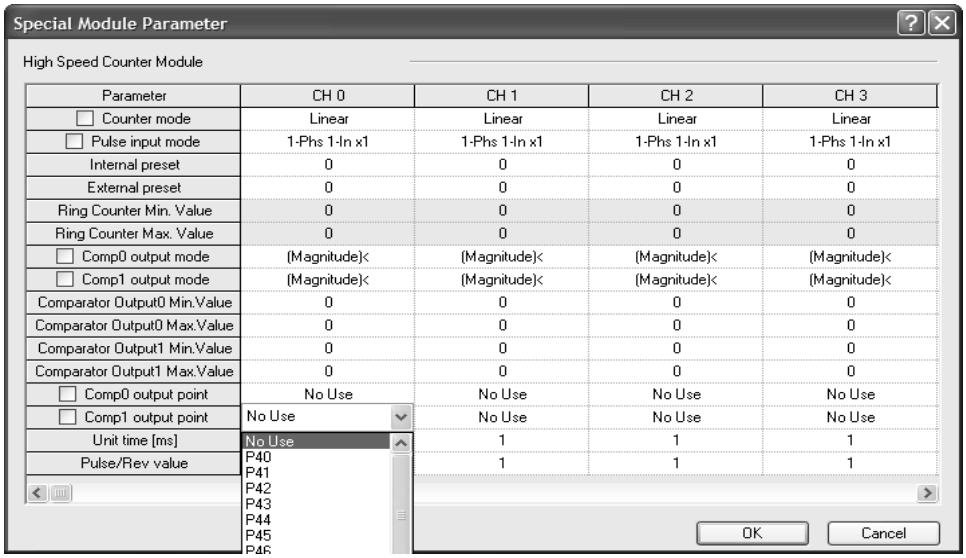
■ In order to output the compared output signal, compared output enable flag set to '1' after compared output condition set.

Classification	Area per channel								Operation
	Ch. 0	Ch. 1	Ch. 2	Ch. 3	Ch. 4	Ch. 5	Ch. 6	Ch. 7	
Count enable signal	%KX 4160	%KX 4320	%KX 4480	%KX 4640	%KX 34880	%KX 35040	%KX 35200	%KX 35360	0:disable, 1: enable
Compared 0 enable signal	%KX 4164	%KX 4324	%KX 4484	%KX 4644	%KX 34884	%KX 35044	%KX 35204	%KX 35364	0: disable, 1: enable
Compared 1 enable signal	%KX 4167	%KX 4327	%KX 4487	%KX 4687	%KX 34887	%KX 35047	%KX 35207	%KX 36367	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

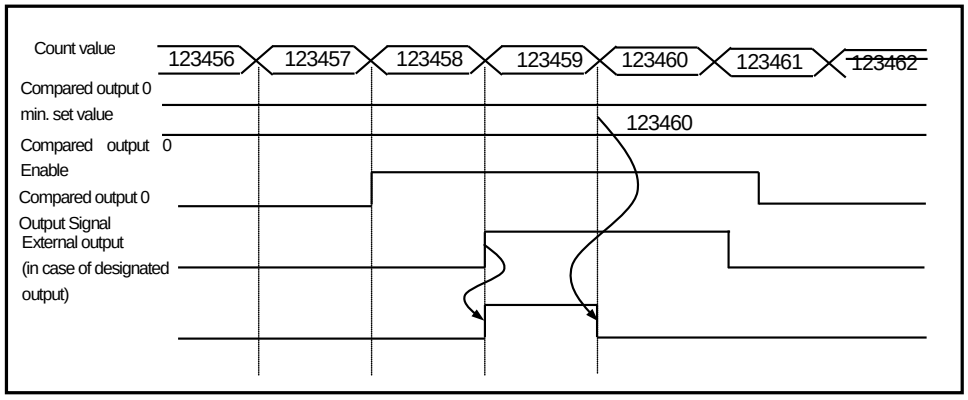


(e) Detail of comparator output

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

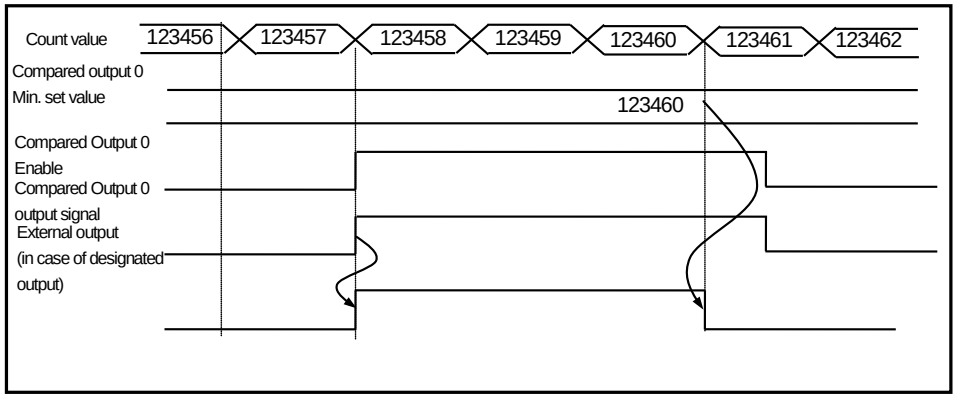
1) Mode 0 (Present value < Compared value)

■ 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.



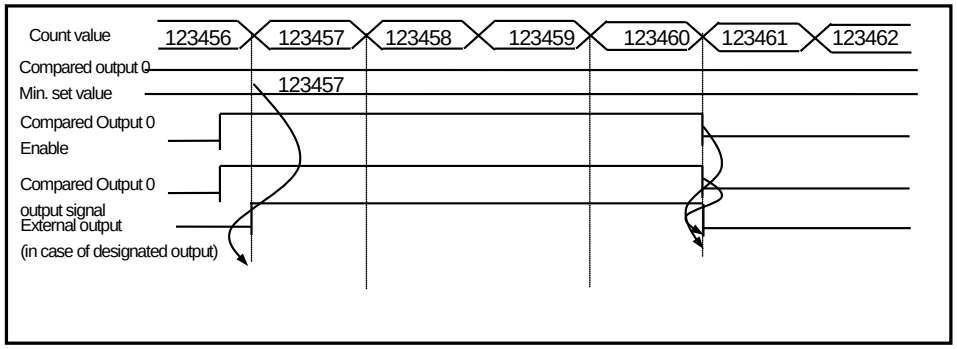
2) Mode1 (Count value ≤ Compared value)

■ 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.



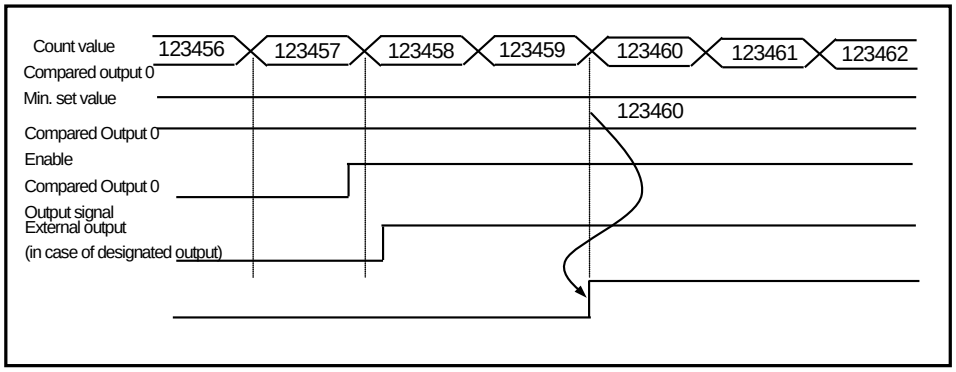
3) Mode 2 (Count value = Compared value)

■ 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.



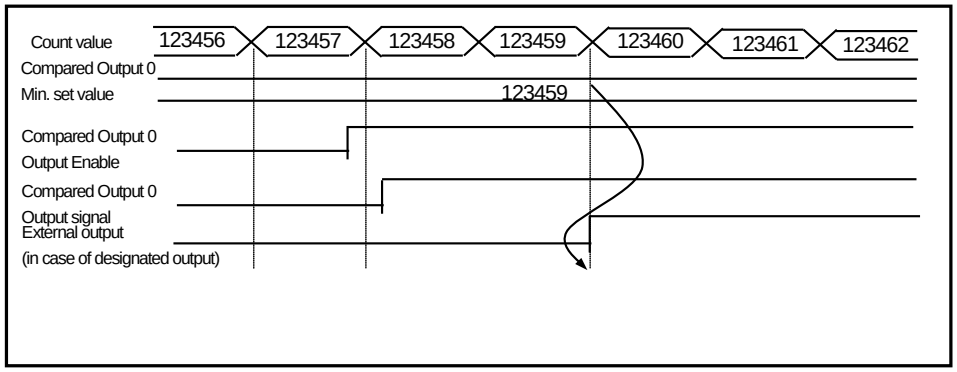
4) Mode 3 (Count value ≥ Compared value)

■ 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)

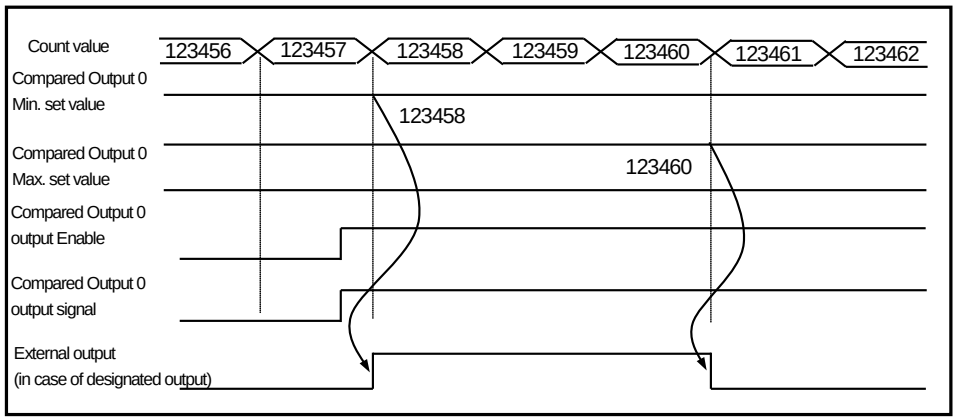
■ If present count value is greater than the minimum set value of compared output 0, output is sent out, and if count value decreases to be less than or equal to the minimum set value of compared output 0, output is not sent out.



6) Mode 5

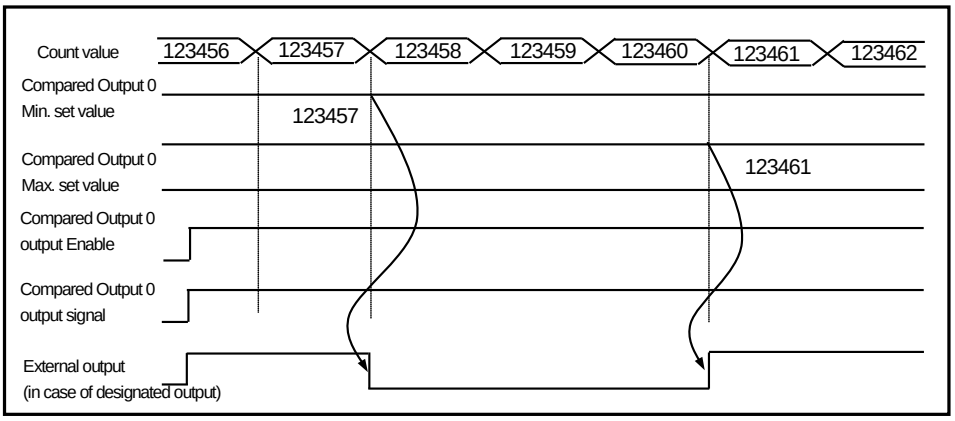
(Section comparison: Min. set value of Compared Output 0 ≤ Count value ≤ Max. set value of Compared Output 0)

■ 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.

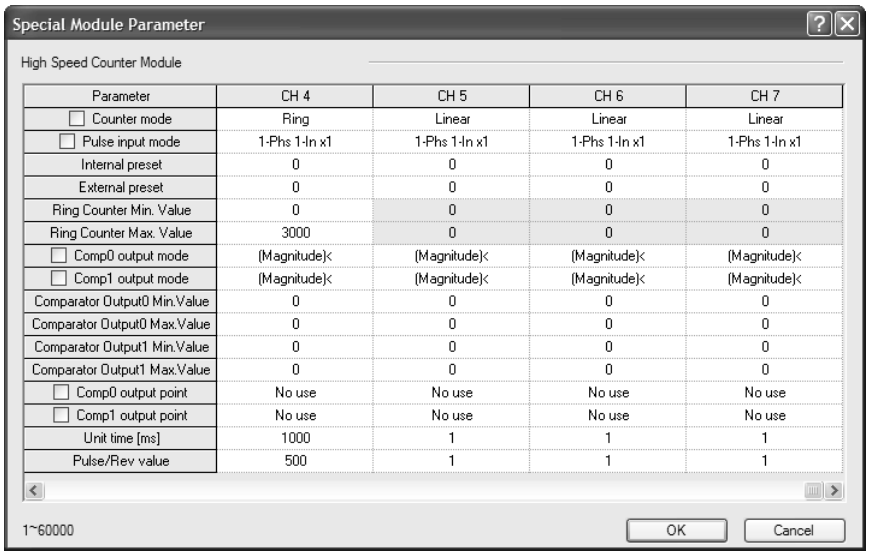
Classification	Device area per channel							
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7
Borrow signal	%KX4177	%KX4337	%KX4497	%KX4657	%KX34897	%KX35057	%KX35127	%KX35376

(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	%KW 322	%KW 352	%KW 382	%WK 412	%KW 2242	%KW 2272	%KW 2302	%KW 2332	1~60000ms
Pulse/Rev value	%KW 323	%KW 353	%KW 383	%KW 413	%KW 2243	%KW 2273	%KW 2303	%KW 2333	1~60000

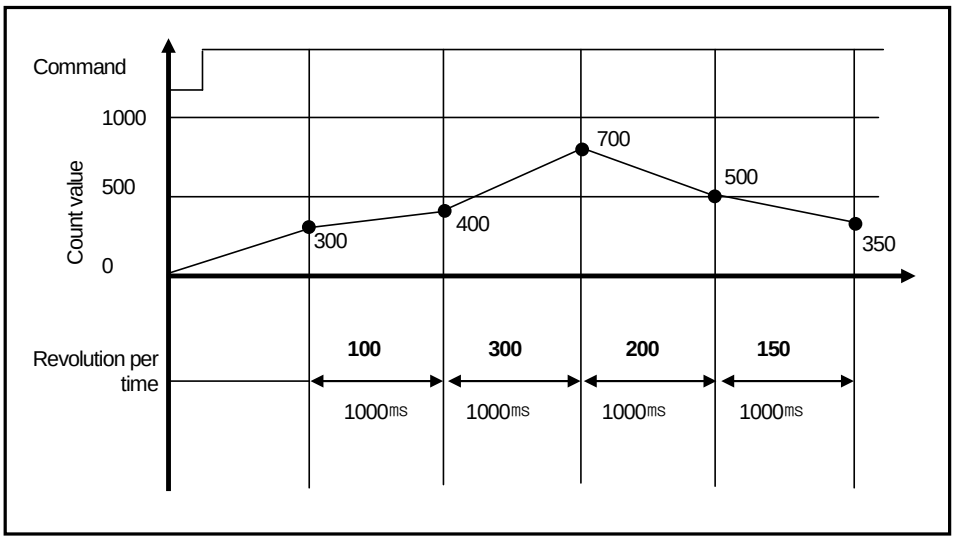
2) In case of using Rev/unit time function, enable the following special K area

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	%KX 4165	%KX 4325	%KX 4485	%KX 4645	%KX 34885	%KX 35045	%KX 35205	%KX 35365	0: disable 1: enable

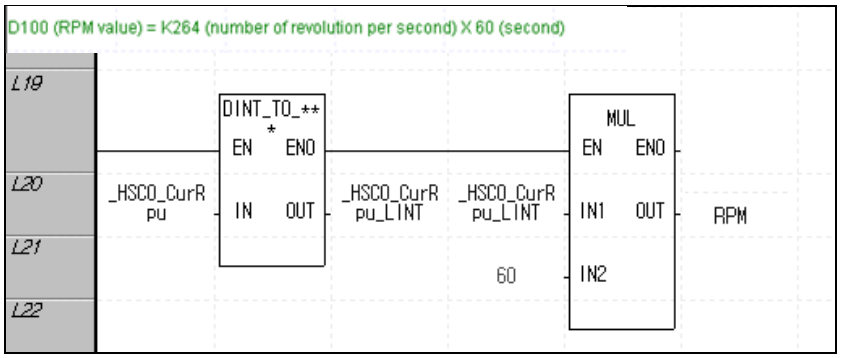
3) Rev/unit time value is saved at the following special K area.

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	%KD 132	%KD 137	%KD 142	%KD 147	%KD 1029	%KD 1097	%KD 1102	%KD 1107	-

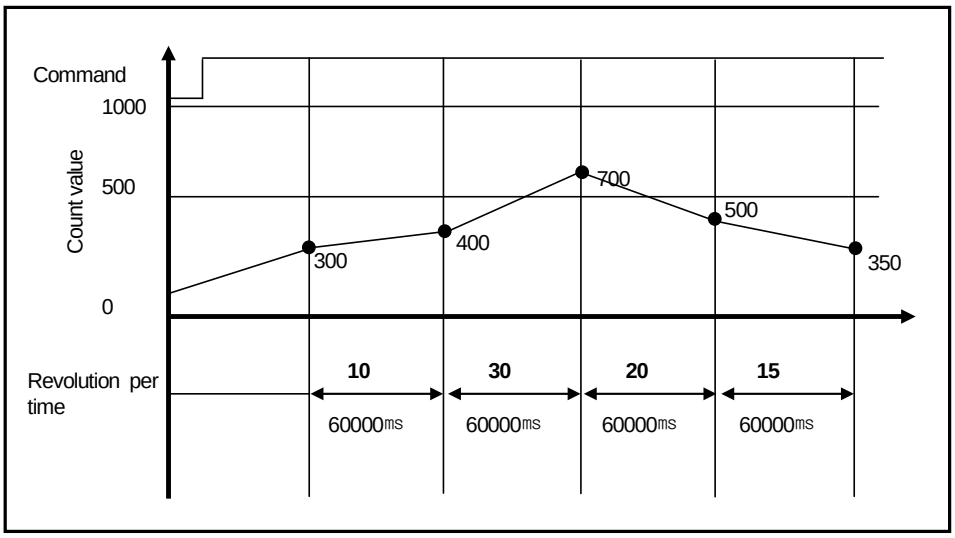
(b) Count function of Revolution/Unit time is used to count the number of pulses for a specified time while auxiliary mode enable signal is On.
(c) With the displayed number of pulses updated for a specified time and the number of pulses per revolution input, Revolution/Unit time can be counted.
(d) 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 program is as shown below. During DMUL operation, RPM value is saved 64 bit in %DW100~%DW103. If operated RPM value is used, it can use to Word or Dword type according to system (case of RPM value is small number).



(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	%KX 4166	%KX 4326	%KX 4486	%KX 4646	%KX 34886	%KX 35046	%KX 35206	%KX 35366	0: disable 1: enable

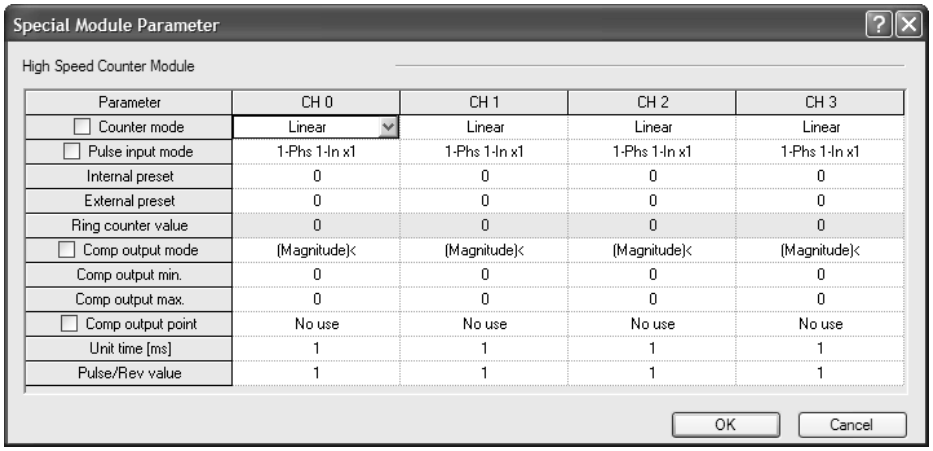
▪ Count latch function is operated when Count latch signal is On. Namely, counter value is not cleared when power supply is on and mode is changed, It is counted from previous value.

▪ 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	%KD 152	%KD 167	%KD 182	%KD 197	%KD 1112	%KD 1127	%KD 1142	%KD 1157	–
External preset value	%KD 153	%KD 168	%K 183	%KD 198	%KD 1113	%KD 1128	%KD 1143	%KD 1158	–

• 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	%KX 4161	%KX 4321	%KX 4481	%KX 4641	%KX 34881	%KX 35041	%KX 35201	%KX 35361	–
External preset allowance	%KX 412	%KX 4322	%KX 4482	%KX 4642	%KX 34882	%KX 35042	%KX 35202	%KX 35362	–
External preset command	%IX 0.0.8	%IX 0.0.9	%IX 0.0.10	%IX 0.0.11	%IX 0.0.12	%IX 0.0.13	%IX 0.0.14	%IX 0.0.15	–

8.2 Installation and Wiring

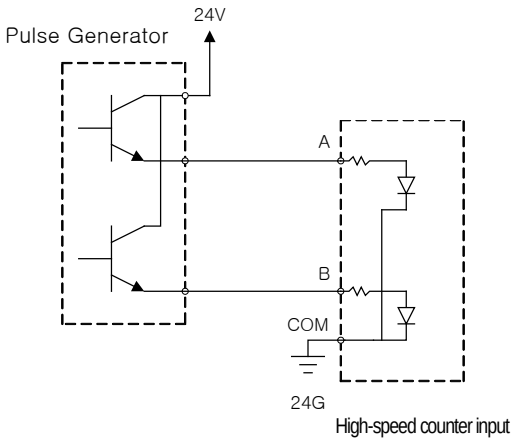
8.2.1 Precaution for wiring

Pay attention to the counteractions against wiring noise especially for High-speed pulse input.
(1) Make sure to 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.

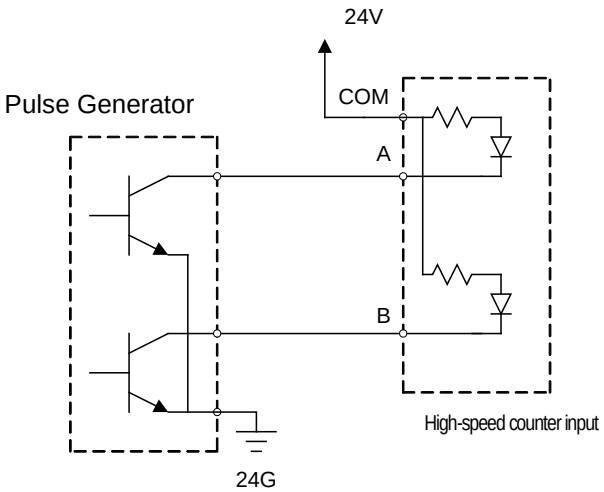
- ▶ Connect A-phase only for 1-phase input.
- ▶ Connect A-phase and B-phase for 2-phase input.

8.2.2 Example of wiring

(1) Pulse generator (encoder) is voltage output type



(2) Pulse generator is open collector type



8.3 Internal Memory

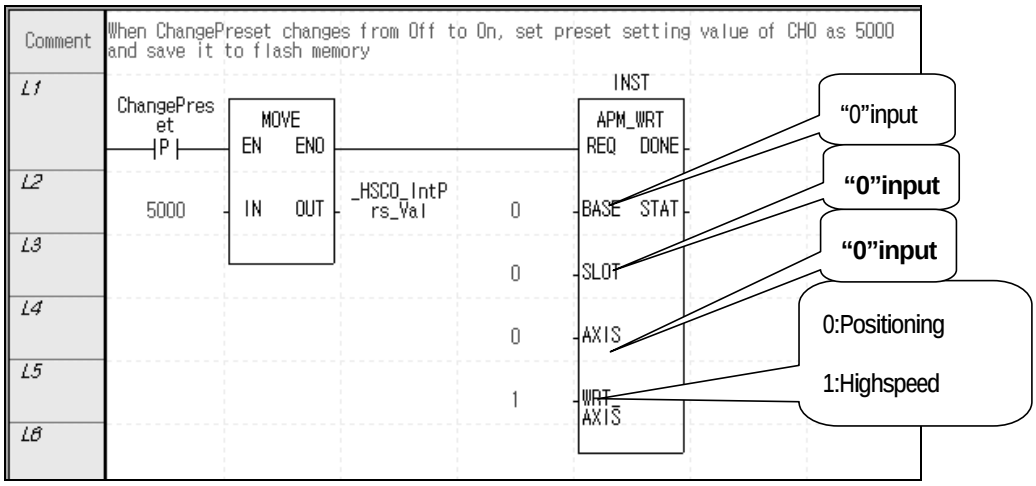
8.3.1 Special area for High-speed counter

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) 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. slot information is set to '0' in case of built-in function.

메모 [S1]:



(1) 'E' type

(a) Parameter setting

Parameter	Description		Device area per channel				Remark
	Value	Setting	Ch 0	Ch 1	Ch 2	Ch 3	
Counter mode	h0000	Linear count	%KW300	%KW330	%KW360	%KW390	Word
	h0001	Ring count					
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					
	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) >					
	h0005	(Range) Include					
	h0006	(Range) Exclude					
Internal preset value setting	-2,147,483,648 ~ 2,147,483,647		%KW304	%KW334	%KW364	%KW394	Double word
External preset value setting	-2,147,483,648 ~ 2,147,483,647		%KW306	%KW336	%KW366	%KW396	Double word

Parameter	Description		Device area per channel				Remark
	Value	Setting	Ch 0	Ch 1	Ch 2	Ch 3	
Ring counter value setting	-2,147,483,648 ~ 2,147,483,645		%KD155	%KD170	%KD185	%KD200	Double word
Comp. output min. value setting	-2,147,483,648 ~ 2,147,483,647		%KD156	%KD171	%KD186	%KD201	Double word
Comp. output max. value setting	-2,147,483,648 ~ 2,147,483,647		%KD157	%KD172	%KD187	%KD402	Double word
Comp. output 0 point designation	h0000	%QX0.0.0	%KW320	%KW350	%KW380	%KW410	Word
	h0001	%QX0.0.1					
	h0002	%QX0.0.2					
	h0003	%QX0.0.3					
	h0004	%QX0.0.4					
	h0005	%QX0.0.5					
	h0006	%QX0.0.6					
	h0007	%QX0.0.7					
	h0008	%QX0.0.8					
Unit time [ms]	1 ~ 60,000		%KW322	%KW352	%KW382	%KW412	Word
Pulse/Rev.value	1 ~ 60,000		%KW323	%KW353	%KW383	%KW413	Word

(b) Operation command

Parameter	Device area per channel			
	Ch 0	Ch 1	Ch 2	Ch 3
Counter enabling	%KX4160	%KX4320	%KX4480	%KX4640
Internal preset designation of counter	%KX4161	%KX4321	%KX4481	%KX4641
External preset enabling of counter	%KX4162	%KX4322	%KX4482	%KX4642
Designation of decremental counter	%KX4163	%KX4323	%KX4483	%KX4643
Comp. output 0 enabling	%KX4164	%KX4324	%KX4484	%KX4644
Comp. output 1 enabling	%KX4165	%KX4325	%KX4485	%KX4645
Enabling of revolution time per unit time	%KX4166	%KX4326	%KX4486	%KX4646
Designation of latch counter	%KX4176	%KX4336	%KX4496	%KX4656
Carry signal (Bit)	%KX4177	%KX4337	%KX4497	%KX4657
Borrow signal	%KX4178	%KX4338	%KX4498	%KX4648

(c) Area of monitoring

Parameter	Device area per channel			
	Ch 0	Ch 1	Ch 2	Ch 3
Current count value	%KD131	%KD136	%KD141	%KD146
Rev/unit time	%KD132	%KD137	%KD142	%KD147

(2) 'SU' type

(a) Parameter setting

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	%KW 300	%KW 330	%KW 360	%KW 390	Word
	h0001	Ring count	%KW 2220	%KW 2250	%KW 2280	%KW 2310	
Pulse input mode setting	h0000	1 phase 1 input 1 multiplication	%KW 301	%KW 331	%KW 361	%KW 391	Word
	h0001	1 phase 2 input 1 multiplication					
	h0002	CW / CCW	%KW 2221	%KW 2251	%KW 2281	%KW 2311	Word
	h0003	2 phase 4 multiplication					
Comp. Output 0 mode setting	h0000	(Magnitude) <	%KW 302	%KW 332	%KW 362	%KW 392	Word
	h0001	(Magnitude) ≤					
	h0002	(Magnitude) =					
	h0003	(Magnitude) ≥					
	h0004	(Magnitude) >	%KW 2222	%KW 2252	%KW 2282	%KW 2312	
	h0005	(Range) Include					
	h0006	(Range) Exclude					
Comp. Output 1 mode setting	h0000	(Magnitude) <	%KW 303	%KW 333	%KW 363	%KW 393	Word
	h0001	(Magnitude) ≤					
	h0002	(Magnitude) =					
	h0003	(Magnitude) ≥					
	h0004	(Magnitude) >	%KW 2223	%KW 2253	%KW 2283	%KW 2313	
	h0005	(Range) Include					
	h0006	(Range) Exclude					
Internal preset value setting	-2,147,483,648 ~ 2,147,483,647		%KD152	%KD167	%KD182	%KD197	Double word
			%KD 1112	%KD 1127	%KD 1142	%KD 1157	
External preset value setting	-2,147,483,648 ~ 2,147,483,647		%KD153	%KD168	%KD183	%KD198	Double word
			%KD 1113	%KD 1128	%KD 1143	%KD 1158	

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		%KD 154	%KD 169	%KD 184	%KD 199	DWord
			%KD 1114	%KD 1129	%KD 1144	%KD 1159	
Ring counter max. value setting	-2,147,483,646 2,147,483,647		%KD 155	%KD 170	%KD 185	%KD 200	DWord
			%KD 1115	%KD 1130	%KD 1145	%KD 1160	
Comp. output min. value setting	-2,147,483,648 ~ 2,147,483,647		%KD 156	%KD 171	%KD 186	%KD 201	DWord
			%KD 1116	%KD 1131	%KD 1146	%KD 1161	
Comp. output max. value setting	-2,147,483,648 ~ 2,147,483,647		%KD 157	%KD 172	%KD 187	%KD 202	DWord
			%KD 1117	%KD 1132	%KD 1147	%KD 1162	
Comp. output 0 point designation	HFFFF	No use	%KW 320	%KW 350	%KW 380	%KW 410	Word
	h0000	%QX0.0.0					
	h0001	%QX0.0.1					
	h0002	%QX0.0.2					
	h0003	%QX0.0.3					
	h0004	%QX0.0.4					
	h0005	%QX0.0.5					
	h0006	%QX0.0.6					
	h0007	%QX0.0.7					
	h0008	%QX0.0.8	%KW 2240	%KW 2270	%KW 2300	%KW 2330	
	h0009	%QX0.0.9					
	h000A	%QX0.0.10					
	h000B	%QX0.0.11					
	h000C	%QX0.0.12					
	h000D	%QX0.0.13					
	h000E	%QX0.0.14					
	h000F	%QX0.0.15					

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	%KW 321	%KW 351	%KW 381	%KW 411	Word
	h0000	%QX0.0.0					
	h0001	%QX0.0.1					
	h0002	%QX0.0.2					
	h0003	%QX0.0.3					
	h0004	%QX0.0.4					
	h0005	%QX0.0.5					
	h0006	%QX0.0.6					
	h0007	%QX0.0.7					
	h0008	%QX0.0.8	%KW 2241	%KW 2271	%KW 2301	%KW 2331	
	h0009	%QX0.0.9					
	h000A	%QX0.0.10					
	h000B	%QX0.0.11					
	h000C	%QX0.0.12					
	h000D	%QX0.0.13					
	h000E	%QX0.0.14					
	h000F	%QX0.0.15					
Unit time [ms]	1 ~ 60,000 ms		%KW 322	%KW 352	%KW 382	%KW 412	Word
			%KW 2242	%KW 2272	%KW 2302	%KW 2332	
Pulse/Rev.value	1 ~ 60,000		%KW 323	%KW 353	%KW 383	%KW 413	Word
			%KW 2243	%KW 2273	%KW 2303	%KW 2333	

(b) 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

(c) 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

Remark

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

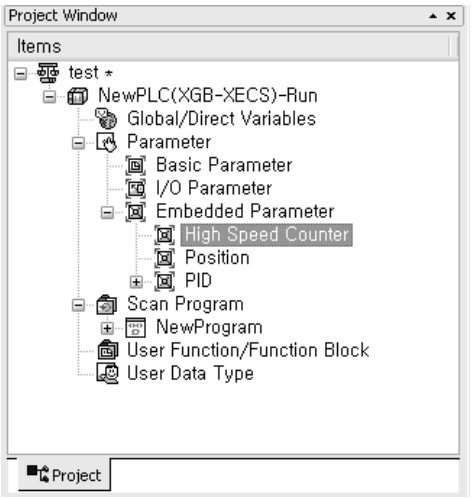
8.4 Examples: Using High-speed Counter

The section 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.

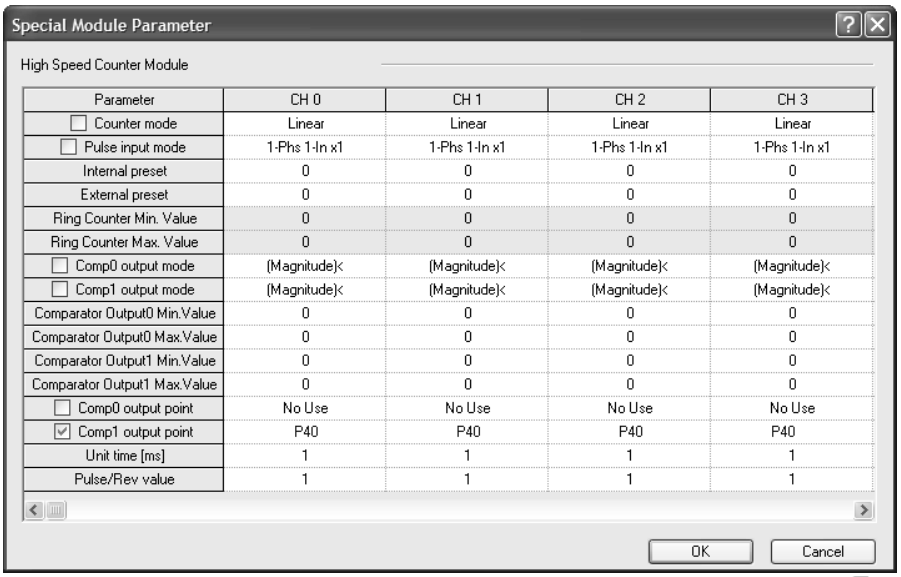
(a) Set 『Internal Parameters』 in the basic project window.



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

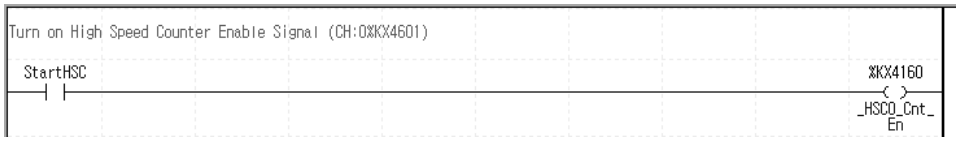
For details regarding each parameter setting, refer to 8.1~8.3.

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



Parameter	CH 0	CH 1	CH 2	CH 3
Counter mode	Linear	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. Value	0	0	0	0
Ring Counter Max. Value	0	0	0	0
Comp0 output mode	(Magnitude)<	(Magnitude)<	(Magnitude)<	(Magnitude)<
Comp1 output mode	(Magnitude)<	(Magnitude)<	(Magnitude)<	(Magnitude)<
Comparator Output0 Min.Value	0	0	0	0
Comparator Output0 Max.Value	0	0	0	0
Comparator Output1 Min.Value	0	0	0	0
Comparator Output1 Max.Value	0	0	0	0
Comp0 output point	No Use	No Use	No Use	No Use
Comp1 output point	P40	P40	P40	P40
Unit time [ms]	1	1	1	1
Pulse/Rev value	1	1	1	1

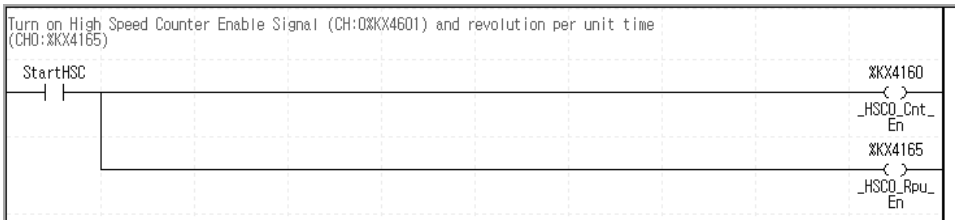
(c) Turn 'ON' the high-speed counter Enable signal (Ch0: :%KX4160) in the program.



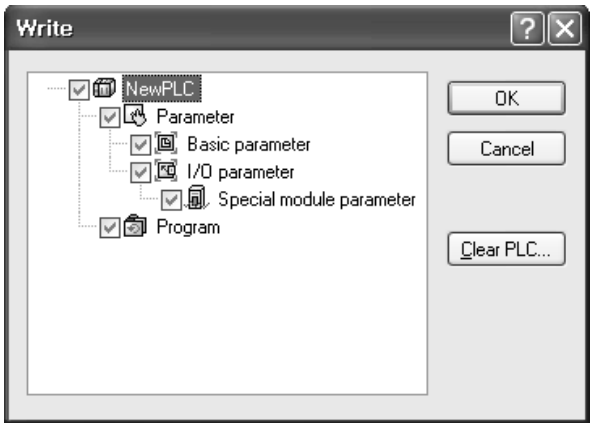
(d) To use additional functions of the high-speed counter, you needs to turn on the flag allowing an operation command.

* 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.



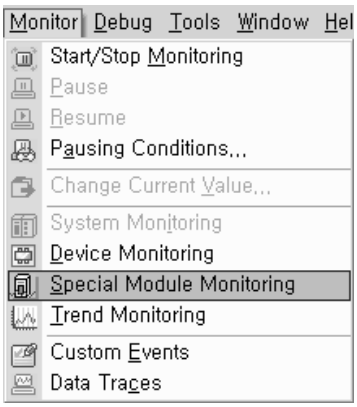
(e) Upon the setting, download program and parameter to PLC.

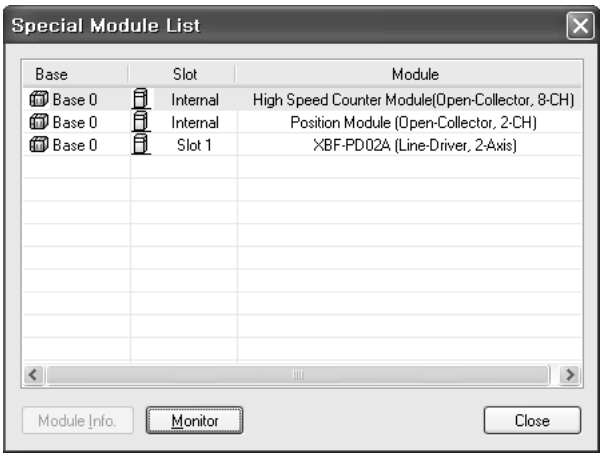


(2) Monitoring and setting command

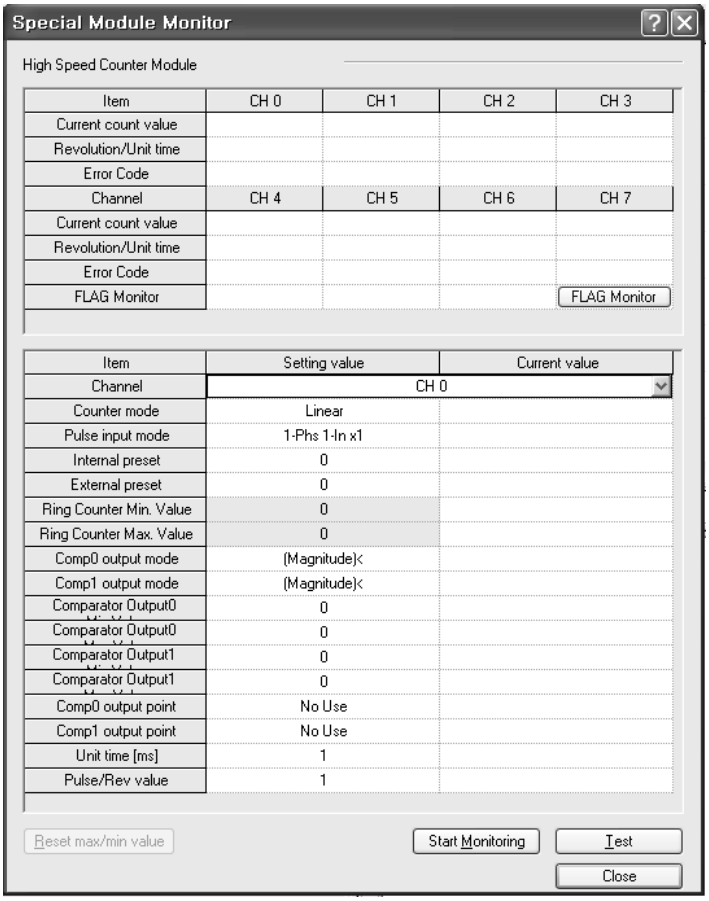
Monitoring and command setting of high-speed counter are described as follows.

(a) When a monitor and clicking a Special Module Monitor are started, the following window is opened.



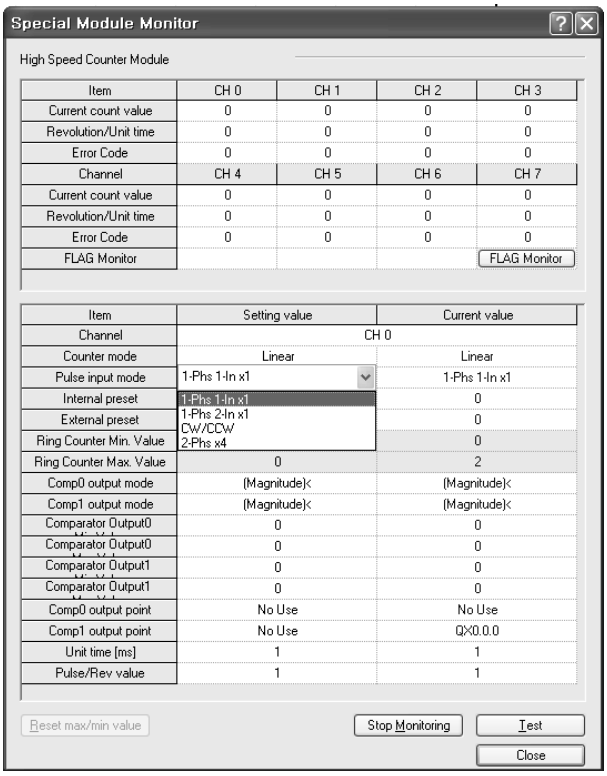


(b) Clicking 『Monitor』 shows monitor and test window of high-speed counter.

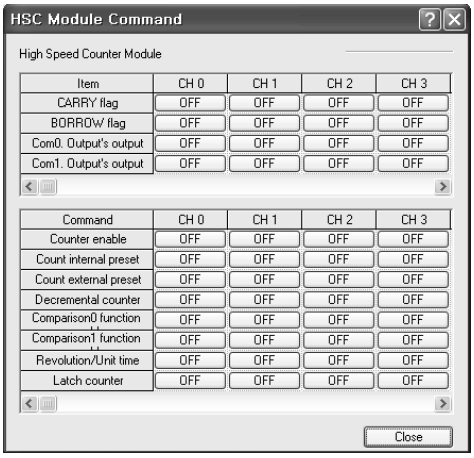


Item	Description
FLAG Monitor	Show flag monitoring and command window of high-speed counter
Start Monitoring	Start monitoring each item (special K device area monitor).
Test	Write each item setting to PLC. (Write the setting to special K device)
Close	Close monitor

(c) Clicking 『Start Monitoring』 shows the high-speed counter monitor display, in which you may set each parameter. In this mode, changed values are not saved if power 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 RTC Option Board

9.1 Battery

9.1.1 Battery specification

Item	Specification
Voltage/Current	DC 3V / 220 mA
Warranty period	3 years (ambient temp.)
Purpose	Program and data backup, RTC operation in case of power failure
Specification	Manganese Dioxide lithium battery
Dimension (mm)	ϕ 20 X 3.2 mm

.

9.1.2 Notice in using

(1) Do not heat the battery or solder the polarity. (It may cause the reduction of life.)
(2) Do not measure the voltage or short with tester. (It may cause the fire.)
(3) Do not disassemble the battery.

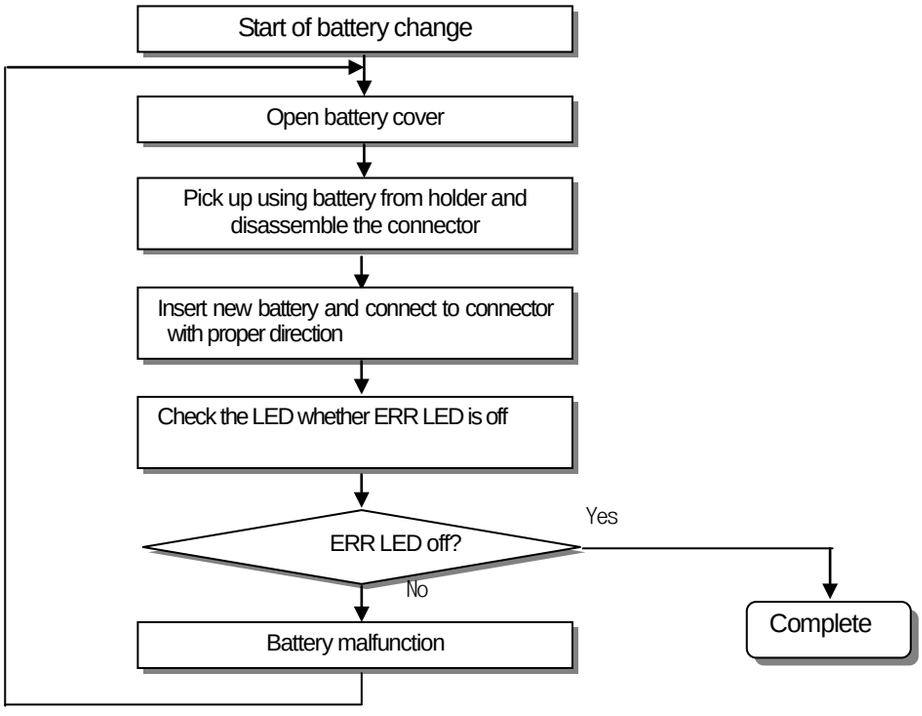
9.1.3 Life of battery

Life of battery depends on the power failure time and ambient temperature etc..
If battery is getting low, main unit cause the warning, 'battery voltage low warning'. The user can check it by error LED, flag and error message of XG5000.
Since battery works properly for long time, after battery voltage low warning, so the user can take the action after battery voltage low warning occurred.

9.1.4 How to change battery

User should change the battery periodically to save the program and backup the data in case of power failure.
If user eliminate the battery, it works for 30 minute by super capacitor. But, For the safety reason, Change the battery as fast as possible.

Sequence changing battery is as follows.



Remark

1) Battery for Program and Data back- up can be used with RTC
 -RTC provides advanced back-up function compare to with out RTC

9.2 RTC Function

Economic type (XBC-DxxxE), standard type (XBC-DxxxS, XBC-DxxxSU) doesn't support RTC function. If you equip RTC option board, you 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.

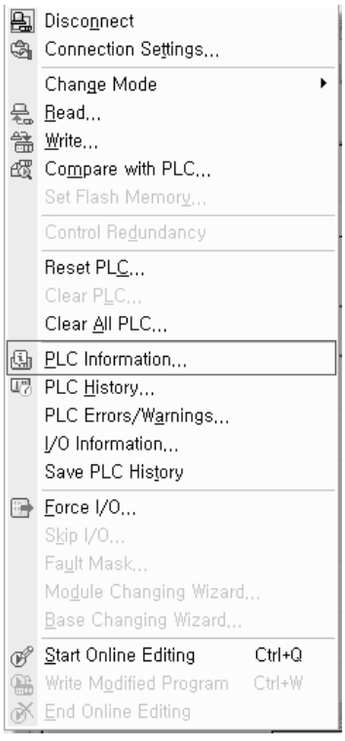
9.2.1 How to use

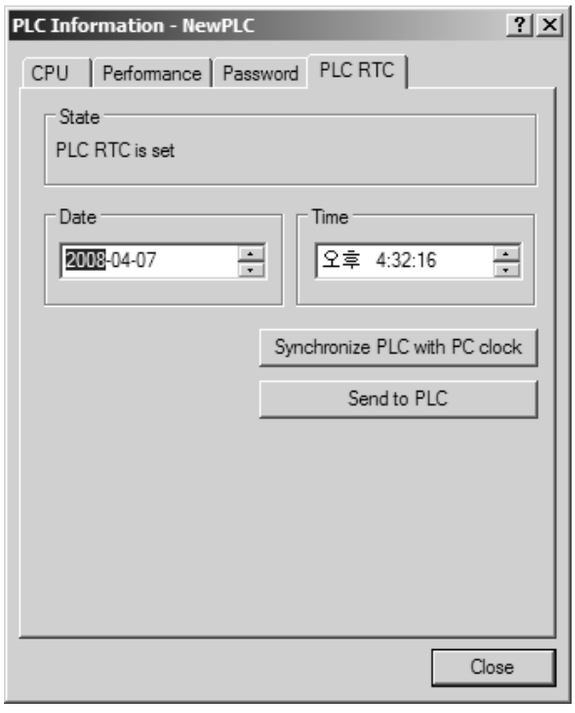
(1) Reading/setting clock data

(a) Reading or setting from XG5000

1) Click PLC Information of Online.

2) Click PLC RTC tap of PLC Information』.





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

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

(b) Reading by special relay

The user can monitor as follows

Flag	Data	Contents
_MON_YEAR	H0710	10year 07month
_TIME_DAY	H1729	29date 17hour
_SEC_MIN	H1020	10second 20minute
_HUND_WK	H2004	20XXyear, Thursday

(c) Modification of clock data by program

Variable	Flag	Content
%FW210	_MON_YEAR_DT	Month, year
%FW211	_TIME_DAY_DT	Hour, date
%FW212	_SEC_MIN_DT	Second, minute
%FW213	_HUND_WK_DT	Centaury, day

Write clock data to temporary device (I,Q,M,R,W,F,K,L,U) and turn on/off input contact point.
(If date and day data is not matched, Write is not available.)
Monitor and check the above special area (%FW53~%FW56)

(d) How to express the day

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

(2) Deviation of clock data

±2. 2s / 1 d (normal temperature)

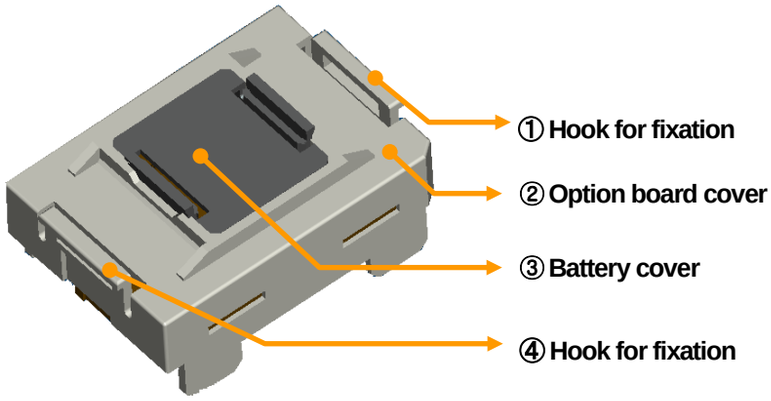
Operating temperature	Max deviation (second/day)
0 ℃	-5.5 ~ 1.5
25 ℃	-2.2 ~ 2.2
55 ℃	-7 ~ 1

Remark

1) Initially, RTC may not have any clock data.
2) When using the product, 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.
5) Be aware that margin of error depend on operating temperature.
6) RTC can operate only in 9th slot.

9.3 Name and Function of Each Part

(1) Describes the name and function of each part



No.	Name	Contents
①④	Hook for fixation	▶ Hook for fixing the option board to main unit
②	Option board cover	▶Option board cover
③	Battery cover	▶Battery cover

(2) RTC can operate only in 9th slot.

Chapter 10 DC Input Option Function

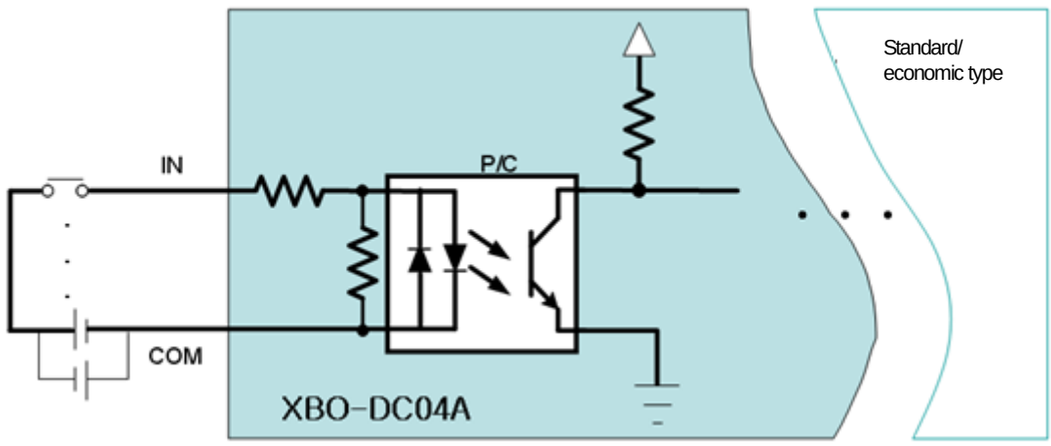
This chapter describes specifications and usage of input option board's function.

10.1 DC input Option Board Specification

10.1.1 DC Input Option Board Specification

Specification of XGB input option board is as follows.

Item		DC input specification	
		XBO-DC04A	Remark
Input point		4 points (supports high-speed counter function when installed at standard type)	
Insulation Method		Photo coupler insulation	
Rated input voltage		DC24V	
Rated input current		About 10㎃	
Voltage range		DC20.4~28.8V (ripple rate within 5%)	
On voltage / On current		DC19V or above / 3㎃ or above	
Off voltage / Off current		DC6V or less / 1㎃ or less	
Input resistance		About 2.7㏀	
Response time	Off → On	1/3/5/10/20/70/100㎳ (set through I/O parameter) Initial value: 3㎳	
	On → Off		
Common method		4 points / COM	〃
High speed counter	Performance	4kpps 4 channels (based on 1 phase)	when installed at standard type
	Mode	Linear counter	
Circuit configuration			



10.2 High Speed Counter Specification

High speed counter function is built in XGB input option board. It describes specifications, setting and usage of function, programming and wiring with external device.

10.2.1 Performance Specification

(1) Performance Specification

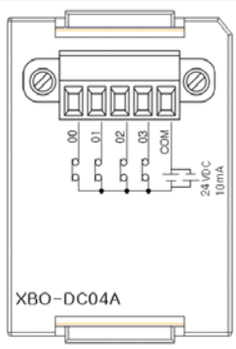
Item		Specification
		XBO-DC04A
Count input signal	Signal	A-phase, B-phase
	Input type	Voltage input (Open collector)
	Signal level	DC 24V
Max. count speed		4kpps
No. of channels	1 phase	4kpps 4 channels
	2 phase	2kpps 2 channels
Count range		Signed 32 Bit (-2,147,483,648 ~ 2,147,483,647)
Count type (Program setting)		Linear count (if it exceeds 32-bit range, Carry/Borrow occurs)
Input mode (Program setting)		1-phase input
		2-phase 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
Multiplication function	1 phase input	1 multiplication
	2 phase input	2 multiplication
Count Enable		Set by program (Counted on “Enable” statue)
Preset function		Set by program

(2) Counter input specification

Item	Specification
Input voltage	24V DC (20.4V ~ 28.8V)
Input current	10㎃
On guranteed voltage (min.)	20.4V
Off guranteed voltage (max.)	6V

10.2.2 Name of Each Part

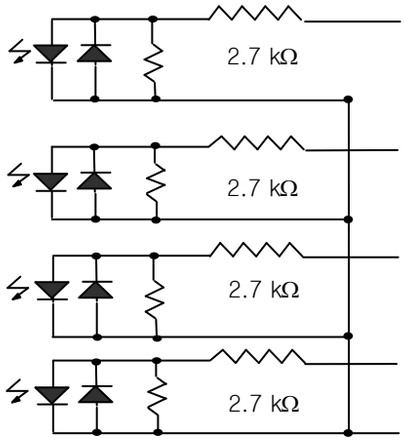
(1) Name of each part

Name	XBO-DC04A
Structure	

Terminal No.	Name		Usage	
	1-phase	2-phase	1-phase	2-phase
00	Ch0 counter input	Ch0 A-phase input	Counter input terminal	A-phase input terminal
01	Ch1 counter input	Ch0 B-phase input	Counter input terminal	B-phase input terminal
02	Ch2 counter input	Ch2 A-phase input	Counter input terminal	A-phase input terminal
03	Ch3 counter input	Ch2 B-phase input	Counter input terminal	B-phase input terminal
COM	Input common	Input common	Common terminal	Common terminal

(2) Interface with external devices

The following table describes interface with external devices

I/O	Internal circuit	Terminal No.	Signal		Operation	Input guaranteed voltage
			1-phase	2-phase		
Input		00	CH0 Pulse input	CH0 A-phase input	On	20.4~28.8V
					Off	6V or less
		01	CH 1 Pulse input	CH0 B-phase input	On	20.4~28.8V
					Off	6V or less
		02	CH 2 Pulse input	CH2 A-phase input	On	20.4~28.8V
					Off	6V or less
		03	CH 3 Pulse input	CH0 B-phase input	On	20.4~28.8V
					Off	6V or less
		COM	COM(Input common)		-	

10.2.3 Function

(1)Counter mode

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

(b) Available input mode is 1-phase input, 2-phase input

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

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

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

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

(d) Auxiliary modes are as follows

1) Count Latch

(e) Input mode

1) 1-phase count mode

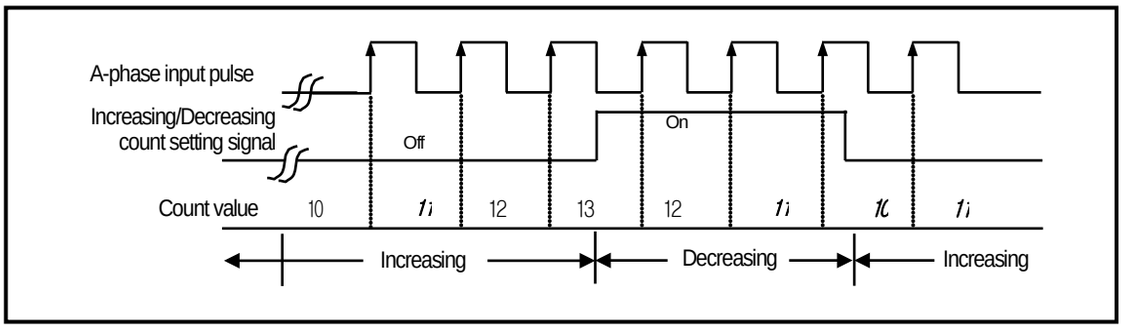
a) Increasing/decreasing count operation by program setting

1-phase 1-input 1-multiplication

A-phase input pulse is counted at rising and increasing/decreasing will be decided by the 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



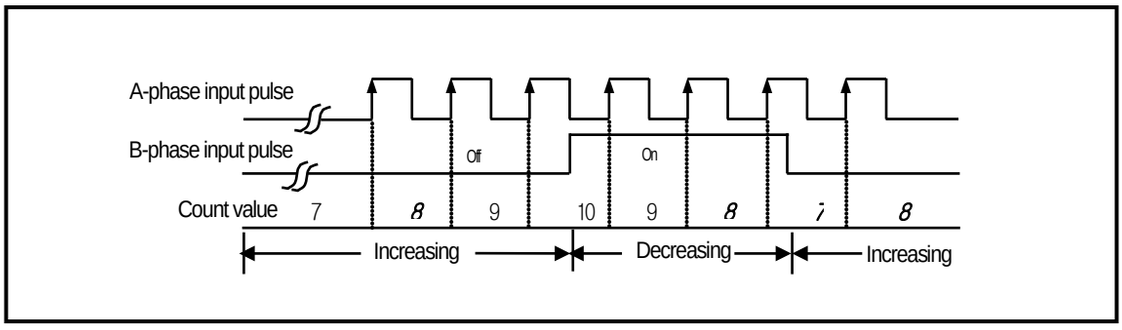
b) Increasing/decreasing count operation by B-phase input signal

•1-phase 2-input 1-multiplication

A-phase input pulse is counted 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

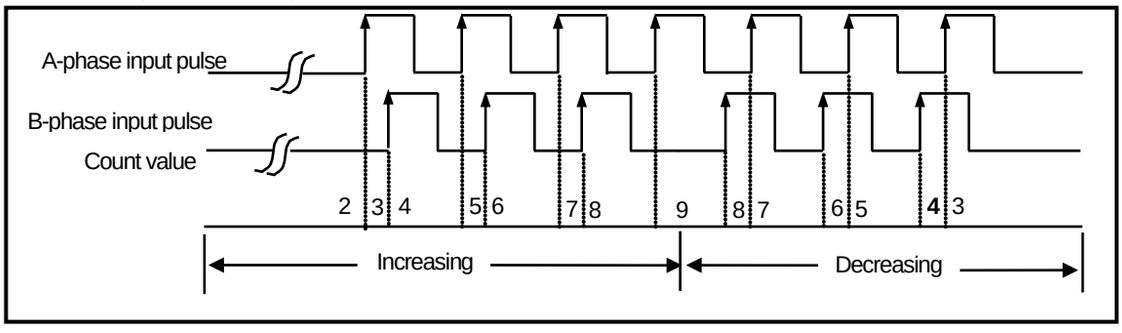


2) 2-phase count mode

a) 2-phase 2-multiplication

A-phase input pulse and B-phase input pulse are counted at rising 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



(2) Counter type

Option board supports linear counter.

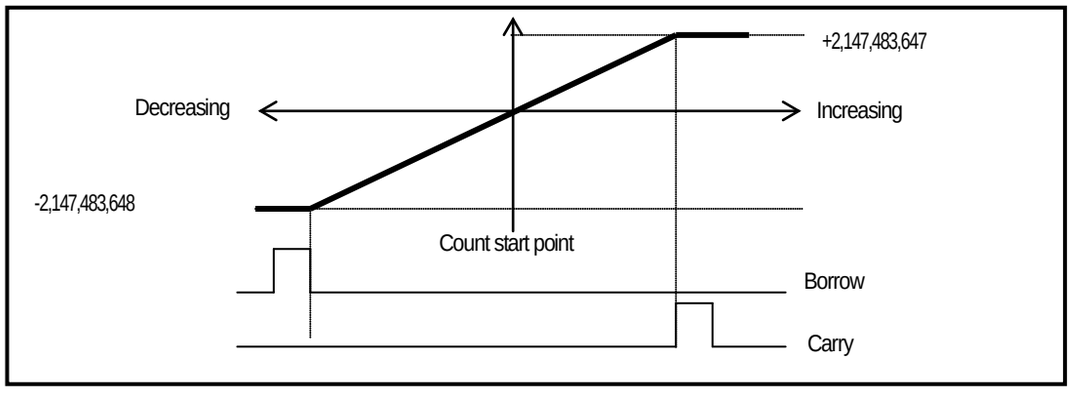
(a) Linear counter

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

2) 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.

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

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



(3) Carry signal

(a) When Carry signal occurs

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

(b) Count when Carry Signal occurs

1) Count stops if Carry occurs during Linear Count.

(c) Carry reset

1) 'Carry reset' instruction is not supported at option board. Reset 'Carry' by using 'Preset' instruction after making the counter value within counter range.

(4) Borrow signal

(a) When Borrow signal occurs

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

(b) Count when Borrow signal occurs

1) Count stops if Borrow occurs during Linear Count.

(c) Borrow reset

1) 'Carry reset' instruction is not supported at option board. Reset 'Carry' by using 'Preset' instruction after making the counter value within counter range.

(5) Count latch

(a) When Count latch signal is On, present count value is latched

(b) Setting

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

Type	Device area per channel				Ref.
	CH0	CH1	CH2	CH3	
When mounted at slot no.9	%UX0.9.6	%UX0.9.134	%UX0.9.262	%UX0.9.390	0: Disable 1: Enable
When mounted at slot no.10	%UX0.10.6	%UX0.10.134	%UX0.10.262	%UX0.10.390	

(c) 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.

(d) In latch counter function, internal preset function has to be used for clearing present value.

(6) Preset function

It changes the current value into preset value.

• Preset setting value is saved at the following U area.

Type	Area per each channel (Double word)				Ref.
	CH0	CH1	CH2	CH3	
Slot no. 9 internal preset value	%UD0.9.3	%UD0.9.7	%UD0.9.11	%UD0.9.15	
Slot no. 10 internal preset value	%UD0.10.3	%UD0.10.7	%UD0.10.11	%UD0.10.15	

• Preset command is specified through the following U area

Type	Area per each channel (bit)				Ref.
	CH0	CH1	CH2	CH3	
Slot no. 9 Internal preset command	%UX0.9.1	%UX0.9.129	%UX0.9.257	%UX0.9.385	0: Disable 1: Enable
Slot no. 10 Internal preset command	%UX0.10.1	%UX0.10.129	%UX0.10.257	%UX0.10.385	

10.3 Installation and Wiring

10.3.1 Precaution for wiring

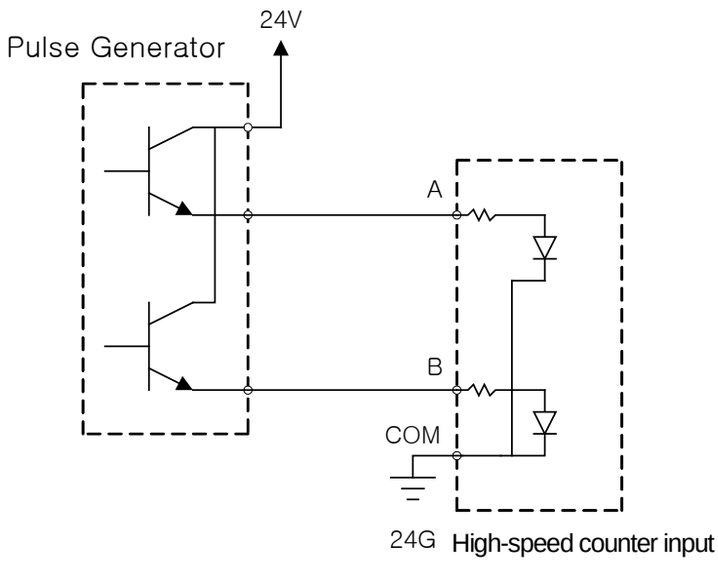
Pay attention to the counteractions against wiring noise especially for High-speed pulse input

(1) Make sure to 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.

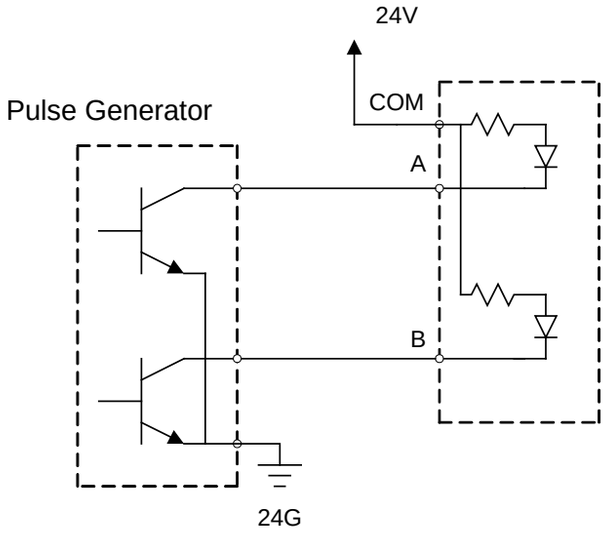
- ▶ Connect A-phase only for 1-phase input.
- ▶ Connect A-phase and B-phase for 2-phase input.

10.3.2 Example of wiring

(1) When pulse generator (encoder) is voltage output type



(2) When pulse generator is open collector type



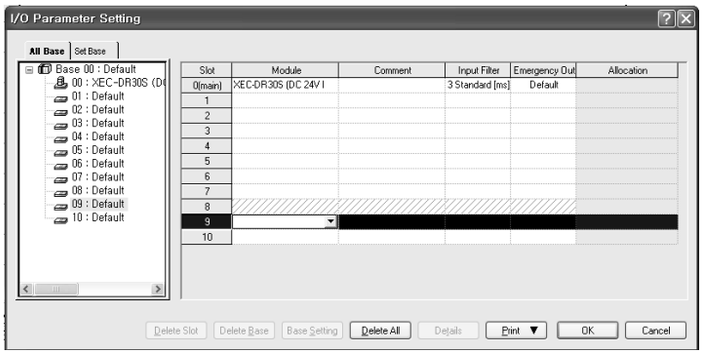
10.4 Internal Memory

10.4.1 Special area for High-speed counter

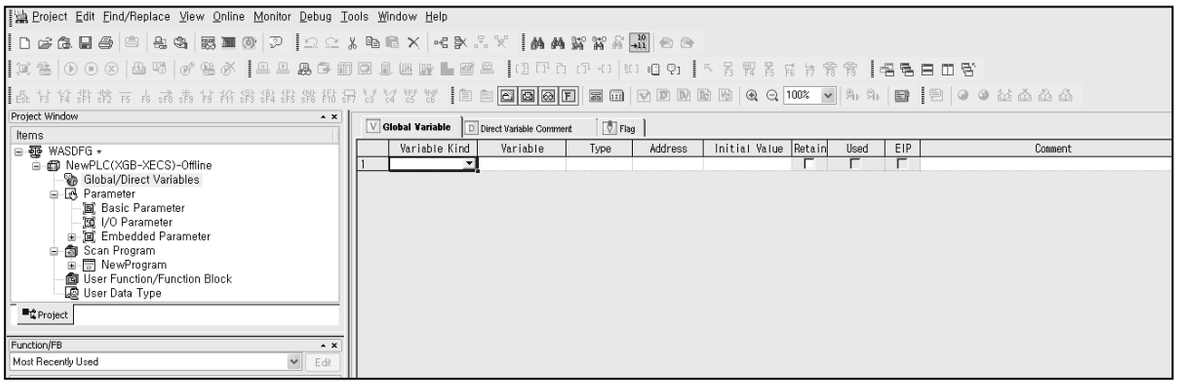
U device is used for parameter and operation command area of built-in high-speed counter.
This chapter describes how to register basic paramter and each item.

(1) U device auto-registration

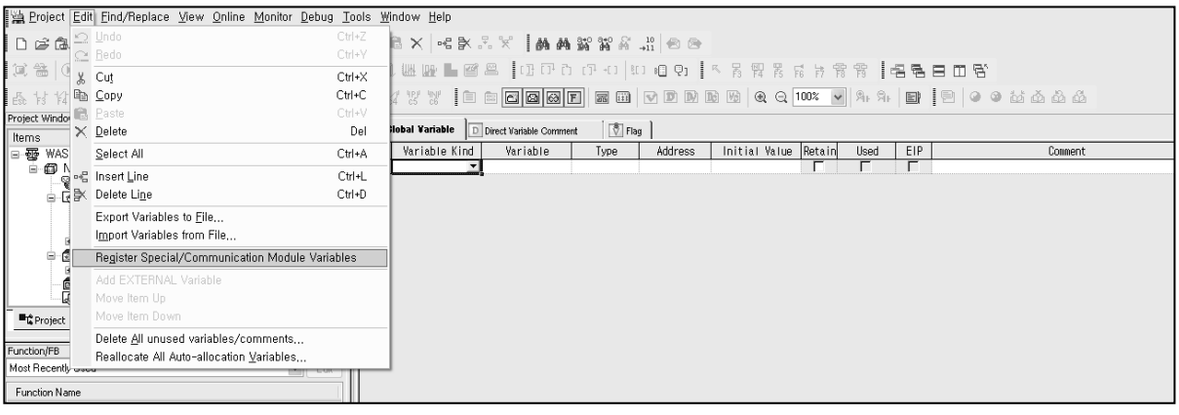
(a) Set the module at slot in [I/O parameter]



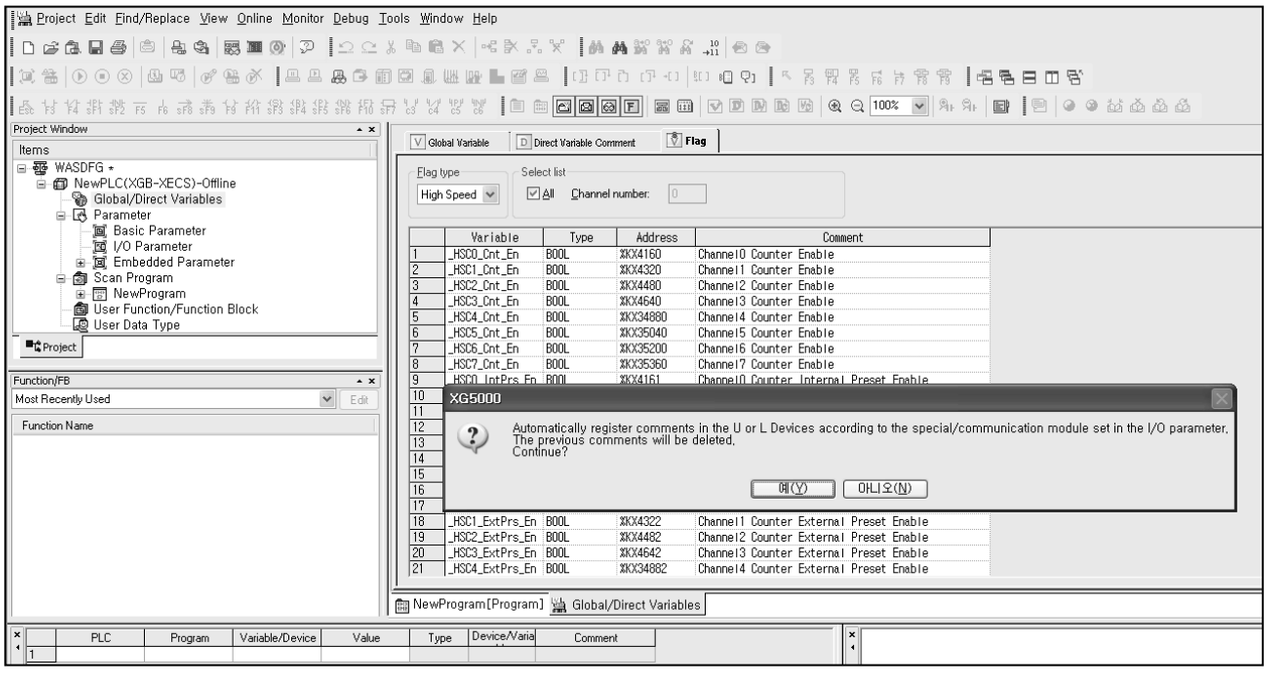
(b) Double-click [Variable/comment]



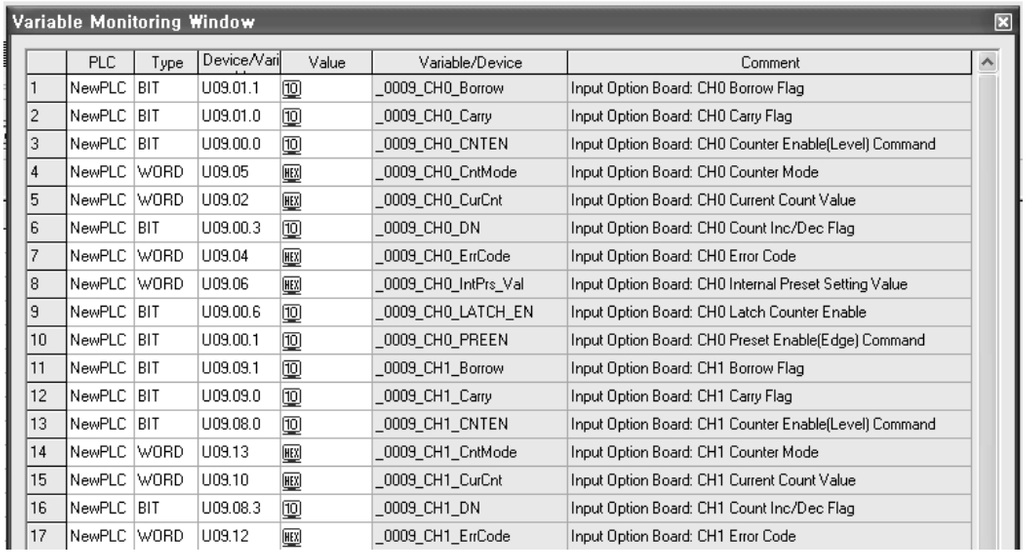
(c) Select 'Register Special/Communication Module Variables' on menu 'Edit'



(d) Click 'Yes'.



(e) Variables are registered as follows.



	PLC	Type	Device/Vari	Value	Variable/Device	Comment
1	NewPLC	BIT	U09.01.1	10	_0009_CH0_Borrow	Input Option Board: CH0 Borrow Flag
2	NewPLC	BIT	U09.01.0	10	_0009_CH0_Carry	Input Option Board: CH0 Carry Flag
3	NewPLC	BIT	U09.00.0	10	_0009_CH0_CNTEN	Input Option Board: CH0 Counter Enable(Level) Command
4	NewPLC	WORD	U09.05	HEX	_0009_CH0_CntMode	Input Option Board: CH0 Counter Mode
5	NewPLC	WORD	U09.02	HEX	_0009_CH0_CurCnt	Input Option Board: CH0 Current Count Value
6	NewPLC	BIT	U09.00.3	10	_0009_CH0_DN	Input Option Board: CH0 Count Inc/Dec Flag
7	NewPLC	WORD	U09.04	HEX	_0009_CH0_ErrCode	Input Option Board: CH0 Error Code
8	NewPLC	WORD	U09.06	HEX	_0009_CH0_IntPrs_Val	Input Option Board: CH0 Internal Preset Setting Value
9	NewPLC	BIT	U09.00.6	10	_0009_CH0_LATCH_EN	Input Option Board: CH0 Latch Counter Enable
10	NewPLC	BIT	U09.00.1	10	_0009_CH0_PREEN	Input Option Board: CH0 Preset Enable(Edge) Command
11	NewPLC	BIT	U09.09.1	10	_0009_CH1_Borrow	Input Option Board: CH1 Borrow Flag
12	NewPLC	BIT	U09.09.0	10	_0009_CH1_Carry	Input Option Board: CH1 Carry Flag
13	NewPLC	BIT	U09.08.0	10	_0009_CH1_CNTEN	Input Option Board: CH1 Counter Enable(Level) Command
14	NewPLC	WORD	U09.13	HEX	_0009_CH1_CntMode	Input Option Board: CH1 Counter Mode
15	NewPLC	WORD	U09.10	HEX	_0009_CH1_CurCnt	Input Option Board: CH1 Current Count Value
16	NewPLC	BIT	U09.08.3	10	_0009_CH1_DN	Input Option Board: CH1 Count Inc/Dec Flag
17	NewPLC	WORD	U09.12	HEX	_0009_CH1_ErrCode	Input Option Board: CH1 Error Code

Remark

When registered by "auto-registration", data type is expressed as BIT, WORD. If you want to check with other types such as DINT, DWORD, change the type.

(2) No. 9 slot device area

(a) Action command

Type	Device area per each channel				Ref.
	CH0	CH1	CH2	CH3	
Enable counter	%UX0.9.0	%UX0.9.128	%UX0.9.256	%UX0.9.384	BIT
Enable internal preset	%UX0.9.1	%UX0.9.129	%UX0.9.257	%UX0.9.385	BIT
Count inc/dec flag	%UX0.9.3	%UX0.9.131	%UX0.9.259	%UX0.9.387	BIT
Latch counter enable	%UX0.9.6	%UX0.9.134	%UX0.9.262	%UX0.9.390	BIT
Pulse input mode	%UW0.9.5	%UW0.9.13	%UW0.9.21	%UW0.9.29	INT
Internal preset setting value	%UD0.9.3	%UD0.9.7	%UD0.9.11	%UD0.9.15	DINT

(b) Monitor area

Type	Device area per each channel				Ref.
	CH0	CH1	CH2	CH3	
Carry flag	%UX0.9.16	%UX0.9.144	%UX0.9.272	%UX0.9.400	BIT
Borrow flag	%UX0.9.17	%UX0.9.145	%UX0.9.273	%UX0.9.401	BIT
Current counter value	%UD0.9.1	%UD0.9.5	%UD0.9.9	%UD0.9.13	DINT
Error code	%UW0.9.4	%UW0.9.12	%UW0.9.20	%UW0.9.28	INT

(3) No. 10 slot device area

(a) Action command

Type	Device area per each channel				Ref.
	CH0	CH1	CH2	CH3	
Enable counter	%UX0.10.0	%UX0.10.128	%UX0.10.256	%UX0.10.384	BIT
Enable internal preset	%UX0.10.1	%UX0.10.129	%UX0.10.257	%UX0.10.385	BIT
Count inc/dec flag	%UX0.10.3	%UX0.10.131	%UX0.10.259	%UX0.10.387	BIT
Latch counter enable	%UX0.10.6	%UX0.10.134	%UX0.10.262	%UX0.10.390	BIT
Pulse input mode	%UW0.10.5	%UW0.10.13	%UW0.10.21	%UW0.10.29	INT
Internal preset setting value	%UD0.10.3	%UD0.10.7	%UD0.10.11	%UD0.10.15	DINT

(b) Monitor area

Type	Device area per each channel				Ref.
	CH0	CH1	CH2	CH3	
Carry flag	%UX0.10.16	%UX0.10.144	%UX0.10.272	%UX0.10.400	BIT
Borrow flag	%UX0.10.17	%UX0.10.145	%UX0.10.273	%UX0.10.401	BIT
Current counter value	%UD0.10.1	%UD0.10.5	%UD0.10.9	%UD0.10.13	DINT
Error code	%UW0.10.4	%UW0.10.12	%UW0.10.20	%UW0.10.28	INT

(4)Parameter setup

(a) Action command

Type	Device status information (based on slot 9, ch0)		Ref.
	CH0	Information	
Enable counter	%UX0.9.0	0: disable, 1: enable	BIT
Enable internal preset	%UX0.9.1	0: disable, 1: enable	BIT
Count inc/dec flag	%UX0.9.3	0: INC, 1: DEC	BIT
Latch counter enable	%UX0.9.6	0: disable, 1: enable	BIT
Pulse input mode	%UW0.9.5	0: 1-phase 1-input 1: 1-phase 2-input 2: 2-phase 2 multiplication	INT
Internal preset setting value	%UD0.9.3	-2,147,483,648 ~ 2,147,483,647	DINT

(b) Monitor area

Type	Device status information (based on slot 9, ch0)		Ref.
	CH0	Information	
Carry flag	%UX0.9.16	0: disable, 1: enable	BIT
Borrow flag	%UX0.9.17	0: disable, 1: enable	BIT
Current counter value	%UD0.9.1	-2,147,483,648 ~ 2,147,483,647	DINT
Error code	%UW0.9.4	Indicates error code	INT

10.4.2 Error code

Describes on error of option board high-speed counter

• Describes error code

Error code (Dec.)	Error contents	Ref.
21	Pulse input type range setting error	
22	CH1(3) RUN request while CH0(2) 2-phase RUN * CH1(3) is not available when CH0(2) operate as 2-phase mode	
25	Internal preset value exceeded counter range	

Remark

If more than two errors occur, the latest error code is saved and previous error code is removed.

10.5 Example using high-speed counter

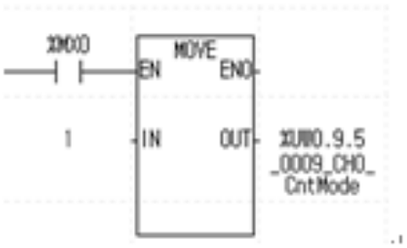
Describes option board high-speed counter example

(1) High-speed counter setup

Set up option board high-speed counter operation by using U area.

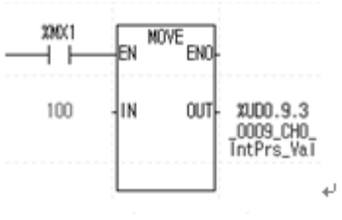
(a) Select high-speed counter mode.

Set up high-speed counter mode



(b) If you need 'Preset' function, input 'Preset value' and turn on 'Preset Enable" bit.

Input value to preset



(c) Specify 'Latch counter' or 'Up/Down counter'

Preset Enable signal ON

(d) Turn on 'High-speed counter enable' signal

Turn on High-speed Counter Enable signal (No. 9 slot, No.0 ch) of input option board (XBO-DC04A)

(2) Monitoring

You can check option board high-speed counter value by registering %UD0.9.1 (no.9 slot, no.0 ch) in variable mornitring window or program.

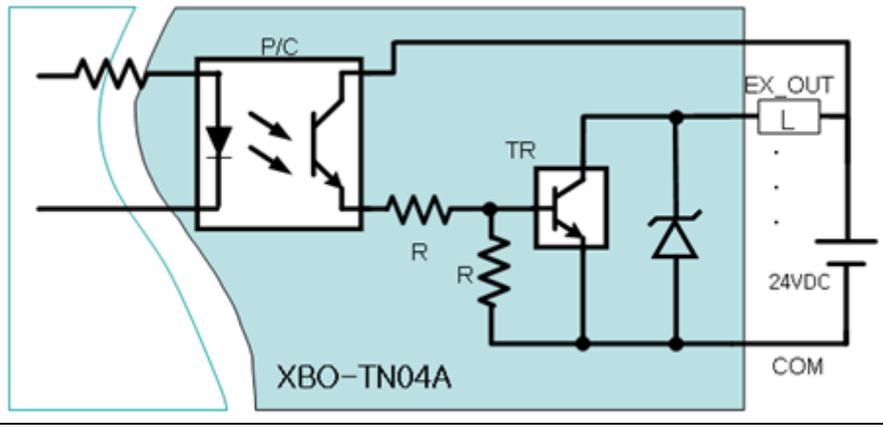
Chapter11 TR Output Option Board

This chapter describes specification and how to use the output option board.

11.1 XBO-TN04A Specification

11.1.1 Output option board specification

Item		Transistor output specification	
		XBO-TN04A	Remark
No. of output		4 (Pulse output function is supported when mounted on standard type)	
Insulation method		Photo coupler insulation	
Rated load voltage		DC 24V	
Max. load current		0.5A/point, 2A/COM	
Surge killer		Zener diode	
Leakage current when Off		0.1㎃ or less	
Voltage drop when On		DC 1V or less	
Inrush current		3A, 10㎳ or less	
Response time	Off → On	1㎳ or less	
	On → Off	1㎳ or less	
Operating indicator		-	
Pulse output	No. of axes	2	When mounted on standard type
	Output method	Open collector method	
	Control unit	Pulse	
	Control speed	10kpps (One option board supported _ No. 9 slot)	
	Setting method	Setup by DST instruction	
Circuit configuration			



11.2 Positioning Specification

Positioning function is built in XGB output option board. This section describes specification, how-to-use, function, programming and wiring of built-in positioning.

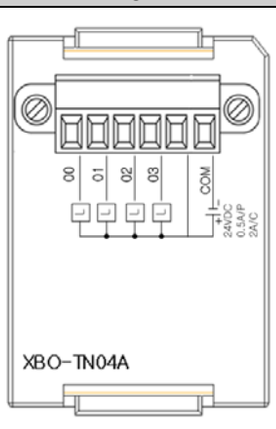
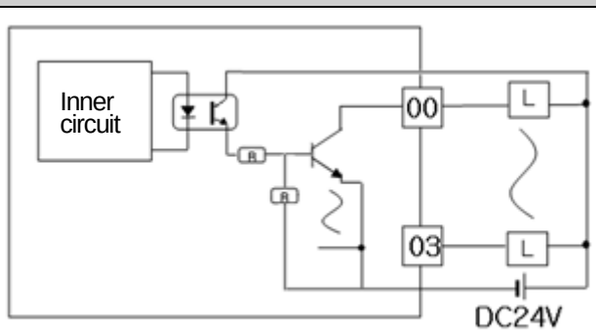
11.2.1 Performance Specification

(1) Performance Specification

Item \ Model		XBO-TN04A
No. of axes		2
Control method		Position control, speed control
Control unit		Pulse
Positioning	Method	Incremental
	Address range	-2,147,483,648 ~ 2,147,483,647(pulse)
	Speed range	1 ~ 10,000pps(1pps unit)
Manual operation		JOG operation
Home return		By DOG
Max. connection		2 m
Connector		6 Pin connector

11.2.2 Name of each part

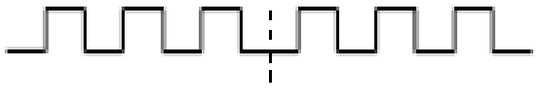
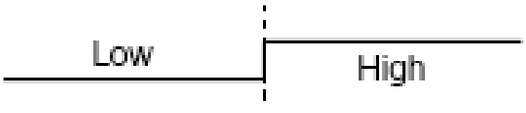
(1) Name of each part

Item	XBO-TN04A	
	Diagram	
Structure		

Connector	Output point No.		Description	Remark
Pulse output	X-axis	00	Positioning X-axis pulse string output point (Open collector output)	High Active
	Y-axis	01	Positioning Y-axis pulse string output point (Open collector output)	
Direction output	X-axis	02	Positioning X-axis direction output point (Open collector output)	
	Y-axis	03	Positioning Y-axis direction output point (Open collector output)	
External power	X/Y-axis	24V	Terminal for external power supply for TR	
Output common	X/Y-axis	COM	Output common terminal	

(2) Output pulse level

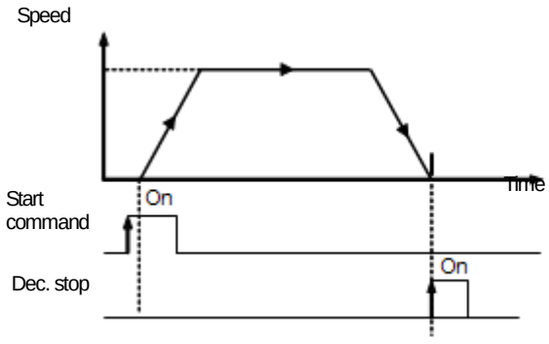
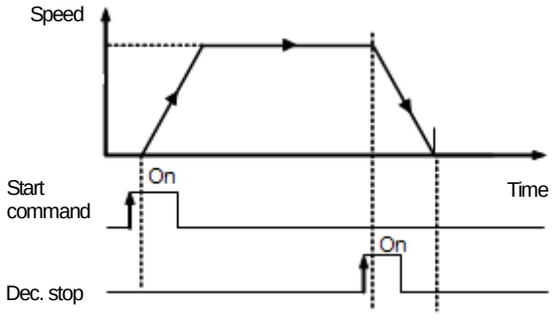
Basic option board output pulse is as follows.

Pulse output method	Output signal	Output signal level	
		Forward	Reverse
Pulse+Direction mode	Pulse		
	Direction		

11.2.3 Before Positioning

(1) Positioning function list

Positioning function of XGB option board built-in positioning is as follows.

<table>
<tr><th>Positioning function</th><th colspan="2">description</th><th>Instruction</th><th>Ref.</th></tr>
<tr><td rowspan="2">Position control</td><td>Operation pattern</td><td> 
</td><td>DST</td><td></td></tr>
<tr><td>Operation</td><td colspan="3">If the rising edge of start command is detected, it moves with designated speed to designated position, and complete signal is on (dwell is not supported)</td></tr>
<tr><td rowspan="2">Speed control</td><td>Operation pattern</td><td> 
</td><td>DST</td><td></td></tr>
<tr><td>Operation</td><td colspan="3">If the rising edge of start command is detected, it moves with designated speed and stops after deceleration by stop command. At this time, complete signal will not be not on.</td></tr>
</table>

(2) Position control

Position control moves the designated axis from start address (present position) up to target address (movement). There are two position control methods, absolute and incremental.

(a) Control by absolute coordinates (Absolute coordinates)

Object moves from start address to target address. Position control is performed, based on the address designated in Home Return (home address).

Direction is determined by start address and target address.

- Start address < target address: forward positioning
- Start address > target address: reverse positioning

(b) Control by incremental coordinates (incremental coordinates)

Object moves from current position as far as the address set in operation data. At this time, target address is based on start address. Direction is determined by sign (+,-).

- When Address is positive number: forward positioning（Direction increasing address)
- When Address is negative number: reverse positioning (Direction decreasing address)

(3) Speed control

Speed control means that object moves with steady speed (steady pulse string) until stop command.

•When controlling speed, direction is determined by sign of Address set in operation data.

Forward : Address is positive number

Reverse : Address is negative number

In the speed control, direction is determined by sign of target address regardless of current position and target position.

For example, current position is 100 and target position is 90, though target position is less than current position, since sign is positive, it moves forward.

Remark

- For more information, refer to XGB positioning manual.

11.2.4 Positioning Stop Factor

(1) Stop factor and how to deal with stop factor

• If following factor occurs during positioning, it stops without completing positioning.
In case positioning stops by stop instruction (STP, EMG) or following stop factor, generally, the only axis where stop instruction is executed or stop factor occurs stops.

Stop factor \ Operation status		Positioning *1	Homing	Jog operation	Axis operation status after stop instruction *2
Stop by sequence program *3	Dec. stop instruction	Dec. stop	Dec. stop	Error 322 (Keep operating)	Decelerating
	Emg. Stop instruction	Immediate stop			Error status (Error 481) Output prohibited
Stop by external signal	External upper limit “On”	Immediate stop		Forward immediate stop	Error status (Error 492)
	External lower limit “On”	Immediate stop		Backward immediate stop	Error status (Erro 493)

Remark

*1 : Positioning refers to position control, speed control by positioning data.
*2 : If axis is ‘Output prohibited status’ after being stopped, run a instruction to cancel ‘Output prohibited status’. (CLR instruction) .
*3 : Stop by sequence program refers to stop by “Stop instruction” at XGB program.

(2) Stop Process and Priority

(a) Dec. stop process
• If it stops due to deceleration stop instruction, since positioning operation is not complete, it does not generate positioning completion signal.

(b) Process of emergency stop and external input upper/lower limits
• If emergency stop instruction or external input upper/lower limits are inputted during positioning control, it stops positioning control and turns into ‘Output prohibited stats’, generating an error.

(c) Stop process priority
The priority of stop process is as follows.

Dec. stop < Emg. stop

(d) Emergency stop

- It immediately stops if it meets emergency stop while performing start-related instructions (indirect start, direct start, Home Return start, jog start).
- Emergency stop generates Error 481.
- Since it turns into “Output prohibited status” and “un-defined origin status”, once emergency stop is executed, execute origin determination (Home return, Current position preset) again to run an instruction that requires defined origin status”

11.2.5 Manual operation

In general, manual operations refer to operation which doesn’t use operation data. In output option board, JOG operation is supported.

(1) JOG operation

- Jog operation means positioning by jog operation stat contact point

Item		Jog forward start	Jog backward start	Jog high speed/low speed
XBO-TN04A	X-axis	%UX0.9.24	%UX0.9.25	%UX0.9.26
	Y-axis	%UX0.9.280	%UX0.9.281	%UX0.9.282

- It is operated by jog speed set in positioning parameter.
- It can be executed when origin is not determined.
- Acceleration/deceleration process is controlled by the duration set in jog acceleration/deceleration time among parameter settings of this software package.
- If jog speed is set out of allowable range, it generates an error and operation is not available

Range	High speed jog operation	1 ~ 10	(Unit: 1pps)
	Low speed jog operation	1 jog high speed	

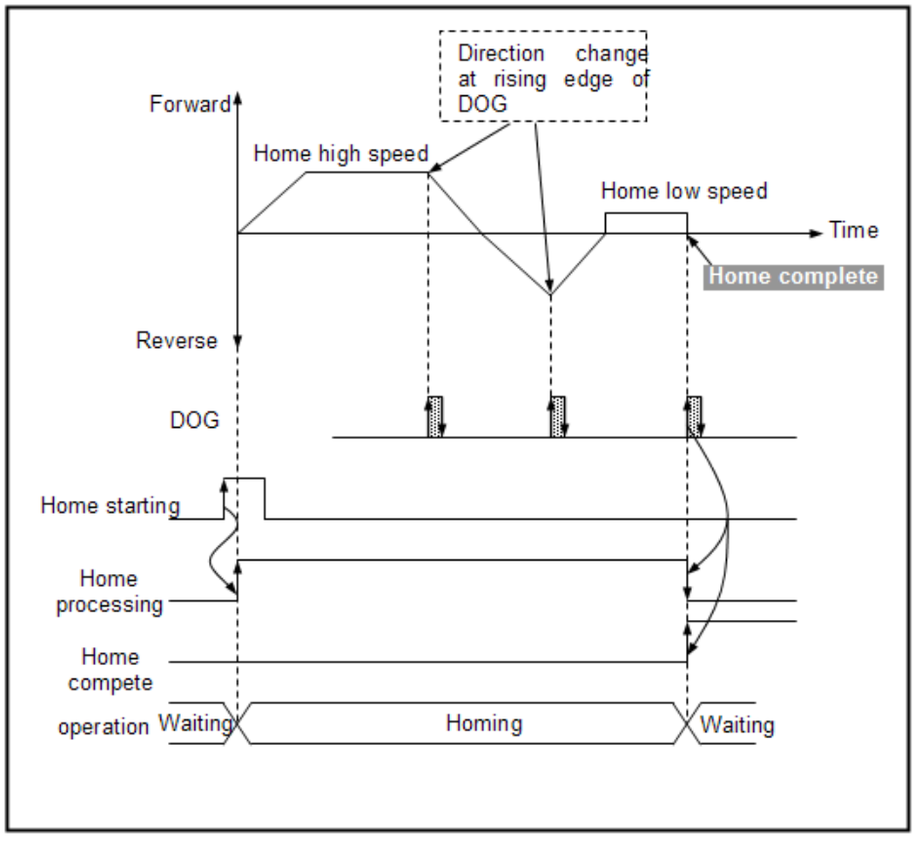
Remark

- Make sure to follow the cautions

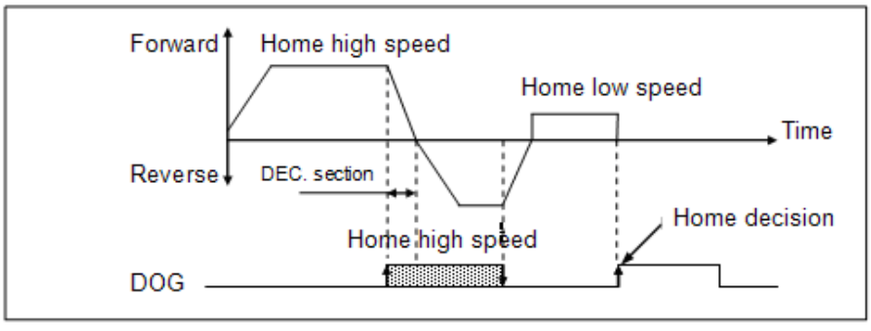
Bias speed ≤ Jog high speed ≤ Speed limit

11.2.6 Home return

XBO-TN04A supports only “Home return by DOG”.



(a) When homing command (ORG instruction) is executed, it accelerates to home direction set in Home Parameter and it homes with high speed. (The above figure is example when homing direction is forward)
(b) While target is homing with high speed, if rising edge of DOG (U9.1.B: X-axis) occurs, target speed decreases and change its direction.
(c) When it accelerates after changing direction, if rising edge of DOG occurs, it homes with low speed.
(d) In the homing status with low speed, rising edge occurs of DOG third time, it stops and determines the origin.
(e) When ‘On’ time of DOG signal is larger decreasing time, it changes the direction at the falling edge of DOG and moves with low speed and stops at the rising edge of DOG and determines the origin.

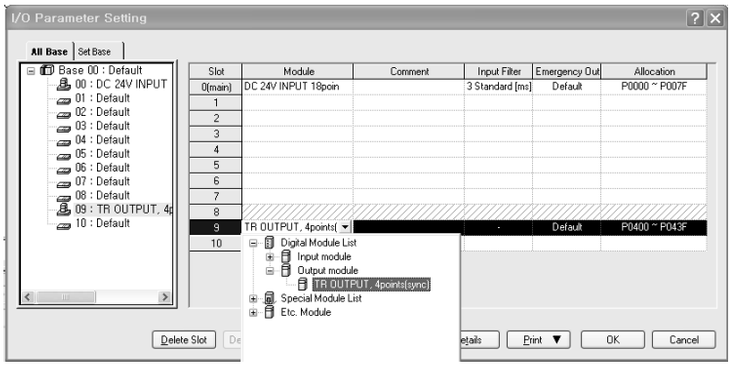


11.2.7 Positioning Basic Parameter Setup

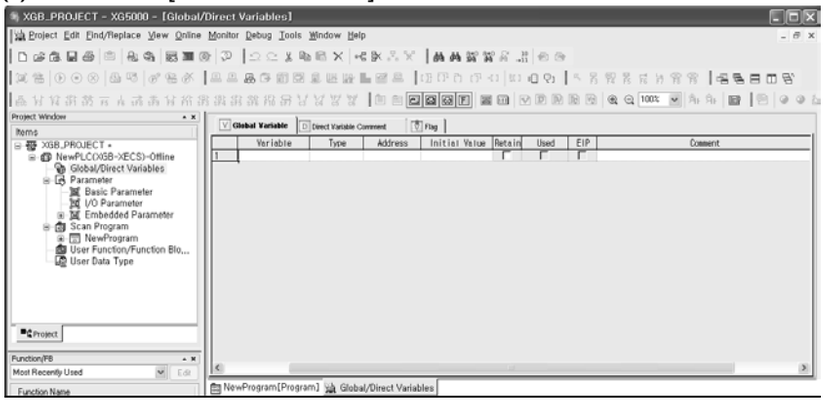
This chapter describes how to register basic parameter of XGB main output option board positioning function and each item.

(1) U device auto registration

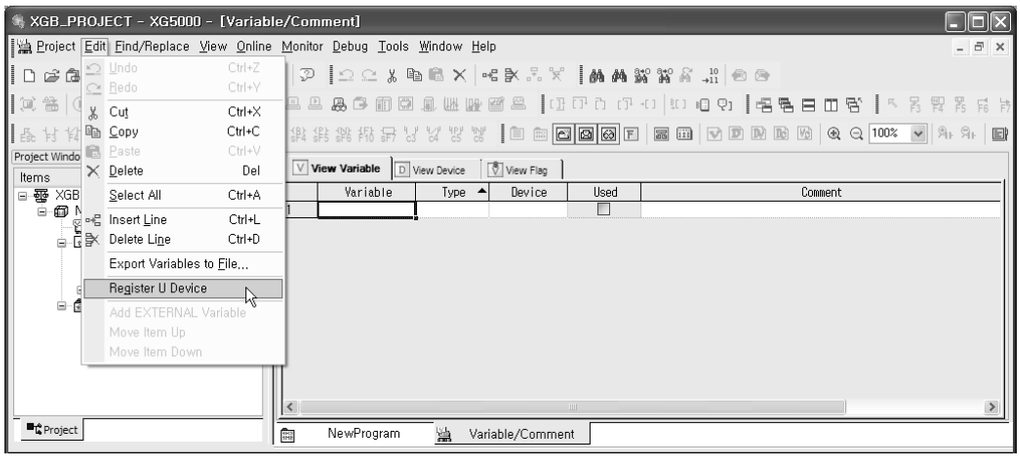
(a) Set up the module at the slot in [I/O Parameter]



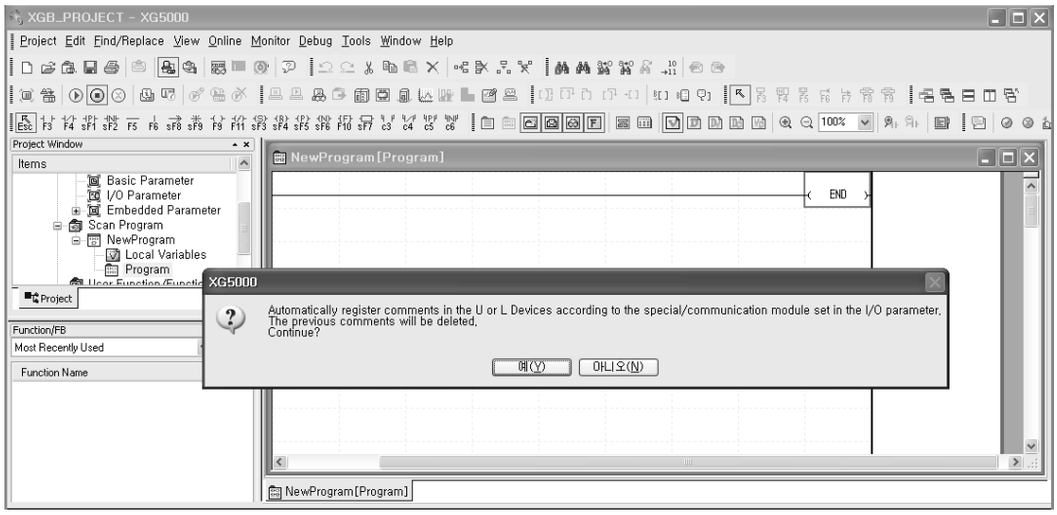
(b) Double-click [Variable/Comment].



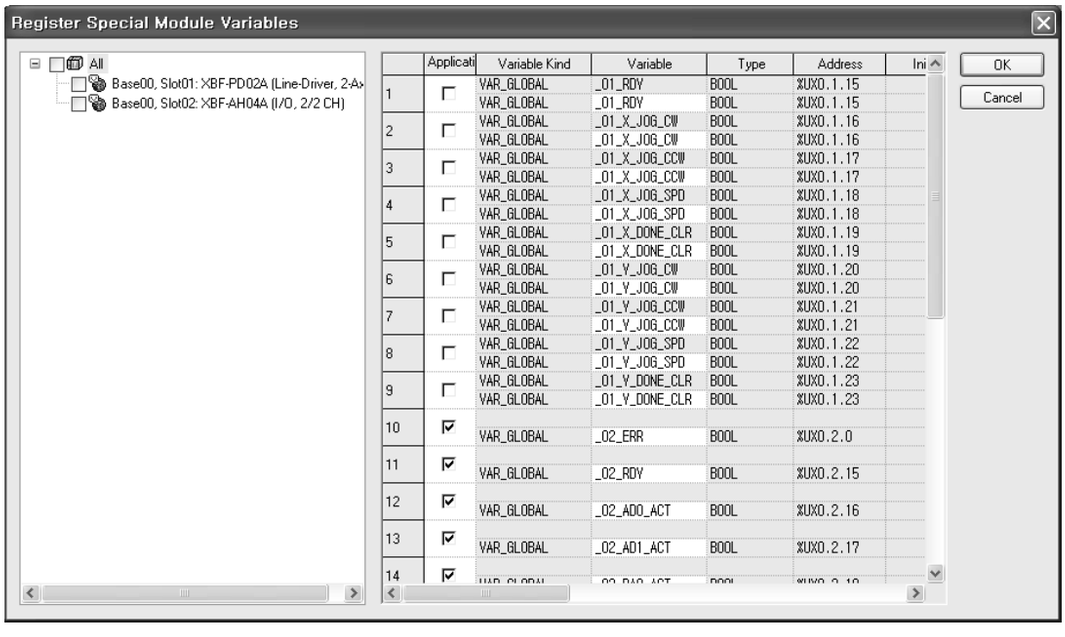
(c) Select “Register U device” on menu ‘Edit’.



(d) Click 'yes'.



(e) Variables are registered as the screen below.



	Applicati	Variable Kind	Variable	Type	Address	Ini
1	☐	VAR_GLOBAL	_01_RDY	BOOL	%UX0.1.15	
		VAR_GLOBAL	_01_RDY	BOOL	%UX0.1.15	
2	☐	VAR_GLOBAL	_01_X_JOG_CW	BOOL	%UX0.1.16	
		VAR_GLOBAL	_01_X_JOG_CW	BOOL	%UX0.1.16	
3	☐	VAR_GLOBAL	_01_X_JOG_CCW	BOOL	%UX0.1.17	
		VAR_GLOBAL	_01_X_JOG_CCW	BOOL	%UX0.1.17	
4	☐	VAR_GLOBAL	_01_X_JOG_SPD	BOOL	%UX0.1.18	
		VAR_GLOBAL	_01_X_JOG_SPD	BOOL	%UX0.1.18	
5	☐	VAR_GLOBAL	_01_X_DONE_CLR	BOOL	%UX0.1.19	
		VAR_GLOBAL	_01_X_DONE_CLR	BOOL	%UX0.1.19	
6	☐	VAR_GLOBAL	_01_V_JOG_CW	BOOL	%UX0.1.20	
		VAR_GLOBAL	_01_V_JOG_CW	BOOL	%UX0.1.20	
7	☐	VAR_GLOBAL	_01_V_JOG_CCW	BOOL	%UX0.1.21	
		VAR_GLOBAL	_01_V_JOG_CCW	BOOL	%UX0.1.21	
8	☐	VAR_GLOBAL	_01_V_JOG_SPD	BOOL	%UX0.1.22	
		VAR_GLOBAL	_01_V_JOG_SPD	BOOL	%UX0.1.22	
9	☐	VAR_GLOBAL	_01_V_DONE_CLR	BOOL	%UX0.1.23	
		VAR_GLOBAL	_01_V_DONE_CLR	BOOL	%UX0.1.23	
10	☑	VAR_GLOBAL	_02_ERR	BOOL	%UX0.2.0	
11	☑	VAR_GLOBAL	_02_RDY	BOOL	%UX0.2.15	
12	☑	VAR_GLOBAL	_02_AD0_ACT	BOOL	%UX0.2.16	
13	☑	VAR_GLOBAL	_02_AD1_ACT	BOOL	%UX0.2.17	
14	☑					

Remark

When variables are registered by above method, variables are expressed by BIT and WORD.
If you want to check them as DINT, DOWRD, change the data type.

(2) Positioning parameter of XBO-TN04A

U area of each item is as follows.

Item	Data type	Signal direction	Status information	U area for positioning	
				X-axis	Y-axis
BUSY	BOOL	Output (monitoring)	0: Stop, 1: Run	%UX0.9.0	%UX0.9.256
Error			0: No error, 1: Error occurred	%UX0.9.1	%UX0.9.257
Positioning complete			0: not complete, 1: complete	%UX0.9.2	%UX0.9.258
Home determination			0: not determined, 1: determined	%UX0.9.3	%UX0.9.259
Output prohibited			0: output available, 1: output prohibited	%UX0.9.4	%UX0.9.260
Stop status			0: not stop status, 1: stop status	%UX0.9.5	%UX0.9.261
Upper limit			0: not detect, 1: detect	%UX0.9.6	%UX0.9.262
Lower limit			0: not detect, 1: detect	%UX0.9.7	%UX0.9.263
EMG. Stop			0: normal status, 1: EMG. Stop status	%UX0.9.8	%UX0.9.264
CW/CCW			0:CW, 1:CCW	%UX0.9.9	%UX0.9.265
Operation status (accelerating)			0: not accelerating , 1: accelerating	%UX0.9.10	%UX0.9.266
Operation status (steady status)			0: not steady status, 1: steady status	%UX0.9.11	%UX0.9.267
Operation status (decelerating)			0: not decelerating , 1: decelerating	%UX0.9.12	%UX0.9.268
Position control			0: not under position control 1: under position control	%UX0.9.13	%UX0.9.269
Speed control			0: not under speed control 1: under speed control	%UX0.9.14	%UX0.9.270
Home return			0: not under home return 1:under home return	%UX0.9.15	%UX0.9.271
JOG low speed			0: not under JOG low speed 1: under JOG low speed	%UX0.9.16	%UX0.9.272
JOG high speed			0: not under JOG high speed 1: under JOG high speed	%UX0.9.17	%UX0.9.273
Forward JOG start		Input	0: JOG stop, 1: forward JOG start	%UX0.9.24	%UX0.9.280
Reverse JOG start			0: JOG stop, 1: Reverse JOG start	%UX0.9.25	%UX0.9.281
JOG low/high speed			0: JOG low speed, 1: JOG high speed	%UX0.9.26	%UX0.9.282
DOG			Operate at rising edge	%UX0.9.27	%UX0.9.283
Upper limit signal			Detected at falling edge	%UX0.9.28	%UX0.9.284
Lower limit signal			Detected at falling edge	%UX0.9.29	%UX0.9.285
Home return direction	BOOL	Input	0: CW, 1: CCW	%UX0.9.30	%UX0.9.286
Positioning status			0: disable, 1: enable	%UX0.9.31	%UX0.9.287
Current position	DWARD	Output	-2,147,483,648 ~ 2,147,483,647	%UD0.9.1	%UD0.9.9
Current speed	WORD		1 ~ 10,000[pulse/s]	%UW0.9.4	%UW0.9.20
Error code	WORD		Indicates positioning error	%UW0.9.5	%UW0.9.21

Item	Data type	Signal direction	Status information	U area for positioning	
				X-axis	Y-axis
Bias speed	WORD	Input	1 ~ 10,000[pulse/s]	%UW0.9.6	%UW0.9.22
Speed limit	WORD		1 ~ 10,000[pulse/s]	%UW0.9.7	%UW0.9.23
Acc. time	WORD		0 ~ 10,000[unit: ms]	%UW0.9.8	%UW0.9.24
Dec. time	WORD		0 ~ 10,000[unit: ms]	%UW0.9.9	%UW0.9.25
Home address	DINT		-2,147,483,648 ~ 2,147,483,647	%UD0.9.5	%UD0.9.13
Home return high speed	WORD		1 ~ 10,000[pulse/s]	%UW0.9.12	%UW0.9.28
Home return low speed	WORD		1 ~ 10,000[pulse/s]	%UW0.9.13	%UW0.9.29
JOG high speed	WORD		1 ~ 10,000[pulse/s]	%UW0.9.14	%UW0.9.30
JOG low speed	WORD		1 ~ 10,000[pulse/s]	%UW0.9.15	%UW0.9.31

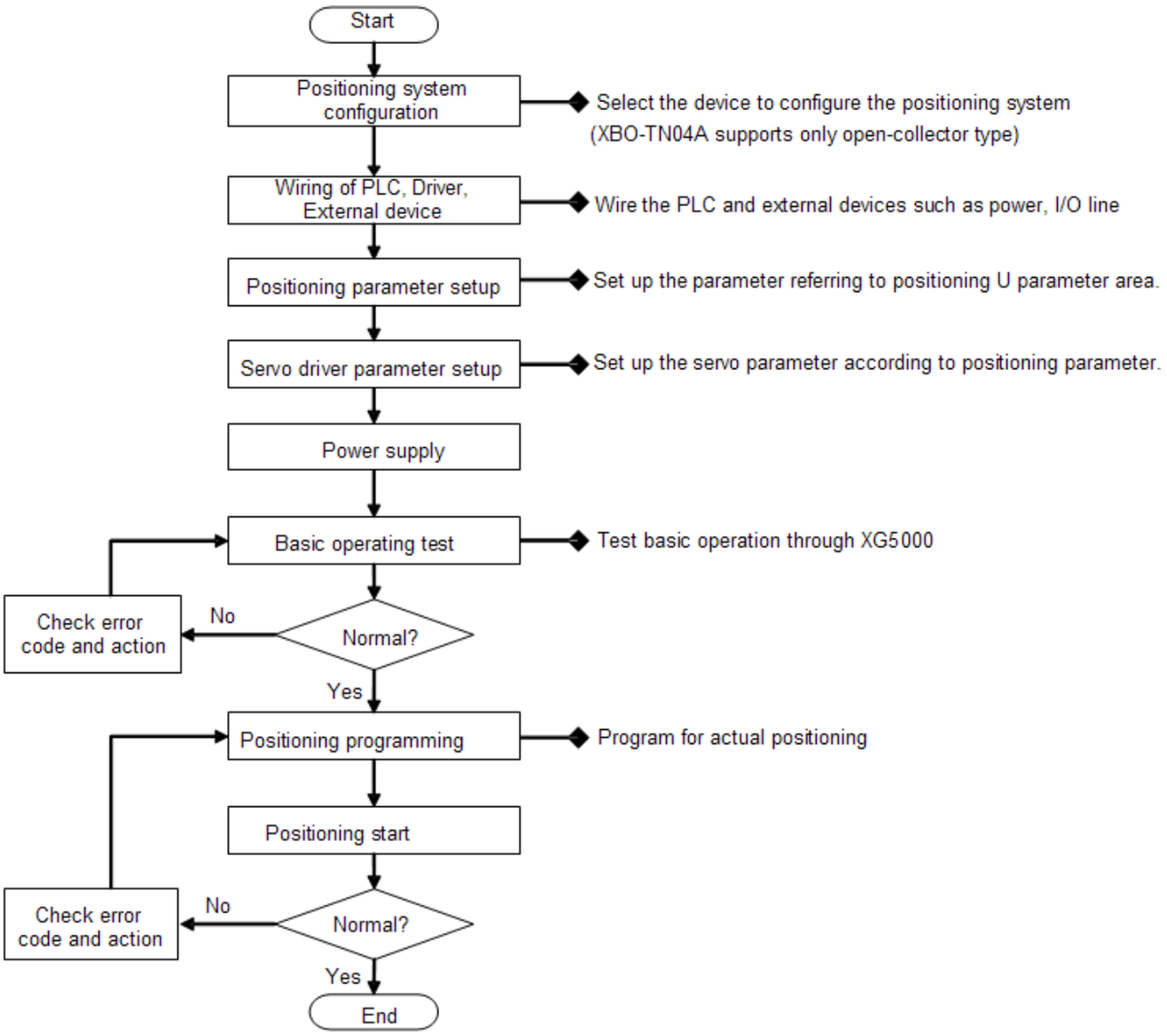
Remark

• For more information on positioning parameter item, refer to XGB built-in positioning manual.

11.3 TR Output Option Board Operation Sequence of Positioning

11.3.1 Operation Sequence of Positioning

Operation sequence is as follows. Positioning function of the option board operates only at slot number 9.



11.4 Positioning Instruction List

Positioning instructions used in XBO-TN04A positioning are summarized as follows.

(1) XBO-TN04A positioning instruction

Instruction	Command	Command condition	XGB built-in positioning manual
ORG	Home return	Slot, command axis	5.2.1
DST	Direct start	Slot, command axis, position, speed, dwell time, M code, control word	5.2.3
STP	Stop	Slot, command axis, dec. time	5.2.9
PRS	Current position preset	Slot, command axis, position	5.2.18
EMG	EMG. Stop	Slot, command axis	5.2.19
CLR	Error reset, output prohibition cancel	Slot, command axis, disable/enable pulse output	5.2.20

Remark

- XGB positioning instruction operates at rising edge. Namely, instruction is executed once when execution contact point is on.
- For instruction, refer to XGB positioning manual.
- When using DST instruction in XBO-TN04A, dwell time and M code are not supported.

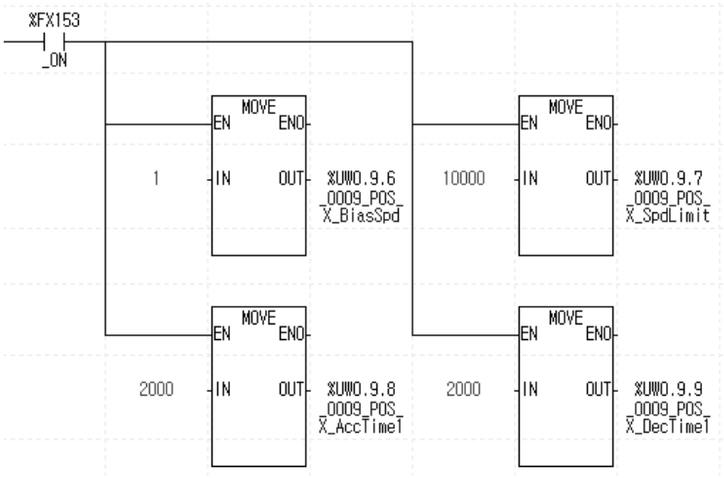
11.5 Positioning Example

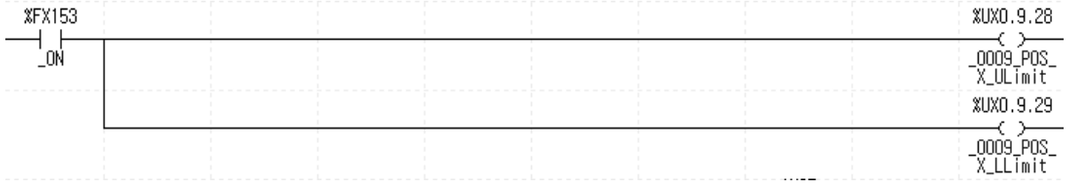
This chapter describes positioning example of XBO-TN04A.

(1)Positioning setup

Option board positioning is set up by U area. Set up each parameter to use positioning function.

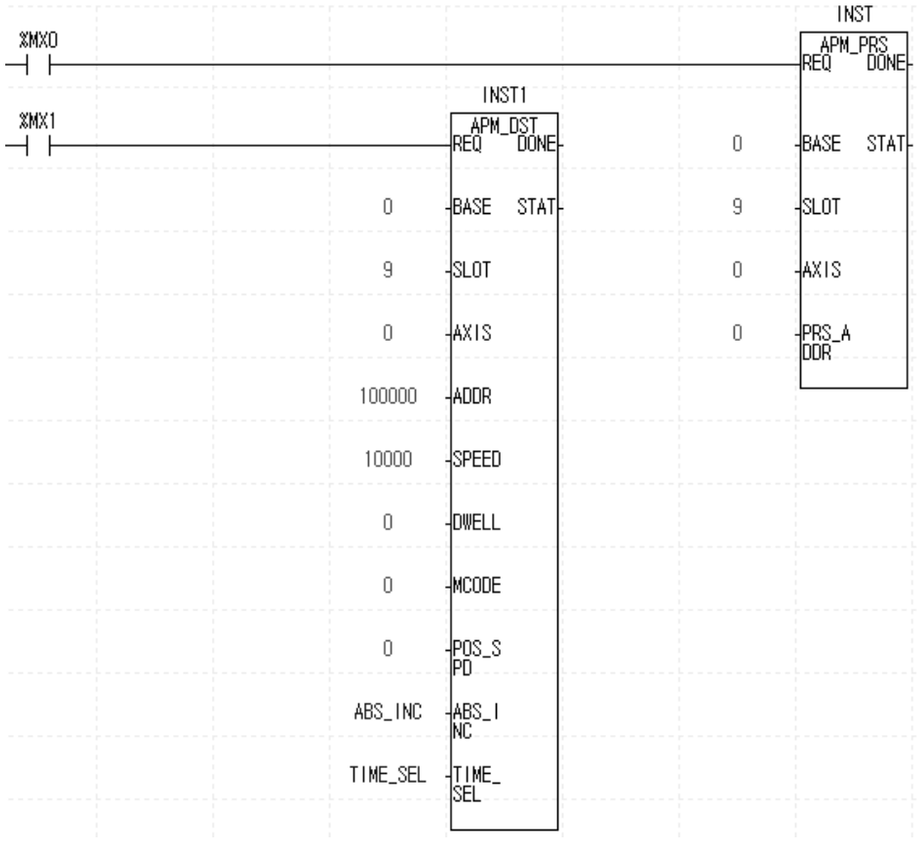
(a) Input each parameter value.





(b) Turn On or Off according whether to use positioning

(c) Set up the function as follows.



Monitoring

You can check option board posioing speed, crrent position by regstering %UW0.9.4,% UW0.9.1(No. 9 slot, X-axis) at variable monitor window or program

Chapter12 Memory Module

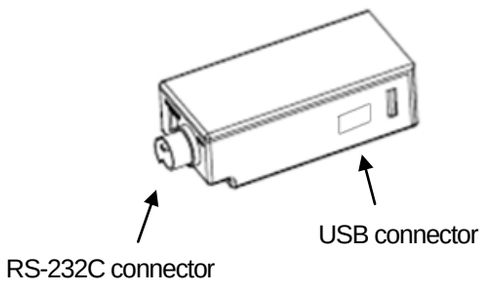
12.1 Memory Module Specification

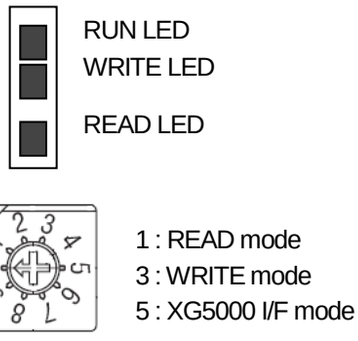
You can save user program safely or download user program to PLC without special handling when user program is damaged by using external memory module in XGB PLC

12.1.1 Memory module specification

Item	XBO-M2MB	Ref.
Memory capacity	2MByte	
Memory type	Flash Memory	
Specification	USB supported, Program Read/Write	
Indicator	LED (RUN/ WRITE/ READ)	
Operating mode setup	Mode setup by rotary switch	
Operating power supply	RS-232C communication connecter, USB connector	5V
Purpose	For moving	

12.1.2 Memory module structure





Remark

-.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)

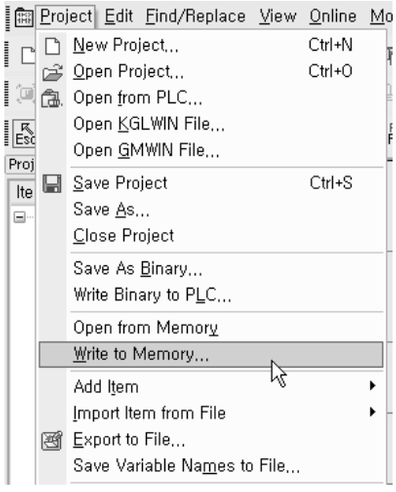
12.1.3 How to use memory module

(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

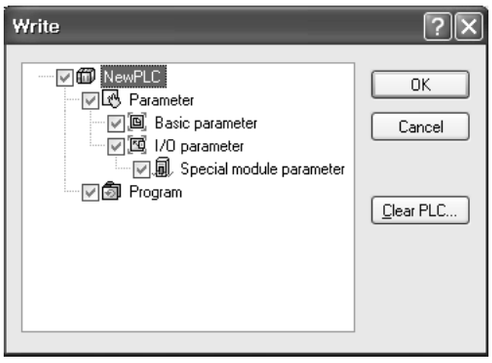
(2) Save user program of external memory module at main unit
  (a) Set the operating mode of main unit as STOP
   - In RUN mode, you can't save program
  (b) Set the switch of memory module as 3
  (c) Install the memory module
   - Install it at the RS-232C port of the main unit.
   - PLC program and 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

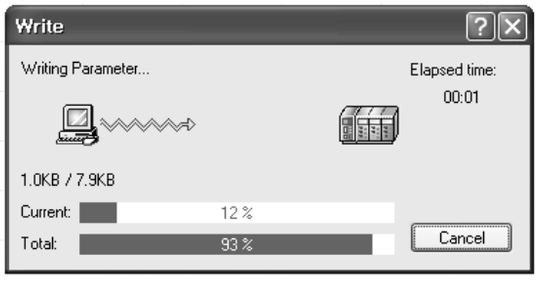
(3) Save program of XG5000at the memory module
  (a) Set the mode switch of XBO-M2MB as "5" and connect XBO-M2MB to USB port of PC
  (b) Select Project → Write to Memory on XG5000 menu.

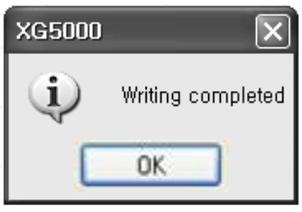


(c) 'Write' window is created as follows.



(d) "Writing completed" window appears.



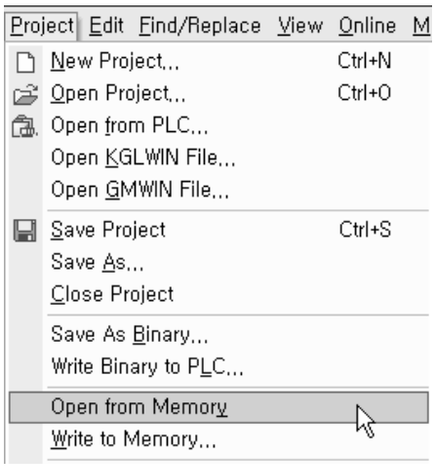


(e) With above method, through XG5000, you can save program, parameter, communication parameter at XBO-M2MB

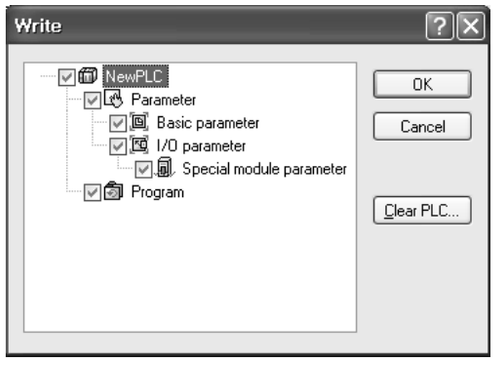
(4) Open from memory module

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

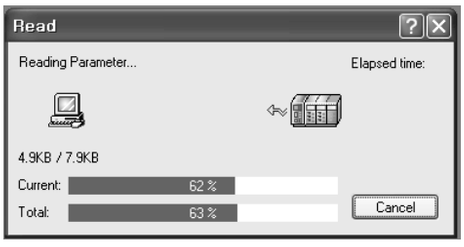
(b) Select "Project → Open from Memory" on XG5000 menu

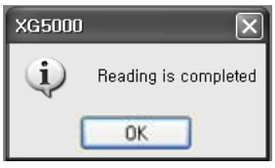


(c) “Read” window is created as follows.



(d) “Reading is completed” window appears.



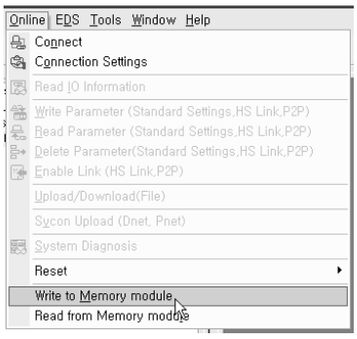


(e) With above method, through XG5000, you can save program, parameter, communication parameter from XBO-M2MB

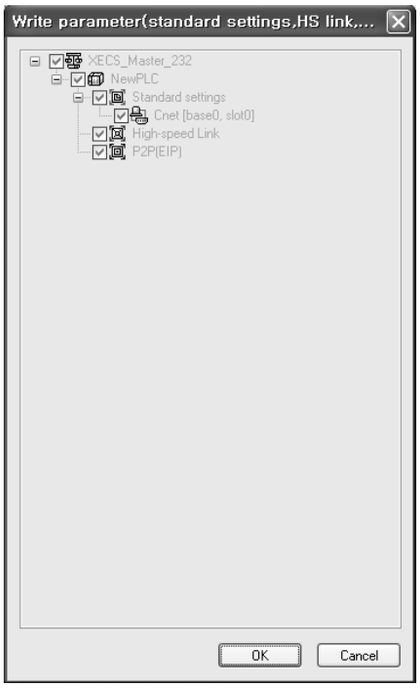
(5) Write to Memory module

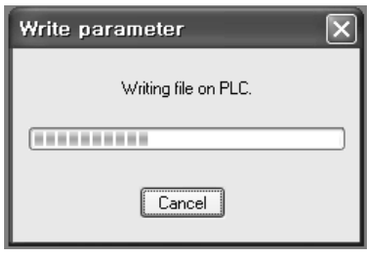
(a) Set the mode switch of XBO-M2MB as “5” and connect XBO-M2MB to USB port

(b) Click “Online → Write to Memory module” on XG-PD menu

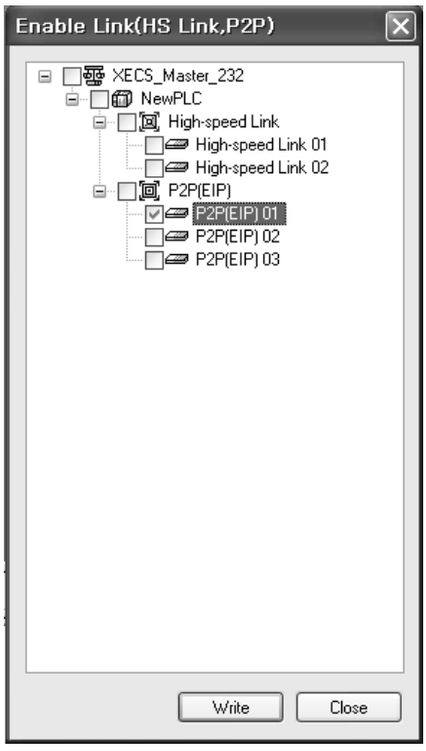


(c) If you click “OK” button, it saves each parameter at the memory module.

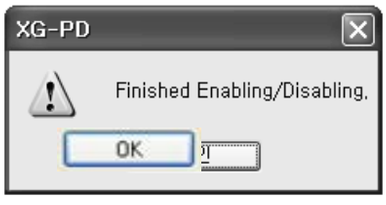




(d) If “Enable Link” window appears, check the item and press “Write”



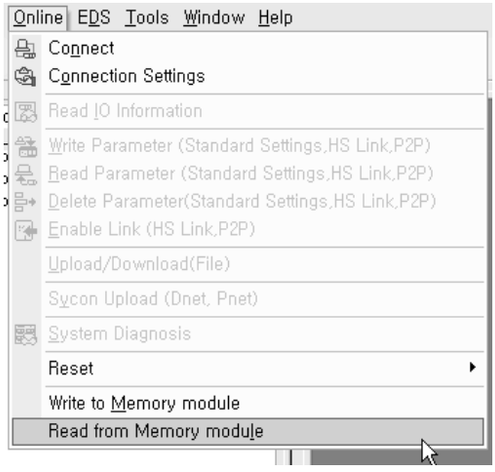
(e) “Enable, Disable” window appears



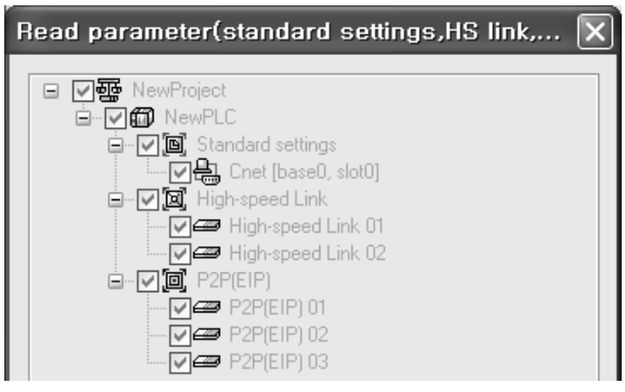
(6) Read from Memory module

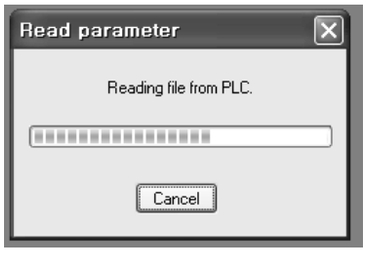
(a) Set the mode switch of XBO-M2MB as “5” and connect XBO-M2MB to USB port of PC

(b) Select “Online → Read from Memory module” on XG-PD menu.



(c) If you click “OK” button”, it read each parameter form the memory module.





Remark

-. “Open from memory module” and “Write to Memory module” menus of XG5000 are activated when PLC is Offline. They are deactivated when PLC is Online.

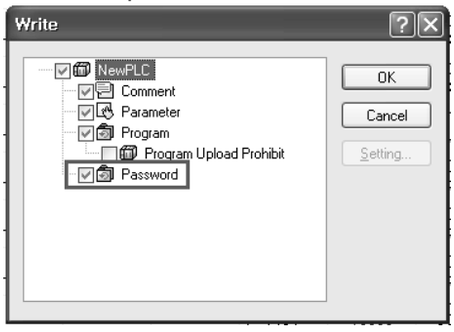
-. When connecting with XG5000, connection type should be ‘USB’

12.1.4 How to use when password is set

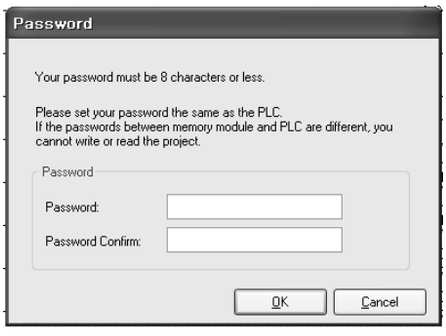
(1) When connecting XG5000 with memory module

(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 XG5000, 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
3) When no password is set in the memory module
- Writing is not executed
4) 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 XG5000 or PLC	RUN LED flickers
3	Connected to XG5000 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 XG5000 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

Remark

-. 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.

Chapter 13 Installation and Wiring

13.1 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
- When 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 10.2 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.
- When load current is 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.

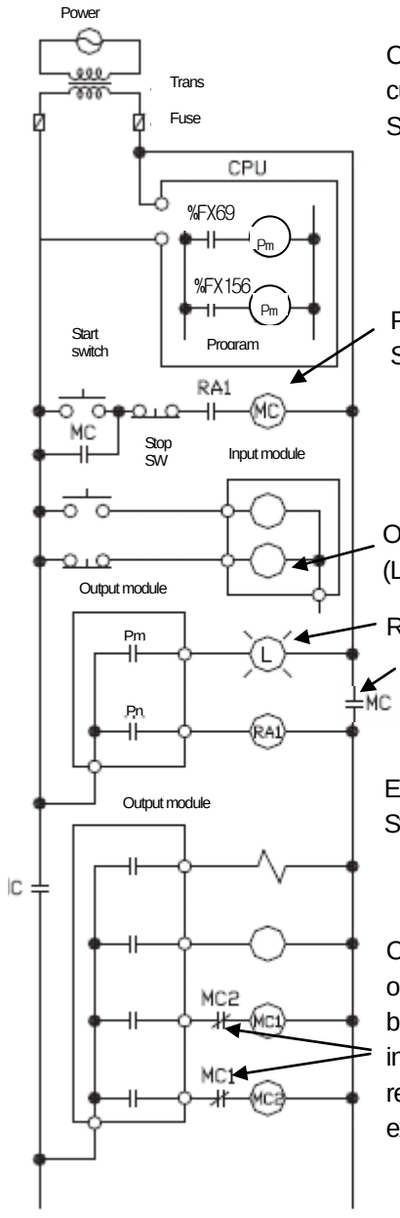
- Process output may not work properly according to difference of delay of PLC main power and external power for process (especially DC in case of PLC power On-Off and of start time.
  For example, in case of turning on PLC main power after supplying external power for process, DC output module may malfunction 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

13.1.1 Fail safe circuit

(1) example of system design (When ERR contact point of power module is not used)

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 to output device

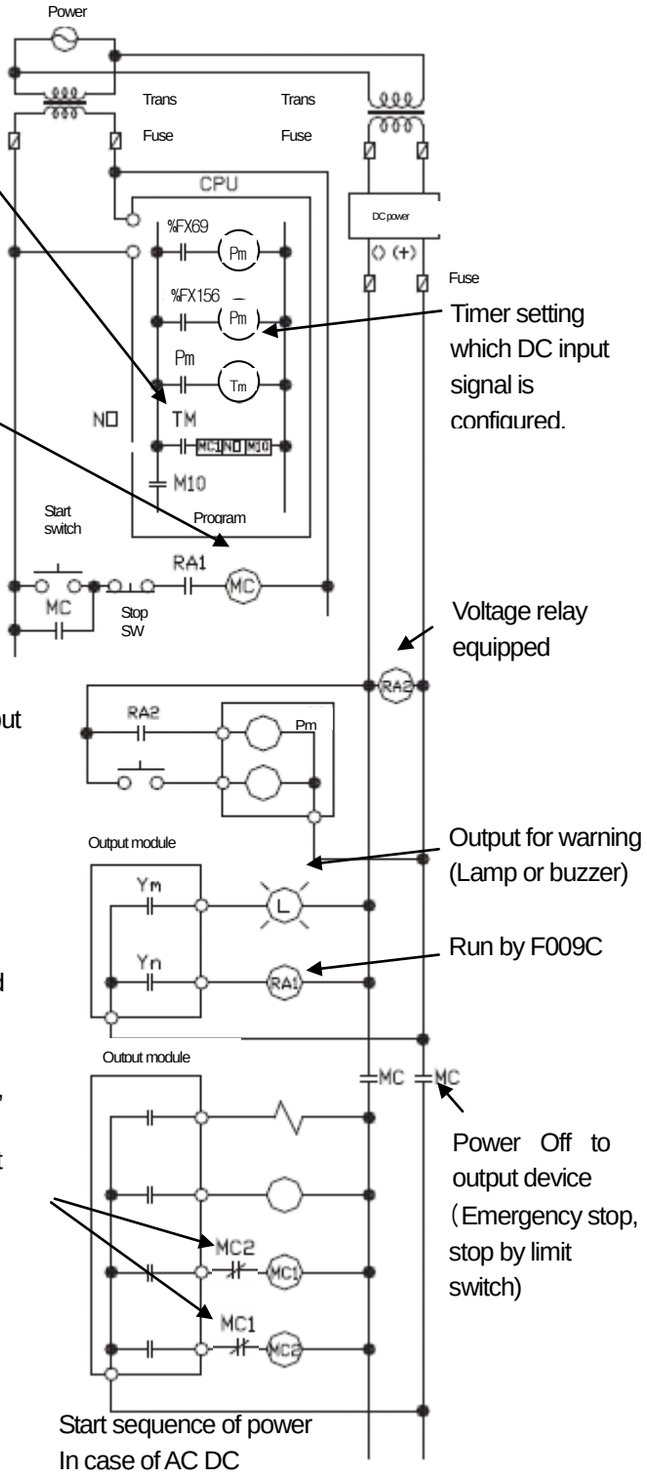
Emergency stop, Stop by limit

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

Output for warning (Lamp or buzzer)

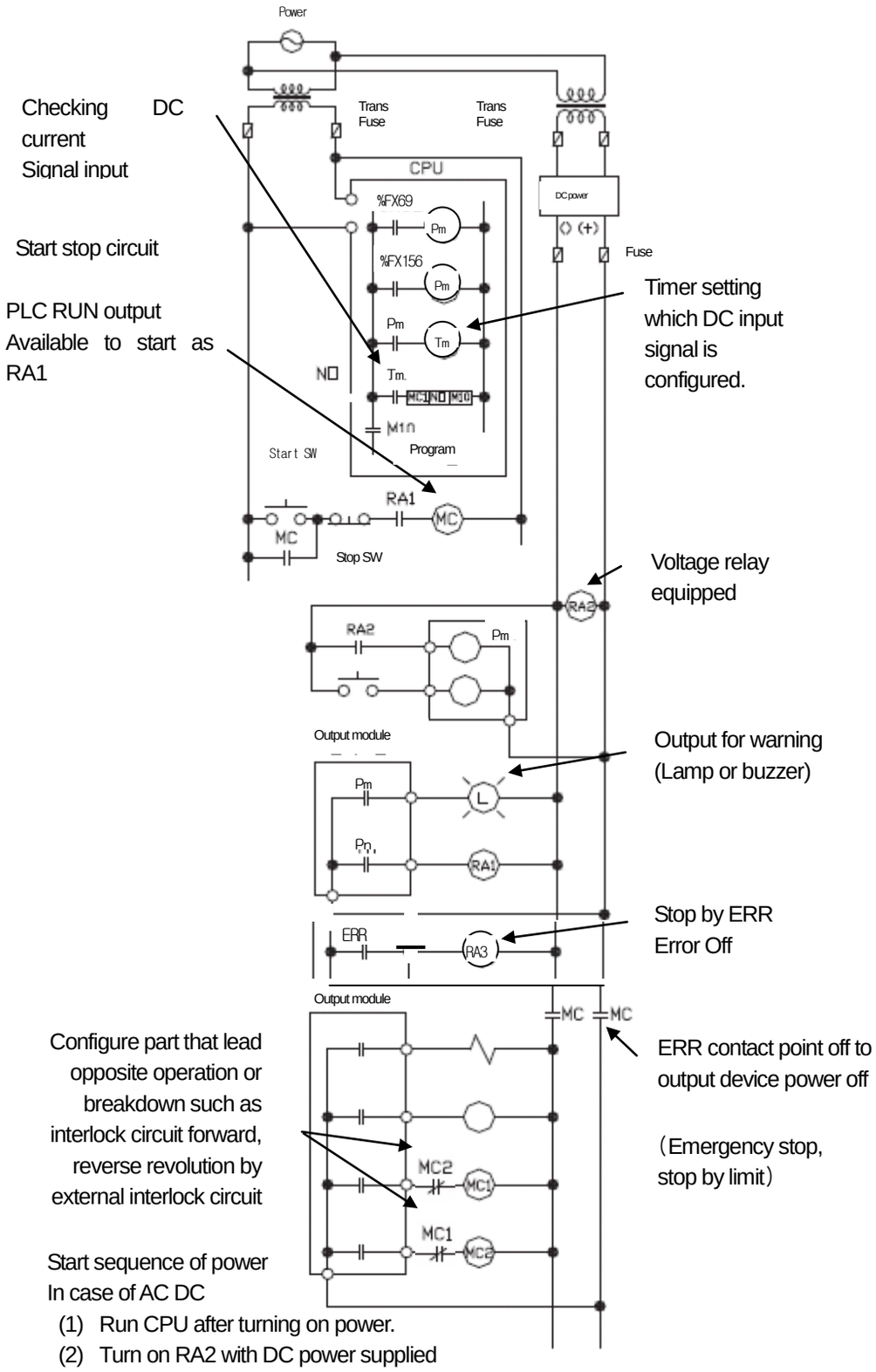
Run by F009C

Power Off to output device (Emergency stop, stop by limit switch)

Start sequence of power
In case of AC DC

(1) Run CPU after power is on
(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 (When ERR contact point of power module is used)



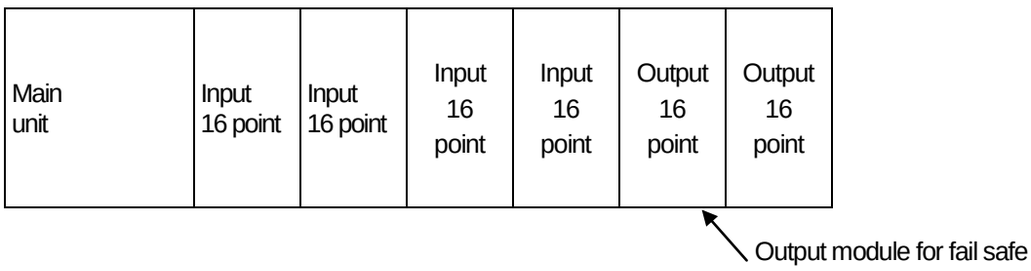
Start sequence of power In case of AC DC

(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 s/w
(5) Turn on start switch Output device runs by program through magnetic contactor (MC) [On]

(3) Fail safe countermeasure in case of PLC error

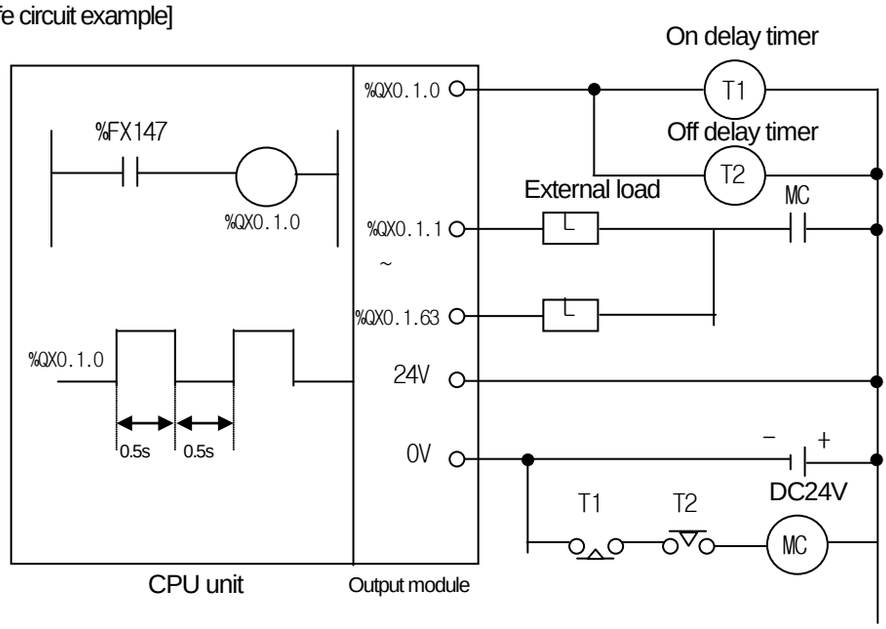
Error of PLC CPU and memory is detected by self diagnosis but in case error occurs in IO control part, etc., CPU can detect the error. In this case, though it is different according to status error, all contact point is on or off, so safety may not be guaranteed. Though we do our best to our quality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

13.1.2 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} X 5) + (I_{24V} X 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} X 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.

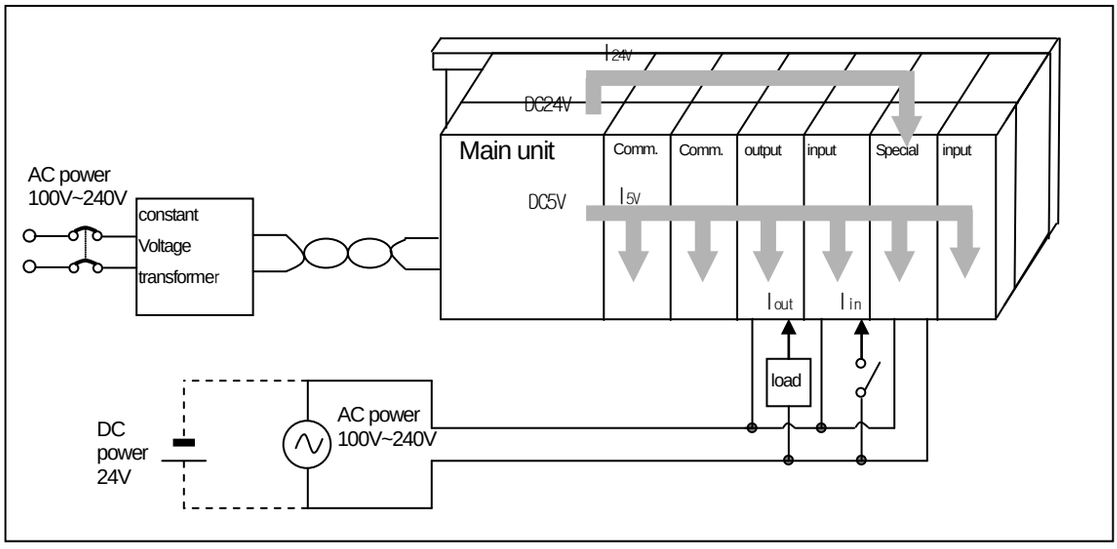
- W_{24V} = I_{24V} X 24 (W)

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

- W_{out} = I_{out} X V_{drop} X 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.

13.2 Attachment/Detachment of Modules

13.2.1 Attachment/Detachment of modules

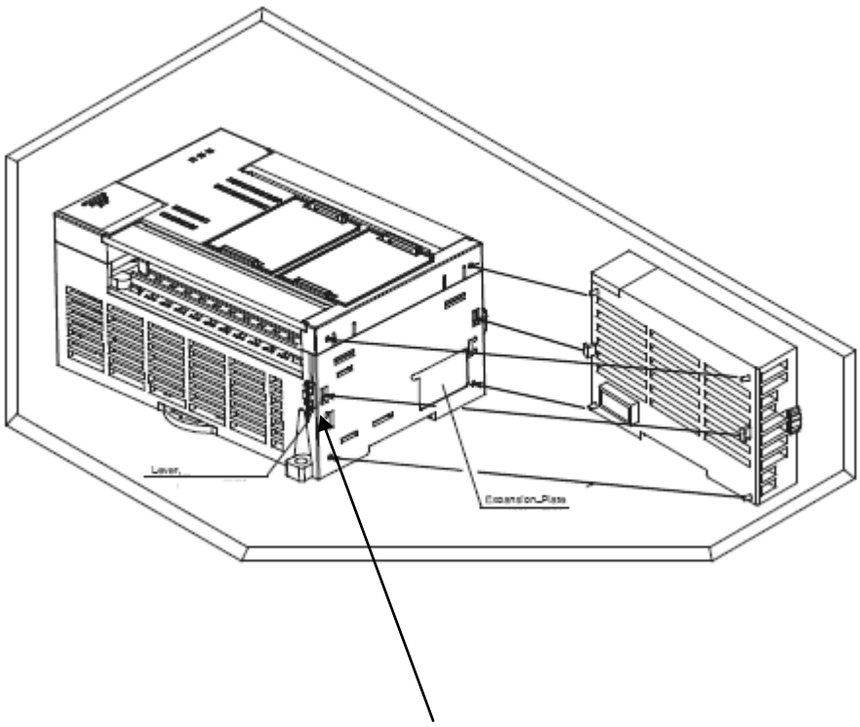
Caution in handling
Use PLC in the range of general specification specified by manual.
In case of usage out of range, it may cause electric shock, fire, malfunction, damage of product.

⚠ Remark

- 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 PCB from case.

(1) Equipment of module

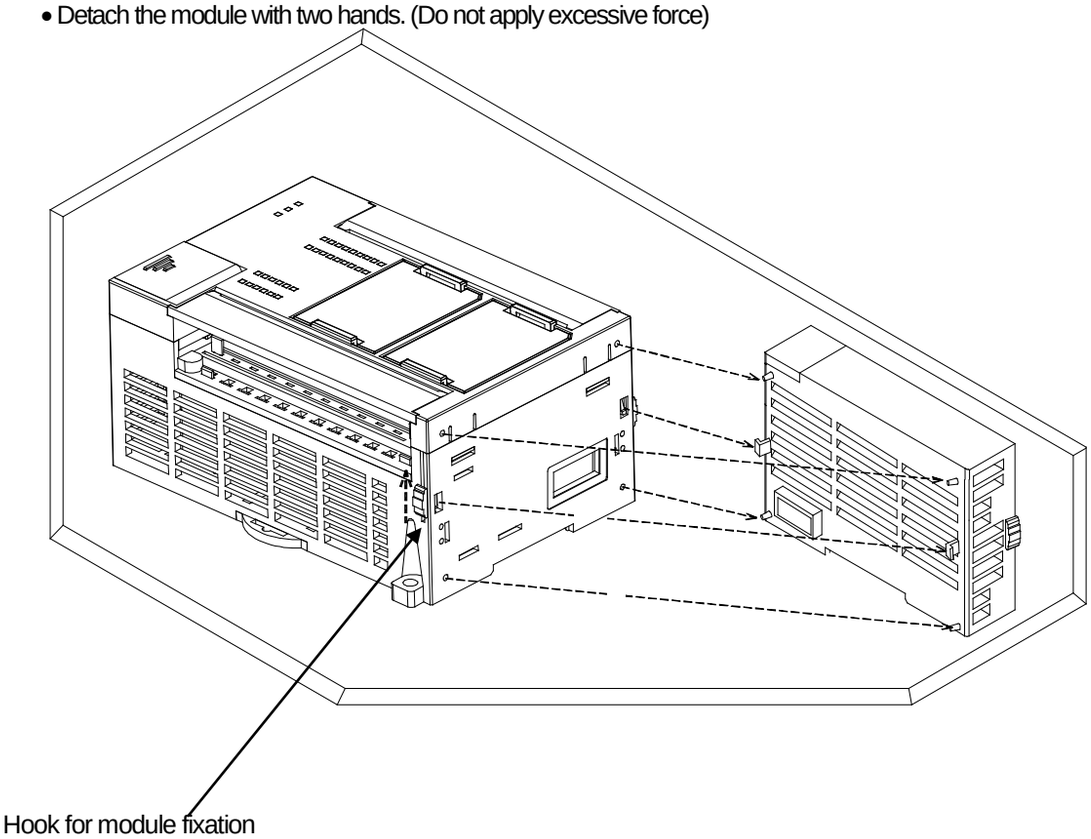
- Eliminate the extension cover on the upper side of module.
- Push the module and connect it in agreement with hook for fixation of four edges and hook for connection at the bottom.
- After connection, pull down the hook for fixation at the upper part and lower part and fix it completely.



Module fixation (Hook)

(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. (Do not apply excessive force)



Hook for module fixation

Remark

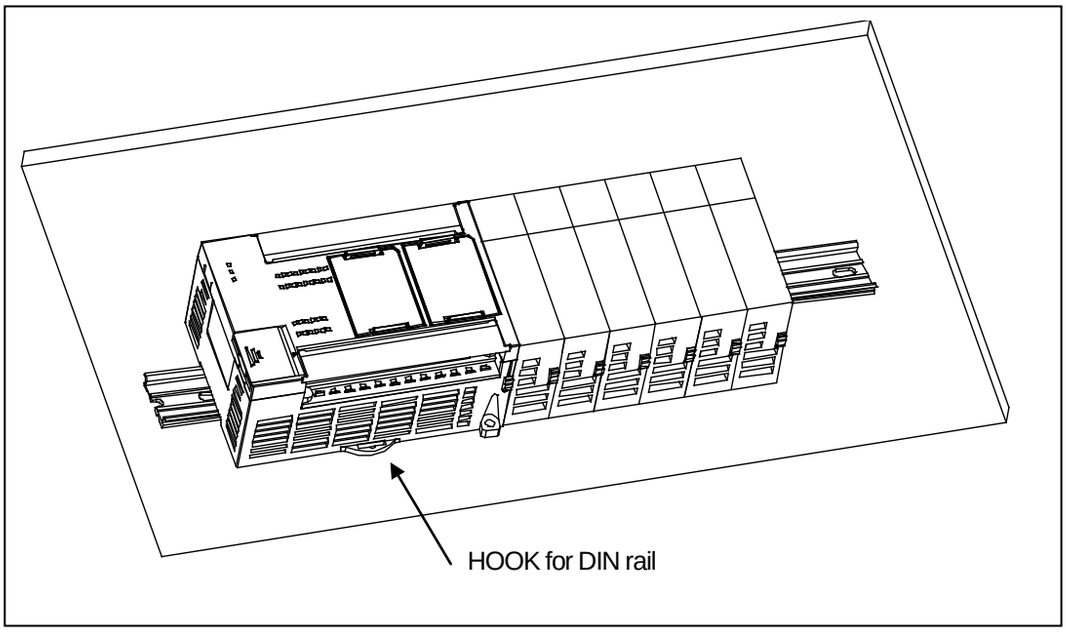
- When separating module, do not apply excessive force. If so, hook may be damaged.

(3) Installation of module

XGB PLC has a hook for DIN rail (rail width: 35mm) so that cab be installed at DIN rail.

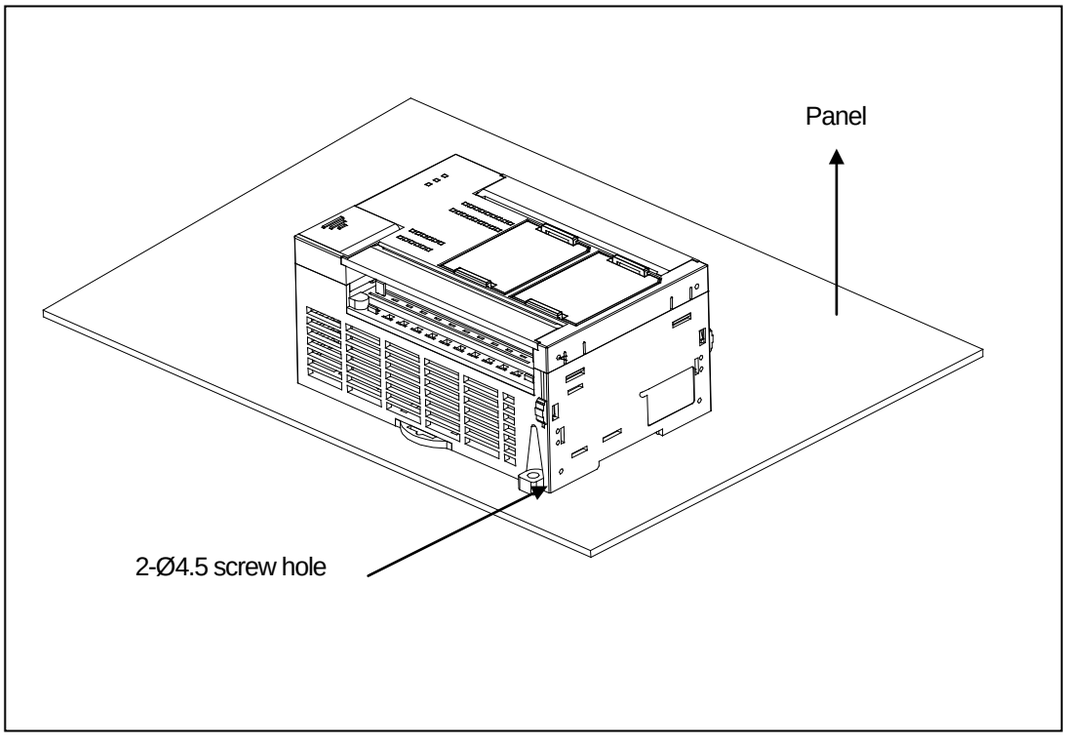
(a) In case of installing at DIN rail

- Pull the hook as shown below for DIN rail at the bottom of module and install it at DIN rail
- Push the hook to fix the module at DIN rail after installing module at DIN rail



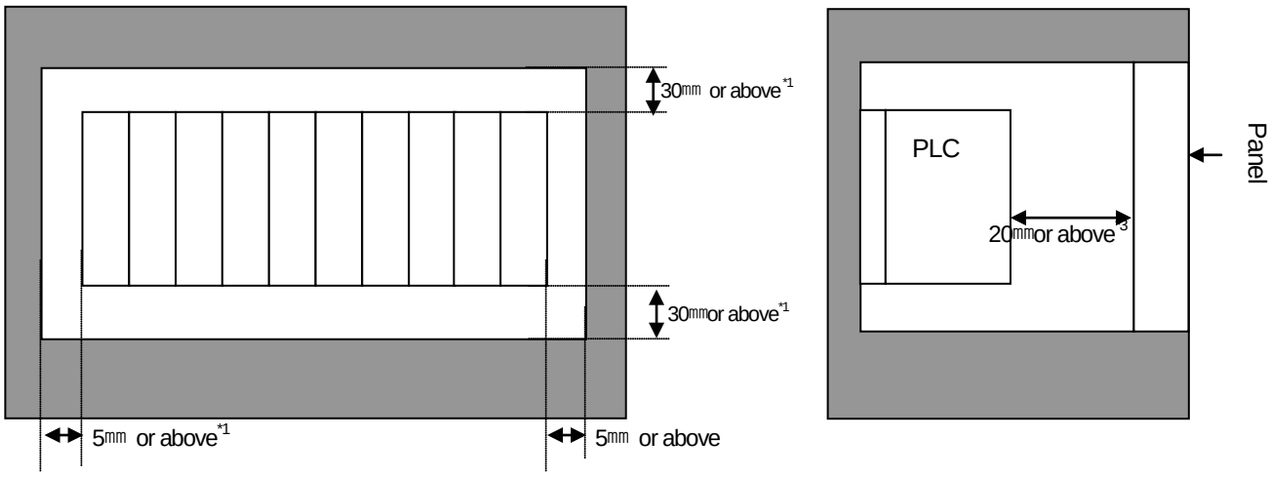
(b) In case of installing at panel

- You can install XGB compact type main unit onto a panel directly using screw hole
- Use M4 type screw to install the product onto a panel.



(4) Module equipment location

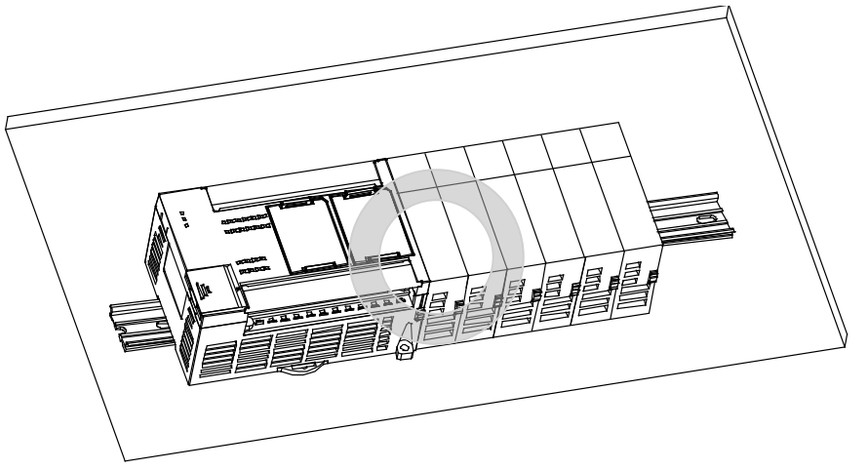
Keep the following distance between module and structure or part for ventilation, easy detachment and attachment.



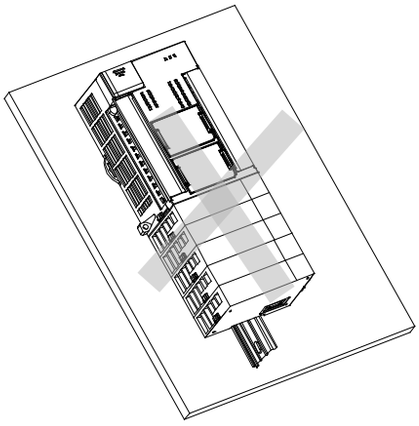
*1 : In case height of wiring duct is less than 50 mm (except this 40mm or more)
*2 : In case of equipping cable without removing near module, 20mm or more
*3 : In case of connector type, 20mm or above

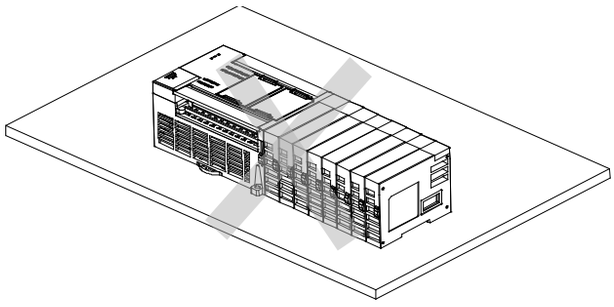
(5) Module equipment direction

(a) For easy ventilation, install as shown below.



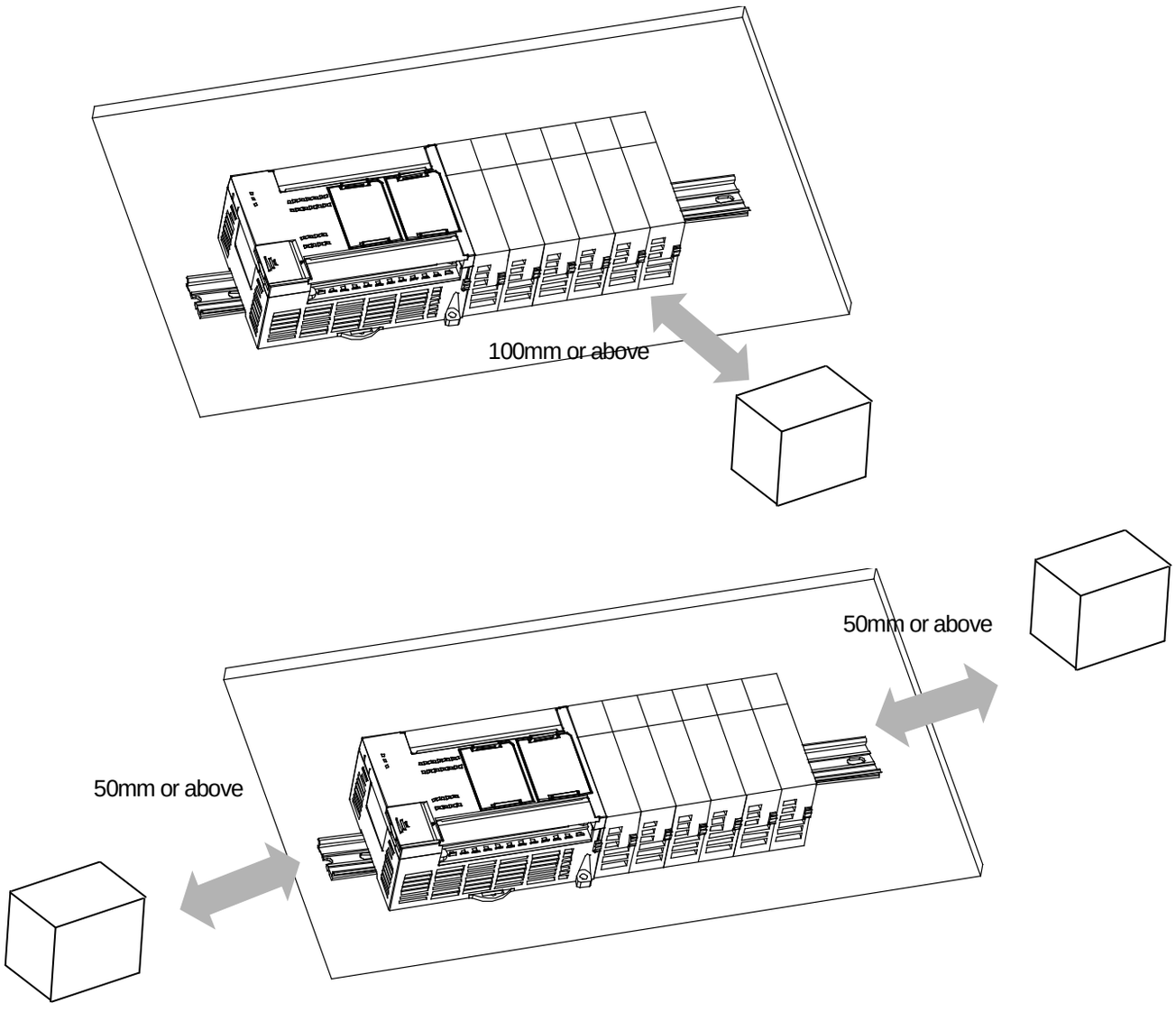
(b) Don't install as shown below.





(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 more
Device installed beside PLC: 50 ㎜ or more



13.2.2 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 an 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

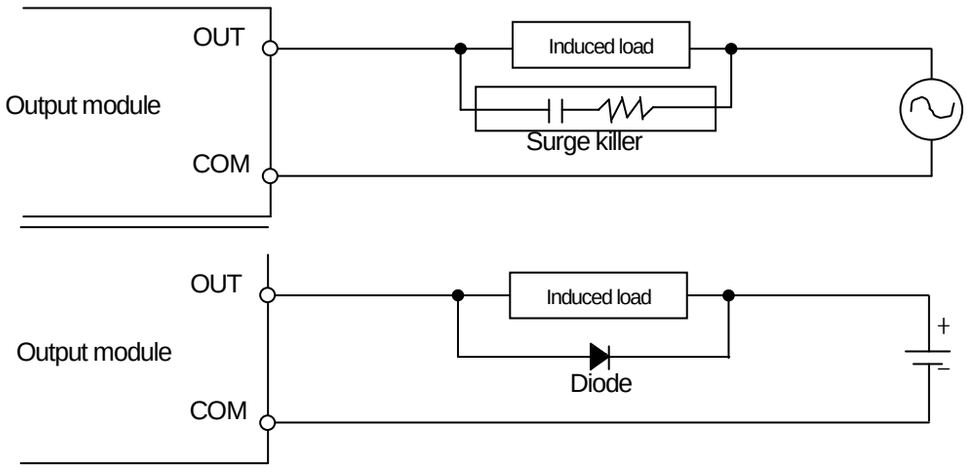
In case of wiring IO module, if device or material that induce high heat is too close or oil contacts wire too long time, it may cause short, malfunction or error.

(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 in parallel. Connect cathode of diode to + side of power.



(f) Terminal block

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

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

13.3 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.

⚠ Remark

- 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.

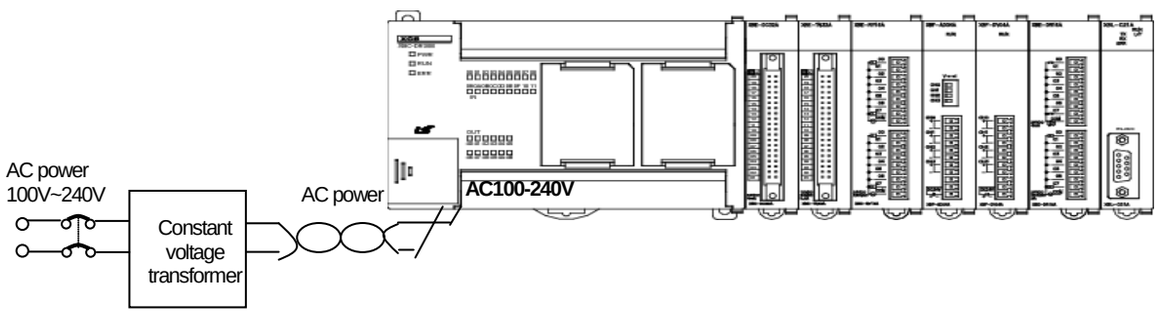
- For external connecting connector, use designated device and solder.

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.

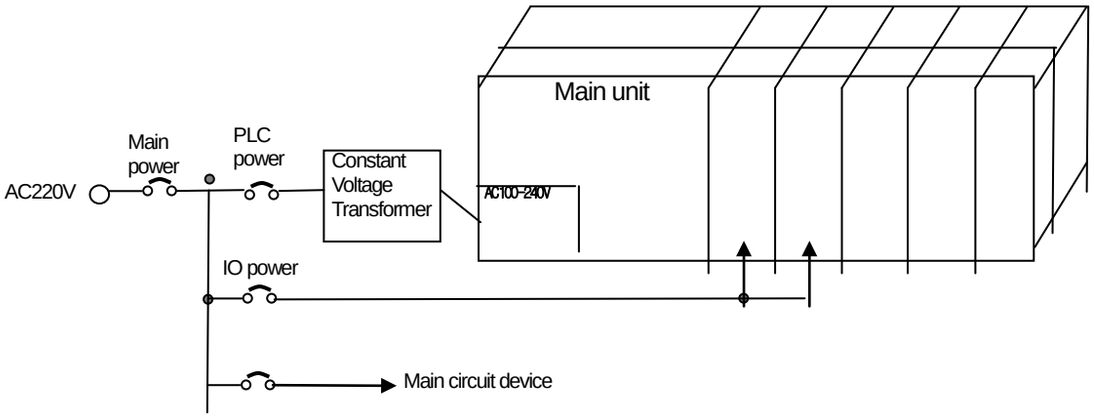
13.3.1 Power wiring

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



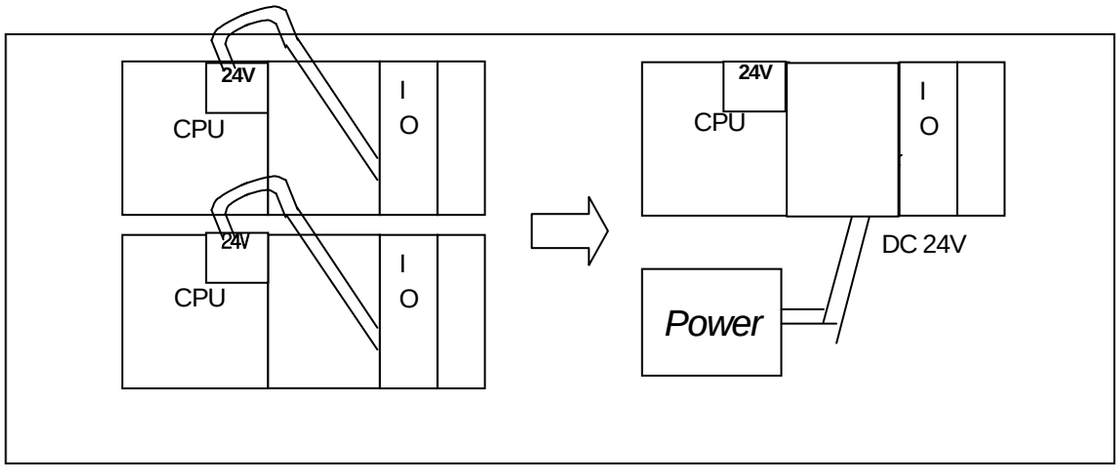
(2) Connect noise that include small noise between line and earth.
(When there are moch noise, connect insulated transformer.)

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



(4) If using DC24V of the main unit

(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.

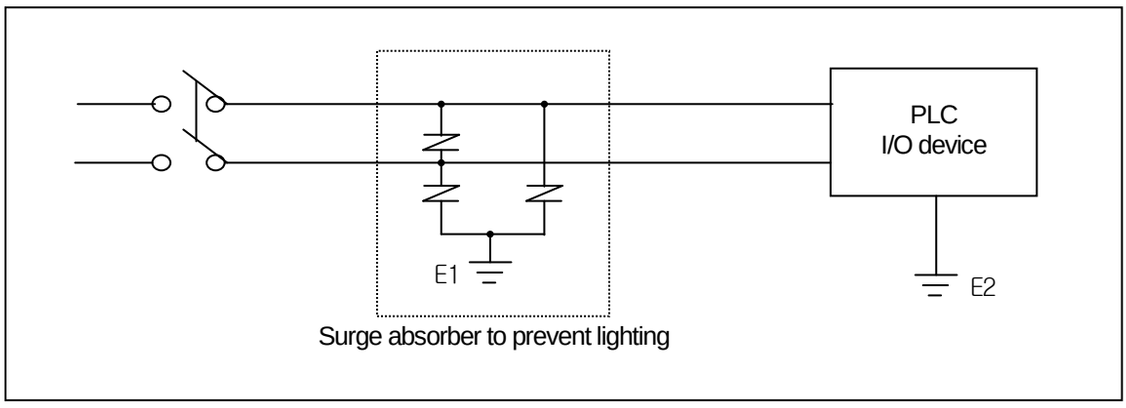


(5) AC110V/AC220V/DC24V cables should be compactly twisted and connected in the shortest distance.

(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.



Remark

(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 penetration coure 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.

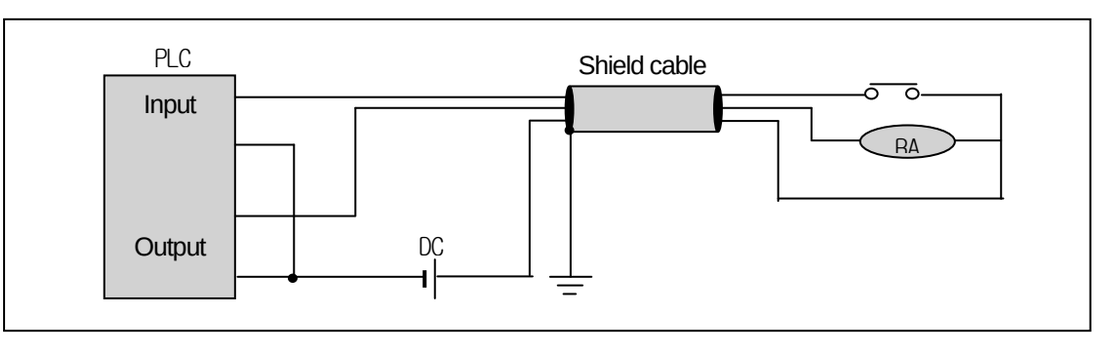
13.3.2 I/O Device wiring

(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.



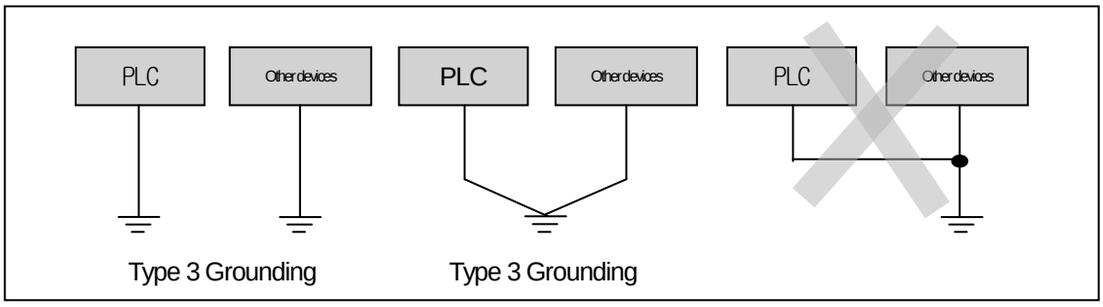
(5) When applying pipe-wiring, make sure to firmly ground the piping.

13.3.3 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.

13.3.4 Specifications of wiring cable

The specifications of cable used for wiring are as follows.

Types of external connection	Cable specification (mm^2)	
	Lower limit	Upper limit
Digital input	0.18 (AWG24)	1.5 (AWG16)
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 13 Installation and Wiring

13.1 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
- When 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 10.2 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.
- When load current is 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.

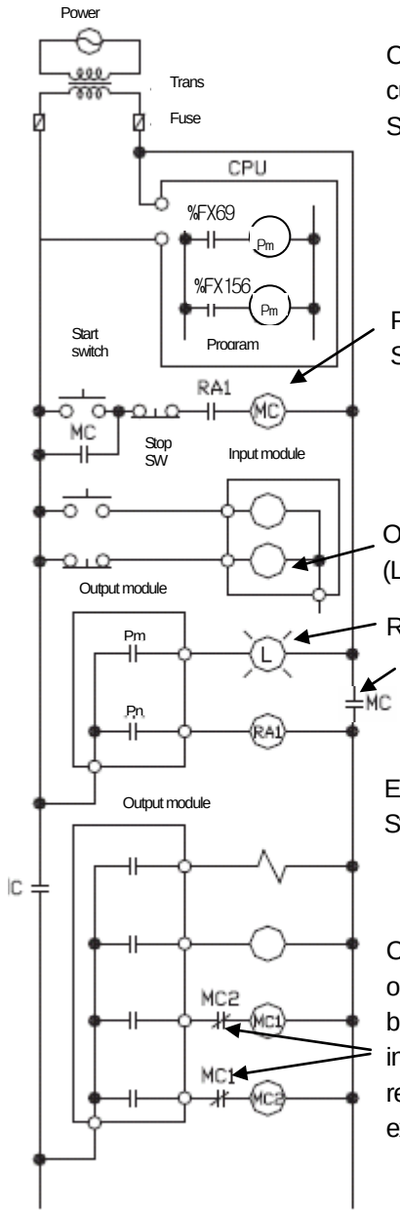
- Process output may not work properly according to difference of delay of PLC main power and external power for process (especially DC in case of PLC power On-Off and of start time.
  For example, in case of turning on PLC main power after supplying external power for process, DC output module may malfunction 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

13.1.1 Fail safe circuit

(1) example of system design (When ERR contact point of power module is not used)

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 to output device

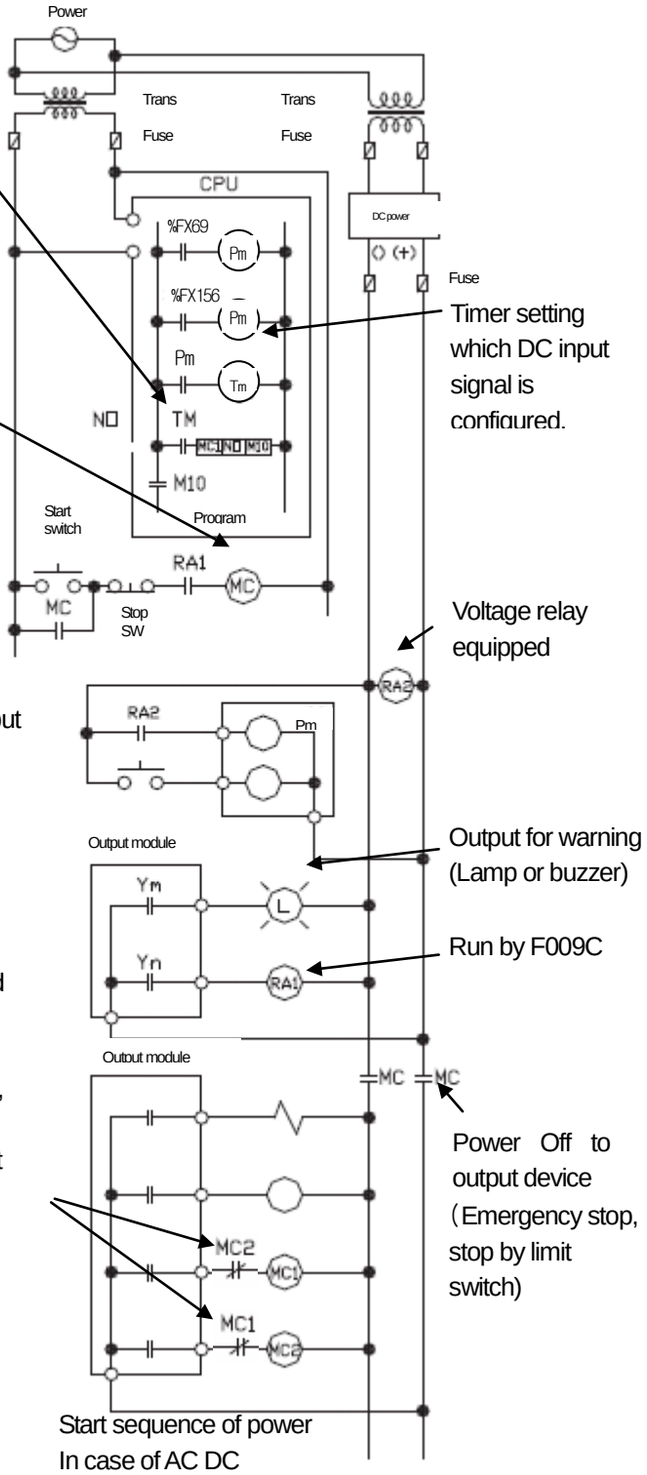
Emergency stop, Stop by limit

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

Output for warning (Lamp or buzzer)

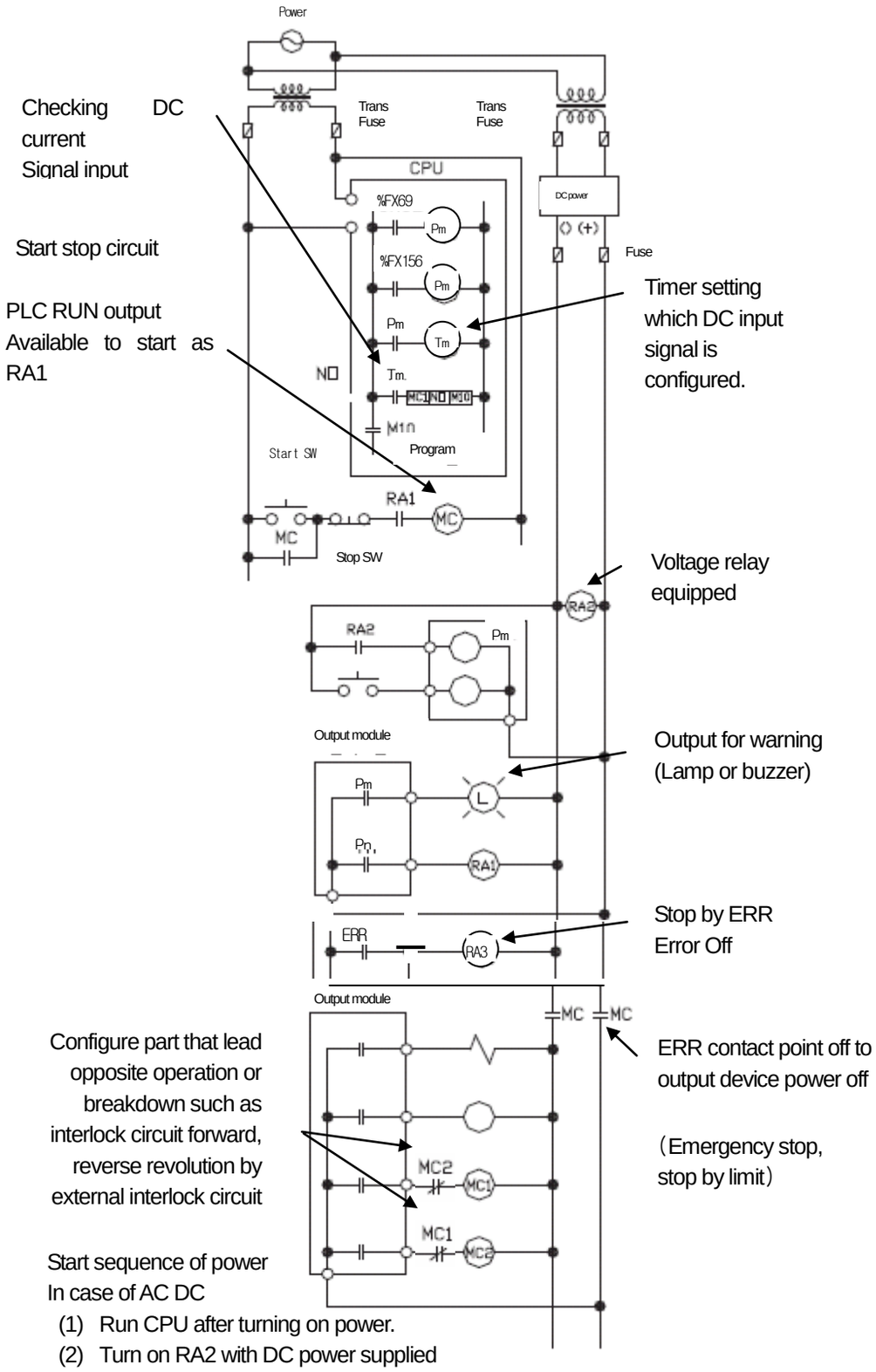
Run by F009C

Power Off to output device (Emergency stop, stop by limit switch)

Start sequence of power
In case of AC DC

(1) Run CPU after power is on
(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 (When ERR contact point of power module is used)



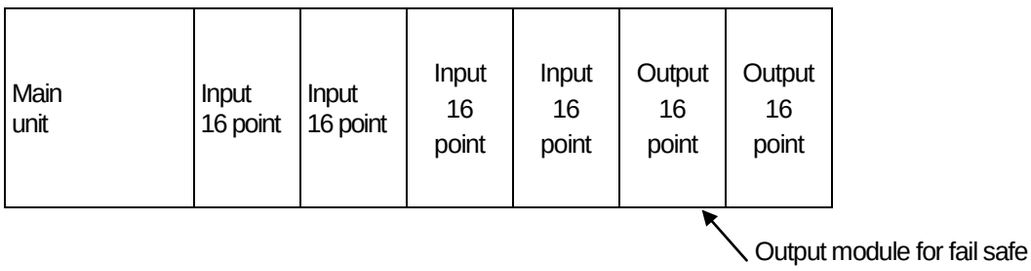
Start sequence of power In case of AC DC

(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 s/w
(5) Turn on start switch Output device runs by program through magnetic contactor (MC) [On]

(3) Fail safe countermeasure in case of PLC error

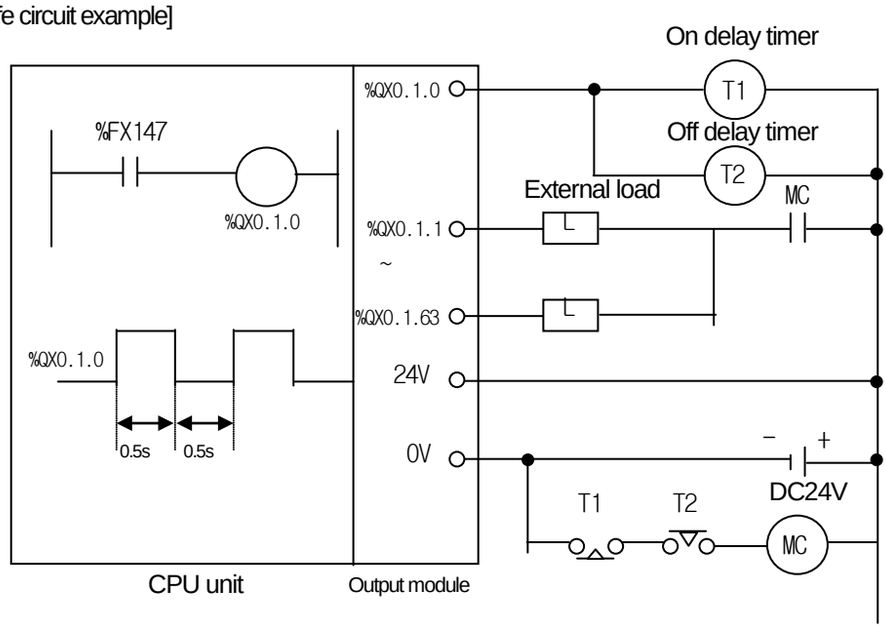
Error of PLC CPU and memory is detected by self diagnosis but in case error occurs in IO control part, etc., CPU can detect the error. In this case, though it is different according to status error, all contact point is on or off, so safety may not be guaranteed. Though we do our best to our quality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

13.1.2 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} X 5) + (I_{24V} X 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} X 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.

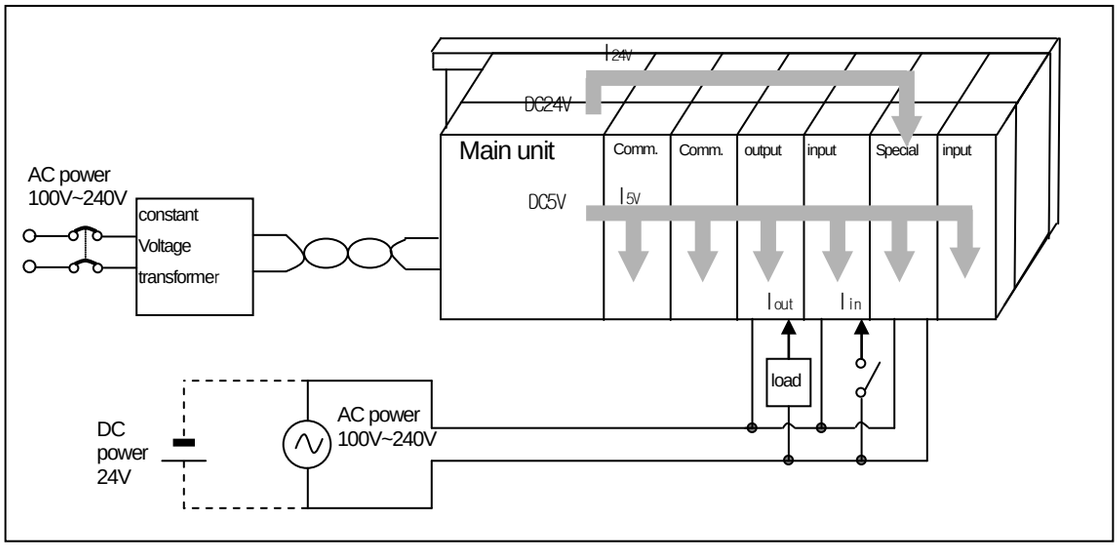
- W_{24V} = I_{24V} X 24 (W)

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

- W_{out} = I_{out} X V_{drop} X 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.

13.2 Attachment/Detachment of Modules

13.2.1 Attachment/Detachment of modules

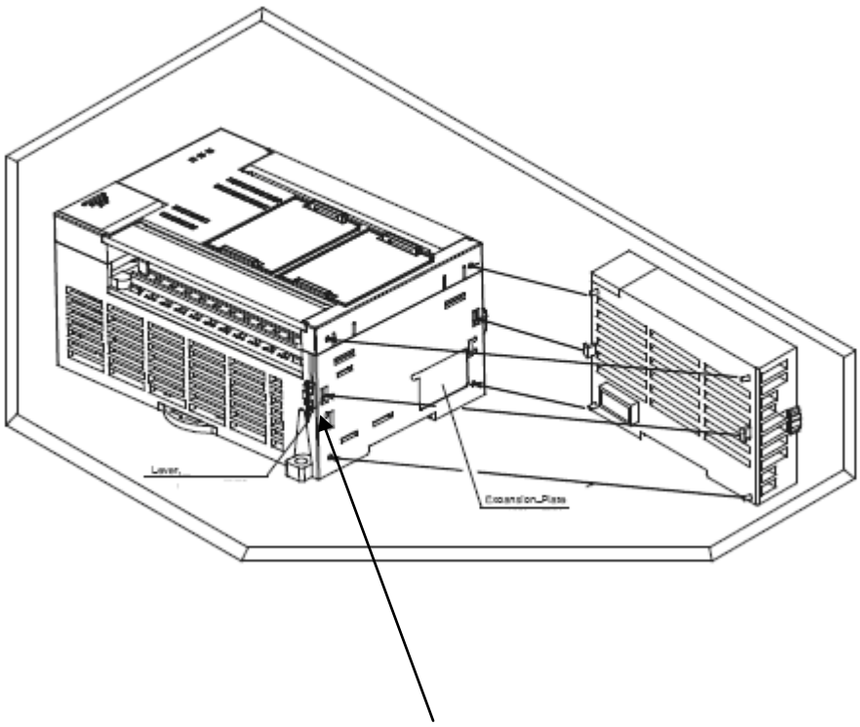
Caution in handling
Use PLC in the range of general specification specified by manual.
In case of usage out of range, it may cause electric shock, fire, malfunction, damage of product.

⚠ Remark

- 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 PCB from case.

(1) Equipment of module

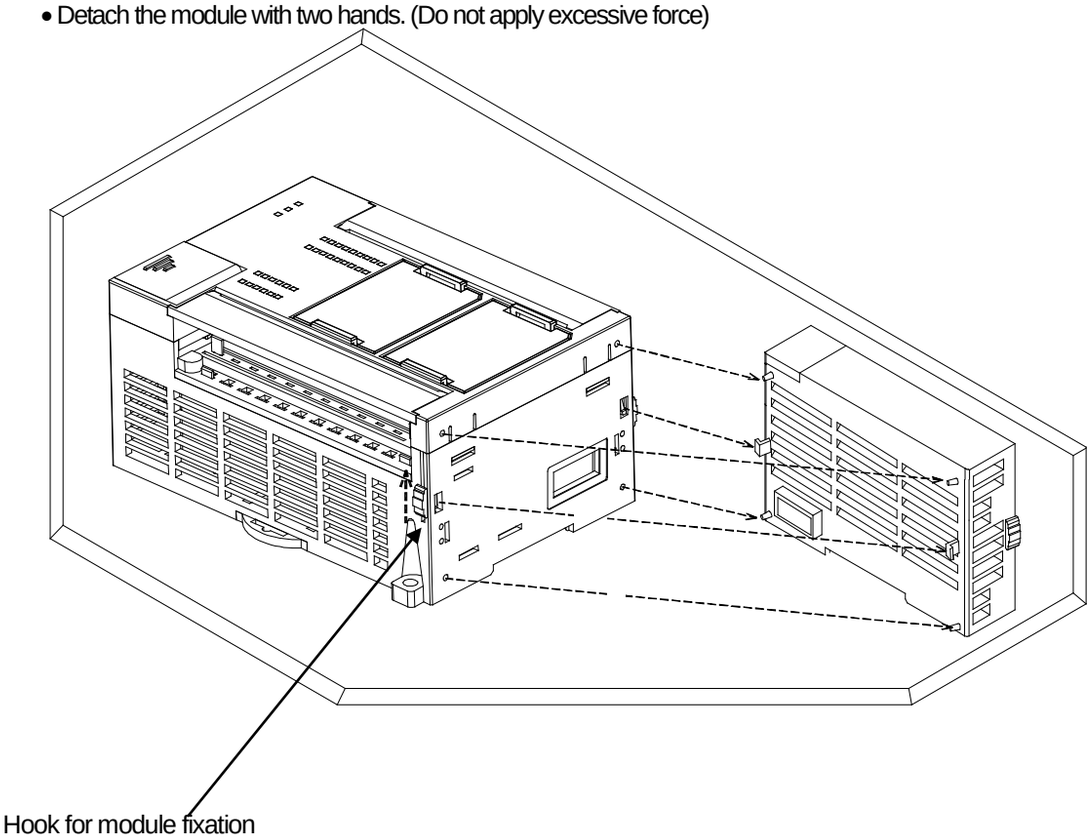
- Eliminate the extension cover on the upper side of module.
- Push the module and connect it in agreement with hook for fixation of four edges and hook for connection at the bottom.
- After connection, pull down the hook for fixation at the upper part and lower part and fix it completely.



Module fixation (Hook)

(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. (Do not apply excessive force)



Hook for module fixation

Remark

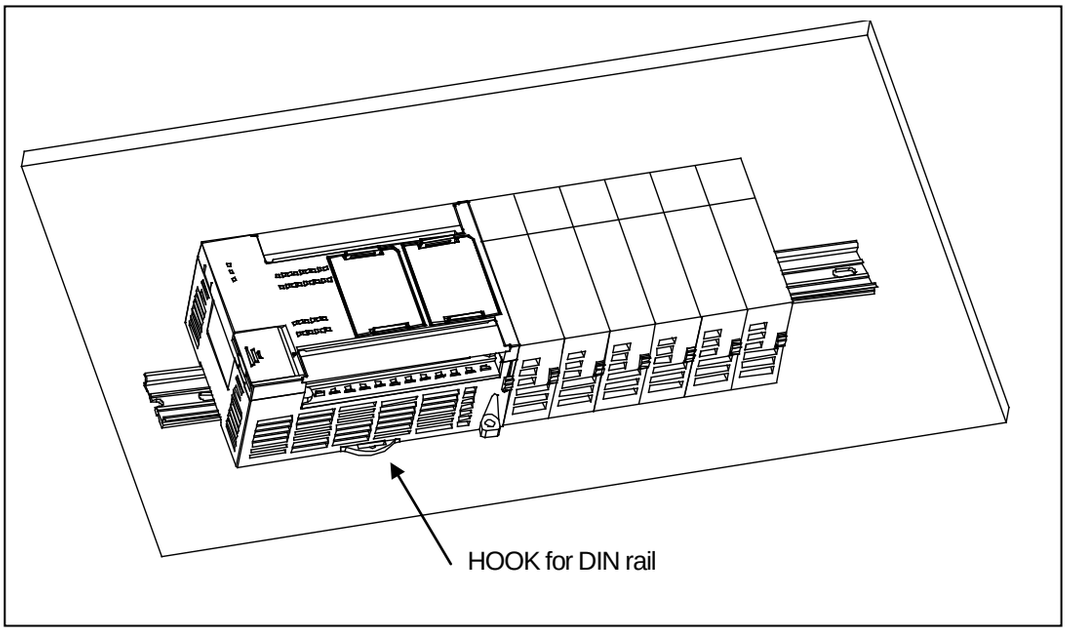
- When separating module, do not apply excessive force. If so, hook may be damaged.

(3) Installation of module

XGB PLC has a hook for DIN rail (rail width: 35mm) so that cab be installed at DIN rail.

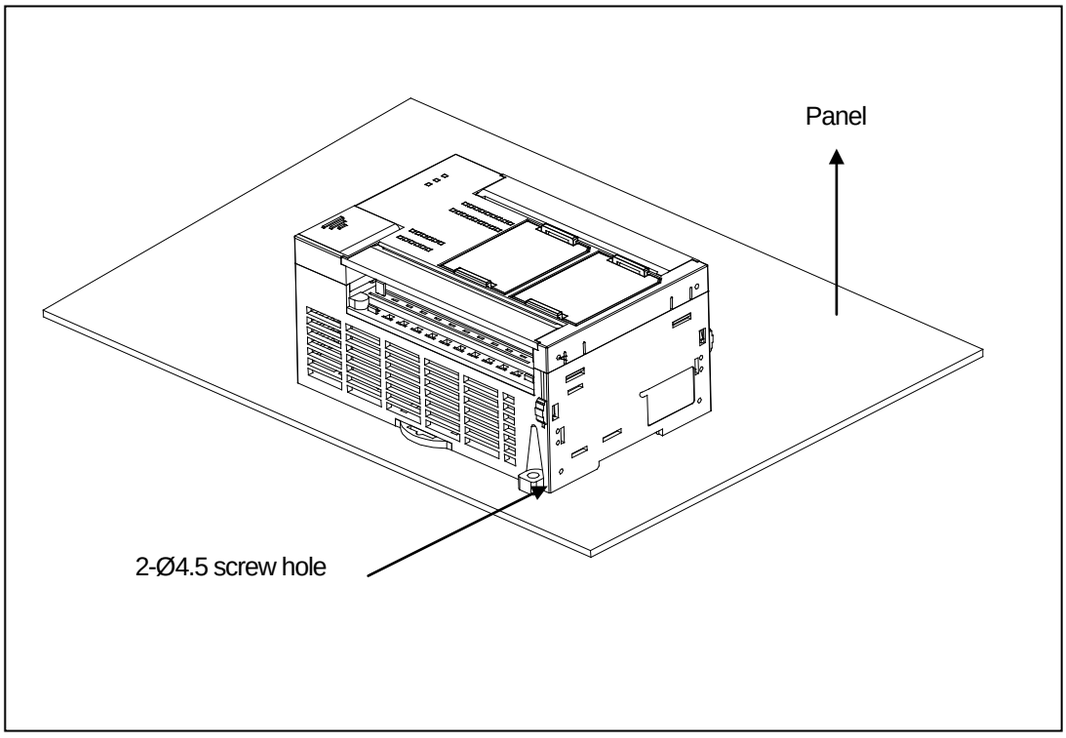
(a) In case of installing at DIN rail

- Pull the hook as shown below for DIN rail at the bottom of module and install it at DIN rail
- Push the hook to fix the module at DIN rail after installing module at DIN rail



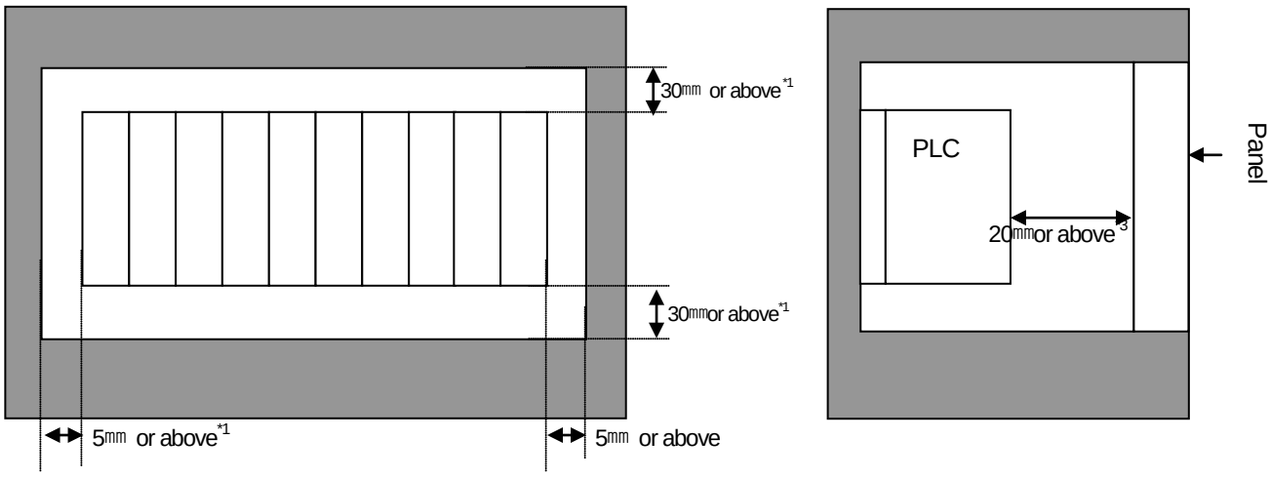
(b) In case of installing at panel

- You can install XGB compact type main unit onto a panel directly using screw hole
- Use M4 type screw to install the product onto a panel.



(4) Module equipment location

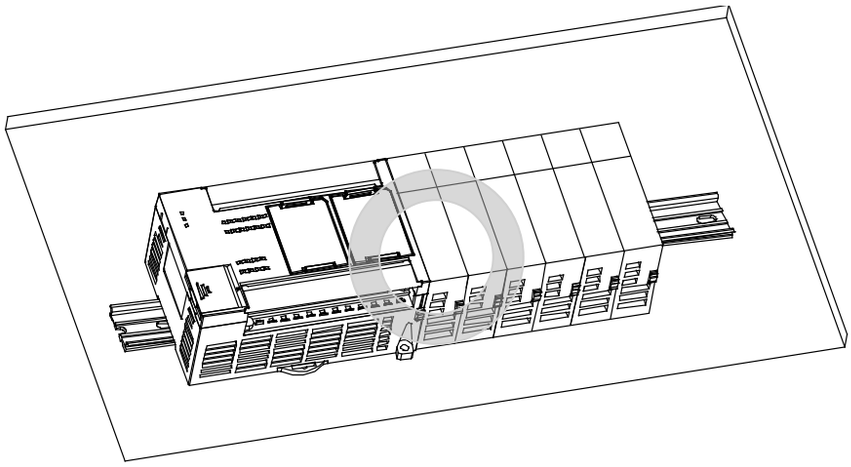
Keep the following distance between module and structure or part for ventilation, easy detachment and attachment.



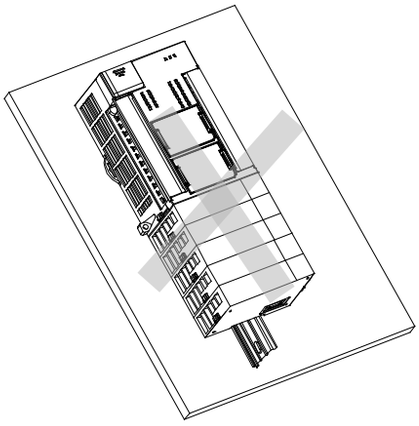
*1 : In case height of wiring duct is less than 50 mm (except this 40mm or more)
*2 : In case of equipping cable without removing near module, 20mm or more
*3 : In case of connector type, 20mm or above

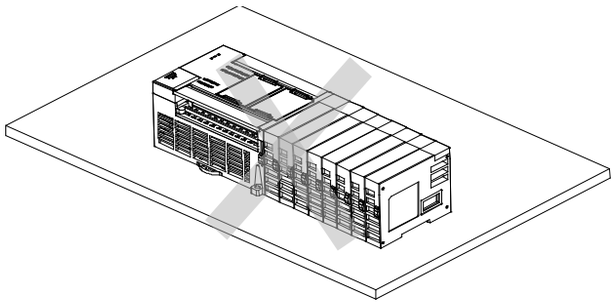
(5) Module equipment direction

(a) For easy ventilation, install as shown below.



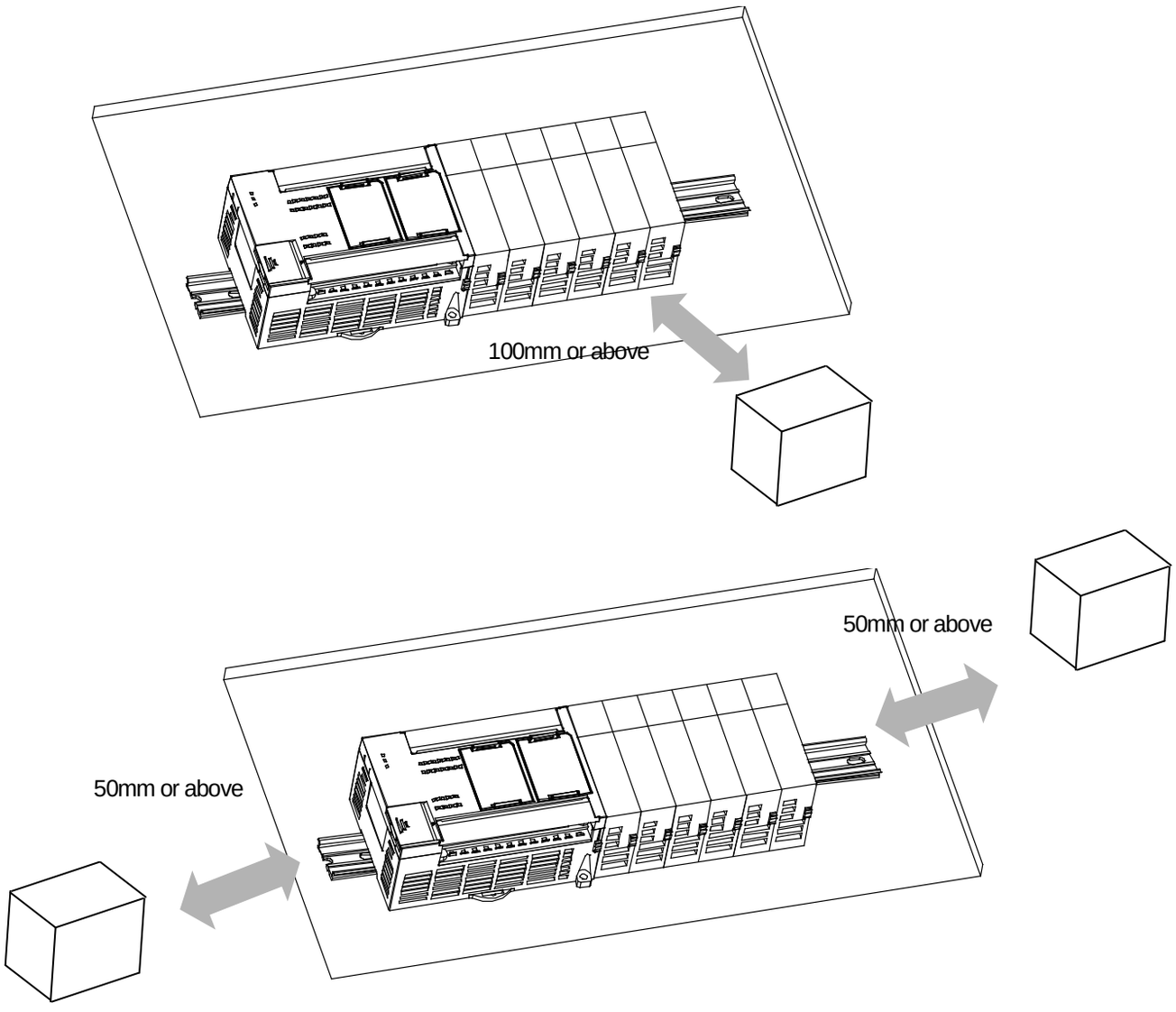
(b) Don't install as shown below.





(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 more
Device installed beside PLC: 50 ㎜ or more



13.2.2 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 an 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

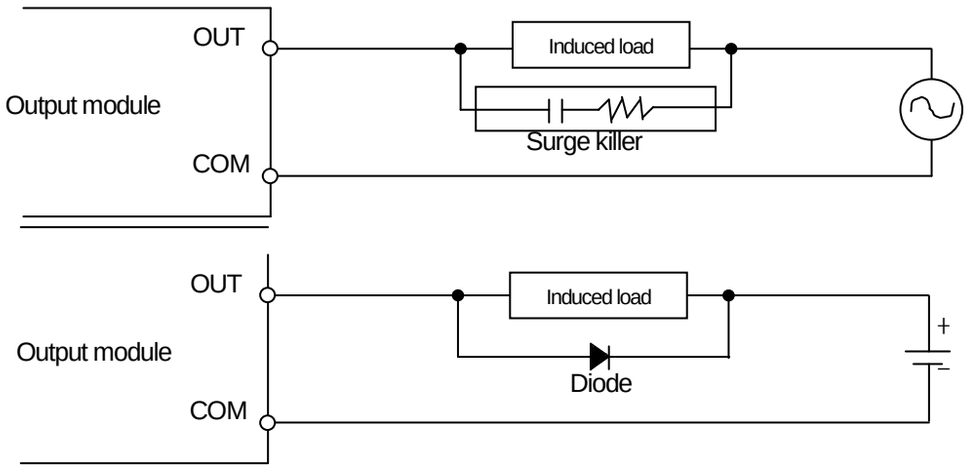
In case of wiring IO module, if device or material that induce high heat is too close or oil contacts wire too long time, it may cause short, malfunction or error.

(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 in parallel. Connect cathode of diode to + side of power.



(f) Terminal block

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

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

13.3 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.

⚠ Remark

- 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.

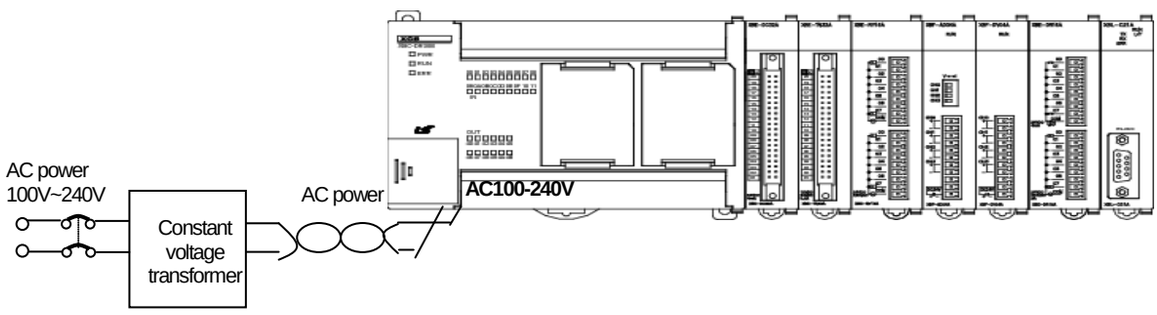
- For external connecting connector, use designated device and solder.

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.

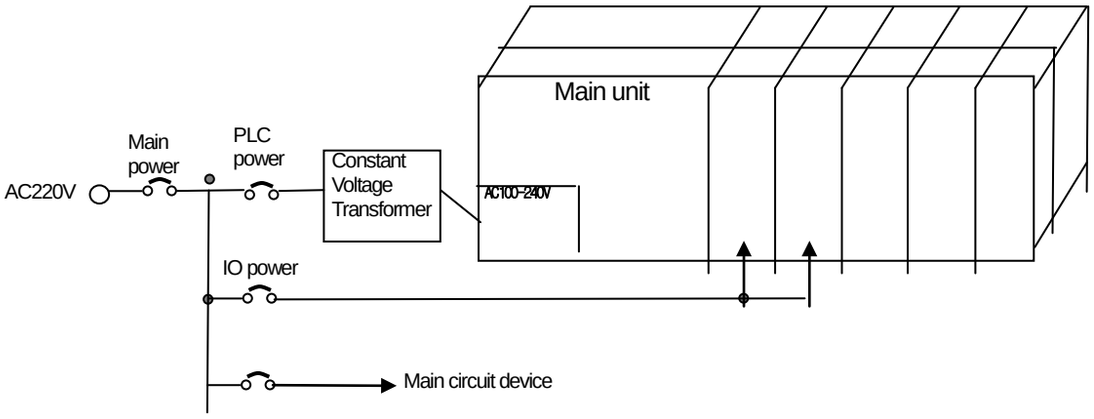
13.3.1 Power wiring

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



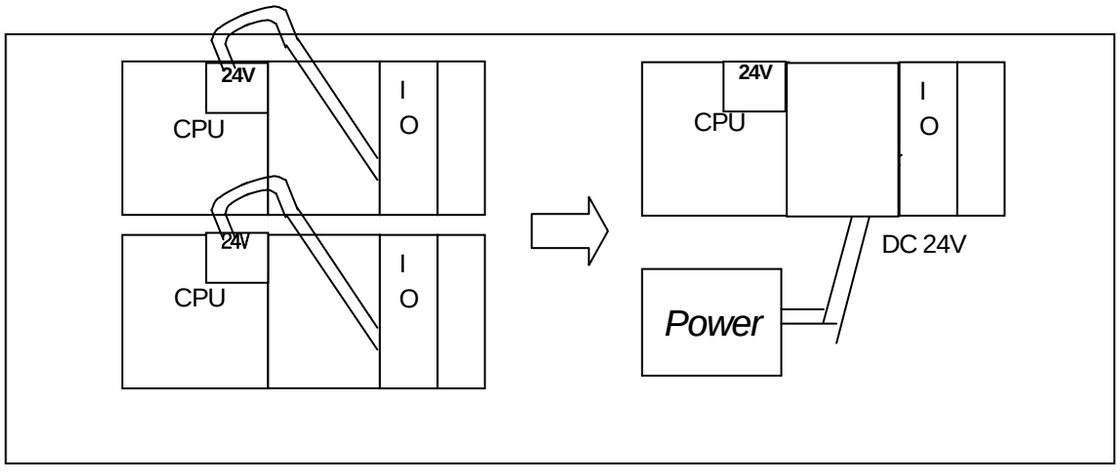
(2) Connect noise that include small noise between line and earth.
(When there are moch noise, connect insulated transformer.)

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



(4) If using DC24V of the main unit

(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.

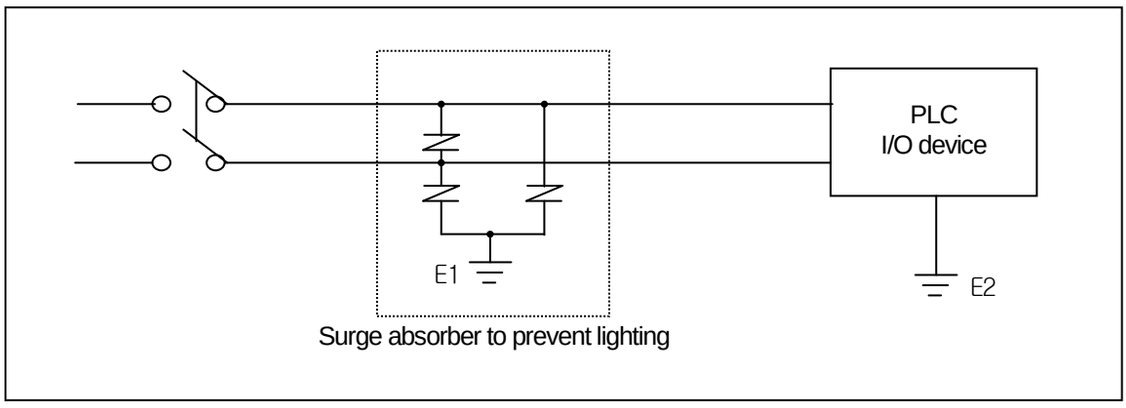


(5) AC110V/AC220V/DC24V cables should be compactly twisted and connected in the shortest distance.

(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.



Remark

(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 penetration coure 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.

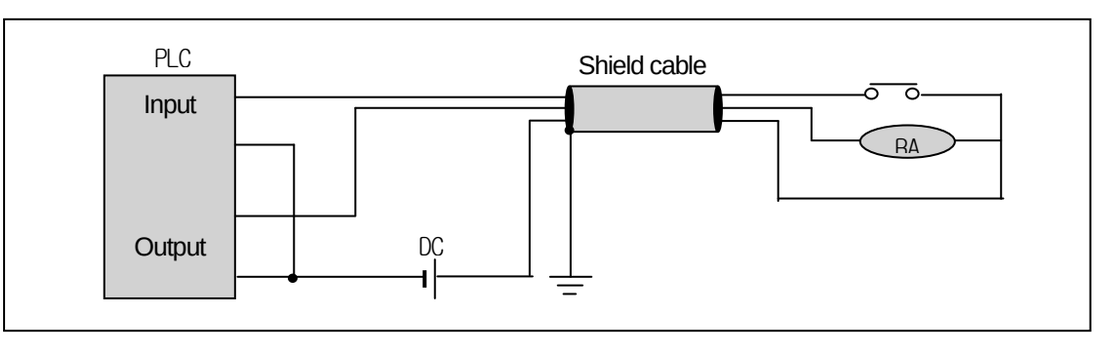
13.3.2 I/O Device wiring

(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.



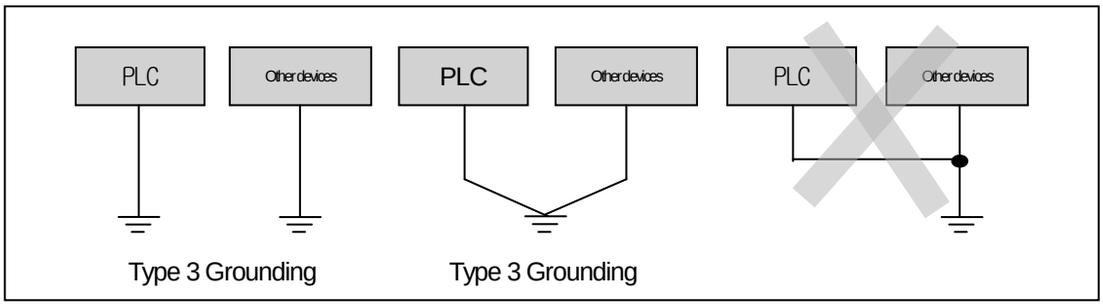
(5) When applying pipe-wiring, make sure to firmly ground the piping.

13.3.3 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.

13.3.4 Specifications of wiring cable

The specifications of cable used for wiring are as follows.

Types of external connection	Cable specification (mm^2)	
	Lower limit	Upper limit
Digital input	0.18 (AWG24)	1.5 (AWG16)
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 14 Maintenance

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

14.1 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°C	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.

14.2 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 base		Check the screws.	Screws should not be loose.	Retighten Screws.
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 4.
	Run LED	Check that the LED is On during Run.	On (flickering or On indicates an error)	See chapter 4.
	ERR LED	Check that the LED is Off during Run.	Flickering indicates an error	See chapter 4.
	Input LED	Check that the LED turns On and Off.	On when input is On, Off when input is off.	See chapter 4.
	Output LED	Check that the LED turns On and Off	On when output is On, Off when output is off	See chapter 4.

14.3 Periodic Inspection

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

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	
Connectingconditions	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	DC24V: DC20.4 ~ 28.8V	Change supply power

Chapter 15 Troubleshooting

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

15.1 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 are 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.

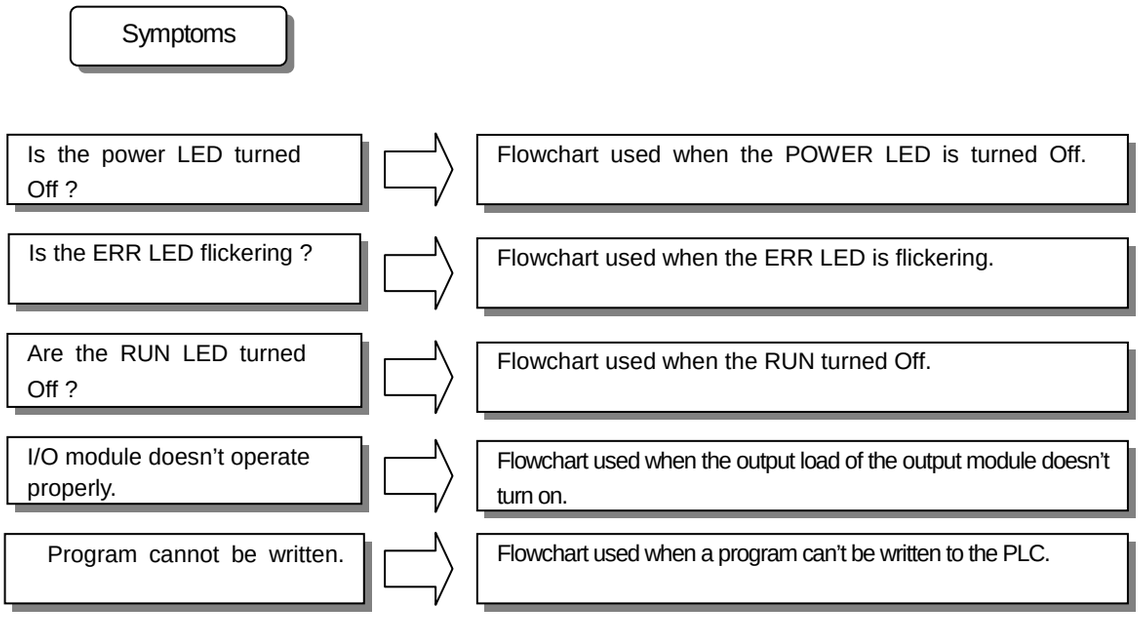
- Switch to the STOP position, and then turn the power on and off.

(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?

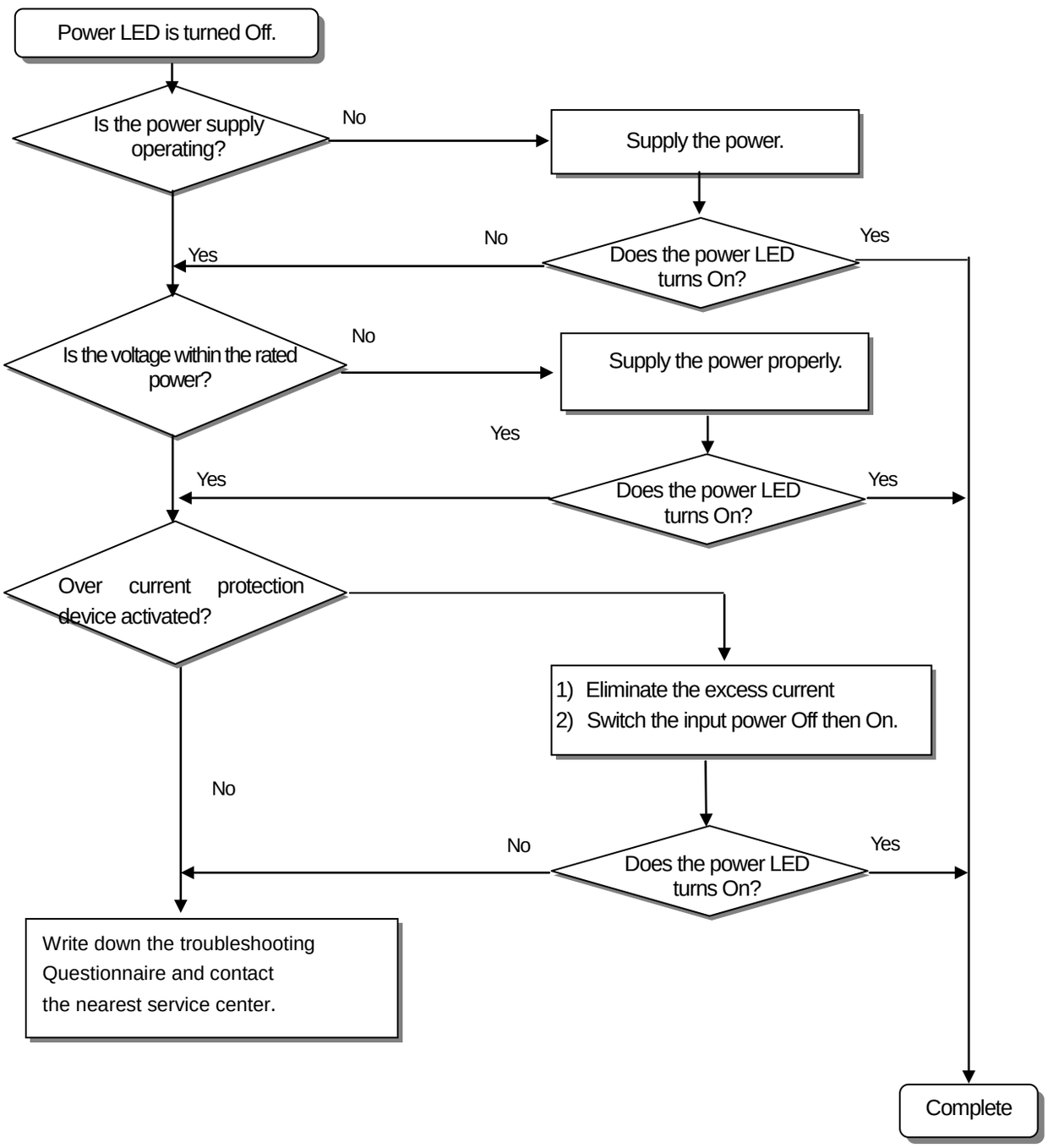
15.2 Troubleshooting

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



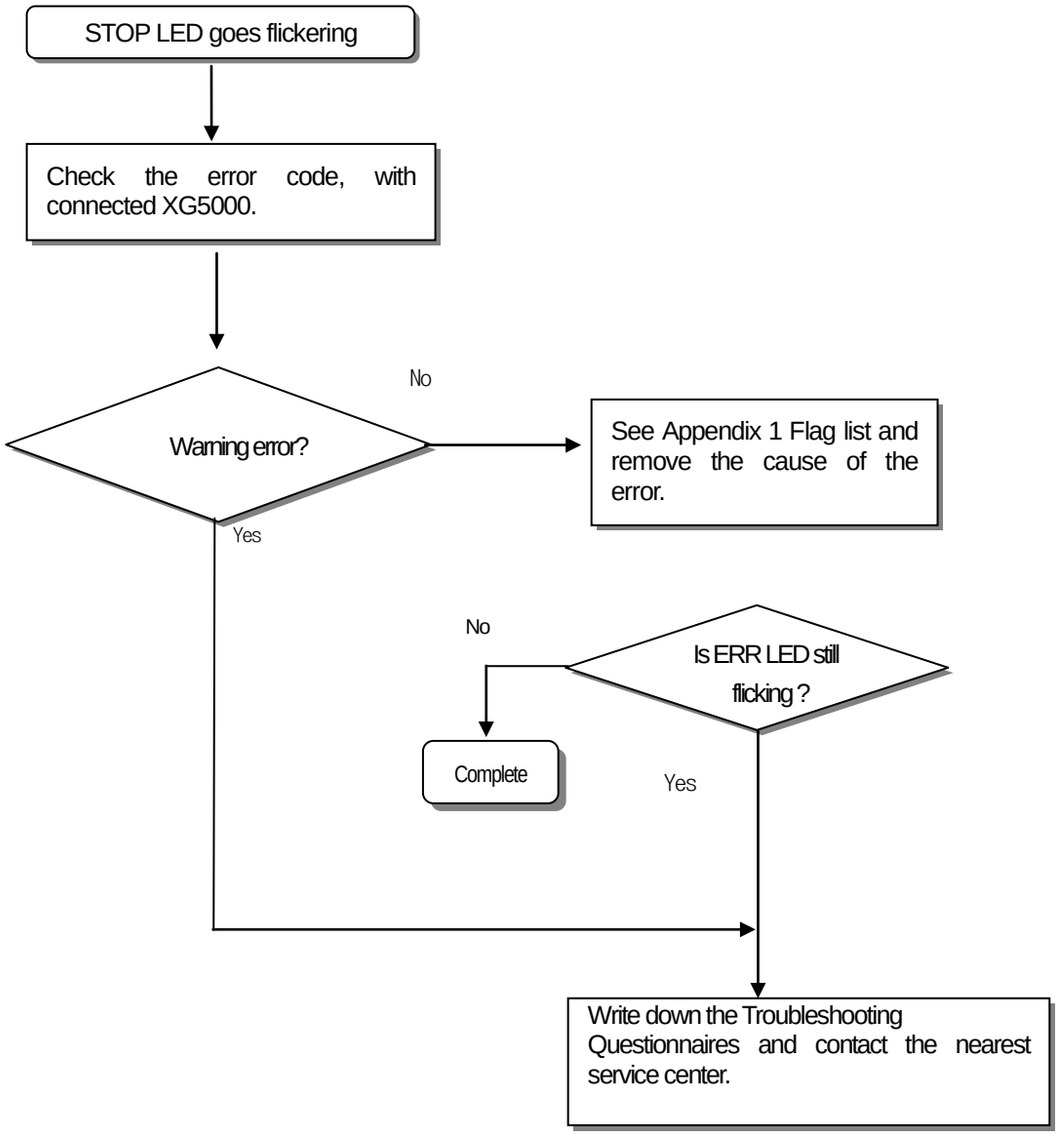
15.2.1 Troubleshooting flowchart used when the PWR (Power) LED turns Off

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



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

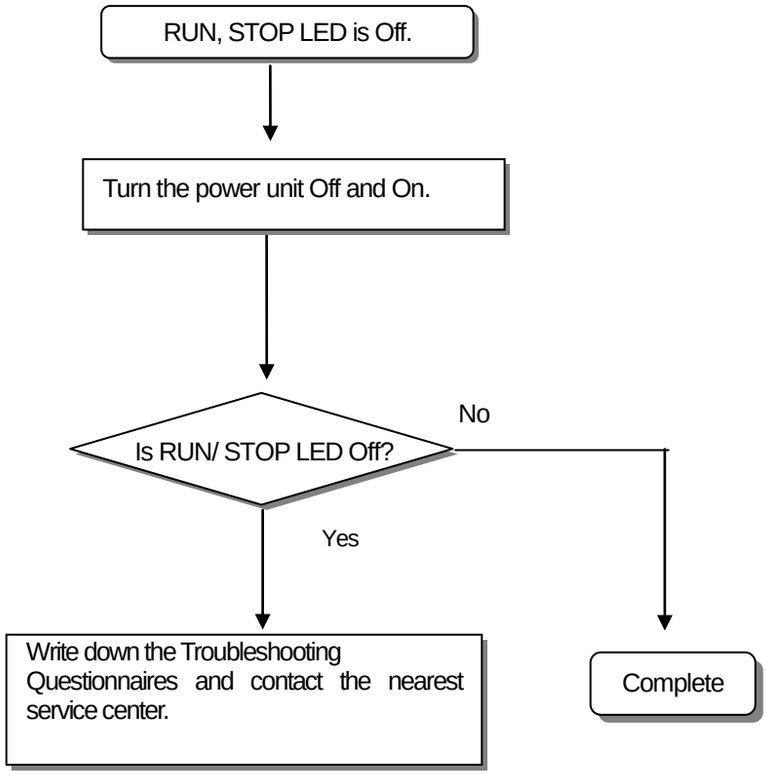
The following flowchart explains corrective action procedure used when the power is supplied starts or the ERR LED is flickering during operation.



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

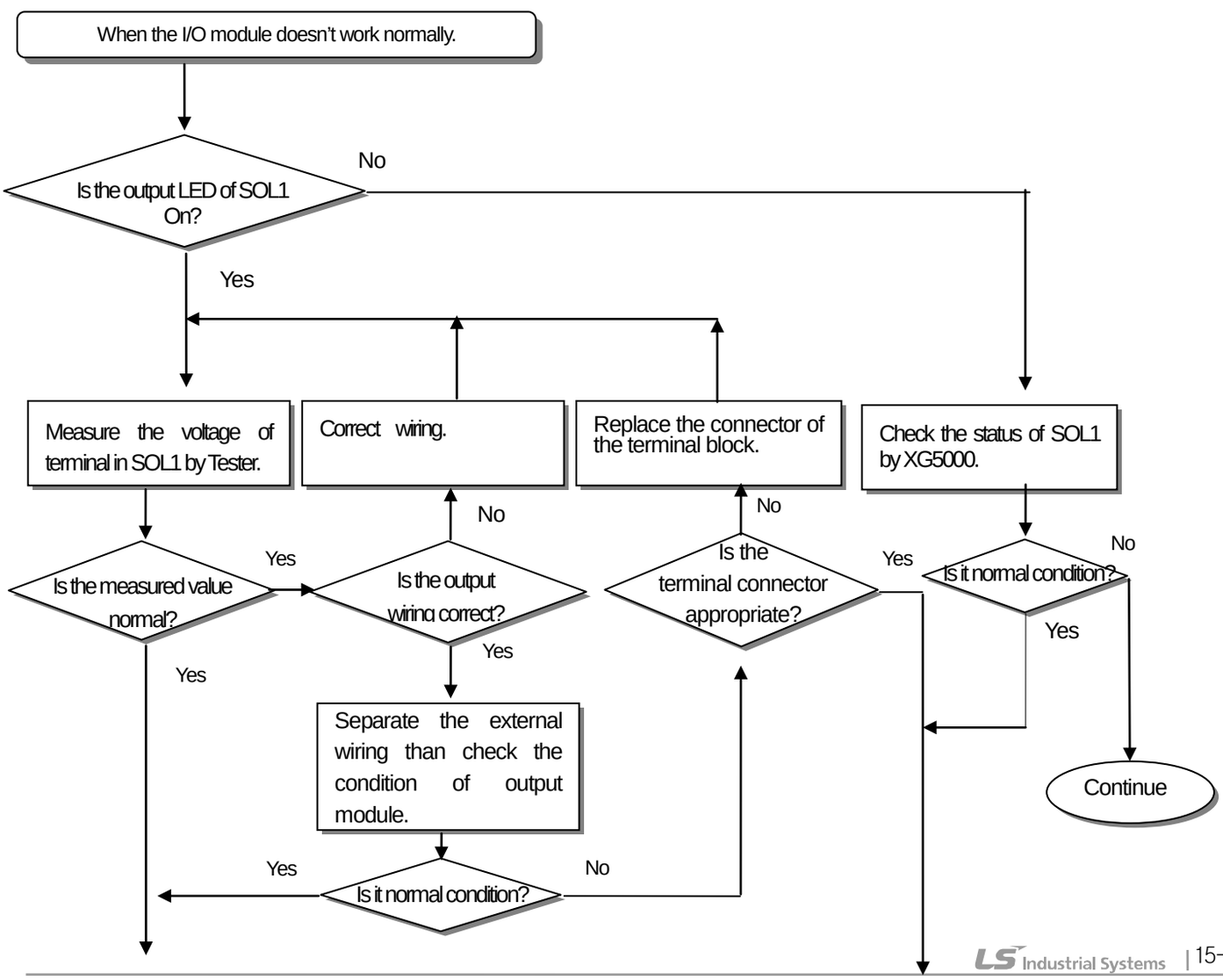
15.2.3 Troubleshooting flowchart used with when the RUN , STOP LED turns Off.

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



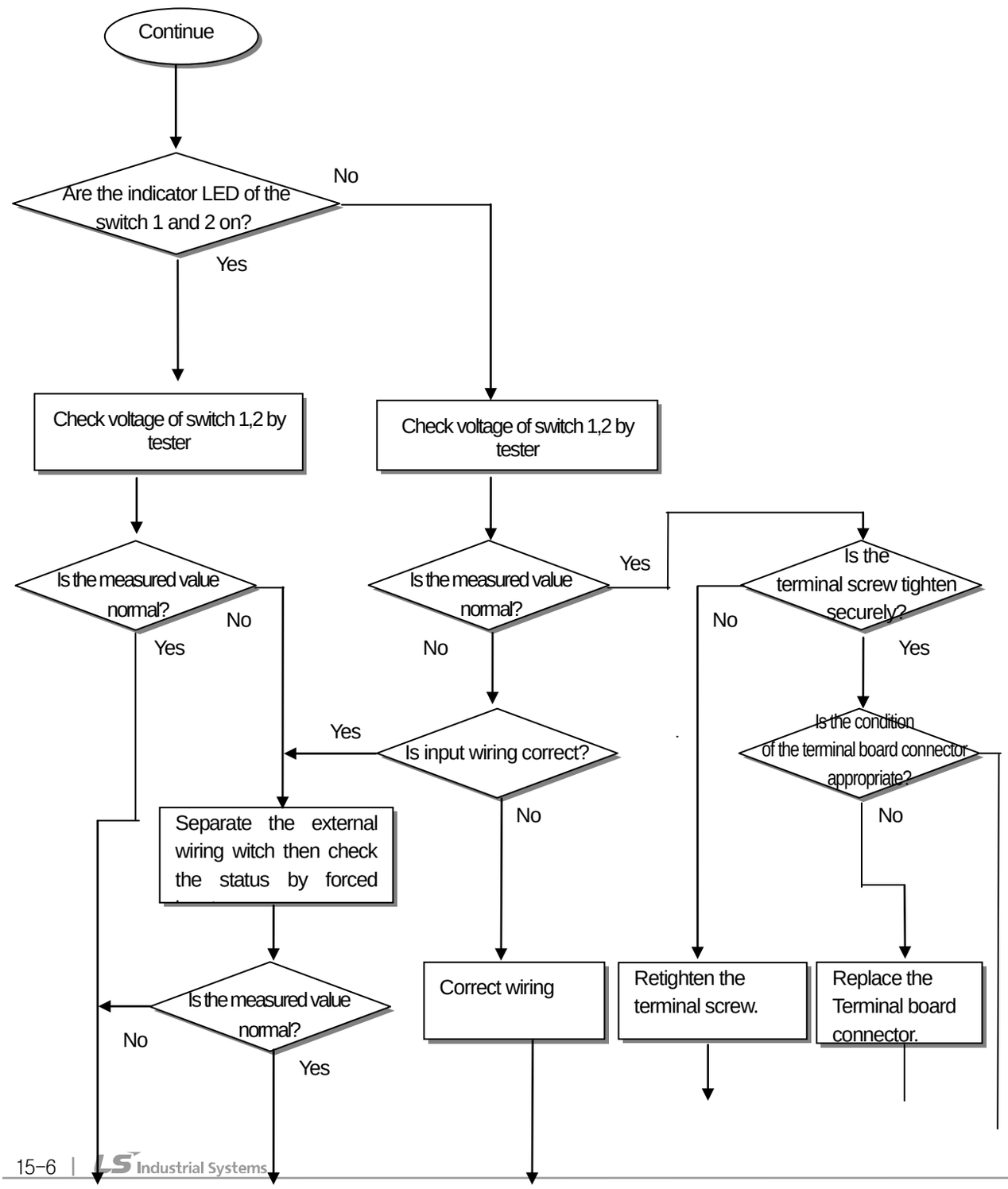
15.2.4 **Troubleshooting flowchart used when the I/O part doesn't operate normally.**

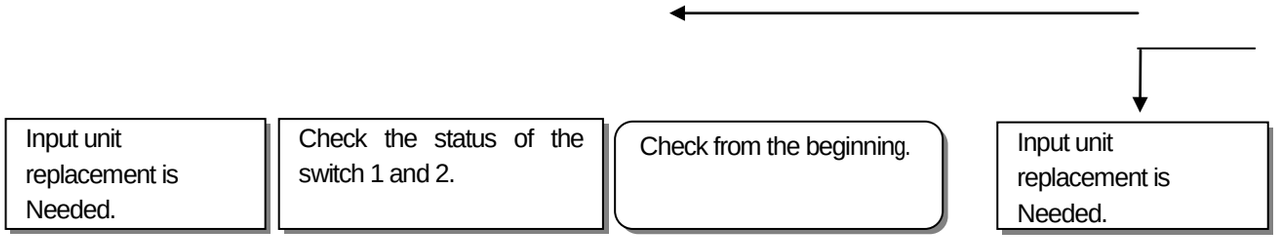
The following flowchart explains corrective action procedure used when the I/O module doesn't operate normally.



Check the status of SOL1.

Replace the Unit





15.3 Troubleshooting Questionnaire

If any problem occurs during the operation of XGB 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:

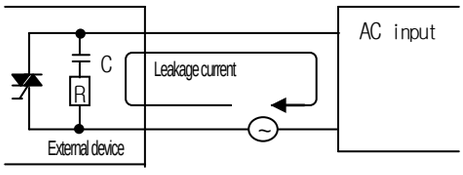
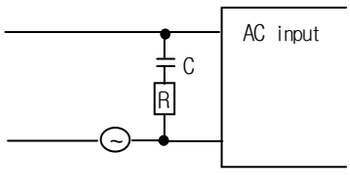
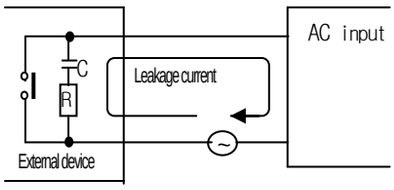
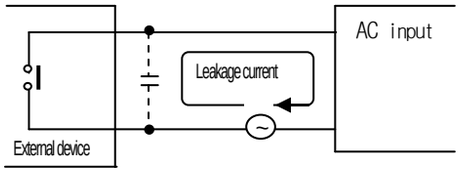
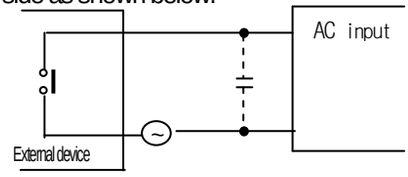
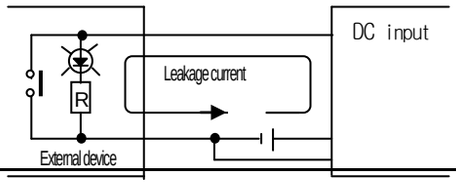
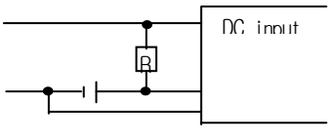
12. Configuration diagram for the applied system:

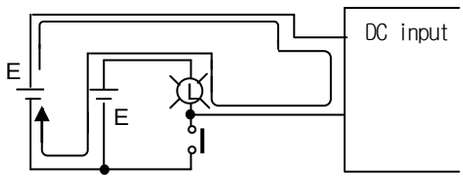
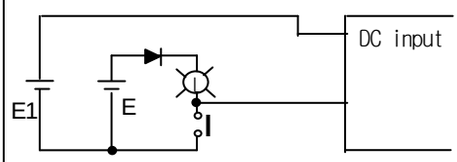
15.4 Troubleshooting Examples

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

15.4.1 Input circuit troubles and corrective actions

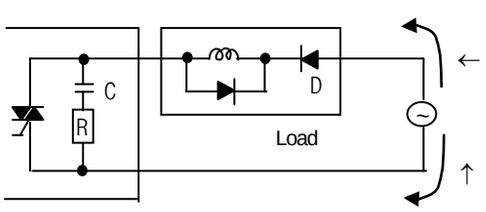
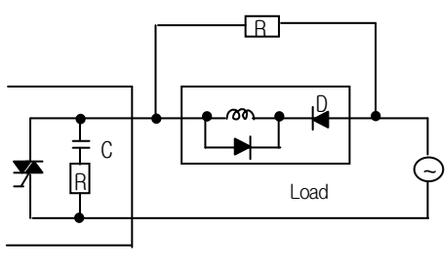
The followings describe possible troubles with input circuits, as well as corrective actions.

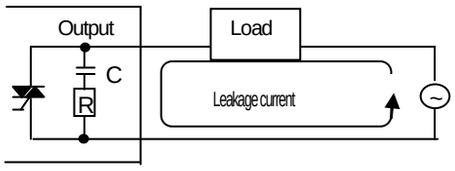
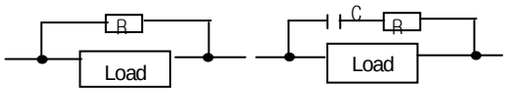
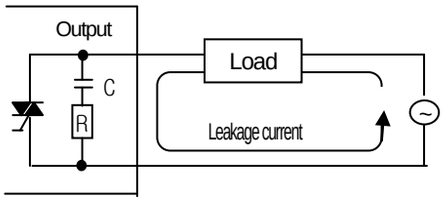
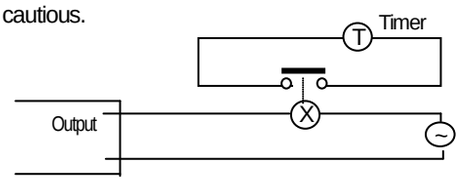
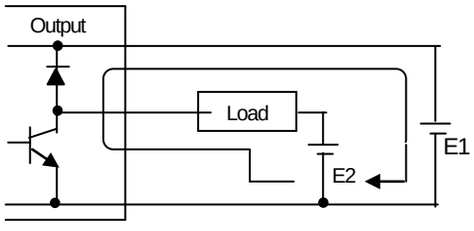
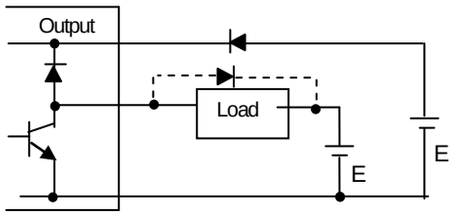
Condition	Cause	Corrective Actions
Input signal doesn't turn off.	Leakage current of external device (Such as a drive by non-contact switch) 	• Connect an appropriate register and capacity, which will make the voltage lower across the terminals of the input module. 
Input signal doesn't turn off. (Neon lamp may be still on)	Leakage current of external device (Drive by a limit switch with neon lamp) 	• 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.
Input signal doesn't turn off.	Leakage current due to line capacity of wiring cable. 	• Locate the power supply on the external device side as shown below. 
Input signal doesn't turn off.	Leakage current of external device (Drive by switch with LED indicator) 	• Connect an appropriate register, which will make the voltage higher than the OFF voltage across the input module terminal and common terminal. 

Input signal doesn't turn off.	• Sneak current due to the use of two different power supplies.  • E1 > E2, sneaked.	• Use only one power supply. • Connect a sneak current prevention diode. 

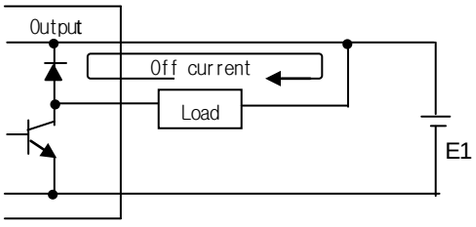
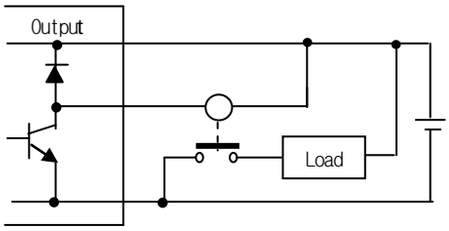
15.4.2 Output circuit and corrective actions

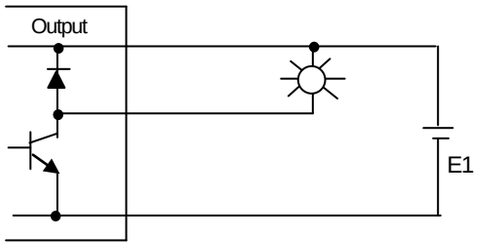
The following describes possible troubles with output circuits, as well as their corrective actions.

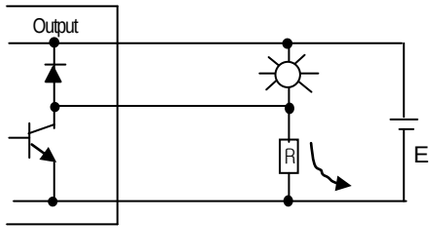
Condition	Cause	Corrective Action
When the output is off, excessive voltage is applied to the load.	•Load is half-wave rectified inside (in some cases, it is true of a solenoid) •When the polarity of the power supply is as shown in ①, C is charged. When the polarity is as shown in ②, the voltage charged in C plus the line voltage are applied across D. Max. voltage is approx. $2\sqrt{2}$.  *) 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. 

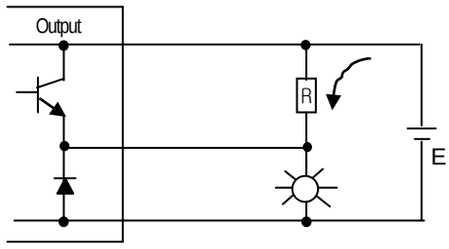
The load doesn't turn off.	• Leakage current by surge absorbing circuit, which is connected to output element in parallel. 	• Connect C and R across the load, which are of registers of tens KΩ. When the wiring distance from the output module to the load is long, there may be a leakage current due to 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. 	• Insert a small L/R magnetic contact and drive the load using the same contact. 

<table>
<tr><td></td><td>• 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.</td><td></td></tr>
<tr><td>Output transistor is destroyed.</td><td>Surge current of the white lamp on.
 

A surge current of 10 times or more when turned on.</td><td>• 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</td></tr>
</table>

15.5 Error Code List

Error code (Dec)	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

Error code (Dec)	Error cause	Action (restart mode after taking an action)	Operation status	LED status	Diagnosis point
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

Chapter 15 Troubleshooting

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

15.1 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 are 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.

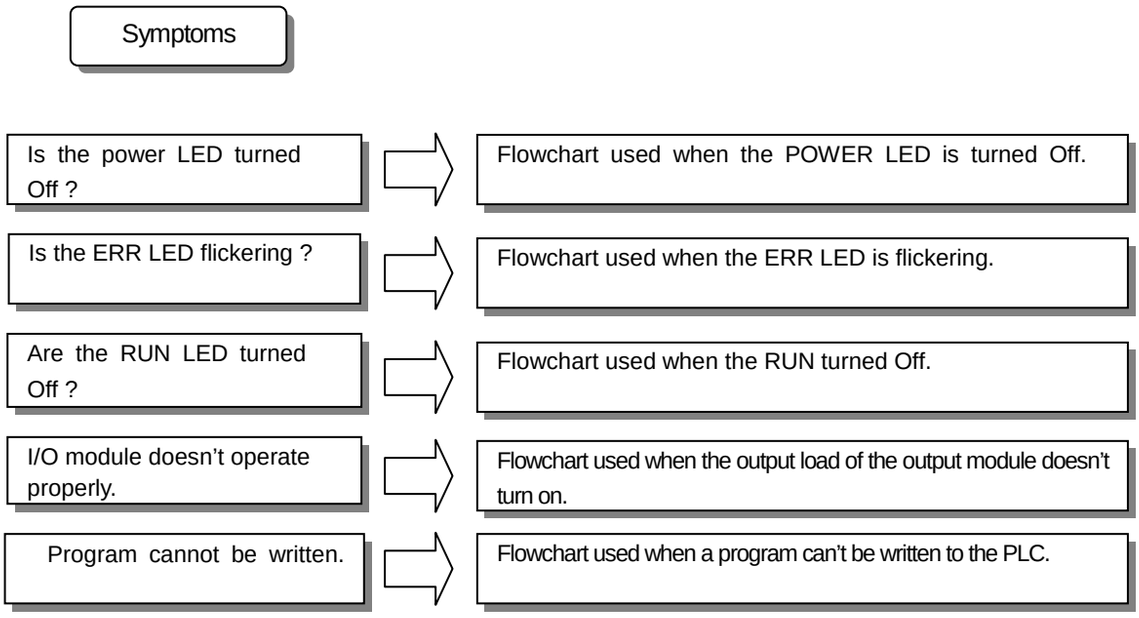
- Switch to the STOP position, and then turn the power on and off.

(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?

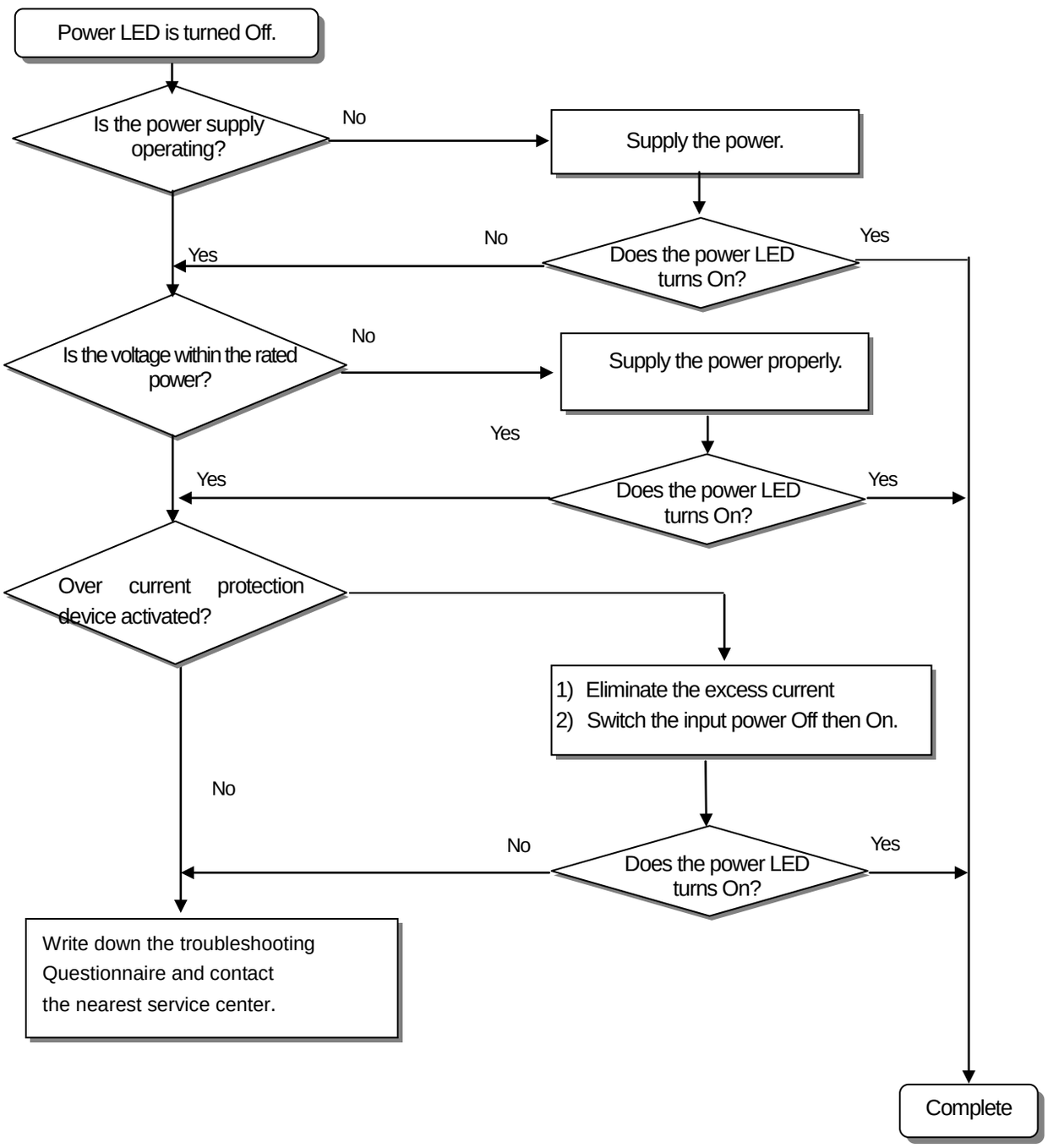
15.2 Troubleshooting

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



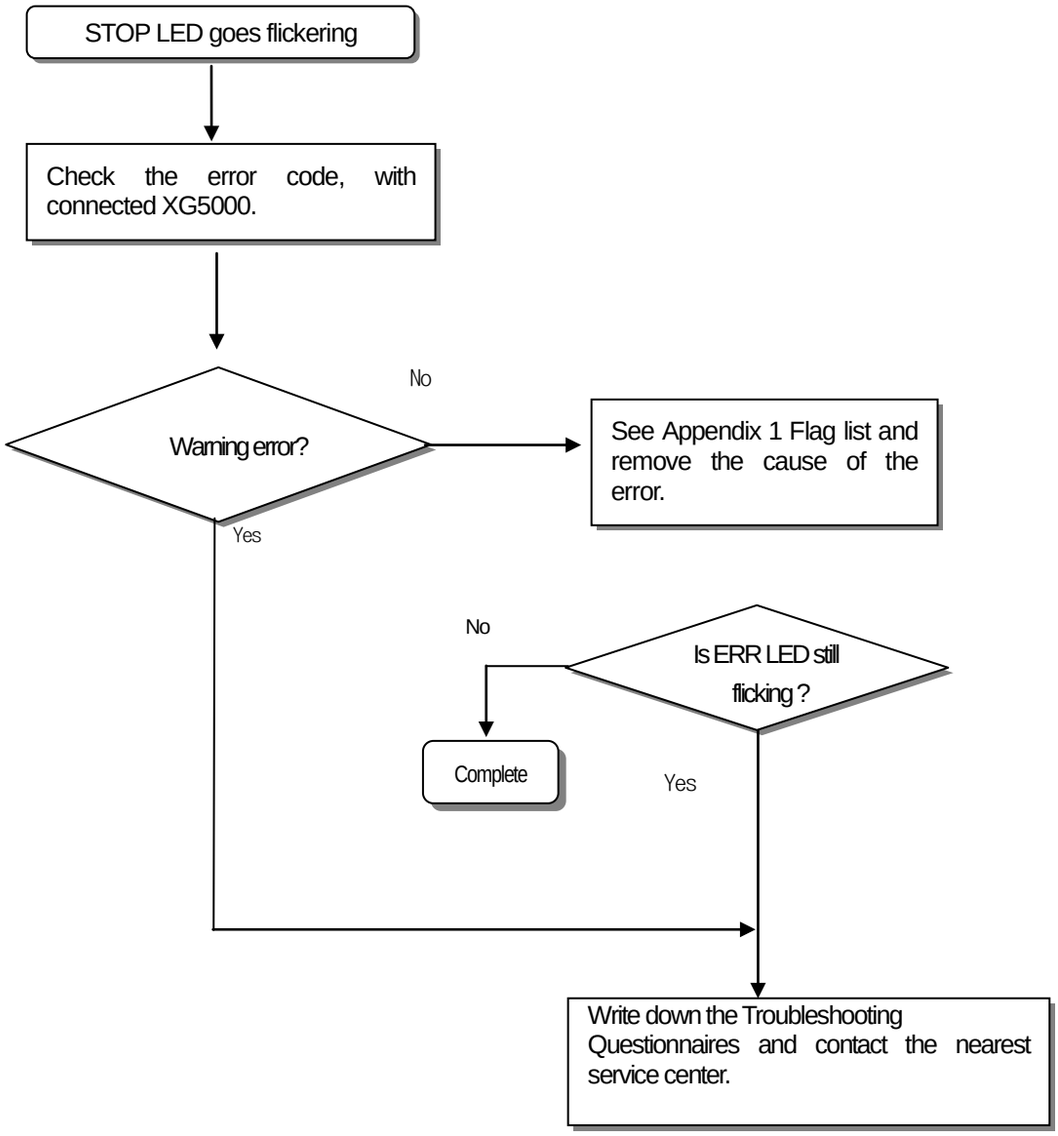
15.2.1 Troubleshooting flowchart used when the PWR (Power) LED turns Off

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



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

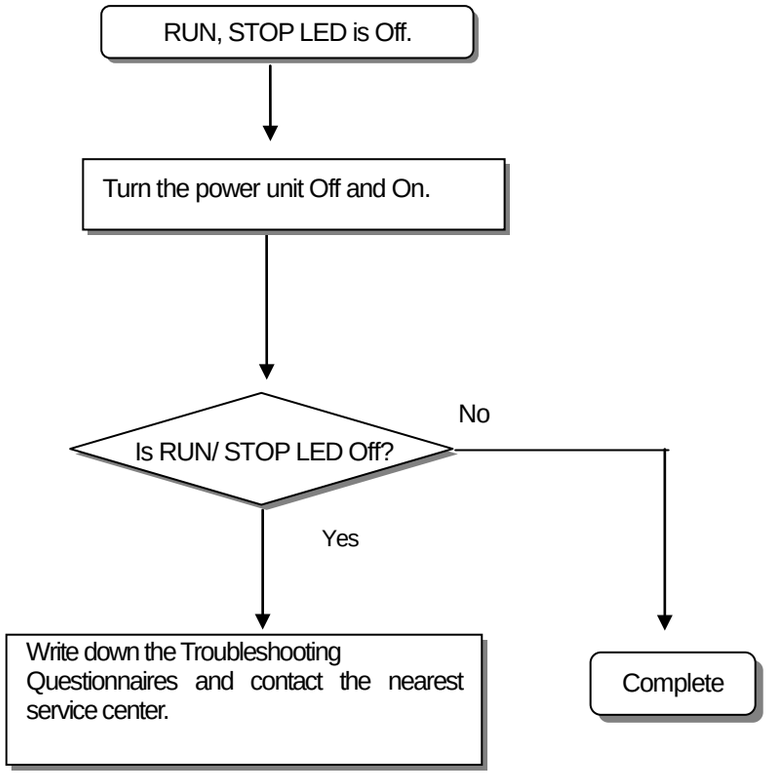
The following flowchart explains corrective action procedure used when the power is supplied starts or the ERR LED is flickering during operation.



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

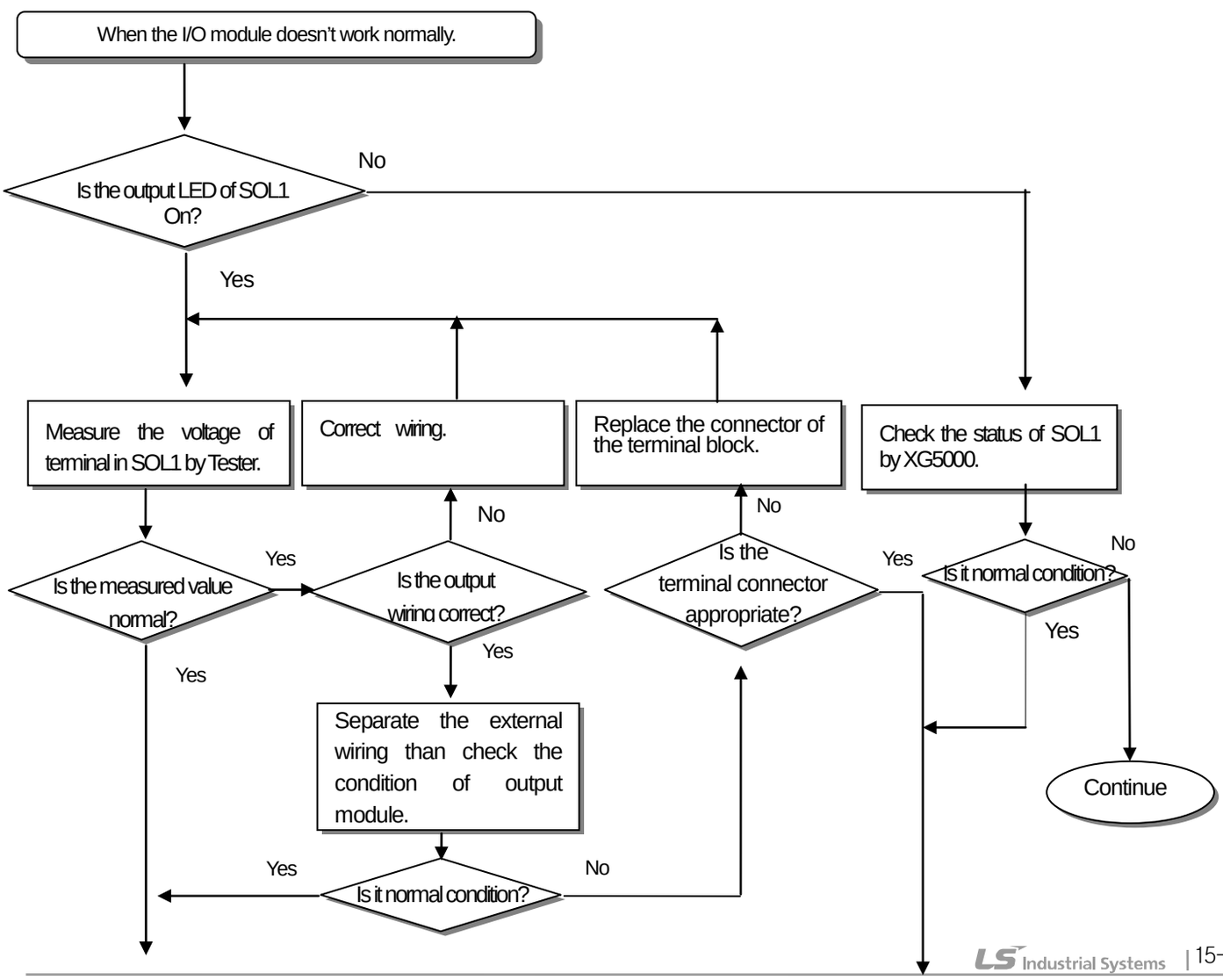
15.2.3 Troubleshooting flowchart used with when the RUN , STOP LED turns Off.

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



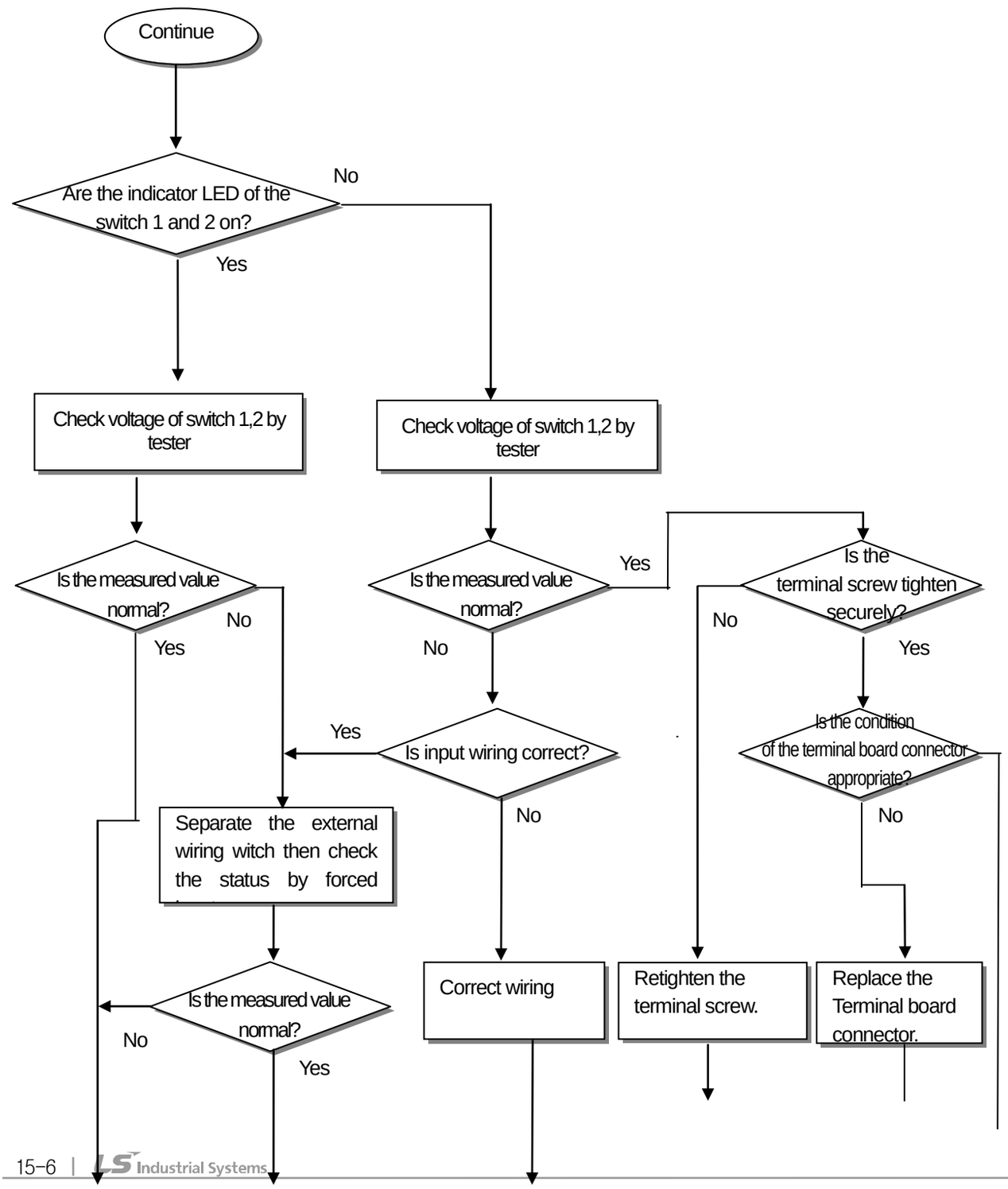
15.2.4 **Troubleshooting flowchart used when the I/O part doesn't operate normally.**

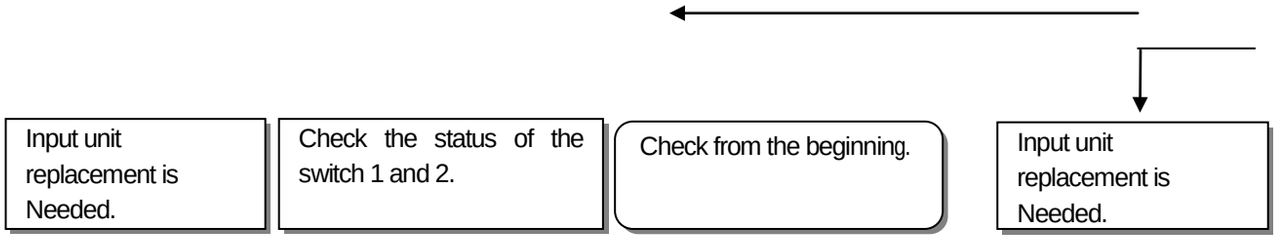
The following flowchart explains corrective action procedure used when the I/O module doesn't operate normally.



Check the status of SOL1.

Replace the Unit





15.3 Troubleshooting Questionnaire

If any problem occurs during the operation of XGB 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:

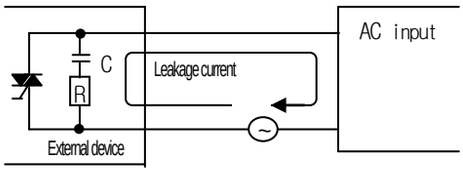
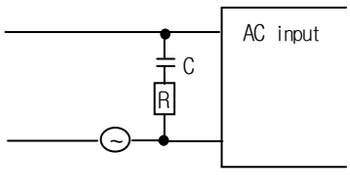
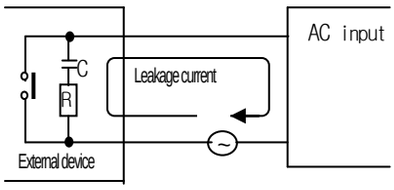
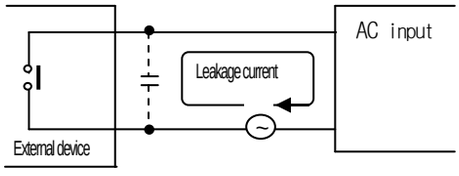
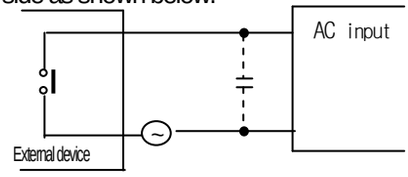
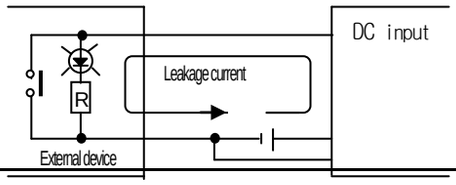
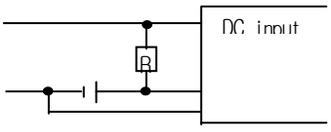
12. Configuration diagram for the applied system:

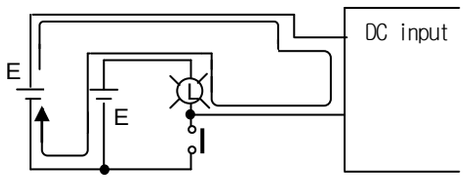
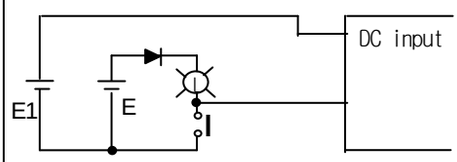
15.4 Troubleshooting Examples

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

15.4.1 Input circuit troubles and corrective actions

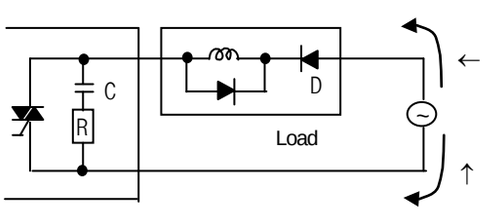
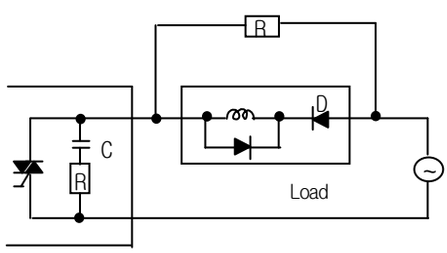
The followings describe possible troubles with input circuits, as well as corrective actions.

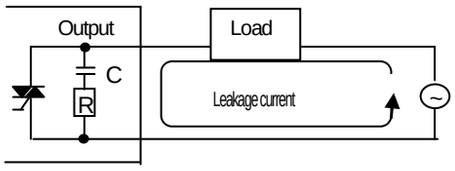
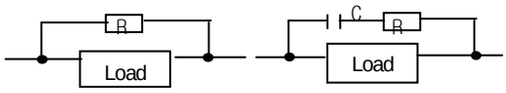
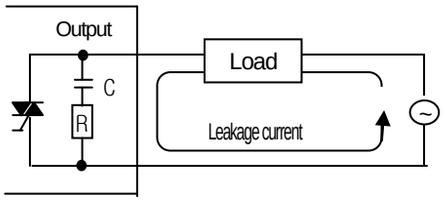
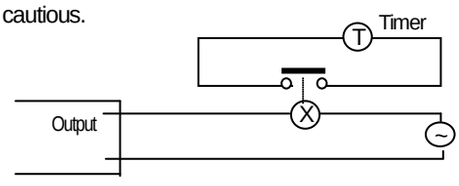
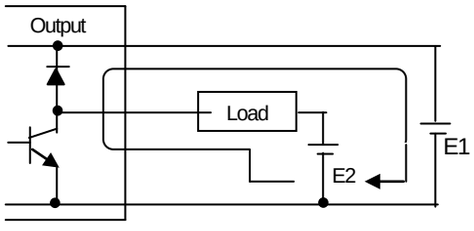
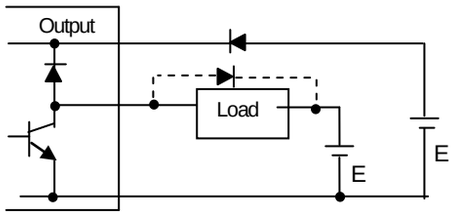
Condition	Cause	Corrective Actions
Input signal doesn't turn off.	Leakage current of external device (Such as a drive by non-contact switch) 	• Connect an appropriate register and capacity, which will make the voltage lower across the terminals of the input module. 
Input signal doesn't turn off. (Neon lamp may be still on)	Leakage current of external device (Drive by a limit switch with neon lamp) 	• 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.
Input signal doesn't turn off.	Leakage current due to line capacity of wiring cable. 	• Locate the power supply on the external device side as shown below. 
Input signal doesn't turn off.	Leakage current of external device (Drive by switch with LED indicator) 	• Connect an appropriate register, which will make the voltage higher than the OFF voltage across the input module terminal and common terminal. 

Input signal doesn't turn off.	• Sneak current due to the use of two different power supplies.  • E1 > E2, sneaked.	• Use only one power supply. • Connect a sneak current prevention diode. 

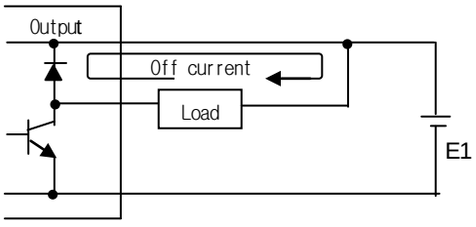
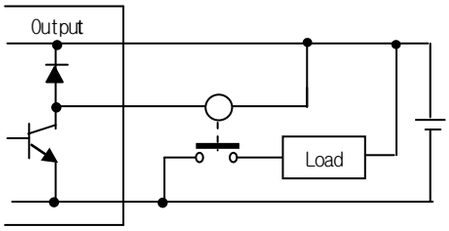
15.4.2 Output circuit and corrective actions

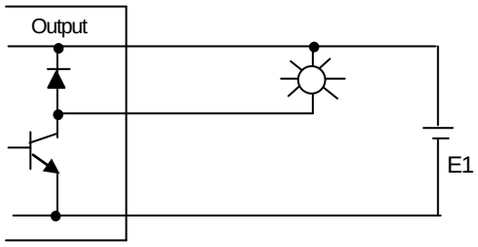
The following describes possible troubles with output circuits, as well as their corrective actions.

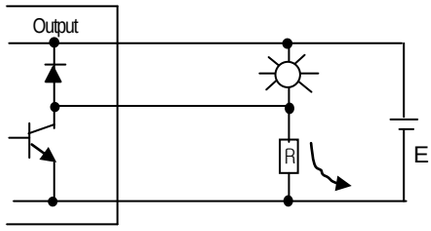
Condition	Cause	Corrective Action
When the output is off, excessive voltage is applied to the load.	•Load is half-wave rectified inside (in some cases, it is true of a solenoid) •When the polarity of the power supply is as shown in ①, C is charged. When the polarity is as shown in ②, the voltage charged in C plus the line voltage are applied across D. Max. voltage is approx. $2\sqrt{2}$.  *) 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. 

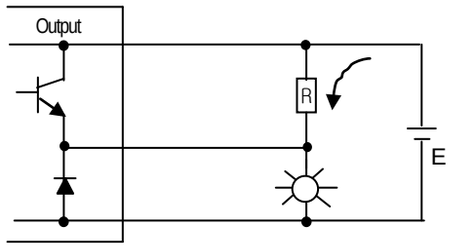
The load doesn't turn off.	• Leakage current by surge absorbing circuit, which is connected to output element in parallel. 	• Connect C and R across the load, which are of registers of tens KΩ. When the wiring distance from the output module to the load is long, there may be a leakage current due to 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. 	• Insert a small L/R magnetic contact and drive the load using the same contact. 

<table>
<tr><td></td><td>• 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.</td><td></td></tr>
<tr><td>Output transistor is destroyed.</td><td>Surge current of the white lamp on.
 

A surge current of 10 times or more when turned on.</td><td>• 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</td></tr>
</table>

15.5 Error Code List

Error code (Dec)	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

Error code (Dec)	Error cause	Action (restart mode after taking an action)	Operation status	LED status	Diagnosis point
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

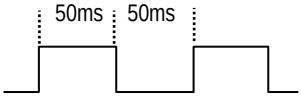
Error code	Error cause	Action (restart mode after taking an action)	Operation status	LED status	Diagnosis point
500	Data memory backup not possible	If not error in battery, power reinput Remote mode is switched to STOP mode.	Warning	1 second Flicker	Reset
501	Abnormal clock data	Setting the time by XG5000 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.

Appendix 1 Flag List

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.

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

Appendix 1 Flag List

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

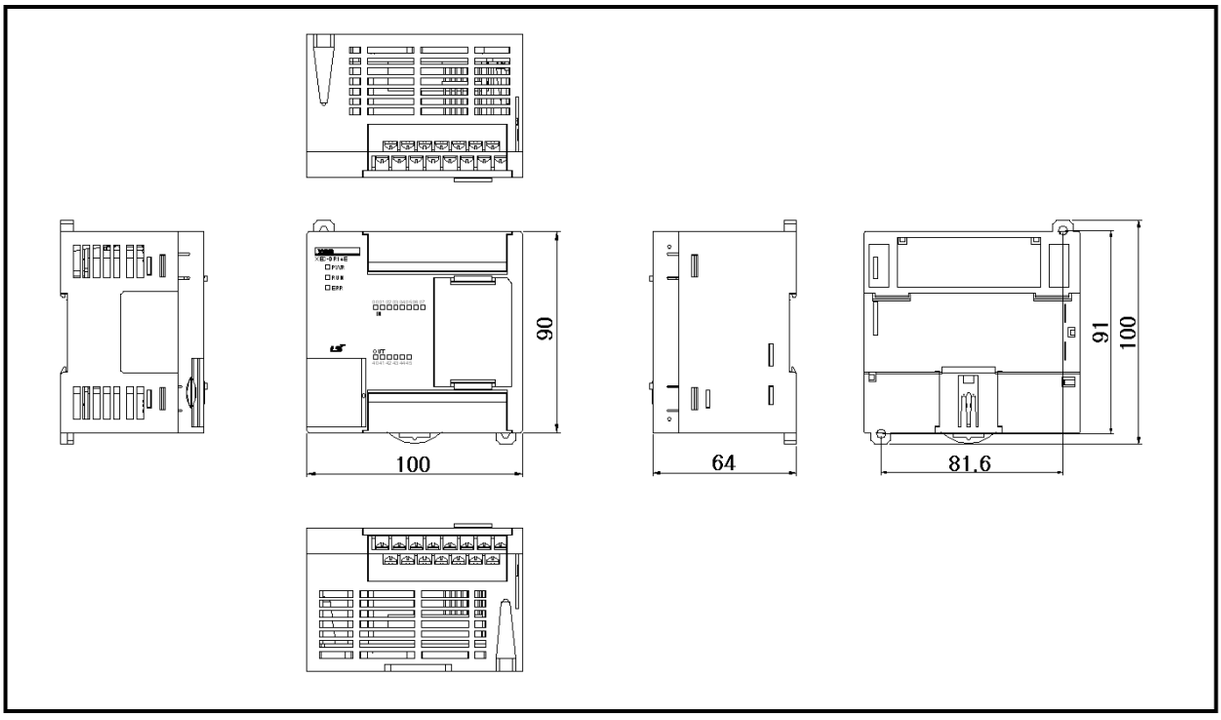
Communication flag list according to P2P service setting.
P2P parameter: 1~3, P2P block: 0~31

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.

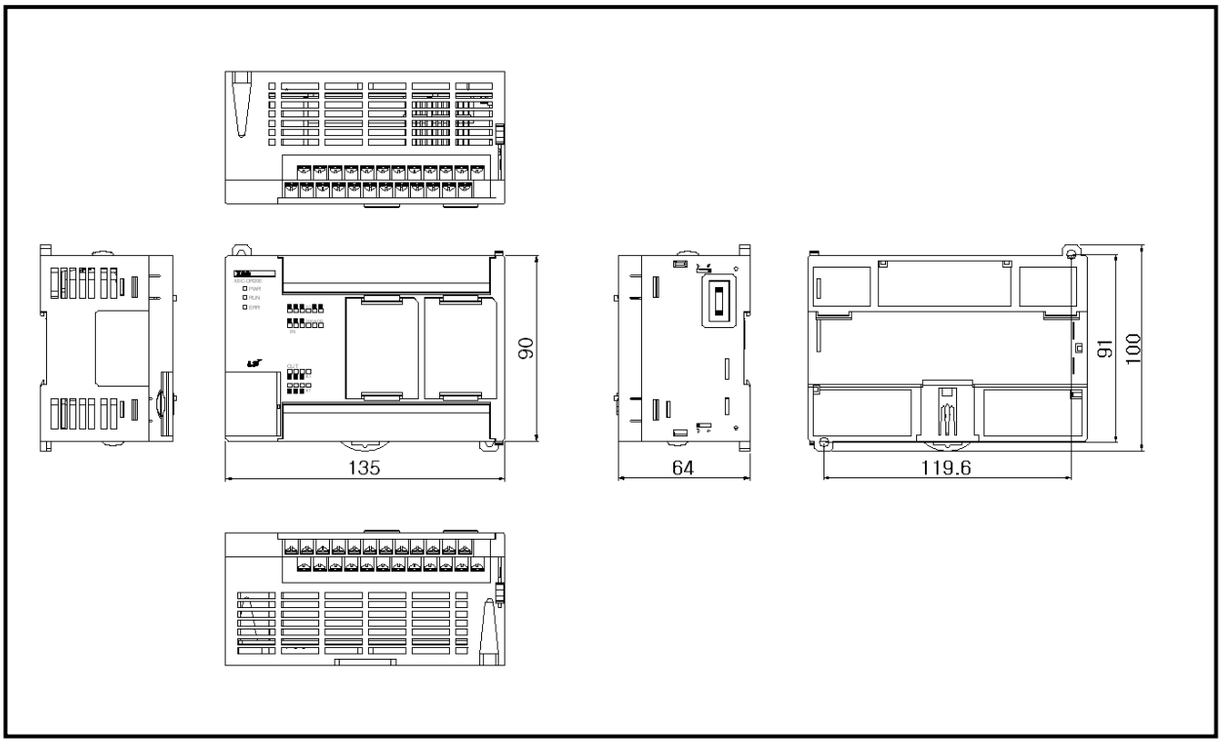
Appendix 2 Dimension (Unit: mm)

(1) Economy type main unit("E"type)

-. XEC-Dx10/14E

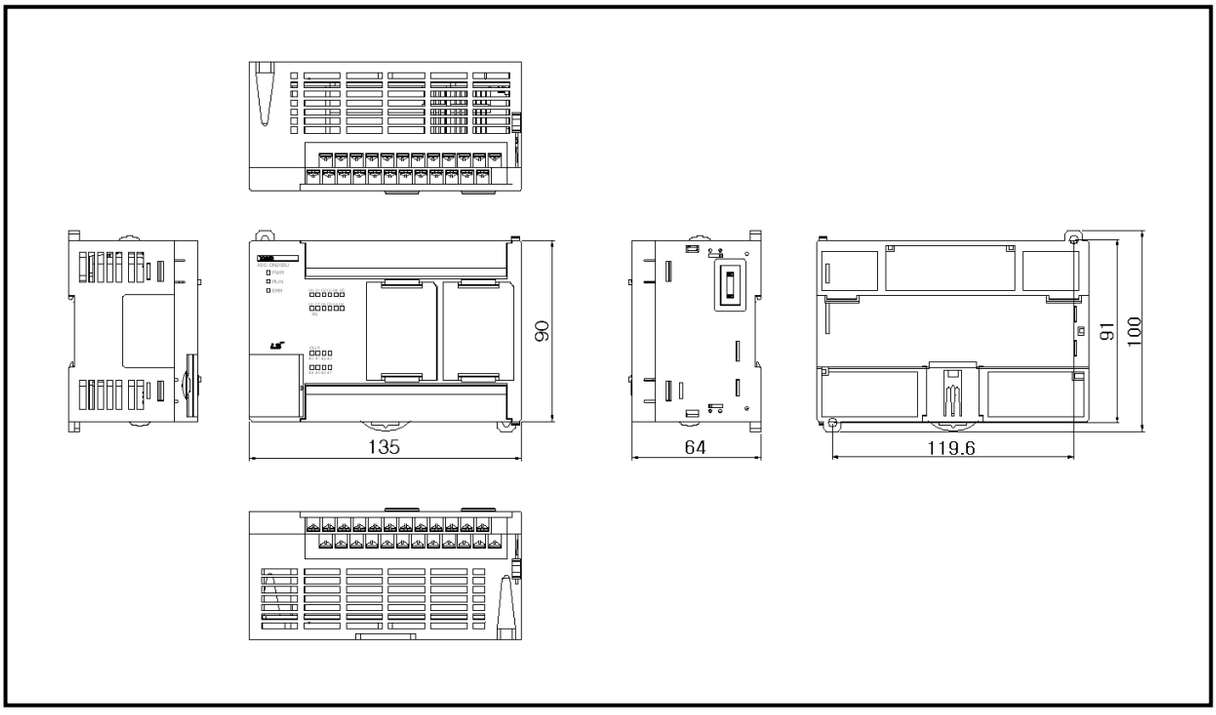


-. XEC-Dx20/30E

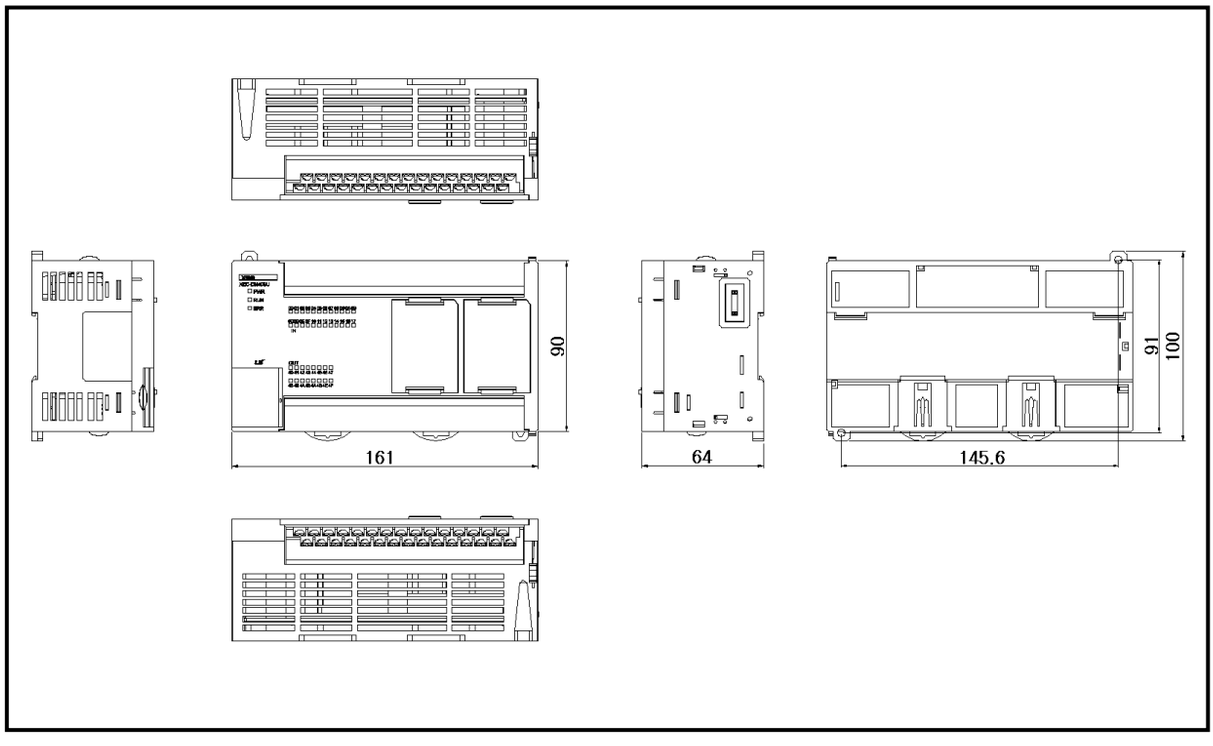


(2) Standard type main unit("SU"타입)

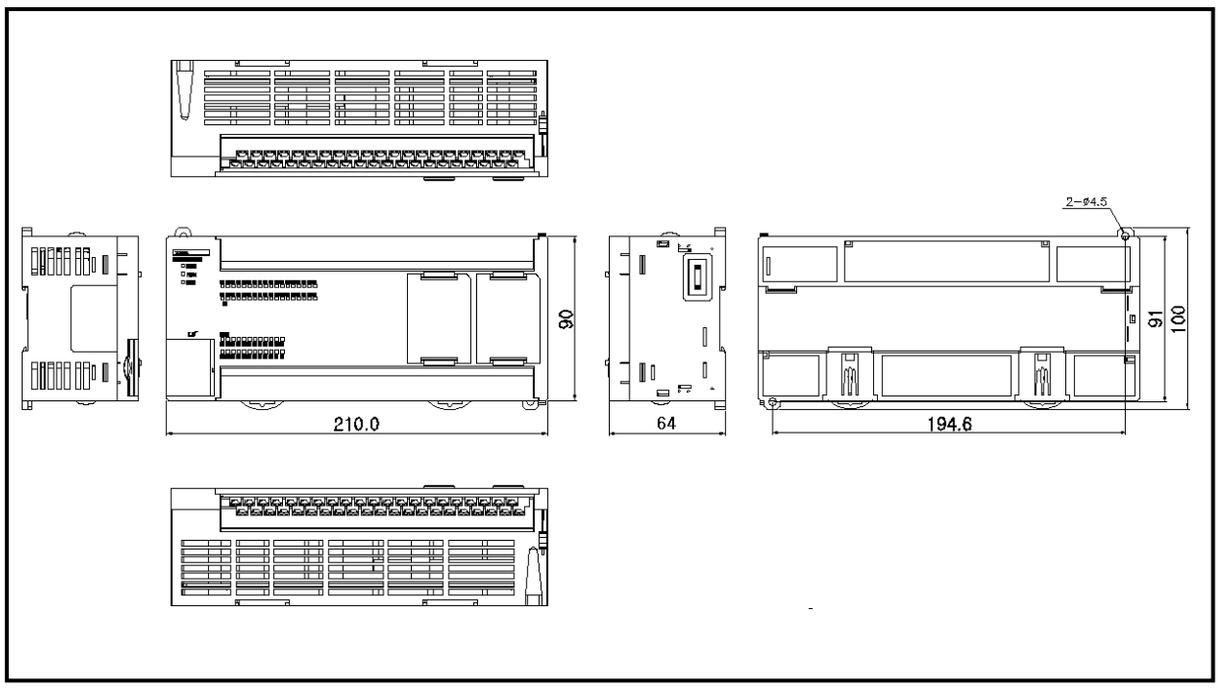
-. XEC-Dx20/30SU



- XEC-Dx40SU

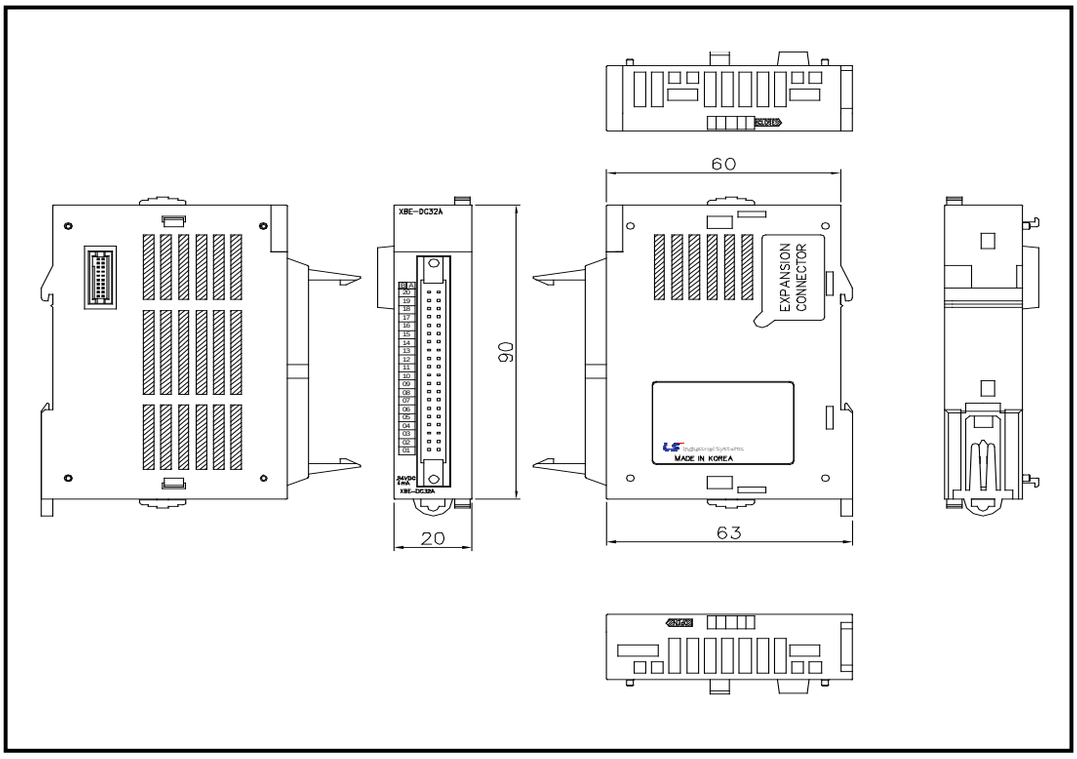


- XEC-Dx60SU

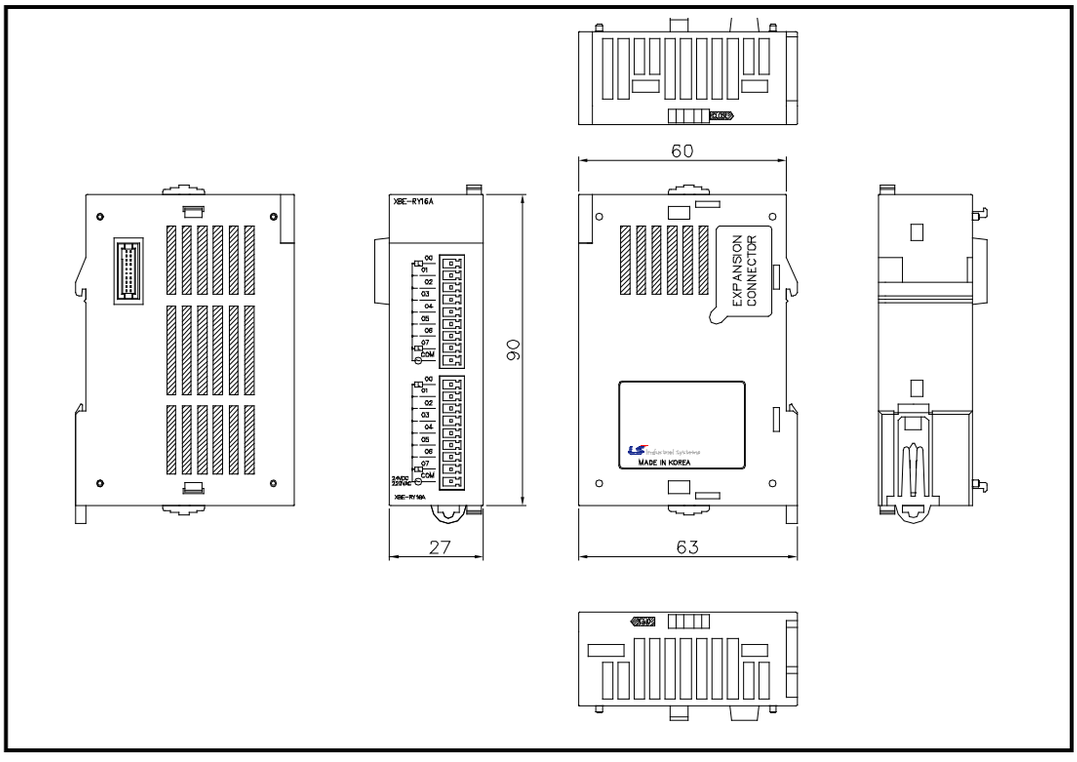


(3) Extension I/O module

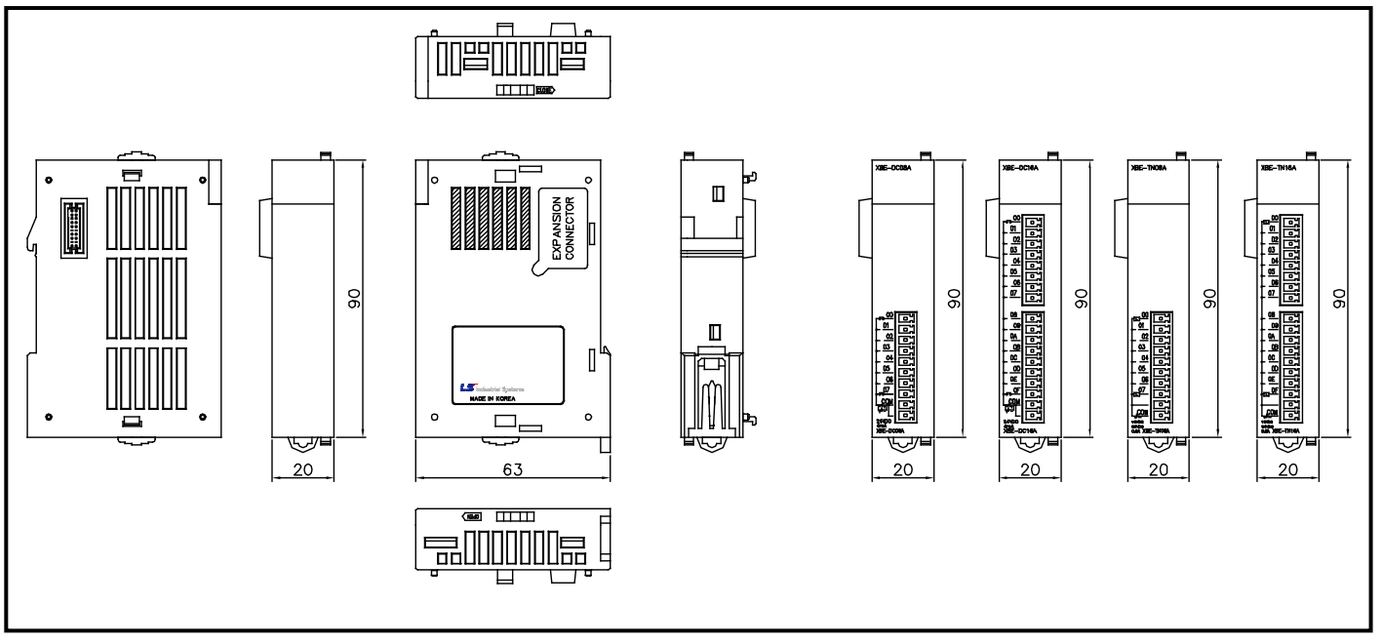
-. XBE-DC32A, XBE-TR32A



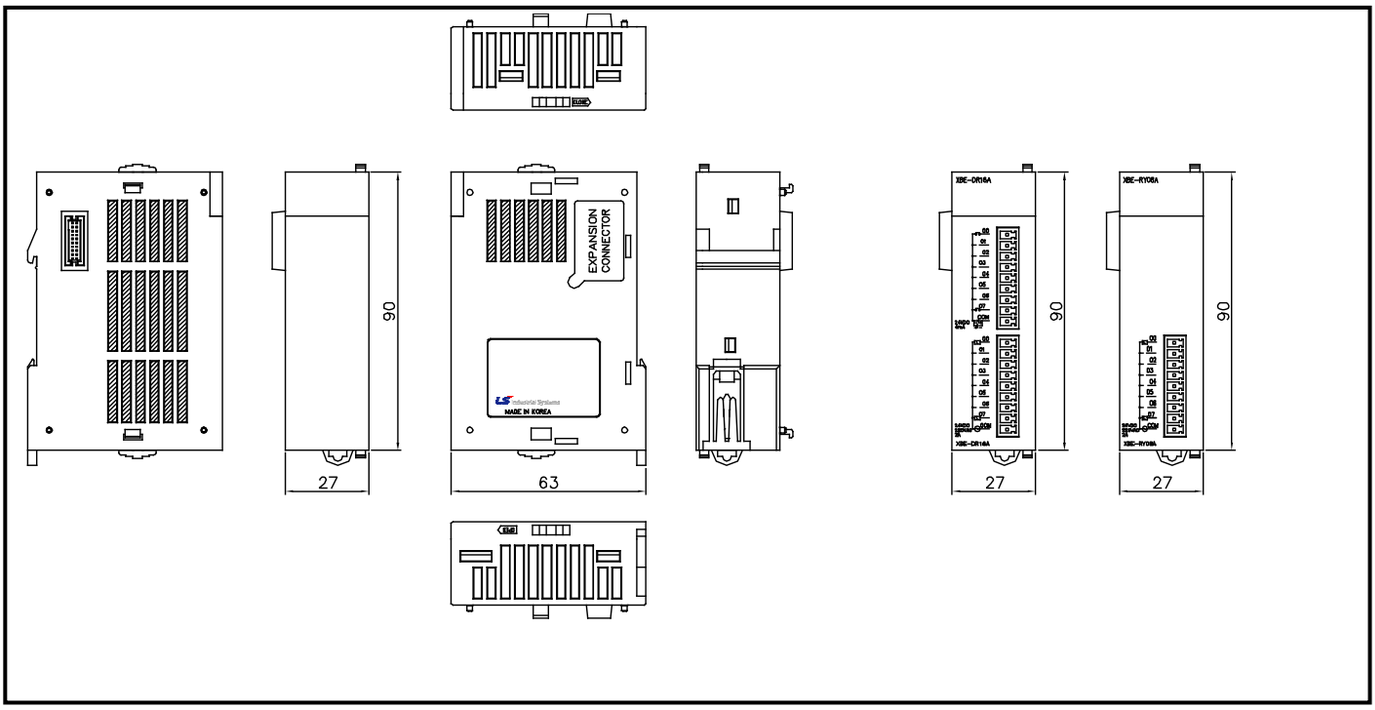
-. XBE-RY16A



-. XBE-DC08A, XBE-DC16A, XBE-TN08A, XBE-TN16A



-. XBE-DR16A, XBE-RY08A



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 user's manuals for Instrurction

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	

Appendix 4 Instruction List

Function Group	Function	Input data type	Output data type	Remarks
SINT_TO_***	SINT_TO_INT	SINT	INT	
	SINT_TO_DINT	SINT	DINT	
	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	

Function Group	Function	Input data type	Output data type	Remarks
	LINT_TO_WORD	LINT	WORD	
	LINT_TO_DWORD	LINT	DWORD	
	LINT_TO_LWORD	LINT	LWORD	
	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	-

Function Group	Function	Input data type	Output data type	Remarks
ULINT_TO_***	ULINT_TO_SINT	ULINT	SINT	-
	ULINT_TO_INT	ULINT	INT	-
	ULINT_TO_DINT	ULINT	DINT	-
	ULINT_TO_LINT	ULINT	LINT	-
	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	

Function Group	Function	Input data type	Output data type	Remarks
	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	
	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_***	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_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_***	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_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_***	TIME_TO_UDINT	TIME	UDINT	
	TIME_TO_DWORD	TIME	DWORD	
	TIME_TO_STRING	TIME	STRING	

Function Group	Function	Input data type	Output data type	Remarks
DATE_TO_***	DATE_TO_UINT	DATE	UINT	
	DATE_TO_WORD	DATE	WORD	
	DATE_TO_STRING	DATE	STRING	
TOD_TO_***	TOD_TO_UDINT	TOD	UDINT	
	TOD_TO_DWORD	TOD	DWORD	
	TOD_TO_STRING	TOD	STRING	
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 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 GLOFA 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 will be guaranteed for 18 months from the date of manufacturing.

2. Scope of Warranty
   Any trouble or defect occurring for the above-mentioned period will be partially replaced or repaired. However, please note the following cases will be excluded from the scope of warranty.

   (1) Any trouble attributable to unreasonable condition, environment or handling otherwise specified in the manual,
   (2) Any trouble attributable to others' products,
   (3) If the product is modified or repaired in any other place not designated by the company,
   (4) Due to unintended purposes
   (5) Owing to the reasons unexpected at the level of the contemporary science and technology when delivered.
   (6) Not attributable to the company; for instance, natural disasters or fire

3. Since the above warranty is limited to PLC unit only, make sure to use the product considering the safety for system configuration or applications.

Environmental Policy

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

Environmental Management

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

About Disposal

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

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