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

# **Programmable Logic Control**

# **XBC Standard/Economic Type Main**

XGT Series	Use	er Manual
	XBC-DR20SU XBC-DN20S(U) XBC-DP20SU XBC-DR30SU XBC-DN30S(U) XBC-DN30SU XBC-DP30SU XBC-DR40SU XBC-DN40SU XBC-DP40SU XBC-DR60SU XBC-DN60SU	XBC-DR10E XBC-DN10E XBC-DP10E XBC-DR14E XBC-DN14E XBC-DP14E XBC-DP14E XBC-DR20E XBC-DN20E XBC-DN20E XBC-DN20E XBC-DN30E XBC-DN30E
Safety Instructions		
Read this manual carefully before installing.	7	

LSELECTRIC

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

#### 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;



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



This symbol indicates the possibility of slight injury or damage to products if some applicable instruction is violated

The marks displayed on the product and in the user's manual have the ► following meanings.



/! Be careful! Danger may be expected.

Be careful! Electric shock may occur.

The user's manual even after read shall be kept available and accessible to any user of the product.

## Safety Instructions when designing

- Please, install protection circuit on the exterior of PLC to protect the whole control system from any error in external power or PLC module. Any abnormal output or operation may cause serious problem in safety of the whole system.
  - Install applicable protection unit on the exterior of PLC to protect the system from physical damage such as emergent stop switch, protection circuit, the upper/lowest limit switch, forward/reverse operation interlock circuit, etc.
  - If any system error (watch-dog timer error, module installation error, etc.) is detected during CPU operation in PLC, the whole output is designed to be turned off and stopped for system safety. However, in case CPU error if caused on output device itself such as relay or TR can not be detected, the output may be kept on, which may cause serious problems. Thus, you are recommended to install an addition circuit to monitor the output status.
- Never connect the overload than rated to the output module nor allow the output circuit to have a short circuit, which may cause a fire.
- Never let the external power of the output circuit be designed to be On earlier than PLC power, which may cause abnormal output or operation.
- In case of data exchange between computer or other external equipment and PLC through communication or any operation of PLC (e.g. operation mode change), please install interlock in the sequence program to protect the system from any error. If not, it may cause abnormal output or operation.

## Safety Instructions when designing

# 

 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

# 

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

## Safety Instructions when wiring

# 

- Prior to wiring, be sure that power of PLC and external power is turned off. If not, electric shock or damage on the product may be caused.
- Before PLC system is powered on, be sure that all the covers of the terminal are securely closed. If not, electric shock may be caused

# $\triangle$ Caution

- Let the wiring installed correctly after checking the voltage rated of each product and the arrangement of terminals. If not, fire, electric shock or abnormal operation may be caused.
- Secure the screws of terminals tightly with specified torque when wiring. If the screws of terminals get loose, short circuit, fire or abnormal operation may be caused.
- Surely use the ground wire of Class 3 for FG terminals, which is exclusively used for PLC. If the terminals not grounded correctly, abnormal operation may be caused.
- Don't let any foreign materials such as wiring waste inside the module while wiring, which may cause fire, damage on the product or abnormal operation.

## Safety Instructions for test-operation or repair

# 

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

# 

- Don't remove PCB from the module case nor remodel the module. Fire, electric shock or abnormal operation may occur.
- Prior to installing or disassembling the module, let all the external power off including PLC power. If not, electric shock or abnormal operation may occur.
- Keep any wireless installations or cell phone at least 30cm away from PLC. If not, abnormal operation may be caused.

## Safety Instructions for waste disposal

# 

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

# **Revision History**

٦

Version	Date	Remark	Page
V 1.0	2010.3	1. First Edition	-
V 1.1	2010.12	<ol> <li>XGB output module added (XBC-RY08B, XBE-DC16B)</li> <li>Error fixed</li> <li>Sequence diagram on troubleshooting fixed</li> </ol>	
V 1.2	2010.12	<ol> <li>XGB SU type added (XBC-DN20SU, XBC-DN30SU)</li> <li>RTC option board added (XBO-RTCA)</li> </ol>	- Chapter 9
V 1.3	2011.06	<ol> <li>XGB SU type added (XBC-DN40SU, XBC-DN60SU, XBC-DR40SU, XBC-DR60SU)</li> <li>XGB option module added (XBO-DC04A, XBC-TN04A, XBO-M2MB)</li> </ol>	- Ch10, Ch11, Ch12
V1.4	2012.01	<ol> <li>XGB E type added (XBC-DN10E, XBC-DN14E, XBC-DN20E, XBC-DN30E, XBC-DP10E, XBC-DP14E, XBC-DP20E, XBC-DP30E)</li> </ol>	-
V1.5	2013.01	<ol> <li>XGB SU type added (XBC-DP20SU, XBC-DP30SU, XBC-DP40SU, XBC-DP60SU)</li> <li>Data Backup time modified</li> </ol>	- 4-14
V1.6	2014.09	<ol> <li>Domain of Homepage changed</li> <li>RTC Option specification added(Available on slot 9)</li> </ol>	Front/Back Cover 2-2,2-4,9-4
	2015.02 2015.07	<ol> <li>Data backup time and available slot added         <ul> <li>User should change the battery periodically~ as possible.</li> <li>RTC can~ 9th slot</li> </ul> </li> <li>Address&amp; phone number changed</li> </ol>	9-2 9-5 BackCover
V1.7		<ol> <li>Description of using Timer flag added .</li> <li>I/O(Input/Output) terminal error check and modification -Input terminal block error check</li> <li>Output terminal block error check, SG→PE</li> <li>New PLC added</li> <li>-XBF-TC04RT/ TC04TT, XBL-PMEC/ PSEA/DSEA</li> </ol>	App1-2,App1-7 7-7~7-14 7-15~7-38 2-1~ 2-9,
V1.8	2016.11	1.New PLC added -XBE-DN32A	7-52, 7-54
V 1.9	2020.06	LSIS to change its corporate name to LS ELECTRIC	Entire
V2.0	2022.09	Change domain (Iselectric.co.kr -> Is-electric.com)	Entire
V2.1	2023.05	1. Module added (1) XBE-AC08A 2. XBCE_XBCS Max.Load changed	7-43
		3. Ferrule specification contents added	7-3

Г

## **About User's Manual**

Congratulations on purchasing PLC of LS ELECTRIC Co.,Ltd.

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

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

Relevant User's Manual

Title	Description	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
XGK/XGB Series Instruction & Programming	It describes how to use the instructions for programming using XGK/XGB series.	10310000510
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 Cnet I/F User's Manual	It describes how to use built-in communication function for XGB main unit and external Cnet I/F module.	10310000816
XGB Fast Ethernet I/F User's Manual	It describes how to use XGB FEnet I/F module.	10310000873

Г

# © Contents ©

Chapter 1 Introduction	
------------------------	--

1.1 Guide to Use This Manual	. 1-1
1.2 Features	. 1-2
1.3 Terminology	. 1-4

2.1 XGB System Configuration	2-1
2.2 Product List	2-3
2.3 Classification and Type of Product Name	2-5
2.3.1 Classification and type of basic unit	2-5
2.3.2 Classification and type of expansion module	2-7
2.3.3 Classification and type of special module	2-8
2.3.4 Classification and type of communication module	2-9
2.4 System Configuration	2-11
2.4.1 Cnet I/F system	2-11
2.4.2 Ethernet system	2-14

4.1 Performance Specifications	4-1
4.2 Names of Part and Function	4-7
4.3 Power Supply Specifications	4-10
4.4 Calculating Example of Consumption Current/Voltage	4-13
4.5 Data Backup Time	4-14

Chapter 5 Program Configuration and Operation Method5	1~5-37
---	--------

5.1 Program Instruction
5.1.1 Program execution methods
5.1.2 Operation processing during momentary power failure
5.1.3 Scan time
5.1.4 Scan Watchdog timer
5.1.5 Timer processing
5.1.6 Counter processing
5.2 Program Execution
5.2.1 Configuration of program 5-11
5.2.2 Program execution methods
5.2.3 Interrupt
5.3 Operation Mode
5.3.1 RUN mode
5.3.2 STOP mode
5.3.3 DEBUG mode
5.3.4 Change operation mode
5.4 Memory
5.4.1 Data memory
5.5 Configuration Diagram of Data Memory
5.5.1 "S" type
5.5.2 "H" type
5.5.3 Data latch area setting

Γ

## Chapter 6 CPU Functions......6-1~6-25

6.1 Type Setting
6.2 Parameter Setting
6.2.1 Basic parameter setting
6.2.2 I/O parameter setting
6.3 Self-diagnosis Function
6.3.1 Saving of error log
6.3.2 Troubleshooting
6.4 Remote Functions
6.5 Forced Input/Output On and Off Function
6.5.1 Force I/O setup
6.5.2 Processing time and method of Forced Input/Output On and Off
6.6 Direct Input/Output Operation
6.7 Diagnosis of External Device
6.8 Allocation of Input/Output Number

6.9 Online Editing	6-13
6.10 Reading Input/Output Information	6-16
6.11 Monitoring	6-17
6.12 Program Upload Prohibit	6-22
6.13 Clear All PLC	6-23
6.14 Password Setting per Program Block	6-24

#### 

7.1 Introduction
7.2 Main Unit Digital Input Specifications
7.2.1 XBC-DR10E/ DN10E/ DP10E 6 point DC24V input (Source/Sink type)
7.2.2 XBC-DR14E/ DN14E/ DP14E 8 point DC24V input (Source/Sink type)
7.2.3 XBC-DR20E/DN20E/DP20E 12 point DC24V input (Source/Sink type)7-10
7.2.4 XBC-DR30E/DN30E/ DP30E 18 point DC24V input (Source/Sink type)
7.2.5 XBC-DR20SU/DN20SU/DP20SU 12 point DC24V input (Source/Sink type)
7.2.6 XBC- DR30SU/DN30SU/DP30SU 18 point DC24V input (Source/Sink type)7-13
7.2.7 XBC-DR40SU/DR40SU/ DR40SU 24 point DC24V input (Source/Sink Type) 7-14
7.2.8 XBC-DR60SU/DN60SU/ DP60SU 36 point DC24V input (Source/Sink Type) 7-15
7.3 Main Unit Digital Output Specifications
7.3.1 XBC-DR10E 4 point relay output
7.3.2 XBC-DR14E 6 point relay output
7.3.3 XBC-DR20E 8 point relay output
7.3.4 XBC-DR30E 12 point relay output
7.3.5 XBC-DN10E 4 point transistor output (Sink type)7-20
7.3.6 XBC-DN14E 6 point transistor output (Sink type)7-21
7.3.7 XBC-DN20E 8 point transistor output (Sink type)7-22
7.3.8 XBC-DN30E 12 point transistor output (Sink type)
7.3.9 XBC-DP10E 4 point transistor output (Source type)
7.3.10 XBC-DP14E 6 point transistor output (Source type)7-25
7.3.11 XBC-DP20E 8 point transistor output (Source type)7-26
7.3.12 XBC-DP30E 12 point transistor output (Source type)7-27
7.3.13 XBC-DR20SU 8 point relay output
7.3.14 XBC-DR30SU 12 point relay output
7.3.15 XBC-DR40SU 16 point relay output
7.3.16 XBC-DR60SU 24 point relay output
7.3.17 XBC-DN20S(U) 8 point transistor output (Sink type)7-32
7.3.18 XBC-DN30S(U) 12 point transistor output (Sink type)7-33
7.3.19 XBC-DN40SU 16 point TR output (Sink type)

7.3.20 XBC-DN60SU 24 point TR output (Sink type)
7.3.21 XBC-DP20SU 8 point transistor output (Source type)7-36
7.3.22 XBC-DP30SU 12 point transistor output (Source type)7-37
7.3.23 XBC-DP40SU 16 point TR output (Source type)7-38
7.3.24 XBC-DP60SU 24 point TR output (Source type)7-39
7.4 Digital Input Module Specifications
7.4.1 8 point DC24V input module (Source/Sink type)7-40
7.4.2 16 point DC24V input module (Source/Sink type)7-41
7.4.3 32 point DC24V input module (Source/Sink type)7-42
7.4.3 8 point AC110V input module
7.5 Digital Output Module Specifications
7.5.1 8 point relay output module
7.5.2 8 point relay output module (independent point)7-45
7.5.3 16 point relay output module7-46
7.5.4 8 point transistor output module (Sink type)
7.5.5 16 point transistor output module (Sink type)7-48
7.5.6 32 point transistor output module (Sink type)7-49
7.5.7 8 point transistor output module (Source type)7-50
7.5.8 16 point transistor output module (Source type)7-51
7.5.9 32 point transistor output module (Source type)7-52
7.6 Combined Digital I/O module Input Specification7-53
7.6.1 8 point DC24V input (Source/Sink type)7-53
7.6.2 16 point DC24V input (Source/Sink type)7-54
7.7 Combined Digital I/O module Output Specification7-55
7.7.1 8 point relay output7-55
7.7.2 16 point transistor output (Sink type)7-56
7.8 IO Wiring by Using Smart Link Board
7.8.1 Smart link board7-57

Γ

#### Chapter 8 Built-in High-speed Counter Function ......8-1~8-54

8.1 High-speed Counter Specifications	8-1
8.1.1 Performance specifications	8-1
8.1.2 Designation of parts	8-3
8.1.3 "E" type Functions	8-6
8.1.4 "S(U)" type Functions	8-23
8.2 Installation and Wiring	
8.2.1 Precaution for wiring	
8.2.2 Example of wiring	

8.3 Internal Memory	8-41
8.3.1 Special area for High-speed counter	8-41
8.3.2 Error code	8-49
8.4 Examples: Using High-speed Counter	8-50

٦

Chapter 9 RTC Option Board	9-1	~9	)-5
----------------------------	-----	----	-----

9.1 Battery	Э-1
9.1.1 Battery specification	9-1
9.1.2 Notice in using	9-1
9.1.3 Life of battery	Э-1
9.1.4 How to change battery	9-2
9.2 RTC Function	9-3
9.2.1 How to use	Э-З
9.3 Name and Function of Each Part9	9-5

Chapter 10 DC Input Option Function ......10-1~10-15

10.1 DC input Option Board Specification
10.1.1 DC input Option Board Specification
10.2 High Speed Counter Specification
10.2.1 Performance Specification
10.2.2 Name of Each Part 10-3
10.2.3 Function
10.3 Installation and Wiring 10-9
10.3.1 Power wiring
10.3.2 Example of wiring
10.4 Internal Memory 10-11
10.4.1 Special area for High-speed counter 10-11
10.5 Example using high-speed counter 10-15

Chapter 11 TR Output Option Board 11-1~11-1	Char	apter 11	TR Outp	ut Option Board		11-1~11-1	6
---	------	----------	---------	-----------------	--	-----------	---

11.1 TR Output Option Board Operation Sequence of Positioning 11	-1
11.1.1 Operation Sequence of Positioning 11	-1
11.2 XBO-TN04A Specification	-2
11.2.1 Output option board specification	-2
11.3 Positioning Specification 11	-3

11.3.1 Performance Specification	11-3
11.3.2 Name of each part	11-3
11.3.3 Before Positioning	11-5
11.3.4 Positioning Stop Factor	11-7
11.3.5 Manual operation	11-8
11.3.6 Home return	11-9
11.3.7 Positioning Basic Parameter Setup	11-10
11.4 Positioning Instruction List	11-14
11.5 Positioning Example	11-15

Г

Chapter 12 Memory Module	12-1~12-9

12.1 M	emory Module Specification1	12-1
12.1.1	Memory module specification1	12-1
12.1.2	Memory module structure 1	12-1
12.1.3	How to use memory module1	12-2
12.1.4	How to use when password is set1	12-7

Chapter 13 Installation and Wirin	g	13-1-13	-18
Chapter to installation and winning		.13-1~13	-10

13.1 Safety Instruction	13-1
13.1.1 Fail safe circuit	13-3
13.1.2 PLC heat calculation	13-6
13.2 Attachment/Detachment of Modules	
13.2.1 Attachment/Detachment of modules	
13.2.2 Caution in handling	
13.3 Wire	
13.3.1 Power wiring	
13.3.2 I/O Device wiring	
13.3.3 Grounding wiring	
13.3.4 Specifications of wiring cable	

Chapter 14 Maintenance14-1~14-	Chapter 14 Maintenance		14-1~14-2
--------------------------------	------------------------	--	-----------

14.1 Maintenance and Inspection	
14.2 Daily Inspection	14-1
14.3 Periodic Inspection	

C	Chapter 15 Troubleshooting	15-1~15-12
15	5.1 Basic Procedure of Troubleshooting	15-1
15	5.2 Troubleshooting	15-1
15	5.2.1 Troubleshooting flowchart used with when the PWR(Power) LED turns	s Off 15-2
15	5.2.2 Troubleshooting flowchart used with when the ERR(Error) LED is flick	ering 15-3
15	5.2.3 Troubleshooting flowchart used with when the RUN,STOP LED turns (	Off 15-4
15	5.2.4 Troubleshooting flowchart used with when the I/O part doesn't operate	normally15-5
15	5.3 Troubleshooting Questionnaire	15-7
15	5.4 Troubleshooting Examples	15-8
15	5.4.1 Input circuit troubles and corrective actions	15-8
15	5.4.2 Output circuit and corrective actions	15-9
15	5.5 Error Code List	15-11
Aj	ppendix 1 Flag ListApp.	. 1-1~App.1-13
Aj	ppendix 1.1 Special Relay (F) List	App. 1-1
Aj	ppendix 1.2 Communication Relay (L) List	App. 1-6
Aj	ppendix 2 DimensionAp	p.2-1~App.2-4
Aj	ppendix 3 Compatibility with MASTER-K	p.3-1~App.3-6
Aj	ppendix 4 Instruction ListApp	o.4-1~App.4-40
Aj	ppendix 4.1 Classification of Instructions	App.4-1
A	ppendix 4.2 Basic Instructions	Арр.4-2
A	ppendix 4.3 Application Instruction	App.4-5
Aj	ppendix 4.4 Special/Communication Instruction	App.4-37
Aj	ppendix 5 Installation Of Option Board	Арр.5-1

٦

Г

## **Chapter 1 Introduction**

#### 1.1 Guide to Use This Manual

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

No.	Title	Contents	
Chapter 1	Introduction	Describes configuration of this manual, unit's features and	
		terminology.	
Chapter 2	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		
Chapter 5	Program Configuration and	Describes performances, specifications and operations.	
	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	Describes built-in high-speed counter functions.	
Chapter o	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	Describes the compatibility with MASTER-K.	
MASTER-K Describes the compatibility with Mixter Ert R.			
Appendix 4 Instruction List Describes the special relay and 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

ltem	Туре		Reference	
item	XBC-DRxxE	XBC-DxxxS(U)	Reference	
Operation processing speed	0.24 µs / Step	94ns / Step	-	
Max IO contact point	38 points	284 points	In case of using option module 4 points (Coming soon)	
Program capacity	4kstep	15kstep	-	
Max. no. of expanded stage	Option module 2 stages	7 stages (including option module 2 stages)	-	

(c) Enough program capacity

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

(e) XBC-DRxxE is expressed as "E" type and XBC-DxxxS(U) is expressed as "S(U)" 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	Туре	Size (W * H * D)	Reference
	XBC-Dx20S		"C" turo o
	XBC-Dx30S	135*90*64	"S" type
	XBC-Dx20SU	135 90 64	
	XBC-Dx30SU		· "SU" type
Basic unit	XBC-Dx40SU	161 * 90 * 64	SU type
	XBC-Dx60SU	210 * 90 * 64	
	XBC-Dx10E	100*90*64	
	XBC-Dx14E	100 30 04	" <b>厂</b> " turno
	XBC-Dx20E	135*90*64	"E" type
	XBC-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 increased.
   ("S(U)" type main unit)
- (b) By adopting connector coupling method, modules may be easily connected and separated.
- (4) Improved maintenance ability with kinds of register, RTC option, comment backup and etc
  - (a) Convenient programming environment by providing analogue register and index register.

- (b) Improved maintenance ability by operating plural programs and task program through module program.
- (c) Built-in Flash ROM enabling permanent backup of program without any separate battery.
- (d) Improved maintenance ability by types of comment backup.
- (e) Built-in RTC function enabling convenient history and schedule management
- (5) Optimized communication environment.
  - (a) With max. 2 channels of built-in COM (1 channel for "E" type (except load port)), communication is available without any expanded of module.
  - (b) Supporting various protocols to improve the convenience (leased<u>dedicated</u>, Modbus, user-defined communication)
  - (c) Communication module may be additionally increased by adding modules (up to 2 <u>rackstage</u>s such as Cnet, Enet and etc). ("S(U)" type main unit)
  - (d) Convenient network-diagnostic function through network & communication frame monitoring.
  - (e) Convenient networking to upper systems through Enet or Cnet. ("S(U)" 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 analogue-exclusive-dedicated register design and full attachable mechanism.
  - (a) All analogue modules can be attachable on extension base. ("S(U)" type: up to 7 racks stages available)
  - (b) With analogue exclusive dedicated register(U) and monitoring exclusive 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) Providing high-High-speed counter 1phase, 2phase and more additional functions.
  - (b) Providing parameter setting, diverse monitoring and diagnosis function using XG5000.
  - (c) Monitoring function in XG5000 can inspect without program, inspecting external wiring, data setting and others.\_

<del>(마침표)</del>

- (10) Built-in position control function ("S(U)" type TR output main unit)
  - (a) Supporting max 100Kpps 2 axes.
  - (b) Providing parameter setting, operation data collection, diverse monitoring and diagnosis by using XG5000.
  - (c) Commissioning by monitoring of XG5000, without program, inspecting external wiring and operation data setting.

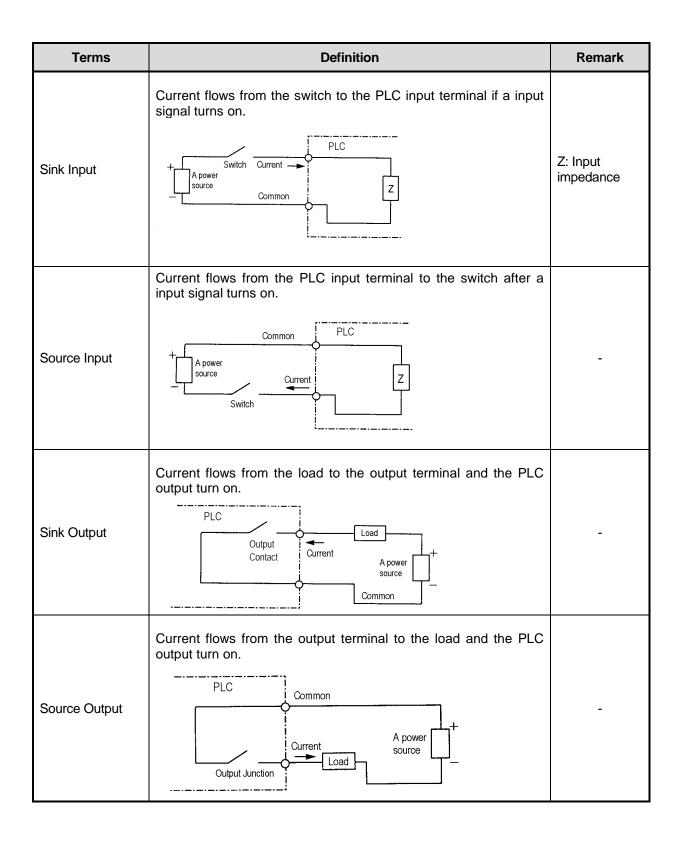
- (11) Built-in PID ("S(U)" type main unit)
  - (a) Supporting max. 16 loops.
  - (b) Setting parameters by using XG5000 and supporting loop status monitoring conveniently with trend monitor.
  - (c) Control constant setting through the improved automatic-<u>Auto-</u>tuning function.
  - (d) With many other additional functions including PWM output, △MV, △PV and SV Ramp, improving the control preciseness.
  - (e) Supporting types of control modes such as forward/backward mixed operation, 2-stage SV PID control, cascade control and etc.
  - (f) A variety of warning functions such as PV MAX and PV variation warning securing the safety.

#### 1.3 Terminology

Γ

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

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



Γ

## **Chapter 2 System Configuration**

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

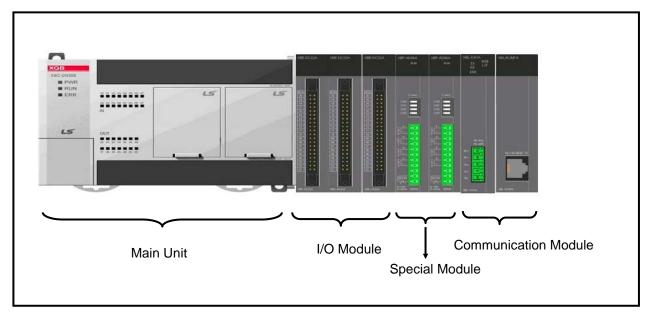
This chapter describes the configuration and features of each system.

## 2.1 XGB System Configuration

XGB series System Configuration is as follows.

For "E" type, only option module can be attached

For "S" type, up to 7 stages connection is available. But in case of attaching 2 option modules, up to 5 stages connection is available. (For communication module, up to 2 connection is available.)



Item		n	Descri	ption
<b>T</b> ( 11/0			• XBC-DxxxS ("S(U)" type): 20~2	284 points
Total I/O	points		• XBC-DxxxE ("E" type): 10~38 p	points
Digital I/O		Digital I/O module	• "S(U)" type: Max. 7	
		Special module	• "S(U)" type: Max. 7	
Maximur	n number of	Communication	• "S(U)" type: Max. 2	
expansio	expansion I/F module			
modules			• "S(U)" type: Max. 2	
		Option module	• "E" type: Max. 2	
			(In case of 10/14 points, only one	e is available)
	Main unit	"O" to re-	• XBC-DR20/30/40/60SU	• XBC-DN20/30S
		"S" type	• XBC-DN20/30/40/60SU	• XBC-DP20/30/40/60SU
Items		11 <b>1</b> 22 to us a	• XBC-DR10/14/20/30E	• XBC-DN10/14/20/30E
		"E" type	• XBC-DP10/14/20/30E	

Item			Description		
	Expansion module	Digital I/O module	• XBE-DC08/16A/B/32A • XBE-RY08A/B/16A	• XBE-TN08/16/32A • XBE-DR16A	• XBE-TP08/16/32A • XBE-DN32A
		Special module	XBF-AD04A     XBF-AD08A     XBF-AD04C     XBF-DC04A     XBF-DC04C	<ul> <li>XBF-DV04A</li> <li>XBF-DV04C</li> <li>XBF-AH04A</li> <li>XBF-RD04A</li> <li>XBF-TC04S</li> </ul>	<ul> <li>XBF-TC04RT</li> <li>XBF-TC04TT</li> <li>XBF-PD02A</li> <li>XBF-HD02A</li> <li>XBF-HD02A</li> <li>XBF-HO02A</li> </ul>
Items		Communication I/F module	• XBL-C41A • XBL-EMTA • XBL-CSEA • XBL-DSEA	• XBL-C21A • XBL-EIMT • XBL-PMEC	• XBL-EIPT • XBL-CMEA • XBL-PSEA
		Digital I/O module	XBO-DC04A(High speed     XBO-TN04A(Positioning		
	Option module	Special module	• XBO-AD02A • XBO-RD01A	• XBO-DA02A • XBO-TC02A	• XBO-AH02A
		RTC module	XBO-RTCA(available on	n slot 9)	
		Memory module	• XBO-M2MB		

Г

## 2.2 Product List

XGB series' product list is as follows.

Types	Model	Description	Remark
	XBC-DR32H	AC100~240V power supply, DC24V input 16 point, Relay output 16 point	
	XBC-DN32H	AC100~240V power supply, DC24V input 16 point, Transistor output 16 point	
	XBC-DR64H	AC100~240V power supply, DC24V input 32 point, Relay output 32 point	
	XBC-DN64H	AC100~240V power supply, DC24V input 32 point, Transistor output 32 point	
	XBC-DR20SU	AC100~240V power supply, DC 24V input 12 point, relay output 8 point	
	XBC-DN20S(U)	AC100~240V power supply, DC24V input 12 point, transistor 8 point	
	XBC-DP20SU	AC100~240V power supply, DC24V input 12 point, transistor 8 point	
	XBC-DR30SU	AC100~240V power supply, DC 24V input 18 point, relay output 12 point	
	XBC-DN30S(U)	AC100~240V power supply, DC 24V input 18 point, transistor output 12 point	
	XBC-DP30SU	AC100~240V power supply, DC 24V input 18 point, transistor output 12 point	
	XBC-DR40SU	AC100~240V power supply, DC 24V input 24 point, relay output 16 point	
	XBC-DN40SU	AC100~240V power supply, DC 24V input 24 point, transistor output 16 point	
	XBC-DP40SU	AC100~240V power supply, DC 24V input 24 point, transistor output 16 point	
	XBC-DR60SU	AC100~240V power supply, DC 24V input 36 point, relay output 24 point	
nit	XBC-DN60SU	AC100-240V power supply, DC 24V input 36 point, relay output 24 point AC100-240V power supply, DC 24V input 36 point, transistor output 24 point	
IJ,	XBC-DP60SU	AC100~240V power supply, DC 24V input 36 point, transistor output 24 point	
Main Unit	XBC-DR10E	AC100~240V power supply, DC 24V input 6 point, relay output 4 point	
2	XBC-DR14E	AC100~240V power supply, DC 24V input 8 point, relay output 6 point	
	XBC-DR20E	AC100~240V power supply, DC 24V input 12 point, relay output 8 point	
	XBC-DR30E	AC100~240V power supply, DC 24V input 18 point, relay output 12 point	
	XBC-DN10E	AC100~240V power supply, DC 24V input 6 point, transistor output 4 point	
	XBC-DN14E	AC100~240V power supply, DC 24V input 8 point, transistor output 6 point	
	XBC-DN20E	AC100~240V power supply, DC 24V input 12 point, transistor output 8 point	
	XBC-DN30E	AC100~240V power supply, DC 24V input 18 point, transistor output 12 point	
	XBC-DP10E	AC100~240V power supply, DC 24V input 6 point, transistor output 4 point	
	XBC-DP14E	AC100~240V power supply, DC 24V input 8 point, transistor output 6 point	
	XBC-DP20E	AC100~240V power supply, DC 24V input 12 point, transistor output 8 point	
	XBC-DP30E	AC100~240V power supply, DC 24V input 18 point, transistor output 12 point	
	XBM-DN16S	DC24V Power supply, DC24V Input 8 point, Transistor output 8 point	
	XBM-DN32S	DC24V Power supply, DC24V Input 16 point, Transistor output 16 point	
	XBM-DR16S	DC24V Power supply, DC24V Input 8 point, Relay output 8 point	
	XBE-DC08A	DC24V Input 8 point	
	XBE-DC16A/B	DC24V Input 16 point	
	XBE-DC32A	DC24V Input 32 point	
Φ	XBE-AC08A	AC110V Input 8 point	
qul	XBE-RY08A	Relay output 8 point	
Mo	XBE-RY08B	Relay output 8 point (independent point)	
o	XBE-RY16A XBE-TN08A	Relay output 16 point Transistor output 8 point (sink type)	
Expansion Module	XBE-TN16A	Transistor output 16 point (sink type)	
	XBE-TN32A	Transistor output 32 point (sink type)	
ш	XBE-TP08A	Transistor output 8 point (source type)	
	XBE-TP16A	Transistor output 16 point (source type)	
	XBE-TP32A	Transistor output 32 point (source type)	
	XBE-DR16A	DC24V Input 8 point, Relay output 8 point	

Types	Model	Description	Remark
	XBE-DN32A	DC24V Input 16 point, Transistor output 16 point (sink type)	

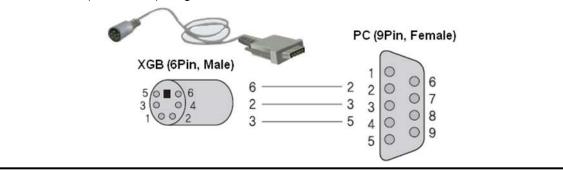
Г

Types	Model	Description	Remark
ule	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	
pol	XBF-AH04A	Current/voltage input 2 channel, output 2 channel	
Special Module	XBF-RD04A	RTD (Resistance Temperature Detector) input 4 channel	
scia	XBF-TC04S	TC (Thermocouple) input 4 channel	
Spe	XBF-TC04RT	Temperature controller module (RTD input, 4 roof)	
••	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	
	XBL-C21A	Cnet (RS-232C/Modem) I/F	
	XBL-C41A	Cnet (RS-422/485) I/F	
_	XBL-EMTA	Enet I/F	
Communication <b>Module</b>	XBL-EIMT/F/H	RAPIEnet I/F	
nmunicati <b>Module</b>	XBL-EIPT	EtherNet/IP module	
Joc	XBL-CMEA	CANopen Master	
Com	XBL-CSEA	CANOpen Slave	
0	XBL-PMEC	Profibus-DP, Master	
	XBL-PSEA	Profibus-DP, Slave	
	XBL-DSEA	DeviceNet, Slave	
	XBO-AD02A	Current/voltage input 2channel	
	XBO-DA02A	Current/voltage output 2 channel	
Option Module	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(High speed counter is available on "SU "type)	
	XBO-TN04A	Sink type transistor output 4 channel (Positioning is available on slot 9 of "SU "type)	
	XBO-RTCA	RTC module(available on slot 9)	
	XBO-M2MB	Memory module	
e a	PMC-310S	Connection cable (PC to PLC), 9pin(PC)-6pin(PLC)	
ca ble	USB-301A	Connection cable (PC to PLC), USB	

٦

#### Note

Download Cable (PMC-310S) Diagram

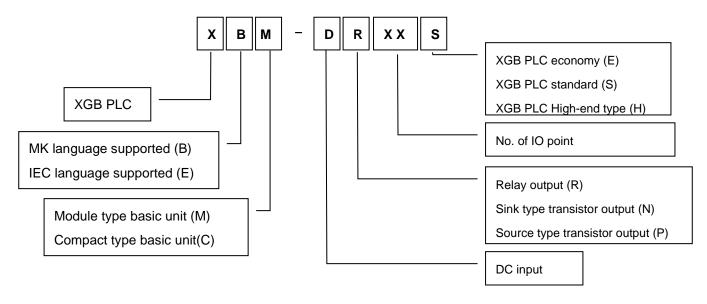


## 2.3 Classification and Type of Product Name

### 2.3.1 Classification and type of basic unit

Name of basic unit is classified as follows.

Γ



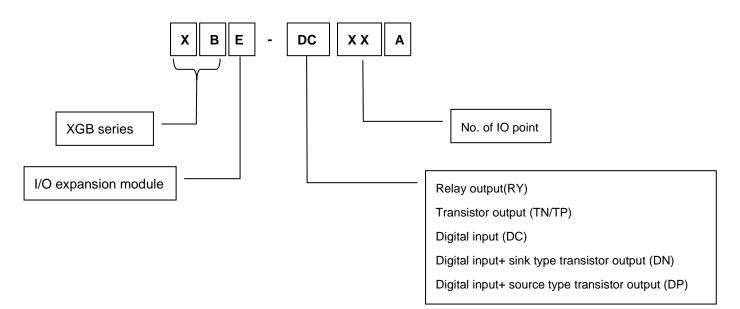
## Chapter 2. System Configuration

Classification	Name	DC input	Relay output	Transistor output	Power
	XBM-DR16S	8 point	8 point	None	
Modular type	XBM-DN16S	8 point	None	8 point	DC24V
main unit	XBM-DN32S	16 point	None	16 point	
	XBC-DR32H	16 point	16 point	None	
	XBC-DN32H	16 point	None	16 point	
	XBC-DR64H	32 point	32 point	None	
	XBC-DN64H	32 point	None	32 point	-
	XBC-DN20S(U)	12 point	None	8 point	
	XBC-DN30S(U)	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	
	XBC-DR20SU	12 point	8 point	None	_
Compact type	XBC-DR30SU	18 point	12 point	None	
main nit	XBC-DR40SU	24 point	16 point	None	AC100V~240V
	XBC-DR60SU	36 point	24 point	None	_
	XBC-DR10E	6 point	4 point	None	_
	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	

#### 2.3.2 Classification and type of expansion module

Name of expansion module is classified as follows.

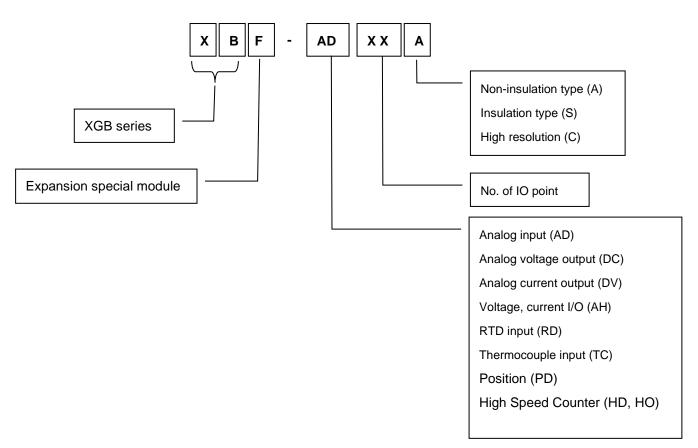
Γ



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

#### 2.3.3 Classification and type of special module

Special module is classified as follows.

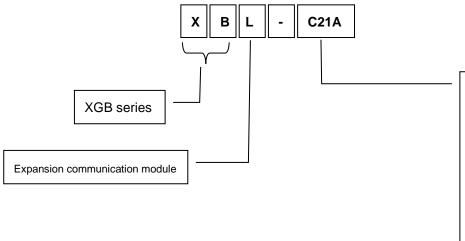


Classification	Name	No. of input ch.	Input type	No. of output ch.	Output type
Angles input	XBF-AD04A/C	4	Voltage/Current	None	-
Analog input	XBF-AD08A	8	Voltage/Current	None	
	XBF-DC04A/C	None	-	4	Current
Analog output	XBF-DV04A/C	None	-	4	Voltage
	XBF-RD04A	4	PT100/JPT100	None	-
RTD input	XBF-RD01A	1	PT100/JPT100	None	-
	XBF-TC04S	4	K, J, T, R	None	-
TC input	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	XBF-HD02A	2	Line Driver		
Counter	XBF-HO02A	2	Open Collector		

#### 2.3.4 Classification and type of communication module

Name of communication module is classified as follows.

Γ

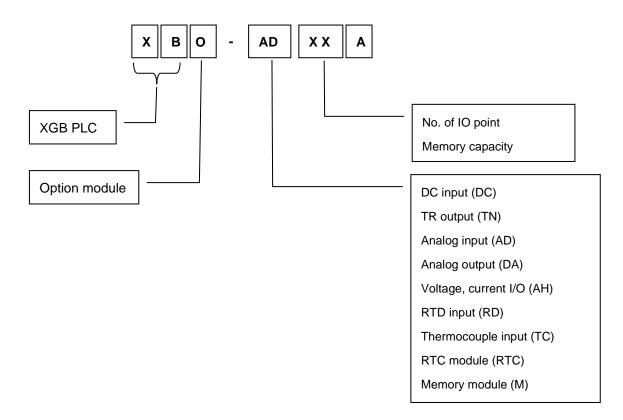


Cnet 1 channel (RS-232C): C21A					
Cnet 1 channel (RS-422/485): C41A					
FEnet 1 port: EMTA					
RAPIEnet 2 port: EIMT/F/H					
EtherNet/IP 2 port: EIPT					
CANopen Master: CMEA					
CANopen Slave: CSEA					

Classification	Name	Туре	
Cnet Comm. Module	XBL-C21A	RS-232C, 1 channel	
Chet Comm. Module	XBL-C41A	RS-422/485, 1 channel	
FEnet Comm. Module	XBL-EMTA	Electricity, open type Ethernet	
RAPIEnet Comm. Module	XBL-	Comm. Module between PLCs, electric media,	
RAFIENEL COMM. MODULE	EIMT/EIMF/EIMH	100 Mbps industrial Ethernet supported	
EtherNet Comm. Module	XBL-EIPT	Open EtherNet I/P	
CANIanan Comm Madula	XBL-CMEA	CANopen Master	
CANopen Comm. Module	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	DC 24V
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	-

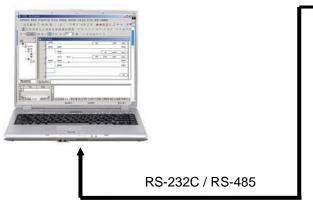
# 2.4 System Configuration

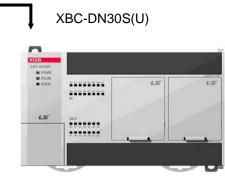
## 2.4.1 Cnet I/F system

Cnet I/F System is used for communication between the main unit and external devices using RS-232C/RS-422 (485) Interface. The XGB series has a built-in RS-232C port, RS-485 port

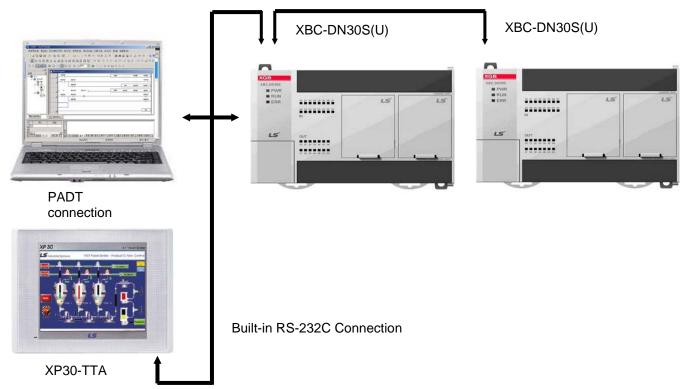
For "E" type, only one communication port between RS-232C and RS-485 can be used and you can specify at parameter setting window. For "S" type, RS-232C and RS-485 can be used independently and add RS-232C dedicated Cnet I/F module (XBL-C21A) and RS-422/485 dedicated Cnet I/F module (XBL-C41A). It is possible to configure the following communication system on demand

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

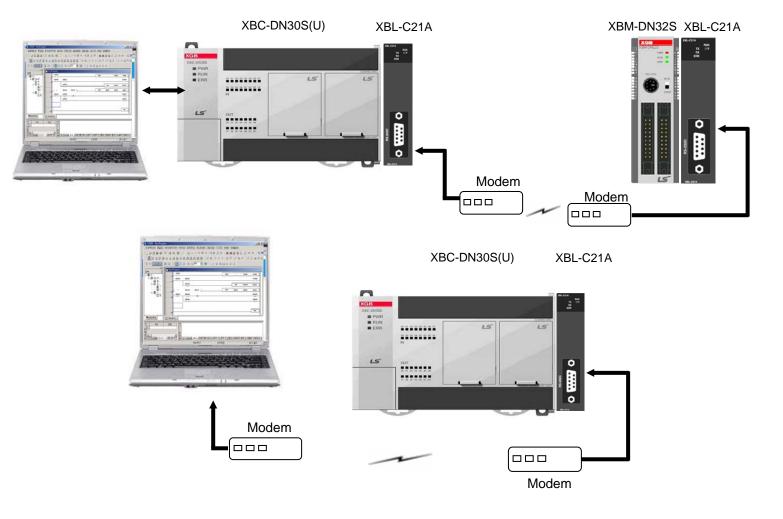




(b) 1:1 communication with main unit using a built-in RS-485 port (In case of built-in RS-232C,it is for connecting to HMI device.)

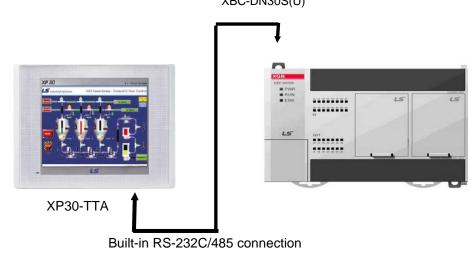


Built-in RS-485 Connection



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

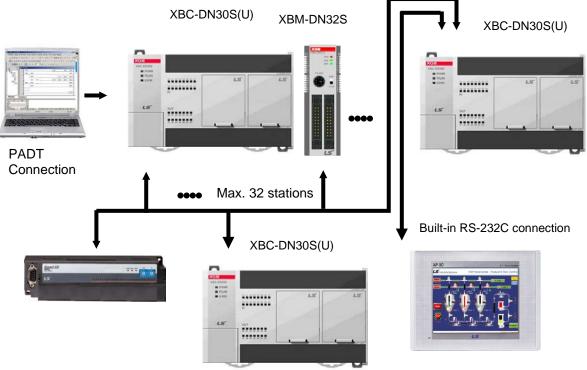
(d) 1:1 communication of an external device (monitoring unit) with main unit using a built-in RS-232C/485 port.
 XBC-DN30S(U)



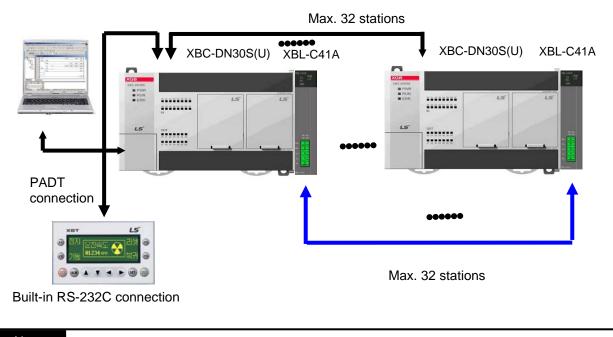
## (2) 1:n Communication system

Γ

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



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

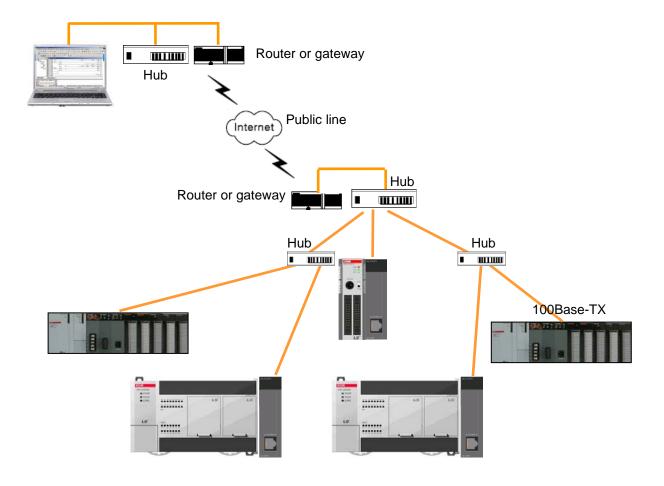


## Note

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

## 2.4.2 Ethernet system

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



### Note

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

# **Chapter 3 General Specifications**

# 3.1 General Specifications

The General specification of XGB series is as below.

No.	Items		Specification					
1	Ambient Temp.			0 ~ 55 °C				
2	Storage Temp.			–25 ~ +70 °C				
3	Ambient humidity		5 ~ 95%	RH (Non-cond	densing)		-	
4	Storage humidity		5 ~ 95%	RH (Non-cond	densing)			
			Occasional	vibration		-		
		Frequency	Acc	eleration	Amplitude	Times		
		$10 \le f < 57Hz$	z	-	0.075mm			
5	Vibration	57 ≤ f ≤ 150H	lz 9.8r	n/s²(1G)	-	10 times		
5	resistance		Continuous	vibration		each		
		Frequency	Acce	eleration	Amplitude	direction	IEC61131-2	
		$10 \leq f < 57Hz$	Z	-	0.035mm	(X,Y and Z)	120011012	
		$57 \le f \le 150$ Hz $4.9$ m/s <sup>2</sup> (0.5G) –						
		<ul> <li>Peak acceleration</li> </ul>	<ul> <li>Peak acceleration : 147 m/s<sup>2</sup> (15G)</li> </ul>					
6	Shock resistance	Duration : 11ms						
		Half-sine, 3 times e	each directio	•				
				LS ELECTRIC				
		impulse noise	DC: ±900 V				standard	
		Electrostatic		Voltage: 4kV	(Contact discha	rge)	IEC61131-2	
		discharge				<b>•</b> ·	IEC61000-4-2	
7	Noise resistance	Radiated					IEC61131-2,	
		electromagnetic		80 ~ 1,0	00 MHz, 10V/m		IEC61000-4-3	
		field noise		Power suppl	Digital/Apal	og Input/Output,		
		Fast transient	Segment	module		•	IEC61131-2	
		/Burst noise	Voltage	2kV		Communication Interface 1kV		
8	Environment	Free	Free from corrosive gases and excessive dust					
9	Altitude	Up to 2,000 ms						
10	Pollution degree	2 or less				-		
10								
	Cooling			Air-cooling				

## Notes

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.

Г

# **Chapter 4 CPU Specifications**

# 4.1 Performance Specifications

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

XBC-Dx10/14/20/30E).			Specification	s ("E" type)		
Items		XBC-DR10E	XBC-DR14E	XBC-DR20E	XBC-DR30E	
Ite	ems	XBC-DN10E	XBC-DN14E	XBC-DN20E	XBC-DN30E	Remark
		XBC-DP10E	XBC-DP14E	XBC-DP20E	XBC-DP30E	
Program co	ontrol method	Reiterative ope	eration, fixed cycle	e operation, cons	tant scan	
I/O control	method		nous batch proces	sing method (Re	fresh method),	
Program la	nguage	Ladder Diagra	m, Instruction List			
Number of	Basic	About 30				
instructions	Application	About 490				
Processing (Basic instr		0.24 µs/Step				
Program ca	apacity	4 k steps		1		
Max. I/O po	oints	14 point Main + 1 option	18 point Main + 1 option	28 point Main + 2 options	38 point Main + 2 options	-
	Р	P0000 ~ P127	F (2,048 point)	· · ·		
	М	M0000 ~ M25				
	К	K00000 ~ K25				
	L	L00000 ~ L12				
	F	F000 ~ F255F				
Data area	Т	100ms, 10ms, (Adjustable by				
	С	C000 ~ C255				
	S	S00.00 ~ S127	7.99			
	D	D0000 ~ D51	19 (5120 word)			
	U	U00.00 ~ U07 (Analog data r	Word			
	Z	Z000~Z127 (1	28 Word)			
Total progra	am	128				
Initial task		1				
Cyclic task		Max. 8				
I/O task		Max. 4				
Internal device task		Max. 8	-			
Operation mode		RUN, STOP, DEBUG				
Self-diagno	sis function	Detects errors of scan time, memory, I/O				
Program po	ort	RS-232C (Loa	ader)			
Back-up me	ethod	Latch area se	tting in basic para	meter		

Items	XBC-DR10E	XBC-DR14E	XBC-DR20E	XBC-DR30E	Remark
items	XBC-DN10E	XBC-DN14E	XBC-DN20E	XBC-DN30E	Remark
	XBC-DP10E	XBC-DP14E	XBC-DP20E	XBC-DP30E	
	250mA	280mA	350mA	470mA	
Internal consumption current	180mA	190mA	200mA	210mA	
	180mA	190mA	200mA	210mA	
	330g	340g	450g	465 g	
Weight	313g	315g	418g	423g	
	313g	315g	418g	423g	

Г

The following table shows the general specifications of the XGB compact type CPU (XBC-DN20/30S).

٦

Items		Specification	ns ("S" type)	Domork
116	ems	XBC-DN20S	XBC-DN30S	Remark
Program co	ontrol method	Reiterative operation, fixed cycl		
I/O control	method	Scan synchronous batch proces Directed by program instruction	ssing method (Refresh method),	
Program la	nguage	Ladder Diagram, Instruction Lis	t	
Number of		About 30		
instructions	Application	About 540		
Processing (Basic instr	•	94 ns/Step		
Program ca	pacity	15 k steps		
Max. I/O pc	oints	244 point (Main + Expansion 7 stages)	254 point (Main + Expansion 7 stages)	-
	Р	P0000 ~ P1023F (16,384 point)		
	Μ	M0000 ~ M1023F (16,384 point	)	
	К	K0000 ~ K4095F (65,536 point)		
	L	L0000 ~ L2047F (32,768 point)		
	F	F0000 ~ F1023F (16,384 point)		
Data area	т	100ms, 10ms, 1ms : T0000 ~ T (Adjustable by parameter settin		
	С	C0000 ~ C1023 (1,024)		
	S	S00.00 ~ S127.99		
	D	D0000 ~ D10239 (10,240 word		
	U	U00.00 ~ U0A.31 (Analog data	Word	
	Z	Z000~Z127 (128 Word)		
	R	R0000~R10239 (10,240 word)		
Total progra	am	128		
Initial task		1		
Cyclic task		Max. 8		
I/O task		Max. 8		
Internal dev	/ice task	Max. 8		
Operation mode		RUN, STOP, DEBUG	-	
Self-diagno	sis function	Detects errors of scan time, merr	nory, I/O	
Program po	ort	RS-232C 1 channel		
Back-up me	ethod	Latch area setting in basic para	imeter	
Internal consu	Imption current	240 mA	255 mA	
Weight		470g	475g	

The following table shows the general specifications of the XGB compact type CPU (XBC-Dx20/30/40/60SU).

Γ

Specifications ("SU" type)         XBC-DR20SU       XBC-DR30SU       XBC-DR40SU       XBC-DR60SU       XBC-DR60SU         XBC-DN20SU       XBC-DN30SU       XBC-DN40SU       XBC-DN60SU       XBC-DN60SU         XBC-DP20SU       XBC-DP30SU       XBC-DP40SU       XBC-DP60SU       XBC-DP60SU         Program colspan="4">Program colspan="4">Reiterative operation, fixed cycle operation, constant scan         I/O control       Reiterative operation, fixed cycle operation, constant scan         I/O control       Scan synchronous batch processing method (Refresh method), Directed by program instruction List         Program large       Ladder Diagram, Instruction List         Number of instructions       About 30         Processing speed (Basic instruction)       94 ns/Step         94 ns/Step       15 k steps         Memory       640KB RAM / TMB Flash
XBC-DN20SUXBC-DN30SUXBC-DN40SUXBC-DN60SUVBC-DP20SUXBC-DP20SUXBC-DP40SUXBC-DP60SUProgram control methodReiterative operation, fixed cycle operation, constant scanI/O control methodScan synchroous batch processing method (Refresh method), Directed by program instruction ListProgram languageLadder Diagram, Instruction ListNumber of instructionsBasicAbout 30ApplicationAbout 540Processing speed (Basic instruction)94 ns/StepProgram caracity15 k stepsMemory640KB RAM / IMB Flash
Program control methodReiterative operation, fixed cycle operation, constant scanI/O control methodScan synchronous batch processing method (Refresh method), Directed by program instructionProgram languageLadder Diagram, Instruction ListNumber of instructionsBasicAbout 30Processing speed (Basic instruction)94 ns/StepProgram capacity15 k stepsMemory640KB RAM / 1MB Flash
I/O control methodScan synchronous batch processing method (Refresh method), Directed by program instructionProgram languageLadder Diagram, Instruction ListNumber of instructionsBasicAbout 30ApplicationAbout 540Processing speed (Basic instruction)94 ns/StepProgram capacity15 k stepsMemory640KB RAM / 1MB Flash
I/O control methodDirected by program instructionProgram languageLadder Diagram, Instruction ListNumber of instructionsBasicAbout 30ApplicationAbout 540Processing speed (Basic instruction)94 ns/StepProgram capacity15 k stepsMemory640KB RAM / 1MB Flash
Number of instructionsBasicAbout 30ApplicationAbout 540Processing speed (Basic instruction)94 ns/StepProgram capacity15 k stepsMemory640KB RAM / 1MB Flash
instructionsApplicationAbout 540Processing speed (Basic instruction)94 ns/StepProgram capacity15 k stepsMemory640KB RAM / 1MB Flash
Processing speed (Basic instruction)94 ns/StepProgram capacity15 k stepsMemory640KB RAM / 1MB Flash
(Basic instruction)     94 hs/Step       Program capacity     15 k steps       Memory     640KB RAM / 1MB Flash
Memory 640KB RAM / 1MB Flash
244 point 254 point 264 point 284 point _
Max. I/O points (Main + Expansion (Main + Expansion (Main + Expansion (Main + Expansion
7 stages) 7 stages) 7 stages) 7 stages) 7 stages)
P P0000 ~ P1023F (16,384 point)
M M0000 ~ M1023F (16,384 point)
K K0000 ~ K4095F (65,536 point)
L L0000 ~ L2047F (32,768 point)
F F0000 ~ F1023F (16,384 point)
Data areaT100ms, 10ms, 1ms : T0000 ~ T1023 (1,024 point) (Adjustable by parameter setting)
C C0000 ~ C1023 (1,024)
S S00.00 ~ S127.99
D D0000 ~ D10239 (10,240 word)
U U00.00 ~ U0A.31 (Analog data refresh area: 352 word)
Z Z000~Z127 (128 Word) Word
R R0000~R10239 (10,240 word)
Total program 128
Initial task 1
Cyclic task Max. 8
I/O task Max. 8
Internal device task Max. 8 -
Operation mode RUN, STOP, DEBUG
Self-diagnosis function Detects errors of scan time, memory, I/O
Program port RS-232C 1 channel, USB 1 channel
Back-up method Latch area setting in basic parameter

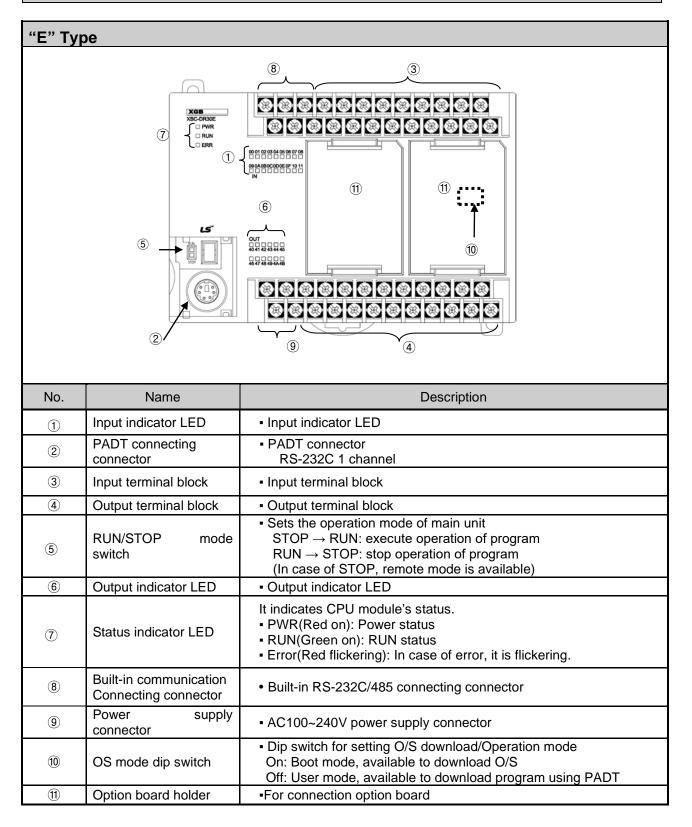
Items	XBC-DR20SU	C-DR20SU XBC-DR30SU XBC-DR40SU XBC-		XBC-DR60SU	Remark
nomo	XBC-DN20SU	XBC-DN30SU	XBC-DN40SU	XBC-DN60SU	Remain
	XBC-DP20SU	XBC-DP30SU	XBC-DP40SU	XBC-DP60SU	
	478 mA	626 mA	684 mA	942 mA	
Internal consumption current	252 mA	310 mA	288 mA	340 mA	
	305 mA	352 mA	355 mA	394 mA	
	514g	528g	594g	804g	
Weight	475g	476g	578g	636g	
	442g	446g	544g	717g	

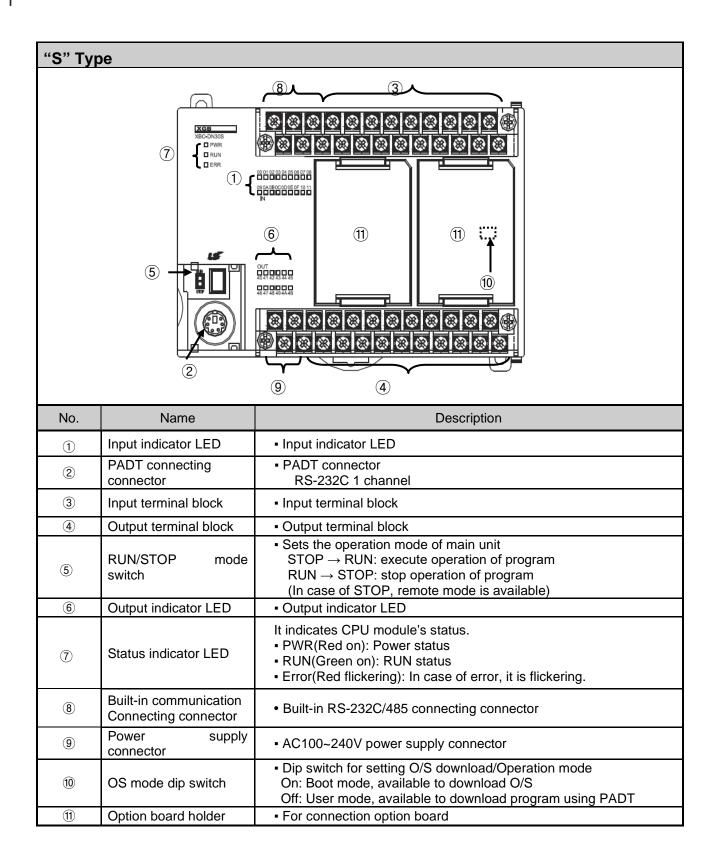
٦

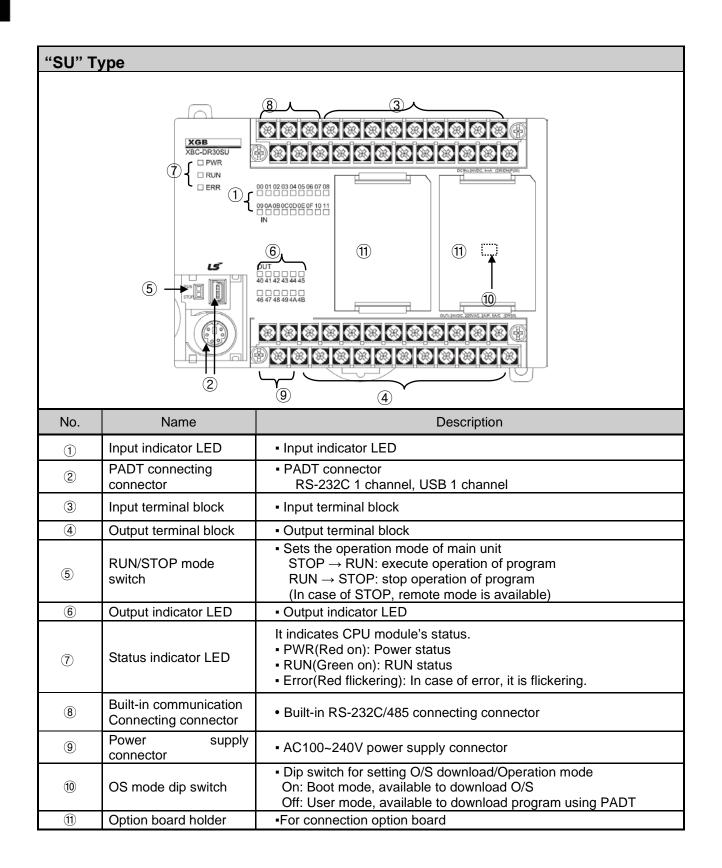
Itomo			Spec	Durind	
Items			"E" type	"S(U)" type	Remark
	PID control function		Controlled by instructions, Auto- Forced output, Adjustable oper MV function, SV-Ramp function Max. 16 loops are supported	Supported in "S(U)" type	
	Cne	t I/F function	Dedicated protocol support MODBUS protocol support User defined protocol support Select one port between RS-		
			232C 1 port, RS-485 1 port by parameter	respectively	
		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	
	High-speed counter	Counter mode	<ul> <li>4 different counter modes acco addition/subtraction method</li> <li>1 phase pulse input: additi</li> <li>1 phase pulse input: ad phase</li> <li>2 phase pulse input: additi</li> </ul>	on/subtraction counter ddition/subtraction counter by B	
	High-spe	High-spee	<ul> <li>2 phase pulse input: addition/subtraction by rising pulse phase differences</li> </ul>	• 2 phase pulse input: addition/subtraction by rising/falling pulse phase differences	
Inction		Additional function	<ul> <li>Internal/External preset fur</li> <li>Latch counter function</li> <li>Comparison output functio</li> <li>Revolution number per uni</li> </ul>		
Built-in function	tion	Basic function	No. of control axis: 2 axes Control method: position/spe Control unit: pulse Positioning data: 80 data/ax Operation mode: End/Keep/ Operation method: Single, F		
	Positioning function	Positioning Medical Positioning medical Positioning Address range: function Speed: Max. 10 Acceleration / D		ng method: Absolute / Incremental range: -2,147,483,648 ~ 2,147,483,647 Max. 100kpps(setting range 1 ~ 100,000pps) tion / Deceleration method : trapezoidal method	
	Posit	Return to Origin	By Home and DOG (Off) By Home and DOG (On) By DOG		output
		JOG operation	Setting range: 1~100,000 ( H	igh / Low speed)	
		Additional function		synchronizing operation, Position ear interpolation operation etc.	
	Pulse catch		50 ⊭s 4 point (P0000 ~ P0003)	10 μs 2 point (P0000 ~ P0001) 50 μs 6 point (P0002 ~ P0007)	_
	External interrupt		4 point: 50 ⊭s (P0000 ~ P0003)	10 μs 2 point (P0000 ~ P0001) 50 μs 6 point (P0002 ~ P0007)	
	I	nput filter	Select among 1,3,5,10,20,7	0,100 ms (Adjustable)	

Г

# 4.2 Names of Part and Function







# 4.3 Power Supply Specifications

Γ

It describes the power supply specification of main unit.

			Specification						
Items			XBC-	XBC-	XBC-	XBC-	XBC-	XBC-	
	-		Dx10/14E	Dx20/30E	Dx20S(U)	Dx30S(U)	Dx40SU	Dx60SU	
		voltage nty voltage)	AC 100 ~ 2	AC 100 ~ 240 V					
		age range	AC85~264	V(-15%, +10	)%)				
	Inrush current		50APeak or	less					
Input	Input current		0.5A or less (220V), 1A or less (110V)						
	Efficiency		65% or more						
	Permitted momentary power failure		Less than 10 ms						
	Rated	DC5V	500mA	800mA	1.5A	1.5A	2.0A	2.5A	
Output	output	DC24V	0.2A	0.2A	0.3A	0.3A	0.3A	0.5A	
Output voltage ripple			DC5V (±2%)						
Power s	Power supply status indication			LED On when power supply is normal					
C	able specific	cation	0.75 ~ 2 mm <sup>2</sup>						

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

## 1) Consumption current (DC 5V)

Туре	Model	Consumption current (Unit : mA)
	XBM-DR16S	400
	XBM-DN16S	250
	XBM-DN32S	280
	XBC-DR32H	660
	XBC-DR64H	1,040
	XBC-DN32H	260
	XBC-DN64H	330
	XBC-DN30S	255
	XBC-DN20S	240
	XBC-DN20SU	252
	XBC-DN30SU	270
	XBC-DN40SU	288
	XBC-DN60SU	340
	XBC-DP20SU	305
	XBC-DP30SU	352
	XBC-DP40SU	355
Main unit	XBC-DP60SU	394
	XBC-DR20SU	478
	XBC-DR30SU	626
	XBC-DR40SU	684
	XBC-DR60SU	942
	XBC-DR30E	470
	XBC-DR20E	350
	XBC-DR14E	280
	XBC-DR10E	250
	XBC-DN30E	210
	XBC-DN20E	200
	XBC-DN14E	190
	XBC-DN10E	180
	XBC-DP30E	210
	XBC-DP20E	200
	XBC-DP14E	190
	XBC-DP10E	180
	XBE-DC32A	50
	XBE-DC16A/B	30
	XBE-DC08A	20
	XBE-AC08A	30
	XBE-RY16A	440
	XBE-RY08A/B	240
	XBE-TN32A	80
Expansion I/O module	XBE-TN16A	50
	XBE-TN08A	40
	XBE-TP32A	80
	XBE-TP16A	50
	XBE-TP08A	40
	XBE-DR16A	250
	XBE-DN32A	60

٦

Туре	Model	Consumption current (Unit : mA)
	XBF-AD04A	120
	XBF-AD08A	105
	XBF-AH04A	120
	XBF-DV04A	110
	XBF-DC04A	110
	XBF-RD04A	100
Expansion special module	XBF-TC04S	100
	XBF-PD02A	500
	XBF-HD02A	260
	XBF-HO02A	200
	XBF-AD04C	100
	XBF-DC04C	160
	XBF-DV04C	160
	XBL-C21A	120
	XBL-C41A	120
	XBL-EMTA	300
	XBL-EIMT	280
Expansion communication module	XBL-EIMF	670
	XBL-EIMH	480
	XBL-EIPT	290
	XBL-CMEA	211
	XBL-CSEA	202
	XBO-DC04A	80
	XBO-TN04A	100
	XBO-AD02A	50
	XBO-DA02A	150
Option module	XBO-AH02A	150
	XBO-RD01A	30
	XBO-TC02A	50
	XBO-RTCA	30
	XBO-M2MB	-

Γ

# 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.

Туре	Model	Unit No.	Internal 5V consumption current (Unit : m <sup>A</sup> )	Remark
Main unit	XBC-DN20S	1	240	
	XBE-DC32A	2	50	In case contact points are On. (Maximum consumption current)
	XBE-TN32A	2	80	
Expansion module	XBF-AD04A	1	120	
modulo	XBF-DC04A	1	110	All channel is used. (Maximum consumption current)
	XBL-C21A	1	110	
Consumption current	5	<b>850</b> mA		-
Consumption voltage		4.25 W	0.85 * 5V = 4.25W	

In case system is configured as above, since 5V consumption current is total 850mA and 5V output of XGB standard type main unit is maximum 1.5A, normal system configuration is available.

#### (2) XGB PLC configuration example 2

Туре	Model	Unit No.	Internal 5V consumption current (Unit : m <sup>A</sup> )	Remark
Main unit	XBC-DN30S	1	255	
Expansion	XBE-DR16A	2	250	In case all contact points are On. (Maximum consumption current)
	XBE-RY16A	2	440	
module	XBF-AD04A	2	120	All channel is used.
	XBL-C21A	1	110	(Maximum consumption current)
Consumption current	1	,985 mA		-
Consumption voltage		9.925 W	1.985 × 5V = 9.925W	

If system is configured as above, total 5V current consumption is exceeded 1,985 mA 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.

Туре	Model	Unit No.	Internal 5V consumption current (Unit : mA)	Remark
Main unit	XBC-DN32H	1	260	In case of all contact points are
	XBE-DR16A	2	250	On.
Expansion	XBE-RY16A	2	440	(Maximum consumption current)
module	XBF-AD04A	2	120	All channel is used.
	XBL-C21A	1	110	(Maximum consumption current)
Consumption current	1	,990 mA		-
Consumption voltage		9.95 W		1.99A × 5V = 9.95W

(3) XGB PLC configuration example 3

The above system is an example using XBC-DN32H about 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,

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

But charge super capacitor enough 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.

## (1) Phenomenon

- (a) RUN mode
  - 1) In case of Remote Run mode, operation mode changes to Stop mode. In case of Local Run mode, it operates normally with abnormal data backup warning
  - 2) In case of Stop mode, abnormal data backup warning occurs.
- (b) Latch data
  - 1) Latch area 1,2 : all data are cleared into "0".
  - 2) K area, F area : all data are cleared into "0".
- (2) Measure
  - (a) 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.

## Notice

Above data backup time can be different according to 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'. The series of processing like this is called 'cyclic operation method'. The processing is divided per stage as below.

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

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

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

The signal to inform this kind of urgent status to CPU module is called 'interrupt signal'. There is a Cycle time signal that operates program every appointed time and external interrupt signal that operates program by external contact ("S" 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)

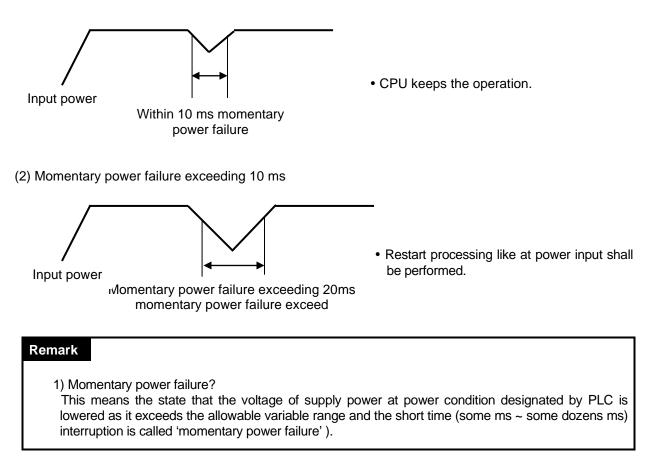
This is the operation method that performs the scan program every appointed time. This stands by for a while after performing all the scan program, and starts again the program scan when it reaches to the appointed time. The difference from constant program is the update of input/output and the thing to perform with synchronization. At constant operation, the scan time indicates the net program processing time where the standby time is deducted. In case that scan time is bigger than 'constant', [F0005C] '\_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 ms, the operation is stop and the output is Off. Restart processing like at power input shall be performed.

(1) Momentary power failure within 10 ms



## 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.

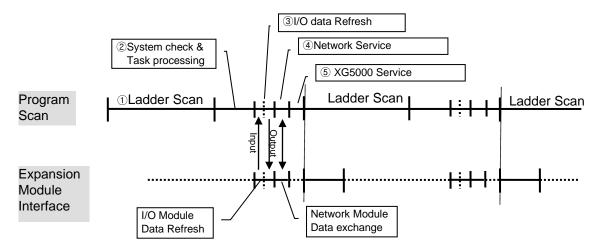
- (a) Scan time = Scan program processing time + Interrupt program processing time + PLC internal processing time
  - Scan program processing time = processing time of user program except interrupt program
  - Interrupt program processing time = Sum of interrupt program proceeding time processed during 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.

	MPU processing time		Expansion interface processing time				
Туре	Executing ladder (4Kstep)	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 ms	1.0 ms	-	-	0.5 ms		
"S" type	3.0 ms	0.5 ms	<b>0.3</b> ms	<b>3.0</b> ms	<b>0.8</b> ms		

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  $\mu$ s ~ 1.0 ms [varies depending on the usage of auxiliary functions]
- (3) XG5000 Service process time: 100  $\,\mu$ s 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

Γ

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 ( $\mu$ S) = ladder execution time + system processing time + digital module I/O processing time + analog I/O processing time + communication module processing time + XG5000 Service processing time = (2047 x (0.67(LOAD)+ 0.80(OUT)) + (500) + (300 x 5) + (3000 x 1) + (800 x 1) + (100)  $\mu$ S = 3009 + 500 + 1500 + 3000 + 800 + 100  $\mu$ S = 8909  $\mu$ S = 8.9 mS

(But, in case of online editing or writing XG-PD parameter, scan time increases temporary up to 100ms)

### (3) Scan time monitor

Opline Manitar Dahua Taala Window

(a) Scan time can be monitored "Online" - "PLC Information" - "Performance".

2	Intel Monitor Debug Tools Window		
e,	Disco <u>n</u> nect	PLC info, - NewPLC	? ×
٩	Connection Se <u>t</u> tings	CPU Performance Password ]	
	Change Mode	⊂ Scan time	_ 1
묷	, <u>R</u> ead	Max, 0,0ms Min,: 0,0ms Cur,: 0,0ms	
2	-		
£	Compare with PLC	Memory used	
	Set Flash Memory	Program: 0,0KStep / 10,0K Step : 0%	-
	Control Re <u>d</u> undancy	Uetalis	
	Reset PLC	Comment: 0,5KB / 16,0KB : 3%	
	Clear PLC	D <u>e</u> tails	
	Clear <u>A</u> ll PLC		
Q	PLC Information		
Ę	PLC <u>H</u> istory		
	PLC Errors/Warnings	Close	
	I/O Information		;
	Save PLC His <u>t</u> ory		

- (b) Scan time is save in special relay (F) area as follows.
  - F0050: max. value of scan time (unit: 0.1 ms)
  - F0051: min. value of scan time (unit: 0.1 ms)
  - F0052: current value of scan time (unit: 0.1 ms)

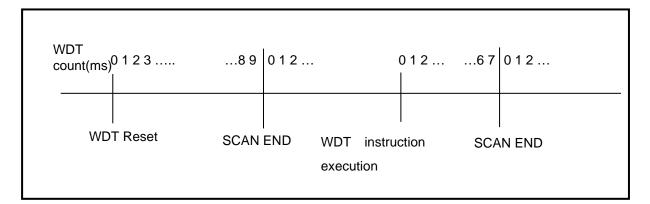
## 5.1.4 Scan Watchdog timer

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, we can use the following method : power re-supply, manipulation of manual reset switch, mode conversion to STOP mode.



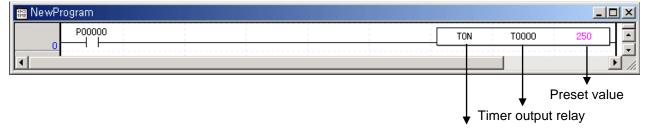
## Remark

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

## 5.1.5 Timer processing

The XGB series use up count timer. There are 5 timer instructions such as on-delay (TON), off-delay (TOFF), integral (TMR), monostable (TMON), and re-triggerable (TRTG) timer.

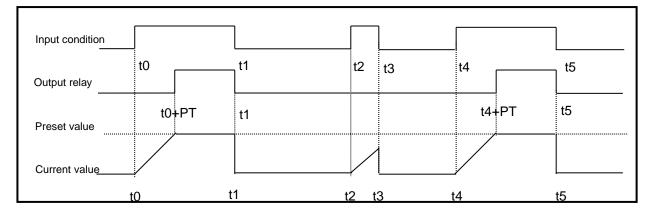
The measuring range of 100msec timer is  $0.1 \sim 6553.5$  seconds, 10msec timer is  $0.01 \sim 655.35$  seconds, and that of 1msec timer is  $0.001 \sim 65.53$  seconds. Please refer to the 'XG5000 User manual' for details.



#### (1) On delay timer

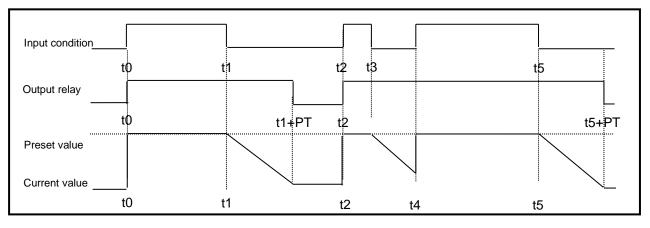
Timer type

The current value of timer starts to increase from 0 when the input condition of TON instruction turns on. When the current value reaches the preset value (Current value=Preset value), the timer output relay (Txxxx) turns on. When the timer input condition is turned off, the current value becomes 0 and the timer output relay is turned off.



#### (2) Off delay timer

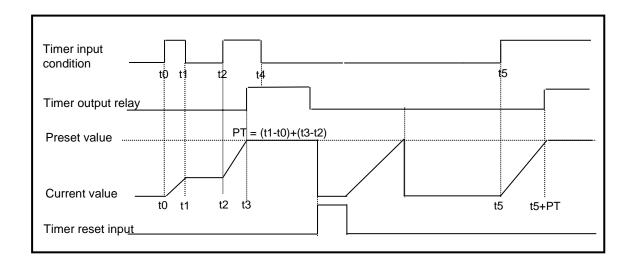
The current value of timer set as preset value and the timer output relay is turned on when the input condition of TOFF instruction turns on. When the input condition is turned off, the current value starts to decrease. The timer output relay is turned off when the current value reaches 0.



## (3) Integral timer

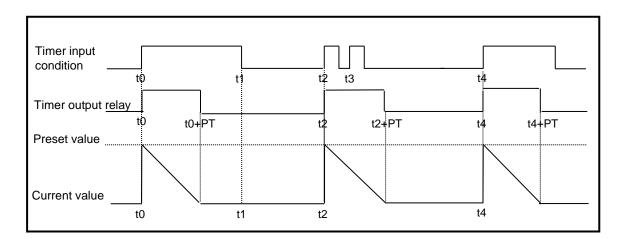
In general, its operation is same as on-delay timer. Only the difference is the current value will not be clear when the input condition of TMR instruction is turned off. It keeps the elapsed value and restart to increase when the input condition is turned on again. When the current value reaches preset value, the timer output relay is turned on.

The current value can be cleared by the RST instruction only.



### (4) Monostable timer

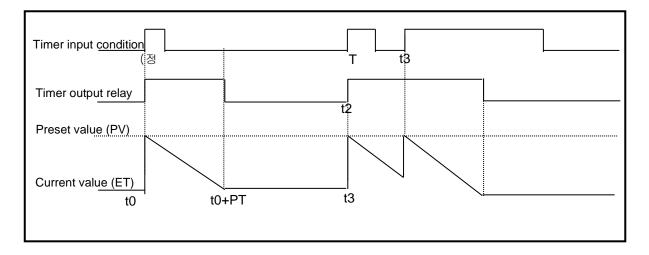
In general, its operation is same as off-delay timer. However, the change of input condition is ignored while the timer is operating (decreasing). When current value reaches preset value the timer output relay is turned off and current value is cleared.



## (5) Retriggerable timer

Γ

The operation of retriggerable timer is same as that of monostable timer. Only difference is that the retriggerable timer is not ignore the input condition of TRTG instruction while the timer is operating (decreasing). The current value of retriggerable timer will be set as preset value whenever the input condition of TRTG instruction is turned on.



#### Remark

The Maximum timer error of timers of XGB series is '1 scan time + the time from 0 step to timer instruction'

## 5.1.6 Counter processing

The counter counts the rising edges of pulses driving its input signal and counts once only when the input signal is switched from off to on. XGB series have 4 counter instructions such as CTU, CTD, CTUD, and CTR. The followings shows brief information for counter operation. Refer to the 'XGB Instruction Manual' for details.

- Up counter increases the current value.
- Down counter decreases the current value.
- Up/Down counter compares the input value from both counters input.
- Ring counter increase the current value and the current value is cleared as 0 when the current value reaches the preset value.

#### (1) Renewal of counter's current value and contact On/Off

#### (a) Up counter

🏦 NewProgram					_	
F00093			CTU	C0000	1000	
M00001						-
3	 	 				-   -
<u>                                      </u>						<b>)</b> //

• Up counter increases the current value at the rising edges of input.

• The counter output contact (Cxxx) is turned On when the current value reaches the preset value. When the reset input is turned On, the counter output contact (Cxxx) is turned Off.

#### (b) Down counter

🗰 NewProg	gram						_	
	F00093			[	CTD	C0000	1000	]
	моооо1	1					C0000	-
3								
•								E/

• Down counter decreases the current value at the rising edges of input.

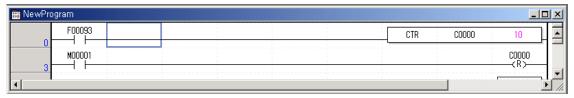
• The counter output contact (Cxxx) is turned On when the current value reaches the preset value. When the reset input is turned On, the counter output contact (Cxxx) is turned Off.

#### (c) Up/Down counter

NewProgram				1		
M00010		CTUD	C0000	M00002	M00003	10
M00001						C0000
6	 		1 			(6)

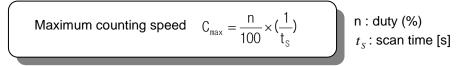
- The current value is increased with the rising edge of up-count input signal, and decreased with the rising edge of down-count input signal. The counter output contact (Cxxx) is turned On when the current value is same as or more than current value. The counter output contact (Cxxx) is turned Off when the current value is same as or less than current value.
- When the reset input is turned On, the current value is cleared as 0.

(d) Ring counter

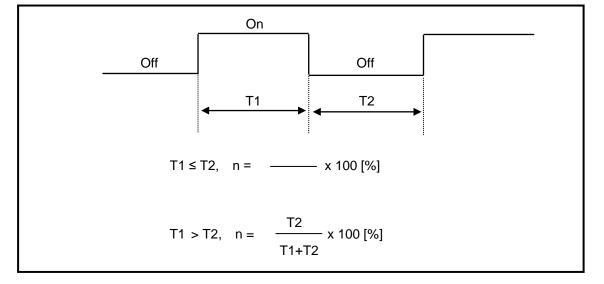


- The current value is increased with the rising edge of the counter input signal, and the counter output contact (Cxxx) is turned on when the current value reaches the preset value. Then the current value and counter output contact (Cxxx) is cleared as 0 when the next rising edge of the counter input signal is applied.
- When the reset input is turned On, the counter output contact is cleared as 0.
- (2) Maximum counting speed

The maximum counting speed of determined by the length of scan time. Counting is possible only when the on/off switching time of the counter input signal is longer than scan time.



• Duty is the ratio of the input signal's on time to off time as a percentage.



#### Remark

1) Use of High Speed Counter

In order to counter pulse that is faster than maximum counting speed of normal counter, use built-in High Speed counter function.

# **5.2 Program Execution**

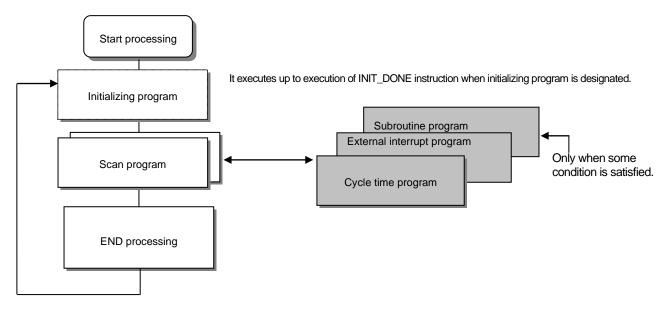
## 5.2.1 Configuration of program

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

Program type	Description
Initializing program	<ul> <li>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</li> </ul>
Scan program	<ul> <li>The scan program is executed regularly in every scan.</li> </ul>
Cycle time interrupt program	<ul> <li>The program is performed according to the fixed time interval in case that the required processing time condition is as below.</li> <li>In case that the faster processing than 1 scan average processing time is required</li> <li>In case that the longer time interval than 1 scan average processing time is required</li> <li>In case that program is processed with the appointed time interval</li> </ul>
External interrupt program	• The external interrupt program is performed process on external interrupt signal.
Subroutine program	<ul> <li>Only when some condition is satisfied.(in case that input condition of CALL instruction is On)</li> </ul>

## 5.2.2 Program execution methods

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



- (1) Scan program
  - (a) Function

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

• In case that the execution condition of interrupt by task interrupt or 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 contact task program): "S" type available to use up to 8. (P000 ~ P007)
      - "E" type available to use up to 4. (P000~P003)
  - 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 ("S" type: P000~P007, "E" type: P000~P003).

#### Remark

(1) Write the interrupt program as shortly as possible. In case same interrupt occurs repeatedly

before completion of interrupt, program is not executed and O/S watch dog error may occur.

(2) Though interrupt which has lower priority occurs many times during execution of interrupt

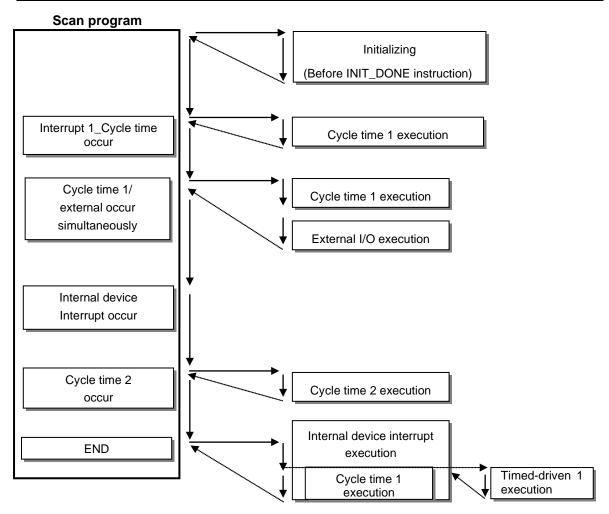
which has higher priority, interrupt which has lower priority occurs only one time.

## 5.2.3 Interrupt

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

•	Interrupt	setting
---	-----------	---------

Interrupt source	Interrupt name	priority	Task No.	Program
Initializing	Interrupt 0_	-	-	-
Cycle time 1	Interrupt 1_cycle time	2	0	Cycle time 1
External	Interrupt 2_external	2	8	External
Internal device	Interrupt 3_internal	3	14	Internal
Cycle time 2	Interrupt 4_cycle time	3	1	Cycle time 2



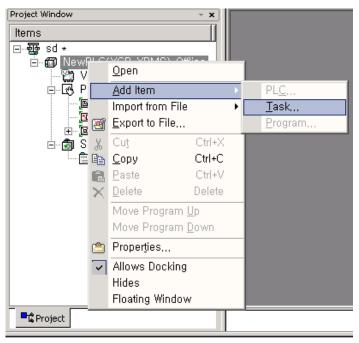
## Remark

- 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 state 'Enable'. 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 prepare interrupt program

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

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



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

Task	<u>? ×</u>
Iask name:	OK
Priority: 2	Cancel
Task number: 0 (Cycle time: 0~7, I/O: 8~15, Internal de	vice: 16~23)
C Initialization	
⊙ <u>C</u> ycle time ms	
C I/Q (0~7)	
I/O execution conditions	
st te ste	
C Internal <u>d</u> evice BIT	
Internal device execution conditions	
De <u>v</u> ice:	
C Rising C Falling C Transition C On	C Off

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

Project Window	/		<b>▼ X</b>	1	
Items					
	ewPLC(XGB-XB Variable/Com Parameter IB Basic Para I D Paramu I O Paramu	men Imet eters	t ers s		
	⊡ <b>⊠</b> , Internal Pa ¶ Scan Program		eters		
	💼 NewProgra		<u>O</u> pen		
····· 😵	Initial(Initialize		<u>A</u> dd Item	۲.	PL <u>C</u>
			Import from	n File 🔹 🕨	<u>T</u> ask,
Content Project		Ŧ	Export to I	File	Program
		Ж	Cu <u>t</u>	Ctrl+X	
	[	Ē	<u>С</u> ору	Ctrl+C	
			<u>P</u> aste	Ctrl+V	
		×	<u>D</u> elete	Delete	
			Move Program <u>U</u> p		
			Move Prog	gram <u>D</u> own	
		٢	Proper <u>t</u> ies		
		~	Allows Docking		
			Hides		
			Floating W	'indow	

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

٦

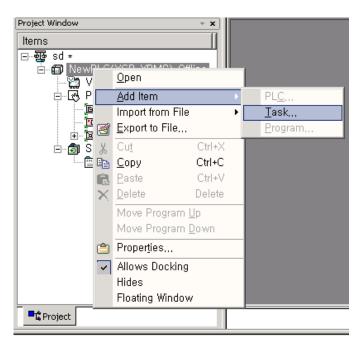
🔠 NewProg	gram						_	
	P0040			[	TON	T000	1000	
		 	             				INIT_DONE	
		 	 				END	
<b> </b> •   −								

(2) How to prepare Cycle interrupt program

Γ

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

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



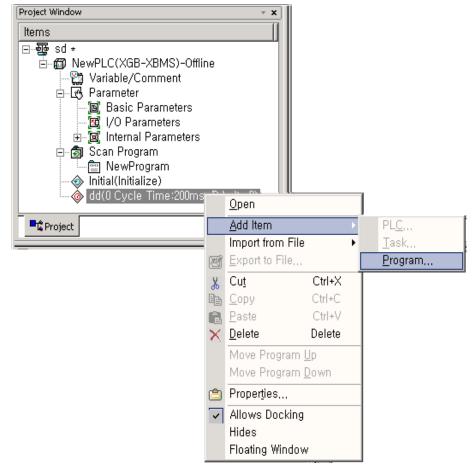
• It shows setting screen of Task.

Task	? ×
Task name: dd	OK
Priority: 2	Cancel
Task <u>n</u> umber: 0 (Cycle time: 0~7, I/O: 8~15, Internal devic Execution condition	e: 16~23)
C Initialization	
© Cycle time 200 ms	
C I/Q 0 (0~7)	
I/O execution conditions	
st te st	
C Internal device BIT	
Internal device execution conditions	
Device:	
Rising C Falling C Transition C On C C	Off

(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		<ul> <li>Set the Task number.</li> <li>Cycle time task (0 ~ 7): 8</li> <li>External I/O task (8 ~ 15): "S" type: 8, "E" type: 4</li> <li>Internal device task (16 ~ 23): 8</li> </ul>	-
	Initialization	Set the initial program when running the project.	Till the execution of INIT_DONE instruction
Execution	Cycle time	Set the cyclic interrupt.	0~4294967295 ms available
condition	I/O	Set the external I/O.	P000 ~ P007 available
	Internal device	Set the internal device to interrupt execution. • Bit: Among Rising, Falling, Transition, On, Off • Word: Among >,>=,<,<=	-

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



(d) Register the Program name and Program description.

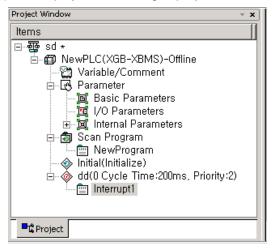
Γ

Program	? ×
Program <u>n</u> ame:	ОК
	Cancel
Program des <u>c</u> ription:	
A	

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

📰 Interrupt1		
		<b>_</b>
		<b>.</b>

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



#### (3) Task type

Task type and function is as follows.

Type Spec.	Cycle time task (Interval task)	I/O task (Interrupt task)		Internal device task (Single task)
opeo.		"S" type	"E" type	(Cirigie task)
Max. Task number	8	8 4		8
Start condition	Cyclic (setting up to max. 4,294,967.295 sec. by 1ms unit)	Rising or falling edge of mainRising or falling edge of main unit's contactP000 ~P007P000 ~P003		Internal device execution condition
Detection and execution	Cyclic execution per setting time	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		Delay as much as max. scan time
Execution priority	2~7 level setting (2 level is highest in priority)	2~7 level setting (2 level is highest in priority)		2~7 level setting (2 level is highest in priority)
Task no.	Within 0~7 range without user duplication	With 8~15 range without user duplication		Within 16~23 range without user duplication

(4) Processing methods of task program

Here describes common processing method and notices for Task program.

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

(b) Execution priority

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

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

- 1) Task detection delay (Refer to detailed description of each task.)
- 2) Program proceeding delay caused by Priority Task Program proceeding
- 3) Input/output data refresh of expansion special module and using PUT, GET instruction.

(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.
  - 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.
  - If interrupt is occurred while 'CALLP' instruction executing, interrupt program is executed after 'CALLP' instruction execution.

🚟 NewProgram				×
F00093		INCP	D00000	•
3		 		
F00095		 CALLP		
		INCP	D00200	
9			EI	
10 M00001			C0000 (B)	
12			END	
•	 1		<u>↓</u>	

(5) Cyclic task program processing method

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

(a) Items to be set in Task

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

(b) Cyclic task processing

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

- (c) Notice in using cyclic task program
  - 1) When cyclic task program is in execution currently or waiting for execution, if the demand to execute the same task program occurs, the new occurred task shall be disregarded.
  - 2) Timer that makes a demand to execute cyclic task program only while operation mode is Run mode, shall be added. The shutdown time shall be all disregarded.
  - 3) When setting the execution cycle of cyclic task program, consider the possibility that the demand to execute several cyclic task program at the same time occurs.

If 4 cyclic task programs that the cycle is 2sec, 4sec, 10sec and 20sec are used, 4 demands of execution per 20 seconds shall be occurred at the same time and scan time may extend instantaneously.

Task	?>
Task name: Cycle	ОК
Priority: 2	Cancel
Task <u>n</u> umber: 1 (Cycle time: 0~7, I/O: 8~15, Inter	nal device: 16~23)
C Initialization	
⊙ <u>C</u> ycle time 20 ms	
C I/ <u>O</u> (0∼7)	
VO execution conditions Fising C Falling C Transition	
1 to 1 to 1	
C Internal device BIT	
Internal device execution conditions	
Device:	
C Rising C Falling C Transition C On	C Off

(6) I/O task program processing

It described the I/O task program processing. ("S" type: P000~P007, "E" type: P000~P003)

Task ?
Task name: Cycle OK
Priority: 2  Cancel
Task number: 8 (Cycle time: 0~7, I/O: 8~15, Internal device: 16~23)
C Initialization
O <u>C</u> ycle time 20 ms
○ 170 0 (0~7)
VO execution conditions © Rising © Falling © Transition
st te ste
C Internal device BIT
Internal device execution conditions
Device:
C Rising C Falling C Transition C On C Off

(a) Items to be set in Task

Set the execution condition and priority to the task being executed. Check the task no. to manage the task. (b) I/O task processing

If interrupt signal from external signal (I/O) is occurred on main unit ("S" type: P000 ~ P007. "E" type: P000~P003), task program is executed by external (I/O) signal.

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

#### (7) Internal device task program processing

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

lask lask	?
Task name: Cycle	OK
Priority: 2	Cancel
Task number: 16 (Cycle time: 0~7, 1/0: 8~15, Internal de	vice: 16~23)
C Initialization	
C <u>C</u> ycle time 20 ms	
C I/Q 0~7)	
I/O execution conditions C Rising C Falling C Transition	
Internal device BIT ▼ Internal device execution conditions	
De <u>v</u> ice: M000	
Rising C Falling C Transition C On	⊂ Off
لائف ہے کے لیے	, ,

(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
  - 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) Are task programs made as shortly as possible?

Long running time of the task program can cause the long or irregular scan time or may lead to the conflict of task programs. Make the task programs as shortly as possible.

Especially, when attaching expansion special module, or using PUT,GET instructions, program processing might be delayed. (More than 10ms task cycle is recommended).

(d) Is program protection for the high priority task needed during program execution?

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

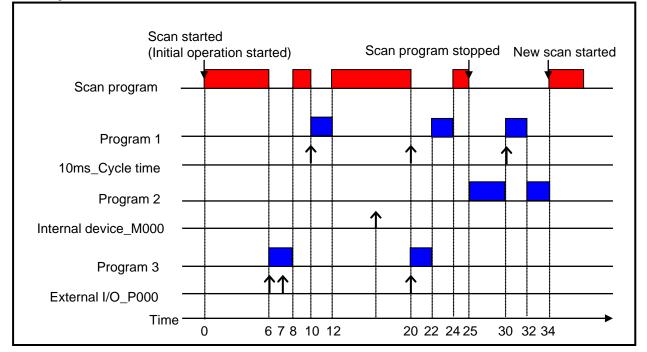
#### (9) Program configuration and processing example

If task and program are registered as below.

Interrupt type	Interrupt name	Priority	Task No.	Program
Cycle time	10 <sup>ms</sup> _cycle time	3	0	Program 1
Internal device	Internal device_M00	5	16	Program 2
I/O	I/O_P00	2	8	Program 3

1) Scan program name: "Scan Program"

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



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

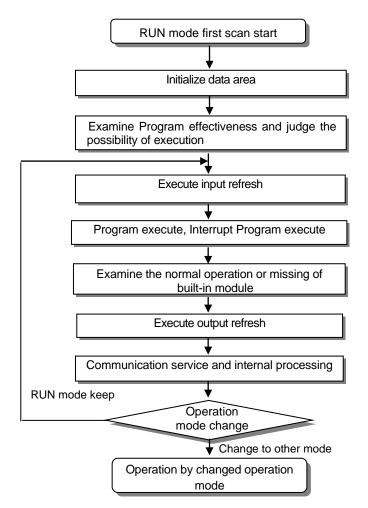
Γ

## **5.3 Operation Mode**

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

## 5.3.1 RUN mode

This is the mode to executed program operation normally.



(1) Processing at mode change

At the beginning, execute initialization of data area and examine the effectiveness of program and judge the possibility of execution.

#### (2) Operation processing contents

Execute I/O refresh and program operation.

- (a) Detects the start condition of Interrupt Program and executes Interrupt Program.
- (b) Examines the normal operation or missing of built-in module.
- (c) Communication service and other internal processing.

## 5.3.2 STOP mode

Γ

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

(1) Processing at Mode Change

Clear the output image area and execute output refresh.

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

## 5.3.3 DEBUG mode (Supported at "S" 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

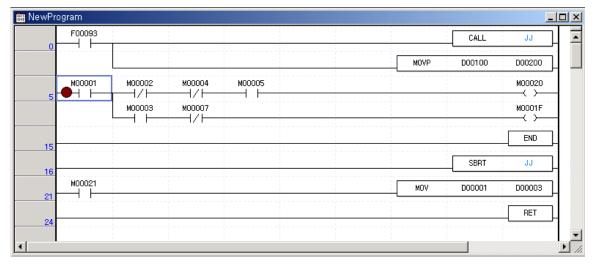
□ It describes debug mode.

<u>D</u> eb	ug <u>T</u> ools <u>W</u> indow <u>H</u> elp	
()	Start/Stop <u>D</u> ebugging	
[]	<u>G</u> o	Ctrl+F9
[]]	<u>S</u> tep Over	Ctrl+F8
7	Step Into	Ctrl+F7
[]]	Step <u>O</u> ut	
÷[]	G <u>o</u> to Cursor	Ctrl+F2
<u>8</u> 0 0	Set/Remove <u>B</u> reakpoints	Ctrl+F5
B	Breakpoints <u>L</u> ist	
Qı	Breakpoint <u>C</u> onditions	

ltem	Description	Remark
Start/Stop Debugging	Change the debug $\leftrightarrow$ stop mode	
Go	It starts debug operation.	
Step Over	It operates by 1 step.	
Step Into	It starts the subroutine program.	Other operation is identical to Step
Step Out	It finished the subroutine program.	Over.
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,  $\bigcirc$  (breakpoint setting indicator) is displayed.



(b) Go

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

🏭 NewProgram						
F00093					CALL	JJ
				MOVP	D00100	D00200
5 -M00001	M00002	M00004	моооо5			M00020
	мооооз	M00007				M0001F
15						END
16					SBRT	JJ
M00021	*			MOV	D00001	D00003
24						RET
•						

(c) Step Over

Γ

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

🔛 NewProgram						
F00093					CALL	JJ
				MOVP	D00100	D00200
M00001	M00002	M00004	M00005			M00020
5	M00003	моооот — 171—				M0001F
15						END
16					SBRT	JJ
M00021				MOV	D00001	D00003
24						RET
•						

#### (d) Breakpoint List

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

	P	Char.	Count	OK
Use	Program	Step	Count	
	NewProgram	4	I	Cancel
				<u>S</u> elect All
				<u>R</u> eset All
				<u>G</u> oto
				Re <u>m</u> ove
				Remove <u>A</u> ll

### (e) Break condition

• It sets Device Break and Scan Break.

Break condition -	NewPLC		? ×
Device Break	Scan Break		
_ <b>⊡</b> Use the de	evice as a device break		
<u>D</u> evice:	D0000	<u> </u>	
<u>T</u> ype:	WORD 💌		
<u>V</u> ariable∶	Empty		
<u>C</u> omment:	Empty		
🔽 Use value	break		
<u>V</u> alue:	H1234		

Break condition – NewPLC	<u>?</u> ×
Device Break Scan Break	
✓ Use scan break Debugger stops after scanning following counts Scan <u>C</u> ount: <u>60000</u>	

٦

## Remark

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

## 5.3.4 Change operation mode

(1) Operation Mode Change Method

Γ

The method to change operation mode are as follows.

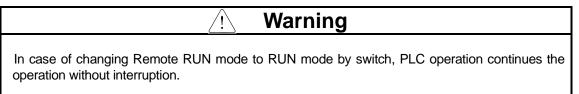
- (a) By mode key of CPU module
- (b) By connecting the programming tool (XG5000) to communication port of CPU
- (c) By changing the operation mode of other CPU module connected to network by XG5000 connected to communication port of CPU.
- (d) By using XG5000, HMI, computer link module connected to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

#### (2) Type of operation mode

The operation mode setting is as follows.

Operation mode switch	XG5000 command	Operation mode
RUN	unchangeable	Local Run
	RUN	Remote Run
STOP	STOP	Remote Stop
310P	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.



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 Data memory

(1) Bit device area

Various Bit Device are provided per function. The indication method is indicated by device type for first digit, word position by decimal for middle digit and bit position by hexadecimal for the last digit.

Area per d	evice	Device features	Description
"E" type	"S" type	Device features	Description
P0000 ~ P127f	P0000~ P1023f	I/O device "P"	Image area to save the state of I/O device. After reading the input module state, saves it in the corresponding P area and sends P area Data saving the operation result to output module.
M0000 ~ M255f	M0000~ M1023f	Internal device "M"	Internal Memory provided to save Bit Data in Program
L0000 ~ L1279f	L0000~ L2047f	Communication device "L"	Device to indicate high speed link/P2P service state information of communication module.
K00000 ~ K2559f	K00000~ K4095f	Preservation device "K"	Device area to preserve the data during power shutdown, which is used without setting power shutdown preservation parameter separately. (Pay attention to write in special area (K2600 ~ 2559F)).
F0000 ~ F255f	F0000~ F1023f	Special device "F"	System flag area that manages the flag necessary for system operation in PLC.
T0000 ~ T255	T0000~ T1023	Timer device "T"	Area to save the state of contact/current value/set value of timer device
C0000 ~ C255	C0000~ C1023	Counter device "C"	Area to save the state of contact/current value/set value of counter device
S00.00 ~ S127.99	S00.00~ S127.99	Step controller "S" 128 x 100 step	Relay for step control

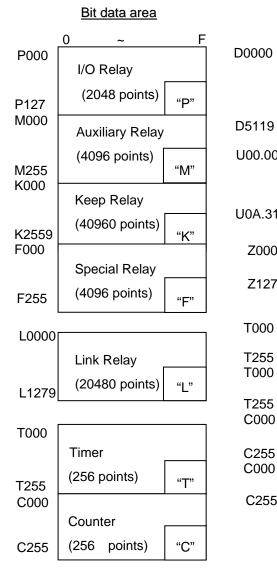
(2) Word device area

Γ

Area per	r device		Development
"E" type	"S" type	Device features	Description
D00000 ~ D5119	D0000~ D10239	Data register "D"	Area to preserve the internal data. Bit expression possible. (D0000.0)
U00.00 ~ U0A.31	U00.00~ U0A.31	Analog data register "U"	Register used to read data from special module installed in the slot. Bit expression possible
Z000 ~ Z127	Z000~ Z127	Index register "Z"	Dedicated device to use Index function Bit expression impossible
T0000 ~ T255	T0000~ T1023	Timer current value register "T"	Area to indicate the current value of timer
C0000 ~ C255	C0000~ C1023	Counter current value register "C"	Area to indicate the current value of counter
-	R0000~ R10239	File register "R"	Register for saving file Bit expression available (F0000.0)

## 5.5 Configuration Diagram of Data Memory

## 5.5.1 "E" type



S000	Step controller	
	(128 x 100 step)	"0"
S127	S00.00~S127.99	"S"

	Word data are	<u>a</u>
-	~ 0000	FFF
0000	Data Register	
	(5120 words)	
5119		"D"
J00.00	Analog Data	
	Register	
I0A.31	(1024 words)	"U"
Z000	Index Register	
Z127	(128 words)	"Z"
T000	Timer setting va	alue
T255	(256 words)	
Т000	Timer current v	alue
T255	(256 words)	
C000	Counter setting	value

(256 words)

(256 words)

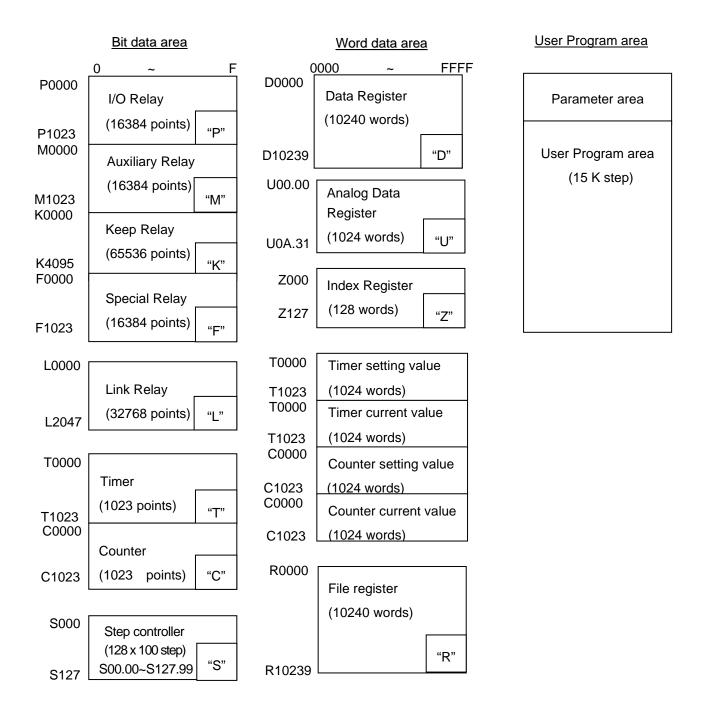
C255

Counter current value

# User Program area Parameter area User Program area (4 K step)

## 5.5.2 "S" type

Γ



## 5.5.3 Data latch area setting

When PLC stops and restarts the data required for operation or the data occurred during operation, if you want to keep and use those data, data latch can be used and it is available to use a certain area of some data device as latch area by parameter setting.

Device	1 <sup>st</sup> latch	2 <sup>nd</sup> latch	Features
Р	Х	Х	Image area to save the state of I/O device
М	0	0	Internal device area
К	Х	Х	Device keeping the device state during power shutdown
F	Х	Х	System flag area
Т	0	0	Timer related area (Bit/words both)
С	0	0	Counter related area (Bit/words both)
S	0	0	Relay for step control
D	0	0	General words data save area
U	Х	Х	Analog Data Register (latch disabled )
L	Х	Х	High speed link/P2P Service state device of communication module (latch enabled)
Z	Х	Х	Index dedicated Register (latch disabled)
R	0	0	File register (latch enabled)

The below shows the features for latch device.

## Remark

• K, L, R devices are basically latched.

#### (1) Latch area setting

(a) Click Device Area Setup of Basic parameter settings.

elect latch ar Selects the ar		lata lf not	Latch area		Latch area 1			Latch area 2	
selected, the will be ignore	set values i	n right table	Kind	Use	Start	End	Use	Start	End
✓ Enable area 1 ✓ Enable area 2			D	<u>v</u>	0	5119		0	0
			M	V	0	255		0	0
'imer boundar	у ———		n s	☑	0	127		0	0
Kind	Start	End	С	☑	0	255		0	0
100ms	0	191	T(100ms)	•	0	191		0	0
10ms	192	200	T(10ms)	•	192	200		0	0
1ms	201	255	T(1ms)		201	255		0	0

(2) Data latch area operation

Γ

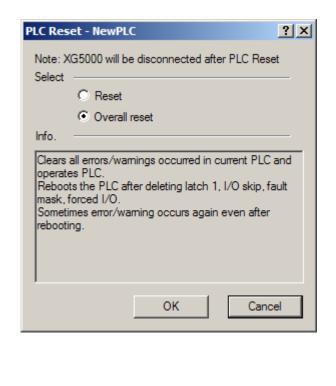
- (a) The method to delete the latched data is as below.
  - latch 1, latch 2 clear operation by XG5000
  - write by Program (initialization program recommended)
  - write '0' FILL from XG5000 monitor mode.

For keep or reset (clear) operation of latch area data according to PLC operation, please refer to the below table.

No.	Classification	Detailed operation	Latch 1	Latch 2
1	Power change	Off/On	Keep	Keep
2	Reset by XG5000	Overall reset	Reset	Keep
3	Program write (online)	-	Keep	Keep
	4 Data broken	SRAM broken by battery error	Reset	Reset
4		Data broken by other reason	Reset	Reset
_	5 XG5000 online	Clear Latch 1	Reset	Keep
5		Clear Latch 2	Reset	Reset

(b) Latch 1 area is cleared by "Online" - "Reset PLC" - "Overall reset".

<u>O</u> nlir	<u>M</u> onitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow								
<del>L</del>	isco <u>n</u> nect								
٩	Connection Se <u>t</u> tings								
	hange Mode								
뭁	ead								
	<u>V</u> rite								
£	ompare with PLC								
	Set Flash Memor <u>v</u>								
	Control Re <u>d</u> undancy								
	leset PL <u>C</u>								
	lear PLC								
	Clear <u>A</u> ll PLC								
٩	LC Information								
5	LC <u>H</u> istory								
	LC Errors/W <u>a</u> rnings								
	/O Information								
	ave PLC His <u>t</u> ory								
<b>•</b>	orce I/O								
	<u>ki</u> p I/O								
	a <u>u</u> lt Mask								
	Io <u>d</u> ule Changing Wizard								
	ase Changing Wizard								
Ċ	tart Online Editing Ctrl+Q								
	Vrite Modified Program Ctrl+W								
Ø.	nd Online Editing	1							



(c) Latch 1, 2 area is cleared by "Online" - "Clear PLC".

	Clear - NewPLC									
С	Clear Item Clear Memory Clear Latch									
	Latch 1 □ Latch 2Clear									
	Latch se	et in	PLC —							
			12							
		Use	Start device		Use	Start device	End device			
	D		0	5119		0	0			
	М	<u> </u>	0	255	<u> </u>	0	0			
	S	<u> </u>	0	127		0	0			
	С		0	255	<u>C</u>	0	0			
	T 100m	<u> </u>	0	191		0	0			
	T 10ms		192	200		0	0			
	T 1ms		201	255		0	0			
_										
							Clos	е		

#### (3) Data initialization

In case of Memory Delete state, the memory of all device shall be cleared as '0'. In case of giving the data value at the beginning according to system, please use the initialization task.

I

×

(a) Device area is cleared by click 'Clear' in "Online" - "Clear PLC" - "Clear Memory".

Select प्रमुख सुरुख प्रया सुरुख सारुख सुरुख सारुख सारुख सारुख सारुख सार सार सार सारक सार सार सार सार सार सार सार सार सार सार	M K C C C S S U U Z Z	Start device 0 0 0 0 0 0 0 0 0 0 0 0 0 0	End device 127 255 2559 1279 255 255 127 255 127 255 127 5119	<u>C</u> lear Select <u>A</u> I <u>R</u> eset All	0	Cancel
---	---	--	---	---	---	--------

Γ

## **Chapter 6 CPU Functions**

## 6.1 Type Setting

It describes setting of XGB PLC type.

New Project				? 🛛
Project name:				ОК
File directory:	D:₩XG5000₩			Cancel
			Find	
PLC Series				
◯ XGK	⊙ XGB	<mark>⊘ X</mark> GI	◯ XGR	
CPU type:	XGB-XBMS 🗸 🗸			
Program name:	NewProgram			
Program langu	lage			
() LD	⊖ SFC		⊖st	
Project descripti	on:			
			<u>~</u>	
			<u> </u>	

PLC Series	CPU type	Description	Reference
	XGB-DR16C3	Dedicated product	Modular type
	XGB-DR32HL	Dedicated product	Modular type
	XGB-XBCE	"E" type : XBC-DR10/14/20/30E	Compact type
XGB	XGB-XBCH	"H" type : XBC-DR32/64H , XBC-DN32/64H	Compact type
XOD	XGB-XBCS	"S(U)" type : XBC-DR20/30/40/60SU, XBC-DN20/30S(U), XBC-DN40/60SU	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 IEC language

1

## Remark

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

## 6.2 Parameter Setting

Γ

This paragraph describes how to set parameters.

## 6.2.1 Basic parameter setting

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

Project Window	<b>∀ X</b>
Items	
□	
C Project	

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

Basic operation settings	Output control settings
Fixed period operation 10 ms mode (1 ~ 999ms):	C Output during debugging
Assign fixed points to J/O slot(64)	Keep output when an error occurs
- Set timer	■ Keep output when converting <u>B</u> UN->STOP
Watchdog timer: 50 ms	Keep output when converting STOP->BUN
Standard ingut filter: 3 🔽 ms	Delete all areas except latch when an error occurs

Category	Item	Description	Note
	Fixed period operation	Set the time of fixed period operation.	1~999 ms
	Watchdog timer	Set the time of scan watchdog.	10~1000 ms
	Standard input filter	Set the time of standard input filter.	1,3,5,10,20,70,100 ms
Basic operations	Output during debugging	Set whether to allow output actually during debugging operation.	Allowance/Prohibition
	Keep output when an error occurs	Set whether to preserve output holding function set in I/O parameter in case of error.	Allowance/Prohibition
	Delete all areas except latch when an error occurs	Set whether 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 area of each device.	-
Error operation	Operation resumes in case of operation error	Set whether to pause or resume operation in case of operation error.	Pause/Resume

## 6.2.2 I/O parameter setting

This setting is to set and reserve each I/O information. Clicking  $\[I/O\]$  Parameter in the project window shows the following setting window.

Module list ⊡-1777 Base 00 : Default — 00 : Default	Slot	Module	Comment	Input Filter	Emergency Output	Allocation
<ul> <li>00 Default</li> <li>02 Default</li> <li>03 Default</li> <li>03 Default</li> <li>04 Default</li> <li>05 Default</li> <li>05 Default</li> <li>06 Default</li> <li>07 Default</li> </ul>	0(main) 1 2 3 4 5 6 7 7	Digital Module Litt     D	ELAY OUTPUT, 16points R OUTPUT, 16points			
	Delete Slot Delet		lis	Print	▼OK	Cancel

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.

I/O Parameter Setting						<u>?</u> ×
Module list						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Output	4
00 : DC 24V INPUT/RELAY	0(main)	DC 24V INPUT/RELAY OUTPUT, 16points		3 Standard [ms]	Default	P000
01 : Default	1	<b>•</b>				
02 : Default 03 : Default	2					
04 : Default	3					
05 : Default	4					
06 : Default	5					
07 : Default	6					
	7					
	•					►
<u>D</u> elete S	Slot Delet	e <u>B</u> ase Base <u>S</u> etting <u>D</u> elete All	Dețails <u>P</u> rint	▼ _	OK Can	cel

Clicking <sup>®</sup>Details<sub>1</sub> in <sup>®</sup>Slot Position<sub>1</sub> shows the following window to set filter and emergency output.

Input/Output Module Setting	<u>?</u> ×	Input/0	Output Module Setting		<u>?</u> ×
Module: DC 24V INPUT/RELAY OUTPUT,		Modu	ule: DC 24V INPUT/RE	LAY OUTPUT,	
Input		Input			
Filter: Standard 💌	[	Filte	er: Standard	•	
Pulse C Standard	6 7	Puls	se Catch: 🗖 0 🥅 1	2 3 4 5 6 6	7
Output – 3 ms 5 ms		Outp	ut		-
10 ms 20 ms	utput		Channel	Emergency Output	
CH 70 ms 100 ms			Channel 00 (00-07)	Clear	<u> </u>
	-			Hold Clear	
OK	Cancel			OK Canc	el

#### 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.

Error/Warning - NewPLC	<u>?</u> ×
Error/Warning Error Log	
Index         Code         Date         Time           ◎ 16         30         0         0         17         39         0         18         30         0         19         39         0         20         30         0         21         30         0         221         30         0         223         30         0         223         30         0         224         30         0         224         30         0         224         30         0         225         30         0         0         25         30         0         0         24         30         0         0         25         30         0	Contents ▲ Module type mismatch error, Base 0, Slot 1 Abnormal stop of CPU or malfunction Module type mismatch error, Base 0, Slot 1 Abnormal stop of CPU or malfunction Module type mismatch error, Base 0, Slot 1 Module type mismatch error, Base 0, Slot 0
<b>26</b> 30	Module type mismatch error, Base 0, Slot 0
, Details/Remedy Download after modifying I/O p	arameter, and try to run PLC again.
	Update Clear
	Read All Save Close

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

## Remark

(1) Saved data are not deleted until selecting a menu of XG5000 and clicking "Delete".

## 6.3.2 Troubleshooting

(1) Trouble types

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

The causes troubling PLC system are as follows.

- 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 F002,003.
- (2) For details of flag, refer to the appendix 1 Flag List.

## **6.4 Remote Functions**

Γ

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 Users Manual.

## 6.5 Forced Input/Output On and Off Function

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

1

## 6.5.1 Force I/O setup

Click  $\ensuremath{\,^{\ensuremath{\mathbb{T}}}}$  Online  $\ensuremath{\,^{\ensuremath{\mathbb{T}}}}$  -  $\ensuremath{\,^{\ensuremath{\mathbb{T}}}}$  Force I/O  $\ensuremath{\,^{\ensuremath{\mathbb{T}}}}$  .

Forced I/O Setup				<u>?×</u>
Move address	P000 > >>	Forced input	it: <u>E</u> nable     ●   Disab <u>l</u> ut:           E <u>n</u> able     ●   Di <u>s</u> abl	
Force I/O				Setting device list
P000 Flag Data	P001 Flag 🗖 Data	P002 Flag 🗖 Data	P003 Flag Data	F 045
i 🎽 🖬 i	i 🎽 🖬 i	iðði	ið ði	
40 4	40 4	4004	4004	
5 💽 🛄 5	5 💽 🛄 5	50 05	50 05	
	6 🗭 🛄 6	6 🔍 🔍 6	6 🗭 🕥 6	
8 🖸 🔳 8	Reading forced I/0	) information, Plea	ase wait	
9 🕒 🛄 9	· ·			
B B B B				
c 🌒 🛄 c				
	E 🙆 🛄 E	E O O E	= <b>0 0</b> =	
FÖ 🖬 F	F <b>ŏ</b> 🖥 F	FÖÖF	FÖÖF	Delete
🥥 Flag 🔚 Input 🥥	Output <u>V</u> ariat	oles <u>D</u> elete All	Select <u>A</u> ll Of	Cancel

Item		Description
	-	Move to the beginning and end of I/O area (P000 $\leftrightarrow$ P127)
Move address	$\langle \langle \rangle$	Move to $\pm 8$ of I/O area displayed at the very left.
	$\langle \rangle$	Move to ±1 of I/O area.
Application		Set whether to allow or not Force I/O
Single	Flag	Set whether to allow or not Force I/O by bits.
Single	Data	Set Force I/O data on or off by bits.
Select All		Set to allow Force I/O with all I/O area on
Delete All		Delete to allow Force I/O with all I/O area off.
Setting device		Display I/O area set as a bit.

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

(1) Forced Input

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

(2) Forced Output

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

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

This function may be useful when directly reading the status of input contact during program operation by refreshing I/O by means of 'IORF' instruction or outputting operation results to output contact.

🔛 NewProgr	am							_	
0	мооооо				IORF	h0002	h0000FFFF	h0000FFFF	
				       				END	
▲	······	·····	<u>+</u> -				÷		

'IORF' command is operated when M00000 is ON. First operand designates slot number. Second operand designates the upper 32 bit data as mask data. Third operand designates the lower 32 bit data as mask data. The bit to refresh set as 1 (hFF) and others set as 0 (h00) (not refreshed).

#### Remark

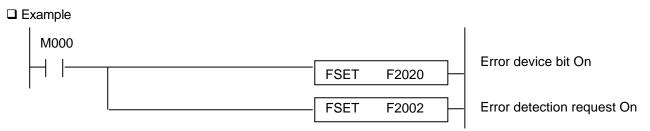
- When using IORF instruction to read/write data at expansion module, scan time increases by 2ms. So when executing interrupt task program by external input less than 10ms or cycle time task less than 10ms, task collision may occurs.

-For details regarding IORF instruction, refer to XGK/XGB Instructions List.

## 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.

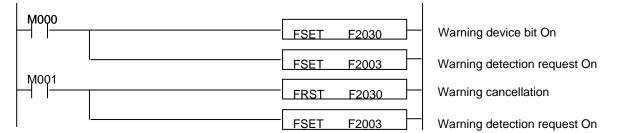
- (1) Detection and classification of faults in external device
  - (a) The trouble (fault) of external device may be detected by user program and largely divided, depending on the type, into error and warning; the former requires halt of PLC operation and the latter simply displays the status while PLC keeps working.
  - (b) 'Error' uses 'F202 (\_ANC\_ERR)' and 'Warning' uses 'F203 (\_ANC\_WB) flag'.
  - (c) As the detection request flag, 'Error' uses 'F2002 (\_CHK\_ANC\_ERR) flag' while 'Warning' uses 'F2003 (\_CHK\_ANC\_WB) flag'.
- (2) Troubleshooting external device
  - (a) When detecting any trouble of external device in user program, it writes a value except '0' by classifying the type, which is defined by a user in 'F202 (\_ANC\_ERR)' while the detection request flag checks it at the time when the program ends with 'F2002 (\_CHK\_ANC\_ERR) On, and PLC outputs based on the "Emergency Output" setting in I/O parameter, making it as the same error status as detected by PLC itself.
  - (b) If any trouble occurs, a user may identify the cause by using XG5000 and alternatively by monitoring 'F202 (\_ANC\_ERR) flag'.



(c) If any trouble occurs, CPU is in error status and operation halts. At this moment, F2020 and F2002 flags are off (error LED switches on and off every second.)

#### (3) Processing warning of external device

- (a) When detecting any warning of external device in user program, it turns on a flag in the warning position of system flag 'F203 (\_ANC\_WB) and if turning on the detection request flag, 'F2003 (\_CHK\_ANC\_WB)', it displays warning at the time when scan program ends. If a warning occurs, the detection request flag, 'F2003 (\_CHK\_ANC\_WB)' is automatically off (F203 is not deleted).
- (b) If a warning occurs, the LED switches on and off every other second.
- (c) If turning off a bit in question of F203 and turning on F2003 bit after processing warning, warning is cancelled and the LED turns off.



## 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.

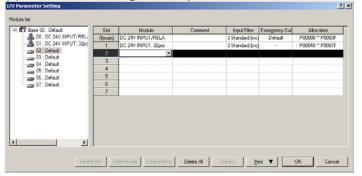
#### (1) Allocation of I/O number

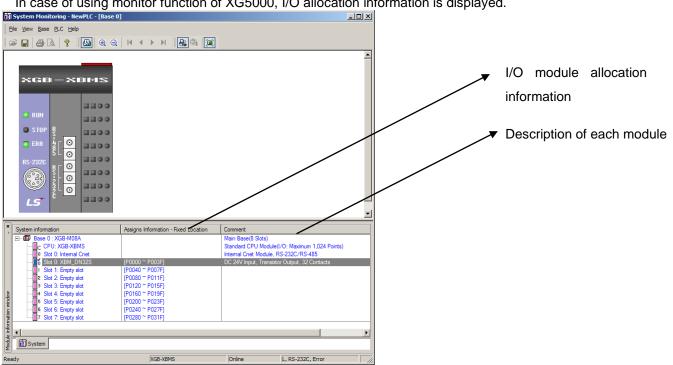
124 points are allocated to main unit and 64 points are allocated to every module except main unit (incl. special, communication).

System Configu	uration		
Number of Connection stage	Туре	I/O allocation	Remarks
0	XBC-DN30S(U)	Input : P0000 ~ P003F Output : P0040 ~ P007F	Main unit fixed
1	XBE-DC32A	Input : P0080~P011F	Actual input: P0080 ~ P009F
2	XBE-TN32A	Output : P0120 ~ P015F	Actual output : P0120 ~ P013F
3	XBL-C21A	P0160 ~ P019F	-
4	XBF-AD04A	P0200 ~ P023F	-
5	XBF-DV04A	P0240 ~ P027F	-
6	XBE-DC32A	Input : P0280 ~ P031F	Actual input : P0280 ~ P029F
7	XBE-TN32A	Output : P0320 ~ P035F	Actual output : P0320 ~ P033F

Empty I/O point is available for internal relay.

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





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

Γ

## 6.9 Online Editing

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

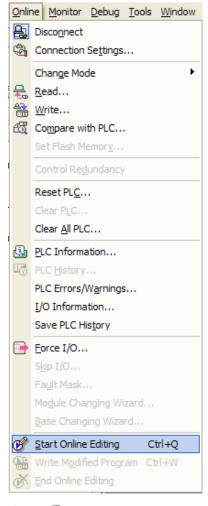
Items to be modified during operation are as follows.

- Program
- Communication parameter

(1) It displays programs that are currently running.

🏦 NewProgram							
мооооо			ADDP	1	D00000	D00000	╷╴
				MOVP	D00100	D00200	]
моооо1	моооо2 					M00020	
	мооооз	 		\$MOV	D01000	D00300	]
16		 				END	]

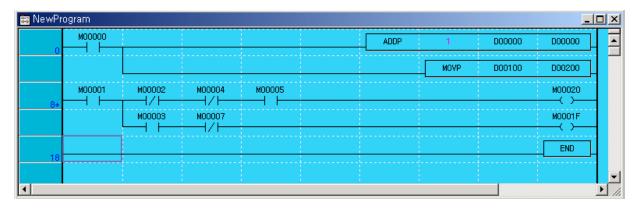
(2) Click "Online - "Start Online Editing...



мососо		 	ADDP	1	D00000	D00000
		 		MOVP	D00100	D00200
моооо1 8 — Н —	M00002	 				M00020
	мооооз	 		\$MOV	D01000	D00300
16		 				END

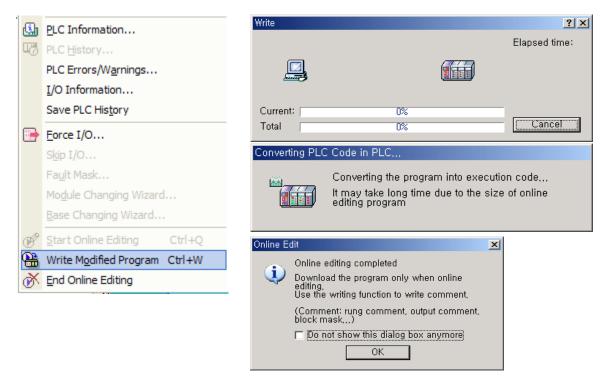
(3) It turns to program modification mode during run when the program background is changed.

### (4) Modifying a program.



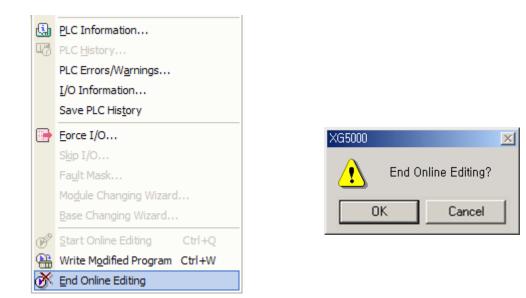
(5) Upon the modification of program, click "Online" - "Writ

"Online" - "Write Modified Program".



#### **Chapter 6. CPU Functions**

(6) Upon the writing of program, click  $"Online_"$  -  $"End Online Editing_"$ .



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

моосоо				ADDP	1	D00000	D00000
					MOVP	D00100	D00200
M00001	M00002	M00004	M00005			4	M00020
8 ' '	мооооз	моооот —————————————————————————————————	1 1				M0001F
18							END

#### Remark

• For parameter modification during run, change each parameter on XG-PD and click "Online\_ - "Write Modified Program .

# 6.10 Reading Input/Output Information

Γ

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

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

I/O information			<u>? ×</u>
Base module information	Slot I/O i	nformation	
🗂 Base 00	Slot	Module	
	0	DC 24V INPUT/RELAY OUTPUT, 1	l 6points
	1		
	2		
	3		
	4		
	5		
	6		
	7	1	
1/0 <u>S</u> y	nc,	Details OK	Cancel

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

М	odule Info, - DC	24V INPUT/RELAY OUTPUT? ×
	Details	Content
	Module name	DC 24V INPUT/RELAY OUTPUT, 16p
	Error	Error Code(0x0)
	OS Ver.	Ver. 1.00
	OS Date	2006. 06. 08.

### 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.	
Custom Events	Monitor the value of device set when an event set by a user occurs.	For details, refer to XG5000 Users Manual.
Data Traces	Trace the value of device.	Account of the manual.

Γ

(a) Change current valueIt changes the current value of each device selected in the current program window.

Change Current Value	Change Current Value
Device: M0022 Type BIT Display type: Signed decimal	Device: D0100 Type WORD Display type: Signed decimal
Range: (0 ~ 1)	Range: (-32768 ~ 32767)
Current value © On Off	Current value COn COff Value: h1234
Value: Forced I/Ov OK Cancel	Forced I/OV OK Cancel

#### (b) Device monitoring

It monitors by device (type	e).														
NewPLC - Device Monitoring - [M]															
Eile Edit <u>V</u> iew <u>P</u> LC <u>W</u> indow <u>H</u> elp														-	a ×
🖉 🔒 🐰 🖻 🛍 📥 😹 🕼	à 💡														
16 32 64 2 10 10 10 10		FF 10		Q. Q.	•	Q	•ŏ•								
a a a ta t															
Device Tree 🔹 🗴		0	1	2	3	4	5	6	7	8	9		 		^
G XGB-XBCE	M000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000				
P P	M010					0000	0000	0000	0000	0000	0000				
	M020				0000		0000	0000	0000		0000				
— 🔛 К	M030								0000		0000				
- 🛱 F	M040					0000	0000	0000			0000				
	M050				0000			0000	0000		0000				
- 🛱 C	M060				0000						0000				
	M070 M080		0000		0000		0000				0000				
Z Z	M080							0000	0000		0000				
S S	M100										0000				
	M110			0000	0000				0000		0000				
	M120		0000	0000	0000	0000	0000	0000	0000		0000				
	M130	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000				
	M140	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000				
	M150	0000	0000	0000	0000	0000	0000	0000	0000		0000				
	M160		0000		0000	0000	0000	0000	0000		0000				
	M170		0000		0000		0000	0000	0000		0000				
	M180						0000		0000		0000				
	M190 M200		0000	0000	0000	0000	0000	0000	0000	0000	0000				
	M200 M210		0000	0000	0000	0000	0000	0000	0000	0000	0000				
	M210		0000		0000		0000	0000	0000		0000				
	M220		0000	0000	0000	0000	0000	0000	0000	0000	0000				
	M240									0000					~
Device	(M)	м													
Ready		Y	GB-XBC	F			Onli	ne			RS-232	C OK			
Reduy			-x0C	-			Uni	ine -		L, 1	13-232	J, OK			

#### (c) Pausing conditions

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

Paus	sing Cor	iditions – N	ewPLC					? ×
	<u>S</u> elect A	<u> </u>	eset Al					<u> </u>
1 2 3 4 5 6 7 8 9 10		Type WORD	Device D0000	Condition ==	Set value 20	Variable		
Mon	itor Pau Monite	se or is pause	d		<u>? ×</u>	1	OK	Cancel
Na Co Se	ame: ondition: at Value: alue:	D0000 == 20 20	)K	in the second				

1

#### (d) Trend monitoring

It displays device values graphically.

🚰 Trend Monitoring		
ON 11 CONTRACTOR CONT	Device	Value
F0095 - F0093 - F0095 - F0095	F0093 F0095	OFF OFF
13:55:25.5 13:52:25.5 13:52:25.5 13:55:25.5 13:55:32.8 13:55:32.8 13:55:33.6 13:55:35:35 13:55:35:35 13:55:35:35 13:55:35:35 13:55:35:35 13:55:35:35 13:55:35:35 13:55:35 13		
600 D0000	Device D0000	Value 585,00
400-		00,00
200		
3:52:25.5 3:52:25.5 3:52:46.3 3:55:25:46.3 3:55:25:46.3 3:55:54:51.7 3:55:55:54:51.7 3:55:55:54:51.7 3:55:55:55		

#### (e) Custom events

Γ

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

Event Settings Event Histor	· .	able		<u>?</u> ×
ID Enabl Type	Device	Variable	Event condition	
	Add Event Edit Event Cut Copy Paste	—		
	Delete Delete All			Þ
<u></u>	Save Event Open Event	oply PLC	OK	Cancel

- 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 D0000,L0000,D0100,N1000 are recorded.

Event Settings				? ×
Basic Settings	Associated Device S	Setup		
<u>D</u> evice:	M0000	<u>V</u> ariables	Bit type de	evice only)
Event condit	ion: 💿 <u>R</u> ising	⊙ <u>F</u> alling ⁺	○ <u>T</u> ransitio	
<u>T</u> ype:	Alarm	<b>_</b>		
<u>M</u> essage:	Out of order Wate	er Tank1		×
			ок	Cancel

3) Set the relative device(s).

E٧	ent Settings				? ×
ſ	Basic Settings	Associated Device S	etup		
	Available	07 (Current) / 16 (	(Maximum)		
	Number	Device	Variable	Туре	
	1	D0000		WORD	
	2	L00000	_HS1_RLINK	BIT	
	3	D0010		WORD	
	4	N0010		WORD	
	5				
	1				
			OK	Can	cel

4) Monitor event history of custom event.

Number	Туре	Event ID	Date	Time	Device	Contents
1	🛞 Alarm	1	1984-01-01	00:00:00:000	M0000	Out of order Water Tank1
2	🛞 Alarm	1	1984-01-01	00:00:00:000	M0000	Out of order Water Tank1
3	🛞 Alarm	1	1984-01-01	00:00:00:000	M0000	Out of order Water Tank1
4	🛞 Alarm	1	1984-01-01	00:00:00:000	M0000	Out of order Water Tank1

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

٦

Event History	/			<u>? ×</u>	
Event Hist	ory				
Date:     1984-01-01     Time:     00:00:000     Back       Event ID:     1     Type:     Alarm     Next       Condition:     Rising     Device:     M0000     Copy       Message:     Out of order Water Tank1     Image: Comparison of the second seco					
Associat	ed device lis	t:			
Number	Device	Variable	Туре	Value	
1	D0000		WORD	1722	
2	L00000	_HS1_RLINK	BIT	0	
3	D0010		WORD	0	
4	N0010		WORD	0	
				Close	

#### Remark

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

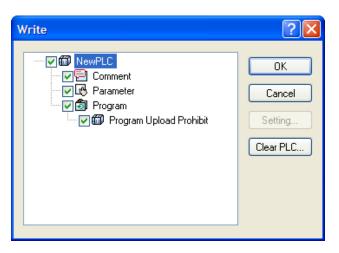
#### 6.12 Program Upload Prohibit

Program Upload Prohibit function prohibits from uploading comment, parameter, program saved on PLC. If Program Upload Prohibit function is set, you can't open from PLC, read PLC and compare PLC.

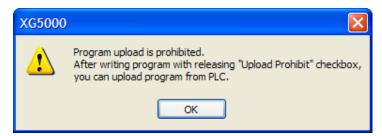
#### (1) How to set

Γ

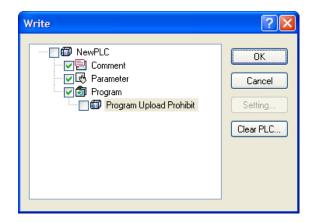
(a) Click "Online" - "Write"



- (b) Select "Program" to activate "Program Upload Prohibit"
- (c) Select "Program Upload Prohibit" and click OK.
- (2) When reading PLC is prohibited, if you try to read PLC, the following dialog box appears. After releasing Program Upload Prohibit, execute reading.



(3) How to release Program Upload Prohibit (a) Click 『Online』 - 『Write』 .



(b) Release Program Upload Prohibit and click OK.

### 6.13 Clear All PLC

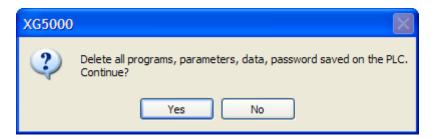
Clear All PLC function clears parameter, program, data, password saved on PLC

(1) How to clear all PLC

(a) Click "Online" - "Clear All PLC".

Online Settings - NewPLC	? 🛛					
Connection settings						
Type: RS-232C 🗸	Settings					
Depth: Local 💌	Preview					
General						
Timeout interval:	5 🛟 sec.					
Retrial times:	1					
Read / Write data size in PLC run mode						
🔘 Normal 🛛 💿 Maximum						
* Send maximum data size in stop mode						
Connect OK	Cancel					

(b) After selection connection method, click "Connect\_ or "OK\_ .



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

#### Note

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

### 6.14 Password Setting per Program Block

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

- (1) How to set program block password
  - (a) Click "Properties\_ after selecting program in project window.
  - (b) Click password tap.

Γ

Program	×
Program Password	
Previous password	
Password: Delete	
○ New password	
Password: (Maximum of 8 characters in length)	
Confirm password:	
OK Cancel	

(c) Click **"OK** after inputting new password.

#### (2) Opening password-set program

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

Confirm Pas	×	
Password:		
ОК	Cancel	

(b) After inputting correct password, click

"OK<sub>1</sub> to open program.

(3) How to delete program block password

(a) After program in project window, click

(b) Click password tap.

『Properties』.

Program	
Program Password	
Previous password	
Password:	Delete
New password	
Password:	(Maximum of 8 characters in length)
Confirm password:	
	OK Cancel

- (d) Click 『OK』.

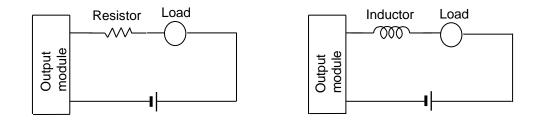
Г

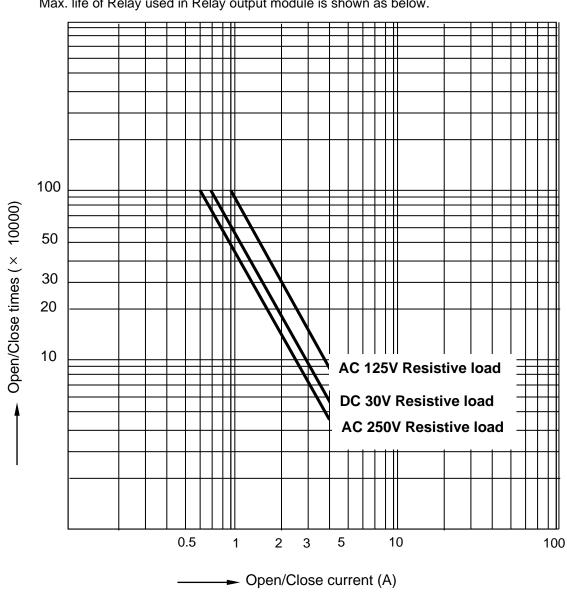
# **Chapter 7 Input/Output Specifications**

#### 7.1 Introduction

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

- (1) For the type of digital input, there are two types such as current sink input and current source input.
- (2) The number of max. Simultaneous input contact point is different according to module type. It depends on the input voltage, ambient temperature. Use input module after checking the specification.
- (3) When response to high speed input is necessary, use interrupt input contact point. Up to 8 interrupt points are supported.
- (4) In case that open/close frequency is high or it is used for conductive load open/close, use Transistor output module or triac output module as the durability of Relay Output Module shall be reduced.
- (5) For output module to run the conductive (L) load, max. open/close frequency should be used by 1second On, 1 second Off.
- (6) For output module, in case that counter timer using DC/DC Converter as a load was used, Inrush current may flow in a certain cycle when it is ON or during operation. In this case, if average current is selected, it may cause the failure. Accordingly, if the previous load was used, it is recommended to connect resistor or inductor to the load in serial in order to reduce the impact of Inrush current or use the large module having a max. load current value.





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

Γ

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

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

1) Barrier terminal block

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



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

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

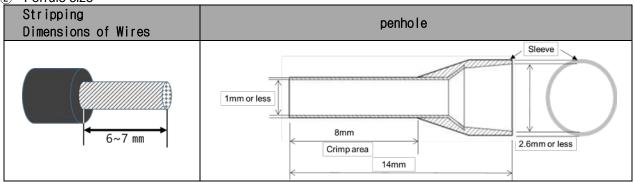
Coupling position	Coupling torque range
IO module terminal strip screw (M3 screw)	42 ~ 58 N·cm
IO module terminal strip fixation screw (M3 screw)	66 ~ 89 N⋅cm
IO module external connector(M2 screw)	18 ~ 22 N· cm

2) Screw connection type plug (PCB plug, Screw connection):XBE-xx08A, XBE-xx16A

As a terminal block mainly applied to the XGB compact type basic unit, crimp terminals with insulation Wire size

Number of wires per contact			When using ferrules with plastic sleeves	When using ferrules without plastic sleeves	
1	0.2 ~ 1.5 mm²	0.2 ~ 1.5 mm²	0.25 ~ 0.5 mm <sup>2</sup>	0.25 ~ 1.5 mm <sup>2</sup>	
2	0.75 mm²	0.75 mm²	0.5 mm <sup>2</sup> (Twin Ferrules)	0.25 ~ 0.34 mm²	

#### 2 Ferrule size



#### ③ Recommended ferrule

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

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

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

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

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

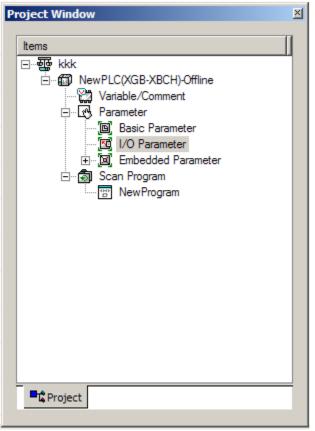
Γ

(a) Rated voltage, load: 3 million times: 100 million times (b) 200V AC 1.5A, 240V AC 1A ( $COS \notin =0.7$ ): 1 million times (c) 200V AC 0.4A, 240V AC 0.3A ( $COS \notin =0.7$ ): 3 million times (d) 200V AC 1A, 240V AC 0.5A ( $COS \notin =0.35$ ): 1 million times (e) 200V AC 0.3A, 240V AC 0.15A ( $COS \notin =0.35$ ): 3 million times (f) 24V DC 1A, 100V DC 0.1A (L/R=7ms): 1 million times (g) 24V DC 0.3A, 100V DC 0.03A (L/R=7ms): 3 million 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 <sup>[</sup>Module] at the slot location.

lodule list ⊡ 1000 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)	Module	Comment	input Filter	Emergency out	Allocation
01 : Default	o(main)					
02 : Default	2					
03 : Default	3					
	4				•	
	5					
07 : Default	6					
	7					
09 : Default 10 : Default	8					
	9					
	10	l.				
()						

#### 3) Set I/O module really equipped.

Γ

I/O Parameter Setting					? ×
Type randing the constraint           Module list           Image: Second	Slot 0(main) 1 2 3 4	 Module NPUT/TR OUTPUT, 32p NPUT/TR OUTPUT, 64p	Input Filter	Emergency Out	Allocation
Of: Default	5 6 7 8 9 10	NPUT/RELAY OUTPUT, NPUT/RELAY OUTPUT,			
Dela	te Slot De		etails <u>P</u>	rint 🔻 Oł	Cancel

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

Module list						
E 🗊 Base 00 : Default	Slot	Module	Comment		Emergency Out	Allocation
	0(main)	DC 24V INPUT/TR O		3 Standard [ms]	Default	P00000 ~ P0003F
01 : Default	1					
02 : Default 	2					
04 : Default	3					
05 : Default	4					
06 : Default	5					
07 : Default	6					
	7					
09 : Default	8					
	9					
	10					
<b>I</b>						

#### 5) Set filter value.

Input/Out	put Module Setti	ng	? ×
Module: In Input —	nput/Output Module	:DC 24V INPUT/TR	OUTPUT.
Filter: Pulse Ca Output	Standard Standard 1 ms 3 ms 5 ms 10 ms 20 ms	•	6 🗖 7
Cha Cha			
		ОК	Cancel

(b) Setting output status in case of error

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

I/O Parameter Setting						? ×
Module list						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
	0(main)	DC 24V INPUT/TR O		3 Standard [ms]		P00000 ~ P0003F
01 : Default	1					
02 : Default	2				å	
03 : Default 04 : Default	3				å	
05 : Default	4				00	
06 : Default	5					
07 : Default	6				0	
08 : Default	7					
09 : Default	8					
10 : Default	9					
	10					
	1					
		un lin ow			_ 1 _	
Delete	De De	lete Base Base Setting	Delete All D	etails <u>P</u> r	int 🔻	OK Cancel

I

2) Click Emergency Output.

Input/Output Module Sett	ing <mark>? X</mark>
Module: Input/Output Module	EDC 24V INPUT/TR OUTPUT,
Input	
Filter: Standard	<b>_</b>
Pulse Catch: 🔲 0 🔲 1	2 2 3 4 5 5 6 7
Output	
Channel	Emergency Output
Channel 00 (00-07)	Clear 💌
Channel 01 (08-15)	Hold
	Clear
,	
	OK Const
	OK Cancel

If it is 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

Γ

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

	Model		Ν	/lain uni	t						
Specificati	on	XBC-DR10E	XE	BC-DN1	)E		XBC-DP10E				
Input point		6 point									
Insulation me	ethod	Photo coupler insulation	on								
Rated input v	voltage	DC24V									
Rated input of	current	About 4 mA (Contact p	oint 0~3:	about 7	mA)						
Operation vo	ltage range	DC20.4~28.8V (within	ripple rat	te 5%)							
On voltage /	On current	DC19V or higher / 3 m/	DC19V or higher / 3 <sup>mA</sup> or higher								
Off voltage /	Off current	DC6V or lower / 1 mA	or lower								
Input resistar	nce	About 5.6 kΩ (P00~P0	3: about	2.7 kΩ)							
Response	$\text{Off} \to \text{On}$	1/3/5/10/20/70/100 ms	(Set by I	/O narai	motor) I	Dofault	• <b>3</b> ms				
time	$\text{On} \to \text{Off}$	1/3/3/10/20/10/100 110	3/5/10/20/70/100 ms (Set by I/O parameter) Default: 3 ms								
Insulation pre	essure	AC560Vrms / 3 cycle (	altitude 2	2000m)							
Insulation res	sistance	10 $^{M\Omega}$ or more by Meg	OhmMet	er							
Common me	thod	6 point / COM									
Proper cable	size	0.3 mm²									
Operation inc		LED On when Input O	n								
External con method	nection	14 point terminal block	connect	or (M3 )	K 6 scre	ew)					
Weight		330g	313g			313g					
	Circuit cont	iguration	No.	Contact	No.	Contact	Туре				
Г			TB2	485+	TB1	RX	TB1				
тве		Photo coupler	TB4	485-	TB3	ТΧ	TB2 485+ TX TB3				
$[ ] \langle ]$			TB6	00	TB5	SG	TB4 485- 5G TB5				
5 TB11	; "			TB7	01	TB6 P00 P01 TB7					
		circuit	TB8	02	TB9	03	TB8 P02 TB9				
DC24V			TB10	04	TB11	05	TB10 P04 P05 TB11				
	Terminal block no	).	TB12	NC	TB13	NC	TB12 NC TB13				
			TB14	СОМ							

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

	Model		Ν	/lain uni	t						
Specificatio	on	XBC-DR14E	XE	BC-DN14	4E		XBC-DP14E				
Input point		8 point									
Insulation me	ethod	Photo coupler insulation	on								
Rated input v	voltage	DC24V									
Rated input of	current	About 4 mA (Contact p	oint 0~3:	about 7	'mA)						
Operation vo	ltage range	DC20.4~28.8V (Within	ripple ra	ite 5%)							
On voltage /	On current	DC19V or higher / 3 M	DC19V or higher / 3 M or higher								
Off voltage /	Off current	DC6V or lower / 1 $^{\rm mA}$ (	or lower								
Input resistar	nce	About 5.6 kΩ (P00~P0	3: about	2.7 kΩ)							
Response	$\text{Off} \to \text{On}$	1/3/5/10/20/70/100 ms	$\frac{1}{2}\frac{5}{10}\frac{100}{20}\frac{100}{70}$ (set by $\frac{1}{0}$ peremeter) default: 2 ms								
time	$\text{On} \to \text{Off}$		'3/5/10/20/70/100 $^{\rm ms}$ (set by I/O parameter) default: 3 $^{\rm ms}$								
Insulation pre	essure	AC560Vrms / 3 cycle (	altitude 2	2000m)							
Insulation res	sistance	$10^{M\Omega}$ or more by Meg	OhmMet	er							
Common me	thod	8 point / COM									
Proper cable	size	0.3 mm²									
Operation inc		LED On when Input O	n								
External conr method	nection	14 point terminal block	connect	or (M3 )	K 6 scre	ew)					
Weight		340g	313g			313g	I				
	Circuit conf	iguration	No.	Contact	No.	Contact	Туре				
			TB2	485+	TB1	RX	TB1				
тве		Photo coupler	TB4	485-	TB3	ТΧ	TB2 485+ TX TB3				
$ [ ] \langle ] $			TB6	00	TB5	SG	TB4 485- TB5				
7 TB13					TB7	01	TB6 P00 P01 TB7				
	5	circuit	TB8	02	TB9	03	TB8 P02 P03 TB9				
DC24V			TB10	04	TB11	05	TB10 P04 P05 TB11				
	Terminal block no		TB12	06	TB13	07	P06 TB13				
			TB14	СОМ							

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

Γ

Model		Ν	<i>l</i> lain un	it						
Specification	XBC-DR20E	XB	C-DN2	0E		XBC-DP20E				
Input point	12 point									
Insulation method	Photo coupler insulation	n								
Rated input voltage	DC24V									
Rated input current	About 4 mA (Contact p	oint 0~3:	about 7	7 mA)						
Operation voltage range	DC20.4~28.8V (within	ripple rat	te 5%)							
On voltage / On current	DC19V or higher / 3 mA	or high	er							
Off voltage / Off current	DC6V or lower / 1 mA	or lower								
Input resistance	About 5.6 kΩ (P00~P0	About 5.6 <sup>k</sup> $\Omega$ (P00~P07: about 2.7 <sup>k</sup> $\Omega$ )								
ResponseOff $\rightarrow$ OntimeOn $\rightarrow$ Off	1/3/5/10/20/70/100 ms	/3/5/10/20/70/100 ${\rm ms}$ (set by I/O parameter) default: 3 ${\rm ms}$								
Insulation pressure	AC560Vrms / 3 cycle (	C560Vrms / 3 cycle (altitude 2000m)								
Insulation resistance	10 $^{M\Omega}$ or more by Meg	OhmMet	er							
Common method	12 point / COM	12 point / COM								
Proper cable size	0.3 mm²	0.3 mm <sup>2</sup>								
Operation indicator	LED On When Input O	'n								
External connection method	24 point terminal block	connect	or (M3	X 6 scre	ew)					
Weight	450g	418g			418g	I				
Circuit conf	iguration	No.	Contact	No.	Contact	Туре				
		TB2	485+	TB1	RX	RX TB1				
		TB4	485-	TB3	ТΧ	TB2 485+ TX TB3				
		TB6	00	TB5	SG	TB4 485- SG TB5				
	hoto coupler			TB7	01	TB6 P00 P01 TB7				
		TB8	02	TB9	03	TB8 P02 P03 TB9				
		TB10	04	TB11	05	TB10 P04 P05 TB11				
	circuit	TB12	06	TB13	07	TB12 P06 P07 TB13				
∎	TB14 08 TB15 09 TB14 P08 P09 T									
ITerminal block no	).	TB16	0A	TB17	0B	TB16 POA TB17				
		TB18 NC TB19 NC TB20 NC TB19								
		TB22 NC TB21 NC TB22 NC NC NC								
		TB24	СОМ	TB23	NC	TB24 COM				

### 7.2.4 XBC-DR30E/ DR30E/DP30E 18 point DC24V input (Source/Sink type)

Model		ſ	Main un	it						
Specification	XBC-DR30E	XE	BC-DN3	0E		XBC-DP30E				
Input point	18 point									
Insulation method	Photo coupler insulation	n								
Rated input voltage	DC24V									
Rated input current	About 4 mA (Contact po	oint 0~3:	about 7	<b>′</b> mA)						
Operation voltage range	DC20.4~28.8V (within	ripple ra	te 5%)							
On voltage / On current	DC19V or higher / 3 mA	or high	er							
Off voltage / Off current	DC6V or lower / 1 mA c	or lower								
Input resistance	About 5.6 kΩ (P00~P0	7: about	2.7 kΩ)							
ResponseOff $\rightarrow$ OntimeOn $\rightarrow$ Off	1/3/5/10/20/70/100 ms	/3/5/10/20/70/100 ms (set by I/O parameter) default: 3 ms								
Insulation pressure	AC560Vrms / 3 cycle (	AC560Vrms / 3 cycle (altitude 2000m)								
Insulation resistance	10 $^{M\Omega}$ or higher by Meg	10 <sup>MΩ</sup> or higher by MegOhmMeter								
Common method	18 point / COM									
Proper cable size	0.3 mm²									
Operation indicator	LED on when Input On	I								
External connection method	24 point terminal block	connect	or (M3	X 6 scre	ew)					
Weight	465g	423g			4230	9				
Circuit cont	iguration	No.	Contact	No.	Contact	Туре				
		TB2	485+	TB1	RX	ТВ1				
		TB4	485-	TB3	ТΧ	TB2 485+ TK TB3				
		TB6	00	TB5	SG	TB4 485- TX TB5				
тв6	Photo coupler & DC5V			TB7	01	TB6 P00 SG TB7				
		TB8	02	TB9	03	TB8 P02 P01 TB9				
		TB10	04	TB11	05	1810 P04 TB11				
	circuit	TB12	06	TB13	07	TB12 P06 TB13				
∎   ▲ DC24V		TB14	08	TB15	09	TB14 P08 P09 TB15				
Terminal block no	).	TB16	0A	TB17	0B	TB16 POA TB17				
		TB18	0C	TB19	0D	TB18 POC TB19				
		TB20	0E		0D 0F	TB20 POE TB21				
		TB22	10	TB21	-	TB22 P10 TB23				
		TB24	СОМ	TB23	11					

# 7.2.5 XBC-DR20SU/DN20SU/DP20SU 12 point DC24V input (Source/Sink type)

Γ

Model		Ν	/lain uni	it							
Specification	XBC-DR20SU	XB	C-DN20	SU		хвс	-DP2	20SL	J		
Input point	12 point										
Insulation method	Photo coupler insulatio	n									
Rated input voltage	DC24V										
Rated input current	About 4 mA (point 0~1:	about 16	6 <sup>mA</sup> , po	int 2~7:	about	10 m	A)				
Operation voltage range	DC20.4~28.8V (within	ripple rat	te 5%)								
On voltage / On current	DC19V or higher / 3 mA	or high	er								
Off voltage / Off current	DC6V or lower / 1 mA of	or lower									
Input resistance	About 5.6 kΩ (P00~P0	About 5.6 k $\Omega$ (P00~P01: about 1.5 k $\Omega$ , P02~P07: about 2.7 k $\Omega$ )									
Response $Off \rightarrow On$	1/3/5/10/20/70/100 ms	(set by b	/O para	meter) (	default:	<b>3</b> ms	5				
time $On \rightarrow Off$	110101101201101100	/3/5/10/20/70/100 ms (set by I/O parameter) default: 3 ms									
Insulation pressure	AC560Vrms / 3 cycle (altitude 2000m)										
Insulation resistance	10 $^{M\Omega}$ or more by Meg	10 <sup>MΩ</sup> or more by MegOhmMeter									
Common method	12 point / COM										
Proper cable size	0.3 mm <sup>2</sup>										
Operation indicator	LED On When Input O	n									
External connection method	24 point terminal block	connect	or (M3	X 6 scre	∋w)						
Weight	514g	475g			4750	)					
Circuit conf	iguration	No.	Contact	No.	Contact		Туре				
		TB2	485+	TB1	RX		$\bigcirc$	RX	TB1		
		TB4	485-	TB3	ТΧ	TB2	485+	ТХ	твз		
	0	TB6	00	TB5	SG	TB4	485-	SG	TB5		
	hoto coupler	TB8	02	TB7	01	TB6	P00	P01	тв7		
				TB9	03	TB8	P02	P03	тв9		
		TB10	04	TB11	05	TB10	P04	P05	TB11		
	circuit	TB12	06	TB13	07	TB12	P06	P03	TB13		
∎		TB14	08	TB15	09	TB14	P08	P09	TB15		
ITerminal block no	TB16	0A	TB17	0B	TB16	POA	POB	TB17			
	TB18	NC	TB19	NC	TB18	NC	NC	TB19			
		TB20	NC	TB21	NC	TB20	NC	NC	TB21		
	TB22	NC	TB21		TB22	NC	NC	TB23			
		TB24	СОМ	1823	NC	TB24	сом				
								$ $ $\Box$	J		

## 7.2.6 XBC-DR30SU/DN30SU/DP30SU 18 point DC24V input (Source/Sink type)

Model		I	Main un	it							
Specification	XBC-DN30SU	XB	C-DN30	SU		XBC-D	DN3	0SL	J		
Input point	18 point										
Insulation method	Photo coupler insulation	n									
Rated input voltage	DC24V										
Rated input current	About 4 mA (point 0~1:	about 10	6 <sup>mA</sup> , po	int 2~7:	about	10 mA)					
Operation voltage range	DC20.4~28.8V (within	ripple ra	te 5%)								
On voltage / On current	DC19V or higher / 3 mA	or high	er								
Off voltage / Off current	DC6V or lower / 1 mA c	or lower									
Input resistance	About 5.6 kΩ (P00~P0	About 5.6 <sup>k</sup> $\Omega$ (P00~P01: about 1.5 <sup>k</sup> $\Omega$ , P02~P07: about 2.7 <sup>k</sup> $\Omega$ )									
$\begin{array}{c} \text{Response} & \text{Off} \rightarrow \text{On} \\ \text{time} & \text{On} \rightarrow \text{Off} \end{array}$	1/3/5/10/20/70/100 ms	/3/5/10/20/70/100 ™s (set by I/O parameter) default: 3 ™s									
Insulation pressure	AC560Vrms / 3 cycle (	C560Vrms / 3 cycle (altitude 2000m)									
Insulation resistance	10 $^{M\Omega}$ or higher by Me	0 <sup>M</sup> Ω or higher by MegOhmMeter									
Common method	18 point / COM	18 point / COM									
Proper cable size	0.3 mm²										
Operation indicator	LED on when Input On	1									
External connection method	24 point terminal block	connect	or (M3	X 6 scre	ew)						
Weight	528g	476g			476g	9					
Circuit conf	iguration	No.	Contact	No.	Contact		Ту	pe	1		
		TB2	485+	TB1	RX		$\bullet$	RX	TB1		
		TB4	485-	TB3	ТΧ	TB2	485+	тх	твз		
		TB6	00	TB5	SG		485-	SG	TB5		
тв6	Photo coupler  DC5V			TB7	01	TB6	P00	P01	TB7		
		TB8	02	TB9	03	TB8	P02	P03	тв9		
11ТВ23		TB10	04	TB11	05	TB10	P04	P05	TB11		
	circuit	TB12	06	TB13	07	TB12	P06	P07	TB13		
∎   ▲ DC24V		TB14	08	TB15	09	TB14	P08	P09	TB15		
Terminal block no		TB16	0A	TB17	0B	TB16	POA	POB	TB17		
		TB18	0C	TB19	0D		POC	POD	TB19		
		TB22	10	TB21	0F	TB22	P10	P11	TB23		
		TB24	СОМ	TB23	11	TB24	сом	$   \mathbf{\bullet} $			

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

Γ

Specification         XBC-DR40SU         XBC-DN40SU         XBC-DP40SU           Input point         24 point	Model			Main ur					<u> </u>	7		
Input point         24 point           Insulation method         Photo coupler insulation           Rated input voltage         DC24V           Rated input current         About 4 m4 (point 0-1: about 16 m4, point 2-7: about 10 m4)           Operation voltage / On current         DC19V or higher / 3 m4 or higher           Off voltage / Off current         DC20.4-28.8V (within ripple rate 5%)           On voltage / On current         DC19V or higher / 3 m4 or higher           Off voltage / Off current         DC6V or lower / 1 mA or lower           Input resistance         About 5.6 k2 (P00-P01: about 1.5 k9, P02-P07: about 2.7 k9)           Response         Off → On ime         1/3/5/10/20/70/100 ms (set by I/O parameter) default: 3 ms           Insulation pressure         AC560Vrms / 3 cycle (altitude 2000m)           Insulation resistance         10 M2 or higher by MegOhmMeter           Common method         24 point / COM           Proper cable size         0.3 mf           Operation indicator         LED on when Input On           External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g           TB1         RX           TB2         485+ TB3         TA           TB4         04         TB1         05	Specification	XBC-DR40SU	XB	C-DN4	0SU		XB	C-DP	40Sl	J		
Rated input voltage         DC24V           Rated input current         About 4 mA (point 0-1; about 16 mA, point 2-7; about 10 mA)           Operation voltage range         DC20.4-28.8V (within ripple rate 5%)           On voltage / Off current         DC6V or lower / 1 mA or lower           Input resistance         About 5.6 k <sup>Q</sup> (P00-P01; about 1.5 k <sup>Q</sup> , P02-P07; about 2.7 k <sup>Q</sup> )           Response         Off → On On → Off         1/3/5/10/20/70/100 ms (set by I/O parameter) default: 3 ms           Insulation pressure         AC5660Vrms / 3 cycle (attitude 2000m)           Insulation resistance         10 M <sup>Q</sup> or higher by MegOhmMeter           Common method         24 point / COM           Proper cable size         0.3 mf           Operation indicator         LED on when Input On           External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g         578g           TB8         02         TB8           TB8         02         TB9           TB1         RX         TB2           TB2         0.6         TB1           TB2         0.7         TB1           TB2         0.7         TB1           TB2         TB1         TS           TB1         TB1		24 point										
Rated input current         About 4 mA (point 0-1: about 16 mA, point 2-7: about 10 mA)           Operation voltage range         DC20.4-28.8V (within ripple rate 5%)           On voltage / On current         DC19V or higher / 3 m <sup>3</sup> or higher           Off voltage / Off current         DC6V or lower / 1 m <sup>A</sup> or lower           Input resistance         About 5.6 k <sup>3</sup> (P00-P01: about 1.5 k <sup>2</sup> , P02-P07: about 2.7 k <sup>2</sup> )           Response         Off → On time         1/3/5/10/20/70/100 ms (set by I/O parameter) default: 3 ms           Insulation pressure         AC560Vrms / 3 cycle (altitude 2000m)           Insulation resistance         10 We or higher by MegOhmMeter           Common method         24 point / COM           Proper cable size         0.3 m <sup>2</sup> Operation indicator         LED on when Input On           External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g           578g         T81           TB1         RX           TB2         485+ TB3           TB1         0A           TB1         0A           TB2         0F           TB1         0A           TB1         TB1           TB1         TB1           TB2         60      T	Insulation method	Photo coupler insulatior	n									
Operation voltage range         DC20.4–28.8V (within ripple rate 5%)           On voltage / On current         DC19V or higher / 3 ™A or higher           Off voltage / Off current         DC6V or lower / 1 ™A or lower           Input resistance         About 5.6 k <sup>Q</sup> (P00–P01: about 1.5 k <sup>Q</sup> , P02–P07: about 2.7 k <sup>Q</sup> )           Response         Off → On (n → Off         1/3/5/10/20/70/100 ™s (set by I/O parameter) default: 3 ms           Insulation pressure         AC560Vrms / 3 cycle (altitude 2000m)           Insulation resistance         10 № or higher by MegOhmMeter           Common method         24 point / COM           Proper cable size         0.3 mi           Operation indicator         LED on when Input On           External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g           578g         578g           TB1         RX           TB2         485+           TB3         07           TB4         485+           TB1         07           TB2         181           TB2         181           TB2         181           TB2         181           TB2         181           TB2         181           T	Rated input voltage	DC24V										
On voltage / On current         DC19V or higher / 3 mÅ or higher           Off voltage / Off current         DC6V or lower / 1 mÅ or lower           Input resistance         About 5.6 № (P00-P01: about 1.5 №, P02-P07: about 2.7 №)           Response         Off → On           Image / Off → On         1/3/5/10/20/70/100 ms (set by I/O parameter) default: 3 ms           Insulation pressure         AC560Vrms / 3 cycle (altitude 2000m)           Insulation resistance         10 № or higher by MegOhmMeter           Common method         24 point / COM           Proper cable size         0.3 mf           Operation indicator         LED on when Input On           External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g         578g           TB1         RX           TB2         485+           TB3         TX           TB4         485-           TB3         TX           TB4         485-           TB3         TB1           TB1         07           TB4         485-           TB3         TX           TB4         701           TB4         701           TB4         701 <td< td=""><td>Rated input current</td><td>About 4 mA (point 0~1: a</td><td>about 16</td><td>s mA, po</td><td>int 2~7</td><td>: about</td><td>10 r</td><td>nA)</td><td></td><td></td></td<>	Rated input current	About 4 mA (point 0~1: a	about 16	s mA, po	int 2~7	: about	10 r	nA)				
Off voltage / Off current         DC6V or lower / 1 mA or lower           Input resistance         About 5.6 k2 (P00-P01: about 1.5 k2, P02-P07: about 2.7 k2)           Response         Off → On           Insulation pressure         AC560Vrms / 3 cycle (altitude 2000m)           Insulation resistance         10 M2 or higher by MegOhmMeter           Common method         24 point / COM           Proper cable size         0.3 mf           Operation indicator         LED on when Input On           External connection         30 point terminal block connector (M3 X 6 screw)           Weight         594g         578g           Circuit configuration         No.         Contact           No.         Contact         No.           TB2         485+         TB3           TB4         485-         TB5           TB6         00         TB1           No.         TB1         07           TB2         485+         TB3           TB10         04         TB11         05           TB2         0F         TB17         TB1           TB14         08         TB13         07           TB2         18         02         TB1           TB10	Operation voltage range	DC20.4~28.8V (within r	ipple rat	e 5%)								
Input resistanceAbout 5.6 k2 (P00~P01: about 1.5 k2, P02~P07: about 2.7 k2)Response timeOff → On On → Off1/3/5/10/20/70/100 ms (set by I/O parameter) default: 3 msInsulation pressureAC560Vrms / 3 cycle (altitude 2000m)Insulation resistance10 M2 or higher by MegOhmMeterCommon method24 point / COMProper cable size0.3 mfOperation indicatorLED on when Input OnExternal connection method30 point terminal block connector (M3 X 6 screw)Weight594g578gCircuit configurationNo.CornetTB2MonoretTB1R802TB1TB3TB1TB3TB104TB1TB1TB104TB104TB104TB105TB106TB104TB106TB107TB108TB104TB105TB211TB108TB104TB105TB104TB107TB108TB108TB108TB210TB210TB108TB108TB211TB212TB213TB214TB215TB216TB108TB216 <td< td=""><td>On voltage / On current</td><td>DC19V or higher / 3 mA</td><td>or highe</td><td>er</td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	On voltage / On current	DC19V or higher / 3 mA	or highe	er								
Response timeOff → On On → Off1/3/5/10/20/70/100 ms(set by I/O parameter) default: 3 msInsulation pressure Common methodAC560Vrms / 3 cycle (altitude 2000m)Insulation resistance10 M2 or higher by MegOhmMeterCommon method24 point / COMProper cable size0.3 mrOperation indicatorLED on when Input OnExternal connection method30 point terminal block connector (M3 X 6 screw)Weight594g578gCircuit configurationNo.CorneatNo.CorneatNo.TB2485+TB4485+TB5SGTB600TB711TB204TB1RXTB204TB104TB105TB104TB106TB107TB108TB108TB107TB206TB107TB207TB108TB106TB107TB108TB107TB211TB206TB107TB211TB211TB211TB211TB211TB211TB211TB211TB211TB211TB211TB211TB2	Off voltage / Off current	DC6V or lower / 1 mA or	lower									
time On → Off Insulation pressure AC560Vrms / 3 cycle (altitude 2000m) Insulation resistance 10 M <sup>2</sup> or higher by MegOhmMeter Common method 24 point / COM Proper cable size 0.3 m <sup>2</sup> Operation indicator External connection method 30 point terminal block connector (M3 X 6 screw) Weight 594g 578g Circuit configuration TB2 485+ TB3 TX TB4 485- TB5 SG TB7 01 TB2 485+ TB1 04 TB1 04	Input resistance	About 5.6 kΩ (P00~P01	: about	1.5 kΩ,	P02~P	07: abo	out 2	. <b>7</b> kΩ)	)			
Insulation resistance         10 MQ or higher by MegOhmMeter           Common method         24 point / COM           Proper cable size         0.3 mm <sup>2</sup> Operation indicator         LED on when Input On           External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g         578g           Circuit configuration         No.         Center         No.         Conter         No.         Conter         No.         Conter         TB2         485+         TB1         RX           Photo-coupler         TB2         TB3         TB1         RX           TB2         TB3         TB1         RX         TB1           Photo-coupler         TB2         TB3         TB1         TB1           TB2         TB2         TB1         TB1         TB1           TB2         TB2         TB2 <th colspan="2" t<="" tb1<="" td=""><td></td><td>1/3/5/10/20/70/100 ms (</td><td>set by I/</td><td>O para</td><td>meter)</td><td>default</td><td>::3 m</td><td>S</td><td></td><td></td></th>	<td></td> <td>1/3/5/10/20/70/100 ms (</td> <td>set by I/</td> <td>O para</td> <td>meter)</td> <td>default</td> <td>::3 m</td> <td>S</td> <td></td> <td></td>			1/3/5/10/20/70/100 ms (	set by I/	O para	meter)	default	::3 m	S		
Common method         24 point / COM           Proper cable size         0.3 mm²           Operation indicator         LED on when Input On           External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g           Circuit configuration         No.           Contact         No.           TB1         RX           TB2         485+           TB3         TX           TB4         485-           TB5         SG           TB4         485-           TB5         TB6           TB4         485-           TB5         TB6           TB10         04           TB11         05           TB12         06           TB14         08           TB15         09           TB14         08           TB14         08 <t< td=""><td>Insulation pressure</td><td>AC560Vrms / 3 cycle (a</td><td>ltitude 2</td><td>000m)</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Insulation pressure	AC560Vrms / 3 cycle (a	ltitude 2	000m)								
Proper cable size         0.3 mm²           Operation indicator         LED on when Input On           External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g         578g         578g           Circuit configuration         No.         Contact         No.         Contact         Type           TB2         485+         TB1         RX         TB2         485-         TB3         TX           TB4         485-         TB5         SG         TB7         O1         TB7	Insulation resistance	10 $^{M\Omega}$ or higher by Meg										
Operation indicator         LED on when Input On           External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g         578g           Circuit configuration         No.         Contact         No.         Contact           TB2         485+         TB1         RX         TB2         485+           TB4         485-         TB3         TX         TB2         485+           TB6         00         TB7<01	Common method	24 point / COM	point / COM									
External connection method         30 point terminal block connector (M3 X 6 screw)           Weight         594g         578g           Circuit configuration         No.         Contact         No.         Contact         Type           TB2         485+ TB3         TX         TB1         RX         TB2         485+ TB5         TB1         RX           TB4         485- TB6         TB6         00         TB7         01         TB2         485- TB6         TB1         RX           TB10         04         TB10         04         TB10         04         TB10         04         TB10         04         TB10         04         TB12         P00         TB11         TB12         P00         TB12         P00         TB12         P00         TB11         TB12         P00         TB12         P00         TB13         P01         TB12         P00         TB12         P00         TB13         P00         TB14         P08         TB17         TB14         P08         TB14         P08         TB17         TB14         P08         TB17         TB14         P08         TB14         P08         TB14         P08         TB17         TB14         P08         TB14         P08<	Proper cable size	0.3 mm²										
method         30 point terminal block connector (W3 X 6 screw)           Weight         594g         578g         578g           Circuit configuration         No.         contact         No.         contact         Type           TB1         RX         TB1         RX         TB2         485+         TB3         TX           TB4         485-         TB5         SG         TB2         485+         TB5         SG           TB4         485-         TB5         SG         TB6         00         TB7         01           TB2         TB10         04         TB11         05         TB6         P02         P03           TB10         04         TB13         07         TB10         P04         P05         TB11           TB10         04         TB13         07         TB14         P08         P00         TB13           TB10         04         TB13         07         TB14         P08         P00         TB13           TB14         08         TB17         0B         TB14         P08         P00         TB17           TB14         D08         TB17         DB         TB14         P08         P00 </td <td>Operation indicator</td> <td>LED on when Input On</td> <td colspan="10">O on when Input On</td>	Operation indicator	LED on when Input On	O on when Input On									
O         Circuit configuration         No.         Contact         No.         Contact         Type           TB2         485+         TB1         RX         TB2         485+         TB1         RX         TB2         485+         TB1         485+         TX         TB2         485+         TB1         RX         TB2         485+         TB1         RX         TB2         485+         TX         TB2         485+         TX         TB2         485+         TX         TB2         485+         TX         TB3         TB3         TX         TB3         TX         TB3         TS         TB3         TB3         TS         TB3         TB3         TB3         TB14         08         TB12         P06         P07         TB13         TB14         P08         TB14         P08         TB17		30 point terminal block	point terminal block connector (M3 X 6 screw)									
Image: Construction of the second	Weight	594g	578g			578	g					
TB2       485+       TB3       TX       TB1         TB4       485-       TB3       TX       TB4       485-       TB3       TX       TB4       485-       TS5       SG       TB4       485-       SG       TB5       SG       TB7       O11       TB7       D11       TB7       D11       TB7       D11       TB7       D11       TB7       D11       D22       P02       P01       TB7       D11       TB7       D11       D24       P02       P01       TB7       D11       D24       D22       D01       TB7       D11       D25       TB10       O4       TB11       O5       TB11       D04       P03       TB11       D11       D04       P03       TB11       D11       D12       D06       P03       TB11       D11       D11       D22       D01       TB14       P08       TB13       D7       TB14       P08       TB17       TB14       P08       TB17       TB14       P08       P03       TB17       TB14       P08       P04       P08       <	Circuit cont	figuration	No.	Contact	No.	Contact		Ţ	/pe			
0       TB3       TX       TB4       485-       TX       TB5       TB6       000       TB7       01       TB6       000       TB7       01       TB7       TB7 <td></td> <td></td> <td></td> <td></td> <td>TB1</td> <td>RX</td> <td></td> <td></td> <td></td> <td>]</td>					TB1	RX				]		
0       TB4       485       TB5       TB4       485       TB         0       TB6       00       TB7       01       TB7			TB2	485+	TB3	ту	TB2		RX	TB1		
Photo-coupler       Photo-coupler       TB6       00       TB7       01       TB7       P00       P01       TB7         TB23       TB24       TB24       TB10       04       TB11       05       TB12       P00       P01       TB11         TB12       06       TB13       07       TB12       P06       P07       TB11         TB12       06       TB13       07       TB12       P06       P07       TB13         TB14       08       TB15       09       TB16       P00       P08       P09       TB17         TB14       08       TB17       0B       TB16       P00       P08       P09       TB17         TB16       0A       TB17       0B       TB16       P00       P08       P09       TB17         TB18       0C       TB17       0B       TB16       P00       P00       P01       P01 </td <td></td> <td></td> <td>TB4</td> <td>485-</td> <td></td> <td></td> <td></td> <td>485+</td> <td>ΤХ</td> <td>твз</td>			TB4	485-				485+	ΤХ	твз		
0       TB6       P00       TB7       01       TB6       P00       P01       TB7         11       TB20       TB20       TB1       05       TB10       04       TB11       05       TB10       P04       P05       TB11         TB12       COM       TB14       08       TB13       07       TB14       P06       P07       TB13         TB14       08       TB15       09       TB14       P08       P09       TB15       TB14       P08       P09       TB15       TB14       P08       P09       TB13       TB14       P08       P09       TB15       TB14       P08       P08       TB17       TB14       P08       P09       TB17       TB14       P08       P08       TB17       TB14       P08       P08       TB17       TB14       P08       P08       TB17       TB16       P04       P08       TB17       TB17       TB14       P08       P08       TB17       TB20       P06       TB17       TB20       P06		<u> </u>	TB6	00	TB5	SG	TB4	485-	56	TB5		
11       TB23       TB24       TB10       04       TB11       05       TB12       P04       P05       TB11         TB12       06       TB13       07       TB14       08       TB15       09       TB14       P06       P07       TB15         TB14       08       TB15       09       TB16       0A       TB17       0B       TB18       P00       TB19       P00       TB19       P00       TB17       TB18       P00       TB19       P00       TB20       P00       TB21       P00       TB21       P00       TB21       P00       TB23       TB24       P12       P11       TB23       TB24       P12       P13       TB27       TB28       P16       P17       TB29       P15       TB29       P15       TB29       TB29       TB29       TB30       COM       P17       TB29       TB29		hoto-coupler			TB7	01	TB6	P00		тв7		
10       TB23       TB10       04       TB11       05       TB12       P04       P05       TB11         TB24       COM       TB12       06       TB13       07       TB14       P06       P07       TB13         Dc24v       Terminal block No.       TB16       0A       TB17       0B       TB16       P0A       P09       TB17         TB18       0C       TB17       0B       TB18       P0C       P0D       TB17         TB20       0E       TB21       0F       TB22       P0E       P0F       TB21         TB22       10       TB23       11       TB22       P10       P11       TB23         TB26       14       TB27       T5       TB26       P14       P15       TB27         TB28       16       TB29       17       TB30       COM       P17       TB29					TB9	03	TB8	P02		тв9		
TB24       Second       TB12       O6       TB13       O7       TB12       P06       P07       TB13         COM       TB14       O8       TB15       O9       TB14       P08       P09       TB15         Dc24v       Terminal block No.       TB16       OA       TB17       OB       P08       P09       TB17         TB18       OC       TB17       OB       TB18       P00       P00       TB17         TB20       OE       TB19       OD       TB20       P00       TB21       P00       P01       TB21         TB22       10       TB23       11       TB24       12       P10       P11       TB23         TB24       12       TB23       11       TB24       12       P10       P11       TB23         TB24       12       TB25       13       TB26       P14       P15       TB27         TB28       16       TB29       17       TB30       COM       P17       TB29			TB10	04	TB11	05	TB10	P04		TB11		
TB14       08       TB13       07       TB14       P07       TB13         DC24V       Terminal block No.       TB16       0A       TB15       09       TB16       P00       TB17         TB18       0C       TB17       0B       TB18       P0C       P00       TB17         TB18       0C       TB19       0D       TB20       P0E       P0E       P0D       TB19         TB22       10       TB23       11       TB24       P12       P11       TB23         TB24       12       TB25       13       TB26       P14       P15       TB27         TB28       16       TB29       17       TB30       COM       P17       TB29		circuit	TB12	06			TB12	P06	P05			
BODAV       TB15       09       TB15       09       TB15         Terminal block No.       TB16       0A       TB17       0B       TB17       P09       TB17         TB18       0C       TB17       0B       TB18       P0C       P00       TB17         TB18       0C       TB19       0D       TB20       P00       TB19       P00       TB19         TB20       0E       TB21       0F       TB22       P00       TB21       P01       TB23         TB24       12       TB23       11       TB24       P12       P11       TB23         TB26       14       TB27       15       TB28       P16       P17       TB29         TB28       16       TB29       17       TB30       COM       P11       TB29			TB14	08	TB13	07	TB14	000	P07	TB13		
IB10     OA     TB17     OB     F0A     P0B     TB17       TB18     OC     TB17     OB     TB18     POC     POB     TB17       TB20     OE     TB19     OD     TB20     POE     POE     POD     TB19       TB22     10     TB23     11     TB24     P11     TB23     TB23     P11     TB23       TB24     12     TB25     13     TB26     P14     P15     TB27       TB28     16     TB29     17     TB30     COM     P17     TB29			TD4C	0.0	TB15	09	TB16		P09	TB15		
TB10     OC     TB19     OD     POC     POD     TB19       TB20     OE     TB21     OF     TB22     POF     POF     TB21       TB22     10     TB23     11     TB24     PI     PI     TB23       TB26     14     TB25     13     TB26     PI     PI     TB27       TB28     16     TB29     17     TB30     COM     PI					TB17	0B			POB	TB17		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			TB18	0C	TB19	0D		POC	POD	TB19		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			TB20	0E			TB20	POE	DUE	TB21		
TB24     12     TB23     11     TB24     P12     P13     TB25       TB26     14     TB25     13     TB26     P14     P15     TB27       TB28     16     TB29     17     TB30     COM     P17     TB29		TB22	10		-				TB23			
TB26     14     TB25     13     TB26     P14       TB28     16     TB27     15     TB28     P16     P17     TB29       TB29     17     TB20     COM     TB29			TB24	12	TB23	11	TB24	P12		TB25		
TB28     16     TB27     15     TB28     P16     P17     TB29       TB29     17     TB20     COM     TB29					TB25	13						
ТВ29 10 ТВ29 17 ТВ30 СОМ			TP29	16	TB27	15	TB28	P16		TB29		
			TB30	COM	TB29	17	TB30	СОМ	P17			

## 7.2.8 XBC-DR60SU/DN60SU/DP60SU 36 point DC24V input (Source/Sink Type)

Mode	)		1	Main ur	nit						
	XBC-DR60SU		ХВ	C-DN6	0SU		XBC	D-DP	60S	U	
Specification	26 point										
Input point Insulation method	36 point Photo coupler insula	tion									
Rated input voltage	DC24V	llion									
Rated input current	About 4 mA (point 0~	.1· a	hout 16	mA no	int 2~7	· about	10 m	A)			
Operation voltage rang					111 2.37	. about	10	~)			
On voltage / On current											
Off voltage / Off current											
Input resistance	About 5.6 kΩ (P00~			1 5 kQ	P02~P	07: abo	2 1110	<b>7</b> kΩ'	\		
	,	01.	about	1.5 🕬,	F UZ~F	07. abt	Jul 2.	1 1.00	)		
ResponseOff $\rightarrow$ CtimeOn $\rightarrow$ C		/5/10/20/70/100 ms (set by I/O parameter) default: 3 ms									
Insulation pressure		560\/rms / 3 cycle (altitude 2000m)									
Insulation resistance		AC560Vrms / 3 cycle (altitude 2000m) 10 <sup>MΩ</sup> or higher by MegOhmMeter									
Common method	36 point / COM	lege									
Proper cable size	0.3 m <sup>2</sup>										
Operation indicator	LED on when Input	On									
External connection	· · · · · · · · · · · · · · · · · · ·										
method	42 point terminal block connector (M3 X 6 screw)										
Weight	804g	6	36g			636	g				
	t configuration		No.	Contact	No.	Contact		T	уре		
				10-5	TB1	RX		$\bigcirc$		]	
			TB2	485+	TB3	ТХ	TB2	-	RX	TB1	
			TB4	485-	-			485+	тх	твз	
		_	TB6	00	TB5	SG	TB4	485-	SG	TB5	
	Photo-coupler				TB7	01	TB6	P00		тв7	
			TB8	02	TB9	03	TB8	P02	P01		
$\parallel \zeta \mid -$			TB10	04			TB10	P04	P03	TB9	
11			TB12	06	TB11	05	TB12	P04	P05	TB11	
	circuit		TD44	00	TB13	07	1012	P06	P07	TB13	
			TB14	08	TB15	09	TB14	P08		TB15	
DC24V			TB16	0A	TB17	0B	TB16	POA	P09		
Terminal blo	ock no.		TB18	0C		-	TB18	POC	POB	TB17	
				05	TB19	0D	TB20	PUC	POD	TB19	
			TB20	0E	TB21	0F	1020	POE	POF	TB21	
			TB22	10	TB23	11	TB22	P10		TB23	
			TB24	12			TB24	P12	P11		
			TB26	14	TB25	13	TB26	P14	P13	TB25	
					TB27	15	TB28		P15	TB27	
			TB28	16	TB29	17		P16	P17	тв29	
			TB30	18			TB30	P18	P19	TB31	
			TB32	1A	TB31	19	TB32	P1A		TB33	
					TB33	1B	TB34	P1C	P1B		
			TB34	1C	TB35	1D	TB36		P1D	TB35	
			TB36	1E				P1E	P1F	TB37	
			TB38	20	TB37	1F	TB38	P20	P21	TB39	
			TB40	22	TB39	21	TB40	P22		TB41	
			1040	22	TB41	23	TB42	сом	P23		
			TB42	COM					$\bullet$		
										-	

# 7.3 Main Unit Digital Output Specification

Γ

# 7.3.1 XBC-DR10E 4 point relay output

	Model			Main un	nit					
Specifica	tion		X	(BC-DR1	0E					
Output poin	t	4 point								
Insulation m	nethod	Relay insulation								
Rated load voltage/curr	ent	DC24V 2A (resistive loa	nd) / AC2	220V 2A	(COSΦ	9 = 1), 5/	A/COMx(x:0~2)			
Min. load vo	oltage/current	DC5V / 1 mA								
Max. load v	oltage	AC250V, DC125V								
Off leakage	current	0.1 mA (AC220V, 60 Hz)								
Max. On/Of	f frequency	3,600 times / hour								
Surge absorber None										
	Mechanical	20 million times or more	)							
		Rated load voltage / Cu	rrent 10	0,000 tin	nes or n	nore				
Service life	Electrical	AC200V / 1.5A, AC240	V / 1A (C	$\cos\Phi = 0$	0.7) 100	0,000 tin	nes or more			
me	Electrical	AC200V / 1A, AC240V /	/ 0.5A (C	$\cos\Phi = 0$	0.35) 10	00,000 t	imes or more			
		DC24V / 1A, DC100V /	0.1A (L	/ R = 7 m	s) 100,(	000 time	es or more			
Response	$\text{Off} \to \text{On}$	10 ms or less	10 ms or less							
time	$\text{On} \rightarrow \text{Off}$	12 ms or less								
Common m	ethod	2 point / COM								
Proper cabl	e size	Stranded cable 0.3~0.7	5 mm² (Ex	ternal di	ameter	2.8 mm	or less)			
Operation in		LED On when Output O	'n							
External method	connection	14 point terminal block	connecto	or (M3 X	6 screv	v)				
Weight		330g								
	Circuit conf	iguration	No.	Contact	No.	Contact	Туре			
		TB5	TB2	PE	TB1	AC100 ~240V	TB2 PE AC100 0101			
			TB4	COM0	TB3		TB4 COM0 TB5			
nterna			TB6	COM1	TB5	40	TB6 COM1 TB7			
Internal circuit			TB8	COM2	TB7	41	TB8 COM2 P41 TB9			
			TB10	43	TB9	42	TB10 P43 TB11			
		COM2 TB8	TB12	NC	TB11	NC	TB12 NC TB13 TB14 24G			
		Terminal no.	TB14	24G	TB13	24V	246			

# 7.3.2 XBC-DR14E 6 point relay output

	Model			Main ur	nit							
Specifica	tion		>	(BC-DR1	14E							
Output poin		6 point										
Insulation m	nethod	Relay insulation										
Rated load voltage/curr	rent	DC24V 2A (resistive loa	ad) / AC2	220V 2A	(COS4	v = 1), 5,	A/CO	Mx(x:	0~2)			
Min. load vo	oltage/current	DC5V / 1 mA										
Max. load v	oltage	AC250V, DC125V										
Off leakage	current	0.1 mA (AC220V, 60 Hz)										
Max. On/Of	f frequency	3,600 times / hour										
Surge abso	rber	None										
	Mechanical	20 million times or more	)									
<b>.</b> .		Rated load voltage / Cu	ted load voltage / Current 100,000 times or more									
Service life	Electrical	AC200V / 1.5A, AC240	200V / 1.5A, AC240V / 1A (COS $\Phi$ = 0.7) 100,000 times or more									
	LIECTICAI	AC200V / 1A, AC240V /	AC200V / 1A, AC240V / 0.5A (COS $\Phi$ = 0.35) 100,000 times or more									
		DC24V / 1A, DC100V /	0.1A (L	/ R = 7 m	s) 100,	000 time	es or r	more				
Response	$Off\toOn$	10 ms or less	10 ms or less									
time	$On\toOff$	12 ms or less										
Common m	ethod	4 point / COM										
Proper cabl	e size	Stranded cable 0.3~0.7	5 mm² (E>	ternal di	ameter	2.8 mm	or les	s)				
Operation in		LED On when Output C	n									
External method	connection	14 point terminal block	connect	or (M3 X	6 screv	N)						
Weight		340g										
	Circuit conf	iguration	No.	Contact	No.	Contact		Ту	ре			
		TB5	TB2	PE	TB1	AC100 ~240V	TB2	$   \mathbf{\bullet} $	AC100	TB1		
		COMO TB4	TB4	COM0	TB3		TB4	PE COM0	~240V			
ernal			TB6	COM1	TB5	40	TB6	COM1	P40	TB5 TB7		
Internal circuit			TB8	COM2	TB7	41	TB8	COM2	P41 P42	ТВ9		
<b> </b>   <del> </del>		тв9 тв12 <	TB10	43	TB9	42	TB10 TB12	P43	P44	TB11		
			TB12	NC	TB11	NC	TB12	P45	24V	TB13		
L		Terminal no.	TB14	24G	TB13	24V		240	lacksquare			

# 7.3.3 XBC-DR20E 8 point relay output

Γ

	Model			Main un	it							
Specificatio	n		XI	BC-DR2	0E							
Output poin	t	8 point										
Insulation m	nethod	Relay insulation										
Rated load voltage/curr	ent	DC24V 2A (resistive lo	ad) / AC	220V 2	A (COS	SΦ = 1)	, 5A/C	OMx	(x:0~4)			
	oltage/current	DC5V / 1 mA										
Max. load v		AC250V, DC125V										
Off leakage		0.1 mA (AC220V, 60 Hz	)									
Max. On/Of		3,600 times / hour	/									
Surge abso		None										
Curge abou	Mechanical	20 million times or mor	e									
	Moonanioar	Rated load voltage / C		00 000 t	imes o	r more						
Service		AC200V / 1.5A, AC240					times	or m	ore			
life	Electrical	AC200V / 1A, AC240V		•	,							
		DC24V / 1A, DC100V /										
Response	$Off \rightarrow On$	10ms or less	0.17 (1	_/ IX = /	10	0,000 1	11163 0		6			
time	$On \rightarrow Off$	12ms or less										
Common m		4 point / COM (COM0~COM8), 8 point / COM (COM4~COM5)										
Proper cabl		Stranded cable 0.3~0.75 <sup>m<sup>2</sup></sup> (External diameter 2.8 <sup>mm</sup> or less)										
Operation in		LED On when Output On										
External	connection	LED ON when Output of	JI									
method	connection	24 point terminal block	connec	tor (M3	X 6 scr	ew)						
Weight		450g										
Troigin	Circuit conf		No.	Contact	No.	Contact	_	T. /n	<u>`</u>			
					TB1			-				
	 ₹⊊₽_;∎		TB2	PE	твз	AC100 ~240V	TB2					
			TB4	COM0	TB5	40	трс	юм0 Р	10 TB5			
	[		TB6	COM1	TB7	41	TRR	OM2 P	11 TB7			
		COM1 TB6	TB8	COM2	ТВ9	42	TR10	P43	TB11			
Internal circuit	' 		TB10	43	TB11	NC	TB12 C	OM3	C TP12			
circui		тв10 2	TB12	COM3	TB13	44		P45	TB15			
		COM2 TB8	TB14	45	TB15	46	TB16 TB18		C TB17			
	 ∗⊑v ;I	TB13	TB16	47	TB17	NC	тв20		C TB19			
		TB16 2	TB18	NC	TB19	NC	тв22					
	I		TB20	NC	TB21	NC	TB24	24G				
L		Terminal No.	TB22	NC	TB23	24V			$\mathbf{\mathcal{D}}$			
			TB24	24G	1023	241						
				-								

# 7.3.4 XBC-DR30E 12 point relay output

	Model			Main un	it						
Specificatio	on	XBC-DR30E									
Output poin		12 point									
Insulation m		Relay insulation									
Rated load voltage/curr	ent	DC24V 2A (resistive lo	oad) / AC	220V 2	A (COS	SΦ = 1)	, 5A/COMx(x:0~4)				
Min. load voltage/current		DC5V / 1 mA									
Max. load v	oltage	AC250V, DC125V									
Off leakage	current	0.1 mA (AC220V, 60 Hz	Z)								
Max. On/Of	f frequency										
Surge abso		None									
	Mechanical	20 million times or mor									
Service		Rated load voltage / C									
life	Electrical	AC200V / 1.5A, AC240		<b>`</b>	,						
me	Liectrical	AC200V / 1A, AC240V			,						
		DC24V / 1A, DC100V	/ 0.1A (L	_ / R = 7	ˈms <b>) 10</b>	0,000 ti	mes or more				
Response	$Off\toOn$	10 ms or less									
time	$\text{On} \rightarrow \text{Off}$	12 ms or less									
Common m	ethod	4 point / COM (COM0-	~COM8)	), 8 poin	t / CON	1 (COM	4~COM5)				
Proper cabl	e size	Stranded cable 0.3~0.75 mm <sup>2</sup> (External diameter 2.8 mm or less)									
Operation in	ndicator	LED On when Output On									
External	connection	2 point terminal block	ronnecto	nr (M3 X	( 6 scre	w)					
method		•			0 3010	•••)					
Weight		465g									
-	Circuit conf	<u> </u>	No.	Contact	No.	Contact	Туре				
<b>E</b>	€		TB2	PE	TB1 TB3	AC100 ~240V	TB2 PE AC100 ~240V TB3				
	<u>    (</u>	COM0 TB4	TB4	COM0	ТВ5	40					
			TB6	COM1	твл		TB6 COM1 P40				
Inte		COM1 TB6	TB8	COM2		41	TB8 COM2 P41 TB9				
ernal		TB10 2	TB10	43	TB9	42	TB10 P43 NC TB11				
Internal Circuit		COM2 TB8	TB12	COM3	TB11	NC	тв12 сомз рад тв13				
üit			TB14	45	TB13	44	TB14 P45 TB15				
		COM3 TB12	TB16	47	TB15	46	TB16 P47 NC TB17				
					TB17	NC	TB20 P48 TB19				
	_ <b>t</b> _ 	0M4 TB18	TB18	COM4	TB19	48	P49 P4A TB21				
		Terminal No.	TB20	49	TB21	4A	TB24 24G TB23				
			TB22	4B	TB23	24V	240				
			TB24	24G							

	Model			Main u	nit					
Specificatio	n		Х	BC-DN	10E					
Output poin	t	4 point								
Insulation m	n method Photo coupler insulation									
Rated load	voltage	DC 12 / 24V								
Operation load voltage DC 10.2 ~ 26.4V										
Max. load c	urrent	0.5A / 1 point, 2A / CO	Mx(x:0-	~1)						
Off leakage		0.1 mA or less								
Max. inrush current 4A / 10 ms or less										
Max. voltag On	je drop when	DC 0.4V or less								
Surge abso	rber	Zener diode								
Response	$Off \rightarrow On$	1 ms or less								
time	$\text{On} \to \text{Off}$	1 ms or less (rated load	l, resist	ive loac	d)					
Common m	ethod	4 point / COM								
Proper wire	size	Stranded wire 0.3~0.75 mm <sup>2</sup> (external diameter 2.8 mm or less)								
External	Voltage	DC12/24V $\pm$ 10% (Ripple voltage 4 Vp-p or less)								
power	Current	25 mA or less (When connecting DC24V)								
Operation in		LED On when Output On								
External method	connection	14 point terminal block	conne	ctor(M3	X 6 sc	rew)				
Weight		313g	-							
	Circuit cont	iguration	No.	Contact	No.	Contact		<u></u>	уре	-
			TB2	PE	TB1	AC100	TB2	$   \mathbf{\bullet} $	AC100	TB1
, T	दि र		TB4	Р	TB3	~240V	- TB4	PE	~240V	TB3
<sup>-</sup> Internal Circui		TB09., DC12/24V.,	TB6	СОМО	TB5	40	TB6		P40	TB5
Circuit	╔┱┲╢╴╴╯		TB8	COM1	TB7	41	TB8		P41	TB7 TB9
	LE C		TB10	43	TB9	42	TB10		P42	TB11
		тв4.,	TB12	NC	TB11	NC	TB12	NC	NC 24V	TB13
		Terminal No.	TB14	24G	TB13	24V	TB14	24G		

## 7.3.5 XBC-DN10E 4 point transistor output (Sink type)

Γ

## 7.3.6 XBC-DN14E 6 point transistor output (Sink type)

	Model			Main	unit					
Specificatio	n			XBC-DI	N14E					
Output poin		6 point								
Insulation m	nethod	Photo coupler insulat	ion							
Rated load	voltage	DC 12 / 24V								
Operation range	load voltage	DC 10.2 ~ 26.4V								
Max. load c	urrent	0.5A / 1 point, 2A / C	OMx(x:	:0~1)						
Off leakage	current	0.1 mA or less								
Max. inrush		4A / 10 $^{\rm ms}$ or less								
Max. voltage drop when DC 0.4V or less										
Surge abso	rber	Zener diode								
Response	$Off\toOn$	1 ms or less	1 ms or less							
time	$On\toOff$	1 ms or less (rated load, resistive load)								
Common m	ethod	4 point / COM								
Proper wire	size	Stranded wire 0.3~0.	75 <sup>mm²</sup> (	externa	l diame	eter 2.8 🛛	nm or	less)		
External	Voltage	DC12/24V ± 10% (Ri				r less)				
power	Current	25 mA or less (When		cting DC	24V)					
Operation in		LED On when Output	t On							
External method	connection	14 point terminal bloc	ck conr	nector(M	3 X 6 :	screw)				
Weight		315g								
	Circuit confi	guration	No.	Contact	No.	Contact		Ту	/pe	1
DC5V.	`⊨‡		TB2	PE	TB1	AC100 ~240V	TB2	$\bullet$	AC100	TB1
	इट ँ≀	TB07.	TB4	Р	TB3	~240V	TB4	PE P	~240V	твз
Internal Circu		TB09., DC12/24V.,	TB6	СОМО	TB5	40	TB6		P40	TB5
Circuit	┲┲┼╍┉┋	TB12.	TB8	COM1	TB7	41	TB8		P41	TB7
	<u>ניבן</u> ∠	TB08.,	TB10	43	TB9	42	TB10		P42	TB9
		тв4.,	TB12	45	TB11	44	TB12	P45	P44	TB11 TB13
	L	Terminal No.	TB14	24G	TB13	24V	TB14	24G	24V	
			1014	LTU					$\Box$	]

## 7.3.7 XBC-DN20E 8 point transistor output (Sink type)

Γ

	Model			Main ur	nit				
Specification			Х	BC-DN	20E				
Output point		8 point							
Insulation meth	od	Photo coupler insulati	on						
Rated load volt	age	DC 12 / 24V							
Operation load	voltage range	DC 10.2 ~ 26.4V							
Max. load curre	ent	0.5A / 1 point, 2A / CO	DMx(x:0	)~2)					
Off leakage cur	Off leakage current 0.1 mA or less								
Max. inrush cu	rrent	4A / 10 ms or less							
Max. voltage d	rop when On	DC 0.4V or less							
Surge absorbe	r	Zener diode							
Response	1 ms or less								
time	$\text{On} \rightarrow \text{Off}$	1 ms or less (rated loa	1 ms or less (rated load, resistive load)						
Common methe	od	4 point / COM							
Proper wire siz	e	Stranded wire 0.3~0.7	′5 ㎜ (€	external	diamet	er 2.8 🛙	™ or less)		
External	Voltage	DC12/24V $\pm$ 10% (Ripple voltage 4 Vp-p or less)							
power	Current	25 mA or less (When connecting DC24V)							
Operation indic	ator	LED On when Output	On						
External conne	ction method	24 point terminal bloc	k conne	ector(M3	3 X 6 so	crew)			
Weight		418g							
	Circuit configu	uration No. Contact No. Contact Ty							
		TB05.,	TB2	PE	TB1	AC100	ТВ1		
DC5V.			TD 4	0	TB3	~240V	TB2 PE AC100 ~240V TB3		
			TB4	Р	TB5	40	TB4 P TB5		
	fi –		TB6	COMO	TB7	41	ТВ6 COM0 ТВ7		
Internal Circuit		TB09., DC12/24V.,	TB8	COM1	107	41	TB8 COM1 TB9		
cuit	┙╡┓	TB10.	TB10	43	TB9	42	TB10 P43 TB11 TB11		
	<u>rt</u> i <u>~</u>				TB11	NC	TB12 COM2 TB13		
	4	DC12/24V., TB13.,	TB12	COM2	TB13	44	TB14 P45		
			TB14	45			TB16 P47 TB17		
	┎┎╴┊╝		TB16	47	TB15	46	TB18 NC TB19		
	-~~, `				TB17	NC	TB20 NC TB21		
		DC12/24V., 'TB4.,	TB18	NC	TB19	NC	TB22 NC TB22		
		+	TB20	NC			TB24 24G		
		Terminal No.	TB22	NC	TB21	NC			
			TB24	24G	TB23	24V			
			, ULT						

## 7.3.8 XBC-DN30E 12 point transistor output (Sink type)

SpecificationXBC-DN30EOutput point12 pointInsulation methodPhoto coupler insulationRated load voltageDC 12 / 24VOperation load voltage rangeDC 10.2 ~ 26 AVMax. load current0.5A / 1 point, 2A / COMx(x:0~2)Off leakage current0.1 m² or lessMax. inrush current4A / 10 ms or lessMax. voltage drop when OnDC 0.4V or lessSurge absorberZener diodeResponse timeOff $\rightarrow$ On1 ms or less (rated load, resistive load)Common method4 point / COMProper wire sizeStranded wire 0.3-0.75 m/ (external diameter 2.8 mm or less)External powerVoltageCurrent25 m² or less (When connecting DC24V)Operation indicatorLED On when Output OnExternal connection method24 point terminal block connector(M3 X 6 screw)Weight423gTimeTestOct/2/2W, TestTestTimeTestTimeTestTimeTestCircuit configurationNo.ContextNo.TimeTestTimeTestTimeTestTimeTestTimeTestTimeTestTimeTestPostTestTimeTestResponseTimeTimeTestTimeTestTimeTestTimeTestTimeTestTim		Model			Main ur	nit				
Output point12 pointInsulation methodPhoto coupler insulationRated load voltageDC 12 / 24VOperation load voltage rangeDC 10.2 ~ 26.4VMax. load current0.5A / 1 point, 2A / COMx(x:0-2)Off leakage current0.1 mA or lessMax. inrush current4A / 10 ms or lessMax. voltage drop when OnDC 0.4V or lessSurge absorberZener diodeResponseOff $\rightarrow$ On1 ms or less (rated load, resistive load)Common method4 point / COMProper wire sizeStranded wire 0.3-0.75 mf (external diameter 2.8 mn or less)External powerVoltageDC12/24V ± 10% (Ripple voltage 4 Vp-p or less)powerCurrent25 mA or less (When connecting DC24V)Opration indicatorLED On when Output OnExternal connection method24 point terminal block connector(M3 X 6 screw)Weight423gTible 7 1817 NCTible 7 2407 NateTible 7 1817 NCTible 7 2408 NateTible 7 1817 NCTible 7 1817 NC	Specificatio	n		Х	BC-DN	30E				
Rated load voltageDC 12 / 24VOperation load voltage rangeDC 10.2 ~ 26.4VMax. load current0.5A / 1 point, 2A / COMx(x:0~2)Off leakage current0.1 mA or lessMax. inrush current4A / 10 ms or lessMax. voltage drop when OnDC 0.4V or lessSurge absorberZener diodeResponseOff $\rightarrow$ On1 ms or less (rated load, resistive load)Common method4 point / COMProper wire sizeStranded wire 0.3~0.75 mf (external diameter 2.8 mm or less)External powerVoltageDC12/24V ± 10% (Ripple voltage 4 Vp-p or less) powerOperation indicatorLED On when Output OnExternal connection method24 point terminal block connector(M3 X 6 screw)Weight423gTibloTB00TB00TB0TB10 43TB11 NCTB10 43TB15 40TB10 43TB15 40TB10 43TB15 40TB10 43TB17 NCTB10 43TB17 NCTB10 43TB17 NCTB10 43TB17 NCTB10 43TB17 NCTB10 43TB19 48TB10 43TB19 48TB18 7004TB17 700TB18 7004<			12 point							
Operation load voltage rangeDC 10.2 ~ 26.4VMax. load current0.5A / 1 point, 2A / COMx(x:0-2)Off leakage current0.1 mA or lessMax. inrush current4A / 10 ms or lessMax. voltage drop when OnDC 0.4V or lessSurge absorberZener diodeResponse timeOff $\rightarrow$ On1 ms or less (rated load, resistive load)Common method4 point / COMProper wire sizeStranded wire 0.3-0.75 mm² (external diameter 2.8 mm or less)External powerVoltageDC12/24V ± 10% (Ripple voltage 4 Vp-p or less)Current25 mA or less (When connecting DC24V)Operation indicatorLED On when Output OnExternal connection method24 point terminal block connector(M3 X 6 screw)Weight423gUsingeCircuit configurationNo.ContactTB10.TB1TB10.TB1TB10.TB1TB10.TB1TB10.TB1TB10.TB1TB10.TB1TB10.TB1TB10.TB1TB10.TB13TB1344TB1445TB1344TB1445TB1445TB1546TB1948TB1948TB1949TB10.TB19TB10.TB19TB10.TB19TB11.TB11TB12COM2TB1344TB1445TB13	Insulation n	nethod	Photo coupler insulati	on						
Max. load current       0.5A / 1 point, 2A / COMx(x:0-2)         Off leakage current       0.1 mA or less         Max. inrush current       4A / 10 ms or less         Max. voltage drop when On       DC 0.4V or less         Surge absorber       Zener diode         Response time       Off → On       1 ms or less (rated load, resistive load)         Common method       4 point / COM         Proper wire size       Stranded wire 0.3-0.75 mf (external diameter 2.8 mm or less)         External power       Voltage       DC 12/24V ± 10% (Ripple voltage 4 Vp-p or less)         Dower       Current       25 mA or less (When connecting DC24V)         Operation indicator       LED On when Output On       TB1 Action       TB1 Action         External connection method       24 point terminal block connector(M3 X 6 screw)       TB1 Action       TB1 Action         Upper       TB05.       TB1 Action       TB1 A	Rated load	voltage	DC 12 / 24V							
Off leakage current0.1 mA or lessMax. inrush current4A / 10 ms or lessMax. voltage drop when OnDC 0.4V or lessSurge absorberZener diodeResponseOff $\rightarrow$ On1 ms or less (rated load, resistive load)Common method4 point / COMProper wire sizeStranded wire 0.3~0.75 mf (external diameter 2.8 mm or less)ExternalVoltageDC12/24V ± 10% (Ripple voltage 4 Vp-p or less)powerCurrent25 mA or less (When connecting DC24V)Operation indicatorLED On when Output OnExternal connection method24 point terminal block connector(M3 X 6 screw)Weight423gTB05TB08CC12/24V.TB08CC12/24V.TB10TB10TB11TB13TB12TB13TB13TB13TB14TB13TB15TB14TB18TB13TB19TB14TB19TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17TB18TB17.	Operation l	oad voltage range	DC 10.2 ~ 26.4V							
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Max. load c	urrent	0.5A / 1 point, 2A / CO	DMx(x:0	)~2)					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Off leakage current 0.1 mA or less									
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Max. inrush current 4A / 10 ms or less									
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Max. voltage drop when On DC 0.4V or less									
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Surge absorber Zener diode									
time On $\rightarrow$ Off 1 ms or less (rated load, resistive load) Common method 4 point / COM Proper wire size Stranded wire 0.3~0.75 mf (external diameter 2.8 mm or less) External power Current 25 mA 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 Type TB0. TB0. TB0. TB0. TB0. TB0. TB0. TB0. TB0. TB0. TB0. TB0. TB1. TB1. TB1. TB1. TB1. TB1. TB1. TB1. TB1. TB1. TB1. TB1. TB2. TB1. TB2. TB3.	Response Off $\rightarrow$ On 1 ms or less									
Proper wire size         Stranded wire 0.3~0.75 m² (external diameter 2.8 m² or less)           External power         Voltage         DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)           Current         25 m² 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         Type           TB05.         TB07.         TB07.         TB1         AC100         TB2         PE         TB1         AC100         TB2         PE         Ac100         TB3         Contact         TB2         PE         TB1         Ac100         TB7         41         TB8         COM1         PA1         TB1         PA1         TB1         PA1         TB1         PA2         TB1         PA1         TB13         FB1         PA3         FB1         PA3         FB1         PA3         FB1         FB1 </td <td></td> <td><math>On \rightarrow Off</math></td> <td>1 ms or less (rated loa</td> <td colspan="7">ms or less (rated load, resistive load)</td>		$On \rightarrow Off$	1 ms or less (rated loa	ms or less (rated load, resistive load)						
External power         Voltage         DC12/24V ± 10% (Ripple voltage 4 Vp-p or less)           Current         25 mA 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         TB1           Circuit configuration         No.         contact         Type           TB2         PE         TB1         AC100           TB2         PE         TB1         AC100           TB3         -240V         TB3         -240V           TB4         P         TB5         40           TB6         COM0         TB7         41           TB8         COM1         TB1         RC           TB10         43         TB11         NC         TB14           TB12         COM2         TB13         44         TB16           TB14         45         TB15         46         TB15           TB14         FB14         FB14         FB14         FB14           FB14         FB14         FB14         FB14         FB14	Common m	ethod	4 point / COM							
District         Current         25 mA 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         Type           TB1         AC100         TB1         AC100         TB2         PE         TB1         AC100         TB2         PE         TB3         ~240V	Proper wire	size	Stranded wire 0.3~0.7	75 <sup>mm²</sup> (e	external	diamet	er 2.8 🛙	™ or less)		
Operation indicator         LED On when Output On           External connection method         24 point terminal block connector(M3 X 6 screw)           Weight         423g           TB05.           Circuit configuration         No.           Contact         No.           TB05.         TB07.           TB06.         TB1           TB09.         TB2           TB8         COM0           TB7         41           TB8         COM1           TB8         COM1           TB10.         TB10.	External Voltage DC12/24V ± 10% (Ripple voltage 4						less)			
External connection method         24 point terminal block connector(M3 X 6 screw)           Weight         423g           Circuit configuration         No.         Contact         No.         Contact         Type           TB1         AC 100         TB2         PE         AC100         TB1         AC100         PE         AC100	power	Current 25 <sup>mA</sup> or less (When connecting DC24V)								
Weight         423g           Circuit configuration         No.         Contact         No.         Contact         Type           TB05.         TB07.         TB07.         TB1         Ac100         TB2         PE         Ac100         TB1         Ac100         TB1         Ac100         TB1         Ac100         TB1         Ac100         TB2         PE         Ac100         TB2         PE         Ac100         TB1         Ac100         TB1         Ac100         TB1         Ac100         TB1         Ac100         TB2         PE         Ac100         TB2         PE         Ac100         TB1         TB1         Ac100         TB1         TB1         TB1         TB1         TB1         TB1         TB1         TB1         TB1 <th< td=""><td>Operation i</td><td>ndicator</td><td>LED On when Output</td><td>On</td><td></td><td></td><td></td><td></td></th<>	Operation i	ndicator	LED On when Output	On						
Circuit configuration         No.         Contact         No.         Contact         Type           Image: Circuit configuration         TB05, Image: Circuit configuration         TB1         AC100         PE         AC100         AC100         AC100 <td>External co</td> <td>nnection method</td> <td>24 point terminal bloc</td> <td>k conne</td> <td>ector(M3</td> <td>3 X 6 sc</td> <td>crew)</td> <td></td>	External co	nnection method	24 point terminal bloc	k conne	ector(M3	3 X 6 sc	crew)			
DC5V       TB05       TB2       PE       TB1       AC100       AC10	Weight		3							
DC5V       IBUS       TB2       PE       AC100       PE       PE       AC100       PE       AC100       PE       AC100       PE       PE       PE       PE       PE       PE </td <td></td> <td>Circuit config</td> <td>uration</td> <td>No.</td> <td>Contact</td> <td>No.</td> <td>Contact</td> <td>Туре</td>		Circuit config	uration	No.	Contact	No.	Contact	Туре		
Image: constraint of the second of the se	P DC5	. E		TB2	PE	TB1				
Image: Construction of the second	÷	□□	твот,			TB3	~240V	240V TB3		
Image: Construction of the second of the		_ <b>⊈⊑</b> <u>∕</u> _		184	Р	TB5	40	P P40 TB5		
TB       TB <td< td=""><td>ernal</td><td></td><td>TB09., DC12/24V.,</td><td>TB6</td><td>COMO</td><td>T07</td><td></td><td>COM0</td></td<>	ernal		TB09., DC12/24V.,	TB6	COMO	T07		COM0		
TB10       43       TB10       43       TB11       NC       TB12         TB11       NC       TB14       P44       TB15       P44       TB15         TB12       COM2       TB13       44       TB15       P46       TB15         TB12       TB14       45       TB15       46       TB17       NC       TB19         TB19       TB12       TB18       COM3       TB17       NC       TB19       P44       TB19         TB12       TB18       COM3       TB17       NC       TB19       P48       TB11       TB12       TB12       P48       TB19         TB14       45       TB17       NC       TB20       P49       P44       TB13         TB12       TB18       COM3       TB17       NC       TB18       TB19       P48       TB19         TB22       TB22       TB22       TB22       P48       TB23       TB24       Z40       TB23	Circu	┥┉┥╤╄		TB8	COM1	187	41	TB8 COM1 TB9		
Image: Constraint of the second se	<del>]</del> ∺	िइटी उँ		TP 10	10	TB9	42	P43 TB11		
TB13.       TB13.       TB12       COM2       TB13       44       FB15       FB16       FB17       FB17       FB18       FB18       COM3       FB19		—		ТВТО	43	TB11	NC	TB12 COM2 TB13		
TB14     45     TB15     46     TB18     COM3       TB19     TB19     TB12     TB19     TB17     TB17     TB17       TB18     COM3     TB17     TB22     P48     TB21       TB22     TB22     TB22     P48     TB22     P48       TB22     TB22     TB22     P48     TB22       TB22     TB22     TB22     P48     TB23			TB13.	TB12	COM2	TB 13	11	P45 TB15		
TB12.     TB12.     TB16     47     TB15     46     TB18     COM3     P48     TB19       TB19.     TB19.     TB18     COM3     TB17     NC     TB22     P48     TB21       TB22.     TB22.     TB22.     TB20     49     TB24     240     TB23		╶╾╼╎┤╚╾╢╤╋	тв16	TB14	45		44	TB16 P47 TB17		
TB19     DC12/24V.     TB17     NC     TB20     P49     TB21       TB22.     TB22.     TB22.     TB20     49     TB22     TB23		_¥ĘI <	TB12.	TB16	47	TB15	46	TB18 COM3 TB19		
			TB19. DC12/24V.			TB17	NC	TB20 P49 TB21		
		┌┼┉┤┋		TB18	COM3	TB19	48	P4B TB23		
		रिद्य रि		TB20	49			TB24 24G		
TB22 4B		- 4 -		TB22	4B	TB21	4A			
Terminal No.         TB24         240		L	184.1			TB23	24V			

## 7.3.9 XBC-DP10E 4 point transistor output (Source type)

Γ

	Model			Main	unit					
Specificatio	n			XBC-D	P10E					
Output poin	t	4 point								
Insulation m	nethod	Photo coupler insulat	ion							
Rated load	voltage	DC 12 / 24V								
Operation range	load voltage	DC 10.2 ~ 26.4V								
Max. load c	urrent	0.5A / 1 point, 2A / C	0.5A / 1 point, 2A / COMx(x:0~1)							
Off leakage	current	0.1 <sup>mA</sup> or less								
Max. inrush		4A / 10 ms or less								
Max. voltag On	ge drop when	DC 0.4V or less								
Surge abso	rber	Zener diode								
Response	$\text{Off} \to \text{On}$	1 ms or less								
time	$\text{On} \rightarrow \text{Off}$	1 ms or less (rated load, resistive load)								
Common m	ethod	4 point / COM								
Proper wire	size	Stranded wire 0.3~0.	75 <sup>mm²</sup> (	externa	l diame	eter 2.8	<sup>nm</sup> or	less)		
External	Voltage	DC12/24V ± 10% (Ri				or less)				
power	Current	25 mA or less (When		cting DC	24V)					
Operation in		LED On when Output On								
External method	connection	14 point terminal block connector(M3 X 6 screw)								
Weight		313g								
	Circuit config	guration	No.	Contact	No.	Contact		Ту	′pe	_
DC5V.,			TB2	PE	TB1	AC100 ~240V	TB2	$\bullet$	AC100	TB1
♥			TB4	N	TB3	~240V	TB2	PE	~240V	
Internal		TB09., TB	TB6	СОМО	TB5	40	TB6		P40	TB5
		$\downarrow$	TB8	COM1	TB7	41	TB8		P41	TB7
	विद्ये 🖸				TB9	42	TB10		P42	TB9
		DC12/24V.	TB10	43	TB11	NC	TB12	NC	NC	TB11
	L	TB4 Terminal No.	TB12	NC	TB13	24V	TB14		24V	TB13
			TB14	24G						

### 7.3.10 XBC-DP14E 6 point transistor output (Source type)

	Model			Main	unit						
Specificatio	n			XBC-D	P14E						
Output poin	t	6 point									
Insulation m	nethod	Photo coupler insulati	ion								
Rated load	voltage	DC 12 / 24V									
Operation range	load voltage	DC 10.2 ~ 26.4V									
Max. load c	urrent	0.5A / 1 point, 2A / CO	.5A / 1 point, 2A / COMx(x:0~1)								
Off leakage	current	0.1 <sup>mA</sup> or less									
Max. inrush		4A / 10 ms or less									
Max. voltag On	je drop when	DC 0.4V or less									
Surge abso	rber	Zener diode									
Response	$Off\toOn$	1 ms or less									
time	$\text{On} \to \text{Off}$	1 ms or less (rated loa	ad, res	istive loa	ad)						
Common m	ethod	4 point / COM									
Proper wire	size	Stranded wire 0.3~0.7	75 <sup>mm²</sup> (	externa	l diame	eter 2.8 n	<sup>nm</sup> or	less)			
External	Voltage	DC12/24V ± 10% (Rip		<b>U</b>		r less)					
power	Current	25 mA or less (When o		cting DC	24V)						
Operation in		LED On when Output	On								
External method	connection	14 point terminal bloc	k conr	nector(M	3 X 6 s	screw)					
Weight		315g									
	Circuit confi	guration	No.	Contact	No.	Contact		Ту	/pe		
DC5V.			TB2	PE	TB1	AC100	TB2	lacksquare	AC100	TB1	
	दित् र		TB4	N	TB3	~240V	TB2	PE N	~240V	твз	
Internal Circ		TB09., DC12/24V.,	TB6	СОМО	TB5	40	TB6	сомо	P40	TB5	
Circuit	╼┶┤ᢁ᠊╚		TB8	COM1	TB7	41	TB8	COM1	P41	TB7 TB9	
	<u>(</u> 독리	TB08.,	TB10	43	TB9	42	TB10	P43	P42	TB11	
		TB4.	TB12	45	TB11	44	TB12	P45	24V	TB13	
		Terminal No.	TB14	24G	TB13	24V	TB14	24G	$   \mathbf{\bullet} $		

# 7.3.11 XBC-DP20E 8 point transistor output (Source type)

	Model			Main ur	nit		
Specification			Х	BC-DP2	20E		
Output point		8 point					
Insulation met	hod	Photo coupler insulati	on				
Rated load vo	Itage	DC 12 / 24V					
Operation load	d voltage range	DC 10.2 ~ 26.4V					
Max. load curr	ent	0.5A / 1 point, 2A / CO	DMx(x:0	)~2)			
Off leakage cu	ırrent	0.1 <sup>mA</sup> or less					
Max. inrush cu	urrent	4A / 10 ms or less					
Max. voltage o	drop when On	DC 0.4V or less					
Surge absorbe	er	Zener diode					
Response	$Off\toOn$	1 ms or less					
time	$\text{On} \rightarrow \text{Off}$	1 ms or less (rated loa	ad, resis	stive loa	d)		
Common meth	nod	4 point / COM					
Proper wire size	ze	Stranded wire 0.3~0.7	75 <sup>mm²</sup> (e	external	diamet	er 2.8 ¤	m or less)
External	Voltage	DC12/24V $\pm$ 10% (Rip	ople vol	tage 4 \	/p-p or	less)	
power	Current	25 <sup>mA</sup> or less (When o	connect	ting DC2	24V)		
Operation indi	cator	LED On when Output	On				
External conne	ection method	24 point terminal bloc	k conne	ector(M3	3 X 6 so	rew)	
Weight		418g	1		1	1	
	Circuit configu	Iration	No.	Contact	No.	Contact	Туре
			TB2	PE	TB1	AC100	ТВ1
P DC5V.,	<del>_</del>				TB3	~240V	TB2 PE AC100 ~240V TB3
'I®			TB4	N	TB5	40	TB4 N P40 TB5
	<u>للا من</u>		TB6	COMO	707	41	ТВ6 СОМО Р41 ТВ7
rnal Circuit		тво9., родина во странити тво9., родина во странити на	TB8	COM1	TB7	41	TB8 COM1 TB9
fircuit	⊢⊸⊣≣		TD 10	40	TB9	42	TB10 P43 NC TB11
	दिये 🖓		TB10	43	TB11	NC	TB12 COM2 TB13
	- 4	DC12/24V., TB13.,	TB12	COM2	TB13	44	TB14 P45 TB15 TB16 P46 TB15
			TB14	45	TB15	46	TB18 P47 NC TB17
	≣⊈  ੋੋ		TB16	47	TB17	NC	TB20 NC TB19
	- 4 -	+ TB12., DC12/24V.,	TB18	NC			TB22 NC TB23
		<u>тв4.,</u>	TB20	NC	TB19	NC	TB24 24G 24V
		Terminal No.	TB22	NC	TB21	NC	
					TB23	24V	
			TB24	24G			

# 7.3.12 XBC-DP30E 12 point transistor output (Source type)

	Model			Main ur	nit						
Specificatio	n		Х	BC-DP	30E						
Output poin		12 point									
Insulation m	nethod	Photo coupler insulati	on								
Rated load	voltage	DC 12 / 24V									
Operation lo	oad voltage range	DC 10.2 ~ 26.4V									
Max. load c	urrent	0.5A / 1 point, 2A / CO	DMx(x:0	)~2)							
Off leakage	current	0.1 mA or less									
Max. inrush	current	4A / 10 ms or less	A / 10 ms or less								
Max. voltag	e drop when On	DC 0.4V or less	C 0.4V or less								
Surge abso	rber	Zener diode	ener diode								
Response	$Off \rightarrow On$	1 ms or less									
time	$On \rightarrow Off$	1 ms or less (rated loa	ad, resis	stive loa	d)						
Common m	ethod	4 point / COM									
Proper wire	size	Stranded wire 0.3~0.7	75 ㎜ (€	external	diamet	er 2.8 🛙	™ or less)				
External	Voltage	DC12/24V $\pm$ 10% (Rip	ople vol	tage 4 \	/p-p or	less)					
power	Current	25 mA or less (When o	connect	ting DC2	24V)						
Operation in	ndicator	LED On when Output	On								
External co	nnection method	24 point terminal bloc	k conne	ector(M3	3 X 6 sc	crew)					
Weight		423g									
	Circuit config	uration	No.	Contact	No.	Contact	Туре				
P DC5	(a		TB2	PE	TB1	AC 100	TB1				
					TB3	~240V	TB2 PF AC100				
	_( <u>¥</u> ⊑) <u>∕</u>		TB4	Ν	TB5	40	TB4 N				
		TB09., DC12/24V.,	TB6	COMO			тв6 сомо тв5				
Circuit		┇┥╾╹┚╽	TB8	COM1	TB7	41	TB8 COM1 P41 TB7				
	Ţ_  _ŢŢ		TD 10		TB9	42	TB10 P43 TB9				
			TB10	43	TB11	NC	TB12 COM2 NC TB11				
		TB13.	TB12	COM2	TB13	44	TB14 P45 TB13				
	╶╾╴┤╍╌╡		TB14	45			TB16 P46 TB15				
	Ľ¥Ęl ́		TB16	47	TB15	46	TB18 COM3 NC TB17				
		TB19., DC12/24V.,			TB17	NC	TB20 P49 TB19				
	┝╶┍┼╍┉┤═┦		TB18	COM3	TB19	48	тв22 р48 Р4А ТВ21				
	t Z		TB20	49	TB21	4A	TB24 24G TB23				
	⊢ ५ −	TB18     TB18.	TB22	4B		48	240				
	L	Terminal No.	TB24	24G	TB23	24V					
1			1024								

# 7.3.13 XBC-DR20SU 8 point relay output

	Model	Main unit									
Specification			XB	C-DR20	SU						
Output point		8 point									
Insulation m		Relay insulation									
Rated load voltage/curre		DC24V 2A (resistive lo	ad) / AC	220V 2	A (COS	SΦ = 1)	, 5A/C	CON	lx(x:	0~3)	
	Itage/current	DC5V / 1 mA									
Max. load vo	-	AC250V, DC125V									
Off leakage	-	0.1 mA (AC220V, 60 Hz									
Max. On/Off		3,600 times / hour	)								
Surge absor		None									
	Mechanical	20 million times or mor	e								
		Rated load voltage / C		00.000 t	imes o	r more					
Service		AC200V / 1.5A, AC240					times	s or	mor	е	
life	Electrical	AC200V / 1A, AC240V									
		,	DC24V / 1A, $DC100V / 0.1A$ (L / R = 7 ms) 100,000 times or more								
Response	$Off \rightarrow On$	10ms or less									
time	$On \rightarrow Off$	12ms or less									
Common me		4 point / COM (COM0-	-COM8)	, 8 poin	t / CON	1 (COM	4~CC	DM5	)		
Proper cable		Stranded cable 0.3~0.									
Operation in	dicator	LED On when Output	On Ò					,			
External	connection	•		tor (N/2	VGaa						
method		42 point terminal block	connec	tor (IVI3	X 6 SCI	ew)					
Weight		450g	_								
	Circuit conf	iguration	No.	Contact	No.	Contact		Ту	/pe		
		TB5	70.0		TB1	AC100		lacksquare		TB1	
	¥ چ		TB2	PE	TB3	~240V	TB2	PE	AC100 ~240V	твз	
		COM0 TB4	TB4	COM0	ТВ5	40	TB4	COM0	P40	TB5	
			TB6	COM1			TB6	COM1		тв7	
	¥⊈يً		TB8	COM2	TB7	41	TB8	COM2	P41		
Inter			TB10	43	ТВ9	42	TB10	P43	P42 NC	TB9 TB11	
Internal circuit			TB12	COM3	TB11	NC		COM3	P44	TB13	
Cuit –		TB10 TB14 45 TB13 44 TB14 P45 TB13 CT TB13 TB14 P45 TB15 TB15 P46 TB1								TB15	
	·	TB13	<b>TD 10</b>	47	TB15	46	TB18	P47	NC	TB17	
			TB16	47	TB17	NC	TB20	NC NC	NC	TB19	
		TB16 2	TB18	NC	TB19	NC	TB22		NC	TB21	
	I	COM3 TB12	TB20	NC			1 L	NC	24V	TB23	
		Terminal No.	TB22	NC	TB21		TB24	24G			
			TB24	24G	TB23	24V					

# 7.3.14 XBC-DR30SU 12 point relay output

	Model	Main unit						
Specificati	on		XB	C-DR30	SU			
Output poin		12 point						
Insulation m		Relay insulation						
Rated load voltage/curr	ent	DC24V 2A (resistive	load) / AC	220V 2	A (COS	SΦ = 1)	, 5A/COMx(x:0~4)	
-	oltage/current	DC5V / 1 mA						
Max. load v	-	AC250V, DC125V						
Off leakage	current	0.1 mA (AC220V, 60	Hz)					
Max. On/Of	f frequency	3,600 times / hour	,					
Surge abso	rber	None						
	Mechanical	20 million times or me	ore					
Samilaa		Rated load voltage /	Current 1	00,000 t	imes o	r more		
Service life	Electrical	AC200V / 1.5A, AC24	40V / 1A (	COS $\Phi$ :	= 0.7) 1	00,000	times or more	
me	Electrical	AC200V / 1A, AC240	V / 0.5A (	COS <sub>Φ</sub> :	= 0.35)	100,00	0 times or more	
		DC24V / 1A, DC100\	/ / 0.1A (L	/ R = 7	ˈms <b>) 10</b>	0,000 ti	mes or more	
Response	$Off \rightarrow On$	10 ms or less						
time	$On \rightarrow Off$	12 ms or less						
Common m	ethod	4 point / COM (COM	0~COM8)	, 8 poin	t / CON	1 (COM	4~COM5)	
Proper cabl	e size	Stranded cable 0.3~0	).75 mm² (E	xternal	diamet	er 2.8 m	m or less)	
Operation in		LED On when Output	t On				,	
External	connection	•		tor (N/2	VEco	(out)		
method		42 point terminal bloc	ck connec		A 6 SCI	ew)		
Weight		465g						
	Circuit conf	iguration	No.	Contact	No.	Contact	Туре	
			TB2	PE	TB1	AC100 ~240V		
		COM0 TB4	TB4	COM0	TB3		TB4 COM0	
	 ₩		TB6	COM1	TB5	40	TB6 COM1 P40 TB5	
_		COM1 TB6	TB8	COM2	TB7	41	TB8 COM2 P41 TB7	
Internal Circuit				43	TB9	42	TB10 P43 TB11	
		COM2 TB8	TB10		TB11	NC	TB12 COM3 P44 TB13	
-cuit			TB12	COM3	TB13	44	TB14 P45 TB15	
	<del>t</del> _; ii	TB16 2	TB14	45	TB15	46	TB16 P47 TB17	
		COM3 TB12	TB16	47	TB17	NC	TB18 COM4 P48 TB19	
	ŧф	TB22 2	TB18	COM4	TB19	48	749 P4A TB21	
			TB20	49	TB21	4A	TB22 P4B 24V TB23	
		L Terminal No.	TB22	4B				
			TB24	24G	TB23	24V		

# 7.3.15 XBC-DR40SU 16 point relay output

-	Model	Main unit									
Specification	on		XB	C-DR40	DSU						
Output point	t	16 point									
Insulation m	lethod	Relay insulation									
Rated load voltage/curr	ent	DC24V 2A (resistive lo	ad) / AC	220V 2	A (COS	SΦ = 1)	, 5A/	CON	lx(x:C	)~5)	
	ltage/current	DC5V / 1 mA									
Max. load vo	-	AC250V, DC125V									
Off leakage	current	0.1 mA (AC220V, 60 Hz	:)								
Max. On/Off	f frequency	3,600 times / hour									
Surge absor		None									
	Mechanical	20 million times or mor									
Service		Rated load voltage / C									
life	Electrical	AC200V / 1.5A, AC240		•							
		AC200V / 1A, AC240V								re	
		DC24V / 1A, DC100V /	/ 0.1A (L	_ / R = 7	′ ms) 10	0,000 ti	mes	or m	ore		
Response	$Off \rightarrow On$	10ms or less									
time	$On \rightarrow Off$	12ms or less						0			
Common m		4 point / COM (COM0-							•		
Proper cable		Stranded cable 0.3~0.	· · ·	xternal	diamet	er 2.8 🗉	m or	· less	)		
Operation in		LED On when Output	On								
External	connection	30 point terminal block	connec	tor (M3	X 6 scr	ew)					
method Weight		594g		,		,					
weight	0	<u> </u>						_			
	Circuit conf	iguration No. Contact No. Contact Type									
1			TDO	05	TB1	AC 100		lacksquare			
+         -		TB5	TB2	PE	TB3	~240V	TB2	PE	AC100	TB1	
			TB4	COMO	100		-	PE	~240V	твз	
		COMO TB4	TB6	COM1	TB5	40	TB4	COM0	P40	TB5	
			TB8	COM2	TB7	41	TB6	COM1	P41	тв7	
		COM1 TB6	TB10	43	TB9	42	TB8	COM2	P42	тв9	
Inte			TB12	COM3	TB11	NC	TB10	P43	NC	TB11	
	╡╋	тв10 2	TDTZ	CONID	TB13	44	TB12	COM3	P44	TB13	
nal circuit		COM2 TB8	TB14	45	TB15	46	TB14	P45	P44	TB15	
			TB16	47	TB17	NC	TB16	P47	NC	TB17	
		COM3 TB12	TB18	COM4	TB19	48	TB18	COM4	P48	TB19	
			TB20	49	TB21	40 4A	TB20	P49	P4A	TB21	
		TB28 2 2	TB22	4B	TB23	NC NC	TB22	P4B	NC	тв23	
	<u> </u>	COM5 TB24	TB24	COM5			TB24	COM5	P4C	тв25	
		Terminal block no.	TB26	4D	TB25	4C	TB26	P4D	P4E	тв27	
				1	TB27	4E	TB28	P4F		TB29	
l			TB28	4F	TB29	24V	TB30	24G	24V	1025	

# 7.3.16 XBC-DR60SU 24 point relay output

SpecificationXBC-DR60SUOutput point24 pointInsulation methodRelay insulationRated load voltage/currentDC24V 2A (resistive load) / AC220V 2A ( $COS\Phi = 1$ ), $5A/COMx(x:0~7$ )Min. load voltage/currentDC5V / 1 mAMax. load voltageAC250V, DC125VOff leakage current0.1 mA (AC220V, 60 Hz)Max. On/Off frequency3,600 times / hourSurge absorberNoneService lifeRated load voltage / Current 100,000 times or more AC200V / 1.5A, AC240V / 1A ( $COS\Phi = 0.7$ ) 100,000 times or more AC200V / 1A, AC240V / 0.5A ( $COS\Phi = 0.35$ ) 100,000 times or more DC24V / 1A, DC100V / 0.1A (L / R = 7 ms) 100,000 times or moreResponseOff $\rightarrow$ On10ms or less		Mode		Main unit												
Output point         24 point           Insulation method         Relay insulation           Rated load voltage/current         DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COMx(x:0-7)           Min. load voltage/current         DC5V / 1 m²           Max. On/Off frequency         S600 times / hour           Surge absorber         None           Mechanical         20 million times or more           Rated load         AC220V / 15A, AC240V / 1A (COSΦ = 0.35) 100,000 times or more           AC200V / 1A, AC240V / 1A (COSΦ = 0.35) 100,000 times or more         AC200V / 1A, AC240V / 1A (COSΦ = 0.35) 100,000 times or more           Response         Off → On         10ms or less           Common method         4 point / COM (COM0-COM8),8 point / COM (COM4-COM5)           Proper cable size         Stranded cable 0.3-0.75 m/ (External diameter 2.8 m/m or less)           Opretation indicator         LED On when Output On           External         connection           00m         104           100         101           00m         104           1181         00m           00m         10m or less           Commition         30 point terminal block connector (M3 X 6 screw)           Weight         804g           1181         1181	Specificati															
Insulation         Relay insulation           Rated load         DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COMx(x:0-7)           Vilage/current         DC5V / 1 mA           Max. load voltage/current         DC5V / 1 mA           Max. load voltage         AC250V, DC125V           Off leakage current         0.1 mA (AC220V, 60 Hz)           Max. On/Off frequency         3.600 times / hour           Surge absorber         None           Service life         Rated load voltage / current 100,000 times or more           Rated load voltage / current 100,000 times or more         AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more           Service life         Rated load voltage / current 100,000 times or more         AC200V / 1.A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more           Common method         4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5)         Common method           Proper cable size         Stranded cable 0.3-0.75 mf (External diameter 2.8 mm or less)         Operation indicator           LED On when Output On         Stranded cable 0.3-0.75 mf (External diameter 2.8 mm or less)         Operation indicator           Usight         804g         Table 40         Table 40         Table 40           TB8         Com retific         Table 40         Table 40         Table 40           TB8         Com r				24 po	oint											
Rated load         DC24V 2A (resistive load) / AC220V 2A (COSΦ = 1), 5A/COMx(x:0-7)           Min. load voltage/current         DC5V / 1 mA           Max. load voltage         AC250V, DC125V           Off leakage current         0.1 mA (AC220V, 60 Hz)           Max. On/Off frequency         3,600 times / hour           Surge absorber         None           Service life         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 / 1A (COSΦ = 0.35) 100,000 times or more           AC200V / 1A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more         DC24V / 1A, DC100V / 0.5A (COSΦ = 0.35) 100,000 times or more           Response         Off → On         10ms or less         more           Common method         4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5)         Proper cable 0.3 - 0.75 im <sup>-1</sup> (External diameter 2.8 im or less)           Operation indicator         LED On when Output On         External         Tas or less           Common method         4 point / TB6         118/2         711/4         411/4           B10         A3         6x100         Tas or less         Tas or less           Common method         4 point / TB6         118/2         118/2         118/2           Gotation findicator         LED On when Output On						ation										
Min. load voltage/current       DCSV / 1 m^A         Max. load voltage       AC250V, DC125V         Off leakage current       O.1 m^A (AC220V, 60 Hz)         Max. load voltage       ConvOff frequency       3.600 times / hour         Surge absorber       None         Service life       Electrical       Rated load voltage / Current 100,000 times or more         Ac200V / 1.6, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more       Ac200V / 1.6, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more         Response       Off → On       10ms or less       Stranded cable 0.3 - 0.75 mr (External diameter 2.8 mm or less)         Operation indicator       LED On when Output On       Stranded cable 0.3 - 0.75 mr (External diameter 2.8 mm or less)         Operation indicator       LED On when Output On       Tone         Stranded cable 0.3 - 0.75 mr (External diameter 2.8 mm or less)       Tone         Weight       804g       Table 40       Table 40         TB1       Contrast TB1       Ac100       Table 40       Table 40         TB2       TB1       Ac100       Table 40       Table 40       Table 40         TB2       TB1       Ac100       Table 40       Table 40       Table 40         TB2       TB1       Ac100       Table 40       Table 40       Table 40 <th< td=""><td>Rated load</td><td></td><td></td><td></td><td></td><td></td><td>ve loa</td><td>d) / AC</td><td>220V 2/</td><td>A (COS</td><td>Φ = 1),</td><td>5A/0</td><td>СОМ</td><td>x(x:0</td><td>)~7)</td></th<>	Rated load						ve loa	d) / AC	220V 2/	A (COS	Φ = 1),	5A/0	СОМ	x(x:0	)~7)	
Max. load voltage       AC250V, DC125V         Off leakage current       0.1 m² (AC220V, 60 Hz)         Max. On/Off frequency       None         Service life       Electrical       Rated load voltage / Current 100,000 times or more         Response       Off = A2200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more         Response       Off = A200V / 1A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more         Response       Off = A200V / 1A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more         Common method       4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5)         Proper cable size       Stranded cable 0.3-0.75 mil (External diameter 2.8 mill or less)         Operation indicator       LED On when Output On         External method       804g         Bild       Max       Common TB         Bild       Max       Common TB         Bild       A       Center       No         Bild       Bild       Bild       A       Center         Bild       Bild <t< td=""><td>-</td><td></td><td>rent</td><td>DC5\</td><td>//1 m/</td><td>Ą</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	-		rent	DC5\	//1 m/	Ą										
Off leakage current         0.1 mA (AC220V, 60 Hz)           Max. On/Off frequency         3,600 times / hour           Surge absorber         None           Service life         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           Response         Off → On         10ms or less           Common method         4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5)           Proper cable size         Stranded cable 0.3-0.75 mf (External diameter 2.8 mm or less)           Operation indicator         LED On when Output On           External         Context         Mo         Context         Mo         Context         Mo         Context         Max         Context		-					/									
Max. On/Off frequency       3,600 times / hour         Surge absorber       None         Mechanical       20 million times or more         Rated load voltage / Current 100,000 times or more       Rated load voltage / Current 100,000 times or more         Service life       Electrical       Rated load voltage / Current 100,000 times or more         Response       Off → On       10ms or less         Common method       4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5)         Proper cable size       Stranded cable 0.3-0.75 mill (External diameter 2.8 million times or more         Operation indicator       LED On when Output On         External method       804g         Weight       804g         Circuit configuration       No       Content       Tune         TBB       Add 100       Table 40       Table 40       Table 40         TBB       Could TB4       TB1       Add 100       Table 40       Table 40       Table 40         TBB       Add 100       TBB       Add 100       Table 40       Table 40 <td></td> <td>0</td> <td></td>		0														
Surge absorber         None           Service life         Rated load voltage / Current 100,000 times or more           AC200V / 1.5A, AC240V / 1A (COSΦ = 0.7) 100,000 times or more           AC200V / 1.5A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more           DC24V / 1.A, DC100V / 0.1A (L / R = 7 ms) 100,000 times or more           DC24V / 1.A, DC100V / 0.1A (L / R = 7 ms) 100,000 times or more           Common method         4 point / COM (COM0~COM8), 8 point / COM (COM4~COM5)           Proper cable size         Stranded cable 0.3~0.75 mf (External diameter 2.8 mm or less)           Operation indicator         LED On when Output On           External         connection           a0 point terminal block connector (M3 X 6 screw)           Weight         804g           Circuit configuration         TB1           AC100         TB           TB1         AC100           TB2         FE           TB1         AC100           TB2         TB1           TB1         AC100           TB2         FE           TB1         AC100           TB2         TB1           TB1         AC100           TB2         FE           TB1         AC100           TB2         FE	<b>.</b>		су	3,600	) times	s / hour	·									
Service life         Rated load voltage / Current 100,000 times or more           AC200V / 1.3., AC240V / 1A, (COSΦ = 0.7) 100,000 times or more           AC200V / 1A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more           Response         Off → On           0f → Off         12ms or less           Common method         4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5)           Proper cable size         Stranded cable 0.3-0.75 mf' (External diameter 2.8 mn or less)           Operation indicator         LED On when Output On           External         connection           method         804g           Weight           Weight         804g           Trait           Trait           Trait           Cond TB4           10         100           Trait			<i>.</i>	None												
Service life         Electrical         AC200V / 1.5A, AC240V / 1A (COSΦ = 0.3) 100,000 times or more AC200V / 1A, AC240V / 0.5A (COSΦ = 0.35) 100,000 times or more DC24V / 1A, AC240V / 0.1A (L / R = 7 ms) 100,000 times or more           Response         Off → On On → Off         12ms or less           Common method         4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5) Proper cable size         Stranded cable 0.3-0.75 mm (External diameter 2.8 mm or less)           Operation indicator         LED On when Output On External method         No         Commat Max 6 screw)           Weight         804g         Turne         Turne         Turne           IBI3         Output         IBI3         IBI3 <thibi3< th="">         IBI3         IBI3</thibi3<>		Mechan	ical	20 mi	illion ti	imes or	r more									
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$				Rateo	d load	voltage	e / Cur	rent 10	00,000 ti	imes or	more					
Ac2uv / 1A, AC2uv / 1A, AC2uv / 0.5A (COS¢ = 0.35) 100,000 times or more           Response         Off → On         10ms or less           Common method         4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5)           Proper cable size         Stranded cable 0.3-0.75 mm (External diameter 2.8 mm or less)           Operation indicator         LED On when Output On           External         connection           30 point terminal block connector (M3 X 6 screw)           Weight         804g           TB2         FE         TB3         Common TB4           TB2         FE         TB3         Common TB4           TB3         Common TB4         TB3         TB3         TB3           TB3         Common TB4         TB3         TB3         TB3         TB3           TB3         Common TB4         TB3         TB3         TB1         RC         REsponse           TB1         Com         TB3         TB1         RC         REsponse	Service life	Electric		AC20	0V / 1	.5A, A	C240V	′ / 1A (	COSΦ =	= 0.7) 1	00,000	time	s or i	more	;	
Response         Off → On         10ms or less           Common method         4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5)           Proper cable size         Stranded cable 0.3-0.75 mm (External diameter 2.8 mm or less)           Operation indicator         LED On when Output On           Stranded cable 0.3-0.75 mm (External diameter 2.8 mm or less)           Operation indicator         LED On when Output On           30 point terminal block connector (M3 X 6 screw)           Weight         804g           True           True           True           True           Connection           True           True <td colsp<="" td=""><td></td><td>Electrica</td><td>ai</td><td>AC20</td><td>0V / 1</td><td>A, AC2</td><td>240V /</td><td>0.5A (</td><td>COSΦ =</td><td>= 0.35)</td><td>100,000</td><td>) tim</td><td>es or</td><td>mo</td><td>re</td></td>	<td></td> <td>Electrica</td> <td>ai</td> <td>AC20</td> <td>0V / 1</td> <td>A, AC2</td> <td>240V /</td> <td>0.5A (</td> <td>COSΦ =</td> <td>= 0.35)</td> <td>100,000</td> <td>) tim</td> <td>es or</td> <td>mo</td> <td>re</td>		Electrica	ai	AC20	0V / 1	A, AC2	240V /	0.5A (	COSΦ =	= 0.35)	100,000	) tim	es or	mo	re
time On → Off 12ms or less Common method 4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5) Proper cable size Stranded cable 0.3-0.75 mr (External diameter 2.8 mm or less) Operation indicator LED On when Output On External connection method 30 point terminal block connector (M3 X 6 screw) Weight 804g Weight 100 TB4 0 TB2 PE TB1 AC100 TB4 0 TB3 -240V TB4 COM0 TB4 0 TB5 40 TB4 COM0 TB4 0 TB1 41 TB7 41 TB1 42 TB9 42 TB1 44 5 TB1 44 5 TB1 44 5 TB1 44 7 TB1 7 TB2 7 TB2 7 TB2 7 TB2 7 TB2 7 TB2 7 TB2 7 TB3				DC24	IV / 1 <i>F</i>	A, DC1	00V / C	).1A (L	/ R = 7	ms) 100	),000 tin	nes	or mo	ore		
Common method         4 point / COM (COM0-COM8), 8 point / COM (COM4-COM5)           Proper cable size         Stranded cable 0.3-0.75 mtr (External diameter 2.8 mt or less)           Operation indicator         LED On when Output On           Stranded cable 0.3-0.75 mtr (External diameter 2.8 mt or less)           Operation indicator         LED On when Output On           Stranded cable 0.3-0.75 mtr (External diameter 2.8 mt or less)           Weight         804g           To connection           method         804g           Contact Indicator           Contact Indicator           Contact Indicator           Contact Indicator           Contact Indicator           Contact Indicator           To endition of the contact Indicator           To endition of the contact Indicator           Contact Indicator           To endition of the contact Indicator           To enditin the contact Indicator <td>Response</td> <td></td> <td></td> <td>10ms</td> <td colspan="9">)ms or less</td> <td></td>	Response			10ms	)ms or less											
Proper cable size         Stranded cable 0.3-0.75 m² (External diameter 2.8 m² or less)           Operation indicator         LED On when Output On           External method         son point terminal block connector (M3 X 6 screw)           Weight         804g           Circuit configuration         No         Contact         No         Contact         Tune           TB2         PE         TB1         AC100         TB2         Contact         Tune           TB2         PE         TB1         AC100         TB2         Contact         Tune           TB4         COM0         TB4         COM0         TB3         Contact         Tune           TB4         COM0         TB4         TB7         41         T62         PE         TB1         AC100         TB4         TB1         TB1         TB1         TB1         TB2         AU         TB4         TB1         TB1         TB1         TB1         TB2         AU         TB4         TB1         T	time		Off													
Operation indicator         LED On when Output On           External         connection         30 point terminal block connector (M3 X 6 screw)           Weight         804g           Circuit configuration         No         Context         No         Context         Tune           IB2         PE         TB1         AC100         TB2         PE         TB1         AC100           TB4         CON0         TB5         40         TB5         42         TB5           TB4         CON0         TB4         TB7         41         TB6         Context         TB4         Context         TB4         Context         TB1         AC100         TB5         Context         TB4         TB4         Context         TB4         Context         TB4								,					,			
External method         connection         30 point terminal block connector (M3 X 6 screw)           Weight         804g         Ture         Ture           Circuit configuration         No         Contact         No								,	xternal	diamete	er 2.8 mm	י or	less)			
method         30 point terminal block connector (M3 X 6 screw)           Weight         804g           Circuit configuration         N/c         Context         Tune           IB2         FE         TB1         AC100         FE         Context         Tune           B8         COM0         TB5         40         TB2         FE         TB1         AC100         FE         Context         FE         FE         FE         FE         FE         FE         FE         FE         FE			-	LED	On wh	nen Out	tput Or	า								
Territod         804g           Circuit configuration         Na         Contact         Na         Contact         Top           TB2         FE         TB1         AC100         FE         FE         AC100         FE         FE         FE         FE         FE		conr	nection	30 pc	oint ter	minal b	olock c	onnect	tor (M3	X 6 scre	ew)					
Circuit configuration         Nic         Contact         Nic         Nic <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>`</td><td></td><td>,</td><td></td><td></td><td></td><td></td></th<>									`		,					
Image: constrained by the constrained b	weight	Circ	uit conf	0	20			No	Contact	No	Contact	I	Т	100		
TB2       PE       TB3       -240V       TB2       FE1         TB4       COM0       TB5       40       TB2       FE       -260V       TB3         TB4       COM0       TB4       COM0       TB5       40       TB6       COM1       FE       -260V       TB3         TB6       COM1       TB7       41       TB6       COM1       FE       -260V       FE       FE       FE       FE       FE </td <td></td> <td>Carr.</td> <td></td>		Carr.														
TB4       COM0       TB5       40       TB4       COM0       FB       -2407       TB3         TB5       40       TB5       40       TB5       40       FB       -2407       FB         TB6       COM0       TB4       COM1       TB5       40       TB6       COM2       FB       41       FB       COM2       FB       743       FB       FB<								TB2	PE				)		TB1	
TB5       40       TB5       40       TB5       40       FB6       COM       FB7       FB7<								TRA	COMO	TB3	~240V	TB2	PE		твз	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $										TB5	40	TB4	сомо		TRE	
Image: constraint of the second se					TB5			186	COM1	TB7	41	TB6	COM1	P40		
Image: construction of the construc			\$I		-			TB8	COM2			TB8		P41	TB7	
Image: constraint of the second se				COMO	TB4	$\sim$		TB10	43	189	42	TR10		P42	TB9	
Image: constrained block in the					TB7									NC	TB11	
COM1       TB6       TB9       TB15       46       TB16       P46       TB17       NC         TB16       47       TB17       NC       TB16       P47       NC       TB19         TB17       TB10       TB10       TB13       TB18       COM4       TB19       48       TB22       P46       TB17         TB12       TB13       TB13       TB12       TB13       TB12       TB13       TB12       TB13       TB12       P46       TB17       NC       TB18       COM4       TB19       P48       TB21       TB17       TB19       P48       TB21       TB17       TB19       P48       TB21       TB17       TB19       P48       TB21       TB17       TB19       P48       TB23       TB17       TB19       P48       TB21       TB17       TB19       TB23       TB24       COM5       TB25       4C       TB26       P40       P42       TB27       TB25       TB25       4C       TB26       P40       P41       TB27       TB27       TB28       TB27       TB28       TB27       TB28       TB27       TB28       TB27       TB27       TB28       TB27       TB28       TB27       TB28       TB27			а́I					TR1/	15	TB 13	44	TD14		P44	TB13	
Image: constraint of the second se				COM 1	TB6	$\bigcirc$				TB 15	46			P46	TB15	
Image: constraint of the constraint					TB9	9		TB16	47	TB17	NC	TB16	P47		TB17	
Image: constraint of the constraint	l l ina	│₩	Ş					TB18	COM4			TB18	COM4		TR10	
Image: constraint of the constraint		:		COM2		$\sim$		TB20	49	IB19	48	тв20	P49	P48		
Image: constraint of the constraint	Cui	.	I	00mL		$\odot$				TB21	4A	TB22	DAR	P4A	TB21	
COM3       TB12       TB37       TB26       4C       TB26       4C       TB26       P4E       TB27         TB26       4D       TB27       4E       TB28       4F       TB29       NC       TB30       COM6       TB31       50       TB32       P51       P52       TB33         TB36       COM7       TB36       S       TB32       51       TB33       52       TB34       P51       P52       TB35         TB36       COM7       TB36       S       TB36       COM7       TB37       54       TB36       P55       P56       TB39       754       TB40       P55       P56       TB37       TB41       24V       <			<b>.</b>					1822	4B	TB23	NC	TB24		NC	TB23	
Image: Construction of the line of			۴ <b>–</b>			۲		TB24	COM5	TDOE	40		COM5	P4C	TB25	
<			_ا ڊ			$\sim \square$		TB26	4D	1820		TB26	P4D	DAE	TB27	
Image: Comparison of the second state of the second sta				ζ	TB37	$\stackrel{\smile}{\rightarrow}$		TR28	٨E	TB27	4E	TB28	P4F		TB29	
COM7       TB36       TB31       50       TB32       P51       P52       TB33         no.       TB34       53       TB35       NC       TB36       OM7       TB37       54       TB39       56       TB39       F56       TB41       24V       TB41       TB41 <td< td=""><td></td><td>  🗗</td><td>ခို</td><td></td><td>TB40</td><td>2 6</td><td>2</td><td></td><td></td><td>TB29</td><td>NC</td><td>TB30</td><td>COM6</td><td>NC</td><td></td></td<>		🗗	ခို		TB40	2 6	2			TB29	NC	TB30	COM6	NC		
Terminal block       TB32       51       TB33       52       P53       NC         no.       TB36       COM7       TB35       NC       TB36       COM7       TB37       54       TB39       56       TB39       56       TB40       57       TB41       24V       TB41				COM7	TB36			1 <sup>°</sup> B30	COM6	TB31	50	TB32		P50	1831	
no. $\begin{array}{c ccccccccccccccccccccccccccccccccccc$			•			$\smile$	al block	TB32	51			TR3/		P52	TB33	
TB36     COM7     TB37     54     TB37       TB38     55     TB39     56     TB40     57       TB40     57     TB41     24V     TB42					<u> </u>			TB34	53					NC	TB35	
TB38     55     TB39     56     F57       TB40     57     TB41     24V     TB42								TB36	COM7					P54		
TB40 57 TB41 24V TB41 24V TB42 24G								TB38	55			тв40		P56		
								TB40	57			тв42		24V	TB41	
								TB42	24G	1041	24V			lacksquare		
									1		L	l				

#### 7.3.17 XBC-DN20S(U) 8 point transistor output (Sink type)

Γ

	Model	Main unit									
Specification			XB	C-DN20	)S(U)						
Output point		8 point									
Insulation meth	nod	Photo coupler insulati	on								
Rated load vol	tage	DC 12 / 24V									
Operation load	voltage range	DC 10.2 ~ 26.4V									
Max. load curr	ent	0.5A / 1 point, 2A / CC	DMx(x:0	0~3)							
Off leakage cu	rrent	0.1 mA or less		-							
Max. inrush cu	rrent	4A / 10 ms or less	A / 10 ms or less								
Max. voltage d	rop when On	DC 0.4V or less	DC 0.4V or less								
Surge absorbe	r	Zener diode	Zener diode								
Response	$Off \rightarrow On$	1 ms or less	ms or less								
time	$On \rightarrow Off$	1 ms or less (rated loa	ld, resis	stive loa	d)						
Common meth	od	4 point / COM	•								
Proper wire siz	e	Stranded wire 0.3~0.7	Stranded wire 0.3~0.75 m <sup>a</sup> (external diameter 2.8 m or less)								
External	Voltage	DC12/24V $\pm$ 10% (Ripple voltage 4 Vp-p or less)									
power	Current	25 mA or less (When connecting DC24V)									
Operation indic	cator	LED On when Output	LED On when Output On								
External conne	ection method	24 point terminal bloc	k conne	ector(M3	3 X 6 sc	rew)					
Weight		470g									
	Circuit configu	uration	No.	Contact	No.	Contact			/pe		
		TB05			TB1	AC100		$\bigcirc$		TB1	
			TB2	PE	ТВЗ	~240V	TB2		AC100		
		1	TB4	СОМО	105		тв4		~240V	TB3	
	<u>F</u> -FL				TB5	40		сомо	P40	TB5	
		DC12/24V	TB6	COM1	TB7	41	TB6	сом1		тв7	
			TB8	COM2		41	TB8	сом2	P41		
	▙ <mark>┲</mark> ┤ <sup>┲╝</sup> ╵╧┛				TB9	42	TB10		P42	TB9	
	<u>F</u> []	ТВО6	TB10	43	TD44		TD 1 2	P43	Р	TB11	
Internal circuit		DC12/24V	TB12	COM3	TB11	Р	TB12	сомз	P44	TB13	
	<del>_</del> _				TB13	44	TB14	P45	P44	TB15	
	┍┿╔┙╡ <del>╡</del> ╋		TB14	45			TB16	P47	P46	1012	
	<u> </u>										
		DC12/24V			TB17	NC		NC	NC	TB19	
			TB18	NC			TB20	NC		TB21	
	▖ <u></u> ╡ᢁ᠆╡ <u></u> ╡╋	TB16	TB20	NC	TB19	NC	TB22	NC	NC		
	<u> </u>		1020		TB21	NC	тв24		24V	TB23	
	· L	tB12 ↓ TB11 DC12/24V	TB22	NC			-	24G		1	
			TB24	24G	TB23	24V				J	
		T Terminal no.	1024	240							

### 7.3.18 XBC-DN30S(U) 12 point transistor output (Sink type)

٦

	Model	Main unit								
Specification			XB	C-DN30	)S(U)					
Output point		12 point								
Insulation me	ethod	Photo coupler insulati	on							
Rated load v	oltage	DC 12 / 24V								
Operation loa	ad voltage range	DC 10.2 ~ 26.4V								
Max. load cu	rrent	0.5A / 1 point, 2A / CO	OMx(x:0	)~4)						
Off leakage	current	0.1 mA (AC220V, 60 H	z)							
Max. inrush	current	4A / 10 ms or less								
Max. voltage	drop when On	DC 0.4V or less								
Surge absor	ber	Zener diode								
Response	$Off \rightarrow On$	1 ms or less	ms or less							
time	$On \rightarrow Off$	1 ms or less (rated loa	ms or less (rated load, resistive load)							
Common me	ethod	4 point / COM								
Proper wire s	size	Stranded wire 0.3~0.7	75 ㎜ (€	external	diamet	er 2.8 🛛	m o	r less	;)	
External	Voltage	DC12/24V ± 10% (Rip	ople vol	tage 4 \	/p-p or	less)				
power	Current	25 mA or less (When o		ting DC2	24V)					
Operation in		LED On when Output								
	nection method	24 point terminal bloc	k conne	ector(M3	3 X 6 so	crew)				
Weight		475g					1			
	Circuit configu	Iration	No.	Contact	No.	Contact		Ţ	уре	
<b>9</b> DC5V		TB05			TB1	AC100				]
			TB2	PE	твз	~240V	TB2		AC100	TB1
	╔ <u>┙</u>	ן	TB4	COM0	163		_	PE	~240V	
	<u> </u>				TB5	40	TB4	сомо		TB5
		TB09 DC12/24V	TB6	COM1			TBG	сом1	P40	
			ТВ8	COM2	TB7	41	тва	сом2	P41	TB7
			TDO	COIVIZ	ТВ9	42	TD10		P42	TB9
	मिनी र		TB10	43			TB10	P43	P	TB11
Internal circuit		DC12/24V			TB11	Р	TB12	сомз	<u> </u>	TB13
<u>a</u> <u>C</u> .			TB12	COM3	TB13	44	TB14	P45	P44	
rcuit	ᠼᠼ᠋᠃ᢪ		TB14	45			TB16		P46	TB15
	· [부탁] ·	TB12			TB15	46		P47	NC	TB17
	<b></b>	TB19 DC12/24V TB16 47 TB17 NC P48 TB19								TB19
			TB18	COM4	TB17	NC	TB20	P49	P48	
	╶╾╼╴╴╴╴╴╴╴╴╴				TB19	48	TB22	2 P4B	P4A	TB21
	(독타) <	TB18	TB20	49			TB24	1	24V	TB23
	<b>4</b>	TB11 DC12/24V	троо	40	TB21	4A	1024	24G		1
	L		TB22	4B	TB23	24V	1			
		block no.	TB24	24G						
				1			I			

Model			Main						
Specification		Х	BC-DN	14050					
Output point Insulation method	16 point								
Rated load voltage	Photo-coupler insulation	חו							
Load voltage range	DC 10.2 ~ 26.4V								
Max. load current	0.5A / 1point, 2A / COI	Mx(x·0	~5) (P	40 P4	1·0 1A	/100	int)		
Off leakage current	0.1 <sup>mA</sup> or less	11/(/0	0) (!	10,11		., .po			
Max. inrush current	4A / 10 ms or less								
Max. voltage drop when On	DC 0.4V or less								
Surge killer	Zener diode								
$Off \rightarrow On$	1 ms or less								
Response time $On \rightarrow Off$	1 ms or less (rated load	d, resis	stive lo	ad)					
Common method	4 point / COM			,					
Proper cable size		randed cable 0.3~0.75 m <sup>a</sup> (External diameter 2.8 mm or less)							
External Voltage	DC12/24V ± 10% (ripp		1					,	
supply power Current	25 mA or less (when co				/				
Operation indicator	LED On When Output		0 0	/					
External connection method	30 point terminal blo		nector	(M3 X	6 scre	w)			
Weight	578g								
Circuit config	uration	No.	Contact	No.	Contact		Ту	/pe	
	<b>—</b> =====			TB1					
	TB05	TB2	PE		AC100 ~240V		$\bigcirc$		TB1
║╋┍── <sub>┝┲─</sub> └─ <sup>╔┙╡</sup>		TB4	COMO	TB3		TB2 TB4	PE	AC100 ~240V	TB3
	TB04	TB6	COM1	TB5	40		COM0	P40	TB5
	DC12/24V			TB7	41	TB6	COM1	P41	TB7
		TB8	COM2	TB9	42	TB8	COM2	P42	твэ
	TB10	TB10	43	TB11	Р	TB10	P43		TB11
		TB12	COM3		44	TB12	СОМЗ	Р	TB13
	DC12/24V	TB14	45	TB13		TB14	P45	P44	
		TB16	47	TB15	46	TB16	P47	P46	TB15
				TB17	NC	TB18		NC	TB17
		TB18	COM4	TB 19	48		COM4	P48	TB19
	TB25 DC12/24V	TB20	49			TB20	P49	P4A	TB21
		TB22	4B	TB21	4A	TB22	P4B	NC	TB23
		TB24	COM5	TB23	NC	TB24	COM5		TB25
	t TB24 I → TB11 DC12/24V	TB26	4D	TB25	4C	TB26	P4D	P4C	TB27
				TB27	4E	TB28	P4F	P4E	TB29
	Terminal block no.	TB28	4F	TB29	24V	TB30	24G	24V	
		TB30	24G					lacksquare	

# 7.3.19 XBC-DN40SU 16 point TR output (Sink type)

Γ

#### 7.3.20 XBC-DN60SU 24 point TR output (Sink type)

Model	Main unit								
Specification		X	BC-DN						
Output point	24 point		000.						
Insulation method	Photo-coupler insulati	on							
Rated load voltage	DC 12 / 24V								
Load voltage range	DC 10.2 ~ 26.4V								
Max. load current	0.5A / 1point, 2A / CO	Mx(x:0	~7) (P4	40, P4	1: 0.1A	. / 1po	int)		
Off leakage current	0.1 mA or less								
Max. inrush current	4A / 10 ms or less								
Max. voltage drop when On	DC 0.4V or less								
Surge killer	Zener diode								
Response time $Off \rightarrow On$	1 ms or less								
$On \rightarrow Off$	1 ms or less (rated loa	d, resis	stive lo	ad)					
Common method	4 point / COM								
Proper cable size	Stranded cable 0.3~0	.75 <sup>mm²</sup>	(Exterr	nal diai	meter 2	<u>2.8</u> mm	or le	ss)	
External Voltage	DC12/24V ± 10% (rip)	ole volt	age 4 \	/p-p o	r less)				
supply power Current	25 mA or less (when c		ing DC	24V)					
Operation indicator	LED On When Output								
External connection method	42 point terminal blo	ck con	nector	(M3 X	6 scre	w)			
Weight	636g		1		1				
Circuit config	uration	No.	Contact	No.	Contact		Ту	/pe	
		TB2	PE	TB1	AC100		$\bigcirc$		TB1
				TB3	~240V	TB2	PE	AC100 ~240V	
<b>•</b>		TB4	COMO	TB5	40	TB4	сомо	~240V	TB3
		TB6	COM1			TRA		P40	TB5
┃  ♥  └┰┲┤ ╵ <sup>─</sup>	ᢪ┥╎	TB8	COM2	TB7	41	TB6	COM1	P41	TB7
	TB04			TB9	42	TB8	COM2		тв9
	DC12/24V	TB10	43	TB11	Р	TB10	P43	P42	
		TB12	СОМЗ	TB13	44	TB12	сомз	P	TB11
╡│ │ │ │ │		TB14	45	1013		TB14		P44	TB13
		TB16	47	TB15	46		P45	P46	TB15
				TB17	NC	TB16	P47	NC	TB17
	DC12/24V	TB18	COM4	TB19	48	TB18	COM4	INC.	TB19
		TB20	49			TB20	P49	P48	1019
▎▏▏ <sup></sup> <sup>;;</sup> ▎▏▏ <sup>;</sup> ▎		TB22	4B	TB21	4A	TB22		P4A	TB21
				TB23	NC		P4B	NC	TB23
		TB24	COM5	TB25	4C	TB24	COM5	P4C	TB25
	DC12/24V	TB26	4D			TB26	P4D	P4C	TB27
	ねん シート	TB28	4F	TB27	4E	TB28	P4F	P4E	
				TB29	NC	TB30		NC	TB29
<u>  (</u> ] <u> </u>   <u> </u>		TB30	COM6	TB31	50		COM6	P50	TB31
		TB32	51	TB33		TB32	P51	P52	TB33
	TB11 0012/24V	TB34	53		52	TB34	P53		TB35
	T Terminal	TB36	COM7	TB35	NC	TB36	COM7	NC	
	block no.			TB37	54	TB38		P54	TB37
	biook no.	TB38	55	TB39	56		P55	P56	твз9
		TB40	57			TB40	P57	24V	TB41
		TB42		TB41	24V	TB42	24G		
		=	24G					$\bullet$	
			240						

٦

#### 7.3.21 XBC-DP20SU 8 point transistor output (Source type)

Γ

	Model			Main ur	nit		
Specification			XE	3C-DP2	0SU		
Output point		8 point					
Insulation meth	nod	Photo coupler insulat	on				
Rated load vol	tage	DC 12 / 24V					
Operation load	l voltage range	DC 10.2 ~ 26.4V					
Max. load curr	ent	0.5A / 1point, 2A / CC	)Mx(x:0	~3) (P40	), P41:	0.1A / ′	1point)
Off leakage cu	rrent	0.1 <sup>mA</sup> or less					
Max. inrush cu	rrent	4A / 10 ms or less					
Max. voltage d	rop when On	DC 0.4V or less					
Surge absorbe	er	Zener diode					
Response	$Off\toOn$	1 ms or less					
time	$\text{On} \to \text{Off}$	1 ms or less (rated loa	ad, resis	stive loa	d)		
Common meth	od	4 point / COM					
Proper wire siz	e	Stranded wire 0.3~0.	75 <sup>mm²</sup> (e	external	diamet	er 2.8 m	™ or less)
External	Voltage	DC12/24V $\pm$ 10% (Ri	ople vol	tage 4 ∖	/p-p or	less)	
power	Current	25 M or less (When	connect	ing DC2	24V)		
Operation indic	cator	LED On when Output	On				
External conne	ection method	24 point terminal bloc	k conne	ector(M3	3 X 6 sc	rew)	
Weight		470g					
	Circuit configu	Iration	No.	Contact	No.	Contact	Туре
₽ DC5V			тра	DE	TB1	AC100	
I I I I I I I I I I I I I I I I I I I	╶╾╌╴═╌═╄		TB2	PE	TB3	~240V	TB2 AC100 TB1
니 나 나 나 나 나 나 나 나 나 나 나 나 다 나 나 다 나 다 나	ĽĽ →		TB4	COM0	TB5	40	TB2 PE ~240V TB3
회 로			TB6	COM1	160	40	P40 TB5
	╼╼┤ᢁ᠆ᡛᢩᡟ		TB8	COM2	TB7	41	COM1 TB7
	मिली —	твоб	ТВо	COIVIZ	TB9	42	TB8 COM2 P42 TB9
		DC12/24V	TB10	43	TB11	N	TB10 P43 TB11
	╶╾┼╔╾╚╊		TB12	COM3			TB12 COM3 P44 TB13
	<u>I</u> II →		TB14	45	TB13	44	TB14 P45 TB15
	5			-10	TB15	46	TB16 P47 TB17
	╼╌┼╍╌┋		TB16	47	TB17	NC	TB18 NC TB19
	별퇴 스		TB18	NC		-	TB20 NC
		DC12/24V	TB20	NC	TB19	NC	TB22 NC TB22
		TB11			TB21	NC	TB24 24G TB23
		Terminal no	TB22	NC	TB23	24V	$\blacksquare \blacksquare$
			TB24	24G			

### 7.3.22 XBC-DP30SU 12 point transistor output (Source type)

٦

	Model			Main ur	nit			
Specification		XBC-DP30SU						
Output point		12 point						
Insulation meth	nod	Photo coupler insulati	Photo coupler insulation					
Rated load vol	tage	DC 12 / 24V	DC 12 / 24V					
Operation load	l voltage range	DC 10.2 ~ 26.4V						
Max. load curre	ent	0.5A / 1point, 2A / COM	Лх(x:0~	4) (P40	P41: 0	).1A / 1	point)	
Off leakage cu	rrent	0.1 mA (AC220V, 60 H	0.1 mA (AC220V, 60 Hz)					
Max. inrush cu	rrent	4A / 10 ms or less						
Max. voltage d	rop when On	DC 0.4V or less						
Surge absorbe	r	Zener diode						
Response	$Off\toOn$	1 ms or less	1 ms or less					
time	$\text{On} \to \text{Off}$	1 ms or less (rated loa	1 ms or less (rated load, resistive load)					
Common meth	od	4 point / COM						
Proper wire siz	ze	Stranded wire 0.3~0.7	75 <sup>mm²</sup> (e	external	diamet	er 2.8 m	<sup>™</sup> or less)	
External	Voltage	DC12/24V $\pm$ 10% (Ripple voltage 4 Vp-p or less)						
power	Current	25 <sup>mA</sup> or less (When connecting DC24V)						
Operation indic	cator	LED On when Output On						
External conne	ection method	24 point terminal block connector(M3 X 6 screw)						
Weight		475g						
	Circuit configu	uration	No.	Contact	No.	Contact	Туре	
P DC5V	тво	)5	TDO	DE	TB1	AC100	ТВ1	
	╪┎╷╶╖╵		TB2	PE	твз	~240V	TB2 AC100	
부 회		)4 Ⅰ↓ _7_ DC12/24V	TB4	COM0	TDC	40	TB4 COM0 ~240V TB3	
토	▁┌┼╔┙╘┋┟		TB6	COM1	TB5	40	TB6 P40 TB5	
	FL	<u>06   I + + + + + + + + + + + + + + + + + +</u>	тро	COM2	TB7	41	TB8 20110 P41 TB7	
		)9 DC12/24V	TB8	COM2	TB9	42	TB10 P42 TB9	
	┱┎┤ <sup>┎╗┥</sup> ╧╠ <sup>┲</sup> ┱┎╎╴╴╴╎┠╝		TB10	43	TB11	Р	TB12 P43 N TB11	
		DC12/24V	TB12	COM3			TB14 P44 TB13	
			TB14	45	TB13	44	P45 TB15	
	FI CI				TB15	46	TB18 COLUMN NC TB17	
		DC12/24V	TB16	47	TB17	NC	COM4 TB19	
	╈┎╎╴╱╵╟╩		TB18	COM4			TB20 P49 TB21	
	╒╼╝ ╡ ╺┶╢ <sub>┺</sub>	18   I	TB20	49	TB19	48	TB22 P4B TB23	
	тв	11	троо	40	TB21	4A	TB24 24G	
	<u> </u>	- Terminal	TB22	4B	TB23	24V		
		no	TB24	24G				

	Model		Main unit							
Specification		10	X	BC-DF	240SU					
Output point Insulation metho		16 point								
Rated load volta		Photo-coupler insulat DC 12 / 24V	ion							
	<u>v</u>	DC 12724V DC 10.2 ~ 26.4V								
Load voltage range         DC 10.2 ~ 26.4V           Max. load current         0.5A / 1point, 2A / COMx(x:0~5) (P40, P41: 0.1A / 1point)										
Off leakage curr		0.1  mA or less								
Max. inrush curi		4A / 10 ms or less								
Max. voltage dr		DC 0.4V or less								
Surge killer	Jp when On	Zener diode								
Surge Killer	$O^{\text{ff}} \rightarrow O^{\text{p}}$	1 ms or less								
Response time	$\frac{\text{Off} \to \text{On}}{\text{On} \to \text{Off}}$		ad raaid	tive le	o d)					
Common moths		1 ms or less (rated loa	au, resis	sive io	au)					
Common metho		4 point / COM Stranded cable 0.3~0	<b>75</b> mm <sup>2</sup>	(Extor	ol dia:	notor C	) Q mm	orla	20)	
Proper cable siz				`			2.0 IIIII	UT IES	55)	
External	Voltage	DC12/24V ± 10% (rip				iess)				
supply power	Current	25 mA or less (when o		ing DC	24V)					
Operation indica		LED On When Outpu				<u>C</u>	)			
External connec	tion method	30 point terminal blo	JCK CON	nector	(11/3 X	6 scre	W)			
Weight	<u> </u>			1		1		_		
	Circuit config	uration	No.	Contact	No.	Contact		Ту	ре	
T DC5	,				TB1	AC100		lacksquare		]
	┍═┥╧╬╴		TB2	PE	тро	~240V	TB2	$\bullet$	AC100	TB1
<sub>1</sub>	LIF _	TB04 I	TB4	COMO	TB3	2.00	102	PE	~240V	твз
부 회 로	] Ţ	TB07 DC12/24V		00110	TB5	40	TB4	сомо		
<sup>2</sup>			TB6	COM1			TB6		P40	TB5
	TEL _		TB8	COM2	TB7	41		COM1	P41	TB7
		TB05 0C12/24V	TDO	OOIVIZ	TB9	42	TB8	COM2	141	700
			TB 10	43		-	TB10		P42	TB9
		TB10	TD 10	0040	TB11	Ν		P43	N	TB11
	┝┱┲┤╶╶ႃႃ		TB12	COM3	TB13	44	TB12	сомз		TB13
		TB13 DC12/24V	TOIA	45	1010	• •	TB14	P45	P44	1013
			TB14	45						TDIE
		ТВ16			TB15	46		P40	P46	TB15
			TB 14 TB 16	45 47			TB16	P45		
		TB12 1 OC12/24V	TB16	47		46 NC	TB16 TB18	P47	P46 NC	TB17
			TB 16 TB 18	47 COM4			TB18			
		TB12 1 OC12/24V	TB16	47	TB17 TB19	NC 48		P47	NC P48	TB17 TB19
		TB12    DC12/24V TB19 TB22	TB 16 TB 18 TB20	47 COM4 49	TB17	NC	TB18	P47 COM4 P49	NC	TB17
		TB12   DC12/24V TB19 TB22 TB22	TB 16 TB 18	47 COM4	TB17 TB19	NC 48	TB18 TB20 TB22	P47 COM4	NC P48	TB17 TB19
		TB12    DC12/24V TB19 TB22	TB 16 TB 18 TB20	47 COM4 49	TB17 TB19 TB21 TB23	NC 48 4A NC	TB18 TB20	P47 COM4 P49	NC P48 P4A NC	TB17 TB19 TB21 TB23
		TB12 DC12/24V TB13 TB22 TB22 TB18 DC12/24V	TB 16 TB 18 TB20 TB22 TB24	47 COM4 49 4B COM5	TB17 TB19 TB21	NC 48 4A	TB18 TB20 TB22	P47 COM4 P49 P48 COM5	NC P48 P4A	TB17 TB19 TB21 TB23 TB25
		TB12 DC12/24V TB19 TB22 TB18 TB18 TB18 TB18 TB25	TB 16 TB 18 TB20 TB22	47 COM4 49 4B	TB17 TB19 TB21 TB23 TB25	NC 48 4A NC 4C	TB18 TB20 TB22 TB24 TB26	P47 COM4 P49 P48 COM5 P4D	NC P48 P4A NC	TB17 TB19 TB21 TB23
		TB12     Image: Constraint of the second secon	TB 16 TB 18 TB20 TB22 TB24	47 COM4 49 4B COM5	TB17 TB19 TB21 TB23 TB25 TB27	NC 48 4A NC 4C 4E	TB18 TB20 TB22 TB24	P47 COM4 P49 P48 COM5 P4D	NC P48 P4A NC P4C P4E	TB17 TB19 TB21 TB23 TB25
		TB12 DC12/24V TB19 TB22 TB18 DC12/24V TB25 TB25 TB25 TB26 TB24	TB 16 TB 18 TB20 TB22 TB24 TB26	47 COM4 49 4B COM5 4D	TB17 TB19 TB21 TB23 TB25	NC 48 4A NC 4C	TB18 TB20 TB22 TB24 TB26	P47 COM4 P49 P48 COM5 P4D	NC P48 P4A NC P4C	TB17 TB19 TB21 TB23 TB25 TB27

# 7.3.23 XBC-DP40SU 16 point TR output (Source type)

Γ

#### 7.3.24 XBC-DP60SU 24 point TR output (Source type)

Model			Main	unit					
Specification		X	BC-DF						
Output point	24 point								
Insulation method	Photo-coupler insulat	tion							
Rated load voltage	DC 12 / 24V								
Load voltage range	DC 10.2 ~ 26.4V								
Max. load current		0.5A / 1point, 2A / COMx(x:0~7) (P40, P41: 0.1A / 1point)							
Off leakage current	0.1 mA or less								
Max. inrush current	4A / 10 ms or less								
Max. voltage drop when On	DC 0.4V or less								
Surge killer	Zener diode								
Response time $\frac{\text{Off} \to \text{On}}{\text{On} \to \text{Off}}$	1 ms or less	1 ms or less							
$On \rightarrow Off$	1 ms or less (rated lo	ad, resis	stive lo	ad)					
Common method	4 point / COM								
Proper cable size	Stranded cable 0.3~0	).75 <sup>mm²</sup>	(Exterr	nal dia	meter 2	<u>2.8</u> mm	or le	ss)	
External Voltage	DC12/24V ± 10% (rip	ple volt	age 4 \	√p-p o	r less)				
supply power Current	25 mA or less (when a		ing DC	24V)					
Operation indicator	LED On When Outpu								
External connection method	42 point terminal bl	ock con	nector	(M3 X	6 scre	w)			
Weight	636g				1	<del>.                                    </del>			
Circuit config	uration	No.	Contact	No.	Contact		Ту	ре	_
T DC5V		TB2	PE	TB1	AC100		$\bigcirc$		TB1
				TB3	~240V	TB2		AC100 ~240V	
	1	TB4	COMO	TB5	40	тв4		~240V	TB3
		TB6	COM1			тве	сомо	P40	TB5
회 회 도		TB8	COM2	TB7	41	100	COM1	P41	тв7
				TB9	42	TB8	сом2	P42	TB9
		TB10	43	TB11	N	TB10	P43		TB11
	DC12/24V	TB12	COM3	TD 12	44	TB12	сомз	N	
		TB14	45	TB13	44	тв14	P45	P44	TB13
		TB16	47	TB 15	46	TB16		P46	TB15
				TB17	NC		P47	NC	TB17
	DC12/24V	TB18	COM4	TB19	48	TB18	сом4		TB19
		TB20	49			TB20	P49	P48	TB21
		TB22	4B	TB21	4A	тв22	P4B	P4A	
				TB23	NC	тв24		NC	TB23
	DC12/24V	TB24	COM5	TB25	4C	1	сомь	P4C	тв25
		TB26	4D			TB26	P4D	P4E	TB27
	TB22 □ ↓	TB28	4F	TB27	4E	TB28	P4F		TB29
				TB29	NC	TB30	сом6	NC	
	DC12/24V	TB30	COM6	TB31	50	TB32		P50	TB31
		TB32	51			TB34	P51	P52	TB33
		TB34	53	TB33	52	_	P53	NC	TB35
		TB36		TB35	NC	TB36	сом7		TB37
			COM7	TB37	54	TB38	P55	P54	
		TB38	55	TB39		тв40	P57	P56	TB39
	DC12/24V TB11	TB40	57		56	TB42		24V	TB41
	Terminal no	TB42		TB41	24V	10-12	24G		
		1042	24G		1	1			J

٦

# 7.4 Digital Input Module Specification

Γ

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

	Model	I	DC input module					
Specification			XBE-DC08A					
Input point		8 point	8 point					
Insulation me	ethod	Photo coupler insulation						
Rated input v	/oltage	DC24V						
Rated input of	current	About 4 mA						
Operation vo	ltage range	DC20.4~28.8V (ripple rate	< 5%)					
On Voltage/C	Current	DC19V or higher / 3 mA or	higher					
Off Voltage/C	Current	DC6V or less / 1 mA or less	i					
Input resistar	nce	About 5.6 kΩ						
Response time	$\begin{array}{c} \text{Off} \rightarrow \text{On} \\ \text{On} \rightarrow \text{Off} \end{array}$	1/3/5/10/20/70/100 ms(set b	1/3/5/10/20/70/100 ms(set by CPU parameter) Default: 3 ms					
Insulation pre	essure	AC560Vrms / 3Cycle (altitu	AC560Vrms / 3Cycle (altitude 2000m)					
Insulation res	sistance	10 <sup>M</sup> <sup>Ω</sup> or more by Megohmmeter						
Common me	thod	8 point / COM						
Proper cable	size	Stranded pair 0.3~0.75 mm (External diameter 2.8 mm or less)						
Current cons	umption	30 mA (when all point On)						
Operation inc	dicator	Input On, LED On						
External con method	nection	10 point terminal block con	nector					
Weight		52 g						
	Circuit co	onfiguration	No.	Contact	Туре			
			TB2	0				
ſ		<b>↔</b> ↔	TB2	1	тв1 [			
		Photo coupler	TB3	2	TB2			
5			TB4	3	TB3 <b>F</b>			
7 TB8 0	TB8 TB9 COM				тв5			
					твб [			
DC24V			TB7	6	TB7			
	Terminal block no.		TB8	7	TB8			
			TB9	СОМ	TB10			
			TB10	СОМ				

SpecificationXBE-DC16AXBE-DC16BInput point16 pointInsulation methodPhoto coupler insulationRated input voltageDC24VRated input currentAbout 4 mAAbout 4/8 mAOperation voltage rangeDC20.4~28.8V (ripple rate < 5%)On Voltage/CurrentDC19V or higher / 3 mA or higherOff Voltage/CurrentDC6V or less / 1 mA or lessInput resistanceAbout 5.6 kQAbout 2.7 kQResponse timeOff $\rightarrow$ On On $\rightarrow$ OffInsulation pressureAC560Vrms / 3Cycle (altitude 2000m)Insulation resistance10 MQ or more by MegohmmeterCommon method16 point / COMProper cable sizeStranded cable 0.3~0.75 mm² (External diameter 2.8 mm or less	mA or		
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	mA or		
Rated input voltageDC24VDC12/24VRated input currentAbout 4 mAAbout 4/8 mAOperation voltage rangeDC20.4~28.8V (ripple rate < 5%)	mA or		
Rated input currentAbout 4 mAAbout 4/8 mAOperation voltage rangeDC20.4~28.8V (ripple rate < 5%)	mA or		
Operation voltage rangeDC20.4~28.8V (ripple rate < 5%)DC9.5~30V (ripple rate <On Voltage/CurrentDC19V or higher / 3 mA or higherDC9V or higher / 3 higherOff Voltage/CurrentDC6V or less / 1 mA or lessDC5V or less / 1 mA or lessInput resistanceAbout 5.6 kQAbout 2.7 kQResponse timeOff $\rightarrow$ On On $\rightarrow$ Off1/3/5/10/20/70/100 ms (set by CPU parameter) Default: 3 msInsulation pressureAC560Vrms / 3Cycle (altitude 2000m)Insulation resistance10 MQ or more by MegohmmeterCommon method16 point / COM	mA or		
Operation voltage range(ripple rate < 5%)DC9.5~30V (ripple rate <On Voltage/CurrentDC19V or higher / 3 mA or higherDC9V or higher / 3 higherOff Voltage/CurrentDC6V or less / 1 mA or lessDC5V or less / 1 mA or lessInput resistanceAbout 5.6 kQAbout 2.7 kQResponse timeOff $\rightarrow$ On On $\rightarrow$ Off1/3/5/10/20/70/100 ms (set by CPU parameter) Default: 3 msInsulation pressureAC560Vrms / 3Cycle (altitude 2000m)Insulation resistance10 MQ or more by MegohmmeterCommon method16 point / COM	mA or		
On voltage/CurrenthigherhigherOff Voltage/CurrentDC6V or less / 1 mA or lessDC5V or less / 1 mA or lessInput resistanceAbout 5.6 kQAbout 2.7 kQResponse timeOff $\rightarrow$ On On $\rightarrow$ Off1/3/5/10/20/70/100 ms (set by CPU parameter) Default: 3 msInsulation pressureAC560Vrms / 3Cycle (altitude 2000m)Insulation resistance10 MQ or more by MegohmmeterCommon method16 point / COM			
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	SS		
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			
Response time $1/3/5/10/20/70/100 \text{ ms}$ (set by CPU parameter) Default: 3 msInsulation pressureAC560Vrms / 3Cycle (altitude 2000m)Insulation resistance $10 \text{ M}\Omega$ or more by MegohmmeterCommon method16 point / COM			
timeOn $\rightarrow$ OffInsulation pressureAC560Vrms / 3Cycle (altitude 2000m)Insulation resistance10 MQ or more by MegohmmeterCommon method16 point / COM			
Insulation resistance     10 <sup>MΩ</sup> or more by Megohmmeter       Common method     16 point / COM			
Common method 16 point / COM			
· ·			
Proper cable size Stranded cable 0.3~0.75 m <sup>2</sup> (External diameter 2.8 mm or les			
	ss)		
Current consumption 40 <sup>mA</sup> (when all point On)			
Operation indicator Input On, LED On			
External connection method 8 pin terminal block connector + 10 pin terminal block conne	ctor		
Weight 53 g			
Circuit configuration No. Contact Type			
TB4 3 TB4			
TB7     6     TB7     0       TB8     7     TB8     0			
DC24V Terminal block no. TB6 D TB6 D			
TB7     E     TB7			
TB8 F TB8			
ТВ9 СОМ ТВ9			
TB10 COM TB10			

٦

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

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

Model	DC input module						
Specification	XBE-DC32A						
Input point	32 point	32 point					
Insulation method	Photo coupler insulation						
Rated input voltage	DC24V						
Rated input current	About 4 mA	About 4 mA					
Operation voltage range	DC20.4~28.8V (rip	ple rate	< 5%)				
Input Derating	Refer to Derating d	iagram					
On Voltage/Current	DC 19V or higher /	3 mA o	r higher				
Off Voltage/Current	DC 6V or less / 1 m/	A or les	s				
Input resistance	About 5.6 kΩ						
Response $Off \rightarrow On$	1/3/5/10/20/70/100 @	ns (set l	ov CPU n	aramet	er) Defai	ult:3 ms	
time $On \rightarrow Off$	1/3/5/10/20/70/100 ms (set by CPU parameter) Default:3 ms						
Insulation pressure	AC 560Vrms / 3 Cy	vcle (alti	tude 200	0m)			
Insulation resistance	10 $^{M\Omega}$ or more by N	legohm	meter				
Common method	32 point / COM						
Proper cable size	0.3 mm²						
Current consumption	50 mA (when all point On)						
Operation indicator	Input On, LED On						
External connection method	40 pin connector						
Weight	60g						
Circuit configur	ation	No.	Contact	No.	Contact	Туре	
		B20	00	A20	10		
		B19	01	A19	11		
		B18 B17	02	A18	12		
	Internal	B17 B16	03 04	A17	13 14	B19 A19	
	circuit	B15	04	A16 A15	14	B18 A18 B17 A17	
DC24V Terminal block no.		B13	06	A14	16	B16 • A16	
Input Derating diagram		B13	07	A13	10	B15 A15 B14 A14	
	<u> </u>	B12	08	A12	18	B13 A13	
90	<b>⊢   -      </b>	B11	09	A11	10	B12 • • A12 B11 • • A11	
80	DC28.8V	B10	0A	A10	1A	B10 A10	
	+ + + + + + + + + + + + + + + + + + +	B09	0B	A09	1B	B09 A09 B08 A08	
07 (%) 00 uate	$\left  + + + + - \right  \qquad  $	B08	0C	A08	1C	B07	
	$\left  + + + + - \right  \qquad  $	B07	0D	A07	1D	B06 9 A06 B05 9 A05	
40 40 10 20 30	<u>       </u> 40 50 55 ℃	B06	0E	A06	1E	B04 A04	
Ambient tempera		B05	0F	A05	1F	B03 B02	
· · · · · · · · · · · · · · · · · · ·		B04	NC	A04	NC	B01 A01	
		B03	NC	A03	NC		
		B02	COM	A02	COM		
		B01	COM	A01	COM		

#### 7.4.4 8 point AC110V input module

Mc	odel		AC input module					
Specification			XBE-AC08A					
Input point		8 point	8 point					
Insulation me	ethod	Photo coupler insulation						
Rated input v	voltage	AC100-120V(+10/-15%) 50/60	) Hz(±3 Hz)	(distortion ra	ate < 5%)			
Rated input of	current	About 8 mA(AC100,60 Hz), A	About 7m	A(AC100, 5	60 Hz)			
Inrush currer	nt	Max. 200 mA 1 ms (AC132V)						
Input Deratin	g	Refer to the below Derating di	agram.					
On Voltage/C	Current	AC80V or higher / 5 mA or hig	her (50 <sup>Hz</sup> ,	60 Hz)				
Off Voltage/C	Current	AC30V or lower / 1 mA or low	er (50 <sup>Hz</sup> , 6	0 Hz)				
Input resistar	nce	About 12 k $\Omega$ (60 Hz), About 15	kΩ(50 Hz)					
Response	$Off\toOn$	20 ms or less (AC100V 50 $^{\text{Hz}}$ ,	20 ms or less (AC100V 50 <sup>Hz</sup> , 60 <sup>Hz</sup> )					
time	$On\toOff$	25 ms or less (AC100V 50 $^{\text{Hz}},$	25 ms or less (AC100V 50 Hz, 60 Hz)					
Insulation pre	essure	AC3000Vrms / 3Cycle (altit	ude 2000	m)				
Insulation res	sistance	10 M <sub>Ω</sub> or more by Megohmmeter						
Common me	thod	4 point / COM						
Proper cable	size	Twisted pair 0.3~0.75 mm² (external diameter 2.8mm or less)						
Current cons	umption	30 <sup>mA</sup> (when all point On)						
Operation inc	dicator	Input On, LED On						
External con method	nection	10 point terminal block connector						
Weight		70 g	-					
	Circuit co	onfiguration	No.	Contact	Туре			
		Don't A	TB1	0				
0		DC5V LED	TB2	1				
			TB3	2	TB01			
			TB4	3	TB02 <b>F</b> TB03 <b>F</b>			
		Internal	TB5	COM0	тво4			
	<sup>36</sup> 0	Photocoupler Circuit	TB6	4	твоз 📜			
	Ĩ¥★ば	TB7	5					
	M1		TB8	6	TB07			
AC110V * COM : TB5,	TB10				твоэ			
90			TB9	7	тв10 [			
80			TB10	COM1				
- 70 On rate <sub>60</sub>		AC120V						
(%) 50 50		AC132V						

AC132V

50 55

40

30

Ambient temp(℃) Derating level ٦

40

0

10

# 7.5 Digital Output Module Specification

### 7.5.1 8 point relay output module

	Model	Relay c	Relay output module			
Specificatio	n	XBE-RY08A				
Output point		8 point				
Insulation me	ethod	Relay insulation				
Rated load v	oltage / Current	DC24V 2A (Resistive load) / A	C220V 2A	(COSΨ =	1), 5A/COM	
Min. load vol	tage/Current	DC5V / 1 mA				
Max. load vo	ltage/Current	AC250V, DC125V				
Off leakage	current	0.1 mA (AC220V, 60 Hz)				
Max. On/Off	frequency	3,600 times/hr				
Surge absor	ber	None	None			
	Mechanical	20 millions times or more				
		Rated load voltage / current 10	00,000 tim	es or more		
Service life	Electrical	AC200V / 1.5A, AC240V / 1A (	(COSΨ = 0	0.7) 100,00	00 times or more	
	Liectrical	AC200V / 1A, AC240V / 0.5A (	(COSΨ = 0	0.35) 100,0	00 times or more	
		DC24V / 1A, DC100V / 0.1A (L	_ / R = 7 ms	∍) 100,000	times or more	
Response	$\text{Off} \to \text{On}$	10 ms or less				
time	$\text{On} \rightarrow \text{Off}$	12 ms or less				
Common me	ethod	8 point / COM				
Proper cable	e size	Stranded cable 0.3~0.75 m <sup>2</sup> (External diameter 2.8 mm or less)				
Current cons	sumption	230 mA (when all point On)				
Operation in	dicator	Output On, LED On				
External con	nection method	9 point terminal block connected	or			
Weight		80g				
	Circuit co	onfiguration	No.	Contact	Туре	
_			TB1	0		
e	→ DC5V		TB2	1		
		TD1	TB3	2	TB1	
	ernal		TB4	3	твз	
circuit			TB5	4	TB4	
			TB6	5	TB6 <b>-</b>	
			TB7	6	тва	
		Terminal block no.	TB8	7	ТВ9	
			TB9	СОМ		

	Model	Relay output module						
Specificati	on		XBE-RY08B					
Output poir		8 point	8 point					
Insulation n		•	Relay insulation					
Rated load Current	voltage /	DC24V 2A (Resistive load) / AC220V 2A (COS $\Psi$ = 1), 2A/COM						
	oltage/Current	DC5V / 1 mA						
Max. load voltage/Cur	-	AC250V, DC125V						
Off leakage		0.1 mA (AC220V, 60 Hz)						
Max. On/Of	f frequency	3,600 times/hr						
Surge abso	rber	None						
	Mechanical	20 millions times or more						
Service life	Electrical	Rated load voltage / current 100,000 times or more AC200V / 1.5A, AC240V / 1A ( $COS\Psi = 0.7$ ) 100,000 times or mor AC200V / 1A, AC240V / 0.5A ( $COS\Psi = 0.35$ ) 100,000 times or more DC24V / 1A, DC100V / 0.1A (L / R = 7 ms) 100,000 times or more						
Response	$Off \rightarrow On$	10 ms or less		<u> </u>				
time	$On \rightarrow Off$	12 ms or less						
Common m	ethod	1 point / COM						
Proper cabl	e size	Stranded cable 0.3~0.75 m <sup>2</sup> (External diameter 2.8 m or less)						
Current cor	sumption	230 mA (when all point On)						
Operation in	ndicator	Output On, LED On						
External co method	nnection	9 point terminal block conne	ector x 2					
Weight		81g						
	Circuit	configuration	No.	configu ration	No.			
			TB1	0				
			TB2	COM0	TB1			
Ŷ	DC5V		TB3	1	TB3			
	)		TB4	COM1	тва 🔚			
	, 	TB1	TB5	2	TB5			
			TB6	COM2	твб			
			100	001012				
	│ ▲☞ ┆		TB7	3	ТВ7			
		I		_	TB7			
		I	TB7	3	ТВ7			
		TB2	TB7 TB8	3 COM3	TB7 50 TB8 50 TB9 50 TB1 50			
	ernal cuit	TB2                   TB7	TB7 TB8 TB9	3 COM3 NC	TB7     Image: Constraint of the second			
			TB7 TB8 TB9 TB1	3 COM3 NC 4	TB7 TB8 TB9 TB1 TB2 TB3			
	ernal cuit	TB2                   TB7	TB7           TB8           TB9           TB1           TB2	3 COM3 NC 4 COM4	TB7     Image: Constraint of the second			
	ernal cuit		TB7         TB8         TB9         TB1         TB2         TB3         TB4         TB5	3 COM3 NC 4 COM4 5	TB7     Image: Constraint of the second			
	ernal cuit		TB7         TB8         TB9         TB1         TB2         TB3         TB4         TB5	3 COM3 NC 4 COM4 5 COM5	TB7     Image: Constraint of the second			
	ernal cuit		TB7         TB8         TB9         TB1         TB2         TB3         TB4         TB5	3 COM3 NC 4 COM4 5 COM5 6	TB7       Image: Constraint of the second seco			
	ernal cuit		TB7         TB8         TB9         TB1         TB2         TB3         TB4         TB5         TB6	3 COM3 NC 4 COM4 5 COM5 6 COM6	TB7       Image: Constraint of the sector of t			

٦

#### 7.5.2 8 point relay output module (Independent point)

#### 7.5.3 16 point relay output module

	Model	Relay output module				
Specification	n	XBE-RY16A				
Output poin		16 point				
Insulation m		Relay insulation				
Rated load	voltage/ current	DC24V 2A (Resistive load	) / AC220V	2A (COSΨ	= 1), 5A/COM	
	oltage/current	DC5V / 1 mA	/		,,	
-	oltage/current	AC250V, DC125V				
Off leakage	•	0.1 mA (AC220V, 60 Hz)				
Max. On/Of		3,600 times/hr				
Surge absor		None				
	Mechanical	20 millions times or more				
		Rated load voltage / currer	nt 100.000 t	imes or mo	re	
Service		AC200V / 1.5A, AC240V /				
life	Electrical	AC200V / 1A, AC240V / 0.	,	,		
		DC24V / 1A, DC100V / 0.1	· ·	,		
Response	$Off \rightarrow On$	10 ms or less		,,		
time	$On \rightarrow Off$	12 ms or less				
Common m	ethod	8 point / COM				
Proper cable	e size	Stranded cable 0.3~0.75 m <sup>2</sup> (External diameter 2.8 m or less)				
Current con		420 mA (when all point On)				
Operation in		Output On, LED On				
	nnection method	9 point terminal block conr	nector x 2 e	а		
Weight		130g				
	Circuit con		No.	Contact	Туре	
			TB1	0		
			TB2	1		
<del>۵</del>	DC5V		TB3	2	TB2	
	2001		TB4	3	TB4	
$    \Psi$			TB5	4	TB5	
			TB6	5	тва 🛄	
Inter			TB7	6	твт	
circu			TB8	7		
			TB9	COM	ТВ9	
		ТВ9	TB1	8	TB1	
			TB2	9	TB2	
		Terminal block no.	TB3	A		
			TB4	В	TB4 TB5	
			TB5	С		
			TB6	D	TB7	
			TB7	E	тва 📴	
			TB8	F	TB9	
			TB9	COM		

#### 7.5.4 8 point transistor output module (Sink type)

	Model	Transistor output module							
Specification	n	XI	XBE-TN08A						
Output point		8 point							
Insulation me	ethod	Photo coupler insulation							
Rated load vo	oltage	DC 12 / 24V							
Load voltage	range	DC 10.2 ~ 26.4V	DC 10.2 ~ 26.4V						
Max. load vol	Itage	0.5A / 1 point							
Off leakage of	current	0.1 <sup>mA</sup> or less							
Max. inrush c	current	4A / 10 ms or less							
Max. voltage	drop (On)	DC 0.4V or less							
Surge absorb	ber	Zener Diode							
Response	$Off\toOn$	1 ms or less							
time	$\text{On} \to \text{Off}$	1 ms or less (Rated load, resis	stive load)	)					
Common me	8 point / COM								
Proper cable	Proper cable size Stranded cable 0.3~0.75 m <sup>2</sup> (				External diameter 2.8 mm or less)				
Current cons	umption	40 mA (when all point On)							
External	Voltage	DC12/24V $\pm$ 10% (ripple voltage 4 Vp-p or less)							
power supply	Current	10 mA or less (DC24V connect							
Operation inc		Output On, LED On							
External conr method	nection	10 point terminal block connect	ector						
Weight		53							
	Circuit co	onfiguration	No.	Contact	Туре				
			TB01	0					
🕈 DC5V			TB02	1	тво1				
			TB03	2	TB02				
	┝ <u></u> 」└®─		TB04	3	твоз 🛄				
Internal circuit			TB05	4	TB04				
			TB06	5	твоб				
		TB09	TB07	6	TB07				
		TB10	TB08	7	твоэ				
		DC12/24V	TB09	DC12 /24V	ТВ10				
		Terminal block no.	TB10	COM					

7.5.5 16 point transistor	r output module	(Sink type)
---------------------------	-----------------	-------------

Г

	Model		Transist	or output m	odule	
Specification			Х	BE-TN16A		
Output point		16 point				
Insulation meth	nod	Photo c	oupler insulation			
Rated load volt	tage	DC 12/	24V			
Load voltage ra	-	DC 10.2	2 ~ 26.4V			
Max. load volta	ige	0.5A / 1	point, 2A / 1COM			
Off leakage cu	rrent	0.1 mA c	or less			
Max. inrush cu	rrent	4A / 10	ms or less			
Max. voltage d	rop (On)	DC 0.4\	/ or less			
Surge absorbe	r	Zener D	liode			
Response	$Off \rightarrow On$	1 ms or	less			
time	$\text{On} \to \text{Off}$	1 ms or	less (Rated load, resis	stive load)		
Common meth	od	16 point	: / COM			
Proper cable s	ize	Strande	d cable 0.3~0.75 ㎜ (	External dia	ameter 2.8	<sup>nm</sup> or less)
Current consumption		60 mA (v	when all point On)			
External	Voltage	DC12/24	$4V \pm 10\%$ (ripple volta	age 4 Vp-p	or less)	
power supply	Current	10 <sup>mA</sup> or	less (DC24V connect	tion)		
Operation indic	cator	Output (	On, LED On			
External conne	ection method	8 pin ter	rminal block connecto	r + 10 pin t	erminal bloc	ck connector
Weight		54 g				
	Circuit cor	nfiguration		No.	Contact	Туре
				TB01	0	тво1
				TB02	1	TB02
				TB03	2	твоз 🛄
	V		TD01	TB04 TB05	4	
				TB05	5	TB05
	<u> </u>	┤╤╬		TB07	6	твот
		┉┫		TB08	7	TB08
Internal circuit	I (¥ Ľ, J	$\geq$		TB01	8	
		$\leq$	TB08	TB02	9	TB01
		Ţ		TB03	А	TB02
			ТВ09	TB04	В	TB03
			TB10 .	TB05	С	TB05
		<u> </u>		TB06	D	твоб
			DC12/24V	TB07	E	твот 📴
			Terminal block no.	TB08	F	твов 🖃
				TB09	DC12 /24V	TB09 📑
				TB10	COM	

# 7.5.6 32 point transistor output module (Sink type)

	Model	Tr	ansisto	or output	t modu	le		
Specification			XBE-TN32A					
Output point		32 point						
Insulation method		Photo coupler insulation	n					
Rated load voltag	e	DC 12 / 24V						
Load voltage rang		DC 10.2 ~ 26.4V						
Max. load voltage		0.2A / 1 point, 2A / 1CC	DM					
Off leakage curre		0.1 <sup>mA</sup> or less						
Max. inrush curre		0.7A / 10 ms or less						
Max. voltage drop	(On)	DC 0.4V or less						
Surge absorber	· · /	Zener Diode						
	$Off \rightarrow On$	1 ms or less						
Response time	$On \rightarrow Off$	1 ms or less (Rated load	d. resis	tive loa	d)			
Common method		32 point / COM	.,					
Proper cable size		0.3 mm <sup>2</sup>						
Current consumpt	ion	120 mA (when all point of	On)					
-	Voltage	DC12/24V ± 10% (rippl	,					
External power supply	Current	20 mA or less (DC24V c						
Operation indicate		Output On, LED On	United	1011)				
-								
External connection	on method	40 pin connector						
Weight		60g		Conta		Conta	Туре	
	Circuit configur	ation	No.	ct	No.	ct	туре	
			B20	00	A20	10		
♥ DC5V			B19	01	A19	11		
		B20	B18 B17	02 03	A18 A17	12 13	B20 A20	
			B17	03	A16	14	B18 A19 A18	
	┝╌╗╵╚╇		B15	05	A15	15	B17 A17	
lnternal circuit			B14	06	A14	16	B16 A16 B15 A15	
		<u>A05</u>	B13	07	A13	17	B14 A14 B13 A14	
			B12	08	A12	18	B13 A13 B12 A12	
		B01.B02	B11	09	A11	19	B11  B10  A11 B10  B10  B10	
		A01,A02	B10	0A	A10	1A	B09 A09	
		DC12/24V	B09	0B	A09	1B	B08 A08 A07	
		Terminal block no.	B08	0C	A08	1C	B06 A06	
			B07	0D	A07	1D	B05 9 A05 B04 9 A04	
			B06	0E	A06	1E	B03 A03	
			B05	0F	A05	1F	B02 B01 B01 A02 A01	
			B04	NC	A04	NC		
			B03	NC	A03	NC		
			B02	DC12/	A02	СОМ		
			B01	24V	A01		<u> </u>	

	Model	Transis	tor output	module		
Specification		×	(BE-TP08	A		
	t point	8 point				
Insulation	n method	Photo coupler insulation				
Rated loa	id voltage	DC 12 / 24V				
Load volta	age range	DC 10.2 ~ 26.4V				
Max. loa	d voltage	0.5A / 1 point				
Off leaka	ge current	0.1 <sup>mA</sup> or less				
Max. inrus	sh current	4A / 10 ms or less				
Max. voltag	e drop (On)	DC 0.4V or less				
Surge a	bsorber	Zener Diode				
Response	$\text{Off} \to \text{On}$	1 ms or less				
time	$\text{On} \to \text{Off}$	1 ms or less (Rated load, resi	istive load	)		
Commor	n method	8 point / COM	8 point / COM			
Proper c	able size	Stranded cable 0.3~0.75 m <sup>e</sup> (external diameter 2.8 mm or		.8 mm or less)		
Current co	nsumption	40 mA (when all outputs are o	on)			
External	Voltage	DC12/24V $\pm$ 10% (ripple voltation of the second s	age 4 Vp-j	o or less)		
power	Current	10 mA or less (when connecti	ng DC24\	/)		
	n indicator	LED on when output on				
External c met	onnection hod	10 pin terminal block connec	tor			
We	ight	30g				
	Circuit co	onfiguration	No.	Contact	Туре	
			TB01	0		
DC5V		TB09	TB02	1		
			TB03	2	TB01	
Internal		TB10	TB04	3	твоз	
circuit			TB05	4	TB04	
			TB06	5		
			TB07	6	твот 🛄	
			TB08	7	TB08	
		Terminal	TB09	СОМ	TB10	
		block no.	TB10	0V		

# 7.5.7 8 point transistor output module (Source type)

	Model	Transisto	r output mo	odule	
Specification		ХВ	E-TP16A		
Output	t point	16 point			
Insulation	method	Photo coupler insulation			
Rated loa	d voltage	DC 12/24V			
Load volta	ige range	DC 10.2 ~ 26.4V			
Max. load	d voltage	0.5A / 1 point, 2A / 1COM			
Off leakag	je current	0.1 mA or less			
Max. inrus	sh current	4A / 10 ms or less			
Max. voltage	e drop (On)	DC 0.4V or less			
Surge a	bsorber	Zener Diode			
Response	$\text{Off} \to \text{On}$	1 ms or less			
time	$\text{On} \to \text{Off}$	1 ms or less (Rated load, resist	ive load)		
Common	method	16 point / COM			
Proper ca	able size	Stranded cable 0.3~0.75 mm <sup>2</sup> (e.	xternal dia	meter 2.8 m	™ or less)
Current co	nsumption	60 mA (When all outputs are on	)		
External	Voltage	DC12/24V $\pm$ 10% (ripple voltag	e 4 Vp-p o	r less)	
power	Current	10 mA or less (connecting DC2-	4V)		
Operation	indicator	LED On when output On			
External conne	ection method	8 pin terminal block connector	+ 10 pin te	rminal bloc	k connector
Wei	ght	40g		I	
	Circuit co	onfiguration	No.	Contact	Туре
			TB01	0	тво1
<del>♀</del> DC5V	1		TB02 TB03	1	тво2
		TB09	TB04	3	
		DC12/24V	TB05	4	TB04
Internal		TB10	TB06	5	твоб
circuit	( <b>¥ K</b> )		TB07	6	твот
			TB08	7	твов
			TB01	8	тво1
			TB02	9	тво2
			TB03	А	твоз
			TB04	В	TB04
			TB05	С	TB05
		block no.	TB06	D	твоб 🛄
			TB07	E	твот 🖳
			TB08	F	твов
			TB09	COM	
			TB10	0V	TB10

٦

### 7.5.8 16 point transistor output module (Source type)

Specification         XBE-TP32A           Output point         32 point           Insulation method         Photo coupler insulation           Rated load voltage         DC 12 / 24V           Load voltage range         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 m <sup>A</sup> or less           Max. voltage drop (On)         DC 0.4V or less           Surge absorber         Zener Diode           Response time         On -> Off           On -> Off         1 ms or less (Rated load, resistive load)           Common method         32 point / COM           Proper cable size         0.3 mf           Current consumption         120 m <sup>A</sup> (When all outputs are on)           External power         Current consumption           Voltage         DC 1/24V ± 10% (ripple voltage 4 Vp-p or less)           External connection method         40 pin connector           B10         0A 20         10           B11         01         A16           B12         06         A20         10           B12         00         A20         10           B12         00         A20		Model	T	ransiste	or outpu	ıt modu	le		
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 mA or less           Max. inrush current         4A/ 10 ms or less           Max. voltage drop (On)         DC 0.4V or less           Surge absorber         Zener Diode           Response time         Off -> On           On -> Off         1 mS or less (Rated load, resistive load)           Corrent consumption         32 point / COM           Proper cable size         0.3 mr/           Current consumption         120 mA (When all outputs are on)           External power         Voltage           Voltage         DC12/24V ± 10% (ripple voltage 4 Vp-p or less)           Current 20 mA or less (connecting DC24V)           Operation indicator         LED On when output On           External connection method         40 pin connector           B10         A16         14           B11         60         A12         18           B12         06         A16         14           B13         O7	Specification				BE-TP3	2A			
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 mA or less         Max. voltage drop (On)       DC 0.4V or less         Surge absorber       Zener Diode         Response time       Off $\rightarrow$ On       1 ms or less         On $\rightarrow$ Off       1 ms or less       Current consumption         Current consumption       120 mA (When all outputs are on)       Current 20 mA or less (connecting DC24V)         Operation indicator       LED On when output On       Response time       Type         External power       Circuit configuration       No.       Commat       Type         Weight       60g       No.       Commat       No.       Commat       Type         Bit 0 ot A11 10       A11 11       Bit 0 ot A11 11		point	32 point						
Load voltage rangeDC 10.2 ~ 26.4VMax. load voltage0.2A / 1 point, 2A / 1COMOff leakage current0.1 mA or lessMax. inrush current4A / 10 ms or lessMax. voltage drop (On)DC 0.4V or lessSurge absorberZener DiodeResponse timeOff $\rightarrow$ OnOff $\rightarrow$ On1 ms or less (Rated load, resistive load)Common method32 point / COMProper cable size0.3 mfCurrent consumption120 mA (When all outputs are on)External powerVoltageVoltageDC12/24V ± 10% (ripple voltage 4 Vp-p or less)Current20 mA or less (connecting DC24V)Operation indicatorLED On when output OnExternal connection method40 pin connectorWeight60gCircuit configurationNo.CorriertNo.Corriert0.3 mfCircuit configurationNo.Corriert820 00 A20 10Bit 0 06 A116 16Bit 0 06 A141 16Bit 0 0	-	-	-	on					
Max. load voltage         0.2A / 1 point, 2A / 1COM           Off leakage current         0.1 mA or less           Max. inrush current         4A / 10 ms or less           Max. voltage drop (On)         DC 0.4V or less           Surge absorber         Zener Diode           Response time         Off → On           On → Off         1 ms or less (Rated load, resistive load)           Common method         32 point / COM           Proper cable size         0.3 mf           Current consumption         120 mA (When all outputs are on)           External power         Voltage           Velight         60g           Current         20 mA or less (connecting DC24V)           Operation indicator         LED On when output On           External connection method         40 pin connector           Veight         60g           Circuit configuration         Image Proper Pro	Rated load	d voltage	DC 12 / 24V						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Load volta	ige range	DC 10.2 ~ 26.4V						
$\begin{tabular}{ c c c c c c c } \hline Max. inrush current & 4A / 10 ms or less \\ \hline Max. voltage drop (On) & DC 0.4V or less \\ \hline Surge absorber & Zener Diode \\ \hline Cener Diode & \hline Common method & 32 point / COM & \hline Common method & 32 point / COM & \hline Common method & 32 point / COM & \hline Corrent consumption & 120 mA (When all outputs are on) & \hline Corrent consumption & 120 mA or less (connecting DC24V) & \hline Corrent & 20 mA or less (connecting DC24V) & \hline Corrent & Connector & Corrent Connector & Corrent Connector & Corrent Configuration & \hline Corrent & No. & Contea & No.$	Max. load	l voltage	0.2A / 1 point, 2A / 1C	ОМ					
Max. voltage drop (On)         DC 0.4V or less           Surge absorber         Zener Diode           Response time         Off → On         1 ms or less           On → Off         1 ms or less (Rated load, resistive load)           Common method         32 point / COM           Proper cable size         0.3 mi <sup>+</sup> Current consumption         120 mA (When all outputs are on)           External power         Voltage         DC12/24V ± 10% (ripple voltage 4 Vp-p or less)           Current         20 mA or less (connecting DC24V)           Operation indicator         LED On when output On           External connection method         40 pin connector         820         00         A20         10           Weight         60g         1818         02         1818         12         17           Upper cable size         0.0         Center         No.         Center         No.         Center         No.           External connection method         40 pin connector         820         00         A20         10           B10         0A         A11         18         12         18         17           B11         02         A11         19         10         A11         19         10<	Off leakag	e current	0.1 <sup>mA</sup> or less						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Max. inrus	h current	4A / 10 ms or less						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Max. voltage	e drop (On)	DC 0.4V or less						
Response time         On → Off         1 ms or less (Rated load, resistive load)           Common method         32 point / COM           Proper cable size         0.3 mf           Current consumption         120 mA (When all outputs are on)           External power         Current           Current         20 mA or less (connecting DC24V)           Operation indicator         LED On when output On           External connection method         40 pin connector           Weight         60g           Circuit configuration         60g           Voltage         DC12/24V ± 10% (ripple voltage 4 Vp-p or less)           External connection method         40 pin connector           Weight         60g           Circuit configuration         Mo.           Cornad         No.           Cornad         No.           DC5V         B20           A02,A01         B18           B14         06           B13         07           B14         06           B13         07           B14         06           B13         07           B14         06           B13         07           B14         06	Surge al	osorber	Zener Diode						
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Descretions	$Off\toOn$	1 ms or less						
Proper cable size         0.3 mm           Current consumption         120 mA (When all outputs are on)           External power         Voltage         DC12/24V ± 10% (ripple voltage 4 Vp-p or less)           Current         20 mA 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           DC5V         EB02.801         B18         02         A18         12           B18         02         A11         13         813         07         A13         17           B13         07         A13         17         B13         08         A12         18           B11         09         A11         19         B16         04         A16         14           B13         07         A13         17         B16         04         A16         14           B11         09         A11         19         B16         04         A16         14           B13         07         A13         17         B17         A13         A17	Response time	$On\toOff$	1 ms or less (Rated loa	ad, resi	stive loa	ıd)			
Current consumption         120 mA (When all outputs are on)           External power         Voltage         DC12/24V ± 10% (ripple voltage 4 Vp-p or less)           Current         20 mA 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         Type           B20         00         A20         10         B19         01         A19         11           B18         02         A18         12         B19         01         A19         11           B15         05         A15         15         B14         06         A14         16           B13         07         A13         17         B12         08         A10         1A           B10         0A         A10         1A         B19         D11         B19         B13         D7         A13         17           B10         0A         A10         A         B10         0A         A10         A           B10         0A         A10         A         B10	Common	method	32 point / COM						
External power         Voltage         DC12/24V ± 10% (ripple voltage 4 Vp-p or less)           Current         20 mA or less (connecting DC24V)           Operation indicator         LED On when output On           External connection method         40 pin connector           Weight         60g           Circuit configuration         No.           Contact         No.           B02.801         A17< 13	Proper ca	able size	0.3 mm²						
External power         Current         20 mA 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         Type           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           B11         09         A11         19         B16         04         A10         1A           B14         06         A14         16         B13         07         A13         17           B09         0B         A09         1B         B06         C         A06         1E           B06         0C         A06         1E         B07         D0         A07         D10           B06 </td <td>Current cor</td> <td>nsumption</td> <td>120 mA (When all outp</td> <td>outs are</td> <td>on)</td> <td></td> <td></td> <td></td> <td></td>	Current cor	nsumption	120 mA (When all outp	outs are	on)				
Current         20 mA 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         Type           B20         00         A20         10         B19         01         A19         A19           Item of the contact of the		Voltage	DC12/24V ± 10% (ripp	ole volta	nge 4 Vp	o-p or le	ess)		
External connection method         40 pin connector           Weight         60g           Circuit configuration         No.         Contact         No.         Contact         Type           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         B18         B13         07         A13         17           B11         09         A11         19         B10         0A         A10         1A           B10         0A         A10         1A         B13         07         A13         17           B10         0A         A10         1A         B13         07         A13         17           B10         0A         A10         1A         B08         C         A08         B07           B08         C         A0	External power	Current	20 mA or less (connect	ting DC	24V)				
Weight         60g           Circuit configuration         No.         Contact         No.         Contact         Type           Image: Control of the state of t	Operation	indicator	LED On when output (	Эn					
Circuit configuration         No.         Contact         No.         Contact         Type           Image: Circuit configuration         No.         Contact         No.         Contact         No.         Contact         Type           Image: Circuit configuration         B02,B01         B19         01         A19         11           B18         02         A18         12         B17         03         A17         13           B16         O4         A16         14         B15         O5         A15         15           B14         O6         A14         16         B13         07         A13         17           B12         08         A12         18         B11         09         A11         19           B10         OA         A10         1A         B12         08         A12         18           B11         09         A11         19         B10         OA         A10         1A           B09         0B         A09         1B         B08         OC         A06         B02           B03         NC         A03         NC         B03         NC         A03         A02	External conne	ection method	40 pin connector						
Internal       Internal <td< td=""><td>Wei</td><td>ght</td><td>60g</td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	Wei	ght	60g						
DCSV       B02,B01       B19       01       A19       11         B16       04       A16       14         B15       05       A15       15         B14       06       A14       16         B13       07       A13       17         B12       08       A12       18         B14       06       A14       16         B13       07       A13       17         B12       08       A12       18         B10       0A       A10       1A         B09       0B       A09       18         B10       0A       A10       1A         B11       09       A11       19         B10       0A       A10       1A         B09       0B       A09       1B         B06       0E       A06       1E         B07       0D       A07       1D         B04       NC       A04       NC         B03       NC       A03       NC         B02       COM       A02       OV		Circuit configura	ition	No.	Contact	No.	Contact	Туре	
DC5V       B02,B01       B02,A01       B18       02       A18       12         B17       03       A17       13       B17       B18       02       A18       A17         Internal circuit       A02,A01       DC12/24V       A05       L       B14       06       A14       A16         B13       07       A13       17       B18       B11       09       A11       B13       B14       A14       A16       A14       A14       A16       A14       A16       A14				-				-	
B02,B01       B02,B01       B17       03       A17       13       B17       B16       04       A16       14       B17       <				-					-
B02,B01 A02,A01 A02,A01 A05 B16 O4 A16 B16 O4 A16 B15 D5 A15 B16 O4 A16 B15 D5 A15 B14 O6 A14 B15 D5 A15 B14 D6 A14 B15 D7 A13 D7 A13 D7 A13 D7 A13 D7 A13 D7 B12 D8 A10 A15 B14 D9 A11 D9 A11 D9 A11 D9 A11 D9 A11 D9 A11 D9 B10 OA A10 A05 B10 D0 A07 D0 B00 D0 A07 D0 B07 D0 A07 D0 B07 D0 A07 D0 B07 D0 A07 D0 B06 DE A05 B07 B06 DE A05 B07 B07 A05 B07 B07 A05 B07 B07 A05 B07 B07 B07 A05 B07 B07 B07 A05 B07 B07 B07 A05 B07 B07 B07 B07 B07 B07 B07 B07								в20	A20
Internal       A02,A01       A02,A01       B15       05       A15       15       B17       B16       B15       B17       B16       B15       B17       B16       B16       B15       B17       B16       B16       B15       B17       B16       B16       B15       B13       07       A13       17       B16       B15       B13       07       A13       17       B16       B15       B14       B13       D7       A13       17       B16       B15       B14       B15       B17       B16       B16       B15       B17       B16       B15       A17       A16       A14			B02,B01						
Internal circuit       A02,A01       B14       06       A14       16       B15       B14       A16         B13       07       A13       17       B14       B12       08       A12       18       B13       B12       B14       06       A14       A13       A14       A13       A14       A13       B12       08       A12       18       B13       B12       08       A10       1A       B10       0A       A10       1A       A13       B12       B11       09       A11       19       B10       B09       0B       A09       B09       B08       B07       0D       A07       B06       B06       B06       0E       A06       A05       A06       A06       A05       A04       A06       A05       A04       A06       A06       A04       A06       A02       A01       A02       A01       A02       A01       A01			DC12/24V						
circuit       A05       B13       07       A13       17       B14       B13       B14       B14       B13       B14 <td< td=""><td></td><td>-    </td><td>A02,A01</td><td></td><td></td><td></td><td></td><td></td><td></td></td<>		-	A02,A01						
B12       08       A12       18       B12       B12       18       B12       B11       D9       A11       B12       B11       D9       A11       D9       B12       B11       D9       B12       B11       D9       A13       A12       A13       A13       A14		<b>T</b>	A05		07				
B11       09       A11       19         B10       0A       A10       1A         B09       0B       A09       1B         B07       0D       A07       1D         B06       0E       A06       1E         B05       0F       A05       A04         B03       NC       A03       NC         B02       COM       A02       0V		<b>––––</b>			08		18		
B10       0A       A10       A10         B09       0B       A09       1B         B09       0B       A09       1B         B07       0D       A07       1D         B06       0E       A06       A06         B05       0F       A05       A04         B03       NC       A03       A02         B02       COM       A02       0V								B11	
B       B       B       A       B       B       A       A       B								B10	
B20       L       B08       OC       A08       1C         B07       OD       A07       1D         B06       OE       A06       1E         B05       OF       A05       1F         B04       NC       A04       A02         B02       COM       A02       OV		└──®─┤॑╋						B08	
B07       0D       A07       1D         B06       0E       A06       1E         B05       0F       A05       1F         B04       NC       A04       NC         B03       NC       A03       NC         B02       COM       A02       0V			B20	-					A07
Connector       B06       0E       A06       1E         No.       B05       0F       A05       1F         B04       NC       A04       NC         B03       NC       A03       NC         B02       COM       A02       0V				-					
No. $ \begin{array}{c cccc} B05 & 0F & A05 & 1F \\ B04 & NC & A04 & NC \\ B03 & NC & A03 & NC \\ B02 & COM & A02 & 0V \\ \end{array} $									A04
$ \begin{array}{c cccc} B04 & NC & A04 & NC \\ B03 & NC & A03 & NC \\ B02 & COM & A02 & 0V \end{array} $			No.						
B03 NC A03 NC B02 COM A02 OV									
B02 COM A02 OV								│	4
									-
					СОМ	A01	0V		

# 7.5.9 32 point transistor output module (Source type)

# 7.6 Combined Digital I/O module Input Specification

Model				nodule			
Specificatio	on		XBE-DF	R16A			
Input	point	8 point					
Insulation	n method	Photo coupler insulation					
Rated inp	ut voltage	DC24V					
Rated inp	out current	About 4 mA					
Operation vo	oltage range	DC20.4~28.8V (within rippl	e rate 5%	)			
On Voltag	ge/Current	DC19V or higher / 3 mA or I	nigher				
Off Voltag	ge/Current	DC6V or less / 1 $^{mA}$ or less					
Input rea	sistance	About 5.6 kΩ					
Response	$\text{Off} \to \text{On}$	1/3/5/10/20/70/100 ms(set b		ramatar) F	ofault: 2 ms		
time	$\text{On} \to \text{Off}$		у СРО ра	aranneter) L			
Insulation	pressure	AC560Vrms / 3Cycle (altitu	de 2000m	ו)			
Insulation resistance $10^{M\Omega}$ or more by Megohm				neter			
Commor	n method	8 point / COM					
Proper cable size Stranded cable 0.3~0.75 mm <sup>2</sup>			ຳ (External diameter 2.8 🔤 or less)				
Current co	nsumption	280 $^{mA}$ (When all inputs an	d outputs	are on)			
Operation	n indicator	LED on when input on					
External o met	connection hod	9 pin terminal block connec	tor				
We	ight	81g					
	Circuit co	nfiguration	No.	Contact	Туре		
			TB1	0			
Γ		<del>ዎ</del> DC5V <del>ዎ</del>	TB2	1	TB1		
		Photo coupler	TB3	2	TB2		
			TB4	3	TB3		
			TB5	4			
			TB6	5	твб		
DC24V			TB7	6			
	LTerminal block no.			7	TB8 TB9		
			TB9	COM			

Model	DC input module					
Specification			XBE-DN	32A		
Input point	16 point					
Insulation method	Photo coupler insu	lation				
Rated input voltage	DC24V					
Rated input current	About 4 mA					
Operation voltage range	DC20.4~28.8V (r	ipple rat	e < 5%)			
Input Derating	Refer to Derating c	liagram				
On Voltage/Current	DC 19V or higher /	′3 mA o	r higher			
Off Voltage/Current	DC 6V or less / 1 m	A or les	s			
Input resistance	About 5.6 kΩ					
Response $Off \rightarrow On$	4/0/5/40/00/70/400					ult.O. ma
time $On \rightarrow Off$	1/3/5/10/20/70/100 1	ns (set	by CPU	parame	eter) Defa	uit:3 ms
Insulation pressure	AC 560Vrms / 3 Cy	/cle (a	ltitude 20	00m)		
Insulation resistance	10 MΩ or more by M	Negohm	meter			
Common method	16 point / COM					
Proper cable size	0.3 mm²					
Current consumption	60 mA (When all in	nputs ar	nd outputs	s are on	ı)	
Operation indicator	Input On, LED On					
External connection method	40 pin connector					
Weight	60g					
Circuit configur	ation	No.	Contact	No.	Contact	Туре
		B20	00	A20	20	
	<del>\</del> <del>\</del>	B19	01	A19	21	
		B18	02	A18	22	
		B17	03	A17	23	B20 B19 A20
	circuit	B16	04	A16	24	B18 A1
DC24Mput Derating diagram		B15	05	A15	25	B17 B17 B17 B17 B16 B16 B16 B16 B17
		B14	06	A14	26	B15 A1
90	-+++	B13	07	A13	27	B14 A14 B13 A13
80		B12	08	A12	28	B12 A12
70		B11	09	A11	29	B10 A1
		B10	0A	A10	2A	B09 A01
		B09	0B	A09	2B	B07
40 10 20 30	40 50 55 👡	B08	0C	A08	2C	B06 A0 B05 A0
	emperature	B07	00 0D	A07	20 2D	B04 A0 B03 A0
		B06	0E	A06	2E	B02 A0
		B05	0E 0F	A05	2E 2F	
		B03	NC	A04	P	
		B04	NC	A04 A03	P	
		-			F OUT_CO	
		B02	IN_COM	A02	M OUT_CO	
		B01	IN_COM	A01	M	

### 7.6.2 16 point DC24V input (Source/Sink type)

# 7.7 Combined Digital I/O module Output Specification

# 7.7.1 8 point relay output

	Model	Relay or	Relay output module			
Specification	n	XBE	-DR16A			
Outp	out point	8 point				
Insulatio	on method	Relay insulation				
	ed load / Current	DC24V 2A(Resistive load) / AC2	20V 2A(C0	OSΨ = 1), έ	5A/COM	
Min. load vo	oltage/Current	DC5V/1 mA				
Max. loa	ad voltage	AC250V, DC125V				
Off leaka	age current	0.1 mA (AC220V, 60 Hz)				
Max. On/C	Off frequency	3,600 times/hr				
Surge	absorber	None				
	Mechanical	20 millions times or more				
		Rated load voltage / current 100,	,000 times	or more		
Service life	Ele etricel	AC200V / 1.5A, AC240V / 1A (C	OSΨ = 0.7	) 100,000 t	times or more	
inc	Electrical	AC200V / 1A, AC240V / 0.5A (C	OSΨ = 0.3	5) 100,000	) times or more	
		DC24V / 1A, DC100V / 0.1A (L /	R = 7 ms) 7	100,000 tin	nes or more	
Response	$Off\toOn$	10 ms or less				
time	$\text{On} \to \text{Off}$	12 ms or less				
Commo	on method	8 point / COM				
Proper	cable size	Stranded cable 0.3~0.75 mm <sup>2</sup> (ext	ernal diameter 2.8 mm or less)			
Current c	onsumption	280 mA (When all inputs and out	outputs are on)			
Operatio	n indicator	LED on when output on				
	connection ethod	9 pin terminal block connector				
We	eight	81g				
	Circui	t configuration	No.	Contact	Туре	
			TB1	0		
	<del>Q</del> DC5V		TB2	1	TB1	
LED			TB3	2	TB2	
			TB4	3	TB3	
			TB5	4	TB5	
			TB6	5	TB6	
			TB7	6	тва	
		Terminal	TB8	7	ТВ9	
		block no.	TB9	СОМ		

	Model	Transistor output module						
Specification			XBE-DN32A					
Output point		16 point						
Insulation method		Photo coupler insulation	า					
Rated load voltage	9	DC 12 / 24V						
Load voltage rang	e	DC 10.2 ~ 26.4V						
Max. load voltage		0.2A / 1 point, 2A / 1CC	M					
Off leakage currer	nt	0.1 mA or less						
Max. inrush currer	nt	0.7A / 10 ms or less						
Max. voltage drop	(On)	DC 0.4V or less						
Surge absorber		TVS Diode						
	$Off \rightarrow On$	1 ms or less						
Response time	$On \rightarrow Off$	1 ms or less (Rated lo	ad, res	istive lo	ad)			
Common method		16 point / COM			,			
Proper cable size		0.3 mm²						
Current consumpt	ion	60 mA (When all inputs	and o	utputs a	re on)			
External power	Voltage	DC12/24V ± 10% (rip)				less)		
supply	Current	20 mA or less (DC24V		•	р <b>р с</b> .	,		
Operation indicato		Output On, LED On	001110	ouony				
External connection		40 pin connector						
Weight	in method	60g						
Wolgin		-	NL.	Conta	NL.	Contac	Туре	
	Circuit configura	ation	No.	ct	No.	t	- 71	
			B20	00	A20	20		
			B19	01	A19	21		1
DC5V		A20	B18 B17	02 03	A18 A17	22 23	в20	A20
			B17	03	A17 A16	23	B19	A19
			B15	04	A15	24	B18	A18
			B13	05	A14	25	B17 B16	A17 A16
lnternal circuit	·돠 >		B13	00	A13	20	B15	A15
		A05	B12	08	A12	28	B14	A14
			B11	09	A11	29	B13 B12	A13
		A03.A04	B10	03 0A	A10	23 2A	B11	A12 A11
A01,A02			B09	0A 0B	A09	2B	B10 🗨 🗖	A10
			B03	0D 0C	A03	2D 2C	B09 B08	A09
DC12/24V Terminal block no.			B07	00 0D	A00	20 2D	B07	A08 A07
			B06	0D 0E	A07	2D 2E	В06	A06
		]	B05	0E 0F	A05	2E 2F	B05 99 B04 99	A05
			B03	NC	A03	P	B03	A04 A03
			B04	NC	A04 A03	P	B02	A02
			B03 B02		A03 A02	OUT_CO	B01 <b>H</b>	A01
			B02 B01	IN_COM IN_COM	A02 A01	M OUT_CO		
			501		AUT	M	L	

#### 7.7.2 16 point transistor output (Sink type)

Г

### 7.8 IO Wiring by Using Smart Link Board

#### 7.8.1 Smart link board

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

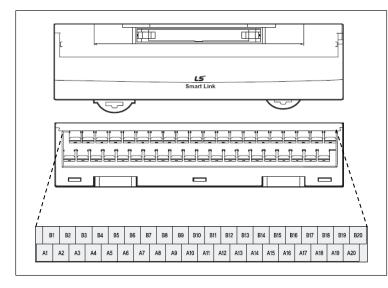
X	GB	Smart	link	Connection cable		
Item	Model	Model	No. of Pin	Model	Length	Contents
Main unit	XBM- DN32S XBM- DN16S	SLP- T40P	40	SLT-CT101- XBM	1m	For main unit connection (20Pin + 20Pin)
	XBE- DC32A	SLP- T40P	40	SLT-CT101- XBE	1m	For expansion module
Expansion		SLP- T40P	40	SLT-CT101- XBE	1m	connection (40Pin)
module	XBE- TN32A	SLP- RY4A	40	SLP-CT101- XBE	1m	For expansion module connection (40Pin) Exclusive for relay built-in SLP type

It describes wring of XGB, SLP-T40P and SLT-CT101-XBM.

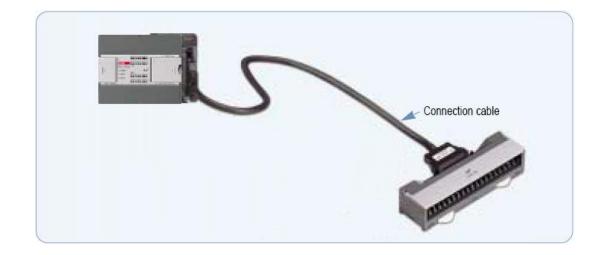
For wring of other smart link boards or XGB extension module, refer to XGB user manual for hardware.

1) SLT-T40P terminal array

Terminal array of SLP-T40P is as follows.



Item	Specification		
Rated voltage	AC/DC 125[V]		
Rated current	Max. 1[A]		
Withstanding voltage	600V 1min		
Insulation resistor	100 MΩ (DC500V)		
Cable specification	1.25[mm] or below		
Terminal/screw	M3 X 8L		
Torque	6.2 kgf.cm or above		
Terminal material	PBT, UL94V-0		
Weight	186g		



2) Wiring of SLT-T40P and XGB extension modulet Wiring of XGB extension module through SLP-T40P and SLT-CT101-XBE is as follows.

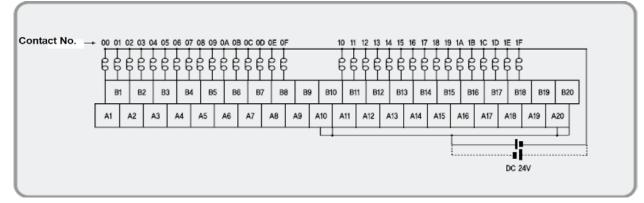
Γ

At this time, relationship of XGB IO signal and Smart link board terminal number is as follows. The following figure describes signal allocation when SLT-CT101-XBE is used as connection cable. When the user makes the cable, make sure that wring is done as figure below.

						PLC				Terminal b	lock Name		
		Pin No.		XBE-I	DC32A	XBE-1	[N32A	XBE-	TP32A	Terminal block board (SLP-T40P)			
		B20	A20	00	10	00	10	00	10	A1	A11		
		B19	A19	01	11	01	11	01	11	B1	B11		
B20 -	A20	B18	A18	02	12	02	12	02	12	A2	A12		
	A18	B17	A17	03	13	03	13	03	13	B2	B12		
	■ A17	B16	A16	04	14	04	14	04	14	A3	A13		
B16 🖬 B15 🗖		B15	A15	05	15	05	15	05	15	B3	B13		
	A14	B14	A14	06	16	06	16	06	16	A4	A14		
B13 =	A13	B13	A13	07	17	07	17	07	17	B4	B14		
B11 =		B12	A12	08	18	08	18	08	18	A5	A15		
B10 =	A10	B11	A11	09	19	09	19	09	19	B5	B15		
B09	- A09	B10	A10 A09	0A 0B 0C	1A	0A	1A	0A 0B	1A	A6	A16		
507	- A07	B09			1B	0B	1B		1B	B6	B16		
B06 =	A06 A05	B09 B07	A08		10	0C	10	0C	10	A7	A17		
	- A04		A07	0D	1D	0D	1D	0D	1D	B7	B17		
	A03	B06	A06	0E	1E	0E	1E	0E	1E	A8	A18		
B01		B05	A05	0F	1F	0E	1E	0E	1F	B8	B18		
		B04	A04	NC	NC	NC	NC	NC NC	NC	A9	A19		
		B03	A03	NC	NC	NC	NC	NC	NC	B9	B19		
		B02	A02							A10	A20		
		B02	A02	COM	COM	DC12/24V	COM	COM	DC0V	B10	B20		
		801	AUT							ы	D20		

3) I/O wiring

- XBE-DC32A (SLP-T40P)



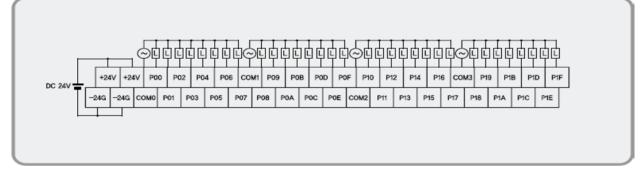
#### - XBE-TN32A (SLP-T40P)

Contact No. → 00	01 02 03	04 05	06 07 0	08 09 0/	A 0B 00	OD OE OF			10 11	12 13	14 15	16 17	18 19 1	A 1B	1C 1D	1E 1F			
¢.	фф¢	)	ţ¢	ţţţ	фф	ффф		_	¢¢	цф	ф¢	фф		Ъф	фф	фф		┌╴╤	DC 12/24V
	B1 B2	: вз	B4	B5	B6	B7 B8	B9	B1	0 B1	1 B1	2 B1	3 B14	B15	B16	5 B17	B18	B1	9 В20	,
A1	A2	A3	A4	A5 A	6 A	7 A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	-
l																			

#### - XBE-TP32A (SLP-T40P)

Contact No. 🛶	00 01 0	02 03 0	04 05 0	6 07 0	08 09	DA OB	0C 0D 0	E OF			10 11	12 13	14 1	5 16	17 1	B 19 1	A 1B	1C 1D	1E 1F			
	фф	ι Η Η			έ¢ι	φ¢			2 12/24		-		þ	ļļ				ι¢¢	ι¢¢	]		
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	0 В1	1 B	2 E	13	B14	B15	B1	6 B1	7 B1	8 В	19 B2	0
	A1	A2 /	A3 /	44	A5	A6	A7 /	18 A	.9 A	A10	A11	A12	A13	A1	14 A	15	A16	A17	A18	A19	A20	_

#### - XBE-TN32A (SLP-RY4A)



Г

# **Chapter 8 Built-in High-speed Counter Function**

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

# 8.1 High-speed Counter Specifications

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

# 8.1.1 Performance specifications

(1) Performance specification

Classification		Desc	ription			
Class	sincation	"E" type	"S(U)" type			
Count input	Signal	A-phase, B-phase				
signal	Input type	Voltage input (Open collector)				
Signal	Signal level	DC 24V	DC 24V			
Max. count speed		4kpps	100kpps			
Number of	1 phase	4kpps 4 channels	100kpps 2 channels/ 20kpps 6 channels			
channels	2 phase	2kpps 2 channels   50kpps 1 channel / 8kpps 3 channel				
Count range		Signed 32 Bit (-2,147,483,648 ~ 2,14	47,483,647)			
		Linear count (if 32-bit range exceeded	ed, Carry/Borrow occurs)			
Count mode		Counter max. and min. value is indic	cated			
(Program set	ting)	Ring count (repeated count within setting range)				
Input mode		1-phase input				
(Program set	tina)	2-phase input				
(Flografii set	ung)	CW/CCW input				
Signal type		Voltage				
	1 phase input	Increasing/decreasing operation setting by B-phase input				
	i phase input	Increasing/decreasing operation setting by program				
Up/Down		Operating setting by rising edge	Operating setting by rising/falling			
setting	2 phase input	phase difference	edge phase difference			
		A-phase input: increasing operation				
	CW/CCW	B-phase input: decreasing operation				
Multiplication	1 phase input	1 multiplication				
	2 phase input	2 multiplication	4 multiplication			
function	CW/CCW	1 multiplication				
	Signal	Preset instruction input				
Control input	Signal level	DC 24V input type				
	Signal type	Voltage				

Classification		Desc	ription	
		"E" type	"S(U)" type	
		1 point/channel (for each channel)	2 point/channel (for each channel)	
	Output points	:uses output contact point of main	:use output contact point of main	
External		unit	unit	
output	Туре	Selects single-compared (>, >=, =, =<, <) or section-compared output		
	Турс	(included or excluded) (program setting)		
Output type		Relay, Open-collector output (Sink)		
Count Enable		To be set through program (count available only in enable status)		
Preset function		To be set through terminal (contact) or program		
Auxiliary mode	)	Count Latch		
(Program setti	ng)	Count per unit time (time setting valu	ue: 1~60,000ms)	

# (2) Counter/Preset input specification

Γ

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

# Notice

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. When using high speed counter, consider this.

# 8.1.2 Designation of parts

(1) Designation of parts

# (a) "E" type

Terminal	Names		Usage		
No.	1-phase	2-phase	1-phase	2-phase	
P000	Ch0 counter input	Ch0 A-phase input	Counter input terminal	A-phase input	
P001	Ch1 counter input	Ch0 B-phase input	Counter input terminal	B-phase input	
P002	Ch2 counter input	Ch2 A-phase input	Counter input terminal	A-phase input	
P003	Ch3 counter input	Ch2 B-phase input	Counter input terminal	B-phase input	
P004	Ch0 preset 24V	Ch0 preset 24V	Preset input terminal	Preset input terminal	
P005	Ch1 preset 24V	-	Preset input terminal	No use	
P006	Ch2 preset 24V	Ch2 preset 24V	Preset input terminal	Preset input terminal	
P007	Ch4 preset 24V	-	Preset input terminal	No use	
COM0	Input common	Input common	Common terminal	Common terminal	

٦

# (b) "S(U)" type

Terminal	Nar	nes	Usa	age
No.	1-phase	2-phase	1-phase	2-phase
P000	Ch0 counter input	Ch0 A-phase input	Counter input terminal	A-phase input
P001	Ch1 counter input	Ch0 B-phase input	Counter input terminal	B-phase input
P002	Ch2 counter input	Ch2 A-phase input	Counter input terminal	A-phase input
P003	Ch3 counter input	Ch2 B-phase input	Counter input terminal	B-phase input
P004	Ch4 counter input	Ch4 A-phase input	Counter input terminal	A-phase input
P005	Ch5 counter input	Ch4 B-phase input	Counter input terminal	B-phase input
P006	Ch6 counter input	Ch6 A-phase input	Counter input terminal	A-phase input
P007	Ch7 counter input	Ch6 B-phase input	Counter input terminal	B-phase input
P008	Ch0 preset 24V	Ch0 preset 24V	Preset input terminal	Preset input terminal
P009	Ch1 preset 24V	-	Preset input terminal	No use
P00A	Ch2 preset 24V	Ch2 preset 24V	Preset input terminal	Preset input terminal
P00B	Ch4 preset 24V	-	Preset input terminal	No use
P00C	Ch5 preset 24V	Ch4 preset 24V	Preset input terminal	Preset input terminal
P00D	Ch6 preset 24V	-	Preset input terminal	No use
P00E	Ch7 preset 24V	Ch6 preset 24V	Preset input terminal	Preset input terminal
P00F	Ch8 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

Γ

		Terminal	Si	gnal	Operation	On/Off
I/O	Internal circuit	No.	1-phase	2-phase		guaranteed voltage
		P00	Ch 0	Ch 0	On	20.4~28.8V
	4 <b>Φ Δ</b> 2.7 kΩ	F00	Pulse input	A-phase input	Off	6V or less
		P01	Ch 1	Ch 0	On	20.4~28.8V
	4 2.7 kΩ	FUI	Pulse input	B-phase input	Off	6V or less
		P02	Ch 2	Ch 2	On	20.4~28.8V
	<b>4 Φ Ε</b> 2.7 kΩ	P02	Pulse input	A-phase input	Off	6V or less
		P03	Ch 3	Ch 2	On	20.4~28.8V
		F03	Pulse input	B-phase input	Off	6V or less
Input	· · · · · · · · · · · · · · · · · · ·	P04	Ch 0	Ch 0	On	20.4~28.8V
	<b>∠ ▼ ▲ ↓</b> 5.6 kΩ	P04	Preset input	Preset input	Off	6V or less
		P05	Ch 1		On	20.4~28.8V
	4 <b>Φ ξ</b> 5.6 kΩ	P00	Preset input	-	Off	6V or less
		P06	Ch 2	Ch 2	On	20.4~28.8V
	μ τ τ τ τ τ τ τ τ τ τ τ τ τ τ τ τ τ τ τ		Preset input	Preset input	Off	6V or less
		P07	Ch 3	-	On	20.4~28.8V
	5.6 kΩ		Preset input		Off	6V or less
		COM0	COM (inp	ut common)		

For XBC-DR10E, there is no physical circuit for P0006 ~ P0007. Turn on this contact point by program.

(b) "S(U)" type

b) "S(U)" ty	·	Terminal	Się	gnal	uo	On/Off
I/O	Internal circuit	No.	1 2200	) nhaaa	Operation	guaranteed
		INO.	1-phase	2-phase	do	voltage
		P0000	Ch 0	Ch 0	On	20.4~28.8V
	<b>∻▼</b> ▲ ≥ 2.7 kΩ	F0000	Pulse input	A-phase input	Off	6V or less
		P0001	Ch 1	Ch 0	On	20.4~28.8V
	<b>∻ ▼ ▲ ≷</b> 2.7 kΩ	FUUUT	Pulse input	B-phase input	Off	6V or less
		P0002	Ch 2	Ch 2	On	20.4~28.8V
	<b>4 Σ Ξ</b> 2.7 kΩ	F0002	Pulse input	A-phase input	Off	6V or less
		P0003	Ch 3	Ch 2	On	20.4~28.8V
	<b>φ φ φ ξ</b> 2.7 kΩ	F0003	Pulse input	B-phase input	Off	6V or less
		P0004	Ch 4	Ch 4	On	20.4~28.8V
	<b>4 Σ 2</b> .7 kΩ	F0004	Pulse input	A-phase input	Off	6V or less
		P0005	Ch 5	Ch 4	On	20.4~28.8V
	<b>φ φ ξ</b> 2.7 kΩ	P0005	Pulse input	B-phase input	Off	6V or less
		P0006	Ch 6	Ch 6	On	20.4~28.8V
	<b>∻</b> ▼ <b>▲ ≷</b> 2.7 kΩ	F0000	Pulse input	A-phase input	Off	6V or less
		P0007	Ch 7	Ch 6	On	20.4~28.8V
	<b>∻ ★ ≩</b> 2.7 kΩ	F 0007	Pulse input	B-phase input	Off	6V or less
Input		DOOOR	Ch 0	Ch 0	On	20.4~28.8V
	<b>∻▼</b>	P0008	Preset input	Preset input	Off	6V or less
		P0009	Ch 1		On	20.4~28.8V
	<b>∻ ★</b> <b>♦</b> 5.6 kΩ	F0009	Preset input	-	Off	6V or less
		P000A	Ch 2	Ch 2	On	20.4~28.8V
	<b>4 Σ</b> 5.6 kΩ	FUUUA	Preset input	Preset input	Off	6V or less
		P000B	Ch 3		On	20.4~28.8V
	<b>∻▼</b> ★ ξ 5.6 kΩ	PUUUB	Preset input	-	Off	6V or less
		P000C	Ch 4	Ch 4	On	20.4~28.8V
	<b>⊊ ▼ 本</b> ≩ 5.6 kΩ	FUUUC	Preset input	Preset input	Off	6V or less
		DOOD	Ch 5		On	20.4~28.8V
	<b>4 Φ ξ</b> 5.6 kΩ	P000D	Preset input	-	Off	6V or less
			Ch 6	Ch 6	On	20.4~28.8V
		P000E	Preset input	Preset input	Off	6V or less
		P000F	Ch 7		On	20.4~28.8V
	5.6 kΩ		Preset input	-	Off	6V or less
		COM0	COM(inpu	ut common)		
	For XBC-DR/DN20S, there is no	physical c	ircuit for P0	00C ~ P000F	. Turn	on this

٦

For XBC-DR/DN20S, there is no physical circuit for P000C ~ P000F. 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

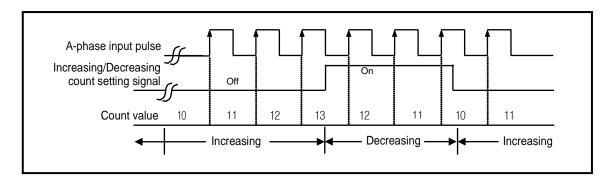
operation if A-phase is LOW with B-phase input.

(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



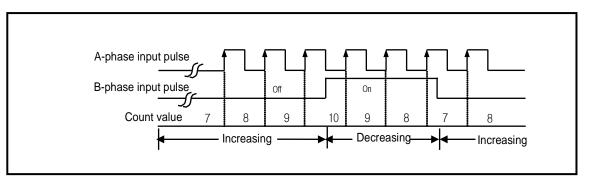
b) Increasing/decreasing count operation by B-phase input signal

• 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	-

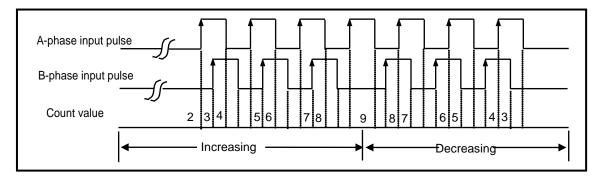
• Operation example



- 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 Bphase input, increasing operation starts, and if B-phase input is antecedent to A-phase input, decreasing operation starts.

Operation example



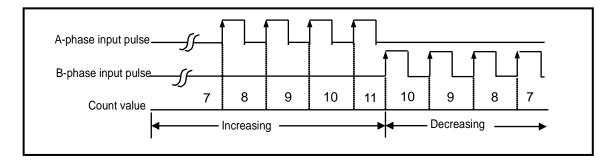
# 3) CW(Clockwise)/CCW(Counter Clockwise) operation mode

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

Γ

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

Parameter	CH 0	CH 1	CH 2	CH 3
Counter mode	Linear 🗸 🗸	Linear	Linear	Linear
Pulse input mode	Linear	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1
Internal preset	Ring	0	0	0
External preset	0	0	0	0
Ring counter value	0	0	0	0
Comp output mode	(Magnitude)<	(Magnitude)<	(Magnitude)<	(Magnitude)<
Comp output min.	0	0	0	0
Comp output max.	0	0	0	0
Comp output point	No use	No use	No use	No use
Unit time [ms]	1	1	1	1
Pulse/Rev value	1	1	1	1

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

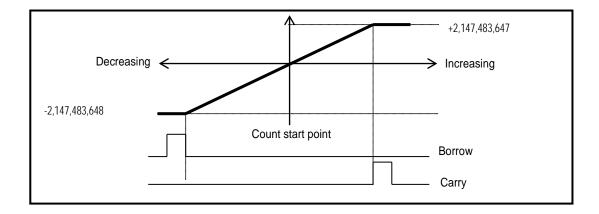
Mode Area per each channel (word)					Reference*1)
Mode	Ch.0	Ch.1	Ch.2	Ch.3	Reference "
Counter mode	K300	K330	K360	K390	0 : linear 1 : ring

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

2 types of count can be selected for the applicable use based on functions.

(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.



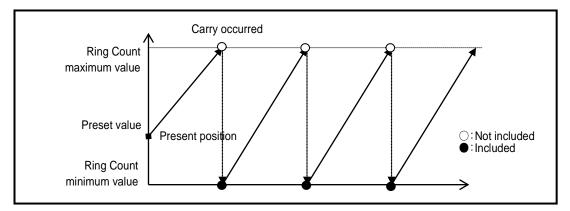
- (b) Ring count
  - Ring Count range: user-defined minimum value ~ user-defined maximum value
  - Count display: If Ring Counted, user-defined minimum value of Ring Count is counted and displayed, but the value is not displayed.

Parameter	CH 0	CH 1	CH 2	СН 3
Counter mode	Ring	Linear	Linear	Linear
Pulse input mode	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1
Internal preset	0	0	0	0
External preset	0	0	0	0
Ring counter value	1000	0	0	0
Comp output mode	(Magnitude)<	(Magnitude)<	(Magnitude)<	(Magnitude)<
Comp output min.	0	0	0	0
Comp output max.	0	0	0	0
Comp output point	No use	No use	No use	No use
Unit time [ms]	1	1	1	1
Pulse/Rev value	1	1	1	1

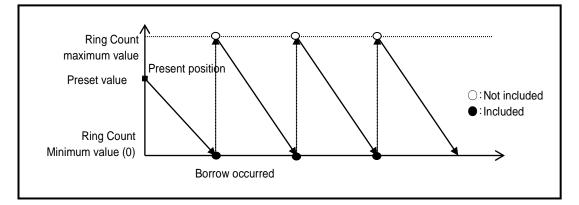
• Ring counter value is saved at the following special K area.

tupo	Area per each channel (Double word)				Reference
type	Ch.0	Ch.1	Ch.2	Ch.3	Reference
Ring counter value	K310	K340	K270	K400	

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

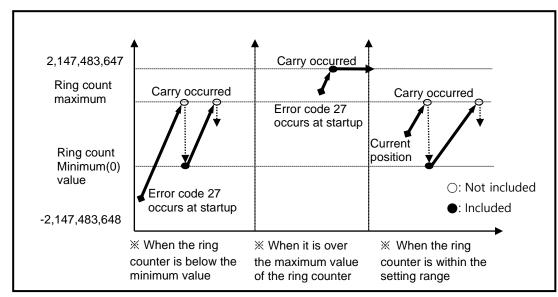


- 2) During decreasing count
  - Even if count value exceeds user-defined minimum value during decreasing count, Borrow only occurs and count does not stop differently to Linear Count.

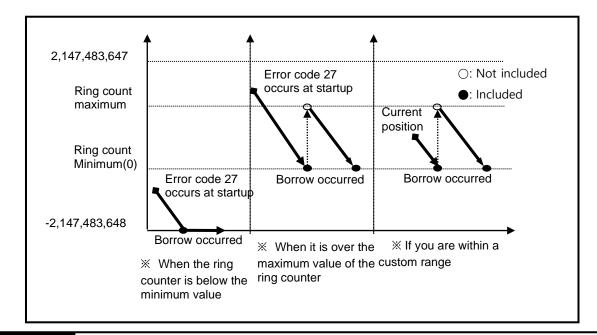


3) Operation when setting Ring Count based on present count value (during increasing count)

- When setting the ring count, the current count value is below the minimum value of the ring counter.
- Opens an error (Code No. 27), operates as a linear counter, and operates as a ring count when the current count value falls within the range of the ring count (error codes are not cleared).
- When setting the ring count, the current count value is above the maximum value of the ring counter.
- Displays an error (Code No. 27), operates as a linear counter, and stops counting when the current count value reaches the maximum count value (error code is not cleared).
- When setting the ring count, the current count value is within the user setting range
- It starts to increase from the current count value, increases to the maximum value set by the user, then becomes the minimum value set by the user and continues to count after carrying a carry.
- As shown in the figure below, the maximum value is not displayed and the count continues after displaying the minimum value.



- 4) Operation when setting Ring Count based on present count value (during decreasing count)
  - When setting the ring count, the current count value is below the minimum value of the ring counter.
  - When an error (Code No. 27) is displayed, it operates as a linear counter, and if the current count value falls within the range of the ring count, it operates as a ring count. (The error code is not cleared)
  - When setting the ring count, the current count value is above the maximum value of the link counter.
  - An error (Code No. 27) is displayed, and it operates as a linear counter, but stops counting when the current count value reaches the count minimum value. (The error code is not cleared)
  - When setting the ring count, the current count value is within the user setting range
  - It starts to decrease from the current count value, decreases to the minimum value set by the user, and becomes the maximum value set by the user, and then continues counting after Borrow occurs.



# Remark

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

#### (3) Compared output

ſ

- (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

			<u> </u>	011.0
Parameter	CH 0	CH 1	CH 2	CH 3
Counter mode	Ring	Linear	Linear	Linear
Pulse input mode	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1
Internal preset	0	0	0	0
External preset	0	0	0	0
Ring counter value	1000	0	0	0
Comp output mode	(Magnitude)< 🗸 🗸	(Magnitude)<	(Magnitude)<	(Magnitude)<
Comp output min.	(Magnitude)<	0	0	0
Comp output max.	(Magnitude)<= (Magnitude)=	0	0	0
Comp output point	(Magnitude)>=	No use	No use	No use
Unit time [ms]	(Magnitude)>	1	1	1
Pulse/Rev value	(Range)Include (Range)Exclude	1	1	1

#### ■ Upper setting value is saved in special K area.

Compared output condition	Memory address (word)	Value <sup>*2)</sup>
Present Value < Compared Value		Set to "0"
Present Value ≤ Compared Value		Set to "1"
Present Value = Compared Value	Channel 0 : K302	Set to "2"
Present Value ≥ Compared Value	Channel 1 : K330 Channel 2 : K358	Set to "3"
Present Value > Compared Value	Channel 3 : K386	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 is to be On.

Clossification		Area pe	r channel	Operation	
Classification	Ch. 0	Ch. 1	Ch. 2	Ch. 3	Operation
Count enable signal	K2600	K2700	K2800	K2900	0: N/A, 1: enable
Compared enable signal	K2604	K2704	K2804	K2904	0: forbidden, 1: enable

 In order to make external output, the compared equivalent output signal (P20~P27) must be set. If Compared output contact is Off, Compared coincidence output signal (internal device) is only output. 1

Classification		Area per channel			Operation	
Classification	Ch. 0	Ch. 1	Ch. 2	Ch. 3	Operation	
Compared equivalent output signal	K2612	K2712	K2812	K2912	0: Compared output not equivalent 1: Compared output equivalent	

# • Comp output point (P40 ~ P43) setting

gh Speed Counter Module				
Parameter	СНО	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 value	2	2	2	2
Comp output mode	(Magnitude)<	(Magnitude)<	(Magnitude)<	(Magnitude)<
Comp output min.	0	0	0	0
Comp output max.	0	0	0	0
Comp output point	No Use 🗸	No Use	No Use	No Use
Unit time [ms]	No Use	1	1	1
Pulse/Rev value	P40	1	1	1
	P41 P42 P43		ок	Cancel

(e) Detailed description for compared output

Γ

- 1) Mode 0 (Present value < Compared value)
- If counted present value is less than compared value, output is sent out, and if present value increases to be equal to or greater than compared value, output is not sent out.

Count value	<u>123456</u> <u>123457</u> <u>123458</u> <u>123459</u> <u>123460</u> <u>123461</u> <u>123462</u>
Compared output - Min. set value -	123460
Compared Output Enable Compared Output output signal External output (in case of designated output)	

2) Mode1 (Count value ≤ Compared value)

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

Count value 123456 123457	123458 123459 123460 123461 123462
Compared Output	
Min. set value	123460
Compared Output Enable Compared Output output signal External output (in case of designated output)	

# 3) Mode 2 (Count value = Compared value)

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

Count value	123456	123457	123458	123459	123460	123461 123462
Compared Output						
Min. set value		123457				
Compared Output Enable Compared Output output signal External output (in case of designated output					Ç	

4) Mode 3 (Count value  $\geq$  Compared value)

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

Count value 1	23456 123457	123458 123459	123460 123461 123462
Compared Output <del>-</del> Min. set value _			123460
Compared Output Enable			
Compared Output output signal			
External output (in case of designated output)		<u> </u>	

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

Γ

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

Count value	23456 123457 123458 123459 123460 123461 123462
Compared Output Min. set value	123459
Compared Output Enable	
Compared Output signal	
External output (in case of designated outpu	t)

- 6) Mode 5 (Compared output Min. set value  $\leq$  Count value  $\leq$  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.

Count value 12	23456 123457 123458 123459 123460	123461 123462
Compared Output		
Min. set value	123458	
Compared Output -		<u></u>
Max. set value	123460	$\backslash$
- Compared Output Enable		
Compared Output		
signal		
External Output		-
(in case of	<b>N</b>	l l l l l l l l l l l l l l l l l l l
designated output)		

7) Mode 6 (Count value ≤ Compared output Min. value, Count value ≥ Compared output Max. value)

1

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.

Count value	100150	(100457)	<u></u>	450 (400			
Compared Output	<u>123456</u> >	(123457)	< <u>123</u>	458 123	3 <u>459 × 123</u>	<u>3460 X</u>	123461 123462
Min. set value		123457	$\setminus$				
Compared Output Max. set value							123461
			$\rightarrow$				
Compared Output Enable	<b></b>						
Compared Output							/
output signal		/					
External output							
(in case of designated output)		X				*	
designated output;							

# (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					
Classification	Channel 0	Channel 1	Channel 2	Channel 3		
Carry signal	K2610	K2710	K2810	K2910		

# (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					
Classification	Channel 0	Channel 1	Channel 2	Channel 3		
Borrow signal	K2611	K2711	K2811	K2911		

#### 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

Speed Counter Module				
Parameter	CH O	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 value	0	0	0	0
Comp output mode	(Magnitude)<	(Magnitude)<	(Magnitude)<	(Magnitude)<
Comp output min.	0	0	0	0
Comp output max.	0	0	0	0
Comp output point	No use	No use	No use	No use
Unit time [ms]	1000	1	1	1
Pulse/Rev value	1	1	1	1

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

Classification	Device area per channel					
Classification	Channel 0	Channel 1	Channel 2	Channel 3		
Unit time (1~60000ms)*3)	K322	K352	K382	K412		

<sup>\*3)</sup> 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					
Classification	Channel 0	Channel 1	Channel 2	Channel 3		
Pulse number /revolution (1~60000) <sup>*4)</sup>	K323	K353	K383	K413		

<sup>\*4)</sup> 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.

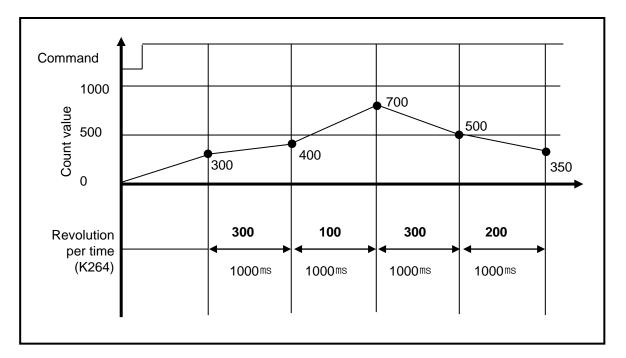
Classification	Device area per channel					
Classification	Channel 0	Channel 1	Channel 2	Channel 3		
Revolution/unit time command	K2605	K2705	K2805	K2905		

(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.

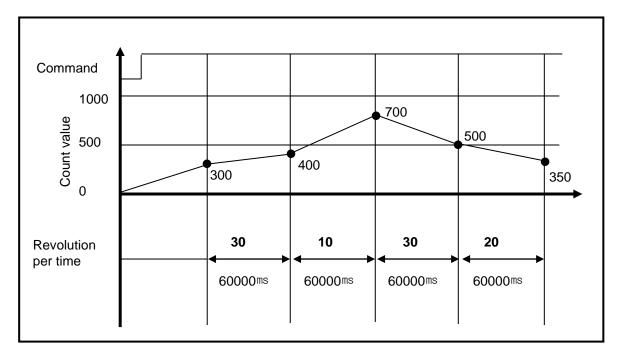
ſ

- (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. In case of DMUL operation, RPM value is saved 64 bit in D100~D103. If operated RPM value is used, it can use to Word or Dword type according to system (case of RPM value is small number).

D100 (RPM value) = K	264 (number of	revolution per	second) X 60 (s	second)				
F00099					DMUL	K0264	60	D00100
Always ON								



(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				
Classification	Channel 0	Channel 1	Channel 2	Channel 3	
Count latch command	K2606	K2706	K2806	K2906	

(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 or external preset function has to use for clearing present value.

# (8) Preset function

Γ

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.

n Speed Counter Module				
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 value	0	0	0	0
Comp output mode	(Magnitude)<	(Magnitude)<	(Magnitude)<	(Magnitude)<
Comp output min.	0	0	0	0
Comp output max.	0	0	0	0
Comp output point	No use	No use	No use	No use
Unit time [ms]	1	1	1	1
Pulse/Rev value	1	1	1	1

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

Tuno	Area per each channel (Double word)					
Туре	Ch.0	Ch.1	Ch.2	Ch.3	Ref.	
Internal preset	K304	K334	K364	K394	-	
External preset	K306	K336	K366	K396	-	

• 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.

Turno		Area per each	n channel (Bit)		Ref.
Туре	Ch.0	Ch.1	Ch.2	Ch.3	Rei.
Internal preset command	K2601	K2701	K2801	K2901	-
External preset allowance	K2602	K2702	K2802	K2902	-
External preset command	· P004		P006	P007	-

# 8.1.4 "S(U)" 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.

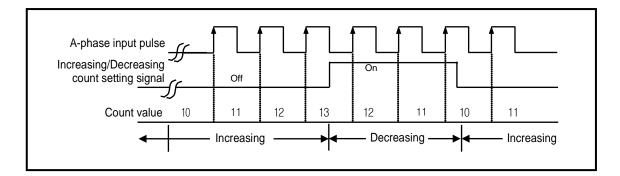
(d) Auxiliary modes are as follows;

- 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



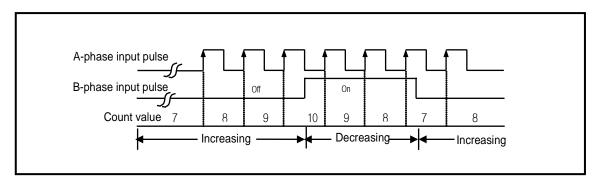
- b) Increasing/decreasing count operation by B-phase input signal
  - 1-phase 2-input 1-multiplication operation mode

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

Γ

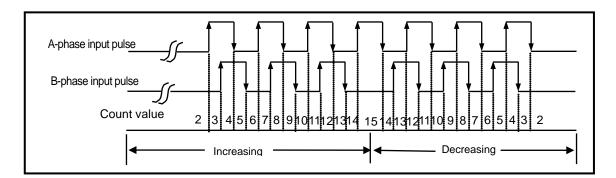


# 2) 2-phase count mode

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



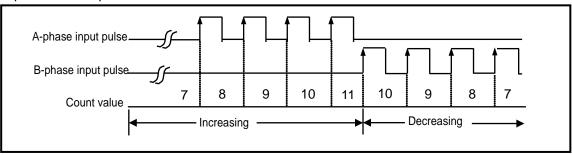
# 3) CW(Clockwise)/CCW(Counter Clockwise) operation mode

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.

Parameter	CH 4	CH 5	CH 6	CH 7
Counter mode	Linear 🗸 Linear		Linear	Linear
Pulse input mode	Linear	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1
Internal preset	Ring	0	0	0
External preset	0	0	0	0
Ring Counter Min. Value	0	0	0	0
Ring Counter Max. Value	ounter 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
omparator Output1 Max.Value	0	0	0	0
Comp0 output point	it point No use No use		No use	No use
Comp1 output point	No use No use		No use	No use
Unit time [ms]	1	1	1	1
Pulse/Rev value	1	1	1	1

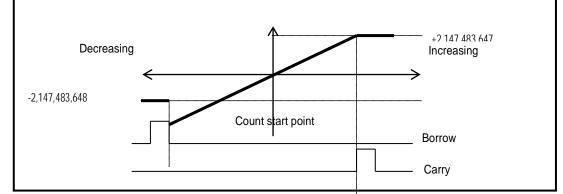
- Counter mode is saved at the following special K area.

Mode		Area per each channel (word)										
Wode	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ref.			
Counter mode	K300	K330	K360	K390	K2220	K2250	K2280	K2310	0 : linear 1 : ring			

(a) Linear counter

Γ

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



(b) Ring count

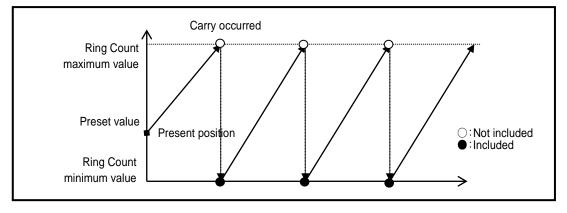
Set Ring Counter Min. Value and Max. value. Preset value and compared set value should be in range of ring counter min. value and max. value.

Parameter	CH 4	CH 5	CH 6	CH 7
Counter mode	Ring	Linear	Linear	Linear
Pulse input mode	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1
Internal preset	0	0	0	0
External preset	0	0	0	0
Ring Counter Min. Value	0	0	0	0
Ring Counter Max. Value	3000	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
omparator Output0 Max.Value	0	0	0	0
Comparator Output1 Min.Value	0	0	0	0
omparator Output1 Max.Value	0	0	0	0
Comp0 output point	No use	No use	No use	No use
Comp1 output point	No use	No use	No use	No use
Unit time [ms]	1	1	1	1
Pulse/Rev value	1	1	1	1

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

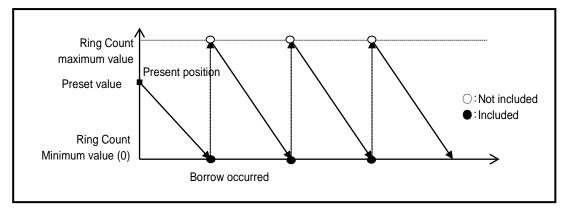
tupo		Area per each channel (Double word)							
type	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ref.
Ring counter min. value	K308	K338	K368	K398	K2228	K2258	K2288	K2318	-
Ring counter max. value	K310	K340	K270	K400	K2230	K2260	K2290	K2320	-

- Range of Ring counter: user defined min. value ~ user defined max. value
- Counter display: in case of using ring counter, user defined max. value is not displayed.
  - 1) During increasing count
    - Even if count value exceeds user-defined maximum value during increasing count, Carry only occurs and count does not stop differently to Linear Count.

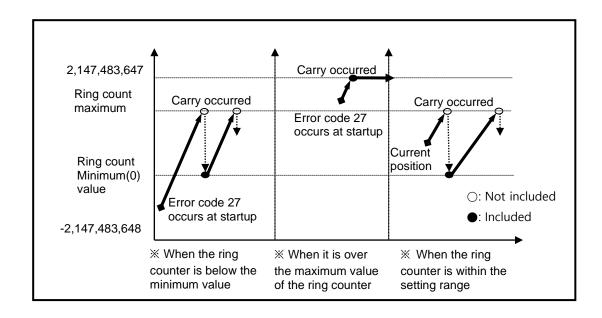


# 2) During decreasing count

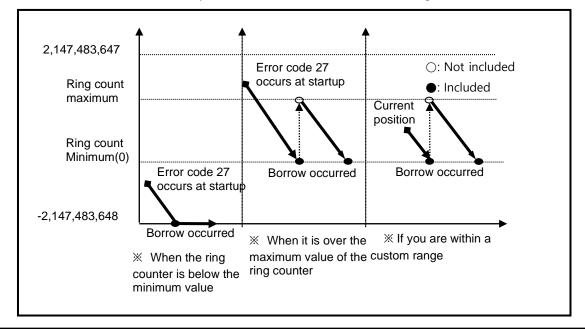
Even if count value exceeds user-defined minimum value during decreasing count, Borrow only occurs and count does not stop differently to Linear Count.



- 3) Operation when setting Ring Count based on present count value (during increasing count)
- When setting the ring count, the current count value is below the minimum value of the ring counter.
- Opens an error (Code No. 27), operates as a linear counter, and operates as a ring count when the current count value falls within the range of the ring count (error codes are not cleared).
- When setting the ring count, the current count value is above the maximum value of the ring counter.
- Displays an error (Code No. 27), operates as a linear counter, and stops counting when the current count value reaches the maximum count value (error code is not cleared).
- When setting the ring count, the current count value is within the user setting range
- It starts to increase from the current count value, increases to the maximum value set by the user, then becomes the minimum value set by the user and continues to count after carrying a carry.
- As shown in the figure below, the maximum value is not displayed and the count continues after displaying the minimum value.



- 4) Operation when setting Ring Count based on present count value (during decreasing count)
  - When setting the ring count, the current count value is below the minimum value of the ring counter.
  - When an error (Code No. 27) is displayed, it operates as a linear counter, and if the current count value falls within the range of the ring count, it operates as a ring count. (The error code is not cleared)
  - When setting the ring count, the current count value is above the maximum value of the link counter.
  - An error (Code No. 27) is displayed, and it operates as a linear counter, but stops counting when the current count value reaches the count minimum value. (The error code is not cleared)
  - When setting the ring count, the current count value is within the user setting range
  - It starts to decrease from the current count value, decreases to the minimum value set by the user, and becomes the maximum value set by the user, and then continues counting after Borrow occurs.



# Remark

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

# (3) Compared output

- (a) High Speed counter module has a compared output function used to compare present count value with compared value in size to output as compared.
- (b) Available compared outputs are 2 for 1 channel, which can be used separately.
- (c) Compared output conditions are 7 associated with >, =, < .
- (d) Parameter setting
- Comp. output mode setting

Imaginitude]=         0         0           omparator Output0 Max.Value (Magnitude)>=         0         0         0           omparator Output1 Min.Value (Range)Include (Range)Exclude         0         0         0           Comp0 output1 Max.Value (Range)Exclude         0         0         0           Comp0 output point         No use         No use         No use         No use           Comp1 output point         No use         No use         No use         No use           Unit time [ms]         1         1         1         1	Parameter	CH 4	CH 5	CH 6	CH 7
Internal preset000External preset0000Ring Counter Min. Value0000Ring Counter Max. Value3000000Comp0 output mode(Magnitude)<	Counter mode	Ring	Linear	Linear	Linear
External preset000Ring Counter Min. Value0000Ring Counter Max. Value3000000Comp0 output mode(Magnitude)<	Pulse input mode	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1
Ring Counter Min. Value0000Ring Counter Max. Value3000000Comp0 output mode(Magnitude)<	Internal preset	0	0	0	0
Ring Counter Max. Value     3000     0     0       Comp0 output mode     (Magnitude)<	External preset	0	0	0	0
Comp0 output mode       (Magnitude)<       0	Ring Counter Min. Value	0	0	0	0
Comp1 output mode       [Magnitude]       (Magnitude]<	Ring Counter Max. Value	3000	0	0	0
Imparator Output0 Min.Value         (Magnitude)<=         0         0           Imparator Output0 Max.Value         (Magnitude)=         0         0         0           Imparator Output0 Max.Value         (Magnitude)=         0         0         0           Imparator Output1 Min.Value         (Magnitude)=         0         0         0           Imparator Output1 Min.Value         (Magnitude)>         0         0         0           Imparator Output1 Max.Value         (Range)Include         0         0         0           (Range)Include         0         0         0         0           (Comp0 output point         No use         No use         No use         No use           Unit time [ms]         1         1         1         1	Comp0 output mode	(Magnitude)< 🗸 🗸 🗸	(Magnitude)<	(Magnitude)<	(Magnitude)<
Imparator Output Mint Value     (Magnitude)= (Magnitude)>=     0     0       Imparator Output Max.Value     (Magnitude)>=     0     0       Imparator Output Max.Value     No use     No use     No use       Imparator Output point     No use     No use     No use       Imparator Output point     No use     No use     No use       Imparator Output point     No use     No use     No use	Comp1 output mode		(Magnitude)<	(Magnitude)<	(Magnitude)<
Imparator Output0 Max.Value         Magnitude)>= (Magn	omparator Output0 Min.Value		0	0	0
Imparator Output Mir Valde         [Range]Include (Range]Exclude         0         0         0           Imparator Output Max.Value         (Range]Exclude         0         0         0         0           Comp0 output point         No use           Unit time [ms]         1         1         1         1	omparator Output0 Max.Value	(Magnitude)>=	0	0	0
Imparator Output1 Max.Value         (Range)Exclude         0         0           Comp0 output point         No use         No use         No use           Comp1 output point         No use         No use         No use           Unit time [ms]         1         1         1	omparator Output1 Min.Value		0	0	0
Comp0 output point         No use         No use         No use           Comp1 output point         No use         No use         No use           Unit time [ms]         1         1         1	omparator Output1 Max.Value		0	0	0
Unit time [ms]         1         1         1	Comp0 output point		No use	No use	No use
	Comp1 output point	No use No use		No use	No use
	Unit time [ms]	1 1		1	1
	Pulse/Rev value	1	1 1 1		1

■ Upper setting value is saved in special K area.

Compared output condition	Memory address	(word)	Value <sup>*2)</sup>
Compared output condition	Comp output 0	Comp output 1	value -/
Present Value < Compared Value			Set to "0"
Present Value ≤ Compared Value	Ch.0 K302	Ch.0 K303	Set to "1"
Present Value = Compared Value	Ch.1 K332 Ch.2 K362	Ch.1 K333 Ch.2 K363	Set to "2"
Present Value ≥ Compared Value	Ch.3 K392 Ch.4 K2222	Ch.3 K393 Ch.4 K2223	Set to "3"
Present Value > Compared Value	Ch.5 K2252	Ch.5 K2253	Set to "4"
Compared value $1 \leq \text{Count value} \leq \text{Compared value} 2$	Ch.6 K2282 Ch.7 K2312	Ch.6 K2283 Ch.7 K2313	Set to "5"
Count value ≤ Compared value 1, Count value ≥ Compared value 2			Set to "6"

<sup>\*2)</sup> 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
Classification	Ch. 0	Ch. 1	Ch. 2	Ch. 3	Ch. 4	Ch. 5	Ch. 6	Ch. 7	Operation
Count enable signal	K2600	K2700	K2800	K2900	K21800	K21900	K22000	K22100	0:disable, 1: enable
Compared 0 enable signal	K2604	K2704	K2804	K2904	K21804	K21904	K22004	K22104	0: disable, 1: enable
Compared 1 enable signal	K2607	K2707	K2807	K2907	K21807	K21907	K22007	K22107	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
Classification	Ch. 0	Ch. 1	Ch. 2	Ch.4	Ch.5	Ch. 6	Ch.7	Operation
Compared coincidence	K2612	K2712	K2812	K2912	K21812	K22012	K22112	0: Compared output Off
output signal 0	N2012	K2/12	K2012	K2912	K21012	KZ2012	NZZTIZ	1: Compared output On
Compared coincidence	K2613	K2713	K2813	K2913	K21813	K22013	K22113	0: Compared output Off
output signal 1	K2013	N2713	N2013	K2913	K21013	K22013	N22113	1: Compared output On

# • Comp. output point (P40 ~ P4F) setting

Γ

	<u></u>	014	01.0	01.0
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	NoUse 🗸 🗸	No Use	No Use	No Use
Unit time [ms]	No Use 🔥	1	1	1
Pulse/Rev value	P40 P41	1	1	1
)[III]	P42			

(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.

Count value	123456 12345	<u>57 123458 </u>	123459 1234	60 123461 123462
Compared output min. set value	0 <u> </u>		1234	160
Compared output Enable	0			
Compared output Output Signal	0			
External output (in case of designated output	t)			

- 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.

Count value 1	23456	123457	7 123458	8 12345	59 1234	60 12	3461 123462
Compared output ( Min. set value	D 0				1234	460	
Compared Output Enable Compared Output							<u>}</u>
output signal External output (in case of designated output	)					 	

# 3) Mode 2 (Count value = Compared value)

Γ

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.

Count value 1234	<u>56 123457 123458 12345</u>	59 123460 123461 123462
Compared output 0		
Min. set value	123457	
Compared Output 0		
Enable		
Compared Output 0		
output signal	J (	
External output	*	
(in case of designated out	tput)	

4) Mode 3 (Count value  $\geq$  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.

Count value	123456	123457	123458	123459	123460 123461 123462
Compared output	t <u>0</u>				
Min. set value					123460
Compared Outpu Enable	ut 0				
Compared Outpu	ut O			/	
Output signal			_		
External output				•	
(in case of desig	nated output)				-

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.

Count value	123456	123457 1234	123459	123460 123461 123462
Compared Outp	ut <u>0</u>			
Min. set value			123459	
Compared Outp	ut 0			
Output Enable		<b>I</b>		
Compared Outp	out 0			
Output signal			(	
External output				
(in case of desig	gnated output)			1

# 6) Mode 5

(Section comparison: Min. set value of Compared Output  $0 \le$  Count value  $\le$  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.

Count value	123456 12345	7 123458	123459 123460	× 123461 × 123462
Compared Output 0		_^ \	/	
Min. set value		123458		
Compared Output 0 Max. set value			123460	
Compared Output 0 output Enable				
Compared Output 0 output signal		[ <del>/</del>	(	/
External output (in case of designat	ed output)			

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

Γ

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.

Count value 123456	123457 123458 1234	<u>59 123460 123461 123462</u>
Compared Output 0		
Min. set value	123457	
Compared Output 0		123461
Max. set value	<u>↓                                    </u>	
Compared Output 0		
output Enable		
Compared Output 0	+/	/
output signal		
External output	×	*
(in case of designated	L	

# (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								
Classification								Ch.7	
Carry signal	K2610	K2710	K2810	K2910	K21810	K21910	K22010	K22110	

# (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 a	rea per ch	annel		
Classification Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	
Borrow signal	K2611	K2711	K2811	K2911	K21811	K21911	K22011	K22111

# (6) Revolution/Unit time

Γ

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.

Parameter	CH 4	CH 5	CH 6	CH 7
Counter mode	Ring	Linear	Linear	Linear
Pulse input mode	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1	1-Phs 1-In x1
Internal preset	0	0	0	0
External preset	0	0	0	0
Ring Counter Min. Value	0	0	0	0
Ring Counter Max. Value	3000	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	No use	No use	No use	No use
Unit time [ms]	1000	1	1	1
Pulse/Rev value	500	1	1	1

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

Class		Device per each channel (Word)							
Class	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	range
Unit time	K322	K352	K382	K412	K2242	K2272	K2302	K2332	1~60000ms
Pulse/Rev value	K323	K353	K383	K413	K2243	K2273	K2303	K2333	1~60000

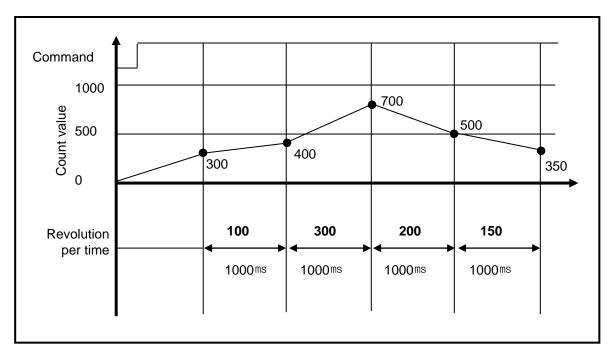
2) In case of using Rev/unit time function, enable the following special K area

Class		Operation							
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Operation
Rev/unit time command	K2605	K2705	K2805	K2905	K21805	K21905	K22005	K22105	0: disable 1: enable

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

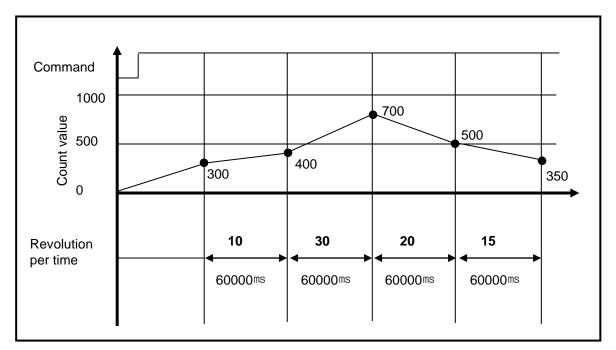
Class	Device per each channel (Word)								
	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ref.
Rev/unit time	K264	K274	K284	K294	K2184	K2194	K2204	K2214	-

- (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. In case of DMUL operation, RPM value is saved 64 bit in D100~D103. If operated RPM value is used, it can use to Word or Dword type according to system (case of RPM value is small number).

D100 (RPM value) = k	<264 (number of	revolution pe	r second) X 60	(second)				
F00099					DMUL	K0264	60	D00100
Always ON								



(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

Γ

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	Class Device area per channel								
Class	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Operation
Count latch	K2606	K2706	K2806	K2906	K21806	K21006	K22006	K22106	0: disable
command	112000	1\2700	112000	112900	1121000	K21906	r22006		1: enable

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

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

#### (8) Preset function

It changes the current value into preset value.

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

n Speed Counter Module				
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 value	0	0	0	0
Comp output mode	(Magnitude)<	(Magnitude)<	(Magnitude)<	(Magnitude)<
Comp output min.	0	0	0	0
Comp output max.	0	0	0	0
Comp output point	No use	Nouse	No use	No use
Unit time [ms]	1	1	1	1
Pulse/Rev value	1	1	1	1

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

Туре		Area per each channel (Double word)								
туре	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ref.	
Internal preset value	K304	K334	K364	K394	K2224	K2254	K2284	K2314	_	
External preset value	K306	K336	K366	K396	K2226	K2256	K2286	K2316	_	

• 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.

Tupo			Area	i per each	n channel	(Bit)			Ref.
Туре	Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Rei.
Internal preset command	K2601	K2701	K2801	K2901	K21801	K21901	K22001	K22101	_
External preset allowance	K2602	K2702	K2802	K2902	K21802	K21902	K22002	K22102	_
External preset command	P008	P009	POOA	POOB	POOC	POOD	P00E	POOF	_

## 8.2 Installation and Wiring

ſ

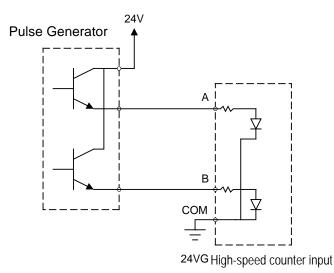
#### 8.2.1 Precaution for wiring

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

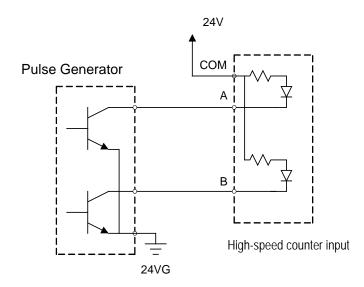
- (1) Surely use twisted pair shielded cable, grounded with 3 class applied.
- (2) Keep away from power cable or I/O line which may cause noise.
- (3) Stabilized power should be used for filter.
  - Connect A-phase only for 1-phase input.
  - Connect A-phase and B-phase for 2-phase input.

### 8.2.2 Example of wiring

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



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



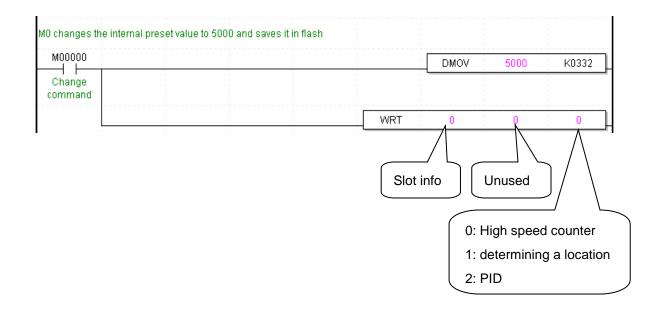
## 8.3 Internal Memory

#### 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 WRT command 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 an order command (M000), it moves (MOV) the new internal preset value (5000) to the CH1 present area (K332).
  - To save the changed settings into flash, it uses WRT command. At the moment, slot information is set to '0' in case of built-in function.



#### Remark

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

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

## (1) "E" type

Γ

## (a) Parameter setting

Parameter		Description	De	vice area	per char	inel	Remark
Falametei	Value	Setting	Ch 0	Ch 1	Ch 2	Ch 3	Reindik
Counter	h0000	Linear count					
mode	h0001	Ring count	K300	K330	K360	K390	Word
	h0000	1 phase 1 input 1 multiplication					
Pulse input	h0001	1 phase 2 input 1 multiplication	1/2014	1/004	KOCA	1/004	
mode	h0002	CW/CCW	- K301	K331	K361	K391	Word
	h0003	2 phase 2 multiplication					
	h0000	(Magnitude) <					
	h0001	(Magnitude) $\leq$					
	h0002	(Magnitude) =					
Comp.	h0003	(Magnitude) $\geq$	K302	K332	K362	K392	Word
Output mode	h0004	(Magnitude) >					
	h0005	(Range) Include					
	h0006	(Range) Exclude					
Internal							
preset value	-2,147,4	83,648 ~ 2,147,483,647	K304	K334	K364	K394	DWord
setting							
External							
preset value	-2,147,4	83,648 ~ 2,147,483,647	K306	K336	K366	K396	DWord
setting							

Parameter		Description	De	vice area	per char	inel	Remark
Falameter	Value	Setting	Ch 0	Ch 1	Ch 2	Ch 3	Kennark
Ring counter Max. value setting	-2,147,483	648 ~ 2,147,483,647	K310	K340	K370	K400	DWord
Comp. Output Min. value setting	-2,147,483	648 ~ 2,147,483,647	K312	K342	K372	K402	DWord
Comp. output Max. value setting	-2,147,483	648 ~ 2,147,483,647	K314	K344	K374	K404	DWord
Comp. output point designation	HFFFF h0000 h0001 h0002 h0003 h0004 h0005 h0006 h0007	No use           P0020           P0021           P0022           P0023           P0024           P0025           P0026           P0027	K320	K350	K380	K410	Word
Unit time [ms]		1 ~ 60,000	K322	K352	K382	K412	DWord
Pulse/Rev.value		1 ~ 60,000	K323	K353	K383	K413	DWord

٦

## (b) Operation command

Γ

Parameter		Device are	ea per channel	
Parameter	Ch 0	Ch 1	Ch 2	Ch 3
Counter enabling	K2600 K2700		K2800	K2900
Internal preset	K2601	K2701	K2801	K2901
designation of counter	N2001	N2701	N2001	K2901
External preset enabling	K2602	K2702	K2802	K2902
of counter	N2002	N2702	N2002	N2902
Designation of	K2603	K2703	K2803	K2903
decremental counter	N2003	N2703	N2003	N2903
Comp. output enabling	K2604	K2704	K2804	K2904
Enabling of revolution	K2605	K2705	K2805	K2905
time per unit time	N2005	N2705	N2003	N2903
Designation of latch	K2606	K2706	K2806	K2906
counter	12000	112700	12000	12300
Carry signal (Bit)	K2610	K2710	K2810	K2910
Borrow signal	K2611	K2711	K2811	K2911
Comp. output signal	K2612	K2712	K2812	K2912

(c) Area of monitoring

Parameter		Remark			
Parameter	Ch 0	Ch 1	Ch 2	Ch 3	Remark
Current counter value	K262	K272	K282	K292	DWord
Revolution time per unit time	K264	K274	K284	K294	DWord

## (2) "S(U)" type

(a) Parameter setting

		Description	De	vice area	per chan	inel	
Parameter	Value	Setting	Ch 0	Ch 1	Ch 2	Ch 3	Remark
	value	Setting	Ch 4	Ch 5	Ch 6	Ch 7	
Counter	h0000	Linear count	K300	K330	K360	K390	Word
mode	h0001	Ring count	K2220	K2250	K2280	K2310	voiu
	h0000	1 phase 1 input 1 multiplication	1/201	1/224	Kaca	1/201	\A/ord
Pulse input	h0001	1 phase 2 input 1 multiplication	- K301	K331	K361	K391	Word
mode setting	h0002	CW / CCW	1/0004	1/0054	1/0004	1/0044	\A/and
Setting	h0003	2 phase 4 multiplication	K2221	K2251	K2281	K2311	Word
	h0000	(Magnitude) <					
	h0001	(Magnitude) ≤	1/2000	1/000	Kaca	1/2020	
Comp.	h0002	(Magnitude) =	K302	K332	K362	K392	
Output 0 mode	(Magnitude) ≥					Word	
setting	h0004	(Magnitude) >					
Soung	h0005	(Range) Include	K2222	K2252	K2282	K2312	
	h0006	(Range) Exclude					
	h0000	(Magnitude) <					
Comp.	h0001	(Magnitude) $\leq$	- K303	K333	K363	K393	
Output 1	h0002	(Magnitude) =	1,000	1000	1000	1030	
mode	h0003	(Magnitude) ≥					Word
setting	h0004	(Magnitude) >	_				
	h0005	(Range) Include	K2223	K2253	K2283	K2313	
	h0006	(Range) Exclude					
Internal	0 4 47 400		K304	K334	K364	K394	DMand
preset value setting	-2,147,483	3,648 ~ 2,147,483,647	K2224	K2254	K2284	K2314	DWord
External			K306	K336	K366	K396	
preset value setting	-2,147,483	3,648 ~ 2,147,483,647	K2226	K2256	K2286	K2316	DWord

٦

		Description	De	vice area	per char	inel	
Parameter		0	Ch 0	Ch 1	Ch 2	Ch 3	Remark
	Value	Setting	Ch 4	Ch 5	Ch 6	Ch 7	
Ring counter			K308	K338	K368	K398	
min. value	-2,147,483	648 ~ 2,147,483,645	1/0000	1/0050	1/0000	1/0040	DWord
setting			K2228	K2258	K2288	K2318	
Ring counter			K310	K340	K370	K400	
max. value	-2,147,483	6,646 2,147,483,647	K2230	K2260	K2290	K2320	DWord
setting			12230	112200	112230	12320	
Comp. output			K312	K342	K372	K402	
min. value	-2,147,483	,648 ~ 2,147,483,647	K2232	K2262	K2292	K2322	DWord
setting			NZZJZ	112202	112292	NZJZZ	
Comp. output			K314	K344	K374	K404	
max. value	-2,147,483	,648 ~ 2,147,483,647	K2234	K2264	K2294	K2324	DWord
setting			112204	112204	112204	N2024	
	HFFFF	No use					
	h0000	P0020					
	h0001	P0021					
	h0002	P0022		K350	K380	K410	
	h0003	P0023	K320				
	h0004	P0024					
	h0005	P0025					
Comp. output 0	h0006	P0026					
point	h0007	P0027					Word
designation	h0008	P0028					
	h0009	P0029					
	h000A	P002A					
	h000B	P002B	K0040	K0070	K2200	K2330	
	h000C	P002C	K2240	K2270	K2300	r2330	
	h000D	P002D					
	h000E	P002E					
	h000F	P002F					

Γ

		Description	De	vice area	per char	nel	
Parameter	) (also	O attice a	Ch 0	Ch 1	Ch 2	Ch 3	Remark
	Value	Setting	Ch 4	Ch 5	Ch 6	Ch 7	
	HFFFF	No use					
	h0000	P0020					
	h0001	P0021					
	h0002	P0022					
	h0003	P0023	K321	K351	K381	K411	
	h0004	P0024					
	h0005	P0025					
Comp. output 1	h0006	P0026	-				
point	h0007	P0027					Word
designation	h0008	P0028					
	h0009	P0029					
	h000A	P002A					
	h000B	P002B	K2241	K2271	K2301	K2331	
	h000C	P002C	KZZ41	K2271	K2301	K2331	
	h000D	P002D					
	h000E	P002E					
	h000F	P002F					
Unit time [ms]		1 ~ 60,000 ms	K322	K352	K382	K412	Word
		1 00,000 ms	K2242	K2272	K2302	K2332	Word
		1 60.000	K323	K353	K383	K413	Word
Pulse/Rev.value		1 ~ 60,000	K2243	K2273	K2303	K2333	Word

٦

## (b) Operation command

Γ

Deremeter		Device area per channel								
Parameter	Ch 0	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7		
Counter enabling	K2600	K2700	K2800	K2900	K21800	K21900	K22000	K22100		
Internal preset designation of counter	K2601	K2701	K2801	K2901	K21801	K21901	K22001	K22101		
External preset enabling of counter	K2602	K2702	K2802	K2902	K21802	K21902	K22002	K22102		
Designation of decremental counter	K2603	K2703	K2803	K2903	K21803	K21903	K22003	K22103		
Comp. output 0 enabling	K2604	K2704	K2804	K2904	K21804	K21904	K22004	K22104		
Comp. output 1 enabling	K2607	K2707	K2807	K2907	K21807	K21907	K22007	K22107		
Enabling of revolution time per unit time	K2605	K2705	K2805	K2905	K21805	K21905	K22005	K22105		
Designation of latch counter	K2606	K2706	K2806	K2906	K21806	K21906	K22006	K22100		
Carry signal (Bit)	K2610	K2710	K2810	K29100	K21810	K21910	K22010	K22110		
Borrow signal	K2611	K2711	K2811	K29101	K21811	K21911	K22011	K22111		
Comp. output 0 signal	K2612	K2712	K2812	K29102	K21812	K21912	K22012	K22112		
Comp. output 1 signal	K2613	K2713	K2813	K29103	K21813	K21913	K22013	K22113		

## (c) Area of monitoring

Descentes		Device area per channel							
Parameter	Ch 0	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	
Current counter value	K262	K272	K282	K292	K2182	K2192	K2202	K2212	
Revolution per unit time	K264	K274	K284	K294	K2184	K2194	K2204	K2214	

#### 8.3.2 Error code

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

• Error occurred is saved in the following area.

Cotogony			De	evice area	per chanı	nel			Remark
Category	Ch0	Ch1	Ch2	Ch3	Ch4	Ch5	Ch6	Ch7	Remark
Error code	K266	K276	K286	K296	K2186	K2196	K2206	K2216	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(
22	* 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
21	* 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

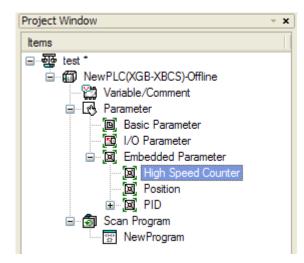
It describes examples of using high-speed counter.

(1)Setting high-speed counter parameter

ſ

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)<
omparator Output0 Min.Value	0	0	0	0
omparator Output0 Max.Value	0	0	0	0
omparator Output1 Min.Value	0	0	0	0
omparator 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

LSELECTRIC | 8-50

(c) Turn 'ON' the high-speed counter Enable signal (CH0:K2600) in the program.

High-speed counter E	nable signal (C	h.0: K2600) is	On.		
F00099					K02600

- (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 2605 bit if among additional functions, rotation number function is used.

F00099	K02600
	/
	K02605

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

Write		<u>?</u> ×
NewPL	nment ameter	
<u>S</u> etting,	<u> </u>	Cancel

#### (2) Monitoring and setting command

Γ

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

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



😬 Data Tra<u>c</u>es

Special Module	List			×
Base		Slot	Module	
👔 Base O		Internal	HSC Module (Open-Collector, 4-CH)	
🗂 Base O	ß	Internal	APM Module (Open-Collector, 2-CH)	
				-
				- 11
				-11
				1
•			I	
Module Info	,	<u>M</u> onit	tor Close	ו

ltem	СНО	CH 1
Current count value	0,10	
Revolution/Unit time		
Error Code		
Channel	CH 2	СНЗ
Current count value		
Revolution/Unit time		
Error Code		
FLAG Monitor		FLAG Monitor
ltem	Setting value	Current value
Channel	С	HO
Counter mode	Linear	
Pulse input mode	1-Phs 1-In x1	
Internal preset	0	
External preset	0	
Ring counter value	2	
Comp output mode	(Magnitude)≺	
Comp output min.	0	
Comp output max.	0	
Comp output point	No use	
Unit time [ms]	1	
Pulse/Revivalue	1	

(b) Clicking "Monitor\_ shows monitor and test window of high-speed counter.

٦

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 <sup>C</sup>Start Monitoring<sub>J</sub> shows the high-speed counter monitor display, in which you may set each parameter. At this moment, if any, changed values are not saved if power off=> on or mode is changed.

pecial Module Monitor		?>
High Speed Counter Mod	jule —	
Item	CH 0	CH 1
Current count value	0	0
Revolution/Unit time	0	0
Error Code	0	0
Channel	CH 2	СНЗ
Current count value	0	0
Revolution/Unit time	0	0
Error Code	0	0
FLAG Monitor		FLAG Monitor
ltem	Setting value	Current value
Channel	Cł	40
Counter mode	Linear	Linear
Pulse input mode	1-Phs 1-In x1 🛛 🔻	1-Phs 1-In x1
Internal preset	1-Phs 1-In x1	0
External preset	1-Phs 2-In x1	0
Ring counter value	CW/CCW 2-Phs x4	2
Comp output mode	(wagmicoe)<	(Magnitude)≺
Comp output min.	0	0
Comp output max.	0	0
Comp output point	No use	No use
Unit time [ms]	1	1
Pulse/Rev value	1	1
	Stop <u>M</u> onitor	ing <u>T</u> est
		Close
		01036

Γ

(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).

Item	CH 0	CH 1	CH 2	СНЗ
CARRY flag	OFF	OFF	OFF	OFF
BORROW flag	OFF	OFF	OFF	OFF
Com. Output's output	OFF	OFF	OFF	OFF
Command	CH 0	CH 1	CH 2	СН 3
Counter enable	OFF	OFF	OFF	OFF
Count internal preset	OFF	OFF	OFF	OFF
Count external preset	OFF	OFF	OFF	OFF
Decremental counter	OFF	OFF	OFF	OFF
Comparison function	OFF	OFF	OFF	OFF
Revolution/Unit time	OFF	OFF	OFF	OFF
Latch counter	OFF	OFF	OFF	OFF

# **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.

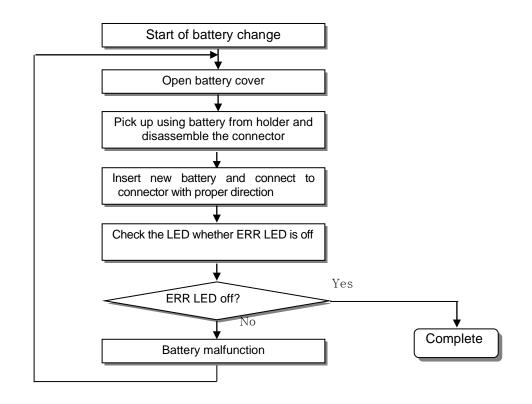
Since battery works properly for long time, after battery voltage low warning, so the user can take the action after battery voltage low warning occurred.

### 9.1.4 How to change battery

ſ

The user should change the battery used to save the program and backup the data in case of power failure periodically. Though the user eliminate the battery, it works for 30 minute by super capacitor. 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 without RTC
  - Refer to 4.5 Data backup time for more details.

## 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 『Online』 의 『PLC Information』.
    - 2) Click PLC RTC tap of PLC Information』.

	Disco <u>n</u> nect Connection Se <u>t</u> tings	PLC Information - NewPLC
1	Change Mode <u>B</u> ead, <u>Write</u> Compare with PLC Set Flash Memory	CPU Performance Password PLC RTC State PLC RTC is set
	Control Redundancy Reset PLC Clear PLC Clear All PLC PLC Information PLC History PLC Errors/Warnings	Date 2003-04-07 ★ Synchronize PLC with PC clock Send to PLC
•	J/O Information Save PLC History Eorce I/O Skip I/O Fault Mask Module Changing Wizard Dage Charging Wizard	
e E K	Base Changing Wizard,           Start Online Editing         Ctrl+Q           Write Modified Program         Ctrl+W           End Online Editing         Ctrl+W	Close

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

#### (b) Reading by special relay

The user can monitor as follows by special relay.

Special relay area	Data	Contents
F053	H0710	10year 07month
F054	H1729	29date 17hour
F055	H1020	10second 20minute
F056	H2004	20XXyear, Thursday

F00098 MOV h0709 K0000 + +0 MOV K0001 h1214 MOV h2040 K0002 MOV h2002 K0003 M00000 DATEWR K0000  $\dashv$ 9 END 12

(c) Modification of clock data by p	program
-------------------------------------	---------

Γ

area	Content
M0000	Month, year
M0001	Hour, date
M0002	Second, minute
M0003	Centaury, day

Write clock data to temporary device (P, M, K, L, Z, U, D, R) and turn on/off input contact point M0100. (If date and day data is not matched, Write is not available.) Monitor and check the above special area (F053~F056)

(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)

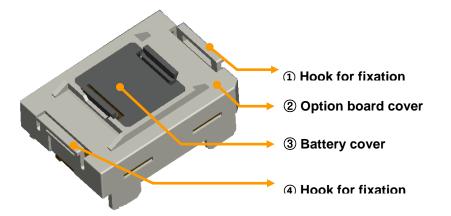
Operating temperature	Max deviation (second/day)
0 °C	-5.5 ~ 1.5
<b>25</b> ℃	-2.2 ~ 2.2
<b>55</b> ℃	-7 ~ 1

#### 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 25H4) 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.

# 9.3 Name and Function of Each Part

(1) Describes the name and function of each part



No.	Name	Contents		
14	Hook for	Hook for fixing the option board to main unit		
	fixation	<b>~</b> .		
2	Option board	► Option board cover		
Ŀ	cover			
3	Battery cover	► Battery cover		

1

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



Γ

# **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.

Itom		DC input specification			
	Item	XBO-DC04A	Remark		
Input point		4 points (supports high-speed counter function			
		when installed at standard type)			
Insulation Me		Photo coupler insulation			
Rated input v	-	DC24V			
Rated input c	current	About 10 <sup>mA</sup>			
Voltage range	9	DC20.4~28.8V (ripple rate within 5%)			
On voltage /	On current	DC19V or above / 3 <sup>mA</sup> or above			
Off voltage /	Off current	DC6V or less / 1 <sup>mA</sup> or less			
Input resistar	nce	About 2.7 <sup>k</sup>			
Response	$\text{Off} \to \text{On}$	1/3/5/10/20/70/100ms (set through I/O parameter)			
time	$On \rightarrow Off$	Initial value: 3 <sup>ms</sup>			
Common method		4 points / COM	"		
High speed	Performance	4kpps 4 channels (based on 1 phase)	when installed at		
counter	Mode	Linear counter	standard type		
		Circuit configuration			
	IN		Standard/ economic type		

# **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

Γ

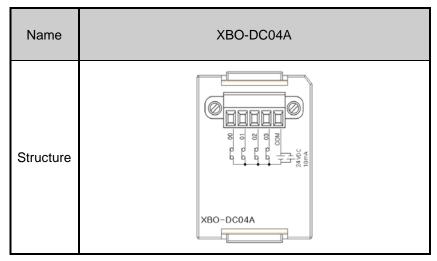
ltem		Specification		
		XBO-DC04A		
	Signal	A-phase, B-phase		
Count input signal	Input type	Voltage input (Open collector)		
Signal	Signal level	DC 24V		
Max. co	unt speed	4kpps		
No. of	1 phase	4kpps 4 channels		
channels	2 phase	2kpps 2 channels		
Coun	it range	Signed 32 Bit (-2,147,483,648 ~ 2,147,483,647)		
Count type (Program setting)		Linear count (if it exceeds 32-bit range, Carry/Borrow occurs)		
	t mode	1-phase input		
(Progra	m setting)	2-phase input		
Sign	al type	Voltage		
	1-phase input	Increasing/decreasing operation setting by B-phase input		
Up/Down	r-priase input	Increasing/decreasing operation setting by program		
setting	2-phase input	Automatic setting by difference in phase		
Multiplication	1 phase input	1 multiplication		
function	2 phase input	2 multiplication		
Count	t 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	<b>10</b> mA
On guranteed voltage (min.)	20.4V
Off guranteed voltage (max.)	6V

## 10.2.2 Name of Each Part

(1) Name of each part



٦

Terminal	Na	me	Usage			
No.	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		
СОМ	Input common	Input common	Common terminal	Common terminal		

(2) Interface with external devices

Γ

The following table describes interface with external devices

		Terminal	Się	gnal	on	Input
I/O			1-phase	2-phase	Operation	guaranteed voltage
			CH0	CH0	On	20.4~28.8V
	2.7 kΩ	00	Pulse input	A-phase input	Off	6V or less
			CH 1	CH0	On	20.4~28.8V
	2.7 kΩ	01	Pulse input	B-phase input	Off	6V or less
Input	<b>4 Δ 2.7 k</b> Ω		CH 2	CH2	On	20.4~28.8V
	2.7 kΩ	02	Pulse input	A-phase input	Off	6V or less
			CH 3	CH0	On	20.4~28.8V
		03	Pulse input	B-phase input	Off	6V or less
		СОМ	COM(Inpu	it 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

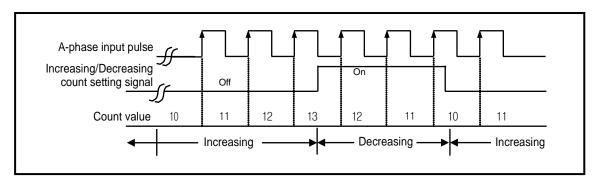
b) Increasing/decreasing count operation by B-phase input signal

- 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



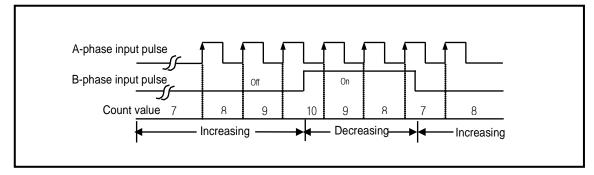
- b) Increasing/decreasing count operation by B-phase input signal
  - •1-phase 2-input 1-multiplication

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

Γ

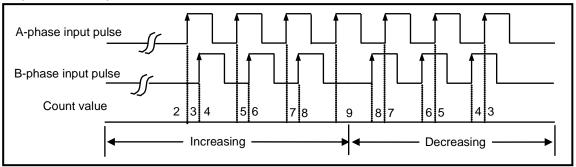


#### 2) 2-phase count mode

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.

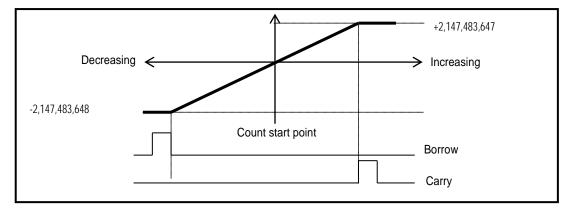
• Operation example



(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 Count 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

ſ

- (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'.

Turpo		Ref.			
Туре	CH0	CH1	CH2	CH3	Kel.
When mounted at slot no.9	U9.0.6	U9.8.6	U9.16.6	U9.24.6	0: Disable
When mounted at slot no.10	UA.0.6	UA.8.6	UA.16.6	UA.24.6	1: Enable

(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.

Tuno	Area per each channel (Double word)						
Туре	CH0	CH1	CH2	CH3	Ref.		
Slot no. 9 internal preset value	U9.6	U9.14	U9.22	U9.30			
Slot no. 10 internal preset value	UA.6	UA.14	UA.22	UA.30			

• Preset command is specified through the following U area

Turno	Area per each channel (bit)						
Туре	CH0	CH1	CH2	CH3	Ref.		
Internal preset command	U9.0.1	U9.8.1	U9.16.1	U9.24.1	0: Disable		
Internal preset command	UA.0.1	UA.8.1	UA.16.1	UA.24.1	1: Enable		

## 10.3 Installation and Wiring

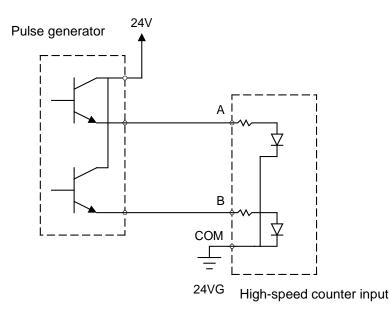
## **10.3.1 Precaution for wiring**

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

- (1) Surely use twisted pair shielded cable, grounded with 3 class applied.
- (2) Keep away from power cable or I/O line which may cause noise.
- (3) Stabilized power should be used.
  - ► Connect A-phase only for 1-phase input.
  - ► Connect A-phase and B-phase for 2-phase input.

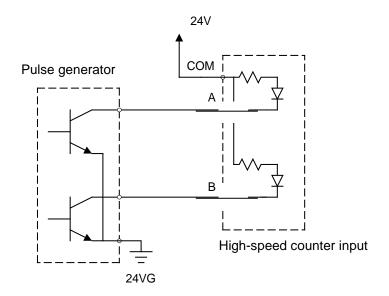
#### 10.3.2 Example of wiring

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



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

Γ



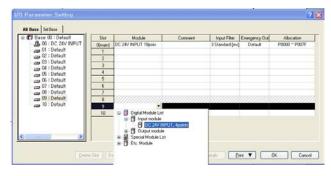
### 10.4 Internal Memory

#### 10.4.1 Special area for High-speed counter

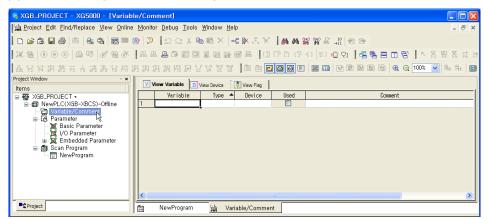
U device is used for parameter and operation command area of built-in high-speed counter.

This chapter describes on 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]

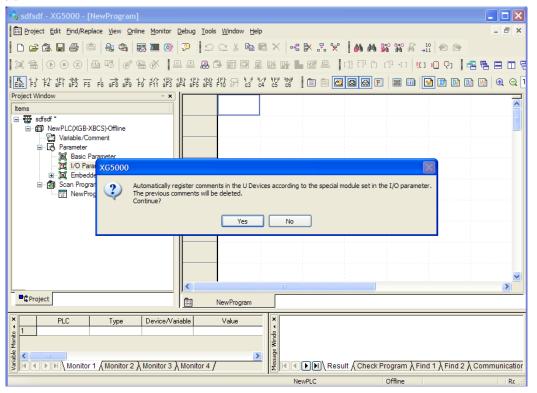


(c) Select 'Register U device' on menu 'Edit'

🔩 XGB_PRC	JECT - XG500	0 - [Variable	e/Com	ment]					
🕍 Project 🗄	dit <u>F</u> ind/Replace	⊻iew <u>O</u> nline	<u>M</u> onitor	<u>D</u> ebug <u>T</u> oo	ols <u>W</u> indow	<u>H</u> elp			_ 8 ×
I L 🗁 🖾 🖉	∑ <u>U</u> ndo ≚ <u>R</u> edo	Ctrl+Z Ctrl+Y	9	⊆⊆ <b>∦</b>	, 🖻 🖻 🗙		64.64	¥ ¥ 🖧 📲 🔿 👁	
1 🗆 🖀   0 🥉	Cut	Ctrl+X		<b>8</b> • 11		<b>e e e</b> (1	) []] []] []]	+0   \$0 🕲 🕹 📲 🚍 🛄	😚 🛛 🔨 昌 智 器 肩 詩
ELSC F3 F4	<u>C</u> opy	Ctrl+C	sP4 sP	3 \$8 FB FF	348	😻 💼 🚺	5 🖾 🖾 E	] 📰 🔟 🔽 🕅 🐨 🚱	ର୍ 100% 🔽 ମିନ ମିନ 📰
Project windo ~	<u>P</u> aste	Ctrl+V	N/ Nr		-	International I			
Items >	<u>D</u> elete	Del	V	P	D View Device	View Flag			1
⊟ 퍫 XGB	Select All	Ctrl+A		Variable	Туре	<ul> <li>Device</li> </ul>	Used	Conment	
ė- 🗊 👌 🚬	Insert Line	Ctrl+L							
	C Delete Li <u>n</u> e	Ctrl+D							
	Export Variable:	s to <u>F</u> ile							
G	Register U Devi	ce N							
⊡-€		. Variable							
	Move Item Up								
	Move Item Dow	'n							
			<						
Project			<b></b>	NewProgram	n 🕍 '	Variable/Comme	nt		

(d) Click 'Yes'.

ſ



#### (e) Variables are registered as follows.

ariat	le Moni	toring \	Vindow			
	PLC	Туре	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		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

#### Note

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

Turpo	D	Ref.			
Туре	CH0	CH1	CH2	CH3	Rei.
Enable counter	U9.0.0	U9.8.0	U9.16.0	U9.24.0	BIT
Enable internal preset	U9.0.1	U9.8.1	U9.16.1	U9.24.1	BIT
Count inc/dec flag	U9.0.3	U9.8.3	U9.16.3	U9.24.3	BIT
Latch counter enable	U9.0.6	U9.8.6	U9.16.6	U9.24.6	BIT
Pulse input mode	U9.5	U9.13	U9.21	U9.29	INT
Internal preset setting value	U9.6	U9.14	U9.22	U9.30	DINT

٦

#### (b) Monitor area

Turpo	D	Device area per each channel					
Туре	CH0	CH1 CH2 CH3		Ref.			
Carry flag	U9.1.0	U9.9.0	U9.17.0	U9.25.0	BIT		
Borrow flag	U9.1.1	U9.9.1	U9.17.1	U9.25.1	BIT		
Current counter value	U9.2	U9.10	U9.18	U9.26	DINT		
Error code	U9.4	U9.12	U9.20	U9.28	INT		

### (3) No. 10 slot device area

#### (a) Action command

Turpo	D	Ref.			
Туре	CH0	CH1	CH2	CH3	Rei.
Enable counter	UA.0.0	UA.8.0	UA.16.0	UA.24.0	BIT
Enable internal preset	UA.0.1	UA.8.1	UA.16.1	UA.24.1	BIT
Count inc/dec flag	UA.0.3	UA.8.3	U9.16.3	UA.24.3	BIT
Latch counter enable	UA.0.6	UA.8.6	UA.16.6	UA.24.6	BIT
Pulse input mode	UA.5	UA.13	UA.21	UA.29	INT
Internal preset setting value	UA.6	UA.14	UA.22	UA.30	DINT

## (b) Monitor area

Turpo	D	Ref.				
Туре	CH0	CH1	CH2	CH3	itel.	
Carry flag	UA.1.0	UA.9.0	UA.17.0	UA.25.0	BIT	
Borrow flag	UA.1.1	UA.9.1	UA.17.1	UA.25.1	BIT	
Current counter value	UA.2	UA.10	UA.18	UA.26	DINT	
Error code	UA.4	UA.12	UA.20	UA.28	INT	

## (4) Parameter setup

Γ

#### (a) Action command

Turpo	Device st	Device status information (based on slot 9, ch0)				
Туре	CH0	Information	Ref.			
Enable counter	U9.0.0	0: disable, 1: enable	BIT			
Enable internal preset	U9.0.1	0: disable, 1: enable	BIT			
Count inc/dec flag	U9.0.3	0: INC, 1: DEC	BIT			
Latch counter enable	U9.0.6	0: disable, 1: enable	BIT			
		0: 1-phase 1-input				
Pulse input mode	U9.5	1: 1-phase 2-input	INT			
		2: 2-phase 2 multiplication				
Internal preset setting value	U9.6	-2,147,483,648 ~ 2,147,483,647	DINT			

## (b) Monitor area

Turoo	Device st	Device status information (based on slot 9, ch0)				
Туре	CH0	Information	Ref.			
Carry flag	U9.1.0	0: disable, 1: enable	BIT			
Borrow flag	U9.1.1	0: disable, 1: enable	BIT			
Current counter value	U9.2	-2,147,483,648 ~ 2,147,483,647	DINT			
Error code	U9.4	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	
22	* CH1(3) is not available when CH0(2) operate as 2-phase mode	
25	Internal preset value exceeded counter range	

#### Note

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 on 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

F00099				HOV	1.0001	U09.05
				MOV	h0001	008.05

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

Input value to pr	eset					
M00000				MOV	h0010	U09.06

#### Preset Enable signal ON

M00001			U09.00.1
MUUUUI			009.00.1

- (c) Specify 'Latch counter' or 'Up/Down counter'
- (d) Turn on 'High-speed counter enable' signal

Turn on High-speed	Counter Enable	signal (No. 9	slot, No.0 c	h) of input op	tion board (XI	BO-DC04A)
F00099						U09.00.0

#### (2) Monitoring

You can check option board high-speed counter value by registering U9.2 (no.0 slot, no.0 ch) at variable mornitring window or program.

Γ

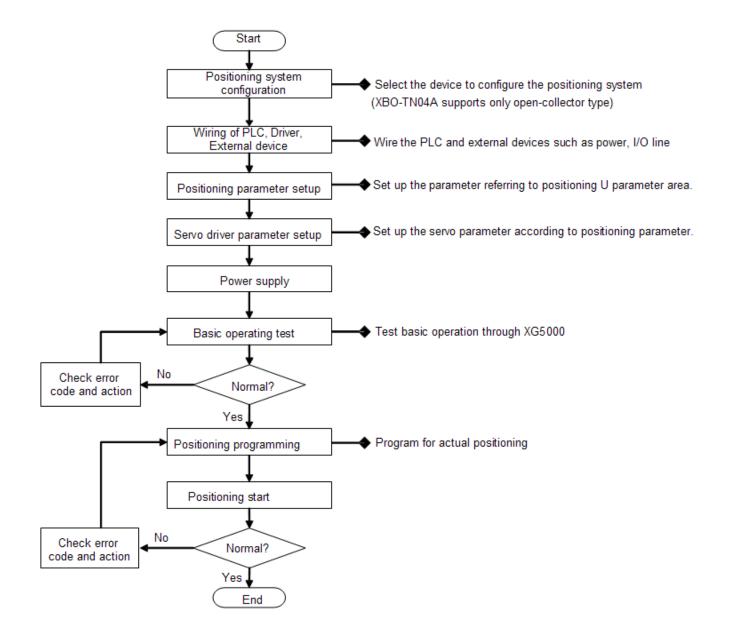
# **Chapter11 TR Output Option Board**

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

# 11.1 TR Output Option Board Operation Sequence of Positioning

## 11.1.1 Operation Sequence of Positioning

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



# 11.2 XBO-TN04A Specification

Γ

# 11.2.1 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 metho	bc	Photo coupler insulation		
Rated load volta	age	DC 24V		
Max. load curre	nt	0.5A/point, 2A/COM		
Surge killer		Zener diode		
Leakage curren	t when Off	0.1 <sup>mA</sup> or less		
Voltage drop wh	nen On	DC 1V or less		
Inrush current		3A, 10 <sup>ms</sup> or less		
Deepense time	$\text{Off} \to \text{On}$	1 <sup>ms</sup> or less		
Response time	Response time     On $\rightarrow$ Off     1 <sup>ms</sup> or less			
Operating indica	ator	-		
	No. of axes	2		
	Output method	Open collector method	When mounted	
Pulse output	Control unit	Pulse	on standard	
	Control speed	10kpps (One option board supported _ No. 9 slot)	type	
	Setting method	Setup by DST instruction		
		Circuit configuration		

# **11.3 Positioning Specification**

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

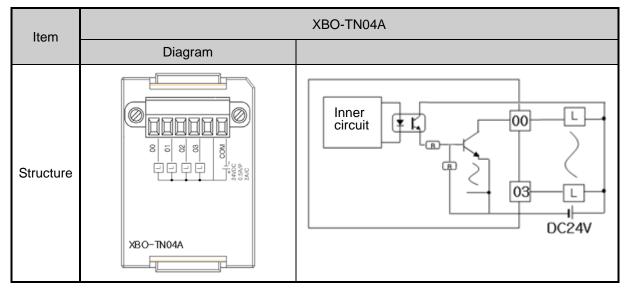
# **11.3.1 Performance Specification**

(1) Performance Specification

lte	Model m	XBO-TN04A				
No. c	of axes	2				
Cont	rol method	Position control, speed control				
Cont	rol unit	Pulse				
Po	Method	Incremental				
Positioning	Address range	-2,147,483,648 ~ 2,147,483,647(pulse)				
ling	Speed range	1 ~10,000pps(1pps unit)				
Manu	ual operation	JOG operation				
Hom	e return	By DOG				
Max. dista	connection nce	2 m				
Conr	nector	6 Pin connector				

# 11.3.2 Name of each part

(1) Name of each part



Connector	Output point No.		Description	Remark
Pulse	X-axis	X-axis 00 Positioning X-axis pulse string output point (Open collector output)		
output	Y-axis	01	Positioning Y-axis pulse string output point (Open collector output)	High
Direction	X-axis	02	Positioning X-axis direction output point (Open collector output)	Active
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

Γ

Basic option board output pulse is as follows.

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

# 11.3.3 Before Positioning

# (1) Positioning function list

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

1

Positioning function		description	Instruction	Ref.
Position control	Operation pattern	Speed Start command Dec. stop	DST	
	Operation	If the rising edge of start command is detected, it r speed to designated position, and complete sign supported)		-
Speed control	Operation pattern	Speed Start command Dec. stop	DST	
	Operation	If the rising edge of start command is detected, it n speed and stops after deceleration by stop cor complete signal will not be not on.		-

Position control

Position control is to move 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</li>
- 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 (+,-).

- In case Address is positive number: forward positioning (Direction increasing address)
- In case Address is negative number: reverse positioning (Direction decreasing address)
- (2) Speed control

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

• In case of speed control, 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.

#### Note

• For more information, refer to XGB positioning manual.

# **11.3.4 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.

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

#### Note

- \*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"

### 11.3.5 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

		Jog forward start	Jog backward start	Jog high speed/low speed
XBO- TN04A	X-axis	U9.1.8	U9.1.9	U9.1.A
	Y-axis	U9.17.8	U9.17.9	U9.17.A

- 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 ~ 100,000	( <b>Unit</b> : 1pps)
	Low speed jog operation	1 ~ jog high speed	

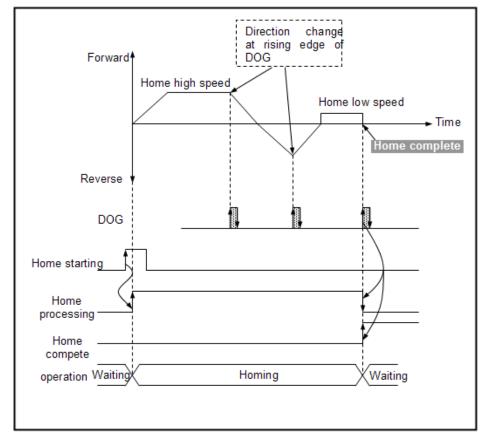
#### Remark

• Make sure to follow the cautions

Bias speed  $\leq$  Jog high speed  $\leq$  Speed limit

#### 11.3.6 Home return

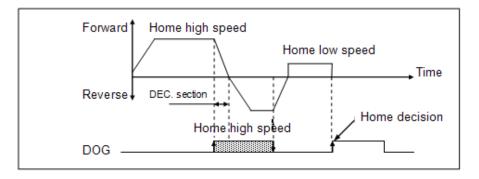
XBO-TN04A supports only "Home return by DOG".



(a) If 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.



# 11.3.7 Positioning Basic Parameter Setup

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

## (1) U device auto registration

Γ

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

						? 🗙
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
- 🔒 00 : DC 24V INPUT	0(main)	DC 24V INPUT 18poin		3 Standard [ms]	Default	P0000 ~ P007F
01 : Default	1					
02 : Default 03 : Default	2					
03 : Default	3					
05 : Default	4					
06 : Default	5					
🖂 07 : Default	6					
08 : Default 40 09 : TR OUTPUT, 40	7					
	8			8///////	[[[[[]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]	
a 10 : Default	9	TR OUTPUT, 4points( 💌			Default	P0400 ~ P043F
	10	Digital Module Lis     Digital Module Lis     Duput module     Duput module	e 1UT, 4points[sync]]			
Delete	Slot De	_		etails <u>P</u> i	int 🔻	OK Cancel

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

🍕 XGB_PROJECT - XG5000 - [Vari	able/Comment]	
🕌 Project Edit Find/Replace View Onl	ne <u>M</u> onitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u> elp	_ & ×
0 📽 🕼 🖶 🎒 🖄 😸 🛙	◎ 🖓 🗠 🗠 ½ 🛍 🛍 🗙 🔤 🛠 🎘 🛠 🦓 🖓 🖓 🖓 🖓 🖗 🛞	
	<   & @ @ @ @ @ @ @ @ @ @ @ @ @ @ @ @	K F3 ₩4 ₩5 ₩6 ₩7
Esc 1/3 1/4 \$11 \$12 F5 F6 \$78 \$79 1/3 F	: 洗洗洗洗洗テンンンVV 🚺 🖮 🗃 🗃 🖬 🖬 🖬 🖬 🖬 🖬 🖗 🔍	100% 🔽 🦻 🎘
Project Window ~	View Variable View Device	
Items Gradient Action	Variable Type A Device Used Comment	
MowPLC(V&B-XBCS)-Offline     Parameter     Basic Parameter     G    Vo Parameter     G    Vo Parameter     G    Scan Program     NewProgram		

(c) Select "Register U device" on menu 'Edit'.

🔩 XGB_PRO	JECT - XG5000	- [Variable	/Соп	nment]					
🕍 <u>P</u> roject <u>E</u> d	it <u>F</u> ind/Replace \	/iew <u>O</u> nline	<u>M</u> onito	r <u>D</u> ebug <u>T</u> ools	<u>W</u> indow <u>H</u> e	p			_ 8 ×
E   🚈 📼 🗆		Ctrl+Z Ctrl+Y	🦻	122×6	6 @ ×   •	e 🛃 🕫 😪	64 64 🔒	¥° ¥° Å →11 🕙 🕾	
101 432 (1	Cut	Ctrl+X						- 1 (1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
ESC FO F4	<u>С</u> ору	Ctrl+C	(B) ( sF4 s	F\$ \$F6 F10 \$F7 6	1 4/1 401 401 64 c5 c6		1 🖸 🐼 F	📰 🖽   🗹 🖻 🖻 🖻 姆 🔍 100% 💌	9 F 9 F 📘
Troject windo	Paste Delete	Ctrl+V Del	VV	fiew Variable	View Device	View Flag			
⊡ - ∰g XGB	Select All	Ctrl+A		Variable	Туре 🔺	Device	Used	Comment	[]
	Insert <u>L</u> ine	Ctrl+L	-	L					
₫≯	Delete Li <u>n</u> e	Ctrl+D							
	Export Variables	to <u>F</u> ile							
6	Register U Device	• •							
i - C	Add EXTERNAL	Variable							
	Move Item Up								
	Move Item Down								
			<				Ш		>
Project			33 2	NewProgram	🕍 Var	iable/Comme	nt		

(d) Click 'yes'.

🗞 asdasd - XG5000			🔳 🗖 🗙
Project Edit End/Replace Yew Online Monitor De	ebug Iools Window Help		
	DOINGX CONSY M	NWWR BOO	
			2 2 2 2 3 4 9 2 3
			the second s
E62 F3 F4 sF1 sF2 F5 F6 sF8 sF9 F9 F11 sF3 Project Window - *	574 575 576 F10 377 83 84 85 85   LL III III III III III III III III II		
berns	RewProgram		
Seadod *      Seadod *	XC5000  Automatically register comments in the U Devices a Gondinue?  Yes  NewProgram  NewProgram	coording to the special module set in the I/O parameter.	
PLC Type Device/Vi	ariable Value Variable/Device		
2			
4 <	(X)		
3   4   4   ≥ ≥ \ Monitor 1 \ Monitor 2 \ Monitor 3	Amonitor 4 /	E A Result (Check Program ) Find 1 ) Find	
		NewPLC Offine	Row 0, Column 0 Overwrite

1

#### (e) Variables are registered as the screen below.

Va	Variable Monitoring Window E							
Γ		PLC	Туре	Device/Vari	Value	Variable/Device	Comment	^
ŀ	1	NewPLC	BIT	U09.00.0	10	_0009_POS_X_Busy	XAxis BUSY	
	2	NewPLC	BIT	U09.00.1	10	_0009_POS_X_Err	XAxis Error	
	3	NewPLC	BIT	U09.00.2	10	_0009_POS_X_Done	XAxis Position Complete	
4	4	NewPLC	BIT	U09.00.3	10	_0009_POS_X_OriginFix	XAxis Origin Fix	
Į	5	NewPLC	BIT	U09.00.4	10	_0009_POS_X_OutInhibit	XAxis Output Inhibit	
Ī	6	NewPLC	BIT	U09.00.5	10	_0009_POS_X_Stop	XAxis Stop	
	7	NewPLC	BIT	U09.00.6	10	_0009_POS_X_ULimit	XAxis Upper Limit Detection	
Ī	8	NewPLC	BIT	U09.00.7	10	_0009_POS_X_LLimit	XAxis Lower Limit Detection	
	9	NewPLC	BIT	U09.00.8	10	_0009_POS_X_Estop	XAxis Emergency Stop	
ŀ	10	NewPLC	BIT	U09.00.9	10	_0009_POS_X_Dir	XAxis CW/CCW	
ŀ	11	NewPLC	BIT	U09.00.A	10	_0009_POS_X_Acc	XAxis Move Status(Acceleration)	
ŀ	12	NewPLC	BIT	U09.00.B	10	_0009_POS_X_Const	XAxis Move Status(Constant)	=

## Note

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.

Γ

ltem	Data type	Signal direction	Status information		a for oning
		unection			Y-axis
BUSY			0: Stop, 1: Run	U9.0.0	U9.16.0
Error			0: No error, 1: Error occurred	U9.0.1	U9.16.1
Positioning complete			0: not complete, 1: complete	U9.0.2	U9.16.2
Home determination			0: not determined, 1: determined	U9.0.3	U9.16.3
Outrast much ikita d			0: output available,		
Output prohibited			1: output prohibited	U9.0.4	U9.16.4
Stop status			0: not stop status, 1: stop status	U9.0.5	U9.16.5
Upper limit			0: not detect, 1: detect	U9.0.6	U9.16.6
Lower limit			0: not detect, 1: detect	U9.0.7	U9.16.7
			0: normal status,		
EMG. Stop			1: EMG. Stop status	U9.0.8	U9.16.8
CW/CCW			0:CW, 1:CCW	U9.0.9	U9.16.9
		-	0: not accelerating ,		
Operation status (accelerating)		Output	1: accelerating	U9.0.A	U9.16.A
		(monitoring)	0: not steady status,	U9.0.B	U9.16.B
Operation status (steady status)			1: steady status		
	BOOL		0: not decelerating ,	U9.0.C	U9.16.C
Operation status (decelerating)			1: decelerating		
			0: not under position control		
Position control			1: under position control	U9.0.D	U9.16.D
			0: not under speed control		
Speed control			1: under speed control	U9.0.E	U9.16.E
			0: not under home return		
Home return			1:under home return	U9.0.F	U9.16.F
			0: not under JOG low speed		
JOG low speed			1: under JOG low speed	U9.1.0	U9.17.0
			0: not under JOG high speed		
JOG high speed			1: under JOG high speed	U9.1.1	U9.17.1
			0: JOG stop,		
Forward JOG start			1: forward JOG start	U9.1.8	U9.17.8
		Input	0: JOG stop,		U9.17.9
Reverse JOG start			1: Reverse JOG start	U9.1.9	

# Chapter 11 TR Output Option Board

ltem	Data type	Signal direction	Status information		ea for ioning
		unection		X-axis	Y-axis
JOG low/high speed			0: JOG low speed,	U9.1.A	U9.17.A
JOG IOW/Tight speed			1: JOG high speed	09.1.A	09.17.A
DOG			Operate at rising edge	U9.1.B	U9.17.B
Upper limit signal			Detected at falling edge	U9.1.C	U9.17.C
Lower limit signal			Detected at falling edge	U9.1.D	U9.17.D
Home return direction	BOOL	logut	0: CW, 1: CCW	U9.1.E	U9.17.E
Positioning status	BOOL	Input	0: disable, 1: enable	U9.1.F	U9.17.F
Current position	DINT		-2,147,483,648 ~ 2,147,483,647	U9.2	U9.18
Current speed	WORD	Output	1 ~ 10,000[pulse/s]	U9.4	U9.20
Error code	WORD		Indicates positioning error	U9.5	U9.21
Bias speed	WORD		1 ~ 10,000[pulse/s]	U9.6	U9.22
Speed limit	WORD		1 ~ 10,000[pulse/s]	U9.7	U9.23
Acc. time	WORD		0 ~ 10,000[unit: ms]	U9.8	U9.24
Dec. time	WORD		0 ~ 10,000[unit: ms]	U9.9	U9.25
Home address	DINT	Input	-2,147,483,648 ~ 2,147,483,647	U9.10	U9.26
Home return high speed	WORD	1	1 ~ 10,000[pulse/s]	U9.12	U9.28
Home return low speed	WORD	1	1 ~ 10,000[pulse/s]	U9.13	U9.29
JOG high speed	WORD		1 ~ 10,000[pulse/s]	U9.14	U9.30
JOG low speed	WORD	]	1 ~ 10,000[pulse/s]	U9.15	U9.31

1

## Note

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

# **11.4 Positioning Instruction List**

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

Instructi			XGB built-in
on	Command	Command condition	positioning
On			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	Slot, command axis, disable/enable pulse output	5.2.20
ULK	prohibition cancel	Siot, command axis, disable/enable pulse output	5.2.20

#### (1) XBO-TN04A positioning instruction

### Note

ſ

- 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.

F00099	MOV	1	U09.06	X-axis bias speed
	MOV	10000	U09.07	Speed limit
	MOV	2000	U09.08	X acc. time
	MOV	2000	U09.09	X dec. time
	MOV	8000	U09.14	X JOG high speed
	MOV	7500	U09.15	X JOG low speed
	MOV	1	U09.22	Y-axis bias speed
	MOV	10000	U09.23	- Speed limit
	MOV	2000	U09.24	Y acc. time
	MOV	2000	U09.25	Y dec. time
	MOV	8000	U09.30	Y JOG high speed
	MOV	1000	U09.31	Y JOG low speed

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



M00001					CLR	9	0	1
M00002					PRS	9	0	0
мооооз —						EMG	9	0
M00004					STP	9	0	100
M00011	DST	9	0	80000	10000	0	0	0
M00011	DST	9	1	80000	10000	0	0	0

#### (c) Set up the function as follows.

# (2) Monitoring

Γ

You can check option board posioing speed, crrent position by regstering U9.2, U9.4(No. 9 slot, X-axis) at variable monitor window or program

# **Chapter12 Memory Module**

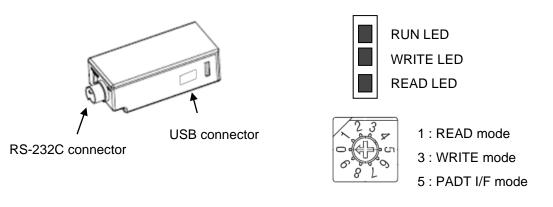
# **12.1 Memory Module Specification**

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	1. RUN 2. WRITE 3. READ
Operating mode setup	Mode setup by rotary switch	
Operating power supply	RS-232C communication connecter, USB connector	5V
Purpose	For moving	

### 12.1.2 Memory module structure



#### Note

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

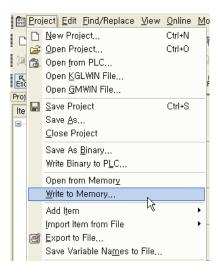
### 12.1.3 How to use memory module

- (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.

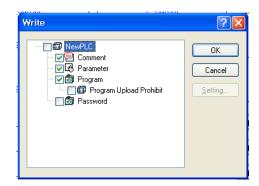
With the above handling, you can run PLC with program saved in memory module

#### (3) Save program of XG5000at the memory module

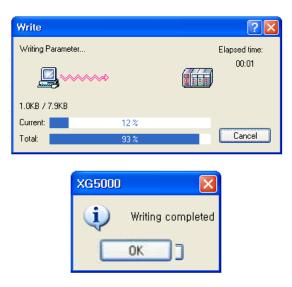
- (a) Set the mode switch of XBO-M2MB as "5" and connect XBO-M2MB to USB port of PC
- (b) Select Project  $\rightarrow$  Write to Memory on XG5000 menu.



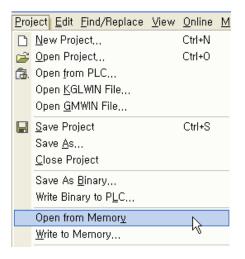
(c) 'Write' window is created as follows.



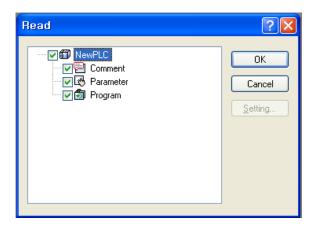
(d) "Writing completed" window appears.



- (e) With above method, through PADT, you can save program, parameter, communication parameter at XBO-M2MB
- (4) Open from memory module
  - (a) Set the mode switch of XBO-M2MB as "5" and connect XBO-M2MB to USB port of PC
  - (b) Select "Project → Open from Memory" on XG5000 menu



(c) "Read" window is created as follows.



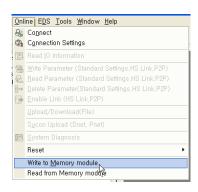
(d) "Reading is completed" window appears.



- (e) With above method, through PADT, you can save program, parameter, communication parameter from XBO-M2MB
- (5) Write to Memory module

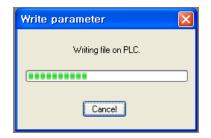
Γ

- (a) Set the mode switch of XBO-M2MB as "5" and connect XBO-M2MB to USB port
- (b) Click "Online  $\rightarrow$  Write to Memory module" on XG-PD menu



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

4	Write parameter(standard settings,HS link,	$\mathbf{X}$
	Image: Application of the set of t	
	OK Cancel	

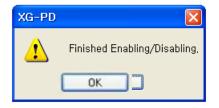


٦

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

E	nable Link(HS Link,P2P)	×
	KBCS-Master_232     KBCS-Master_232     High-speed Link     High-speed Link 01     High-speed Link 02     P2P(EIP) 01     P2P(EIP) 02     P2P(EIP) 03	
	Write Close	כ

(e) "Enable, Disable" window appears



#### (6) Read from Memory module

Γ

- (a) Set the mode switch of XBO-M2MB as "5" and connect XBO-M2MB to USB port of PC
- (b) Select "Online  $\rightarrow$  Read from Memory module" on XG-PD menu.

	<u>O</u> nli	ine E <u>D</u> S <u>T</u> ools <u>W</u> indow <u>H</u> elp				
	읍	Co <u>n</u> nect				
	<b>B</b>	C <u>o</u> nnection Settings				
c	B	Read <u>IO</u> Information				
-	鶕	Write Parameter (Standard Settings,HS Link,P2P)				
2		Read Parameter (Standard Settings,HS Link,P2P)				
2	8*	Delete Parameter(Standard Settings,HS Link,P2P)				
		Enable Link (HS Link,P2P)				
		Upload/Download(File)				
		Sycon Upload (Dnet, Pnet)				
	毄	<u>S</u> ystem Diagnosis				
		Reset +				
		Write to Memory module				
		Read from Memory module				
		- Line Line Line Line Line Line Line Line				

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

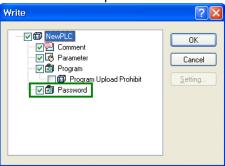
Read parameter(standard settings,HS link,	×
NewProject      NewPLC      Standard settings      Migh-speed Link      Migh-speed Link 01      Migh-speed Link 02      P2P(EIP)      P2P(EIP)      P2P(EIP) 01      P2P(EIP) 02      P2P(EIP) 03      P2P(EIP) 04      P2P(EI	
Read parameter	
Reading file from PLC.	
Cancel	

#### Note

- -. "Open from memory module" and "Write to Memory module" menus of PADT are activated when PLC is Offline. They are deactivated when PLC is Online.
- -. When connecting with PADT, connection type should be 'USB'

### 12.1.4 How to use when password is set

- (1) When connecting PADT with memory module
  - (a) When setting password at program and writing program to memory module, it is saved according to rotary switch operating mode without functions cancelling the password
    - 1) When writing program, check whether to use password at 'Write' window.



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

Password	
Your password must be Please set your passwor If the passwords betwee cannot write or read the	rd the same as the PLC. en memory module and PLC are different, you
Password	polec.
Password: Password Confirm:	
	<u> <u> </u> <u></u></u>

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

Password ?X
Password is set in the PLC Enter the password
Password:
OK Cancel

- 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

Γ

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

- (3) Reading program in PLC to memory module
  - (a) When password of program in PLC is not set
    - 1) When no password is set in the memory module
    - Reads program from PLC
    - 2) When password is set in the memory module
      - After reading, it clears password of the memory module
  - (b) When password of program in PLC is set
    - 1) When no password is set in the memory module
    - Writing is not executed
    - 2) When password is set in the memory module
      - When PLC password is same as that of the memory module, writing is executed.
      - When PLC password is not same as that of the memory module, writing is not executed.

#### (4) When LED flickers

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

#### Note

-. Memory module can cancel PLC password and read/write but can't set, delete and change the password.

- -. Do not run PLC while external memory module is connected to.
- -. Do not remove memory module while READ/WRITE LED is on.

Γ

# **Chapter 13 Installation and Wiring**

# **13.1 Safety Instruction**

<u> </u>		
Please design protection circuit at the external of PLC for entire system to operate safely because an		
abnormal output or an malfunction may cause accident when any error of external power or malfunction		
of PLC module.		
(1) It should be installed at the external side of PLC to emergency stop circuit, protection circuit, interlock		
circuit of opposition action such as forward /reverse operation and interlock circuit for protecting		
machine damage such as upper/lower limit of positioning.		
(2) If PLC detects the following error, all operation stops and all output is off.		
(Available to hold output according to parameter setting)		
(a) When over current protection equipment or over voltage protection operates		
(b) When self diagnosis function error such as WDT error in PLC CPU occurs		
In case of error about IO control part that is not detected by PLC CPU, all output is off.		
Design Fail Safe circuit at the external of PLC for machine to operate safely. Refer to 13.1.1 Fail Safe		
circuit.		
(1) Because of error of output device, Relay, TR, etc., output may not be normal. About output signal that		
may cause the heavy accident, design supervisory circuit to external.		
▶ In case load current more than rating or over current by load short flows continuously, danger of heat, fire		
may occur so design safety circuit to external such as fuse.		
► Design for external power supply to be done first after PLC power supply is done. If external power		
supply is done first, it may cause accident by misoutput, misoperation.		
In case communication error occurs, for operation status of each station, refer to each communication		
manual.		
► In case of controlling the PLC while peripheral is connected to CPU module, configure the interlock circuit		
for system to operate safely. During operation, in case of executing program change, operation status		
change, familiarize the manual and check the safety status. Especially, in case of controlling long		
distance PLC, user may not response to error of PLC promptly because of communication error or etc.		
Limit how to take action in case of data communication error between PLC CPU and external device		
adding installing interlock circuit at the PLC program.		

1

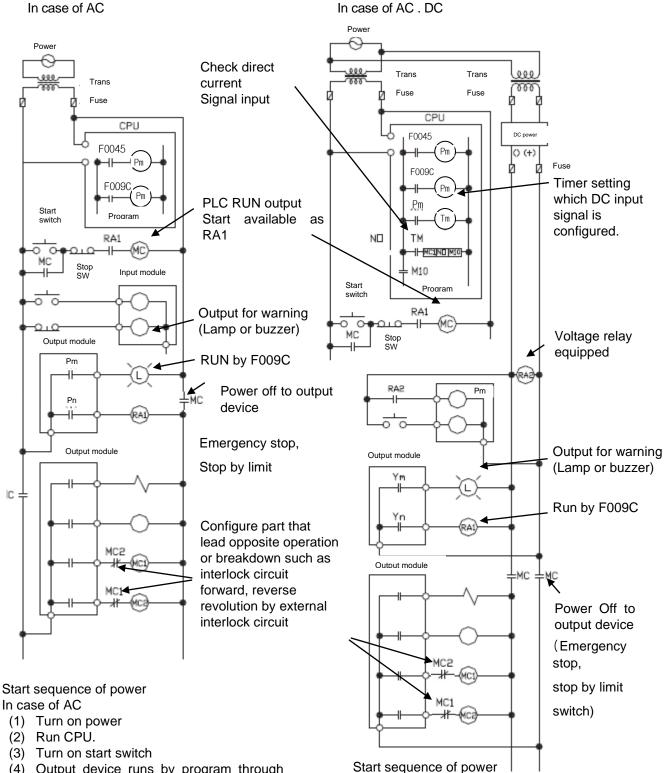
# 🖄 Danger

- ➤ 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 (In case of not using ERR contact point of power module)

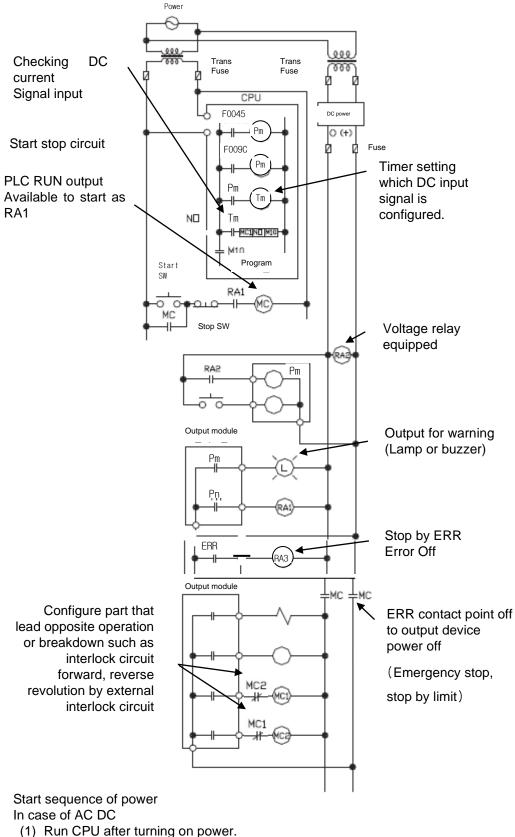
In case of AC



(4) Output device runs by program through magnetic contactor (MC) [On]

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 (In case of using ERR contact point of power module)

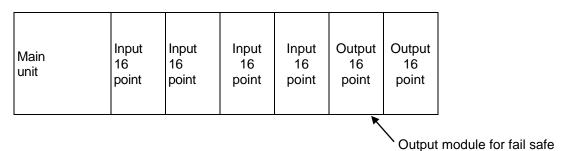
- (1) Run CPU after turning on power.
- (2) Turn on RA2 with DC power supplied
- (3) Turn on timer after DC power is stable
- (4) Turn on start s/w
- (5) Turn on start switch Output device runs by program through magnetic contactor (MC) [On]



#### (3) Fail safe countermeasure in case of PLC error

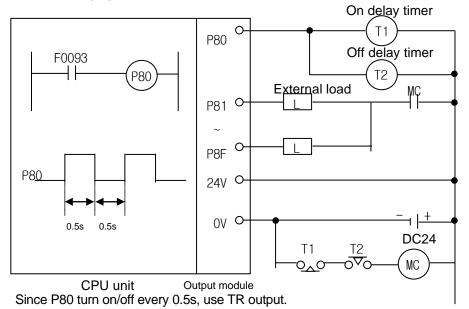
Error of PLC CPU and memory is detected by self diagnosis but in case error occurs in IO control part, etc., CPU can detect the error. At this case, though it is different according to status of error, all contact point is on or off, so safety may not be guaranteed. Though we do out best to our quality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

System example



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

[Fail safe circuit example]



- 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.

- Wpw = 3/7 {(I5v X 5) + (I24v X 24)} (W)
- Isv : power consumption of each module DC5V circuit(internal current consumption)
- $I_{24V\!:}$  the average current consumption of DC24V used for output module
  - (current consumption of simultaneous On point)

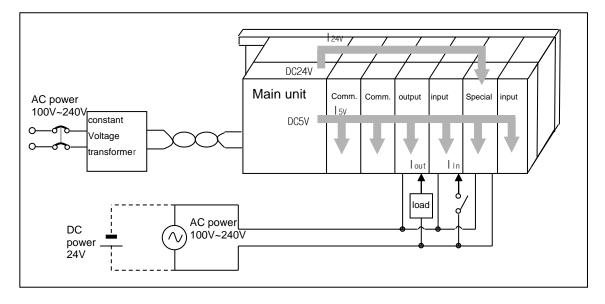
If DC24V is externally supplied or a power module without DC24V is used, it is not applicable.

(b) Sum of DC5V circuit current consumption

The DC5V output circuit power of the power module is the sum of power consumption used by each module. •  $W_{5V} = I_{5V} \times 5$  (W)

- (c) DC24V average power consumption(power consumption of simultaneous On point) The DC24V output circuit's average power of the power module is the sum of power consumption used by each module.
  - W24V = I24V X 24 (W)
- (d) Average power consumption by output voltage drop of the output module(power consumption of simultaneous On point)

• Wout = Iout X Vdrop X output point X simultaneous On rate (W) Iout : output current (actually used current) (A) Vdrop: voltage drop of each output module (V)



(e) Input average power consumption of input module

(power consumption of simultaneous On point)

• Win = Iin X E X input point X simultaneous On rate (W)

lin: 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

• Ws = I5v X 5 + I24v X 24 + I100v 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.

 $T = W / UA [^{\circ}C]$ 

W : power consumption of the entire PLC system (the above calculated value)

A : surface area of control panel [m<sup>2</sup>]

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

Γ

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

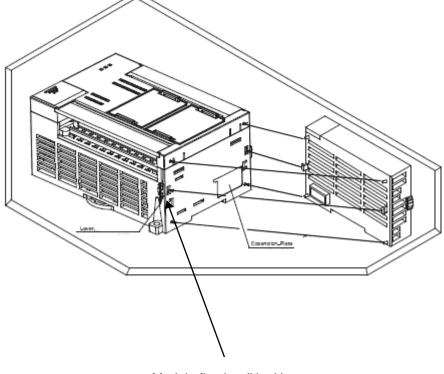
- Warning
- Module must be mounted to hook for fixation properly before its fixation. The module may be damaged from over-applied force. If module is not mounted properly, it may cause malfunction.
- > Do not drop or impact the module case, terminal block connector.
- Do not separate the PCB from case.

#### (1) Equipment of module

• Eliminate the extension cover at the upper of module.

• Push the module and connect it in agreement with hook for fixation of four edges and hook for connection at the bottom.

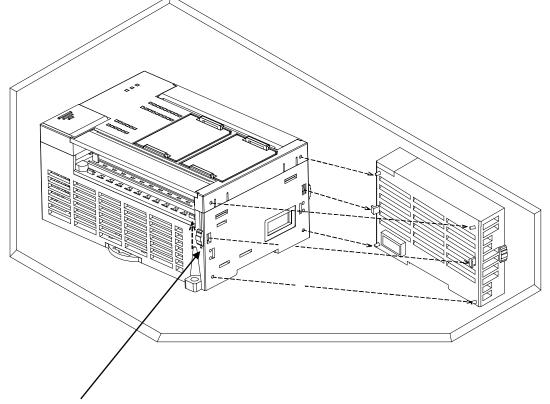
• After connection, get down the hook for fixation at the upper part and lower part and fix it completely.



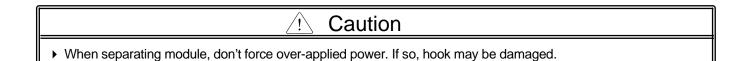
Module fixation (Hook)

(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. (Don't force over-applied force.)



Hook for module fixation



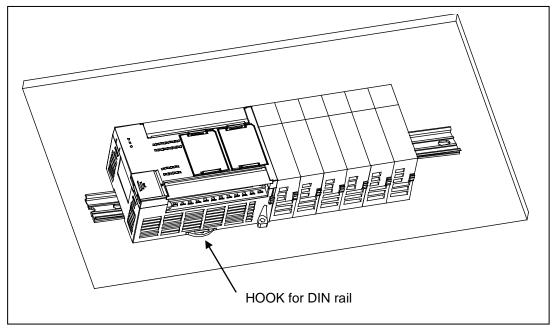
(3) Installation of module

Γ

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

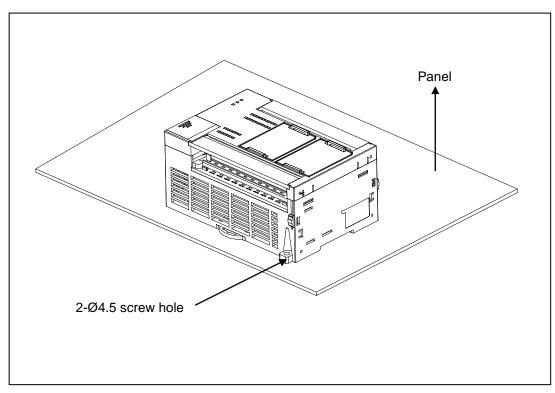
(a) In case of installing at DIN rail

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



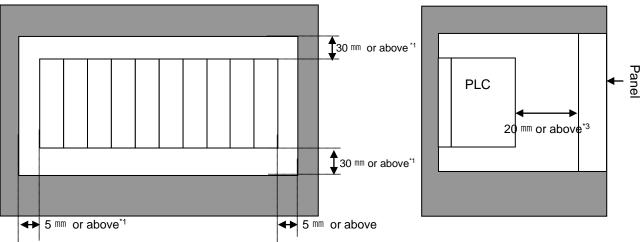
(b) In case of installing at panel

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



#### (4) Module equipment location

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

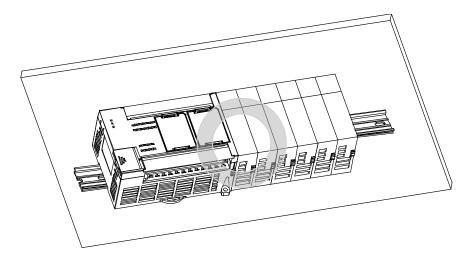


\*1 : In case height of wiring duct is less than 50 mm (except this 40mm or above)

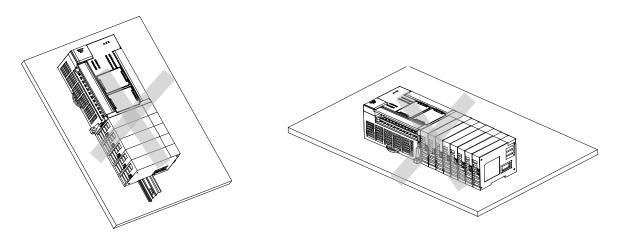
- \*2 : In case of equipping cable without removing near module, 20mm or above
- \*3 : In case of connector type, 80mm or above

#### (5) Module equipment direction

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



(b) Don't install like the following figure

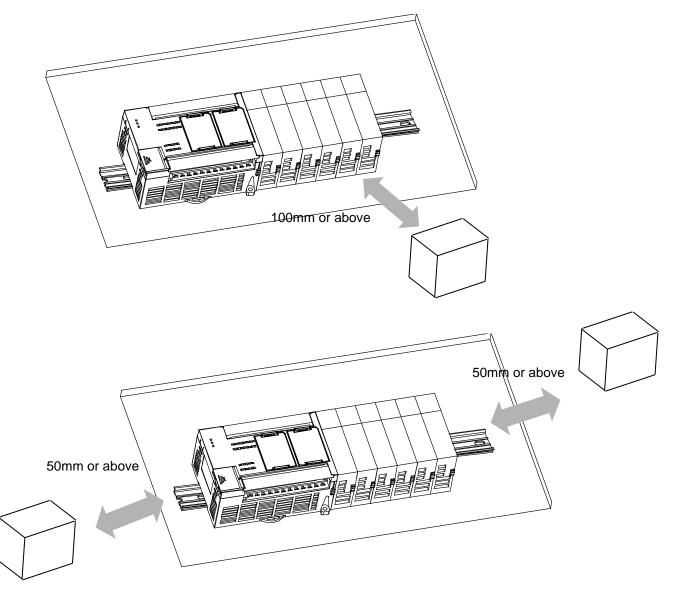


(6) Distance with other device

Γ

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 mm or above Device installed beside PLC: 50 mm or above



### 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 the error.
- In case of wiring, make sure foreign substance not to enter upper part of module. If it enters, eliminate it.

(1) Caution in handling IO module

It describes caution in handling IO module.

(a) Recheck of IO module specification

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

(b) Used wire

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

(c) Environment

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

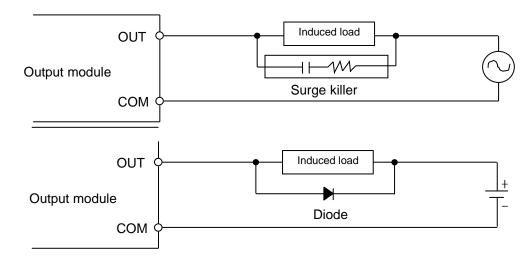
(d) Polarity

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

(e) Wiring

• In case of wiring IO with high voltage line or power line, induced obstacle may cause error.

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



(f) Terminal block

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

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

### 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.

# ⚠ Caution

Do D type ground (type 3 ground) or above dedicated for PLC for FG and LG terminal. It may cause electric shock or malfunction.

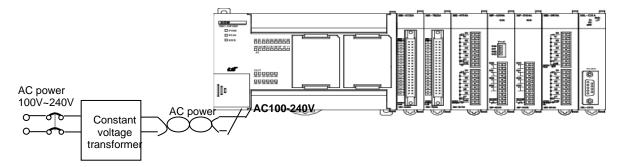
When wiring module, check the rated voltage and terminal array and do properly.

If rating is different, it may cause fire, malfunction.

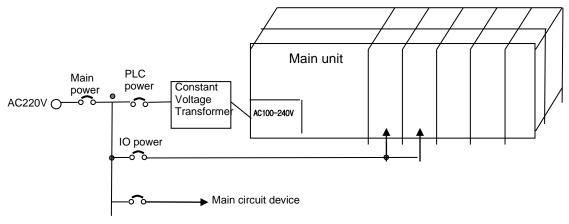
- For external connecting connector, use designated device and solder. If connecting is not safe, it may cause short, fire, malfunction.
- For screwing, use designated torque range. If it is not fit, it may cause short, fire, malfunction.
- Let no foreign material enter such as garbage or disconnection part into module. It may cause fire, malfunction, error.

### 13.3.1 Power wiring

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



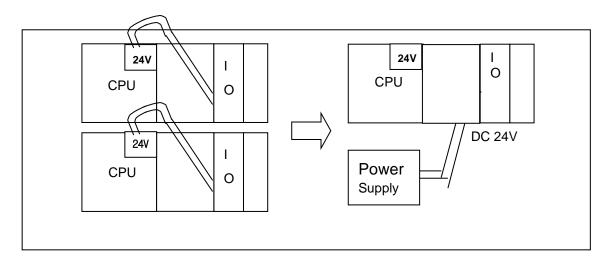
(2) Connect noise that include small noise between line and earth. (When there are many noise, connect insulated transformer.) (3) Isolate the PLC power, I/O devices and power devices as follows.



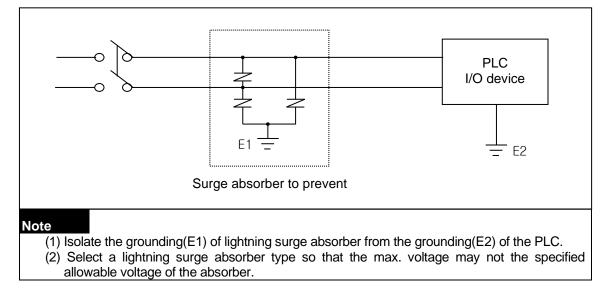
#### (4) If using DC24V of the main unit

(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<sup>2</sup>) 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



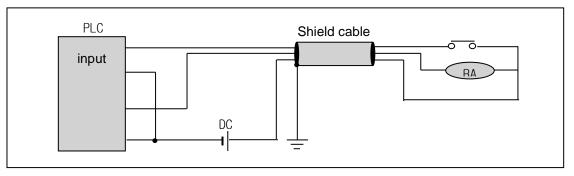
(8) To prevent surge from lightning, use the lightning surge absorber as presented below.

Γ

- (9) When noise may be intruded inside it, use an insulated shielding transformer or noise filter.
- (10) Wiring of each input power should be twisted as short as possible and the wiring of shielding transformer or noise filter should not be arranged via a duct.
- (11) All field-wiring connections to this unit shall be from Limited Voltage / Limited Current, below 24Vdc isolated secondary source with an output fused with a 4A fuse max. or class 2 secondary circuits as defined in UL 508, 17th Edition.

#### 13.3.2 I/O Device wiring

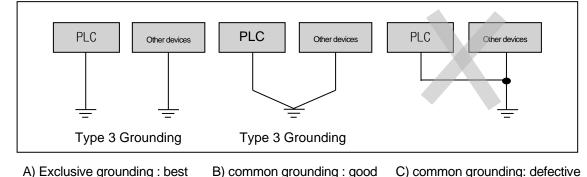
- The size of I/O device cable is limited to 0.3~2 mm<sup>2</sup> but it is recommended to select a size(0.3 mm<sup>2</sup>) to use conveniently.
- (2) Please isolate input signal line from output signal line.
- (3) I/O signal lines should be wired 100mm and more away from high voltage/high current main 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.



- (4) Use the grounding cable more than 2 mm<sup>2</sup>. 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

Γ

The specifications of cable used for wiring are as follows.

Types of external	Types of external Cable specific		ernal Cable specification (mm <sup>2</sup> )			Temperature
connection	Lower limit	Upper limit	Wire Type	rating		
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)	<u></u>			
Communication	0.18 (AWG24)	1.5 (AWG16)	Cu	60℃/75℃		
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 f	or input/output	Input/Output specification of each module	Hold it with the allowable range of each module.
Ambient	Temperature	0 ~ + 55°C	Adjust the operating temperature and humidity with the
environment	Humidity	5 ~ 95%RH	defined range.
Christment	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.
		Check the number of	
Spare parts		Spare parts and their	Cover the shortage and improve the conditions.
		Store 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 of Input/Output		Check the connecting screws Check module cover.	Screws should not be loose.	Retighten Screws.
Connecting	conditions of	Check for loose mounting screws.	Screws should not be loose.	Retighten Screws.
terminal bloc cable	ck or extension	Check the distance between solderless terminals.	Proper clearance should be provided.	Correct.
Cable		Connecting of expansion cable.	Connector should not be loose.	Correct.
	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.
LED ERR LED		Check that the LED is Off during Run.	Flickering indicates an error	See chapter 4.
indicator	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

Γ

Ch	eck Items	Checking Methods	Judgment	Corrective Actions	
Angleingt	Ambient temperature	Measure with thermometer	0 ~ 55 °C	Adjust to general standard	
Ambient environment	Ambient Humidity	and hygrometer	5 ~ 95%RH	(Internal environmental	
Children	Ambient pollution level	measure corrosive gas	There should be no corrosive gases	standard of control section)	
	Looseness,	The module should be move	The module should be		
PLC	Ingress	the unit	mounted securely.	Retighten screws	
Conditions	dust or foreign material	Visual check	No dust or foreign material		
	Loose terminal screws	Re-tighten screws	Screws should not be loose	Retighten	
Connecting conditions	Distance between terminals	Visual check	Proper clearance	Correct	
CONDITIONS	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	

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

# **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 is needed for speedy operation of system. The following shows the basic instructions for troubleshooting.

- (1) Visual checks
  - Check the following points.
    - Machine operating condition (in stop and operation status)
    - Power On/Off
    - Status of I/O devices
    - Condition of wiring (I/O wires, extension and communications cables)

• Display states of various indicators (such as POWER LED, RUN LED, ERR LED and I/O LED)

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

(2) Trouble Check

Observe any change in the error conditions during the following.

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

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

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

### **15.2 Troubleshooting**

Symptoms

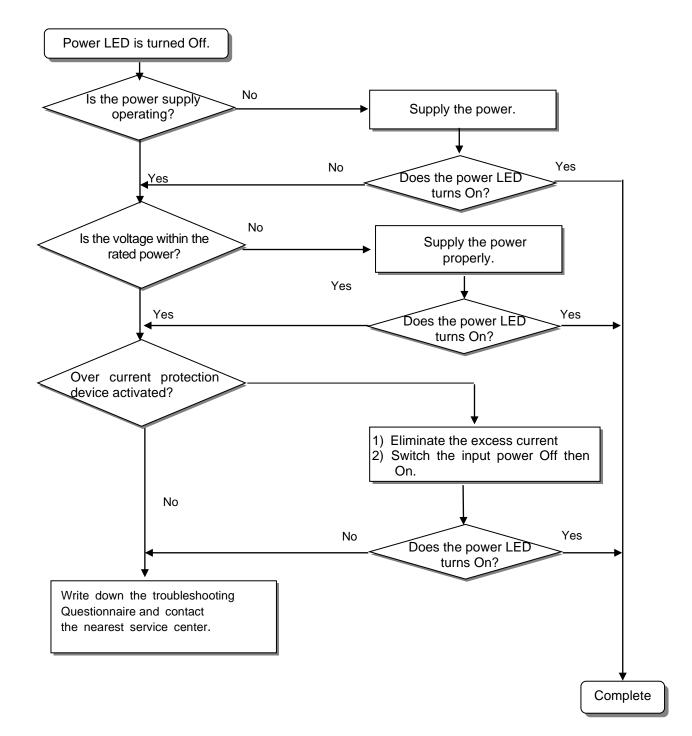
This section explains the procedure for determining the cause of troubles as well as the errors and corrective actions.

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

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

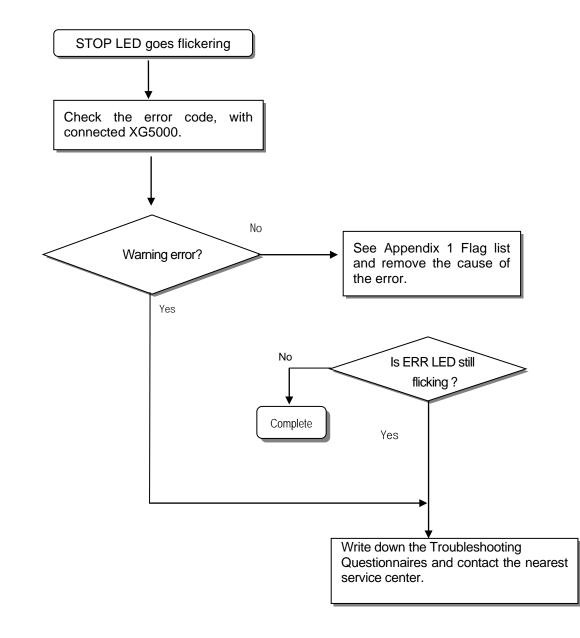
Γ

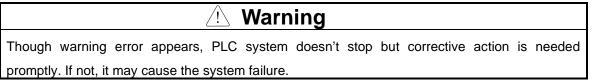
The following flowchart explains corrective action procedure used when the power is supplied or the power LED turns Off during operation.



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

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

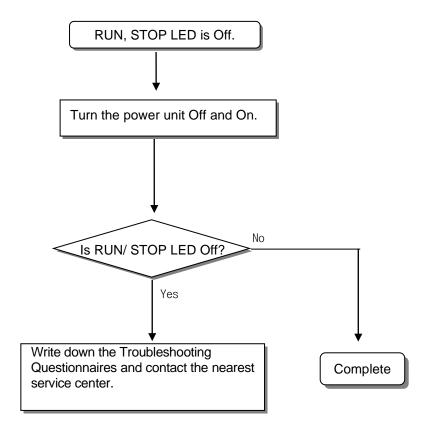




### 15.2.3 Troubleshooting flowchart used with when the RUN, STOP LED turns Off.

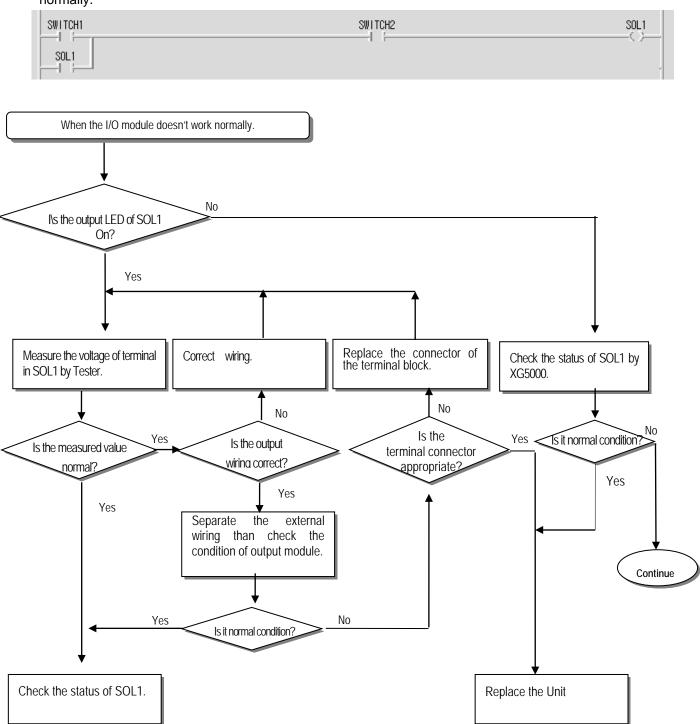
Γ

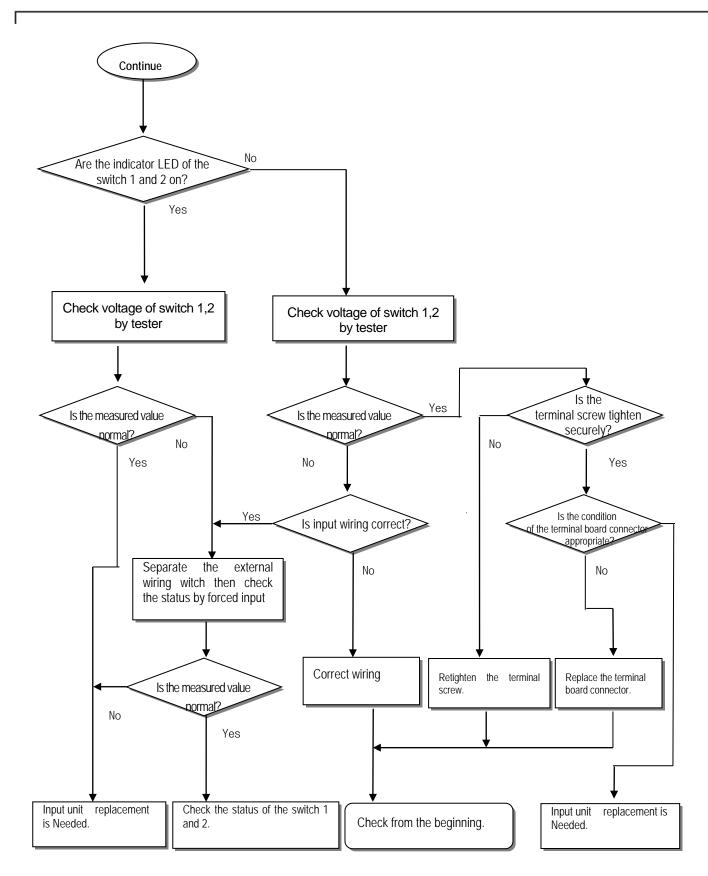
The following flowchart explains corrective action procedure to treat the lights-out of RUN LED when the power is supplied, operation starts or operation is in the process.



### 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.





### **15.3 Troubleshooting Questionnaire**

When problems have been met during operation of the XGC series, please write down this Questionnaires and contact the service center via telephone or facsimile. • For errors relating to special or communication modules, use the questionnaire included in the User's manual of the unit. 1. Telephone & FAX No FAX) Tell) 2. Using equipment model: 3. Details of using equipment Serial No.( ) CPU model: ( ) OS version 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

Γ

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

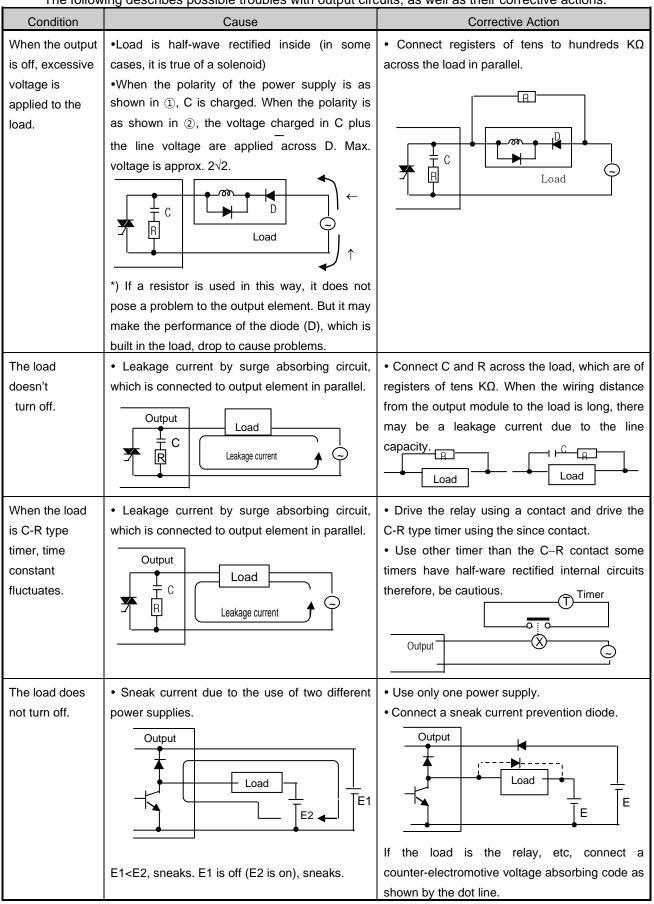
### 15.4.1 Input circuit troubles and corrective actions

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

Condition	Cause	Corrective Actions		
	Leakage current of external device (Such as a drive by non-contact switch)	Connect an appropriate register and		
Input signal	AC input	capacity, which will make the voltage lower		
doesn't turn off.	T C Leakage current	across the terminals of the input module.		
011.		AC input		
	Leakage current of external device			
Input signal	(Drive by a limit switch with neon lamp)			
doesn't turn		CR values are determined by the leakage		
off.	AC input	current value.		
(Neon lamp	Leakage current	– Recommended value C : 0.1 ~ 0.47 $\mu$ F		
may be still on)	External device	R: 47 ~ 120 $\Omega$ (1/2W) Or make up another independent display circuit.		
Input signal	Leakage current due to line capacity of wiring			
doesn't turn	cable.	<ul> <li>Locate the power supply on the external device side as shown below.</li> </ul>		
off.	AC input	AC input		
	External device	External device		
Input signal	Leakage current of external device (Drive by switch with LED indicator)	• Connect an appropriate register, which will make		
doesn't turn off.	·	the voltage higher than the OFF voltage across the		
011.	DC input	input module terminal and common terminal.		
	Leakage current	DC input		
	External device			
Input signal	<ul> <li>Sneak current due to the use of two different power supplies.</li> </ul>	Use only one power supply.		
doesn't turn	DC input	Connect a sneak current prevention diode.		
off.		E1 DC input		
	• E1 > E2, sneaked.			

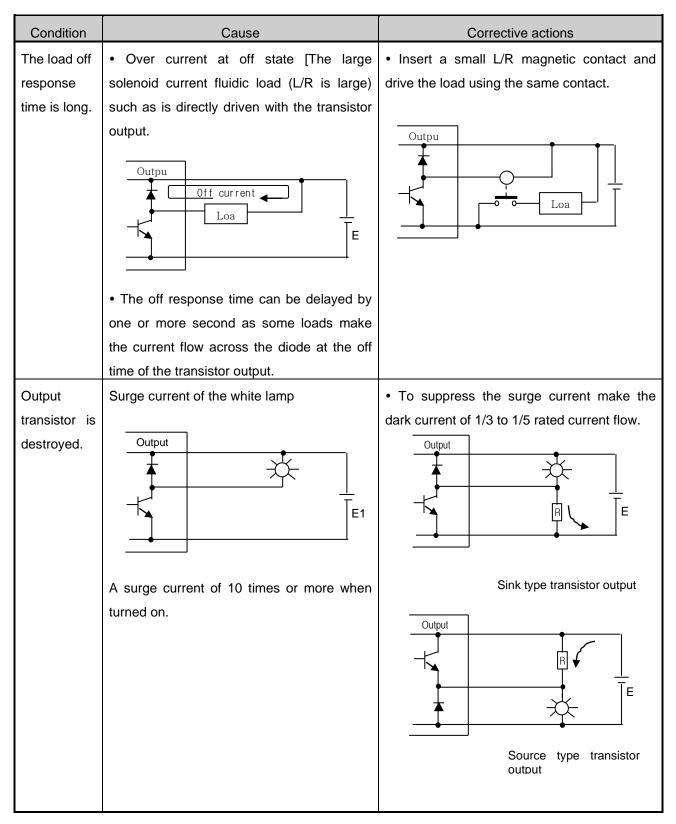
### 15.4.2 Output circuit and corrective actions

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



Output circuit troubles and corrective actions (continued).

Γ



# 15.5 Error Code List

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

٦

Error code	Error cause (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

Г

# Appendix 1 Flag List

# Appendix 1.1 Special Relay (F) List

### (1) "S(U)" type

Word	Bit	Variables	Function	Description
	-	_SYS_STATE	Mode and state	Indicates PLC mode and operation State.
	F0000	_RUN	Run	Run state.
	F0001	_STOP	Stop	Stop state.
	F0002	_ERROR	Error	Error state.
	F0003	_DEBUG	Debug	Debug state.
	F0004	_LOCAL_CON	Local control	Local control mode.
	F0006	_REMOTE_CON	Remote mode	Remote control mode.
	F0008	_RUN_EDIT_ST	Editing during RUN	Editing program download during RUN.
	F0009	_RUN_EDIT_CHK	Editing during RUN	Internal edit processing during RUN.
	F000A	_RUN_EDIT_DONE	Edit done during RUN	Edit is done during RUN.
	F000B	_RUN_EDIT_END	Edit end during RUN	Edit is ended during RUN.
	F000C	_CMOD_KEY	Operation mode	Operation mode changed by key.
<b>F000</b> 4	F000D	_CMOD_LPADT	Operation mode	Operation mode changed by local PADT.
F000~1	F000E	_CMOD_RPADT	Operation mode	Operation mode changed by Remote PADT.
	F000F	_CMOD_RLINK	Operation mode	Operation mode changed by Remote communication module.
	F0010	_FORCE_IN	Forced input	Forced input state.
	F0011	_FORCE_OUT	Forced output	Forced output state.
	F0014	_MON_On	Monitor	Monitor on execution.
	F0015	_USTOP_On	Stop	Stop by Stop function.
	F0016	_ESTOP_On	EStop	Stop by EStop function.
	F0017	_CONPILE_MODE	Compile	Compile on execution.
	F0018	_INIT_RUN	Initialize	Initialization task on execution.
	F001C	_PB1	Program Code 1	Program Code 1 selected.
	F001D	_PB2	Program Code 2	Program Code 2 selected.
	F001E	_CB1	Compile Code 1	Compile Code 1 selected.
	F001F	_CB2	Compile Code2	Compile Code 2 selected.
	-	_CNF_ER	System error	Reports heavy error state of system.
	F0021	_IO_TYER	Module Type error	Module Type does not match.
F002~3	F0022	_IO_DEER	Module detachment error	Module is detached.
1002~3	F0024	_IO_RWER	Module I/O error	Module I/O error.
	F0025	_IP_IFER	Module interface error	Special/communication module interface error.
	F0026	_ANNUM_ER	External device error	Detected heavy error in external Device.

٦

Word	Bit	Variable	Function	Description
	F0028	_BPRM_ER	Basic parameter	Basic parameter error.
	F0029	_IOPRM_ER	IO parameter	I/O configuration parameter error.
	F002A	_SPPRM_ER	Special module parameter	Special module parameter is Abnormal.
F002~3	F002B	_CPPRM_ER	Communication module parameter	Communication module parameter is abnormal.
	F002C	_PGM_ER	Program error	Program error.
	F002D	_CODE_ER	Code error	Program Code error.
	F002E	_SWDT_ER	System watchdog	System watchdog operated.
	F0030	_WDT_ER	Scan watchdog	Scan watchdog operated.
	-	_CNF_WAR	System warning	Reports light error state of system.
	F0041	_DBCK_ER	Backup error	Data backup error.
	F0043	_ABSD_ER	Operation shutdown error	Stop by abnormal operation.
	F0046	_ANNUM_WAR	External device error	Detected light error of external device.
F004	F0048	_HS_WAR1	High speed link 1	High speed link – parameter 1 error.
F004	F0049	_HS_WAR2	High speed link 2	High speed link – parameter 2 error.
	F0054	_P2P_WAR1	P2P parameter 1	P2P – parameter 1 error.
	F0055	_P2P_WAR2	P2P parameter 2	P2P – parameter 2 error.
	F0056	_P2P_WAR3	P2P parameter 3	P2P – parameter 3 error.
	F005C	_CONSTANT_ER	Constant error	Constant error.
	-	_USER_F	User contact	Timer used by user.
	F0090	_T20MS	20ms	As a clock signal available at user program, it reverses On/Off every half period. Since clock
	F0091	_T100MS	100ms	signal is dealt with at the end of scan, there may
	F0092	_T200MS	200ms	be delay or distortion according to scan time. So use clock that's longer than scan time. Clock
	F0093	_T1S	1s Clock	signal is Off status at the start of scan program and task program.
	F0094	_T2S	2 s Clock	_T100ms clock
F009	F0095	_T10S	10 s Clock	50ms 50ms
F009	F0096	_T20S	20 s Clock	
	F0097	_T60S	60 s Clock	
	F0099	_On	Ordinary time On	Always On state Bit.
	F009A	_Off	Ordinary time Off	Always Off state Bit.
	F009B	_1On	1scan On	First scan On Bit.
	F009C	_1Off	1scan Off	First scan OFF bit.
	F009D	_STOG	Reversal	Reversal every scan.

Г

Word	Bit	Variable	Function	Description
	-	_USER_CLK	User Clock	Clock available for user setting.
	F0100	_USR_CLK0	Setting scan repeat	On/Off as much as set scan Clock 0.
	F0101	_USR_CLK1	Setting scan repeat	On/Off as much as set scan Clock 1.
	F0102	_USR_CLK2	Setting scan repeat	On/Off as much as set scan Clock 2.
F010	F0103	_USR_CLK3	Setting scan repeat	On/Off as much as set scan Clock 3.
	F0104	_USR_CLK4	Setting scan repeat	On/Off as much as set scan Clock 4.
	F0105	_USR_CLK5	Setting scan repeat	On/Off as much as set scan Clock 5.
	F0106	_USR_CLK6	Setting scan repeat	On/Off as much as set scan Clock 6.
	F0107	_USR_CLK7	Setting scan repeat	On/Off as much as set scan Clock 7.
	-	_LOGIC_RESULT	Logic result	Indicates logic results.
	F0110	_LER	operation error	On during 1 scan in case of operation error.
F011	F0111	_ZERO	Zero flag	On when operation result is 0.
1011	F0112	_CARRY	Carry flag	On when carry occurs during operation.
	F0113	_ALL_Off	All output OFF	On in case that all output is Off.
	F0115	_LER_LATCH	Operation error Latch	Keeps On during operation error.
	-	_CMP_RESULT	Comparison result	Indicates the comparison result.
	F0120	_LT	LT flag	On in case of "less than".
	F0121	_LTE	LTE flag	On in case of "equal or less than".
F012	F0122	_EQU	EQU flag	On in case of "equal".
	F0123	_GT	GT flag	On in case of "greater than".
	F0124	_GTE	GTE flag	On in case of "equal or greater than".
	F0125	_NEQ	NEQ flag	On in case of "not equal".
F014	-	_FALS_NUM	FALS no.	Indicates FALS no.
F015	-	_PUTGET_ERR0	PUT/GET error 0	Main base Put / Get error.
F023	-	_PUTGET_NDR0	PUT/GET end 0	Main base Put/Get end.
F044	-	_CPU_TYPE	CPU Type	Indicates information for CPU Type.
F045	-	_CPU_VER	CPU version	Indicates CPU version.
F046	-	_OS_VER	OS version	Indicates OS version.
F048	-	_OS_DATE	OS date	Indicates OS distribution date.
F050	-	_SCAN_MAX	Max. scan time	Indicates max. scan time.
F051	-	_SCAN_MIN	Min. scan time	Indicates min. scan time.
F052	-	_SCAN_CUR	Current scan time	Current scan time.
F0053	-	_MON_YEAR	Month/year	Clock data (month/year) Supported when using RTC option module
F0054	-	_TIME_DAY	Hour/date	Clock data (hour/date) Supported when using RTC option module
F0055	-	_SEC_MIN	Second/minute	Clock data (Second/minute) Supported when using RTC option module

٦

Word	Bit	Variable	Function	Description
F0056	-	_HUND_WK	Hundred year/week	Clock data (Hundred year/week) Supported when using RTC option module
	-	_FPU_INFO	N/A	-
	F0570	_FPU_LFLAG_I	N/A	-
	F0571	_FPU_LFLAG_U	N/A	-
	F0572	_FPU_LFLAG_O	N/A	-
	F0573	_FPU_LFLAG_Z	N/A	-
	F0574	_FPU_LFLAG_V	N/A	-
F057	F057A	_FPU_FLAG_I	N/A	-
	F057B	_FPU_FLAG_U	N/A	-
	F057C	_FPU_FLAG_O	N/A	-
	F057D	_FPU_FLAG_Z	N/A	-
	F057E	_FPU_FLAG_V	N/A	-
	F057F	_FPU_FLAG_E	Irregular input	Reports in case of irregular input.
F058	-	_ERR_STEP	Error step	Saves error step.
F060	-	_REF_COUNT	Refresh	Increase when module Refresh.
F062	-	_REF_OK_CNT	Refresh OK	Increase when module Refresh is normal.
F064	-	_REF_NG_CNT	Refresh NG	Increase when module Refresh is Abnormal.
F066	-	_REF_LIM_CNT	Refresh Limit	Increase when module Refresh is abnormal (Time Out).
F068	-	_REF_ERR_CNT	Refresh Error	Increase when module Refresh is Abnormal.
F070	-	_MOD_RD_ERR_CNT	-	-
F072	-	_MOD_WR_ERR_CN T	-	-
F074	-	_CA_CNT	-	-
F076	-	_CA_LIM_CNT	-	-
F078	-	_CA_ERR_CNT	-	-
F080	-	_BUF_FULL_CNT	Buffer Full	Increase when CPU internal buffer is full.
F082	-	_PUT_CNT	Put count	Increase when Put count.
F084	-	_GET_CNT	Get count	Increase when Get count.
F086	-	_KEY	Current key	indicates the current state of local key.
F088	-	_KEY_PREV	Previous key	indicates the previous state of local key
F090	-	_IO_TYER_N	Mismatch slot	Module Type mismatched slot no.
F091	-	_IO_DEER_N	Detach slot	Module detached slot no.
F093	-	_IO_RWER_N	RW error slot	Module read/write error slot no.
F094	-	_IP_IFER_N	IF error slot	Module interface error slot no.
F096	-	_IO_TYER0	Module Type 0 error	Main base module Type error.

Г

Word	Bit	Variable	Function	Description
F104	-	_IO_DEER0	Module Detach 0 error	Main base module Detach error.
F120	-	_IO_RWER0	Module RW 0 error	Main base module read/write error.
F128	-	_IO_IFER_0	Module IF 0 error	Main base module interface error.
F140	-	_AC_FAIL_CNT	Power shutdown times	Saves the times of power shutdown.
F142	-	_ERR_HIS_CNT	Error occur times	Saves the times of error occur.
F144	-	_MOD_HIS_CNT	Mode conversion times	Saves the times of mode conversion.
F146	-	_SYS_HIS_CNT	History occur times	Saves the times of system history.
F148	-	_LOG_ROTATE	N/A	
F150	-	_BASE_INFO0	Slot information 0	Main base slot information.
	-	_USER_WRITE_F	Available contact point	Contact point available in program.
	F2000	_RTC_WR	RTC RW	Data write and read in RTC.
	F2001	_SCAN_WR	Scan WR	Initializing the value of scan.
F200	F2002	_CHK_ANC_ERR	Request detection of external serious error	Request detection of external error.
	F2003	_CHK_ANC_WAR	Request detection of external slight error (warning)	Request detection of external slight error (warning).
F204	-	_USER_STAUS_F	User contact point	User contact point.
F201	F2010	_INIT_DONE	Initialization completed	Initialization complete displayed.
F202	-	_ANC_ERR	Display information of external serious error	Display information of external serious error
F203	-	_ANC_WAR	Display information of external slight error (warning)	Display information of external slight error (warning)
F210	-	_MON_YEAR_DT	Month/year	Clock data (month/year) Supported when using RTC option module
F211	-	_TIME_DAY_DT	Hour/date	Clock data (hour/date) Supported when using RTC option module
F212	-	_SEC_MIN_DT	Second/minute	Clock data (Second/minute) Supported when using RTC option module
F213	-	_HUND_WK_DT	Hundred year/week	Clock data (Hundred year/week) Supported when using RTC option module

٦

(2) "E" type

Г

Word	Bit	Variables	Function	Description
	-	_SYS_STATE	Mode and state	Indicates PLC mode and operation State.
	F0000	_RUN	Run	Run state.
	F0001	_STOP	Stop	Stop state.
	F0002	_ERROR	Error	Error state.
	F0003	_DEBUG	N/A	
	F0004	_LOCAL_CON	Local control	Local control mode.
	F0006	_REMOTE_CON	Remote mode	Remote control mode.
	F0008	_RUN_EDIT_ST	Editing during RUN	Editing program download during RUN.
	F0009	_RUN_EDIT_CHK	Editing during RUN	Internal edit processing during RUN.
	F000A	_RUN_EDIT_DONE	Edit done during RUN	Edit is done during RUN.
	F000B	_RUN_EDIT_END	Edit end during RUN	Edit is ended during RUN.
	F000C	_CMOD_KEY	Operation mode	Operation mode changed by key.
	F000D	_CMOD_LPADT	Operation mode	Operation mode changed by local PADT.
F000~1	F000E	_CMOD_RPADT	Operation mode	Operation mode changed by Remote PADT.
	F000F	_CMOD_RLINK	Operation mode	Operation mode changed by Remote communication module.
	F0010	_FORCE_IN	Forced input	Forced input state.
	F0011	_FORCE_OUT	Forced output	Forced output state.
	F0014	_MON_On	Monitor	Monitor on execution.
	F0015	_USTOP_On	Stop	Stop by Stop function.
	F0016	_ESTOP_On	EStop	Stop by EStop function.
	F0017	_CONPILE_MODE	Compile	Compile on execution.
	F0018	_INIT_RUN	Initialize	Initialization task on execution.
	F001C	_PB1	Program Code 1	Program Code 1 selected.
	F001D	_PB2	Program Code 2	Program Code 2 selected.
	F001E	_CB1	Compile Code 1	Compile Code 1 selected.
	F001F	_CB2	Compile Code2	Compile Code 2 selected.
F002~3	-	_CNF_ER	System error	Reports heavy error state of system.
	F0021	_IO_TYER	Module Type error	Module Type does not match.
	F0022	_IO_DEER	Module detachment error	Module is detached.
	F0024	_IO_RWER	Module I/O error	Module I/O error.
	F0025	_IP_IFER	Module interface error	Special/communication module interface error.
	F0026	_ANNUM_ER	External device error	Detected heavy error in external Device.

Word	Bit	Variable	Function	Description
F002~3	F0028	_BPRM_ER	Basic parameter	Basic parameter error.
	F0029	_IOPRM_ER	IO parameter	I/O configuration parameter error.
	F002A	_SPPRM_ER	Special module parameter	Special module parameter is Abnormal.
	F002B	_CPPRM_ER	Communication module parameter	Communication module parameter is abnormal.
	F002C	_PGM_ER	Program error	Program error.
	F002D	_CODE_ER	Code error	Program Code error.
	F002E	_SWDT_ER	System watchdog	System watchdog operated.
	F0030	_WDT_ER	Scan watchdog	Scan watchdog operated.
	-	_CNF_WAR	System warning	Reports light error state of system.
	F0041	_DBCK_ER	Backup error	Data backup error.
	F0043	_ABSD_ER	Operation shutdown error	Stop by abnormal operation.
	F0046	_ANNUM_WAR	External device error	Detected light error of external device.
F004	F0048	_HS_WAR1	N/A	
Г004	F0049	_HS_WAR2	N/A	
	F0054	_P2P_WAR1	P2P parameter 1	P2P – parameter 1 error.
	F0055	_P2P_WAR2	N/A	
	F0056	_P2P_WAR3	N/A	
	F005C	_CONSTANT_ER	Constant error	Constant error.
	-	_USER_F	User contact	Timer used by user.
	F0090	_T20MS	20ms	As a clock signal available at user program, it reverses On/Off every half period. Since clock
	F0091	_T100MS	100ms	signal is dealt with at the end of scan, there may
	F0092	_T200MS	200ms	be delay or distortion according to scan time. So use clock that's longer than scan time. Clock
	F0093	_T1S	1s Clock	signal is Off status at the start of scan program and task program.
	F0094	_T2S	2 s Clock	_T100ms clock : 50ms : 50ms :
F009	F0095	_T10S	10 s Clock	
	F0096	_T20S	20 s Clock	
	F0097	_T60S	60 s Clock	
	F0099	_On	Ordinary time On	Always On state Bit.
	F009A	_Off	Ordinary time Off	Always Off state Bit.
	F009B	_10n	1scan On	First scan On Bit.
	F009C	_1Off	1scan Off	First scan OFF bit.
	F009D	_STOG	Reversal	Reversal every scan.

٦

Word	Bit	Variable	Function	Description
	-	_USER_CLK	User Clock	Clock available for user setting.
	F0100	_USR_CLK0	Setting scan repeat	On/Off as much as set scan Clock 0.
	F0101	_USR_CLK1	Setting scan repeat	On/Off as much as set scan Clock 1.
	F0102	_USR_CLK2	Setting scan repeat	On/Off as much as set scan Clock 2.
F010	F0103	_USR_CLK3	Setting scan repeat	On/Off as much as set scan Clock 3.
	F0104	_USR_CLK4	Setting scan repeat	On/Off as much as set scan Clock 4.
	F0105	_USR_CLK5	Setting scan repeat	On/Off as much as set scan Clock 5.
	F0106	_USR_CLK6	Setting scan repeat	On/Off as much as set scan Clock 6.
	F0107	_USR_CLK7	Setting scan repeat	On/Off as much as set scan Clock 7.
	-	_LOGIC_RESULT	Logic result	Indicates logic results.
	F0110	_LER	operation error	On during 1 scan in case of operation error.
F011	F0111	_ZERO	Zero flag	On when operation result is 0.
1011	F0112	_CARRY	Carry flag	On when carry occurs during operation.
	F0113	_ALL_Off	All output OFF	On in case that all output is Off.
	F0115	_LER_LATCH	Operation error Latch	Keeps On during operation error.
	-	_CMP_RESULT	Comparison result	Indicates the comparison result.
	F0120	_LT	LT flag	On in case of "less than".
	F0121	_LTE	LTE flag	On in case of "equal or less than".
F012	F0122	_EQU	EQU flag	On in case of "equal".
	F0123	_GT	GT flag	On in case of "greater than".
	F0124	_GTE	GTE flag	On in case of "equal or greater than".
	F0125	_NEQ	NEQ flag	On in case of "not equal".
F014	-	_FALS_NUM	FALS no.	Indicates FALS no.
F015	-	_PUTGET_ERR0	PUT/GET error 0	Main base Put / Get error.
F023	-	_PUTGET_NDR0	PUT/GET end 0	Main base Put/Get end.
F044	-	_CPU_TYPE	СРИ Туре	Indicates information for CPU Type.
F045	-	_CPU_VER	CPU version	Indicates CPU version.
F046	-	_OS_VER	OS version	Indicates OS version.
F048	-	_OS_DATE	OS date	Indicates OS distribution date.
F050	-	_SCAN_MAX	Max. scan time	Indicates max. scan time.
F051	-	_SCAN_MIN	Min. scan time	Indicates min. scan time.
F052	-	_SCAN_CUR	Current scan time	Current scan time.
F0053	-	_MON_YEAR	Month/year	Clock data (month/year) Supported when using RTC option module
F0054	-	_TIME_DAY	Hour/date	Clock data (hour/date) Supported when using RTC option module
F0055	-	_SEC_MIN	Second/minute	Clock data (Second/minute) Supported when using RTC option

Г

Word	Bit	Variable	Function	Description
				module
F0056	-	_HUND_WK	Hundred year/week	Clock data (Hundred year/week) Supported when using RTC option module
	-	_FPU_INFO	N/A	-
	F0570	_FPU_LFLAG_I	N/A	-
	F0571	_FPU_LFLAG_U	N/A	-
	F0572	_FPU_LFLAG_O	N/A	-
	F0573	_FPU_LFLAG_Z	N/A	-
F057	F0574	_FPU_LFLAG_V	N/A	-
FU97	F057A	_FPU_FLAG_I	N/A	-
	F057B	_FPU_FLAG_U	N/A	-
	F057C	_FPU_FLAG_O	N/A	-
	F057D	_FPU_FLAG_Z	N/A	-
	F057E	_FPU_FLAG_V	N/A	-
	F057F	_FPU_FLAG_E	Irregular input	Reports in case of irregular input.
F058	-	_ERR_STEP	Error step	Saves error step.
F060	-	_REF_COUNT	Refresh	Increase when module Refresh.
F062	-	_REF_OK_CNT	Refresh OK	Increase when module Refresh is normal.
F064	-	_REF_NG_CNT	Refresh NG	Increase when module Refresh is Abnormal.
F066	-	_REF_LIM_CNT	Refresh Limit	Increase when module Refresh is abnormal (Time Out).
F068	-	_REF_ERR_CNT	Refresh Error	Increase when module Refresh is Abnormal.
F070	-	_MOD_RD_ERR_CNT	-	-
F072	-	_MOD_WR_ERR_CN T	-	-
F074	-	_CA_CNT	-	-
F076	-	_CA_LIM_CNT	-	-
F078	-	_CA_ERR_CNT	-	-
F080	-	_BUF_FULL_CNT	Buffer Full	Increase when CPU internal buffer is full.
F082	-	_PUT_CNT	Put count	Increase when Put count.
F084	-	_GET_CNT	Get count	Increase when Get count.
F086	-	_KEY	Current key	indicates the current state of local key.
F088	-	_KEY_PREV	Previous key	indicates the previous state of local key
F090	-	_IO_TYER_N	Mismatch slot	Module Type mismatched slot no.
F091	-	_IO_DEER_N	Detach slot	Module detached slot no.
F093	-	_IO_RWER_N	RW error slot	Module read/write error slot no.
F094	-	_IP_IFER_N	IF error slot	Module interface error slot no.
F096	-	_IO_TYER0	Module Type 0 error	Main base module Type error.

٦

Word	Bit	Variable	Function	Description
F104	-	_IO_DEER0	Module Detach 0 error	Main base module Detach error.
F120	-	_IO_RWER0	Module RW 0 error	Main base module read/write error.
F128	-	_IO_IFER_0	Module IF 0 error	Main base module interface error.
F140	-	_AC_FAIL_CNT	N/A	
F142	-	_ERR_HIS_CNT	N/A	
F144	-	_MOD_HIS_CNT	N/A	
F146	-	_SYS_HIS_CNT	History occur times	Saves the times of system history.
F148	-	_LOG_ROTATE	N/A	
F150	-	_BASE_INFO0	Slot information 0	Main base slot information.
	-	_USER_WRITE_F	Available contact point	Contact point available in program.
	F2000	_RTC_WR	RTC RW	Data write and read in RTC.
	F2001	_SCAN_WR	Scan WR	Initializing the value of scan.
F200	F2002	_CHK_ANC_ERR	Request detection of external serious error	Request detection of external error.
	F2003	_CHK_ANC_WAR	Request detection of external slight error (warning)	Request detection of external slight error (warning).
F201	-	_USER_STAUS_F	User contact point	User contact point.
F201	F2010	_INIT_DONE	Initialization completed	Initialization complete displayed.
F202	-	_ANC_ERR	Display information of external serious error	Display information of external serious error
F203	-	_ANC_WAR	Display information of external slight error (warning)	Display information of external slight error (warning)
F210	-	_MON_YEAR_DT	Month/year	Clock data (month/year) Supported when using RTC option module
F211	-	_TIME_DAY_DT	Hour/date	Clock data (hour/date) Supported when using RTC option module
F212	-	_SEC_MIN_DT	Second/minute	Clock data (Second/minute) Supported when using RTC option module
F213	-	_HUND_WK_DT	Hundred year/week	Clock data (Hundred year/week) Supported when using RTC option module

Г

# Appendix 1.2 Communication Relay (L) List

Here describes data link communication relay(L). (Supported in "S(U)" type)

(1) High-speed Link 1

Device	Keyword	Туре	Description
			High speed link parameter 1 normal operation of all station
L000	_HS1_RLINK	Bit	<ul> <li>Indicates normal operation of all station according to parameter set in High speed link, and On under the condition as below.</li> <li>1. In case that all station set in parameter is RUN mode and no error,</li> <li>2. All data block set in parameter is communicated normally, and</li> <li>3. The parameter set in each station itself is communicated normally.</li> <li>Once RUN_LINK is On, it keeps On unless stopped by LINK_DISABLE.</li> </ul>
			Abnormal state after _HS1RLINK On
L001	_HS1_LTRBL	Bit	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.
			High speed link parameter 1, K block general state
L0020 ~ L005F	_HS1_STATE[k] (k = 00~63)	Bit Array	Indicates the general state of communication information for each data block of setting parameter. _HS1_STATE[k] = HS1MOD[k]&_HS1TRX[k]&(~_HS1_ERR[k])
L0060 ~	_HS1_MOD[k]	Bit	High speed link parameter 1, k block station RUN operation mode
L009F	(k = 00~63)	Array	Indicates operation mode of station set in K data block of parameter.
L0100 ~ L013F			Normal communication with High speed link parameter 1, k block station Indicates if communication state of Kdata of parameter is communicated smoothly according to the setting.
L0140 ~HS1ERR[k]		Bit	High speed link parameter 1, K block station operation error mode
L0140 ~ L017F	(k = 00~63)	Array	Indicates if the error occurs in the communication state of k data block of parameter.
L0180 ~		Bit	High speed link parameter 1, K block setting
L021F	_HS1_SETBLOCK[k]	Array	Indicates whether or not to set k data block of parameter.

### (2) High-speed Link2

Device	Keyword	Туре	Description
L0260	_HS2_RLINK	Bit	<ul> <li>High-speed link parameter 2 normal operation of all station.</li> <li>Indicates normal operation of all station according to parameter set in High-speed link and On under the condition as below.</li> <li>1. In case that all station set in parameter is Run mode and no error</li> <li>2. All data block set in parameter is communicated and</li> <li>3. The parameter set in each station itself is communicated normally.</li> <li>Once RUN_LINK is On, it keeps On unless stopped by LINK_DISABLE.</li> </ul>
L0261	_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.
L0280 ~ L031F	_HS2_STATE[k] (k = 00~63)	Bit Array	High speed link parameter 1, k block general state. Indicates the general state of communication information for each data block of setting parameter. _HS2_STATE[k]=HS2MOD[k]&_HS2TRX[k]&(~_HS2_ERR[k])
L0320 ~	_HS2_MOD[k]	Bit	High speed link parameter 1, k block station RUN operation mode.
L035F	(k = 00~63)	Array	Indicates operation mode of station set in k data block of parameter.
L0360 ~	_HS2_TRX[k]	Bit	Normal communication with High speed link parameter 1, K block station.
L039F	(k = 00~63)	Array	Indicates if communication state of K data of parameter is communicated smoothly according to the setting.
L0400 ~	_HS2_ERR[k]	Bit	High speed link parameter 1, K block station operation error mode.
L043F	(k = 00~63)	Array	Indicates if the error occurs in the communication state of k data block of parameter.
L0440 ~	_HS2_SETBLOCK[k]	Bit	High speed link parameter 1, K block setting.
L047F		Array	Indicates whether or not to set k data block of parameter.

#### (3) Common area

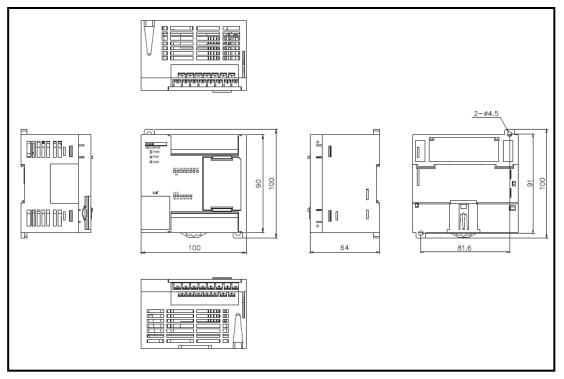
Communication flag list according to P2P service setting. P2P parameter: "S" type 1~3, "E" type 1 P2P block: "S" type and "E" type 0~31

Device	Keyword	Туре	Description
L5120	_P2P1_NDR00	Bit	Indicates P2P parameter 1, 0 Block service normal end.
L5121	_P2P1_ERR00	Bit	Indicates P2P parameter 1, 0 Block service abnormal end.
L513	_P2P1_STATUS00	Word	Indicates error code in case of P2P parameter 1, 0 Block service abnormal end.
L514	_P2P1_SVCCNT00	DWord	Indicates P2P parameter 1, 0 Block service normal count.
L516	_P2P1_ERRCNT00	DWord	Indicates P2P parameter 1, 0 Block service abnormal count.
L5180	_P2P1_NDR01	Bit	P2P parameter 1, 1 Block service normal end.
L5181	_P2P1_ERR01	Bit	P2P parameter 1, 1 Block service abnormal end.
L519	_P2P1_STATUS01	Word	Indicates error code in case of P2P parameter 1, 1 Block service abnormal end.
L520	_P2P1_SVCCNT01	DWord	Indicates P2P parameter 1, 1 Block service normal count.
L522	_P2P1_ERRCNT01	DWord	Indicates P2P parameter 1, 1 Block service abnormal count.
L524~L529	-	Word	P2P parameter 1,2 Block service total.
L530~L535	-	Word	P2P parameter 1,3 Block service total.
L536~L697	-	Word	P2P parameter 1,4~30 Block service total.
L698~L703	-	Word	P2P parameter 1,31 Block service total.

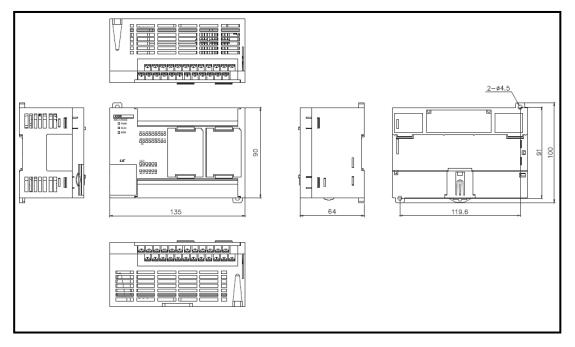
# Appendix 2 Dimension (Unit: mm)

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

-. XBC-DR10/14E, XBC-DN10/14E, XBC-DP10/14E



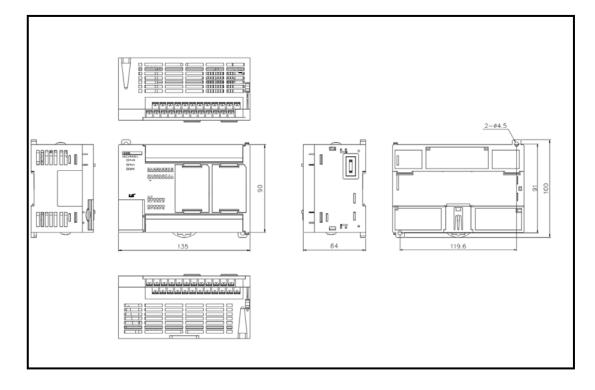
-. XBC-DR20/30E, XBC-DN20/30E, XBC-DP20/30E



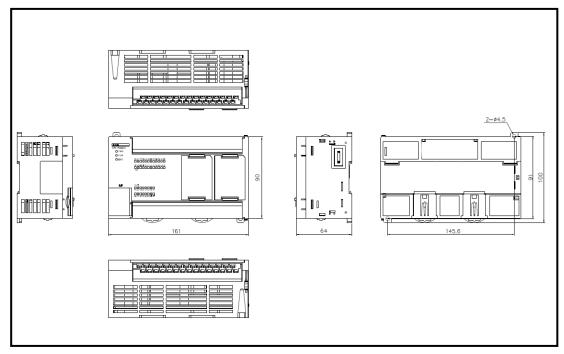
(2) Standard type main unit ("S(U)" type)

Γ

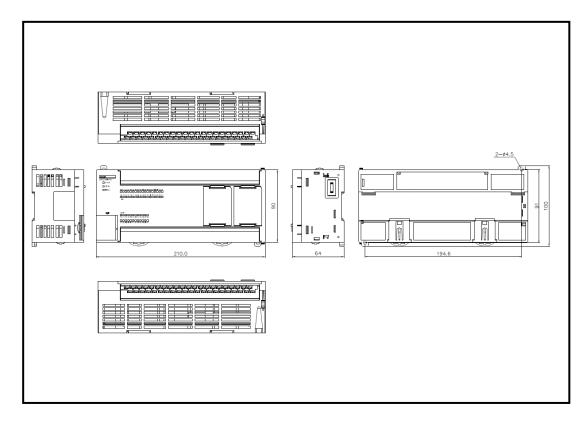
-. XBC-DN20/30S(U), XBC-DR20/30SU, XBC-DP20/30SU



- XBC-DN40SU, XBC-DR40SU , XBC-DP40SU



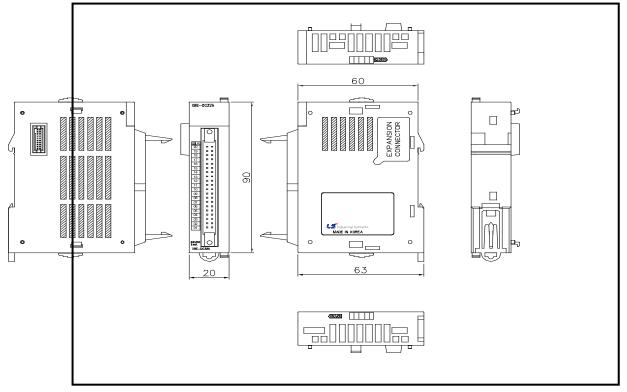
- XBC-DN60SU, XBC-DR60SU, XBC-DP60SU



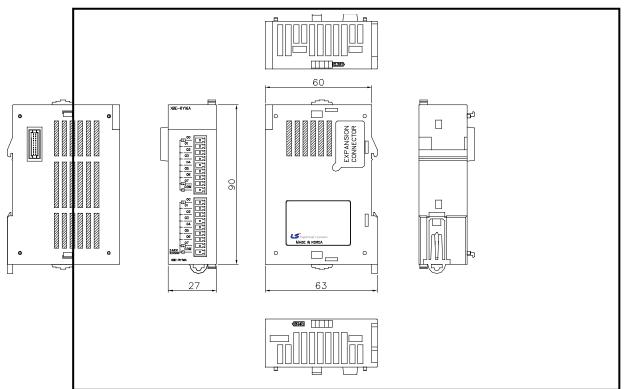
### (3) Extension I/O module

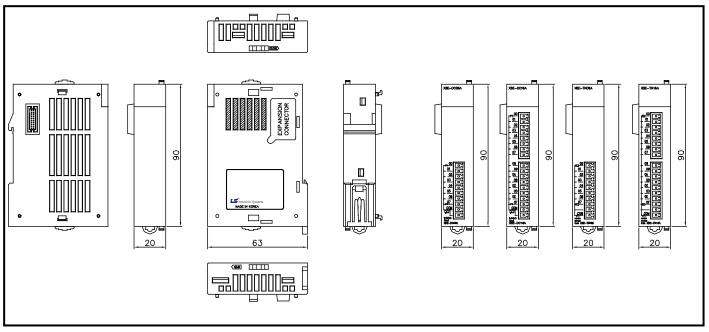
Γ

#### -. XBE-DC32A, XBE-TN32A, XBE-DP32A, XBE-DN32A



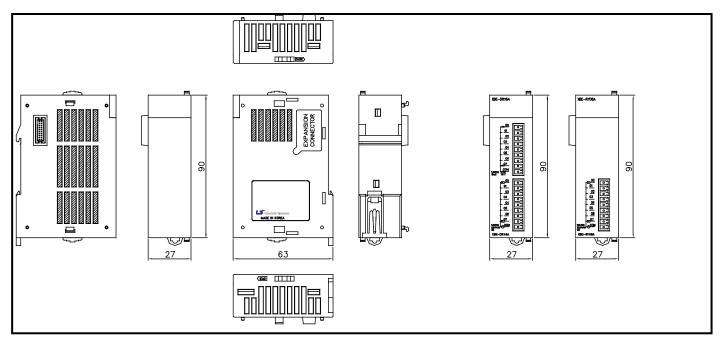
### -. XBE-RY16A





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

#### -. XBE-DR16A, XBE-RY08A



# Appendix 3 Compatibility with MASTER-K (Special Relay)

	MASTER-K	Question	XGB		
Device	Function	Symbol	Device	Function	
F0000	RUN mode	_RUN	F0000	RUN Edit mode	
F0001	Program mode	_STOP	F0001	Program mode	
F0002	Pause mode	_ERROR	F0002	Error mode	
F0003	Debug mode	_DEBUG	F0003	Debug mode	
F0004	N/A	_LOCAL_CON	F0006	Remote mode	
F0005	N/A	_MODBUS_CON	F0006	Remote mode	
F0006	Remote mode	_REMOTE_CON	F0006	Remote mode	
F0007	User memory setup	-	F0007	N/A	
F0008	N/A	_RUN_EDIT_ST	F0008	Editing during RUN	
F0009	N/A	_RUN_EDIT_CHK	F0009	Editing during RUN	
F000A	User memory operation	_RUN_EDIT_DONE	F000A	Edit done during RUN	
F000B	N/A	_RUN_EDIT_END	F000B	Edit end during RUN	
F000C	N/A	_CMOD_KEY	F000C	Operation mode change by KEY	
F000D	N/A	_CMOD_LPADT	F000D	Operation mode change by PADT	
F000E	N/A	_CMOD_RPADT	F000E	Operation mode change by Remote PADT	
F000F	STOP command execution	_CMOD_RLINK	F000F	Operation mode change cause by remote communication module	
F0010	Ordinary time On	_FORCE_IN	F0010	Forced input	
F0011	Ordinary time Off	_FORCE_OUT	F0011	Forced output	
F0012	1 Scan On	_SKIP_ON	F0012	I/O Skip execution	
F0013	1 Scan Off	_EMASK_ON	F0013	Error mask execution	
F0014	Reversal every Scan	_MON_ON	F0014	Monitor execution	
		_USTOP_ON	F0015	Stop by Stop Function	
		_ESTOP_ON	F0016	Stop by ESTOP Function	
F0015 ~		_CONPILE_MODE	F0017	Compile	
F001C	N/A	_INIT_RUN	F0018	Initialize	
		-	F0019 ~ F001F	N/A	
		_PB1	F001C	Program Code 1	
F001D	N/A	_PB2	F001D	Program Code 2	
F001E	N/A	_CB1	F001E	Compile code 1	
F001F	N/A	_CB2	F001F	Compile code 2	

MASTER-K			XGB		
Device	Function	Symbol	Device	Function	
F0020	1 Step RUN	_CPU_ER	F0020	CPU configuration error	
F0021	Break Point RUN	_IO_TYER	F0021	Module type mismatch error	
F0022	Scan RUN	_IO_DEER	F0022	Module detach error	
F0023	Contact value match RUN	_FUSE_ER	F0023	Fuse cutoff error	
F0024	Word value match RUN	_IO_RWER	F0024	I/O module read/write error	
		_IP_IFER	F0025	Special/communication module interface error	
		_ANNUM_ER	F0026	Heavy error detection of external equipment error	
		-	F0027	N/A	
		_BPRM_ER	F0028	Basic parameter error	
50005		_IOPRM_ER	F0029	I/O configuration parameter error	
F0025 ~ F002F	N/A	_SPPRM_ER	F002A	Special module parameter error	
		_CPPRM_ER	F002B	Communication module parameter error	
		_PGM_ER	F002C	Program error	
		_CODE_ER	F002D	Program Code error	
		_SWDT_ER	F002E	System watchdog error	
		_BASE_POWER_ ER	F002F	Base power error	
F0030	Heavy error	_WDT_ER	F0030	Scan watchdog	
F0031	Light error	-	F0031	-	
F0032	WDT error	-	F0032	-	
F0033	I/O combination error	-	F0033	-	
F0034	Battery voltage error	-	F0034	-	
F0035	Fuse error	-	F0035	-	
F0036 ~ F0038	N/A	-	F0036 ~ F0038	-	
F0039	Backup normal	-	F0039	-	
F003A	Clock data error	-	F003A	-	
F003B	Program change	-	F003B	-	
F003C	Program change error	-	F003C	-	
F003D ~ F003F	N/A	-	F003D ~ F003F	N/A	
		_RTC_ER	F0040	RTC data error	
		_DBCK_ER	F0041	Data backup error	
		_HBCK_ER	F0042	Hot restart disabled error	
F0040~ F005F	N/A	_ABSD_ER	F0043	Abnormal operation stop	
		_TASK_ER	F0044	Task collision	
		_BAT_ER	F0045	Battery error	
		_ANNUM_ER	F0046	Light error detection of external equipment	

Γ

MASTER-K			XGB		
Device	Function	Symbol	Device	Function	
		_LOG_FULL	F0047	Log memory full warning	
		_HS_WAR1	F0048	High speed link parameter 1 error	
F0040 ~ F005F		_HS_WAR2	F0049	High speed link parameter 2 error	
		-	F004A ~ F0053	N/A	
	N//A	_P2P_WAR1	F0054	P2P parameter 1 error	
	N/A	_P2P_WAR2	F0055	P2P parameter 2 error	
		_P2P_WAR3	F0056	P2P parameter 3 error	
		-	F0057 ~ F005B	N/A	
		_Constant_ER	F005C	Constant error	
		-	F005D ~ F005F	N/A	
F0060 ~ F006F	Error Code save	-	F0060 ~ F006F	N/A	
F0070 ~ F008F	Fuse cutoff save	-	F0070 ~ F008F	N/A	
F0090	20ms cycle Clock	_T20MS	F0090	20ms cycle Clock	
F0091	100ms cycle Clock	_T100MS	F0091	100ms cycle Clock	
F0092	200ms cycle Clock	_T200MS	F0092	200ms cycle Clock	
F0093	1s cycle Clock	_T1S	F0093	1s cycle Clock	
F0094	2s cycle Clock	_T2S	F0094	2s cycle Clock	
F0095	10s cycle Clock	_T10S	F0095	10s cycle Clock	
F0096	20s cycle Clock	_T20S	F0096	20s cycle Clock	
F0097	60s cycle Clock	_T60S	F0097	60s cycle Clock	
		-	F0098	N/A	
		_ON	F0099	Ordinary time On	
		_OFF	F009A	Ordinary time Off	
F0098 ~F009F	N/A	_10N	F009B	1 Scan On	
		_10FF	F009C	1 Scan Off	
		_STOG	F009D	Reversal every Scan	
		-	F009B ~ F009F	N/A	
F0100	User Clock 0	-	F0100	User Clock 0	
F0101	User Clock 1	-	F0101	User Clock 1	
F0102	User Clock 2	-	F0102	User Clock 2	
F0103	User Clock 3	-	F0103	User Clock 3	
F0104	User Clock 4	-	F0104	User Clock 4	
F0105	User Clock 5	-	F0105	User Clock 5	
F0106	User Clock 6	-	F0106	User Clock 6	
F0107	User Clock 7	-	F0107	User Clock 7	

MASTER-K		Querrale al	XGB		
Device	Function	Symbol	Device	Function	
F0108 ~ F010F		-	F0108 ~ F010F	N/A	
F0110	Operation error flag	_Ler	F0110	Operation error flag	
F0111	Zero flag	_Zero	F0111	Zero flag	
F0112	Carry flag	_Carry	F0112	Carry flag	
F0113	Full output Off	_AII_Off	F0113	Full output Off	
F0114	Common RAM R/W error	-	F0114	N/A	
F0115	Operation error flag (latch)	_Ler_Latch	F0115	Operation error flag(latch)	
F0116 ~ F011F		-	F0116 ~ F011F	N/A	
F0120	LT flag	_LT	F0120	LT flag	
F0121	LTE flag	_LTE	F0121	LTE flag	
F0122	EQU flag	_EQU	F0122	EQU flag	
F0123	GT flag	_GT	F0123	GT flag	
F0124	GTE flag	_GTE	F0124	GTE flag	
F0125	NEQ flag	_NEQ	F0125	NEQ flag	
F0126 ~ F012F	N/A	-	F0126 ~ F012F	N/A	
F0130~ F013F	AC Down Count	_AC_F_CNT	F0130~ F013F	AC Down Count	
F0140~ F014F	FALS no.	_FALS_NUM	F0140~ F014F	FALS no.	
		_PUTGET_ERR	F0150~ F030F	PUT/GET error flag	
F0150~ F015F	PUT/GET orror flog	CPU TYPE	F0440 ~ F044F	CPU TYPE	
	PUT/GET error flag	CPU VERSION	F0450 ~ F045F	CPU VERSION	
		OS version no.	F0460 ~ F047F	System OS version no.	
F0160~ F049F	N/A	OS date	F0480 ~ F049F	System OS DATE	

MASTER-K			XGB		
Device	Function	Symbol	Device	Function	
F0500~ F050F	Max. Scan time	_SCAN_MAX	F0500~ F050F	Max. Scan time	
F0510~ F051F	Min. Scan time	_SCAN_MIN	F0510~ F051F	Min. Scan time	
F0520~ F052F	Current Scan time	_SCAN_CUR	F0520~ F052F	Current Scan time	
F0530~ F053F	Clock data (year/month)	_YEAR_MON	F0530~ F053F	Clock data (year/month)	
F0540~ F054F	Clock data (day/hr)	_DAY_TIME	F0540~ F054F	Clock data(day/hr)	
F0550~ F055F	Clock data (min/sec)	_MIN_SEC	F0550~ F055F	Clock data(min/sec)	
F0560~ F056F	Clock data (100year/weekday)	_HUND_WK	F0560~ F056F	Clock data(100year/weekday)	
		_FPU_LFlag_I	F0570	-	
		_FPU_LFlag_U	F0571	-	
		_FPU_LFlag_O	F0572	-	
		_FPU_LFlag_Z	F0573	-	
		_FPU_LFlag_V	F0574	-	
	N/A	-	F0575 ~ F0579	N/A	
F0570~ F058F		_FPU_Flag_I	F057A	-	
		_FPU_Flag_U	F057B	-	
		_FPU_Flag_O	F057C	-	
		_FPU_Flag_Z	F057D	-	
		_FPU_Flag_V	F057E	-	
		_FPU_Flag_E	F057F	-	
		Error Step	F0580~ F058F	Error step save	
F0590~ F059F	Error step save	-	F0590~ F059F	N/A	
F0600~ F060F	FMM detailed error information	_REF_COUNT	F060~F061	Refresh Count	
F0610~ F063F	N/A	_REF_OK_CNT	F062~F063	Refresh OK Count	
-	-	_REF_NG_CNT	F064~F065	Refresh NG Count	
-	-	_REF_LIM_CNT	F066~F067	Refresh Limit Count	
-	-	_REF_ERR_CNT	F068~F069	Refresh Error Count	
-	-	_MOD_RD_ERR_CNT	F070~F071	MODULE Read Error Count	
-	-	_MOD_WR_ERR_CNT	F072~F073	MODULE Write Error Count	
-	-	_CA_CNT	F074~F075	Cmd Access Count	
-	-	_CA_LIM_CNT	F076~F077	Cmd Access Limit Count	
-	-	_CA_ERR_CNT	F078~F079	Cmd Access Error Count	
-	-	_BUF_FULL_CNT	F080~F081	Buffer Full Count	

#### Note

Γ

- 1. When you convert the project written by KGLWIN in MASTER-K series (K80S, K200S, K300S, and K1000S) into XG5000 project, some instructions used in only MASTER-K is not converted. And the previous parameter used in MASTER-K is converted into default value.
- 2. XGB economy type project can be converted into XGB standard type project but parameter is converted into default value.
- 3. When you convert the XGB standard type project into XGB economy type project, some instructions used in only XGB standard type is not converted. And the parameter is converted into default value.

# **Appendix 4 Instruction List**

# Appendix 4.1 Classification of Instructions

Classification	Instructions	Details	Remarks
	Contact Point Instruction	LOAD, AND, OR related Instructions	
	Unite Instruction	AND LOAD, OR LOAD, MPUSH, MLOAD, MPOP	
	Reverse Instruction	NOT	
	Master Control Instruction	MCS, MCSCLR	
Basic	Output Instruction	OUT, SET, RST, 1 Scan Output Instruction, Output Reverse Instruction (FF)	
Instructions	Sequence/Last-input Preferred Instruction	Step Control Instruction (SET Sxx.xx, OUT Sxx.xx)	
	End Instruction	END	
	Non-Process Instruction	NOP	
	Timer Instruction	TON, TOFF, TMR, TMON, TRTG	
	Counter Instruction	CTD, CTU, CTUD, CTR	
	Data Transfer Instruction	Transfers specified Data, Group, String	4/8/64 Bits available
	Conversion Instruction	Converts BIN/BCD of specified Data & Group	4/8 Bits available
	Data Type Conversion Instruction	Converts Integer/Real Number	
	Output Terminal Compare Instruction	Saves compared results in special relay	Compare to Unsigned
	Input Terminal Compare Instruction	Saves compared results in BR. Compares Real Number, String & Group. Compares 3 Operands	Compare to Signed
-	Increase/Decrease Instruction	Increases or decreases specified data 1 by 1	4/8 Bits available
	Rotate Instruction	Rotates specified data to the left and right, including Carry	4/8 Bits available
	Move Instruction	Moves specified data to the left and right, word by word, bit by bit	4/8 Bits available
	Exchange Instruction	Exchanges between devices, higher & lower byte, group data	
	BIN Operation Instruction	Addition, Subtraction, Multiplication & Division for Integer/ Real Number, Addition for String, Addition & Subtraction for Group	
	BCD Operation Instruction	Addition, Subtraction, Multiplication, Division.	
Application	Logic Operation Instruction Logic Multiplication, Logic Addition, Exclusive OR, Exclus		
Instructions	System Instruction	Error Display, WDT Initialize, Output Control, Operation Stop, etc.	
	Data Process Instruction	Encode, Decode, Data Disconnect/Connect, Search, Align, Max., Min., Total, Average, etc.	
	Data Table Process Instruction	Data Input/Output of Data Table	
	String Process Instruction	String related Convert, Comment Read, String Extract, ASCII Convert, HEX Convert, String Search, etc.	
	Special Function Instruction	Trigonometric Function, Exponential/Log Function, Angle/ Radian Convert, etc.	
	Data Control Instruction	Max/Min Limit Control, Dead-zone Control, Zone Control	
	Time related Instruction	Date Time Data Read/Write, Time Data Adjust & Convert	
	Diverge Instruction	JMP, CALL	
	Loop Instruction	FOR/NEXT/BREAK	
	Flag related Instruction	Carry Flag Set/Reset, Error Flag Clear	
	Special/Communication related Instruction	Data Read/Write by BUSCON Direct Access	
	Interrupt related Instruction	Interrupt Enable/Disable	
	Signal Reverse Instruction	Reverse Integer/Real Signals, Absolute Value Operation	
	File related Instruction	Blcok Read/Write/Compare/Convert, Flash data Transmission	

# Appendix 4.2 Basic Instructions

## (1) Contact point instruction

Γ

Classification	Designations	Symbol	Description	Support	
Classification Designations Symbol		Description	XGK	XGB	
	LOAD		A Contact Point Operation Start	0	0
	LOAD NOT		B Contact Point Operation Start	0	0
	AND		A Contact Point Series- Connected	0	0
	AND NOT		B Contact Point Series- Connected	0	0
	OR		A Contact Point Parallel- Connected	0	0
Contact	OR NOT		B Contact Point Parallel- Connected	0	0
Point	LOADP	⊢ P	Positive Convert Detected Contact Point	0	0
	LOADN	N	Negative Convert Detected Contact Point	0	0
	ANDP		Positive Convert Detected Contact Point Series-	0	0
	ANDN	— N	Negative Convert Detected Contact Point Series-	0	0
	ORP	└──┤₽ ├──┘	Positive Convert Detected Contact Point Parallel-	0	0
	ORN	└──┤N	Negative Convert Detected Contact Point Parallel-	0	0

## (2) Union instruction

Classification	Designations	Symbol	Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
	AND LOAD	A B L	A,B Block Series-Connected	0	0
	OR LOAD		A,B Block Parallel-Connected	0	0
Unite	MPUSH		Operation Result Push up to present	0	0
	MLOAD		Operation Result Load Previous to Diverge Point	0	0
	MPOP		Operation Result Pop Previous to Diverge Point	0	0

### (3) Reverse instruction

-	Classification	Classification Designations Symbol	Description	Support		
	Classification	Designations	Symbol	Description	XGK	XGB
	Reverse	NOT	— <u>*</u> —	Previous Operation results Reverse	0	0

### (4) Master Control instruction

Classification	Designations	Symbol	Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
Master	MCS	MCS n	Master Control Setting (n:0~7)	0	0
Control	MCSCLR	MCSCLR n	Master Control Cancel (n:0~7)	0	0

### (5) Output instruction

Classification	Designations	Symbol	Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
	OUT	— ( )—	Operation Results Output	0	0
	OUT NOT	(/)	Operation Results Reverse Output	0	0
	OUTP	( P )	1 Scan Output if Input Condition rises	0	0
Output	OUTN	——( N )—	1 Scan Output if Input Condition falls	0	0
	SET	( s )	Contact Point Output ON kept	0	0
	RST	——( R )—	Contact Point Output OFF kept	0	0
	FF	FF D	Output Reverse if Input Condition rises	0	0

## (6) Sequence/Last-input preferred instruction

Classification	Designations Symbol		Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
Step	SET S	Syy.xx ───( S )──	Sequence Control	0	0
Control	OUT S	Syy.xx ( )	Last-input Preferred	0	0

### (7) End instruction

Classification	Designations	Symbol	Description	Support	
Classification		Symbol		XGK	XGB
End	END	-END-	Program End	0	0

### (8) Non-process instruction

Classification	Designations Symbol		Description	Sup	oport
Classification	Designations	Symbol	Description	XGK	XGB
Non-Process	Non-Process NOP Ladder not displayed		Non-Process Instruction, used in Nimonic	0	0

## (9) Timer instruction

Г

/	Classification	Designations	ations Symbol Description		Sup	port
	Designatione		Cymbol	Description	XGK	XGB
		TON		Input + t +	0	0
		TOFF		Input t	0	0
	Timer	TMR	TMR T t	Input $t1+t2 = t$ $\leftarrow t1 \rightarrow   \leftarrow t2 \rightarrow  $ T	0	0
		TMON		Input [	0	0
		TRTG		Input ← t → T	0	0

# (10) Counter instruction

Classification	Designations Symbol Description			oport	
				XGK	XGB
	CTD	CTD C c	Reset Count Pulse Present	0	0
	СТU	CTU C c	Reset Count Pulse Present Output	0	0
Counter	CTUD		Reset Increased Pulse Decreased Pulse Present	0	Ο
	CTR	CTR C c	Reset Count Pulse Present	0	0

# **Appendix 4.3 Application Instruction**

# (1) Data transfer instruction

Classification Designations		Symbol	Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
16 bits	MOV	MOV S D	(S) → (D)	0	0
Transfer	MOVP	MOVP S D			
32 bits	DMOV		$\underbrace{\mathbf{S} \ \mathbf{D}}_{$		0
Transfer	DMOVP	DMOVP S D			
Short Real Number	RMOV	RMOV SD	(S+1,S) → (D+1,D)	0	0
Transfer	RMOVP	-RMOVP SD-		0	0
Long	LMOV		(S+3,S+2,S+1,S)		
Real Number Transfer	LMOVP		(D+3,D+2,D+1,D)	0	0
4 bits	MOV4	MOV4 Sb Db	(Sb): Bit Position b15 b0 t1 t1 t1 t1 4bit trans		
Transfer	MOV4P	MOV4P Sb Db	(Db): Bit Position	0	0
8 bits	MOV8	MOV8 Sb Db	(Sb): Bit Position		0
Transfer	MOV8P		Bbit trans	0	0
	CMOV	CMOV S D	1's complement		
1's complement	CMOVP	CMOVP S D	(S) → (D)	0	0
Transfer	DCMOV	DCMOV S D	1's complement	0	0
	DCMOVP	DCMOVP S D	$(S+1,S) \longrightarrow (D+1,D)$	0	0
16 bits	GMOV	GMOV SDN		0	0
Group Transfer	GMOVP	GMOVP S D N		0	0
Multiple	FMOV	FMOV S D N	(S) (D)		
Transfer	FMOVP			0	0
Specified Bits	BMOV	BMOV S D N	(S)	0	0
Transfer	BMOVP	-BMOVP SDN	(D) <b>Z</b> : Control Word	0	0
Specified Bits	GBMOV	GBMOV SDZN-	(S) b15 b0 : (S+N) (D)	0	0
Group Transfer	GBMOVP	GBMOVP S D Z N	(D+N) * Z: Control Word	0	0

## (1) Data Transfer Instruction (continued)

Γ

Classification Designation		Symbol	Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
String	\$MOV		String started from (S)	0	0
Transfer	\$MOVP		String started from (D)	0	0

# (2) BCD/BIN conversion instruction

Classification	Designations Symbol		Description	Support	
Classification	Designations	Gymbol	·	XGK	XGB
	BCD	BCD S D	(S) → (D)	0	0
BCD	BCDP	BCDP S D	Ê BIN( 0∼9999 )	0	0
Conversion	DBCD	DBCD S D	(S+1,S) <b>To BCD</b> (D+1,D)		
	DBCDP	DBCDP S D	Ê BIN( 0∼999999999 )	0	0
	BCD4	BCD4 Sb Db	(Sb):Bit, BIN(0~9) b15 ↓ b0	0	0
4/8 Bits BCD	BCD4P	BCD4P Sb Db	To 4bit BCD	-	-
Conversion	BCD8	BCD8 Sb Db	(Sb):Bit, BIN(0~99) b15 ↓ b0	0	0
	BCD8P	BCD8P Sb Db	To 8bit BCD	Ū	•
	BIN	BIN S D	(S) → (D)	0	0
BIN	BINP	BINP S D	Ê BCD( 0∼99999 )	0	0
Conversion	DBIN	DBIN S D	(S+1,S) To BIN (D+1,D)		_
	DBINP	DBINP S D	€ BCD( 0~999999999 )	0	0
	BIN4	BIN4 Sb Db	(Sb):Bit, BCD(0~9) b15	0	0
4/8 Bits BIN	BIN4P	BIN4P Sb Db	To 4bit BIN (Db):Bit	0	0
Conversion	BIN8	BIN8 Sb Db	(Sb):Bit, BCD(0~99) <sup>b15</sup> ↓ <sup>b0</sup>	0	0
	BIN8P	BIN8P Sb Db	To bit BIN	Ū	•
	GBCD	GBCD S D N	□Data (S) to N converted to BCD,	0	0
Group	GBCDP	GBCDP S D N	and (D) to N saved	0	0
BCD,BIN Conversion	GBIN	GBIN S D N	□ Data (S) to N converted to BIN,		
	GBINP	GBINP S D N	and (D) to N saved	0	0

(3)	Data	type	conversion	instruction

	Designations	Symbol	Description	Sup	port
Classification	Designations	Symbol	Description	XGK	XGB
16 Bits	I2R I2RP		(S)	0	0
Integer/Real Conversion 32 Bits Integer/Real Conversion	I2L I2LP	[12LP S D[12LP S D[12LP S D	(S) $\xrightarrow{\text{To Long}}$ (D+3,D+2,D+1,D) $\uparrow \qquad \qquad$	0	0
	D2R D2RP	D2R SD	(S+1,S)	0	0
	D2L D2LP		(S+1,S)	0	0
Short	R2I R2IP		$(S+1,S) \xrightarrow{\text{To INT}} (D)$ $\uparrow \qquad Whole Sing Real Range$	0	0
Real/Integer Conversion	R2D R2DP		$(S+1,S) \xrightarrow{\text{To DINT}} (D+1,D)$ $ Whole Sing Real Range$	0	0
Long	L2I L2IP		$(S+3,S+2,S+1,S) \xrightarrow{\text{To INT}} (D)$ $\textcircled{D}$ $\textcircled{D}$ Whole Double Real Range	0	0
Real/Integer Conversion	L2D L2DP	L2D S D L2DP S D	$(S+3,S+2,S+1,S) \xrightarrow{\text{To DINT}} (D+1,D)$ $\textcircled{D}$ Whole Double Real Range	0	0

٦

#### Remark

Integer value and Real value will be saved respectively in quite different format. For such reason, Real Number Data should be converted as applicable before used for Integer Operation.

## (4) Comparison instruction

Γ

	Designations	Symbol	Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
Unsigned	CMP	CMP S1 S2	CMP(S1,S2) and applicable Flag SET	0 0	0
Compare with Special	CMPP	CMPP S1 S2	2 (S1, S2 is Word)	)	0
Relay	DCMP	DCMP S1 S2	CMP(S1,S2) and applicable Flag SET	0	0
used	DCMPP	DCMPP S1 S2	(S1, S2 is Double Word)	0	0
	CMP4		CMP(S1,S2) and applicable Flag SET	0	0
4/8 Bits	CMP4P	CMP4P S1 S2	(S1, S2 is Nibble)	0	0
Compare	CMP8		CMP(S1,S2) and applicable Flag SET	0	0
	CMP8P	CMP8P S1 S2	(S1, S2 is Byte)	0	0
	ТСМР	TCMP S1 S2 D	CMP(S1,S2))		
Table	ТСМРР	TCMPP S1 S2 D	<ul> <li>− CMP(S1+15,S2+15)</li> <li>↑ Result:(D) ~ (D+15), 1 if identical</li> </ul>	0	0
Compare	DTCMP	DTCMP S1 S2 D	CMP((S1+1,S1),(S2+1,S2)) CMP((S1+31,S1+30),(S2+31,S2+30)) Result:(D) ~ (D+15)	0	0
	DTCMPP	DTCMPP S1 S2 D		0	0
	GEQ	GEQ S1 S2 D N			
	GEQP	GEQP S1 S2 D N			
	GGT	GGT S1 S2 D N			
	GGTP	GGTP S1 S2 D N			
	GLT	GLT S1 S2 D N			
Group	GLTP	GLTP S1 S2 D N	Compares S1 data to S2 data word by word, and saves its result in Device (D) bit by bit from the lower	0	0
Compare (16 Bits)	GGE		bit $(N \le 16)$	0	0
	GGEP	GGEP S1 S2 D N			
	GLE	GLE S1 S2 D N			
	GLEP	GLEP S1 S2 D N			
	GNE	GNE S1 S2 D N			
	GNEP	GNEP S1 S2 D N			

#### Remark

CMP(P), DCMP(P), CMP4(P), CMP8(P), TCMP(P) & DTCMP(P) Instructions all process the results of Unsigned Compare. All the other Compare Instructions will perform Signed Compare.

Classification	Designations	Symbol	Description	Sup	port
Classification	Designations	Symbol	Description	XGK	XGB
	GDEQ	GDEQ S1 S2 D N		0	0
	GDEQP	GDEQP S1 S2 D N		0	0
		0	0		
	GDGTP	GDGTP S1 S2 D N		0	0
GDLT - GDLT S1 S2 D N	Compares S1 data to S2 data 2	0	0		
Group Compare	GDLTP	GDLTP S1 S2 D N	Compares S1 data to S2 data 2 by 2 words, and saves its result in Device (D) bit by bit from the lower bit $(N \le 16)$		0
(32 Bits)	GDGE	GDGE S1 S2 D N		0	0
	GDGEP	GDGEP S1 S2 D N		0	0
	GDLE	GDLE S1 S2 D N		0	0
	GDLEPGDLEP S1 S2 D N		0	0	
GDNE –	GDNE S1 S2 D N		0	0	
	GDNEP	GDNEP S1 S2 D N		0	0

Γ

Classification	Designations	Symbol	Description	Sup	oport
Classification	Designations	Symbol	Description	XGK	XGB
	LOAD=	= S1 S2			
	LOAD>	> S1 S2			
16 Bits Data	LOAD<	< S1 S2	Compares (S1) to (S2), and saves its result in Bit Result(BR) (Signed	0	0
Compare (LOAD)	LOAD>=	>= S1 S2	Operation)	0	0
· · · /	LOAD<=	<= S1 S2			
	LOAD<>	→ S1 S2 →			
	AND=	-   - <b>  =   S1   S2</b>			
	AND>		Performs AND operation of (S1) &		
16 Bits Data	AND<	HH< S1 S2	(S2) Compare Result and Bit Result (BR), and then saves its result in BR (Signed Operation)	0	0
Compare (AND)	AND>=	S1  S2		0	0
	AND<=	-  - <b>&lt;=</b>  S1  S2			
	AND<>	HH <> S1 S2			
16 Bits	OR=		Performs OR operation of (S1) &		
Data Compare	OR<=	<= S1 S2	(S2) Compare Result and Bit Result (BR), and then saves its result in BR (Signed Operation)	0 0	0
(OR)	OR<>	- -  <>   S1  S2  -			
	LOADD=	D= \$1 \$2			
	LOADD>	D> S1 S2			
32 Bits Data	LOADD<	D< \$1 \$2	Compares (S1) to (S2), and saves its result in Bit Result(BR) (Signed		
Compare (LOAD)	LOADD>=	D>= \$1 \$2	Operation)		
()	LOADD<=	D<= \$1 \$2			
	LOADD<>	D<> \$1 \$2	]		

#### Remark

Comparison instruction for input process the result of Signed comparison instruction generally. To process Unsigned comparison, Use comparison instruction for input.

Classification	Designations	Symbol	Description	Sup	port
Classification	•	-	Description	XGK	XGB
32 Bits	ANDD=				
	ANDD>		Deviation of (C1) 8		
Data	ANDD<		Performs AND operation of (S1) & (S2) Compare Result and Bit Result	0	0
Compare (AND)	ANDD>=	- - _D>=   S1  S2	(BR), and then saves its result in BR (Signed Operation)	Ŭ	0
	ANDD<=				
	ANDD<>	⊣⊢ <b>D&lt;&gt;</b> \$1\$2			
	ORD=	D= S1 S2			
	ORD>	D> S1 S2			
32bt Data	ORD<	D< S1 S2	Performs OR operation of (S1) & (S2) Compare Result and Bit Result	0	0
Compare (OR)	ORD>=	D>= S1 S2	(BR), and then saves its result in BR (Signed Operation)	0	0
	ORD<=	D<= S1 S2			
	ORD<>	D<> S1 S2			
	LOADR=	R= \$1\$2			
	LOADR>				
Short Real Number	LOADR<	R< \$1 \$2	Performs OR operation of (S1) & (S2) Compare Result and Bit	0	0
Compare (LOAD)	LOADR>=	R>= S1 S2	Result (BR), and then saves its result in BR (Signed Operation)	-	÷
	LOADR<=	R<= \$1 \$2			
	LOADR<>	R<> S1 S2			
	ANDR=	-  -  <b>R=</b>  S1  S2			
	ANDR>	HH <b>R&gt; S1 S2</b>			
Short Real Number	ANDR<	HHR< S1 S2	Compares (S1+1,S) to (S2+1,S2) and saves its result in Bit Result	0	0
Compare (AND)	ANDR>=		(BR) (Signed Operation)	Ŭ	Ŭ
	ANDR<=	HHR<= S1 S2			
	ANDR<>	HH <b>R&lt;&gt;</b> S1 S2			

Classification	Designations	Symbol	Description		port
Classification	Designations	Symbol	Description	XGK	XGB
	ORR=	R= S1 S2			
	ORR>	R> \$1 \$2			
Real Number	ORR<	R< S1 S2	Compares (S1+1,S1) to (S2+1,S2) and saves its result in Bit Result	0	
Compare (OR)	ORR>=	R>= S1 S2	(BR) (Signed Operation)	0	0
	ORR<=	R<= S1 S2			
	ORR<>	R<> S1 S2			
	LOADL=	L= S1 S2	Compares (S1+3,S1+2,S1+1,S) to (S2+3,S2+2, S2+1,S2) and saves its result in Bit Result(BR) (Signed		
	LOADL>	L> S1 S2			
Long Real Number Compare	LOADL<	L< \$1 \$2		0	0
(LOAD)	LOADL>=	L>= S1 S2-	Operation)	0	0
	LOADL<=	L<= S1 S2			
	LOADL<>	L<> \$1 \$2			
	ANDL=	HHL= S1 S2			
	ANDL>				
Long Real Number	ANDL<	⊣⊢L< <u>\$1</u> \$2—	Performs AND operation of (S1+ 1,S1) & (S2+1,S2) Compare Result and Bit Result(BR), and then saves	0	0
Compare (AND)	ANDL>=	HHL>= S1 S2	its result in BR (Signed Operation)	0	9
	ANDL<=	⊣⊢L<= S1 S2			
	ANDL<>	HHL<> S1 S2			

Classification	Designations	Symbol	Description	Sup	port
Classification	Designations	Symbol	Description	XGK	XGB
	ORL=				
	ORL>	L> S1 S2			
Double Real Number	ORL<		Performs OR operation of (S1 +1,S1) & (S2+1,S2) Compare Result and Bit Result(BR), and		
Compare (OR)	ORL>=		then saves its result in BR (Signed Operation)	0	0
	ORL<=	L<= S1 S2			
	ORL<>	L<> S1 S2			
	LOAD\$=	\$= S1 S2	Compares (S1) to (S2) Starting String and saves its result in Bit Result(BR)		
	LOAD\$>	\$> S1 S2			
String Compare	LOAD\$<	\$< S1 S2		0	0
(LOAD)	LOAD\$>=	\$>= \$1 \$2		0	0
	LOAD\$<=	\$<= \$1 \$2			
	LOAD\$<>	\$<> \$1 \$2			
	AND\$=	HH \$= S1 S2			
	AND\$>				
String Compare	AND\$<	HH <b>\$&lt; </b> \$1 \$2	Performs AND operation of (S 1) & (S2) Starting String Compare	0	0
(AND)	AND\$>=		Result and Bit Result(BR), and then saves its result in BR		J
	AND\$<=	HH <b>\$&lt;=</b> S1 S2			
	AND\$<>	⊣⊢ <b>\$&lt;&gt;</b> S1 S2			

Classification	Designations	Symbol	Description	Sup	
	Designations	Gymbol	Description	XGK	XGB
	OR\$=	\$= S1 S2			
	OR\$>	\$> S1 S2			
String	OR\$<	-  \$< \$1 \$2	Performs OR operation of (S1) & (S2) Starting String Compare Result and Bit Result(BR), and		
Compare (OR)	OR\$>=	\$>= S1 S2	then saves its result in BR	0	0
	OR\$<=	\$<= \$1 \$2			
	OR\$<>	\$<> \$1 \$2			
	LOADG=	G= S1 S2 N			
	LOADG>	G> S1 S2 N	Compared (S1) (S1)(1)		
16 Bits	LOADG<	G< S1 S2 N	Compares (S1), (S1+1), …, (S1+N) to (S2), (S2+1), …,		
Data Group Compare (LOAD)	LOADG>=	G>= S1 S2 N	<ul> <li>(S2+N) 1 to 1, and then saves</li> <li>1 in Bit Result(BR) if each</li> <li>value compared meets given condition</li> </ul>	0	0
	LOADG<=	G<= S1 S2 N			
	LOADG<>	G<> S1 S2 N			
	ANDG=				
	ANDG>		Performs AND operation of		
16 Bits Data	ANDG<	HHG<  S1  S1  N	(S1), (S1+1), ····, (S1+N) & (S2), (S2+1), ···· , (S2+N) 1 to		
Group Compare (AND)	ANDG>=	-  G>=   S1  S1  N	1 Compare Result and Bit Result (BR), and then saves its	0	0
	ANDG<=	⊢⊢G<= S1 S1 N	result in BR		
	ANDG<>	-  G<>   S1  S1  N			
	ORG=	G= S1 S2 N			
	ORG>	G> S1 S2 N			
16 Bits Data	ORG<	G< S1 S2 N	Performs OR operation of (S1), (S1+1), ···, (S1+N) & (S2), (S2+1), ··· , (S2+N) 1 to 1		
Group Compare (OR)	ORG>=	G>= S1 S2 N	Compare Result and Bit Result (BR), and then saves its result in BR	0	0
	ORG<=	G<= S1 S2 N			
	ORG<>	G<> S1 S2 N			

Classification	Designations	Symbol	Description	Sup	port
Classification	Designations	Symbol	Description	XGX	XGB
	LOADDG= LOADDG>	DG= S1 S2 N DG> S1 S2 N			
32 Bits Data	LOADDG<	DG< S1 S2 N	Compares (S1), (S1+1), …, (S1+N) to (S2), (S2+1), …, (S2+N) 1 to 1, and then saves		
Group Compare	LOADDG>=	DG>= S1 S2 N	1 in Bit Result(BR) if each value compared meets given	0	0
(LOAD)	LOADDG<=	DG<= \$1 \$2 N	condition		
	LOADDG<>	DG<> \$1 \$2 N			
	ANDDG=	HHDG= S1 S1 N			
	ANDDG>	HHDG> S1 S1 N	Performs AND operation of		
32 Bits Data Group	ANDDG<	HHDG< S1 S1 N	(S1), (S1+1), …, (S1+N) & (S2), (S2+1), …, (S2+N) 1 to 1 Compare Result and Bit Result(BR), and then saves its result in BR	0	0
Compare (AND)	ANDDG>=			0	0
(/(2))	ANDDG<=	HHDG<= \$1\$1 N			
	ANDDG<>	HHDG<> \$1\$1 N			
	ORDG=	DG= S1 S2 N			
	ORDG>				
32 Bits Data	ORDG<		Performs OR operation of (S1), (S1+1), …, (S1+N) & (S2), (S2+1), …, (S2+N) 1 to		
Group Compare (OR)	ORDG>=		1 Compare Result and Bit Result(BR), and then saves its result in BR	0	0
	ORDG<=		1		
	ORDG<>		]		

Classification	Designations	Symbol	Description	Sup	
				XGK	XGB
	LOAD3=	3= S1 S2 S3	-		
	LOAD3>	3> S1 S2 S3			
Three 16-Bit Data Compare	LOAD3<		Saves 1 in Bit Result(BR) if each value of (S1), (S2), (S3) meets	0	0
(LOAD)	LOAD3>=	3>= S1 S2 S3	given condition	0	0
	LOAD3<=	3<= S1 S2 S3			
	LOAD3<>				
	AND3=	HH 3= S1 S2 S3			
	AND3>	HH 3> S1 S2 S3			
Three 16-Bit Data Compare	AND3<	HH 3< S1 S2 S3	Performs AND operation of (S1), (S2), (S3) Compare Result by given condition and Bit Result	0	0
(AND)	AND3>=	-  -  -  -  -  -  -  -  -  -  -  -  -	(BR), and then saves its result in BR	0	0
	AND3<=	-  -  -  -  -  -  -  -  -  -  -  -  -			
	AND3<>	HH3<> S1 S2 S3			
	OR3=	3= S1 S2 S3	Performs OR operation of (S1), (S2), (S3) Compare Result by		
	OR3>	3> \$1 \$2 \$3			
Three 32-Bit Data Compare	OR3<				0
(OR)	OR3>=	>=3 S1 S2 S3	given condition and Bit Result (BR), and then saves its result in BR	0	0
	OR3<=	3<= \$1 \$2 \$3			
	OR3<>	3<> \$1\$2\$3			
	LOADD3=	D3= S1 S2 S3			
	LOADD3>	D3> S1 S2 S3			
Three 16-Bit	LOADD3<	D3< S1 S2 S3	Saves 1 in Bit Result(BR) if each		
Data Compare (LOAD)	LOADD3>=	D3>= S1 S2 S3	value of (S1+1,S1), (S2+ 1,S2), (S3+1,S3) meets given condition	0	0
	LOADD3<=	D3<= S1 S2 S3	1		
	LOADD3<>	D3<> S1 S2 S3			

Classification	Designations Symbol		Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
	ANDD3=	H H D3= S1 S2 S3			
	ANDD3>	HHD3> S1 S2 S3			
Three 32-Bit Data Compare	ANDD3<	HHD3< S1 S2 S3	Performs AND operation of (S1+ 1,S1), (S2+1,S2), (S3+1,S3) Compare Result by given condition and Bit	0	0
(AND)	ANDD3>=	HH <b>D3&gt;= S1 S2 S3</b> ──	Result (BR), and then saves its result in BR	and Bit o	0
	ANDD3<=	⊢⊢D3<= \$1 \$2 \$3			
	ANDD<>	HHD3<> S1 S2 S3			
	ORD3=	D3= S1 S2 S3			
	ORD3>	D3> S1 S2 S3			
Three 32-Bit	ORD3<	D3< S1 S2 S3	Performs OR operation of (S1+1, S1), (S2+1,S2), (S3+1,S3) Compare		0
Data Compare (OR)	ORD3>=	D3>= S1 S2 S3	Result (BR), and then saves its result in BR	0	0
	ORD3<=	D3<= S1 S2 S3	Performs OR operation of (S1+1, S1), (S2+1,S2), (S3+1,S3) Compare Result by given condition and Bit Result (BR), and then saves its result in BR		
	ORD3<>	D3<> S1 S2 S3			

## (5) Increase/Decrease instruction

Classification	Designations	Symbol	Description	Sup	port
Classification	Designations	Symbol	Description	XGK	XGB
	INC		(D)+1 → (D)	2	
	INCP			2	4-94
	DINC		(D+1,D)+1 → (D+1,D)	2	4-94
BIN Data Increase	DINCP	DINCP D		2	
/ Decrease (Signed)	DEC	DEC D	(D)−1 → (D)	2	
(0.9.100)	DECP	DECP D		2	4.00
	DDEC	DDEC D	(D+1,D)−1 → (D+1,D)		4-96
	DDECP	DDECP D		2	
	INC4	INC4 Db	(D:x bit ~ D:x bit+4) + 1	2	
	INC4P	INC4P Db	$\longrightarrow$ (D:x bit ~ D:x bit+4)	3	4.05
	INC8	INC8 Db	(D:x bit ~ D:x bit+8) + 1	2	4-95
4/8 Bits Data Increase	INC8P	INC8P Db	(D:x bit ~ D:x bit+8)	3	
/ Decrease (Signed)	DEC4	DEC4 Db	(D:x bit ~ D:x bit+4) - 1	2	
(Oigned)	DEC4P	DEC4P Db	(D:x bit ~ D:x bit+4)	3	4.07
	DEC8	DEC8 Db	(D:x bit ~ D:x bit+8) - 1	2	4-97
	DEC8P	DEC8P Db	(D:x bit ~ D:x bit+8)	3	
	INCU		(D)+1 → (D)		
	INCUP			2	
	DINCU		(D+1,D)+1 → (D+1,D)		4-98
BIN Data Increase	DINCUP			2	
/ Decrease (Upsigned)	DECU	DECU D	(D)−1 → (D)		
(Unsigned)	DECUP	DECUP D		2	4.62
	DDECU		(D+1,D)−1 → (D+1,D)		4-99
	DDECUP	DDECUP D		2	

## (6) Rotation instruction

Classification	Designations	Cumhal	Description	Sup	oport
Classification	Designations	Symbol	Description	XGK	XGB
	ROL	ROL D n	b <u>15 b</u> 0		
Rotate to Left	ROLP	ROLP D n			0
	DROL	DROL D n	b31 b15 b0 CY <b>∢</b> D+1 D <b>∢</b>	0	0
	DROLP	DROLP D n			
	ROL4	ROL4 Db n			
4/8 Bits	ROL4P	ROL4P Db n			0
Rotate to Left	ROL8	ROL8 Db n		0	0
	ROL8P	ROL8P Db n			
	ROR	ROR D n	b15 b0		
Detete te Diebt	RORP	RORP D n			
Rotate to Right	DROR	DROR D n	b31 b15 b0	0	0
	DRORP	DRORP D n		- O	
	ROR4	ROR4 Db n			
4/8 Bits	ROR4P	ROR4P Db n		_	
Rotate to Right	ROR8	ROR8 Db n		0	0
	ROR8P	ROR8P Db n			
	RCL	RCL D n	b <u>15b</u> 0		
Rotate to Left	RCLP	RCLP D n			
(including Carry)	DRCL	DRCL D n	b <u>31 b15 b</u> 0	0	0
	DRCLP	DRCLP D n			
	RCL4	RCL4 Db n			
4/8 Bits Rotate to Left	RCL4P	RCL4P Db n			
(including Carry)	RCL8	RCL8 Db n		0	0
	RCL8P	RCL8P Db n			
	RCR	RCR D n	b15 b0		
Rotate to Right	RCRP	RCRP D n			
(including Carry)	DRCR	DRCR D n		0	0
	DRCRP	DRCRP D n	$ \xrightarrow{\bullet} D+1 \qquad D \xrightarrow{\bullet} CY $		
	RCR4	RCR4 Db n			
4/8 Bits Rotate to Right	RCR4P	RCR4P Db n		_	
(including Carry)	RCR8	RCR8 Db n		0	0
50	RCR8P	RCR8P Db n			

## (7) Move instruction

Classification	Designations	Symbol	Description		oport
	2 00.g	<i>cy</i>		XGK	XGB
Bits Move	BSFT	BSFT St Ed	St Ed b15 I I b0	0	0
	BSFTP	BSFTP St Ed	<b>↑</b> 0		
Move to Higher Bit	BSFL	BSFL D n	(D)	0	0
	BSFLP	BSFLP D n	CY		
	DBSFL	DBSFL D n	(D+1, D)		
	DBSFLP	DBSFLP D n			
Move to Higher Bit within 4/8 Bits range	BSFL4	BSFL4 Db n	b+3 b	0	0
	BSFL4P	BSFL4P Db n			
	BSFL8	BSFL8 Db n	b+7 b	0	
	BSFL8P	BSFL8P Db n			
Move to Lower Bit	BSFR	BSFR D n		0	0
	BSFRP	BSFRP D n	0 CY		
	DBSFR	DBSFR D n	(D+1, D)	0	
	DBSFRP	DBSFRP D n			
Move to Lower Bit within 4/8 Bits range	BSFR4	BSFR4 Db n		0	0
	BSFR4P	BSFR4P Db n			
	BSFR8	BSFR8 Db n			
	BSFR8P	BSFR8P Db n	0 CY		
Word Move	WSFT	WSFT Et Ed	h0000	0	0
	WSFTP	WSFTP Et Ed	Ed (End Word)		
Word Data Move to Left/Right	WSFL		h0000 → □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	- 0	ο
	WSFLP	WSFLP D1 D2 N	••••••••••••••••••••••••••••••••••••••		
	WSFR	WSFR D1 D2 N			
	WSFRP	WSFRP D1 D2 N	h0000		
Bit Move	SR	SR Db I D N	Moves N bits starting from Db bit along Input direction (I) and Move direction (D)	0	0

# (8) Exchange instruction

Classification	Designations	Symbol	Description	Sup	port
Classification	Designations	Symbol	Description	XGK	XGB
	ХСНБ	XCHG D1 D2	(D1) ← → (D2)		
Data	XCHGP	XCHGP D1 D2		0	0
Exchange	DXCHG	DXCHG D1 D2	(D1+1 D1) (D2+1 D2)		-
	DXCHGP	DXCHGP D1 D2		XGK	
Group Data	GXCHG	GXCHG D1 D2 N			0
Exchange	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0	0		
Higher/Lower Byte	SWAP			0	0
Exchange	SWAPP		(D) Lower Byte Upper Byte		0
Group Byte	GSWAP	GSWAP D N	Exchanges Higher/Lower		0
Exchange	GSWAPP	GSWAPP D N	Byte of Words N starting from D	0	0

### (9) BIN operation instruction

Classification Designations		Symbol	Description	Support	
	Designations	Gymbol	Description	XGK	XGB
	ADD	ADD S1 S2 D	(S1)+(S2) → (D)		
Integer Addition	ADDP	ADDP S1 S2 D		0	0
(Signed)	DADD	-DADD S1 S2 D	(S1+1,S1)+(S2+1,S2)	0	0
	DADDP	DADDP S1 S2 D	→ (D+1,D)		
	SUB		(S1)-(S2) → (D)		
Integer	SUBP	UBP S1 S2 D			
Subtraction (Signed)	DSUB	DSUB S1 S2 D	(S1+1,S1)-(S2+1,S2)	0	0
	DSUBP	DSUBP S1 S2 D	→ (D+1,D)		
	MUL		(S1)×(S2) → (D+1,D)		
Integer Multiplication	MULP	MULP S1 S2 D			0
(Signed)	DMUL	DMUL S1 S2 D	(S1+1,S1)×(S2+1,S2)	0	0
	DMULP	-DMULP S1 S2 D	→ (D+3,D+2,D+1,D)		
	DIV	— DIV S1 S2 D –	(S1)÷(S2) → (D) Quotient (D+1) Remainder		
Integer Division	DIVP		(D+1) Remainder		0
(Signed)	DDIV	DDIVS1_S2_D	(S1+1,S1)÷(S2+1,S2) → (D+1,D) Quotient	0	0
	DDIVP	DDIVP S1 S2 D	(D+3,D+2) Remainder		
	ADDU	ADDU S1 S2 D	(S1)+(S2) → (D)		
Integer Addition	ADDUP	ADDUP S1 S2 D			0
(Unsigned)	DADDU	DADDU S1 S2 D	(S1+1,S1)+(S2+1,S2)	0	0
	DADDUP	DADDUP S1 S2 D	→ (D+1,D)		
	SUBU	UBU S1 S2 D	(S1)−(S2) → (D)		
Integer Subtraction	SUBUP	UBUP S1 S2 D			0
(Unsigned)	DSUBU		(S1+1,S1)-(S2+1,S2)	0	0
	DSUBUP	DSUBUP S1 S2 D	→ (D+1,D)		
	MULU		(S1)×(S2) → (D+1,D)		
Integer	MULUP	MULUP S1 S2 D			
Multiplication (Unsigned)	DMULU		(S1+1,S1)×(S2+1,S2)	0	0
	DMULUP		→ (D+3,D+2,D+1,D)		

# (9) BIN operation instruction (continued)

Classification	Designations	Symbol	Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
	DIVU	DIVU S1 S2 D	$(S1) \div (S2) \longrightarrow (D) $ Quotient (D+1) Remainder		
Integer Division	DIVUP	DIVUP S1 S2 D	(D+1) Remainder	0	0
(Unsigned)	DDIVU	DDIVU S1 S2 D	(S1+1,S1)÷(S2+1,S2)	0	0
	DDIVUP	DDIVUP S1 S2 D	(D+3,D+2) Remainder		
	RADD	RADD S1 S2 D	(S1+1,S1)+(S2+1,S2)		
Real Number	RADDP	RADDP S1 S2 D	→(D+1,D)	0	0
Addition	LADD	LADD S1 S2 D	(S1+3,S1+2,S1+1,S1) +(S2+3,S2+2,S2+1,S2)	0	0
	LADDP	LADDP S1 S2 D	→ (D+3,D+2,D+1,D)		
	RSUB	RSUB S1 S2 D	(S1+1,S1)-(S2+1,S2)		
Real Number	RSUBP	RSUBP S1 S2 D	→ (D+1,D)		
Subtraction	LSUB	LSUB S1 S2 D	(S1+3,S1+2,S1+1,S1) -(S2+3,S2+2,S2+1,S2)	0	0
	LSUBP	LSUBP S1 S2 D	→ (D+3,D+2,D+1,D)		
	RMUL	-RMUL S1 S2 D	(S1+1,S1)×(S2+1,S2)		
Real Number	RMULP	-RMULP S1 S2 D	→ (D+1,D)	0	0
Multiplication	LMUL	LMUL S1 S2 D	(S1+3,S1+2,S1+1,S1) ×(S2+3,S2+2,S2+1,S2)	0	0
	LMULP	LMULP SI S2 D	→ (D+3,D+2,D+1,D)		
	RDIV	RDIV S1 S2 D	(S1+1,S1)÷(S2+1,S2)		
Real Number	RDIVP	RDIVP S1 S2 D	→ (D+1,D)		
Division	LDIV		(S1+3,S1+2,S1+1,S1) ÷(S2+3,S2+2,S2+1,S2)	0	0
	LDIVP	LDIVP S1 S2 D	→ (D+3,D+2,D+1,D)		
String	\$ADD		Connects S1 String with S2 String		
Addition	\$ADDP		to save in D	0	0
	GADD	GADD S1 S2 D N	(S1) (S2) (D)	_	_
Group Addition	GADDP	GADDP S1 S2 D N	+ = +	0	0
Group	GSUB	GSUB S1 S2 D N	(S1) (S2) (D) (D)		
Subtraction	GSUBP	GSUBP S1 S2 D N		0	0

# (10) BCD operation instruction

Classification Designations		Symbol	Description	Su	pport
Classification	Designations	Symbol	Description	XGK	XGB
	ADDB	ADDB S1 S2 D	(S1)+(S2) → (D)		
BCD Addition	ADDBP	ADDBP S1 S2 D			
BCD Addition	DADDB	DADDB S1 S2 D	(\$1+1,\$1)+(\$2+1,\$2)	0	0
	DADDBP	DADDBP S1 S2 D	→ (D+1,D)		
	SUBB	UBB S1 S2 D	(S1)−(S2)		
BCD Subtraction	SUBBP	UBBP S1 S2 D			
BCD Subtraction	DSUBB	DSUBB S1 S2 D	(S1+1,S1)-(S2+1,S2)	0	0
	DSUBBP	DSUBBP S1 S2 D	→ (D+1,D)		
	MULB	MULB S1 S2 D	(S1)×(S2) → (D+1,D)		
BCD	MULBP	MULBP S1 S2 D		0	0
Multiplication	DMULB	DMULB S1 S2 D	(S1+1,S1)×(S2+1,S2)	0	0
	DMULBP	DMULBP S1 S2 D	→ (D+3,D+2,D+1,D)		
	DIVB	DIVB S1 S2 D	$(S1)$ ÷ $(S2)$ $\longrightarrow$ (D) Quotient (D) 4) Remainder		
BCD Division	DIVBP	DIVBP S1 S2 D	(D+1) Remainder		
	DDIVB	DDIVB S1 S2 D	(S1+1,S1)÷(S2+1,S2)	0	0
	DDIVBP	DDIVBP S1 S2 D	(D+3,D+2) Remainder		

# (11) Logic operation instruction

Classification	Designations	Symbol	Description	Basic Steps	Page
	WAND	WAND S1 S2 D	Word AND		
Logic	WANDP	WANDP S1 S2 D	(S1) ∧ (S2)(D)		
Multiplication	DWAND	DWAND S1 S2 D	DWord AND	0	0
	DWANDP	DWANDP S1 S2 D	(S1+1,S1)∧(S2+1,S2) (D+1,D)		
	WOR	WOR S1 S2 D	Word OR		
Logio Addition	WORP	WORP S1 S2 D	(S1) V (S2) (D)		
Logic Addition	DWOR	DWOR S1 S2 D	DWord OR	0	0
	DWORP	DWORP S1 S2 D	(S1+1,S1)∨(S2+1,S2) (D+1,D)		
	WXOR	WXOR S1 S2 D	Word Exclusive OR		
Exclusive	WXORP	WXORP S1 S2 D	(S1) ↓ (S2)(D)		
OR	DWXOR	DWXOR S1 S2 D	DWord Exclusive OR	0	0
	DWXORP	DWXORP S1 S2 D	(S1+1,S1) <u>↓</u> (S2+1,S2) (D+1,D)		
	WXNR	WXNR S1 S2 D	Word Exclusive NOR		
Exclusive	WXNRP	WXNRP S1 S2 D	(S1) ¥ (S2)(D)		
NOR	DWXNR	DWXNR S1 S2 D	DWord Exclusive NOR	0	0
	DWXNRP	DWXNRP S1 S2 D	(S1+1,S1)¥(S2+1,S2)→ (D+1,D)		
	GWAND	GWAND S1 S2 D N	(S1) (S2) (D) (D)		
	GWANDP	GWANDP S1 S2 D N		0	0
	GWOR	GWOR S1 S2 D N			
Group	GWORP	GWORP S1 S2 D N		0	0
Logic Operation	GWXOR	GWXOR S1 S2 D N	(S1) (S2) (D)		
	GWXORP	GWXORP S1 S2 D N		0	0
	GWXNR	GWXNR S1 S2 D N	(S1) $(S2)$ $(D)$		
	GWXNRP	GWXNRP S1 S2 D N		0	0

# (12) Data process instruction

Classification	Desimations	Sumbol	Description	Sup	oport
Classification	Designations	Symbol	Description	XGK	XGB
	BSUM	BSUM S D	b15 b0		
Dit Chack	BSUMP	BSUMP S D	1's number		
Bit Check	DBSUM	DBSUM S D	b31 b15 b0 S S	0	0
	DBSUMP	DBSUMP S D	1's number		
Dit Depet	BRST	BRST D N			
Bit Reset	BRSTP	BRSTP D N	Resets N Bits (starting from D) to 0	0	0
	ENCO	ENCO S D n			
Encode	ENCOP	ENCOP SD n	2 <sup>N</sup> bits 2binary	0	0
	DECO	DECO S D n			
Decode	DECOP	DECOP S D n	N bits 2binary 2 <sup>N</sup> bits	0	0
	DIS	— DIS SD n			
Data Disconnect &	DISP	DISP S D n	S ÷ D+N−1		
Connect	UNI	UNI SDn		Ū	0
	UNIP	UNIP SD n			
	WTOB	WTOB SD n	S Higher Lower → h00 Lower D h00 Higher D+1		
Word/ Byte	WTOBP	WTOBP S D n	S+N-1 Higher Lower h00 Lower h00 Higher	0	0
Conversion	BTOW	BTOW SD n	D h00 Lower Higher Lower S D+1 h00 Higher	0	0
	BTOWP	BTOWP S D n	h00 Lower h00 Higher		
I/O	IORF		Right after masking I/O data (located on S1) with S2 and S3 data, perform	0	0
Refresh	IORFP	IORFP S1 S2 S3	process	0	0
	SCH	SCH S1 S2 D N			
Data	SCHP	SCHP S1 S2 D N	Finds S1 value within S2 ~ N range and saves the first identical valued	0	0
Search	DSCH	DSCH S1 S2 D N	position in D and S1's identical valued total number in D+1	0	0
	DSCHP	DSCHP SI S2 D N			
	MAX	MAX S D n	Saves the max value in D among N		
Max. Value	MAXP	MAXP S D n	words starting from S	0	0
Search	DMAX	DMAX S D n	Saves the max value in D among N	Ŭ	Ŭ
	DMAXP	DMAXP S D n	double words starting from S		

# (12) Data process instruction (continued)

Classification	Designatio	Symbol	Description	tion	
Classification	ns	Symbol	Description	XGK	XGB
	MIN	MIN S D n	Saves the min value in D among N		
Min. Value	MINP	MINP S D n	words starting from S	0	0
Search	DMIN	- DMIN S D n	Saves the min value in D among N	0	0
	DMINP	DMINP S D n	$\square$ nSaves the min value in D among N words starting from S $\square$ nSaves the min value in D among N double words starting from S $\square$ nSaves the min value in D among N double words starting from S $\square$ nAdds up N words starting from S to save in D $\square$ nAdds up N double words starting from S to save in D $\square$ nAdds up N double words starting from S to save in D $\square$ nAdds up N double words starting from S to save in D $\square$ nAverages N words starting from S to save in D $\square$ nAverages N double words starting from S to save in D $\square$ nAverages N double words starting from S to save in D $\square$ n $\bigwedge$ $\checkmark$ $\square$ n $\square$ <		
	SUM		Adds up N words starting from S to		
Sum	SUMP	SUMP S D n	save in D	0	0
Sum	DSUM	DSUM S D n	Adds up N double words starting	0	0
	DSUMP	DSUMP S D n	from S to save in D		
	AVE	AVE SD n			
Average	AVEP	AVEP S D n	to save in D	0	0
Avelage	DAVE	DAVE SD n	Averages N double words starting	0	0
	DAVEP	DAVEP S D n	from S to save in D		
	MUX	MUX S1 S2 D N			
MUX	MUXP	MUXP S1 S2 D N		0	0
MOX	DMUX	DMUX SI S2 D N		0	0
	DMUXP	DMUXP S1 S2 D N			
Data	DETECT	DETECT SI S2 D N		0	0
Detect	DETECTP	DETECTP S1 S2 D N		0	0
Ramp Signal Output	RAMP	RAMP n1 n2 D1 n3 D2	during n3 scanning of initial value n1 to final n2 and present scanning number in D1+1, and changes D2	0	0
Data	SORT	SORT S n1 n2 D1 D2	n1 : Number of Words to sort n1+1 : Sorting Method	0	0
Align	SORTP	SORTP S n1 n2 D1 D2	n2: Operation number per Scan D1 : ON if complete D2 : Auxiliary Area	-	

Classification	Designations	Symbol	Description		port
Classification	Designations	Symbol	Description	XGK	XGB
Data	FIWR	-FIWR SD	Adds S to the last of Data Table D ~		
Write	FIWRP	FIWRP S D	Length(N) saved in D by 1	0	0
First-input Data	FIFRD	FIFRD SD	Moves first data, S+1 of Data Table S ~ S+N to D (pull 1 place after origin		0
Read	FIFRDP		deleted) and decreases Data Table Length(N) saved in D by 1 S	ХGК о о о о	0
Last-Input Data	FILRD	FILRD SD	Moves last data, S+N of Data Table S ~ S+N to D (origin deleted) and		0
Read	FILRDP		decreases Data Table Length(N) saved in D by 1 S	о о о о	0
Data	FIINS	-FINS SDn	Adds S to 'N'th place of Data Table D $\sim$ D+N (origin data pulled by 1), and		
Insert	FIINSP	-FINSP SDn	increases Data Table Length(N) saved in D by 1	о о о	0
Data	FIDEL		Deletes 'N'th data of Data Table S ~ S+N (pull 1 place) and decreases	0	0
Pull	FIDELP	FDELP SDn	Data Table Length(N) saved in D by 1	, and increases Data Table       •         , and decreases Data Table       •         , and eases Data Table Length(N)       •         , and in D by 1 S       •         , and in D by 1 S       •         , and in D by 1       •         , and decreases       •         , and in D by 1       •	0

#### (13) Data table process instruction

Г

# (14) Display instruction

Classification Designation	Designations	Symbol	Symbol Description		port
Classification	Designations	Symbol	Description	XGK	XGB
7 Segment	SEG	SEG S D Z	Converts S Data to 7-Segment as	_	_
Display	SEGP	SEGP S D Z	adjusted in Z Format so to save in D	0	0

# (15) String Process instruction

Classification	Designations	Symbol	Description	Sup	port
Classification	Designations	Symbol	Description	XGK	XGB
	BINDA	BINDA SD	Converts S of 1-word BIN value to Decimal ASCII Cord to save in		
Convert to Decimal	BINDAP	BINDAP S D	starting D	0	0
ASCII Cord	DBINDA	DBINDA SD	Converts S of 2-word BIN value to Decimal ASCII Cord to save in	0	0
	DBINDAP	DBINDAP S D	starting D		
	BINHA	BINHA SD	Converts S of 1-word BIN value to Hexadecimal ASCII Cord to save		
Convert to Hexadecimal	BINHAP	BINHAP SD	in starting D	_	
ASCII Cord	DBINHA	DBINHA S D	Converts S of 2-word BIN value to Hexadecimal ASCII Cord to save in	0	0
	DBINHAP	DBINHAP S D	starting D		
	BCDDA	BCDDA S D	Converts S of 1-word BCD to ASCII		
Convert BCD to Decimal	BCDDAP	BCDDAP S D	Cord to save in starting D	_	
ASCII Cord	DBCDDA	DBCDDA S D	Converts S of 2-word BCD to ASCII	0	0
	DBCDDAP	DBCDDAP S D	Cord to save in starting D		
	DABIN	DABIN S D	Converts S S+2,S+1,S's Decimal		
Convert Decimal ASCII	DABINP	DABINP S D	ASCII Cord to BIN to save in D	0	0
to BIN	DDABIN	DDABIN S D	Converts S+5~S's Decimal ASCII Cord to BIN value to save in D+1 &	0	0
	DDABINP	DDABINP S D	D		
	HABIN	HABIN S D	Converts S+1,S's Hexadecimal ASCII		
Convert Hexadecimal	HABINP	HABINP S D	Cord to BIN value to save in D		
ASCII to BIN	DHABIN	DHABIN S D	Converts S+3~S's Hexadecimal ASCII	0	0
	DHABINP		Cord to BIN to save in D		
	DABCD	DABCD S D	Converts S+1,S's Decimal ASCII		
Convert Decimal ASCII	DABCDP	DABCDP S D	Cord to BCD to save in D	_	~
to BCD	DDABCD	DDABCD S D	Converts S+3~S's Decimal ASCII	0	0
	DDABCDP	DDABCDP S D	Cord to BCD to save in D		
String	LEN	LEN S D	Saves String Length with S starting		- -
Length Detect	LENP		in D	0	0

# (15) String process instruction (continued)

Classification	Designations	Symbol	Description	Sup	port
	Designations	Gymbol		XGK	XGB
	STR	STR S1 S2 D	Adjusts S2 saved word data to S1 saved place		
Convert BIN16/32 to	STRP		number to convert to String and save in D	0	0
String	DSTR	-DSTR S1 S2 D	Adjusts S2 saved double word data to S1 saved	0	0
	DSTRP	DSTRP S1 S2 D	place number to convert to String and save in D		
Convert String to	VAL	VAL S D1 D2	Adjusts S saved string to number to save in word		
	VALP	VALP S D1 D2	D1 and saves the place number in D2	0	0
BIN16/32	DVAL	DVAL S D1 D2	Adjusts S saved string to number to save in double	0	0
	DVALP		word D1 and saves the place number in D2		
Convert Real Number to String	RSTR	RSTR S1 S2 D	Adjusts Floating decimal point point Real Number		
	RSTRP	RSTRP S1 S2 D	Data (S1: number, S2: places) to String format to save in D	_	х
	LSTR	LSTR S1 S2 D	Adjusts Floating decimal point point Double Real	0	~
	LSTRP	LSTRP S1 S2 D	Number Data (S1:number, S2:places) to String format to save in D		
	STRR		Converts String S to Floating decimal point point Real		
Convert String to Real Number	STRRP		Number Data to save in D	0	х
Number	STRL	STRL SD	Converts String S to Floating decimal point	0	~
	STRLP		point Double Real Number Data to save in D		
ASCII Conversion	ASC	ASC S D cw	Converts BIN Data to ASCII in Nibble unit,	0	0
	ASCP	ASCP S D cw	based on cw's format from S to save in D	0	0
	HEX	HEX S D N	Converts 2N ASCII saved in N words from S in byte	_	
HEX Conversion	HEXP	HEXP S D N	unit to Nibble unit of Hexadecimal BIN so to save in D	0	0
String Extract from	RIGHT		Extracts n string from S string's final letter to save	0	0
Right	RIGHTP		in starting D	0	0
String Extract from Left	LEFT		Extracts n string from S string's first letter to save	0	0
	LEFTP	LEFTP S D N	in starting D	, , , , , , , , , , , , , , , , , , ,	ÿ
String Random Extract	MID		Extracts string which conforms to S2 condition	0	0
	MIDP	MIDP S1 S2 D	among S1 string to save in starting D	~	ÿ

# (15) String process instruction (continued)

Classification	Designations	Symbol	Description	Basic Steps	Page
String Random	REPLACE	REPLACE S1 D S2	Processes S1 String as	0	0
Replace	REPLACEP	REPLACEP S1 D S2	applicable to S2 Condition to save in D String	Steps o o o o	0
Otain a Fin d	FIND	FIND S1 S2 D N	Finds identical String to S2 in $S1 \otimes S2 \otimes N$ Finds identical String to S2 in $S1 \sim N$ data to save the	_	
String Find	FINDP	FINDP S1 S2 D N	absolute position in D	0	0
	RBCD	RBCD S1 S2 D	Adjusts Floating decimal point point Real Number Data S1 to		
Parse Real	RBCDP	RBCDP S1 S2 D	S2 place to convert to BCD, and then to save in D		x
Number to BCD	LBCD	LBCD S1 S2 D	Adjusts Floating decimal point point Double Real Number	0	~
	LBCDP	LBCDP S1 S2 D	Data S1 to S2 place to convert to BCD, and then to save in D		
	BCDR	BCDR S1 S2 D	Adjusts BCD Data S1 to S2 place to convert to Floating		
Convert BCD	BCDRP	BCDRP S1 S2 D	decimal point point Real Number, and then to save in D		
Data to Real Number	BCDL	BCDR S1 S2 D	Adjusts BCD Data S1 to S2 place to convert to Floating	0	х
	BCDLP	BCDLP S1 S2 D	decimal point point Double Real Number, and then to save in D		

# (16) Special function instruction

Classification	Designations	Symbol	Description	Basic Steps	Page
CIN On exetien	SIN	-SIN S D	C(N)(C+1,C) $(D+1,D)$		_
SIN Operation	SINP		SIN(S+1,S) (D+1,D)	0	0
COS	COS	COS S D	COS(S+1,S) (D+1,D)	0	0
Operation	COSP	COSP S D		0	0
TAN Operation	TAN	TAN S D	TAN(S+1,S) (D+1,D)	0	0
	TANP	TANP S D		0	0
RAD	RAD	RAD S D	(S+1,S) (D+1,D)		
Conversion	RADP	RADP S D	Converts angle to radian	0	0
Angle	DEG	DEG S D	(S+1,S) (D+1,D)		
Conversion	DEGP	DEGP S D	Converts radian to angle	0	0
Square Root	SQRT	SQRT S D			
Operation	SQRTP	SQRTP S D	$\sqrt{(S+1,S)} \longrightarrow (D+1,D)$	0	0

# (17) Data control instruction

Classification	Designations	Symbol	Description	Basic Steps	Page
	LIMIT	LIMIT S1 S2 S3 D	14 S1 + S2 than		
Limit	LIMITP	LIMITP S1 S2 S3 D	If S1 < S2, then D = S2 If S2 < S1 < S3, then	0	0
Control	DLIMIT	DLIMIT S1 S2 S3 D	D = S1 If S3 < S1, then D = S3	0	0
	DLIMITP	DLIMITP S1 S2 S3 D			
	DZONE	DZONE S1 S2 S3 D			
Dead-zone	DZONEP	DZONEP S1 S2 S3 D	If S1 < -S2, then D = S1+S2-S2(S3/100) If –S2 < S1 < S2, then	0	0
Control	DDZONE	DDZONE S1 S2 S3 D	D = (S3/100)S1 If S1 < S2, then D = S1-S2+S2(S3/100)	0	0
	DDZONEP	DDZONEP S1 S2 S3 D			
	VZONE	VZONE S1 S2 S3 D	If S1 < -S2(S3/100), then D = S1-S2+S2(S3/100) If $-S2(S3/100) < S1 < S2(S3/100)$ , then D = (100/S3)S1 If S1 < S2(S3/100), then D = S1+S2-S2(S3/100)		
Vertical-zone	VZONEP	VZONEP S1 S2 S3 D		0	0
Control	DVZONE	DVZONE S1 S2 S3 D		0	0
	DVZONEP	DVZONEP S1 S2 S3 D			
	PIDRUN	PIDRUN N	Operates PID Loop N	0	0
	PIDPAUSE	PIDPAUSE N	Stops PID Loop N momentarily	0	х
Built-in PID Control Instruction	PIDPRMT	-PIDPRMT SN-	Changes PID Loop N's Parameter. ( SV(word) / Ts(word) / Kp(real) / Ti(real) / Td(real) )	0	х
	PIDAT	PIDRUN N	Start of PID loop Auto-tuning	Х	0
	PIDCAS		Start of PID loop cascade operation	Х	0
	PIDHBD	PIDPRMT SN	Start of PID loop combination operation	Х	0

#### (18) Time related instruction

Γ

Classification	Designations	Symbol	Description		port
Classification	Designations	Symbol	Description	XGK	XGB
Date/Time Data	DATERD	DATERD D	Reads PLC Time to save in D ~ D+6	0	х
Read	DATERDP	DATERDP D	(Yr/Mn/Dt/Hr/Mn/Sd/Day)	0	^
Date/Time Data	DATEWR	DATEWR S	Input S ~ S+6's Time Data in PLC	0	х
Write	DATEWRP	DATEWRP S	(Yr/Mn/Dt/Hr/Mn/Sd/Day)	0	^
Time Data	ADDCLK	ADDCLK S1 S2 D	Adds S1 ~ S1+2 & S2 ~ S2+2 Time Data to save in D ~ D+2 in Time	0	x
Increase	ADDCLKP	ADDCLKP S1 S2 D	Data format (Hr/Mn/Sd)	0	~
Time Data	SUBCLK	UBCLK S1 S2 D	Extracts S2 ~ S2+2's Time Data from S1 ~ S1+2 to save in D ~ D+2 in	0	х
Decrease	SUBCLKP	SUBCLKP S1 S2 D	Time Data format (Hr/Mn/Sd)	0	^
	SECOND	SECOND S D	Converts Time Data S ~ S+2 to	0	x
Time Data	SECONDP	SECONDP S D	seconds to save in double word D	0	^
Format Conversion	HOUR	HOUR SD	Converts the seconds saved in		х
	HOURP	HOURPSD	double word S to Hr/Mn/Sd to save in D ~ D+2	0	^

#### (19) Divergence instruction

Classification	ion Designations Symbol Description -		Support		
Classification	Designations	Symbol	Description	XGK	XGB
Divergence	JMP	JMP LABEL	Jumps to LABEL location	0	0
Instruction	LABEL	LABEL   ( )	Jumps and designates the location to move to		0
	CALL	CALL LABEL	- Calls Function applicable to LABEL		
Subroutine	CALLP	CALLP LABEL		0	
Call Functional	SBRT	SBRT LABEL	Designates Function to be called by CALL	0	0
	RET	RET	RETURN		

#### (20) Loop instruction

Classification Designations	Symbol	Description	Support		
	Designations	Symbol	Description	XGK	XGB
	FOR	FOR N	Operates FOR~NEXT section n times	0	0
Loop Instruction	NEXT	NEXT		0	0
	BREAK	BREAK	Escapes from FOR~NEXT section	0	0

٦

#### (21) Flag instruction

Classification Designations	Symbol	Description	Support		
			XGK	XGB	
Carry	STC	STC	Carry Flag ( F0112 ) SET	o	0
Flag Set, Reset	CLC		Carry Flag ( F0112 ) RESET		0
Error Flag Clear	CLE		Error Latch Flag (F0115) RESET	0	0

#### (22) System instruction

Classification	Designations	Symbol	Symbol Description		port
Classification	Designations	Symbol	Description	XGK	XGB
Error Display	FALS	FALS	Self Diagnosis (Error Display )	0	0
Scan Cluck	DUTY	DUTY D n1 n2	On during n1 Scan, Off during n2 Scan	0	0
Time Cluck	TFLK		On during S1 set time, Off during S2 set time	0	0
WDT	WDT	-WDT	Watch Dag Timor Class	0	0
Initialize	WDTP	WDTP	Watch Dog Timer Clear	0	0
Output Control	OUTOFF		All Output Off	0	0
Operation Stop	STOP	-STOP	Finishes applicable scan to end PLC Operation	0	0
Emergent Operation Stop	ESTOP	ESTOP	Ends PLC operation right after Instruction executed	0	0

#### (23) Interrupt related instruction

Classification Designations	Designations	Symbol	Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
Interrupt	EI	EI	All Channels Interrupt allowed	0	0
	DI	DI	All Channel Interrupt prohibited		
Individual Channel	EIN	EIN N	Individual Channel Interrupt allowed	0	0
Interrupt Setting	DIN		Individual Channel Interrupt prohibited		0

(24) Sign	reversion	instruction
-----------	-----------	-------------

Г

Classification	Designations	Symbol	Description	Sup	port
Classification	Designations	Symbol	Description	XGK	XGB
	NEG	NEG D	Saves D value again in D with 2's		
2's	NEGP	NEGP D	complement taken	0	0
complement	DNEG	DNEG D	Saves (D+1,D) value again in (D+1,D)	0	0
	DNEGP	DNEGP D	with 2's complement taken		
	RNEG	-RNEG D	Reverses D Real Number Sign then to save again	- 0	0
Real Number Data Sign	RNEGP	RNEGP D			
Reverse	LNEGR	LNEG D	Reverses D Double Real Number Sign then to save again		
	LNEGP	LNEGP D			
	ABS	ABS D	Converte D higheast Bit to 0		
Absolute Value	ABSP	ABSP D	Converts D highest Bit to 0	- 0	
Operation	DABS	DABS D	Converts (D+1,D)		0
	DABSP	DABSP D	highest Bit to 0		

#### (25) File related instruction

Classification	Designations	Symbol	Description	Sup	port
Classification	Designations	Symbol	Description	XGK	XGB
Block	RSET	RSET S	Changes Block Number of file register	0	x
Conversion	RSETP	RSETPS	to S Number	0	^
Flash Word Data	EMOV	EMOV S1 S2 D	Transfers S2 word data in S1 Block to D		
Transfer EMOVP	EMOVP	EMOVP S1 S2 D		0	х
Flash Double Word	EDMOV	EDMOV S1 S2 D	Transfers S2+1, S2 double word data in S1 Block to D+1, D		
Data Transfer	EDMOVP	EDMOVP S1 S2 D			
Block Read	EBREAD	EBREAD S1S2	Reads Flash Memory Block	0	х
Block Write	EBWRITE	EBWRITE S1 S2	Writes Flash Memory Block	0	х
Block Compare	EBCMP	EBCMP S1S2D1D2	Compares R Area's Bank with Flash Area's Block	0	х

# **Appendix 4.4 Special/Communication Instruction**

#### (1) Communication module related instruction

Classification	Designations	esignations Symbol	Description	Support	
Classification	Designations	Symbol	Description	XGK	XGB
Station No. Set	P2PSN	P2PSN n1 n2 n3	Sets opposite station No. for P2P Communication. n1:P2P No., n2:Block, n3:Station No.	0	х
Read Area Set (WORD)	P2PWRD		Sets word data Read Area n1:P2P No., n2:Block, n3:Variable sequence, n4:Variable Size, n5:Device	0	х
Write Area Set (WORD)	P2PWWR		Sets word data Write Area n1:P2P No., n2:Block, n3:Variable sequence, n4:Variable Size, n5:Device	0	х
Read Area Set (BIT)	P2PBRD	P2PBRD n1 n2 n3 n4 n5	Sets bit data Read Area n1:P2P No., n2:Block, n3:Variable sequence, n4: Variable Size, n5:Device	0	х
Write Area Set (BIT)	P2PBWR		Sets bit data Write Area n1:P2P No., n2:Block, n3:Variable sequence,n4:Variable Size, n5:Device	0	х

1

#### (2) Special module common instruction

Classification	Designations	Symbol	Description	Support	
				XGK	XGB
Special Module Read/Write	GET	GET SI S D N	Reads data of special module	0	0
	GETP		memory is installed on		
	PUT	PUT si si si si -	Writes data on special module	0	0
	PUTP		memory is installed on	0	0

# (3) Exclusive positioning instruction

Classification	Designations	Symbol	Description	Support		
Classification				XGK	XGB	
Return to Origin Point	ORG	-ORG slax	Instructions Positioning Module's ax axis installed on sl slot to return to Origin Point	0	0	
Floating Origin Point	FLT		Instructions Positioning Module's ax axis installed on sl slot to set Floating Origin Point	0	0	
Direct Start	DST	-DST slax n1 n2 n3 n4 n5	Instructions Positioning Module's ax axis installed on sl slot to start directly with Target Position(n1), Target Speed(n2), Dwell Time(n3), M Code(n4) & Control Word(n5)	0	0	
Indirect Start	IST		Instructions Positioning Module's ax axis installed on sl slot to start n step indirectly	0	0	
Linear Interpolation	LIN	LIN sl ax n1 n2	Instructions Positioning Module's ax axis installed on sl slot to let n2 axes operate n1 step by Linear Interpolation	0	0	
Circular Interpolation	CIN	CIN sl ax n1 n2	Instructions Positioning Module's ax axis installed on sl slot to let n2 axes operate n1 step by Circular Interpolation	0	Х	
Simultaneous Start	SST	-SST si ax n1 n2 n3 n4-	Instructions Positioning Module's ax axis installed on sl slot to let n4 axes operate n1(X), n2(Y), n3(Z) steps by Simultaneous Start	0	0	
Speed/Position Control Switch	VTP	VTP si ax	Instructions Positioning Module's ax axis installed on sl slot to switch Speed to Position Control	0	0	
Position/Speed Control Switch	PTV	PTV slax	Instructions Positioning Module's ax axis installed on sl slot to switch Position to Speed Control	0	0	
Decelerated Stop	STP	STP si ax	Instructions Positioning Module's ax axis installed on sl slot to stop as decelerated.	0	0	
Skip	SKP	SKP si ax	Instructions Positioning Module's ax axis installed on sl slot to skip	0	х	
Position Synchronization	SSP	-SSP si ax n1 n2 n3	Instructions Positioning Module's ax axis installed on sl slot to do Position Sync with main axis of n3, n1 sync-positioned and n2 step operated	0	0	
Speed Synchronization	SSS	SSS sl ax n1 n2 n3	Instructions Positioning Module's ax axis installed on sl slot to do Speed Sync with main axis of n3, n1 master and n2 slave	0	0	
Position Override	POR	-POR slax n	Instructions Positioning Module's ax axis installed on sI slot to override Position to change the target position to n	0	0	

# (4) Exclusive position control instruction (continued)

Classification	Designations	Symbol	Description	Support	
				XGK	XGB
Speed Override	SOR	-SOR slax n	Instructions Positioning Module's ax axis installed on sI slot to override Speed to change the target speed to n	0	0
Position specified Speed Override	PSO	PSO si ax n	Instructions Positioning Module's ax axis installed on sI slot to override position specified speed to change the target speed to n2 from n1 position	0	0
Continuous Operation	NMV	NMV si ax	Instructions Positioning Module's ax axis installed on sl slot to operate continuously to n step	0	х
Inching	INCH		Instructions Positioning Module's ax axis installed on sI slot to inch to n position	0	0
Return to Position Previous to Manual Operation	RTP	-RTP si ax	Instructions Positioning Module's ax axis installed on sI slot to return to position previous to manual operation	0	х
Operation Step Change	SNS	-SNS slax n	Instructions Positioning Module's ax axis installed on sl slot to change operation step to n	0	0
Repeated Operation Step Change	SRS	SRS slax n	Instructions Positioning Module's ax axis installed on sI slot to change repeated operation step to n	0	x
M Code Off	MOF	MOF si ax	Instructions Positioning Module's ax axis installed on sI slot to make M code off	0	0
Present Position Change	PRS	PRS slax n	Instructions Positioning Module's ax axis to change present position to n	0	0
Zone Allowed	ZOE	ZOE si ax	Allows zone output of Positioning Module installed on sI slot	0	х
Zone Prohibited	ZOD	ZOD si ax	Prohibits zone output of Positioning Module installed on sI slot	0	х
Encoder Value change	EPRS	EPRS slax n	Changes Encoder Value of Positioning Module installed on sl slot to n	0	х
Teaching	TEA	TEA si ax n1 n2 n3 n4	Changes n1 step's target position or speed of Positioning Module's ax axis installed on sl slot	0	х
Teaching Array	TEAA	TEAA si ax n1 n2 n3 n4	Changes multiple target positions or speed of Positioning Module's ax axis installed on sl slot	0	х
Emergent Stop	EMG	EMG si ax	Instructions Positioning Module installed on sl slot to perform Emergent Stop	0	0

# (5) Exclusive position control instruction (continued)

Classification	Designations	Symbol	Description	Support	
				XGK	XGB
Error Reset	CLR		Resets Error originated from Positioning Module's ax axis installed on sl slot	0	0
Error History Reset	ECLR	ECLR si ax	Deletes Error History originated from Positioning Module's ax axis installed on sl slot	0	х
Point Operation	PST		Performs Point Operation of Positioning Module's ax axis installed on sl slot	0	х
Basic Parameter Teaching	ТВР	TBP sl ax n1 n2	Changes n2 to n1 among basic parameters of Positioning Module's ax axis installed on sl slot	0	х
Extended Parameter Teaching	TEP	TEP sl ax n1 n2	Changes n2 to n1 among extended parameters of Positioning Module's ax axis installed on sl slot	0	х
Return to Origin Point Parameter Teaching	THP	THP sl ax n1 n2	Changes n2 to n1 among returned parameters to origin point of Positioning Module's ax axis installed on sI slot	0	х
Manual Operation Parameter Teaching	ТМР		Changes n2 to n1 among manual operation parameters of Positioning Module's ax axis installed on sI slot	0	х
Input Signal Parameter Teaching	TSP	— TSP slax n –	Changes input signal parameter of Positioning Module's ax axis installed on sl slot to the value set in n1	0	х
Common Parameter Teaching	ТСР		Changes n2 to n1 among common parameters of Positioning Module installed on sl slot	0	х
Parameter Save	WRT	WRT slax n	Instructions Positioning Module's ax axis installed on sI slot to save present parameter of n axis in flash ROM.	0	0
Present State Read	SRD	SRD sl ax D	Reads and saves present state of Positioning Module's ax axis installed on sl slot in D area of CPU	0	х
Point Operation Step Write	PWR		Writes value of S area of CPU on point operation step area of Positioning Module's ax axis installed on sI slot in	0	х
Plural Teaching Data Write	TWR	TWR slax s n1	Writes n value of S area of CPU on plural teaching dada area of Positioning Module's ax axis installed on sI slot in	0	х

#### Warranty

#### 1. Warranty Period

The product you purchased will be guaranteed for 18 months from the date of manufacturing.

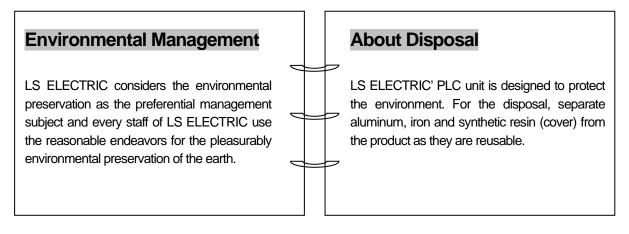
#### 2. Scope of Warranty

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**

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



Γ



# www.ls-electric.com

# LS ELECTRIC Co., Ltd.

Headquarter

- LS-ro 127(Hogye-dong) Dongan-gu, Anyang-si, Gyeonggi-Do, 14119, Korea Seoul Office
- LS Yongsan Tower, 92, Hangang-daero, Yongsan-gu, Seoul, 04386, Korea Tel: 82-2-2034-4033, 4888, 4703 Fax: 82-2-2034-4588 E-mail: automation@ls-electric.com
- Overseas Subsidiaries
- LS ELECTRIC Japan Co., Ltd. (Tokyo, Japan) Tel: 81-3-6268-8241 E-Mail: japan@ls-electric.com
- LS ELECTRIC (Dalian) Co., Ltd. (Dalian, China) Tel: 86-411-8730-6495 E-Mail: china.dalian@lselectric.com.cn
- LS ELECTRIC (Wuxi) Co., Ltd. (Wuxi, China) Tel: 86-510-6851-6666 E-Mail: china.wuxi@lselectric.com.cn
- LS ELECTRIC Middle East FZE (Dubai, U.A.E.)
- Tel: 971-4-886-5360 E-Mail: middleeast@ls-electric.com • LS ELECTRIC Europe B.V. (Hoofddorp, Netherlands)
- Tel: 31-20-654-1424 E-Mail: europartner@ls-electric.com • LS ELECTRIC America Inc. (Chicago, USA)
- Tel: 1-800-891-2941 E-Mail: sales.us@lselectricamerica.com • LS ELECTRIC Turkey Co., Ltd.
  - Tel: 90-212-806-1225 E-Mail: turkey@ls-electric.com

- Overseas Branches
- LS ELECTRIC Tokyo Office (Japan)
- Tel: 81-3-6268-8241 E-Mail: tokyo@ls-electric.com LS ELECTRIC Beijing Office (China)
- Tel: 86-10-5095-1631 E-Mail: china.auto@lselectric.com.cn • LS ELECTRIC Shanghai Office (China)
- Tel: 86-21-5237-9977 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Guangzhou Office (China) Tel: 86-20-3818-2883 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Chengdu Office (China) Tel: 86-28-8670-3201 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Qingdao Office (China) Tel: 86-532-8501-2065 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Nanjing Office (China) Tel: 86-25-8467-0005 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Bangkok Office (Thailand) Tel: 66-90-950-9683 E-Mail: thailand@ls-electric.com
- LS ELECTRIC Jakarta Office (Indonesia)
- Tel: 62-21-2933-7614 E-Mail: indonesia@ls-electric.com • LS ELECTRIC Moscow Office (Russia)
  - Tel: 7-499-682-6130 E-Mail: info@lselectric-ru.com
- LS ELECTRIC America Western Office (Irvine, USA)
  - Tel: 1-949-333-3140 E-Mail: america@ls-electric.com

Disclaimer of Liability LS ELECTRIC has reviewed the information in this publication to ensure consistency with the hardware and software described. However, LS ELECTRIC cannot guarantee full consistency, nor be responsible for any damages or compensation, since variance cannot be precluded entirely. Please check again the version of this publication before you use the product. © LS ELECTRIC Co., Ltd 2015 All Right Reserved.