

XGB ANALOG MODULE USER MANUAL

XBF-AD04A XBF-AD08A XBF-DV04A XBF-DC04A XBF-RD04A XBF-RD04A XBF-TC04S XBF-AH04A



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Programmable Logic Control

XGB Analog

User Manual

Analog input	XBF-AD04A
	XBF-AD08A
Analog output	XBF-DV04A
	XBF-DC04A
Temperature input	XBF-RD04A
	XBF-TC04S
Analog input/output	XBF-AH04A
Analog input option board	XBO-AD02A
Analog output option board	XBO-DA02A
Analog input/output option board	XBO-AH02A
Temperature input option board	XBO-RD01A
	XBO-TC02A

Built-in PID



Safety Instructions

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





XGT Series

Before using the product ...

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

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

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

\triangle Caution

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

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

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

 $\underline{/!}$ Be careful! Danger may be expected.

4 Be careful! Electric shock may occur.

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

Safety Instructions for Design Process

- Design the analog input / output signal or pulse input / output line at least 100mm away from high voltage line or power line so that it is not affected by noise or magnetic field change. It may cause malfunction due to noise.
- If there is a lot of vibration in the installation environment, take measures to prevent direct vibration from being applied to the PLC. It may cause electric shock, fire or malfunction.
- If metallic dust is present in the installation environment, take measures to prevent

metallic dust from entering the product. It may cause electric shock, fire or malfunction.

Safety Instructions on Installation Process

- Use PLC only in the environment specified in PLC manual or general standard of datasheet. If not, electric shock, fire, abnormal operation of the product may be caused.
- Before install or remove the module, be sure PLC power is off. If not, electric shock or damage on the product may be caused.
- Be sure that every module is securely attached after adding a module or an extension connector. If the product is installed loosely or incorrectly, abnormal operation, error or dropping may be caused. In addition, contact failures under poor cable installation will be causing malfunctions as well.
- Make sure that the I / O connector is securely fastened. It may cause wrong input or output.

Safety Instructions for Wiring Process

Warning

Prior to wiring works, make sure that every power is turned off. If not, electric shock or damage on the product may be caused.

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

Safety Instructions for Test-Operation and Maintenance

- 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.



Safety Instructions for Waste Disposal

Caution

> Product or battery waste shall be processed as industrial waste. The waste may discharge

toxic materials or explode itself.

Revision History

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Version	Date	Remark	Revised position
V 1.0	2007.7	 Adding contents Setting Sequence before operation Accuracy calculation example Chaptering contents 	2-1,3-1,4-1 2-9,3-7
		 (1) Wiring examples (2) Configuration and Function of Internal Memory 	2-13,3-9,4-9 2-28,3-18,4-20
		(3) Example Program	2-33,3-23,4-24,5-37
V 1.1	2008. 1	1. Adding model (1) Thermocouple input module (XBF-TC04S) 2. Adding contents	5-1 ~ 5-54
		 (1) Thermo electromotive force and compensating cable 	Appendix 2
		(2) Performance Specification(3) Dimension3. Changing chapter number	1-5 APP.3-3
		(1) CH.6 PID Function (2) Appendix 3. Dimension	CH 5 → CH6 App.2> App.3
V1.2	2008.4	1. Adding XGB compact 'H' type	All over
V1.3	2009.2	1. Adding contents about XGB IEC type	All over
V1.4	2009.7	1. Adding model	
		(1) Analog combo module (XBF-AH04A)	6-1 ~ 6-48
		2. Adding/changing contents	
		(1) Adding contents at chapter 1	1-1,1-6,1-7
		(2) Adding dimension	Appendix3-3
V1.5	'20.4	Format and contents modification according to the change of company name(LSIS \rightarrow LS ELECTRIC)	-
V1.6	2011.2	1. Adding new model	
		(1) Analog Input Option Board (XBO-AD02A)	8-1 ~ 8-35
		(2) Analog Output Option Board(XBO-DA02A)	9-1 ~ 9-35
		(3) Analog IO Option Board(XBO-AH02A)	10-1 ~ 10-44
		(4) RTD Input Option Board(XBO-RD01A)	11-1 ~ 11-27
		(5) Thermocouple Input Option Board(XBO-TC02A)	12-1 ~ 12-35
		(6) Thermocouple Voltage Input (XBF-TC04B)	5-1 ~ 5-60
		2. Contents added/modified	$\text{CH8} \rightarrow \text{CH13}$
		(1) CH.8 PID moved to CH13	

Revision History

Version	Date	Remark	Revised position
V1.7	2012.8	1. Adding new model	40.4 40.47
		(1) XBF-AD04C	13-1~13-47
		(2) XBF-DV04C/DC04C	14-1 ~ 14-41
		2. Changing contents	
		(1) CH.13 PID moved to CH15	$CH13 \rightarrow CH1$
V1.8	2014.1	1. Adding Analog/Temp option board IEC	
		Memory Area	
		(1) XBO-AD02A/DA02A/AH02A	8-26,9-22,10-32
		(2) XBO-RD01A/TC02A	11-20,12-24
V1.9	2014.3	1. Revision of content error	
		(1) XBF-DC04C Current Resolution	14-3
V2.0	2015.7	1. Domain name changed	2-2,3-2,4-2,5-2,6-2
		2. General specifications changed by reason of IEC Specifications.	7-2,8-2,9-2,10-2,11-2
			12-2,13-2,14-2
V2.1	2020.06	Corporate Identity changed	Entire
		(LSIS →LS ELECTRIC)	
V2.2	2021.10	1.XBF-AD04A input range setting correction	2-31
		2. Updating the maximum number of supported models	1-3~1-8,1-10,1-12
			2-3,3-3,4-3,5-6,6-4,7-3
			13-3,14-3
V2.3	2023.05	1. Error Correction	
		(1) Modify the front connector geometry orientation of XBF-AH04A	6-5, 6-18, 6-19, 6-21
		(2) Modify the front connector geometry orientation of	A3-2
		XBF-RD04A / XBF-AD04C	
V2.4	2024.06	1.XBF-AD04A external current consumption modification	1-3, 2-3
		2. Modification of warranty details	-

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Thank you for purchasing PLC of LS ELECTRIC Co., Ltd.

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

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

Title	Description
XG5000 user's manual	It describes how to use XG5000 software about online functions such as programming, printing, monitoring and debugging by using XGB series products.
XG5000 user's manual (for XGI/XGR/XEC)	It describes how to use XG5000 software about online functions such as programming, printing, monitoring and debugging by using XGB (IEC language)
XGK/XGB Instructions & Programming	It is the user's manual for programming to explain how to use commands that are used PLC system with XGB CPU.
XGI/XGR/XEC Instructions & Programming	It is the user's manual for programming to explain how to use commands that are used in XGB (IEC language)
XGB hardware	It describes power, IO, extension specification and system configuration, built-in high speed counter of XGB main unit.
XGB hardware (IEC)	It describes power, IO, extension specification and system configuration, built-in high speed counter of XGB (IEC) main unit.
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 basic unit.
XGB Position 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 basic unit.
XGB Cnet I/F	It is the user's manual about XGB Cnet I/F that describes built-in communication function and external Cnet I/F module of XGB basic unit
XGB FEnet I/F	It describes how to use XGB FEnet I/F module.
XBC Standard /Economic Type Main Unit	It describes power, I/O, extension specification and system configuration, built-in high speed counter of XGB standard / economic type main unit.
XGB High speed counter User's Manual	It is the user's manual for High speed counter extension module of XGB basic unit to explain High speed counter extension module function of XGB basic unit.
XGB Fast Ethernet I/F	It describes how to use XGB FEnet I/F module.
XGB CANopen I/F	It describes how to use the CANopen that is kind of opened type network.

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Chapter 1 General

Here describes about analog module and built-in PID function of XGB series.

1.1 Analog Product List

Classification	Name	No. of channel	Range	Resolution	Characteristic
XBF-AD04A			0 ~ 10V	2.5 mV	1.Range selection by external switch and
	4	0~20 mA 4mA~20mA	5.0 µA	2. External DC24V used	
			1 ~ 5V	0.250mV	1.Range selection by external switch and
			0 ~ 5V	0.3125mV	parameter setting
		1	0 ~ 10V	0.625mV	2 Function of. Filter, Average,
Voltage/		4	±10V	1.250 ^{mV}	Detection disconnection, Alarm,
Current input			4 ~ 20 ^{mA}	1.0 <i>µ</i> A	Retaining Valid conversion value
			0 ~ 20mA	1.25 <i>µ</i> A	3. External DC24V used
			4~20 ^{mA} 0~20 ^{mA}	5.0 µA	1.Range selection by external switch and
	XBF-AD08A	8	1~5V 0~5V	1.25 mV	parameter setting 2. Filter function, average function
			0~10V	2.5 mV	3. External DC24V used
	XBF-DV04A	4	0 ~ 10V	2.5 mV	
	XBF-DV04C	4	1 ~ 5V	0.250mV	1. External DC24V used
Voltage output			0 ~ 5V	0.3125mV	2. Designates output in case of Error and
			0 ~ 10V	0.625mV	CPU SIUP
			±10V	1.250mV	
	XBF-DC04A	4	0 ~ 20 ^{mA} 4 ^{mA} ~20 ^{mA}	5.0 µA	 External DC24V used Designates output in case of Error and
	XBF-DC04B	4	0 ~ 1.2mA	0.3 <i>µ</i> A	CPU STOP
Current output	XBF-DC04C 4		4~20 ^{mA}	1.0 <i>µ</i> A	 1. 1. External DC24V used 2. Designates output in case of Error and
		4	0 ~ 20 ^{mA}	1.25 <i>µ</i> A	3. Interpolation Function(Linear, S-type)4. Detection disconnection
	XBF-RD04A	4	PT100	a 1ºa	1. External DC24V used
RID input	XBF-RD01A	1	JPT100	0.1°C	2. Filter function
Thermocouple	le XBF-TC04S	Neted	1. External DC24V used		
Input module	XBF-TC04B	4		notet)	2. Filter function, average function

Note1) for more detail on thermocouple input module resolution, refer to Ch.5.2.6 accuracy/resolution.

Classification	Name	No. of channel	Range	Resolution	Characteristic
Analog			4~20 ^{mA} 0~20 ^{mA}	5.0 µA	1.Range selection by external switch and parameter setting
Input/Output (voltage/current	XBF-AH04A	2(Input) 2(Output)	1~5V 0~5V	1.25 mV	2.Filter function, averaging function 3.Specifies output when error or CPU
I/O)			0~10V	2.5 mV	STOP 4. Uses external DC24V
Analog Input Option Board	XBO-AD02A	2	4~20 ^{mA}	6.25 µA	1. Parameter setting
Analog Output	XBO-DA02A	2	0~20 ^{mA}	5.0 µA	2. Filter function, average function 3. Internal VDD 5V
Option Board			0~10V	2.5 mV	
Analog IO		1(Input)	4~20 ^{mA}	6.25 # ^A	1. Parameter setting
Option Board	XBO-AH02A		0~20 ^{mA}	5.0 µA	2. Filter function, average function
		1(Output)	0~10V	2.5 mV	
RTD Input	XBO-RD01A	1	PT100	0.1℃	1. Internal VDD 5V
Option Board		•	JPT100	-	2. Filter function, average function
Thermocouple Input Option Board	XBO-TC02A	2	K/J	Note2)	 Internal VDD 5V Filter function, average function

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Note2) for more detail on Thermocouple Input Option Board resolution, refer to Ch.12.5 accuracy

1.2 Specification of Analog Module

Here describes about specification of analog module of XGB series.

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1.2.1 Analog input

ltem			XBF-AD04A		
A H H H	Туре		Voltage	Current	
Analog input range		Range	DC 0 ~ 10V (Input resistance: 1 MΩ min.)	DC 4 ~ 20 ^{mA} DC 0 ~ 20 ^{mA} (Input resistance: 250 Ω)	
		Туре	12 bit binary	data	
		Unsigned value	0 ~ 400	0	
Digital output	Pango	Signed value	-2000 ~ 20	000	
	Range	Precise value	0 ~ 1000	400 ~ 2000/0 ~ 2000	
		Percentile value	0 ~ 100	0	
Ma	x. resolut	ion	2.5 ^{mV} (1/4000)	5# ^A (1/4000)	
Accuracy			± 0.5% or less		
Max. c	onversior	n speed	1.5ms/channel		
Absolute max. input		input	DC ±15V	DC +25 ^{mA}	
No. of	output cl	nannel	4 channe	els	
Insu	lation me	thod	Photo-coupler insulation between input terminal and PLC power (No insulation between channels)		
Conn	ection Tei	rminal	11 point terminal block		
l/O p	oints occ	upied	Fixed type: 64 points		
Max. number of equipment			7 [When using XBM-Dxxx□ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type)		
Consumption	Inn	er (DC 5V)	120 mA		
current	Exter	nal (DC 24V)	90 mA		
	Weight		64g		
Additional function			Filter-processing, average-processing (time, count)		

Items				XBF-AD04C		
Nu	mber of	f ch	annels	4 channels		
		Туре		Voltage	Current	
Analog input		Range		DC 1 ~ 5V DC 0 ~ 5V DC 0 ~ 10V DC -10 ~ 10V (Input resistance: 1 MΩ min) Current input or Voltage input ca terminal wiring setting. ► In voltage mode, use V+ and CO	DC 4 ~ 20mA DC 0 ~ 20mA (Input resistance: 250 Ω) In be selected through the external DM terminal for the channel.	
				In current mode, short V+ and C and COM terminal.	COM terminal and then use I+	
			Туре	16 bit binary da	ata (Data : 14Bit)	
			Unsigned value	0 ~ ^	16,000	
			Signed value	-8,000	~ 8,000	
Digital output	Rang	je	Precise value	1,000 ~ 5,000 (1 ~ 5V) 0 ~ 5,000 (0 ~ 5V) 0 ~ 10,000 (0 ~ 10V) -10,000 ~ 10,000 (±10V)	4,000 ~ 20,000 (4 ~ 20 ^{mA}) 0 ~ 20,000 (0 ~ 20 ^{mA})	
			Percentile value	0 ~ 10,000		
	•			1/16,000		
7	Max. resolution		ition	0.250 ^{mV} (1 ~ 5V) 0.3125 ^{mV} (0 ~ 5V) 0.625 ^{mV} (0 ~ 10V) 1.250 ^{mV} (±10V)	1.0 ^{µA} (4 ~ 20 ^{mA}) 1.25 ^{µA} (0 ~ 20 ^{mA})	
	Accu	irac	у	±0.2% or less (When ambient temperature 25℃) ±0.3% or less (When ambient temperature 0 ~ 55℃)		
Max	. conve	rsio	n speed	1 ^{ms} / channel		
Ab	solute r	max	. input	DC ±15V DC ±30 ^{mA}		
		Filt	er	Digital filter(4 ~ 64,000ms)		
		Δνα	erane	Time average (4~16,000 ^{ms})		
	_		Jiugo	Count average (2~64,000times)		
Addition	n _	Det	tection alarm	Disconnection(DC 1~5V, DC 4~20 ^{mA})		
Turiction	1	Ho	ld last value	When input signal exceeds the effective range, holds the last effective value.		
		Ala	rm function	When input signal exceeds the eff	ective range, relevant flag turns on.	
In	sulatior	n me	ethod	Photo-coupler insulation between input terminal and PLC power (No insulation between channels)		
Co	nnectio	n te	erminal	15 point te	erminal block	
I/C	points	000	cupied		assignment: 64	
Max.	attacha	able	number	7 [When using XBM-Dxxx□ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type)		
Consumpt	ion	Inte	ernal (DC 5V)	11	0mA	
current		Exte	ernal (DC 24V)	10	0mA	
	We	ight		7	72g	
Module input power		power	DC 20.	.4~28.8V		

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ltem			XBF-AD08A		
		Туре	Voltage	Current	
Analog input range	Range		DC 1 ~ 5V DC 0 ~ 5V DC 0 ~ 10V (Input resistance: 1 MΩ min.) Input range can be voltage/curre	DC 4 ~ 20 ^{mA} DC 0 ~ 20 ^{mA} (Input resistance: 250 Ω) ent selector switch after being set	
		Туре	12 bit bir	nary data	
		Unsigned value	0 ~	4000	
Digital output		Signed value	-2000) ~ 2000	
	Range	Precise value	100 ~ 500 (DC 1 ~ 5V) 0 ~ 500 (DC 0 ~ 5V) 0 ~ 1000 (DC 0 ~ 10V)	400 ~ 2000 (DC 4 ~ 20 ^{mA}) 0 ~ 2000 (DC 0 ~ 20 ^{mA})	
		Percentile value	0 ~	1000	
			1/-	4000	
Ma	x. resolut	ion	1.25 ^{mV} (DC 1~5V, 0~5V) 2.5 ^{mV} (DC 0~10V)	5 ^{µA} (DC4~20 ^{mA} , 0~20 ^{mA})	
	Accuracy	,	± 0.5% or less		
Max. conversion speed			1.5ms/channel		
Abso	lute max.	input	DC ±15V	DC +25 ^{mA}	
No. of	output cł	nannel	8 ch	annels	
Insu	lation me	thod	Photo-coupler insulation between input terminal and PLC power (No insulation between channels)		
Conn	ection Tei	rminal	11 point terminal block		
l/O p	oints occi	upied	Fixed type: 64 points		
Max. nur	nber of e	quipment	 7 [When using XBM-Dxxx□ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type) 		
	Filt	er function	Digital filter (4~64,000ms)		
			Time average	e (4~16,000ms)	
Additional function	Aver	age function	Count average (2~64,000 times)		
			Moving average (2~100)		
	Ala	rm function	Disconnection detection (DC 1~5V, DC 4~20 ^{mA})		
Consumption	Inn	er (DC 5V)	10	05mA	
current	Exter	nal (DC 24V)	85mA		
Weight		81g			

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1.2.2 Analog output

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Item			XBF-DV04A	XBF-DC04A XBF-DC04B		
	Т	уре	Voltage	Current	Current	
Analog output	Range		DC 0 ~ 10V (Load resistance: 2kΩ or more)	DC 4 ~ 20mA DC 0 ~ 20mA (Load resistance: 510Ω or less)	DC 0 ~ 1.2mA (Load resistance: 510Ω or less)	
	Т	уре	12-bit binary data			
		Signed value	0 ~ 4000	0 ~ 4000	0 ~ 4000	
Digital input	Denne	Unsigned value	-2000 ~ 2000	-2000 ~ 2000	-2000 ~ 2000	
	Range	Precise value	0 ~ 1000	400 ~ 2000/0 ~ 2000	0 ~ 1,200	
		Percentile value	0 ~ 1000	0 ~ 1000	0 ~ 1,000	
Maximum resolution		2.5 ^{mV} (1/4000)	5#A (1/4000)	0.3#4 (1/4000)		
Accuracy		±0.5% or less				
Maximum conversion speed		1 ms/channel				
Absolute	e maximu	um output	DC ±15V DC +25 ^{mA}			
Num	per of ma channel	ximum I	4 channels			
Insu	ulation me	ethod	Photo-coupler insulation between input terminal and PLC power (no insulation between channels)			
Term	inal conr	nected	11-point terminal block			
I/O p	oints occ	cupied	Fixed type: 64 points			
Max. no. of installation		7 [When using XBM-Dxxx (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type)				
Current	Intern	al (DC 5V)	110mA	110mA 110mA		
tion	Externa	al (DC 24V)	70mA	120mA		
	Weight		64g	70g		

Items			XBF-DV04C	XBF-DC04C	
Channels			4 channels		
		Туре	Voltage	Current	
Analog output range	Range		DC 1 ~ 5V DC 0 ~ 5V DC 0 ~ 10V DC -10 ~ 10V (Load resistance: $1^{k\Omega}$ or more) Output ranges are set in user pr channel.	DC 4 ~ 20 ^{mA} DC 0 ~ 20 ^{mA} (Load resistance: 600Ω or less) ogram or I/O parameter per each	
		Type	16 bit binary da	ta (Data : 14Bit)	
		Unsigned value	0 ~ 1	6,000	
		Signed value	-8,000	~ 8,000	
Digital input	Range	Precise value	1,000 ~ 5,000 (1 ~ 5V) 0 ~ 5,000 (0 ~ 5V) 0 ~ 10,000 (0 ~ 10V) -10,000 ~ 10,000 (±10V)	4,000 ~ 20,000 (4 ~ 20 ^{mA}) 0 ~ 20,000 (0 ~ 20 ^{mA})	
		Percentile value	0 ~ 10,000		
	•		1/16,000		
Max. resolution		lution	0.250 ^{mV} (1 ~ 5V) 0.3125 ^{mV} (0 ~ 5V) 0.625 ^{mV} (0 ~ 10V) 1.250 ^{mV} (±10V)	1.0 ^{µA} (4 ~ 20 ^{mA}) 1.25 ^{µA} (0 ~ 20 ^{mA})	
	Accura	су	$\pm 0.2\%$ or less (When ambient temperature is 25%) $\pm 0.3\%$ or less (When ambient temperature is $0 \sim 55\%$)		
Max.	conversi	on speed	1 ^{ms} / channel		
Additional function		unction	Setting of channel output status (Select one among previous, Min, Max value) Setting of interpolation method (Linear interpolation, S-type interpolation)		
In	sulation n	nethod	Photo-coupler insulation between output terminal and PLC power (no insulation between channels)		
Ter	minal cor	nnected	11 point terminal		
I/O	occupied	d points	Fixed point assig	gnment: 64 points	
Max. attachable number		e number	7 [When using XBM-Dxxx (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxF type)		
	Weigh	nt	68g	69g	
Consume	d Ir	nternal (DC 5V)	75	mA	
current	Power Su	(ternal (DC 24V)	170mA DC 20.4V ~ 28.8V		

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1.2.3 RTD input

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	ltem	XBF-RD04A	XBF-RD01A	
No. of i	input channel	4 channels	One channel	
Input sensor	PT100	JIS C16	04-1997	
type	JPT100	JIS C1604-1981	, KS C1603-1991	
Temperature	PT100	-200 ~	600°C	
input range	JPT100	-200 ~	600°C	
	PT100	-2000	~ 6000	
Digital output	JPT100	-2000	~ 6000	
	Scaling display	0~4	4000	
Accuracy	Normal temp.(25°C)	Within ±0.3%		
,	Full temp.(0~55°C)	Within ±0.5%		
Conve	ersion speed	40ms / channel		
Inculation	Channel to Channel	Non-insulation		
Insulation	Terminal to PLC Power	Insulation (Photo-Coupler)		
Tern	ninal block	15-point terminal block		
I/O poi	nts occupied	Fixed type: 64 points		
Wiri	ng method	3-wire		
Max. number of equipment		7 [When using XBM-Dxxx□ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type)		
Function	Filtering	Digital filter (160 ~ 64000ms)		
	Alarm	Disconnection detection		
Current	Inner DC5V	100mA		
consumption	external DC24V	100 ^{mA}		
١	Weight	63g		

1.2.4 Thermocouple input

(1) Thermocouple input specification (XBF-TC04S / XBF-TC04B)	

	Items	Specification	
		4 channels	
Numb	per of input channel	Select channel type by parameter	
		(thermocouple input)	
Turn	o of input concor	Thermocouple K / J / T / R type	
тур		JIS C1602-1995	
	K	-200.0℃ ~ 1300.0℃	
Range of input	J	-200.0℃ ~ 1200.0℃	
temperature	Т	-200.0°C ~ 400.0°C	
	R	0.0℃ ~ 1700.0℃	
	Tomp display	Displaying down to one decimal place – note1)	
Digital output	Temp. display	K, J, T type: 0.1 ℃, R type: 0.5 ℃	
	Scaling display	Unsigned scaling (0 ~ 65535)	
	(user-defined scaling)	Signed scaling (-32768 ~ 32767)	
	Ambient temperature(25℃)	Within ±0.2% – note 2)	
Accuracy	Temp. coefficient	100 nnm/°C	
	(range of operating temp)	$\pm 100 \text{ ppm/ C}$	
C	onversion time	50ms / channel	
Reference	Auto comper	nsation by RJC sensing (Thermistor)	
junction	Componention amount	+1 0°C	
compensation	Compensation amount	±1.0 C	
W	arming-up time	15 min or above –note 3)	

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Note1), Note2) For more detail specification, refer to 5.2.6 accuracy/resolution. Note 3) Warming-up time: for stability of measured temperature, 15 min is necessary after power is on.

(2) Voltage input specification (XBF-TC04B)

	Items	Specification	
Numt	per of input channel	4 channels Select channel type by parameter (thermocouple/voltage input)	
Analog input range		0 ~ 100 mV (Input impedance: $1^{M\Omega}$ or above)	
	Туре	0 ~ 20000	
Digital output	Scaling display	Unsigned scaling (0 ~ 65535)	
	(user-defined scaling)	Signed scaling (-32768 ~ 32767)	
Ν	lax. resolution	1/20000 (0.005mV)	
	Ambient temperature (25℃)	Within ±0.2%	
Accuracy	Temp. coefficient	±100 ppm/℃	
	(operating temp. range)		
C	onversion time	50ms / channel	

Items			Specification	
	Inculation	Terminal – inner circuit	Photo-coupler insulation	
Inculation	method	Terminal – operating power	DC/DC converter insulation	
Insulation		Between channels	Photomos relay insulation	
	Dielectric	withstand voltage	400 V AC, 50/60 Hz, 1min, leakage current 10 ^{mA} or below	
	Insulation	resistance	500 V DC, 10 M Ω or below	
	Terminal b	lock	11 point terminal	
l,	O occupied	points	64 points	
Max. number of equipment		equipment	 7 [When using XBM-Dxxx□ (□:"S","H","H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type) 	
	Filter process		Digital filter (200 ~ 64,000 ^{ms})	
Additional	Average process		Time average (400~64,000 ^{ms}) Count average (2~64,000 times)	
function		A.L	Moving average (2~100)	
	Max		Disconnection detection	
	IVIAX	./IVIIN. display	Display Max./Min.	
O and the second	SCa		Signed scaling / Unsigned scaling	
Consumption			100 mA	
current	L Ext Weigh	ernal DC24V	100 ^{mA} 63g	

(3) Common specification (XBF-TC04S / XBF-TC04B)

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1.2.5 Analog Input/Output

(1) Input performance specification

Items			XBF-	AH04A	
No.	of input	channel	2 channels		
		Туре	Voltage	Current	
			DC 1 ~ 5V	DC 4 ~ 20 ^{mA}	
Analog			DC 0 ~ 5V	DC 0 ~ 20mA	
input		_	DC 0 ~ 10V	(input resistor 250 Ω)	
range		Range	(input resistor: 1 M Ω or above)		
			Input range can be set through exter	nal voltage/current selector switch after	
			setting at user program or I/O parame	eter per input channel	
		Туре	12bit bi	inary data	
		Unsigned		1000	
		value	0~	4000	
Disital		Signed value	-2000) ~ 2000	
Digital	Dener	ge Precise	100 ~ 500 (DC 1 ~ 5V)	400 ~ 2000 (DC 4 ~ 20 ^{mA})	
oulpul	Range		0 ~ 500 (DC 0 ~ 5V)	0 ~ 2000 (DC 0 ~ 20 ^{mA})	
		value	0 ~ 1000 (DC 0 ~ 10V)		
		Percentile	0 - 1000		
		value	U ~ 1000		
			1/4000		
Ν	lax. res	olution	1.25 ^{mV} (DC 1~5V, 0~5V)	5 ^{µA} (DC4~20 ^{mA} , 0~20 ^{mA})	
			2.5 ^{mV} (DC 0~10V)		
	Precis	ion	±0.5% or less		
Max.	convers	sion speed	1ms/channel		
Abs	olute m	ax. input	DC ±15V	DC ±25 ^{mA}	
		Filter function	Digital filter	(4 ~ 64,000 ^{ms})	
م d ditio a		Auronosina	Time averagir	ng (4~16,000ms)	
Addition	ai	Averaging	Cyclic averagin	g (2~64,000cycle)	
TUNCTION		TUNCTION	Moving averaging (2~100samples)		
		Alarm function	Disconnection detection (DC 1~5V, DC4~20 ^{mA})		

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Items **XBF-AH04A** 2 channels No. of output channel Туре Voltage Current DC 4 ~ 20 mA DC 1 ~ 5V DC 0 ~ 20mA DC 0 ~ 5V Analog output DC 0 ~ 10V (Load resistor 510 Ω or less) Range range (Load resistor: 2kΩ or above) Input range can be set through external voltage/current selector switch after setting at user program or I/O parameter per input channel Туре 12 bit binary data Unsigned 0 ~ 4000 value Signed value -2000 ~ 2000 Digital 100 ~ 500 (DC 1 ~ 5V) 400 ~ 2000 (DC 4 ~ 20mA) input Range Precise 0~2000 (DC 0~20mA) 0 ~ 500 (DC 0 ~ 5V) value 0~1000 (DC 0~10V) Percentile 0~1000 value 1/4000 1.25^{mV} (DC 1~5V, 0~5V) 5^{µA} (DC4~20^{mA}, 0~20^{mA}) Max. resolution 2.5 mV (DC 0~10V) ±0.5% or less Precision Max. conversion speed 1ms/channel DC ±15V DC 25mA Absolute max. output Function setting channel output status Additional function (Can select one among Previous, Minimum, median, maximum) (3) I/O common performance specification Items **XBF-AH04A** Photo coupler insulation between I/O terminal and PLC power (not Insulation method insulated between channels) I/O terminal block 11 points terminal block No. of I/O occupation point Fixed type: 64 points 7 [When using XBM-Dxxx - (-:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type) Max. number of equipment Consumption Internal (DC 5V) 120mA

(2) Output performance specification

current

External (DC 24V)

Weight

LSELECTRIC | 1-12

130mA

73g

1.2.6 Analog Input Option Board

Items			XBO-AD02A	
Number of channel			2 channels	
		Туре	Voltage	Current
Analog input range	Range		DC 0 ~ 10V (Input resistance: 1 $M\Omega$ or above)	DC 4 ~ 20mA DC 0 ~ 20mA (Input resistance 250 Ω) tor switch after being set at user
			program or I/O parameter per each channel	
		Туре	12 bit bina	ary data
		Unsigned value	0 ~ 40	000
Digital output	Dener	Signed value	-2000 ~	2000
	Range	Precise value	0 ~ 1000 (DC 0 ~ 10V)	400 ~ 2000 (DC 4 ~ 20 ^{mA}) 0 ~ 2000 (DC 0 ~ 20 ^{mA})
		Percentile value	0 ~ 10	000
			1/4000 (DC 4~20 ^{mA} : 1/3200)	
Max	c. resolution	on	2.5mV (DC 0~10V)	5μA (DC 0~20mA) 6.25μA (DC 4 ~ 20mA)
A	Accuracy		±1.0% c	r less
Max. co	nversion	speed	1ms/channel	+ scan time
Absolu	ute max. i	nput	DC +12V / -10V	DC ±25 ^{mA}
Additional	Aver	age function	Count average (2 ~ 64,000 times)	
function	Gain adjustment function		Gain adjustment (-40~40)	
Insula	ation met	nod	No insulation between channels No insulation between input terminal and PLC main unit	
Inp	ut termina	al	5 - point terminal block	
I/O po	ints occu	pied	Fixed type: 64 points	
Max. no. of installation			1 (when using XBC-DR10E/DR14E type) 2 (when using XBC-DR20E/DR30E type) 2 (when using XBC-DxxxS/SU type)	
Su	pply powe	er	Internal	DC 5V
Consu	mption cu	rrent	50 mA	
	Weight		200]

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1.2.7 Analog Output Option Board

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ltem			XBO-DA02A		
No. of channels			2 channels		
	Туре		Voltage	Current	
Analog output range	Range		DC 0 ~ 10V (Load resistance: 2kg or more) Output range can be set at user pr	DC 4 ~ 20 ^{mA} DC 0 ~ 20 ^{mA} (Load resistance: 450Ω) er program or I/O parameter for each	
		Туре	12-bit binary data		
		Unsigned value	0~4000		
Digital		Signed value	-2000 ~ 2000		
inpat	Range	Precise value	0 ~ 1000 (DC0~10V)	400 ~ 2000 (DC4~20mA) 0 ~ 2000 (DC0~20mA)	
		Percentile value	0 ~ 1000		
			1/4000 (DC 4 ~ 20mA: 1/3200)		
M	aximum r	resolution	2.5™ (DC 0 ~ 10V)	5,4/A (DC 0~20mA) 6.25,4/A (DC 4~20mA)	
	Accur	acy	±1.0%	or less	
Maxim	าum conv	version speed	1 ^{ms} /channel	+ scan time	
Α	dditional	function	Channel output state setting (former, min, middle, max value) Gain adjustment function		
 	nsulation	method	no insulation between analog output channels no insulation between output terminal and PLC main unit		
	I/O terr	minal	5-point terminal block		
Power supply			Internal 5V		
I/O points occupied			Fixed type: 64 points		
Supply power			Internal DC5V		
Current consumption			150 mA		
Weight			20g		

1.2.8 Analog I/O Option Board

(1) Input performance specification

Items			XBO-AH02A	
Number of channels			1 channel	
	Туре		Voltage	Current
Analog input range	Range		$ \begin{array}{c c} DC \ 0 \ \sim \ 10V \\ \hline (Input \ resistance: \ 1M\Omega \ or \ above) \end{array} \begin{array}{c} DC \ 4 \ \sim \ 20^{mA} \\ DC \ 0 \ \sim \ 20^{mA} \\ \hline (Input \ resistance: \ 250 \ \Omega) \end{array} $	
			or I/O parameter per each channel	
		Туре	12 bit bir	nary data
	Range	Unsigned value	0 ~ 4000	
Digital		Signed value	-2000 ~ 2000	
output		e Precise value	0 ~ 1000 (DC 0 ~ 10V)	400 ~ 2000 (DC 4 ~ 20 ^{mA}) 0 ~ 2000 (DC 0 ~ 20 ^{mA})
		Percentile value	0 ~ 1	1000
			1/4000 (DC 4~20 ^{mA} : 1/3200)	
Max. resolution			2.5 ^{mV} (DC 0~10V)	5 ^{µA} (DC 0~20 ^{mA}) 6.25 ^{µA} (DC 4~20 ^{mA})
	Accu	racy	±1.0% or less	
Max. conversion speed			1ms/channel + scan time	
Absolute max. input		nax. input	DC +12V / -10V	DC ±25 ^{mA}
Addition		Average function	Count average (2 ~ 64,000 times)	
function	า	Gain adjustment function	Gain adjustment (-40~40)	

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(2) Output performance specification

Items			XBO-AH02A		
Number of channels			1 channel		
	Туре		Voltage	Current	
Analog output range	Range		DC 0 ~ 10V (Load resistance: 2kΩ or above) Set at user program or I/O para channel	DC 4 ~ 20 ^{mA} DC 0 ~ 20 ^{mA} (Load resistance: 450 Ω) ameter per each channel per each	
	Туре		12 bit binary data		
	Range	Unsigned value	0 ~ 4000		
Digital		Signed value	-2000 ~ 2000		
input		Precise value	0 ~ 1000 (DC 0 ~ 10V)	400 ~ 2000 (DC 4 ~ 20 ^{mA}) 0 ~ 2000 (DC 0 ~ 20 ^{mA})	
		Percentile value	0 ~	1000	
			1/4000 (DC 4 ~ 20 ^{mA} : 1/3200)		
Max. resolution			2.5 ^{mV} (DC 0~10V)	5 ^{µA} (DC 0~20 ^{mA}) 6.25 ^{µA} (DC 4~20 ^{mA})	
	Accurac	cy	±1.0% or less		
Max. conversion speed			1ms/channel + scan time		
Additional function			CH output status setting(select among former, min, middle, max value) Gain adjustment function		

(3) I/O Common performance specification

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Items	XBO-AH02A	
Insulation method	Non-insulation betweens analog I/O channels Non-insulation between I/O terminal and PLC main unit	
I/O terminal	5-point terminal block	
I/O occupation point	Fixed type: 64 points	
Max. installation count	1(when using XBC-DR10E/DR14E type) 2(when using XBC-DR20E/DR30E type) 2(when using XBC-DxxxS/SU type)	
Supply power	Internal DC5V	
Consumption current	150 ^{mA}	
Weight	20g	

Items		XBO-RD01A	
No. of input channels		One channel	
Input sensor	PT100	JIS C1604-1997	
type	JPT100	JIS C1604-1981 , KS C1603-1991	
Temperature	PT100	-200 ~ 600 °C	
input range	JPT100	-200 ~ 600 ℃	
	PT100	-2000 ~ 6000	
Digital output	JPT100	-2000 ~ 6000	
Accuracy		Within ±1.0%	
Conve	rsion speed	25m/1 channel	
Inculation	Channel to Channel	Non-insulation	
Insulation	Terminal to PLC Power	Insulation (Photo-Coupler)	
Term	ninal block	5-point terminal block	
I/O poi	nts occupied	Fixed type: 64 points	
Max. number of equipment		1 (when using XBC-DR10E/DR14E type) 2 (when using XBC-DR20E/DR30E type) 2 (when using XBC-DxxxS type)	
Wiring method		3-wire type	
Function	Averaging	Count averaging function	
Function	Alarm	Disconnection detection	
Supply power		Internal DC5V	
Consumption current		30 mA	
Weight		20g	

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1.2.9 RTD Input Option Board

	Items	XBO-TC02A	
Numb	er of input channel	2 channels	
Тур	e of input sensor	Thermocouple K / J type (JIS C1602-1995)	
Range of input	K type sensor	-200.0°C ~ 1300.0°C	
temperature	J type sensor	-200.0°C ~ 1200.0°C	
Digital output	Temp. display unit	16 bit binary data Displaying down to one decimal place (K, J, type: 0.1°C)	
	Accuracy	±1.0% or less	
Co	nversion speed	50ms/2chanelles –note1)	
Reference	Auto compen	sation by RJC sensing (Thermistor)	
junction compensation	Compensation amount	±1.0°C	
Additional	Average process	Count averaging	
function	Alarm	Input disconnection detection	
W	arming-up time	15 min or above – note2)	
Ins	sulation method	Non-insulation between input channels Non-insulation between input terminal and PLC main unit	
	I/O terminal	5-point terminal block	
Max. n	umber of equipment	1 (when using XBC-DR10E/DR14E type) 2 (when using XBC-DR20E/DR30E type) 2 (when using XBC-DxxxS type)	
:	Supply power	Internal DC5V	
I/O	occupied points	Fixed type: 64 points	
Con	sumption current	50mA	
	Weight	20g	

1.2.10 Thermocouple Input Option Module

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Chapter 2 Analog Input Module

2.1 Setting Sequence before operation

Before using the analog input module, follow steps below.



2.2 Specifications

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2.2.1 General specifications

General specifications are as follows.

No.	ltem	Specifications					Related specifications
1	Ambient temperature	0℃~+55℃				-	
2	Storage temperature			-25 ℃~	+70℃		-
3	Ambient humidity		5	5 ~ 95%RH (No	n-condensing)		-
4	Storage humidity		Ę	5 ~ 95%RH (No	n-condensing)		-
			Occasio	onal vibration		-	-
		Frequency	Ac	celeration	Amplitude	How many times	
		5 ≤ f < 8.4 ⊞	z	-	3.5 mm		
	Vibration	8.4 ≤ f ≤ 150	Hz 9.8	3 m/s² (1G)	-		
5	resistance		For contir	nuous vibratio	า	10 times each	IEC61131-2
		Frequency	Ac	celeration	Amplitude	directions	
		5 ≤ f < 8.4 ⊞	z	-	1.75 mm	(,, , , , , , , , , , , , , , , , , , ,	
		8.4 ≤ f ≤ 150 J	Hz 4.9	m/s² (0.5G)	-		
6	 Peak acceleration: 147 m/s²(15G) Duration: 11ms Half-sine, 3 times each direction per each axis 					IEC61131-2	
		AC: ± 1,500V					
	Noise resistance	Impulse noise		DC: ± 900V			
		Electrostatic discharge	Voltage : 4kV (contact discharging)			IEC 61131-2, IEC 61000-4- 2	
7 N		Radiated electromagnetic field noise		80 ~ 1,000 MHz, 10V/m			IEC 61131-2, IEC 61000-4- 3
		Fast transient	Segment	Power supply module	Digital/an	alog input/output ication interface	IEC 61131-2, IEC 61000-4-
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Voltage	2kV		1kV	4
8	Environment	Free from corrosive gasses and excessive dust				-	
9	Altitude	Up to 2,000 ms				-	
10	Pollution degree	Less than equal to 2				-	
11	Cooling	Air-cooling				-	

2.2.2 Performance specifications

Performance specifications are as follows.

	Items		XBF-AD04A		
Analog input	Туре		Voltage	Current	
range	Range		DC 0 ~ 10V (Input resistance: 1 MΩ min.)	DC 4 ~ 20mA DC 0 ~ 20mA (Input resistance 250 Ω)	
		Туре	12 bit binary data		
		Unsigned value	0 ~ 4000		
Digital output	Damas	Signed value	-2000 ~ 2000		
	Range	Precise value	0 ~ 1000	400 ~ 2000/0 ~ 2000	
		Percentile value	0 ~ 1	000	
Max	. resoluti	on	2.5 ^{mV} (1/4000)	5 ^{µA} (1/4000)	
Accuracy			±0.5% or less		
Max. co	onversion	speed	1.5ms/channel		
Absolute max. output			DC ±15V	DC ±25 ^{mA}	
No. of output channel			4 char	nnels	
Insulation method			Photo-coupler insulation between input terminal and PLC power (No insulation between channels)		
Conne	ection terr	ninal	11 point terminal block		
I/O points occupied			Fixed type: 64 points		
Max. no of installation			7 [When using XBM-Dxxx□ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type)		
Consumption	Inner (DC 5V)		120 ^{mA}		
current	External (DC 24V)		90 mA		
Weight			64g		
Additional function			Filter-processing, average-processing (time, count)		

Notes

- 1) When A/D conversion module is released from the factory, Offset/Gain value is as adjusted for respective analog input ranges, which is unavailable for user to change.
- 2) Offset Value: Analog input value where digital output value is 0 when digital output format is set to Unsigned Value.
- 3) Gain Value: Analog input value where digital output value is 16000 when digital output format is set to Unsigned Value.
2.3 Name of part and function

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Respective designations of the parts are as described below.



No.	Description
	RUN LED
1	Displays the operation status of XBF-AD04A On: Operation normal Flickering: Error occurs (page 12-30) Off: Module error
	Terminal block
2	• Analog input terminal, whose respective channels can be connected with external devices.
	Voltage/Current selection switch
3	 Switch for voltage and current selection of analog input

2.4 Characteristic of I/O conversion

Characteristics of I/O conversion are the inclination connected in a straight line between Offset and Gain values when converting analog signal (voltage or current input) from PLC's external device to digital value. I/O conversion characteristics of A/D conversion modules are as described below.



2.5 Conversion Characteristic according to Input Range

Voltage input range can be set through user program or special module package for respective channels. Output formats of digital data are as specified below;

- A. Unsigned Value
- B. Signed Value

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- C. Precise Value
- D. Percentile Value

2.5.1 If the range is DC 0 ~ 10V



Digital output value for voltage input characteristic is as specified below. (Resolution (based on 1/4000): 2.5 mV)

Digital output	Analog input voltage (V)								
range	0	2.5	5	7.5	10	10.11			
Unsigned value (0 ~ 4047)	0	1000	2000	3000	4000	4047			
Signed value (-2000 ~ 2047)	-2000	-1000	0	1000	2000	2047			
Precise value (0 ~ 1011)	0	250	500	750	1000	1011			
Percentile value (0 ~ 1011)	0	250	500	750	1000	1011			

2.5.2 If the range is DC 0 ~ 20mA



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- Digital output value for current input characteristic is as specified below. (Resolution (based on 1/4000): 5 $\mu^{\!A})$

Digital output	Analog input current (^{mA})							
range	0	5	10	15	20	20.23		
Unsigned value (0 ~ 4047)	0	1000	2000	3000	4000	4047		
Signed value (-2000 ~ 2047)	-2000	-1000	0	1000	2000	2047		
Precise value (0 ~ 2023)	0	500	1000	1500	2000	2023		
Percentile value (0 ~ 1011)	0	250	500	750	1000	1011		



2.5.3 If range is DC4 ~ 20mA

- Digital output value for current input characteristic is as specified below. (Resolution (Based on 1/4000): 5 $\,\mu^{\!A})$

Digital	Analog input current (mA)									
Output range	0	4	8	12	16	20	20.23			
Unsigned value (-48 ~ 4047)	-48	0	1000	2000	3000	4000	4047			
Signed value (-2048 ~ 2047)	-2048	-2000	-1000	0	1000	2000	2047			
Precise value (381 ~ 2023)	381	400	800	1200	1600	2000	2023			
Percentile value (-12 ~ 1011)	-12	0	250	500	750	1000	1011			

Notes

 If analog input value exceeding digital output range is input, the digital output value will be kept to be the max. or the min. value applicable to the output range specified. For example, if the digital output range is set to unsigned value (0 ~ 4000) and the digital output value exceeding 4047 or analog value exceeding –0 is input, the digital output value will be fixed as 0~4047.

2) Voltage and current input shall not exceed ±15 V and ±25 ^{mA} respectively. Rising heat may cause defects.

2.6 Accuracy

Accuracy of digital output value does not changed even if input range is changed. Figure below shows the range of the accuracy with analog input range of 0 \sim 10 V and digital output type of unsigned value selected.

Accuracy of XBF-AD04A is ±0.5%.



- (1) Accuracy when using 5V input 4000 × 0.5% = 20 Therefore the range of the accuracy will become (2000-20) ~ (2000+20) = 1980 ~ 2020 when using 5V input.
- (2) Accuracy when using 10V input 4000 × 0.5% = 20 Therefore the range of the accuracy will become (4000-20) ~ (4000+20) = 3980 ~ 4020 when using 10V input.

2.7 Functions of Analog Input Module

Function	Description
Channel Run/Stop setting	 (1) Specify Run/Stop of the channel to execute A/D conversion. (2) If the unused channel is set to Stop, whole Run time can be reduced.
Input voltage/Current range setting	(1) Specify analog input range to be used.(2) Select range in parameter setting after select Voltage/Current switch.
Output data format setting	(1) Specify digital output type.(2) 4 output data formats are provided in this module.
A/D conversion methods	 Sampling processing Sampling process will be performed if A/D conversion type is not specified. Filter processing Used to delay the sudden change of input value. Average processing Outputs average A/D conversion value based on frequency or time.

Functions of XBF-AD04A conversion module are as described below.

There are three A/D conversion methods, sampling processing, filter processing and average processing.



(1) Sampling processing

It collects analog input sign through general A/D conversion processing at a specific interval so to convert to digital. The time required for A/D conversion of analog input sign till saved on the memory depends on the number of channels used.

- (Processing time) = (Number of channels used) X (Conversion speed)
- (Ex.) If the number of channels used is 3, its process time will be $3 \times 1.5 \text{ ms} = 4.5 \text{ ms}$

Sampling is to calculate the sampling value of continuous analog sign at a specific interval.

(2) Filter processing

Filter process function is used to obtain stable digital output value by filtering (delaying) noise or sudden change of input value. Filter constant can be specified for respective channels through user program or I/O parameters setting.

• Setting range: 1 ~ 99 (%)

 $F[n] = (1 - \alpha) \times A[n] + \alpha \times F[n - 1]$

F[n]: Present filter output value A[n]: Present A/D converted value F[n-1]: Previous filter output value A: Filter constant (0.01 ~ 0.99: previous value

added)

□ If filter setting value is not specified within 1 ~ 99, RUN LED flickering at an interval of 1 second. In order to set RUN LED to On status, reset the filter setting value within 1 ~ 99 and then convert PLC CPU from STOP to RUN. Be sure to use request flag of error clear (UXY.11.0) to clear the error through modification during RUN.

• Analog input range: DC 0 ~ 10 V, Digital output range: 0 ~ 4000

• If analog input value changes 0 V \rightarrow 10 V (0 \rightarrow 4000), filter output value based on α value is as specified below.

an column	Filter ou	tput value			
avalue	0 scan	1 scan	2 scan	3 scan	
*1) 0.01	0	3600	3960	3997	1% inclined toward previous value
*2) 0.66	0	1360	2257	2850	50% inclined toward previous value
*3) 0.99	0	40	80	119	99% inclined toward previous value

4000 output after about 4 scans

4000 output after about 18 scans

4000 output after about 950 scans(1.19 s for 1 channel Run)

□ If filter process function is not used, present A/D converted value will be output as it is. The filter process function takes value-added data between 'Present A/D converted value' and 'Previous A/D converted value'. And the value-added data can be decided with filter constant. If output data shakes too much, set a big filter constant value.

(3) Average processing

This process is used to execute A/D conversion of the channel designated for specified frequency or for specified time and save the average of the accumulated sum on memory. Average processing option and time/frequency value can be defined through user program or I/O parameters setting for respective channels.

(a) What is the average process used for

This process is used for A/D conversion of abnormal analog input signal such as noise to a value near to normal analog input signal.

(b) Average processing type

Average processing type is of time average and count average.

1) Time average processing

Setting range: 4 ~ 16000 (ms)

Average processing count =

• Average processing count within specified time is decided based on the number of channels used.

Setting time

(Number of Channels used) x (Conversion Speed)

Ex.1) Channels used: 1, setting time: 16000 ms

Average processing count = $\frac{16000 \text{ ms}}{1 \times 1.5 \text{ ms}}$ = 10667 times

Ex.2) Channels used: 4, setting time: 4 ms

Average processing count = $\frac{4 ms}{4 \times 1.5 ms}$ = 1 times

If setting value of time average is not specified within 4 ~ 16000, RUN LED flickering at an interval of 1 second. In order to set RUN LED to On status, reset the setting value of time average within 4 ~ 16000 and then convert PLC CPU from STOP to RUN. Be sure to use request flag of error clear (UXY.11.0) to clear the error through modification during RUN.

• Time average is processed after converted to average of the times inside the A/D conversion module. In this case, a remainder may be produced when setting time is divided by (number of channels used X conversion speed), which will be disregarded. Thus, the average processing frequency will be the quotient of [(setting time) ÷ (number of channels used x conversion speed)].

Ex.) If the number of channels used is 5, and setting time is 151 ms

151 ms \div (4 X 1.5 ms) = 26 times Remainder of 2 \rightarrow 26 times

2) Count average process

• Setting range: 2 ~ 64000 (times)

• The time required for average value to be saved on memory when frequency average used depends on the number of channels used.

Process time = setting frequency X number of channels used X conversion speed

If setting value of count average is not specified within 2 ~ 64000, RUN LED flickering at an interval of 1 second. In order to set RUN LED to On status, reset the setting value of frequency average within 2 ~ 64000 and then convert PLC CPU from STOP to RUN. Be sure to use request flag of error clear (UXY.11.0) to clear the error through modification during RUN.

Ex.) If the number of channels used is 4, and average processing frequency is 50 50 X 4 X (1.5 ms) = 300 ms

2.8 Wiring

2.8.1 Precaution for wiring

- (1) Don't let AC power line near to A/D conversion module's external input sign line. With an enough distance kept away between, it will be free from surge or inductive noise.
- (2) Cable shall be selected in due consideration of ambient temperature and allowable current, whose size is not less than the max. cable standard of AWG22 (0.3^{mm²}).
- (3) Don't let the cable too close to hot device and material or in direct contact with oil for long, which will cause damage or abnormal operation due to short-circuit.
- (4) Check the polarity when wiring the terminal.
- (5) Wiring with high-voltage line or power line may produce inductive hindrance causing abnormal operation or defect.

2.8.2 Wiring examples

(1) Example of voltage wiring

- In case of voltage/current input, wiring is same. Adjust the voltage/current setting switch according to the case.



(a) Input resistance of current input circuit is 250 Ω (typ.).

(b) Input resistance of voltage input circuit is 1 M Ω (min.).

- (c) Enable the necessary channel only.
- (d) Analog input module doesn't support power for input device. Use the external power supplier.

(2) Wiring example of 2-Wire sensor/transmitter (current input)

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- In case of voltage/current input, wiring is same. Adjust the voltage/current setting switch according to the case.



(a) Input resistance of current input circuit is 250 Ω (typ.).

- (b) Input resistance of voltage input circuit is $1 M\Omega$ (min.).
- (c) Enable the necessary channel only.

(d) Analog input module doesn't support power for input device. Use the external power supplier.

(3) Wiring example of 4-Wire sensor/transmitter (Voltage/Current input)

- In case of voltage/current input, wiring is same. Adjust the voltage/current setting switch according to the case.



- (a) Input resistance of current input circuit is 250 Ω (typ.).
- (b) Input resistance of voltage input circuit is $1 M\Omega$ (min.).
- (c) Enable the necessary channel only.
- (d) Analog input module doesn't support power for input device. Use the external power supplier.

(4) Relationship between voltage input accuracy and wiring length In voltage input, the wiring (cable) length between transmitter or sensor and module has an effect on digital-converted values of the module as specified below.



Where,

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- Rc: Resistance value due to line resistance of cable
- Rs: Internal resistance value of transmitter or sensor
- Ri: Internal resistance value (1^{MΩ}) of voltage input module
- Vin: Voltage allowed to analog input module
- % Vi: Tolerance of converted value (%) due to source and cable length in voltage input

$$Vin = \frac{Ri \times Vs}{\left[Rs + \left(2 \times Rc\right) + Ri\right]}$$

$$\% Vi = \left(1 - \frac{Vin}{Vs}\right) \times 100 \%$$

2.9 Operation Parameter Setting

A/D conversion module's operation parameters can be specified through XG5000's [I/O parameters].

(1) Settings

For the user's convenience of A/D conversion module, XG5000 provides GUI (Graphical User Interface) for parameters setting of A/D conversion module. Setting items available through [I/O parameters] on the XG5000 project window are as described below in the table.

(2) I/O Parameter setting

(a) Run XG5000 to create a project.

(Refer to XG5000 program manual for details on how to create the project)

(b) Double-click [I/O parameters] on the project window.

Project Window	Vertical Line 🚽 🗙
Items	
⊟…•∰g sd ★	
📄 💼 🗂 NewPLC(XGB-XB	IMS)-Stop
🔤 🔤 🥁 Variable/Com	ment
🚊 🐼 Parameter	
📄 🔚 🗐 Basic Para	imeters
🔤 🔤 🔤 🔤	eters
庄 🔟 Internal Pa	rameters
🚊 🗟 Scan Program	
📄 🔤 NewProgra	im
■L Project	

(c) On the 'I/O parameters setting' screen, find and click the slot of the base A/D conversion module is installed on. 4-channel voltage type of A/D conversion module is installed on Base No.0, Slot No.4 in this description.

I/O Parameter Setting	_	_	_			<u>? ×</u>
⊡- 10 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Output	Allocation
- 00 : Default	0(main)					
01 : Default	1					
	2					
03 : Default	3					
👝 05 : Default	4	-				
06 : Default	5					
07 : Default	6					
	/					
4	E					
	Delete Slot Delete E	Base Base Setting	Delete All Details	Print	• ОК	Cancel

(d) Click the arrow button on the screen above to display the screen where an applicable module can be selected. Search for the applicable module to select.

⊡- ff10 Base 00 : Default 	Slot O(main) 1	Module	Comment	Input Filter	Emergency Output	Allocation
	2 3 4					
07 : Default	6 7	Becial Module List Becial Module List Becial Module List Becial Module Becial Module Becial Module Becial Module Becial Module Becial Module	urrent, 4-CH)			
	•					

(e) After the module selected, click [Details].

I

I/O Parameter Setting						<u>? ×</u>
Module list						
⊡-100 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Output	Allocation
00 : Default	0(main)					
UI: Default	1					
02 : Default	2					
R 04 : XBE-AD04A (Volt/Cum	3					
- D5 : Default	4	XBF-AD04A (Volt/Current, 4-				P00160 ~ P0019F
06 : Default	5					
07 : Default	6					
	7					
۲ <u>)</u>						
Delete S	lot Delet	e <u>B</u> ase Base <u>S</u> etting	Delete All Dețai	ls <u>P</u> rint	▼ OK	Cancel

(f) A screen will be displayed for you to specify parameters for respective channels as shown below. Click a desired item to display parameters to set for respective items.

BF-AD04A (Volt/Current	, 4-CH)			?
XBF-AD04A (Volt/Curre	nt, 4-CH)			
Parameter	СНО	CH 1	CH 2	СН З
🔲 Channel status	Disable	Disable	Disable	Disable
🔲 Input range	0~10V	0~10V	0~10V	0~10V
Output type	0~4000	0~4000	0~4000	0~4000
Filter process	Disable	Disable	Disable	Disable
Filter constant	1	1	1	1
Average setting	Disable	Disable	Disable	Disable
Average processing	Count-Avr	Count-Avr	Count-Avr	Count-Avr
Average value	2	2	2	2
			ÜK	Cancel

2.10 Special Module Monitoring Functions

Functions of Special Module Monitoring are as described below.

(1) Monitor/Test

Through applicable XG5000 menu of [Monitor] -> [Special Module Monitoring], A/D converted value can be monitored and the operation of A/D conversion module can be tested. (2) Monitoring the max./min. value

- The max./min. value of the channel can be monitored during Run. However, the max./min. value displayed here is based on the present value shown on the screen. Accordingly, when
- displayed here is based on the present value shown on the screen. Accordingly, when [Monitoring/Test] screen is closed, the max./min. value will not be saved.
- The parameters specified for the test of A/D conversion module on the "Special Module Monitoring" screen of [Special Module Monitoring] will be deleted the moment the "Special Module Monitoring" screen is closed. In other words, the parameters of A/D conversion module specified on the "Special Module Monitoring" screen will not be saved in [I/O parameters] located



• Test function of [Special Module Monitoring] is provided for user to check the normal operation of A/D conversion module even without sequence programming. If A/D conversion module is to be used for other purposes than a test, use parameters setting function in [I/O parameters].

2.10.1 How to use special module monitoring

Monitoring special module will be based on XBF-AD04A.

(1) Start of [Special Module Monitoring]

Go through [OnLine] -> [Connect] and [Monitor] -> [Special Module Monitoring] to start. If the status is not [OnLine], [Special Module Monitoring] menu will not be active.

<u>M</u> or	nitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u> el
	Start/Stop Monitoring
	<u>P</u> ause
	<u>R</u> esume
₿	P <u>a</u> using Conditions
3	Change Current <u>V</u> alue
Ð	System Mon <u>i</u> toring
٢	Device Monitoring
	Special Module Monitoring
	Trend Monitoring
Ĩ	Custom <u>E</u> vents
	Data Tra <u>c</u> es

- (2) How to use [Special Module Monitoring]
- (a) With XG5000 connected to PLC CPU (on-line status), click [Monitor] -> [Special Module Monitoring] to display 'Special Module Select' screen as in Fig. 5.1 showing base/slot information in addition to special module type. The module installed on the present PLC system will be displayed on the list dialog box.

Special Mo	odule	List			×			
Base			Slot	Module				
🗂 Base	0	Ø	Internal	HSC Module (Open-Collector, 4-CH)				
🗂 Base	0	Ð	Internal	APM Module (Open-Collector, 2-CH)				
🗂 🗂 Base	0	Ø	Slot 1	XBF-AD04A (Volt/Current, 4-CH)				
👩 🗂 Base	0	Ø	Slot 2	XBF-DV04A (Voltage, 4-CH)				
Monitor Close								

(b) Select Special module and click [Module information] to display the information as below.

Sp	Special Module Information							
	Displays the i	nformations of special module,						
	ltem	Information						
	Module Info	XBF-AD04A (Volt/Current, 4-CH)						
	OS version	Module O/S Version 1.0						
	OS date	2006/ 3/ 2						
	Module status	No Error. (0)						
		(ОК						

(c) Click [Monitor] on the "Special Module" screen in [Special Module List] to display [Special Module Monitoring] screen as below, where 4 options are available such as [Reset max./min. value], [start Monitoring], [Test] and [Close]. A/D conversion module's output value and max./ min. value are displayed on the monitoring screen at the top of the screen, and parameters items of respective modules are displayed for individual setting on the test screen at the bottom of the screen.

Special Module Monitor						
XBF-AD04A (Volt/Curren	it, 4–CH) –					
Item	Max/Min value	Current value				
CH0 A/D value						
CH1 A/D value						
CH2 A/D value						
CH3 A/D value						
Item	Setting Value	Current Value				
Channel	CH					
Channel status	Disable	· · · · · · · · · · · · · · · · · · ·				
Input range	0~10V					
Output type	0~4000					
Filter process	Disable					
Filter constant	1					
Average setting	Disable					
Average processing	Count-Avr					
Average value	2					
[<u>H</u> eset max/min value]	Start <u>M</u> onitoring	<u> </u>				
		Close				

(d) [Start Monitoring]: Click [Start Monitoring] to display A/D converted value of the presently operated channel. Below screen is the monitoring screen displayed when the whole channels are in Stop status. In the present value field at the screen bottom, presently specified parameters of A/D conversion module are displayed

pecial Module Monitor									
XBF-AD04A (Volt/Curren	XBF-AD04A (Volt/Current, 4-CH)								
Item	Max/Min value	Current value							
CH0 A/D value	0/0	0							
CH1 A/D value	0/0	0							
CH2 A/D value	0/0	0							
CH3 A/D value	0/0	0							
Item	Setting Value	Current Value							
Channel	CH	10							
Channel status	Disable	Disable							
Input range	0~10V	0~10V							
Output type	0~4000	0~4000							
Filter process	Disable	Disable							
Filter constant	1	1							
Average setting	Disable	Disable							
Average processing	Count-Avr	Count-Avr							
Average value	2	2							
<u>R</u> eset max/min value	(Stop <u>M</u> onitoring)	<u>T</u> est							
		Close							

Execution screen of [Start Monitoring]

(e) [Test]: [Test] is used to change the presently specified parameters of A/D conversion module. Click the setting value at the bottom field of the screen to change parameters. Below screen will be displayed after [Test] is executed with channels 0's input voltage range changed to -0~20 mA in the state of input not wired.

ltem	Max/Min value	Current value
CH0 A/D value	0/0	0
CH1 A/D value	0/0	0
CH2 A/D value	0/0	0
CH3 A/D value	0/0	0
ltem	Setting Value	Current Value
ltem Channel	Setting Value CH	Current Value 1 0
Item Channel Channel status	Setting Value CH Disable	Current Value 1 0 Disable
Item Channel Channel status Input range	Setting Value CH Disable 0~20mA	Current Value 10 Disable 0~10V
Item Channel Channel status Input range Output type	Setting Value CH Disable 0~20mA 0~4000	Current Value 10 Disable 0~10V 0~4000
Item Channel Channel status Input range Output type Filter process	Setting Value CH Disable 0~20mA 0~4000 Enable	Current Value 10 Disable 0~10V 0~4000 Enable
Item Channel Channel status Input range Output type Filter process Filter constant	Setting Value CF Disable 0~20mA 0~4000 Enable 1	Current Value 10 Disable 0~10V 0~4000 Enable 1
Item Channel Channel status Input range Output type Filter process Filter constant Average setting	Setting Value CF Disable 0~20mA 0~4000 Enable 1 Disable	Current Value 10 Disable 0~10V 0~4000 Enable 1 Disable
Item Channel Channel status Input range Output type Filter process Filter constant Average setting Average processing	Setting Value CF Disable 0~20mA 0~4000 Enable 1 Disable Count-Avr	Current Value 10 Disable 0~10V 0~4000 Enable 1 Disable Count-Avr
Item Channel Channel status Input range Output type Filter process Filter constant Average setting Average processing Average value	Setting Value CF Disable 0~4000 Enable 1 Disable Count-Avr 2	Current Value 10 Disable 0~10V 0~4000 Enable 1 Disable Count-Avr 2
Item Channel Status Input range Output type Filter process Filter constant Average setting Average processing Average value Eleset max/min value	Setting Value CF Disable 0~200M Enable 1 Disable Count-Avr 2 Stop Monitoring	Current Value 10 Disable 0~10V 0~4000 Enable 1 Disable Count-Avr 2 <u>Lest</u>

Execution screen of [Test]

(f) [Reset max/min value]: The max/min value field at the upper screen shows the max. value and the min. value of A/D converted value. Click [Reset max/min value] to initialize the max./min. value. Below screen is after [Reset max/min value] button is clicked in the screen of Special Module Monitor, where channel 0's A/D converted value can be checked as reset.

Special Module Monitor									
XBF-AD04A (Volt/Current, 4-CH)									
Item	Max/Min value	Current value							
CH0 A/D value	0/0	0							
CH1 A/D value	0/0	0							
CH2 A/D value	0/0	0							
CH3 A/D value	0/0	0							
Item	Setting Value	Current Value							
Channel	CH	0							
Channel status	Disable	Disable							
Input range	0~20mA	0~10V							
Output type	0~4000	0~4000							
Filter process	Enable	Enable							
Filter constant	1	1							
Average setting	Disable	Disable							
Average processing	Count-Avr	Count-Avr							
Average value	2	2							
[<u>H</u> eset max/min value]	Stop <u>M</u> onitoring	<u>T</u> est							
		Close							

Execution screen of [Reset max/min value]

(g) [Close]: [Close] is used to escape from the monitoring/test screen. When the monitoring/test screen is closed, the max. value, the min. value and the present value will not be saved any more.

2.11 Register U devices

Register the variables for each module referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

(1) Procedure

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(a) Select the special module type in the [I/O Parameter Setting] window.

odule list a-ff0 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Output	Allocation
man 00 : Default	0(main)	Module	Comment	mpacriter	Emergency output	Allocation
B 01 : XBF-AD04A (Volt/Curre	o(main)	XRF.4D044 Molt/Current 4. ▼				P00040 ~ P0007E
📲 02 : XBF-DV04A (Voltage, 4	2	XBF-DV04A (Voltage, 4-CH)		-	-	P00080 ~ P0011F
U3 : Default	3					
05 : Default	4					
🛛 🗖 06 : Default	5					
07 : Default	6					
	7					
() »						

(b) Double click 'Variable/Comment' from the project window.



(c) Select [Edit] - [Register U Device].

<u>E</u> dit	<u>F</u> ind/Replac	e <u>V</u> iew	<u>C</u>
\Box	<u>U</u> ndo	Ctrl+Z	
\square	<u>R</u> edo	Ctrl+Y	
Ж	Cu <u>t</u>	Ctrl+X	
Đ	<u>С</u> ору	Ctrl+C	
ß	<u>P</u> aste	Ctrl+V	
\times	<u>D</u> elete	Del	
	<u>S</u> elect All	Ctrl+A	
마음	Insert <u>L</u> ine	Ctrl+L	
×	Delete Li <u>n</u> e	Ctrl+D	
	Export to <u>F</u> ile)	
	Register U De	evice	

(d) Click 'Yes'.

XG5000	×
?	Automatically register comments in the U Devices according to the special module set in the I/O parameter. The previous comment will be deleted. Continue?
	Yes No

(e) As shown below, the variables are registered.

View Variable Device 🐧 View Flag									
	Variable	Туре	Device	Used	HMI	Comment			
1	_01_CH0_ACT	BIT	U01.01.0	Г	Γ	Analog Input Module: CH0 Activation Status			
2	_01_CH0_DATA	WORD	U01.02	Г	Γ	Analog Input Module: CH0 Output			
3	_01_CH1_ACT	BIT	U01.01.1	Г	Γ	Analog Input Module: CH1 Activation Status			
4	_01_CH1_DATA	WORD	U01.03	Г	Γ	Analog Input Module: CH1 Output			
5	_01_CH2_ACT	BIT	U01.01.2	Г	Γ	Analog Input Module: CH2 Activation Status			
6	_01_CH2_DATA	WORD	U01.04	Г	Γ	Analog Input Module: CH2 Output			
7	_01_CH3_ACT	BIT	U01.01.3	Г	Γ	Analog Input Module: CH3 Activation Status			
8	_01_CH3_DATA	WORD	U01.05	Г	Γ	Analog Input Module: CH3 Output			
9	_01_ERR	BIT	U01.00.0	Г	Γ	Analog Input Module: Error Flag			
10	_01_ERR_CLR	BIT	U01.11.0	Г	Γ	Analog Input Module: Error Clear Request			
11	_01_RDY	BIT	U01.00.F	Г	Γ	Analog Input Module: Ready Flag			

(f) For IEC type, as shown below, the variables are registered.

V Glob	V Global Variable D Direct Variable Comment 🐧 Flag									
	Variable Kind	Variable	Туре	Address	Initial Value	Retain	Used	EIP/OPC UA	HMI	Comment
1	VAR_GLOBAL	_01_CH0_ACT	BOOL	%UX0.1.16		Г	Г			Analog Input Module: CH0 Activation Status
2	VAR_GLOBAL	_01_CH0_DATA	WORD	%UW0.1.2		Г	Γ			Analog Input Module: CH0 Output
3	VAR_GLOBAL	_01_CH1_ACT	BOOL	%UX0.1.17		Г	Γ			Analog Input Module: CH1 Activation Status
4	VAR_GLOBAL	_01_CH1_DATA	WORD	%UW0.1.3		Г	Г			Analog Input Module: CH1 Output
5	VAR_GLOBAL	_01_CH2_ACT	BOOL	%UX0.1.18		Г	Γ			Analog Input Module: CH2 Activation Status
6	VAR_GLOBAL	_01_CH2_DATA	WORD	%UW0.1.4		Г	Г			Analog Input Module: CH2 Output
7	VAR_GLOBAL	_01_CH3_ACT	BOOL	%UX0.1.19		Г	Г		Γ	Analog Input Module: CH3 Activation Status
8	VAR_GLOBAL	_01_CH3_DATA	WORD	%UW0.1.5		Г	Г			Analog Input Module: CH3 Output
9	VAR_GLOBAL	_01_CH_ACT_ARY	ARRAY[03]	%UX0.1.16		Г	Г		Γ	Analog Input Module: Each CH Active
10	VAR_GLOBAL	_01_CH_DATA_ARY	ARRAY[03]	%UW0.1.2		Г	Γ		Π	Analog Input Module: Each CH Output
11	VAR_GLOBAL	_01_ERR	BOOL	%UX0.1.0		Г	Г			Analog Input Module: Error Flag
12	VAR_GLOBAL	_01_ERR_CLR	BOOL	%UX0.1.176		Г	Г		Γ	Analog Input Module: Error Clear Request
13	VAR_GLOBAL	_01_RDY	BOOL	%UX0.1.15		Г	Г		Γ	Analog Input Module: Ready Flag

(2) Save variables

- (a) The contents of 'View Variable' can be saved as a text file.
- (b) Select [Edit] -> [Export to File].
- (c) The contents of 'View variable' are saved as a text file.

(3) View variables

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The example of XGB 'S' type and 'H' type is as follows. (a) The example program of XG5000 is as shown below.

	моооо — 171—					M0010 (S)
2	M0010	U01.00.F	U01.01.0	MOV	U01.02	D0100
		U01.00.F	U01.01.1	MOV	U01.03	D0101
		U01.00.F	U01.01.2	MOV	U01.04	D0102
		U01.00.F	U01.01.3	MOV	U01.05	D0103
23						END

(b) Select [View] -> [Variables]. The devices are changed into variables.

	мооооо — 1 / Н——					M00010 (S)
2	M00010	_01_RDY	_01_CH0_ACT	MOV	_01_CH0_DAT A	D00100
		_01_RDY	_01_CH1_ACT	MOV	_01_CH1_DAT Å	D00101
		_01_RDY	_01_CH2_ACT	MOV	_01_CH2_DAT A	D00102
			_01_CH3_ACT	MOV	_01_CH3_DAT A	D00103
23						END

(c) Select [View] -> [Devices/Variables]. Devices and variables are both displayed.

					M00010 (S)
M00010	U01.00.F	U01.01.0	MOV	U01.02	D00100
2		_01_CHO_ACT		_01_CHO_DAT A	
	U01.00.F	U01.01.1	MOV	U01.03	D00101
	_01_RDY	_01_CH1_ACT		_O1_CH1_DAT A	ſ
	U01.00.F	U01.01.2	MOV	U01.04	D00102
	_01_RDV	_01_CH2_ACT		_01_CH2_DAT A	
	U01.00.F	U01.01.3	MOV	U01.05	D00103
	_01_RDY	_01_CH3_ACT		_01_CH3_DAT A	
23					END

	M0000						M0010
0		U01.00.F	U01.01.0		MOV	1101.02	
		Analog Input Module: Module Ready	Analog Input Module: CH0 Active	L	WOV	Analog Input Module: CH0 Output	L
2		U01.00.F	U01.01.1	·····	MOV	U01.03	D0100
		Analog Input Module: Module Ready	Analog Input Module: CH1 Active			Analog Input Module: CH1 Output	
		U01.00.F	U01.01.2	·····	MOV	U01.04	D0100
		Analog Input Module: Module Ready	Analog Input Module: CH2 Active			Analog Input Module: CH2 Output	
		U01.00.F	U01.01.0	Γ	MOV	U01.02	D0100
		Analog Input Module: Module Ready	Analog Input Module: CH0 Active			Analog Input Module: CH0 Output	
		U01.00.F	U01.01.3		MOV	U01.05	D0100
		Analog Input Module: Module Ready	Analog Input Module: CH3 Active			Analog Input Module: CH3 Output	
28							END

(d) Select [View] -> [Device/Comments]. Devices and comments are both displayed.

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(e) In case of IEC, you can see variables with diverse option at 'View' menu like (b)~(d). The following is example selecting 'View Variable/Comment' at IEC type.



2.12 Configuration and Function of Internal Memory

A/D conversion module has the internal memory to transmit/receive data to/from PLC CPU.

2.12.1 I/O area of A/D converted data

I/O area of A/D converted data is as displayed in table.

Device assigned ("S" or "H" type)	Device assigned (IEC type)	Details	R/W	Sign direction
UXY.00.0 UXY.00.F	%UX0.x.0 %UX0.x.15	Module ERROR flag Module READY flag	R	$A/D \rightarrow CPU$
UXY.01.0 UXY.01.1 UXY.01.2 UXY.01.3	%UX0.x.16 %UX0.x.17 %UX0.x.18 %UX0.x.19	CH0 Run flag CH1 Run flag CH2 Run flag CH3 Run flag	R	A/D → CPU
UXY.02	%UW0.x.2	Ch0 digital output value	R	
UXY.03	%UW0.x.3	Ch1 digital output value	R	$A/D \rightarrow CPU$
UXY.04	%UW0.x.4	Ch2 digital output value	R	
UXY.05	%UW0.x.5	Ch3 digital output value	R	
UXY.11.0	%UX0.x.176	Flag to request error clear	W	$CPU \rightarrow A/D$

- In the device assigned, X stands for the Base No. and Y for the Slot No. on which module is installed.
- In order to read 'CH1 digital output value' of A/D conversion module installed on Base No.0, Slot No.4, it shall be displayed as U04.03. (in case of IEC type, %UW0.4.3)





- In order to read 'Flag to detect CH4 disconnection' of A/D conversion module installed on Base No.0, Slot No.5, it shall be displayed as U05.10.4.



- (1) Module Ready/Error flag (U0x.00, x: slot number)
 - (a) U0x.00.F: It will be ON when PLC CPU is powered or reset with A/D conversion ready to process A/D conversion.
 - (b) U0x.00.0: It is a flag to display the error status of A/D conversion module.





Error status Bit On (1): error, Bit Off (0): normal

(2) Run channel flag (UXY.01, X: Base No., Y: Slot No.)

- The area where Run information of respective channels is saved
- * XGB series base number is 0

	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
UXY.01 (%UW0.x.1)	_	_			_	_						_	С Н З	C H 2	С Н 1	C H O
													1			

Run channel information Bit ON (1): During Run, Bit Off (0): Operation Stop

- (3) Digital output value (UXY.02 ~ UXY.09, X: Base No., Y: Slot No.)
 - (a) A/D converted-digital output value will be output to buffer memory addresses UXY.02 ~ UXY.05 (%UW0.x.2 ~ %UW0.x.5) for respective channels.
 - (b) Digital output value will be saved in 16-bit binary.
 - * XGB PLC's base number is 0.

U0x.02	Channel 0 digital output value	(%UW0.x.2)
U0x.03	Channel 1 digital output value	(%UW0.x.3)
U0x.04	Channel 2 digital output value	(%UW0.x.4)
U0x.05	Channel 3 digital output value	(%UW0.x.5)

B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1 B0

- (4) Flag to request error clear (() means the case of IEC type, x: slot number)
 - (a) If a parameters setting error occurs, address No.22's error code will not be automatically erased even if parameters are changed correctly. At this time, turn the 'error clear request' bit ON to delete address No.22's error code and the error displayed in XG5000's [System Monitor]. In addition, RUN LED which flickering will be back to On status.
 - (b) The 'flag to request error clear' shall be used surely together with UXY.00.0 attached thereon for guaranteed Normal operation.
 - XGB PLC base number is 0



Flag to request error clear (UXY.11.0) Bit ON (1): Error clear request, Bit Off (0): Error clear standing-by

LO	U00.11.0	U00.00.0			U00.1	11.0
SO	Error Clear Request	Error Flag			Error C Requ) Clear Jest

[How to use the flag to request error clear ("S" type or "H" type)]

XUX0.1.178	%UX0.1.0			XUX0.1.178
Analog Input	Analog Input			Analog
Module: Error	Module: Module			Module: Error
Clear Request	Error			Clear Request

[How to use the flag to request error clear (IEC type)]

2.12.2 Operation parameters setting area

Memory	address	Dotaila		Pomark
Hex.	Dec.	Details	r///	Remark
0н	0	Channel enable/disable setting	R/W	PUT
1н	1	Setting ranges of input voltage/current	R/W	PUT
2н	2	Output data format setting	R/W	PUT
3н	3	Filter processing enable/disable setting	R/W	PUT
4 _H	4	CH0 filter constant		
5н	5	CH1 filter constant		
6н	6	CH2 filter constant	D/ VV	FUI
7н	7	CH3 filter constant		
Сн	12	Average processing enable/disable setting	R/W	
Dн	13	Average processing method setting	R/W	
Ен	14	CH0 average value		PUT
Fн	15	CH1 average value		
10н	16	CH2 average value	FX/ VV	
11н	17	CH3 average value		
16 _н	22	Error code	R/W	GET

Setting area of A/D conversion module's Run parameters is as described in Table.

* R/W is to denote Read/Write if available from PLC program.

(1) Setting operation channels

If the channel to use is not specified, all the channels will be set to prohibit.



Setting channel to use (bit) Bit On (1): Run, Bit Off (0): Stop

(2) Setting input range

The range of analog voltage input is DC 0~10V, the range of analog current input is DC 4~20mA.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
Address 1	_	_	_	_	_	_		_	Cŀ	CH.3		CH.3 CH.2		1.2	CH.1		Cŀ	1.0	
									<u> </u>								/		
													V						
									S	ettin	g inp	ut ra	nge	(bit)					
									÷	• 00:́	0~	10V	0	. /					
									÷	→ 01:	0~	20m	A						
									÷	10:	4 ~	20m	A						

(3) Setting output data type

- (a) The range of digital output data for analog input can be specified for respective channels.
- (b) If the output data range is not specified, the range of all the channels will be set to $0 \sim 4000$.



When using the filter process, specify the filter constant.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address 4		CH.0 filter constant														
Address 5						С	H.1	filter	. col	nstai	nt					
Address 6						С	H.2	filter	· cor	nstai	nt					
Address 7						С	H.3	filter	· cor	nstai	nt					

(6) Setting average process

Address

If the average process is not specified, the average process of all channels will not be executed.

	DILIS	DIL14	DILIS	DILIZ	ווזמ	DILIU	bita	DILO	DIL7	DIIO	CIIC	DIL4	DIL3	DILZ	DILI	110	
12		_	_	_	_	_		_	_	_	_	_	CH. 3	CH. 2	CH. 1	CH. 0	
															/]

Setting average process (bit) Bit On (1): used, Bit Off (0): not used

(7) Setting average process method

This area is used to specify average processing method, where 'count average' and 'time average' are available.



Setting average process method (bit) \rightarrow 00: count average \rightarrow 01: time average

(8) Error code (address 22)

(a) It saves the error code detected from A/D conversion module.

(b) Error type and details is as below.

Address 22	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	—	—	—	—	—	—	—	—			E	rror	cod	е		

Error code (Dec.)	Details	Remark
0	Normal operation	RUN LED flickering
50#	Exceeding of filter constant setting range	
60#	Exceeding of time average setting range	Flickering RUN LED
70#	Exceeding of Frequency average setting range	1s intervals
80#	Setting error of analog input range	

* # of the error codes stands for the channel with error found.

- (c) If 2 or more errors occur, the module sill not save other error codes than the first error code found.
- (d) If an error found is corrected, use the 'flag to request error clear', or let power OFF → ON in order to stop LED blinking and to delete the error code.

2.13 Example Program

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2.13.1 Program to sort A/D converted value in size

(1) System configuration



Sustan information	Assigns Information - Fixed Location	Commont
System moniation	Assigns information - rived Location	Comment
🖃 🗰 Base 0 : XGB-M08A		Main Base(8 Slots)
		Standard CPU Module(I/O: Maximum 1,024 Points)
		Internal Cnet Module, RS-232C/RS-485
I Slot 0: XBM_DN32S	[P0000 ~ P003F]	DC 24V Input, Transistor Output, 32 Contacts
I Slot 1: XBF_AD04A	[P0040 ~ P007F]	A/D Voltage Input Type(4 Channels)
2 Slot 2: Empty slot	[P0080 ~ P011F]	
	[P0120 ~ P015F]	
4 Slot 4: Empty slot	[P0160 ~ P019F]	
	[P0200 ~ P023F]	
	[P0240 ~ P027F]	
Slot 7: Empty slot	[P0280 ~ P031F]	

(2) Initial setting

No.	Item	Details	Internal memory address	The value to write in internal memory
1	Channel	Ch0, Ch1, Ch2	0	h0007
2	Input voltage range	0 ~ 10 V	1	h0000
3	Output data range	0 ~ 4000	2	h0000
4	Filter process	Ch 0	3	h0001
5	Ch 0 filter constant	50	4	50
6	Average process	Ch1, Ch2	12	h0006
6	Average process method	Frequency average: Ch1 Time average: Ch2	13	h0100
7	Average velue	Frequency average value: 100 (times)	15	100
1	Average value	Time average value: 200 (ms)	16	200

(3) Program flow

- (a) If Ch 0's digital value is less than 3000, Contact No. 0 (P00080) of relay output module installed on Slot No.2 will be On.
- (b) If CH 1's digital value is greater than 3200, Contact No.2 (P00082) of relay output module installed on Slot No.2 will be On.
- (c) If CH 2's digital value is greater than or equal to 3000 and less than or equal to 3200, Contact No.4 (P00086) of relay output module installed on Slot No.2 will be On.
- (d) If CH 2's digital value is equal to 3200, Contact No.5 (P00085) of relay output module installed on Slot No.2 will be On.

4 Analog input Module: CH0 Active Analog input Module: CH0 Output Analog input Module: CH0 Output 3200 P0082 4 U01.01.1 Analog input Module: CH1 Active > U01.03 Analog input Module: CH1 Active 3200 M0002 4 U01.01.2 Analog input Module: CH2 Active >= U01.04 Analog input Module: CH2 Output 3000 M0002 4 Image input Module: CH2 Active >= U01.04 Analog input Module: CH2 Output 3200 P0086 5 Image input Module: CH2 Output Image input Module: CH2 Output 3200 P0086 6ET 1 22 D0000 1 4 Image input Module: CH2 Output 3200 Image input Module: CH2 Output Im		M0001		<	U01.02	3000				P0080
U01.01.1 > U01.03 3200 P0082 Analog Input Module: CH1 Active Analog Input Module: CH1 Active Analog Input Module: CH2 Output 3000 M0002 U01.01.2 >= U01.04 Analog Input Module: CH2 Output 3000 M0002 Image: CH2 Active CH2 Output 3200 P0086 Image: CH2 Active CH2 Output 3200 P0086 Image: CH2 Active CH2 Output CH2 Output Data no. to read Image: CH2 Output GET 1 22 D0000 1 Image: CH2 Output 3200 Slot no. Internal Internal Device for memory saving address END	4		Analog Input Module: CH0 Active	I	Analog Input Module: CH0 Output					
Analog Input Module: CH1 Active CH1 Active CH1 Output Module: CH1 Output Module: CH1 Output Module: CH2 Output Module: CH2 Active CH2 Active CH2 Active CH2 Active CH2 Output Module: CH2 Output MODUE CH2 OUTPUE CH2 OUTPUE CH2 OUTPUE CH2 OUTPUE CH2 OUTPUE CH2 OUTPUE CH2 OUTPUE CH2 OUTPUE CH2 OUTPUE			U01.01.1	>	U01.03	3200				P0082
U01.01.2 Analog input Module: CH2 Active >= U01.04 Analog input Module: CH2 Output 3000 M0002 Image: CH2 Active Image: CH2 Active Image: CH2 Output 3200 Image: CH2 Output Image: CH2 Active Image: CH2 Output 3200 Image: CH2 Output Image: CH2 Active Image: CH2 Output 3200 Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output Image: CH2 Output			Analog Input Module: CH1 Active	I	Analog Input Module: CH1 Output					
Analog Input Module: CH2 Active Analog Input Module: CH2 Output			U01.01.2		U01.04	3000				M0002
Image: space of the space o			Analog Input Module: CH2 Active		Analog Input Module: CH2 Output					
Analog Input Module: CH2 Output				4 =	U01.04	3200				P0086
Read error code GET 1 22 D0000 1 M0002 <=				•	Analog Input Module: CH2 Output				Data no.	to read
M0002 <=			Read error	code		GET	1	22	D0000	1
Analog Input Module: CH2 Output 30 34		M0002	<=	U01.04	3200					P0085
34 END	30			Analog Input Module: CH2 Output			Slot no.	Internal memory address	Device for saving	
	34									

[Program in case of "S" type or "H" type]

L		elete Slot Dele	te <u>B</u> ase <mark> Base S</mark> i	etting Delete A	JI Dețails							
×	XBF-AD04A (Volt/Current, 4-CH)											
	XBF-AD04A (Volt/Curre	nt, 4–CH)										
	Parameter	CHO	CH 1	CH 2	СНЗ							
	🗌 Channel status	Disable	Disable	Disable	Disable							
	🗖 Input range	0~10V	0~10V	0~10V	0~10V							
	Output type	0~4000	0~4000	0~4000	0~4000							
	🗌 Filter process	Enable	Disable	Disable	Disable							
	Filter constant	1	1	1	1							
	🗌 Average setting	Disable	Enable	Enable	Disable							
	Average processing	Count-Avr	Count-Avr	Time-Avr	Count-Avr							
	Average value	2	2	5	2							
				ОК	Cancel							

⊡ 🗂 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Output	Allocation
00 : Deraum B 01 : XBF-AD04A (Volt/Curre	0(main) 1	XBF-AD04A (Volt/Current, 4-		-	-	P00040 ~ P0007
B 02 : XBF-DV04A (Voltage, 4 03 : Default 04 : Default	2	XBF-DV04A (Voltage, 4-CH)		•	•	P00080 ~ P0011
	3					
	4					
06 : Default	5				-	
UV : Default	7					
	<u> </u>	J		I.		

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M0001 —≺s≻

U00.01.F

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P0000

(4) Program

10	XUX0.1.15	XIX0.0.0									XMX1
L1	01_RDY XMX1	*UX0.1.16									NOL
12		_01_CHO_AC							%UX0.1.2		₩QX0.2.0
13									_01_CHO_DA TA 3000	-IN2	
14		XUX0.1.17									
15		1, 1,				XUWO.1.3					XQX0.2.2
18						_01_CH1_D TA 3200	A -IN2				
L7		XUXO.1.18	-EN GI	E ENO-							
LB		_01_CH2_AC T XUW0.1.4	-IN1	OUT-							XMX2
19		_01_CH2_DA TA 3000	-IN2								
L10											
L11		XUX0.1.18								_	
L12		_01_ĊHŹ_AC T				INST Get_word Req don	₽	%UWO.1.4	-IN1 OUT		XQXO.2.6
L13					0	-BASE STA	т-	_01_CH2_DA TA 3200	-IN2		
L14					1	-SLOT DAT	A- Error_Code				
L15					22	-MADDR					
L18		-EN LE ENO-									
L17	XUW0.1.4	-IN1 OUT-									XQX0.2.5
L 18	TA 3200	-IN2									
L19											

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U01.00.F	моооо —————————————————————————————————			PUTP		1	0	h0007	1	
Analog Input Module: Module Ready						_				Channel assignme (Ch0,1,2)
				PUTP		1	1	0	1	Input type (Voltage)
				PUTP		1	2	h0000	1	Output type (0~400
				PUTP		1	3	h0001	1	Filter process (Chl
				PUTP		1	4	50	1	Filter constant (Ch
				PUTP		1	12	h0006	1	Average process (
				PUTP		1	13	h0100	1	Ch1: Count average Ch2: Time average
				PUTP		1	15	100	1	Ch1 average value
Channel	Run signal			PUTP		1	16	200	1	Ch2 average value
U00.01.F	P0000								M0001	
	U01.01.0 Analog Input Module:	- <	U01.02 Analog Input Module:	3000					P0080	-
1	U01.01.1 Analog Input Module: CH1 Active	>	U01.03 Analog Input Module: CH1 Output	3200					P0082	-
	U01.01.2 Analog Input Module: CH2 Active	┥ >=	U01.04 Analog Input Module: CH2 Output	3000	⊢				M0002	-
		4 =	U01.04 Analog Input Module: CH2 Output	3200	-				P0086	-
				GET		1	22	D0000	1	-
M0002	- <=	U01.04 Analog Input Module: CH2 Output	³²⁰⁰ -						P0085	-
)										-

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(b) Program example of PUT/GET instruction used

[Program in case of "S" type or "H" type]

XUX0.1.1	15 %IXO.0	.0											-(2)-
_01_RDY	2 XUX0.1	. 16									IT	_	(0)
\vdash		_AC									EN	ENO-	XUXU 2 1
	T								_01	IX0.1.2 - _CHO_DA	IN1	OUT-	~()-
										TA 3000 -	IN2		
	XUX0.1	. 17					GT IN ENI]			0		
					%UW0	.1.3 -1	N1 00'	Г	1				XQX0.2.
					_01_CF TA 321	11_DA	N2						
	\$UX0_1	18	ec 1		- OL								
	_01_CH2	_AC	ENO-			Ŀ							9MV2
	XUW0.1 _01_CH2	.4 IN1	OUT-										~()—
	3000	-1N2											
	XUX0.1	. 18							EN	EQ ENO-			
	_01_ĊH2	_AC			IN:	ST MARD 1							XQX0.2.
						DONE-		XUW0.1 _01_CH2_ TA	.4 -IN1 _DA	OUT-			_()_
				0	-BASE	STAT-		3200	-1N2				
				1	-SLOT	DATA- E	Error_Code						
				22	-MADDR								
XMX2	EN LE	ENO- OUT											XQXO.2. ()
XUW0.1.4 XUW0.1.4 	EN LE 4 - IN1 DA - IN2	ENO- OUT		RII			INS	12				13	XQXO.2. ()
XMX2 XUW0.1.4 201_CH2 TA 3200 01_RDY	EN LE 4 - IN1 - IN2 - IN2 - IN2	ENO- OUT		IST1 _WORD _DONE			TNS PUT_ REQ	ST2 WORD DONE			INS PUT_I REQ	T3 WORD DONE -	XQX0.2.
XMX2 XUW0.1.4 _01_CH2_1 TA 3200 _01_RDY 	EN LE 4 - IN1 - IN2 - IN2 - IN2 - IN2 - IN2	ENO- OUT	IN PUT, REQ -BASE	IST1 _WORD _DONE 			INS PUT REQ -BASE	ST2 WORD DONE STAT -		0	INS PUT_1 REQ BASE	T3 NORD DONE - STAT -	¥QXO.2. ()
×MX2 ×UW0.1.4 01_CH2_ TA 3200 	EN LE 4 - IN1 - IN2 - IN2 - IN2 - IN2	END- OUT		IST1 WORD DONE STAT -		0	INS PUT_ REQ -BASE -SLOT	ST2 WORD DONE STAT -		0	-BASE - SLOT	T3 WORD DONE - STAT -	*QX0.2.
XMX2 XLW0.1.4 2LW0.1.4 -01_CH2_ TA 3200	EN LE 4_DA - IN1 - IN2 - IN2 - IN2	END- OUT		ISTI WORD DONE STAT -		0	TNS PUT_ REQ -BASE -SLOT -MADD	ST2 WORD DONE STAT -		0 1 2	TNS PUT_1 - REQ - BASE - SLOT - MADD	T3 WORD DONE - STAT -	*0X0.2.
2002 201_F1 201_F12 7A 3200	EN LE 4IN1 -IN2 -IN2 -IN2	END- OUT 0 1 0 7		IST1 WORD DONE STAT -		0	INS PUT REQ -BASE -SLOT -MADD R -DATA	ST2 WORD DONE STAT -		0 1 2 0	INS PUT_1 REQ BASE - SLOT MADD R - DATA	T3 WORD DONE - STAT -	*0x0.2.
201_R0Y	EN LE 4	EN0- OUT 0 0 1 0 7	IN PUT REQ -BASE -SLOT -MADD R -DATA	ISTI JORD DONE STAT -		0 1 1 0	INS PUT BASE - SLOT - MADD R - DATA	ST2 WORD DONE STAT -		0 1 2 0	INS PUT_ REQ_ BASE - SLOT - MADD R - DATA	T3 NORD DONE - STAT -	<u>xoxo.2.</u>
201_RDV	EN LE 4IN1 IN2 IN2 IN2 IN2 IN2	END- OUT 0 0 1 0 7	IN PUT BASE -SLOT -MADD R -DATA IN PUT	IST1 WORD DONE STAT - ISTAT -		0 1 1 0	INS PUT REQ -BASE -SLOT -MADO R -DATA INS -DATA	ST2 DORE STAT -		0 1 2 0	INS PUT_1 BASE -BASE -SLOT MADD R DATA INS PUT_1	TT3 JIORD DONE - STAT - STAT -	¥QX0.2.1
XUW0.1. XUW0.1. TA 	EN LE 4IN1 IN2 IN2 IN2	END- OUT 0 0 1 0 7	IN PUT BASE -SLOT -MADD R -DATA IN REQ IN REQ -DATA	IST1 UORD DONE STAT		0 1 1 0	INS PUT_ REQ BASE -SLOT -MADD RADD -DATA INS -REQ -REQ -REQ -	ST2 WORD DONE STAT - STAT -		0 1 2 0	INS PUT - REQ - BASE - SLOT - MADD R - DATA INS - PUT - - PUT -	T3 DONE - STAT - STAT -	¥QX0.2.1
XIW22 XIW0.1.4 XIW0.1.4 -01_CH2 TA -01_CH2 TA -01_CH2 TA -01_CH2	EN LE 4IN1 -IN2 -IN2 -IN2	EN0- OUT 0 0 1 0 7 7 0 0	IN PUT BASE SLOT MADD R DATA IN REQ BASE	IST1 DONE STAT - ISTA ISTA ISTA ISTA ISTA ISTAT -		0 1 1 0 0 0 0	INS PUT BASE - SLOT - MADO R - DATA INS PUT REQ - BASE	STAT - STAT - STAT - STS WORD ONNE STAT -		0 1 2 0 0 0	INS PUT_1 REQ -BASE -SLOT -MADD R -DATA INS PUT_ REQ ⁻¹ -BASE	TT3 WORD DONE - STAT - TG WORD STAT -	¥QX0.2.1
XWX2 XWW0.1.4 XUW0.1.4 TA 3200 01_R0Y 1	EN LE 4IN1 IN2 IN2 IN2	END- OUT 0 1 0 7 0 1 0 7 0 1		IST1 DONE STAT - IST4 WOBD STAT -		0 1 1 0 0 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1	INC PUT REQ -BASE -SLOT -MADD R -DATA INC REQ - BASE -SLOT	STAT - STAT - STAT - STAT - STAT -		0 1 2 0 0 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1	INS PUT_ REQ -BASE -SLOT -MADD R -DATA INS -DATA -BASE -SLOT	TT3 NORD DONE - STAT - STAT - NORD DONE - STAT -	¥QX0.2.1
XUX2 XUW0.1.4 XUW0.1.4 TA 3200 01_RDY 	EN LE 4	EN0- OUT 0 0 1 0 7 0 7 0 1 0 1 3	IN PUT REQ -BASE -SLOT -MADD REQ -DATA -PUT REQ -BASE -SLOT -MADD R -MADD R	IST1 JONE DONE STAT - IST4 IST4 JODNE STAT -		0 1 1 0 0 1 1 4	INS PUT BASE - SLOT - MADD R - DATA - DATA - REQ - SLOT - MADD R	ST2 WORD DONE STAT - ST5 ST5 ST5 ST5 ST4T -		0 1 2 0 1 1 2 1 1 1 1 2	INS PUT_ RE0 -BASE -SLOT -MADD R -DATA INS -DATA INS -CATA -SLOT -SLOT -MADD R -SLOT -NADD -	T3 JORD DONE - STAT - STAT - STAT - STAT -	¥QX0.2.1
XMX2 	EN LE 4IN1 IN2 IN2 IN2	END- OUT 0 0 1 0 7 7 0 0 1 3 1	TR PUT PUT BASE SLOT MADD R DATA IN PUT REQ BASE SLOT R SLOT R DATA	IST1 JONE STAT - ISTA ISTA ISTA ISTA ISTA ISTA ISTAT -		0 1 1 0 0 1 4 50	INC PUT REQ -BASE -SLOT -MADO R -DATA -BASE -SLOT -MADO R -DATA	STAT -		0 1 2 0 0 1 1 2 0 1 1 2 15#0006	INS PUT_1 REQ -BASE -SLOT -MADD R PUT_1 REQ -BASE -SLOT R -DATA	TT3 WORD DONE - STAT - STAT - WORD DONE - STAT -	XQX0.2.1
XWX2 XWW0.1.4 XUW0.1.4 TA 3200 	EN LE 4	END- OUT 0 0 1 0 7 0 1 0 7 0 1 3 1	IN PUT REQ BASE SLOT MADD REQ BASE SLOT REQ BASE SLOT REQ IN REQ IN REQ IN REQ IN REQ IN REQ IN REQ IN REQ IN REQ IN REQ IN IN REQ IN IN REQ IN IN REQ IN IN REQ IN IN IN IN IN IN IN IN IN IN IN IN IN	IST1 WORD DONE STAT - IST4 WORD DONE STAT - IST4 IST4 STAT -		0 1 1 0 0 1 4 50	INS PUT REQ BASE SLOT MADD R DATA BASE SLOT REQ BASE SLOT R HADD R NS NS NS NS NS NS NS NS NS NS NS NS NS	STAT - STAT - STAT - STAT - STAT -		0 1 2 0 1 1 12 16#0006	INS PUT_ REQ -BASE -SLOT -MADO R -DATA -BASE -SLOT -SLOT -BASE -SLOT -SLOT -MADO R -DATA -DATA -DATA	TT3 WORD DONE - STAT - STAT - STAT - STAT - STAT - STAT -	×qx0.2.1
XIMX2 XIM0.1.4 XIM0.1.4 -01_CH2 TA -01_CH2 TA -01_CH2 TA -01_CH2	EN LE 4	END- OUT 0 0 1 0 7 7 0 1 3 1	IN PUT REQ - BASE - SLOT - MADD R - DATA IN - BASE - SLOT - BASE - SLOT - MADD R - DATA IN - DATA	IST1 JUORD DONE STAT STAT - STAT BOONE STAT STAT - STAT - STAT - STAT -		0 1 1 0 1 4 50	INS PUT REQ BASE SLOT MADD REQ DATA BASE SLOT MADD REQ SLOT REQ NS DATA	STAT		0 1 2 0 0 1 1 2 0 1 1 1 2 15#0006	INS PUT_1 REQ -BASE -SLOT -MADD R PUT_ REQ -DATA -BASE -SLOT -MADD R SLOT -MADD R -DATA -DATA -DATA -REQ - INS	TT3 WORD DONE - STAT - STAT - ORD DONE - STAT - STAT - STAT - STAT -	XQX0.2.1
XWX2 	EN LE 4	END- OUT 0 0 1 0 7 7 0 1 3 1 3 1 0 0	IN PUT BASE SLOT -MADD R DATA -DATA -BASE -SLOT -MADD R BASE -SLOT -MADD R -DATA -DATA	IST1 WORD DONE STAT - IST4 WORD DONE STAT - IST7 WORD DONE STAT -		0 1 1 0 0 1 4 50 0 0	INS PUT REQ -BASE -SLOT -MADO R -DATA -BASE -SLOT -MADO R -DATA -SLOT -MADO R -DATA -DATA -DATA	STAT - STAT - STAT - STAT - STAT - STAT - STAT - STAT - STAT - STAT -		0 1 2 0 1 1 2 0 1 1 2 0 1 1 2 15#0005	INS PUT_1 REQ -BASE -SLOT -MADD R -DATA -BASE -SLOT -MADD R -SLOT R -DATA - NADD R - DATA - REQ ⁻¹	TT3 WORD DONE - STAT - STAT - STAT - STAT - STAT - STAT - STAT - STAT -	XQX0.2.1
XIW0.1.4 XIW0.1.4 XIW0.1.4 -01_CH2	EN LE 4	END- OUT 0 0 1 0 7 0 1 3 1 3 1 0 1 3 1 0 1 3 1	IN REQ BASE SLOT MADD R DATA BASE SLOT BASE SLOT NADD R BASE SLOT R BASE SLOT R BASE SLOT R C SLOT	IST1 JONE STAT - IST4 IST4 JONE STAT - IST7 - UORD STAT - STAT -			INS PUT REQ BASE SLOT MADD DATA INS REQ BASE SLOT REQ BASE SLOT INS REQ BASE SLOT	STAT		0 1 2 0 1 1 2 0 1 1 2 16#0006 0 1	INS PUT_1 RE0 -BASE -SLOT -MADD RE0 -DATA INS PUT_1 -BASE -SLOT -MADD RE0 -SLOT -MADD -BASE -SLOT -BASE -SLOT	TT3 WORD DONNE - STAT - STAT - ODONE - STAT - STAT - STAT - STAT -	XQX0.2.:
XMX2 	EN LE 4	END- OUT 0 0 1 0 7 7 0 1 3 1 1 3 1 1 3 1 1 3	IN REQ -BASE -SLOT -MADD R -DATA -DATA -BASE -SLOT -MADD R -BASE -SLOT -BASE -SLOT -BASE -SLOT -BASE -SLOT -BASE -SLOT	IST1 WORD DONE STAT - ISTA WORD ISTA ISTA WORD STAT - ISTA IS			INS PUT REQ -BASE -SLOT -MADO RC -DATA -BASE -SLOT -MADD REQ -DATA -BASE -SLOT -BASE -SLOT -BASE -SLOT -BASE -SLOT -BASE -SLOT -BASE	STAT - ST		0 1 2 0 1 1 2 0 1 1 2 0 1 1 2 0 0 1 1 1 5 #0006 0 1 1 1 5 #0006	INS PUT_1 REQ - -BASE -SLOT -MADD REU - -DATA -BASE -SLOT -MADD R -DATA INS -DATA -BASE -SLOT -BASE -SLOT -BASE -SLOT -MADD R -BASE	TT3 WORD DONE - STAT - STAT - ODNE - STAT - STAT - T9 WORD DONE - STAT - STAT -	XQX0.2.5

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[Program in case of IEC type]

2.14 Troubleshooting

2.14.1 RUN LED flickers



Error code (Dec.)	Error Details	Action
50#	Filter constant setting range exceeded	Change filter constant setting value within 1 ~ 99.
60#	Time average setting range exceeded	Change time average setting value within 4 ~ 16000.
70#	Frequency average setting range exceeded	Change frequency average setting value within 2 ~ 64000.

※ # indicates channel number.
2.14.2 RUN LED is off

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2.14.3 A/D conversion value is not normal

A/D conversion value is "0".		
$\overline{\Box}$		
Channel status is set as Enable.		
No Yes		Check and correct the channel status on the I/O parameter.
External power (DC 24V) is supplied.		
No Yes		Supply external power (DC 24V)
Wiring of each channel is normal.		
No Yes	\Rightarrow	Refer to 2.8.2 and wire properly.
Input voltage/current of external terminal block is normal.		
No	\Rightarrow	Check the status of the external input sensor

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2.14.4 Status check of A/D conversion module through XG5000 system monitor

Module type, module information, OS version and module status of A/D conversion module can be checked through XG5000 system monitoring function.

1) Execution sequence

- Two routes are available for the execution.
- (1) [Monitor] -> [System Monitoring] -> And on the module screen, click the right mouse button to display [Module Information].
- (2) [Monitor] -> [System Monitoring] -> And Double-click the module screen.

2) Module information

- (1) Module type: shows the information of the module presently installed.
- (2) Module information: shows the OS version information of A/D conversion module.
- (3) O/S version: shows the OS prepared date of A/D conversion module.
- (4) Module status: shows the present error code. (Refer to 7.1 for detailed error codes)

N	lodule Info XB	BF-AD04A (Volt ?X
	Dotaile	Contont
	Details	
	Module Name	XBF-ADU4A (Volt/Current, 4-
	OS Ver	Ver. 1.10
	OS Update Date	2008-5-23
	Module Status	Normal. (0)
	<	>
		Close

Chapter 3 Analog Output Module

3.1 Setting Sequence before Operation

Before using the analog output module, follow steps below.



3.2 Specification

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3.2.1 General specifications

No.	ltem		•		Related specifications			
1	Ambient temperature			0°C ~	+55 ℃		-	
2	Storage temperature			-25 ℃	∼ +70 ℃		-	
3	Ambient humidity		5	5 ~ 95%RH (N	on-condensing)		-	
4	Storage humidity		5 ~ 95%RH (Non-condensing)					
			Occasional vibration -					
		Frequency	Ac	celeration	Amplitude	How many times		
		5 ≤ f < 8.4 ⊞	z	-	3.5 mm			
	Vibration	8.4 ≤ f ≤ 150 J	Hz 9.8	3 m/s² (1G)	-			
5	resistance		For contir	nuous vibratio	on	10 times each	IEC61131-2	
		Frequency		celeration	Amplitude	directions (X_Y and Z)		
		5 ≤ f < 8.4 ⊞	z	-	1.75 mm	(,, , , , , , , , , , , , , , , , , , ,		
		8.4 ≤ f ≤ 150	Iz 4.9	m/s² (0.5G)	-			
6	Shock resistance	 Peak acceleratio Duration: 11ms Half-sine, 3 times 	Peak acceleration: 147 m/s²(15G) Duration: 11ms Half-sine, 3 times each direction per each axis					
		Square wave Impulse noise			AC: ± 1,500V DC: ± 900V		LS ELECTRIC standard	
		Electrostatic discharge		IEC 61131-2, IEC 61000-4- 2				
7	Noise resistance	Radiated electromagnetic field noise		80 ~	∙ 1,000 MHz, 10\	//m	IEC 61131-2, IEC 61000-4- 3	
		Fast transient	Segment	Power suppl module	y Digital/ana	alog input/output ication interface	IEC 61131-2, IEC 61000-4-	
			Voltage	2kV		1kV	4	
8	Environment		Free from	corrosive gas	ses and excessive o	dust	-	
9	Altitude			Up to 2,	000 ms		-	
10	Pollution degree			Less than	equal to 2		-	
11	Cooling			Air-co	ooling		-	

Here describes general specification of analog output module.

3.2.2 Performance specifications

			Specification					
	Ite	m	XBF-DV04A	XBF-DC04A	XBF-DC04B			
		Туре	Voltage	Current	Current			
Analog output		Range	DC 0 ~ 10V (Load resistance: 2kΩ or more)	DC 4 ~ 20mA DC 0 ~ 20mA (Load resistance: 510Ω or less)	DC 0 ~ 1.2mA (Load resistance: 510Ω or less)			
		Туре		12-bit binary data				
		Signed value	0 ~ 4000	0 ~ 4000	0 ~ 4000			
Digital input	Dongo	Unsigned value	-2000 ~ 2000	-2000 ~ 2000	-2000 ~ 2000			
nput	Range	Precise value	0 ~ 1000	400 ~ 2000/0 ~ 2000	0 ~ 1,200			
		Percentile value	0 ~ 1000	0 ~ 1000	0 ~ 1,000			
M	aximum ı	resolution	2.5 ^{mV} (1/4000)	5 ^{#A} (1/4000)	0.3#A (1/4000)			
	Accu	racy		±0.5% or less				
Maxim	num conv	version speed	1 ms/channel					
Abso	lute max	imum output	DC ±15V	DC +25	mA			
Numbe	er of max	imum channel		4 channels				
1	nsulation	method	Photo-coupler insulation between input terminal and PLC power (no insulation between channels)					
Te	erminal c	onnected	11-point terminal block					
1/0	O points	occupied	Fixed type: 64 points					
Ma	x. no. of	installation	7 [When using XBM-Dxxx □ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxF type)					
Current	Inte	ernal (DC 5V)	110mA	110m/	A			
consump tion	(DC	External 21.6 ~26.4V)	70mA	12-bit binary data 0 ~ 4000 0 - 2000 ~ 2000 400 ~ 2000/0 ~ 2000 0 ~ 1000 0) 5//A 11/4000) 0) 11/5% or less 11 ms/channel 0C +25 mA 4 4 11-point terminal and F (no insulation between input terminal and F (no insulation between channels) 11-point terminal block Fixed type: 64 points -DxxxD -DxxXD (D: C-DxxXU type) Using XB(E)C-DxxxE type) 110mA 120mA 70g	A			
	Weig	ght	64g	70g				

Here describes performance specification of analog output module.

Remark

Offset and gain about analog output range have been set at the factory and the user can change them.

3.3 Designations and Functions

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Here describes designation and functions.

No.	Description					
	RUN LED					
1	It displays the operation status of D/A conversion module - On: Normal operation status - Flickering: Error occurred - Off: Power off or abnormal status of the module					
	Analog output terminal (Voltage, Current)					
2	It is an output terminal to connect an analog output (Voltage, Current) of each channel to external machinery and tools.					
	External power input terminal					
3	It is an external DC 24V input terminal that supplies power for an analoutput (voltage, current).	og				

3.4 Characteristic of I/O Conversion

Characteristic of I/O conversion converts a digital input into an analog output (voltage, current) and displays a straight line with the gradient as shown below. The range of digital input is shown with Unsigned Value, Signed Value, Precise Value, and Percentile Value such as the graph below.



3.5 Characteristic of Input/Output

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The range of a voltage output is DC 0 ~ 10V and a current output is DC 4 ~ 20mA / DC 0 ~ 20mA.

Parameter	CH 0	CH 1	CH 2	CH 3
🔲 Channel status	Disable	Disable	Disable	Disable
Output range	0~10/ 🚽	0~10V	0~10V	0~10V
Input type	0~10V	0~4000	0~4000	0~4000
CH. Output type	Former value	Former value	Former value	Former value
CH. Output type	Former value	Former value	Former value	Former value
CH. Output type	Former value	Former value	Former value	Former value
CH. Output type	Former value	Former value	Former value	Former value

Parameter	CH 0	CH 1	CH 2	CH 3
🔲 Channel status	Disable	Disable	Disable	Disable
🗌 Output range	4~20mA ▼	4~20mA	4~20mA	4~20mA
Input type	4~20mA	0~4000	0~4000	0~4000
CH. Output type	10 20me	Former value	Former value	Former value

Digital input value toward analog voltage output is shown below.

The range of	Analog voltage output							
digital input	under 0V	0V	2.5V	5V	7.5V	10V	over 10V	
Unsigned value (-48 ~ 4047)	under 0	0	1000	2000	3000	4000	over 4000	
Signed value (-2048 ~ 2047)	under -2000	-2000	-1000	0	1000	2000	over 2000	
Precise value (-12 ~ 1011)	under 0	0	250	500	750	1000	over 1000	
Percentile value (-12 ~ 1011)	under 0	0	250	500	750	1000	over 1000	

Resolution: 2.5mV (1/4000), Accuracy: within $\pm 0.5\%$

Digital input value toward analog current output is shown below. Resolution: 5µA (1/4000), Accuracy: within $\pm 0.5\%$

The range of	Analog current output								
digital input	under 4mA	4mA	8mA	12mA	16mA	20mA	over 20mA		
U 1	under 0mA	0mA	5mA	10mA	15mA	20mA	over 20mA		
Unsigned value (-48 ~ 4047)	under 0	0	1000	2000	3000	4000	over 4000		
Signed value (-2048 ~ 2047)	under -2000	-2000	-1000	0	1000	2000	over 2000		
Precise value	under 400	400	800	1200	1600	2000	over 2000		
(381 ~ 2018, -24 ~ 2023)	under 0	0	500	1000	1500	2000	over 2000		
Percentile value (-12 ~ 1011)	under 0	0	250	500	750	1000	over 1000		

3.6 Accuracy

Though the range of input is changed, the accuracy for the analog output values doesn't change. The range of accuracy is displayed at the ambient temperature of 25 ± 5 °C if you select unsigned value as your range of the digital input. The accuracy is satisfied $\pm 0.5\%$.



- (1) Accuracy in case of 5V output 4000 × 0.5% = 20 in case of 5V output, accuracy range is (5V - 20×0.0025V) ~ (5V+20×0.0025V) = 4.95V ~ 5.05V
- (2) Accuracy in case of 10V
 4000 × 0.5% = 20
 in case of 10V output, accuracy range is
 (10V 20×0.0025V) ~ (10V + 20×0.0025V) = 9.95 ~ 10.05

3.7 Functions of Analog Output Module

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Function	Details
Operation channel	 It sets up Run/Stop of a channel that will operate an analog output. You can save the time of whole operation by stopping unused channels.
The range of output	 It sets up the range of an analog output. Analog voltage output module offers one range of output (DC 0 ~ 10V) and analog current output module offers two (DC 4 ~ 20mA, DC 0 ~ 20mA).
The range of input data	 It sets up the range of a digital input. It offers four ranges of a digital input.
The status of channel output	 It sets up the output status of a channel when it switches Run to Stop. It offers four types of output status.

Here describes functions of XBF-DV04A/DC04A module.

3.8 Wiring

3.8.1 Precautions for wiring

- (1) Use separate cable of an A.C. power line and an external output signal of an analog output module to prevent a surge or inductive noise from the A.C. side.
- (2) Select the cable with consideration of an ambient temperature and a permitted current limit. It is recommended over AWG22 (0.3mm²).
- (3) Don't let the cable at close range to hot devices or materials. And don't bring it into contact with oil for a long time. These are the factors of a short circuit occurs unusual operation or damages devices.
- (4) Check the polarity before external power is supplied to the terminal.
- (5) It may produce inductive hindrance that is a cause of unusual operations or defects if you wire the cable with a high-voltage line or a power line.



3.8.2 Wiring example

(2) Wiring example for analog current output module



※1: Use a 2-core twisted shielded wire.

X2: The (-) terminals of the channel should be separated from each other. It may cause malfunction.



3.9 Operation Parameter Setting

You can specify operation parameters of the analog output module through [I/O parameters] menu in XG5000.

(1) Setting items

For the user's convenience, XG5000 provides GUI (Graphical User Interface) for parameters setting of analog voltage/current output module.

Followings are available through [I/O parameters] on the XG5000 project window.

ltem	Details
[I/O Parameters]	(1) It specifies the following items for the module operation.
	 Channel Enable/Disable
	 Analog output range
	 Input type
	 Channel output type (2) After the parameters that user specified in XG5000 are downloaded, they will be saved to a flash memory in the CPU unit

- (2) How to use [I/O Parameters] menu
 - (a) Run XG5000 to create a project. (Refer to XG5000 program manual for details on how to create the project)
 - (b) Double-click [I/O Parameters] on the project window.



 (c) Click the slot of the base that contains analog output module in the [I/O Parameter Setting] window. In the example, the analog output module is contained in the slot 1.

Module list							
🖃 🗊 Base 00 : Default		Slot	Module	Comment	Input Filter	Emergency Output	Allocation
00 : Default		0					
01 : Default		1					
		2					
03 : Default		2					
05 : Default		4					
06 : Default		5					
07 : Default		6					
U8 : Default		7			¢		
U9: Default		8					
IU: Default		9					
II: Default		10					
H → H Dase UI : Detault		11		\$	•		
iereining base 02 : Default				â	Å		
	•						
	<u>D</u> elete S	Slot	Delete Base Base Setting	Delete All Details	Print	• ОК	Cancel

Chapter 3 Analog Output (XBF-DV04A/DC04A/DC04B) (d) Click the arrow button then you can see the menu to choose the applicable module. Select the applicable module. 21 11

Base UU : Default	Slot	Module	Comment	Input Filter	Emergency Output	Allocation
	0(main)					
 03 : Default 04 : Default 05 : Default 06 : Default 06 : Default 07 : Default 07 : Default 	2 3 4 5 6 7	Gongal Module List G., Special Module List G., Special Module List G., Analog Input Modul G. Analog Input Modul G. Analog Dutput Modul G. Special Science Scienc	a Jeo Stage, 4-CH) urrent, 4-CH) odule List			
1						

Γ

(e) Double-click the applicable slot that is selected for the parameters setting or click [Details].

Module list						
⊡-100 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Output	Allocation
00 : Default	0(main)					
- B 01 : XBF-DV04A (Voltage, 4	1	XBF-DV04A (Voltage, 4-CH) 💌		-	•	P00010 ~ P0001F
U2 : Default	2					
	3					
05 : Default	4					
- 06 : Default	5					
07 : Default	6					
	7					
4						
Delete	Slot De	elete <u>B</u> ase Base <u>S</u> etting	Delete All Det	ails <u>P</u> rin	t 🔻 🛛 OK	Cancel

(f) A screen will be displayed for you to specify parameters for respective channels as shown below. Click a desired item to display parameters to set for respective items. ? | X |

ise 00 : Default	Slot	Module	Cor	mment	Input Filter	Emergency Output	Allocation
00 : Default	0(main)						
01 : XBF-DV04A (Voltage, 4	1	XBF-DV04A (Voltage, 4-CH)			2.	-	P00010 ~ P00018
02 : Default	2	XBF-DV04A (Voltage, 4-C	H)			? ×	
. 04 : Default	3		010				
05 : Default	4	XBF-DVU4A (Voltage, 4	I-CH)				
06 : Default	5	Parameter	CH 0	CH 1	CH 2	СН 3	
07 : Default	6	. Channel status	Disable	Disable	Disable	Disable	
	7	. 🗌 Output range	0~10V	0~10V	0~10V	0~10V	
		Input type	0~4000	0~4000	0~4000	0~4000	
		CH. Output type	Former value	Former value	Former value	Former value	
	Slot De					DK	Canc

3.10 Special Module Monitoring Function

You can start to test the analog output module connecting by [Online] \rightarrow [Connect] and then click [Monitor] \rightarrow [Special Module Monitoring] menu in XG5000.

Remark

- 1) If the program is not displayed normally because of insufficient system resource, you may start XG5000 again after close the program and other applications.
- 2) I/O parameters those are specified in the state of [Special Module Monitoring] menu are temporarily set up for the test. They will be disappeared when the [Special Module Monitoring] is finished.
- 3) Testing of [Special Module Monitoring] is the way to test the analog output module. It can test the module without a sequence program.

3.10.1 How to use special module monitoring

Special module monitoring function is described below based on the analog voltage output module (XGF-DV04A).

(1) Start of [Special Module Monitoring]

Go through [Online] \rightarrow [Connect] and [Monitor] \rightarrow [Special module Monitoring] to start. If the status is not online, [Special Module Monitoring] menu will not be activated.

🔩 XG5000 - [NewProgram]		
Project Edit Eind/Replace View Online	Monitor Debug Tools Window He	ip
	Start/Stop <u>M</u> onitoring Pause	.t. 🛠 🛛 🏘
````#` ●●⊗ & ™ & *	Resume	98 (]C
Esc F3 F4 sF1 sF2 F5 F6 sF8 sF9 F9 F11	Pausing Conditions	
Project Window	Change Current value	
Items	System Mon <u>i</u> toring	
⊡-• 💀 Sample *	Device Monitoring	
NewPLC(XGB-XBMS)-Stop	🗐 Special Module Monitoring 📐	
- 😭 Variable/Comment	🗽 Irend Monitoring	
🖻 🐼 Parameter	Custom Events	
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Data Traces	
🖻 👼 Scan Program		
📺 NewProgram		

- (2) How to use [Special Module Monitoring]
- (a) Connecting XG5000 with PLC basic unit, [Special Module List] window will show base/slot information and types of special module by click [Monitor] → [Special Module Monitoring]. Special Module List will display the modules that are installed in PLC now.

pecial Module I	lst	2
Base	Slot	Module
🗂 Base O	f Internal	HSC Module (Open-Collector, 4-CH)
🗂 Base O	🗍 Internal	Position Module (Open-Collector, 2-CH)
🗂 Base O	🛐 Slot 1	XBF-DV04A (Voltage, 4-CH)
🗂 Base O	🗍 Slot 2	XBF-DV04A (Voltage, 4-CH)
		[]]]
Module Into	<u> </u>	tor Close

Chapter 3 Analog Output (XBF-DV04A/DC04A/DC04B) (b) Select a special module then click [Module Info.] button to display the information as described below.

S	oecial Module Infomation	1	? X
	Displays the i	nformations of special module,	
	ltem	Information	
	Module Name	XBF-DV04A (Voltage, 4-CH)	
	OS Ver	Ver. 1.0	
	OS Update Date	2006-5-16	
	Error Status	No Error. (0)	
		UK (	

Γ

(c) Click [Monitor] button in the [Special Module List] window to display the [Special Module Monitor] window as below

Item	Setting value	Current value			
CHO D/A value					
CH1 D/A value					
CH2 D7A value					
CH3 D/A value					
			1		
Item	Setting value	Current value	1		
ltem Channels	Setting value	Current value			
ltem Channels Channel status	Setting value Disable	Current value			
Item Channels Channel status Output range	Setting value CH Disable 0~10V	Current value			
Item Channels Channel status Output range Input type	Setting value Disable 0~10V 0~4000	Current value		Param	eter setting for a to
Item Channels Channel status Output range Input type CH. Output type	Setting value Disable 0~10V 0~4000 Former value	Current value		Param	eter setting for a to
Item Channels Channel status Output range Input type H. Output type Digital value	Setting value Disable 0~10V 0~4000 Former value 0	Current value		Param	eter setting for a to
Item Channels Channel status Output range Input type H. Output type Digital value Output enable	Setting value Disable 0~10V 0~4000 Former value 0 Disable	Current value	+C	Param	eter setting for a to
Item Channels Channel status Output range Input type CH. Output type Digital value Output enable	Setting value Disable 0~10V 0~4000 Former value 0 Disable	Current value	+C	Param	eter setting for a to
Item Channels Channel status Output range Input type CH. Output type Digital value Output enable	Setting value Disable 0~10V 0~4000 Former value 0 Disable	Current value		Param	eter setting for a to
Item Channels Channel status Output range Input type H. Output type Digital value Output enable	Setting value Disable 0~10V 0~4000 Former value 0 Disable	Current value		Param	eter setting for a to
Item Channels Channel status Output range H. Output type Digital value Dutput enable	Setting value Disable 0~10V 0~4000 Former value 0 Disable	Current value		Param	eter setting for a to

(d) [Start Monitoring] button will show you digital input data of the operating channel.



(e) [Test] is used to change the parameters of the voltage output module. You can change the parameters when you click the values at the bottom of the screen. It is only available when XGB CPU unit's status is in [Stop Monitoring].

oecial Module Monitor		?
XBF-DV04A (Voltage, 4-	СН) ———	
Item	Setting value	Current value
CH0 D/A value		2000
CH1 D/A value		0
CH2 D/A value		0
CH3 D/A value		0
Item	Setting value	Current value
Channels	Cł	40
Channel status	Disable	Disable
Output range	0~10V	0~10V
Input type	0~4000	0~4000
		0 4000
CH. Output type	Former value	Former value
CH. Output type Digital value	Former value 2000	Former value 2000
CH. Output type Digital value Output enable	Former value 2000 Disable	Former value 2000 Disable
CH. Output type Digital value Output enable	Former value 2000 Disable	Former value 2000 Disable
CH. Output type Digital value Output enable	Former value 2000 Disable	Former value 2000 Disable
CH. Output type Digital value Output enable	Former value 2000 Disable	Former value 2000 Disable
CH. Output type Digital value Output enable	Former value 2000 Disable	Former value 2000 Disable

(f) [Close] is used to escape from the monitoring/test screen.

## 3.11 Register U devices (special module variable)

Register the variables for each module referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

(1) Registration sequence

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(a) Select a special module type in [I/O Parameter Setting] window.

I/O Parameter Setting						<u>?</u> ×
Module list						
⊟⊣@ Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Output	Allocation
00 : Default	0(main)					
B U1 : XBF-DVU4A (Voltage, 4	1	XBF-DV04A (Voltage, 4-CH)		-	•	P00010 ~ P0001F
U2 : Default	2					
04 : Default	3					
- 200 05 : Default	4					
- 🖂 06 : Default	5					
07 : Default	6					
	7					
4						
Delet	e Slot 🛛 De	lete <u>B</u> ase Base <u>S</u> etting	Delete All Detai	ls <u>P</u> rint	▼ OK	Cancel

(b) Double-click [Variable/Comment] from the project window.

Project Edit Eind/Replace View Onlin	e <u>M</u> onitor <u>D</u> ebug <u>T</u> ools	<u>W</u> indow <u>H</u>	elp	
0668588	∎ ⊅  ≏⊂% ∎	• 🖻 🗙   •	€≱.∜.%	<b>A A 33° 33°</b> A _11 🔊 👁
	x 🛛 🕮 🚇 🗊		<b>g 2</b> [1]	0,0,40   10 60   4 6 6 0 6
4 64 64 64 a a a a da da da a	1 \$P3 \$P4 \$P5 \$P6 PT0 \$P			) <b>                             </b>
Project Window	V View Variable	/iew Device	🕅 View Flag	
□       Sample ★         □       Image: Sample ★         □       Image: Sample ★         □       Image: Sample ★         □       Image: Sample ★         Image: Sample ★       Image: Sample ★	Variable	Туре	Device	Comment

(c) Select [Edit] → [Register U Device]. In case of IEC, select [Edit] →[Register special module variable] X65000 - [Variable/Comment]

🔛 <u>P</u> roject 🛛	Edit <u>F</u> ind/Replac	e <u>∨</u> iew <u>O</u> nl	ine <u>M</u> onitor <u>D</u> ebu	g <u>T</u> ools <u>W</u> indow	<u>H</u> elp	
DØæ	<u>∽</u> <u>U</u> ndo ∝ Redo	Ctrl+Z Ctrl+V	<b>n</b>   🤉   ည 🤇	: % 🖻 🖻 🗙	•6 🕅 🖓 🖓	<b>M M W W M </b>
<b>1 1 1 1 1</b>	χ Cu <u>t</u>	Ctrl+X		° 🗊 🖬 💷		[] [] [] [] [] [] [] [] [] [] [] [] [] [
ES 15 14	Copy	Ctrl+C	住 許 那 部 部	韬 新		] <b>.</b>
Project Windo	× <u>D</u> elete	Del	V View Variab	le D View Device	View Flag	
items ⊡-•55 Sam	<u>S</u> elect All	Ctrl+A	Vari	able Type	Device	Comment
	⊶⊟ Insert <u>L</u> ine メ Delete Li <u>n</u> e	Ctrl+L Ctrl+D				
E-U	Export to <u>F</u> ile	ł				
	Register U De	evice				
Ē	🗐 Internal Dev	/ice				

#### Chapter 3 Analog Output (XBF-DV04A/DC04A/DC04B)



#### (2) Save variables

- (a) The contents of 'View Variables' can be saved as a text file
- (b) Click [Edit]  $\rightarrow$  [Export to File].
- (c) The contents of 'View Variable' are saved as a text file.

#### (3) View variables in a program

#### (a) The example of XG5000 is shown below.

MOV	h000F	U01.02
MOV	0	U01.03
MOV	1500	U01.04
MOV	2500	U01.05
MOV	4000	U01.06

#### (b) Select [View] $\rightarrow$ [Variables]. The devices are changed into variables.

MOV ht	100F U01.02
MOV	0 U01.03
MOV 1	500 U01.04
MOV 2	500 U01.05
MOV 4	DOO UO1.06
 	EN

#### (c) Select [View] $\rightarrow$ [Devices/Variables]. Device and variable both are displayed.

• ···· • • •			
U01.00.F	MOV	h000F	U01.02
0 _01_RDY			_01_OUTEN
	MOV	0	U01.03
			_01_CHO_DA TA
	MOV	1500	U01.04
			_01_CH1_DA TA
	MOV	2500	U01.05
			_01_CH2_DA TA
	MOV	4000	U01.06
			_01_CH3_DA TA
			END
111			

	MOV	h000F	U01.02
Analog Output Module: Module Ready 0			Analog Output Module: Output Status Setting
	MOV	0	U01.03
			Analog Output Module: CH0 Input
	MOV	1500	U01.04
			Analog Output Module: CH1 Input
	MOV	2500	U01.05
			Analog Output Module: CH2 Input
	MOV	4000	U01.06
			Analog Output Module: CH3 Input
			END

#### (d) Select [View] $\rightarrow$ [Devices/Comments]. Device and comment both are displayed.

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### 3.12 Internal memory

Describes configuration and function of internal memory

#### 3.12.1 Data I/O area Describes data I/O area of analog output module Address Address Description Details Remarks ('s', 'h' type) (IEC type) F(15) Bit On(1): Module Ready U0x.00 %UW0.x.0 Module Ready / Error 0~3 Bit On(1): Channel Error Read Bit On(1): Channel Run available U0x.01 %UW0.x.1 CH operation information Bit Off(0): Channel Stop Bit On(1): Output Allow U0x.02 %UW0.x.2 Output setting Bit Off(0): Output Forbid CH0 digital input value U0x.03 %UW0.x.3 Read/Write U0x.04 %UW0.x.4 CH1 digital input value available 12-bit binary data U0x.05 %UW0.x.5 CH2 digital input value U0x.06 %UW0.x.6 CH3 digital input value

X In the device assignment, x stands for a slot number that the module is installed

(1) Module Ready/Channel Error information (() means deice name of IEC type)

- (a) U0x.00.F (%UX0.x.15): It will be ON when XGB CPU unit is powered or reset with the condition that an analog output module has prepared to convert.
- (b) U0x.00.0 ~ U0x.00.3 (%UW0.x.0~%UW0.x.3): It is the flags those display error status of each channel in the analog output module.



(2) Channel operation information

(a) This area is used to display the channel being used.



Run channel information (bit)  $\rightarrow$  Bit On (1): During Run  $\rightarrow$  Bit Off (0): Operation Stop

- (3) Output setting
  - (a) Each channel can be specified enable/disable the analog output.
  - (b) If the output is not specified, output of all the channels will be disabled.



Output status setting (bit)  $\rightarrow$  Bit On (1): Allowed  $\rightarrow$  Bit Off (0): Forbidden

(4) Digital input

(a) Digital input value can be selected and used within the range of -48~4047, -2048~2047, -12~1011 (381~2018/-24~2023), and -12~1011 based on input type.

(b) If the digital input value is not specified, it will be set to 0.

		D1E	D14	D12	D12	D11	<b>P10</b>	PO	БО	D7	DC	DE	D/	DЭ	DЭ	D1	PO						
U	0x.03	613	D14	D13	DIZ				80	D/	D0	D0	D4	D3	DΖ	ы	60	1 1					
			Digital input Data of CH0											(%	6UV	V0.×	(.3						
U	0x.04		Digital input Data of CH1													(%	6UV	V0.×	۲.4				
U	0x.05					[	Digita	al in	put	Data	a of	CH2	2						(%	6UV	V0.×	κ.5	
U	0x.06					[	Digita	al in	put	Data	a of	СНЗ	5					1	(%	6UV	V0.×	k.6	
			ess Address Details																				
	Add ('S', 'H	lress I' typ	be)		Ad (IEC	dre: C typ	ss ce)					٦	Deta	ils									
	Add ( <b>'S', 'H</b> U0	lress I' typ x.03	pe)		Ad (IEC %U	<b>dre</b> s <b>C tyj</b> W0.:	ss pe) x.3			D	igita	<b>r</b> I inp	<b>Deta</b> ut va	<b>ils</b> alue	of C	CH0							
	Add ( <b>'S', 'H</b> U0 U0	<b>Iress I' typ</b> x.03 x.04	be)		Ad (IEC %U	dre: C typ W0.: W0.:	<b>ss pe)</b> x.3 x.4			D	igita igita	l inp I inp	Deta ut va ut va	<b>ils</b> alue alue	of C of C	CH0							
	Add ('S', 'H U0 U0	<b>Iress</b> <b>I' typ</b> x.03 x.04 x.05	pe)		Ad (IEC %U %U	dre: C tyj W0.: W0.:	<b>ss</b> <b>be)</b> x.3 x.4 x.5			D D D	igita igita igita	l inp I inp I inp	Deta ut va ut va ut va	<b>ils</b> alue alue alue	of C of C of C	200 2011 2012							

# 3.12.2 Setting area of operation parameters

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Address (Dec)	Description	Details	Remarks		
0	Set up the run channel	Bit On(1): Run Bit Off(0): Stop			
1	Set up the output voltage range	Bit (00): 0 ~ 10V			
2	Set up the input data type	Bit (00): 0 ~ 4000 Bit (01): -2000 ~ 2000 Bit (10): 0 ~ 1000 Bit (11): 0 ~ 1000	Read/Write available		
3	Set up the output type of CH0	Or outputs the provisue value			
4	Set up the output type of CH1	1: outputs the min. value of output range			
5	Set up the output type of CH2	2: outputs the mid. value of output range			
6	Set up the output type of CH3				
11	CH0 setting error				
12	CH1 setting error		Read		
13	CH2 setting error	Error code	available		
14	CH3 setting error				

#### XBF-DC04A

Address (Dec)	Description	Details	Remarks		
0	Set up the run channel	Bit On(1): Run Bit Off(0): Stop			
1	Set up the output voltage range	Bit (00): 4 ~ 20mA Bit (01): 0 ~ 20mA			
2	Set up the input data type	Bit (00): 0 ~ 4000 Bit (01): -2000 ~ 2000 Bit (10): 400 ~ 2000/0 ~ 2000 Bit (11): 0 ~ 1000	Read/Write available		
3	Set up the output type of CH0	Or outputs the provisue value			
4	Set up the output type of CH1	1: outputs the min. value of output range			
5	Set up the output type of CH2	2: outputs the mid. value of output range			
6	Set up the output type of CH3	S. Outputs the max. Value of output range			
11	CH0 setting error				
12	CH1 setting error	Fror ode	Read		
13	CH2 setting error		available		
14	CH3 setting error				

Address (Dec)	Description	Details	Remarks		
0	Set up the run channel	Bit On(1): Run Bit Off(0): Stop			
1	Set up the output voltage range	Bit (00): 4 ~ 20mA Bit (01): 0 ~ 20mA			
2	Set up the input data type	Bit (00): 0 ~ 4000 Bit (01): -2000 ~ 2000 Bit (10): 0 ~ 1200 Bit (11): 0 ~ 1000	Read/Write available		
3	Set up the output type of CH0	Or outputs the provisus value			
4	Set up the output type of CH1	1: outputs the min. value of output range			
5	Set up the output type of CH2	2: outputs the mid. value of output range			
6	Set up the output type of CH3	S. Outputs the max. Value of output range			
11	CH0 setting error				
12	CH1 setting error		Read		
13	CH2 setting error		available		
14	CH3 setting error				

#### XBF-DC04B

#### (1) Setting up the run channel

If the run channel is not specified, all the channels will be set to Stop.



(2) Setting up the output voltage/current range

The range of analog output voltage is DC 0 ~ 10V and analog output current is DC 4 ~ 20mA, DC 0 ~ 20mA.



#### (3) Setting up the input data type

ſ

- (a) Input type can be specified for respective channels.
- (b) If input data type is not specified, all the channels will be set to the range of 0 ~ 4000.



#### (4) Setting up the output type

- (a) It defines an analog output status when XGB CPU unit is stopped.
- (b) The range is 0 ~3 and used devices are regarded as Words.

Address "2"	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Address 3 ~ Address "6"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Va	lue
															Į	ļ

Address	Details
3	Set up the output type of CH0
4	Set up the output type of CH1
5	Set up the output type of CH2
6	Set up the output type of CH3

Input data type (bit)
$\rightarrow$ 00: Previous value
→ 01: Min. value
$\rightarrow$ 10: Mid. value
→ 11: Max. value

#### (5) Error code

It displays error codes of each channel.

	B15 B14 B12 B11 B11 B10 B9	B8 B7 B6	B5	B4	B3	B2	B1	B0
Address "11" ~	Addres		Details					
Address "14"	11					СНС	) err	or
	12					CH1	err	or
	13					CH2	err	or
	14					СНЗ	8 err	or

Error code (Dec)	Details	LED status
-	Offset/Gain setting error	Flickering 2s intervals
31#	Exceed the range of parameter	Flickering 1s
41#	Exceed the range of digital input	intervals

* # stands for the channel with error found.

# 3.13 Example Program

# 3.13.1 Analog output program

(1) Program example using [I/O Parameter Setting].

I/O Parameter Setting							? ×
Module list							
⊡-100 Base 00 : Default 00 : Default	Slot	Module	Input Filter	Emergency Output	Allocation		
01 : Default	0(main)						
2 : Default 3 : Default	2       ⊕ I Digital Module List         3       ⊕ I Analog Input Module         4       ⊕ I Analog Dutput Module         5       ⊕ I SE-DV04A Voltage, 4-CHI         6       I SE-DV04A Voltage, 4-CHI         7       ⊕ I Temp. Measuring Module         B - I Communication Module List						
	Slot De				ils <b>  <u>P</u>rir</b>	it <b>▼  </b> OK	Cancel
I/O Parameter Setting	_	_					<u>? ×</u>
Module list		4.00	_		21		
⊡ • 🗂 Base 00 : Default	XBP-DV04A (Voltage	, 4-CH)	_		<u>.</u>	Emergency Output	Allocation
- B 01 : XBF-DV04A (Voltage, 4	XBF-DV04A (Volta	ge, 4-CH)					P00010 ~ P0001F
	Parameter	CH 0	CH 1	CH 2	CH 3		
03 : Default	Channel statu	is Enable 👻	Enable	Enable	Enable		
05 : Default	Output range	0~10V	0~10V	0~10V	0~10V		
	Input type	0~4000	0~4000	0~4000	0~4000		
07 : Default		be Former value	Former value	Former value	Former value		
I I				UK	Cancel		

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Delete Slot	Delete <u>B</u> ase	Base <u>S</u> etting	Delete All	De <u>t</u> ails	<u>P</u> rint	<b>•</b>	0K	Cancel

Module ready	
U01.00.F	MOV h000F U01.02 Enable all channels
	MOV 1000 U01.03 Write a digital inp at CHO
U01.01.1	MOV 2000 U01.04 Write a digital inp at CH1
U01.01.2	MOV 3000 U01.05 Write a digital inp at CH2
001.01.3	MOV 4000 U01.06 Write a digital inp at CH3
CH. Run information	Digital input data

### Chapter 3 Analog Output (XBF-DV04A/DC04A/DC04B)

	te du la mandu		Ir	nternal mem address	ory	Data No. to	ata No. to write		
IV			Slot No.		Data				
0.		PUT	1		h000F	1	Run channel(0,1,2,3)		
0		PUT	1	1	h0000	1	The range of output voltage(0~10V)		
		PUT	1	2	h0000	1	Input data type (0~4000)		
		PUT	1	3	0	1	CHO output status (previous value)		
		PUT	1	4	1	1	CH1 output status (min. value)		
		PUT	1	5	2	1	CH2 output status (mid. value)		
		PUT	1	6	3	1	CH3 output status (max. value)		
36				, <u> </u>	h000F	U01.02	Enable run all channels		
				MOV	1000	U01.03	Write a dital input at CHO		
				MOV	2000	U01.04	Write a dital input at CH1		
	001.01.2			MOV	3000	U01.05			
				MOV	4000	U01.06	Write a dital input		
	CH. Run information			Digita	l input da	ata _{END}			
DU									

#### (2) Program example with PUT/GET instruction.

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# (3) Program example using parameter in case of IEC type

_01_RDV		_01_CHO_OU TEN
		(S) _01_CH1_OU _TEN
		(S) _01_CH3_OU
		(S)
	_01_CH0_AC	
	1000 - IN OUT01_CH0_DA 2000 - IN OUT01_CH1_DA	
	_01_CH2_AC	
	3000 - IN OUT01_CH2_DA 4000 - IN OUT01_CH3_DA	

### 4) Program example using PUT/GET instruction in case of IEC type

01 009					INST1			INST2	
		- REQ DONE -			PUT_WORD REQ DONE				
	0	BASE STAT		0	BASE STAT	_	0	-BASE STAT	_
	1	SLOT		1	SLOT		1	SLOT	
	0	MADD		1	MADD		2	-MADD	
	16#000f	-DATA		0	-DATA		0	-DATA	
		INST3 PUT_WORD REQ DONE			INST4			INST5 PUT_WORD REQ_DONE	
	0	-BASE STAT		0	BASE STAT		0	-BASE STAT	
	1	SLOT		1	SLOT		1	-SLOT	
	3	MADD		4	MADD		5	-MADD	
	0	-DATA		1	DATA		2	-DATA	
		INST6 PUT_WORD REQ_DONE							
	0	BASE STAT							
	1	SLOT							
	6	MADD							
	3	-DATA							
_01_RDY									_01_CHO_OU TEN
									_01_CH1_OU TEN
									_01_CH2_OU TEN (S)
									_01_CH3_0U TEN (S)
	_01_CHO_AC	MOVE EN ENO		_01_CH1_AC	MOVE EN ENO	_			
	1000	- IN OUT	_01_CHO_DA TA	2000	IN OUT	_01_CH1_DA - TA			
	_01_CH2_AC	MOVE EN ENO		_01_CH3_AC	MOVE EN ENO				
	3000	- IN OUT	_01_CH2_DA TA	4000	IN OUT	_01_CH3_DA TA			

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# 3.14 Troubleshooting

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#### 3.14.1 RUN LED flickers



Error Code (Dec.)	Error Details	Action
31#	Parameter range excess error	Adjust parameter setting range
41#	Digital input value range excess error	Adjust digital input value range

% # indicates channel number.

### 3.14.2 RUN LED is off





### 3.14.3 Analog output value is not normal.

#### 3.14.4 Status check of D/A conversion module through XG5000 system monitor

Module type, module information, O/S version and module status of D/A conversion module can be checked through XG5000 system monitoring function.

(1) Execution sequence

Two routes are available for the execution.

(a) [Monitor] -> [System Monitoring] -> And on the module screen, click the right mouse button to display [Module Information].

(b) [Monitor] -> [System Monitoring] -> And Double-click the module screen.

#### (2) Module information

- (a) Module type: shows the information of the module presently installed.
- (b) Module information: shows the O/S version information of A/D conversion module.
- (c) O/S version: shows the O/S prepared date of A/D conversion module.
- (d) Module status: shows the present error code. (Refer to 3.23 for detailed error codes)

# **Chapter 4 RTD Input Module**

## 4.1 Setting Sequence before Operation

Before using the RTD input module, follow steps below.



# 4.2 Specification

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# 4.2.1 General Specifications

No.	ltem		Related specifications											
1	Ambient temperature		0°C ~ +55 ℃											
2	Storage temperature		-											
3	Ambient humidity		5 ~ 95%RH (Non-condensing)							5 ~ 95%RH (Non-condensing)				-
4	Storage humidity		5	5 ~ 95%RH (N	lon-condensing)	_	-							
			Occasio	onal vibration		-	-							
		Frequency	Ac	celeration	Amplitude	How many times								
		5 ≤ f < 8.4 Hz	z	-	3.5 mm									
_	Vibration	8.4 ≤ f ≤ 150 I	lz 9.8	3 m/s² (1G)	-									
5	resistance	For continuous vibration 10 times each												
		Frequency	Ac	celeration	Amplitude	directions (X, Y and Z)								
		5 ≤ f < 8.4 Hz	z	-	1.75 mm									
		8.4 ≤ f ≤ 150 I	lz 4.9	m/s² (0.5G)	-									
6	Peak acceleration: 147 m/s²(15G) Shock resistance Duration: 11ms Half-sine, 3 times each direction per each axis						IEC61131-2							
		Square wave			AC: ± 1,500V									
		Impulse noise		LSIS standard										
		Electrostatic discharge		charging)	IEC 61131-2, IEC 61000-4- 2									
7	Noise resistance	Radiated electromagnetic field noise	2 80 ~ 1,000 MHz, 10V/m				IEC 61131-2, IEC 61000-4- 3							
		Fast transient		egment Power supply Digital/ana		nalog input/output nication interface	IEC 61131-2, IEC 61000-4-							
		, buot holoo	Voltage 2kV 1kV		1kV	4								
8	Environment		-											
9	Altitude	Up to 2,000 ms					-							
10	Pollution degree	Less than equal to 2					-							
11	Cooling	Air-cooling					-							

Here describes general specifications of RTD input module.
# 4.2.2 Performance specifications

	Have	Specifi	cations
	Item	XBF-RD04A	XBF-RD01A
No. of i	input channel	4 channels	One channel
Input sensor	PT100	JIS C16	04-1997
type	JPT100	JIS C1604-1981	, KS C1603-1991
Temperature	PT100	-200 ~	600°C
input range	JPT100	-200 ~	600°C
	PT100	-2000	~ 6000
Digital output	JPT100	-2000	~ 6000
	Scaling display	0~4	4000
Accuracy	Normal temp.(25°C)	Within	±0.3%
-	Full temp.(0~55°C)	Within	±0.5%
Conve	rsion speed	40ms /	channel
Inculation	Channel to Channel	Non-ins	sulation
	Terminal to PLC Power	Insulation (F	Photo-Coupler)
Tern	ninal block	15-point ter	minal block
I/O poi	nts occupied	Fixed type	: 64 points
Wirin	ng method	3-v	vire
Max. numb	per of equipment	7 [When using XBM-Dxxx□ (□ 7 (when using XB(E)C-DxxxSU 10 (when using XB(E)C-DxxxH Not Available (when using XB(E)	:"S",'H',"H2","HP") type] type) type or XB(E)C-DxxxU type) )C-DxxxE type)
Function	Filtering	Digital filter (16	50 ~ 64000ms)
	Alarm	Disconnecti	on detection
Current	Inner DC5V	100	Owy
consumption	external DC24V	10	Owy
١	Weight	6:	3g

Here describes general specifications of RTD input module.

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# **4.3 Part Names and Functions**

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Here describes part names and functions.



No.	Name	Descriptions
(1)	RUN LED	<ul> <li>Displays the hardware operation status of XBF-RD04A On: Normal Flickering: Error (0.2s intervals) Off: power disconnected, hardware error</li> </ul>
2	ALM LED	<ul> <li>Displays the disconnection status of XBF-RD04A (Alarm indication LED)</li> <li>Flickering: Disconnection is detected (1s intervals)</li> <li>Off: normal operation</li> </ul>
3	Terminal block	► Terminal block for connecting external RTD temperature sensor
4	External power supply terminal	Terminal for supplying external DC24V
5	Connector for extension	Connection connector for connecting extension module

# **4.4 Temperature Conversion Characteristic**

Since RTD sensor has non-linear characteristic, RTD input module linearizes the relationship between input and output in each section.

The graph below is an example to describe the linearization process and is different with graph about sensor temperature input.



### Remark

Non-linear characteristics: The resistance-temperature characteristics for RTD sensor are presented with table (JIS C1604-1997). This characteristics table displays resistance value of the sensor to temperature, namely, the change of the resistance value per increment of 1°C. When the temperature is changed by 1°C, the change of resistance is not in constant width but in different width per section, which is called the non-linear characteristics.

# **4.5 Conversion Speed**

The conversion speed of XGF-RD4A is 40 ms per channel and each channel is converted sequentially, that is, one channel is converted and then the next channel is converted. (Run/stop can be specified independently for each channel.) The conversion speed includes the time to convert input temperature (resistance value) to digital value and to save the converted digital data into the internal memory.

 $\therefore$  Processing time = 40ms X Number of the using channels

[Example] 3 channels are used: Processing time = 40ms X 3 = 120ms

## 4.6 Accuracy

The accuracy of RTD module is described below.

- $\bullet$  When the ambient temperature is 25  $\pm$  5  $^\circ\!\!\mathbb{C}$  : within  $\pm 0.3\%$  of available input range
- $\bullet$  When the ambient temperature is 0 to 55  ${}^\circ\!{\mathbb C}$  : within  $\pm 0.5\%$  of available input range

Example) PT100 is used and the ambient temperature is normal.

To measure  $100^{\circ}$ , the conversion data output range:

100℃ - [ { 600 - (-200) } x 0.3 % ] ~ 100℃ + [ { 600 - (-200) } x 0.3 % ] Namely, 97.6 ~ 102.4 [℃]

## 4.7 Temperature Display

(1) The input temperature is converted to digital value down to the one decimal place.

Ex.) If the detected temperature is 123.4°C, its converted value to be saved to the internal memory will be 1234.

(2) Temperature can be converted to Celsius or Fahrenheit scale temperature value as desired.

Ex) If Pt100 sensor is used, the temperature of 100.0°C can be converted to 2120 when Fahrenheit scale is used.

• Conversion °C to °F, 
$$F = \frac{9}{5}C + 32$$
  
• Conversion °F to °C,  $C = \frac{5}{9}(F - 32)$ 

(3) Maximum temperature input range is higher/lower within 10°C than regular temperature input range. However, the precision will not be guaranteed for any temperature out of regular temperature input range.

Maximum temperature input ranges of sensor are as follows;

- PT100 : −210.0 ~ 610.0℃
- JPT100 : −210.0 ~ 610.0 °C

# **4.8 Scaling Function**

It is used to scale and output the range specified by the user other than temperature range.

• Scaling expression = 
$$\frac{(Temperature \times 10 + 2000)}{2}$$

Ex.) When scaling is allowed and sensor input is 200°C with PT100 sensor, scaling value is as follows.

Scaling value = 
$$\frac{(200 \times 10 + 2000)}{2}$$
 = 2000

The figure below displays the relation between temperature input and scaling value.



# **4.9 Disconnection Detection Function**

- (1) As a module used to measure the temperature with the RTD temperature sensor directly connected, it detects and displays disconnection of the sensor connected. If any disconnection occurs in the sensor used and extended lead wire, LED (ALM) will flicker in a cycle of 1 second and produce an error code.
- (2) Disconnection can be detected per channel, however, only for the channel specified to run. LED (ALM) is used in common for all the channels. It will flicker if one or more channels are disconnected.
- (3) The figure below shows the temperature sensor's appearance of the 3-wired RTD. (The appearance depends on sensor type)



* A disconnection: if disconnected between terminal A and terminal board of the module in the sensor figure.

* B disconnection: if disconnected between terminal B (two for 3-wired sensor) and terminal board of the module in the sensor figure, or if A and B lines are all disconnected.

(4) The basic connection between RTD module and RTD Sensor is based on 3-wired RTD sensor. If 2-wired or 4-wired sensor is used, the connection between the sensor and the module shall be kept as 3-wired. Disconnection will be detected on the basis of 3-wired wiring.

(5) In case of disconnection, status of ALD LED and operation of disconnection flag are as follows. - For disconnection flag, refer to 12.3.14 internal memory.

Connection status	Channel status	ALM LED status	Disconnection flag
Normal	Run	Off	Off
Normai	Stop	Off	Off
A line disconnected or	Run	Flicker (1s)	On
B line disconnected	Stop	Off	Off
Any sensor is not	Run	Flicker (1s)	On
connected	Stop	Off	Off

# 4.10 Wiring

- 3 types of sensor-connecting methods are available (2, 3 and 4-wired).
- The standard wiring method for XGF-RD4A module is 3-wired wiring.
- Use an identical type of wire (thickness, length, etc.) for each 3 wire when extended lead wire is used.
- The resistance of each conductor is to be less than  $10\Omega$ . (If larger than this, it will cause an error.)
- Resistance difference of each conductor is to be less than 1Ω. (If larger than this, it will cause an error.)
- Length of wire is to be as short as possible and it is recommended to connect the wire directly to the terminal block of module without connection terminal unit. If a connection terminal is to be used, compensating wire shall be connected as shown below.

## 4.10.1 If 2-wired sensor is used (connection terminal unit is used)



*3 DC 24V external supply terminal to supply the analog power to module

## 4.10.2 If 3-wired sensor is used (connection terminal unit is used)





# 4.10.3 If 4-wired sensor is used (connection terminal unit is used)

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# **4.11 Filtering Function**

Based on the filter value (time-constant) which defines the temperature-converted value of the specified channel, it performs and outputs calculation as below.

 $\mathsf{Filtered temperature} = \frac{(\mathsf{Previously filtered temp.x Filter value}_{ms}) + (\mathsf{Presently input temp.x40}_{ms} \times \mathsf{Channels used})}{\mathsf{Filter value}_{ms} + (40_{ms} \times \mathsf{Channels used})}$ 



• Filtering constant setting range = 160 ~ 64000 [ms]

# 4.12 Operation Parameter Setting

Operation parameters of RTD module can be specified through [I/O parameters] of XG5000.

## 4.12.1 Setting items

For the user's convenience, XG5000 provides GUI (Graphical User Interface) for parameters setting of RTD module. Setting items available through [I/O parameters] of the XG5000 project window are described below.

Item	Details
[I/O Parameter]	<ul> <li>(1) Specify the following setting items necessary for the module operation.</li> <li>Channel Run/Stop</li> <li>Sensor type</li> <li>Filter setting</li> <li>Scaling setting</li> <li>(2) The data specified by user through S/W package will be saved on the flash memory of RTD module when [I/O Parameters] are downloaded.</li> </ul>

## 4.12.2 How to use [I/O Parameter]

- (1) Run XG5000 to create a project. (Refer to XG5000 programming manual for details on how to create the project)
- (2) Double-click [I/O Parameter] on the project window.



- (3) If [I/O Parameter Setting] screen appears, click Module part at relevant slot and select relevant module.
- (4) On the 'I/O parameters setting' screen, find and click the slot of the base where RTD module is installed on.

🗂 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
01 : Default	1	-				
	2					
	3					
05 : Default	4					
	5					
	6					
	7					

(5) Click the arrow button on the screen to display the screen where an applicable module can be selected. Search for the applicable module to select.

Module list	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
Dup case wit Default 2011 Default 2012 Default 2013 Default 2013 Default 2013 Default 2015 Default 2015 Default 2015 Default 2015 Default 2015 Default 2017 Default 2017 Default 2017 Default	Slot Q(main) 1 2 3 4 5 6 7 7	Module → ① Digital Module Lis → ③ Special Module Li ⊕ ④ Analog Input ⊕ ↑ Analog Unput ⊕ ↑ Temp Measure ↓ \$387-BDC ⊕ € Communication M	Lomment at Module img Module da (RTD, 4-CH) da (RTD, 1-CH) odule List	etails <u>P</u>	Intergency Uut	Allocation

(6) After the module selected, click [Details] or double-click relevant slot.

🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
	1	XBF-RD04A (RTD, 4- 💌			•	P00040 ~ P0007F
02 : Default	2					
	3					
05 : Default	4					
06 : Default	5					
07 : Default	6					
	7					

(7) A screen will be displayed to specify parameters for respective channels as shown below. Click a desired item to display parameters to set for respective items.

🗊 Base 00 : Default	XBF-RD04A (RTD, 4-CH)				?	× Out Allocation
	XBF-RD04A (RTD, 4-CH)					P00040 ~ P00076
02 : Default	Parameter	CH 0	CH 1	CH 2	CH 3	
03 : Default	Channel status	Disable 💌	Disable	Disable	Disable	
05 : Default	Sensor type	PT100	PT100	PT100	PT100	
06 : Default	Temp. unit	Celsius	Celsius	Celsius	Celsius	
07 : Default	Filter constant	0	0	0	0	
	Scaling	Disable	Disable	Disable	Disable	
				ок	Cancel	

(8) The initial values of respective items are as follows.(a) Channel status setting screen

Parameter	CH O	CH 1	CH 2	CH 3
Channel status	Disable 💌	Disable	Disable	Disable
Sensor type	Disable	PT100	PT100	PT100
🔲 Temp. unit	Enable	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Scaling	Disable	Disable	Disable	Disable

## (b) Input sensor type setting screen

Channel status         Disable         Disable	Parameter	CHO	CH 1	CH 2	CH 3
	Channel status	Disable	Disable	Disable	Disable
Temp. unit PT100 Celsius Celsius Celsi	Sensor type	PT100 🗨	PT100	PT100	PT100
	🔲 Temp. unit	PT100	Celsius	Celsius	Celsius
Filter constant 0 0 0	Filter constant	PT100	0	0	0
Scaling Disable Disable Disable Disab	🔲 Scaling	Disable	Disable	Disable	Disable

### (c) Temp. unit setting screen

Channel status Disable Disable Disable D Sensor type PT100 PT100 PT100 P	Disable PT100
Sensor type PT100 PT100 PT100 P	PT100
Tamp unit Celsius - Colsius Colsius	
Leisius Ceisius Ceisius Ceisius	Celsius
Filter constant Celsius 0 0	0
Scaling Fahrenheit Disable D	Disable

### (d) Scaling setting screen

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Disable	Disable	Disable	Disable
🔲 Sensor type	PT100	PT100	PT100	PT100
🔲 Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
🔲 Scaling	Disable 👻	Disable	Disable	Disable
	Disable Enable			

- (9) If necessary setting is complete, press OK.
- (10) Check the check box on the parameter menu to select and change setting of a channel then the setting value of all the channels will be identical to changed setting value. The figure below shows an example with this function that channel status is changed to 'Enable' of all the channels.

   XBF-RD04A (RTD, 4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
🔽 Channel status	Disable 👻	Disable	Disable	Disable
Sensor type	Disable	PT100	PT100	PT100
🔲 Temp. unit	Enable	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Scaling	Disable	Disable	Disable	Disable

# 4.13 Special Module Monitoring

Run Special Module Monitoring by selecting [On-Line] -> [Connect] and [Monitor] -> [Special Module Monitoring]. If the status is not [On-Line], [Special Module Monitoring] menu will not be activated.

### Remark

- 1) If the program is not displayed normally because of insufficient system resource, you may start XG5000 again after close the program and other applications.
- 2) I/O parameters those are specified in the state of [Special Module Monitoring] menu are temporarily set up for the test. They will be disappeared when the [Special Module Monitoring] is finished.
- 3) Testing of [Special Module Monitoring] is the way to test the analog output module. It can test the module without a sequence program.

## 4.13.1 How to use special module monitoring

(1) Start of [Special Module Monitoring]

Go through [Online]  $\rightarrow$  [Connect] and [Monitor]  $\rightarrow$  [Special module Monitoring] to start. If the status is not online, [Special Module Monitoring] menu will not be activated.

🍓 XG5000 - [NewProgram]					
Project Edit Eind/Replace View Online	<u>M</u> on	itor <u>D</u> ebug	<u>T</u> ools	<u>W</u> indow	Help
		Start <u>M</u> onito Pause	oring		
	Þ	<u>R</u> esume			
■ F + + +/ト +Pト +Nト	₩.,	P <u>a</u> using Con	ditions		_
Project Window	B	Change Cun	rent <u>V</u> a	lue	_ŀ
Items	Ð	System Mon	itoring		
– • • • • • • • • • • • • • • • • • • •	<b>;;;</b>	<u>D</u> evice Moni	toring		
NewPLC(XGB-XBMS)-Stop	Q.	Special Mode	ule Mon	itoring	
Variable/Comment	W	<u>T</u> rend Monit	oring		
⊡… Lot, Parameter	ø	Custom <u>E</u> ve	nts		
·····································	<u></u>	Data Tra <u>c</u> es	;		
🖃 🗐 Scan Program					
NewProgram					

(2) How to use [Special Module Monitoring]

(a) [Special Module List] window will show base/slot information and types of special module by click [Monitor] → [Special Module Monitoring].In this list box, the modules that are now installed in PLC system will be displayed.

Base	S	ot	Module
🗊 Base O	👩 In	temal	HSC Module (Open-Collector, 4-CH)
🗊 Base O	<u> </u> In	temal	Position Module (Open-Collector, 2-CH)
🗊 Base O		olot 1	XBF-RD04A (RTD, 4-CH)
•			

(b) Select a special module then click [Module Info.] button to display the information as described below.

ſ

5	Displays the information	n ? X
	ltem	Information
	Module Name	XBF-RD04A (RTD, 4-CH)
	OS Ver	Ver. 1.0
	OS Update Date	2007-2-23
	Module Status	Normal. (0)
		ОК

(c) Select a special module then click [Start Monitoring] button to display the information as described below.

s	pecial Module Monitor			? ×
	XBF-RD04A (RTD, 4-CH)			
	Item	CH 0	CH 1	
	Temperature value			
	Scaling value			
	Min. temp value			
	Max. temp value			
	Item	CH 2	CH 3	
	Temperature value			
	Scaling value			
	Min. temp value			
	Max. temp value			
	Item	Setting value	Current value	
	Channel	СНО		_
	Channel status	Disable		
	Sensor type	PT100		
	Temp. unit	Celsius		
	Filter constant	0		
	Scaling	Disable		
	Reset max/min value	Start Monitoring	Test	
			Class	_
			Close	

(d) [Start Monitoring]: [Start Monitoring] button will show you digital input data of the operating channel. The figure below is monitoring screen when all channels are Run status.

## Chapter 4 RTD Input (XBF-RD04A/RD01A)

Special Module Monitor		? ×		
XBF-RD04A (RTD, 4-CH)				
Item	CH 0			
Temperature value	0			
Scaling value	0	0		
Min. temp value	0	0	\ г	
Max. temp value	0	0		Monitoring screen
Item	CH 2	CH 3	U L	5
Temperature value	0	0	/	
Scaling value	0	0		
Min. temp value	0			
Max. temp value	0			
	I			
Item	Setting value	Current value	г	
Channel	CHU	<u> </u>	•	Detail of channel 0
Channel status	Disable	Disable	L	
Sensor type	PT100	PT100		
Temp. unit	Celsius	Celsius		
Filter constant	0			
Scaling	Disable	Disable		
Reset max/min value	Stop Monitoring	Test Close		

[Start Monitoring] execution screen

(e) [Test]: [Test] is used to change the parameters of the RTD input module. You can change the parameters when you click the values at the bottom of the screen. It is only available when XGB CPU unit's status is in [Stop].

Special Module Monitor		? ×
XBF-RD04A (RTD, 4-CH)	-	
Item	CH 0	CH 1
Temperature value	0	0
Scaling value	0	0
Min. temp value	0	0
Max. temp value	0	0
Item	CH 2	CH 3
Temperature value	0	0
Scaling value	0	0
Min. temp value	0	0
Max. temp value	0	0
Item	Setting value	Current value
Channel	CH	0
Channel status	Disable	Disable
Sensor type	PT100	PT100
Temp. unit	Celsius	Celsius
Filter constant	0	0
Scaling	Disable	Disable
Reset max/min value	Stop Monitoring	Test
		Close

[Test] execution screen

(g) [Close]: [Close] is used to escape from the monitoring/test screen. When the monitoring/test screen is closed, the max. value, the min. value and the present value will not be saved any more.

Remark

[Test] function is only available when XGB CPU unit's status is in [Stop]

# 4.14 Register U devices (Special module variable)

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Register the variables for each module referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

(1) Procedure (a) Select the spi 1/0 Parameter Setting	ecial	module type	e in the [I/C	) Param	neter Se	tting] windo
Image: Second	Slot 0(main) 1 2 3 4 5 6 7 7	Module DC 24V INPUT/TR 0 X8F-RD04A (RTD, 4-	Comment	Input Filter 3 Standard [ms	Emergency Out Default	Allocation P00000 ~ P0003F P00040 ~ P0007F
L Delete	Slot De	elete Base Base Setting	Delete All	Details <u>P</u> r	int 🔻	OK Cancel

### (b) Double click 'Variable/Comment' from the project window. .

a XG5000 - [Variable/Comment]	괴죄
xh Project Edit Eind/Replace View Online Monitor Debug Iools Window Help	<u> </u>
□ ☞ ▲ ■ ● ● ● ● ■ ◎ ■ ◎ □ ♀ ↓ ● ● × ≪ ≯ ∴ × ● ● ● ↓ ● ● ●	
\$\$\$ ®®⊗ <b>\$</b> \$\$ <b>0 0 0 0 0 0 0 0 0 0</b>	Ξ
[品材材料批方方式为材料料料料料料料】 自由□@@F @ □ ▼ ■ ■ ■ ■ ■ ■	0%
Project Window   View Variable View Device View Flag	
Image: Stample_XGB     Variable     Type     Device     Comment       Image: Stample_XGB     Variable     Type     Device     Comment       Image: Stample_XGB     Stample_XGB     Stample_XGB     Image: Stample_XGB       Image: Stample_XGB     Stample_XGB     Stample_XGB     Image: Stample_XGB       Image: Stample_XGB     Stample_XGB     Stample_XGB     Image: Stample_XGB       Image: Stample_XGB     Image: Stample_XGB     Image: Stample_XGB     Ima	
New Program Variable/Comment	
PLC     Type       Image: State of the state of	λUse
NewPLC Offine View Variable 0	ve //

(c) Select [Edit] – [Register U Device]. In case of IEC, select [Edit] – [Register special module variable]



(d) Click 'Yes'.							
🛞 XG5000 - [Variable/Comment]						_ 🗆 🗡	
Project Edit Eind/Replace View Online	<u>M</u> onitor <u>D</u> eb	ug <u>T</u> ools <u>W</u> indow	<u>H</u> elp			_ 8 ×	
D 2 6 8 6 8 8 8 8	□▷▷໋						
	x II.	L₽₽	20,446	) 🖴 🛛 [] [	ן נן נן אין אין גנו גם ניין גי	9 4 4 8	
Esc \$3 \$4 \$1 \$12 F5 \$6 \$78 \$79 \$6	(/); (S); (B); F11 sF3 sF4	\$F5 \$F6 F10 \$F7		0 🛛 F		₫ @ Q 100%	
Project Window	V Vie	w Variable	/iew Device	View Flag			
Items □		Variable	Туре	Device	C	omment	
NewPLC(XGB-XBMS)-Offline	1		]				
Parar X55000		_	_	_	×		
[B] E [S] I. Automatically	register comm	ients in the U Device	es according to t	he special module	e set in the I/O parameter.		
☐ ☐ ☐ E Continue?	comment will b	e deleted.					
■t Project		No.		1			
Function/FB		Tes	IND	]			
Most Recently Used Edit							
Function Name		NewProgram		ishle/Comment		<u> </u>	
		New rogian	and va	iable/Comment			
PLC Type	×						
M Eu	>						
onitor	lindov						
	age V						
Monitor 1 Monitor 2	Mess	▶ ▶I \ Result / Cl	neck Program,	∖Find 1 <u>}</u> Find	12 $\lambda$ Communication $\lambda$ Cr	oss Reference $\lambda$ Use	
	Ne	ewPLC	Offlir	ne j		Ove //	

1

(e) As shown below, the variables are registered.

Image: Second State State       Image: Second State State       Image: Second State State State       Image: Second Stat	🖏 XG5000 - [Variable/Comment]			
Project       Non-No       No       Non-No       Non-No	Project Edit Eind/Replace View Online	<u>1</u> onitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u> elp		_ & ×
Image: Second	0668688	■ 🖓 🗠 ≏ % 🖻 🛱 🗙	****	AA 🐝 💥 着 斗 🖻 🕾
Project Window       Image: Comment       Image				n u n n n n n n n n n u
IProject Window         Image: KGB*         Variable       Type       Device       Comment         Of RewPLC/KGB-XBMS/Offline         Of RewPLC         Of RewPLC/KGB-XBMS/Offline         Of RewPLC/KGB-XBMS/Offline         Of RewPLC/KGB-XBMS/Offline         Of RewPLC         Of RewPLC         Of RewPLC/KGB-XBMS/Offline         Of RewPLC/KGB-XBMS/Offline         Of RewPLC/KGB-XBMS/Offline         Of RewPLC         Of RewPLC/KGB-XBMS/Offline         Of RewPLC/KGB-XBMS/OFFLINE         Of RewPLC/KGB-XBMS/OFFLINE	Esc 1+3 1+4 3+1 3+2 F5 F6 sF8 sF9 1+9 1+	化 \$P\$ \$P\$ \$P\$ \$P\$ FP\$ \$P\$ 间 💼		e 🗰 🗹 🖻 🕪 🖻 🔍 🔍 100%
Image: Start Star	Project Window	View Variable D View Device	View Flag	
Image: Description of the second of the s		Variable Type	e ▼ Device	Comment 🔺
Image: Comment in the image: Commen	E m NewPLC(XGB-XBMS)-Offline	1 _01_RDY BIT	U01.00.F Te	emp. Measuring Module : Module Rea
Communication / F8     Function / F8     Function / F8     Function / F8     Function Name     PLC     Type     Yup Amount of the second	Variable/Comment	2 _01_CH0_ACT BIT	U01.01.0 Te	emp. Measuring Module : CH0 Runnir
Image: Basic Parameter       4       _01_CH2_ACT       BIT       U01.01.2       Temp. Measuring Module: CH2 Runnir         Image: Charameter       _01_CH3_ACT       BIT       U01.01.3       Temp. Measuring Module: CH3 Runnir         Image: Charameter       _01_CH3_ACT       BIT       U01.01.4       Temp. Measuring Module: CH3 Runnir         Image: Charameter       _01_CH3_ACT       BIT       U01.01.4       Temp. Measuring Module: CH0 Input D         Image: Charameter       _01_CH3_BOUT       BIT       U01.01.5       Temp. Measuring Module: CH2 Input D         Image: Charameter       _01_CH3_BOUT       BIT       U01.01.6       Temp. Measuring Module: CH2 Input D         Image: Charameter       _01_CH3_BOUT       BIT       U01.01.7       Temp. Measuring Module: CH3 Input D         Image: Charameter       _01_CH3_BOUT       BIT       U01.01.7       Temp. Measuring Module: CH3 Input D         Image: Charameter       _01_CH3_BOUT       BIT       U01.04       Temp. Measuring Module: CH3 Input D         Image: Charameter       _01_CH3_BOUT       BIT       U01.04       Temp. Measuring Module: CH3 Input D         Image: Charameter       _01_CH3_BOUT       BIT       U01.04       Temp. Measuring Module: CH3 Input D         Image: Charameter       _01_CH3_BOUT       _01_CH3_BOUT       _01	Parameter	3 _01_CH1_ACT BIT	U01.01.1 Te	emp. Measuring Module : CH1 Runnir
Communication Across Reference Ause      Monitor 1 (Monitor 2)      Monitor 2      Monitor 3      Monitor 3      Monitor 3      Monitor 4      Monitor	Basic Parameter	4 _01_CH2_ACT BIT	U01.01.2 Te	emp. Measuring Module : CH2 Runnir
Bit Mail       Bit Out 01.01.4       Temp. Measuring Module : CH0 Input D         7       0.1_CH1_BOUT       Bit U01.01.4       Temp. Measuring Module : CH1 Input D         7       0.1_CH1_BOUT       Bit U01.01.5       Temp. Measuring Module : CH1 Input D         8       0.1_CH2_BOUT       Bit U01.01.6       Temp. Measuring Module : CH2 Input D         9       0.1_CH3_BOUT       Bit U01.01.7       Temp. Measuring Module : CH2 Input D         10       _01_CH3_BOUT       Bit U01.01.7       Temp. Measuring Module : CH3 Input D         10       _01_CH3_BOUT       Bit U01.01.7       Temp. Measuring Module : CH0 Temp. Input D         10       _01_CH0_TEMP       WORD       U01.04       Temp. Measuring Module : CH0 Temp. Input D         10       _01_CH0_TEMP       WORD       U01.04       Temp. Measuring Module : CH0 Temp. Input D         11	1/O Parameter	5 _01_CH3_ACT BIT	U01.01.3 Te	emp. Measuring Module : CH3 Runnir
Image: Construction /FB       7       _01_CH1_BOUT       BIT       U01.01.5       Temp. Measuring Module : CH1 Input D         Image: Character in the second		6 _01_CH0_BOUT BIT	U01.01.4 Te	emp. Measuring Module : CH0 Input D
Function/FB       x         Most Recently Used       Image: CH2_BOUT_BIT	■© Project	7 _01_CH1_BOUT BIT	U01.01.5 Te	emp. Measuring Module : CH1 Input D
Function/FB       A         Most Recently Used       Edit         Function Name       0         Out_CH0_TEMP       WORD         U01.01.7       Temp. Measuring Module : CH3 Input D         Temp. Measuring Module : CH0 Temp.         NewProgram       Variable/Comment         NewProgram       Variable/Comment         Monitor 1 (Monitor 2)       Monitor 2)         NewPLC       Offline		8 _01_CH2_BOUT BIT	U01.01.6 Te	emp. Measuring Module : CH2 Input D
Most Recently Used     Edit     Image: Chick of the chick of	Function/FB 🔺 🗙	9 _01_CH3_BOUT BIT	U01.01.7 Te	emp. Measuring Module : CH3 Input D
Function Name     NewProgram       Image: State of the stateo	Most Recently Used 💌 Edit	10 _01_CH0_TEMP WORD	U01.04 Te	emp. Measuring Module : CH0 Temp. 💌
PLC     Type       1	Function Name			
PLC Type	- reneared the second s	🕅 NewProgram 🕌	Variable/Comment	
PLC     Type       1     Image: Second seco		×		
Monitor 1 / Monitor 2 /         Monitor 2	PLC Type	•		
Monitor 1 / Monitor 2 / Monitor 2 / NewPLC         NewPLC         Offline         View Variable   Over //	nitorin	wopu		
Monitor 1 Monitor 2 Result Check Program A Find 1 A Find 2 A Communication A Cross Reference A Use NewPLC Offline View Variable Ove //	Σ	N af		
NewPLC Offline View Variable Ove //	Monitor 1 Monitor 2	Result / Check Prog	ram λFind 1 λFind 2	$\lambda$ Communication $\lambda$ Cross Reference $\lambda$ Use
		NewPLC	Offline	View Variable Ove //

### (2) Save variables

- (a) The contents of 'View Variable' can be saved as a text file.
- (b) Select [Edit] -> [Export to File].
- (c) The contents of 'View variable' are saved as a text file.

## (3) View variables

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(a) The example program of XG5000 is as shown below.

U02.00.F	U02.01.0	MOV	U02.04	D0000
	U02.01.1	MOV	U02.05	D0001
	U02.01.2	MOV	U02.06	D0002
	U02.01.3	MOV	U02.07	D0003
3				END

### (b) Select [View] -> [Variables]. The devices are changed into variables.

_02_RDV	_U2_UHU_AC T 	MOV _02_CH0_TEMP D0000
		MOV _02_CH1_TEMP D0001
	_02_CH2_AC T	MOV _02_CH2_TEMP D0002
	_02_CH3_AC T	MOV _02_CH3_TEMP D0003
		END

(c) Select [View] -> [Devices/Variables]. Devices and variables are both displayed.

U02.00.F	U02.01.0	MOV	U02.04 D0000
_02_RDV	_02_cHo_ac T		02_CHO_TE MP
	U02.01.1	MOV	U02.05 D0001
	_02_CH1_AC T	-	02_CH1_TE MP
	U02.01.2	MOV	U02.06 D0002
	_02_CH2_AC T		02_CH2_TE MP
	U02.01.3	MOV	U02.07 D0003
	_02_CH3_AC T		02_CH3_TE MP
			END

### (d) Select [View] -> [Device/Comments]. Devices and comments are both displayed.

U02.00.F	002.01.0	MOV U02.04	00000
Temp. Measuring Module : Module Ready	Temp. Measuring Module : CHO Running	Temp, Measuring Module : CH0 Temp, Value	
	U02.01.1	MOV U02.05 I	00001
	Temp. Measuring Module : CH1 Running	Temp. Measuring Module : CH1 Temp. Value	
	U02.01.2	MOV U02.06 I	00002
	Temp. Measuring Module : CH2 Running	Temp. Measuring Module : CH2 Temp. Value	
	U02.01.3	MOV U02.07	00003
	Temp. Measuring Module : CH3 Running	Temp. Measuring Module : CH3 Temp. Value	
			END

# 4.15 Configuration and Function of Internal Memory

Here describes configuration and function of internal memory.

## 4.15.1 Data I/O area of RTD input module

Data I/O area of RTD input module is as shown below.

Area ('S', 'H' type)	Area (IEC type)	Details	Content	R/W
U0x.00.0 U0x.00.F	%UX0.x.0 %UX0.x.15	Module ERROR flag Module READY flag	0 Bit On(1): module error F(15) Bit On(1): module normal	R
U0x.01.0 U0x.01.1 U0x.01.2 U0x.01.3	%UX0.x.16 %UX0.x.17 %UX0.x.18 %UX0.x.19	CH0 Run flag CH1 Run flag CH2 Run flag CH3 Run flag	Bit On(1): channel run Bit Off(0): channel stop	R
U0x.01.4 U0x.01.5 U0x.01.6 U0x.01.7	%UX0.x.20 %UX0.x.21 %UX0.x.22 %UX0.x.23	CH0 Disconnection flag CH1 Disconnection flag CH2 Disconnection flag CH3 Disconnection flag	Bit On(1): Disconnection Bit Off(0): Normal	R
U0x.04	%UW0.x.4	CH0 digital output value	Temperature value ×10	R
U0x.05	%UW0.x.5	CH1 digital output value	_	R
U0x.06	%UW0.x.6	CH2 digital output value	_	R
U0x.07	%UW0.x.7	CH3 digital output value	_	R
U0x.08	%UW0.x.8	CH0 scaling value	0 ~ 4000	R
U0x.09	%UW0.x.9	CH1 scaling value	_	R
U0x.10	%UW0.x.10	CH2 scaling value	_	R
U0x.11	%UW0.x.11	CH3 scaling value	_	R

※ In the device assigned, x stands for the slot no. on which module is installed.

(1) Module ready/channel error information ( ( ) means device name of IEC type)

- (a) U0x.00.F (%UX0.x.15): It will be ON when PLC CPU is powered or reset with A/D conversion ready to process A/D conversion.
- (b) U0x.00.0 ~ U0x.00.3 (%UW0.x.0~%UW0.x.3): It is a flag to display the error status of A/D conversion module.



# (2) Channel run/stop information(a) It displays which channel is being used.

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	סודו סודו סודו סודו סודו סודו סודו סוד סוד	
U0x.04	CH0 temperature conversion value	(%UW0.x.4)
U0x.05	CH1 temperature conversion value	(%UW0.x.5)
U0x.06	CH2 temperature conversion value	(%UW0.x.6)
U0x.07	CH3 temperature conversion value	(%UW0.x.7)

## 4.15.2 Operation parameter setting area

Operation parameter setting areas of RTD input module are as follows.

Memory a	ddress	Deteile	D/M	Domork	
Hex.	Dec.	Details	r/w	Remark	
0н	0	Channel enable/disable setting	R/W	PUT	
1н	1	CH0 sensor type setting	R/W	PUT	
2н	2	CH1 sensor type setting	R/W	PUT	
3н	3	CH2 sensor type setting	R/W	PUT	
4 _H	4	CH3 sensor type setting	R/W	PUT	
5н	5	Temperature display unit setting	R/W	PUT	
6н	6	CH0 filter constant setting	R/W	PUT	
7 _Н	7	CH1 filter constant setting	R/W	PUT	
8н	8	CH2 filter constant setting	R/W	PUT	
9н	9	CH3 filter constant setting	R/W	PUT	
A _H _ 11 _H	10~17	Not used	-	_	
12 _H	18	Scaling setting	R/W	PUT	
13н - 43н	19~67	Not used	-	-	
44 _H	68	CH0 disconnection information (code)	R/W	GET	
45н	69	CH1 disconnection information (code)	R/W	GET	
46H	70	CH2 disconnection information (code)	R/W	GET	
47H	71	CH3 disconnection information (code)	R/W	GET	

(1) Run channel setting

If Run channel is not specified, all channels will be stop status.



Setting channel to use (bit) Bit On (1): Run, Bit Off (0): Stop 1

(2) Sensor type setting

If it is not specified manually, all channels will be specified as Pt100.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address 1		Ch0 sensor type setting														
Address 2		Ch1 sensor type setting														
Address 3		Ch2 sensor type setting														
Address 4		Ch3 sensor type setting														
	Word Description															
			0					S	Spec	ified	as	PT1	00			
			1					S	neci	fied	as J	PT1	00			

### (3) Setting temperature display unit

Unit of temperature conversion value can be specified as Celsius/ Fahrenheit.

Address 5	

 bit15	bit14	Bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	Bit0
_												С Н З	C H 2	C H 1	С Н 0

Bit	Description
0	Celsius
1	Fahrenheit

### (4) Setting filter constant

If filter constant is not specified or specified as "0", relevant channel is not filtered.

bit15 bit14 bit13 bit12 bit11 bit10 bit9 bit8 bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0

Address 6	Setting Ch0 filter constant (1~99)
Address 7	Setting Ch1 filter constant (1~99)
Address 8	Setting Ch2 filter constant (1~99)
Address 9	Setting Ch3 filter constant (1~99)

### (5) Setting scaling

It specifies whether scaling function is used or not.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address 10													с	с	с	с
	—	—	—	—	_	—	_	—	—	—	—	—	н	н	н	н
													3	2	1	0
		В	it			Description										

(6) Disconnection information

It outputs disconnection information of each channel.

0 1

bit15 bit14 bit13 bit12 bit11 bit10 bit9 bit8 bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0

Scaling function is not used

Scaling function is used

Addross 69	Channel 0 disconnection information				
Address 66	(0: normal,1: sensor A disconnection, 2: sensor B disconnection)				
Address 69	Channel 1 disconnection information				
Address 05	(0: normal,1: sensor A disconnection, 2: sensor B disconnection)				
Address 70	Channel 2 disconnection information				
Address 70	(0: normal,1: sensor A disconnection, 2: sensor B disconnection)				
Address 71	Channel 3 disconnection information				
	(0: normal, 1: sensor A disconnection, 2: sensor B disconnection)				

# 4.16 Example Program

- Here describes how to specify the operation condition of RTD input module.
- RTD input module is installed on slot 2.
- Initial setting condition is that with one input, initial setting value is saved in internal memory of module.
- The following program is an example to read temperature value and disconnection information.

### (1) Program example using [I/O Parameter Setting]

I/O Paramet	er Setting			, r							<u>? ×</u>	
Module list												
🖃 🗊 Base	e 00 : Default		Slot		Module	Comment	In	iput Filter	Emergency	Out	Allocation	
4	00 : DC 24V IN	IPUT/TR C	0(main)	DC 24V II	NPUT/TR O		3 Sta	andard [ms]	Default		P00000 ~ P0003F	
	01 : TR OUTP 02 : XBF-RD0	4A (RTD, 4	1	TR OUTP	PUT, 32points			-	Default		P00040 ~ P0007F	
	03 : Default		2		J4A (NTU, 4-			-	-			
	04 : Default 05 : Default		4	-								
	06 : Default		5	_								
	07 : Default		6									
			(				l			l		
•		•										
		Delete	Slot	ielete Base	Base Setting	Delete All	Details	<u>P</u> ri	nt 🔻	0	K Cancel	
VRE-DD04A		<b>\</b>				2						
ADF-KD04A	(KTD, 4-CH	,	_	_	_	<u>.</u>						
XBF-RD04A	(RTD, 4-CH)											
Pa	rameter	CHO	1	CH 1	CH 2	CH 3	Г					
🗌 🗖 Cha	annel status	Enabl	e	Enable	Disable	Disable 💌						
S S	ensor type	PT10	0	PT100	PT100	PT100						
	emp. unit	Celsiu	IS	Celsius	Celsius	Celsius						
Filter	constant			0	0	0						
	scaling	Disad	le	Disable	Disable	Disable						
· ·				_								
					OK	Cancel						
1102.00 5	102.01.0	102.01.4									Г	
							MOV	U02.0	04 D0	000	Moving channel	0 temp. value to
Temp. Measuring	Temp. Measuring	Temp. Measuring						Temp Measuri	na		D0 area	
Module :	Module :	Module :						Module	e:			
Ready	Running	Disconnecti						CH0 Ter Value	np.			
	_	on										
	U02.01.1	U02.01.5					MOV	U02.0	)5 D0	001	Moving channel 1 temp. value D1 area	
	Temp.	Temp.						Temp				
	Measuring Module :	Measuring Module :						Measuri Module	ng			
	CH1	CH1 Input						CH1 Ter	np.			
	nunning	on						vaiue	,			
							<u></u>	MOO	n .	1	Moving channel	0 disconnection
		1			GEI	2	68	MUU	J	<u></u> _	information to M	0
					GET	2	69	M010	D	1	Moving channel	1 disconnection
		+									information to M	1
									E	ND		

# (2) Program example using PUT/GET command

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								P0001	-
1 1 Scan ON				PUTP	2	0	H0003	1	CH Enable
				PUTP	2	1	H0000	2	Sensor type (PT100)
				PUTP	2	5	H0000	1	Temperature unit (Celsius)
				PUTP	2	6	H0000	2	Filter value
P0001	U02.00.F	U02.01.0	U02.01.4			MOV	U02.04	D0000	Moving channel 0
	Temp. Measuring Module : Module Ready	Temp. Measuring Module : CH0 Running	Temp. Measuring Module : CHO Input Disconnecti on				Temp. Measuring Module : CH0 Temp. Value		
2		U02.01.1	U02.01.5			MOV	1102.05	D0001	Moving channel 1
		Temp. Measuring Module : CH1 Running	Temp. Measuring Module : CH1 Input Disconnecti an				Temp. Measuring Module : CH1 Temp. Value		temp. value to
				GET	2	68	M000	1	Moving channel 0 disconnection information to M0
				GET	2	69	M010	1	Moving channel 1 disconnection
								END	information to M

# (3) Program example using parameter in case of IEC

_01_RDY Temp. Measuring Module : Module Ready	_O1_CHO_AC T Temp, Measuring Module: CHO Running	_01_CH0_B0 UT Temp, Measuring Module: CH0 Input Disconnect ion _01_CH0_TE MP Temp, Measuring Module: CH0 Temp, Value	- EN - IN	OUT	CHOTempDat a				
	_01_CH1_AC T Temp: Measuring Module : CH1 Running	_01_CH1_B0 UT Temp. Medsuring Module : CH1 Input Disconnect ion _01_CH1_TE MP Temp. Measuring Module : CH1 Temp. Value	- EN - IN	IVE ENO OUT	- CH1TempDat a				
			IN GET REQ	IST WORD DONE			IN GET REQ	ST1 .WORD DONE	
		0	BASE	STAT		0	BASE	STAT	
		1	SLOT	DATA	CHODisconn - ectionInfo	1	SLOT	DATA	CH1Disconn ectionInfo
		68	-MADD R			69	-MADD R		



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### (4) Program example using PUT/GET function block inn case of IEC



# 4.17.3 ALM (Alarm) LED flickers

ALM LED flickers.		
3 wired wiring is normal.		
No Yes	=>[v	Vire properly referring to 4.10
Wiring to sensor is normal	1	
No Yes	=>[v	Vire properly referring to 4.10
Contact the nearest agency or A/S center.		

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# 4.17.4 Temperature conversion value is not normal.

Temperature conversion value is not normal.	]
$\overline{\bigcirc}$	-
External DC 24V input power is normal.	]
No Yes	Supply external power (DC 24V)
PE ground is normal.	]
No Yes	Execute PE ground properly referring to 4.10
Contact the nearest agency or A/S center.	]

## 4.17.5 Stats check of RTD input module through XG5000 system monitor

Module type, module information, O/S version and module status of RTD input module can be checked through XG5000 system monitoring function.

(1) Execution sequence

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- Two routes are available for the execution.
- (a) [Monitor] -> [System Monitoring] -> And on the module screen, click the right mouse button to display [Module Information].
- (b) [Monitor] -> [System Monitoring] -> And Double-click the module screen.

### (2) Module information

- (a) Module type: shows the information of the module presently installed.
- (b) Module information: shows the O/S version information of module.
- (c) O/S version: shows the O/S prepared date of module.
- (d) Module status: shows the present error code.

# 5.1 General

Here describes specification, handling, and programming of XGB thermocouple input module (XBF-TC04S/XBF-TC04B).

Thermocouple input module is used to convert the temperature data detected from thermocouple to signed 16 bit data.

# 5.1.1 Characteristic

(1) Module selection according to purpose

XBF-TC04S/XBF-TC04B: 4 channel input (Insulation between channels by photomos relay)

- (2) Four kinds of thermocouple available (K / J / T / R) Available to select the different thermocouple according to each channel
- (3) Voltage input (0 ~ 100^{mV}) available (XBF-TC04B) Available to select voltage input (0~100^{mV}) and thermocouple (K type / J type / T type / R type) for each channel

### (4) Disconnection detection

If thermocouple is disconnected, it is detected and indicated.

(5) Celsius (°C)/ Fahrenheit (°F) type available

Temperature conversion data of **Celsius (°C)/** Fahrenheit (°F) is indicated down to one decimal place

### (6) Temperature data scaling function

(Available to use it as additional data than temperature indication) Scaling conversion of temperature data is available within -32,768~32,767/0~65,535.

### (7) Various additional function

Filter process, Average process (time/count/moving), Max./Min. detection process

### (8) Parameter setting / Monitoring by GUI (Graphical user interface) method

It enhanced user-friendly features by changing to I/O parameter settings (intensify user interface) from parameter settings by previous instructions. By [I/O Parameter], the sequence program can be reduced and by [Special Module Monitoring], it is easy to monitor the temperature conversion value.

## 5.1.2 Required version

When making the system, the version below is required.

Basic unit type	Basic unit	Tuno	Required version		
	name	Type	XBF-TC04S	XBF-TC04B	
XGB modular standard type		Basic unit	Ver 1.8 or above	-	
basic unit (XBMS)	VDINI-DXX2	XG5000	Ver 2.2 or above	-	
XGB compact standard type		Basic unit	Ver 1.8 or above	Ver 1.12 or above	
basic unit (XBCS)	VPC-DXX2	XG5000	Ver 3.61 or above	Ver 3.62 or above	
XGB compact high-end type		Basic unit	Ver 1.8 or above	-	
basic unit (XBCH)		XG5000	Ver 2.2 or above	-	
XGB IEC high-end type basic		Basic unit	Ver 1.0 or above	-	
unit (XECH)		XG5000	Ver 3.0 or above	-	

## 5.1.3 Setting sequence before operation

1) Before using the thermocouple input module, follow steps below.



2) Before using the thermocouple/voltage input module, follow steps below.



# 5.2 Specification

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# 5.2.1 General specification

General specifications are as follows.

No.	ltem		Related specifications					
1	Ambient temperature			0°C ~	+ <b>55</b> ℃		-	
2	Storage temperature			<b>-25</b> ℃ ~	- <b>+70</b> ℃		-	
3	Ambient humidity		Ę	5 ~ 95%RH (N	on-condensing)		-	
4	Storage humidity		Ę	5 ~ 95%RH (N	on-condensing)		-	
			Occasi	onal vibration		-	-	
		Frequency	Ac	celeration	Amplitude	How many times	_	
		5 ≤ f < 8.4 ⊞	Z	-	3.5 mm			
_	Vibration	8.4 ≤ f ≤ 150	Hz 9.8	3 m/s² (1G)	-			
5	resistance		For contin	nuous vibratio	n	10 times each	IEC61131-2	
		Frequency	Ac	celeration	Amplitude	directions (X, Y and Z)		
		5 ≤ f < 8.4 ⊞	Z	-	1.75 mm	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
		8.4 ≤ f ≤ 150	Hz 4.9	m/s² (0.5G)	-			
6	<ul> <li>Peak acceleration: 147 m/s²(15G)</li> <li>Shock resistance</li> <li>Duration: 11ms</li> <li>Half-sine, 3 times each direction per each axis</li> </ul>						IEC61131-2	
		Square wave Impulse noise		AC: ± 1,500V DC: ± 900V				
		Electrostatic discharge		narging)	IEC 61131-2, IEC 61000-4- 2			
7	Noise resistance	e resistance Radiated electromagnetic field noise		80 ~ 1,000 MHz, 10V/m				
		Fast transient /bust noise	Segment	Power supply module	y Digital/ana	alog input/output ication interface	IEC 61131-2, IEC 61000-4-	
		,	Voltage 2kV			1kV	4	
8	Environment	Free from corrosive gasses and excessive dust					-	
9	Altitude			Up to 2,0	000 ms		-	
10	Pollution degree			Less than	equal to 2		-	
11	Cooling			Air-co	oling		-	

# **5.2.2 Performance Specification**

	ltems	Specification			
		4 channels			
Number of input ch	nannel	Select channel type by parameter			
		(thermocouple input)			
Type of input sons	or	Thermocouple K / J / T / R type			
Type of input sens	01	JIS C1602-1995			
	К	-200.0℃ ~ 1300.0℃			
Range of input	J	-200.0℃ ~ 1200.0℃			
temperature	Т	-200.0°C ~ 400.0°C			
	R	0.0℃ ~ 1700.0℃			
	Tomp display	Displaying down to one decimal place – note1)			
Digital autout	Temp. display	K, J, T type: 0.1℃, R type: 0.5℃			
Digital output	Scaling display	Unsigned scaling (0 ~ 65535)			
	(user-defined scaling)	Signed scaling (-32768 ~ 32767)			
	Ambient temperature(25℃)	Within ±0.2% – note 2)			
Accuracy	Temp. coefficient	:100 ppm/%			
	(range of operating temp)	±100 ppm/ C			
Conversion time		50ms / channel			
Reference	Auto compensation by RJC se	ensing (Thermistor)			
junction	Componention amount	+1.0°C			
compensation		±1.0 C			
Warming-up time		15 min or above –note 3)			

(1) Thermocouple input specification (XBF-TC04S/XBF-TC04B)

Note1), Note2) For more detail specification, refer to 5.2.6 accuracy/resolution. Note 3) Warming-up time: for stability of measured temperature, 15 min is necessary after power is on.

(2) Voltage input specification (XBF-TC04B)

	Items	Specification		
Number of input ch	nannel	4 channels Select channel type by parameter (thermocouple/voltage input)		
Analog input range		0 ~ 100 ^{mV} (Input impedance: 1 ^{MΩ} or above)		
	Туре	0 ~ 20000		
Digital output	Scaling display	Unsigned scaling (0 ~ 65535)		
	(user-defined scaling)	Signed scaling (-32768 ~ 32767)		
Max. resolution		1/20000 (0.005mV)		
	Ambient temperature (25 $^{\circ}$ C)	Within ±0.2%		
Accuracy	Temp. coefficient (operating temp. range)	±100 ppm/℃		
Conversion time		50ms / channel		

(3) Common specification (XB	3F-TC04S/XBF-TC04B)
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	Items		Specification		
	Inculation	Terminal – inner circuit	Photo-coupler insulation		
Inculation	method	Terminal – operating power	DC/DC converter insulation		
insulation		Between channels	Photomos relay insulation		
	Dielectric	withstand voltage	400 V AC, 50/60 Hz, 1min, leakage current 10 ^{mA} or below		
	Insulation	resistance	500 V DC, 10 MΩ or below		
Terminal block			11 point terminal		
I/O occupied p	oints		64 points		
Max. number of equipment			7 [When using XBM-Dxxx□ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type)		
	Filter proce	ess	Digital filter (200 ~ 64,000ms)		
			Time average (400~64,000 ^{ms} )		
A dditional	Average pi	ocess	Count average (2~64,000 times)		
Additional			Moving average (2~100)		
Tunction	Alarm		Disconnection detection		
	Max./Min.	display	Display Max./Min.		
	Scaling fur	nction	Signed scaling / Unsigned scaling		
Consumption	Inner DC5	V	100 ^{mA}		
current	External D	C24V	100 ^{mA}		
Weight			63g		

# 5.2.3 Name of part and function

Respective designations of the parts are as described below



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No.	Name	Description
1	RUN LED	<ul> <li>Displays the status of thermocouple input module On: operation normal</li> <li>Flickering: Error occurs (0.2s flickering)</li> <li>Off: power Off or module error</li> </ul>
2	ALM LED	<ul> <li>Displays the disconnection status of thermocouple input module (Alarm indication LED)</li> <li>Flickering: Disconnection error occurs (1s flickering)</li> <li>Off: operation normal</li> </ul>
3	Terminal block	<ul> <li>Terminal block for wiring to connect the thermocouple (K, J, T, R type) (0~100mV, XBF-TC04B)</li> </ul>
4	External power supply terminal	Terminal for supply of external DC24V
5	Connector for extension	► Connection connector for connecting the extension module
6	Reference junction compensator	Thermistor for reference junction compensation (RJC)

## 5.2.4 Characteristic of thermocouple temperature conversion

Thermocouple input module connect 4 kinds of thermocouple and one voltage input (XBF-TC04B) directly, input characteristic are as described below.



(1) Thermocouple K (JIS C1602-1995): -200 ℃(-5891 ᠕) ~ 1300 ℃(52410 ᠕)




#### (3) Thermocouple T (JIS C1602-1995): -200 ℃(-5603 𝒫) ~ 400 ℃(20872 𝒫)



#### (4) Thermocouple R (JIS C1602-1995): 0 ℃(0 ⊮) ~ 1700 ℃(20222 ⊮)



#### Remark

Thermocouple characteristics: thermocouple sensor measures temperature by using fine voltage (electromotive force), which occurs when applying temperature gradient to a junction between two different metals.

The temperature-electromotive force relation specification of normal thermocouple sensor provides the electromotive force, which is measured when a sensor's measuring point is at  $O^{\circ}C$ . On that account, when measuring temperature by using thermocouple sensor, cold junction compensation (reference junction compensation, RJC) is used. (built-in function of temperature measuring module).

#### (5) Temperature conversion characteristic

Thermocouple input module converts the thermocouple input with non-linear characteristics into A/D and outputs the temperature conversion that is linearly treated.

Temperature conversion to thermocouple input has non-linear characteristics.

## Remark

Non-linear characteristics: regarding the relation of temperature ( $^{\circ}C$ ) and electromotive force ( $^{\mu\nu}$ ) of a thermocouple sensor, electromotive force is different by sections even though temperature changes by a certain amount, which is called 'non-linear characteristics.' As seen in the above graph, it is shown that the relation of temperature and electromotive force is a curve by temperature sections. The module processes the non-linear characteristics table as linear.



#### (6) Voltage input range (0 ~ 100^mV)

## 5.2.5 Temperature display

- (1) Temperature is displayed down to one decimal place. In the XG5000, when monitoring the temperature conversion value, select "Signed decimal" According to monitor indication type, temperature is monitored like figure below.
  - Ex.) if displaying -123.0°C by converting, the value stored in the internal memory would be -1230.



- (2) Temperature display unit
   (a) K, J, T type: 0.1 °C
   (b) R type: 0.5 °C
- (3) Temperature may be displayed by Celsius or Fahrenheit, depending on the settings.

Ex.) if displaying 100 °C in Fahrenheit, it would be 212 F by using the following formula.

(a) From Celsius to Fahrenheit degree  $F = \frac{9}{5}C + 32$ (b) From Fahrenheit to Celsius degree  $C = \frac{5}{9}(F - 32)$ 

#### 5.2.6 Accuracy / Resolution

			Accura	Accuracy - note1)		
Thermocouple type	Measurement temperature range	Indication temperature range	Normal temperature (25℃)	Operating temperature - note2) (0℃ ~ 55℃)	resolution	
		<b>-270.0℃ ~ -200.0℃</b>		- note3)		
K	<b>-200.0</b> ℃ ~	<b>-200.0</b> ℃ ~ 0.0℃	<b>±3.0</b> ℃	<b>±7.5</b> ℃	<b>0.2</b> ℃	
ĸ	<b>1300.0</b> ℃	<b>0.0℃ ~ 1300.0℃</b>	<b>±3.0</b> ℃	<b>±7.5</b> ℃	<b>0.1</b> ℃	
		<b>1300.0℃ ~ 1372.0℃</b>		- note3)		
	200 0 %	<b>-210.0</b> ℃ ~ -200.0℃		- note3)		
J	-200.0 C ~	<b>-200.0</b> ℃ ~ -100.0℃	<b>±2.8</b> ℃	<b>±7.0</b> ℃	<b>0.2</b> ℃	
	1200.0 0	<b>-100.0℃ ~ 1200.0℃</b>	<b>±2.8</b> ℃	<b>±7.0</b> ℃	<b>0.1</b> ℃	
Ŧ	-200.0℃ ~	<b>-270.0℃ ~ -200.0℃</b>		- note3)		
1	<b>400.0</b> ℃	<b>-200.0℃ ~ 400.0℃</b>	<b>±1.2</b> ℃	±3.0℃	<b>0.1</b> ℃	
		<b>-50.0℃</b> ~ 0.0℃	- note3)			
R	0.0 C ~ 1700 0℃	<b>0.0℃ ~ 1700.0℃</b>	±3.5℃	<b>±8.5</b> ℃	<b>0.5</b> ℃	
	1700.00	<b>1700.0℃ ~ 1768.0℃</b>		- note3)		

Accuracy / Resolution are as follows according to ambient temperature

Note1) Total accuracy (normal temp.) = accuracy (normal temp.) + cold junction compensation accuracy =  $\pm$ (full scale X 0.2% + 1.0°C)

Cold junction compensation accuracy =  $\pm 1.0^{\circ}$ C

Note2) Temp. coefficient: ±100 ppm/°C

Note3) Measuring the temp. is available, but accuracy and resolution is not guaranteed.

(1) When ambient temp. is normal  $(25 \pm 5^{\circ}C)$ : within the  $\pm 0.2\%$  range of measurement temp.

(2) When ambient temp. is operating temp.  $(0 \sim 55 ^{\circ}C)$ : within the ±0.5% range of measurement temp.

Ex.) When K type thermocouple is used and ambient temperature is normal. In case of measuring 1000 °C temperature, output range of conversion data is

 $1000^{\circ}$  - [{1300 - (-200)} x 0.2 %] - 1 ~  $1000^{\circ}$  + [{1300 - (-200)} x 0.2 %] + 1 namely, 996.0 ~ 1004.0 [°C].

#### Note

- (1) For stabilization of measurement temperature, warming-up time more than 15 min. is necessary, after restart.
- (2) If ambient temperature changes rapidly, measurement temperature may change temporally. Keep the ambient temperature steady for stabilization of measuring temperature.
- (3) If wind of the cooling pan contacts with module directly in the panel, accuracy decreases. Do not contact with wind directly.

## 5.2.7 Conversion velocity

- (1) Conversion velocity per channel: 50ms/channel
- (2) Sequential process method The next channel is converted after conversion of one channel is completed. (Run/Stop of the respective channels can be set independently.)
- (3) Concept of conversion time

The conversion velocity of XBF-TC04S module is a cycle that the temperature (electromotive force) entered into terminal strip is converted into digital value and stored in internal memory.

Conversion time increase by a multiple of the no. of used channels

- $\therefore$  Conversion time = 50ms X no. of used channels
- Ex.) In case 3 channels is used: conversion time = 50ms X 3 = 150ms



## **5.3 Function**

#### **5.3.1 Disconnection detection function**

Thermocouple input module has a function to detect the disconnection and display it. That the module detects and displays disconnection means that the following cabling path would have partially bad connection, which requires taking measures

- (1) Disconnection occurs between a sensor used/compensating cable and module, LED(ALM) flickers every second and generates error code.
- (2) Disconnection can be detected by channels. However, it is available for the only channel(s) designated for operation. LED (ALM) is commonly used for every channel. It flickers in case even only one channel is disconnected.

Thermocouple connection status	Channel run	ALM LED status	Disconnection flag
Normal	Run	Off	Off
Normai	Stop	Off	Off
Thermocouple disconnection	Run	Flickering (1s)	On
	Stop	Off	Off

(3) In case disconnection occurs, disconnection flag of each channel will be turned on and in case disconnection is canceled, it will be turned off.

Disconnection flag	Contents
U0x.01.4	Ch. 0 disconnection
U0x.01.5	Ch. 1 disconnection
U0x.01.6	Ch. 2 disconnection
U0x.01.7	Ch. 3 disconnection

(4) When disconnection occurs, the min value among range is displayed.

Туре	Displayed temperature in case of disconnection
K type	-270.0 ℃
J type	-210.0 ℃
T type	<b>-270.0</b> ℃
R type	<b>-50.0</b> ℃

Туре	Displayed value in case of disconnection
0 ~ 100mV	
(XBF-TC04B)	U

## 5.3.2 Scaling function

Thermocouple input module has a function to scale value in user-defined range besides temperature display. The scope is classified into two types; 16 bits data type, -32768~32767 and 16 bits data type without mark, 0~65535. If a user selects one of these two types and sets the range, it displays the temperature through scaling operation.

Scaling data type	Scaling min. value	Scaling max. value
Signed value	-32768 ~ [Scaling max. value -1]	[Scaling min. value+1] ~ 32767
Unsigned value	0 ~ [Scaling max. value-1]	[Scaling min. value+1] ~ 65535

The following graph indicates relation between scaled value and temperature input.



Ex.) If scaling with mark is set with -2000 ~ 13000 and the temperature measured K type sensor is  $500.0^{\circ}$ C, the value scaled is as follows.

• Scaling conversion value = 
$$\frac{(13000 - (-2000))}{(1300 - (-200))}(500 - (-200)) + (-200) = 5000$$

## 5.3.3 Filter function

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By means of filter value (time constant 63.2%) setting temperature conversion of a designated channel, it operates and outputs as follows.

 $Filtered temp. value = \frac{(previously filtered temp. value \times filtere value_{ms}) + (presen input temp. value x 50_{ms} \times No.of channel used)}{Filter value_{ms} + (50_{ms} \times No.of channels used)}$ 

Filter constant setting range = 200 ~ 64000 [ms]



## 5.3.4 Average function

(1) Time average

It accumulates temperature conversion values of a selected channel and displays the average of the total sum in digital data.



Setting range of average time = 400 ~ 64000 [ms]

Frequency of average process for a preset time can be calculated as follows.

Average Process Frequency [times] =  $\frac{\text{Average time}_{ms}}{\text{No. of channel used} \times 50_{ms}}$ 

#### (2) Averaged frequency

It accumulates temperature conversion values of a selected channel as many as frequency and displays the average of the total sum in digital data.



Setting range of average frequency = 2 ~ 64000 [times] Average process interval of channel used can be calculated as follows

Average process interval[ms] = Average frequency × No. or channel used × 50[ms]

(3) Moving average

It accumulates temperature conversion values of a selected channel as many as set and displays the average of the total sum in digital data. In case of the moving average, it outputs average per scan.

Setting range of average number = 2 ~ 100



#### Remark

- (1) time/frequency average characteristically does not output temperature data every conversion time and instead, it keeps a feature to maintain the previous status until it reaches time/average frequency.
- (2) In case of moving average, it outputs the converted temperature as taking temperature history and average, which are entered previously, every conversion time, so it can obtain relatively faster data response than time/frequency average.
- (3) Filtering can be processed with one of the foresaid averaging functions simultaneously. If simultaneous process is selected, filtering would be processed first and it averages and output temperature value in digital value. At the moment, the digital data output (temperature) is displayed as the value gained after the final process.

#### 5.3.5 Max./Min. display

It displays maximum/minimum value of temperature conversion value of a selected channel for a selected section (a section allowed for max./min. search)



Status of command allowing/prohibiting max./min. search

## 5.4 Installation and Wiring

## 5.4.1 Installation environment

Although the device can be installed with high reliance regardless of installation environment, attention should be paid to the followings in order to secure the reliance and stability of the system.

#### (1) Environmental Conditions

- (a) Install on a water-proof and dust-proof control board.
- (b) Place free of continuous impact or vibration.
- (c) Place not directly exposed to direct sunrays.
- (d) Place where dew does not form due to rapid temperature change.
- (e) Place where ambient temperature is maintained between 0  $55\,^\circ$ C.

#### (2) Installation Construction

- (a) In case of screw hole processing or wiring construction, wiring dregs should not go into PLC.
- (b) Install on a position easy to access.
- (c) Should not install on the same panel which high voltage device is installed on.
- (d) It should be 50mm and longer distant from duct and modules.
- (e) Should ground in the environment where is not interrupted from noise.
- (f) Install not to contact with cooling pan in the panel
- (3) Cautions in handling

It describes caution in handling from unpacking module to installation.

- (a) Do not fall or apply excessive impact on it.
- (b) Never attempt to separate PCB from the case.
- (c) Make sure that any impurities including wiring dregs should not go into the upper part of module during wiring work.
- (d) Never attempt to attach or detach the module when it is turned on.

## 5.4.2 Wiring

- (1) Cautions in wiring
  - (a) Do not place AC power line close to the AUX signal line of the module. To avoid surge or induced noise occurring from AC, make sure to leave a proper space.
  - (b) Cable should be selected by considering ambient temperature and allowable current and the specification of cable should be as follows.

Cable specification				
Lower limit Upper limit				
0.18mm ² (AWG24)	1.5 mm² (AWG16)			

- (c) If cable is placed too close to any heating device or materials or if it directly contacts oil and similar materials for a long time, it may cause short-circuit, resulting in breakdown and malfunction.
- (d) Check the polarities during terminal strip wiring
- (e) Wiring with high voltage cable or power line may cause induction problem, causing malfunction or trouble.
- (f) External DC24V power should be same with power of XGB. If external DC24 V power of thermocouple input module is turned on/off while power of XGB main unit is on, temperature input value may have an error.
- (g) Thermocouple input module may use 4 types of thermocouple sensors. (K / J / T / R)

## (2) Terminal array

I

Terminal array of thermocouple input module is as follows.



(3) Wiring example

Thermocouple can be connected with module directly. If point where temperature is measured is far from the module, use the compensating cable to connect

(The compensating cables are different according to thermocouple type. For more information about the compensating cable, contact the producer of thermocouple.)



- 1) In case sensor and compensating cable are shielded, shield connection is possible to PLC PE terminal.
- 2) It is necessary to use extension terminal block of which material is kept at uniform temperature in order to reduce error.
- 3) Compensating cable should use the same type of sensor, which was used for measuring.

(4) Voltage (0~100mV) input wiring example



Input resistance of voltage input circuit is 1 M $\Omega$  (min.).

(5) Relationship between voltage input accuracy and wiring length In voltage input, the wiring (cable) length between transmitter or sensor and module has an effect on digital-converted values of the module as specified below;



Where,

Rc: Resistance value due to line resistance of cable Rs: Internal resistance value of transmitter or sensor Ri: Internal resistance value (1^{MQ}) of voltage input module Vin: Voltage allowed to analog input module % Vi: Tolerance of converted value (%) due to source and cable length in voltage input  $Vin = \frac{Ri \times Vs}{[Rs + (2 \times Rc) + Ri]}$ 

$$\% Vi = \left(1 - \frac{Vin}{Vs}\right) \times 100\%$$

## 5.5 Operation Setting and Monitor

#### 5.5.1 Operation Parameter Setting

Operation parameter of thermocouple input module can be set through [I/O Parameter] of XG5000.

#### (1) Setting items

For user convenience, parameter setting of thermocouple input module is provided by GUI (Graphical User Interface) method in the XG5000. The items which can be set through [I/O Parameter] in the project window are as follows.

Items	Content
	(a) Sets the following items for operation of module.
	1) Channel status (Disable / Enable)
	2) Sensor status (K / J / T / R)
	3) Filter constant
[I/O Parameter]	4) Average processing (Sampling / Time-Avr. / Count-Avr. / Moving-Avr.)
	5) Scaling data type (Bipolar / Unipolar)
	6) Scaling min./max. value
	(b) The parameter set by the user is saved in the flash memory of XGB main
	unit after download.

#### (2) How to use [I/O Parameter]

- (a) Execute the XG5000 and make the project. (For how to make the project, refer to the XG5000 user manual)
- (b) Double-click [I/O Parameter] on the project window.

Project Window 👻 🗙
Items
Example_XGB NewPLC(XGB-XBMS)-Offline Variable/Comment <p< td=""></p<>
■t Project

(c) If [I/O Parameter Setting] window shows, find slot of base where module is installed and click it.







(e) Select a module registered and click [Details] or double-click a module

I/O Parameter Setting						?	×
Module list							
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation	
00 : Default	0(main)						
	1	XBF-TCO4S (TC, 4-CH -		-		P00040 ~ P0007F	
02 : Default	2						
04 : Default	3						
05 : Default	4						
06 : Default	5						
07 : Default	6						
	7	1					
				R			
Delet	e Slot De	lete Base Base Setting	Delete All De	etails <u>P</u> r	rint 🔻	OK Cancel	

💼 🛱 Base 00 : Default	XBF-TC04S (TC, 4-CH)	_			?	× Out	Allocation
	XBF-TC04S (TC, 4-CH)						P00040 ~ P0007F
02 : Default	Parameter	CH 0	CH 1	CH 2	CH 3		
03 : Default	Channel status	Disable 🔽	Disable	Disable	Disable		
05 : Default	Sensor status	К	K	ĸ	к		
06 : Default	Temp. unit	Celsius	Celsius	Celsius	Celsius		
07 : Default	Filter constant	0	0	0	0		
	Average processing	Sampling	Sampling	Sampling	Sampling		
	Average value	0	0	0	0		
	Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar		
	Scaling min. value	-32768	-32768	-32768	-32768		
	Scaling max. value	32767	32767	32767	32767		
			_				
				ок	Cancel		

(f) Select the required settings in Parameter Settings and click [OK].

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(g) The initial values of each item are as figure shown below 1) Channel status (Disable / Enable)

XBF-TC04S (TC, 4-CH	)			?:
XBF-TC04S (TC, 4-CH)				
Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Disable 🗸 🗸	Disable	Disable	Disable
Sensor status	Disable	K	K	ĸ
🗌 Temp. unit	Enable	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	-32768	-32768	-32768	-32768
Scaling max. value	32767	32767	32767	32767
		[	ОК	Cancel

#### 2) Sensor status (K / J / T / R)

KBF-TC04S (TC, 4-CH)	)			?
XBF-TC04S (TC, 4-CH)				
Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Disable	Disable	Disable	Disable
Sensor status	K ·	₩ К	K	К
🗌 Temp. unit	К	Celsius	Celsius	Celsius
Filter constant	1,	0	0	0
Average processing	R	Sampling	y Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	-32768	-32768	-32768	-32768
Scaling max. value	32767	32767	32767	32767
			ОК	Cancel

#### 3) Temp. unit (Celsius / Fahrenheit)

BF-TC045 (TC, 4-CH)	)			?
XBF-TC04S (TC, 4-CH)				
Parameter	СНО	CH 1	CH 2	CH 3
📃 Channel status	Disable	Disable	Disable	Disable
Sensor status	K	К	K	к
📃 Temp. unit	Celsius 🗸 🗸	Celsius	Celsius	Celsius
Filter constant	Celsius	0	0	0
Average processing	Fahrenheit	Sampling	Sampling	Sampling
Average value	0	0	0	0
📃 Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	-32768	-32768	-32768	-32768
Scaling max, value	32767	32767	32767	32767

#### 4) Filter constant (0, 200 ~ 64000)

XBF-TC04S (TC, 4-CH)				?×
XBF-TC04S (TC, 4-CH)				
Parameter	CH 0	CH 1	CH 2	СН З
Channel status	Disable	Disable	Disable	Disable
Sensor status	к	К	ĸ	К
🗌 Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	-32768	-32768	-32768	-32768
Scaling max. value	32767	32767	32767	32767
0, 200~64000			ок	Cancel

#### 5) Average processing (Sampling / Time-Avr / Count-Avr / Moving-Avr)

Parameter	СНО	CH 1	CH 2	CH 3
Channel status	Disable	Disable	Disable	Disable
Sensor status	к	K	к	K
📃 Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling 🗸	Sampling	Sampling	Sampling
Average value	Sampling	0	0	0
📃 Scaling data type	Time-Avr Count-Aur	Bipolar	Bipolar	Bipolar
Scaling min. value	Moving-Avr	-32768	-32768	-32768
Scaling max. value	32767	32767	32767	32767

## 6) Scaling data type (Bipolar / Unipolar)

XBF-TC04S (TC, 4-CH)					
Parameter	CH 0		CH 1	CH 2	CH 3
📃 Channel status	Disabl	e	Disable	Disable	Disable
Sensor status	K		К	к	K
📃 Temp. unit	Celsiu	s	Celsius	Celsius	Celsius
Filter constant	0		0	0	0
Average processing	Samplir	ng	Sampling	Sampling	Sampling
Average value	0		0	0	0
📃 Scaling data type	Bipolar	~	Bipolar	Bipolar	Bipolar
Scaling min. value	Bipolar		-32768	-32768	-32768
Scaling max, value	Unipolar		32767	32767	32767

#### 7) Scaling min. value/scaling max. value

	_		
CH 0	CH 1	CH 2	CH 3
Disable	Disable	Disable	Disable
ĸ	ĸ	ĸ	К
Celsius	Celsius	Celsius	Celsius
0	0	0	0
Sampling	Sampling	Sampling	Sampling
0	0	0	0
Bipolar	Bipolar	Bipolar	Bipolar
-32768	-32768	-32768	-32768
32767	32767	32767	32767
	CH 0 Disable K Celsius 0 Sampling 0 Bipolar -32768 32767	CH 0 CH 1 Disable Disable K K Celsius Cetsius 0 0 Sampling Sampling 0 0 Bipolar Bipolar -32768 -32767	CH 0         CH 1         CH 2           Disable         Disable         Disable           Disable         Disable         Disable           K         K         K           Celsius         Celsius         Celsius           0         0         0           Sampling         Sampling         Sampling           0         0         0           Bipolar         Bipolar         Bipolar           -32768         -32768         -32767           32767         32767         32767

Scaling data type	Scaling min value	Scaling max value
With sign	-32768 ~ [scaling max value -1]	[scaling min value+1] ~ 32767
Without sign	0 ~ [scaling max value -1]	[scaling min value+1] ~ 65535

#### (h) Constant input

I

1) In case the user inputs numbers directly like filter constant, if the relevant parameter is selected, available range is displayed in the bottom.

BF-TC04S (TC, 4-CH)				?
XBF-TC04S (TC, 4-CH)				
Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Disable	Disable	Disable	Disable
Sensor status	K	K	K	K
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	þ	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	-32768	-32768	-32768	-32768
Scaling may value	32767	32767	32767	32767

2) If the number is out of range, error message is displayed. (If error information shows, it returns to previous status. Set again.)

? X XBF-TC04S (TC, 4-CH) Parameter CH 0 CH 1 CH 2 CH 3 Channel status Disable able Error info. Sensor status К 🔲 Temp. unit Celsius sius ⚠ Out of range. Enter again! Filter constant Π Sampling Average processing pling OK Average value 0 Scaling data type olar Bipolar -32768 -32768 -32768 -32768 Scaling min. value 32767 32767 32767 32767 Scaling max. value 0, 200~64000 ОK Cancel

3) If the wrong number is specified, it is displayed with red color. (When Average value or scaling min./max. value is out of range.)

BF-TC04S (TC, 4-CH)				
Parameter	CH O	CH 1	CH 2	CH 3
🗌 Channel status	Disable	Disable	Disable	Disable
Sensor status	К	ĸ	K	К
🗌 Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Time-Avr	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	-32768	-32768	-32768	-32768
Scaling max. value	32767	32767	32767	32767

#### 5.5.2 Special module monitoring function

While XG5000 is connected with PLC, through [Monitor] -> [Special Module Monitoring], the user can test the operation of the analog output module.

#### Remark

- 1) If system resource is short, the screen may not be displayed properly. In case of this, shut down other application program and restart the XG5000.
- 2) On the [Special Module Monitoring] status, I/O parameter is set temporarily to execute the test. So if [Special Module Monitoring] status ends, I/O parameter is not saved.
- By test function of [Special Module Monitoring], the user can check if analog module operates properly or not without any sequence program.
  - (1) How to use special module monitoring
    - (a) Start of [Special Module Monitoring]

While XG5000 is connected with PLC, start [Monitor] -> [Special Module Monitoring]. If that is not online status, [Special Module Monitoring] is not activated.



(b) How to use [Special Module Monitoring]

ſ

 Click [Monitor] -> [Special Module Monitoring] while XG5000 is connected with PLC basic unit. 'Special Module List' screen is displayed as shown below and displays information of base/slot with special module type. On the list dialog box, The modules currently equipped at the PLC are displayed.

Special Modul	le List		×
Base Base 0 Base 0 Base 0 Base 0	Slot	Module HSC Module (Open-Collector, 4-CH) Position Module (Open-Collector, 2-CH) XBF-TC04S (TC, 4-CH)	
K Module Info.	Monitor		>

2) Clicking [Module Info.] shows the information of special module.

S	pecial Module Infoma	tion ?×
	Displays the infom	nations of special module.
	ltem	Information
	Module Name	XBF-TC04S (TC, 4-CH)
	OS Ver	Ver. 1.0
	OS Update Date	2008-2-25
	Module Status	Normal. (0)
	J	
		ОК

3) Clicking [Monitor] shows the following screen.

Special Module Monitor		?×
XBF-TC04S (TC, 4-CH)		
Item	CH O	CH 1
Temperature value		
Scaling value		
Min. temp value		
Max. temp value		
Item	CH 2	CH 3
Temperature value		
Scaling value		
Min. temp value		
Max. temp value		
FLAG Monitor		FLAG Monitor
Item	Setting value	Current value
Channel	CH	0 🗸
Channel status	Disable	
Channel status Sensor type	Disable K	
Channel status Sensor type Temp. unit	Disable K Celsius	
Channel status Sensor type Temp. unit Filter constant	Disable K Celsius 0	
Channel status Sensor type Temp, unit Filter constant Average processing	Disable K Celsius O Sampling	
Channel status Sensor type Temp, unit Filter constant Average processing Average value	Disable K Celsius O Sampling O	
Channel status Sensor type Temp, unit Filter constant Average processing Average value Scaling data type	Disable K Celsius 0 Sampling 0 Bipolar	
Channel status Sensor type Temp. unit Filter constant Average processing Average value Scaling data type Scaling min. value	Disable K Celsius 0 Sampling 0 Bipolar -32768	
Channel status Sensor type Temp. unit Filter constant Average processing Average value Scaling dat type Scaling max. value	Disable K Celsius 0 Sampling 0 Bipolar -32768 32767	

4) [Start Monitoring]: [Start Monitoring] button will show you digital input data of the operating channel. The figure below is monitoring screen when all channels are Run status.



5) [Test]: [Test] is used to change the parameters of the Thermocouple input module. You can change the parameters when you click the values at the bottom of the screen. It is only available when XGB CPU unit's status is in [Stop].

Special Module Monitor								
XBF-TC04S (TC, 4-CH)								
Item	CH 0	CH 1						
Temperature value	278	0						
Scaling value	-22815	0						
Min. temp value	0	0						
Max. temp value	0	0						
Item	CH 2	CH 3						
Temperature value	0	0						
Scaling value	0	0						
Min. temp value	0	0						
Max. temp value	0	0						
FLAG Monitor		FLAG Monitor						
,								
Item	Setting value	Current value						
Channel	CH	10						
Channel status	Enable	Enable						
Sensor type	K	K						
Temp. unit	Celsius	Celsius						
Filter constant	0	0						
Average processing	Sampling	Sampling						
Average value	0	0						
Scaling data type	Bipolar	Bipolar						
Scaling min. value	-32768	-32768						
Scaling max. value	32767	32767						
J								
	Stop Monitoring	Test						
		Close						

[Test] execution screen

6) If [Flag Monitor] is selected on the [Special Module Monitor] window, [Temp. Measuring Module Command] screen can be monitored.



[Temp. Measuring Module Command] execution screen

7) [Temp. Measuring Module Command] screen

On the monitoring screen, Channel status (Run/Stop) and Sensor status (Normal/Disconnection) can be monitored.

On the flag command screen, Max/Min active (ENABLE/DISABLE) and cold junction compensation (ENABLE/DISABLE) can be specified.

Temp. Measuring Module Co	mmand	?	$\left  \times \right $	
XBF-TC04S (TC, 4-CH)			_	
Item	CHO	CH 1	$\mathbb{Z}$	
Channel status	Run	Stop		
Sensor status	Normal	Normal		
Item	CH 2	CH 3		— Monitoring screen
Channel status	Stop	Stop		_
Sensor status	Normal	Normal	2	
		1	-	
Command	СНО	CH 1		
Max/Min active	DISABLE	DISABLE		
RJC Active	ENABLE	ENABLE	ווכ	
Command	CH 2	СН 3	ĨI <b>↓</b>	—  Flag command screen
Max/Min active	DISABLE	DISABLE	7	
RJC Active	ENABLE	ENABLE	ונכ	
			~	
		Close		

8) [Close]: [Close] is used to escape from the monitoring/test screen. When the monitoring/test screen is closed, the max. value, the min. value and the present value will not be saved any more.

#### Remark

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[Test] function is only available when XGB CPU unit's status is in [Stop].

## 5.5.3 Register U devices (Special module variable)

Register the variables for each module referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

#### (1) Procedure

(a) Select the special module type in the [I/O Parameter Setting] window.

Dase UU . Derault	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
	0(main)	DC 24V INPUT/TR 0	<b>`</b>	3 Standard [ms]	Default	P00000 ~ P0003F
01: XBF-1C045 (1C, 4-C	1	XBF-TC04S (TC, 4-CH	,	-	-	P00040 ~ P0007F
03 : Default	2					
04 : Default	3					
05 : Default	 					
06 : Default	6					
	7					

(b) Double click 'Variable/Comment' from the project window.

KG5000 - [NewProgram]	
E Project Edit Eind/Replace View Online Monitor Debug Iools Window Help	- 8 ×
● 11. 4 46 46 46 9 8 9 9 2 2 2 4 9 6 × 4 4 5 7 7 4 4 5 7 8 4 4 5 7 4 4 5 7 4 4 5 7 4 4 5 7 4 5 7 4 5 7 4 5 7 4 5	8
▋▋\$\$ ④●⊗ \$\$\$\$ \$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$	
	⊇ 85%
Project Window v x	
ltems o	<b>^</b>
(Verable/Comment     (Ver	×
Project Variable/Comment	
PLC Type	ference $\lambda$ Us
NewPLC Offline Row 0, Column	19 Ove ;;;

(c) Select [Edit] – [Register U Device]. In case of XEC, select [Edit] - [Register special module variable]											
👒 XG5000 - [Variable/Con	nment]				_						
Project Edit Eind/Replace	<u>V</u> iew <u>O</u> nline M	Monitor <u>D</u> ebug <u>T</u> ools	<u>W</u> indow <u>H</u> elp			- 8 X					
D c≩ @ Ω Undo	Ctrl+Z	la se.	k 🖻 🖻 🗙 🔤	BX 3. X L	<b>M M W W A .</b> !! 🔿 🔿						
Redo	Ctrl+Y			we han	a a u ku e e l e						
K Cut	Ctrl+X										
Est 指指 Copy	Ctrl+C	i sF3 sF4 sF5 sF6 F1	8 \$7 🔳 📾 🖸	5 <b>2</b> 63 F 1		100%					
Project Windc	Del	View Variable	D View Device	🕅 View Flag							
Exan Select All	Ctrl+A	Variat	ole Type	Device	Comment	^					
	Ctrl+I	-									
□ [ 🕅 Delete Line	Ctrl+D	2									
Export Variable	es to Eile	4									
Register U Dev	ice	5									
Add EXTERNAL	Variable										
Move Item Up		8									
Move Item Dov	vn	9				~					
		<				>					
■t‡ Project		Variable/Com	iment 🔠	NewProgram							
PLC PLC Automatically registers comments in	Type Monitor 2 h the U Devices a	x sopula aberray	uit (Check Program	λFind 1λFind ine	2 ≿ Communication ≿ Cross Refer	ence \ Us					

Γ



#### (d) Click 'Yes'. The previous comment will be deleted.

#### (e) As shown below, the variables are registered.

🔩 XG5000 - [Variable/Comment]											
🕌 Project Edit Eind/Replace View Online M	Monitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow	Help	_ 8 ×								
D 2 6 8 5 6 4 8 8	🖬 🔊 🗠 🗶 🖿	8 ×	👬 👫 🐝 👬 🖓 🕺 📩 10								
¤ #   D O ⊗   <b>G</b> \\$   \$* \$* 6	×	<b></b>	10000 1000 1000 1000								
あおおおおちゃままなおおおおおおお ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●											
Project Window v 🗴											
ltems		ew Device	1								
	Variable	Type 🔻 Device	Comment								
NewPLC(XGB-XBMS)-Offline	101_CH0_ADJE	BIT U01.00.0	Temp. Measuring Module : CH0 Offset/(								
Variable/Comment	201_CH1_ADJE	BIT U01.00.1	Temp. Measuring Module : CH1 Offset/(								
⊡…Lt. Parameter	301_CH2_ADJE	BIT U01.00.2	Temp. Measuring Module : CH2 Offset/(								
j Dasic Farameter	4 _01_CH3_ADJE	BIT U01.00.3	Temp. Measuring Module : CH3 Offset/(								
	5 _01_EEPROME	BIT U01.00.D	Temp. Measuring Module : Offset/Gain								
🖃 🗟 Scan Program	6 _UI_WDI_ERR	BII UU1.00.E	Temp. Measuring Module : Module H/V								
NewProgram		BII UU1.00.F	Temp. Measuring Module : Module Rea								
		DII UU1.01.0	Temp. Measuring Module : CH0 Runnin								
		DII UU1.01.1	Temp. Measuring Module : CH1 Runnin								
	11 01 CH2 ACT	BIT U01.01.2	Temp. Measuring Module : CH2 Runnin								
		BIT 101.01.4	Temp. Measuring Module : CH0 Input F								
	12 _01_CH1_BOUT	BIT U01.01.4	Temp. Measuring Module : CH1 Input C								
	14 01 CH2 BOUT	BIT U01.01.6	Temp. Measuring Module : CH2 Input D								
	15 01 CH3 BOUT	BIT U01.01.7	Temp. Measuring Module : CH3 Input D								
	16 01 CH0 SETE	BIT U01 01 8	Temp Measuring Module : CH0 Setting								
	17 01 CH1 SETE	BIT U01.01.9	Temp. Measuring Module : CH1 Setting								
	18 01 CH2 SETE	BIT U01.01.A	Temp. Measuring Module : CH2 Setting								
		[-									
- G Project	🚆 Variable/Comment	NewProgram									
PLC Type	x										
e Monitori	le Window										
Hapitor 1 (Maritar 2)		book Brogram ) Find 1 ) Fi-	ad 2) Communication ) Cross Deference ) Us								
SIGN MONITOR I A MONITOR 2 A	E C P P Kesult / C	neck Program Arino I Arin	IN 2 V COMMUNICATION V CLOSS RELEVENCE V OS								
	NewPLC	Offline	View Variable Ove								

(2) Save variables

ſ

- (a) The contents of 'View Variable' can be saved as a text file.
- (b) Select [Edit] -> [Export to File].
- (c) The contents of 'View variable' are saved as a text file.

#### (3) View variables

(a) The example program of XG5000 is as shown below.

🔠 NewP	rogram									
<i>10</i> S0	U01.00.F	U01.01.0				MOV	U01.04	D0000	]	^
11		U01.01.1	 			MOV	U01.05	D0000	]	
12		U01.01.2			 	MOV	U01.06	D0000	]	
L3		U01.01.3			 	MOV	U01.07	D0000	]	
<i>L4</i> \$17					 			END	]	
15 <				Ш					1	× >.::

#### (b) Select [View] -> [Variables]. The devices are changed into variables.

🏛 NewProgram			- DX
	MOY	_01_CHO_TEMP DOOD	
11	MOV	_01_CH1_TEMP DOOD	
12	MOV	_01_CH2_TEMP D000	
L3	MOY	_01_CH3_TEMP DOOD	D
14 S17		EN	
<			۲

## (c) Select [View] -> [Devices/Variables]. Devices and variables are both displayed.

🔠 NewP	rogram									
10	U01.00.F	U01.01.0			M	OV	U01.04	D0000	T	~
SO	_01_RDY	_01_CHO_AC T					_01_CHO_TE MP		_	
L1		U01.01.1			м	OV	U01.05	D0000	1	
		_01_CH1_AC T					_01_CH1_TE MP			
12		U01.01.2			м	OV	U01.06	D0000	1	
		_O1_CH2_AC T					_01_CH2_TE MP			
L3		U01.01.3			м	OV	U01.07	D0000	1	
		_01_CH3_AC T					_01_CH3_TE MP		-	
14								END	1	
517									-	~
S										≥

001.00.0	001.01.0	MOV	U01.04	D0000
Temp.	Temp.		Temp.	
Measuring	Measuring		Measuring	
Module :	Module :		Module :	
Module	CH0		CH0 Temp.	
Ready	Running		Value	
	U01.01.1		1101.05	D.000
		MOV	UU1.05	D000
	Temp.		Temp.	
	Measuring		Measuring	
	Module :		Module :	
	CH1		CH1 Temp.	
	Running		Value	
	U01.01.2	MOV	U01.06	D000
	Terra		Temp	
	Measuring		Measuring	
	Module :		Module :	
	CH2		CH2 Temp.	
	Running		Value	
	U01.01.3		1101.07	0.000
		MOV	001.07	0000
	Temp.		Temp.	
	Measuring		Measuring	
	Module :		Module :	
	CH3		CH3 Temp.	
	Running		value	
				END
				- 240

## (d) Select [View] -> [Device/Comments]. Devices and comments are both displayed.

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## 5.6 Configuration and Function of Internal Memory

It describes the configuration and function of internal memory.

## 5.6.1 Data I/O area (U device)

Γ

(1) Data sent from module to XGB main unit (XGB PLC input
-----------------------------------------------------------

Device assignment	Туре	Comment	Content	R/W	Signal direction		
U0x.00.0	BIT	CH 0 offset/gain adjustment error		R			
U0x.00.1	BIT	CH 1 offset/gain adjustment error	gain adjustment error				
U0x.00.2	BIT	CH 2 offset/gain adjustment error	R				
U0x.00.3	BIT	CH 3 offset/gain adjustment error	normal	R			
U0x.00.D	BIT	Module offset/gain backup error		R	TC→CFU		
U0x.00.E	BIT	Module H/W error		R			
U0x.00.F	BIT	Module Ready	On: ready Off: not ready	R			
U0x.01.0	BIT	CH 0 running		R			
U0x.01.1	BIT	CH 1 running	Channel running	R			
U0x.01.2	BIT	CH 2 running	On: run, Off: stop	R			
U0x.01.3	BIT	CH 3 running		R			
U0x.01.4	BIT	CH 0 disconnection	Thermocouple	R			
U0x.01.5	BIT	CH 1 disconnection	sensor	R			
U0x.01.6	BIT	CH 2 disconnection	On: disconnection,	R	TC→CFU		
U0x.01.7	BIT	CH 3 disconnection	Off: normal	R			
U0x.01.8	BIT	CH 0 setting error		R			
U0x.01.9	BIT	CH 1 setting error	Parameter setting	R			
U0x.01.A	BIT	CH 2 setting error	Off: setting normal	R			
U0x.01.B	BIT	CH 3 setting error	• · · · • • • · · · · · · · · ·	R			
U0x.04	WORD	CH 0 temp. conversion value	Temp. conversion	R			
U0x.05	WORD	CH 1 temp. conversion value	value	R			
U0x.06	WORD	CH 2 temp. conversion value	(Measured	R			
U0x.07	WORD	CH 3 temp. conversion value	temp.x10)	R			
U0x.08	WORD	CH 0 scaling operation value	Range with sign:	R			
U0x.09	WORD	CH 1 scaling operation value	-32768~32767	R	TC→CPU		
U0x.10	WORD	CH 2 scaling operation value	Range without sign:	R			
U0x.11	WORD	CH 3 scaling operation value	0~65535	R			
U0x.12	WORD	CH 0 min. temp. conversion value		R			
U0x.13	WORD	CH 0 max. temp. conversion value	_	R			
U0x.14	WORD	CH 1 min. temp. conversion value	Tomp conversion	R			
U0x.15	WORD	CH 1 max. temp. conversion value	min /max	R	TC→CPU		
U0x.16	WORD	CH 2 min. temp. conversion value	accumulation	R	IC→CPU		
U0x.17	WORD	CH 2 max. temp. conversion value		R			
U0x.18	WORD	CH 3 min. temp. conversion value		R			
U0x.19	WORD	CH 3 max. temp. conversion value		R			

% 'x' means slot no. where module is installed.

Ex.) U02.04: no.2 slot channel 0 temp. conversion value (word)

## Chapter 5 Thermocouple Input (XBF-TC04S/TC04B)

Device assignment	Туре	Comment	Content	R/W	Signal direction
U0x.29.0	BIT	CH 0 max./min. searching Enable/Disable		R/W	
U0x.29.1	BIT	CH 1 max./min. searching Enable/Disable	Min./max. search	R/W	
U0x.29.2	BIT	CH 2 max./min. searching Enable/Disable	Off: disable	R/W	
U0x.29.3	BIT	CH 3 max./min. searching Enable/Disable		R/W	
U0x.29.8	BIT	CH 0 cold junction compensation Enable/Disable		R/W	CPU↔TC
U0x.29.9	BIT	CH 1 cold junction compensation Enable/Disable	Cold junction compensation	R/W	
U0x.29.A	BIT	CH 2 cold junction compensation Enable/Disable	On: enable Off: disable	R/W	
U0x.29.B	BIT	CH 3 cold junction compensation Enable/Disable		R/W	

(2) Command sent from XGB main unit to module (XGB PLC output area, read/write available)

% 'x' means slot no. where module is installed.

Ex.) U03.29.02: no.3 slot, CH 2 max./min. searching Enable/Disable (bit)

## (3) Data sent from module to XGB main unit (IEC type) (XGB PLC input area, read only)

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Device assignment	Туре	Comment	Content	R/W	Signal direction		
%UX0.x.0	BIT	CH 0 offset/gain adjustment error		R			
%UX0.x.1	BIT	CH 1 offset/gain adjustment error		R			
%UX0.x.2	BIT	CH 2 offset/gain adjustment error	On: error	R			
%UX0.x.3	BIT	CH 3 offset/gain adjustment error	Off: normal	R			
%UX0.x.13	BIT	Module offset/gain backup error		R	TC→CFU		
%UX0.x.14	BIT	Module H/W error		R			
%UX0.x.15	BIT	Module Ready	On: ready Off: not ready	R			
%UX0.x.16	BIT	CH 0 running		R			
%UX0.x.17	BIT	CH 1 running	Channel running	R			
%UX0.x.18	BIT	CH 2 running	On: run, Off: stop	R			
%UX0.x.19	BIT	CH 3 running		R			
%UX0.x.20	BIT	CH 0 disconnection	Thermocouple	R			
%UX0.x.21	BIT	CH 1 disconnection	sensor	R			
%UX0.x.22	BIT	CH 2 disconnection	On: disconnection,	R	TC→CPU		
%UX0.x.23	BIT	CH 3 disconnection	Off: normal	R			
%UX0.x.24	BIT	CH 0 setting error		R			
%UX0.x.25	BIT	CH 1 setting error	Parameter setting	R			
%UX0.x.26	BIT	CH 2 setting error	Off: setting normal	R			
%UX0.x.27	BIT	CH 3 setting error		R			
%UW0.x.4	WORD	CH 0 temp. conversion value	Town conversion	R			
%UW0.x.5	WORD	CH 1 temp. conversion value	value	R			
%UW0.x.6	WORD	CH 2 temp. conversion value	(Measured temp.x10)	R	IC→CPU		
%UW0.x.7	WORD	CH 3 temp. conversion value	(	R			
%UW0.x.8	WORD	CH 0 scaling operation value	Range with sign:	R			
%UW0.x.9	WORD	CH 1 scaling operation value	-32768~32767	R			
%UW0.x.10	WORD	CH 2 scaling operation value	Range without sign:	R			
%UW0.x.11	WORD	CH 3 scaling operation value	0~65535	R			
%UW0.x.12	WORD	CH 0 min. temp. conversion value		R			
%UW0.x.13	WORD	CH 0 max. temp. conversion value		R			
%UW0.x.14	WORD	CH 1 min. temp. conversion value	Town conversion	R			
%UW0.x.15	WORD	CH 1 max. temp. conversion value	min /max	R			
%UW0.x.16	WORD	CH 2 min. temp. conversion value	accumulation	R	IC→CPU		
%UW0.x.17	WORD	CH 2 max. temp. conversion value		R			
%UW0.x.18	WORD	CH 3 min. temp. conversion value		R			
%UW0.x.19	WORD	CH 3 max. temp. conversion value		R			

* 'x' means slot no. where module is installed.

Ex.) %UW0.2.4: no.2 slot channel 0 temp. conversion value (word)

## Chapter 5 Thermocouple Input (XBF-TC04S/TC04B)

Device assignment	Туре	Comment	Content	R/W	Signal direction
%UX0.x.464	BIT	CH 0 max./min. searching Enable/Disable		R/W	
%UX0.x.465	BIT	CH 1 max./min. searching Enable/Disable	Min./max. search	R/W	
%UX0.x.466	BIT	CH 2 max./min. searching Enable/Disable	Off: disable	R/W	
%UX0.x.467	BIT	CH 3 max./min. searching Enable/Disable		R/W	
%UX0.x.472	BIT	CH 0 cold junction compensation Enable/Disable		R/W	CPU↔TC
%UX0.x.473	BIT	CH 1 cold junction compensation Enable/Disable	Cold junction compensation	R/W	
%UX0.x.474	BIT	CH 2 cold junction compensation Enable/Disable	On: enable Off: disable	R/W	
%UX0.x.475	BIT	CH 3 cold junction compensation Enable/Disable		R/W	

(4) Command sent from XGB main unit (IEC type) to module (XGB PLC output area, read/write available)

* 'x' means slot no. where module is installed.

Ex.) %UX0.3.466: no.3 slot, CH 2 max./min. searching Enable/Disable (bit)

#### 5.6.2 How to set operation parameter

Operation parameter of thermocouple input module can be set by two methods.

(1) Setting operation parameters through [I/O parameter setting] window.



J01.00.F M0000	DUT		0	0.0000		h0001: Ch0 running
	PUI	1	U	D0000	1	h0002: Ch1 running
						h0004: Ch3 running
M0001	PUT	1	0	h0000	1	All channels stop
M0002	PUT	1	0	h000F	1	All channges run
M0003	PUT	1	1	h0000	1	Ch0 K type sensor
M0004	PUT	1	5	h0000	1	Celsius
M0005	PUT	1	10	h0001	1	Enable Ch0 time - Avr
M0006	PUT	1	14	400	1	Time-Avr value: 400ms
M0007	PUT	1	18	h0000	1	Bipolar
M0008	PUT	1	19	0	1	Ch0 scaling min, value
MOOO9				1		
	PUT	1	20	0	1	Ch.0 scaling max. value
					END	1

Γ

#### Remark How to use PUT instruction COMMAND PUT $\dashv$ $\vdash$ sl **S**1 S2 Ν COMMAND PUTP ΠP S1 S2 sl Ν С indicates PUT instruction. Γ [Area setting] Operand Description Data size sl Slot no. where special module is mounted WORD S1 Internal memory address of special module WORD S2 Device to save in special module WORD Ν WORD The number of data

## LSELECTRIC 5-40

(3) Writing operation parameters at setting area of thermocouple input module through program (IEC type, PUT function block is used)

٦

.1.15	sStop									EN MC	)VE ENO	-
_RDY	IIIChannel sRun						DVE		0	IN	ОЛТ	OperationT
	CHORun	EN ^{MO}	VE ENO		16#000f	- IN	OUT	OperationT ype				- ypc
	16#0001	- IN	OUT	OperationT - ype		_						
	CH1Run									- EN	)VE ENO	_
	CH2Run					EN	DVE ENO		16#0002	- IN	OUT	OperationT - ype
	CH3Run	EN MO	VE ENO		16#0004	- IN	OUT	OperationT ype				
	16#0008	- IN	OUT	OperationT - ype								
		INS PUT- REQ	WORD DONE			IN PUT REQ	ST7 WORD DONE			PUT REQ	st8 .Word Done	
	0	BASE	STAT		0	BASE	STAT		0	BASE	STAT	
	1	SLOT			1	SLOT			1	SLOT		
	0	MADD			1	MADD			5	- MADD R		
0	perationT ype	DATA			0	-DATA			0	-DATA		
		INS PUT_ REQ	T9 WORD DONE			IN: Put Req	ST10 WORD DONE			INS PUT- REQ	T11 WORD DONE	
	0	BASE	STAT		0	BASE	STAT		0	BASE	STAT	
	1	SLOT			1	SLOT			1	SLOT		
	10	MADD			14	MADD			18	-MADD R		
	1	DATA			400	DATA			0	-DATA		
		INS PUT_ REQ	T12 WORD DONE			IN PUT REQ	ST13 -WORD DONE					
	0	BASE	STAT		0	BASE	STAT					
	1	SLOT			1	SLOT						
	19	MADD			20	-MADD R						
	0	DATA			0	DATA						

## 5.6.3 Operation parameter setting area

Г

It describes operation parameter setting area of thermocouple input module.

Men	nory	Description	October	DAM	la starsting
Hex	Dec	Description	Setting value	R/W	Instruction
Полі	200.	Designate a channel to			
00 н	0	use	bit0:bit3, 0: stop, 1: run	R/W	
01 н	1	Set sensor type of CH 0			
02 н	2	Set sensor type of CH 1	K:0, J:1, T:2, R:3	DAA	
03 н	3	Set sensor type of CH 2	0~100 ™V:4 (XBF-TC04B)	R/VV	
04 н	4	Set sensor type of CH 3			
05	5	Designate temperature	bit0:bit3, 0: Celsius, 1:		
00 H	5	metric system	Fahrenheit	11/10	
06 н	6	Set CH 0 filter value			
07 н	7	Set CH 1 filter value	$0 \text{ or } 200 \approx 64000$	R/W	
08 н	8	Set CH 2 filter value		10,00	
09 н	9	Set CH 3 filter value			
	10	Set averaging method			
0/18	10	of CH 0			
0B H	11	Set averaging method	0: sampling		
		of CH 1	1: time average	R/W	
0С н	12	Set averaging method	2: count average		
		of CH 2			
0D н	13	Set averaging method			
		of CH 3			
0Е н	14	Set mean value of CH 0	Time everage: 400, 60000 mg		PUT/GET
0F н	15	Set mean value of CH 1	Count average: 2~64000 times	R/W	
10 н	16	Set mean value of CH 2	Moving average: 2~100		
11 н	17	Set mean value of CH 3	h:+0.h:+0		
12 н	18	Designate scaling type	0: signed, 1: unsigned	R/W	
12	10	Set min. value of CH 0			
тэн	19	scaling range			
14	20	Set max. value of CH 0			
14 H	20	scaling range			
15	21	Set min. value of CH 1			
10 1	21	scaling range	Min. value		
16 ⊔	22	Set max. value of CH 1	signed: -32768~[max1]		
1011		scaling range	unsigned: 0~[max1]	R/W	
17 _H	23	Set min. value of CH 2	Max. value	10,00	
	20	scaling range	signed: [Min.+1]~32767		
18 н	24	Set max. value of CH 2			
		scaling range			
19 н	25	Set min. value of CH 3			
	-	scaling range			
1А н	26	Set max. value of CH 3			
		scaling range			
1В н	27	Set error inf. Of CH0.	Setting error information (Flag)	R	GET

## Chapter 5 Thermocouple Input (XBF-TC04S/TC04B)

Men add	nory ress	Description	Setting value	R/W	Instruction
Hex.	Dec.				
1С н	28	Set error inf. Of CH1			
1D н	29	Set error inf. Of CH2			
1Е н	30	Set error inf. Of CH3			
		Cold junction			
1F н	31	compensation temp. of			
		CH0.			
		Cold junction			
20 н	32	compensation temp. of			
		CH1.	Measured value of cold junction	P	OFT
		Cold junction	compensation temp.	ĸ	GET
21 н	33	compensation temp. of			
		CH2.			
		Cold junction	1		
22 н	34	compensation temp. of			
		CH3.			
23 н ~3F н	35 ~63	System area (Offset gain storage area)	Read/Write unavailable	unavailable	-

# 

(1) If input value of memory address 00_H~1A_H(0~26) is out of range of setting value, U0x.01.8~U0x.01.B (setting error representation flag, in case of IEC type, %UX0.x.24~%UX0.x.27) are on and it acts as default setting value. Error information is displayed in 1B_H~1F_H(27~30) area.

(2) System area (Offset gain storage area) is area where Read/Write is unavailable.

If this area changes, malfunction or breakdown may occur.

#### (1) Designating Channel (Address 0)

- (a) Temperature conversion module Enable/Disable can be set to each channel.
- (b) By prohibiting a channel not to use from conversion, conversion interval by channels can be shortened.
- (c) If channel to use is not designated, every channel can not be used.
- (d) In case of using PUT instruction, temperature conversion module Enable/Disable are as follows.



BIT	Description
0	Stop
1	Operate

- (e) Vales set in B4 ~ B15 are ignored.
- (f) This area shows the same results with operation channel designation in I/O parameter setting window.

XBF-TC04S (TC, 4-CH)							
XBF-TC04S (TC, 4-CH)							
Parameter	CH 0	CH 1	CH 2	СН 3			
Channel status	Enable 🗸	Enable	Enable	Enable			
Sensor status	Disable	К	K	К			
🗌 Temp. unit	Enable	Celsius	Celsius	Celsius			
Filter constant	0	0	0	0			
Average processing	Sampling	Sampling	Sampling	Sampling			
Average value	0	0	0	0			
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar			
Scaling min. value	-32768	-32768	-32768	-32768			
Scaling max. value	32767	32767	32767	32767			
		ſ	ок	Cancel			

- (2) Sensor Type Setting Area (Address 1~4)
  - (a) Thermocouple sensor type can be set per channel.
  - (b) In case of using PUT instruction, Sensor Type Setting Area is as follows.

	B15	B14	B13	B12	Bt11	B10	B3	B8	В/	86	B2	B4	B3	B2	B1	B0
Address "1"						С	H0 se	ensor	type	settir	ng					
Address "2"						С	H1 se	ensor	type	settir	ng					
Address "3"						С	H2 se	ensor	type	settir	ng					
Address "4"						С	H3 se	ensor	type	settir	ng					

Word	Description
0	K type
1	J type
2	T type
3	R type
4	0~100mV (XBF-TC04B)

(c) When input value is larger than 4, 0 (K type) is selected by force.

But, U0x.01.8~ U0x.01.B (setting error representation, in case of IEC type, %UX0.x.24 ~ %UX0.x.27) are on, error information is displayed at bit 0 of address 27~30.
(d) This area shows the same results with sensor type designation in I/O parameter setting window.

XBF-T	XBF-TC04S (TC, 4-CH)									
XBF-T	C04S (TC, 4-CH)									
	Parameter	Cł	10	Т	CH 1	CH 2	CH 3			
	Channel status	Dis	able		Enable	Enable	Enable			
	Sensor status	К	-	1	K	K	K			
	📃 Temp. unit	К			Celsius	Celsius	Celsius			
	Filter constant	J			0	0	0			
	Average processing	Ŕ			Sampling	Sampling	Sampling			
	Average value		)		0	0	0			
	Scaling data type	Bip	olar	1	Bipolar	Bipolar	Bipolar			
S	caling min. value	-32	768	1	-32768	-32768	-32768			
S	caling max. value	32	767	1	32767	32767	32767			
		•				ок	Cancel			

- (3) Temp. unit setting area (Address 5)
  - (a) Temp. unit (Celsius/ Fahrenheit) of thermocouple input module can be set per channel.(b) In case of PUT instruction, Temp. unit setting area is as follows.

	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Address "5"													С	С	С	С
	—	—	—	—	—	—	—	—	—	—	—	—	н	н	н	н
													3	2	1	0
												· · · · ·	\			
		E	Bit						D	esc	ripti	on				
			0							Ce	sius	;				
			1						F	ahr	enhe	əit				

- (c) Vales set in B4 ~ B15 are ignored.
- (d) This area shows the same results with temp. unit setting in I/O parameter setting window.

Parameter	CH 0		CH 1	CH 2	CH 3
📃 Channel status	Disable		Enable	Enable	Enable
Sensor status	ĸ		K	K	К
📃 Temp. unit	Celsius	~	Celsius	Celsius	Celsius
Filter constant	Celsius		0	0	0
Average processing	Fahrenheit		Sampling	Sampling	Sampling
Average value	0		0	0	0
📃 Scaling data type	Bipolar		Bipolar	Bipolar	Bipolar
Scaling min. value	-32768		-32768	-32768	-32768
Scaling max. value	32767		32767	32767	32767

- (4) Filter constant setting area (Address 6~9)
  - (a) Filter constant can be set per channel.
  - (b) Filter constant ranges 0 or 200 ~ 64000.
  - (c) If filter constant is set as 0, filtering process is not executed.
  - (d) When input is 1~199 or larger than 6400, 0 (filter disable) is selected by force.
    - But, U0x.01.8~ U0x.01.B (setting error representation, in case of IEC type, %UX0.x.24 ~ %UX0.x.27) are on, error information is displayed at bit 1 of address 27~30.
  - (e) In case of PUT instruction, filter constant setting address is as follows.

	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Address "6"				CHO	) filte	er co	nsta	nt se	etting	g (0,	200	~64(	000)			
Address "7"				CH1	l filte	er co	nsta	nt se	etting	g (0,	200	~64(	000)			
Address "8"				CH2	2 filte	er co	nsta	nt se	etting	g (0,	200	~64(	000)			
Address "9"				CH3	3 filte	er co	nsta	nt se	etting	<b>y (</b> 0,	200	~64(	000)			

(f) This area shows the same results with filter constant setting in I/O parameter setting window.

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Disable	Enable	Enable	Enable
Sensor status	K	ĸ	ĸ	K
📃 Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	-32768	-32768	-32768	-32768
Scaling max, value	32767	32767	32767	32767

- (5) Average processing setting area (Address 10~13)
  - (a) Average processing method can be set per channel.
  - (b) Average processing method (Sampling: 0 / time-avr.: 1 / count-avr.: 2 / moving-avr.: 3)
  - (c) When input is larger than 4, 0 (sampling) is set by force.
  - But, U0x.01.8~ U0x.01.B (setting error representation, in case of IEC type, %UX0.x.24~%UX0.x.27) are on, error information is displayed at bit 2 of address 27~30.
    (d) In case of PUT instruction, average processing setting method is as follows.

	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Address "10"					CH	# ave	erag	e pro	oces	sing	met	thod	setti	ing		
Address "11"					0: 5	Samp	bling	rogo								
Address "12"					1. 1 2: C	Coun	t-ave	erag	e							
Address "13"					3: N	/lovir	ng-a	vera	ge							

(e) This area shows the same results with average processing method setting in I/O parameter setting window.

XBF-TC04S (TC, 4-CH)									
XBF-TC04S (TC, 4-CH)									
Parameter	CH 0		CH 1	CH 2	CH 3				
Channel status	Disable		Enable	Enable	Enable				
Sensor status	K		К	К	ĸ				
Temp. unit	Celsius		Celsius	Celsius	Celsius				
Filter constant	0		0	0	0				
Average processing	Sampling	*	Sampling	Sampling	Sampling				
Average value	Sampling		0	0	0				
Scaling data type	Time-Avr		Bipolar	Bipolar	Bipolar				
Scaling min. value	Moving-Avr		-32768	-32768	-32768				
Scaling max. value	32767		32767	32767	32767				
				ок	Cancel				

- (6) Average value setting area (Address 14~17)
  - (a) Average value can be set per channel.
  - (b) In case average processing method is sampling, values of this area are ignored.
  - (c) In case of using PUT instruction, average value setting address is as follows.

	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	
4.11																	

Address "14"	CH# average value setting
Address "15"	Time-average: 400 ~ 64000[ms]
Address "16"	Count-average: 2 ~ 64000[times]
Address "17"	Moving-average: 2 ~ 100

(d) When input is out of range, the min. value of each address is selected by force.

But, U0x.01.8~ U0x.01.B (setting error representation, in case of IEC type, %UX0.x.24 ~ %UX0.x.27) are on, error information is displayed at bit 3~5 of address 27~30.

(Bit 3: time-average, bit 4: count-average, bit 5: moving-average)

Ex.) When selecting the Time-average and setting average value as 200, 400ms is selected in address "14" by force.

(e) This area shows the same results with average value setting in I/O parameter setting window. In the I/O parameter setting window, prohibition function is provided not to set value that is out of range. (In case of setting value that is out of range, that values are displayed with red color and error message is displayed.)

F-TC04S (TC, 4-CH)				?
F-TC04S (TC, 4-CH)				
Parameter	CH O	CH 1	CH 2	CH 3
Channel status	Disable	Enable	Enable	Enable
Sensor status	K	ĸ	ĸ	К
	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Time-Avr	Sampling	Sampling	Sampling
Averane value	500	0	0	0
Scaling data tune	Bipolar	Bipolar	Binolar	Binolar
Scaling min_value	-32768	-32768	-32768	-32768
Scaling max, value	32767	32767	32767	32767
	L			
0~64000			ОК	Cancel
Count-Avr				
-TC04S (TC, 4-CH)				<u>ا</u>
		_	_	
F-TC04S (TC, 4-CH)				
Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Disable	Enable	Enable	Enable
Sensor status	ĸ	K	К.	K
	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Count-Avr	Sampling	Sampling	Sampling
Average value	500	0 company	n n	0 annpan ng
Scaling data tupe	Bipolar	Bipolar	Bipolar	Ripolar
Scaling min_value	.32769	.32769	-32769	.32769
Scaling min. value	32767	32767	32767	32767
Scaing max. value	52/0/	32707	32707	52/6/
4000			ОК	Cancel
Moving-A	/r			
				ſ
-10043 (10, 4-01)		_		L
-TC04S (TC, 4-CH)				
Devenuelas	CH 0	CH 1	CH 2	CH 3
Falallieter				
Channel status	Disable	Enable	Enable	Enable
Channel status Sensor status	Disable K	Enable K	Enable K	Enable K
Channel status     Sensor status     Temp. unit	Disable K Celsius	Enable K Celsius	Enable K Celsius	Enable K Celsius
Channel status Sensor status Temp. unit Filter constant	Disable K Celsius 0	Enable K Celsius O	Enable K Celsius O	Enable K Celsius O
Channel status     Sensor status     Temp. unit     Filter constant     Average processing	Disable K Celsius O Moving-Avr	Enable K Celsius O Sampling	Enable K Celsius 0 Sampling	Enable K Celsius O Sampling
Channel status     Channel status     Sensor status     Temp. unit     Filter constant     Average processing     Average value	Disable K Celsius 0 Moving-Avr 50	Enable K Celsius O Sampling O	Enable K Celsius O Sampling O	Enable K Celsius O Sampling O
Average value     Scaling data type	Disable K Celsius 0 Moving-Avr 50 Bipolar	Enable K Celsius O Sampling O Bipolar	Enable K Celsius O Sampling O Bipolar	Enable K Celsius O Sampling O Bipolar
Channel status     Channel status     Sensor status     Temp. unit     Filter constant     Average processing     Average value     Scaling data type     Scaling min. value	Disable K Celsius 0 Moving:Avr 50 Bipolar -32768	Enable K Celsius 0 Sampling 0 Bipolar -32768	Enable K Celsius 0 Sampling 0 Bipolar -32768	Enable K Celsius O Sampling O Bipolar -32768
Channel status     Channel status     Sensor status     Temp. unit     Filter constant     Average processing     Average value     Scaling data type     Scaling min. value     Scaling max, value	Disable K Celsius 0 Moving-Avr 50 Bipolar -32768 32767	Enable K Celsius 0 Sampling 0 Bipolar -32768 32767	Enable K Celsius 0 Sampling 0 Bipolar -32768 32767	Enable K Celsius 0 Sampling 0 Bipolar -32768 32767
Channel status     Channel status     Channel status     Temp. unit     Filter constant     Average processing     Average value     Scaling data type     Scaling min. value     Scaling max. value	Disable K Celsius 0 Moving-Avr 50 Bipolar -32768 32767	Enable K Celsius 0 Sampling 0 Bipolar -32768 32767	Enable K Celsius 0 Sampling 0 Bipolar -32768 32767	Enable K Celsius 0 Sampling 0 Bipolar -32768 32767

(7) Scaling data type setting area (address 18)

Address "0"

- (a) Scaling data type can set per channel.
- (b) There are two type of scaling operation output, unsigned 16 bit (0~65535) or signed 16 bit (-32768~32768).
- (c) In case of using PUT instruction, scaling data type setting address is as follows.

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
_	_	_	_	_	_	_	_	_	_	_	_	С Н З	C H 2	C H 1	С Н 0
												١			
														V	

Bit	Description
0	Signed integer
1	Unsigned integer

- (d) Values set in B4~15 are ignored.
- (e) This area shows the same results with Scaling data type setting in I/O parameter setting window.

XBF-TC04S (TC, 4-CH	)			?×
XBF-TC04S (TC, 4-CH)				
Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Disable	Enable	e Enable	Enable
Sensor status	K	К	K	K
Temp. unit	Celsius	Celsius	s Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Moving-Avr	Samplin	ig Sampling	Sampling
Average value	50	0	0	0
📃 Scaling data type	Bipolar 🔹	<ul> <li>Bipolar</li> </ul>	r Bipolar	Bipolar
Scaling min. value	Bipolar	-32768	-32768	-32768
Scaling max. value	Unipolar	32767	32767	32767
	-			
			ОК	Cancel

- (8) Scaling min./max. value setting area (Address 19~26)
  - (a) Scaling min./max. value can be set per channel.
  - (b) There are two type of scaling operation output, unsigned 16 bit (0~65535) or signed 16 bit (-32768~32767).
  - (c) In case of using PUT instruction, scaling min./max. value setting address is as follows.

	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Address "19"		~			,		. 1									
Address "20"		CH# 1) w	sca ith si	ling r an	nin./I	max. ∧	vaiu 1in	e -3276	<u> </u>	[Sca	lina i	max	valu	e-11		
Address "21"		.,		9.1		N	lax.:	[Sca	ling ı	min.	value	∋+1]-	-327	67 67		
Address "22"		2) w	ithou	ıt sig	n	N	lin.: (	) ~ [S	Scalii	ng m	ax. v		-1] 6553	25		
Address "23"		CH0	: mir	n. ad	dress	vi s 19 /	max	(Sca k. add	dress	5 20	alue	+1]~	0000	50		
Address "24"		CH1	: mir	n. ad	dress	s 21 /	max	k. ad	dress	s 22						
Address "25"		CH2	: mir	n. ad	dress	s 23 /	/ max	k. ad	dress	s 24						
Address "26"		СПЗ		i. au	ules	5 20 /	max	k. au	uless	5 20						

(d) If input is out of range, it keeps previous value.

But, U0x.01.8~ U0x.01.B (setting error representation, in case of IEC type, %UX0.x.24~%UX0.x.27) are on, error information is displayed at bit 6 of address 27~30.

(e) This area shows the same results with Scaling min./max. value setting in I/O parameter setting window.

CH O	CH 1	CH 2	CH 3
Disable	Enable	Enable	Enable
K	к	ĸ	к
Celsius	Celsius	Celsius	Celsius
0	0	0	0
Moving-Avr	Sampling	Sampling	Sampling
50	0	0	0
Bipolar	Bipolar	Bipolar	Bipolar
-32768	-32768	-32768	-32768
32767	32767	32767	32767
	CH 0 Disable K Celsius 0 Moving-Avr 50 Bipolar -32768 32767	CH 0         CH 1           Disable         Enable           K         K           Celsius         Celsius           0         0           Moving-Avr         Sampling           50         0           Bipolar         Bipolar           -32768         -32767	CH 0         CH 1         CH 2           Disable         Enable         Enable           K         K         K           Celsius         Celsius         Celsius           0         0         0           Moving-Avr         Sampling         Sampling           50         0         0           Bipolar         Bipolar         Bipolar           -32768         -32768         -32767

Scaling data type	Scaling min. value	Scaling max. value
Signed	-32768 ~ [Scaling max. value -1]	[Scaling min. value+1] ~ 32767
Unsigned	0 ~ [Scaling max. value-1]	[Scaling min. value+1] ~ 65535

- (9) Setting error information area (address 27~30)
  - (a) If there is error when setting parameter (address 1~26), error information is displayed at address 27~30 per channel.
  - (b) In case of GET instruction, setting error information address is as follows.

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
					CHO	) setti	ng er	ror inf	forma	tion					
					CH1	setti	ng er	ror inf	forma	tion					
					CH2	2 setti	ng er	ror inf	forma	tion					
					CH3	3 setti	ng er	ror inf	forma	tion					
	B15	B15 B14	B15 B14 B13	B15 B14 B13 B12	B15 B14 B13 B12 B11	B15 B14 B13 B12 B11 B10 CH0 CH1 CH2 CH2 CH3	B15         B14         B13         B12         B11         B10         B9           CH0 setti           CH1 setti           CH2 setti           CH2 setti           CH3 setti	B15 B14 B13 B12 B11 B10 B9 B8 CH0 setting er CH1 setting er CH2 setting er CH3 setting er	B15       B14       B13       B12       B11       B10       B9       B8       B7         CH0 setting error int         CH1 setting error int         CH2 setting error int         CH2 setting error int         CH3 setting error int	B15       B14       B13       B12       B11       B10       B9       B8       B7       B6         CH0 setting error informa         CH1 setting error informa         CH2 setting error informa         CH2 setting error informa         CH3 setting error informa	B15       B14       B13       B12       B11       B10       B9       B8       B7       B6       B5         CH0 setting error information         CH1 setting error information         CH2 setting error information         CH3 setting error information	B15       B14       B13       B12       B11       B10       B9       B8       B7       B6       B5       B4         CH0 setting error information         CH1 setting error information         CH2 setting error information         CH2 setting error information         CH3 setting error information	B15       B14       B13       B12       B11       B10       B9       B8       B7       B6       B5       B4       B3         CH0 setting error information         CH1 setting error information         CH2 setting error information         CH2 setting error information         CH3 setting error information	B15       B14       B13       B12       B11       B10       B9       B8       B7       B6       B5       B4       B3       B2         CH0 setting error information         CH1 setting error information         CH2 setting error information         CH2 setting error information         CH3 setting error information	B15       B14       B13       B12       B11       B10       B9       B8       B7       B6       B5       B4       B3       B2       B1         CH0 setting error information         CH1 setting error information         CH2 setting error information         CH2 setting error information         CH3 setting error information

Bit	Description	Related add	memory ress
		Hex.	Dec.
Bit0	Sensor type (Off: normal, On: error)	01н~04н	1~4
Bit1	Filter constant (Off: normal, On: error)	06н~09н	6~9
Bit2	Average processing method (Off: normal, On: error)	0Ан~0Dн	10~13
Bit3	Time-average value (Off: normal, On: error)		
Bit4	Count-average value (Off: normal, On: error))	0Ен~11н	14~17
Bit5	Moving-average value (Off: normal, On: error)		
Bit6	Scaling range (Off: normal, On: error)	13н~1Ан	19~26

- (c) In case there is error, setting error representation flag (U0x.01.8 ~ U0x.01.B, in case of IEC type, %UX0.x.24 ~ %UX0.x.27) will be on, it acts as default value.
  - If setting error representation flag (U0x.01.8 ~ U0x.01.B) is on, check error information  $1B_H \sim 1F_H$  (27~30) area and solve the error.

(10) Cold junction compensation temp. area (Address 31~34)

Γ

(a) Cold junction compensation temp. can be seen per channel.

(b) In case of GET instruction, cold junction compensation temp. area is as follows.

	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Address "31"				С	:H0 d	cold j	unct	ion c	omp	ensa	ation	temp	Э.			
Address "32"				С	:H1 (	cold j	unct	ion c	omp	ensa	ation	temp	Э.			
Address "33"				С	H2 (	cold j	unct	ion c	omp	ensa	ation	temp	Э.			
Address "34"				С	H3 (	cold j	unct	ion c	omp	ensa	ation	temp	Э.			

(11) System area (offset gain storage area: address 35~63)(a) In the system area, Read/Write is unavailable.

A Coution	If the user changes this area, it may cause malfunction or breakdown.
	So do not handle this area.

# 5.7 Example Program

- (1) It describes how to set operation parameter in the internal memory of thermocouple module.
- (2) Regarding the initial condition, the initial settings are saved in the internal memory of thermocouple module if saved once.
- (3) The following is program example that reads the temp. value of thermocouple input module of slot 1 and check whether disconnection occurs or not.

# 5.7.1 Example using [I/O Parameter]

#### (1) I/O parameter setting window

🗆 🎁 Base 00 · Default		ilot b	dadula	Commont	Input Filter	Emorgonou Out	Allocation
		not n nain) DC 24V/IN		Comment	3 Standard Ims	Default	P00000 ~ P01
4 01 : XBF-TC04S	(TC, 4-C	1 XBF-TCO	4S (TC, 4-CH		· · ·	, Dordan	P00040 ~ P0
2 : Default		2					
03 : Default		3					
04 : Default		4					
06 : Default		5					
07 : Default		6					
		/					
	>						
	Delete Slot	Delete Base	Base Setting	Delete All	Details <u>P</u>	rint 🔻	ок с
BF-TC04S (TC, 4-CH)	Delete Slot	Delete Base	Base Setting	Delete Al	Details <u>P</u>	rint 🔻	ок
IBF-TC04S (TC, 4-CH) XBF-TC04S (TC, 4-CH) Parameter	CH 0	CH 1	Base Setting	CH 3	Details <u>P</u>	int 🔻	ОК С
IBF-TC04S (TC, 4-CH) XBF-TC04S (TC, 4-CH) Parameter	CH 0 Enable	CH 1	Base Setting	CH 3	Details P	nint 🔻	ОК
BF-TC04S (TC, 4-CH) XBF-TC04S (TC, 4-CH) Parameter Charmel status Sensor status	CH 0 Enable	CH 1 Disable	Base Setting CH 2 Disable K	CH 3 K	Details P	rint 🔻	OK C
BF-TC04S (TC, 4-CH) ABF-TC04S (TC, 4-CH) Parameter Channel status Sensor status Temp, unit	CH 0 Enable K Celsius	CH 1 Disable K Celsius	Base Setting CH 2 Disable K Celsius	CH 3 CH 3 Disable V K Celsius	Details P	tint V	ок с
BF-TC04S (TC, 4-CH) Parameter Channel status Sensor status Temp. unit Filter constant	CH 0 Enable K Celsius 0	CH 1 Disable K Celsius O	Base Setting CH 2 Disable K Celsius 0	CH 3 CH 3 Disable M K Celsius 0	Details P	rint V	ок с
BF-TC04S (TC, 4-CH) XBF-TC04S (TC, 4-CH) Parameter Channel status Sensor status Temp. unit Filter constant Average processing	CH 0 Enable K Celsius 0 Sampling	CH 1 Disable K Celsius O Sampling	Base Setting CH 2 Disable K Celsius 0 Sampling	Delete All  CH 3  Disable K  Celsius 0 Sampling	Details E	rint V	ок с
BF-TCO4S (TC, 4-CH) Parameter Channel status Sensor status Temp. unit Filter constant Average processing Average value	Delete Slot CH 0 Enable K Celsius 0 Sampling 0	CH 1 Disable K Celsius 0 Sampling 0	Base Setting CH 2 Disable K Celsius 0 Sampling 0	CH 3 CH 3 Disable K Celsius 0 Sampling 0	Details <u>P</u>	int V	ок с
BF-TC04S (TC, 4-CH) Parameter Channel status Sensor status Temp. unit Filter constant Average processing Average value Scaling data type	Delete Slot CH 0 Enable K Cetsius 0 Sampling 0 Bipolar	CH 1 Disable K Celsius 0 Sampling 0 Bipolar	Base Setting CH 2 Disable K Celsius 0 Sampling 0 Bipolar	Delete All CH 3 Disable W K Celsius 0 Sampling 0 Bipolar	Details <u>P</u>	int V	ок с
BF-TCO4S (TC, 4-CH) Parameter Channel status Sensor status Fifter constant Average processing Average value Scaling diat type Scaling min. value	Delete Slot CH 0 Enable K Celsius 0 Sampling 0 Bipolar -32768	CH 1 Disable K Celsius 0 Sampling 0 Bipolar -32768	Ease Setting CH 2 Disable K Celsius 0 Sampling 0 Bipolar -32768	Delete All  CH 3  CH 3  Disable  K  Celsius  0  Sampling  0  Bipolar -32768	Details <u>P</u>	int V	OK C
BF-TC04S (TC, 4-CH) XBF-TC04S (TC, 4-CH) Parameter Channel status Sensor status Temp. unit Filter constant Average processing Average value Scaling data type Scaling max. value	CH 0 Enable K Celsus 0 Sampling 0 Bipolar -32768 32767	CH 1 Disable K Cetsius 0 Sampling 0 Bipolar -32768 32767	Base Setting CH 2 Disable K Celsius 0 Sampling 0 Bipolar -32768 32767	Delete All CH 3 CH 3 Disable K Celsius 0 Sampling 0 Bipolar -32768 32767	Details E	int <b>V</b>	οκ ο

#### (2) Program example

U01.00.F U0	D1.00.0 	U01.00.E  /  _01_WDT_ER R	U01.01.0 	U01.01.8  /  _01_CH0_SE TERR				M0000
M0000						MOY	U01.04	D0000
							_01_CHO_TE MP	
U01.01.4								M0001
_01_CH0_B0								
01								END

(a) If module is under normal operation, M0000 is on.

- U01.00.F(module Ready) = On
- U01.00.0(CH0 offset/gain adjustment error) = Off
- U01.00.E(module H/W error) = Off
- U01.00.E(CH0 running) = On
- (b) If M0000 is on, temp. conversion value (U01.04) of CH0 moves to D0000.
- (c) If disconnection error occurs at CH0, U01.01.4 (CH0 disconnection) is on and M0001 bit is set.

XUX0.1.15	%UX0.1.0	%UX0.1.14	%UXO.1.16	%UX0.1.24			start
Temp. Measuring Module : Module Ready	Temp. Measuring Module : CHO Offset/Gai n Error	Temp. Measuring Module : Module H/W Error	Temp. Measuring Module : CHO Running	Temp. Measuring Module : CHO Setting Error			 
start	EN ENO						
XUWO.1.4 Temp. Measuring Module : CHO Temp. Value	- IN OUT	CHOTempDat - a					
XUX0.1.20 Temp. Measuring Module : CHO Input Disconnect					 	 	 CHODisconn ectionErro r (S)

#### (3) Program example (in case of IEC type)

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(a) If module is running normally, operation start bit is on

%UX0.1.15 (Module Ready) = On

%UX0.1.0 (CH 0 offset/gain adjustment error) = Off

%UX0.1.14 (Module H/W error) = Off

- %UX0.1.16 (CH 0 running) = On
- %UX0.1.24 (Setting error) = Off
- (b) If operation start bit is on, it moves CH 0 temp. conversion value (%UW0.1.4) into CH 0 temp. data
- (c) If CH 0 disconnection error occurs, %UX0.1.20 (CH0 disconnection) is on and CH 0 disconnection error bit is set

# 5.7.2 Program example using PUT/GET instruction

F009B				[	PUT	1	0	h0001	1
_10N							_		
U01.00.F	U01.00.0	U01.00.E	U01.01.0	U01.01.8					M0000
_01_RDY	_01_CHO_AD JERR	_01_WDT_ER R	_01_CHO_AC	_01_CHO_SE TERR					
110000								278	278
							MOV	U01.04	D0000
								_01_CHO_TE MP	
U01.01.4									M0001
.01_CHO_BO									(3)
40000								0	
					GET	1	27	D0001	1
									END

(a) It writes h0001 at address 0 of slot 1 in order to enable CH0.

- (b) If module is under normal operation, M0000 is on.
  - U01.00.F(module Ready) = On U01.00.0(CH0 offset/gain adjustment error) = Off
  - U01.00.E(module H/W error) = Off
  - U01.00.E(CH0 running) = On
- (c) If M0000 is on, temp. conversion value of CH0 moves to D0000.
  - Current temp. conversion value, 278(27.8°C2) is saving in U01.04.
- (d) If disconnection error occurs at CH0, U01.01.4 (CH0 disconnection) is on and M0001 bit is set.
- (e) If M0000 is on, setting error (address 27) of CH0 moves to D0001. Since setting error (address 27) of CH0 is 0, there is no setting error.

(2) Program example (in case of IEC type)

					INST14	
%FX155						
1 scan ON	INST15					
start	GET_WORD REQ DONE -			0	BASE STAT	
0	BASE STAT			1	SLOT	
1	-SLOT DATA-	CHOErrorIn fo		0	-MADD R	
27	MADD			1	DATA	
\$UX0.1.15	XUX0.1.0	XUX0.1.14	XUXO.1.16	XUX0.1.24		start
Temp. Measuring Module : Module Ready	Temp. Measuring Module : CHO Offset/Gai n Error	Temp. Measuring Module : Module H/W Error	Temp. Measuring Module: CHO Running	Temp. Measuring Module : CHO Setting Error		
start	EN ENO					
<b>XUWO.1.4</b> Temp. Measuring Module: CHO Temp. Value	- IN OUT -	CHOTempDat a				
*UX0.1.20	·					CHODisconn ectionErro r (S)
Measuring Module : CHO Input Disconnect ion						

- (a) Writes 1 at address 0 of slot 1 and operates CH 0 by using PUT_WORD function block.
- (b) If operation start bit is on, reads CH 0 setting error (address 27) and movies it into D0001.
- (c) If module is running normally, operation start bit is on.
  - %UX0.1.15 (module Ready) = On
  - %UX0.1.0 (CH 0 offset/gain adjustment error) = Off
  - %UX0.1.14 (Module H/W error) = Off
  - %UX0.1.16 (CH 0 running) = On
  - %UX0.1.24 (setting error) = Off
- (d) Operation start bit is on, moves CH 0 temp. conversion value (%UW0.1.4) into CH 0 temp. data
- (e) Disconnection error occurs at CH 0, %UX0.1.20 (CH 0 disconnection) is on and CH 0 disconnection error bit is set.

# 5.7.3 Example when error occurs

... -

(1) Progra	m example	Э							
F009B					PUT	1	0	h0001	1
_10N					1				
U01.00.F	U01.00.0	U01.00.E	U01.01.0	U01.01.8					M0000
_01_RDY	_01_CHO_AD JERR	_01_WDT_ER R	_01_CHO_AC	_01_CHO_SE TERR					
HOOOO								-2700	-2700
							MOV	U01.04	D0000
								_01_CHO_TE MP	
UO1.01.4									M0001
_01_CH0_B0 UT									( <u>n</u> )
моооо								0	
					GET	1	27	D0001	1
									END

1

- (a) If disconnection error occurs at CH0, U01.01.4 (CH0 disconnection) is on and M0001 bit is set.
- (b) If disconnection error occurs at CH0, min. value within the range of K type temperature senor is displayed at U01.04.
- (c) It is monitored as follows according to monitor display type.
  - When monitoring the temp. conversion value, select "Unsigned Decimal".

Monitor display type	Display content
Unsigned Decimal	62836
Signed Decimal	-2700 (-270.0°C)
Hexadecimal	hF574
As Instruction	62836

# 5.8 Troubleshooting

I

The chapter describes diagnostics and measures in case any trouble occurs during use of thermocouple input module.

#### 5.8.1 LED Indication by Errors

Thermocouple input module has two LEDs and it is possible to check whether it had any error with the indication of RUN LED and ALM LED.

Item	Normal	Disconnection	Abnormal module H/W (error)
	ON	ON	Flicker every 0.2
RONTEED	ÖN		second
ALM LED	OFF	Flicker every second	OFF
Operation	Normal operation	Every function works	Module function
Operation	Every function works	Min. temp. is displayed	stops
Management	-	Checking sensor wiring	Customer service

## 5.8.2 Stats check of module through XG5000 system monitor

Module type, module information, O/S version and module status of thermocouple input module can be checked through XG5000 system monitoring function.

#### (1) Execution sequence

Two routes are available for the execution.

- (a) [Monitor] -> [System Monitoring] -> And on the module screen, click the right mouse button to display [Module Information].
- (b) [Monitor] -> [System Monitoring] -> And Double-click the module screen.

#### (2) Module information

- (a) Module type: shows the information of the module presently installed.
- (b) Module information: shows the O/S version information of module.
- (c) O/S version: shows the O/S prepared date of module.

# 5.8.3 Troubleshooting



(2) RUN LED is off.



(3) ALM LED flickers.		
ALM LED flickers.		
Ţ		
Sensor wiring is normal.		
No	$\Rightarrow$	Wire properly referring to wiring method of user manual.
Yes		. <u> </u>
Contact the nearest agency or LS branch office.		
(4) Temperature conversion value is not norm	nal.	
Temperature conversion value is not normal.		
$\Box$		
External DC 24V input power is normal.		
No	$\Rightarrow$	Supply external power (DC 24V)
Yes Z		
PE ground is normal.		
No	$\mathbf{i}$	Execute PE ground properly referring to user manual
Parameter setting is normal. (Channel status, sensor type)		
	7	Set parameter properly referring to user manual.
Ves	$\checkmark$	
Contact the pagest agona or LS branch office		
Contact the hearest agency of Lo branch office.		

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# 5.8.4 Error code and measure

Device assignment ('S', 'H' type)	Device assignment (IEC type)	Description	Content	Measure	
U0x.00.0	%UX0.x.0	CH0 offset/gain adjustment error			
U0x.00.1	%UX0.x.1	CH1 offset/gain adjustment error		If repeated when restarting	
U0x.00.2	%UX0.x.2	CH2 offset/gain adjustment error		service center	
U0x.00.3	%UX0.x.3	CH3 offset/gain adjustment error	On: error Off: normal		
U0x.00.D	%UX0.x.13	Module offset/gain backup error		If repeated when restarting the power, contact custom service center	
U0x.00.E	%UX0.x.14	Module H/W error		If repeated when restarting the power, contact custom service center	
U0x.01.8	%UX0.x.24	CH0 setting error	Parameter setting	Check the parameter setting	
U0x.01.9	%UX0.x.25	CH1 setting error	On: setting error	area (address 27~30) by GET	
U0x.01.A	%UX0.x.26	CH2 setting error	Off: setting	instruction, solve the setting	
U0x.01.B	%UX0.x.27	CH3 setting error	normal	error contents.	

(1) Measure when error flag of data I/O area (U device) occurs.

(2) Checking error information area (address 27~30) of operation parameter area

(a) Setting error information area (address 27~30)

Bit	Description	Related memory address		
		Hex.	Dec.	
Bit0	Sensor type setting (Off: normal, On: error)	01н~04н	1~4	
Bit1	Filter constant setting (Off: normal, On: error)	06н~09н	6~9	
Bit2	Average processing method setting (Off: normal, On: error)	0Ан~0Dн	10~13	
Bit3	Time average value (Off: normal, On: error)			
Bit4	Count average value (Off: normal, On: error)	0Ен~11н	14~17	
Bit5	Moving average value (Off: normal, On: error)			
Bit6	Scaling range (Off: normal, On: error)	13н~1Ан	19~26	

#### (b) Checking setting error information

Check the setting error information (address 27~30) area by GET instruction.

	-			
Ex.1) In case	thermocouple	input module	is mounted	at slot 1.

M0000	GET	1	27	D0000	1
	GET	1	28	D0001	1
	GET	1	29	D0002	1
	GET	1	30	D0003	1

_//			
ReadError		INST16 Get_word BEQDONE	
	0	-BASE STAT-	0 -BASE STAT-
	1	-SLOT DATA - CHOErro	r 1 SLOT DATA CH1Error
	27	-MADD	28 - MADD
		INST18 GET_WORD REQ DONE	
	0	-BASE STAT	0 -BASE STAT-
	1	-SLOT DATA - CH2Erro	r 1 -SLOT DATA - CH3Error
	29	-MADD R	30 - MADD R

Ex 2) In case thermocouple input module is mounted at slot 1. (In case of IEC)

Γ

(c) In case setting error occurs, setting error representation flag (U0x.01.8~ U0x.01.B, in case of IEC type %UX0.x.24 ~ %UX0.x.27) will be on and it will act as default value. If setting error representation flag (U0x.01.8~ U0x.01.B, in case of IEC type, %UX0.x.24 ~ %UX0.x.27) is on, check above setting error information  $1B_H \sim 1F_H$  (address 27~30) area, check related memory address  $01_H \sim 1A_H$  (address 1~26) and cancel error.r

# Chapter 6 Analog I/O Module

# 6.1 Pre-operation Setting Procedure

Please proceed as follows before operating analog I/O module.



# 6.2 Specification

Γ

**6.2.1 General Specification** This section describes general specifications of the analog I/O module.

No.	ltem		Related specifications						
1	Ambient temperature			0 °C ~-	<b>-55</b> ℃		-		
2	Storage temperature			<b>-25</b> ℃~	<b>+70</b> ℃		-		
3	Ambient humidity		5 ~ 95%RH (Non-condensing)						
4	Storage humidity		5	5 ~ 95%RH (No	n-condensing)		-		
			Occasio	onal vibration		-	-		
		Frequency	Ace	celeration	Amplitude	How many times			
		5 ≤ f < 8.4 ⊞	z	-	3.5 mm				
	Vibration	8.4 ≤ f ≤ 150	Hz 9.8	3 m/s² (1G)	-				
5	resistance		For contir	nuous vibratio	ı	10 times each	IEC61131-2		
		Frequency	Ace	celeration	Amplitude	directions (X_Y and Z)			
		5 ≤ f < 8.4 ⊞	z	-	1.75 mm	(,, , , , , , , , , , , , , , , , , , ,			
		8.4 ≤ f ≤ 150	Hz 4.9	m/s² (0.5G)	-	-			
6	<ul> <li>Peak acceleration: 147 m/s²(15G)</li> <li>Shock resistance</li> <li>Duration: 11ms</li> <li>Half-sine, 3 times each direction per each axis</li> </ul>								
		Square wave Impulse noise		LS ELECTRIC standard					
		Electrostatic discharge		IEC 61131-2, IEC 61000-4- 2					
7	7 Noise resistance	Radiated electromagnetic field noise	c 80 ~ 1,000 MHz, 10V/m II		80 ~ 1,000 MHz, 10V/m				
		Fast transient	Segment	Power supply module	Digital/ana communi	alog input/output ication interface	IEC 61131-2, IEC 61000-4-		
		Voltage 2kV 1kV			1kV	4			
8	Environment		Free from	corrosive gass	es and excessive o	dust	-		
9	Altitude			Up to 2,0	00 ms		-		
10	Pollution degree			Less than e	qual to 2		-		
11	Cooling			Air-coo	bling		-		

**6.2.2 Performance Specification** This section specified the performance of analog I/O module.

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(1)	Inpu	t Performance	Specifi	cation

Classification		ication	Input Performance Specification				
No	. input	channels	2 char	inels			
		Туре	Voltage	Current			
			DC 1 ~ 5V	DC 4 ~ 20 ^{mA}			
Analog			DC 0 ~ 5V	DC 0 ~ 20 ^{mA}			
Input		Panga	DC 0 ~ 10V	(Input resistance 250 $\Omega$ )			
Range		Range	(Input resistance: 1 MΩ min.)				
			Input range shall be specified in u	user program or I/O parameters			
			by channel, and selected with extend	ernal voltage/current switches.			
		Туре	12-bit bina	ary data			
		Unsigned	0 ~ 4	000			
		Signed	-2000 ~	2000			
Digital			100 ~ 500 (DC 1 ~ 5V)	400 ~ 2000 (DC 4 ~ 20mA)			
Output	Value	e Precise	0 ~ 500 (DC 0 ~ 5V)	0 ~ 2000 (DC 0 ~ 20 ^{mA} )			
	Rang	e Value	0 ~ 1000 (DC 0 ~ 10V)				
		Percentile Value	0 ~ 1000				
			1/4000				
М	ax. Re	solution	1.25 ^{mV} (DC 1~5V, 0~5V)	5#A (DC4~20mA, 0~20mA)			
			2.5 ^{mV} (DC 0~10V)				
	Preci	ision	±0.5%	max.			
Max.	Conve	ersion Rate	1ms/ch	annel			
Max	k. Absc	lute Input	DC ±15V	DC ±25 ^{mA}			
		Filtration	Digital filter (4	~ 64,000ms)			
			Time average	(4~16,000 ^{ms} )			
Addition	al	Averaging	Cycle average (2-	~64,000 cycles)			
Function	IS		Moving average	(2~100 values)			
		Alarm	Open line detection (DC 1~5V, DC4~20 ^{mA} )				

(	Classifica	tion	Output Performance Specification			
No. d	of output of	hannels	2 cha	nnels		
		Туре	Voltage	Current		
			DC 1 ~ 5V	DC 4 ~ 20 ^{mA}		
Analog			DC 0 ~ 5V	DC 0 ~ 20 ^{mA}		
Output			DC 0 ~ 10V	(Load resistance: 510 Ω max.)		
Range		Range	(Load resistance: 2kΩ min.)			
, in the second second			Output range shall be speci	fied in user program or I/O		
			parameters by channel, a	and selected with external		
		-	voltage/current switches.			
		Туре	12-bit bir	hary data		
		Unsigned	0~4000			
	Value Range	Signed	-2000	~ 2000		
Digital		Precise	100 ~ 500 (DC 1 ~ 5V)	400 ~ 2000 (DC 4 ~ 20 ^{mA} )		
Input			0 ~ 500 (DC 0 ~ 5V)	0 ~ 2000 (DC 0 ~ 20 ^{mA} )		
		Value	0 ~ 1000 (DC 0 ~ 10V)			
		Percentile	0~	1000		
		Value	0~1000			
			1/4	000		
N	lax. Resol	ution	1.25 ^{mV} (DC 1~5V, 0~5V)	5,44 (DC4~20 ^{mA} , 0~20 ^{mA} )		
			2.5 ^{mV} (DC 0~10V)			
	Precisio	n	±0.5% max.			
Max	Conversi	on Rate	1ms/c	hannel		
Max	. Absolute	Output	DC ±15V	DC 25 mA		
Ada	litional Fu	nctions	Channel output status setting function (selectable from previous,			
Auc	illional Fu		min., mean, max. value outputs)			

# (2) Output Performance Specification

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# (3) I/O Common Performance Specification

Cla	assification	I/O Common Performance Specification		
laa		Photo-coupler isolation between I/O terminal and PLC power		
1115	sulation Type	source (no insulation between channels)		
1/0	O Terminals	11 point terminal block		
	I/O Points	Fixed type: 64 points		
Max. No. of Installation		7 [When using XBM-Dxxx □ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type)		
Current	Internal (DC 5V)	120mA		
Current	External (DC 24V)	130mA		
	Weight	73g		
Power Supply		DC 20.4 ~ 28.8V		

Note1) In order to use analog I/O module, the following version is needed.

Main unit	Version information
XBM-DxxxS type	V2.4
XBC-DxxxH type	V1.7
XEC-DxxxH type	V1.0
XEC-DxxxS type	V1.0

# 6.3 Major Components

Major components are as follows;



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No.	Name	Description
1	INPUT LED	<ul> <li>Indicate operation of input part On: normal operation</li> <li>Flickering: in error (1s intervals)</li> <li>Off: power off or module failure</li> </ul>
2	OUTPUT LED	<ul> <li>Indicate operation of output part On: normal operation</li> <li>Flikering: in error (1s intervals)</li> <li>Off: power off or module failure</li> </ul>
3	Input Volt/Current Select Switch	<ul> <li>Switch for selecting voltage/current input of analog input Ch 0 and Ch 1</li> </ul>
4	Output Volt/Current Select Switch	<ul> <li>Switch for selecting voltage/current output of analog output Ch 0 and Ch 1</li> </ul>
5	Input Terminal Block	<ul> <li>Terminal block for analog input wiring with external devices</li> </ul>
6	Output Terminal Block	<ul> <li>Terminal block for analog output wiring with external devices</li> </ul>
7	Ext. Power Connector	Connector for DC24V external power supply
(8)	Ext. Connector	Connector for extension modules

# 6.4 Conversion Characteristics by I/O Range

The input/output ranges of voltage and current can be set up per channel with user program or I/O parameters. The I/O types of digital data are defined as follows.

- (1) Unsigned Value
- (2) Signed Value

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- (3) Precise Value
- (4) Percentile Value

## 6.4.1 Input Characteristics

The graph below shows the data conversion characteristics by input range.



#### (1) DC 4 ~ 20mA Range Input

Digital	Analog Input Current (mA)								
Output Range	3.81	4	8	12	16	20	20.18		
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047		
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047		
Precise Value (400 ~ 2000)	381	400	800	1200	1600	2000	2018		
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011		

# (2) DC 0 ~ 20mA Range Input

Digital	Analog Input Current (mA)								
Output Range	-0.24	0	5	10	15	20	20.23		
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047		
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047		
Precise Value (0 ~ 2000)	-24	0	500	1000	1500	2000	2023		
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011		

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### (3) DC 1 ~ 5V Range Input

Digital	Analog Input Voltage (V)								
Output Range	0.96	1	2	3	4	5	5.04		
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047		
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047		
Precise Value (100 ~ 500)	96	100	200	300	400	500	504		
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011		

#### (4) DC 0 ~ 5V Range Input

Digital		Analog Input Voltage (V)							
Output Range	-0.06	0	1.25	2.5	3.75	5	5.05		
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047		
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047		
Precise Value (0 ~ 500)	-6	0	125	250	375	500	505		
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011		

#### (5) DC 0 ~ 10V Range Input

Digital	Analog Input Voltage (V)								
Output Range	-0.12	0	2.5	5	7.5	10	10.11		
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047		
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047		
Precise Value (0 ~ 1000)	-12	0	250	500	750	1000	1011		
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011		

# 6.4.2 Output Characteristics

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# (1) DC 4 ~ 20mA Range Output

Digital Input		Analog Output Current (mA)								
Range	4mA less	4	8	12	16	20	20mA over			
Unsigned Value (0 ~ 4000)	0 less	0	1000	2000	3000	4000	4000 over			
Signed Value (-2000 ~ 2000)	-2000 less	- 2000	-1000	0	1000	2000	2000 over			
Precise Value (400 ~ 2000)	400 less	400	800	1200	1600	2000	2000 over			
Percentile Value(0 ~ 1000)	0 less	0	250	500	750	1000	1000 over			

## (2) DC 0 ~ 20mA Range Output

Digital Input			Analog	<b>Output Cu</b>	rrent (mA)		
Range	0mA less	0	5	10	15	20	20mA over
Unsigned Value (0 ~ 4000)	0 less	0	1000	2000	3000	4000	4000 over
Signed Value (-2000 ~ 2000)	-2000 less	-2000	-1000	0	1000	2000	2000 over
Precise Value (0 ~ 2000)	0 less	0	500	1000	1500	2000	2000 over
Percentile Value(0 ~ 1000)	0 less	0	250	500	750	1000	1000 over

# (3) DC 1 ~ 5V Range Output

Digital Input	Analog Output Voltage (V)						
Range	1V less	1	2	3	4	5	5V over
Unsigned Value (0 ~ 4000)	0 less	0	1000	2000	3000	4000	4000 over
Signed Value (-2000 ~ 2000)	-2000 less	-2000	-1000	0	1000	2000	2000 over
Precise Value (100 ~ 500)	100 less	100	200	300	400	500	500 over
Percentile Value(0 ~ 1000)	0 less	0	250	500	750	1000	1000 over

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# (4) DC 0 ~ 5V Range Output

Digital Input	Analog Output Voltage (V)						
Range	0V less	0	1.25	2.5	3.75	5	5V over
Unsigned Value (0 ~ 4000)	0 less	0	1000	2000	3000	4000	4000 over
Signed Value (-2000 ~ 2000)	-2000 less	-2000	-1000	0	1000	2000	2000 over
Precise Value (0 ~ 500)	0 less	0	125	250	375	500	500 over
Percentile Value(0 ~ 1000)	0 less	0	250	500	750	1000	1000 over

#### (5) DC 0 ~ 10V Range Output

Digital Input	Analog Output Voltage (V)						
Range	0V less	0	2.5	5	7.5	10	10V over
Unsigned Value (0 ~ 4000)	0 less	0	1000	2000	3000	4000	4000 over
Signed Value (-2000 ~ 2000)	-2000 less	-2000	-1000	0	1000	2000	2000 over
Precise Value (0 ~ 1000)	0 less	0	250	500	750	1000	1000 over
Percentile Value(0 ~ 1000)	0 less	0	250	500	750	1000	1000 over

# 6.5 Precision

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### 6.5.1 Input Precision

The precision of digital output is not dependent upon the input range.

The graph below shows the variation of precision when the analog input range is  $0 \sim 10$  V for unsigned value for digital output.

The input precision of the XBF-AH04A is  $\pm 0.5\%$ .



(1) Precision at 5V input;
4000 × 0.5% = 20
Therefore, precision range at 5V input is; (2000-20) ~ (2000+20) = 1980 ~ 2020.

(2) Precision at 10V input;
 4000 × 0.5% = 20
 Therefore, precision range at 10V input is;(4000-20) ~ (4000+20) = 3980 ~ 4020.

## 6.5.2 Output Precision

The precision of analog output is not dependent upon the output range.

The graph below shows the variation of precision when the analog output range is 0  $\sim$  10 V for unsigned value for digital output.

The output precision of the XBF-AH04A is ±0.5%



(1) Precision at 5V output;
 4000 × 0.5% = 20, therefore,
 precision range at 5V output is; (5V - 20×0.0025V) ~ (5V+20×0.0025V) = 4.95 ~ 5.05V.

(2) Precision at 10V output;
 4000 × 0.5% = 20, therefore,
 precision range at 10V output is; (10V-20×0.0025V) ~ (5V+20×0.0025V) = 9.95 ~ 10.05V.

# 6.6 Functions of Analog I/O Module

Function	Description
Channel operation/stop setting	<ul> <li>Specify operation/stop of the channel which will perform A/D and D/A conversion.</li> <li>Specifying unused channels as Stop can shorted overall operation time.</li> </ul>
I/O Voltage /current range setting	<ul> <li>Specify desired range of analog I/O.</li> <li>Select voltage/current with external switch, and set up range with parameter.</li> <li>Analog I/O Module provides 2 ranges(4~20mA, 0~20mA) of current I/O and 3 ranges (1~5V, 0~5V, 0~10V) of voltage I/O.</li> </ul>
I/O data type setting	<ul> <li>Specify digital I/O types.</li> <li>This module provides 4 output data types (Unsigned, Signed, Precision, and Percentile Values)</li> </ul>
A/D input conversion method	<ul> <li>Sampling Process <ul> <li>If A/D conversion method has not been specified, the module processes sampling.</li> </ul> </li> <li>Filter process <ul> <li>Filters rapid changes in input value by external noise.</li> </ul> </li> <li>Averaging process <ul> <li>Outputs A/D converted value averaged by time, cycle, and moving.</li> </ul> </li> </ul>
D/A output status	Sets up channel output state at transition from run to stop.     Provides 4 output selections (Previous Minimum Mean Maximum Values)
D/A output status setting	<ul> <li>Outputs A/D converted value averaged by time, cycle, and moving.</li> <li>Sets up channel output state at transition from run to stop.</li> <li>Provides 4 output selections (Previous, Minimum, Mean, Maximum Values)</li> </ul>

The functions of XBF-AH04A Module are as follows.

# 6.6.1 Sampling Process

In popular A/D conversion process, analog input signals are collected at constant time intervals and A/D converted. The time elapsed for the analog signals converted into digital signals and saved in memory device depends upon the number of channels used.

#### (Process Time) = (No. of Channels Used) x (Conversion Rate)

(Ex.) Process time when using 3 of 4 I/O channels;  $3 \times 1 \text{ ms} = 3.0 \text{ ms}$ 

The term 'sampling' means taking analog signal values at certain time intervals.

# 6.6.2 Filtering Function

The input value of the designated channel is calculated with previously filtered input value using preset filter constant (time constant 63.2%) by the formula below;

 $\Pr{esentlyFilteredInput} = \frac{(\Pr{eviouslyFilteredInput} \times FilterCons \tan t) + (\Pr{esentInput} \times 1ms \times No.ofChannelsUsed)}{FilterCons \tan t + (1ms \times No.ofChannelsUsed)}$ 

Filter Constant setting range = 4 ~ 64000 [ms]



In the above graph, if the input value changes rapidly from 0 to 100, the input value is filtered. Filter (time) constant is the time required for input values to vary by 63.2% of the actual input value.

#### 6.6.3 Averaging Function

#### (1) Average by Time

The input values of the designated channel are accumulated for the preset time, and the average value of the total sum is outputted in digital data.



Setting Range =  $4 \sim 16000$  [ms]

For time averaging, No. of averaging cycles are calculated with the No. of channels used as below;

No. Averaging Cycles =  $\frac{AverageTime}{No.ofChannelsUsed \times 1ms}$ 

#### (2) Average by Cycles

The input values of the designated channel are accumulated for the preset cycles, and the average value of the total sum is outputted in digital data.



Setting Range = 2 ~ 64000 [Cycle]

For cycle averaging, averaging interval is calculated with the No. of channels used.

AveragingInterval [ms] = AveragingCycle × No.ofChannelsUsed × 1ms

#### (3) Moving Average

The inputs into the designated channel are accumulated for the presser number, and its average is calculated and outputted in digital data. However, in moving average method, each scan provides its average value.



### Note

- (1) In case of time/cycle averages. The input value is not outputted at every conversion, but the previous value is maintained until the average time or cycle is reached.
- (2) In case of moving averages, the converted input is averaged with the previously entered value and the result is outputted at every conversion. Therefore, data response is faster than time/cycle averaging methods.
- (3) The three averaging methods can be processed simultaneously with the filter function described earlier. In such case, the filter function is executed first, and averaging function is processed to output the average value in digital data, which is expressed with the finallyprocessed value.

# 6.6.4 Line Open Detection Function

The analog I/O module has a diagnostic function which can detect and indicate open input line, when voltage input range of DC 1~5V or current input range of DC 4~20mA is selected as its analog input range. If the module indicates open input line, check the wiring.

- (1) If the wiring to the module is open, the Input LED flikers at 1 second intervals and the respective error code is generated.
- (2) Line open detection is available for each channel. However, open indication is provided only for the channel selected for the operation. The Input LED is common for the input channels 0 and 1, and flickering if 1 or more channels are open.

Input Connection	Channel Operation	Input LED State	Open Line Flag	
Normal	Working	On	Off	
Normai	Stopped	On	Off	
Input wire open or	Working	Flickering (1s)	On	
disconnected	Stopped	On	Off	

(3) At line open, the line open flag of the channel turns On, and turns Off at correction.

Open Flag	Description
U0x.01.4	Ch 0 open
U0x.01.5	Ch 1 open

(4) At line open, the least of all input values is indicated.

# 6.6.5 Channel Output Status Setting Function

This function sets up the output in response to PLC shutdown or failure.

(1) Function

This function is used to obtain preset output value of the analog I/O module when the PLC system is transferred from run to stop.

(2) Type

Channel output can be one of the followings;

(a) Previous value: maintains the last output from normal operation.

(b) Minimum: outputs the least values of the respective output ranges.

- (c) Median: outputs the median values of the respective output ranges.
- (d) Maximum: outputs the largest values of the respective output ranges.
- (3) Example

Assume that the output channel range is set to 4 ~ 20mA and the output level is 10mA. If the PLC system is switched from run to stop status, the output will be one of followings according to the setting;

(a) Previous value: maintains 10mA which is the previous normal operation value.

(b) Minimum: outputs 4mA which is the minimum of the output range setting.

(c) Median: outputs 12mA which is the median of the output range setting.

(d) Maximum: outputs 20mA which is the maximum of the output range setting.

# 6.7 Wiring

### 6.7.1 Precautions for Wiring

- (1) Keep the I/O signal lines of the analog I/O module away from AC power line. Otherwise, the surge or induction noise of the AC line may affect the module.
- (2) The cable should be selected taking ambient temperature and allowable current into consideration. Recommended cable is AWG22 (0.3^{mm²}) or higher grade.
- (3) Keep the cables away from heat source or oil. Otherwise, short-circuit, damage, or malfunction of the module may occur.
- (4) Check polarity at terminal block connection.
- (5) Keep the cables away from high voltage line or power line to avoid malfunction or failure of the module by induction.

### 6.7.2 Exemplary Analog Input Wiring

- (1) Input resistance of the current input circuit is 250  $\Omega$  (typ.).
- (2) Input resistance of the voltage input circuit is 1 M $\Omega$  (min.).
- (3) Set only the channels to be used up for operation.
- (4) Analog I/O module does not provide power supply to external input device. Use external power supply.
- (5) Exemplary analog input wiring

Same wiring scheme is applied to voltage and current inputs, except that voltage/current setting switch must be set up accordingly.



(6) Exemplary Wiring for Analog Input 2-Wire Sensor/Transmission

Same wiring scheme is applied to voltage and current inputs, except that voltage/current setting switch must be set up accordingly.



(7) Exemplary Wiring for Analog Input 4-Wire Sensor/Transmission Same wiring scheme is applied to voltage and current inputs, except that voltage/current setting switch must be set up accordingly.



(8) Relation between voltage input precision and cable length

In voltage input system, the cable length between the module and transmitter or sensor influences on the converted digital value of the module. The value is as follows.



Where,

Rc: line resistance of the wire,

Rs: internal resistance of the transmitter or sensor,

Ri: internal resistance of voltage input module (1 M2)

Vin: voltage applied to the analog input

% Vi: error in the converted value caused by source and cable length in voltage input(%)

$$Vin = \frac{Ri \times Vs}{\left[Rs + (2 \times Rc) + Ri\right]}$$
  
%Vi =  $\left(1 - \frac{Vin}{Vs}\right) \times 100\%$ 

LSELECTRIC 6-20
# 6.7.3 Exemplary Analog Output Wiring

(1) Exemplary analog voltage output wiring

Same wiring scheme is applied to voltage and current outputs, except that voltage/current setting switch must be set up accordingly.



(2) Exemplary analog current output wiring

Same wiring scheme is applied to voltage and current outputs, except that voltage/current setting switch must be set up accordingly.



# 6.8 Operation Parameter Setting

The operation parameters of analog I/O module can be set up with XG5000 [I/O Parameter].

#### (1) Setting Items

For user convenience, XG5000 provides GUI (graphic user interface) for analog I/O module parameter setting. The items which can be set up in the [I/O Parameter] in the XG5000 project window are as follows.

ltem	Description
[I/O Parameter]	<ul> <li>(a) Input parameter setting Sets up following items required for module operation.</li> <li>1) Operation channel (Stop/Run)</li> <li>2) Input voltage (current) range</li> <li>3) Output data type</li> <li>4) Filter constant</li> <li>5) averaging process</li> <li>6) Average value</li> <li>(b) Output parameter setting Sets up following items required for module operation.</li> <li>1) Operation channel (Stop/Run)</li> <li>2) Output voltage (current) range</li> <li>3) Input data type</li> <li>4) Channel output status</li> <li>(c) The parameters set up in XG5000, when downloaded, are stored in the flash memory of the XGB base unit.</li> </ul>

## (2) Usage of [I/O Parameter]

(a) Create a project with XG5000. See XG5000 Program Manual for project creation.(b) In the Project window, double-click [I/O Parameter].

Items
<ul> <li>➡ ∰ AH ★</li> <li>➡ ∰ NewPLC(XGB-XBCH)-Offline</li> <li>➡ ∰ Variable/Comment</li> <li>➡ ∰ Basic Parameter</li> <li>➡ ∭ Basic Parameter</li> <li>➡ ∭ I/O Parameter</li> <li>➡ ∭ Embedded Parameter</li> <li>➡ ∭ Scan Program</li> <li>➡ ∰ NewProgram</li> </ul>
C Project

(c) In the [I/O Parameter Setting] window, find out the slot of the base where the analog I/O module is installed, and click it.

I/O Parameter Setting						?×
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
UI: Default	1	<u> </u>				
02 : Default	2					
04 : Default	3					
05 : Default	4					
06 : Default	5					
07 : Default	6					
U8 : Default	7					
10 : Default	8					
	9					
	10					
1						
1 1						
,	,					
Delet	e Slot Delete	Base Base Setting	Delete All	Dețails <u>F</u>	int 🔻 Oł	Cancel

(d) In the above window, click the arrow button to call the window where the module can be selected. Find out the module and select it.



(e) To set up parameter, double click with the respective slot being selected, or click [Detail] button.

I/O Parameter Setting				_		?×
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
02 : Default	1	XBF-AH04A (1/0, 2/2 💌			-	P00040 ~ P0007F
	2					
04 : Default	3					
05 : Default	4					
🛛 🔤 06 : Default	5					
07 : Default	6					
	7					
10 · Default	8					
To . Default	9					
	10					
<			]	à		
	e Slot De	lete <u>B</u> ase Base <u>S</u> etting	Delete All De	e <u>t</u> ails <u>P</u>	rint 🔻	OK Cancel

(f) The window below where parameters can be set up by channel appears. Click the item to set up. The parameters which can be set up appear by item.

x	XBF-AH04A (I/O, 2/2 CH)						
;	KBF-AH04A (I/O, 2/2 CH)						
	Input Parameter	CH O	CH 1				
	Channel status	Disable 💌	Disable				
	🗌 Input range	4~20mA	4~20mA				
	Output type	0~4000	0~4000				
	Filter constant	0	0				
	Average processing	Sampling	Sampling				
	Average value	0	0				
	Output Parameter	Channel O	Channel 1				
	🗌 Channel status	Disable	Disable				
	🗌 Output range	4~20mA	4~20mA				
	Input type	0~4000	0~4000				
	CH. Output type	Former value	Former value				
OK Cancel							

# 6.9 Special Module Monitor Function

The functions of the special module monitor are as follows.

- (1) Start-up of [Special Module Monitor]
  - Select [Online] -> [Connect], and [Monitor] -> [Special Module Monitor] to start up. [Special Module Monitor] menu is enabled only in the [Online] condition.



## Note

- 1) The screen may not function properly if the system resources are not sufficient. In this case, close the screen, exit other applications, and rerun XG5000.
- 2) The I/O parameters set up in [Special Module Monitor] condition are temporarily set up for testing purpose. Therefore, these I/O parameters are deleted after exit from [Special Module Monitor].
   2) the test function of the [Special Module Monitor] enables testing applies testing applies to the set function.
- 3) the test function of the [Special Module Monitor] enables testing analog I/O modules without sequence programming.

- (2) Usage of [Special Module Monitor]
  - (a) With the XG5000 in connection (online) with the base unit of PLC, select [Monitor] -> [Special Module Monitor]. The Select Special Module window shown below will appear showing the type of the special modules and base/slot information. In the list dialog, the modules present in the PLC system are displayed.

Special Mod	dule List	$\mathbf{X}$
Dava	Clas	hi a shi la
Dase	3100	Module
🛍 Base O	<u> </u> Internal	High Speed Counter Module(Open-Collector, 8-CH)
🗂 Base O	<u> 1</u> Internal	Position Module (Open-Collector, 2-CH)
💮 Base O	Slot 1	XBF-AH04A (I/O, 2/2 CH)
<		
Module Info.	<u>M</u> onitor	Close

(b) In the above window, select the special module and click [Module Info.] to see the information window below.



(c) Click the [Monitor] button in the "Special Module" window. The "Special Module Monitor' window will appear as shown below.

Special Module Monitor					
XBF-AH04A (1/0, 2/2 CH)					
Input Item	Max/Min value	Current value			
CH0 A/D value					
CH1 A/D value					
Output item	Setting value	Current value			
CHO Digital value					
CH1 Digital value					
Innut Item	Setting Value	Current Value			
Channel	CH	0 *			
Channel status	Disable				
Input range	4~20mA				
Output type	0~4000				
Filter constant	0				
Average processing	Sampling				
Average value	0				
Output Item	Setting Value	Current Value			
Channels	CH	10			
Channel status	Disable				
Output range	4~20mA				
Input type	0~4000				
CH. Output type	Former value				
D/A Digital value	0				
Output enable	Disable				
]					
<u>B</u> eset max/min value	Start Monitoring	Iest			
		Close			

(d) [Start Monitoring]: click [Start Monitoring] to look up the digital input data of the channel currently in operation. The screen shot below is a monitoring window when all the channels are in operation status.

Special Module Mon	itor	?	
XBF-AH04A (1/0, 2/2 CH)	-		
Input Item	Max/Min value	Current value	
CH0 A/D value	0/0	0	Input Monitoring
CH1 A/D value	0/0	0	mparmonitoring
Output item	Setting value	Current value	7
CHO Digital value		0	Output Monitoring
CH1 Digital value		0	Output Monitoring
Input Item	Setting Value	Current Value	
Channel	СН	0	
Channel status	Disable	Disable	
Input range	4~20mA	4~20mA	
Output type	0~4000	0~4000	Detail information
Filter constant	0	0	of input CH0
Average processing	Sampling	Sampling	
Average value	0	0	
Output Item	Setting Value	Current Value	
Channels	다	10	
Channel status	Disable	Disable	
Output range	4~20mA	4~20mA	Detail information
Input type	0~4000	0~4000	of output CH0
CH. Output type	Former value	Former value	
D/A Digital value	0	0	
Output enable	Disable	Disable	
<u>R</u> eset max/min value	Stop <u>M</u> onitoring	<u>T</u> est	
		Close	

The screen executing [Start Monitoring]

I

(e) [Test]: this function is used to change the current parameter settings of the analog I/O module. Click the settings in the fields in the bottom screen to change the parameters. [Test] can be set up only when the operation status of the XGB base unit is STOP.

3F-AH04A (1/0, 2/2 CH)		
Input Item	Max/Min value	Current value
CH0 A/D value	0/0	0
CH1 A/D value	0/0	0
Output item	Setting value	Current value
CH0 Digital value		0
CH1 Digital value		0
Input Item	Setting Value	Current Value
Channel	Cł	10
Channel status	Enable	Enable
Input range	4~20mA	4~20mA
Output type	0~4000	0~4000
Filter constant	0	0
Average processing	Sampling	Sampling
Average value	0	0
Output Item	Setting Value	Current Value
Channels	Cł	10
Channel status	Enable	Enable
Output range	4~20mA	4~20mA
Input type	0~4000	0~4000
CH. Output type	Former value	Former value
D/A Digital value	0	0
Output enable	Disable	Disable
Beset max/min value	Stop <u>M</u> onitoring	] <u>T</u> est

## (f) Minimum/Maximum Value Monitoring

The minimum and maximum values of the input channels in operation can be monitored. However, the Max/Min values in the window are based on the current value. Therefore, the Max/Min values are not saved when exiting from the [Monitoring/Testing Screen]. 

	Prosvinin value	Current value	
CH0 A/D value	0/0 .	0	Monitors Max/Min value
CH1 A/D value	0/0	0	
Output item	Setting value	Current value	
CH0 Digital value		0	
CH1 Digital value		0	
	0 W 141		
Input Item	Setting Value	Current Value	
Channel	Dissuls	Disable	
Lhannel status	Disable	Disable	
Input range	4 ZUMA	4 ZUMA	
Output type	0-4000	0-4000	
Filter constant	U	U	
Average processing	Sampling	Sampling	
Average value	0	0	
Output Item	Setting Value	Current Value	
Channels	CH	10	
Channel status	Disable	Disable	
Output range	4~20mA	4~20mA	
Input type	0~4000	0~4000	
CH. Output type	Former value	Former value	
D/A Digital value	0	0	
Output enable	Disable	Disable	

The screen executing [Max/Min Value Monitoring]

#### (g) Close

[Close] button is for ending/closing the monitoring/testing screen. Maximum, minimum, and current values are not saved at exit.

# 6.10 Auto-registration of U-Device (Special Module Variable)

The variables for each module are automatically registered by referring to the information of the special modules set up in the [I/O Parameter]. User can modify variables and descriptions.

0 Parameter Setting			_			?
All Base Set Base	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default 01 : XBF-AH04A (I/( 02 : Default	U(main)	XBF-AH04A (1/0, 2/2 💌		•	•	P00040 ~ P0007F
03 : Default 04 : Default 05 : Default	3					
	5					
	7					
IU : Default	9 10				-	

#### (b) Double click [Variables/Comment].

ſ

🖏 AH - XG5000 - [Variable/Comment]			
Project Edit Find/Replace View Online Monit	or <u>D</u> ebug <u>T</u> ools <u>W</u> indo	ow <u>H</u> elp	
D 2 6. B 4 🖨 🖧 🐯 🌉 🛞 🖓	<b>b</b> 🛍	×   ⊶: ≱ ∴ %	<b>М М 33 19</b> 8 .
\$ \$   0 0 ×   4 7   0 6 8 ×   4 1		<b>H II</b> 22 2 1 1 1	[]] [] [] [] +[] [] [] [] []
医指指指病方病毒的纤维的	(P3 (N) (F1) (F7) (3) (4)		1 <b>2</b> 🕅 F 📰 🖽
Project Window 👻 🗙			- 1
Items		View Device View	Flag
⊡∰a AH ★	Variable	Type Dev	ice Used
<ul> <li>☐-∰ NewPLC(XGB-XBCH)-Offline</li> <li>└</li> <li>└</li></ul>	1	1	Г

(c) In the 'Edit' menu, select 'U-Device Auto Registration' (special module variable auto registration).

🧠 AH - XG50	00 - [Variable	e/Comment]								
🕍 Project Edi	t <u>F</u> ind/Replace	<u>V</u> iew <u>O</u> nline	Monito	or <u>D</u> ebug	<u>T</u> ools	<u>W</u> indov	v <u>H</u> elp			
ിലഗുകാല	<u>U</u> ndo	Ctrl+Z	12	100	<u>≥ %</u> Ę	a 🖻 🕻	K Har BK		M 350 350	
	<u>R</u> edo	Ctrl+Y				e tu	Inn. C228 604	La ci a		
1.4 m 1 d X	Cuţ	Ctrl+X						1 1 L L L	] []+ +[] [3	LJ B
長村村間	<u>С</u> ору	Ctrl+C	(B) ( sF4 s	F5 \$F6 F1	1 57 4	4 474 4P 04 c	; W 🗈	i 🖸 🛛	69 F 🔤	111
Project Windo	<u>P</u> aste	Ctrl+V	×			) <u> </u>				
Items ×	<u>D</u> elete	Del		V View	v Variable	DV	iew Device	🕅 View Flag	-	
⊡~∰ AH ∗	<u>S</u> elect All	Ctrl+A			Variat	ole	Туре	Device	Used	
	Insert <u>L</u> ine	Ctrl+L		╞╴┺		l				
	Delete Li <u>n</u> e	Ctrl+D								
	Export Variable	s to <u>F</u> ile								
G	Register U Devi	ce								
<u> </u>	Add EXTERNAL	. Variable								
	Move Item Up									
	Move Item Dow	'n								

## (d) Click 'Yes.'

×0	201	<i>.</i>
1	9	1

Automatically register comments in the U Devices according to the special module set in the I/O parameter. The previous comment will be deleted. Continue?

No

Yes

×

#### (e) Variables are registered as shown below.

V	/iew Variable	View Device	🕅 View Flag		
	Variable	Type 🔺	Device	Used	Comment
1	_01_ERR	BIT	U01.00.0	Г	Analog 10 Module: Module Error
2	_01_RDY	BIT	U01.00.F	Г	Analog 10 Module: Module Ready
3	_01_ADO_ACT	BIT	UO1.01.0	Г	Analog 10 Module: Input CHO Active
4	_O1_AD1_ACT	BIT	U01.01.1	Г	Analog 10 Module: Input CH1 Active
5	_01_DAO_ACT	BIT	U01.01.2	Г	Analog 10 Module: Output CHO Active
6	_O1_DA1_ACT	BIT	UO1.01.3	Г	Analog 10 Module: Output CH1 Active
7	_01_AD0_1DD	BIT	UO1.01.4	Г	Analog 10 Module: Input CHO Disconnection Flag
8	_01_AD1_1DD	BIT	UO1.01.5	Г	Analog 10 Module: Input CH1 Disconnection Flag
9	_01_ADO_ERR	BIT	UO1.01.8	Г	Analog 10 Module: Input CHO Error
10	_01_AD1_ERR	BIT	UO1.01.9	Г	Analog 10 Module: Input CH1 Error
11	_01_DAO_ERR	BIT	UO1.01.A	Г	Analog 10 Module: Output CHO Error
12	_01_DA1_ERR	BIT	UO1.01.B	Г	Analog 10 Module: Output CH1 Error
13	_01_DA0_OUTEN	BIT	UO1.06.0	Г	Analog 10 Module: Output CHO Status Setting
14	_01_DA1_OUTEN	BIT	UO1.06.1	Г	Analog 10 Module: Output CH1 Status Setting
15	_01_ADO_DATA	WORD	U01.04	Г	Analog 10 Module: Input CHO Data
16	_O1_AD1_DATA	WORD	U01.05	Г	Analog 10 Module: Input CH1 Data
17	_01_DAO_DATA	WORD	U01.07	Г	Analog 10 Module: Output CHO DATA
18	_O1_DA1_DATA	WORD	U01.08	Г	Analog 10 Module: Output CH1 DATA

#### (f) In IEC types, the variables are registered as shown below.

V	Global Variable	Direct Variable Comment	🕅 Flag				
	Variable Kind	Variable	Туре	Address	Initial Retain	Used	Comment
2	VAR_GLOBAL	_01_ADO_DATA	WORD	%UW0.1.4	Г	Г	Analog 10 Module: Input CHO Data
3	VAR_GLOBAL	_01_ADO_ERR	BOOL	%UX0.1.24	Г	Г	Analog 10 Module: Input CHO Error
4	VAR_GLOBAL	_01_AD0_1DD	BOOL	XUX0.1.20	Г	Г	Analog 10 Module: Input CHO Disconnection
5	VAR_GLOBAL	_01_AD1_ACT	BOOL	%UX0.1.17	Г	Г	Analog 10 Module: Input CH1 Active
6	VAR_GLOBAL	_01_AD1_DATA	WORD	%UWO.1.5	Г	Г	Analog 10 Module: Input CH1 Data
7	VAR_GLOBAL	_01_AD1_ERR	BOOL	%UX0.1.25	Г	Г	Analog 10 Module: Input CH1 Error
8	VAR_GLOBAL	_01_AD1_1DD	BOOL	%UX0.1.21	Г	Г	Analog 10 Module: Input CH1 Disconnection
9	VAR_GLOBAL	_01_DAO_ACT	BOOL	%UXO.1.18	Г	Г	Analog 10 Module: Output CHO Active
10	VAR_GLOBAL	_01_DAO_DATA	WORD	%UWO.1.7	Г	Г	Analog 10 Module: Output CHO DATA
11	VAR_GLOBAL	_01_DAO_ERR	BOOL	%UXO.1.26	Г	Г	Analog 10 Module: Output CHO Error
12	VAR_GLOBAL	_01_DA0_OUTEN	BOOL	XUX0.1.96	Г	Г	Analog 10 Module: Output CHO Status Setti
13	VAR_GLOBAL	_01_DA1_ACT	BOOL	%UXO.1.19	Г	Г	Analog 10 Module: Output CH1 Active
14	VAR_GLOBAL	_01_DA1_DATA	WORD	%UWO.1.8	Г	Г	Analog 10 Module: Output CH1 DATA
15	VAR_GLOBAL	_01_DA1_ERR	BOOL	%UX0.1.27	Г	Г	Analog 10 Module: Output CH1 Error
16	VAR_GLOBAL	_01_DA1_OUTEN	BOOL	%UX0.1.97	Г	Г	Analog 10 Module: Output CH1 Status Setti
17	VAR_GLOBAL	_01_ERR	BOOL	%UXO.1.0	Г	Г	Analog 10 Module: Module Error
18	VAR_GLOBAL	_01_RDY	BOOL	%UX0.1.15	Г	Г	Analog 10 Module: Module Ready
19		Į			Г	Г	

(2) Saving Variables

(a) The contents in the 'View Variables' tab can be saved in a text file.

(b) In the 'Edit' menu, select 'Save as Text File.'

(c) The contents in the 'View Variables' tab are saved in a text file.

### (3) Viewing Variables in Program

Γ

The figures below present examples of use in XGB "S" and "H" types.

### (a) Below is an exemplary program for XG5000.

10 S0	M00000	U01.00.F	U01.01.0	MOV	U01.04	D00100
11		U01.00.F	U01.01.1	 MOV	U01.05	D00101
12	M00001	U01.00.F	U01.01.2			U01.06.0
		U01.00.F	U01.01.3	 		U01.06.1
<i>L4</i>	M00002	U01.00.F	U01.01.2	MOV	D00200	U01.07
 15		U01.00.F	U01.01.3	MOV	D00201	U01.08
<i>L0</i> \$31				 		END

#### (b) In the 'View' menu, click 'View Variables.' The devices are changed into variables.

10	M00000	_01_RDY	_01_ADO_AC	MOV	_01_AD0_DA TA	D00100
	<u>, , , , , , , , , , , , , , , , , , , </u>		_01_AD1_AC T	MOV	_01_AD1_DA TA	D00101
12	M00001	_01_RDV	_01_DA0_AC			_01_DA0_OU TEN
						_01_DA1_0U TEN
14	M00002	_01_RDV	_01_DA0_AC	MOV	D00200	_01_DAO_D ATA
15		_01_RDY	_01_DA1_AC T 	MOV	D00201	_01_DA1_D ATA
<i>LB</i> \$31						END

# (c) In the 'View' menu, click 'View Device/Variables' to look up the devices and variables at the same time.

10							
10		MUUOOO	UU1.00.F	U01.01.0	MOV	U01.04	D00100
	SO		_01_RDY	_01_ADO_AC T		_01_ADO_DA TA	
11			U01.00.F	U01.01.1	MOV	U01.05	D00101
			_01_RDY	_01_AD1_AC T		_01_AD1_DA TA	
12		M00001	U01.00.F	U01.01.2			U01.06.0
	S11		_01_RDY	_01_DAO_AC			_01_DA0_OU TEN
L3			U01.00.F	U01.01.3			U01.06.1
			_01_RDV	_01_DA1_AC			_01_DA1_OU TEN
14		M00002	U01.00.F	U01.01.2	MOV	D00200	U01.07
	S20		_01_RDY	_01_0A0_AC			_01_DA0_DA TA
15			U01.00.F	U01.01.3	MOV	D00201	U01.08
10			_01_RDY	_01_DA'1_AC T			_01_DA1_DA TA
18							END

M00000	) U01.00.F	U01.01.0	MOV	U01.04	D00100
	Analog 10 Module: Module Ready	Analog 10 Module: Input CHO Active		Analog 10 Module: Input CHO Data	
	U01.00.F	U01.01.1	MOV	U01.05	D00101
	Analog 10 Module: Module Ready	Analog 10 Module: Input CH1 Active		Analog 10 Module: Input CH1 Data	
M00001	U01.00.F	U01.01.2			U01.06.0
	Analog 10 Module: Module Ready	Analog IO Module: Output CHO Active			Analog 10 Module: Output CHO Status Setting
	U01.00.F	U01.01.3			U01.06.1
	Analog 10 Module: Module Ready	Analog IO Module: Output CH1 Active			Analog 10 Module: Output CH1 Status Setting
M00002	2 U01.00.F	U01.01.2	MOV	D00200	U01.07
	Analog 10 Module: Module Ready	Analog 10 Module: Output CHO Active			Analog IO Module: Output CHO DATA
	U01.00.F	U01.01.3	MOV	D00201	U01.08
	Analog 10 Module: Module Ready	Analog 10 Module: Output CH1 Active			Analog 10 Module: Output CH1 DATA
					END

(d) In the 'View' menu, click 'View Device/Description' to look up the devices and descriptions at the same time.

1

(e) For IEC type also, as shown in Fig. (a) ~ (d), you can look up variables with diversified options in the 'View' menu. The figure below is the case of an IEC type with which the 'View Variables/Descriptions' option.

Γ

XMXO	_01_RDY	_01_ADO_AC T				MOVE		
	Analog 10 Module: Module Ready	Analog IO Module: Input CHO Active					-	
		_01_AD1_AC	MOVE En Eno		_01_AD1_DA TA	IN OUT	CH1Convers - ionValue	
	Module: Module Ready	Module: Input CH1 Active			Module: Input CH1 Data			
		_01_ADO_DA TA Analog 10 Module: Input CHO Data	IN OUT	CHOInput Va - Iue				
XMX1	_01_RDY	_01_DAO_AC T						_01_DA0_0 TEN
	Analog 10 Module: Module Ready	Analog IO Module: Output CHO Active						Analog IC Module: Output CH Status Setting
	_01_RDY	_01_DA1_AC T						_01_DA1_0 TEN
	Analog 10 Module: Module Ready	Analog 10 Module: Output CH1 Active						Analog IG Module: Output CH Status Setting
XMX2	_01_RDY	_01_DAO_AC				MOVE		
-1	Analog 10 Module: Module Ready	Analog 10 Module: Output CHO Active				EN ENU	-	
	_01_RDY	_01_DA1_AC T	MOVE EN ENO		CH1OutputV	וא חוד	_01_DA1_DA	
	Analog 10 Module: Module Ready	Analog 10 Module: Output CH1 Active			uiue .		Analog 10 Module: Output CH1 DATA	
		CHOOutputY alue	- IN OUT	_01_DAO_DA _ TA Analog 10 Module: Output CHO DATA				

# 6.11 Constitution and Function of Internal Memory

An analog I/O module has internal memory for data communication with XGB base unit.

# 6.11.1 Analog Data I/O Area

**Device Allocation** Read/ Signal Variable Туре "S" or "H" Description Write Direction **IEC Type** Туре 0y_ERR BIT U0y.00.0 %UX0.y.0 Module error  $AH04A \rightarrow CPU$ Read 0y_RDY BIT U0y.00.F %UX0.y.15 Module ready _0y_AD0_ACT BIT U0y.01.0 %UX0.y.16 Input Ch 0 operating 0y_AD1_ACT BIT U0y.01.1 %UX0.y.17 Input Ch 1 operating AH04A → CPU Read 0y_DA0_ACT BIT U0y.01.2 %UX0.y.18 Output Ch 0 operating _0y_DA1_ACT BIT U0y.01.3 %UX0.y.19 Output Ch 1 operating Input Ch 0 open wire %UX0.y.20 0y AD0 IDD BIT U0y.01.4 detected  $AH04A \rightarrow CPU$ Read Input Ch 1 open wire U0y.01.5 %UX0.y.21 _0y_AD1_IDD BIT detected _0y_AD0_ERR BIT U0y.01.8 %UX0.y.24 Input Ch 0 error 0y_AD1_ERR BIT U0y.01.9 %UX0.y.25 Input Ch 1 error  $AH04A \rightarrow CPU$ Read 0y DA0 ERR BIT U0y.01.A %UX0.y.26 Output Ch 0 error Output Ch 1 error 0y_DA1_ERR BIT U0y.01.B %UX0.y.27 Input Ch 0 converted 0y AD0 DATA WORD U0y.04 %UW0.y.4  $AH04A \rightarrow CPU$ Read value Input Ch 1 converted _0y_AD1_DATA WORD U0y.05 %UW0.y.5  $AH04A \rightarrow CPU$ Read value BIT 0y_DA0_OUTEN U0y.06.0 %UX0.y.96 Ch 0 output state setting Write AH04A ↔ CPU U0y.06.1 0y_DA1_OUTEN BIT %UX0.y.97 Ch 1 output state setting U0y.07 _0y_DA0_DATA WORD %UW0.y.7 Output Ch 0 input value  $AH04A \leftrightarrow CPU$ Write 0y_DA1_DATA WORD U0y.08 %UW0.y.8 Output Ch 1 input value  $AH04A \leftrightarrow CPU$ Write

The table below presents the analog data I/O area.

- In the device allocation, the small letter 'y' is the No. of the slot where the module is installed.

- For example, to read the 'Input Ch 1 Converted Value' of the analog I/O module installed in the 4th slot, write in U04.05. (%UW0.4.5 for IEC types)



["S" or "H" type]



- To read the 'Output Ch 1 Output Status Setting' of the analog I/O module installed in the 5th slot, write in U05.06.1 (%UX0.5.97 for IEC types)





(1) Module Ready/Error Flag (() is for IEC types, x: slot No.)

(a) U0x.00.F(%UX0.x.15): at power on or reset of PLC CPU, turns on when the analog I/O conversion is ready and analog conversion is performed.

(b) U0x.00.0(%UX0.x.0): the flag indicating the error status of A/D conversion module.



(2) Operation channel information/ open-wire detection information/ channel error information flags ( '( )' is for IEC types, x: slot No.)

This is the area for storing the operation information, input wire open detection and channel error information by channel.

 $\times$  The base No. of the XGB PLC is 0.



- (3) Digital Output Values (() is for IEC types, x: slot No.)
  - (a) A/D converted digital values are outputted to buffer memory address U0x.04 ~ U0x.05 (%UW0.x.4 ~ %UW0.x.5) by channel-basis.
  - (b) Digital output values are saved in 16-bit binary figures.
  - X The base No. of the XGB PLC is 0.

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
U0x.04 (%UW0.x.4)						Inp	ut cha	nnel 0	conve	rted va	lue					
U0x.05 (%UW0.x.5)						Inp	ut cha	nnel 1	conve	rted va	lue					

(4) Output Permit Setting (() is for IEC types, x: slot No.)

- (a) Output permit/prohibit can be set up for each channel.
- (b) The default setting is 'Output Prohibited.'
- % The base No. of the XGB PLC is 0.



- percentile (-12~1011) values.
- (b) When digital input value is not set up, they are processed as zero.
- % The base No. of the XGB PLC is 0.

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
U0x.07 (%UW0.x.7)						0	utput	channe	el 0 inp	ut valu	e					
U0x.08 (%UW0.x.8)						0	utput	channe	el 1 inp	ut valu	e					

# 6.11.2 Operation Parameter Setting Area

The operation parameter setting area of the analog I/O module is as follows.

Memory Add.	Description	Setting	R/W	Command
0	Appoint operating channel	Bit Off (0): stop, Bit ON (1): run	R/W	
1	I/O range setting	I/O range setting (4 bit per Ch.) 0: 4 ~ 20 mA 1: 0 ~ 20 mA 2: 1 ~ 5 V 3: 0 ~ 5 V 4: 0 ~ 10 V	R/W	
2	I/O data type setting	<ul> <li>I/O data type setting (4 bit per Ch.)</li> <li>0: 0 ~ 4000</li> <li>1: -2000 ~ 2000</li> <li>2: Precision value</li> <li>3: 0 ~ 1000</li> <li>for precision values;</li> <li>4 ~ 20 mA: 400 ~ 2000</li> <li>0 ~ 20 mA: 0 ~ 2000</li> <li>1 ~ 5 V: 100 ~ 500</li> <li>0 ~ 5 V: 0 ~ 500</li> <li>0 ~ 10 V: 0 ~ 1000</li> </ul>	R/W	PUT/GET
3	Input Ch 0 filter value setting	0 or 4 64000	R/W	
4	Input Ch 1 filter value setting	0 01 4 ~ 04000	R/W	
5	Averaging method setting	Averaging method setting (4 bit per Ch.) 0: Sampling 1: Time average 2: Cycle average 3: Moving average	R/W	
6	Input Ch 0 average value setting	Time average: 4 ~ 16000 [ms]	R/W	
7	Input Ch 1 average value setting	Moving average: 2 ~ 64000 [cycles]	R/W	
8	Channel output status setting	0: previous value 1: min. value 2: median 3: max.	R/W	
9	Set-up error information output area	10#: Input Ch range setting error 20#: Input Ch data type setting error 30#: Input Ch filter value setting error 40#: Input Ch averaging setting error 50#: Input Ch average value setting error 60#: Output Ch range setting error 70#: Output Ch data type setting error 80#: Ch output status setting error 90#: Output Ch input value range-over error (#: channel number)	R	GET

## Note

- (1) If the memory address 0~8 area is entered with values different from the setting. U0x.01.8~U0x.01.B (setting error representative flag, for IEC type, %UX0.x.24 ~%UX0.x.27) is ON and runs with default values. The error information is displayed in the setting error information are (No. 9).
- (2) System areas (after No. 10) are read/write protected.
  - Changing these areas may cause malfunction or failure of the product.

## (1) Operating Channel Setting

The default setting for operating channel is 'Stop.'



- (2) I/O Range Setting
  - (a) The analog I/O voltage range is DC 1~5V, DC 0~5V, DC 0~10V, and analog current I/O range is DC 4~20mA, DC 0~20mA.
  - (b) Default range is DC 4~20mA.

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Address1		Output CH.1														
	Output CH.1				Output	CH.0			Input	CH.1			Input	CH.0		

Input ch. Set-up I/O range(by ch. 4bit)

0 ~ 10 V: 0 ~ 1000

- $\begin{array}{l} 0:4\sim 20 \text{ mA} \\ 1:0\sim 20 \text{ mA} \\ 2:1\sim 5 \text{ V} \\ 3:0\sim 5 \text{ V} \end{array}$
- 4:0~10V

- (3) I/O Data Type Setting
  - (a) I/O data type can be set up for each channel.
  - (b) If the I/O data type is not set up, all the channels are processed in 0~4000 range.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address2		Output	t CH. 1			Output	CH. 0	I		Input	CH. 1			Input	CH. 0	
						Set-up 0:0~ 1:-20 2:Pre 3:0~	0 I/O da 4000 00 ~ 2 ecision 1000	ata typ 2000 value	e (by	Ch.4bit	:)		- For p 4 ~ 2 0 ~ 2 1 ~ 5 0 ~ 5	orecisio 20 mA: 4 20 mA: 0 5 V: 100 5 V: 0 ~	n value 00 ~ 2 ) ~ 200 ) ~ 500	es 000 0

## (4) Filter Constant Setting

- (a) If set to 0, no filtration is processed.
- (b) Default setting is 0 no filtration process.

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Address3					Input	channe	el O filt	er con	stant (	0 or 4 -	- 6400	0 ms)				
Address4					Input	channe	el 1 filt	er con:	stant (	0 or 4 -	- 6400	0 ms)				

#### (5) Averaging Method Setting

- (a) Averaging method can be one of; time average, cycle average, moving average.
- (b) Default setting is no averaging throughout the channels.



#### (6) Average Value Setting

- (a) Set up average values in accordance with the setting area of the averaging method.
- (b) If the average value is out of setting range, averaging is not applied.

	비트15	비트14	비트13	비트12	비트11	비트10	비트9	비트8	비트7	비트6	비트5	비트4	비트3	비트2	비트1	비트0
Address6		Input channel 0 average value														
Address7		Input channel 1 average value														
								-								

Input channel# average value setting Time average : 4 ~ 16000 [ms] Cycle average : 2 ~ 64000 [Cycle] Moving average : 2 ~ 100 [samples]

#### (7) Output Status Setting

(a) This sets up the analog output status when the XGB base unit is changed from run to stop.(b) Default setting is the Previous Value output.



- (8) Error Code (Address 9)
  - (a) Saves the error code detected by the analog I/O module.
  - (b) The types and descriptions of the error are as follows.

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Address9							Set-u	p error	inform	nation						

Туре	Error Code	LED Lamp	Description	Priority Order	Remark
	10#		Input Ch range setting error	2	
	20#	INPUT LED	Input Ch data type setting error	3	
Input Error	30#	flickering 1s	Input Ch filter cons. Setting error	4	
Liioi	40#	intervals	Input Ch averaging setting error	5	#: Ch No.
	50#		Input Ch average value setting error	6	Input Ch. 0,1
	60#		Output Ch range setting error	7	Output Ch. 0,1
Output	70#	OUTPUT LED	Output Ch data type setting error	8	
Error	80#	intervals	Output Ch status setting error	9	
	90#		Output Ch input value range-over error	1	

(c) In case of plural errors, the code with higher priority order will be saved.

#### (9) System Area (after Address 10)

(a) System area (after address 10) is read/write protected.



# 6.12 Example Program

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- (1) This sample program sets up operating parameters of analog I/O module.
- (2) Initial settings are saved in the internal memory of the module by input by once.
- (3) The sample program below controls the I/O data of the analog I/O module at slot #1 and check open wire.

# 6.12.1 Example of [I/O Parameter] Usage

(1) I/O Parameter Setting Window

🗊 Base OO : Default 🛛 📗	Slot	Module	Comment	Input Filter	Emergency Ou	t Allocation
00 : DC 24V INPUT/	0(main) DC 24V	/INPUT/RELA		3 Standard [ms]	] Default	
01 : XBF-AH04A (I/1	1 XBF-AH	104A (1/0, 2/2		-	-	
2 02 : Default	2					
🔄 04 : Default	3					
05 : Default	5					
m 06 : Default	6				•	
🔄 08 : Default	7					
09 : Default	8					
	9					
	10					
	te Slot Delete Base	e Base <u>S</u> etting	Delete All	Dețails <u>P</u> r	rint 🔻	ОК Са
_ <u>Dele</u> -AH04A (1/0, 2/2 CH	te Slot Delete Base	e Base <u>S</u> etting	Pelete All	De <u>t</u> ails <u>P</u> r	rint 🔻	OK Ca
Dele - AHD4A (1/O, 2/2 CH AH04A (1/0, 2/2 CH)	te Slot Delete <u>B</u> ase	e Base <u>S</u> etting	Delete Al	Dețails <u>P</u>	rint <b>V</b>	OK Ca
Dele - AH04A (I/O, 2/2 CH AH04A (I/O, 2/2 CH) Input Parameter	ie Slot Delete Base	e Base <u>S</u> etting CH 1		Dețails Pr	rint <b>V</b>	OK Ca
_ele -AH04A (I/O, 2/2 CH AH04A (I/O, 2/2 CH) Input Parameter ☐ Channel status	te Slot Delete Base	e Base Setting CH 1 Disable	Delete Al	Dețails Pr	int 🔻	OK Ca
Dele     AH04A (I/O, 2/2 CH     AH04A (I/O, 2/2 CH)     Input Parameter     Channel status     Input range	te Slot Delete Base Delete Base CH 0 Enable 4~20mA	e Base Setting CH 1 Disable 0~10V	Delete Al	Dețails Pr	nint 🔻	OK Ca
Dele     AH04A (I/O, 2/2 CH     AH04A (I/O, 2/2 CH)     Input Parameter     Channel status     Input range     Output type	Le Slot Delete Base CH 0 Enable 4 ^{~2} 0mA 0~4000	e Base Setting CH 1 Disable 0~10/ 0~4000	Delete Al	Dețails P	nint <b>V</b>	OK Ca
Dele     AH04A (I/O, 2/2 CH     AH04A (I/O, 2/2 CH)     Input Parameter     Channel status     Input range     Output type     Filter constant	te Slot Delete Base CH 0 Enable 4 ²² 0mA 0 ²⁴⁰⁰⁰ 0	e Base Setting CH 1 Disable 0~10/ 0~4000 0	Delete Al	Dețails <u>P</u>	nint <b>V</b>	OK Ca
Delet     AH04A (I/O, 2/2 CH     AH04A (I/O, 2/2 CH)     Input Parameter     Channel status     Input range     Output type     Filter constant     Average processing	te Slot Delete Base CH 0 Enable 4 ^{~2} 0mA 0 ^{~4000} 0 Sampling	e Base Setting CH 1 Disable 0~10/ 0~4000 0 Samplin	Delete Al	Dețails <u>P</u>	nint <b>V</b>	OK Ca
Delet     Delet     AH04A (I/O, 2/2 CH)     Input Parameter     Channel status     Input range     Output type     Filter constant     Average processing     Average value	te Slot Delete Base CH 0 Enable 4 ^{~2} 0mA 0 ^{~4} 000 0 Sampling 0	e Base Setting CH 1 Disable 0~10/ 0~4000 0 Samplin 0	Delete Al	Dețails <u>P</u>	nint <b>V</b>	OK Ca
Delet     Delet     AH04A (I/O, 2/2 CH)     Input Parameter     Channel status     Input range     Output type     Filter constant     Average processing     Average value     Output Parameter	te Slot Delete Base CH 0 Enable 4~20mA 0~4000 0 Sampling 0 Channel 0	e Base Setting CH 1 Disable 0~10/ 0~400/ 0 Samplin 0 Samplin 0	Pelete Al	Dețails <u>P</u>	nint 🔻	OK Ca
Delet     Delet     AH04A (I/O, 2/2 CH)     Input Parameter     Channel status     Input range     Output type     Filter constant     Average processing     Average value     Output Parameter     Output Parameter     Channel status	Le Slot Delete Base CH 0 Enable 4~20mA 0~4000 0 Sampling 0 Channel 0 Enable	e Base Setting CH 1 Disable 0~10/ 0~400/ 0 Samplin 0 Samplin 0 Channel Disable		Dețails <u>P</u>	nint 🔻	OK Ca
Delet     Delet     Delet     AH04A (I/O, 2/2 CH)     Input Parameter     Channel status     Input range     Output type     Filter constant     Average processing     Average value     Output Parameter     Channel status     Output range	Le Slot Delete Base CH 0 Enable 4~20mA 0~4000 0 Sampling 0 Channel 0 Enable 4~20mA	e Base Setting CH 1 Disable 0~10V 0~4000 0~4000 0 Samplin 0 Channel Disable 0~10V		Dețails <u>P</u>	nint 🔻	OK Ca
Delet     Delet     Delet     AH04A (I/O, 2/2 CH)     Input Parameter     Channel status     Input range     Output type     Filter constant     Average processing     Average value     Output Parameter     Channel status     Output range     Input range     Input range     Input range     Input parameter     Output p	Le Slot Delete Base CH 0 Enable 4~20mA 0~4000 0 Sampling 0 Channel 0 Enable 4~20mA 0~4000	e Base Setting CH 1 Disable 0~10V 0~4000 0 3 Samplin 0 Channel Disable 0~10V 0~4000 0 3 Channel		Dețails <u>P</u>	nint 🔻	OK Ca

- (a) Input Channel 0 is set to operating channel and input range is set to 4~20mA.
- (b) Output Channel 0 is set to operating channel and output range is set to 4~20mA.

## (2) Sample Input Program

## Input CH0 program

L1		U01.00.0	U01.00.F	U01.01.0	U01.01.8				M00000
	S1	_O1_ERR	_01_RDY	_01_ADO_AC	_01_ÅD0_ER R				.,
12		M00000					MOV	U01.04	D00100
	S6							_01_ADO_DA TA	
L3		U01.01.4							M00001
	S9	_01_ADO_1D D							(0)
L4									END

- (a) When the module is in normal operation, M0000 is turned On.
  - U01.00.0(Module Error) = Off U01.00.F(Module Ready) = On

U01.01.0(Input Channel 0 in-operation) = On

- U01.01.8(Input Channel 0 Error) = Off
- (b) When M0000 is ON, Input Channel 0 Converted Value(U01.04) is moved to D00100.
- (c) If open-wire error occurs in channel 0, U01.01.4(channel 0 open-wire) is ON, and M0001 bit is set.
- (3) Sample Output Program

Output CH0 program

L1		U01.00.0	U01.00.F	U01.01.2	U01.01.A	 	 		M00010
	\$1	_01_ERR	_01_RDV	_01_DA0_AC	_01_DA0_ER R				
12	01	M00010							U01.06.0
	S6					 			_01_DA0_OU TEN
L3		M00010					MOV	D00200	U01.07
	58								_01_DA0_DA TA
L4	\$11								END

(a) When the module is in normal operation, M00010 is turned ON.

- U01.00.0(Module Error) = Off
- U01.00.F(Module Ready) = On
- U01.01.2(Output Channel 0 in-operation) = On
- U01.01.A(Output Channel 0 Error) = Off
- (b) When M00010 is On, channel 0 output status setting (U01.06.0) is turned ON and output is permitted.
- (c) When M00010 is On, the data in D00200 is transmitted to Output Channel 0 input value (U01.07) and outputted.

(4) Sam	ple Input	Program (	(for IEC ty	/pe)				
10	%UX0.1.0	%UXO.1.15	%UXO.1.16	%UX0.1.24				XMXO
	//  01_ERR	 01_RDY	_01_AD0_AC					
Lf								
	×MXO		- EN ENO	-				
12								
		%UWO.1.4 - _01_ADO_DA TA	- IN OUT -	CH0Inp Value	out			
<i>L3</i>								
14	XUX0.1.20							XMX1
	_01_ADO_ID							

(a) When the module is in normal operation, %MX0 is turned ON.

. - - -

%UX0.1.0(Module Error) = Off

.....

%UX0.1.15(Module Ready) = On

%UX0.1.16(Input Channel 0 in-operation) = On

%UX0.1.24(Input Channel 0 Error) = Off

- (b) When %MX0 is ON, Input Channel 0 Converted Value(%UW0.1.4) is transferred to "Channel 0 Input" variable.
- (c) If open-wire error occurs at Channel 0, %UX0.1.20(Channel0open) turns ON and %MX1 bit is set.

#### (5) Sample Output Program (for IEC type)

` <i>LÓ</i>	XUXO.1.0 XUXO.1.15	XUX0.1.18	XUX0.1.26	%MX10
	_01_ERR _01_RDY		L _01_DAO_ER	()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()()())()()()()()())()()()()())()()()())()()()())()())()
Lf	%MX10			XUX0.1.96
				_01_DAO_OU TEN
12	9WV10	HOUE		
		EN ENO		
L3				
	CH0Output ⁻ Value	IN OUT-	%UW0.1.7 _01_DA0_DA _TA	
14	U			
(a) \//	An the medule is in	normala	operation 0/MV10 is turned ON	

(a) When the module is in normal operation, %MX10 is turned ON.
 %UX0.1.0(Module Error) = Off
 %UX0.1.15(Module Ready) = On
 %UX0.1.18(Output Channel 0 in-operation) = On

- %UX0.1.26(Output Channel 0 Error) = Off
- (b) When %MX10 is ON, Channel0 output status setting (%UX0.1.96) is turned ON and output is permitted
- (c) When %MX10 is ON, the data of the 'Channel 0output' variable is transferred to Output Channel 0 Input Value (%UW0.1.7) and outputted.





(a) Using PUT command to write h0005 in the address 0, slot 1 to operate Input Channel 0 and Output Channel 0.

- (b) Using PUT command to write h0000 in the address 1, slot 1 to set the input range of Input Channel 0 to DC 4 ~ 20mA and the output range of the Output Channel 0 to DC 4 ~ 20mA.
- (c) When the module is in normal operation, M0000 is turned ON. U01.00.0(Module Error) = Off, U01.00.F(Module Ready) = On
- U01.01.0(Input Channel 0 in-operation) = ON, U01.01.8(Input Channel 0 Error) = Off
- (d) When M0000 is ON, Input Channel 0 Converted Value(U01.04) is transferred to D00100.
- (e) If open-wire error occurs at Channel 0, U01.01.4(Channel0open) is ON, and M0001 bit is set.



## (2) Sample Output Program

(a) Using PUT command to write h0005 in the address 0, slot 1 to operate Input Channel 0 and Output Channel 0.

- (b) Using PUT command to write h0000 in the address 1, slot 1 to set the input range of Input Channel 0 to DC 4 ~ 20mA and the output range of the Output Channel 0 to DC 4 ~ 20mA.
- (c) When the module is in normal operation, M00010 is turned ON.
   U01.00.0(Module Error) = Off, U01.00.F(Module Ready) = On
   U01.01.2(Output Channel 0 in-operation) = ON, U01.01.A(Output Channel 0 Error) = Off
- (d) When M00010 is ON, Channel 0 Output Status setting (U01.06.0) is turned ON and output is permitted.
- (e) When M00010 is ON, data of D00200 is transferred to Output Channel 0 Input Value (U01.07) and outputted.

10	%FX155 ───┤		INST PUT_WORD REQ DONE			INSTI PUT_WORD REQ DONE-			
Lf		0	-BASE STAT	STATO	0	-BASE STAT-	STAT1		
12		1	SLOT		1	SLOT			
13		0	MADD		1	MADD			
14		16#0005	DATA		16#0000	DATA			
15									
18	*UX0.1.0 // _01_ERR	XUXO.1.15	XUXO.1.16 	XUX0.1.24					%MXO ──< >──
L7	%мхо 1		- EN ENO						
LB		%UWO.1.4 _01_ADO_DA TA	- IN OUT -	CH0Inpu Value	t				
19									
L10	XUX0.1.20								XMX1 (S)

#### (3) Sample Input Program (for IEC type)

- (a) Using PUT command to write h0005 in the address 0, slot 1 to operate Input Channel 0 and Output Channel 0.
- (b) Using PUT command to write h0000 in the address 1, slot 1 to set the input range of Input Channel 0 to DC 4 ~ 20mA and the output range of the Output Channel 0 to DC 4 ~ 20mA.
- (c) When the module is in normal operation, %MX0 is turned on. %UX0.1.0(Module Error) = Off %UX0.1.15(Module Ready) = On %UX0.1.16(Input Channel 0 in-operation) = On %UX0.1.24(Input Channel 0 Error) = Off
- (d) When %MX0 is on, Input Channel 0 Converted Value (%UW0.1.4) is transferred to "Channel 0 Input" variable.
- (e) If open-wire error occurs at Channel 0, %UX0.1.20(Channel0open) is turned on and %MX1 bit is set.

10			INST			INST1		
	%FX155		- PUT_WORD			PUT_WORD		
	_10N		They borne					
11		0	BASE STAT	- STATO	0	BASE STAT	STAT1	
12		1	SLOT		1	SLOT		
13		0	MADD		1	MADD		
14			R					
		16#0005	-DATA		16#0000	DATA		
15								
10								
18	XUXO.1.0	XUXO.1.15	XUX0.1.18	XUX0.1.26				XMX10
	_01_ERR	_01_RDY	_01_DAO_AC	_01_DA0_ER				
L7	%MX10			n				XUX0.1.96
	$ \rightarrow  \vdash $							
								_UT_DA0_00 TEN
LB	%MX10		MOVE					
			EN ENO	-				
LØ								
	CH0	Outnput	IN OUT	- %UW0.1.7 01 DAO DA				
1.40	Value	е		TÅ				
110								
	_ U			i i				

### (4) Sample Output Program (for IEC type)

- (a) Using PUT command to write h0005 in the address 0, slot 1 to operate Input Channel 0 and Output Channel 0.
- (b) Using PUT command to write h0000 in the address 1, slot 1 to set the input range of Input Channel 0 to DC 4 ~ 20mA and the output range of the Output Channel 0 to DC 4 ~ 20mA.
- (c) When the module is in normal operation, %MX10 is turned on. %UX0.1.0(Module Error) = Off %UX0.1.15(Module Ready) = On %UX0.1.18(Output Channel 0 in-operation) = On %UX0.1.26(Output Channel 0 Error) = Off
- (d) When %MX10 is on, Channel 0 Output Status setting (%UX0.1.96) is turned on and output is permitted.
- (e) When %MX10 is on, data of the 'Channel 0output' variable is transferred to Output Channel 0 Input Value (%UW0.1.7) and outputted.

# 6.13 Troubleshooting

I

This section describes methods for identifying the troubles which may occur during the operation of analog I/O module, and their solutions.

## 6.13.1 LED Indication for Error

An analog I/O module has INPUT LED and OUTPUT LED to indicate error status of the module.

Classification	Normal State	Channel Open (Input)	Parameter Setting Error	Module H/W Failure (Serious Failure)
INPUT LED	On	Flickering 1s intervals	Flickering 1s intervals (input parameter setting error)	Flickering 0.2s intervals
OUTPUT LED	On	N/A	Flikering at 1s intervals (output parameter setting error)	Flickering 0.2s intervals
Module Behavior	All functions are normal	All functions are performed. Indicates min. input value	All functions work at default parameter setting	Module cannot function
Action	-	Check input wire	Check parameter setting	Request for A/S

## 6.13.2 Checking Module Condition

XG5000's system monitor enables verification of the analog I/O module conditions (module type, module information, OS version).

- (1) Procedure
  - The verification can be done in 2 ways;
  - (a) [Monitor] -> [System Monitor] -> mouse right click on module icon -> [Module Information]
  - (b) [Monitor] -> [System Monitor] -> double click module icon.

(2) Module Information

- (a) Module type: shows the information on the present module.
- (b) Module information: shows the OS version of the module.
- (c) OS version: shows release date of Module OS.

## 6.13.3 Troubleshooting

(1) INPUT LED or OUTPUT LED is off.



#### (2) INPUT LED flikering.



#### (3) OUTPUT LED flikering



(4) Analog I/O value is abnormal.



# Chapter 7 Analog Input Module (XBF-AD08A)

# 7.1 Setting Sequence before operation

Before using the analog input module, follow steps below.



# 7.2 Specifications

Γ

# 7.2.1 General specifications

General specifications are as follows.

No.	ltem		Related specifications					
1	Ambient temperature			0°C ~	<b>+55</b> ℃		-	
2	Storage temperature			<b>-25</b> ℃ -	~ <b>+70</b> ℃		-	
3	Ambient humidity		Į	5 ~ 95%RH (N	on-condensing)		-	
4	Storage humidity		Į	5 ~ 95%RH (N	on-condensing)		-	
			Occasi	onal vibration		-	-	
		Frequency	Ac	celeration	Amplitude	How many times	_	
		5 ≤ f < 8.4 ⊞	Z	-	3.5 mm			
	Vibration	8.4 ≤ f ≤ 150 J	Hz 9.8	3 m/s² (1G)	-			
5	resistance		For conti	nuous vibratio	n	10 times each	IEC61131-2	
		Frequency	Ac	celeration	Amplitude	directions (X. Y and Z)		
		5 ≤ f < 8.4 ⊞	Z	-	1.75 mm			
		8.4 ≤ f ≤ 150 J	Hz 4.9	m/s² (0.5G)	-			
6	Shock resistance	<ul> <li>Peak acceleratio</li> <li>Duration: 11ms</li> <li>Half-sine, 3 times</li> </ul>	n: 147 m/s² s each direo	147 m/s²(15G) each direction per each axis				
		Square wave Impulse noise			AC: ± 1,500V DC: ± 900V		LS ELECTRIC standard	
		Electrostatic discharge		Voltage :	4kV (contact discl	narging)	IEC 61131-2, IEC 61000-4- 2	
7	Noise resistance	Radiated electromagnetic field noise		80 ~ 1,000 MHz,		//m	IEC 61131-2, IEC 61000-4- 3	
		Fast transient	Segment	Power suppl module	y Digital/an commun	alog input/output ication interface	IEC 61131-2, IEC 61000-4-	
		1000110100	Voltage	Voltage 2kV		1kV	4	
8	Environment		Free from	corrosive gas	ses and excessive of	dust	-	
9	Altitude			Up to 2,	000 ms		-	
10	Pollution degree			Less than	equal to 2		-	
11	Cooling		Air-cooling					

# 7.2.2 Performance specifications

Performance specifications are as follows.

	Items		Performance specification			
Numb	per of cha	nnel	8 chan	nels		
		Туре	Voltage	Current		
Analog input range		Range	DC 1 ~ 5V DC 0 ~ 5V DC 0 ~ 10V (Input resistance: 1 MΩ or above)	DC 4 ~ 20mA DC 0 ~ 20mA (Input resistance 250 Ω)		
		Туре	12 bit bina	ary data		
		Signed value	0 ~ 40	000		
Digital output		Unsigned value	-2000 ~	2000		
Digital output	Range	Precise value	100 ~ 500 (DC 1 ~ 5V) 0 ~ 500 (DC 0 ~ 5V) 0 ~ 1000 (DC 0 ~ 10V)	400 ~ 2000 (DC 4 ~ 20 ^{mA} ) 0 ~ 2000 (DC 0 ~ 20 ^{mA} )		
		Percentile value	0 ~ 10	000		
			1/4000			
Max	<. resolution	on	1.25 ^{mV} (DC 1~5V, 0~5V) 2.5 ^{mV} (DC 0~10V)	5 ^{µA} (DC4~20 ^{mA} , 0~20 ^{mA} )		
/	Accuracy		±0.5% o	r less		
Max. co	nversion	speed	1.5ms/channel			
Absolu	ite max. o	utput	DC ±15V DC ±25mA			
	Fil	ter function	Digital filter (4	~ 64,000ms)		
Additional			Time average (4	4 ~ 16,000ms)		
function	Ave	rage function	Count average (2	~ 64,000 times)		
			Moving avera	ge (2 ~ 100)		
	Ala	Irm function	Detecting disconnection (DC 1~5V, DC4~20mA)			
Insul	ation met	hod	Photo-coupler insulation betwee (No insulation betwee)	n I/O terminal and PLC power ween channels)		
Inp	out termina	al	11 point term	ninal block		
I/O points occupied			Fixed type:	64 points		
Max. no. of installation		llation	7 [When using XBM-Dxxx □ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type)			
Consumption	Inne	er (DC 5V)	105n	nA		
current	Exterr	nal (DC 24V)	85m	A		
	Weight		810	]		
Module su	pply powe	er source	20.4~28.8 V			

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Note1) In order to use analog input module (XBF-AD08A), the following version is needed.

Main unit	Version information
XBM-DxxxS type	V2.6
XBC-DxxxH type	V1.9
XEC-DxxxH type	V1.3
XBC-DxxxS type	V1.0

# 7.3 Name of part and function

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Respective designations of the parts are as described below.

No.	Name	Description
1	LED	<ul> <li>Displays the operation status of XBF-AD08A On: Operation normal</li> <li>Flickering: Error occurs (1s intervals)</li> <li>Off: power off or module error</li> </ul>
2	Voltage/current selector switch	<ul> <li>switch to select voltage/current input of analog input CH0~CH7</li> </ul>
3	Terminal block	<ul> <li>Wiring terminal block to connect with external device (Analog input)</li> </ul>
4	External power supply terminal	Terminal for DC24V external power supply
5	Connector for expansion	Connection connector for expansion module

# 7.4 Characteristic of I/O conversion

The input/output ranges of voltage and current can be set up per channel with user program or I/O parameters. The I/O types of digital data are defined as follows.

- (1) Unsigned Value
- (2) Signed Value
- (3) Precise Value
- (4) Percentile Value



#### (1) DC 4 ~ 20mA Range Input

Digital			Analog	Input Cur	rent (mA)		
Output Range	3.81	4	8	12	16	20	20.18
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047
Precise Value (400 ~ 2000)	381	400	800	1200	1600	2000	2018
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011

Digital			Analog	Input Cur	rent (mA)		
Output Range	-0.24	0	5	10	15	20	20.23
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047
Precise Value (0 ~ 2000)	-24	0	500	1000	1500	2000	2023
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011

## (2) DC 0 ~ 20mA Range Input

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## (3) DC 1 ~ 5V Range Input

Digital	Analog Input Voltage (V)									
Output Range	0.96	1	2	3	4	5	5.04			
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047			
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047			
Precise Value (100 ~ 500)	96	100	200	300	400	500	504			
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011			

## (4) DC 0 ~ 5V Range Input

Digital			Analog	g Input Vol	tage (V)		
Output Range	-0.06	0	1.25	2.5	3.75	5	5.05
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047
Precise Value (0 ~ 500)	-6	0	125	250	375	500	505
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011

# (5) DC 0 ~ 10V Range Input

Digital			Analog	g Input Volt	tage (V)		
Output Range	-0.12	0	2.5	5	7.5	10	10.11
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047
Precise Value (0 ~ 1000)	-12	0	250	500	750	1000	1011
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011

## 7.5 Accuracy

Accuracy of digital output value does not changed even if input range is changed. Figure below shows the range of the accuracy with analog input range of  $0 \sim 10$  V and digital output type of unsigned value selected.

Accuracy of XBF-AD08A is ±0.5%.



- (1) Accuracy when using 5V input  $4000 \times 0.5\% = 20$ Therefore the range of the accuracy will become (2000-20) ~ (2000+20) = 1980 ~ 2020 when using 5V input.
- (2) Accuracy when using 10V input

 $4000 \times 0.5\% = 20$ 

Therefore the range of the accuracy will become  $(4000-20) \sim (4000+20) = 3980 \sim 4020$  when using 10V input.

# 7.6 Functions of Analog Input Module

Function	Description
Channel	Specify operation/stop of the channel which will perform A/D and D/A conversion.
operation/stop setting	<ul> <li>Specifying unused channels as Stop can shorted overall operation time.</li> </ul>
I/O Voltage /current range setting	<ul> <li>Specify desired range of analog I/O.</li> <li>Select voltage/current with external switch, and set up range with parameter.</li> <li>Analog Mix Module provides 2 ranges(4~20mA, 0~20mA) of current I/O and 3 ranges (1~5V, 0~5V, 0~10V) of voltage I/O.</li> </ul>
I/O data type setting	<ul> <li>Specify digital I/O types.</li> <li>This module provides 4 output data types (Unsigned, Signed, Precision, and Percentile Values)</li> </ul>
A/D input conversion method	<ul> <li>Sampling Process <ul> <li>If A/D conversion method has not been specified, the module processes sampling.</li> </ul> </li> <li>Filter process <ul> <li>Filters rapid changes in input value by external noise.</li> </ul> </li> <li>Averaging process <ul> <li>Outputs A/D converted value averaged by time, cycle, and moving.</li> </ul> </li> </ul>
D/A output status	Sets up channel output state at transition from run to stop.
setting	Provides 4 output selections (Previous, Minimum, Mean, Maximum Values)

The functions of XBF-AD08A Module are as follows.

## 7.6.1 Sampling Process

In popular A/D conversion process, analog input signals are collected at constant time intervals and A/D converted. The time elapsed for the analog signals converted into digital signals and saved in memory device depends upon the number of channels used.

### (Process Time) = (No. of Channels Used) x (Conversion Rate)

(Ex.) Process time when using 3 of 4 I/O channels;

 $3 \times 1 \text{ ms} = 3.0 \text{ ms}$ 

The term 'sampling' means taking analog signal values at certain time intervals.
# 7.6.2 Filtering Function

The input value of the designated channel is calculated with previously filtered input value using preset filter constant (time constant 63.2%) by the formula below;

 $Pr esentlyFilteredInput = \frac{(Pr \ eviouslyFilteredInput \times FilterCons \ tan \ t) + (Pr \ esentInput \times 1ms \times No.ofChannelsUsed)}{FilterCons \ tan \ t + (1ms \times No.ofChannelsUsed)}$ 

Filter Constant setting range = 4 ~ 64000 [ms]



In the above graph, if the input value changes rapidly from 0 to 100, the input value is filtered. Filter (time) constant is the time required for input values to vary by 63.2% of the actual input value.

# 7.6.3 Averaging Function

### (1) Average by Time

The input values of the designated channel are accumulated for the preset time, and the average value of the total sum is outputted in digital data.



Setting Range =  $4 \sim 16000$  [ms]

For time averaging, No. of averaging cycles are calculated with the No. of channels used as below;

No. Averaging Cycles =  $\frac{AverageTime}{No.ofChannelsUsed \times 1ms}$ 

(2) Average by Cycles

The input values of the designated channel are accumulated for the preset cycles, and the average value of the total sum is outputted in digital data.





 $AveragingInterval \ [ms] = AveragingCycle \times No.ofChannelsUsed \times 1ms$ 

### (3) Moving Average

The inputs into the designated channel are accumulated for the presser number, and its average is calculated and outputted in digital data. However, in moving average method, each scan provides its average value.



# Note

- (1) In case of time/cycle averages. The input value is not outputted at every conversion, but the previous value is maintained until the average time or cycle is reached.
- (2) In case of moving averages, the converted input is averaged with the previously entered value and the result is outputted at every conversion. Therefore, data response is faster than time/cycle averaging methods.
- (3) The three averaging methods can be processed simultaneously with the filter function described earlier. In such case, the filter function is executed first, and averaging function is processed to output the average value in digital data, which is expressed with the finallyprocessed value.

# 7.6.4 Disconnection detecting Function

The analog mix module has a diagnostic function which can detect and indicate open input line, when voltage input range of DC 1~5V or current input range of DC 4~20mA is selected as its analog input range. If the module indicates open input line, check the wiring.

- (1) If the wiring to the module is open, the Input LED flickering 1 second intervals and the respective error code is generated.
- (2) Line open detection is available for each channel. However, open indication is provided only for the channel selected for the operation. The Input LED is common for the input channels 0 and 1, and flickering if 1 or more channels are open.

Input Connection	Channel Operation	Input LED State	Open Line Flag
Normal	Working	On	Off
Normai	Stopped	On	Off
Input wire open or	Working	Flickering (1s intervals)	On
disconnected	Stopped	On	Off

(3) At line open, the line open flag of the channel turns on, and turns Off at correction.

Open Flag	Description
U0x.10.0	Ch 0 open
U0x.10.1	Ch 1 open
U0x.10.2	Ch 2 open
U0x.10.3	Ch 3 open
U0x.10.4	Ch 4 open
U0x.10.5	Ch 5 open
U0x.10.6	Ch 6 open
U0x.10.7	Ch 7 open

(4) At line open, the least of all input values is indicated.

# 7.7 Wiring

# 7.7.1 Precaution for wiring

- (1) Don't let AC power line near to A/D conversion module's external input sign line. With an enough distance kept away between, it will be free from surge or inductive noise.
- (2) Cable shall be selected in due consideration of ambient temperature and allowable current, whose size is not less than the max. cable standard of AWG22 (0.3mm²).
- (3) Don't let the cable too close to hot device and material or in direct contact with oil for long, which will cause damage or abnormal operation due to short-circuit.
- (4) Check the polarity when wiring the terminal.
- (5) Wiring with high-voltage line or power line may produce inductive hindrance causing abnormal operation or defect.

# 7.7.2 Wiring examples

- (1) Input resistance of current input circuit is 250  $\Omega$  (typ.).
- (2) Input resistance of voltage input circuit is 1 M $\Omega$  (min.).
- (3) Enable the necessary channel only.
- (4) Analog input module doesn't support power for input device. Use the external power supplier.
- (5) Wiring example of analog input
  - In case of voltage/current input, wiring is same. Adjust the voltage/current setting switch according to the case.



(6) Wiring example of analog input 2-Wire sensor/transmitter

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- In case of voltage/current input, wiring is same. Adjust the voltage/current setting switch according to the case.



- (7) Wiring example of analog input 4-Wire sensor/transmitter
  - In case of voltage/current input, wiring is same. Adjust the voltage/current setting switch according to the case.



- (8) Relationship between voltage input accuracy and wiring length
  - In voltage input, the wiring (cable) length between transmitter or sensor and module has an effect on digital-converted values of the module as specified below;



Where,

- Rc: Resistance value due to line resistance of cable
- Rs: Internal resistance value of transmitter or sensor
- Ri: Internal resistance value  $(1^{M\Omega})$  of voltage input module
- Vin: Voltage allowed to analog input module
- % Vi: Tolerance of converted value (%) due to source and cable length in voltage input

$$Vin = \frac{Ri \times Vs}{\left[Rs + \left(2 \times Rc\right) + Ri\right]}$$

$$\% Vi = \left(1 - \frac{Vin}{Vs}\right) \times 100 \%$$

# 7.8 Operation Parameter Setting

A/D conversion module's operation parameters can be specified through XG5000's [I/O parameters].

(1) Settings

For the user's convenience of A/D conversion module, XG5000 provides GUI (Graphical User Interface) for parameters setting of A/D conversion module. Setting items available through [I/O parameters] on the XG5000 project window are as described below in the table.

Item	Details		
[I/O parameter]	(a) Specify the following setting items necessary for the module operation.		
	1) Channel Enable/Disable setting		
	<ol><li>Setting ranges of input voltage/current</li></ol>		
	3) Output data format setting		
	4) Filter constant setting		
	5) Average processing method setting		
	6) Average value setting		
	(b) If downloading is complete Parameter set by user in XG5000 is saved		
	in Flash memory of XGB main unit.		

## (2) Usage of [I/O Parameter]

(a) Create a project with XG5000. See XG5000 Program Manual for project creation.

(b) In the Project window, double-click [I/O Parameter].



(c) In the [I/O Parameter Setting] window, find out the slot of the base where the analog mix module is installed, and click it.



(d) In the above window, click the arrow button to call the window where the module can be selected. Find out the module and select it.



(e) To set up parameter, double click with the respective slot being selected, or click [Detail] button.

I/O Parameter Setting						?×
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
01: XBF-AD08A (Volt/C	1	XBF-AD08A (Volt/Curr 💌		-	-	P0040 ~ P007F
02 : Default	2					
05: Default	3					
05 : Default	4					
06 : Default	5					
07 : Default	6					
08 : Default	7					
09 : Default	8					
10 : Default	9					
	10					
<				$\searrow$		
Delete	Slot De	lete Base Base Setting	Delete All	Details <u>P</u>	rint 🔻	OK Cancel

(f) The window below where parameters can be set up by channel appears. Click the item to set up. The parameters which can be set up appear by item.

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У	BF-AD08A (Volt/Current	, 8-CH)							?×
	XBF-AD08A (Volt/Current, 8-CH)								
	Parameter	CH 0	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7
	Channel status	Disable 🔽	Disable						
	Input range	4~20mA	4~20mA	4~20mA	4~20mA	4~20mA	4~20mA	4~20mA	4~20mA
	Output type	0~4000	0~4000	0~4000	0~4000	0~4000	0~4000	0~4000	0~4000
	Filter constant	0	0	0	0	0	0	0	0
	Average processing	Sampling	Sampling	Sampling	Sampling	Sampling	Sampling	Sampling	Sampling
	Average value	0	0	0	0	0	0	0	0
								ОК	Cancel

# 7.9 Special Module Monitoring Functions

The functions of the special module monitor are as follows.

- (1) Start-up of [Special Module Monitor]
- Select [Online] -> [Connect], and [Monitor] -> [Special Module Monitor] to start up. [Special Module Monitor] menu is enabled only in the [Online] condition.



### Notes

- The screen may not function properly if the system resources are not sufficient. In this case, close the screen, exit other applications, and rerun XG5000.
- 2) The I/O parameters set up in [Special Module Monitor] condition are temporarily set up for testing purpose. Therefore, these I/O parameters are deleted after exit from [Special Module Monitor].3) the test function of the [Special Module Monitor] enables testing analog mix modules without
- sequence programming.
- (2) Usage of [Special Module Monitor]
  - (a) With the XG5000 in connection (online) with the base unit of PLC, select [Monitor] -> [Special Module Monitor]. The Select Special Module window shown below will appear showing the type of the special modules and base/slot information. In the list dialog, the modules present in the PLC system are displayed.

Special Modu	le List		X
Base		Slot	Module
🗂 Base O	ß	Internal	High Speed Counter Module(Open-Collector, 8-CH)
🗊 Base O	<u>8</u>	Internal	Position Module (Open-Collector, 2-CH)
🍈 Base O		Slot 1	XBF-AD08A (Volt/Current, 8-CH)
<			
Module Info.	JL	Monitor	Close

(b) In the above window, select the special module and click [Module Info.] to see the information window below.

-		in bolom.
S	pecial Module Informa	ation ?×
	Displays the inform	nations of special module.
	ltem	Information
	Module Name	XBF-AD08A (Volt/Current, 8-CH)
	OS Ver	Ver. 9.0
	OS Update Date	2009-9-25
	Module Status	Normal. (0)
		OK

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(c) Click the [Monitor] button in the "Special Module" window. The "Special Module Monitor' window will appear as shown below.

Special Module Monitor		?×
XBF-AD08A (Volt/Current, 8-0	CH) -	
Item	Max/Min value	Current value
CH0 A/D value		
CH1 A/D value		
CH2 A/D value		
CH3 A/D value		
CH4 A/D value		
CH5 A/D value		
CH6 A/D value		
CH7 A/D value		
Item	Setting Value	Current Value
Channel	CH	
Channel status	Disable	
Input range	4~20mA	
Output type	0~4000	
Filter constant	0	
Average processing	Sampling	
Average value	0	
Reset max/min value	Start Monitoring	Test
		Close

(d) [Start Monitoring]: click [Start Monitoring] to look up the digital input data of the channel currently in operation. The screen shot below is a monitoring window when all the channels are in operation status.

	Max/Min value	Current value		
CH0 A/D value	0/0	0		— Monitoring
CH1 A/D value	0/0	0		
CH2 A/D value	0/0	0		
CH3 A/D value	0/0	0		
CH4 A/D value	0/0	0		
CH5 A/D value	0/0	0		
CH6 A/D value	0/0	0		
CH7 A/D value	0/0	0		
Item	Setting Value	Current Value	T	
Channel	CHI	)		Detailing
onannor	······	D: 11		Detail informa
Channel status	Disable	Disable		( 0) 10
Channel status Input range	Disable 4~20mA	Uisable 4~20mA		of CH0
Channel status Input range Output type	Disable 4~20mA 0~4000	4~20mA 0~4000		of CH0
Channel status Input range Output type Filter constant	Disable 4~20mA 0~4000 0	Uisable 4~20mA 0~4000 0		of CH0
Channel status Input range Output type Filter constant Average processing	Disable 4~~20mA 0~4000 0 Sampling	Ursable 4~20mA 0~4000 0 Sampling	2000 2000 2000 2000 2000 2000 2000 200	of CH0

The screen executing [Start Monitoring]

(e) [Test]: this function is used to change the current parameter settings of the analog mix module. Click the settings in the fields in the bottom screen to change the parameters. [Test] can be set up only when the operation status of the XGB base unit is STOP.

Special Module Monitor					
XBF-AD08A (Volt/Current, 8-0	CH) -				
Item	Max/Min value	Current value			
CH0 A/D value	0/0	0			
CH1 A/D value	0/0	0			
CH2 A/D value	0/0	0			
CH3 A/D value	0/0	0			
CH4 A/D value	0/0	0			
CH5 A/D value	0/0	0			
CH6 A/D value	0/0	0			
CH7 A/D value	0/0	0			
ltem	Setting Value	Current Value			
	CI CI	40			
Lhannel					
Channel Channel status	Enable	Enable			
Channel Channel status Input range	Enable 4~20mA	Enable 4~20mA			
Channel Channel status Input range Output type	Enable 4~20mA 0~4000	Enable 4~20mA 0~4000			
Channel Channel status Input range Output type Filter constant	Enable 4~20mA 0~4000 0	Enable 4~20mA 0~4000 0			
Channel Channel status Input range Output type Filter constant Average processing	Enable 4~20mA 0~4000 0 Sampling	Enable 4~20mA 0~4000 0 Sampling			
Channel status Channel status Input range Output type Filter constant Average processing Average value	Enable 4~20mA 0~4000 0 Sampling 0	Enable 4~20mA 0~4000 0 Sampling 0			
Channel status Input range Output type Filter constant Average processing Average value	Enable 4~20mA 0~4000 0 Sampling 0	Enable 4~20mA 0~4000 0 Sampling 0			
Channel status Channel status Input range Output type Filter constant Average processing Average value Reset max/min value	Enable 4~20mA 0~4000 0 Sampling 0 Stop Monitoring	Enable 4~20mA 0~4000 0 Sampling 0 Test			

The screen executing [Test]

## (f) Minimum/Maximum Value Monitoring

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The minimum and maximum values of the input channels in operation can be monitored. However, the Max/Min values in the window are based on the current value. Therefore, the Max/Min values are not saved when exiting from the [Monitoring/Testing Screen].

Special Module Monitor		?	
XBF-AD08A (Volt/Current, 8-0	CH) -		—
Item	Max/Min value	Current value	
CH0 A/D value	0/0	0	
CH1 A/D value	0/0 _	0	Monitors Max/Min value
CH2 A/D value	0/0	0	
CH3 A/D value	0/0	0	
CH4 A/D value	0/0	0	
CH5 A/D value	0/0	0	
CH6 A/D value	0/0	0	
CH7 A/D value	0/0	0	
Item	Setting Value	Lurrent Value	
Channel	CH L	J	
Channel status	Disable	Disable	
Input range	4~20mA	4~20mA	
Output type	0~4000	0~4000	
Filter constant	0	0	
Average processing	Sampling	Sampling	
Average value	0	0	
Reset max/min value	Stop Monitoring	Test	Resets Max/Min value
		Close	

The screen executing [Max/Min Value Monitoring]

### (g) Close

[Close] button is for ending/closing the monitoring/testing screen. Maximum, minimum, and current values are not saved at exit.

# 7.10 Register U devices

The variables for each module are automatically registered by referring to the information of the special modules set up in the [I/O Parameter]. User can modify variables and descriptions.

### (1) Registration Procedure

(a) In [I/O Parameter], set up special module in slot. I/O Parameter Setting  $\nabla \mathbf{x}$ All Base Set Base 🖃 🗊 Base 00 : Default Input Filter Emergency Out Module Slot Comment Allocation 00 : Default 01 : XBF-AD08A (Volt/C 0(main) XBF-AD08A (Volt/Curr 💌 1 P0040 ~ P007P 👝 02 : Default 03 : Default 2 04 : Default 05 : Default 4 👝 06 : Default 5 🔄 07 : Default 6 208 : Default 7 👝 09 : Default 8 2 10 : Default 9 10 
 Delete Slot
 Delete Base
 Base Setting
 Delete All
 Details
 Print
 ▼
 OK
 Cancel

### (b) Double click [Variables/Comment].

👒 AH - XG5000 - [Variable/Comment]	
₩ Project Edit Find/Replace View Online Monit	itor <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u> elp
- C & G - G - S - S - S - S - S - S - S - S -	
(0, ≜   0 0 ⊗   ⊈ 5   0 ⊕ 6 € 7   ₽ !	u: u·7) 670 🛛 🕮 🏨 🕊 🖉 🖓 4
副标准群群 表示 A 示 新 好 科 路 路	## # # # # # # # # # # # # # # # # # #
Project Window 👻 🗙	
Items	View Variable D View Device View Flag
⊡~∰a AH *	Variable Type Device Used
🖥 🗊 NewPLC(XGB-XBCH)-Offline	
	<u>-</u>
🖃 🐼 Parameter	
🔄 📴 Basic Parameter	
🔤 I/O Parameter	
🚊 🔟 Embedded Parameter	
ia⊢jaj Embedded Parameter ⊡⊣aj Scan Program	

(c) In the 'Edit' menu, select 'U-Device Auto Registration (special module variable auto registration).



×

# (d) Click 'Yes.'

?)

I

Automatically register comments in the U Devices according to the special module set in the I/O parameter. The previous comment will be deleted. Continue?

# Yes No

### (e) Variables are registered as shown below.

VV	ew Variable D View Device	🕅 View Flag	]		
	Variable	Туре 🔺	Device	Used	Comment
1	_01_ERR	BIT	U01.00.0	Г	Analog Input Module: Module Error
2	_01_RDY	BIT	U01.00.F	Г	Analog Input Module: Module Ready
3	_01_CH0_ACT	BIT	U01.01.0	Г	Analog Input Module: CH0 Active
4	_01_CH1_ACT	BIT	U01.01.1	Г	Analog Input Module: CH1 Active
5	_01_CH2_ACT	BIT	U01.01.2	Г	Analog Input Module: CH2 Active
6	_01_CH3_ACT	BIT	U01.01.3	Г	Analog Input Module: CH3 Active
7	_01_CH4_ACT	BIT	U01.01.4	Г	Analog Input Module: CH4 Active
8	_01_CH5_ACT	BIT	U01.01.5	Г	Analog Input Module: CH5 Active
9	_01_CH6_ACT	BIT	U01.01.6	Г	Analog Input Module: CH6 Active
10	_01_CH7_ACT	BIT	U01.01.7	Г	Analog Input Module: CH7 Active
11	_01_CH0_ERR	BIT	U01.01.8	Г	Analog Input Module: CH0 Error
12	_01_CH1_ERR	BIT	U01.01.9	Г	Analog Input Module: CH1 Error
13	_01_CH2_ERR	BIT	U01.01.A	Г	Analog Input Module: CH2 Error
14	_01_CH3_ERR	BIT	U01.01.B	Г	Analog Input Module: CH3 Error
15	_01_CH4_ERR	BIT	U01.01.C	Г	Analog Input Module: CH4 Error
16	_01_CH5_ERR	BIT	U01.01.D	Г	Analog Input Module: CH5 Error
17	_01_CH6_ERR	BIT	U01.01.E	Г	Analog Input Module: CH6 Error

### (f) In IEC types, the variables are registered as shown below.

V	Global Variable	Direct Variable Comment	🖏 Flag			
	Variable Kind	Variable	Туре	Ad In	niti Use	Comment
8	VAR_GLOBAL	_01_CH1_IDD	BOOL	%	Г	Analog Input Module: CH1 Input Disconnection Flag
9	VAR_GLOBAL	_01_CH2_ACT	BOOL	%	Г	Analog Input Module: CH2 Active
10	VAR_GLOBAL	_01_CH2_DATA	WORD	%	Г	Analog Input Module: CH2 Output
11	VAR_GLOBAL	_01_CH2_ERR	BOOL	%	Г	Analog Input Module: CH2 Error
12	VAR_GLOBAL	_01_CH2_IDD	BOOL	%	Г	Analog Input Module: CH2 Input Disconnection Flag
13	VAR_GLOBAL	_01_CH3_ACT	BOOL	%	Г	Analog Input Module: CH3 Active
14	VAR_GLOBAL	_01_CH3_DATA	WORD	%	Г	Analog Input Module: CH3 Output
15	VAR_GLOBAL	_01_CH3_ERR	BOOL	%	Г	Analog Input Module: CH3 Error
16	VAR_GLOBAL	_01_CH3_IDD	BOOL	%	Г	Analog Input Module: CH3 Input Disconnection Flag
17	VAR_GLOBAL	_01_CH4_ACT	BOOL	%	Г	Analog Input Module: CH4 Active
18	VAR_GLOBAL	_01_CH4_DATA	WORD	%	Г	Analog Input Module: CH4 Output
19	VAR_GLOBAL	_01_CH4_ERR	BOOL	%	Г	Analog Input Module: CH4 Error
20	VAR_GLOBAL	_01_CH4_IDD	BOOL	%	Г	Analog Input Module: CH4 Input Disconnection Flag
21	VAR_GLOBAL	_01_CH5_ACT	BOOL	%	Г	Analog Input Module: CH5 Active
22	VAR_GLOBAL	_01_CH5_DATA	WORD	%	Г	Analog Input Module: CH5 Output
23	VAR_GLOBAL	_01_CH5_ERR	BOOL	%	Г	Analog Input Module: CH5 Error
24	VAR_GLOBAL	_01_CH5_IDD	BOOL	%	Г	Analog Input Module: CH5 Input Disconnection Flag
25	VAR_GLOBAL	_01_CH6_ACT	BOOL	%	Г	Analog Input Module: CH6 Active
26	VAR_GLOBAL	_01_CH6_DATA	WORD	%	Γ	Analog Input Module: CH6 Output

### (2) Saving Variables

(a) The contents in the 'View Variables' tab can be saved in a text file.

- (b) In the 'Edit' menu, select 'Save as Text File.'
- (c) The contents in the 'View Variables' tab are saved in a text file.

# (3) Viewing Variables in Program

The figures below present examples of use in XGB "S" and "H" types.

## (a) Below is an exemplary program for XG5000.

10 S0	мооооо ————————————————————————————————	U01.00.F	U01.01.0	MOV	U01.02	D00100
11		U01.00.F	U01.01.1	MOV	U01.03	D00101
12 S11	M00001	U01.00.F	U01.01.2	MOV	U01.04	D00102
13		U01.00.F	U01.01.3	MOV	U01.05	D00103
14 \$22	M00002	U01.00.F	U01.01.4	MOV	U01.06	D00104
15		U01.00.F	U01.01.5	MOV	U01.07	D00105
<i>LB</i> 533	M00003	U01.00.F	U01.01.6	MOV	U01.08	D00106
17		U01.00.F	U01.01.7	MOV	U01.09	D00107

### (b) In the 'View' menu, click 'View Variables.' The devices are changed into variables.

10	M00000	_01_RDY	_01_CH0_AC T	MOV	_01_CH0_DA TA	D00100
11				MOV	_01_CH1_DA TA	D00101
12	M00001	_01_RDY	_01_cH2_AC	MOV	_01_CH2_DA TA	D00102
13		_01_RDV	_01_CH3_AC	MOV	_01_CH3_DA TA	D00103
14	M00002	_01_RDY	_01_CH4_AC	MOV	_01_CH4_DA TA	D00104
 		_01_RDY		MOV	_01_CH5_DA TA	D00105
18	M00003	_01_RDY	_01_CH6_AC	MOV	_01_CH6_DA TA	D00106
			_01_cH7_AC	MOV	_01_CH7_DA TA	D00107

# (c) In the 'View' menu, click 'View Device/Variables' to look up the devices and variables at the same time.

10	M00000	U01.00.F	U01.01.0	MAY 1101 02 DOD100
S			O1CHOAC	
L1		U01.00.F	U01.01.1	MOV U01.03 D00101
		_01_RDY	_01_CH1_AC	01_CH1_DA
12	M00001	U01.00.F	U01.01.2	MOV U01.04 D00102
S1			_01_CH2_AC	O1_CH2_DA
13		U01.00.F	U01.01.3	MOV U01.05 D00103
		_01_RDY	_01_cH3_AC	01_CH3_DA
14	M00002	U01.00.F	U01.01.4	MOV U01.06 D00104
S2	2	_01_RDY	_01_CH4_AC	01_CH4_DA
15		U01.00.F	U01.01.5	MOV U01.07 D00105
		_01_RDY	_01_cH5_AC	O1_CH5_DA
18	M00003	U01.00.F	U01.01.6	MOV U01.08 D00106
S3	3	_01_RDY	_01_CH6_AC	01_CH6_DA
17		U01.00.F	U01.01.7	MOV U01.09 D00107
		_01_RDY	_01_CH7_AC	01_CH7_DA

(d) In the	e 'View'	menu,	click "	View D	Device/[	Descriptior	i' to loo	k up the	e devices	and	descriptio	ons at the
sam	e time.											

Γ

M0002         U01015         U01014         MOV         U0108         D00194           Arading Module         Module Module         Module Module         Module Module         Module CH4 Active Resty         MOV         U0107         D00195           2         U01005         U01015         MOV         U0107         D00195           4         Module         Module Module         Module Module         Arading Module         Arading Module           M0003         U01005         U01014         MOV         U0108         D00195           M0004         Module Module         Module Module         Module Module         Arading Module         MoV         U0108         D00195           M0003         U01005         U01014         MOV         U0108         D00197           Module         Module         Module         Module         Module         Module           Module         U01017         MOV         U0108         D00197           Module         U01017         MOV         U0108         D00197           Module         U01017         Module         Module         Module           Module         U01014         MOV         U0107         D00197           Module						
1     Analog Input Input Madue Ready Ready Madue Ready Madue Ready Madue Ready Madue Madue Madue Ready Madue Mad	M00002	U01.00.F	U01.01.4	MOV	U01.06	D00104
4         U0100.F         U0101.5         MOV         U01.07         D00105           Analog         Madue         Ma		Analog Input Module: Module Ready	Analog Input Module: CH4 Active		Analog Input Module: CH4 Output	
Mobile Resty         Mobile CHS Active         Mobile CHS Cupst           M00003         U01:01.F         U01:01.8         MOV         U01:08         D00108           M00003         U01:01.F         U01:01.8         MOV         U01:08         D00108           M0000         Module Module CHS Active Resty         MOV         U01:08         D00108           M0000         U01:01.7         MOV         U01:09         D00107           Module Module CHS Active Resty         Aratiog Module Module Module         Aratiog Module Module         Aratiog Module CH7 Output         Aratiog Module Module         MOV         U01:09         D00107           M00002         U01:01.7         MOV         U01:03         D00104         MOV         U01:09         D00104           M00002         U01:01.7         MOV         U01:08         D00104         Module Module         Module Module         Aratiog Module         Aratiog Module         Mov         U01:08         D00104           M00002         U01:01.5         MOV         U01:08         D00104         Aratiog Module         Module CH8 Output         Module Module         Mov         D00108           M00002         U01:01.5         MOV         U01:07.0         D00108         Module Module         Mov </td <td>2</td> <td>U01.00.F Analog</td> <td>U01.01.5</td> <td>MOV</td> <td>U01.07 Analog Input</td> <td>D00105</td>	2	U01.00.F Analog	U01.01.5	MOV	U01.07 Analog Input	D00105
M00003     U01005     U01018     MCV     U0108     D00198       Analog Modular     Modular     Modular     Analog Modular     Analog Modular     Modular       Modular     Modular     Modular     Modular     Modular     Modular       Modular     CH8 Active     Modular     Modular     Modular       Modular     CH8 Active     Modular     Modular     Modular       Modular     CH8 Active     Modular     Modular     Modular       Modular     Analog Impa     Modular     Modular     Modular       Modular     Modular     Modular     Modular     Modular       Modular     CH7 Active     Modular     Analog       Modular     Modular     Modular     Modular     Analog       Modular     Modular     CH4 Active     Modular     Analog       Modular     Modular     Modular     Analog     Modular       Modular     Modular     Modular     CH4 Active     Analog       Modular     Modular     <		Module: Module Ready	Module: CH5 Active		Module: CH5 Output	
Analog     Analog       Module     Module       Module     Module       Module     Module       Module     Module       Module     CH8 Active       Ready     U0100.F       U0100.F     U0101.7       Analog     Module       Module     Module    <	M00003	U01.00.F	U01.01.6	MOV	U01.08	D00106
3 U0100F U01017 Analog Analog Input Module: Module: Module: CH7/Active Ready CH7/Active Ready CH7/Active Ready CH7/Active Ready CH7/Active CH4/Active CH		Analog Input Module: Module Ready	Analog Input Module: CH6 Active		Analog Input Module: CH6 Output	
Analog Input Module Ready     Analog Input Module CH7 Active     Analog Input Module CH7 Output     Analog Input Module CH7 Active       M00002     U01:00.F     U01:01.4     MOV     U01:08     D00104       Analog Ready     Analog Analog Input Module CH4 Active     Analog Analog Input Module CH4 Active     Analog Analog Input Module CH4 Active     Analog Input Module CH4 Active     Analog Input Module CH4 Active       2     U01:00.F     U01:01.5     MOV     U01:07     D00105       4     H     Analog Input Module CH5 Active     Analog Input Module CH5 Active Ready     Analog Input Module CH5 Active Ready     Analog Input Module CH5 Active Ready     Analog Input Module CH6 Active Ready     MOV     U01:08     D00108       4     H     H     MOV     U01:08     D00108     Analog Input Module CH5 Active Ready     Analog Input Module CH6 Active Ready     Analog Input Module CH6 Active Ready     Analog Input Module CH6 Active Ready     CH7 Active CH7 Output     CH7 Active CH7 Output	3	U01.00.F	U01.01.7	MOV	U01.09	D00107
M00002       U01.00.F       U01.01.4       MOV       U01.08       D00104         Analog       Analog       Analog       Input       Input       Input         Module:       Module:       Module:       Module:       Module:       CH4 Output         Module:       Module:       Module:       Module:       CH4 Output       Module:         U01.00.F       U01.01.5       MOV       U01.07       D00105         Analog       Analog       Analog       Input       Module:         Module:       Module:       Module:       Module:       CH4 Output         Module:       Module:       Module:       Module:       Module:         Module:       Module:       Module:       Module:       Module:       Module:         Module:       Module:       Module:       Module:       Module:       Module:       Module:         Module:       Module:       Module:       Module:       Module:       Module: <td></td> <td>Analog Input Module: Ready</td> <td>Analog Input Module: CH7 Active</td> <td></td> <td>Analog Input Module: CH7 Output</td> <td>F</td>		Analog Input Module: Ready	Analog Input Module: CH7 Active		Analog Input Module: CH7 Output	F
Analog     Analog     Analog     Input       Input     Input     Input     Module:       Module     Module:     Module:     Module:       Ready     CH4 Active     Module:     Module:       U01.00.F     U01.01.5     MOV     U01.07     D00105       Analog     Analog     Analog     Input       Input     Input     Module:     Module:       Module     Module:     Module:     Module:       Module     Module:     Module:     Module:       Module     Module:     Module:     Module:       Module     CH5 Active     CH5 Output       Module     CH5 Active     Module:       Module     Module:     Module:       Module:     Module:	M00002	U01.00.F	U01.01.4	MOV	LI01.08	D00104
2     U01.00.F     U01.01.5     MOV     U01.07     D00105       Anslog Input Module:     Input Module:     Module:     Anslog Input Module:     Anslog Input Module:     Anslog Input Module:     Anslog Input Module:     Anslog Input Module:     MOV     U01.08     D00108       M000003     U01.00.F     U01.01.6     MOV     U01.08     D00108       M00003     U01.00.F     U01.01.6     MOV     U01.08     D00108       Anslog Input Module:     Module:     Module:     Anslog Input Input Module:     Anslog Input Module:     Anslog Input Module:     Anslog Input Module:     Module:       U01.00.F     U01.01.7     MOV     U01.09     D00107       Anslog Input Module:     Anslog Input Module:     Anslog Input Module:     Anslog Input Module:     Anslog Input Module:       Module:     CH7 Active     CH7 Active CH7 Output     Module:     Module:		Analog Input Module: Module Ready	Analog Input Module: CH4 Active		Analog Input Module: CH4 Output	ł
Analog Analog Input Input Input Module: Module: Module: CH5 Active Ready Module: Module: Module: Module: Module: Module: Module: Module: CH6 Active Ready CH6 Active CH6 Output Ready CH6 Active CH6 Output Ready CH6 Active Ready CH6 Active Ready CH6 Active CH6 Output Ready CH6 Active CH7 Output Ready CH7 Active CH7 Output Ready CH7	2	U01.00.F	U01.01.5	MOV	U01.07	D00105
M00003     U01.00.F     U01.01.6     MOV     U01.08     D00108       Analog Input Module:     Analog Input Module:     Analog Input Module:     Analog Input Module:     Analog Input Module:       3		Analog Input Module: Module Ready	Analog Input Module: CHS Active		Analog Input Module: CH5 Output	F
Analog Analog Input Input Input Module: Module: Module: CH8 Active CH8 Active CH8 Output Input Module: CH7 Active CH7 Output CH7 Ou	M00003	U01.00.F	U01.01.6	MOV	U01.08	D00106
a U01.00.F U01.01.7 MOV U01.09 D00107 Analog Analog Input Input Module: Module: Module: CH7 Active CH7 Output		Analog Input Module: Module Ready	Analog Input Module: CH6 Active		Analog Input Module: CH6 Output	
Analog Analog Analog Input Input Input Module: Module: Module: CH7 Active CH7 Output	3	U01.00.F	U01.01.7	MOV	U01.09	D00107
		Analog Input Module: Module Ready	Analog Input Module: CH7 Active		Analog Input Module: CH7 Output	ł

(e) For IEC type also, as shown in Fig. (a) ~ (d), you can look up variables with diversified options in the 'View' menu. The figure below is the case of an IEC type with which the 'View Variables/Comment' option.

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# 7.11 Configuration and Function of Internal Memory

An analog mix module has internal memory for data communication with XGB base unit.

# 7.11.1 Analog Data I/O Area

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		Device a	assignment		Deed	Signal		
Variable	Туре	"S"or "H"type	IEC type	Description	Write	direction		
_0y_ERR	_0y_ERR BIT U0y.00.0 %		%UX0.y.0	Module Error	Pood			
_0y_RDY	BIT	U0y.00.F	%UX0.y.15	Module Ready	Reau	$AD00A \rightarrow CF0$		
_0y_CH0_ACT	BIT	BIT U0y.01.0 %UX0.y.16 CH0 Active						
_0y_CH1_ACT	BIT	U0y.01.1	%UX0.y.17 CH1 Active					
_0y_CH2_ACT	BIT	U0y.01.2	%UX0.y.18	CH2 Active				
_0y_CH3_ACT	BIT	U0y.01.3	%UX0.y.19	CH3 Active	Road			
_0y_CH4_ACT	BIT	U0y.01.4	%UX0.y.20	CH4 Active	Reau			
_0y_CH5_ACT	BIT	U0y.01.5	%UX0.y.21	CH5 Active				
_0y_CH6_ACT	BIT	U0y.01.6	%UX0.y.22	CH6 Active				
_0y_CH7_ACT	BIT	U0y.01.7	%UX0.y.23	CH7 Active				
_0y_CH0_ERR	BIT	U0y.01.8	%UX0.y.24	CH0 error				
_0y_CH1_ERR	BIT	U0y.01.9	%UX0.y.25	CH1 error				
_0y_CH2_ERR	BIT	U0y.01.A	%UX0.y.26	CH2 error				
_0y_CH3_ERR	BIT	U0y.01.B	%UX0.y.27	CH3 error	Deed			
_0y_CH4_ERR	BIT U0y.01.C		%UX0.y.28	CH4 error	Read	ADU6A $\rightarrow$ CPU		
_0y_CH5_ERR	BIT	U0y.01.D	%UX0.y.29	CH5 error				
_0y_CH6_ERR	BIT	U0y.01.E	%UX0.y.30	CH6 error				
_0y_CH7_ERR	BIT	U0y.01.F	%UX0.y.31	CH7 error				
_0y_CH0_DATA	WORD	U0y.02	%UW0.y.2	CH0 Output				
_0y_CH1_DATA	WORD	U0y.03	%UW0.y.3	CH1 Output				
_0y_CH2_DATA	WORD	U0y.04	%UW0.y.4	CH2 Output				
_0y_CH3_DATA	WORD	U0y.05	%UW0.y.5	CH3 Output	Pood			
_0y_CH4_DATA	WORD	U0y.06	%UW0.y.6	CH4 Output	Reau	$AD00A \rightarrow CF0$		
_0y_CH5_DATA	WORD	U0y.07	%UW0.y.7	CH5 Output				
_0y_CH6_DATA	WORD	U0y.08	%UW0.y.8	CH6 Output				
_0y_CH7_DATA	WORD	U0y.09	%UW0.y.9	CH7 Output				
_0y_CH0_IDD	BIT	U0y.10.0	%UX0.y.160	CH0 Disconnection flag				
_0y_CH1_IDD	BIT	U0y.10.1	%UX0.y.161	CH1 Disconnection flag				
_0y_CH2_IDD	BIT	U0y.10.2	%UX0.y.162	CH2 Disconnection flag				
_0y_CH3_IDD	BIT	U0y.10.3	%UX0.y.163	CH3 Disconnection flag	Bood			
_0y_CH4_IDD	BIT	U0y.10.4	%UX0.y.164	CH4 Disconnection flag	Reau	$AD00A \rightarrow CFU$		
_0y_CH5_IDD	BIT	U0y.10.5	%UX0.y.165	CH5 Disconnection flag				
_0y_CH6_IDD	BIT	U0y.10.6	%UX0.y.166	CH6 Disconnection flag				
_0y_CH7_IDD	BIT	U0y.10.7	%UX0.y.167	CH7 Disconnection flag				
_0y_ERR_CLR	BIT	U0y.11.0	%UX0.y.176	Error Clear Request	Read/ Write	$AD08A \leftrightarrow CPU$		

## Chapter 7 Analog Input (XBF-AD08A)

- In the device allocation, the small letter 'y' is the No. of the slot where the module is installed.
- For example, to read the 'CH3 Output' of the analog module installed in the slot 4, write in U04.05. (%UW0.4.5 for IEC types)



- (1) Module Ready/Error Flag ( ( ) is for IEC types, y: slot No.)
  - (a) U0y.00.F (%UX0.y.15): at power on or reset of PLC CPU, turns on when the analog I/O conversion is ready, and analog conversion is performed.
  - (b) U0y.00.0(%UX0.y.0): the flag indicating the error status of A/D conversion module.



(2) Operation channel information

(() is for IEC types, x: slot No.)
This is the area for storing the operation information, input wire open detection, and channel error information by channel.
% The base No. of the XGB PLC is 0.

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
U0x.01 (%UW0.x.1)	_	_	_	_	-	-	-	-	H C 7	HC 6	H C 5	년 4	Н С З	H 2	H C 1	H O

Operation Ch, Info. Bit On (1): in operation Bit Off (0): Stop operation

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- (3) Digital Output Values (() is for IEC types, y: slot No.)
  (a) A/D converted digital values are outputted to buffer memory address U0y.02 ~ U0y.09 (%UW0.y.2~ %UW0.y.9) by channel-basis.
  (b) Digital output values are saved in 16-bit binary figures.
  ※ The base No. of the XGB PLC is 0.

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	비트15	비트14	비트13	비트12	비트11	비트10	비트9	비트8	비트7	비트6	비트5	비트4	비트3	비트2	비트1	비트0
U0y.02 (%UW0 y 2)								CH	1 0 Out	tput						
U0y.03								CF	1 Out	tput						
U0y.04								CH	1 2 Out	tput						
(%UW0.y.4) U0y.05								 CF	1 3 Out	tput						
(%UW0.y.5) U0y.06																
(%UW0.y.6) U0v.07										.put						
(%UW0.y.7)	<b> </b>							CH	i <b>5</b> Out	:put						
(%UW0.y.8)								СН	6 Out	iput						
U0y.09 (%UW0.y.9)								СН	l <b>7</b> Out	tput						

# 7.11.2 Operation Parameter Setting Area

The operation parameter setting area of the analog mix module is as follows.

Memory Add.	Description	Setting	R/W	Command
0	Appoint operating channel	Bit Off (0): stop, Bit ON (1): run	R/W	
1	I/O range setting (CH0~CH3)	I/O range setting (bit) 0000: 4 ~ 20 ^{mA} 0001: 0 ~ 20 ^{mA} 0010: 1 ~ 5 V	R/W	
2	I/O range setting (CH4~CH7)	0011: 0 ~ 5 V 0100: 0 ~ 10 V	R/W	
3	Output data type setting	Input data type setting (bit) $00: 0 \sim 4000$ $01: -2000 \sim 2000$ 10: precise value $11: 0 \sim 1000$ - In case of precise value $4 \sim 20 \text{ mA}: 400 \sim 2000$ $0 \sim 20 \text{ mA}: 0 \sim 2000$ $1 \sim 5 \text{ V}: 100 \sim 500$ $0 \sim 5 \text{ V}: 0 \sim 500$ $0 \sim 10 \text{ V}: 0 \sim 1000$	R/W	
4	CH0 Filter constant			
5	CH1 Filter constant			
6	CH2 Filter constant			
7	CH3 Filter constant	0 or 4 64000		
8	CH4 Filter constant	0 01 4 ~ 64000	K/VV	
9	CH5 Filter constant			PUT/GET
10	CH6 Filter constant			
11	CH7 Filter constant			
12	Average processing method	Specifies average processing method (2bit per channel) 00: Sampling processing 01: Time average processing 10: Count average processing 11: Moving average processing	R/W	
13	CH0 average value			
14	CH1 average value			
15	CH2 average value	Time average: 4 ~ 16000 [ms]		
16	CH3 average value	Count average: 2 ~ 64000 [times]	R/W	
18	CH5 average value	Moving average: 2 ~ 100		
19	CH6 average value			
20	CH7 average value			
		Error information (Decimal, # channel n0.)		
21	Error information	10-7: CH0-7 10#: error in channel range 20#: error in channel filter value 30#: error in channel average value	R	GET

# Note

(1) If the memory address 0~8 area is entered with values different from the setting U0x.01.8~U0x.01.B (setting error representative flag, for IEC type, %UX0.x.24~%UX0.x.27) is ON and runs with default values. The error information is displayed in the setting error information are (No. 9).

(2) System areas (after No. 10) are read/write protected.

Changing these areas may cause malfunction or failure of the product.

# (1) Operating Channel Setting

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The default setting for operating channel is 'Stop.'



### (2) Input Range Setting

(a) The analog input voltage range is DC 1~5V, DC 0~5V, DC 0~10V, and analog current input range is DC 4~20mA, DC 0~20mA.

(b) Default range is DC 4~20mA.

CH 0	
BIT2 BIT1	BITO
CH 4	
	$\frown$
-	BIT2 BIT1 CH 4

Input range setting (4 bit per channel)

0:4~20 mA 1:0~20 mA 2:1~5V 3:0~5V

4:0~10V

(3) I/O Data Type Setting

(a) I/O data type can be set up for each channel.

(b) If the I/O data type is not set up, all the channels are processed in 0~4000 range.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address3																
	Cł	47	Cł	16	CH	15	CH	14	CH	13	CH	12	CH	11	C⊦	10
								_								$\sim$

Input data type setting (2bit per channel))

- 0:0~4000
- 1 : -2000 ~ 2000
- 2 : Precise value
- 3:0~1000

- For precise value 4 ~ 20 mA: 400 ~ 2000 0 ~ 20 mA: 0 ~ 2000 1 ~ 5 V: 100 ~ 500

- 0 ~ 5 V: 0 ~ 500
- 0 ~ 10 V: 0 ~ 1000

# (4) Filter Constant Setting

(a) If set to 0, no filtration is processed.

(b) Default setting is 0 – no filtration process.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address4						CH	0 filter	const	tant (0	or 4~	·64000	)ms)				
Address5						СН	1 filter	const	tant (0	or 4~	·64000	)ms)				
Address6						CH :	2 filter	const	tant (0	or 4~	64000	)ms)				
Address7						СН :	3 filter	const	tant (0	or 4~	64000	)ms)				
Address8						CH 4	4 filter	const	tant (0	or 4~	·64000	)ms)				
Address9						CH	5 filter	const	tant (0	or 4~	·64000	)ms)				
Address10						CH	6 filter	const	tant (0	or 4~	·64000	)ms)				
Address11						СН	7 filter	const	tant (0	or 4~	·64000	)ms)				

### (5) Averaging Method Setting

- (a) Averaging method can be one of; time average, count average, moving average.
- (b) Default setting is no averaging throughout the channels.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address12	СН	7	СН	6	СН	5	СН	4	СН	3	С	H 2	Cł	⊣ 1	CH	H 0
																$\sim$

### Average processing (4 bit per channel)

- 0:Sampling Processing
  - 1: Time average processing
  - 2 : Count average processing
  - 3: Moving average processing

### (6) Average Value Setting

- (a) Set up average values in accordance with the setting area of the averaging method.
- (b) If the average value is out of setting range, averaging is not applied.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address13								CH 0 a	verage	e value	e					
Address14								CH 1 a	verage	e value	e					
Address15								CH 2 a	verage	e value	e					
Address16								CH 3 a	verage	e value	9					
Address17								CH 4 a	verage	e value	9					
Address18								CH 5 a	verage	e value	e					
Address19								CH 6 a	verage	e value	9					
Address20								CH 7 a	verage	e value	e					
	<u> </u>															

Input channel # average value setting Time average : 4 ~ 16000[ms] Count average : 2 ~ 64000[times] Moving average: 2 ~ 100

### (7) Error Code (Address 21)

- (a) Saves the error code detected by the analog mix module.
- (b) The types and descriptions of the error are as follows.

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Address21							Set-u	p error	inform	nation						

Туре	Error code	LED	Description	Error code Priority	Remark
	10#	LED	Channel range set-up error	1	
Error	20#	flickering	Channel filter constant set-up error	2	# channel no.
	30#	1s intervals	Channel average value set-up error	3	

(c) In case of plural errors, the code with higher priority order will be saved.

### (9) System Area (after Address 22)

(a) System area (after address 22) is read/write protected.

# 7.12 Example Program

- (1) This sample program sets up operating parameters of analog input module.(2) Initial settings are saved in the internal memory of the module by input by once.
- (3) The sample program below controls the output data of the analog input module at slot #1 and check open wire.

# 7.12.1 Example of [I/O Parameter] Usage

Detault		Slot	M	odule	Comment	Input P	Filter Emergen	nevΩutİ A	llocation
B 00 : DC 24V INP	UT/TR	0(main)	DC 24V IN		Commone	3 Standa	rd [ms] Defa	ault P000	10 ~ P003E
🛃 01: XBF-AD08A	(Volt/C	1	XBE-AD084	A Molt/Curr				P004	10 ~ P007E
02 : Default		2							
03 : Default		3							
04 : Default		4							
05 : Default		5							
07: Default		6							
08 : Default		7							
09 : Default		8							
10 : Default		9							
		10	-						
) 	Delete	Slot De	elete Base	Base Setting	Delete All	Details	_ <u>Print</u> ▼	ОК	) Canc
		Slot	elete Base	Base Setting	Delete All	Details	_ <u>P</u> rint ▼	ОК	Canc
-AD08A (Volt/Current, -AD08A (Volt/Current, 8-CH)	Delete	Slot De	elete Base	Base Setting	Delete All	Details	Print V	ОК	Canc
-AD08A (Volt/Current, -AD08A (Volt/Current, 8-CH) Parameter	Delete	Slot De	elete Base	Base Setting	CH 3	CH 4	Print ▼	ОК	Canc
-AD08A (Volt/Current, -AD08A (Volt/Current, 8-CH) Parameter Channel status	Delete	Slot Da	CH 1	Base Setting CH 2 Disable	Delete All	CH 4 Disable	Print ▼ CH 5 Disable	CH 6 Disable	Canc
-AD08A (Volt/Current, -AD08A (Volt/Current, 8-CH) Parameter Channel status Input range	Delete , 8-CH) CH 0 Enable 4~20m	Slot De e Di A 4	CH 1	Base Setting CH 2 Disable 4~20mA	Delete All CH 3 Disable 4~20mA	Details CH 4 Disable 4~20mA	Print ▼ CH 5 Disable 4~20mA	CH 6 Disable 4~20mA	Canc
-AD08A (Volt/Current, -AD08A (Volt/Current, 8-CH) Parameter Channel status Input range Output type	Delete     8-CH)     CH 0     Enable     4~20m     0~400	Slot De e Di A 4 0 (	CH 1 sable v "20mA or 4000	Base Setting CH 2 Disable 4*20mA 0*4000	Delete All Disable 4*20mA 0*4000	Details CH 4 Disable 4~20mA 0~4000	Print ▼ CH 5 Disable 4~20mA 0~4000	CH 6 Disable 4~20mA 0~4000	Canc CH 7 Disab 4~20r 0~400
-ADO8A (Volt/Current, -ADO8A (Volt/Current, 8-CH) Parameter Channel status Duput type Filter constant	Delete           , 8-CH)           CH 0           Enable           4"20m           0"400           0	Slot De 	CH 1 sable "20mA 0	Base Setting CH 2 Disable 4 ²⁷ 20mA 0 ⁻⁴ 4000 0	CH 3 Disable 4~20mA 0~4000 0	Details           CH 4           Disable           4~20mA           0~4000           0	Print ▼ CH 5 Disable 4  20mA 0  4000 0	ОК СН 6 Disable 4~20mA 0~4000 0	Canc CH 7 Disab 4~20n 0~400 0
-ADO8A (Volt/Current, -ADO8A (Volt/Current, 8-CH) Parameter Channel status Input range Output type Filter constant Average processing	Delete     CH 0     Enable     4~20m     0     Samplin	Slot De e Di A 4 0 ( 10 10 10 10	CH 1 sable v "20mA 0 ampling	Base Setting CH 2 Disable 4~20mA 0~4000 0 Sampling	CH 3 Disable 4*20mA 0*4000 0 Sampling	CH 4 Disable 4*20mA 0*4000 0 Sampling	Print ▼ CH 5 Disable 4~20mA 0~4000 0 Sampling	ОК СН 6 Disable 4~20mA 0~4000 0 Sampling	CH 7 CH 7 Disab 4*20n 0*400 0 Sampli

### (1) I/O Parameter Setting Window

(a) Input Channel 0 is set to operating channel and input range is set to 4~20mA.

### (2) Sample Program

### CH0 program

L1	U01.00.0 U01.00.F U01.01.0 U01.01.8		M00000
12	мооооо	MOV U01.02	D00100
L3	U01.10.0	TA	M00001 (\$)
59 14			END

(a) When the module is in normal operation, M0000 is turned On.

- U01.00.0 (Module Error) = Off
- U01.00.F (Module Ready) = On
- U01.01.0 (Input Channel 0 in-operation) = On
- U01.01.8 (Input Channel 0 Error) = Off
- (b) When M0000 is ON, Input Channel 0 Converted Value(U01.02) is moved to D00100.
- (c) If open-wire error occurs in channel 0, U01.10.0 (channel 0 open-wire) is ON, and M0001 bit is set.
- (3) Sample Program (IEC type) Output CH0 program

10	XUXO.1.0	XUXO.1.15	XUXO.1.16	XUX0.1.24			XMXO ( )
11	хмхо — 1		-EN ^{MOVE} ENO-				
12		%UWO.1.2 _01_CHO_DA TA	-IN OUT-	CH 0 input			
13							
14	XUXO.1.160						%MX1 (S)

(a) When the module is in normal operation, %MX0 is turned ON.

%UX0.1.0(Module Error) = Off %UX0.1.15(Module Ready) = On

%UX0.1.15(WOUULE Ready) = OII

%UX0.1.16(Channel 0 in-operation) = On

- %UX0.1.24(Channel 0 Error) = Off
- (b) When %MX0 is ON, Input Channel 0 Converted Value(%UW0.1.4) is transferred to "CH 0 Input" variable.
- (c) If open-wire error occurs at Channel 0, %UX0.1.160 (Channel 0 open) turns ON and %MX1 bit is set.

# 7.13 Troubleshooting

This section describes methods for identifying the troubles which may occur during the operation of analog input module, and their solutions.

# 7.13.1 LED Indication for Error

ltem	Normal State	Channel Open (Input)	Parameter Setting Error	Module H/W Failure (Serious Failure)
LED	On	Flickering 1s intervals	Flickering 1s intervals (input parameter setting error)	Flickering 0.2s Intervals
Module Behavior	All functions are normal	All functions are performed. Indicates min. input value	All functions work at default parameter setting	Module cannot function
Action	-	Check input wire	Check parameter setting	Request for A/S

An analog input module has one INPUT LED to indicate error status of the module.

# 7.13.2 Checking Module Condition

XG5000's system monitor enables verification of the analog mix module conditions (module type, module information, OS version).

- (1) Procedure
  - The verification can be done in 2 ways;
  - (a) [Monitor] -> [System Monitor] -> mouse right click on module icon -> [Module Information]
  - (b) [Monitor] -> [System Monitor] -> double click module icon.
- (2) Module Information
  - (a) Module type: shows the information on the present module.
  - (b) Module information: shows the OS version of the module.
  - (c) OS version: shows release date of Module OS.

# 7.13.3 Troubleshooting

(1) INPUT LED is off.



(2) LED flickering.



(3) Analog input value is abnormal.



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# **Chapter 8 Analog Input Option Board**

# 8.1 Setting Sequence before operation

Before using the analog input option board, follow steps below.



# 8.2 Specifications

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# 8.2.1 General specifications

General specifications are as follows.

No.	Item	Specifications					Related specifications
1	Ambient temperature	0 ℃ ~+55 ℃					-
2	Storage temperature	-25 °C ~+70 °C					-
3	Ambient humidity	5 ~ 95%RH (Non-condensing)					-
4	Storage humidity	5 ~ 95%RH (Non-condensing)					-
	Vibration resistance	Occasional vibration -					-
		Frequency	Ac	celeration	Amplitude	How many times	-
5		5 ≤ f < 8.4 ⊞	z	-	3.5 mm		
		8.4 ≤ f ≤ 150	Hz 9.8	3 m/s² (1G)	-		
		For continuous vibration 10 times each					IEC61131-2
		Frequency	Ac	celeration	Amplitude	directions (X, Y and Z)	
		5 ≤ f < 8.4 ⊞	z	-	1.75 mm		
		8.4 ≤ f ≤ 150	Hz 4.9	m/s² (0.5G)	-		
6	Shock resistance	<ul> <li>Peak acceleration: 147 m/s²(15G)</li> <li>Duration: 11ms</li> <li>Half-sine, 3 times each direction per each axis</li> </ul>					IEC61131-2
	Noise resistance	Square wave Impulse noise	AC: ± 1,500V DC: ± 900V			LS ELECTRIC standard	
		Electrostatic discharge	Voltage : 4kV (contact discharging)				IEC 61131-2, IEC 61000-4- 2
7		Radiated electromagnetic field noise	80 ~ 1,000 MHz, 10V/m				IEC 61131-2, IEC 61000-4- 3
		Fast transient	Segment         Power supply module         Digital/analog input/output communication interface		IEC 61131-2, IEC 61000-4-		
			Voltage	2kV	1kV		4
8	Environment	Free from corrosive gasses and excessive dust				-	
9	Altitude	Up to 2,000 ms				-	
10	Pollution degree	Less than equal to 2				-	
11	Cooling	Air-cooling				-	

# 8.2.2 Performance specifications

Performance specifications are as follows.

	Items		Performance specification		
Numb	per of char	nnel	2 channels		
	Туре		Voltage	Current	
Analog input range	Range		DC 0 ~ 10V (Input resistance: 1 M Min.)	DC 4 ~ 20nA DC 0 ~ 20nA (Input resistance 250 Ω)	
			Set by external voltage/current selector switch after being set at user program or I/O parameter per each channel		
		Туре	12 bit binary data		
		Unsigned value	0 ~ 4000		
Digital output	Dener	Signed value	-2000 ~ 2000		
	Range	Precise value	0 ~ 1000 (DC 0 ~ 10V)	400 ~ 2000 (DC 4 ~ 20 ^{mA} ) 0 ~ 2000 (DC 0 ~ 20 ^{mA} )	
		Percentile value	0 ~ 1000		
			1/4000 (DC 4~20 ^{mA} : 1/3200)		
Max. resolution			2.5 ^{mV} (DC 0~10V)	5 ^{µA} (DC 0~20 ^{mA} ) 0 ~ 2000 (DC 0 ~ 20 ^{mA} )	
F	Accuracy		±1.0% or less		
Max. conversion speed			1ms/channel + scan time		
Absolute max. input		nput	DC +12V / -10V	DC ±25 ^{mA}	
Additional	Average function		Count average (2 ~ 64,000 times)		
function	Gain adjustment function		Gain adjustment (-40~40)		
Insulation method			No insulation between channels No insulation between input terminal and PLC main unit		
Inp	out termina	al	5 - point terminal block		
I/O pc	ints occu	pied	Fixed type: 64 points		
Su	pply powe	<b>∌r</b>	Inner DC 5V		
Consumption current			50mA		
Weight			20g		

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Note1) In order to use analog input option board, the following version is needed.

Main unit	Version information	
XBC E type	V1.1 or above	
XBC S type	V1.1 or above	
XBC SU type	V1.0 or above	
XEC E type	V1.0 or above	
XEC SU type	V1.0 or above	
XG5000	V.3.61 or above	

Note2) Offset/gain value on the analog input range can be adjusted at XG5000- I/O parameter

# 8.3 Name of part and function

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Respective designations of the parts are as described below.



No.	Name	Description
1	Hook for fixation	Hook for fixing the option board to main unit
2	Terminal block	<ul> <li>Wiring terminal block to connect with external device (Analog input)</li> </ul>
3	Cover	► Option board cover
(4)	Hook for fixation	Hook for fixing the option board to main unit
(5)	Connector for option board	► Connection connector for connecting the option board to the main unit
6	Input connector	Wiring connector for connecting with the external device
## 8.4 Characteristic of I/O conversion

The input ranges of voltage and current can be set up per channel with user program or I/O parameters. The output types of digital data are defined as follows.

- (1) Unsigned Value
- (2) Signed Value
- (3) Precise Value
- (4) Percentile Value



#### (1) DC 4 ~ 20mA Range Input

Digital	Analog Input Current (mA)						
Output Range	3.81	4	8	12	16	20	20.18
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047
Precise Value (400 ~ 2000)	381	400	800	1200	1600	2000	2018
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011

Digital		Analog Input Current (mA)					
Output Range	-0.24	0	5	10	15	20	20.23
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047
Precise Value (0 ~ 2000)	-24	0	500	1000	1500	2000	2023
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011

## (2) DC 0 ~ 20mA Range Input

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## (3) DC 0 ~ 10V Range Input

Digital	Analog Input Voltage (V)						
Output Range	-0.12	0	2.5	5	7.5	10	10.11
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047
Precise Value (0 ~ 1000)	-12	0	250	500	750	1000	1011
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011

#### 8.5 Accuracy

Accuracy of digital output value does not changed even if input range is changed. Figure below shows the range of the accuracy with analog input range of  $0 \sim 10$  V and digital output type of unsigned value selected.

Accuracy of XBO-AD02A is ±1.0%.



- (1) Accuracy when using 5V input  $4000 \times 1.0\% = 40$ Therefore the range of the accuracy will become (2000-40) ~ (2000+40) = 1960 ~ 2040 when using 5V input.
- (2) Accuracy when using 10V input  $4000 \times 1.0\% = 40$ Therefore the range of the accuracy will become (4000-40) ~ (4000+40) = 3960 ~ 4040 when using 10V input.

## 8.6 Functions of Analog Input Option Board

Function	Description				
Channel	Specify operation/stop of the channel which will perform A/D conversion.				
operation/stop setting	<ul> <li>Specifying unused channels as Stop can shorten overall operation time.</li> </ul>				
Input Voltage /current range setting	<ul> <li>Specify desired range of analog I/O.</li> <li>Analog input option board provides 2 ranges(4~20mA, 0~20mA) of current I/O and 1 range ( 0~10V) of voltage I/O.</li> </ul>				
Output data type setting	<ul> <li>Specify digital I/O types.</li> <li>This module provides 4 output data types (Unsigned, Signed, Precise, and Percentile Values)</li> </ul>				
A/D input conversion method	<ul> <li>Sampling Process <ul> <li>If A/D conversion method has not been specified, the module processes sampling.</li> </ul> </li> <li>Averaging process <ul> <li>Outputs A/D converted value averaged by count to reduce rapid change of input value caused by external noise</li> </ul> </li> </ul>				

The functions of analog input option board are as follows.

#### 8.6.1 Sampling Process

In popular A/D conversion process, analog input signals are collected at constant time intervals and A/D converted. The time elapsed for the analog signals to be converted into digital signals and saved in memory device depends upon the number of channels used.

#### (Process Time) = (No. of Channels Used) x (Conversion Speed + Scan time)

(Ex.) Process time when using 1 of 2 I/O channels and scan time is 2ms;

 $1 \times (1 \text{ ms} + 2 \text{ ms}) = 3 \text{ ms}$ 

The term 'sampling' means taking sample value among continuous analog signal values at regular intervals.

## 8.6.2 Count Averaging Function

The input values of the designated channel are accumulated for the preset cycles, and the average value of the total sum is outputted in digital data.



Setting Range = 2 ~ 64000 [times]

For count averaging, averaging interval is calculated with the No. of channels used.

Averaging interval [ms] = Averaging count x (No. of channels used x1ms + Scan time)

#### Note

(1) Averaging interval varies according to scan time

### 8.6.3 Gain Adjustment Function

You can adjust input gain of the analog input option board.

When selecting current input for analog input range, the digital output (4000) corresponding to analog input max. value (20mA) is standard gain value. When selecting voltage input, the digital output (4000) corresponding to analog input max. value (10V) is standard gain value.

- (1) You can adjust input gain at I/O parameter
- (2) Input gain setting range =  $-40 \sim 40$
- (3) Adjusting gain for each channel is available

XBO-AD02A (Volt/Current, 2-CH)									
XB0-AD02A (Volt/Current, 2-CH)									
	Parameter	CH O	CH 1						
	Channel status	Disable	Disable						
	🔄 Input range	4~20mA	4~20mA						
	Output type	0~4000	0~4000						
	Count-Avr	0	0						
Input gain		0	0						
	-40~40 OK Cancel								

(4) Example

When you set "Input gain" as -5, 3996 (=4000-5) applies for gain.

#### Note

(1) When you adjust the input gain, max. resolution changes, too.

### 8.7 Wiring

#### 8.7.1 Precaution for wiring

- (1) Don't let AC power line near to A/D conversion module's external input sign line. With an enough distance kept away between, it will be free from surge or inductive noise.
- (2) Cable shall be selected in due consideration of ambient temperature and allowable current, whose size is not less than the max. cable standard of AWG22 (0.3mm²).
- (3) Don't let the cable too close to hot device and material or in direct contact with oil for long, which will cause damage or abnormal operation due to short-circuit.
- (4) Check the polarity when wiring the terminal.
- (5) Wiring with high-voltage line or power line may produce inductive hindrance causing abnormal operation or defect.
- (6) Enable only needed channels

### 8.7.2 Wiring examples



*(a) In case of current input, connect V+ terminal to I+ terminal

- *(b) Input resistance of current input circuit is 250  $\Omega$  (typ.).
- *(c) Input resistance of voltage input circuit is 1 M $\Omega$  (min.)

(3) Terminal block configuration

XBO-AD02A

(4) Relationship between voltage input accuracy and wiring length In voltage input, the wiring (cable) length between transmitter or sensor and option board has an effect on digital-converted values of the option board as specified below;



Where,

- Rc: Resistance value due to line resistance of cable
- Rs: Internal resistance value of transmitter or sensor
- Ri: Internal resistance value (1^{MQ}) of voltage input module
- Vin: Voltage allowed to analog input module
- % Vi: Tolerance of converted value (%) due to source and cable length in voltage input

$$Vin = \frac{Ri \times Vs}{\left[Rs + \left(2 \times Rc\right) + Ri\right]}$$

$$\%Vi = \left(1 - \frac{Vin}{Vs}\right) \times 100\%$$

## 8.8 Operation Parameter Setting

Analog input option board's operation parameters can be specified through XG5000's [I/O parameters].

(1) Settings

For the user's convenience, XG5000 provides GUI (Graphical User Interface) for parameters setting of analog option board. Setting items available through [I/O parameters] on the XG5000 project window are as described below in the table.

Item	Details						
[I/O parameter]	<ul> <li>(a) Specify the following setting items necessary for the option board operation.</li> <li>1) Channel Enable/Disable setting</li> <li>2) Setting ranges of input voltage/current</li> <li>3) Output data format setting</li> <li>4) Count averaging</li> <li>5) Input gain</li> <li>(b) If downloading is complete, Parameter set by user in XG5000 is saved in Flash memory of XGB main unit.</li> </ul>						

#### (2) Usage of [I/O Parameter]

- (a) Create a project with XG5000. See XG5000 Program Manual for project creation.
- (b) In the Project window, double-click [I/O Parameter].



(c) In the [I/O Parameter Setting] window, find out the slot of the base where the analog input option board is installed, and click it.

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(d) In the above window, click the arrow button to call the window where the module can be selected. Find out the module and select it.



(e) To set up parameter, double click with the respective slot being selected, or click [Detail] button.



(f) The window below where parameters can be set up by channel appears. Click the item to set up. The parameters which can be set up appear by item.

XBO-AD02A (Volt/Current, 2-CH)									
XB0-AD02A (Volt/Current, 2-CH)									
Parameter CH 0 CH 1									
Channel status	Disable	Disable							
Input range	4~20mA	4~20mA							
Output type 0~4000 0~4000									
Count-Avr	0	0							
Input gain 0 0									
OK Cancel									

## 8.9 Special Module Monitoring Functions

The functions of the special module monitor are as follows.

(1) Start-up of [Special Module Monitor]

Select [Online] -> [Connect], and [Monitor] -> [Special Module Monitor] to start up. [Special Module Monitor] menu is enabled only in the [Online] condition.



#### Note

- The screen may not function properly if the system resources are not sufficient. In this case, close the screen, exit other applications, and rerun XG5000.
- 2) The I/O parameters set up in [Special Module Monitor] condition are temporarily set up for testing purpose. Therefore, these I/O parameters are deleted after exit from [Special Module Monitor].
- 3) The test function of the [Special Module Monitor] enables testing analog input option board without sequence programming.
  - (2) Usage of [Special Module Monitor]
    - (a) With the XG5000 in connection (online) with the base unit of PLC, select [Monitor] -> [Special Module Monitor]. The Select Special Module window shown below will appear showing the type of the special modules and base/slot information. In the list dialog, the modules present in the PLC system are displayed.

Special Mod	dule List	×					
Pres.	Clat	Madula					
Dase	300	Module					
🗂 Base O	<u> </u> Internal	High Speed Counter Module(Open-Collector, 8-CH)					
🗂 Base O	<u> 1</u> Internal	Position Module (Open-Collector, 2-CH)					
Base 0	Slot 9	XBO-AD02A (Volt/Current, 2-CH)					
		``````````````````````````````````````					
<							
Module Info.	Monitor	Close					
<u> </u>							

(b) In the above window, select the special module and click [Module Info.] to see the information window below.

1

S	Special Module Information						
	Displays the inform	nations of special module.					
	ltem	Information					
	Module Name	XB0-AD02A (Volt/Current, 2-CH)					
	OS Ver	Ver. 10.02					
	OS Update Date	2010-10-26					
	Module Status Normal. (0)						
		ОК					

(c) Click the [Monitor] button in the "Special Module" window. The "Special Module Monitor' window will appear as shown below.

Special Module Moni	tor	?×
XBO-AD02A (Volt/Current, 2-0	CH)	
Item	Max/Min value	Current value
CH0 A/D value		
CH1 A/D value		
Item	Setting Value	Current Value
Channel	CH () 🖌
Channel status	Disable	
Input range	4~20mA	
Output type	0~4000	
Count-Avr	0	
Input gain	0	
<u>R</u> eset max/min value	Start <u>M</u> onitoring	<u>I</u> est
		Close

(d) [Start Monitoring]: click [Start Monitoring] to look up the digital input data of the channel currently in operation. The screen shot below is a monitoring window when all the channels are in operation status.

	eration etatae	-	_	
Special Module Mon	itor	?	×	
XBO-AD02A (Volt/Current, 2-	CH)		-	
Item	Max/Min value	Current value	n	
CH0 A/D value	-48 / -48	-48		Monitoring
CH1 A/D value	0/0	0		
	>			
Item	Setting Value	Current Value	N	
Channel	CH	10		
Channel status	Disable	Enable		Detailed
Input range	4~20mA	4~20mA	\vdash	information of CH0
Output type	0~4000	0~4000		
Count-Avr	0	0		
Input gain	0	0)	
<u>R</u> eset max/min value	Stop <u>M</u> onitoring] <u>I</u> est]	
		Close]	

The screen executing [Start Monitoring]

 (e) [Test]: this function is used to change the current parameter settings of the analog mix module. Click the settings in the fields in the bottom screen to change the parameters.
 [Test] can be set up only when the operation status of the XGB base unit is STOP mode.

Special Module Moni	itor	? ×
XB0-AD02A (Volt/Current, 2-	CH)	
Item	Max/Min value	Current value
CH0 A/D value	4001 / 3998	4000
CH1 A/D value	0/0	0
Item	Setting Value	Current Value
Channel	CH	10
Channel status	Enable	Enable
Input range	4~20mA	4~20mA
Output type	0~4000	0~4000
Count-Avr	0	0
Input gain	0	0
J	•	
<u>R</u> eset max/min value	Stop <u>M</u> onitoring] <u>I</u> est
		Close

The screen executing [Test]

(f) Minimum/Maximum Value Monitoring

The minimum and maximum values of the input channels in operation can be monitored. However, the Max/Min values in the window are based on the current value. Therefore, the Max/Min values are not saved when exiting from the [Monitoring/Testing Screen].

S	pecial Module Mon	itor	?×	
:	XBO-AD02A (Volt/Current, 2	CH)		
	Item	Max/Min value	Current value	
	CH0 A/D value	-48 / -48	-48	
	CH1 A/D value	0/0	0	
				Monitor max/min
	ltem	Setting Value	Current Value	 value
	Channel	СН	0	Value
	Channel status	Disable	Enable	
	Input range	4~20mA	4~20mA	
	Output type	0~4000	0~4000	
	Count-Avr	0	0	Reset max/min
	Input gain	0	0	value
4		<u>}</u>		Value
	Reset max/min value	Stop <u>M</u> onitoring	<u>I</u> est	
C			Close	

The screen executing [Max/Min Value Monitoring]

(g) Close

[Close] button is for ending/closing the monitoring/testing screen. Maximum, minimum, and current values are not saved at exit.

8.10 Register U devices

I

The variables for each module are automatically registered by referring to the information of the special modules set up in the [I/O Parameter]. User can modify variables and descriptions.

(1) Registration Procedure

(a) In [I/O Parameter], set up special module in slot.

🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
	0(main)	DC 24V INPUT 12points/TR OUTP		3 Standard [ms]	Default	P0000 ~ P007F
B 01 : RELAY OUTPU	1	RELAY OUTPUT, 16points		•	Default	P0080 ~ P011F
U2 : Default	2	1				
03 . Default	3	1				
05 : Default	4					
06 : Default	5					
🛛 🔄 07 : Default	6					
08 : Default	7					
	8					
10 : Default	9	XBO-AD02A (Volt/Current, 2-CH)		•	•	P0400 ~ P043F
	10	<u>ا</u>				

(b) Double click [Variables/Comment].

🍕 XGB_PROJECT - XG5000 - [Variab	ple/Comment]	-DX
I 🕌 Project Edit Find/Replace ⊻iew Online	e <u>M</u> onitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u> elp	1 19 X
D 2 2 2 8 8 8 0 2 3 8 8 ■ (② ② △ △ ↓ ⓑ ⓑ × ॡ ▶ 兆 ¥ Ⅰ ♣ ♣ 號 點 ☆ ↓ 1 ⊕ ⊕	
	· 프 프 & C III II / 프 III / EII / EIII / EII / EII / EIII / EII / EIII	F4 F5 F6 F7
Es 14 14 11 112 F5 16 57 56 14 14 14 1	彩料彩料标开了了发发发 📋 🖮 🗃 🗃 🗃 🖬 🖬 🖬 🖬 🖬 🖬 🖬 🖬 🖬 🖬 🖬 🖬 🖬	9 F 9 F E
Project Window v X	View Variable	
XGB_PROJECT + XGB_PROJECT + CVXGB-XBCS)-Offline CVXiiable/Comment GC Parameter JC Parameter JC Parameter CV	Variable Type Device Used Comment	>
■t Project	🔚 NewProgram 🕌 Variable/Comment	

(c) In the 'Edit' menu, select 'Register U device'

🕷 XGB_PROJECT - XG5000 - [Variable/Comment]									
🕍 Project Ed	it <u>F</u> ind/Replace	⊻iew <u>O</u> nline	<u>M</u> onito	r <u>D</u> ebug <u>T</u> oo	ils <u>₩</u> indow	<u>H</u> elp			_ 8 ×
066	<u>U</u> ndo Dada	Ctrl+Z	9	100 X	₽ C ×		M # 9	₩0 8₩0 ∰ _10 ₩1 ₩1 ∯ _111 🛞 🛞	
1 (a)	Eleao Cut	Ctrl+Y					ាក់ពេក		¥ 【 K 昆 智 毘 昆 詩
5. 11 11 B	Сод Сору	Ctrl+C	(B) (J	2 2	0000	v in mi			-
Project Windo	<u>P</u> aste	Ctrl+V		1-					
Items ×	<u>D</u> elete	Del	V Vi	iew Variable	D View Device	View Flag		-	1
⊡ - ∰er XGB	Select All	Ctrl+A	-	Variable	lype	 Uevice 	Used	Lomment	
	Insert <u>L</u> ine	Ctrl+L	<u> </u>						
<u>⊜</u>	Delete Li <u>n</u> e	Ctrl+D							
	Export Variable	s to <u>F</u> ile							
	Register U Devi	ce D							
		_ Variable 🎽							
	Move Item Up								
	iviove item Dow	/n	1						
			<						>
■t Project				NewProgram	<u>بية</u> 1	Variable/Comm	ent		

(d) Click 'Yes.'



(e) Variables are registered as shown below.

🖺 Va	Variable/Comment									
V	/iew Variable	View Device	🖏 View Flag							
	Variable	Туре 🔺	Device	Used	Comment					
1	_09_ERR	BIT	U09.00.0		Analog Input Option Board: Error					
2	_09_RDY	BIT	U09.00.F		Analog Input Option Board: Ready					
3	_09_ADO_ACT	BIT	U09.01.0		Analog Input Option Board: Input CHO Active					
4	_09_AD1_ACT	BIT	U09.01.1		Analog Input Option Board: Input CH1 Active					
5	_09_AD0_1DD	BIT	U09.01.4		Analog Input Option Board: CHO Input Disconnection Flag					
6	_09_AD1_1DD	BIT	U09.01.5		Analog Input Option Board: CH1 Input Disconnection Flag					
7	_09_AD0_ERR	BIT	U09.01.8		Analog Input Option Board: Input CHO Error					
8	_09_AD1_ERR	BIT	U09.01.9		Analog Input Option Board: Input CH1 Error					
9	_09_ADO_DATA	WORD	U09.04		Analog Input Option Board: Input CHO Data					
10	_09_AD1_DATA	WORD	U09.05		Analog Input Option Board: Input CH1 Data					

(2) Saving Variables

(a) The contents in the 'View Variables' tab can be saved in a text file.

- (b) In the 'Edit' menu, select 'Save as Text File.'
- (c) The contents in the 'View Variables' tab are saved in a text file.

(3) Viewing Variables in Program

Γ

The figures below present examples of use in XGB compact "E" and "S" types

10	M00000 U09.00.F U09.01.0	MOV	U09.04	D00100
	U09.00.F U09.01.1	MOV	U09.05	D00101
12	U09.00.0	MOV	U09.04	D00102
	U09.01.8			
14	U09.01.4			
15		MOV	U09.05	D00103
18	U09.01.9			
L7	U09.01.5			

(a) Below is an exemplary program for XG5000.

(b) In the 'View' menu, click 'View Variables.' The devices are changed into variables.

10 S0		MOV	_09_AD0_DA TA	D00100
LI		MOV	_09_AD1_DA TA	D00101
12		MOV	_09_AD0_DA TA	D00102
	09_AD0_ER R			
14				
L5 916		MOV	_09_AD1_DA TA	D00103
18				
L7				

10	М00000	U01.00.F	U01.01.0	MOV	U01.02	D00100
SO		_01_RDV	_01_CHO_AC		_01_CHO_DA TA	
Lf		U01.00.F	U01.01.1	MOV	U01.03	D00101
		_01_RDV	_01_CH1_AC T		_01_CH1_DA TA	
12	M00001	U01.00.F	U01.01.2	MOV	U01.04	D00102
S11		_01_RDV	_01_CH2_AC T		_01_CH2_DA TA	
L3		U01.00.F	U01.01.3	MOV	U01.05	D00103
		_01_ŔDY	_01_CH3_AC T		_01_CH3_DA TA	
14	M00002	U01.00.F	U01.01.4	MOV	U01.06	D00104
S22		_01_ŔDY	_01_CH4_AC T		_01_CH4_DA TA	
15		U01.00.F	U01.01.5	MOV	U01.07	D00105
		_01_ŔDY	_01_CH5_AC T		_01_CH5_DA TA	
18	M00003	U01.00.F	U01.01.6	MOV	U01.08	D00106
\$33		_01_ŔDY	_01_CH6_AC T		_01_CH6_DA TA	
L7		U01.00.F	U01.01.7	MOV	U01.09	D00107
		_01_RDY	_01_CH7_AC T		_01_CH7_DA TA	

(c) In the 'View' menu, click 'View Device/Variables' to look up the devices and variables at the same time.

(d) In the 'View' menu, click 'View Device/Comment' to look up the devices and descriptions at the same time.



10	M00000 _09_RD		MOV	_09_AD0_DA TA	D00100
50	Analog Input Option Board: Ready	I Analog Input Option Board: Input CHD Active		Analog Input Option Board: Input CHO Data	
Lf	_09_RD	U _09_AD1_AC T	MOV	_09_AD1_DA TA	D00101
	Analog Input Option Board: Ready	Analog Input Option Board: Input CH1 Active		Analog Input Option Board: Input CH1 Data	
12	_09_ERR		MOV	_09_AD0_DA TA	D00102
\$11	Analog Input Option Board: Error			Analog Input Option Board: Input CHO Data	
L3	_09_AD0_ER R			baca	
	Analog Input Option Board: Input CHO Error				
14	_09_AD0_1D D				
	Analog Input Option Board: CHO Input Disconnect ion Flag				
15	_09_ERR		MOV	_09_AD1_DA TA	D00103
S16	Analog Input Option Board: Error			Analog Input Option Board: Input CH1 Data	
18	_09_AD1_ER R				
	Analog Input Option Board: Input CH1 Error				
L7	_09_AD1_ID 				
	Analog Input Option Board: CH1 Input Disconnect ion Flag				

(e) In the 'View' menu, click 'View Variable/Comment' to look up the devices and descriptions at the same time.

Γ

(f) For IEC type also, as shown in Fig. (a) ~ (e), you can look up variables with diversified options in the 'View' menu. The figure below is the case of an IEC type with which the 'View Device/Variables' option.

LO	%MX0 %UX0.9.15	%UX0.9.16		MOVE EN ENO	_
	_09_RDY	_09_AD0_A CT			
L1			%UW0.9.4 _09_AD0_ DATA	IN OUT	- CH0_DATA
L2					
L3		%UX0.9.17		MOVE EN ENO	_
		_09_AD1_A CT			
L4			%UW0.9.5 _09_AD1_ DATA	IN OUT	- CH1_DATA
L5					

1

8.11 Configuration and Function of Internal Memory

An analog input option board has internal memory for data communication with XGB base unit.

Variable	Туро	Device as	ssignment	Description		Signal
Valiable	Type	XBC	IEC	Description		direction
_0y_ERR	BIT	U0y.00.0	%UX0.y.0	Module Error	Б	
_0y_RDY	BIT	U0y.00.F	%UX0.y.15	Module Ready	ĸ	Option \rightarrow CPU
_0y_AD0_ACT	BIT	U0y.01.0	%UX0.y.16	CH0 Active		Ontion ODU
_0y_AD1_ACT	BIT	U0y.01.1	%UX0.y.17	CH1 Active	ĸ	Option \rightarrow CPU
_0y_AD0_IDD	BIT	U0y.01.4	%UX0.y.20	CH0 Disconnection flag	Р	Option \rightarrow CPU
_0y_AD1_IDD	BIT	U0y.01.5	%UX0.y.21	CH1 Disconnection flag	R.	
_0y_AD0_ERR	BIT	U0y.01.8	%UX0.y.24	CH0 error	Б	Ontion CDU
_0y_AD1_ERR	BIT	U0y.01.9	%UX0.y.25	CH1 error	ĸ	Option \rightarrow CPU
_0y_AD0_DATA	WORD	U0y.04	%UW0.y.4	CH0 Output	R	Option \rightarrow CPU
_0y_AD1_DATA	WORD	U0y.05	%UW0.y.5	CH1 Output	R	Option \rightarrow CPU

8.11.1 Analog Data I/O Area

I

TI . (.) I

- In the device allocation, the small letter 'y' is the No. of the slot where the module is installed.

- For example, to read the 'CH0 Input A/D Value' of the analog module installed in the slot 9, write in U09.05. (%UW0.9.4 for IEC types)





- (1) Module Ready/Error Flag (() is for IEC types, y: slot No.)
 - (a) U0y.00.F(%UX0.y.15): at power on or reset of PLC CPU, turns on when the analog I/O conversion is ready and analog conversion is performed.
 - (b) U0y.00.0(%UX0.y.0): the flag indicating the error status of analog input option board module.



(2) Operation channel information/ channel error information flag (() is for IEC types, y: slot No.) This is the area for storing the operation information and channel error information by channel.



- (3) Digital Output Values (() is for IEC types, y: slot No.)
 - (a) A/D converted digital values are outputted to buffer memory address U0y.04 ~ U0y.05 by channel-basis.
 - (b) Digital output values are saved in 16-bit binary figures.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
U0y.04 (%UW0.y.4)	Input CH0 conversion value															
U0y.05 (%UW0.y.5)						Ir	nput C	H1 cor	nversio	on valu	е					

8.11.2 Operation Parameter Setting Area

Γ

The operation parameter setting area of the analog mix module is as follows.

Memory Add.	Description	Setting	R/W	Command
0	Enable channel	Bit Off (0): disable, Bit ON (1): enable	R/W	
1	Input range setting	Input range setting (4 bit per channels) 0: $4 \sim 20 \text{ mA}$ 1: $0 \sim 20 \text{ mA}$ 2: $0 \sim 10 \text{ V}$	R/W	
2	Output data type setting	Output data type setting (4 bit per channels) $0: 0 \sim 4000$ $1: -2000 \sim 2000$ 2: Precise value $3: 0 \sim 1000$ - In case of precise value $4 \sim 20 \text{ mA}: 400 \sim 2000$ $0 \sim 20 \text{ mA}: 0 \sim 2000$ $0 \sim 10 \text{ V}: 0 \sim 1000$	R/W	PUT/GET
3	Input channel 0 count average value setting	0 or 2 64000 [times]	R/W	
4	Input channel 1 count averaging value setting	0 01 2 ~ 04000 [limes]	R/W	
9	Input channel 0 gain weighting	-40~40	R/W	
10	Input channel 1 gain weighting		R/W	
13	Setup error information	10#: input ch range setting error 20#: input ch data type setting error 30#: input ch average value setting error 40#: input ch gain weighting setting error (#: channel number)	R	GET

(1) Operating Channel Setting (address 0)

- (a) You can set "Enable/Disable" of analog input option board per each channel
- (b) Disable the unused channels to reduce the conversion period.
- (c) Default value is "Disable" for all channels
- (d) When using PUT instruction, address is as follows.



Enable CH Bit On (1): enable Bit Off (0): disable

(e) The values set in bit 2~15 are ignored.

(f)This area is same as setting in "Channel status" of I/O parameter

XBO-AD02A (Volt/Current, 2-CH)											
XB0-AD02A (Volt/Current, 2-CH)											
Parameter	СН О	CH 1									
Channel status	Disable	Disable									
lnput range	4~20mA	4~20mA									
Output type	0~4000	0~4000									
Count-Avr	0	0									
Input gain	0	0									
	-										
OK Cancel											

(2) Input range setting area (address 1)

I

(a) Set the type of input range with the following code

Bit (HEX)	Input range
0000 (0)	4 ~ 20 mA
0001 (1)	0~20 mA
0010 (2)	0 ~ 10 V

- (b) If you set more than 3, 0 (4~20^{mA}) will be set forcibly But, U0X.01.8~ U0X.01.9 (Setup error flag) will be ON.
- (c) When using PUT instruction, address is as follows.

bit15 bit14 bit13 bit12 bit11 bit10 bit9 bit8 bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0

Address1	_	_	_	_	_	_	_	_	Input CH 1	Input CH 0

Input range (4bit per channel)

1:0~20 mA 2:0~10 V

(d) The values set in bit 8~15 are ignored.

(e)This area is same as setting in "Input range" of I/O parameter

XBO-AD02A (Volt/Current, 2-CH)											
XB0-AD02A (Volt/Current, 2-CH)											
Parameter	CH O	CH 1									
Channel status	Disable	Disable									
Input range	4~20mA	4~20mA									
Output type	0~4000	0~4000									
Count-Avr	0	0									
Input gain	0	0									
1	•										
OK Cancel											

^{0:4~20} mA

- (3) Output data type setting area (address 2)
 - (a) Set the type of output data type with the following code

Bit (HEX)	Output data type
0000 (0)	0~4000
0001 (1)	-2000~2000
0010 (2)	Precise value
0011 (3)	0~1000

In case of precise value, output data type is designated as the following value according to each input range type

Input range	Precise value
4~20 mA	400 ~ 2000
0~20 mA	0 ~ 2000
0 ~ 10 V	0 ~ 1000

(b) If you set more than 4, 0 (0~4000) will be set forcibly. But, U0X.01.8~ U0X.01.9 (Setup error flag) will be ON.

(c) When using PUT instruction, address is as follows



(d) The values set in bit 8~15 are ignored.

(e)This area is same as setting in "Output type" of I/O parameter

XBO-AD02A (Volt/Current, 2-CH)											
XB0-AD02A (Volt/Current, 2-CH)											
Parameter	CH O	CH 1									
Channel status	Disable	Disable									
Input range	4~20mA	4~20mA									
Output type	0~4000	0~4000									
Count-Avr	0	0									
Input gain	0	0									
OK Cancel											

(4) Count average value setting area (address 3~4)

I

- (a) Set count average value with 0 or value of 2~6400
- (b) If you set the count average value as 0, corresponding channel will not perform averaging process and output sampled analog input value
- (c) If you set 1 or more than 64001, 0 (Disable averaging) will be set forcibly. But, U0X.01.8~ U0X.01.9 (Setup error flag) will be ON.
- d) When using DUT instruction, address is as follows
- (d) When using PUT instruction, address is as follows

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address3		Input CH0 count average value (0 or 2 ~ 64000 [times)														
Address4				Inj	put CH	l1 cour	nt aver	age va	ılue (0) or 2 ~	64000) [time	s)			

(e) This area is same as setting in "Count-Avr" of I/O parameter

XBO-AD02A (Volt/Current, 2-CH)											
XB0-AD02A (Volt/Current, 2-CH)											
Parameter	CH O	CH 1									
Channel status	Disable	Disable									
Input range	4~20mA	4~20mA									
Output type	0~4000	0~4000									
Count-Avr	0	0									
Input gain	0	0									
OK Cancel											

- (5) Input gain weighting setting area (address 9~10)
 - (a) Set input gain weighting with value of -40~40
 - (b) If you set this as 0 (default value), 4000 will apply for gain value
 - (c)For example, if you set this as -10, 4010 (=4000-(-10)) will apply for gain value
 - (d) When using PUT instruction, address is as follows

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address9	Input CH0 gain (-40 ~ 40)															
Address10						I	Input C	CH1 ga	ւin (-40) ~ 40)						

(e) This area is same as setting in "Input gain" of I/O parameter

XBO-AD02A (Volt/Current, 2-CH)						
XB0-AD02A (Volt/Current, 2-CH)						
Parameter	CH O	CH 1				
Channel status	Disable	Disable				
Input range	4~20mA	4~20mA				
Output type	0~4000	0~4000				
Count-Avr	0	0				
Input gain	D	0				
,	OK	Cancel				

- (6) Setup error information output area (address 13)
 - (a) Saves error code detected when setting (setting by program)
 - (b) Setting error is canceled when value is reset to make it in the valid range
 - (c) When U0X.01.8~ U0X.01.9 (setting error flat) is on, check that area and fix the corresponding setting to cancel the error
 - (d) When using GET instruction, address is as follows

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
ddress13							Settin	g erro	r inforn	nation						

Туре	Error code	Description	Priority	Remark
	10#	Input CH range setting error	1	
Setting	20#	20# Input CH data type setting error		#: CH number
error	30#	Input CH count average value setting error	3	Input CH 0,1
	40#	40# Input CH gain weighting setting error		

(e) When more than two errors occur simultaneously, it saves error code having higher priority.

8.12 Example Program

I

- (1) This sample program sets up operating parameters of analog input option board.
- (2) Initial settings are saved in the internal memory of the XGB main unit by one input.
- (3) The sample program below controls the I/O data of the analog input option board at option slot #0 (I/O slot #9) and check open wire.

8.12.1 Example of [I/O Parameter] Usage

I/O Parameter Setting ? 🗙 All Base Set Base 🖃 🗊 Base OO : Default Allocation P0000 ~ P007F Slot Module Comment Input Filter Emergency Out ▲ 00 : DC 24V INPUT DC 24V INPUT 12points/TR OU 0(main) 3 Standard [ms] Default 01 : Default 03 : Default 04 : Default 05 : Default 4 06 : Default 5 6 08 : Default 7 2 08 : Detault 2 09 : XBO-AD02A (Vo 8 👝 10 : Default XBO-AD02A (Volt/Current, 2-CH) P0400 ~ P043F 10 Delete Slot Delete Base Base Setting Delete All Details Print ▼ Cancel XBO-AD02A (Volt/Current, 2-CH) ?∥× XBO-AD02A (Volt/Current, 2-CH) Parameter CH 0 CH 1 📃 Channel status Enable Disable 4~20mA 📃 Input range 4~20mA 0~4000 Output type 0~4000 Count-Avr 0 0 Input gain 0 0 ΟK Cancel

(a) Input Channel 0 is set to operating channel and input range is set to 4~20mA.

(1) I/O Parameter Setting Window

(2) Sample Program (XBC Type)

Comn	ient	Channel O Pro	ogram						
LI	01	U09.00.0 	U09.00.F _09_RDY	U09.01.0	U09.01.8				M00000
12	- 21	M00000			n		MOV	U09.04	D00100
	S6							_09_AD0_DA TA	
13									M00001 (S)
11	<u>S9</u>	_U9_AUU_TU D							
14	S11								

(a) When the option board is in normal operation, M0000 is turned On. U09.00.0 (Module Error) = Off U09.00.F (Module Ready) = On U09.01.0 (Input Channel 0 in-operation) = On U09.01.8 (Input Channel 0 Error) = Off

- (b) When M0000 is ON, Input Channel 0 Converted Value(U09.04) is moved to D00100.
- (c) If open-wire error occurs in channel 0, U09.01.4 (channel 0 open-wire) is ON, and M0001 bit is set.
- (3) Sample Program (IEC Type)

10	XUXO.9.0	XUX0.9.15	XUX0.9.16	XUX0.9.24			XMX0 ()
	_09_ERR	_09_RDY	_09_ADO_AC T	_09_ADO_ER R			
LI	%мхо ——1 ——		EN MOVE ENO-				
12		%UWO.9.4 _09_ADO_DA TA	-IN OUT-	CHO_DATA			
13							
14	XUX0.9.20						%MX1
	_U9_ADO_1D D						

(a) When the option board is in normal operation, %MX0 is turned On.

%UX0.9.0 (Module Error) = Off

%UX0.9.15 (Module Ready) = On

%UX0.9.16 (Input Channel 0 in-operation) = On

%UX0.9.24 (Input Channel 0 Error) = Off

- (b) When M0000 is ON, Input Channel 0 Converted Value((%UW0.9.4) is moved to "CH0_DATA".
- (c) If open-wire error occurs in channel 0, %UX0.9.20 (channel 0 open-wire) is ON, and %M1 bit is set.

8.13 Troubleshooting

Γ

This section describes methods for identifying the troubles which may occur during the operation of analog input option board, and their solutions.

8.13.1 Troubleshooting

(1) Analog input value is abnormal.

Analog input value is abnormal.	
Installation is OK.	
	Install the option board properly
PE around is OK	
	Correct PE grounding according to the wiring in the user manual
Yes	
Wiring is OK (Current input wiring, voltage input wiring)	
No Voo	Refer to the manual and wire properly
Parameter setting is OK (Operation channel permit, I/O range setting	
No Yes	Set up the parameters correctly according to the user manual
Contact nearest dealer or A/S center	

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Chapter 9 Analog Output Option Board

9.1 Setting Sequence before Operation

Before using the analog output option board, follow steps below.



9.2 Specification

Γ

9.2.1 General specifications

No.	ltem	5	Related specifications						
1	Ambient temperature			0°C~	+55 ℃		-		
2	Storage temperature		-25 ℃ ~+70 ℃						
3	Ambient humidity		5	5 ~ 95%RH (N	on-condensing)		-		
4	Storage humidity		5	5 ~ 95%RH (N	on-condensing)		-		
			Occasio	onal vibration		-	-		
		Frequency	Ace	celeration	Amplitude	How many times			
		5 ≤ f < 8.4 ⊞	z	-	3.5 mm				
	Vibration	8.4 ≤ f ≤ 150 l	Hz 9.8	3 m/s² (1G)	-				
5	resistance		IEC61131-2						
		Frequency	Ace	celeration	Amplitude	directions (X, Y and Z)			
		5 ≤ f < 8.4 Hz		-	1.75 mm	(-,, -, -, -, -, -, -, -, -, -, -, -,			
		8.4 ≤ f ≤ 150 l	Iz 4.9	m/s² (0.5G)	-				
6	 Peak acceleration: 147 m/s²(15G) Shock resistance Duration: 11ms Half-sine, 3 times each direction per each axis 								
		Square wave Impulse noise			LS ELECTRIC standard				
		Electrostatic discharge		IEC 61131-2, IEC 61000-4- 2					
7	7 Noise resistance	Radiated electromagnetic field noise	80 ~ 1,000 MHz, 10V/m IEC 6113 3			IEC 61131-2, IEC 61000-4- 3			
		Fast transient		Power suppl module	/ Digital/analog input/output communication interface		IEC 61131-2, IEC 61000-4-		
		,	Voltage 2kV 1kV				4		
8	Environment		-						
9	Altitude	Up to 2,000 ms							
10	Pollution degree	Less than equal to 2 -							
11	Cooling	Air-cooling							

Here describes general specification of analog output option board.

9.2.2 Performance specifications

ltem			Specification			
No. of channels			2 channels			
		Туре	Voltage	Current		
Analog output		Range	DC 0 ~ 10V (Load resistance: 2㎏ Min.)	DC 4 ~ 20 ^{mA} DC 0 ~ 20 ^{mA} (Load resistance: 450Ω Max.)		
range			Output range can be set at user pr channel	ogram or I/O parameter for each		
		Туре	12-bit bina	ary data		
		Unsigned value	0~4(000		
Digital	_	Signed value	-2000 ~	- 2000		
input	Range	Precise value	0 ~ 1000 (DC0~10V)	400 ~ 2000 (DC4~20mA) 0 ~ 2000 (DC0~20mA)		
		Percentile value	0 ~ 1000			
			1/4000 (DC 4 ~ 20 ^{mA} : 1/3200)			
M	aximum ı	resolution	2.5 ^{mV} (DC 0 ~ 10V)	5#A (DC 0~20mA) 6.25#A (DC 4~20mA)		
	Accu	racy	±1.0% or less			
Maxim	num conv	version speed	1 ^{ms} /channel + scan time			
A	dditional	function	Channel output state setting (former, min, middle, max value) Gain adjustment function			
Insulation method			no insulation between analog output channels			
I/O terminal			5-point terminal block			
Power supply			Internal 5V			
I/O points occupied			Fixed type: 64 points			
	Supply	power	Internal DC5V			
Cu	urrent cor	nsumption	150 mA			
Weight			20g			

Here describes performance specification of analog output module.

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Note1) In order to use analog output option board, the following version is needed.

Main unit	Version information
XBC E type	V1.1 or above
XBC S type	V1.1 or above
XBC SU type	V1.0 or above
XEC E type	V1.0 or above
XEC SU type	V1.0 or above
XG5000	V.3.61 or above

Note2) Offset/gain value on analog I/O range can be adjusted at XG5000 - I/O parameter

9.3 Designations and Functions

Here describes designation and functions.

Γ



No.	Name	Description
14	Hook for fixation	Hook for fixing the option board to main unit
2	Terminal block	 Wiring terminal block to connect with external device (Analog input)
3	Cover	► Option board cover
(5)	Connector for option board	Connection connector for connecting the option board to the main unit
6	Input connector	Wiring connector for connecting with the external device
9.4 Characteristic of I/O Conversion

The output ranges of voltage and current can be set up per channel with user program or I/O parameters. The input types of digital data are defined as follows.

1

- (1) Unsigned Value
- (2) Signed Value
- (3) Precise Value
- (4) Percentile Value



(1) DC4~20mA range output

Divital in mut	Analog output current (mA)								
range	4mA or less	4	8	12	16	20	Over 20mA		
Unsigned value (0 ~ 4000)	0 or less	0	1000	2000	3000	4000	Over 4000		
Signed value (-2000 ~ 2000)	-2000 or less	-2000	-1000	0	1000	2000	Over 2000		
Precise value (400 ~ 2000)	400 or less	400	800	1200	1600	2000	Over 2000		
Percentile value (0 ~ 1000)	0 or less	0	250	500	750	1000	Over 1000		

Digital input	Analog output current (mA)								
range	0mA or less	0	5	10	15	20	Over 20mA		
Unsigned value (0 ~ 4000)	0 or less	0	1000	2000	3000	4000	Over 4000		
Signed value (-2000 ~ 2000)	-2000 or less	-2000	-1000	0	1000	2000	Over 2000		
Precise value (0 ~ 2000)	0 or less	0	500	1000	1500	2000	Over 2000		
Percentile value (0 ~ 1000)	0 or less	0	250	500	750	1000	Over 1000		

(2) DC 0 ~ 20mA range output

(3) DC 0 ~ 10V range output

Digital input	Analog output voltage (V)						
range	0V or less	0	2.5	5	7.5	10	Over 10V
Unsigned value (0 ~ 4000)	0 or less	0	1000	2000	3000	4000	Over 4000
Signed value (-2000 ~ 2000)	-2000 or less	-2000	-1000	0	1000	2000	Over 2000
Precise value (0 ~ 1000)	0 or less	0	250	500	750	1000	Over 1000
Percentile value (0 ~ 1000)	0 or less	0	250	500	750	1000	Over 1000

Note

(1) There is "Dead Band" area around voltage output (0V), current output (0mA).
 (a) Digital input-based: about 0 ~ 10

(b) Analog output-based: voltage(about $0 \sim 25 \text{ mV}$), current (about $0 \sim 50 \mu$ A)

(2) In "Dead Band" area, digital input and analog output may not coincide (within accuracy)

9.5 Accuracy

Accuracy for analog output value does not changed even if output range is changed. Figure below shows the range of the accuracy with analog output range of 0 \sim 10 V and digital output type of unsigned value selected.

Accuracy of XBO-DA02A is ±1.0%.



- (1) Accuracy in case of 5V output
 4000 × 1.0% = 40
 So in case of 5V output, accuracy range is (5V 40×0.0025V) ~ (5V+40×0.0025V) = 4.9 ~ 5.1V
- (2) Accuracy in case of 10V
 4000 × 1.0% = 40
 So in case of 10V output, accuracy range is (10V-40×0.0025V) ~ (5V+40×0.0025V) = 9.9 ~ 10.1V

9.6 Functions of Analog Output Option Board

Function	Details
Enable/Disable channel	 It sets up Run/Stop of a channel that will operate an analog output. You can save the time of whole operation by stopping unused channels.
The range of	1) It sets up the range of an analog output.
output	2) Analog output option board offers one voltage output (DC 0 ~ 10V) and two
voltage/current	current output (DC 4 ~ 20mA, DC 0 ~ 20mA).
The input date	1) It sets up the type of a digital input.
	2) It offers four types of a digital input.
туре	(Unsigned value, signed value, precise value, percentile value)
The status of	1) It sets up the output status of a channel when it switches Run to Stop.
The status of	2) It offers four types of output status.
ouipui	(Former, min, middle, max value)

Here describes functions of XBO-DA02A option board

9.6.1 Channel Output State Setting Function

It sets output against PLC stop and abnormal state

(1) Function

It is used to output an already set value when PLC system switches RUN to Stop

(2) Type

You can select one among former, min, middle and max value.

- (a) Former value: keeps last normal output value
- (b) Min. value: outputs minimum value of the each output range
- (c) Middle value: outputs middle value of the each output range
- (d) Max. value: outputs max. value of the each output range.
- (3) Example

When output is 10mA and range of output channel is 4~20mA, if system switches Run to Stop, it outputs as follows according to output state setting.

- (a) Former value: keeps previous output, 10mA
- (b) Min. value: outputs min. value of corresponding range, 4mA.
- (c) Middle value: outputs middle value of corresponding range, 12mA
- (d) Max. value: outputs max. value of corresponding range, 20mA.

9.6.2 Gain Adjustment Function

You can adjust output gain of the analog output option board.

When selecting current output for analog output range, the digital input (4000) corresponding to analog output max. value (20mA) is standard gain value. When selecting voltage output, the digital input (4000) corresponding to analog output max. value (10V) is standard gain value.

- (1) You can adjust output gain at I/O parameter
- (2) Output gain setting range = $-40 \sim 40$
- (3) Adjusting gain for each channel is available

XBO-DA02A (Volt/Current, 2-CH)						
XBO-DA02A (Volt/Current, 2-CH)						
Parameter	CH 0	CH 1				
Channel status	Disable	Disable				
🗌 Output range	4~20mA	4~20mA				
Input type	0~4000	0~4000				
CH. Output type	Former value	Former value				
Output gain	0	0				
OK Cancel						

(4) Example

When you set "Output gain" as -5, 4,005 (=4000- (-5)) applies for gain.

Note

(1) When you adjust the output gain, max. resolution changes, too.

9.7 Wiring

9.7.1 Precautions for wiring

- (1) Don't let AC power line at close range to output option board to prevent a surge or inductive noise from the A.C. side.
- (2) Select the cable with consideration of an ambient temperature and a permitted current limit. It is recommended over AWG22 (0.3mm²).
- (3) Don't let the cable at close range to hot devices or materials. And don't bring it into contact with oil for a long time. These are the factors of a short circuit occurs unusual operation or damages devices.
- (4) Check the polarity before external power is supplied to the terminal.
- (5) It may produce inductive hindrance that is a cause of unusual operations or defects if you wire the cable with a high-voltage line or a power line.
- (6) Enable the only channel you want to use

9.7.2 Wiring example

(1) Current output



9.8 Operation Parameter Setting

You can specify operation parameters of the analog output option board through [I/O parameters] menu in XG5000.

(1) Setting items

For the user's convenience, XG5000 provides GUI (Graphical User Interface) for parameters setting of analog output option board.

Followings are available through [I/O parameters] on the XG5000 project window.

ltem	Details
[I/O Parameters]	(1) Parameter setting
	It specifies the following items for the option board operation.
	 Channel Enable/Disable
	 Analog output range (Voltage/current)
	 Input data type
	 Channel output type
	 Output gain (2) After the parameters that user specified in XG5000 are downloaded, they will be saved to a flash memory in the XGB main unit.

- (2) How to use [I/O Parameters] menu
 - (a) Run XG5000 to create a project. (Refer to XG5000 program manual for details on how to create the project)
 - (b) Double-click [I/O Parameters] on the project window.

Project Window	×
Items Items Image: Second state	

(c) Click the slot of the base that contains analog output option board in the [I/O Parameter Setting] window.

I/O Parameter Setting				_		?×
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00:Default	0(main)					
UI: Default	1					
03 : Default	2					
	3					
05 : Default	4					
	5					
07 : Default	6					
08 : Default	7					
U9: Default	8				<u> </u>	
IU : Default	9	X				
	10	μş				
< >						
	J					
Delete	Slot Delete	Base Base Setting	Delete All De	etails <u>P</u>	int 🔻 🖸 C	K Cancel
Delete	Slot Delete	Base Base Setting	Delete All De	etails <u>P</u>	rint 🔻 🔽 C	K Cancel

(d) Click the arrow button then you can see the menu to choose the applicable module. Select the ______applicable option board.



(e) Double-click the applicable slot that is selected for the parameters setting or click [Details].



(f) A screen will be displayed for you to specify parameters for respective channels as shown below. Click a desired item to display parameters to set for respective items.

XBO-DA02A (Volt/Current, 2-CH)							
XB0-DA02A (Volt/Current, 2-CH)							
Parameter	CH 0	CH 1					
Channel status	Disable 🔽	Disable					
Output range	4~20mA	4~20mA					
Input type	0~4000	0~4000					
CH. Output type	Former value	Former value					
Output gain	0	0					
J							
	ОК	Cancel					

9.9 Special Module Monitoring Function

The function of the special module monitor is as follows.

- (1) Start of [Special Module Monitoring]
 - Go through [Online] \rightarrow [Connect] and [Monitor] \rightarrow [Special module Monitoring] to start. If the status is not online, [Special Module Monitoring] menu will not be activated.



Note

- 1) The screen may not function properly if the system resources are not sufficient. In this case, close the screen, exit other applications, and rerun XG5000.
- 2) The I/O parameters set up in [Special Module Monitor] condition are temporarily set up for testing purpose. Therefore, these I/O parameters are deleted after exit from [Special Module Monitor].3) The test function of the [Special Module Monitor] enables testing analog output option board
 - without sequence programming.

(2) How to use [Special Module Monitoring]

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(a) Connecting XG5000 with PLC basic unit, [Special Module List] window will show base/slot information and types of special module by click [Monitor] → [Special Module Monitoring]. Special Module List will display the modules that are installed in PLC now.

Special Mod	dule List	×
Base Base 0 Base 0 Base 0 Base 0	Slot Internal Internal Slot 9	Module High Speed Counter Module(Open-Collector, 8-CH) Position Module (Open-Collector, 2-CH) XBO-DA02A (Volt/Current, 2-CH)
K Module Info.) Monitor	Close

(b) Select a special module then click [Module Info.] button to display the information as described below.

Special Module Info	ormation ?X						
Displays the informations of special module.							
ltem	Information						
Module Name	XB0-DA02A (Volt/Current, 2-CH)						
OS Ver	Ver. 10.02						
OS Update Date	2010-10-26						
Module Status	Normal. (0)						
,	OK						

(c) Click [Monitor] button in the [Special Module List] window to display the [Special Module Monitor] window as below

Special Module Moni	itor	?×
XB0-DA02A (Volt/Current, 2-	CH)	
Item	Setting value	Current value
CH0 D/A value		
CH1 D/A value		
Item	Setting value	Current value
Channels	CHI)
Channel status	Disable	
Output range	4~20mA	
Input type	0~4000	
CH. Output type	Former value	
Digital value	0	
Output enable	Disable	
Output gain	0	
<u>R</u> eset max/min value	Start <u>M</u> onitoring	<u>I</u> est
		Close



(d) [Start Monitoring] button will show you digital input data of the operating channel.

[Start Monitoring] execution screen

(e) [Test] is used to change the parameters of the voltage output module. You can change the parameters when you click the values at the bottom of the screen. It is only available when XGB CPU unit's status is in [Stop Monitoring].

Special Module Monitor									
XBO-DA02A (Volt/Current, 2-0	CH)								
Item	Setting value	Current value							
CH0 D/A value		2300							
CH1 D/A value		0							
1									
Item	Setting value	Current value							
Channels	CH	10							
Channel status	Enable	Enable							
Output range	4~20mA	4~20mA							
Input type	0~4000	0~4000							
CH. Output type	Former value	Former value							
Digital value	2300	2300							
Output enable	Enable	Enable							
Output gain	0	0							
Reset max/min value	Stop <u>M</u> onitoring								
-96~4096		Close							

[Test] execution screen

(f) [Close] is used to escape from the monitoring/test screen.

When closing the "Monitoring/Test" screen, the setting value is not saved anymore.

9.10 Register U devices (special module variable)

Register the variables for each option board referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

(1) Registration sequence

ſ

All Base Set Base TD Base 00 : Default 01 : Default 01 : Default 02 : Default	Slot	Module				
Di Base 00 : Default 00 : Default 01 : Default 02 : Default	Slot	Module				
00 : Default 	O(main)	modulo	Comment	Input Filter	Emergency Out	Allocation
01 : Default 02 : Default	(Indin)					
U2:Default	1					
- 02 : Defeuilt	2					
05 : Default	3					
05 : Default	4					
🛛 🔄 06 : Default	5					
07 : Default	6					
08 : Default	7		,			
10 : Defeult	8		<u> [] [] [] [] [] [] [</u>		8//////////////////////////////////////	
10 . Delault	9	XB0-DA02A (Volt/Current, 2-CH)	<u></u>	-	-	P0400 ~ P043F
	10		V			

(b) Double-click [Variable/Comment] from the project window.

🍕 XGB_PROJECT - XG5000 - [Variab	ole/Comment]	- DX
Project Edit Find/Replace View Online	e <u>M</u> onitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u> elp	- 8 ×
D 2 6. 8 4 8 8 1	Ø 2 2 4 6 6 × 6 8 8 8 9 1 6 6	
		F3 F4 F5 F6 F7
昏时和群群东方的薪薪的称	\$\$ \$\$ \$\$ \$\$ \$\$ \$7 \$7 \$7 \$7 \$7 \$7 \$7 \$1 \$1 \$1 \$1 \$2 \$2 \$2 \$100\$	♥ 𝔅 𝔅 𝔅
Project Window · ×	View Variable	
I I I I I I I I I I I I I I I I I I I	Variable Type A Device Used Comment	
 ⊕ NewPLCXSB-XBCS)-Offline ⊕ Variable/Comment ⊕ Parameter ↓ Parameter ↓ Sameter ↓ Variable/Comment ↓ Sameter ↓ Sameter		Σ
■t Project	📾 NewProgram 🕍 Variable/Comment	

(c) Select [Edit] \rightarrow [Register U Device].

👒 XGB_PF	ЮJ	ECT - XG5000	- [Variable	/Com	ment]					- DX
🕍 <u>P</u> roject	<u>E</u> dit	Eind/Replace	<u>v</u> iew <u>O</u> nline .	<u>M</u> onitor	r <u>D</u> ebug <u>T</u> ools	<u>W</u> indow <u>H</u>	<u>l</u> elp			- 8 ×
066	2	<u>U</u> ndo	Ctrl+Z	9	00%	b 🖻 🗙	** ** ** **	M #4 3	*0 8*0 Å 10 💌 👁	
12 番 6	<u>_</u>	Hedo	Utrl+Y		80 A B	[ក្រក		<
R LE LE	க் Ba	Copy	Ctrl+C	(B) (B	22 - N2 - E2 - 4	્રમ પ્ર∕ુષ પણ્ટ પ	 V in mR	aar		1× 🗸 9. 9. 🕞
Project Windo	e	Paste	Ctrl+V	SF4 SF	-5 SF6 F10 SF/ C	3 04 05 0				
Items	×	<u>D</u> elete	Del	V Vi	ew Variable	View Device	View Flag			1
⊟ 🐺 XGB		<u>S</u> elect All	Ctrl+A		Variable	Туре	▲ Device	Used	Comment	
	매음	Insert <u>L</u> ine	Ctrl+L	┝──┕						
	×	Delete Li <u>n</u> e	Ctrl+D							
		Export Variables	to <u>F</u> ile							
G		Register U Device	e							
⊡- €		Add EXTERNAL	Variable							
		Move Item Up								
		Move Item Down								
	_			-						
				<						>
■t Project					NewProgram		'ariable/Comme	nt		

(d) Click 'Yes'.

XG5000	
?	Automatically register comments in the U Devices according to the special module set in the I/O parameter. The previous comments will be deleted. Continue?
	Yes No

1

(e) As shown below, the variables are registered.

🖺 Va	riable/Comme	ent				٦×
V	/iew Variable	View Device	🕅 View Flag			
	Variable	Type 🔺	Device	Used	Comment	
1	_09_ERR	BIT	U09.00.0		Analog Output Option Board: Error	
2	_09_RDY	BIT	U09.00.F		Analog Output Option Board: Ready	
3	_09_DAO_ACT	BIT	U09.01.2		Analog Output Option Board: Output CHO Active	
4	_09_DA1_ACT	BIT	U09.01.3		Analog Output Option Board: Output CH1 Active	
5	_09_DA0_ERR	BIT	U09.01.A		Analog Output Option Board: Output CHO Error	
6	_09_DA1_ERR	BIT	U09.01.B		Analog Output Option Board: Output CH1 Error	
7	_09_DA0_OUTEN	BIT	UO9.06.0		Analog Output Option Board: Output CHO Status Setting	
8	_09_DA1_OUTEN	BIT	U09.06.1		Analog Output Option Board: Output CH1 Status Setting	
9	_09_DAO_DATA	WORD	009.07		Analog Output Option Board: Output CHO DATA	
10	_09_DA1_DATA	WORD	U09.08		Analog Output Option Board: Output CH1 DATA	

(2) Save variables

(a) The contents of 'View Variables' can be saved as a text file

(b) Click [Edit] \rightarrow [Export to File].

(c) The contents of 'View Variable' are saved as a text file.

(3) View variables in a program

Γ

The figure below present examples of use in XGB compact "E" and "S" types

(a) I	lie e	example	01 2020	00 15 5110		•			
10	SO	U09.00.0	U09.00.F	U09.01.2	U09.01.A				M00000
Lf	00 0E	U09.00.0	U09.00.F	U09.01.3	U09.01.B				M00001
12	010	M00000							U09.06.0
L3	- 210						 MOV	U09.07	D00100
14	014	M00001							U09.06.1
15	514						 MOV	U09.08	D00100
LØ							 		END
	S18								

(a) The example of XG5000 is shown below.

(b) Select [View] \rightarrow [Variables]. The devices are changed into variables.

10	SO	_09_ERR	_09_RDY	_09_DA0_AC T	_09_DA0_ER R /				M00000
Lf	S5	_09_ERR	_09_RDY	_09_DA1_AC T	_09_DA1_ER R —//				M00001
12	S10	M00000							_09_DA0_OU TEN
L3	310					 	MOV	_09_DAO_DA TA	D00100
14	014	M00001							_09_DA1_OU TEN
15	514					 	MOV	_09_DA1_DA TA	D00100
18	S18								END

(c) Select [View] \rightarrow [Devices/Variables]. Device and variable both are displayed.

10		U09.00.0	U09.00.F	U09.01.2	U09.01.A				M00000
	SO	_09_ERR	_09_RDY	_09_DAO_AC	_09_DA0_ER R				
11		U09.00.0	U09.00.F	U09.01.3	U09.01.B				M00001
	95	_09_ERR	_09_RDY	_09_DA1_AC	_09_DA1_ER				
12		M00000							U09.06.0
	S10								_09_DAO_OU TEN
L3	0.00						MOV	U09.07	D00100
								_09_DA0_DA TA	
14		M00001							U09.06.1
	S14	1 1							_09_DA1_OU TEN
15							MOV	U09.08	D00100
								_09_DA1_DA TA	
18	010								END
	- 010 I								

., oc	1000			00/00/11	nontoj. D	evice and con	innent bour a		nuyou.	
10		U09.00.0	U09.00.F	U09.01.2	U09.01.A					M00000
		Analog Dutput	Analog Dutput	Analog Dutput	Analog Dutput					
		Option Board	Option Board:	Option Board	Option Board					
		Error	Ready	Output CHO	Output CHO					
11	- 30	U09.00.0	U09.00.F	U09.01.3	U09.01.B					M00001
										()
		Output	Output	Output	Output					
		Board:	Board:	Board:	Board:					
	S5	Error	Ready	Active	Error					
12		M00000								U09.06.0
										Analog
										Option
										Output CHO
										Setting
1.3	<u>S10</u>									
1.0								MOV	U09.07	D00100
									Output	
									Board:	
									DATA	
14		M00001								U09.06.1
										Analog
										Option
										Output CH1
										Status Setting
15	S14						r			
1.0								MOV	U09.08	D00100
									Output	
									Board:	
									Output CH1 DATA	
18										END
	S18									

(d) Select [View] \rightarrow [Devices/Comments]. Device and comment both are displayed.

٦

10		_09_ERR	_09_RDY	_09_DA0_AC T	_09_DA0_ER R			,	мооооо
	SO	Analog Output Option Board: Error	Analog Output Option Board: Ready	Analog Output Option Board: Output CHO Active	Analog Output Option Board: Output CHO Error				
LI		_09_ERR	_09_RDV	_09_DA1_AC T	_09_DA1_ER R				M00001
	S5	Analog Output Option Board: Error	Analog Output Option Board: Ready	Analog Output Option Board: Output CH1 Active	Analog Output Option Board: Output CH1 Error				
12		M00000							_09_DA0_0U TEN
	S10								Analog Output Option Board: Output CHO Status Setting
L3							MOV	_09_DA0_DA TA	D00100
								Analog Output Option Board: Output CHO DATA	
14		M00001							_09_DA1_0U TEN
	S14	_1 [Analog Output Option Board: Output CH1 Status Setting
15							MOV	_09_DA1_DA TA	D00100
								Analog Output Option Board: Output CH1 DATA	
18									END
	- 218								

(e) Select [View] \rightarrow [Variable/Comments]. Variable and comment both are displayed.

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Chapter 9 Analog Output Option (XBO-DA02A)

(f) For IEC type also, as shown in Fig. (a) ~ (e), you can look up variables with diversified options in the 'View' menu. The figure below is the case of an IEC type with which the 'View Device/Variables' option. 1

10	%UX0.9.0	%UX0.9.15	%UX0.9.18	%UX0.9.26				%MX0
	_09_ERR	_09_RDY	_09_DA0_A CT	_09_DA0_ ERR				
L1	%UX0.9.0	%UX0.9.15	%UX0.9.19	%UX0.9.27				%MX1
	_09_ERR	_09_RDY	_09_DA1_A CT	_09_DA1_ ERR				
L2	%MX0							%UX0.9.96
								09 40 OUTEN
L3						MOVE		
						EN ENO		
14					CH0_Outpu t_Value	IN OUT	- %UW0.9.7 _09_DA0_ DATA	
L5								
L6	%MX1							%UX0.9.97
								_09_DA1_ OUTEN
17						MOVE		
18		 				EN ENO	• · · · · · · · · · · · · · · · · · · ·	
20					CH1_Outpu t_Value	-IN OUT-	%UW0.9.8 _09_DA1_ DATA	
L9								

9.11 Internal memory

Describes configuration and function of internal memory

Variable name	Type	Device as	signment	Description	R/W	Signal	
variable flame	туре	XBC	IEC	Description		direction	
_0y_ERR	BIT	U0y.00.0	%UX0.y.0	Module Error	Б	Ontion CPU	
_0y_RDY	BIT	U0y.00.F	%UX0.y.15	Module Ready	n.		
_0y_DA0_ACT	BIT	U0y.01.2	%UX0.y.16	CH0 active		Ontion CDU	
_0y_DA1_ACT	BIT	U0y.01.3	%UX0.y.17	CH1 active	ĸ		
_0y_DA0_ERR	BIT	U0y.01.A	%UX0.y.20	CH0 error	Б	Option CPU	
_0y_DA1_ERR	BIT	U0y.01.B	%UX0.y.21	CH1 error	n.	Option → CPU	
_0y_DA0_OUTEN	BIT	U0y.06.0	%UX0.y.24	CH0 output state setting	\A/	Ontion () CPU	
_0y_DA1_OUTEN	BIT	U0y.06.1	%UX0.y.25	CH1 output state setting	vv	Option ↔ CF0	
_0y_DA0_DATA	WORD	U0y.07	%UW0.y.4	CH0 input value	W	Option \leftrightarrow CPU	
_0y_DA1_DATA	WORD	U0y.08	%UW0.y.5	CH1 input value	W	Option \leftrightarrow CPU	

9.11.1 Data I/O area

I

- In the device allocation, the small letter 'y' is the No. of the slot where the module is installed.

- For example, to Write the 'CH0 Output A/D Value' of the analog module installed in the slot 9, write in U09.07 (%UW0.9.7 for IEC types)





LSELECTRIC 9-22

- (1) Module Ready/Channel Error information (() is for IEC types, y: slot No.)
 - (a) U0y.00.F(%UX0.y.15): It will be ON when PLC CPU unit is powered or reset with the condition that an analog option board has prepared to convert.
 - (b) U0y.00.0(%UX0.y.0): It is the flag which displays error status of each channel in the analog option board.



(2) Channel operation information (() is for IEC types, y: slot No.)(a) This area is used to display the channel being used and channel error information.



(3) Output setting (() is for IEC types, y: slot No.)

(a) Each channel can be specified enable/disable the analog output.

(b) If the output is not specified, output of all the channels will be disabled.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
U0y.06 (%UW0.y.6)	_	_					_	_		_	_	_			CH1	CHO
															CIII	CIIO
															$ \subseteq $	
													Out	put se	tting	o. o to .

Bit On (1): enable output Bit Off (0): disable output

- (4) Digital input (() is for IEC types, y: slot No.)
 - (a) Digital input value can be selected and used within the range of unsigned value (0~4047), signed value (-2000~2047), precise value and percentile value (0~1011) based on input type.
 (b) If the digital input value is get an edited it will be set to 2
 - (b) If the digital input value is not specified, it will be set to 0.

	DITIS	DIT14	DITI 3	DITIZ	DITTT	DITTU	DIt9	DIt8	DIt7	DIto	DItS	DIt4	DIt3	DILZ	DICI	DItU
U0y.07 (%UW0.y.7)							Outpu	ut CH0	input	value						
U0y.08 (%UW0.y.8)							Outpu	ut CH1	input	value						

Memory address	Description	Setting value	R/W	Instruction	
0	Enable CH	Bit Off (0): disable, bit On (1): enable	R/W		
1	Output range setting	Input range setting (4 bit per channel) 0: 4 ~ 20 mA 1: 0 ~ 20 mA 2: 0 ~ 10 V	R/W		
2	Input data type setting	Input data type setting (4 bit per channel) 0: $0 \sim 4000$ 1: -2000 ~ 2000 2: Precise value 3: $0 \sim 1000$ - In case of precise value $4 \sim 20$ mA: $400 \sim 2000$ $0 \sim 20$ mA: $0 \sim 2000$ $0 \sim 10$ V: $0 \sim 1000$	R/W	PUT/GET	
8	CH output state setting	CH output state setting (4bit per channel) 0: Former value 1: min value 2: middle value 3: max value	R/W		
11	Output CH0 gain weighting	-40 ~ 40	R/W		
12	Output CH1 gain weighting		R/W		
13	Setup error information	50#: output ch range setting error 60#: output ch data type setting error 70#: output ch output state setting error 80#: output ch gain weighting setting error 90#: output ch input value excess error (#: channel number)	R	GET	

9.11.2 Setting area of operation parameters

Γ

(1) Operating Channel Setting (address 0)

- (a) You can set "Enable/Disable" of analog output option board per each channel
- (b) Disable the unused channels to reduce the conversion period.
- (c) Default value is "Disable" for all channels
- (d) When using PUT instruction, address is as follows.



Enable CH Bit On (1): enable Bit Off (0): disable

(e) The values set in bit 2~15 are ignored.

(f)This area is same as setting in "Channel status" of I/O parameter

XBO-DA02A (Volt/Current, 2-CH)										
XBO-DA02A (Volt/Current, 2-CH)										
Parameter	СН О	CH 1								
Channel status	Disable	Disable								
Output range	4~20mA	4~20mA								
Input type	0~4000	0~4000								
CH. Output type	Former value	Former value								
Output gain	0	0								
	OK	Cancel								

(2) Output range setting area (address 1)(a) Set the type of output range with the following code

Bit (HEX)	Input range
0000 (0)	4 ~ 20 mA
0001 (1)	0~20 mA
0010 (2)	0 ~ 10 V

(b) If you set more than 3, 0 (4~20^{mA}) will be set forcibly But, U0X.01.A~ U0X.01.B (Setup error flag) will be ON.

(c) When using PUT instruction, address is as follows.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address1	_	_	_	_	_	_	_	_		Outpu	t CH 1			Output	t CH 0	

Output range (4bit per channel)



^{1:0~20} mA 2:0~10 V

(d) The values set in bit 8~15 are ignored.

(e)This area is same as setting in "Output range" of I/O parameter

XBO-DA02A (Volt/Current, 2-CH)										
CH O	CH 1									
Disable	Disable									
4~20mA	4~20mA									
0~4000	0~4000									
Former value	Former value									
0	0									
ОК	Cancel									
	CH 0 Disable 4~20mA 0~4000 Former value 0									

- (3) Input data type setting area (address 2)
 - (a) Set the type of input data type with the following code

/ //	
Bit (HEX)	Input data type
0000 (0)	0~4000
0001 (1)	-2000~2000
0010 (2)	Precise value
0011 (3)	0~1000

In case of precise value, input data type is designated as the following value according to each output range type

Output range	Precise value
4~20 mA	400 ~ 2000
0~20 mA	0 ~ 2000
0 ~ 10 V	0 ~ 1000

(b) If you set more than 4, 0 (0~4000) will be set forcibly. But, U0X.01.A~ U0X.01.B (Setup error flag) will be ON.

(c) When using PUT instruction, address is as follows

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Address2	_	_	_	_	_	_	_	_	_	Outpu	t CH 1			Outpu	t CH 0	
												_	-			

Input data type (4bit per channel)

- 0:0~4000
- 1 : -2000 ~ 2000
- 2 : precise value 3 : 0 ~ 1000

- In case of precise value

4 ~ 20 mA: 400 ~ 2000

- 0 ~ 20 mA: 0 ~ 2000
- 0 ~ 10 V: 0 ~ 1000

(d) The values set in bit 8~15 are ignored.

(e)This area is same as setting in "Input type" of I/O parameter

XBO-DA02A (Volt/Current, 2-CH)											
XBO-DA02A (Volt/Current, 2-CH)											
Parameter	СНО	CH 1									
Channel status	Disable	Disable									
Output range	4~20mA	4~20mA									
Input type	0~4000	0~4000									
CH. Output type	Former value	Former value									
Output gain	0	0									
	ОК	Cancel									

(4) Channel output state setting area (address 8)(a) Set the output state setting with the following code

I

Bit (Hex)	Channel output state
0000 (0)	Former value
0001 (1)	Min value
0010 (2)	Middle value
0011 (3)	Max value

- (b) If you set more than 4, 0 (former value) will be set forcibly. But, U0X.01.A~ U0X.01.B (Setup error flag) will be ON.
- (c) When using PUT instruction, address is as follows

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Address8																
	-	-	-	-	-	-	-	-		Output	CH 1			Output	t CH 0	
										Inpu	t data	type (4	4bit pe	r chanr	nel)	

- 0 : Former value
- 1 : Min value
- 2 : Middle value
- 3 : Max value

(d) The values set in bit 8~15 are ignored.

(e)This area is same as setting in "CH. Output type" of I/O parameter

XBO-DA02A (Volt/Current, 2-CH)							
XBO-DA02A (Volt/Current, 2-CH)							
Parameter	CH O	CH 1					
Channel status	Disable	Disable					
Output range	4~20mA	4~20mA					
Input type	0~4000	0~4000					
CH. Output type	Former value	Former value					
Output gain	0	0					
	OK	Cancel					

- (5) Output gain weighting setting area (address 11~12)
 - (a) Set output gain weighting with value of -40~40
 - (b) If you set this as 0 (default value), 4000 will apply for gain value
 - (c)For example, if you set this as -10, 4010 (=4000-(-10)) will apply for gain value
 - (d) When using PUT instruction, address is as follows

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address11						O	output (CH0 g	ain (-4	0 ~ 40)						
Address12						C	output (CH1 g	ain (-4	0 ~ 40)						

(e) This area is same as setting in "Output gain" of I/O parameter

>	XBO-DA02A (Volt/Current, 2-CH)								
	XBO-DA02A (Volt/Current, 2-CH)								
	Parameter	CH O	CH 1						
	Channel status	Disable	Disable						
	🗌 Output range	4~20mA	4~20mA						
	Input type	0~4000	0~4000						
	CH. Output type	Former value	Former value						
	Output gain	0	0						
4									
		OK	Cancel						

- (6) Setup error information output area (address 13)
 - (a) Saves error code detected when setting (setting by program)
 - (b) Setting error is canceled when value is reset to make it in the valid range
 - (c) When U0X.01.A~ U0X.01.B (setting error flat) is on, check that area and fix the corresponding setting to cancel the error
 - (d) When using GET instruction, address is as follows

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address13							Settin	g erroi	r inforn	nation						

Туре	Error code	Description	Priority	Remark
	50#	Output CH range setting error	2	
0	60#	Output CH data type setting error	3	
Setting	70#	Output CH state setting error	4	#: CH number Output CH 0 1
CITO	80#	Output CH gain weighting setting error	5	Output Off 0,1
	90#	Output CH input value excess error	1	

(e) When more than two errors occur simultaneously, it saves error code having higher priority.

9.12 Example Program

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- (1) This sample program sets up operating parameters of analog output option board.
- (2) Initial settings are saved in the internal memory of the XGB main unit by one input.
- (3) The sample program below controls the I/O data of the analog output option board at option slot #0 (I/O slot #9) and check open wire.

9.12.1 Example of [I/O Parameter] Usage

(1) I/O Parameter Setting Window

O Parameter Setting						1
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
- a 01 : Default	1					
03 : Default	2					
- 04 : Default	3					
05 : Default	4					
🛛 🔤 06 : Default	5					
07 : Default	6					
	7			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
10 : Default	8		4		7/////////////////////////////////////	
	9	XBU-DAU2A (Volt/Lurrent, 2-LH)	Į.	-	· ·	P0400 ** P043F
< >	Slot Del	ete Base Base Setting	lete All D	e <u>t</u> ails [<u>P</u> int ▼	OK Cance
(BO-DA02A (Volt/Curre KBO-DA02A (Volt/Current, 2-CH)	ent, 2-C	H)	?×			
Parameter	C	HO CH1				
Channel status	Ena	ible 📉 Disable				
Outrust commo	4~	20-4 NS 4020-4				

📃 Output range	4~20mA ^ዛ ኝ	4~20mA
Input type	0~4000	0~4000
CH. Output type	Former value	Former value
Output gain	0	0
	<u>i</u>	
	OK	Cancel

(a) Output Channel 0 is set to operating channel and output range is set to 4~20mA.

Cor	nment	Channel O Pr	ogram						
L1	01	U09.00.0 / _09_ERR	U09.00.F _09_RDY	U09.01.2	U09.01.A				M00000
12	51	M00000			n				U09.06.0
13	<u> </u>					 	 MOV	D00100	U09.07 09 DAO DA
14	S10					 	 		

(2) Sample Program(XBC Type)

(a) When the option board is in normal operation, M0000 is turned On.

U09.00.0 (Module Error) = Off

U09.00.F (Module Ready) = On

U09.01.2 (Output Channel 0 in-operation) = On

U09.01.A (Output Channel 0 Error) = Off

(b) When M0000 is ON, it turns on CH0 output state (U09.06.0) and allows output

(c) When M0000 is ON, D00100 data is moved to output CH0 Output value (U09.07) and outputs.

(3) Sample Program/(IEC Type)

LO	%UX0.9.0	%UX0.9.15	%UX0.9.18	%UX0.9.26 ──┤/				%MX0
	_09_ERR	_09_RDY	_09_DA0_A CT	_09_DA0_ ERR				
L1	%MX0							%UX0.9.96
								_09_DA0_ OUTEN
L2						MOVE		
				 	- 	EN ENO		
23					CH0_Outpu t_Value	IN OUT	- %UW0.9.7 _09_DA0_ DATA	
L4								

- (a) When the option board is in normal operation, %MX0 is turned On. %UX0.9.0 (Module Error) = Off %UX0.9.15 (Module Ready) = On %UX0.9.18 (Output Channel 0 in-operation) = On %UX0.9.26 (Output Channel 0 Error) = Off
- (b) When M0000 is ON, it turns on CH0 output state (%UX0.9.96) and allows output
- (c) When %MX0 is ON, CH0_Output_Value data is moved to output CH0 Output value (%UW0.9.7) and outputs.

9.13 Troubleshooting

Γ

This section describes methods for idetifying the troubles which may occur during the operation of analog output option board, and their solutions.

9.13.1 Troubleshooting

(1) Analog output value is abnormal.

Analog output value is abnormal.	
Installation is OK.	
No Yes	Install the option board properly
PE ground is OK	
	Correct PE grounding according to the wiring in the user manual
Wiring is OK (Current output wiring, voltage output wiring)	
No Yes	Refer to the manual and wire properly
Parameter setting is OK (Operation channel permit, I/O range setting	
No Yes	Set up the parameters correctly according to the user manual
Contact nearest dealer or A/S center	

Chapter 10 Analog I/O Option Board

10.1 Setting Sequence before operation

Before using the analog I/O option board, follow steps below.



10.2 Specifications

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10.2.1 General specifications

General specifications are as follows.

No.	ltem		Related specifications						
1	Ambient temperature		0℃~+55℃						
2	Storage temperature			-25 ℃ ~	∻+70 ℃		-		
3	Ambient humidity		Ę	5 ~ 95%RH (No	on-condensing)		-		
4	Storage humidity		Ę	5 ~ 95%RH (No	on-condensing)		-		
			Occasi	onal vibration		-	-		
		Frequency	Ac	celeration	Amplitude	How many times			
		5 ≤ f < 8.4 ⊞	z	-	3.5 mm				
	Vibration	8.4 ≤ f ≤ 150	lz 9.8	3 m/s² (1G)	-				
5	resistance		For contin	nuous vibratio	n	10 times each	IEC61131-2		
		Frequency	Ac	celeration	Amplitude	directions (X, Y and Z)			
		5 ≤ f < 8.4 ⊞	z	-	1.75 mm	(, , , , , , , , , , , , , , , , , , ,			
		8.4 ≤ f ≤ 150 J	Iz 4.9	m/s² (0.5G)	-				
6	 Peak acceleration: 147 m/s²(15G) Shock resistance Duration: 11ms Half-sine, 3 times each direction per each axis 								
		Square wave Impulse noise		LS ELECTRIC standard					
		Electrostatic discharge		IEC 61131-2, IEC 61000-4- 2					
7	Noise resistance	Radiated electromagnetic field noise		80 ~ 1,000 MHz, 10V/m			IEC 61131-2, IEC 61000-4- 3		
		Fast transient	Segment	Power supply module	/ Digital/ana	alog input/output ication interface	IEC 61131-2, IEC 61000-4-		
		,	Voltage 2kV 1kV				4		
8	Environment		Free from corrosive gasses and excessive dust						
9	Altitude		Up to 2,000 ms						
10	Pollution degree			Less than e	equal to 2		-		
11	Cooling		Air-cooling						

10.2.2 Performance specifications

Performance specifications are as follows.

(1) Input performance specification

Items			Input performance specification			
Nur	nber of	channels	1 cha	nnel		
		Туре	Voltage	Current		
Analog input range	Range		$\begin{array}{c} DC \ 0 \ \sim \ 10V \\ (Input resistance: 1^{M_{\Omega}} \ Min.) \end{array} \qquad \begin{array}{c} DC \ 4 \ \sim \ 20^{mA} \\ DC \ 0 \ \sim \ 20^{mA} \\ (Input resistance: 250 \ \Omega) \end{array}$			
			or I/O parameter per each channel			
		Туре	12 bit bir	ary data		
	Range	Unsigned value	0 ~ 4000			
Digital		Signed value	-2000 -	~ 2000		
output		e Precise value	0 ~ 1000 (DC 0 ~ 10V)	400 ~ 2000 (DC 4 ~ 20 ^{mA}) 0 ~ 2000 (DC 0 ~ 20 ^{mA})		
		Percentile value	0 ~ 1	000		
			1/4000 (DC 4~20 ^{mA} : 1/3200)			
Ν	lax. res	solution	2.5 ^{mV} (DC 0~10V)	5 ^{µA} (DC 0~20 ^{mA}) 6.25 ^{µA} (DC 4~20 ^{mA})		
	Accu	racy	±1.0% or less			
Max. conversion speed		sion speed	1ms/channel	+ scan time		
Abs	solute r	nax. input	DC +12V / -10V	DC ±25 ^{mA}		
م المانية م	al	Average function	Count average (2	2 ~ 64,000 times)		
function	ai N	Gain adjustment function	Gain adjustment (-40~40)			

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Items			Output performance specification			
Nur	nber of ch	annels	1 channel			
		Туре	Voltage	Current		
Analog output range	Range		$ \begin{array}{c} DC \ 0 \ \sim \ 10V \\ (Load \ resistance: \ 2k\Omega \ Min.) \end{array} \qquad \begin{array}{c} DC \ 4 \ \sim \ 20^{mA} \\ DC \ 0 \ \sim \ 20^{mA} \\ (Load \ resistance: \ 450 \ \Omega \ Max.) \end{array} \\ \hline \\ Set \ at \ user \ program \ or \ I/O \ parameter \ per \ each \ channel \ per \ each \ channel \ per \ each \ channel \end{array} $			
		Туре	12 bit bi	nary data		
		Unsigned value	0 ~ 4000			
Digital		Signed value	-2000	~ 2000		
input	Range	Precise value	0 ~ 1000 (DC 0 ~ 10V)	400 ~ 2000 (DC 4 ~ 20mA) 0 ~ 2000 (DC 0 ~ 20mA)		
		Percentile value	0 ~ 1000			
			1/4000 (DC 4 ~ 20 ^{mA} : 1/3200)			
Ν	lax. resol	ution	2.5 ^{mV} (DC 0~10V)	5 ^{µA} (DC 0~20 ^{mA}) 6.25 ^{µA} (DC 4~20 ^{mA})		
	Accurac	су	±1.0% or less			
Max. conversion speed			1ms/channe	l + scan time		
Ad	ditional fu	nction	CH output status setting (select among former, min, middle, max value) Gain adjustment function			

(2) Output performance specification

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(3) I/O Common performance specification

Items	I/O common performance specification			
Insulation method	Non-insulation betweens analog I/O channels Non-insulation between I/O terminal and PLC main unit			
I/O terminal	5-point terminal block			
I/O occupation point	Fixed type: 64 points			
Supply power	Internal DC5V			
Consumption current	150 mA			
Weight	20g			

Note1) In order to use analog I/O option board, the following version is needed.

Main unit	Version information
XBC E type	V1.1 or above
XBC S type	V1.1 or above
XBC SU type	V1.0 or above
XEC E type	V1.0 or above
XEC SU type	V1.0 or above
XG5000	V.3.61

Note2) Offset/gain value on the analog output range can be adjusted at XG5000- I/O parameter

10.3 Name of Part and Function

Respective designations of the parts are as described below.



1

No.	Name	Description
14	Hook for fixation	Hook for fixing the option board to main unit
2	Terminal block	 Wiring terminal block to connect with external device (Analog Input/Output)
3	Cover	► Option board cover
(5)	Connector for option board	Connection connector for connecting the option board to the main unit
6	Input connector	Wiring connector for connecting with the external device

10.4 Characteristic of I/O conversion

The input ranges of voltage and current can be set up per channel with user program or I/O parameters. The output types of digital data are defined as follows.

- (1) Unsigned Value
- (2) Signed Value

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- (3) Precise Value
- (4) Percentile Value

10.4.1 Input characteristic

Data conversion characteristic per input range is as follows.

				•	Analog in	put practical		
	1011 1000	2047 2000	4047 4000					– Gain
	750	1000	3000					
Digital output	500	0	2000			/		
	250	-1000	1000		/			
	0 -12	-2000 -2048	0 -48		Offset			
Analog		DC 4 ~ 20 m	A	4 mA	1:	2 mA	20 mA	
input	[[DC 0 ~ 20 m	A	0 mA	1	0 mA	20 mA	
		DC 0 ~ 10 V	/	0 V		5 V	10 V	

(1) DC 4 ~ 20mA Range Input

Digital	Analog Input Current (mA)								
Output Range	3.81	4	8	12	16	20	20.18		
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047		
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047		
Precise Value (400 ~ 2000)	381	400	800	1200	1600	2000	2018		
Percentile Value(0 ~ 1000)	-12	0	250	500	750	1000	1011		

(2) DC 0 ~ 20r	nA Range Input
----------------	----------------

Digital	Analog Input Current (mA)								
Output Range	-0.24	0	5	10	15	20	20.23		
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047		
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047		
Precise Value (0 ~ 2000)	-24	0	500	1000	1500	2000	2023		
Percentile Value (0 ~ 1000)	-12	0	250	500	750	1000	1011		

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(3) DC 0 ~ 10V Range Input

Digital	Analog Input Voltage (V)							
Output Range	-0.12	0	2.5	5	7.5	10	10.11	
Unsigned Value (0 ~ 4000)	-48	0	1000	2000	3000	4000	4047	
Signed Value (-2000 ~ 2000)	-2048	-2000	-1000	0	1000	2000	2047	
Precise Value (0 ~ 1000)	-12	0	250	500	750	1000	1011	
Percentile Value (0 ~ 1000)	-12	0	250	500	750	1000	1011	

10.4.2 Output characteristic

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Data conversion characteristic per output range is as follows.



(1) DC 4~20mA range output

Digital input	Analog output current (mA)							
range	4mA or less	4	8	12	16	20	Over 20mA	
Unsigned value (0 ~ 4000)	0 or less	0	1000	2000	3000	4000	Over 4000	
Signed value (-2000 ~ 2000)	-2000 or less	-2000	-1000	0	1000	2000	Over 2000	
Precise value (400 ~ 2000)	400 or less	400	800	1200	1600	2000	Over 2000	
Percentile value (0 ~ 1000)	0 or less	0	250	500	750	1000	Over 1000	

(2) DC 0 ~ 20mA range output

Digital input range	Analog output current (mA)						
	0mA or less	0	5	10	15	20	Over 20mA
Unsigned value (0 ~ 4000)	0 or less	0	1000	2000	3000	4000	Over 4000
Signed value (-2000 ~ 2000)	-2000 or less	-2000	-1000	0	1000	2000	Over 2000
Precise value (0 ~ 2000)	0 or less	0	500	1000	1500	2000	Over 2000
Percentile value (0 ~ 1000)	0 or less	0	250	500	750	1000	Over 1000
Digital input	Analog output voltage (V)						
--------------------------------	---------------------------	-------	-------	------	------	------	-----------
range	0V or less	0	2.5	5	7.5	10	Over 10V
Unsigned value (0 ~ 4000)	0 or less	0	1000	2000	3000	4000	Over 4000
Signed value (-2000 ~ 2000)	-2000 or less	-2000	-1000	0	1000	2000	Over 2000
Precise value (0 ~ 2000)	0 or less	0	250	500	750	1000	Over 1000
Percentile value (0 ~ 1000)	0 or less	0	250	500	750	1000	Over 1000

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(3) DC 0 ~ 10V range output

Note

(1) There is "Dead Band" area around voltage output (0V), current output (0mA).

(a) Digital input-based: about 0 ~ 10

(b) Analog output-based: voltage(about $0 \sim 25 \text{ mV}$), current (about $0 \sim 50 \mu$ A)

(2) In "Dead Band" area, digital input and analog output may not coincide (within accuracy)

10.5 Accuracy

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10.5.1 Input accuracy

Accuracy of digital output value does not changed even if input range is changed. Figure below shows the range of the accuracy with analog input range of $0 \sim 10$ V and digital output type of unsigned value selected.

Accuracy of XBO-AH02A is ±1.0%.



(1) Accuracy when using 5V input

 $4000 \times 1.0\% = 40$

Therefore the range of the accuracy will become $(2000-40) \sim (2000+40) = 1960 \sim 2040$ when using 5V input.

(2) Accuracy when using 10V input

 $4000 \times 1.0\% = 40$

Therefore the range of the accuracy will become $(4000-40) \sim (4000+40) = 3960 \sim 4040$ when using 10V input.

LSELECTRIC | 10-10

10.5.2 Input accuracy

Accuracy for analog output value does not changed even if output range is changed. Figure below shows the range of the accuracy with analog output range of $0 \sim 10$ V and digital output type of unsigned value selected.

Accuracy of XBO-DA02A is ±1.0%.



(1) Accuracy in case of 5V output $4000 \times 1.0\% = 40$ So in case of 5V output, accuracy range is $(5V - 40 \times 0.0025V) \sim (5V+40 \times 0.0025V) = 4.9 \sim 5.1V$

(2) Accuracy in case of 10V $4000 \times 1.0\% = 40$ So in case of 10V output, accuracy range is $(10V-40 \times 0.0025V) \sim (5V+40 \times 0.0025V) = 9.9 \sim 10.1V$

10.6 Functions of Analog I/O Option Board

Function	Description
Channel	• Specify operation/stop of the channel which will perform A/D, D/A conversion
operation/stop setting	 Specifying unused channels as Stop can shorten overall operation time.
I/O Voltage/current range setting	 Specify desired range of analog I/O. Select voltage/current with external switch, and set up range with parameter. Analog I/O option board provides 2 ranges(4~20mA, 0~20mA) of current I/O and 1 range (0~10V) of voltage I/O.
I/O data type setting	 Specify digital I/O types. This option board provides 4 output data types (Unsigned, Signed, Precise, and Percentile Values)
A/D input conversion method	 Sampling Process If A/D conversion method has not been specified, it processes sampling. Averaging process Outputs A/D converted value averaged by count to reduce rapid change of input value caused by external noise
D/A output status setting	 When switching form RUN to STOP, it sets output status of channel Provides 4 types of output status (former, min, middle and max value)

The functions of XBO-AH02A analog I/O option board are as follows.

10.6.1 Sampling Process

In popular A/D conversion process, analog input signals are collected at constant time intervals and A/D converted. The time elapsed for the analog signals to be converted into digital signals and saved in memory device depends upon the number of channels used.

(Process Time) = (No. of Channels Used) x (Conversion Speed + Scan time)

(Ex.) Process time when using 1 of 2 I/O channels and scan time is 2^{ms} ;

 $1 \times (1 \text{ ms} + 2 \text{ms}) = 3 \text{ ms}$

The term 'sampling' means taking sample value among continuous analog signal values at regular intervals.

10.6.2 Count Averaging Function

The input values of the designated channel are accumulated for the preset cycles, and the average value of the total sum is outputted in digital data.



Setting Range = 2 ~ 64000 [times]

For count averaging, averaging interval is calculated with the No. of channels used.

Averaging interval [ms] = Averaging count x (No. of channels used x1ms + Scan time)

Note

(1) Averaging interval varies according to scan time

10.6.3 Channel Output State Setting Function

It sets output against PLC stop and abnormal state

(1) Function

It is used to output an already set value when PLC system switches RUN to Stop

(2) Type

You can select one among former, min, middle and max value.

(a) Former value: keeps last normal output value

- (b) Min. value: outputs minimum value of the each output range
- (c) Middle value: outputs middle value of the each output range

(d) Max. value: outputs max. value of the each output range.

(3) Example

When output is 10mA and range of output channel is 4~20mA, if system switches Run to Stop, it outputs as follows according to output state setting.

- (a) Former value: keeps previous output, 10mA
- (b) Min. value: outputs min. value of corresponding range, 4mA.
- (c) Middle value: outputs middle value of corresponding range, 12mA
- (d) Max. value: outputs max. value of corresponding range, 20mA.

10.6.4 Gain Adjustment Function

You can adjust I/O gain of the analog I/O option board.

When selecting current input for analog input range, the digital output (4000) corresponding to analog input max. value (20mA) is standard gain value. When selecting voltage input, the digital output (4000) corresponding to analog input max. value (10V) is standard gain value.

- (1) You can adjust input gain at I/O parameter
- (2) I/O gain setting range = $40 \sim 40$
- (3) Adjusting gain for each channel is available

XBO-AH02A (I/O, 1/1 CH)			
XBO-AH02A (I/O, 1/1 CH)			
Input Parameter	CH 0		
Channel status	Disable		
Input range	4~20mA		
Output type	0~4000		
Count-Avr	0		
Input gain	0		
Output Parameter	CH 0		
Channel status	Disable		
Output range	4~20mA		
Input type	0~4000		
CH. Output type	Former value		
Output gain	0		
1	OK Cancel		

(4) Example

When you set "Input gain" as -5, 4005 (=4000-(-5)) applies for gain.

Note

(1) When you adjust the I/O gain, max. resolution changes, too.

10.7 Wiring

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10.7.1 Precaution for wiring

- (1) Don't let AC power line near to A/D conversion module's external input sign line. With an enough distance kept away between, it will be free from surge or inductive noise.
- (2) Cable shall be selected in due consideration of ambient temperature and allowable current, whose size is not less than the max. cable standard of AWG22 (0.3^{mm²}).
- (3) Don't let the cable too close to hot device and material or in direct contact with oil for long, which will cause damage or abnormal operation due to short-circuit.
- (4) Check the polarity when wiring the terminal.
- (5) Wiring with high-voltage line or power line may produce inductive hindrance causing abnormal operation or defect.
- (6) Enable only needed channels

10.7.2 Terminal block configuration



10.7.3 Analog input wiring example

(1) Current input wiring example



*(a) In case of current input, connect V+ terminal to I+ terminal

*(b) Input resistance of current input circuit is 250 Ω (typ.).

(2) Voltage input wiring example



*(a) Input resistance of voltage input circuit is 1 M Ω (min.)

- (3) Relationship between voltage input accuracy and wiring length
 - In voltage input, the wiring (cable) length between transmitter or sensor and option board has an effect on digital-converted values of the option board as specified below;



Where,

Rc: Resistance value due to line resistance of cable

Rs: Internal resistance value of transmitter or sensor

Ri: Internal resistance value (1^{MQ}) of voltage input module

Vin: Voltage allowed to analog input module

% Vi: Tolerance of converted value (%) due to source and cable length in voltage input

$$Vin = \frac{Ri \times Vs}{[Rs + (2 \times Rc) + Ri]}$$

$$\%Vi = \left(1 - \frac{Vin}{Vs}\right) \times 100\%$$

10.7.4 Analog output wiring example

(1) Current output wiring example



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(2) Voltage output wiring example



10.8 Operation Parameter Setting

Analog I/O option board's operation parameters can be specified through XG5000's [I/O parameters].

(1) Settings

For the user's convenience, XG5000 provides GUI (Graphical User Interface) for parameters setting of analog option board. Setting items available through [I/O parameters] on the XG5000 project window are as described below in the table.

Item	Details			
[I/O parameter]	 (a) Input parameter setting Specify the following setting items necessary for the option board operation. 1) Channel Enable/Disable setting 2) Setting ranges of input voltage/current 3) Output data format setting 4) Count averaging 5) Input gain (b) Output parameter setting Specify the following setting items necessary for the option board operation. 1) Channel Enable/Disable 2) Analog output range (Voltage/current) 3) Input data type 4) Channel output type 5) Output gain (c) If downloading is complete, Parameter set by user in XG5000 is saved in Flash memory of XGB main unit. 			

(2) Usage of [I/O Parameter]

- (a) Create a project with XG5000. See XG5000 Program Manual for project creation.
- (b) In the Project window, double-click [I/O Parameter].

Project Window	×
Items SGB_PROJECT * SGB_PROJECT * NewPLC(XGB-XBCS)-Offline Variable/Comment Parameter Basic Parameter Basic Parameter Scan Program NewProgram	
■¢ Project	

(c) In the [I/O Parameter Setting] window, find out the slot of the base where the analog input option board is installed, and click it.

🗊 Base OO : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
🛛 🔤 00 : Default	0(main)					
U1: Default	1					
UZ : Default	2					
04 : Default	3					
05 : Default	4					
06 : Default	5					
	6					
08 : Default						
10 : Default	8				<u> </u>	
	10		<u> </u>			

(d) In the above window, click the arrow button to call the window where the module can be selected. Find out the module and select it.



(e) To set up parameter, double click with the respective slot being selected, or click [Detail] button.



(f) The window below where parameters can be set up by channel appears. Click the item to set up. The parameters which can be set up appear by item.

XBO-AH02A (I/O, 1/1 CI	H) ?×		
XBO-AH02A (I/O, 1/1 CH)			
Input Parameter	CH 0		
Channel status	Disable		
Input range	4~20mA		
Output type	0~4000		
Count-Avr	0		
Input gain	0		
Output Parameter	CH 0		
Channel status	Disable		
Output range	4~20mA		
Input type	0~4000		
CH. Output type	Former value		
Output gain	tput gain O		
	OK Cancel		

10.9 Special Module Monitoring Functions

The functions of the special module monitor are as follows.

- (1) Start-up of [Special Module Monitor]
- Select [Online] -> [Connect], and [Monitor] -> [Special Module Monitor] to start up. [Special Module Monitor] menu is enabled only in the [Online] condition.



Note

- 1) The screen may not function properly if the system resources are not sufficient. In this case, close the screen, exit other applications, and rerun XG5000.
- 2) The I/O parameters set up in [Special Module Monitor] condition are temporarily set up for testing purpose. Therefore, these I/O parameters are deleted after exit from [Special Module Monitor].
- 3) The test function of the [Special Module Monitor] enables testing analog input option board without sequence programming.

(2) Usage of [Special Module Monitor]

(a) With the XG5000 in connection (online) with the base unit of PLC, select [Monitor] -> [Special Module Monitor]. The Select Special Module window shown below will appear showing the type of the special modules and base/slot information. In the list dialog, the modules present in the PLC system are displayed.

Special Mod	lule List	×
Base Base 0 Base 0 Base 0	Slot Internal Slot 9	Module High Speed Counter Module(Open-Collector, 8-CH) Position Module (Open-Collector, 2-CH) X80-AH02A (I/O, 1/1 CH)
Module Info.	Monitor	Close

(b) In the above window, select the special module and click [Module Info.] to see the information window below.

Special Module Information				
Displays the informations of special module.				
Item	Information			
Module Name	XBO-AH02A (I/O, 1/1 CH)			
OS Ver	Ver. 10.02			
OS Update Date	2010-10-26			
Module Status	Normal. (0)			
	OK			

(c) Click the [Monitor] button in the "Special Module" window. The "Special Module Monitor' window will appear as shown below.

Special Module Moni	tor	?>
XBO-AH02A (I/O, 1/1 CH)		
Input Item	Max/Min value	Current value
CH0 A/D value		
Output item	Setting value	Current value
CH0 Digital value		
Item	Setting Value	Current Value
Channel	CH	10
Channel status	Disable	
Input range	4~20mA	
Output type	0~4000	
Count-Avr	0	
Input gain	0	
Output Item	Setting Value	Current Value
Channels	CH	10
Channel status	Disable	
Output range	4~20mA	
Input type	0~4000	
CH. Output type	Former value	
Digital value	0	
Output enable	Disable	
Output gain	0	
<u>R</u> eset max/min value	Start <u>M</u> onitoring] <u>I</u> est
		Close

(d) [Start Monitoring]: click [Start Monitoring] to look up the digital input data of the channel currently in operation. The screen shot below is a monitoring window when all the channels are in operation status.

Special Mo	dule Moni	itor	?	\mathbf{X}	
XBO-AH02A (1/	(O, 1/1 CH)			-	
Input	Item	Max/Min value	Current value		Input monitoring
CH0 A/	D value	3513 / 3512	3513		
Outpu	titem 🖌	Setting value	Current value	ЪТ	
CHO Digi	tal value		3500		Output monitoring
		\geq		\leq	
lte	m (Setting Value	Current Value	7	
Cha	nnel	다	10		
Channe	l status	Disable	Enable		Detailed
Input	range	4~20mA	0~10V		information of input
Outpu	t type	0~4000	0~4000		CH0
Coun	t-Avr	0	0		
Input	gain 🔪		0		
Outpu	t Item	Setting Value	Current Value	3	
Char	inels	CH	10		
Channe	l status	Disable	Enable		
Output	range	4~20mA	0~10V		Detailed
Input	type	0~4000	0~4000		information of
CH. Out	put type	Former value	Former value		output CH0
Digital	value	0	3500		
Output	enable	Disable	Enable		
Outpu	tgain ∖		0)	
<u>R</u> eset max/	min value	Stop <u>M</u> onitoring	Iest Close		
				-	

The screen executing [Start Monitoring]

 (e) [Test]: this function is used to change the current parameter settings of the analog mix module. Click the settings in the fields in the bottom screen to change the parameters.
 [Test] can be set up only when the operation status of the XGB base unit is STOP mode.

Special Module Monitor 🤶 🏹				
XBO-AH02A (I/O, 1/1 CH)				
Input Item	Max/Min value	Current value		
CH0 A/D value	2226 / 2225	2226		
Output item	Setting value	Current value		
CH0 Digital value		1750		
)				
Item	Setting Value	Current Value		
Channel	Cł	10		
Channel status	Enable	Enable		
Input range	0~10V	0~10V		
Output type	0~4000	0~4000		
Count-Avr	0	0		
Input gain	0	0		
Output Item	Setting Value	Current Value		
Channels	Cł	10		
Channel status	Enable	Enable		
Output range	4~20mA	4~20mA		
Input type	0~4000	0~4000		
CH. Output type	Former value	Former value		
Digital value	1750	1750		
Output enable	Enable	Enable		
Output gain	0	0		
 <u>R</u> eset max/min value	Stop <u>M</u> onitoring	<u>Iest</u>		
		Close		

The screen executing [Test]

(f) Minimum/Maximum Value Monitoring

The minimum and maximum values of the input channels in operation can be monitored. However, the Max/Min values in the window are based on the current value. Therefore, the Max/Min values are not saved when exiting from the [Monitoring/Testing Screen].

Special Module Mon	itor	?>	3	
XBO-AH02A (1/0, 1/1 CH)				
Input Item	Max/Min value	Current value		
CH0 A/D value	2226 / 2225	2226		
Output item	Setting value	Current value		Max/Min value
CH0 Digital value		1750		monitoring
)	-			0
Item	Setting Value	Current Value		
Channel	CH	10		
Channel status	Enable	Enable		
Input range	0~10V	0~10V		
Output type	0~4000	0~4000		
Count-Avr	0	0		
Input gain	0	0		
Output Item	Setting Value	Current Value		
Channels	CH	10		
Channel status	Enable	Enable		
Output range	4~20mA	4~20mA		
Input type	0~4000	0~4000		
CH. Output type	Former value	Former value		
Digital value	1750	1750	l r	
Output enable	Enable	Enable		Max/Min value
Output gain	0	1		
				16361
<u>R</u> eset max/min value	Stop Monitoring	Iest		
		Close		

The screen executing [Max/Min Value Monitoring]

(g) Close

[Close] button is for ending/closing the monitoring/testing screen. Maximum, minimum, and current values are not saved at exit.

10.10 Register U devices

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The variables for each module are automatically registered by referring to the information of the special modules set up in the [I/O Parameter]. User can modify variables and descriptions.

(1) Registration Procedure

(a) In [I/O Parameter], set up special module in slot.

🛙 🗊 Base 00 : Default 🛛 📗	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
UI: Detault	1					
D3 : Default	2					
n4 : Default	3					
05 : Default	4					
🖂 🗃 06 : Default	5					
07 : Default	6					
08 : Default	7					
U9 : XBO-AH02A (1/1	8		<u> </u>	<u> X////////////////////////////////////</u>	K/////////////////////////////////////	
	9	XBO-AH02A (I/O, 1/1 CH)	1	-	-	P0400 ~ P043F
	10		*\\			

(b) Double click [Variables/Comment].

🔩 XGB_PROJECT - XG5000 - [Variab	le/Comment]	- DX
🕌 Project Edit Find/Replace View Online	<u>M</u> onitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u> elp	_ 8 ×
D 2 2 3 8 5 0 2 4 4 5 5	◎ ◎ □ □ ↓ ⓑ ⓑ × ज़ 承 ౫ ः ४ क़ क़ ॷ ॷ क़ ₊!! @ @	
I II II ● ● ⊗ & II II & H &	프 프 중 8 8 8 8 8 8 8 8 8 9 10 10 10 10 10 10 10 10 10 10 10 10 10	K F3 行4 F5 F6 持
■ 昏 好 招 招 按 〒 k 鹉 鹉 仔 裕:	お井井井井 ひととない。 自由回日日 日日 回回 回回 回回 日 4 4 5	100% 🗸 🎙 🖓
Project Window v ×	View Variable View Device	
B GB_PROJECT ★	Variable Type A Device Used Comment	
■ New Full CAGE-ABCS/-Dimine ● Wintbil/Comment ● Parameter ● Basic Parameter ● ■ ■ ■		8
■ \$ Project	📾 NewProgram 🙀 Variable/Comment	

(c) In the 'Edit' menu, select 'Register U device'

🍕 XGB_PI	90J	ECT - XG500	0 - [Variable	e/Com	ment]						- DX
🕍 Project	Edit	Eind/Replace	<u>V</u> iew <u>O</u> nline	Monitor	<u>D</u> ebug <u>T</u> o	ols <u>₩</u> indo	w <u>H</u> e	lp			_ 8 ×
000	2	<u>U</u> ndo De de	Ctrl+Z	P	1223	K 🗈 🖻 '	×	* * * *	64 64 9	¥0 8*0 ∰ _10 € ⊕	
1 1 1 1 1	<u> </u>	Cut	Ctrl+Y					e e []	ក្រក		古 へ 呙 智 呙 扇 討
長日招	л Па	<u>С</u> ору	Ctrl+C	(P) (P	2 82 FR 5	1441	er inr				୍ର ପ୍ର 100% 🗸 ମାନ ମାନ 📑
Project Windo	C	Paste	Ctrl+V				1				
Items	X	Delete	Del	V V	ew variable	D View Dev	ce	View Flag	Unad	Convert	1
⊟⊸ange XGB		Select All	Ctrl+A	1	variable	i iy	pe -	Device	Used	Comment	
	머믑	Insert <u>L</u> ine	Ctrl+L	<u> </u>							
- G	₿X.	Delete Li <u>n</u> e	Ctrl+D								
		Export Variable	s to <u>F</u> ile								
E		Register U Devi	ce]							
8-6		Add EXTERNAL	. Variable								
		Move Item Up									
		Move Item Dow									
	_			ľ							
				<							>
Project					NewProgram	m 🕍	Var	iable/Comme	nt		

(d) Click 'Yes.'



(e) Variables are registered as shown below.

🖺 Va	ariable/Comme	ent			
V	View Variable	View Device	🖏 View Flag		
	Variable	Туре 🔺	Device	Used	Comment
1	_09_ERR	BIT	UO9.00.0	Г	Analog IO Option Board: Error
2	_09_RDY	BIT	U09.00.F	Г	Analog IO Option Board: Ready
3	_09_ADO_ACT	BIT	U09.01.0	Г	Analog 10 Option Board: Input CHO Active
4	_09_DA0_ACT	BIT	U09.01.2	Г	Analog 10 Option Board: Output CHO Active
5	_09_AD0_1DD	BIT	U09.01.4	Г	Analog IO Option Board: CHO Input Disconnection Flag
6	_09_AD0_ERR	BIT	U09.01.8	Г	Analog IO Option Board: Output CHO Error
7	_09_DA0_ERR	BIT	U09.01.A	Г	Analog IO Option Board: Output CHO Error
8	_09_DA0_OUTEN	BIT	U09.06.0	Г	Analog 10 Option Board: Output CHO Status Setting
9	_09_AD0_DATA	WORD	U09.04	Г	Analog 10 Option Board: Input CHO Data
10	_09_DA0_DATA	WORD	U09.07	Γ	Analog IO Option Board: Output CHO Data

(2) Saving Variables

(a) The contents in the 'View Variables' tab can be saved in a text file.

- (b) In the 'Edit' menu, select 'Save as Text File.'
- (c) The contents in the 'View Variables' tab are saved in a text file.

(3) Viewing Variables in Program

The figures below present examples of use in XGB compact "E" and "S" types

10	SO	U09.00.0 ──┤╱┝──	U09.00.F	U09.01.0	U09.01.8				M00000
L1		M00000					MOV	U09.04	D00100
12	55	U09.01.4				 			M00001
L3	<u>\$8</u>	U09.00.0	U09.00.F	U09.01.2	U09.01.A				M00001
14	0.0	M00001							U09.06.0
15	<u>S15</u>						MOV	D00102	U09.07
18							·		
	S19								

(a) Below is an exemplary program for XG5000.

(b) In the 'View' menu, click 'View Variables.' The devices are changed into variables.

10		_09_ERR	_09_RDY	_09_AD0_AC T	_09_AD0_ER R 1 / L				M00000
Lf	SO	мооооо			17.1		MOV	_09_AD0_DA TA	D00100
12		_09_AD0_1D D							M00001
L3	58			_09_DAO_AC	_09_DA0_ER	 		-	(S)
	S10		_U9_RUY		н Н/Н	 			MUUUU1
14	01E	M00001							_U9_UAU_UU TEN ()
15	315						MOV	D00102	_09_DA0_D ATA
LØ									END
	S19					 			۰ <u> </u> ۲

(c) In the 'View' menu, click 'View Device/Variables' to look up the devices and variables at the same time.

10		U09.00.0	U09.00.F	U09.01.0	U09.01.8				M00000
	SO	_09_ERR	_09_RDY	_09_ADO_AC	_09_AD0_ER				()
11		M00000					MOV	U09.04	D00100
	S5	1.1						_09_AD0_DA TA	
12		U09.01.4							M00001
	S8	_09_ADO_1D D							,
L3		U09.00.0	U09.00.F	U09.01.2	U09.01.A				M00001
	S10	_O9́_ÉRR	_09_RDY	_09_DAO_AC T	_09_ÓAO_ER R				
L4		M00001							U09.06.0
	S15								_09_DÁO_OU TEN
15							MOV	D00102	U09.07
									_09_DA0_DA TA
18	210								END
	2131								

10		U09.00.0	U09.00.F	U09.01.0	U09.01.8					M00000
	SO	Analog 10 Option Board: Error	Analog 10 Option Board: Ready	Analog 10 Option Board: Input CHO Active	Analog IO Option Board: Output CHO Error					
Lf		M00000						MOV	U09.04	D00100
	S5						L		Analog 10 Option Board: Input CHO Data	
12		U09.01.4								M00001
	82	Analog 10 Option Board: CHO Input Disconnect ion Flag								
L3	00	U09.00.0	U09.00.F	U09.01.2	U09.01.A					M00001
	S10	Analog 10 Option Board: Error	Analog 10 Option Board: Ready	Analog 10 Option Board: Output CHO Active	Analog 10 Option Board: Output CHO Error					()
14		M00001								U09.06.0
	\$15									Analog 10 Option Board: Output CHO Status Setting
15								MOV	D00102	U09.07
14										Analog 10 Option Board: Output CH1 DATA
10	910									END
	213									

(d) In the 'View' menu, click 'View Device/Comment' to look up the devices and descriptions at the same time.

٦

10	мооооо	_09_RDY	_09_AD0_AC T		MOV	_09_AD0_DA TA	D00100
		Analog Input Option Board: Ready	Analog Input Option Board: Input CHO Active			Analog Input Option Board: Input CHO Data	
Lf		_09_RDY	_09_AD1_AC T		MOV	_09_AD1_DA TA	D00101
		Analog Input Option Board: Ready	Analog Input Option Board: Input CH1 Active			Analog Input Option Board: Input CH1 Data	
12	_09_ERR				MOV	_09_ado_da Ta	D00102
\$11	Analog Input Option Board: Error					Analog Input Option Board: Input CHO Data	
13	_09_AD0_ER R						
	Analog Input Option Board: Input CHO Error						
14	_09_AD0_1D 						
	Analog Input Option Board: CHO Input Disconnect ion Flag						
15	_09_ERR				MOV	_09_AD1_DA TA	D00103
S16	Analog Input Option Board: Error					Analog Input Option Board: Input CH1 Data	
L8	_09_AD1_ER R						
	Analog Input Option Board: Input CH1 Error						
L7	_09_AD1_ID D						
	Analog Input Option Board: CH1 Input Disconnect ion Flag						

(e) In the 'View' menu, click 'View Variable/Comment' to look up the devices and descriptions at the same time.

Γ

(f) For IEC type also, as shown in Fig. (a) ~ (e), you can look up variables with diversified options in the 'View' menu. The figure below is the case of an IEC type with which the 'View Device/Variables' option.

٦

LO	%UX0.9.0	%UX0.9.15	%UX0.9.16	%UX0.9.24				%MX0
	_09_ERR	_09_RDY	_09_AD0_A CT	_09_AD0_ ERR				
L1	%MX0					MOVE EN ENO	-	
L2					%UW0.9.4 _09_AD0_ DATA	IN OUT	- CH0_DATA	
L3								
L4	%UX0.9.20	I I I I	I I I I		 	 		%MX1
	_09_AD0_I DD							(S)
L5	%UX0.9.0	%UX0.9.15	%UX0.9.18	%UX0.9.26				%MX0
	_09_ERR	_09_RDY	_09_DA0_A CT	_09_DA0_ ERR				
L6	%MX0							%UX0.9.96
								_09_DA0_ OUTEN
L7								
						EN ENO	-	
L8					CH0_Outpu t_Value	IN OUT	- %UW0.9.7 _09_DA0_ DATA	
L9								

10.11 Configuration and Function of Internal Memory

An analog input option board has internal memory for data communication with XGB base unit.

Variable	Туре	Device a XBC	issignment IEC	Description	R/W	Signal direction
_0y_ERR	BIT	U0x.00.0	%UX0.0y.0	Module Error	D	Ontion ODU
_0y_RDY	BIT	U0x.00.F	%UX0.0y.15	Module Ready	ĸ	
_0y_AD0_ACT	BIT	U0x.01.0	%UX0.0y.16	Input CH0 Active	D	Ontion CDU
_0y_DA0_ACT	BIT	U0x.01.2	%UX0.0y.18	Output CH0 Active	ĸ	Option → CPU
_0y_AD0_IDD	BIT	U0x.01.4	%UX0.0y.20	Input CH0 Disconnection flag	R	Option \rightarrow CPU
_0y_AD0_ERR	BIT	U0x.01.8	%UX0.0y.24	Input CH0 error	Б	Ontion CDU
_0y_DA0_ERR	BIT	U0x.01.A	%UX0.0y.26	Output CH0 error	ĸ	Option → CF0
_0y_AD0_DATA	WORD	U0x.04	%UW0.0y.4	Input CH0 converted value	R	$Option \to CPU$
_0y_DA0_OUTEN	BIT	U0x.06.0	%UX0.0y.6	CH0 output status setting	W	Option \leftrightarrow CPU
_0y_DA0_DATA	WORD	U0x.07	%UW0.0y.7	Output CH0 input value	W	Option \leftrightarrow CPU

10.11.1 Analog Data I/O Area

The table below presents the analog data I/O area

- In the device allocation, the small letter 'y' is the No. of the slot where the module is installed.

- For example, to read the 'CH0 Input A/D Value' of the analog module installed in the slot 9, write in U09.05. (%UW0.9.4 for IEC types)





[IEC type]

- To read the 'Ch0 Output Value' of the analog I/O module installed in the 9th slot, write in U09.07 (%UX0.9.7 for IEC types)





- (1) Module Ready/Error Flag (() is for IEC types, y: slot No.)
- (a) U0y.00.F(%UX0.y.15): at power on or reset of PLC CPU, turns on when the analog I/O conversion is ready and analog conversion is performed.
- (b) U0y.00.0(%UX0.y.0): the flag indicating the error status of analog input option board module.



()	0	•														
	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
U0y.07							0		. :							

10.11.2 Operation Parameter Setting Area

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The operation parameter setting area of the analog mix module is as follows.

Memory Add.	Description	Setting	R/W	Command
0	Enable channel	Bit Off (0): disable, Bit ON (1): enable	R/W	
1	I/O range setting	Input range setting (4 bit per channels) 0: 4 ~ 20 mA 1: 0 ~ 20 mA 2: 0 ~ 10 V	R/W	
2	I/O data type setting	 I/O data type setting (4 bit per channels) 0: 0 ~ 4000 1: -2000 ~ 2000 2: Precise value 3: 0 ~ 1000 - In case of precise value 4 ~ 20 mA: 400 ~ 2000 0 ~ 20 mA: 0 ~ 2000 0 ~ 10 V: 0 ~ 1000 	R/W	PUT/GET
3	Input channel 0 count average value setting	0 or 2 ~ 64000 [times]	R/W	
8	CH output state setting	CH output state setting (4bit per channel) 0: Former value 1: min value 2: middle value 3: max value	R/W	
9	Input channel 0 gain weighting	40 40	R/W	
11	Output channel 0 gain weighting	-40~40	R/W	
13	Setup error information	100: input ch range setting error 200: input ch data type setting error 300: input ch average value setting error 400: input ch gain weighting setting error 500: output ch range setting error 600: output ch data type setting error 700: output ch output state setting error 800: output ch gain weighting setting error 900: output ch input value excess error	R	GET

(1) Operating Channel Setting (address 0)

- (a) You can set "Enable/Disable" of analog I/O option board per each channel
- (b) Disable the unused channels to reduce the conversion period.
- (c) Default value is "Disable" for all channels
- (d) When using PUT instruction, address is as follows.



Enable CH Bit On (1): enable Bit Off (0): disable

1

(e) The values set in bit 2~15 are ignored.

(f)This area is same as setting in "Channel status" of I/O parameter

хво-анога (і/о, 1/1 сн)							
XBO-AH02A (I/O, 1/1 CH)							
Input Parameter	CH 0						
Channel status	Disable						
Input range	4~20mA						
Output type	0~4000						
Count-Avr	0						
Input gain	0						
Output Parameter	CH 0						
Channel status	Disable						
Output range	4~20mA						
Input type	0~4000						
CH. Output type	Former value						
Output gain	0						
	OK Cancel						

(2) I/O range setting area (address 1)

(a) Set the type of I/O range with the following code

Bit (HEX)	I/O range
0000 (0)	4 ~ 20 mA
0001 (1)	0~20 mA
0010 (2)	0 ~ 10 V

- (b) If you set more than 3, 0 (4~20^{mA}) will be set forcibly But, U0X.01.8~ U0X.01.A (Setup error flag) will be ON.
- (c) When using PUT instruction, address is as follows.

bit15 bit14 bit13 bit12 bit11 bit10 bit9 bit8 bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0

Address1	_	_	_	_	_	_	_	_	Output CH 1	Input CH 0

I/O range (4bit per channel)

- 0:4~20 mA
- 1:0~20 mA 2:0~10 V

(d) The values set in bit 8~15 are ignored.

(e)This area is same as setting in "Input range" of I/O parameter

XBO-AH02A (I/O, 1/1 CH)						
XBO-AH02A (I/O, 1/1 CH)						
Input Parameter	CH 0					
Channel status	Disable					
Input range	4~20mA					
Output type	0~4000					
Count-Avr	0					
Input gain	0					
Output Parameter	CH 0					
Channel status	Disable					
Output range	4~20mA					
Input type	0~4000					
CH. Output type	Former value					
Output gain	0					
	OK Cancel					

- (3) I/O data type setting area (address 2)
 - (a) Set the type of I/O data type with the following code

Bit (HEX)	Output data type
0000 (0)	0~4000
0001 (1)	-2000~2000
0010 (2)	Precise value
0011 (3)	0~1000

In case of precise value, I/O data type is designated as the following value according to each I/O range type

I/O range	Precise value
4~20 mA	400 ~ 2000
0~20 mA	0 ~ 2000
0 ~ 10 V	0 ~ 1000

(b) If you set more than 4, 0 (0~4000) will be set forcibly. But, U0X.01.8~ U0X.01.A (Setup error flag) will be ON.

(c) When using PUT instruction, address is as follows

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Address2	_	_	_	_	_	_	_	_		Outpu	t CH 0			Input	CH 0	

I/O data type (4bit per channel) $0: 0 \sim 4000$

- In case of precise value

- 1 : -2000 ~ 2000 2 : precise value 3 : 0 ~ 1000
- 4 ~ 20 mA: 400 ~ 2000 0 ~ 20 mA: 0 ~ 2000
- 0 ~ 10 V: 0 ~ 1000

(d) The values set in bit 8~15 are ignored.

(e)This area is same as	setting in	"Output type"	of I/O parameter
-------------------------	------------	---------------	------------------

хво-анога (і/о, і/і сн)						
XBO-AH02A (I/O, 1/1 CH)						
Input Parameter	CH 0					
Channel status	Disable					
Input range	4~20mA					
Output type	0~4000					
Count-Avr	0					
Input gain	0					
Output Parameter	CH 0					
Channel status	Disable					
Output range	4~20mA					
Input type	0~4000					
CH. Output type	Former value					
Output gain	0					
	-					
	OK Cancel					

(4) Count average value setting area (address 3)

I

- (a) Set count average value with 0 or value of 2~6400
- (b) If you set the count average value as 0, corresponding channel will not perform averaging process and output sampled analog input value
- (c) If you set 1 or more than 64001, 0 (Disable averaging) will be set forcibly. But, U0X.01.8 (Setup error flag) will be ON.
- (d) When using PUT instruction, address is as follows

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address3				Inp	out CH	0 cour	nt avera	age va	lue (0) or 2 ~	64000) [time:	s])			

(e) This area is same as setting in "Count-Avr" of I/O parameter

хво-анога (I/O, 1/1 CH)							
XBO-AH02A (I/O, 1/1 CH)							
Input Parameter	CH 0						
Channel status	Disable						
Input range	4~20mA						
Output type	0~4000						
Count-Avr	0						
Input gain	0						
Output Parameter	CH 0						
Channel status	Disable						
Output range	4~20mA						
Input type	0~4000						
CH. Output type	Former value						
Output gain	0						
)							
	OK Cancel						

(5) Channel output state setting area (address 8)

(a) Set the output state setting with the following code

Bit (Hex)	Channel output state
0000 (0)	Former value
0001 (1)	Min value
0010 (2)	Middle value
0011 (3)	Max value

Chapter 10 Analog I/O Option (XBO-AH02A)

- (b) If you set more than 4, 0 (former value) will be set forcibly. But, U0X.01.A (Setup error flag) will be ON.
- (c) When using PUT instruction, address is as follows



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- (d) The values set in bit 8~15 are ignored.
- (e)This area is same as setting in "CH. Output type" of I/O parameter

XBO-AH02A (I/O, 1/1 C	H) ?×
XBO-AH02A (I/O, 1/1 CH)	
Input Parameter	CH 0
Channel status	Disable
Input range	4~20mA
Output type	0~4000
Count-Avr	0
Input gain	0
Output Parameter	CH 0
Channel status	Disable
Output range	4~20mA
Input type	0~4000
CH. Output type	Former value
Output gain	0
	OK Cancel

(6) I/O gain weighting setting area (address 9~11)

- (a) Set input gain weighting with value of -40~40
- (b) If you set this as 0 (default value),
 - 4000 will apply for input gain value
 - 4000 will apply for output gain value
- (c)For example, if you set this as -10, 4010 (=4000-(-10)) will apply for gain value
- (d) When using PUT instruction, address is as follows

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address9						I	nput C	CH0 ga	in (-40	~ 40)						
Address11						С)utput	CH0 g	ain (-4	0 ~ 40)					

(e) This area is same as setting in "I/O gain" of I/O parameter

XBO-AH02A (I/O, 1/1 C	H) ?×						
XBO-AH02A (I/O, 1/1 CH)							
Input Parameter	CH 0						
Channel status	Disable						
Input range	4~20mA						
Output type	0~4000						
Count-Avr	0						
Input gain	0						
Output Parameter	CH 0						
Channel status	Disable						
Output range	4~20mA						
Input type	0~4000						
CH. Output type	Former value						
Output gain	0						
9							
	OK Cancel						

(6) Setup error information output area (address 13)

- (a) Saves error code detected when setting (setting by program)
- (b) Setting error is canceled when value is reset to make it in the valid range
- (c) When U0X.01.8~ U0X.01.A (setting error flat) is on, check that area and fix the corresponding setting to cancel the error

1

(d) When using GET instruction, address is as follows

	bit15 bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0		
ddress13						Settir	ig erro	r inforr	nation								
Туре	Error code		Description								Priorit	у	Remark				
	100	Input	CH ra	ange	setting	g erro	r				2						
Input	200	Input CH data type setting error									3 4						
error	300	Input CH count average value setting error															
	400	Input CH gain weighting setting error									5						
	500	Outp	ut CH	range	e setti	ng eri	or				6			_			
	600	Output CH data type setting error								7							
Output	700	Output CH state setting error								8							
CITO	800	Outp	Output CH gain weighting setting error								9		1				
	900	Outp	ut CH	input	value	exce	ss err	or			1						

(e) When more than two errors occur simultaneously, it saves error code having higher priority.

10.12 Example Program

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- (1) This sample program sets up operating parameters of analog input option board.
- (2) Initial settings are saved in the internal memory of the XGB main unit by one input.
- (3) The sample program below controls the I/O data of the analog I/O option board at option slot #0 (I/O slot #9) and check open wire.

10.12.1 Example of [I/O Parameter] Usage

∃ 🗊 Base 00 : Default	Slot	Module	Comment	I Input Filter	LEmergency Uut	Allocation
👝 00 : Default	0(main)					
01 : Default	1					
03 : Default	2					
- 04 : Default	4					
06 : Default	5					
👝 07 : Default	6					
	7	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2777777777777777777	1777777777777777777777777777777777777	7777777777777777777
a 10 : Default	9 ×80-	AH02A (I/O, 1/1 CH) 💌		· · · ·	-	P0400 ~ P04
	10					
(BO-AH02A (1/O, 1/	te Slot Delete Ba	ise Base Setting	Delete All De		nt 🔻 🔽 0	K Car
<u>_</u> eee 3 BO-AH02A (I/O, 1/ ×80-AH02A (I/O, 1/1 CH)	tte Slot Delete Ba	ise Base Setting	Qelete All De		nt 🔻 💽 O	K Car
Defe BO-AHO2A (I/O, 1/ KBO-AHO2A (I/O, 1/1 CH) Input Parameter	tte Slot Delete <u>B</u> a ∕1 CH)	ise Base Setting	Qelete All De		nt 🔻 💽	K Car
Dete BO-AH02A (I/O, 1/ KB0-AH02A (I/0, 1/1 CH) Input Parameter Channel status	te Slot Delete Ba	Ese Base Setting	Qelete Ali De		nt 🔻 💽	K Car
BO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/1 CH) Input Parameter Channel status Input range	te Slot Delete Ba	Ease Setting () CH 0 Enable 4~20mA	Delete Ali De		nt 🔻 💽	K Car
BO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/1 CH) Input Parameter Channel status Input range Output type	te Slot Delete Ba	Ease Setting () CH 0 Enable 4~20mA 0~4000	Delete Ali De		nt 🔻 💽	K Car
BO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/1 CH) Input Parameter Channel status Input range Output type Count-Avr	te Slot Delete Ba	ese Base Setting () CH 0 Enable 4~20mA 0~4000 0	Qelete Ali De		nt 🔻 💽	K Car
BO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/1 CH) Input Parameter Channel status Input range Output type Count-Avr Input gain	te Slot Delete Ba	se Base Setting () CH 0 Enable 4~20mA 0~4000 0 0	Delete Ali De		nt V O	K Car
BO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/1 CH) Input Parameter Channel status Input range Output type Count-Avr Input gain Output Parameter	te Slot Delete Be	se Base Setting () CH 0 Enable 4~20mA 0~4000 0 0 CH 0	Delete All De		nt V O	K Car
Bee BO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/1 CH) Input Parameter Channel status Input range Output type Count-Avr Input gain Output Parameter Channel status	/1 CH)	ese Base Setting () CH 0 Enable 4~20mA 0~4000 0 0 CH 0 Enable	Delete All De		nt V O	K Car
Bee BO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/1 CH) Input Parameter Channel status Input range Output type Count-Avr Input gain Output Parameter Channel status Output range	/1 CH)	se Base Setting () CH 0 Enable 4~20mA 0~4000 0 0 CH 0 Enable 4~20mA	Delete All De		nt V O	K Car
Beek BO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/1 CH) Input Parameter Channel status Input range Output type Count-Avr Input gain Output Parameter Channel status Output range Input type	/1 CH)	se Base Setting () CH 0 Enable 4~20mA 0~4000 0 0 CH 0 Enable 4~20mA 0~4000	Delete All De		nt V O	K Car
Bee BO-AH02A (I/O, 1/ KBO-AH02A (I/O, 1/1 CH) Input Parameter Channel status Input range Output type Count-Avr Input gain Output Parameter Channel status Output range Input type CH. Output type	te Slot Delete Ba	Base Setting	Delete All De		nt V O	K Car

(1) I/O Parameter Setting Window

- (a) Input Channel 0 is set to operating channel and input range is set to 4~20mA.
- (b) Output Channel 0 is set to operating channel and output range is set to 4~20mA.

M00000
~ /
D00100
M00001 —(S)——
END

(2) Sample Input Program (XBC Type)

- (a) When the option board is in normal operation, M0000 is turned On.
 - U09.00.0 (Module Error) = Off
 - U09.00.F (Module Ready) = On
 - U09.01.0 (Input Channel 0 in-operation) = On
 - U09.01.8 (Input Channel 0 Error) = Off
- (b) When M0000 is ON, Input Channel 0 Converted Value(U09.04) is moved to D00100.
- (c) If open-wire error occurs in channel 0, U09.01.4 (channel 0 open-wire) is ON, and M0001 bit is set.

(3) Sample Output Program (XBC Type)

Comment	Output Progr	a.m						
Lt	U09.00.0	U09.00.F _09_RDY	U09.01.2	U09.01.A				M00001
	M00001		Τ	R	 	 		U09.06.0
<u>56</u> 						MOV	D00102	U09.07 _09_DA0_DA
<i>L4</i> 								

(a) When the option board is in normal operation, M0000 is turned On.

U09.00.0 (Module Error) = Off

U09.00.F (Module Ready) = On

U09.01.2 (Output Channel 0 in-operation) = On

U09.01.A (Output Channel 0 Error) = Off

(b) When M0000 is ON, it turns on CH0 output state (U09.06.0) and allows output

(c) When M0000 is ON, D00100 data is moved to output CH0 Output value (U09.07) and outputs.

Comment	tInput Profram	
L1	%UX0.9.0 %UX0.9.15 %UX0.9.16 %UX0.9.24 ////////////////////////////////////	%MX0
L2		
	%MX0	MOVE EN ENO-
L3	%UW0.9.4 _09_AD0_ DATA	IN OUT- CH0_DATA
L4		
L5	%UX0.9.20	%MX1 (S)

(4) Sample Input Program (IEC Type)

- (a) When the option board is in normal operation, %MX0 is turned On. %UX0.9.0 (Module Error) = Off %UX0.9.15 (Module Ready) = On %UX0.9.16 (Input Channel 0 in-operation) = On %UX0.9.24 (Input Channel 0 Error) = Off
- (b) When %MX0 is ON, Input Channel 0 Converted Value(%UW0.9.4) is moved to "CH0_DATA".
- (c) If open-wire error occurs in channel 0, %UX0.9.20 (channel 0 open-wire) is ON, and %MX1 bit is set.

(5) Sample Input Program (IEC Type)

Comment	Onput Profra	m						
L7	%UX0.9.0 	%UX0.9.15 	%UX0.9.18 09_DA0_A CT	%UX0.9.26 				%MX0
L8	%мхо —— ——							%UX0.9.96
L9						MOVE EN ENO	-	UNITER
L10					CH0_Outpu t_Value	IN OUT	- %UW0.9.7 _09_DA0_ DATA	
L11								

(a) When the option board is in normal operation, %MX0 is turned On. %UX0.9.0 (Module Error) = Off %UX0.9.15 (Module Ready) = On %UX0.9.18 (Output Channel 0 in-operation) = On %UX0.9.26 (Output Channel 0 Error) = Off

- (b) When %MX0 is ON, it turns on CH0 output state (%UX0.9.96) and allows output
- (c) When %MX0 is ON, CH0_Output_Value data is moved to output CH0 Output value (%UW0.9.7) and outputs.
10.13 Troubleshooting

This section describes methods for identifying the troubles which may occur during the operation of analog I/O option board, and their solutions.

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10.13.1 Troubleshooting

(1) Analog input value is abnormal.

Analog input value is abnormal.	
Installation is OK.	
No	Install the option board properly
Yes	
PE ground is OK	
No	Correct PE grounding according to the wiring in the user manual
Yes	
Wiring is OK (Current input wiring, voltage input wiring)	
	 Refer to the manual and wire properly
Parameter setting is OK (Operation channel permit, I/O range setting	
No Yes	Set up the parameters correctly according to the user manual
Contact nearest dealer or A/S center	

(2) Analog output value is abnormal.

Г

Analog output value is abnormal.	
Installation is OK.	
No	Install the option board properly
PE ground is OK	
	Correct PE grounding according to the wiring in the user manual
Wiring is OK (Current output wiring, voltage output wiring)	
No Yes	Refer to the manual and wire properly
Parameter setting is OK (Operation channel permit, I/O range setting	
No Yes	Set up the parameters correctly according to the user manual
Contact nearest dealer or A/S center	

Chapter 11 RTD Input Option Board

11.1 Setting Sequence before Operation

Before using the RTD input option board, follow steps below.



11.2 Specification

Γ

11.2.1 General Specifications

Here describes general specifications of RTD input option board.

No.	ltem	Specifications					Related specifications
1	Ambient temperature	0℃~+55℃					-
2	Storage temperature			-25 ℃~	+70 ℃		-
3	Ambient humidity		5 ~ 95%RH (Non-condensing)				
4	Storage humidity		5	5 ~ 95%RH (No	n-condensing)		-
			Occasio	onal vibration		-	-
		Frequency	Ace	celeration	Amplitude	How many times	
		5 ≤ f < 8.4 ⊞	z	-	3.5 mm		
	Vibration	8.4 ≤ f ≤ 150	Hz 9.8	3 m/s² (1G)	-		
5	resistance		For contir	nuous vibratior	ı	10 times each	IEC61131-2
		Frequency	Ace	celeration	Amplitude	directions (X, Y and Z)	
		5 ≤ f < 8.4 ⊞	z	-	1.75 mm	(,, , , , , , , , , , , , , , , , , , ,	
		8.4 ≤ f ≤ 150	Hz 4.9	m/s² (0.5G)	-		
6	Shock resistance	 Peak acceleratio Duration: 11ms Half-sine, 3 times 	Peak acceleration: 147 m/s²(15G) Duration: 11ms Half-sine, 3 times each direction per each axis				IEC61131-2
		Square wave Impulse noise			AC: ± 1,500V DC: ± 900V		LS ELETRIC standard
		Electrostatic discharge		Voltage : 4	4kV (contact discl	harging)	IEC 61131-2, IEC 61000-4- 2
7	Noise resistance	Radiated electromagnetic field noise		80 ~	1,000 MHz, 10\	//m	IEC 61131-2, IEC 61000-4- 3
		Fast transient	Segment	Power supply module	Digital/an commun	alog input/output ication interface	IEC 61131-2, IEC 61000-4-
			Voltage 2kV 1kV		4		
8	Environment	Free from corrosive gasses and excessive dust				-	
9	Altitude	Up to 2,000 ms				-	
10	Pollution degree	Less than equal to 2				-	
11	Cooling	Air-cooling				-	

11.2.2 Performance specifications

-		XBO-RD01A	
No. of input channels		One channel	
Input sensor	PT100	JIS C1604-1997	
type	JPT100	JIS C1604-1981 , KS C1603-1991	
Temperature	PT100	-200.0 ~ 600.0°C (-328.0°F~1112.0°F)	
input range	JPT100	-200.0 ~ 600.0°C (-328.0°F~1112.0°F)	
	PT100	-2000 ~ 6000	
Digital output	JPT100	-2000 ~ 6000	
Accuracy		Within ±1.0%	
Conversion speed		25ms/1Ch – note1)	
Inculation	Channel to Channel	Non-insulation	
Insulation	Terminal to PLC Power	Insulation (Photo-Coupler)	
Termin	al block	5-point terminal block	
I/O points	s occupied	Fixed type: 64 points	
Wiring	method	3-wire type	
Function	Averaging	Count averaging function	
Function	Alarm	Disconnection detection	
Current consumption	Inner DC5V	30 mA	
Weight		20g	

Here describes general specifications of RTD input option board.

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Note1) Conversion speed can be delayed because of scan delay per channel by XGB main unit

- In order to use analog input option board, the following version is needed.

Main unit	Version information
XBC E type	V1.1 or above
XBC S type	V1.1 or above
XBC SU type	V1.0 or above
XEC E type	V1.0 or above
XEC SU type	V1.0 or above
XG5000	V.3.61 or above

11.3 Part Names and Functions

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Here describes part names and functions.



No.	Name	Description
1	Hook for fixation	Hook for fixing the option board to main unit
2	Terminal block	 Wiring terminal block to connect with external device (RTD input)
3	Cover	► Option board cover
4	Hook for fixation	Hook for fixing the option board to main unit
5	Connector for option board	Connection connector for connecting the option board to the main unit
6	Input connector	Wiring connector for connecting with the external device

11.4 Temperature Conversion Characteristic

Since RTD sensor has non-linear characteristic, RTD input module executes linearization per each section.

The graph below is an example to describe the linearization process and is different with graph about actual sensor temperature input.

(1) PT100: JIS1604-1997 Temperature (°C) 600.0℃ 18.52 0.0℃ Measured temperature 100 313.71 Resistance (Ω) Linearized sensor characteristics Real Sensor characteristics 200.0℃ (2) JPT100: JIS C1604-1981, KS C1603-1991 Temperature (°C) **600.0**℃ 17.14 0.0℃ 100 317.28 Measured temperature Resistance (Ω)

Remark

Non-linear characteristics: The resistance-temperature characteristics for RTD sensor are presented with table (JIS C1604-1997). This characteristics table displays resistance value of the sensor to temperature, namely, the change of the resistance value per increment of 1 $^{\circ}$ C. When the temperature is changed by 1 $^{\circ}$ C, the change of resistance is not in constant width but in different width per section, which is called the non-linear characteristics.

Linearized sensor characteristics Real sensor characteristics

11.5 Conversion Speed

The conversion speed of RTD input option board is less than 25ms + 3 x scan time. The conversion speed includes the time to convert input temperature (resistance value) to digital value and to save the converted digital data into the internal memory.

 \therefore Processing time = less than 25ms + 3 x scan time

11.6 Accuracy

The accuracy of RTD module is described below.

• When the ambient temperature is 0 to $55\,$ °C: within $\pm 1.0\%$ of available input range

Example) PT100 is used and the ambient temperature is normal.

To measure 100° , the conversion data output range:

100℃ - [{ 600 - (-200) } x 1.0 %] ~ 100℃ + [{ 600 - (-200) } x 1.0 %] Namely, 92.0 ~ 108.0 [℃]

11.7 Temperature Display

(1) The input temperature is converted to digital value down to the one decimal place.

- Ex.) If the detected temperature is 123.4°C, its converted value to be saved to the internal memory will be 1234.
- (2) Temperature can be converted to Celsius or Fahrenheit scale temperature value as desired.
 - Ex) If Pt100 sensor is used, the temperature of 100.0 °C can be converted to 2120 when Fahrenheit scale is used.
 - Conversion °C to °F, $F = \frac{9}{5}C + 32$

• Conversion °F to °C, $C = \frac{5}{9}(F - 32)$

- (3) temperature input ranges of sensor are as follows;
 - PT100 : -200.0 ~ 600.0 °C (-328.0 °F ~1112.0 °F)
 - JPT100 : -200.0 ~ 600.0 ℃ (-328.0 °F~1112.0 °F)

11.8 Disconnection Detection Function

- (1) As a module used to measure the temperature with the RTD temperature sensor directly connected, it detects and displays disconnection of the sensor connected. If any disconnection occurs in the sensor used and extended lead wire, it will turn on the disconnection diction bit
- (2) The figure below shows the temperature sensor's appearance of the 3-wired RTD. (The appearance depends on sensor type) Module terminal block



* A disconnection: if disconnected between terminal A and module terminal block in the sensor figure.

* B disconnection: if disconnected between terminal B (two for 3-wired sensor) and module terminal block in the sensor figure, or if A and B lines are all disconnected.

- (3) The basic connection between RTD module and RTD Sensor is based on 3-wired RTD sensor. If 2-wired or 4-wired sensor is used, the connection between the sensor and the module shall be kept as 3-wired. Disconnection will be detected on the basis of 3-wired wiring.
- (4) In case of disconnection, operation of disconnection flag is as follows.

Connection status	Channel status	Disconnection flag
Normal	Run	Off
Normai	Stop	Off
Disconnection	Run	On
Disconnection	Stop	Off
Any sensor is not	Run	On
connected	Stop	Off

11.9 Wiring

- 3 types of sensor-connecting methods are available (2, 3 and 4-wired).
- The standard wiring method for XBO-RD1A module is 3-wired wiring.
- Use an identical type of wire (thickness, length, etc.) for each 3 wire when extended lead wire is used.
- The resistance of each conductor is to be less than 10Ω . (If larger than this, it will cause an error.)
- Resistance difference of each conductor is to be less than 1Ω. (If larger than this, it will cause an error.)
- Length of wire is to be as short as possible and it is recommended to connect the wire directly to the terminal block of module without connection terminal unit. If a connection terminal is to be used, compensating wire shall be connected as shown below.

11.9.1 If 2-wired sensor is used (connection terminal unit is used)



11.9.2 If 3-wired sensor is used (connection terminal unit is used)





11.9.3 If 4-wired sensor is used (connection terminal unit is used)

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11.10 Average Function

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It accumulates temperature conversion values of a selected channel as many as average value and displays the average of the total sum in digital data



- Setting range = 2 ~ 64000 [times]
- Averaging interval is calculated according to the number of channel used
- Averaging interval[ms] = Averaging count x (25ms + 3*scan time)

Remark

(1) Averaging interval varies according to change of scan time.

11.11 Operation Parameter Setting

Operation parameters of RTD input option board can be specified through [I/O parameters] of XG5000.

11.11.1 Setting items

For the user's convenience, XG5000 provides GUI (Graphical User Interface) for parameters setting of RTD module. Setting items available through [I/O parameters] of the XG5000 project window are described below.

Item	Details
[I/O Parameter]	 (1) Specify the following setting items necessary for the module operation. Channel Run/Stop Sensor type Temp. unit Count average (2) The data specified by user through S/W package will be saved on the flash memory of basic unit when [I/O Parameters] are downloaded.

11.11.2 How to use [I/O Parameter]

- (1) Run XG5000 to create a project. (Refer to XG5000 programming manual for details on how to create the project)
- (2) Double-click [I/O Parameter] on the project window.



(3) On the 'I/O parameters setting' screen, find and click the slot of the base where RTD option board is installed on.

All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
01 : Default	1					
U2: Default	2					
04 : Default	3					
04 : Default	4					
06 : Default	5					
07 : Default	6					
08 : Default	7					
09 : Default	8					77777777777777777
10 : Default	9	•		hadada hada hada hada h		<u> </u>
	10					
	Clash Dalas	- P P C-#				

(4) Click the arrow button on the screen to display the screen where an applicable option board can be selected. Search for the applicable option board to select.



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(5) After the option board selected, click [Details] or double-click relevant slot.

- MTO Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
🛛 👝 00 : Default	0(main)		Common	in port inter	Enorgonoy out	1 mood (off
01 : Default	1					
2 : Default	2					
04 : Default	3					
- 05 : Default	4					
🔄 06 : Default	5					
🔄 07 : Default	6					
08 : Default	7					
B U9 : XBO-RDUTA (R	8				<u> </u>	
	9	×80-RD01A (RTD, 1- 💌		-	-	P0400 ~ P043F
	10]				
	,					

(6) A screen will be displayed to specify parameters for respective channels as shown below. Click a desired item to display parameters to set for respective items.

XBO-RD01A (RTD, 1-CH	-1) ?×
XBO-RD01A (RTD, 1-CH)	
Parameter	CH 0
Channel status	Disable 💌
Sensor type	PT100
Temp. unit	Celsius
Count-Avr	0
1	
	OK Cancel

(7) The initial values of respective items are as follows.(a) Channel status setting screen

XBO-RDO1A (RTD, 1-C	н)	?×
XBO-RD01A (RTD, 1-CH)		
Parameter	CH 0	
Channel status	Disable	~
Sensor type	Disable	
Temp. unit	Enable	
Count-Avr	0	
	_	
J		
	ОК	Cancel

(b) Input sensor type setting screen

XBO-RDOIA (RTD, 1-CH	1) ? 🗙
XBO-RD01A (RTD, 1-CH)	
Parameter	CH 0
Channel status	Enable
Sensor type	PT100 🗸
Temp. unit	PT100
Count-Avr	PT100
J	
	OK Cancel

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(c) Temp. unit setting screen

XBO-RD01A (RTD, 1-C	:H) ? 🔀
XBO-RD01A (RTD, 1-CH)	
Parameter	CH 0
Channel status	Enable
Sensor type	PT100
Temp. unit	Celsius 🗸
Count-Avr	Celsius
	Fahrenheit
1	
	OK Cancel

(d) Count average setting screen

Parameter	CH 0
Channel status	Enable
Sensor type	PT100
Temp. unit	Celsius
Count-Avr	0

(8) If necessary setting is complete, press OK.

11.12 Special Module Monitoring

Run Special Module Monitoring by selecting [Online] -> [Connect] and [Monitor] -> [Special Module Monitoring]. If the status is not [On-Line], [Special Module Monitoring] menu will not be activated.

Remark

- 1) If the program is not displayed normally because of insufficient system resource, you may start XG5000 again after close the program and other applications.
- 2) I/O parameters those are specified in the state of [Special Module Monitoring] menu are temporarily set up for the test. They will be disappeared when the [Special Module Monitoring] is finished.
- 3) Testing of [Special Module Monitoring] is the way to test the analog output module. It can test the

module without a sequence program.

11.12.1 How to use special module monitoring

(1) Start of [Special Module Monitoring]

Go through [Online] \rightarrow [Connect] and [Monitor] \rightarrow [Special module Monitoring] to start. If the status is not online, [Special Module Monitoring] menu will not be activated.

🖏 XBO-RD01A - XG5000 - [NewProgra	am]		
🕅 Project Edit Find/Replace View Online	<u>M</u> o	nitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u>	elp
		Stop <u>M</u> onitoring	
		<u>P</u> ause	
	Þ	<u>R</u> esume	
長はおお声と読あなおな	₿	P <u>a</u> using Conditions	
Project Window	3	Change Current <u>V</u> alue,	-
Items	Ð	System Mon <u>i</u> toring	
~ XBO-RD01A ★		Device Monitoring	
🖶 🗇 NewPLC(XGB-XBCS)-Stop		Special Module Monitoring	
Variable/Comment	100	Trend Monitoring	-
Basic Parameter		PID Monitoring	
🦉 🛛 🔤 🖉		SOE Monitoring	
⊞⊸⊠j Embedded Parameter ⊜⊸∰i Scan Program	đ	Custom <u>E</u> vents	-
BewProgram	M	Data Tra <u>c</u> es	

- (2) How to use [Special Module Monitoring]
 - (a) [Special Module List] window will show base/slot information and types of special module by click [Monitor] → [Special Module Monitoring].In this list box, the modules that are now installed in PLC system will be displayed.

Special Mo	dule List	×
Base	Slot	Module
🗊 Base O	<u> </u> Internal	High Speed Counter Module(Open-Collector, 8-CH)
🗊 Base O	<u> </u> Internal	Position Module (Open-Collector, 2-CH)
Base 0	Slot 9	XBO-RD01A (RTD, 1-CH)
🗇 Base O	🗍 Slot 10	XBO-RD01A (RTD, 1-CH)
<		III >
Module <u>I</u> nfo.	<u>M</u> onitor	Close

(b) Select a special module then click [Module Info.] button to display the information as described below.

Special Module Info	rmation ?X
Displays the inform	nations of special module.
ltem	Information
OS Ver	Ver. 11.0
OS Update Date	2010-12-17
Module Status	Normal. (0)
	OK

(c) Select a special module then click [Start Monitoring] button to display the information as described below.

Special Module Moni	itor	?×
XBO-RD01A (RTD, 1-CH)		
Item	CH 0	
Temperature value		
Item	Setting value	Current value
Channel	다	10
Channel status	Disable	
Sensor type	PT100	
Temp. unit	Celsius	
Count-Avr	0	
	•	
	Start <u>M</u> onitoring	<u>I</u> est
		Close

(d) [Start Monitoring]: [Start Monitoring] button will show you digital input data of the operating channel. The figure below is monitoring screen when all channels are Run status.



[Start Monitoring] execution screen

(e) [Test]: [Test] is used to change the parameters of the RTD input module. You can change the parameters when you click the values at the bottom of the screen. It is only available when XGB CPU unit's status is in [Stop].



[Test] execution screen

(g) [Close]: [Close] is used to escape from the monitoring/test screen. When the monitoring/test screen is closed, the max. value, the min. value and the present value will not be saved any more.

Remark

[Test] function is only available when XGB CPU unit's status is in [Stop].

11.13 Register U devices (Special module variable)

Register the variables for each module referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

1

(1) Procedure

(a) Select the special module in the [I/O Parameter Setting] window.

🗊 Base OO : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
🔤 00 : Default	0(main)					
01: Default	1					
02 : Default	2					
04 : Default	3					
05 : Default	4					
👝 06 : Default	5					
	6					
	7					
	8			///////////////////////////////////////	8//////////////////////////////////////	
10 : Default	9	XBO-RDO1A (RTD, 1- 💌		· ·	· ·	P0400 ~ P043F
	10					

(b) Double click 'Variable/Comment' from the project window. .

🔩 XBO-RD01A - XG5000 - [Variable/Comr	nent]					
I 🚆 Project Edit Find/Replace ⊻iew Online Mon	itor <u>D</u> ebug <u>T</u> o	iols <u>W</u> indow <u>H</u> elp				
D 2 A B 4 A 8 5 1 0 7	200	2 % 🖻 🖻 🗙 🗖	* * *	M M 3%	a+0 0 10 ₩1 ₩ →11	£
	B & G ()	0.44	* * • •	[]] [] [] [] [] [] []	1 80 1 BC 0	9 45600 5
■ 髭 材 排 誹 詐 テ5 f6 請 蔀 材 術 錦 錦	SF5 SF6 F10 SF	7 13 13 13 18 10		60 F 25	•	D D H @ Q 100% V
Project Window 👻 🗙	V Mary Mar	inte la via i	181	1		
Items		Table D View Device	V view Flag			
□		Variable	Туре	Device	Used	Comment
MewPLC(XGB-XBCH)-Offline	1				Г	
Pa Variable/Comment			•			
- A Parameter						
Basic Parameter						
1/0 Parameter						
+ M Empedded Parameter						
⊞-@j Embedded Parameter						
a-g Embedded Parameter a-g Scan Program ⊡⊡ NewProgram						
⊯_w, Embedded Parameter ⊜-∰ Scan Program —∰ NewProgram						

(c) Select [Edit] – [Register U Device].

🔛 🖄 🔤 Proje	ct Edit	Eind/Replace	⊻iew <u>O</u> nline	<u>M</u> oni	tor <u>D</u> eb	ug <u>T</u> ools	<u>W</u> indow <u>H</u> elp				
00	a 2	<u>U</u> ndo Dada	Ctrl+Z	িল্প	P	ചെല 🐰	₽ 🕅 🗙 寻	* .*. *	M M 33	a+0 0 10 ₩ ₩ +11	88
10 8		Cut	Ctrl+Y		e "	6 6 0		78 D	በት በ በት ቀር	1 10 10 0	
ES. 14	- * 1/1 🖻	<u>Сору</u>	Ctrl+C	(B)	192 192	お最い	X X X I		ØF 35		▶ B B ⊕ Q 100% ¥
Project Wi	ndo 🖻	<u>P</u> aste	Ctrl+V	×			1		1		
Items	$\neg \times$	<u>D</u> elete	Del		<u>v</u>	iew Variable	D View Device	🕅 View Flag			
	BO	Select All	Ctrl+A			ţ.	'ariable	Type	Device	Used	Comment
		Insert <u>L</u> ine	Ctrl+L							<u> </u>	
6	⊡Ğ ≹	Delete Li <u>n</u> e	Ctrl+D								
		Export Variable	s to <u>F</u> ile								
	G	Register U Devi	ce								
e e	-6		Variable								
		Move Item Up									
		Move Item Dow									

(d) Click 'Yes'.

🔩 XBO-RD01A - XG5000 - [Variable/Co	Comment]	
Project Edit Find/Replace View Online N	Monitor Debug Tools Window Help	
026.83 8 8 8 9 0	◎唷 2 1 2 2 % 10 6 × 1 4 8 % % 1 4 4 % % % 4 4 8 8 * .	
	LLL_COULUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU	□ 🕾 🕓 🕫 🥰
Be はなおおた r5 ke i あなれ お	8 # # # # # 7 7 7 7 7 7 1 = 8 8 8 7 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Q 100% V 9th \$
Project Window - Items - -	View Variable D View Device View Flag	Comment
Parameter Basic Parameter JO Parameter JO Parameter G. Embedded Parameter Scan Program NewProgram	XG5000 Automatically register comments in the U Devices according to the special module set in The previous comments will be deleted, Continue?	in the I/O parameter,
	예(오) 아니오(Ŋ)	

(e) As shown below, the variables are registered.

XBU-RUUTA - XG5000 - [Variable/Comr	nentj					
🕌 Project Edit Find/Replace View Online Mor	itor <u>D</u> eb	oug <u>T</u> ools <u>W</u> indow <u>H</u> elp				
0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Q 1	b € x •	* .*. *	M M 33	a+0 ∰ _10 #1 ∯ →11	8 8
(3) 26 0 0 0 0 17 0 16 0 0 1		• • • • • • • • •	* * • •	CT CT +C) QC) B 🖸 🤇	2) 【名名日日答】 < 名明 話 は
■····································	(P) (N) sF5 sF6	F10 5F7 13 13 19 10 10		1 🐼 F 🚟	•	🕅 🔀 😥 Q. 100% 💌 🕅 🖓 F 🗐 📑
Project Window × ×	VV	/iew Variable D View Device	[Ŝ] View Flag	1		
Items						
		Usudahta	Turne	Davias	المعط	Convert
回 疆 XBO-RD01A ★		Variable	Туре 4	Device	Used	Comment
■ ■	1	Variable _O9_ERR	Type A	Device	Used	Comment Temp. Measuring Option Board : Module Error
G-∰ XBO-RD01A ★ G-∰ NewPLC(XGB-XBCH)-Offline -∰ Variable/Comment	1	Variable _O9_ERR _O9_RDV	Type A BIT BIT	Device U09.00.0 U09.00.F	Used F	Comment Temp. Measuring Option Board : Module Error Temp. Measuring Option Board : Module Ready
■ ⊞ XBO-RD01A + ■ ① NewPLC(XGB-XBCH)-Offline □ ① Variable/Comment □ □ □ □ □ □ □ □ □ □	1 2 3	Variable _09_ERR _09_RDY _09_CH0_ACT	Type A BIT BIT BIT	Device U09.00.0 U09.00.F U09.01.0	Used	Comment Temp, Measuring Option Board : Module Error Temp, Measuring Option Board : Module Ready Temp, Measuring Option Board : CHO Running
	1 2 3 4	Variable _09_ERR _09_RDV _09_CH0_ACT _09_CH0_B0UT	Type A BIT BIT BIT BIT	Device U09.00.0 U09.00.F U09.01.0 U09.01.4	Used	Comment Temp. Measuring Option Board : Module Error Temp. Measuring Option Board : Module Ready Temp. Measuring Option Board : CHO Running Temp. Measuring Option Board : CHO Input Disconne
	1 2 3 4 5	Variable _09_ERR _09_R0Y _09_CH0_ACT _09_CH0_B0UT _09_CH0_TEMP	Type A BIT BIT BIT BIT WORD	Device U09.00.0 U09.00.F U09.01.0 U09.01.4 U09.04	Used	Comment Temp. Measuring Option Board : Module Error Temp. Measuring Option Board : Module Ready Temp. Measuring Option Board : CHO Running Temp. Measuring Option Board : CHO Input Discome Temp. Measuring Option Board : CHO Temp. Value
□ □ □ NewPLC(X6B-XBCH)-Offline □ □ Wariable/Comment □ □ Parameter □ □ Basic Parameter □ □ To Fmedded Parameter □ □ To Fmedded Parameter	1 2 3 4 5	Variable _09_ERR _09_RDV _09_CH0_ACT _09_CH0_BOUT _09_CH0_BOUT _09_CH0_TEMP	Type A BIT BIT BIT BIT WORD	Device U09.00.0 U09.00.F U09.01.0 U09.01.4 U09.04	Used F F F F	Comment Temp. Measuring Option Board : Module Error Temp. Measuring Option Board : Module Ready Temp. Measuring Option Board : CHO Innut Disconne Temp. Measuring Option Board : CHO Input Disconne Temp. Measuring Option Board : CHO Temp. Value
	1 2 3 4 5	Variable _09_ERR _09_R0V _09_CH0_ACT _09_CH0_ACT _09_CH0_B0UT _09_CH0_TEMP	Type A BIT BIT BIT BIT WORD	Device U09.00.0 U09.00.F U09.01.0 U09.01.4 U09.04		Comment Temp, Measuring Option Board : Module Error Temp, Measuring Option Board : Module Ready Temp, Measuring Option Board : CHO Running Temp, Measuring Option Board : CHO Input Disconne Temp, Measuring Option Board : CHO Temp, Value
□ □ □ NewPLC(X6B-XBCH)-Offline □ □ NewPLC(X6B-XBCH)-Offline □ □ Trainable/Comment □ □ Trainable/Comment □ □ Basic Parameter □ □ Basic Parameter □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	1 2 3 4 5	Variable _09_ERR _09_RDV _09_CH0_ACT _09_CH0_BOUT _09_CH0_TEMP	Type A BIT BIT BIT BIT WORD	Device U09.00.0 U09.00.F U09.01.0 U09.01.4 U09.04	Used	Comment Temp. Measuring Option Board : Module Error Temp. Measuring Option Board : Module Ready Temp. Measuring Option Board : CHO Running Temp. Measuring Option Board : CHO Input Disconne Temp. Measuring Option Board : CHO Temp. Value

(2) Save variables

(a) The contents of 'View Variable' can be saved as a text file.

- (b) Select [Edit] -> [Export to File].
- (c) The contents of 'View variable' are saved as a text file.

(3) View variables

Example in the XGB compact "E" type and "S" type are as follows.

(a) The example program of XG5000 is as shown below.

0	U09.00.F U09.01.0				MOV	U09.04	D00000
			 				END
4				· · · · · · · · · · · · · · · · · · ·		 	

(b) Select [View] -> [Variables]. The devices are changed into variables.

_09_RDY	_09_CH0_AC T			MOV	_09_CH0_TE MP	D00000
4						END

(c) Select [View] -> [Devices/Variables]. Devices and variables are both displayed.

	U09.00.F U09.01.0		 	MOV	U09.04	D00000
0	_O9_ŔDV _O9_ĊHO_AC T				_09_CHO_TE MP	
4						END
4						

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.

(d) Select [View] -> [Device/Comments]. Devices and comments are both displayed.

U09.00.F	U09.01.0			MOV	U09.04	D00000
Temp, Measuring Option Board : Module O Ready	Temp. Measuring Option Board : CHO Running				Temp. Measuring Option Board : CHO Temp. Value	
4						END

(e) For IEC type also, as shown in Fig. (a) ~ (d), you can look up variables with diversified options in the 'View' menu. The figure below is the case of an IEC type with which the 'View Device/Variables' option.

LO	%UX0.9.15 %UX0.9.16 	EN ENO-
L1		%UW0.9.4 - IN OUT- CH0_DATA _09_AD0_ DATA
L2		

11.14 Configuration and Function of Internal Memory

Here describes configuration and function of internal memory.

11.14.1 Data I/O area

Data I/O area of RTD input option board is as shown below.

Variable	Type	D	evice	Description	R/W	Signal direction	
	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	XBC	IEC	Decemption			
_0y_ERR	Bit	U0y.00.0	%UX0.y.0	Module error	R		
_0y_RDY	Bit	U0y.00.F %UX0.y.15		Module Ready	R		
_0y_CH0_ACT	Bit	U0y.01.0 %UX0.y.16		CH0 running	R	Option \rightarrow CPU	
_0y_CH0_BOUT	Bit	U0y.01.4	%UX0.y.20	CH0 disconnection	R	Option \rightarrow CPU	
_0y_CH0_TEMP	Word	U0y.04	%UW0.y.4	CH0 temp. value	R	Option \rightarrow CPU	

- In the device allocation, the small letter 'y' is the No. of the slot where the module is installed.

- For example, to read the 'CH0 Temperature Value' of the RTD module installed in the slot 9, write in U09.05. (%UW0.9.4 for IEC types)





Chapter 11 RTD Input Option (XBO-RD01A)

- (1) Module ready/error flag (() is for IEC types, y: slot No.)
 - (a) U0x.00.F: It will be ON when PLC CPU is powered or reset with A/D conversion ready to process A/D conversion.
- (b) U0x.00.0: It is a flag to display the error status of A/D conversion option board.



(2) Channel run, stop information / channel disconnection information flag It displays which channel is being used. (() is for IEC types, y: slot No.)



(3) Temperature value (() is for IEC types, y: slot No.)It displays current temperature value. Its form is temperature value ×10.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
U0y.04 (%UW0.y.4)						C	H0 RT	D Terr	nperatu	ure Val	ue					

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11.14.2 Operation parameter setting area Operation parameter setting areas of RTD input option board are as follows.

Memory address	Contents	Setting value	R/W	Instruction
0	Channel enable/disable setting	CH status setting 0: Stop 1: Run	R/W	
1	sensor type setting	Input range setting 0: PT100 1: JPT100	R/W	PUT/GET
5	Temperature display unit setting	Data type setting 0: Celsius 1: Fahrenheit	R/W	
6	disconnection information	0: Normal 1: Disconnection	R	GET
14	Count average value	0 or 2~64,000	R/W	PUT GET
15	Error information	100: sensor type setting error 300: count average value setting error	R	GET

- (1) Run channel setting (address 0)
 - (a) You can enable/disable the RTD input option board
 - (b) If Run channel is not specified, all channels will be stop status.
 - (c) When using Put instruction, Channel Status address is as follows



- (d) Vales set in B1 ~ B15 are ignored.
- (e) This area shows the same results with "Channel status" in I/O parameter setting window.
- (2) Sensor type setting (address 1)
 - (a) Sets sensor type with the following code.

Word	Sensor type
0	PT100
1	JPT100

- (b) When input value is larger than 2, 0 (PT100 type) is selected by force.
- (c) In case of using PUT instruction, Sensor Type Setting Area is as follows.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address1							Ch0 s	sensor	type s	etting						
													Sen	sor ty	pe sett	ing

0: PT100 1: JPT 100

(3) Setting temperature display unit (address 5)

	(a) Sets ten	np. display unit	with the following code.
--	--------------	------------------	--------------------------

Bit	Temp. display unit
0	Celsius
1	Fahrenheit

(b) When input value is larger than 2, 0 (Celsius) is selected by force.

(c) In case of using PUT instruction, Output Data Type Area is as follows.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address5																с
	-	-	_	-	-	-	-	_	_	-	-	-	-	-	_	Н 0
																\neg

Temp. unit setting Bit Off(0): Celsius Bit On(1): Fahrenheit

- (4) Disconnection information (address 6)
 - (a) Displays disconnection information of channel.
 - (b) In case of using GET instruction, Disconnection Information address is as follows.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address6				CHO) disco	nnectio	on info	rmatio	n (0: no	ormal,	1: disc	connec	tion)			

- (5) Count average value setting (address 14)
 - (a) Count average value should be 0 or 2~64000.
 - (b) If count average value is set as 0, averaging process is not applied and sampling-processed temperature value is outputted.
 - (c) When count average value is larger than 64001, 0 (Averaging disabled) is selected by force
 - (d) In case of using PUT instruction, Count Average Value Setting address is as follows.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address14					С	Η0 coι	unt ave	erage s	setting	: 0 or 2	~64,00	00				

- (6) Error information (address 15)
 - (a) Saves error code detected at setup (in case of setup by the program)
 - (b) Setting error is canceled when invalid setting is corrected by resetting
 - (c) In case of GET instruction, setting error information address is as follows.

bit15 bit14 bit13 bit12 bit11 bit10 bit9 bit8 bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0

Address15	CH0 setup error information

Туре	Error code	Description	Priority	Remark
Setup	100	Input sensor type setting error	1	
error	300	Input count average value rage setting error	2	-

11.15 Example Program

- Here describes how to specify the operation condition of RTD input option board.
- RTD input option board is installed on slot 9.
- Initial setting value is saved in internal memory of module with one input.
- The following program is an example to read temperature value and disconnection information.



U09.01.0	U09.01.4			MOV	U09.04	D00000
Temp. Measuring Option Board : CHO Running	Temp, Temp, Option Board : CHO Input Disconnect ion				Temp. Measuring Option Board : CHO Temp. Value	
		GET	9	6	M0000	1
				1		
	U09.01.0 Temp. Measuring Option Board : CHO Running	U09.01.0 U09.01.4 Temp. Temp. Measuring Measuring Option Board : Board : CHD CHD Input Running Disconnect ion	U09.01.0 U09.01.4 Temp, Temp, Measuring Measuring Option Board : Board : CHO CHO Input Running Disconnect ion	U09.01.0 U09.01.4 Temp, Temp, Measuring Measuring Option Board : Board : CHO CHO Input Running Disconnect ion GET 9	U09.01.0 U09.01.4 MOV Temp, Temp, Measuring Option Board : Board : CHO CHO Input Running Disconnect ion BET 9 6	U09.01.0 U09.01.4 Temp. Temp. Measuring Option Option Option Board : CH0 Input CH0 Input CH0 Temp. Running Disconnect ion 6ET

Moving channel 0 temp. value to D0 area

Moving channel 0 disconnection information to M0

(2) Program example using PUT/GET command

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F0009C								P00001
1 scan OFF		: : :						
-				PUT	9	0	h0001	1
				PUT	9	1	h0000	1
				PUT	9	5	h0000	1
				PUT	9	14	h0000	1
P00001	U09.00.F	U09.01.0	U09.01.4			MOV	U09.04	D00000
	Temp. Measuring Option Board : Module Ready	Temp. Measuring Option Board : CHO Running	Temp. Measuring Option Board : CHO Input Disconnect ion				Temp. Measuring Option Board : CHO Temp. Value	
				GET	9	6	M0000	1

CH Enable

Sensor type (PT100)

Temperature unit (Celsius)

Count average value setting

Moving channel 0 temp. value to D0

Moving channel 0 disconnection information to M0

11.16 Troubleshooting

Describes troubleshooting about the problem that occurs during using RTD input option board

11. 16.1 Troubleshooting

(1) Temperature conversion value is not normal.

Temperature conversion value is not normal	
Installation is correct	F
No Yes	Install the option board correctly.
FG ground is normal	
No Yes	Execute FG ground properly referring to user manual
Wiring is normal	
No Yes	Wire properly referring to user manual
Parameter setting is normal. (Channel status, sensor type setting)	
No Yes	Set parameter properly referring to user manual.
Contact the nearest agency or LS branch office.	

11.16.2 Stats check of RTD input option board through XG5000 system monitor

Module type, module information, O/S version and module status of RTD input module can be checked through XG5000 system monitoring function.

(1) Execution sequence

Two routes are available for the execution.

- (a) [Monitor] -> [System Monitoring] -> And on the module screen, click the right mouse button to display [Module Information].
- (b) [Monitor] -> [System Monitoring] -> And Double-click the module screen.

(2) Module information

- (a) Module type: shows the information of the module presently installed.
- (b) Module information: shows the O/S version information of module.
- (c) O/S version: shows the O/S prepared date of module.
- (d) Module status: shows the present error code.

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12.1 Setting sequence before operation

Setting sequence before operation

Before using the thermocouple input module, follow steps below.



12.2 Specification

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12.2.1 General specification

General specifications of thermocouple input option module are as follows.

No.	ltem			Related specifications							
1	Ambient temperature			0°C ~-	⊦55 ℃		-				
2	Storage temperature			-25 ℃~	+ 70 ℃		-				
3	Ambient humidity		ł	5 ~ 95%RH (No	on-condensing)		-				
4	Storage humidity		-								
			Occasional vibration -								
		Frequency	Ac	celeration	Amplitude	How many times	-				
		5 ≤ f < 8.4 ⊞	Z	-	3.5 mm						
_	Vibration	8.4 ≤ f ≤ 150	Hz 9.8	8 m/s² (1G)	-						
5	resistance		For conti	nuous vibratio	n	10 times each	IEC61131-2				
		Frequency	Ac	celeration	Amplitude	directions (X, Y and Z)					
		5 ≤ f < 8.4 ⊞	Z	-	1.75 mm						
		8.4 ≤ f ≤ 150 J	Hz 4.9	m/s² (0.5G)	-						
6	Shock resistance	 Peak acceleratio Duration: 11ms Half-sine, 3 times 	n: 147 m/s ² s each direo	²(15G) ction per each a	ixis		IEC61131-2				
		Square wave			AC: ± 1,500V						
		Impulse noise			DC: ± 900V		LSIS standard				
		Electrostatic discharge		Voltage :	4kV (contact discl	harging)	IEC 61131-2, IEC 61000-4- 2				
7	Noise resistance	Radiated electromagnetic field noise		80 ~ 1,000 MHz, 10V/m							
		Fast transient	Segment	Power supply module	v Digital/an commun	alog input/output ication interface	IEC 61131-2, IEC 61000-4-				
			Voltage 2kV 1kV				4				
8	Environment		-								
9	Altitude		-								
10	Pollution degree		-								
11	Cooling		Air-cooling								

12.2.2 Performance Specification

Performance specifications are as follows

	Items	Specification					
Number of input	channel	2 channels					
Type of input ser	nsor	Thermocouple K / J type (JIS C1602-1995)					
Range of input	K type sensor	-200.0℃ ~ 1300.0℃ (-328.0°F ~ 2372.0°F)					
temperature	J type sensor	-200.0℃ ~ 1200.0℃ (-328.0°F ~ 2192.0°F)					
Digital output	Temp. display unit	16 bit binary data Displaying down to one decimal place (K, J, type: 0.1℃)					
	Accuracy	±1.0% or less					
Cor	version speed	50ms/2chanelles -note1)					
Reference	Auto compens	ation by RJC sensing (Thermistor)					
junction compensation	Compensation amount	±1.0℃					
Additional	Average process	Count averaging					
function	Alarm	Input disconnection detection					
Warming-up time		15 min or above – note2)					
Insulation method		Non-insulation between input channels Non-insulation between input terminal and PLC main unit					
I/O terminal		5-point terminal block					
Supply power		Internal 5V					
I/O occupied poi	nts	Fixed type: 64 points					
Consumption cu	rrent(Internal)	50 mA					
Weight		20g					

Note1) Conversion speed can be delayed because of scan delay per channel by XGB main unit Note2) Warming-up time: for stability of measured temperature, 15 min is necessary after power is on.

- In order to use analog input option board, the following version is needed.

Main Unit	Version
XBC E type	V1.1 or above
XBC S type	V1.1 or above
XBC SU type	V1.0 or above
XEC E type	V1.0 or above
XEC SU type	V1.0 or above
XG5000	V.3.61 or above

12.3 Name and Function of Each Part

Describes name and function of each part

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No.	Name	Description
14	Hook for fixation	Hook for fixing the option board to main unit
2	Terminal block	 Wiring terminal block to connect with external device (Analog input)
3	Cover	► Option board cover
(5)	Connector for option board	Connection connector for connecting the option board to the main unit
6	Input connector	Wiring connector for connecting with the external device

12.4 Characteristic of Thermocouple Temperature Conversion

Thermocouple input module connect 2 kinds of thermocouple directly, input characteristic are as described below.

```
(1) Thermocouple K (JIS C1602-1995): -200 ℃(-5891 𝒫) ~ 1300 ℃(52410 𝒫)
```



(2) Thermocouple J (JIS C1602-1995): -200 ℃(-7890 Å) ~ 1200 ℃(69553 Å)



Remark

Thermocouple characteristics: thermocouple sensor measures temperature by using fine voltage (electromotive force), which occurs when applying temperature gradient to a junction between two different metals.

The temperature-electromotive force relation specification of normal thermocouple sensor provides the electromotive force, which is measured when a sensor's measuring point is at $O^{\circ}C$. On that account, when measuring temperature by using thermocouple sensor, cold junction compensation (reference junction compensation, RJC) is used. (built-in function of temperature measuring module).

12.5 Accuracy

			Accuracy - note1)		
Thermocouple type	Measurement temperature range	Indication temperature range	Normal temperature (25℃)	Operating temperature - note2) (0℃ ~ 55℃)	Resolution
К	-200.0℃ ~	-200.0℃ ~ 0.0℃	±15.0℃		0.2 ℃
	1300.0 ℃	0.0℃ ~ 1300.0℃			0.1 ℃
J	-200.0℃ ~	-200.0℃ ~ -100.0℃	±14.0℃		0.2 ℃
	1200.0 ℃	-100.0℃ ~ 1200.0℃			0.1 ℃

Accuracy / Resolution are as follows according to ambient temperature

Note1) Total accuracy (normal temp.) = accuracy (normal temp.) + cold junction compensation accuracy = \pm (full scale X 0.2% + 1.0°C)

Cold junction compensation accuracy = ± 1.0 °C

Note2) Temp. coefficient: ±100 ppm/°C

(1) When ambient temp. is normal (25 ± 5 °C): within the $\pm 1\%$ of entire measurement temp. range

(2) When ambient temp. is operating temp. (0 ~ 55 $^\circ \!\!\! C$): within the ±1% of measurement temp. range

Ex.) When K type thermocouple is used and ambient temperature is normal. In case of measuring 1000°C temperature, output range of conversion data is 1000°C - [{1300 - (-200)} x 1 %] - 1 ~ 1000°C + [{1300 - (-200)} x 1%] + 1 namely, 984.0 ~ 1016.0 [°C] 입니다.

Note

- (1) For stabilization of measurement temperature, warming-up time more than 15 min. is necessary, after restart.
- (2) If ambient temperature changes rapidly, measurement temperature may change temporally. Keep the ambient temperature steady for stabilization of measuring temperature.
- (3) If wind of the cooling pan contacts with module directly in the panel, accuracy decreases. Do not contact with wind directly.
12.6 Conversion speed

12.6.1 Conversion speed function

- (1) Conversion speed: 50ms/2Ch
- (2) Sequential process method

The next channel is converted after conversion of one channel is completed.

- (Run/Stop of the respective channels can be set independently.)
- (3) Concept of conversion time

The time taken to convert the temperature from terminal block to digital value and save it at internal memory

 \therefore Processing time = less than 50ms + 6 x scan time

Example) PLC average scan time: 1 ms When using all channels: conversion time = 50ms+6 X1ms = 56 ms



12.7 Conversion speed

12.6.1 Temperature Display function

(1) The input temperature is converted to digital value down to the one decimal place.

Ex.) If the detected temperature is 123.4° C, its converted value to be saved to the internal memory will be 1234.

(2) Temperature can be converted to Celsius or Fahrenheit scale temperature value as desired.

Ex) If Pt100 sensor is used, the temperature of 100.0° C can be converted to 2120 when Fahrenheit scale is used.

• Conversion °C to °F, $F = \frac{9}{5}C + 32$

• Conversion °F to °C, $C = \frac{5}{9}(F - 32)$

(3) temperature input ranges of sensor are as follows;

- •K Type: -200.0 ~ 1300.0°C (-328.0°F ~ 2372.0°F)
- J Type: $-200.0 \sim 1200.0^{\circ}$ C (-328.0° F $\sim 2192.0^{\circ}$ F)

12.8 Disconnection detection

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12.8.1 Disconnection detection function

Thermocouple input module has a function that detects the disconnection and displays it. That the module detects and displays disconnection means that the following cabling path would have partially bad connection, which requires taking measures

- (1) If disconnection occurs between thermocouple or compensating cable and module, it generates error code.
- (2) Disconnection can be detected by channels. However, it is available for the only channel(s) designated for operation.

Thermocouple connection status	Channel run	Disconnection flag
Normal	Run	Off
normai	Stop	Off
Thermocouple disconnection	Run	On
	Stop	Off

(3) In case disconnection occurs, disconnection flag of each channel will be turned on and in case disconnection is canceled, it will be turned off.

Disconnection flag	Contents
U0y.01.4	Ch. 0 disconnection
U0y.01.5	Ch. 1 disconnection

(4) When disconnection occurs, the min value among indication temperatures is displayed

Туре	Displayed temperature in case of disconnection	
K type	-250.0℃	
J type	-210.0℃	

12.9 Disconnection detection

12.9.1 Average function

(1) Count average

It accumulates temperature conversion values of a selected channel as many as average value and displays the average of the total sum in digital data



- Setting range = 2 ~ 64000 [times]

- Averaging interval is calculated according to the number of channel used
- Averaging interval[ms] = Averaging count x (50ms + 6 scan time)

Remark

(1) Averaging interval varies according to change of scan time.

12.10 Disconnection detection

12.10.1 Installation environment

Attention should be paid to the followings in order to secure the reliance and stability of the system.

- (1) Environmental Conditions
 - (a) Install on a water-proof and dust-proof control board.
 - (b) Place free of continuous impact or vibration.
 - (c) Place not directly exposed to direct sunrays.
 - (d) Place where dew does not form due to rapid temperature change.
 - (e) Place where ambient temperature is maintained between 0 55 °C.

(2) Installation Construction

- (a) In case of screw hole processing or wiring construction, wiring dregs should not go into PLC.
- (b) Install on a position easy to access.
- (c) Should not install on the same panel which high voltage device is installed on.
- (d) It should be 50mm and longer distant from duct and modules.
- (e) Should ground in the environment where is not interrupted from noise.
- (f) Install not to contact with cooling pan in the panel
- (3) Cautions in handling
 - It describes caution in handling from unpacking module to installation.
 - (a) Do not fall or apply excessive impact on it.
 - (b) Never attempt to separate PCB from the case.
 - (c) Make sure that any impurities including wiring dregs should not go into the upper part of module during wiring work.

12.10.2 Wiring

- (1) Cautions in wiring
 - (a) Do not place AC power line close to the AUX signal line of the module. To avoid surge or induced noise occurring from AC, make sure to leave a proper space.
 - (b) Cable should be selected by considering ambient temperature and allowable current and the specification of cable should be as follows.

Cable specification		
Lower limit Upper limit		
0.18mm ² (AWG24) 1.5 mm ² (AWG16)		

- (c) If cable is placed too close to any heating device or materials or if it directly contacts oil and similar materials for a long time, it may cause short-circuit, resulting in breakdown and malfunction.
- (d) Check the polarities during terminal strip wiring
- (e) Wiring with high voltage cable or power line may cause induction problem, causing malfunction or trouble.
- (f) External DC24V power should be same with power of XGB. If external DC24 V power of thermocouple input module is turned on/off while power of XGB main unit is on, temperature input value may have an error.
- (g) Thermocouple input module may use 4 types of thermocouple sensors. (K / J / T / R)

(2) Terminal array

Terminal array of thermocouple input module is as follows.



Signal name	Purpose	
CH0 +	Channel O thermosourole input	
CH0 -		
CH1 +	Channel 1 thermosourle input	
CH1 -		
NC	Not used	

(3) Wiring example

Thermocouple can be connected with module directly. If point where temperature is measured is far from the module, use the compensating cable to connect

(The compensating cables are different according to thermocouple type. For more information about the compensating cable, contact the producer of thermocouple.)



- 1) In case sensor and compensating cable are shielded, shield connection is possible to PLC FG terminal.
- 2) It is necessary to use extension terminal block of which material is kept at uniform temperature in order to reduce error.
- 3) Compensating cable should use the same type of sensor, which was used for measuring.

12.11 Operation Setting and Monitor

12.11.1 Operation Parameter Setting

Operation parameter of thermocouple input module can be set through [I/O Parameter] of XG5000

(1) Setting items

For user convenience, parameter setting of thermocouple input module is provided by GUI (Graphical User Interface) method in the XG5000. The items which can be set through [I/O Parameter] in the project window are as follows.

Items	Contents
[I/O Parameter]	 (a) Sets the following items for operation of module. 1) Channel status (Disable / Enable) 2) Sensor type (K / J) 3) Filter setup (Filter constant) 4) Averaging process (Count averaging) (b) The parameter set by the user is saved in the flash memory of XGB main unit after download.

- (2) How to use [I/O Parameter]
 - (a) Execute the XG5000 and make the project.
 (For how to make the project, refer to the XG5000 user manual)
 - (b) Double-click [I/O Parameter] on the project window.





(c) If [I/O Parameter Setting] window shows, find slot of base where module is installed and click it









(f) Parameter setup screen appears as follows. If you click the item you want to set, settable parameter will be displayed.

ХВО-ТС02А (ТС, 2-СН)		?×
XBO-TC02A (TC, 2-CH)		
Parameter	CH 0	CH 1
Channel status	Disable 🔽	Disable
Sensor type	К	К
Temp. unit	Celsius	Celsius
Count-Avr	0	0
	•	
, ·		
	OK	Cancel

(g) The initial values of each item are as figure shown below

1) Channel status (Disable / Enable)

XBO-TC02A (TC, 2-CH)		?×
XBO-TC02A (TC, 2-CH)		
Parameter	CH 0	CH 1
Channel status	Enable 🗸 🗸	Disable
Sensor type	Disable	ј к
🗌 Temp. unit	Enable	😽 Celsius
Count-Avr	0	0
1		
	OK	Cancel

2) Sensor type (K / J)

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хВО-ТСО2А (ТС, 2-СН)		?×
XBO-TC02A (TC, 2-CH)		
Parameter	CH O	CH 1
Channel status	Disable	Disable
Sensor type	K K	K
🗌 Temp. unit	K	Celsius
Count-Avr	J	0
	-	
J		
	OK	Cancel

3) Temp. unit (Celsius / Fahrenheit)

ХВО-ТСО2А (ТС, 2-СН)		?×
XBO-TC02A (TC, 2-CH)		
Parameter	CH 0	CH 1
Channel status	Disable	Disable
Sensor type	K	K
🗌 Temp. unit	Celsius 🗙	Celsius
Count-Avr	Celsius	0
	Fahrenheit	
]		
	ОК	Cancel

4) Average processing (Count averaging)

XBO-TCO2A (TC, 2-CH)		?×
XBO-TC02A (TC, 2-CH)		
Parameter	CH O	CH 1
Channel status	Disable	Disable
Sensor type	К	К
🗌 Temp. unit	Celsius	Celsius
Count-Avr	100	0
	Ŋ	
0, 2~64000	ОК	Cancel

5) If you input invalid number, error message will be displayed. (When average value is out o range)



Error in	fo. 🗙
	Out of range, Enter again!
	확인

12.11.2 Special module monitoring function

While XG5000 is connected with PLC, through [Monitor] -> [Special Module Monitoring], the user can test the operation of the module.

Remark

- If system resource is short, the screen may not be displayed properly. In case of this, shut down other application program and restart the XG5000.
- 2) On the [Special Module Monitoring] status, I/O parameter is set temporarily to execute the test. So if [Special Module Monitoring] status ends, I/O parameter is not saved.
- 3) By test function of [Special Module Monitoring], the user can check if analog module operates properly or not without any sequence program.
 - (1) How to use special module monitoring
 - (a) Start of [Special Module Monitoring]
 - While XG5000 is connected with PLC, start [Monitor] -> [Special Module Monitoring]. If that is not online status, [Special Module Monitoring] is not activated.



- (b) How to use [Special Module Monitoring]
 - Click [Monitor] -> [Special Module Monitoring] while XG5000 is connected with PLC basic unit. 'Special Module List' screen is displayed as shown below and displays information of base/slot with special module type. On the list dialog box, the modules currently equipped at the PLC are displayed.

Special Mo	dule List	×
-		
Base	Slot	Module
🗂 Base O	<u> </u> Internal	High Speed Counter Module(Open-Collector, 8-CH)
🗊 Base O	<u> </u> Internal	Position Module (Open-Collector, 2-CH)
🗂 Base O	🗍 Slot 2	XBF-TC04S (TC, 4-CH)
🙆 Base O	Slot 10	XBO-TC02A (TC, 2-CH)
<u> </u>		
Module Info.	<u>M</u> onitor	Close

2) Clicking [Module Info.] shows the information of special module

Special Module Info	rmation ?X
Displays the inform	lations of special module.
ltem	Information
OS Ver	Ver. 7.04
OS Update Date	2010-12-22
Module Status	Normal. (0)
	ОК

3) Clicking [Monitor] shows the following screen

Special Module Moni	itor	?!>
XBO-TC02A (TC, 2-CH)	-	
Item	CH 0	CH 1
Temperature value		
r		
ltem	Setting value	Current value
Channel	CH	0 🖌
Channel status	Disable	
Sensor type	K	
Temp. unit	Celsius	
Count-Avr	0	
1	•	
	Start <u>M</u> onitoring] <u>I</u> est
		Close

4) [Start Monitoring]: [Start Monitoring] button will show you digital input data of the operating channel. The figure below is monitoring screen when all channels are "Run" status.

Special Module Moni	itor	?×		
XBO-TC02A (TC, 2-CH)	-	,		
Item	CH 0	CH 1		
Temperature value	-2500	-2500		
Item	Setting value	Current value		
Channel	СН	0		
Channel status	Disable	Enable		
Sensor type	К	К		
Temp. unit	Celsius	Celsius		
Count-Avr	0	0		
)				
	Stop <u>M</u> onitoring	<u>I</u> est		
		Close		

[Start Monitoring] execution screen

I

5) [Test]: [Test] is used to change the parameters of the Thermocouple input module. You can change the parameters when you click the values at the bottom of the screen. It is only available when XGB CPU unit's status is in [Stop].

S	pecial Module Moni	tor	?×			
	XBO-TC02A (TC, 2-CH)	-				
	ltem	CH O	CH 1			
	Temperature value	0	0			
	ltem	Setting value	Current value			
	Channel	CH 0				
	Channel status	Disable	Disable			
	Sensor type	К	K			
	Temp. unit	Celsius	Celsius			
	Count-Avr	0	0			
		•				
		Stop <u>M</u> onitoring	<u>I</u> est			
			Close			

[Test] execution screen

12.11.3 Register U devices (Special module variable)

It registers the variables for each module referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

1

- (1) Procedure
 - (a) Select the special module type in the [I/O Parameter Setting] window.

I/O Parameter Setting					?×
All Base Set Base					
🖃 🗊 Base 00 : Default 🛛 🛛 Slot	Module	Comment	Input Filter	Emergency Out	Allocation
0(main)	DC 24V INPUT 18poin		3 Standard [ms]	Default	P0000 ~ P007F
UI : RELAY OUTPUL 1	RELAY OUTPUT, 16p		-	Default	P0080 ~ P011F
04 : Default 3					
05 : Default 4					
06 : Default 5					
07 : Default 6					
			27777777777777777	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
3	VB0.TC026 (TC 2.CH) N		-	-	P0440 ~ P047E
	100-1002A (10, 2-01)	6			10440 10471
Delete Slot De	lete <u>B</u> ase Base <u>S</u> etting	Delete All De	e <u>t</u> ails <u>P</u> r	int 🔻 🗌	OK Cancel

(b) Double click 'Variable/Comment' from the project window.

👒 TC02A_PROJECT - XG5000 - [Variable/	'Comment]				- IX
🕌 Project Edit Find/Replace View Online Mor	nitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u> elp)			- 8 ×
D 2 & B 4 4 8 5 0 3	₽ % ħ®× •	XXX MA	*0 3*0 & 10 Na Ma A +11	S	
Ĩ @ #\$ D O ⊗ \$ 0 \$ # \$ #	8 & 6 fi 0 0 . W H	68 11 67 6	(j) +C) BC) B	9 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	計發酵
● 「「「「「「」」」」 「「」」」 「「」」」 「」」」 「」」」 「」」」 「」」」 「」 「	4 \$F5 \$F6 F10 \$F7 63 64 65 66	Î î C Q 		D D D D D C Q Q 100% 🗸 🤋 🕸	
Project Window • ×	View Variable D View Device	e 🔯 View Flag			
■	Variable	Type 🔺 Device	Used	Comment	
□-m NewPLC(XGB-XBCS)-Stop □-m Variable/Comment N	2		F		
🖃 💽 Parameter	3		Г		
	4		Γ		
🖃 🧕 Embedded Parameter	5		F		
⊡-@ Scan Program	7		Г		
	8		Γ		
■¢ Project					
Most Recently Used					
Function Marrie					
T uncount traine	🕍 Variable/Comment				
× Device/Variable Value Comment		×			
		e e			
E Contraction of the contraction		e Win			
The second secon	Appitor 4			k Program) Find 1) Find 2) Communication) Or	acc Poforono
	Normor 4 /		/ Result / Check	Kerogram Arind T Arind 2 A Communication A Cr	Oss Referenc
		NewPLC	Stop	L, HS-252U, UK	Uverwrite

ln c	a	se of XEC	, selec	ct	[Ed	dit] -	[Reg	gister	speci	al	modu	le var	iabl	e]		
🍕 TC02A.	.PR	OJECT - XG5000	l - [Variat	ole/	′Соп	iment]										_ D ×
道 <u>P</u> roject	<u>E</u> di	t <u>F</u> ind/Replace <u>V</u> ie	ew <u>O</u> nline	Mor	nitor	Debug [[ools <u>W</u> i	indow <u>H</u> el)							- 8 ×
D¢A	Ω	<u>U</u> ndo	Ctrl+Z		2	20	光 喧り		: : :	×	64.64.5		10 +11			
1 m As (C.		Ctrl+V		Ð	B. 13. f	6866	, a tox log, l	L (78) (23)	I	7. F7. F1	r54 -r1 8r	1 1 1	lasom	ev i k z g z	
	*	Cut	Ctrl+X			an 117		al load load	i e e							
Esc 7+5 7+4		<u>C</u> opy Paste	Ctrl+U	sF	4 sF5	sF6 F10	sF7 c3 0	64 65 66		C		26 111	VD		100% Y MF MF	
Project Windo	X	Delete	Del	×		View Va	riable [D View Devic	e 🕅 Vie	w Flag						
E - 張 TCO			Ctrl+A	H			Varia	ble	Туре	•	Device	Used			Comment	
		Insert Line	Ctrl+L		1							Ē				
	₿×	Delete Li <u>n</u> e	Ctrl+D		2											
		Export Variables to	<u>F</u> ile		4							Г				
(Register U Device	2	1	5											
ė-6		Add EXTERNAL Va	ariable		6											
		Move Item Up			8							Ē				
- Draiget		Move Item Down		H												
- G Project																
Function/FB			•	×												
Most Recent	y Use	d	Edi	it												
Function Na	me			_	L IVL	Ondeki										
						variaui	e/Cumm	ent								
X Dev	∕ice∧	/ariable Value	Commer	nt						×						
										lindo						
βe										age V						
A D N	\mathbb{H}	Monitor 1 🗸 Monitor	2 À Monitor 3	3 <u>)</u> 1	Nonito	or 4 /				Mess		Result	Check P	Program λ Find 1 λ Find	d 2 👌 Communication 〉	Cross Referenc
Automatical	y reg	gisters comments in	the U Devic	es a	iccor	ding to th	e special	module se	t in the I N	IewPi	LC	S	Stop	L, RS-232C, OK	View Variable	Overwrite

(c) Select [Edit] – [Register U Device].

Γ

(d) If you click "yes", U device will be registered automatically. At this time, if there is U device comment inputted previously, the previous comment will be removed.

🚯 TC02A_PROJECT - XG5000 - [Variable/Comment]	
🕌 Project Edit Find/Replace View Online Monitor Debug Tools Window Help	- 8 ×
□ > > = = = = = = = = = = = = = = = = =	
	* 常 臀
品好找料数方方式表好的路路路路路好好发发发 自由回风风下 圆面 又回回回回。《Q 100% ▼ 外外 圖	9 0
Project Window * * Items View Variable D View Device View Flag	
B B TC02A_PROJECT ★ Variable Type ▲ Device Used Comment	
Variable/Comment	
Basic Parameter XC5000	
Image: Second Program Image: Second Program Image: Second Program Image: Second Program <td></td>	
Most Recently Used	
Function Name	
Mariable/Comment	
Image: State of the state o	s Referenc
NewPLC Stop L, RS-232C, OK Ov	erwrite 📑

(e) As shown below, the variables are registered.

TC02A_PROJECT - XG5000 - [Variable/Co	mment]											
🕌 Project Edit Eind/Replace View Online Monitor	🛓 Project Edit Find/Replace View Online Monitor Debug Iools Window Help											
D 🕫 🕞 🖨 🎒 🚔 🍇 🗮 🔍 🖓	D ☞ & ■ ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●											
: \$\$\$ ● ● < \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$	& © 6 9 9 . WW		136767	<u>]</u>] +[] §[]	18 명· 김 명·	F6 片臀臀						
■ 話 お お お お まち F5 F6 F8 F9 F1 お お お お お お お お お お お お お お お お お お	8 88 FB F7 13 13 18 18		E 🛛 🖓 F		V D D B 16 @ Q 100% Y 3+ 3+							
Project Window × X	View Variable	vice 🚺 Viev	v Flag									
	Variable	Туре	 Device 	Used	Comment	[]						
MewPLC(XGB-XBCS)-Stop	_0A_WDT_ERR	BIT	U0A.00.E	Г	Temp. Measuring Option Board : Module H/W Error							
Variable/Comment	_0A_RDY	BIT	U0A.00.F	Г	Temp. Measuring Option Board : Module Ready							
⊡_Log Parameter 3	_OA_CH0_ACT	BIT	U0A.01.0	Г	Temp. Measuring Option Board : CH0 Running							
Basic Parameter	_OA_CH1_ACT	BIT	U0A.01.1	Г	Temp. Measuring Option Board : CH1 Running							
Find Embedded Parameter	_OA_CH0_BOUT	BIT	U0A.01.4	Г	Temp. Measuring Option Board : CH0 Input Discon	nection						
Scan Program	_OA_CH1_BOUT	BIT	U0A.01.5	Г	Temp. Measuring Option Board : CH1 Input Discon	nection						
RewProgram Z	_OA_CH0_TEMP	WORD	U0A.04	Г	Temp. Measuring Option Board : CH0 Temp. Value							
8	_OA_CH1_TEMP	WORD	U0A.05	Г	Temp. Measuring Option Board : CH1 Temp. Value							
Project												
Most Becently Used												
Wost Hoconky Osod												
Function Name												
	a Variable/Comment											
Device/Variable Value Comment	n		essage Windo ▲ ×			December 201						
Monitor 2 V Monitor 3 V Mon	1101 4 /		SIDDE D N	Result A Ch	reck Program A Find 1 A Find 2 A Communication A	Cross Referenc						
		Ne	ewPLC	Sto	p L, RS-232C, OK View Variable	Overwrite						

(2) Save variables

- (a) The contents of 'View Variable' can be saved as a text file.
- (b) Select [Edit] -> [Export to File].
- (c) The contents of 'View variable' are saved as a text

(3) View variables

Γ

(a) The example program of XG5000 is as shown below

🔩 тсо	2A_	PRO.	JECT	- XG5()00 -	[NewP	rogram]							
Ero	ject	<u>E</u> dit	<u>F</u> ind/	Replace	<u>V</u> iew	<u>O</u> nline	<u>M</u> onitor	<u>D</u> ebug	<u>T</u> ools	<u>W</u> indow	<u>H</u> elp			-	a ×
	0	UOA.0	0.F	U0A.01.	.0							MOV	U0A.04	D01000	
				U0A.01.	0							MOV	U0A.05	D02000	-
	0													END	~
<	31														>
1 22	Net	vProg	ram												
											NewPLC		Stop	L, RS-232C,	0К

(b) Select [View] -> [Variables]. The devices are changed into variables.

👒 тсо	2A_PRO	JECT -	XG5000	- [NewP	rogran	1]							
Eroj	ject <u>E</u> dit	<u>F</u> ind/Rep	lace <u>V</u> iev	w <u>O</u> nline	<u>M</u> onitor	<u>D</u> ebug	<u>T</u> ools	<u>W</u> indow	<u>H</u> elp			-	a x
		_0, RDY	A_CH0_ ACT 							MOV	_0A_CH0_ TEMP	D01000	
		_0/	A_CH0_ ACT 							MOV	_0A_CH1_ TEMP	D02000	
<	9											END	~
<u> </u>	NewProg	Iram							NewPLC		Stop	L, RS-232C.	, 0K

(c) Select [View] -> [Devices/Variables]. Devices and variables are both displayed

👒 TCO2A.	_PROJEC	r - XG500	0 - [NewF	rogran	n]							
Eroject 📰	<u>E</u> dit <u>F</u> ind,	/Replace ⊻	iew <u>O</u> nline	<u>M</u> onitor	<u>D</u> ebug	Tools	<u>W</u> indow	<u>H</u> elp			-	ъ×
	U0A.00.F	U0A.01.0							MOV	U0A.04 _0A_CH0_	D01000	
0									MOV		D02000	-
		_UA_CHU_ ACT								_UA_UHI_ TEMP	END	
9 9 1	wDrogrop										- <u></u> r	
	9WProgram							NewPLC		Stop	L, RS-232C	, 0K

👒 TC02A	PROJEC	T - XG5000 -	[NewProgra	am]			_				
Erojec 🔝	t <u>E</u> dit <u>F</u> ind,	/Replace <u>V</u> iew	′ <u>O</u> nline <u>M</u> onit	or <u>D</u> ebug	<u>T</u> ools	<u>₩</u> indow	<u>H</u> elp			-	a ×
	U0A.00.F	U0A.01.0						MOV	U0A.04	D01000	^
0	Temp. Measuring Option Board : Module Ready	Temp. Measuring Option Board : CH0 Running							Temp. Measuring Option Board : CH0 Temp. Value		
		U0A.01.0						MOV	U0A.05 Temp.	D02000	-
		Measuring Option Board : CH0 Running							Measuring Option Board : CH1 Temp. Value		
9										END	~
🛱 N	ewProgram										
							NewPLC		Stop	L, RS-232C	, OK

(d) Select [View] -> [Device/Comments]. Devices and comments are both displayed.

12.12 Configuration and Function of Internal Memory

It describes the configuration and function of internal memory

12.12.1 Data I/O area (U device)

(1)	Data sent from module to XGB main unit	(XGB PLC input area, read only	/
۰			· · · · · · · · · · · · · · · · · · ·	,

Device	Туро	Device a	signment		DW	Signal
assignment	Type	XBC	IEC	Comment	1.7.44	direction
_0y_ERR	BIT	U0x.00.E	%UX0.y.14	Module H/W error	R	
_0y_RDY	BIT	U0x.00.F	%UX0.y.15	Module Ready	R	TCUZA→CFU
_0y_CH0_ACT	BIT	U0x.01.0	%UX0.y.16	CH 0 running	R	
_0y_CH1_ACT	BIT	U0x.01.1	%UX0.y.17	CH 1 running	R	
_0y_CH0_BOUT	BIT	U0x.01.4	%UX0.y.20	CH 0 disconnection	R	TCUZA→CFU
_0y_CH1_BOUT	BIT	U0x.01.5	%UX0.y.21	CH 1 disconnection	R	
_0y_CH0_TEMP	WORD	U0x.04	%UW0.y.4	CH 0 temp. conversion value	R	
_0y_CH1_TEMP	WORD	U0x.05	%UW0.y.5	CH 1 temp. conversion value	R	

- In the device allocation, the small letter 'y' is the No. of the slot where the module is installed.

- For example, to read the 'CH0 Temperature Value' of the TC module installed in the slot 9, write in U09.05. (%UW0.9.4 for IEC types)





(2) Writing operation parameters through program (PUT instruction is used.) U0A.00.F M00000 PUT CH0,CH1 : OPERATION 10 0 D00000 1 + \vdash $+ \vdash$ M00001 PUT 10 1 D00000 1 CH 0 : K TYPE/J TYPE + +M00002 PUT 10 D00001 2 1 CH 1 : K TYPE/J TYPE \dashv M00003 CH0,CH1: PUT 10 5 D00002 1 \dashv \vdash Celsius/Fahrenheit M00004 PUT CH 0 : Count-Avr 10 14 D00003 1 $\dashv \vdash$ M00005 PUT 10 15 D00004 1 CH 1 : Count-Avr \dashv END 52



12.12.2 How to set operation parameter

ſ

Operation parameter of thermocouple input module can be set by two methods.

(1) Setting operation parameters through [I/O parameter setting] window.



XBO-TC02A (TC, 2-CH)					
XBO-TC02A (TC, 2-CH)					
Parameter	CH 0	CH 1			
Channel status	Disable	Disable			
Sensor type	К	К			
🗌 Temp. unit	Celsius	Celsius			
Count-Avr	0	0			
0, 2~64000	ОК	Cancel			

12.12.3 Operation parameter setting area

Men add	nory ress	Description	Setting value	R/W	Instruction
Hex.	Dec.	-			
00 н	0	Designate a channel to use	bit0: bit3, 0: stop, 1: run	R/W	
01 н	1	Set sensor type of CH 0		DAA	
02 н	2	Set sensor type of CH 1	K.U, J.T	R/VV	PUT/GET
05 н	5	Designate temperature metric system	bit0: bit3, 0: Celsius, 1: Fahrenheit	R/W	
0Ен	14	CH0 average value	Count average: 2~64000 times	R/\/	
0 F н	15	CH1 average value	Count average. 2~04000 times	11/11	
10 н	16	Error information	10#: sensor type setting error 20#: count average value setting error	R	GET
11 н	17	Cold junction compensation temp.	Measured value of cold junction compensation temp.	R	GET
12 н ~18 н	18 ~24	System area (Offset gain storage area)	Read/Write unavailable	unavailable	-

It describes operation parameter setting area of thermocouple input module.

Remark

Warning (1) System area (Offset gain storage area) is area where Read/Write is unavailable. If this area changes, malfunction or breakdown may occur.

(1) Designating Channel (Address 0)

- (a) Temperature conversion module Enable/Disable can be set to each channel.
- (b) By prohibiting a channel not to use from conversion, conversion interval by channels can be shortened.
- (c) If channel to use is not designated, every channel can not be used.
- (d) In case of using PUT instruction, temperature conversion module Enable/Disable are as follows.



(e) Vales set in B4 ~ B15 are ignored.

(f) This area shows the same results with "Channel status" in I/O parameter setting window.

ХВО-ТС02А (ТС, 2-СН)	j	?×
XBO-TC02A (TC, 2-CH)		
Parameter	CH 0	CH 1
Channel status	Enable 🗸 🗸	Disable
Sensor type	Disable] к
🗌 Temp. unit	Enable	Celsius
Count-Avr	0	0
1		
	ОК	Cancel

(2) Sensor type setting area (Address 1~2)

(a) Sets sensor type with the following code.

Word	Sensor type
0	K
1	J

(b) When input value is larger than 2, 0 (K type) is selected by force

(c) In case of using PUT instruction, Sensor Type Setting Area is as follows.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address 1							CH0 s	sensor	type s	etting						
Address 2							CH1 s	sensor	type s	etting						

- (d) Vales set in B8 ~ B15 are ignored.
- (e) This area shows the same results with sensor type designation in I/O parameter setting window.

Chapter 12 Thermocouple Input Option (XBO-TC02A)

XBO-TC02A (TC, 2-CH)		?×
XBO-TC02A (TC, 2-CH)		
Parameter	CH 0	CH 1
Channel status	Disable	Disable
Sensor type	K K	K
Temp. unit	K	Celsius
Count-Avr	Մ	0
	OK	Cancel

(3) Temp. unit setting area (Address 5)

- (a) Temp. unit (Celsius/ Fahrenheit) of thermocouple input module can be set per channel. (b) In case of PUT instruction, Temp. unit setting area is as follows.
 - bit13 bit12 bit11 bit10 bit9 bit8 bit15 bit14 bit7 bit6 bit5



hit4

Bit Description					
0	Celsius				
1	Fahrenheit				

(c) Vales set in B2 ~ B15 are ignored.

(d) This area shows the same results with temp. unit setting in I/O parameter setting window.

XBO-TC02A (TC, 2-CH)						
XBO-TC02A (TC, 2-CH)						
Parameter	CH O	CH 1				
Channel status	Disable	Disable				
Sensor type	K	К				
🗌 Temp. unit	Celsius 🗙	Celsius				
Count-Avr	Celsius	0				
	Fahrenheit					
1						
	ОК	Cancel				

(4) Average value setting area (Address 14~15)

- (a) Average value can be set per channel.
- (b) If count average value is set as 0, averaging process is not applied and sampling-processed thermocouple input value is outputted.
- (c) In case of using PUT instruction, average value setting address is as follows.

	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Address 14			С	H# ave	erage v	alue s	etting									
Address 15			C	ount-a	verage	: 2 ~ 6	4000[1	times]								

- (d) This area shows the same results with count average value setting in I/O parameter setting window.
- (e) In the I/O parameter setting window, prohibition function is provided not to set value that is out of range. (In case of setting value that is out of range, error message is displayed.)

bit2

bit1

bit0

XBO-TC02A (TC, 2-CH)		
Parameter	CH 0	CH 1
Channel status	Disable	Disable
Sensor type	К	К
🗌 Temp. unit	Celsius	Celsius
Count-Avr	100 N	0
		•

(5) Setting error information area (Address 16)

- (a) Saves error code detected at setup by the program
- (b) Setting error is canceled when invalid setting is corrected by resetting
- (c) When U0X.01.8~ U0X.01.9 (setting error flag) is on, you can cancel the error by checking this area and resetting
- (d) In case of GET instruction, setting error information address is as follows.

Address 16	CH0, 1 setting error information	
------------	----------------------------------	--

Туре	Error code	Description	Priority	Remark
Setting	10#	Input sensor type setting error	1	# means channel number
error	20#	Input count average value rage setting error	2	Input channel 0,1

(e) If there are more than one errors, error code having higher priority will be saved.

(10) Cold junction compensation temp. area (Address 17)

(a) Cold junction compensation temp. can be seen per channel.

(b) In case of GET instruction, cold junction compensation temp. area is as follows.

bit15 bit14 bit13 bit12 bit11 bit10 bit9 bit8 bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0

Address 17 CH0,1 cold junction compensation temp.

(11) System area (offset gain storage area: address 18~24)

(a) In the system area (18~24: offset gain storage area), Read/Write is unavailable

\wedge	If the user changes this area, it may cause malfunction or breakdown.
\bigtriangleup Caution	So do not handle this area.

12.13 Example Program

- (1) It describes how to set operation parameter.
- (2) The initial settings are saved in the internal memory of thermocouple module
- (3) The following is program example that reads the temp. value of thermocouple input module of slot 1 and check whether disconnection occurs or not.

12.13.1 Example using [I/O Parameter]

(1) I/O parameter setting window

I/O 파라미터 설정						?	×
I/O 파라미더 성정 장치 리스트 - 월, 00: 0C 24V 입력/TR 출력, - 월, 01: 20C 24V 입력/TR 출력, - 월, 01: 20E - CO4S (4채실) - 20: CI 출트 - 20: CI 출트	승 로 (메인) 1 2 3 4 5 6 7	모듈 DC 24V 입력/TR 출력, XBF-TC04S (4원달)	설명	입력 필터 3 표준[ms] -	비상 출력 [폴트 -	(?) 활당 정보 P00000 ~ P0003F P00040 ~ P0007F	×
· · · · · · · · · · · · · · · · · · ·	(X) 베이스	삭제(<u>B</u>)] [베미스 설정(<u>S</u>)] (전체삭제(<u>D</u>) 상세히	(I) 인쇄(P)	•	확인 취소	

ADO-TC02A (TC, 2-CH)		<u>r</u>
XBO-TC02A (TC, 2-CH)		
Parameter	CH 0	CH 1
Channel status	Disable	Disable
Sensor type	К	К
Temp. unit	Celsius	Celsius
Count-Avr	0	0
0, 2~64000	ОК	Cancel

(2) Program example

Í	U0A.00.F	U0A.00.E	U0A.01.0			M00000
52	_0A_RDY	_0A_WDT_ ERR	_0A_CH0_ ACT			
	M00000			MOV	U0A.04	D00000
56					_0A_CH0_ TEMP	
	U0A.01.4					M00001
59	_0A_CH0_ BOUT					-3/
						END

(a) If module is under normal operation, M0000 is on.

U0A.00.F(module Ready) = On

U0A.00.E(module H/W error) = Off

- U0A.01.0(CH0 running) = On
- (b) If M0000 is on, temp. conversion value (U0A.04) of CH0 moves to D0000.
- (c) If disconnection error occurs at CH0, U0A.01.4 (CH0 disconnection) is on and M0001 bit is set.

12.13.2 Program example using PUT/GET instruction

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1) Prog	ram exar	nple (XBC	CType)						
	F0009B			PUT	Г	10	0	1	1
0	_10N								
	U0A.00.F	U0A.00.E	U0A.01.0						M00000
5	_0A_RDY	_0A_WDT_ ERR	_0A_CH0_ ACT						•
								302	302
	M00000						MOV	U0A.04	D00000
9								_0A_CH0_ TEMP	
	U0A.01.4								M00001
12	_0A_CH0_ BOUT								
								0	
14	M00000			GET	Г	10	16	D00001	1
									END
19				í					

(a) It writes h0001 at address 0 of slot 1 in order to enable CH0 by using PUT instruction.

(b) If module is under normal operation, M0000 is on.

U0A.00.F(Module Ready) = On

U0A.00.E(Module H/W error) = Off

U0A.01.0(CH 0 running) = On

(c) If M0000 is on, temp. conversion value of CH0 moves to D0000.

Current temp. conversion value, 278(27.8℃2) is saving in U0A.04.

- (d) If disconnection error occurs at CH0, U0A.01.4 (CH0 disconnection) is on and M0001 bit is set.
- (e) If M0000 is on, setting error (address 16) of CH0 moves to D0001. Since setting error (address 16) of CH0 is 0, there is no setting error.

\rightarrow		21 /			
LO				INST	
				PUT_WOR	
	%FX155			REQ DON	
	_10N			E	
L1			0	BAS STAT	
12				E	· · · · · · · · · · · · · · · · · · ·
			10	SLO	
L3				Τ	
			0	MAD	i i i i d
L4			1	DATA	
15					
-					
L6	%UX0.10.1 %UX0.10.1	%UX0.10.1			
		6 			%MX0
	_0A_RDY _0A_WDT_	_0A_CH0_			
17	ERR	ACI			
L/	%MX0			MOVE	
				EN ENO-	
L8			0/10MD 10 4		
			_0A_CH0_	IN OUT CHULDAIA	
			TEMP		
19					
1 10	%UX0 10 2				· · · · · · · · · · · · · · · · · · ·
2.00	0				%MX1
	OA CHO				<s></s>
	BOUT				
L11					
	%MX1			D D	
				REQ DON-	
L12				E	
			U	BAS STAT	
213			10	SLO DATA ERR_DATA	
L14				Τ	· · · · · · · · · · · · · · · · · · ·
			16	MAD	
L15				DR	

(2) Program example (IEC Type)

(a) It writes 1 at address 0 of slot 1 in order to enable CH0 by using PUT instruction.

- (b) If module is under normal operation, %MX0 is on.
 - %UX0.10.15 (Module Ready) = On
 - %UX0.10.14 (Module H/W error) = Off
 - %UX0.10.16 (CH 0 running) = On

(c) If M0000 is on, temp. conversion value of CH0 moves to CH0_DATA.

Current temp. conversion value, CH0 Temp Value(%UW0.10.4) is saving in CH0_DATA.

- (d) If disconnection error occurs at CH0, %XU0.10.20 (CH0 disconnection) is on and %MX1 bit is set.
- (e) If %MX0 is on, setting error (address 16) of CH0 moves to ERR_DATA. Since setting error (address 16) of CH0 is 0, there is no setting error.

12.13.3 Example when error occurs

(1) Program Example

I

	F0009B				PUT	10	0	1	1
0	_10N								
	U0A.00.F	U0A.00.E	U0A.01.0						
5	_0A_RDY	_0A_WDT_ ERR	_0A_CH0_ ACT						-
								-2500	-2500
	M00000						MOV	U0A.04	D00000
9								_0A_CH0_ TEMP	
	U0A.01.4								M00001
12	_0A_CH0_ BOUT								-
								0	
14	M00000			[GET	10	16	D00001	1
									END
19									-

(a) If disconnection error occurs at CH0, U0A.01.4 (CH0 disconnection) is on and M0001 bit is set

(b) If disconnection error occurs at CH0, min. value within the range of K type temperature senor is displayed at U01.04.

(c) It is monitored as follows according to monitor display type.

When monitoring the temp. conversion value, select "Unsigned Decimal".

Monitor display type	Display content
Unsigned Decimal	63036
Signed Decimal	-2500 (-250.0℃)
Hexadecimal	hF63C
As Instruction	63036

12.14 Troubleshooting

The chapter describes diagnostics and measures in case any trouble occurs during use of thermocouple input module.

12.14.1 Status in case of error

You can check whether there is error or not according to the module status.

Items	Normal	Disconnection	Module H/W error (Heavy error)	
Operation	Normal operation	Normal operation	Modulo function stops	
Operation	Every function works	Min. temp. is displayed	would function stops	
Measure	_	Checking sensor wiring	Customer service	

12.14.2 Stats check of module

Module type, module information, O/S version and module status of thermocouple input module can be checked through XG5000 system monitoring function.

- (1) Execution sequence
 - Two routes are available for the execution.
 - (a) [Monitor] -> [System Monitoring] -> And on the module screen, click the right mouse button to display [Module Information].
 - (b) [Monitor] -> [System Monitoring] -> And Double-click the module screen.
- (2) Module information
 - (a) Module type: shows the information of the module presently installed.
 - (b) Module information: shows the O/S version information of module.
 - (c) O/S version: shows the O/S prepared date of module.

12.14.3 Troubleshooting



Chapter 13 Analog Input Module (XBF-AD04C)

13.1 Setting Sequence before Operation

Before using the analog input module, follow steps below.



13.2 Specifications

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13.2.1 General specifications General specifications are as follows.

No.	ltem		Related specifications					
1	Ambient temperature		-					
2	Storage temperature		-25 ℃ ~ +70 ℃					
3	Ambient humidity		5 ~ 95%RH (Non-condensing)					
4	Storage humidity		:	5 ~ 95%RH (N	on-condensing)		-	
			Occasi	onal vibration		-	-	
		Frequency	Ac	celeration	Amplitude	How many times		
		5 ≤ f < 8.4 ⊞	Z	-	3.5 mm			
	Vibration	8.4 ≤ f ≤ 150 I	lz 9.	8 m/s² (1G)	-			
5	resistance		For conti	nuous vibratio	n	10 times each	IEC61131-2	
		Frequency	Ac	celeration	Amplitude	directions (X. Y and Z)		
		5 ≤ f < 8.4 ⊞	Z	-	1.75 mm			
		8.4 ≤ f ≤ 150 I	Iz 4.9	m/s² (0.5G)	-			
6	Shock resistance	 Peak acceleration Duration: 11ms Half-sine, 3 times 	IEC61131-2					
		Square wave Impulse noise		AC: ± 1,500V DC: ± 900V				
		Electrostatic discharge		IEC 61131-2, IEC 61000-4- 2				
7	7 Noise resistance	Radiated electromagnetic field noise	80 ~ 1,000 MHz, 10V/m			//m	IEC 61131-2, IEC 61000-4- 3	
		Fast transient	Segment Power supp module		y Digital/an commun	Digital/analog input/output communication interface		
			Voltage 2kV 1kV				4	
8	Environment	Free from corrosive gasses and excessive dust					-	
9	Altitude	Up to 2,000 ms					-	
10	Pollution degree	Less than equal to 2				-		
11	Cooling	Air-cooling					-	

13.2.2 **Performance specifications** Performance specifications are as follows.

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Items			Performance specification					
Number of channels			nnels	4 channels				
		Т	уре	Voltage	Current			
Analog				DC 1 ~ 5V DC 0 ~ 5V DC 0 ~ 10V DC -10 ~ 10V (Input resistance: 1 $M\Omega$ min)	DC 4 ~ 20mA DC 0 ~ 20mA (Input resistance: 250 Ω)			
input		Range		Current input or Voltage input can be selected through the external terminal wiring setting. ► In voltage mode, use V+ and COM terminal for the channel. In current mode, short V+ and COM terminal and then use I+ and COM terminal				
		Т	_ уре	16 bit binary da	ta (Data : 14Bit)			
		l N	Unsigned value	0 ~ 1	6,000			
		S	Signed value	-8,000	~ 8,000			
Digital output	Rang	Precise value		1,000 ~ 5,000 (1 ~ 5V) 0 ~ 5,000 (0 ~ 5V) 0 ~ 10,000 (0 ~ 10V) -10,000 ~ 10,000 (±10V)	4,000 ~ 20,000 (4 ~ 20 ^{mA}) 0 ~ 20,000 (0 ~ 20 ^{mA})			
		Percentile value		0 ~ 10,000				
				1/16,000				
Max. resolution		on	0.250mV (1 ~ 5V) 0.3125mV (0 ~ 5V) 0.625mV (0 ~ 10V) 1.250mV (±10V)	1.0 ^{µA} (4 ~ 20 ^{mA}) 1.25 ^{µA} (0 ~ 20 ^{mA})				
	Асси	uracy		±0.2% or less (When am	bient temperature 25°			
Max	conve	rsion	speed					
Abs	solute	max.	input	DC ±15V	DC ±30 ^{mA}			
		Filte	r	Digital filter(4 ~ 64,000ms)				
		Aver		Time average (4~16,000 ^{ms})				
		Aver	aye	Count average (2~64,000times)				
Addition	,	Dete	ection alarm	Disconnection(DC 1~5V, DC 4~20 ^{mA})				
function		Hold last value		When input signal exceeds the effective range, holds the last effective value.				
		Alarr	m function	When input signal exceeds the effective range, relevant flag turns on.				
Insulation method		hod	Photo-coupler insulation between input terminal and PLC power (No insulation between channels)					
Connection terminal		minal	15 point terminal block					
I/O points occupied		ıpied	Fixed type assignment: 64					
Max. attachable number		number	7 [vvnen using XBM-DXXX ^D (D:"S", H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type)					
Consumpti	on	Inter	rnal (DC 5V)	105mA				
current		Exter	nal (DC 24V)	100mA				
	We	ight		72g				
Module input power		ower	DC 20.4~28.8V					

Segment	Version
XBM-DxxxS Type	V3.30 or above
XBC-DxxxH Type	V2.20 or above
XBC-DxxxSU Type	V1.30 or above
XBC-DxxxS Type	V1.20 or above
XEC-DxxxH Type	V1.50 or above
XEC-DxxxSU Type	V1.10 or above
XG5000	V3.64 or above

Remark 1) To use the analog input module (14 Bit), It needs the basic unit more than below table.

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13.3 Name of each Part and Functions

Respective designations of the parts are as described below.



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No.	Name	Description
1	RUN LED	 Displays the operation status of module On: Operation normal Blinks: Error occurs (Flickering 1s intervals) Off: Power off or module error
2	Terminal	Wiring terminal block to connect with external device
3	External power supply	Terminal for supplying the external DC24V
4	Ext. Connector	Connector for extension modules.

13.4 Characteristic of I/O Conversion

Voltage/Current input ranges are able to set from each channel by using user program or I/O parameter. Data output type of digital is defined as below.

- (1) Unsigned Value
- (2) Signed Value

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- (3) Precise Value
- (4) Percentile Value



(1) DC 4 ~ 20mA Input range

Digital	Analog input current (mA)						
output range	3.808	4	8	12	16	20	20.191
Unsigned value (-192 ~ 16191)	-192	0	4,000	8,000	12,000	16,000	16,191
Signed value (-8192 ~ 8191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191
Precise value (3808 ~ 20191)	3,808	4,000	8,000	12,000	16,000	20,000	20,191
Percentile value (-120 ~ 10119)	-120	0	2,500	5,000	7,500	10,000	10,119

(2) DC 0 ~ 20mA Input range

Digital	Analog input current (mA)							
output range	-0.24	0	5	10	15	20	20.239	
Unsigned value (-192 ~ 16191)	-192	0	4,000	8,000	12,000	16,000	16,191	
Signed value (-8192 ~ 8191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191	
Precise value (-240 ~ 20239)	-240	0	5,000	10,000	15,000	20,000	20,239	
Percentile value (-120 ~ 10119)	-120	0	2,500	5,000	7,500	10,000	10,119	
(3) DC 1 ~ 5V Input range

Digital	Analog input voltage (V)							
output range	0.952	1	2	3	4	5	5.047	
Unsigned Value (-192 ~ 16,191)	-192	0	4,000	8,000	12,000	16,000	16,191	
Signed Value (-8,192 ~ 8,191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191	
Precise Value (952 ~ 5,047)	952	1,000	2,000	3,000	4,000	5,000	5,047	
Percentile Value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119	

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(4) DC 0 ~ 5V Input range

Digital	Analog input voltage (V)							
output range	-0.06	0	1.25	2.5	3.75	5	5.059	
Unsigned Value (-192 ~ 16,191)	-192	0	4,000	8,000	12,000	16,000	16,191	
Signed Value (-8,192 ~ 8,191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191	
Precise Value (-60 ~ 5,059)	-60	0	1,250	2,500	3,750	5,000	5,059	
Percentile Value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119	

(5) DC 0 ~ 10V Input range

Digital	Analog input voltage (V)							
output range	-0.12	0	2.5	5	7.5	10	10.119	
Unsigned Value (-192 ~ 16,191)	-192	0	4,000	8,000	12,000	16,000	16,191	
Signed Value (-8,192 ~ 8,191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191	
Precise Value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119	
Percentile Value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119	

(6) DC -10 ~ 10V Input range

Digital	Analog input voltage (V)							
output range	-10.24	-10	-5	0	5	10	10.239	
Unsigned Value (-192 ~ 16,191)	-192	0	4,000	8,000	12,000	16,000	16,191	
Signed Value (-8,192 ~ 8,191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191	
Precise Value (-10,240 ~ 10,239)	-10,240	-10,000	-5,000	0	5,000	10,000	10,239	
Percentile Value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119	

13.5 Accuracy

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Accuracy of digital output value does not changed even if input range is changed. Figure below shows the range of the accuracy with analog input range of $0 \sim 10$ V and digital output type of unsigned value selected.

Accuracy of XBF-AD04C is ±0.2% (ambient temperature of 25 degrees)



- (1) Accuracy when using 5V input 16,000 × 0.2% = 32 Therefore the range of the accuracy will become (8,000-32) ~ (8,000+32) = 7,968 ~ 8,032 when using 5V input.
- (2) Accuracy when using 10V input 16,000 × 0.2% = 32 Therefore the range of the accuracy will become (16,000-32)~(16,000+32) = 15,968 ~16,032 when using 10V input.

13.6 Functions of Analog Input Module

Function	Description
Channel Run/Stop setting	 Specify Run/Stop of the channel to execute A/D conversion. If the unused channel is set to Stop, whole Run time can be reduced.
Input voltage/current range setting	 Specify analog input range to be used. Select range in parameter setting after select Voltage/Current switch. Analog input module provides two kinds of current input ranges (4~20mA, 0~20mA) and four kinds of voltage input ranges (1~5V, 0~5V, 0~10V,10~10V)
Output data format setting	 Specify digital output type. 4 output data formats are provided in this module. (Unsigned value, Signed value, Precise value, Percentile value)
A/D conversion methods	 Sampling processing Sampling process will be performed if A/D conversion type is not specified. Filter processing Used to delay the sudden change of input value. Average processing Outputs average A/D conversion value based on frequency or time. Detection alarm After detecting whether disconnection of the input circuit, the alarm is displayed by a single flag. (Input signal range : 4 ~ 20^{mA}, 1 ~ 5 V) Maintenance function of valid conversion value. When valid conversion value is exceeded, whether conversion value retains will be able to set. Alarm function When exceeding valid input range, alarm and maximum /minimum flag will be generated.

Functions of XBF-AD04C conversion module are as described below.

13.6.1 Sampling processing

It collects analog input sign through general A/D conversion processing at a specific interval to convert to digital. The time required for A/D conversion of analog input sign till saved on the memory depends on the number of channels used.

(Processing time) = (Number of channels used) X (Conversion speed)

(Ex.) If the number of channels used is 3, its process time will be $3 \times 1 \text{ ms} = 3 \text{ ms}$

Sampling is to calculate the sampling value of continuous analog sign at a specific interval.

13.6.2 Filter processing

 $\begin{aligned} \text{Pre-filter input value and specified channel are calculated as below.} \\ \text{Filtered Value} = \frac{(\text{Pre-Filtered Input Value} \times \text{Filter Constant}) + (\text{Current Input Value} \times \text{Ims} \times \text{Number of used channels})}{\text{Filter Constant} + (1\text{ms} \times \text{Number of used channels})} \end{aligned}$

Setting range of Filter constant = 4 ~ 64,000 [ms]



As the above graph, if the input value rapidly decreases from 0 to 10,000, the input value will be filtered. Specified time with filter constant is that the input value is the time to change by 63.2% of actual time constant.

13.6.3 Average processing

1) Time average

Input value of specified channel accumulates during setting time and then the average value of the sum is shown with digital data.



Setting range = $4 \sim 16,000$ [ms]

In case of the time average, the average processing count is calculated by depending on the number of used channels.

Average processing count = $\frac{\text{Average time}}{\text{Number of used channels} \times 1ms}$

2) Number of averages

Input value of specified channel accumulates during setting numbers and then the average value of the sum is shown with digital data.



Setting range = $2 \sim 64,000$ [times]

In case of number of averages, the average processing interval is calculated by depending on used channels.

Average processing interval [ms] = Number of averages × Number of used channels × 1ms

Notes

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- (1) In case of the time/number of average, every conversion time input value is not outputted. And precondition is retained until the average time/number is arrived.
- (2) Two kinds of average functions and introduced filtering functions that are above are able to deal with at the same time.

When those are chosen at the same time, the top priority is filter function in the processing sequence. And then the chosen average function is adapted. Finally, digital data is outputted. At that time digital data value is outputted as the final processing value.

13.6.4 Detecting disconnection wire

In case that Input voltage(DC 1~5V) or Input current (DC 4~20 mA) is chosen with analog input range, the analog input module has diagnostic function by checking disconnection and showing. If the module shows disconnection, that means the parts of connections in the wiring connection are faulty. If so, check and take action.

(1) Detection conditions

When input signal range of 4~20mA and 1~5V is used, disconnection of input circuit can be detected. The detection conditions of each input signal range are as below.

Input signal range	Voltage/Current recognized as a disconnection
4~20 mA	0.8 ^{mA} or less
1 ~ 5 V	0.2 V or less

- (2) When between used wiring and module is disconnected, the LED will be turned on/off 1s intervals and make an error code.
- (3) Each channel can detect disconnection. However, Disconnection is only displayed for specified operation channel. The LED can commonly use the channel from 0 to 3. If one or more channel is disconnected, LED will be turned on/off.

Input connections	Channel operation	LED condition	Disconnection flag
Normal	Operation	On	Off
normai	Stop	On	Off
Input wiring is disconnected	Operation	Flickering 1s intervals	On
or Input is not connected.	Stop	On	Off

(4) In case of disconnection, disconnection flag of relevant channel will turn on and In case of connection, disconnection flag of relevant channel will turn off.

Disconne	ection flag	Decorintion	Condition	
XBM/XBC	XEC	Description	Condition	
U0y.10.0	%UX0.y.160	Channel 0 disconnection		
U0y.10.1	%UX0.y.161	Channel 1 disconnection	Off: Normal	
U0y.10.2	%UX0.y.162	Channel 2 disconnection	On: Disconnection	
U0y.10.3	%UX0.y.163	Channel 3 disconnection		

The 'y' is a slot number equipped with a module.

(5) In case of disconnection, the input value displays the lowest value among each input range.

13.6.5 Function retaining valid conversion value

When the valid signal is out of the range, the last converted valid input value is retained. The function retaining valid conversion value is able to designate for each channel by user program and I/O parameter setting.

1) Used input range

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In the channels that allow the function retaining valid conversion value, the actual ranges provided within each digital conversion value are shown.

For example, in case of operating output data type of unsigned value, original digital output value is shown from -192 to 16,191.

However, if this function is allowed, it will be shown from 0 to 16,000.

(1) Digital output value depending on input range (unsigned value, signed value, percentile value)

Classification	Unsigned value	Signed value	Precise value	Percentile value
Unapplied case	-192~16,191	-8,192~8,191	(2) Deference	-120~10,119
Applied case	0~16,000	-8,000~8,000	(2) Reference	0~10,000

(2) Digital output value depending on input range (Precise value)

Analog input range	Classification	Precise value	
4 20 m∆	Unapplied case	3,808~20,191	
4~20	Applied case	4,000~20,000	
0 20mA	Unapplied case	-240~20,239	
0~20	Applied case	0~20,000	
1 5\/	Unapplied case	952~5,047	
1~50	Applied case	1,000~5,000	
0 5\/	Unapplied case	-60~5,059	
0~30	Applied case	0~5,000	
0 ~ 10\/	Unapplied case	-120~10,119	
0~100	Applied case	0~10,000	
-10 ~ 10\/	Unapplied case	-10,240~10,239	
-10~100	Applied case	-10,000~10,000	

2) Operation

When operating with $4 \sim 20$ mA while being allowed this function, output value for input value change of the moment is as follows. (Output data type : In case of $0 \sim 16,000$)

Input current(^{mA})	12 mA	3mA	4 mA	12 mA	21 mA	20 mA
Digital output value	8,000	8,000	0	12,000	12,000	16,000
Remarks for reference	_	Retaining previous value	_	_	Retaining previous value	_

13.6.6 Alarm function

When the input signal is exceeded from valid value, the alarm will be shown through alarm flag of relevant channel.

1)Input detection function

Analog input range	Difference	Permission range	Low limit	High limit
4 ~ 20 ^{mA}	16 ^{mA}		3.808mA	20.192 ^{mA}
0 ~ 20 ^{mA}	20 mA		-0.24 mA	20.24mA
1 ~ 5V	4V	4.00/	0.952V	5.048V
0 ~ 5V	5V	1.2%	-0.06V	5.06V
0 ~ 10V	10V		-0.12V	10.12V
-10 ~ 10V	20V		-10.24V	10.24V

Detection condition for each input signal range is as below.

2)Alarm sign of each channel

Alarm detection signal about each input channel is shown on U0y.11 and U0y.12. If the input signal come back, the alarm detection sign will automatically come back. (The 'y' is the slot number of equipped modules.)

(1) High limit alarm (U0X.11)

Device as	signment	Description	Status description
XBM/XBC	XEC	Description Status des	
U0y.11.0	%UX0.y.176	Channel0 high limit alarm	
U0y.11.1	%UX0.y.177	Channel1 high limit alarm	Off: Normal
U0y.11.2	%UX0.y.178	Channel2 high limit alarm	occurrence
U0y.11.3	%UX0.y.179	Channel3 high limit alarm	

(2) Low limit alarm (U0X.12)

Device as	signment	Description Status descript	
XBM/XBC	XEC		
U0y.12.0	%UX0.y.192	Channel0 low limit alarm	
U0y.12.1	%UX0.y.193	Channel1 low limit alarm	Off: Normal
U0y.12.2	%UX0.y.194	Channel2 low limit alarm	occurrence
U0y.12.3	%UX0.y.195	Channel3 low limit alarm	

13.7 Installation and Wiring

13.7.1 Installation and separation of module

Notices in handling

Use the PLC within general specification ranges from instructions. When the PLC is used out of the specified ranges, it will cause burning, getting electric shock, abnormal operation.

Caution Fix the module after being equipped with binding bump of module. If the module is incorrectly attached, the module will be broken and malfunction. > Please be careful for external impact, like falling the case of module, terminal connector. • Do not separate the PCB board of module from the case. (1) Installation of module

- Remove the extension cover above the module to connect.
- Push modules to connect each other after situating four positions binding correctly.
- After connection, fix the binding hook that is in the upward part and downward part completely.



Hook for module fixing

(2) Separation of module

- Divide connections by lifting hook for module fixing in the upward part and downward part.
- Separate modules by holding modules with both hands. (Do not hold strongly in the module.)



Hook for module separating

\triangle Caution

When you try to separate the modules strongly, the hook and bump for fixing will be broken.

13.7.2 Notices in wiring

- (1) Do not put the power line near the external I/O signal line of analog input module. You have to secure enough distance to avoid the interruption from the induced noise and the surge.
- (2) The wire has to select by considering permitted current and the ambient temperature. The maximum wire size is good in case of AWG22 (0.3^{mm}) or more.
- (3) When the wire is so near with high temperature machines and materials and touched with oil for a long time, it can be short circuit and malfunction.
- (4) When doing terminal ports wiring, check the polarity.
- (5) In case that the high voltage line and the power line are wired at the same time, the induced interruption is caused. So it can be a reason for breakdown.

13.7.3 Example for the wiring

- (1) The input resistance of current input circuit is 250Ω (typ.).
- (2) The input resistance of voltage input circuit is 1 M Ω (min.).
- (3) Set the operation mode only if you want to use channels.
- (4) The analog input module doesn't provide the power for input device. Use the external power device.
- (5) Example for analog input wiring When inputting the voltage, relevant channel V+ and COM terminal is used. When inputting the current, relevant channel V+ and COM terminal is used after connecting between V+ and I+ terminal.
 - a) Voltage wiring



X DC power for analog power supply have to connect DC24V- with PE.

b) Current wiring



- % DC power for analog power supply have to connect DC24V- with PE.
- (6) The example of analog input 2-Wire sensor/transmitter wiring(The current wiring) Use the I+ and COM terminal after connecting V+ with I+ terminal.



* DC power for analog power supply have to connect DC24V- with PE.

(7) The example of analog input 4-Wire sensor/transmitter wiring(The current input) Use the I+ and COM terminal after connecting V+ with I+ terminal.

Г



* DC power for analog power supply have to connect DC24V- with PE.

(8) Relationship between voltage input accuracy and wiring length

In voltage input, the wiring (cable) length between transmitter or sensor and module has an effect on digital-converted values of the module as specified below;



Where,

Rc: Resistance value due to line resistance of cable

Rs: Internal resistance value of transmitter or sensor

Ri: Internal resistance value (1MQ) of voltage input module

Vin: Voltage allowed to analog input module

% Vi: Tolerance of converted value (%) due to source and cable length in voltage input

$$Vin = \frac{Ri \times Vs}{\left[Rs + \left(2 \times Rc\right) + Ri\right]}$$

%Vi = $\left(1 - \frac{Vin}{Vs}\right) \times 100\%$

Remark

(1) While using a input voltage range among 1~5V, 0~5V, 0~10V, -10~10V If the external wiring is disconnected, It will take a certain amount of time to display output data value of 0V.If you want to reduce that time, connect the resistance about $0.1M\Omega \sim 1M\Omega$ between input channel V+ and COM.

13.8 Operation Parameter Setting

A/D conversion module's operation parameters can be specified through XG5000's [I/O parameters].

(1) Settings

I

For the user's convenience of A/D conversion module, XG5000 provides GUI (Graphical User Interface) for parameters setting of A/D conversion module. Setting items available through [I/O parameters] on the XG5000 project window are as described below in the table.

Item	Details
[I/O parameter]	 (a) Parameter setting Specify the following setting items necessary for the module operation. 1) Channel Enable/Disable setting 2) Input voltage(current) range 3) Output data format setting 4) Filter constant setting 5) Average processing method setting
	6) Average value setting (b) When the parameters set by user in XG5000 is downloaded, that data is
	saved in flash memory of XGB basic unit.

- 2) [I/O Parameter] Using method
 - (1) Run XG5000 to create a project.
 - (Refer to XG5000 program manual for details on how to create the project)
 - (2) Double-click [I/O parameters] on the project window.

Project Window	- x
Items	
 ➡ W:lk * ➡ WewPLC(XGB-XBCH)-Run ➡ Wariable/Comment ➡ Parameter ➡ Basic Parameter ➡ I/O Parameter ➡ I/O Parameter ➡ Embedded Parameter ➡ Scan Program ➡ WewProgram 	
Project	

(3) [I/O Parameter setting] On the 'I/O parameters setting' screen, find and click the slot equipped with analog input module.

All Base Set Base	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
OI : Default O2 : Default O3 : Default O4 : Default O5 : Default O6 : Default O7 : Default O7 : Default O9 : Default O9 : Default O9 : Default	0(nan) 1 2 3 4 5 6 7 8 9 9 10					

(4) Click the arrow button on the screen above to display the screen where an applicable module can be selected. Search for the applicable module to select.



(5) After the module selected, click [Details].

I/O Parameter Setting						?×
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
	1	XBF-AD04C(Volt/Curre				P0040 ~ P007F
03 : Default	2					
	3					
05 : Default	4					
06 : Default	5					
07 : Default	6					
08 : Default	7					
09 : Default	8					
10: Default	9					
	10					
< >						
<u>Current Consumption</u>	Slot De	lete <u>B</u> ase Base <u>S</u> etting	Delete All	De <u>t</u> ails <u>P</u>	rint 🔻 📃	OK Cancel

(6) A screen will be displayed for you to specify parameters for respective channels as below. Click a desired item to display parameters to set for respective items.

XBF-AD04C(Volt/Cur	rent, 4-CH,	. 14bit)		?×
XBF-AD04C(Volt/Current, 4-C	:H, 14bit)			
Parameter	CHO	CH1	CH2	СНЗ
Channel status	Disable	Disable	Disable	Disable
Input range	4~20mA	4~20mA	4~20mA	4~20mA
Output type	0~16000	0~16000	0~16000	0~16000
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Hold last value	Disable	Disable	Disable	Disable
			ОК	Cancel

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13.9 Special Module Monitoring Functions

Functions of Special Module Monitoring are as described below.

- 1) Start of [Special Module Monitoring]
 - Go through [Online] \rightarrow [Connect] and [Monitor] \rightarrow [Special module Monitoring] to start. If the status is not online, [Special Module Monitoring] menu will not be activated.

🖏 XBF-ADU4C - XG5000 - LNewProgra	IM1		
🖩 Project Edit Find/Replace View Online	<u>M</u> oi	nitor <u>D</u> ebug <u>T</u> ools <u>W</u> indow	<u>H</u> elp
D 2 6 8 5 6 8 8 8 8		Start <u>M</u> onitoring	E 🕸 🕮 🛠 🛛 🛤 🛤
	Þ	<u>R</u> esume	- 2 2 17 77 73
■ FS + + +/+ +P+ +N+ + # ++ -(-)- +(/)- +(5 ESC F3 F4 SF1 SF2 F5 F6 SF8 SF9 F9 F11 SF	₽	Pausing Conditions	
Project Window	3	Change Current <u>V</u> alue	
Items	Ð	System Monitoring	
⊡-खुः XBF-AD04C	¢	Device Monitoring	
NewPLC(XGB-XBCH)-Stop	Q.	Special Module Monitoring	
Parameter	W.	Trend Monitoring	
Basic Parameter	Įп.	PID Monitoring	
		SOE Monitoring	
⊞ jag Embedded Parameter	ø	Custom Events	
NewProgram	M	Data Tra <u>c</u> es	
	_		

Notes

1) The screen may not normally be shown due to the lack of system resource. In this case, terminate all applications and try to start XG5000 again.

2) I/O parameter set in status of [Special Module Monitor] is temporally set to implement the test. So, If status of [Special Module Monitor] is ended, I/O parameter which is set becomes extinct.

3) The test of [Special Module Monitor] is a examination function to check operation of the analog input module when the sequence program is not made up.

2) How to use special module monitoring

(1) With XG5000 connected to PLC CPU (on-line status), click [Monitor] -> [Special Module Monitoring] to display 'Special Module Select' screen as below showing base/slot information in addition to special module type. The module installed on the present PLC system will be displayed on the list dialog box.

Special Mod	dule List	X
Base	Slot	Module High Speed Counter Module(Open-Collector, 8-CH)
Base 0	Internal	Position Module (Open-Collector, 2-CH) XBF-AD04C(Volt/Current, 4-CH, 14bit)
4		
Module Info.	<u>M</u> onitor) Close

(2) Select "Special Module" and click [Module information] to display the information as below.

5	pecial Module Info	ormation ? X
	Displays the inform	nations of special module.
	ltem	Information
	Module Name	XBF-AD04C(Volt/Current, 4-CH, 1
	OS Ver	Ver. 1.0
	OS Update Date	2012-7-12
	Module Status	Normal. (0)
	1	OK

Γ

(3) Click [Monitor] on the "Special Module" screen in [Special Module List] to display [Special Module Monitoring] screen as below.

XBF-AD04C(Volt/0	Current, 4-CH	l, 14bit) 🥐 🗙
XBF-AD04C(Volt/Current,	4-CH, 14bit)	
Item	Max/Min	Current value
Ch0 A/D Value		
Ch1 A/D Value		
Ch2 A/D Value		
Ch3 A/D Value		
Item	Setting value	Current value
Channel	Chi)
Channel status	Disable	
Input range	4~20mA	
Output type	0~16000	
Filter constant	0	
Average processing	Sampling	
Average value	0	
Hold last value	Disable	
	Start <u>M</u> onitorin	ng <u>I</u> est Close

(4) Start Monitoring: Click [Start Monitoring] to show digital input data of current operated channel. When the channel is operating you can see the painting through monitor.

Item	Max/Min	Current value	$\overline{\Lambda}$	
Ch0 A/D Value	0/0	0		
Ch1 A/D Value	0/0	0		Monitoring
Ch2 A/D Value	0/0	0		_
Ch3 A/D Value	0/0	ر ٥	1	
Item Channel	Setting value	Uurrent value	l t	
Channel				
Channel status	Disable	Disable		
Input range	4~20mA	4~20mA		
Output type	0~16000	0~16000	. ↓	CH0 detai
Filter constant	0	0		L
Average processing	Sampling	Sampling		
Average value	0	0		
Hold last value	Disable	Disable	/	
<u>R</u> eset max/min value	Stop <u>M</u> onitorir	ng] <u>I</u> est		

Execution screen of [Start Monitoring]

(5) Test: [Test] is a function to change the parameter of the analog input module which is presently set. In case of clicking the setting value in the bottom of the screen, you can change the parameter. [Test] is able to set only if operation status of XGB's basic unit is stop.

ltem	Max/Min	Current value					
Ch0 A/D Value	0/0	0					
Ch1 A/D Value	0/0	0					
Ch2 A/D Value	0/0	0					
Ch3 A/D Value	0/0	0					
Item	Setting value	Current value					
Channel	C	hO					
Channel status	Enable	Enable					
Input range	4~20mA	4~20mA					
Output type	0~16000	0~16000					
Filter constant	0	0					
Average processing	Sampling	Sampling					
Average value	0	0					
Hold last value	Disable	Disable					
Reset max/min value Stop Monitoring							

Execution screen of [Test]

(6) Max/Min Value Monitor

Γ

Max/Min value of input channel in operation can be monitored. However, visible Max/Min values are based on present value.

So Max/Min value is not saved when [Monitoring/Test Screen] is closed.

Item	May/Min	Current value		
Ch0 A/D Value	070			
Ch1 A/D Value	0/0	- 0		Monitoring of Max/Min value
Ch2 A/D Value	0/0	0		
Ch3 A/D Value	0/0 /	0		
ltem Channel	Setting value	Current value		
Channel		, 		
Channel status	Disable	Enable		
Input range	-10~10V	4~20mA		
Output type	0~16000	0~16000		
Filter constant	0	0		
Average processing	Sampling	Sampling		Reset of Max/Min value
Average value	0	0	-	
Hold last value	Disable	Disable		
	Stop <u>M</u> onitorir	ng <u>I</u> est)	

(7) Close

[Close]: [Close] is used to escape from the monitoring/test screen. When the monitoring /test screen is closed, the max. value, the min. value and the present value will not be saved any more.

13.10 Register U Devices

Register the variables for each module referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

1) Procedure

(1) Select the special module type in the [I/O Parameter Setting] window.

I/O Parameter Setting						?×
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
02 : Defeult	1	XBF-AD04C(Volt/Curre 🔻		-	-	P0040 ~ P007F
02 : Default	2					
04 : Default	3				ļ	
🖂 05 : Default	4					
06 : Default	5				ļ	
07 : Default	6					
	7				ļ	
10 : Default	8					
io : Deladit	9					
	10					
<						
	,					
<u>Current Consumption</u> <u>D</u> elete	Slot De	lete <u>B</u> ase Base <u>S</u> etting	Delete All	etails <u>P</u>	rint 🔻	OK Cancel

(2) Double click 'Variable/Comment' from the project window.

XBE-AD04C - XG5000 - [Variable/Comment]	
La Project Edit Eind/Replace View Online Monitor Det	ebug Iools Window Help
	○○×№高×1-40×2,5 1 ▲ ▲ 20 22 2 3 10 0 0
IX % 000 B 7 6 8 8 B B B	· · · · · · · · · · · · · · · · · · ·
[品片以出茶 〒 1 清清 日前潟 出 出	**************************************
Project Window - ×	V View Variable D View Device
	Veriable Type Device Used Comment 1 - </td
C Project	📷 NewProgram 🙀 Variable/Comment
×□<□>>>> Monitor 1 & Monitor 2 & Monitor 3 & Monitor 4	4/
	NewPLC Stop L, USB, OK View Variable Overwrite

(3) Select [Edit] – [Register U Device].

🖷 XBF-AD	004	C - XG5000 - [Variable/Comment]		I
Project	Edi	Eind/Replace View Online Monitor Debu	ebug Iools Window Help	. 8 ×
1 D G G	2	Undo Ctrl+Z	² x \$\$\$ \$ < < \$ < < < < < < < < < < < < <	
	100			
10.22	*	Cut Ctrl+X	× BBB FFM FRE GE GOOD OF ON 0 0 1 44 5 5 0 5 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	
品付加	60	Copy Ctrl+C	C	
Project Windo	18	Paste Ctrl+V		
Items	×	Delete Del	el V View Variable D View Device View Fibg	
😑 🐺 XBF	-	Select All Ctrl+A	A Variable Type A Device Used Comment	^
• •).e	Insert Line Ctrl+L		
- C	8×	Delete Line Ctrl+D		
	1	Export Variables to File		
		Import Variables from File		
	-	Peopleter II Device		
	-	negister o bewce		
			E E	
			F	
		Delete All unused variables/comments		
		Reallocate All Auto-allocation Variables		
			16	
				×
Project	1		📾 NewProgram 强 Variable/Comment	
×III	[F]	Monitor 1 🖌 Monitor 2 👌 Monitor 3 🍌 Monitor 4 🖊	4 / XI ≤ ● D)\Result & Check Program & Find 1 & Find 2 & Communication & Cross Reference & Used Device & Duplic	ate Coil
Automatical	y re	gisters comments in the U Devices according t	ng to the special module set in the I/O parameter, NewPLC Stop L, USB, OK View Variable Over	write:

(4) Click 'Yes'

Chapter 13 Analog Input (XBF-AD04C)

VRE-ADM/C - VCEDID - [Variable/Common]	
Just project Fall End Realize View Childs Monitor Dehus Tools Window Help	
【□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ 1 □ □ 1 □ □ 1 □ □ □ 1 □	
· [1] 21 21 21 21 21 21 21 21 21 21 21 21 21	
▲ 好な許然 真古 清清 骨谷 將 將 將 將 册 牙 岁 岁 梦 ● 自 ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●	
Project Window - x Itoms View Variable D View Device View Flag	
le ∰ XBF-AD04C + Variable Type ▲ Device Used Comment	^
WewPLCXGB-X8CH)-Stop	
Privatele/comment xG5000	
Automatically register comments in the U Devices according to the special module set in the U/O parameter	
e. The previous comments will be deleted,	≡
B San Program	
NewProgram IN IN IN	
	_
	×
Scroject NewProgram 🙀 Variable/Comment	
Monitor 1 / Monitor 2 / Monitor 3 / Monitor 4 /	uplicate Coil
NewPLC Stop L, USB, OK	Overwrite

(5) As shown below, the variables are registered.

Γ

👒 XBF-AD04C - XG5000 - [Variable/Comment]				
I∰ Project Edit Find/Replace ⊻iew Online Monitor De	bug <u>T</u> ools <u>W</u> indow <u>H</u> e	lp		_ 8 ×
D 2 A B 4 A B 2 A B B B 0 7 1	2 2 % B R X •	**** ##	a•0 a•0 & _	10
	◓▯◙▯៷⊮	6 2 (177)	[]] +[] \$E]	1 @ 91 君魯曰曰啓 5 段段段段方符
■ Est はな はな まな まな ます	FR FR 13 12 12 12	1 1 C Q G F		V D D B B (Q Q 100% V A+ A+ E E
Project Window - ×	V View Variable	Trieve Device	1	
Items	Uariahia	Ture A Device	llead	Convent
			Useu	touinient
NewPLU(XGB-XBCH)-Stop		BIT U01.00.0		Analog Input Module: Module Error
		BIT U01.00.1	F	Analog Input Module: CHD Active
Parameter		BIT U01 01 1	F	Analog Input Module: CHI Active
國 L/O Parameter	5 01 CH2 ACT	BIT U01.01.2	F	Analog Input Module: CH2 Active
Im Embedded Parameter	6 01 CH3 ACT	BIT U01.01.3	F	Analog Input Module: CH3 Active
E-S Scan Program	7 _01_CH0_ERR	BIT U01.01.8	Г	Analog Input Module: CHO Error
RewProgram	8 _01_CH1_ERR	BIT U01.01.9	Г	Analog Input Module: CH1 Error
	9 _01_CH2_ERR	BIT U01.01.A	Г	Analog Input Module: CH2 Error
	10 _01_CH3_ERR	BIT U01.01.B	Г	Analog Input Module: CH3 Error
	11 _01_CHO_IDD	BIT U01.10.0	Г	Analog Input Module: CHO Input Disconnection Flag
	12 _01_CH1_IDD	BIT U01.10.1	Г	Analog Input Module: CH1 Input Disconnection Flag
	13 _01_CH2_IDD	BIT U01.10.2	Г	Analog Input Module: CH2 Input Disconnection Flag
	14 _01_CH3_IDD	BIT U01.10.3	Г	Analog Input Module: CH3 Input Disconnection Flag
	15 _01_CH0_HOOR	BIT U01.11.0	Г	Analog Input Module: CHO Alarm (Upper Limit)
	16 _01_CH1_HOOR	BIT U01.11.1	Г	Analog Input Module: CH1 Alarm (Upper Limit)
	17 _01_CH2_HOOR	BIT U01.11.2	Г	Analog Input Module: CH2 Alarm (Upper Limit)
	18 _01_CH3_HOOR	BIT U01.11.3	Г	Analog Input Module: CH3 Alarm (Upper Limit)
	1901_CHO_LOOR	BIT U01.12.0	Г	Analog Input Module: CHO Alarm (Lower Limit)
	20 _01_CH1_LOOR	BIT U01.12.1	<u> </u>	Analog Input Module: CH1 Alarm (Lower Limit)
	21 _01_CH2_LOOR	BIT U01.12.2	<u> </u>	Analog Input Module: CH2 Alarm (Lower Limit)
		BII 001.12.3	L	Analog Input Module: CH3 Alarm (Lower Limit)
	23 _U1_EKR_CLR	BII 001.13.0	L	Analog Input Module: Error Clear Request
	24 _U1_CHU_DATA	WURU UU1.U2	Ŀ	Analog Input Module: CHU Uutput
		WORD U01.03		Analog Input Module; CHI Uutput
	20 _UI_UH2_UATA	WUKU UU1.U4		Analog input Module: CH2 Output
-		00,100		miarog mpac Modure, ono output
■© Project	NewProgram	🕍 Variable/Comn	nent	
Monitor 1 A Monitor 2 A Monitor 3 A Monitor 4		Result / Chec	k Program ∖	Find 1 λ Find 2 λ Communication λ Cross Reference λ Used E
		NewPLC	Stop	L, USB, OK View Variable Overwrite

V	Global Variable 🕞	Direct Variable Comr	ment 🕅 I	lag					
	Variable Kind	Variable	Туре	Address	Initial Value	Retain	Used	EIP	Comment
1	VAR_GLOBAL	_01_CHO_ACT	BOOL	XUX0.1.16		Г	Г	Г	Analog Input Module: CHD Active
2	VAR_GLOBAL	_01_CHO_DATA	WORD	XUW0.1.2		Г	Г	Г	Analog Input Module: CHO Output
3	VAR_GLOBAL	_01_CHO_ERR	BOOL	%UX0.1.24		Г	Г	Г	Analog Input Module: CHO Error
4	VAR_GLOBAL	_01_CHO_HOOR	BOOL	XUX0.1.176		Г	Г	Г	Analog Input Module: CHO Alarm (Upper Limit)
5	VAR_GLOBAL	_01_CH0_1DD	BOOL	%UX0.1.160		Г	Г	Г	Analog Input Module: CHO Input Disconnection Flag
6	VAR_GLOBAL	_01_CH0_LOOR	BOOL	XUX0.1.192		Г	Г	Г	Analog Input Module: CHO Alarm (Lower Limit)
7	VAR_GLOBAL	_01_CH1_ACT	BOOL	%UX0.1.17		Г	Г	Г	Analog Input Module: CH1 Active
8	VAR_GLOBAL	_01_CH1_DATA	WORD	XUW0.1.3		Г	Г	Г	Analog Input Module: CH1 Output
9	VAR_GLOBAL	_01_CH1_ERR	BOOL	%UX0.1.25		Г	Г	Г	Analog Input Module: CH1 Error
10	VAR_GLOBAL	_01_CH1_HOOR	BOOL	%UX0.1.177		Г	Г	Г	Analog Input Module: CH1 Alarm (Upper Limit)
11	VAR_GLOBAL	_01_CH1_IDD	BOOL	%UX0.1.161		Г	Г	Г	Analog Input Module: CH1 Input Disconnection Flag
12	VAR_GLOBAL	_01_CH1_LOOR	BOOL	XUX0.1.193		Г	Г	Г	Analog Input Module: CH1 Alarm (Lower Limit)
13	VAR_GLOBAL	_01_CH2_ACT	BOOL	XUX0.1.18		Г	Г	Г	Analog Input Module: CH2 Active
14	VAR_GLOBAL	_01_CH2_DATA	WORD	%UW0.1.4		Г	Г	Г	Analog Input Module: CH2 Output
15	VAR_GLOBAL	_01_CH2_ERR	BOOL	%UX0.1.26		Г	Г	Г	Analog Input Module: CH2 Error
16	VAR_GLOBAL	_01_CH2_HOOR	BOOL	%UX0.1.178		Г	Г	Г	Analog Input Module: CH2 Alarm (Upper Limit)
17	VAR_GLOBAL	_01_CH2_1DD	BOOL	%UX0.1.162		Г	Г	Г	Analog Input Module: CH2 Input Disconnection Flag
18	VAR_GLOBAL	_01_CH2_LOOR	BOOL	%UX0.1.194		Г	Г	Г	Analog Input Module: CH2 Alarm (Lower Limit)
19	VAR_GLOBAL	_01_CH3_ACT	BOOL	%UX0.1.19		Г	Г	Г	Analog Input Module: CH3 Active
20	VAR_GLOBAL	_01_CH3_DATA	WORD	%UW0.1.5		Г	Г	Г	Analog Input Module: CH3 Output
21	VAR_GLOBAL	_01_CH3_ERR	BOOL	%UX0.1.27		Г	Г	Г	Analog Input Module: CH3 Error
22	VAR_GLOBAL	_01_CH3_HOOR	BOOL	%UX0.1.179		Г	Г	Г	Analog Input Module: CH3 Alarm (Upper Limit)
23	VAR_GLOBAL	_01_CH3_1DD	BOOL	XUX0.1.163		Г	Г	Г	Analog Input Module: CH3 Input Disconnection Flag
24	VAR_GLOBAL	_01_CH3_LOOR	BOOL	%UX0.1.195		Г	Г	Г	Analog Input Module: CH3 Alarm (Lower Limit)
25	VAR_GLOBAL	_01_ERR	BOOL	%UX0.1.0		Г	Г	Г	Analog Input Module: Module Error
26	VAR_GLOBAL	_01_ERR_CLR	BOOL	XUX0.1.208		Г	Г	Г	Analog Input Module: Error Clear Request
27	VAR_GLOBAL	_01_RDY	BOOL	%UX0.1.15		Г	Г	Г	Analog Input Module: Module Ready
28	_					Г	Г	Г	

(6) For IEC type, as shown below, the variables are registered.

2) Save variables

(1) The contents of 'View Variable' can be saved as a text file.

- (2) Select [Edit] -> [Export to File].
 (3) The contents of 'View variable' are saved as a text file.

3) View variables

I

The example of XBC type is as follows.

M00000 U	01.00.F U01.01.0	MOV	U01.02	D00100
0		MOV	U01.03	D00200
	U01.01.2	MOV	U01.04	D00300
	U01.01.3	MOV	U01.05	D00400
18				END

(1) The example program of XG5000 is as shown below.

(2) Select [View] -> [Variables]. The devices are changed into variables.

M00000 _01_RDY	_01_CH0_AC 	MOV	_01_CHO_DA TA	D00100
	_01_CH1_AC	MOV	_01_CH1_DA TA	D00200
	_01_CH2_AC	MOV	_01_CH2_DA TA	D00300
		MOV	_01_CH3_DA TA	D00400
18				END

(3) Select [View] -> [Devices/Variables]. Devices and variables are both displayed.

M00000	U01.00.F	U01.01.0	MOV U01.02 D0010	10
0	_01_RDY	_01_CHO_AC	O1_CHO_DA	_
		U01.01.1	MOY U01.03 D0020	10
		_01_CH1_AC		_
		U01.01.2	MOY U01.04 D0030	10
		_O1_CH2_AC T	01_CH2_DA TA	_
			MOY U01.05 D0040	J
		_01_CH3_AC T	01_CH3_DA TA	_
10			END	
18				

M00000	U01.00.F	U01.01.0	MOV	U01.02	D00100
	Analog Input Module: Module Ready	Analog Input Module: CHO in operation		Analog Input Module: Analog Input Module: CHO conversion value	
		U01.01.1	MOV	U01.03	D00200
		Analog Input Module: CH1 in operation		Analog Input Module: Analog Input Module: CH1 conversion value	
			MOV	U01.04	D00300
		Analog Input Module: CH2 in operation		Analog Input Module: Analog Input Module: CH2 conversion value	
			MOV	U01.05	D00400
		Analog Input Module: CH3 in operation		Analog Input Module: Analog Input Module: CH3 conversion value	
10					END

(4) Select [View] -> [Device/Comments]. Devices and comments are both displayed.

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M00000	_01_RDY	_01_CHO_AC	MOV	_01_CHO_DA TA	D00100
0	Analog Input Module: Module Ready	Analog Input Module: CHO in operation		Analog Input Module: Analog Input Module: CHO conversion value	
		_01_CH1_AC	MOV	_O1_CH1_DA TA	D00200
		Analog Input Module: CH1 in operation		Analog Input Module: Analog Input Module: CH1 conversion value	
		_01_CH2_AC	MOV	_01_CH2_DA TA	D00300
		Analog Input Module: CH2 in operation		Analog Input Module: Analog Input Module: CH2 conversion value	
		_01_CH3_AC	MOV	_01_CH3_DA TA	D00400
		Analog Input Module: CH3 in operation		Analog Input Module: Analog Input Module: CH3 conversion value	
19					END

(5) Select [View] -> [Variables/Comments]. Variables and comments are both displayed.

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Lf	_01_RDY	_01_CHO_AC					MOVE	ENO-		
	 Analog Input Module: Module Ready	Analog Input Module: CHO in operation								
12		_01_CH1_AC Analog Input Module: CH1 Conversion Value		EN ENO	-	_01_CH0_DA TA Analog Input Module: CH0 Conversion Value	-IN	OUT-	CHO_Output	
13			_01_CH1_DA TA Analog Input Module: CH1 Conversion Value	- IN OUT.	- CH1_Output					
L5		_01_CH2_AC		· · · · · · · · · · · · · · · · · · ·			MOVE -EN	ENO-		
		Analog Input Module: CH2 in operation								
18						_O1_CH2_DA TA Analog Input Module: CH2 Conversion Value	- IN	OUT-	CH2_Output	
L7										
18		_01_CH3_AC Analog Input Module: CH3 in operation		EN ENO						
19			_01_CH3_DA TA Analog Input Module: CH3 Conversion Value	- IN OUT.	CH3_Output					
L10										

(6) In case of IEC, you can see variables with diverse option at 'View' menu like (1)~(5). The following is example selecting 'View Variable/Comment' at IEC type.

13.11 Configuration and Function of Internal Memory

A/D conversion module has the internal memory to transmit/receive data to/from PLC CPU.

13.11.1 I/O area of A/D converted data

I/O area of A/D converted data is as displayed in table.

		Device	assigned			
Variable name	Туре	XBM/XBC	XEC (IEC type)	Details	R/W	of signal
_0y_ERR	BIT	U0y.00.0	%UX0.y.0	Module Error	Б	AD04C \rightarrow
_0y_RDY	BIT	U0y.00.F	%UX0.y.15	Module Ready	ĸ	CPU
_0y_CH0_ACT	BIT	U0y.01.0	%UX0.y.16	Channel 0 Run		
_0y_CH1_ACT	BIT	U0y.01.1	%UX0.y.17	Channel 1 Run	\\/	AD04C \rightarrow
_0y_CH2_ACT	BIT	U0y.01.2	%UX0.y.18	Channel 2 Run	vv	CPU
_0y_CH3_ACT	BIT	U0y.01.3	%UX0.y.19	Channel 3 Run		
_0y_CH0_ERR	BIT	U0y.01.8	%UX0.y.24	Channel 0 Error		
_0y_CH1_ERR	BIT	U0y.01.9	%UX0.y.25	Channel 1 Error	R	AD04C \rightarrow
_0y_CH2_ERR	BIT	U0y.01.A	%UX0.y.26	Channel 2 Error		CPU
_0y_CH3_ERR	BIT	U0y.01.B	%UX0.y.27	Channel 3 Error		
_0y_CH0_DATA	WORD	U0y.02	%UW0.y.2	Channel 0 Conversion value		
_0y_CH1_DATA	WORD	U0y.03	%UW0.y.3	Channel 1 Conversion value	R	AD04C \rightarrow
_0y_CH2_DATA	WORD	U0y.04	%UW0.y.4	Channel 2 Conversion value		CPU
_0y_CH3_DATA	WORD	U0y.05	%UW0.y.5	Channel 3 Conversion value		
_0y_CH0_IDD	BIT	U0y.10.0	%UX0.y.160	Channel 0 Disconnection detection		
_0y_CH1_IDD	BIT	U0y.10.1	%UX0.y.161	Channel 1 Disconnection detection	R	AD04C \rightarrow
_0y_CH2_IDD	BIT	U0y.10.2	%UX0.y.162	Channel 2 Disconnection detection		CPU
_0y_CH3_IDD	BIT	U0y.10.3	%UX0.y.163	Channel 3 Disconnection detection		
_0y_CH0_HOOR	BIT	U0y.11.0	%UX0.y.176	Channel 0 High limit alarm		
_0y_CH1_HOOR	BIT	U0y.11.1	%UX0.y.177	Channel 1 High limit alarm	R	AD04C \rightarrow
_0y_CH2_HOOR	BIT	U0y.11.2	%UX0.y.178	Channel 2 High limit alarm		CPU
_0y_CH3_HOOR	BIT	U0y.11.3	%UX0.y.179	Channel 3 High limit alarm		
_0y_CH0_LOOR	BIT	BIT U0y.12.0 %UX0.y.192 Channel 0 Low limit alarm				
_0y_CH1_LOOR	BIT	U0y.12.1	%UX0.y.193	Channel 1 Low limit alarm	R	AD04C \rightarrow
_0y_CH2_LOOR	BIT	U0y.12.2	%UX0.y.194	Channel 2 Low limit alarm		CPU
_0y_CH3_LOOR	BIT	U0y.12.3	%UX0.y.195	Channel 3 Low limit alarm		
_0y_ERR_CLR	BIT	U0y.13.0	%UX0.y.208	Error clear request	w	AD04C ← CPU

- In the device assigned, 'y' means slot number equipped with module.

- In order to read 'CH3 conversion value' of A/D conversion module installed on Slot No.4, it shall be displayed as U04.05. (In case of IEC type %UW0.4.5)





Module Ready/Error flag ('()' means the case of IEC type, y: slot number)
 (1) U0y.00.F(%UX0.y.15) : It will be ON when PLC CPU is powered or reset with A/D conversion ready to process A/D conversion.

(2) U0y.00.0(%UX0.y.0) : It is a flag to display the error status of A/D conversion module.



2) Run channel flag ('()' means the case of IEC type, y: slot number)

- The area where Run information of respective channels is saved
- * XGB series base number is 0.



3) Digital output value ('()' means the case of IEC type, y: slot number)

- (1) A/D converted-digital output value will be output to buffer memory addresses UXY.02 ~ UXY.05 (%UW0.x.2 ~ %UW0.x.5) for respective channels.
- (2) Digital output value will be saved in 16-bit binary.
- XGB PLC's base number is 0.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
U0y.02 (%UW0.y.2)						С	hanne	l 0 cor	versio	n value	Э					
U0y.03 (%UW0.y.3)						С	hanne	l 1 cor	versio	n value	Э					
U0x.04 (%UW0.x.4)		Channel 2 conversion value														
U0x.05 (%UW0.x.5)						С	hanne	l 3 cor	versio	n value	Э					

4) Input disconnection flag (() means the case of IEC type, y: slot number) The area where the input disconnection detection signal of each channel is saved. U0y.10.0 ~ U0y.10.3 (%UX0.y.160 ~ %UX0.y.163) % XGB PLC's base number is 0.



5) High limit alarm flag (() means the case of IEC type, y: slot number) The area where the high limit alarm detection signal of each channel is saved. U0y.11.0 ~ U0y.11.3 (%UX0.y.176 ~ %UX0.y.179) % XGB PLC's base number is 0.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
U0y.011 (%UW0.y.11)	_	_	_	_	_	_	_	_	_	_	_	_	Ĉ	Ĉ	Ĉ	Ĉ
													3	2	1	0

Maximum warning detection Bit On (1): occurrence of maximum warning Bit Off (0): Normal

6) Low limit alarm flag (() means the case of IEC type, y: slot number) The area where the low limit alarm detection signal of each channel is saved. U0y.12.0 ~ U0y.12.3 (%UX0.y.192 ~ %UX0.y.195) % XGB PLC's base number is 0.



Notes

(1) If the external 24V power is not provided, operating channel information [U0y.01.0~U0y.01.3 (%UX0.y.16 ~%UX0.y.19)], input disconnection flag [U0y.10.0~U0y.10.3(%UX0.y.160~%UX0.y.163)], high limit alarm flag [U0y.11.0~U0y.11.3(%UX0.y.176~%UX0.y.179)], low limit alarm flag [U0y.12.0~U0y.12.3 (%UX0.y.192 ~ %UX0.y.195)] will be off.

13.11.2 Operation parameters setting area

Setting area of A/D conversion module's Run parameters is as described in Table.

Memory address	Descriptions	Details	R/W	Remark
0	Specify channel to use	Bit 0 ~ Bit 3 0: Stop, 1: Run	R/W	
1	Specify range of input voltage/current	Input range setting (4 Bits) 0000 : 4 ~ 20 ^{mA} 0001 : 0 ~ 20 ^{mA} 0010 : 1 ~ 5 V 0011 : 0 ~ 5 V 0100 : 0 ~ 10 V 0101 : -10 ~ 10V	R/W	
3	Specify range of output data	Output data format setting (2 Bit) 00: $0 \sim 16,000$ 01: -8,000 ~ 8,000 10: Precise value 11: $0 \sim 10,000$ - In case of precise value $4 \sim 20^{\text{mA}}$: 4,000 ~ 20,000 $0 \sim 20^{\text{mA}}$: 0 ~ 20,000 $1 \sim 5\text{V}$: 1,000 ~ 5,000 $0 \sim 5\text{V}$: 0 ~ 5,000 $0 \sim 10\text{V}$: 0 ~ 10,000 -10 ~ 10\text{V}: -10,000 ~ 10,000	R/W	PUT/GET
4	CH0 filter constant			
5	CH1 filter constant			
6	CH2 filter constant	0 0r 4 ~ 64,000	R/VV	
7	CH3 filter constant			
12	Specify average processing method	Average process (2 Bits) 00 : Sampling process 01 : Time average process 10 : Number of average process	R/W	
13	CH0 average value			
14	CH1 average value	Input channe average type setting	D AA/	
15	CH2 average value	Count average : $2 \sim 64,000$ [fins]		
16	CH3 average value			
21	Hold last value	Bit 0 ~ Bit 3 0: Disable, 1: Enable	R/W	
22	Setting error	0-3: CH 0-3 (10Dec, #: Channel No.) 10#: Channel range over 20#: Filter constant range over 30#: Average constant range over	R/W	GET

Notes

- (1) When memory addresses of 1, 4~7, 13~16 areas are entered from external setting values, U0y.01.8~U0y.01.B (representative flag of setting error, in case of IEC type) is on and operates with basic setting value. Error information is shown on error information area(No. 22).
- (2) The system area (after No. 23) is prohibited for reading/writing. If this area is changed, malfunction and breakdown can be made.

1) Setting operation channels

If the channel to use is not specified, all the channels will be set to Prohibited.



- 2) Setting input range
 - (1) The range of analog input voltage are DC 1~5V, DC 0~5V, DC 0~10V, DC -10~10V, the range of analog current input are DC 4~20mA, DC 0~20mA.
 - (2) When the input range is not set, it is handled as range of DC 4~20mA.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address No. 1																
		Chan	nel 3			Chan	nel 2			Chan	nel 1			Char	nel 0	
					Inp 0 :	out rang	ge sett mA	ing (4	bit per	chanr	nel)					

- 0 : 4 ~ 20 mA 1 : 0 ~ 20 mA 2 : 1 ~ 5 V 3 : 0 ~ 5 V 4 : 0 ~ 10 V 5 : -10 ~ 10 V
- 3) Setting output data type
 - (1) The range of digital output data for analog input can be specified for respective channels.
 - (2) If the output data range is not specified, the range of all the channels will be set to $0 \sim 16000$.

Address No. 3								<u> </u>				
-								ç		;	Ĉ	8
	_	-	-	_	_	-	-	3	2		1	0

Output data setting (2bit per channel) 0 : 0 ~ 16000

- 1 : -8000 ~ 8000
- 2 : Precise value
- 3:0~10000

Case of precise value $4 \sim 20 \text{ mA}$: $4000 \sim 20000$ $0 \sim 20 \text{ mA}$: $0 \sim 20000$ $1 \sim 5 \text{ V}$: $1000 \sim 5000$ $0 \sim 5 \text{ V}$: $0 \sim 5000$ $0 \sim 10 \text{ V}$: $0 \sim 10000$ $-10 \sim 10\text{ V}$: $-10000 \sim 10000$

4) Setting filter constant

- (1) When the filter constant is specified with 0, the filter will not be operated.
- (2) If the filter constant is not specified with anything, it can't filter and it will be handled in 0.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address					Char	nnel 0	filter c	onstar	nt (0 o	r 4 ~	64000	ms)				
Address No. 5					Cha	nnel 1	filter o	consta	nt(0 or	• 4 ~ 6	64000	ms)				
Address No. 6					Cha	nnel 2	filter o	consta	nt(0 or	4~6	64000	ms)				
Address No. 7					Cha	nnel 3	filter o	consta	nt(0 or	• 4 ~ 6	64000	ms)				

5) Setting average process method

- (1) When setting average process, the average process method is selected among time average, number of averages, moving average.
- (2) If setting average process is not specified, all channels will not handle the average process.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	n Bit 6	Bit 5	n Bit 4	Bit 3	D Bit 2	Bit 1	n Bit 0
Address No. 12										6		S		S		ç
	-	_	-	_	_	_	-	_		3		2		1		0
																~

Designation of average processing method(2bit per channel)

- 0 : Sampling processing
- 1 : Time average processing
- 2 : Average of number of rocessing

6) Setting average value

- (1) The average value is set depending on setting area of average process method.
- (2) When the average value is out of the setting area, the average process will not be made.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address No. 13							Chanr	nel 0 av	verage	value						
Address No. 14							Chanr	nel 1 av	verage	value						
Address No. 15							Chanr	nel 2 av	verage	value						
Address							Chanr	nel 3 av	/erage	value						

Input channel average value setting Time average : 4 ~ 16000 [ms] Number of average : 2 ~ 64000 [times]

- 7) Maintaining valid conversion value
 - (1) In case that retaining valid conversion value is set at the same time, if the invalid value is come, the late valid value will only be retained. For example, firstly, it is operated with 4 ~20mA. Secondly, 10mA comes in. Finally, the signal is immediately falling down to 3mA without falling down the current continually. In this case, relevant channels will retain the output value of 10mA.
 - (2) When this function is set, digital output value related with actual range of analog input is only shown. Refer to the actual range of the analog from "chapter 13.4".
 - (3) This function can only be operated within input range.
 - 1) 4 ~ 20^{mA}
 - 2) 0 ~ 20 mA

Refer to the using method from "chapter 13.6.5" for detail..

(4) Setting of retaining valid conversion value is as below.



- - (1) It saves the error code detected from A/D conversion module.
 - (2) Error type and details is as below.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address No. 21						Er	rror inf	ormat	ion of	settin	g					

Туре	Error code	LED sign	Details	Priority of error code	Remarks for reference
Error	10#	LED Flickering 1s intervals	Setting error of channel range	1	'#' is the number of CH 1~3
	20#		Setting error of channel filter value	2	
	30#		Setting error of channel average value	3	

- (3) When errors of two or more are caused, the high priority error code is saved. And when the same error code is caused in channels of two or more, the error code of low channel number is saved preferentially.
- 9) System area (after No. 23)
 - (1) The system area (after No. 23) is prohibited for reading/writing.

Caution

If this area is changed, the product can malfunction and be broken.
13.12 Example Program

- (1) Setting of operation parameter of analog input module is explained.(2) The initial setting condition is saved in internal memory of the analog input module by inputting once.
- (3) As below, these example programs are that the analog input modules of the slot No. 1 control the output data of the analog input module and detect whether wire is disconnect.

13.12.1 Analog input program

1) Setting I/O parameter

I/O Parameter Setting									
All Base Set Base									
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation	T'		
00 : XBC-DR32H (D1	0(main)	XBC-DR32H (DC 24V I		3 Standard [ms]	Default	P0000 ~ P003F	17		
01 : XBF-AD04C(Vo	1	XBF-AD04C(Volt/Curre				P0040 ~ P007F			
03 : Default	2								
03 : Default	3								
05 : Default	4								
🗾 🚾 06 : Default	5								
🛛 🔤 07 : Default	6								
08 : Default	7								
09 : Default	8				{				
	9								
	10								
Current Consumption Delete Slot Delete Base Base Setting Delete All Details Print OK Cancel									

XBF-AD04C(Volt/Current, 4-CH, 14bit)									
XBF-AD04C(Volt/Current, 4-CH, 14bit)									
Parameter	СНО	CH1	CH2	СНЗ					
Channel status	Enable	Disable	Disable	Disable					
Input range	4~20mA ▼	4~20mA	4~20mA	4~20mA					
Output type	0~16000	0~16000	0~16000	0~16000					
Filter constant	0	0	0	0					
Average processing	Sampling	Sampling	Sampling	Sampling					
Average value	0	0	0	0					
Hold last value	Disable	Disable	Disable	Disable					
			ОК	Cancel					

(1) The channel 0 is set with operation channel, the ranges are set with 4~20mA.

2) Example program

Comment	CHO Program					
						M00000
I	_01_Lnn	_01_00	_01_LNN	_01_LNN		
	мооооо				M0Y U01.02	D00100
6					_01_CH0_D4 TA	
	U01 10 0					N00001
	// //					
9	U					
						END

- (1) The 'M0000' is on while the module normally operates.
 - U01.00.0(Module Error) = Off U01.00.F(Module Ready) = On U01.01.0(CH0 Run) = On
 - U01.01.8(CH0 Error) = Off
- (2) When the 'M0000' is on, conversion value (U01.02) of CH0 is moved to the 'D00100'.
- (3) If the error is caused on CH0, U01.10.0 Bit(CH0 disconnection) and the M00001 will be on.
- 3) Example Program (In case of IEC)

10	XUX0.1.0	XUX0.1.15	XUX0.1.16	XUX0.1.24			XMXO
	_01_ERR	_01_RDY	_01_CH0_AC	_01_CHO_ER R			
Lf	%мхо ——1 ——		EN MOVE ENO				
12		%UWO.1.2 _01_CHO_DA	-IN OUT	CHO_Output			
L3		In					
14	XUXO.1.160						%MX1 (S)

- (1) If the module operation is normal, the '%MX0' will be on.
 - %UX0.1.0(Module Error) = Off
 - %UX0.1.15(Module Ready) = On
 - %UX0.1.16(CH0 Run) = On %UX0.1.24(CH0 Error) = Off
- (2) If the '%MX0' is on, conversion value (%UW0.1.2) of CH0 will be moved to the variable of "input value of CH0".
- (3) If the disconnection error of CH0 is caused, %UX0.1.160 (CH0 disconnection) and the 'MX1' Bit will be on.

13.13 Breakdown test

Explain the test and measure method of breakdown while using the analog input module.

13.13.1 Checking the LED status in case of error

The analog input module has a LED and is able to check whether there is error of the module through the sign of LED.

ltom	Normal Status	When CH is disconnected	When parameter setting	
item	Normal Status	(Input)	is error	
			Flickering 1s intervals	
LED	Light on	Flickering 1s intervals	(When the input parameter	
			setting is error)	
	Normal operation	Operation of all functions	Operation of all functions	
Module Operation			(Operation by basic value of	
	Operation of all functions	Sign of minimum input value	parameter)	
Measure	-	Check wiring	Check parameter setting	

13.13.2 Check the module status

The status of analog input module (Module type/information/OS version) can be checked through the system monitor of XG5000.

1) The order of execution

It can be implemented through one of the methods among next items.

(1)[Monitor] -> [System Monitor] -> Click the right button of mouse on the painting of module.

-> [Module Information]

(2)[Monitor] -> [System Monitor] -> Double click the painting of module

(3)[Monitor] -> [Special Module Monitor] -> [XBF-AD04C] Selection ->Click the module information

(4)[Online] -> [I/O Information] -> [XBF-AD04C] Selection -> Click the details

(5)[Online] -> [I/O Information] -> [XBF-AD04C] Double click

2) Module information

(1) Module Name: Information of recently equipped module device is shown.

(2) OS Version: OS version of module is shown.

(3) OS Update Date: The OS prepared date of module is shown.

(4) Module status: The present error code is shown.

13.13.3 Check and Measure the breakdown

1) The LED is turned off.

Γ

The LED is turned off.	
The analog module is installed on	
	> Install the analog module correctly.
I/O information is shown in XG5000 software.	
	Senter.
When the abnormal analog input module is changed into normal one, it operates well.	
Yes	Call our near agency or A/S center.

2) The LED is flickering.

Make wiring correctly by referring the instructions.(Check disconnection)
The operation parameter is error. Set correctly by referring parameter setting rules from instructions. (Check error code)

3) The analog input value is abnormal.



Chapter 14 Analog Output Module (XBF-DV04C/XBF-DC04C)

14.1 Setting Sequence before Operation

Before using the analog input module, follow steps below.



14.2 Specifications

Γ

14.2.1 General specifications General specifications are as follows.

No.	ltem		Related specifications						
1	Ambient temperature			0°C ~·	⊦55 ℃		-		
2	Storage temperature		-25 ℃ ~+70 ℃						
3	Ambient humidity		5 ~ 95%RH (Non-condensing)						
4	Storage humidity		Ę	5 ~ 95%RH (No	on-condensing)		-		
			Occasi	onal vibration		-	-		
		Frequency	Ac	celeration	Amplitude	How many times			
		5 ≤ f < 8.4 ⊞	z	-	3.5 mm				
	Vibration	8.4 ≤ f ≤ 150 J	Hz 9.8	3 m/s² (1G)	-				
5	resistance		For contin	nuous vibratio	n	10 times each	IEC61131-2		
		Frequency	Ac	celeration	Amplitude	directions (X, Y and Z)			
		5 ≤ f < 8.4 ⊞	z	-	1.75 mm	(-,			
		8.4 ≤ f ≤ 150 J	Hz 4.9	m/s² (0.5G)	-				
6	 Peak acceleration: 147 m/s²(15G) Shock resistance Duration: 11ms Half-sine, 3 times each direction per each axis 								
		Square wave Impulse noise		LSIS standard					
		Electrostatic discharge		IEC 61131-2, IEC 61000-4- 2					
7	Noise resistance	Radiated electromagnetic field noise		80 ~	1,000 MHz, 10\	//m	IEC 61131-2, IEC 61000-4- 3		
		Fast transient	Segment	Power supply module	v Digital/an commun	alog input/output ication interface	IEC 61131-2, IEC 61000-4-		
		1000110100	Voltage 2kV 1kV		1kV	4			
8	Environment		-						
9	Altitude			Up to 2,0	00 ms		-		
10	Pollution degree			Less than e	equal to 2		-		
11	Cooling			Air-co	bling		-		

14.2.2 Performance specifications Performance specifications are as follows.

			Performance specification			
	Items	S	XBF-DV04C	XBF-DC04C		
	Channe	els	4 cha	nnels		
		Туре	Voltage	Current		
Analog output range	Range		DC 1 ~ 5V DC 0 ~ 5V DC 0 ~ 10V DC -10 ~ 10V (Load resistance: $1^{\text{k}\Omega}$ or more) Output ranges are set in user pr channel.	DC 4 ~ 20 ^{mA} DC 0 ~ 20 ^{mA} (Load resistance: 600Ω or less) ogram or I/O parameter per each		
		Type	16 bit binary da	ta (Data : 14Bit)		
		Unsigned value	0 ~ 1	6,000		
		Signed value	-8,000	~ 8,000		
Digital input	Range	Precise value	1,000 ~ 5,000 (1 ~ 5V) 0 ~ 5,000 (0 ~ 5V) 0 ~ 10,000 (0 ~ 10V) -10,000 ~ 10,000 (±10V)	4,000 ~ 20,000 (4 ~ 20 ^{mA}) 0 ~ 20,000 (0 ~ 20 ^{mA})		
		Percentile value	0 ~ 1	0,000		
			1/16,000			
Γ	Max. resolution		0.250 ^{mV} (1 ~ 5V) 0.3125 ^{mV} (0 ~ 5V) 0.625 ^{mV} (0 ~ 10V) 1.250 ^{mV} (±10V)	1.0 ^{µA} (4 ~ 20 ^{mA}) 1.25 ^{µA} (0 ~ 20 ^{mA})		
	Accura	су	±0.2% or less (When ambient temperature is 25℃) ±0.3% or less (When ambient temperature is 0 ~ 55℃)			
Max.	. conversi	ion speed	1 ^{ms} / channel			
Ac	ditional f	unction	Setting of channel output status (Select one among previous, Min, Max value) Setting of interpolation method (Linear interpolation, S-type interpolation)			
In	sulation n	nethod	Photo-coupler insulation between (no insulation between channels)	output terminal and PLC power		
Terminal connected		nnected	11 point	t terminal		
I/C	occupied	d points	Fixed point assig	gnment: 64 points		
Max. attachable number		le number	 7 [When using XBM-Dxxx□ (□:"S",'H',"H2","HP") type] 7 (when using XB(E)C-DxxxSU type) 10 (when using XB(E)C-DxxxH type or XB(E)C-DxxxU type) Not Available (when using XB(E)C-DxxxE type) 			
	Weigh	nt	68g	69g		
Consume	ed Ir	nternal (DC 5V)	70	mA		
current	<u>Ε</u> Power Sι	kternal (DC 24V) upply	160mA DC 20.4V ~ 28.8V			

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Segment	Version
XBM-DxxxS Type	V3.30 or above
XBC-DxxxH Type	V2.20 or above
XBC-DxxxSU Type	V1.30 or above
XBC-DxxxS Type	V1.20 or above
XEC-DxxxH Type	V1.50 or above
XEC-DxxxSU Type	V1.10 or above
XG5000	V3.64 or above

Remark 1) To use the analog input module (14 Bit), It needs the basic unit more than below table.

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14.3 Name of each Part and Functions



Respective designations of the parts are as described below.

No.	Name	Description
1	RUN LED	 Displays the operation status of analog output module On: Normal operation Flickers: Error occurs (Flickering 1s intervals) Off: Power off or Module error
2	Terminal block	Analog output(voltage, current) terminal, whose respective channels can be connected with external devices
3	External power supply terminal	Terminal for supplying the external DC24V
4	Ext. Connector	Connector for extension modules

14.4 Conversion Characteristic of each Output Range

The output conversion characteristic is described by graphs as follows after changing digital input set from XBG basic unit to analog output (Voltage, Current).

In the digital input range, there are four kinds of value. Those are unsigned value, signed value, precise value, percentile value.

I/O conversion characteristic is as follows depending on each range of digital input.

1) Conversion characteristic of analog output module (XBF-DV04C)



(1) DC 1 ~ 5V Output range

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	Analog output voltage (V)							
Digital input	0.952	1	2	3	4	5	5.047	
Unsigned value (-192 ~ 16,191)	-192	0	4,000	8,000	12,000	16,000	16,191	
Signed value (-8,192 ~ 8,191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191	
Precise value (952 ~ 5,047)	952	1,000	2,000	3,000	4,000	5,000	5,047	
Percentile value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119	

(2) DC 0 ~ 5V Output range

Distingtion	Analog output voltage (V)						
Digital value	-0.06	0	1.25	2.5	3.75	5	5.059
Unsigned value (-192 ~ 16,191)	-192	0	4,000	8,000	1,2000	16,000	16,191
Signed value (-8,192 ~ 8,191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191
Precise value (-60 ~ 5,059)	-60	0	1,250	2,500	3,750	5,000	5,059
Percentile value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119

Disital issue	Analog output voltage (V)						
Digital input	-0.12	0	2.5	5	7.5	10	10.119
Unsigned value (-192 ~ 16,191)	-192	0	4,000	8,000	12,000	16,000	16,191
Signed value (-8,192 ~ 8,191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191
Precise value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119
Percentile value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119

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(3) DC 0 ~ 10V Output range

(4) DC -10 ~ 10V Output range

		Analog output voltage (V)						
Digital input	-10.24	-10	-5	0	5	10	10.239	
Unsigned value (-192 ~ 16,191)	-192	0	4,000	8,000	12,000	16,000	16,191	
Signed value (-8,192 ~ 8,191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191	
Precise value (-10,240 ~ 10,239)	-10,240	-10,000	-5,000	0	5,000	10,000	10,239	
Percentile value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119	



2) Conversion characteristic of analog output module (XBF-DC04C: Current)

(1) DC 4 ~ 20^{mA} Output range

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Digital input range		Analog output current (mA)						
Digital input range	3.808	4	8	12	16	20	20.191	
Unsigned value (-192 ~ 16,191)	-192	0	4,000	8,000	12,000	16,000	16,191	
Signed value (-8,192 ~ 8,191)	-8,192	-8,000	-4,000	0	4,000	8,000	8,191	
Precise value (3,808 ~ 20,191)	3,808	4,000	8,000	12,000	16,000	20,000	20,191	
Percentile value (-120 ~ 10,119)	-120	0	2,500	5,000	7,500	10,000	10,119	

(2) DC 0 ~ 20^{mA} Output range

Digital input range	Analog output current (^{mA})							
Digital input range	-	0	5	10	15	20	20.239	
Unsigned value (-192 ~ 16,191)	_	0	4,000	8,000	12,000	16,000	16,191	
Signed value (-8,192 ~ 8,191)	—	-8,000	-4,000	0	4,000	8,000	8,191	
Precise value (0 ~ 20,239)	-	0	5,000	10,000	15,000	20,000	20,239	
Percentile value (-120 ~ 10,119)	-	0	2,500	5,000	7,500	10,000	10,119	

14.5 Accuracy

Accuracy of digital output value does not changed even if input range is changed. When digital input range is selected with unsigned value, accuracy is $\pm 0.2\%$ (Ambient temperature of 25 ± 5 °C)



(1) Accuracy when using -10~10V output
 16000 × 0.2% = 32
 Accuracy range when using -10V output will become
 (-10V - 32×1.25^{mV}) ~ (-10V + 32×1.25^{mV}) = -10.04 ~ -9.96V,

Accuracy range when using 10V output will become $(10V - 32 \times 1.25 \text{ mV}) \sim (10V + 32 \times 1.25 \text{ mV}) = 9.96 \sim 10.04 \text{ V}$

(2) Accuracy when using $4\sim 20^{\text{mA}}$ output $16000 \times 0.2\% = 32$

Accuracy range when using 4^{mA} output will become $(4^{\text{mA}} - 32 \times 1 \mu^{\text{A}}) \sim (4^{\text{mA}} + 32 \times 1 \mu^{\text{A}}) = 3.97^{\text{mA}} \sim 4.03^{\text{mA}}$

Accuracy range when using 20^{mA} output will become ($20^{\text{mA}} - 32 \times 1 \mu^{\text{A}}$) ~ ($20^{\text{mA}} + 32 \times 1 \mu^{\text{A}}$) = 19.97^{mA} ~ 20.03^{mA}

14.6 Functions of Analog Output Module

Functions of XBF-DV04C / DC04C conversion module are as described below.

Function	Description
Channel Run/Stop setting	 Specify Run/Stop of channel to execute analog output. If the unused channel is set with Stop, whole operation time can be shorter.
Range setting of the output data	 Set analog output range. The analog voltage output module provides four kinds of output ranges (DC 1~5V, DC 0~5V, DC 0~10V, DC -10~10V). And the analog current output module provides two kinds of output ranges (DC 4~20mA, DC 0~20mA).
Range setting of the Input data	 Set digital input range. The four kinds of digital input ranges are provided. (Refer from 14.2.2)
Channel output status	 Set the output status of channel when changing 'Run' to 'Stop'. The four kinds of output statuses (Previous, Min, Mid, Max value) are provided.
Interpolation method setting	• Set linear interpolation, S-type interpolation method.

14.6.1 Setting function of channel output status

Set the output against stop and abnormal condition of PLC.

1) Function

When initialization of module and error of PLC system are happened, use to prevent abnormal output.

2) Type

You can set an output status of channel among Previous, Min, Mid, Max value.

(1) Previous value: The last output operated normally is retained.

- (2) Min: The Min value of each range is outputted.
- (3) Mid: The Mid value of each range is outputted.
- (4) Max: The Max value of each range is outputted.
- 3) Example

When the range of output channel is set by 4 ~ 20mA and the output is 10mA, and then If the system is changed from 'Run' to 'Stop', the output will be as follows depending on setting data of channel output status.

(1) Previous value: 10mA which is previous output value is retained.

- (2) Min value: 4mA which is min value of relevant range is outputted.
- (3) Mid value: 12mA which is mid value of relevant range is outputted
- (4) Max value: 20mA which is max value of relevant range is outputted.

14.6.2 Interpolation method setting

1) Functions

The output signal of module is used in order to execute interpolation output depending on set interpolation time. When the voltage and current is outputted, it can be used to prevent transient response of load system as a suddenly changed output.

2) Interpolation method setting

Interpolation method can set the one among interpolation prohibition, linear interpolation S-type interpolation.

- (1) Interpolation prohibition : It doesn't execute interpolation operation. And it outputs digital input value intactly.
- (2) Linear interpolation : The output is changed up to objective value with linear during the interpolation time.



(3) S-type interpolation : The output is changed up to objective value with S-type during the interpolation time.



3) Interpolation time setting

The interpolation time can be set with the one among 10[ms], 100[ms], 1[s], 60[s]. The output is changed depending on interpolation method setting during the set interpolation time.

4) Interpolation output value

The interpolation operation value that is currently being outputted can check in parameter area (Address No. $17 \sim 20$) while using interpolation function.

Address of interpolation output value	Details
No.17	Channel 0 interpolation operation value
No.18	Channel 1 interpolation operation value
No.19	Channel 2 interpolation operation value
No.20	Channel 3 interpolation operation value

5) Interpolation flag turns on while the interpolation is outputted. And when the interpolation output value is reached at objective value, It will turn off.

Interpolation flag	Details
U0y.01.8	Channel 0 interpolation output in operation
U0y.01.9	Channel 1 interpolation output in operation
U0y.01.A	Channel 2 interpolation output in operation
U0y.01.B	Channel 3 interpolation output in operation

6) Example

The output is changed from 4mA to 20mA and then when it is reached at 20mA, if the output comes back 4mA again, you have to do as follows.



Notes

- 1) During the interpolation output, If the internal parameter is changed, the interpolation operation will be temporarily stopped and the output can be immediately changed to objective value.
- 2) If the change of internal parameter is needed, change the parameter during interpolation output after the flag turns off when the analog output value is not changed.

14.6.3 Disconnection detecting function (Only for current output module XBF-DC04C)

If the analog current output module detects disconnection of output, it can show the status of module.

In case that the module checks the disconnection and it is shown as the disconnection status, there are faulty in parts of wiring connection paths. Please check and take action.

- 1) In case that the disconnection between used output wiring and module is caused, LED can flicker 1s intervals and make an error flag.
- 2) The disconnection can be detected per each channel only for designed channels for operation. LED can use from channel 0 to 3 in common. If the one channel or more is disconnected, flickering will be generated.

Output connections	Channel operation	LED condition	Disconnection flag
Normal	Operation	On	Off
normai	Stop	On	Off
Output wiring is	Operation	Flickering 1s intervals	On
not connected	Stop	On	Off

3) If the disconnection is happened, disconnection flag of relevant channel will turn. However, if the disconnection is changed to connection, the disconnection flag will turn off.

Disconnection flag	Details
U0y.01.C	Channel 0 Disconnection
U0y.01.D	Channel 1 Disconnection
U0y.01.E	Channel 2 Disconnection
U0y.01.F	Channel 3 Disconnection

14.7 Installation and Wiring

14.7.1 Installation and separation of module

Notices in handling

Use the PLC within general specification ranges from instructions. When the PLC is used out of the specified ranges, it will cause burning, getting electric shock, abnormal operation.



- (1) Installation of module
- Remove the extension cover above the module to connect.
- Push modules to connect each other after situating four positions binding correctly.
- After connection, fix the binding hook that is in the upward part and downward part completely.



(2) Separation of module

- Divide connections by lifting hook for module fixing in the upward part and downward part.
- Separate modules by holding modules with both hands. (Do not hold strongly in the module.)



When you try to separate the modules strongly, the hook and bump for fixing will be broken.

14.7.2 Notices in wiring

- (1) Do not put the power line near the external I/O signal line of analog input module. You have to secure enough distance to avoid the interruption from the induced noise and the surge.
- (2) The wire has to select by considering permitted current and the ambient temperature. The maximum wire size is good in case of AWG22 (0.3^{mit}) or more.
- (3) When the wire is so near with high temperature machines and materials and touched with oil for a long time, it can be short circuit and malfunction.
- (4) When doing terminal ports wiring, check the polarity.
- (5) In case that the high voltage line and the power line are wired at the same time, the induced interruption is caused. So it can be a reason for breakdown.

14.7.3 Example for wiring

(1) Example for analog voltage output wiring (XBF-DV04C : Voltage)



%1: Two-core twisted shield wire should be used as wire.

*2: DC power for analog power supply has to connect DC24V- with PE.

(2) Example for analog current output wiring (XBF-DC04C : Current)



- *1: Two-core twisted shield wire should be used as wire.
- *2: DC power for analog power supply has to connect DC24V- with PE.

14.8 Operation Parameter Setting

A/D conversion module's operation parameters can be specified through XG5000's [I/O parameters].

(1) Settings

I

For the user's convenience of D/A conversion module, XG5000 provides GUI (Graphical User Interface) for parameters setting of D/A conversion module. Setting items available through [I/O parameters] on the XG5000 project window are as described below in the table.

Item	Details
[I/O parameter]	 (1) Specify the following setting items necessary for the module operation. Channel Enable/Disable setting Output voltage(current) range Input data format setting Channel output status setting Interpolation method setting Interpolation time (2) When the parameters set by user in XG5000 is downloaded, that data is saved in flash memory of XGB basic unit

2) [I/O Parameter] Using method

(1) Run XG5000 to create a project. (Refer to XG5000 program manual for details on how to create the project)

(2) Double-click [I/O parameters] on the project window.

Project Window	∀ X
Items ■ ∰ kl:lk * ■ ∰ Variable/Cor ■ ℝ Parameter ■ ℝ Basic Pa ■ ℝ I/O Parar ■ ℝ Embedde ■ ∰ Scan Progra	(BCH)-Stop nment rameter neter ed Parameter m
C Project	

(3) [I/O Parameter setting] On the 'I/O parameters setting' screen, find and click the slot equipped with analog input module.

I/O Parameter Setting						?×
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
	0(main)					
	1					
	2					
	3					
	4					
	5					
	6					
	7					
09: Default	8					
IU: Default	9					
	10					
Current Consumption	e Slot 🛛 Dele	ete <u>B</u> ase Base <u>S</u> etting	Delete All De	ețails <u>P</u>	rint 🔻 📃	OK Cancel

(4) Click the arrow button on the screen above to display the screen where an applicable module can be selected. Search for the applicable module to select.



(5) After the module selected, click [Details].

I/O Parameter Setting						?×
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
	1	XBF-DV04C(Voltage, 4 💌		-	-	P0040 ~ P007F
	2					
	3					
	4					
	5					
U/: Default	5					
- 00 : Default	- <u>(</u>					
10 : Default	8					
	10					
	- 10					
Current Consumption	e Slot De	elete <u>B</u> ase Base <u>S</u> etting	Delete All	De <u>t</u> ails <u>P</u>	rint 🔻	OK Cancel

(6) A screen will be displayed for you to specify parameters for respective channels as below. Click a desired item to display parameters to set for respective items.

Channel status Disable Disable Disable Cutput range 1~5V 1~5V 1~5V Input type 0~16000 0~16000 0~16000	Disable			I LHU I	Parameter
Output range 1~5V 1~5V 1~5V Input type 0~16000 0~16000 0~16000	Disable	Disable	Disable	Disable	Channel status
Input type 0~16000 0~16000 0~16000	1~5V	1~5V	1~5V	1~5V	🔲 Output range
	0~16000	0~16000	0~16000	0~16000	Input type
Ch.Output type Formal value Formal value Formal value	Formal value	Formal value	Formal value	Formal value	Ch.Output type
☐ Interpolation method Disable Disable Disable	Disable	Disable	Disable	Disable	Interpolation method
Interpolation period 10[ms] 10[ms] 10[ms]	10[ms]	10[ms]	10[ms]	10[ms]	Interpolation period

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14.9 Special Module Monitoring Functions

You can start to test the analog output module connecting by [Online] \rightarrow [Connect] and then click [Monitor] \rightarrow [Special Module Monitoring] menu in XG5000.

14.9.1 How to use special module monitoring

Special module monitoring function is described below based on the analog voltage output module (XGF-DV04C).

1) Start of [Special Module Monitoring]

Go through [Online] \rightarrow [Connect] and [Monitor] \rightarrow [Special module Monitoring] to start. If the status is not online, [Special Module Monitoring] menu will not be activated.

am]	
Monitor Debug Tools Window Hel	p
C Start <u>M</u> onitoring	:≹x :≅ ¥
<u>R</u> esume	e e 17
Bausing Conditions	
Change Current <u>V</u> alue,	
🗊 System Mon <u>i</u> toring	
Device Monitoring	
📓 Special Module Monitoring	
Irend Monitoring	
PID Monitoring	
SOE Monitoring	
Custom <u>E</u> vents	
🚊 Data Tra <u>c</u> es	
	Monitor Debug Tools Window Hell Start Monitoring Pause Resume Pausing Conditions Change Current Value System Monitoring Device Monitoring Device Monitoring PID Monitoring PID Monitoring Custom Events Custom Events Data Traces

Notes

- The screen may not normally be shown due to the lack of system resource. In this case, terminate all applications and try to start XG5000 again.
- 2) I/O parameter set in status of [Special Module Monitor] is temporally set to implement the test. So, If status of [Special Module Monitor] is ended, I/O parameter which is set becomes extinct.
- 3) The test of [Special Module Monitor] is a examination function to check operation of the analog input module when the sequence program is not made up.
 - 2) How to use [Special Module Monitoring]
 - (1) Connecting XG5000 with PLC basic unit, [Special Module List] window will show base/slot information and types of special module by click [Monitor] → [Special Module Monitoring]. Special Module List will display the modules that are installed in PLC now.

Special Mo	dule List	×
Base	Slot	Module
Base 0	1 Internal	High Speed Counter Module(Open-Collector, 8-CH)
🗂 Base O	<u> </u> Internal	Position Module (Open-Collector, 2-CH)
🗊 Base O	<u> </u> Slot 1	XBF-DC04C(Current, 4-CH, 14bit)
🗂 Base O	🗗 Slot 2	XBF-DV04C(Voltage, 4-CH, 14bit)
<		
Module Info.	<u>M</u> onitor	Close

(2) Select a special module then click [Module Info.] button to display the information as described below.

Γ

Special Module Information							
Displays the infor	mations of special module.						
ltem	Information						
Module Name	XBF-DV04C(Voltage, 4-CH, 14bit)						
OS Ver	Ver. 1.0						
OS Update Date	2012-7-12						
Module Status	Normal. (0)						
	ОК						

(3) Click [Monitor] button in the [Special Module List] window to display the [Special Module Monitor] window as below.

XBF-DV04C(Voltag	XBF-DV04C(Voltage, 4-CH, 14bit) ?X							
XBF-DV04C(Voltage, 4-C)	H, 14bit)							
Item	Setting value	Current value						
Ch0 Digital value								
Ch1 Digital value								
Ch2 Digital value								
Ch3 Digital value								
Item	Setting value	Current value						
Channel	Chú)						
Channel status	Disable							
Output range	1~5V							
Input type	0~16000							
Ch.Output type	Formal value							
Interpolation method	Disable							
Interpolation period	10[ms]							
D/A output value	0							
Output enable	Disable							
	Start <u>M</u> onitorin	ng <u>I</u> est						
		Close						

XBF-DV04C(Volta	ge, 4-CH, 14	bit) ?×		
XBF-DV04C(Voltage, 4-0	(H., 14bit)		1	
	. ,			
Item	Setting value	Current value		
Ch0 Digital value		0		
Ch1 Digital value		0	Г	
Ch2 Digital value		0	H	Monitoring
Ch3 Digital value			L .	
J				
Item	Setting value	Current value		
Channel	Chú			
Channel status	Disable	Disable		
Output range	1~5V	1~5V		
Input type	0~16000	0~16000	1	
Ch.Output type	Formal value	Formal value	Г	
Interpolation method	Disable	Disable	<u> </u>	CHU detai
Interpolation period	10[ms]	10[ms]	1	
D/A output value	0	0	1	
Output enable	Disable	Disable		
	-			
			1	
	6			
	Stop <u>Monitorir</u>	ng <u>I</u> est		
		Close		

(4) [Start Monitoring] button will show you digital input data of the operating channel.

Execution screen of [Start Monitoring]

(5) [Test] is used to change the parameters of the voltage output module. You can change the parameters when you click the values at the bottom of the screen. It is only available when XGB CPU unit's status is in [Stop Monitoring].

XBF-DV04C(Voltag	je, 4-CH, 14	bit) (? 🗙
XBF-DV04C(Voltage, 4-CF	H, 14bit)	
Item	Setting value	Current value
Ch0 Digital value		0
Ch1 Digital value		0
Ch2 Digital value		0
Ch3 Digital value		0
Item	Setting value	Current value
Channel	C	hO
Channel status	Disable	Disable
Output range	-10~10V 💌	1~5V
Input type	0~16000	0~16000
Ch.Output type	Formal value	Formal value
Interpolation method	Disable	Disable
Interpolation period	10[ms]	10[ms]
D/A output value	0	0
Output enable	Disable	Disable
	Stop <u>M</u> onitorir	ng <u>I</u> est Close

Execution screen of [Test]

(6) [Close] is used to escape from the monitoring/test screen. The Max value, Min value, current value will not saved anymore after the monitoring/test screen is closed.

14.10 Register U Devices

Register the variables for each module referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

1) Procedure

I

(1) Select the special module type in the [I/O Parameter Setting] window.

I/O Parameter Setting						?×
All Base Set Base						
🖃 🗊 Base 00 : Default	Slot	Module	Comment	Input Filter	Emergency Out	Allocation
00 : Default	0(main)					
	1	XBF-DV04C(Voltage, 4		-	-	P0040 ~ P007F
U2 : Default	2					
	3					
	4					
	5					
	6					
	7					
09 : Default	8					
10 : Default	9					
	10					
<u>Current Consumption</u>	a Slot De	lete <u>B</u> ase Base <u>S</u> etting	Delete All	etails <u>P</u> i	int 🔻 🗌	OK Cancel

(2) Double click 'Variable/Comment' from the project window.

🍕 XBF-DA04C - XG5000 - [Variable/Comment]		- DX				
🕍 Project Edit Find/Replace View Online Monitor Deb	ug <u>T</u> ools <u>W</u> indow <u>H</u> elp	- 8 ×				
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	NewPLC Stop ILUSB_OK View Variable	Overwrite				

(3) Select [Edit] – [Register U Device].

🍕 XBF-DA040	C - XG5000 - [Variable/Comr	nent]						
🕍 Project Edi	t <u>F</u> ind/Replace <u>V</u> iew <u>O</u> nline <u>M</u> or	nitor <u>D</u> ebug	<u>T</u> ools <u>W</u> indow <u>H</u> elp					_ 8 ×
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	Insert <u>L</u> ine	Ctrl+L				· · · · ·		
- Č 🕅	Delete Li <u>n</u> e	Ctrl+D						
	Export Variables to <u>File</u>							
G	Import Variables from File							
	Register U Device							
	Add EXTERNAL Variable							
	Move Item Up							
	Move Item Down			_				
- G Project	Delete <u>A</u> ll unused variables/comm	ents	NewProgram	🕍 Vari	iable/Comme	nt		
XMAD	Reallocate All Auto-allocation Varia	bles	×]\Result / Cł	ieck Progran	n 太Find 1 太Find 2 太Communication 太Cross Re	ference \Used Device
Automatically reg	aisters comments in the U Devices a	iccording to t	he special module set	in the I/O p: I	VewPLC		Stop L. USB. OK View Va	riable Overwrite

(4) Click 'Yes'	
🗞 XBF-DA04C - XG5000 - [Variable/Comment]	- IX
i 🕍 Project Edit Eind/Replace View Online Monitor Debug Iools Window Help	- 8 ×
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Project Window × X	
Image: Star DadaC X25000 Image: Star DadaC	
Image: Scan Program Image: NewProgram Image: NewProgram Image: NewProgram Image: NewProgram Image: NewProgram Image: NewProgram	
Kesult & Check Program & Find 1 & Find 2 & Communication & Cross Reference & Cross Reference & Communication	Used Device
NewPLC Stop L, USB, OK	Overwrite

1

(5) As shown below, the variables are registered.

V	liew Yariable 🕞	View Device	🔊 View Flag]	
	Variable	Туре 🔺	• Device	Used	Comment
1	_01_CHO_ERR	BIT	U01.00.0	Г	Analog Output Module: CHO Error
2	_01_CH1_ERR	BIT	U01.00.1	Г	Analog Output Module: CH1 Error
3	_01_CH2_ERR	BIT	U01.00.2	Г	Analog Output Module: CH2 Error
4	_01_CH3_ERR	BIT	UO1.00.3	Г	Analog Output Module: CH3 Error
5	_01_RDY	BIT	U01.00.F	Г	Analog Output Module: Module Ready
6	_01_CHO_ACT	BIT	UO1.01.0	Г	Analog Output Module: CHO Active
7	_O1_CH1_ACT	BIT	U01.01.1	Г	Analog Output Module: CH1 Active
8	_O1_CH2_ACT	BIT	U01.01.2	Г	Analog Output Module: CH2 Active
9	_01_CH3_ACT	BIT	UO1.01.3	Г	Analog Output Module: CH3 Active
10	_01_CHO_INTP	BIT	UO1.01.8	Г	Analog Output Module : CHO Interpolation Enabled
11	_O1_CH1_INTP	BIT	UO1.01.9	Г	Analog Output Module: CH1 Interpolation Enabled
12	_01_CH2_INTP	BIT	U01.01.A	Г	Analog Output Module: CH2 Interpolation Enabled
13	_O1_CH3_INTP	BIT	UO1.01.B	Г	Analog Output Module: CH3 Interpolation Enabled
14	_01_CH0_OUTEN	BIT	UO1.02.0	Г	Analog Output Module: CHO Output Status Setting
15	_O1_CH1_OUTEN	BIT	U01.02.1	Г	Analog Output Module: CH1 Output Status Setting
16	_01_CH2_OUTEN	BIT	U01.02.2	Г	Analog Output Module: CH2 Output Status Setting
17	_01_CH3_OUTEN	BIT	UO1.02.3	Г	Analog Output Module: CH3 Output Status Setting
18	_01_OUTEN	WORD	U01.02	Г	Analog Output Module: Output Status Setting
19	_O1_CHO_DATA	WORD	U01.03	Г	Analog Output Module: CHO Input
20	_O1_CH1_DATA	WORD	U01.04	Г	Analog Output Module: CH1 Input
21	_O1_CH2_DATA	WORD	UO1.05	Г	Analog Output Module: CH2 Input
22	O1_CH3_DATA	WORD	UO1.06	Г	Analog Output Module: CH3 Input

(6) For IEC type, as shown below, the variables are registered.

V	Global Variable	Direct Variable Comm	ent 🕅 F	lag					
	Variable Kind	Variable	Туре	Address	Initial Value	Retain	Used	EIP	Comment
1	VAR_GLOBAL	_01_CHO_ACT	BOOL	XUX0.1.16		Г	Г	Г	Analog Output Module: CHO Active
2	VAR_GLOBAL	_01_CHO_DATA	WORD	%UWO.1.3		Г	Г	Г	Analog Output Module: CHO Input
3	VAR_GLOBAL	_01_CHO_ERR	BOOL	%UXO.1.0		Г	Г	Г	Analog Output Module: CHO Error
4	VAR_GLOBAL	_01_CH0_INTP	BOOL	%UX0.1.24		Г	Г	Г	Analog Output Module : CHO Interpolation Enabled
5	VAR_GLOBAL	_01_CH0_OUTEN	BOOL	%UX0.1.32		Г	Г	Г	Analog Output Module: CHO Output Status Setting
6	VAR_GLOBAL	_O1_CH1_ACT	BOOL	%UX0.1.17		Г	Г	Г	Analog Output Module: CH1 Active
7	VAR_GLOBAL	_O1_CH1_DATA	WORD	%UWO.1.4		Г	Г	Г	Analog Output Module: CH1 Input
8	VAR_GLOBAL	_01_CH1_ERR	BOOL	%UXO.1.1		Г	Г	Г	Analog Output Module: CH1 Error
9	VAR_GLOBAL	_01_CH1_INTP	BOOL	%UX0.1.25		Г	Г	Г	Analog Output Module: CH1 Interpolation Enabled
10	VAR_GLOBAL	_01_CH1_OUTEN	BOOL	%UX0.1.33		Г	Г	Г	Analog Output Module: CH1 Output Status Setting
11	VAR_GLOBAL	_01_CH2_ACT	BOOL	%UXO.1.18		Г	Г	Г	Analog Output Module: CH2 Active
12	VAR_GLOBAL	_01_CH2_DATA	WORD	%UW0.1.5		Г	Г	Г	Analog Output Module: CH2 Input
13	VAR_GLOBAL	_01_CH2_ERR	BOOL	%UX0.1.2		Г	Г	Г	Analog Output Module: CH2 Error
14	VAR_GLOBAL	_01_CH2_INTP	BOOL	%UXO.1.26		Г	Г	Г	Analog Output Module: CH2 Interpolation Enabled
15	VAR_GLOBAL	_01_CH2_OUTEN	BOOL	%UXO.1.34		Г	Г	Г	Analog Output Module: CH2 Output Status Setting
16	VAR_GLOBAL	_O1_CH3_ACT	BOOL	%UXO.1.19		Г	Г	Г	Analog Output Module: CH3 Active
17	VAR_GLOBAL	_01_CH3_DATA	WORD	%UWO.1.6		Г	Г	Г	Analog Output Module: CH3 Input
18	VAR_GLOBAL	_01_CH3_ERR	BOOL	%UXO.1.3		Г	Г	Г	Analog Output Module: CH3 Error
19	VAR_GLOBAL	_01_CH3_INTP	BOOL	%UX0.1.27		Г	Г	Г	Analog Output Module: CH3 Interpolation Enabled
20	VAR_GLOBAL	_01_CH3_OUTEN	BOOL	%UX0.1.35		Г	Г	Г	Analog Output Module: CH3 Output Status Setting
21	VAR_GLOBAL	_01_OUTEN	WORD	%UWO.1.2		Г	Г	Г	Analog Output Module: Output Status Setting
22	VAR_GLOBAL	_01_RDY	BOOL	%UXO.1.15		Г	Г	Г	Analog Output Module: Module Ready
23	•					Г	Г	Г	

2) Save variables

I

- (1) The contents of 'View Variable' can be saved as a text file.
- (2) Select [Edit] -> [Export to File].
- (3) The contents of 'View variable' are saved as a text file.

3) View variables

(1) The example of XBC type is as follows.

U01.00.F		MOV	h000F	U01.02
	U01.01.0	MOV	0	U01.03
	U01.01.1	MOV	4000	U01.04
	U01.01.2	MOV	8000	U01.03
	U01.01.3	MOV	12000	U01.03
19				END

(2) Select [View] -> [Variables]. The devices are changed into variables.

0 -	01_RDY	[MOV	h000F	_01_OUTEN
		[MOV	0	_01_CHO_D ATA
	_01_CH1_AC	[MOV	4000	_01_CH1_D ATA
		[MOV	8000	_01_CHO_D ATA
		[MOV	12000	_01_CHO_D ATA
19					END

(3) Select [View] -> [Devices/Variables]. Devices and variables are both displayed.

			-	
U01.00.F		MOV	h000F	U01.02
001_RDY				_01_OUTEN
		MOV	0	U01.03
	_01_CHO_AC			_01_CH0_DA TA
	U01.01.1	MOV	4000	U01.04
				_01_CH1_DA TA
	U01.01.2	MOV	8000	U01.03
	_01_CH2_AC			_01_CHO_DA TA
	U01.01.3	MOV	12000	U01.03
	_01_CH3_AC			_01_CHO_DA TA
19				END

		i alopiaj	5 u	
U01.00.F		MOV	h000F	U01.02
Analog Output Module: Module Ready 0				Analog Output Module: Output Status setting
		MOV	h000F	U01.03
	Analog Output Module: CHO in operation			Analog Output Module: CHO input value
	U01.01.1	MOV	6000E	101.04
	Analog Output Module: CHI in operation		10001	Analog Output Module: CH1 input value
	U01.01.2	MOV	h000F	U01.05
	Analog Output Module: CH2 in operation	۱ <u>ــــــ</u>		Analog Output Module: CH2 input value
	U01.01.3	MOV	h000F	U01.06
	Analog Output Module: CH3 in operation	۲ <u>ــــــــــــــــــــــــــــــــــــ</u>		Analog Output Module: CH3 input value
				END

(4) Select [View] -> [Device/Comments]. Devices and comments are both displayed

(5) In case of IEC-type can also see variety option variables like (1) ~ (4). As shown below, there is an example when 'Variable/Instruction window' is selected in the IEC-type.

10	XMXO	_01_RDY	_01_CH0_AC				
1.1		Analog Output Module: Module Ready	Analog Output module: CHO in operaiton				
			_O1_CH1_AC MOVE Analog Output module: CH1 in operaiton	ENO-	_01_CHO_DA TA Analog Output Module: CHO Input	-IN OUT	CHO_Conver sion_value
12			_01_CH1_DA TA IN Analog Output Module: CH1 Input	OUT- sion_value			
L3							
14			_01_CH2_AC Analog Output module: CH2 in operaiton			EN MOVE ENO	
<i>L5</i>			_01_CH3_AC Analog Output module: CH3 in operaiton	EN MOVE ENO-	_01_CH2_DA TA Analog Output Module: CH2 Input	-IN OUT	CH2_Conver sion_value
18			_01_CH3 TA Analos Output Module CH3 Ing	_DA -IN OUT-sion_value : : ut			
L7							

14.11 Internal Memory

Γ

Describes configuration and function of internal memory

14.11.1 Data I/O area

Describes data I/O area of analog output module.

Device	assigned	Turne	Description	Deteile	DAM	Direction
XBM/XBC	XEC	туре	Description	Details	R/W	of signal
U0y.00.0	%UX0.y.0	BIT	Channel0 Error			
U0y.00.1	%UX0.y.1	BIT	Channel1 Error	Parameter setting		
U0y.00.2	%UX0.y.2	BIT	Channel2 Error	On(1): Setting error Off(0): Setting normal	R	DV04C / DC04C →
U0y.00.3	%UX0.y.3	BIT	Channel3 Error			CPU
U0y.00.F	%UX0.y.15	BIT	Module Ready	On(1): Ready for action Off(0): Not ready		
U0y.01.0	%UX0.y.16	BIT	Channel0 In operation			
U0y.01.1	%UX0.y.17	BIT	Channel1 In operation	Channel operation	R	DV04C /
U0y.01.2	%UX0.y.18	BIT	Channel2 In operation	Off(0): Stop		CPU
U0y.01.3	%UX0.y.19	BIT	Channel3 In operation			
U0y.01.8	%UX0.y.24	BIT	Channel 0 Interpolation output			
U0y.01.9	%UX0.y.25	BIT	Channel 1 Interpolation output	Interpolation output status	Р	DV04C /
U0y.01.A	%UX0.y.26	BIT	Channel 2 Interpolation output	Off(0): Stop	к	CPU
U0y.01.B	%UX0.y.27	BIT	Channel 3 Interpolation output			
U0y.01.C	%UX0.y.28	BIT	Channel0 disconnection detection	Disconnection detection		
U0y.01.D	%UX0.y.29	BIT	Channel1 disconnection detection	On(1): Disconnection	R	DC04C \rightarrow
U0y.01.E	%UX0.y.30	BIT	Channel2 disconnection detection	Off(0): Stop		CPU
U0y.01.F	%UX0.y.31	BIT	Channel3 disconnection detection	(Only for XBF-DC04C)		
U0y.02	%UW0.y.2	WORD	Output enable setting	Output status setting	W	DV04C / DC04C ↔ CPU
U0y.02.0	%UX0.y.32	BIT	Channel0 Output enable setting			
U0y.02.1	%UX0.y.33	BIT	Channel1 Output enable setting	Output enable setting	14/	DV04C /
U0y.02.2	%UX0.y.34	BIT	Channel Output enable setting	Off(0): Output prohibition	vv	CPU
U0y.02.3	%UX0.y.35	BIT	Channel3 Output enable setting			
U0y.03	%UW0.y.3	WORD	CHannel0 Input value		W	DV04C / DC04C ↔ CPU
U0y.04	%UW0.y.4	WORD	Channel1 Input value	Output conversion value	W	DV04C / DC04C ↔ CPU
U0y.05	%UW0.y.5	WORD	Channel2 Input value		W	DV04C / DC04C ↔ CPU
U0y.06	%UW0.y.6	WORD	Channel3 Input value		W	DV04C/ DC04C↔ CPU

- In the device assigned, 'y' means slot number equipped with module.
- In order to read 'CH2 conversion value' of A/D conversion module installed on Slot No.4, it shall be displayed as U04.05. (In case of IEC type %UW0.4.5)



- In order to read 'CH1 conversion value' of A/D conversion module installed on Slot No.5, it shall be displayed as U05.02.1 (In case of IEC type %UW0.5.33)



- 1) Module Ready/Error flag ('()' means the case of IEC type, y: slot number)
 - U0y.00.F(%UX0.y.15): It will be ON when PLC CPU is powered or reset with D/A conversion ready to process A/D conversion.
 - (2) U0y.00.0 ~ U0y.00.3(%UX0.y.0 ~ %UX0.y.3): It is a flag to display the error status of D/A conversion module.
 - * The base number of XGB PLC is '0'.



2) Channel operation information

ſ

- (1) This area shows the channel being used.
- * The base number of XGB PLC is '0'.



3) Status of interpolation output

- (1) This area shows the channel being outputting interpolation.
 - * The base number of XGB PLC is '0'.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
U0y.01 (%UW0.y.1)	_	_	_	_	2 3	2	2 1	C o	_	_	_	_	_	_	_	_



- 4) Output disconnection detection (Only for current output module XBF-DC04C)
 - (1) This area shows the channel detecting output disconnection.
 - * The base number of XGB PLC is '0'.

	II Bit 15	II Bit 14	II Bit 13	II Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
U0y.01 (%UW0.y.1)	с З	2	2 1	8 0	-	-	-	-	-	-	-	-	-	-	-	-
•																

Disconnection detection information Bit On (1): occurrence of disconnection Bit Off (0): Normal

5) Output permission setting

- (1) The output enable / disable for each channel can be set.
- (2) When the output permission is not set, the output of all channels will be prohibited.
- * The base number of XGB PLC is '0'.



6) Digital input value

- (1) Unsigned value(-192~16,191 / 0~16,191), Signed value(-8,192~8,191 / -8,000~8,191), Precise value(-952~5,047 / -60~5,059 / -120~10,119 / -10,240~10,239 / 3,808~20,191 / 0~20,239), Percentile value(-120~10,119 / 0~10,119) can be used within these ranges depending on the setting of input data type.
- (2) If the digital input value is not set, it will be handled as '0'.
- * The base number of XGB PLC is '0'.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
U0y.03						(boon		aital in	out do	20					
(%UW0.y.3)																
U0y.04						(bann		aital in	nut dat	5					
(%UW0.y.4)		Channel 1 Digital input data														
U0y.05						(hann	al 2 Di	aital in	nut dat	ha					
(%UW0.x.5)									gitai ili	putua	la					
U0y.06						(hann	ים ג וי	aital in	nut dat	2					
(%UW0.y.6)								5 0	yitai ili	pulua	la					

Notes

(1) If the external 24V is not supplied, the operation channel information [U0y.01.0 ~ U0y.01.3, (%UX0.y.16 ~ %UX0.y.19)], interpolation output status flag [U0y.01.8 ~ U0y.01.B (%UX0.y.24 ~ %UX0.y.27)], output disconnection detection flag [U0y.01.C ~ U0y.01.F (%UX0.y.28 ~ %UX0.y.31)], will be turned off.
Г

14.11.2 Operation parameters setting area Setting area of D/A conversion module's Run parameters is as described in Table.

Memory address	Descriptions	Details	R/W	Remark
0	Specify channel to use	Bit 0 ~ Bit 3 0: Stop 1: Operation	R/W	
1	Specify voltage output range	Output range setting (2Bit) 00 : 1 ~ 5 V (4 ~ 20 ^{mA}) 01 : 0 ~ 5 V (0 ~ 20 ^{mA}) 10 : 0 ~ 10 V 11 : -10 ~ 10V	R/W	
2	Specify input type	Input data type setting (2Bit) 00: $0 \sim 16,000$ 01: -8,000 ~ 8,000 10: Precise value 11: $0 \sim 10,000$ - In case of precise value $4 \sim 20mA$: $4,000 \sim 20,000$ $0 \sim 20mA$: $0 \sim 20,000$ $1 \sim 5V$: $1000 \sim 5,000$ $0 \sim 5V$: $0 \sim 5,000$ $0 \sim 10V$: $0 \sim 10,000$ -10 ~ $10V$: $-10,000 \sim 10,000$	R/W	PUT/GET
3	Specify Ch0 output setting	Output status setting (2Bit)		
4	Specify Ch1 output setting	00: Previous value output 01: Min value output	R/W	
5	Specify Ch2 output setting	10: Mid value output	-	
6	Specify Ch3 output setting	11: Max value output		
11	Interpolation method	Interpolation method setting (2Bit) 00: Prohibition 01: Linear interpolation 10: S-type interpolation	R/W	
12	Interpolation time	Interpolation time setting (2Bit) 00: 10[ms] 01: 100[ms] 10: 1[s] 11: 60[s]	R/W	
13	CH0 setting error	0: Normal operation		
14	CH1 setting error	31#: Excess error of output range setting 41#: Excess error of digital input value range	P	OFT
15	CH2 setting error	51#: Excess error of interpolation method range	ĸ	GET
16	CH3 setting error	(Decimal, #:Channel number, CH 0-3)		
17	CH 0 interpolation value	When the interpolation operates:		
18	CH 1 interpolation value	Show operated current output digital value. When the interpolation is prohibited:	R	GET
19	CH 2 interpolation value	Show the output value in the data I/O area. $(100,03-06, \%100,03-6)$		021
20	CH 3 interpolation value			
22 ~ 44	System area (Offset/Gain save area)	Read / Write Prohibited	-	-

Notes (1) In case of U0y.00.0~U0y.00.3 and IEC type, %UX0.y.0~%UX0.y.3 turns on and operates as the basic setting value when Inputting except set value in 1, 2, 11 area of memory address. (2) The system area (after No. 22) is prohibited to read/write. If this area is changed, malfunctions or breakdowns will be happened.

1) Operation channel setting

If the operation channel is not set, all channels will be stopped.



2) Output range setting

The range of analog output voltage is DC 0 ~ 10V. And the range of analog output current is DC 4 ~ 20mA, DC 0 ~ 20mA.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address No. 1	_	_	_	_	_	_	_	_	Chai	nnel 3	Cha	nnel 2	Cha	annel 1	Char	nnel 0
	Output range setting (Channel per 2 bits 00 : 1 ~ 5V (4 ~ 20 mÅ) 01 : 0 ~ 5V (0 ~ 20 mÅ 10 : 0 ~ 10 V 11 : -10 ~ 10 V												² bits))		

3) Input data type setting

(1) Input data type can be set for each channel.

(2) All channels will be handled as the range of 0~ 16,000 when the input data type is not set.



4) Output status setting

- (1) When the XGB basic unit is stopped, set the analog output status.
- (2) When the output status setting is not specified, output the previous value.



00 : Previous value output

01 : Min value output

10 : Mid value output 11 : Max value output

Address	Details	Setting
3	Channel 0 Output status setting	Input data type setting (bit)
4	Channel 1 Output status setting	\rightarrow 00: Previous value
5	Channel 2 Output status setting	\rightarrow 10: Mid value
6	Channel 3 Output status setting	→ 11: Max value

5) Interpolation method setting

Show the setting of the interpolation method of each channel.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address No. 11	_	_	_	_	_	_	_	_	Chan	nel 3	Chan	nel 2	Char	nnel 1	Chan	nel 0

Interpolation method setting (2 bits per channel) 00 : Prohibition

01 : Direct interpolation

10 : S type interpolation

6) Interpolation time setting Show the setting of interpolation time of each channel.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address No. 12	_	_	_	-	_	_	_	_	Chan	nel 3	Chan	inel 2	Char	nnel 1	Chan	nel 0
	Interpolation time setting (2 bit 00 : 10[ms] 01 : 100[ms] 10 : 1[s] 11 : 60[s]									oits pe	r chanr	nel)				

7) Channel error

Show the error code of each channel.

When two error or more are happened, the high priority of error code will be saved.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address							Cha	nnel O	orror o	odo						
No. 13							Cha			oue						
Address							Cha	nnol 1	orror o	odo						
No. 14							Cha			oue						
Address							Cha	anal 2	orror o	odo						
No. 15							Gha			oue						
Address							Cha	anal 2	orror o	odo						
No. 16							Ghai			oue						

Error code (Decimal)	Details	Error code order of priority	Remarks
0	Normal operation	_	
31#	Excess error of output range setting	2	#CH number 0.2
41#	Excess error of digital input value range	1	
51#	Excess error of interpolation method range	3	

8) Interpolation operation value

Show the interpolation operation value of each channel.

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address						Channe		ornolo	tion on	orotion						
No. 17					, c	Jnanne	a o inte	erpola	uon op	eratior	i value					
Address					(Channe		ornolo	tion on	oration	walua					
No. 18							9 T INU	erpola	uon op	eration	i value					
Address					(hanne	ol 2 Int	ornola	tion on	oration	voluo					
No. 19							51 Z 1110	erpola	uon op	eration	value					
Address						hanne	al 2 Int	ornola	tion on	oration						
No. 20					, c		5 J I II	erpola	uon op	eralior	value					

9) System area

The system area (after No. 22) is prohibited to read/write.

🕐 Warning	If this area is changed, malfunctions or breakdowns will be happened. So do not control this area.
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14.12 Example Program

04 : Default 05 : Default 06 : Default

07 : Default

👼 09 : Default

👍 10 : Default

Current Consumption

I

14.12.1 Analog output program

I/O Parameter Setting								?
All Base Set Base All Base 00 : Default Base 00 : XBC-DR32H (D 01 : Default 02 : Default 03 : Default 04 : Default 05 : Default 06 : Default 07 : Default 08 : Default 09 : Default 09 : Default 10 : Default 09 : Default 00 : D	Slot O(main) 1 2 3 4 5 6 7 7 8 9 10 10		Module 2H (DC 24V I Digital Module Li Special Module Li Analog Input Analog Unput XBF-DUC XBF-DUC XBF-DUC XBF-DUC Analog ID Mo Positioning M High Speed C Communication M	Commer ist Module t Module 14A (Voltage, 4-Cl 14A (Current, 4-Ch 14B (Current, 4-Ch 14B (Current, 4-Ch 14C (Current, 4-Ch))))))))))))))))))))))))))))))))))))	nt H) H) H) H) H, 14bit) I, 14bit)	Input Filter 3 Standard (ms)	Emergency Out Default	Allocation P0000 ~ P003F
I/O Parameter Setting								?
All Base Set Base ■	BF-DV04C(\ BF-DV04C(Volta)	/oltage ge, 4·CH, ⁻	, 4–СН, 14b (4bit)	it)		2 04	?× Out	Allocation P0000 ~ P003F P0040 ~ P007F

1~5V

0~16000

Formal value

Disable

10[ms]

Delete Base Base Setting Delete All

Disable

Disable

1~5V

0~16000

Formal value

Disable

10[ms]

Disable

1~5V

0~16000

Formal value

Disable

10[ms]

ΟK

Details

1

Disable

1~5V

0~16000

Formal value

Disable

10[ms]

Cancel

<u>P</u>rint ▼

ΟK

Cancel

(1) FIUTIAIII EXAMPLE USING MO FAIAMELEI SELLING	ing].	Parameter Sett	[I/O	ple using	example	Program	(1)	
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Delete Slot

Channel status

Output range

Input type Ch.Output type

Interpolation method

Interpolation period



		Inte	ernal men	nory	Number	of writing
	Slot Numbe	er	address	Setting	data da	ata
U01.00.F	PUT	1	0	h000F	1	←Operating CH(0,1,2,3)
0 _01_ŔDY						
	PUT	1	1	60000		■Output Voltage range(1~5)
	PUT	1	2	h0000	1	◄ Input data type(0~16000)
	PUT	1	3	0	1	←CH0 Output status ←(Previous value)
	PUT	1	4	1		←CH1 Output status (Min value)
	PUT	1	5	2	1	←CH2 Output status (Mid value)
	PUT	1	6	3		◄ CH3 Output status (Max value)
U01.00.F		i	MOV	h000F	U01.02	
1_01_RDY					_01_OUTEN	
			MOV	0	U01.03	◆Output Voltage range(1~5)
					TA	
001.01.1			MOV	4000	U01.04	←Output Voltage range(1~5)
L01_CH1_AC					_O1_CH1_DA	
U01.01.2			MOV	8000	U01.03	←Output Voltage range(1~5)
LO1_CH2_AC					_01_CHO_DA	
U01.01.3			MOV	12000	U01.03	◆Output Voltage range(1~5)
LO1_CH3_AC				·	O1_CHO_DA	
·}					END	
	i i i		D' ''			7

(2) Program example with PUT/GET instruction

Channel operation information

Digital input value

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(3) Program example using parameter in case of IEC type



$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	10			INST			INS	T1			INS	T2	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		_01_RDY		PUT_WORD REQ DONE			PUT_	iord Done			PUT_I -REQ	JORD DONE	
1 2.01 1 2.07 1 1 2.07 1 1 0 M408 1 M608 2 M608 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 2 M08 4 M08 5 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1 2.07 1	L1		0	-BASE STAT		0	-BASE	STAT-		0	BASE	STAT	
L3 0 HUCR 1 SUD1 1 SUD1 L4 0 HUCR 1 SUD2 HUCR 2 HUCR L5 1 IGR000 JATA 109000 JATA 109000 JATA L6 1 SUD1 1 SUD1 10000 JATA 109000 JATA L6 1 SUD1 1 SUD1 1 SUD1 1 SUD1 L6 0 BASE STAT 0 SASE STAT 0 SASE STAT 0 L6 1 SUD1 1 SUD1 1 SUD1 1 L77 0 BASE STAT 0 SASE STAT 0 SASE STAT L60 0 BASE STAT 1 SUD1 1 SUD1 L77 1 SUD1 1 SUD1 1 SUD1 L60 0 BASE STAT 1 SUD1 1 SUD1 L61 0 BASE STAT 1 SUD1 1 SUD1 L62 0 BASE STAT 1 SUD1 1 SUD1 L63 0 BASE STAT 1 SUD1 1 SUD1	12		1	81 OT		1	OL OT			1	91 OT		
1 0 34LH 1 34LH 1 34LH 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2.01 0 3 9400 4 9000 94.14 1 1 1 2.01 1 1 2.01 1 2.01 1 1 2.01 1 2.01 1 3.01 1 3.01 1 2.01 0 94.14 1 94.14 2 94.14 1 2.01 0 94.14 1 94.14 2 94.14 1 1 1 94.14 1 94.14 2 94.14 1 1 94.14 1 94.14 2 94.14 1 1 94.14 1 94.14 2 94.14 1 1 94.14 1 94.14 2 94.14 1 1 1 94.14 1 94.14 2 94.14 1 1 1 1 94.14 1 94	L3			-3201	 		-SLUI				-SLUT		
L5 16/001 DATA 16/000 DATA 16/000 DATA L6 INST6 INST7 INST8 PDI MORE PDI MORE L7 0 DASE STAT 0 DASE STAT 0 DASE STAT L6 1 2.01 1 DATA 1 DATA 2 DATA L6 1 2.01 1 DATA 1 DATA 2 DATA L6 1 2.01 1 DATA 1 DATA 2 DATA L7 0 DASE STAT 0 DASE STAT 0 DATA 1 DATA L67 0 DASE STAT 0 DASE STAT 0 DASE STAT 0 DATA L77 1 SADT 0 DASE STAT 0 DI DOLOU DI DOLOU L67 3 DATA 1 DATA 0 DI DOLOU DI DOLOU L67 3 DATA 1 DATA 1 DI DOLOU DI DOLOU L67 3 DATA 0 DI DOLOU DI DOLOU DI DOLOU DI DOLOU L67 DI DOLOU DI DOLOU DI DOLOU DI DOLOU DI DOLOU <	14		U	-Mauur		1	-MAUUR			2	MAUUR		
L6 INST6 INST6 INST6 INST7 INST8 L7 0 AXSE STAT 0 AXSE STAT 0 BXSE STAT L6 1 SL0T 1 SL0T 1 SL0T L6 3 MCCR 4 ALCR 5 MCCR L7 0 DASE STAT 0 DASE STAT 0 BASE STAT L6 1 SL0T 1 SL0T 1 SL0T L7 0 DATA 1 DATA 2 DATA L7 INST8 INST8 INST8 INST8 INST8 L74 INST8 INST8 INST8 INST8 INST8 L74 INST8 INST8 INST8 INST8 INST8 L74 INST8 INST8 INST8 INST8 <td>15</td> <td></td> <td>16#000f</td> <td>-DATA</td> <td></td> <td>16#0000</td> <td>-DATA</td> <td>·</td> <td></td> <td>16#0000</td> <td>-DATA</td> <td></td> <td></td>	15		16#000f	-DATA		16#0000	-DATA	·		16#0000	-DATA		
27 0 BXSE STAT 0 BXSE STAT 0 BXSE STAT 28 1 SLOT 1 SLOT 1 SLOT 28 0 DATA 1 OATA 2 DATA 217 0 BXSE STAT 0 BXSE STAT 0 BXSE STAT 217 0 DATA 1 OATA 1 OATA 2 DATA 217 0 BXSE STAT 0 BXSE STAT 0 SUT 0 217 0 BXSE STAT 0 BXSE STAT 0 SUT 0 217 0 BXSE STAT 0 BXSE STAT 0 SUT 0 216 0 BXSE STAT 0 BXSE STAT 0 SUT 0 217 1 SUT 0 BXSE STAT 0 SUT 0 SUT SUT 218 0 DUCR 0 DUCR DUCR SUT	18			INST6 PUT_WORD REQ DONE			INS PUT_ REQ	it7 Vord Done			INS PUT_V -REQ	t8 Jord Done	
L4 1 SLOT 1 SLOT 1 SLOT L9 3 MADOR 4 MADOR 5 MADOR L17 0 DATA 1 DATA 2 DATA L17 1 SLOT 1 SLOT 1 SLOT L18 0 BASE STAT 1 SLOT 1 L18 0 BASE STAT 1 SLOT 1 L18 0 BASE STAT 1 SLOT 1 L18 0 BASE STAT 1 SLOT 1 1 L18 0 BASE STAT 1 SLOT 1 1 L18 0 BASE STAT 1 SLOT 1 1 L18 0 DI_OPOLOR 0 DI_OPOLOR 0 0 L20	17		0	-BASE STAT		0	-BASE	STAT-		0	BASE	STAT	
L9 3 MCOR 4 MAOR 5 MAOR L10 0 QATA 1 QATA 2 QATA L17 1 QATA 1 QATA 2 QATA L12 INST9 FEIT/USER 1 QATA 1 QATA L13 0 BASE STAT 1 QATA 1 QATA L14 1 QATA 1 QATA 1 QATA L13 0 BASE STAT 1 QATA 1 QATA L16 6 MAOR 1 1 QATA 1 QATA L16 3 QATA 1 QATA 1 QATA L17 1 QATA 1 QATA 1 QATA L18 0 QATA 1 QATA 1 QATA L19 0 QATA 1 QATA 1 QATA L20 QATA QATA 1 QATA 1 QATA L21 QATA QATA QATA QATA QATA QATA L21 QATA QATA QATA QATA QATA QATA L21	LB		1	-SLOT		1	SLOT			1	SLOT		
L10 0 DATA 1 DATA 2 DATA L17 INST9 INST9 INST9 INST9 INST9 L13 0 BASE STAT INST9 INST9 INST9 L14 1 SLOT INST9 INST9 INST9 L14 1 SLOT INST9 INST9 INST9 L14 1 SLOT INST9 INST9 INST9 L160 JOI (DR) INST9 INST9 INST9 L160 JOI (DR) INST9 INST9 INST9 L177 INST9 INST9 INST9 INST9 L160 JOI (DR) INST9 INST9 INST9 L177 INST9 INST9 INST9 INST9 L177 INST9 INST9 INST9 INST9 L177 INST9 INST9 INST9 INST9 L160 JOI (DR) INST9 INST9 INST9 L177 INST9 INST9 INST9 INST9 L177 INST9 INST9 INST9 INST9 L27 JOI (DR) AC INST9 INST9 INST9 L28 JOI (DR) AC INST9 I	19		3	-MADDR		4	-MADDR			5	MADDR		
L17 INST3 L18 INST3 L19 0 L14 1 L15 6 S 6 L18 3 L18 3 L18 3 L18 3 L18 3 L18 3 L19	L10		0	-DATA		1	-DATA			2	DATA		
1/2 INCT9 FEG - 100Ke 1/3 0 AKE STAT 1/3 1 SLOT 1/3 6 AKDCR 1/3 6 AKDCR 1/3 6 AKDCR 1/3 0 DATA 1/3 DATA DATA 1/3 DATA DATA 1/3 DATA DATA	Lff						-						
2/3 0 -BASE STAT 2/4 1 -SLOT 2/5 6 -MADOR 2/7 3 -DATA 2/7	L12			INST9 PUT_WORD REQ DONE	-								
L/4 1 SL0T L/5 6 M00R L/8 3 DATA L/7	L13		0	-BASE STAT									
2/5 6 MADOR 2/6 3 DATA 2/7 _01_607 _01_60,00 2/7 _01_607 _01_60,00 2/7 _01_60,00 _01_60,00 2/8 _01_60,00 _01_60,00 2/19 _01_60,00 _01_60,00 2/19 _01_60,00 _01_60,00 2/20 _01_60,00 _01_60,00 2/21 _01_60,00 _01_60,00 2/22 _01_60,00 _01_60,00 2/23 _01_60,00 _01_60,00 2/24 _01_60,00 _01_60,00 2/25 _01_60,00 _01_60,00 2/24 _01_60,00 _01_60,00 2/24 _01_60,00 _01_60,00 2/25 _01_60,00 _01_60,00 2/24 _01_60,00 _01_60,00 2/25 _01_60,00 _01_60,00 2/26,00 _01_60,00 _01_60,00 2/27 _01_60,00 _01_60,00 2/29 _12000 _000 _000	L14		1	-SLOT	L								
2.16 3 0ATA 2.17 .01_POV .01_OD_OU 2.18 .01_POV .01_OD_OU 2.19 .01_POV .01_OD_OU 2.19 .01_POV .01_OD_OU 2.20 .01_POL .01_POL 2.21 .01_POL .01_POL 2.22 .01_POL .01_POL 2.23 .01_POL .01_POL 2.24 .01_POL .01_POL 2.25 .01_POL .01_POL 2.24 .01_POL .01_POL 2.25 .01_POL .01_POL 2.26 .01_POL .01_POL 2.27 .01_POL .01_POL 2.28 .01_POL .01_POL 2.29 .01_POL .01_POL	L15		6	-MADDR									
L17	L18		3	-DATA	L								
L18 _01,80Y _01,0H,0U L19 _01,0H,0U L20 _01,0H,0U L21 _01,0H,0U L22 _01,0H,0L _01,0H,0L _0	L17												
1/9	L18	_01_RDV											_01_CH0_OU TEN (S)
L20	L19	· · · · ·											_01_CH1_OU TEN
L21	L20												_01_CH2_OU TEN
L22 01_CH0_AC 1 01_CH1_AC 01_CH1_AC NOVE 01_CH1_AC NOVE 01_CH1_AC NOVE 1 00	L21												_01_CH3_OU TEN (S)
L23	1.22		_01_CH0_AC						MOVE N END-				
L24 4000 IN OUT CH1_Conver sion_value L25 _01_CH2_AC	L23		_01_CH1_AC		MOVE EN END		0		N 011T	CHO_Conver			
L25	L24			4000		CH1_Conve	r	[sion_value			
L28 01_CH2_AC NOVE L27 01_CH3_AC NOVE 01_CH3_AC NOVE 1	L25			4000		sion_valu	•						
L27 _01_CH3_AC MOVE L28 I EN ENO- 8000 -IN Out- CH2_Conver sion_value L29 I 000- IN OUT- CH3_Conver sion_value	L28		_01_CH2_AC					[MOVE				
L28 12000 -IN OUT- CH3_Conver sion_value	L27		_01_CH3_AC		MOVE					CH2 Conver			
	L28			10000	-EN ENO	CH3 Conve	800 r		N UUT-	sion_value			
	L29			12000		sion_valu	•						

(4) Program example using PUT/GET instruction in case of IEC type

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14.13 Breakdown Test

Explain the test and measure method of breakdown while using the analog input module.

14.13.1 Checking the LED status in case of error

The analog input module has a LED and is able to check whether there is error of the module through the sign of LED.

ltem	Normal Status	When CH is disconnected	When parameter setting is error
LED	Light on	Flickering 1s intervals	Flickering 1s intervals (When the output parameter setting is error)
Module Operation	Normal operation Operation of all functions	Operation of all functions	Operation of all functions (Operation by basic value of parameter)
Measure	-	Check output wiring	Check parameter setting

14.13.2 Check the module status

The status of analog input module (Module type/information/OS version) can be checked through the system monitor of XG5000.

1) The order of execution

It can be implemented through one of the methods among next items.

(1)[Monitor] -> [System Monitor] -> Click the right button of mouse on the painting of module. -> [Module Information]

(2)[Monitor] -> [System Monitor] -> Double click the painting of module

(3)[Monitor] -> [Special Module Monitor] -> [XBF-AD04C] Selection ->Click the module information

(4)[Online] -> [I/O Information] -> [XBF-AD04C] Selection -> Click the details

(5)[Online] -> [I/O Information] -> [XBF-AD04C] Double click

2) Module information

- (1) Module Name: Information of recently equipped module device is shown.
- (2) OS Version: OS version of module is shown.
- (3) OS Update Date: The OS prepared date of module is shown.
- (4) Module status: The present error code is shown.

14.13.3 Check and Measure the breakdown

(1) RUN LED is turned off.

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RUN LED is turned off.	
The analog module is installed on correct position.	
No Yes	Install the analog module correctly.
I/O information is shown in XG5000 software.	
No Yes	Call our near agency or A/S center.
When the abnormal analog input module is changed into normal one, it operates well.	
Yes	Call our near agency or A/S center.
(2) RUN LED is flickering.	
RUN LED is flikering 1s intervals.	
Output channel input value is exceeded.	Enter correct value by referring output range
No	from instructions.
Output wiring is disconnected. (Only for current output.	·
Yes No	Make wiring correctly by referring instructions.
The parameter setting is correct. (Check 'PUT')	The operation parameter is error. Set correctly by referring parameter setting rules from instructions. (Check error code)

(3) The analog output value is abnormal.



15. 1General

15.1.1 General

Here describes built-in PID (Proportional Integral Derivative) function. When there is plant (target of control), Control means that the user changes the status such as velocity, temperature, position, voltage, current etc. as the user wishes. Here describes PID control that is most frequently used among diverse control methods. Basic concept of PID control is as follows. First, it detects the PV (Process Value) through sensor and calculates what the difference with SV (Set value) is. Then it outputs MV (Manipulated Value) for PV to be same with SV.

At this time, 3 types of operation, such as Proportion, Integration, Derivation is executed according to the requirement of the user. PID control has high compatibility, flexibility, affordability in comparison with Robust control and Linear optimal control. In case of other control methods, since control device can be applied to the system after mathematical analysis of system, if system or the requirement of the user changes, the analysis of system is done again. But in case of PID control, PID device copes with change of system or requirement of the user with simple auto-tunings without analysis of system rapidly.

The figure 6.1 is example indicating system configuration of temperature control of heating system.



< Figure 15.1 PID Temperature control system with PLC >

At this time, PLC becomes control device for this system, output temperature of heating system becomes target for control. And temperature sensor and valve becomes devices to detect and manipulate the status of system respectively. If temperature sensor detects the output temperature and inputs that to PLC, PLC manipulate the valve status through PID operation and control the quantity of gas that goes into heating system. So temperature of heating system changes. This process is called control loop and PID control is executed by repeating the control loop. The control loop is repeated with a cycle of ms ~ s.

15.1.2 Features

The built-in PID control functions of XGB series feature as follows.

- (1) Since operations are executed within CPU part, it can be controlled by PID parameters and PLC program without PID module.
- (2) A variety of controls can be selected
- That is, a user can easily select P operation, PI operation and PID operation.
- (3) Precise control operation
- It can make precise PID control operations possible through floating point operations.
- (4) PWM (Pulse Width Modulation) output available.
- It outputs control operation results to the output contact point designated by a user through PWM.
- (5) Improving convenience of control settings and monitoring
- Through parameter setting method and K area flag, it maximizes control parameter settings during operation and convenience of monitoring
- (6) Freely selectable operation direction
- · Forward, reverse and mixed forward/reverse operations are available
- (7) Cascade operation realizing quick and precise PID control
- It can increase quickness of response to disturbance through cascade loop.

(8) Various additional functions

• PID control can be achieved by various methods a user wishes because set value ramp, the present value follow-up, limiting change of values and types of alarm functions are provided.

15.2 PID Control

15.2.1 Basic theory of PID control

Here describes basic theory of PID control and how to configure PID control.

(1) Terms

Terms used in this user manual are as follows.

- PV: status of plant detected by sensor (Process value)
- SV: Target value (Set Value) to control plant, if control is done normally, PV should follow the SV.
- E: error between SV and PV. It can be expressed as (SV-PV).
- Kp: proportional coefficient
- Ti: Integral time constant. Sometimes called integral time
- Td: Derivative time constant. Sometimes called derivative time
- MV: Control input or control device output. The input to plant to make PV follow the V
- Ts: Sampling time, a cycle of operation to execute PID control

(2)PID operation expression

Basic PID operation expressions are as follows.

$$E = SV - PV \tag{15.2.1}$$

$$MV_P = K_P E \tag{15.2.2}$$

$$MV_i = \frac{K_P}{T_i} \int Edt \tag{15.2.3}$$

$$MV_d = K_P T_d \frac{dE}{dt}$$
(15.2.4)

$$MV = MV_P + MV_i + MV_d \tag{15.2.5}$$

PID control operation expressions of XGB series are more complicate than expression $(15.2.1) \sim (15.2.5)$ mathematically but those are base on the above expression. The followings describe the characteristics of control process with an example that controls the output temperature of heating system in figure 15.1. At this example, the system and PID parameters imaginary to help the comprehension and those may be different with real heating system. If the heating system in figure 15.1 is expressed as second order system with transfer function like expression (15.2.6) in frequency domain, it is expressed as differential equation like expression (15.2.6) in the time domain.

Transfer function = $\frac{32}{(2s+1)(3s+5))}$ (15.2.6)

$$\frac{6}{32}\frac{d^2y(t)}{dt^2} + \frac{13}{32}\frac{dy(t)}{dt} + 5y(t) = x(t)$$
(15.2.7)

That is, x(t) is Manipulated value and y(t) is Process value.

At this system, we assume that the PID parameter is specified as shown below to describe the PID control operation.

Items	Value	Items	Value
Output temperature of heating system (PV)	0°C	Proportional coefficient (K _P)	5
Target temperature (SV)	50℃	Integral time (Ti)	3s
Cycle of operation	0.01s	Derivative time (T _d)	0.19s

<Table 15.1 example of control of heating system>

At this system, if we assume that target value of output temperature is 50°C and initial value of output temperature is 0°C, SV and PV becomes 50 and 0 respectively. In case of this, PID controller acts as follows.

(3) Proportional control (P control)

In the proportional control, the controller yields output that is proportional to error. Manipulated value of controller by Proportional control is as follows.

$$MV_P = E \times K_P \tag{15.2.8}$$

(a) If P control starts, output of controller by initial P operation is as follows.

$$MV_0 = 50 \times 4 = 200$$

If P control is executed for 10 seconds, output temperature will be as table 15.2. If this is expressed with graph, it will be as Figure 15.2.

Time	Target temp.	Proportional coefficient	Output temp.	Error
0	50	5	0	50
1	50	5	44.98	5.02
2	50	5	53.08	-3.08
3	50	5	50.15	-0.15
4	50	5	48.42	1.58
5	50	5	48.28	1.72
6	50	5	48.44	1.56
7	50	5	48.49	1.51
8	50	5	48.49	1.51
9	50	5	48.49	1.51

< Table 15.2 example of Proportional control >



- (b) Concerning the result of simulation, it has the maximum overshoot of about 23.4°C at 0.62s and after 7s, it converges at 48.49°C with offset of 1.51°C (about 3%).
- (c) Offset is an unavoidable error when only P control is executed. Offset decreases proportional to P coefficient but overshoot increases proportional to P coefficient. Table 15.3 and Figure 15.3 is simulation of offset and overshoot according to P coefficient.

Time	Target temperature	Kp = 5	Kp = 2.5	Kp = 1
0	50	0	0	0
1	50	45.02	63.46	46.67
2	50	53.11	42.52	46.77
3	50	50.15	47.93	41.38
4	50	50.22	47.25	41.60
5	50	48.27	46.96	43.30
6	50	48.35	46.92	43.25
7	50	48.44	46.90	43.21
8	50	48.53	46.90	43.18
9	50	48.53	46.90	43.18

<Table 15.3 Temperature- time table according to P coefficient>



< Figure 15.3 Temperature- time graph according to P coefficient >

- (c) Considering table 15.3, as P coefficient decreases, offset increases but overshoot decreases.
- (d) Generally, offset can't be solved with only P control. In order to remove the offset, P control and I control is used together.

(4) Proportional Integral Control (PI Control)

In I control, it yields the output proportional to error accumulated according to time. And the expression is as follows.

$$MV_i = \frac{K_P}{T_i} \int Edt \tag{15.2.9}$$

- (a) In the expression 15.2.9, Ti means the time takes for MV_i, output by I control, to be added into real output.
- (b) Generally, I control is used with P control. So the expression of PI control is as follows.

$$MV = MV_P + MV_i = E \times K_P + \frac{K_P}{T_i} \int Edt$$
(15.2.10)

(c) In the above heating system, the simulation results are as shown in the table 15.4 when proportional coefficient is 2.5 and integral time is 1.5s.

Time	Target temp.	Proportional coefficient	Integral time	P Control	PI Control
0	50	2.5	1.5	0	0
1	50	2.5	1.5	63.46	74.41
2	50	2.5	1.5	42.52	40.63
3	50	2.5	1.5	47.93	52.99
4	50	2.5	1.5	47.05	49.67

Time	Target temp.	Proportional coefficient	Integral time	P Control	PI Control
5	50	2.5	1.5	46.96	49.70
6	50	2.5	1.5	47.12	50.38
7	50	2.5	1.5	47.03	49.76
8	50	2.5	1.5	47.07	50.14
9	50	2.5	1.5	47.06	49.94
10	50	2.5	1.5	47.06	50.02
11	50	2.5	1.5	47.06	49.99
12	50	2.5	1.5	47.06	50.00
13	50	2.5	1.5	47.06	50.00
14	50	2.5	1.5	47.06	50.00
15	50	2.5	1.5	47.06	50.00

< Table 15.4 Temp.- time table >

- (d) Considering table 15.4 and Figure 15.4, if P and I control is used together, offset is removed and temp. converges at 50°C, target temp. after 12s
- (e) But in this case, convergence time is longer than that of P control and overshoot is larger. Generally, as integral time increases, overshoot decrease. About this, refer to the Figure 15.5.



< Figure 15.4 Temp.- time graph >



< Figure 15.5 overshoot according to integral time >

- (f) Like this, if I control is used, overshoot is larger. According to system, large overshoot can be problem. In order to solve this, PID control is used.
- (5) Proportional integral derivative control (PID control)
 - In D control, when status of system changes rapidly, D control yields the output to reduce the error. Namely, D control yields the output proportional to change velocity of current status. So if D control is used, response speed of controller about status change of system increases, and overshoot decreases. Output of controller by D control is as shown in expression 15.2.11.

$$MV_d = K_P T_d \frac{dE}{dt}$$
(15.2.11)

- (a) In the expression 15.2.11, Td means the time takes for MV_d output by I control, to be added into real output.
- (b) Generally, D control is not used solely but with PD control. So PID control is expressed as expression 15.2.12.

$$MV = MV_P + MV_i + MV_d = E \times K_P + \frac{K_P}{T_i} \int Edt + K_p T_d \frac{dE}{dt}$$
(15.2.12)

(c) The Figure 15.6 is simulation result when PID control is applied to above heating system.

Time	Target temp.	Proportional coefficient	Integral time	Derivative time	PI Control	PID Control
0	50	2.5	1.5	0.3	0	0
1	50	2.5	1.5	0.3	74.41	55.50
2	50	2.5	1.5	0.3	40.63	56.33
3	50	2.5	1.5	0.3	52.99	52.50
4	50	2.5	1.5	0.3	49.67	50.92
5	50	2.5	1.5	0.3	49.70	50.34
6	50	2.5	1.5	0.3	50.38	50.12
7	50	2.5	1.5	0.3	49.76	50.05
8	50	2.5	1.5	0.3	50.14	50.02
9	50	2.5	1.5	0.3	49.94	50.01
10	50	2.5	1.5	0.3	50.02	50.00
11	50	2.5	1.5	0.3	49.99	50.00
12	50	2.5	1.5	0.3	50.00	50.00
13	50	2.5	1.5	0.3	50.00	50.00

< Table 15.5 comparison of PI control and PID control >



< Figure 15.6 comparison of PI control and PID control >

(d) Considering table 15.5, in case PID control is used, max. overshoot decreases from 16.5°C to 8.5°C. At this time, P coefficient, integral time, derivative time are not optimal values, just one of the examples. Actually, P coefficient, integral time, derivative time values vary according to PID control system.

15.2.2 Functional specifications of PID control

(1) Functional Specifications

The performance specifications of the built-in PID control function in XGB series are summarized in the below table.

	ltem	Specifications
	No. of loops	16 Loop
Scope of	Proportional constant(P)	Real number (0 ~ 3.40282347e+38)
setting PID	Integral constant(I)	Real number (0 ~ 3.40282347e+38), unit: second
constants	Differential constant(D)	Real number (0 ~ 3.40282347e+38), unit: second
Sco	ope of set value	INT (-32,768 ~ 32,767)
Scope	e of present value	INT (-32,768 ~ 32,767)
Scope	of maneuver value	INT (-32,768 ~ 32,767)
Scope of m	nanual maneuver value	INT (-32,768 ~ 32,767)
	RUN/STOP	Operation: PID RUN Flag On (by loops) Stop: PID RUN Flag Off (by loops)
Indication	Error	Normal: PID Error Flag Off (by loops) Error: PID Error Flag On, Error code occurrence (by loops)
	Warning	Normal: PID Warning Flag Off (by loops) Error: PID Warning Flag On, Warnig code occurrence (by loops)
Control operation		Control of P,PI,PD and PID, control of forward/reverse operation
С	ontrol interval	10.0ms ~ 6,553.6ms (0.1msUnit)
	PWM output	Supportable
	Mixed forward/reverse output	Supportable
	Limiting change of present value	INT (-32,768 ~ 32,767)
	Limiting change of maneuver value	INT (-32,768 ~ 32,767)
	Equally dividing set value	0 ~ 65,536 (frequency of control cycle time)
Additional functions	Present value follow- up	0 ~ 65,536 (frequency of control cycle time)
	Cascade control	Supportable.
	Min./max. present value	-32,768 ~ 32,767
	Differential filter	0.01 ~ 655.35 (x 100 Scaled Up)
	Dead band setting	0 ~ 65,535
	Prevention of dual integral accumulation	Supportable
	PID operation pause	Supportable

< Table 15.6 built-in PID control performance specification >

15.2.3 PID control parameter setting

To use the built-in PID control function of XGB series, it is necessary to set PID control parameters by loops in the parameter window and operate it though the commands. Here, it explains parameters to use PID control functions and how to set them.

- (1) PID parameter settings
 - Follow the steps below to set the PID control function parameters of XGB series.
- (a) If selecting the built-in parameters in Parameter of the project window, it shows the built-in parameter setting window as in below figure.



< Figure 15.7 Parameters setting window >

(b) If selecting PID Control, it shows the PID control parameter setting window as in below figure.

i aramotor	LOOP 0	LOOP 1	LOOP 2	LOC
Operational Mode	Auto Opr	Auto Opr	Auto Opr	Auto
Operational Direction	Forward	Forward	Forward	For
Secondary Anti windup	Disable	Disable	Disable	Dis
Derivative term Cal. Method	By Error	By Error	By Error	By
Enable PWM Output	Disable	Disable	Disable	Dis
Set Value	0	0	0	
Scan Period	100	100	100	1
Proportional Gain	1	1	1	
Integral Time	0	0	0	
Derivative Time	0	0	0	
Delta PV Limit	0	0	0	
Delta MV Limit	0	0	0	
Max. MV	4000	4000	4000	4
Min. MV	0	0	0	
Manual MV	0	0	0	
DeadBand Setting Value	0	0	0	
Set filtering coefficient	0	0	0	
PW/M Contact	P20	P20	P20	F
PWM Output Period	100	100	100	1
Set SV Ramp	0	0	0	
Set PV Tracking	0	0	0	
Min PV	0	0	0	
May PV	4000	4000	4000	4

[Figure 15.8 Built-in PID function parameters setting window]

(c) Input items

The items to set in the built-in PID function parameter window and the available scope of them are summarized in below table.

٦

Items	Description	Scope
RUN mode	Set the operation mode of PID control.	Auto/manual operation
RUN direction	Set the operation direction of PID control.	Forward/reverse
Prevention of dual integral accumulation	Set whether to allow dual integral accumulation.	Disabled/enabled
PWM output	Set whether to allow PWM output of maneuver value.	Disabled/enabled
Operation cycle time	Set the operation cycle time of PID control cycle.	100 ~ 65535
Set value	Set target control value.	-32,768 ~ 32,767
Proportional gain	Set proportional gain.	Real number
Integral time	Set integral time.	Real number
Differential time	Set differential time.	Real number
Limiting change of present value	Set the limited change of present value per operation cycle.	-32,768 ~ 32,767
Limiting change of maneuver value	Set the limited change of maneuver value per operation cycle.	-32,768 ~ 32,767
Max. maneuver value	Set the max. maneuver value for control.	-32,768 ~ 32,767
Min. maneuver value	Set the min. maneuver value for control.	-32,768 ~ 32,767
Manual maneuver value	Set the manual maneuver value for control.	-32,768 ~ 32,767
DeadBand setting	Set the deadband width of the set value.	0 ~ 65,535
Differential filter value	Set the filter coefficient of differential operation.	0 ~ 65,535
PWM junction	Set the junction to which PWM output is out.	P20 ~ P3F (%QX0.0.0~%QX0.0.31)
PWM output cycle	Set the output cycle of PWM output.	100 ~ 65,535
Set value ramp	Set the frequency of set value ramp.	0 ~ 65,535
Present value follow- up	Set the follow-up frequency of the present value follow-up function.	0 ~ 65,535
Min. present value	Set the min. value of the input present value.	-32,768 ~ 32,767
Max. present value	Set the max. value of input present value.	-32,768 ~ 32,767

< Table 15.7 PID function parameter setting items >

(2) Description of Setting of PID Parameters

(a) Operation mode

It is the mode to set the operation for PID control of a loop in question.

The available scope is automatic operation or manual operation.

If automatic operation is selected, it outputs the PID control result internally operated by the input PID control parameter as the maneuver value while if manual operation is selected, it outputs the value input to the manual maneuver value parameter without PID operation modified. The default is automatic operation.

(b) Operation direction

It is designed to set the operation direction for PID control of a loop in question. The available scope is forward or reverse direction. At the moment, forward direction means increase of PV when MV increases; reverse direction means decrease PV when MV increases. For instance, a heater is a kind of forward direction system because PV(temperature) increases when output(heating) increases. A refrigerator is a kind of reverse direction system in which PV(temperature) decreases when output increases.

(c) Prevention of dual integral accumulation

It makes dual integral accumulation function enabled/disabled. To understand integral accumulation prevention function, it is necessary to explain the phenomenon of integral accumulation first of all. Every drive has a limit. That is, a motor is limited to the speed and a valve can become status overcoming the complete open/close. If it happens that MV output from a control is beyond the output limit of a drive, its output is maintained as saturated, which may deteriorate the control performance of a system and shorten the life of a drive. Formula (7.2.3) shows that the integral control among PID control output components accumulates errors as time goes on, from which it may take more time to return the normal status after the actuator is saturated in a system of which response characteristically is slow. It is so called integral accumulation phenomenon as illustrated in Fig. 7.9, which shows that if the initial error is very large, the error is continuously accumulated by integral control. Accordingly, a drive is saturated within its output upper limit while the control signal is getting larger, keeping being saturated for a long while until the drift becomes negative and the integral term turns small enough. Due to the operation, the PV may have a large over-shoot as seen in the figure. Such a wind-up phenomenon may occur if the initial drift is large or by a large disturbance or due to malfunction of a device.

The PID function of XGB series is basically with the integral accumulation prevention function, cutting off any integral accumulation phenomenon. In addition, it can detect a time when SV is suddenly decreased, providing a more strong dual integral accumulation prevention function.



< Figure 15.9 Integral accumulation phenomenon >

(d) PWM Output Enabled

PWM output means an output method to turn a junction on – off with a duty proportional to control output calculated by a uniform output cycle. If PWM output is enabled, it realizes PWM output in

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accordance with PWM output cycle set in the parameter of PWM output junction(P20 ~ P3F) designated in the parameter. At the moment, the PWM output cycle follows the PWM output cycle separately set in PID operation cycle. PWM output cycle is available between 10ms ~ 6553.5ms (setting value: 100 ~ 65,535) while it is set at a unit of integer per 0.1ms. figure shows the relation between PID control output and PWM output.

Ex) if PWM output cycle: 1 second, PWM output junction: P20, max. output: 10000, min. output: 0

Time	Output	P40 junction operation			
0 sec	5000	0.5 sec On, 0.5 sec Off			
1 sec	3000	0.3 sec On, 0.7 sec Off			



[Figure 15.10 Relation between PWM output cycle and MV]

(e) Set value

It sets the target of a loop in question, that is, the target status a user wishes to control. In case of the PID control built in XGB, physical values (temperature, flow rate, pressure and etc) of an object to control is not meaningful and instead, it should use the physical amount of an object to control after converting them into numerals. For instance, in order to control a system using a sensor that the output is 0V when its heating device temperature is 0°C while it is 10V when the temperature is 100°C as much as 50°C, it is necessary to set SV as 2000 (as long as it uses AD input module XBE-AD04A).

(f) Operation cycle

It sets the cycle to yield control output by executing the built-in PID operation. The setting cycle is 0.1ms and available between 10ms ~ 6553.5ms (setting value: $100 \sim 65,535$) while it is set at a unit of integer per 0.1ms. For instance, to set PID operation per 100ms, set the operation cycle as 1000.

(g) Proportional gain

It is intended to set the proportional coefficient of a PID loop in question (Kp). As larger Kp, the proportional control operation is getting stronger. The scope is real number.

(h) Integral time

It sets the integral time of PID loop in question (Ti). As larger the integral time, the integral operation is getting weaker. The scope is real number at the unit of second.

(i) Differential time

It sets the differential time of PID loop in question (Td). As larger the differential time, the differential operation is getting stronger. The scope is real number at the unit of second.

(j) Limiting change of present value

It sets the limit of change in present value of PID loop in question. If PV suddenly changes due to signal components such as sensor's malfunction, noise or disturbance during control of PID, it may cause sudden change of PID control output. To prevent the phenomenon, a user can set the max. limit of change in present value that is allowed per PID operation cycle. If the change of present value is limited accordingly, it may calculate the present value as much as the limit although the present value is changed more than the limit once the limit of change in present value is changed more than the limit once the limit of change in present value is set. If using the PV change limit function, it may prevent against sudden change of control output owing to noise or etc. If it is, however, set too small, it may reduce the response speed to the PV change of an actual system, not to sudden change by noise or etc, so it is necessary to set the value appropriately according to the environment of a system to control in order that the PV toward the set value does not take a longer time. The available scope is between -32,768 ~ 32,767. If setting the PV change limit as 0, the function is not available.

(k) Limiting change of MV (Δ MV function)

It limits the max. size that control output, which is output by PID operation is changed at a time. The output MV in this operation cycle is not changed more than the max. change limit set in the previous operation cycle. The function has an effect to prevent a drive from operating excessively due to sudden change of output by preventing sudden change of output resulting from instantaneous change of set value. If it is, however, set too small, it may cause taking a longer time until PV reaches to its target, so it is necessary to adjust it appropriately. The available scope is between -32,768 ~ 32,767. If setting it as 0, the function does not work.

(I) Max. MV

It sets the max. value of control output that may be output by the result of PID operation. The available scope is between -32,768 ~ 32,767. if it exceeds the max. output designated by PID operation result, it outputs the set max. output and alerts the max. output excess warning. For the types and description of warnings, refer to Error/Warning Codes.

(m) Min. MV

It sets the min. value of control output that may be output by the result of PID operation. The available scope is between -32,768 ~ 32,767. If it is smaller than the min. output value designated by PID operation result, it outputs the set min. MV and alerts the min. output shortage warning. For the types and description of warnings, refer to Error/Warning Codes.

(n) Manual MV

It sets the output when the operation mode is manual. The available scope is between -32,768 ~ 32,767.

(o) DeadBand setting

It sets the deadband between set value and present value. Although it may be important to reduce normal status reply of PV for its set value even when MV fluctuates heavily, depending on control system, it may be more important to reduce the frequent change of MV although the normal status reply is somewhat getting larger. DeadBand may be useful in the case. Below figure shows an example of DeadBand setting.



If setting deadband as in the figure, the PID control built in XGB may regard the error between PV and set value as 0 as long as PV is within the available scope of deadband from set value.

That is, in this case, the change of MV is reduced. The available scope of setting is between 0 \sim 65,535 and if it is set as 0, it does not work.

(p) Differential Filter Value Setting

It sets the coefficient of differential filter. Since differential control outputs in proportion to gradient of error and gradient of PV change, it may suddenly change MV as it generates a large response to instantaneous noise or disturbance. To prevent it, XGB series uses a value to which PV is filtered mathematically for differential control. Differential filter value is the coefficient to determine the filter degree for differential control. As smaller differential value set, as stronger differential operation is. The available scope is between $0 \sim 65,535$ and if it is set as 0, the differential filter does not work.

(q) Setting set value ramp

Since the drift is suddenly large if SV is heavily changed during PID control, MV is also changed heavily to correct it. Such an operation may cause excessive operation of a system to control and a drive. To prevent it, SV ramp is used, changing SV gradually step by step when modifying SV during operation. If using the function, SV is gradually changed by SV ramp when SV is changed during PID control. At the moment, SV ramp setting represents the frequency of PID operation cycle taken from when SV starts changing to when it reaches to the final SV. For instance, if SV is to be changed from 1000 to 2000 during operation as PID operation cycle is 10ms and its SV ramp is 500, SV may reach to 2000 after 500X10ms = 5 seconds, that is, as it increases each 2 per operation cycle and after the 500th operation scans. The available scope of setting is between 0 ~65,535 and it is set as 0, it does not work.



[Figure 15.12 SV Ramp function]

(r) PV Follow-up setting

It is intended to prevent any excessive operation of a drive resulting from sudden change of output at the initial control and changes SV gradually from PV at the time when PID operation starts, not directly to SV in case control just turns from stop to operation mode or it changes from manual to automatic operation. At the moment, SV represents the frequency of PID operation cycles taken from when control starts to when it reaches to the set SV (other operations are same as SV ramp function). The available scope is between 0 ~ 65,535. If SV is changed again while PV follow-up is in operation, the SV would be also changed according to SV ramp.

1

(s) Min./max. PV

It sets the min./max. value entered as the present value of PID control. The available scope is between -32,768 ~ 32,767.

15.2.4 PID flag

The parameter set by the XGB series built-in PID control function is saved into the flash memory of the basic unit. Such parameters are moved to K area for the built-in PID function as soon as PLC turns from STOP to RUN mode. PID control operation by PID control command is executed through K area data for PID functions. Therefore, if a user changes the value in the trend monitor window or variable monitor window during operation, PID operation is executed by the changed value. At the moment, if PLC is changed to RUN again after being changed to STOP, it loads the parameters in flash memory to K area, so the data changed in K area is lost. Thus, to keep applying the parameters adjusted in K area, it is necessary to write the parameter set in K area to flash memory by using WRT command. (In case of IEC, APM_WRT)

(1) PID Flag Configuration

K area flags for XGB series built-in PID control function are summarized in the below table.

Loop	K area	IEC type	Symbol	Data type	Default	Description
	K12000~F	%KX19200~15	_PID_MAN	Bit	Auto	PID output designation(0:auto, 1:manual)
	K12010~F	%KX19216~31	_PID_PAUSE	Bit	RUN	PID pause (0:RUN, 1:pause)
	K12020~F	%KX19232~47	_PID_REV	Bit	Forward	Control direction(0:forward, 1:reverse) operation control
	K12030~F	%KX19248~63	_PID_AW2D	Bit	Disabled	Dual integral accumulation prevention(0:enabled, 1:disabled)
	K12040~F	%KX19264~79	_PID_REM_RUN	Bit	Disabled	PID remote operation(0:disabled, 1:enabled)
Common	K1205~K1207	%KW1205~%KW1207	Reserved	WORD	-	Reserved area
	K12080~F	%KX19328~43	_PID_PWM_EN	Bit	Disabled	PWM output enable(0:disabled, 1:enabled)
	K12090~F	%KX19344~59	_PID_STD	Bit	-	PID operation indication(0:stop, 1:run)
	K12100~F	%KX19360~75	_PID_ALARM	Bit	-	PID warning(0:normal, 1:warning)
	K12110~F	%KX19376~91	_PID_ERROR	Bit	-	PID error(0:normal, 1:error)
	K1212~K1215	%KW1212~%KW1215	Reserved	WORD	-	Reserved
	K1216	%KW1216	_PID00_SV	INT	0	PID SV
	K1217	%KW1217	_PID00_T_s	WORD	100	PID operation cycle[0.1ms]
	K1218	%KD609	_PID00_K_p	REAL	1	PID proportional constant
	K1220	%KD610	_PID00_T_i	REAL	0	PID integral time[sec]
	K1222	%KD611	_PID00_T_d	REAL	0	PID differential time[sec]
Loop 0	K1224	%KW1224	_PID00_d_PV_max	WORD	0	PID PV change limit
	K1225	%KW1225	_PID00_d_MV_max	WORD	0	PID MV change limit
	K1226	%KW1226	_PID00_MV_max	INT	4000	PID MV max. value limit
	K1227	%KW1227	_PID00_MV_min	INT	0	PID MV min. value limit
	K1228	%KW1228	_PID00_MV_man	INT	0	PID manual output
	K1229	%KW1229	_PID00_PV	INT	-	PID PV

< Table 15.8 K area flags for PID control >

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Loop	K area	IEC type	Symbol	Data type	Default	Description
	K1230	%KW1230	_PID00_PV_old	INT	-	PID PV of previous cycle
	K1231	%KW1231	_PID00_MV	INT	0	PID MV
	K1232	%KD616	_PID00_ERR	DINT	-	PID control error
	K1234	%KD617	_PID00_MV_p	REAL	0	PID MV proportional value component
	K1236	%KD618	_PID00_Mv_i	REAL	0	PID MV integral control component
	K1238	%KD619	_PID00_MV_d	00_MV_d REAL		PID MV differential control component
	K1240	%KW1240	_PID00_DB_W	WORD	0	PID deadband setting
	K1241	%KW1241	_PID00_Td_lag	D00_Td_lag WORD		PID differential filter coefficient
Loop 0	K1242	%KW1242	_PID00_PWM	WORD	H'20	PID PWM junction setting
	K1243	%KW1243	_PID00_PWM_Prd	WORD	100	PID PWM output cycle
	K1244	%KW1244	_PID00_SV_RAMP	WORD	0	PID SV Ramp value
	K1245	%KW1245	_PID00_PV_Track	WORD	0	PID PV follow-up setting
	K1246	%KW1246	_PID00_PV_MIN	INT	0	PID PV min. value limit
	K1247	%KW1247	_PID00_PV_MAX	INT	4000	PID PV max. value limit
	K1248	%KW1248	_PID00_ALM_CODE	Word	0	PID warning code
	K1249	%KW1249	_PID00_ERR_CODE	Word	0	PID error code
	K1250	%KW1250	_PID00_CUR_SV	INT	0	PID SV of current cycle
	K1251-1255	%KW1251-1255	Reserved	WORD	-	Reserved area
Loop 1	K1256~K1295	%KW1256~%KW1295	-	-	-	PID Loop1 control parameter
			~			
Loop16	K1816~K1855	%KW1816~%KW1855	-	-	-	PID Loop16 control parameter

< Table 15.8 K area flags for PID control (continued) >

K1200 ~ K1211 areas are the common bit areas of PID loops while each bit represents the status of each PID control loop. Therefore, each 16 bits, the max number of loops of XGB PID control represents loop status and setting respectively. K1216 ~ K1255 areas are K areas for PID control loop 0 and save the loop 0 setting and status. It also contains parameters such as SV, operation cycle, proportional coefficient, integral time and differential time set in the built-in parameter window and the XGB built-in PID function executes PID control by each device value in question. In addition, the output data such as MV calculated and output while PID control is executed is also saved into the K areas. By changing the values in K areas, control setting may be changed any time during PID control.

Remark	By changing value of area, you can change control setting whenever you want
	during the PID control
1) PID con	ntrol flag expression : _PID[n]_xxx
→ [n]	: loop number
→ xxx	< : flag function
Ex) PID1(0 K. n. means K. n. of loon 10

2) PID flag function

Each function of K area flags for XGB series built-in PID control function is summarized as follows.

(a) Common bit area

The area is a flag collecting operation setting and information consisting of bits to each 16 loop. Each bit of each word device represents the information of each loop. That is, 'n' th bit represents the information about PID loop n.

1) _PID_MAN (PID RUN mode setting)

Flag name	address	IEC type address	Unit	Setting
_PID_MAN (PID RUN mode setting)	K1200n	%KX19200 + n	BIT	Available

It determines whether to operate the PID control of n loop automatically or manually. For more information about RUN mode, refer to 6.2.3 PID control parameter setting. If the bit is off, it operates automatically; if on, it runs manually.

2) _PID_PAUSE (PID Pause setting)

Flag name	Address	IEC type address	Unit	Setting
_PID_PAUSE (PID pause setting)	K1201n	%KX19216 + n	BIT	Available

It changes PID control of n loop to pause status. If PID control is paused, the control MV is fixed as the output at the time of pause. At the moment, PID operation is continued internally with output fixed. If changing pause status to operation status again, it resumes control, so it may take a longer time until the PV is going to SV once system status is largely changed during pause. If the bit is off, it cancels pause; if on, it operates as paused.

3) _PID_REV (PID RUN direction setting)

Flag name	Address	IEC type address	Unit	Setting
_PID_REV (PID RUN direction setting)	K1202n	%KX19232 + n	BIT	Available

It sets the RUN direction of PID control of 'n'th loop. For more information about run direction, refer to 7.2.3 PID control parameter setting. If the bit is off, it operates normally; if on, it operates reversely.

4) _PID_AW2D (Dual Integral accumulation prevention setting)

Flag name	Address	IEC type address	Unit	Setting
_PID_AW2D (dual integral accumulation prevention setting)	K1203n	%KX19248 + n	BIT	Available

It sets enable/disable of dual integral accumulation prevention of 'n'th loop. For more information about dual integral accumulation prevention, refer to 7.2.3 PID control parameter setting. If the bit is off, it is enabled; if on, it is disabled.

5) _PID_REM_RUN (PID remote operation setting)

Flag name	Address	IEC type address	Unit	Setting
_PID_REM_RUN (PID remote run setting)	K1204n	%KX19264 + n	BIT	Available

GB series built-in PID function can be started by both run from command's start junction and remote run bit setting. That is, XGB starts PID control if PIDRUN command's start junction is on or remote run setting bit is on. Namely, if one of them is on, it executed PID control.

6) _PID_PWM_EN (PWM output enable)

Flag name	Address	IEC type address	Unit	Setting
_PID_PWM_EN (PWM output enable)	K1208n	%KX19328 + n	BIT	Available

It determines whether to output the MV of PID control of 'n'th loop as PWM output. For more information about PWM output, refer to 15.2.3 PID control parameter setting. If the bit is off, it is disabled; if on, it is enabled.

7) _PID_STD (PID RUN status indication)

Flag name	Address	IEC type address	Unit	Setting
_PID_STD (PID RUN status indication)	K1209n	%KX19344 + n	BIT	Unavailable

It indicates the PID control RUN status of 'n' th loop. If a loop is running or paused, it is on while if it stops or has an error during RUN, it is off. In the area as monitoring area, it is changed to the current run status by PLC although a user enters any value temporarily.

8) _PID_ALARM (PID Warning occurrence)

Flag name	Address	IEC type address	Unit	Setting
_PID_ALARM (PID Warning occurrence)	K1210n	%KX19360 + n	BIT	Unavailable

It indicates warning if any warning occurs during PID control of 'n'th loop. Once a warning occurs during PID control operation of a loop, it is on while if it is normal, it is off. At the moment, despite of warning, PID control continues without interruption, but it is desirable to check warning information and take a proper measure. Once a warning occurs, the warning code is also indicated in warning code area of a loop. For more information about the types of warning codes and measures, refer to 15.5. In the area as monitoring area, it is changed to the current run status by PLC although a user enters any value temporarily.

9) _PID_ERROR (PID Error occurrence)

Flag name	Address	IEC type address	Unit	Setting
_PID_ERROR (PID error occurrence)	K1211n	%KX19376 + n	BIT	Unavailable

If an error that discontinues running during PID control of 'n' th loop occurs, it indicates the error's occurrence. If an error generates warning, it is on; if normal, it is off. When an error occurs, PID control stops and MV is output as the min. output set in parameter. Also, if an error

occurs, the error code is indicated in the error code area of a loop. For more information about type of error codes and measures, refer to 15.5. In the area as monitoring area, it is changed to the current run status by PLC although a user enters any value temporarily.

(b) PID Flag area by loops

PID flag areas by loops are allocated between K1216 ~ K1855 and for totally 16 loops, each 40 words is allocated per loop. Therefore, the individual data areas of 'n' th loop are between K $(1216+16*n) \sim K (1255+16*n)$. Every setting of the PID flag areas by loops may be changed during PID control operation. Once the settings are changed, they are applied from the next PID control cycle.

1) _PIDxx_SV (PID xx Loop SV setting)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_SV (PID xx Loop SV setting)	K1216+16*xx	%KW1216+16*xx	INT	-32,768 ~ 32,767

It sets/indicates the SV of PID control of 'xx' th loop. For more information about SV, refer to 15.2.3 PID control parameter setting. The available scope is between -32,768 ~ 32,767.

2) _PIDxx_T_s (PID xx Loop operation cycle)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_T_s (PID xx Loop operation cycle)	K1217+16*xx	%KW1217+16*xx	WORD	100 ~ 65,535

It sets/indicates the operation cycle of PID control of 'xx' th loop. For more information about operation cycle, refer to 15.2.3 PID control parameter setting. The available scope is between $100 \sim 65,535$.

3) _PIDxx_K_p (PID xx Loop proportional constant)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_K_p (PID xx Loop proportional constant)	K1218+16*xx	%KD609+20*xx	REAL	Real number

It sets/indicates the proportional constant of PID control of 'xx' th loop. For more information about proportional constant, refer to 7.2.3 PID Control Parameter Setting. The available scope is real number (-3.40282347e+38 ~ -1.17549435e-38, 0, 1.17549435e-38 ~ 3.40282347e+38). If it is, however, set as 0 and lower, the PID control of a loop generates an error and does not work.

4) _PIDxx_T_i (PID xx Loop Integral time)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_T_i (PID xx Loop integral time)	K1220+16*xx	%KD610+20*xx	REAL	Real number

It sets/indicates integral time of PID control of 'xx' th loop. The available scope is real number. If it is set as 0 and lower, it does not execute integral control.

5) _PIDxx_T_d (PID xx Loop differential time)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_T_d (PID xx Loop differential time)	K1222+16*xx	%KD611+20*xx	REAL	Real number

It sets/indicates differential time of PID control of 'xx' th loop. The available scope is real number. If it is set as 0 and lower, it does not execute differential control.

6) _PIDxx_d_PV_max (PV change limit)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_d_PV_max (PV change limit)	K1224+16*xx	%KD612+20*xx	WORD	0 ~ 65,535

It sets the PV change limit of 'xx' th loop.

For more information about PV change limit, refer to 15.2.3 PID control parameter setting. If it is set as 0, the PV change limit function does not work.

7) _PIDxx_d_MV_max (MV change limit)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_d_MV_max (MV change limit)	K1225+16*xx	%KD610+20*xx	WORD	0 ~ 65,535

It sets the MV change limit of 'xx'th loop. For more information about MV change limit, refer to 15.2.3 PID control parameter setting. If it is set as 0, the MV change limit function does not work.

8) _PIDxx_MV_max, _PIDxx_MV_min, _PIDxx_MV_man (max. MV, min. MV, manual MV)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_MV_max (max. MV)	K1226+16*xx	%KW1226+16*xx		
_PIDxx_MV_min (min. MV)	K1227+16*xx	%KW K1227+16*xx	INT	-32,768 ~ 32,767
_PIDxx_MV_man (manual MV)	K1228+16*xx	%KW K1228+16*xx		

It sets the max. MV, min. MV and manual MV of 'xx' th loop. For more information about max. MV, min. MV and manual MV, refer to 15.2.3 PID control parameter setting. If the max. MV is set lower than the min. MV, the PID control loop generates an error and does not work.

9) _PIDxx_PV (prevent value)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_PV (present value)	K1229+16*xx	%KW1229+16*xx	INT	-32,768 ~ 32,767

It is the area that receives the present value of 'xx' th PID control loop. PV is the present status of the system to control and is normally saved into U device via input devices such as A/D input module if it is entered from a sensor. The value is used to execute PID operation by moving to _PIDxx_PV by means of commands like MOV.

10) _PIDxx_PV_OLD (PV of previous control cycle)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_PV_OLD (PV of previous control cycle)	K1230+16*xx	%KW1230+16*xx	INT	Unavailable

The area indicates the PV just before the xx th PID control loop. The flag, as a dedicated monitoring flag, would be updated by PLC although a user directly enters it.

11) _PIDxx_MV (Control MV)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_MV (control MV)	K1231+16*xx	%KW1231+16*xx	INT	Unavailable

The area shows the MV of 'xx' th PID control loop. As the area in which XGB built-in PID operation result is output every PID control cycle, it delivers the value in the area to U device every scanning by using commands like MOV in the program and outputs to D/A output module, operating a drive.

12) _PID00_ERR (Present error)

Flag name	Address	IEC type address	Unit	Scope
_PID00_ERR _ (present error)	K1232+16*xx	%KW1232+16*xx	DINT	Unavailable

he areas shows the current error of 'xx' th PID control loop. It is also used as an indicator about how much gap the present status has with a desired status and if an error is 0, it means the control system reaches a desired status exactly. Therefore, if control starts, error is quickly reduced at transient state and it reaches normal state, maintaining remaining drift as 0, it could be an ideal control system. The flag, as a dedicated monitoring, is updated although a user directly enters it.

13) _PIDxx_MV_p, _PIDxx_MV_i, _PIDxx_MV_d (P/I/D control components of MV)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_MV_p (MV proportional control component)	K1234+16*xx	%KD616+20*xx		
_PIDxx_MV_i (MV integral control component)	K1236+16*xx	%KD617+20*xx	REAL	Unavailable
_PIDxx_MV_d (MV differential control component)	K1238+16*xx	%KD618+20*xx		

It indicates 'n' th loop MV by classifying proportional control MV, integral control max. MV and differential control MV. The entire MV consists of the sum of these three components. The flag, as a dedicated monitoring, is updated although a user directly enters it.

14) _PIDxx_DB_W (DeadBand setting)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_DB_W (DeadBand setting)	K1240+16*xx	%KW1232+16*xx	WORD	0 ~ 65,535

It sets the deadband of 'xx' th loop. For more information about Deadband function, refer to 15.2.3 PID control parameter setting. If it is set as 0, the function does not work.

15) _PIDxx_Td_lag (Differential filter coefficient)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_Td_lag (differential filter coefficient)	K1241+16*xx	%KW1241+16*xx	WORD	0 ~ 65,535

It sets the differential filter coefficient of 'xx' th loop. For more information about differential filter coefficient, refer to 15.2.3 PID control parameter setting. If it is set as 0, the function does not work.

16) _PIDxx_PWM (PWM output junction setting)

Flag name	Address	IEC type address	Unit	Scope
_PID00_PWM (PWM output junction setting)	K1242+16*xx	%KW1242+16*xx	WORD	H'20 ~ H'3F

It sets the junction to which PWM output of 'xx' th loop is output. PWM output junction is valid only between H'20 \sim H'3F. If any other value is entered, PWM output does not work.

17) _PIDxx_PWM_Prd (PWM Output cycle setting)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_PWM_Prd (PWM output cycle setting)	K1243+16*xx	%KW1243+16*xx	WORD	100 ~ 65,535

It sets the PWM output cycle of 'xx' th loop. The available scope is between $100 \sim 65,535$ at the unit of 0.1ms.

18) _PIDxx_SV_RAMP (SV ramp setting)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_SV_RAMP (SV ramp setting)	K1244+16*xx	%KW1244+16*xx	WORD	0 ~ 65,535

It sets the SV ramp value of 'xx' th loop. For more information about SV ramp of PV, refer to 15.2.3 PID control parameter setting. If it is set as 0, the function does not work.

19) _PIDxx_PV_Track (PV follow-up setting)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_PV_Track (PV follow-up setting)	K1245+16*xx	%KW1245+16*xx	WORD	0 ~ 65,535

It sets the PV follow-up SV of 'xx' th loop. For more information about PV follow-up, refer to 15.2.3 PID control parameter setting. If it is set as 0, the function does not work.

20) _PIDxx_PV_MIN, _PIDxx_PV_MAX(Min. PV input, Max. PV input)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_MV_p (MV proportional control component)	K1246+16*xx	%KW1246+16*xx		20 760 20 767
_PIDxx_MV_i (MV integral control component)	K1247+16*xx	%KW1247+16*xx		-32,700 ~ 32,707

It sets the min./max. PV of 'xx' th loop.

21) _PIDxx_ALM_CODE (Warning code)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_ALM_CODE (Warning code)	K1248+16*xx	%KW1248+16*xx	WORD	Unavailable

It indicates warning code if a warning occurs during 'xx' th loop run. The flag, as a dedicated monitoring, is updated although a user directly enters it. For more information about warning code, refer to 15.5.

22) _PIDxx_ERR_CODE (Error code)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_ERR_CODE (error code)	K1249+16*xx	%KW1249+16*xx	WORD	Unavailable

It indicates error code if an error occurs during 'xx' th loop run. The flag, as a dedicated monitoring, is updated although a user directly enters it. For more information about warning code, refer to 15.5.

23) _PIDxx_CUR_SV (SV of the present cycle)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_CUR_SV (SV of the present cycle)	K1250+16*xx	%KW1250+16*xx	INT	Unavailable

It indicates SV currently running of 'xx' th loop. If SV is changing due to SV ramp or PV followup function, it shows the currently changing PV. The flag, as a dedicated monitoring, is updated although a user directly enters it.
15.3 PID Instructions

It describes PID control commands used in XGB series. The command type of PID control used in XGB series built-in PID control is 4.

(1) PIDRUN

PIDRUN is used to execute PID control by loops.

Start	Signal				PIDRUN	S

- Operand S means the loop no. to execute PID control and avaiable only for constant(0~15).

- If start signal is on, the PID control of a loop starts.

- In case of IEC type, PID control is conducted by PIDRUN function block.

- In case of XGB IEC type, inputs '0' at BLOCK



- PID_STAT, only supported on IEC type, indicates status of PID operation. For meaning of inidcation data, refer to indication contents of PID STATE.

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Item	Indication	Flag name	Contents
	16#0001	PV_MIN_MAX_ALM	Current value exceeds range of maximum, minimum value
	16#0002	PID_SCANTIME_AL M	Operation cycle is too short.
ALARM	16#0003	PID_dPV_WARN	Variation of current value of this PID cycle exceeds the current value variation limit.
	16#0004	PID_dMV_WARN	Variation of manipulated value of this PID cycle exceeds the manipulated value variation limit.
	16#0005	PID_MV_MAX_WAR N	Manipulated value of this PID cycle exceeds maximum manipulated value.
	16#0006	PID_MV_MIN_WAR N	Manipulated value of this PID cycle is smaller than minimum manipulated value.
	16#0100	MV_MIN_MAX_ERR	Maximum manipulated value is set to be smaller than minimum manipulated value.
	16#0200	PV_MIN_MAX_ERR	Maximum current value is set to be smaller than current manipulated value.
	16#0300	PWM_PERIOD_ER R	PWM output cycle is set to be smaller than 100(10ms).
	16#0400	SV_RANGE_ERR	In case of forward operation, set value at start of auto- tuning is smaller than current value. In case of reverse operation, set value at start of auto-tuning is larger than current value.
	16#0500	PWM_ADDRESS_E RR	PWM output is set as contact point other than %QX0.0.0~0.0.31.
ERROR	16#0600	P_GAIN_SET_ERR	Proportional constant is set to be smaller than 0.
	16#0700	I_TIME_SET_ERR	Integral constant is set to be smaller than 0
	16#0800	D_TIME_SET_ERR	Differential constant is set to be smaller than 0
	16#0900	CONTROL_MODE_ ERR	Control mode is other than P, PI, PD and PID.
	16#0B00	PID_PERIOD_ERR;	PIC operation cycle is set to be smaller than 100(10ms)
	16#0C00	HBD_WRONG_DIR	In combined operation, directional parameter of forward operation loop is set as reverse operation or directional parameter of reverse operation loop is set as forward operation
	16#0D00	HBD_SV_NOT_MAT CH	In combined operation, set values of two loops are different
	16#0E00	LOOP EXCEED	PID LOOP number is larger 15

Indication contents of PID STATE

(2) PIDCAS

PIDCAS is a command to execute CASCADE control.

Start S	Signal L			PIDCAS	М	S

- Operand M and S mean master loop and slave loop respecively and available only for constant(0~15).
- If start junction is on, cascade control is executed through master loop and slave loop.
- In case of IEC type, PIDCAS function block is used for cascade control.



Cascade control is called a control method which is intended to increase control stability through quick removal of disturbance by connecting two PID control loops in series and is structured as follows.



[Figure 15.13 Comparison of single loop control and cascade control]

Looking at the figure, it is found that cascade control contains slave loop control within external control loop. That is, the control output of external loop PID control is entered as SV of the internal loop control. Therefore, if steam valve suffers from disturbance in the figure, single loop PID control may not be modified until PV, y(s) appears while cascade control is structured to remove any disturbance by the internal PID loop control before any disturbance that occurs in its internal loop affects the PV, y(s), so it can early remove the influence from disturbance.

XGB internal PID control connects two PID control loops each other, making cascade control possible. At the moment, MV of external loop is automatically entered as the SV of internal loop, so it is not necessary to enter it through program.

(3) PIDHBD

PIDHBD is a command to execute the mixed forward/reverse E control.

Start s	signal			PIDHBD	F	R

- Operand F and R represent forward operation loop and reverse operation loop and available only for constant(0~15).
- If start junction is on, it starts the mixed forward/reverse operation from the designated forward/reverse loops.
- In case of IEC type, combined operation is executed by using PIDHBD function block

Star H	t PIDHBD REQ DONE	
0	-BLOC FWD_ K STAT	- FWD_STAT
F	-LOOP REV _FWD STAT	- REV_STAT
R	-LOOP _REV	

The mixed forward/reverse control is called a control method to control forward operation control output and reverse operation control operation alternatively to a single control process. The XGB built-in PID control enables the mixed forward/reverse control by connecting two PID control loops set as forward/reverse operations. At the moment, it uses PIDHBD command. For more information about the command, refer to 15.2.5. The mixed forward/reverse run is executed as follows in the XGB built-in PID control.

(a) Commencement of mixed run

If PIDHBC command starts first, it starts reverse run when PV is higher than SV; it starts forward run if PV is lower than SV.

(b) Conversion of RUN direction

The conversion of run direction is executed according to the following principles. In case of forward operation run, it keeps running by converting to reverse operation once PV is over SV + DeadBand value. At the moment, the DeadBand setting value uses the deadband of a loop set for forward operation. If PV is below SV – DeadBand value during reverse operation, it also keeps running by converting to forward operation. In the case, the DeadBand setting uses the deadband of a loop set for reverse loop. It may be illustrated as 15.14.



[Figure 15.14 Conversion of RUN direction in the mixed forward/reverse control]

- (c) At the moment, every control parameter uses the parameter of a loop set for forward operation while MV is output to MV output area of a loop of forward operation. Reversely, every control parameter uses the parameter of a loop set for reverse operation during reverse operation run while MV is also output to MV output area of reverse operation loop.
- (d) WRT

WRT is a command to save K area flags changed during operation to the internal flash memory of PLC.

	M0000	1	 	1		ШПТ	0	 0	0	-
						WKT	U	U	U	- Н
4					_					_

- Once start juction is on, it writes K area values to flash memory.

- Each operand description is summarized as follows.

Operand	Item designated	Available device	Remark
OP1	Slot	Constant	Designating basic uit as 0
OP2	N/A	P,M,L,K,D,Z,R, constant	Not used
			0 : positioning X axis
			1 : positioning Y axis
OP3	Parameter type	P,M,L,K,D,Z,R,constant	2 : HS counter
			3 : PID parameter
			4 : PID auto-tuning parameter

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- In case of IEC type, APM_WRT function block is used.

	TN3	INST3				
Start ——	APM <u>.</u> Req	DONE				
0	BASE	STAT				
SLOT	SLOT					
NotUsed	AXIS					
ParameterT ype	WRT AXIS					

15.4 PID Auto-tuning

15.4.1 Basic theory of PID auto-tuning

It describes the function of PID auto-tuning.

The performance of PID controller is very different according to P, I, D coefficient. Generally, It is very difficult and takes long time to predict the system and set P, I, D coefficient because of non-periodical disturbance, interference of other control loop, dynamic characteristic of control system though the engineer is good at handling the PID controller. So auto-tuning that sets the PID coefficient automatically is very useful. Generally, there are many methods in setting the PID coefficient. Here, it will describe Relay Auto-tuning.

(1) PID coefficient setting by Relay auto-tuning

It makes critical oscillation by force and uses the width and period of oscillation to specify the PID coefficient. It applies max. output and min. output to control system for auto-tuning. Then, oscillation with steady period and steady width occurs around the Set value like figure 6.15, and it can calculate the boundary gain by using it like expression (15.3.1).



< Figure 15.15 Relay auto-tuning >

$$K_{u} = \frac{4 \times (Max.output - Min.output)}{\pi \times width}$$
(15.4.1)

At this time, oscillation period is called boundary period. If boundary gain and period is specified, use table 15.9, Ziegler & Nichols tuning table to specify the PID coefficient. This Relay tuning is relatively simple to configure and easy to know the boundary gain and period so it is used frequently and XGB built-in PID auto-tuning uses this method.

Controller	Proportional gain (Kp)	Integral time(Ti)	Differential time(Td)
Р	$0.5K_u$	-	-
PI	$0.45 K_{u}$	$P_{u}/1.2$	-
PID	$0.6K_u$	<i>P</i> _{<i>u</i>} / 2	$P_u/8$

< Table 15.9 Ziegler & Nichols tuning table >

15.4.2 PID Auto-Tuning function specifications

The specifications of the XGB series built-in PID auto-tuning function are summarized as in Table.

Item		Specifications
Scope of SV		INT (-32,768 ~ 32,767)
Scope of PV		INT (-32,768 ~ 32,767)
Scope of MV		INT (-32,768 ~ 32,767)
	Error indication	Normal: error flag off Error: error flag off, error code occurs
AT di	rection setting	Forward/Reverse
Co	ontrol cycle	100 ~ 65,536 (0.1msUnit)
Additional	PWM output	Supportable
function	Hysteresis	Supportable

[Table 15.10 Spec. of built-in PID auto-tuning function]

15.4.3 Auto-tuning parameter setting

To use the XGB series auto-tuning function, it is necessary to start it by using a command after setting auto-tuning parameters by loops in the parameter window. It explains the parameters to use auto-tuning function and how to set them.

(1) Auto-tuning parameter setting

To set the parameters of XGB series auto-tuning function, follow the steps.

(a) If selecting parameter in project window and the built-in parameter, it shows the built-in parameter setting window as seen in below figure.



< Figure 15.16 Built-in parameter setting window >

(b) If selecting auto-tuning, it shows the parameter setting window as seen in Figure 15.17.

Falameter	LOOP 0	LOOP 1	L00P 2	LO
Operational Direction	Forward	Forward	Forward	Fo
Enable PW/M Output	Disable	Disable	Disable	Di
Set Value	0	0	0	
Scan Period	100	100	100	1
Max. MV	4000	4000	4000	4
Min. MV	0	0	0	
PWM Contact	P20	P20	P20	F
PWM Output Period	100	100	100	1
Hysterisis Band	10	10	10	

<Figure 15.17 Built-in auto-tuning function parameter setting window>

(c) Input items

Table shows the items to set in auto-tuning parameter window and the available scopes.

Items	Description	Scope
RUN direction	Set the run direction of auto-tuning.	Forward/reverse
PWM output enable	Set whether to set PWM output of MV enabled/ disabled.	Disable/enable
SV	Set SV.	-32,768 ~ 32,767
Operation time	Set auto-tuning operation time.	100 ~ 65535
Max. MV	Set the max. MV in control.	-32,768 ~ 32,767
Min. mV	Set the min. MV in control.	-32,768 ~ 32,767
PWM junction designation	Designate the junction to which PWM output is output.	P20 ~ P3F
PWM output cycle	Set the output cycle of PWM output.	100 ~ 65,535
Hysteresis setting	Set the hysteresis of auto-tuning MV.	0 ~ 65,535

< Table 15.11 Auto-tuning function parameter setting items>

(2) Description of auto-tuning parameters and how to set them

(a) RUN direction

RUN direction is to set the direction of auto-tuning run of a loop. The available option is forward or reverse. The former (forward) means that PV increase when MV increases while the latter (reverse) means PV decreases when MV increases. For instance, a heater is a kind of forward direction system because PV (temperature) increases when output (heating) increases. A refrigerator is a kind of reverse direction system in which PV (temperature) decreases when output increases.

(b) PWM output enable

PWM output means an output method to turn a junction on – off with a duty proportional to control output calculated by a uniform output cycle. If PWM output is enabled, it realizes PWM output in accordance with PWM output cycle set in the parameter of PWM output junction (P20 ~ P3F, in case of IEC type, %QX0.0.0~%QX0.0.15) designated in the parameter. At the moment, the PWM output cycle follows the PWM output cycle separately set in auto-tuning operation cycle.

(c) SV

It sets the auto-tuning SV of a loop in question. Similar to PID control, physical values (temperature, flow rate, pressure and etc) of an object to control is not meaningful and instead, it should use the physical amount of an object to control after converting them into numerals. For instance, in order to control a system using a sensor that the output is 0V when its heating device temperature is 0° C while it is 10V when the temperature is 100° C as much as 50° C, it is necessary to set SV as 2000(as long as it uses AD input module XBE-AD04A).

(d) Operation time

It sets the cycle to execute operation for auto-tuning. The setting cycle is 0.1ms and available between 10ms ~ 6553.5ms (setting value: $100 \sim 65,535$) while it is set at a unit of integer per 0.1ms.

(e) Max./min. MV

It sets the max./min. value of output for auto-tuning. The available scope is between $-32,768 \sim 32,767$. If the max. MV is set lower than min. MV, the auto-tuning function of a loop generates an error and does not work.

(f) Hysteresis setting

Looking at relay tuning in Figure 15.15, it shows it outputs the max. MV as auto-tuning starts but it converts to min. output as PV is over SV and then, it converts to the max. output as PV is lower than SV. However, if input PV contains noise components or reply components, auto-tuning ends by a slight vibration of PV around SV, yielding incorrect tuning result. To prevent it, hysteresis may be set. XGB auto-tuning converts output at SV + Hysteresis when PV increases or at SV – Hysteresis when it decreases once hysteresis is set. With it, it may prevent incorrect tuning by a slight vibration around SV.



[Figure 15.16 Example of Hysterisis setting]

15.4.4 Auto-tuning flag

The parameters set in the XGB series auto-tuning function are saved to the flash memory of basic unit. Such parameters are moved to K area for auto-tuning function as soon as PLC enters to RUN mode from STOP. Auto-tuning operation using auto-tuning command is achieved by data in K area. At the moment, if PLC is changed to RUN again after being changed to STOP, it takes the parameters in flash memory to K area, so the data changed in K area is lost. Therefore, to continuously apply the parameters adjusted in K area, it is necessary to write the parameters set in K area into flash memory by using WRT command. (In case of IEC type, APM_WRT function block)

(1) Auto-tuning flag configuration

The K area flags of XGB series auto-tuning function are summarized in Table 15.12.

Loops	K area	IEC type	Symbol	Data type	Default	Description
	K18560~F	%KX29696 ~%KX29711	_AT_REV	Bit	Forward	Auto-tuning direction(0:forward, 1:reverse)
Common	K18570~F	%KX29712 ~%KX29727	_AT_PWM_EN	Bit	Disable	PWM output enable(0:disable, 1:enable)
	K18580~F	%KX29728 ~%KX29743	_AT_ERROR	Bit	-	Auto-tuning error(0:normal,1:error)
	K1859	%KW1859	Reserved	WORD	-	Reserved area
	K1860	%KW1860	_AT00_SV	INT	0	AT SV – loop 00
	K1861	%KW1861	_AT00_T_s	WORD	100	AT operation cycle (T_s)[0.1msec]
	K1862	%KW1862	_AT00_MV_max	INT	4000	AT MV max. value limit
	K1863	%KW1863	_AT00_MV_min	INT	0	AT MV min. value limit
	K1864	%KW1864	_AT00_PWM	WORD	0	AT PWM junction setting
	K1865	%KW1865	_AT00_PWM_Prd	WORD	0	AT PWM output cycle
	K1866	%KW1866	_AT00_HYS_val	WORD	0	AT hysterisis setting
Loop0	K1867	%KW1867	_AT00_STATUS	WORD	0	AT auto-tuning status indication
	K1868	%KW1868	_AT00_ERR_CODE	WORD	0	AT error code
	K1869	%KD	_AT00_K_p	REAL	0	AT result proportional coefficient
	K1871	-	_AT00_T_i	REAL	0	AT result integral time
	K1873	-	_AT00_T_d	REAL	0	AT result differential time
	K1875	-	_AT00_PV	INT	0	AT PV
	K1876	-	_AT00_MV	INT	0	AT MV
	K1877~1879	%KW1877 ~%KW1879	Reserved	Word	0	Reserved area

[Table 15.12 K area flags for auto-tuning]

K1856 ~ K1859 areas (In case of IEC type, %KW1856~%KW1859) are the common bit areas for auto-tuning and each bit represents auto-tuning loop status respectively. K1860~K1879 areas save the setting and status of loop 0 as the K area for auto-tuning loop 0. In the area, the parameters such as PV, operation cycle and etc set in the built-in parameter window are saved and the XGB built-in auto-tuning function executes auto-tuning by the device values and saves the results into the K areas.

(2) Auto-tuning flag function

Each function of K area flags for XGB series auto-tuning is summarized as follows.

A) Common bit area

The area is a flag collecting operation setting and information consisting of bits to each 16 loop. Each bit of each word device represents the information of each loop.

1) _AT_REV (auto-tuning run direction setting)

Flag name	Address	IEC type address	Unit	Setting
_AT_REV (PID RUN direction setting)	K1856n	%KX29696 + n	BIT	Available

It determines the run direction of auto-tuning of 'n' th loop. If the bit is off, it is forward operation; if on, it is reverse operation.

2) _AT_PWM_EN (PWM output enable)

Flag name	Address	IEC type address	Unit	Setting
_AT_PWM_EN (PWM output enable)	K857n	%KX29713 + n	BIT	Available

It sets whether to output the auto-tuning MV of 'n' th loop as PWM output. If the bit is off, it is disabled; if on, it is enabled.

3) _AT_ERROR (Auto-tuning error occurrence)

Flag name	Address	IEC type address	Unit	Setting
_PID_ERROR	K1858n	%KX29728 + n	BIT	Unavailable
(PID error occurrence)		/010(2012011)	2	Charanabio

It indicates the error in case an error that discontinues operation during auto-tuning of 'n'th loop occurs. If an error occurs, it is on; if normal, it is off. Once an error occurs, auto-tuning stops and the MV is output as the min. output set in the parameter. Also, if an error occurs, it indicates the error code in the error code area of a loop. For more information about error code types and measures, refer to 15.5. The area, as a dedicated monitor area, is updated although a user directly enters it.

B) Auto-tuning flag area by loops

The auto-tuning flag areas by loops are K1860 ~ K2179 and each 20 words per loop are allocated to totally 16 loops. Therefore, individual data area of 'n' th loop is between K $(1860+16^*n) \sim K (1879+16^*n)$.

1) _ATxx_SV (auto-tuning xx Loop SV setting)

Flag name	Address	IEC type address	Unit	Scope
_ATxx_SV (AT xx Loop SV setting)	K1860+16*xx	%KW1860+16*xx	INT	-32,768 ~ 32,767

It sets/indicates the auto-tuning SV of 'xx'th loop. The available scope is between -32,768 ~ 32,767. 2) _ATxx_T_s (Auto-tuning xx Loop operation cycle)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_T_s (Auto-tuning xx Loop operation cycle)	K1861+16*xx	%KW1861+16*xx	WORD	100 ~ 65,535

It sets/indicates the operation cycle of 'xx' th loop auto-tuning. The available scope is 100 \sim 65,535.

3) _ATxx_MV_max, _ATxx_MV_min(max. MV, min. MV)

Flag name	Address	IEC type address	Unit	Scope
_PIDxx_MV_max (Max. MV)	K1862+16*xx	%KW1862+16*xx		-32,768 ~ 32,767
_PIDxx_MV_min (Min. MV)	K1863+16*xx	%KW1863+16*xx		

It sets max. MV and min. MV of 'xx' th loop respectively. If the max. MV is set lower than min. MV, the auto-tuning loop generates an error and does not work.

4) _ATxx_PWM (AT output junction setting)

Flag name	Address	IEC type address	Unit	Scope
_AT00_PWM (AT output junction setting)	K1864+16*xx	%KW1864+16*xx	WORD	H'20 ~ H'3F

It sets the junction that PWM output of 'xx'th loop is output. The PWM output junction is valid only between H'20 ~ H'3F (hex). If any other value is entered, PWM output does not work.

5) _ATxx_PWM_Prd (PWM output cycle setting)

Flag name	Address	IEC type address	Unit	Scope
_ATxx_PWM_Prd (PWM output cycle setting)	K1865+16*xx	%KW1865+16*xx	WORD	100 ~ 65,535

It sets the PWM output cycle of 'xx' th loop. The available scope is between $100 \sim 65,535$ at the unit of 0.1ms.

6) _ATxx_HYS_val (Hysterisis setting)

Flag name	Address	IEC type address	Unit	Scope
_ATxx_HYS_val (Hysterisis setting)	K1866+16*xx	%KW1866+16*xx	WORD	0 ~ 65,535

It sets the hysterisis of 'xx' th loop. For more information about hysterisis function, refer to 6.3.3 Auto-Tuning Parameter Setting. If it is set as 0, it does not work.

7) _ATxx_STATUS (Auto-tuning status)

Flag name	Address	IEC type address	Unit	Scope
_ATxx_STATUS (Auto-tuning status)	K1867+16*xx	%KW1867+16*xx	WORD	Unavailable

It indicates the auto-tuning status of 'xx' th loop. If auto-tuning is in operation, it is 1; if completed, it is 128. In any other cases, it shows 0.

8) _ATxx_ERR_CODE (Error code)

Flag name	Address	IEC type address	Unit	Scope
_ATxx_ERR_CODE (Error code)	K1868+16*xx	%KW1868+16*xx	WORD	Unavailable

It indicates error code in case an error occurs during the auto-tuning of 'xx'th loop. The flag, as a dedicated monitor, is updated although a user directly enters it. For more information about error code, refer to 15.5.

9) _ATxx_K_p, _ATxx_T_i, _ATxx_T_d (AT result proportional coefficient, integral time, differential time)

Flag name	Address	IEC type address	Unit	Scope
_ATxx_K_p (proportional coefficient)	K1869+16*xx	%KD934+20*xx		
_ATxx_T_i (integral time)	K1871+16*xx	%KD1004+20*xx	Real	Unavailable
_ATxx_T_d (differential time)	K1873+16*xx	%K1005+20*xx		

The area indicates proportional coefficient, integral time and differential time calculated after the auto-tuning of 'xx' th loop is normally completed. The flag, as a dedicated monitoring, updated although a user directly enters it.

10) _ATxx_PV (PV)

Flag name	Address	IEC type address	Unit	Scope
_ATxx_PV (PV)	K1875+16*xx	%KW1875+16*xx	INT	-32,768 ~ 32,767

It is the area to receive PV of 'xx' th auto-tuning loop. PV is the present status of a system to control and in case of PID control, the entry from a sensor is saved into U device through input devices such as A/D input module and it moves the value to _ATxx_PV by using commands such as MOV every scanning, executing auto-tuning.

11) _ATxx_MV (Auto-tuning MV)

Flag name	Address	IEC type address	Unit	Scope
_ATxx_MV (auto-tuning MV)	K1876+16*xx	%KW1876+16*xx	INT	Unavailable

It is the area to output MV of 'xx' th auto-tuning loop. Every auto-tuning cycle, it saves XGB auto-tuning and it delivers the value in the area by using commands like MOV in a program and operates a drive every scanning.

15.4.5 Auto-tuning instructions

The commands used in XGB series auto-tuning are as follows.

1) PIDAT

PIDAT is a command to execute auto-tuning by loops.

Star	t si(gnal				PIDAT	S	Ι
								1

- Operand S means the loop no. to execute auto-tuning and avaiable only for constant(0~15).

- If start junction is on, the PID control of a loop starts.

- In case of IEC type, the following PIDAT function block is used for start of auto-tuning

Start	IN: 	ST4 DAT DONE	
0	BLOC	AT_S- TAT	AT_STAT
S	LOOP		

15.5 Example Programs

The paragraph explains example programs regarding the directions of XGB built-in PID function.

The example programs are explained with water level system as illustrated in 15.17.



[Figure 15.17 Example of water level control system]

15.5.1 System structure

The example system in figure is an example of a system to control a pail's water level to a desired level. The pail's water level is sensed by a water level sensor and entered to A/D input module while PID control operation result, MV is output to a pump through D/A output module, controlling a pump's rotation velocity, regulating the water amount flowing into a pail and regulating the water level as desired. Each mechanism is explained as follows.

(1) XGB basic unit

The XGB basic unit operates by PID control operating PID control operation. It receives PV from A/D input module (XBF-AD04A), executes the built-in PID control operation, output the MV to D/A (XBF-DV04A) and executes PID control.

(2) A/D input module (XBF-AD04A)

It functions as receiving PV of an object to control from a water level sensor and delivering it to basic unit. XBF-AD04A is a 4CH analog input module and settings of analog input types and scopes can be changed in the I/O parameter setting window appeared when selecting I/O parameter in the parameter item of project window. For more information, refer to Analog I/O Module.

(3) D/A output module (XBF-DV04A)

It functions as delivering control MV from basic unit to a drive (pump). XBF-DV04A is a 4CH analog voltage output module and ranges 0 ~ 10V. For detail setting, refer to Analog I/O Module.

(4) Water Level Sensor

A water level sensor plays a role to deliver the PV of an object to control to XGB by measuring the water level of a pail and outputting it within $0 \sim 10V$. Since the types and output scope of water level sensors varies, the output scope of a sensor should be identical with that of A/D input module's input scope. The example uses a water level sensor outputting between $0 \sim 10V$.

(5) Drive (pump)

A drive uses a pump that receives control output of XGF-DV04A and of which rotation velocity is variable. For accurate PID control, the output scope of XBF-DV04A (0~10V) should be same with that of a pump's control input. The example uses a pump that receives its control input between 0 ~ 10V.

15.5.2. Example of PID Auto-tuning

Here, with examples, it explains how to calculate proportional constant, integral time and differential time by using PID auto-tuning function

- (1) PID auto-tuning parameter setting
 - (a) If double-clicking Parameter Built-in Parameter PID Auto-tuning parameter in the project window, it opens up the auto-tuning parameter setting window as illustrated in Figure 15.18.

i arameter	LOOP 0	LOOP 1	LOOP 2	LO
Operational Direction	Forward	Forward	Forward	For
Enable PWM Output	Disable	Disable	Disable	Dia
Set Value	0	0	0	
Scan Period	100	100	100	1
Max. MV	4000	4000	4000	41
Min. MV	0	0	0	
PWM Contact	P20	P20	P20	F
PWM Output Period	100	100	100	1
Hysterisis Band	10	10	10	

[Figure 15.18 Auto-tuning parameter setting window]

(b) Set each parameter and click OK.

In the example, Loop 0 is set as follows.

- RUN direction: forward
 - Since in the system, water level is going up as MV increases and pump's rotation velocity increases, it should be set as forward operation.
- PWM output: disabled
 - In the example, auto-tuning using PWM is not executed. Therefore, PWM output is set as disabled.
- SV: 1000(2.5V)
 - It shows an example in which XBF-AD04A is set as the voltage input of 0~10V.

- Max. MV: 4000
 Max. MV is set as 4000. If MV is 4000, XBF-DV04A outputs 10V.
- Min. MV: 0
 Min. MV is set as 0. If MV is 0, XBF-DV04A outputs 0V.
- PWM junction, PWM output cycle - It is not necessary to set it because the example does not use PWM output.
- Hysteresis setting: 10
- (2) A/D input module parameter setting
 - (a) If double-clicking Parameter I/O parameter, it opens up the setting window as illustrated in figure 15.19.

ase 00 : Default	Slot	Module	Comment	Input Filter	Emergency Output	Allocation
a 00 : Default	0(main)					na kana kana kana kana kana kana kana k
a 01 : Default	1					
g U2:Default	2					
a US: Derault - 04: Default	3					
n 05 : Default	4					
a 06 : Default	5					
07 : Default	6					
	7					

[Figure 15.19 I/O parameter setting window]

(b) If selecting A/D module for a slot in A/D input module, it opens up the setting window as illustrated in Figure 15.20.
I/O Parameter Setting

🕽 Base 00 : Default	Slot	Mo	dule	Commer	it	Input Filter	Emergency Output	Allocation
00 : Default	0(main)							
B 01 : XBF-AD04A (Volt/Cu	1	XBF-AD04A	Volt/Curre				•	P00040 ~ P0007
U2: Default	2		XBF-AD04	A (Volt/Current,	4-CH)			<u> </u>
- 04 : Default	3							
	4		XBF-AD04	A (Volt/Current, 4-	СНЈ			
	5		Pa	arameter	CHO	СН	1 CH 2	CH 3
	6		C Ch	annel status	Disable	Disat	le Disable	Disable
	7			nput range	0~10V	0~10	V 0~10V	0~10V
			01	utput type	0~4000	0~40	0~4000	0~4000
			Fi	Iter process	Disable	Disat	le Disable	Disable
			Filte	er constant	1	1	1	1
			E Ave	erage setting	Disable	Disat	le Disable	Disable
			Avera	ige processing	Count-Avi	r Count	Avr Count-Av	r Count-Avr
			Ave	rage value	2	2	2	2

[Figure 15.20 A/D input mode setting window]

- (c) Check A/D Module operation parameter and click OK. The example is set as follows.
 - RUN CH: CH0 RUN

- The example receives the water level sensor input as CH0.

- Input scope: 0 ~ 10V
 - Set XBF-AD04A input scope as 0 ~ 10V so that it should be identical with the output scope of water level sensor.

- Output data type: 0 ~ 4000
 - It converts the input 0 ~ 10V to digital value from 0 ~ 4000 and delivers it to basic unit.
 - In the case, the resolving power of digital value 1 is 10/4000 = 2.5 mV
- Filter process, averaging: disabled
 - The example sets the input values in order that filter process and averaging are not available.
 - For more information about each function, refer to 12 Analog I/O Module.
- (3) D/A Output Module Parameter setting
 - (a) Set the parameter of D/A output module(XBF-DV04A) that output MV to a drive. How to set them is as same as A/D input module. In the example, it is set as follows.

Parameter	СНО	CH 1	CH 2	СНЗ
Channel status	Disable	Disable	Disable	Disable
🔲 Output range	0~10V	0~10V	0~10V	0~10V
Input type	0~4000	0~4000	0~4000	0~4000
CH. Output type	Former value	Former value	Former value	Former valu

- RUN CH: CH0 RUN
 - In the example, MV is output as CH0 of D/A output module.
- Output scope : 0 ~ 10V
- Input data type: 0 ~ 4000

4) Example of PID Auto-tuning program The example of PID auto-tuning program is illustrated as Figu	ure 15.21.		
comment Enables ChO of D/A conversion module and A/d Conversion module			
F0099			U01.01.0
			_01_CH0_ACT
			_02_CH0_OUTE
comment Move current input value of A/D conversion module to PV Device area of AT Loop O			
F0099	MOV	U01.02 _01_CH0_DATA	K1875 _ATOO_PV
comment Executes auto tuning of AT loop O during MO bit is ON			
9		PIDAT	0
comment Move current MV value of AT loop O to D/A conversion module O			
F0099	MOV	K1876	U02.03
		_ATOO_MV	_02_CHO_DATA
comment Move minimum MV value of AT loop O to D/A conversion module O when auto tuning has bee successfully or error has been occured	n finished		
K18580			M0001
18 _ATOO_ERROR			(0)
H = K1867 h0080 H _ATOO_STATUS			
			END

< Figure 15.21 Auto-tuning example program >

(a) Devices used

Device	Data type	Application
F0099	BIT	It is always on, so it readily operates once PLC is RUN.
U01.01.0 BIT It starts operation of C		It starts operation of CH0 of Slot 1 A/D input module.
U02.02.0 BIT It starts operation of CH0 of		It starts operation of CH0 of Slot 2 D/A output module.
U01.02	INT	PV entered to A/D input module.
U02.03 INT MV entered to D/A output module.		MV entered to D/A output module.
K1875 INT Device to which PV is entered		Device to which PV is entered for LOOP 0 auto-tuning
K1876 INT Dev		Device to which auto-tuning MV of LOOP 0 is output.
K18677	BIT	Junction that is on once auto-tuning is complete.
K18580	BIT	Junction that is on once auto-tuning has an error.
K1863	INT	Min. MV of auto-tuning designated in parameter.

(b) Program explanation

- 1) Since F0099(always on) is ON if PLC is converted form STOP to RUN, CH0 of A/D and D/A starts operating.
- 2) At the moment, PV entered to CH0 is moved to K1875, the input device of PV and saved accordingly.
- 3) Once M0000 junction is on, the auto-tuning of loop 0 starts.
- 4) The auto-tuning MV of loop 0 that is output by PIDAT command is output to D/A output module by line 14 MOV command.
- 5) If auto-tuning is complete or there is any error during auto-tuning, M0001 junction is set, blocking operation of PIDAT command and it outputs min. MV set in parameter to D/A output module.

(c) Monitoring and changing PID control variables using K area

In XGB series built-in auto-tuning, it can monitor and change RUN status of auto-tuning by using K area allocated as fixed area by loops.

1) Variable registration

If selecting "Register in Variable/Description" by right clicking in the variable monitor window, "Variable/Device Selection" window appears. Select "Item" as PID, deselect "View All" and enter 0(means loop number) in "Parameter No", K area device list to save every setting and status of loop 0 appears as shown Figure 15.22. Then, if selecting a variable to monitor and clicking "OK", a selected device is registered to variable monitor window as illustrated in Figure 15.23. Through the monitor window, a user can monitor auto-tuning run status or change the settings.

	Variable	Туре	Device	Comment
-	01 CH0 ACT	BIT	U01.01.0	Analog Input Module: CH0 Active
2	01 CHO DATA	WORD	U01.02	Analog Input Module: CH0 Output
	01 CHO IDD	BIT	U01.10.0	Analog Input Module: CH0 Input Disconnection Flag
	01 CH1 ACT	BIT	U01.01.1	Analog Input Module: CH1 Active
	01 CH1 DATA	WORD	U01.03	Analog Input Module: CH1 Output
	01 CH1 IDD	BIT	U01.10.1	Analog Input Module: CH1 Input Disconnection Flag
	01 CH2 ACT	BIT	U01.01.2	Analog Input Module: CH2 Active
	01 CH2 DATA	WORD	U01.04	Analog Input Module: CH2 Output
	01 CH2 IDD	BIT	U01.10.2	Analog Input Module: CH2 Input Disconnection Flag
,	_01_CH3_ACT	BIT	U01.01.3	Analog Input Module: CH3 Active
	01 CH3 DATA	WORD	U01.05	Analog Input Module: CH3 Output
	01 CH3 IDD	BIT	U01.10.3	Analog Input Module: CH3 Input Disconnection Flag
	01_ERR	BIT	U01.00.0	Analog Input Module: Module Error
	_01_ERR_CLR	BIT	U01.11.2	Analog Input Module: Error Clear Request
	_01_RDY	BIT	U01.00.F	Analog Input Module: Module Ready
;	_02_CH0_ACT	BIT	U02.01.0	Analog Output Module: CH0 Active
	_02_CH0_DATA	WORD	U02.03	Analog Output Module: CH0 Input
}	_02_CH0_ERR	BIT	U02.00.0	Analog Output Module: CH0 Error
1	_02_CH0_OUTEN	BIT	U02.02.0	Analog Output Module: CHO Output Status Setting
)	_02_CH1_ACT	BIT	U02.01.1	Analog Output Module: CH1 Active
	_02_CH1_DATA	WORD	U02.04	Analog Output Module: CH1 Input
-	_02_CH1_ERR	BIT	U02.00.1	Analog Output Module: CH1 Error
	_02_CH1_OUTEN	BIT	U02.02.1	Analog Output Module: CH1 Output Status Setting
1	02_CH2_ACT	BIT	U02.01.2	Analog Output Module: CH2 Active

[Figure 15.22 Variable registration window]

×	PLC	Туре	Device	Value	Variable	Comment 🔺
1	NewPLC	віт	K12000	0	_PID00_MAN	PID Output Se (0:Auto, 1:Man - Loop00
2	NewPLC	BIT	K12010	10	_PID00_PAUSE	PID PAUSE (0:STOP or RL 1:Pause) - Loo
3	NewPLC	BIT	K12020	0	_PID00_REV	PID Operate Direction (0:Forward, 1:Reverse) - Loop00
	NewPLC	віт	K12030	<u>10</u>	_PID00_AW2D	PID Anti Wind-up2 (0:Enable, 1:Disable) - ►
						•
314	🔍 🕨 🕨 🔪 Moni	tor 1 A Monitor 2	A Monitor 3	λ Monitor 4 /		

[Figure 15.23 Auto-tuning variables registered]

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(d) In case of IEC type, example program In case of IEC type, the following program is used.

Comment	Operates A/D input module of slot 1 and CHO of D/A output module of slot 2	
Lf	%FX153	%UX0.1.16
		_01_CHO_AC
12	• • • • • • • • • • • • • • • • • • • •	%UX0.2.32
		_02_CHO_OU
Comment	Moves present value(PV) coming from A/D module to Auto-tuning LoopO current value input devie	
14	%FX153 MOVE EN ENO ON EN ENO	
15	XUW0.1.2 - IN OUT - XKW1875 _01_CH0_DAAT00_PV	
18		
Comment	If Auto-tuning bit is on, auto-tuning of Loop O starts	
LB	INST5 TuningErro PIDAT AutoTuning r PIDAT H REQ DONE-	
19	0 -BLOC AT_S- AT_STAT	
L10	0 -LOOP	
L11		
Comment	Moves output of auto-tuning to digital input value of D/A module Ch1	
L13	*FX153 MOVE 	
L14	XKW1876 - IN OUT - XUW0.2.3	
215		

- (5) Observing RUN status by using trend monitor function
 - Since it is possible to monitor the operation status of XGB series built-in auto-tuning graphically, it is useful to monitor the operation status of auto-tuning clearly.
 - (a) If selecting Monitor Trend monitor menu, it shows the trend monitor widow as illustrated in Figure 15.24.



[Figure 15.24 Trend Monitor window]

(b) If right-clicking trend setting, a user can select a variable to monitor as illustrated in Figure 15.25.

onitor Setup	?
Sample setting	
Max. sample to display: 1000 Sample, Time:	1000 sec.
Max. sample to keep: 1000 Sample. Time:	1000 sec.
Frequency: 1000 ms	
Device setting	
Bit Graph Trend Graph	
ID Device Variable Name	Туре
1	
	ſ
Apply OK	Cancel

[Figure 15.25 window to register trend monitor variable]

(c) For more information about trend monitor, refer to "XG5000 Use's Manual."

15.5.3. Stand-along operation after PID Auto-Tuning

Here, with example, it explains how to execute PID control followed by PID auto-tuning.

(1) PID auto-tuning parameter setting

• PID auto-tuning parameters are set as same as examples of 15.4.2 Example of PID Autotuning.

(2) Setting parameters of A/D input module and D/A output module

 Set the parameters of A/D input module and D/A output module as same as the example in 15.4.2 Example of PID Auto-tuning.

- (3) PID parameter setting
 - (a) If double-clicking Parameter Built-in Parameter PID PID Parameter, it shows the built-in PID parameter setting window as seen in Figure 15.26.

Parameter	LOOP 0	LOOP 1	LOOP 2	LO
Operational Mode	Auto Opr	Auto Opr	Auto Opr	Aut
Operational Direction	Forward	Forward	Forward	For
Secondary Anti windup	Disable	Disable	Disable	Di
erivative term Cal. Method	By Error	By Error	By Error	By
Enable PWM Output	Disable	Disable	Disable	Di
Set Value	0	0	0	
Scan Period	100	100	100	1
Proportional Gain	1	1	1	
Integral Time	0	0	0	
Derivative Time	0	0	0	
Delta PV Limit	0	0	0	
Delta MV Limit	0	0	0	
Max. MV	4000	4000	4000	4
Min. MV	0	0	0	
Manual MV	0	0	0	
DeadBand Setting Value	0	0	0	
Set filtering coefficient	0	0	0	
PWM Contact	P20	P20	P20	ſ
PWM Output Period	100	100	100	
Set SV Ramp	0	0	0	
Set PV Tracking	0	0	0	
Min PV	0	0	0	
Max PV	4000	4000	4000	4
Min PV Max PV	0 4000	0 4000	0 4000	

[Figure 15.26 Auto-tuning parameter setting window]

(b) Set each parameter and click OK.

In the example, Loop 0 is set as follows.

- RUN mode: automatic
 - Set as automatic in order that PID control is executed as the built-in PID operation outputs MV.
- RUN direction: forward
 - Since in the system, water level is going up as MV increases and pump's rotation velocity increases, it should be set as forward operation.
- PWM Output: disabled
 - In the example, auto-tuning using PWM is not executed. Therefore, PWM output is set as disabled.

- SV: 1000(2.5V)
 It shows an example in which XBF-AD04A is set as the voltage input of 0~10V
- Operation cycle: 1000 - In the example, it is set that PID control is executed every 100ms.
- Proportional gain, integral time and differential time
 - It should be initially set as 1,0,0 because PID auto-tuning results is used with PID constant.
- Max. MV: 4000 - Max. MV is set as 4000. If MV is 4000, XBF-DV04A outputs 10V.
- DeadBand: 0 - It is set as 0 because the example does not use DeadBand function.
- Differential filter setting: 0
 it is also set as 0 because the example does not use differential filter.
- Min. MV: 0
 - Min. MV is set as 0. If MV is 0, XBF-DV04A outputs 0V.
- PWM junction, PWM output cycle - It is not necessary to set them because the example does not use PWM output.
- SV ramp, PV follow-up: 0
 - It is not necessary to set SV ramp and PV follow-up because the example does not use them.
- Min. PV, Max. PV: 0
 - Set them as 0 and 4000 respectively so that it could be identical with A/D input module's input scope.

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(c) Example of PID control program after PID auto-tuning The program example for PID auto-tuning is illustrated as Figure 15.27.

	F0099				U01,01,0
0	ON				_01_CHO_AC
					U02,02,0
					_02_CHO_OU TEN
	F0099	M0000	MOV	U01,02	K1875
3	_on	_a't_èn		_01_CHO_DA TA	_ATOO_PV
	моооо —————————————————————————————————	M0001		PIDAT	0
7	_AT_EN	17.1			
	F0099	M0000	MOV	K1876	U02,03
11	_on	_AT_ÈN		_ATOO_MV	_02_CHO_DA TA
	K18677		RMOV	K1869	K1218
15	_AT_DONE			_AT00_K_p	_PID00_K_p
			RMOV	K1871	K1220
				_AT00_T_i	_PID00_T_i
			RMOV	K1873	K1222
				_ATOO_T_d	_PIDO0_T_d MOOO1 (S)
23	M0001			PIDRUN	0
	F0099	M0001	MOV	U01,02	К1229
26	LON			_01_CHO_DA TA	_PIDOO_PV
	F0099	M0001	MOV	K1231	U02,03
30	_on	1.1		_PIDOO_MV	_02_CHO_DA TA
34					END

[Figure 15.27 Example program of PID control after auto-tuning]

1) Devices used

Device	Data type	Application
F0099	BIT	It is always on, so it readily operates once PLC is RUN.
U01.01.0	BIT	It starts operation of CH0 of Slot 1 A/D input module.
U02.02.0	BIT	It starts operation of CH0 of Slot 2 D/A output module.
U01.02	INT	PV entered to A/D input module.
U02.03	INT	MV entered to D/A output module.
K1875	INT	Device to which PV is entered for LOOP 0 auto-tuning
K1876	INT	Device to which auto-tuning MV of LOOP 0 is output.
K18677	BIT	Junction that is on once auto-tuning is complete.
K18580	BIT	Junction that is on once auto-tuning has an error.
K1863	INT	Min. MV of auto-tuning designated in parameter.
K1229	INT	Device to which PV is entered for Loop 0 PID control
K1876	INT	Device to which MV of loop 0 PID control is output.

2) Program explanation

- a) Since F0099 (always on) is ON if PLC is converted form STOP to RUN, CH0 of A/D and D/A starts operating.
- b) Once M0000 junction is on, the auto-tuning of loop 0 starts. At the moment, PV entered to CH0 is moved to K1875, the PV input device of loop 0 and saved accordingly.
- c) The auto-tuning MV of Loop 0 output by PIDAT command is output to D/A output module by line 11, MOV command.
- d) Once auto-tuning is complete, it moves P, I, D coefficients generated from auto-tuning to the input devices of P, I and D, K1218,K1220 and K1222, sets M001 and starts the operation of PID loop 0.

3) In case of IEC type, program example is as shown below.

%FX153															XUX0.1.16
_ON															_01_CHO_AC
															XUX0.2.32
															_02_CHO_OU TEN
%FX153					MOVE	un l									
_ON		INST6													
AutoTuning	TuningComp leted 	PIDAT REQ DONE	-	%UW0.1.2 _01_CH0_DA TA	- IN OL	JT - %} _A	(W1875 TOO_PV								
	0	-BLOC AT_S	- AT_STAT												
	0	-LOOP													
xKx29879 ──┤]									EN MO	/E ENO -		
									- EN ENO	-	%K₩1876 _atoo_mv	- IN	OUT	%UW0.2.3 _02_CH0_DA	
					MOVE									IA	
					EN EI	10		%KD934 _ATOO_K_p	- IN OUT	- %KD609 _PID00_К_р					
		MOVE	٦.	WI/DOOF			VIDC10								
			-	_ATOO_T_i		א - יי PI	КОБТО DOO_T_i								
	%KD936 _AT00_T_d	IN OUT	- %KD611 _PID00_T_d		L										
			J												
															TuningComp leted (S)

15.6 Error/Warning Codes

It describes error codes and warning codes of the XGB built-in PID function. The error codes and warning codes that may occur during use of the XGB built-in PID function are summarized as table. If any error or warning occurs, remove potential causes of the error by referring to the tables.

15.6.1. Error codes

Error codes	Indications	Measures
H'0001	MV_MIN_MAX_ERR	It occurs when max. MV is set lower than min. MV. Make sure to set max. MV larger than min. MV.
H'0002	PV_MIN_MAX_ERR	It occurs when max. PV is set lower min. Pv. Make sure to set max. PV larger than min. PV.
H'0003	PWM_PERIOD_ERR	It occurs when the period of auto tuning or PID operation loop is set under 100(10ms). Make sure to set output period more than 100.
H'0004	SV_RANGE_ERR	It occurs when SV is larger than PV at the start time of auto-tuning if auto-tuning is forward or when SV is larger than PV at the start time of auto-tuning if auto-tuning is reverse.
H'0005	PWM_ADDRESS_ERR	It occurs when the junction designated as PWM output junction is beyond between P20 ~ P3F.
H'0006	P_GAIN_SET_ERR	It occurs when proportional constant is set lower than 0.
H'0007	I_TIME_SET_ERR	It occurs when integral time is set lower than 0.
H'0008	D_TIME_SET_ERR	It occurs when differential time is set lower than 0.
H'0009	CONTROL_MODE_ERR	It occurs when control mode is not P, PI, PD or PID.
H'000A	TUNE_DIR_CHG_ERR	It occurs when operation direction is changed during auto- tuning. Never attempt to change operation direction during auto-tuning.
H000B	PID_PERIOD_ERR	It occurs when period of operation is smaller than 100 (10ms) at Auto-tuning or PID operation. Make sure to set period of operation larger than 100.
H000C	HBD_WRONG_DIR	In mixed operation, It occurs when the direction parameter of forward operation set to reverse operation or the direction parameter of reverse operation set to forward operation. Make sure set to appropriate direction each loop.
H000D	HBD_SV_NOT_MATCH	In mixed operation, it occurs when the Set value of each loop is not concurrent. Make sure set to Set value concurrently.

[Table 15.13 : PID error codes]

15.6.2. Warning codes

Error codes	Indications	Measures
H'0001	PV_MIN_MAX_ALM	It occurs when the set PV is beyond the min./max. PV.
H'0002	PID_SCANTIME_ALM	It occurs when PID operation cycle is too short. It is desirable to set PID operation cycle longer than PLC scan time.
H'0003	PID_dPV_WARN	It occurs when the PV change of PID cycle exceeds PV change limit.
H'0004	PID_dMV_WARN	It occurs when the PV cycle MV change exceeds MV change limit.
H'0005	PID_MV_MAX_WARN	It occurs when the calculated MV of PID cycle exceeds the max. MV.
H'0006	PID_MV_MIN_WARN	It occurs when the calculated MV of PID cycle is smaller than the min. MV

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[Table 15.14 : PID error codes]

Appendix 1 Standard Resistor of RTD General

					Pt100Ω								
-200	18.52												
-100	60.26	56.19	52.11	48.00	43.88	39.72	35.54	31.34	27.10	22.83			
0	100.00	96.09	92.55	88.22	84.27	80.31	76.33	72.33	68.33	64.30			
Temp.(℃)	0	10	20	30	40	50	60	70	80	90			
0	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.08	130.90	134.71			
100	138.51	142.29	146.07	149.83	153.58	157.33	161.05	164.77	168.48	172.17			
200	175.86	179.53	183.19	186.84	190.47	194.10	197.71	201.31	204.90	208.48			
300	212.05	215.61	219.86	222.68	226.21	229.72	233.21	236.70	240.18	243.64			
400	247.09	250.53	253.96	257.38	260.78	264.18	267.56	270.93	274.29	277.64			
500	280.98	284.30	287.62	290.92	294.21	297.49	300.75	304.01	307.25	310.49			
600	313.71												
	JPt100Ω												
-200	17.14												
-100	59.57	55.44	51.29	47.11	42.91	38.68	34.42	30.12	25.80	21.46			
0	100.00	96.02	92.02	88.01	83.99	79.96	75.91	71.85	67.77	63.68			
Temp.(℃)	0	10	20	30	40	50	60	70	80	90			
0	100.00	103.97	107.93	111.88	115.81	119.73	123.64	127.54	131.42	135.3			
100	139.16	143.01	146.85	150.67	154.49	158.29	162.08	165.86	169.63	173.38			
200	177.13	180.86	184.58	188.29	191.99	195.67	199.35	203.01	206.66	210.3			
300	213.93	217.51	221.15	224.74	228.32	231.89	235.45	238.99	242.53	246.05			
400	249.56	253.06	256.55	260.02	263.49	266.94	270.38	273.8	277.22	280.63			
500	284.02	287.4	290.77	294.12	297.47	300.8	304.12	307.43	310.72	314.01			
600	317.28												

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Appendix 2 Thermo Electromotive Force and Compensating Cab

2.1 Table of Thermo Electromotive Force

Type K

-200	- 100	-0	Temp. (℃)	Temp. (℃)	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
-5891	-3553	-0	-0	0	0	4095	8137	12207	16395	20640	24902	29128	33277	37325	41269	45108	48828
	-3852	-392	-10	10	397	4508	8537	12623	16818	21066	25327	29547	33686	37724	41657	45486	
	-4138	-777	-20	20	798	4919	8938	13039	17241	21493	25751	29965	34095	38122	42045	45863	
	-4410	-1156	-30	30	1203	5327	9341	13456	17664	21919	26176	30383	34502	38519	42432	46238	
	-4669	-1527	-40	40	1611	5733	9745	13874	18088	22346	26599	30799	34909	38915	42817	46612	
	-4912	-1889	-50	50	2022	6137	10151	14292	18513	22772	27022	31214	35314	39310	43202	46985	
	-5141	-2243	-60	60	2436	6539	10560	14712	18938	23198	27445	31629	35718	39703	43585	47356	
	-5354	-2586	-70	70	2850	6939	10969	15132	19363	23624	27867	32042	36121	40096	43968	47726	
	-5550	-2920	-80	80	3266	7338	11381	15552	19788	24050	28288	32455	36524	40488	44349	48095	
	-5730	-3242	-90	90	3681	7737	11793	15974	20214	24476	28709	32866	36925	40879	44729	48462	

▶ Type J

unit: µV

unit: μV

-200	-100	-0	(°C) (°C)	Temp. (℃)+	0	100	200	300	400	500	600	700	800
-7890	-4632	0	-0	0	0	5268	10777	16325	21846	27388	33096	39130	45498
	-5036	-501	-10	10	507	5812	11332	16879	22397	27949	33683	39754	
	-5426	-995	-20	20	1019	6359	11887	17432	22949	28511	34273	40382	
	-5801	-1481	-30	30	1536	6907	12442	17984	23501	29075	34867	41013	
	-6159	-1960	-40	40	2058	7457	12998	18537	24054	29642	35464	41647	
	-6499	-2431	-50	50	2585	8008	13553	19089	24607	30210	36066	42283	
	-6821	-2892	-60	60	3115	8560	14108	19640	25161	30782	36671	42922	
	-7122	-3344	-70	70	3649	9113	14663	20192	25716	31356	37280	43563	
	-7402	-3785	-80	80	4186	9667	15217	20743	26272	31933	37893	44207	
	-7659	-4215	-90	90	4725	10222	15771	21295	26829	32513	38510	44852	

▶ Туре Т

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unit: µV

-200	- 100	-0	(T)	(T)	0	100	200	300	400
-5603	-3378	0	-0	0	0	4277	9286	14860	20869
	-3656	-383	-10	10	391	4749	9820	15443	
	-3923	-757	-20	20	789	5227	10360	16030	
	-4177	-1121	-30	30	1196	5712	10905	16621	
	-4419	-1475	-40	40	1611	6204	11456	17217	
	-4648	-1819	-50	50	2035	6702	12011	17816	
	-4865	-2152	-60	60	2467	7207	12572	18420	
	-5069	-2475	-70	70	2908	7718	13137	19027	
	-5261	-2788	-80	80	3357	8235	13707	19638	
	-5439	-3089	-90	90	3813	8757	14281	20252	

▶ Type R

unit : µV

(T)	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700
0	0	647	1468	2400	3407	4471	5582	6741	7949	9203	10503	11846	13224	14624	16035	17445	18842	20215
10	54	723	1557	2498	3511	4580	5696	6860	8072	9331	10636	11983	13363	14765	16176	17585	18981	20350
20	111	800	1647	2596	3616	4689	5810	6979	8196	9460	10768	12119	13502	14906	16317	17726	19119	20483
30	171	879	1738	2695	3721	4799	5925	7098	8320	9589	10902	12257	13642	15047	16458	17866	19257	20616
40	232	959	1830	2795	3826	4910	6040	7218	8445	9718	11035	12394	13782	15188	16599	18006	19395	20748
50	296	1041	1923	2896	3933	5021	6155	7339	8570	9848	11170	12532	13922	15329	16741	18146	19533	20878
60	363	1124	2017	2997	4039	5132	6272	7460	8696	9978	11304	12669	14062	15470	16882	18286	19670	21006
70	431	1208	2111	3099	4146	5244	6388	7582	8822	10109	11439	12808	14202	15611	17022	18425	19807	
80	501	1294	2207	3201	4254	5356	6505	7704	8949	10240	11574	12946	14343	15752	17163	18564	19944	
90	573	1380	2303	3304	4362	5469	6623	7826	9076	10371	11710	13085	14483	15893	17304	18703	20080	

2.2 Thermocouple

2.2.1 Common limit and overheat limit

Symbol of materials	Former symbols (cf)	Nominal diameter (mm)	Common limit (1) °C	Overheat limit (2) °C		
		0.65	650	850		
		1.00	750	950		
К	СА	1.60	850	1050		
		2.30	900	1100		
		3.20	1000	1200		
		0.65	400	500		
		1.00	450	550		
J	IC	1.60	500	650		
		2.30	550	750		
		3.20	600	750		
		0.32	200	250		
т	00	0.65	200	250		
I		1.00	250	300		
		1.60	300	300		
R	-	0.50	1400	1600		

Remarks

(1): common limit refers to the temperature limit that continuously use in the air.

(2): overheat limit refers to the temperature limit that may inevitably use for a short time.

Symbol of materials	Former symbols (cf)	Temperature	Grade	Allowance
		0 °C ~ lower than 1000°C	0.4	$\pm 1.5^{\circ}\text{C}$ or $\pm 0.4\%$ of temperature measured
К	CA	0°C ~ lower than 1200°C	0.75	$\pm 2.5^{\circ}\text{C}$ or $\pm 0.75\%$ of temperature measured
		-200°C~ lower than 0°C	1.5	$\pm 2.5^{\circ}\text{C}$ or $\pm 1.5\%$ of temperature measured
J	10	0°C~ lower than 750°C	0.4	$\pm 1.5~^\circ\text{C}$ or $\pm 0.4\%$ of temperature measured
	IC	0°C~ lower than 750°C	0.75	$\pm 2.5^{\circ}\text{C}$ or $\pm 0.75\%$ of temperature measured
Т		0°C~ lower than 350°C	0.4	$\pm 0.5^{\circ}\text{C}$ or $\pm 0.4\%$ of temperature measured
	CC	0°C~ lower than 350°C	0.75	$\pm 1^{\circ}\text{C}$ or $\pm 0.75\%$ of temperature measured
		-200°C~ lower than 0°C	1.5	$\pm 1^{\circ}\text{C}$ or \pm 1.5% of temperature measured
R	-	0 °C ~ lower than 1600°C	0.25	\pm 1.5 °C or \pm 0.25% of temperature measured

2.2.2 Allowance by temperature

Remark

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Allowance refers to the allowable max. limit subtracting the actual temperature of junction from the converted temperature, based on thermo electromotive force table. In addition, the allowance will be bigger one of °C or %.

2.3 Compensating Cable

2.3.1 Type and specifications of compensating cable

Type of compound thermocouple		Type of compensating type		Sectional ratio by	Materials		Operating	Temp. of	Electric resistan ce of	Electric resistan	Charath	Corecablescolor		
Symbol	Former symbol	symbol	Former symbol	application and allowance	+ point - point (°C) ju	inerrito. and junction (°C)	compensating cable (Ω) ⁽²⁾	return cable (Ω) ⁽²⁾	colors	+	I	– Remarks		
		KX-G	WCA-G	Common for general us	Alloy of nickel and chrome	Alloy of nickel	20,00		±2.5			Red		
		KX-GS	WCA-GS	Common for general use			-20~90		±1.5	15	Blue			
К		KX-H	WCA-H	Common for heat-resistance			0~150	20, 150	±2.5	0.5				
	CA	KX-HS	WCA-HS	Common for heat-resistance				-20~ 150	±1.5				White	
		WX-G	WCA-G	Common for general us		Alloy of copper and nickel	-20~90		12.0					
		WX-H	WCA-H	Common for heat-resistance			0~150		±3.0					
		VX-G	WCA-G	Common for general us	Copper	Alloy of copper and nickel	-20~90	-20~100		0.8				
		JX-G	WIC-G	Common for general us	Iron	Alloy of copper and nickel	-20~90		±2.5	0.8	Vallavi	Red	White	
J	IC	JX-H	WIC-H	Common for heat-resistance			0~150				Yellow			
		TX-G	WCC-C	Common for general us			-20~90 of		±2.0			Red	White	
т		TX-GS	-	Precise for general use	Conner	Alloy of		-20~150	±1.0	0.0	Drover			
	U	TX-H	WCC-H	Common for heat-resistance	Copper	oper copper and nickel	copper and nickel 0~150		±2.0	0.8	Brown			
		TX-HS	-	Precise for heat-resistance					±1.0					
R	_	Rx-G	-	Common for general us	Copper	Alloy of	0~90	0 150	+3(1)	0.1	Black	Red	White	
к	-	RX-H		Common for heat-resistance	Cohhei	copper and nickel	0~150	0~150	- 7	0.1	RIACK			

Remark

(1) The thermocouple electromotive force of thermocouple R and S is non-linear, so it does not indicate the actual temperature measurement error.

(2) Applicable to nominal cross-sectional area of 1.25mm² and more.
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Appendix 3 Dimension

1) Dimension of XBF-AD04A

Unit: mm

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2) Dimension of XBF-DV04A / DV04C

Unit: mm





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3) Dimension of XBF-DC04A / DC04B / DC04C

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Unit: mm



4) Dimension of XBF-RD04A / XBF-AD04C

Unit: mm



5) Dimension of XBF-TC04S

Unit: mm

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6) Dimension of XBF-AH04A

Unit: mm









7) Dimension of XBF-AD08A

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Unit: mm







8) Dimension of XBO-AD02A

Unit: mm





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9) Dimension of XBO-DA02A

Unit: mm

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10) Dimension of XBO-AH02A

Unit: mm











A3-5 **LS**ELECTRIC

11) Dimension of XBO-RD01A

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Unit: mm





12) Dimension of XBO-TC02A

Unit: mm













Warranty

1. Warranty Period

The product you purchased is guaranteed for 36 months from the date of manufacture.

- 2. Scope of Warranty
 - (1) The initial diagnosis of faults is basically conducted by your company. However, upon your request, our company or our service network can undertake this task for a fee. If the cause of the fault lies with our company, this service will be provided free of charge.
 - (2) This warranty only applies if the product is used under normal conditions according to the specifications and precautions described in the handling instructions, user manuals, catalogs, and caution labels.
 - (3) Even within the free warranty period, the following cases will be subject to paid repairs:
 - 1) Replacement of consumable and life-limited parts (e.g., relays, fuses, electrolytic capacitors, fans, LCDs, batteries, etc.)
 - 2) Failures or damages caused by improper storage, handling, negligence, or accidents by the customer
 - 3) Failures resulting from the customer's hardware or software design
 - 4) Failures due to modifications without our consent

(Repairs will be refused, even for a fee, if recognized as modified or repaired outside our company)

- 5) Failures that could have been avoided if the customer's equipment, in which our product is incorporated, had safety devices required by legal regulations or common industry standards
- 6) Failures that could have been prevented if maintenance and replacement of consumable parts were performed normally according to the handling instructions or user manuals
- 7) Failures and damages to the product caused by using connected equipment or inappropriate consumables
- 8) Failures caused by external factors such as fire, abnormal voltage, force majeure, and natural disasters such as earthquakes, lightning, salt damage, wind, and flood damage
- 9) Failures due to reasons that could not be predicted with the scientific and technical standards at the time of our shipment
- 10) Other failures, damages, or defects recognized as the responsibility of your company

Environmental Policy

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



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



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

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