

User Manual

LS Programmable Logic Controller

XGT High Speed Counter Module

XGF-HO2A / XGF-HD2A



Safety Instructions

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

Safety Instructions

Before using the product ...

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



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



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



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

- ▶ The marks displayed on the product and in the user’s manual have the following meanings.
 -  Be careful! Danger may be expected.
 -  Be careful! Electric shock may occur.
- ▶ The user’s manual even after read shall be kept available and accessible to any user of the product.

Safety Instructions

Safety Instructions when designing

Warning

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

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

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

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

Safety Instructions

Safety Instructions when designing

Caution

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

Safety Instructions when designing

Caution

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

Safety Instructions

Safety Instructions when wiring

Warning

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

Caution

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

Safety Instructions

Safety Instructions for test-operation or repair

Warning

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

Caution

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

Safety Instructions for waste disposal

Caution

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

Revision History

Version	Date	Remark	Page
V 1.0	'06.02	First Edition	-

◎ Table of Contents ◎

Safety Instruction

Chapter 1 Overview 1-1

Chapter 2 Specifications 2-1 ~ 2-26

2.1	General Specifications	2-1
2.2	Performance Specifications	2-2
2.2.1	Performance specifications	2-2
2.2.2	Counter input specification	2-4
2.2.3	Preset/Gate input specification.....	2-4
2.2.4	Transistor output (SINK) specification	2-4
2.3	Part Names	2-5
2.3.1	Part Names.....	2-5
2.3.2	Specification of interface with external devices.....	2-6
2.4	Functions.....	2-9
2.4.1	Pulse input mode.....	2-9
2.4.2	Counter mode.....	2-13
2.4.3	Compared output.....	2-16
2.4.4	Carry signal.....	2-20
2.4.5	Borrow signal.....	2-20
2.4.6	Auxiliary mode	2-21

Chapter 3 Installation and Wiring 3-1 ~ 3-5

3.1	Installation	3-1
3.1.1	Installation environment.....	3-1
3.1.2	Handling precautions.....	3-1
3.2	Wiring Precautions	3-1
3.2.1	Example of DC5V voltage output wiring.....	3-2

3.2.2	Example of DC12V NPN Open Collector output wiring.....	3-3
3.2.3	Example of DC24V PNP Open Collector output wiring.....	3-4
3.2.4	Example of Line Driver output wiring.....	3-5

Chapter 4 Operation Procedures and Monitoring (XG5000)	4-1 ~ 4-8
---	------------------

4.1	Operation Method	4-1
4.1.1	Execution of XG5000.....	4-1
4.1.2	Parameters setting and monitoring	4-2
4.2	Parameters Setting	4-5
4.2.1	Parameters setting screen.....	4-5
4.3	Monitoring and Test	4-7
4.3.1	Monitoring/Test screen	4-7
4.4	Register U Devices	4-9
4.4.1	View variables.....	4-9
4.4.2	Register U Devices.....	4-10

Chapter 5 Internal Memory & I/O Signals	5-1 ~ 5-4
--	------------------

5.1	Internal Memory	5-1
5.1.1	Configuration of the internal memory	5-1
5.1.2	Details & Data configuration	5-2
5.1.3	Status display	5-3
5.2	I/O Signals.....	5-4

Chapter 6 Programming	6-1 ~ 6-38
------------------------------------	-------------------

6.1	Read/Write Internal memory	6-1
6.1.1	Read internal memory	6-1
6.1.2	Write internal memory	6-3
6.2	Basic Program.....	6-6
6.2.1	Operation through program	6-6
6.2.2	Count type setting.....	6-7
6.2.3	Operation mode setting	6-8
6.2.4	Count enabled setting.....	6-9
6.2.5	Preset setting.....	6-10
6.2.6	Read 'present count value'	6-11

6.2.7	Setting of compared value and compared condition	6-12
6.2.8	Carry/Borrow resetting.....	6-13
6.2.9	Auxiliary mode setting	6-14
6.2.10	Present value recovery in case of power failure	6-26
6.3	Application program	6-27
6.3.1	Program to move the object car	6-27
6.3.2	Revolution control program of regular angle in turn table	6-33

Chapter 7 Troubleshooting	7-1 ~ 7-9
--	------------------

7.1	Error code.....	7-1
7.2	Troubleshooting	7-2
7.2.1	LED display status of HS counter module.....	7-2
7.2.2	Counter status of HS counter module	7-2
7.2.3	Output status of HS counter module	7-2
7.3	Troubleshooting sequence.....	7-3
7.3.1	RUN LED Off	7-3
7.3.2	RUN LED Blinks	7-4
7.3.3	Counter operation error	7-6
7.3.4	Counter value error.....	7-7
7.3.5	Output operation error	7-8
7.3.6	Module status check through XG5000 system monitoring.....	7-9

Appendices	Appendix -1 ~ Appendix -2
-------------------------	----------------------------------

Appendix 1 Terminology	Appendix 1 -1
Appendix 2 Dimensions	Appendix 2 -1

Warranty

Chapter 1 Overview

High Speed counter module designed for XGT series and used with XGT PLC CPU and XGF-HO2A , and XGF-HD2A modules available.

High Speed counter module has the following functions;

- 1) If 1-phase is input
 - (1) Increasing/Decreasing function by means of the applicable program
 - (2) Increasing/Decreasing function by means of the B-phase input
- 2) 1-multiplier, 2-multiplier, 4-multiplier increasing/decreasing function by means of the difference in phase if 2-phase is input
- 3) Increasing/Decreasing function by means of A-phase or B-phase if CW/CCW is input
- 4) Preset/Gate function by means of the applicable program or external input signal
- 5) 7 kinds of compared signals can be output at output contact of the built-in transistor through compared based value and present value. 2 outputs are provided respectively for each channel.
- 6) 6 additional functions are provided such as Count Clear, Count Latch, Sampling Count, Input frequency Measure, Revolution/Unit time and Count Disable.

Chapter 2 Specifications

2.1 General Specifications

General specifications of XGT series are as specified below.

No.	Item	Specification	Related specifications				
1	Operating temperature	0°C ~ +55°C					
2	Storage temperature	-25°C ~ +70°C					
3	Operating humidity	5 ~ 95%RH, Non-condensing					
4	Storage humidity	5 ~ 95%RH, Non-condensing					
5	Vibration	For discontinuous vibration				Each 10 times in X,Y,Z directions	IEC61131-2
		Frequency	Acceleration	Amplitude	Number		
		10≤f< 57Hz	-	0.075mm	-		
		57≤f≤150Hz	9.8m/s2 (1G)	-	-		
		For continuous vibration					
		Frequency	Acceleration	Amplitude	-		
		10≤f< 57Hz	-	0.035mm	-		
57≤f≤150Hz	4.9m/s2 (0.5G)	-	-				
6	Shocks	* Maximum impact acceleration:147m/s ² (15G) * Authorized time :11ms * Pulse wave : Signal half-wave pulse (Each 3 times in X,Y,Z directions)				IEC61131-2	
7	Impulse Noise	Square wave impulse noise		±1,500V		Test specifications of LS Industrial Systems	
		Electrostatic discharging		Voltage : 4kV (contact discharging)		IEC 61131-2, IEC 61000-4-2	
		Radiated electromagnetic field noise		27 ~ 500MHz, 10 V/m		IEC 61131-2, IEC 61000-4-3	
		Fast Transient / burst noise	Class	Power module	Digital/ Analog I/O communication interface		IEC 61131-2, IEC 61000-4-4
	Voltage	2kV	1kV				
8	Ambient conditions	No corrosive gas or dust					
9	Operating height	2,000m or less					
10	Pollution degree	2 or less					
11	Cooling type	Natural air cooling					

Notes

- 1) IEC(International Electrotechnical Commission):
An international nongovernmental organization which promotes internationally cooperated standardization in electric/electronic fields, publishes international standards and manages applicable estimation system related with.
- 2) Pollution degree:
An index indicating pollution level of the operating environment which decides insulation performance of the devices. For instance, Pollution level 2 indicates the state generally that only non-conductive pollution occurs. However, this state contains temporary conduction due to dew produced.

Chapter 2 Specifications

2.2 Performance Specifications

Specifications of High Speed counter module's basic performance, preset/gate input and transistor output are as described below.

2.2.1 Performance specifications

Item		Specification	
		XGF-H02A	XGF-HD2A
Count Input signal	Signal	A-phase, B-phase	
	Input type	Voltage input (Open Collector)	Differential input (Line Drive):
	Signal level	DC 5/12/24V	RS-422A Line Drive /HTL LEVEL Line Drive
Maximum coefficient speed		200kpps	500kpps (HTL input is 250kpps)
Number of channels		2	
Coefficient range		Signed 32-bit (-2,147,483,648 ~ 2,147,483,647)	
Count mode (program setting)		Linear Count (if 32-bit range exceeded, Carry/Borrow occurs, the maximum/minimum count value displayed)	
		Ring Count (repeated count within setting range)	
Input mode (program setting)		1-phase input	
		2-phase input	
		CW/CCW input	
Signal type		Voltage	
Up/down Setting	1-phase input	Increasing/decreasing operation setting by B-phase input	
		Increasing/decreasing operation setting by program	
	2-phase input	Automatic setting by difference in phase	
CW/CCW	A-phase input: increasing operation		
	B-phase input: decreasing operation		
Multiplication function	1-phase input	1/2 multiplication (program setting)	
	2-phase input	1/2/4 multiplication (program setting)	
	CW/CCW	1-multiplication	
Control input	Signal	Preset instruction input, auxiliary mode instruction input	
	Signal level	DC 5V/12V/24V (by terminal selection) input type	
	Signal type	Voltage	
External output	Output points	2-point/channel (for each channel): terminal output available	
	Type	Select single-compared (>, >=, =, <=, <) or section compared output (included or excluded) (program setting)	
	Output type	Open collector output (Sink)	

Chapter 2 Specifications

Item		Specification	
		XGF-H02A	XGF-HD2A
Function to display operation status	Input signal	A-phase, B-phase, Preset instruction, Auxiliary mode instruction	
	Output signal	OUT0, OUT1	
	Operation status	Module Ready, A/B phase pulse input status	
Count enable		To be set through program (count available only in enable status)	
Preset function		To be set through terminal or program	
Auxiliary mode (program setting)		Count Clear, Count Latch, Sampling Count (time setting value: 1~60000ms) Count Input Frequency Measure (for respective input phases) Revolution/Unit time (time setting value: 1~60000ms) Count Disable (setting by internal/external input during count operation)	
Terminal		40-pin connector	
Internal consumed current		270 mA	330 mA
Weight		90g	

Chapter 2 Specifications

2.2.2 Counter input specification

Item	Specification			
	Voltage input type			Differential type
Input voltage	24V DC (17.0V ~ 26.4V)	12V DC (9.8V ~ 13.2V)	5V DC (4.5V ~ 5.5V)	Line Driver
Input current	7~11 mA	7~11 mA	7~11mA	RS-422A Line Driver
On guaranteed voltage (minimum)	17.0 V	9.8V	4.1V	
Off guaranteed voltage (maximum)	4.5V	3.0V	1.7V	HTL LEVEL Line Driver

2.2.3 Preset/Gate input specification

Item	Preset/Gate input		
Input voltage	24V DC (15.2V ~ 26.4V)	12V DC (10.8V ~ 13.2V)	5V DC (4.1V ~ 5.5V)
Input current	3~6 mA	3~6 mA	3~6 mA
On guaranteed voltage	15.2 V	10.8V	4.1V
Off guaranteed voltage	3.2V	2.5V	1.4V
On delayed time	1ms or less		
Off delayed time	1ms or less		

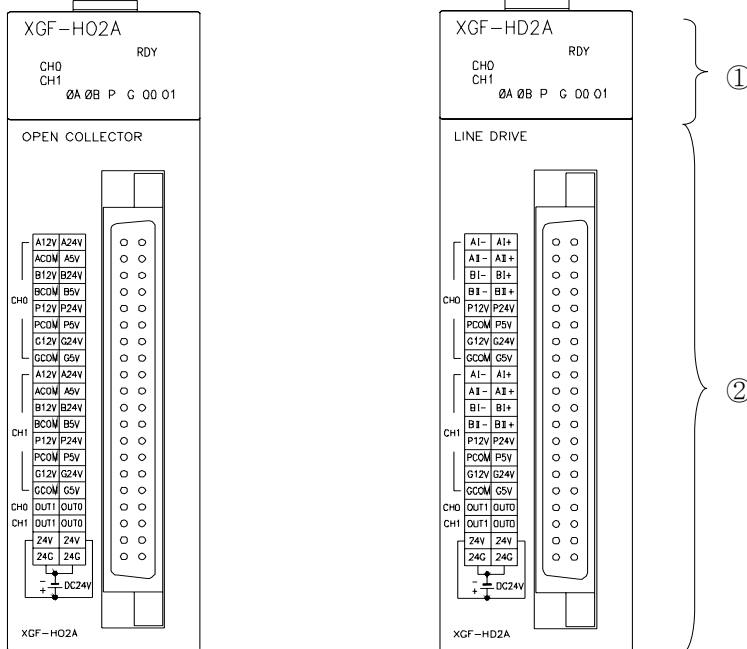
2.2.4 Transistor output (SINK) specification

Item	Specification
Rated output	DC 24V, 100 mA / point
Leaked current	0.1 mA or less
Saturated area voltage	1.3 V or less
On delayed time	0.1 ms or less
Off delayed time	0.1 ms or less

2.3 Part Names

2.3.1 Part Names

1) XGF-HO2A / HD2A



No.	Designation	Details
①	LED display	ØA A-phase pulse input
		ØB B-phase pulse input
		P External preset input
		G External gate input
		OUT0 OUT0 compared output
		OUT1 OUT1 compared output
		READY Ready signal
②	I/O connector	Terminal for I/O with external device

2.3.2 Specification of interface with external devices

1) Arrangement of connector pins

(1) XGF-HO2A

Pin arrangement	Pin No.		Designations of signals	
	CH 0	CH 1		
	1	17	A12V	A-phase DC12V input
	2	18	A24V	A-phase DC24V input
	3	19	A_C	A-phase COM terminal
	4	20	A5V	A-phase DC5V input
	5	21	B12V	B-phase DC12V input
	6	22	B24V	B-phase DC24V input
	7	23	B_C	B-phase COM terminal
	8	24	B5V	B-phase DC5V input
	9	25	P12V	Preset DC12V input
	10	26	P24V	Preset DC24V input
	11	27	P_C	Preset COM terminal
	12	28	P5V	Preset DC5V input
	13	29	G12V	Gate DC12V input
	14	30	G24V	Gate DC24V input
	15	31	G_C	Gate COM terminal
	16	32	G5V	Gate DC5V input
	33	35	OUT1	Compared output OUT1
	34	36	OUT0	Compared output OUT0
	37	38	24V	Supply terminal of external power DC24V
	39	40	24G	

(2) XGF-HD2A

Pin arrangement	Pin No.		Designations of signals	
	CH 0	CH 1		
	1	17	AI-	AI- input (LINE DRIVE TTL LEVEL input)
	2	18	AI+	AI+ input (LINE DRIVE TTL LEVEL input)
	3	19	AII-	AII- input (LINE DRIVE HTL LEVEL input)
	4	20	AII+	AII+ input (LINE DRIVE HTL LEVEL input)
	5	21	BI-	BI- input (LINE DRIVE TTL LEVEL input)
	6	22	BI+	BI+ input (LINE DRIVE TTL LEVEL input)
	7	23	BII-	BII- input (LINE DRIVE HTL LEVEL input)
	8	24	BII+	BII+ input (LINE DRIVE HTL LEVEL input)
	9	25	P12V	Preset DC12V input
	10	26	P24V	Preset DC24V input
	11	27	P_C	Preset COM terminal
	12	28	P5V	Preset DC5V input
	13	29	G12V	Gate DC12V input
	14	30	G24V	Gate DC24V input
	15	31	G_C	Gate COM terminal
	16	32	G5V	Gate DC5V input
	33	35	OUT1	Compared output OUT1
	34	36	OUT0	Compared output OUT0
	37	38	24V	Supply terminal of external power DC24V
	39	40	24G	

Chapter 2 Specifications

2) Internal circuit

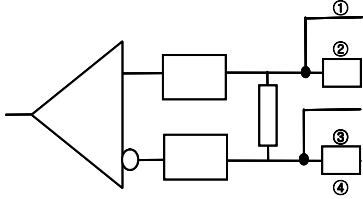
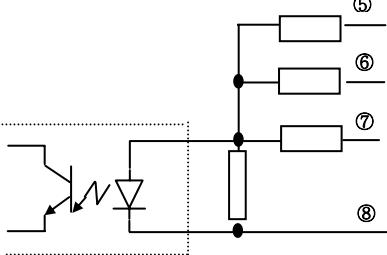
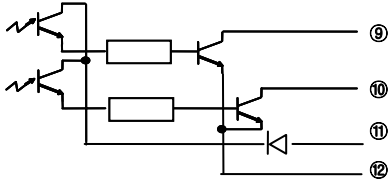
The internal circuit of High Speed counter when connected between High Speed counter module and external device is as described below.

(1) XGF-HO2A

I/O Classification	Internal circuit	No.	Terminal name	Pin No.		Designation of signals
				CH 0	CH 1	
Input		①	A24V	2	18	A-phase pulse input 24V
		②	A12V	1	17	A-phase pulse input 12V
		③	A5V	4	20	A-phase pulse input 5V
		④	A_COM	3	19	A-phase common
		①	B24V	6	22	B-phase pulse input 24V
		②	B12V	5	21	B-phase pulse input 12V
		③	B5V	8	24	B-phase pulse input 5V
		④	B_COM	7	23	B-phase common
		⑤	P24V	10	26	Preset input 24V
		⑥	P12V	9	25	Preset input 12V
		⑦	P5V	12	28	Preset input 5V
		⑧	P_COM	11	27	Preset common
		⑤	G24V	14	30	Gate input 24V
		⑥	G12V	13	29	Gate input 12V
		⑦	G5V	16	32	Gate input 5V
		⑧	G_COM	15	31	Gate common
Output		⑨	OUT0	34	32	External output 0
		⑩	OUT1	33	35	External output 1
		⑪	24V	37	38	External power 24V
		⑫	24G	39	40	External power ground

Chapter 2 Specifications

(2) XGF-HD2A

I/O Classification	Internal circuit	No.	Terminal name	Pin No.		Designation of signals
				CH 0	CH 1	
Input		①	AI+	2	18	AI+ line driver input
		②	All+	4	20	All+ line driver input
		③	AI-	1	17	AI- line driver input
		④	All-	3	19	All- line driver input
		①	BI+	6	22	BI+ line driver input
		②	BII+	8	24	BII+ line driver input
		③	BI-	5	21	BI- line driver input
		④	BII-	7	23	BII- line driver input
		⑤	P24V	10	26	Preset input 24V
		⑥	P12V	9	25	Preset input 12V
		⑦	P5V	12	28	Preset input 5V
		⑧	P_COM	11	27	Preset common
		⑤	G24V	14	30	Gate input 24V
		⑥	G12V	13	29	Gate input 12V
		⑦	G5V	16	32	Gate input 5V
		⑧	G_COM	15	31	Gate common
Output		⑨	OUT0	34	32	External output 0
		⑩	OUT1	33	35	External output 1
		⑪	24V	37	38	External power 24V
		⑫	24G	39	40	External power ground

2.4 Functions

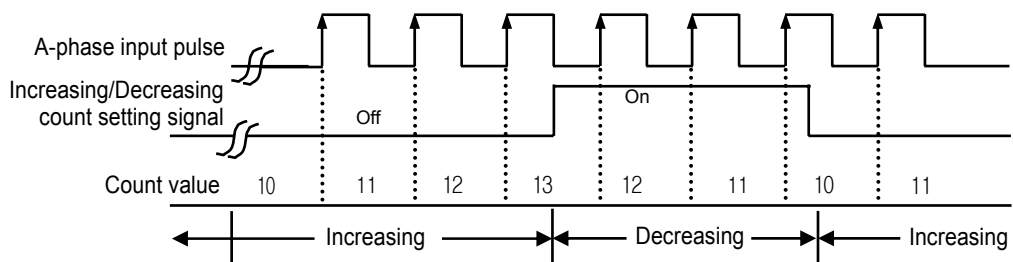
- 1) High Speed counter module can count High Speed pulses which can not be processed by CPU module's counter instructions (CTU, CTD, CTUD, etc.), up to binary value of 32 bits (-2,147,483,648 ~ 2,147,483,647).
- 2) Available input is 1-phase input, 2-phase input and CW/ CCW input.
- 3) Count increasing/decreasing methods are as follows;
 - (1) For 1-phase input: (1) Increasing/decreasing count operation by program setting
(2) Increasing/decreasing count operation by B-phase input signal
 - (2) For 2-phase input: setting by difference in phase between A-phase and B-phase
 - (3) For CW/CCW input: Increasing operation if B-phase is LOW with A-phase input, and Decreasing operation if A-phase is LOW with B-phase input.
- 4) Auxiliary modes are as follows;
 - ① Count Clear
 - ② Count Latch
 - ③ Sampling Count
 - ④ Pulse Frequency Count
 - ⑤ Periodic Pulse Count
 - ⑥ Count Disable Function

2.4.1 Pulse input mode

- 1) 1-phase count mode
 - (1) Increasing/decreasing count operation by program setting
 - A) 1-phase 1-input 1-multiplication operation mode

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

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

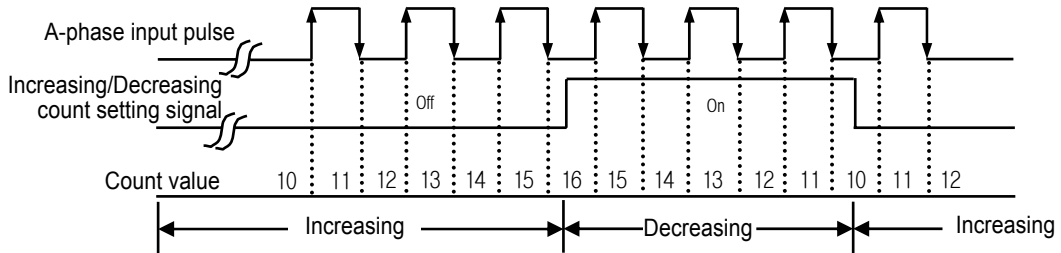


Chapter 2 Specifications

B) 1-phase 1-input 2-multiplication operation mode

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

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

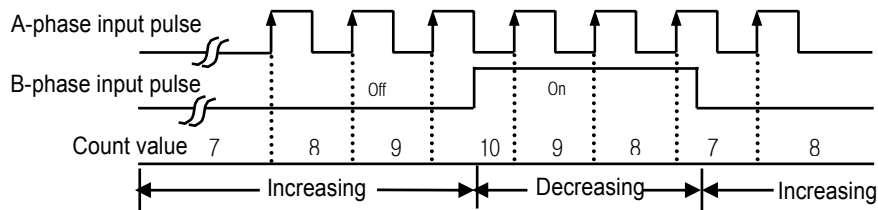


(2) Increasing/decreasing count operation by B-phase input signal

A) 1-phase 2-input 1-multiplication operation mode

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

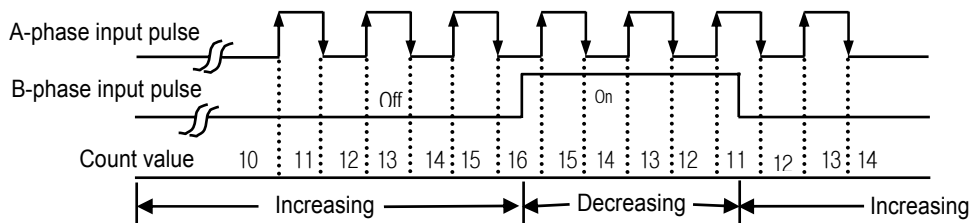
Increasing/Decreasing classification	A-phase input pulse rising	A-phase input pulse falling
B-phase input pulse Off	Increasing count	-
B-phase input pulse On	Decreasing count	-



B) 1-phase 2-input 2-multiplication operation mode

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

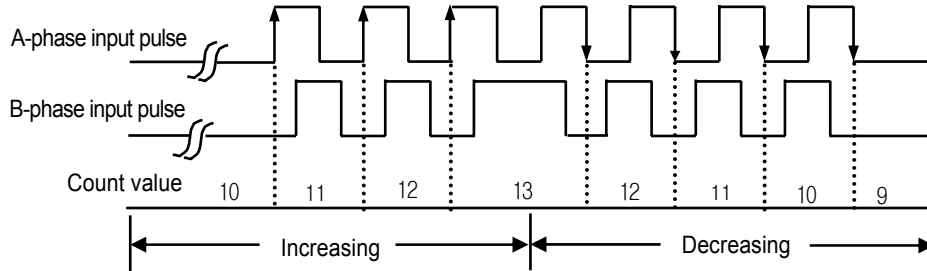
Increasing/Decreasing classification	A-phase input pulse rising	A-phase input pulse falling
B-phase input pulse Off	Increasing count	Increasing count
B-phase input pulse On	Decreasing count	Decreasing count



2) 2-phase count mode

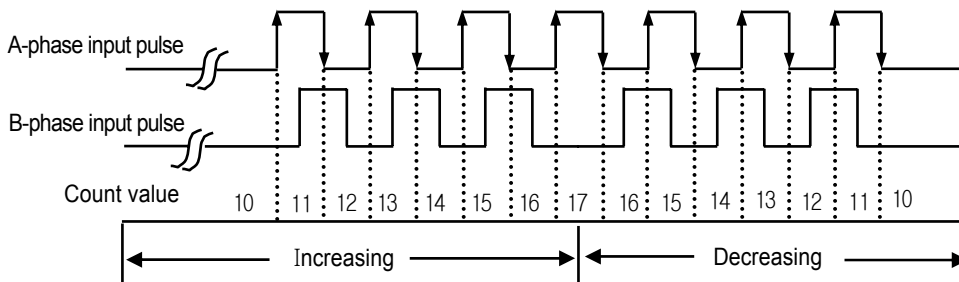
(1) 2-phase 1-multiplication operation mode

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



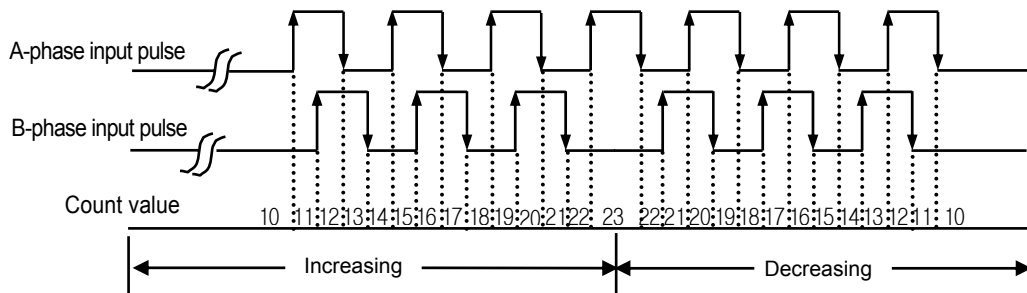
(2) 2-phase 2-multiplication operation mode

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



(3) 2-phase 4-multiplication operation mode

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



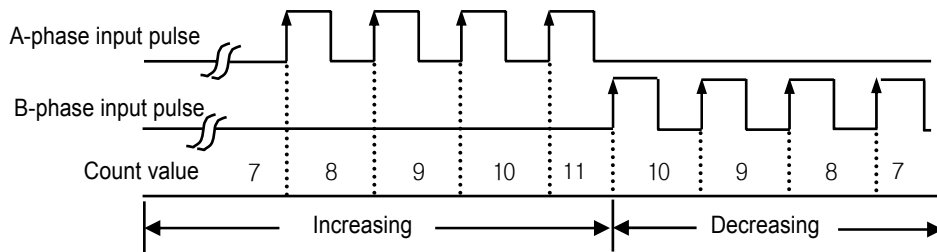
Chapter 2 Specifications

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

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

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

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



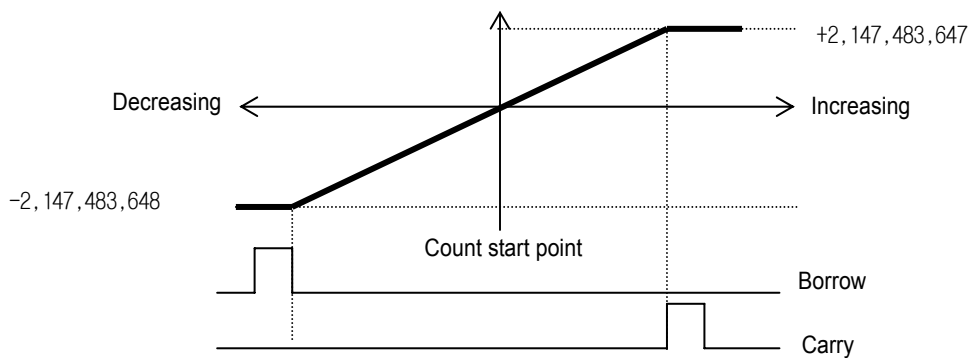
2.4.2 Counter mode

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

Classification	0H address for CH 0, 19H address for CH 1 (internal memory)
Linear Count	Set to "0"
Ring Count	Set to "1"

1) Linear count

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

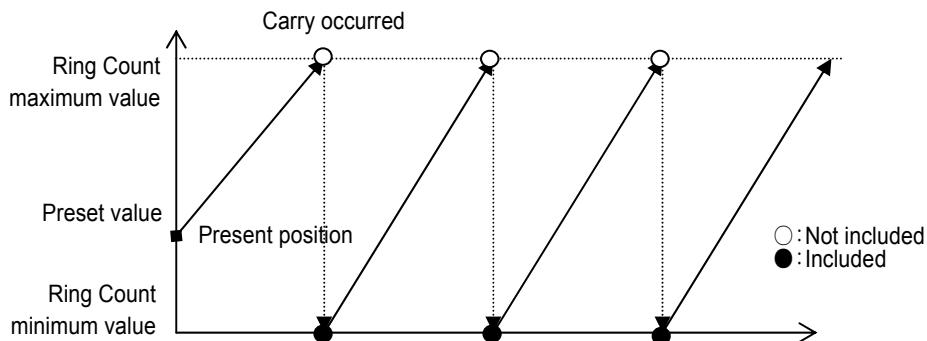


2) Ring Count

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

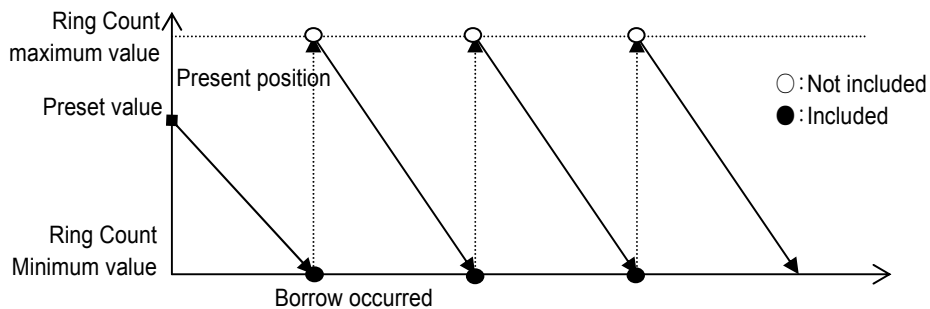
(1) During increasing count

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



(2) During decreasing count

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

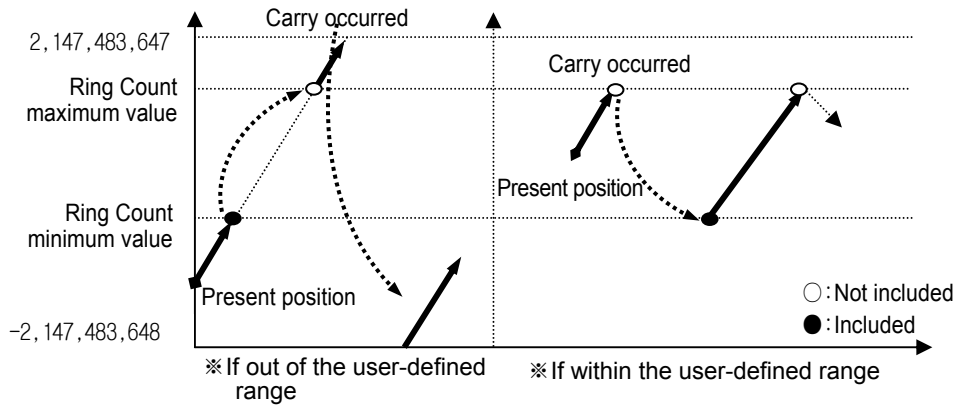


(3) Operation when setting Ring Count based on present count value (during increasing count)

- If present count value exceeds user-defined range when setting Ring Count
 - Present count value starts to increase up to 2,147,483,647, and down to the minimum value (-2,147,483,648) and keeps increasing after Carry occurs.
 - At this moment, only the minimum value is displayed and then count will be over the maximum value as shown above.

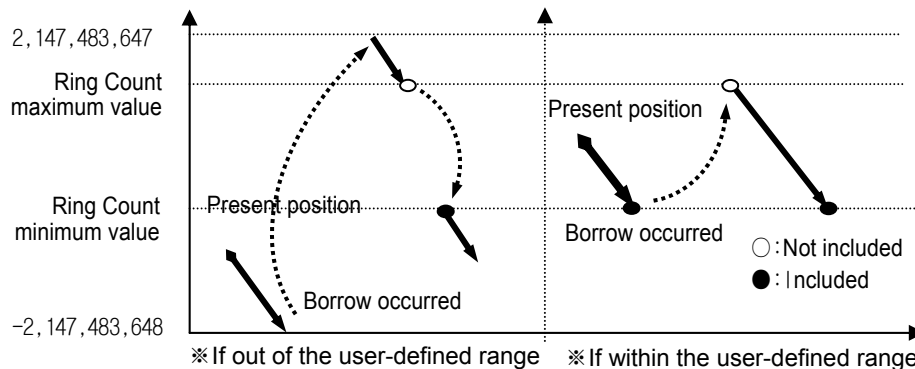
Chapter 2 Specifications

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



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

- If present count value exceeds user-defined range when setting Ring Count
 - Present count value starts to decrease down to -2,147,483,648, and up to the maximum value (2,147,483,647) and keeps counting after Borrow occurs.
- If present count value is within user-defined range when setting Ring Count
 - Present count value starts to decrease down to the user-defined minimum value and up to the user-defined maximum value and keeps counting after Borrow occurs.



Notes

1. Based on count value within or out of user-defined range, count will be decided to be within or out of the range when setting Ring Count.
2. Ring Count setting when count value is out of the range is regarded as user's mistake. The count is not available within the Ring Count range.
3. Use preset function or the like when using Ring Count so to surely position the count value within the range.

2.4.3 Compared output

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

Compared output condition	Memory address & Value setting		
	Output	CH0	CH1
	Out0	8H address	21H address
Out1	9H address	22H address	
Present Value < Compared Value	Set to "0"		
Present Value \leq Compared Value	Set to "1"		
Present Value = Compared Value	Set to "2"		
Present Value \geq Compared Value	Set to "3"		
Present Value > Compared Value	Set to "4"		
Compared Value1 \leq Present Value \leq Compared Value2	Set to "5"		
Compared Value1 \geq Present Value, Present Value \geq Compared Value2	Set to "6"		

- In order to make actual comparison enabled after compared output condition set, the compared enable signal is to be On (at this time, output is displayed only on LED module), and in order to send out the actual external output, the output enable signal is to be On.

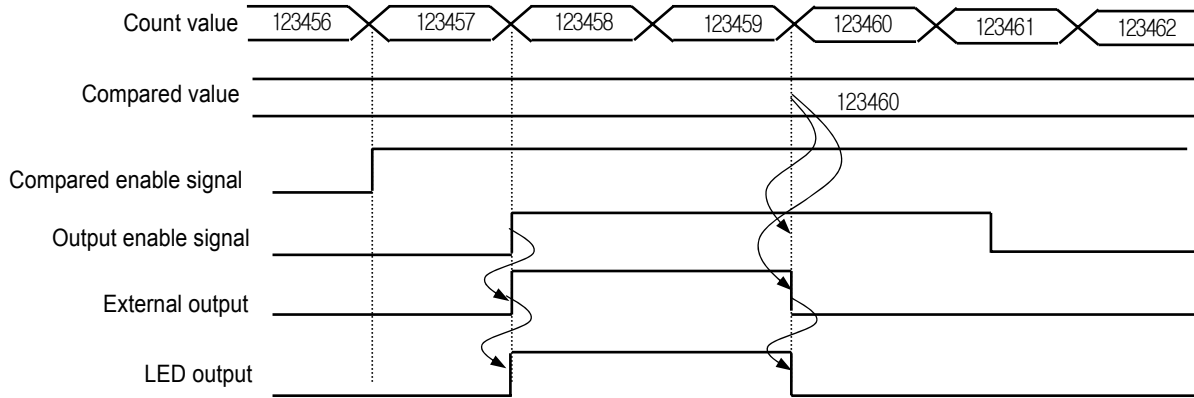
Classification	Details (xy means x: base y: slot No.)
Compared enable signal (LED output)	CH0 turns Uxy.23.4 "On", and CH1 turns Uxy.24.4 "On"
Output enable signal (external output)	CH0 turns Uxy.23.5 "On", and CH1 turns Uxy.24.5 "On"
Identical reset signal	CH0 turns Uxy.23.6~Uxy.23.7 "On", and CH1 turns Uxy.24.6~Uxy.24.7 "On"(select between 2 outputs)

- If comparison only enabled with output disenabled, actual output will not be sent out even if applicable LED is On.

Chapter 2 Specifications

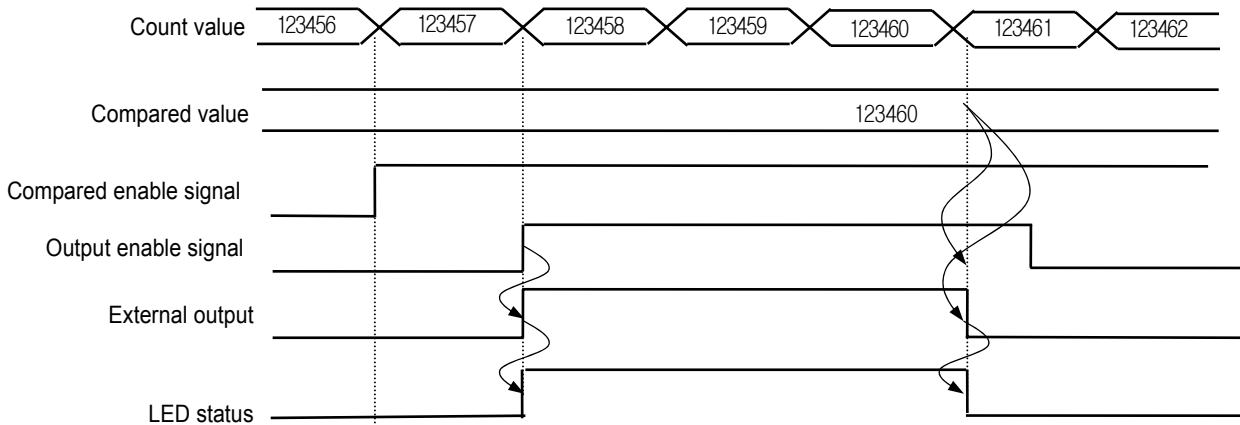
1) Mode 0 (Present value < Compared value)

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



2) Mode1 (Count value ≤ Compared value)

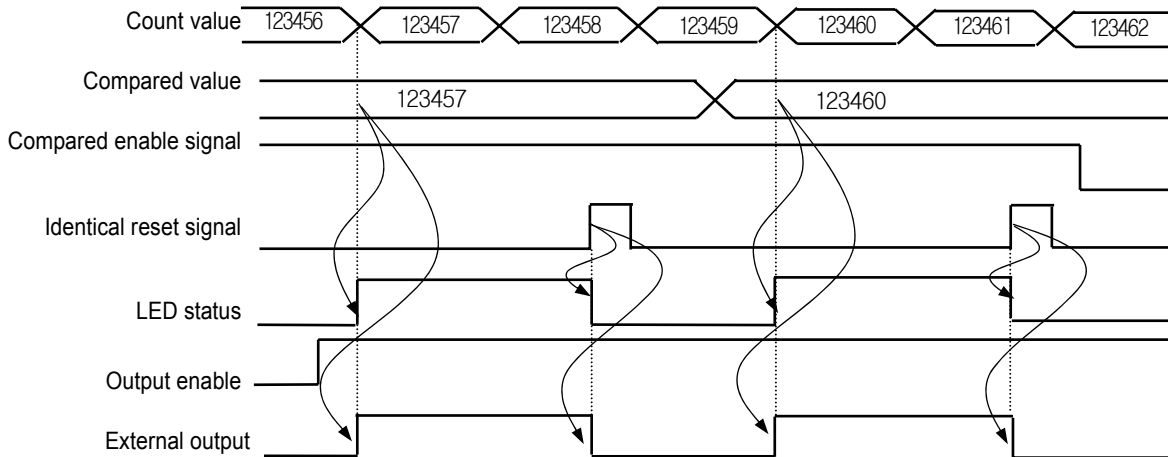
- If present count value is less than or equal to compared value, output is sent out, and if count value increases to be greater than compared value, output is not sent out.



Chapter 2 Specifications

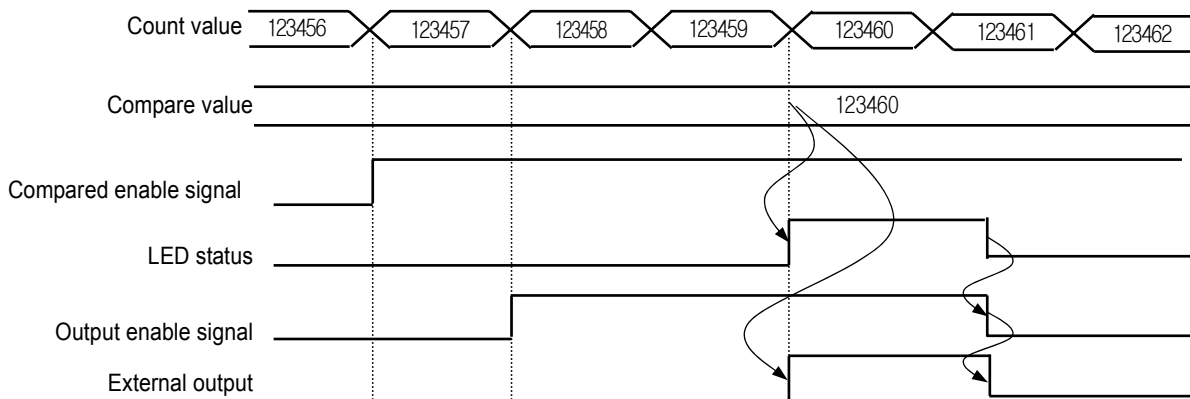
3) Mode 2 (Count value = Compared value)

- If present count value is equal to compared value, output is sent out, and even if count value increases to be greater or less than compared value, output is kept On.
- In order to turn the output Off, identical reset signal is to be On.



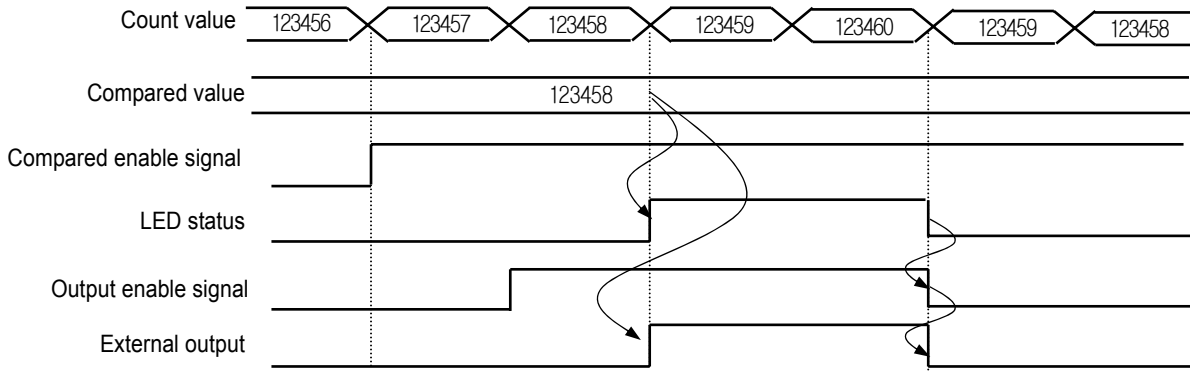
4) Mode 3 (Count value \geq Compared value)

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



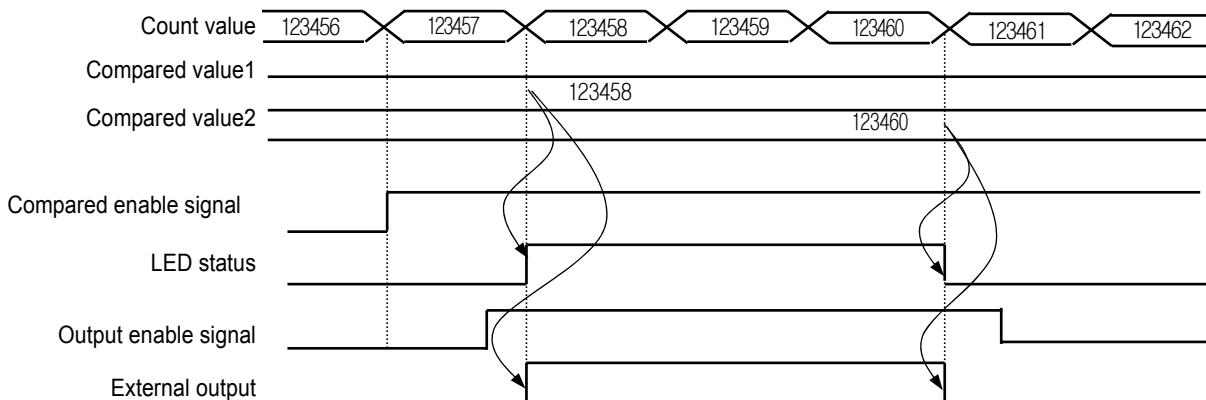
5) Mode 4 (Count value > Compared value)

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



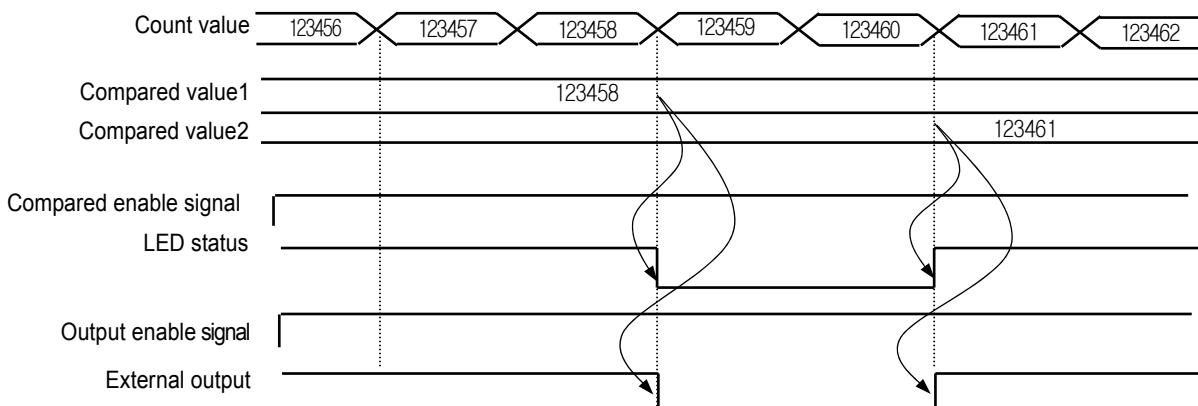
6) Mode 5 (Compared value1 ≤ Count value ≤ Compared value2)

- If present count value is greater than or equal to compared value 1 and less than or equal to compared value 2, output is sent out, and if count value increases/decreases to exceed compared value's range, output is not sent out.



7) Mode 6 (Count value ≤ Compared value1, Count value ≥ Compared value2)

- If present count value is less than or equal to compared value 1 and greater than or equal to compared value 2, output is sent out, and if count value increases/decreases to exceed compared value's range, output is not sent out.



2.4.4 Carry signal

■ Carry Signal occurs

- 1) When count range maximum value of 2,147,483,647 is reached during Linear Count.
- 2) When user-defined maximum value of Ring Count changed to the minimum value during Ring Count.

■ Count when Carry Signal occurs

- 1) Count stops if Carry occurs during Linear Count.
- 2) Count does not stop even if Carry occurs during Ring Count.

■ Carry reset

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

Classification	Details (xy means x: base, y: slot No.)
Carry reset condition	CH0 turns Uxy.23.A "On", and CH1 turns Uxy.24.A "On"

2.4.5 Borrow signal

■ Borrow signal occurs

- When count range minimum value of -2,147,483,648 is reached during Linear Count.
- When user-defined minimum value of Ring Count changed to the maximum value during Ring Count user-defined Ring Count minimum value maximum value.

■ Count when Borrow signal occurs

- Count stops if Borrow occurs during Linear Count.
- Count does not stop even if Borrow occurs during Ring Count.

■ Borrow reset

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

Classification	Details (xy means x: base, y: slot No.)
Carry/Borrow reset condition	CH0 turns Uxy.23.A "On", and CH1 turns Uxy.24.A "On"

2.4.6 Auxiliary mode

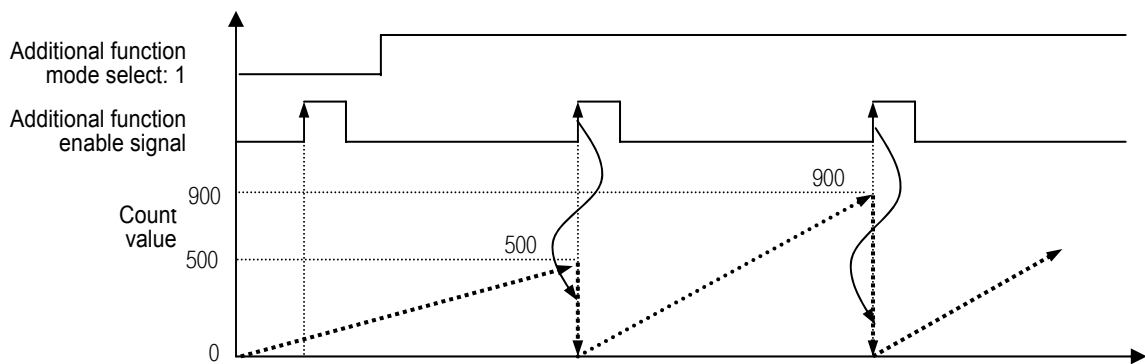
- High Speed counter module provides 5 auxiliary modes as well as basic count function and compared output function.
- In order to use the auxiliary modes, auxiliary mode enable signal is to be “On”.

Classification	Details (x: base, y: slot No.)
Auxiliary mode enable signal (auxiliary mode use)	CH0 turns Uxy.23.3“On”, and CH1 turns Uxy.24.3 “On”

Classification		Address	Count value
Auxiliary mode	Count Clear	CH0: Address 2H CH1: Address 1BH setting	-
	Count Latch		CH0: Uxy. 04, Uxy. Address05 CH1: Uxy. 14, Uxy. Address15
	Ring Count		CH0: Uxy. 06, Uxy. Address07 CH1: Uxy. 16, Uxy. Address17
	Input Frequency Measure		CH0: Uxy. 08, Uxy. Address09 CH1: Uxy. 18, Uxy. Address19
	Revolution / Unit Time		CH0: Uxy. 10, Uxy. Address0B CH0: Uxy. 20, Uxy. Address1B
	Count Disable		

1) Count Clear

- When Auxiliary Mode enable signal is On, present count value is set to 0.
 - Setting method
 - Set auxiliary mode setting mode to 1 -> Auxiliary mode enable signal On.
 - Count clear function is used to clear present count whenever auxiliary mode enable signal is On.
- In other words, while auxiliary mode enable signal is On, operation is not available continuously.



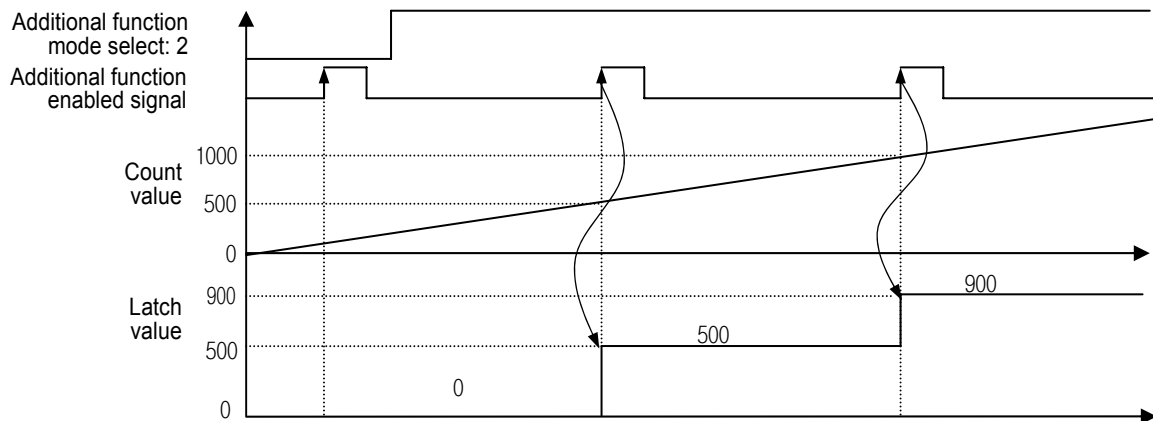
Notes

Auxiliary mode enable signal (**instruction of auxiliary mode use**): Auxiliary mode’s external input enabled instruction shall be set to 0 for use by internal instruction, and auxiliary mode’s external input enabled instruction (gate external input setting signal) set to 1 for use by external input prior to application of external terminal gate.

Chapter 2 Specifications

2) Count Latch

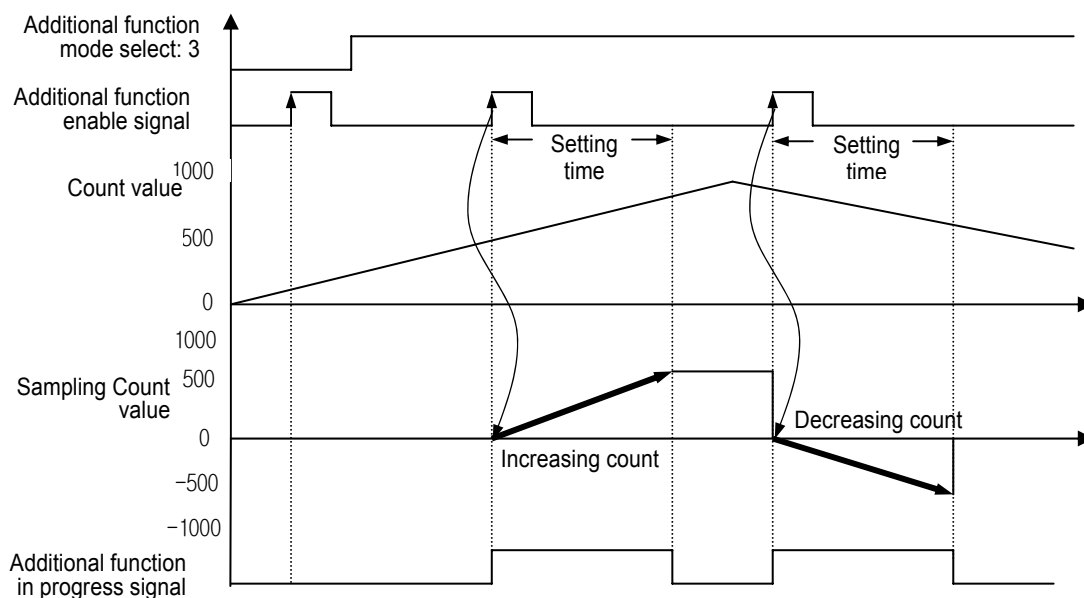
- When auxiliary mode enable signal is On, present count value is latched.
- Setting method
 - Set auxiliary mode setting mode to 2 -> Auxiliary mode enable signal On.
- Count Latch function is used to latch present count whenever auxiliary mode enable signal is On. In other words, while auxiliary mode enable signal is On, operation is not available continuously.
- The latched count value will be displayed on latch count value until the next auxiliary mode enable signal is On.



Chapter 2 Specifications

3) Sampling Count

- When auxiliary mode enable signal is On, it counts for a specified time.
- Setting method
 - Set auxiliary mode setting mode to 3 -> Time setting -> Auxiliary mode enable signal On
- Sampling Count function is used to count from 0 for a specified time whenever auxiliary mode enable signal is On. In other words, while auxiliary mode enable signal is On, operation is not available continuously.
- The value sampling-counted will be displayed on Sampling Count value.
- Display during auxiliary mode operation
 - Sampling Count function operates for a specified time when auxiliary mode enable signal is On, and the auxiliary mode in progress signal is On at the same time.



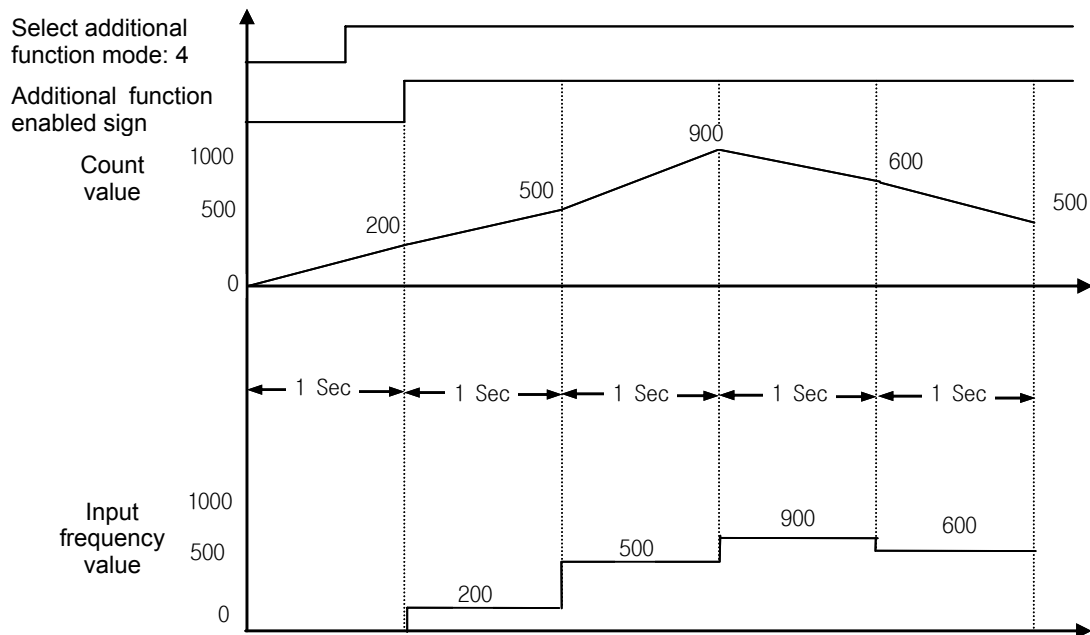
Chapter 2 Specifications

4) Input Frequency Measure

- While auxiliary mode enable signal is On, it measures the input frequency per second (or set unit).
- Setting method
 - Set auxiliary mode setting mode to 4 -> Auxiliary mode enable signal On.
- While auxiliary mode enable signal is On, updated frequency value is displayed on input frequency value, based on unit setting (1Hz: 1s, 10Hz: 100ms, 100Hz: 10ms, 1KHz: 1msec).
- Frequency input mode can be specified as below, whose update cycle and resolution will be decided based on the applicable mode.

Frequency input mode value	Basic unit [Hz]	Updated cycle T [ms]
0	1	1000
1	10	100
2	100	10
3	1000	1

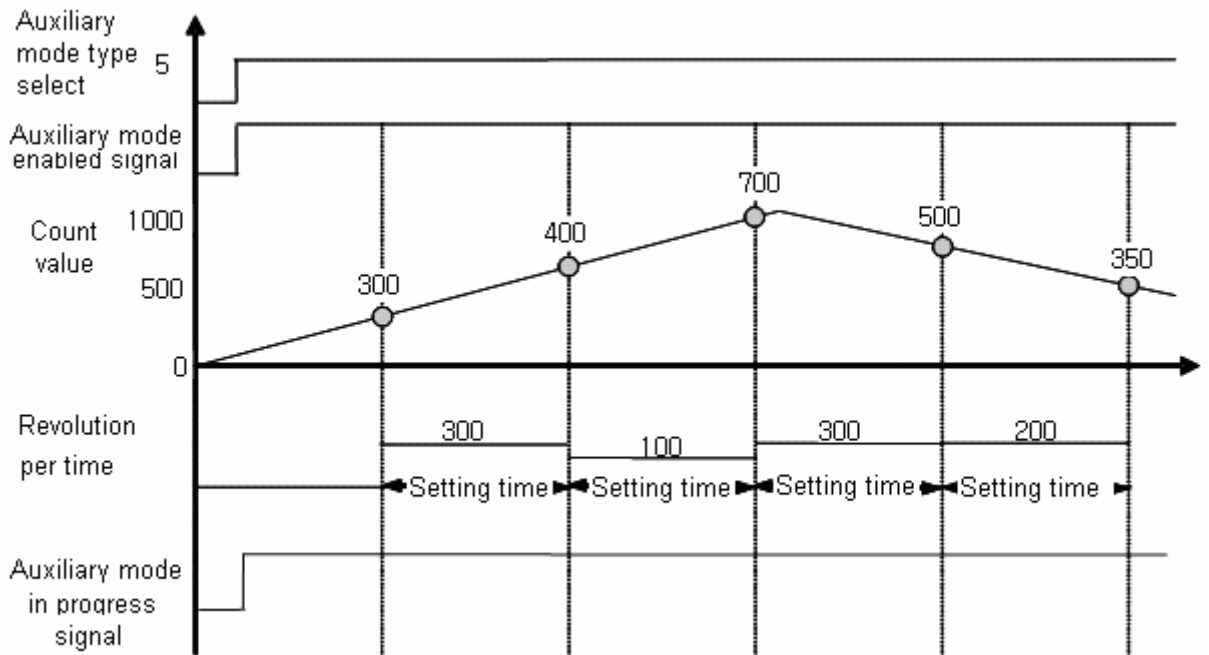
- Display during auxiliary mode operation
 - While auxiliary mode enable signal is On, input frequency measurement function operates with Auxiliary Mode Operation in Progress signal On at the same time. (The figure below shows the example of 1Hz unit of frequency displayed mode selected.)



Chapter 2 Specifications

5) Revolution/Unit time

- While auxiliary mode enable signal is On, it counts the number of input pulses for a specified time.
- Setting method
 - Set auxiliary mode setting mode to 5 setting -> Time setting -> Auxiliary mode enable signal On.
- Count function of Revolution/Unit time is used to count the number of pulses for a specified time while auxiliary mode enable signal is On.
- With the displayed number of pulses updated for a specified time and the number of pulses per revolution input, Revolution/Unit time can be counted.
- With the number of pulses per revolution input and time set to 1 minute (60000ms), the value of RPM is displayed.
- Display during auxiliary mode operation
 - While auxiliary mode enable signal is On, it counts the number of input pulses for the unit time with auxiliary mode in progress signal On at the same time. (The figure below shows the example that the number of pulses per revolution is 1)



Chapter 2 Specifications

6) Count Disable

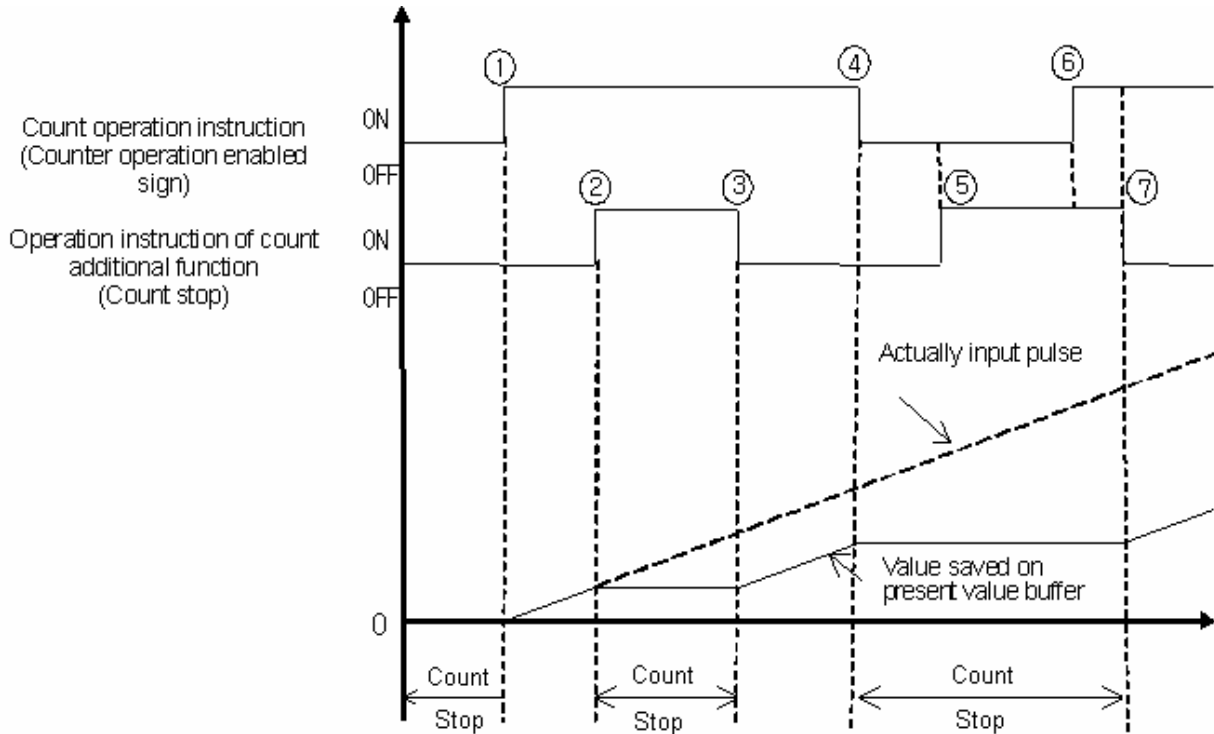
- While auxiliary mode enable signal is On, count operation stops.

- Setting method

- Set auxiliary mode setting mode to 6 -> Time setting -> Auxiliary mode enable signal On.

- Display during auxiliary mode operation

- While auxiliary mode enable signal is On, count operation stops, with auxiliary mode in progress signal On at the same time.



- Details on the figure above are as described below. (The number is identical as shown above)

- ① When count enabled instruction is On, count operation starts.
- ② When start instruction of counter auxiliary mode select is On (select internal or external input), count operation stops.
- ③ When start instruction of counter function select is Off, count operation restarts.
- ④ When count enabled instruction is Off, count operation stops.
- ⑤ When count enabled instruction is Off, count operation stops regardless of start instruction of counter function select.
- ⑥ Count operation stops when start instruction of counter function select is On even if count enabled instruction is On.
- ⑦ When start instruction of counter function select is Off, count operation restarts.

Chapter 3 Installation and Wiring

3.1 Installation

3.1.1 Installation environment

This product is of high reliance regardless of installation environment. However, for the sake of reliance and stability of the system, please pay attention to those precautions described below.

1) Environmental conditions

- To be installed on the control panel waterproof and dustproof.
- No continuous shocks or vibration will be expected.
- Not to be exposed to the direct sunlight.
- No dew should be caused by rapid temperature change.
- Ambient temperature should be kept 0-55°C.

2) Installation work

- No wiring waste is allowed inside PLC when wiring or drilling screw holes.
- To be installed on a good location to work on.
- Don't let it installed on the same panel as a high-voltage device is on.
- Let it kept at least 50mm away from duct or near-by module.
- To be grounded in an agreeable place free from noise.

3.1.2 Handling precautions

Precautions for handling High Speed counter module are as described below from the opening to the installation.

- 1) Don't let it dropped or shocked hard.
- 2) Don't remove PCB from the case. It will cause abnormal operation
- 3) Don't let any foreign materials including wiring waste inside the top of the module when wiring.
Remove foreign materials if any inside.
- 4) Don't install or remove the module while powered On.

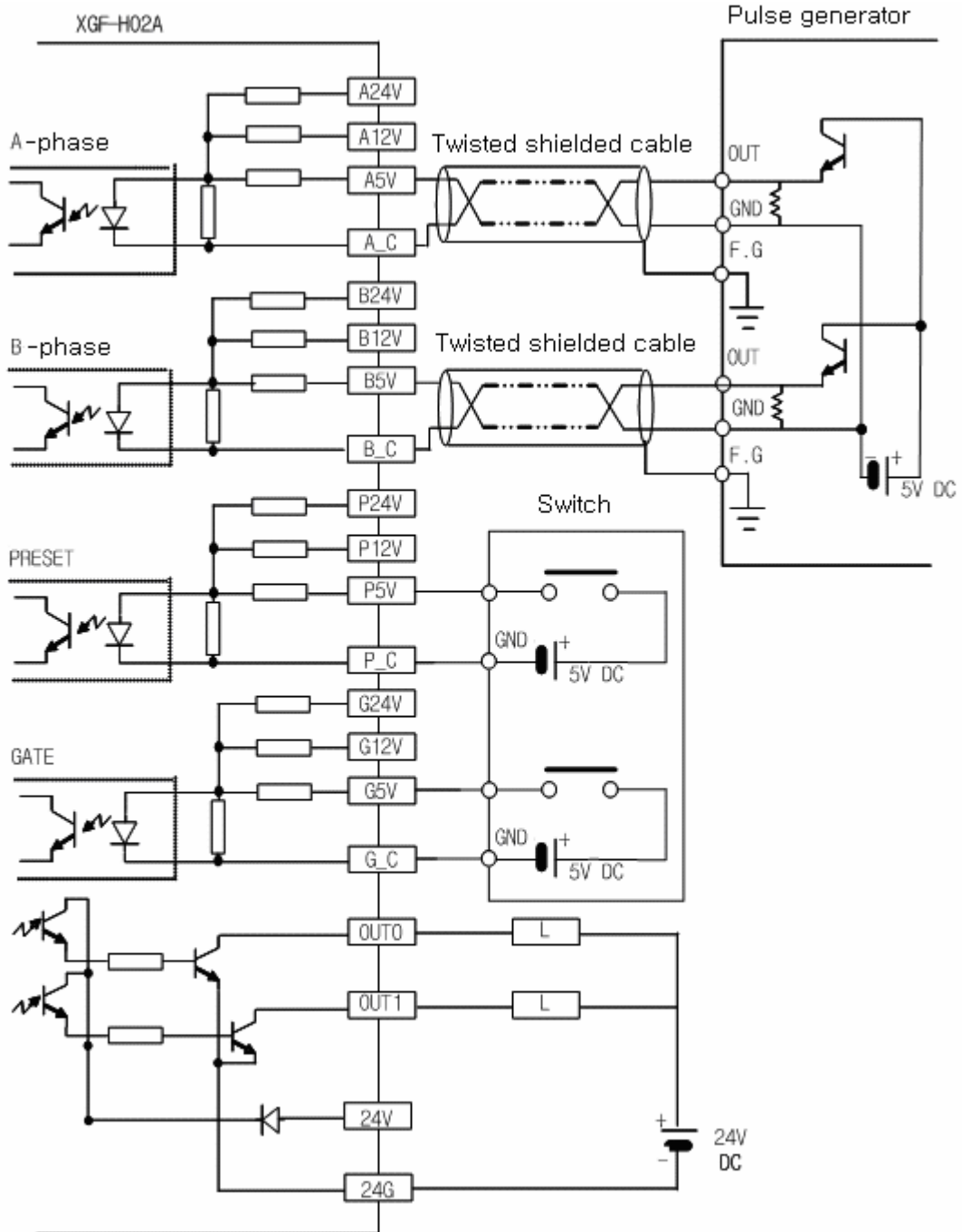
3.2 Wiring Precautions

Pay attention to the counteractions against wiring noise especially for HS pulse input.

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

3.2.1 Example of DC5V voltage output wiring

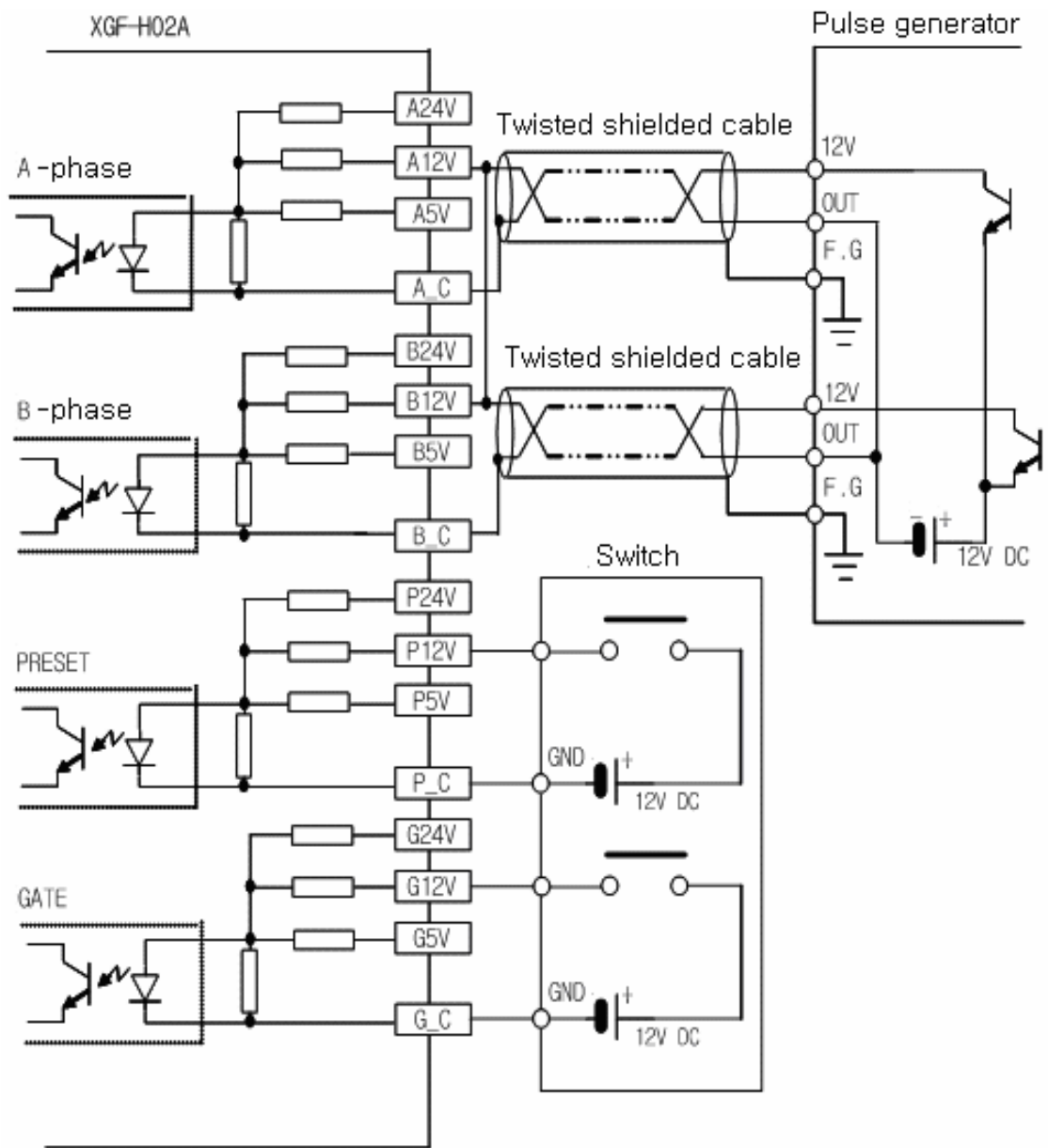
- If the pulse generator is of voltage output type, example of wiring with HSC is as shown below;
- The wiring will be the same if the pulse generator of voltage output type is used through Totem Pole output.
- Wiring of preset signal is identical to that of gate signal.



Note

- 1) Pulse generator OUT is marked as A, B, Z or OUTA, OUTB, OUTZ.
- 2) Consider the maximum output distance of the pulse generator before wiring.

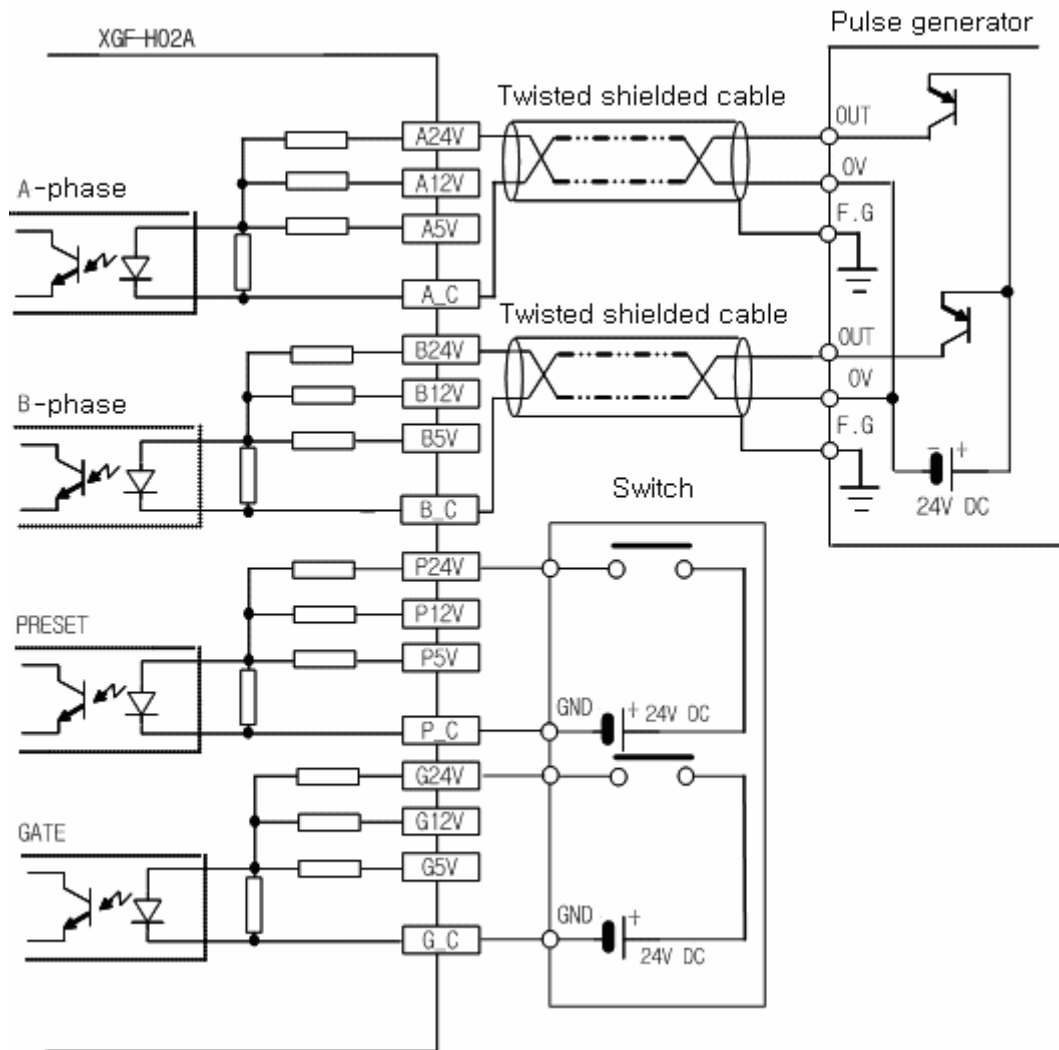
3.2.2 Example of DC12V NPN Open Collector output wiring



Note

- 1) Pulse generator OUT is marked as A, B, Z or OUTA, OUTB, OUTZ.
- 2) Consider the maximum output distance of the pulse generator before wiring.

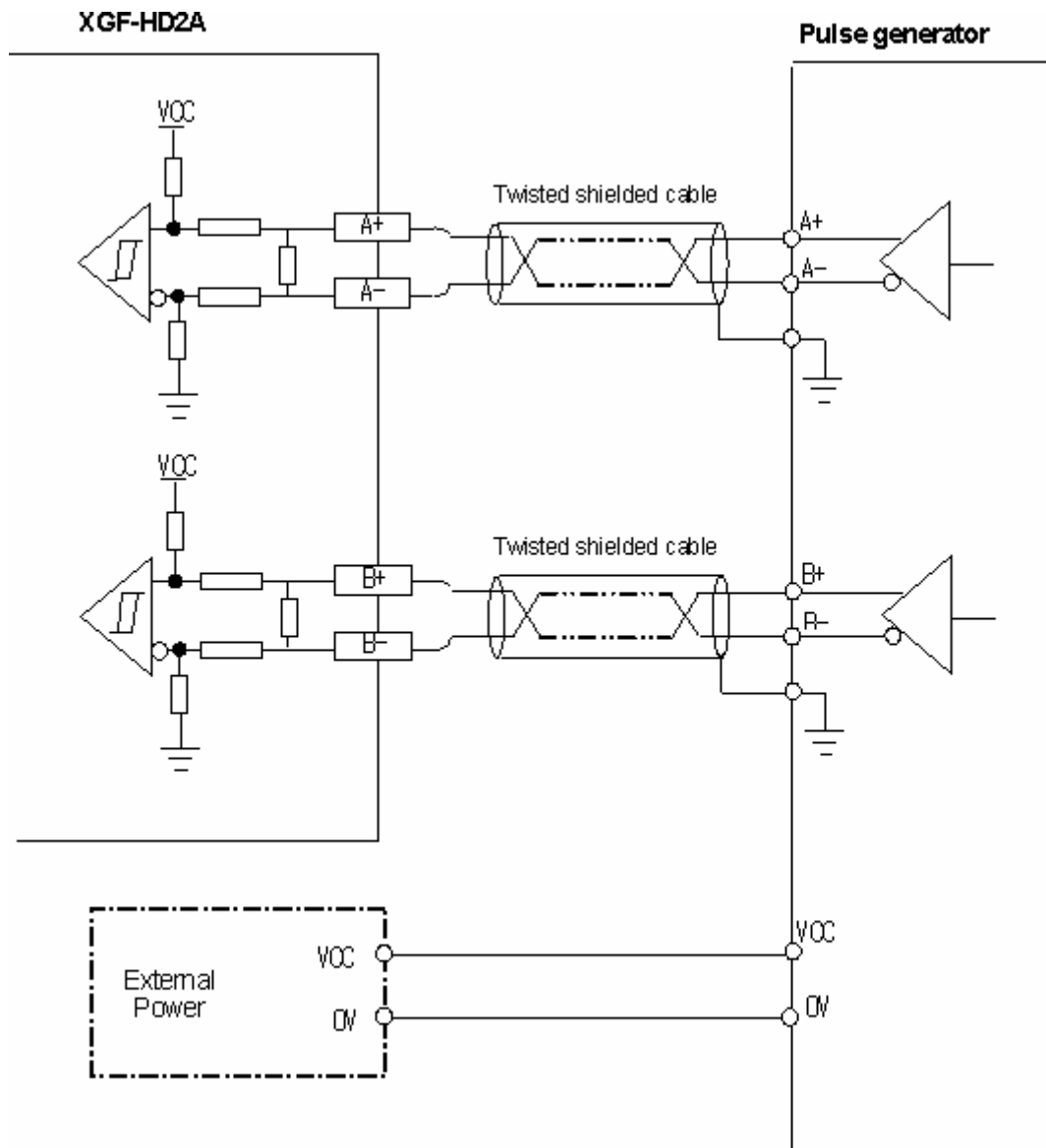
3.2.3 Example of DC24V PNP Open Collector output wiring



Note

- 1) Pulse generator OUT is marked as A, B, Z or OUTA, OUTB, OUTZ.
- 2) Consider the maximum output distance of the pulse generator before wiring.

3.2.4 Example of Line Driver output wiring



Note

1) Consider the maximum output distance of the pulse generator before wiring.

Chapter 4 Operation Procedures and Monitoring (XG5000)

Run setting and monitor functions of XG5000 program will be described in this chapter among operation methods of High-speed counter module.

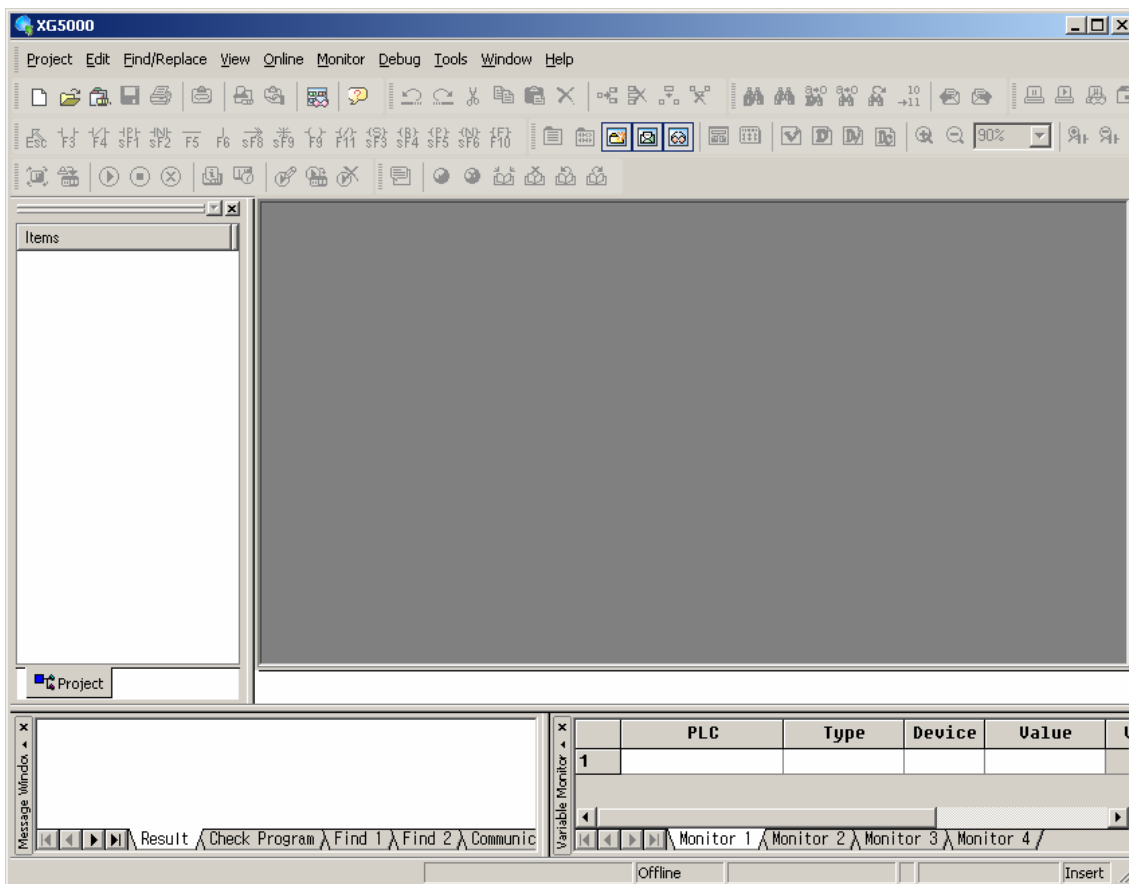
4.1 Operation Method

- The example of High-speed counter will be described for execution method of XG5000. For the user's convenience of High-speed counter conversion module, XG5000 provides GUI (Graphical User Interface) for parameters setting of High-speed counter module.

4.1.1 Execution of XG5000



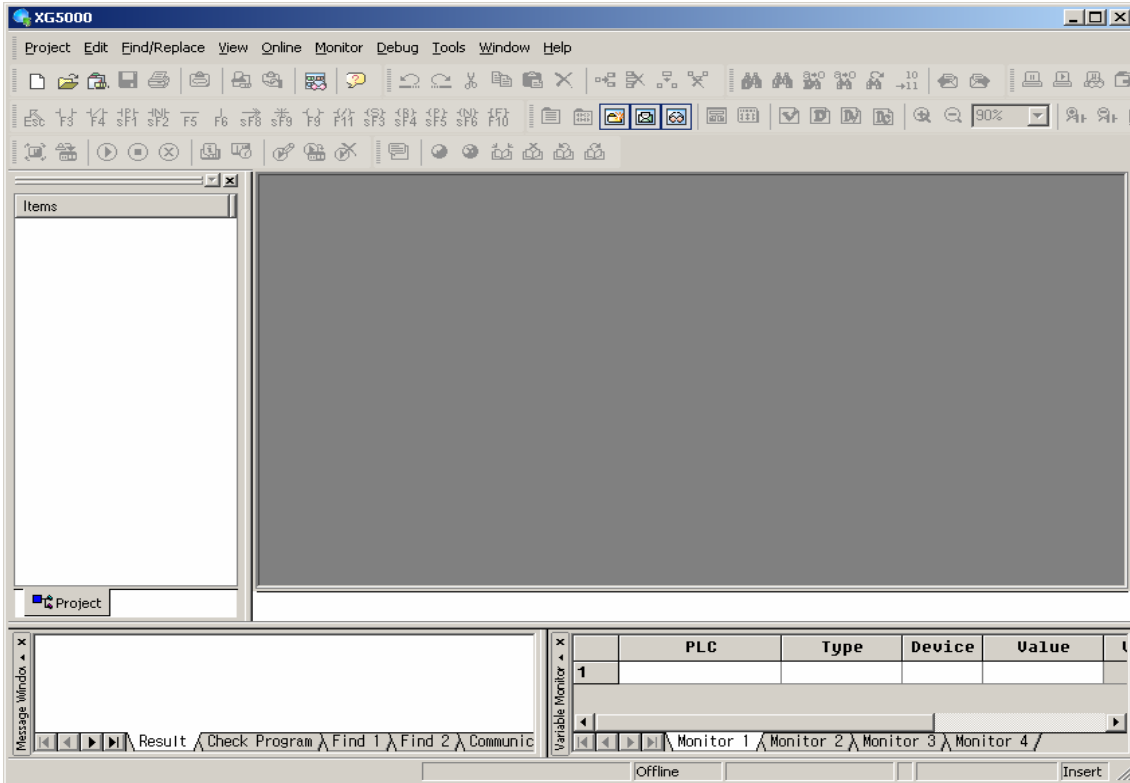
- 1) After XG5000 installed, click the created shortcut icon (see the figure above) to display the initial screen of XG5000 program as shown below;




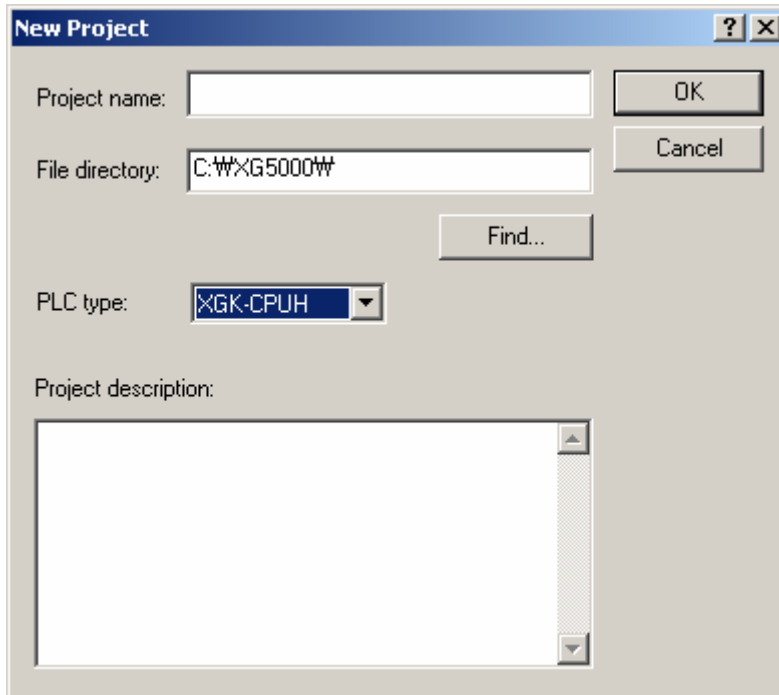
Chapter 4 Operation Procedures and Monitoring (XG5000)

4.1.2 Parameters setting and monitoring

1) Run XG5000 to display the screen as shown below;



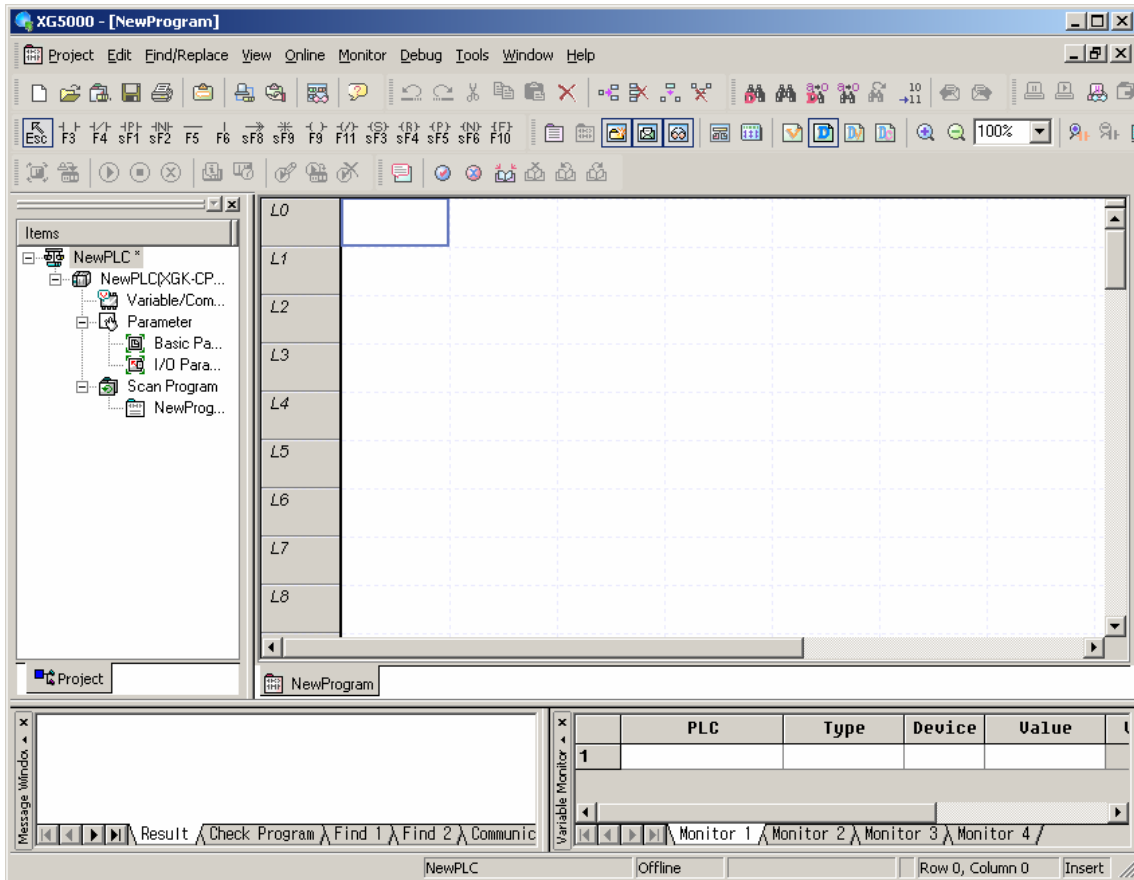
2) On the [Project] menu, click [New Project] or  on the icon menu to display the screen as shown below;




3) Input an applicable name on [Project name] item (Ex: XGF-HO2A) and a directory name on [File directory] desired to save, and then click [OK].

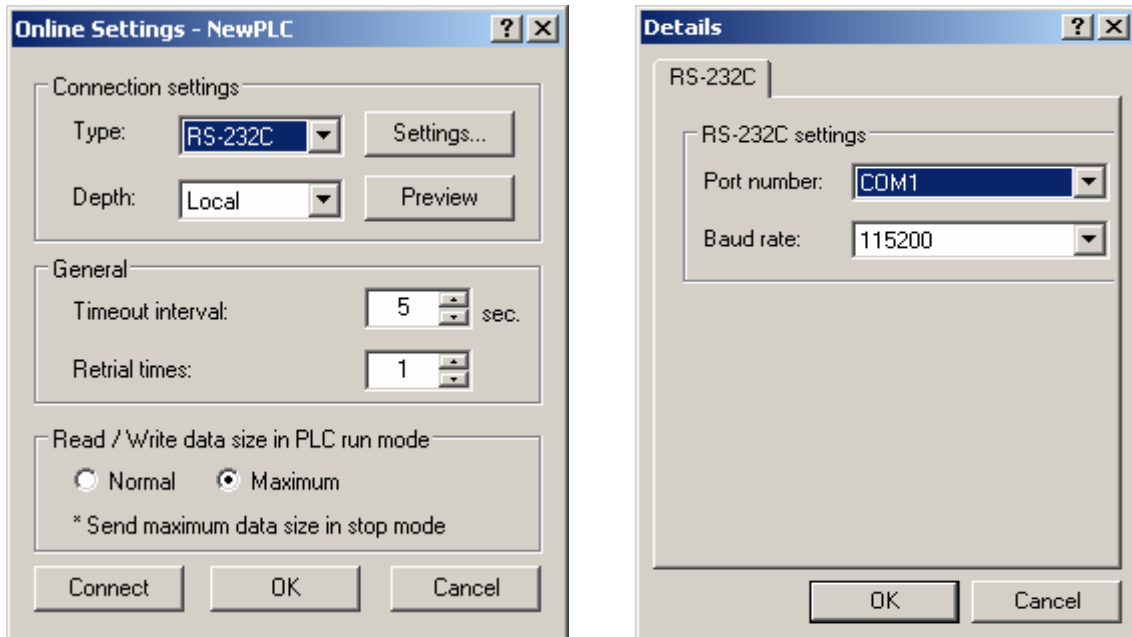
Chapter 4 Operation Procedures and Monitoring (XG5000)


4) After 3) above, a project will be created as shown below;

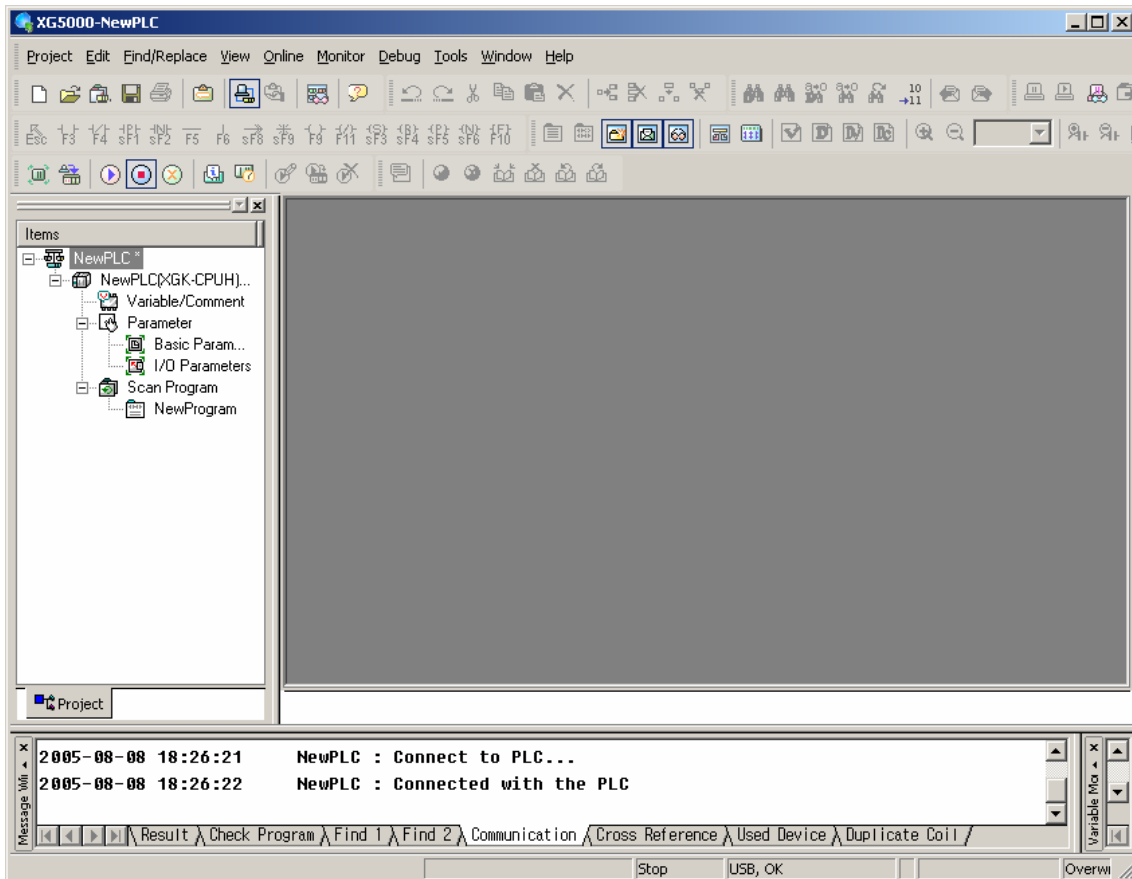


Chapter 4 Operation Procedures and Monitoring (XG5000)

- 5) If a project is created, click [Online]-[Connection Settings] or  on the icon menu to specify the connection method and connection stage, and then click [Settings] to specify the communication port.



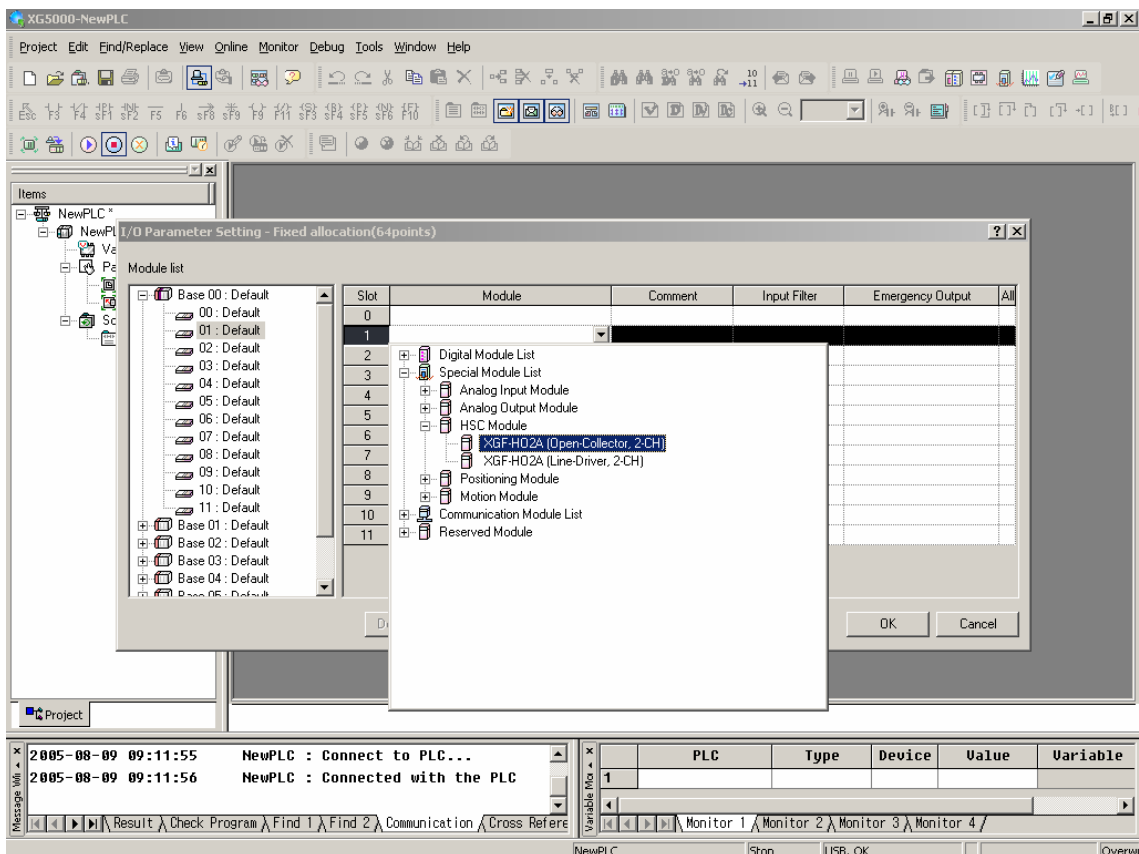
- 6) After all settings complete, click [Online]-[Connect] or  on the icon menu. Click [Message Window] [Communication] to check the connection.



4.2 Parameters Setting

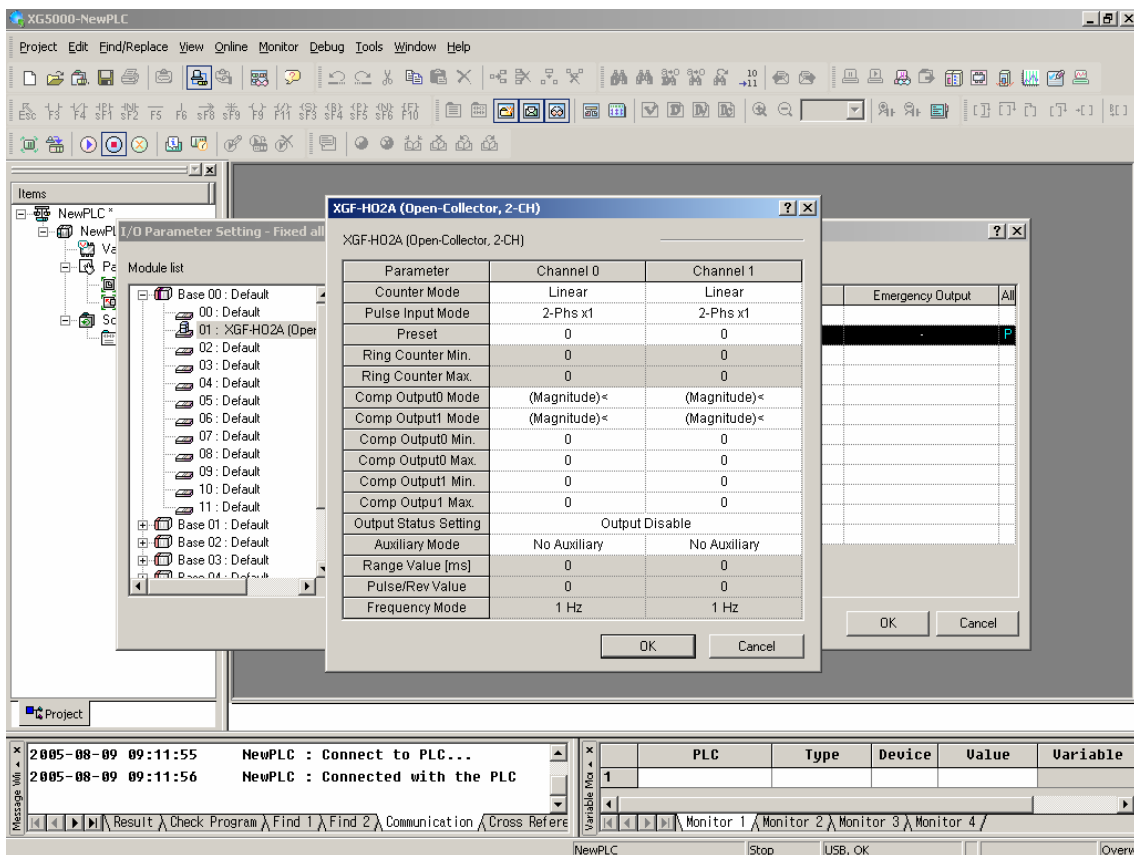
4.2.1 Parameters setting screen

- 1) Double-click [I/O parameters] on the [Project Window] to the left of the project created on XG5000.
- 2) If [I/O parameters setting] window is displayed, click the module area of the applicable slot to select the applicable module

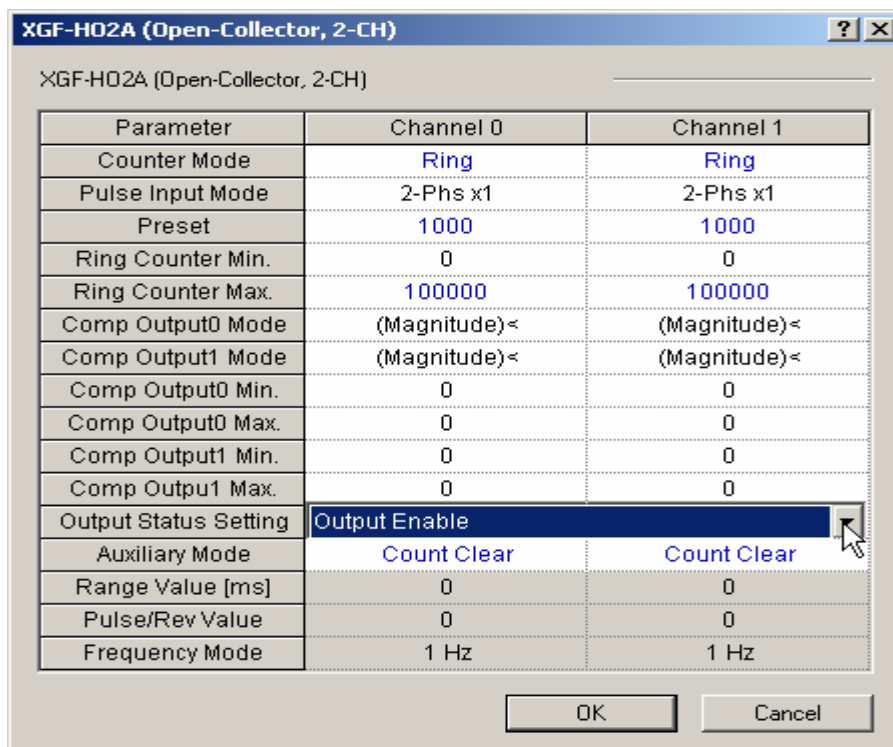


Chapter 4 Operation Procedures and Monitoring (XG5000)

- 3) Double-click the applicable slot selected to specify the parameters, or click [Details] to display the screen where parameters can be set.

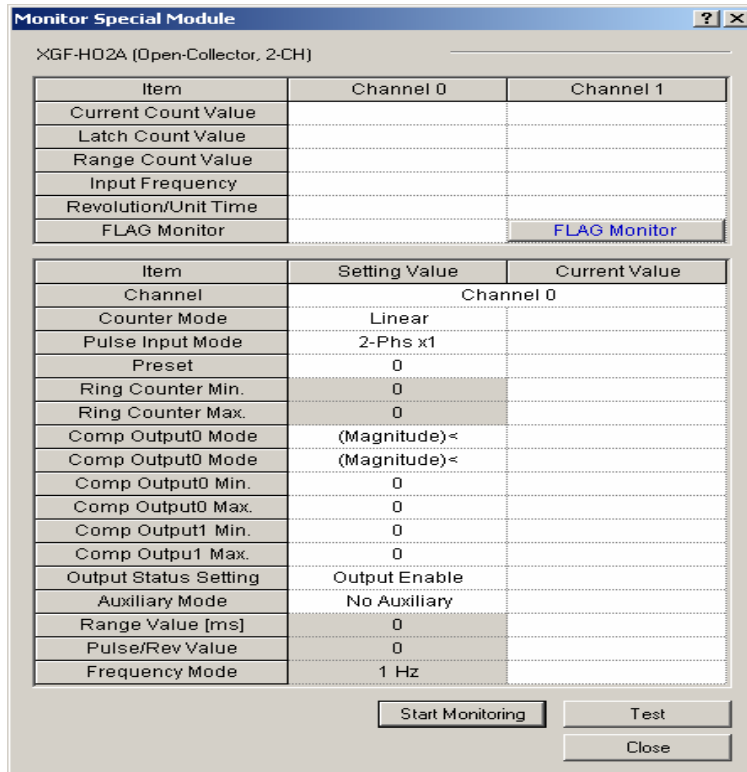


- 4) Set parameters as necessary for operation on the parameters setting window.

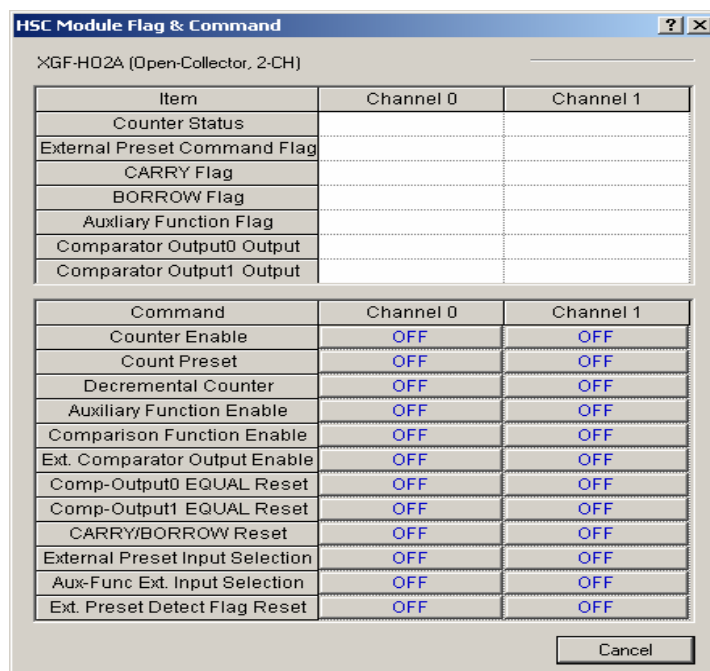


Chapter 4 Operation Procedures and Monitoring (XG5000)

- 3) Select the applicable module and click the monitoring button to display the monitoring/test screen as shown below, whose functions are as follows;
 - On the upper monitoring screen, each special module's monitoring item values are displayed.
 - On the bottom test screen, each module's parameter items can be changed individually.



- 4) In order to monitor the I/O contact status, click the applicable channel's flag monitoring area to display the monitoring screen where each I/O contact status can be checked.

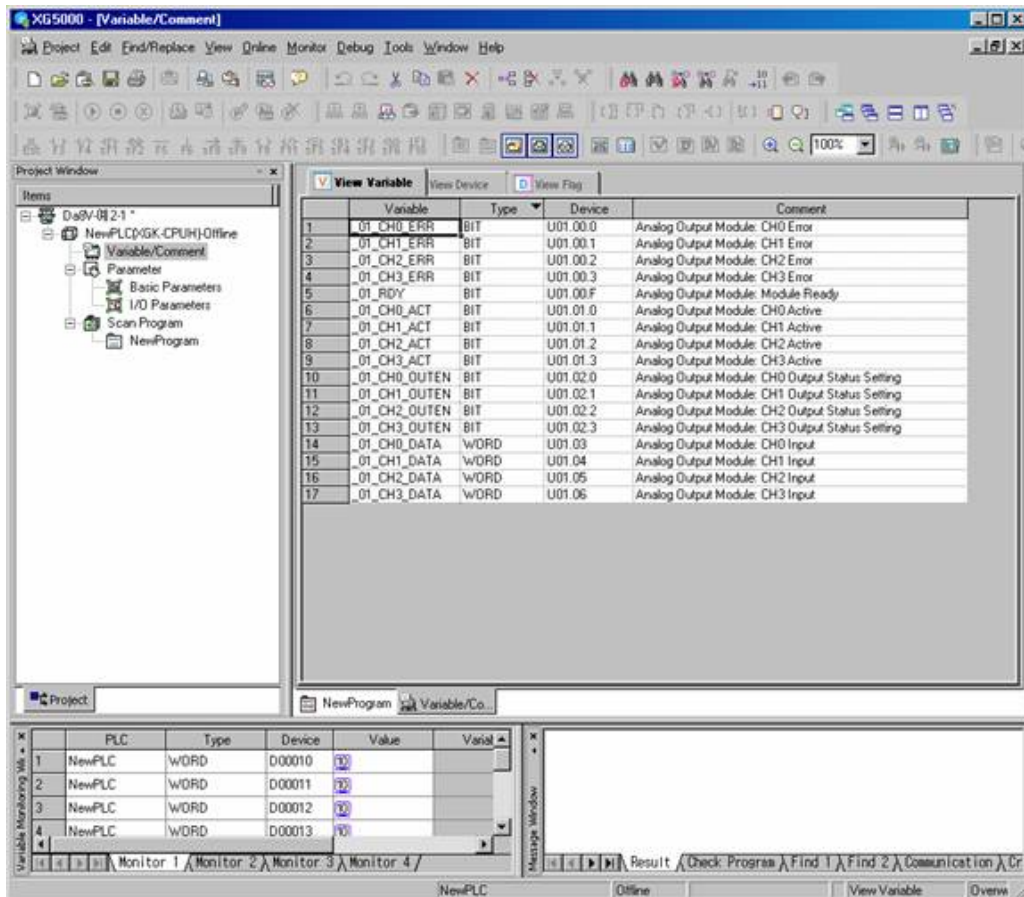
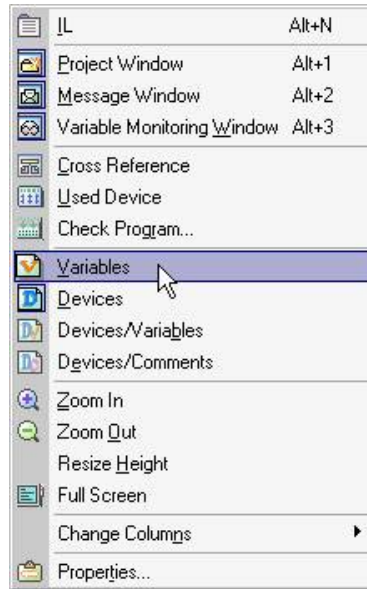


4.4 Register U Devices

Register the variables for each module referring to the special module information that is set in the I/O parameter (See the section 4.2). The user can modify the variables and comments.

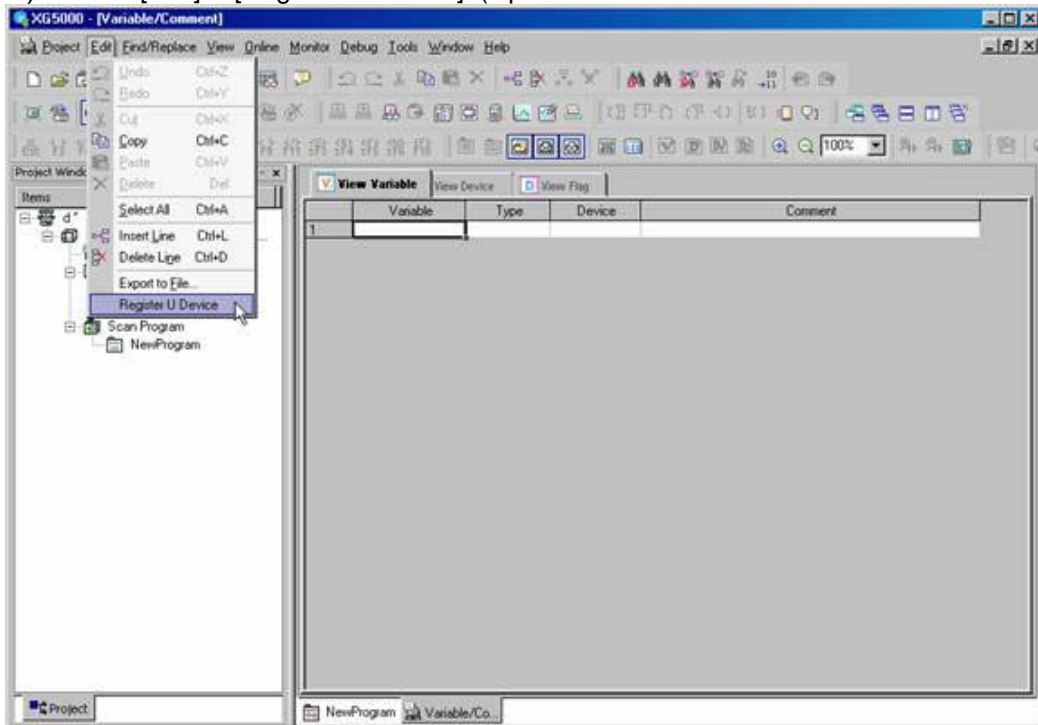
4.4.1 View variables

- 1) Select [View] -> [Variables].
- 2) Currently registered variables and comments are shown in the Variable window.

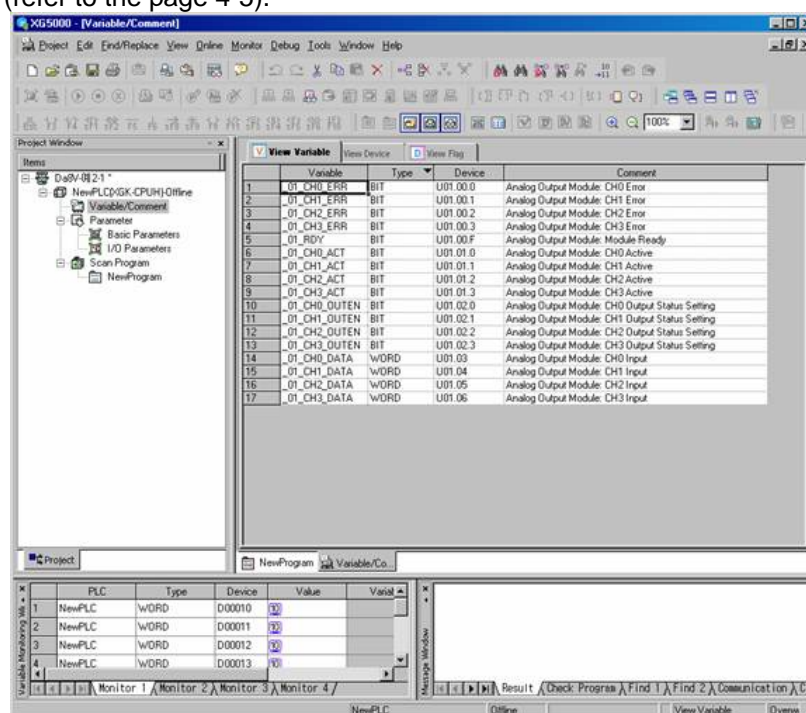


4.4.2 Register U Devices

1) Select [Edit]→ [Register U Device]. (Open the variable window to activate this menu.)



2) Click [Yes] to complete the U device registration that is set at [I/O parameter setting] (refer to the page 4-5).



Chapter 5 Internal Memory & I/O Signals

5.1 Internal Memory

- High Speed Counter has the internal memory used for data Tx/Rx (Write/Read) to/from PLC CPU. The commands used for Tx (Write) from PLC CPU to High Speed Counter's internal memory are PUT and PUTP, and the commands used for Rx (Read) are GET and GETP. Configuration of the internal memory and the data is as described below.

5.1.1 Configuration of the internal memory

1) Input setting area

CH0		CH1		Details
Dec	Hex	Dec	Hex	
0	0H	25	19H	Select counter mode
1	1H	26	1AH	Select pulse input mode
2	2H	27	1BH	Set preset value
3	3H	28	1CH	
4	4H	29	1DH	Ring count minimum value
5	5H	30	1EH	
6	6H	31	1FH	Ring count maximum value
7	7H	32	20H	
8	8H	33	21H	Select OUT0 type
9	9H	34	22H	Select OUT1 type
10	AH	35	23H	OUT0 compared based value (single-compared)/minimum setting value (section compared)
11	BH	36	24H	
12	CH	37	25H	OUT0 compared based value maximum setting value (section-compared)
13	DH	38	26H	
14	EH	39	27H	OUT1 compared based value (single-compared)/ minimum setting value (section-compared)
15	FH	40	28H	
16	10H	41	29H	OUT1 compared based value maximum setting value (section-compared)
17	11H	42	2AH	
50	32H	50	32H	Define output status when PLC CPU stops (CH0, CH1 common)
18	12H	43	2BH	Select auxiliary mode
19	13H	44	2CH	Sampling count time setting or Revolution/Unit time setting
20	14H	45	2DH	Revolutions per hour function, pulses per revolution input
21	15H	46	2EH	Select frequency display mode

2) Output setting area

U area		Details
CH0	CH1	
Uxy.02	Uxy.12	Present count value
Uxy.03	Uxy.13	
Uxy.04	Uxy.14	Latch count value
Uxy.05	Uxy.15	
Uxy.06	Uxy.16	Sampling count value
Uxy.07	Uxy.17	
Uxy.08	Uxy.18	Input frequency value
Uxy.09	Uxy.19	
Uxy.10	Uxy.20	Revolutions per hour value
Uxy.11	Uxy.21	

※ 'xy' stands for the position High Speed Counter module is installed on. (xy => x:base No., y:slot No.)

5.1.2 Details & Data Configuration

- 1) Count mode setting (CH0: 0H address, CH1: 19H address)

Setting value(Dec)	Details
0	Linear count
1	Ring count

- 2) Pulse input mode setting (CH0: 1H address, CH1: 1AH address)

Setting value(Dec)	Details
0	2-phase 1-multiplication
1	2-phase 2-multiplication
2	2-phase 4-multiplication
3	CW / CCW
4	1-phase 1-input 1-multiplication
5	1-phase 1-input 2-multiplication
6	1-phase 2-input 1-multiplication
7	1-phase 2-input 2-multiplication

- 3) Compared condition setting (CH0: 8H~9H address, CH1: 21H~22H address)

Classification	Address		Details	
	CH0	CH1		
OUT0	8H	21H	Setting value	
			0	If present value < compared value, OUT is ON
			1	If present value =< compared value, OUT is ON
OUT1	9H	22H	2	If present value = compared value, OUT is ON
			3	If present value >= compared value, OUT is ON
			4	If present value > compared value, OUT is ON
			5	If compared value1 =< present value =< compared value2, OUT is ON
			6	If compared value1 >= present value, present value >= compared value2, OUT is ON

- 4) Auxiliary mode setting (CH0: 12H address, CH1: 2BH address)

Setting value(Dec)	Details
0	Auxiliary mode not used
1	Count Clear
2	Count Latch
3	Sampling Count
4	Input Frequency Measure
5	Revolution/Unit time
6	Count Disable

- 5) Frequency mode setting (CH0: 15H address, CH1: 2EH address)

Setting value(Dec)	Details
0	1 Hz unit displayed (1000 ms unit frequency value updated)
1	10 Hz unit displayed (100 ms unit frequency value updated)
2	100 Hz unit displayed (10 ms unit frequency value updated)
3	1000 Hz unit displayed (1 ms unit frequency value updated)

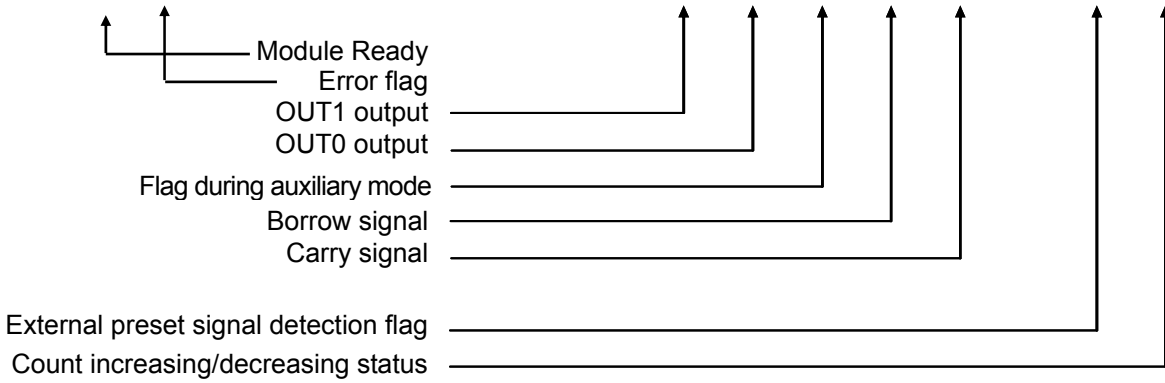
- 6) Output status setting at PLC stop (CH0, CH1 common: 32H)

Setting value(Dec)	Details
0	Output disable
1	Output kept as it is

5.1.3 Status display

Ch0 : Uxy.address 0, Ch1 : Uxy.address 1 (However, Ch0'Bit15 is module ready bit

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
O	O	x	x	x	x	O	O	O	O	O	O	O	x	O	O



Chapter 5 Internal Memory & I/O Signals

5.2 I/O Signals

I/O signals of XGF-HO2A and XGF-HD2A are configured as follows;

PLC <- High Speed Counter			PLC -> High Speed Counter		
CH	Signal	Details	CH	Signal	Details
0	Uxy.00.0	Increasing/decreasing count signal (ON: decreasing/OFF: increasing)	0	Uxy.23.0	Count operation enable signal (Level)
	Uxy.00.1	External input preset flag		Uxy.23.1	Preset enable signal (edge)
	Uxy.00.2	-		Uxy.23.2	Increasing/decreasing count setting signal (Level)
	Uxy.00.3	Carry signal		Uxy.23.3	Auxiliary mode use command (edge, level)
	Uxy.00.4	Borrow signal		Uxy.23.4	Compared function use command (Level)
	Uxy.00.5	Flag during auxiliary mode		Uxy.23.5	Compared output external terminal enabled signal(Level)
	Uxy.00.6	OUT0 output signal		Uxy.23.6	OUT0 coincidence output reset signal (Edge)
	Uxy.00.7	OUT1 output signal		Uxy.23.7	OUT1 coincidence output reset signal (Edge)
	Uxy.00.8	-		Uxy.23.8	-
	Uxy.00.9	-		Uxy.23.9	-
	Uxy.00.A	-		Uxy.23.A	Carry/Borrow reset signal (Edge)
	Uxy.00.B	-		Uxy.23.B	Preset external input setting signal
	Uxy.00.C	-		Uxy.23.C	Command of auxiliary mode use (external input setting signal(gate signal))
	Uxy.00.D	-		Uxy.23.D	External input preset flag reset signal
	Uxy.00.E	CH0 error flag		Uxy.23.E	-
	Uxy.00.F	Module Ready		Uxy.23.F	-
1	Uxy.01.0	Increasing/decreasing count signal (ON: decreasing/OFF: increasing)	1	Uxy.24.0	Count operation enable signal (Level)
	Uxy.01.1	External input preset flag		Uxy.24.1	Preset enable signal (edge)
	Uxy.01.2	-		Uxy.24.2	Increasing/decreasing count setting signal (Level)
	Uxy.01.3	Carry signal		Uxy.24.3	Additional function use command (edge, level)
	Uxy.01.4	Borrow signal		Uxy.24.4	Compared function use command (Level)
	Uxy.01.5	Flag during auxiliary mode		Uxy.24.5	Compared output external terminal enabled signal (Level)
	Uxy.01.6	OUT0 output signal		Uxy.24.6	OUT0 coincidence output reset signal (Edge)
	Uxy.01.7	OUT1 output signal		Uxy.24.7	OUT1 coincidence output reset signal (Edge)
	Uxy.01.8	-		Uxy.24.8	-
	Uxy.01.9	-		Uxy.24.9	-
	Uxy.01.A	-		Uxy.24.A	Carry/Borrow reset signal (Edge)
	Uxy.01.B	-		Uxy.24.B	Preset external input setting signal
	Uxy.01.C	-		Uxy.24.C	Command of auxiliary mode use (external input setting signal(gate signal))
	Uxy.01.D	-		Uxy.24.D	External input preset flag reset signal
	Uxy.01.E	CH1 error flag		Uxy.24.E	-
	Uxy.01.F	-		Uxy.24.F	-

※ 'xy' stands for the position High Speed Counter module is installed on. (xy => x: base No., y: slot No.)

Chapter 6 Programming

High Speed counter module can be operated by means of XG5000 program menu or tool bar through parameters setting of the applicable module, monitoring/test function executed, or Read/Write function of internal memory data by the scan program.


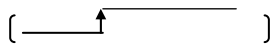
6.1 Read/Write Internal Memory

- How to read or write the internal memory of High-speed counter is as described below.

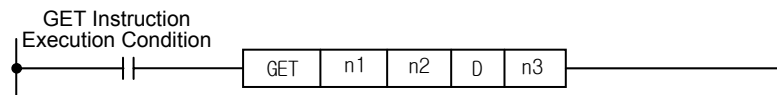
6.1.1 Read internal memory

- It is a instruction used to read the details of High Speed counter module's internal memory to PLC CPU. The read data can be saved on PLC CPU memory (except F area).

1) GET/GETP Instruction


Always executed with execution condition On		GET
Executed with execution condition of operation start		GETP

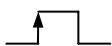
2) Configuration of GET/GETP Instruction



Type	Description	Area Available
n1	Slot No. the special module is installed on	Integer
n2	Start address of special module's operation parameters setting area to read data	Integer
D	Device's start address with saved data to read	M, P, K, L, T, C, D, #D
n3	Number of words data to read	Integer

< Difference between GET instruction and GETP instruction >

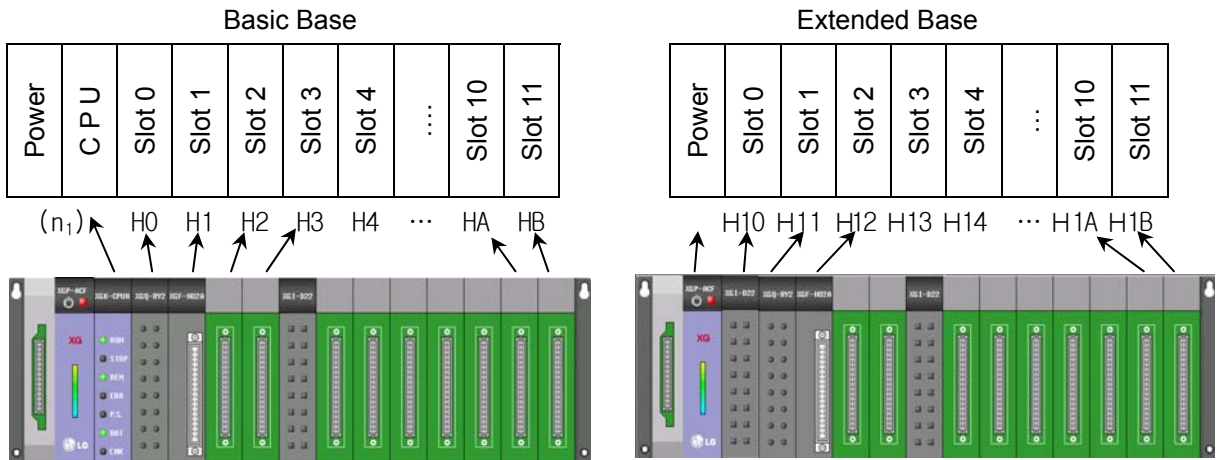
GET : Always executed with execution condition On ()

GETP : Executed with execution condition of operation start ()

- ※ If setting value of n3 is 2 or more, the memory area of D shall be surely specified. (If D value is Integer, and setting value of n3 is 2, other value than the setting value will be specified.)

Chapter 6 Programming

3) How to set n1 (Slot Number)

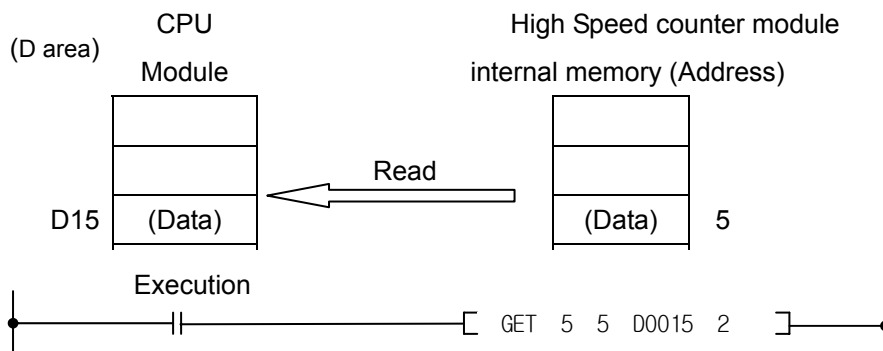


※ n1(Slot No.): Base 1's I/O Start Address is from H10, Extended Base 2's I/O Start Address from H20, and Extended Base 3's I/O Start Address from H30.

4) Instruction example of GET/GETP

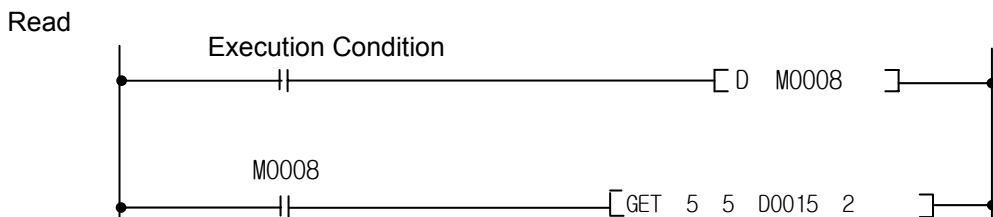
Ex.1

If High Speed counter module is installed on the base's 5th slot and internal memory address No.5's 2-Word data is respectively read to D0015, D0016



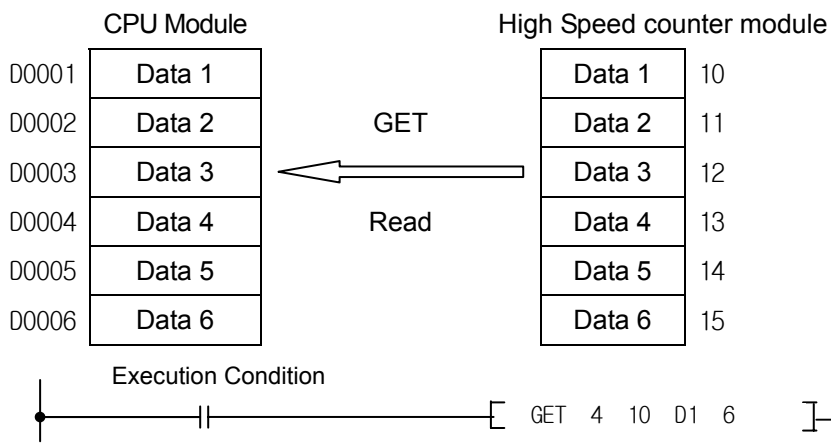
Ex.2

Ex.1) If Read is executed only when Execution Condition is of rising pulse On with identical data



Ex.3

High Speed counter module is installed on the basic base's 4th slot and internal memory addresses No.10~15's 6-Word data is respectively read to D0001 ~ D0006



6.1.2 Write internal memory

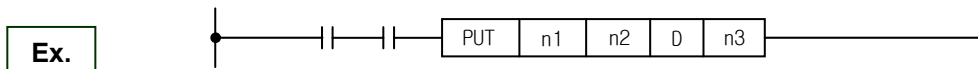
Data to be written from CPU module onto High Speed counter module's internal memory is the data saved on the CPU's memory area and the integer (Decimal (00) or Hexadecimal (H00)).

1) PUT/PUTP Instruction

Always executed with execution condition On	()	PUT
Executed with execution condition of operation Start	()	PUTP


Chapter 6 Programming


2) Configuration of PUT/PUTP Instruction



Type	Description	Area Available
n1	Slot No. the special module is installed on	Integer
n2	Start address of special module's internal memory to write data.	Integer
D	Device's start address or integer with saved data to write.	M, P, K, L, T, C, D, #D, Integer
n3	Number of words data to write	Integer

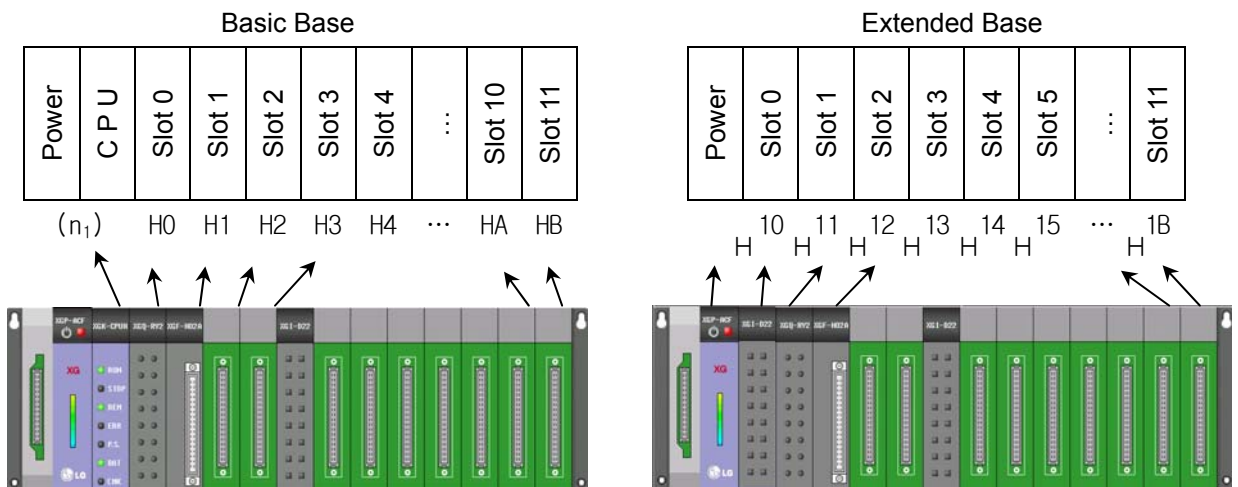
< Difference between PUT instruction and PUTP instruction >

PUT : always executed with execution condition On ()

PUTP : executed with execution condition of operation start ()

※ If setting value of n3 is 2 or more, the memory area of D should be surely specified. (If D value is Integer, and setting value of n3 is 2, other value than the setting value will be specified.)

3) How to set n1



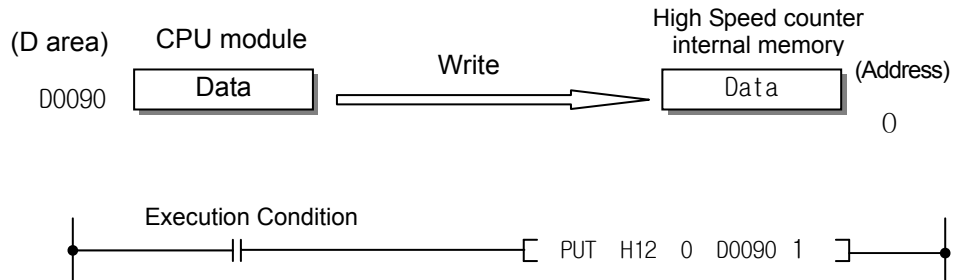
※ n1 (Slot No.) Extended Base 1's I/O Start Address is from H10, Extended Base 2's I/O Start Address from H20, and Extended Base 3's I/O Start Address from H30.

4) Instruction example of PUT/PUTP

Ex.1

● 16-Bit Data Write

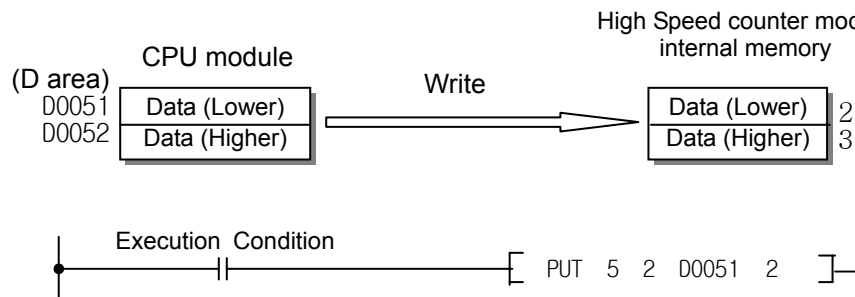
High Speed counter module is installed on the 1st extended base's 2nd slot and 1-Word data saved on CPU module's D Area (D0090) is written on the address 0 of the internal memory



Ex.2

● 32-Bit Data Write

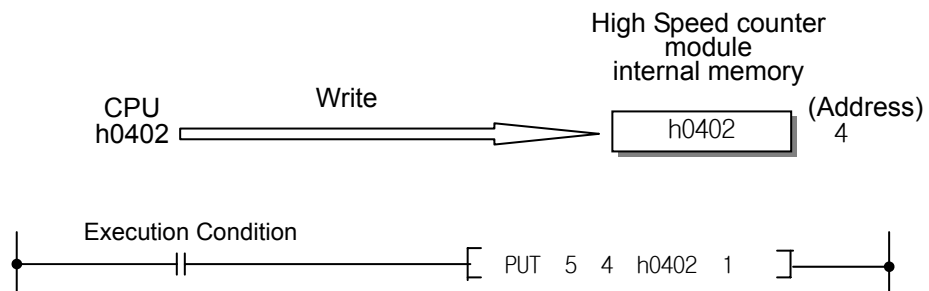
High Speed counter module is installed on the basic base's 5th slot and 2-Word (32 Bits) data saved on CPU module's D area(D0051, D0052) is written on the addresses 2 & 3 of the internal memory



Ex.3

● Integer Write

High Speed counter module is installed on the basic base's 5th slot and h0402 is written on the address 4 of the internal memory

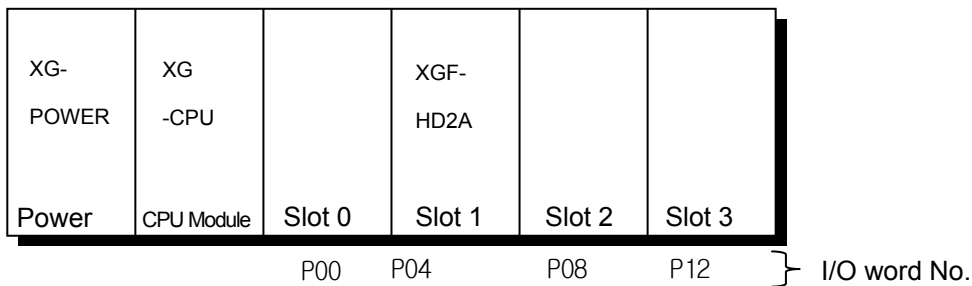


6.2 Basic Program

High Speed counter parameters can be set by means of the scan program through Tx (Write) instructions of PUT, PUTP and Rx (Read) instructions of GET, GETP and through I/O parameters Write/Read. High Speed counter's instruction enabled and status monitoring can be executed through Write/Read of U contact.

6.2.1 Operation through program

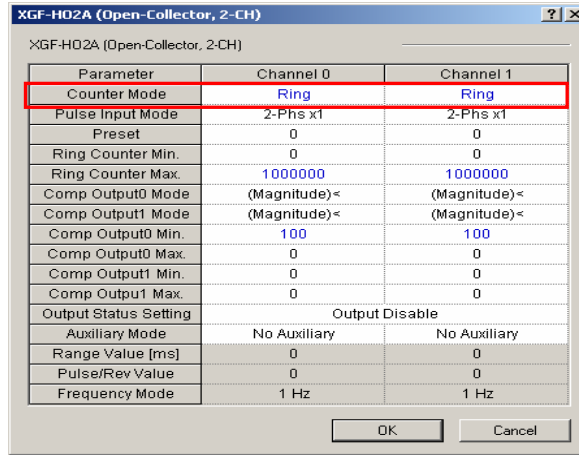
- The system displayed below with High Speed counter module installed on the slot 1 will be described as based on XGF-HD2A unless stated differently.



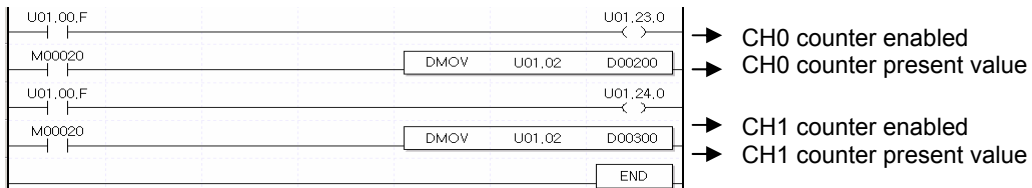
6.2.2 Count type setting

- If the count type is not specified, operation will be with the linear count. The figure below shows the parameters setting screen to write the maximum value and the minimum value together on High Speed counter's internal memory when Ring count is specified. (I/O Parameters → I/O → Parameters setting)

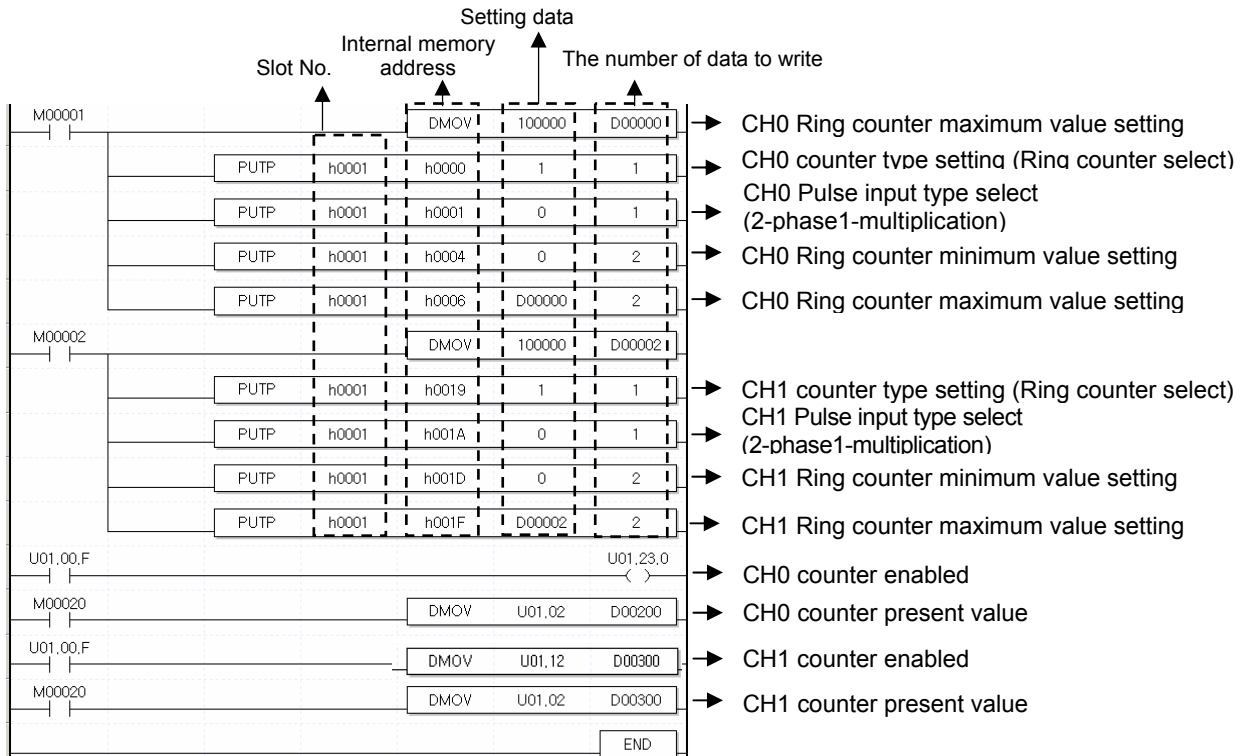
<Parameter setting screen>



<Scan Program>



- ※ Write the above parameters and the scan program on PLC. (Input : A/B phase)
- Other parameters setting method than I/O parameters write is available through PUTP instruction in the scan program as shown below;



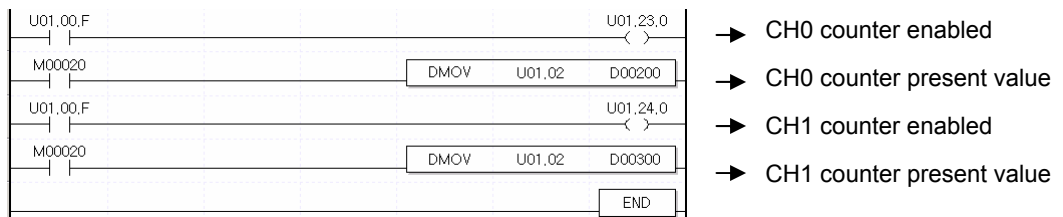
6.2.3 Operation mode setting

- Among 2-phase 1-multiplication, 2-phase 2-multiplication, 2-phase 4-multiplication, CW/CCW, 1-phase 1-input 1-multiplication, 1-phase 1-input 2-multiplication, 1-phase 2-input 1-multiplication and 1-phase 2-input 2-multiplication, one operation mode should be specified. If not specified, operation will be with 2-phase 1-multiplication. The figure below shows the parameters setting screen to write 2-phase 4-multiplication on High Speed counter's internal memory. (I/O Parameters → Module Register (I/O Parameters setting))

<Parameter setting screen>

Parameter	Channel 0	Channel 1
Counter Mode	Linear	Linear
Pulse Input Mode	2-Phs x2	2-Phs x2
Preset	0	0
Ring Counter Min.	0	0
Ring Counter Max.	10000	10000
Comp Output0 Mode	(Magnitude)<	(Magnitude)<
Comp Output1 Mode	(Magnitude)<	(Magnitude)<
Comp Output0 Min.	100	100
Comp Output0 Max.	0	0
Comp Output1 Min.	0	0
Comp Output1 Max.	0	0
Output Status Setting	Output Disable	
Auxiliary Mode	No Auxiliary	No Auxiliary
Range Value [ms]	0	0
Pulse/Rev Value	0	0
Frequency Mode	1 Hz	1 Hz

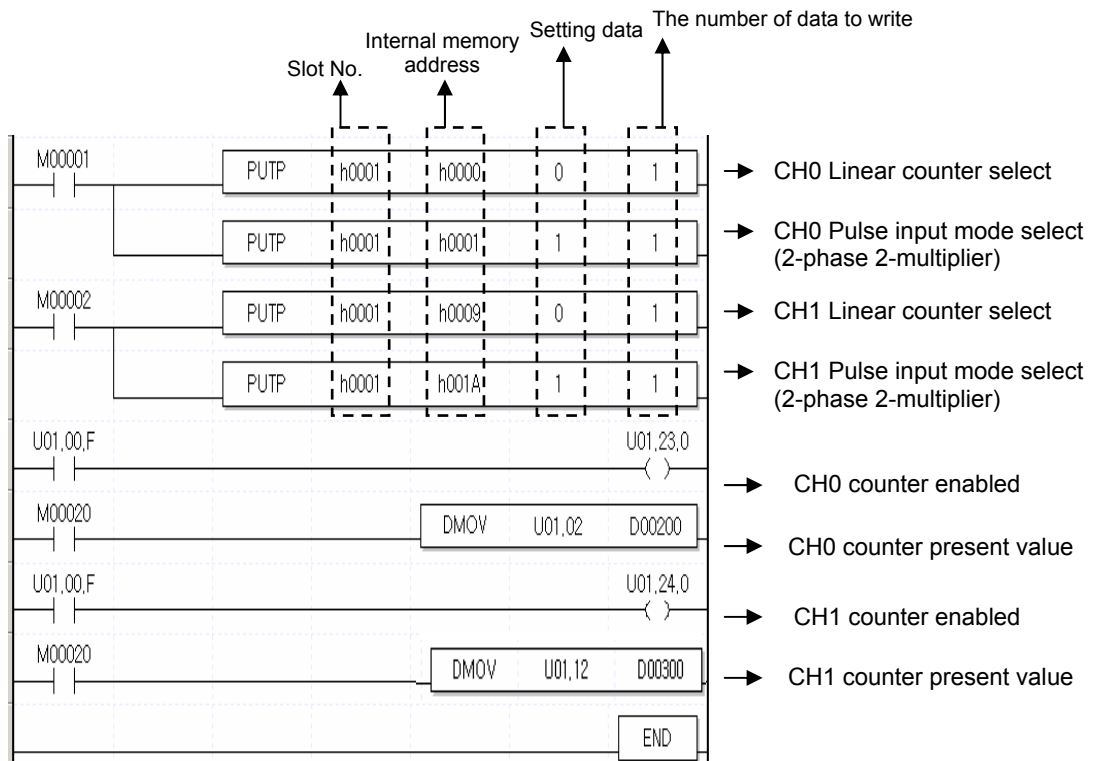
<Ladder Program>



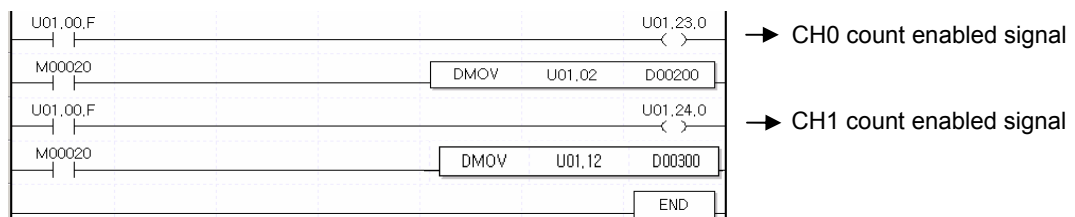
※ Write parameters and ladder program on PLC.

Chapter 6 Programming

- Other parameters setting method than I/O parameters Write is available through PUTP instruction in the scan program as shown below.



6.2.4 Count enabled setting

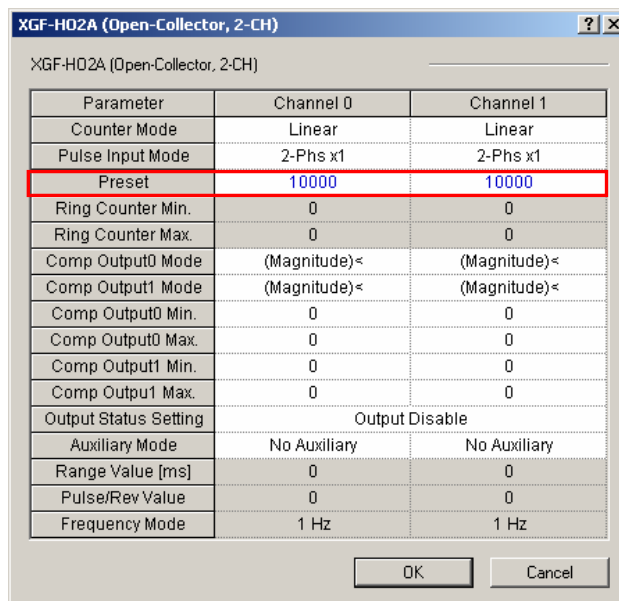


- Bit information of U area assigned as the count I/O instruction area can be set to specify the count enabled signal.
- If the counter enabled signal is Off, the counter will not operate.

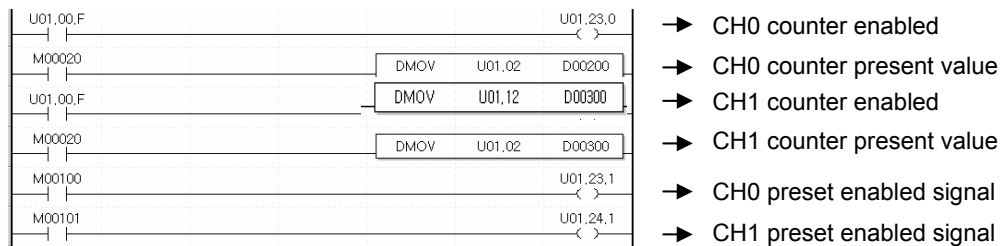
6.2.5 Preset setting

- Preset can be set by the preset input value specified first and then preset enabled signal specified.
- Since preset input value is the parameter value, it can be set through I/O parameters Write (first figure below) and through PUP/PUTP in the scan program (second figure below).
- Since preset enabled signal is the I/O instruction area, the setting method of U area device can be used. The following example is for the preset value of 10000.

<Parameter setting screen>

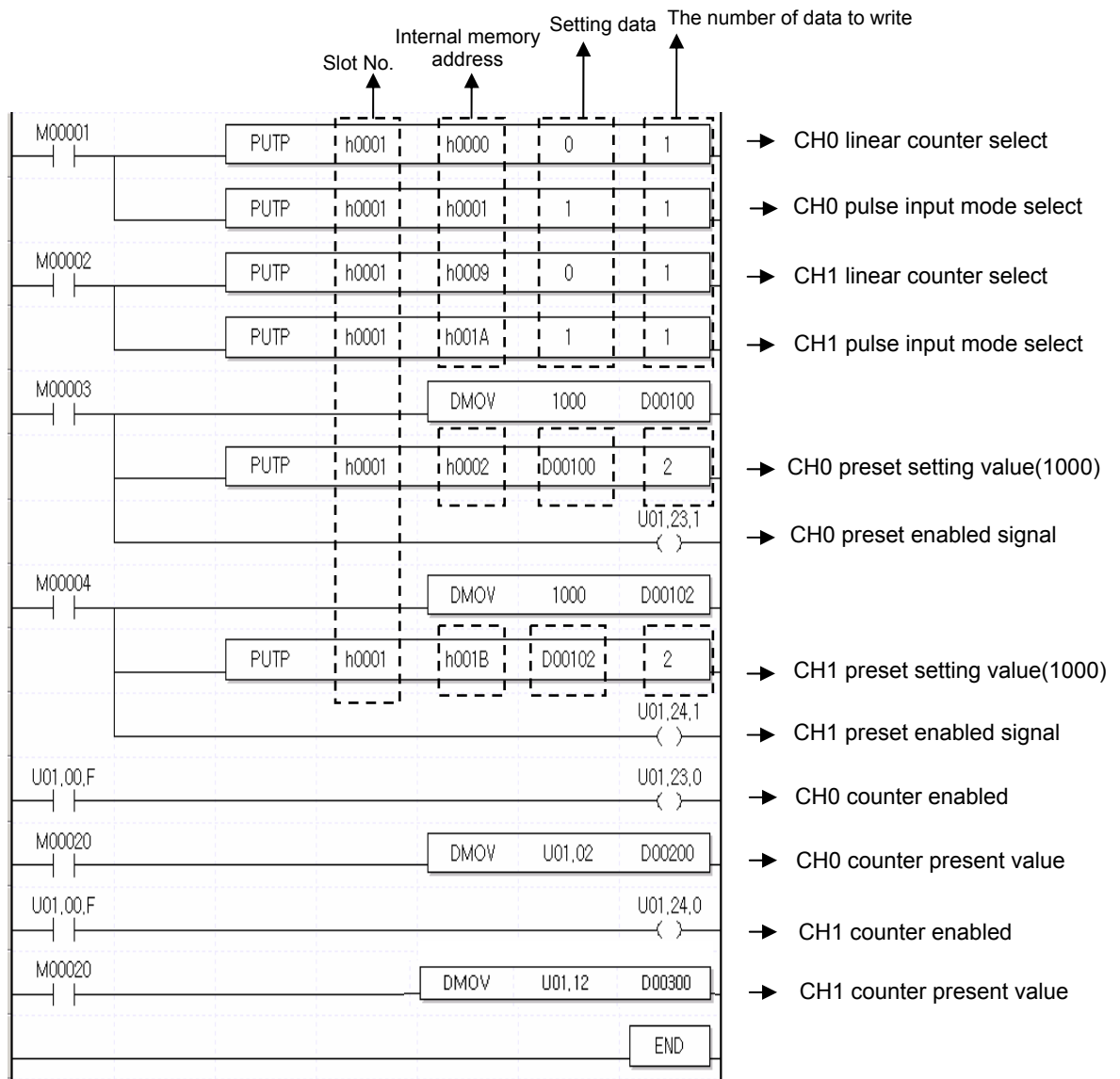


< Ladder Program >

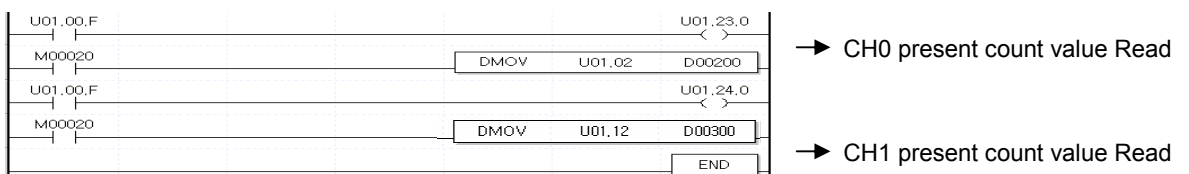


Chapter 6 Programming

- Other parameters setting method than I/O parameters Write is available through PUTP instruction in the scan program as shown below;



6.2.6 Read 'present count value'



- The figure above shows the example of CH0/CH1's present count value read from PLC scan program.
- CH0's present count value (U01.02, U01.03) is read onto the areas of D00200 and D00201, and CH1's present count value (U01.12, U01.13) is read onto the areas of D00300 and D00301.

6.2.7 Setting of compared value and compared condition

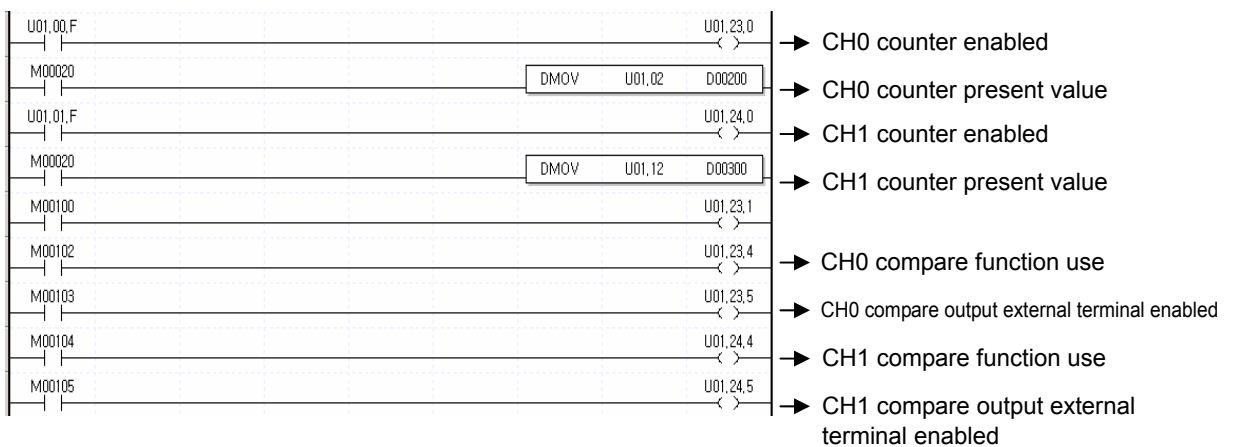
- The first figure below shows the example of compared condition of 5 (section compare-included) and the minimum compared value of 500, the maximum compared value of 1000, with compared output of 0 respectively for the channel 0 and 1.

The second figure shows the example of the scan program with compared value and condition specified, and compared operation output enabled.

<Parameter setting screen>

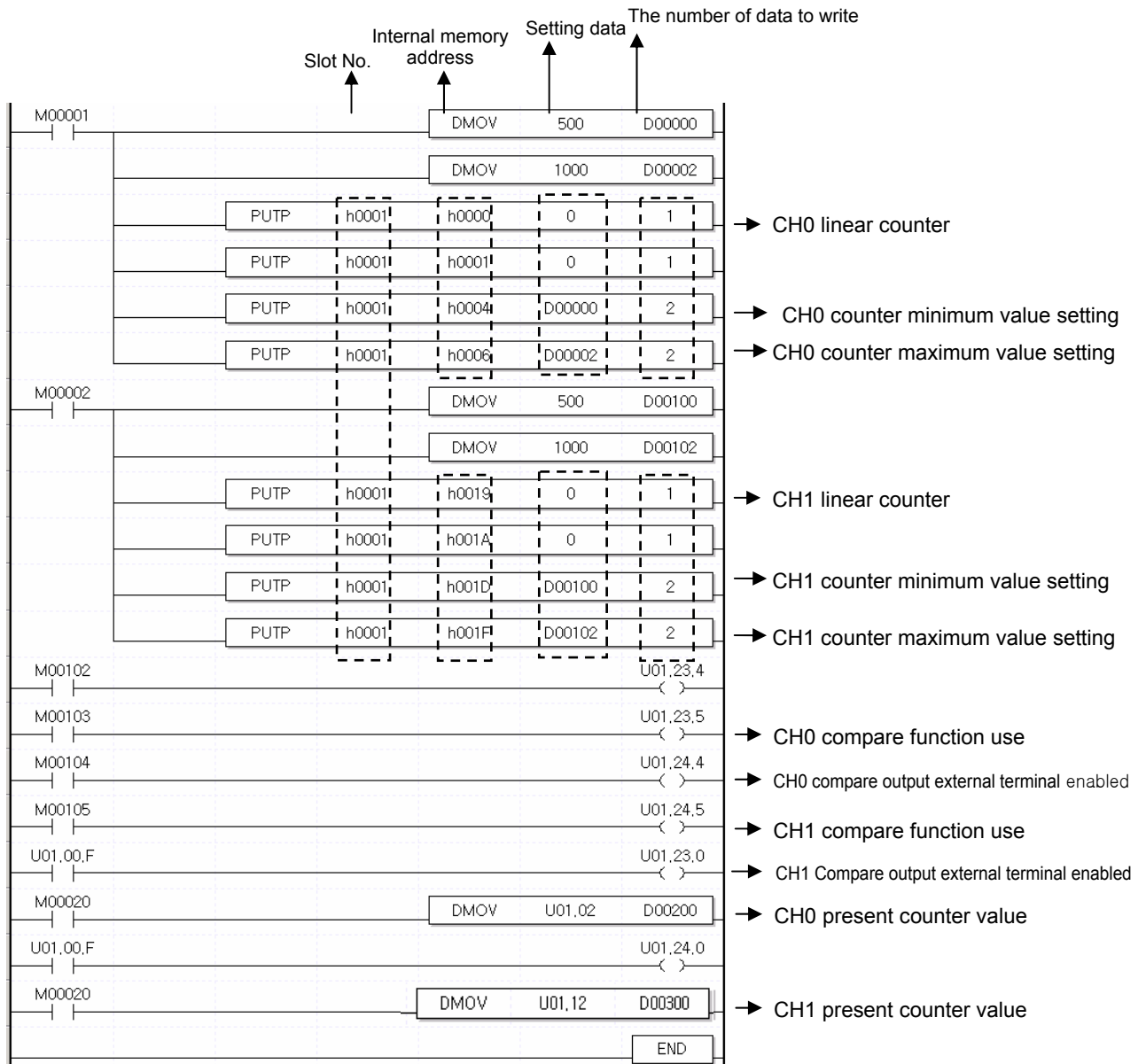
Parameter	Channel 0	Channel 1
Counter Mode	Linear	Linear
Pulse Input Mode	2-Phs x1	2-Phs x1
Preset	0	0
Ring Counter Min.	0	0
Ring Counter Max.	0	0
Comp Output0 Mode	(Range)Include	(Range)Include
Comp Output1 Mode	(Magnitude)<	(Magnitude)<
Comp Output0 Min.	500	500
Comp Output0 Max.	1000	1000
Comp Output1 Min.	0	0
Comp Output1 Max.	0	0
Output Status Setting	Output Disable	
Auxiliary Mode	No Auxiliary	No Auxiliary
Range Value [ms]	0	0
Pulse/Rev Value	0	0
Frequency Mode	1 Hz	1 Hz

< Ladder Program >

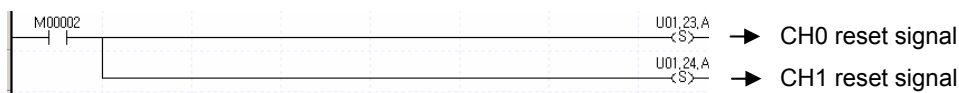


Chapter 6 Programming

- Other parameters setting method than I/O parameters write is available through PUTP instruction in the scan program as shown below;



6.2.8 Carry/Borrow resetting



- The figure above shows the example of Carry/Borrow resetting program produced during counter operation.
- By setting the specified bit of U area device, Carry/Borrow can be reset (or clear).

6.2.9 Auxiliary mode setting

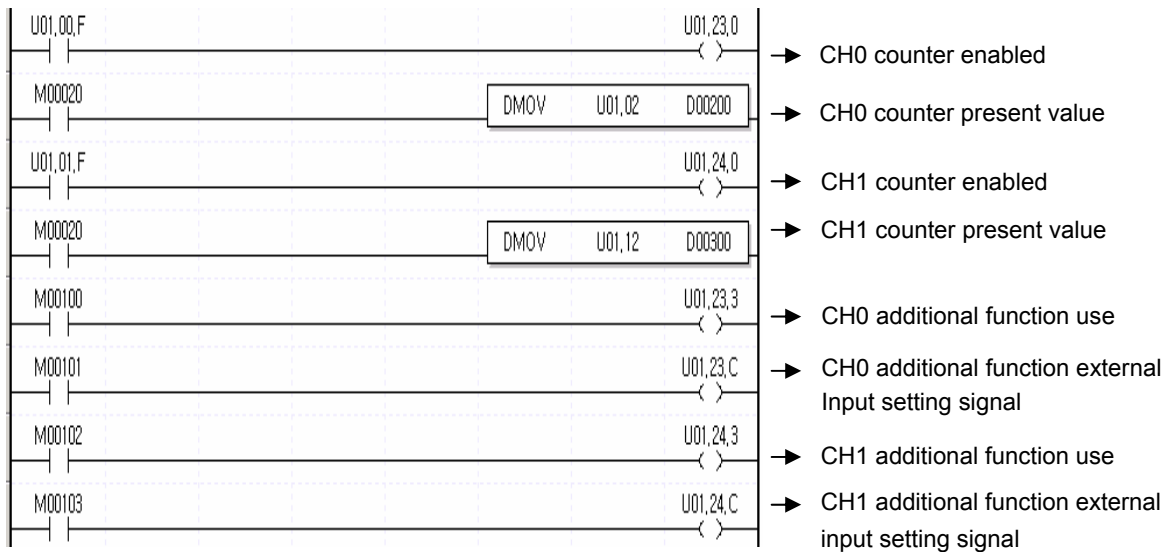
(1) Count clear

- The first figure below shows the setting example of Auxiliary Mode to 1 (count clear) through I/O parameters. The second figure shows the example of the scan program with Auxiliary Mode set to 1 (count clear) and Auxiliary Mode operation enabled.

<Parameter setting screen>

Parameter	Channel 0	Channel 1
Counter Mode	Linear	Linear
Pulse Input Mode	2-Phs x1	2-Phs x1
Preset	0	0
Ring Counter Min.	0	0
Ring Counter Max.	0	0
Comp Output0 Mode	(Magnitude)<	(Magnitude)<
Comp Output1 Mode	(Magnitude)<	(Magnitude)<
Comp Output0 Min.	0	0
Comp Output0 Max.	0	0
Comp Output1 Min.	0	0
Comp Output1 Max.	0	0
Output Status Setting	Output Disable	
Auxiliary Mode	Count Clear	Count Clear
Range Value [ms]	0	0
Pulse/Rev Value	0	0
Frequency Mode	1 Hz	1 Hz

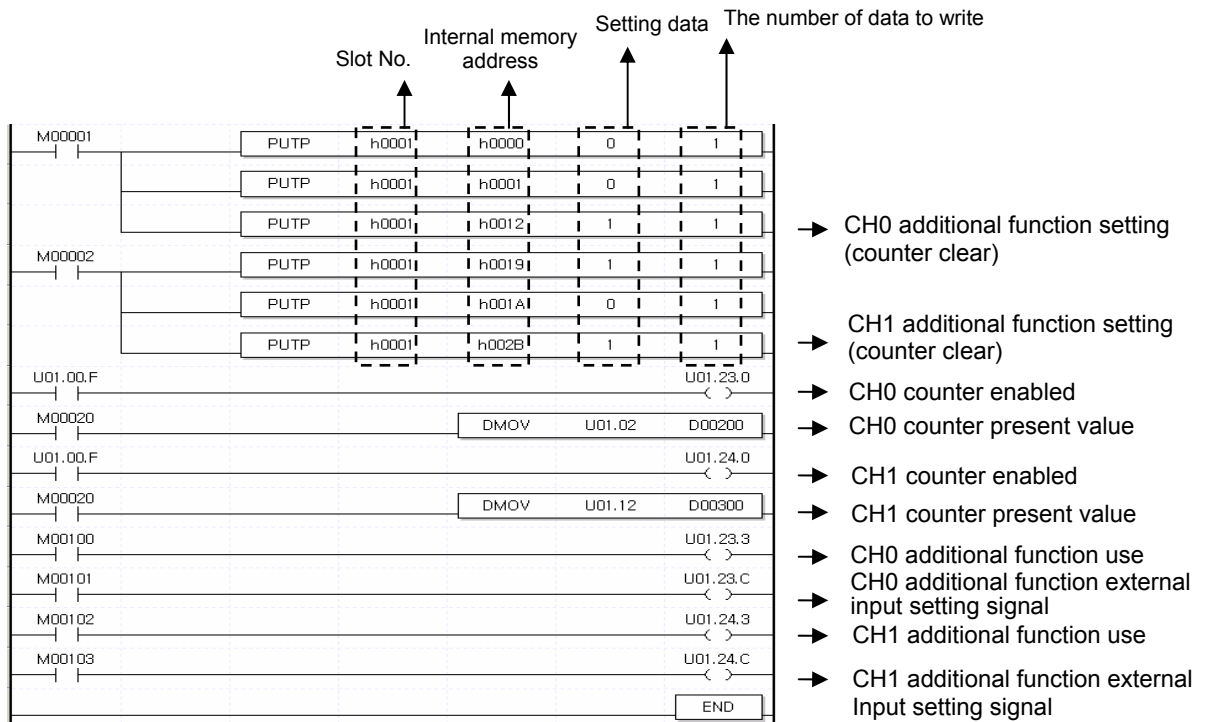
< Ladder Program >



※ Auxiliary Mode external input setting signal uses the signal input from external terminal (gate input) of High Speed counter to clear the counter.

Chapter 6 Programming

- Other parameters setting method than I/O parameters Write is available through PUTP instruction in the scan program as shown below;



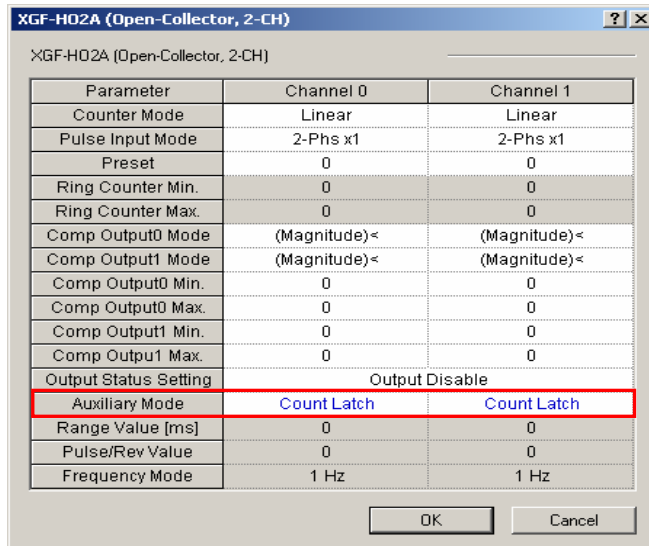
- ※ Auxiliary Mode external input setting signal clears the counter using the signal input from the external terminal (gate input).
- ※ Even if Auxiliary Mode external input setting signal (U1.23.C) is On and Auxiliary Mode use instruction (U1.23.3) is On, the counter will not be cleared. The external instruction has priority.

Chapter 6 Programming

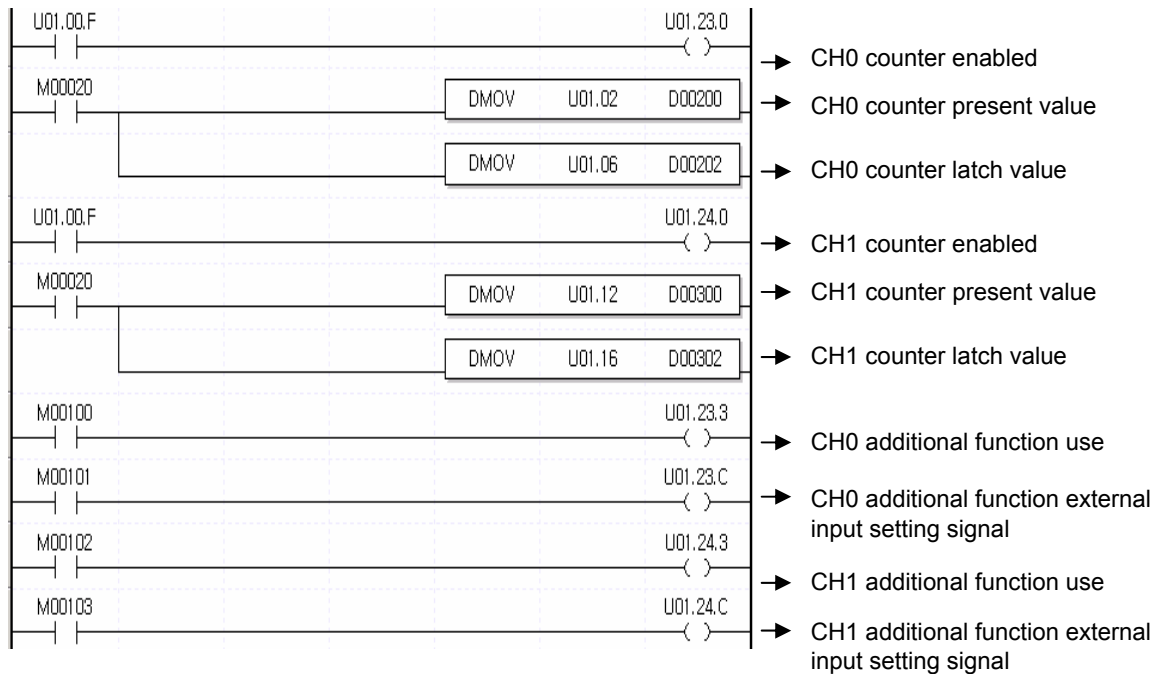
(2) Count Latch

- The first figure below shows the setting example of Auxiliary Mode to 2 (Count latch) through I/O parameters. The second figure shows the example of the scan program with Auxiliary Mode set to 2 (Count Latch), Auxiliary Mode operation enabled and then present latch count value read.

<Parameter setting screen>

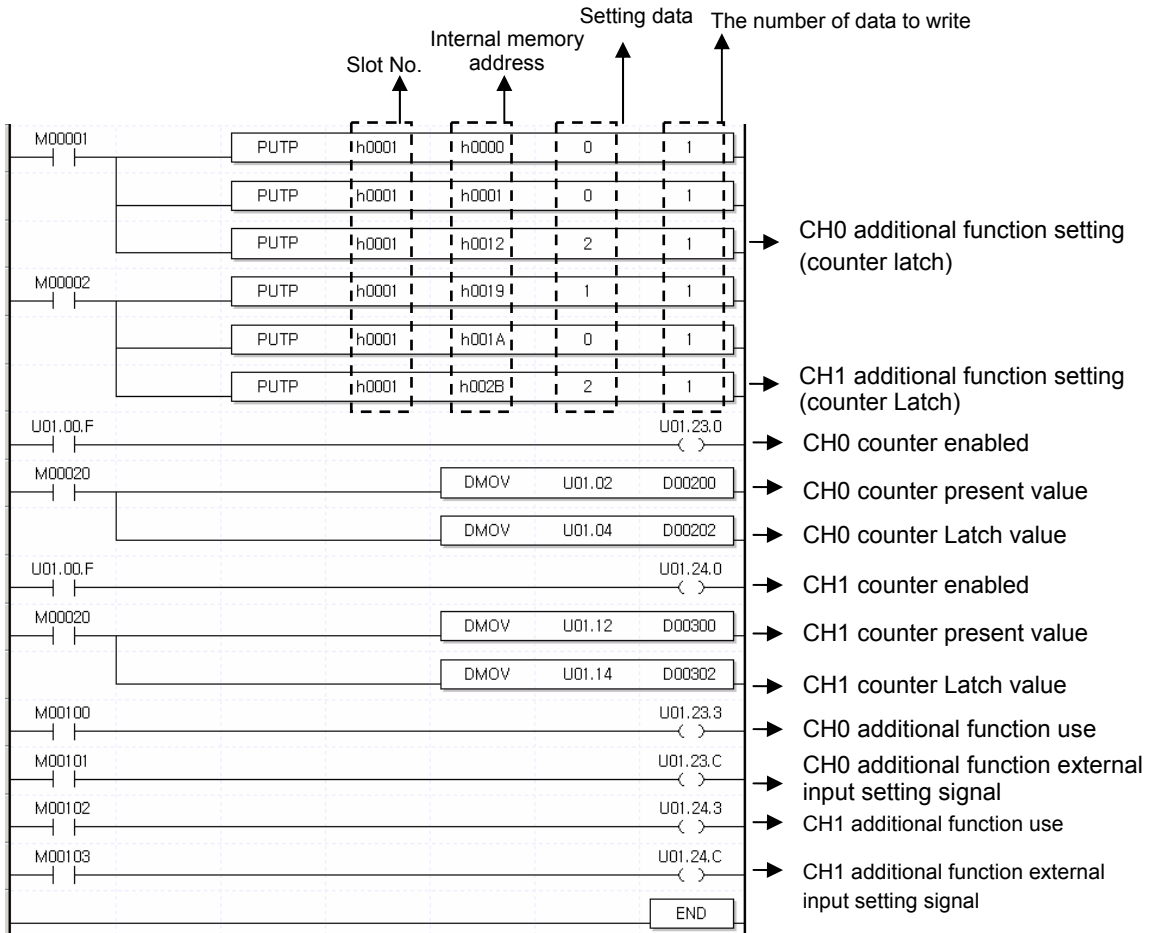


< Ladder Program >



Chapter 6 Programming

- Other parameters setting method than I/O parameters Write is available through PUTP instruction in the scan program as shown below;



Chapter 6 Programming

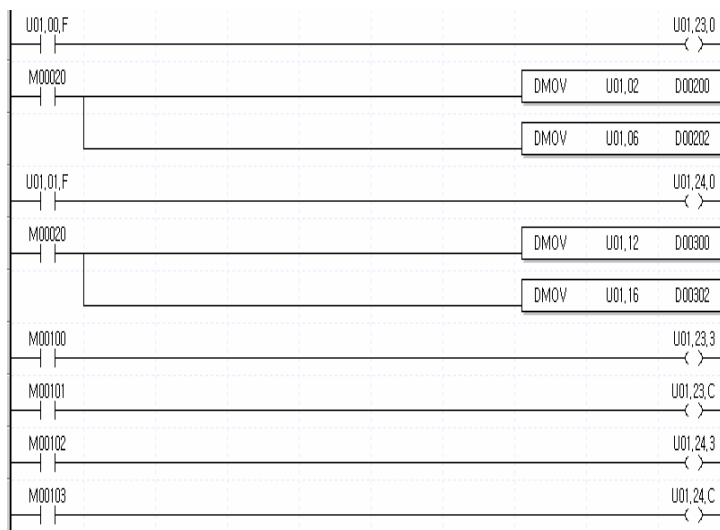
(3) Sampling Count

- The first figure below shows the setting example of Auxiliary Mode to 3 sampling counter through I/O parameters. Section setting value displaying sampling section is also set to 1000ms (1s) respectively for the channels 0 and 1 as in the figure. The second figure shows the example of the scan program with Auxiliary Mode set to 3 (Sampling Count), additional function operation enabled and then present section count value read.

<Parameter setting screen>

XGF-H02A (Open-Collector, 2-CH)		
Parameter	Channel 0	Channel 1
Counter Mode	Linear	Linear
Pulse Input Mode	2-Phs x1	2-Phs x1
Preset	0	0
Ring Counter Min.	0	0
Ring Counter Max.	0	0
Comp Output0 Mode	(Magnitude)<	(Magnitude)<
Comp Output1 Mode	(Magnitude)<	(Magnitude)<
Comp Output0 Min.	0	0
Comp Output0 Max.	0	0
Comp Output1 Min.	0	0
Comp Output1 Max.	0	0
Output Status Setting	Output Disable	
Auxiliary Mode	Sampling Count	Sampling Count
Range Value [ms]	1000	1000
Pulse/Rev Value	0	0
Frequency Mode	1 Hz	1 Hz

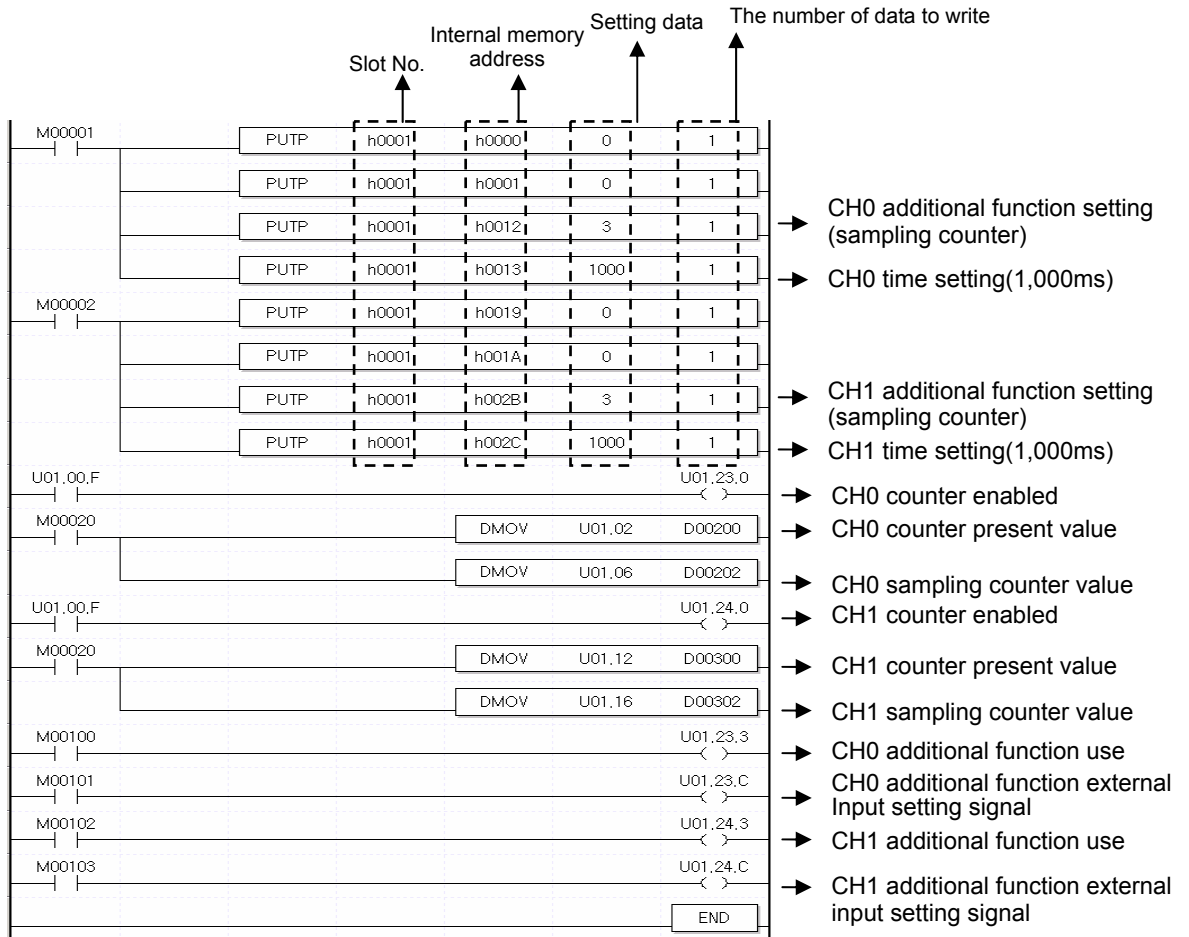
< Ladder Program >



- CH0 counter enabled
- CH0 counter present value
- CH0 section counter value
- CH1 counter enabled
- CH1 counter present value
- CH1 section counter value
- CH0 additional function use
- CH0 additional function external input setting signal
- CH1 additional function use
- CH1 additional function external input setting signal

Chapter 6 Programming

- Other parameters setting method than I/O parameters write is available through PUTP instruction in the scan program as shown below;



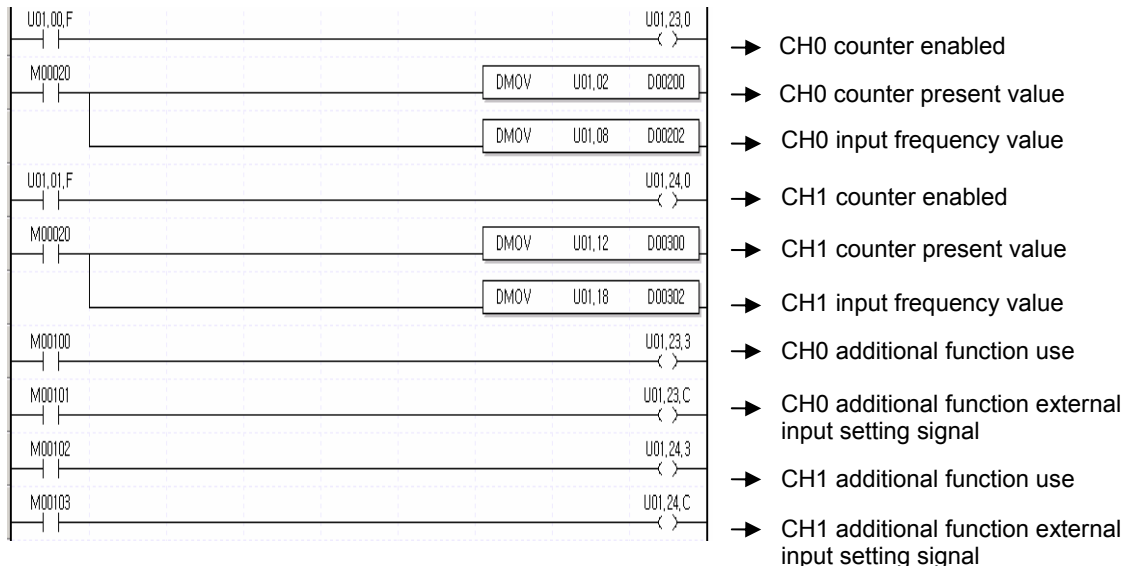
(4) Input Frequency Measure

- The first figure below shows the setting example of Auxiliary Mode to 4 (Input Frequency Measure) through I/O parameters. Frequency display mode value used to specify frequency display mode unit is also set to 10Hz (100ms unit of frequency value updated) respectively for the channels 0 and 1 as in the figure. The second figure shows the example of the scan program with Auxiliary Mode set to 4 (Input Frequency Measure), Auxiliary Mode operation enabled and then present input frequency value read.

<Parameter setting screen>

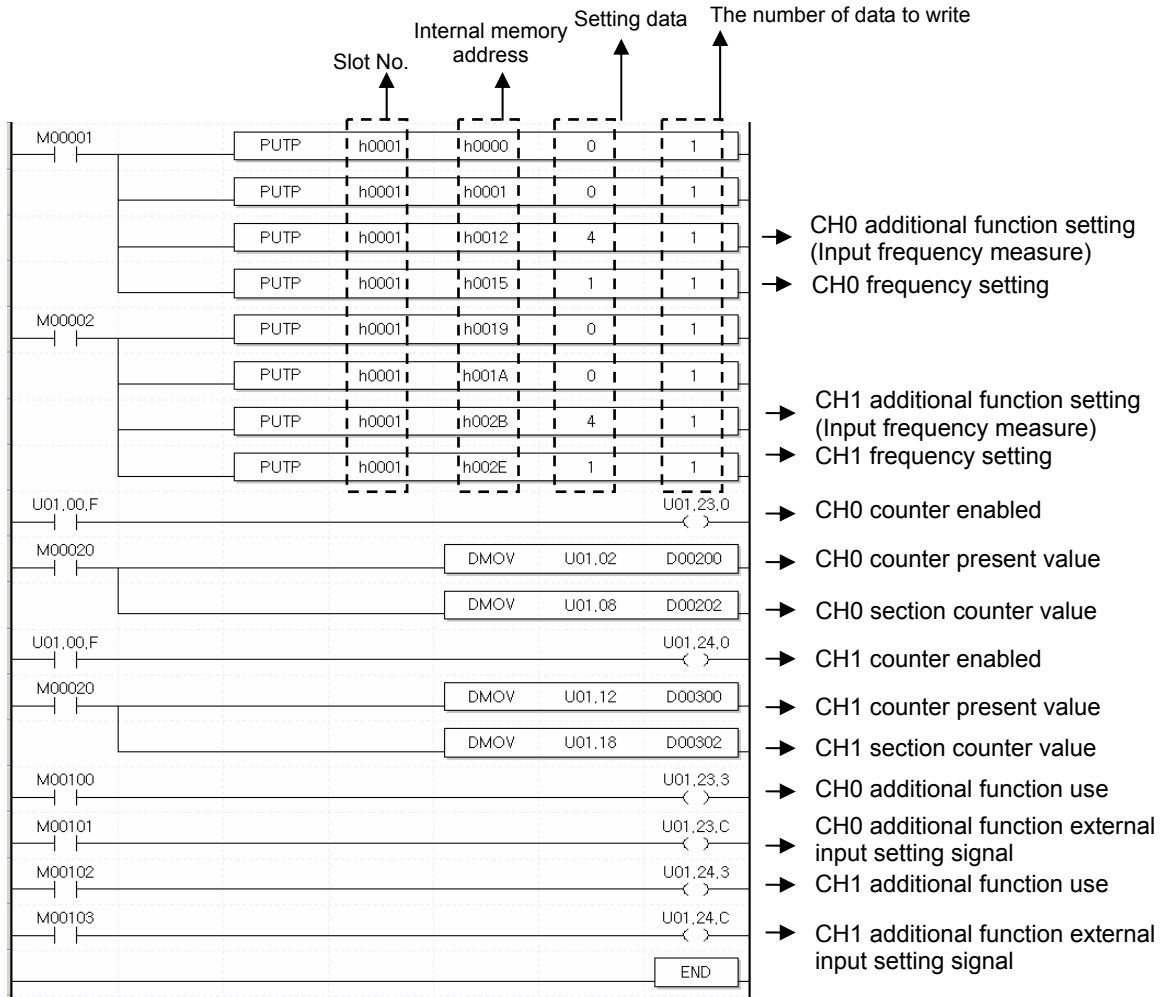
Parameter	Channel 0	Channel 1
Counter Mode	Linear	Linear
Pulse Input Mode	2-Phs x1	2-Phs x1
Preset	0	0
Ring Counter Min.	0	0
Ring Counter Max.	0	0
Comp Output0 Mode	(Magnitude)<	(Magnitude)<
Comp Output1 Mode	(Magnitude)<	(Magnitude)<
Comp Output0 Min.	0	0
Comp Output0 Max.	0	0
Comp Output1 Min.	0	0
Comp Output1 Max.	0	0
Output Status Setting	Output Disable	
Auxiliary Mode	Input Freq. Measure	Input Freq. Measure
Range Value [ms]	0	0
Pulse/Rev Value	0	0
Frequency Mode	10 Hz	10 Hz

<Ladder Program>



Chapter 6 Programming

- Other parameters setting method than I/O parameters Write is available through PUTP instruction in the scan program as shown below;



(5) Revolution/Unit Time

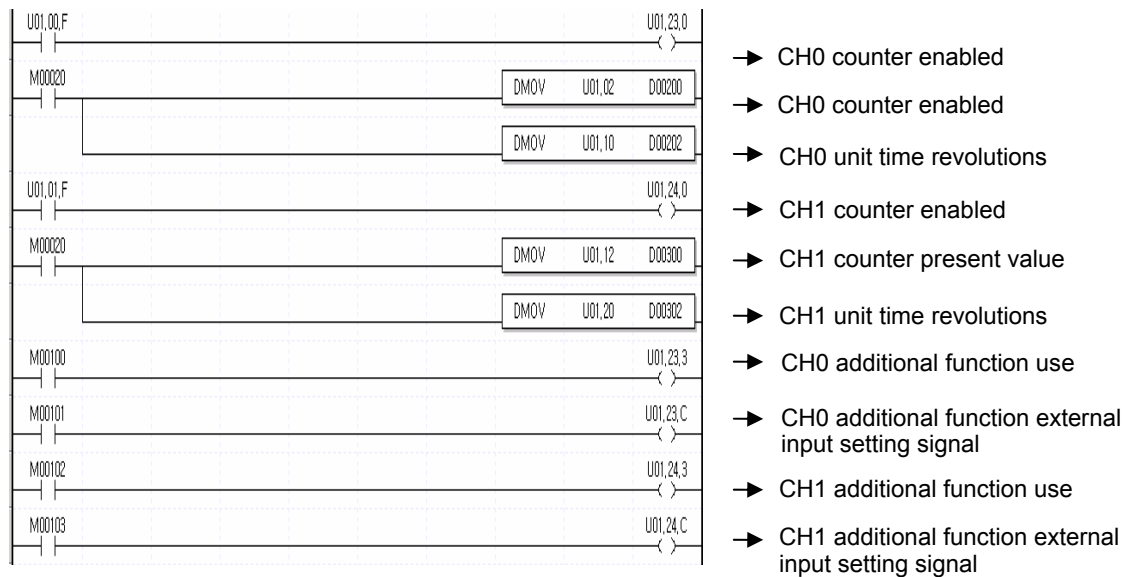
- The figure below shows the setting example of Auxiliary Mode to 5 (revolutions per unit time) through I/O parameters. Pulses per revolution can be also specified, and the value is used to convert pulses per unit time to revolutions per unit time. Section setting value can be also specified, which is the value per unit time used to measure revolutions per unit time.

<Parameter setting screen>

XGF-H02A (Open-Collector, 2-CH)		
Parameter	Channel 0	Channel 1
Counter Mode	Linear	Linear
Pulse Input Mode	2-Phs x1	2-Phs x1
Preset	0	0
Ring Counter Min.	0	0
Ring Counter Max.	0	0
Comp Output0 Mode	(Magnitude)<	(Magnitude)<
Comp Output1 Mode	(Magnitude)<	(Magnitude)<
Comp Output0 Min.	0	0
Comp Output0 Max.	0	0
Comp Output1 Min.	0	0
Comp Output1 Max.	0	0
Output Status Setting	Output Disable	
Auxiliary Mode	Revolution/Unit time	Revolution/Unit time
Range Value [ms]	1000	1000
Pulse/Rev Value	1024	1024
Frequency Mode	10 Hz	10 Hz

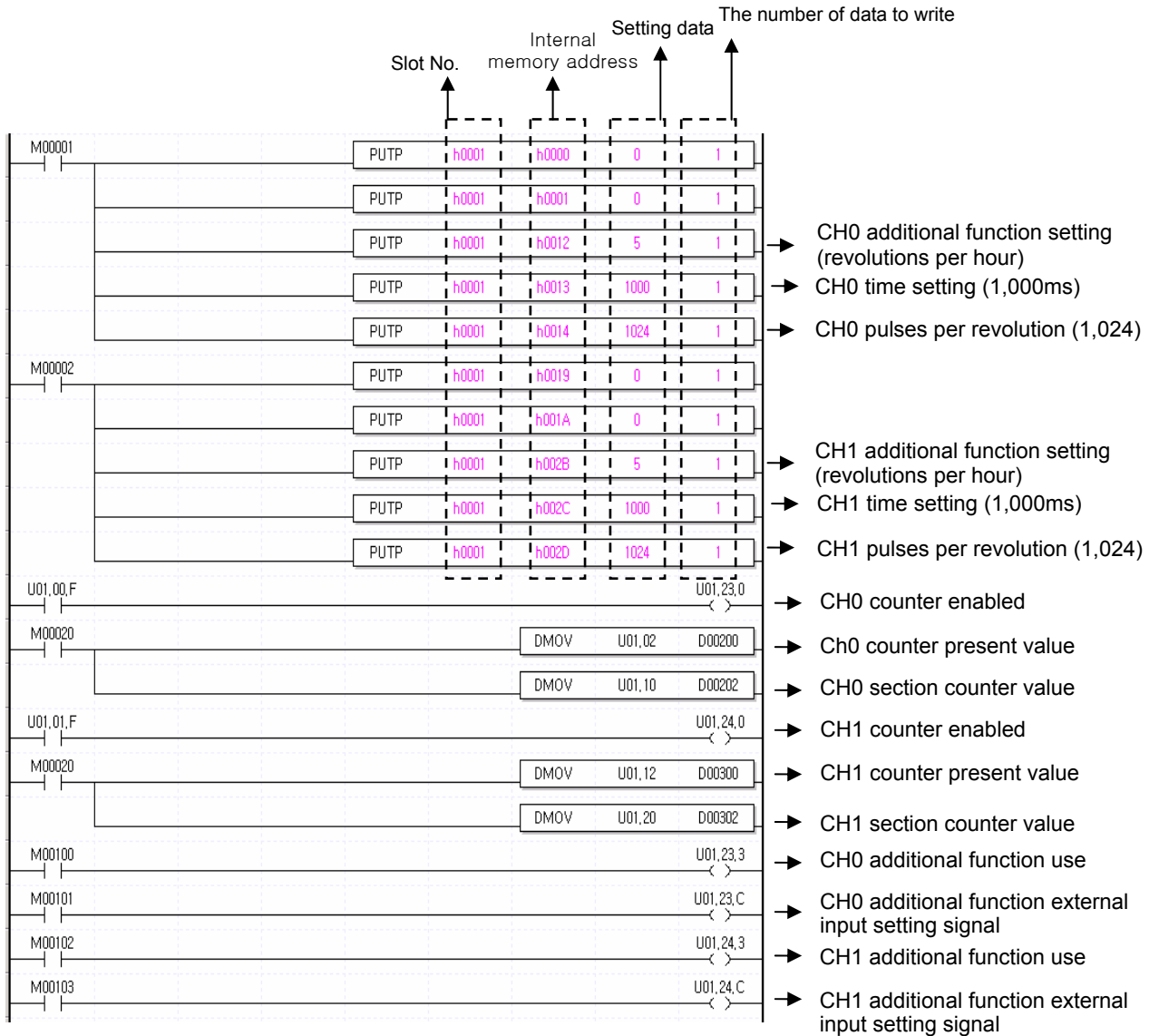
OK Cancel

< Ladder Program >



Chapter 6 Programming

- The figure below shows the example of the scan program with Auxiliary Mode set to 5 (Revolution/Unit time), Auxiliary Mode operation enabled and then present revolutions per unit time value read.



Chapter 6 Programming

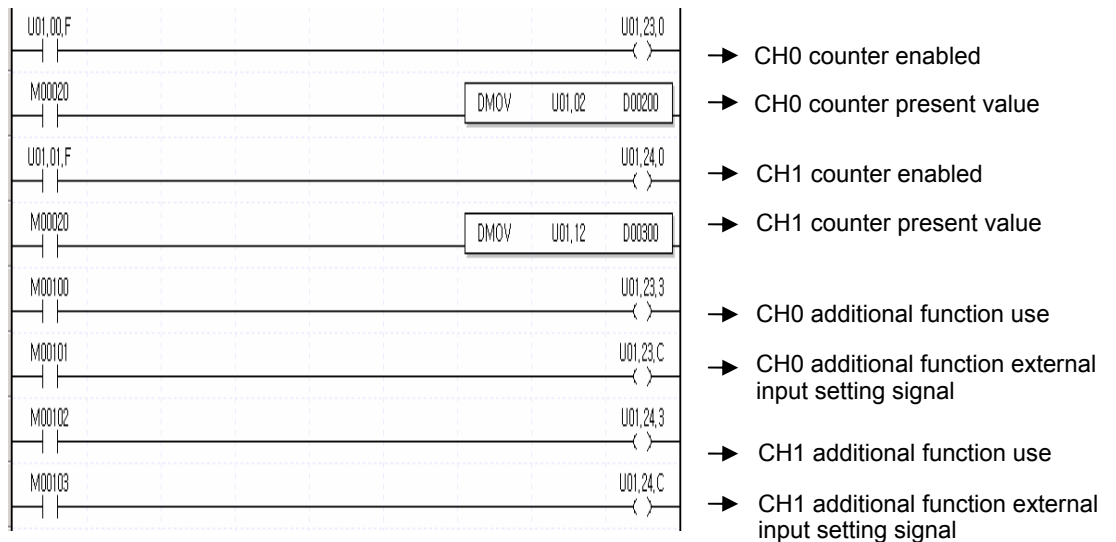
(5) Count Disable

- The first figure below shows the setting example of Auxiliary Mode to 6 (Count Disable) through I/O parameters. The second figure shows the example of the scan program with Auxiliary Mode set to 6 (Count Disable), Auxiliary Mode operation enabled and then present count value read.

<Parameter setting screen>

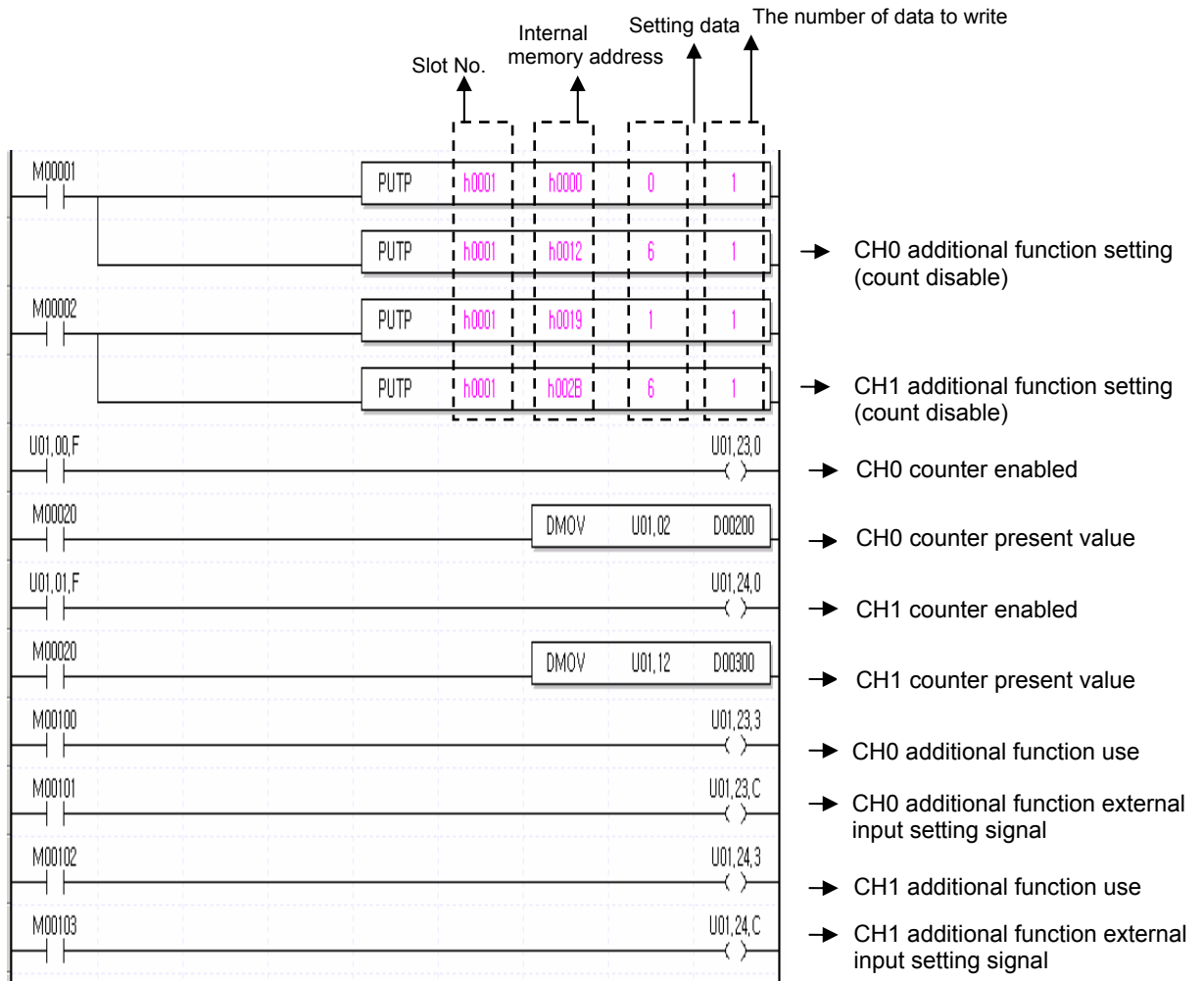
Parameter	Channel 0	Channel 1
Counter Mode	Linear	Linear
Pulse Input Mode	2-Phs x1	2-Phs x1
Preset	0	0
Ring Counter Min.	0	0
Ring Counter Max.	0	0
Comp Output0 Mode	(Magnitude)<	(Magnitude)<
Comp Output1 Mode	(Magnitude)<	(Magnitude)<
Comp Output0 Min.	0	0
Comp Output0 Max.	0	0
Comp Output1 Min.	0	0
Comp Output1 Max.	0	0
Output Status Setting	Output Disable	
Auxiliary Mode	Count Disable	Count Disable
Range Value [ms]	0	0
Pulse/Rev Value	0	0
Frequency Mode	1 Hz	1 Hz

<Ladder Program>



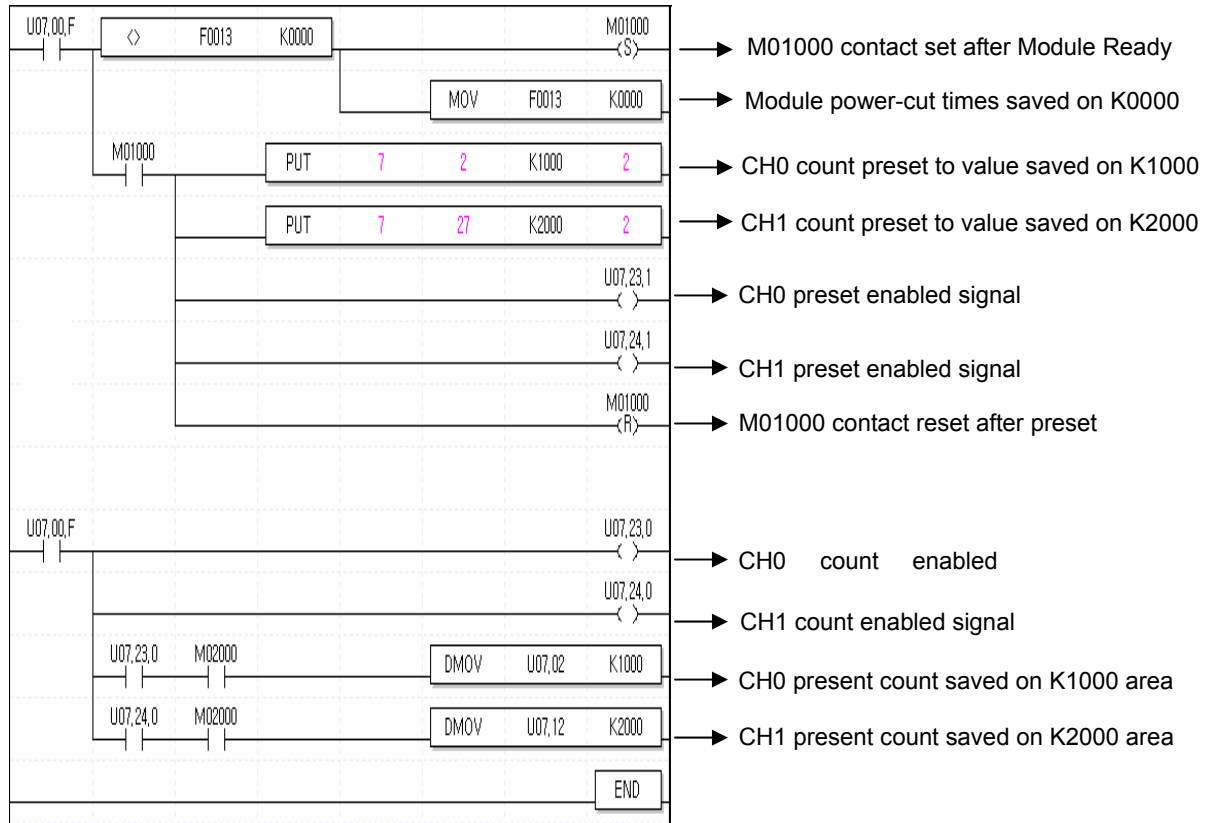
Chapter 6 Programming

- The figure below shows the example of the scan program with Auxiliary Mode set to 6 (Count Disable), Auxiliary Mode operation enabled and then present revolutions per unit time value read.



6.2.10 Present value recovery in case of power failure

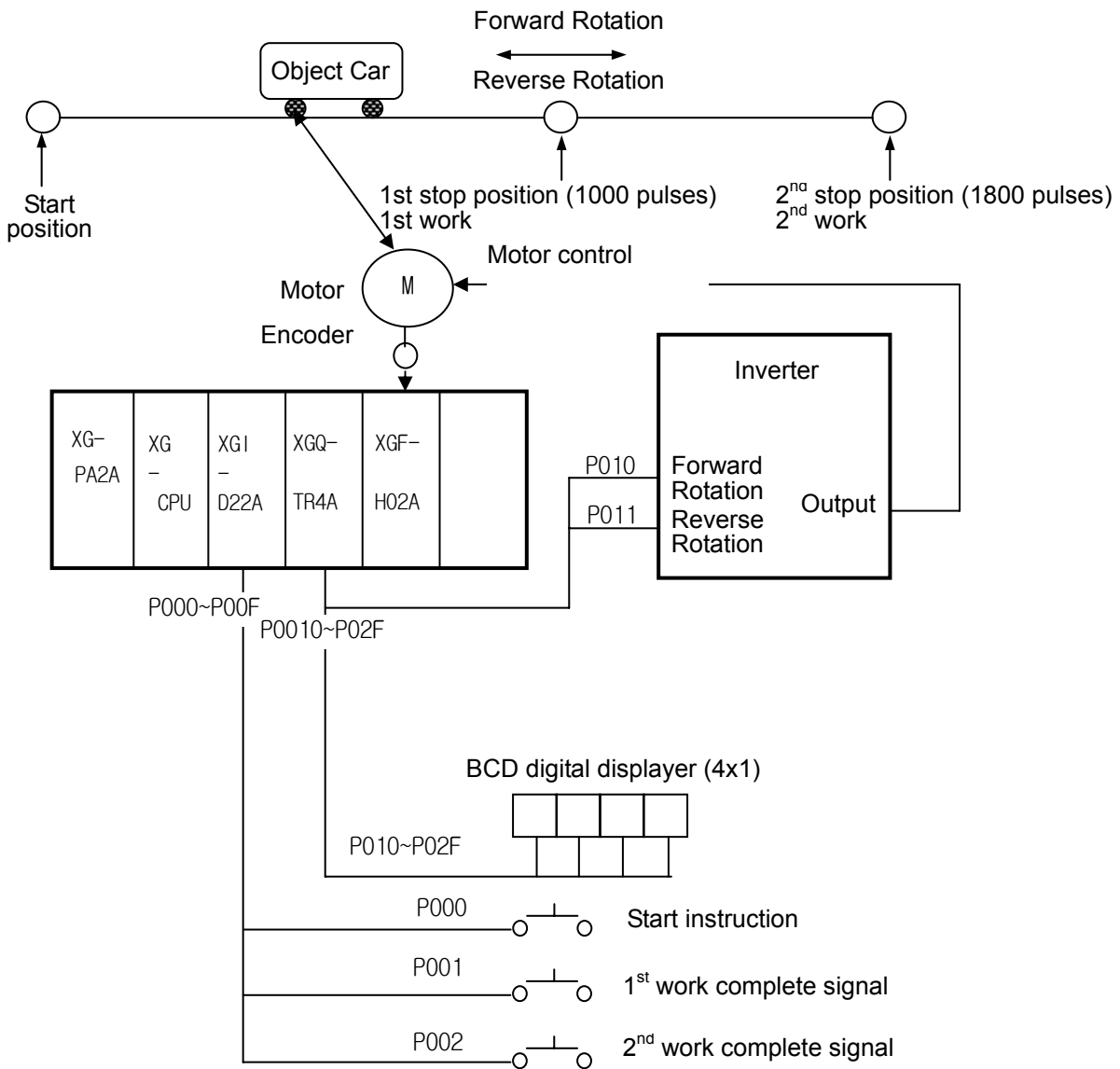
- The program is used to recover the present value in case of power failure by saving count value on K area (latch device) at power failure and presetting the previous count value to the present count value.



6.3 Application Program

6.3.1 Program to move the object car

■ System Configuration



Chapter 6 Programming

■ Description of Operation

If the motor used to move the object car rotates with the start signal, the signal of the encoder installed on the motor is counted by High Speed counter to stop it at the 1st stop position.

And if the 1st work complete signal is On, it moves to the 2nd stop position and stops. If the 2nd work complete signal is On, it comes back to the start position.

■ Assignment of I/O Signal

P000 : Start instruction

P001 : 1st work complete signal

P002 : 2nd work complete signal

} Input
(used with High Speed counter's OUT contact input)

P010 : Motor forward rotation signal (On : Forward rotation, Off : Stop)

P011 : Motor reverse rotation signal (On : Reverse rotation, Off : Stop)

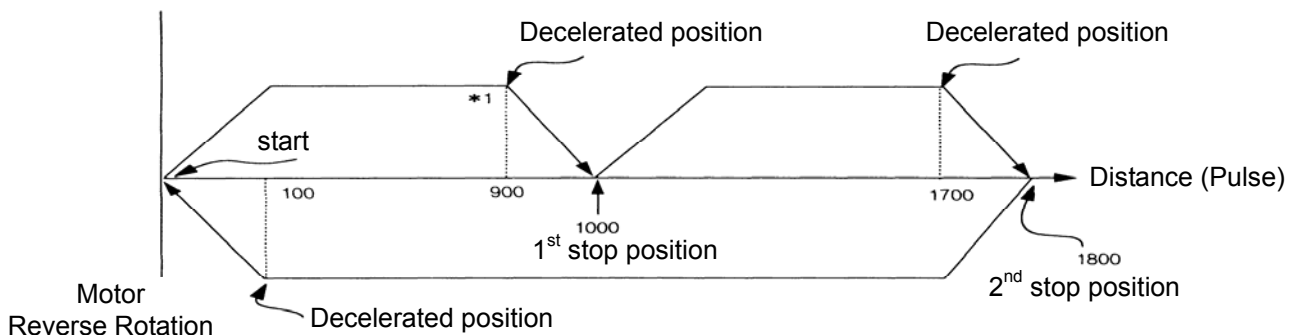
P020~P02F : High Speed counter present value displayed (BCD)

} Output

■ Assignment of D area

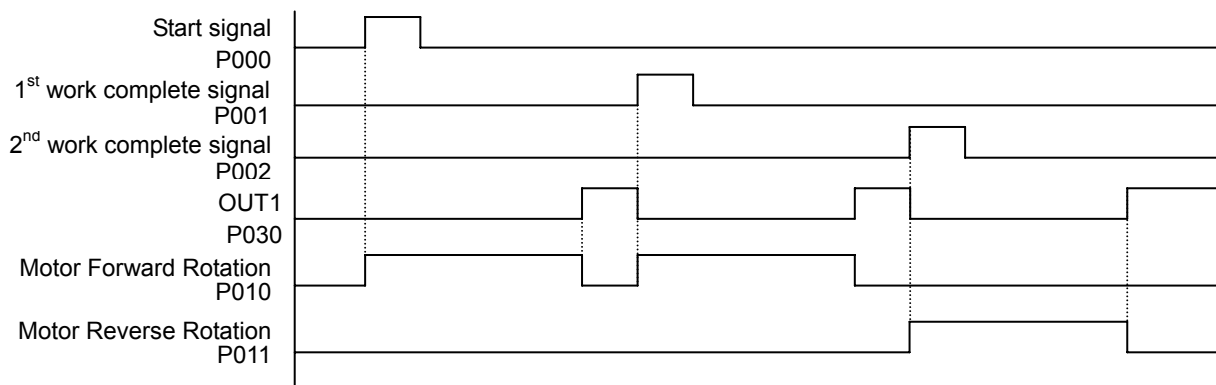
D0000 ~ D0001 : High Speed counter present value

■ Operation type



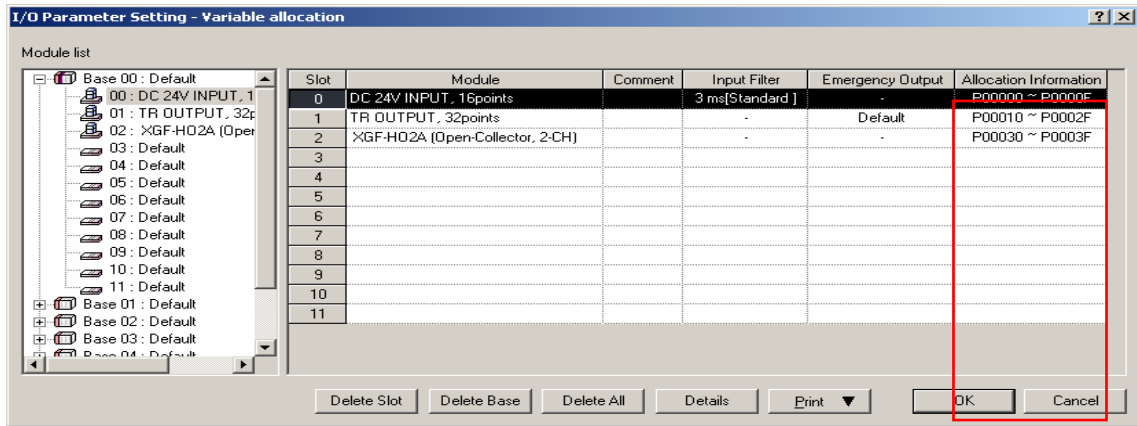
*1: The difference of 100 between stop position and decelerated position is the delayed stop distance by the decelerated timed of the inverter.

■ Operation timing

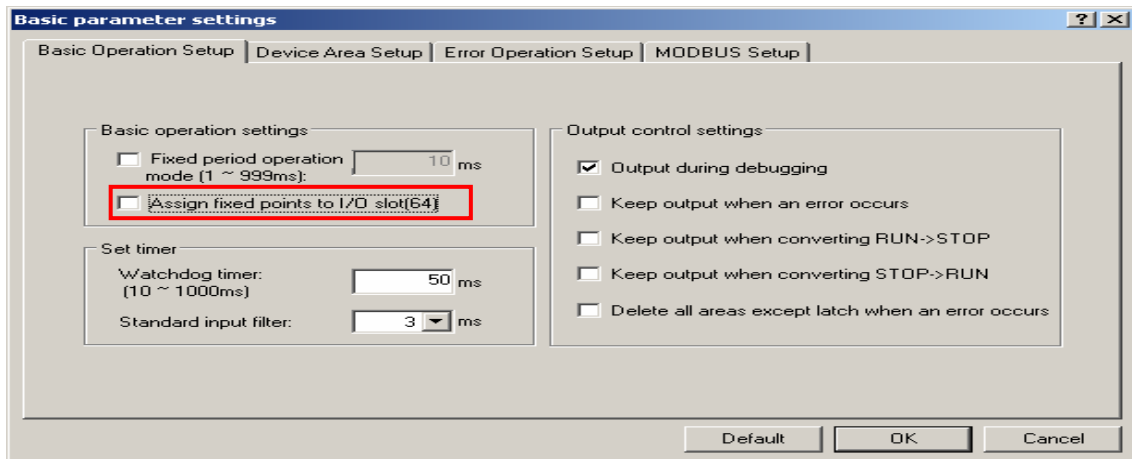


■ Program (through I/O Parameter Setting)

Module installation information setting

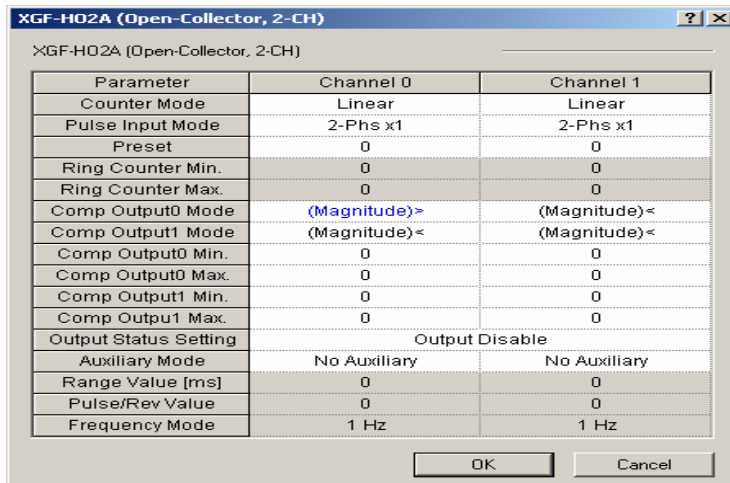


I/O assigned information setting



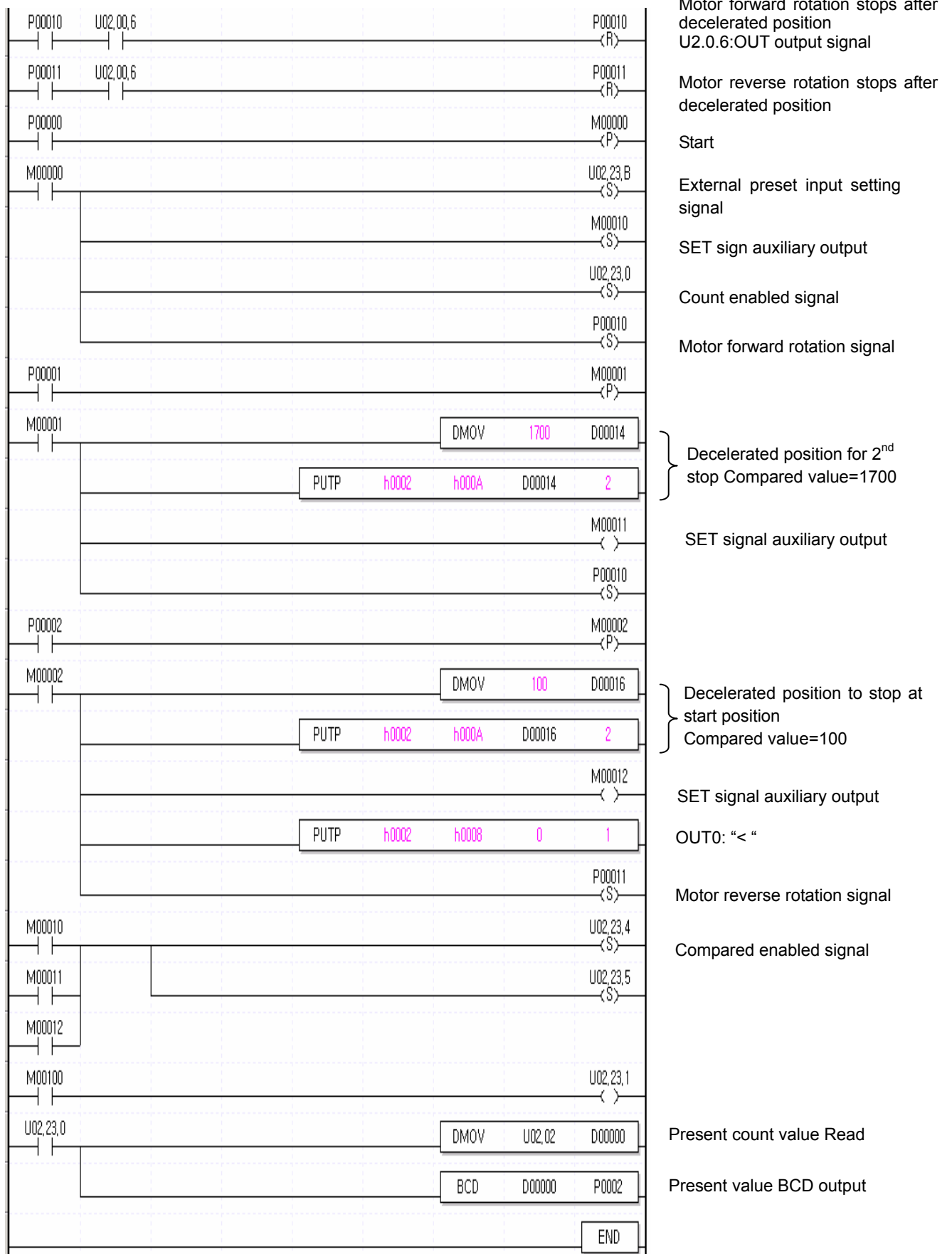
- I/O slot fixed points assigned: 1 slot 64 points
- I/O slot changeable points assigned: Changeable based on module installed

I/O parameters setting



Chapter 6 Programming

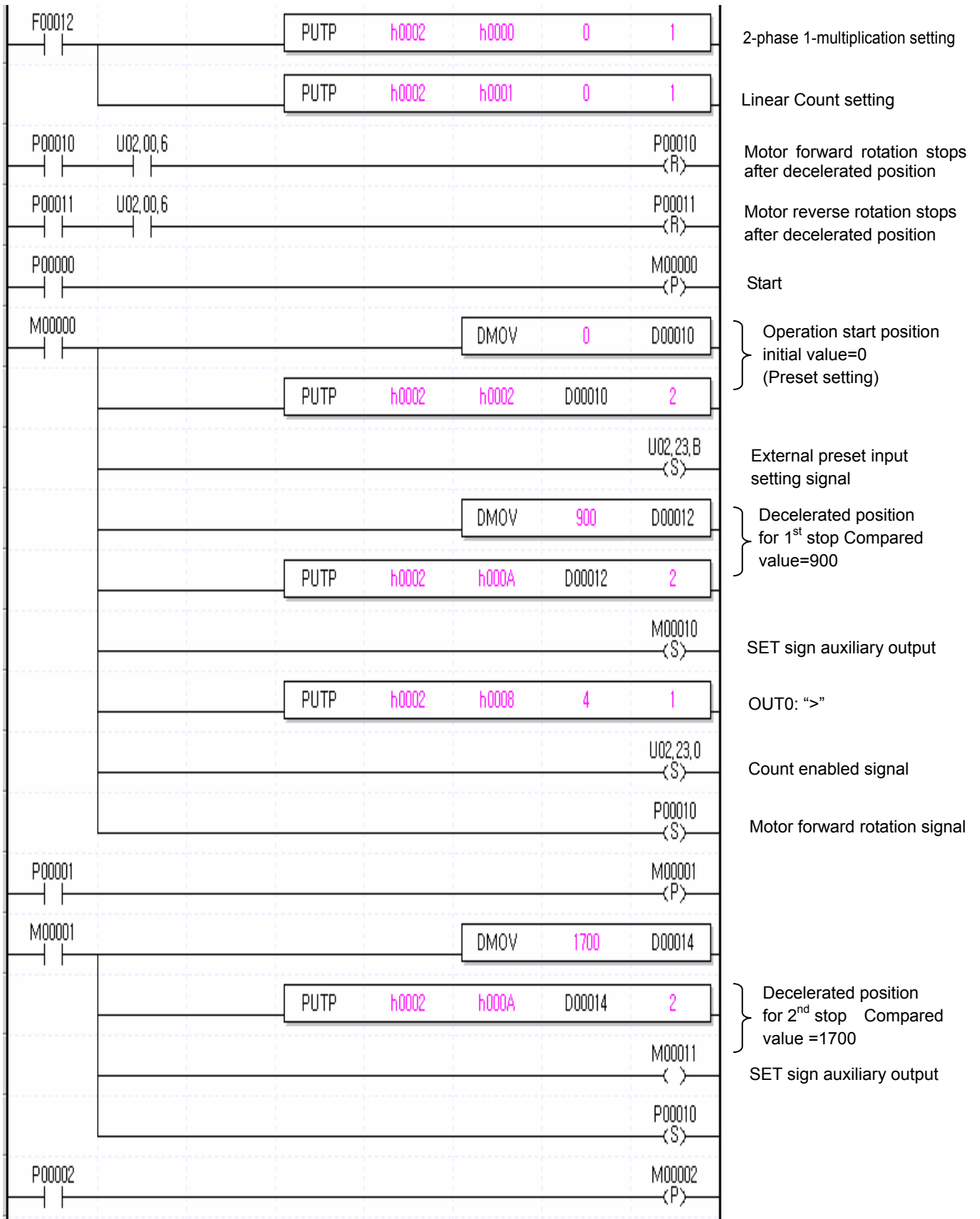
Ladder Program



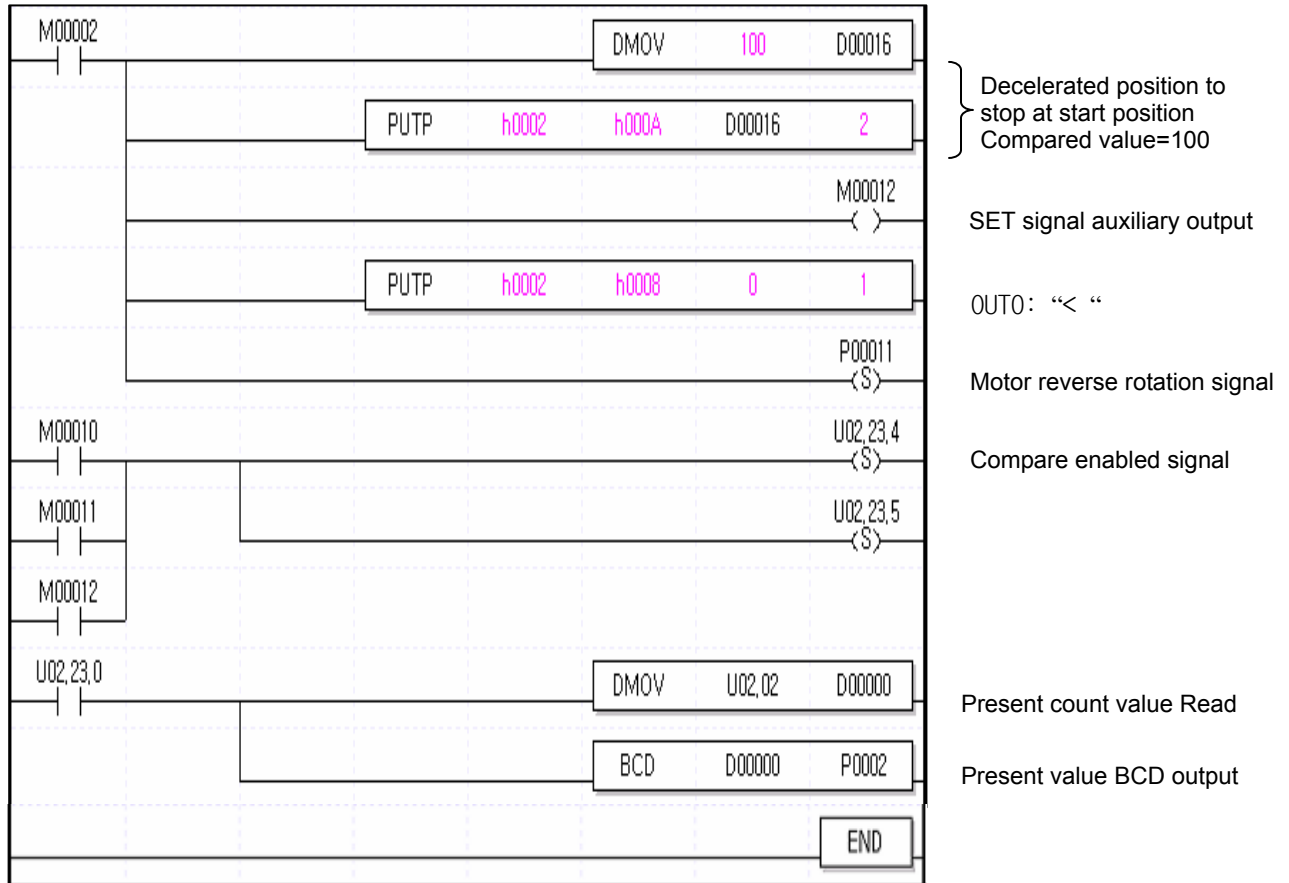
Chapter 6 Programming

■ Program (through PUT/GET)

Ladder Program

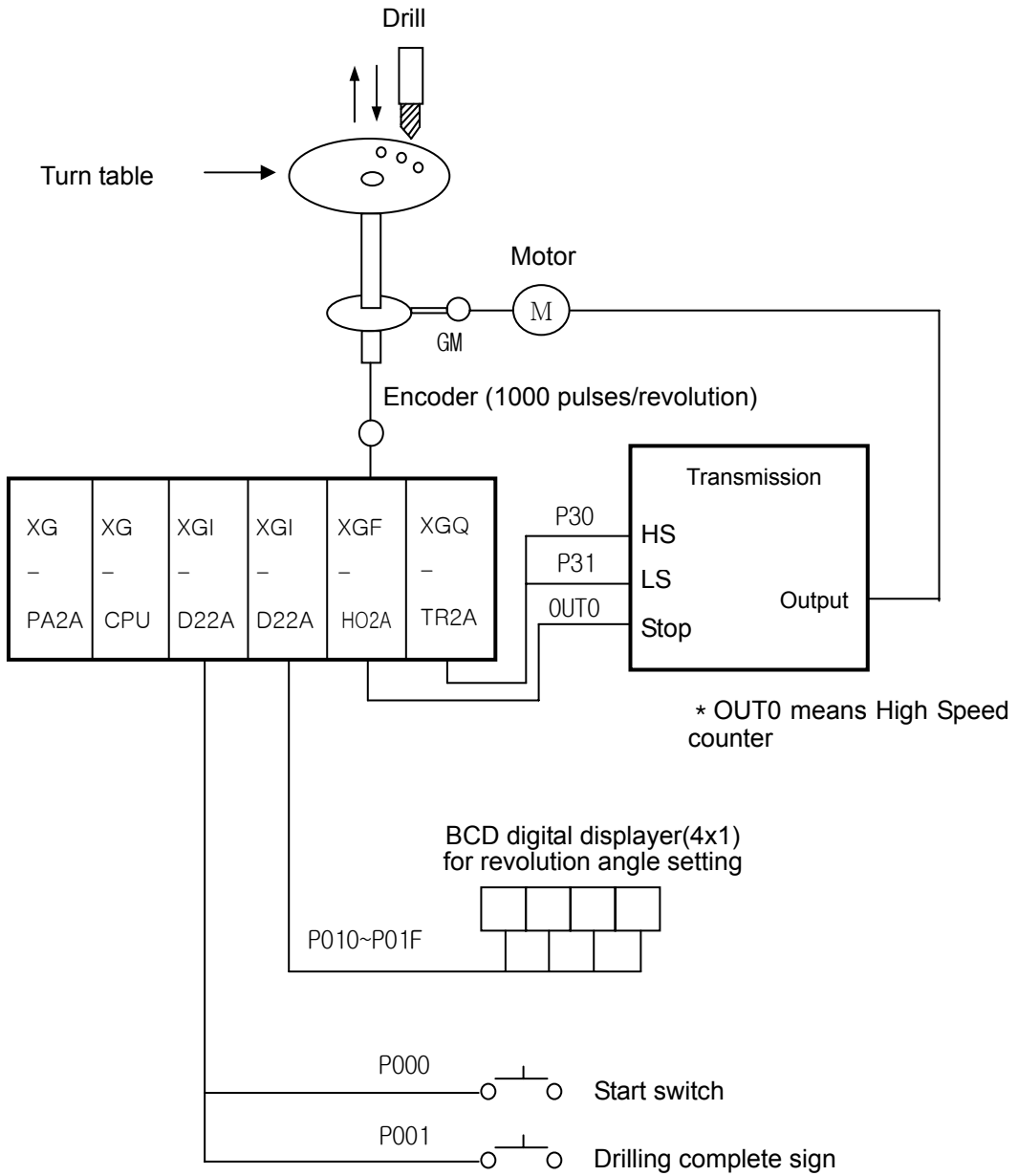


Chapter 6 Programming



6.3.2 Revolution control program of regular angle in turn table

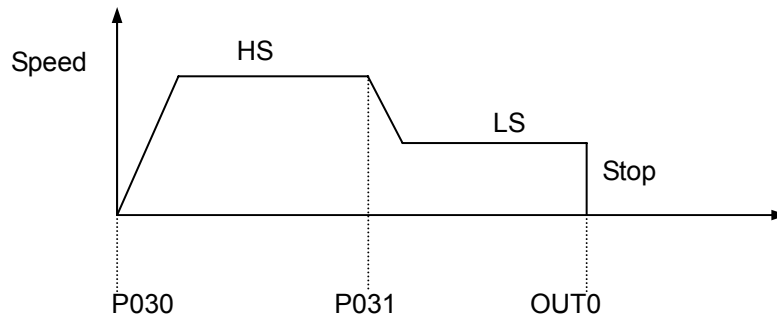
■ System Configuration



■ Description of operation

If the start switch is pressed, drilling will be completed after rotated as much as specified (60°). If drilling complete signal is On, drilling of another 60° will be executed. After 6 times of drilling operation repeated, the process will be completed.

■ Operation diagram

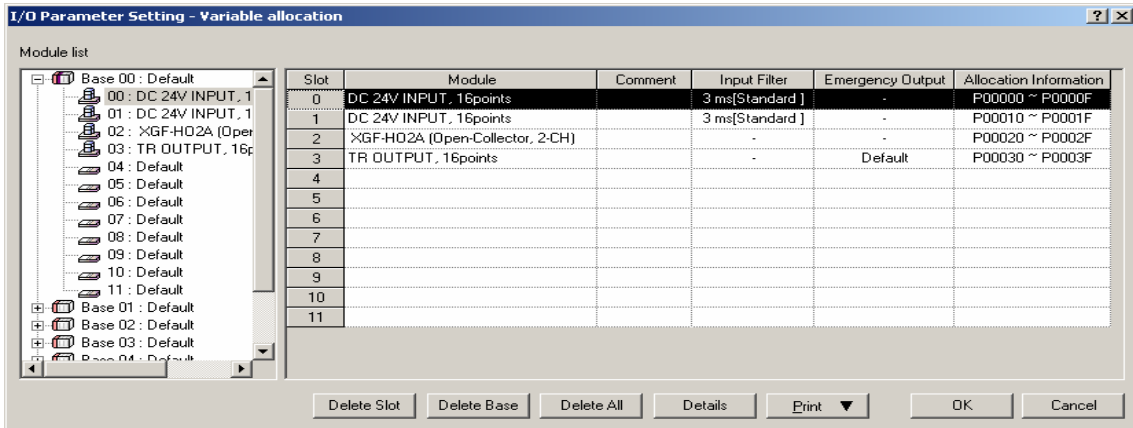


(Operation diagram of 1 revolution)

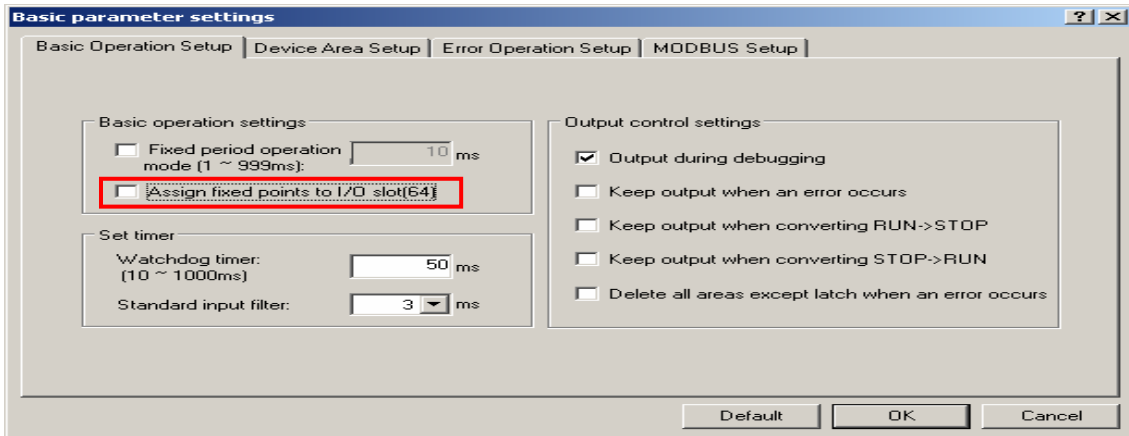
Chapter 6 Programming

■ Program (through I/O parameters setting)

◆ Module installation information setting

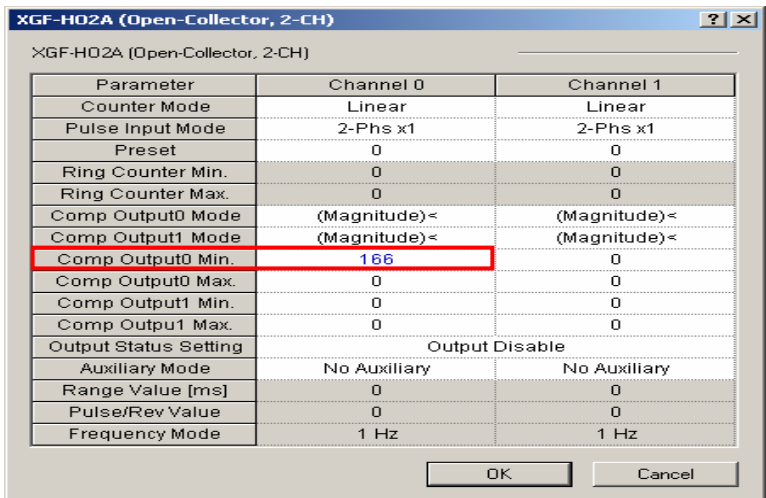


I/O assigned information setting



- I/O Slot fixed points assigned: 1 slot 64 points
- I/O Slot changeable points assigned: Changeable based on module installed

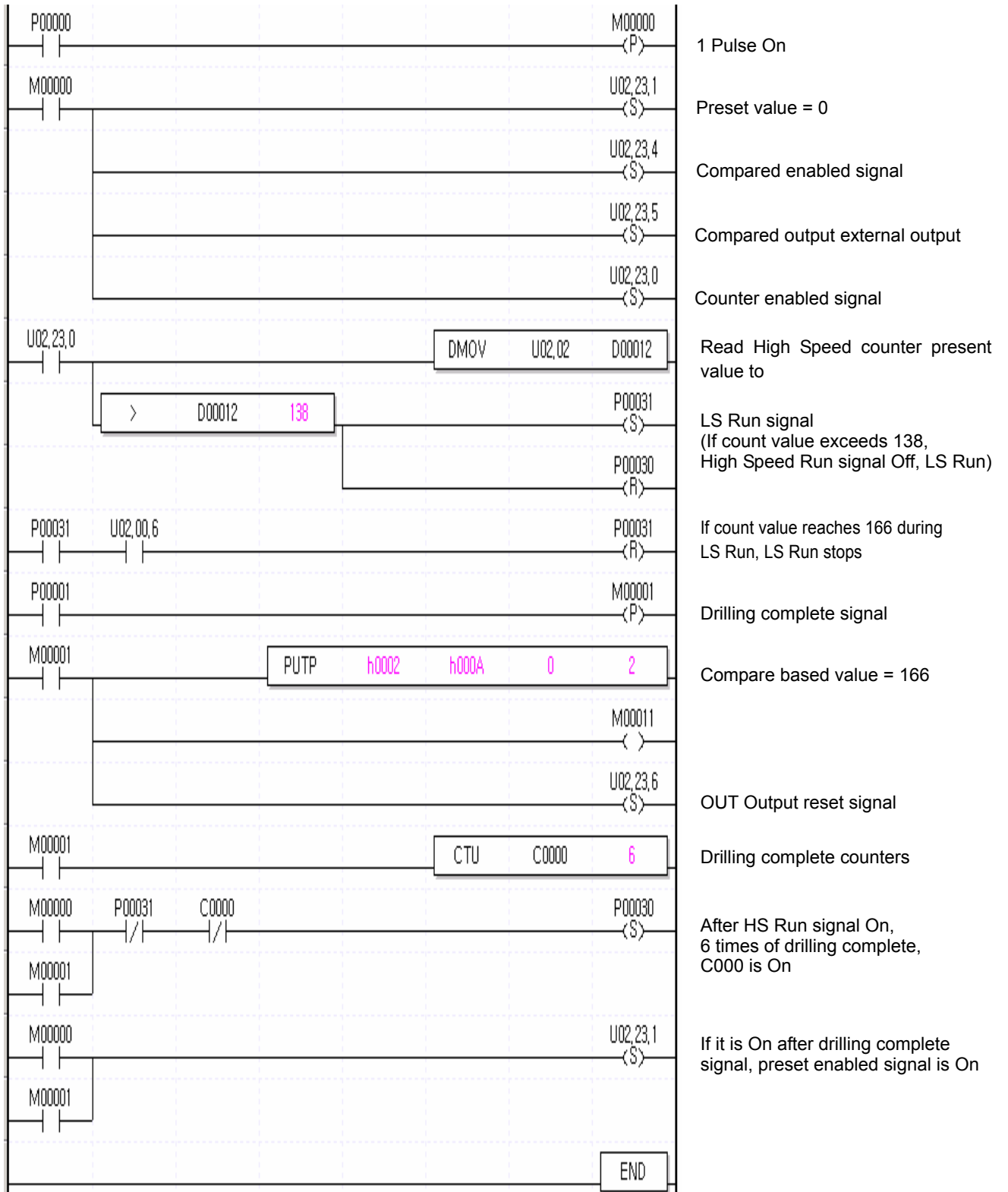
I/O parameters setting



* Compared output 0, minimum output value
 - 1,000 Pulses/1 revolution → 360°: 1,000 Pulses = 60°: X (Pulses when rotated 60°:166)

Chapter 6 Programming

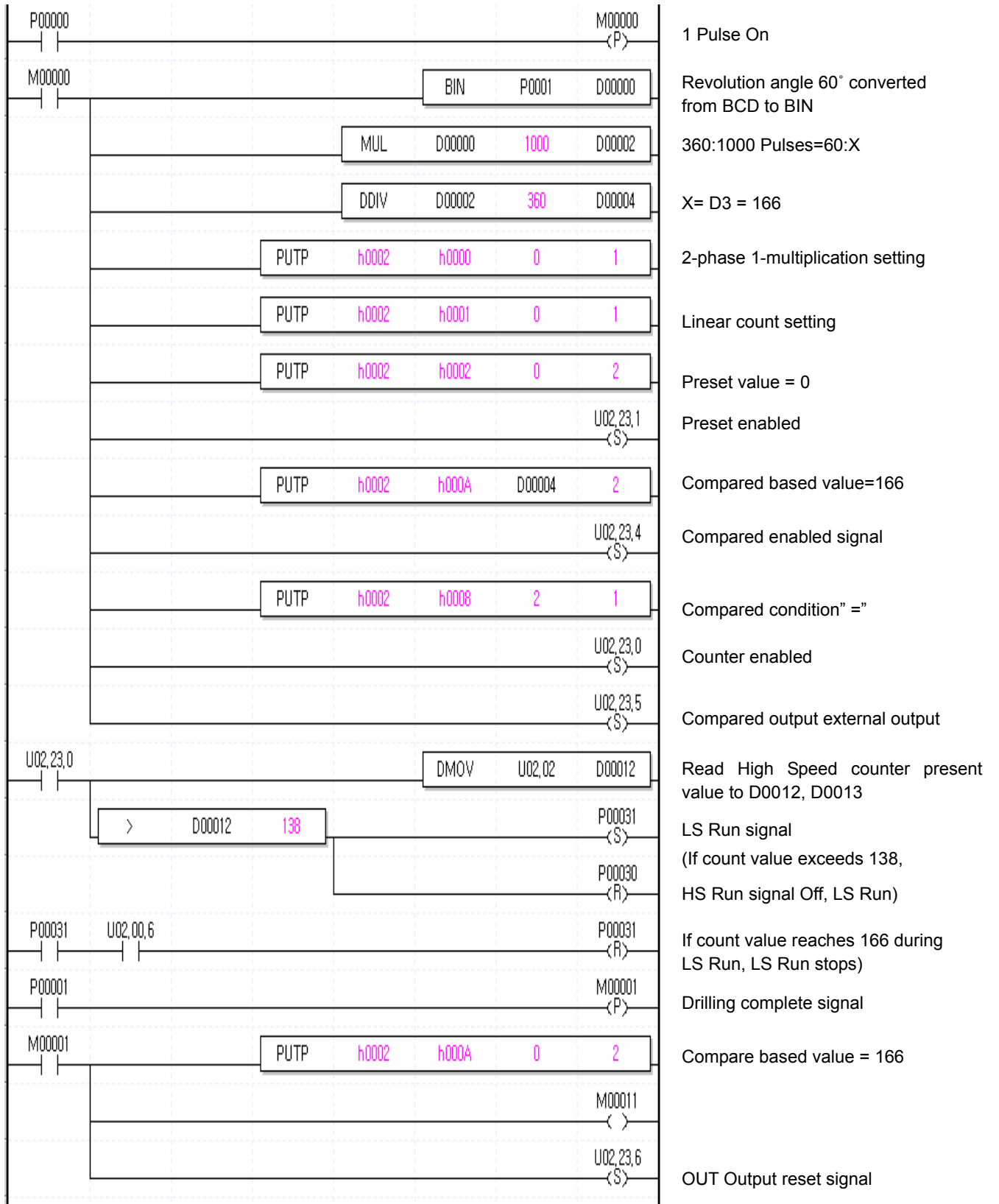
Ladder Program



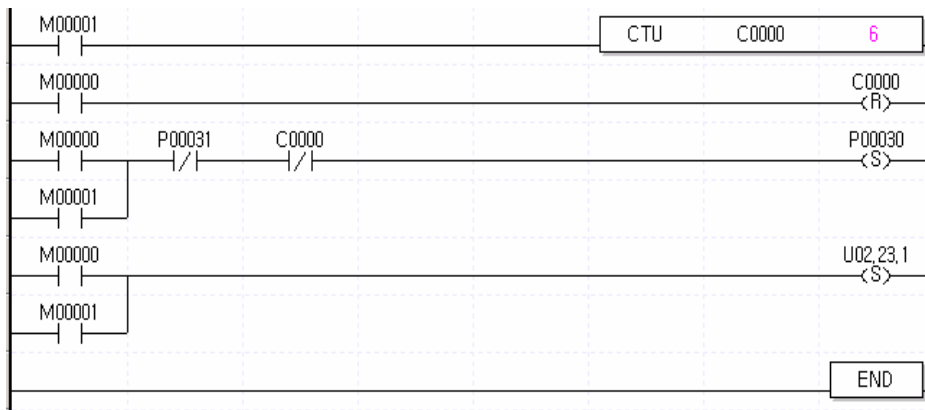
Chapter 6 Programming

■ Program (through PUT/GET)

Ladder Program



Chapter 6 Programming



Drilling complete counters

After HS Run signal On,
6 times of drilling complete,
C000 is On

If it is On after drilling complete
signal, preset enabled signal is On

Chapter 7 Troubleshooting

How to shoot the troubles on HS counter module will be described.

7.1 Error code


Errors of HS counter module are as described below.


Error code (Dec)		Description	RUN LED status
CH0	CH1		
10		Module error (ASIC Reset error)	Blinks every 0.2 sec.
11		Module error (ASIC RAM error)	
12		Module error (ASIC Register error)	
20	120	Counter type range exceeded	Blinks every 1 sec
21	121	Pulse input type range exceeded	
22	122	Auxiliary Mode type range exceeded	
23	123	Sampling Count value range exceeded	
24	124	Compared output0 type range exceeded	
25	125	Compared output1 type range exceeded	
26	126	Preset value exceeded counter range	
27	127	Ring counter minimum. value \geq Ring counter maximum value input	
28	128	Compared output 0 minimum value exceeded maximum input range	
29	129	Compared output 0 maximum value exceeded maximum input range	
30	130	Compared output 0 minimum value > compared output 0 maximum value set	
31	131	Compared output 1 minimum value exceeded maximum input range	
32	132	Compared output 1 maximum value exceeded maximum input range	
33	133	Compared output 1 minimum value > compared output1 maximum value set	
34	134	Pulses per revolution range exceeded	
35	135	Frequency input mode range exceeded	

Notes
<p>(1) If the module is normal, RUN LED is On.</p> <p>(2) If 2 or more errors occur, the module will save the first error code generated, and the displayed error will be first deleted to let the next error deleted.</p> <p>(3) In case of serious error which makes LED blinks every 0.2 sec., let power OFF -> ON to delete the error.</p> <p>(4) In case of slight error which makes LED blinks every 1 sec., the error can be deleted without power OFF -> ON and the module can keep operating.</p> <p>In case of slight error which makes LED blinks every 1 sec, the parameter value causing the applicable error is not set on the module, with the existing parameter value kept as it is.</p>


7.2 Troubleshooting


7.2.1 LED display status of HS counter module

RUN LED is Off.  Go to 7.3.1


RUN LED blinks.  Go to 7.3.2

7.2.2 Counter status of HS counter module

The counter value is the same as before.  Go to 7.3.3

The change of counter value is not consistent with operation  Go to 7.3.4

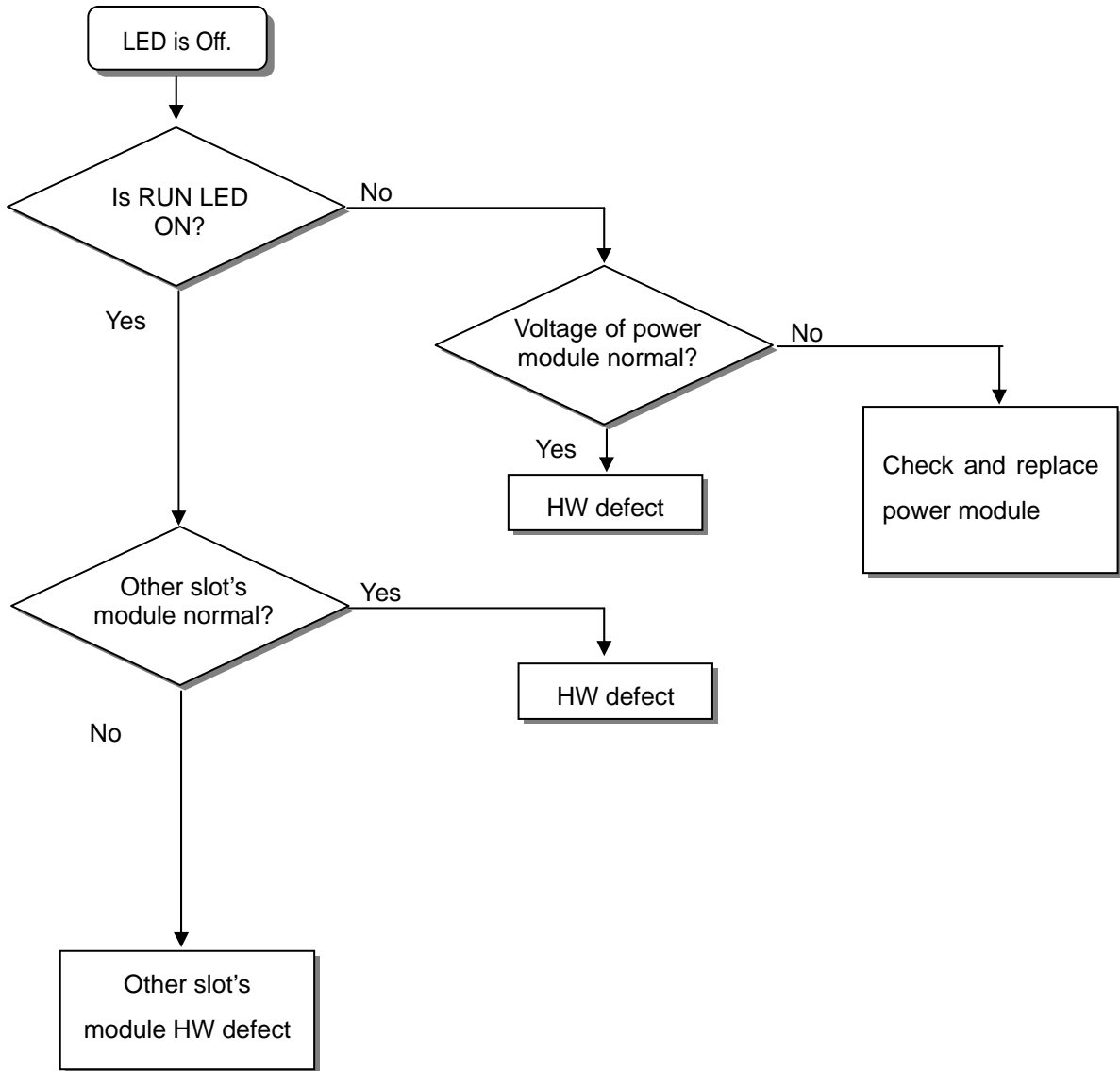
7.2.3 Output status of HS counter module

Output operation is not available  Go to 7.3.5

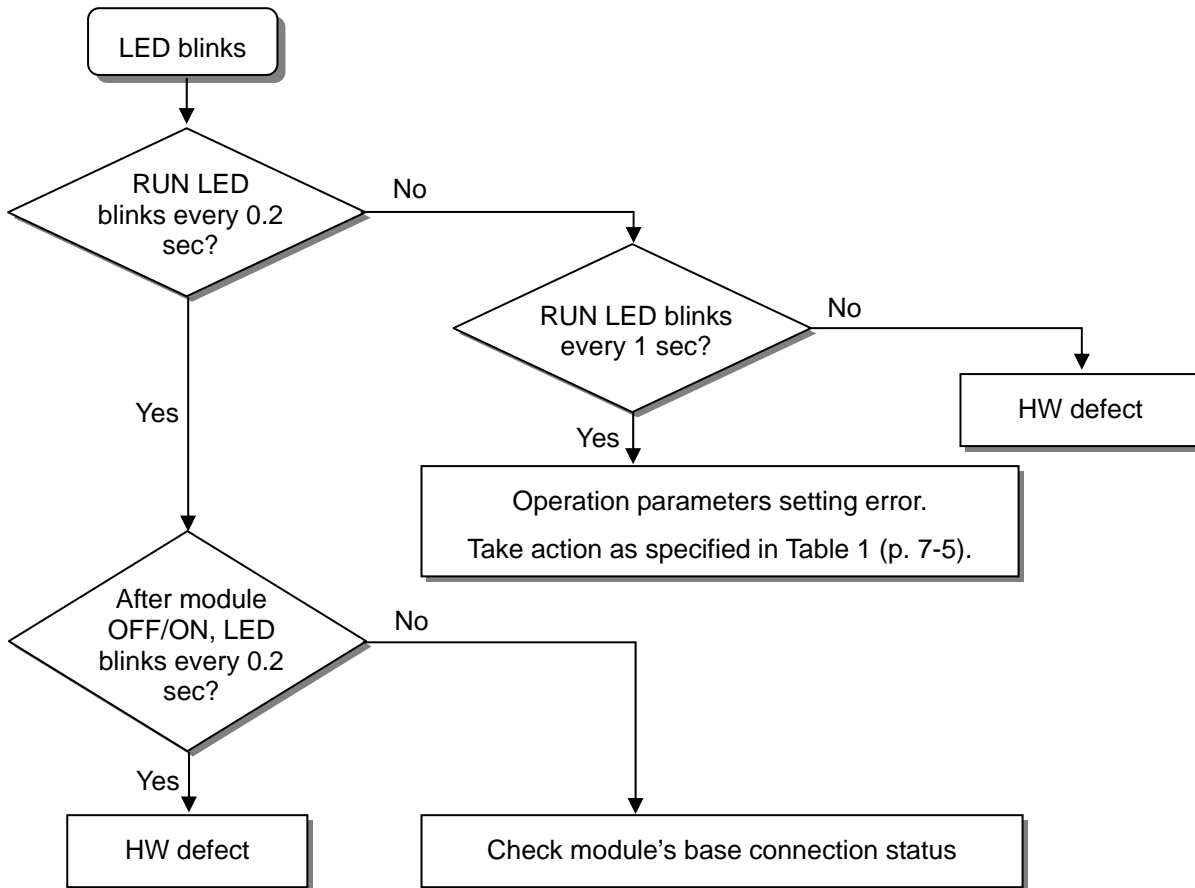
Output operation is not consistent with operation status.

7.3 Troubleshooting sequence

7.3.1 RUN LED Off



7.3.2 RUN LED Blinks

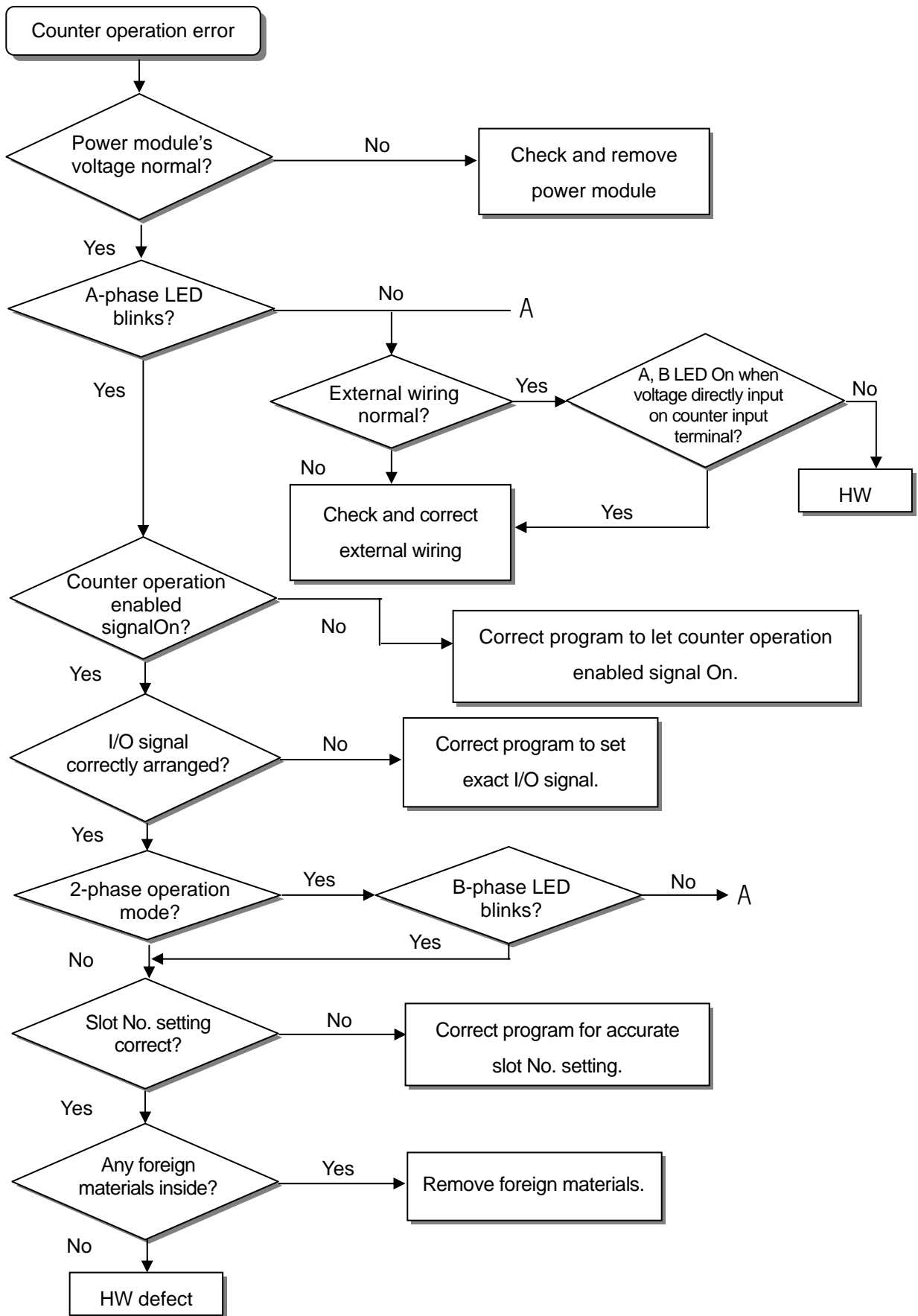


Chapter 7 Troubleshooting

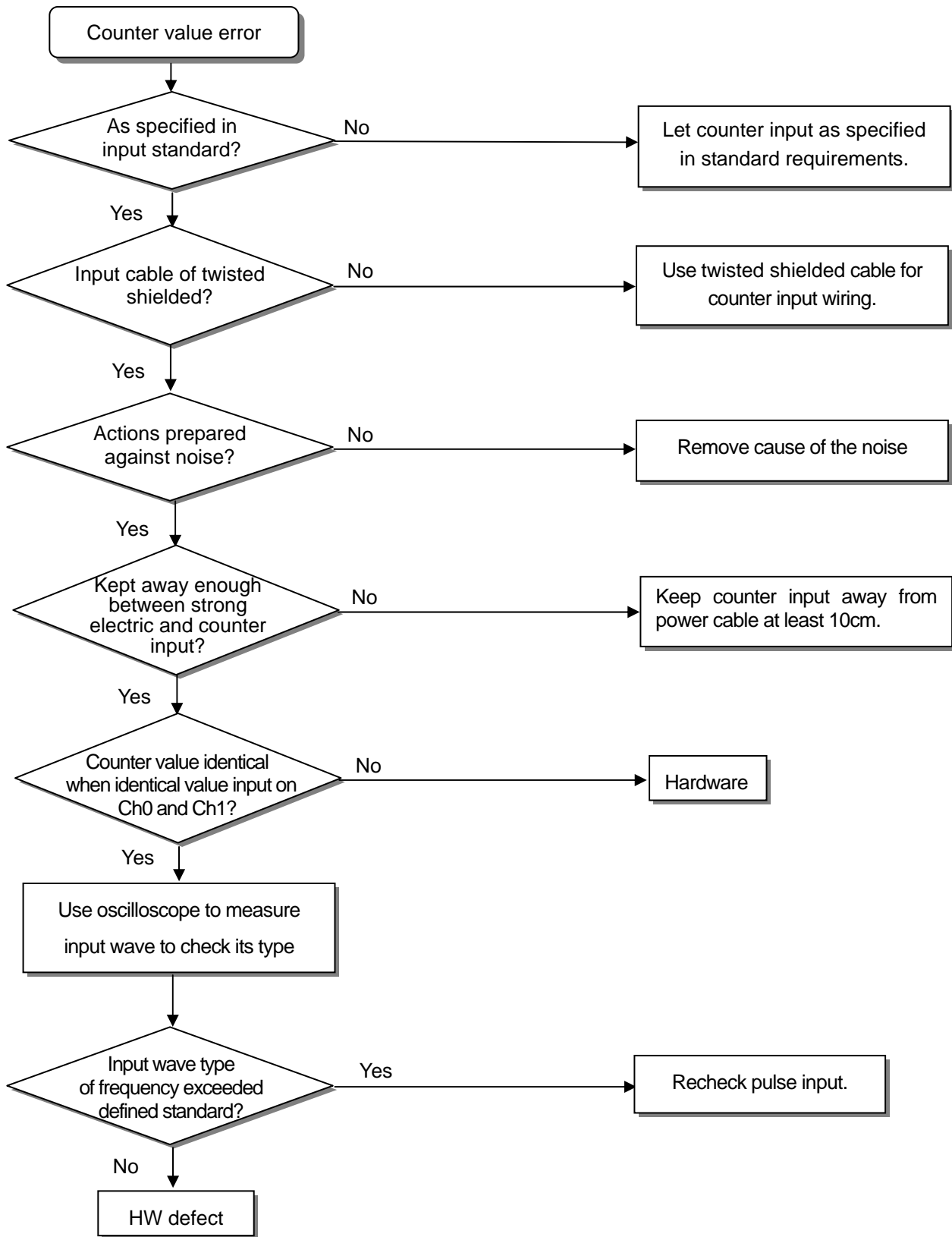
Error code 120		Description	Action
CH0	CH1		
20	120	Counter type range exceeded	Set counter type to (0-7).
21	121	Pulse input type range exceeded	Set pulse input type to (0-1).
22	122	Auxiliary Mode type range exceeded	Set Auxiliary Mode type to (0-6)
23	123	Sampling Count value range exceeded	Set section count value to (0-60000). (only if Auxiliary Mode type of sampling count or revolutions per Unit time selected)
24	124	Compared output 0 type range exceeded	Set compared output 0 type to (0-6)
25	125	Compared output 1 type range exceeded	Set compared output 1 type to (0-6)
26	126	Preset value exceeded counter range	Set preset value within counter range
27	127	Ring counter minimum. value \geq Ring counter maximum value input	Set to Ring counter minimum. value < maximum value range (if counter type of Ring counter selected)
28	128	Compared output0 minimum value exceeded maximum input range	Set compared output0 minimum. Value (maximum value) within counter range
29	129	Compared output0 maximum value exceeded maximum input range	
30	130	Compared output 0 minimum. Value > compared output 0 maximum value set	Set to compared output0 minimum. value < maximum value range
31	131	Compared output1 minimum value exceeded maximum input range	Set compared output0 minimum. value (maximum value) within counter range
32	132	Compared output1 maximum value exceeded maximum input range	
33	133	Compared output1 minimum. Value > compared output1 maximum value set	Set to compared output1 minimum. value < maximum value range setting
34	134	Pulses per revolution range exceeded	Set pulses per revolution to (1-60000). (Only if Auxiliary Mode type of revolutions per hour measurement selected)
35	135	Frequency input mode range exceeded	Set frequency input mode to (0-3). (Only if Auxiliary Mode type of input frequency measurement selected)

Table 1. Detailed counteractions against slight errors

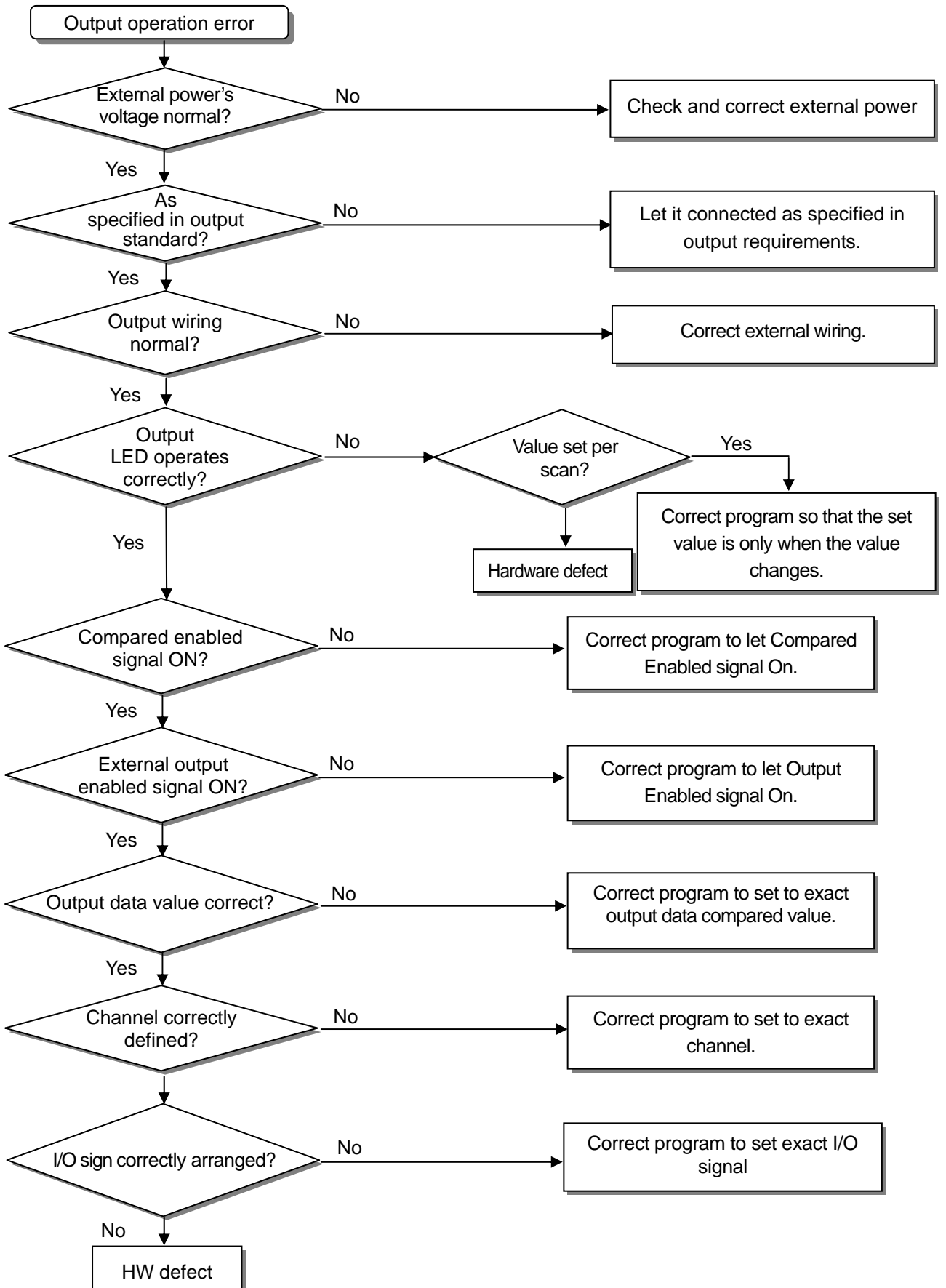
7.3.3 Counter operation error



7.3.4 Counter value error



7.3.5 Output operation error



7.3.6 Module status check through XG5000 system monitoring

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

1) Execution sequence

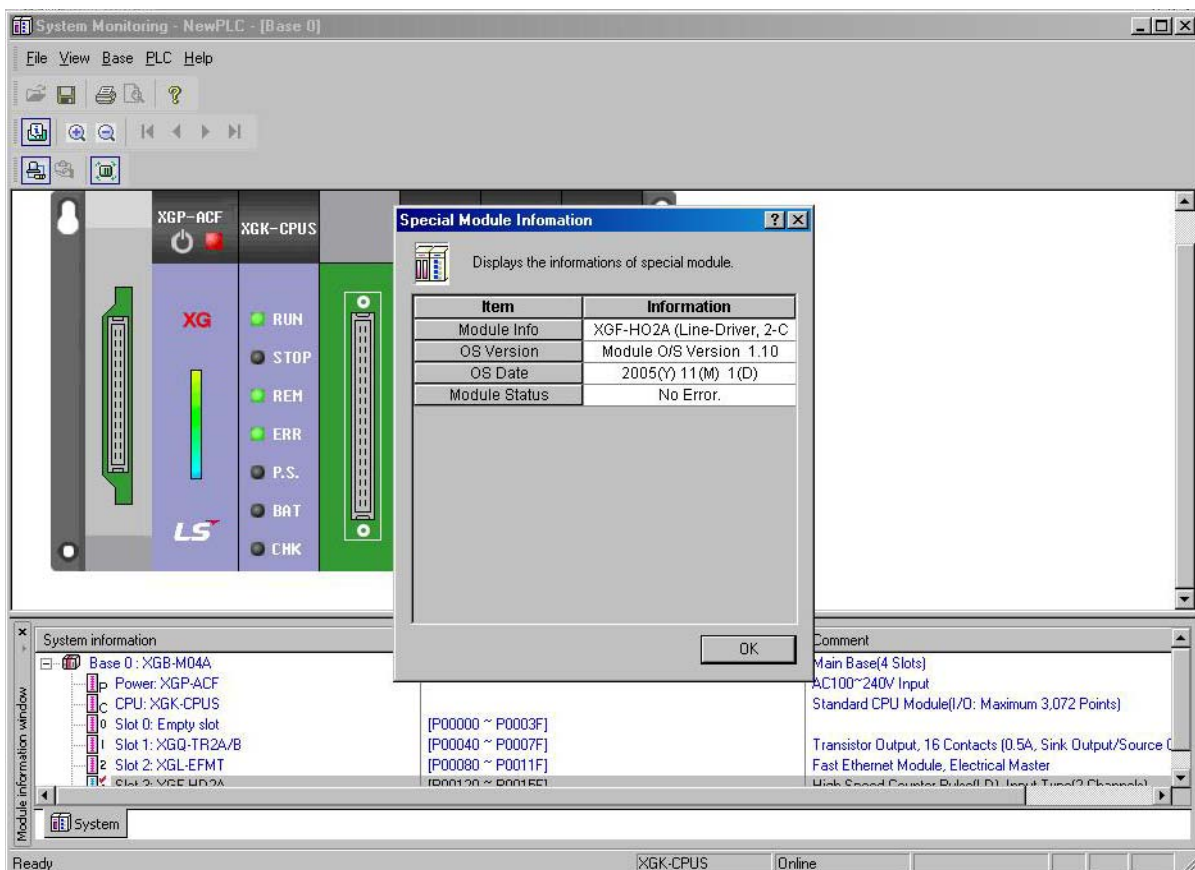
Two routes are available for the execution.

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

3) System Monitoring



Appendix 1 Terminology

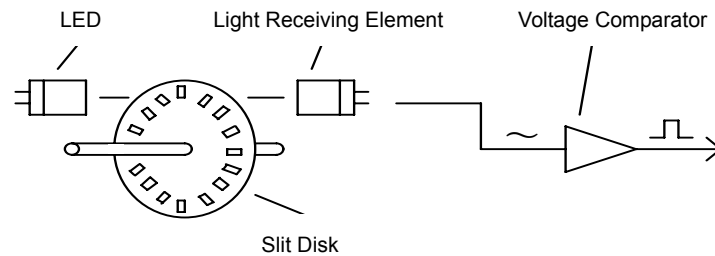
1. Pulse

Used to turn voltage (current) On/Off for a short time, and pulse line is of continuous pulses



2. Encoder

Used mainly in servo-detector in order to detect speed and position, whose basic principle is that if infrared ray from LED passes the slit disk and reaches the light receiving element, analog electric sign is output which will be converted by voltage comparator to digital sign to be output.



Encoder output is classified into 3 types; A phase, A • B phase and A • B • Z phase.

- A phase: Basic output, signal of pulses is output as many as the number of resolutions for 1 revolution of shaft.
- B phase: Signal with a specific phase difference from A phase, which can detect revolution direction of shaft
- Z phase: 1 pulse is output for 1 revolution of shaft.

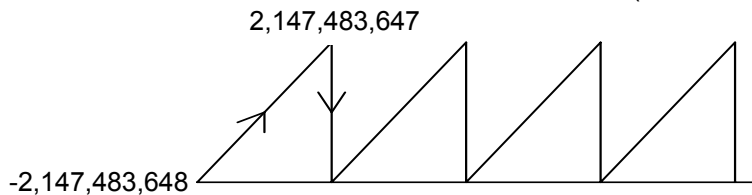
That is, they are used to reset external counter or to detect the origin position.

3. Manual Pulse Generator

A device that handle can be rotated by hand to generate pulses. If rotated + direction, forward pulses are generated, and if rotated – direction, reverse pulses are generated.

4. Increasing Counter

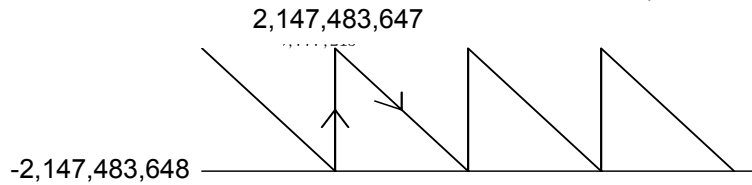
A counter value increases from -2,147,483,648 to 2,147,483,647 (for 32-bit counter).



Appendix 1 Terminology

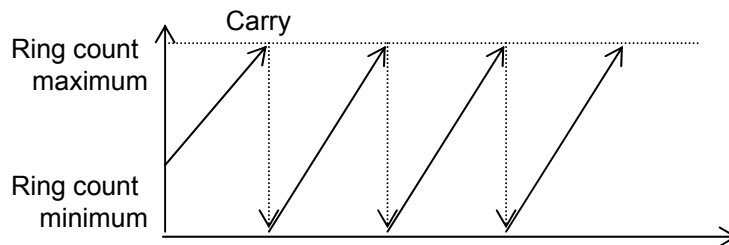
5. Decreasing Counter

A counter value decreases from 2,147,483,647 to -2,147,483,648 (for 32-bit counter).



6. Ring Counter

A counter that counter value increases/decreases between the maximum value and the minimum value of the Ring count that user has defined.



7. 1-Phase Operation Mode

Mode used to count 1-phase input pulse.

8. CW/CCW Operation Mode

Mode used to count another 1-phase if 1 phase is Low among 2-phase input pulses.

9. CW/CCW Operation Mode

Mode used to count 2-phase input pulse.

10. Preset

Mode used to set present counter value to discretionary value.

11. Gate

Signal used to enable additional function operation.

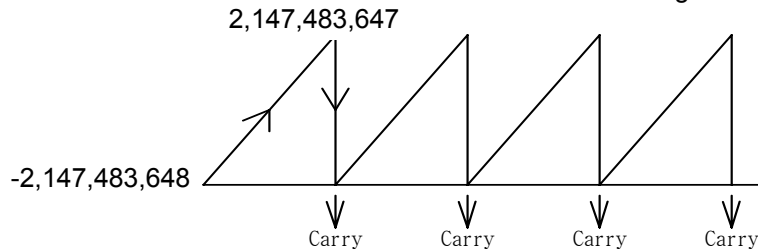
12. Compared Value

Basic value used to compare counters in size.

Appendix 1 Terminology

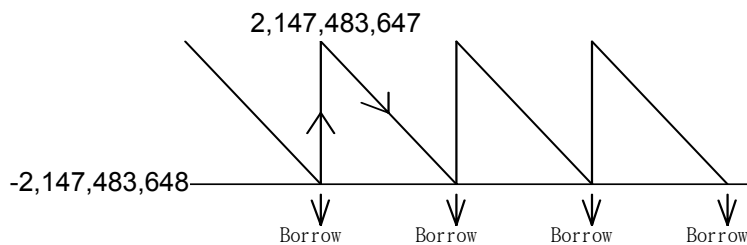
13. Carry

Signal displayed when Linear count changes from 2,147,483,646 to 2,147,483,647 and when Ring count changes from the maximum value to the minimum value with increasing counter operation.



14. Borrow

Signal displayed when Linear count changes from -2,147,483,647 → -2,147,483,648 and when Ring count changes from the minimum value to the maximum value with decreasing counter operation.



15. LT (<) Signal

Signal displayed if 'present counter value < compared value'.

16. EQ (=) Signal

Signal displayed if 'present counter value = compared value'.

17. GT (>) Signal

Signal displayed if 'present counter value > compared value'.

18. Section Signal ($\geq \leq$ or $\leq \geq$)

Signal displayed if present counter value is between two user-defined values or exceeds the two values.

19. External Preset

External signal used to change present counter value to discretionarily specified value.

20. External Gate

External signal used to enable the additional function operation.

Warranty

1. Terms of warranty

LSIS provides an 18-month warranty starting from the date of production.

2. Range of warranty

For problems within the terms of the warranty, LSIS will replace the entire PLC or repair the defective parts free of charge except for the following cases.

- (1) Problems caused by improper conditions, environment or treatment.
- (2) Problems caused by external devices.
- (3) Problems caused by the user remodeling or repairing the PLC.
- (4) Problems caused by improper use of the product.
- (5) Problems caused by circumstances where the expectations exceed that of the science and technology level when LSIS produced the product.
- (6) Problems caused by natural disaster.

3. This warranty is limited to the PLC itself only. It is not valid for the system which the PLC is attached to.