

User Manual

XGT series

Programmable Logic Controller

**XGF-PO1A
XGF-PO2A
XGF-PO3A
XGF-PD1A
XGF-PD2A
XGF-PD3A**



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.



Warning

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



Caution

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

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



indicates handling and directions probably causing a danger.

If you find this mark, you should read it carefully and follow the directions to avoid danger.



indicates the possibility of electric shock under a certain condition.

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

Safety Instructions

Safety Instructions for designing



Caution

- ▶ **Analog I/O signal or pulse I/O cable should be installed, at least, 100mm away from high voltage/power cable so that such cables may not be affected by noise or magnetic field change.**

It may cause incorrect operation due to noise.

- ▶ **If huge vibration exists in the installation place, it is necessary to take a measure PLC may not be directly subject to the vibration.**

It may cause an electric shock/fire or incorrect operation.

- ▶ **It is necessary that no metallic impurities are inserted into the product if it is installed in a place with metallic impurities.**

It may cause an electric shock/fire or incorrect operation.

Safety Instructions when installing



Caution

- ▶ **Before use, please install PLC in the environment conditions in accordance with the specifications in the data sheet.**

It may cause an electric shock/fire or incorrect operation.

- ▶ **Please check whether PLC power is off before installing the module.**

It may cause an electric shock or damages on a product.

- ▶ **Please check whether each module of PLC is correctly fixed.**

If any part of the product is loosely or incorrectly installed, it may cause incorrect operation, trouble or fall.

Safety Instructions

Safety Instruction for wiring



Warning

- ▶ **Before wiring, please check whether the power of PLC and the external power are disconnected.**

It may cause an electric shock or damages on the product



Caution

- ▶ **After checking the rated voltage and terminal array of each product, wire them accurately.**

If connecting to a different voltage, not rated voltage, or wiring incorrectly, may cause a fire or trouble.

- ▶ **Firmly tighten the screws for wiring with a specified torque.**

Loosely tightened screw may cause short-circuit or incorrect operation.

- ▶ **Make sure to use the exclusive PLC type 3 grounding for FG terminal grounding**

Without grounding, it may cause incorrect operation.

- ▶ **A special caution should be paid so that no wiring impurities are inserted into the product during wiring.**

It may cause a fire/damages on product or incorrect operation.

Safety Instructions

Safety instructions for trial operation/ maintenance



Warning

- ▶ **Never attempt to touch terminal block with the power on.**
It may cause an electric shock or incorrect operation.
- ▶ **When cleaning it up or tightening a terminal, it is necessary to turn off PLC and all other external power.**
It may cause an electric shock/incorrect operation



Caution

- ▶ **Do not detach PCB from the case nor alter it.**
It may cause a trouble, incorrect operation, damages on product or a fire.
- ▶ **Installing or detaching the module should be executed with every external power off.**
It may cause an electric power or incorrect operation.
- ▶ **When using a cellular phone or radio set, stay, at least, 30cm from PLC.**
It may cause an incorrect operation.

Safety Instructions for disposing



Caution

- ▶ **When disposing the product, treat it as industrial waste.**
It may generate harmful substances.

Revision History

Version	Date	Description	Modified Page
V 1.0	May, '06	First edition published	-
V 2.0	April, '07	Detailed description modified and XGI content added	-

※ The No. of user's manual is indicated on the right side of back cover.

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About User's Manual

Congratulations on purchasing PLC of LS Industrial System Co., Ltd.

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

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

Relevant User's Manuals

Title	Description	No. of User's Manual
XG5000 User's Manual	It describes how to use XG5000 software especially about online functions such as programming, printing, monitoring and debugging by using XGT series products.	10310000512
XGK/XGB Series Instructions & Programming	It is the user's manual for programming to explain how to use commands that are used PLC system with XGK CPU.	10310000510
XGK-CPU User's Manual	It describes CPU specifications and technical terms for the XGT PLC system using a series of XGI-CPUU module.	10310000508

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Appendix 2 Positioning Error Information & Actions A2-1~ A2-9
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Appendix 3 Positioning Module Appearance Dimension..... A3-1

Chapter 1 Overview

This user's manual describes the standard of positioning module, installation method, the method to use each positioning function, programming and the wiring with external equipment as below.

No. of control axis	Product Name		APM S/W Package
	Open Collector	Line Driver	
1 axis	XGF-PO1A	XGF-PD1A	 APM Software Package.exe
2 axis	XGF-PO2A	XGF-PD2A	
3 axis	XGF-PO3A	XGF-PD3A	

All described here are applied only for XGF-PD1A, XGF-PD2A, XGF-PD3A, XGF-PO1A, XGF-PO2A and XGF-PO3A (hereinafter referred to 'Positioning Module').

1.1 Characteristics

The characteristics of positioning module are as follows.

1) The positioning module is available for XGT Series.

2) Various positioning control function

It has various functions needed for positioning system such as positioning control at the random position, equal speed operation etc.

(1) The operation data including positioning address and operation method, operation pattern is available to set max. 400 at each axis.

With this operation data, positioning at each axis is carried out

(2/3 axis interpolation control and 2/3 axis simultaneous start is available)

(2) In case of positioning control at each axis, the linear control (3 axis simultaneous start available) is available.

This control enables the single position control by one operation data and the continuous position control by plural operation data.

(3) In case of positioning more than 2 axes, synchronous control, linear interpolation control and circular interpolation control of 2 axis are available.

(4) According to the control method designated by each operation data and parameter, there are position control, speed control, speed/position switching control, position/speed switching control.

(5) There are various origin return control functions.

(A) The method of origin return is shown as below and available to select one from 6 methods.

- ▶ The origin detection after near point OFF
- ▶ The origin detection after deceleration in case of near point ON
- ▶ The origin detection by the origin and high-low limit
- ▶ The origin detection by near point
- ▶ High speed origin detection
- ▶ Origin detection by high-low limit

- (B) Available to execute the positioning control (floating origin setting) from random position to the origin of machine
- (6) For the Acceleration/Deceleration method, it is available to select trapezoid and S-type.
- 3) High speeding of start process
 - Due to the realization of high speeding of positioning operation start process, the start process time reduced by 4 ms – 5 ms. Therefore, the delay time will not occur between axis in case of synchronous start (using several axis or during interpolation operation).
- 4) High speeding of pulse output and making a long-distance connection with drive
 - In case of using Line Driver type, it is available to realize the high speeding and making a long-distance connection.
- 5) Easy maintenance
 - Various data such as positioning data, parameter etc. is saved in flash memory within positioning module.
- 6) The number of positioning module using in one base is not limited
 - (But, it is available to use within the range satisfied with the capacity of power module.)
- 7) Self-diagnosis, monitoring, test by strong positioning software package is available.
 - (1) Diagnosis for I/O signal line
 - (2) Monitoring
 - (3) Tracking
 - (4) Simulation
 - (5) Detailed information and action for each error
 - (6) Multipurpose Printer function
 - (7) Operation data editing of each axis available in Excel program

1.2 Purpose of Positioning Control

The purpose of positioning module is to transfer the moving objects (unprocessed items, tools etc.) by setting speed from the current position and stop them on the setting position correctly. And it also controls the position of high precision by positioning pulse string signal as it is connected to various servo driving devices or stepping motor control driving devices.

In application, it can be used widely with engineering machine, semiconductor assembly machine, grinder, small machine center, lifter etc.

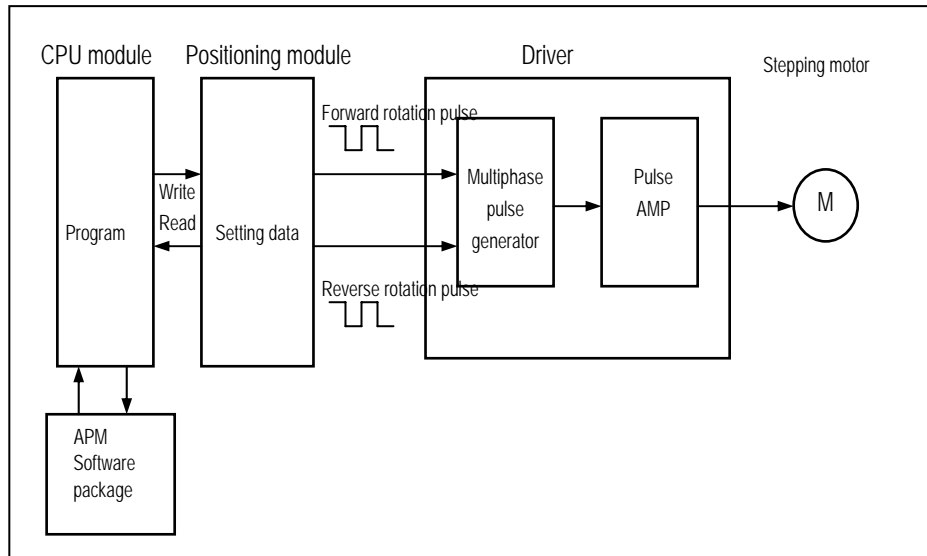


Fig. 1.1 Overview of Position Control for Stepping Motor

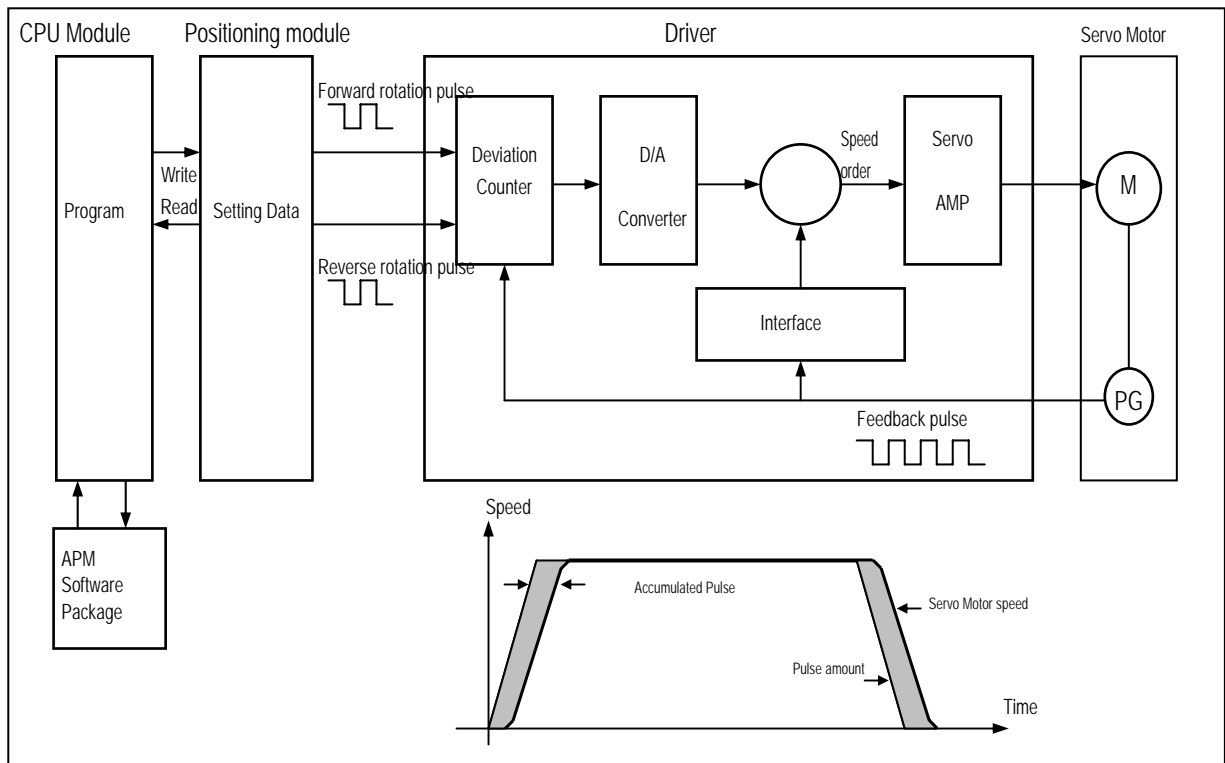
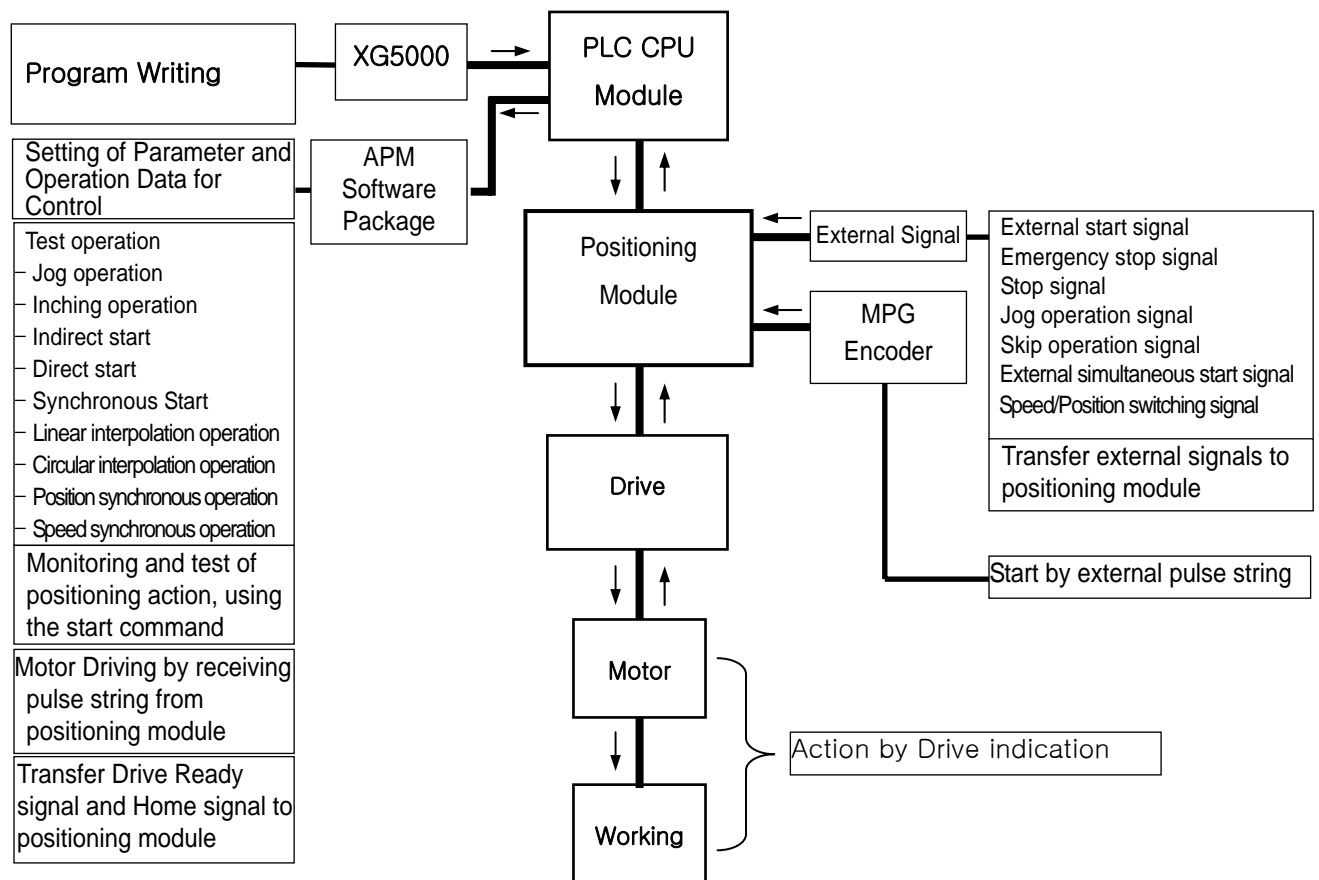


Fig. 1.2 Overview of Position Control for Servo Motor

1.3 Signal Flow of Positioning Module

The flow of PLC system using the positioning module is as follows.



Chapter 2 Specifications

2.1 General Specifications

The following table shows the general specification of XGT series.

No.	Item	Specifications				Related specifications
1	Operating temp.	0℃ ~ +55℃				-
2	Storage temp.	-25℃ ~ +70℃				-
3	Operating humidity	5 ~ 95%RH, no dew allowed				-
4	Storage humidity	5 ~ 95%RH, no dew allowed				-
5	Vibration immunity	For discontinuous vibration				-
		Frequency	Acceleration	Amplitude	Number	IEC61131-2
		10≤f< 57Hz	-	0.075mm	Each 10 times in X,Y,Z directions	
		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	Impact immunity	* Max. impact acceleration: 147m/s² (15G) * Authorized time: 11ms * Pulse wave : Sign half-wave pulse (Each 3 times in X,Y,Z directions)				IEC61131-2
7	Noise immunity	Square wave impulse noise			±1,500V	Test specification of LS Industrial Systems
		Static electric discharging			Voltage : 4kV (contact discharging)	IEC 61131-2, IEC 61000-4-2
		Radiation 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 level	2 or less				
11	Cooling type	Natural air cooling				

Table 2.1 General Specifications

Notes

[Note 1] IEC (International Electrotechnical Commission):

An international nongovernmental organization which promotes internationally cooperated standardization in electric/electronic field, publishes international standards and manages applicable estimation system related with.

[Note 2] Pollution level:

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.

2.2 Performance Specifications

The following table shows the performance specifications of XGT Positioning Module.

Model		XGF-PD1A XGF-PO1A		XGF-PD2A XGF-PO2A		XGF-PD3A XGF-PO3A	
Items							
No. of control axis		1 axis		2 axis		3 axis	
Interpolation function		N/A		2 axis linear interpolation 2 axis circular arcs interpolation		2/3 axis linear interpolation 2 axis circular arcs interpolation	
Control method		Position control, Speed control, Speed/Position control, Position/Speed control					
Control unit		Pulse, mm, inch, degree					
Positioning data		Each axis has 400 data range.(Operation step number : 1 ~ 400) Available to set with software package or program					
Software package		Available (connected with RS-232C or USB Port of CPU module)					
Back-up		Save the parameter, operation data in Flash ROM (No Battery)					
POSITIONING	Positioning method	Absolute method/Relative method					
	Position address range	mm	-214748364.8 ~ 214748364.7(μm)				
		inch	-21474.83648 ~ 21474.83647				
		degree	-21474.83648 ~ 21474.83647				
		pulse	-2147483648 ~ 2147483647				
	Speed range			Open Collector		Line Driver	
		mm	0.01 ~ 20000000.00(mm/min)				
		inch	0.001 ~ 2000000.000(inch/min)				
		degree	0.001 ~ 2000000.000(degree/min)				
		pulse	1 ~ 200,000(pulse/sec)		1 ~ 200,000(pulse/sec)		
Acceleration/deceleration process		Trapezoid type, S-type					
Acceleration/deceleration time		1 ~ 65535 ms selection available from 4 types of acceleration/deceleration pattern					
Max. output pulse		XGF-PO1A, XGF-PO2A, XGF-PO3A : 200 kpps XGF-PD1A, XGF-PD2A, XGF-PD3A : 1 Mpps					
Max. connection distance		XGF-PO1A, XGF-PO2A, XGF-PO3A : 2 m XGF-PD1A, XGF-PD2A, XGF-PD3A : 10 m					
Max. encoder input		200 kpps					
Error indication		Indicated by LED					
Connection connector		40 Pin connector					
Size of use cable		AWG #24					
I/O share point		Variable: 16 points, Fixed: 64 points					
Consumable current(mA)		XGF-PD1A : 510mA XGF-PO1A : 340mA		XGF-PD2A : 790mA XGF-PO2A : 360mA		XGF-PD3A : 860mA XGF-PO3A : 400mA	
Weight(g)		120g		130		135g	

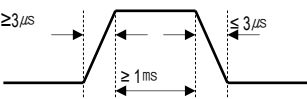
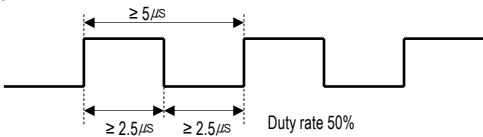
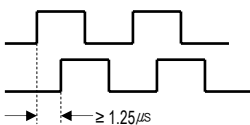
Notes

The number of positioning module is not limited but cares should be taken as it is constrained in DC 5V capacity of power module. For example, if using power module XGP-ACF2., the capacity of DC 5V is 6A from which 960mA is used for CPU module and the rest of 5.04A can be used for operation of positioning module. That is, if using power module XGP-ACF2, it is possible to use max. 5 of 3 axis positioning module (Line driver type).

2.3 External Interface I/O Specifications

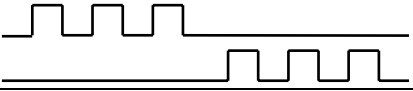
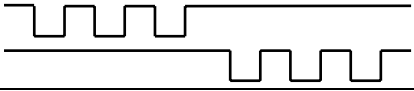
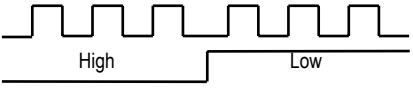
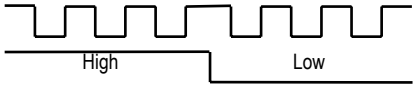
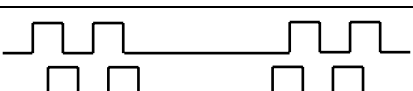
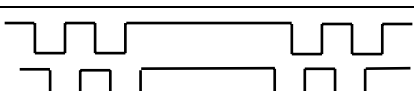
Here describes the I/O interface for external equipment.

2.3.1 Input Specifications

Signal name	Rated input voltage/ current	Use voltage range	On voltage/ current	Off voltage/current	Input resistance	Response time
Near point	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms
External high-limit	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms
External low-limit	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms
Emergency stop	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms
External stop	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms
External command	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms
Jog reverse direction	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms
Drive Ready/ in-position	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms
External simultaneous setting	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms
Origin	DC 24V/8.9mA	DC 20.4 ~ 26.4V	≥DC 16V/6.0mA	≤DC 4V/1.6mA	Approx. 2.7kΩ	≤0.4ms
	DC 5V/8.9mA	DC 4.25 ~ 5.5 V	≥DC 2.5V/6.0mA	≤DC 1V/1.9mA	Approx. 570Ω	≤0.4ms
						
Manual pulse generator / Encoder input	DC 5V/7.0mA	DC 4.25 ~ 5.5 V	≥DC 2.5V/3.0mA	≤DC 1V/1.0mA	Approx. 940Ω	≤0.6ms
	Encoder input : based on RS-422A Line Driver Level (Am26LS31)					
	<p>1) Pulse width</p>  <p>2) Phase difference</p>  <p>If A phase input pulse precedes B phase input pulse, the position address value increases.</p> <p>If B phase input pulse precedes A phase input pulse, the position address value decreases.</p>					
Speed/Position switching signal	DC 24V/4.7mA	DC 20.4 ~ 26.4V	≥DC 16V/3.1mA	≤DC 4V/1.0mA	Approx. 5.1kΩ	≤0.5ms

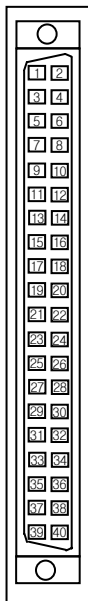
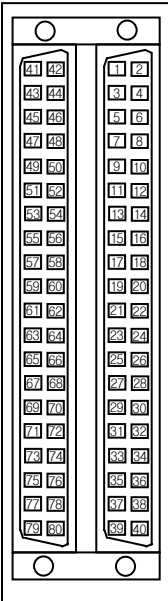
2.3.2 Output Specifications

1) Pulse Output Specifications

Rated load voltage	Use load voltage range	Max. load current / Dash current	Max. voltage falling (On)	Leakage current (Off)	Response Time
DC 5~24V	DC 4.75~26.4V	50mA(1 point) / ≤200mA 10ms	≤DC 0.5V	≤0.1mA	-
<p>▷ Differential Line Driver (in case of Line Driver) based on Am26C31</p> <p>▷ CW/ CCW type, Pulse/Sign type, A phase/B phase type can be selected from pulse output mode of basic parameter for program and APM S/W Package.</p> <p>▷ The relation of Pulse output mode (setting from basic parameter of program and APM S/W Package), Pulse output direction (setting from extension parameter of program and APM S/W Package) and Pulse output level (setting from common parameter of program and APM S/W Package) is as follows.</p>					
Pulse output mode	Selection of output signal level				
	Forward rotation direction		Reverse rotation direction		
	Forward	Reverse	Forward	Reverse	
CW CCW					
PLS DIR					
Phase A Phase B					

2.3.3 External Equipment and Interface Specifications

1) Pin Array of Connector

Pin Array	Classification	Pin no.			Signal Name		Signal direction positioning-external	Action condition	
		X axis	Y axis	Z axis					
	Function per Axis	21	41	61	FP+	Pulse output (forward +)	→		
		22	42	62	FP-	Pulse output (forward -)	→		
		23	43	63	RP+	Pulse sign (reverse +)	→		
		24	44	64	RP-	Pulse sign (reverse -)	→		
		25	45	65	OV+	High limit signal	←	Edge	
		26	46	66	OV-	Low limit signal	←	Edge	
		27	47	67	STOP	External stop signal	←	Edge	
		28	48	68	DOG	Near point signal	←	Edge	
		29	49	69	VTP	Speed/position switching signal	←	Edge	
		30	50	70	ECMD	External command signal	Start	←	Edge
						Skip	←	Edge	
						Jog+	←	Level	
		31	51	71	JOG-	Reverse(Jog operation)	←	Level	
		32	52	72	COM	Common (OV+,OV-,STOP,DOG,VTP,ECMD,JOG-)	↔		
		33	53	73	DR/INP	Drive ready/in-position signal	←	Level/Edge	
		34	54	74	DR/INP COM	Drive ready/in-position signal Common	↔		
		35	55	75	HOME +24V	Home signal(+24V)	←	Edge	
		36	56	76	NC	No use			
		37	57	77	HOME +5V	Home signal(+5V)	←	Edge	
		38	58	78	HOME COM	Home signal(+24V, +5V) Common	↔		
		39	59	79	24V	External 24V power (no use in case of Line Driver output)			
		40	60	80	P COM	External 24V GND (no use in case of Line Driver output)			
	Common function	1			MPG A+	Manual pulse generator/Encoder A+ input	←		
		2			MPG A-	Manual pulse generator/Encoder A- input	←		
		3			MPG B+	Manual pulse generator/Encoder B+ input	←		
		4			MPG B-	Manual pulse generator/Encoder B- input	←		
		5			NC	No use			
		6			NC	No use			
		7			CON	External simultaneous start signal	←	Edge	
		8			EMG	Emergency stop signal	←	Edge	
		9			NC	No use			
		10			COM	Common(CON,EMG)	↔		
		11 ~ 20			NC	No use			

Note

- 1) Open collector should be structured so that the external 24V power(24V: 39,59,79, 0V: 40,60,80) is connected to an axis to operate. No pulse is outputted unless the external 24V is supplied.
- 2) If an external command is set in the extension parameter of APM software package by JOG+ and an external signal is entered to No.30, 50 and 70, it operates in Job +; if the signal is entered to No. 31, 51 and 71, it operates in Jog-.

Chapter 2 Specifications

2) Internal circuit of connector

(1) Pulse output

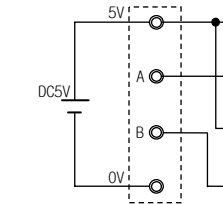
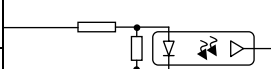

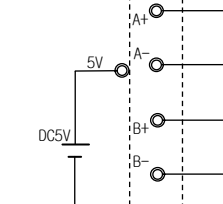
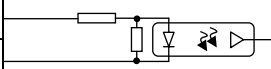

Internal circuit	Pin No.			Signal	
	X axis	Y axis	Z axis		
Open collector output 	21	41	61	FP+	Forward Pulse(CW/PLS/Phase A)
	22	42	62	FP-	Pulse COM(CW/PLS/Phase A)
	23	43	63	RP+	Reverse Pulse(CCW/DIR/Phase B)
	24	44	64	RP-	Pulse COM(CCW/DIR/Phase B)
	39	59	79	24V	External 24V power (no use in case of Line Driver output)
	40	60	70	P COM	External 24V GND (no use in case of Line Driver output)
Line Driver output 	21	41	61	FP+	Forward Pulse+(CW/PLS/Phase A)
	22	42	62	FP-	Forward Pulse-(CW/PLS/Phase A)
	23	43	63	RP+	Reverse Pulse+(CCW/DIR/Phase B)
	24	44	64	RP-	Reverse Pulse-(CCW/DIR/Phase B)

(2) Input signal

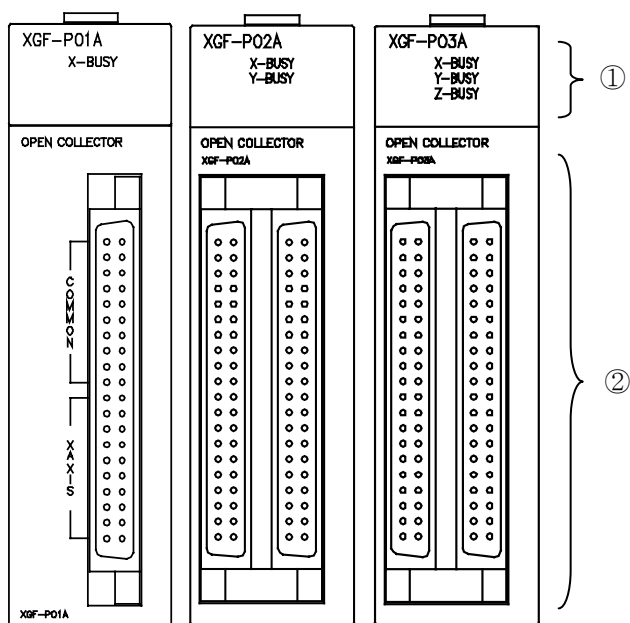
Classification	Pin No.			Internal circuit	Signal	
	X axis	Y axis	Z axis			
<div>DC24V</div> <div>*1</div> <div>DC24V</div> <div>*1</div> <div>DC24V</div> <div>*1</div>	25	45	65		OV+	High limit signal
	26	46	66		OV-	Low limit signal
	27	47	67		STOP	External stop signal
	28	48	68		DOG	Near point signal
	29	49	69		VTP	Speed/Position switching signal
	30	50	70		ECMD	External command signal
	31	51	71		JOG-	Reverse jog operation
	32	52	72		COM	Common (OV+, OV-, STOP, DOG, VTP, ECMD, JOG-)
	33	53	73		DR/INP	Driver Ready/In-position signal
	34	54	74		DR/INP COM	Driver Ready/In-position signal Common
	35	55	75		HOME +24V	Home signal (+24V)
	37	57	77		HOME +5V	Home signal (+5V)
	38	58	78		HOME COM	Home signal (+24V, +5V) Common
					CON	External simultaneous start signal
	<div>DC24V</div>	7	8		EMG	Emergency stop signal
		10	COM		Common(CON,EMG)	

*1: Available to use NPN or PNP type device.

(3) Manual pulse generator input/encoder input

Classification	Pin No.	Internal circuit	Signal	
 <p>Open collector type voltage</p>	1		MPG A+	Manual pulse generator A+ input
	2		MPG A-	Manual pulse generator A- input
	3		MPG B+	Manual pulse generator B+ input
	4		MPG B-	Manual pulse generator B- input
	5		NC	No use
	6		NC	No use
 <p>Line driver type input</p>	1		MPG A+	Encoder A+ input
	2		MPG A-	Encoder A- input
	3		MPG B+	Encoder B+ input
	4		MPG B-	Encoder B- input
	5		NC	No use
	6		NC	No use

2.4 The Name of Each Part and its Function

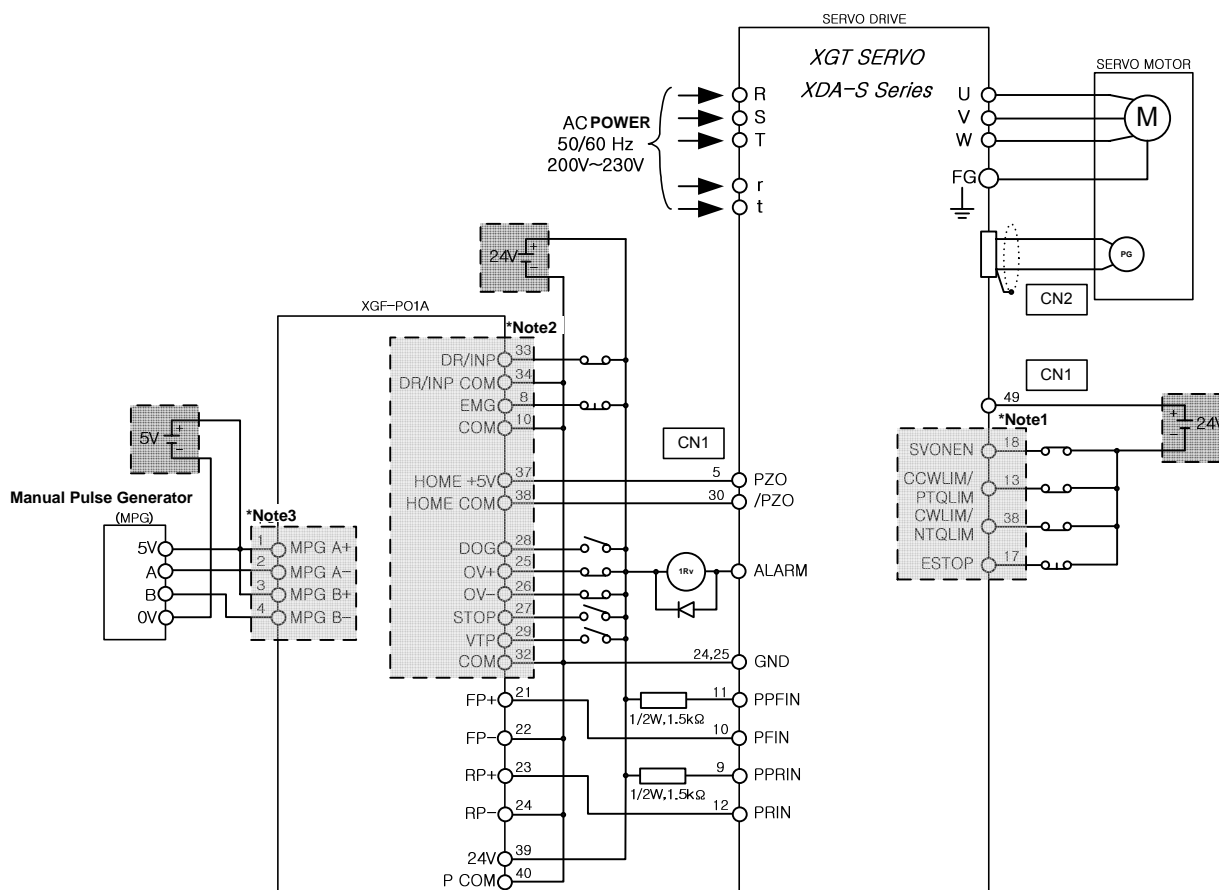


No.	Name	Description
①	Operation indication LED	1. Operation indication ▶ Light-On: during operation of the corresponding axis ▶ Light-Off: when the corresponding axis stops 2. Error indication ▶ Light-On: during normal operation ▶ Blink: error of the corresponding axis
②	External wiring connector	Connector to connect with drive machine, machine field input, manual pulse generator etc.

2.5 Connection to XGT Servo System

2.5.1 Connection of Open Collector

The following shows the basic wiring diagram of XGF-PO1A and XGT Servo System XDA-S Series. The connection between and among XGF-PO2A, XGF-PO3A and XGT Servo System XDA-S Series should be wired by referring to “2.3.3 External Equipment and Interface Specification”.



Note

*Note 1

The external input signal of XGT Servo Drive can be changed by setting the parameter of servo drive. The number allocated in the wiring diagram shows the case when setting the parameter of servo drive to “Position control setting mode(Ph07-01=27).” For the details of external input setting of servo drive, refer to “3.8 Input Point Function Setting”

*Note 2

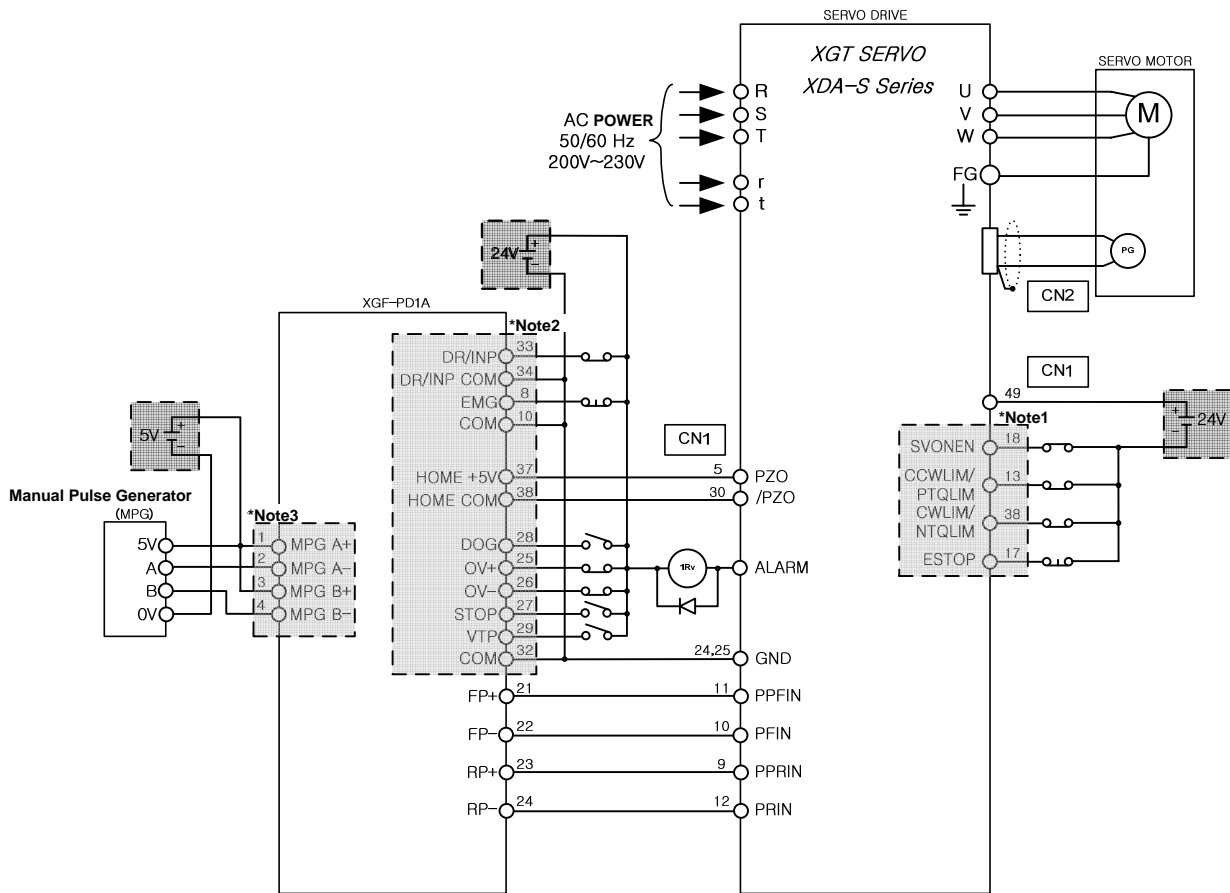
Noting the operation condition of XGF-PO1A may vary on the input signal parameter, refer to the content of “5.4 Input Signal Parameter”.

*Note 3

The manual pulse generator(MPG) illustrates 5V voltage output type(open collector). If 12V/24V type manual pulse generator(MPG) is used, the input voltage should be changed from 5V to 12V/24V.

2.5.2 Connection of Line Driver

The following diagram shows the basic wiring of XGF-PD1A and XGT Servo System XDA-S Series. For the connection of XGF-PD2A, XGF-PD3A and XGT Servo System XDA-S Series, please refer to “2.3.3 External Equipment and Interface Specification”



Note

*Note 1

The external input signal of XGT Servo Drive can be changed by setting the parameter of servo drive. The number allocated in the wiring diagram shows the case when setting the parameter of servo drive to "Position control setting mode(Ph07-01=27)." For the details of external input setting of servo drive, refer to "3.8 Input Point Function Setting"

*Note 2

Noting the operation condition of XGF-PO1A may vary on the input signal parameter, refer to the content of "5.4 Input Signal Parameter".

*Note 3

The manual pulse generator(MPG) illustrates 5V voltage output type(open collector). If 12V/24V type manual pulse generator(MPG) is used, the input voltage should be changed from 5V to 12V/24V.

Chapter 3 Function

3.1 Positioning Control

Positioning Control includes position control, interpolation control, speed control, speed/position switching control, position/speed switching control.

3.1.1 Position Control

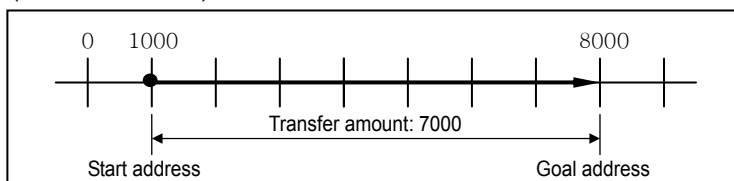
Positioning control from start address (present stop position) to goal address (transfer amount) for the assigned axis.

1) Control by Absolute method (Absolute coordinate)

- (1) Positioning control from start address to goal address (the address assigned by positioning data).
- (2) Positioning control is carried out based on the address assigned (origin address) by homing.
- (3) Transfer direction shall be determined by start address and goal address.
 - ▶ Start address < Goal address : forward direction positioning
 - ▶ Start address > Goal address : reverse direction positioning

[Example]

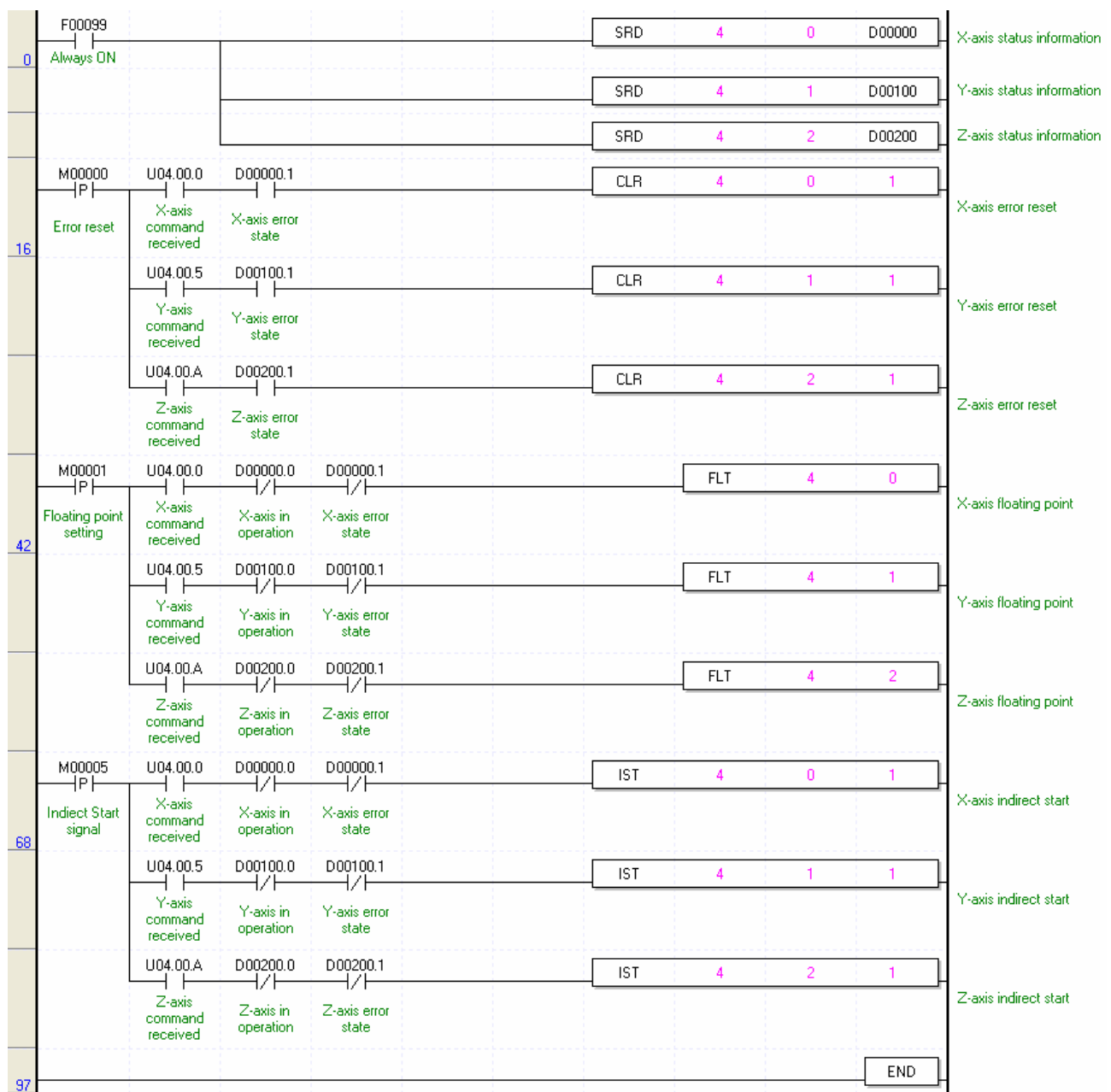
▷ When Start address : 1000, ▷ Goal address : 8000, the transfer amount to forward direction shall be 7000 ($7000=8000-1000$).



▷ Software Package setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
Setting	1	Absolute	Position control	End	Single	8000	0	0	1	100	0	CW

▷ Program



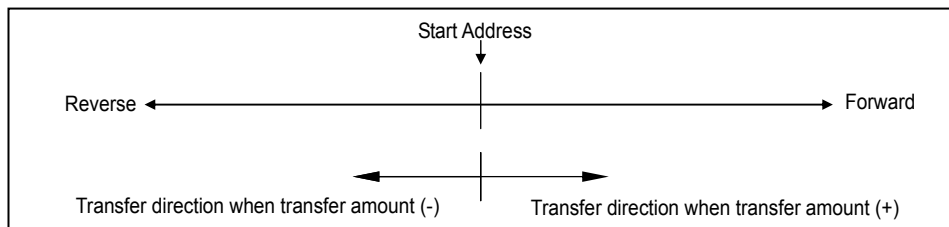
Program 3.1 Indirect Start

Notes

- ▶ A control by Absolute method (Absolute coordinate) shall start only in the state that the origin is determined.
- ▶ If starting without determining the origin, error 234 will occur.

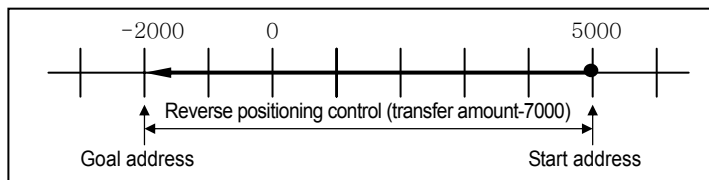
2) Control by Incremental method (Relative coordinate)

- (1) Positioning control as much as the goal transfer amount from start address.
- (2) Transfer direction shall be determined by the sign of transfer amount.
 - ▷ Transfer direction (+) or no sign : forward direction (address increase) positioning
 - ▷ Transfer direction (-) : reverse direction (address decrease) positioning



[Example]

- ▷ When Start address : 5000, ▷ Goal address : -7000, this will be reverse direction and positioning will be at the point of -2000.



▷ Software Package Setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
Setting	1	Absolute	Position control	End	Single	8000	0	0	1	100	0	CW

▷ Program

Same as Program 3.1.

3.1.2 Interpolation Control

1) 2 axis linear interpolation control

This carries out Linear interpolation control at the start address (present stop position) using the 2 assigned axis.

There are 3 types of axis combinations available for interpolation controls : X and Y, X and Z , and Y and Z.

(1) Control by Absolute method (Absolute coordinate)

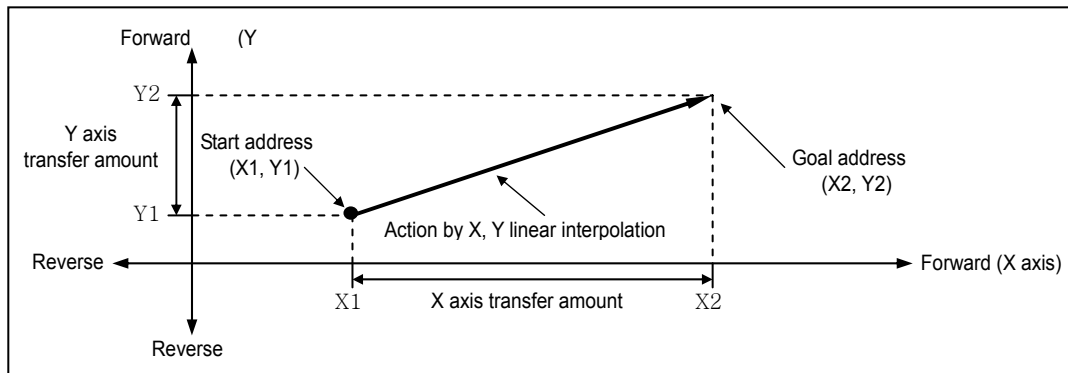
A) This carries out the linear interpolation by 2 axis from Start address to Goal address (the address assigned by positioning data).

B) Positioning control is carried out based on the address assigned by homing.

C) Transfer direction shall be determined by Start address and Goal address of each axis.

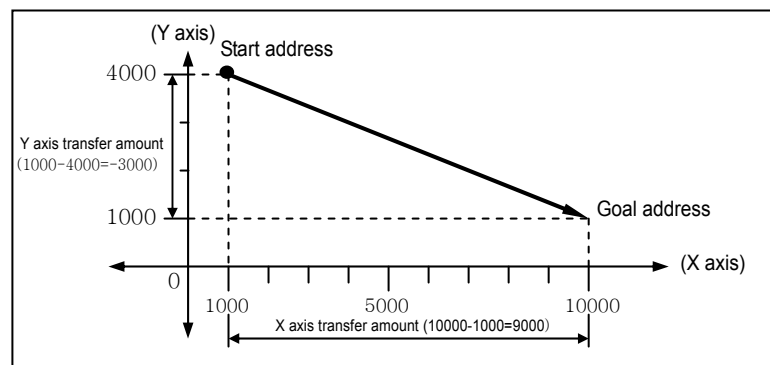
▶ Start address < Goal address : forward direction positioning

▶ Start address > Goal address : reverse direction positioning



[Example]

▶ When Start address (1000, 4000), ▶ Goal address (10000, 1000), the action is as follows.



▶ Software Package Setting

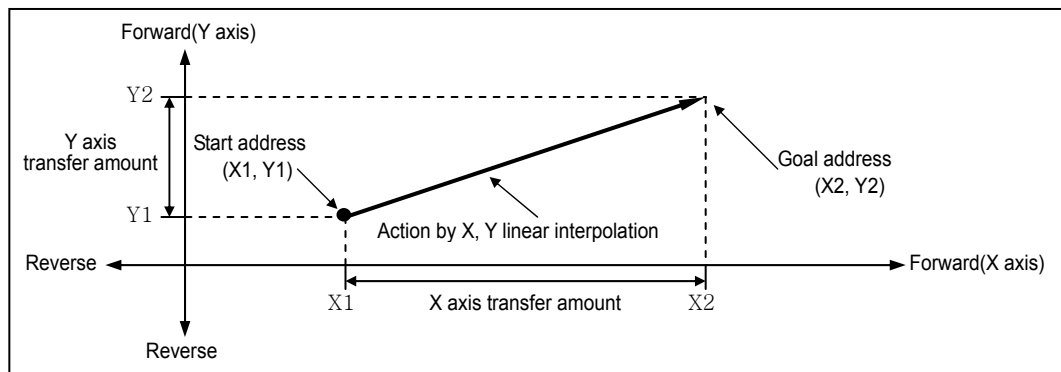
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Absolute	Position control	End	Single	10000	0	0	1	100	0	CW
Y Setting	1	Absolute	Position control	End	Single	1000	0	0	1	100	0	CW

Notes

- As at the linear interpolation start, 2 or 3 axis acts simultaneously, care should be taken in using.
- 1) The available operation pattern is End and Go-on, and operation method is Single and Repeat.
If set as Continuous, it shall be processed as Go on.
 - 2) The available auxiliary operation is as follows.
Speed override, Stop, Emergency stop, Skip, Zone output enabled.
 - 3) The command that is not used at the linear interpolation operation is as follows.
Position/Speed switching control, Position override, Continuous operation, Position/Speed override
 - 4) The auxiliary data related to the operation that acts based on the main axis during linear interpolation operation is as follows.
Operation method, operation pattern, Speed limit, Dwell time,
 - 5) The main and subordinate axis shall be determined by the positioning address amount of operation step.
 - (1) Main axis : the axis whose positioning address amount of the corresponding operation step number is bigger among X, Y, Z axis.
 - (2) Subordinate axis : the axis whose positioning address amount of the corresponding operation step number is smaller among X, Y, Z axis.
; At this time, the speed, acceleration/deceleration time, bias speed of the subordinate axis shall be recalculated.
 - 6) The items that acts based on the setting value of each axis are as follows.
; Backlash compensation amount, Software high limit, Software low limit, Zone setting area among the items of parameter

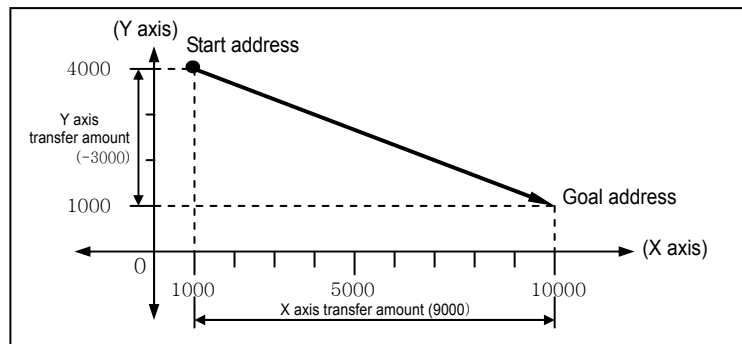
(2) Control by Incremental method (Relative coordinate)

- A) Positioning control from start address to the position including goal transfer direction and transfer amount of each axis.
- B) Transfer direction shall be determined by the sign of transfer amount of each axis.
 - Transfer amount (+) or no sign : forward direction (address increase) positioning
 - Transfer amount (-) : reverse direction (address decrease) positioning



[Example]

▷ When Start address (1000, 4000), ▷ Goal address (9000, -3000), the action is as follows.



▷ Software Package Setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Absolute	Position control	End	Single	10000	0	0	1	100	0	CW
Y Setting	1	Absolute	Position control	End	Single	1000	0	0	1	100	0	CW

2) 3 axis Linear Interpolation Control

This carries out the linear interpolation control from Start address (present stop position) using 3 assigned axis.

(1) Control by Absolute method (Absolute coordinate)

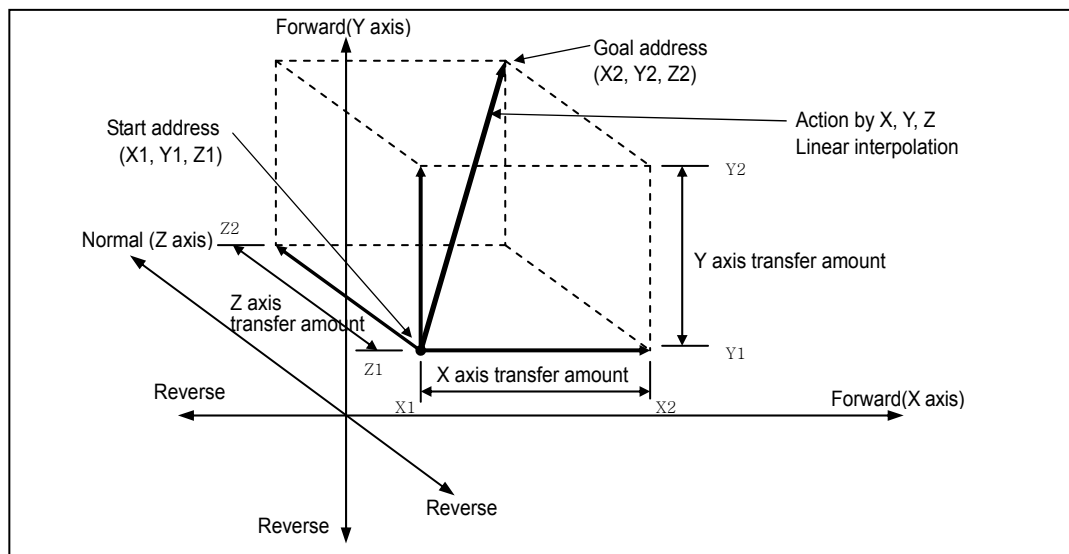
A) This carries out the linear interpolation by 3 axis from Start address to Goal address (the address assigned by positioning data).

B) Positioning control is carried out based on the address assigned by homing.

C) Transfer direction shall be determined by Start address and Goal address of each axis.

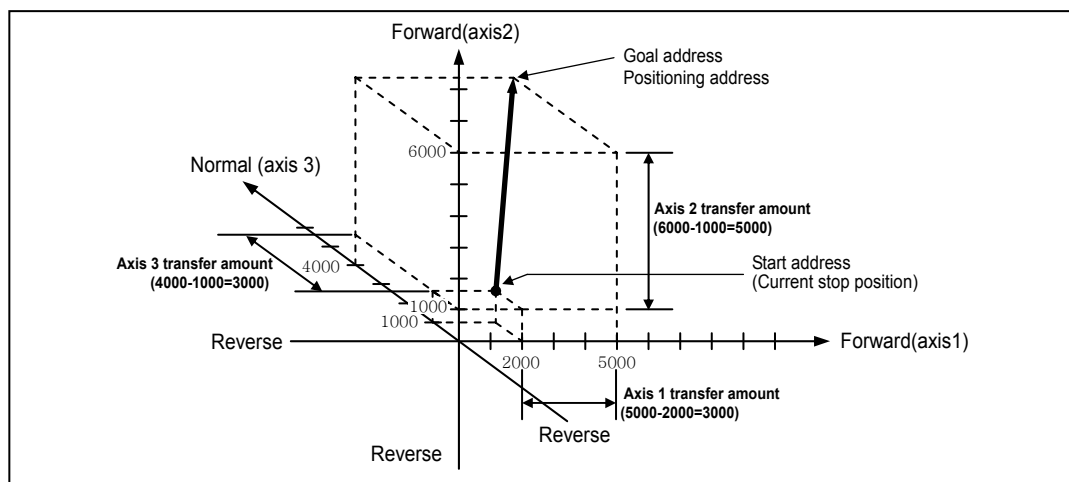
▶ Start address < Goal address : forward direction positioning

▶ Start address > Goal address : reverse direction positioning



[Example]

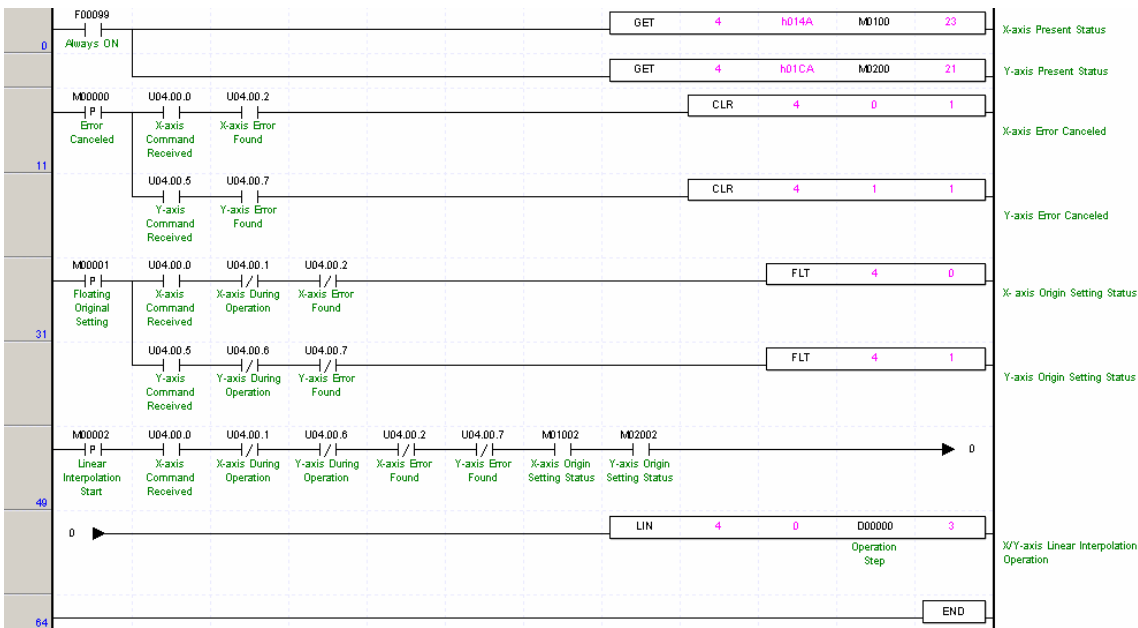
▷ When Start address (2000, 1000, 1000), ▷ Goal address (5000, 5000, 4000), the action is as follows.



▷ Software Package Setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Absolute	Position control	End	Single	5000	0	0	1	100	0	CW
Y Setting	1	Absolute	Position control	End	Single	6000	0	0	1	100	0	CW
Z Setting	1	absolute	Position control	End	Single	4000	0	0	1	100	0	CW

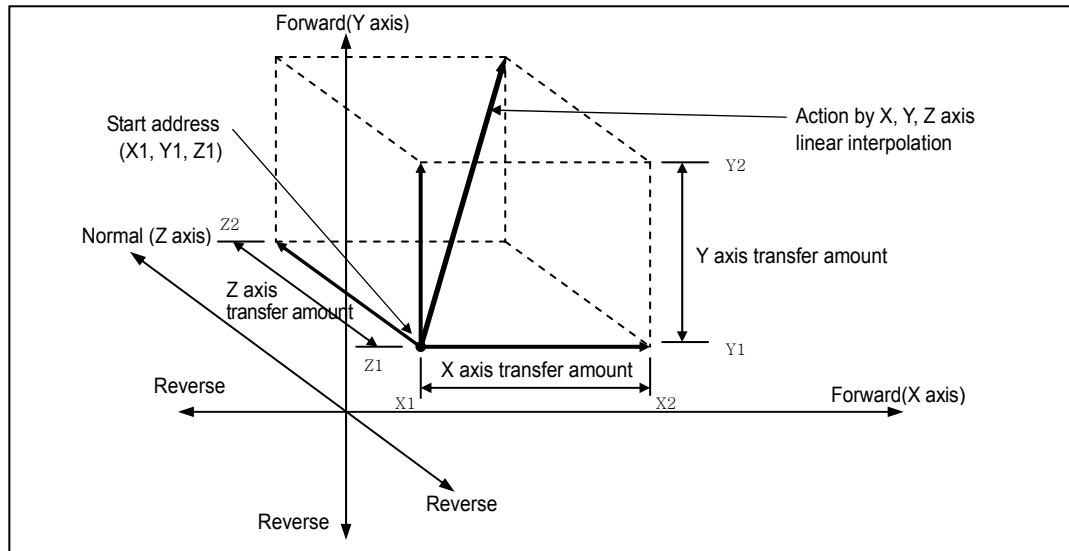
▷ Program



Program 3.2 Linear Interpolation Start

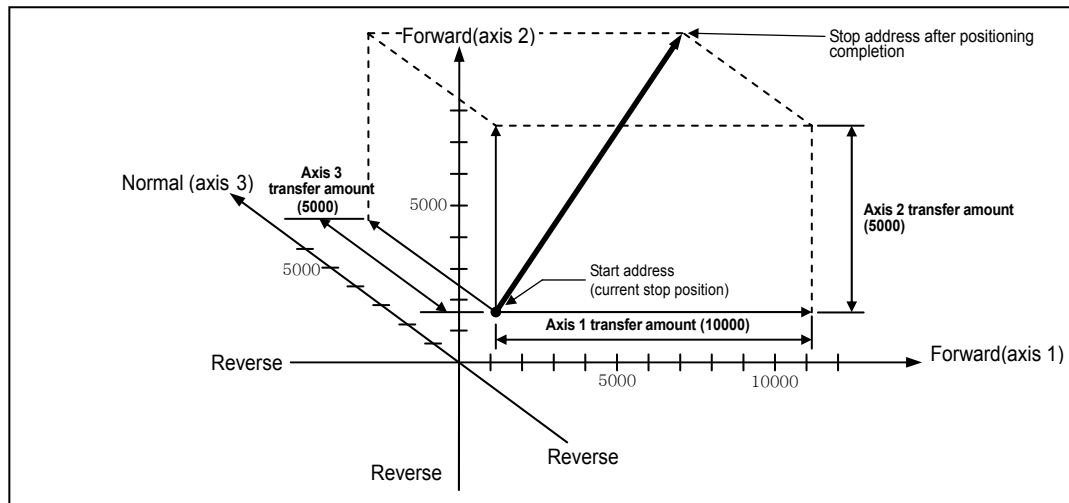
(2) Control by Incremental method (Relative coordinate)

- A) Positioning control from start address to the position including goal transfer direction and transfer amount of each axis.
- B) Transfer direction shall be determined by the sign of transfer amount of each axis.
- Transfer amount (+) or no sign : forward direction (address increase) positioning
 - Transfer amount (-) : reverse direction (address decrease) positioning.



[Example]

- ▷ When X transfer amount : 10000, Y transfer amount : 5000, Z transfer amount : 5000, the action is as follows.



▷ Software Package Setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X Setting	1	absolute	Position control	End	Single	10000	0	0	1	100	0	CW
Y Setting	1	absolute	Position control	End	Single	5000	0	0	1	100	0	CW
Z Setting	1	absolute	Position control	End	Single	5000	0	0	1	100	0	CW

▷ Program

The Program is same as Program 3.2.

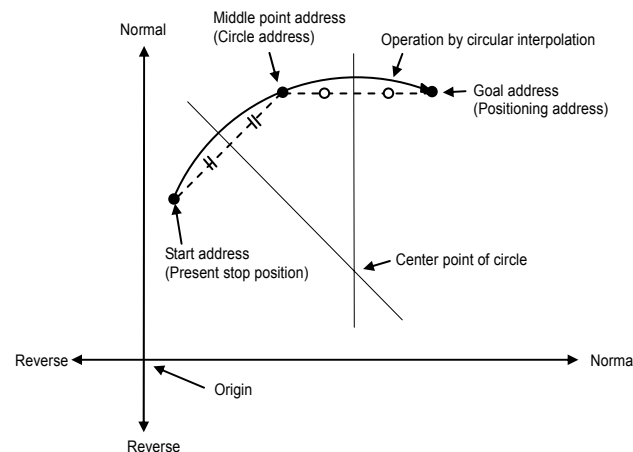
3) 2 axis Circular interpolation control

- ▶ 2 axis circular interpolation control begins the interpolation operation to the traveling direction of each axis using 2 motors.
- ▶ There are 2 kinds of auxiliary point used in circular interpolation : Middle point method that passes the assigned position and Center Point method that acts as a circle using the assigned position as a center position.
- ▶ The available axis combination for circular interpolation control are 3 types : X and Y, X and Z, Y and Z.

(1) Circular interpolation control by Middle point assigned method

1) Control by Absolute method (Absolute coordinate)

- (A) This carries out Circular interpolation from Start address to Goal address through the assigned middle point address.
- (B) The circle is made around the crossing point created by vertical bisection of Start address and Middle point address or Middle point address and Goal address.



- (C) Circular interpolation control can not be used with control unit "Degree".
- (D) Transfer direction shall be determined automatically by the assigned goal position and the setting of circular interpolation auxiliary point.

[Example]

- ▶ When X current position : 0, X goal position : 13000, Y current position : 0, Y goal position : 9000, the action is as follows in case that X auxiliary point :10000, Y auxiliary point :7500, main axis :X, subordinate axis :Y.
- ▶ Software Package Setting

<Operation Data>

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Absolute	Position control	End	Single	13000	10000	0	1	100	0	CW
Y Setting	1	Absolute	Position control	End	Single	9000	7500	0	1	100	0	CW

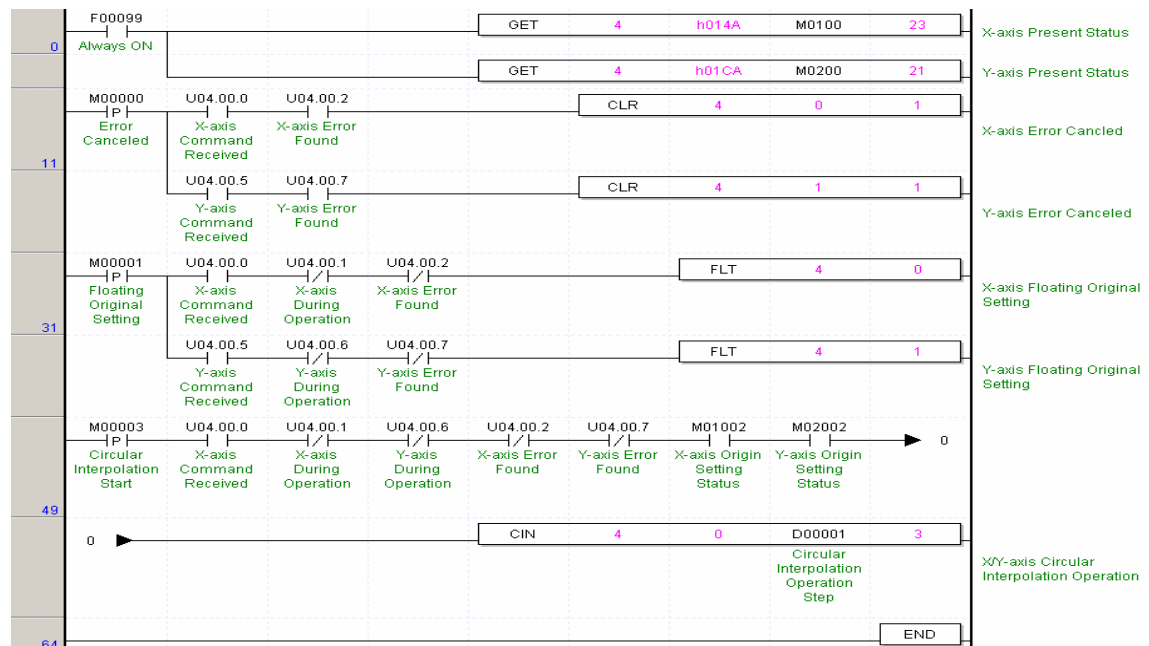
<Command window>

Circular interpolation operation	Step	1	Execution
	Subordinate axis	Y	

<Parameter>

Common parameter	Circular interpolation method	0 : Middle point
------------------	-------------------------------	------------------

Program



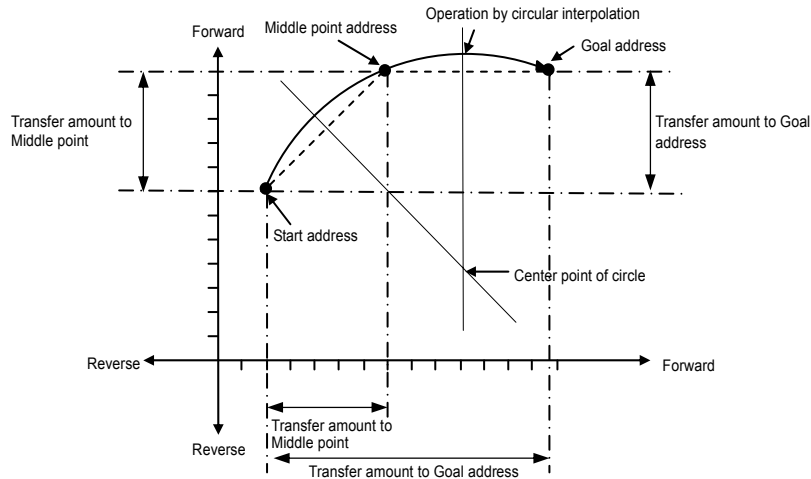
Program 3.3 Circular interpolation start

Notes

- As at Circular interpolation start, 2 axis act simultaneously, cares should be taken.
- 1) The available operation pattern is End, Go-on and the operation method is Single, Repeat.
If set as Continuous, it shall be processed "Go-on".
 - 2) The available auxiliary operation is as follows.
Speed override, Stop, Emergency stop, Zone output enabled.
 - 3) The command that is not used at the circular interpolation operation is as follows.
; Position/Speed switching control, Position override, Continuous operation, Position/Speed override
 - 4) The auxiliary data related to the operation that acts based on the main axis during circular interpolation operation is as follows.
; Operation method, operation pattern, Speed limit, Dwell time,
 - 5) the items that acts based on the setting value of each axis are as follows.
; Backlash compensation amount, Software high limit, Software low limit, Zone setting area among the items of parameter

2) Control by Incremental method (Relative coordinate)

- (A) This carries out the circular interpolation from Start address to Goal address through the assigned middle point address.
- (B) The circle is made around the crossing point created by dividing the Middle point address calculated by transfer amount from Start address to Middle point address and Goal address calculated by transfer amount from Middle point address to Goal address into two vertically.



- (C) Circular interpolation control can not be used with control unit "Degree".
- (D) Transfer direction shall be determined automatically by the assigned goal position and the setting of circular interpolation auxiliary point.

[Example]

- ▷ When X current position : 0, goal position : 13000, Y current position : 0, Y goal position : 9000, the action is as follows in case that X aux. point :10000, Y aux. point: 7500, rotation direction: CW, main axis: X, subordinate axis: Y.
- ▷ Software Package Setting

<Operation Data>

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Relative	Position control	End	Single	13000	10000	0	1	100	0	CW
Y Setting	1	Relative	Position control	End	Single	9000	7500	0	1	100	0	CW

<Command Window>

The Program is same as Program 3.3.

Circular interpolation operation	Step	1	Execution
	Subordinate axis	Y	

<Parameter>

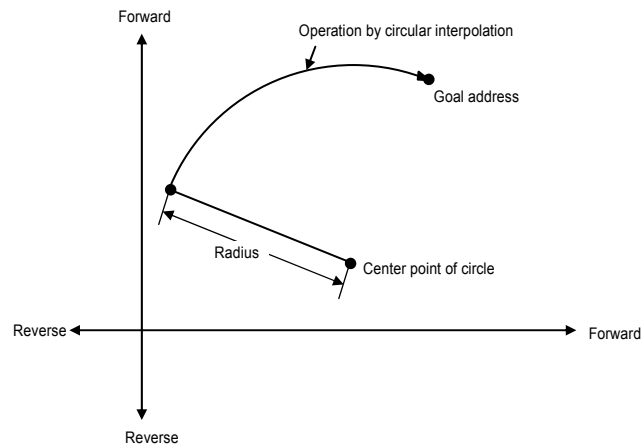
Common parameter	Circular interpolation method	0 : Middle point
------------------	-------------------------------	------------------

(2) Circular interpolation control by Center point assigned method

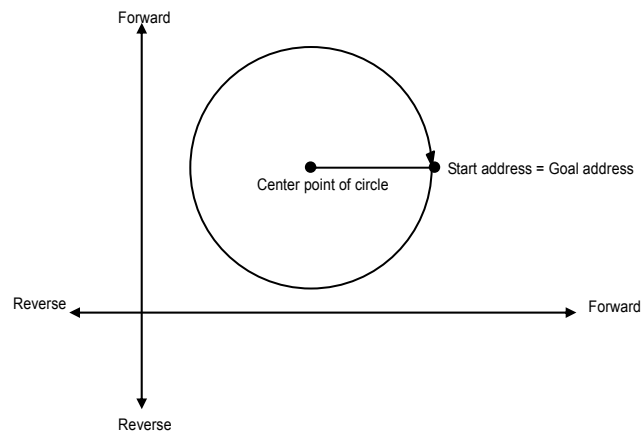
This is the Circular interpolation control to assign the Goal address of circular interpolation and the center point of circle.

1) Control by Absolute method (Absolute coordinate)

- (A) This carries out the circular interpolation to Goal address by the circle whose radius is the distance from Start address to the assigned Middle point address.



- (B) If Goal address equals to the Start address, the positioning for the circle whose radius is from Start address to the center point of circle shall be done.



- (C) Circular interpolation control can not be used with control unit "Degree".
(D) Transfer direction shall be determined to setting direction (CW/CCW) by S/W package and Program.

[Example]

- ▷ When X current position : 0, goal position : 0, Y current position : 0, Y goal position : 0, the action is as follows in case that X aux. point :1000, Y aux. point : 1000, rotation direction :CW, main axis :X, subordinate axis :Y.
- ▷ Software Package Setting

<Operation Data>

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Absolute	Position control	End	Single	0	1000	0	1	100	0	CW
Y Setting	1	Absolute	Position control	End	Single	0	1000	0	1	100	0	CW

<Command Window>

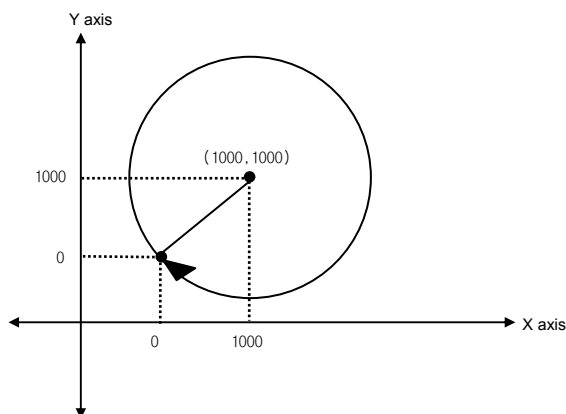
The Program is same as Program 3.3.

Circular interpolation operation	Step	1	Execution
	Subordinate axis	Y	

<Parameter>

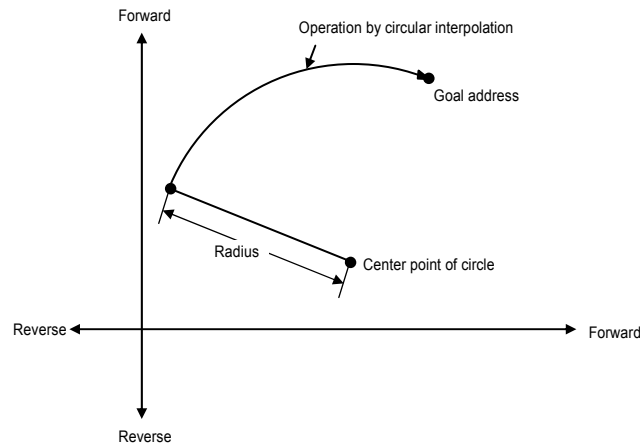
Common parameter	Circular interpolation method	1 : Center point
------------------	-------------------------------	------------------

- ▷ Circular interpolation operation pattern

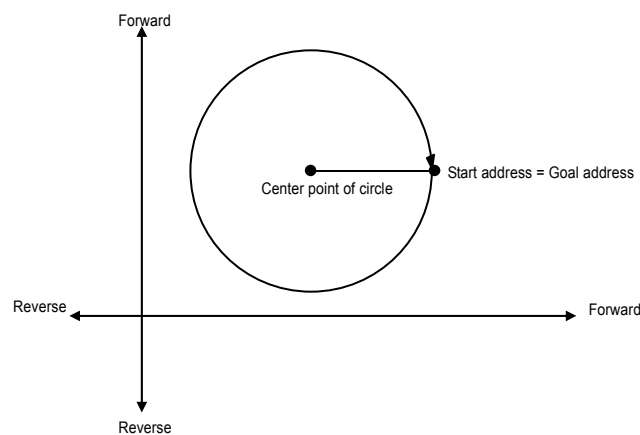


2) Control by Incremental method (Relative coordinate)

(A) This carries out the Circular interpolation to Goal address by the circle whose radius is the distance from Start address to the assigned Middle point address.



(B) If transfer amount is "0", the positioning of the circle whose radius is from Start address to the Middle point address of the circle shall be done.



(C) The circular interpolation control can not be used with control unit "Degree".

(D) Transfer direction shall be determined to the setting direction (CW/CCW) by S/W package and Program.

[Example]

▷ When X goal position : 2000, Y goal position : 0, the action is as follows in case that X aux. point :1000, Y aux. point: 0, rotation direction :CW, main axis :X, subordinate : Y.

▷ Software Package Setting

<Operation Data>

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Relative	Position control	End	Single	2000	1000	0	1	100	0	CW
Y Setting	1	Relative	Position control	End	Single	0	0	0	1	100	0	CW

<Command Window>

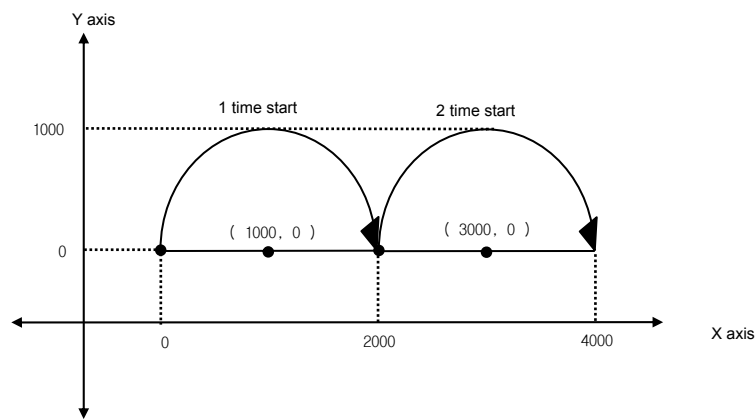
Circular interpolation operation	Step	1	Execution
	Subordinate axis	Y	

The Program is same as Program 3.3.

<Parameter>

Common parameter	Circular interpolation method	1 : Center point
------------------	-------------------------------	------------------

▷ Circular interpolation operation pattern



3.1.3 Speed Control (Equal Speed Operation)

- This controls the speed by the setting speed until deceleration stop command is entered after execution by positioning start.

(If the operation stops by deceleration stop command, it becomes “origin unsettled state” and thus it is not possible to use the position control mode of absolute coordinate method until homing setting or floating origin setting.)

- Speed control contains 2 types of start : Forward direction start and Reverse direction start.

▷ Forward direction : when position address is positive number (+) (“0” included)

▷ Reverse direction : when position address is negative number (-)

- In case of using as speed control, the following items of positioning data does not affect.

Items of Position Data	Step no.	coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
------------------------	----------	------------	----------------	-------------------	------------------	-----------------------	---	--------	-----------------	-------------------------	-----------------	----------------------------------

Items that does not affect → ↑ ↑ ↑ ↑ ↑

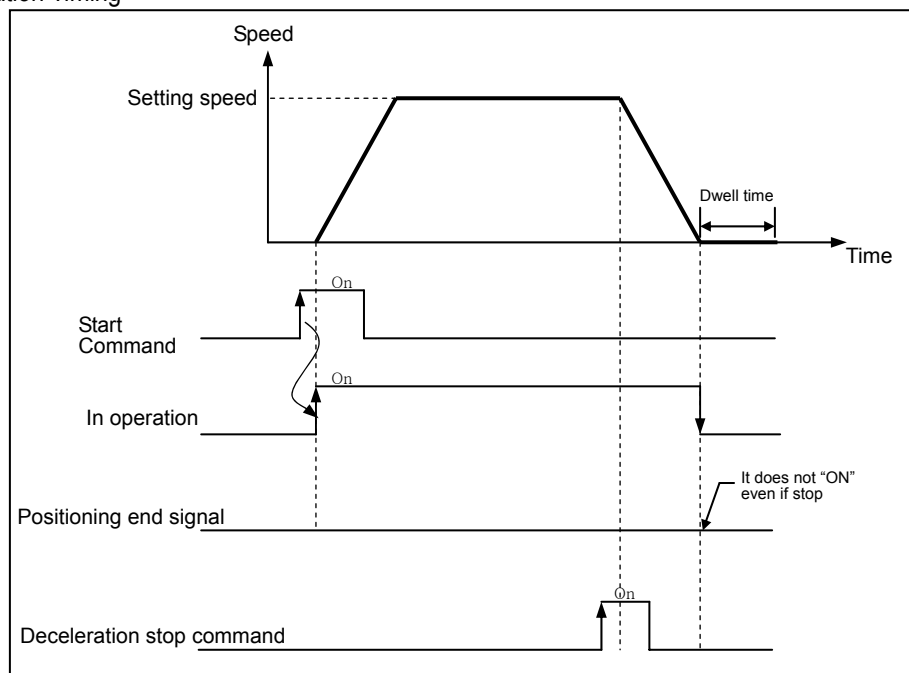
- In case of using M code, please use only “With” mode.

(If using “After” mode, M code “ON” signal does not output.)

- When using the current position during operation, it is required to set “Position during Equal speed operation” from “Extended parameter” of S/W Package as “Indication”.

(This can be used only in the state that the origin is determined.)

- Operation Timing

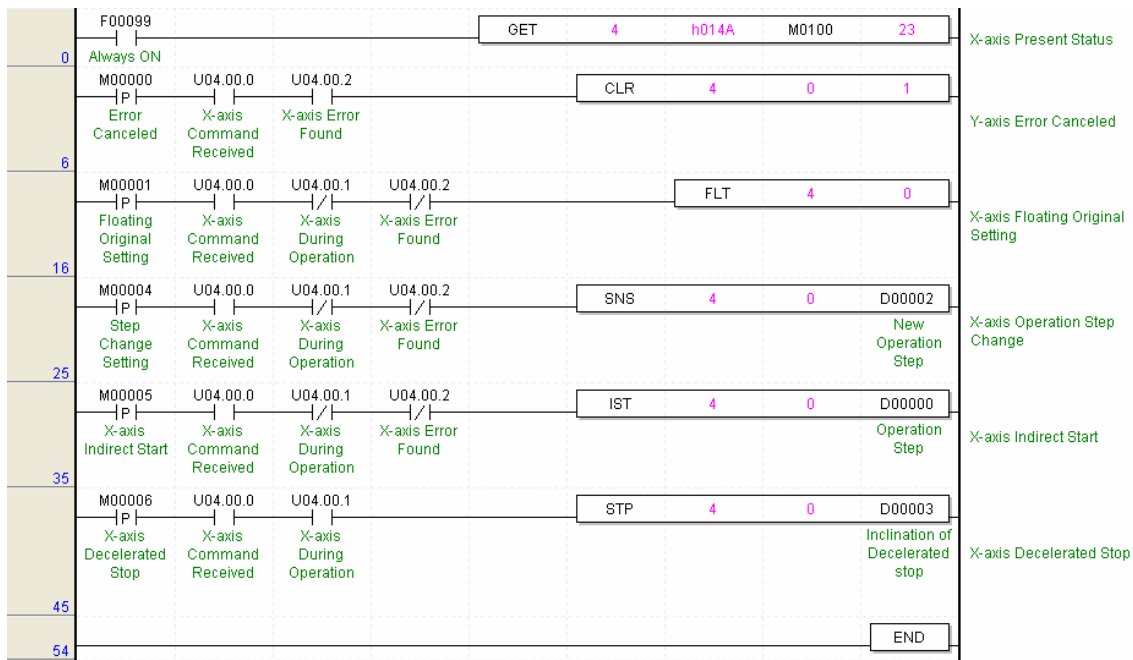


[Example]

- ▷ Software Package Setting

Direction Setting	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
Forward	1	Absolute	Speed control	Go-on	Single	100	0	1	1	1000	0	CW
Reverse	2	Absolute	Speed control	End	Repeat	-100	0	2	1	2000	0	CW

▷ Program



Program 3.4 Speed Control

3.1.4 Speed/Position Switching Control

- ▶ The setting axis by positioning start carries out the speed control and is switched from speed control to position control when speed/position switching signal is entered to the positioning module inside or outside, and then carries out the positioning as much as goal transfer amount.
- ▶ With Speed/Position switching control, it is available to operate to the forward direction and reverse direction.

Direction Setting	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dec.no.	Operation speed [pls/s]	Dwell time [ms]	Circle interpolation direction
Forward	1	Relative	Speed	Go-on	Single	1000	0	1	1	1000	100	CW
Reverse	2	Relative	speed	End	Repeat	-1000	0	2	1	2000	100	CW

The item that does not affect —→

- ▷ Direction of Speed/Position switching control (forward/reverse) shall be determined by the sign of position address.

(In this case, all is processed by Absolute method regardless of Absolute/Relative method.)

*1 (forward direction) : when position address is positive (+)

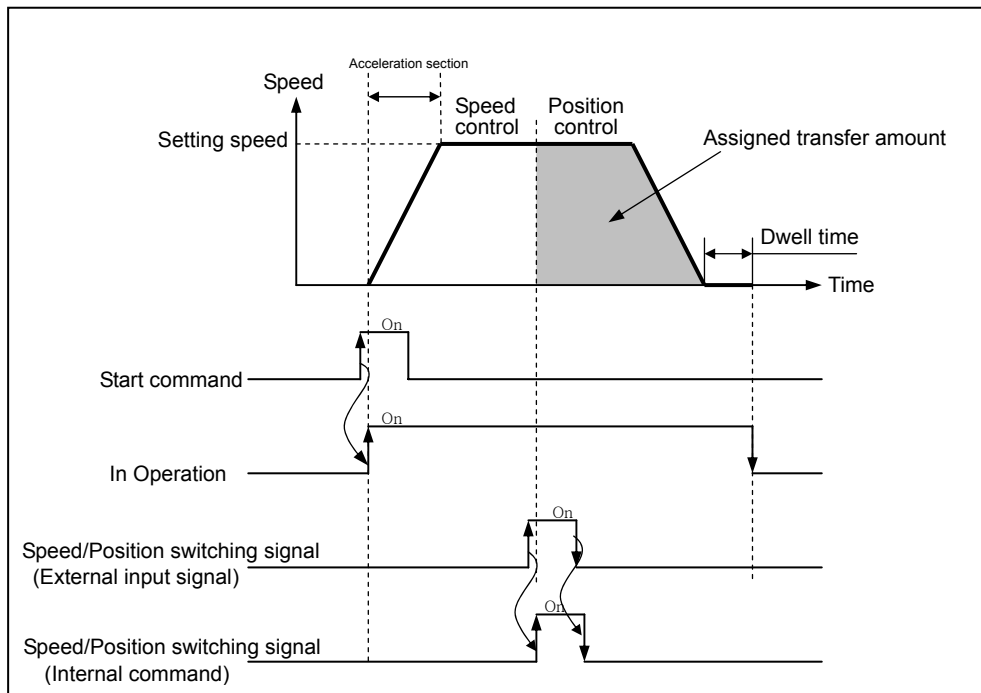
*2 (reverse direction) : when position address is negative (-)

- ▶ According to the selection of position indication ("indication"/"no indication") from "**Position Indication during Equal speed operation**" of **Extended parameter**, the current position shall be indicated differently.

Position indication "indication" : When switching to position control in the state that the origin is determined at speed control and the current position is indicated, it operates from "0" to Goal position.

Position indication "no indication" : When switching to position control in the state that the origin is not determined at speed control and the current position is indicated as "0" , it operates from "0" to Goal position.

- ▶ Operation Timing



- ▷ Program

Program is same as Program 3.4.

3.1.5 Position/Speed Switching Control

- ▶ The setting axis by positioning start carries out the position control and is switched from position control to speed control when position/speed switching signal is entered to the positioning module inside, and then it stops by deceleration stop or SKIP operation or continues next operation.
- ▶ Position/Speed switching control can be operated to the forward direction and reverse direction.

Direction Setting	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circle interpolation direction
Forward	1	Absolute	Speed	Go-on	Single	10000	0	1	1	500	100	CW
Reverse	2	Absolute	Speed	End	Repeat	-10000	0	2	1	600	200	CW

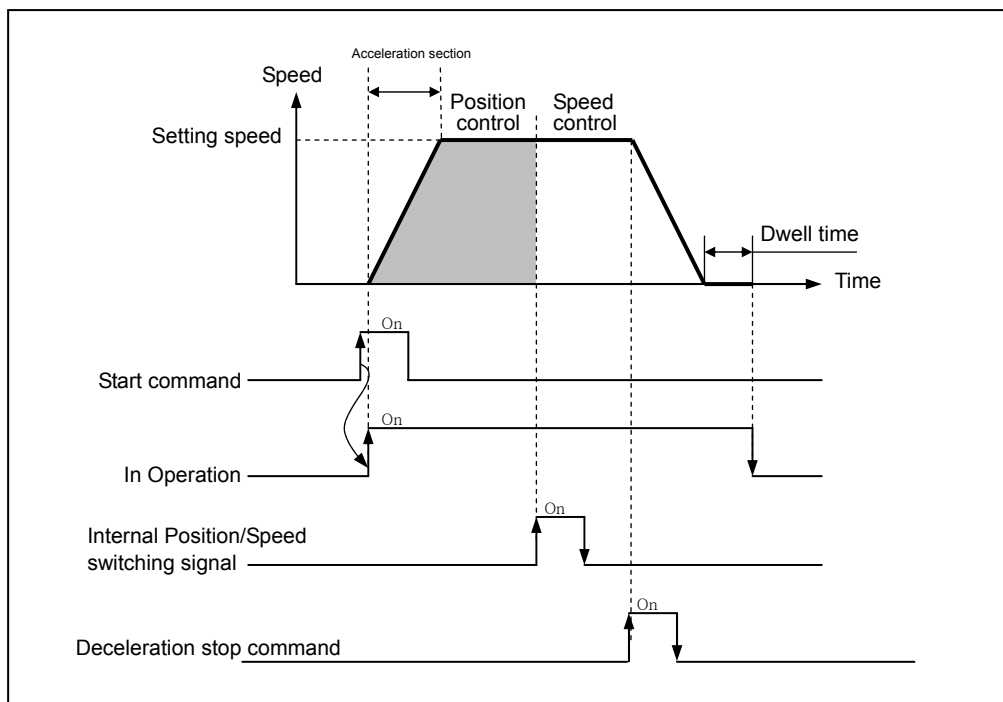
The items that does not affect _____

- ▷ The direction of Position/Speed switching control (forward/reverse) shall be determined by the sign of position address.

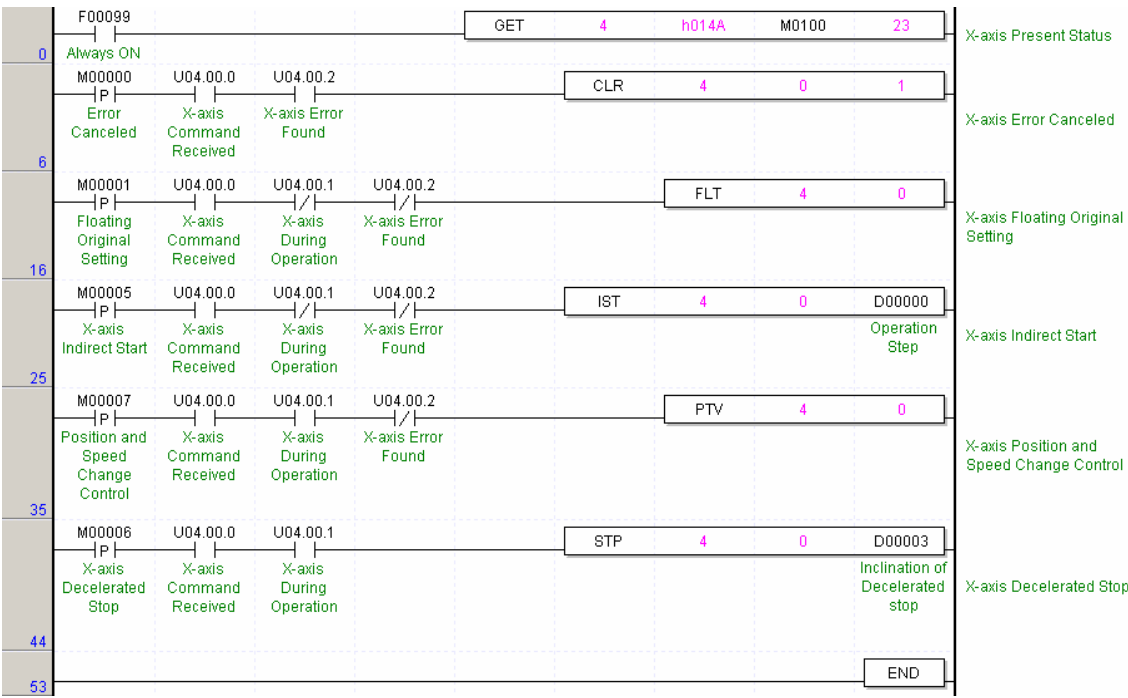
*1 (forward direction) : when position address is positive(+)

*2 (reverse direction) : when position address is negative(-)

▶ Operation Timing



▷ Program



Program 3.5 Position/Speed Switching Control

3.2 Operation Mode

- ▶ Operation mode describes various configuration for how to operate the positioning data using several operation step no. and how to determine the speed of position data.
- ▶ Operation mode types are as follows.

Control method	Operation pattern	Operation method	Others
Position control	End	Single	
	End	Repeat	
	Go-on	Single	
	Go-on	Repeat	
	Continuous	Single	■ Linear/Circular interpolation function is not used.
	Continuous	Repeat	■ Linear/Circular interpolation function is not used.
Speed control	End	Single	■ Linear/Circular interpolation function is not used.
	Go-on Continuous	Single Repeat	■ Not available

- ▶ Operation mode shall be set from PLC Program or Operation data of Software Package.
- ▶ Operation data can be set up to 400 from operation step no. 1 ~ 400 at each axis.

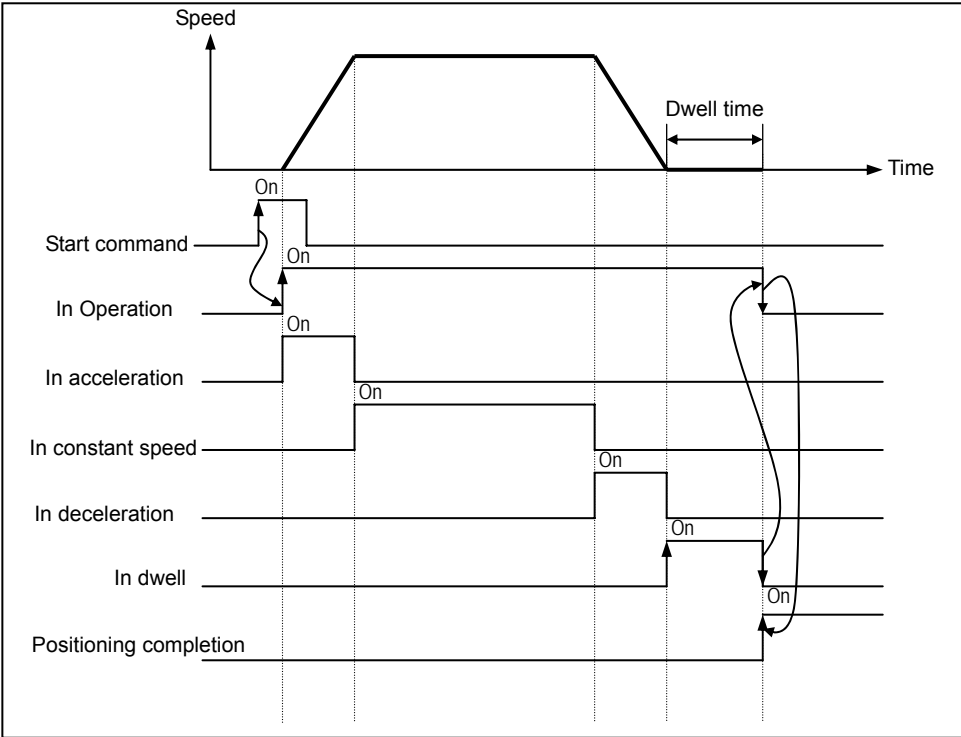
Type of Operation data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circle interpolation direction
Setting range/Type	1 ~ 400	Absolute relative	Position speed	End go-on conti.	Single repeat	- 2147483648 ~ 2147483647	-2147483648 ~ 2147483647	0 ~ 65535	1 ~ 4	0 ~ 1000000	0 ~ 50000	CW,CCW

- ▶ With one time start command, positioning operation method by one operation step positioning data and positioning operation method by several operation step in order shall be determined by operation mode of each positioning data set by the operator.

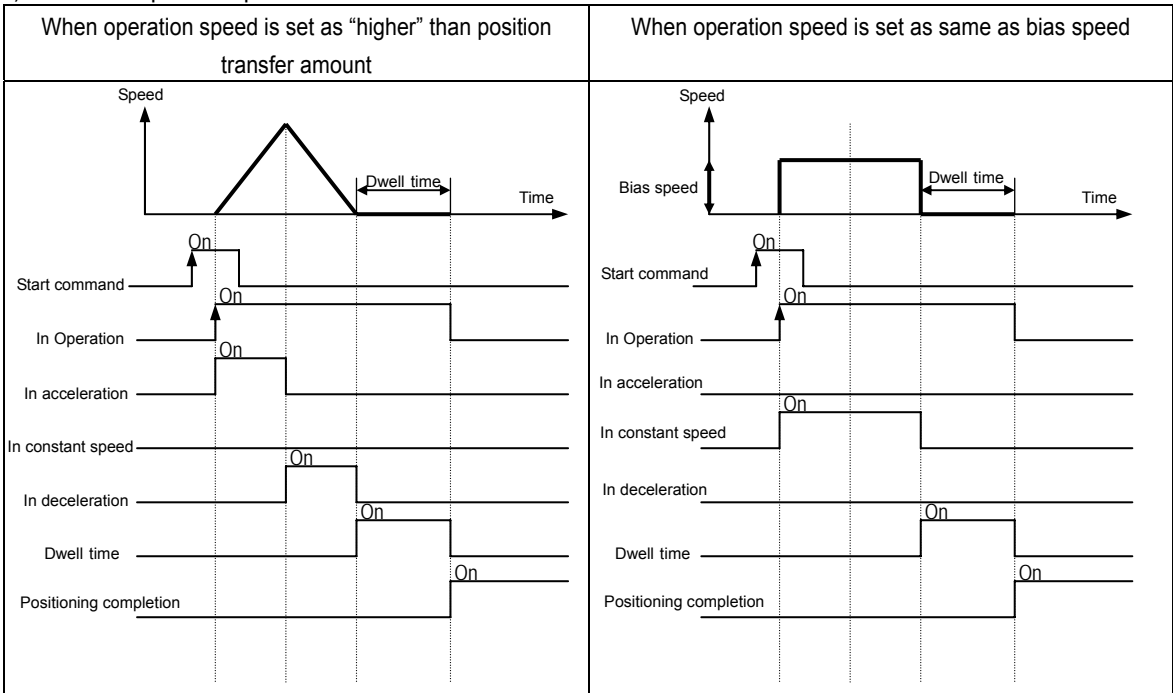
3.2.1 End Operation (Single)

- 1) With one time start command, the positioning to the goal position is executed and the positioning shall be completed at the same time as the dwell time proceeds.
- 2) The positioning completion of this operation mode can be used as operation mode of last positioning data of Go-on operation mode and Continuous operation mode.
- 3) Operation direction shall be determined by position address.
- 4) Operation action is trapezoid type operation that has acceleration, constant, deceleration section according to the setting speed and position data but the operation pattern according to the setting value is as follows.

a) Forward operation pattern

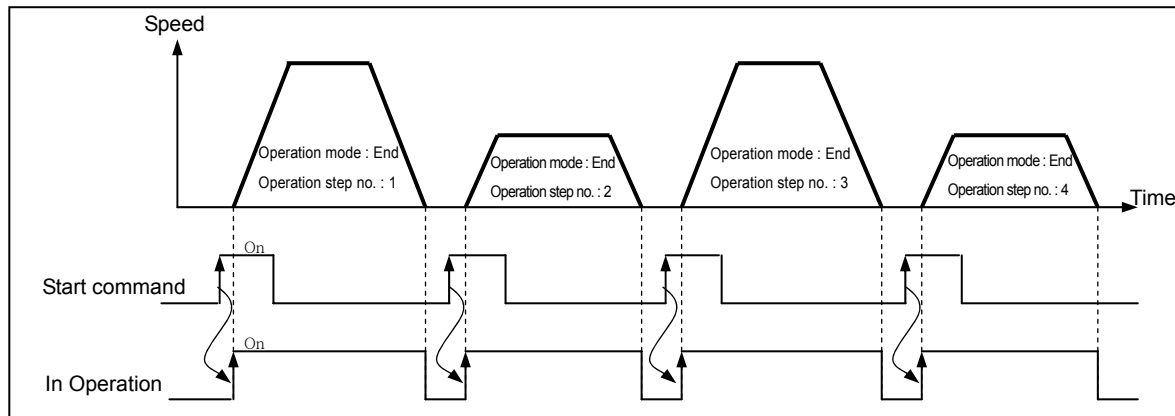


b) Abnormal operation pattern



[Example]

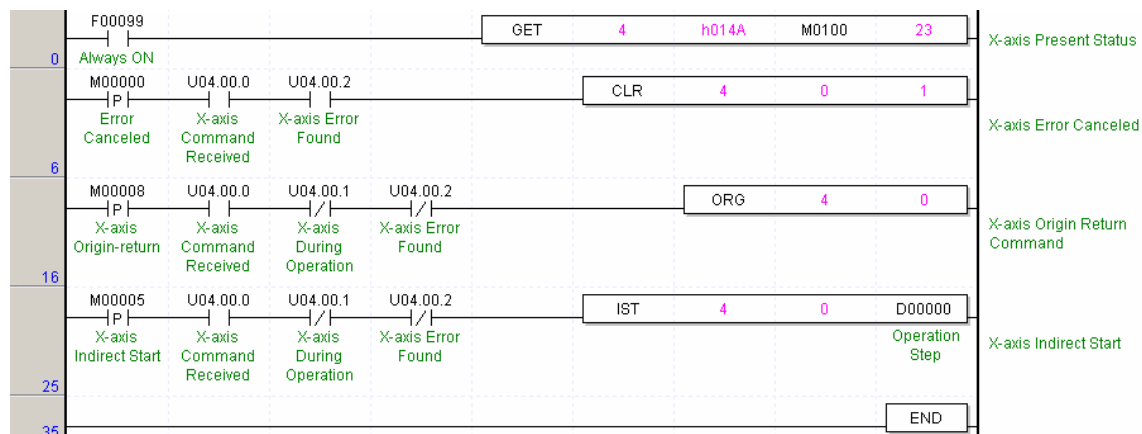
▷ Operation pattern



▷ Software Package Setting

Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circle interpolation direction
1	Absolute	Position	End	Single	10000	0	0	1	1000	0	CW
2	Absolute	Position	End	Single	20000	0	0	1	500	0	CW
3	Absolute	Position	End	Single	30000	0	0	1	1000	0	CW
4	Absolute	Position	End	Single	40000	0	0	1	500	0	CW

▷ Program



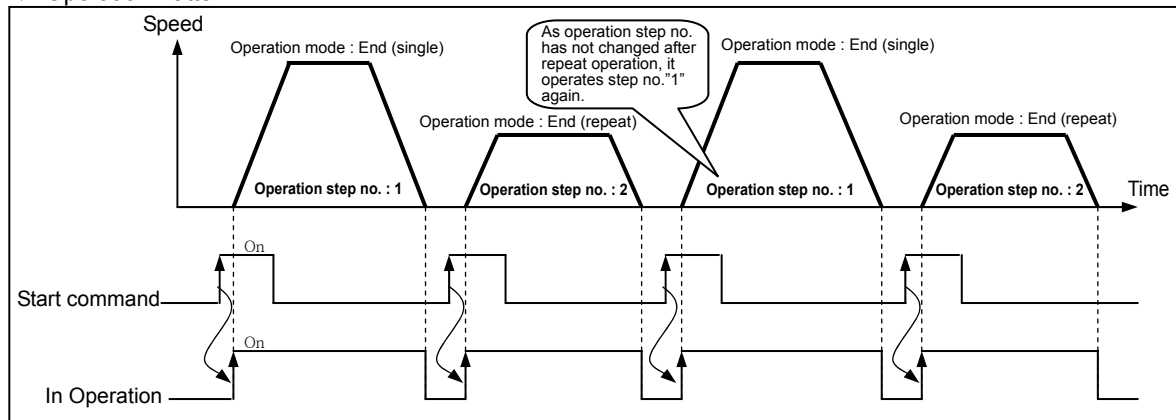
Program 3.6 End Operation

3.2.2 End Operation (Repeat)

- 1) With one time start command [APM_IST: rising edge ↑], the positioning to the goal position is executed and the positioning shall be completed at the same time as the dwell time proceeds.
- 2) The operation type of Repeat operation mode is same as that of Single operation but the different thing is to determine next operation by operation step no. assigned by repeat step no. change command after positioning completion of Repeat operation mode.
- 3) Therefore, if Repeat step no. change command was not executed, the step no. "1" shall be assigned after positioning completion of Repeat operation mode and operated at next Start command. Thus, this operation can be used for the structure that several operation steps are repeated.
- 4) In case that operation step is set as the value except "0" (1~400) for Indirect Start, the positioning operation shall be done with the setting step no. regardless of the current operation step no. But, if the step no. is set as "0", the positioning operation shall be done with the current step no. changed by Repeat operation mode.
- 5) Operation direction shall be determined by position address.
- 6) Repeat operation step no. change command is available to execute during operation.

[Example 1] When operating only by Start Command [when setting the step no. as "0" by indirect start]

▷ Operation Pattern



▷ Software Package Setting

No. of program start command	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circle interpolation direction
1, 3	1	Absolute	Position	End	Single	10000	0	0	1	1000	0	CW
2, 4	2	Absolute	Position	End	Repeat	20000	0	0	1	500	0	CW
	3	Absolute	Position	End	Single	30000	0	0	1	2000	0	CW
	4	Absolute	Position	End	Repeat	40000	0	0	1	3000	0	CW

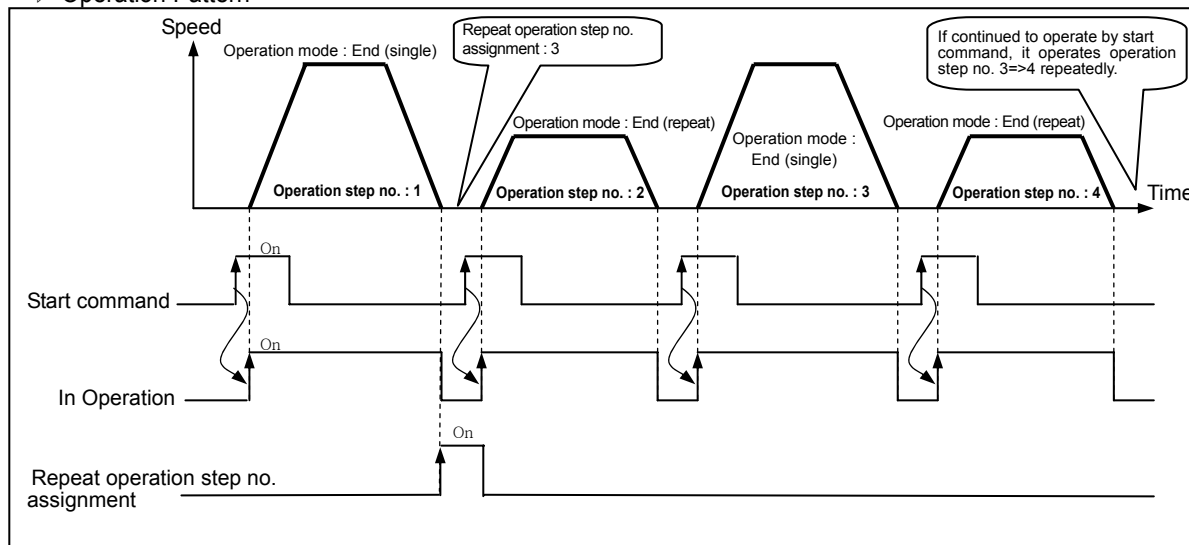
Operation step 3, 4 does not start.

▷ Program

Program is same as Program 3.6.

[Example 2] When operating by Start command and Repeat operation step no. assignment [when setting the step no. as “0” by indirect start]

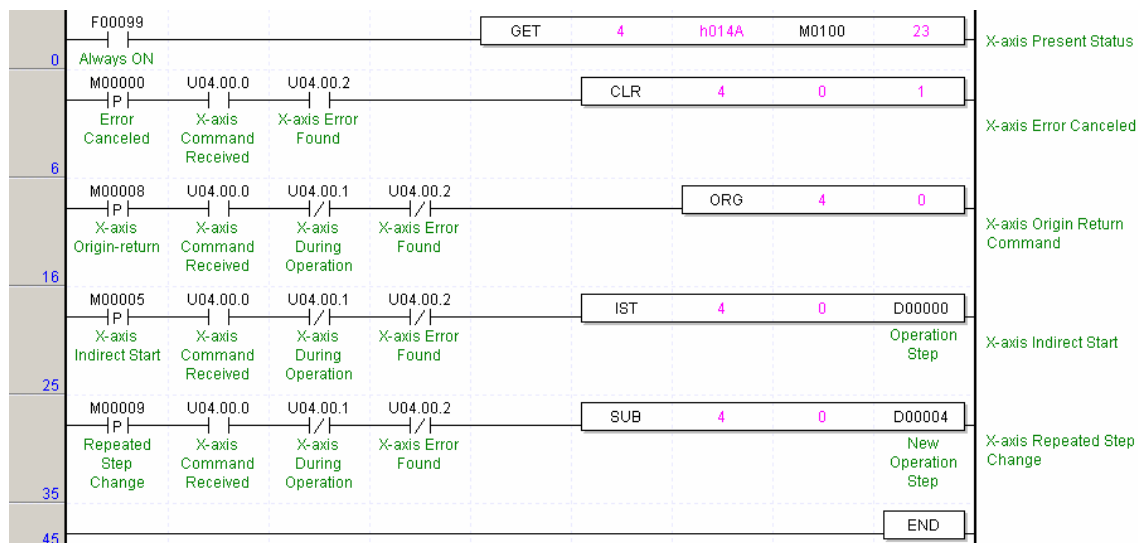
▷ Operation Pattern



▷ Software Package Setting

No. of program start command	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec no.	Operation speed [pls/s]	Dwell time [ms]	Circle interpolation direction
1	1	Absolute	Position	End	Single	10000	0	0	1	1000	0	CW
2	2	Absolute	Position	End	Repeat	20000	0	0	1	500	0	CW
The change of the number by Repeat operation step no. assignment []												
3	3	Absolute	Position	End	Single	30000	0	0	1	1000	0	CW
4	4	Absolute	Position	End	Repeat	40000	0	0	1	500	0	CW

▷ Program



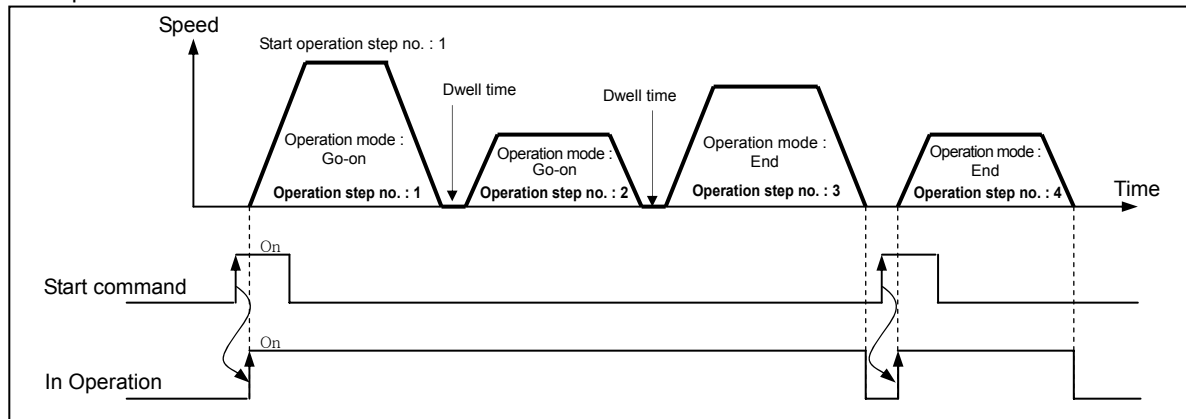
Program 3.7 End Operation (Repeat Operation Step Number Change)

3.2.3 Go-on Operation

- 1) With one time Start command, the positioning to the goal position of operation step is executed and the positioning shall be completed at the same time as dwell time proceeds and without additional start command, the positioning of operation step for (current operation step no. +1) shall be done.
- 2) Go-on operation mode is available to execute several operation step in order.
- 3) Operation direction shall be determined by position address.

[Example]

▷ Operation Pattern



▷ Software Package Setting

No. of program start command	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec no.	Operation speed [pls/s]	Dwell time [ms]	Circle interpolation direction
1	1	Absolute	Position	Go-on	Single	10000	0	0	1	1000	0	CW
	2	Absolute	Position	Go-on	Single	20000	0	0	1	500	0	CW
	3	Absolute	Position	End	Single	30000	0	0	1	800	0	CW
2	4	Absolute	Position	End	Single	40000	0	0	1	500	0	CW

▷ Program

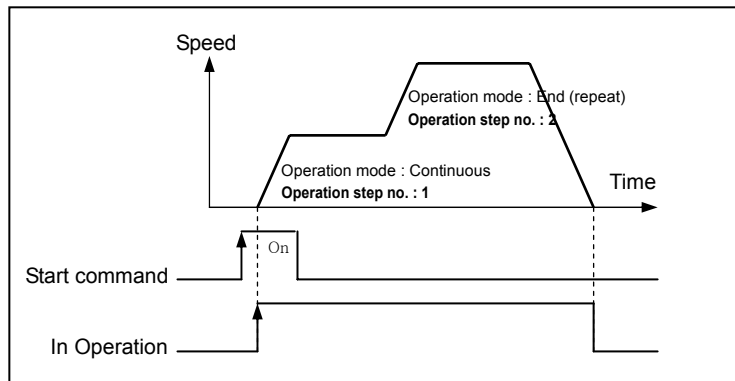
Program is same as Program 3.6.

3.2.4 Continuous Operation

- 1) With one time Start command, the positioning for operation step set by continuous operation mode is executed to the goal position without stop and the positioning shall be completed at the same time as dwell time proceeds.
- 2) If you want to operate with the position and speed of next step before the operation step that is active currently reaches the goal position, the operation by Next Move continuous operation command is available.
- 3) With Next Move continuous operation command, the operation in the acceleration, constant speed, deceleration section of Continuous operation is available.
- 4) Operation direction shall be determined by position address.

[Example]

▷ Operation Pattern



▷ Software Package Setting

No. of program start command	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec no.	Operation speed [pls/s]	Dwell time [ms]	Circle interpolation direction
1	1	Absolute	Position	Continuous	Single	10000	0	0	1	500	0	CW
	2	Absolute	Position	End	Repeat	20000	0	0	1	1000	0	CW

▷ Program

Program is same as Program 3.6.

3.3 Positioning Start

- ▶ When the operation stops during position control action by stop cause, the positioning is carried out at the stopped position address value by starting again.
- ▶ There are 8 kinds of start : 1) General start command, 2) Simultaneous start command, 3) Synchronous start command, 4) Linear interpolation start command, 5) Circular interpolation start command, 6) Homing start command, 7) Jog start command, 8) Inching start command.
- ▶ When you carries out the Start, the signal in operation should be "OFF".

3.3.1 General Start

1) Program Start

XGT has Indirect start (IST) and Direct start (DST) and the start by Refresh area bit (Uxx.01.0, Uxx.01.5, Uxx.01.A).

2) Start by External Input Signal

(1) External command

- A) If setting the external start of extended parameter as "ENABLED" and the command selection as "START", the positioning operation data starts according to the current operation step no. whenever the external input signal is "ON".
- B) If setting the external start of extended parameter as "ENABLED" and the command selection as "JOG", the Jog high speed operation (forward rotation) is carried out while the external input is "ON".

(2) External auxiliary command

If setting the external start of extended parameter as "ENABLED" and the command selection as "JOG", the Jog high speed operation (reverse rotation) is carried out while the external auxiliary command input is "ON".

3.3.2 Synchronous Start

- 1) It carries out the synchronous start operation for 2 axis, 3 axis positioning operation data by internal synchronous start command according to the axis information and the setting step.
In this case, the external synchronous start of extended parameter should be set as "DISABLED".
- 2) If stop command is entered during synchronous start operation, reduce the speed and stop the corresponding axis and if the internal synchronous start command is entered again, the positioning operation is carried out according to Relative coordinate or Absolute coordinate in case that the synchronous start setting step no. is the current operation step no.
- 3) It carries out the synchronous start operation for 2 axis, 3 axis positioning operation data by external input signal according to the axis information and the setting step.
- 4) Set the external synchronous start of the corresponding axis for the synchronous start of extended parameter as "ENABLED" and execute the internal synchronous start command first. Then it shall be "the state in operation" and if the external synchronous start input signal is "ON", it starts synchronously for the positioning operation.

3.3.3 Synchronous Start

1) Synchronous start by Position

- (1) Synchronous Start by Position (SSP) command is carried out only in case that the main axis is in the origin determination state.
- (2) SSP command starts by the synchronization of the subordinate axis according to the current position of the main axis.
- (3) SSP carries out the SSP command at the subordinate axis.
Thus, if setting the command axis and the main axis equally, Error 347 will occur.
- (4) If SSP command is executed, it becomes the state in operation and the actual operation is carried out at the subordinate axis where the current position of the main axis is the setting position of the position synchronous start.
- (5) With position start, the operation step no. of subordinate axis shall be determined by setting the start step no. of the main axis.
- (6) In case of cancellation after executing the SSP command at the subordinate axis, if you execute the stop command, the SSP command shall be released.

2) Synchronous start by Speed

- (1) Synchronous Start by Speed (SSS) command starts to operate by the speed synchronization of the subordinate axis when the main axis starts according to the Synchronous Start by Speed rate.
- (2) Even if the subordinate axis is set as position control mode, the start and the stop repeats at the same time with the operation of main axis. The rotation direction of the subordinate axis is the same as the rotation direction of the main axis.
- (3) If SSS command is executed at the subordinate axis, it becomes the state in operation and maintains the state in SSS operation until the SSS command is released by stop command.
- (4) When setting the Synchronous start by speed rate, the main axis rate \geq the subordinate axis rate. If not, error 356 will occur.

$\text{Synchronous start by speed rate} = \frac{\text{Subordinate axis rate}}{\text{Main axis rate}}$

- (5) If the speed synchronization command is executed in the state that M code is "ON", Error 353 will occur.
Thus, release the M code before using.
- (6) The setting of main axis is available for X, Y, Z axis, Encoder setting.
- (7) For speed synchronization by encoder input, please refer to Article 3.7.2 Encoder Operation pulse input..

3.3.4 Linear Interpolation Start

1) 2 axis Linear Interpolation Control

- (1) This function exists only for 2 axis or 3 axis positioning module and means the command to operate the 2 axis transfer path to be linear.
- (2) As 2 axis act synchronously at the 2 axis linear interpolation start, cares should be taken in using.
- (3) When 2 axis linear interpolation start command is executed, it is divided into the main axis and the subordinate axis by the positioning transfer amount of 2 axis (X-Y, Y-Z, X-Z).

; The speed data of the subordinate axis is processed as the following operation formula.

$\text{Subordinate axis speed} = \frac{\text{Main axis speed} \times \text{Main axis distance}}{\text{Main axis distance}}$

▷ Terminology Definition

Main axis : the axis that has a large positioning transfer amount of the corresponding operation step no. from 2 axis (X-Y, Y-Z, X-Z).

Subordinate axis : the axis that has a small positioning transfer amount of the corresponding operation step no. from 2 axis (X-Y, Y-Z, X-Z).

; In this case, the speed, acceleration/deceleration time, bias speed of the subordinate axis shall be re-calculated.

- (4) The available operation mode is limited as End operation, Go-on operation.
- (5) The operation speed of the subordinate axis during 2 axis linear interpolation operation is not indicated.

2) 3 axis Linear Interpolation Control

- (1) This function exists only for 3 axis positioning module and means the command to operate the 3 axis transfer path to be linear.
- (2) As 3 axis (X-Y-Z) act synchronously at the 3 axis linear interpolation start, cares should be taken in using.
- (3) The available operation mode is limited as End operation, Go-on operation.
- (4) The operation speed of subordinate axis during the 3 axis linear interpolation operation is not indicated.
- (5) For 3 axis linear interpolation operation, if the axis information is set as "X, Y, Z" and the command axis selected from 3 axis executes the linear interpolation command, 3 axis will carry out the linear interpolation operation synchronously. In this case, the 3 axis operation step no. that carries out the interpolation operation shall be the same step no. for interpolation operation.
- (6) The division of the main axis and the subordinate axis is the same as the case of 2 axis linear interpolation operation.

3.3.5 Circular Interpolation Start

- ▶ This function exists only for 2 or 3 axis positioning module and means the command to operate the 2 axis transfer path to be circular.
- ▶ As 2 axis (X-Y, Y-Z, X-Z) act synchronously at the 2 axis circular interpolation start, cares should be taken in using.
- ▶ The circular interpolation operation has 2 types of interpolation method : the method by center point and the method by Middle point and it is required to set the circular interpolation method in advance from common parameter. (S/W Package or PLC program)

Parameter items	Parameter content	Setting content
Common parameter	Circular interpolation method	0: middle point, 1: center point

1) Circular Interpolation by Center point

- (1) For the circular interpolation operation by the center point, cares should be taken in setting the circular interpolation auxiliary data (center point).
- (2) The case that the setting value of circular interpolation aux. point is used as actual radius for operation is shown as below.

(This is the case that one of 2 axis circular interpolation aux. point is set as "0".)

- ▶ When X axis goal position : 0.0um, Y axis goal position : 0.0um, the action of the case that X axis center point : -10000.0um, Y center point : 0.0um, rotation direction : CW, main axis : X, subordinate axis : Y axis is as follows.
- ▶ Software Package Setting

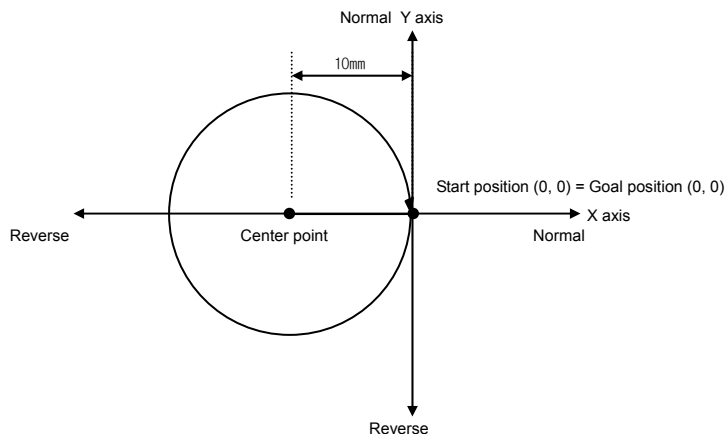
<Operation Data>

Items of Position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [um]	Circular interpolation aux. Point[um]	M code	Acc./Dec no.	Operation speed [mm/m]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Relative	Position	End	Single	0	-10000.0	0	1	100.00	0	CW
Y Setting	1	Relative	Position	End	Single	0	0.0	0	1	100.00	0	CW

<Command Window>

Circular interpolation operation	Step	1	Execution
	Subordinate axis	Y axis	

<Operation Pattern>



(3) The case that the setting value of circular interpolation aux. point is not used as actual radius for operation is shown as below.

▷ When X goal position : 0.0um, Y axis goal position : 0.0um, the action of the case that X axis aux. point : -10000.0um, Y aux. point :10000.0um, rotation direction :CW, main axis :X, subordinate axis :Y is as follow.

▷ Software Package Setting

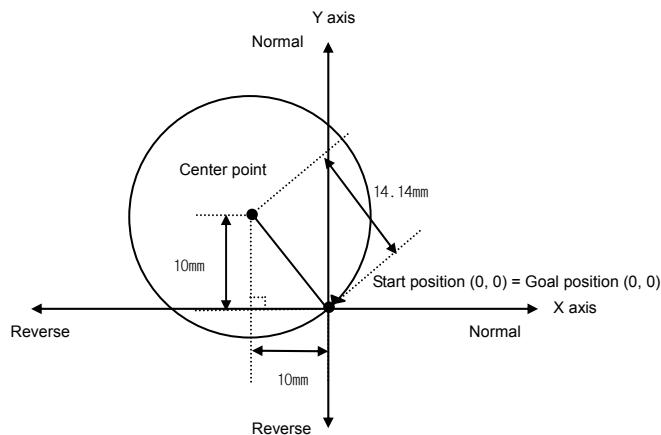
<Operation Data>

Items of Position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [um]	Circular interpolation aux. Point[um]	M code	Acc./dec no.	Operation speed [mm/m]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Relative	Position	End	Single	0.0	-10000.0	0	1	100.00	0	CW
Y Setting	1	Relative	Position	End	Single	0.0	10000.0	0	1	100.00	0	CW

<Command Window>

Circular interpolation operation	Step	1	Execution
	Subordinate axis	Y axis	

<Operation Pattern>



▷ If found the radius of circular interpolation from the above operation pattern,

$$\sqrt{2} \times 10 = 1.414 \times 10\text{mm} = 14.14\text{mm}$$

Thus, with this radius (14.14mm), it carries out the circular interpolation operation. (Actual diameter shall be 28.28mm.)

▷ The formula that finds the circular interpolation radius by center point is as follows according to Pythagorean theorem.

$$\text{Circular interpolation radius} = \sqrt{(\text{Aux.1})^2 + (\text{Aux.2})^2}$$

2) Circular Interpolation by Middle point

- (1) In case of circular interpolation operation by middle point, as the setting value of 2 axis circular interpolation aux. point becomes the middle point of X axis and Y axis, respectively for the circular interpolation operation, cares should be taken in using.
- (2) For further information, please refer to Article 3.1.2 Interpolation Control.
- (3) This carries out the circular interpolation from Start position to Goal position via the assigned middle point position.
- (4) The circle is made around the crossing point created by vertical bisection of Start position and Middle point position or Middle point position and Goal position.
- (5) The circular interpolation control can not be used with control unit "Degree".
- (6) Transfer direction shall be determined automatically by the assigned goal position of 2 axis and circular interpolation aux. point.
- (7) If the 2 axis middle point is set wrong, the circular interpolation radius deviates from the area available to operate and Error 286 will occur.

3.4 Positioning Stop

Here describes the causes to stop the axis during positioning.

3.4.1 Stop Command and Stop Causes

The stop command and stop causes are as follow and is divided into Stop per axis and Synchronous stop of all axis.

1) In case of Stop command and Stop causes per axis, only the axis that has the stop command "ON" or the stop causes will stop.

But in case that there is Stop command and Stop cause on one axis during linear interpolation/circular interpolation control, the axis of interpolation control will stop.

2) In case of Synchronous stop command and Stop causes of all axis, both axis will stop at the point that there is the Stop command "ON" or stop cause.

Stop cause		Positioning ^{*1}	Homing ^{*2}	Jog operation	Manual pulse generator (encoder) operation	Stop axis	Axis action state after stop command ^{*3}	M code "On" Signal state
By parameter setting ^{*4}	Exceeds Soft high limit	Prompt stop	No detection	Prompt stop		Per axis	Error state (error 501) Output prohibited	No change
	Exceeds Soft low limit	Prompt stop	No detection	Prompt stop		Per axis	Error state (error 502) Output prohibited	No change
By sequence program ^{*5}	Deceleration stop command	Deceleration stop	Deceleration stop	Error 322 (operation continue)	Error 323 (operation continue)	Per axis	In deceleration	No change
	Emergency stop command	Prompt stop				All axis	Error state (error 481) Output Disabled	"OFF"
By external signal	External high limit "On"	Prompt stop	Prompt stop (forward direction)		Prompt stop	Per axis	Error state(error492) ^{*6} Output Disabled	No change
	External low limit "On"	Prompt stop	Prompt stop (reverse direction)		Prompt stop	Per axis	Error state(error493) ^{*6} Output Disabled	No change
	Emergency stop "On"	Prompt stop				All axis	Error state (error491) Output prohibited	"OFF"
By software package	Dece. Stop command	Deceleration stop	Deceleration stop	Error 322 (operation continue)	Error 323 (operation continue)	Per axis	In stop	No change

Notes

*1 : Positioning is the position control, speed control, position/speed switching control, speed/position switching control by the positioning data.

*2 : The external input signal (near point and origin signal) does not affect the positioning control in the state of homing completion.

*3 : If the axis action state after stop is "output disabled", execute the output disabled release command. And the output disabled shall be released and the error no. will be reset.

*4 : Soft high/low limit by parameter can not be used in the speed control operation mode.

*5 : Sequence program means XGT program method.

*6 : Error 495 may occur according to rotation direction.

3.4.2 Stop Processing and Priority

1) Stop Processing

Deceleration stop command has different content of processing according to acceleration section, constant speed section and deceleration section of operation pattern.

(1) Deceleration/Constant speed section

► In case of deceleration stop by deceleration stop command, as the positioning operation is not completed by the setting goal position,

- ① positioning completion signal will not occur,
- ② After mode of M code mode does not have M code signal "ON".

If indirect start command (step no. = current step no.) occurs in the stop state afterward, Absolute method operation operates the residual position of the current operation step that is not outputted, and Relative method operation operates as much as the goal address.

(2) Deceleration section

► Even if deceleration stop command is executed in the deceleration section, the positioning completion signal and M code signal will occur same as normal stop.

► If deceleration stop command is executed in the deceleration section of Go-on operation mode and Continuous operation mode, the deceleration stop command is not processed and it carries out the positioning operation by the setting Go-on operation pattern and Continuous operation pattern of operation data.

2) Emergency Stop, External Input High/Low Limit Processing

► If Emergency stop command or external input high/low limit is entered during positioning control, the positioning control will stop and it becomes "output disabled" state and then error will occur.

3) Priority of Stop Processing

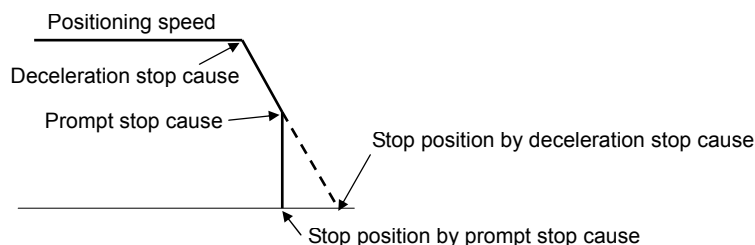
The priority of Stop Processing of positioning module is as follows.

Deceleration stop < Prompt stop

► If encounters the prompt stop cause in the deceleration section in positioning, the prompt stop processing will be done at that point. But if the prompt stop time is longer than deceleration time, it continues the deceleration stop processing even if the prompt stop cause occurs during deceleration stop processing.

Notes

► If the prompt stop cause occurs during deceleration stop, the processing is as follows.



► Prompt stop causes : ① Internal/external emergency stop, ② External input high/low limit, ③ Soft high/low limit

3.4.3 Interpolation Stop

- 1) If encounters stop command during interpolation operation (2 axis/3 axis linear interpolation, 2 axis circular interpolation), it carries out the deceleration stop.
- 2) If indirect start command is executed in the current step when resetting after deceleration stop, it continues the operation to the goal position of positioning operation data. In this case, the operation is carried out differently according to Absolute coordinate and Relative coordinate.
- 3) The stop command during interpolation operation is available for internal deceleration stop and external deceleration stop.
- 4) The deceleration stop command should be executed in the main axis in interpolation operation.

3.4.4 Emergency Stop

- 1) If encounters the emergency stop while executing the start related command (indirect start, direct start, simultaneous start, synchronous start, linear interpolation start, circular interpolation start, homing start, jog start, inching start), it carries out the prompt stop.
- 2) Emergency stop has 2 kinds of method : Internal emergency stop and External emergency stop.
- 3) In case of internal emergency stop, error 481 will occur and in case of external emergency stop, error 491 will occur.
- 4) In case of emergency stop, as it becomes output disabled state and origin unsettled state, it is required to execute positioning (homing, floating origin, current position preset) in case of operating by Absolute coordinate or in the positioning state in order to carry out the positioning operation.
- 5) For 2 axis, 3 axis module, 2 axis or 3 axis carries out Emergency stop synchronously in case of emergency stop, thus, it is required to use Emergency stop signal of SERVO driver when using the individual emergency stop in the SERVO driver.

3.5 Reset after Positioning Stop

1) Reset after Deceleration Stop Command

- (1) When encounters the deceleration stop command in Acceleration/Constant speed section,
 - ▶ First, deceleration stop and then carry out the positioning operation by operation step set at the indirect start.
 - ▶ In case of using with mode of M code mode, M code "On" signal should be "Off" to reset.
- (2) When encounters the Stop command in deceleration section,
 - ▶ If reset after deceleration stop, the next operation step of the current operation step no. will act..
 - But in case of Go-on operation and Continuous operation, the operation will continue by operation pattern without processing the deceleration stop command in the deceleration section.
 - ▶ In case of using with mode or after mode from M code mode, M code "On" signal should be "Off" to reset.

2) After internal emergency stop and external emergency stop,

- ▶ If encounters internal emergency stop and external emergency stop, the positioning module shall be ① output disabled state, ② origin unsettled state.
- ▶ Thus if ① release the output disabled ② settle the origin again (homing start, floating origin setting), and
- ▶ carry out the start, it carries out the reset from the setting operation step no.

3.6 Homing

- ▶ Homing is carried out to confirm the origin of the machine when applying the power.
- ▶ in case of homing, it is required to set homing parameter per axis.
- ▶ If the origin position is determined by homing, the origin detection signal is not recognized during positioning operation.

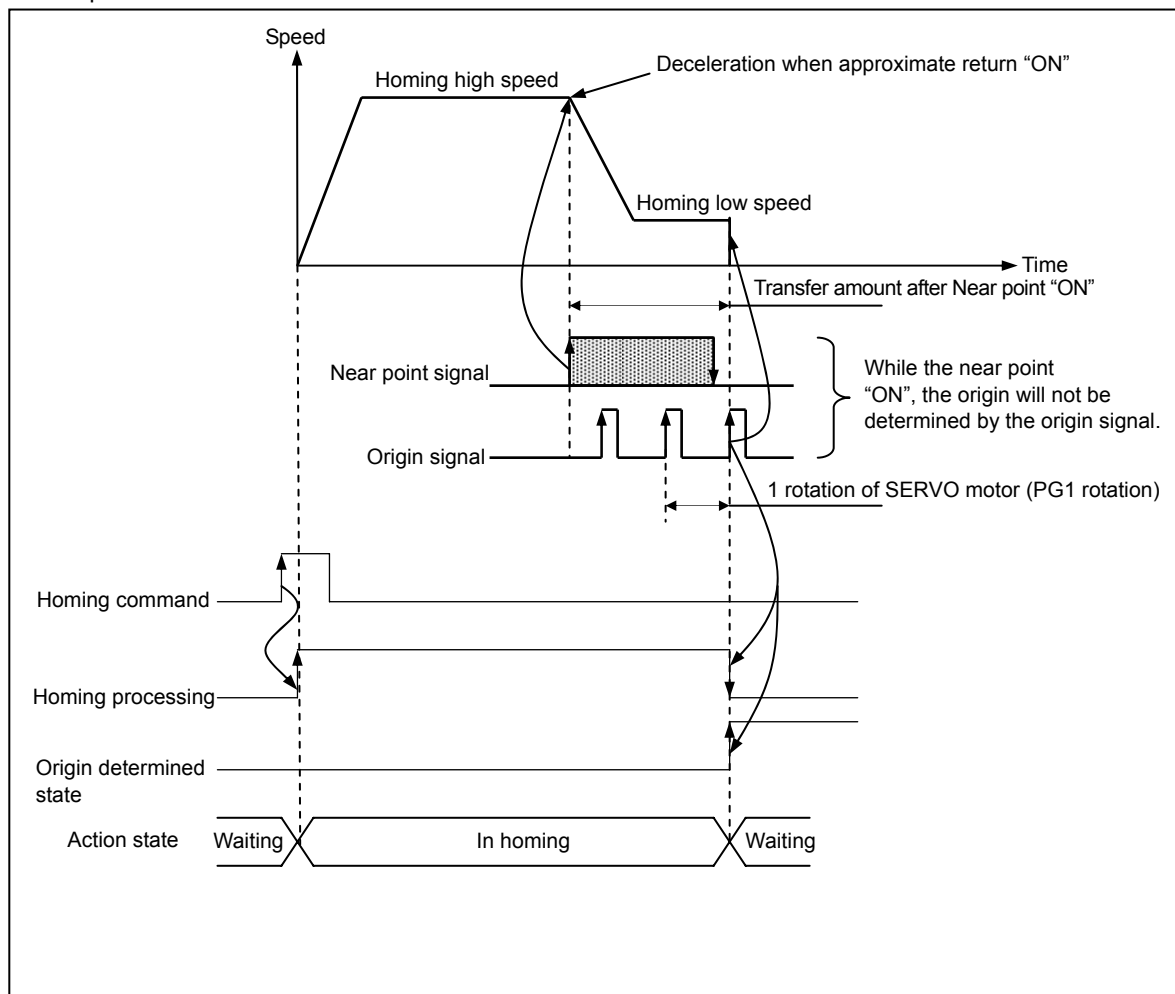
3.6.1 Homing method

- ▶ By near point (approach DOG)
 - Homing processing method by near point (approach DOG) has 3 kinds of methods as follows.
 - (1) Origin detection after near point "Off"
 - (2) Origin detection after deceleration when near point "On"
 - (3) Origin detection by near point
- ▶ By not using near point (approach DOG)
 - (1) Origin detection by origin and high/low limit
 - (2) High speed origin detection
 - (3) Origin detection by high/low limit
- ▶ The items that effects to the homing from Software Package parameter are as follows.
 - (1) Homing method
 - (2) Homing direction
 - (3) Origin compensation amount
 - (4) Homing speed (high speed, low speed)
 - (5) Origin address
 - (6) Homing dwell time
 - (7) Homing reset waiting time
 - (8) Homing acceleration/deceleration time
 - For further information, please refer to Article 5.3.

3.6.2 Origin Detection after Near Point Off

This is the method using the near point and origin signal and the action by homing command is as follows.

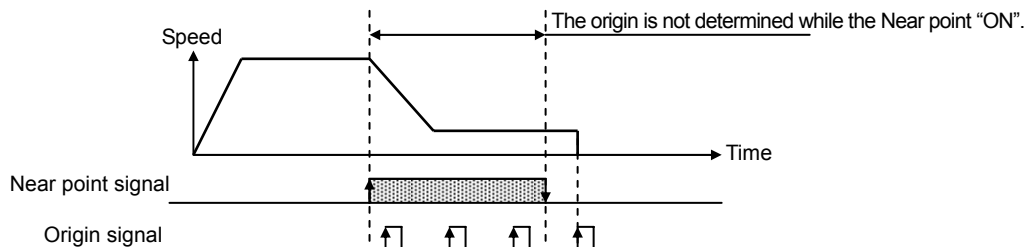
- (1) It accelerates to the setting homing direction and acts by homing high speed.
- (2) In this case, if near point as external input is entered, it decelerates and acts by homing low speed.
- (3) If origin signal as external signal is entered after the near point signal has changed from "On" to "Off", it stops.



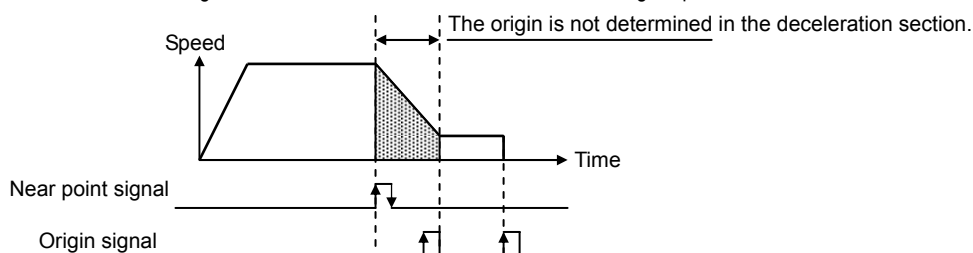
Notes

While near point signal maintains "On", the origin will not be determined by origin signal.

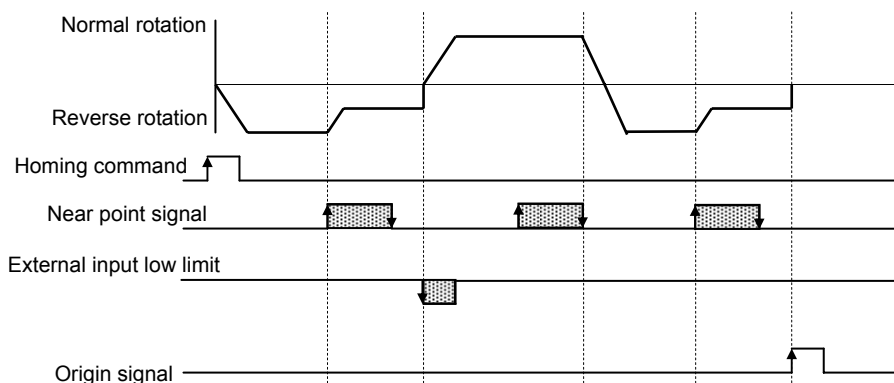
That is, when near point signal changes from "Off" to "On"(acceleration section -> homing high speed), from "On" to "Off" (deceleration section -> homing low speed) and then when the origin changes from "Off" to "On", the origin will be determined.



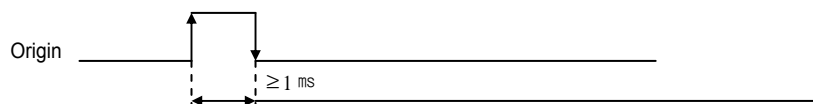
While the homing speed acts to the deceleration section by homing high speed after the near point signal is changed from "Off" to "On", from "On" to "Off", the origin will not be determined even if encounters the origin input.



If the near point signal is changed from "Off" to "On", from "On" to "Off" and encounters external high/low limit while waiting the origin input, the action is as follow.



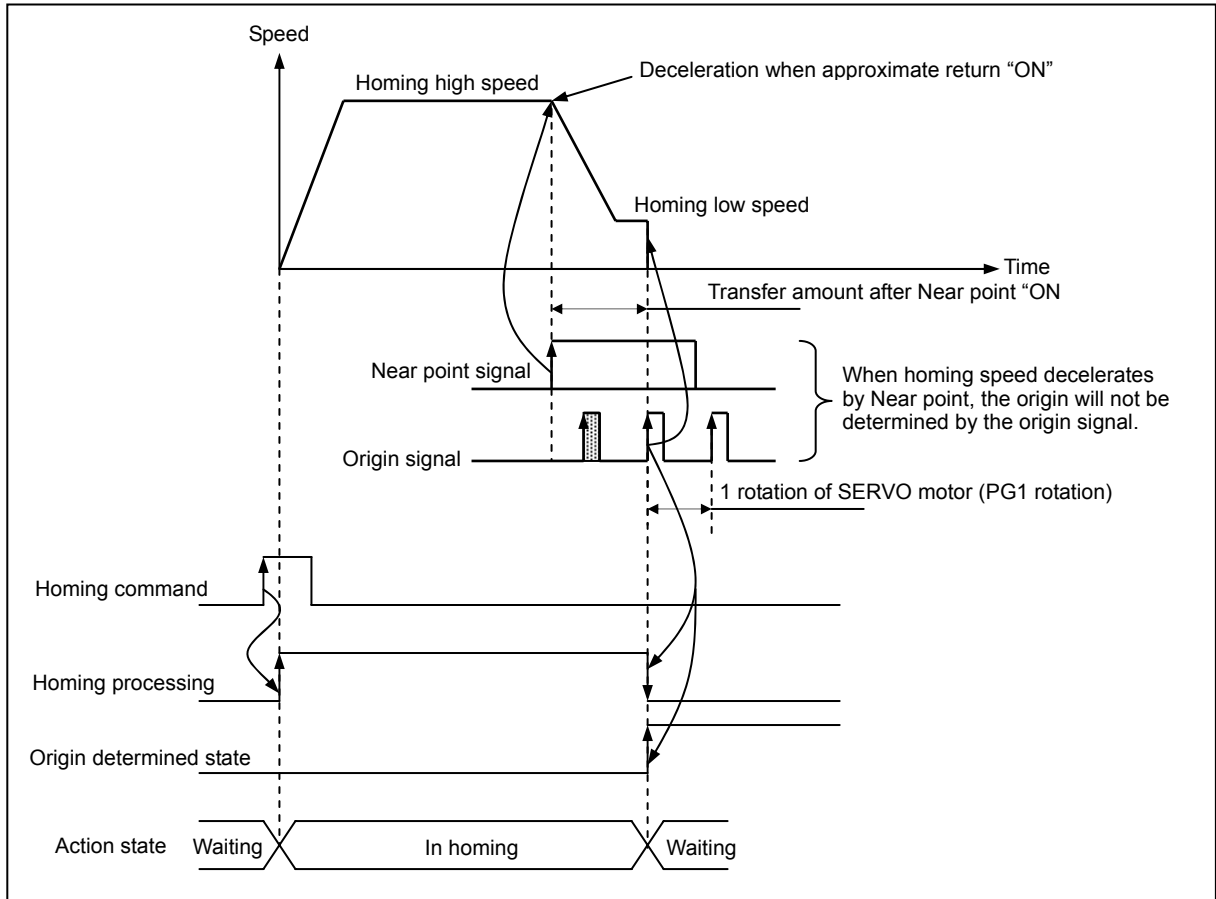
If "On" time of the origin is short, the positioning module can not recognize it.



3.6.3 Origin Detection after Deceleration when Near Point On

This is the method using the near point and origin signal and the action by homing command is as follows.

- (1) It accelerates to the setting homing direction and acts by homing high speed.
- (2) In this case, if near point as external input is entered, it decelerates and acts by homing low speed.
- (3) If encounters the origin signal as external input signal when the near point is "On" while the homing low speed is active, the origin shall be determined and it stops.

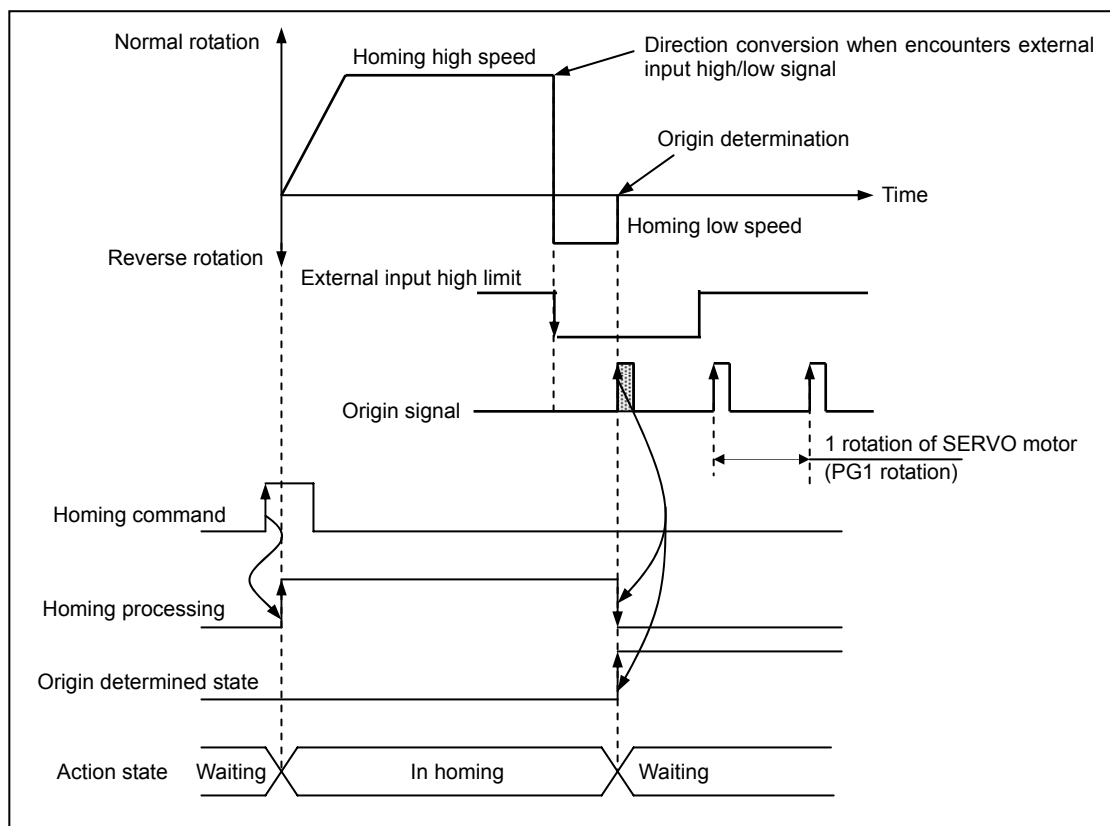


Notes

- 1) Once the near point signal is "On", when the homing speed acts from high speed to low speed via deceleration section, if the origin signal is entered in the state that the near point signal is "ON", the origin will be determined promptly. That is, when the homing speed decelerates, the origin will not be determined by the origin signal.
- 2) When encounters the external input high/low limit signal before origin after the near point signal has changed from "Off" to "On", the action will be the same as the method of Article 3..6.2.
- 3) If "On" time of origin signal is short, the positioning module can not recognize it.

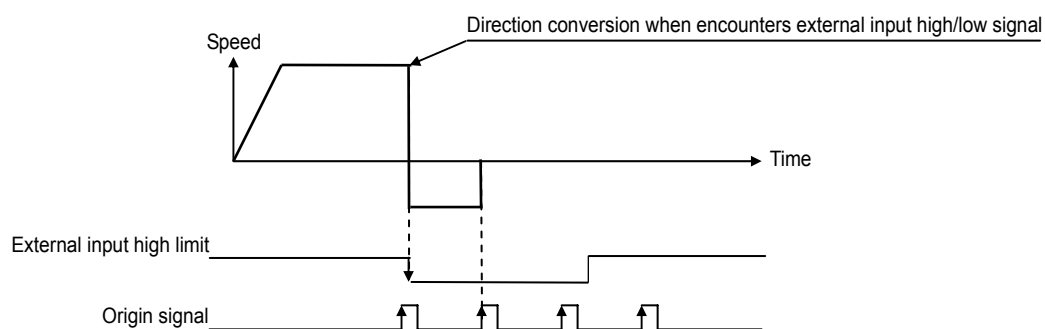
3.6.4 Origin Detection by Origin and High/Low Limit

This is the homing method using external input high/low signal and origin signal and is used in case of not using the near point signal.



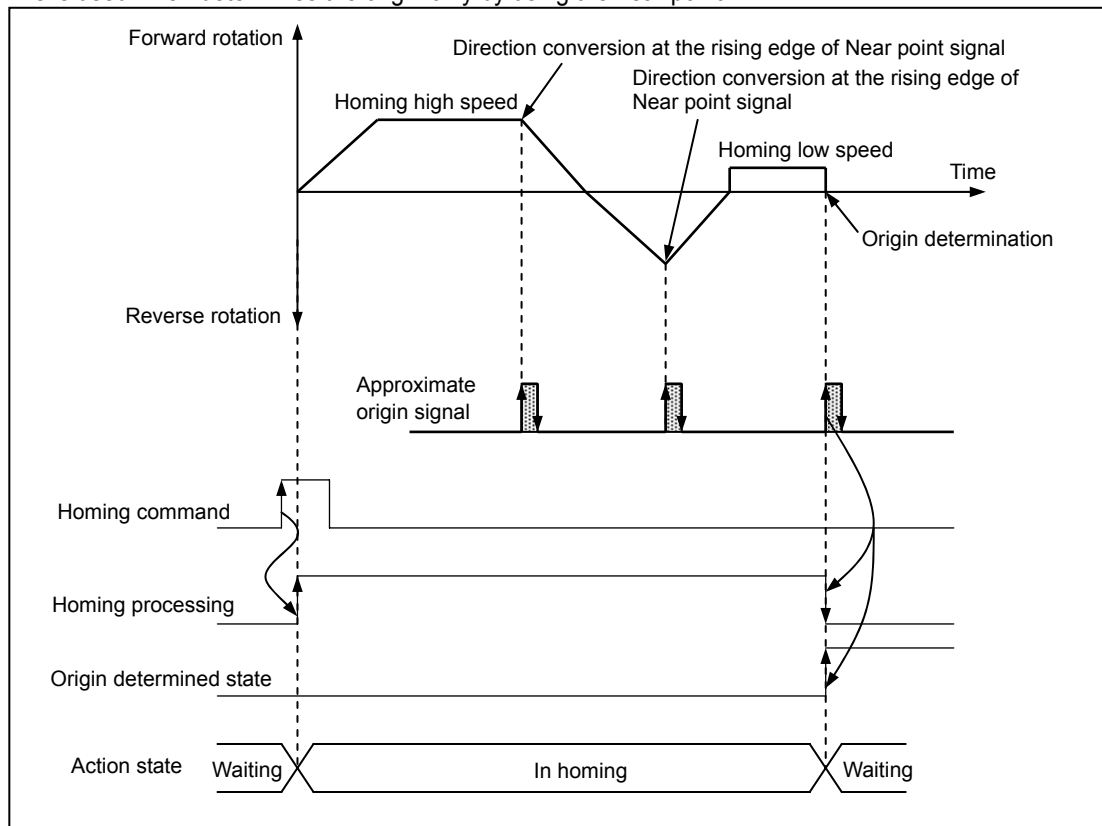
Notes

1. In case that origin signal is "ON" before entering the external input high/low limit signal, it carries out the homing low speed operation when the external input high/low limit signal is entered and when origin signal is "ON", the origin will be determined.



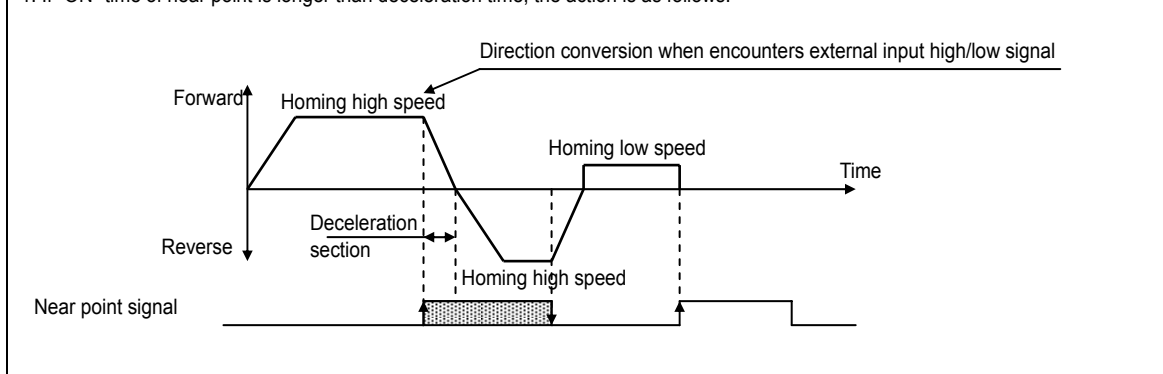
3.6.5 Origin Detection by Near Point

This is used when determines the origin only by using the near point.



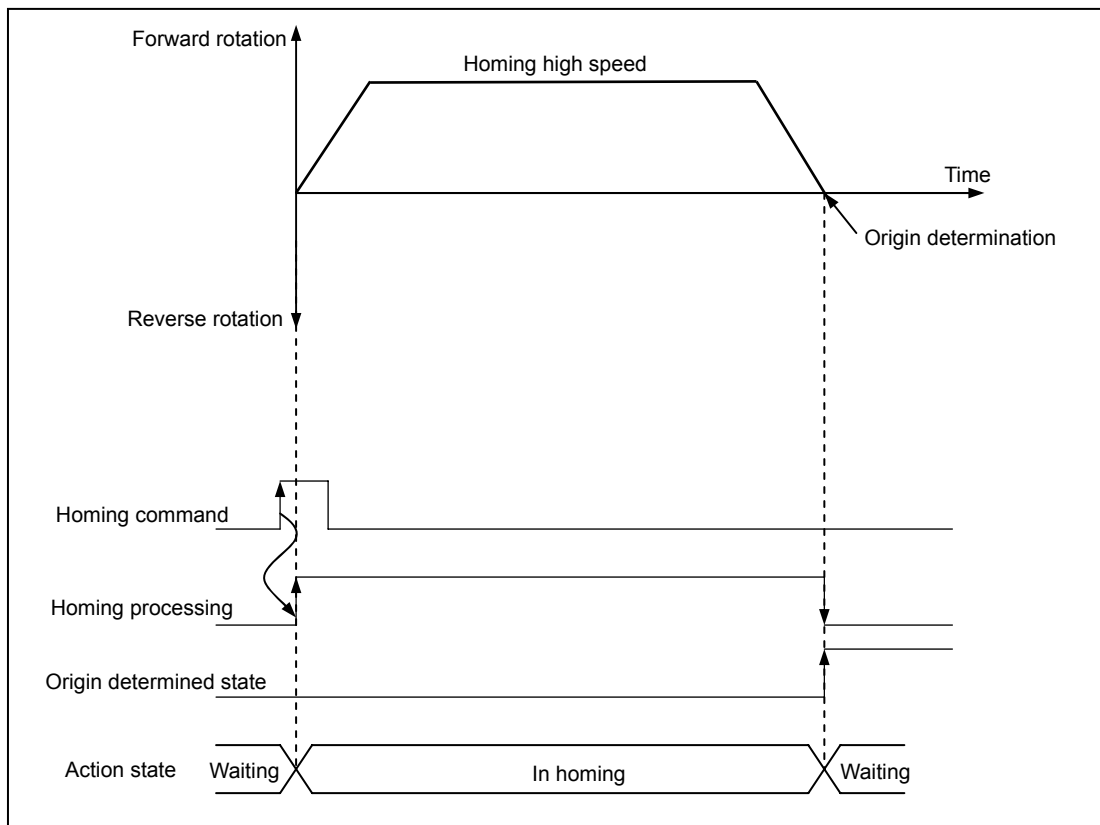
Notes

1. If "ON" time of near point is longer than deceleration time, the action is as follows.



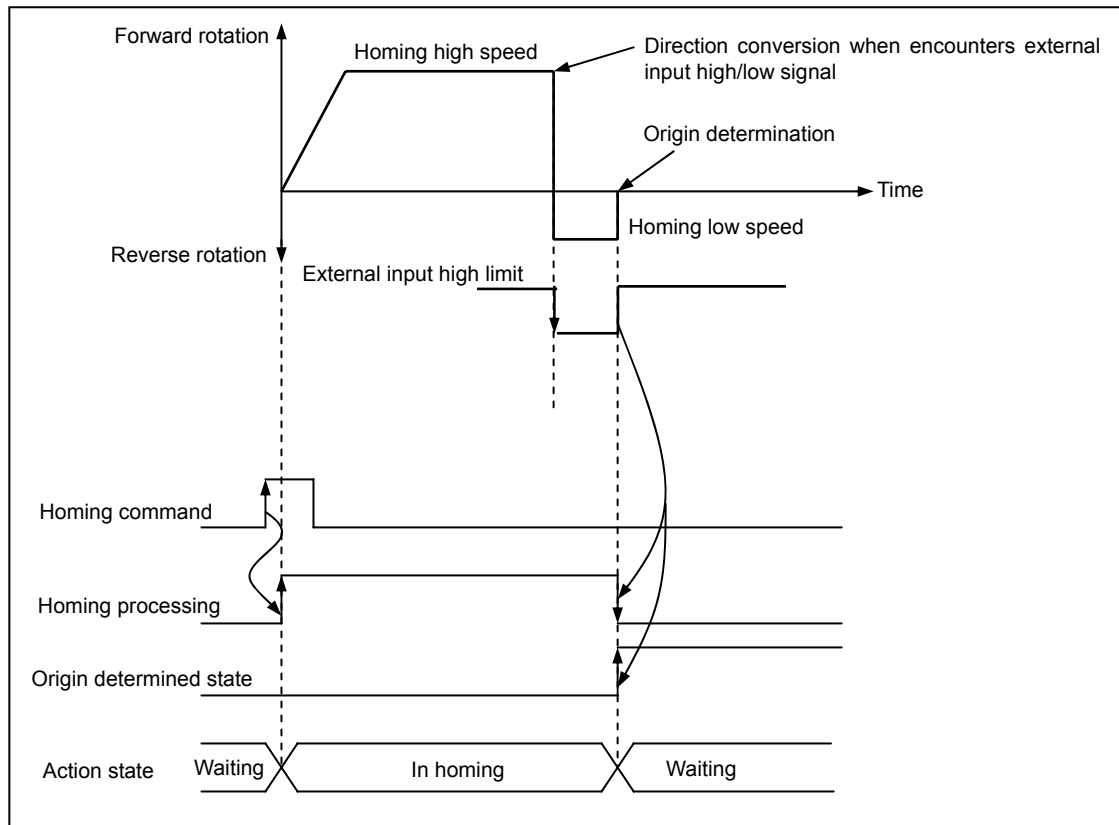
3.6.6 High Speed Homing

- 1) High speed origin detection is one of the homing methods that returns to the origin determination position without detection of external signal (near point, origin signal, High/Low limit) when returning to the mechanical origin position after completion of the mechanical homing.
- 2) When using High speed homing, it should be carried out in the state that the positioning by 4 types of mechanical homing, by floating origin, or by the current position preset is completed in advance.
- 3) The operation pattern of High speed homing is as below.



3.6.7 Origin Detection by High/Low Limit

This is the homing method using the external input high/low limit signal and is used when not using the origin or near point signal.



3.7 Manual Operation

Manual operations includes Jog operation, Manual pulse generator operation, inching operation, previous position movement of manual operation etc.

3.7.1 JOG Operation

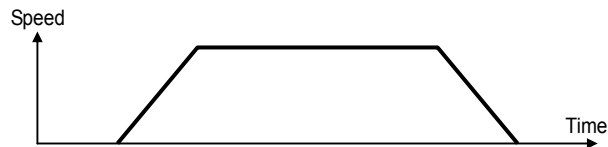
1) JOG operation

- ▶ Carries out the positioning control by Jog command.
- ▶ Carries out the monitoring when the positioning acts by Jog command and the position address is changed.
- ▶ This is one of manual operation method which acts without positioning.

2) Acceleration/Deceleration Processing and Jog speed

- (1) The acceleration/deceleration processing is controlled based on the setting time of Jog acceleration/deceleration time from Software Package parameter setting.

- ▶ Jog high speed/low speed operation : operation pattern with acceleration/deceleration



- (2) If Jog speed is set out of the setting range, error will occur and the operation does not work.

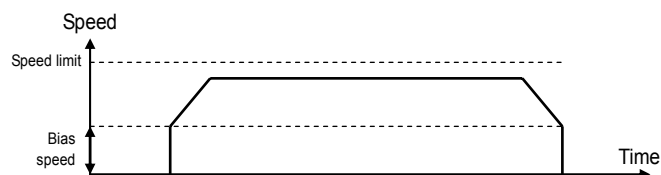
Setting range	Jog high speed operation	1 ~ 1,000,000 (Line driver type) 1 ~ 200,000 (Open collector type)	(Setting unit : 1pps)
	Jog low speed operation	1 ~ 200,000 (Open collector type)	

Notes

The notices for setting Jog speed is as follows.

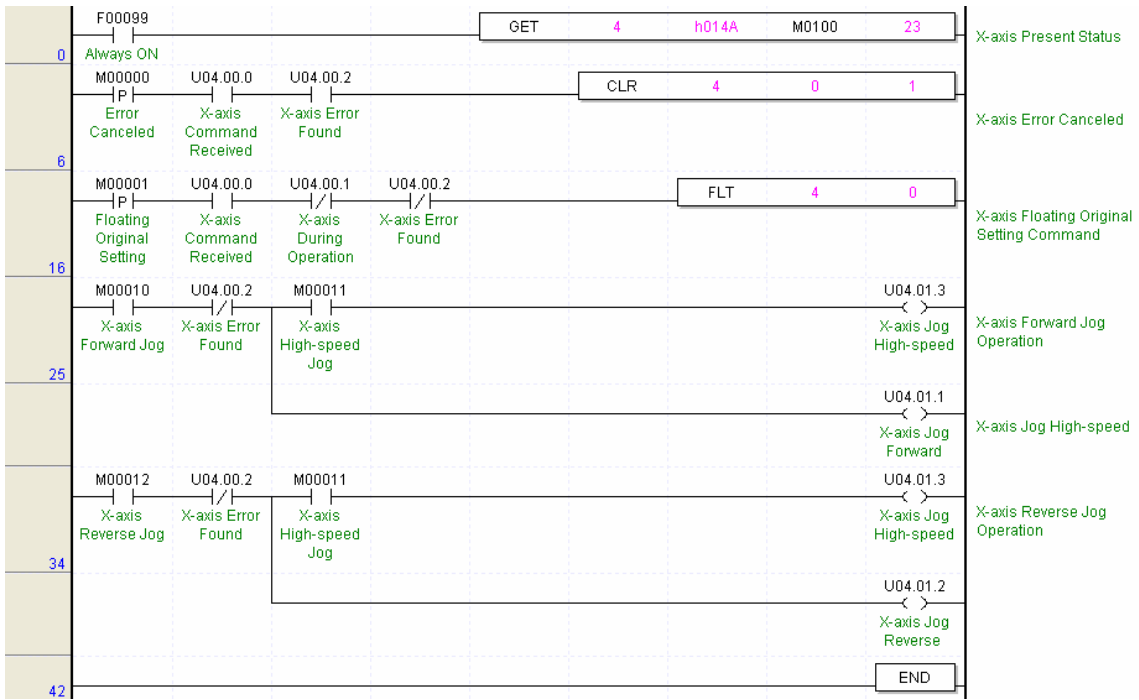
1) Jog high speed setting

Bias speed ≤ Jog high speed ≤ Speed limit



2) Jog low speed acts regardless of Bias speed and Speed limit.

▷ Program



Program 3.8 Jog Operation

3.7.2 Manual Pulse Generator (or Encoder) Operation

1) Manual Pulse Generator Operation :

- ▶ Carries out the positioning control by the pulse entering from manual pulse generator.
- ▶ This is used when carry out the precise positioning by manual.

2) Manual Pulse Generator Operation

- (1) If executes Manual pulse generator operation enabled command, it becomes the state of manual pulse operation permitted.

From this time, this acts as the positioning control by the pulse entering from manual pulse generator.

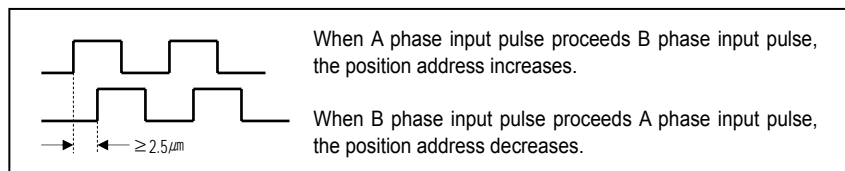
- (2) After releasing it by manual pulse generator operation disabled command, it is available to carry out the positioning operation by next start (start command, homing command, interpolation operation, jog operation, inching operation, simultaneous start, synchronous start).

- (3) It acts regardless of origin determined state or origin unsettled state.

- (4) The pulse entered from manual pulse generator increases or decreases from the current position.

- (5) Transfer direction shall be determined by the difference of phase.

- ▷ Forward direction positioning : when A phase input pulse proceeds B phase input pulse.
- ▷ Reverse direction positioning : when B phase input pulse proceeds A phase input pulse.



- (6) Encoder input mode of common parameter should be set as one of Phase A/B(2 phase1multiplier/2multiplier/4multiplier).

3) Encoder operation

- (1) For encoder operation, select one input mode from Encoder input mode of common parameter that corresponds to Encoder output signal of SERVO driver for the encoder operation.

- (2) Encoder input speed available for Encoder operation is max. 200,000pps.

- (3) Count value by encoder input shall be indicated as Encoder value.

- (4) It is available to set the Count range of actual encoder value by Encoder Auto Reload value of common parameter.

Ex) Auto Reload value : 100,000 Indication range of encoder value : 0 ~ 100,000

- (5) Encoder input mode has 7 kinds of input mode.

(CW/CCW (1phase 1multiplier), CW/CCW (1phase 2multiplier), PLS/DIR (1phase 1multiplier), PLS/DIR (1phase 2multiplier), PHASE A/B (2phase 1multiplier), PHASE A/B (2phase 2multiplier), PHASE A/B (2phase 4multiplier))

- (6) The possibility of encoder operation shall be determined according to the setting of encoder input mode and the combination of pulse output type for encoder operation.

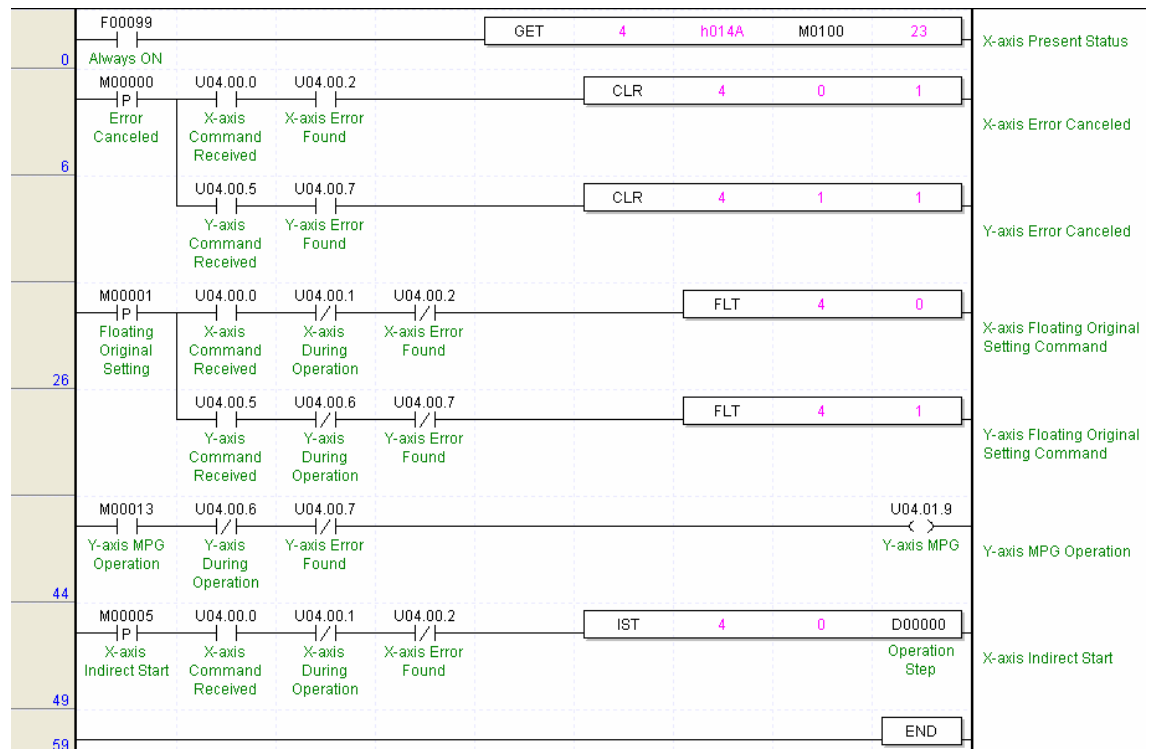
Input pulse type	Output pulse type	Possibility
Phase A/B 1multiplier Phase A/B 2multiplier Phase A/B 4multiplier	CW/CCW	○
	PHASE A/B	✗
	PLS/DIR	○
PLS/DIR 1multiplier PLS/DIR 2multiplier	CW/CCW	○
	PHASE A/B	✗
	PLS/DIR	○
CW/CCW 1multiplier CW/CCW 2multiplier	CW/CCW	○
	PHASE A/B	✗
	PLS/DIR	✗

- ▷ If output pulse type is set wrong during operation by encoder input, error 424 will occur.

Notes

► Manual pulse generator operation shall be operated by the speed of MPG regardless of multiplier setting of encoder input mode.

▷ Program

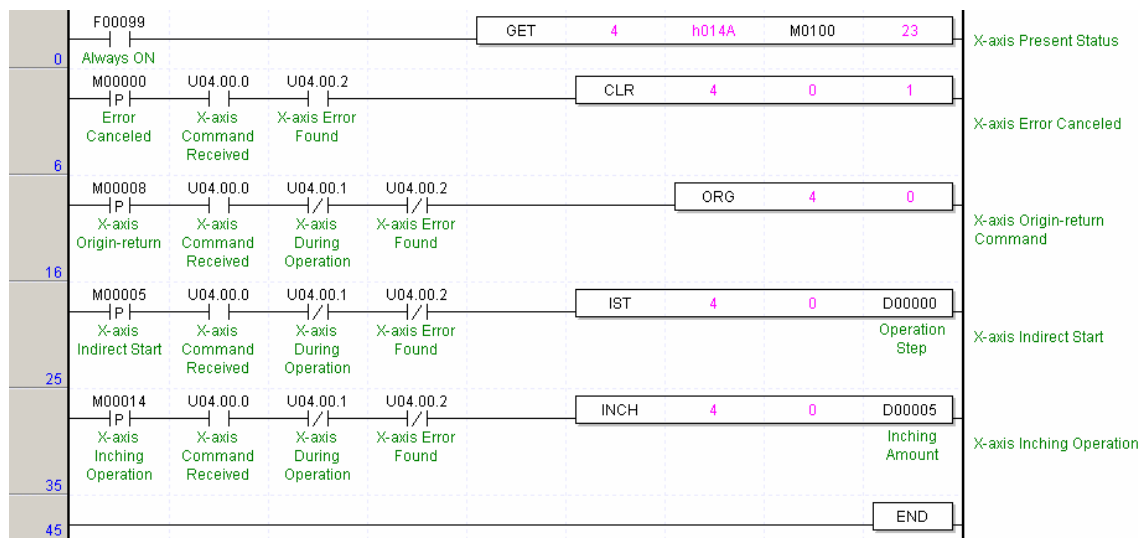


Program 3.9 Manual Pulse Generator (Encoder) Operation

3.7.3 Inching Operation

- ▶ This is a kind of manual operation and outputs as much as the pulse amount by the speed set in the inching speed from origin/manual parameter.
- ▶ While the operation by Jog command is difficult in moving to the correct position as the operation starts and stops according to the command, the inching command enables to set the desired transfer amount easily and reach the goal point.
- ▶ Thus, it is available to reach the correct goal position by moving fast near the working position by Jog command and operating the detail movement by inching command.
- ▶ The setting range is -2147483648 ~ 2147483647 Pulse.

▷ Program



Program 3.10 Inching Operation

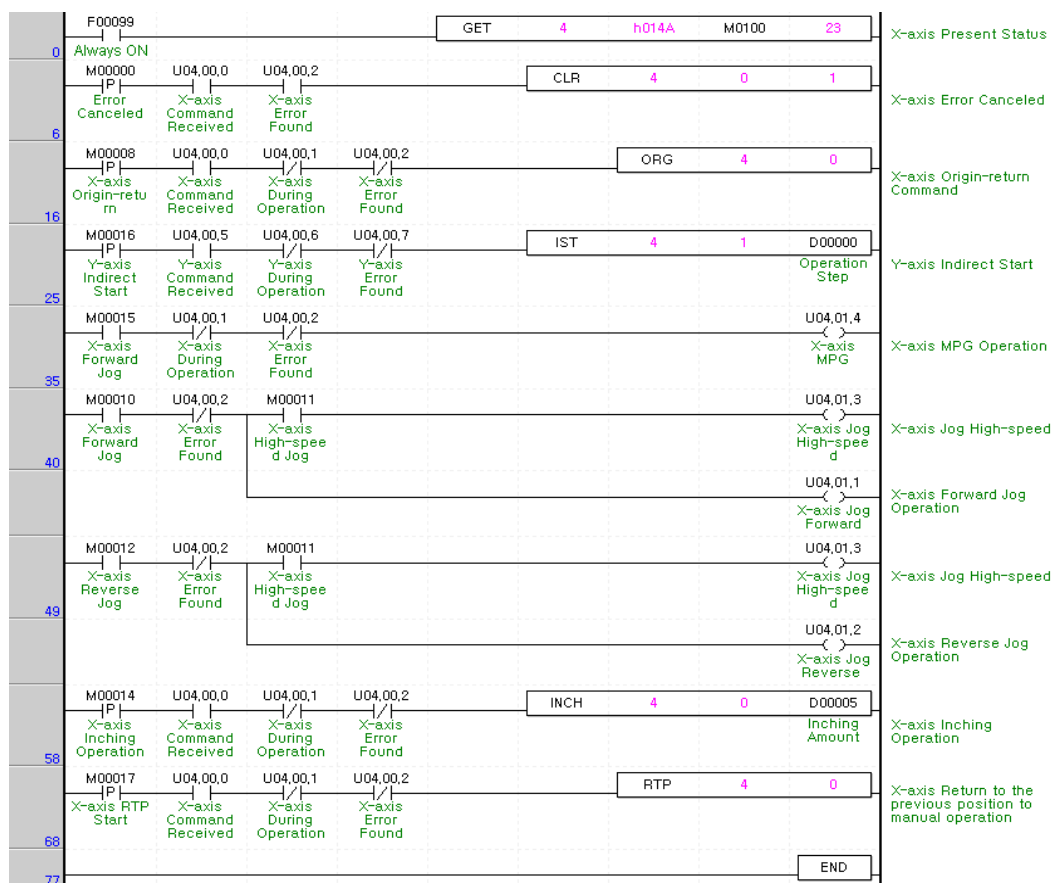
3.7.4 Return to the Position before Manual operation

- ▶ This function is used to return to the position address that the positioning is completed before manual operation when the position is changed by manual operation (Jog operation, inching operation, manual pulse generator operation).
- ▶ The transfer speed is operated by the setting speed of homing low speed from manual/origin parameter.

Notes

- ▶ If the current position address in operation is "A" and the position address changed by the manual operation (Jog operation and Inching operation) is "B", it returns to "A" which is the previous position before manual operation by return to the position before manual operation command.

Program



Program 3.11 Return to the position before Manual operation

3.8 Speed Change during Positioning Operation

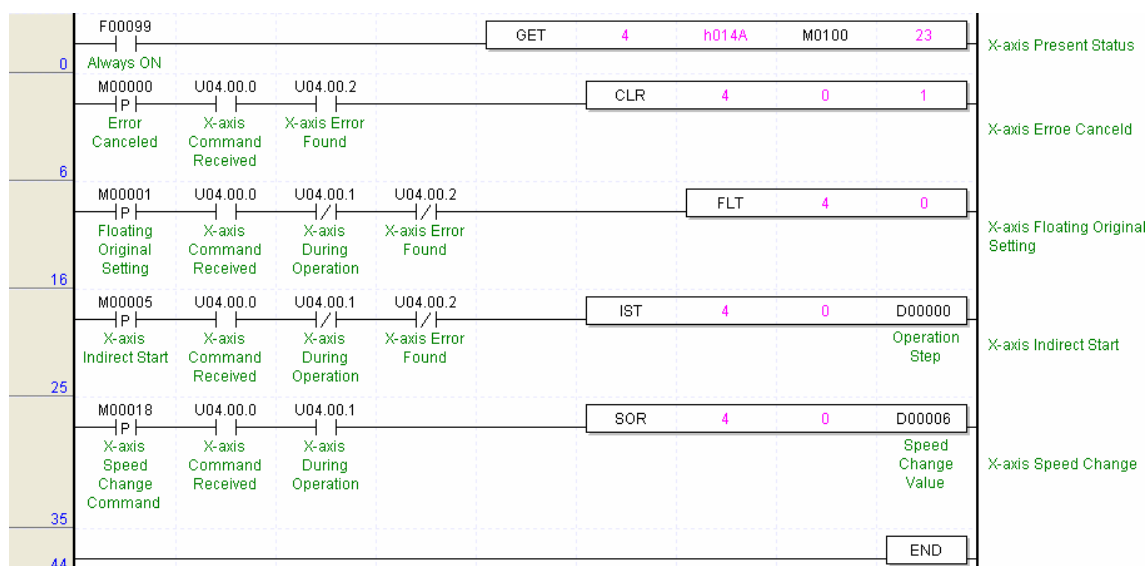
3.8.1 Speed Override Command

- ▶ Speed override command is used only in the acceleration/constant speed section from operation pattern and the available operation mode is End operation, Go-on operation, Continuous operation.
- ▶ The setting range is 1~1,000,000pps for Line Driver type, 1~200,000pps for Open Collector type. (Setting unit : 1pps).

Notes

- ▶ If the difference between the current speed using in operation and the speed changed newly by speed override (APM_SOR: Rising edge ()) is too big, "motor trip" will occur. Thus, cares should be taken in using.
- ▶ If speed override command is executed in deceleration section during operation, Error 377 will occur and it continues to operate.

▷ Program



Program 3.12 Speed Change

3.8.2 Operation Step No. Change by Continuous Operation

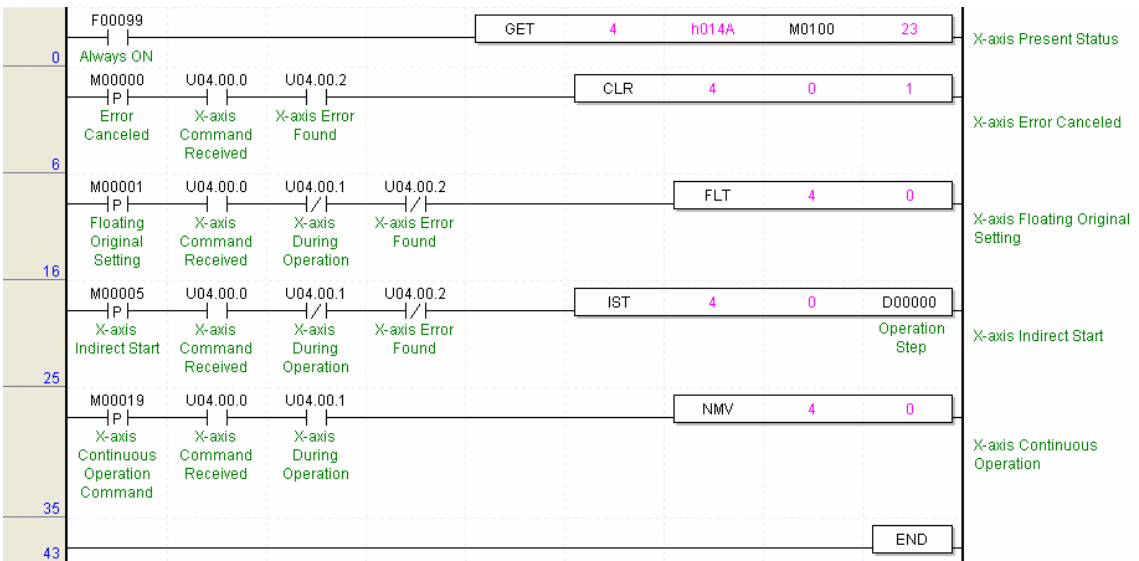
- ▶ This is used in the operation mode (End, Go-on, Continuous operation) and in the operation pattern (Acceleration, Constant speed, Deceleration section).
- ▶ If Continuous operation command is used during operation, the current operation step no. moves to the next operation step no.
- ▶ According to the position data setting (Absolute coordinate/Relative coordinate), there is a difference of action in the Continuous operation command.

	▶ When using in the Absolute coordinate	▶ When using in the Relative coordinate
If not using Continuous operation command	<p>Speed</p> <p>Time</p> <p>Operation mode : Continuous</p> <p>Operation step no. : 2</p> <p>Operation mode : Continuous</p> <p>Operation step no. : 1</p> <p>Position : P1</p> <p>Position : P2</p> <p>Start command</p> <p>In operation</p>	<p>Speed</p> <p>Time</p> <p>Operation mode : Continuous</p> <p>Operation step no. : 2</p> <p>Operation mode : Continuous</p> <p>Operation step no. : 1</p> <p>Position : P1</p> <p>Position : P2</p> <p>Start command</p> <p>In operation</p>
When using Continuous operation command	<p>Speed</p> <p>Time</p> <p>Position : P1</p> <p>Position : P2</p> <p>In operation</p> <p>Continuous operation command</p> <p>A part</p> <p>B part</p> <p>▶ The area of "A section" and "B section" is same.</p> <p>▶ The current position set by Continuous operation command is P2.</p>	<p>Speed</p> <p>Time</p> <p>Position : P1</p> <p>Position : P2</p> <p>In operation</p> <p>Continuous operation command</p> <p>▶ The setting goal position is P1 + P2 but the current position set by Continuous operation command is P1' + P2.</p>

Notes

- ▶ If the positioning in Continuous operation mode is too small, it stops to operate by Continuous operation command and carries out the next step operation. Thus, cares should be taken in using.
- ▶ In case of operating to the same direction by Continuous operation command (Next Move) from End, Go-on, Continuous operation mode, it continues to operate without stopping but in case of changing the rotation direction (forward=>reverse, reverse=>forward), the Continuous operation command is not be carried out. Thus, cares should be taken in using.

▷ Program



Program 3.13 Operation Step No. Change by Continuous Operation

3.8.3 Positioning Speed Override Command (APM_PSO: Rising edge)

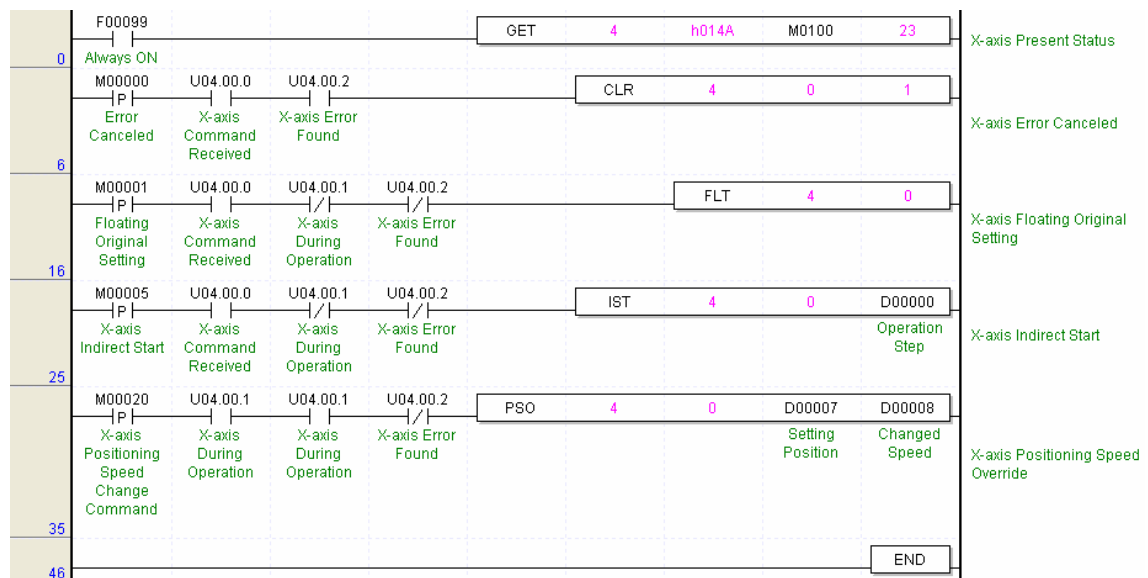
- 1) This is the command to operate by the changed operation speed if it reaches the setting position during positioning operation.
- 2) This command is used only in Acceleration and Constant speed section from operation pattern and the available operation mode is End, Go-on, Continuous operation.
- 3) As this command is not carried out in Deceleration section, cares should be taken in using.
- 4) The position setting range is -2147483648 ~ 2147483647 Pulse.
- 5) The operation speed setting range is 1~1,000,000pps for Line Driver type, 1~ 200,000pps for Open Collector type (setting unit : 1pps).

[Example]

▷ Software Package Setting

Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
1	Absolute	Position	End	Single	100000	0	0	1	1000	0	CW

▷ Program



Program 3.14 Positioning Speed Override Command

3.9 Position Change during Positioning Operation

3.9.1 Position Change by Position Override

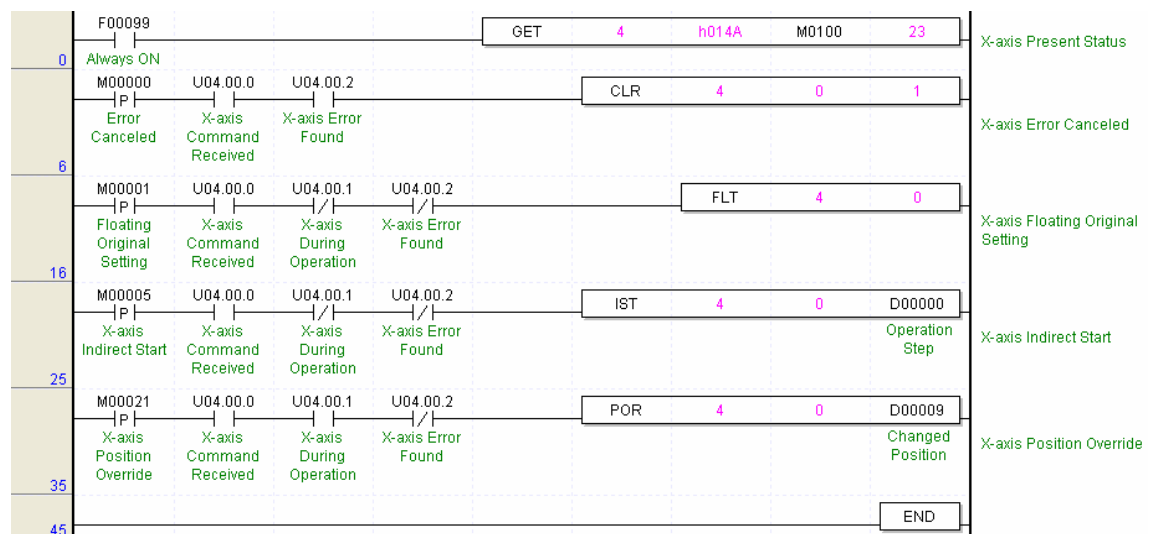
- 1) This is used to change the goal position during positioning operation by positioning data.
- 2) As the operation is different according to Position Override command during operation, cares should be taken in using.
That is, if passing the desired position to change during operation, it carries out deceleration stop and continues the positioning operation by next operation pattern while if not passing yet, it carries out the positioning operation by the changed position.
- 3) Position override command is used in the operation pattern (Acceleration, Constant speed, Deceleration section) and the available operation mode is End operation, Go-on operation, Continuous operation.
- 4) In case of Continuous operation mode, position override operation is available only for one time by placing the goal position desired to change at the current position of start step of continuous operation as relative position.
- 5) Position setting range is $-2147483648 \sim 2147483647$ Pulse.

[Example]

▷ Software Package Setting

Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
1	Absolute	Position	End	Single	100000	0	0	1	1000	0	CW

▷ Program



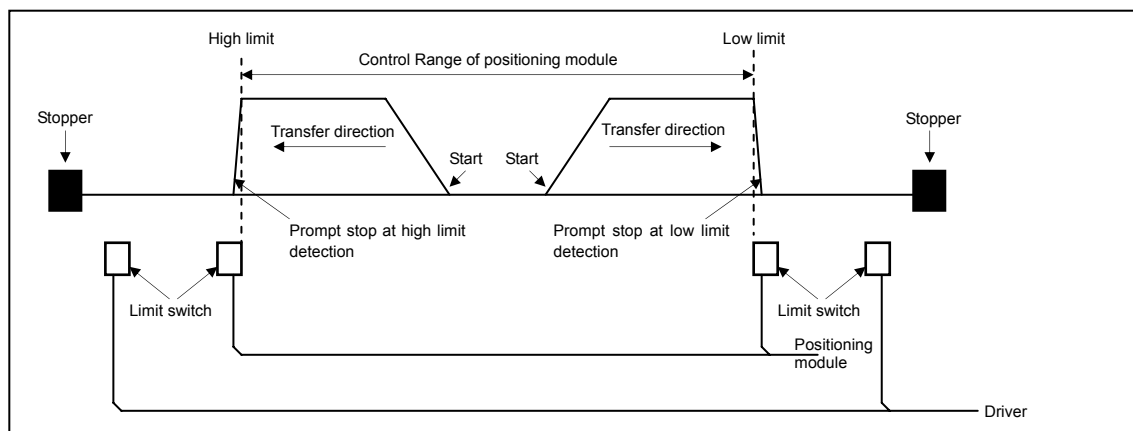
Program 3.15 Position Change by Position Override command

3.10 Stroke high/low Limit

Positioning module includes External input stroke limit (external input high limit signal, external input low limit signal) and Software stroke limit (Software high/low limit).

3.10.1 External Input Stroke High/Low Limit

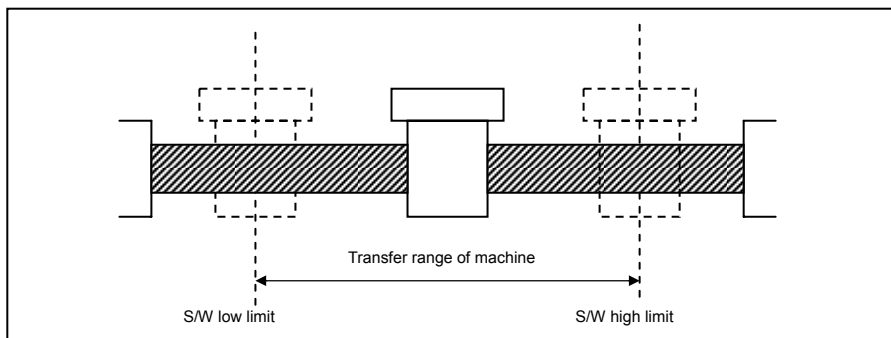
- ▶ External input stroke limit includes External input high limit signal and External input low limit signal as external input connector of positioning module.
- ▶ This is used to stop the positioning module promptly before reaching Stroke limit/Stroke End of the Driver by installing the stroke limit of positioning module inside Stroke limit/Stroke end of the Driver. In this case, if it deviates the high limit, Error 492 will occur and if it deviates the low limit, Error 493 will occur.



- ▶ If positioning module stops out of the control range, the positioning operation does not work. If it stops by external input stroke limit detection, move within the range of positioning module available to control by manual operation (Jog operation, inching operation, manual pulse generator operation).
- ▶ As external input stroke high/low limit error is detected by the edge of positioning module, it is available to release the output prohibit out of stroke range and carry out manual operation.

3.10.2 Software Stroke High/Low Limit

- ▶ Software stroke high/low limit is the function that does not carry out the positioning when operating out of the setting range of stroke high/low limit by software package parameter.
- ▶ The range check of stroke high/low limit shall be done when it starts to operate and during operation, respectively.



- ▶ In case of operating out of the setting range, this function does not carry out the positioning for that command.

Notes

- ▶ Software high/low limit detection is not carried out in the origin unsettled status.
- ▶ If setting S/W high/low limit as "0", it enables to carry out the positioning operation ultimately without detecting the internal input stroke high/low limit. Thus, please refer to this when Fixed-feed control.
But, in case of forward rotation operation, if it reaches the current position max. 2147483647, the current position is changed with -2147483648 and continues the forward rotation while in case of reverse rotation operation, if it reaches the current position min. -2147483648, the current position is changed with 2147483647 and continues the reverse rotation.

[Example]

- ▶ Software Package Setting in case of Fixed-Feed control

<Operation Data Setting>

Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
1	Relative	Position	End	Repeat	1000	0	0	1	100	0	CW

<Parameter Setting>

Extended parameter	S/W high limit	0 pls
	S/W low limit	0 pls

3.11 Random Position Address Value Setting to the Origin and The Change of the current Position

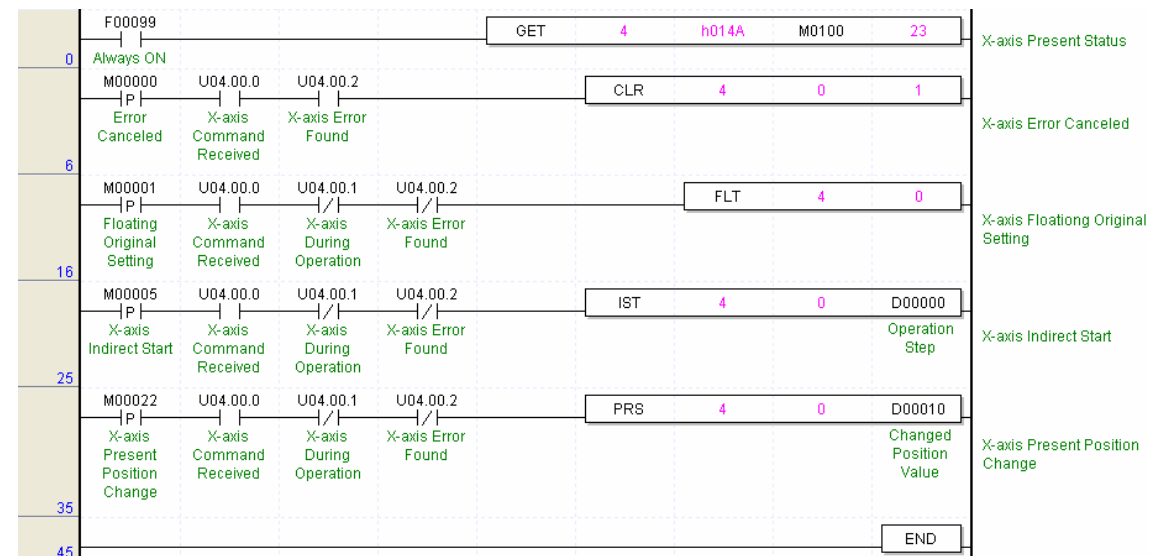
3.11.1 Random Position Address Setting to the Origin

- ▶ Available to set the random position address by using the homing address item of Software package parameter.
- ▶ Available to confirm the random position address of the setting axis by the current operation status code information read function block after completing the floating origin setting or the homing.
- ▶ And also available to confirm it by the current position after completing the floating point setting from software package monitor or the homing.

3.11.2 The Change of the current Position

- ▶ The change of the current position is to change the current address with random address.
- ▶ If the change of current position command is executed in the origin unsettled status, it is changed with the origin settled status.
- ▶ If the current position is changed by the change of the current position (APM_PRS) command, the mechanical origin executed by the homing command is changed. Thus, it is required to execute the homing again.

▷ Program



Program 3.16 The change of Present Position

3.12 Floating Origin Setting

- ▶ This is used to force to set the current position as the origin without carrying out the homing action of the machine.
- ▶ The position set in this case is the setting value from the homing address.

Notes

- ▶ As the floating origin setting forces to set the current position as the origin by the homing address, the following cares should be taken in the program that has the floating origin setting as the origin.
 1. If error occurs, remove the error cause and reset the error and then release the output disabled,
 2. Set the floating origin again, and
 3. Change the desired operation step no. by the operation step no. setting before starting.

3.13 Teaching

- ▶ This is to change the goal position and operation speed value of step no. set by the user without using the software package for positioning operation data.
- ▶ **Teaching function (position teaching and speed teaching) is available for the axis in positioning operation at present. But, it is limited only for RAM teaching function and the teaching is available only for the step no. in stop status.**
- ▶ In case of changing the goal position and operation speed frequently, this function is used very conveniently. Position teaching is to change the goal position and Speed teaching is to change the operation speed.
- ▶ Teaching function includes Single teaching and Plural teaching that has RAM teaching and ROM teaching, respectively.
- ▶ ROM teaching is to change the goal position and operation speed of operation data set in **Flash Memory**.

3.13.1 RAM Teaching and ROM Teaching

1) RAM Teaching

When the positioning module acts in Power-ON, it is available to use it by changing the speed and position address but if the power is OFF, you may lose the speed and position address.

2) ROM Teaching

When the positioning module acts in Power-ON, it is available to use it by changing the speed and position address and even if the power is OFF, the used speed and position address shall be preserved permanently.

Notes

- ▶ ROM teaching is limited in the number of use and cares should be taken in using. (allowable number: max. 1,000,000)
- ▶ If flash memory of positioning module does not work as it is used over max. allowable number, it is required to contact for A/S service.

3.13.2 Single Teaching

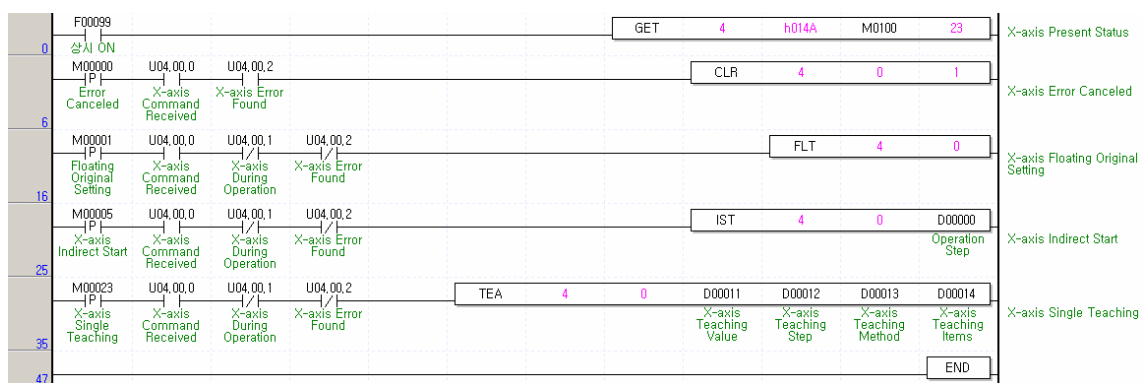
► This is used to change the goal position or operation speed set in one step from positioning operation step.

[Example]

▷ Software Package Setting

Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
1	Absolute	Position	End	Repeat	100000	0	0	1	100	0	CW

▷ Program



Program 3.17 Single Teaching

3.13.3 Plural Teaching

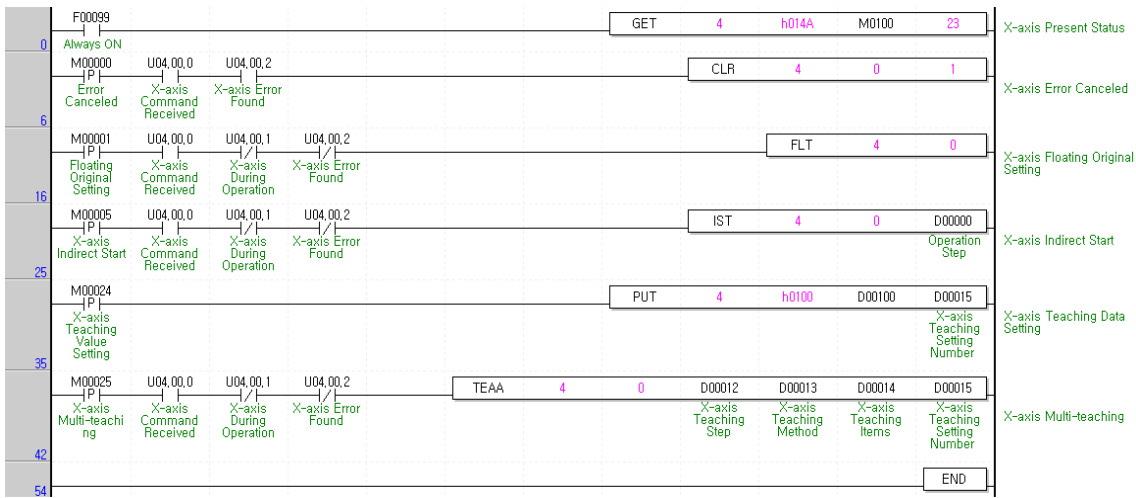
► This is used to change the goal position or operation speed set in the several step from positioning operation step. (Max. 16)

[Example]

▷ Operation data setting

Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./Dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
1	Absolute	Position	End	Single	10000	0	0	1	100	0	CW
2	Absolute	Position	End	Single	20000	0	0	1	150	0	CW
3	Absolute	Position	End	Single	30000	0	0	1	200	0	CW
4	Absolute	Position	End	Single	40000	0	0	1	250	0	CW
5	Absolute	Position	End	Single	50000	0	0	1	250	0	CW
6	Absolute	Position	End	Single	60000	0	0	1	300	0	CW

▷ Program



Program 3.18 Plural teaching

3.14 Start Step No. Change

This is used to change the operation step no. desired to start and available only in Stop status.

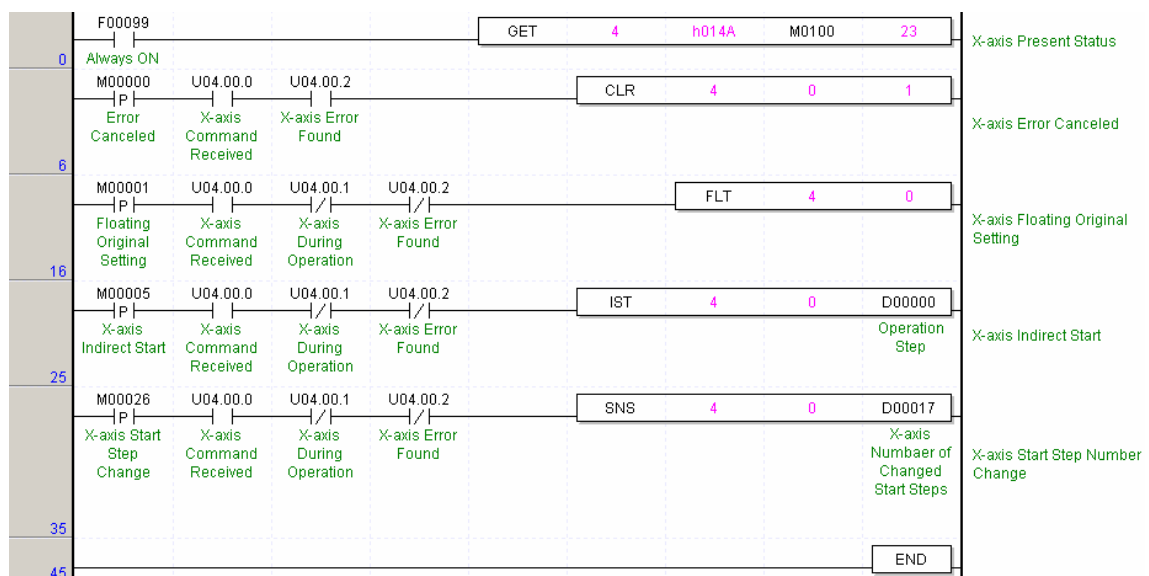
[Example]

►APM Software Package Setting

No. of Program start command	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec.no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
1	1	Relative	Position	End	Single	1000	0	0	1	100	0	CW
2	2	Relative	Position	End	Single	2000	0	0	1	150	0	CW
Step no. change by Operation step no. setting : "10"												
3	10	Relative	Position	Go-on	Single	1000	0	0	1	100	0	CW
	11	Relative	Position	Go-on	Single	2000	0	0	1	150	0	CW
	12	Relative	Position	Go-on	Single	3000	0	0	1	200	0	CW
	13	Relative	Position	End	Single	4000	0	0	1	250	0	CW
Step no. change by Operation step no. setting [APM_SNS: Rising edge ↑] : "20"												
4	20	Relative	Position	End	Single	5000	0	0	1	300	0	CW

If setting the step no. as "0" by indirect start (IST) command, it carries out the positioning operation by the current operation step no. But, if the current operation step no. is 3 and operation speed is 0 without changing the start sep no., E151 will occur.

►Program



Program 3.19 Start Step No. Change

3.15 Skip Operation

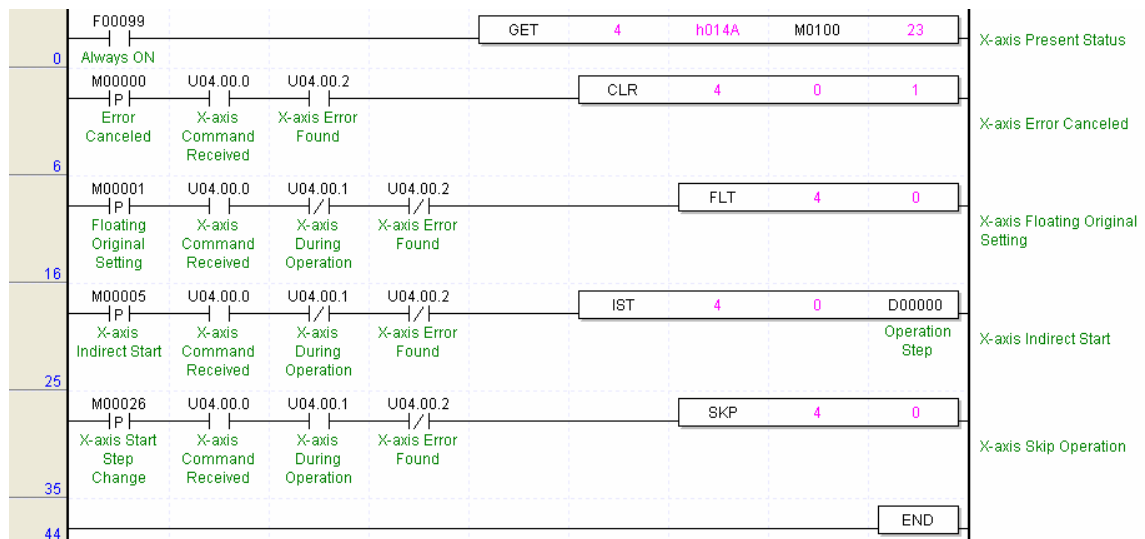
- ▶ This is used in case that the operation mode is End, Go-on, Continuous and the operation pattern is in Acceleration, Constant speed, Deceleration section.
- ▶ If SKIP operation command is executed during operation, it moves from the current operation step no. to next operation step no. and carries out the operation.
- ▶ **SKIP operation command stops the operation and carries out the operation of next step after executing the command other than Continuous operation command (Next Move).**
- ▶ If SKIP operation command is executed in the status that the operation data of next step is not yet set, Error 151 will occur.

[Example]

▶ APM Software Package Setting

No. of Program start command	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
1	1	Absolute	Position	Go-on	Single	1000	0	0	1	1000	0	CW
	2	Absolute	Position	Go-on	Single	2000	0	0	1	1500	0	CW
	3	Absolute	Position	Go-on	Single	3000	0	0	1	2000	0	CW
	4	Absolute	Position	End	Single	4000	0	0	1	2500	0	CW

▶ Program



Program 3.20 Skip Operation

3.16 Repeat Operation Step no. Change

- ▶ In case of repeat operation mode setting (End, Go-on, Continuous operation), the current operation step no. will be changed automatically to operate the step no.1 when repeat operation mode setting step completes the positioning operation but if start step no. change command is executed in repeat operation, the step no. will be changed with the assigned step no. not the step no.1 .
- ▶ The repeat operation step no. change command can be executed during positioning operation.
- ▶ For Program, please refer to Article 3.7 Single Operation (repeat operation step no. change).

3.17 M Code

- ▶ This is used to confirm the current operation step no. and carry out the auxiliary work (Clamp, Drill rotation, Tool change etc.) by reading M Code from the program.
- ▶ M code should be set in the M code item of operation data.(Setting range : 1 ~ 65535)
- ▶ **If M code is set as "0", M code signal will not occur.**
- ▶ M code mode is set from M code output item of extended parameter. (0 : NONE, 1 : WITH, 2 : AFTER)
- ▶ If M code occurs, M code no.(1 ~ 65535) and M code signal (On) will occur simultaneously.
- ▶ In case of Go-on operation mode, if M code no. and M code signal occur, it becomes standby for the next step; if executing M code release (APM_MOF) command, it carries out Go-on operation to the next step without start command.
- ▶ In case of Continuous operation mode, M code no. and M code signal occurs and it carries out the Continuous operation for the next step.
- ▶ M code release command can be used even during operation.
- ▶ For further information, please refer to Article 5.2.6 M code output.

[Example]

▶ APM Software Package Setting

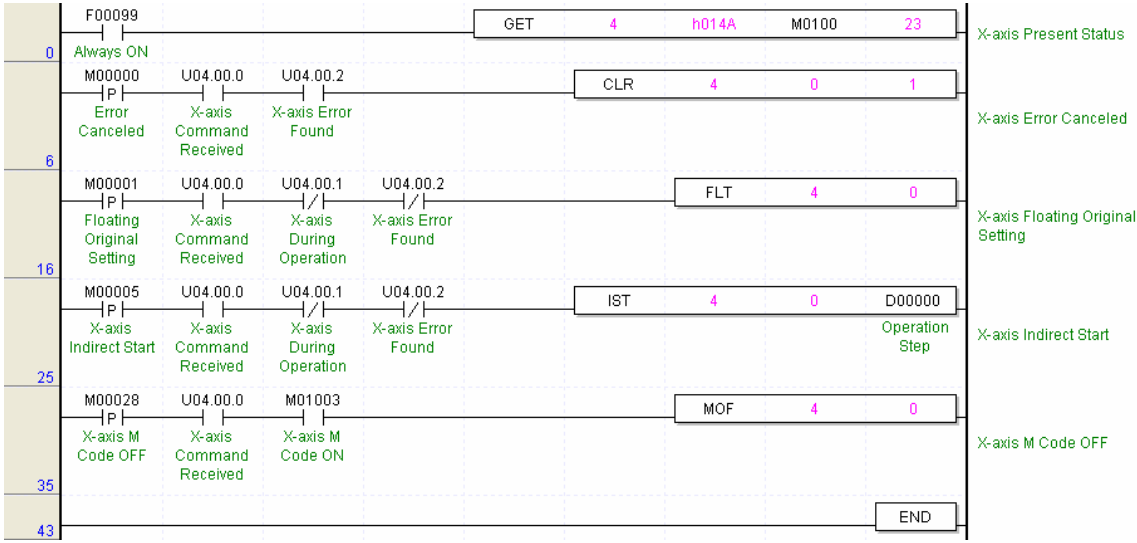
<Operation Data Setting>

No. of Program start command	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point[pulse]	M code	Acc./dec no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
1	1	Absolute	Position	Go-on	Single	10000	0	10	1	1000	0	CW
	2	Absolute	Position	End	Single	20000	0	20	1	2500	0	CW

<Parameter Setting>

Extended parameter	M code output	2 : AFTER
--------------------	---------------	-----------

►Program



Program 3.21 M Code Operation

3.18 Parameter Change from Program

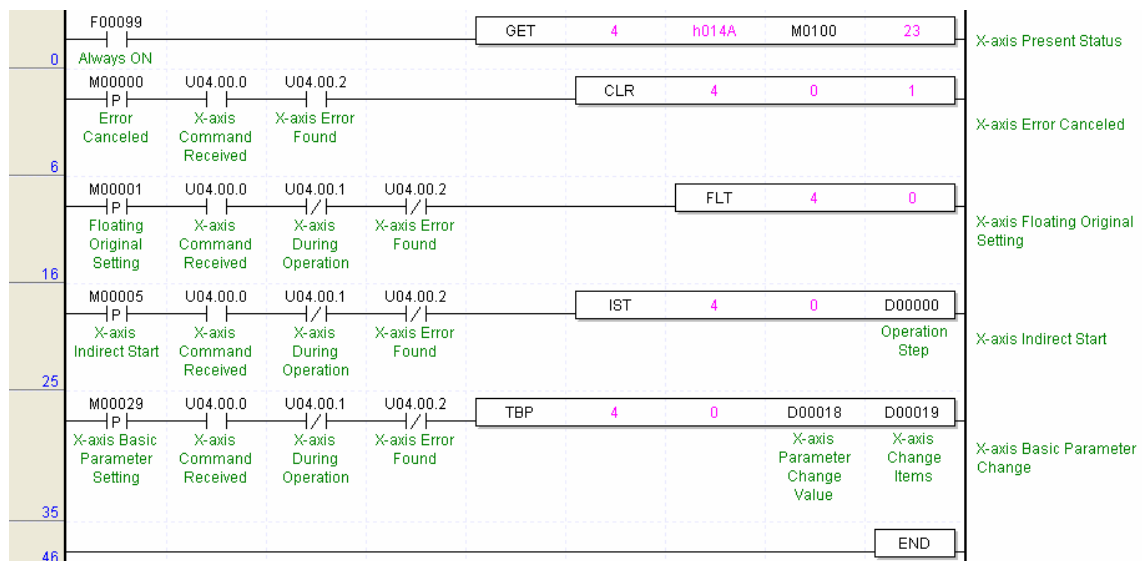
- ▶ This is used to change the APM Software package setting parameter by using each parameter change command.
- ▶ The parameter change is available only when the operation stops.

3.18.1 Basic Parameter Teaching

- ▶ The items available to change are as follows.

Basic Parameter	Setting range
Speed Limit	mm : 1~2,000,000,000[X10 ⁻² mm/min], Inch : 1~2,000,000,000[X10Inch/min], degree : 1~2,000,000,000[X10 ⁻³ degree/min], pulse : 1~200,000 (Open Collector)[pulse/sec] 1~1,000,000(Line Driver)[pulse/sec]
Bias Speed	
Acc./Dec.Time No.1(ms)	0 ~ 65,535
Acc./Dec.Time No.2(ms)	
Acc./Dec.Time No.3(ms)	
Acc./Dec.Time No.4(ms)	
Pulse no. per rotation	1 ~ 65,535
Travel distance per rotation	
Pulse output mode	0:CW/CCW, 1:PLS/DIR, 2:PHASE
Unit	0:pulse, 1:mm, 2:inch, 3:degree
Unit magnification	0: x 1, 1: x 10, 2: x 100, 3: x 1000

▶ Program



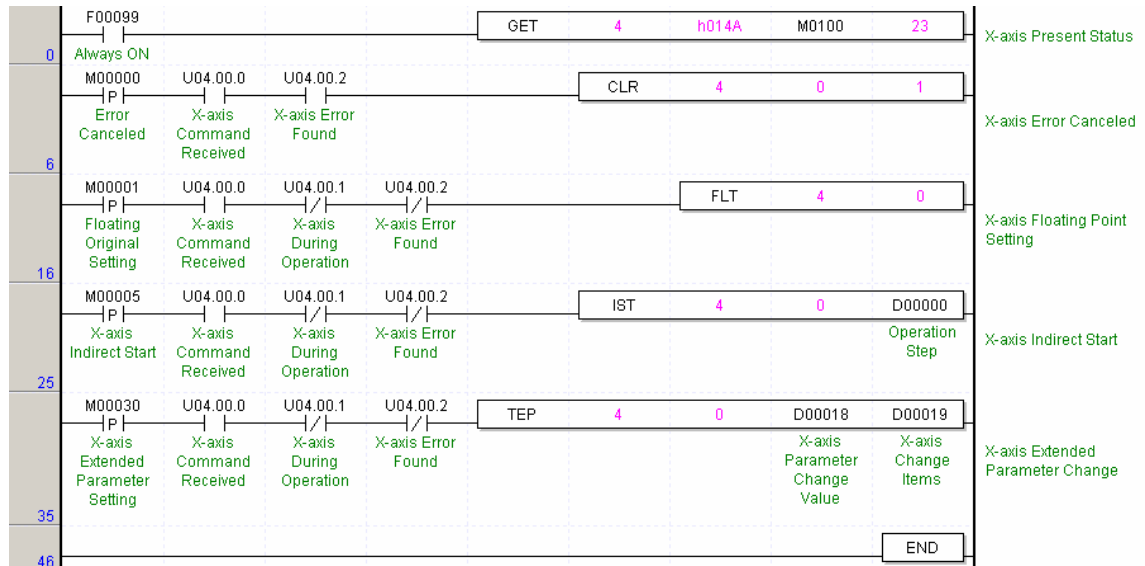
Program 3.22 Basic Parameter Teaching

3.18.2 Extended Parameter Teaching

► The items available to change are as follows.

Extended parameter	Setting Range
Software high limit	mm : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ mm], inch : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ inch], degree : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Software low limit	
Backlash compensation amount	0 ~ 65,535
Positioning completion signal output time (ms)	
S-Curve rate (%)	1 ~ 100
External command signal selection	0: START, 1: JOG operation, 2: SKIP
Pulse output direction	0: CW, 1: CCW
Acceleration/Deceleration pattern	0: Trapezoid operation, 1: S-Curve operation
M Code mode	0: NONE, 1: WITH, 2: AFTER
Position indication during equal speed operation	0: No indication, 1: indication
Software high/low limit detection during equal speed operation	0: No detection, 1: detection
External speed/position control switching enabled/disabled	0: disabled, 1: enabled
External command enabled/disabled	
External stop enabled/disabled	
External synchronous start enabled/disabled	
Positioning completion condition	0: Dwell time, 1: in-position signal, 2: Dwell time AND in-position signal, 3: Dwell time OR in-position signal
Drive ready/in-position selection	0: Drive Ready, 1: in-position

► Program



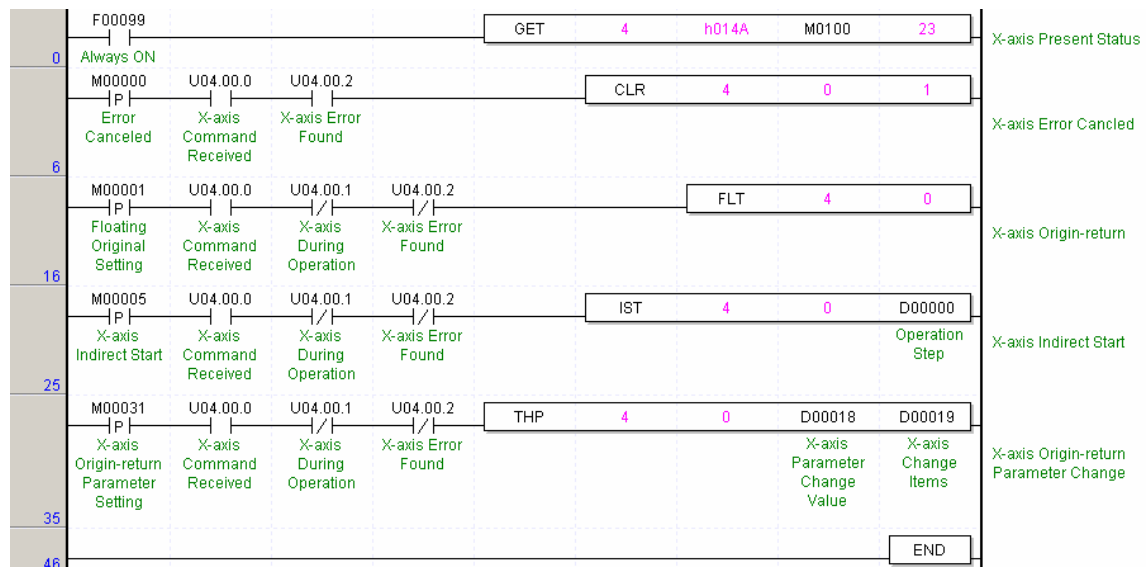
Program 3.23 Extended Parameter Teaching

3.18.3 Origin-return Parameter Teaching

► The items available to change are as follow.

Origin-return parameter	Setting Range
Origin address	mm : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ mm], inch : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ inch], degree : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Origin-return high speed	mm : 1 ~ 2,000,000,000 [$\times 10^{-2}$ mm/min], inch : 1 ~ 2,000,000,000 [$\times 10^{-2}$ inch/min],
Origin-return low speed	degree : 1 ~ 2,000,000,000 [$\times 10^{-3}$ degree/min], pulse : 1 ~ 200,000 (Open collector)[pulse/sec] 1 ~ 1,000,000 (line driver)[pulse/sec]
Origin-return acceleration/Deceleration time	0 ~ 65,535
Origin-return dwell time	
Origin compensation amount	mm : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ mm], inch : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ inch], degree : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Origin-return reset waiting Time	0 ~ 65,535
Origin-return mode	0: DOG/origin(OFF), 1: DOG/origin(ON), 2: high/low limit/origin, 3: near point, 4: high speed origin, 5: high/low limit
Origin-return direction	0: forward, 1: reverse

► Program



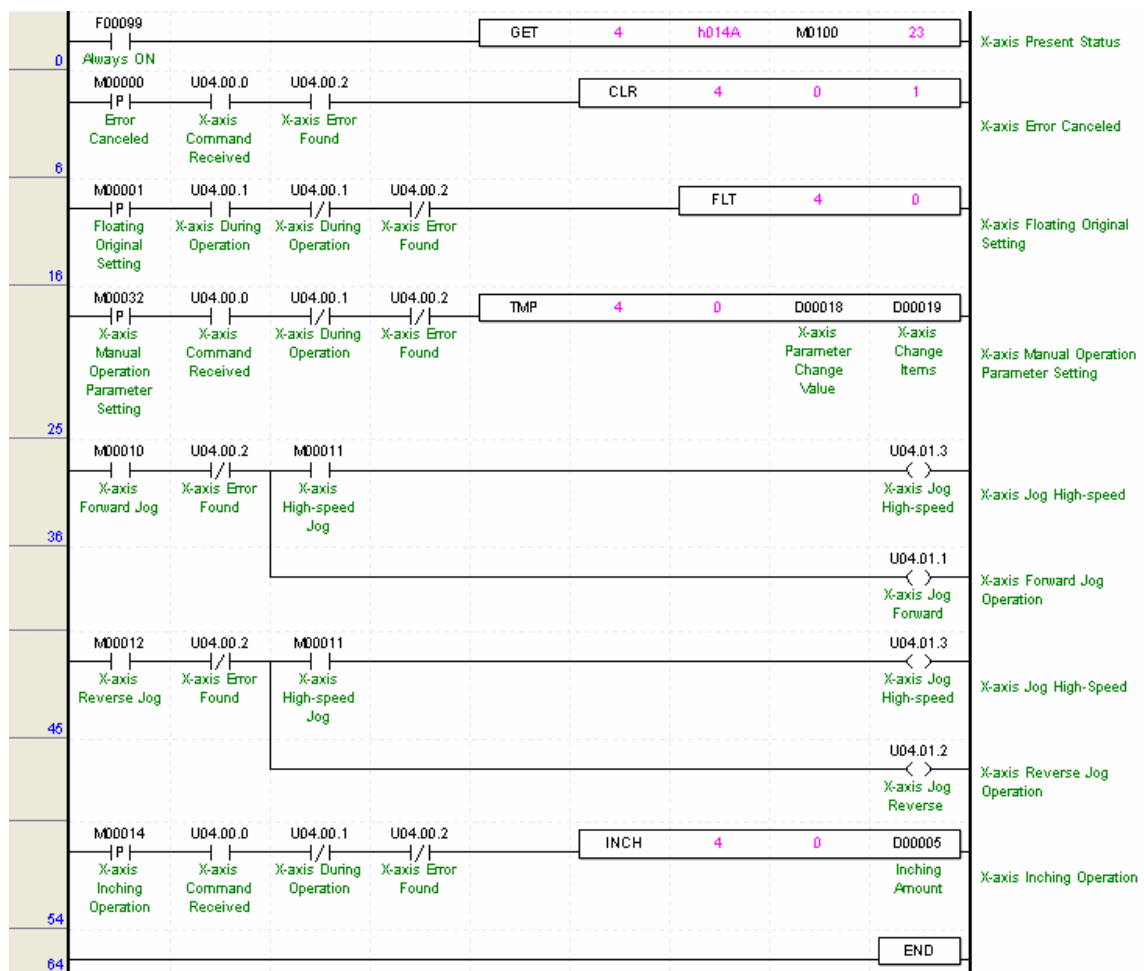
Program 3.24 Origin-return Parameter Teaching

3.18.4 Manual Operation Parameter Teaching

► The items available to change are as follows.

Manual Operation Parameter	Setting Range
JOG high speed	mm : 1 ~ 2,000,000,000[X10 ⁻² mm/min], inch : 1 ~ 2,000,000,000[X10inch/min], degree : 1 ~ 2,000,000,000[X10 ⁻³ degree/min],
JOG low speed	pulse : 1 ~ 200,000 (Open collector)[pulse/sec] 1 ~ 1,000,000 (Line Driver)pulse/sec]
JOG acc./dec. time(ms)	0 ~ 65,535
Inching speed (pps)	mm : 1 ~ 65,535[X10 ⁻² mm/min], inch : 1 ~ 65,535[X10inch/min], degree : 1 ~ 65,535[X10 ⁻³ degree/min], pulse : 1 ~ 65,535[pulse/sec]

► Program



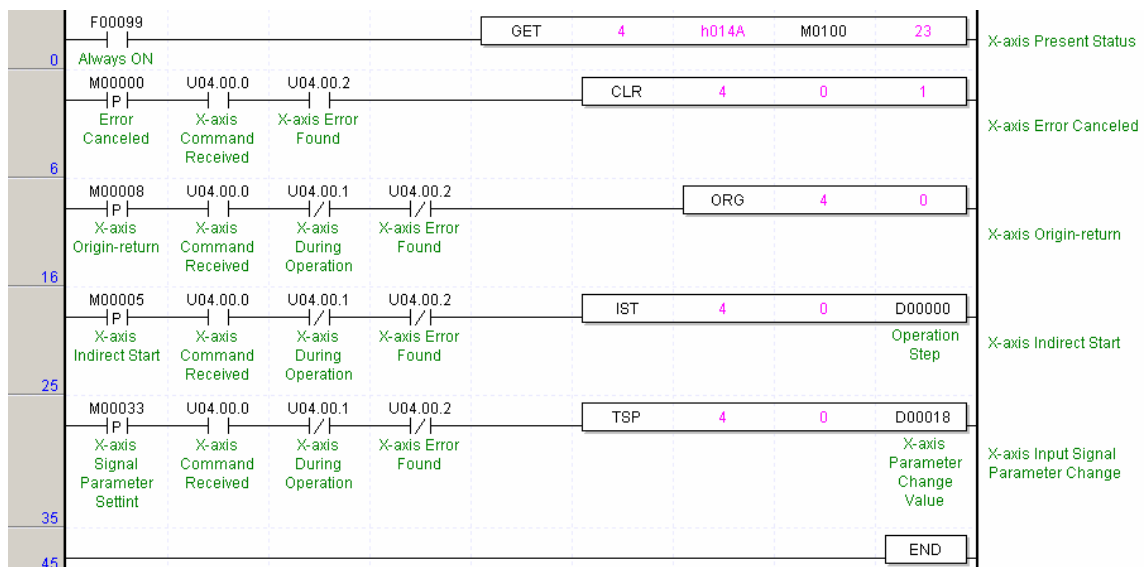
Program 3.25 Manual Operation Parameter Teaching

3.18.5 Input Signal Parameter Teaching

► The items available to change are as follows.

Input Signal Parameter	Setting Range
High limit signal	0 : A contact(Normal Open) 1 : B contact(Normal Close)
Low limit signal	
Near point signal	
Origin signal	
Emergency stop signal	
Deceleration stop signal	
Command signal	
Aux. command signal	
Speed/position switching Control signal	
Driver Ready/In-position signal	
External synchronous signal	

► Program



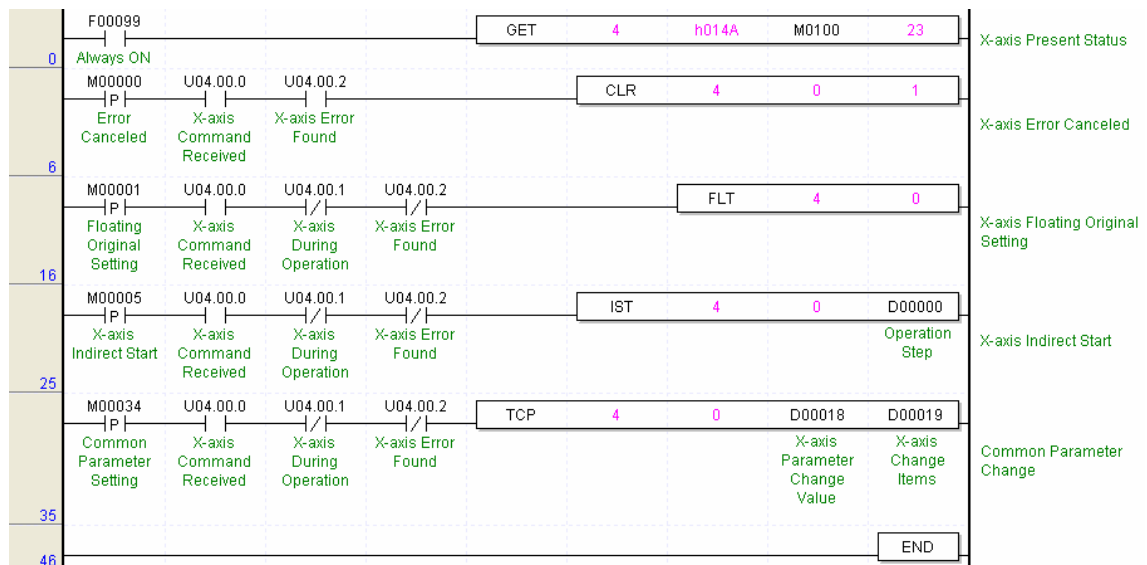
Program 3.26 Input Signal Parameter Teaching

3.18.6 Common Parameter Teaching

► The items available to change are as follows.

Common Parameter	Setting Range
Pulse output level	0:Low Active, 1:High Active
Encoder pulse input mode	0: CW/CCW(1), 1: CW/CCW(2), 2: PLS /DIR(1), 3: PLS/DIR(2), 4: PHASE A/B(1), 5: PHASE A/B(2), 6: PHASE A/B(4)
Z phase clear	-
Encoder Auto Reload value	0 ~ 4,294,967,295
Zone1 setting axis assigned	0:X, 1:Y, 2:Z, 3:Encoder
Zone1 output "ON" position	mm : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ mm], inch : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ inch], degree : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Zone1 output "OFF" position	
Zone2 setting axis setting	0:X, 1:Y, 2:Z, 3:Encoder
Zone2 output "ON" position	mm : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ mm], inch : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ inch], degree : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Zone2 output "OFF" position	
Zone3 setting axis setting	0:X, 1:Y, 2:Z, 3:Encoder
Zone3 output "ON" position	mm : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ mm], inch : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ inch], degree : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Zone3 output "OFF" position	
Zone output mode	0: individual output, 1: batch output (ZONE1)
Circular interpolation method	0: Middle point, 1: Center point

► Program



Program 3.27 Common Parameter Teaching

3.19 Operation Data Setting

► The items available to change are as follows..

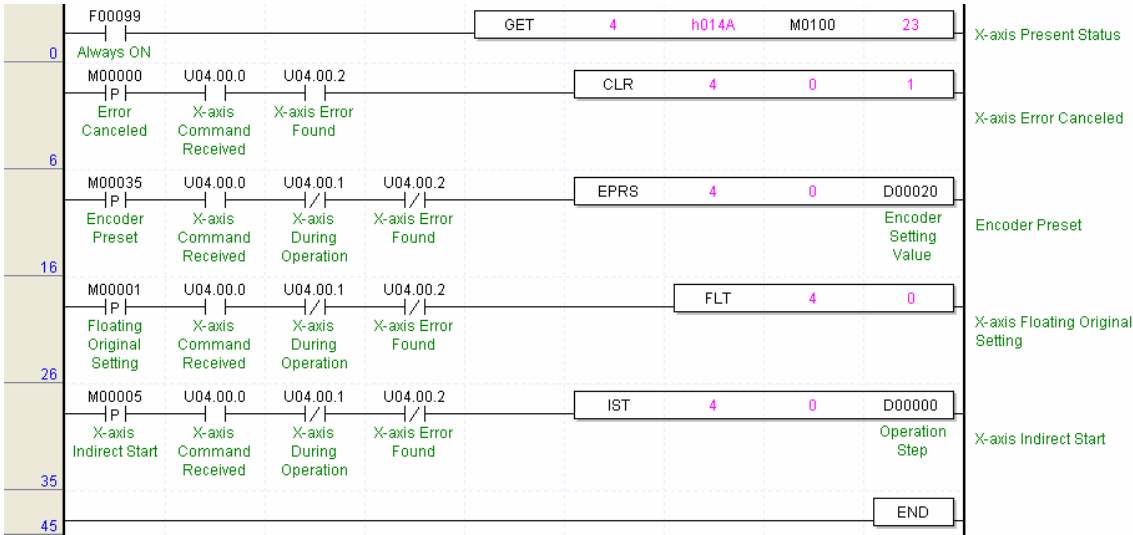
Operation Data	Setting Range
Goal position	mm : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-4}$ mm], inch : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ inch], degree : -2,147,483,648 ~ 2,147,483,647 [$\times 10^{-5}$ degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Operation speed	mm : 1 ~ 2,000,000,000 [$\times 10^{-2}$ mm/min], inch : 1 ~ 2,000,000,000 [$\times 10^{-3}$ inch/min], degree : 1 ~ 2,000,000,000 [$\times 10^{-3}$ degree/min], pulse : 1 ~ 200,000 (Open Collector)[pulse/sec], 1 ~ 1,000,000 (Line Driver)[pulse/sec]
Dwell time(ms)	0 ~ 50,000
M code no.	1 ~ 65,535
Control method	0: position control, 1: speed control
Operation method	0: Single, 1: Repeat
Operation pattern	0: End, 1: Go-on, 2: Continuous
Coordinate	0: Absolute, 2: Relative
Acc./dec. No.	0 ~ 3

► Operation data change is available from 1 to 400 step at X, Y and Z axes respectively.

3.20 Encoder Preset

- ▶ This function is to change the encoder value with encoder preset setting value.
- ▶ Encoder preset command should be executed in the status that external encoder pulse input is not entered.
- ▶ Encoder preset setting range : 0 ~ 4,294,967,295

▶ Program

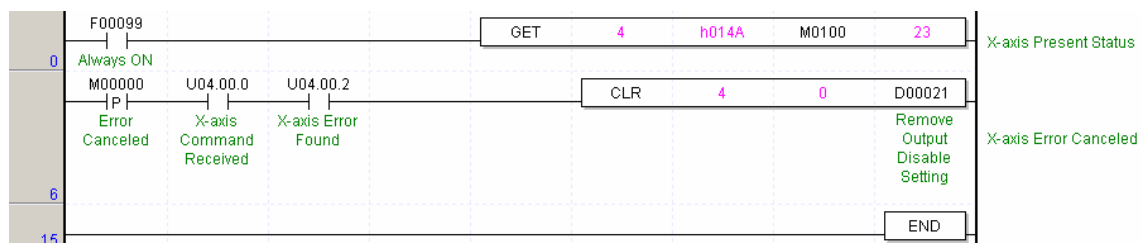


Program 3.29 Encoder Preset

3.21 Error and Output Disabled

- ▶ Error includes Light failure error and Heavy failure error.
- ▶ If light failure error occurs, the positioning operation will continue and only error will occur.
- ▶ In case of heavy failure error, if the error is not cleared, it is not available to carry out the positioning operation.
And if the heavy failure error occurs during operation, the operation will stop.
- ▶ If external high/low limit, external emergency stop, soft high/low limit, internal emergency stop during the positioning operation are detected during the positioning operation, it stops promptly and becomes the pulse output disabled status. Thus it is required to release 'the pulse output disabled' by Error reset command. In case of occurring in the origin determination status, it is required to execute the origin determination by the origin return, floating origin, current position preset.
- ▶ Error reset command includes the case to reset the error only and the case to release the pulse output disabled status.
- ▶ For further information, please refer to Error Information of Appendix 2.
- ▶ For further information of the error contents, it is available to confirm it from APM Software Package Help function and during the operation by APM Software Package it is available to confirm the content of error per axis.
- ▶ Output Disabled can be released when executing "CLR" as long as "Output Disabled Release Value" is set to "1" in the program.

▶ Program

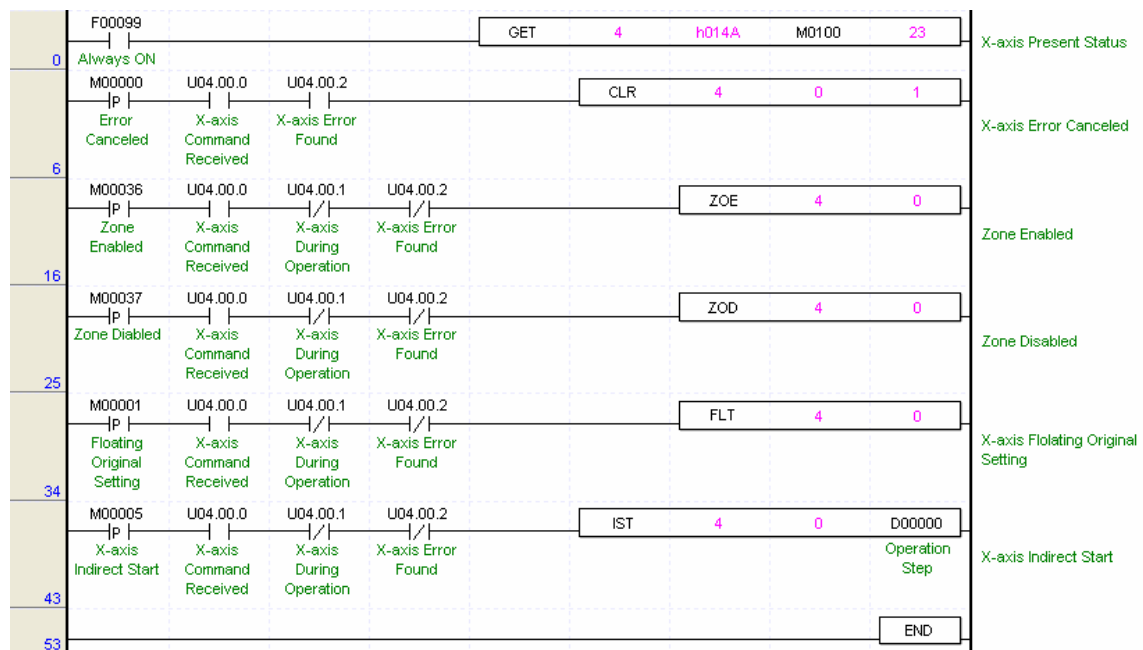


Program 3.30 Error and Output Disabled

3.22 ZONE Output

- ▶ According to ZONE output mode (0: individual output, 1: batch output (ZONE1)), ZONE1/2/3axis setting, ZONE1/2/3 ON starting point, ZONE1/2/3 ON ending point setting, it is outputted by the signal of ZONE1, ZONE2, ZONE3.
- ▶ According ZONE output command, it carries out the external output for ZONE1, ZONE2, ZONE3 "ON" signal or prohibits the external output.
- ▶ For further information, please refer to Article 5.5.5 Zone Output.

▶ Program



Program 3.31 ZONE Output

3.23 Point Start

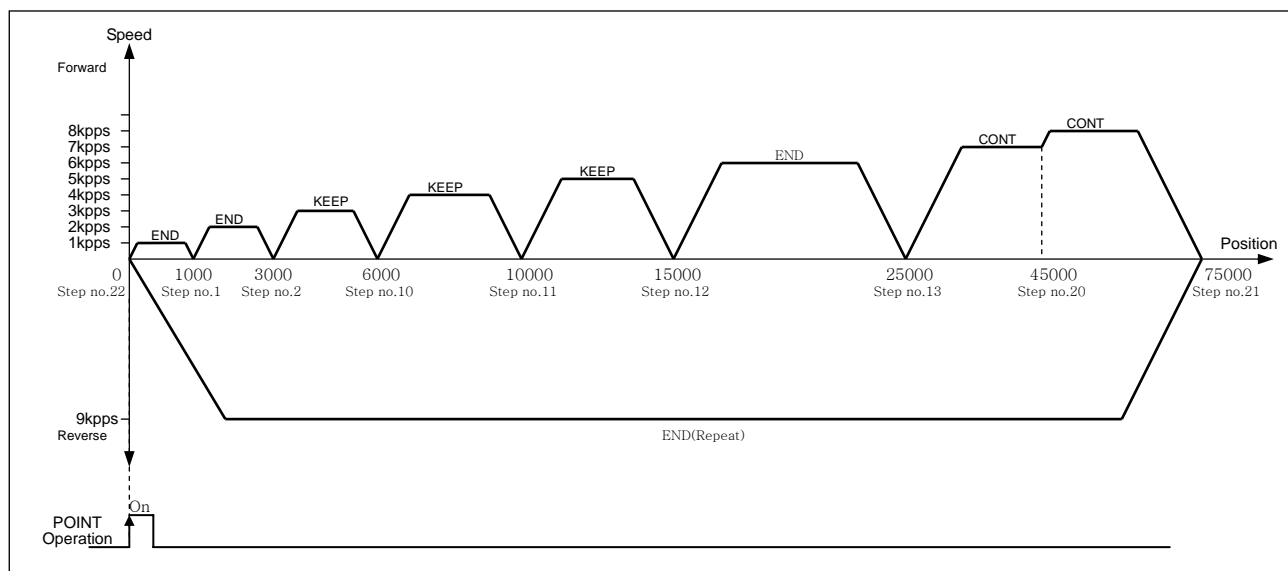
- Point start is the positioning operation available to operate by operation data of the step no. set by one time start command and is called also "PTP(Point To Point)". It is available to set max. 20 steps.
- It carries out the point start as much as the assigned point number from step setting (Point 1) regardless of End, Go-on, Continuous operation mode. In this case, the step no. to be set should be set as the step no. that starts at the very first in case of Go-on or Continuous operation mode.

[Example]

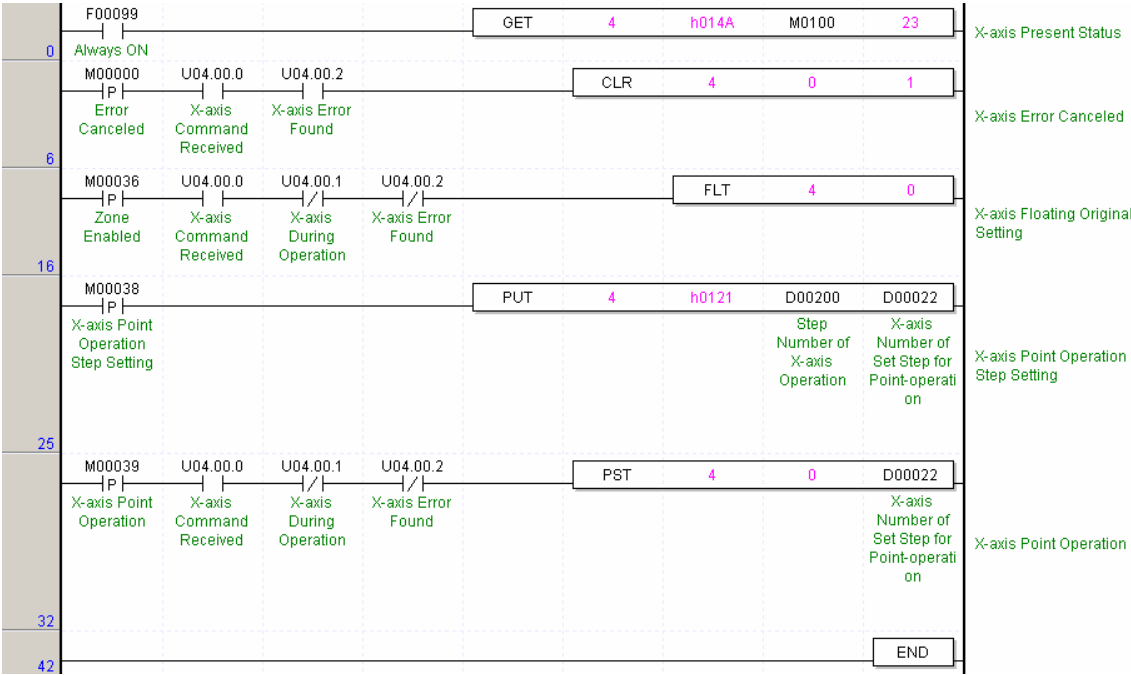
► APM Software Package Setting

Items of Position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point[pulse]	M code	Acc./dec no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X Setting	1	Absolute	Position	End	Single	1000	0	0	1	1000	20	CW
	2	Absolute	Position	End	Single	3000	0	0	1	2000	20	CW
	10	Absolute	Position	Go-on	Single	6000	0	0	1	3000	20	CW
	11	Absolute	Position	Go-on	Single	10000	0	0	1	4000	20	CW
	12	Absolute	Position	Go-on	Single	15000	0	0	1	5000	20	CW
	13	Absolute	Position	End	Single	25000	0	0	1	6000	20	CW
	20	Absolute	Position	Continuous	Single	45000	0	0	2	7000	20	CW
	21	Absolute	Position	Continuous	Single	75000	0	0	2	8000	20	CW
	22	Absolute	Position	End	Repeat	0	0	0	2	9000	20	CW

► Operation Pattern



►Program



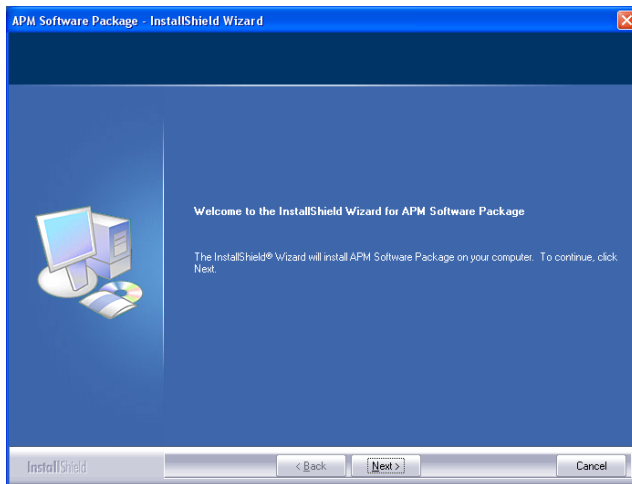
Program 3.32 Point Start

Chapter 4 APM Software Package

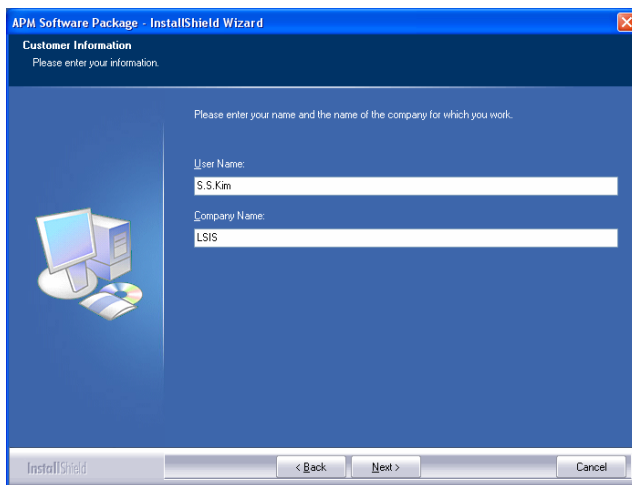
4.1 APM Software Package Installation and Removal

4.1.1 APM Software package Installation Procedure

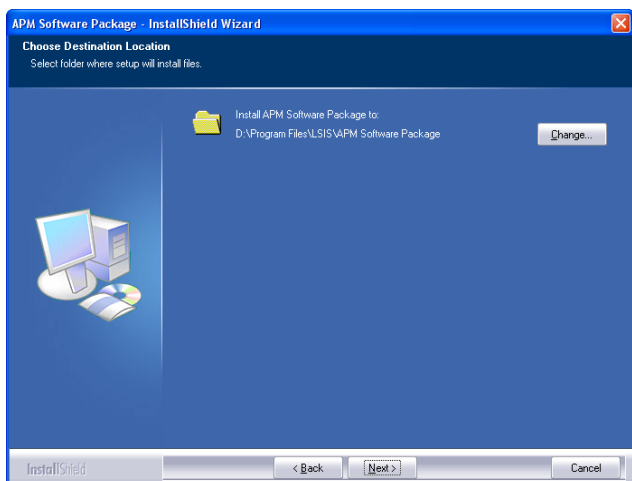
- (1) If double-clicking installation file, it shows the following window. Then, pressing [Next] button, the step processing continues to the next step.



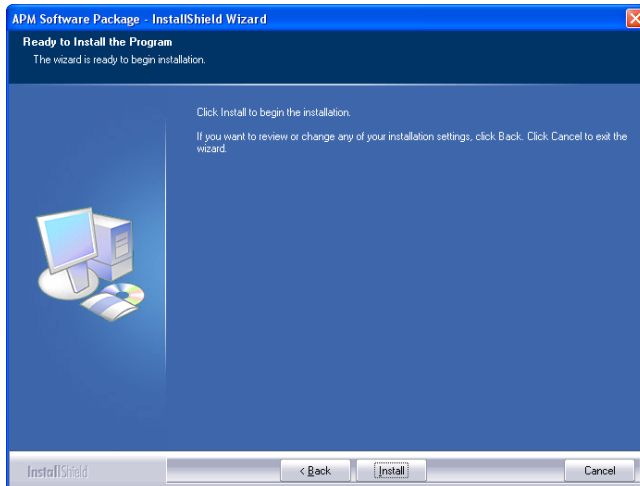
- (2) After entering the user name and the company name or school name, if press [Next] button, it continues to the next step.



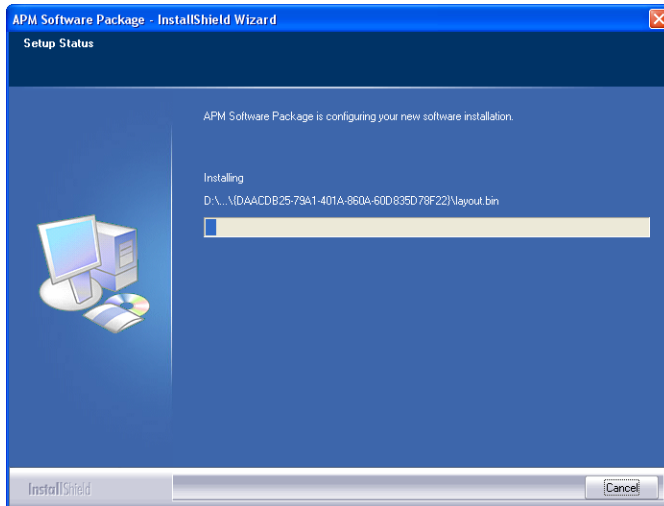
- (3) After selecting the folder to install, press Next button.



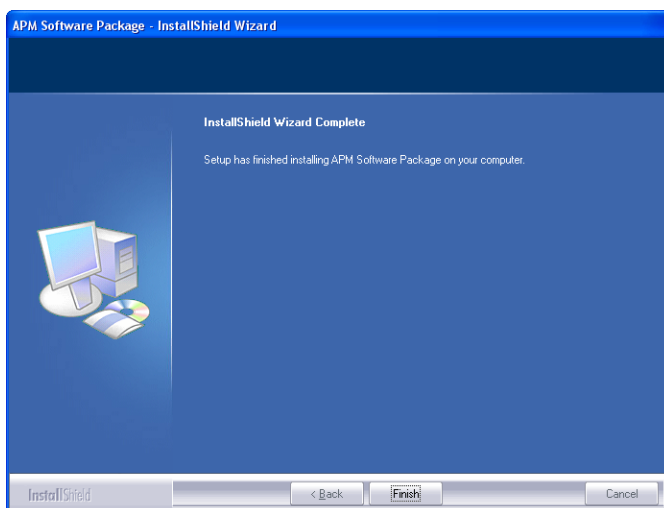
- (4) To continue the installation procedure, press Install button. If pressing Back button, it returns to the previous step.



- (5) The following window shows the installation progression.



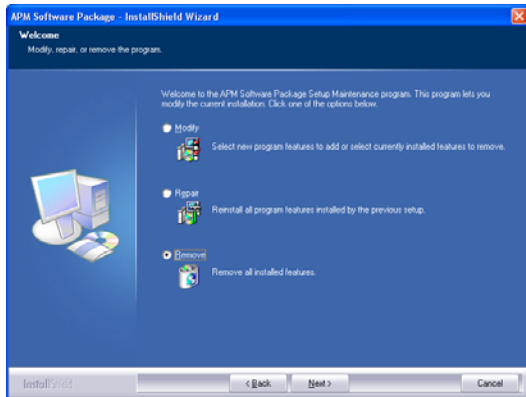
- (6) If the following window appears, press End button to complete the installation procedure.



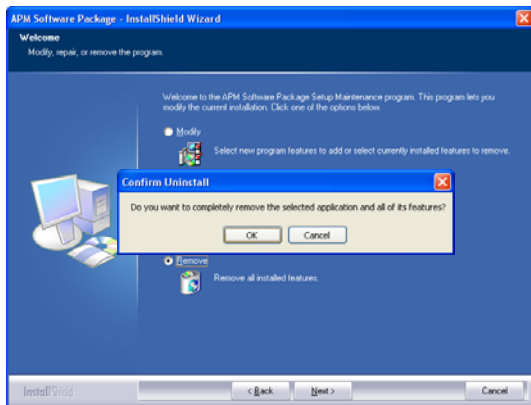
※ When a message stating 'Windows should be rebooted', you should reboot the computer for the normal action of APM Software package.

4.1.2 APM Software Package Removal Procedure

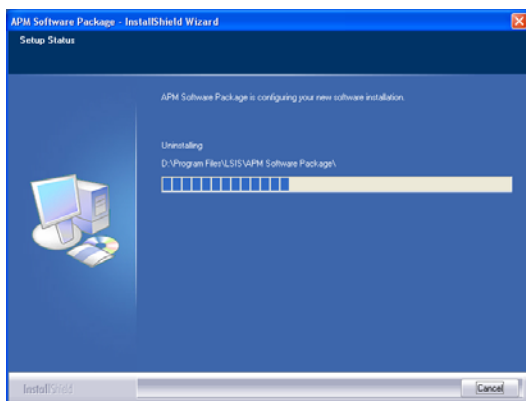
(1) If double-clicking Installation file after the APM Software package is installed, the following window appears. Select Remove and press Next and it starts removing the APM software package.



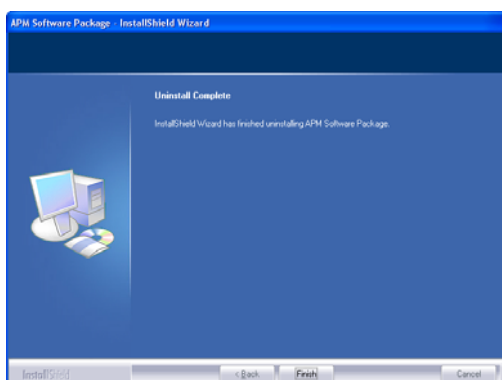
(2) If you press Verify button, APM software package removal begins.



(3) The following window shows the progression of removing procedure.



(4) If you press End button, APM Software package removal is ended.



4.2 APM Software Package Basic Structure and Function List

4.2.1 APM Software package Basic Display

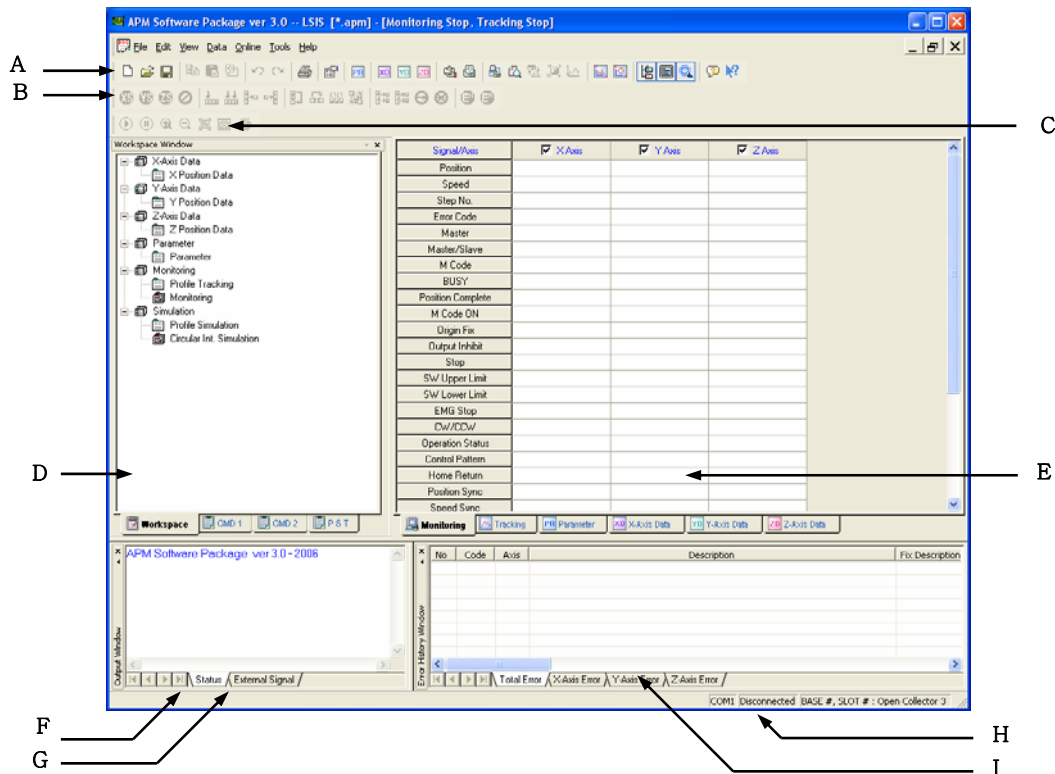


Figure 1. Initial Display of Program Execution

Items	Description
A : Basic Tools gathering	Includes tool collection such as file open/save, edit, print, operation data/operation parameter, online/offline model setting communication connection, monitoring and simulation function etc.
B : Command Tools gathering	Includes tool gathering of frequently used command items.
C : Tracking Tools gathering	With Tracking tools, the user can realize the Zoom-in/out function and various function when carrying out Tracking.
D : Working screen and Command window	Through "working screen", the user can move the working space to the desired display easily and carry out the commands through "command window".
E : Working space	As it is divided into monitoring, Tracking, operation parameter, operation data(X,Y,Z) etc, the user can carry out several works at the same time.
F : Status display window	Indicates the working status information of APM software package.
G : External I/O signal window	Available to confirm the external I/O signal of each axis during monitoring.
H : Status line	Indicates the information of APM module characteristics and position, the information of telecommunication environment/status and max./min. operation parameter etc.
I : Error history window	A Display available to confirm the specification of errors occurred while executing the commands by every 10 of each axis.

Table 1. Function description of APM software package initial display

APM software package has “Show/Hide” function for all parts such as error history window, external I/O signal window, working space etc. This function is shown on **[View]** menu and the function description is shown on the following table.

Items	Action description	Hot key
Main tool gathering	Shows and Hides Basic tool gathering . * refer to Fig. 1	
Command tool gathering	Shows and Hides Command tool gathering .	SHIFT + K
Tracking tool gathering	Shows and Hides Tracking tool gathering .	SHIFT + L
Status line	Shows and Hides Status line .	SHIFT + S
Working space	Shows and Hides Working space and Command window .	SHIFT + W
External I/O signal / Status display	Shows and Hides External I/O signal window and Status display .	SHIFT + V
Error information	Shows and Hides Error history display .	SHIFT + E

Table 2. Show/Hide function of APM software package display

4.2.2 APM Software Package Function List

1) Main Features

(1) Intuitive icon design applied

- Applied the intuitive icon design for the user to use APM software package more easily.

(2) Stereoscopic structure to verify the data easily and fast

- Available to verify the external I/O signal and the error history easily and fast during monitoring.

Especially, as the error history display shows the detailed error contents and actions for the errors shown on the monitoring display at one time, it helps to solve the problem. And it is designed to indicate the external I/O signal status by color classification for the user to verify it easily.

(3) Flexible Communication function

- APM software package is designed for the user to recognize GLOFA GM/MASTER-K PLC or XGT PLC type automatically and as it checks the communication speed automatically, the user can use the positioning module by using this software package easily without setting separately.

(4) Compatible with the previous APM software package

- Enables to read the file prepared in the previous version APM software package and save it as the file for XGT positioning module. But, the file prepared in the upgraded APM software package not allowed to be read in the previous version APM software package.

4.3 Working Screen

4.3.1 Make working screen

1) Method

- (1) Select **[New file]** from file menu or select the corresponding icon from basic tool gathering.
- (2) Select **[Open file]** from file menu or select the corresponding icon from basic tool gathering.
- (3) Select **[Set online model]** or **[Set offline model]** from model setting item or select the corresponding icon from basic tool gathering.





Items	Tool gathering	Hot key
New file		CTRL + N
Open file		CTRL + O
Set online model		SHIFT + N
Set offline model		SHIFT + B

Table 3. "Make working screen" related tool gathering

2) Function description

(1) APM module axis number fixing when making new Working screen

When making Working screen after selecting **[New file]**, the working screen is composed with the assumption that it is basically **APM 1 axis module** and thus the user can not edit other axis except X axis in the monitoring screen, operation parameter, operation data screen.

But if the user makes new working screen by using **[New file]** item after setting the APM module axis number by **[Set online model]** or **[Set offline model]** already, the user can make the working screen using the previously setting APM module axis number information.

4.3.2 Save Working screen

1) Method

- (1) Select **[Save]** or **[Save as other file name]** from file menu.
- (2) Write the file name and save it, it is saved as **file name.apm**.


Items	Tool gathering	Hot key
Save working screen		CTRL + S

Table 4. "Save working screen" related tool gathering

Notes

- The file extension name (apm) of APM software package and the file extension name (apm) of the previous APM software package are same. When you open the specific apm file by using the previous APM software package, if the data is broken, this means that the corresponding file is for XGT APM file and if you use APM software package, you could verify the data correctly.

2) Function Description

(1) Save 3axis data regardless of APM module axis number

When APM software package saves the working screen, it saves all 3 axis data even if APM model is 1 axis or 2 axis. (Ex : in case of 1 axis, Y,Z axis data is saved as Default.)

After setting APM module as 3 axis to form the working screen and saving the corresponding file, if you reset APM software package and open the corresponding file, only 1 axis data shall be displayed. In this case, if you set 3 axis in [set offline model] item and open the file again, you can see all 3 axis data.

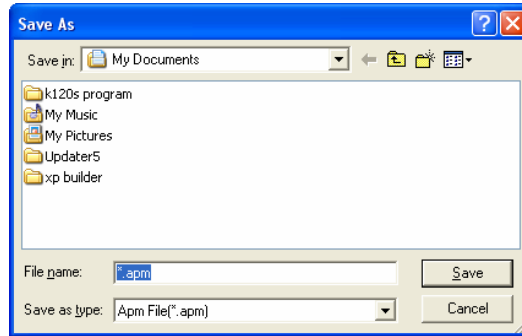


Fig. 2. The screen displayed when saving the working screen

4.3.3 The Structure of Working Screen

1) Function Description

(1) Composed of 1 working screen

Once the working screen is made, it is not available to make other working screen by using **[New file]**. In order to make new working screen instead of the existing working screen, you should save the existing working screen as a file and close it and then make new working screen. If you select **[New file]** to make new working screen in the state that the existing working screen is open, the error will occur.

(2) Proceeding status indication

During monitoring or Tracking, as the upper part of the working screen changes to show the message such as **in Monitoring**, **Tracking stop** or **Monitoring stop, in Tracking**, it is available to recognize the current status when moving to other screen.

	Item	X-Axis	Y-Axis	Z-Axis
Basic Parameter	Unit	0: Pulse	0: Pulse	0: Pulse
	Pulse per rotation	20000 pls	20000 pls	20000 pls
	Travel per rotation	20000 pls	20000 pls	20000 pls
	Unit multiplier	0: x 1	0: x 1	0: x 1
	Pulse Output mode	0: CW/CCW	0: CW/CCW	0: CW/CCW
	Bias Speed	1 pls/s	1 pls/s	1 pls/s
	Speed Limit	100000 pls/s	100000 pls/s	100000 pls/s
	ACC/DEC No.1	500 ms	500 ms	500 ms
	ACC/DEC No.2	1000 ms	1000 ms	1000 ms
Extended Parameter	ACC/DEC No.3	1500 ms	1500 ms	1500 ms
	ACC/DEC No.4	2000 ms	2000 ms	2000 ms
	S/W Upper Limit	2147483647 pls	2147483647 pls	2147483647 pls
	S/W Lower Limit	-2147483648 pls	-2147483648 pls	-2147483648 pls
	Backlash Compensation	0 pls	0 pls	0 pls
	Position Complete Time	1000 ms	1000 ms	1000 ms
	Ext. Command Selection	0: Start	0: Start	0: Start
	Pulse Output Direction	0: CW	0: CW	0: CW
	M Code Output	0: NONE	0: NONE	0: NONE
Extended Parameter	External Command	0: Disable	0: Disable	0: Disable
	External Stop	0: Disable	0: Disable	0: Disable
	External Concurrent Start	0: Disable	0: Disable	0: Disable

Fig 3. Working screen

4.4 Offline and Online Model Setting

4.4.1 Offline model setting

1) Method

- (1) Select **[Set offline model]** from model setting items or click the corresponding icon from basic tool gathering.
- (2) After setting APM module type and APM module axis number, press **[Verify]** Button.

Items	Tool gathering	Hot key
Set offline model		SHIFT + B

Table 5. "Set offline model" related tool gathering

2) Function Description

(1) Automatic setting of Data range according to APM Module type

The purpose of offline model setting is for the user to write operation parameter or operation data without connecting to PLC. As **[Open collector]** type and **[Line driver]** type has different range of **speed limit**, cares should be taken in setting the model.

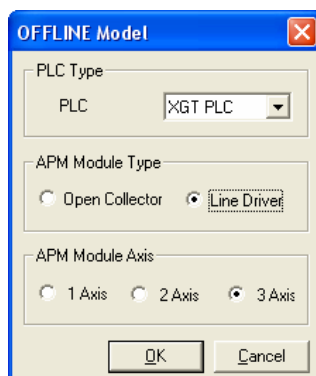


Fig. 4. Offline model setting dialogue box

(2) Maintains the existing data after setting offline model

When you set new offline model in the state that the working screen is open, the existing operation parameter or operation data shall be maintained as it were. But in case that APM module axis number is changed, it may not be available to see the existing operation parameter or operation data. And if you select XGT PLC for PLC type value, the parameter item (input signal parameter) will appear by adding on the operation parameter screen.

4.4.2 Online model setting

1) Method

- (1) Select **[Set online model]** from model setting items or click the corresponding icon from basic tool gathering or click **[The previous online model setting]** icon.
- (2) If you click **[Online model setting]** icon, APM module base position, slot and model information shall be displayed and if several module is set on one base, the APM module list that APM software package is recognizing at present time shall be displayed. If the user carries out **[Online model setting]** regardless of PLC CPU model, APM software package will search PLC CPU model and set the online model automatically. While the communication speed of GLOFA GM/MASTER-K PLC CPU is 38400pbs, the

communication speed of XGT series PLC CPU is 11520bps, but APM software package is designed to check the communication speed automatically so that the user can connect regardless of PLC CPU type without a separate communication setting.

(3) If you select the desired APM module and press **[Verify]** Button, new working screen shall be made.



Items	Tool gathering	Hot key
Set Online model		SHIFT + N
Set the previous online model		None

Table 6. Online model setting tool gathering

2) Function Description

(1) In case that several APM modules are set in PLC

In this case, APM software package can recognize max. 4 bases (32 slot). GLOFA GM/MASTER-K PLC can recognize max. 8 APM modules for one base, and XGT PLC can recognize max. 12 APM module for one base (max. 8 bases). The following figure shows the online model setting dialogue box when several APM modules are inserted.

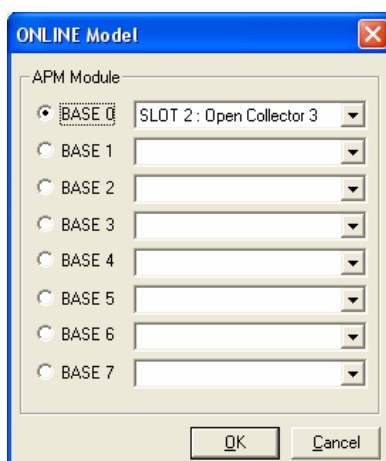


Fig. 5. Online model setting dialogue box

(2) Reconnection function

This function enables to form the working screen by connecting PLC and software package directly using the previous online model setting information instead of using online model setting function when you need to set online model again after closing the communication port. But if you carry out the previous online model setting function without setting the online model more than one time after executing APM software package program, the error message will be displayed as follows. Thus you should set the online model before carrying out this function.

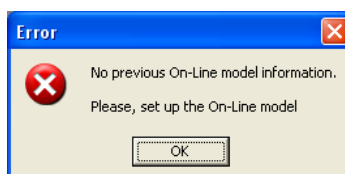


Fig. 6. Error indication for reconnection function

4.5 Communication Environment Setting

4.5.1 Communication Environment Setting

1) Method

Select [Communication environment setting] icon from basic tool gathering.


Items	Tool gathering	Hot key
Communication environment setting		SHIFT + P

Table 7. Offline model setting related tool gathering

2) Function Description

(1) RS-232 and USB communication support

APM software package supports RS-232 and USB communication. For RS-232 communication, the communication speed of GLOFA-GM/MASTER-K PLC CPU and XGT PLC CPU should be set as 38400bps and 115200bps, respectively while the user should set COM port in accordance with the COM port to which PLC is connected. For USB, it is designed to process the data 4-5 times faster than RS-232 communication. The user can set the above two communication methods by using the communication environment setting dialogue box as below and the changed content shall be displayed on the state bar located in the bottom of APM software package.

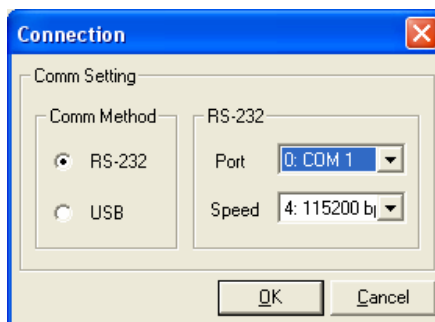


Fig. 7 Communication environment setting dialogue box

4.6 Operation Parameter and Operation Data Setting

4.6.1 Operation Parameter Setting

1) Method

Select [Operation parameter] from data menu or click the corresponding icon from basic tool gathering.


Items	Tool gathering	Hot key
Operation parameter		SHIFT + P

Table 8. Operation parameter related tool gathering

2) Function Description

(1) Configuration

Operation parameter is divided into 5 types as follows.

Basic parameter, Extended parameter, Origin/Manual parameter, Input signal parameter, Common parameter

	Item	X-Axis	Y-Axis	Z-Axis
Basic Parameter	Unit	0: Pulse	0: Pulse	0: Pulse
	Pulse per rotation	20000 pls	20000 pls	20000 pls
	Travel per rotation	20000 pls	20000 pls	20000 pls
	Unit multiplier	0: x 1	0: x 1	0: x 1
	Pulse Output mode	0: CW/CCW	0: CW/CCW	0: CW/CCW
	Bias Speed	1 pls/s	1 pls/s	1 pls/s
	Speed Limit	100000 pls/s	100000 pls/s	100000 pls/s
	ACC/DEC No.1	500 ms	500 ms	500 ms
	ACC/DEC No.2	1000 ms	1000 ms	1000 ms
	ACC/DEC No.3	1500 ms	1500 ms	1500 ms
Extended Parameter	ACC/DEC No.4	2000 ms	2000 ms	2000 ms
	S/W Upper Limit	2147483647 pls	2147483647 pls	2147483647 pls
	S/W Lower Limit	-2147483648 pls	-2147483648 pls	-2147483648 pls
	Backlash Compensation	0 pls	0 pls	0 pls
	Position Complete Time	1000 ms	1000 ms	1000 ms
	Ext. Command Selection	0: Start	0: Start	0: Start
	Pulse Output Direction	0: CW	0: CW	0: CW
	M Code Output	0: NONE	0: NONE	0: NONE
	External Command	0: Disable	0: Disable	0: Disable
	External Stop	0: Disable	0: Disable	0: Disable
	External Concurrent Start	0: Disable	0: Disable	0: Disable
	External VTP	0: Disable	0: Disable	0: Disable
	Software Limit Detect	0: No Detect	0: No Detect	0: No Detect
	Position Display	0: No Display	0: No Display	0: No Display
	ACC/DEC Pattern	0: Trapezoidal	0: Trapezoidal	0: Trapezoidal
	S-Curve Ratio	50	50	50
Home Parameter	Position Complete Cond	0: Dwell	0: Dwell	0: Dwell
	Driver Ready/Inposition	0: Driver Ready	0: Driver Ready	0: Driver Ready
	Homing Method	0: DOG/HOME(OFF)	0: DOG/HOME(OFF)	0: DOG/HOME(OFF)
	Homing Direction	0: CW	0: CW	0: CW
	Home Address	0 pls	0 pls	0 pls
	Home Compensation	0 pls	0 pls	0 pls
	Home High Speed	5000 pls/s	5000 pls/s	5000 pls/s
	Home Low Speed	500 pls/s	500 pls/s	500 pls/s
	Homing Retry Time	0 ms	0 ms	0 ms
	Homing ACC/DEC Time	1000 ms	1000 ms	1000 ms

Fig. 9. Operation parameter screen

(2) Automatic range and data error check function

With [Automatic range and data error check function] for each item, it is available to modify the error directly through detailed error message when the user entered the data wrong. If such data error occurs, it will be restored as the previous value automatically. Especially, when the user enters the data in the speed related parameter item, the related parameter items shall be compared with max/min value automatically and if the items is out of range, the background color is displayed by red so that the user can enter the proper value.

(3) Maintains operation parameter data when making new working screen

Even if the user makes the working screen again through offline/online model setting while editing operation parameter item, operation parameter information does not disappear and is maintained as it were. Thus this is very useful in case of using operation data in several APM modules.

(4) Unit conversion function and Parameter max./min. indication function

If changing the **Unit** of each axis, the items related to speed and position shall be changed automatically in the unit and range indication. As Max./Min. of parameter item per unit is shown on **[Status line]** if selecting the corresponding items, it enables to reduce the data input error.

	Item	X-Axis
Basic Parameter	Unit	0: Pulse
	Pulse per rotation	20000 pls
	Travel per rotation	20000 pls
	Unit multiplier	0: x 1
	Pulse Output mode	0: CW/CCW
	Bias Speed	1 pls/s
	Speed Limit	100000 pls/s
	ACC/DEC No.1	500 ms
	ACC/DEC No.2	1000 ms
	ACC/DEC No.3	1500 ms
ACC/DEC No.4	2000 ms	



	Item	X-Axis
Basic Parameter	Unit	1: mm
	Pulse per rotation	20000 pls
	Travel per rotation	2000.0 um
	Unit multiplier	0: x 1
	Pulse Output mode	0: CW/CCW
	Bias Speed	0.01 mm/m
	Speed Limit	1000.00 mm/m
	ACC/DEC No.1	500 ms
	ACC/DEC No.2	1000 ms
	ACC/DEC No.3	1500 ms
ACC/DEC No.4	2000 ms	

Operation parameter screen

	Item	XcAxis
Extended Parameter	S/Air Upper Limit	214748364.7
	S/Air Lower Limit	-214748364.8
	Backlash Compensation	0.0
	Position Complete Time	1000
	Ext. Command Selection	0: Stop
	Pulse Output Direction	0: Forward
	M Code Output	0: NO
	External Command	0: Disable
	External Stop	0: Disable
	External Concurrent Start	0: Disable
	External VTP	0: Disable
	Software Limit Detect	0: No Detect
	Position Display	0: No Display
	ACC/DEC Pattern	0: Trapezoidal
	S-Curve Ratio	1
Position Complete Cond	0: Disable	
Driver Ready/Inpos	0: Driver Ready	

[illegible]

State bar

Figure 9. Unit conversion function(pulse \rightarrow mm)

Figure 10. Parameter max./min. indication function

(5) Editing function

For operation parameter screen, **[Copy/Paste]** function for block and each item is not applied

4.6.2 Operation Data Setting

1) Method

- Select **[X/Y/Z axis operation data]** from data menu or click the corresponding icon from basic tool gathering.









Items	Tool gathering	Hot key
X axis operation data		SHIFT + X
Y axis operation data		SHIFT + Y
Z axis operation data		SHIFT + Z
Copy		CTRL + C
Paste		CTRL + V
Return		CTRL + Z
Revive		CTRL + R
Initial value setting		None

Table 9. Operation parameter and Operation data setting tool gathering
4-12

2) Function Description

(1) Configuration

APM software package shows 50 operation step items for each axis as initial value. The user can change the step number of each axis through the environment setting function

Step	Cordi	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
2	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
3	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
4	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
5	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
6	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
7	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
8	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
9	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
10	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
11	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
12	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
13	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
14	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
15	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
16	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
17	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
18	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
19	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW

Fig. 11. Operation data screen

(2) Automatic range and data error check function

With **[Automatic range and data error check function]** for each item, it is available to modify the error directly through detailed error message when the user entered the data wrong. If such data error occurs, it will be restored as the previous value automatically.

(3) Maintains operation data when making new working screen

Even if the user change the APM module information through offline/online model setting while editing operation data item, operation data information does not disappear and is maintained as it were. Thus this is very useful in case of using operation data in several APM modules.

(4) Editing function

Operation data screen supports **[Copy/Paste]** function for block and each item and carries out **[Copy/Paste/Return/Revive]** function by using the right side of mouse. And it is available to change the data of each item as initial value by using **[Set initial value]** command.

Step	Cordi	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	KEEP	SIN	158000	0	0	No.1	1000	0	CW
2	ABS	POS	KEEP	SIN	158000	0	0	No.1	2000	0	CW
3	ABS	POS	KEEP	SIN	158000	0	0	No.1	3000	0	CW
4	Copy	Ctrl+C	KEEP	REP	158000	0	0	No.1	4000	0	CW
5	Paste	Ctrl+V	END	SIN	0	0	0	No.1	0	0	CW
6	Undo	Ctrl+Z	END	SIN	0	0	0	No.1	0	0	CW
7	Initial Value		END	SIN	0	0	0	No.1	0	0	CW
8			END	SIN	0	0	0	No.1	0	0	CW

Step	Cordi	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
2	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
3	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
4	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW

Before "initial value setting" / After "initial value setting"

Fig. 12. Initial value setting command execution

(5) Operation data item indication function

When the data is entered in the operation data item, if it is different from initial value, it shall be changed in **Black color** automatically that enables to distinguish the edited data. (Refer to environment setting function)

(6) Operation step change function

Basically the step no. of X, Y, Z axis operation data screen is limited as 50 steps. If setting the range in **[Environment setting]** function to increase the operation step number of each axis, the working screen shall be reformed.

(7) Auto-Fill function

This auto-fill function used in Excel enables the user to write the data in order easily. This function is available to work only in one longitudinal line and not available in case of more than two longitudinal line.

Step	Cord	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pl/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	1000	0	0	No.1	0	0	CW
2	ABS	POS	END	SIN	2000	0	0	No.1	0	0	CW
3	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
4	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
5	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
6	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
7	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
8	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
9	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
10	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
11	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW

↓

Step	Cord	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pl/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	1000	0	0	No.1	0	0	CW
2	ABS	POS	END	SIN	2000	0	0	No.1	0	0	CW
3	ABS	POS	END	SIN	3000	0	0	No.1	0	0	CW
4	ABS	POS	END	SIN	4000	0	0	No.1	0	0	CW
5	ABS	POS	END	SIN	5000	0	0	No.1	0	0	CW
6	ABS	POS	END	SIN	6000	0	0	No.1	0	0	CW
7	ABS	POS	END	SIN	7000	0	0	No.1	0	0	CW
8	ABS	POS	END	SIN	8000	0	0	No.1	0	0	CW
9	ABS	POS	END	SIN	9000	0	0	No.1	0	0	CW
10	ABS	POS	END	SIN	10000	0	0	No.1	0	0	CW

Fig. 13. Auto-Fill function

3) Notices

(1) [Copy/Paste] in different unit

If you set X axis unit as “mm”, “inch”, “degree” (Y, Z axis “pulse”) in operation parameter screen and move to X axis operation data screen to enter “0.01” for the goal position item and “0.1” for operation speed item and carry out block copy and then block paste to Y axis operation data screen, the Y axis goal position item and operation speed item shall be indicated as “0” instead of 0.01 and 0.1. This means that other units except “pulse” unit are allowed to indicate decimal point for goal position and operation speed item while “pulse” unit is not allowed.

Step	Cord	Control	Pattern	Method	Address [um]	Sub Address [um]	M Code	A/D No.	Speed [mm/min]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	0.2	0.1	0	No.1	0.10	0	CW
2	ABS	Copy	Ctrl+C	SIN	0.4	0.2	0	No.1	0.20	0	CW
3	A	Paste	Ctrl+V	SIN	0.0	0.0	0	No.1	0.00	0	CW
4	A	Undo	Ctrl+Z	SIN	0.0	0.0	0	No.1	0.00	0	CW
5	A			SIN	0.0	0.0	0	No.1	0.00	0	CW
6	A	Initial Value		SIN	0.0	0.0	0	No.1	0.00	0	CW

↓

Step	Cord	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pl/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
2	ABS	Copy	Ctrl+C	SIN	0	0	0	No.1	0	0	CW
3	A	Paste	Ctrl+V	SIN	0	0	0	No.1	0	0	CW
4	A	Undo	Ctrl+Z	SIN	0	0	0	No.1	0	0	CW
5	A	Initial Value		SIN	0	0	0	No.1	0	0	CW

X axis operation data(“mm”) / Y axis operation data(“pulse”)

Fig. 14. [Copy/Paste] error in different units

(2) [Copy/Paste] in different block

If you set the block for partial operation data item and carry out **[Copy/Paste]** function to other block without setting the block for overall operation data item and carrying out **[Copy/Paste]** function, the error message shall be displayed as follows.

Step	Cordi	Control	Pattern	Method	Address [um]	Sub Address [um]	M Code	A/D No.	Speed [mm/min]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	0.2	0.1	0	No.1	0.10	0	CW
2	ABS	POS	END	SIN	0.4	0.2	0	No.1	0.20	0	CW
3	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
4	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
5	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
6	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW

Step	Cordi	Control	Pattern	Method	Address [um]	Sub Address [um]	M Code	A/D No.	Speed [mm/min]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	0.2	0.1	0	No.1	0.10	0	CW
2		Copy	Ctrl+C	SIN	0.4	0.2	0	No.1	0.20	0	CW
3		Paste	Ctrl+V	SIN	0.0	0.0	0	No.1	0.00	0	CW
4		Undo	Ctrl+Z	SIN	0.0	0.0	0	No.1	0.00	0	CW
5		Initial Value		SIN	0.0	0.0	0	No.1	0.00	0	CW
6				SIN	0.0	0.0	0	No.1	0.00	0	CW

Fig. 15. [Copy/Paste] error in different block

(3) Speed Items

As the max. speed of Line Driver and Open Collector of APM module is different, if the user changes the APM module type with Open Collector after setting the operation data by Line Driver, it may occur that the value of speed item of operation data is out of max. value. In this case, APM software package is designed to process the item out of max. value with red color so that the user can verify it easily and even in the case of executing data write, the caution message will be displayed. And even in parameter items, the speed related items shall be processed with the same method.

Step	Cordi	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	KEEP	SIN	1000000	0	0	No.1	200000	0	CW
2	ABS	POS	KEEP	REP	2000000	0	0	No.1	50000	0	CW
3	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
4	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
5	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
6	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
7	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
8	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
9	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
10	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW

Fig.16. Operation Speed Check Function according to APM module type

Notes

When selecting XGT positioning module and GM/MK positioning module in APM software package, the operation parameter screen to be seen for the user is different. This is because the item 'Input signal parameter' was added to the XGT positioning module parameter.

4.7 Command

4.7.1 Command

1) Method

- (1) Execute [Set online model].
- (2) After executing Monitoring or Tracking and setting the command axis, if you click the command item button or click the command item button right after setting the command axis, monitoring is automatically carried out and the corresponding command item is executed.

2) Function Description

(1) Configuration

As the command axis setting part does not change even if the command screen is changed or scrolled up and down, it is available to verify the command axis information easily. The command screen is composed of **CMD 1**, the command screen except teaching command, **CMD 2**, the command screen related to teaching and teaching array, and **PST**, Point command screen and if the command axis is set in any from 3 screens, it shall be applied to all command screen simultaneously.



Fig. 17. Command axis setting part

<input checked="" type="checkbox"/> X-Axis	<input type="checkbox"/> Y-Axis	<input type="checkbox"/> Z-Axis	<input checked="" type="checkbox"/> X-Axis	<input type="checkbox"/> Y-Axis	<input type="checkbox"/> Z-Axis	<input checked="" type="checkbox"/> X-Axis	<input type="checkbox"/> Y-Axis	<input type="checkbox"/> Z-Axis	
CMD1			CMD2			PST			
Indirect Start			Teaching	Step	0	Teaching Array	No.	0	
Error Reset				Target	0: RAM		0	0	
Direct Start				Data	POS		1	0	
				Value	0.0 um		2	0	
Value	Step	0	3	0					
	Target	0: RAM	4	0					
	Data	POS	5	0					
	No.	0	6	0					
	0	0.0 um	7	0					
	1	0.0 um	8	0					
	2	0.0 um	9	0					
	3	0.0 um	10	0					
	4	0.0 um	11	0					
	5	0.0 um	12	0					
	6	0.0 um	13	0					
	7	0.0 um	14	0					
	8	0.0 um	15	0					
	9	0.0 um	16	0					
	10	0.0 um	17	0					
	11	0.0 um	18	0					
	12	0.0 um	19	0					
	13	0.0 um							
	14	0.0 um							
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	16	0.0 um							
	17	0.0 um							
	18	0.0 um							
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JOG Stop			JOG Teaching			PST			
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JOG Stop			JOG Teaching			PST			
JOG Stop									

If data input error occurs during monitoring, monitoring will stop for a while and the error message is displayed and then monitoring works starts again.

(4) Command item data

The data to enter in the command item is not saved as a file other than operation data and maintains the input value only when the program is running and it shall be set as an initial value whenever the program begins.

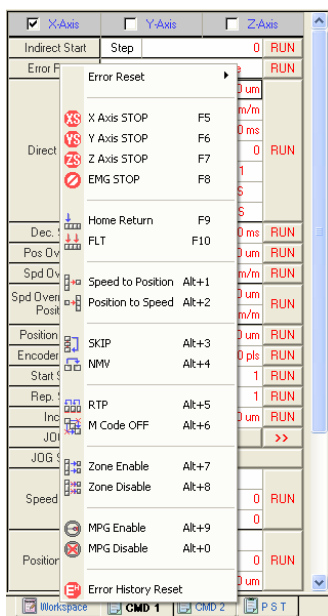
The command required to enter the **Axis information** from command items such as **Synchronous start**, **Circular interpolation etc**, display the item indication differently according to APM module axis number. For example, in case of 2 axis APM module, the axis information required to set on the linear interpolation shows only X, Y axis information except Z axis.

(5) Editing function

The command screen is not available to carry out Editing function such as **Copy/Paste** function for each item.

(6) Short-cut command item and Tool gathering

The command items not necessary to enter the data such as **Floating origin setting**, **Stop**, **Emergency stop** can be carried out simply by using **[Command tool bar]** and **[Hot key]** and if you press the right side of mouse, the menu will be displayed in order to carry out the function same as the function shown on the command tool bar and carry out the command easily.



Item	Icon	Hot Key
X axis stop		F5
Y axis stop		F6
Z axis stop		F7
Emergency stop		F8
Origin return or homing		F9
Floating point setting		F10
Speed to position switching		ALT + 1
Position to speed switching		ALT + 2
Skip operation		ALT + 3
Continuous operation		ALT + 4
Return to the previous position before manual operation		ALT + 5
M Code Off		ALT + 6
Zone output enabled		ALT + 7
Zone output disabled		ALT + 8
MPG enable		ALT + 9
MPG disable		ALT + 0
Error history reset		-
Error reset		-

Fig. 19. Command execution using the Right side mouse and command tool gathering

(7) Command item according to APM Module

The Command item has the item available for all APM module and the item available for more than 2 axis APM module (**Synchronous start**, **circular interpolation**, **position synchronous start**, **speed synchronous start operation etc**). Thus, in case of 1 axis APM module, the user can not carry out the command item which is carried out on 2 axis APM module.

<input checked="" type="checkbox"/> X-Axis	<input type="checkbox"/> Y-Axis	<input type="checkbox"/> Z-Axis
Indirect Start	Step	0 RUN
Error Reset	1: Reset/Output Enable	RUN
Direct Start	Pos	0.0 um
	Spd	0.00 mm/m
	Dwell	0 ms
	Mcode	0 RUN
	Acc/Dec No.	No.1
	Coordinate	ABS
	Contol	PQS
Dec. Stop	Time	0 ms RUN
Pos Override	Pos	0.0 um RUN
Spd Override	Spd	0.00 mm/m RUN
Spd Override with Position	Pos	0.0 um RUN
	Spd	0.00 mm/m
Position Preset	Pos	0.0 um RUN
Encoder Preset	Pos	0 pls RUN
Start Step	Step	1 RUN
Rep. Step	Step	1 RUN
Inch	Value	0.0 um RUN
JOG	<< < > >>	
JOG Stop		
Speed Sync	Master	X
	M.rate	0 RUN
	S.rate	0
Position Sync	Master	X
	Step	0 RUN
	Pos	0.0 um
Concurrent Start	Axis	X,Y
	X	0 RUN
	Y	0
	Z	0
Linear Int.	Axis	X,Y RUN
	Step	0

Fig. 20. The command items prohibited when selecting 1 axis APM module

3) Notices

(1) Communication error

When APM module does not carry out the command normally after the command execution (APM module and communication does not work to connect or the data can not be entered), APM software package shows the following error message after trying the communication connection as much as the number of retry set in the communication option and asks the user whether or not to reconnect.

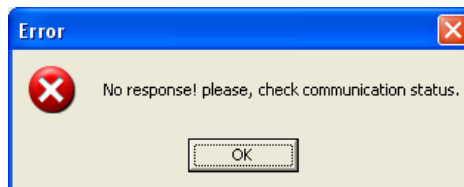


Fig. 21. Communication error message

(2) Command axis setting error

In case of command axis setting, if it does not fit with Monitoring axis or Tracking axis (for example, monitoring axis is set as Y axis and the command axis is set as X axis), the error message will be displayed as follows.

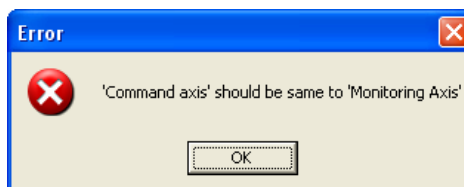


Fig. 22. Command axis setting error message

4.8 Monitoring Execution

4.8.1 Monitoring

1) Method

- (1) Execute [Set online model].
- (2) After selecting the axis for monitoring from monitoring screen, select [Operation status monitoring] from monitoring item or click the corresponding icon from basic tool gathering.
- (3) If you press monitoring icon once, monitoring is executed and if you press the icon one more, it stops.


Items	Tool gathering	Hot key
Monitoring		SHIFT + M

Table 10. Monitoring tool gathering

2) Function Description

(1) Execution environment

While executing monitoring, [Data read/Write] and [Tracking] function shall be inactive and not available to carry out the function.

[External I/O signal window] and [Error history window] is indicated only during monitoring and when monitoring stops, the related data is not indicated.

In case of 1 axis/2axis APM module, Y axis or Z axis shall be treated in **Gray** in monitoring screen and data is not indicated.

(2) Monitoring axis change

While executing monitoring, the user can not change the axis for monitoring. In order to change the axis for monitoring, it is required to stop monitoring and reset.

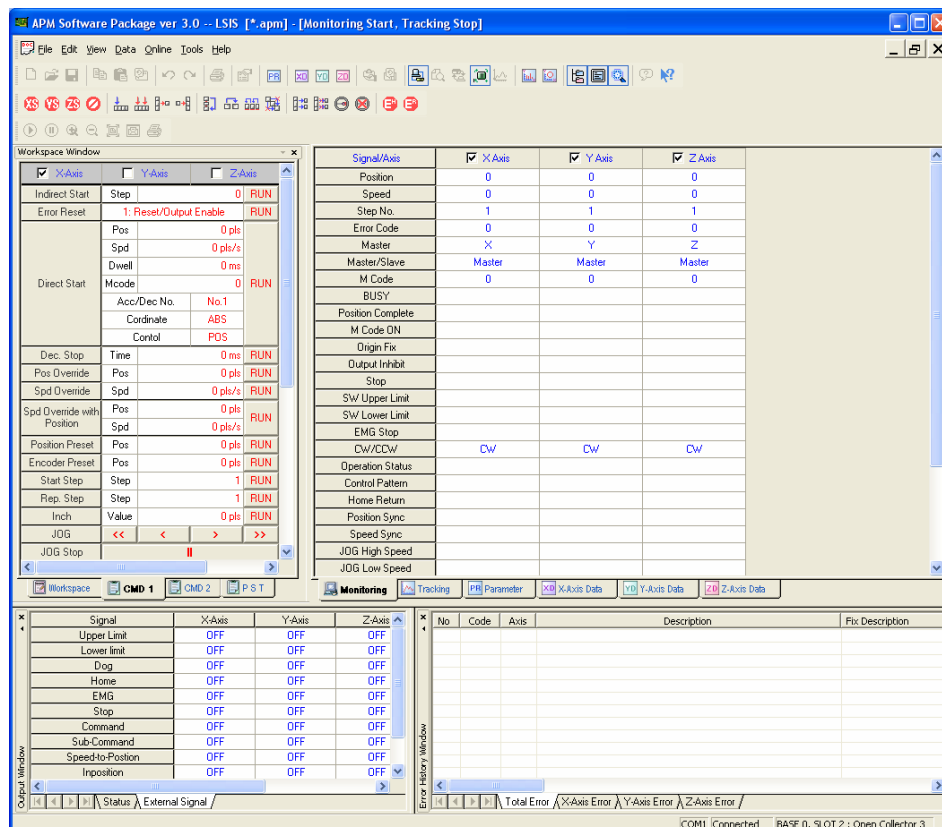


Fig 23. 3 axis APM module monitoring screen

(3) Monitoring period change

It is available to change the monitoring period by using **[Environment setting]** function and set within the range 40 ~ 80 ms.

3) Notices

(1) Communication error

If the communication does not work because of communication problem or PLC power OFF during monitoring, the error message will be displayed and APM software package return to the initial status. That is, as it returns to the previous step before setting online/offline model, the user should set APM online model after checking communication cable status or PLC power status. In this case, operation parameter and operation data set before maintains the previous setting value without changing it as it were.

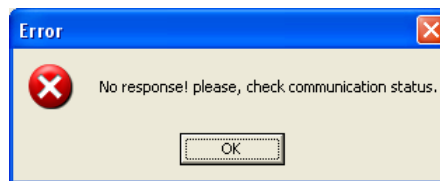


Fig. 24. Communication error message

4.9 Tracking Execution

4.9.1 Tracking

1) Method

- (1) Execute [Set online model].
- (2) After selecting the axis for tracking from Tracking screen, select [Profile tracking] from monitoring menu or click the corresponding icon from basic tool gathering.
- (3) If you press **Tracking icon** once, Tracking is executed and if you press the icon one more time, it stops.










Items	Tool gathering	Hot key
Tracking		SHIFT + T
Start		None
Pause		None
Enlarge		None
Reduce		None
Area enlargement		None
Data indication		None
Save		None
Print		None

Table 10. Tracking tool gathering

2) Function Description

(1) Execution environment

- On the Tracking screen, X axis means **Time** and Y axis means **Speed**.
- During Tracking, [External I/O signal function] is not indicated.
- On the Tracking screen, current position, current speed, current step, unit information are indicated basically.

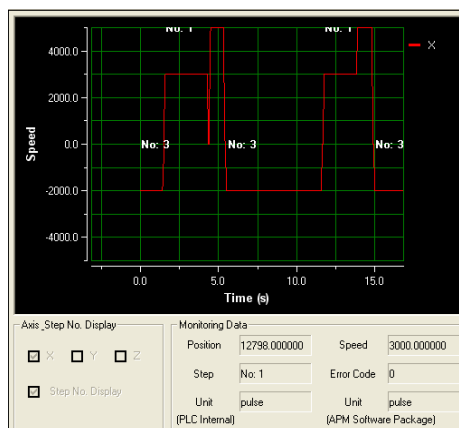


Fig. 25. Tracking screen

- Tracking tool gathering, while the working screen moves, becomes inactive and can not carry out the corresponding function.
- Tracking is available only for 1 axis basically.
- The error occurred during Tracking shall be indicated on the Tracking screen and Error history screen at the same time.

(2) Tracking related tool gathering









Items	Tool gathering	Function
Start		When Tracking screen pauses or the coordinate of the screen is changed by Enlarge/Reduce function, if you press this button, the coordinate shall be restored as same as set at first and Tracking starts again.
Pause		Used for the Pause of Tracking screen.
Enlarge		If you press [Enlarge] Button during tracking, the screen stops for a while automatically and appears enlarged. If you want to start Tracking again, press [Start] Button.
Reduce		If you press [Reduce] Button during tracking, the screen stops for a while automatically and appears reduced. If you want to start Tracking again, press [Start] Button.
Area enlargement		This is used when you want to make the desired part enlarged during Tracking. To use this function correctly, if you stop for a while by using [Pause] button and drag the desired area to enlarge by the mouse, only the selected area appears in enlarged. If you want to start Tracking again, press [Start] Button.
Data indication		This function is used when you want to see X, Y data value of the desired area during Tracking. To use this function correctly, if you stop the desired area by using [pause] button and move the cursor to the desired position, (X, Y) data shall be indicated automatically. If you want to start Tracking, press [Start] Button.
Save		This is used when you want to save the Tracking screen by [Save as picture file] and available only when Tracking screen is in Pause. The picture file type available to support are 3 such as *.bmp, *.emf, *.jpg.
Print		This is used when you want to print Tracking screen and available to use only when Tracking screen is in Pause.

Table 11. Tracking tool gathering function description

(3) Step no. indication function

Step no. indication function is to indicate the operation step no. on the tracking screen when indirect start. The user can verify the operation information such as current operation speed, current position data and operation step information together with tracking screen.

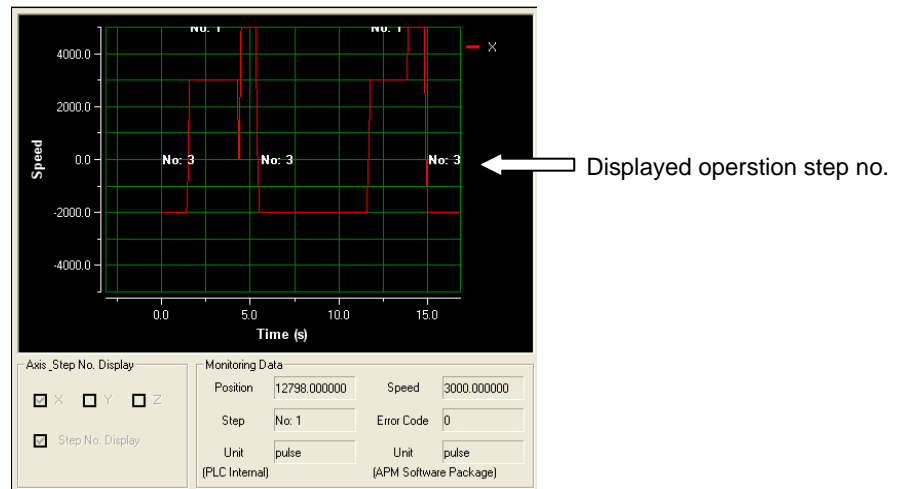


Fig 26. Tracking – Step no. indication function

(4) Tracking axis unit

In the bottom of tracking screen, the axis unit set by APM software package and the corresponding axis unit saved in PLC internal memory are indicated and if two units are different, max. value of Y axis coordinate (speed) shall be set on the Tracking screen based on the unit saved in PLC internal memory.

Unit	Y axis max. value (speed)
pulse	10000
mm	100
Inch, deg	10

Table 12. Tracking-Y axis max. value setting per unit

3) Notices

- Tracking related tool gathering may not act according to the O/S of APM software package installed computer. It may occur sometimes in Windows 2000, Windows XP and in this case the solution is to increase **Tracking period** by using **[Environment setting function]**.

Reference: Window 2000 → Tracking period 40ms

Window XP → Tracking period 60ms

- As X axis (time) value of Tracking screen is quite different from actual operation time, cares should be taken in using.

4.10 Data Read/Write Function

4.10.1 Data Read/Write

1) Method

- (1) As Data Read/Write function is not available during monitoring or tracking, it is required to carry out the function after stop it when the corresponding is active.
- (2) Click **[Data read/write]** item from communication menu or click the corresponding icon from basic tool gathering to select the desired data and then press **[Read]** or **[Write]** Button.


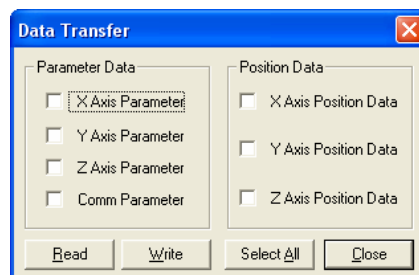
Items	Tool gathering	Hot key
Data Read/Write		SHIFT + R

Table 13. Data Read/Write related tool gathering

2) Function Description

(1) Configuration

The items shown on Data read/write dialogue box are different according to the APM module axis number.



3 axis

Fig 27. Data Read/Write dialogue box by APM module axis number

After carrying out **[Data read]**, it is formed newly on the working screen but after carrying out **[Data write]**, the working screen is maintained as it were. As **[Data read/write]** function can not be cancelled during working, cares should be taken in using. During data read/write working, the proceeding status is indicated in the status line in the bottom of APM software package.

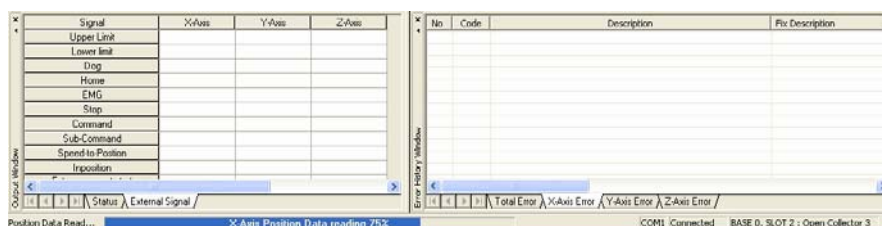


Fig. 28. Data read/write proceeding status indication

3) Notices

- (1) If you want to carry out **[Data write]** while APM is in operation (when 'Busy' signal indicates 'ON'), the error message shall be displayed as follows. But **[Data read/write]** function is available while the PLC CPU is in the **RUN**.

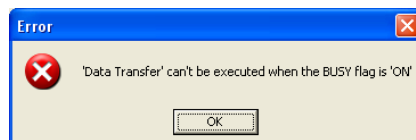


Fig. 29. Error message

4.11 Simulation Function

4.11.1 Profile Simulation

1) Method

- (1) Enter the data into the axis operation data item for simulation.
- (2) Click [**Profile simulation**] from simulation menu or click the corresponding icon from basic tool gathering.
- (3) After setting simulation axis and step no. from simulation dialogue box, press [**Execute simulation**] Button.








Items	Tool gathering	Hot key
Profile simulation		SHIFT + F
Circular interpolation simulation		SHIFT + I
Restore		None
Enlarge		None
Reduce		None
Area enlargement		None
Data indication		None

Table 14. Simulation related tool gathering

2) Function Description

(1) Execution environment

If you click profile or circular interpolation simulation icon, tool gathering with 5 buttons except dialogue box shall be displayed. This tool gathering helps the user know the related result in detail by enlarging/reducing the simulation screen. The function for the corresponding tool gathering is shown same as **Table 11**.

Tracking tool gathering function description.

Profile simulation is available only for 1 axis simulation. That is, it is not available to carry out simulation for the 2 axis interpolation operation.

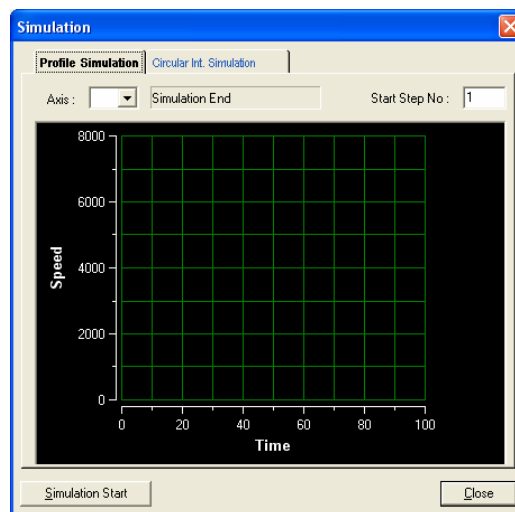


Fig. 30. Profile simulation screen

(2) Run-Time Refresh function

Profile simulation has **Run-Time Refresh** function and if operation data is changed, the changed result shall be reflected right away and indicated on the simulation dialogue box.

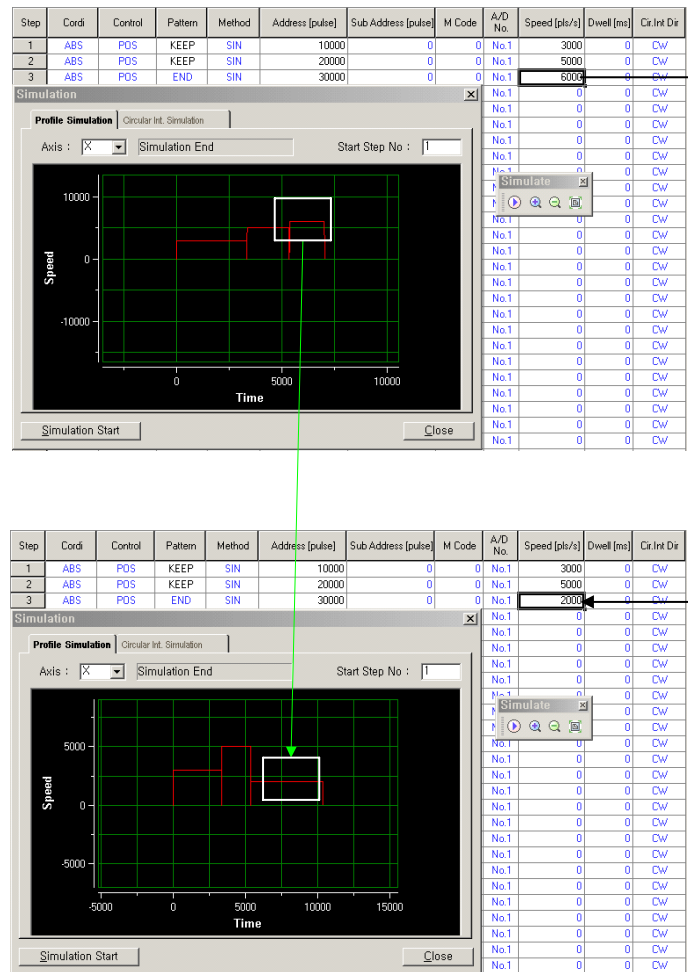


Fig. 31. Profile simulation Run-Time Refresh function

4.11.2 Circular Interpolation Simulation

1) Method

- (1) Click **[Circular interpolation simulation]** from simulation menu or click the corresponding icon from basic tool gathering.
- (2) After entering circular interpolation method/direction information, starting point, Ending point and sub point data from circular interpolation dialogue box, press **[Execute simulation]** button.

2) Function Description

(1) Execute environment

Circular interpolation simulation is available to carry out simulation by using the Sub point method, Center point method and circular interpolation direction setting (CW/CCW).

(2) Sub point method

The following shows the result of simulation by Sub Point method of circular interpolation.

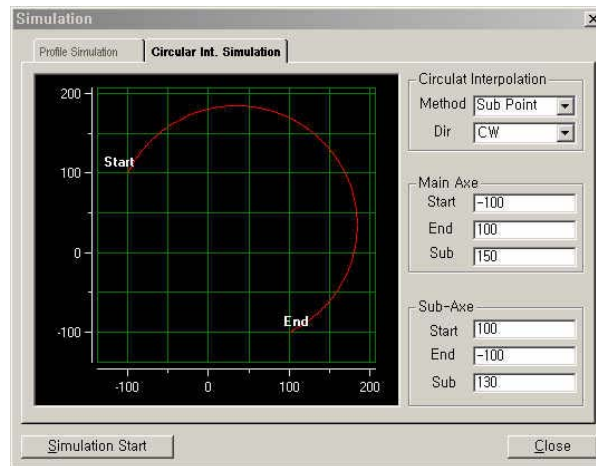


Fig. 32. Circular interpolation simulation by Sub Point method

- A) Sub Point method is the method for simulation by calculating the sub point matching with the starting point and ending point with the coordinate of starting point, the coordinate of ending point and the coordinate of sub point. In this case, as the direction shall be determined according to the position of sub point, the user can not change it by random.
- B) It is not available to match the starting point and the ending point, the ending point and sub point with the starting point and the ending point.
- C) The point can not be arranged in a straight line.

(3) Center point method

The following shows the result of simulation by Center point method of circular interpolation.

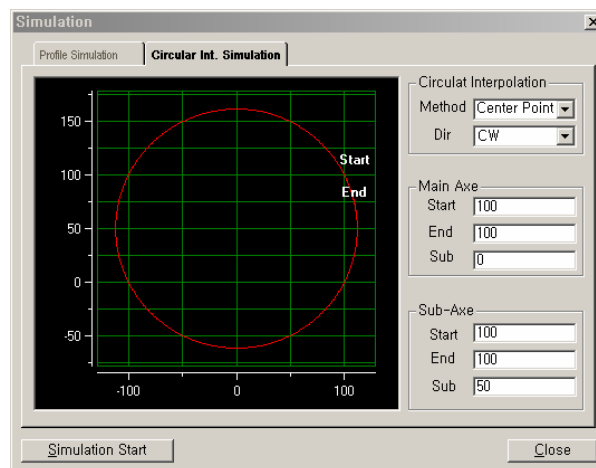


Fig. 33. Circular interpolation simulation by Center point method

- A) Center point method is the method for simulation by calculating the center point again with the coordinate of the starting point, the coordinate of ending point and the coordinate of center point. In this case, the user can determine the direction.
- B) Center point method is available to match the starting point with the ending point. In this case, it becomes the circle.

4.12 Status Screen, External I/O signal and Error history function

4.12.1 Status Screen

1) Function Description

(1) Configuration

Status Screen indicates the working status information that APM software package carries out.

To hide/cover the status screen, press **[SHIFT+V]** Hot key or click **[External I/O signal]** from view menu.

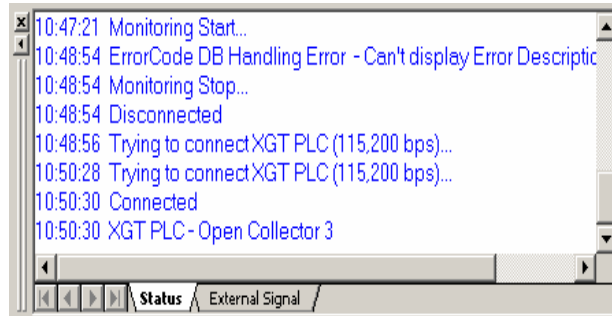


Fig. 34. Status screen

4.12.2 External I/O signal function

1) Function Description

(1) Configuration

External I/O signal window indicates the data only during monitoring. If monitoring stops, the data indicated on the external I/O signal window all disappeared and the screen is converted to the status screen.

The item that appears in external I/O signal window is indicated based on the monitoring axis. That is, when monitoring axis is "X axis", the external I/O signal window indicates only X axis external signal.

To hide/cover external I/O signal screen, press **[SHIFT+V]** Hot key or click **[External I/O signal]** from view menu.

On the external I/O signal screen, if the signal status is "OFF", it is indicated by Blue color while Red color if the signal status is "ON".

Signal	X-Axis	Y-Axis	Z-Axis
Upper Limit	OFF	OFF	OFF
Lower Limit	OFF	OFF	OFF
Doa	OFF	OFF	OFF
Home	OFF	OFF	OFF
EMG	OFF	OFF	OFF
Stop	OFF	OFF	OFF
Command	OFF	OFF	OFF
Sub-Command	OFF	OFF	OFF
Speed-to-Position	OFF	OFF	OFF
Inposition	OFF	OFF	OFF
Ext Simultaneous Start	OFF	OFF	OFF

At the bottom of the window, there are two tabs: 'Status' and 'External Signal' (selected).

Fig. 35. External I/O signal window

4.12.3 Error History function

1) Function Description

(1) Configuration

Error history window is composed of **[Overall error screen]** and **[Each axis error screen]**.

Error history data is indicated only during monitoring. If monitoring stops, the data indicated on the error history window all disappeared.

The item indicated on the error history window is indicated based on the monitoring axis. That is, when monitoring axis is "X axis", error history window indicates only X axis external signal.

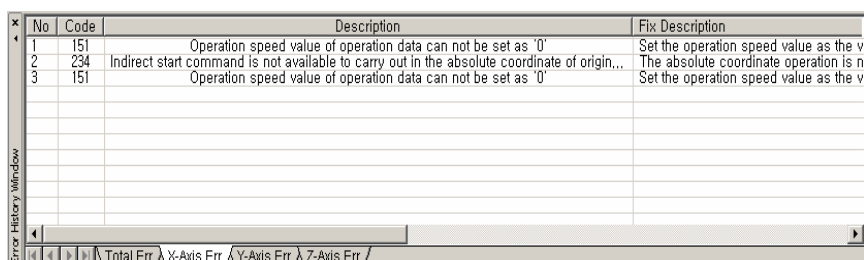
To hide/cover error history signal window, press **[SHIFT+E]** Hot key or click **[Error history information]** from view menu.

(2) Error indication method

[Overall error screen] indicates all the latest occurred errors of each axis and **[X/Y/Z axis error screen]** indicates 10 errors occurred on each axis in order and shows the error description and solutions together in order to carry out the restore works promptly.

If the redundant error repeats, **[Each axis error screen]** indicates only one error and when you start monitoring again after completing monitoring, the redundant error all shall be indicated.

If **[error history reset command]** is executed, the corresponding axis related error shall be removed from **[Overall error screen]** or **[Axis error screen]**. The error lists displayed on the overall screen during monitoring will all disappear if monitoring stops but if monitoring starts again, the previous error lists will not be indicated but instead the latest error is indicated.



No	Code	Description	Fix Description
1	151	Operation speed value of operation data can not be set as '0'	Set the operation speed value as the v
2	234	Indirect start command is not available to carry out in the absolute coordinate of origin...	The absolute coordinate operation is n
3	151	Operation speed value of operation data can not be set as '0'	Set the operation speed value as the v

Fig. 36. Error history window

4.13 Print function

4.13.1 Print

1) Method

- (1) If you click **[Print]** from file menu when the working screen is open or click the corresponding icon from basis tool gathering, the working screen moves to monitoring screen and print dialogue box shall be displayed.
- (2) After selecting the desired item, if you press **[Print]** Button, print dialogue box shall e displayed and it start to print. If you press **[Preview]** Button, you can verify the print screen before printing.

Items	Tool gathering	Hot key
Print		CTRL + P

Table 15. Print related tool gathering

2) Function Description

(1) Execution environment

Print dialogue box indicates **APM module specification** and **PLC information** obtained from **[Online model setting function]**. When printing GLOFA-GM/MASTER-K positioning module parameter, the input signal parameter to be applied for XGT APM module is indicated as “N/A” and printed.

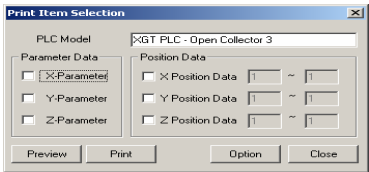


Fig. 37. Print dialogue box

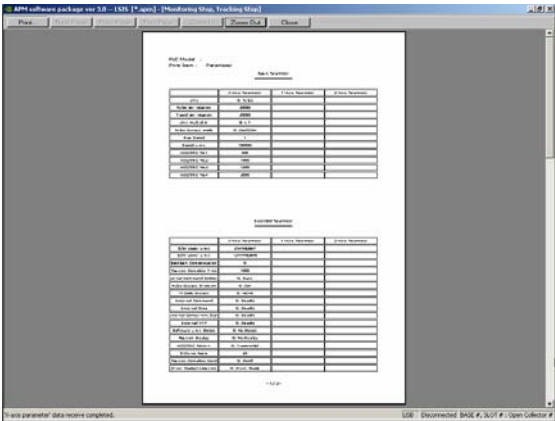


Fig. 38. Preview screen and Printer setting dialogue box

(2) Printer option function

Through print option dialogue box, it is available to set the left/right margin and the head/bottom of print screen.

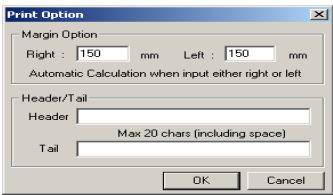


Fig. 39. Print option dialogue box

4.14 Environment Setting Function

4.14.1 Environment Setting Function

1) Method

- (1) Click **[Environment setting]** from file menu or click the corresponding icon from basic tool gathering.

2) Function Description

(1) Operation data option

[Operation data indication extension option] is the option to change the step number of X/Y/Z axis operation data. **[Operation data item indication function]** is the option to change the color in order to distinguish it from other items easily when the data entered in X/Y/Z axis operation data by the user is different from the initial value.

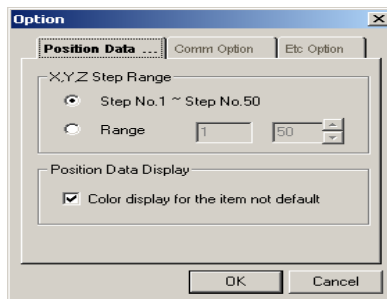


Fig. 40. Environment setting screen – Operation data option

(2) Communication option

[Monitoring period and Tracking period setting option] is the option that the user can change the corresponding period according to the system.

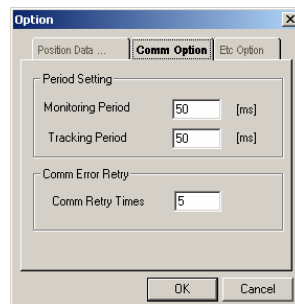


Fig. 41. Environment setting screen – Communication option

[Communication error restore option] is the option to set how many times to try to restore the communication when the communication error occurs while APM software package and PLC carry out the communication works.

(3) Other option

[Error history file create option] is the option to select whether or not to save the error occurred while working with APM by using APM software package as a separate file. As this item is basically set in APM software package, the user can not change it.

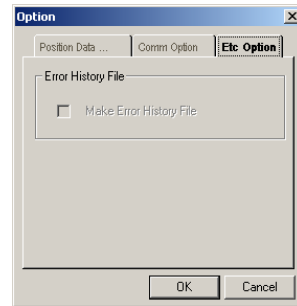


Fig. 42. Environment setting screen – Other option

4.15 Other Function

4.15.1 System Check Function

APM software package exchanges the data with PLC periodically and monitors the status while data read/write, monitoring, tracking is not carried out. But in case that there is no response from PLC, it sends the error message after executing the Retry function as much as it is set in the communication option, and returns to the initial status.

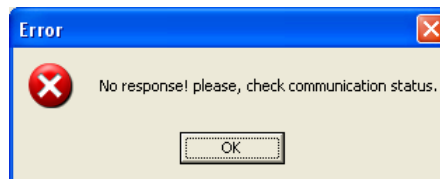


Fig. 43. Communication error message

4.15.2 Automatic file open function

APM software package opens automatically the file saved last when program runs. In this case, the positioning information (APM module type information and axis information) with which the corresponding file was used, will be displayed together.

Chapter Positioning Parameter & Operation Data

- This chapter describes parameter to be set by software package.
- Parameter configuration of software package is as follows and this parameter items should be set at each axis (But common parameter shall be applied to all axis equally)

[Parameter Configuration]

	Item	X-Axis	Y-Axis	Z-Axis
Article 5.1	Unit	1: mm	0: Pulse	0: Pulse
	Pulse per Rotation	5000 pls	20000 pls	20000 pls
	Travel per Rotation	5000.0 um	20000 pls	20000 pls
	Unit Multiplier	0: x1	0: x1	0: x1
	Pulse Output Mode	0: CW/CCW	0: CW/CCW	0: CW/CCW
	Bias Speed	0.01 mm/m	1 pls/s	1 pls/s
	Speed Limit	10000.00 mm/m	100000 pls/s	100000 pls/s
	ACC/DEC No.1	500 ms	500 ms	500 ms
	ACC/DEC No.2	1000 ms	1000 ms	1000 ms
	ACC/DEC No.3	1500 ms	1500 ms	1500 ms
	ACC/DEC No.4	2000 ms	2000 ms	2000 ms
Article 5.2	S/W Upper Limit	214748364.7 um	2147483647 pls	2147483647 pls
	S/W Lower Limit	-214748364.8 um	-2147483648 pls	-2147483648 pls
	Backlash Comp	0.0 um	0 pls	0 pls
	Position Complete Time	1000 ms	1000 ms	1000 ms
	Ext. Command Selection	0: Start	0: Start	0: Start
	Pulse Output Dir	1: CCW	0: CW	0: CW
	M Code Output	0: NONE	0: NONE	0: NONE
	External Command	0: Disable	0: Disable	0: Disable
	External Stop	0: Disable	0: Disable	0: Disable
	Ext. Concurrent Start	0: Disable	0: Disable	0: Disable
	External VTP	0: Disable	0: Disable	0: Disable
	SW Limit Detect	0: No Detect	0: No Detect	0: No Detect
	Position Display	0: No Display	0: No Display	0: No Display
	ACC/DEC Pattern	0: Trapezoidal	0: Trapezoidal	0: Trapezoidal
	S-Curve Ratio	50	50	50
	Position Complete Cond	0: Dwell	0: Dwell	0: Dwell
Article 5.3	Home Method	0: DOG/HOME(OFF)	0: DOG/HOME(OFF)	0: DOG/HOME(OFF)
	Home Dir	1: CCW	1: CCW	1: CCW
	Home Address	0.0 um	0 pls	0 pls
	Home Compensation	0.0 um	0 pls	0 pls
	Home High Speed	2000.00 mm/m	5000 pls/s	5000 pls/s
	Home Low Speed	500.00 mm/m	500 pls/s	500 pls/s
	Home Retry Time	0 ms	0 ms	0 ms
	Home ACC/DEC	1000 ms	1000 ms	1000 ms
	Dwell	0 ms	0 ms	0 ms
	JOG High Speed	2000.00 mm/m	5000 pls/s	5000 pls/s
	JOG Low Speed	500.00 mm/m	1000 pls/s	1000 pls/s
	JOG ACC/DEC Time	1000 ms	1000 ms	1000 ms
	Inch Speed	1.00 mm/m	100 pls/s	100 pls/s
	Upper Limit Signal	1: N.Close	1: N.Close	1: N.Close
Article 5.4	Lower Limit Signal	1: N.Close	1: N.Close	1: N.Close
	DOG Signal	0: N.Open	0: N.Open	0: N.Open
	HOME Signal	0: N.Open	0: N.Open	0: N.Open
	EMG Signal	1: N.Close		
	STOP Signal	0: N.Open	0: N.Open	0: N.Open
	COMMAND Signal	0: N.Open	0: N.Open	0: N.Open
	SUB-COMMAND Signal	0: N.Open	0: N.Open	0: N.Open
	VTP Signal	0: N.Open	0: N.Open	0: N.Open
	INPOSITION Signal	0: N.Open	0: N.Open	0: N.Open
	EXT SIM Signal	0: N.Open		
Article 5.5	Pulse Output Level	0: Low Active		
	Circular Interpolation	0: Sub Point		
	Encoder Input	4: PHASE A/B(2-Phase x1)		
	Auto Reload	4294967295		
	Z-Phase Clear			
	ZONE Output Mode	0: Seperate Ouput		
	ZONE1 Axis	0: X		
	ZONE2 Axis	0: X		
	ZONE3 Axis	0: X		
	ZONE1 ON Area	0.0 um		
	ZONE1 OFF Area	0.0 um		
	ZONE2 ON Area	0.0 um		
	ZONE2 OFF Area	0.0 um		
	ZONE3 ON Area	0.0 um		
	ZONE3 OFF Area	0.0 um		

5.1 Basic Parameter

Here describes the basic parameter

	Item	X-Axis	Y-Axis	Z-Axis
Basic Parameter	Unit	1: mm	0: Pulse	0: Pulse
	Pulse per Rotation	5000 pls	20000 pls	20000 pls
	Travel per Rotation	5000.0 μ m	20000 pls	20000 pls
	Unit Multiplier	0: x 1	0: x 1	0: x 1
	Pulse Output Mode	0: CW/CCW	0: CW/CCW	0: CW/CCW
	Bias Speed	0.01 mm/m	1 pls/s	1 pls/s
	Speed Limit	10000.00 mm/m	100000 pls/s	100000 pls/s
	ACC/DEC No.1	500 ms	500 ms	500 ms
	ACC/DEC No.2	1000 ms	1000 ms	1000 ms
	ACC/DEC No.3	1500 ms	1500 ms	1500 ms
	ACC/DEC No.4	2000 ms	2000 ms	2000 ms

[Configuration of Basic Parameter]

Items		Setting Range	Initial value
Unit		0: pulse, 1: mm, 2: inch, 3: degree	0
Pulse per rotation		1 ~ 65,535 [unit: pulse]	20,000
Travel distance per rotation		mm : 1 ~ 65,535 [$X10^{-1}$ μ m] inch : 1 ~ 65,535 [$X10^{-5}$ inch] degree : 1 ~ 65,535 [$X10^{-5}$ degree] pulse : 1 ~ 65,535 [pulse]	20,000
Unit allocation		0: X1 times, 1: X10 times, 2: X100 times, 3: X1000 times	0
Pulse output mode		0: CW/CCW, 1: PULSE/DIR, 2: A phase/B phase	0
Bias Speed		mm : 1 ~ 2,000,000,000 [$X10^{-2}$ mm/min], inch : 1 ~ 2,000,000,000 [$X10^{-3}$ inch/min], degree : 1 ~ 2,000,000,000 [$X10^{-3}$ degree/min], pulse : 1 ~ 200,000 [pulse/sec](open collector) 1 ~ 1,000,000 [pulse/sec](line driver)	1
Speed limit		mm : 1 ~ 2,000,000,000 [$X10^{-2}$ mm/min], inch : 1 ~ 2,000,000,000 [$X10^{-3}$ inch/min], degree : 1 ~ 2,000,000,000 [$X10^{-3}$ degree/min], pulse : 1 ~ 200,000 [pulse/sec](open collector) 1 ~ 1,000,000 [pulse/sec](line driver)	100,000
Acceleration/ Deceleration Time	No.1	0 ~ 65,535[unit: ms]	500
	No.2		1000
	No.3		1500
	No.4		2000

[Basic Parameter Setting Range]

5.1.1 Unit

- ▶ It sets the command unit for positioning control and according to control object, the command unit (mm, inch, pulse) is set and used from 1 axis to 3 axis at each axis separately.
- ▶ In case of changing the unit setting, as the value of other parameter and operation data does not change, the value of parameter or operation data should be set within the setting range of the unit to be changed.

Ex) mm,inch,pulse : X-Y Table, Conveyor

degree : a body of rotation (360degree/rotation)

5.1.2 Pulse per Rotation (Ap)

- ▶ Only in case of using the unit (mm, inch, pulse) as a positioning command unit, you can set and use the pulse necessary for 1 rotation of motor.
- ▶ In case of using SERVO, you can set the resolution per rotation of SERVO Encoder.

Transfer amount per pulse = Transfer amount per rotation (Al) / Pulse per rotation (Ap)

5.1.3 Travel distance per rotation (Al) and Unit allocation (Am)

- ▶ Only in case of using the unit (mm, inch, degree) as a positioning command unit, you can set and use travel distance per 1 rotation of motor and unit allocation.
- ▶ How is transferred by 1 rotation of motor is determined by the structure of machine.

If the lead of ball screw (mm/rev) is PB and the rate of deceleration is 1/n,

Transfer amount per rotation (AL) = PB × 1/n.

- ▶ But the value available to set with travel distance per 1 rotation (Al) of this parameter is max. 6553.5 μm (approx.6.5 mm).
- ▶ If AL exceeds this value, Al will be set as follows.

Transfer amount per rotation (AL) = PB × 1/n

= (Al) × (Am)

Note) As unit allocation (Am) is 1,10,100,1000, if the value of "PB × 1/n" exceeds 6553.5 μm , it is required to adjust the unit allocation so that the travel distance per rotation (Al) does not exceed 6553.5 μm .

Ex1) In case that (AL) = PB × 1/n = 6000.0 μm (= 6 mm),

$$(AL) = (Al) \times (Am) = 6000 \times 1$$

Ex2) In case that (AL) = PB × 1/n = 60000.0 μm (= 60 mm),

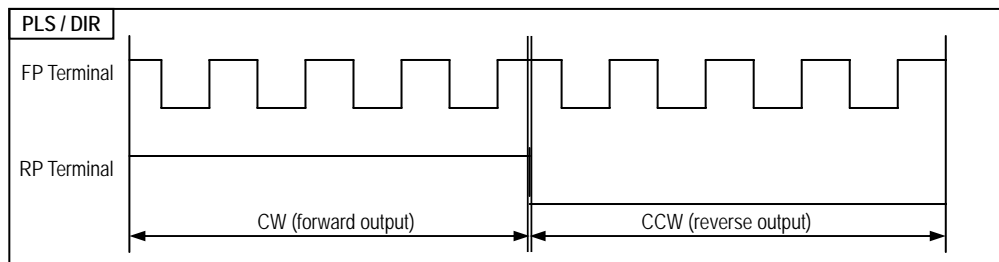
$$\begin{aligned}(AL) &= (Al) \times (Am) = 6000 \times 10 \\ &= 600 \times 100\end{aligned}$$

5.1.4 Pulse Output Mode

- ▶ As input method to be used for SERVO Driver or Stepping Driver is different, it is required to select pulse output mode of positioning module according to the input method.
- ▶ For pulse output mode of High Active, please refer to 5.4.1 pulse output level.

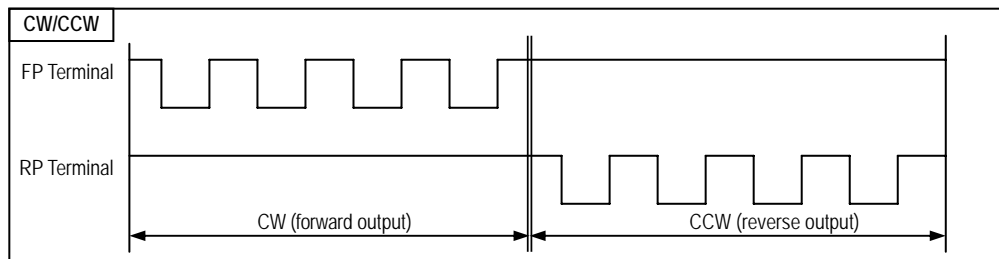
1) PLS/DIR mode

- ▶ PLS/DIR mode shows the case that forward pulse and reverse pulse are outputted from one terminal and the forward/reverse discrimination signal is outputted from different terminal. The following shows the case that pulse output level is low active.



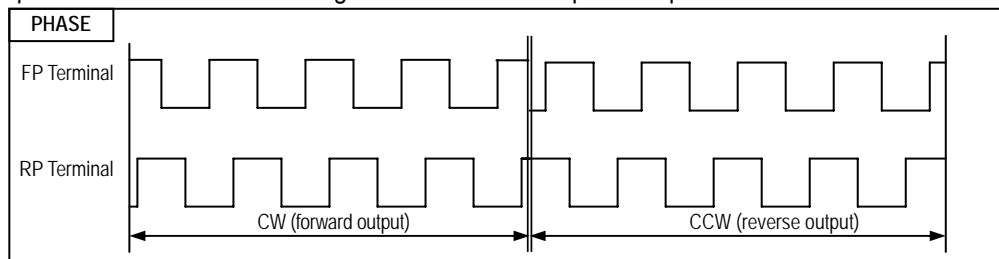
2) CW/CCW mode

- ▶ CW/CCW mode shows the case that forward pulse and reverse pulse comes from different terminal. The following shows that pulse output level is Low Active.



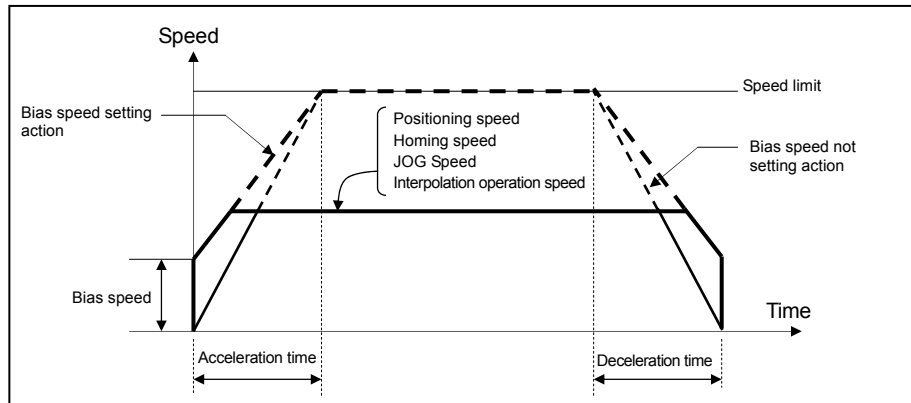
3) PHASE A/B mode

- ▶ PHASE A/B mode shows the case that forward pulse and reverse pulse will be outputted with 90degree phase difference. The following shows the case that pulse output level is Low Active.



5.1.5 Bias Speed

- ▶ As the stepping motor has unstable torque near speed=0, the start speed shall be set in the beginning of operation in command to smooth the rotation of motor and reduce the positioning time. The speed to be set at this time is called "Bias Speed".
- ▶ The setting range is 0~200,000[pps] for Open Collector type and 0~1,000,000[pps] for line driver.
- ▶ Bias speed shall be used for the main axis of ① positioning operation by start command,
 - ② homing operation,
 - ③ JOG operation,
 - ④ Main axis of interpolation operation(subordinate axis is not available).



Notes

- ▶ If Bias speed is set as high, total operation time shall be reduced but if the setting value is too high, it may cause the occurrence of impact sound in the start/end time and forces the excessive effect to the machine. Cares shall be taken in using.
- ▶ The bias speed should be set within the range as follows :
 (If homing speed is set less than bias speed, it occurs error 133, if positioning operation speed is set less than bias speed, error 153, and if Jog operation speed (high speed) is set less than bias speed, error 121, respectively.)
 - 1) Bias speed \leq Positioning speed data
 - 2) Bias speed \leq Homing low speed \leq Homing high speed
 - 3) Bias speed \leq JOG high speed (Jog low speed operation is not related to bias speed.)

5.1.6 Speed Limit

- ▶ Max. Speed available to set for positioning operation.
- ▶ In case of the unit of Pulse, the setting range is 0~200,000[pps] for Open collector type and 0~1,000,000 for line driver type.
- ▶ In case of unit (mm, inch, degree), the setting range depends on the pulse number per rotation, travel distance per rotation and unit allocation.
- ▶ The operation speed of positioning operation, homing speed and Jog operation speed is influenced by speed limit and if they are set as higher value than speed limit, error will occur.
 - ① If homing speed is greater than speed limit : Error 133
 - ② If positioning operation speed is greater than speed limit : Error 152
 - ③ If Jog operation speed is greater than speed limit : Error 121

5.1.7 Acceleration/Deceleration Time

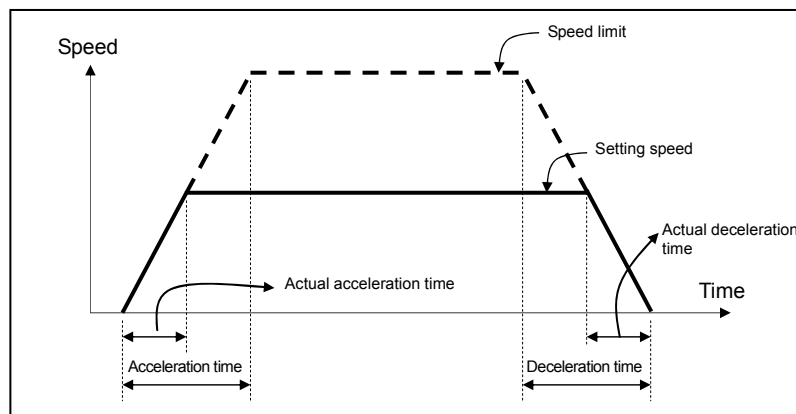
- ▶ This is applied at the starting/ending point of positioning operation and also applied to continuous operation command, SKIP command, speed override, positioning speed override among positioning operation.
- ▶ Acceleration/Deceleration time is set by axis unit at program and APM Software Package.
- ▶ The setting range is 0 ~ 65,535 (unit : 1ms) at each axis.

1) Acceleration time : the time required to reach from speed "0"(stop state) to the speed limit which is set by parameter

- ▷ In case of using BIAS, it is the time required to reach from the setting bias speed to the speed limit which is set by parameter.

2) Deceleration time : the time required to reach from the speed limit set by parameter to the speed "0"(stop state).

- ▷ In case of using BIAS, it is the time required to reach from the speed limit set by parameter to the setting bias speed.



▶ Definition of Terminology

Speed limit : max. Speed available to set for positioning operation at the parameter of software package.

Setting speed : speed value of operation data that position data operates actually.

Actual acceleration time : the time required to reach from speed "0"(stop state) to the speed value which is set by operation data.

Actual deceleration time : the time required to reach from the speed value set by operation data to speed "0"(stop state).

5.2 Extended Parameter

Here describes Extended Parameter

Extended Parameter	S/W Upper Limit	214748364.7 μ m	2147483647 pls	2147483647 pls
	S/W Lower Limit	-214748364.8 μ m	-2147483648 pls	-2147483648 pls
	Backlash Comp	0.0 μ m	0 pls	0 pls
	Position Complete Time	1000 ms	1000 ms	1000 ms
	Ext. Command Selection	0: Start	0: Start	0: Start
	Pulse Output Dir	1: CCW	0: CW	0: CW
	M Code Output	0: NONE	0: NONE	0: NONE
	External Command	0: Disable	0: Disable	0: Disable
	External Stop	0: Disable	0: Disable	0: Disable
	Ext. Concurrent Start	0: Disable	0: Disable	0: Disable
	External VTP	0: Disable	0: Disable	0: Disable
	S/W Limit Detect	0: No Detect	0: No Detect	0: No Detect
	Position Display	0: No Display	0: No Display	0: No Display
	ACC/DEC Pattern	0: Trapezoidal	0: Trapezoidal	0: Trapezoidal
	S-Curve Ratio	50	50	50
	Position Complete Cond	0: Dwell	0: Dwell	0: Dwell
	Home Method	0: Driver Ready	0: Driver Ready	0: Driver Ready

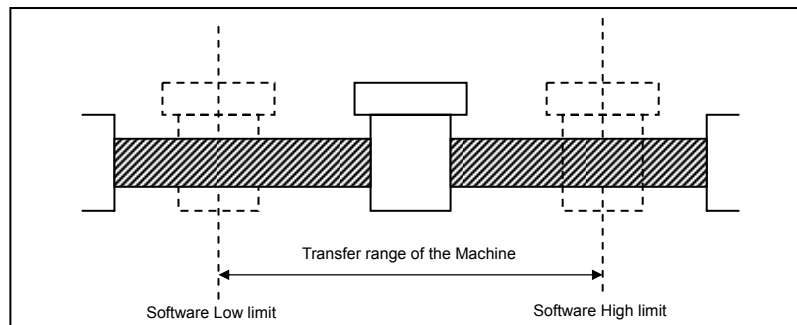
[Configuration of Extended Parameter]

Items	Setting Range	Initial value
Software high limit	mm : -2147483648 ~ 2147483647 [$\times 10^{-4}$ mm] inch : -2147483648 ~ 2147483647 [$\times 10^{-5}$ inch] degree : -2147483648 ~ 2147483647 [$\times 10^{-5}$ degree] pulse : -2147483648 ~ 2147483647 [pulse]	2147483647
Software low limit	mm : -2147483648 ~ 2147483647 [$\times 10^{-4}$ mm] inch : -2147483648 ~ 2147483647 [$\times 10^{-5}$ inch] degree : -2147483648 ~ 2147483647 [$\times 10^{-5}$ degree] pulse : -2147483648 ~ 2147483647 [pulse]	-2147483648
Backlash compensation amount	mm : 0 ~ 65,535 [$\times 10^{-1}$ μ m] inch : 0 ~ 65,535 [$\times 10^{-5}$ inch] degree : 0 ~ 65,535 [$\times 10^{-5}$ degree] pulse : 0 ~ 65,535 [pulse]	0
Output time of positioning end signal	0 ~ 65,535 [unit: ms]	1,000
S-Curve rate	1 ~ 100 [unit: %]	50
External command function selection	0 : Start, 1 : Jog operation, 2 : Skip	0
Pulse output direction	0 : forward, 1 : reverse	0
Acceleration/Deceleration pattern	0 : trapezoid type, 1 : S-type	0
M Code mode	0 : None, 1 : With, 2 : After	0
Position indication during equal speed operation	0 : disabled, 1 : enabled	0
Detection of soft high/low limit during equal speed operation	0 : disabled, 1 : enabled	0
External speed/position switching control enabled/disabled	0 : disabled, 1 : enabled	0
External command enabled/disabled	0 : disabled, 1 : enabled	0
External stop enabled/disabled	0 : disabled, 1 : enabled	0
External simultaneous start enabled/disabled	0 : disabled, 1 : enabled	0
Positioning completion condition	0: dwell time, 1: in-position signal, 2: dwell time and in-position 3: dwell time or in-position	0
Drive ready/in-position	0: Drive ready, 1: in-position	0

[Setting Range of Extended Parameter]

5.2.1 Software High/Low Limit

- ▶ The function is designed so that the machine does not execute the positioning operation out of the range by setting the range of machine available to move as software high limit and software low limit. That is, this function is used to prevent any derailment of incorrect operation position setting and incorrect operation by user program fault. External input high/low limit can be also set besides the software high/low limits.



- ▶ The range check of software high/low limit shall be done when the operation starts.
- ▶ If the software high/low limit is detected, error (Software high limit error : 501, Software low limit error : 502) occurs and the pulse output of positioning module shall be disabled. Therefore, when you want to operate again, it is required to reset error and release the 'output disabled' before using.
- ▶ Setting range
 Software high limit range: -2,147,483,648 ~ 2,147,483,647[pulse]
 Software low limit range: -2,147,483,648 ~ 2,147,483,647[pulse]
- ▶ When the software high/low limits are set identically or as the default values (high limit: 2,147,483,647, low limit: -2,147,483,648), the high/low limits are not detected.

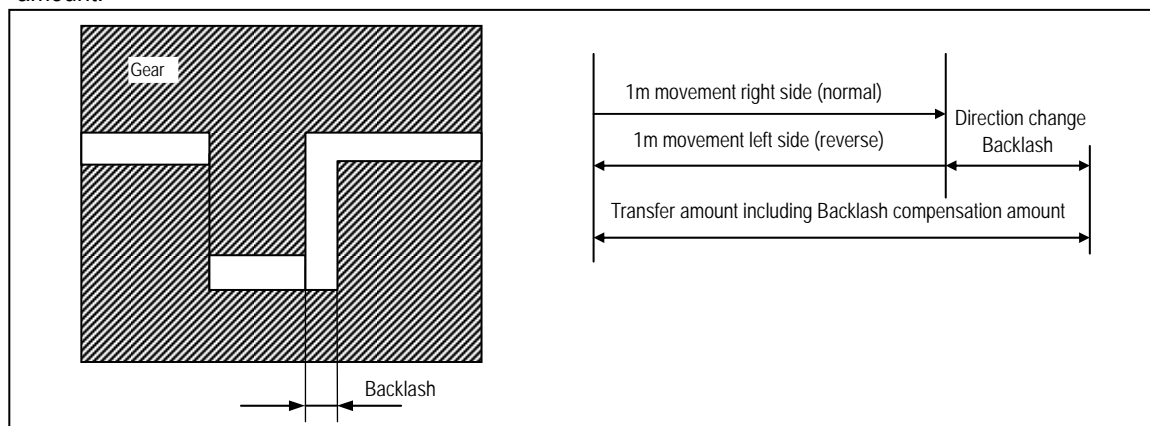
5.2.2 Backlash Compensation Amount

- ▶ The tolerance that the machine does not work by the wear when the rotation direction changes in case that a gear, screw etc is combined to run at the motor axle, is called as 'Backlash'. Therefore, when you change the rotation direction, it is required to add the backlash compensation amount to the positioning amount for output.
- ▶ This is used for positioning operation, inching operation and jog operation
- ▶ The setting range is 0 ~ 65,535 (unit: pulse) at each axis.

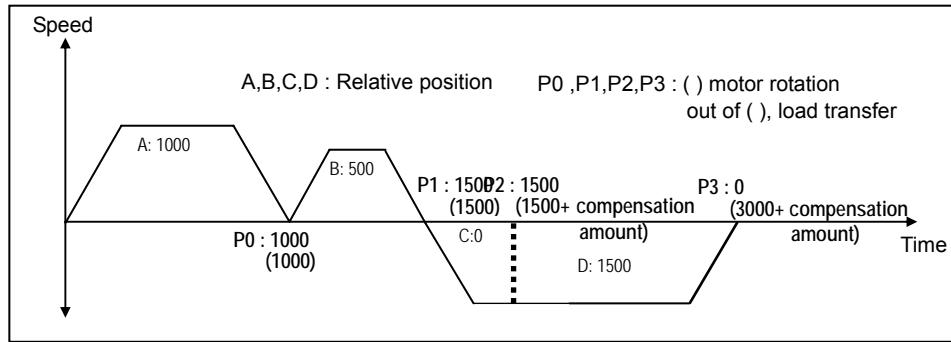
Notes

After setting or changing the backlash compensation amount, the homing should be carried out.

- ▶ As presented in the following figure, if the position moved 1m to the right and again 1m to the left, it is not possible to reach the original position by backlash. At this time, it is required to add backlash compensation amount.



- ▶ For backlash compensation, the backlash compensation amount is outputted first and the address value of positioning operation, inching operation and jog operation will move to the goal point.



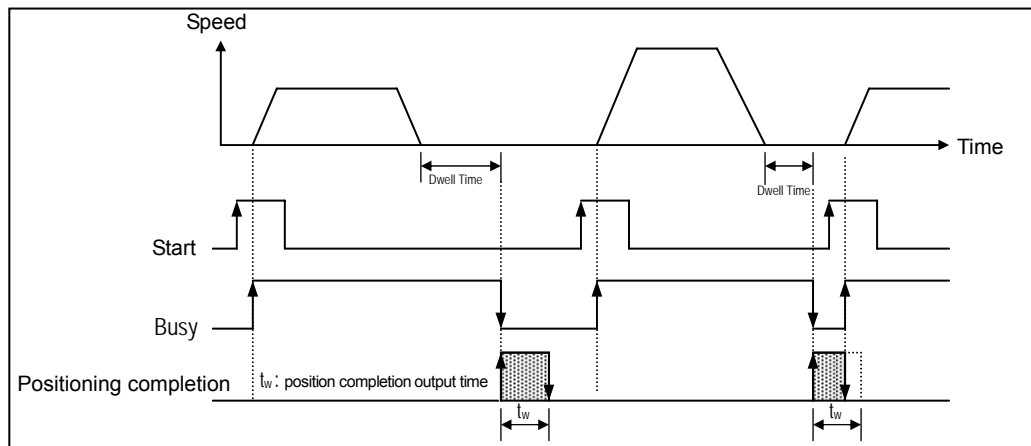
5.2.3 Positioning Completion Time

- Positioning completion time shall be OFF after sustaining “ON” for the setting time after Positioning is completed during single operation, repeat operation, go-on operation, continuous operation, linear interpolation operation, circular interpolation operation, speed/position switching control operation (position indication during equal speed operation), inching operation and positioning end signal becomes “ON”.

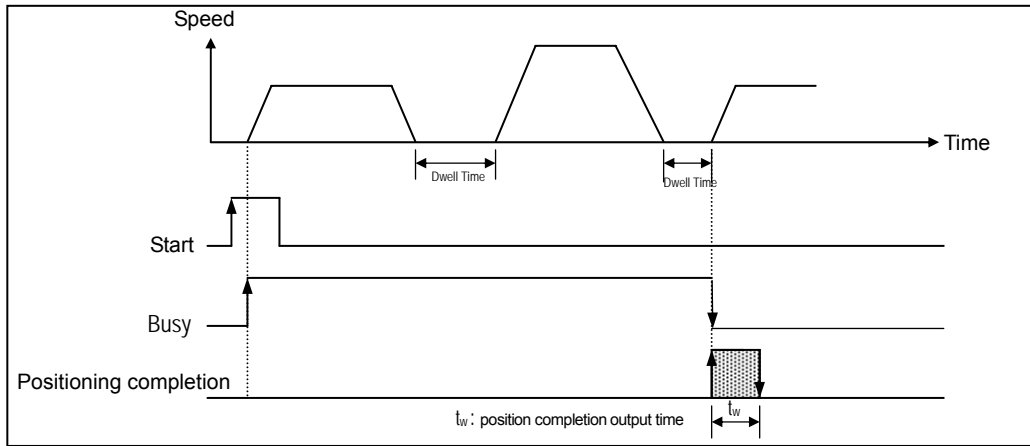
At this time, if all start command is executed while positioning end signal is ON, it shall be OFF.

And only in case that go-on operation mode and continuous operation mode is ended completely, the positioning end signal shall be outputted.

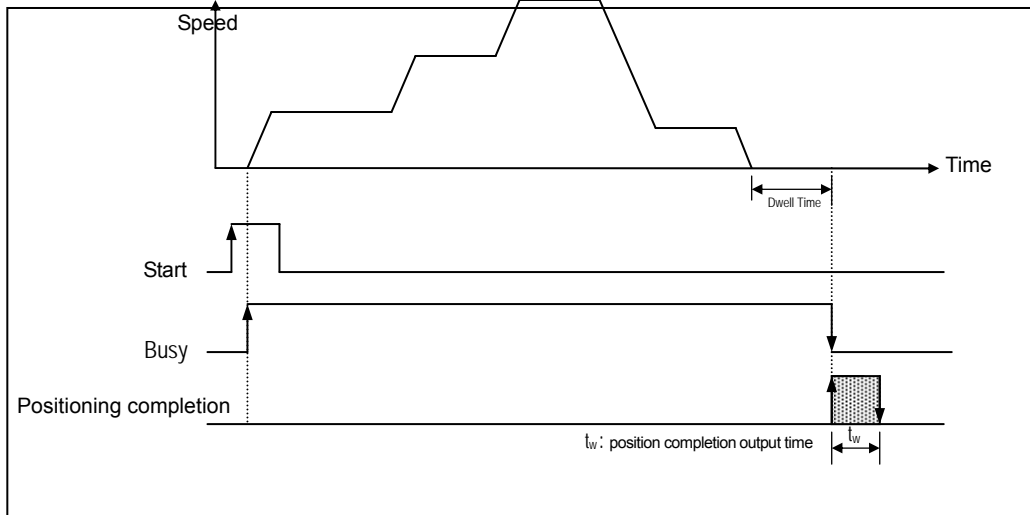
- The setting range is 0 ~ 65,535 (unit: 1 ms).
- The action of single operation mode is as follows :



- The action of Go-on operation mode is as follows :



- The action of Continuous operation mode is as follows.



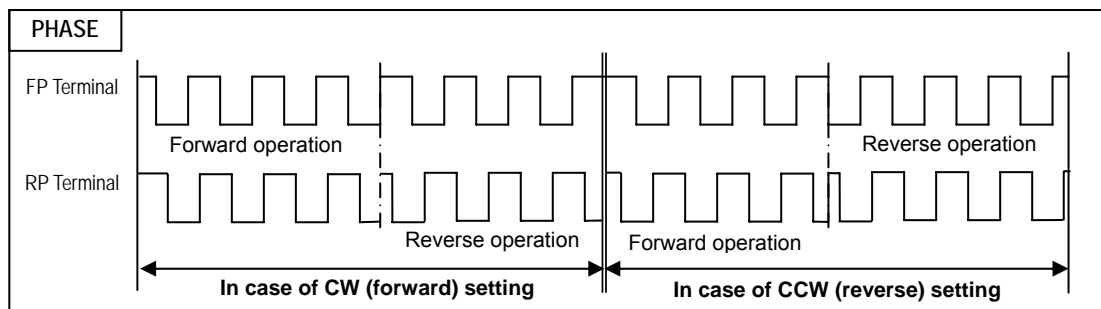
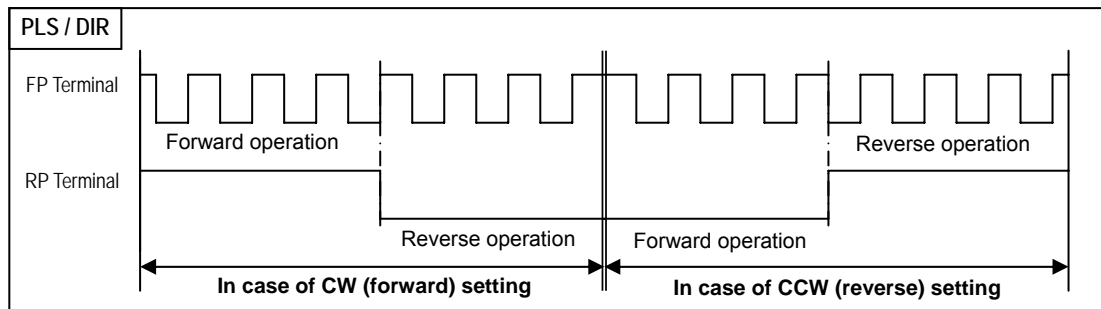
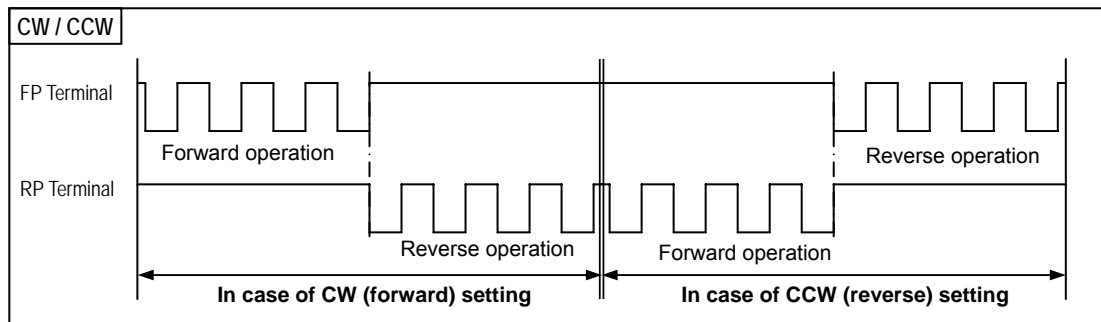
5.2.4 Selection of External Command

- It is available to select one among start, jog operation, skip for external command signal input.
- In case of using the external command signal, the external command should be set as "enabled".
- In case of using jog operation as external command selection, the external command signal shall be acted as jog high speed forward rotation and the external auxiliary command signal is acted as jog high speed reverse rotation.

5.2.5 Pulse Output Direction

The below shows the pulse output direction in case of Low Active.

- Forward rotation : the rotation direction shall be set to the direction to increase the current value of position address.
- Reverse rotation : the rotation direction shall be set to the direction to decrease the current value of position address.



5.2.6 M Code Output

- ▶ M code mode set by parameter shall be applied to all position data of the corresponding axis in a bundle..
- ▶ Available to set M code number differently at each operation step no. of positioning data.
- ▶ M code number setting range : 1 ~ 65,535
- ▶ Available to read and use M code for the identification of operation step no. in operation and the execution of auxiliary works (Clamp, Drill rotation, tool change etc).
- ▶ M code signal occurring during operation shall be reset by M code "Off" command.

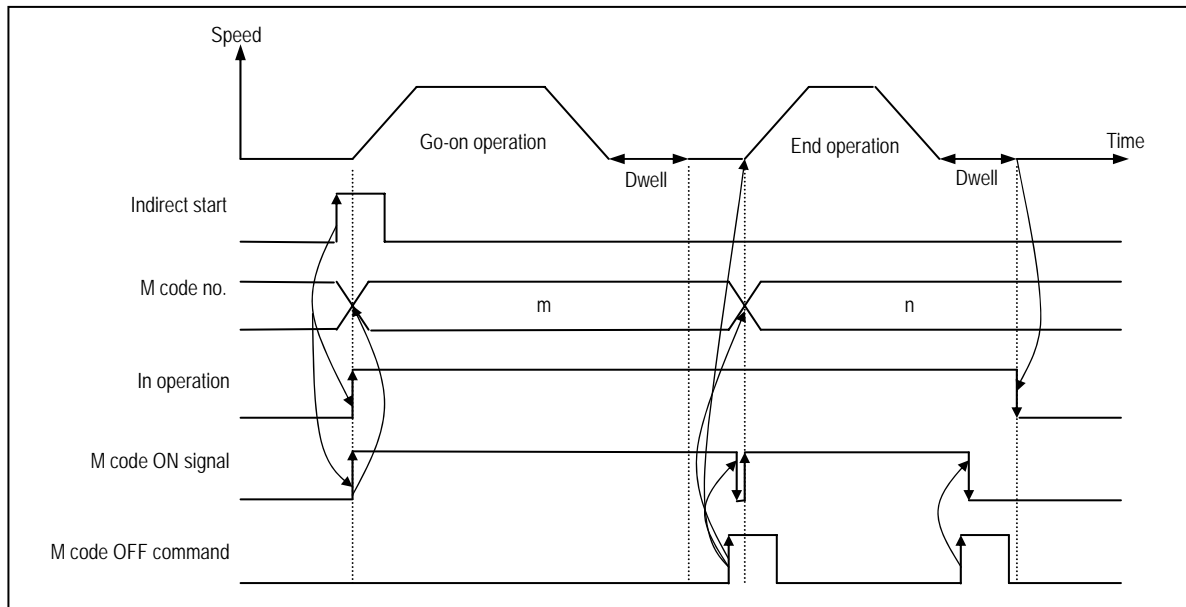
Notes

If M code signal is "ON" even if the positioning is completed, the next operation step no. does not work and the error (E233) will occur. Therefore, in order to act the positioning of the next operation step number, M code signal should be "OFF" by M code "Off" command

- ▶ There are two kinds of M code mode according to the output timing of M code signal : With mode and After mode.

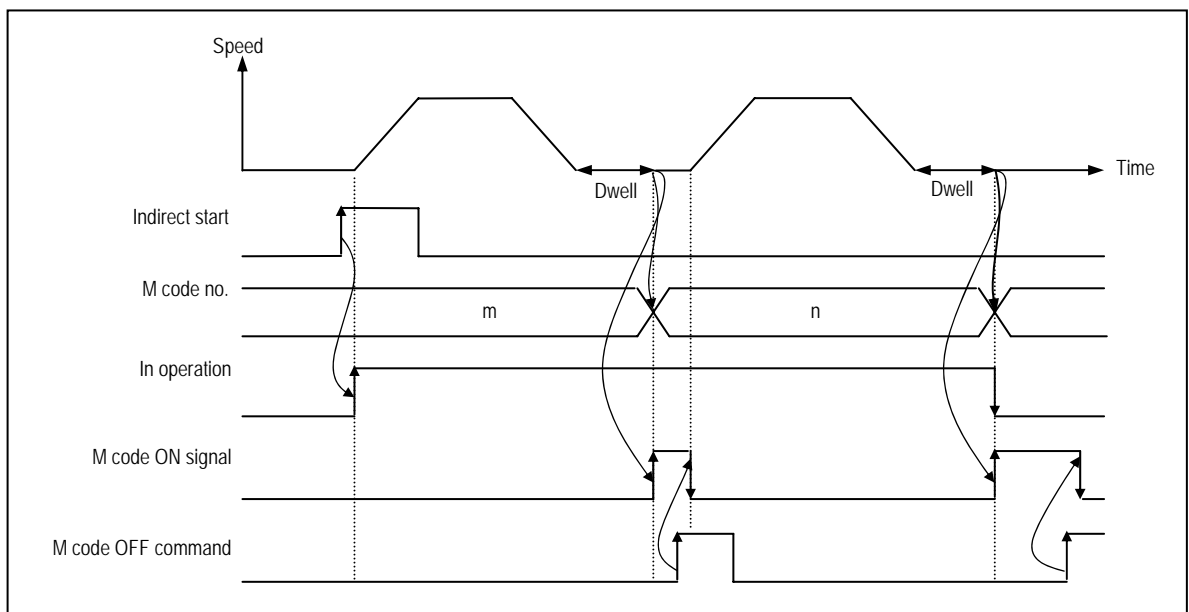
1) With mode

This is the mode that outputs M code number which is set by position data with start command of positioning action [indirect start, direct start, Circular interpolation, Simultaneous start, linear interpolation] and at the same time outputs M code ON signal.



2) After mode

This is the mode that outputs M code number to be set by position data after completing the positioning by start command (indirect start, direct start, circular interpolation, simultaneous start, linear interpolation) and at the same time outputs M code ON signal



5.2.7 External Command

- ▶ In case of selecting one from external command (start, jog operation, skip), the setting of “external command enabled/disabled” should be set as “enabled”.
- ▶ In case that it is set as “disabled”, the start of the external command selection, jog operation (high speed forward rotation), SKIP operation and jog operation by external auxiliary command (high speed reverse rotation) are not possible..

5.2.8 External Stop

- ▶ In case of using external deceleration stop function during positioning operation separately from internal deceleration stop, the external stop should be set as “enabled”

5.2.9 External Simultaneous Start

- ▶ In case of starting 2axis~3axis simultaneously by the external simultaneous start, it should be set as “enabled”.
- ▶ External simultaneous start executes the axis information and operation step number first by internal start command and then makes the external simultaneous start input “ON”.
- ▶ If external simultaneous start is set as “enabled”, it starts only by external simultaneous start input despite of the execution of internal simultaneous start command.

5.2.10 External Speed/Position Switching

- ▶ External speed/position switching should be set as “enabled” in order to switch the position control by external signal during equal speed operation by speed control..

5.2.11 Equal Speed Operation Software High/Low Limit

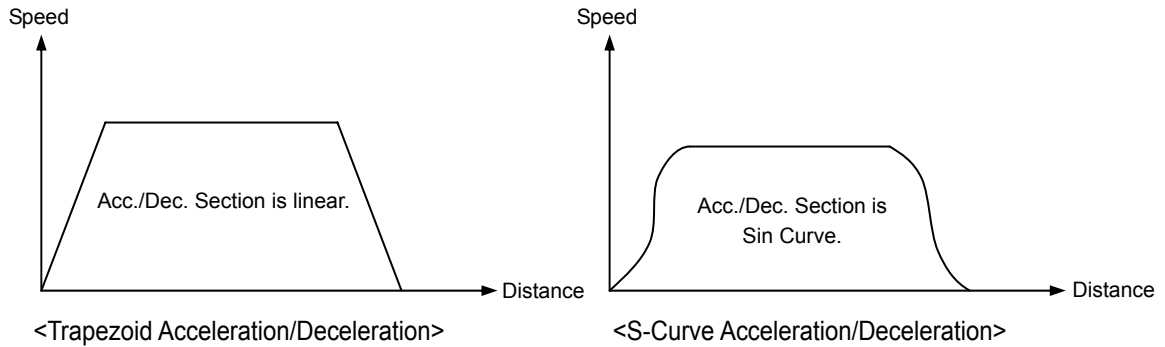
- ▶ This is used to stop the pulse output during equal speed operation by speed control because of detection of Software high/low limit.
- ▶ In this case, the origin determination is completed and the position indication during equal speed operation should be set as “indication” for the detection of Software high/low limit.

5.2.12 Position indication during Equal Speed Operation

- ▶ If you want to know the current position during equal speed operation by speed control, the position indication during equal speed operation should be set as “indication”.
- ▶ But the current position shall be indicated only in the state that the origin determination is completed.

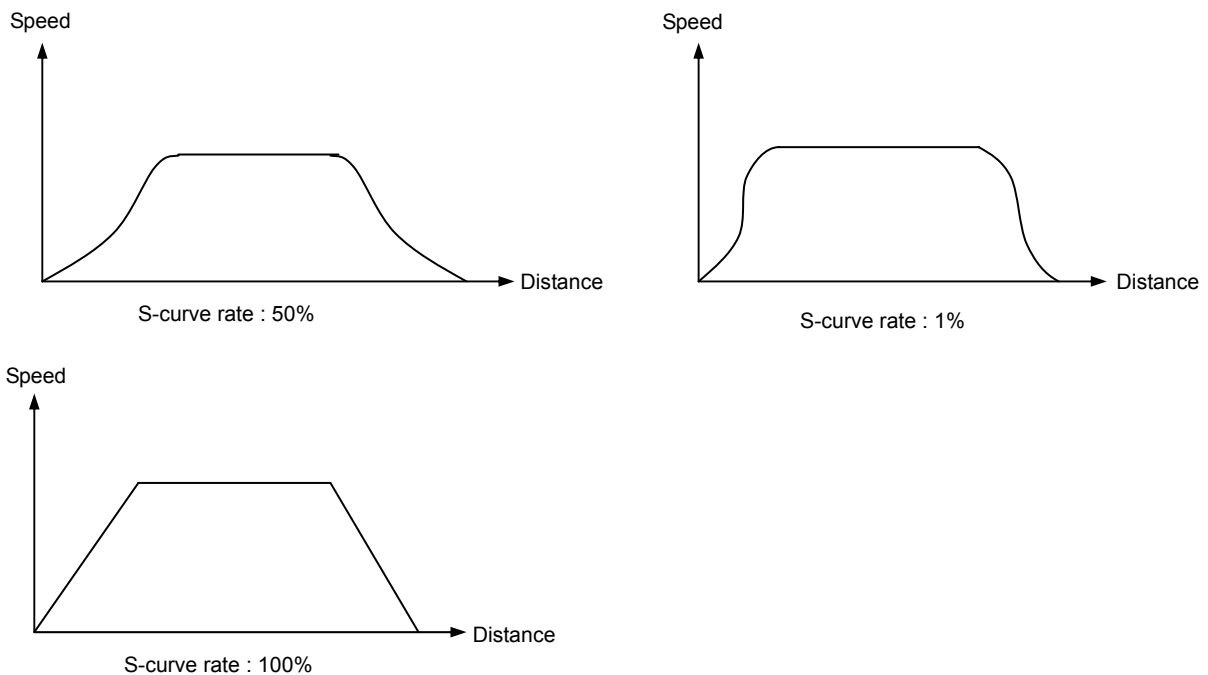
5.2.13 Acceleration/Deceleration Pattern

- ▶ There are 2 kinds of Acceleration/Deceleration operation pattern : Trapezoid operation and S-Curve operation.
- ▶ In case of positioning operation, it is available to select operation pattern (either trapezoid operation or S-Curve operation) at the section of acceleration and de deceleration.
- ▶ As it is not possible to use S-Curve operation pattern in case of continuous operation mode and speed override, care should be taken in setting.
- ▶ In case of using S-Curve acceleration/deceleration, it is available to protect the motor from the load effect at the point that the motor starts to move the moving object and stops it.



5.2.14 S-Curve Rate

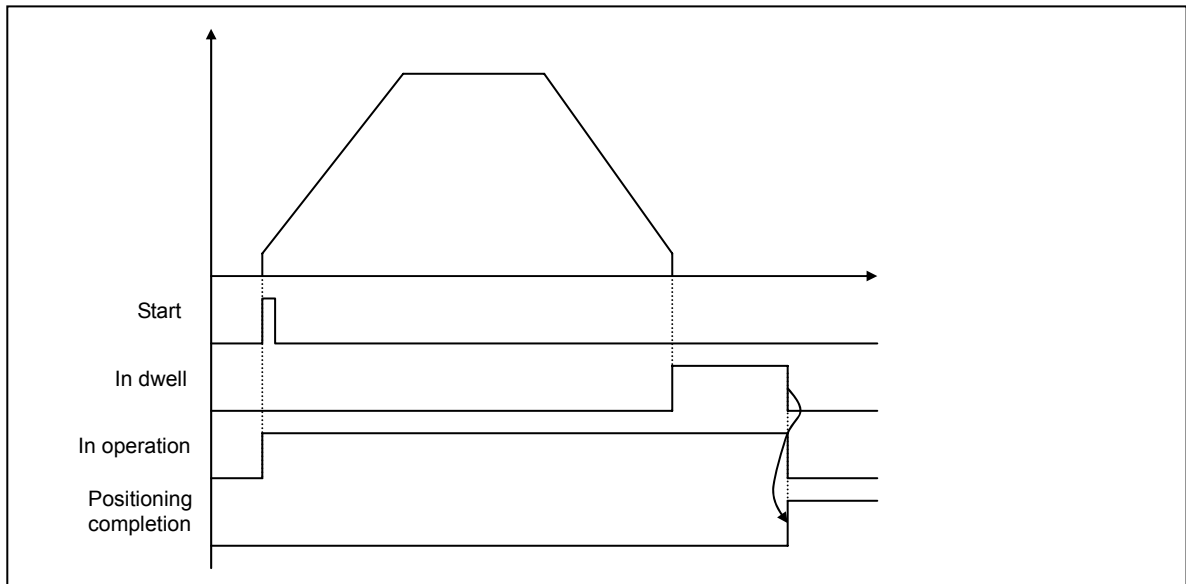
- ▶ In case of selecting S-Curve operation as an acceleration/deceleration pattern, S-Curve rate (1~100%) should be set.
- ▶ According to S-Curve rate, S-Curve operation pattern shall be formed in accordance with sine curve.
- ▶ If S-Curve rate is 100%, it becomes the same as trapezoid operation and if the 50% rate is set, it becomes the acceleration/deceleration curve which is the closest to the Sin Curve.
- ▶ The figure as below shows the example of S-Curve rate setting



5.2.15 Positioning End Condition

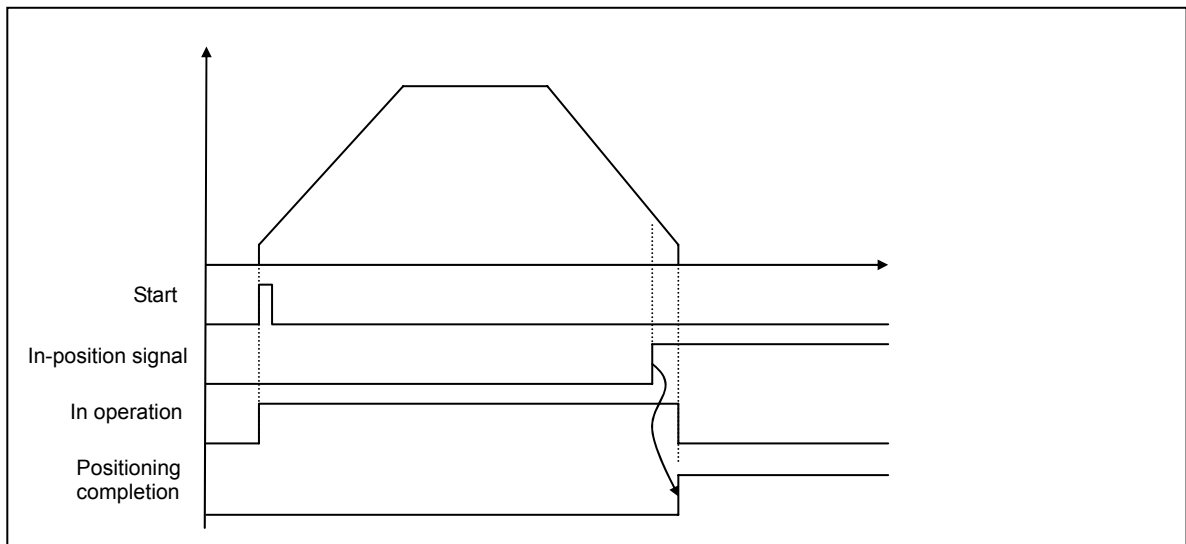
- ▶ Positioning End signal means the signal to notify that the operation set without stop factor after position operation has been completed.
- ▶ There are 4 kinds of methods for positioning end condition.
 - 1) by dwell time
 - 2) by in-position signal
 - 3) by using both dwell time and in-position signal
 - 4) by using either dwell time or in-position signal.
- ▶ It is required to reach the goal position until the positioning end condition is satisfied with, and maintain 'in operation' status even if the positioning operation is finished. If the positioning end condition is satisfied, 'in operation status' shall be OFF and it becomes the positioning end status.

1) Method by dwell time

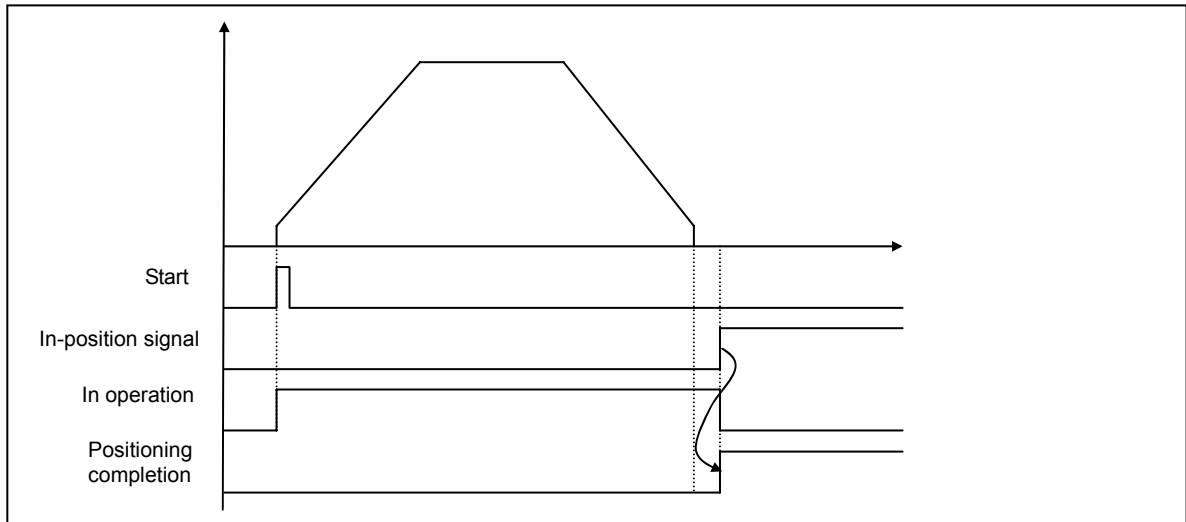


2) Method by in-position signal

- ① In case that in-position signal is ON before positioning is completed

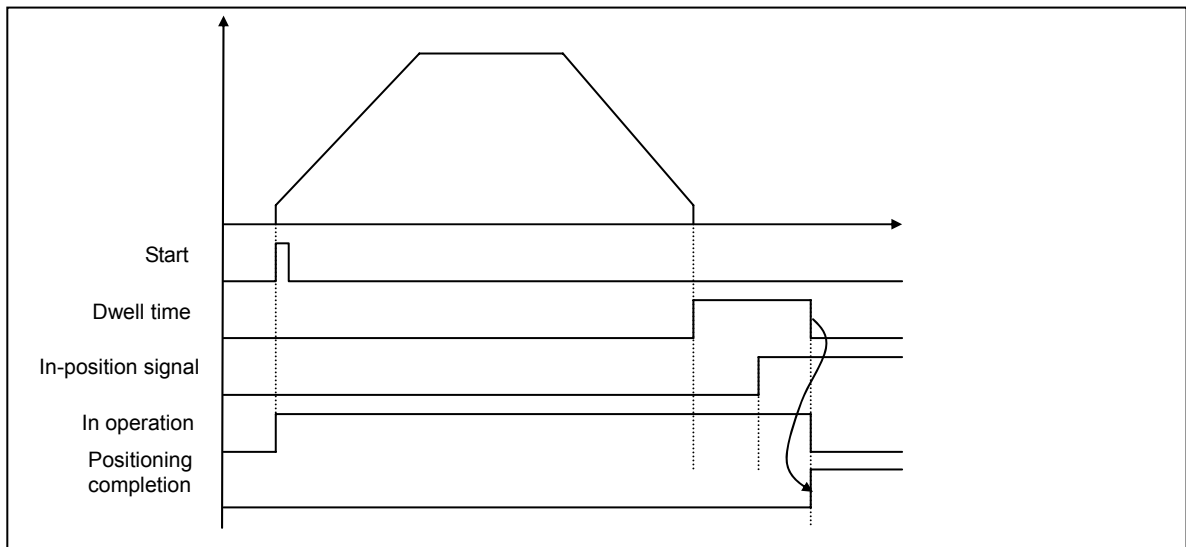


- ② In case that in-position signal is ON after positioning is completed

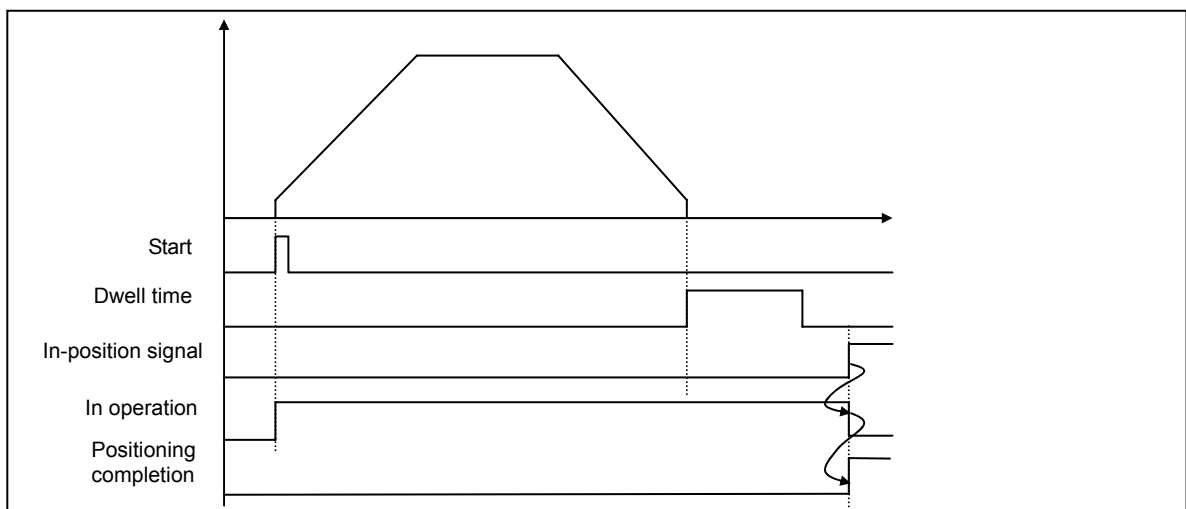


3) Method by using both dwell time and in-position signal

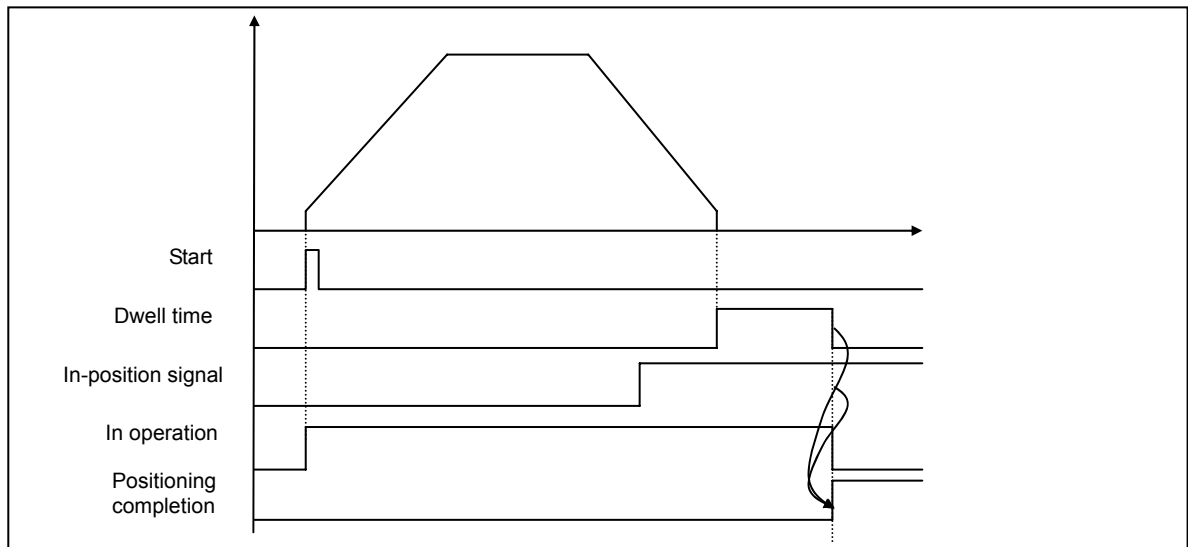
- ① In case that in-position signal occurs before dwell time is ended



- ② In case that in-position signal occurs after dwell time is ended.

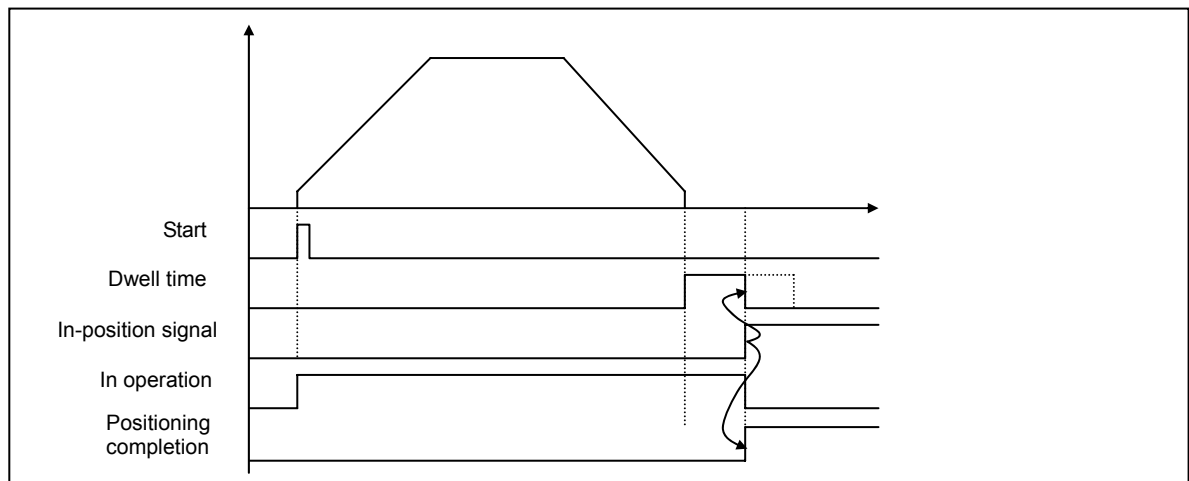


③ In case that in-position signal occurs during pulse output

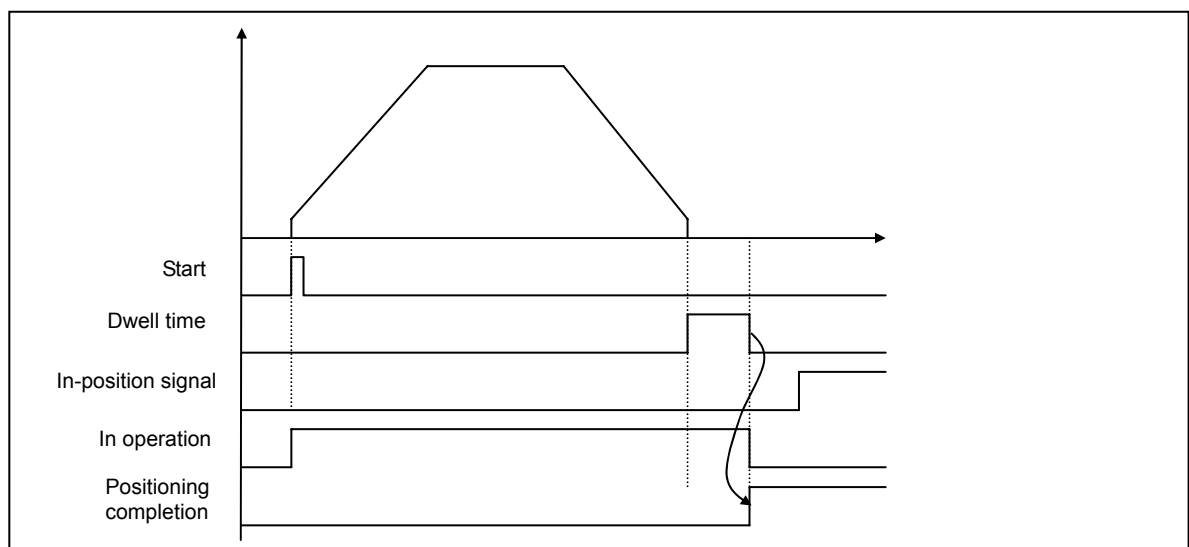


4) Method by using either dwell time or in-position signal

① In case that in-position signal occurs before dwell time is ended



② In case that in-position signal occurs after dwell time is ended.



5.2.16 Driver Ready/In-position

- ▶ It is available to select whether to use external driver ready/in-position input terminal as driver ready signal.
- ▶ As the operation characteristics are changed according to the selection, cares should be taken.

5.3 Origin/Manual Parameter

Here describes Origin/Manual Parameter.

Home Parameter	Home Method	0: DOG/HOME(OFF)	0: DOG/HOME(OFF)	0: DOG/HOME(OFF)
	Home Dir	1: CCW	1: CCW	1: CCW
	Home Address	0.0 um	0 pls	0 pls
	Home Compensation	0.0 um	0 pls	0 pls
	Home High Speed	2000.00 mm/m	5000 pls/s	5000 pls/s
	Home Low Speed	500.00 mm/m	500 pls/s	500 pls/s
	Home Retry Time	0 ms	0 ms	0 ms
	Home ACC/DEC	1000 ms	1000 ms	1000 ms
	Dwell	0 ms	0 ms	0 ms
	JOG High Speed	2000.00 mm/m	5000 pls/s	5000 pls/s
	JOG Low Speed	500.00 mm/m	1000 pls/s	1000 pls/s
	JOG ACC/DEC Time	1000 ms	1000 ms	1000 ms
	Inch Speed	1.00 mm/m	100 pls/s	100 pls/s

[Configuration of Origin/Manual parameter]

Items	Setting Range	Initial value														
Origin address	mm : -2147483648 ~ 2147483647 [X10 ⁻⁴ mm] inch : -2147483648 ~ 2147483647 [X10 ⁻⁵ inch] degree : -2147483648 ~ 2147483647 [X10 ⁻⁵ degree] pulse : -2147483648 ~ 2147483647 [pulse]	0														
Homing high speed	mm : 1 ~ 2,000,000,000 [X10 ⁻² mm/min], inch : 1 ~ 2,000,000,000 [X10 ⁻³ inch/min], degree : 1 ~ 2,000,000,000 [X10 ⁻³ degree/min], pulse : 1 ~ 200,000 [pulse/sec](Open collector) 1 ~ 1,000,000 [pulse/sec](Line driver)	5,000														
Homing-low speed	mm : 1 ~ 2,000,000,000 [X10 ⁻² mm/min], inch : 1 ~ 2,000,000,000 [X10 ⁻³ inch/min], degree : 1 ~ 2,000,000,000 [X10 ⁻³ degree/min], pulse : 1 ~ 200,000 [pulse/sec](Open collector) 1 ~ 1,000,000 [pulse/sec](Line driver)	500														
Homing Acce./dece.time※Note 1	0 ~ 65,535[unit: ms]	0														
Homing dwell time	0 ~ 50,000[unit: ms]	0														
Origin compensation amount	mm : -2147483648 ~ 2147483647 [X10 ⁻⁴ mm] inch : -2147483648 ~ 2147483647 [X10 ⁻⁵ inch] degree : -2147483648 ~ 2147483647 [X10 ⁻⁵ degree] pulse : -2147483648 ~ 2147483647 [pulse]	0														
Homing reset waiting time	0 ~ 65,535[unit: ms]	0														
Homing mode	<table><tr><th>Range</th><th>Description</th></tr><tr><td>0</td><td>Near point/origin(Off)</td></tr><tr><td>1</td><td>Near point/origin(On)</td></tr><tr><td>2</td><td>High/low limit/origin</td></tr><tr><td>3</td><td>Near point</td></tr><tr><td>4</td><td>High speed origin</td></tr><tr><td>5</td><td>High/low limit</td></tr></table>	Range	Description	0	Near point/origin(Off)	1	Near point/origin(On)	2	High/low limit/origin	3	Near point	4	High speed origin	5	High/low limit	0
Range	Description															
0	Near point/origin(Off)															
1	Near point/origin(On)															
2	High/low limit/origin															
3	Near point															
4	High speed origin															
5	High/low limit															
Homing direction	0:forward, 1:reverse	1														

※ Note 1] In case of setting the homing acceleration/deceleration time as "0", it needs to follow the acceleration/deceleration setting value of basic parameter. [Setting range of Origin/Manual Parameter]

Items	Setting Range	Initial value
Jog high speed	mm : 1 ~ 2,000,000,000 [$\times 10^{-2}$ mm/min], inch : 1 ~ 2,000,000,000 [$\times 10^{-3}$ inch/min], degree : 1 ~ 2,000,000,000 [$\times 10^{-3}$ degree/min], pulse : 1 ~ 200,000 [pulse/sec](Open collector), 1 ~ 1,000,000 [pulse/sec](Line driver)	5,000
Jog low speed	mm : 1 ~ 2,000,000,000 [$\times 10^{-2}$ mm/min], inch : 1 ~ 2,000,000,000 [$\times 10^{-3}$ inch/min], degree : 1 ~ 2,000,000,000 [$\times 10^{-3}$ degree/min], pulse : 1 ~ 200,000 [pulse/sec](Open collector), 1 ~ 1,000,000 [pulse/sec](Line driver)	1000
Jog acceleration/ deceleration time <small>*Note 2</small>	0 ~ 65,535[unit: ms]	1000
Inching speed <small>*Note 2</small>	mm : 1 ~ 65,535 [$\times 10^{-2}$ mm/min], inch : 1 ~ 65,535 [$\times 10^{-3}$ inch/min], degree : 1 ~ 65,535 [$\times 10^{-3}$ degree/min], pulse : 1 ~ 65,535 [pulse/sec]	100

※ Note 2. In case of setting the Jog acceleration/deceleration time as “0”, it needs to follow the acceleration/deceleration setting value of basic parameter.

[Setting Range of Origin/Manual Parameter]

5.3.1 Homing Method

- There are 6 kinds of Homing method.

Homing processing method	APM Software package indication
Origin detection after near point OFF	0: Near point/origin(OFF)
Origin detection after deceleration when near point ON	1: Near point/origin(ON)
Origin detection by the origin and High/low limit	2: High/low limit/origin
Origin detection by near point	3: Near point
High speed homing	4: High speed origin
Origin detection by high/low limit	5: High/low limit

- For further information of homing processing method, please refer to homing items.

5.3.2 Homing Direction

- Homing direction is divided into CW(forward rotation) and CCW(reverse rotation) based on the homing direction of 5.3.

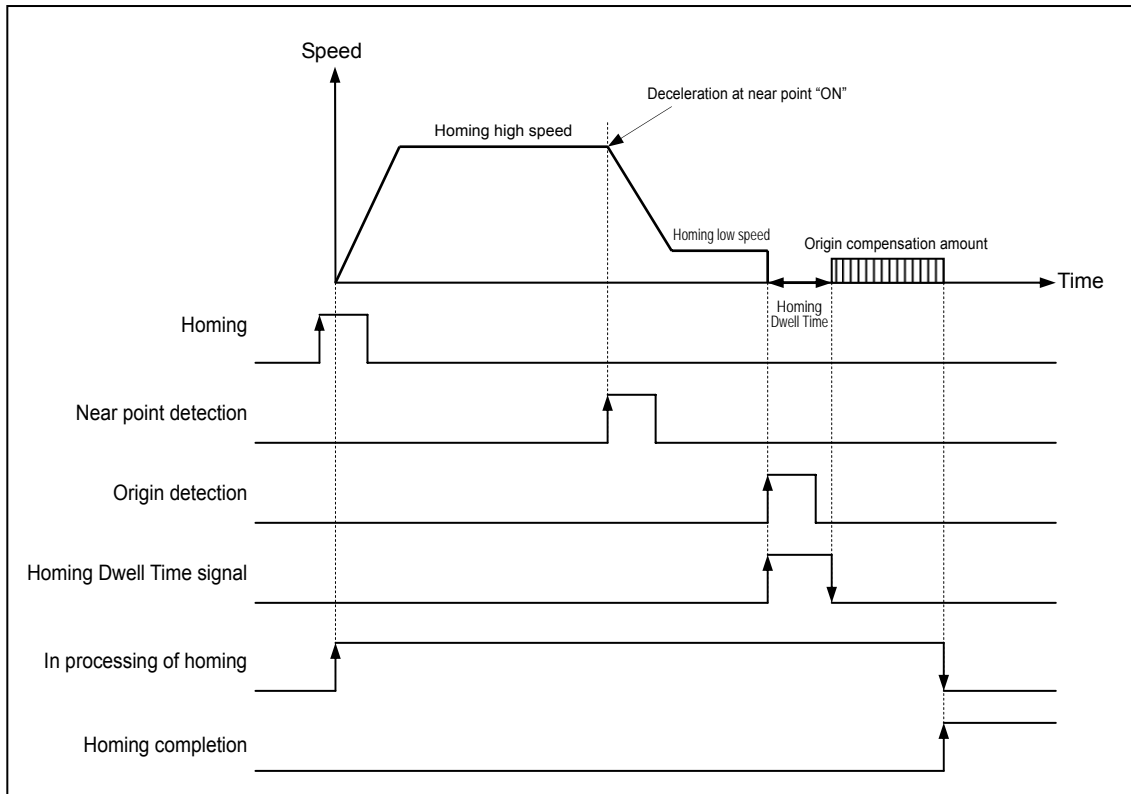
Pulse output direction	Homing direction	Pulse output action of positioning module
CW(forward)	CW(forward)	Homing to the forward direction
	CCW(reverse)	Homing to the opposite (reverse direction) of forward direction
CCW(reverse)	CW(forward)	Homing to the reverse direction
	CCW(reverse)	Homing to the opposite (forward direction) of reverse direction

5.3.3 Origin Address

- When homing is completed by homing command, the value set by homing address shall be used to change the present address value.
- Setting range of homing address : -2,147,483,648 ~ 2,147,483,647(unit: pulse)

5.3.4 Origin Compensation Amount

- ▶ If the machine origin is deviated slightly – the difference between the setting value and the actual transfer amount caused by the mechanical tolerance - at the origin detection (Z phase input), this is used to compensate the tolerance.
- ▶ If origin compensation amount is already set, when you carry out the homing command, if you detect the origin and set (+) as much as data amount set as origin compensation amount, it move to the homing direction and if you set (-), it moves to the opposite of homing direction and then complete the homing action.
- ▶ Origin compensation amount setting range : -2,147,483,648 ~ 2,147,483,647 (unit: pulse)



5.3.5 Homing-High speed

- ▶ The speed when returning to the origin by homing command : high speed and low speed.
- ▶ When setting the homing speed, it should be “speed limit \geq homing-high speed \geq homing-low speed”.
- ▶ The speed that acts to the constant speed section via acceleration section by homing command.
- ▶ Homing-high speed setting range
 Open collector $\rightarrow 1 \sim 200,000[\text{pps}]$
 Line driver $\rightarrow 1 \sim 1,000,000[\text{pps}]$

5.3.6 Homing-Low speed

- ▶ The speed that acts to the constant speed section from high speed section via deceleration section by homing command.
- ▶ Homing-low speed setting range
 Open collector $\rightarrow 1 \sim 200,000[\text{pps}]$
 Line driver $\rightarrow 1 \sim 1,000,000[\text{pps}]$

Notes

- ▶ When setting the homing speed, it is recommended to set the homing-low speed as low speed as possible.
- ▶ If setting the low speed as “too fast”, it may cause the incorrect origin signal detection.

5.3.7 Waiting Time for Reset

- ▶ This is the time to be set when using the homing method such as **origin detection after near point OFF**, **origin detection after deceleration when near point ON**, **homing by near point**, and also the waiting time for homing to be used in case of meeting the external input high/low limit signal without detecting the near point during the homing.
- ▶ As the pulse output is not possible during the time set as a waiting time for reset, the motor does not move actually.

5.3.8 Acceleration/Deceleration Time

- ▶ When returning to the origin by homing command, the homing shall be carried out as homing-high speed and low speed by the acceleration/deceleration time setting.

5.3.9 Dwell Time

- ▶ This is the time needed to maintain the precise stop accuracy of SERVO motor when using the SERVO motor for positioning.
- ▶ Practically, Dwell time is the time needed to remove the residual pulse of deviation counter after completion of positioning and especially Dwell time when returning to the origin is called as "homing dwell time".
- ▶ Setting range of Homing dwell time : 0 ~ 65,535(unit: 1 ms)

5.3.10 JOG High Speed

- ▶ Jog speed is related to Jog operation (a kind of manual operation) and has 2 types of operation : Jog low speed operation and Jog high speed operation.
- ▶ For further information, please refer to 3.7.1 JOG Operation.
- ▶ JOG high speed operation has operation pattern as acceleration, constant speed, deceleration section. Therefore, acceleration section and deceleration section is controlled by JOG acceleration/deceleration time.
- ▶ Jog high speed setting range
Open collector → 1 ~ 200,000[pps]
Line driver → 1 ~ 1,000,000[pps]
(Notices when setting the high speed : Bias speed ≤ Jog high speed ≤ Speed limit)

5.3.11 JOG Low Speed

- ▶ JOG low speed operation has operation pattern as acceleration, constant speed, deceleration section.
- ▶ JOG low speed setting range : 1 ~ JOG high speed

5.3.12 JOG Acceleration/Deceleration Time

- ▶ This means JOG acceleration/deceleration time when Jog high speed and low speed operation.
- ▶ JOG acceleration/deceleration time setting range : 0 ~ 65,535(unit: 1 ms)

5.3.13 Inching Speed

- ▶ The speed necessary for inching operation is set here.
- ▶ Inching speed setting range : 1 ~ 65,535(unit: 1pps)

5.4 Input Signal Parameter

Here describes input signal parameter

Input Signal Parameter	Upper Limit Signal	1: N.Close	1: N.Close	1: N.Close
	Lower Limit Signal	1: N.Close	1: N.Close	1: N.Close
	DOG Signal	0: N.Open	0: N.Open	0: N.Open
	HOME Signal	0: N.Open	0: N.Open	0: N.Open
	EMG Signal	1: N.Close		
	STOP Signal	0: N.Open	0: N.Open	0: N.Open
	COMMAND Signal	0: N.Open	0: N.Open	0: N.Open
	SUB-COMMAND Signal	0: N.Open	0: N.Open	0: N.Open
	VTP Signal	0: N.Open	0: N.Open	0: N.Open
	INPOSITION Signal	0: N.Open	0: N.Open	0: N.Open
	EXT SIM Signal	0: N.Open		

[Input signal parameter configuration]

Items	Setting Range	Initial value
High limit signal	0 : A contact, 1 : B contact	1 : B contact
Low limit signal	0 : A contact, 1 : B contact	
Near point signal	0 : A contact, 1 : B contact	
Origin signal	0 : A contact, 1 : B contact	0 : A contact
Emergency stop signal	0 : A contact, 1 : B contact	1 : B contact
Stop signal	0 : A contact, 1 : B contact	0 : A contact
Command signal	0 : A contact, 1 : B contact	
Auxiliary command signal	0 : A contact, 1 : B contact	
Speed/Position switching signal	0 : A contact, 1 : B contact	
Driver ready/in-position signal	0 : A contact, 1 : B contact	
External synchronous start signal	0 : A contact, 1 : B contact	

[Setting Range of Input Signal Parameter]

► In case of setting the input signal by A contact, it acts when external is ON and in case of setting by B contact, it acts when external signal is OFF.

1) If setting the high limit signal of input signal parameter by A contact and the low limit signal by B contact, the high limit is detected when external high limit signal is ON while the low limit is detected when external low signal is OFF.

2) If selecting Driver Ready from Driver Ready/In-position of extended parameter, the external input signal is used by Driver Ready signal. And if setting Driver Ready/In-position signal of input signal parameter by A contact, the positioning module operates normally when external driver ready is ON. On the contrary, if setting Driver Ready/ In-position signal of input signal parameter by B contact, the positioning module operates normally when external driver ready is OFF.

3) If setting the origin signal of input signal parameter by A contact, the origin is detected when external origin signal is 'Rising edge', while if setting by B contact, the origin is detected when external origin signal is 'Falling edge'.

5.5 Common Parameter

Here describes Common parameter

Common Parameter	Pulse Output Level	0: Low Active
	Circular Interpolation	0: Sub Point
	Encoder Input	4: PHASE A/B(2-Phase x1)
	Auto Reload	4294967295
	Z-Phase Clear	
	ZONE Output Mode	0: Seperate Ouput
	ZONE1 Axis	0: X
	ZONE2 Axis	0: X
	ZONE3 Axis	0: X
	ZONE1 ON Area	0.0 um
	ZONE1 OFF Area	0.0 um
	ZONE2 ON Area	0.0 um
	ZONE2 OFF Area	0.0 um
	ZONE3 ON Area	0.0 um
	ZONE3 OFF Area	0.0 um

[Configuration of Common Parameter]

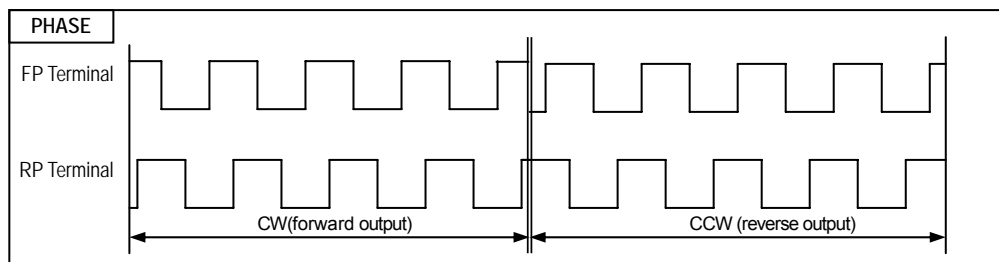
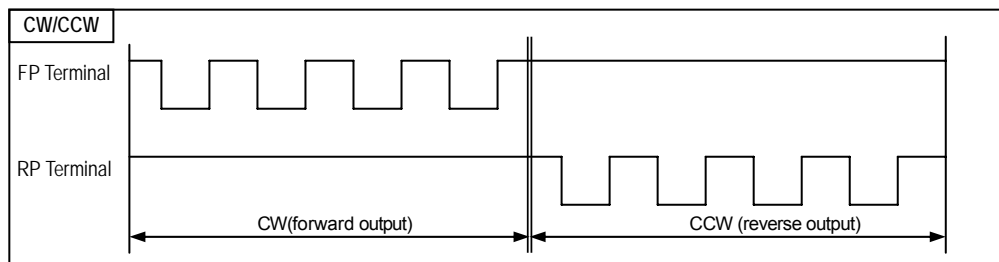
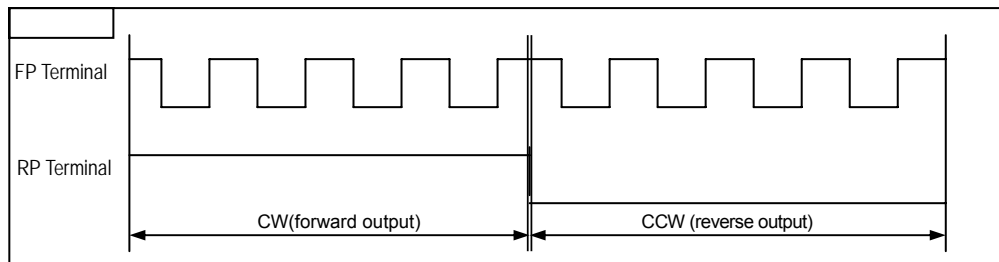
Items	Setting Range	Initial value
Pulse output level	0 : Low Active, 1 : High Active	0
Encoder pulse input mode	0 : CW/CCW, 1phase 1multiplier 1 : CW/CCW, 1phase 2multiplier 2 : Pulse/Dir, 1phase 1multiplier 3 : Pulse/Dir, 1phase 2multiplier 4 : Phase A/B, 2phase 1multiplier 5 : Phase A/B, 2phase 2multiplier 6 : Phase A/B, 2phase 4multiplier	4
Z phase Clear ^{※Note1}	-	-
Auto Reload	0 ~ 4,294,967,295	4294967295
Zone1 axis setting	0 : X, 1 : Y, 2 : Z, 3 : Encoder	0
Zone1 ON area	mm : -2147483648 ~ 2147483647 [$\times 10^{-4}$ mm] inch : -2147483648 ~ 2147483647 [$\times 10^{-5}$ inch]	0
Zone1 OFF area	degree : -2147483648 ~ 2147483647 [$\times 10^{-5}$ degree] pulse : -2147483648 ~ 2147483647 [pulse/초]	0
Zone2 axis setting	0: X, 1: Y, 2: Z, 3: Encoder	0
Zone2 ON area	mm : -2147483648 ~ 2147483647 [$\times 10^{-4}$ mm] inch : -2147483648 ~ 2147483647 [$\times 10^{-5}$ inch]	0
Zone2 OFF area	degree : -2147483648 ~ 2147483647 [$\times 10^{-5}$ degree] pulse : -2147483648 ~ 2147483647 [pulse]	0
Zone3 axis setting	0: X, 1: Y, 2: Z, 3: Encoder	0
Zone3 ON area	mm : -2147483648 ~ 2147483647 [$\times 10^{-4}$ mm] inch : -2147483648 ~ 2147483647 [$\times 10^{-5}$ inch]	0
Zone3 OFF area	degree : -2147483648 ~ 2147483647 [$\times 10^{-5}$ degree] pulse : -2147483648 ~ 2147483647 [pulse]	0
Zone output mode	0 : individual output, 1: batch output [Zone1]	0
Circular interpolation method	0: middle point, 1: center point	0

※Note1] XGT positioning module does not have the function of Encoder Value Clear by external Z phase input.

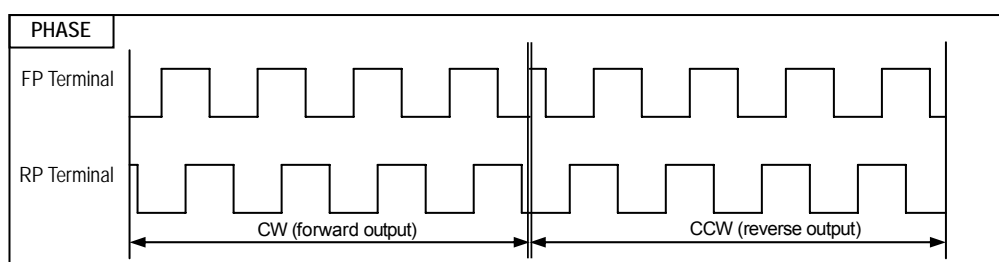
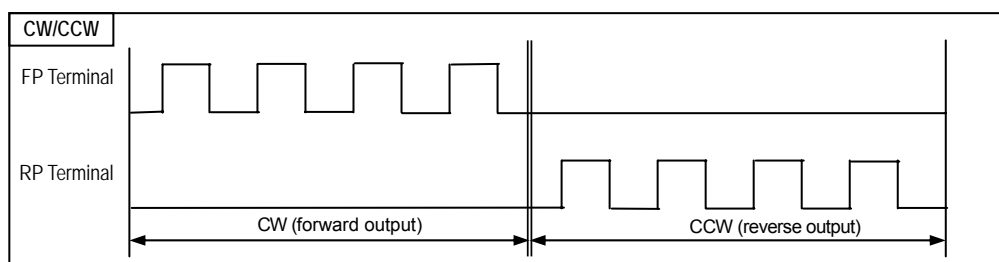
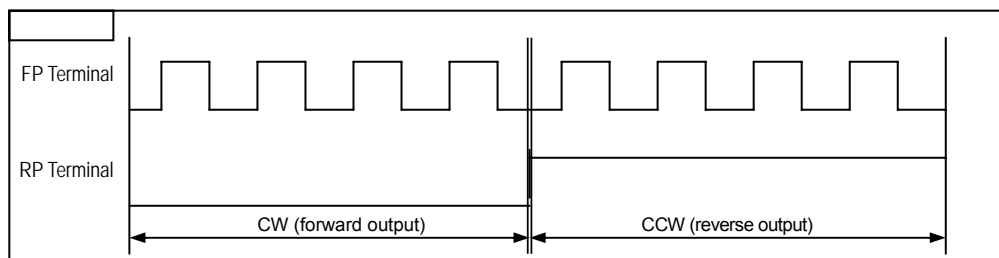
[Setting Range of Common Parameter]

5.5.1 Pulse Output Level

- For the pulse output level setting, select one from Low Active output and High Active output.
- The figure as below shows the case that pulse output level is Low Active according to pulse output mode.



- The figure as below shows the case that pulse output level is High Active according to pulse output mode.



5.5.2 Circular Interpolation method

- ▶ For circular interpolation method, it is available to select either Middle point method or Center point method.
- ▶ For further information, please refer to the content of circular interpolation operation of User's manual.

5.5.3 Encoder Input Signal

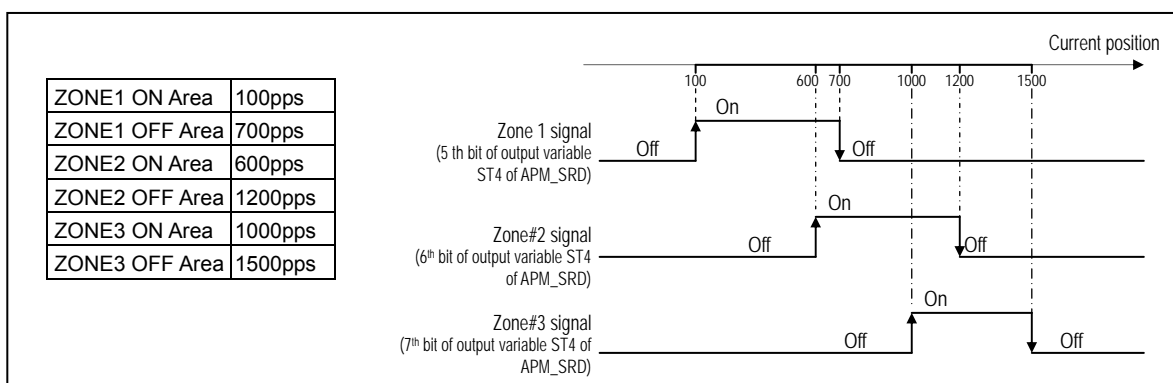
- ▶ In case of using the Encoder input signal of manual pulse generator or SERVO driver, select the signal that matches with the output type of manual pulse generator or encoder.
- ▶ For the encoder input signal setting, select one from CW/CCW(1phase 1multiplier), CW/CCW(1phase 2multiplier), PLS/DIR(1phase 1multiplier), PLS/DIR(1phase 2multiplier), PHASE A/B(2phase 1multiplier), PHASE A/B(2phase 2multiplier) and PHASE A/B(2phase 4multiplier).
- ▶ Manual Pulse Generator(MPG) Operation is operated at the speed of MPG, irrespectively of the multiplier setting of encoder input mode.

5.5.4 Auto Reload

- ▶ When counting the input pulse entered from Encoder signal of manual pulse generator or SERVO driver and indicating it as Encoder value, it is required to set the count range of Encoder value by Auto Reload value.
 - ▶ Setting range of Auto Reload value: 0 ~ 4,294,967,295
- Ex) In case of setting Auto Reload value = 499, the indication range of Encoder value is 0 ~ 499.)

5.5.5 Zone Output

- ▶ It is available to set within the position address range that the positioning module can move, and there are 3 types.
- ▶ When the current position passes between the address value set as "Zone", the Zone no. becomes "ON". Thus, it is available to carry out the separate work by using "ON" information while position controlling for the area set as "Zone".
- ▶ Zone setting range : -2,147,483,648 ~ 2,147,483,647(unit: pulse)
- ▶ Zone setting is as follow.



Notes

The setting of "ON starting point" should be less than the setting of "ON ending point".

- ▶ For Zone output mode, select one from individual output and batch output (Zone 1).
- ▶ For Individual output mode, the signal of Zone 1, Zone 2 and Zone3 becomes "ON" according the setting of Zone 1/2/3 axis..
- ▶ For batch output (Zone 1), batch output for Zone 1 and at the same time individual output for Zone2 and Zone 3 shall be done in the setting section between ON starting point and ending point of Zone 1, Zone 2 and Zone3..
- ▶ For the setting of Zone 1 / 2 / 3 axis, it is available to select one from X, Y, Z axis and Encoder.

5.6 Operation Data

Here describes Operation Data

Step	Cordi	Control	Pattern	Method	Address [μm]	Sub Address [μm]	M Code	A/D No.	Speed [mm/min]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
2	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
3	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
4	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
5	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
6	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
7	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW
8	ABS	POS	END	SIN	0.0	0.0	0	No.1	0.00	0	CW

[Configuration of Operation Data]

Items	Setting Range	Initial value
Goal position	mm : -2147483648 ~ 2147483647 [$\times 10^{-4}$ mm] inch : -2147483648 ~ 2147483647 [$\times 10^{-5}$ inch] degree : -2147483648 ~ 2147483647 [$\times 10^{-5}$ degree] pulse : -2147483648 ~ 2147483647 [pulse]	0
Circular interpolation aux. Position	mm : -2147483648 ~ 2147483647 [$\times 10^{-4}$ mm] inch : -2147483648 ~ 2147483647 [$\times 10^{-5}$ inch] pulse : -2147483648 ~ 2147483647 [pulse]	0
Operation speed	mm : 1 ~ 2,000,000,000 [$\times 10^{-2}$ mm/min] inch : 1 ~ 2,000,000,000 [$\times 10^{-3}$ inch/min] degree : 1 ~ 2,000,000,000 [$\times 10^{-3}$ degree/min] pulse : 1 ~ 200,000 [pulse/sec](Open collector), 1 ~ 1,000,000 [pulse/sec](Line driver)	0
Dwell time	0 ~ 50,000[unit: ms]	0
M Code no.	0 ~ 65,535	0
Operation method	single, repeat	single
Control mode	Position control, Speed control	Position control
Operation pattern	End, Go-on, Continuous	End
Coordinates	Absolute, Relative	Absolute
Circular interpolation direction	CW, CCW	CW
Selection of acceleration/deceleration No.	1: acceleration/deceleration time No1 2: acceleration/deceleration time No2 3: acceleration/deceleration time No3 4: acceleration/deceleration time No4	1

[Setting range of Operation data]

5.6.1 Step No.

- ▶ The setting range of positioning data as serial no. is 0 ~ 400.
- ▶ The first Starting step of operation data is no.1 step.

Notes

If the step no. is set as "0" for indirect start, simultaneous start, linear interpolation operation, circle interpolation operation, position synchronization, it is operated according to the operation data set as the current operation step no.

5.6.2 Coordinate

- ▶ The coordinate of position data includes absolute coordinate and relative coordinate.

1) Absolute Coordinate (Control by Absolute method)

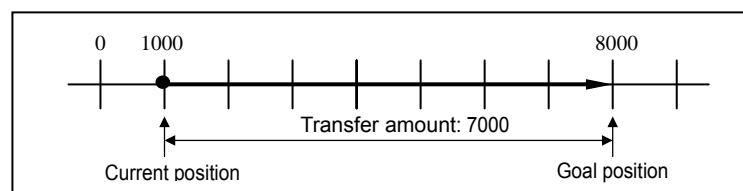
- A) This carries out the positioning control from the current position to the goal position (the goal position assigned by positioning data).
- B) Positioning control is carried out based on the assigned position of homing (origin address).
- C) Transfer direction shall be determined by the current position and goal position.
 - ▶ Start position < Goal position : forward direction positioning
 - ▶ Start position > Goal position : reverse direction positioning

[Example]

- ▶ When current position : 1000 , Goal position : 8000, forward direction transfer amount is 7000(8000-1000).
- ▶ Software Package Setting

Position data setting											
Step	Cordi	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	8000	0	0	No.1	100	0	Cw

▶ Positioning Result

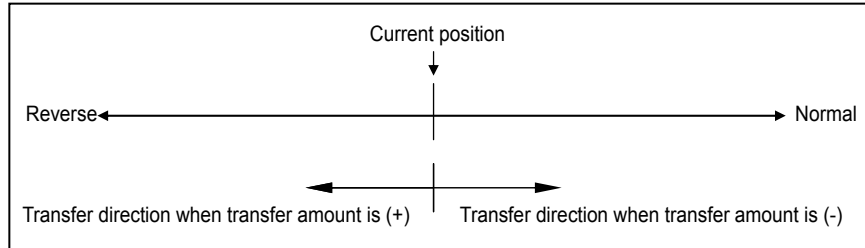


Notes

Control by Absolute method (Absolute coordinate) can start only in the state that the origin is determined. If starting in the state that the origin is not determined, Error 234 will occur.

2) Relative Coordinate (Control by Incremental method)

- A) This carries out the positioning control as much as goal transfer amount from the current position.
- B) Transfer direction shall be determined by the sign of transfer amount.
 - ▶ When transfer direction is (+) or no sign : forward direction positioning (position increase direction)
 - ▶ When transfer direction is (-) : reverse direction positioning (position decrease direction)

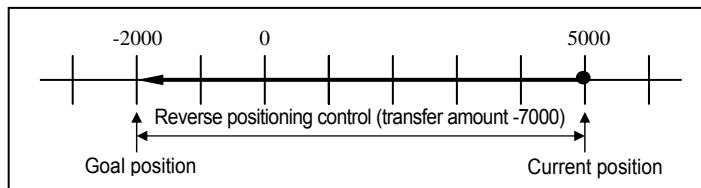


[Example]

- ▷ When current position : 5000 , Goal position : -7000, the positioning shall be done at -2000 position.
- ▷ Software Package Setting

Position data setting											
Step	Cordi	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]	Cir.Int Dir
1	INC	POS	END	SIN	-7000	0	0	No.1	100	0	Cw

- ▷ Positioning Result



5.6.3 Control Method (Position/Speed)

- ▶ Select the control method : Position control method, Speed control method.
- ▶ For further information, please refer to 3.1.1 Position control and 3.1.3 Speed control of Chapter 3 “Function”.

5.6.4 Operation Pattern (End/Go-on/Continuous)

- ▶ Select one operation pattern from End, Go-on, Continuous operation.
- ▶ For further information, please refer to 3.2 Operation Pattern of Chapter 3 “Function”.

5.6.5 Operation Method (Single/Repeat)

- ▶ Select operation method : Single operation or Repeat operation.
- ▶ For further information, please refer to 3.2 Operation Method of “Function”..

5.6.6 Goal Position

- ▶ This is the area to set the transfer amount of position data as “position value”.
- ▶ The setting range is -2,147,483,648 ~ 2,147,483,647(setting unit: pulse).
- ▶ The change of goal position value is available at Program by using position teaching].

5.6.7 M Code

- ▶ M code is applied to the whole axis in a bundle by M code mode set by positioning parameter and is given to each operation step no. as a Number within the setting range to use at Program.
- ▶ The setting range is 1 ~ 65,535.

Notes

- ▶ How to use M code at Program
 - 1) M code no. can be identified by read by the operation state code
 - 2) M code action is available to confirm "ON/OFF" by the operation state read.

- ▶ For further information, please refer to M code output of 5.2.6.

5.6.8 Acceleration/Deceleration No.

- ▶ The dual acceleration/deceleration time setting is available by setting the acceleration/deceleration time 1/2/3/4 of basic parameter as acceleration/deceleration no. 1/2/3/4 respectively.

5.6.9 Operation Speed

- ▶ Operation speed is set within the range that does not exceed Speed limit of basic parameter.
- ▶ Setting range of operation speed
 - Open collector → 1 ~ 200,000[pps]
 - Line driver → 1 ~ 1,000,000[pps]

5.6.10 Dwell Time

- ▶ This is the waiting time before carrying out the next positioning operation after completing one positioning operation.
- ▶ Setting range is 0 ~ 50,000 (ms).
- ▶ Especially, in case of using SERVO motor, this is the data to set the waiting time by the stable stop state as positioning module is in the stop state but actual SERVO motor does not reach to the goal position or in transition state.
- ▶ While dwell time is active, the corresponding axis of positioning module maintains "ON" of the "in operation state" and if dwell time proceeds, "in operation state" becomes "OFF" and the positioning end signal becomes "ON".

Chapter 6 APM Software Package Test Operation

► This chapter describes the Test operation of APM Software Package.

6.1 Test Operation Display Configuration

6.1.1 Display Configuration of Command 1

2/3 axis

Docking Window

☒ X-Axis ☐ Y-Axis ☐ Z-Axis

Indirect Start	Step	0	RUN
Error Reset	1: Reset/Output Enable		RUN
Direct Start	Pos	0 pls	RUN
	Spd	0 pls/s	
	Dwell	0 ms	
	Mcode	0	
	Acc/Dec No.	No.1	
	Coordinate	ABS	
	Contol	POS	
Dec. Stop	Time	0 ms	RUN
Pos Override	Pos	0 pls	RUN
Spd Override	Spd	0 pls/s	RUN
Spd Override with Position	Pos	0 pls	RUN
	Spd	0 pls/s	
Position Preset	Pos	0 pls	RUN
Encoder Preset	Pos	0 pls	RUN
Start Step	Step	1	RUN
Rep. Step	Step	1	RUN
Inch	Value	0 pls	RUN
JOG	<< < > >>		
JOG Stop			
Speed Sync	Master	X	RUN
	M.rate	0	
	S.rate	0	
Position Sync	Master	X	RUN
	Step	0	
	Pos	0 pls	
Concurrent Start	Axis	X,Y	RUN
	X	0	
	Y	0	
	Z	0	
Linear Int.	Axis	X,Y	RUN
	Step	0	

1 axis

Docking Window

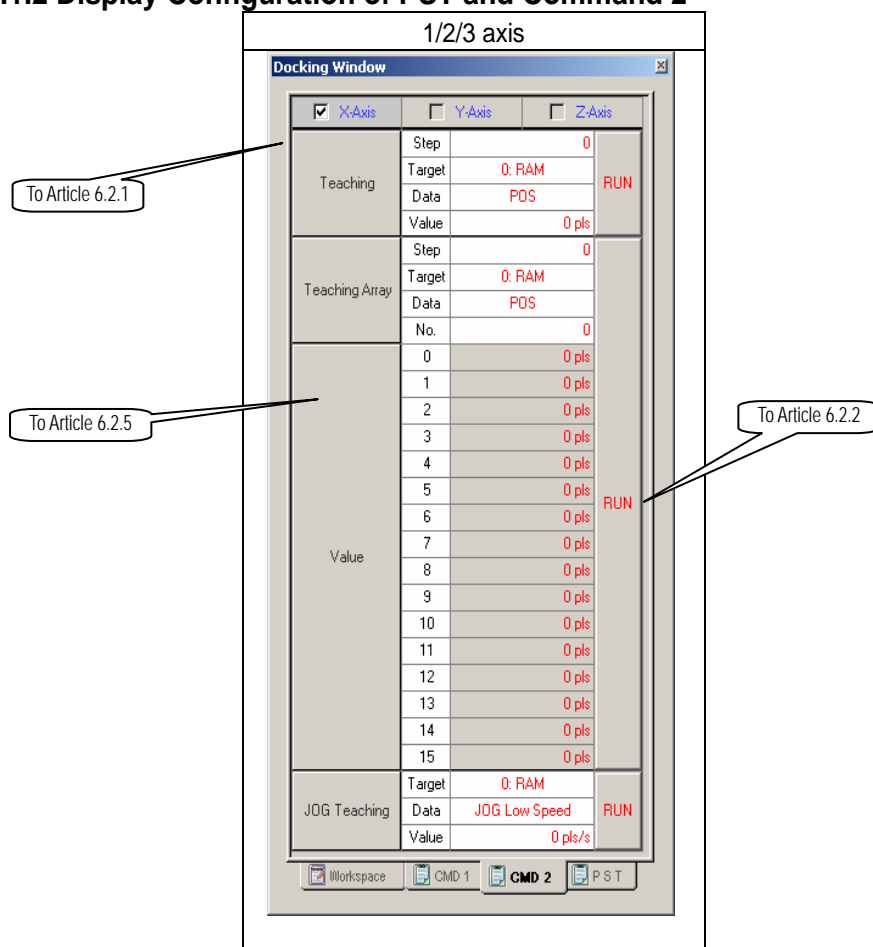
☒ X-Axis ☐ Y-Axis ☐ Z-Axis

Indirect Start	Step	0	RUN
Error Reset	1: Reset/Output Enable		RUN
Direct Start	Pos	0 pls	RUN
	Spd	0 pls/s	
	Dwell	0 ms	
	Mcode	0	
	Acc/Dec No.	No.1	
	Coordinate	ABS	
	Contol	POS	
Dec. Stop	Time	0 ms	RUN
Pos Override	Pos	0 pls	RUN
Spd Override	Spd	0 pls/s	RUN
Spd Override with Position	Pos	0 pls	RUN
	Spd	0 pls/s	
Position Preset	Pos	0 pls	RUN
Encoder Preset	Pos	0 pls	RUN
Start Step	Step	1	RUN
Rep. Step	Step	1	RUN
Inch	Value	0 pls	RUN
JOG	<< < > >>		
JOG Stop			
Speed Sync	Master	X	RUN
	M.rate	0	
	S.rate	0	
Position Sync	Master	X	RUN
	Step	0	
	Pos	0 pls	
Concurrent Start	Axis	X,Y	RUN
	X	0	
	Y	0	
	Z	0	
Linear Int.	Axis	X,Y	RUN
	Step	0	

Workspace CMD 1 CMD 2 PST

[Configuration of Command 1]

6.1.2 Display Configuration of PST and Command 2



[Configuration of Command 2]

- For Display configuration of PST, please refer to Article 6.2.6.

6.1.3 Monitoring Display Configuration

Signal/Axis	<input checked="" type="checkbox"/> X Axis	<input checked="" type="checkbox"/> Y Axis	<input checked="" type="checkbox"/> Z Axis
Position			
Speed			
Step No.			
Error Code			
Master/Slave			
Master			
M Code			
BUSY			
Position Complete			
M Code ON			
Origin Fix			
Output Inhibit			
Stop			
SW Upper Limit			
SW Lower Limit			
EMG Stop			
CW/CCW			
Move Status			
Control Pattern			
Home Return			
Position Sync			
Speed Sync			
JOG High Speed			
JOG Low Speed			
Inch			
Return to Point			
ZONE 1			
ZONE 2			
ZONE 3			
Encoder			

Indication per axis

Common indication

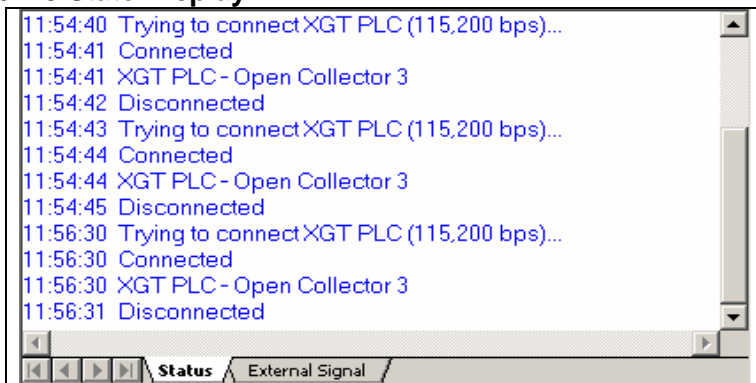
- The contents of "indication per axis" indicates the action state of axis set from the current position to manual operation point return when monitoring axis is set.
- The contents of "common indication" is the part to be monitored when you click "monitoring button" regardless of the setting of axis.

6.1.4 External I/O Signal

Signal	X-Axis	Y-Axis	Z-Axis
Upper Limit			
Lower Limit			
Dog			
Home			
EMG			
Stop			
Command			
Sub-Command			
Speed-to-Position			
Inposition			
Ext Simultaneous Start			

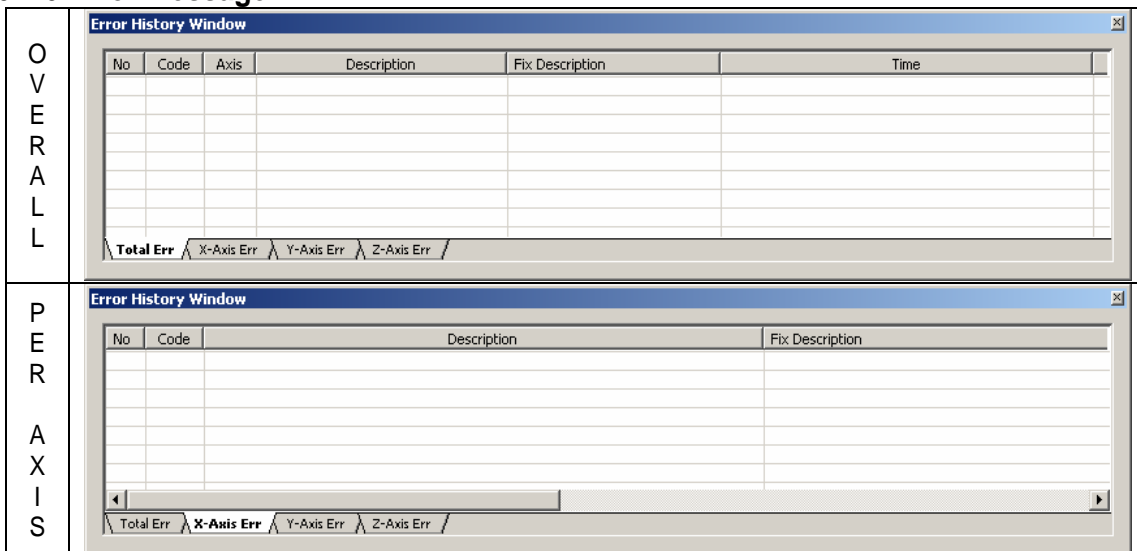
► Here indicates the state of External I/O signal by "ON" or "OFF" per axis respectively.

6.1.5 State Display



► Here describes the information of APM Software Package working state.

6.1.6 Error Message



- The contents of Overall Indication indicates Error code no. that occurs during operation, Error information, Occurrence time and Actions in order.
- The contents of Indication per Axis indicates Error code, Error information and Actions per X, Y, Z axis in order.
- Since checking "Error History File create" from Environment setting/other option as the default, the error history is saved as a file(ErrorHistory.txt file is created in the folder in which APM software package is installed).

6.2 Test Operation Mode

- ▶ This is the area to carry out the test operation of the positioning module by APM Software Package.

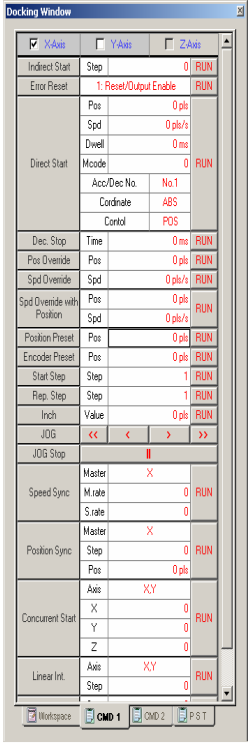
6.2.1 Selection of Command Axis

- ▶ This selects the desired axis for the command of positioning module.
- ▶ The selection of axis is "① X axis ② Y axis ③ Z axis and available to select according to the module.
- ▶ If not selected the axis, the command will not be executed.

6.2.2 Execution

- ▶ If pressing the execute button of all command, the command for the selected axis from Article 6.2.1 will be executed.

6.2.3 Test Operation by APM Software Package

Software Package	Command	Setting range	Related command
	Indirect start	Step : 1 ~ 400	IST
	Error reset	-	CLR
	Direct start	1. Position : -2,147,483,648 ~ 2,147,483,647[pulse] 2. Speed pulse : 1 ~ 200,000[pulse/sec](Open collector) 1 ~ 1,000,000[pulse/sec](Line driver), mm : 1 ~ 2,000,000,000[X10 ⁻² mm/min], inch : 1 ~ 2,000,000,000[X10 ⁻³ inch/min], degree : 1 ~ 2,000,000,000[X10 ⁻³ degree/min] 3.Dwell : 0 ~ 50,000[ms] 4.M code : 0 ~ 65,535	DST
	Deceleration stop	Deceleration time : 0 ~ 65,535[ms]	STP
	Position override	Position: -2,147,483,648 ~ 2,147,483,647pls	POR
	Speed Override	pulse : 1 ~ 200,000[pulse/sec](Open collector) 1 ~ 1,000,000[pulse/sec](Line driver), mm : 1 ~ 2,000,000,000[X10 ⁻² mm/min], inch : 1 ~ 2,000,000,000[X10 ⁻³ inch/min], degree : 1 ~ 2,000,000,000[X10 ⁻³ degree/min]	SOR
	Position preset	1. Position : -2,147,483,648 ~ 2,147,483,647pls 2. Speed pulse : 1 ~ 200,000[pulse/sec](Open collector) 1 ~ 1,000,000[pulse/sec](Line driver), mm : 1 ~ 2,000,000,000[X10 ⁻² mm/min], inch : 1 ~ 2,000,000,000[X10 ⁻³ inch/min], degree : 1 ~ 2,000,000,000[X10 ⁻³ degree/min]	PSO
	Current position preset	Position : -2,147,483,648 ~ 2,147,483,647[pulse]	PRS
	Start step change	Position : 0 ~ 4,294,967,295[pulse]	SNS
	Start step change	Step : 1 ~ 400	SNS
	Inching operation	Step : 1 ~ 400	SRS
	Inching operation	Inching amount : -2,147,483,648 ~ 2,147,483,647[pulse]	-
	JOG operation	-	-
	Position synchronous operation	1. Main axis rate : 0 ~ 65,535 2. subordinate axis rate: 0 ~ 65,535	SSS
	Position synchronous operation	1. Step: 1 ~ 400 2. Position : -2,147,483,648 ~ 2,147,483,647[pulse]	SSP
	Linear interpolation operation	Step : 1 ~ 400	SST
	Linear interpolation operation	Step : 1 ~ 400	LIN
	Circular interpolation operation	Step : 1 ~ 400	CIN

- ▶ Click the right side execute button of the command contents and the command corresponding to the icon will be executed.

6.2.4 JOG Operation by APM Software Package

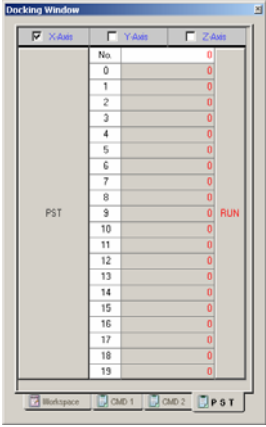
Software package	Icon	Command	Related command
		Reverse high speed JOG operation	JOG
		Reverse low speed JOG operation	
		Forward low speed JOG operation	
		Forward high speed JOG operation	
		JOG operation stop	

▷ If you click JOG operation icon using by mouse, the corresponding command to the icon will be executed, and when you click “JOG stop”, it stops.

6.2.5 Teaching Operation by APM Software Package

Software Package	Command	Setting Range	Related command
	Teaching single	1. Step : 1 ~ 400 2. Mode : 0(RAM teaching), 1(ROM teaching) 3. Method : 0(position teaching), 1(speed teaching) 4. Value - Position teaching -2,147,483,648 ~ 2,147,483,647[pulse] - Speed teaching pulse : 1 ~ 200,000[pulse/sec](open collector) 1 ~ 1,000,000[pulse/sec](line driver), mm : 1 ~ 2,000,000,000[X10 ⁻² mm/min], inch : 1 ~ 2,000,000,000[X10 ⁻³ inch/min], degree: 1 ~ 2,000,000,000[X10 ⁻³ degree/min]	TEA
	Teaching array	1. Step : 1 ~ 400 2. Mode : 0(RAM teaching), 1(ROM teaching) 3. Method : 0(position teaching), 1(speed teaching) 4. Number : 1 ~ 16	TEAA
	Teaching array value	1. Position teaching -2,147,483,648 ~ 2,147,483,647[pulse] 2. Speed teaching pulse : 1 ~ 200,000[pulse/sec](open collector) 1 ~ 1,000,000[pulse/sec](line driver), mm : 1 ~ 2,000,000,000[X10 ⁻² mm/min], inch : 1 ~ 2,000,000,000[X10 ⁻³ inch/min], degree: 1 ~ 2,000,000,000[X10 ⁻³ degree/min]	
	JOG teaching	1. Mode : 0(RAM teaching), 1(ROM teaching) 2. Method : JOG low speed/JOG high speed 3. Value : JOG speed value	TMP

6.2.6 Point Operation by APM Software Package

Software Package	Command	Setting range	Related command
	Point start	Number: 1 ~ 20	PST
		Point setting(0 ~ 19): 1 ~ 400 (Operation step no. setting)	

- ▶ Point operation carries out the positioning operation by max. 20 operation step no. set by one time execution.
- ▶ In case of setting step no. when operation mode is Go-on or Continuous, it is required to set the highest step no. to operate.
- ▶ If setting the Point number in case of Point Operation execution, the lower items (0~19) as much as the setting number shall be activated.
- ▶ For further information of Point operation, please refer to Art.3.23 Point Operation.

6.3 Command Icon

- The command that is executed independently without command condition can be treated easily with Contract icon.
- If pressing the right side of mouse in the area of Command 1 and Command 2, the command menu will display to execute easily as below.



Command icon	Command contents	Action description	Hot key
	X axis Stop	Deceleration/Stop during X axis operation.	F5
	Y axis Stop	Deceleration/Stop during Y axis operation.	F6
	Z axis Stop	Deceleration/Stop during Z axis operation.	F7
	Emergency Stop	Internal Emergency Stop command during operation.	F8
	Homing	Homing command by homing method setting	F9
	Floating origin setting	Software origin setting	F10
	Speed/Position switching	Converts the speed control operation to position control operation.	Alt + 1
	Position/Speed switching	Converts the position control operation to speed control operation.	Alt + 2
	Skip operation	Stop the current step in operation and operate the next step.	Alt + 3
	Continuous operation	The operation continues without stop section from the operation pattern of current step in operation to next step.	Alt + 4
	Return to the previous position before Manual operation	In case of manual operation (JOG/Inching operation) after positioning completion, it returns to the position of positioning completion.	Alt + 5
	M Code OFF	Release command if M Code occurs.	Alt + 6
	ZONE output enabled	The command to enable external ZONE output if the current position in operation is in ZONE 1 / 2 / 3 section.	Alt + 7
	ZONE output disabled	The command to disable external ZONE output if the current position in operation is in ZONE 1 / 2 / 3 section.	Alt + 8
	MPG enabled	The command to enable the operation by manual pulse generator and encoder input signal.	Alt + 9
	MPG disabled	The command to disable the operation by manual pulse generator and encoder input signal.	Alt + 0
	Error history reset	Make clear the error content that occurred by the current time during operation.	-
	Error reset	Make clear the error content that occurs at the present time during operation	-

- For Profile TRACE and Profile/Circle interpolation simulation etc., please refer to the corresponding content of Chapter 4 APM Software Package.

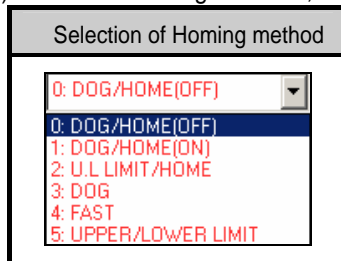
6.4 Examples of APM Software Package Test Operation

Here describes the examples of APM Software Package Test operation.

6.4.1 Homing

Homing is carried out to determine the mechanical positioning in case of using Absolute coordinate

- 1) Select the homing methods, direction from Origin/Manual parameter.



Selection of Homing method

0: DOG/HOME(OFF)

0: DOG/HOME(OFF)

1: DOG/HOME(ON)

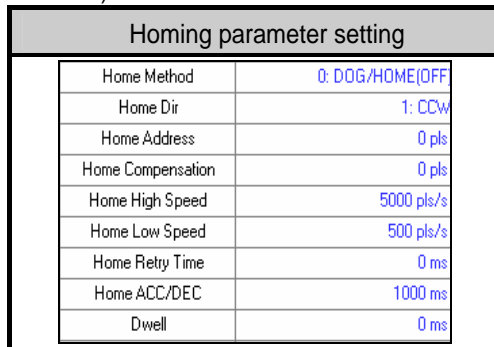
2: U.L LIMIT/HOME

3: DOG

4: FAST

5: UPPER/LOWER LIMIT

- 2) Set the origin address, origin compensation amount, homing high speed/low speed, waiting time for reset, acceleration/deceleration time, Dwell time. (if setting acceleration/deceleration time as "0", the homing acceleration/deceleration operation is carried out by the time set by acceleration/deceleration time of Basic parameter.)



Homing parameter setting

Home Method	0: DOG/HOME(OFF)
Home Dir	1: CCW
Home Address	0 pls
Home Compensation	0 pls
Home High Speed	5000 pls/s
Home Low Speed	500 pls/s
Home Retry Time	0 ms
Home ACC/DEC	1000 ms
Dwell	0 ms

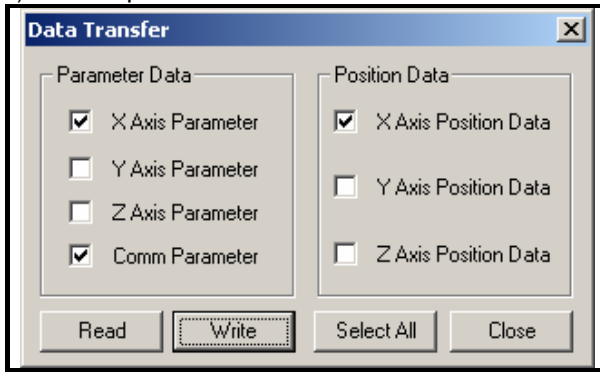
- 3) Click [Data Read/Write] → select [X axis operation parameter] → Click [Write] Click [Close] after completion of transmission (Click [Operation state monitoring]).
- 4) If click [homing] command button, the homing starts to the reverse setting direction of homing (CCW) and homing high speed.
- 5) If DOG(Near point) signal is ON, it decelerates with the homing low speed.
- 6) If origin signal (HOME) is ON after DOG(Near point) signal is OFF, it becomes the completion state of origin determination and the homing shall be completed.

6.4.2 Indirect Start

X axis operation data setting											
Step	Cordi	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	CONT	SIN	1000	0	0	No.1	100	0	CW
2	ABS	POS	CONT	SIN	2000	0	0	No.1	150	0	CW
3	ABS	POS	CONT	SIN	3000	0	0	No.1	200	0	CW
4	ABS	POS	CONT	SIN	4000	0	0	No.1	250	0	CW
5	ABS	POS	CONT	SIN	5000	0	0	No.1	300	0	CW
6	ABS	POS	CONT	SIN	6000	0	0	No.1	350	0	CW
7	ABS	POS	CONT	SIN	7000	0	0	No.1	400	0	CW
8	ABS	POS	CONT	SIN	8000	0	0	No.1	450	0	CW
9	ABS	POS	CONT	SIN	9000	0	0	No.1	500	0	CW
10	ABS	POS	CONT	SIN	10000	0	0	No.1	550	0	CW
11	ABS	POS	CONT	SIN	11000	0	0	No.1	600	0	CW
12	ABS	POS	CONT	SIN	12000	0	0	No.1	650	0	CW
13	ABS	POS	CONT	SIN	13000	0	0	No.1	700	0	CW
14	ABS	POS	CONT	SIN	14000	0	0	No.1	750	0	CW
15	ABS	POS	CONT	SIN	15000	0	0	No.1	800	0	CW
16	ABS	POS	CONT	SIN	16000	0	0	No.1	850	0	CW
17	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
18	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
19	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW
20	ABS	POS	END	SIN	0	0	0	No.1	0	0	CW

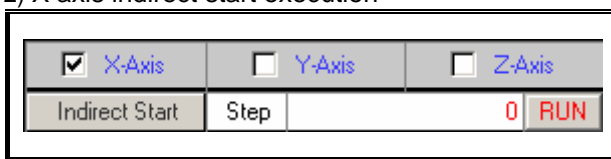
- For X axis parameter setting, the pulse output mode should be set to fit on Servo or stepping drive. (select one from CW/CCW, PLS/DIR, PHASE A/B).
- The operation data setting can be used conveniently as it is available to copy/paste the edited contents from MS-OFFICE EXCEL program.

1) X axis operation data write



- It carries out to write the setting X axis operation parameter, common parameter and operation data in the positioning module.

2) X axis indirect start execution



- It carries out the origin determination by the homing command or floating origin setting as the coordinate of operation data is Absolute coordinate.
- Click the execute button after setting the axis as "X" and the step no. as "0" in the Command 1 display. (In case that the step no. is set as "0", the operation starts from the step no. which is in the state of monitoring.)

3) Display that X axis indirect start is running

Signal/Axis	<input checked="" type="checkbox"/> X Axis	<input checked="" type="checkbox"/> Y Axis	<input checked="" type="checkbox"/> Z Axis
Position	23960	0	0
Speed	10000	0	0
Step No.	1	1	1
Error Code	0	0	0
Master/Slave	X	Y	Z
Master	Master	Master	Master
M Code	0	0	0
BUSY	ON		
Position Complete			
M Code ON			
Origin Fix	ON	ON	ON
Output Inhibit			
Stop			
SW Upper Limit			
SW Lower Limit			
EMG Stop			
Cw/CCw	Cw	Cw	Cw
Move Status	Constant		
Control Pattern	1-Axis Position		
Home Return			
Position Sync			
Speed Sync			
JOG High Speed			
JOG Low Speed			
Inch			
Return to Point			
ZONE 1			
ZONE 2			
ZONE 3			
Encoder			0

- If indirect start runs, it starts to operate from no.1 step to no.16 step with Go-on operation pattern and then ends to operate when the step no. becomes 17.

6.4.3 External Simultaneous Start

- ▶ This is the operation that starts simultaneously by operation data of the corresponding step of each axis set by 2 axis (X-Y, Y-Z, X-Z) or 3 axis (X-Y-Z).
- ▶ When external simultaneous start, first carry out the internal simultaneous start command and then make the external simultaneous start signal "ON".
- 1) Set [external simultaneous start] of extended parameter as "Enabled".
- 2) Set the desired operation data of each axis to start simultaneously per step.
- 3) Click [Data Read/Write] → Select [Operation parameter] and [Operation data] → Click [Write] → Click [Close] after completion of transmission → Click [Operation state monitoring].
- 4) Complete the origin determination for the corresponding axis of simultaneous start.
- 5) Move to the item "Simultaneous start (step no.)" of Command 1 → Select [Axis information] → Set [step no. of the corresponding axis] → Click [Execute] → Make [external simultaneous start signal] "ON".
- 6) In the state that internal simultaneous start command is executed, the actual pulse output is not carried out and the operation speed shall be displayed as "0".

Display that internal simultaneous start command is running			
Signal/Axis	<input checked="" type="checkbox"/> X Axis	<input checked="" type="checkbox"/> Y Axis	<input checked="" type="checkbox"/> Z Axis
Position	0	0	0
Speed	0	0	0
Step No.	1	1	1
Error Code	0	0	0
Master/Slave	X	Y	Z
Master	Master	Master	Master
M Code	0	0	0
BUSY	ON	ON	ON
Position Complete			
M Code ON			
Origin Fix	ON	ON	ON
Output Inhibit			
Stop			
Sw Upper Limit			
Sw Lower Limit			
EMG Stop			
CW/CCW	CW	CW	CW
Move Status			
Control Pattern	1-Axis Position	1-Axis Position	1-Axis Position
Home Return			
Position Sync			
Speed Sync			
JOG High Speed			
JOG Low Speed			
Inch			
Return to Point			
ZONE 1			
ZONE 2			
ZONE 3			
Encoder		0	

- 7) If external simultaneous start signal is "ON", it starts simultaneously by the setting step of the corresponding axis and executes the actual operation.
- ▶ This is the case that the Axis information : X,Y,Z axis and the step no. is set as X: 1, Y: 2, Z: 3 from the items of simultaneous start

6.4.4 Circular Interpolation

- ▶ The circular interpolation operation is carried out by Middle point method and Center point method for 2 axes (X-Y, Y-Z, X-Z).
- 1) First, select the circular interpolation method from Common parameter.(0: Middle point, 1: Center point)
- 2) Set the goal position and speed by operation data of the corresponding axis. (In this case, the operation speed of the subordinate axis should be set as "0" as it has no meaning)
- 3) In case of Center point method of X, Y circular interpolation, the circular interpolation aux. Point of X axis operation data indicates the center point of X axis and the circular interpolation aux. Point of Y axis indicates the center point of Y axis. The direction of circular interpolation shall be set based on the main axis.
- 4) Click [Data Read/Write] → Select [Operation parameter] and [Operation data] → Click [Write] → Click [Close] after completion of transmission → Click [Operation state monitoring].
- 5) Complete the origin determination for the corresponding axis of circular interpolation. (X axis, Y axis)
- 6) Set the step and subordinate axis from circular interpolation items of Command 1.

Circular interpolation data setting display			
Circular Int.	Step	0	RUN
	Slave	Y	

- 7) Click [execute] button after completion of setting from circular interpolation items and the circular interpolation operation starts.

Display that circular interpolation operation is running			
Signal/Axis	✓ X Axis	✓ Y Axis	✓ Z Axis
Position	-29107	31175	0
Speed	10000	0	0
Step No.	1	1	1
Error Code	0	0	0
Master/Slave	X	X	Z
Master	Master	Slave	Master
M Code	0	0	0
BUSY	ON	ON	
Position Complete			
M Code ON			
Origin Fix	ON	ON	ON
Output Inhibit			
Stop			
SW Upper Limit			
SW Lower Limit			
EMG Stop			
CW/CCW	CW	CW	CW
Move Status	Constant	Constant	
Control Pattern	2-Axes Circular Int.	2-Axes Circular Int.	
Home Return			
Position Sync			
Speed Sync			
JOG High Speed			
JOG Low Speed			
Inch			
Return to Point			
ZONE 1			
ZONE 2			
ZONE 3			
Encoder		0	

- ▷ This is the case set by the center point method that the current position of (X, Y axis) is (0, 0), the goal position is (10000, 0), the circular interpolation center point is (5000,0), the speed of main axis (X) is 1000pps.

6.4.5 Speed Synchronization (the case that Y axis is set as subordinate axis)

- ▶ This carries out the speed synchronization operation by the setting rate of the subordinate axis even if the speed of the main axis is changed according to operation speed rate of the main axis and the subordinate axis.
 - ▶ Thus, the setting operation speed and goal position of the subordinate axis that has the speed synchronization, has no meaning.
- 1) First, set the operation data of the main axis. (Available to set the position control and speed control.)
 - 2) Click [Data Read/Write] → Select [Operation parameter] and [Operation data] → Click [Write] → Click [Close] after completion of transmission → Click [Operation state monitoring].
 - 3) In case that the main axis is set as “position control”, complete the origin determination.
 - 4) Set the corresponding axis of speed synchronization in the Display of Command 1.
 - 5) Set the main axis, the main axis rate, the subordinate axis rate, respectively from the speed synchronization items of Command 1.

Speed synchronization data setting display			
<input type="checkbox"/> X-Axis	<input checked="" type="checkbox"/> Y-Axis	<input type="checkbox"/> Z-Axis	
Speed Sync	Master	X	
	M.rate		10 RUN
	S.rate		5

- 6) Click [execute] button from speed synchronization items of Command 1.

Display that speed synchronization is executed			
Signal/Axis	<input checked="" type="checkbox"/> X Axis	<input checked="" type="checkbox"/> Y Axis	<input checked="" type="checkbox"/> Z Axis
Position	0	0	0
Speed	0	0	0
Step No.	1	1	1
Error Code	0	0	0
Master/Slave	X	X	Z
Master	Master	Slave	Master
M Code	0	0	0
BUSY		ON	
Position Complete			
M Code ON			
Origin Fix	ON	ON	
Output Inhibit			
Stop			
SW Upper Limit			
SW Lower Limit			
EMG Stop			
CW/CCW	CW	CW	CW
Move Status			
Control Pattern			
Home Return			
Position Sync			
Speed Sync		ON	
JOG High Speed			
JOG Low Speed			
Inch			
Return to Point			
ZONE 1			
ZONE 2			
ZONE 3			
Encoder		0	

- 7) In case of setting the axis as “the main axis” and indirect start in the display of Command 1, the speed synchronized axis by the setting rate of the main axis and the subordinate axis according to the speed of the main axis carries out the operation.
- 8) After completion of the operation of the main axis, the speed synchronized axis shall be released by the “deceleration stop” command.

6.4.6 Teaching Array

- ▶ The function of Teaching is to set the goal position and operation speed set by operation data again through touch screen in the positioning module and carry out the positioning operation by the changed goal position and operation speed in case of re-operation by the Start command.
 - ▶ Max. no of teaching (Array) is limited by 16.
 - ▶ When teaching (Array), set the goal position of the setting step no. and operation speed from Teaching data "0" in order and the data set as much as the number of teaching is executed in a bundle based on the setting step no.
- 1) First, set the axis for teaching array from teaching display of Command 2.
 - 2) Set the starting step no, teaching pattern (0:RAM, 1:ROM), teaching method (0: position, 1: speed) and the number of teaching array.
 - 3) Set the desired data for teaching from teaching Array value "0" to the number of teaching.

Teaching Array Data Setting Display		
<input checked="" type="checkbox"/> X-Axis	<input type="checkbox"/> Y-Axis	<input type="checkbox"/> Z-Axis
Teaching Array	Step	0
	Target	0: RAM
	Data	POS
	No.	4
Value	0	1000 pls
	1	2000 pls
	2	3000 pls
	3	4000 pls
	4	0 pls
	5	0 pls
	6	0 pls
	7	0 pls
	8	0 pls
	9	0 pls
	10	0 pls
	11	0 pls
	12	0 pls
	13	0 pls
	14	0 pls
	15	0 pls

- 4) Click [execute] button.
- 5) If the step no. is set as "1" from indirect start item of Command 1 and the indirect start is executed, the operation is carried out to the setting goal position from step 1~step 4. (In case of Absolute coordinate, the operation data such as operation speed from step 1~step4 should be set in advance.)
- 6) Click [Read/Write] button to read the operation data of teaching array and check if the goal position of operation data and operation speed is set as the value of teaching.

6.4.7 Point Start

► Here describes the test operation example of Point Start.

1) First, set the operation data desired to operate as follows.

Operation data setting display											
Step	Cordi	Control	Pattern	Method	Address [pulse]	Sub Address [pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]	Cir.Int Dir
1	ABS	POS	END	SIN	10000	0	0	No.1	1000	0	Cw
2	ABS	POS	END	SIN	0	0	0	No.1	0	0	Cw
3	ABS	POS	END	SIN	0	0	0	No.1	0	0	Cw
4	ABS	POS	END	SIN	0	0	0	No.1	0	0	Cw
5	ABS	POS	KEEP	SIN	100000	0	0	No.1	0	0	Cw
6	ABS	POS	END	SIN	0	0	0	No.1	10000	0	Cw
7	ABS	POS	END	SIN	0	0	0	No.1	10000	0	Cw
8	ABS	POS	END	SIN	0	0	0	No.1	0	0	Cw
9	ABS	POS	END	SIN	0	0	0	No.1	0	0	Cw
10	ABS	POS	CONT	SIN	100000	0	0	No.1	0	0	Cw
11	ABS	POS	END	SIN	1000	0	0	No.1	10000	0	Cw
12	ABS	POS	END	SIN	0	0	0	No.1	5000	0	Cw

2) After selecting PST command window, set it as follows.

If the number of Point is set, the items of 0,1,2,3,4 shall be active.

POINT start setting display

Docking Window

☒ X-Axis
 ☐ Y-Axis
 ☐ Z-Axis

No.		0
0		0
1		0
2		0
3		0
4		0
5		0
6		0
7		0
8		0
9		0
10		0
11		0
12		0
13		0
14		0
15		0
16		0
17		0
18		0
19		0

PST

RUN

Workspace

CMD 1

CMD 2

PST

3) Click [Execute] button to carry out Point operation by the operation step order as 10->11->1->5->6. Operation pattern is changed from Go-on(Step no.10)->End(Step no.1)->Continuous (Step no.5).

Chapter 7 Internal Memory and I/O Signal

7.1 Internal Memory

- ▶ Here describes the internal memory used for positioning module if XGK CPU module is used.
- ▶ Internal memory is used when executing direct Data read/write between positioning module and PLC CPU by using PUP(PUTP), GET(GETP) command instead of using the dedicated command. For Data read/write using the dedicated command, please refer to 8.2 Dedicated Command.

7.1.1 Step Data during Point Start

1) Contents of POINT Start Step Data

Address			Command information	Setting range
X axis	Y axis	Z axis		
h0121(289)	h01A1(417)	h0221(545)	POINT Start Step Data 1	1 ~ 400
h0122(290)	h01A2(418)	h0222(546)	POINT Start Step Data 2	
h0123(291)	h01A3(419)	h0223(547)	POINT Start Step Data 3	
h0124(292)	h01A4(420)	h0224(548)	POINT Start Step Data 4	
h0125(293)	h01A5(421)	h0225(549)	POINT Start Step Data 5	
h0126(294)	h01A6(422)	h0226(550)	POINT Start Step Data 6	
h0127(295)	h01A7(423)	h0227(551)	POINT Start Step Data 7	
h0128(296)	h01A8(424)	h0228(552)	POINT Start Step Data 8	
h0129(297)	h01A9(425)	h0229(553)	POINT Start Step Data 9	
h012A(298)	h01AA(426)	h022A(554)	POINT Start Step Data 10	
h012B(299)	h01AB(427)	h022B(555)	POINT Start Step Data 11	
h012C(300)	h01AC(428)	h022C(556)	POINT Start Step Data 12	
h012D(301)	h01AD(429)	h022D(557)	POINT Start Step Data 13	
h012E(302)	h01AE(430)	h022E(558)	POINT Start Step Data 14	
h012F(303)	h01AF(431)	h022F(559)	POINT Start Step Data 15	
h0130(304)	h01B0(432)	h0230(560)	POINT Start Step Data 16	
h0131(305)	h01B1(433)	h0231(562)	POINT Start Step Data 17	
h0132(306)	h01B2(434)	h0232(563)	POINT Start Step Data 18	
h0133(307)	h01B3(435)	h0233(564)	POINT Start Step Data 19	
h0134(308)	h01B4(436)	h0234(565)	POINT Start Step Data 20	

※ The figures in brackets indicates the address of internal memory expressed in decimals.

2) POINT Start Step Data Setting

- (1) Set point operation data to X axis: 121~134 address, Y axis: 1A1~1B4 address, Z axis: 221~234 address, respectively.
- (2) For the setting content of POINT operation command, PST, please refer to Chapter 8 Command.
- (3) In PLC program, POINT operation data setting during POINT operation should be done in the step before POINT operation command is executed for normal action of POINT operation.

P00000	U02.00.0	U02.00.1	U02.00.2		PUTP	2	h0121	000100	20
					PST	2	0	4	

※ This is a test program to execute point start for 4 steps after setting 20 POINT start step data.

Notes

The POINT start step data setting command for POINT Start e during POINT operation is **PWR**.

7.1.2 Teaching Data during Teaching Array

1) Contents of Teaching Array Data

Address			Command Information	Setting range
X axis	Y axis	Z axis		
h0100(256)	h0180(384)	h0200(512)	Teaching Array(Data 1)(Lower)	1. Position teaching setting range mm : -2147483648 ~ 2147483647 [$\times 10^{-4}$ mm/min] inch: -2147483648 ~ 2147483647 [$\times 10^{-5}$ inch/min] degree : -2147483648 ~ 2147483647 [$\times 10^{-5}$ degree/min] pulse : -2147483648 ~ 2147483647 [pulse/sec] 2. Speed teaching setting range mm : 1 ~ 2,000,000,000 [$\times 10^{-2}$ mm/min] inch : 1 ~ 2,000,000,000 [$\times 10^{-3}$ inch/min] degree : 1 ~ 2,000,000,000 [$\times 10^{-3}$ degree/min] pulse : 1 ~ 200,000[pulse/sec] (Open collector) 1 ~ 1,000,000[pulse/sec] (Line Driver)
h0101(257)	h0181(385)	h0201(513)	Teaching Array(Data 1)(Upper)	
h0102(258)	h0182(386)	h0202(514)	Teaching Array(Data 2)(Lower)	
h0103(259)	h0183(387)	h0203(515)	Teaching Array(Data 2)(Upper)	
h0104(260)	h0184(388)	h0204(516)	Teaching Array(Data 3)(Lower)	
h0105(261)	h0185(389)	h0205(517)	Teaching Array(Data 3)(Upper)	
h0106(262)	h0186(390)	h0206(518)	Teaching Array(Data 4)(Lower)	
h0107(263)	h0187(391)	h0207(519)	Teaching Array(Data 4)(Upper)	
h0108(264)	h0188(392)	h0208(520)	Teaching Array(Data 5)(Lower)	
h0109(265)	h0189(393)	h0209(521)	Teaching Array(Data 5)(Upper)	
h010A(266)	h018A(394)	h020A(522)	Teaching Array(Data 6)(Lower)	
h010B(267)	h018B(395)	h020B(523)	Teaching Array(Data 6)(Upper)	
h010C(268)	h018C(396)	h020C(524)	Teaching Array(Data 7)(Lower)	
h010D(269)	h018D(397)	h020D(525)	Teaching Array(Data 7)(Upper)	
h010E(270)	h018E(398)	h020E(526)	Teaching Array(Data 8)(Lower)	
h010F(271)	h018F(399)	h020F(527)	Teaching Array(Data 8)(Upper)	
h0110(272)	h0190(400)	h0210(528)	Teaching Array(Data 9)(Lower)	
h0111(273)	h0191(401)	h0211(529)	Teaching Array(Data 9)(Upper)	
h0112(274)	h0192(402)	h0212(530)	Teaching Array(Data 10)(Lower)	
h0113(275)	h0193(403)	h0213(531)	Teaching Array(Data 10)(Upper)	
h0114(276)	h0194(404)	h0214(532)	Teaching Array(Data 11)(Lower)	
h0115(277)	h0195(405)	h0215(533)	Teaching Array(Data 11)(Upper)	
h0116(278)	h0196(406)	h0216(534)	Teaching Array(Data 12)(Lower)	
h0117(279)	h0197(407)	h0217(535)	Teaching Array(Data 12)(Upper)	
h0118(280)	h0198(408)	h0218(536)	Teaching Array(Data 13)(Lower)	
h0119(281)	h0199(409)	h0219(537)	Teaching Array(Data 13)(Upper)	
h011A(282)	h019A(410)	h021A(538)	Teaching Array(Data 14)(Lower)	
h011B(283)	h019B(411)	h021B(539)	Teaching Array(Data 14)(Upper)	
h011C(284)	h019C(412)	h021C(541)	Teaching Array(Data 15)(Lower)	
h011D(285)	h019D(413)	h021D(542)	Teaching Array(Data 15)(Upper)	
h011E(286)	h019E(414)	h021E(543)	Teaching Array(Data 16)(Lower)	
h011F(287)	h019F(415)	h021F(544)	Teaching Array(Data 16)(Upper)	

※ The figures in brackets indicates the address of internal memory expressed in decimals

2) Teaching Array Data Setting

- (1) Set Teaching array data to X axis: 100~11F address, Y axis: 180~19F address, Z axis: 200 ~ 21F address, respectively.
- (2) For the setting content of Teaching Array Command, TEAA, please refer to Chapter 8 Command.
- (3) In P program, in order to carry out the normal action of Teaching Array, the Teaching data setting during Teaching Array should be done in the step before Teaching Array command is executed.

P00000	U02.00.1	U02.00.2					PUTP	2	h0100	D00010	32		
							TEAA	2	0	10	1	0	10

※ This is the example program to execute teaching for 10 teaching data after setting 16 teaching array data.

Notes

The command of Teaching Array data setting for Teaching Array is **TWR**.

7.1.3 State Information

1) Contents of State Information

Address			State Information
X axis	Y axis	Z axis	
h014A(330)	h01CA(458)	h024A(586)	Operation state bit information (Lower)
h014B(331)	h01CB(459)	h024B(587)	Operation state bit information (Upper)
h014C(332)	h01CC(460)	h024C(588)	Axis information
h014D(333)	h01CD(461)	h024D(589)	External I/O signal state
h014E(334)	h01CE(462)	h024E(590)	Current position (Lower)
h014F(335)	h01CF(463)	h024F(591)	Current position (Upper)
h0150(336)	h01D0(464)	h0250(592)	Current speed (Lower)
h0151(337)	h01D1(465)	h0251(593)	Current speed (Upper)
h0152(338)	h01D2(466)	h0252(594)	Step no.
h0153(339)	h01D3(467)	h0253(595)	M code no.
h0154(340)	h01D4(468)	h0254(596)	Current error information
h0155(341)	h01D5(469)	h0255(597)	Error information 1
h0156(342)	h01D6(470)	h0256(598)	Error information 2
h0157(343)	h01D7(471)	h0257(599)	Error information 3
h0158(344)	h01D8(472)	h0258(600)	Error information 4
h0159(345)	h01D9(473)	h0259(601)	Error information 5
h015A(346)	h01DA(474)	h025A(602)	Error information 6
h015B(347)	h01DB(475)	h025B(603)	Error information 7
h015C(348)	h01DC(476)	h025C(604)	Error information 8
h015D(349)	h01DD(477)	h025D(605)	Error information 9
h015E(350)	h01DE(478)	h025E(606)	Error information 10
h015F(351)			Encoder value (Lower)
h0160(352)			Encoder value (Upper)

※ The figures in brackets indicates the address of internal memory expressed in decimals

► The area of state information of internal memory is the Read only area. Thus, it is available to use only by GET, GETP command. (PUT, PUTP command is not allowed to use in this area).

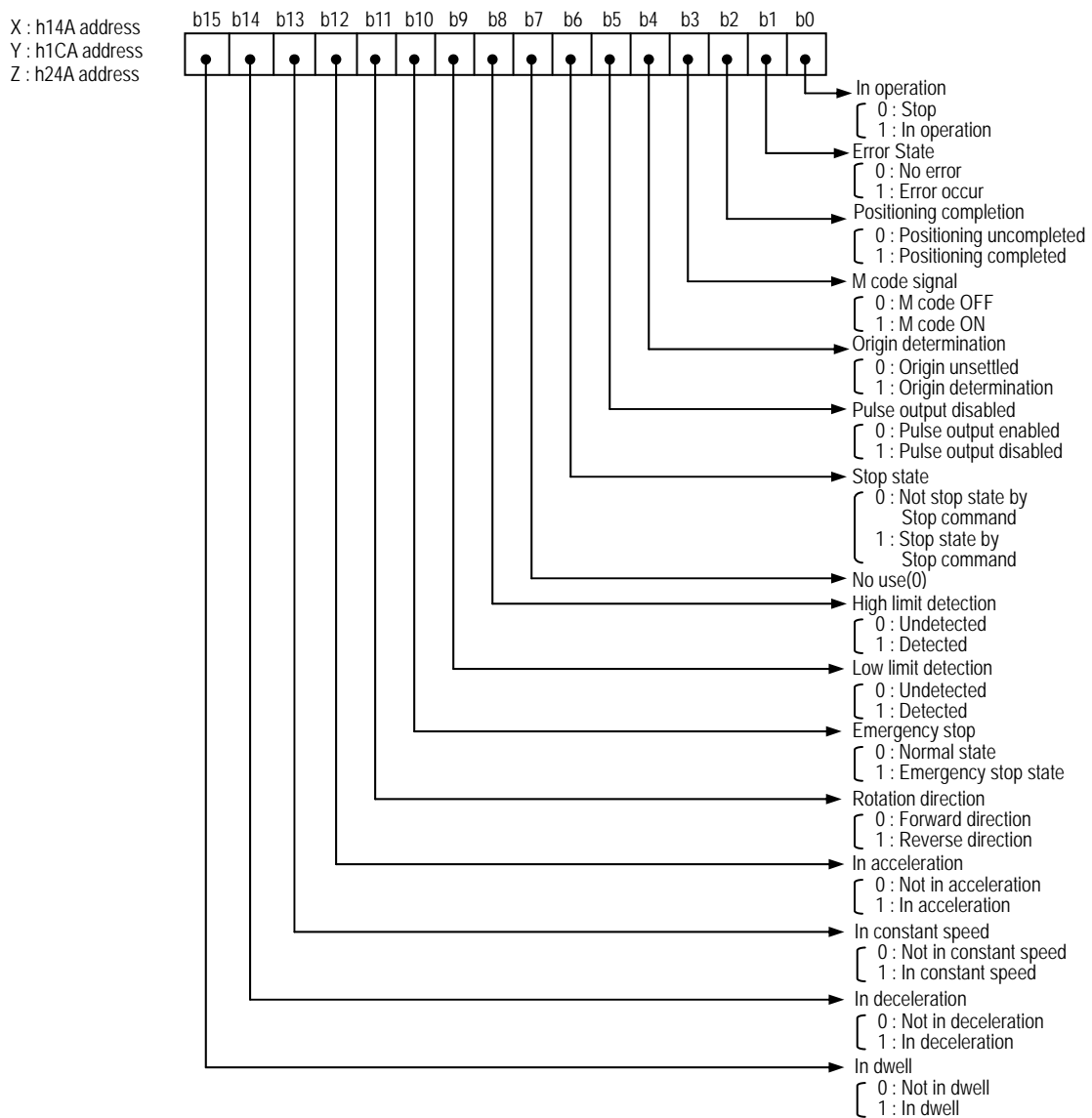
F00099						GET	2	h014A	M0000	23
--------	--	--	--	--	--	-----	---	-------	-------	----

Notes

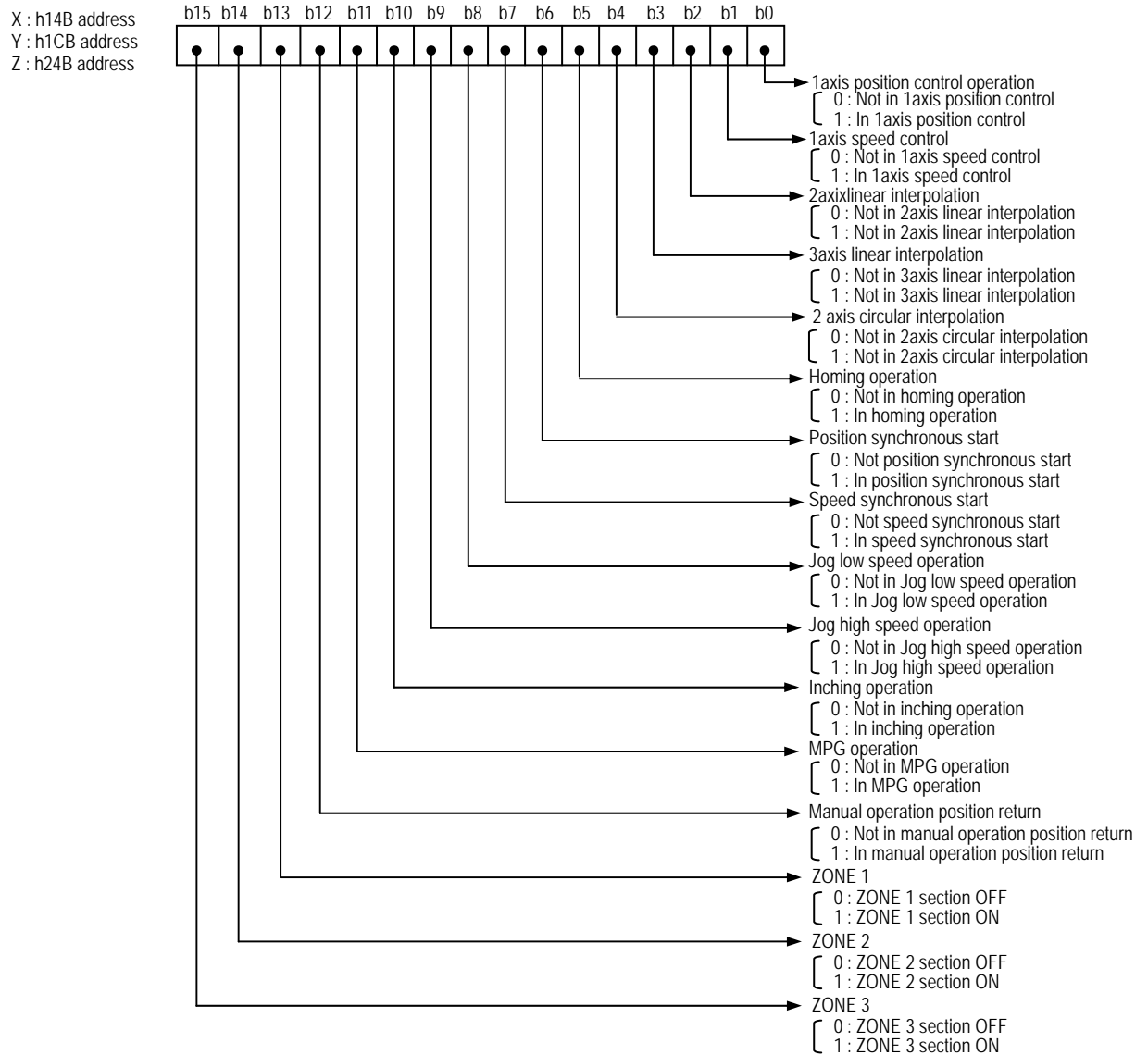
The command of state information read only is **SRD**.

2) Use of State Information

(1) Operation State Bit Information (Lower)

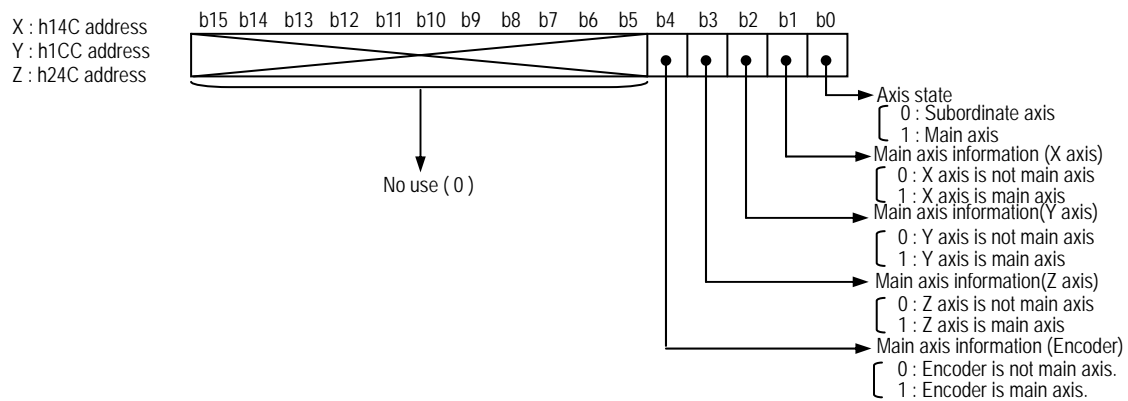


(2) Operation State Bit Information (Upper)

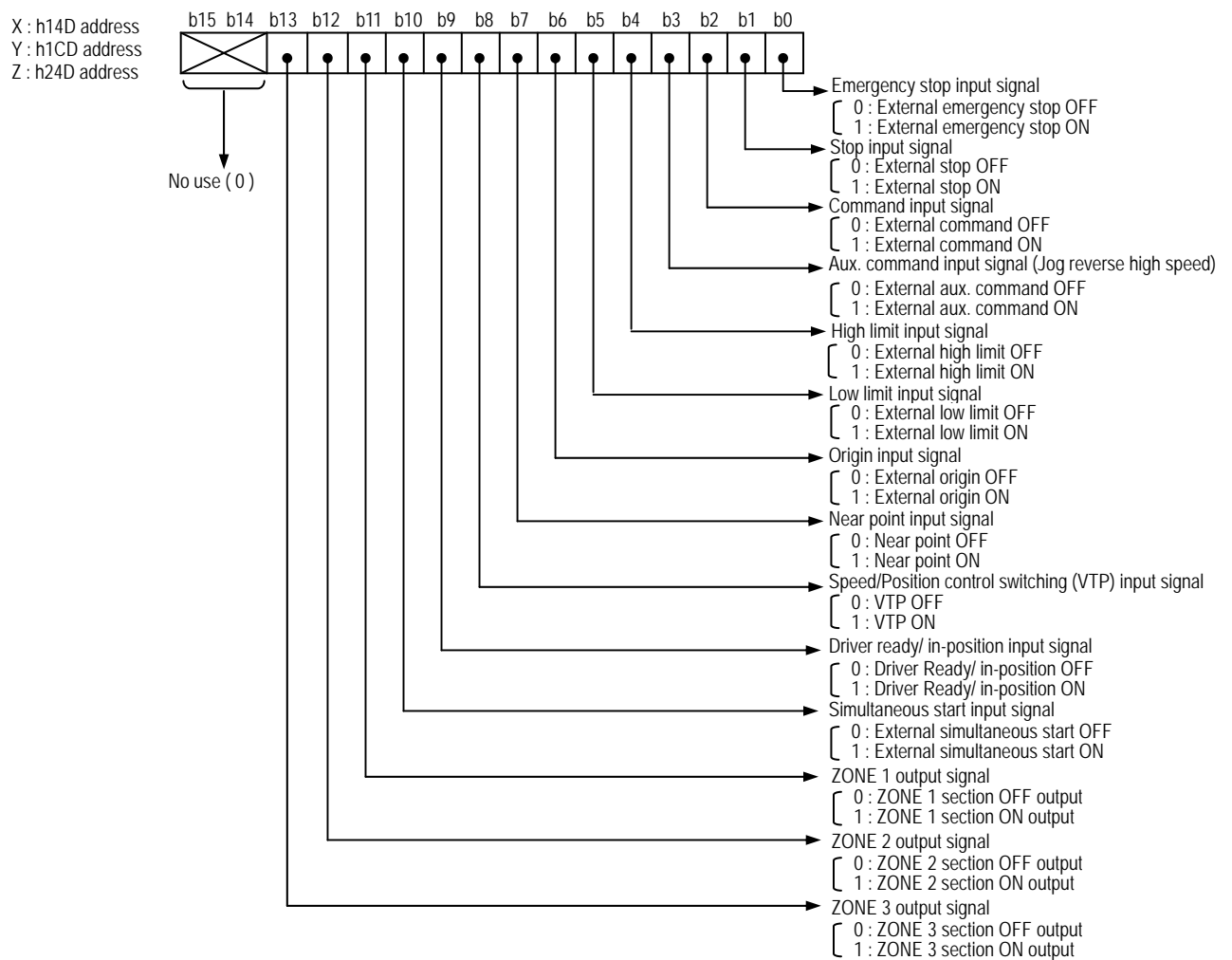


Chapter 7 Internal Memory and I/O Signal

(3) Axis Information



(4) External I/O Signal State



7.2 I/O Signal

Here describes the contents and functions of I/O signal for the exchange of data between Positioning module and XGK CPU module.

7.2.1 Contents of I/O Signal

- 1) I/O signal of positioning module uses input: 16 bits and output: 16 bits.
- 2) The area of actual I/O signal is used differently for each position module. (**XGF-P□1A** uses the corresponding I/O signal of X axis and **XGF-P□2A** uses the corresponding I/O signal of X axis and Y axis, and **XGF-P□3A** uses the corresponding I/O signal of X, Y, Z axis, respectively)
- 3) Positioning Module operation ready signal (Uxx.00.F) becomes “ON” only when **XGF-PD□A** and **XGF-PO□A** are in normal state in H/W and it always keeps “ON” regardless of PLC operation mode.

Axis	Signal direction: CPU Module ← Positioning Module		Signal direction: CPU Module → Positioning Module	
	Input	Description	Output	Description
X axis	Uxx.00.0	X axis command receive	Uxx.01.0	X axis start
	Uxx.00.1	X axis in operation	Uxx.01.1	X axis forward direction Jog
	Uxx.00.2	X axis error state	Uxx.01.2	X axis reverse direction Jog
	Uxx.00.3	X axis positioning completed	Uxx.01.3	X axis Jog high/low speed
	Uxx.00.4	X axis M code ON	Uxx.01.4	X axis MPG operation(Encoder)
Y axis	Uxx.00.5	Y axis command receive	Uxx.01.5	Y axis start
	Uxx.00.6	Y axis in operation	Uxx.01.6	Y axis forward direction Jog
	Uxx.00.7	Y axis error state	Uxx.01.7	Y axis reverse direction Jog
	Uxx.00.8	Y axis positioning completed	Uxx.01.8	Y axis Jog high/low speed
	Uxx.00.9	Y axis M code ON	Uxx.01.9	Y axis MPG operation(Encoder)
Z axis	Uxx.00.A	Z axis command receive	Uxx.01.A	Z axis start
	Uxx.00.B	Z axis in operation	Uxx.01.B	Z axis forward direction Jog
	Uxx.00.C	Z axis error state	Uxx.01.C	Z axis reverse direction Jog
	Uxx.00.D	Z axis positioning completed	Uxx.01.D	Z axis Jog high/low speed
	Uxx.00.E	Z axis M code ON	Uxx.01.E	Z axis MPG operation(Encoder)
Common	Uxx.00.F	Positioning module ready	Uxx.01.F	No use

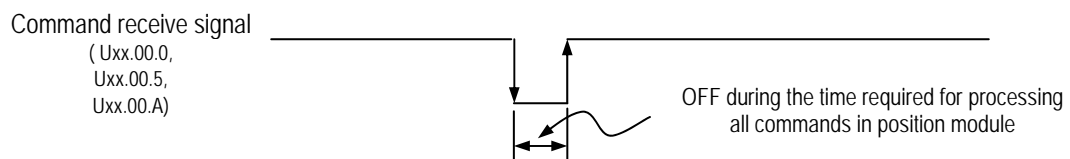
7.2.2 Use of I/O Signal

1) Command Receive signal (Uxx.00.0, Uxx.00.5, Uxx.00.A)

(1) Processing of Command Receive signal

A) Command receive signal is ON when positioning module is normal and it becomes OFF while carrying out the command by command code.

B) If the command by the command code is entered in positioning module, the command receive signal is changed ON -> OFF and after completion of the command, it returns to OFF -> ON state.



Notes

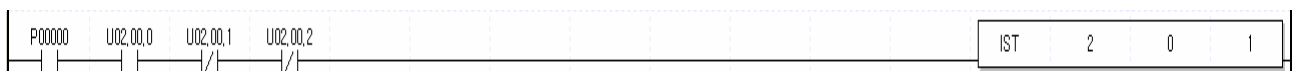
If using Input Signal(in operation, error status, positioning completion, M code On) as the operation condition of program, it should be prohibited to commonly use it with the status bit read in SRD, the status read command and instead, make sure to use the status bit read in any possible SRD. For the details of how to use the status bit read in SRD, refer to "Chapter 9. Program."

(2) Use of Command Receive signal

A) Command receiving signal should be used in Normal Open (A contact) input condition on program when carrying out the command by using all command code.

B) Example of Indirect Start Command Program

(Step no.: 1, Indirect Start command :IST)



Device	Description
P00000	X axis indirect start external input
U02.00.0	X axis command receive signal
U02.00.1	X axis signal in operation
U02.00.2	X axis error state

► But, this is the case that XGT positioning module is installed in Slot 2.

Notes

In case of carrying out the command by I/O signal such as start, Jog operation (forward direction), Jog operation (reverse direction), MPG operation (Encoder), it is not allowed to use the command receive signal but allowed only in case of operating by the command.

- (1) Start signal carries out the positioning operation according to the current operation step no. of positioning module without setting the step no. other than indirect start or direct start by command.

- ### (3) Example of Start Program (P contact start)

B) In case of using Toggle switch as Start external input switch, the signal in operation shall be OFF after positioning completion and it restarts automatically. Thus, cares should be taken in using.

3) JOG Operation

(Uxx.01.1,Uxx.01.2,Uxx.01.3,Uxx.01.6,Uxx.01.7,Uxx.01.8,Uxx.01.B,Uxx.01.C,Uxx.01.D)

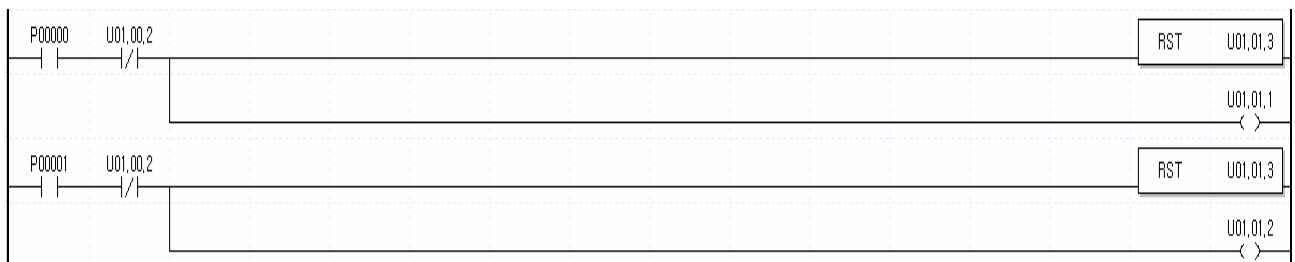
Uxx.01.1	X axis forward direction Jog
Uxx.01.2	X axis reverse direction Jog
Uxx.01.3	X axis Jog high/low speed
Uxx.01.6	Y axis forward direction Jog
Uxx.01.7	Y axis reverse direction Jog
Uxx.01.8	Y axis Jog high/low speed
Uxx.01.B	Z axis forward direction Jog
Uxx.01.C	Z axis reverse direction Jog
Uxx.01.D	Z axis Jog high/low speed

(1) In case of setting Jog high/low speed of Uxx.01.3, Uxx.01.8, Uxx.01.D, it should be set as Jog high speed when ON”, and Jog low speed when “OFF”.

(2) The actual Jog operation shall be divided into Forward/Reverse direction Jog operation according to the ON/OFF signal of Uxx.01.1, Uxx.01.2, Uxx.01.6, Uxx.01.7, Uxx.01.B, Uxx.01.C.

(3) Jog operation carries out the operation by the level of ON/OFF signal and thus it carries out Jog operation when ON while it stops Jog operation when OFF.

(4) Example of Jog operation program



Device	Description
P00000	X axis high speed reverse direction Jog external input
P00001	X axis low speed forward direction Jog external input
U01.00.2	X axis error status
U01.01.1	X axis forward direction Jog
U01.01.2	X axis reverse direction Jog
U01.01.3	X axis low speed(OFF)/high speed(ON)

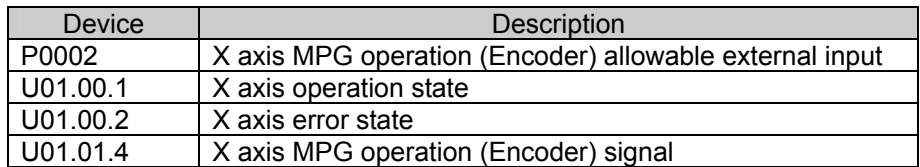
► But, this is the case that positioning module is installed in Slot 1.

Notes

If you carry out Jog operation by adding the signal in operation (Uxx.00.1, Uxx.00.6, Uxx.00.B) as Normal Close (B contact) input, it may occur abnormal operation. Thus, it is not allowed to use it.

(Uxx.01.4, Uxx.01.9, Uxx.01.E)

- #### (4) Example of MPG operation (Encoder) Program



5) M code ON signal (Uxx.00.4, Uxx.00.9, Uxx.00.E)

- 6) Positioning Completion Signal(Uxx.00.3, Uxx.00.8, Uxx.00.D)

- 7-11

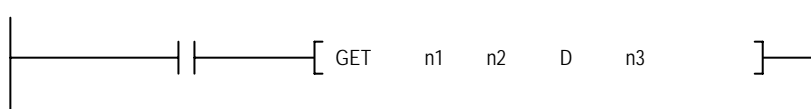
Chapter 8 Command

Here describes the positioning command used in XGK CPU Module.

8.1 Contents of General Command

Comm -and	Command description	Command condition
PUT	Internal memory write(Level)	Base, memory address, save device leading address, data number to write at one time
PUTP	Internal memory write(Edge)	Base, memory address, save device leading address, data number to write at one time
GET	Internal memory read(Level)	Base, memory address, save device leading address, data number to write at one time
GETP	Internal memory read(Edge)	Base, memory address, save device leading address, data number to write at one time

8.1.1 Internal Memory Read (GET, GETP Command)



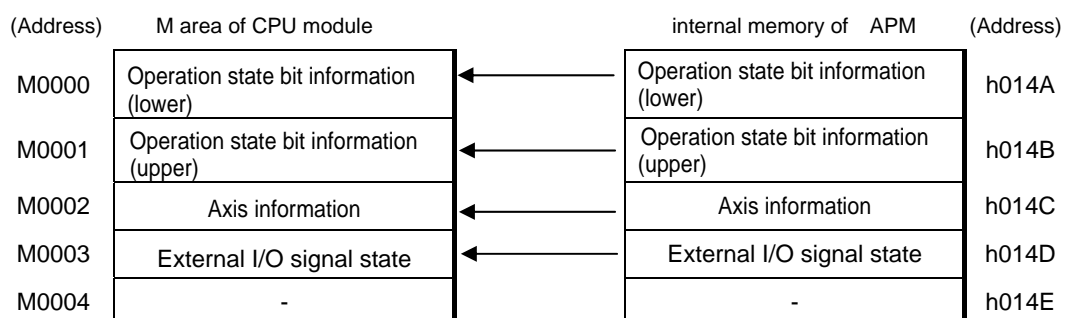
Form	Description	Available area
n1	Base and slot No. installed with special module	Integer or HEX
n2	Leading address of special module internal memory to read a data	Integer
D	Leading address of device to save the data to read	M, P, K, L, T, C, D, #D, integer
n3	Word number of data to read	Integer

< Difference between GET Command and GETP Command>

GET : Always execute with execute condition ON ()

GETP : Execute with operation start of execute condition ()


Example The case that is installed in positioning module No.0 base, slot No.2 and reads X axis state information from h014A by 4 word data by M0000, M0001,M0002,M0003 of CPU module.




8.1.2 Internal Memory Write (PUT, PUTP Command)

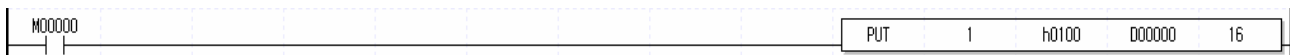
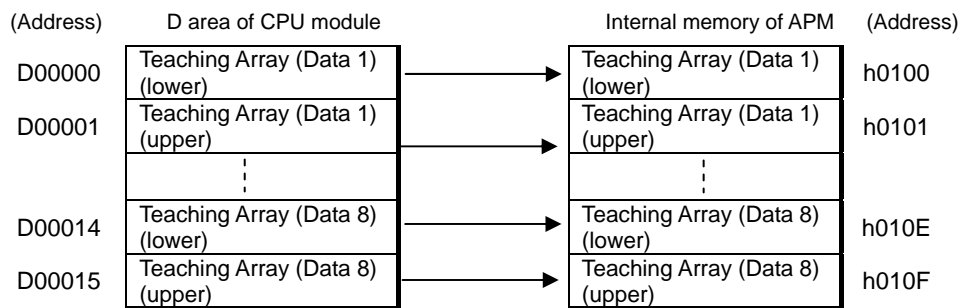
Form	Description	Available area
n1	Base and slot No. installed with special module	Integer or HEX
n2	Leading address of special module internal memory to write	Integer
S	Leading address of device that the data to Write is saved	M, P, K, L, T, C, D, #D, integer
n3	Word number of data to write	Integer

< Difference Between PUT Command and PUTP Command >

PUT : Always execute with execute condition ON ()

PUTP : Execute with operation start of execute condition ()

Example The case that is installed in positioning module No.0 base, slot No.1 and writes value of CPU module as X axis teaching value by 16 Word data of D00000~D00015.



8.2 Contents of Dedicated Commands

Comm -and	Command description	Command condition	Page
ORG	Homing start	Slot, command axis	8-5
FLT	Floating origin setting	Slot, command axis	8-5
DST	Direct start	Slot, command axis, position, speed, dwell time, M code, control word	8-6
IST	Indirect start	Slot, command axis, step no.	8-6
LIN	Linear interpolation start	Slot, command axis, step no., axis information	8-7
CIN	Circular interpolation start	Slot, command axis, step no., axis information	8-7
SST	Simultaneous start	Slot, command axis, X axis step no., Y axis step no., Z axis step no., axis information	8-8
VTP	Speed/position switching	Slot, command axis	8-8
PTV	Position/speed switching	Slot, command axis	8-9
STP	Deceleration stop	Slot, command axis, deceleration time	8-9
SKP	Skip operation	Slot, command axis	8-10
SSP	Position synchronous start	Slot, command axis, step no., main axis position, main axis setting	8-10
SSS	Speed synchronous start	Slot, command axis, main axis rate, subordinate axis rate, main axis setting	8-11
POR	Position override	Slot, command axis, position	8-11
SOR	Speed override	Slot, command axis, speed	8-12
PSO	Position assigned speed override	Slot, command axis, position, speed	8-12
NMV	Continuous operation	Slot, command axis	8-13
INCH	Inching operation	Slot, command axis, inching amount	8-13
RTP	Return to the previous position of manual operation	Slot, command axis	8-13
SNS	Start step No. change	Slot, command axis, step no.	8-14
SRS	Repeat step No. change	Slot, command axis, step no.	8-14
MOF	M code release	Slot, command axis	8-15
PRS	Current position preset	Slot, command axis, position	8-15
ZOE	ZONE output enabled	Slot, command axis	8-15
ZOD	ZONE output disabled	Slot, command axis	8-16
EPRS	Encoder preset	Slot, command axis, position	8-16
TEA	Single Teaching	Slot, command axis, Teaching Data, step no., RAM/ROM, position/speed	8-17
TEAA	Teaching Array	Slot, command axis, step no., RAM/ROM, position/speed, Teaching no.	8-17
TWR	Teaching array data setting	Slot, command axis, teaching data, no. of teaching	8-18
TBP	Basic parameter teaching	Slot, command axis, basic parameter change value, item to change	8-19
TEP	Extended parameter setting	Slot, command axis, extended parameter change value, item to change	8-20
THP	Homing parameter setting	Slot, command axis, homing parameter change value, item to change	8-22
TMP	Manual operation parameter setting	Slot, command axis, manual operation parameter change value, item to change	8-23
TSP	Input signal parameter setting	Slot, command axis, input signal parameter change value	8-24
TCP	Common parameter setting	Slot, command axis, common parameter change value, item to change	8-25
TMD	Operation data teaching	Slot, command axis, operation data value, operation data item, step no.	8-27
WRT	Parameter/operation data save	Slot, command axis, axis information	8-28
EMG	Emergency stop	Slot, command axis	8-29
CLR	Error reset, output disabled clear	Slot, command axis, pulse output disabled/enabled	8-29
ECLR	Error history reset	Slot, command axis	8-29
PST	Point Start	Slot, command axis	8-30
PWR	Point start step data setting	Slot, command axis, step data, step no.	8-30
SRD	Operation state read	Slot, command axis, state information	8-31

Notes

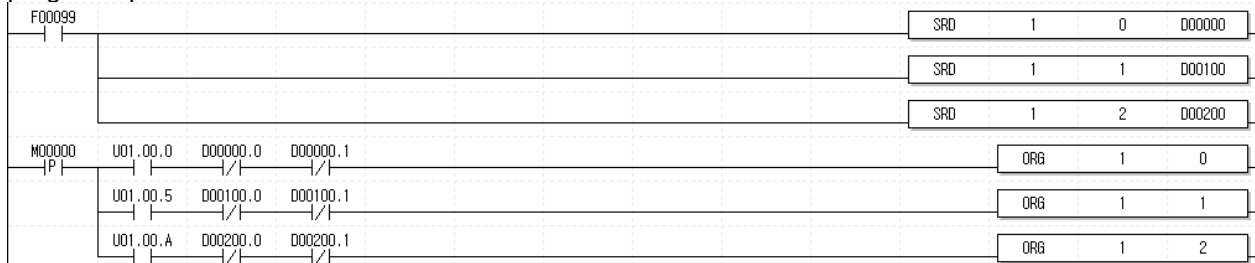
The dedicated command acts at Rising edge. That is, it carries out the first action once when input contact is "ON". But, SRD carries out High level action.

8.3 Use of Dedicated Command

Here describes the command usage based on X axis when the positioning module is inserted into slot 1 of XGK CPU module. The position and speed use the units of pulse and pps, respectively.

Notes

- This is the method used with the operation state bit(in operation, error state) read by using SRD as the program operation condition



- ※ U01.00.0: X axis command receive, D00000.0: X axis in operation, D00000.1: X axis error state
- U01.00.5: X axis command receive, D00100.0: X axis in operation, D00100.1: X axis error state
- U01.00.A: X axis command receive, D00200.0: X axis in operation, D00200.1: X axis error state

- The example program for command in this Chapter 8 also uses the operation state bit as the program operation condition as the above.

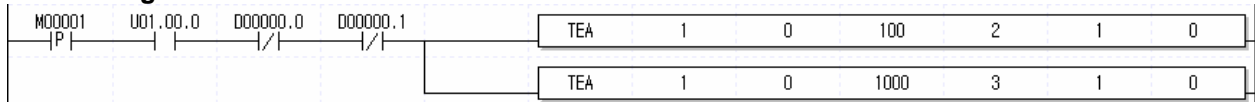
Notes

- All dedicated commands except SRD, PWR and TWR are not allowed to use together for one command execution axis(if it is used like the below example program, a command does not work properly).

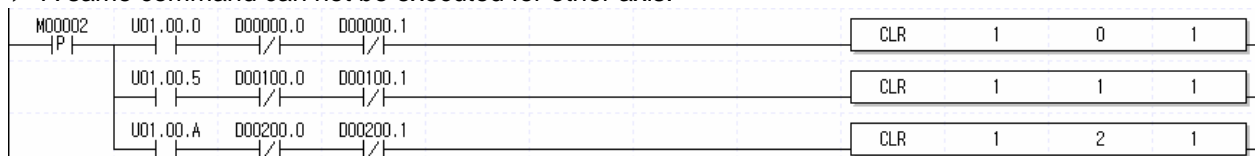
If executing other command



If executing same command



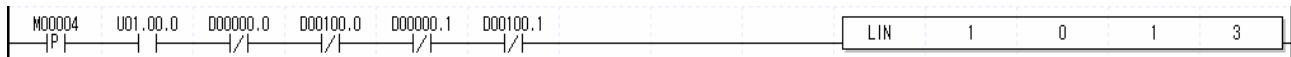
- A same command can not be executed for other axis.



Chapter 8 Command

8.3.5 Linear Interpolation Start (Command : LIN)

1) Program



2) Description

Device	Description
M00004	2axis linear interpolation start input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00100.0	Y axis signal in operation
D00000.1	X axis error state
D00100.1	Y axis error state

Command	LIN				Linear interpolation
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Operation step	PMLK,constant,D,Z,R,ZR	WORD	Step No. to operate (0~400)
	OP4	Operation axis	PMLK,constant,D,Z,R,ZR	WORD	Operation axis setting (Bit0:X, Bit1:Y axis Bit2:Z axis) Bit0,1,2(0:unsetting,1:setting)

※ PMLK means P, M, L and K areas.

- ▷ X and Y axes carry out 2 axis linear interpolation operation by the operation data of No.1 step.
- ▷ If the axis setting to operate is “7”, 3 axis linear interpolation is carried out by setting X, Y and Z axes.

8.3.6 Circular Interpolation Start (Command : CIN)

1) Program



2) Description

Device	Description
M00005	2axis circular interpolation start input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00100.0	Y axis signal in operation
D00000.1	X axis error state
D00100.1	Y axis error state

Command	CIN				Circular interpolation
Operand	OP1	Slot	Constant	WORD	Command axis (0:X,1:Y,2:Z)
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Operation step No.(0~400)
	OP3	Operation step	PMLK,constant,D,Z,R,ZR	WORD	Operation axis setting(bit0:X axis bit1:Y axis bit2:Z axis) Bit0,1,2(0: unsettling,1: setting)
	OP4	Operation axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

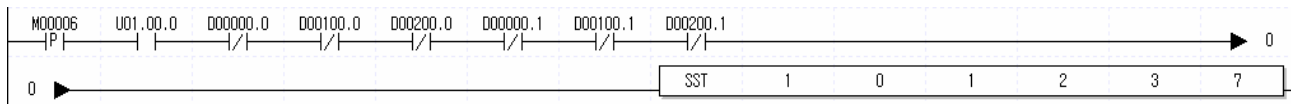
※ PMLK means P, M, L and K areas.

- ▷ X and Y axes carry out 2 axis circular interpolation operation by setting the operation data of No.1 step.
- ▷ For circular interpolation, it is required to preset operation pattern of X and Y axis, goal position, operation speed, circular interpolation aux. point, rotation direction and circular interpolation method of common parameter.

Chapter 8 Command

8.3.7 Simultaneous Start (Command : SST)

1) Program



※ In the above program, the no. of contact is fixed as 14 through “View(V)→No. of Contact Change(S)→Increase of No. of Contact.

2) Description

Device	Description
M00006	3axis simultaneous start input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00100.0	Y axis signal in operation
D00200.0	Z axis signal in operation
D00000.1	X axis error state
D00100.1	Y axis error state
D00200.1	Z axis error state

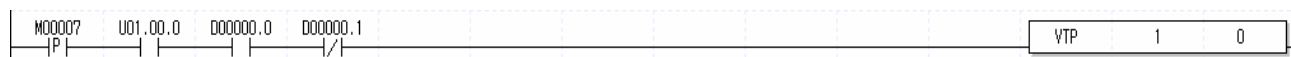
Command	SST				Simultaneous start
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	X axis operation step	PMLK,constant,D,Z,R,ZR	WORD	X axis operation step No.(0~400)
	OP4	Y axis operation step	PMLK,constant,D,Z,R,ZR	WORD	Y axis operation step No.(0~400)
	OP5	Z axis operation step	PMLK,constant,D,Z,R,ZR	WORD	Z axis operation step No.(0~400)
	OP6	Operation axis	PMLK,constant,D,Z,R,ZR	WORD	Operation axis setting (Bit0:X, Bit1:Y, Bit 2:Z axis) Bit0,1,2(0: unsetting,1:setting)

※ PMLK means P, M, L and K areas.

- ▷ This operation carries out simultaneous start with operation data by X axis : step No.1, Y axis : step No.2, Z axis : step No.3
- ▷ Internal simultaneous start and external simultaneous start are different in view of the operation method. For the details, refer to “3.3.2 Simultaneous Start.”

8.3.8 Speed/Position Switching Control(Command : VTP)

1) Program



2) Description

Device	Description
M00007	X axis speed/position switching control input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	VTP				Speed/position switching control
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

Chapter 8 Command

※ PMLK means P, M, L and K areas.

▷ If speed/position switching control is executed in the state of speed control operation, it shall be switched to position control and positioning operation is executed with the position set in the speed control.

8.3.9 Position/Speed Switching Control(Command : PTV)

1) Program

[illegible]

2) Description

Device	Device
M00008	X axis position/speed switching control input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	PTV					Position/speed switching control
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module	
		Axis				
	OP2	Slot	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)	
		Axis				

※ PMLK means P, M, L and K areas.

▷ If position/speed switching control is executed during position control operation, it is converted to speed control, operates at the speed set during position control and stops by executing deceleration stop.

8.3.10 Deceleration Stop (Command : STP)

1) Program

M00009	U01.00.0	D00000.0	STP	1	0	D00000
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2) Description

Device	Description
M00009	X axis deceleration stop input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	STP				Deceleration stop
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Deceleration time	PMLK,constant,D,Z,R,ZR	WORD	deceleration time(0 ~ 65535ms)

※ PMLK means P, M, L and K areas.

▷ Deceleration stop does not carry out the command in deceleration area and instead, it is executed only in acceleration and equal speed areas.

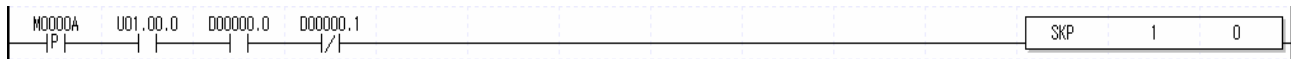
▷ Deceleration time means the time required from deceleration start to stop and it is available to set from 0 ~ 65535ms. But if setting as "0", it stops only by acceleration/deceleration time set by operation data or direct start.

▷ Deceleration time means the time required from the speed limit of basic parameter on operation axis to stop.

Chapter 8 Command

8.3.11 Skip Operation (Command : SKP)

1) Program



2) Description

Device	Description
M0000A	X axis skip operation input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

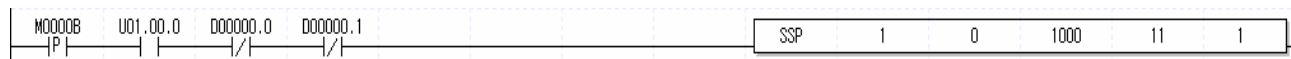
Command	SKP				Skip operation
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ PMLK means P, M, L and K areas.

▷ This ends and stops the operation of step which is in operation currently and then continues to operate the next step.

8.3.12 Synchronous Start by Position (Command : SSP)

1) Program



2) Description

Device	Description
M0000B	X axis synchronous start by speed input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error signal

Command	SSP				Synchronous start by position
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Main axis synchronous start position	PMLK,constant,D,Z,R,ZR	DINT	Synchronous start position of main axis to be operated by command axis (-2147483648 ~ 2147483647)
	OP4	Operation step	PMLK,constant,D,Z,R,ZR	WORD	Command axis operation step No. (0~ 400)
	OP5	Main axis	PMLK,constant,D,Z,R,ZR	WORD	Main axis (0:X axis, 1:Y axis, 2:Z axis)

※ PMLK means P, M, L and K areas.

▷ If the command of synchronous start by position is executed, it becomes in operation state but does not have actual pulse output at X axis (subordinate axis). At the point that Y axis as main axis setting starts and the current position is 1000, X axis will start with pulse output and Y axis carries out positioning operation by operation data of No.11 step.

Chapter 8 Command

8.3.15 Speed Override (Command : SOR)

1) Program

M0000E	U01.00.0	D00000.0	D00000.1							SOR	1	0	5000
P			/										

2) Description

Device	Description
M0000E	X axis speed override input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	SOR				Speed override
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Speed value	PMLK,constant,D,Z,R,ZR	DWORD	Goal speed value to change (LD:1~1000000,OC:1~200000)

※ PMLK means P, M, L and K areas.

▷ If speed override command is executed during operation, operation speed will be changed to 5000 for operation.

8.3.16 Position Assigned Speed Override (Command : PSO)

1) Program

M0000F	U01.00.0	D00000.0	D00000.1							PSO	1	0	10000	5000
P			/											

2) Description

Device	Description
M0000F	X axis position assigned speed override input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	PSO				Position assigned speed override
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Position value	PMLK,constant,D,Z,R,ZR	DINT	Position value to change the speed (-2147483648 ~ 2147483647)
	OP4	Speed value	PMLK,constant,D,Z,R,ZR	DWORD	Goal speed value to change (LD:1~1000000,OC:1~200000)

※ PMLK means P, M, L and K areas.

▷ In case current operation speed is 500 and goal position is 2000000 and if position assigned override command is executed, operation speed is changed to 5000 and it carries out the operation when current position is 10000.

※ PMLK means P, M, L and K areas.

1) Program

[illegible]

Device	Description
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※ PMLK means P, M, L and K areas.

1) Program

[illegible]

Device	Description
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* PMLK means P, M, L and K areas.

▷ Repeat step No. change is available for command execution even during positioning operation.

※ PMLK means P, M, L and K areas.

1) Program

M00019 1 UC

Device

[illegible]

※ PMLK means P, M, L and K areas.

1) Program

MO001A	UC
--------	----

Device

M0001A	X axis encoder preset input
M0002A	X axis encoder preset input

U01.00.0	X axis command receive
D00000.0	Y axis signal in operation

20000000	1000000000
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* PMLK means P, M, L and K areas.

Chapter 8 Command

8.3.27 Single Teaching (Command : TEA)

1) Program

M0001B	U01.00.0	D00000.0	D00000.1	TEA	1	0	10000	2	1	0
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2) Description

Device	Description
M0001B	X axis single teaching input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	TEA				Single Teaching
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Teaching value	PMLK,constant,D,Z,R,ZR	DINT	Data value for Teaching
	OP4	Teaching step	PMLK,constant,D,Z,R,ZR	WORD	Step No. for Teaching (0~400)
	OP5	Teaching method	PMLK,constant,D,Z,R,ZR	WORD	0:RAM Teaching 1:ROM Teaching
	OP6	Teaching item	PMLK,constant,D,Z,R,ZR	WORD	0:Position 1:Speed

※ PMLK means P, M, L and K areas.

- ▷ ROM teaching changes the goal position of step No.2 of operation data to 10000.
- ▷ If ROM teaching is executed, data are written on flash memory, so operation data will be kept even though PLC power is OFF(flash memory data writing is limited to 100,000 frequency).

8.3.28 Teaching Array (Command : TEAA)

1) Program

M0001C	U01.00.0	D00000.0	D00000.1	TEAA	1	0	10	0	1	5
--------	----------	----------	----------	------	---	---	----	---	---	---

2) Description

Device	Description
M0001C	X axis teaching array input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	TEAA				Teaching Array
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Teaching step	PMLK,constant,D,Z,R,ZR	WORD	leading step No. for teaching (0~400)
	OP4	Teaching method	PMLK,constant,D,Z,R,ZR	WORD	0:RAM Teaching 1:ROM Teaching
	OP5	Teaching item	PMLK,constant,D,Z,R,ZR	WORD	0:Position 1:Speed
	OP6	Teaching No.	PMLK,constant,D,Z,R,ZR	WORD	Step No. for Teaching Array (1~16)

※ PMLK means P, M, L and K areas.

- ▷ RAM teaching changes the operation speed from operation data No.10 step through No.14 step(5 steps) to the teaching data set in teaching array data area.
- ▷ Before executing teaching array, teaching data should be set in the teaching array setting area. For teaching array data setting, refer to TWR command.

Chapter 8 Command

M00001 P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00000	1
M00002 P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00002	2
M00003 P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00004	3
M00004 P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00006	4
M00005 P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00008	5
M00006 P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00010	6
M00007 P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00012	7
M00008 P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00014	8
M00009 P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00016	9
M0000A P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00018	10
M0000B P	U01.00.0 	D00000.0 /	D00000.1 /	TBP	1	0	D00020	11
M00100 P								M00101 <S>
M00101 P				DMOV	1		M0000	
T1500 /	M00101 			TON	T1500	50		
T1500 				DROL	M0000	1		
D=	h00000800	M0000						M00101 <R>

From the scan after M00100 is ON, basic parameter is changed in sequence from basic parameter No.1 through No.11.

※ When using the method executing a command every 50ms using a timer, the example program may generate an error or may not change a parameter, depending on the program size. In the case, change the timer setting value.

8.3.31 Extended Parameter Teaching (Command : TEP)

1) Program

M0001F P	U01.00.0 	D00000.0 /	D00000.1 /	TEP	1	0	100	4
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2) Description

Device	Description
M0001F	X axis extended parameter teaching input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	TEP				Extended parameter Teaching
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Parameter value	PMLK,constant,D,Z,R,ZR	DINT	Parameter value to change
	OP4	Parameter item	PMLK,constant,D,Z,R,ZR	WORD	Parameter item to change (1~16)

※ PMLK means P, M, L and K areas.

- ▷ Positioning end output time among Extended parameter is changed to 100ms.
- ▷ The parameter value modified by extended parameter Teaching command is valid only while the power is ON. In order to save the parameter value modified by extended parameter Teaching command in the flash memory, it is required to save the parameter value modified by parameter/operation data save command, WRT in the flash memory after extended parameter Teaching
- ▷ The value to be set in parameter items is as follows.

Chapter 8 Command

Items		Setting value
1	S/W high limit	-2147483648 ~ 2147483647
2	S/W low limit	
3	Backlash compensation amount	0~65535
4	Positioning end output time	
5	S-Curve rate	1~100
6	External command selection	0:Start 1:JOG 2:Skip
7	Pulse output direction	0: Forward 1: Reverse
8	Acc./dec. pattern	0: Trapezoid 1:S-Curve
9	M code mode	0:None 1:With 2:After
10	Position indication during equal speed operation	0: No indication 1: Indication
11	High/low limit detection during equal speed operation	0: No detection 1: Detection
12	External speed/position control switching enabled	0:Disabled 1:Enabled
13	External command enabled	0:Disabled 1:Enabled
14	External stop enabled	0:Disabled 1:Enabled
15	External simultaneous start enabled	0:Disabled 1:Enabled
16	Positioning end condition	0:Dwell time 1: Inposition signal 2:Dwell time AND inposition signal 3:Dwell time OR inposition signal
17	Driver ready/inposition	0: Driver Ready 1: Inposition

▷ In case changing every extended parameter, they can be also changed by the following method.

M00001	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00000	1
M00002	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00002	2
M00003	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00004	3
M00004	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00006	4
M00005	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00008	5
M00006	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00010	6
M00007	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00012	7
M00008	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00014	8
M00009	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00016	9
M0000A	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00018	10
M0000B	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00020	11
M0000C	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00022	12
M0000D	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00024	13
M0000E	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00026	14
M0000F	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00028	15
M00010	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00030	16
M00011	U01.00.0	D00000.0	D00000.1	TEP	1	0	D00032	17
M00100								M00101 <S>
M00101							DMOV	1 M0000
T1500	M00101						TON	T1500 50
T1500							DROL	M0000 1
D=	h00020000	M0000						M00101 <R>

※ When using the method executing a command every 50ms using a timer, the example program may generate an error or may not change a parameter, depending on the program size. In the case, change the timer setting value.

1) Program

Items		Setting value
1	Origin address	-2147483648 ~ 2147483647
2	Homing high speed	LD:1~1000000
3	Homing low speed	OC:1~200000
4	Homing acc./dec. time	0 ~ 65535
5	Homing dwell time	0 ~ 50000
6	Origin compensation amount	-2147483648 ~ 2147483647
7	Homing restart time	0 ~ 65535
8	Homing method	0:DOG/ORG(OFF) 1:DOG/ORG(ON) 2:High/low limit/ORG 3:DOG 4:High speed homing 5: High/low limit
9	Homing direction	0: Forward 1: Reverse

Chapter 8 Command

▷ In case changing every homing parameter, they can be also changed by the following method.

M00001 P	U01.00.0 	D00000.0 /	D00000.1 /	THP	1	0	D00000	1
M00002 P	U01.00.0 	D00000.0 /	D00000.1 /	THP	1	0	D00002	2
M00003 P	U01.00.0 	D00000.0 /	D00000.1 /	THP	1	0	D00004	3
M00004 P	U01.00.0 	D00000.0 /	D00000.1 /	THP	1	0	D00006	4
M00005 P	U01.00.0 	D00000.0 /	D00000.1 /	THP	1	0	D00008	5
M00006 P	U01.00.0 	D00000.0 /	D00000.1 /	THP	1	0	D00010	6
M00007 P	U01.00.0 	D00000.0 /	D00000.1 /	THP	1	0	D00012	7
M00008 P	U01.00.0 	D00000.0 /	D00000.1 /	THP	1	0	D00014	8
M00009 P	U01.00.0 	D00000.0 /	D00000.1 /	THP	1	0	D00016	9
M00100 P								M00101 <S>
M00101 P				DMOV	1		M0000	
T1500 /	M00101 			TON	T1500		50	
T1500 				DRQL	M0000		1	
D=	h00000200	M0000						M00101 <R>

From the scan after M00100 is ON, homing parameter is changed in sequence from basic parameter No.1 through No.9.

※ When using the method executing a command every 50ms using a timer, the example program may generate an error or may not change a parameter, depending on the program size. In the case, change the timer setting value.

8.3.33 Manual Operation Parameter Teaching (Command : TMP)

1) Program

M00021 P	U01.00.0 	D00000.0 /	D00000.1 /	TMP	1	0	1000	2
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2) Description

Device	Description
M00021	X axis manual operation parameter teaching input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	TMP				Manual operation parameter Teaching
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Parameter value	PMLK,constant,D,Z,R,ZR	DINT	parameter value to change
	OP4	Parameter item	PMLK,constant,D,Z,R,ZR	WORD	parameter item to change (1~4)

※ PMLK means P, M, L and K areas.

▷ Jog low speed among manual operation parameter of X axis is changed to 1000.

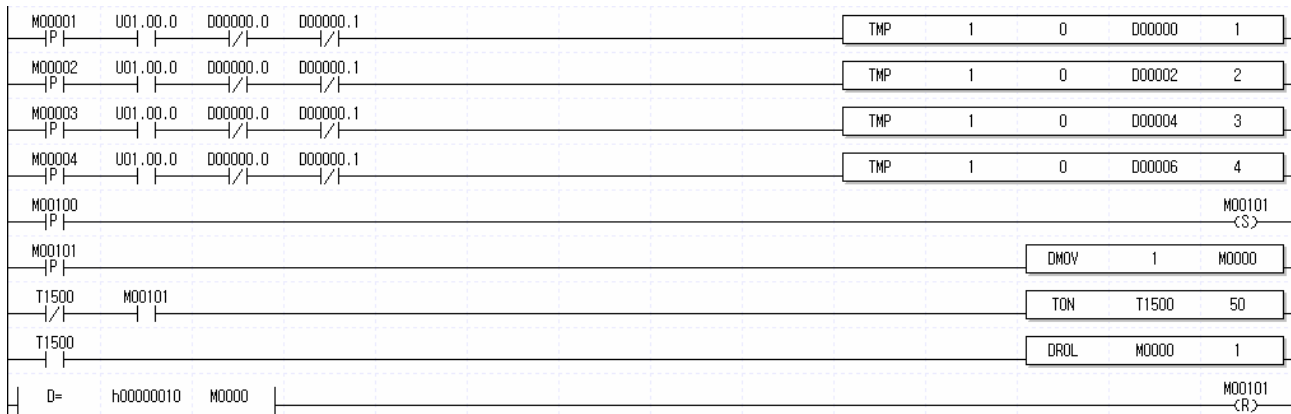
▷ The parameter value modified by manual operation parameter Teaching command is valid only while the power is ON. In order to save the parameter value modified by manual operation parameter Teaching command in the flash memory, it is required to save the parameter value modified by parameter/operation data save command, WRT in the flash memory after manual operation parameter Teaching.

Chapter 8 Command

▷ The value to be set in parameter item is as follows.

Items		Setting value
1	Jog high speed	LD:1~1000000
2	Jog low speed	OC:1~200000
3	Jog acc./dec. time	0 ~ 65535
4	Inching speed	0 ~ 65535

▷ In case changing every manual parameter, they can be also changed by the following method

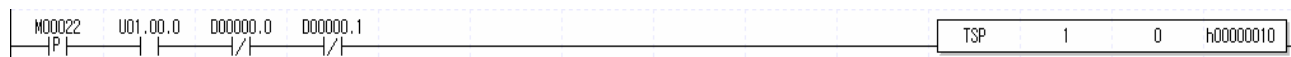


From the scan after M00100 is ON, manual operation parameter is changed in sequence from basic parameter No.1 through No.4.

※ When using the method executing a command every 50ms using a timer, the example program may generate an error or may not change a parameter, depending on the program size. In the case, change the timer setting value.

8.3.34 Input Signal Parameter Teaching (Command : TSP)

1) Program



2) Description

Device	Description
M00022	X axis input signal parameter teaching input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	TSP				Input signal parameter Teaching
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Parameter value	PMLK,constant,D,Z,R,ZR	DINT	parameter value to change

※ PMLK means P, M, L and K areas.

▷ Emergency stop signal among input signal parameter is changed to act to B contact.

▷ The parameter value modified by input signal parameter Teaching command is valid only while the power is ON. In order to save the parameter value modified by input signal parameter Teaching command in the flash memory, it is required to save the parameter value modified by parameter/operation data save command, WRT in the flash memory after input signal parameter Teaching.

Chapter 8 Command

▷ The input signal applied with each bit of the value to be set in parameter item is as follows.

Bit	Input signal	Bit	Input signal
0	High limit signal	6	Command signal
1	Low limit signal	7	Auxiliary command signal
2	Near point signal	8	Speed/position switching signal
3	Origin signal	9	Driver Ready/Inposition signal
4	Emergency stop signal	10	External simultaneous start signal
5	Deceleration stop signal	15 ~ 11	-

▷ For example, if parameter value is h0213, high limit signal, change low limit signal, emergency stop signal, Driver Ready/ Inposition signal to act to B contact.

8.3.35 Common Parameter Teaching (Command : TCP)

1) Program

M00023	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	1	1
P		/	/	/	/	/	/					

2) Description

Device	Description
M00023	Common parameter teaching input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00100.0	Y axis signal in operation
D00200.0	Z axis signal in operation
D00000.1	X axis error state
D00100.1	Y axis error state
D00200.1	Z axis error state

Command	TCP				Common parameter Teaching
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Parameter value	PMLK,constant,D,Z,R,ZR	DINT	parameter value to change
	OP4	Parameter item	PMLK,constant,D,Z,R,ZR	WORD	Parameter item to change (1~14)

※ PMLK means P, M, L and K areas.

▷ Pulse output level among common parameter is changed to act as High Active.

▷ The parameter value modified by common parameter Teaching command is valid only while the power is ON. In order to save the parameter value modified by common parameter Teaching command in the flash memory, it is required to save the parameter value modified by parameter/operation data save command, WRT in the flash memory after common parameter Teaching.

▷ The value to be set in parameter item is as follows.

Chapter 8 Command

Items		Setting value
1	Pulse output level	0:Low Active 1:High Active
2	Circular interpolation method	0:Middle point 1:Center point
3	Encoder pulse input mode	0:CW/CCW(1phase 1multiplier) 1:CW/CCW(1phase 2 multiplier) 2:Pulse/Dir(1phase 1 multiplier) 3:Pulse/Dir(1phase 2 multiplier) 4:PhaseA/B(2phase 1 multiplier) 5:PhaseA/B(2phase 2 multiplier) 6:PhaseA/B(2phase 4 multiplier)
4	Encoder auto reload value	0 ~ 4294967295
5	ZONE output mode	0:Individual output 1:Batch output
6	ZONE 1 axis setting	0:X axis 1:Y axis 2:Z axis 3:Encoder
7	ZONE 2 axis setting	
8	ZONE 3 axis setting	
9	ZONE 1 On area	-2147483648 ~ 2147483647
10	ZONE 1 Off area	
11	ZONE 2 On area	
12	ZONE 2 Off area	
13	ZONE 3 On area	
14	ZONE 3 Off area	

▷ In case changing every common parameter, they can be also changed by the following method.

M00001	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00000	1		
M00002	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00002	2		
M00003	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00004	3		
M00004	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00006	4		
M00005	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00008	5		
M00006	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00010	6		
M00007	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00012	7		
M00008	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00014	8		
M00009	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00016	9		
M0000A	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00018	10		
M0000B	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00020	11		
M0000C	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00022	12		
M0000D	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00024	13		
M0000E	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	D00200.0	D00200.1	TCP	1	0	D00026	14		
M00100												M00101		
M00101												<S>		
												MOV	1	M0000
T1500	M00101											TON	T1500	50
T1500												DROL	M0000	1
D=	h00004000	M0000											M00101	
												<R>		

From the scan after M00100 is ON, common parameter is changed in sequence from basic parameter No.1 through No.14.

※ When using the method executing a command every 50ms using a timer, the example program may generate an error or may not change a parameter, depending on the program size. In the case, change the timer setting value.

M00001 P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00000	1	1
M00002 P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00002	2	1
M00003 P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00004	3	1
M00004 P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00006	4	1
M00005 P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00008	5	1
M00006 P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00010	6	1
M00007 P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00012	7	1
M00008 P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00014	8	1
M00009 P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00016	9	1
M0000A P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00018	10	1
M0000B P	U01.00.0 	D00000.0 /	D00000.1 /	TMD	1	0	D00020	11	1
M00100 P									M00101 <S>
M00101 P							DMOV	1	M0000
T1500 /	M00101 						TON	T1500	50
T1500 							DROL	M0000	1
D=	H00000800	M0000							M00101 <R>

From the scan after M00100 is ON, common parameter is changed in sequence from basic parameter No.1 through No.11.

※ When using the method executing a command every 50ms using a timer, the example program may generate an error or may not change a parameter, depending on the program size. In the case, change the timer setting value.

8.3.37 Parameter/Operation Data Save (Command : WRT)

1) Program

[illegible]

2) Description

Device	Description
M00025	Parameter/Operation data save input
U01.00.0	X axis command receive
D00000.0	X axis in operation
D00000.1	X axis error

Command	WRT				Parameter/operation Data save
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Save axis selection	PMLK,constant,D,Z,R,ZR	WORD	Save selection axis (bit0:X axis, bit1:Y axis, bit2:Z axis)

※ PMLK means P, M, L and K areas.

- ▷ The current parameter and operation data of save selection axis are saved into the flash memory(ROM).
- ▷ The command axis is the basic operand to execute command. Select 0, 1 or 2 and use one temporarily.
- ▷ If WRT command is executed, data are written on flash memory, so changed operation data will be kept even though PLC power is OFF(flash memory data writing is limited to 100,000 frequency).

Chapter 8 Command

8.3.41 POINT Start (Command : PST)

1) Program

M00029	U01.00.0	D00000.0	D00000.1							PST	1	0	5
P		/	/										

2) Description

Device	Description
M000029	X axis point operation input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	PST				Point operation
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Point operation No.	PMLK,constant,D,Z,R,ZR	WORD	Point operation step No. (1~20)

※ PMLK means P, M, L and K areas.

- ▷ Point start is carried out for 5 step data set in the point start data area.
- ▷ Before executing POINT start, step data should be set in the POINT start data area. Please refer to POINT start step data setting command, TWR.

8.3.42 POINT Start Step Data Setting (Command: PWR)

1) Program

M0002A										PWR	1	0	D00200	20
P														

2) Description

Device	Description
M0002A	POINT Start Step Data Setting Input

Command	PWR				POINT Start Step Data Setting
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Axis to save Point operation step
	OP3	Device	PMLK,D,Z,R,ZR	WORD	Leading No. of device with POINT Start Step Data
	OP3	Data No.	PMLK,constant,D,Z,R,ZR	WORD	Data No. to save

※ PMLK means P, M, L and K areas.

- ▷ 20 word data from D00200 through D00219 are set in the POINT start step data area.
- ▷ Point start is not executed only by executing POINT start step data setting command. Please refer to POINT start command, PST.
- ▷ According to the leading No. of device, the POINT start step data are set as follows

Operation state data	Device No.
----------------------	------------

Operation state information (lower)	Device + 0
Operation state information (Upper)	Device + 1
Axis information	Device + 2
External input signal state	Device + 3
Current position	Device + 4
Current speed	Device + 6
Step No.	Device + 8
M code No.	Device + 9
Error information	Device + 10
Error History1	Device + 11
Error History 2	Device + 12
Error History 3	Device + 13
Error History 4	Device + 14
Error History 5	Device + 15
Error History 6	Device + 16
Error History 7	Device + 17
Error History 8	Device + 18
Error History 9	Device + 19
Error History 10	Device + 20
Encoder value (DWORD)	Device + 21
	Device + 22

Figure 1 is a line graph showing the number of cases of COVID-19 in the United States from March 2020 to March 2021. The y-axis is labeled "Number of cases" and ranges from 0 to 5,000,000. The x-axis is labeled "Date" and shows months from March 2020 to March 2021. The graph shows a sharp increase in cases starting in March 2020, peaking in May 2020 at approximately 4,000,000 cases, followed by a decline and then a second, even sharper increase starting in November 2020, peaking in January 2021 at approximately 4,500,000 cases, and then declining again.

P00099			GET	1	h014A	D00000	23
--------	--	--	-----	---	-------	--------	----

Chapter 9 Function Block

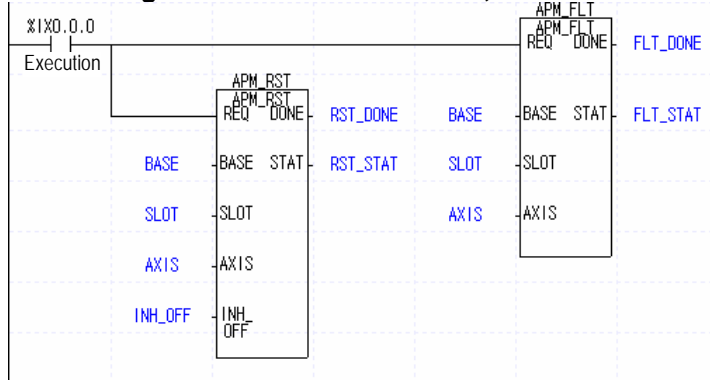
Here describes the positioning function blocks used in XGI CPU Module.

No.	Name	Description	Operation condition	Execution time(ms)
1	APM_ORG	Homing start	Edge	5
2	APM_FLT	Floating origin setting	Edge	5
3	APM_DST	Direct start	Edge	5
4	APM_IST	Indirect start	Edge	5
5	APM_LIN	Linear interpolation start	Edge	5
6	APM_CIN	Circular interpolation start	Edge	5
7	APM_SST	Simultaneous start	Edge	5
8	APM_VTP	Speed/position switching control	Edge	5
9	APM_PTV	Position/speed switching control	Edge	5
10	APM_STP	Deceleration stop	Edge	5
11	APM_SKP	Skip operation	Edge	5
12	APM_SSP	Position synchronization	Edge	5
13	APM_SSS	Speed synchronization	Edge	5
14	APM_POR	Position override	Edge	5
15	APM_SOR	Speed override	Edge	5
16	APM_PSO	Positioning speed override	Edge	5
17	APM_NMV	Continuous operation	Edge	5
18	APM_INC	Inching operation	Edge	5
19	APM_RTP	return to the previous position of manual operation	Edge	5
20	APM_SNS	Start step No. change	Edge	5
21	APM_SRS	Repeat step No. change	Edge	5
22	APM_MOF	M code release	Edge	5
23	APM_PRS	Current position preset	Edge	5
24	APM_ZONE	ZONE output enabled/disabled	Edge	5
25	APM_EPRES	Encoder value preset	Edge	5
26	APM_TEA	Single teaching	Edge	5
27	APM_ATEA	Teaching array	Edge	5
28	APM_SBP	Basic parameter teaching	Edge	5
29	APM_SEP	Extended parameter teaching	Edge	5
30	APM_SHP	Homing parameter teaching	Edge	5
31	APM_SMP	Manual operation parameter teaching	Edge	5
32	APM_SIP	Input signal parameter teaching	Edge	5
33	APM_SCP	Common parameter teaching	Edge	5
34	APM_SMD	Operation data teaching	Edge	5
35	APM_EMG	Emergency stop	Edge	5
36	APM_RST	Error reset/output disabled release	Edge	5
37	APM_PST	Point start	Edge	5
38	APM_WRT	Parameter/operation data save	Edge	1000
39	APM_CRD	Operation information read	Level	0.02
40	APM_SRD	Operation state read	Level	0.02
41	APM_ENCRD	Encoder value read	Level	0.02
42	APM_JOG	JOG operation	Level	5
43	APM_MPG	Manual pulse generator operation	Edge	5

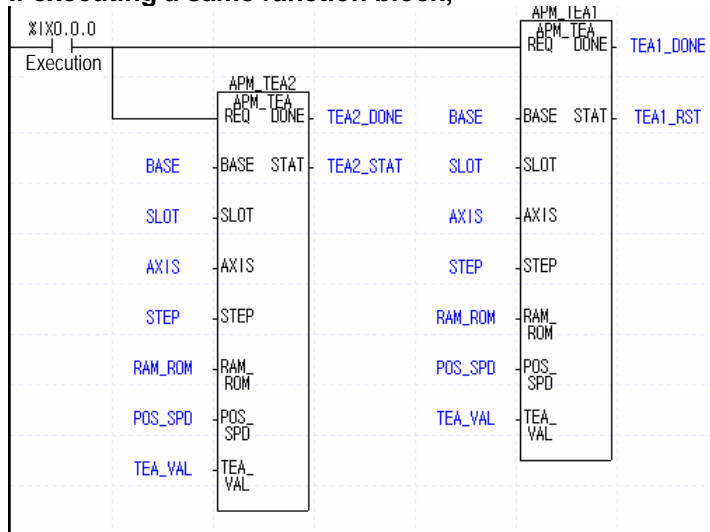
Notes

▷ For the positioning block except APM_SRD, APM_CRD, AMP_ENCRD and APM_JOG, only one should be executed for one function block execution axis within a scan. If using it as presented in the following example program, the function block does not work properly.

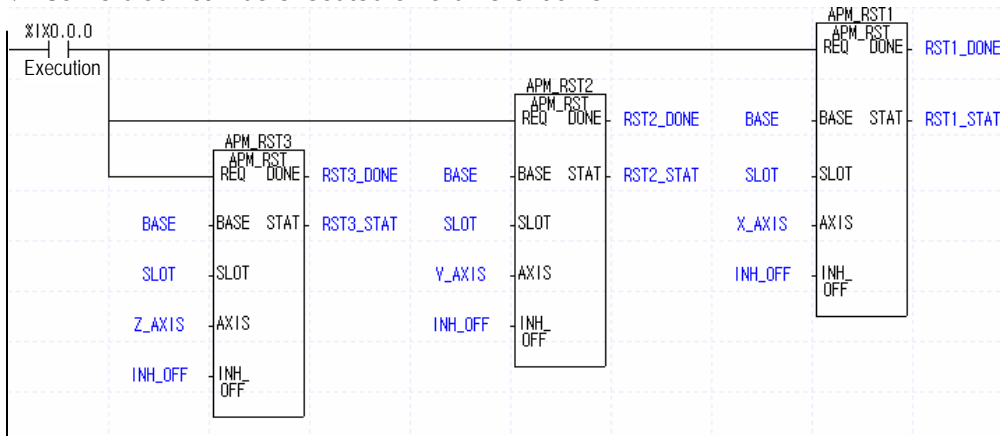
If executing a different function block;



If executing a same function block;



▷ Same block can be executed on a different axis.



9.1 Common Issues of Function Block

1) The functions and directions of the following I/O parameter are common for positioning function block.

Category	Parameter	Data Type	Description
Input	REQ	BOOL	Execution request of function block <ul style="list-style-type: none"> Function block is executed if "0→1"(edge or level) as long as the connection condition is met during the program.
	BASE	USINT	Base position number <ul style="list-style-type: none"> This is the area where the base number on which positioning module is installed is set. Setting range: 0 ~ 7
	SLOT	USINT	Base position number <ul style="list-style-type: none"> This is the area where the slot number on which positioning module is installed is set. Setting range: 0 ~ 7
	AXIS	USINT	Axis number used <ul style="list-style-type: none"> X: 0 Y: 1 Z: 2 "Error 6" is generated if a value out of the setting range is set
Output	DONE	BOOL	Indicates function block execution end state <ul style="list-style-type: none"> "1" is outputted if function block is executed completely without error and maintained until the next execution; if an error occurs, it outputs "0"
	STAT	USINT	Error state indication <ul style="list-style-type: none"> If an error occurs during function block execution, it generates the error number.

2) The position and speed setting ranges of positioning function block are as follows and the ranges are based on pulse for position or pulse/sec for speed.

Category	Setting unit	Setting range
Position	pulse	-2,147,483,648 ~ 2,147,483,647[pulse]
	mm	-2,147,483,648 ~ 2,147,483,647[x 10 ⁻⁴ mm]
	inch	-2,147,483,648 ~ 2,147,483,647[x 10 ⁻⁵ inch]
	degree	-2,147,483,648 ~ 2,147,483,647[x 10 ⁻⁵ degree]
Speed	pulse/sec	Open collector: 1 ~ 200,000[pulse/sec] Line driver: 1 ~ 1,000,000[pulse/sec]
	mm/min	1 ~ 2,000,000,000[x 10 ⁻² mm/min]
	inch/min	1 ~ 2,000,000,000[x 10 ⁻³ inch/min]
	degree/min	1 ~ 2,000,000,000[x 10 ⁻³ degree/min]

9.2 Module Information Read Function Block

9.2.1 Operation Information Read(APM_CRD)

It is used to read the current position, operation speed, operation step number and M code value of a set axis in order to monitor or use them as the conditions in program.

Type	Parameter	Data type	Description
<div> <div>APM_CRD</div> <div>APM_CRD</div> <div>REQ</div> <div>DONE</div> <div>BASE</div> <div>STAT</div> <div>SLOT</div> <div>ERR</div> <div>AXIS</div> <div>CA</div> <div>CV</div> <div>STEP</div> <div>MCD</div> </div>	ERR	UINT	Indicates error information during operation
	CA	DINT	Indicates the current position(address) ● Output range: -2,147,483,648 ~ 2,147,483,647
	CV	UINT	Indicates the current operation speed ● Output range: 0 ~ 400 Open collector: 0 ~ 200,000 Line driver: 0 ~ 1,000,000
	STEP	UINT	Indicates the current operation step No. ● Output range: 1 ~ 400
	MCD	USINT	Indicates the current M code value ● Output range: 0 ~ 65,535

Chapter 9 Function Block

9.2.2 Operation State Read(APM_SRD)

It is used to read the operation, error, positioning end, homing and other state bits of a set axis in order to monitor or use them as the conditions in program. The contents of output parameters, ST1 ~ ST7 are important information necessarily applied in the program.

Type	Parameter	Data type	Description			
			Bit No.	Description	Bit No.	Description
<div> <div>APM_SRD</div> <div>APM_SRD</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT ST1</div> <div>AXIS ST2</div> <div>ST3</div> <div>ST4</div> <div>ST5</div> <div>ST6</div> <div>ST7</div> </div>	ST1	BOOL [ARRAY]	[0]	Operation(0:stop, 1: in operation)	[4]	Origin determination (0: incomplete, 1:complete)
			[1]	Error(0:none, 1:occurrence)	[5]	Pulse output (0:disabled, 1:enabled)
			[2]	Positioning(0:incomplete, 1:complete)	[6]	Stop state
			[3]	M code(0:Off, 1:On)	[7]	-
	ST2	BOOL [ARRAY]	[0]	High limit detection	[4]	In acceleration
			[1]	Low limit detection	[5]	In constant speed
			[2]	Emergency stop state	[6]	In deceleration
			[3]	Operation direction (0: forward, 1: reverse)	[7]	In dwell operation
	ST3	BOOL [ARRAY]	[0]	1 axis position control in operation	[4]	2 axis circular interpolation in operation
			[1]	1 axis speed control in operation	[5]	Homing operation
			[2]	2 axis linear interpolation in operation	[6]	Position synchronization operation
			[3]	3 axis linear interpolation in operation	[7]	Speed synchronization operation
	ST4	BOOL [ARRAY]	[0]	JOG low speed in operation	[4]	Homing operation to the previous manual operation position
			[1]	JOG high speed in operation	[5]	Zone 1 output(0:Off, 1:On)
			[2]	Inching operation	[6]	Zone 2 output(0:Off, 1:On)
			[3]	MPG operation	[7]	Zone 3 output(0:Off, 1:On)
	ST5	BOOL [ARRAY]	[0]	Axis information (0:main, 1:subordinate)	[4]	Main axis information (1: encoder is main)
			[1]	Main axis information (1:X axis is main)	[5]	-
			[2]	Main axis information (1:Y axis is main)	[6]	-
			[3]	Main axis information (1:Z axis is main)	[7]	-
	ST6	BOOL [ARRAY]	[0]	Emergency stop signal	[4]	High limit signal
			[1]	Stop signal	[5]	Low limit signal
			[2]	Command signal	[6]	Origin signal
			[3]	JOG high speed reverse signal	[7]	Near point signal
	ST7	BOOL [ARRAY]	[0]	Speed/position switching control signal	[4]	-
			[1]	Drive ready/in-position signal	[5]	-
			[2]	External simultaneous start signal	[6]	-
			[3]	-	[7]	-

9.2.3 Encoder Value Read(APM_ENCRD)

It is used to read encoder value in order to monitor or use them as the conditions in program.

Type	Parameter	Data type	Description
<div> <div>APM_ENCRD</div> <div>APM_ENCRD</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT ENC_VAL</div> </div>	ENC_VAL	UDINT	Indicates encoder value • Output range: 0 ~ 4,294,967,295

9.3 Parameter Teaching Function Block

9.3.1 Basic Parameter Teaching(APM_SBP)

It is used to use basic parameter, instead of using APM software package.

Type	Parameter	Data type	Description
<div> <div>APM_SBP</div> <div>APM_SBP</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div> <div> <div>BP_N</div> <div>O</div> </div> <div> <div>BP_V</div> <div>AL</div> </div>	BP_N O	UDINT	Basic parameter item to execute change
	BP_V AL	USINT	Basic parameter setting value to execute change

▷ The parameter value modified by basic parameter teaching function block is valid only when the power is on. To save the parameter value modified by basic parameter teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation data save function block(APM_WRT) into the flash memory(ROM) after the basic parameter teaching.

▷ The basic parameter items and setting values are as follows.

Items		Setting values
1	Speed limit	Open collector: 1 ~ 200,000 Line driver: 1 ~ 1,000,000
2	Bias speed	
3	Acc./dec. speed 1	0 ~ 65,535
4	Acc./dec. speed 2	
5	Acc./dec. speed 3	
6	Acc./dec. speed 4	
7	No. of pulse per rotation	1 ~ 65,535
8	Transfer distance per rotation	1 ~ 65,535
9	Pulse output mode	0: CW/CCW, 1: PLS/DIR, 2:
10	Unit	0: pulse, 1: mm, 2: inch, 3: degree
11	Unit multiplication	0: x1, 1: x10, 2: x100, 3: x1,000

9.3.2 Extended Parameter Teaching(APM_SEP)

This is used to change extended parameter, instead of using APM software package.

Type	Parameter	Data type	Description
<div> <div>APM_SEP</div> <div>APM_SEP</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div> <div> <div>EP_NO</div> <div>0</div> </div> <div> <div>EP_VAL</div> <div>AL</div> </div>	EP_NO	UDINT	Extended parameter item to execute change
	EP_VAL	USINT	Extended parameter setting value to execute change

▷ The parameter value modified by extended parameter teaching function block is valid only when the power is on. To save the parameter value modified by extended parameter teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation data save function block(APM_WRT) into the flash memory(ROM) after the extended parameter teaching.

▷ The extended parameter items and setting values are as follows.

Item		Setting value
1	Software high limit	-2,147,483,648 ~ 2,147,483,647
2	Software low limit	
3	Backlash compensation amount	0 ~ 65,535
4	Positioning end output time	
5	S-Curve ratio	1 ~ 100
6	External command selection	0: start, 1: jog, 2: skip
7	Pulse output direction	0: forward, 1: reverse
8	Acc./dec. pattern	0: trapezoid, 1: S-Curve
9	M code mode	0: None, 1: With, 2: After
10	Position indication during constant speed operation	0: no indication, 1: indication
11	High/low limit detection during constant speed operation	0: not detection, 1: detection
12	External speed/position switching control enabled	0: disabled, 1: enabled
13	External command enabled	0: disabled, 1: enabled
14	External stop enabled	0: disabled, 1: enabled
15	External simultaneous start enabled	0: disabled, 1: enabled
16	Positioning end condition	0: dwell time, 1: in-position signal 2: dwell time and in-position signal 3: dwell time or in-position signal
17	Drive ready/in-position selection	0: drive ready, 1: in-position

9.3.3 Homing Parameter Teaching(APM_SHP)

This is used to change homing parameter, instead of using APM software package.

Type	Parameter	Data type	Description
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> APM_SHP APM_SHP REQ DONE BASE STAT SLOT AXIS HP_N 0 HP_V AL </div>	HP_NO	UDINT	Homing parameter item to change
	HP_VAL	USINT	Homing parameter setting value to change

▷ The parameter value modified by homing parameter teaching function block is valid only when the power is on. To save the parameter value modified by homing parameter teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation data save function block(APM_WRT) into the flash memory(ROM) after the homing parameter teaching.

▷ The homing parameter items and setting values are as follows.

Items		Setting value
1	Homing address(position)	-2,147,483,648 ~ 2,147,483,647
2	Homing high speed	Open collector: 1 ~ 200,000 Line driver: 1 ~ 1,000,000
3	Homing low speed	
4	Homing acc./dec. speed time	0 ~ 65,535
5	Homing dwell time	0 ~ 50,000
6	Homing compensation amount	-2,147,483,648 ~ 2,147,483,647
7	Homing restart time	0 ~ 65,535
8	Homing method	0: DOG/origin(Off), 1: DOG/origin(On) 2: high/low limit/origin, 3: DOG 4. high speed homing, 5. High/low limit
9	Homing direction	0: forward, 1: reverse

※ DOG indicates near point signal.

High speed homing executes homing to the point where the current position is 0.

9.3.4 Manual Operation Parameter Teaching(APM_SMP)

This is used to change Manual Operation parameter, instead of using APM software package.

Type	Parameter	Data type	Description
<div> <div>APM_SMP</div> <div>APM_SMP</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> <div>MP_N</div> <div>MP_VAL</div> </div>	MP_NO	UDINT	Manual operation parameter item to change
	MP_VAL	USINT	Manual operation parameter setting value to change

▷ The parameter value modified by manual operation parameter teaching function block is valid only when the power is on. To save the parameter value modified by manual operation parameter teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation data save function block(APM_WRT) into the flash memory(ROM) after the manual operation parameter teaching.

▷ The manual operation parameter items and setting values are as follows.

Items		Setting values
1	JOG high speed	Open collector: 1 ~ 200,000 Line driver: 1 ~ 1,000,000
2	JOG low speed	
3	JOG acc./dec. time	0 ~ 65,535
4	Inching speed	0 ~ 65,535

9.3.5 Input Signal Parameter Teaching(APM_SIP)

This is used to change input signal parameter, instead of using APM software package.

Type	Parameter	Data type	Description
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> APM_SIP APM_SIP REQ DONE BASE STAT SLOT AXIS IP_VAL AL </div>	IP_VAL	USINT	Input signal parameter setting value to change

▷ The parameter value modified by input signal parameter teaching function block is valid only when the power is on. To save the parameter value modified by input signal parameter teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation data save function block(APM_WRT) into the flash memory(ROM) after the input signal parameter teaching.

▷ The manual operation parameter items and setting values are as follows.

Bit	Input signal	Bit	Input signal
0	High limit signal	8	Speed/position switching control signal
1	Low limit signal	9	Drive ready/in-position signal
2	Near point signal	A	External simultaneous start signal
3	Origin signal	B	-
4	Emergency stop signal	C	-
5	Dec. stop signal	D	-
6	Command signal	E	-
7	Auxiliary command signal	F	-

It operates with A contact if the value of each bit is 0; or with B contact if 1. For instance, if the value of input signal parameter is h0213, the high limit signal, low limit signal, emergency stop signal and drive ready/in-position signal operate with B contact.

Chapter 9 Function Block

9.3.6 Common Parameter Teaching(APM_SCP)

This is used to change manual operation parameter, instead of using APM software package.

Type	Parameter	Data type	Description
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> APM_SCP APM_SCP REQ DONE BASE STAT SLOT AXIS CP_NO CP_VAL ENC_LD </div>	CP_NO	UDINT	Manual operation parameter item to change
	CP_VAL	USINT	Manual operation parameter setting value to change
	ENC_LD	UDINT	Encoder Auto Reload setting value

▷ The parameter value modified by common parameter teaching function block is valid only when the power is on. To save the parameter value modified by common parameter teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation data save function block(APM_WRT) into the flash memory(ROM) after the input signal parameter teaching.

▷ The common parameter items and setting values are as follows.

Bit	Items	Setting values
1	Pulse output level	0: Low Active, 1: High Active
2	Circular interpolation method	0: middle point, 1: center point
3	Encoder pulse input mode	0: CW/CCW(1 phase 1 multiplier) 1: CW/CCW(1 phase 2 multiplier) 2: PLS/Dir(1 phase 1 multiplier) 3: PLS/Dir(1 phase 2 multiplier) 4: PHASE A/B(2 phase 1 multiplier) 5: PHASE A/B(2 phase 2 multiplier) 6: PHASE A/B(2 phase 4 multiplier)
4	Encoder Auto Reload value	0 ~ 4,294,967,295
5	Zone output mode	0: individual output, 1: collective output
6	Zone 1 axis setting	0: X, 1: Y, 2: Z, 3: encoder
7	Zone 2 axis setting	
8	Zone 3 axis setting	
9	Zone 1 On area	-2,147,483,648 ~ 2,147,483,647
10	Zone 1 Off area	
11	Zone 2 On area	
12	Zone 2 Off area	
13	Zone 3 On area	
14	Zone 3 Off area	

※ When setting encoder auto reload value, it is necessary to input “4” to the encoder auto reload setting value to “CP_NO” and “the auto reload setting value” to “ENC_LD” and execute the function block in order to set the encoder auto reload value. If entering “4” into “CP_NO” and executing the function block, the “CP_VAL” setting value is ignored.

9.4 Operation Data Teaching Function Block

9.4.1 Operation Data Teaching(APM_SMD)

This is used to change operation data, instead of using APM software package.

Type	Parameter	Data type	Description
APM_SMD APM_SMD REQ - DONE BASE STAT SLOT AXIS STEP MD_N O MD_V AL	STEP	UINT	Operation data step No. to change • Setting range: 0 ~ 400
	BP_NO	UDINT	Operation data item to change
	BP_VAL	USINT	Operation data setting value to change

▷ The parameter value modified by operation data teaching function block is valid only when the power is on. To save the parameter value modified by operation data teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation data save function block(APM_WRT) into the flash memory(ROM) after the basic parameter teaching.

▷ If entering 0 into“STEP”, it changes the current step.

▷ The operation data items and setting values are as follows.

Items		Setting values
1	Goal position	-2,147,483,648 ~ 2,147,483,647
2	Circular interpolation auxiliary position	-2,147,483,648 ~ 2,147,483,647
3	Operation speed	0 ~ max. speed(speed limit setting value)
4	Dwell time	0 ~ 50,000
5	M code number	0 ~ 65,535
6	Control method	0: position control, 1: speed control
7	Operation method	0: single, 1: repeat
8	Operation pattern	0: End, 1: Go-on, 2: continuous
9	Coordinate	0: absolute coordinate, 1: relative coordinate
10	Acc./Dec. number	1 ~ 4
11	Circular interpolation direction	0: CW, 1: CCW

9.4.2 Single Teaching(APM_TEA)

This is used to change the speed or position of operation data, instead of using APM software package.

Type	Parameter	Data type	Description
<div> <div>APM_TEA</div> <div>APM_TEA_REQ</div> <div>APM_TEA_DONE</div> <div>BASE_STAT</div> <div>SLOT</div> <div>AXIS</div> <div>STEP</div> <div>RAM_ROM</div> <div>POS_SPD</div> <div>TEA_VAL</div> </div>	STEP	UINT	Operation data step No. to change <ul style="list-style-type: none"> Setting range: 0 ~ 400 If any other value out of the range is set, it generates "error 11"
	RAM_ROM	BOOL	Select RAM or ROM teaching <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: RAM, 1: ROM)
	POS_SPD	BOOL	Select position/speed teaching <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: position, 1: speed)
	TEA_VAL	DINT	Teaching data setting <ul style="list-style-type: none"> Position teaching range: -2,147,483,648 ~ 2,147,483,647 Speed teaching range <ul style="list-style-type: none"> Open collector: 0 ~ 200,000 Line driver: 0 ~ 1,000,000 If any other value out of the range is set, it generates "error 11"

▷ If entering "0" to "STEP", it changes the current step.

9.4.3 Teaching Array(APM_ATEA)

This is used to change the speed or position of operation data, instead of using APM software package. Up to 16 continuous step data can be changed.

Type	Parameter	Data type	Description
<div> <div>APM_ATEA</div> <div>APM_ATEA_REQ</div> <div>APM_ATEA_DONE</div> <div>BASE_STAT</div> <div>SLOT</div> <div>AXIS</div> <div>STEP</div> <div>RAM_ROM</div> <div>POS_SPD</div> <div>TEA_CNT</div> <div>ATEA_VAL</div> </div>	STEP	UINT	Operation data step No. to change <ul style="list-style-type: none"> Setting range: 0 ~ 400 If any other value out of the range is set, it generates "error 11"
	RAM_ROM	BOOL	Select RAM or ROM teaching <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: RAM, 1: ROM)
	POS_SPD	BOOL	Select position or speed teaching <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: position, 1: speed)
	TEA_CNT	USINT	Select the no. of continuous step to execute teaching <ul style="list-style-type: none"> Setting range: 1 ~ 16 If any other value out of the range is set, it generates "error 11"
	ATEA_VAL	ARRAY [0..15] OF DINT	Teaching data setting <ul style="list-style-type: none"> Position teaching range: -2,147,483,648 ~ 2,147,483,647 Speed teaching range <ul style="list-style-type: none"> Open collector: 0 ~ 200,000 Line driver: 0 ~ 1,000,000 If any other value out of the range is set, it generates "error 11" Teaching data is valid as many as set in TEA_CNT

▷ If entering 0 into "STEP", it changes the current step.

9.5 Save Function Block

9.5.1 Parameter/Operation Data Save(APM_WRT)

This is used to save the setting value of an item changed by parameter teaching and operation data into ROM(flash memory).

Type	Parameter	Data type	Description
<div> <div>APM_WRT</div> <div>APM_WRT</div> <div>REQ</div> <div>DONE</div> <div>BASE</div> <div>STAT</div> <div>SLOT</div> <div>AXIS</div> <div>WRT</div> <div>AXIS</div> </div>	WRT_AXIS	USINT	Select an axis to save <ul style="list-style-type: none"> • Setting range: 0 ~ 1(0: X, 1: Y, 2: Z) • If any other value out of the range is set, it generates "error 11"

▷ Since data will be written into the flash memory if executing the parameter/operation data save function block, the changed parameter and operation data are maintained even if the power is off(writing data to flash memory is limited 100,000 frequency)

9.6 Start Function block

9.6.1 Homing Start(APM_ORG)

Type	Description
<div> <div>APM_ORG</div> <div>APM_ORG</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div>	<p>It is used to execute homing operation with the value set in the homing parameter of each axis. Homing is complete if the origin determination bit(ST1[4]) of the current operation state bit information read(APM_SRD) is 1(On).</p>

9.6.2 Direct Start(APM_DST)

It is used to operate by setting goal position, operation speed, dwell time, M code number, position/speed control, absolute/relative coordinate and acc./dec. time number, instead of relying on the operation data saved in ROM(flash memory).

Type	Parameter	Data type	Description
<div> <div>APM_DST</div> <div>APM_DST</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div> <div> <div>ADDR</div> </div> <div> <div>SPEED</div> </div> <div> <div>DWELL</div> </div> <div> <div>MCODE</div> </div> <div> <div>POS_SPD</div> </div> <div> <div>ABS_INC</div> </div> <div> <div>TIME_SEL</div> </div>	ADDR	DINT	<p>Goal address(position)</p> <ul style="list-style-type: none"> Setting range: -2,147,483,648 ~ 2,147,483,647
	SPEED	UDINT	<p>Operation speed</p> <ul style="list-style-type: none"> Setting range <ul style="list-style-type: none"> Open collector: 0 ~ 200,000 Line driver: 0 ~ 1,000,000 If any other value out of the setting range is set, it generates "Error 11".
	DWELL	DINT	<p>Dwell time</p> <ul style="list-style-type: none"> Setting range: 0 ~ 50,000 If any other value out of the setting range is set, it generates "Error 11".
	MCODE	UINT	<p>M code number</p> <ul style="list-style-type: none"> Setting range: 0 ~ 65,635
	POS_SPD	BOOL	<p>Position/Speed control selection</p> <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: position, 1: speed)
	ABS_INC	BOOL	<p>Absolute/relative coordinate selection</p> <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: absolute, 1: relative)
	TIME_SEL	USINT	<p>Acc./Dec. time number setting</p> <ul style="list-style-type: none"> Setting range: 0 ~ 3 <ul style="list-style-type: none"> 0: Acc./Dec. time 1, 1: Acc./Dec. time 2, 2: Acc./Dec. time 3, 3: Acc./Dec. time 4 If any other value out of the setting range is set, it generates "Error 11".

9.6.3 Indirect Start(APM_IST)

It is used to operate with the operation data saved in ROM(flash memory).

Type	Parameter	Data type	Description
<div> <div>APM_IST</div> <div>APM_IST</div> <div>REQ</div> <div>DONE</div> <div>BASE</div> <div>STAT</div> <div>SLOT</div> <div>AXIS</div> <div>STEP</div> </div>	STEP	UINT	Operation step number <ul style="list-style-type: none"> Setting range: 0 ~ 400 If any other value out of the setting range is set, it generates "Error 11".

If entering 0 into "STEP", it operates for the current step.

9.6.4 Linear Interpolation Start(APM_LIN)

It is used to execute 2/3 axis linear interpolation operation.

Type	Parameter	Data type	Description																												
<div><div>APM_LIN</div><div>APM_LIN</div><div>REQ</div><div>DONE</div><div>BASE</div><div>STAT</div><div>SLOT</div><div>LIN</div><div>AXIS</div><div>STEP</div></div>	LIN_AXIS	USINT	<div>Interpolation operation axis</div> <div>● Setting range: 1 ~ 7(excluding 1, 2 and 4)</div> <table><tr><th colspan="3">Axis information</th><th rowspan="2">Setting value</th><th rowspan="2">Operation axis</th></tr><tr><th>Z axis(Bit2)</th><th>Y axis(Bit1)</th><th>X axis(Bit0)</th></tr><tr><td>Off(0)</td><td>On(1)</td><td>On(1)</td><td>3</td><td>X, Y</td></tr><tr><td>On(1)</td><td>Off(0)</td><td>On(1)</td><td>5</td><td>X, Z</td></tr><tr><td>On(1)</td><td>On(1)</td><td>Off(0)</td><td>6</td><td>Y, Z</td></tr><tr><td>On(1)</td><td>On(1)</td><td>On(1)</td><td>7</td><td>X, Y, Z</td></tr></table> <div>● If any other value out of the setting range is set, it generates “Error 6”.</div>	Axis information			Setting value	Operation axis	Z axis(Bit2)	Y axis(Bit1)	X axis(Bit0)	Off(0)	On(1)	On(1)	3	X, Y	On(1)	Off(0)	On(1)	5	X, Z	On(1)	On(1)	Off(0)	6	Y, Z	On(1)	On(1)	On(1)	7	X, Y, Z
	Axis information			Setting value	Operation axis																										
Z axis(Bit2)	Y axis(Bit1)	X axis(Bit0)																													
Off(0)	On(1)	On(1)	3	X, Y																											
On(1)	Off(0)	On(1)	5	X, Z																											
On(1)	On(1)	Off(0)	6	Y, Z																											
On(1)	On(1)	On(1)	7	X, Y, Z																											
	STEP	UINT	<div>Operation step No.</div> <div>● Setting range: 0 ~ 400</div> <div>● If any other value out of the setting range is set, it generates “Error 11”.</div>																												

If entering 0 into "STEP", it operates for the current step.

9.6.5 Circular Interpolation Start(APM_CIN)

It is used to execute 3 axis circular interpolation operation.

Type	Parameter	Data type	Description
<div> <div>APM_CIN</div> <div>APM_CIN</div> <div>REQ</div> <div>DONE</div> <div>BASE</div> <div>STAT</div> <div>SLOT</div> <div>MST</div> <div>AXIS</div> <div>SLV</div> <div>AXIS</div> <div>STEP</div> </div>	MST_AXIS	USINT	Main axis <ul style="list-style-type: none"> Setting range: 1 ~ 0(0: X axis, 1: Y axis, 2: Z axis) If any other value out of the setting range is set, it generates "Error 6".
	SLV_AXIS	USINT	Subordinate axis <ul style="list-style-type: none"> Setting range: 1 ~ 0(0: X axis, 1: Y axis, 2: Z axis) If any other value out of the setting range is set, it generates "Error 6".
	STEP	UINT	Operation step No. <ul style="list-style-type: none"> Setting range: 0 ~ 400 If any other value out of the setting range is set, it generates "Error 11".

If entering 0 into "STEP", it operates for the current step.

9.6.6 Simultaneous Start(APM_SST)

It is used to execute 3 axis circular interpolation operation.

Type	Parameter	Data type	Description																												
<div><div>APM_SST</div><div>APM_SST</div><div>REQ</div><div>DONE</div><div>BASE</div><div>STAT</div><div>SLOT</div><div>AXIS</div><div>X_STEP</div><div>Y_STEP</div><div>Z_STEP</div></div>	SST_AXIS	USINT	<div>Simultaneous start operation axis</div> <div>● Setting range: 1 ~ 7(excluding 1, 2 and 4)</div> <table><tr><th colspan="3">Axis information</th><th rowspan="2">Setting value</th><th rowspan="2">Operation axis</th></tr><tr><th>Z axis(Bit2)</th><th>Y axis(Bit1)</th><th>X axis(Bit0)</th></tr><tr><td>Off(0)</td><td>On(1)</td><td>On(1)</td><td>3</td><td>X, Y</td></tr><tr><td>On(1)</td><td>Off(0)</td><td>On(1)</td><td>5</td><td>X, Z</td></tr><tr><td>On(1)</td><td>On(1)</td><td>Off(0)</td><td>6</td><td>Y, Z</td></tr><tr><td>On(1)</td><td>On(1)</td><td>On(1)</td><td>7</td><td>X, Y, Z</td></tr></table> <div>● If any other value out of the setting range is set, it generates “Error 6”.</div>	Axis information			Setting value	Operation axis	Z axis(Bit2)	Y axis(Bit1)	X axis(Bit0)	Off(0)	On(1)	On(1)	3	X, Y	On(1)	Off(0)	On(1)	5	X, Z	On(1)	On(1)	Off(0)	6	Y, Z	On(1)	On(1)	On(1)	7	X, Y, Z
	Axis information			Setting value	Operation axis																										
	Z axis(Bit2)	Y axis(Bit1)	X axis(Bit0)																												
	Off(0)	On(1)	On(1)	3	X, Y																										
	On(1)	Off(0)	On(1)	5	X, Z																										
On(1)	On(1)	Off(0)	6	Y, Z																											
On(1)	On(1)	On(1)	7	X, Y, Z																											
X_STEP	UINT	<div>Operation step No.</div> <div>● Setting range: 0 ~ 400</div> <div>● If any other value out of the setting range is set, it generates “Error 11”.</div>																													
Y_STEP	UINT	<div>Operation step No.</div> <div>● Setting range: 0 ~ 400</div> <div>● If any other value out of the setting range is set, it generates “Error 11”.</div>																													
Z_STEP	UINT	<div>Operation step No.</div> <div>● Setting range: 0 ~ 400</div> <div>● If any other value out of the setting range is set, it generates “Error 11”.</div>																													

If entering 0 into "X_STEP", "Y_STEP", "Z_STEP", it operates for the current step.

9.6.7 Point Start(APM_PST)

It is used to execute continuous operation for the preset operation step. Up to 20 operation steps, point step can be executed.

Type	Parameter	Data type	Description
<div> <div>APM_PST</div> <div>APM_PST</div> <div>REQ</div> <div>DONE</div> <div>BASE</div> <div>STAT</div> <div>SLOT</div> <div>AXIS</div> <div>PST_CNT</div> <div>PST_VAL</div> </div>	PST_CNT	USINT	No. of operation step for point start • Setting range: 1 ~ 20 • If any other value out of the setting range is set, it generates "Error 6".
	PST_VAL	ARRAY [0..19] OF UINT	No. of operation step for point start • Setting range: 0 ~ 400 • If any other value out of the setting range is set, it generates "Error 6".

If entering 0 into "STEP", it operates for the current step.

9.7 Manual Operation Function Block

9.7.1 JOG Operation(APM_JOG)

As the manual operation function for operation test, it is used for operation by a user, system operation, wiring state inspection and position check for teaching, and it can be divided by high and low speed. It operates with the set values if the connection condition of input value "REQ" is On; it stops if Off.

Type	Parameter	Data type	Description
<div> <div>APM_JOG</div> <div>APM_JOG</div> <div>REQ</div> <div>DONE</div> <div>BASE_STAT</div> <div>SLOT</div> <div>AXIS</div> <div>JOG_DIR</div> <div>LOW_HIGH</div> </div>	JOG_DIR	BOOL	JOG operation direction <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: forward, 1: reverse)
	LOW_HIGH	BOOL	Select JOG operation low/high speed <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: low speed, 1: high speed)

9.7.2 Inching Operation(APM_INC)

It is the manual operation executed by quantitative operation for a minute movement.

Type	Parameter	Data type	Description
<div> <div>APM_INC</div> <div>APM_INC</div> <div>REQ</div> <div>DONE</div> <div>BASE_STAT</div> <div>SLOT</div> <div>AXIS</div> <div>INCH_VAL</div> </div>	INCH_VAL	DINT	Inching transfer amount <ul style="list-style-type: none"> Setting range: -2,147,483,648 ~ 2,147,483,647

Inching speed can be changed by manual operation parameter.

9.7.3 Manual Pulse Generator Operation(APM_MPG)

It is used to operate it by using MPG externally installed. If the function block is executed, it becomes standby for external pulse input and starts operation as soon as external pulse is entered.

Type	Parameter	Data type	Description
<div> <div>APM_MPG</div> <div>APM_MPG</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div> <div> <div>MPG_EN</div> </div>	MPG_EN	BOOL	Select MPG operation disabled/enabled. • Setting Range: 0 ~ 1(0: disabled, 1: enabled)

9.7.4 Returning to Previous Manual Operation Position(APM_RTP)

Type	Description
<div> <div>APM_RTP</div> <div>APM_RTP</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div>	It is used to return to the previous manual operation position when the position is changed to the manual operation(JOG operation, Inching operation and MPG operation).

9.8 Auxiliary Operation Function Blocks

9.8.1 Position Synchronization(APM_SSP)

If setting the main axis and its goal position for the axis to execute position synchronization operation and executing the function block, the operation step set in the function block is executed when the main axis reaches to the goal position.

Type	Parameter	Data type	Description
<div> <div>APM_SSP</div> <div>APM_SSP REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> <div>STEP</div> <div>MST_AXIS</div> <div>MST_ADDR</div> </div>	STEP	UINT	Operation step number <ul style="list-style-type: none"> Setting range: 0 ~ 400 If any other value out of the setting range is set, it generates "Error 11".
	MST_AXIS	USINT	Main axis <ul style="list-style-type: none"> Setting range: 0 ~ 2(0: X axis, 1: Y axis, 2: Z axis) If any other value out of the setting range is set, it generates "Error 6".
	MST_ADDR	DINT	Goal position of main axis <ul style="list-style-type: none"> Setting range: -2,147,483,648 ~ 2,147,483,647


9.8.2 Speed Synchronization(APM_SSS)

It is used to operate at the operation speed ratio between main axis and subordinate axis. If setting the axis(subordinate) to execute speed synchronous operation and executing the function block, the subordinate axis becomes operation standby. If executing the operation of main axis, it is operated at the speed ratio set in the function block. The speed ratio should be set so that the speed ratio of subordinate axis to main axis ≤ 1 .

Type	Parameter	Data type	Description
<div> <div>APM_SSS</div> <div>APM_SSS REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> <div>MST_AXIS</div> <div>MST_RAT</div> <div>SLV_RAT</div> </div>	MST_AXIS	USINT	Main axis <ul style="list-style-type: none"> Setting range: 0 ~ 3(0: X axis, 1: Y axis, 2: Z axis, 3: encoder) If any other value out of the setting range is set, it generates "Error 6".
	MST_RAT	UINT	Speed ratio of main axis <ul style="list-style-type: none"> Setting range: 1 ~ 65,535
	SLV_RAT	UINT	Speed ratio of subordinate axis <ul style="list-style-type: none"> Setting range: 1 ~ 65,535

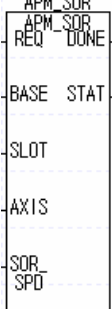
9.8.3 Position Override(APM_POR)

If setting the goal position of an axis in operation to change and executing the function block, the operation is executed to the set goal position.

Type	Parameter	Data type	Description
	POR_ADDR	DINT	Position <ul style="list-style-type: none"> Setting range: -2,147,483,648 ~ 2,147,483,647

9.8.4 Speed Override(APM_SOR)

If setting the goal speed of an axis in operation to change and executing the function block, the operation is executed to the set goal speed.

Type	Parameter	Data type	Description
	SOR_SPD	UDINT	Operation speed <ul style="list-style-type: none"> Setting range <ul style="list-style-type: none"> Open collector: 0 ~ 200,000 Line drover: 0 ~ 1,000,000 If any other value out of the setting range is set, it generates "Error 11".

9.8.5 Position Assigned Speed Override(APM_PSO)

If setting the goal position of an axis in operation for the operation speed/position and executing the function block, the operation speed is changed to the preset operation speed set in the goal position.

Type	Parameter	Data type	Description
<div> <div>APM_PSO</div> <div>APM_PSO</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div> <div> <div>PSO_ADDR</div> </div> <div> <div>PSO_SPD</div> </div>	PSO_ADDR	DINT	Goal Position <ul style="list-style-type: none"> Setting Range: -2,147,483,648 ~ 2,147,483,647
	PSO_SPD	UDINT	Operation Speed <ul style="list-style-type: none"> Setting Range <ul style="list-style-type: none"> Open collector: 0 ~ 200,000 Line driver: 0 ~ 1,000,000 If any other value out of the setting range is set, it generates "Error 11".

9.8.6 Position/Speed Switching Control(APM_PTV)

Type	Description
<div> <div>APM_PTV</div> <div>APM_PTV</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div>	If executing the function block to an axis in position control operation, it is changed to speed control operation and operated accordingly. If the function block is executed, the origin is not determined and it starts operating at the speed set in the operation data.

9.8.7 Speed/Position Switching Control(APM_VTP)

Type	Description
<div> <div>APM_VTP</div> <div>APM_VTP</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div>	If the function block is executed to an axis in speed control operation, it is changed to position control operation and operated accordingly. As soon as the function block is executed, the origin is determined and the positioning is complete after operating to the goal position set in the operation data.

9.8.8 Skip Operation(APM_SKP)

Type	Description
<div> <div>APM_SKP</div> <div>APM_SKP</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> </div>	<p>If executing the function block to an axis in indirect start operation, it stops the operation of the current operation step and keeps the next step operation.</p>

9.8.9 Continuous Operation(APM_NMV)

Type	Description
<div> <div>APM_NMV</div> <div>APM_NMV</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> </div>	<p>If executing the function block to an axis in indirect start operation, the current operation step is changed to the next step, and the next step operation step is switched to speed override and operated to the origin position. The continuous operation changes the only operation pattern of the step in execution and does not change the operation data itself.</p>

9.8.10 Start Step Number Change(APM_SNS)

If setting the operation step No and executing the function block, the operation step to start indirect start is changed. If setting the operation step No. of indirect start to 0 and executing/completing the indirect start, the current step is changed to the next step(end operation, single operation) of the indirect start operation step, so it is usefully used to start indirect start by a certain operation step.

Type	Parameter	Data type	Description
<div> <div>APM_SNS</div> <div>APM_SNS</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> <div>STEP</div> </div>	STEP	UINT	<p>Operation step No.</p> <ul style="list-style-type: none"> Setting range: 1 ~ 400 If any other value out of the setting range is set, it generates "Error 11".

9.8.11 Repeat Step No. Change(APM_SRS)

If setting the operation step No. and executing the function block and completing the operation of a step set as repeat operation, the it is changed to the operation step set by the current operation step No. If the repeat operation is complete, the current operation step is changed to No.1 step, so it is used to execute repeat operation with a specific operation step.

Type	Parameter	Data type	Description
<div> <div>APM_SRS</div> <div>APM_SRS</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> <div>STEP</div> </div>	STEP	UINT	Operation Step No. • Setting range: 1 ~ 400 • If any other value out of the setting range is set, it generates "Error 11".

9.8.12 Deceleration Stop(APM_STP)

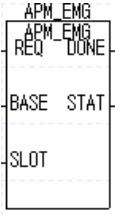
If setting the deceleration time to an axis in operation and executing the function block, it executes the deceleration stop at the deceleration stop in the set deceleration time. If the deceleration time is set to 0, it executes deceleration stop in the acc./dec. time set in the operation of indirect start or direct start.

Type	Variable	Data type	Description
<div> <div>APM_STP</div> <div>APM_STP</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> <div>DEC TIME</div> </div>	DEC_TIME	UINT	Deceleration time • Setting Range: 0 ~ 65,535

The deceleration time means the time required from the speed limit of basic parameter to stop. That is, since the actual operation speed is equal to or less than the speed limit, the time required from the start of deceleration stop to stop is equal to or less than the deceleration time of deceleration stop.

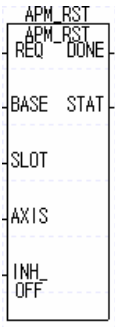
9.9 Error Function blocks

9.9.1 Emergency Stop(APM_EMG)

Type	Description
	<p>If executing the function block, every axis stops. It is used to immediately stop operation in an emergency state; if the emergency stop is executed, it becomes error, output disabled and not determined origin state. To resume operation, it is necessary to execute error reset/output disabled release function block and determine the origin again.</p>

9.9.2 Error Reset/Output Disabled Release(APM_RST)

If setting the output disable release to an axis with an error and executing the function block, the error reset and output disabled are released. For an error with output disabled, to release the output disabled state, it is necessary to set the output disabled release as '1' and execute the function block. For an error without output disabled, to execute error reset, it is necessary to set the output disabled release as '1' and execute the function block.

Type	Parameter	Data type	Description
	INH_OFF	BOOL	<p>Output disabled release</p> <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: output disabled not release, 1: output disabled release)

Output disabled occurs when the signal is detected and the drive ready signal is detected as OFF in case of emergency stop execution, external emergency stop signal detection and reverse wiring of high/low limit.

9.10 Other Function Blocks

9.10.1 ZONE Output Enabled/Disabled(APM_ZONE)

If setting zone output enabled and executing the function block, zone output is On(1) as long as the current position meets the zone output setting condition set in the common parameter.

Type	Parameter	Data type	Description
<div> <div>APM_ZONE</div> <div>APM_ZONE</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div> <div> <div>ZONE</div> <div>_EN</div> </div>	ZONE_EN	BOOL	Zone output enabled <ul style="list-style-type: none"> Setting range: 0 ~ 1(0: Zone output disabled, 1: Zone output enabled) Zone output: ST4, ST4[5](Zone 1), ST4[6](Zone 2), ST4[7](Zone 3), the output parameter of APM_SRD

9.10.2 M Code Release(APM_MOF)

Type	Description
<div> <div>APM_MOF</div> <div>APM_MOF</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div>	If executing the function block, M code signal of On(1) is Off(0) and M code number is 0. M code output is On(1) if setting the M code mode of extended parameter as With or After. <ul style="list-style-type: none"> M code output: ST1[3], the output parameter of APM_SRD

9.10.3 Current Position Preset(APM_PRS)

If setting the preset value and executing the function, the current position is changed to the preset value and the origin is determined again.

Type	Parameter	Data type	Description
<div> <div>APM_PRS</div> <div>APM_PRS</div> <div>REQ</div> <div>DONE</div> </div> <div> <div>BASE</div> <div>STAT</div> </div> <div> <div>SLOT</div> </div> <div> <div>AXIS</div> </div> <div> <div>PRS</div> <div>ADDR</div> </div>	PRS_ADDR	DINT	Preset value <ul style="list-style-type: none"> Setting range: -2,147,483,648 ~ 2,147,483,647

9.10.4 Floating Origin Setting(APM_FLT)

Type	Description
<div> <div>APM_FLT</div> <div>APM_FLT</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> </div>	<p>If executing a function block, the current position is determined as the origin. It is used when setting the current position as the origin, instead of executing homing operation.</p>

9.10.5 Encoder Value Preset(APM_EPRES)

If setting encoder preset value and executing function block, the encoder value is changed to the set value.

Type	Parameter	Data type	Description
<div> <div>APM_EPRES</div> <div>APM_EPRES</div> <div>REQ DONE</div> <div>BASE STAT</div> <div>SLOT</div> <div>AXIS</div> <div>EPRES_VAL</div> </div>	EPRES_VAL	UDINT	<p>Encoder preset value</p> <ul style="list-style-type: none"> Setting range: 0 ~ 4,294,967,295

9.11 Error Code of Function Block

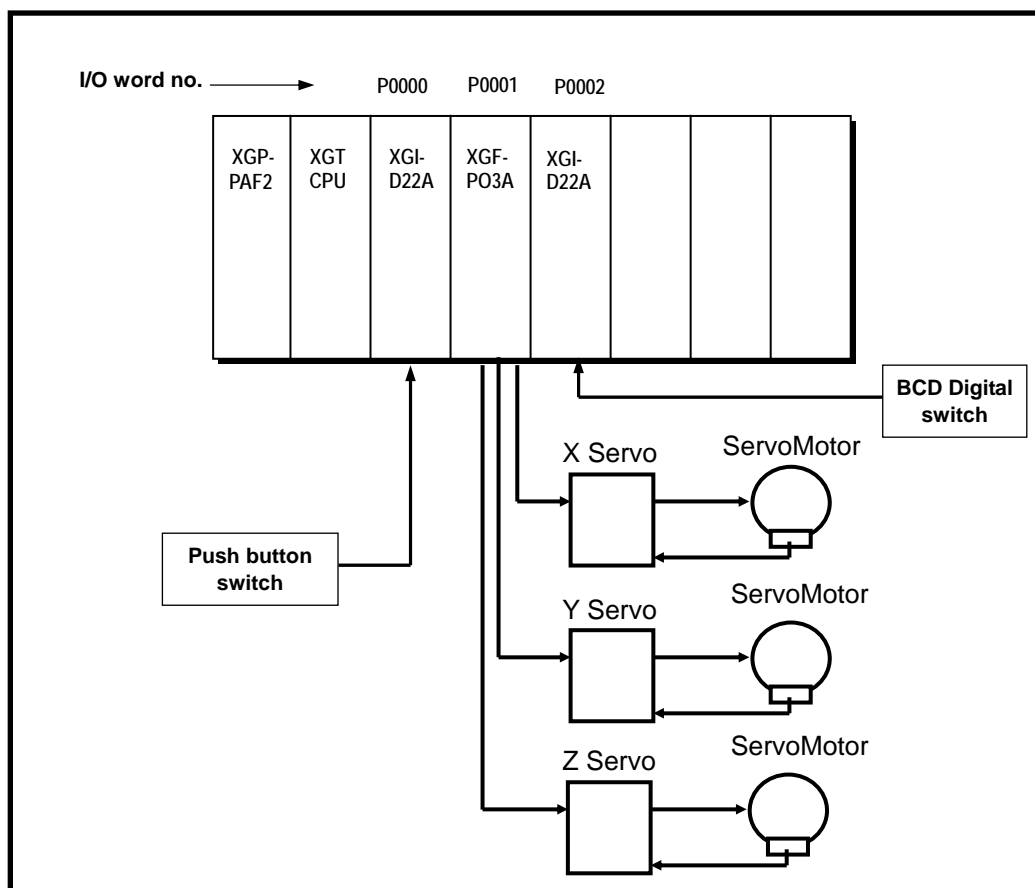
Here describes the error number, type and measure of an output parameter, STAT.

Error code	Error type	Measure
0	Normal operation	-
1	Base No. exceeding the setting range	Adjust the base No. within the setting range
2	H/W error of the base	Request for A/S service of base
3	Slot No. exceeding the setting range	Adjust the slot No. within the setting range
4	No module is installed on the slot	Install APM on the slot
5	A different module is installed on the slot	Install APM on the slot
6	The set axial number exceeding the setting range	Adjust the axis number within the setting range
7	Reserved	-
8	Common RAM error	A/S request
9	It is impossible to execute function block because a module is in operation/stop	Correct the command execution condition
10	A new function block command is executed before the previous command is not complete.	Change the program so that a new function block is executed after the previous command is complete
11	A set auxiliary input value exceeding the range	Adjust it within the setting range
12	Reserved	-
13	Stop-related or emergency stop is executed while a function block is being executed.	Error reset and output disabled release

Chapter 10 Program

10.1 Before using the Program

- ▶ Here describes the basic program that operates positioning module at XGT(XGK/XGI) CPU Module.
- ▶ Unless otherwise mentioned, the example program is prepared by PLC system configuration as below.
- ▶ [Fig.10.1] shows the case that positioning module is installed in Slot 1 at XGT(XGK/XGI) CPU Module.
- ▶ In case that it is used by installing in other slot, it is required to change the slot no. and prepare the sequence program.
- ▶ Push button switch was used as external input switch. In case of using the Toggle switch, cares should be taken.



[Fig 10.1] System Configuration of Basic Example Program

1) Description

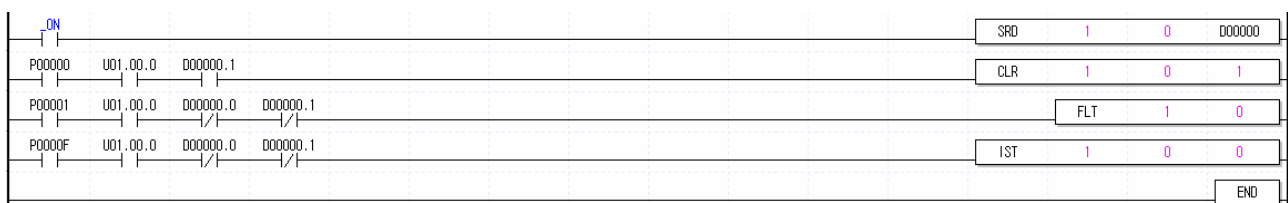
Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis floating origin setting switch
P0000F	X axis start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state info

P00001 (floating origin) switch ON => P0000F (start) switch ON 3 times

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	10000	0	0	1	1000	100	CW
	2	Absolute	Position control	End	Single	20000	0	0	1	1500	100	CW
	3	Absolute	Position control	End	Single	30000	0	0	1	2000	100	CW

The graph illustrates a speed profile with three steps. The vertical axis represents Speed in kpps, with marked values at 1kpps, 1.5kpps, and 2kpps. The horizontal axis represents Time. The profile shows three distinct speed levels: 1kpps for the first step (10000), 1.5kpps for the second step (20000), and 2kpps for the third step (30000). Each step is followed by a dwell time, indicated by horizontal double-headed arrows. Below the graph, a P000F signal is shown as a square wave, with arrows pointing to the dwell times, indicating its state during those periods.

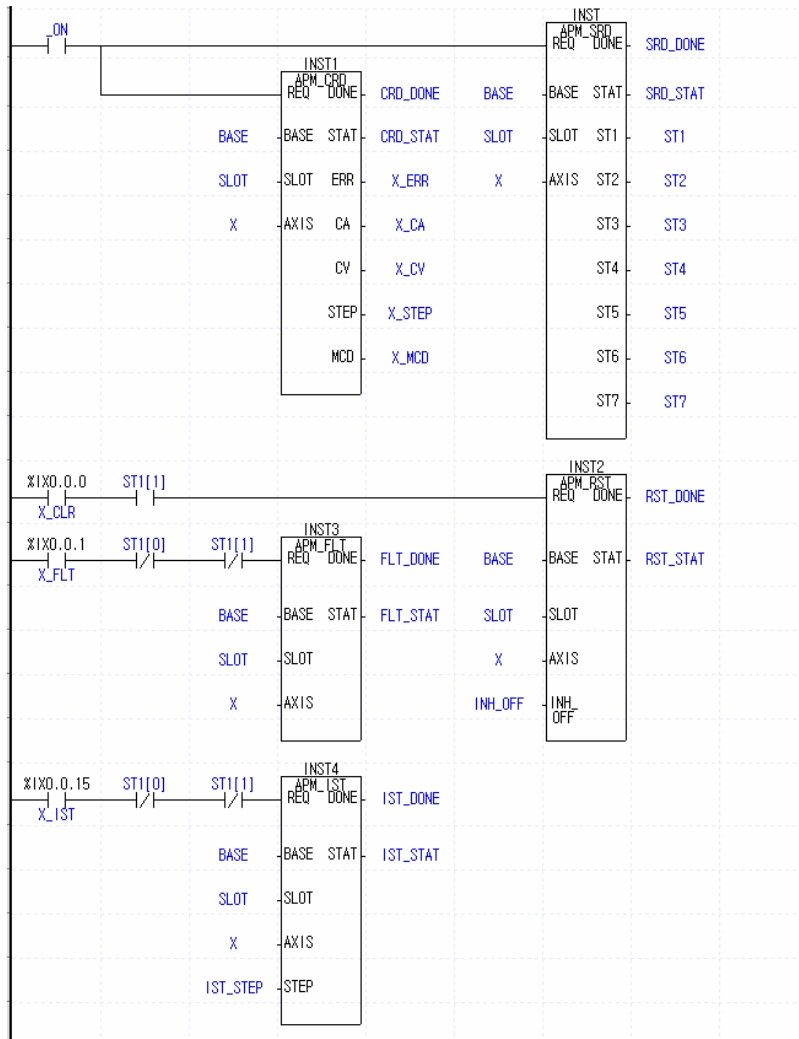
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	Signal in operation	-
ST1[1]	Error state signal	-
X_CLR	X axis reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.2 Basic (Floating origin setting - Linear interpolation Start)

1) Description

(1) The used Device

Device	Description
P00000	X axis,Y axis error reset, output disabled release switch
P00001	X axis,Y axis Floating origin setting switch
P0000F	X axis,Y axis linear interpolation Start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
U01.00.5	Y axis command receive signal
D00100.0	Y axis signal in operation
D00100.1	Y axis error state signal
D00000 ~ D00022	X axis operation state information
D00100 ~ D00122	Y axis operation state information

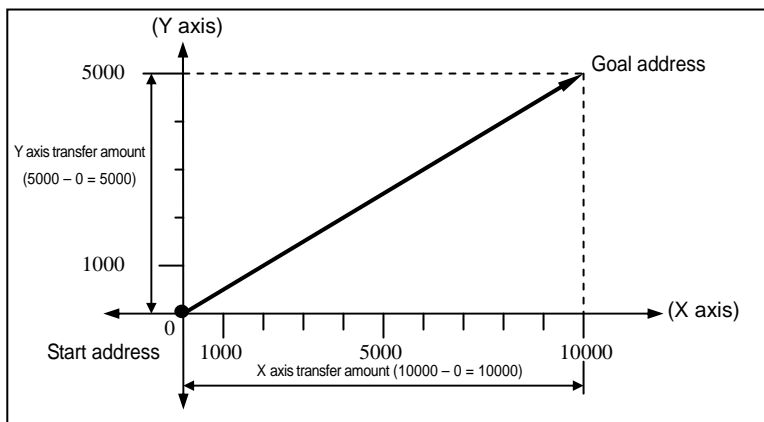
(2) Operation Sequence

P00001 (Floating origin) switch ON \Rightarrow P0000F (Linear interpolation Start) switch ON

(3) Operation data setting

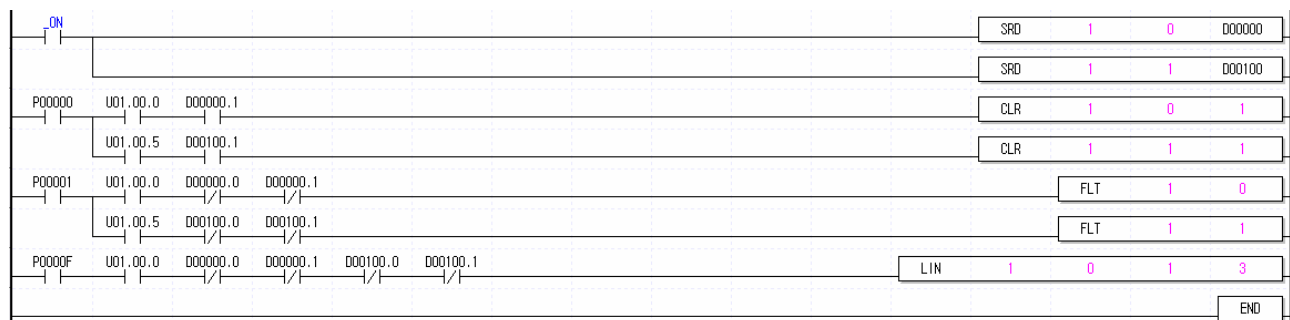
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	10000	0	0	1	1000	100	CW
Y axis setting	1	Absolute	Position control	End	Single	5000	0	0	1	1000	100	CW

(4) Operation pattern



2) Program

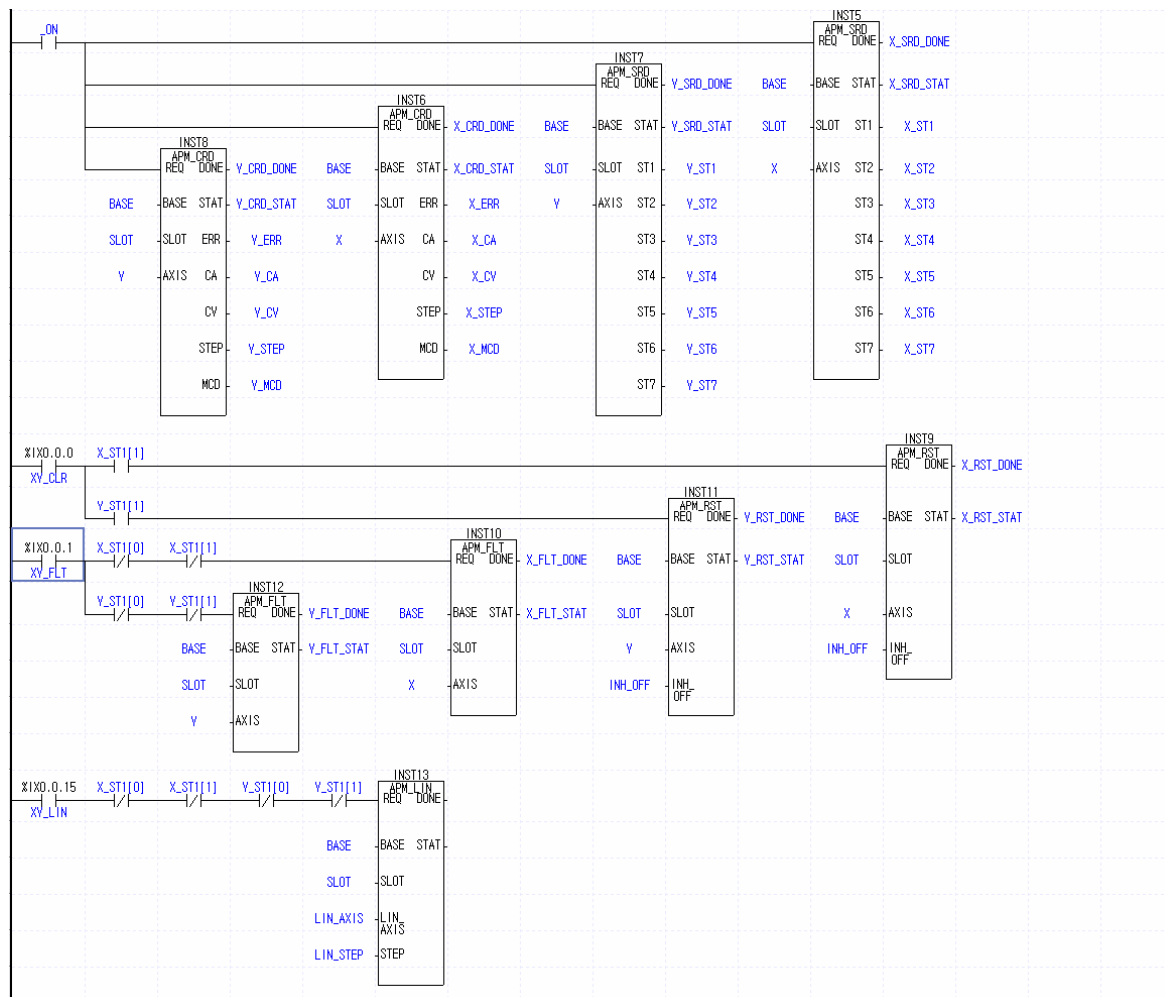
(1) XGK



Chapter 10 Program

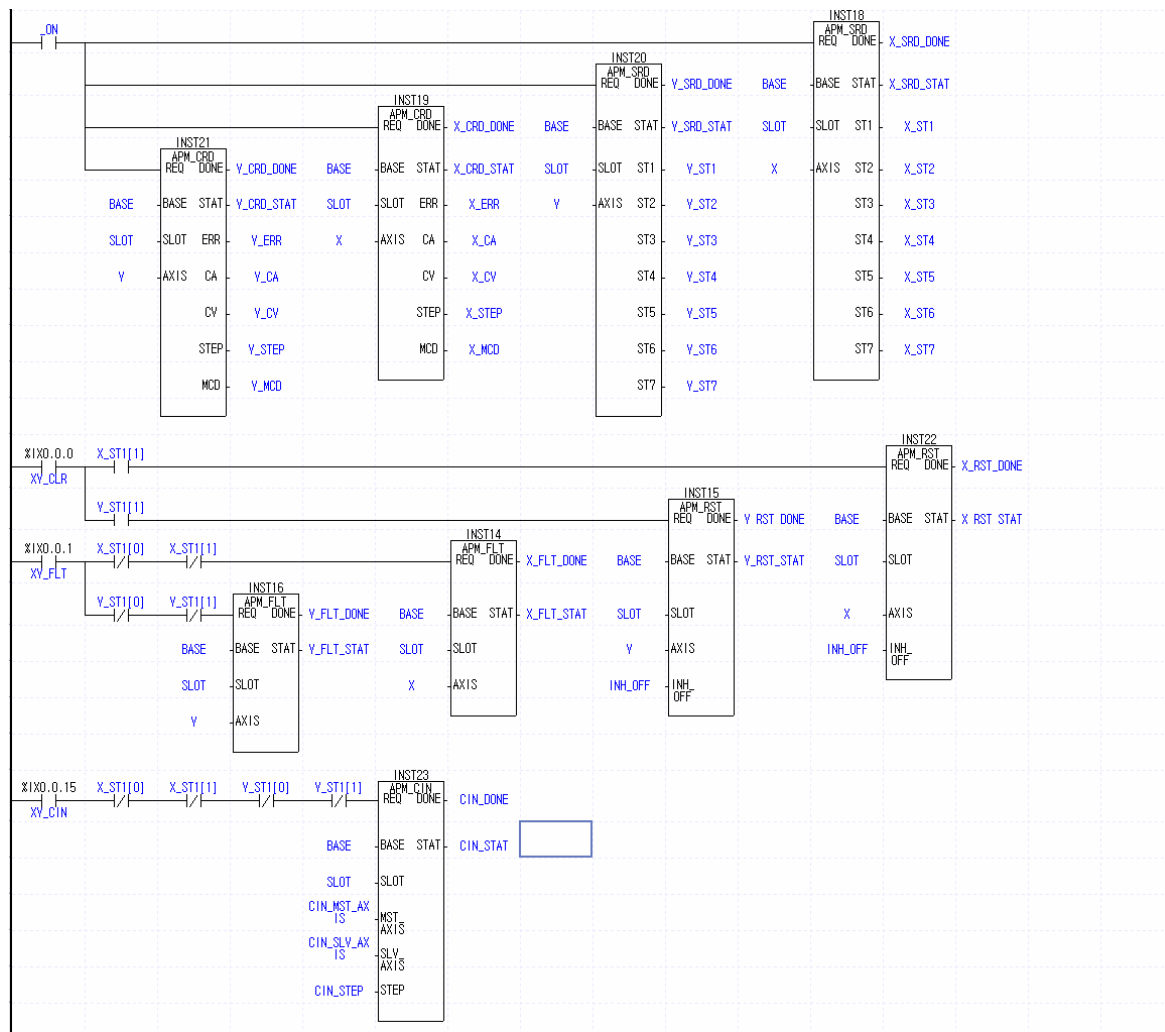
(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
Y	APM Axis to execute function block	1 (Y axis)
X_ST1[0]	X axis signal in operation	-
X_ST1[1]	X axis error state signal	-
Y_ST1[0]	Y axis signal in operation	-
Y_ST1[1]	Y axis error state signal	-
XY_CLR	Y axis/Y axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
XY_FLT	X axis/Y axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
XY_LIN	X axis/Y axis linear interpolation execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
Y	APM Axis to execute function block	1 (Y axis)
X_ST1[0]	X axis signal in operation	-
X_ST1[1]	X axis error state signal	-
Y_ST1[0]	Y axis signal in operation	-
Y_ST1[1]	Y axis error state signal	-
XY_CLR	Y axis/Y axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
XY_FLT	X axis/Y axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
XY_CIN	X axis/Y axis circular interpolation execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.4 Deceleration Stop (Homing)

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	X axis deceleration stop switch
P0000F	X axis Start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000.C	X axis signal in acceleration
D00000.D	X axis signal in constant speed
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P0001(Homing) switch ON ⇒ P000F(Start) switch ON ⇒ P0002(Deceleration Stop) switch ON ⇒ P000F(Start) switch ON

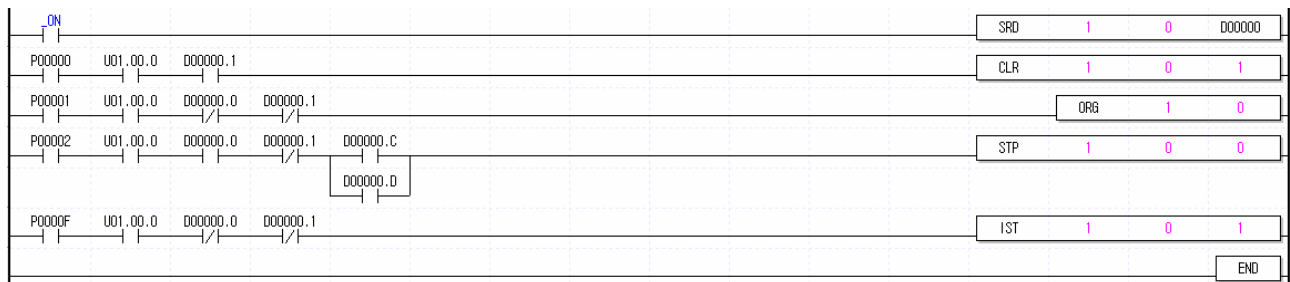
- ▷ This carries out homing by homing method set in homing/manual parameter items. (0: DOG/Origin(OFF)).
- ▷ As deceleration time is set as "0" in deceleration stop command, it carries out the deceleration by 1 acc./dec. time.

(3) Operation data setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	150000	0	0	1	1000	100	CW

2) Program

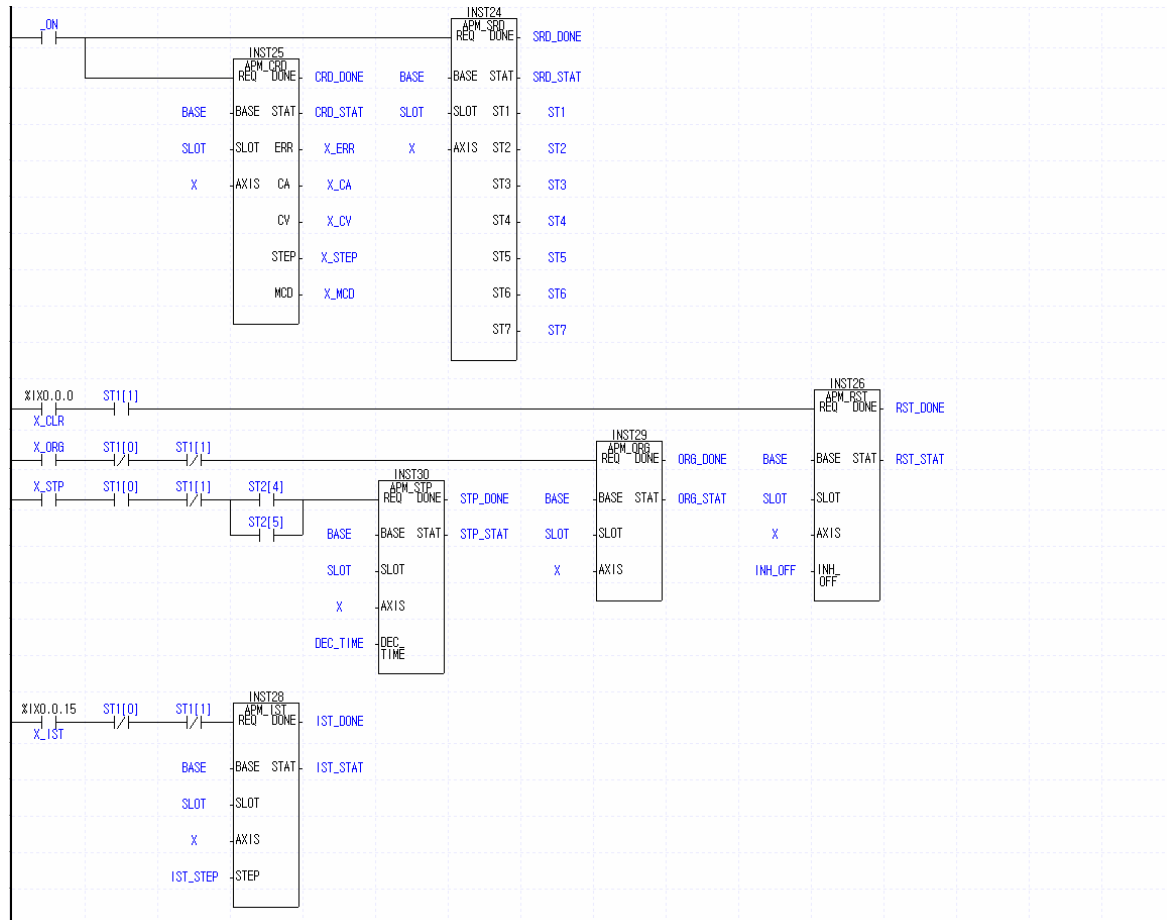
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
ST2[4]	X axis acceleration signal in operation	-
ST2[5]	X axis signal in constant speed operation	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X axis homing execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_STP	X axis deceleration stop execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_IST	X axis indirect start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.5 Single Operation (Operation step no. assigned)

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis Floating origin setting switch
P00002	X axis step no. change switch
P0000F	X axis Start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
P0008	BCD Digitalswitch Input
D00000 ~ D00022	Xaxis operation state information

(2) Operation Sequence

P00001(Floating origin) switch ON ⇒ P0000F(Start) switch ON ⇒ P00002(Start step change) switch ON

⇒ P0000F(Start) switch ON

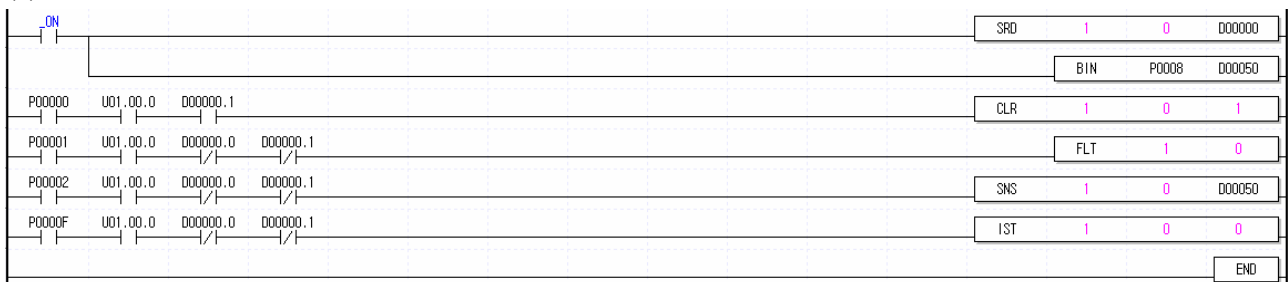
▷ BCD external digital Input should be set as 10 before P00002 switch ON.

(3) Operation data setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	10000	0	0	1	1000	100	CW
	2	Absolute	Position control	End	Single	20000	0	0	1	1500	100	CW
	3	Absolute	Position control	End	Single	30000	0	0	1	2000	100	CW
	10	Absolute	Position control	End	Single	50000	0	0	1	1000	100	CW
	11	Absolute	Position control	End	Single	60000	0	0	1	1500	100	CW
	12	Absolute	Position control	End	Single	70000	0	0	1	2000	100	CW

2) Program

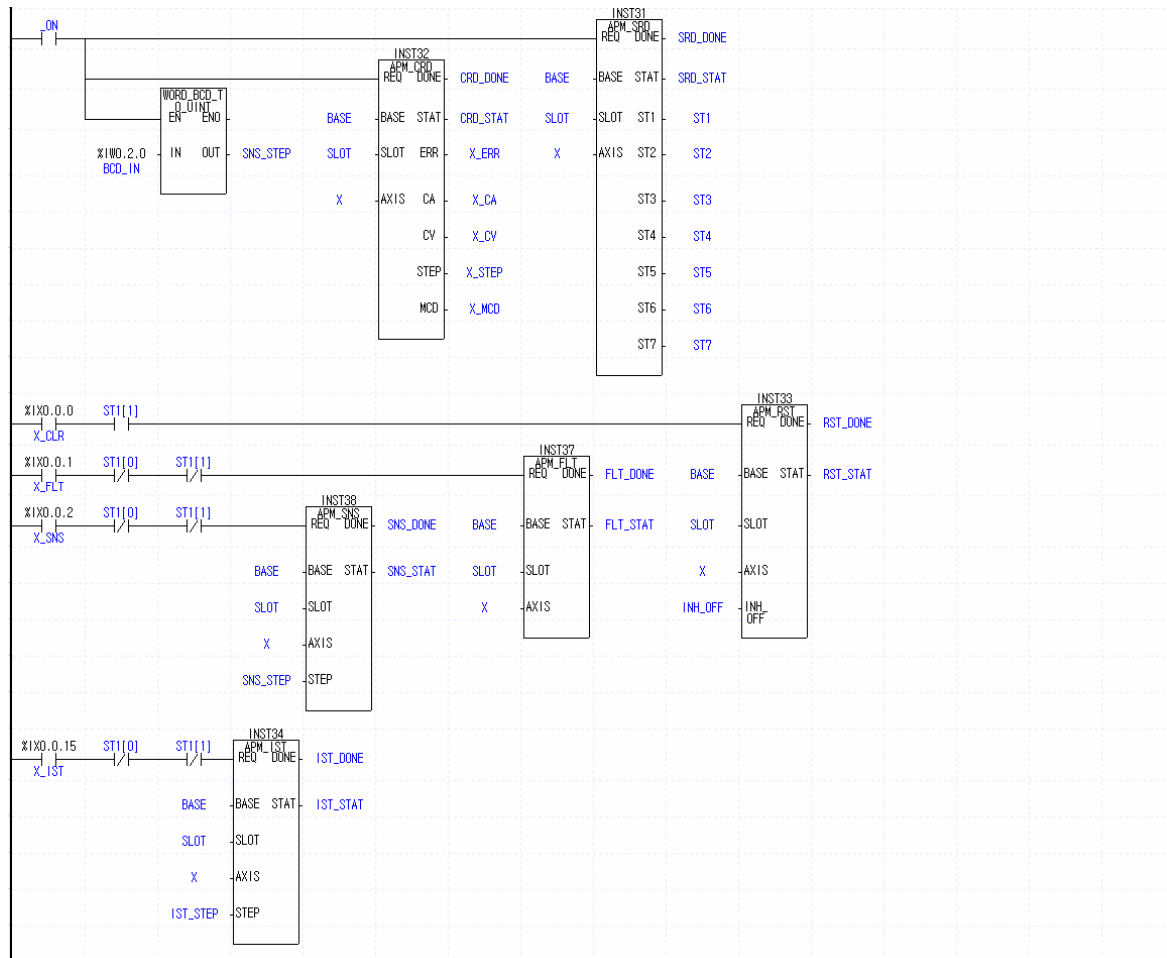
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
BCD_IN	X axis start step change No.	BCD value of No.2 Slot Input Module(%IW0.2.0)
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_SNS	X axis start step change execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_IST	X axis indirect start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.6 Single Operation (by External Input Signal)

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis Floating origin setting switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P00001 (Floating origin) switch ON ⇒ external Start switch ON original point) switch ON

(3) Operation data setting

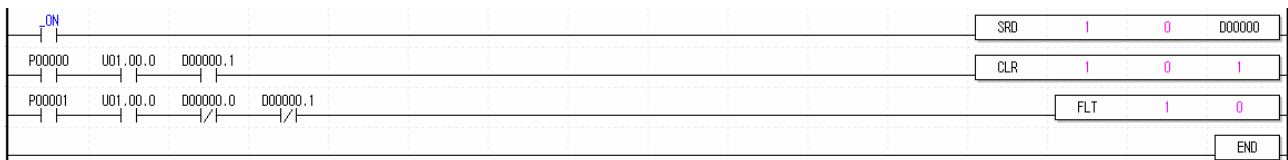
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	10000	0	0	1	1000	100	CW
	2	Absolute	Position control	End	Single	20000	0	0	1	1500	100	CW
	3	Absolute	Position control	End	Single	30000	0	0	1	2000	100	CW

(4) Extended Parameter Setting

Parameter	Setting value
External command selection	0: Start
Pulse output direction	0: CW
M Code output	0: NONE
External command	1: enabled

2) Program

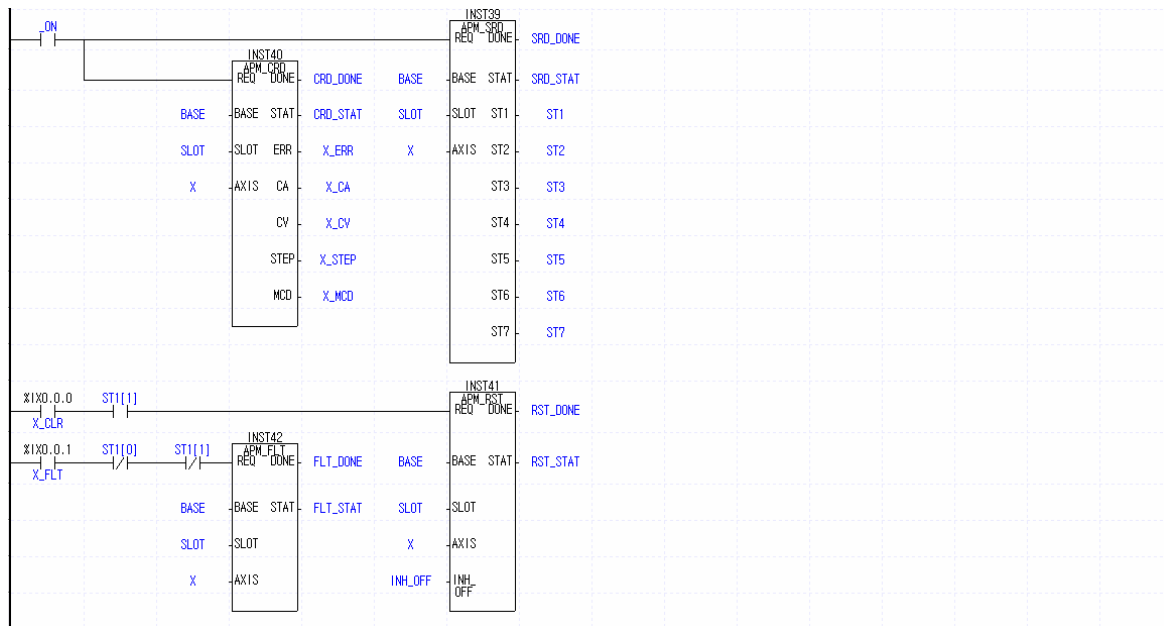
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
BCD_IN	X axis start step change No.	BCD value of No.2 Slot Input Module(%IW0.2.0)
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)



Chapter 10 Program

10.2.7 Equal Speed Operation (Operation step no. assigned)

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis Floating origin setting switch
P00002	X axis step no. change
P00003	X axis deceleration stop
P0000F	X axis Start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
P0008	BCD Digitalswitch Input
D00000 ~ D00022	X axis operatin state information

(2) Operation Sequence

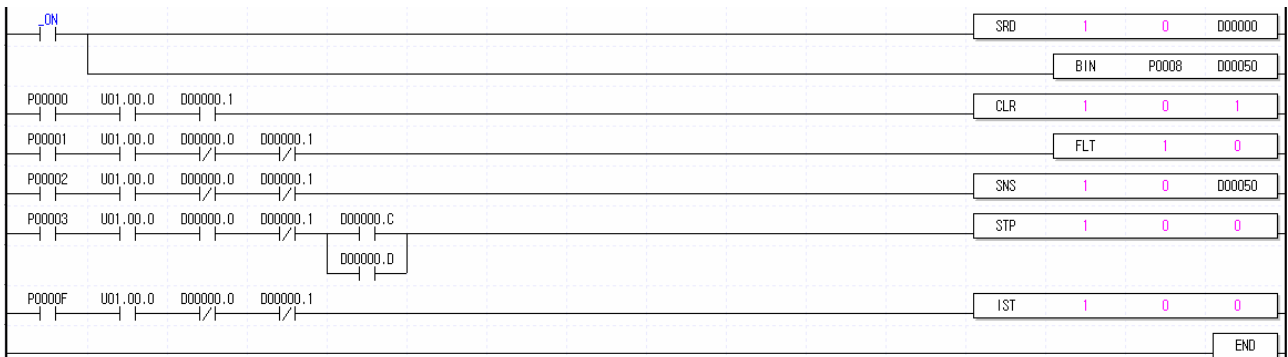
P0000F(Start) switch ON ⇒ P00003(Deceleration Stop) switch ON ⇒ P00001(Floating origin) switch ON ⇒ P00002(Start step change) switch ON ⇒ P0000F(Start) switch ON ⇒ P00003(Deceleration stop) switch ON
 ▷ BCD external digital Input should be set as 10 before P00002 switch ON.
 ▷ As deceleration time is set as "0" in deceleration stop command, it carries out the deceleration by 1 acc./dec. time.

(3) Operation data setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Speed control	End	Single	0	0	0	1	1000	100	CW
X axis setting	10	Absolute	Position control	End	Single	10000	0	0	1	1000	100	CW

2) Program

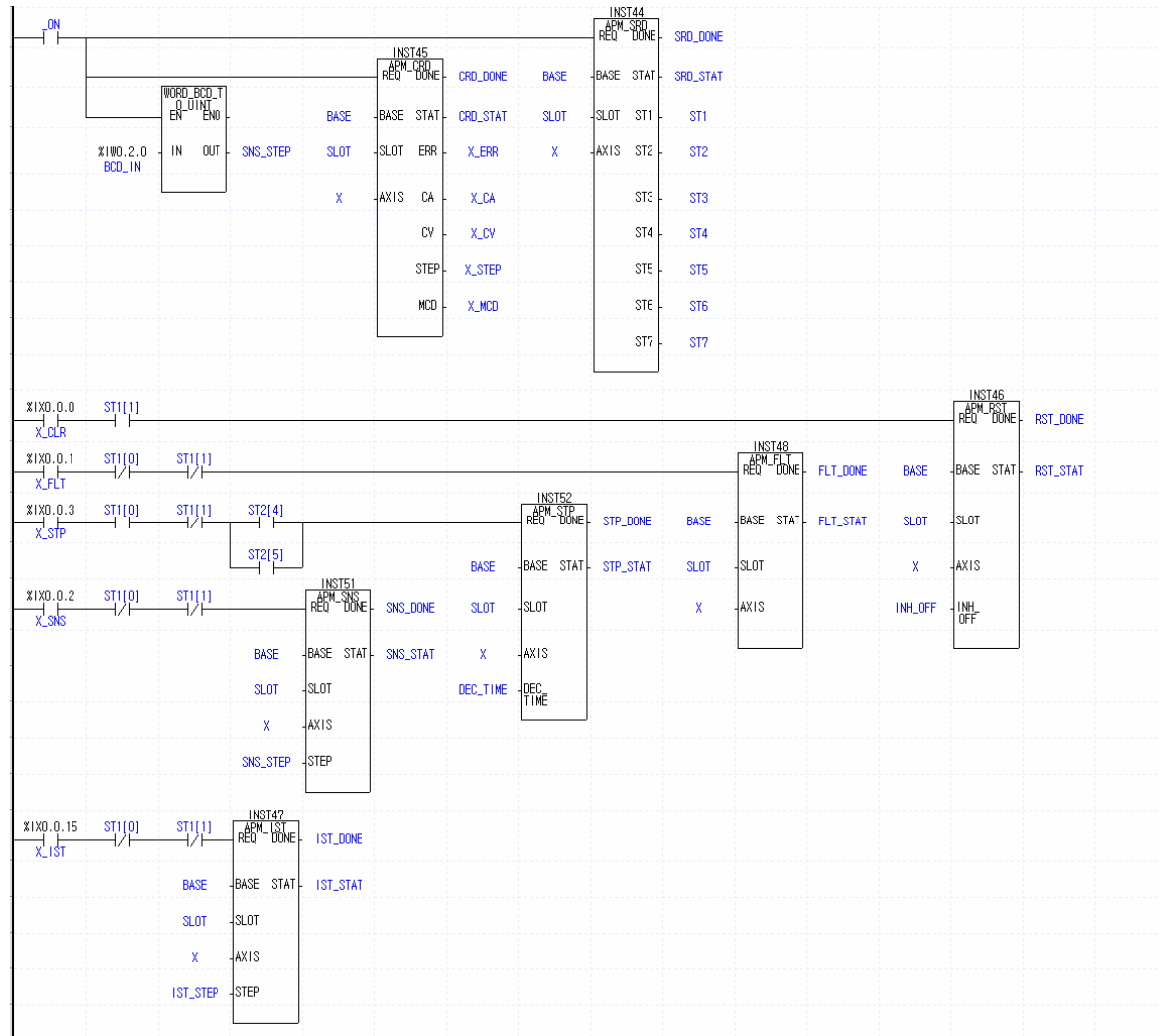
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
BCD_IN	X axis start step change No.	BCD value of No.2 Slot Input Module(%IW0.2.0)
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_SNS	X axis start step change execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_STP	X axis deceleration stop execution	No.3 bit of No.0 Slot Input Module(%IX0.0.3)
X_IST	X axis indirect start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.8 Synchronous Start

1) Description

(1) The used Device

Device	Description
P00000	X axis, Y axis error reset, output disabled release switch
P00001	X axis, Y axis Floating origin setting switch
P0000F	X axis, Y axis synchronous Start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
U01.00.5	Y axis command receive signal
D00100.0	Y axis signal in operation
D00100.1	Y axis error state signal
D00000 ~ D00022	X axis operation state information
D00100 ~ D00122	Y axis operation state information

(2) Operation Sequence

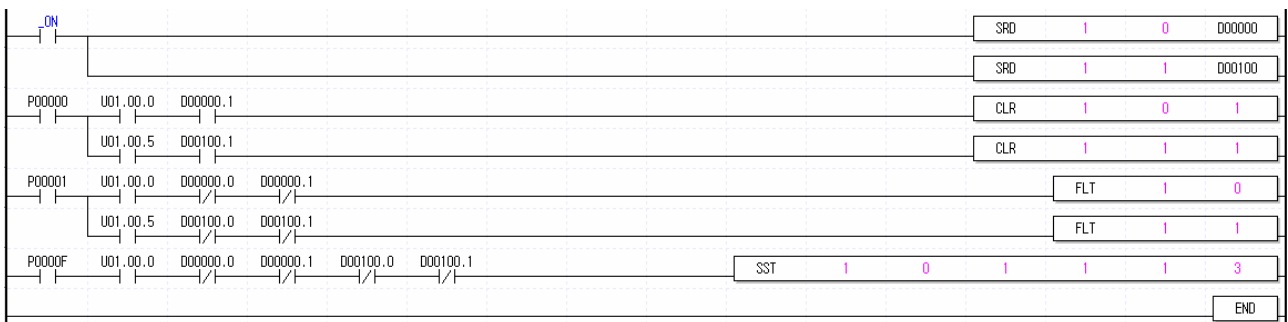
P00001(Floating origin) switch ON ⇒ P0000F(internal synchronous Start) switch ON

(3) Operation data setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position ncontrol	End	Single	10000	0	0	1	1000	100	CW
Y axis setting	1	Absolute	Position control	End	Single	20000	0	0	1	2000	100	CW

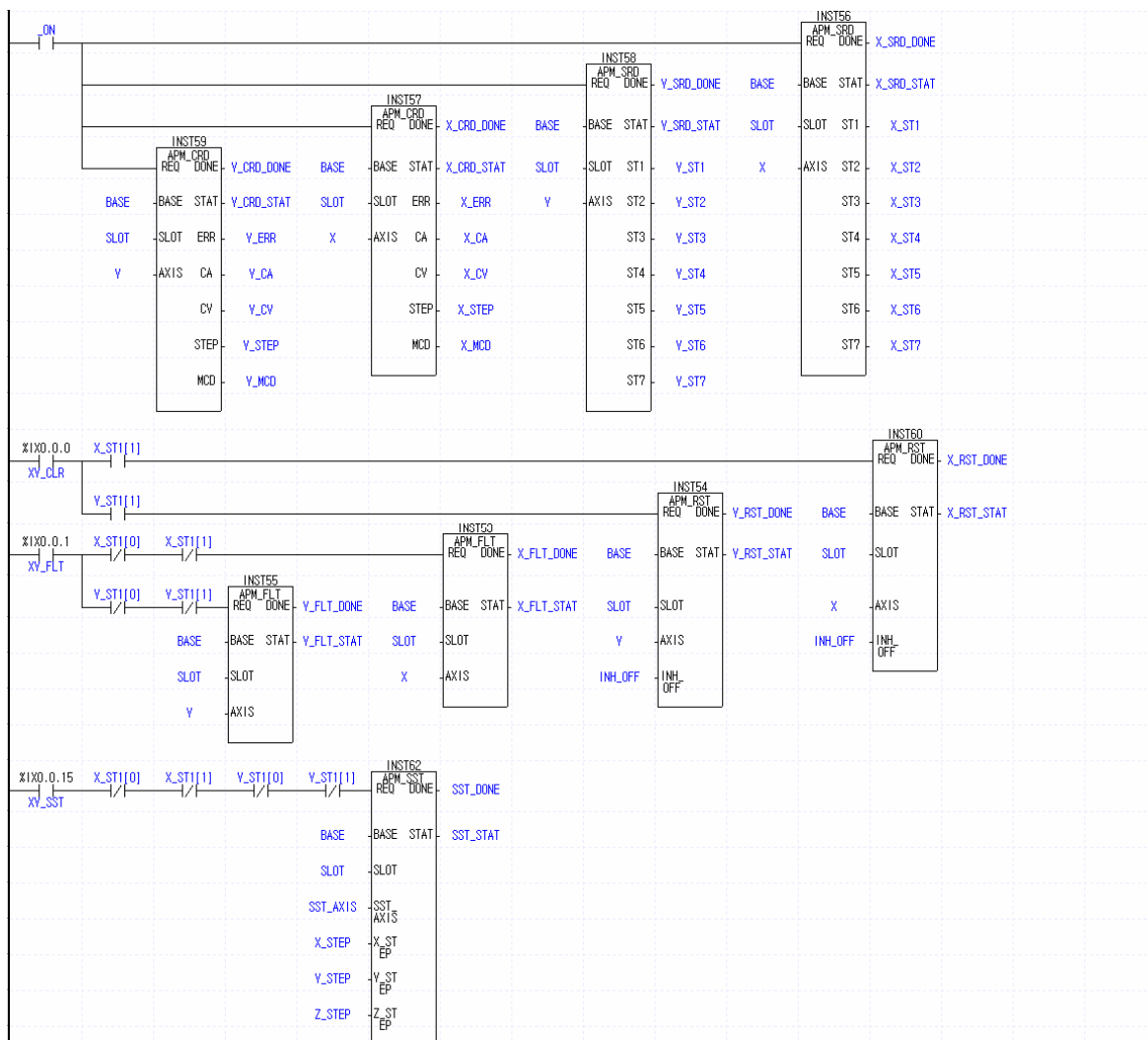
2) Program

(1) XGK



(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
Y	APM Axis to execute function block	1 (Y axis)
X_ST1[0]	X axis signal in operation	-
X_ST1[1]	X axis error state signal	-
Y_ST1[0]	Y axis signal in operation	-
Y_ST1[1]	Y axis error reset signal	-
XY_CLR	Y axis/Y axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
XY_FLT	X axis/Y axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
XY_SST	X axis/Y axis simultaneous start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.9 Synchronous Start by Position

1) Description

(1) The used Device

Device	Description
P00000	X axis, Y axis error reset, output disabled release switch
P00001	X axis, Y axis Floating origin setting switch
P0000E	X axis position synchronous start switch
P0000F	Y axis indirect Start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
U01.00.5	Y axis command receive signal
D00100.0	Y axis signal in operation
D00100.1	Y axis error state signal
D00000 ~ D00022	X axis operation state information
D00100 ~ D00122	Y axis operation state information

(2) Operation Sequence

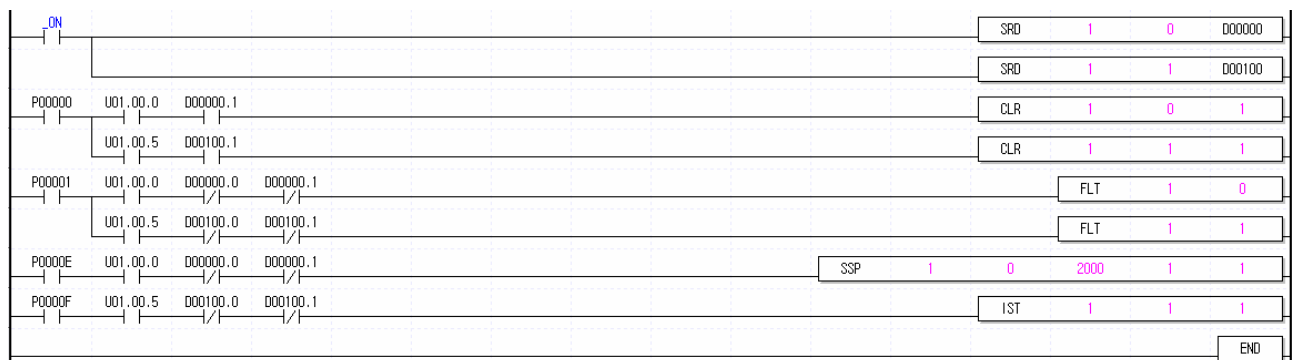
P00001(Floating origin) switch ON ⇒ P0000E(position synchronous start) switch ON ⇒ P0000F(Indirect Start) switch ON

(3) Operation data setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
Subordinate axis X axis setting	1	Absolute	Position control	End	Single	10000	0	0	1	1000	100	CW
Main axis Y axis setting	1	Absolute	Position control	End	Single	15000	0	0	1	1500	100	CW

2) Program

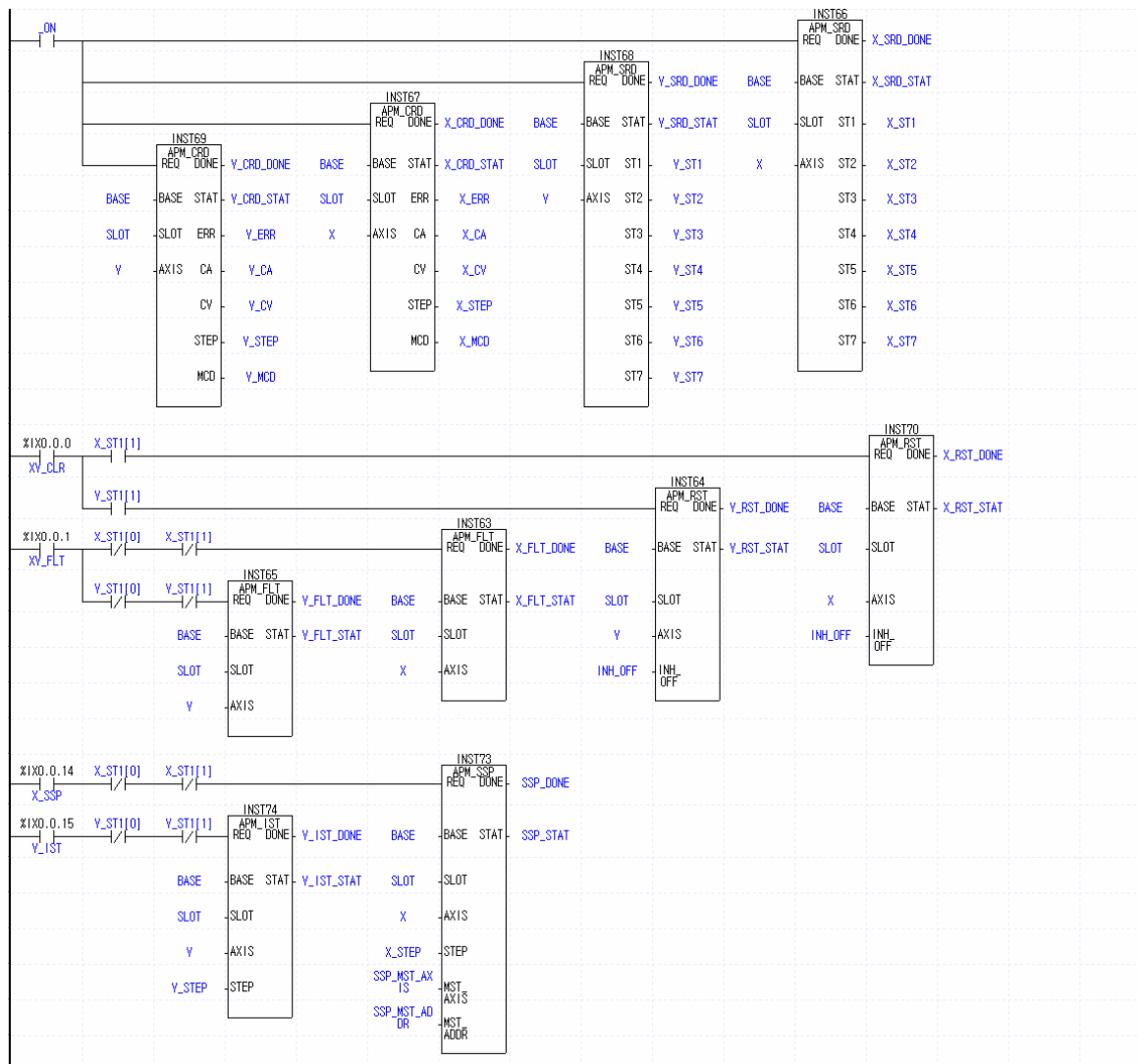
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
Y	APM Axis to execute function block	1 (Y axis)
X_ST1[0]	X axis signal in operation	-
X_ST1[1]	X axis error state signal	-
Y_ST1[0]	Y axis signal in operation	-
Y_ST1[1]	Y axis error state signal	-
XY_CLR	X axis/Y axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
XY_FLT	X axis/Y axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_SSP	X axis position simultaneous execution	No.14 bit of No.0 Slot Input Module(%IX0.0.14)
Y_IST	Y axis start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.10 Synchronous Start by Speed

1) Description

(1) The used Device

Device	Description
P00000	X axis, Y axis error reset, output disabled release switch
P00001	X axis speed synchronous stop switch(deceleration stop command)
P00002	Y axis start switch
P0000E	X axis speed synchronous switch
P0000F	Y axis stop switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
U01.00.5	Y axis command receive signal
D00100.0	Y axis signal in operation
D00100.1	Y axis error state signal
D00000 ~ D00022	X axis operatin state information
D00100 ~ D00122	Y axis operation state information

(2) Operatin Sequence

P0000E(X axis speed synchronous start) switch ON ⇒ P00002(Y axis Start) switch ON ⇒ P0000F(Y axis stop) switch ON ⇒ P00002(Y axis Start) switch ON ⇒ P0000F(Y axis Stop) switch ON ⇒ P00001(X axis speed synchronous stop) switch ON

- ▷ If Toggle switch is used during Y axis deceleration stop, the error will occur.
- ▷ As deceleration time is set as "0" in deceleration stop command, it carries out the deceleration by 1 acc./dec. time.

(3) Operation data setting

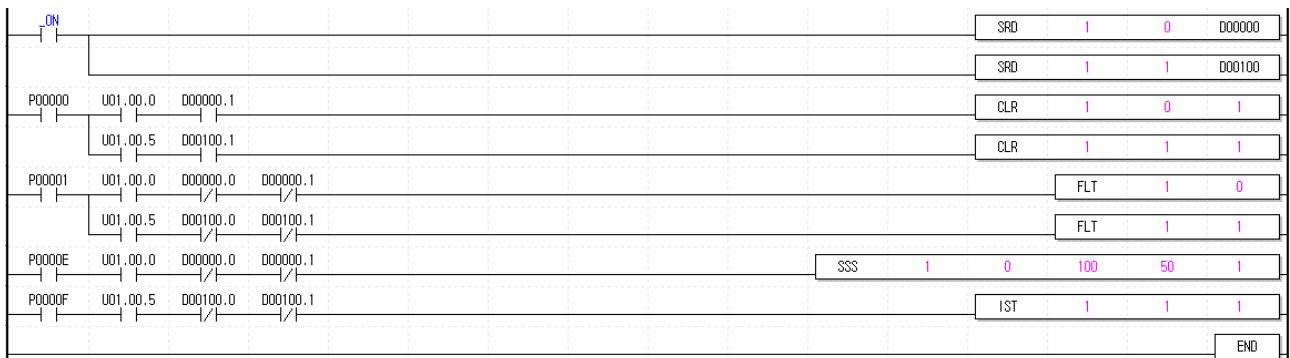
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
Subordinate axis X axis setting	1	Absolute	Speed control	End	Single	0	0	0	1	1000	100	CW
Main axis Y axis setting	1	Absolute	Speed control	End	Single	0	0	0	1	1000	100	CW

(4) Speed synchronous start setting

Command 1	Main axis	1:Y axis
	Main axis rate	100
	Subordinate axis rate	50

2) Program

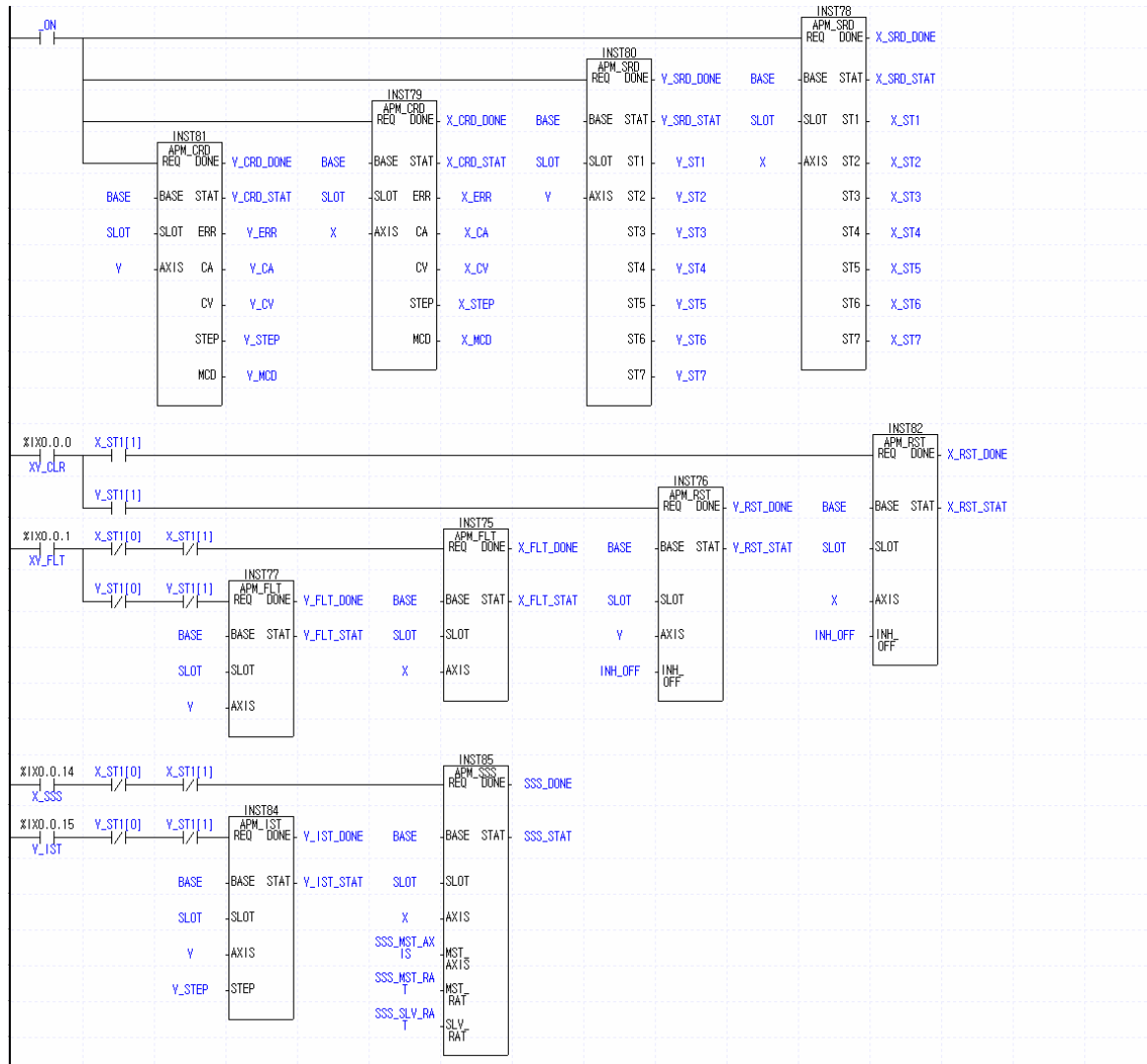
(1)XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
Y	APM Axis to execute function block	1 (Y axis)
X_ST1[0]	X axis signal in operation	-
X_ST1[1]	X axis error state signal	-
Y_ST1[0]	Y axis signal in operation	-
Y_ST1[1]	Y axis error state signal	-
XY_CLR	Y axis/Y axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
XY_FLT	X axis/Y axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_SSS	X axis speed synchronization execution	No.14 bit of No.0 Slot Input Module(%IX0.0.14)
Y_IST	Y axis indirect start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.11 Emergency Stop

1) Description

(1) The used Device

Device	Description
P00000	Error reset during emergency stop, output disabled release switch
P00001	X axis homing switch
P0000F	Emergency stop during homing switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state information

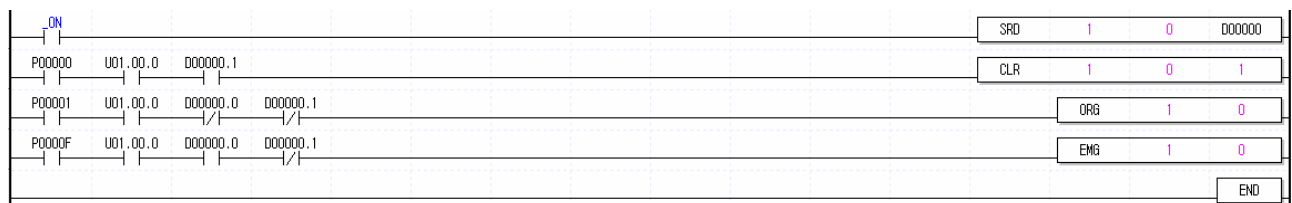
(2) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P0000F(Emergency Stop) switch ON,OFF

- ▷ For 2 axis(XGF-PD2A, XGF-PO2A) or 3 axis module (XGF-PD3A, XGF-PO3A), 2 axis or 3 axis stops emergently at Emergency Stop and output disabled shall be released at the same time at Error Reset. For individual emergency stop for 3axis, use Emergency Stop signal of Servo Driver.

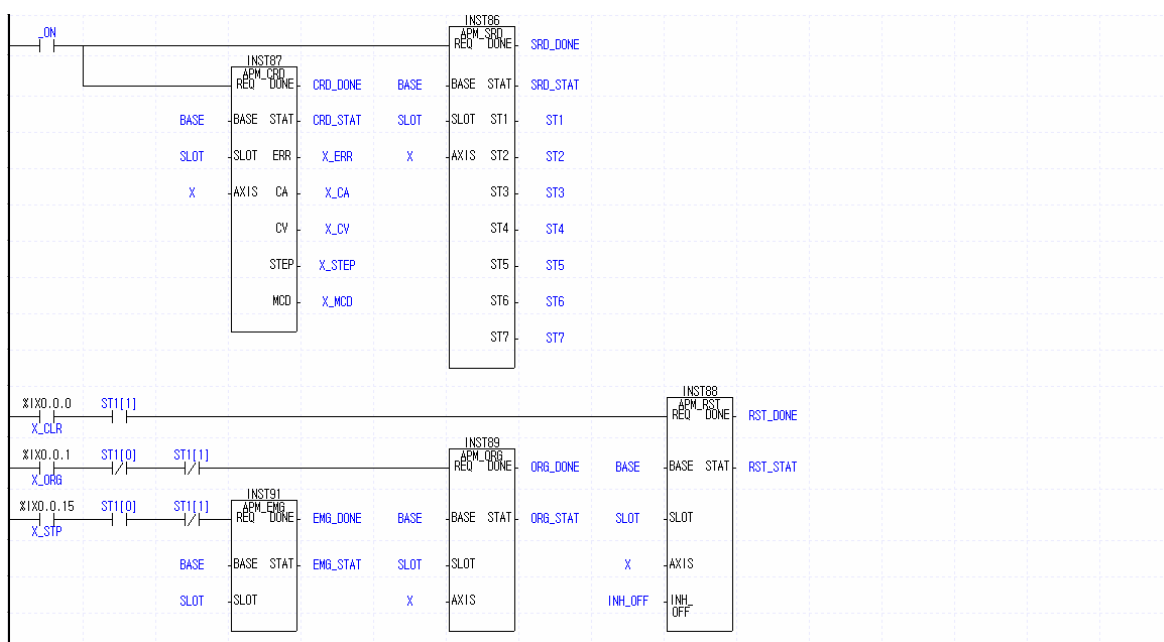
2) Program

(1) XGK



(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X axis homing start execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_EMG	Emergency stop execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.12 Jog Operation

1) Description

(1) The used Device

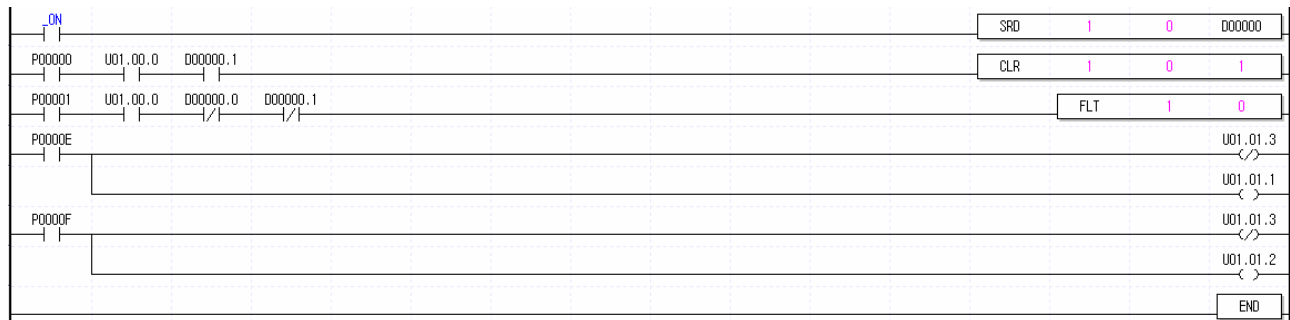
Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis Floating origin setting switch
P0000E	X axis Jog low speed forward rotation
P0000F	X axis Jog low speed reverse rotation
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P00001(Floating origin) switch ON,OFF ⇒ P0000E(Jog low speed forward rotation) switch ON ⇒ P0000E(Jog low speed forward rotation) switch OFF ⇒ P0000F(Jog low speed reverse rotation) switch ON ⇒ P0000F(Jog low speed reverse rotation) switch OFF

2) Program

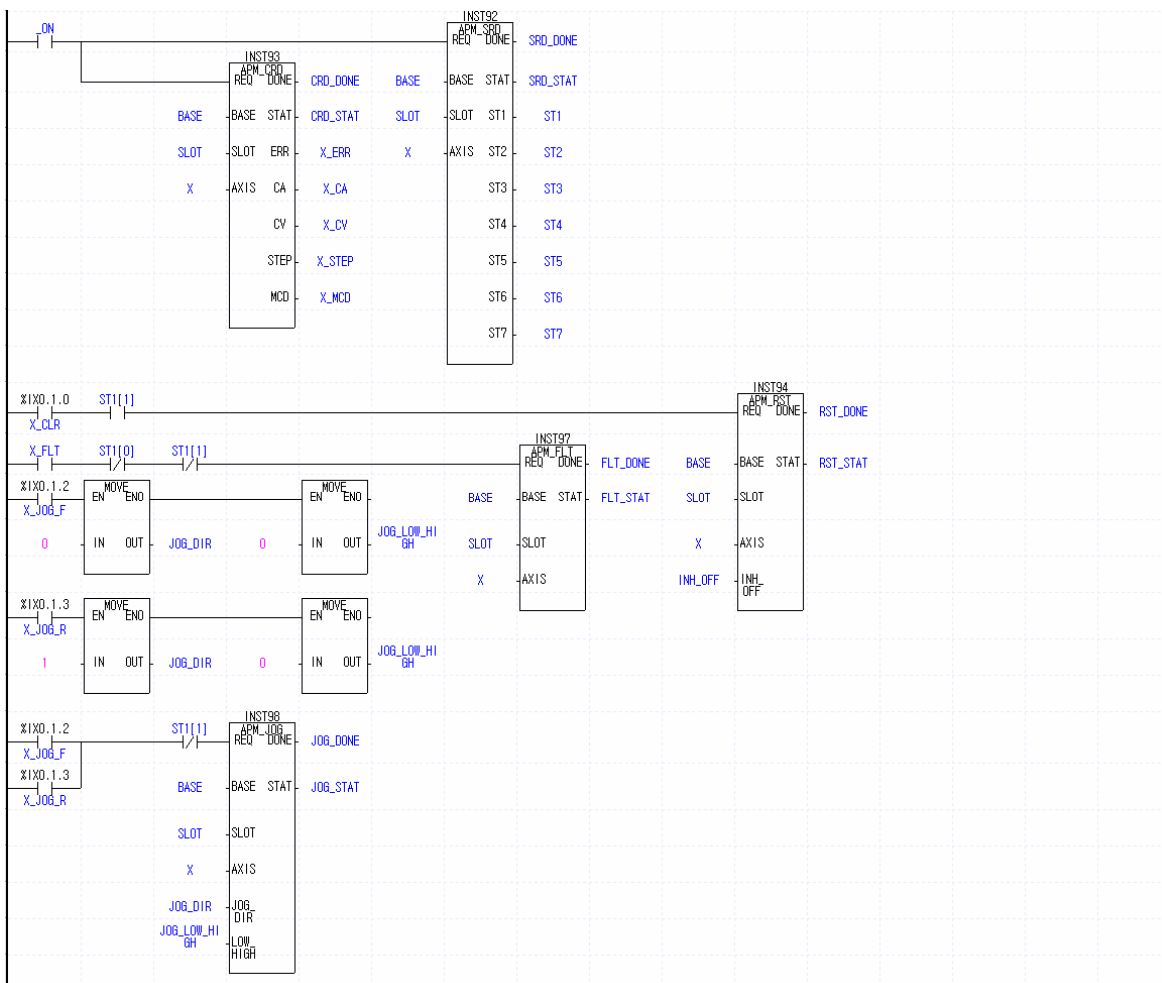
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_JOG_F	X axis forward direction JOG start execution	No.14 bit of No.0 Slot Input Module(%IX0.0.14)
X_JOG_R	X axis reverse direction JOG start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
JOG_DIR	JOG direction	0: forward 1: Reverse
JOG_LOW_HIGH	JOG speed	0: JOG low speed 1: JOG high speed



Chapter 10 Program

10.2.13 Manual Pulse Generator (MPG) Operation

1) Description

(1) The used Device

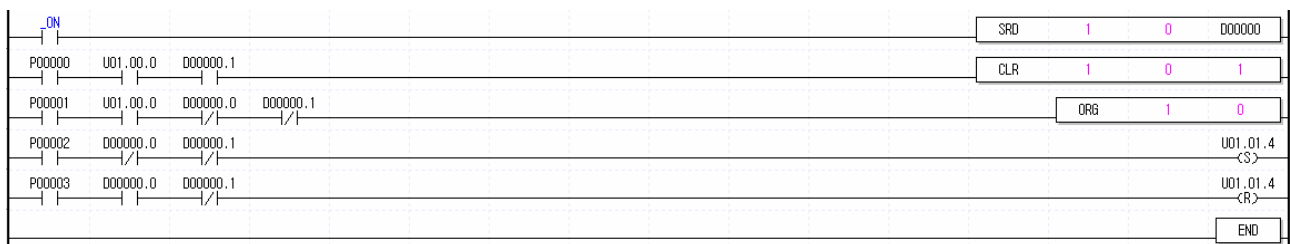
Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	X axis MPG operation enabled
P00003	X axis MPG operation disabled
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P00002(MPG operation enabled) switch ON,OFF ⇒ P00003(MPG operation disabled) switch ON,OFF

2) Program

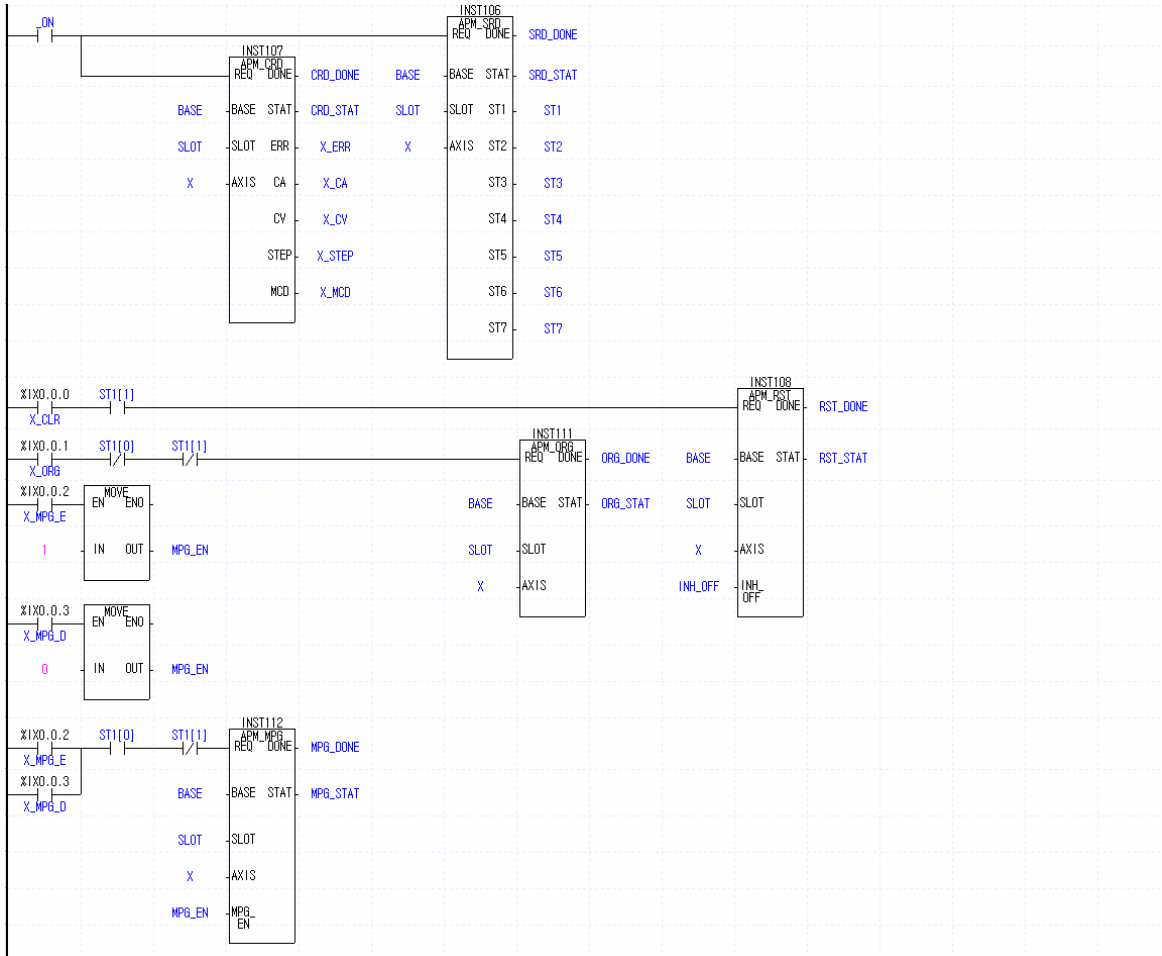
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X axis homing start execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_MPG_E	X axis MPG operation enabled execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_MPG_D	X axis MPG operation disabled execution	No.3 bit of No.0 Slot Input Module(%IX0.0.3)



Chapter 10 Program

10.2.14 Inching Operation

1) Description

(1) The used Device

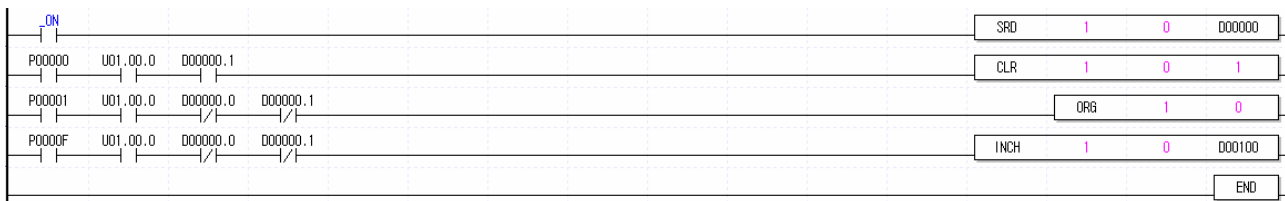
Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P0000F	X axis inching operation switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00100 ~ D00101	Inching transfer amount
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P0000F(Inching operation) switch ON,OFF

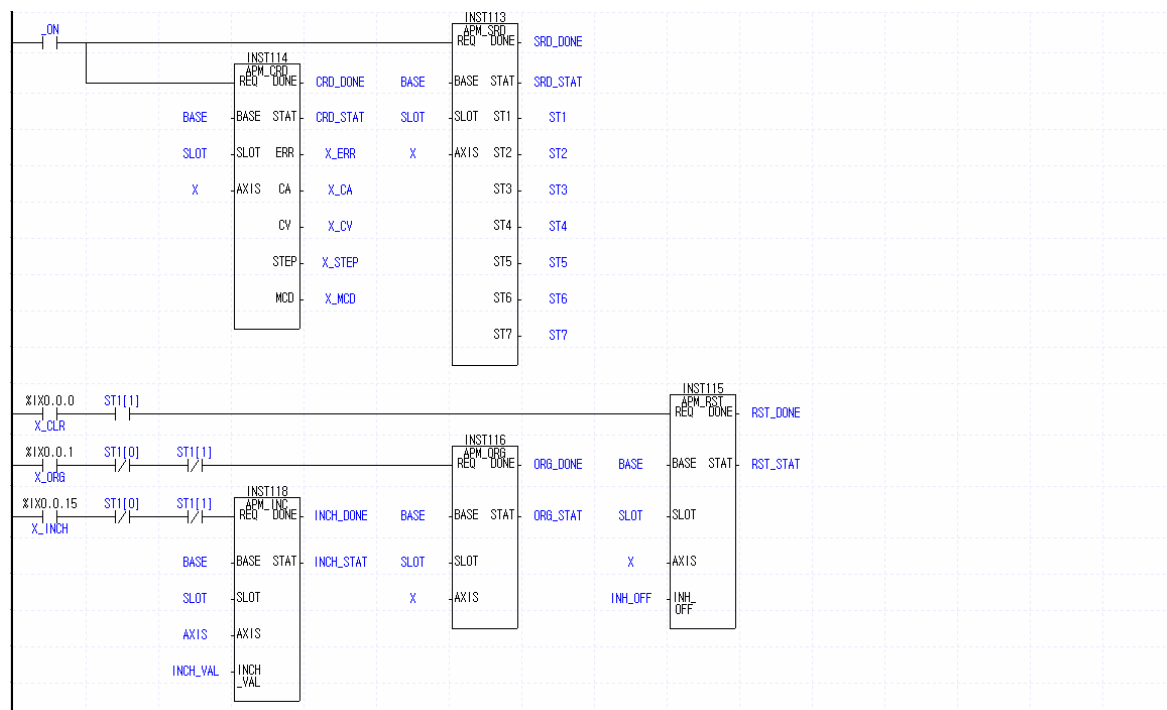
2) Program

(1) XGK



(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X axis homgin start execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_INCH	X axis inching operation execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.15 Return to the position before ManualOperation

1) Description

(1) The used Device

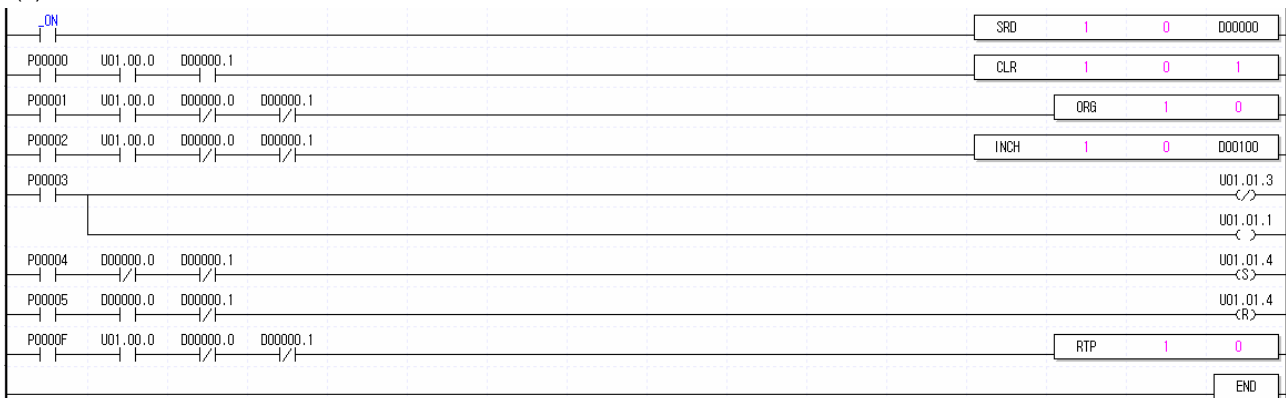
Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	X axis inching operation switch
P00003	X axis Jog high speed forward rotation switch
P00004	X axis MPG operation enabled switch
P00005	X axis MPG operation disabled switch
P0000F	X axis return to the position before manual operation switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state

(2) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P00002(Inching operation) switch ON,OFF ⇒ P00003(Jog high speed forward rotation) switch ON,OFF ⇒ P00004(MPG operation enabled) switch ON,OFF ⇒ P00005(MPG operation disabled) switch ON,OFF ⇒ P0000F(return to the position before manual operation) switch ON,OFF

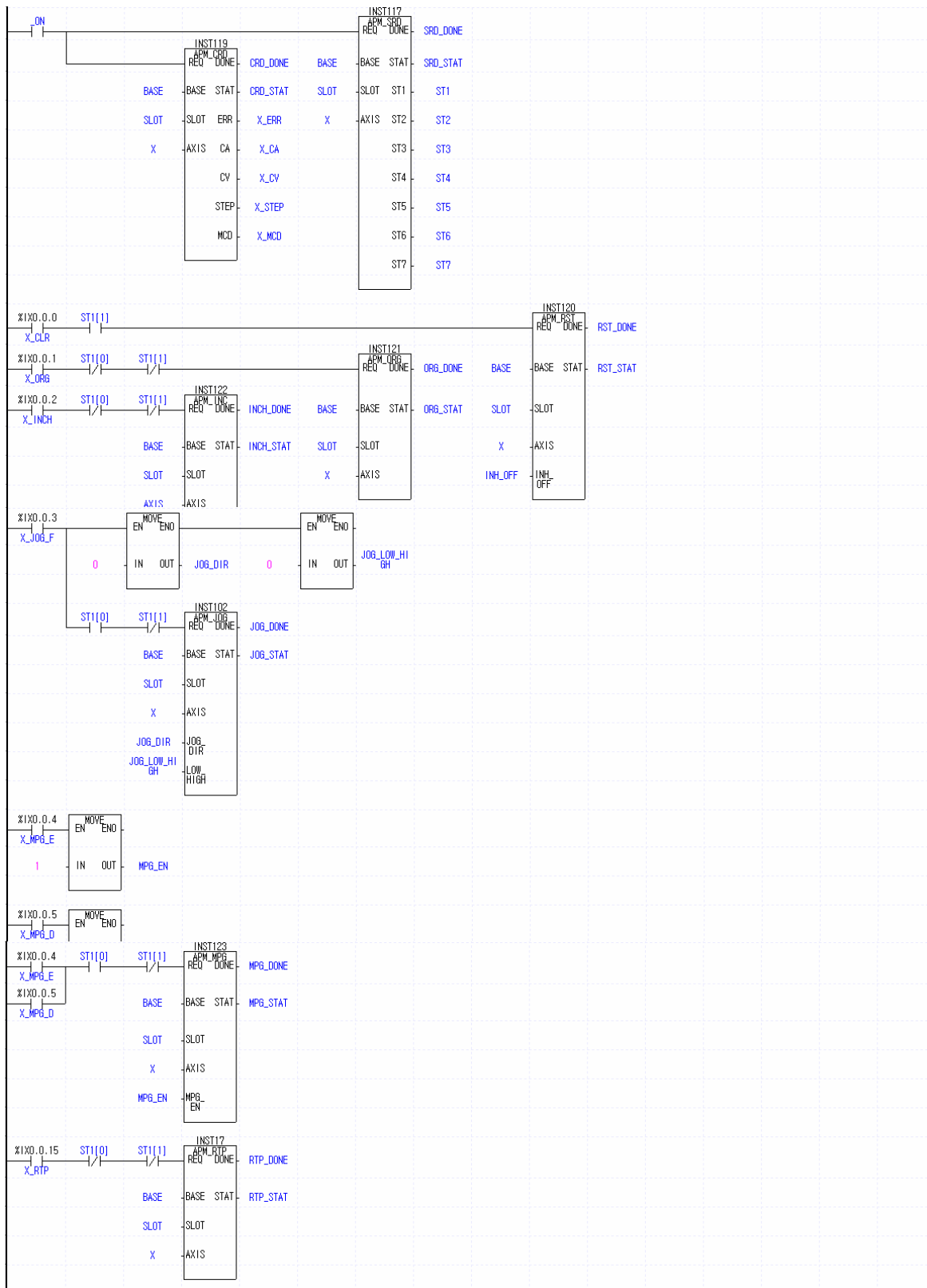
2) Program

(1) XGK



(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X axis homing start execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_INCH	X axis inching operation execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_JOG_F	X axis forward JOG low speed operation execution	No.3 bit of No.0 Slot Input Module(%IX0.0.3)
X_MPG_E	X axis MPG operation enabled execution	No.4 bit of No.0 Slot Input Module(%IX0.0.4)
X_MPG_D	X axis MPG operation disabled execution	No.5 bit of No.0 Slot Input Module(%IX0.0.5)
X_RTP	X axis Manual Operation return to previous position execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.2.16 Speed Override

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis Floating origin setting switch
P00002	X axis Indirect Start switch
P0000F	X axis speed override switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000.C	X axis acceleration signal
D00000.D	X axis equal speed signal
D00100 ~ D00101	Speed override setting value(1000pps)
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P00001(Floating origin) switch ON,OFF ⇒ P00002(Indirect Start) switch ON,OFF ⇒ P0000F(Speed Override) switch ON,OFF

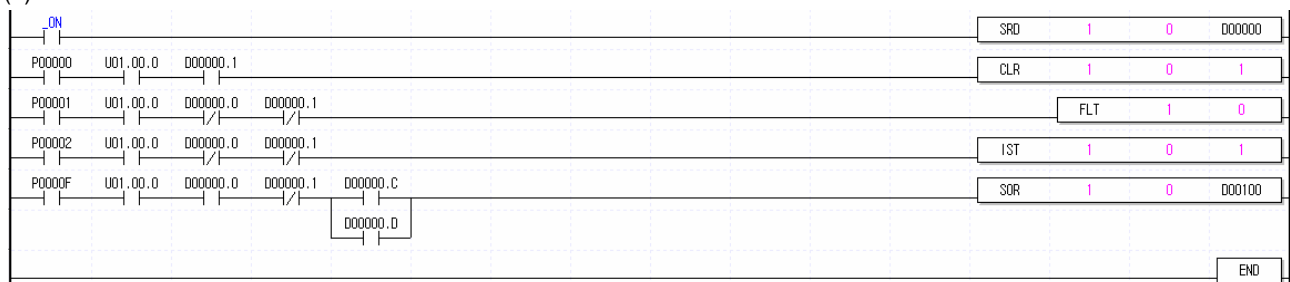
(3) Operation data setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	100000	0	0	1	5000	100	CW

Change the operation speed with 1000

2) Program

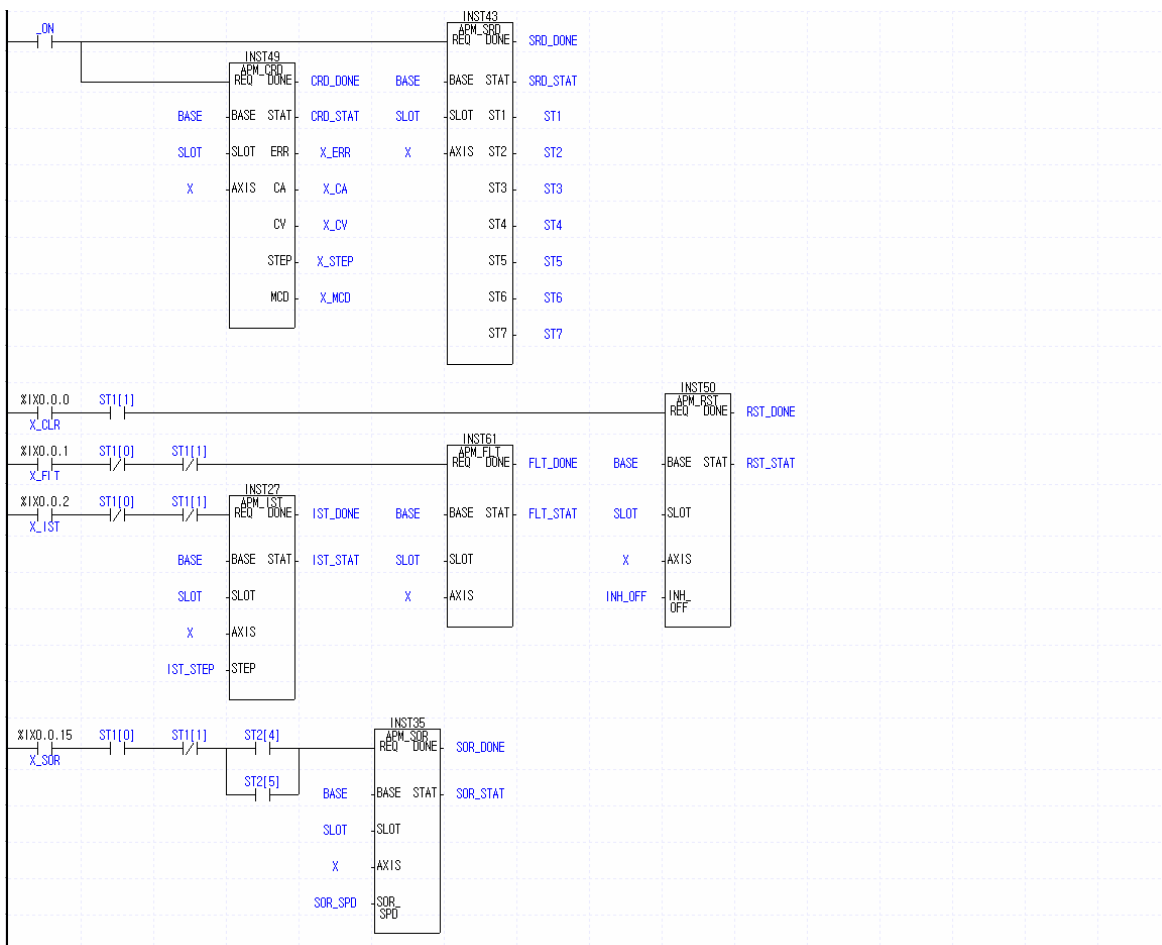
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
ST2[4]	X axis Acc. Signal in operation	-
ST2[5]	X axis Constat speed signal in operation	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_SOR	X axis speed override execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
SOR_SPD	Speed override value	1000 in the example



Chapter 10 Program

10.2.17 Position Override

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis Floating origin setting switch
P00002	X axis Indirect Start switch
P0000F	X axis position override switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000.D	X axis signal in constant speed
D00100 ~ D00101	Position override setting value (120000 pulse)
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P00001(Floating origin) switch ON,OFF ⇒ P00002(Indirect Start) switch ON,OFF ⇒ P0000F(position override) switch ON,OFF

(3) Operation data setting

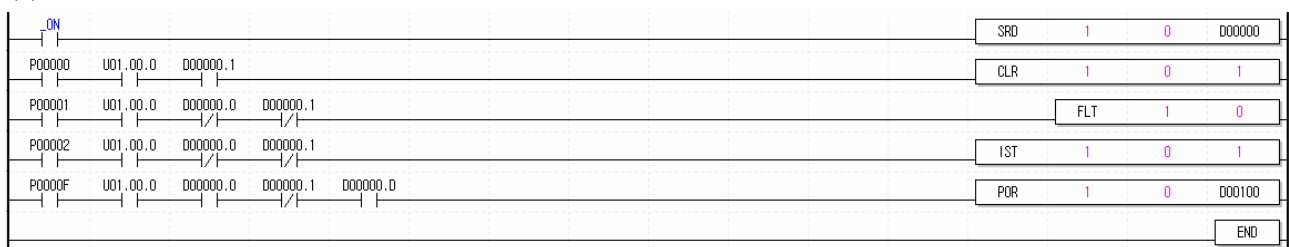
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	100000	0	0	1	5000	100	CW



Change the goal position with 120000 during operation.

2) Program

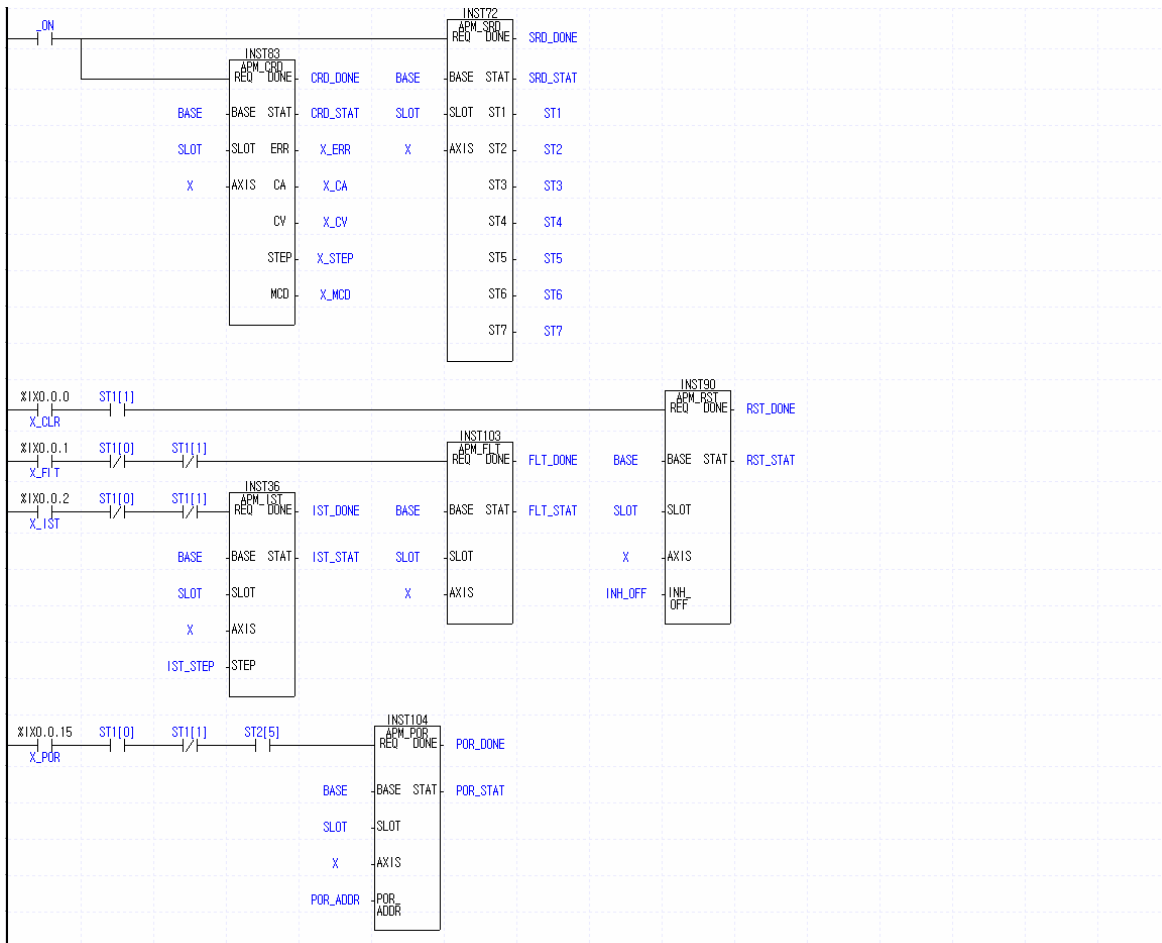
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
ST2[5]	X axis constant speed signal in operation	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_POR	X axis positin override execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
POR_ADDR	Position override value	120000 in the example



Chapter 10 Program

10.2.18 Position Assigned Speed Override

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis Floating origin setting switch
P00002	X axis Indirect Start switch
P0000F	X axis position assigned speed override switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
DOO0O0.D	X axis signal in constant speed
D00100 ~ D00101	Position setting value (50000 pulse)
D00102 ~ D00103	Speed setting value (10000 pps)
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P0001(Floating origin) switch ON,OFF ⇒ P0002(Indirect Start) switch ON,OFF ⇒ P000F(Position assigned speed override) switch ON,OFF

(3) Operation data setting

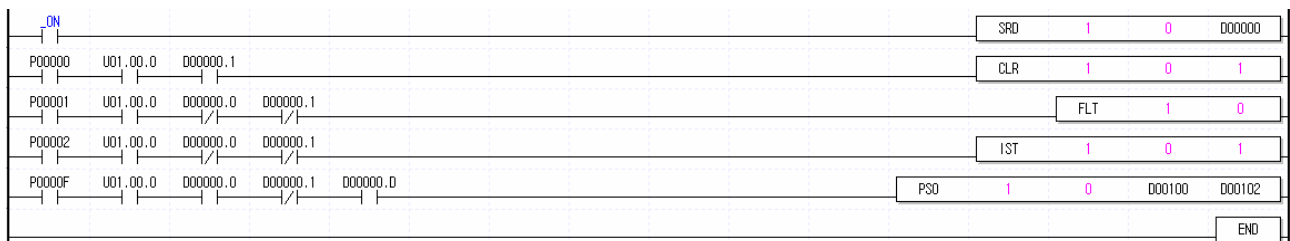
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	100000	0	0	1	5000	100	CW

Change the operation speed with 10000

Change the goal position with 50000 during operation.

2) Program

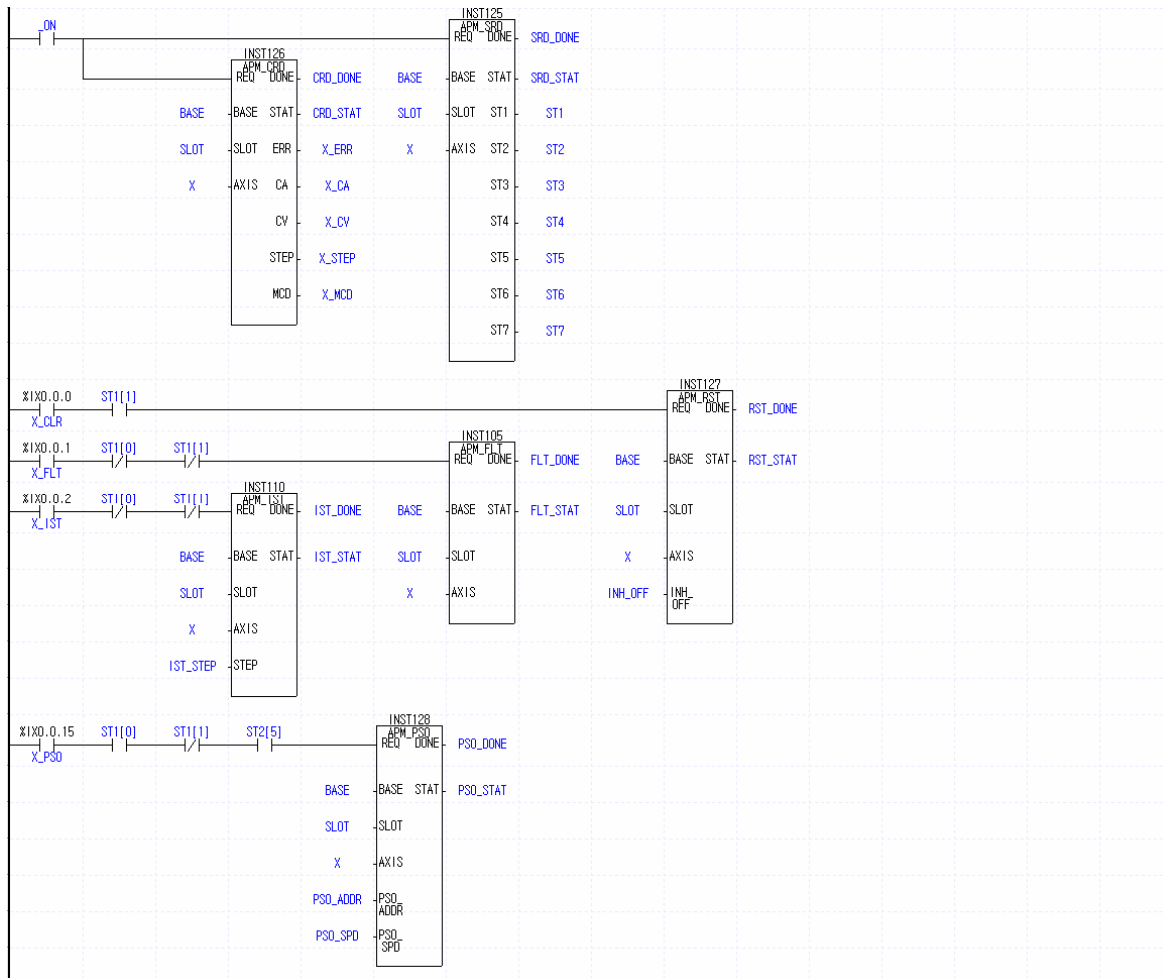
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
ST2[5]	X axis constant speed signal in operation	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_PSO	X axis positioning speed override execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
PSO_SPD	Positioning speed override speed value	10000 in the example
PSO_ADDR	Positioning speed override position value	50000 in the example



Chapter 10 Program

10.2.19 Operation Step No. Change by Continuous Operation

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis Floating origin setting switch
P00002	X axis Start switch
P0000F	X axis operation step no. change by continuous operation switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
DO0000.D	X axis start signal
D00008	X axis signal in constant speed
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

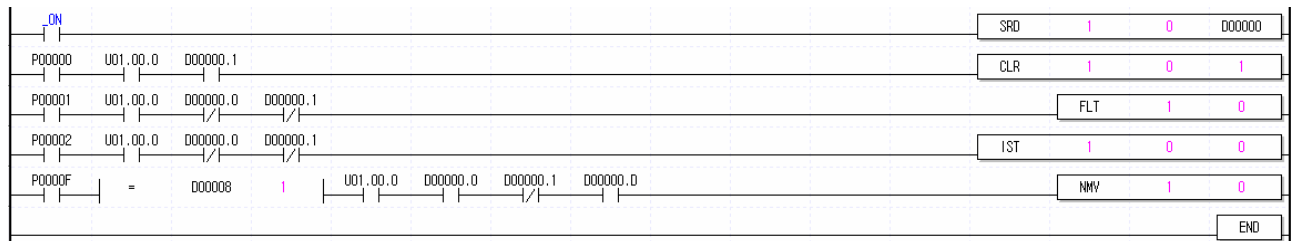
P00001(Floating origin) switch ON,OFF ⇒ P00002(Start) switch ON,OFF ⇒ P0000F(Operation step no.change by Continuous operation) switch ON,OFF

(3) Operation data setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	Continuous	Single	100000	0	0	1	500	100	CW
	2	Absolute	Position control	Continuous	Single	200000	0	0	1	1500	100	CW
	3	Absolute	Position control	End	Single	0	0	0	1	2000	100	CW

2) Program

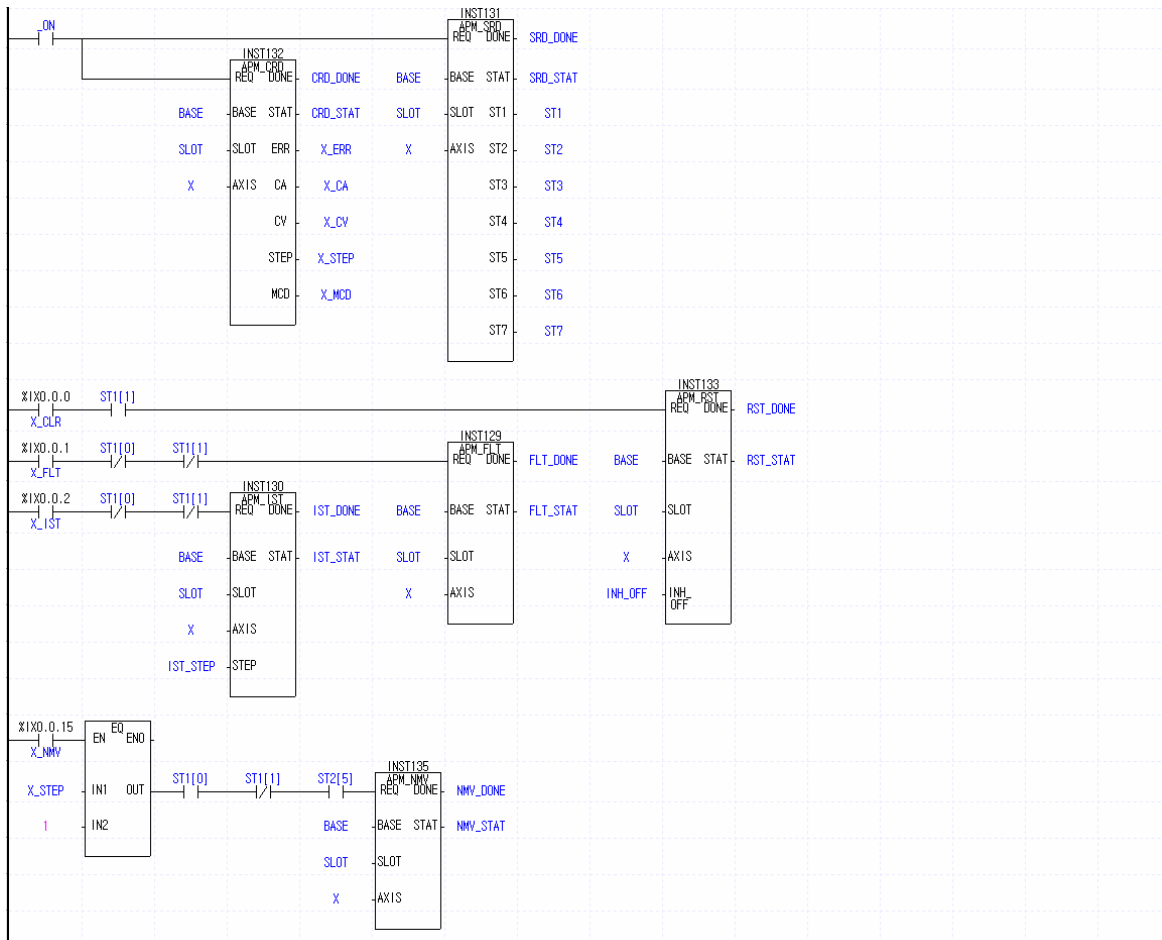
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
ST2[5]	X axis constant speed signal in operation	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_NMV	X axis continuous operation execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
X_STEP	X axis operation step No.	-



Chapter 10 Program

10.2.20 Skip Operation

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	X axis Start switch
P0000F	X axis Skip operation switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
DO0000.D	X axis start signal
D00008	X axis signal in constant speed
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

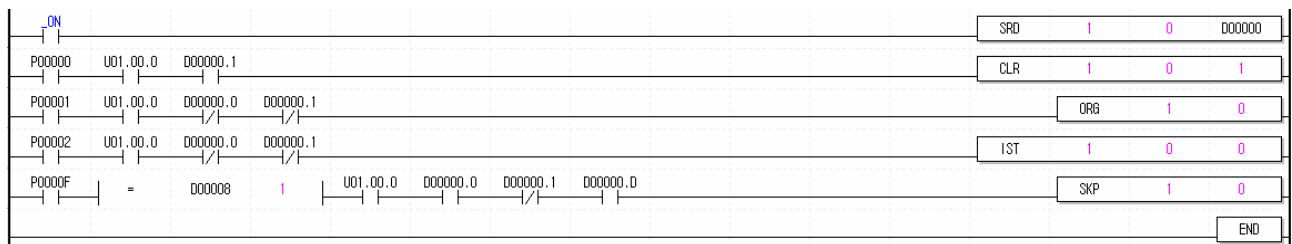
P00001(Homing) switch ON,OFF ⇒ P00002(Start) switch ON,OFF ⇒ P0000F(Skip operation) switch ON,OFF

(3) Operation data setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	Go on	Single	10000	0	0	1	500	100	CW
	2	Absolute	Position control	Go on	Single	20000	0	0	1	1500	100	CW
	3	Absolute	Position control	End	Single	30000	0	0	1	2000	100	CW

2) Program

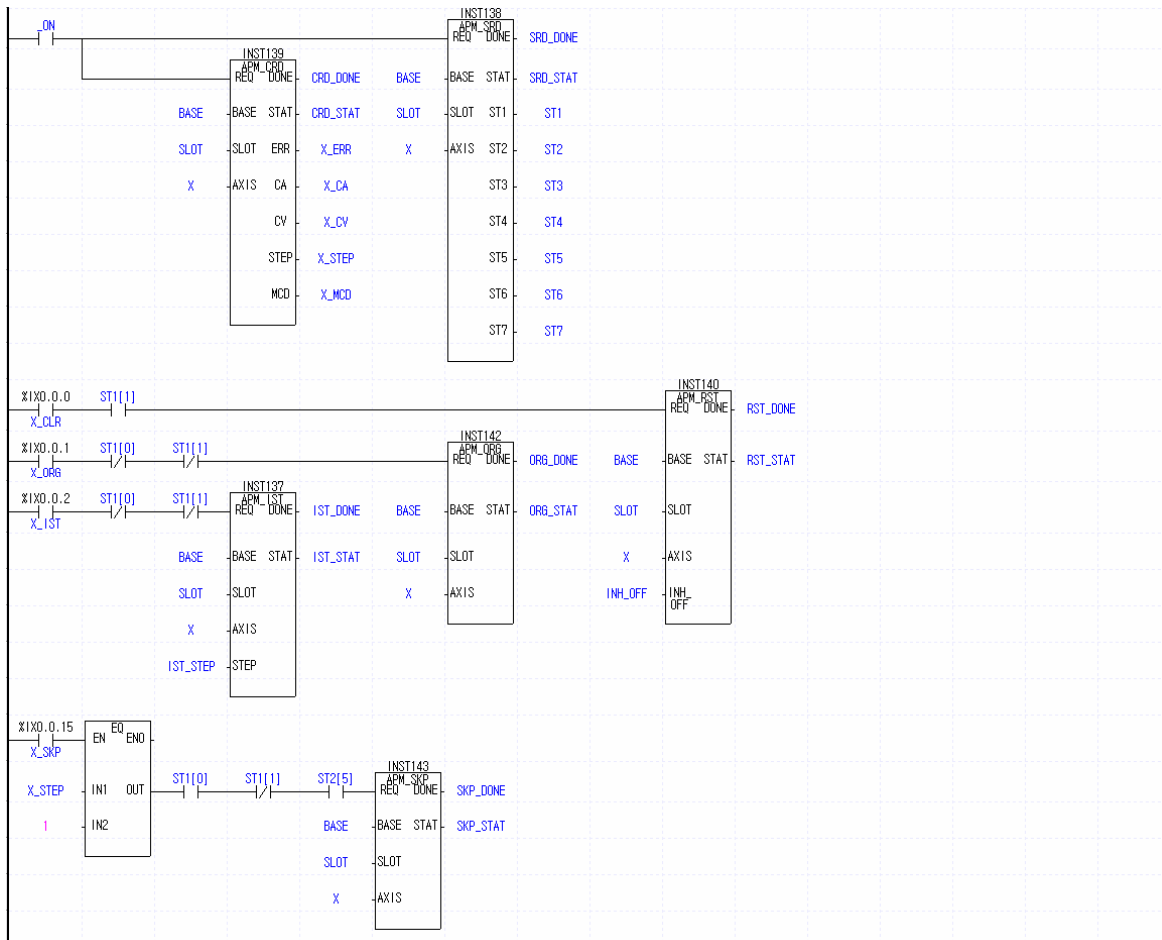
(1) XGK



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
ST2[5]	X axis constant speed signal in operation	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_SKP	X axis skip operation execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
X_STEP	X axis current operation step No.	-



Chapter 10 Program

10.2.21 Operation Step Change during Repeat Operation

1) Description

(1) The used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	X axis Start switch
P0000F	X axis operation step no. change during repeat operation switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

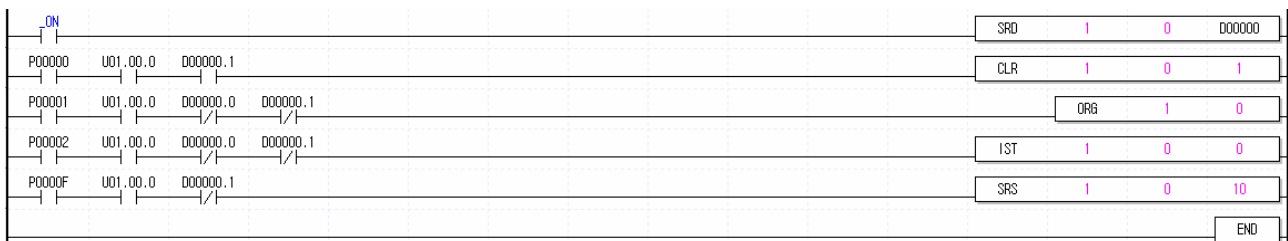
P00001(Homing) switch ON,OFF ⇒ P00002(Start) switch ON,OFF ⇒ P0000F(Operation step no. change during repeat operation) switch ON,OFF ⇒ P00002(Start) switch ON,OFF

(3) Operation data setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	Go on	Single	10000	0	0	1	500	100	CW
	2	Absolute	Position control	End	Repeat	0	0	0	1	1000	100	CW
	10	Absolute	Position control	Go on	Single	15000	0	0	1	1000	100	CW
	11	Absolute	Position control	End	Repeat	0	0	0	1	2000	100	CW

2) Program

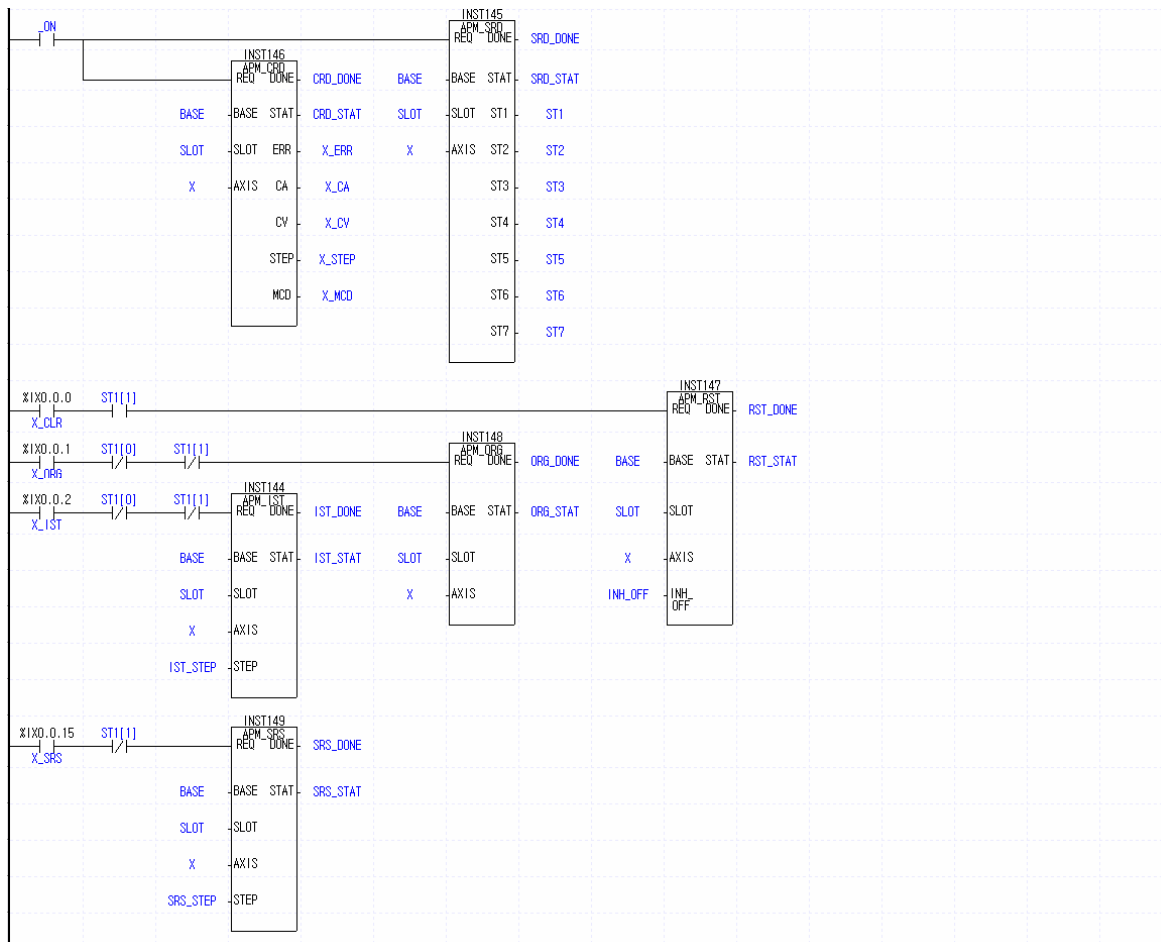
(1) XGK



Chapter 10 Program

(2) XGI

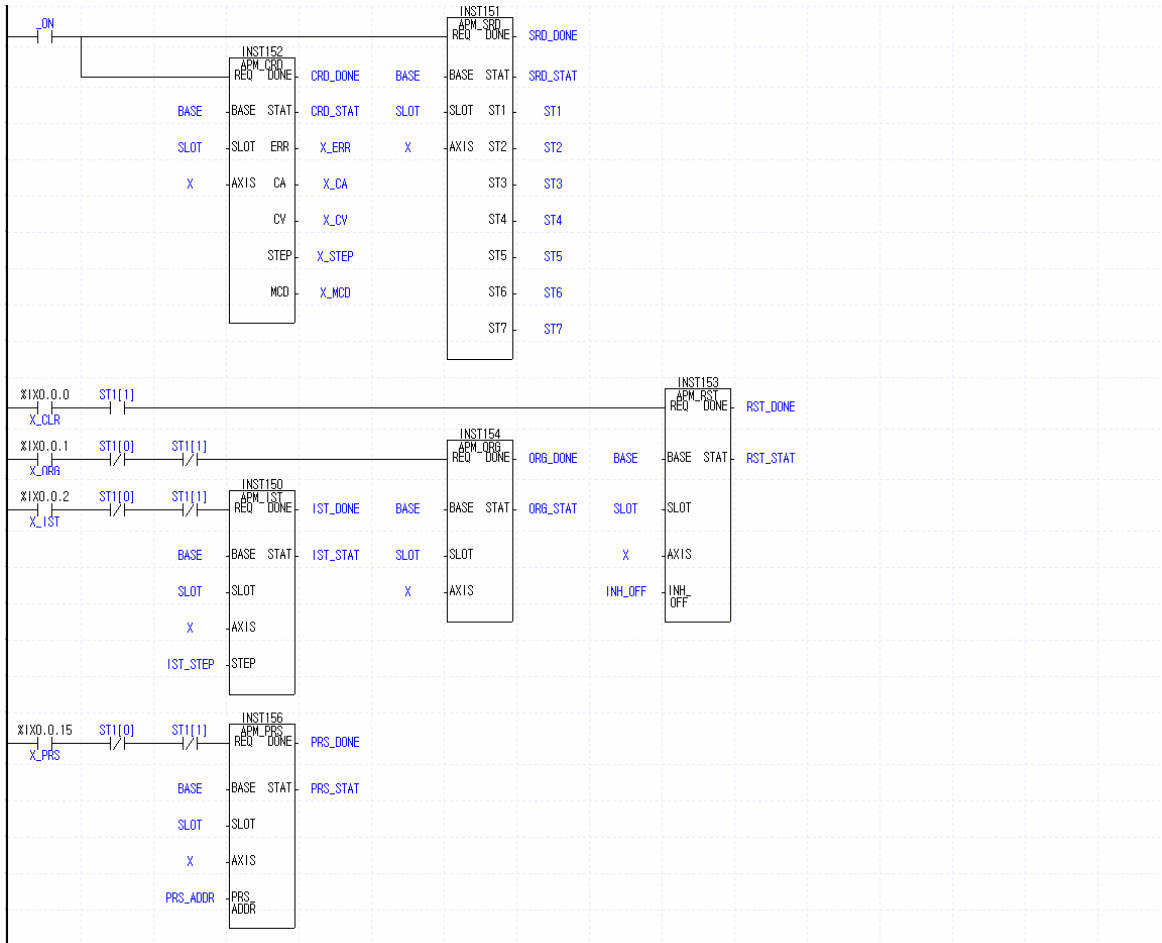
Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_SRS	X axis repeat operation step change execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
SRS_STEP	Repeat operation step to change	10 in the example



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_PRS	X axis current position change execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
PRS_ADDR	Current position value to change	3000 in the example



Chapter 10 Program

10.2.23 Speed Teaching

1) Description

(1) Used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	X axis start switch
P0000F	X axis speed teaching switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00100 ~ D00101	X axis start signal
D00000 ~ D00022	X axis operatin state information

(2) Operation Sequence

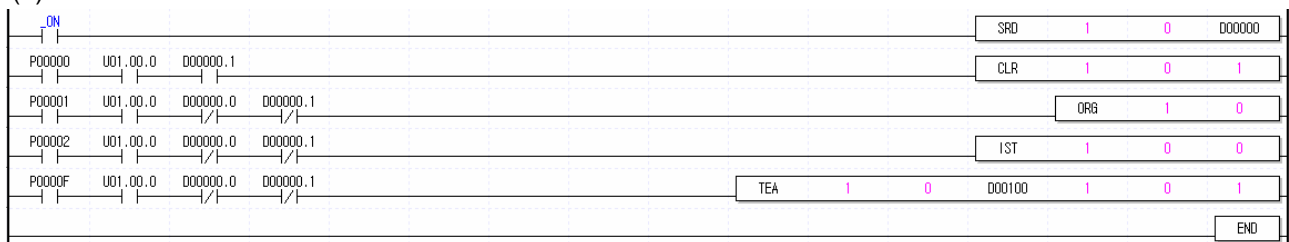
P00001(Homing) switch ON,OFF ⇒ P0000F(speed teaching) switch ON,OFF ⇒ P00002(Start) switch ON,OFF

(3) Operation Data Setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	10000	0	0	1	0	100	CW

2) Program

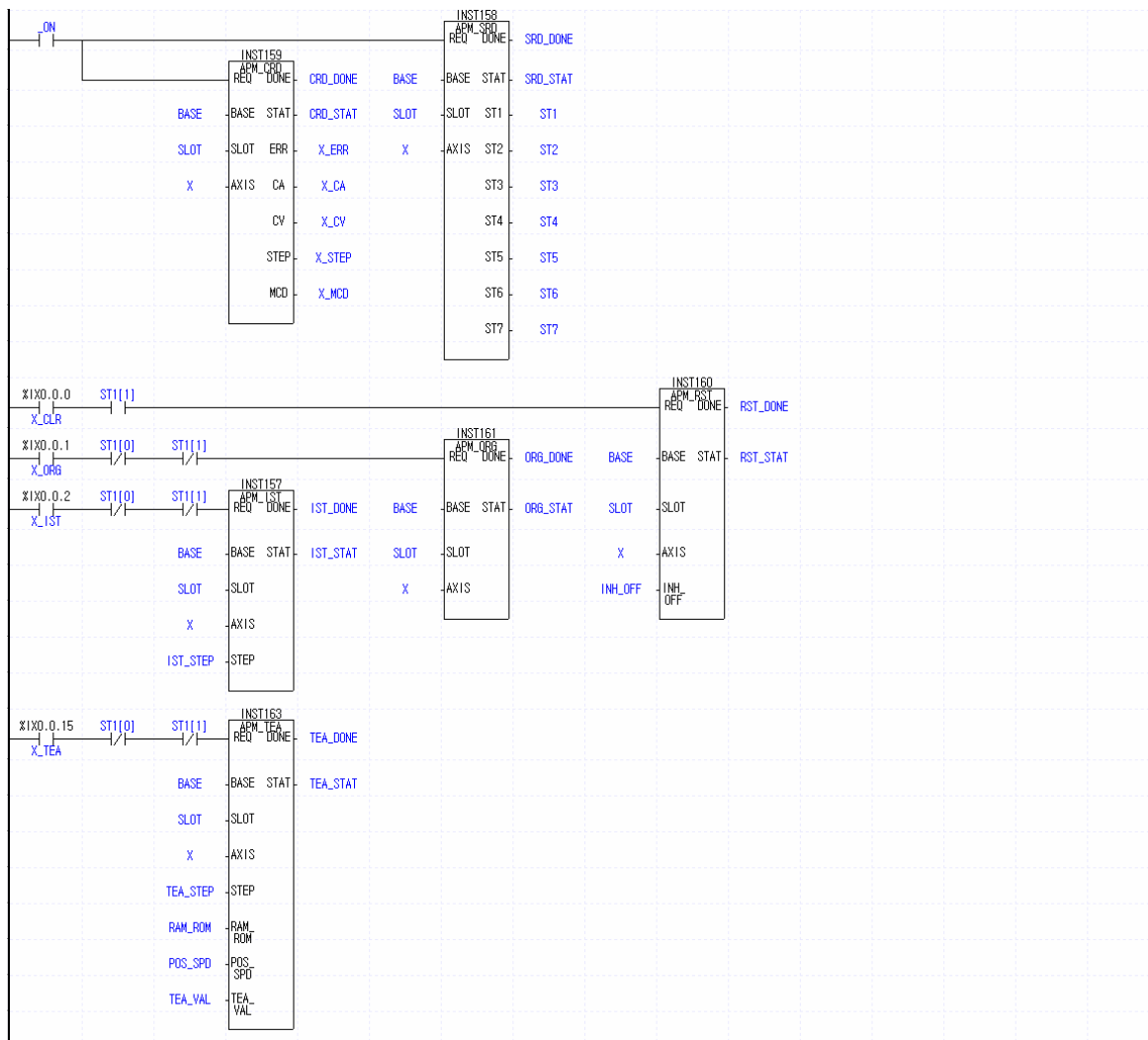
(1) XGK



Chapter 10 Program

(2) XGI

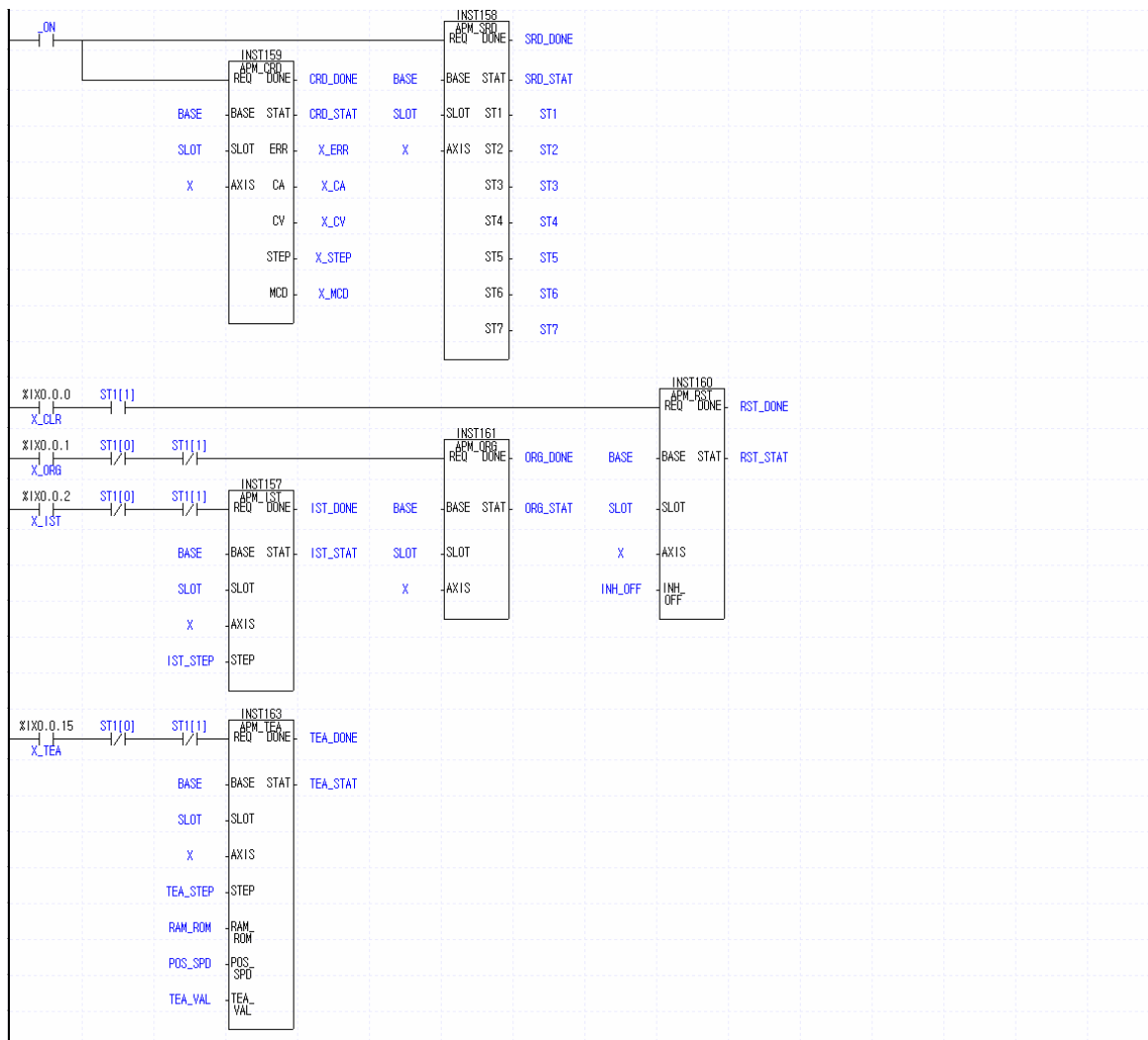
Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_TEA	X axis speed teaching execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
TEA_STEP	Teaching Step No.	1 in the example
ROM_RAM	Teaching method	0: RAM teaching 1: ROM teaching
POS_SPD	Teaching item	0: position 1: speed(1 in the example)
TEA_VAL	Teaching value	3000 in the example



Chapter 10 Program

(2) XGI

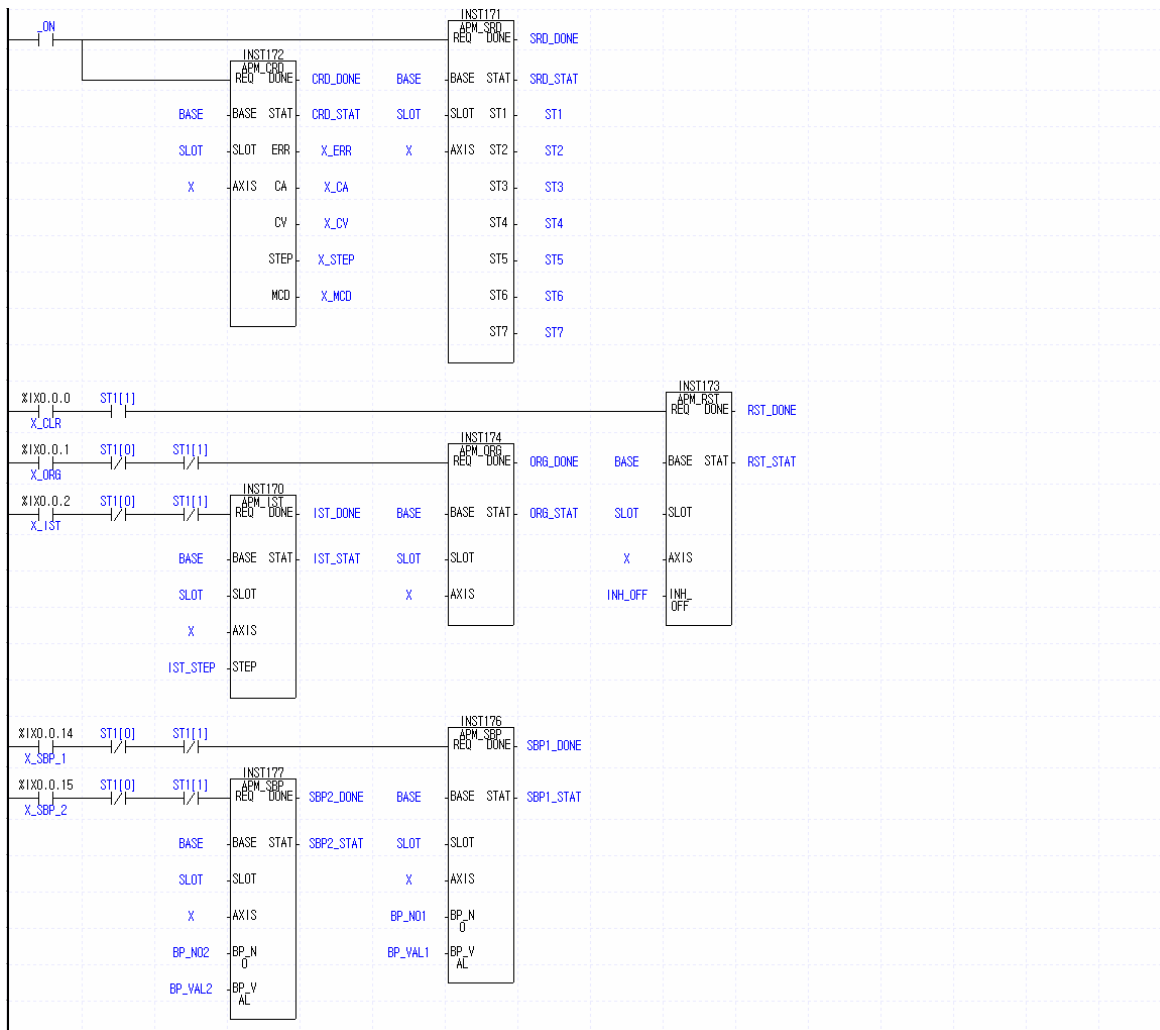
Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_TEA	X axis speed teaching execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
TEA_STEP	Teaching Step No.	1 in the example
ROM_RAM	Teaching method	0: RAM teaching 1: ROM teaching
POS_SPD	Teaching item	0: position 1: speed(0 in the example)
TEA_VAL	Teaching value	5000 in the example



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_SBP_1	X axis basic parameter teaching execution	No.14 bit of No.0 Slot Input Module(%IX0.0.14)
X_SBP_2	X axis basic parameter teaching execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
BP_NO1	Basic parameter No.1 to change	1 in the example(speed limit)
BP_VAL1	Basic parameter value 1 to change	200000 in the example
BP_NO2	Basic parameter No.2 to change	3 in the example(acc./dec. time 1)
BP_VAL2	Basic parameter value 2 to change	100 in the example



Chapter 10 Program

10.2.26 M Code Release

1) Description

(1) Used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	X axis Start switch
P0000F	X axis M code release switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
DO0000.3	X axis start signal
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P00002(Start) switch ON,OFF ⇒ P0000F(M code release) switch ON,OFF ⇒ P0000F(M code release) switch ON,OFF ⇒ P0000F(M code release) switch ON,OFF

(3) Operation Data and Parameter Setting

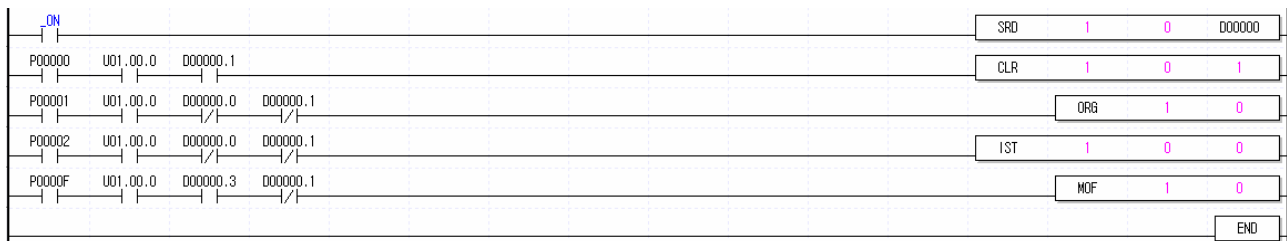
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	Go on	Single	10000	0	1	1	1000	100	CW
	2	Absolute	Position control	Go on	Single	20000	0	2	1	1500	100	CW
	3	Absolute	Position control	End	Ssingle	0	0	3	1	2000	100	CW

(4) Extended Parameter Setting

Parameter	Setting value
M code output	2: AFTER

2) Program

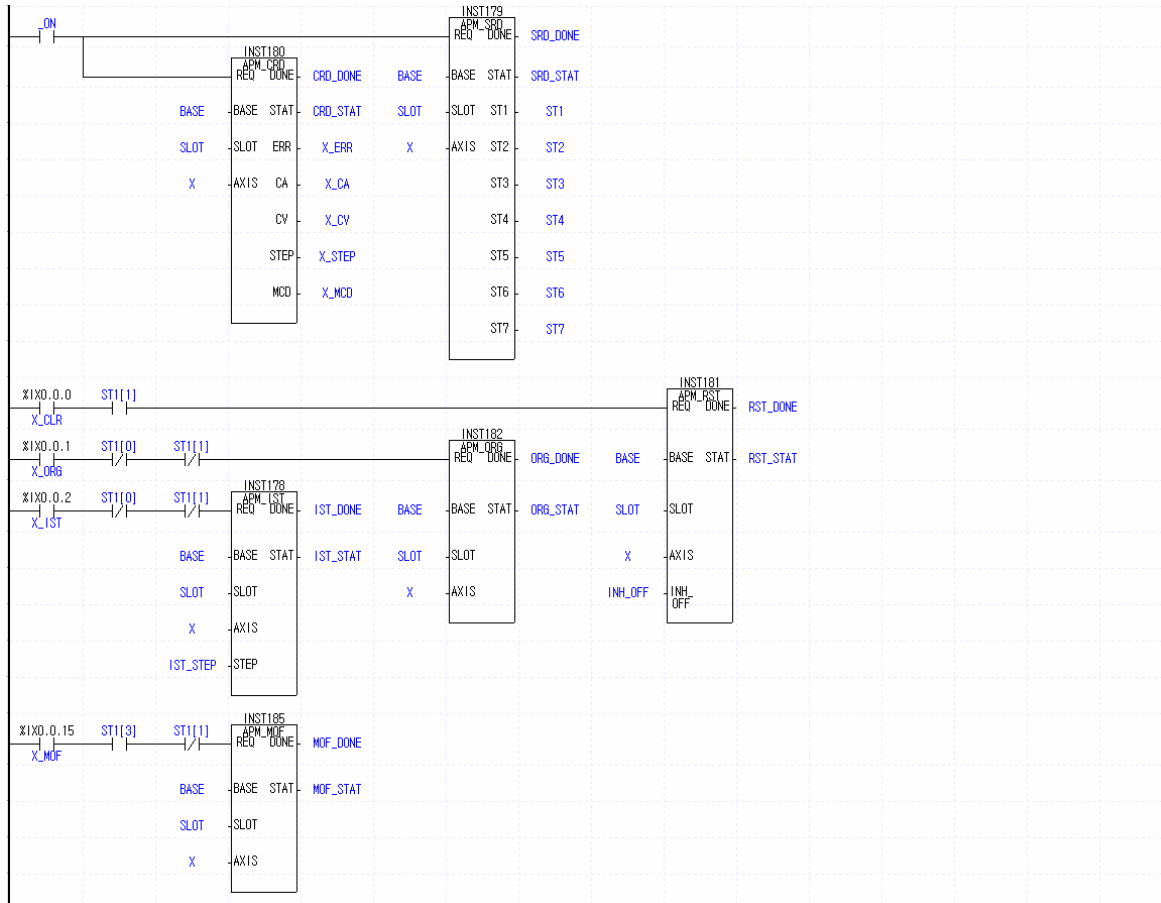
(1) XGK



Chapter 10 Program

(2) XGI

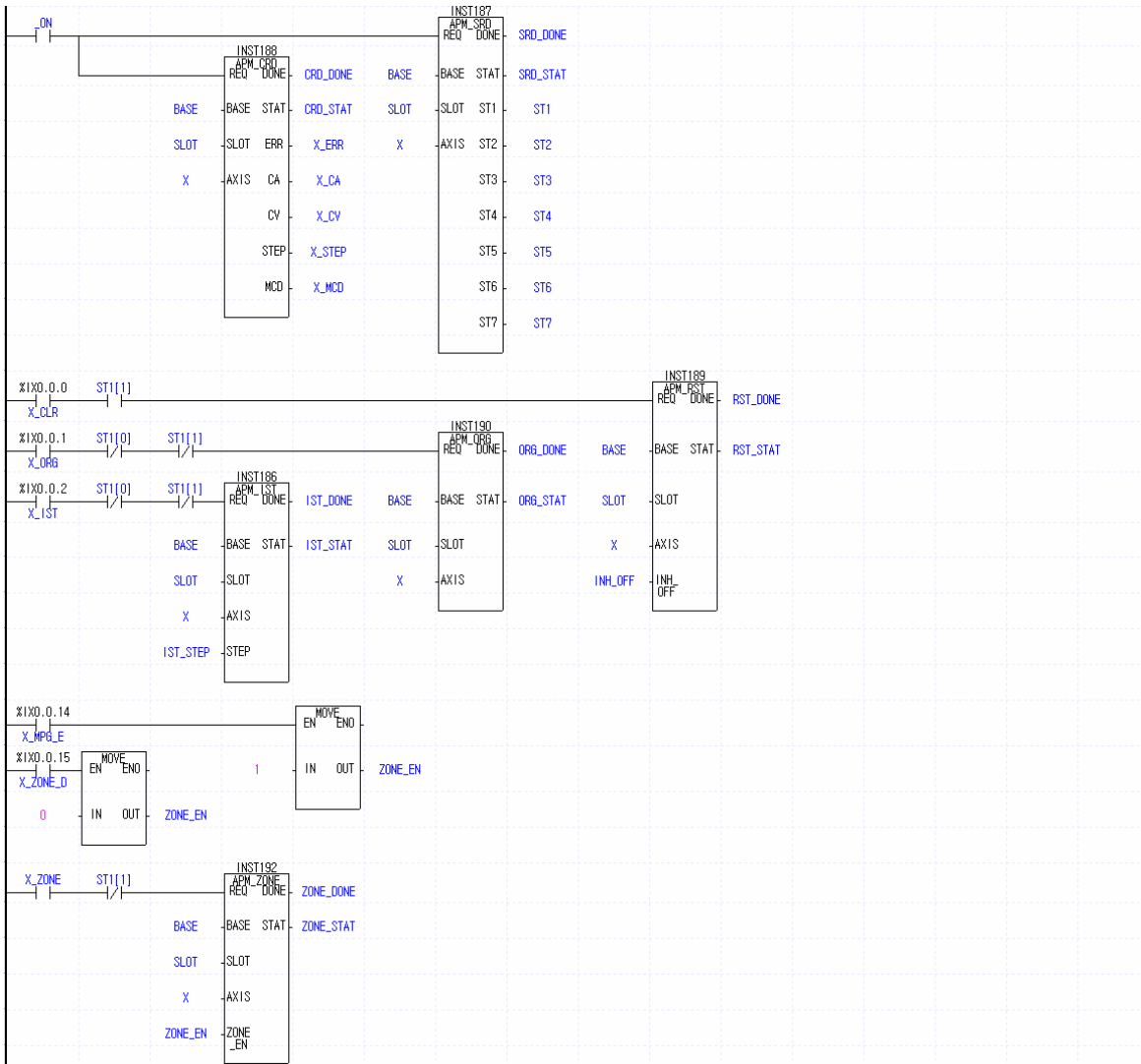
Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
ST1[3]	X axis M code state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_MOF	X axis M code release execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X 軸)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_ZONE_E	ZONE output enabled setting	No.14 bit of No.0 Slot Input Module(%IX0.0.14)
X_ZONE_D	ZONE output disabled setting	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
X_ZONE	ZONE setting execution	-



Chapter 10 Program

10.2.28 Point Start

1) Description

(1) Used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P0000E	X axis point start step setting switch
P0000F	X axis point start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state information

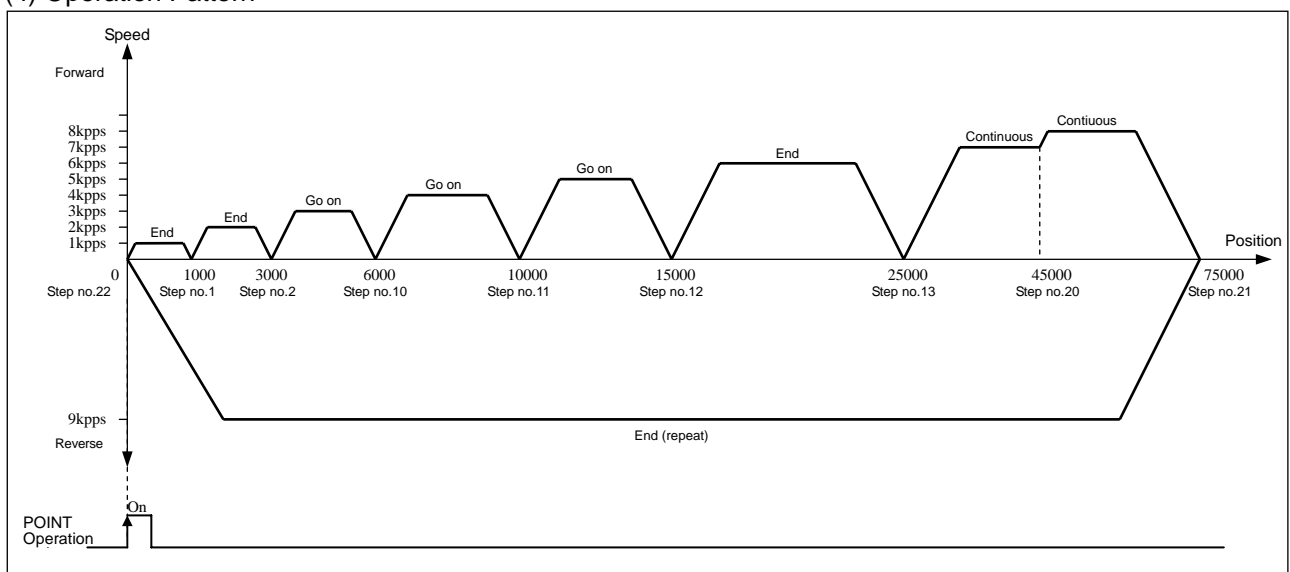
(2) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P0000E(POINT Start Step Setting) Switch ON,OFF ⇒ P0000F(POINT Start) switch ON,OFF

(3) Operation Data Setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	1000	0	0	1	1000	20	CW
	2	Absolute	Position control	End	Single	3000	0	0	1	2000	20	CW
	10	Absolute	Position control	Go on	Single	6000	0	0	1	3000	20	CW
	11	Absolute	Position control	Go on	Single	10000	0	0	1	4000	20	CW
	12	Absolute	Position control	Go on	Single	15000	0	0	1	5000	20	CW
	13	Absolute	Position control	End	Single	25000	0	0	1	6000	20	CW
	20	Absolute	Position control	Continuous	Single	45000	0	0	2	7000	20	CW
	21	Absolute	Position control	Continuous	Single	75000	0	0	2	8000	20	CW
	22	Absolute	Position control	End	Repeat	0	0	0	2	9000	20	CW

(4) Operation Pattern



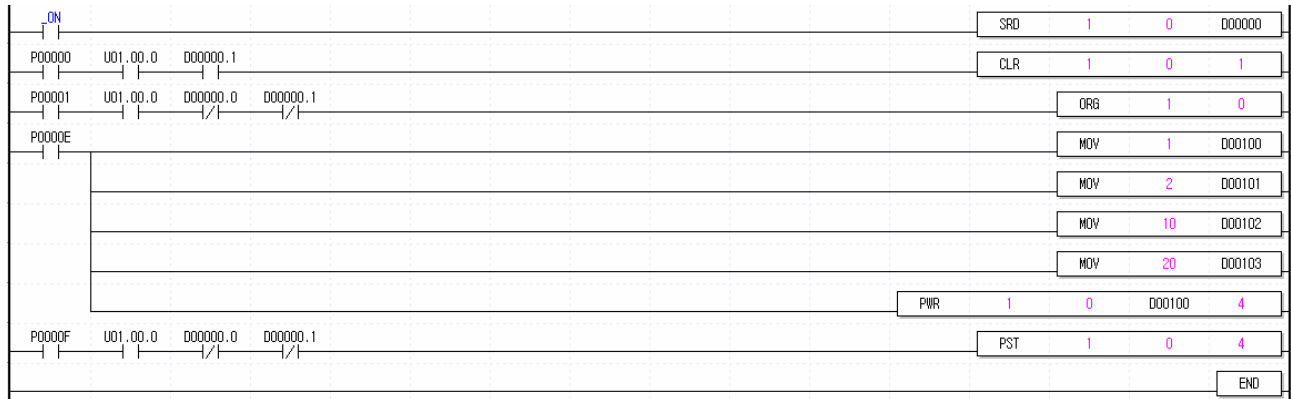
Chapter 10 Program

(5) Operation Step Data Setting

Device	Description	Setting value
D100	Point start step data 1	1
D101	Point start step data 2	2
D102	Point start step data 3	10
D103	Point start step data 4	20

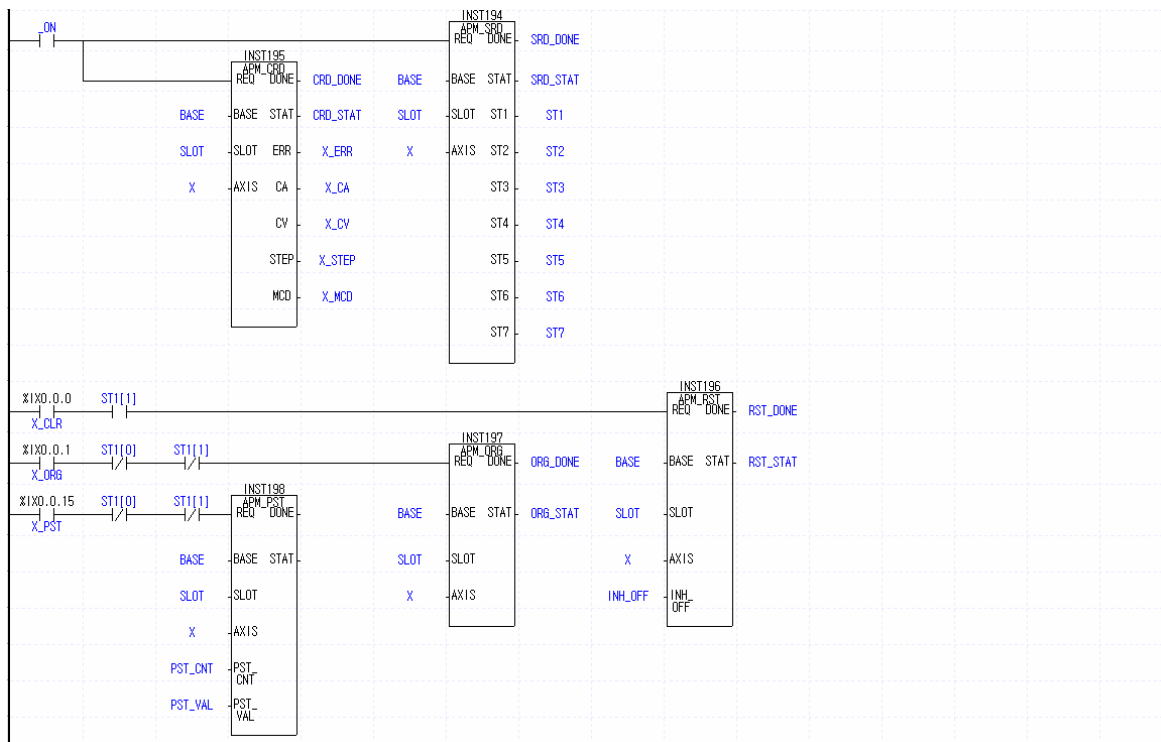
2) Program

(1) XGK



(2) XGI

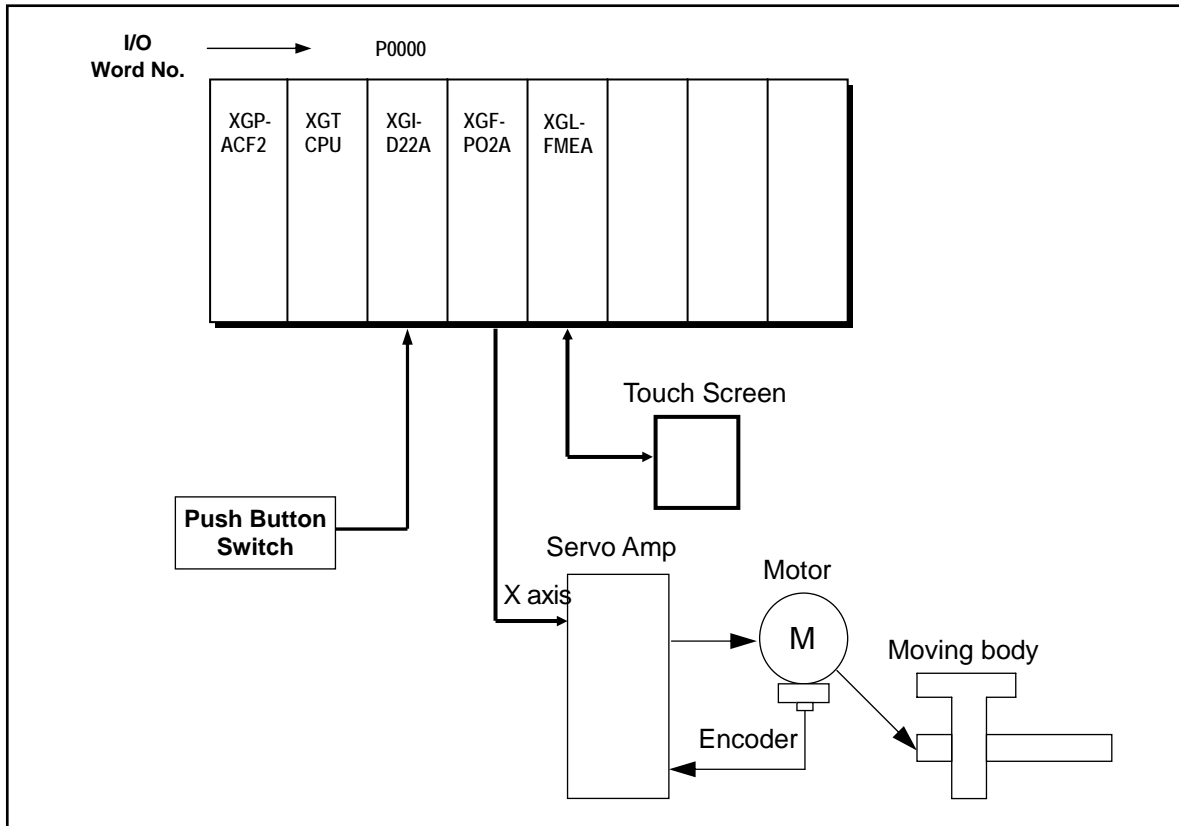
Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_FLT	X axis floating origin setting execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_PST	X axis point start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
PST_CNT	Point start step No.	4 in the example
PST_VAL	Point start step data	PST_VAL[0]: 1 PST_VAL[1]: 2 PST_VAL[2]: 10 PST_VAL[3]: 20 In the example



10.3 Application Program

10.3.1 Position Teaching and Speed Teaching by using HMI

1) System Configuration



2) Description

If you set goal position, forward rotation speed, reverse rotation speed by using a teaching command in Touch Screen and carry out the start after homing, the Servo Motor rotates as much as speed and position transfer data set in Touch Screen. As this uses RAM teaching mode by the program using the position teaching and speed teaching, teaching number is not limited.

3) Used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	Xaxis position Teaching switch
P00003	Xaxis forward rotation speed Teaching switch
P00004	Xaxis reverse rotation speed Teaching switch
P0000F	X axis start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00500 ~ D00501	Xaxis position Teaching data
D00540 ~ D00541	Xaxis forward rotation speed Teaching data
D00542 ~ D00543	Xaxis reverse rotation speed Teaching data
D00000 ~ D00022	X axis operation state information

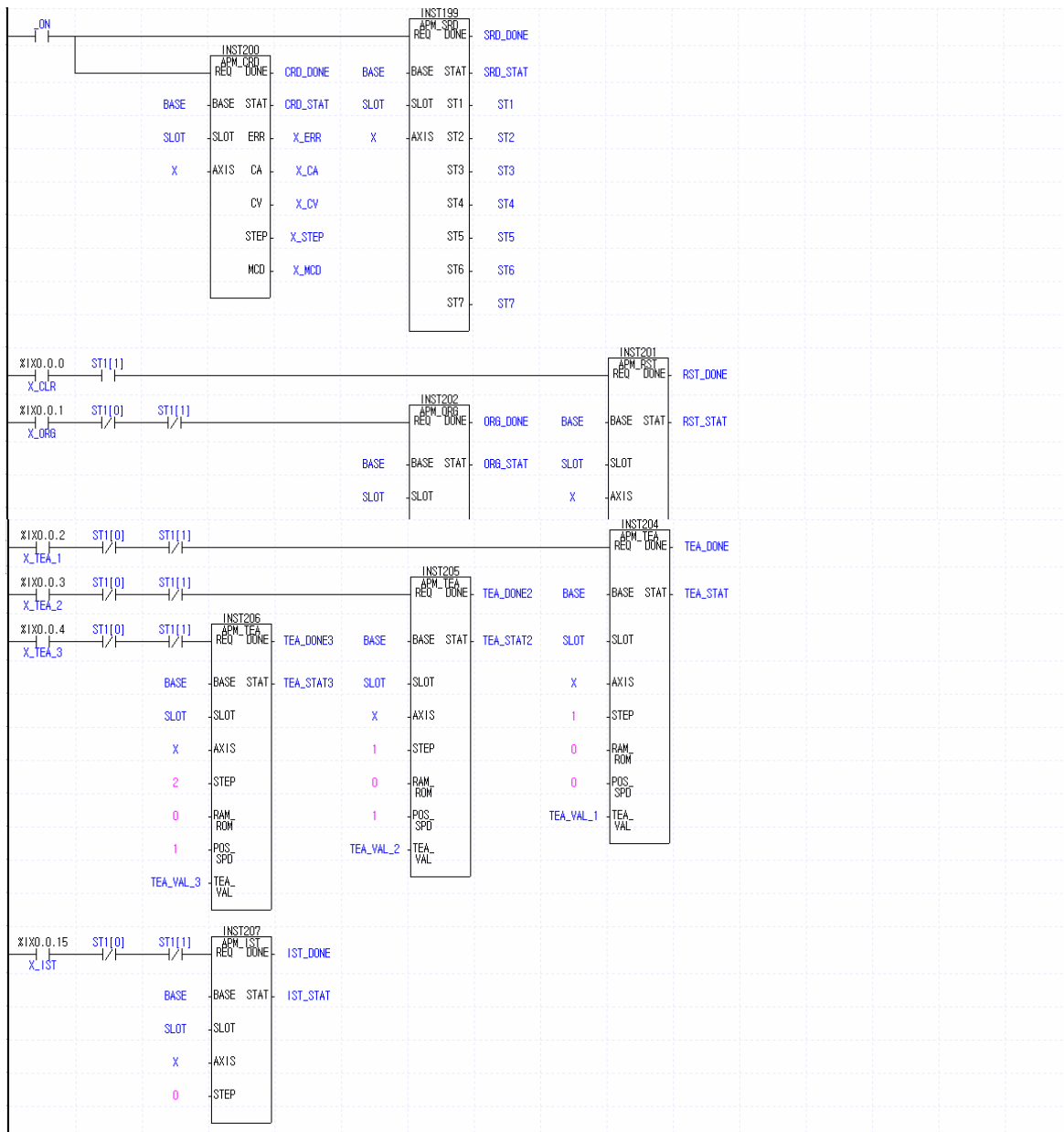
4) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P00002(position Teaching) switch ON,OFF ⇒ P00003(forward rotation speed Teaching) switch ON,OFF ⇒ P0000F(Start) switch ON,OFF ⇒ P00004(reverse rotation speed Teaching) switch ON,OFF ⇒ P0000F(Start) switch ON,OFF

Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X axis homing execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_TEA_1	X axis teaching execution 1	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_TEA_2	X axis teaching execution 2	No.3 bit of No.0 Slot Input Module(%IX0.0.3)
X_TEA_3	X axis teaching execution 3	No.4 bit of No.0 Slot Input Module(%IX0.0.4)
X_IST	X axis indirect start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
TEA_VAL_1	Teaching value 1	D00500 in the XGK example
TEA_VAL_2	Teaching value 2	D00540 in the XGK example
TEA_VAL_3	Teaching value 3	D00542 in the XGK example



Chapter 10 Program

10.3.2 Positioning by End/Go on/Continuous Operation

1) System Configuration

System Configuration is the same as 10.3.1.

2) Used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P0000F	X axis start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state information

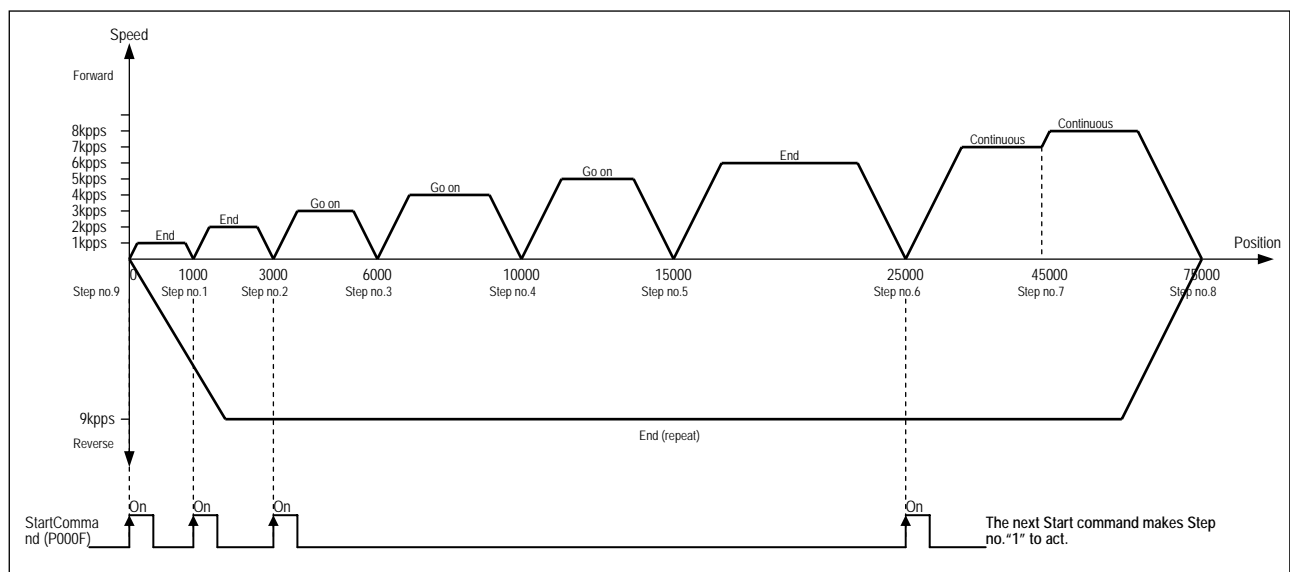
3) Operation Sequence

P00001(Homing) switch ON, OFF ⇒ P0000F(Start) switch ON, OFF 4

4) Operation Data Setting

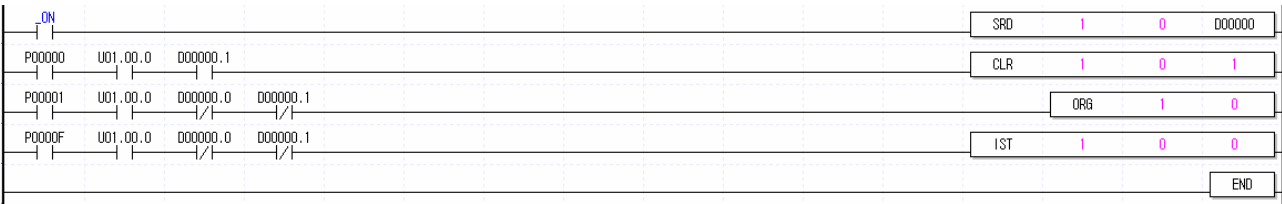
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
Xaxis setting	1	Relative	Position control	End	Single	1000	0	0	1	1000	20	CW
	2	Relative	Position control	end	Single	2000	0	0	1	2000	20	CW
	3	Relative	Position control	Go on	Single	3000	0	0	1	3000	20	CW
	4	Relative	Position control	Go on	Single	4000	0	0	1	4000	20	CW
	5	Relative	Position control	Go on	Single	5000	0	0	1	5000	20	CW
	6	Relative	Position control	End	Single	10000	0	0	1	6000	20	CW
	7	Relative	Position control	Continuous	Single	20000	0	0	1	7000	20	CW
	8	Relative	Position control	Continuous	Single	30000	0	0	1	8000	20	CW
	9	Relative	Position control	End	Repeat	0	0	0	1	9000	20	CW

5) Operation Pattern



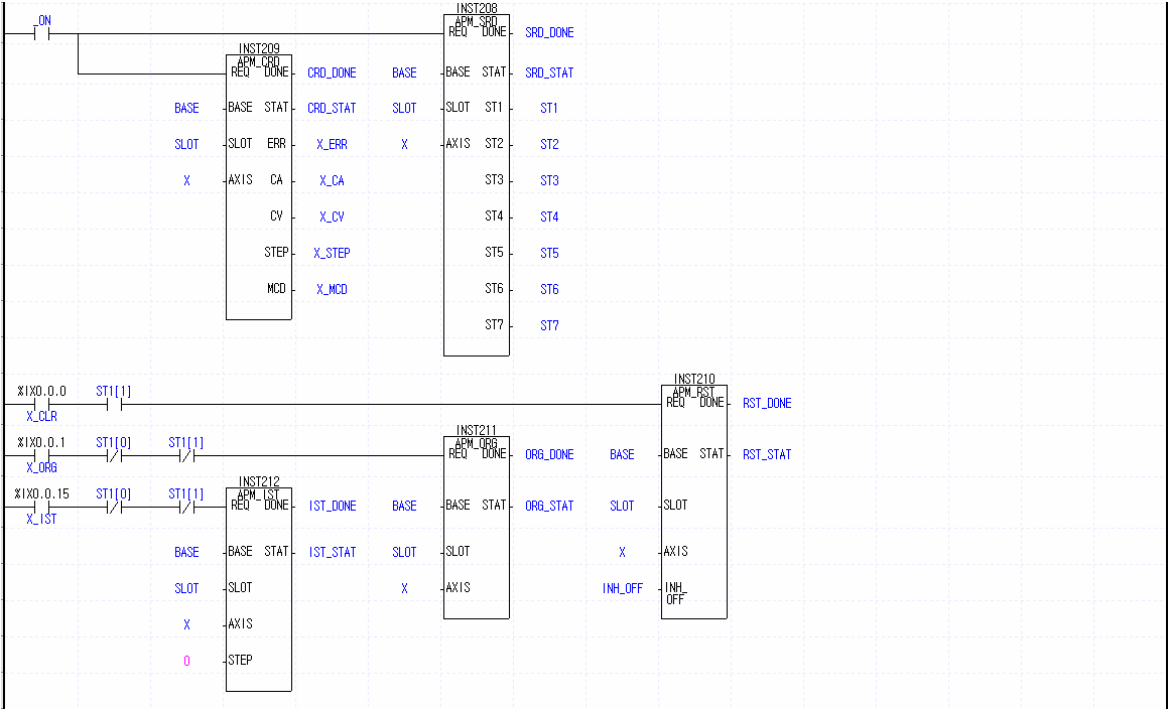
Chapter 10 Program

6) Program (1) XGK



(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X axis homing execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_IST	X axis indirect start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.3.3 Positioning by using M Code

1) System Configuration

System Configuration is the same as 10.3.1.

2) Used Device

Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	X axis M code release switch
P0000F	X axis start switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation state information

3) Operation Sequence

P00001(Homing) switch ON,OFF => P0000F(Start) switch ON,OFF => P00002(M Code release) switch ON,OFF => P0000F(Start) switch ON,OFF => P00002(M Code release) switch ON,OFF => P00002(M Code release) switch ON,OFF => P0000F(Start) switch ON,OFF => P00002(M Code release) switch ON,OFF => P00002(M Code release) switch ON,OFF

▷ Refer to Start command and M Code OFF command of Operation Pattern.

4) Operation Data Setting

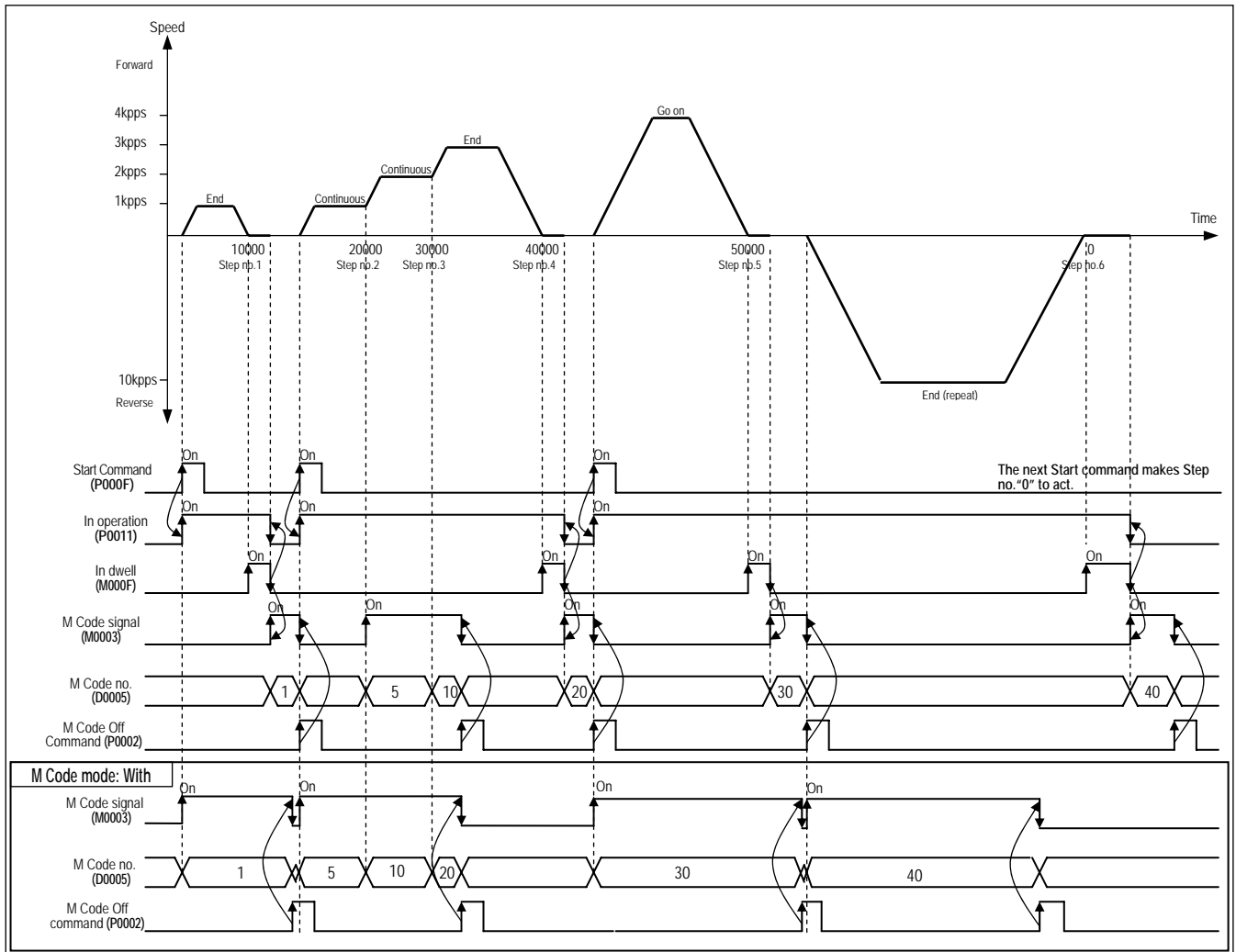
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	10000	0	1	1	1000	100	CW
	2	Absolute	Position control	Continuous	Single	20000	0	5	1	1000	100	CW
	3	Absolute	Position control	Continuous	Single	30000	0	10	1	2000	100	CW
	4	Absolute	Position control	End	Single	40000	0	20	1	3000	100	CW
	5	Absolute	Position control	Go on	Single	50000	0	30	1	4000	100	CW
	6	Absolute	Position control	End	Repeat	0	0	40	1	5000	100	CW

5) Extended Parameter Setting

Parameter	Setting Value
M Code output	2: AFTER

Chapter 10 Program

5) Operation Pattern



Notes

- ▶ In Continuous operation mode, M Code signal is changed with the corresponding M Code no. without stop whenever operation step no. is changed, and the operation continues.
- ▶ In Go on operation mode, if M Code signal is ON, it is required to make M Code "ON" signal OFF by M Code OFF command in order to operate the next operation step no.

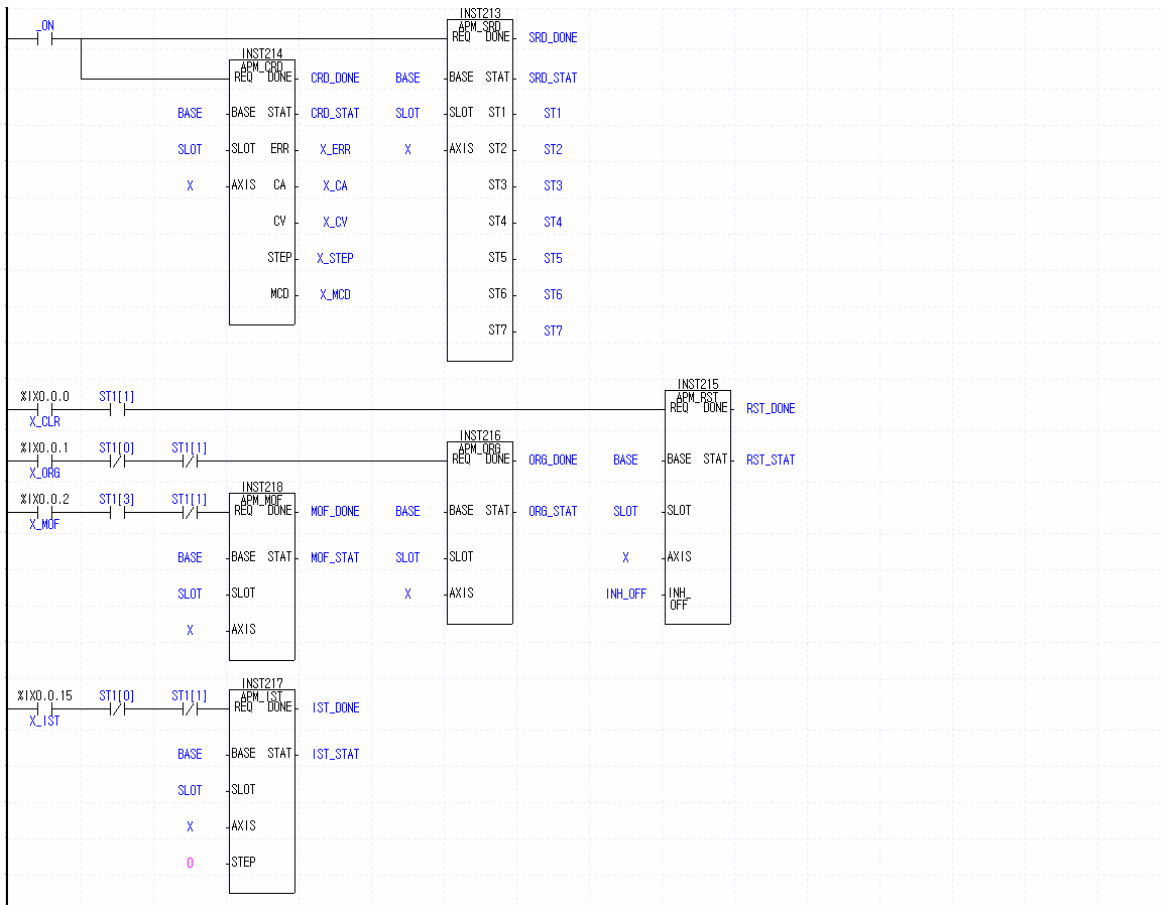
6) Program

_ON				SRD	1	0	D00000
P00000	U01.00.0	D00000.1		CLR	1	0	1
P00001	U01.00.0	D00000.0	D00000.1		ORG	1	0
P00002	U01.00.0	D00000.3	D00000.1		MOF	1	0
P0000F	U01.00.0	D00000.0	D00000.1	IST	1	0	0
				END			

Chapter 10 Program

(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
ST1[3]	X axis M code state signal	-
X_CLR	X axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X axis homing execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_MOF	X axis M code release execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_IST	X axis indirect start execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)



Chapter 10 Program

10.3.4 2 axis Linear Interpolation Operation

1) System Configuration

System Configuration is the one that Y axis Servo driving device is added to X axis Servo driving device of 10.3.1.

2) Used Device

Device	Description
P00000	X axis, Y axis error reset, output disabled release switch
P00001	X axis, Y axis homing switch
P0000F	2 axis Linear interpolation operation switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000 ~ D00022	X axis operation information read(current position, speed, step No., M code, error information)
U01.00.5	Y axis command receive signal
D00100.0	Y axis signal in operation
D00100.1	Y axis error state signal
D00100 ~ D00122	Y axis operation information read(current position, speed, step No., M code, error information)

3) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P0000F(Linear interpolation) switch ON,OFF ⇒ P0000F(Linear interpolation) switch ON,OFF

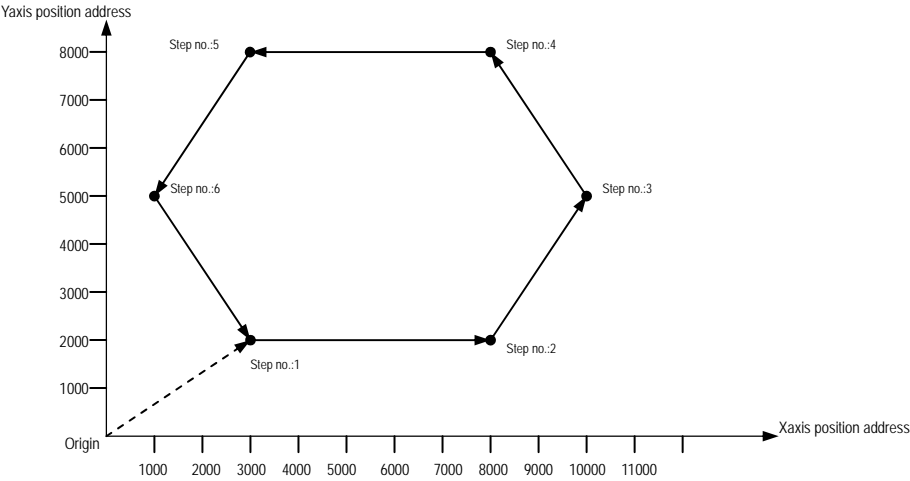
4) Operation Data Setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis Setting	1	Absolute	Position control	End	Single	3000	0	0	1	1000	100	CW
	2	Absolute	Position control	Go on	Single	8000	0	0	1	1000	100	CW
	3	Absolute	Position control	Go on	Single	10000	0	0	1	1000	100	CW
	4	Absolute	Position control	Go on	Single	8000	0	0	1	1000	100	CW
	5	Absolute	Position control	Go on	Single	3000	0	0	1	1000	100	CW
	6	Absolute	Position control	Go on	Repeat	1000	0	0	1	1000	100	CW

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
Y axis Setting	1	Absolute	Position control	end	Single	2000	0	0	1	1000	100	CW
	2	Absolute	Position control	Go on	Single	2000	0	0	1	1000	100	CW
	3	Absolute	Position control	Go on	Single	5000	0	0	1	1000	100	CW
	4	Absolute	Position control	Go on	Single	8000	0	0	1	1000	100	CW
	5	absolute	Position control	Go on	single	8000	0	0	1	1000	100	CW
	6	absolute	Position control	Go on	repeat	5000	0	0	1	1000	100	CW

Chapter 10 Program

5) Operation Pattern



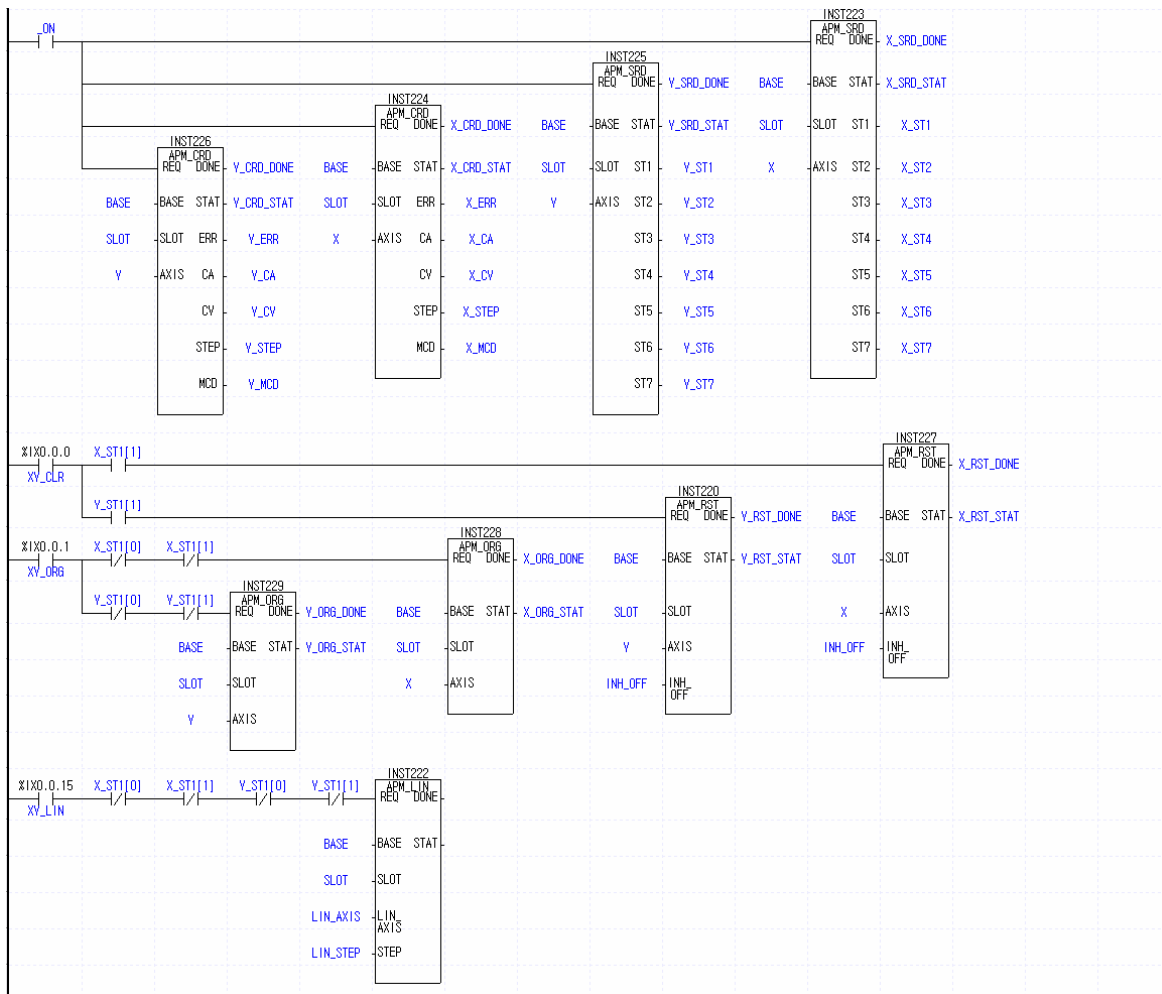
6) Program (1) XGK

_ON				SRD	1	0	D00000
				SRD	1	1	D00100
P00000	U01.00.0	D00000.1		CLR	1	0	1
	U01.00.5	D00100.1		CLR	1	1	1
P00001	U01.00.0	D00000.0	D00000.1	ORG	1	0	
	U01.00.5	D00100.0	D00100.1	ORG	1	1	
P0000F	U01.00.0	D00000.0	D00000.1	D00100.0	D00100.1	LIN	1 0 0 3
				END			

Chapter 10 Program

(2) XGI

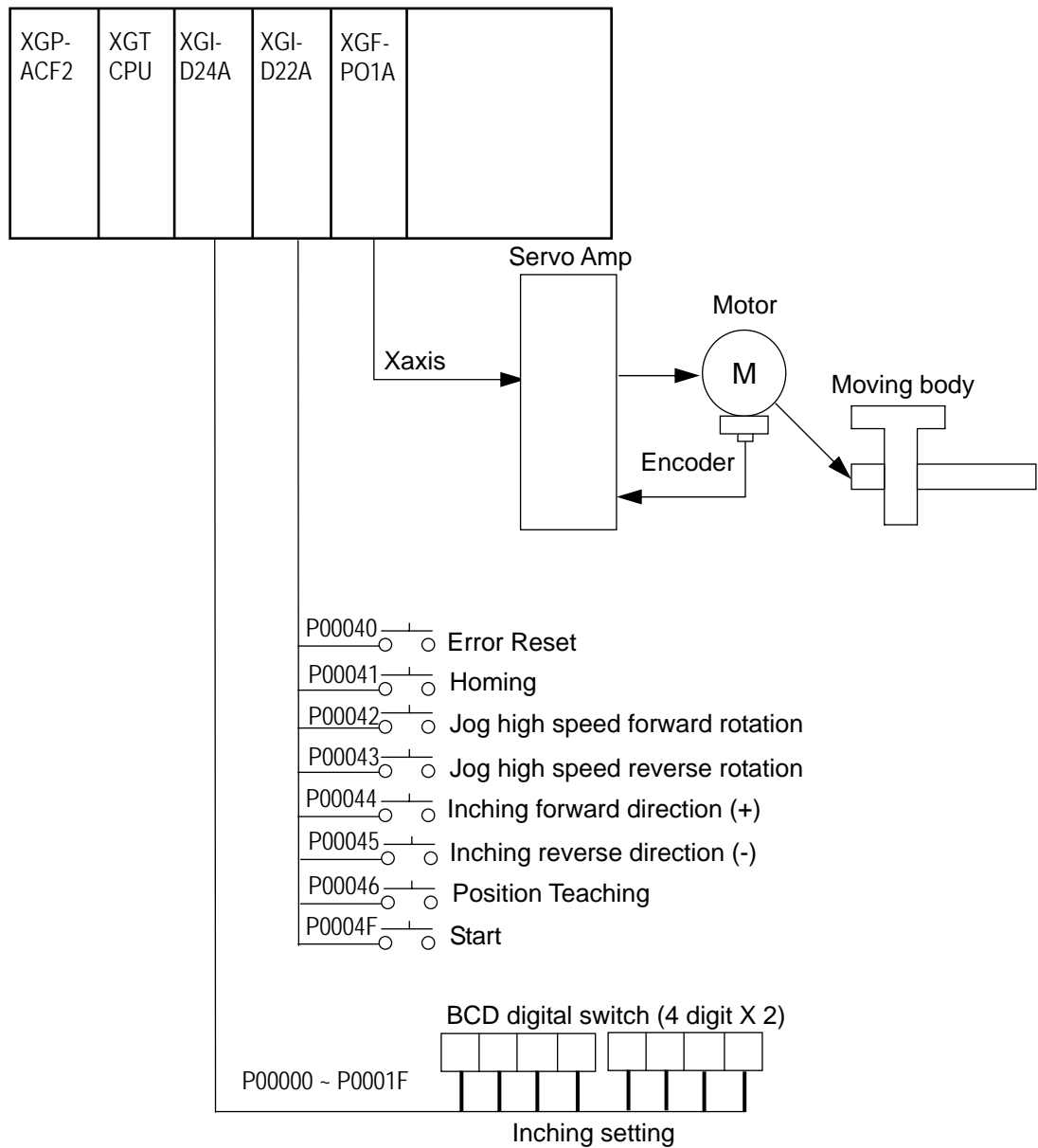
Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	1
X	APM Axis to execute function block	0 (X axis)
Y	APM Axis to execute function block	1 (Y axis)
X_ST1[0]	X axis signal in operation	-
X_ST1[1]	X axis error state signal	-
Y_ST1[0]	Y axis signal in operation	-
Y_ST1[1]	Y axis error state signal	-
XY_CLR	X axis/Y axis error reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
XY_ORG	X axis/Y axis homing execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
XY_LIN	X axis/Y axis linear interpolation execution	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
LIN_AXIS	Linear interpolation axis setting	3 in the example



10.3.5 Position Teaching by Jog Operation and Inching Operation

1) System Configuration

I/O Word No. → P0000, P0004



- In case of the fixed points I/O addressing method, you can set it in the basic parameter of XG5000 (It is assigned to 64 I/O points to 1 slot number of I/O module when you use XGK CPU module.)

Chapter 10 Program

2) Used Device

Device	Description
P00040	X axis error reset, output disabled release switch
P00041	X axis homing switch
P00042	X axis Jog high speed forward rotation switch
P00043	X axis Jog high speed reverse rotation switch
P00044	X axis Inching forward rotation switch
P00045	X axis Inching reverse rotation switch
P00046	X axis position Teaching switch
P0004F	X axis start switch
U02.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00004 ~ D00005	X axis current position
D00100 ~ D00101	Inching forward rotation setting value
D00102 ~ D00103	Inching reverse rotation setting value
D00000 ~ D00022	X axis operation state information

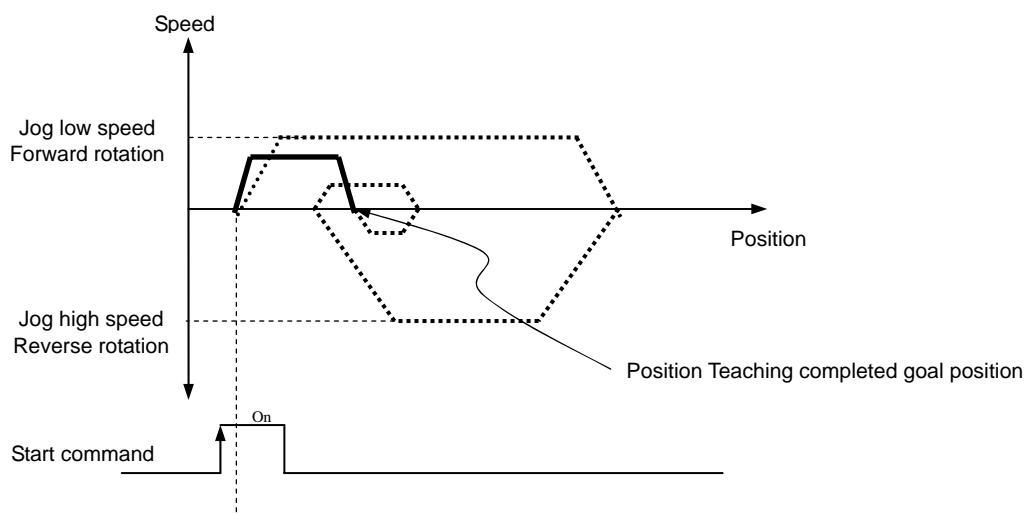
3) Operation Sequence

P00041(Homing) switch ON,OFF ⇒ P00042(Jog high speed forward rotation) switch ON,OFF ⇒ P00043(Jog high speed reverse rotation) switch ON,OFF ⇒ Inching transfer amount setting by BCD digital switch ⇒ P00044(Inching forward rotation) switch ON,OFF ⇒ Inching transfer amount setting by BCD digital switch ⇒ P00045(Inching reverse rotation) switch ON,OFF ⇒ P00046(Position Teaching) switch ON,OFF ⇒ P00041(Homing) switch ON,OFF ⇒ P0004F(Start) switch ON,OFF

4) Operation Data Setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	0	0	0	1	1000	100	CW
	2	Absolute	Position control	End	Single	0	0	0	1	0	0	CW

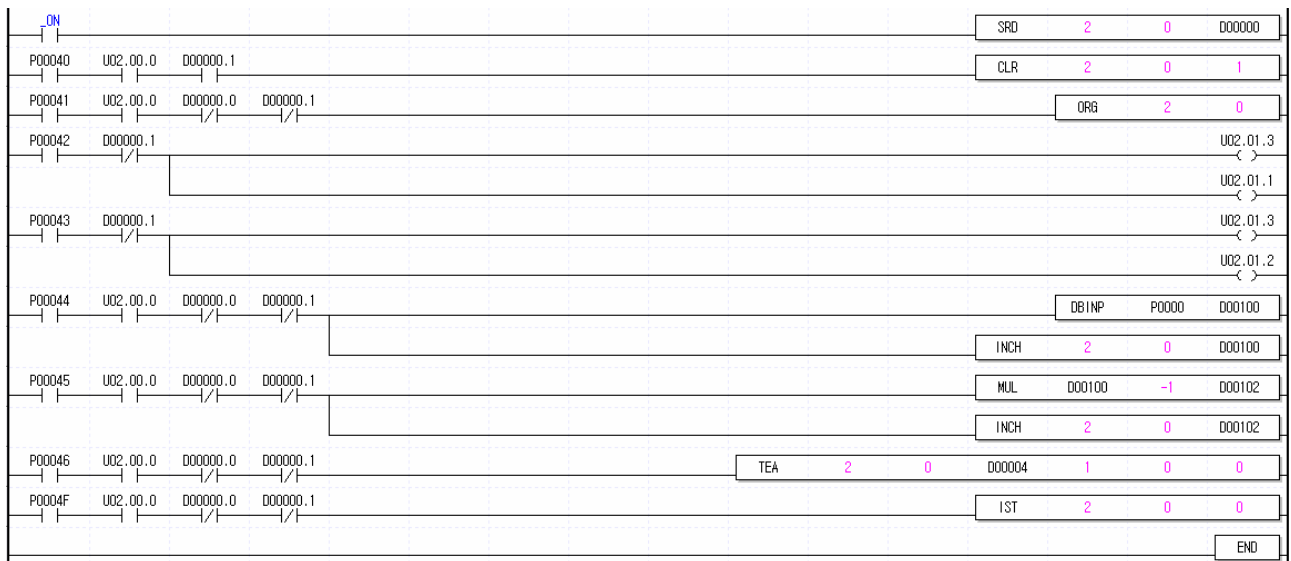
5) Operation Pattern



Chapter 10 Program

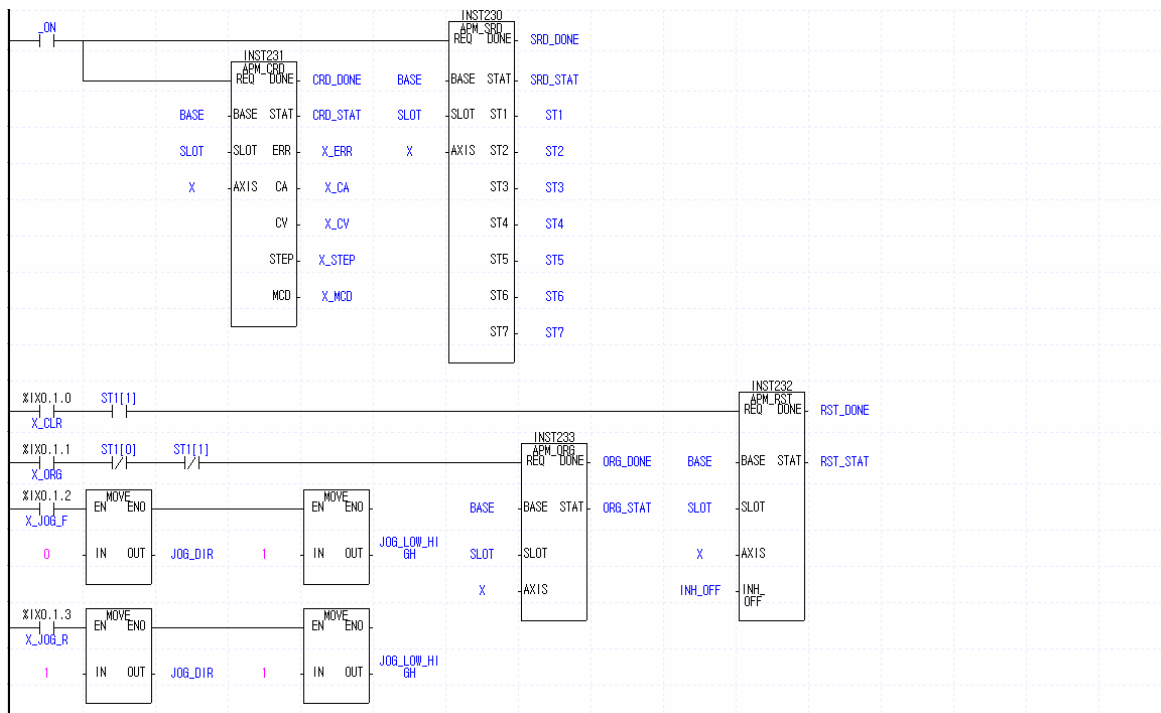
6) Program

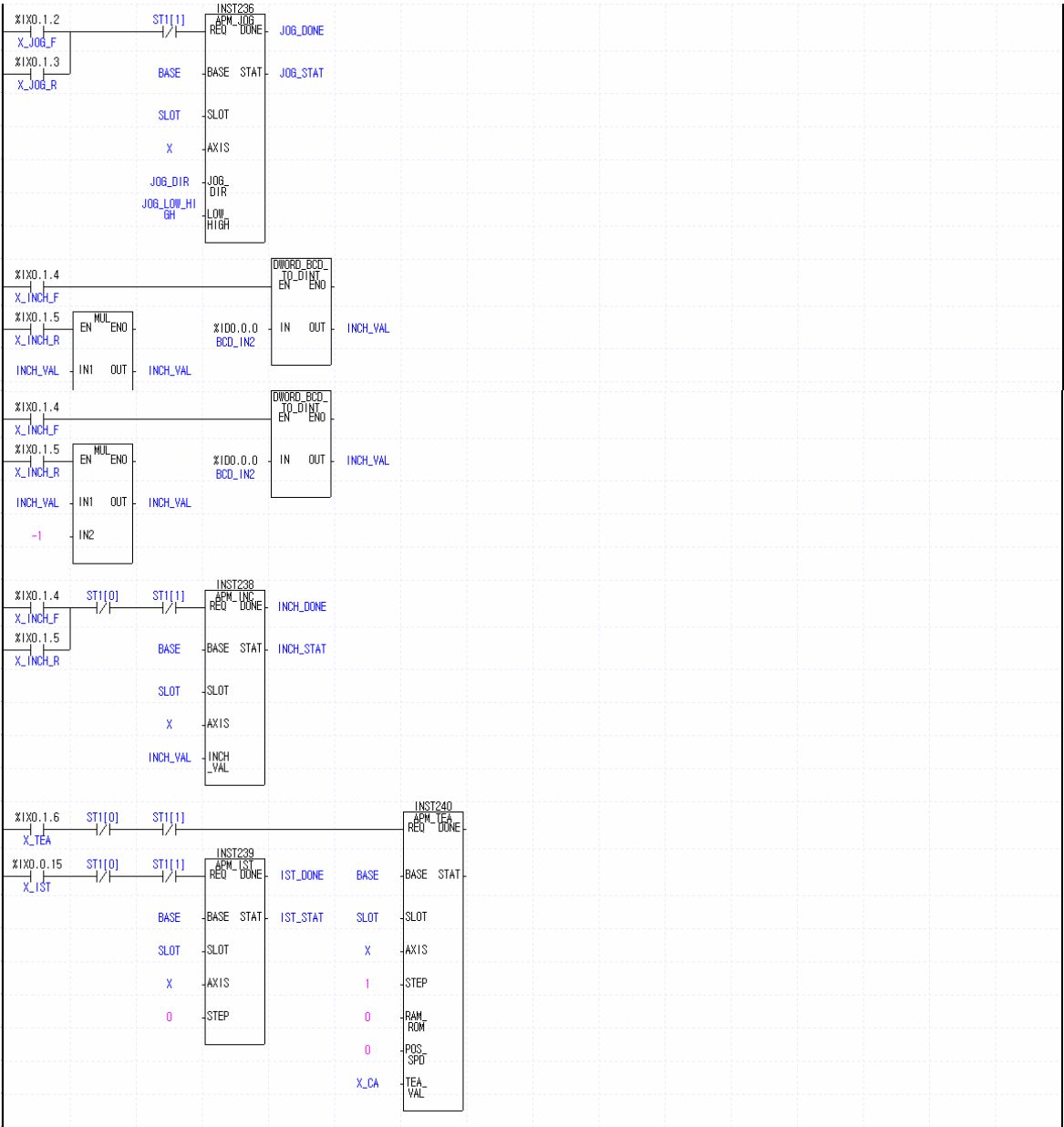
(1) XGK



(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	2
X	APM Axis to execute function block	0 (X 축)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X axis homing execution	No.1 bit of No.0 Slot Input Module(%IX0.0.1)
X_JOG_F	X axis forward JOG high speed execution	No.2 bit of No.0 Slot Input Module(%IX0.0.2)
X_JOG_R	X axis reverse JOG high speed execution	No.3 bit of No.1 Slot Input Module(%IX0.1.3)
X_INCH_F	X axis forward inching value setting	No.4 bit of No.1 Slot Input Module(%IX0.1.4)
X_INCH_R	X axis reverse inching value setting	No.5 bit of No.1 Slot Input Module(%IX0.1.5)
X_INCH	X axis inching operation execution	No.6 bit of No.1 Slot Input Module(%IX0.1.6)
X_IST	X axis indirect start execution	No.15 bit of No.1 Slot Input Module(%IX0.0.15)
INCH_VAL	Inching operation value	D00100 in the XGK example

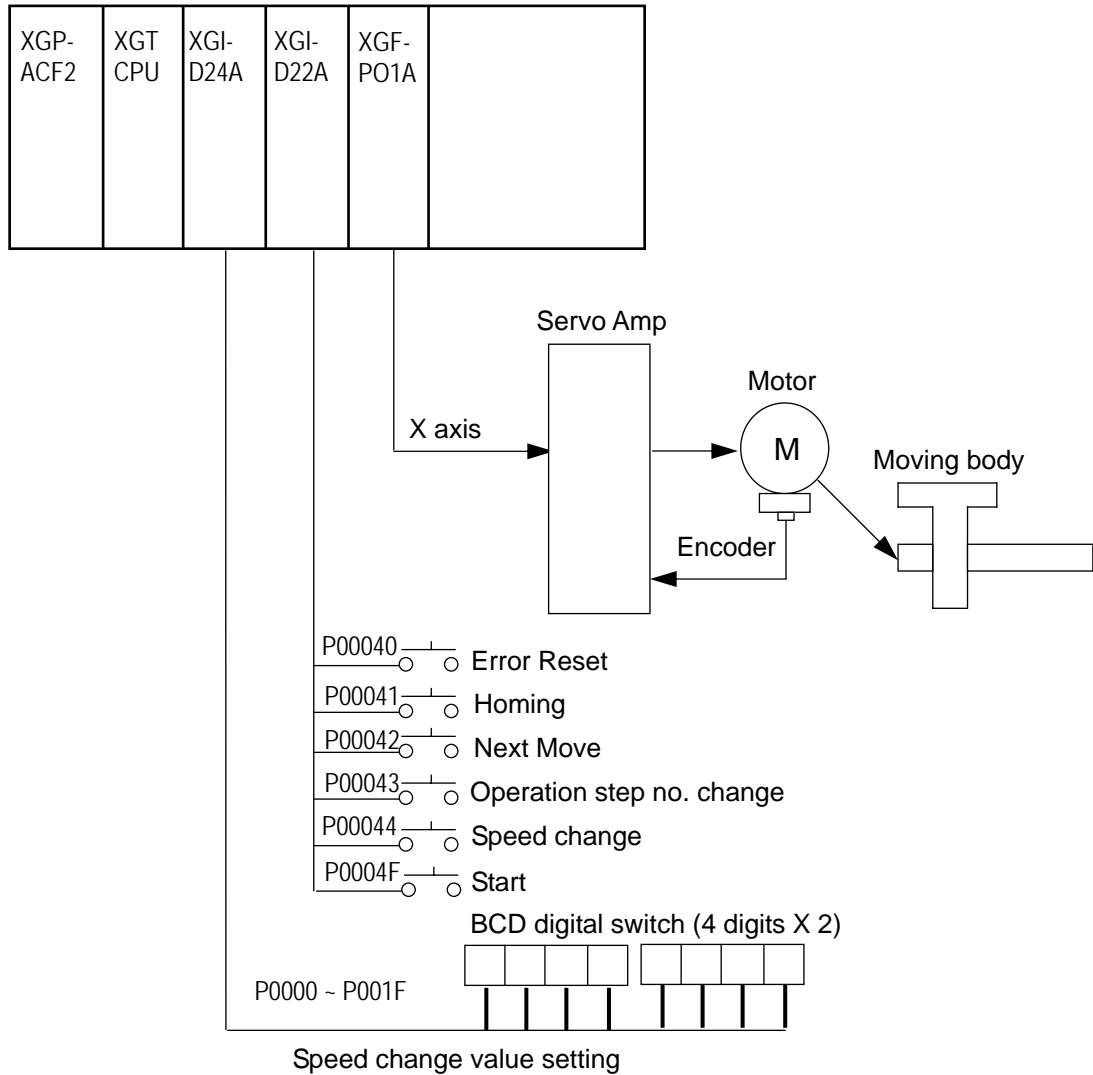




10.3.6 Speed Change, Continuous Operation(NMV)

1) System Configuration

I/O Word No. → P0000 P0004



- In case of the fixed points I/O addressing method, you can set it in the basic parameter of XG5000 (It is assigned to 64 I/O points to 1 slot number of I/O module when you use XGK CPU module.)

2) Used Device

Device	Description
P00040	X axis error reset, output disabled release switch
P00041	X axis homing switch
P00042	X axis continuous operation switch
P00043	X axis Operation step no. change switch
P00044	X axis speed change switch
P0004F	X axis start switch
U02.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00000.D	X axis signal in constant speed
D00100 ~ D00101	Speed change setting value
D00000 ~ D00022	X axis operation state information

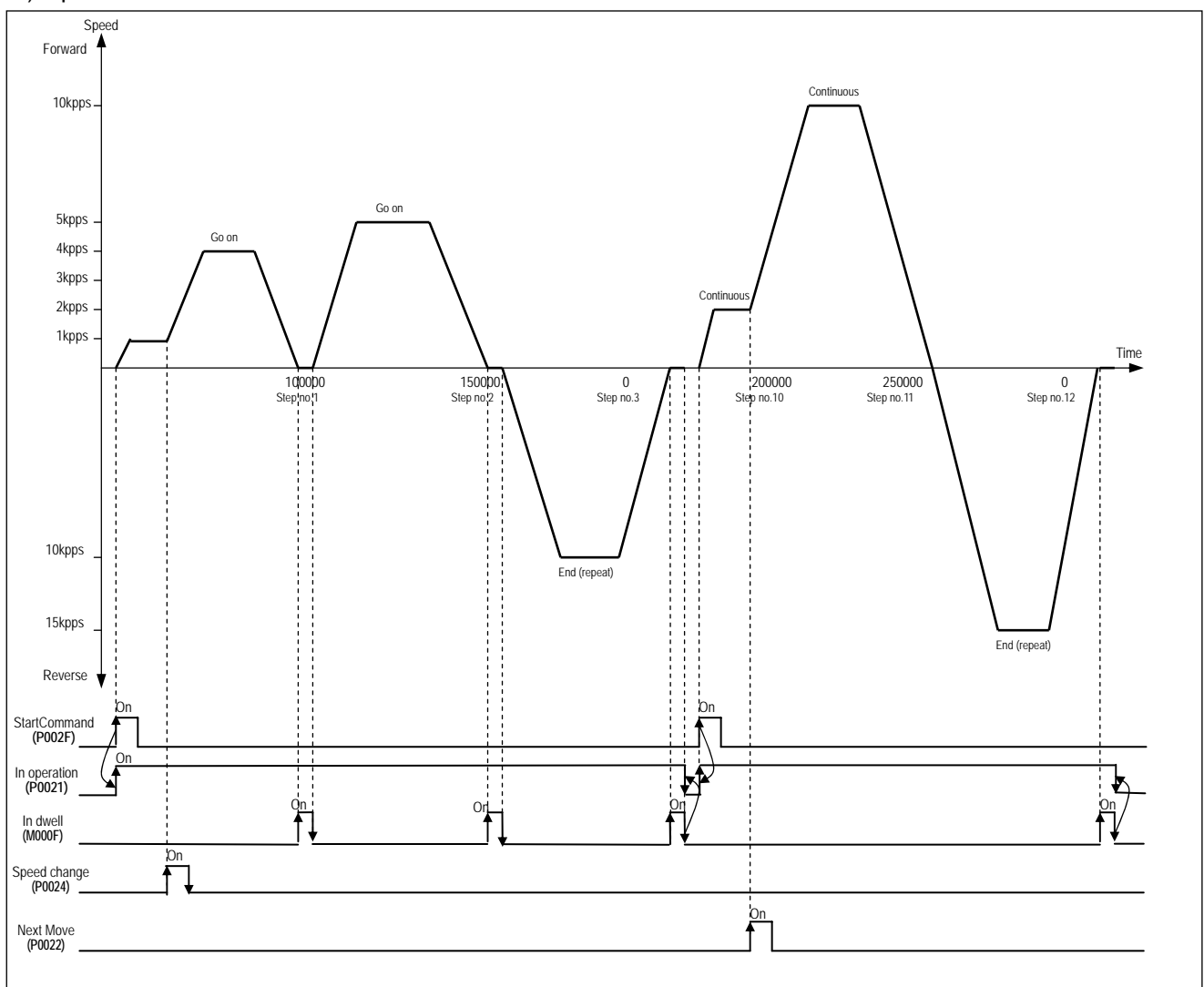
Chapter 10 Program

3) Operation Sequence P00041(Homing) switch ON, OFF ⇒ P0004F(Start) switch ON, OFF ⇒ Speed change value setting by BCD digital switch ⇒ P00044(Speed change) switch ON, OFF ⇒ P00043(Operation step no. change) switch ON, OFF ⇒ P0004F(Start) switch ON, OFF ⇒ P00042(Next Move) switch ON, OFF

4) Operation Data Setting

Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	Go on	Single	100000	0	0	1	1000	100	CW
	2	Absolute	Position control	Go on	Single	150000	0	0	1	5000	100	CW
	3	Absolute	Position control	End	Repeat	0	0	0	1	10000	100	CW
	10	Absolute	position control	Continuous	Single	200000	0	0	1	2000	100	CW
	11	Absolute	position control	Continuous	Single	250000	0	0	1	10000	100	CW
	12	Absolute	position control	End	Repeat	0	0	0	1	15000	100	CW

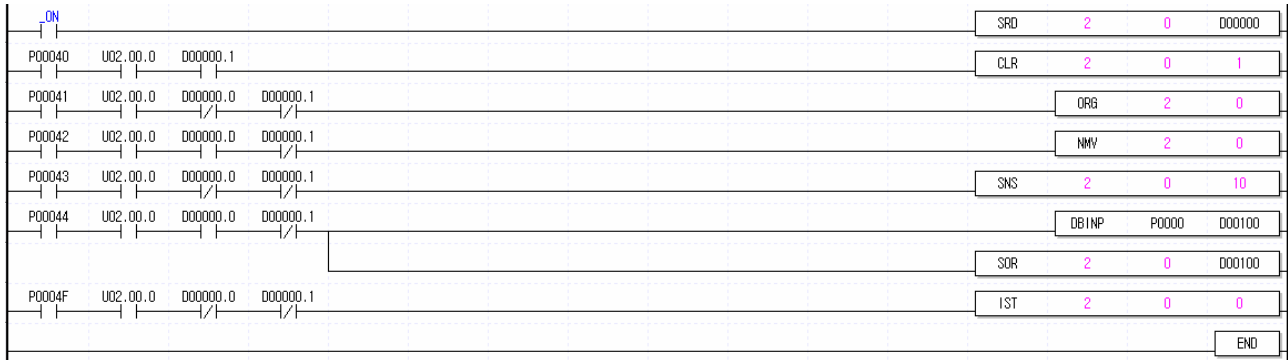
5) Operation Pattern



Chapter 10 Program

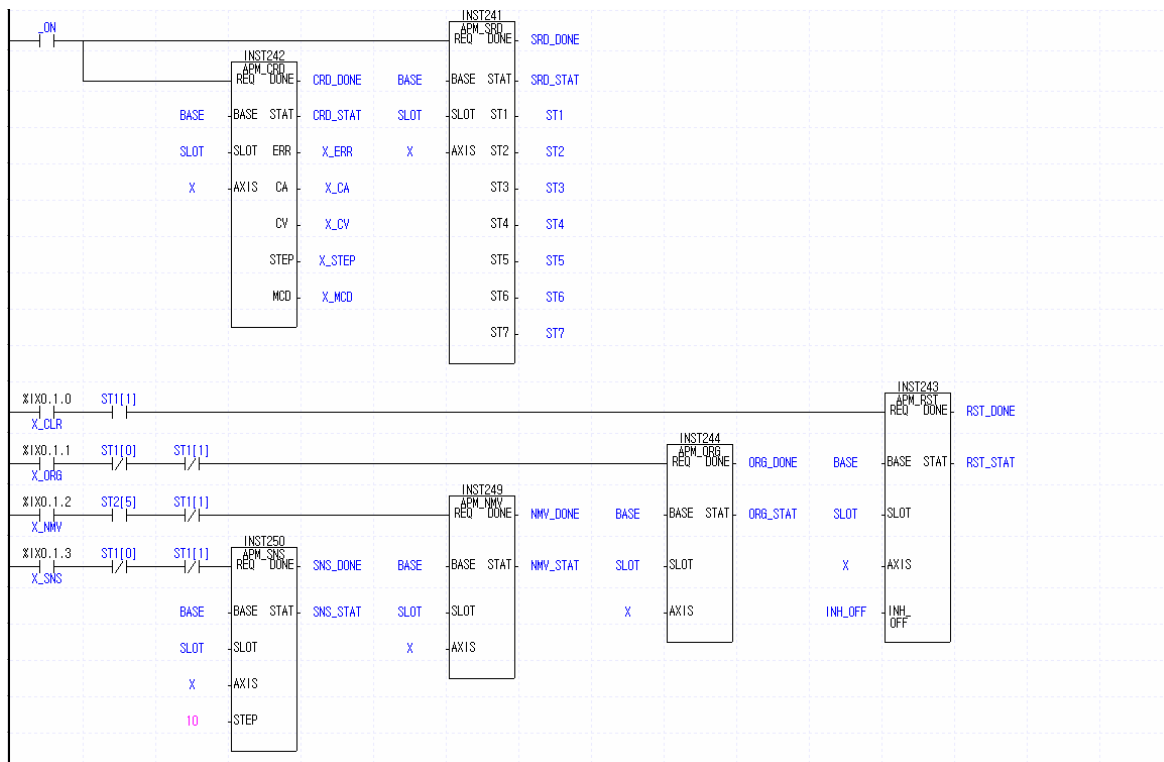
7) Program

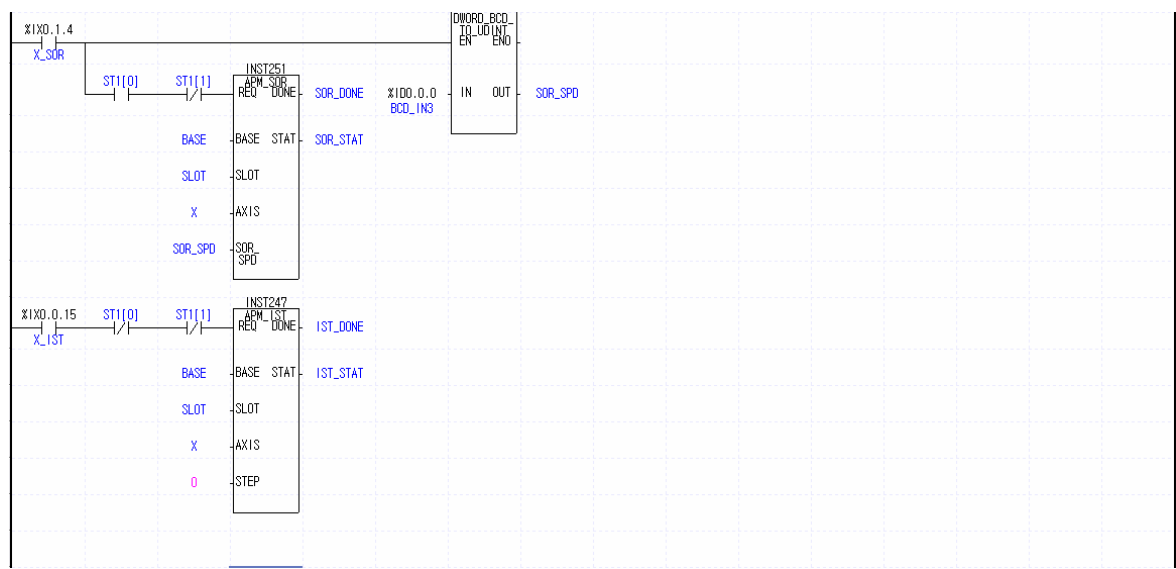
(1) XGK



(2) XGI

Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	2
X	APM Axis to execute function block	0 (X axis)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
ST2[5]	X axis signal in constant speed	-
X_CLR	X axis reset execution	No.0 bit of No.1 Slot Input Module(%IX0.1.0)
X_ORG	X axis homing execution	No.1 bit of No.1 Slot Input Module(%IX0.1.1)
X_NMV	X axis continuous operation execution	No.2 bit of No.1 Slot Input Module(%IX0.1.2)
X_SNS	X axis start step change execution	No.3 bit of No.1 Slot Input Module(%IX0.1.3)
X_SOR	X axis speed override execution	No.4 bit of No.1 Slot Input Module(%IX0.1.4)
X_IST	X axis indirect start execution	No.15 bit of No.1 Slot Input Module(%IX0.0.15)
SOR_SPD	Speed override value	D00100 in the XGK example

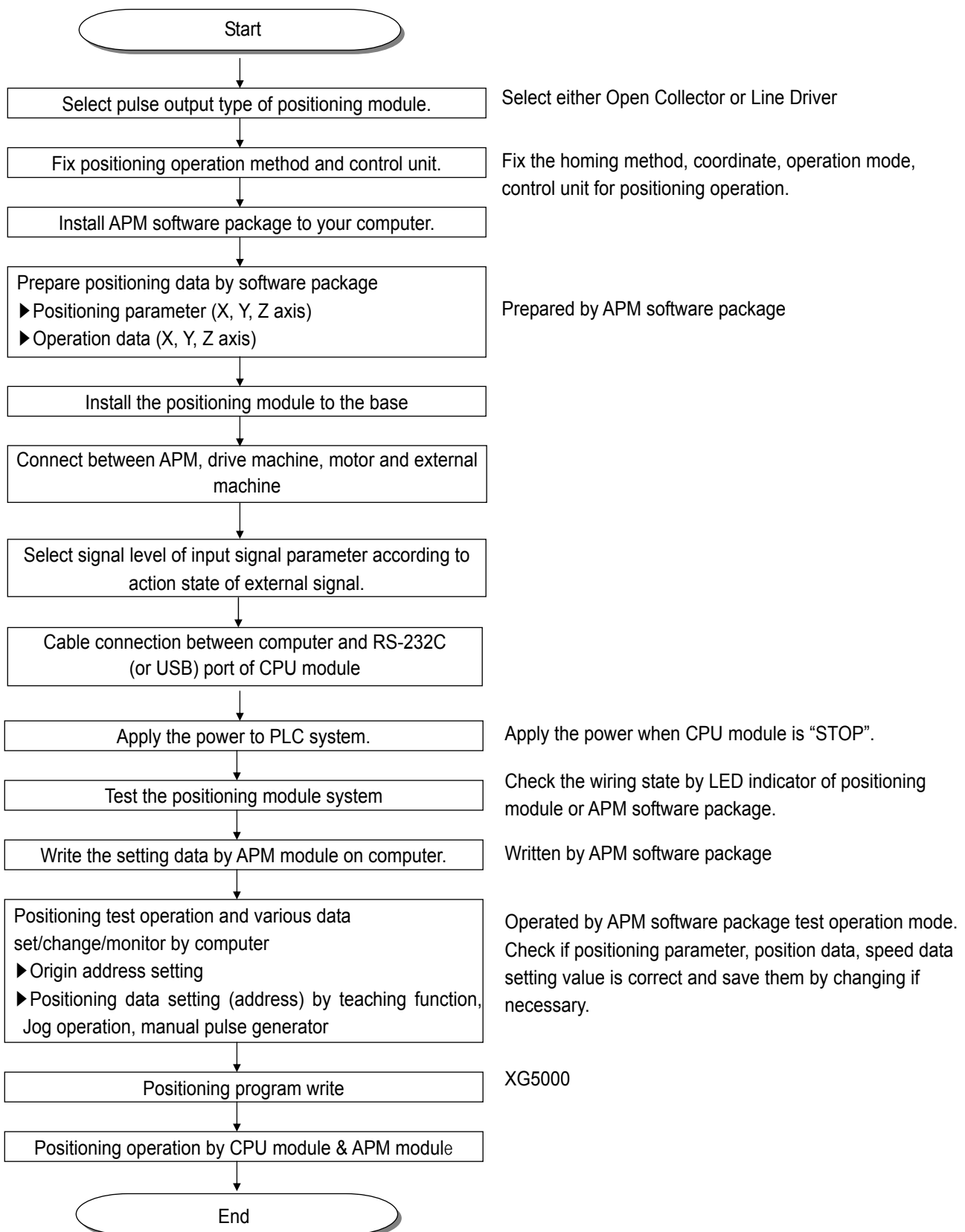




Chapter 11 Operation Order and Installation

11.1 Operation Order

► Here describes the Operation order in case of positioning operation by positioning module.



11.2 Installation

11.2.1 Installation Environment

This machine has a good reliability regardless of installation environment but cares should be taken in the following items to guarantee the reliability and safety of the system.

1) Environment Condition

- Install the control panel available for water-proof, anti-vibration.
- The place free from continuous impact or vibration.
- The place not exposed to direct rays.
- The place with no dew phenomena by rapid temperature change.
- The place where surrounding temperature maintains 0-55℃.

2) Installation Construction

- In case of processing the screw hole or wiring, cares should be taken not to put the wiring remnants to PLC inside.
- Install on the good place to operate.
- Do not install the high voltage machine on the same Panel.
- The distance from duct or surrounding module shall be more than 50mm.
- Ground to the place where surrounding noise environment is good enough.

11.2.2 Notices in Handling

Here describes the notices in handling the positioning module from opening to installation.

- 1) Do not fall down or apply the strong impact.
- 2) Do not remove PCB from the case. It may cause the failure.
- 3) In wiring, cares should be taken not to put the wiring remnants or foreign materials to the upper part of module. If something entered, it should be removed.
- 4) The removal of module in the status of power ON, is prohibited.

11.3 Wiring

11.3.1 Notices in Wiring

- 1) The length of connecting cable between positioning module and drive machine shall be as short as possible. (Max. length : 2m and 10m).
- 2) For cross current and external I/O signal of positioning module, it is required to use the separate cables to avoid the surge or induction noise generated from the cross current.
- 3) The wires should be selected considering surrounding temperature, allowable current and it is recommended to be more than max. size AWG22(0.3mm²).
- 4) In wiring, if it is too close to the high temperature machine or material or it is directly contacted to the oil for a long time, the short-circuit will occur that may cause the damage or malfunction.
- 5) Make sure to check the polarity before applying the external contact signal to the terminal board.
- 6) In case of wiring the high voltage cable and power cables together, the induction obstacle occurs that may cause the malfunction or failure.
- 7) In case of wiring by the pipe, the grounding of pipe is required.
- 8) For the power supplied from outside (DC 5V, DC24V), it is required to use the safe and stable power.
- 9) In case that there is considered to be the noise source in wiring between positioning module and drive machine, it is required to use and connect Twist pair and sealed cable for the wiring of output pulse that comes from the positioning and enters into the motor drive.

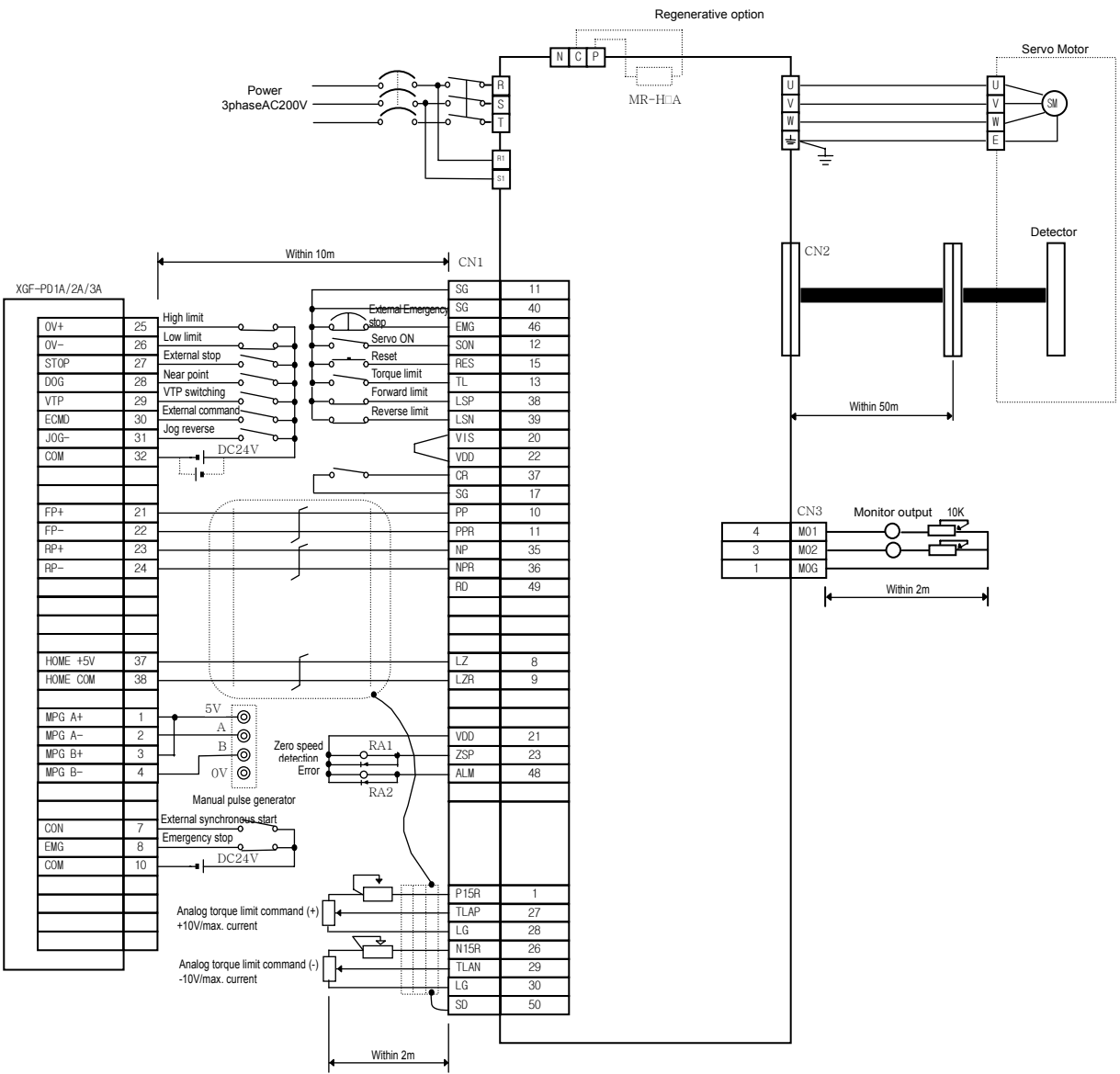
11.3.2 Connection Example of Servo and Stepping Motor Drive Machine

Notes

► Connection example shows the case that the input signal parameter of APM is set as follows.
High limit signal: B contact, Low limit signal: A contact, origin signal: A contact, Emergency stop signal: B contact, Stop signal: A contact, Command signal: A contact, Auxiliary command signal: A contact, Speed/position switching control signal: A contact, Driver Ready/in-position signal: A contact, external simultaneous start signal: A contact

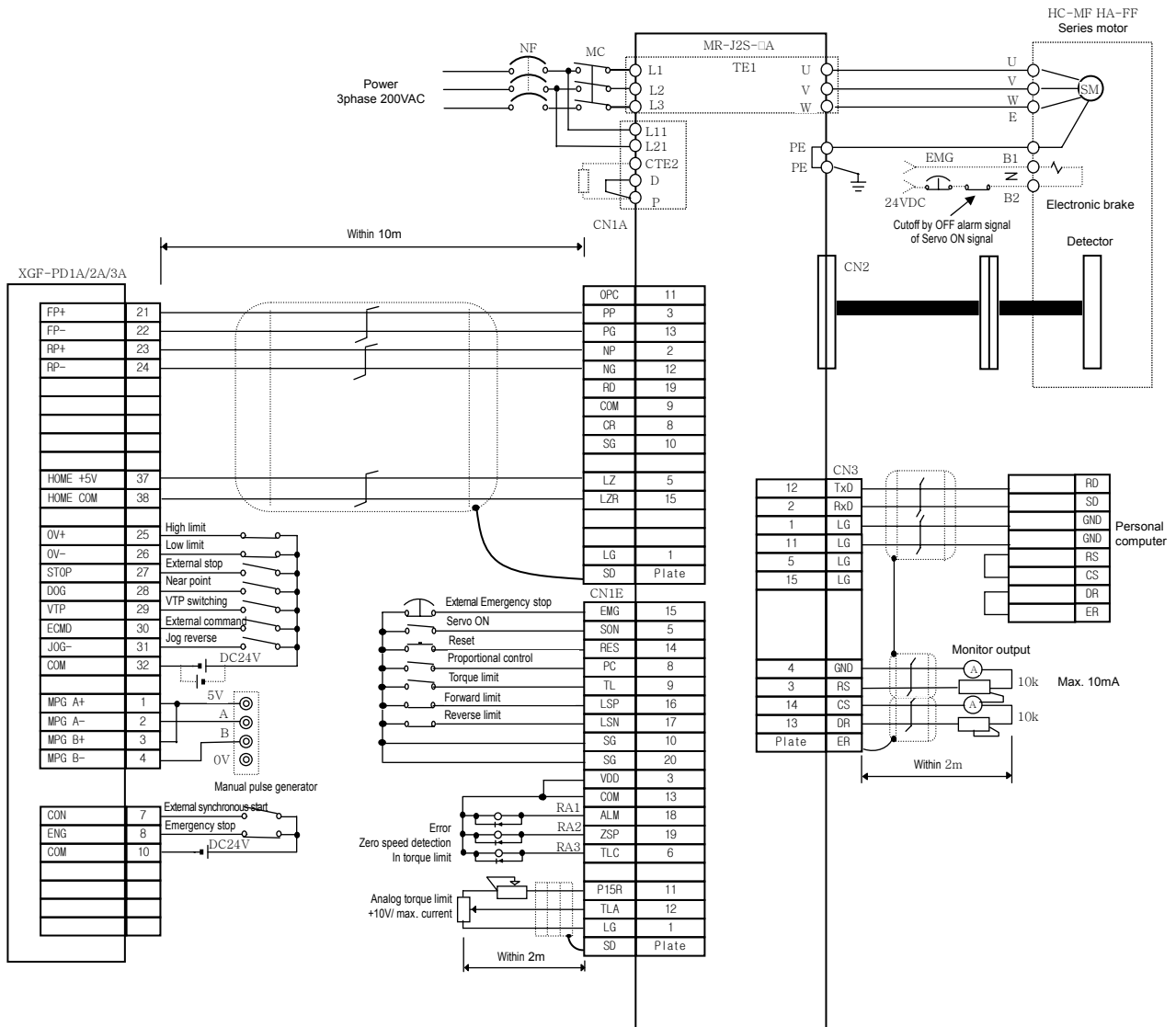
1) MITSUBISHI

(1) MR-H□A Connection (Line Driver)

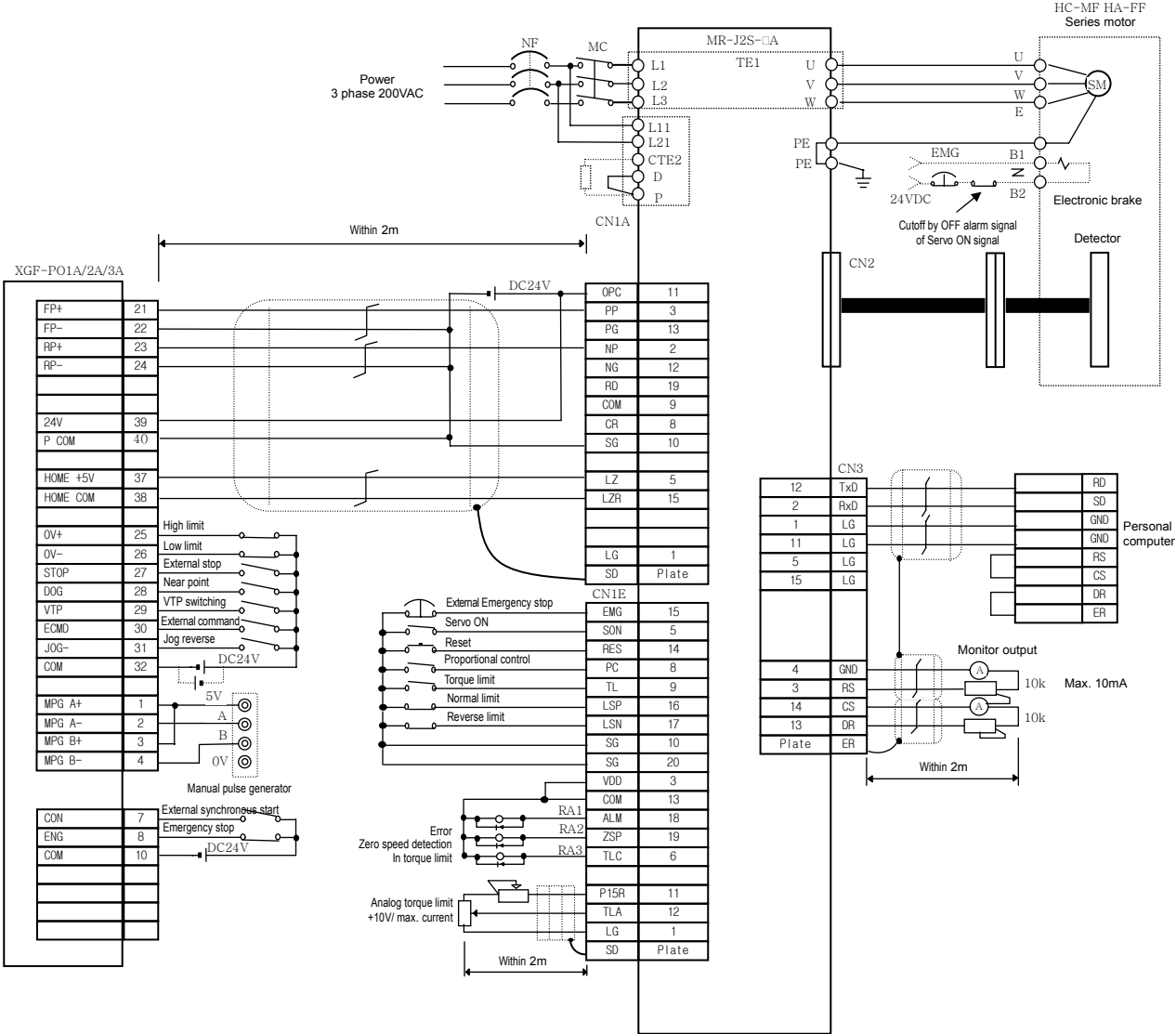


(2) MR-J2/J2S-□A Connection

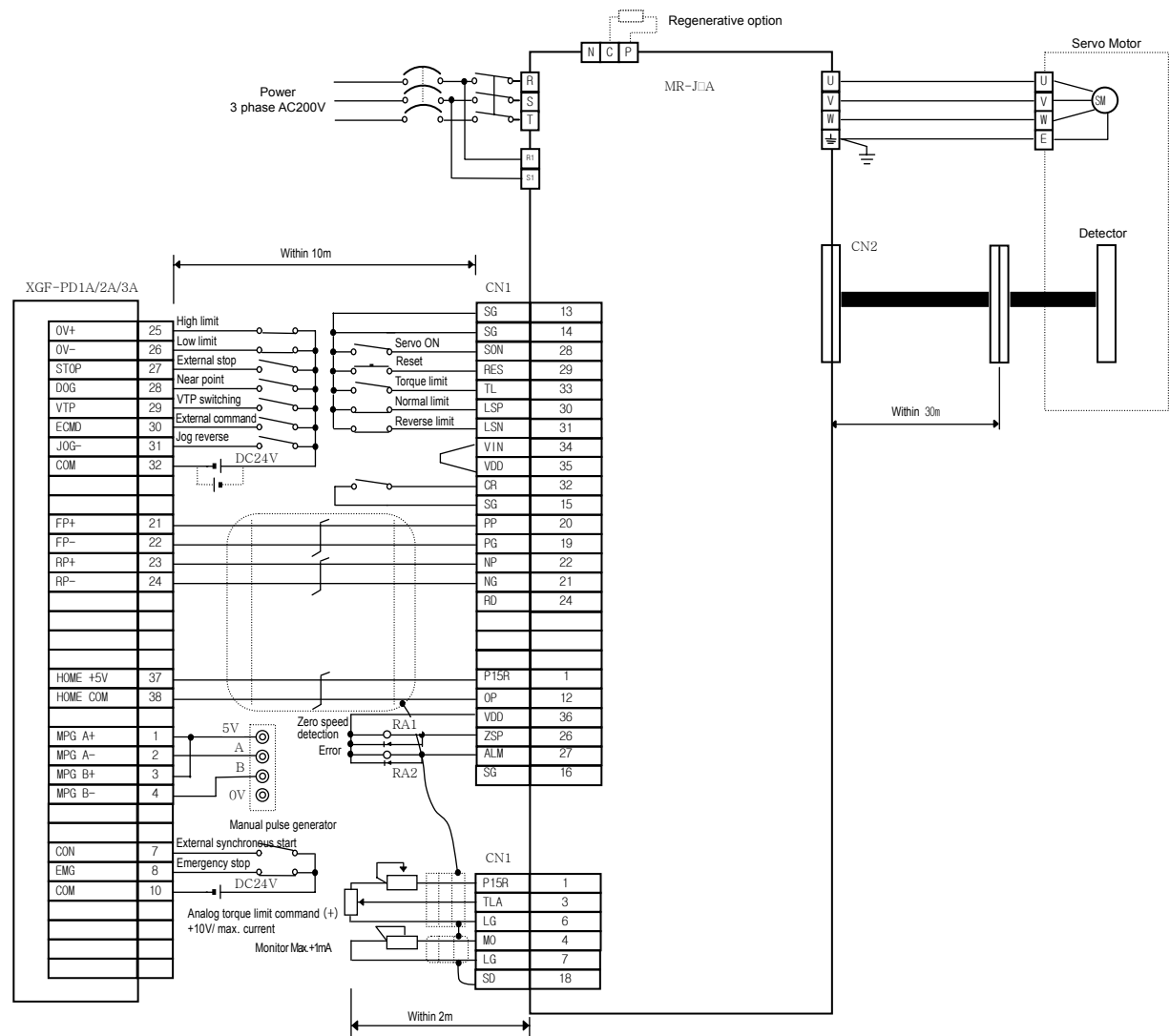
A) Line Driver



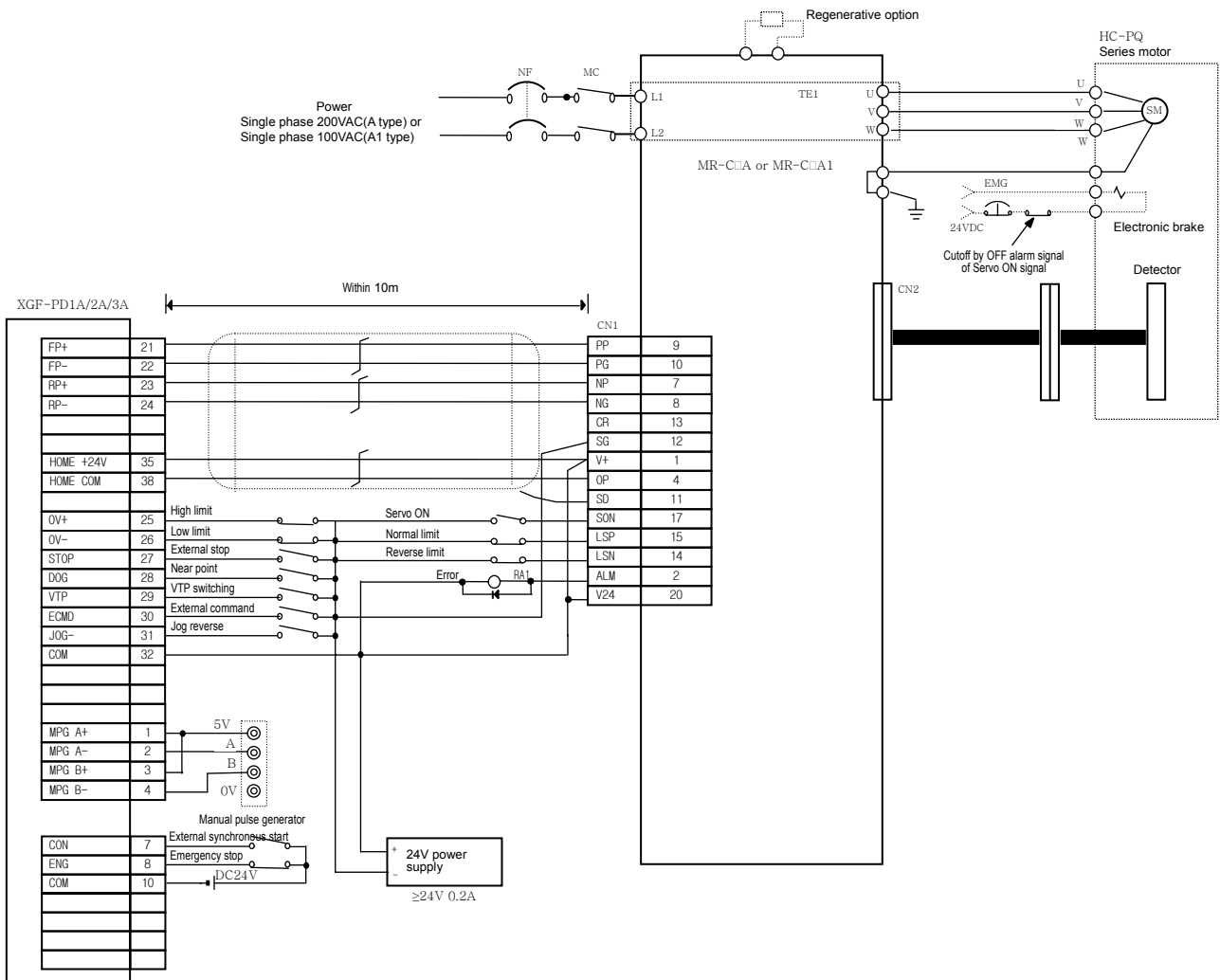
B) Open Collector



(3) MR-J□A Connection (Line Driver)

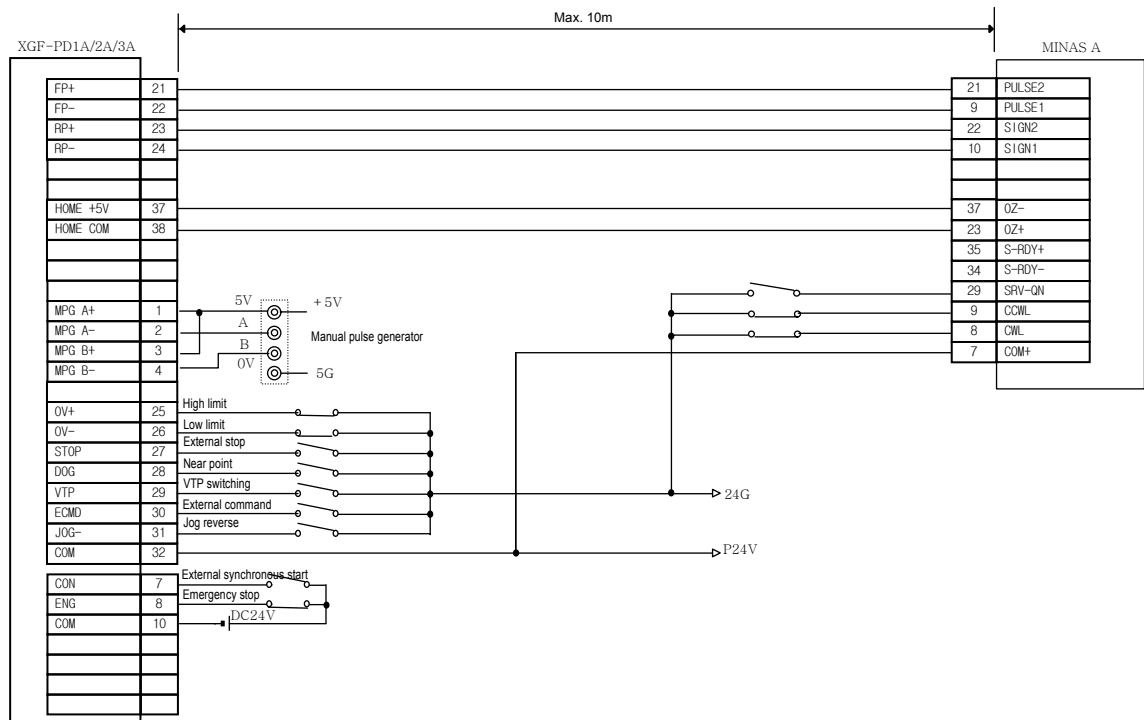


(4) MR-C□A Connection (Line Driver)



2) PANASONIC

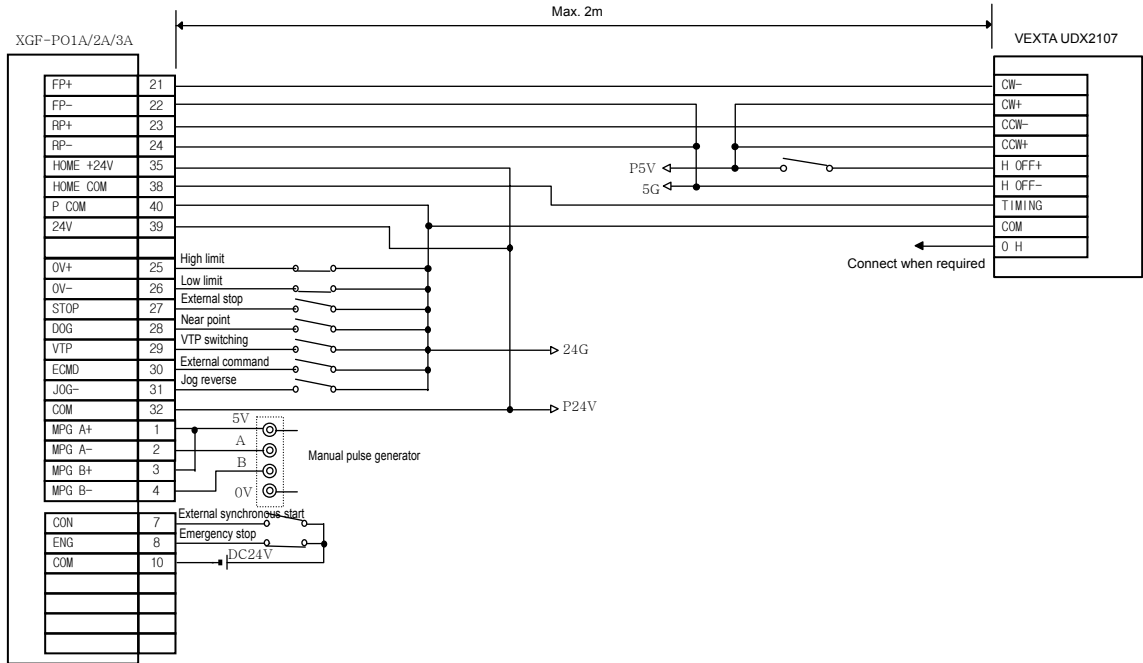
(1) A Series Connection (Line Driver)



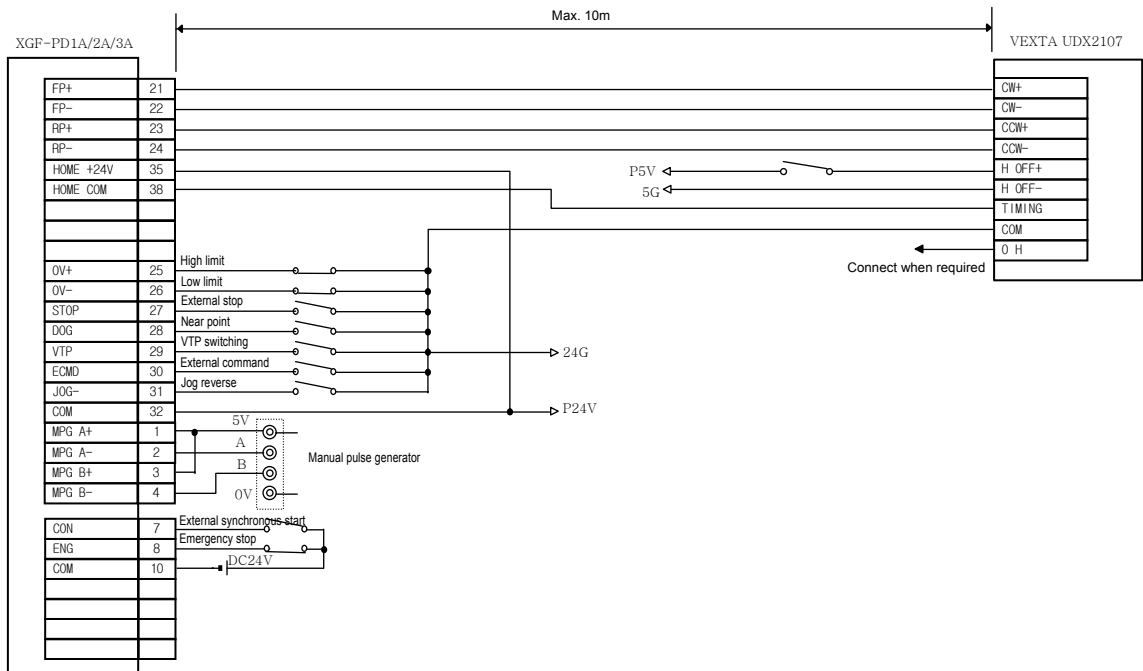
3) VEXTA

(1) UDX2107 Connection

A) Open Collector

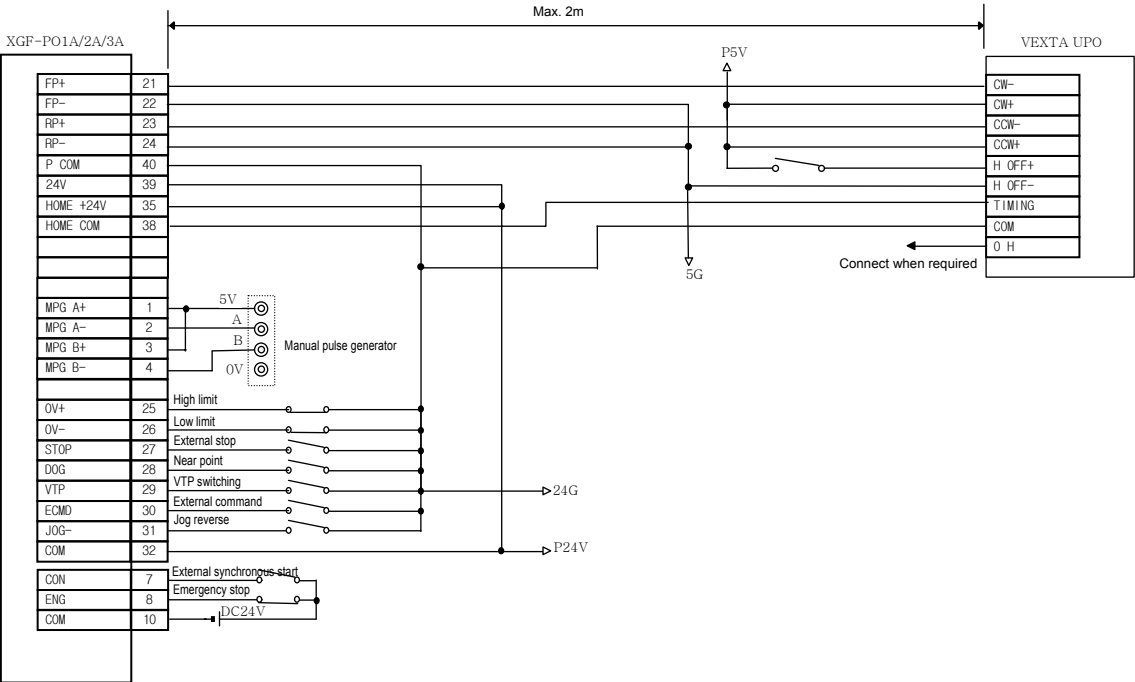


B) Line Driver

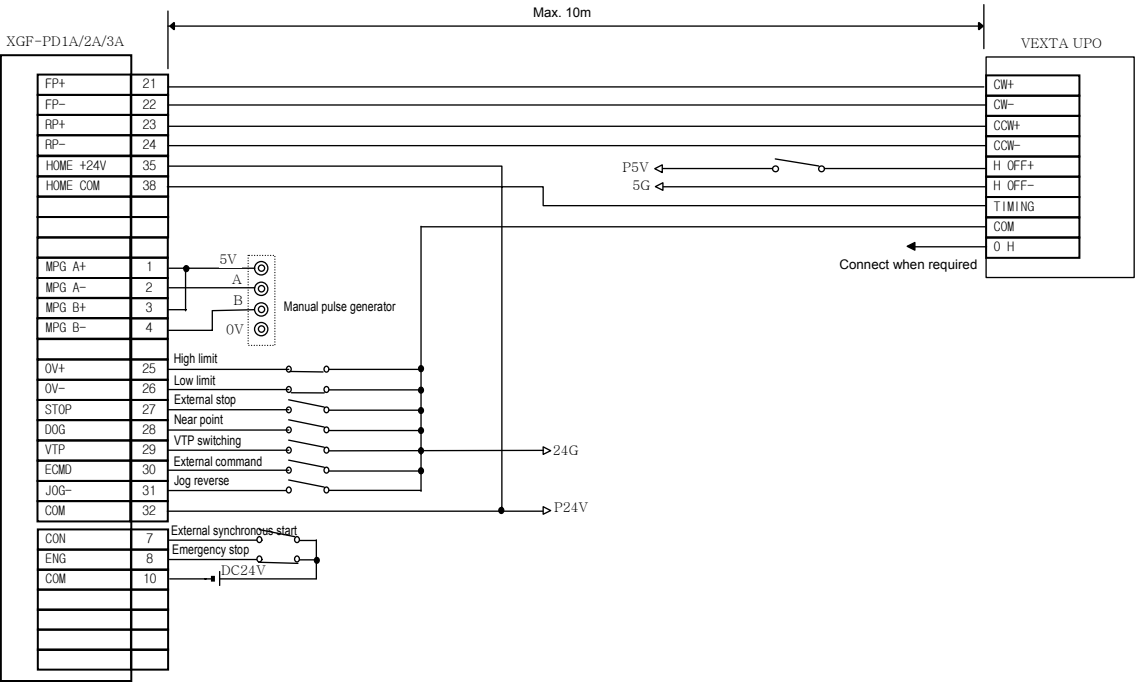


(2) UPD Connection

A) Open Collector

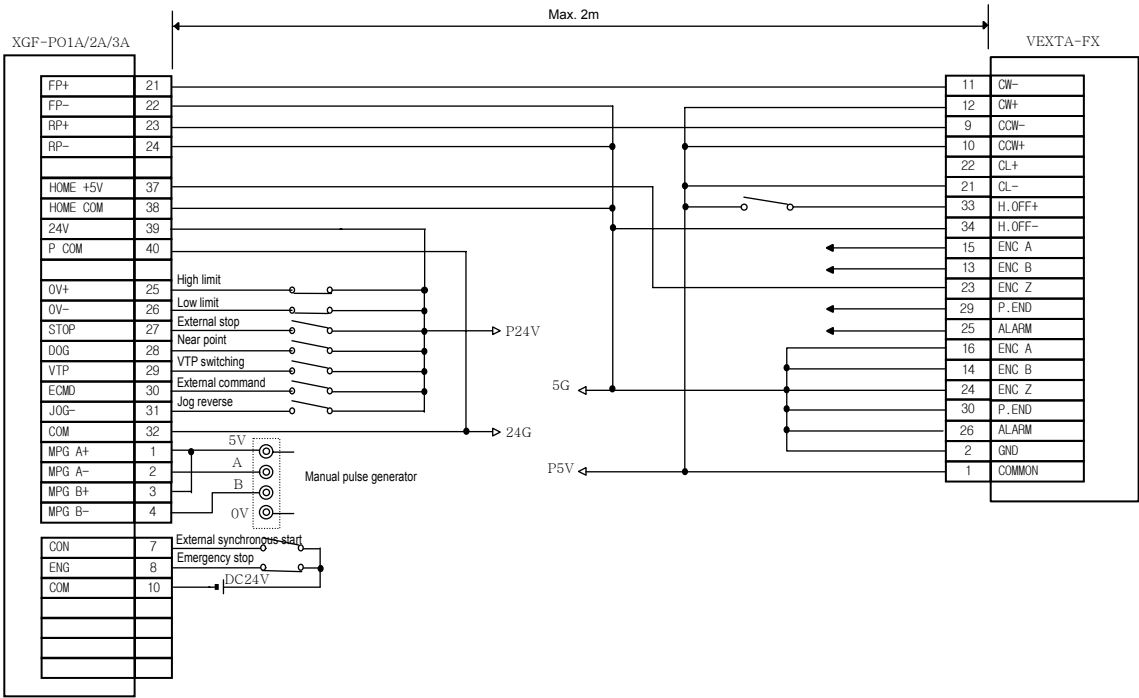


B) Line Driver

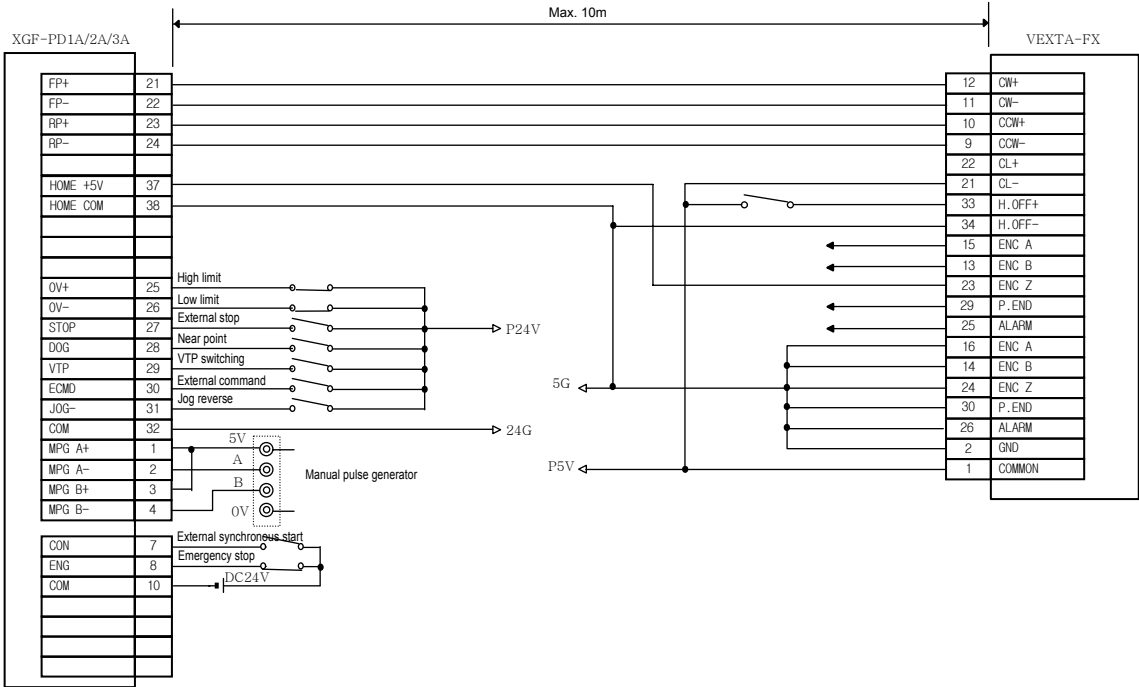


(3) FX Connection

A) Open Collector



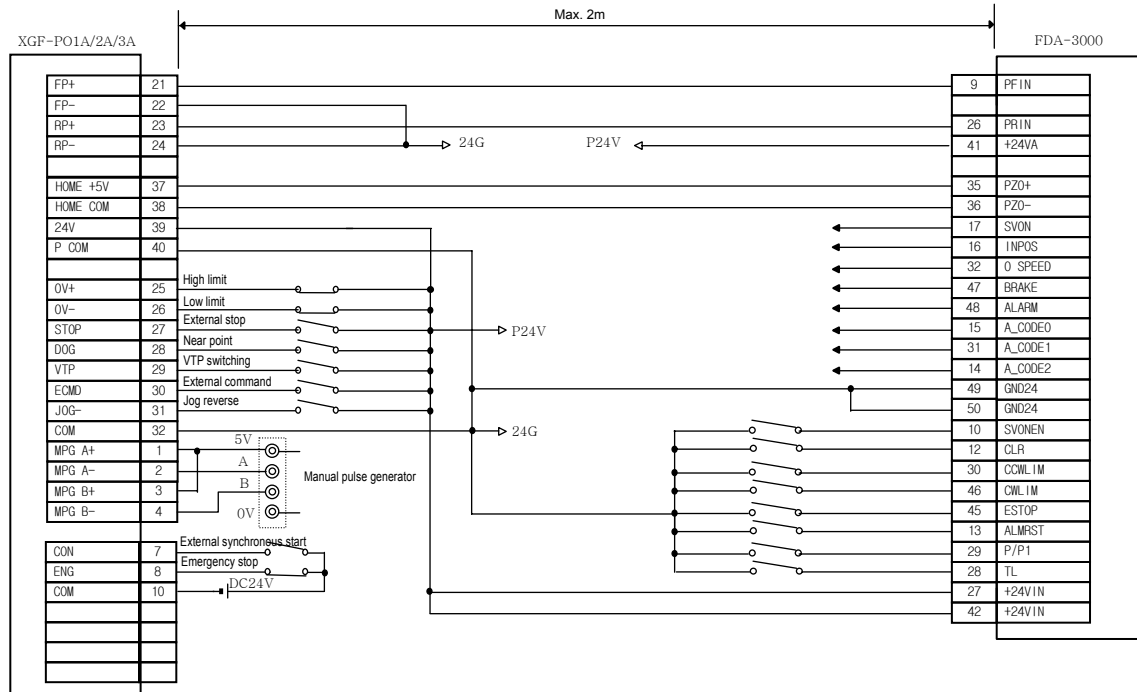
B) Line Driver



4) OTIS-LG

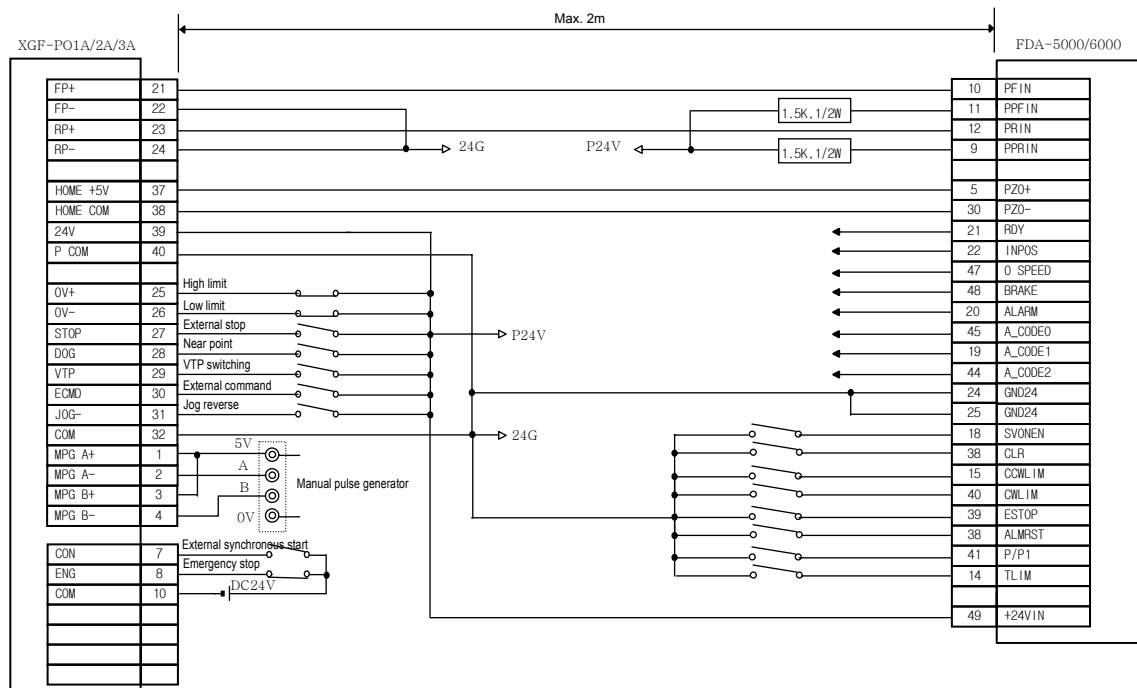
(1) FDA-3000 AC Servo Drive Connection

A) Open Collector

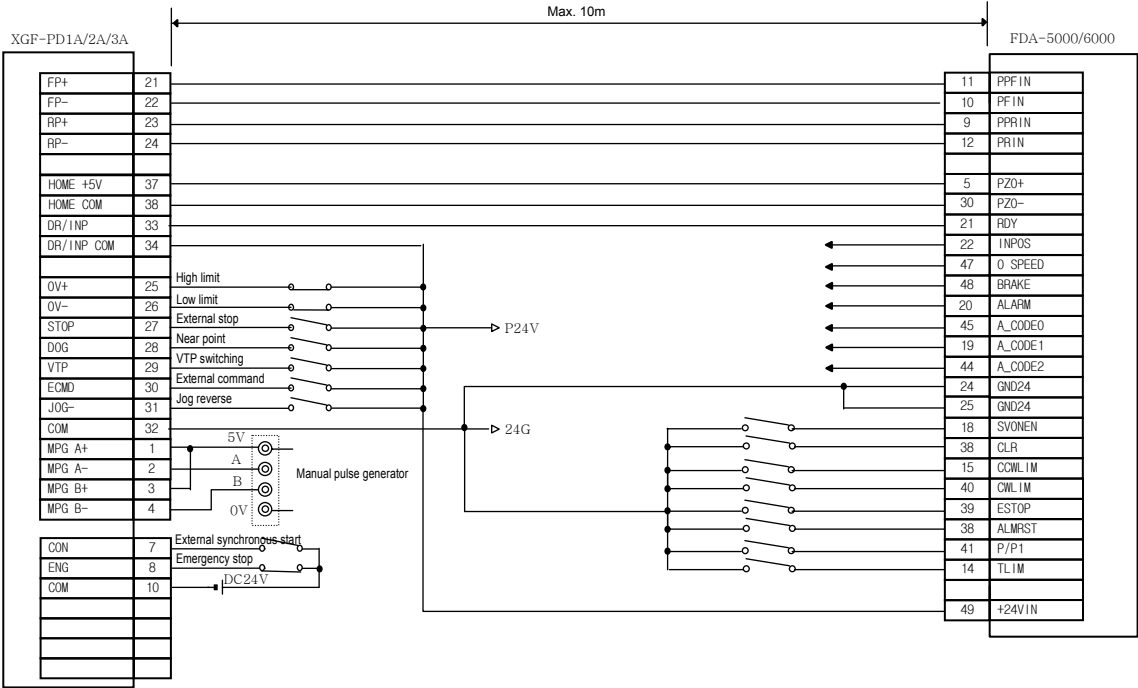


2) FDA-5000/6000 AC Servo Drive Connection

A) Open Collector

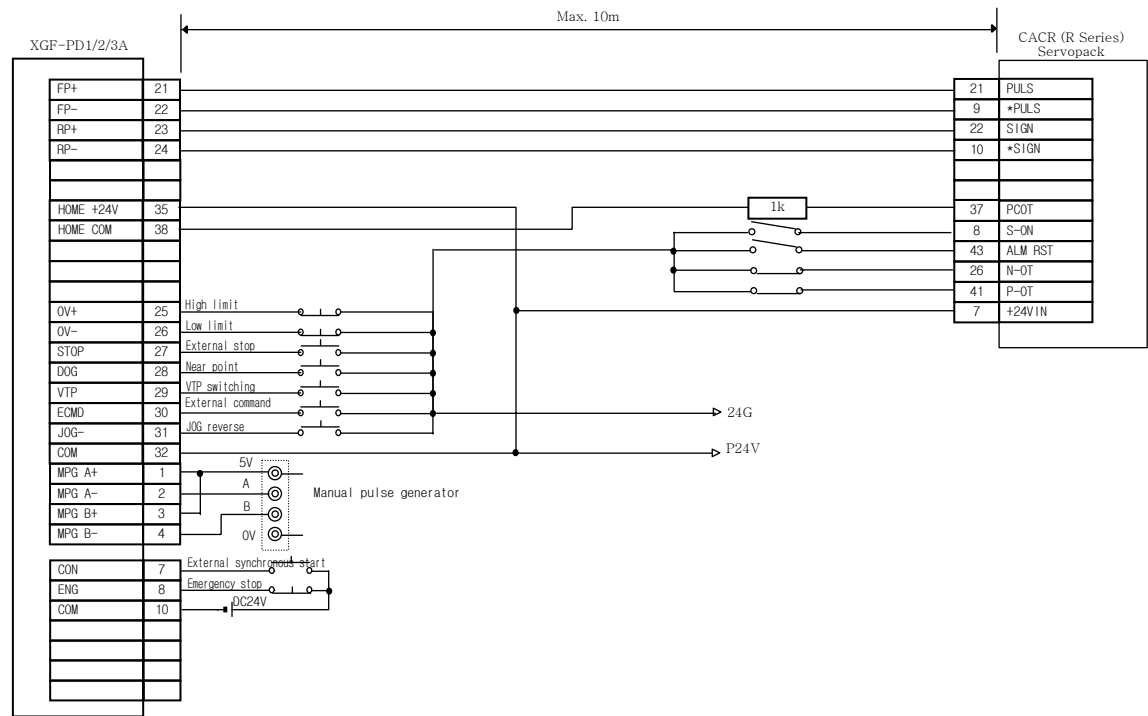


B) Line Driver



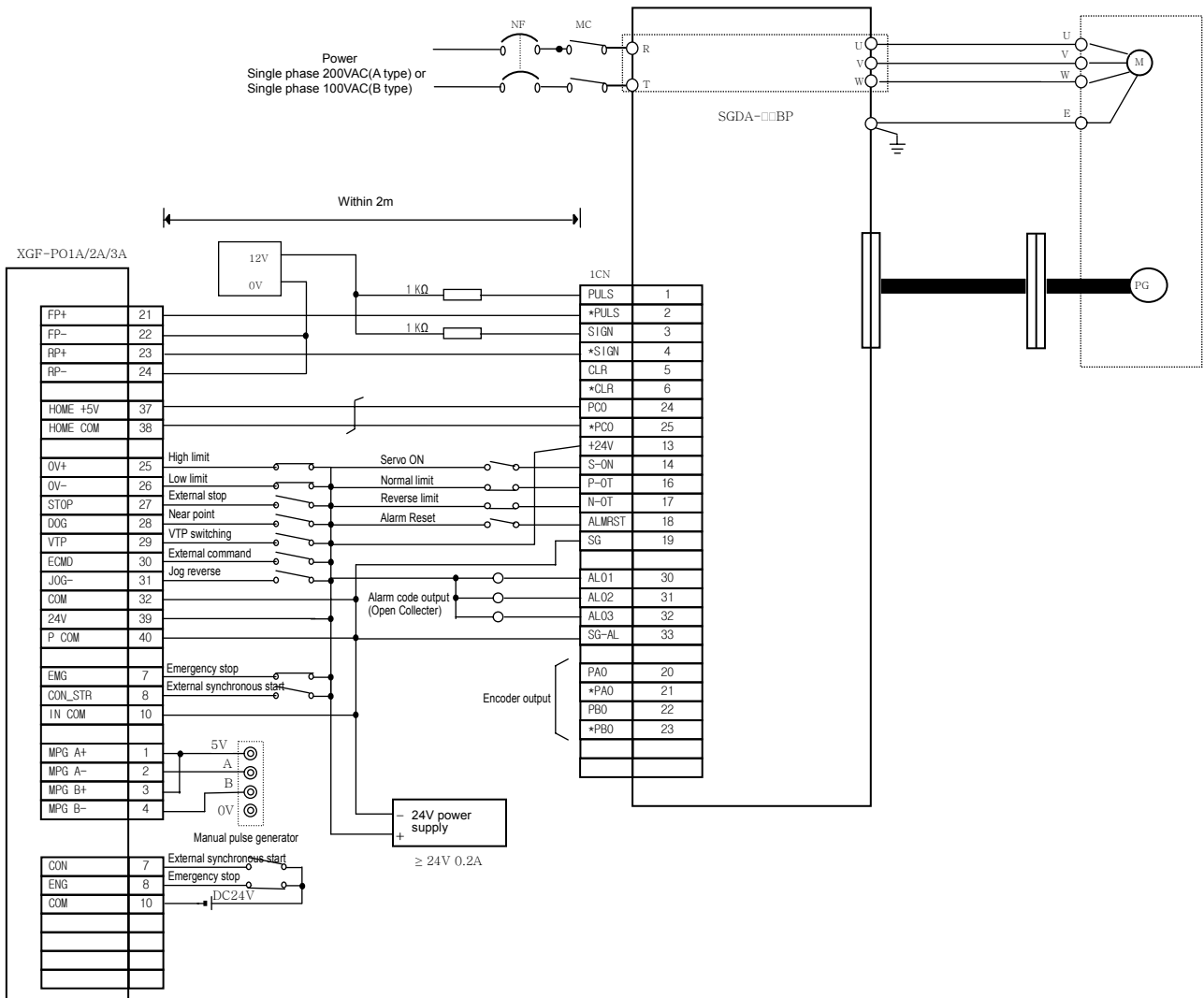
4) YASKAWA

1) CACR(R Series) Connection(Line Driver)

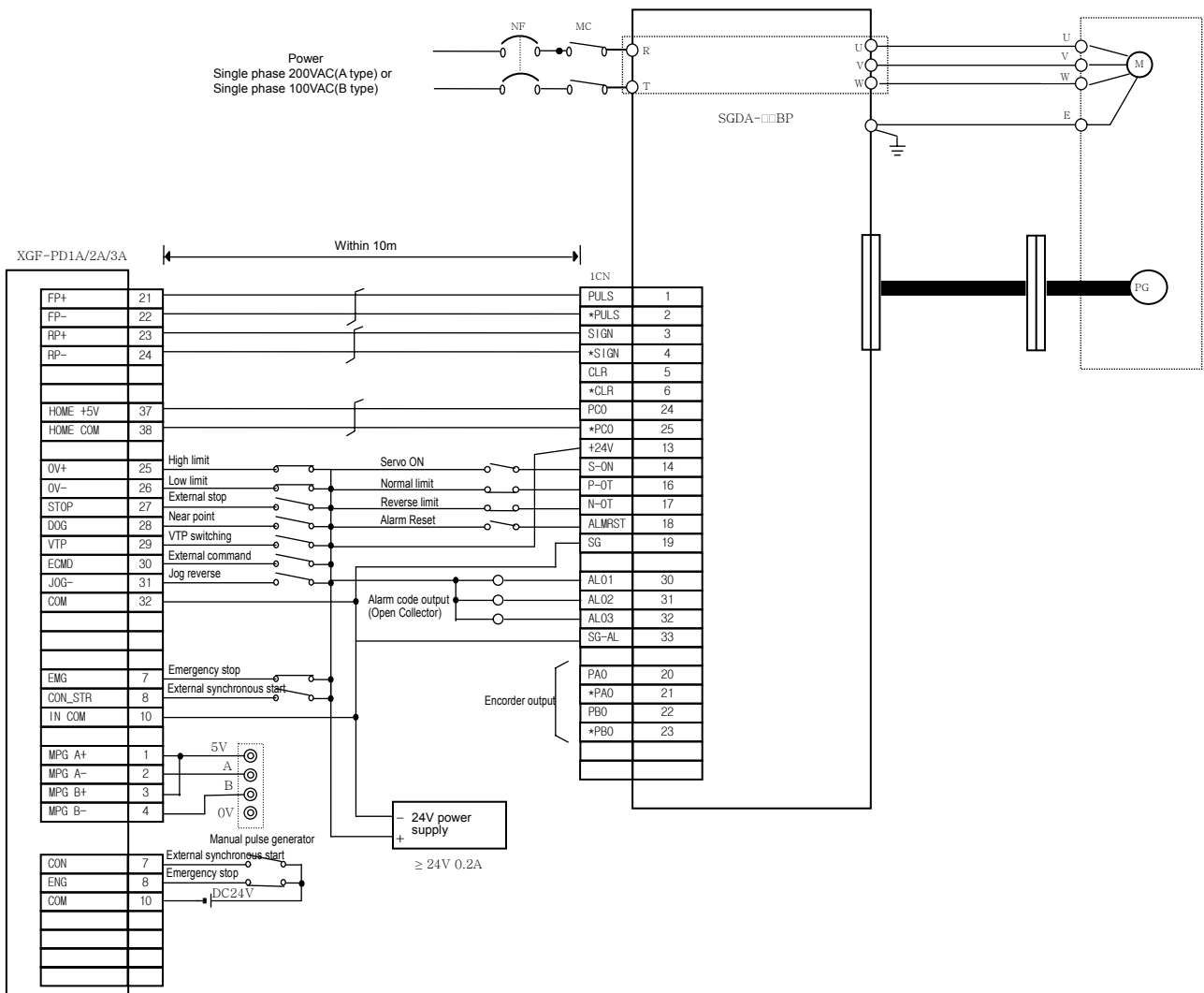


2) SGDA-□□□P Connection

A) Open Collector

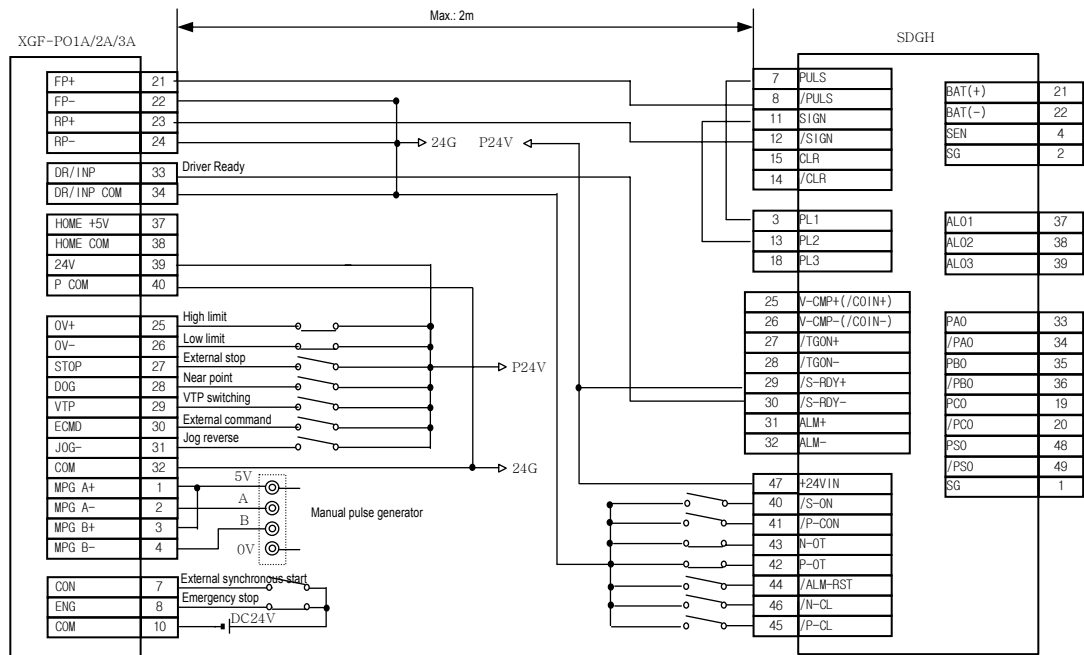


B) Line Driver

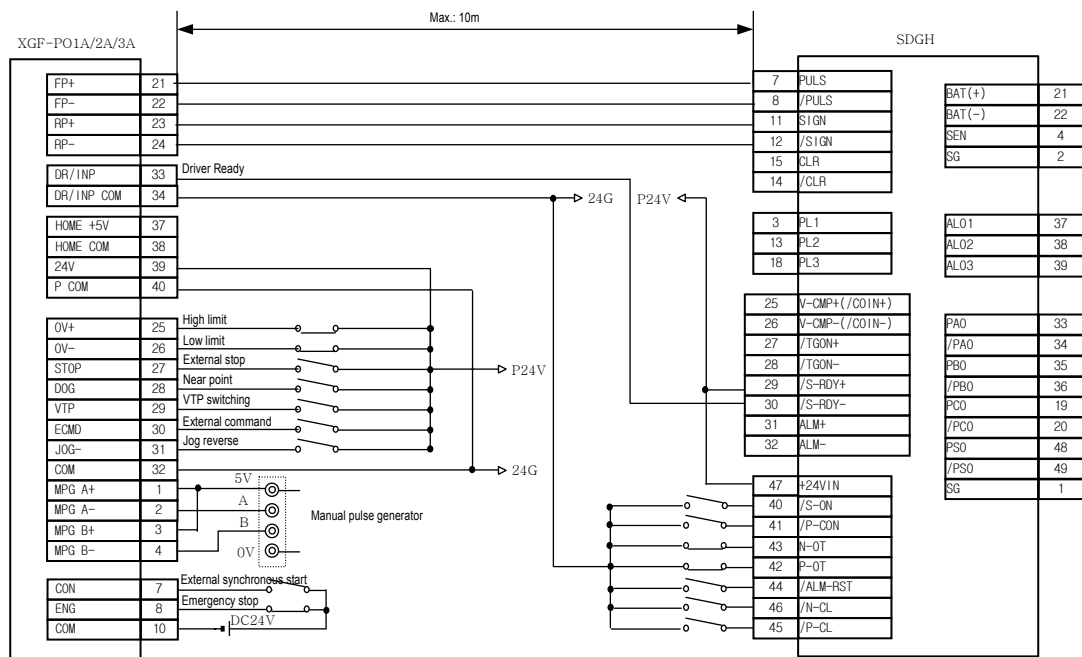


2) Σ - II Series SGD H AC Servo Drive Connection

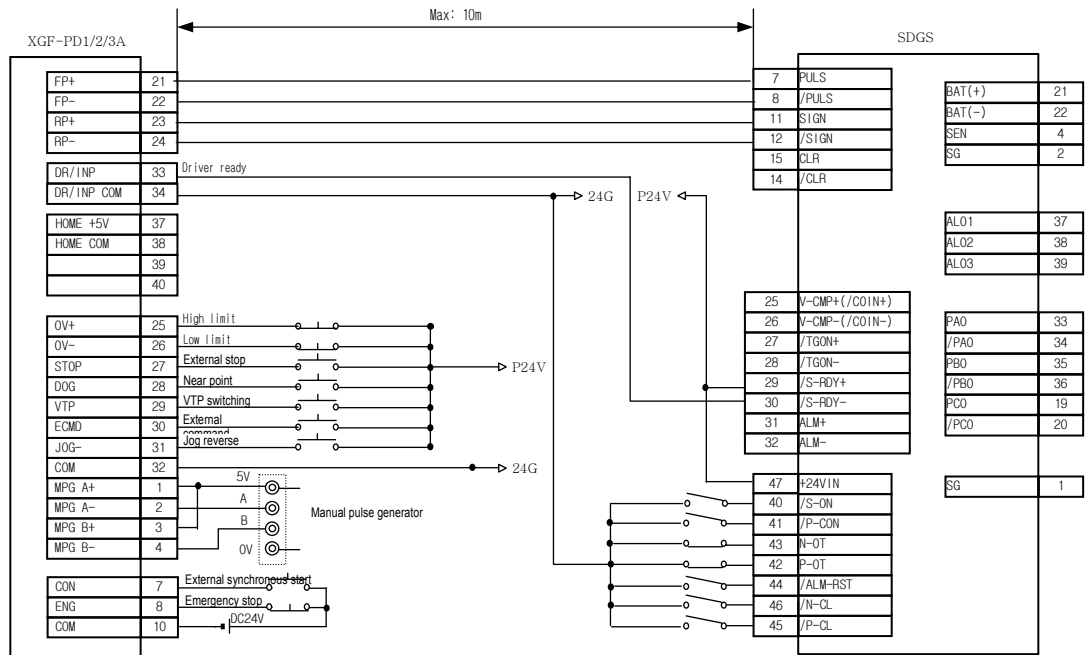
A) Open Collector



B) Line Driver



3) Σ -III Series SGDS AC Servo Drive Connection(Line Driver)



Appendix 1. Positioning Terminology

2-Phase pulse

A phase and B phase pulse strings exist. The phase difference exists and automatically is added to or deducted from pulse count. Standard phase difference is 90° internal phase angle. If B phase is behind A phase at the forward rotation direction (B phase is ON after A phase), A phase shall be behind B phase at the reverse rotation direction and delayed. (A phase is ON following A phase). With this way, forward rotation and reverse rotation (addition /deduction) shall be done automatically.

Absolute encoder

This outputs each data within one time motor rotation to external goal point. Absolute Encoder is available to output 360 degree with 8~12 bit. Incremental Encoder has the weakness to lose the axis position if power is Cut-off. But, Absolute Encoder never loses the axis position even if the power cut-off. Several codes such as binary code and BCD code are available to output. Absolute Encoder is more expensive, elaborate and bigger than Incremental Encoder.

Absolute coordinate

Absolute coordinate uses "0" as a standard and indicates the address by the distance from "0". The direction is not fixed but automatically fixed according to the setting goal position address. Another address system is Relative coordinate.

Acceleration time

This parameter acceleration time means the time that reaches to the speed limit value from the stop status. Thus this gets to shorten in proportion to the reduction of the fixed speed. Acceleration time shall be fixed by some factors such as mechanical inertial, motor torque and load resistance torque.

Position address

This is the numeric value that indicates the positioning position by the units such as mm, inch, degree or pulse. Position Address shall be read after setting by Relative coordinate or Absolute coordinate, or written again by position teaching.

AFTER mode

This is the mode to output M code after positioning (after stop). According to M code output, drilling dimension can be selected or clamping can be executed.

Auto tuning

The response and safety features of the machine run by Servo motor are subject to the change of inertial moment and strength caused by the change of machine load. This function adjusts automatically speed loop gain and position loop gain to be harmonized with the machine status. Thus the action of the machine is maintained in the optimized status. For the machine that has big load fluctuation, the real time auto tuning should be used.

Trapezoidal acceleration/deceleration

The operation pattern that the time and speed graph has trapezoidal shape when positioning operation.

Backlash compensation

As like forward direction is changed to reverse or reverse direction is changed to forward, there is sometimes backlash in gear when rotation direction is changed. This occurs when using worm gear. Because of this backlash, in case of 1m(3.2feet) left feed after 1m right feed, it is not accurate for the machine to return to the original position. Thus, without additional feed corresponding to the backlash, the machine cannot reach the original position. In this case, set the backlash compensation to make up the difference.

Back up function

While power is cut-off, the setting value of positioning parameter and operation data saved in positioning module shall be saved in Flash memory and available to read, write and change in positioning software and PLC sequence program.

Ball screw

One type of screw with the balls arranged on the pitch like ball bearing, which enables reduce the backlash and rotate by a little power.

Appendix1. Positioning Terminology

Bias speed

When the machine starts to move, it needs the large torque but the torque may be unstable when the speed is "0" in the stepping motor. Thus it enables to smooth the movement by starting with the given speed. Bias speed is the speed fixed at the starting point. It is set usually more than 50 ~ 70pps with the reference to the speed-torque features of stepping motor and driver.

Bipolar drive constant current system)

This is the system for the stepping motor operation. In this case, the residual magnet current direction flowing on the fixed magnet coil is contrary and the residual magnet current direction has bipolar direction (+/-). This enables motor coil to be used effectively and obtain the large output torque at the low speed.

Internal memory

This is the memory used to save the data temporarily when sending/receiving between PLC CPU and positioning module. To use the data for the action by the program, it is saved first in positioning module internal memory temporarily. As it is available to read and write the latest data, positioning module uses the internal memory.

Busy

This is the signal that indicates "in positioning operation" and it shall be "ON" during positioning action or Dwell Time.

Counter clockwise

This means the rotation to the contrary clockwise (CCW). In case of motor, this is fixed by the end of the axis (load axis).

Speed/Position control switching signal

This is the signal used to convert the running speed control to the position control. There are the signal by internal program command and the signal by external input.

Circular interpolation

This is automatic operation pattern that the machine path makes the circle when carrying out the

positioning action for horizontal feed and longitudinal feed motor at the same time. The circle or the circle-type can be made by this type of circular interpolation and avoid the obstacles in the machine feed path.

Interpolation operation speed

The speed of the subordinate axis during linear interpolation or circular interpolation operation shall be calculated according to the speed and feed distance of main axis and feed distance of subordinate axis. In this case, the operation speed of subordinate axis is called as interpolation operation speed.

Control unit

This is the setting unit as the basis of positioning data and includes the units such as mm, inch, degree, pulse. The setting unit affects all operation data and parameter.

Continuous operation

This is the control method that operation pattern without stop is connected like speed control. Even if the rotation direction (forward, reverse) is changed, this continuous operation is available.

Homing low speed (Creep speed)

This is the speed that the machine moves very slowly. When returning to the origin, it is difficult for the machine to stop correctly while it is active in high speed. Thus it is required to convert the movement speed to the homing low speed before stop. In this case, the homing low speed is called as Creep speed.

Clockwise

This means the same rotation direction as the rotating hands of a clock.(CW) when you see the end of the axis (load axis) from motor.

The number of operation data

In order to carry out the positioning to more than 2 addresses, each position is allocated by operation step no. such as No1, No2, No3. After then, positioning is accomplished according to this operation step. In case of XGF-PP1/2/3O, XGF-PP1/2/3D, positioning up to 600 steps per axis are available.

Deceleration ratio

This is the rate when the machine decelerates by using the saw-toothed gear and is smaller than 1.

Deceleration ratio = input gear rotation number / output gear rotation number

Deceleration time

Deceleration time is the time from speed limit value to the stop status. Thus, it gets to shorten in proportion to the reduction of the given speed.

Deviation count

The function to count feed pulse generated from positioning module and convert the count pulse to D/A converter of Servo driver and deduct encoder feedback pulse of Servo motor from feed pulse. And it is embedded inside Servo driver to start Servo motor by deviation value (droop pulse) of feed pulse and feedback pulse until the feed pulse becomes "0".

Line drive output (Differential output type)

One type of encoder feedback pulse output which enables the RF transmission and has the noise-resistance. Thus this is also used for high speed signal transmission such as I/O of pulse string. Generally, the transmission part is Driver and the receiving part is Receiver and the dedicated IC is used. Pulse I/O of positioning module and high speed counter module enables Line driver I/O.

Near point DOG signal

This is the signal used when homing by the origin input during near point DOG signal ON section and by the origin input during OFF section, and by ON/OFF signal of near point.

Drive unit

The pulse command output from positioning module is the low voltage, low current command that has insufficient energy for motor drive. This drive unit amplifies such pulse command output to drive the motor.

This is the accessory for Servo motor and stepping motor and there are two types : Servo drive unit for Servo motor and stepping drive unit for stepping motor.

Drive ready signal (Drive unit ready)

This is the output when the Servo drive unit for Servo motor is in normal status (Servo ON). This signal maintains OFF when the power of Servo drive is OFF or in case of Servo OFF, Servo Alarm, Servo emergency stop.

Droop pulse

If the speed command from positioning module is executed in normal status, the machine shall be behind and not available to follow because of the mechanical inertial. Thus, the method to postpone the speed command pulse by the accumulation in the deviation counter of Servo motor can be used. These accumulated pulses are called "droop pulse". Deviation counter generates the droop pulse and when the machine stops, it returns to "0".

Dwell time

This is the time to be fixed to adjust the droop pulse as "0" in the deviation counter of Servo driver after completing the pulse output from positioning module. If this time is very short, the positioning shall be not accurate.

Dynamic brake

When protection circuit acts because of the power cut-off, Emergency stop (EMG) signal, this function is used for the short circuit between Servo motor terminals through the resistance and discharges the rotation energy into heat and may cause the sudden stop without motor inertia. Braking power is generated by electromagnetic brake only when operating the motor to get a big brake torque. As electromagnetic brake does not have maintainability, this is used together with mechanical brake to prevent the falling of vertical axis.

Electromagnetic brake

This is applied only for the motor equipped with electromagnetic brake. Electromagnetic brake is used to prevent the sliding as protective function when the power is cut-off, operating the vertical axis, or when the motor stops. Electromagnetic brake acts in the status that external electromagnetic brake power is not applied.

Appendix1. Positioning Terminology

Electronic gear

This function increases/decreases command pulse from positioning module by 500 times from 1/50 electrically. Thus positioning speed and transfer distance can be controlled by electronic gear ratio magnification. If electronic gear ratio setting is changed, positioning operation speed and the setting transfer distance shall be changed and when setting, it should be Servo OFF and within the setting range to avoid malfunction and crush.

Emergency stop

This applies emergency stop signal to the positioning module to stop emergently regardless of operation status of positioning module. In case of 2, 3 axis positioning module, 2 axis and 3 axis stop emergently at the same time. Thus for the individual emergency stop of each axis, emergency stop signal of Servo driver is used.

External regenerative brake resistor

Called as regenerative resistor. When the machine moves by the motor, the power is supplied to the motor from amplifier. But in case of machine and motor, the rotation energy flows to the amplifier contrarily when motor decelerates or when load operation is downward. External regenerative resistor consumes the regenerative energy as resistance and obtains the regenerative brake torque and enables the overall acceptability of regenerative system during stop. Also it is used for the frequent acceleration/deceleration.

High speed homing

When high speed homing, the axis does not detect the near point dog and returns to the mechanical origin. This is effective only in the status that the positioning such as floating point or homing is completed.

Feed pulse

This is the output pulse from positioning module to Servo driver or stepping driver. It is also called as command pulse.

Feed screw

This is the basic screw mechanically in the positioning by screw rotation. Ball crew is often used to reduce backlash and numeric error.

Feedback pulse

In order to check if the machine acts reliably according to command pulse generated from positioning module, if command pulse is generated against 10,000 pulse, the feedback pulse of 10,000 pulse returns from Servo encoder. After then, the residual deviation value (droop pulse) becomes "0" and it is judged that it complied with command pulse very well.

Please refer to "deviation counter" terminology.

Fixed-feed

This is the feeding of the fixed dimension to cut **paper** and bar work piece by the goal dimension. The increasing system positioning is often used.

Flash memory

This is used to save the parameter and positioning data for the backup memory without battery. As there is no battery, it is not necessary to maintain the battery.

External input high limit (Forward limit switch signal)

This is the input signal to inform the user that the high limit switch (b contact configuration, always ON) is activated out of the action range where the positioning control is carried out. The positioning action stops when external forward direction limit switch signal (b contact) is OFF.

G code

This is the standardized (coded) 2 digit value (00~99) that indicates various control function of numeric control module. It is also called "G function".

Ex;

G01 Linear interpolation

G02 Circular interpolation CW

G04 Dwell

G28 Homing

G50 Max. Spindle speed setting

Appendix1. Positioning Terminology

Gain

The change of ratio between two values that have a proportional relation. In case of Graph, it is the change of tilting of characteristic curve. For example, when 10 is output for the 10 input, output will be changed as 12.5 by changing the gain.

GD²

Inertial moment. Total sum of each small area dimension composing of the material that multiplies by the square of each distance (r) of each area from the given straight line.

The relation $I = \int r^2 dm$ GD² is given together with gravity acceleration g by 4gl.

Incremental encoder

This is the device that output ON/OFF pulse simply by the axis rotation. 1 phase type outputs only A phase pulse and does not indicate the axis rotation direction. 2 phase type outputs A phase and B phase pulse string and indicates the rotation direction. When B phase pulse string is changed with ON if A phase ON, it is judged that the direction is normal but if A phase is ON when B phase is ON, it is judged to be reverse direction. There is also another type of incremental encoder that has Zero signal. The incremental encoder used most generally outputs 100~10,000 pulse per one time axis rotation.

Relative coordinate (Incremental system)

Relative coordinate regards the current value always as "0". The position is described by goal direction (sign of position address) and the moving distance. It is called as "relative address system". This is used for the fixed-feed control.

Inertia

This is the attribute of an object having no effect from outside in the place that maintains the current condition. Inertia moment.

Interlock

Under this condition, the machine cannot move to next action until the current running action is completed. This function is used for the protection of the damage and malfunction of device.

Interpolation operation

This is the synchronous action of several motor to carry out the complex function. Each motor can be set freely by positioning distance, acceleration/deceleration time, speed and other factors. These can be combined to move the goal by line or circle. Linear interpolation and Circular interpolation are available. Circular interpolation uses two motors.

Inverter

This is the device to change DC with AC. This device changes the motor speed by converting the actual commercial frequency 50Hz or 60Hz to DC. And then it changes it with 5~120Hz AC again and controls the motor speed.

Jog

This is a kind of manual operation and carries out Jog action by the setting value such as Jog high speed and Jog low speed of manual operation parameter without setting the operation data. If Jog operation is ON for a long time, the error occurs by stroke high/low limit value.

KPPS

Abbreviation of "Kilo pulses per second". 80kpps equals to 80,000pulse/sec.

Limit switch

This is the switch to stop the moving object on both sides of moving device for the safety. The circuit is pressed by the object moving the switch to activate the contact and will be activated by the forced power-off. For example, press the actuator as below to activate the internal micro switch. There are several types.

Linear interpolation

Linear interpolation operation acts two motors at the same time for horizontal feed and longitudinal feed to move the objects diagonally through positioning module. 3 motors can be active. It is required to set the same number of positioning operation data per axis.

Appendix1. Positioning Terminology

Load inertia ratio

Refer to GDL^2/GDM^2 “GD²” terminology.

Low inertia motor

This is the motor used when the frequent acceleration /deceleration repeats. In case of low inertia motor, the diameter of motor is reduced and the longitudinal is longer to cover the torque. This enables the inertial moment to reduce by 1/3 of standard motor. The ideal load inertia ratio is greater than or smaller than 1.

M code (Machine code)

This is additional function interlocking in order to replace the drill, tighten or loosen the clamp, raise or lower the welding electrode and indicate several data as auxiliary action of positioning operation. M code mode has two types of mode: AFTER mode or WITH mode. When M code is ON, the machine does not carry out the positioning operation of next step. M code becomes OFF by PLC program. 1 ~ 65535 M code no. set by the user can be set from operation data item and monitored or indicated on the external display by using the peripheral.

Machine feed value

When completion of homing, the origin address is saved. This value does not change even if the latest position and latest value of the machine coordinate set by the machine that has the origin address as a basis, are changed.

Manual pulse generator

The handle of this device is rotated manually to generate the pulse. This device is used when carrying out the correct positioning manually.

Main axis

This is the direction that positioning data is executed at first in case of interpolation operation. For example, in case of X, Y axis positioning, the axis that has the largest movement shall be main axis. And the speed follows this axis. The speed of subordinate axis is disregarded.

Movement amount per pulse

When using the units such as mm, inch, degree etc, movement amount is calculated and outputted from the machine to show how much the motor moves per pulse. This is the same as the positioning detection unit. The movement amount per axis rotation from the motor is as follows:

Movement amount per pulse= (P rate * movement amount per rotation)/no. of pulse per encoder rotation

Multi-phase pulse

This is the combination of pulse that has more than 2 phase difference. Ex) 2 phase pulse etc.

Change rate (Increase rate) setting

P rate. Please refer to “P rate” terminology.

Numerical control language

This is the language of paper tape with a punch hole that indicates the numerical control to the numerical control module. Numerical language is composed of EIA code (EIA language), ISO code (ISO standard), and JIS code (JIS standard).

Near point dog

This is a limit switch located before the origin. When this switch is ON, the homing speed changes with creep speed. Thus, the time required to switch ON for this switch should be longer than the time necessary for the deceleration from the homing speed to creep speed.

Numerical control

This is the existing positioning by using the numerical control module. This control can be used to carry out high precision, more than 3 axis high speed control. This is available to carry out movement control for complicated bending and surface.

Origin

This is the position set as the basis for positioning. The positioning of absolute coordinate cannot start without standard point.

Appendix1. Positioning Terminology

Operation pattern

This is the action to be executed after fixing the positioning operation data.

- 1) If selecting "End", the operation will stop after fixing the positioning.
- 2) If selecting "Go-on", the next step no. shall be executed after fixing the positioning.
- 3) If selecting "Continuous", the next step no. shall be executed automatically without stop after fixing the positioning.

Homing method

There are 5 types of Homing method. The method is different according to machine structure, stop precision etc. Homing shall be executed after setting homing parameter.

- 1) Origin detection after near point OFF
- 2) Origin detection after deceleration when near point ON
- 3) Origin detection by the origin and high/low limit
- 4) Origin detection by near point signal
- 5) High speed origin detection
- 6) Origin detection high/low limit

Homing parameter

This parameter is necessary for homing. This is set by the machine design. Thus for the change of this parameter, the machine design should be changed in advance. The origin is the basis for the action of positioning. Thus as if the origin is lost because of the power cutoff during positioning, the power shall be OFF and the machine is operated manually, it is available to return the origin by carrying out the homing. If homing command is executed, the machine moves to search the near point dog regardless of current value and stops at the origin. In this case, the current value becomes the origin address. (in case of homing method by near point)

P magnification pulse

This is a coefficient to amplify the feedback pulse per axis rotation by 2times, 3times, 1/2 or 1/3. This is the ratio of feed pulse and feedback pulse. For example, if the number of pulse per motor axis rotation is set as 2400 pulse, P ratio shall be 2 and

the result shall be the same as 1200 pulse. The rotation per pulse shall be 0.15 degree when it is set as 2400 pulse per rotation. But this is 0.3 degree when 1200 pulse. With P ratio, the positioning accuracy drop increases.

Position control

This is the control of position and dimension such as fixed-feed, positioning, numerical control etc. This is always controlled by feed pulse. There is speed control also. Even if the same Servo motor is using, Servo driver may be different.

Position loop gain

This is the ratio of deviation counter droop pulse for the command pulse frequency.

Position loop gain = Command pulse frequency / droop pulse (sec^{-1})

Increase the gain to promote the stop precision. But if position loop gain increases too much, overshooting occurs and the action shall be unstable. If position loop gain is too low, the machine will stop smoother but the stop deviation increases.

Position loop mode

This is a Servo control mode used for positioning. This is a mode for position control. Other Servo control mode includes speed loop mode to carry out speed control and torque loop mode to carry out torque control (current control).

Positioning

This is to move the machine from one point to the goal point correctly. Movement includes the distance, direction, speed set by the user. Positioning is used for the action such as paper cutting, board punching, installation of parts to PCB, welding etc. This is also used for Robot.

Positioning complete signal

This is the signal generated when positioning is completed. The machine movement will stop after positioning complete signal is ON.

Positioning operation data

This is an operation data for the user to carry out the positioning. This will be set by the user according

Appendix1. Positioning Terminology

to the number of point (the number of address) that positioning is carried out. In case of XGF-PP1/2/3O, XGF-PP1/2/3D, there is 400 points. In principal, positioning is executed from step no.1 in accordance with the order of step no. of operation data.

Positioning parameter

This is the basic data to carry out positioning. Data type includes unit, movement amount per pulse, max. speed limit value, high/low stroke value, acceleration/deceleration time, pulse output mode etc. Parameters have initial value to change the value to meet the control condition.

PTP control (Point to point control)

This is a type of positioning control. The branches to pass by this control method are required to set operation step on the path in advance. Only the movement to the given goal position is required. Here can be the combination of End, Go-on, Continuous operation pattern.

Pulse

This is ON/OFF conversion of current (voltage) for a very short time. One pulse string is a series of pulse. G4F-PP1/2/3O, G4F-PP1/2/3D is the module that generates the pulse.

Pulse generator

This is the device to generate the pulse. For example, this includes the device (encoder) installed on the motor axis that generates the pulse when the axis rotates and digital device. 1 phase type outputs one pulse string. 2 phase type outputs two pulse strings that have the phase difference. It is available to output 600 ~ 1,000,000 pulse per axis rotation.

Pulse output mode of driver

This is the method used to generate forward direction operation and reverse direction operation command to Servo motor. The using type is different according to the machine maker. In case of Type A, normal operation pulse and reverse operation pulse shall be outputted from separate terminals. In case of Type B, normal operation pulse and reverse operation pulse shall be outputted from the same

terminal and forward/ reverse direction operation classification signal shall be outputted from different terminals.

Regenerative brake option

This function is used to carry out acceleration/ deceleration frequently as one option. Refer to "External regenerative resistor".

Resolver

This device resolves two voltages of analog input and detects the angle. This is also called as "2 phase synchronization". For 1 phase voltage input, the axis rotation angle is converted to the 2 phase vertical voltage (analog voltage) and outputted.

Reverse limit switch signal

This is the input signal to inform the user that reverse limit switch (b contact configuration. Always ON) out of movement range to carry out positioning control is activated. The positioning action will stop when reverse limit switch signal (b contact) is OFF.

Turn table

This is a round table that the product is located. The positioning control is carried out while the product is turning within the range of 360 degree.

S pattern acceleration/deceleration

In this pattern, acceleration and deceleration follows the sine curve and the movement is smooth. S pattern ratio can be set up to 1~100%.

Sequence control

This means a sequence program that the completion of a serial of action is detected by switch. By this signal, the action like next action start shall be carried out and controlled in order.

Servo motor

This is the motor that turns according to the command. Servo motor responds very quickly and carries out frequent high speed and high precision start/stop. There are two types of Servo motor : DC type and AC type available for large capacity motor. Generally, the pulse generator (encoder) for speed

Appendix1. Positioning Terminology

detection is installed and the feedback control is carried out frequently.

SFC (Sequential function chart)

SFC is the optimized programming method to carry out the automatic control of the machine in sequence with PLC.

Skip function

When skip signal is entered, the running positioning will stop and the next step positioning will be carried out automatically.

Subordinate axis

During linear interpolation/circular interpolation operation, the speed of subordinate axis shall be calculated automatically from positioning data. This axis moves by operation data of main axis and position address of subordinate axis.

Speed control

Speed control is carried out usually by Servo motor. This is the application for the rotation, welding speed, homing speed of rotation grinder. Speed control is different from position control because current position (address) cannot be controlled.

Speed integral compensation

This is one item of Servo parameter from positioning data. During speed control, it is used to heighten the frequency response and improve the transition characteristics. When adjusting speed loop gain, if overshooting during acceleration/deceleration remains in many, it will be effective to increase this value. This compensation shall be set as ms unit.

Speed limit value

This is max. speed for positioning. If other speed data is set as higher than this value, the error will occur. The setting acceleration time is the time from stop status to speed limit value.

Speed loop gain

This is one item of Servo parameter from positioning data. This means the speed of control response during speed control. When load inertia moment

ratio increases, the speed response of control system will decrease and the action shall be unstable. If such a thing happens, the action could be improved by increasing this value. If speed loop gain increases too much, the overshoot will be large and occur while motor vibration noise is acting or stops.

Speed loop mode

This is Servo control mode used for positioning. This is one mode to carry out speed control. Refer to "Position loop mode".

Step out

The stepping motor rotates in proportion to the number of pulse while the rotation of motor breaks away if the excessive load is applied to the motor. This is called as 'step out'. If the step out occurs, it is required to replace the motor with new motor that has bigger torque. The step out may cause to increase the positioning deviation.

Stepping motor

This is the motor to rotate the given angle (ex: 0.15°) when 1 pulse is generated. Because of this reason, it is available to obtain the rotation in proportion to the number of pulse. 2~5 phase stepping motor is available. In case of 3 phase type, the motor rotates from A to C order when the voltage is supplied. Cares should be taken for the step out when overloading.

External stop signal

This is the input signal to stop the action from external input right away in the positioning control. When external stop signal (a contact) is ON, the action will stop.

Stroke limit

This is the range available for the positioning action or the range that the machine can move without any damage. (The movement out of this range is available in Jog operation mode). For the action using the worm gear, the stroke limit shall be set according to the length of screw.

Appendix1. Positioning Terminology

Sudden stop

This stop is carried out within the shorter time than deceleration time set by parameter.

Torque control

By this function, the limit of resistance torque applied to the motor that is used for positioning will be fixed. If the excessive torque is applied to the motor, the power shall be OFF. When the excessive torque is applied to the motor, it may cause the sudden increase of current. If the stress different from motor consumption occurs, the motor life will be reduced. This function uses the sudden increase of torque when the machine homing gives the command to stop the motor.

Torque loop mode

This is called as “current loop mode”. Refer to “Positioning loop mode” terminology.

Torque ripple

This means the change of torque width or deviation of torque.

Turn table

This is the turn table that is turning by the power. This table is used by dividing into the necessary position from 360 degree rotation. The unit of positioning control is “degree”.

Unit setting

This is the setting of the unit for the actual address or movement amount necessary for positioning. The available units are mm, inch, degree, pulse. The initial value of parameter is pulse unit.

WITH mode

This is the mode that carries out the positioning start and M code output at the same time. This mode enables the voltage to apply to the welding electrodes and to display the positioning speed and it shall be ON when the positioning starts.

XY table

This is the device to move the table to X, Y direction to carry out the positioning easily. There are some products available to use commercially.

Zero signal

This is called as “PGO of pulse generator (one time detection per axis rotation)”. This is also called as “Z phase”. Refer to “pulse generator” terminology.

Appendix 2 Positioning Error Information & Actions

Here describes the positioning error types and actions.

This is applied commonly to error information XGF-P01A/P02A/P03A/PD1A/PD2A/PD3A.

*open : open collector type, line : line driver type

Error Code	Error Description	Output type		Module operation state	Actions
		Open	Line		
101	Max. speed value of Basic Parameter exceeds the range.	0		Stop	Max. speed of Basic Parameter is 1≤max.speed≤20000 for Open collector based on pulse unit, and 1≤max.speed≤100000 for Line Driver.
102	Bias speed value of Basic Parameter exceeds the range.	0		Stop	Bias speed of Basic Parameter should be less than max. speed of Basic Parameter.
103	Pulse output mode value of Basic Parameter exceeds the range.	0		Stop	Pulse output mode of Basic Parameter is 0:CW/CCW 1: Pulse/Dir 2:Phase A/B. Select one among three.
111	Extended Parameter software high/low limit range error	0		Stop	S/W high limit of Extended Parameter should be greater than or equal to S/W low limit of Extended Parameter.
112	Mo Code Mode value of Extended Parameter exceeds the range.	0		Stop	M Code output of Extended Parameter is 0:None, 1:With 2:After. Select one among three.
113	S-Curve rate of Extended Parameter exceeds the range.	0		Stop	Change S-Curve rate of Extended Parameter to be more than 1 and less than 100.
114	External command selection value of Extended Parameter exceeds the range.	0		Stop	External command selection of Extended Parameter is 0:Start, 1:JOG command, 2:SKIP. Select one among three.
121	Jog high speed value of Manual operation parameter exceeds the range.	0		Stop	Set Jog high speed of Manual operation parameter to be greater than or equal to bias speed of Basic Parameter and less than or equal to max. speed of Basic Parameter.
122	Jog low speed value of Manual operation parameter exceeds the range.	0		Stop	Set Jog low speed of Manual operation parameter to be more than 1 and less than Jog high speed of Manual operation parameter.
123	Inching speed value of Manual operation parameter exceeds the range.	0		Stop	Set Inching speed of Manual operation parameter to be greater than or equal to bias speed of Basic Parameter and less than or equal to max. speed of Basic parameter.
131	Homing mode value of Homing parameter exceeds the range.	0		Stop	Homing method of Homing parameter is 0:Dog/Origin(Off), 1:Dog/Origin(On), 2:High/low limit/Origin, 3: Near Point 4:High speed origin. Select one among five.
132	Homing address of Homing parameter exceeds the range.	0		stop	Set Homing address of Homing parameter to be greater than S/W low limit of Extended parameter and less than S/W high limit of Extended Parameter.
133	Homing high speed value of Homing parameter exceeds the range.	0		Stop	Set Homing high speed of Homing parameter to be greater than or equal to bias speed of Basic parameter and less than or equal to max. speed of Basic parameter.
134	Homing low speed value of Homing parameter exceeds the range.	0		Stop	Set Homing low speed of Homing parameter to be greater than or equal to bias speed of Basic parameter and less than or equal to Homing high speed of Homing parameter.
135	Homing dwell time of Homing parameter exceeds the range.	0		Stop	Set the dwell time of Homing parameter to be less than 50000.
141	Encoder type value of Common parameter exceeds the range.	0		Stop	Set Encoder input signal of Common parameter to be between 0 and 6.
142	Exceeds ZONE 1 axis setting value range of Common parameter.	0		Stop	ZONE1 axis setting value of Common parameter is 0:X axis, 1:Yaxis, 2:Zaxis 3:Encoder. Select one among four.
143	Exceeds ZONE 2 axis setting value range of Common parameter.	0		Stop	ZONE2 axis setting value of Common parameter is 0:X axis, 1:Yaxis, 2:Zaxis 3:Encoder. Select one among four.
144	Exceeds ZONE 3 axis setting value range of Common parameter.	0		Stop	ZONE3 axis setting value of Common parameter is 0:X axis, 1:Yaxis, 2:Zaxis 3:Encoder. Select one among four.
145	Exceeds pulse output level setting range of Common parameter.	0		Stop	Pulse output level value of Common parameter is 0:Low Active, 1:High Active. Set one between two.
146	Exceeds Zone output mode setting range of Common parameter	0		Stop	ZONE output mode of Common parameter is 0:individual output 1: batch output(ZONE1). Set one between two.
147	Exceeds Circular interpolation method setting rang of Common parameter.	0		Stop	Circular interpolation method of Common parameter is 0:Middle point, 1:Center point. Set one between two.
151	Not available to set operation speed value of Operation data as "0".	0		Stop	Set operation speed to be greater than "0".
152	Operation speed of Operation data exceeds max. speed value.	0		Stop	Set operation speed to be less than or equal to max.speed set in the Basic Parameter.
153	Operation speed of Operation data is set less than bias speed.	0		Stop	Set operation speed to be greater than or equal to bias speed set in Basic Parameter.
154	Dwell time of Operation data exceeds the setting range.	0		Stop	Set dwell time of operation data to operate to be less than 50000.

Appendix 2 Positioning Error Information & Actions

Error Code	Error Description	Output type		Module operation state	Actions
		Open	Line		
155	Exceeds End/Go on/Continuous operation setting range of Operation data.	O		Stop	Set one from operation pattern (0:End, 1:Go on, 2: Continuous) of operation data to operate.
201	Not possible to carry out Homing command in the state of in operation.	O		Operation	Check if command axis is in operation when the Homing command is executed.
202	Not possible to carry out Homing command in the state of output disabled.	O		Stop	Check if command axis is in the state of output disabled when Homing command is executed. Available to release output disabled by RST command that selects output disabled release option.
203	Not possible to carry out Homing command in the state of Servo Ready OFF.	O		Stop	Check if Driver Ready signal of command axis is OFF when Homing command is executed.
211	Not possible to carry out Floating origin setting command in the state of in operation.	O		Operation	Check if command axis is in operation when Floating origin setting command is executed.
212	Not possible to carry out Floating origin setting command in the state of Servo Ready OFF.	O		Stop	Check if Driver Ready signal of command axis is OFF when Floating origin setting command is executed.
221	Not possible to carry out Direct Start command in the state of in operation.	O		Operation	Check if command axis is in operation when Direct Start command is executed.
222	Not possible to carry out Direct Start command in the state of output disabled.	O		Stop	Check if command axis is in the state of output disabled when Direct Start command is executed. Available to release output disabled by RST command that selects output disabled release option.
223	Not possible to carry out Direct Start command in the state of M Code ON.	O		stop	Check if M code signal of command axis is ON when Direct Start command is executed. MOF command can make M Code OFF.
224	Not possible to carry out Direct Start command at the absolute coordinate in the origin unsettled state.	O		Stop	Not possible to carry out absolute coordinate operation in the origin unsettled state. Check the coordinate of operation data to operate and the current origin determination. Available to carry out absolute coordinate operation after origin determination by Homing command or floating origin setting command.
225	Not possible to carry out Direct Start command in the state of Servo Ready OFF.	O		Stop	Check if Driver Ready signal of command axis is OFF when Direct Start command is executed.
231	Not possible to carry out Indirect Start command in the state of in operation.	O		Operation	Check if command axis is in operation when Indirect Start command is executed.
232	Not possible to carry out Indirect Start command in the state of output disabled.	O		Stop	Check if command axis is in the state of output disabled when Indirect Start command is executed. Available to release output disabled by RST command that selects output disabled release option.
233	Not possible to carry out Indirect Start command in the state of M Code ON.	O		Stop	Check if M code signal of command axis is ON when Indirect Start command is executed. Available to make M Code OFF by MOF command.
234	Not possible to carry out Indirect Start command at the absolute coordinate in the origin unsettled state.	O		Stop	Not available to carry out absolute coordinate operation in the origin unsettled state. Check the coordinate of step to operate and the current origin determination state. Available to carry out absolute coordinate operation after origin determination by Homing command or floating origin setting command.
235	Not possible to carry out Indirect Start command in the state of Servo Ready OFF.	O		Stop	Check if Driver Ready signal of command axis is OFF when Indirect Start command is executed.
236	Not possible to carry out Continuous operation of Indirect Start at speed control.	O		Stop	Check if there is no step that control method is set as speed control in the middle of Continuous operation of position control among Operation data and operation pattern is set as Continuous.
237	Step no. of POINT start is limited up to 20.	O		Stop	Set the step no. for POINT start to be less than 20.
238	Not possible to carry out Continuous operation of Indirect Start at S-Curve acceleration/deceleration pattern.	O		Stop	Check if acc./dec. pattern of extended parameter of command axis is set as S-Curve.
241	Not possible to carry out Linear interpolation Start in the state that main axis of linear interpolation is in operation.	O		Operation	Check if main axis is in operation when Linear interpolation command is executed.
242	Not possible to carry out Linear interpolation Start in the state that subordinate axis 1 of linear interpolation is in operation.	O		Operation	Check if subordinate axis 1 is in operation when Linear interpolation command is executed.
243	Not possible to carry out Linear interpolation Start in the state that subordinate axis 2 of linear interpolation is in operation.	O		Operation	Check if subordinate axis 2 is in operation when Linear interpolation command is executed.

Appendix 2 Positioning Error Information & Actions

Error Code	Error Description	Output type		Module operation state	Actions
		Open	Line		
244	Not possible to carry out Linear interpolation Start in the state that main axis of linear interpolation is output disabled.	O		Stop	Check if main axis is in the state of output disabled when Linear interpolation command is executed. Available to release output disabled by RST command that selects output disabled release option.
245	Not possible to carry out Linear interpolation Start in the state that subordinate axis 1 of linear interpolation is output disabled	O		Stop	Check if subordinate axis 1 is in the state of output disabled when Linear interpolation command is executed. Available to release output disabled by RST command that selects output disabled release option.
246	Not possible to carry out Linear interpolation Start in the state that subordinate axis 2 of linear interpolation is output disabled	O		Stop	Check if subordinate axis 2 is in the state of output disabled when Linear interpolation command is executed. Available to release output disabled by RST command that selects output disabled release option.
247	Not possible to carry out Linear interpolation Start in the state that M Code signal of main axis of Linear interpolation is ON.	O		Stop	Check if M Code signal of main axis is ON when Linear interpolation command is executed. Available to make M Code OFF by MOF command.
248	Not possible to carry out Linear interpolation Start in the state that M Code signal of subordinate axis 1 of Linear interpolation is ON.	O		Stop	Check if M Code signal of subordinate axis 1 is ON when Linear interpolation command is executed. Available to make M Code OFF by MOF command.
249	Not possible to carry out Linear interpolation Start in the state that M Code signal of subordinate axis 2 of Linear interpolation is ON.	O		Stop	Check if M Code signal of subordinate axis 2 is ON when Linear interpolation command is executed. Available to make M Code OFF by MOF command.
250	Not possible to carry out positioning operation of absolute coordinate in the state that main axis of Linear interpolation is origin unsettled.	O		Stop	Not available to carry out absolute coordinate operation in the origin unsettled state. Check the coordinate of step to operate and the current origin determination state. Available to carry out absolute coordinate operation after origin determination by Homing command or floating origin setting command.
251	Not possible to carry out positioning operation of absolute coordinate in the state that subordinate axis 1 of Linear interpolation is origin unsettled.	O		Stop	Not available to carry out absolute coordinate operation in the origin unsettled state. Check the coordinate of step to operate and the current origin determination state. Available to carry out absolute coordinate operation after origin determination by Homing command or floating origin setting command.
252	Not possible to carry out positioning operation of absolute coordinate in the state that subordinate axis 2 of Linear interpolation is origin unsettled	O		Stop	Not available to carry out absolute coordinate operation in the origin unsettled state. Check the coordinate of step to operate and the current origin determination state. Available to carry out absolute coordinate operation after origin determination by Homing command or floating origin setting command.
253	In case that main axis and subordinate axis is set wrong in Linear interpolation. (the case that the subordinate axis is not assigned, the case that only one axis is assigned, or the case that no axis is assigned)	O		Stop	Check if the subordinate axis is not assigned, or only one axis is assigned, or no axis is assigned when Linear interpolation command is executed.
254	Not possible to carry out the operation as Servo Ready is OFF at the main axis of Linear interpolation	O		Stop	Check if Driver Ready signal of main axis is OFF when Linear interpolation command is executed.
255	Not possible to carry out the operation as Servo Ready is OFF at the subordinate axis 1 of Linear interpolation	O		Stop	Check if Driver Ready signal of subordinate axis 1 is OFF when Linear interpolation command is executed.
256	Not possible to carry out the operation as Servo Ready is OFF at the subordinate axis 2 of Linear interpolation	O		Stop	Check if Driver Ready signal of subordinate axis 2 is OFF when Linear interpolation command is executed.
257	Not possible to carry out Linear interpolation if there is no goal position of main axis.	O		Stop	Check if the goal position of operation data of the step for Linear interpolation is not the same with the current position for absolute coordinate and it is set as "0" for relative coordinate.
258	Not possible to carry out Linear interpolation if main axis is at speed control.	O		stop	Check if control method of operation data step of main axis for Linear interpolation operation is set as speed control.
259	Not possible to carry out Linear interpolation if subordinate axis 1 is at speed control.	O		Stop	Check if control method of operation data step of subordinate axis 1 for Linear interpolation operation is set as speed control.
260	Not possible to carry out Linear interpolation if subordinate axis 2 is at speed control.	O		Stop	Check if control method of operation data step of subordinate axis 2 for Linear interpolation operation is set as speed control.
271	Not possible to carry circular interpolation start in the state that main axis of circular interpolation is in operation.	O		Operation	Check if main axis is in operation when circular interpolation command is executed.
272	Not possible to carry circular interpolation start in the state that subordinate axis of circular interpolation is in operation	O		Operation	Check if subordinate axis is in operation when circular interpolation command is executed.

Appendix 2 Positioning Error Information & Actions

Error Code	Error Description	Output type		Module operation state	Actions
		Open	Line		
273	Not possible to carry circular interpolation start in the state that main axis of circular interpolation is output disabled.	0		Stop	Check if main axis is in the state of output disabled when circular interpolation command is executed. Available to release output disabled by RST command that selects output disabled release option
274	Not possible to carry circular interpolation start in the state that subordinate axis of circular interpolation is output disabled.	0		Stop	Check if subordinate axis 1 is in the state of output disabled when circular interpolation command is executed. Available to release output disabled by RST command that selects output disabled release option.
275	Not possible to carry circular interpolation start in the state that M Code signal of main axis of circular interpolation is ON.	0		Stop	Check if M Code signal of main axis is ON when circular interpolation command is executed. Available to make M Code OFF by MOF command.
276	Not possible to carry circular interpolation start in the state that M Code signal of subordinate axis of circular interpolation is ON.	0		Stop	Check if M Code signal of subordinate axis is ON when circular interpolation command is executed. Available to make M Code OFF by MOF command.
277	Not possible to carry positioning operation of absolute coordinate in the state that main axis of circular interpolation is origin unsettled.	0		Stop	Not available to carry out absolute coordinate operation in the origin unsettled state. Check the coordinate of step to operate and the current origin determination state. Available to carry out absolute coordinate operation after origin determination by Homing command or floating origin setting command.
278	Not possible to carry positioning operation of absolute coordinate in the state that subordinate axis of circular interpolation is origin unsettled	0		Stop	Not available to carry out absolute coordinate operation in the origin unsettled state. Check the coordinate of step to operate and the current origin determination state. Available to carry out absolute coordinate operation after origin determination by Homing command or floating origin setting command.
279	Not possible to carry out the operation as main axis and subordinate axis is set as the same in circular interpolation.	0		Stop	Check the setting of main axis and subordinate axis of circular interpolation command.
280	Not possible to carry out the operation as Servo Ready is OFF in main axis of circular interpolation.	0		Stop	Check if Driver Ready signal of main axis is OFF when circular interpolation command is executed.
281	Not possible to carry out the operation as Servo Ready is OFF in subordinate axis of circular interpolation.	0		Stop	Check if Driver Ready signal of subordinate axis 1 is OFF when circular interpolation command is executed.
282	Not possible to carry out degree operation in circular interpolation.	0		Stop	Check if the unit of Basic Parameter of main axis of circular interpolation command is set as degree.
283	Not possible to carry out degree operation in circular interpolation.	0		Stop	Check if the unit of Basic Parameter of subordinate axis of circular interpolation command is set as degree.
284	Not possible to carry out the operation if start point =center point (middle point) or center point (middle point) =end point in circular interpolation.	0		Stop	Check if the center point or middle point is set as the same point as start point or end point in circular interpolation.
285	The start point and end point is Not possible to be same in the middle point mode of circular interpolation.	0		Stop	Check if circular interpolation method of Common parameter is set as middle point and if the position of start point is not the same as end point.
286	Radius setting error in circular interpolation	0		Stop	The radius of the circle to carry out circular interpolation operation is up to 2e31 pulse. Check if it is set in order to carry out the circular interpolation more than the size.
287	Not possible to carry out the operation as linear profile comes out of circular interpolation.	0		Stop	Check if circular interpolation method of Common parameter is set as Middle point and the middle point is set to be aligned with start point and end point.
288	The radius should be larger than backlash amount in circular interpolation.	0		Stop	The radius of circle for circular interpolation operation should be larger than Backlash compensation amount set in the Extended parameter of main axis and subordinate axis. Check the setting value.
289	Center point setting error in circular interpolation	0		Stop	As the radius difference from the start point and end point due to the wrong setting of center point is too much, it is not possible to carry out the right circular interpolation operation. Check the setting value.
291	Not possible to carry out Synchronous Start command in the state of in operation.	0		Operation	Check if the Error occurred axis is included in Synchronous Start command and if there is no axis in operation when the command is executed.
292	Not possible to carry out Synchronous Start command in the state of output disabled.	0		Stop	Check if the Error occurred axis is included in Synchronous Start command and if it is in the state of output disabled when the command is executed. Available to release output disabled by RST command that selects output disabled release option.
293	Not possible to carry out Synchronous Start command in the state of M Code ON.	0		Stop	Check if the Error occurred axis is included in Synchronous Start command and if M Code signal is ON when the command is executed. Available to make M Code OFF by MOF command.

Appendix 2 Positioning Error Information & Actions

Error Code	Error Description	Output type		Module operation state	Actions
		Open	Line		
294	Not possible to carry out Synchronous Start command in case that there is no goal position.	0		Stop	Check if the Error occurred axis is included in Synchronous Start command, and if the goal position of operation data of the step to operate is not the same as the current position for absolute coordinate and is set as "0" for relative coordinate.
295	Not possible to carry out Synchronous Start command in the state that Servo Ready is OFF.	0		Stop	Check if the Error occurred axis is included in Synchronous Start command, and if Driver Ready signal is OFF when the command is executed.
296	In case that Synchronous Start command axis setting is wrong.	0		Stop	Check if only one axis of Synchronous Start command is assigned. The axis assignment address means 0 bit : X axis, 1 bit : Yaxis, 2 bit : Zaxis and each bit is set as "1" for axis assignment.
301	Not possible to carry out Speed/Position control switching command not in the state of in operation.	0		Stop	Check if the axis is 'stop' state when speed/position control switching command is executed.
302	Not possible to carry out Speed/Position control switching command not in the state of speed control.	0		Stop	Check if the axis is 'speed control' state when speed/position control switching command is executed.
303	Not possible to carry out Speed/Position control switching command at subordinate axis of Synchronous Start operation.	0		Stop	Check if the axis is in operation by subordinate axis of Synchronous Start operation when speed/position control switching command is executed.
304	Not possible to carry out Speed/Position control switching command if there is no goal position.	0		Stop	Check if the operation has the goal position when speed/position control switching command is executed.
311	Not possible to carry out Position/Speed control switching command not in the state of in operation.	0		Stop	Check if the axis is 'stop' state when position/speed control switching command is executed.
312	Not possible to carry out Position/Speed control switching command at subordinate axis of Synchronous Start operation.	0		Stop	Check if the axis is in operation by subordinate axis of Synchronous Start operation when position/speed control switching command is executed.
313	Not possible to carry out Position/Speed control switching command in the state of circular interpolation operation.	0		Operation	Check if the axis is in circular interpolation operation when position/speed control switching command is executed.
314	Not possible to carry out Position/Speed control switching command in the state of Linear interpolation operation.	0		Operation	Check if the axis is in linear interpolation operation when position/speed control switching command is executed.
321	Not possible to carry out deceleration stop command not in the state of in operation.	0		Stop	Not possible to carry out deceleration stop command not in the state of in operation.
322	Not possible to carry out deceleration stop command in the state of Jog operation.	0		Operation	Not possible to carry out deceleration stop command in the state of Jog operation.
323	Not possible to carry out deceleration stop command for operation axis of manual pulse generator.	0		Operation	Check if the axis is in manual pulse generator operation when deceleration stop command is executed.
331	Not possible to carry out Skip command not in the state of in operation.	0		Stop	Check if the axis is 'stop' state when Skip command is executed.
332	Not possible to carry out Skip command for subordinate axis of Linear interpolation operation.	0		Operation	Check if the axis is in operation by subordinate axis of Linear interpolation when Skip command is executed.
333	Not possible to carry out Skip command for subordinate axis of Synchronous Start operation.	0		Operation	Check if the axis is in operation by subordinate axis of Synchronous Start operation when Skip command is executed.
334	Not possible to carry out Skip command for operation axis of manual pulse generator.	0		Operation	Check if the axis is in manual pulse generator operation when Skip command is executed.
335	Not possible to carry out Skip command in the state of Jog operation.	0		Operation	Check if the axis is in Jog operation when Skip command is executed.
336	Not possible to carry out Skip command in the state of Direct Start operation.	0		Operation	Check if the axis is in Direct Start operation when Skip command is executed.
337	Not possible to carry out Skip command in the state of Inching operation.	0		Operation	Check if the axis is in Inching operation when Skip command is executed.
338	Not possible to carry out Skip command for subordinate axis of circular interpolation operation.	0		Operation	Check if the axis is in operation by subordinate axis of circular interpolation operation when Skip command is executed.
341	Not possible to carry out Synchronous Start by Position command in the state of in operation.	0		Operation	Check if the axis is in operation when Synchronous Start by Position command is executed.
342	Not possible to carry out Synchronous Start by Position command in the state of output disabled.	0		Stop	Check if the axis is in the state of output disabled when Synchronous Start by Position command is executed. Available to release output disabled by RST command that selects output disabled release option.
343	Not possible to carry out Synchronous Start by Position command in the state of M Code ON.	0		Stop	Check if the M Code signal of the axis is ON when Synchronous Start by Position command is executed. Available to make M Code OFF by MOF command.

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Error Code	Error Description	Output type		Module operation state	Actions
		Open	Line		
344	Not possible to carry out Synchronous Start by Position command at the absolute coordinate in the state of origin unsettled.	O		Stop	Not available to carry out absolute coordinate operation in the origin unsettled state. Check the coordinate of step to operate and the current origin determination state. Available to carry out absolute coordinate operation after origin determination by Homing command or floating origin setting command.
345	Not possible to carry out Synchronous Start by Position command in the state that Servo Ready is OFF.	O		Stop	Check if Driver Ready signal of the axis is OFF when Synchronous Start by Position command is executed.
346	Not possible to carry out Synchronous Start by Position command in the state that the origin of main axis is not settled.	O		Stop	Check if main axis is in the origin unsettled state when Synchronous Start command is executed.
347	There is error in setting main axis/subordinate axis of Synchronous Start by Position command.	O		Stop	Check if main axis of Synchronous Start by Position command is set as the same as command axis. Main axis is set by writing 0(Xaxis),1(Yaxis),2(Zaxis) to the setting address.
348	Not possible to carry out Synchronous Start by Position command when main axis is at speed control without position indication.	O		Stop	Check if main axis is set as "no indication" for the position indication during equal speed operation of Extended parameter and carries out speed control operation when Synchronous Start command is executed.
351	Not possible to carry out Synchronous Start by Speed command in the state of in operation.	O		Operation	Check if the axis is in operation when Synchronous Start by Speed command is executed.
352	Not possible to carry out Synchronous Start by Speed command in the state of output disabled.	O		stop	Check if the axis is in the state of output disabled when Synchronous Start by Speed command is executed. Available to release output disabled by RST command that selects output disabled release option.
353	Not possible to carry out Synchronous Start by Speed command in the state of M Code ON.	O		Stop	Check if the M Code signal of the axis is ON when Synchronous Start by Speed command is executed. Available to make M Code OFF by MOF command.
354	Not possible to carry out Synchronous Start by Speed command in the state that Servo Ready is OFF.	O		Stop	Check if Driver Ready signal of the axis is OFF when Synchronous Start by speed command is executed.
355	There is error in setting main axis/subordinate axis of Synchronou Start by Speed command.	O		Stop	Check if main axis of Synchronous Start by Speed command is set as the same as command axis. Main axis is set by writing 0(Xaxis),1(Yaxis),2(Zaxis) to the setting address.
356	There is error in setting main axis ratio/subordinate axis ratio of Synchronou Start by Speed command.	O		Stop	The main axis ratio of Synchronous Start by Speed command should be greater than or equal to the subordinate axis ratio. Check the main axis ratio/subordinate axis ratio setting.
357	Not possible to carry out Synchronous Start by Speed command at the specific Pulse Mode.	O		Stop	Synchronous Start by speed command may not be carried out according to the combination of pulse output mode set in Basic Parameter of main axis and pulse output mode set in Basic Parameter of subordinate axis.
358	Not possible to carry out Synchronous Start by Speed command in the setting pulse mode.	O		Stop	In case that the main axis of Synchronous Start by speed command is Encoder, Encoder input signal set in Common parameter and the pulse output mode set in Basic parameter may not be carried out according to the combination. Please refer to the manual.
359	Synchronous Start by speed command can not set the subordinate axis of Synchronous Start by Speed or circular interpolation as main axis.	O		Stop	Check if the main axis of Synchronous Start by speed command is in operation by the subordinate coordinate of Synchronous Start by Speed or circular interpolation.
361	Not possible to carry out Position Override command not in the state of in operation (Busy).	O		Stop	Check if the axis is 'stop' state when Position Override command is executed.
362	Not possible to carry out Position Override command not in the state of in dwell.	O		Stop	Check if the axis is in dwell when Position Override command is executed..
363	Not possible to carry out Position Override command not in the state of positioning operation.	O		Operation	Check if the axis is in operation by position control when Position Override command is executed.
364	Not possible to carry out Position Override command for the axis of Linear interpolation operation.	O		Operation	Check if the axis is in Linear interpolation operation when Position Override command is executed.
365	Not possible to carry out Position Override command for the axis of circular interpolation operation.	O		Operation	Check if the axis is in circular interpolation operation when Position Override command is executed.
366	Not possible to carry out Position Override command for the subordinate axis of Synchronous operation.	O		Operation	Check if the axis is in operation by subordinate axis of Synchronous Start operation when Position Override command is executed.
367	Not possible to carry out Position Override command for the operation axis of manual pulse generator.	O		Operation	Check if the axis is in manual pulse generator operation when Position Override command is executed..

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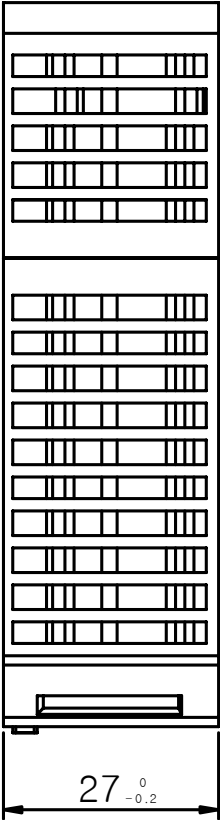
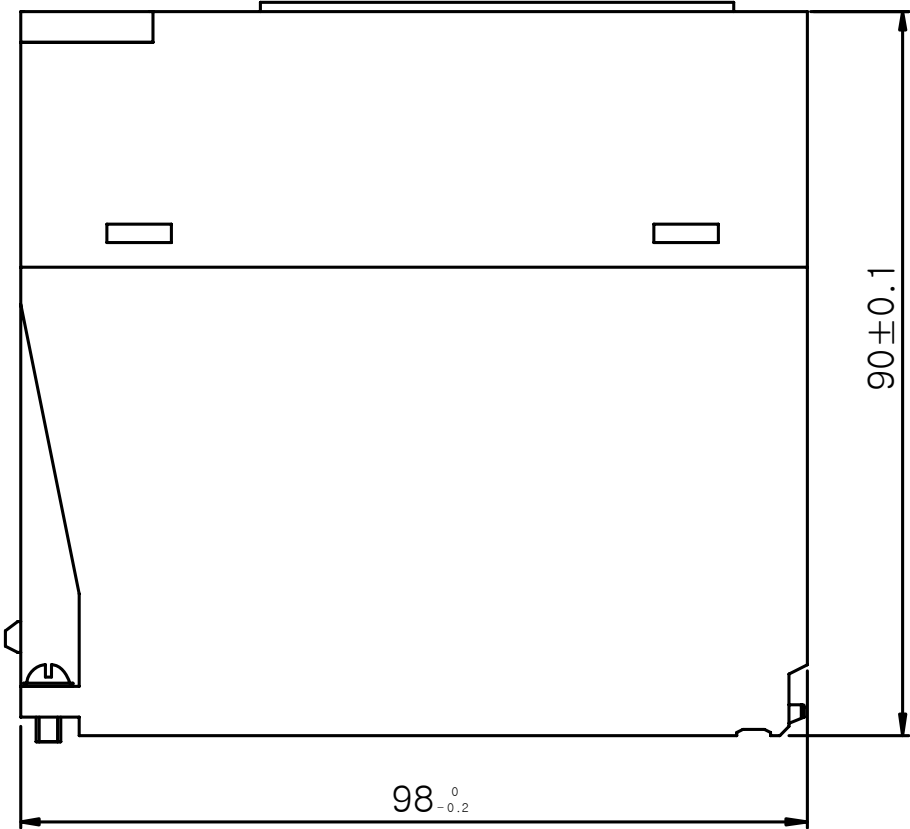
Error Code	Error Description	Output type		Module operation state	Actions
		Open	Line		
371	Not possible to carry out Speed Override command not in the state of in operation (Busy).	O		Stop	Check if the axis is 'stop' state when Speed Override is executed.
372	Exceeds the range of speed override value.	O		Stop	Speed value of Speed Override command should be less than or equal to max. speed set in Basic Parameter. Check the speed value.
373	Not possible to carry out Speed Override command for the subordinate axis of Linear interpolation operation.	O		Operation	Check if the axis is in operation by subordinate axis of Linear interpolation operation when Speed Override command is executed.
374	Not possible to carry out Speed Override command for the axis of circular interpolation operation.	O		Operation	Check if the axis is in operation by subordinate axis of circular interpolation operation when Speed Override command is executed.
375	Not possible to carry out Speed Override command for the subordinate axis of Synchronous operation.	O		Operation	Check if the axis is in operation by subordinate axis of Synchronous Start operation when Speed Override command is executed.
376	Not possible to carry out Speed Override command for the operation axis of manual pulse generator.	O		Operation	Check if the axis is in manual pulse generator operation when Speed Override command is executed.
377	Not possible to carry out Speed Override command in the deceleration section.	O		Operation	Check if the axis is in the state of deceleration stop when Speed Override command is executed.
378	Not possible to carry out Speed Override command in S-curve acceleration/deceleration pattern.	O		Operation	Check if the acceleration/deceleration pattern of Extended Parameter of command axis is set as S-Curve.
381	Not possible to carry out Random position speed override command not in the state of in operation.	O		Stop	Check if the axis is 'stop' state when Random position speed override command is executed.
382	Not possible to carry out Random position speed override command not in positioning operation.	O		Stop	Check if the axis is in speed control operation when Random position speed override command is executed.
383	Exceeds the speed override value range of Random position speed override command.	O		Stop	Speed value of Random position speed override command should be less than or equal to max. speed set in Basic Parameter. Check the speed value.
384	Not possible to carry out Random position speed override command for the subordinate axis of Linear interpolation operation.	O		Operation	Check if the axis is in operation by subordinate axis of Linear interpolation operation when Random position speed override command is executed.
385	Not possible to carry out Random position speed override command for the axis of circular interpolation operation.	O		Operation	Check if the axis is in circular interpolation operation when Speed Override command is executed.
386	Not possible to carry out Random position speed override command for the subordinate axis of Synchronous operation.	O		Operation	Check if the axis is in operation by subordinate axis of Synchronous Start operation when Speed Override command is executed.
387	Not possible to carry out Random position speed override command for the operation axis of manual pulse generator.	O		Operation	Check if the axis is in manual pulse generator operation when Speed Override command is executed.
388	Not possible to carry out Random position speed override command in the state that Servo Ready is OFF.	O		Stop	Check if Driver Ready signal of the axis is OFF when Random position speed override command.
389	Not possible to carry out Random position speed override command in the state that Servo Ready is OFF.	O		Stop	Check if the acceleration/deceleration pattern of Extended Parameter of command axis is set as S-Curve.
390	Not possible to carry out Continuous operation command in S-Curve acceleration/deceleration pattern.	O		Stop	Check if the acceleration/deceleration pattern of Extended Parameter of command axis is set as S-Curve
391	Not possible to carry out Continuous operation command not in the state of in operation.	O		Stop	Check if the axis is 'stop' state when Continuous operation command is executed.
392	Not possible to carry out Continuous operation command not in the state of in dwell.	O		Stop	Check if the axis is in dwell when Continuous operation command is executed.
393	Not possible to carry out Continuous operation command not in the state of positioning operation.	O		Stop	Check if the axis is in speed control operation when Continuous operation command is executed.
394	Speed data value of Continuous operation command exceeds the allowable range.	O		Stop	Speed value of Continuous operation command should be less than or equal to max. speed set in Basic Parameter. Check the speed value.
395	Not possible to carry out Continuous operation command for the subordinate axis of Linear interpolation operation.	O		Stop	Check if the axis is in operation by subordinate axis of Linear interpolation operation when Continuous operation command is executed.
396	Not possible to carry out Continuous operation command for the axis of circular interpolation operation axis.	O		Stop	Check if the axis is in circular interpolation operation when Continuous operation command is executed.
397	Not possible to carry out Continuous operation command for the subordinate axis of Synchronous operation.	O		Operation	Check if the axis is in operation by subordinate axis of Synchronous Start operation when Continuous operation command is executed.

Appendix 2 Positioning Error Information & Actions

Error Code	Error Description	Output type		Module operation state	Actions
		Open	Line		
398	Not possible to carry out Continuous operation command for the operation axis of manual pulse generator.	O		Operation	Check if the axis is in manual pulse generator operation when Continuous operation command is executed.
399	Not possible to carry out Continuous operation command at the last step of Operation data.	O		Operation	Check if the axis is in operation of 400 th step when Continuous operation command is executed.
400	Not possible to carry out Continuous operation command in the state of Direct Start operation.	O		Operation	Check if the axis is in operation by Direct Start command that Continuous operation command is executed.
401	Not possible to carry out Inching command in the state of in operation.	O		Operation	Check if the axis is in operation when Inching command is executed.
402	Not possible to carry out Inching command in the state of output disabled.	O		stop	Check if the axis is in the state of output disabled when Inching command is executed. Available to release output disabled by RST command that selects output disabled release option.
403	Not possible to carry out Inching command in the state that Servo Ready is OFF.	O		Stop	Check if Driver Ready signal of the axis is OFF when Inching command is executed.
411	Not possible to carry out Jog Start command in the state of in operation.	O		Operation	Check if the axis is in operation when Jog Start command is executed.
412	Not possible to carry out Jog Start command in the state of output disabled.	O		Stop	Check if the axis is in the state of output disabled when Jog Start command is executed. Available to release output disabled by RST command that selects output disabled release option.
413	Not possible to carry out Jog Start command in the state that Servo Ready is OFF.	O		Stop	Check if Driver Ready signal of the axis is OFF when Jog Start command is executed.
414	If Jog operation is set as a high speed less than 500pps, JOG high speed may not be changed to JOG low speed in a same direction.	O		Operation	Check whether the JOG high speed setting value is 500pps and lower in Manual Operation Parameter and change it higher than 500pps.
421	Not possible to allow Manual pulse generator operation in the state of in operation.	O		Operation	Check if the axis is in operation when manual pulse generator operation command is executed.
422	Not possible to allow Manual pulse generator operation in the state of output disabled.	O		Stop	Check if the axis is in the state of output disabled when manual pulse generator operation command is executed. Available to release output disabled by RST command that selects output disabled release option.
423	Not possible to carry out Manual pulse generator operation in the state that Servo Ready is OFF.	O		Stop	Check if Driver Ready signal of the axis is OFF when manual pulse generator operation command is executed.
424	Not possible to carry out Manual pulse generator operation in the setting pulse mode.	O		Operation	Manual pulse generator operation command may not be carried out according to the combination of Encoder input signal set in Common parameter and the pulse output mode set in Basic Parameter of command axis.
431	Not possible to carry out Return to the Position before Manual Operation in the state of in operation.	O		Operation	Check if the axis is in operation when Return to the position before manual operation command is executed.
432	Not possible to carry out Return to the Position before Manual Operation in the state of output disabled.	O		Stop	Check if the axis is in the state of output disabled when Return to the position before manual operation command is executed. Available to release output disabled by RST command that selects output disabled release option.
433	Not possible to carry out Return to the Position before Manual Operation in the state that Servo Ready is OFF.	O		Stop	Check if Driver Ready signal of the axis is OFF when Return to the position before manual operation command is executed.
441	Not possible to carry out Start step no. Change/Repeat Operation Start step no. assignment command in the state of in operation.	O		Operation	Check if the axis is in operation when Start step no. change/repeat command is executed.
442	Exceeds the step assignment range of Start step no. Change/Repeat Operation Start step no. assignment command.	O		Stop	Check if the setting step value of Start step no. change command or repeat operation start step no. assignment command is greater than or equal to 1 and less than or equal to 400.
451	Not possible to carry out Current Position Preset command in the state of in operation.	O		Operation	Check if the axis is in operation when Current position preset command is executed.
452	Not possible to set the auxiliary position data value out of range of software high/low limit while Current Position Preset command is executed.	O		Stop	Check if the position value of current position preset command is within the range of soft high /low limit set in Extended Parameter.
461	Not possible to carry out Position Teaching command in the state of in operation.	O		Operation	Check if the axis is in operation when Position teaching command is executed.
462	Not possible to carry out Teaching Array command for the data over 16.	O		-	Check if the data no. of Teaching Array command is set in the range that is greater than or equal to 1 and less than or equal to 16.

Appendix 3 Dimension

Unit: mm



Warranty and Environmental Policy

Warranty

1. Warranty Period

The product you purchased will be guaranteed for 18 months from the date of manufacturing.

2. Scope of Warranty

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

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

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

Environmental Policy

LS Industrial Systems Co., Ltd supports and observes the environmental policy as below.

Environmental Management	About Disposal
LS Industrial Systems considers the environmental preservation as the preferential management subject and every staff of LS Industrial Systems use the reasonable endeavors for the pleasurable environmental preservation of the earth.	LS Industrial Systems' PLC unit is designed to protect the environment. For the disposal, separate aluminum, iron and synthetic resin (cover) from the product as they are reusable.