Right choice for ultimate yield

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Programmable Logic Controller

Advanced Positioning Module

XGT Series

User's Manual

XGF-PD1A/PD2A/PD3A

XGF-PO1A/PO2A/PO3A

Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.

- Keep this manual within easy reach for quick reference.

LS Industrial Systems

http://eng.lsis.biz

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 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 1.1	October, ’08	Detailed description modified and XGI content added	-
V 1.2	January,’10	Command is added (SSSP, RCP)	Ch8.3.14, Ch8.3.45
		Speed synchronous start is modified	Ch3.3.3
		High speed homing is modified	Ch3.6.6
		Parameter batch modification is added	Ch7.1.4
		Specification is added in case command unit is pulse	Ch5.1
		Speed synchronous program is added	Ch3.24, Ch10.2.11
		Current position section repetition program is added	Ch3.25, Ch10.2.30
		XGR is added	Ch2.2, P9-1, Ch10
		Read/Write variable data is added	Ch8.3.46~47 P9-1, Ch9.11 App2, App3

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

About User's Manual

Thank you for 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
XG5000 User's Manual (for XGK, XGB)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGK, XGB CPU
XG5000 User's Manual (for XGI, XGR)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGI, XGR CPU
XGK/XGB Instructions & Programming User's Manual	User's manual for programming to explain how to use instructions that are used PLC system with XGK, XGB CPU.
XGI/XGR/XEC Instructions & Programming User's Manual	User's manual for programming to explain how to use instructions that are used PLC system with XGI, XGR,XEC CPU.
XGK CPU User's Manual (XGK-CPUA/CPUE/CPUH/CPUS/CPUU)	XGK-CPUA/CPUE/CPUH/CPUS/CPUU user manual describing about XGK CPU module, power module, base, IO module, specification of extension cable and system configuration, EMC standard
XGI CPU User's Manual (XGI-CPUU/CPUH/CPUS)	XGI-CPUU/CPUH/CPUS user manual describing about XGI CPU module, power module, base, IO module, specification of extension cable and system configuration, EMC standard
XGR redundant series User's Manual	XGR- CPUH/F, CPUH/T user manual describing about XGR CPU module, power module, extension drive, base, IO module, specification of extension cable and system configuration, EMC standard

Current manual is written based on the following version.

Related OS version list

Product name	OS version
XGK-CPUH, CPUS, CPUA, CPUE, CPUU	V2.0
XGI-CPUU, CPUH	V2.1
XGR-CPUH/F, CPUH/T	V1.1
XG5000(XG-PD)	V2.4
APM software package	V3.2

◎ Table of Contents ◎

Chapter 5 Positioning Parameter & Operation Data……………………… 5-1 ~ 5-31

Chapter 10 Program………………………………………………… 10-1 ~ 10-78

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 ㎳ – 5 ㎳. 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.

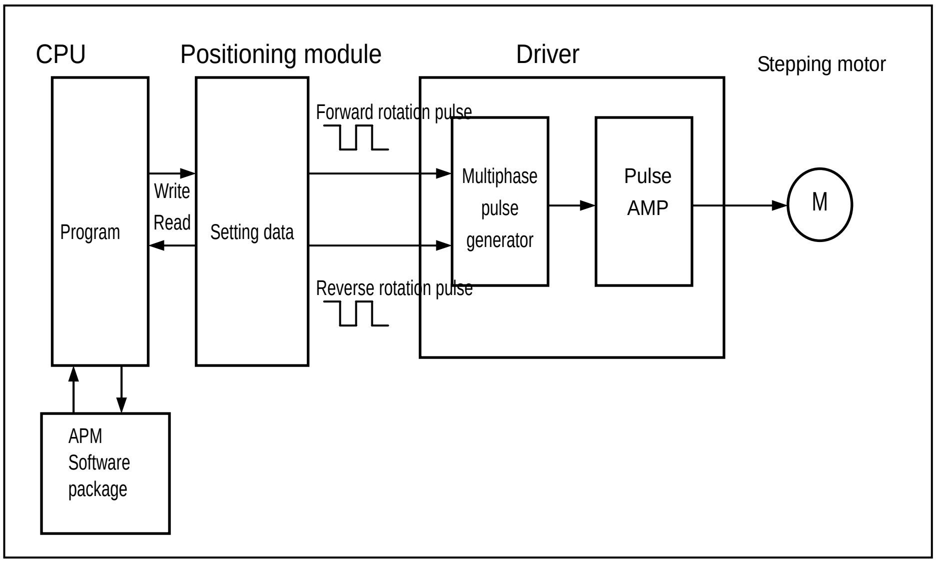


Fig. 1.1 Overview of Position Control for Stepping Motor

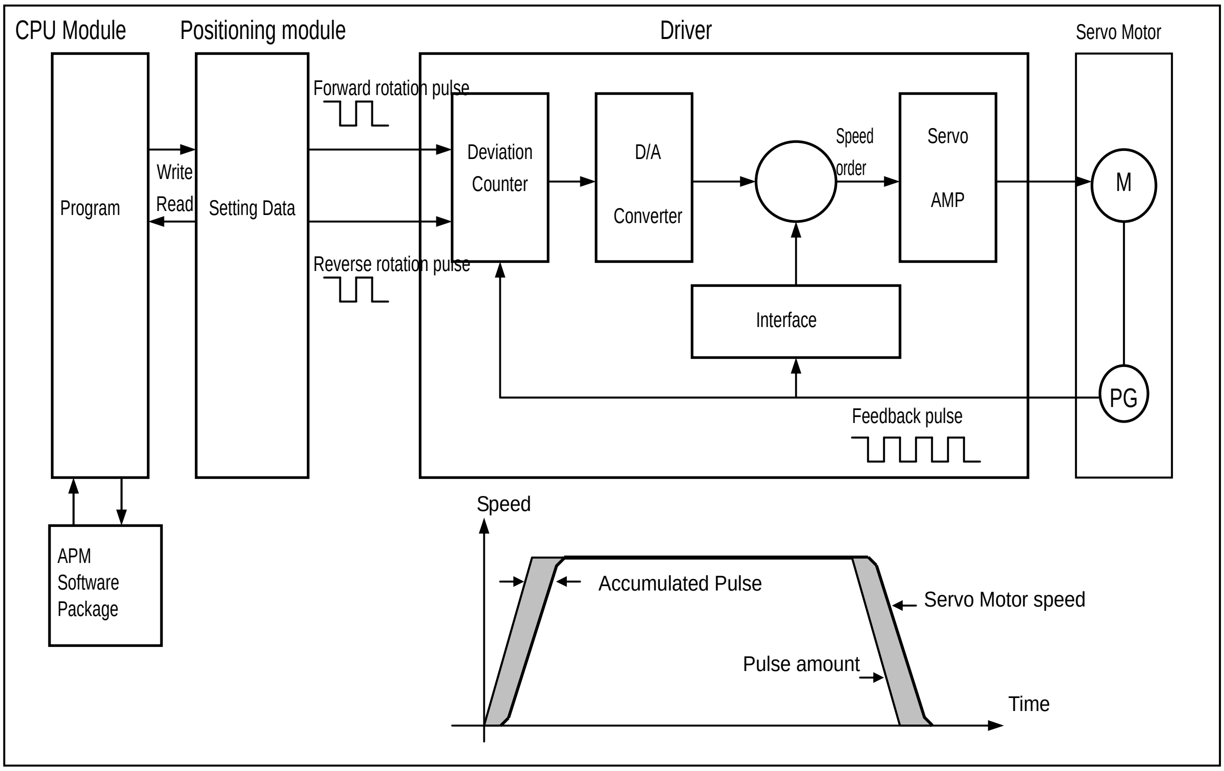
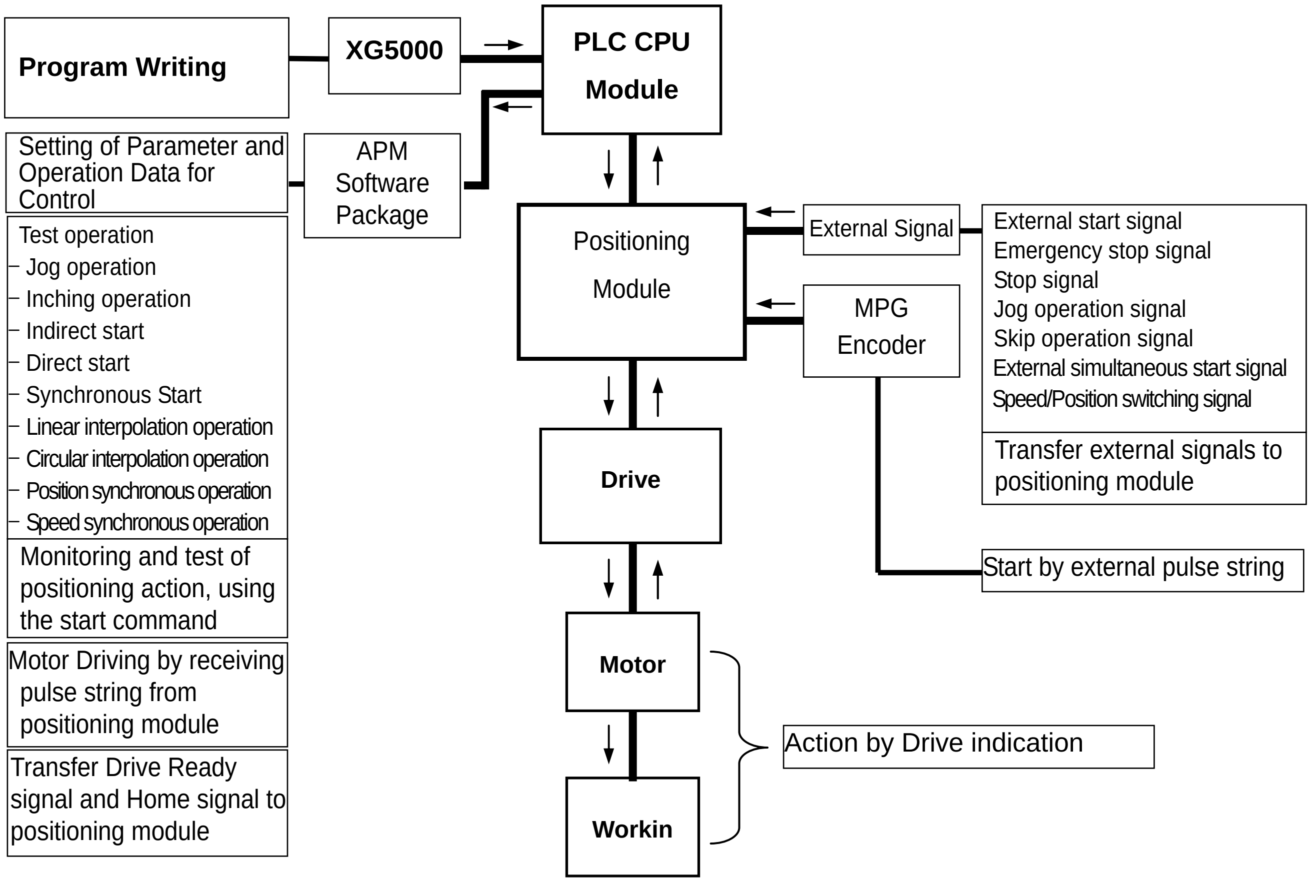


Fig. 1.2 Overview of Position Control for Servo Motor

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.

<table>
<tr><th>No.</th><th>Item</th><th colspan="4">Specifications</th><th>Related specifications</th></tr>
<tr><td>1</td><td>Ambient temperature</td><td colspan="4">0℃～+55℃</td><td>-</td></tr>
<tr><td>2</td><td>Storage temp.</td><td colspan="4">-25℃～+70℃</td><td>-</td></tr>
<tr><td>3</td><td>Ambient humidity</td><td colspan="4">5 ~ 95%RH (Non-condensing)</td><td>-</td></tr>
<tr><td>4</td><td>Storage humidity</td><td colspan="4">5 ~ 95%RH (Non-condensing)</td><td>-</td></tr>
<tr><td rowspan="8">5</td><td rowspan="8">Vibration resistance</td><td colspan="4">Occasional vibration</td><td>-</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>How many times</td><td rowspan="7">IEC61131-2</td></tr>
<tr><td>10≤f< 57㎐</td><td>-</td><td>0.075mm</td><td rowspan="6">10 times each directions
(X, Y and Z)</td></tr>
<tr><td>57≤f≤150㎐</td><td>9.8㎨ (1G)</td><td>-</td></tr>
<tr><td colspan="3">Continuous vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td></tr>
<tr><td>10≤f< 57㎐</td><td>-</td><td>0.035mm</td></tr>
<tr><td>57≤f≤150㎐</td><td>4.9㎨ (0.5G)</td><td>-</td></tr>
<tr><td>6</td><td>Shock resistance</td><td colspan="4">• Peak acceleration: 147 m/s^2(15G)
• Duration: 11ms
• Half-sine, 3 times each direction per each axis</td><td>IEC61131-2</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Noise resistance</td><td colspan="3">Square wave
Impulse noise</td><td>±1,500V</td><td>LSIS standard</td></tr>
<tr><td colspan="3">Electrostatic discharge</td><td>4kV (Contact discharge)</td><td>IEC 61131-2,
IEC 61000-4-2</td></tr>
<tr><td colspan="3">Radiated electromagnetic field noise</td><td>80 ~ 1,000 MHz,　10V/m</td><td>IEC 61131-2,
IEC 61000-4-3</td></tr>
<tr><td rowspan="2">Fast Transient /burst noise</td><td>Segment</td><td>Power supply module</td><td>Digital/analog input/output communication interface</td><td rowspan="2">IEC 61131-2,
IEC 61000-4-4</td></tr>
<tr><td>Voltage</td><td>2kV</td><td>1kV</td></tr>
<tr><td>8</td><td>Environment</td><td colspan="4">Free from corrosive gasses and excessive dust</td><td></td></tr>
<tr><td>9</td><td>Altitude</td><td colspan="4">Up to 2,000 ms</td><td></td></tr>
<tr><td>10</td><td>Pollution degree</td><td colspan="4">Less than equal to 2</td><td></td></tr>
<tr><td>11</td><td>Cooling</td><td colspan="4">Air-cooling</td><td></td></tr>
</table>

Table 2.1 General Specifications

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

2.2 Performance Specifications

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

<table>
<tr><th colspan="2">Items \ Model</th><th>XGF-PD1A
XGF-PO1A</th><th>XGF-PD2A
XGF-PO2A</th><th>XGF-PD3A
XGF-PO3A</th></tr>
<tr><td colspan="2">No. of control axis</td><td>1 axis</td><td>2 axis</td><td>3 axis</td></tr>
<tr><td colspan="2">Interpolation function</td><td>N/A</td><td>2 axis linear interpolation
2 axis circular arcs interpolation</td><td>2/3 axis linear interpolation
2 axis circular arcs interpolation</td></tr>
<tr><td colspan="2">Control method</td><td colspan="3">Position control, Speed control, Speed/Position control, Position/Speed control</td></tr>
<tr><td colspan="2">Control unit</td><td colspan="3">Pulse, ㎜, inch, degree</td></tr>
<tr><td colspan="2">Positioning data</td><td colspan="3">Each axis has 400 data range.(Operation step number : 1 ~ 400)
Available to set with software package or program</td></tr>
<tr><td colspan="2">Software package</td><td colspan="3">Available (connected with RS-232C or USB Port of CPU module)</td></tr>
<tr><td colspan="2">Back-up</td><td colspan="3">Save the parameter, operation data in Flash ROM (No Battery)</td></tr>
<tr><td rowspan="5">POSITIONING</td><td>Positioning method</td><td colspan="3">Absolute method/Relative method</td></tr>
<tr><td>Position address range</td><td colspan="3"><table><tr><td>㎜</td><td>-214748364.8 ~ 214748364.7(㎛)</td></tr><tr><td>inch</td><td>-21474.83648 ~ 21474.83647</td></tr><tr><td>degree</td><td>-21474.83648 ~ 21474.83647</td></tr><tr><td>pulse</td><td>-2147483648 ~ 2147483647</td></tr></table></td></tr>
<tr><td>Speed range</td><td colspan="3"><table><tr><th></th><th>Open Collector</th><th>Line Driver</th></tr><tr><td>㎜</td><td colspan="2">0.01 ~ 20000000.00(㎜/min)</td></tr><tr><td>inch</td><td colspan="2">0.001 ~ 2000000.000(inch/min)</td></tr><tr><td>degree</td><td colspan="2">0.001 ~ 2000000.000(degree/min)</td></tr><tr><td>pulse</td><td>1 ~ 200,000(pulse/sec)</td><td>1 ~ 200,000(pulse/sec)</td></tr></table></td></tr>
<tr><td>Acceleration/deceleration process</td><td colspan="3">Trapezoid type, S-type</td></tr>
<tr><td>Acceleration/deceleration time</td><td colspan="3">1 ~ 65535 ㎳
selection available from 4 types of acceleration/deceleration pattern</td></tr>
<tr><td colspan="2">Max. output pulse</td><td colspan="3">XGF-PO1A, XGF-PO2A, XGF-PO3A : 200 kpps
XGF-PD1A, XGF-PD2A, XGF-PD3A : 1 Mpps</td></tr>
<tr><td colspan="2">Max. connection distance</td><td colspan="3">XGF-PO1A, XGF-PO2A, XGF-PO3A : 2 m
XGF-PD1A, XGF-PD2A, XGF-PD3A : 10 m</td></tr>
<tr><td colspan="2">Max. encoder input</td><td colspan="3">200 kpps</td></tr>
<tr><td colspan="2">Error indication</td><td colspan="3">Indicated by LED</td></tr>
<tr><td colspan="2">Connection connector</td><td colspan="3">40 Pin connector</td></tr>
<tr><td colspan="2">Size of use cable</td><td colspan="3">AWG #24</td></tr>
<tr><td colspan="2">I/O share point</td><td colspan="3">Variable: 16 points, Fixed: 64 points</td></tr>
<tr><td colspan="2">Consumable current(㎃)</td><td>XGF-PD1A : 510mA
XGF-PO1A : 340mA</td><td>XGF-PD2A : 790mA
XGF-PO2A : 360mA</td><td>XGF-PD3A : 860mA
XGF-PO3A : 400mA</td></tr>
<tr><td colspan="2">Weight(g)</td><td>120g</td><td>130</td><td>135g</td></tr>
</table>

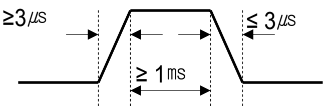
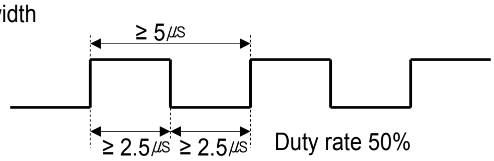
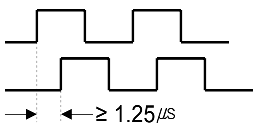
Notes

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

<table>
<tr><th>Signal name</th><th>Rated input voltage/ current</th><th>Use voltage range</th><th>On voltage/ current</th><th>Off voltage/current</th><th>Input resistance</th><th>Response time</th></tr>
<tr><td>Near point</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
<tr><td>External high-limit</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
<tr><td>External low-limit</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
<tr><td>Emergency stop</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
<tr><td>External stop</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
<tr><td>External command</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
<tr><td>Jog reverse direction</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
<tr><td>Drive Ready/ in-position</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
<tr><td>External simultaneous setting</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
<tr><td rowspan="3">Origin</td><td>DC 24V/8.9mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/6.0mA</td><td>≤DC 4V/1.6mA</td><td>Approx. 2.7kΩ</td><td>≤0.4ms</td></tr>
<tr><td>DC 5V/8.9mA</td><td>DC 4.25～5.5 V</td><td>≥DC 2.5V/6.0mA</td><td>≤DC 1V/1.9mA</td><td>Approx. 570Ω</td><td>≤0.4ms</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="3">Manual pulse generator /Encoder input</td><td>DC 5V/7.0mA</td><td>DC 4.25～5.5 V</td><td>≥DC 2.5V/3.0mA</td><td>≤DC 1V/1.0mA</td><td>Approx. 940Ω</td><td>≤0.6ms</td></tr>
<tr><td colspan="6">Encoder input : based on RS-422A Line Driver Level (Am26LS31)</td></tr>
<tr><td colspan="6">1) Pulse width

Duty rate 50%
2) Phase difference

If A phase input pulse precedes B phase input pulse, the position address value increases.
If B phase input pulse precedes A phase input pulse, the position address value decreases.</td></tr>
<tr><td>Speed/Position switching signal</td><td>DC 24V/4.7mA</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1mA</td><td>≤DC 4V/1.0mA</td><td>Approx. 5.1kΩ</td><td>≤0.5ms</td></tr>
</table>

2.3.2 Output Specifications

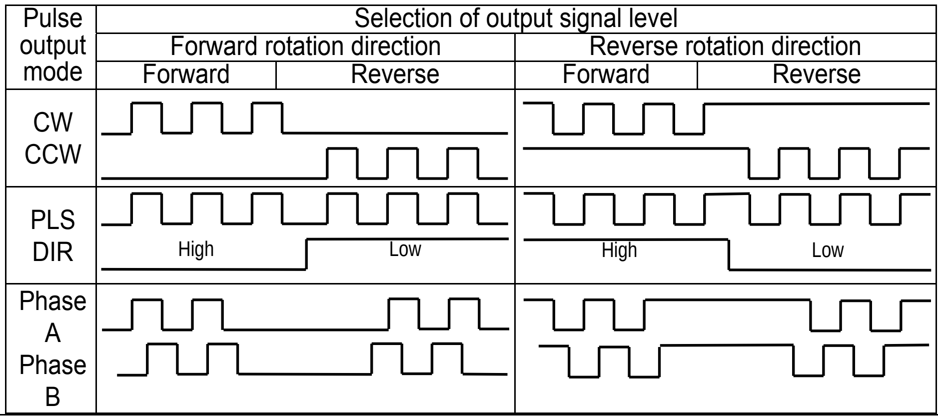
1) Pulse Output Specifications

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	50㎃(1 point) / ≤200㎃ 10㎳	≤DC 0.5V	≤0.1㎃	-

▷Differential Line Driver (in case of Line Driver) based on Am26C31

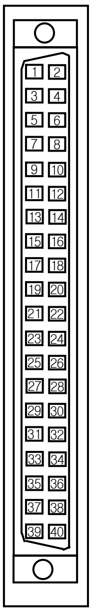
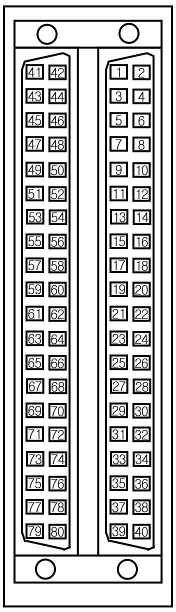
▷CW/ CCW type, Pulse/Sign type, A phase/B phase type can be selected from pulse output mode of basic parameter for program and APM S/W Package.

▷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.



2.3.3 External Equipment and Interface Specifications

1) Pin Array of Connector

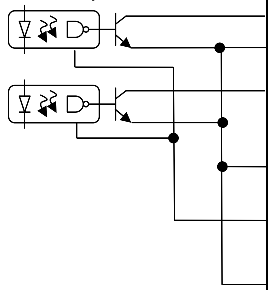
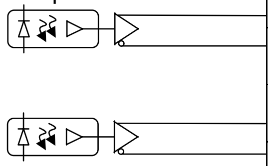
Pin Array	Classification	Pin no. X axis	Pin no. Y axis	Pin no. Z axis	Signal Name			Signal direction positioning-external	Action condition
 1 axis	Function per Axis	21	41	61	FP+	Pulse output (forward +)		→	
		22	42	62	FP-	Pulse output (forward -)		→	
		23	43	63	RP+	Pulse sign (reverse +)		→	
		24	44	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)			
 2/3 axis	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

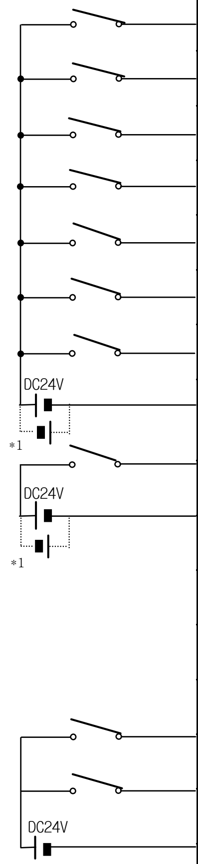
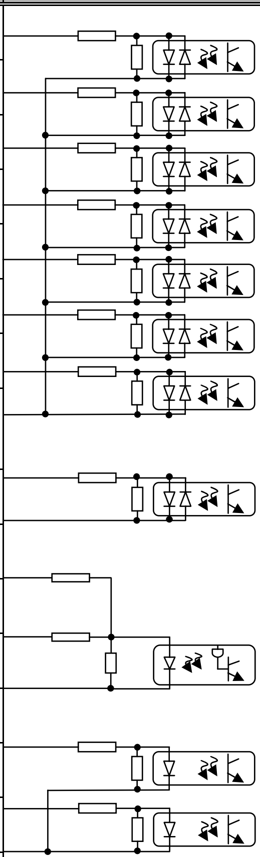
1) Open collector should be structured so that the external 24V power(24V: 39,59,79, 0V: 40,60,80) is connected to an axis t operate. No pulse is outputted unless the external 24V is supplied.
2) If an external command is set in the extension parameter of APM software package by JOG+ and an external 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.

2) Internal circuit of connector

(1) Pulse output

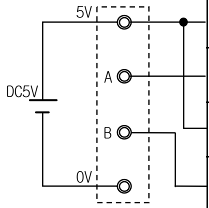
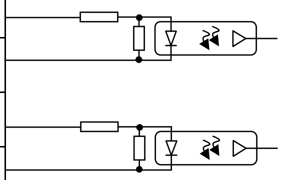
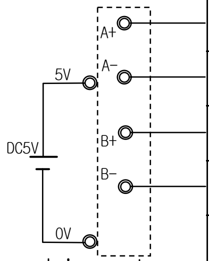
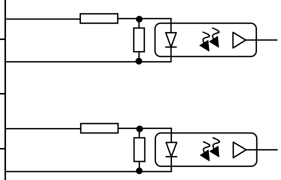
Internal circuit	Pin No.			Signal	
	X axis	Y axis	Z axis		
Open collector output 	21	41	61	FP+	Forward Pulse(CW/PLS/Phase A)
	22	42	62	FP-	Pulse COM(CW/PLS/Phase A)
	23	43	63	RP+	Reverse Pulse(CCW/DIR/Phase B)
	24	44	64	RP-	Pulse COM(CCW/DIR/Phase B)
	39	59	79	24V	External 24V power (no use in case of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

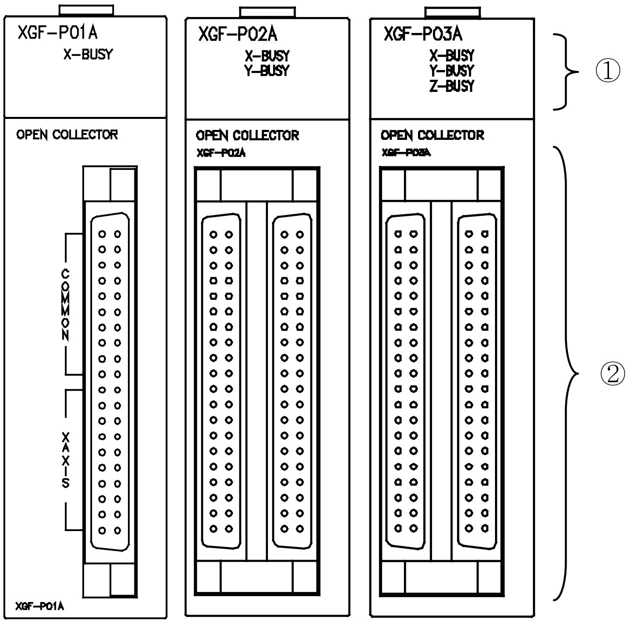
Classification	Pin No.			Internal circuit	Signal	
	X axis	Y axis	Z axis			
	25	45	65		OV+	High limit signal
	26	46	66		OV-	Low limit signal
	27	47	67		STOP	External stop signal
	28	48	68		DOG	Near point signal
	29	49	69		VTP	Speed/Position switching signal
	30	50	70		ECMD	External command signal
	31	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
	7				CON	External simultaneous start signal
	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	
 Open collector type voltage	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
 Line driver type input	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

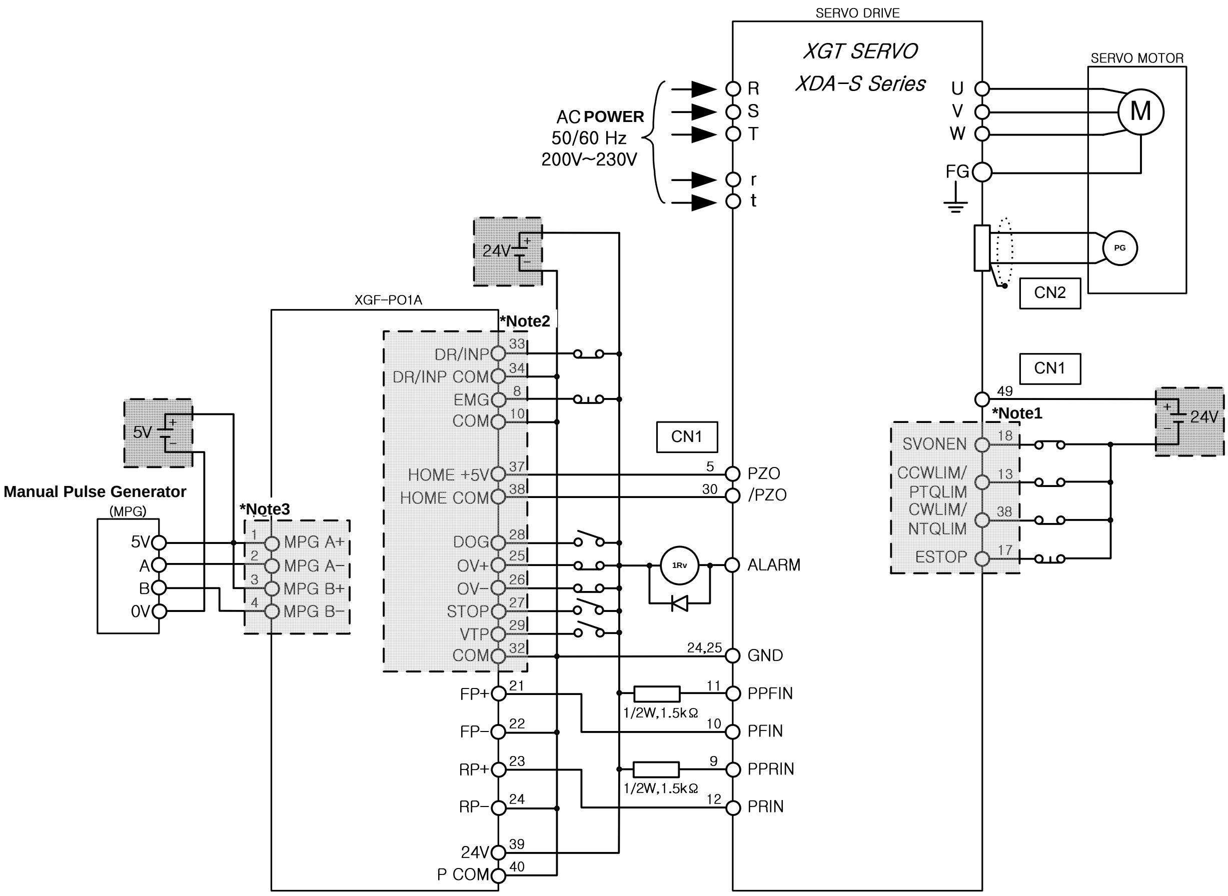


No.	Name	Description
①	Operation indication LED	1. Operation indication ▶Light-On: during operation of the corresponding axis ▶Light-Off: when the corresponding axis stops 2. Error indication ▶Light-On: during normal operation ▶Blink: error of the corresponding axis
②	External wiring connector	Connector 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”.

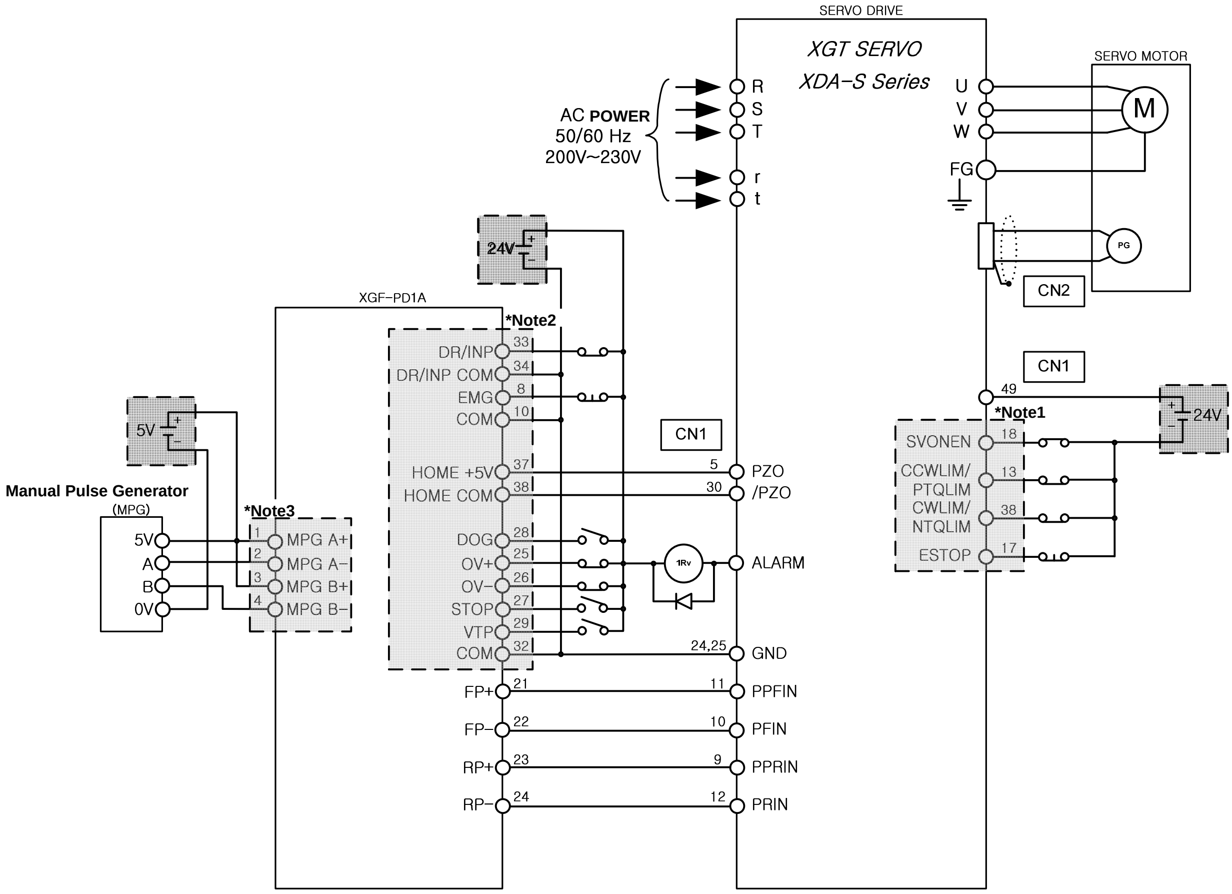


Note

*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

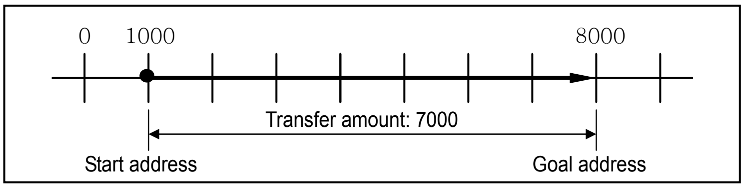
Positioning control from start address (present stop position) to goal address (transfer amount) for the assigned axis.

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]

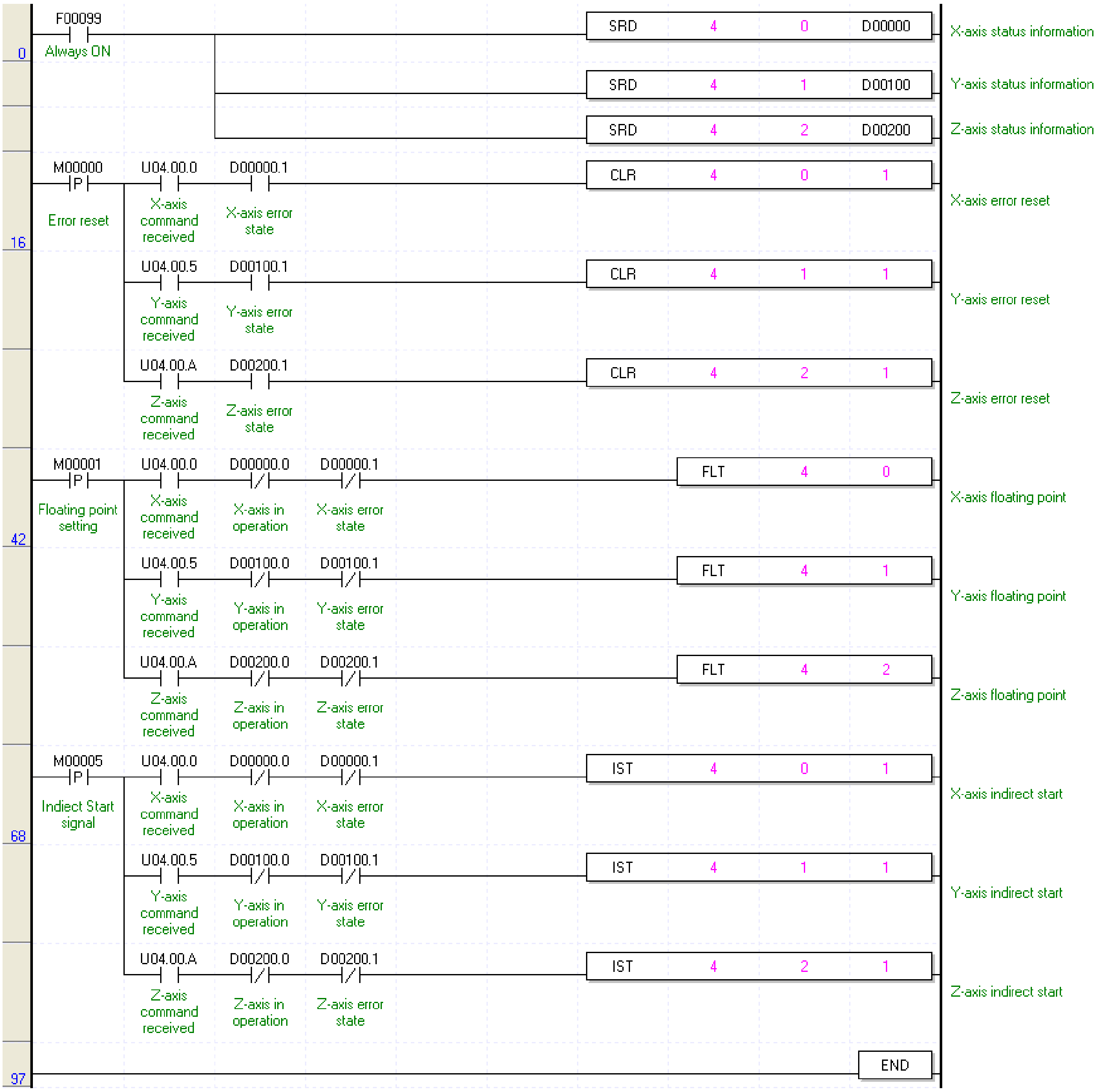
▷When Start address : 1000, ▷Goal address : 8000, the transfer amount to forward direction shall be 7000 (7000=8000-1000).



▷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.

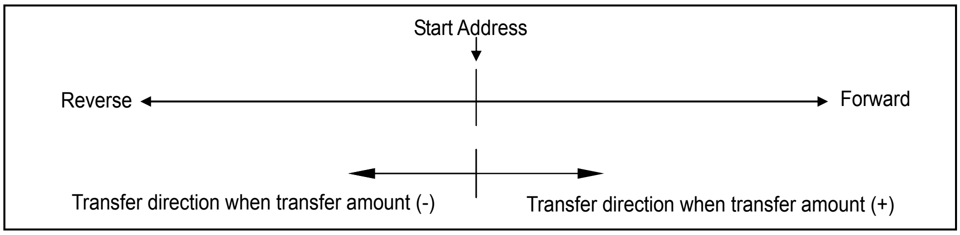
2) Control by Incremental method (Incremental coordinate)

(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.

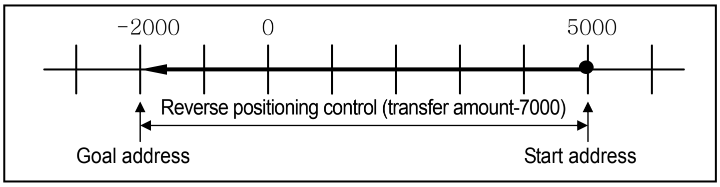
▷Transfer direction (+) or no sign : forward direction (address increase) positioning

▷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 control s : X and Y, X and Z , and Y and Z.

(1) Control by Absolute method (Absolute coordinate)

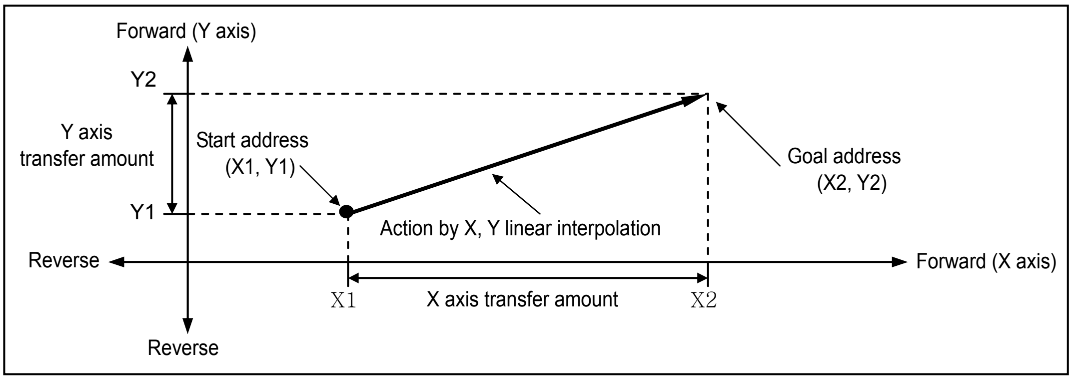
A) This carries out the linear interpolation by 2 axis from Start address to Goal address (the address assigned by positioning data).

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.

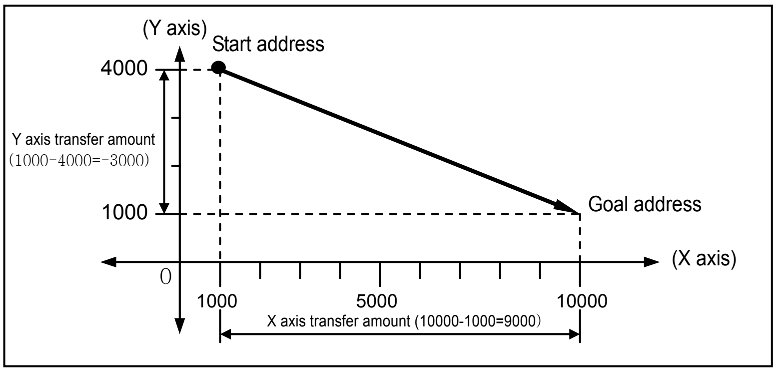
▶Start address < Goal address : forward direction positioning

▶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 [㎳]	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

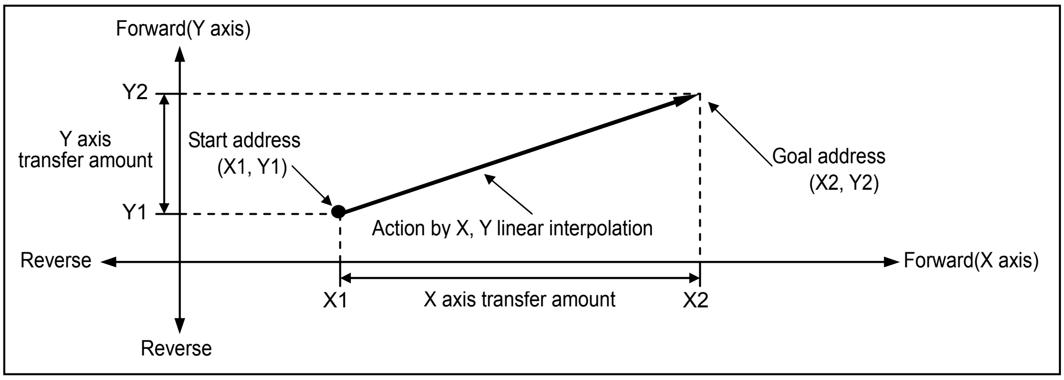
As at the linear interpolation start, 2 or 3 axis acts simultaneously cares should be taken in using.

1) The available operation pattern is End and Keep, 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 (Incremental coordinate)

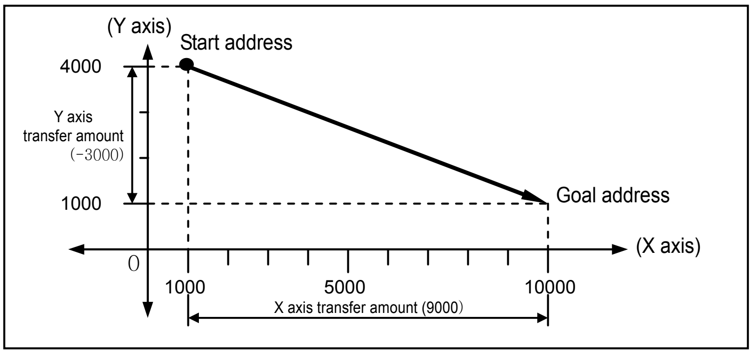
A) Positioning control from start address to the position including goal transfer direction and transfer amount of each axis.

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 axes.

(1) Control by Absolute method (Absolute coordinate)

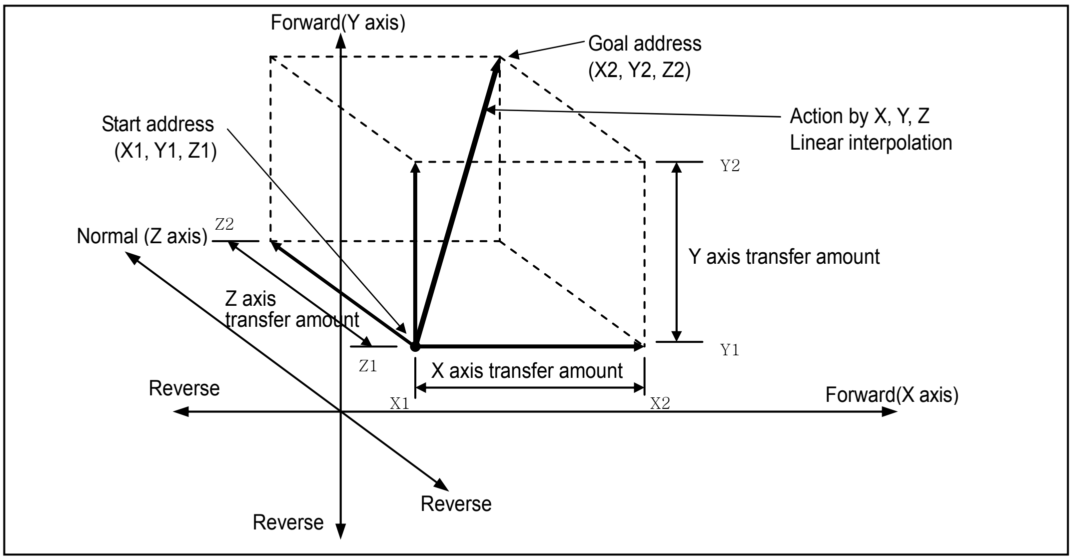
A) This carries out the linear interpolation by 3 axes from Start address to Goal address (the address assigned by positioning data).

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.

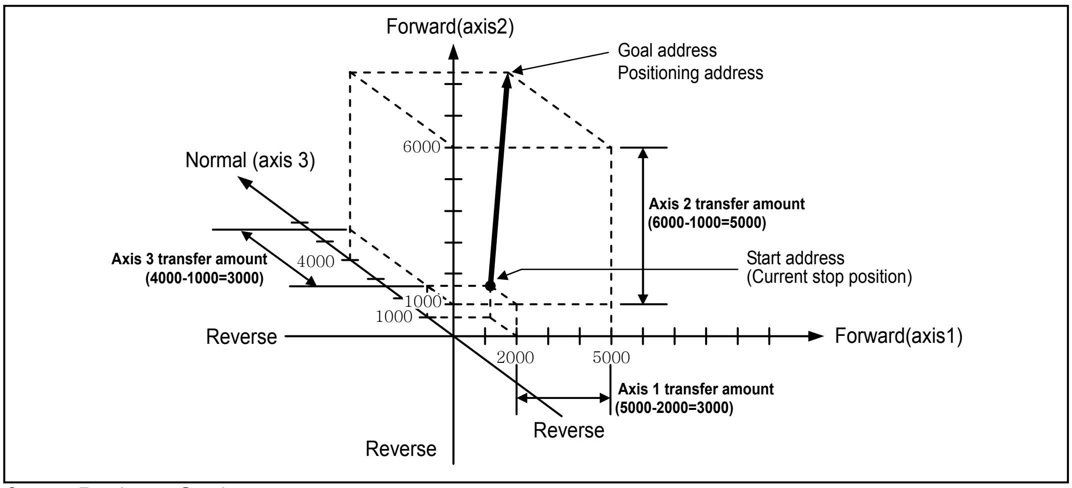
▶Start address < Goal address : forward direction positioning

▶Start address > Goal address : reverse direction positioning



[Example]

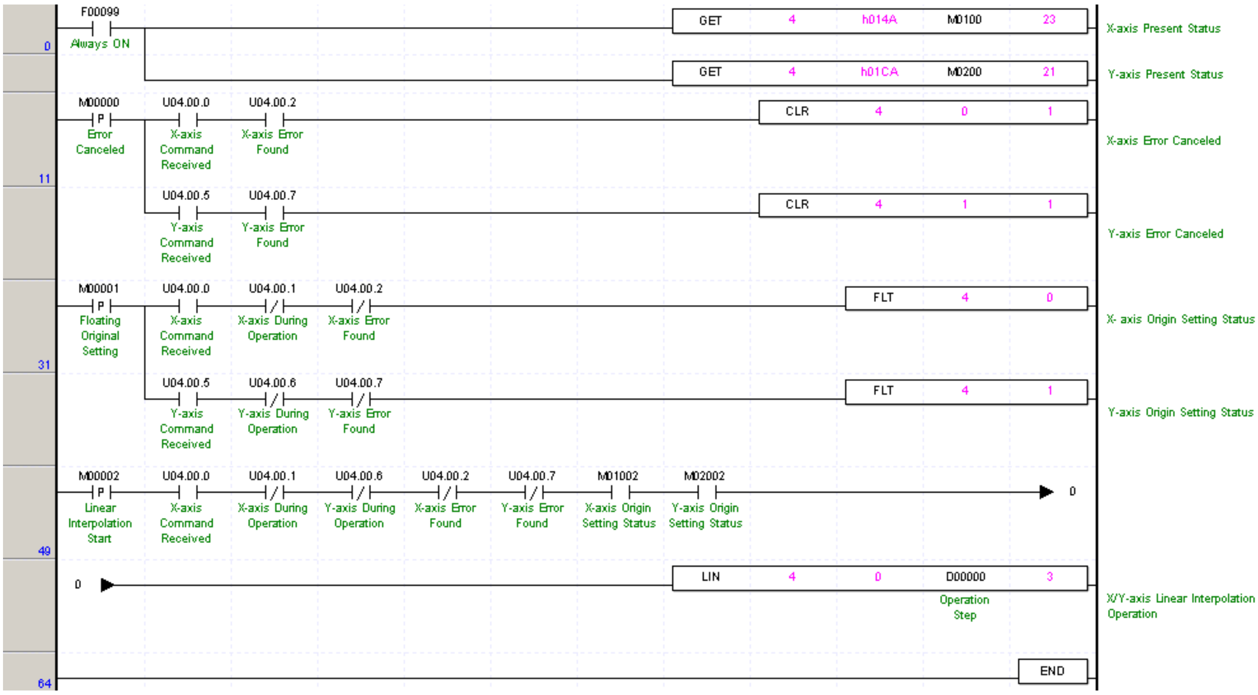
▷When Start address (2000, 1000, 1000), ▷Goal address (5000, 5000, 4000), the action is as follows.



▷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 [㎳]	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



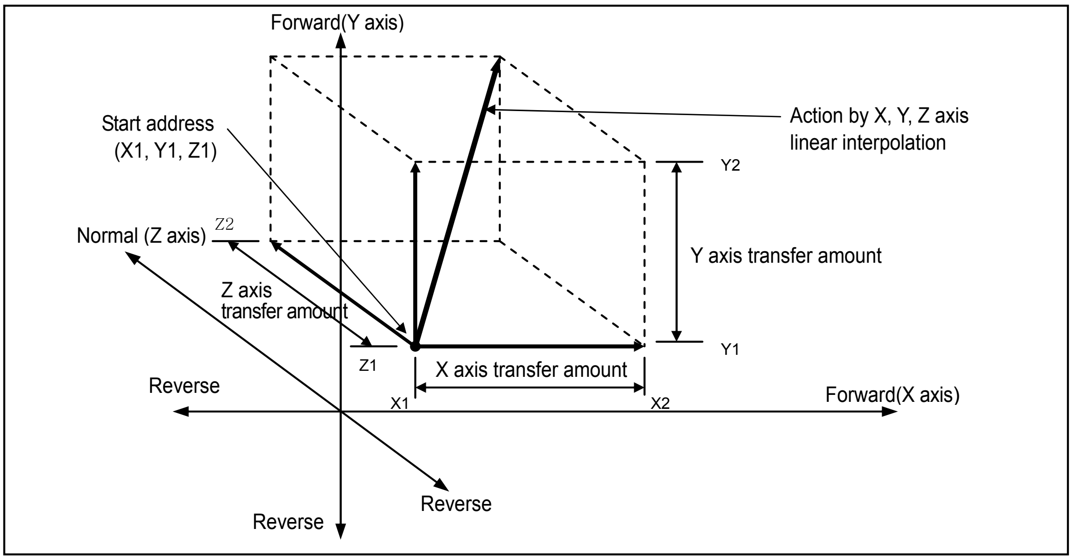
Program 3.2 Linear Interpolation Start

(2) Control by Incremental method (Incremental coordinate)

A) Positioning control from start address to the position including goal transfer direction and transfer amount of each axis.

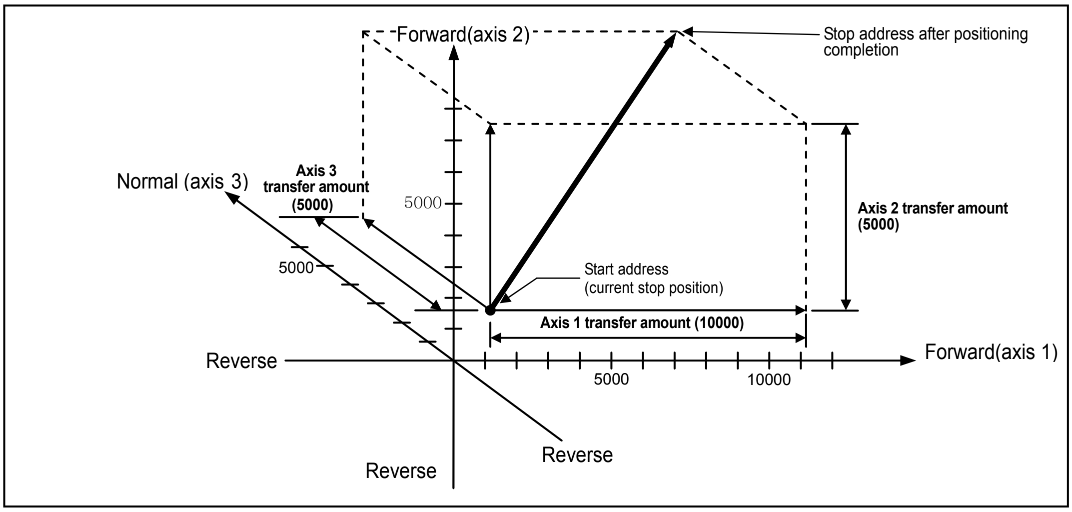
B) Transfer direction shall be determined by the sign of transfer amount of each axis.

- 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 [㎳]	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 an circle using the assigned position as a center position.

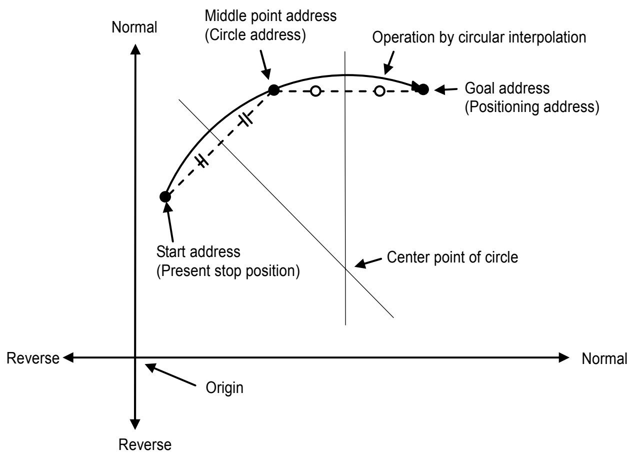
▶The available axis combination for circular interpolation control are 3 types : X and Y, X and Z, Y and Z.

(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 [㎳]	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

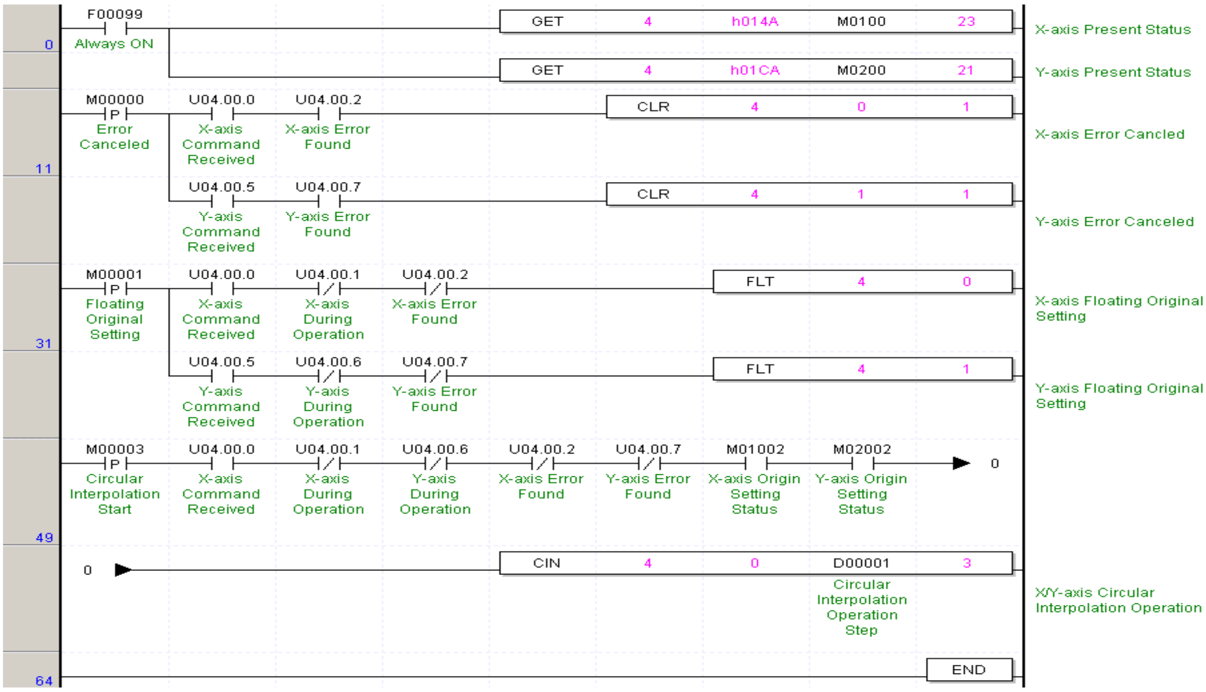
<Command window>

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 interpolationstart, 2 axis act simultaneously, cares should be taken.

1) The available operation pattern is End, Keep and the operation method is Single, Repeat.
If set as Continuous, it shall be processed “Keep”.

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

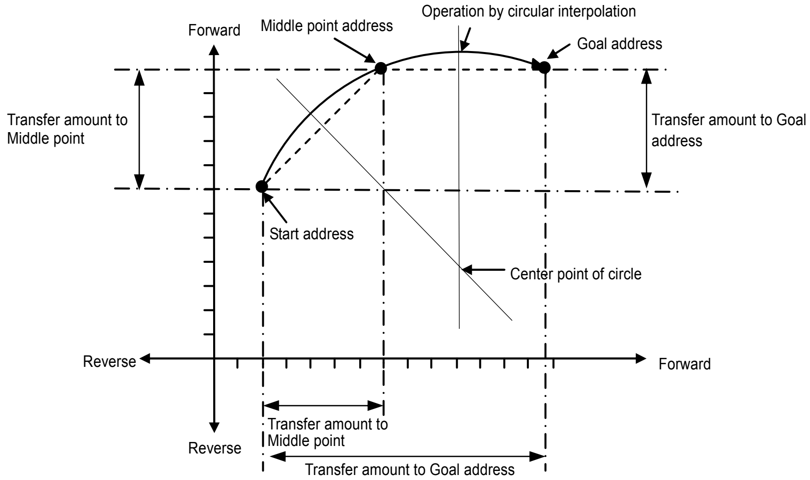
4) The auxiliary data related to the operation that acts based on the main axis during circular interpolation operation is as follows.
; Operation method, operation pattern, Speed limit, Dwell time,

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 (Incremental 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	Incremental	Position control	End	Single	13000	10000	0	1	100	0	CW
Y Setting	1	Incremental	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>

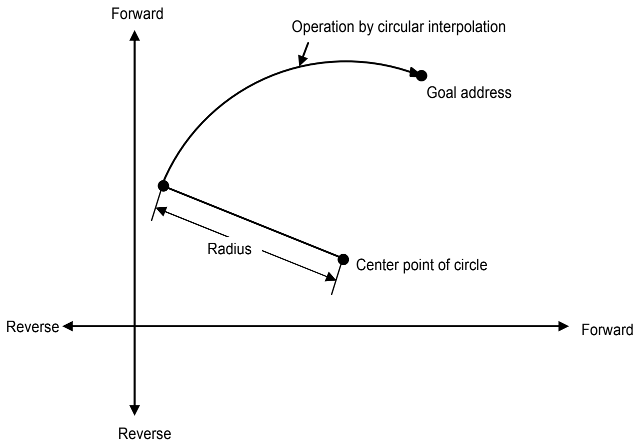
Common parameter	Circular interpolation method	0 : Middle point

(2) Circular interpolation control by Center point assigned method

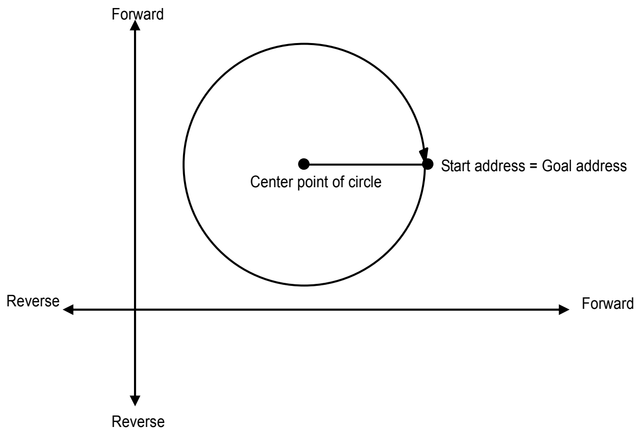
This is the Circular interpolation control to assign the Goal address of circular interpolation and the center point of circle.

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 [㎳]	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>

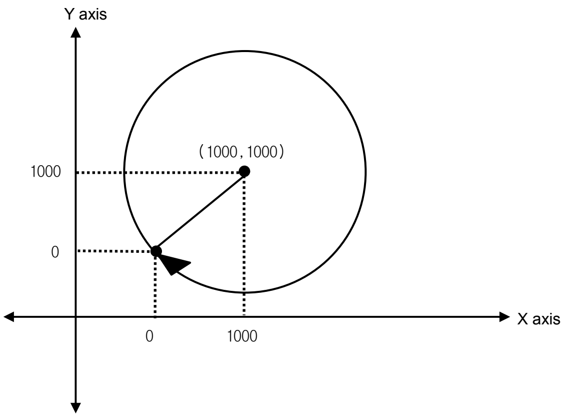
The Program is same as Program 3.3.

Circular interpolation operation	Step	1	Execution
	Subordinate axis	Y	

<Parameter>

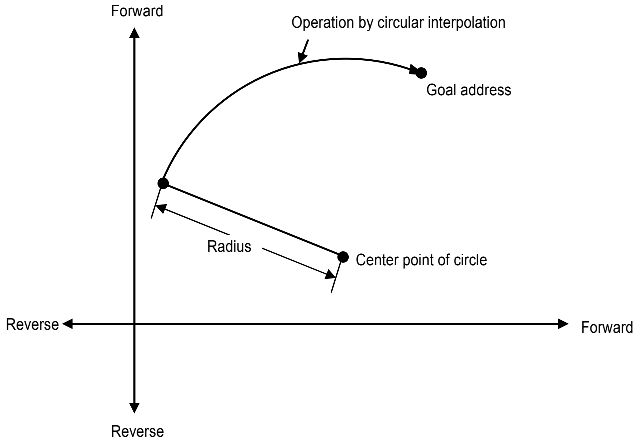
Common parameter	Circular interpolation method	1 : Center point

▷Circular interpolation operation pattern

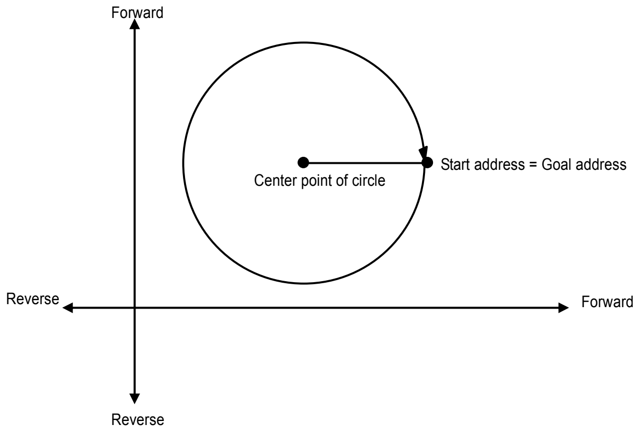


2) Control by Incremental method (Incremental coordinate)

(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 [㎳]	Circular interpolation direction
X Setting	1	Incremental	Position control	End	Single	2000	1000	0	1	100	0	CW
Y Setting	1	Incremental	Position control	End	Single	0	0	0	1	100	0	CW

<Command Window>

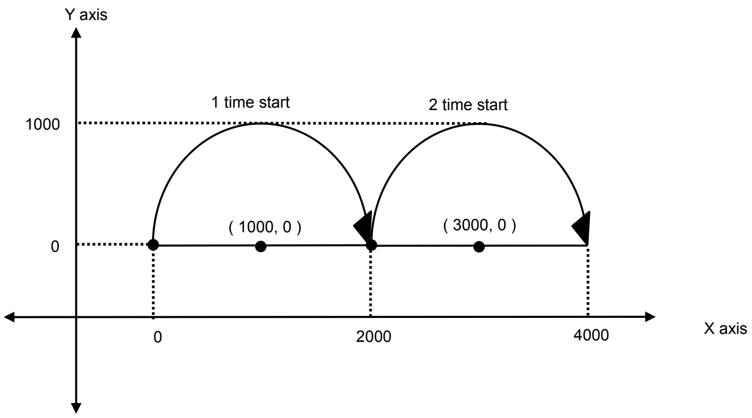
Circular interpolation operation	Step	1	Execution
	Subordinate axis	Y	

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.

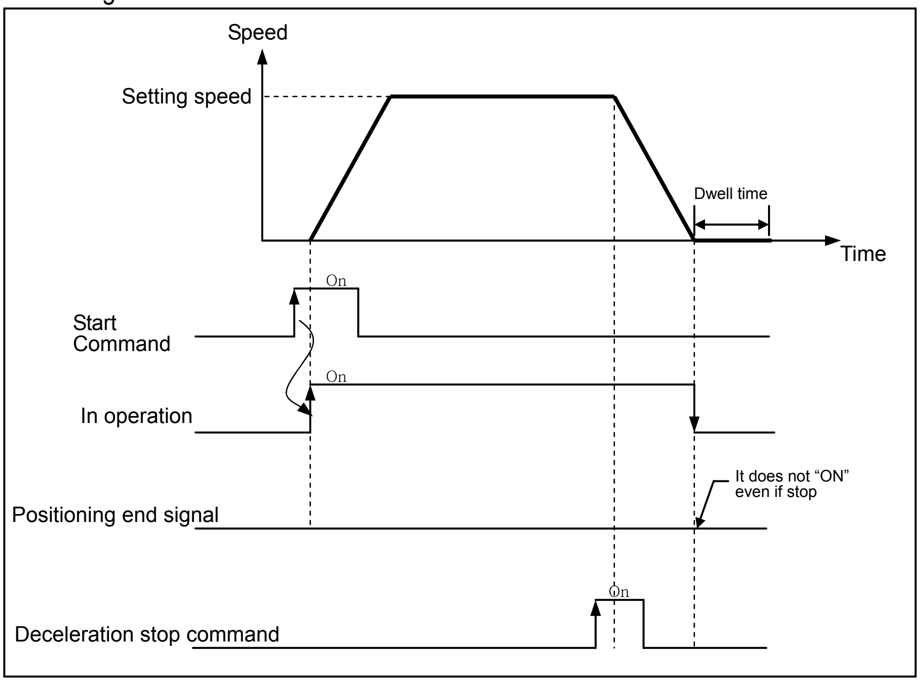
Items of Position Data	Step no.	coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acce/ dece. No.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction

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

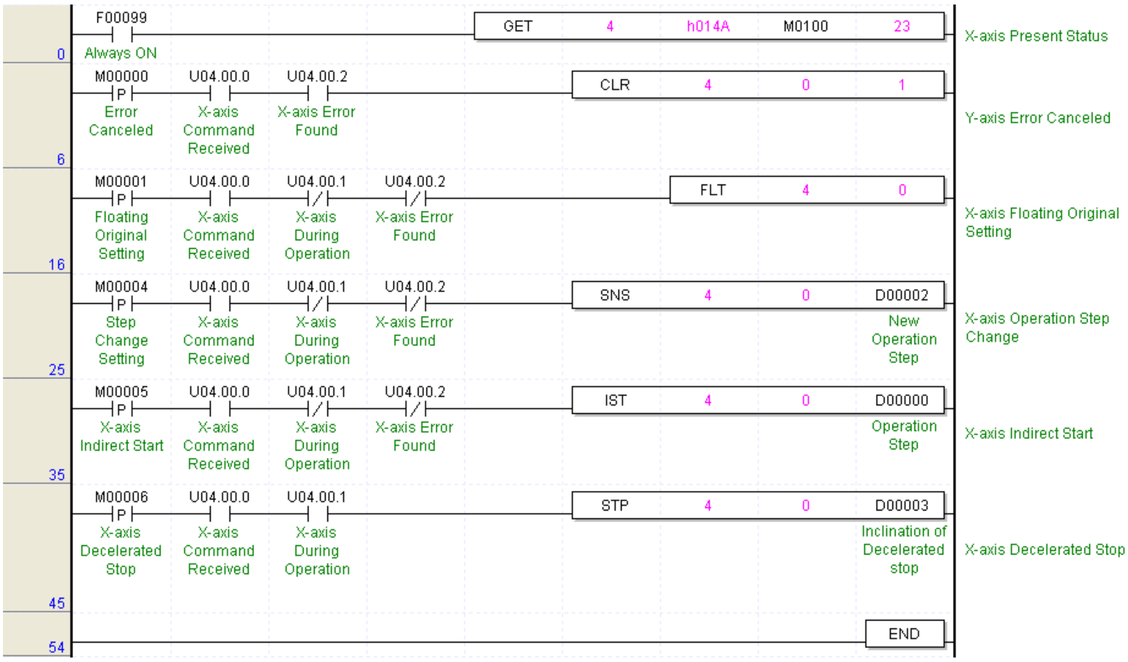


[Example]

▷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	Keep	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 [㎳]	Circle interpolation direction
Forward	1	Incremental	Speed	Keep	Single	1000	0	**1**	1	1000	100	CW
Reverse	2	Incremental	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/Incremental method.)

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

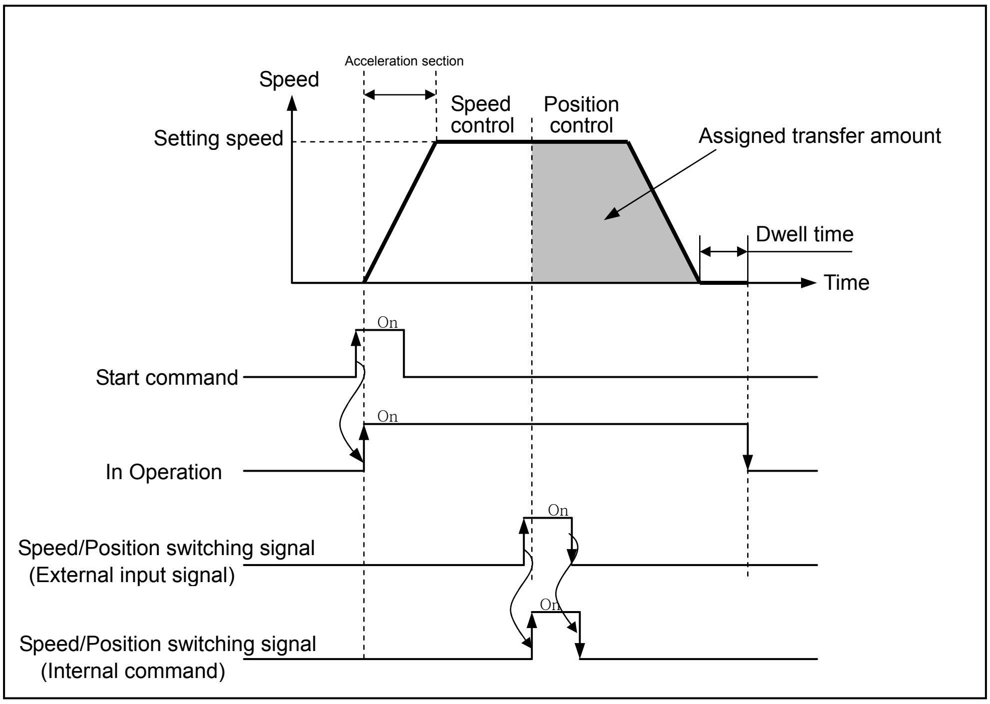
*2 (reverse direction) : when position address is negative (-)

▶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	Keep	Single	10000	0	**1**	1	500	100	CW
Reverse	2	Absolute	Speed	End	Repeat	-10000	0	**2**	1	600	200	CW

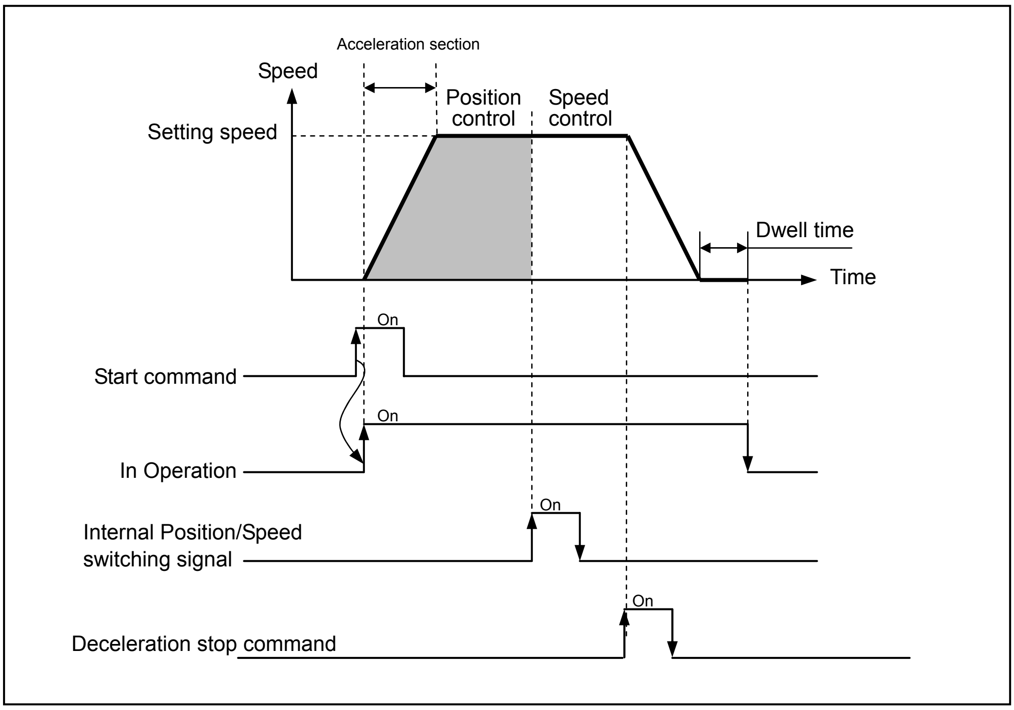
The items that does not affect

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

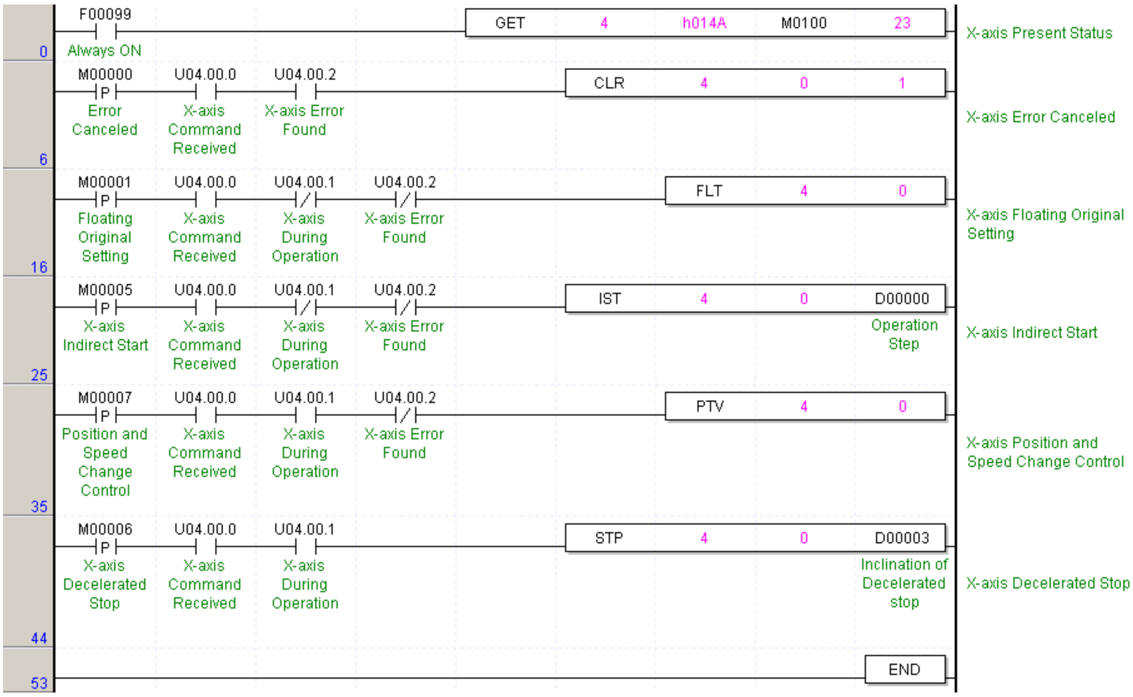
*1 (forward direction) : when position address is positive(+)

*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	
	Keep	Single	
	Keep	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.
	Keep 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.

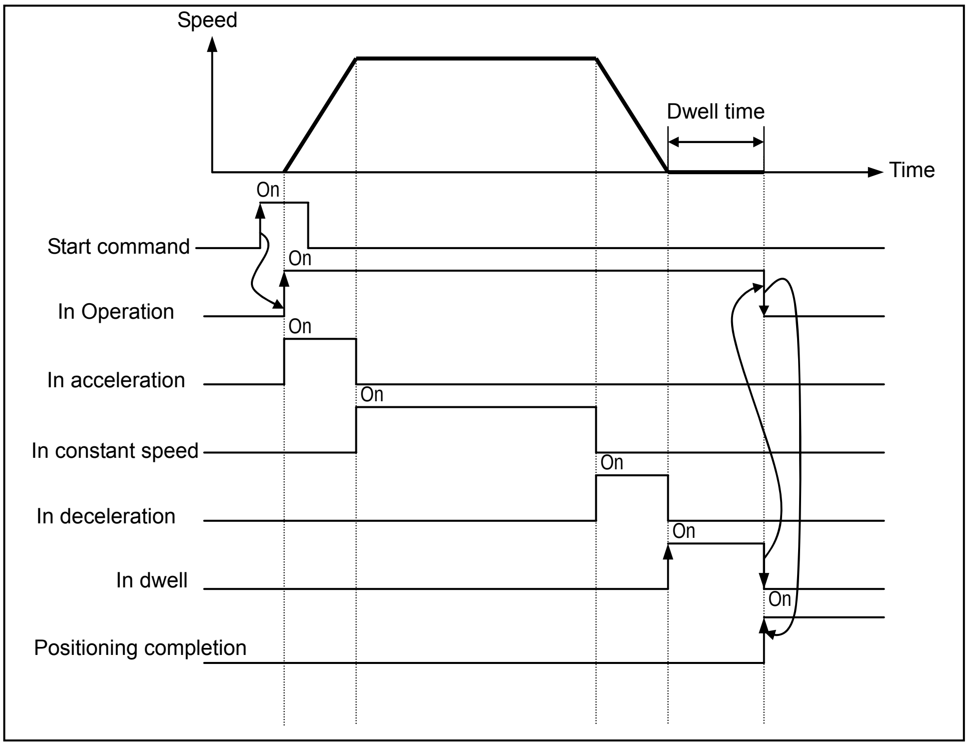
Type of Operation data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circle interpolation direction
Setting range/Type	1 ~ 400	Absolute incremental	Position speed	End keep 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.

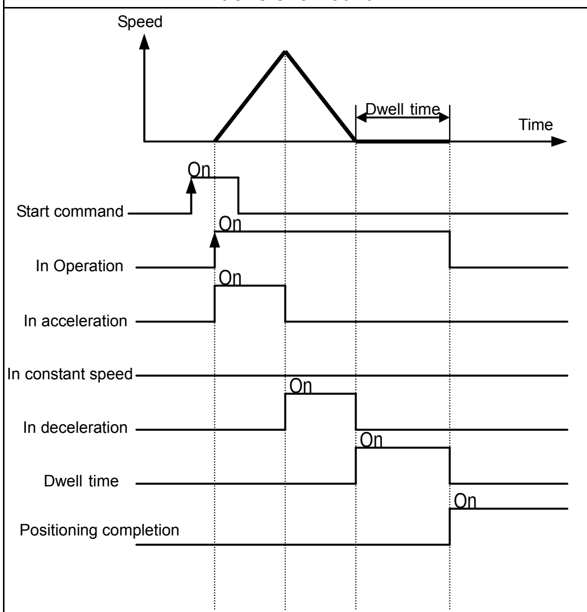
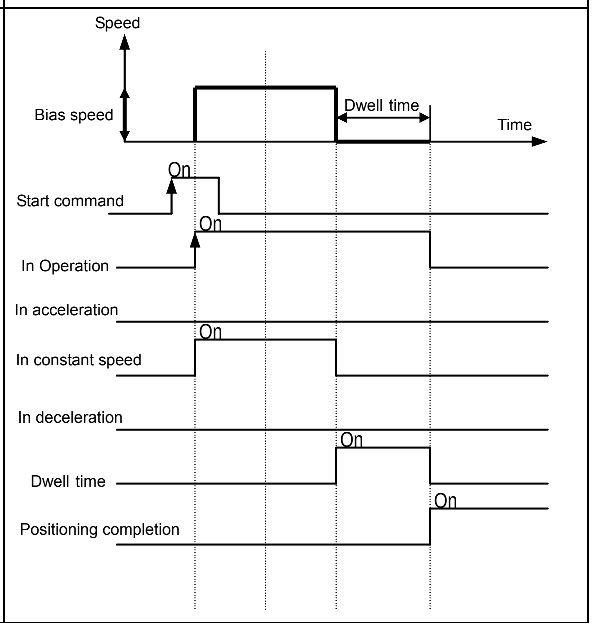
3.2.1 End Operation (Single)

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 Keep 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

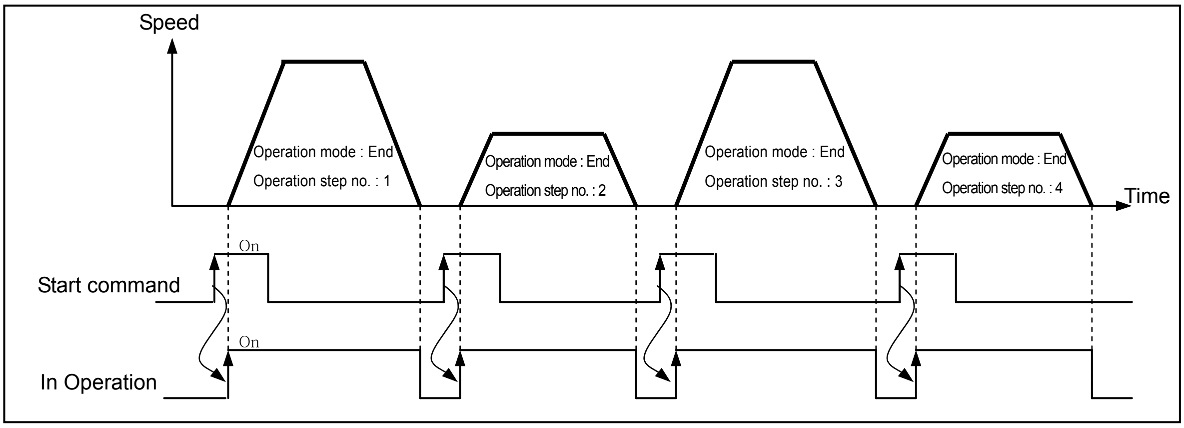


b) Abnormal operation pattern

When operation speed is set as "higher" than position transfer amount	When operation speed is set as same as bias speed
	

[Example]

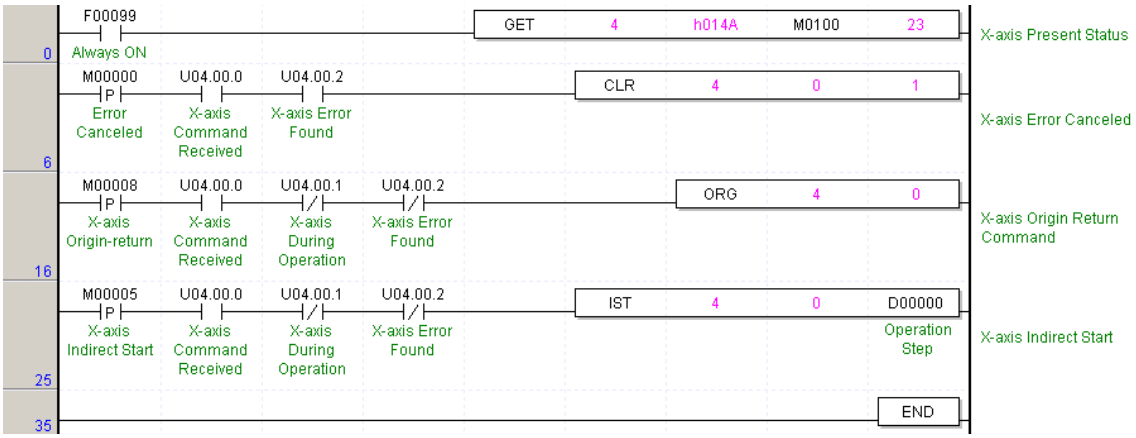
▷ Operation pattern



▷ 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



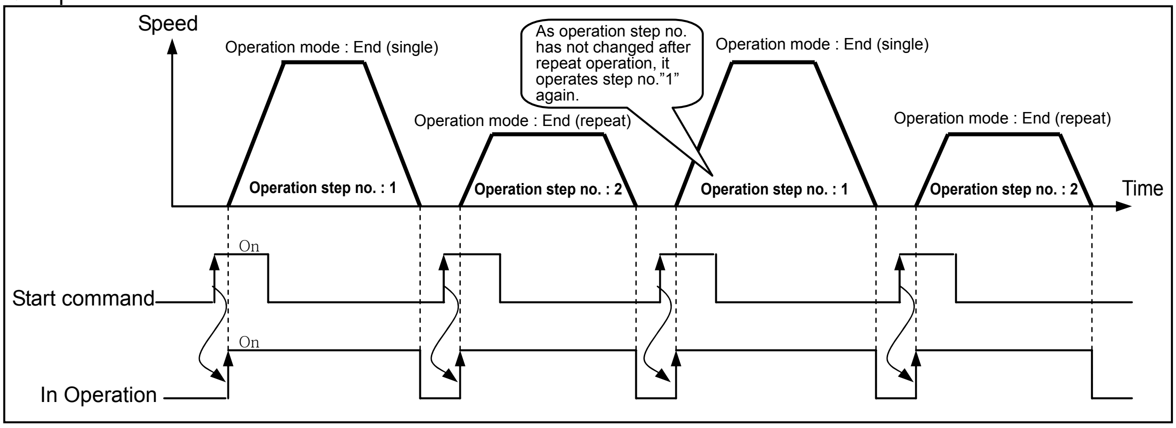
Program 3.6 End Operation

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 [㎳]	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

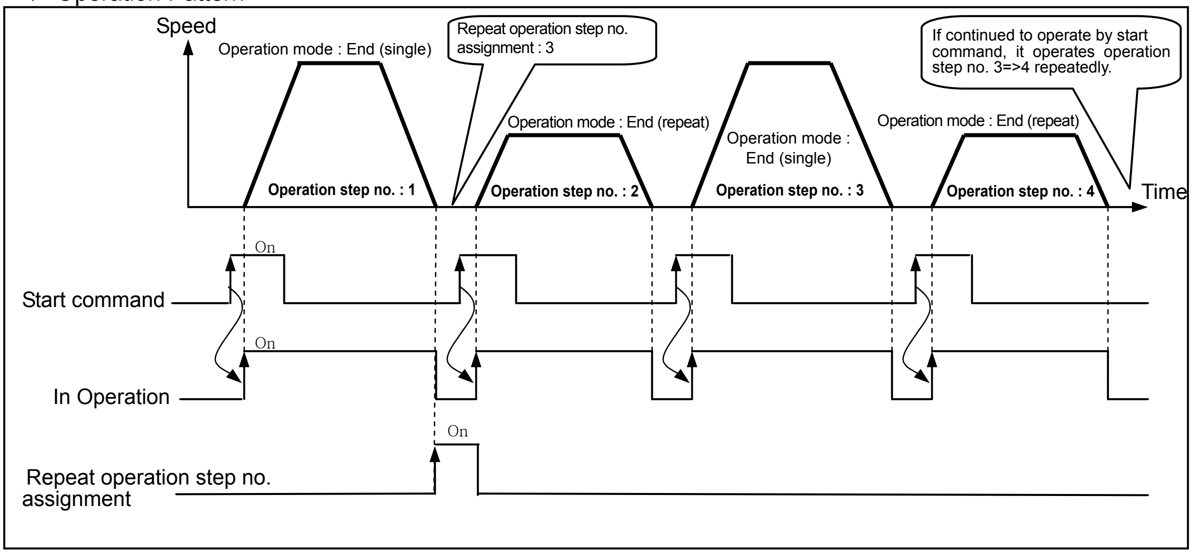
Operation step 3, 4 does not start.

▷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]

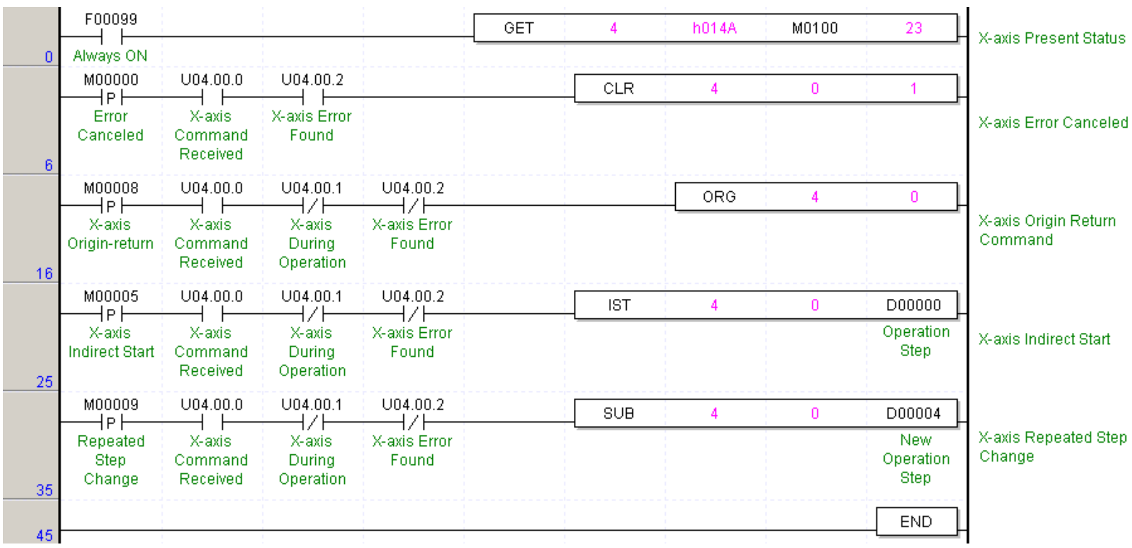
▷ Operation Pattern



▷ 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



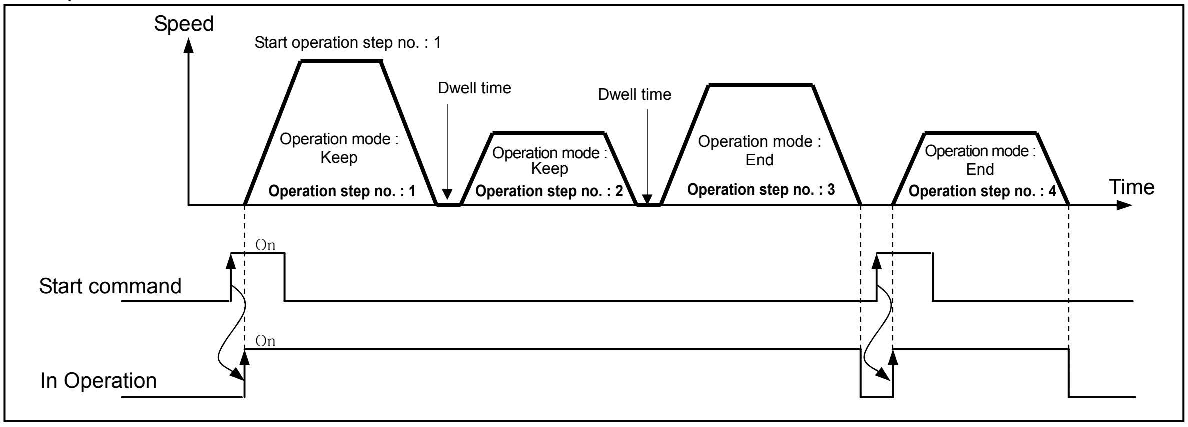
Program 3.7 End Operation (Repeat Operation Step Number Change)

3.2.3 Keep 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) Keep 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 [㎳]	Circle interpolation direction
1	1	Absolute	Position	Keep	Single	10000	0	0	1	1000	0	CW
	2	Absolute	Position	Keep	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

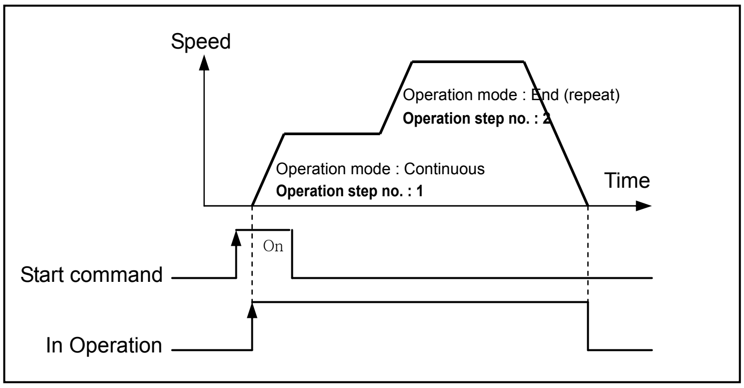
Program is same as Program 3.6.

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 Incremental 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 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 command is executed at the subordinate axis, it becomes the state in operation and maintains the state in operation until the command is released by stop command.

(4) When setting the Synchronous start by speed rate, the main axis rate ≥the subordinate axis rate. If not, error 356 will occur. When main axis is encoder, you can use to be main axis rate ≤ subordinate axis rate. But in this case, speed synchronization rate should be integer. For example, in case main axis rate : subordinate axis rate =2:3, speed synchronization rate should be 1.

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

(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, Keep 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, Keep 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 : 0.0umm, 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

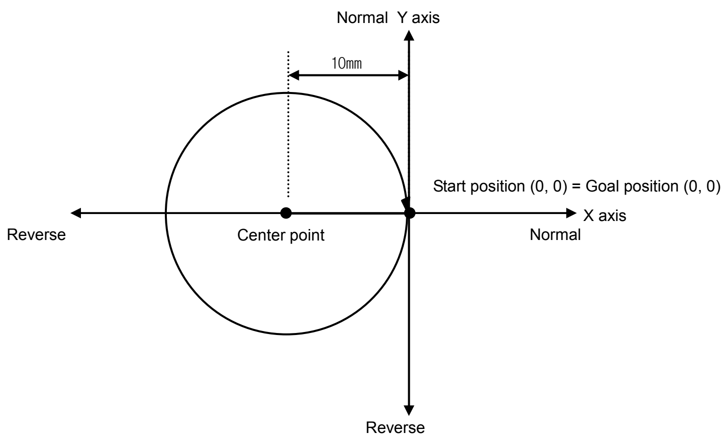
<Operation Data>

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 [㎳]	Circular interpolation direction
X Setting	1	Incremental	Position	End	Single	0	-10000.0	0	1	100.00	0	CW
Y Setting	1	Incremental	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

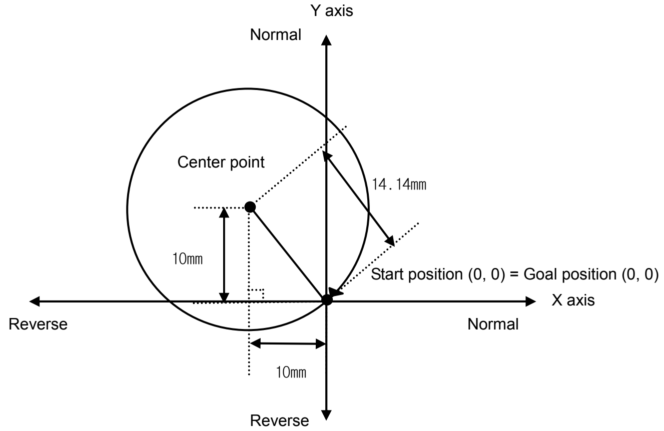
<Operation Data>

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	Incremental	Position	End	Single	0.0	-10000.0	0	1	100.00	0	CW
Y Setting	1	Incremental	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,

$\sqrt{2}$x10 = 1.414 x 10mm = 14.14mm

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.

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

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	Prompt stop	Per axis	Error state (error 501) Output prohibited	No change
	Exceeds Soft low limit	Prompt stop	No detection	Prompt stop	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	Prompt stop	Prompt stop	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 (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 (reverse direction)	Prompt stop	Per axis	Error state(error493) *6 Output Disabled	No change
	Emergency stop “On”	Prompt stop	Prompt stop	Prompt stop	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 Incremental 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 Keep operation mode and Continuous operation mode, the deceleration stop command is not processed and it carries out the positioning operation by the setting Keep 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

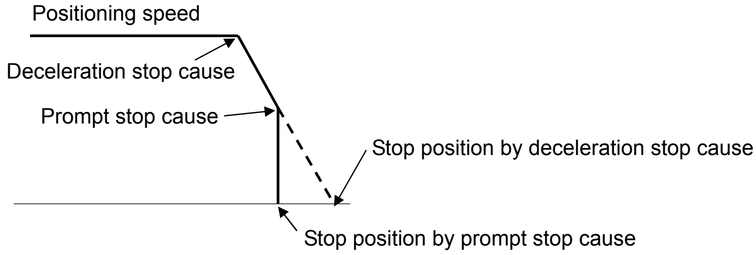
The priority of Stop Processing of positioning module is as follows.

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 Incremental 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 Keep 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.

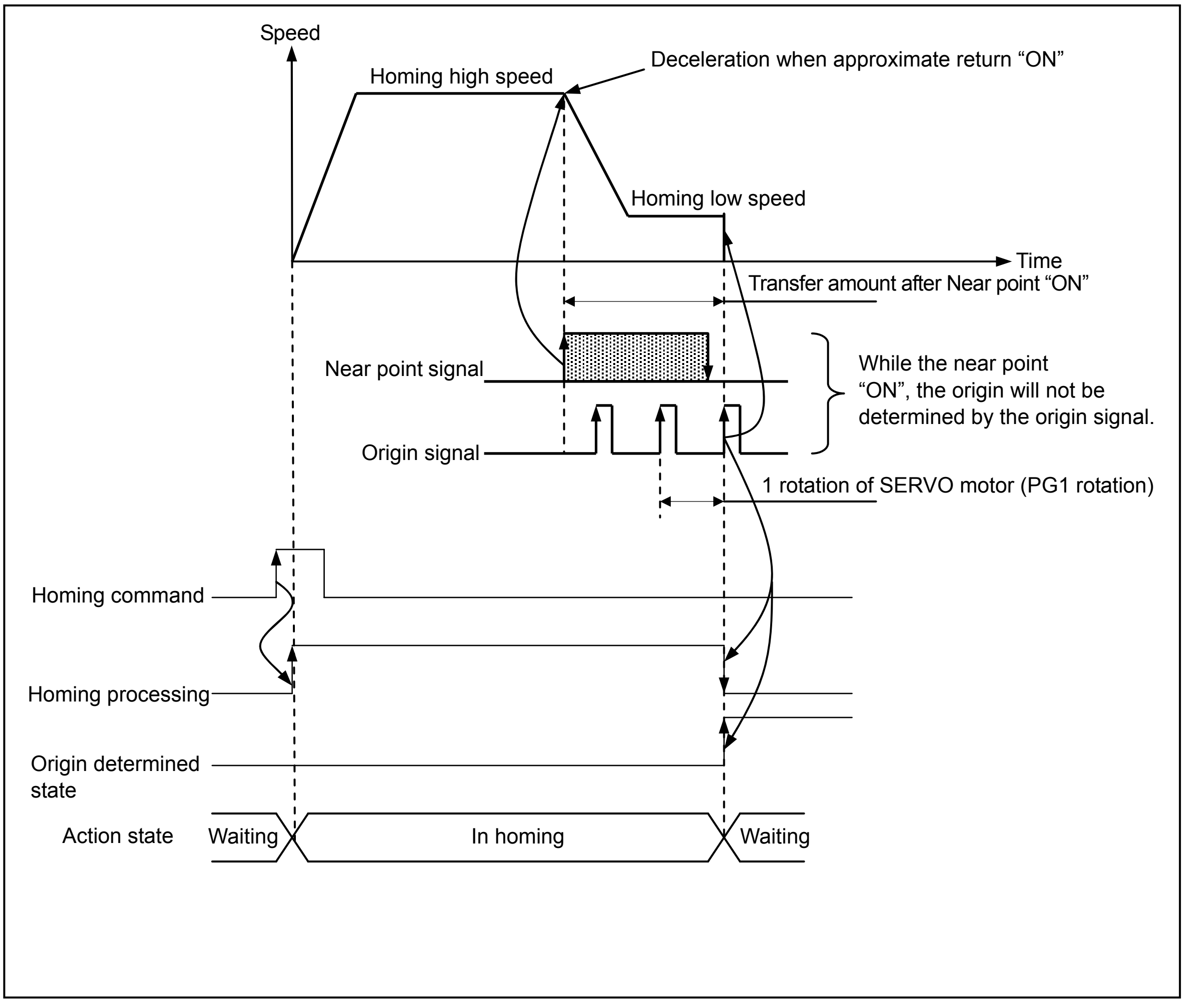
3.6.2 Origin Detection after Near Point Off

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.

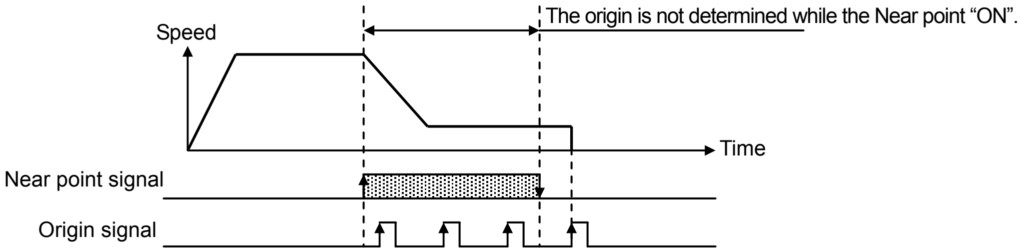
(2) In this case, if near point as external input is entered, it decelerates and acts by homing low speed.

(3) If origin signal as external signal is entered after the near point signal has changed from “On” to “Off”, it stops.

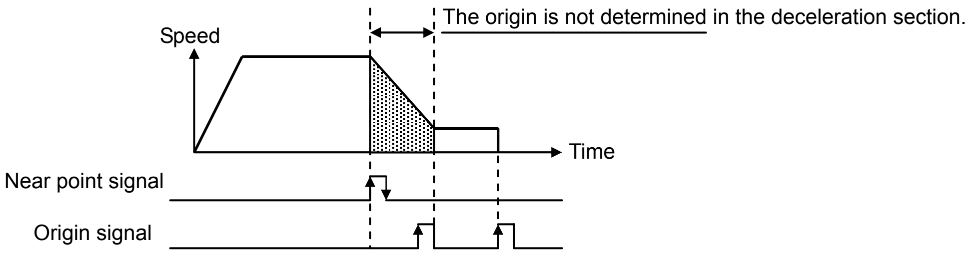


Notes

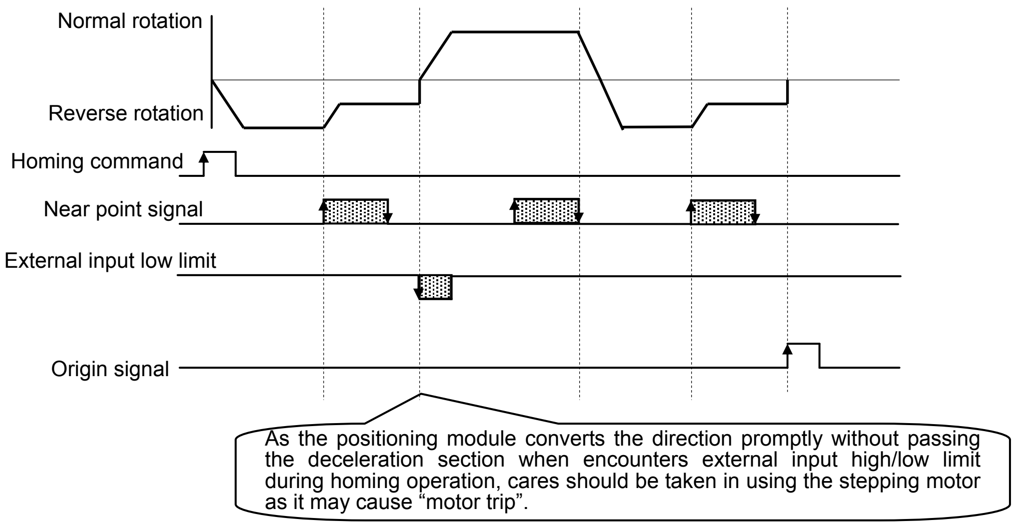
While near point signal maintains "On", the origin will not be determined by origin signal.
That is, when near point signal changes from "Off" to "On"(acceleration section -> homing high speed) , from "On" to "Off" (deceleration section -> homing low speed) and then when the origin changes from "Off" to "On", the origin will be determined.



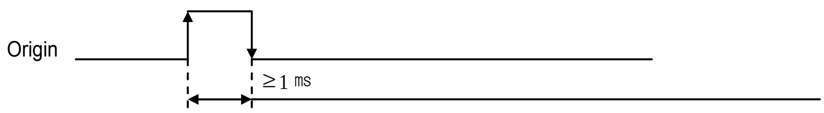
While the homing speed acts to the deceleration section by homing high speed after the near point signal is changed from "Off" to "On", from "On" to "Off", the origin will not be determined even if encounters the origin input.



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.



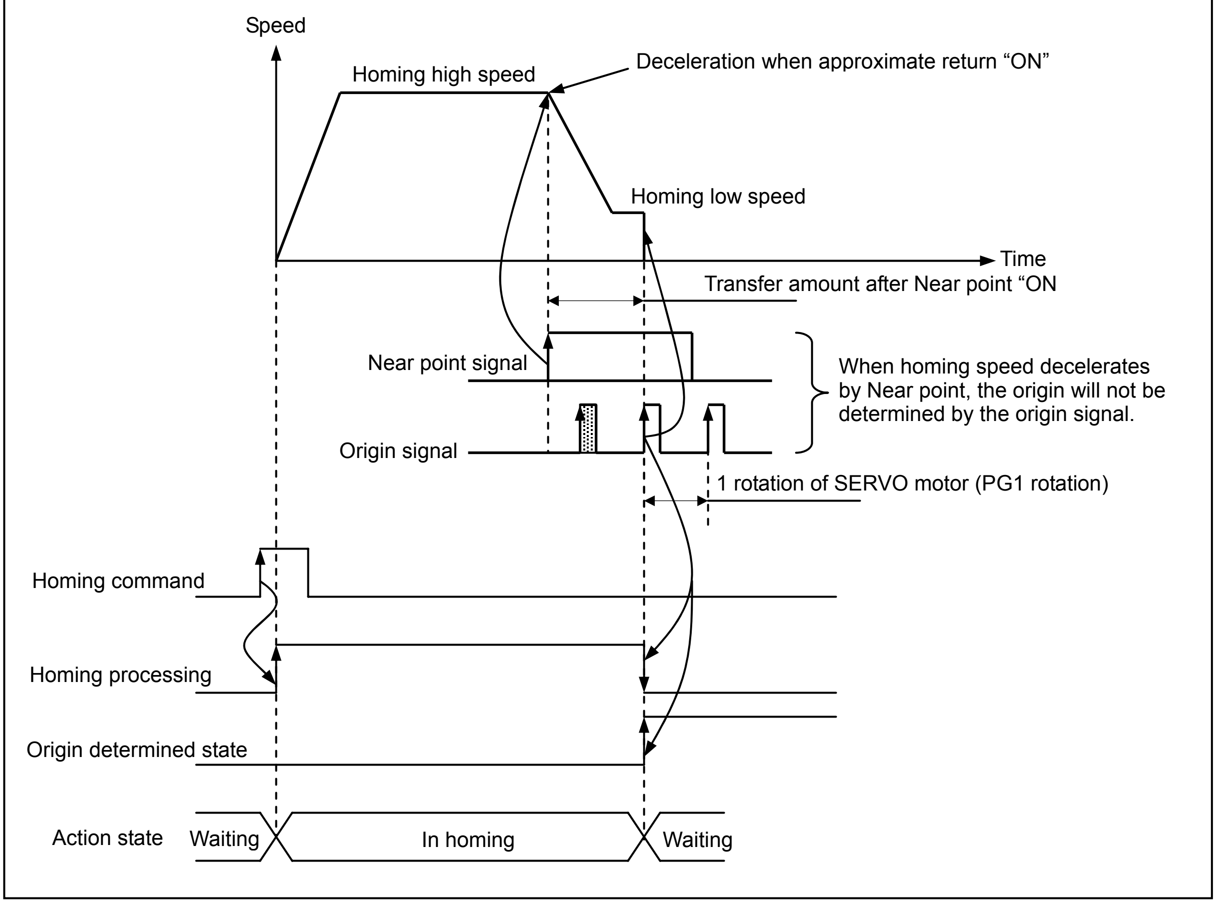
3.6.3 Origin Detection after Deceleration when Near Point On

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

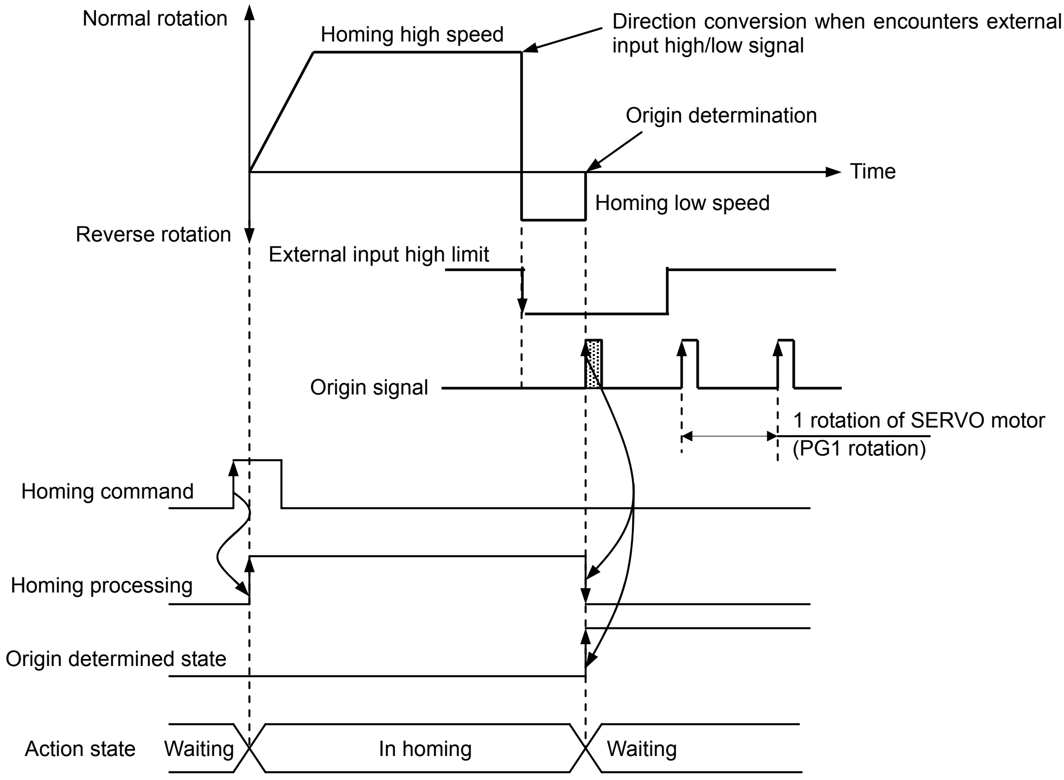
1) Once the near point signal is "On", when the homing speed acts from high speed to low speed via deceleration section, if the origin signal is entered in the state that the near point signal is "ON", the origin will be determined promptly.
That is, when the homing speed decelerates, the origin will 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.

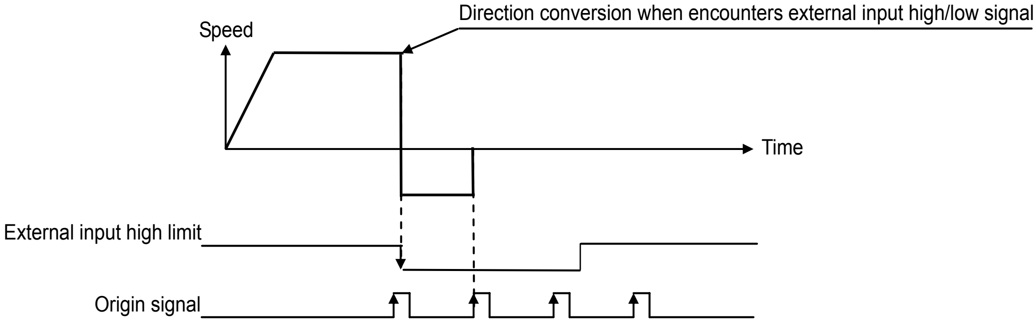
3.6.4 Origin Detection by Origin and High/Low Limit

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.



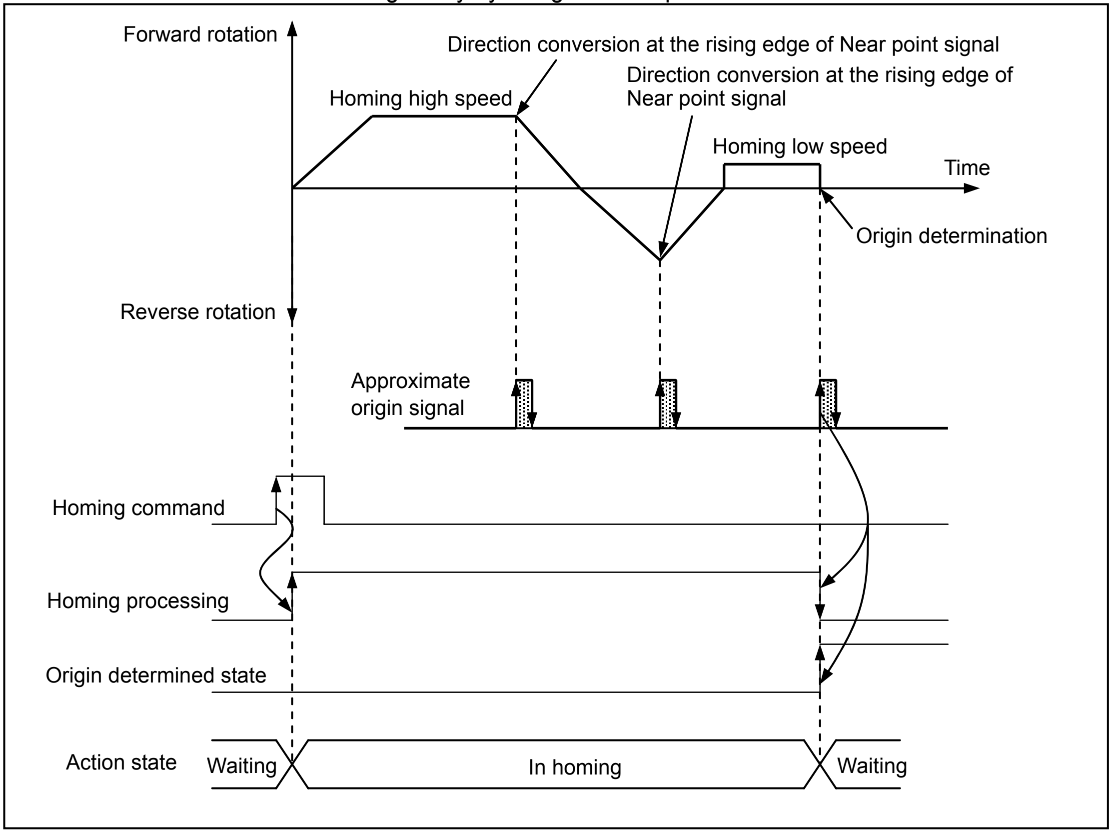
Notes

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.



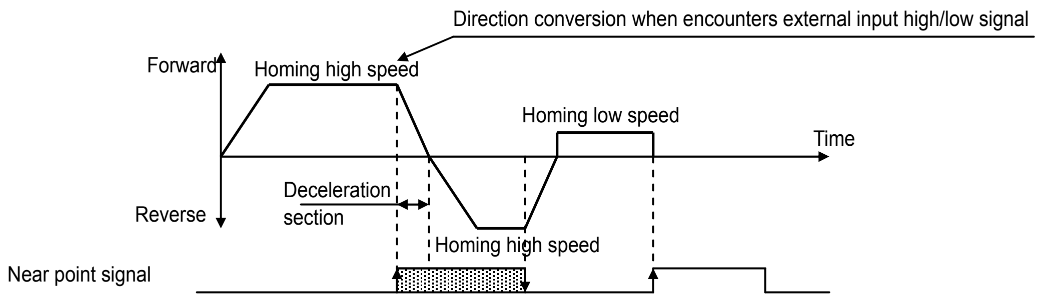
3.6.5 Origin Detection by Near Point

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



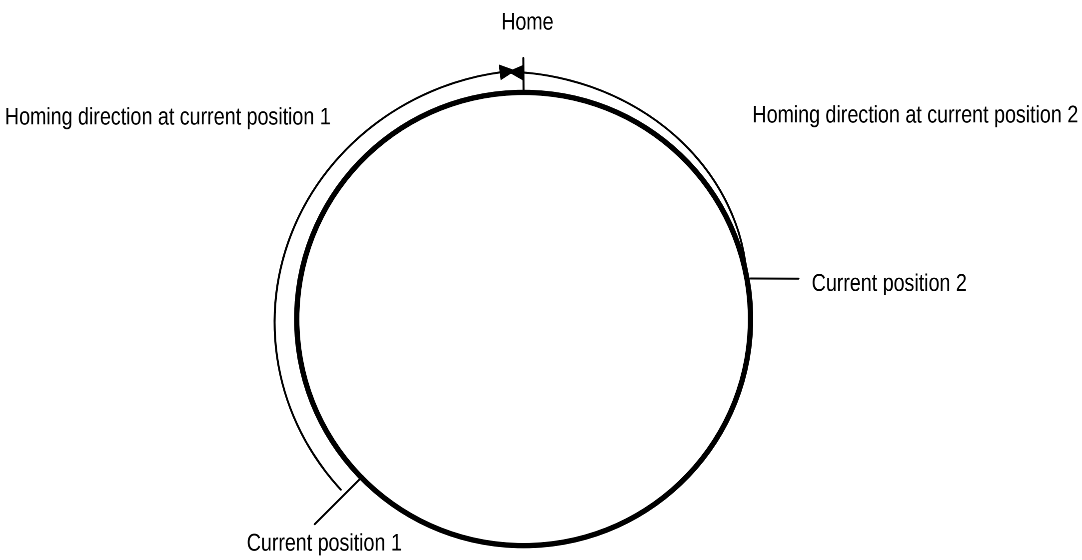
Notes

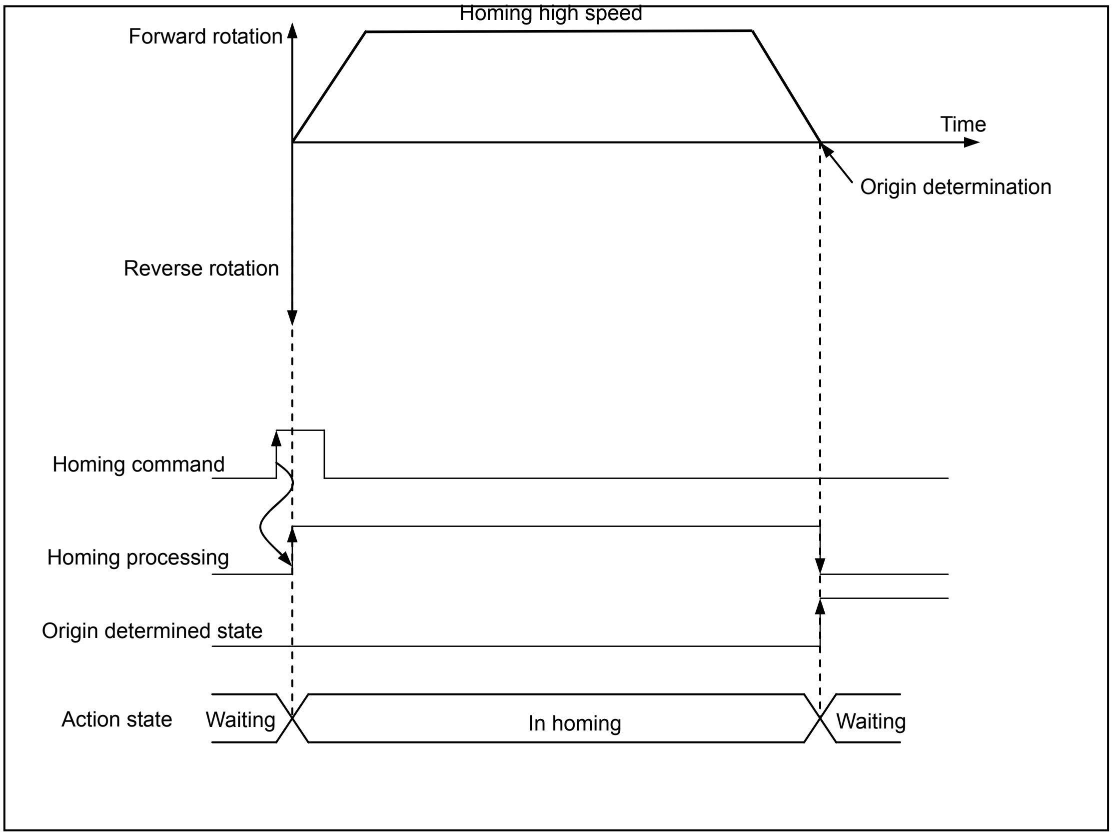
1. If "ON" time of near point is longer than deceleration time, the action is as follows.



3.6.6 High Speed Homing

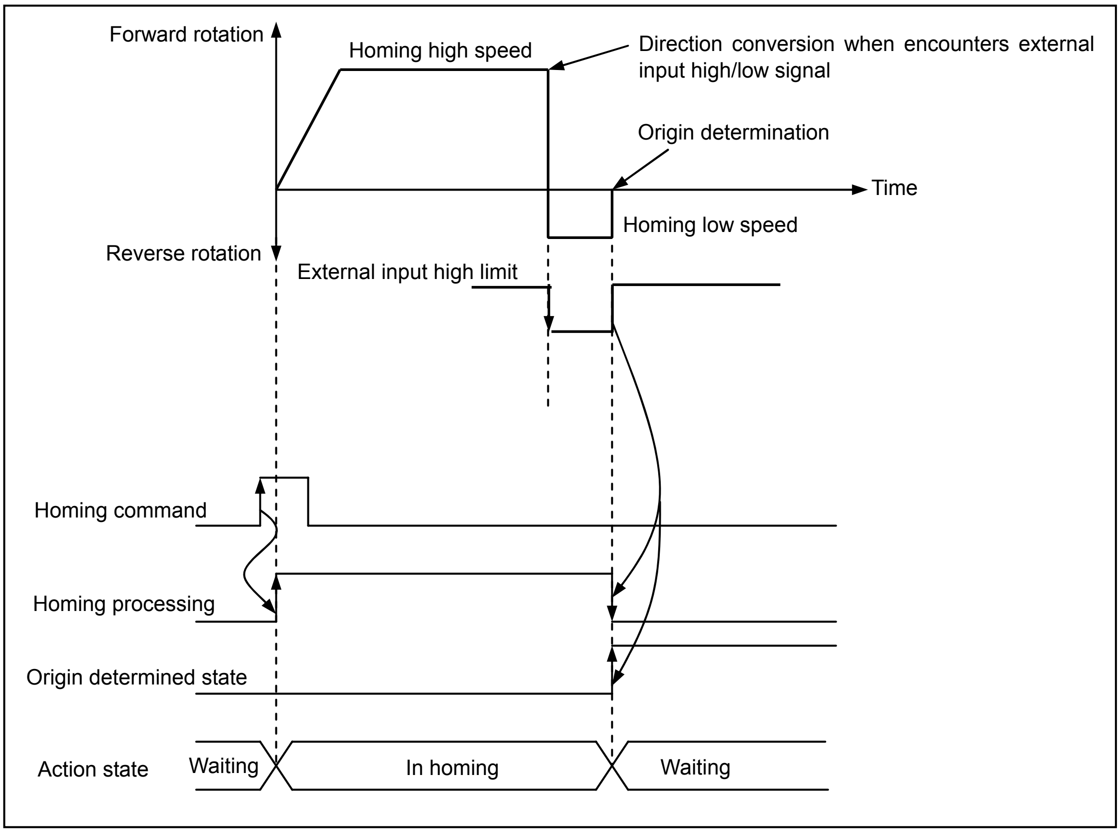
1) High speed origin detection is one of the homing methods that returns to the origin determination position without detection of external signal (near point, origin signal, High/Low limit) when returning to the mechanical origin position after completion of the mechanical homing.
2) When using High 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.
4) In case unit is Degree, Homing direction is determined according to moving distance per one revolution and current position at time of homing command. Namely, if current position is more than moving distance per one revolution/2 based on moving distance per one revolution, it moves forward direction to home. If current position is less than moving distance per one revolution/2 based on moving distance per one revolution, it moves reverse to home




Homing high speed
Forward rotation
Time
Origin determination
Reverse rotation
Homing command
Homing processing
Origin determined state
Action state
Waiting
In homing
Waiting

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.

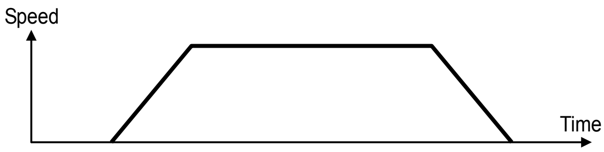
▶Carries out the monitoring when the positioning acts by Jog command and the position address is changed.

▶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.

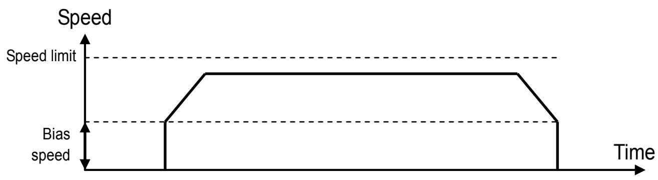
Setting range	Jog high speed operation	1~1,000,000 (Line driver type) 1~200,000 (Open collector type)	(Setting unit :1pps)
	Jog low speed operation	1~200,000 (Open collector type)	

Notes

The notices for setting Jog speed is as follows.

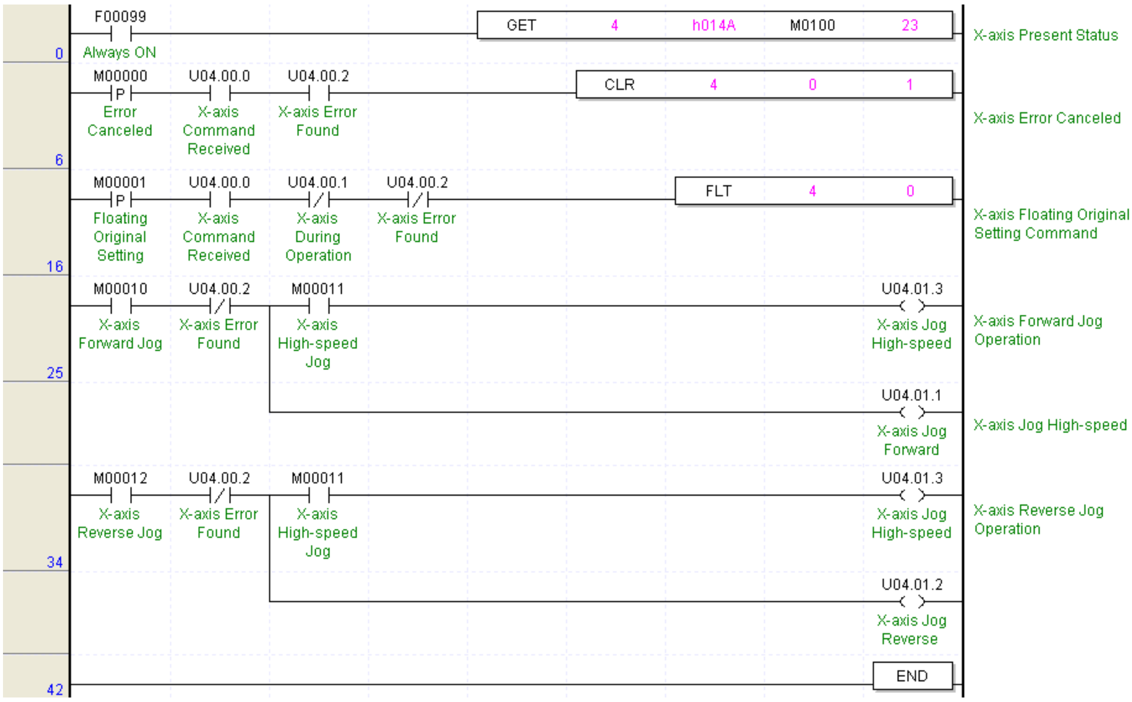
1) Jog high speed setting

Bias speed ≤ Jog high speed ≤ Speed limit



2) Jog low speed acts regardless of Bias sped 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).

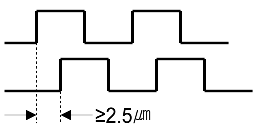
(3) It acts regardless of origin determined state or origin unsettled state.

(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.



When A phase input pulse proceeds B phase input pulse, the position address increases.

When B phase input pulse proceeds A phase input pulse, the position address decreases.

(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.

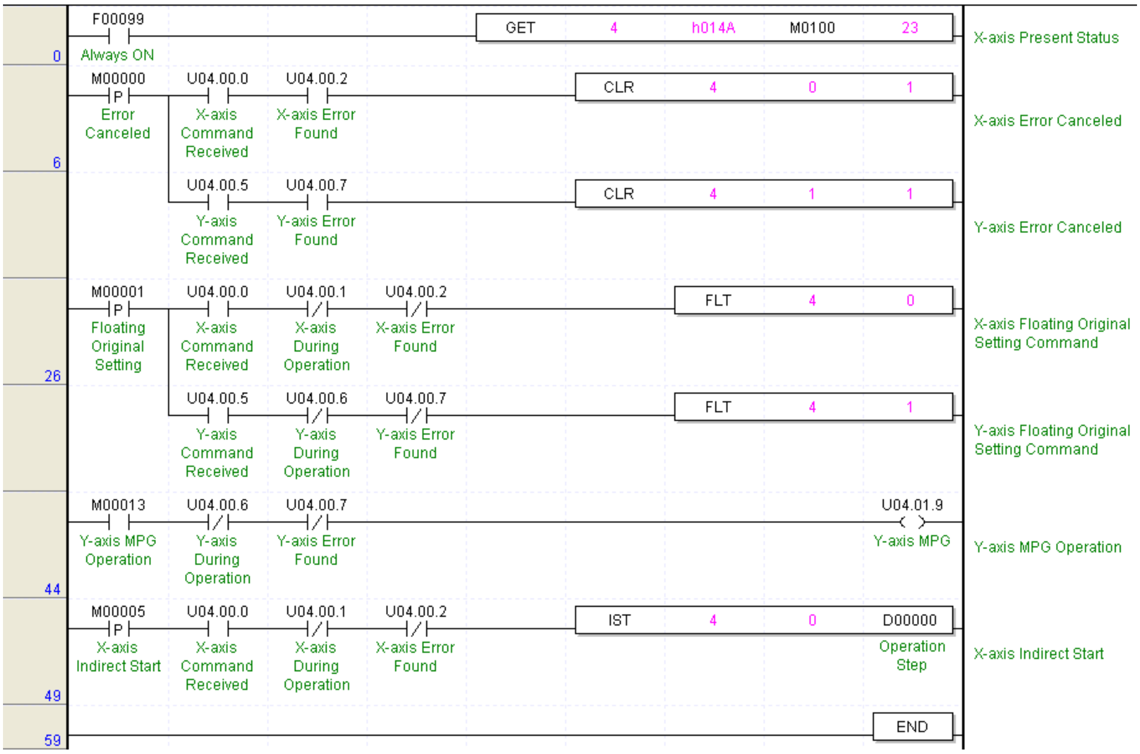
Input pulse type	Output pulse type	Possibility
Phase A/B 1multiplier Phase A/B 2multiplier Phase A/B 4multiplier	CW/CCW	○
	PHASE A/B	×
	PLS/DIR	○
PLS/DIR 1multiplier PLS/DIR 2multiplier	CW/CCW	○
	PHASE A/B	×
	PLS/DIR	○
CW/CCW 1multiplier CW/CCW 2multiplier	CW/CCW	○
	PHASE A/B	×
	PLS/DIR	×

▷ 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

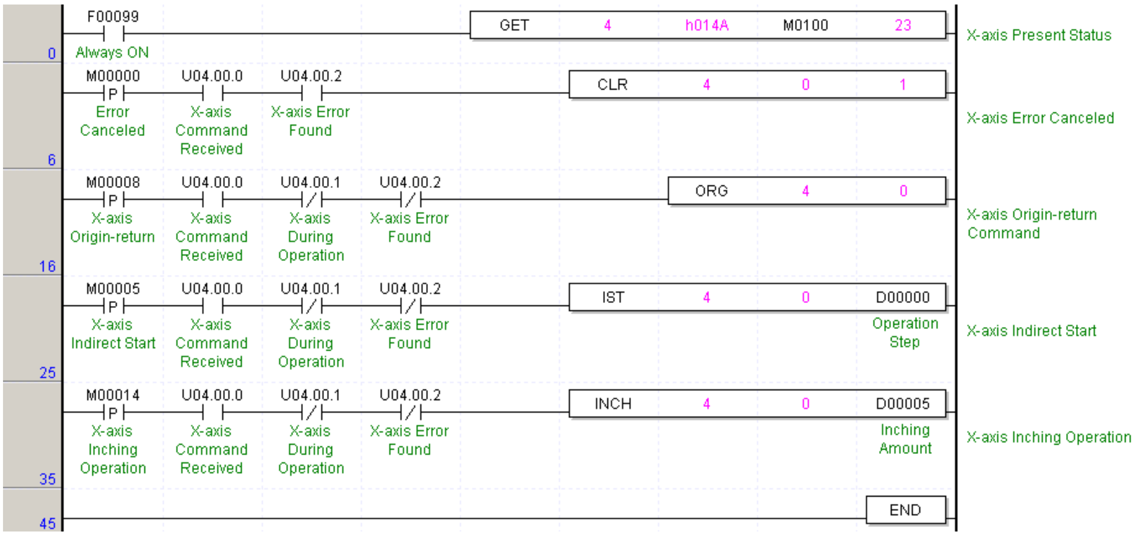


Program 3.9 Manual Pulse Generator (Encoder) Operation

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

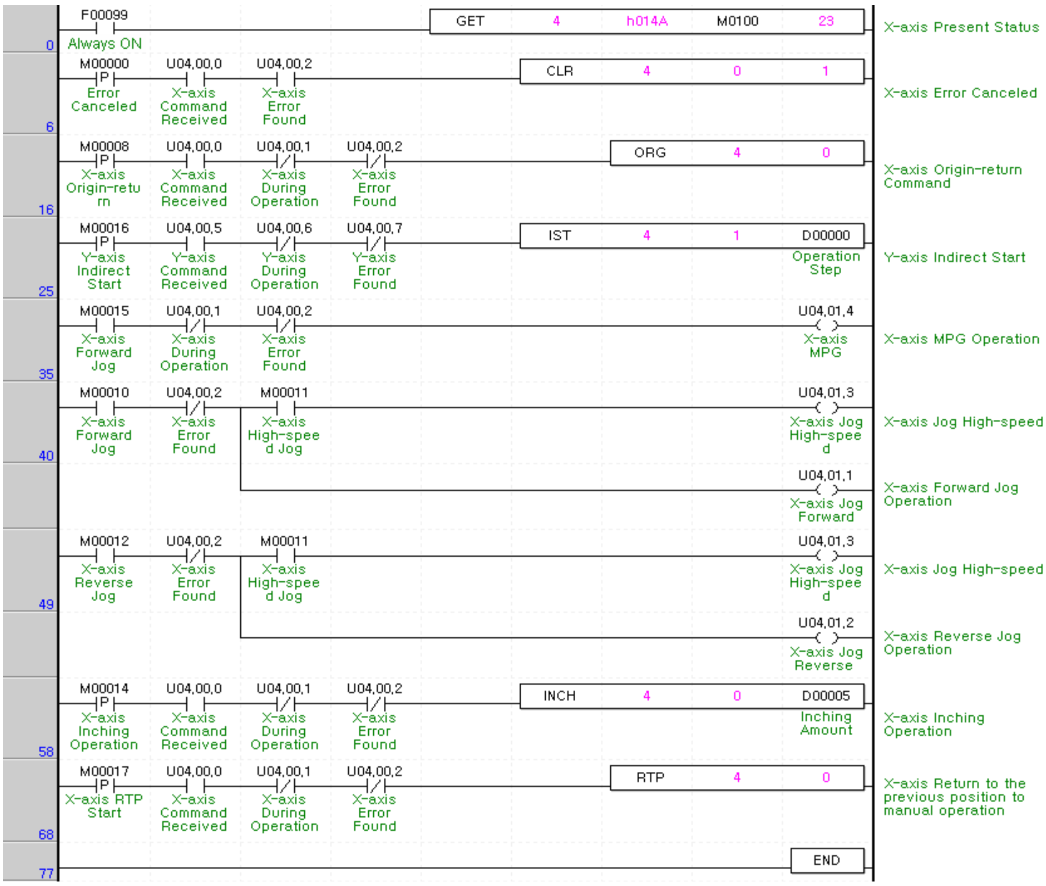
3.7.4 Return to the Position before Manual operation

▶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, Keep operation, Continuous operation.

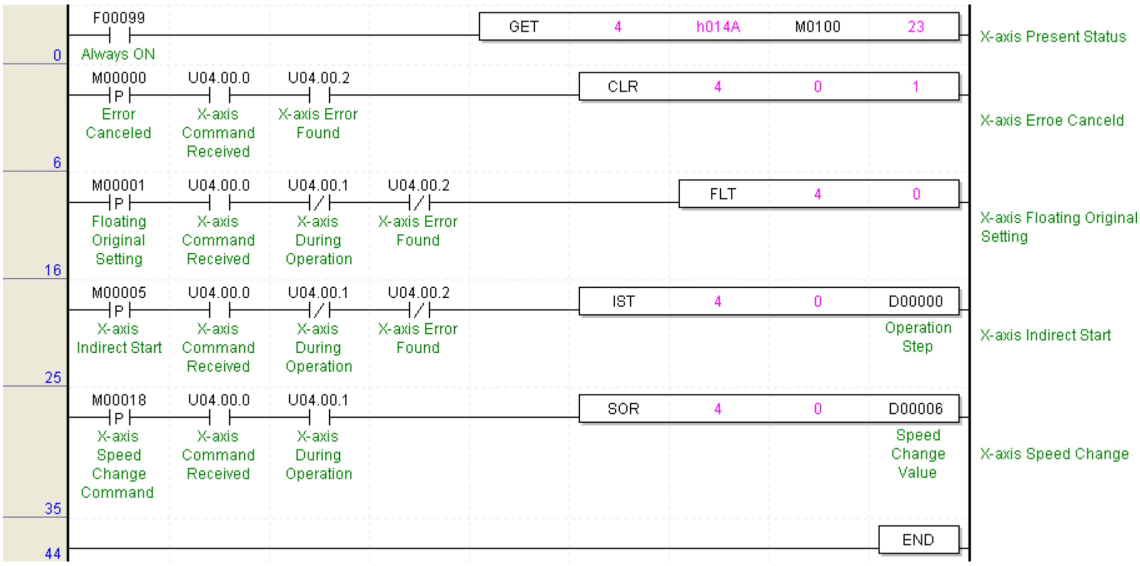
▶The setting range is 1～1,000,000pps for Line Driver type, 1~200,000pps for Open Collector type. (Setting unit : 1pps).

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

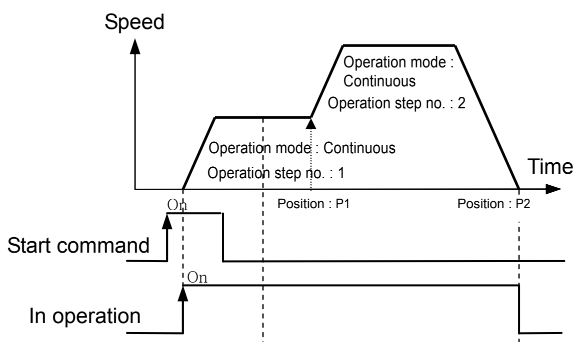
▶This is used in the operation mode (End, Keep, Continuous operation) and in the operation pattern (Acceleration, Constant speed, Deceleration section).

▶If Continuous operation command is used during operation, the current operation step no. moves to the next operation step no.

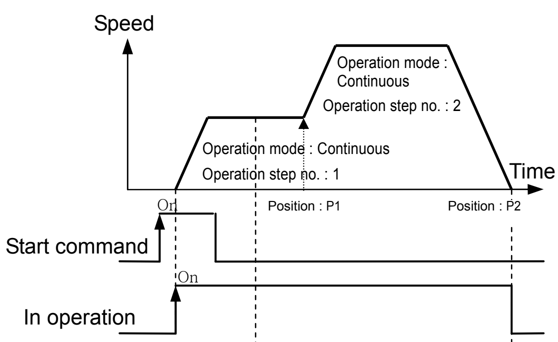
▶According to the position data setting (Absolute coordinate/Incremental coordinate), there is a difference of action in the Continuous operation command.

If not using Continuous operation command

▶When using in the Absolute coordinate

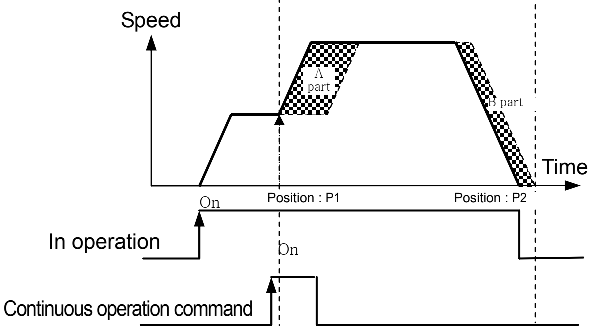


▶When using in the Incremental coordinate



When using Continuous operation command

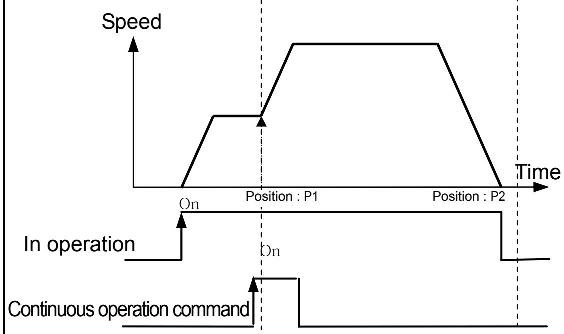
▶When using in the Absolute coordinate



▷ The area of “A section” and “B section” is same.

▷ The current position set by Continuous operation command is P2.

▶When using in the Incremental coordinate



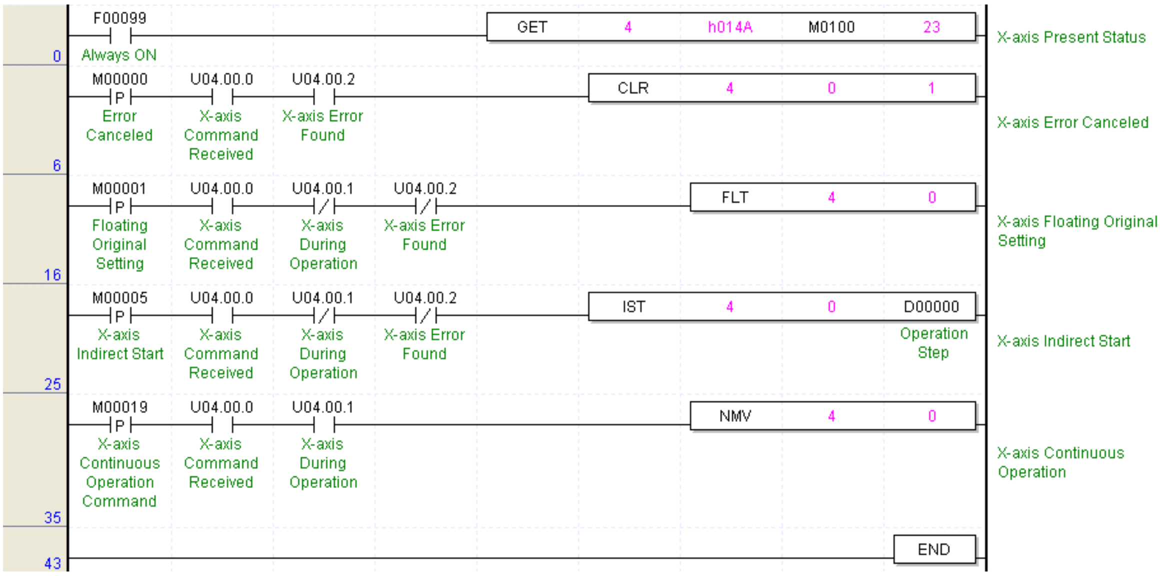
▷ The setting goal position is P1 + P2 but the current position set by Continuous operation command is P1' + P2.

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, Keep, 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)

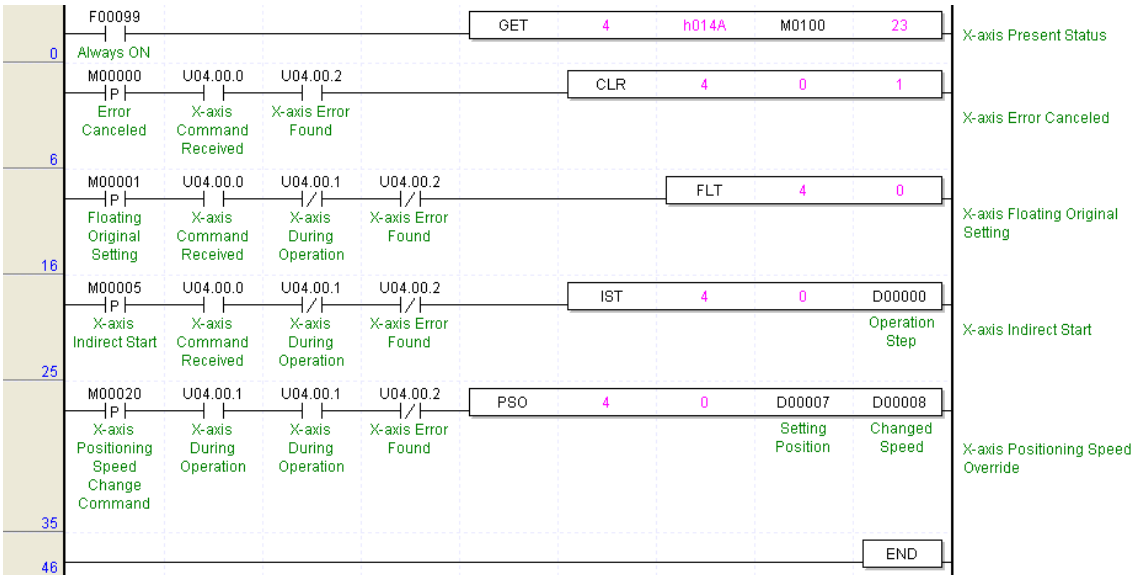
1) This is the command to operate by the changed operation speed if it reaches the setting position during positioning operation.
2) This command is used only in Acceleration and Constant speed section from operation pattern and the available operation mode is End, Keep, Continuous operation.
3) As this 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

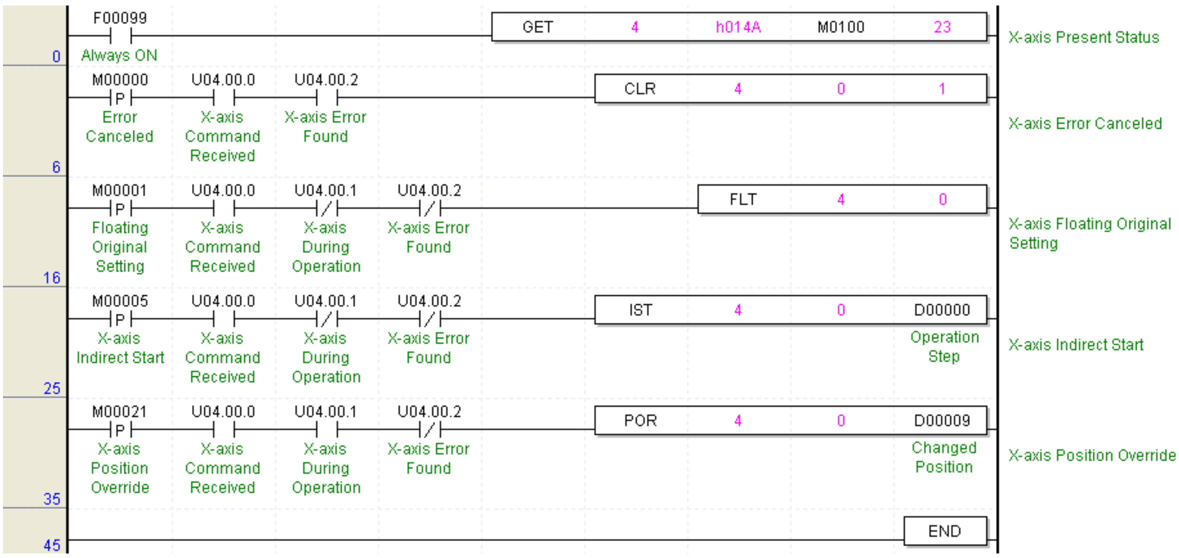
1) This is used to change the goal position during positioning operation by positioning data.
2) As the operation is different according to Position Override command during operation, cares should be taken in using.
   That is, if passing the desired position to change during operation, it carries out 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, Keep 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 incremental position.
5) Position setting range is –2147483648 ~ 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 [㎳]	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

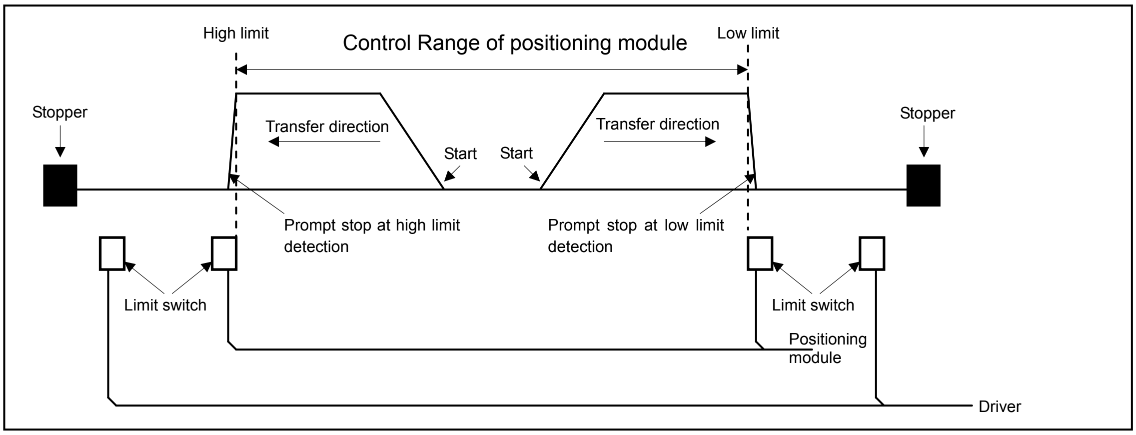
3.10 Stroke high/low Limit

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.



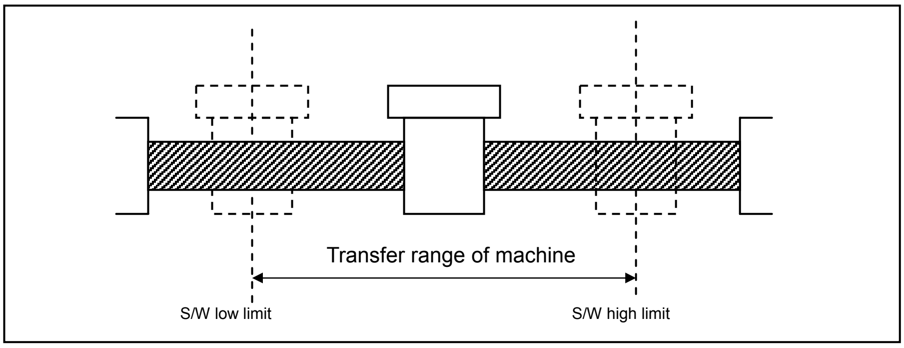
▶If positioning module stops out of the control range, the positioning operation does not work. If it stops by external input stroke limit detection, move within the range of positioning module available to control by manual operation (Jog operation, inching operation, manual pulse generator operation).

▶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	Incremental	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.

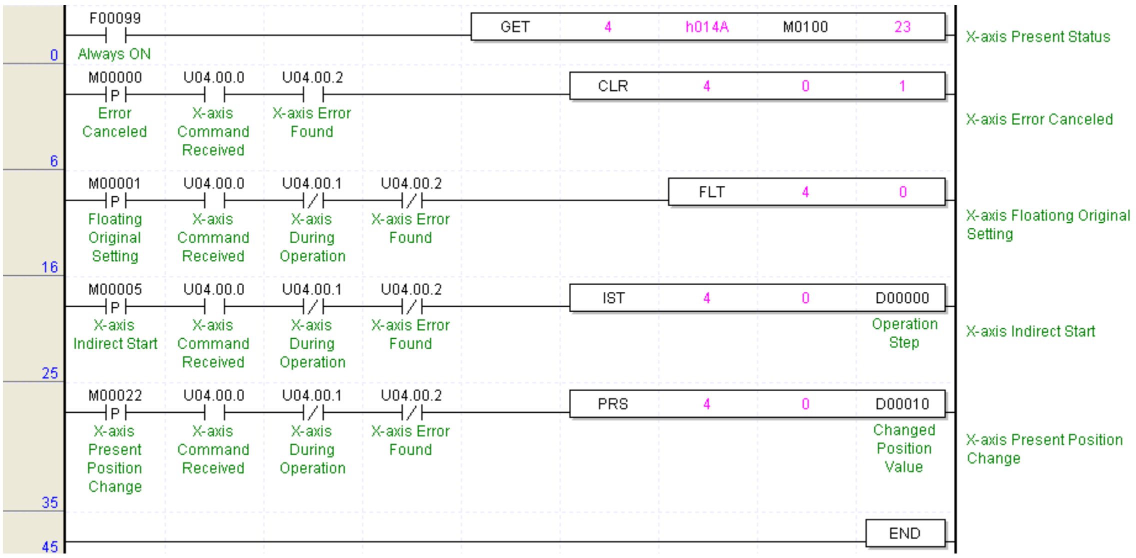
3.11.2 The Change of the current Position

▶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

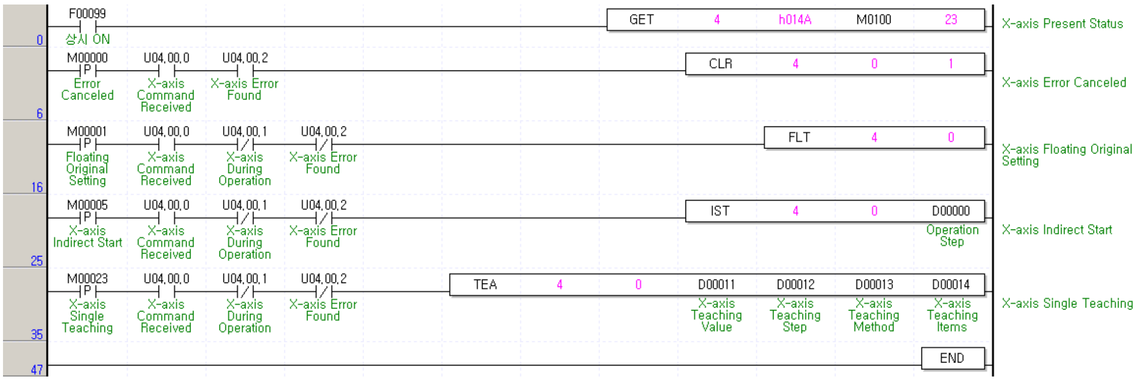
▶This is used to change the goal position or operation speed set in one step from positioning operation step.

[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

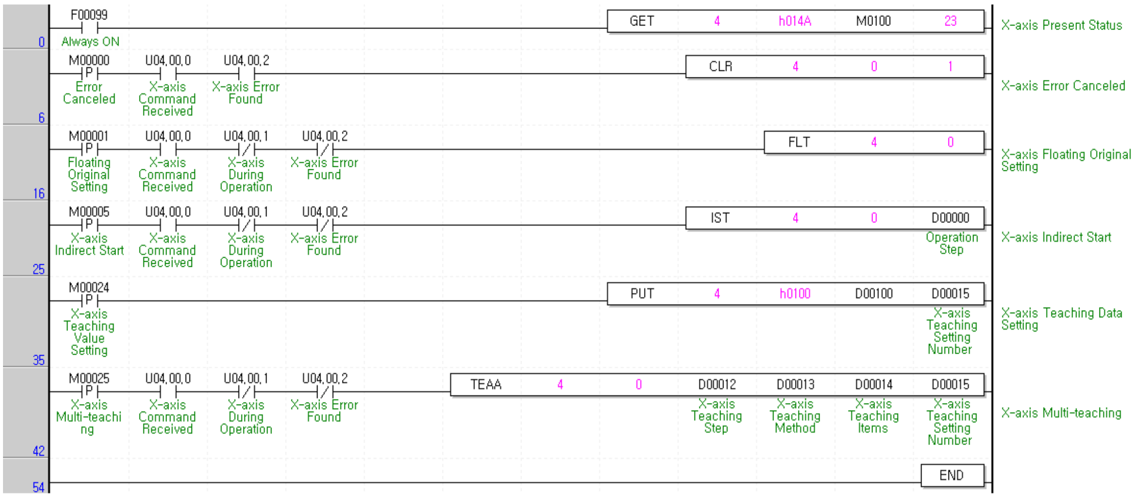
▶ This is used to change the goal position or operation speed set in the several step from positioning operation step. (Max. 16)

[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.

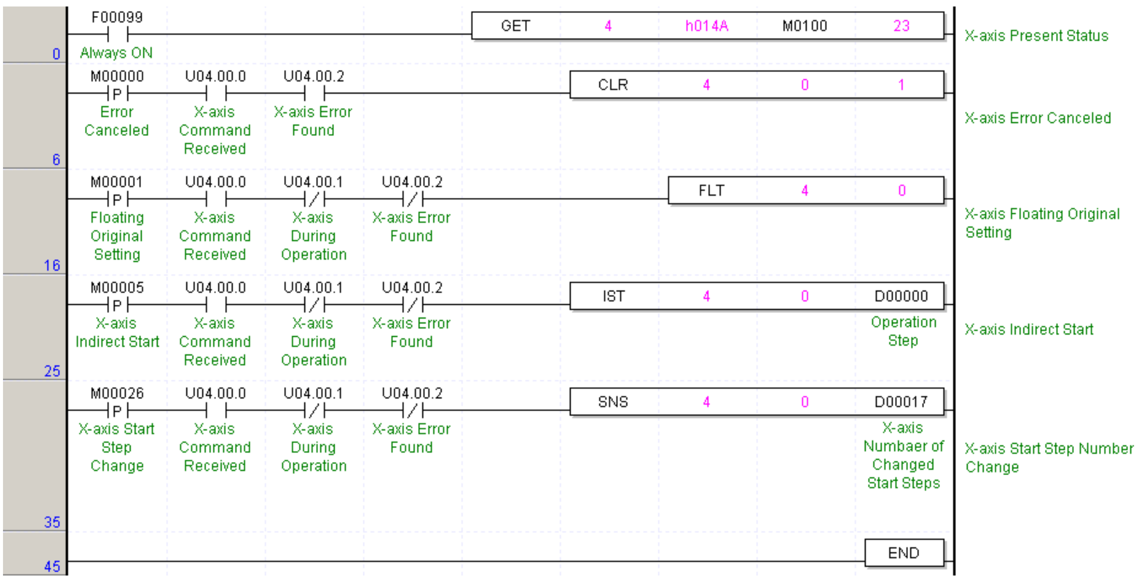
[Example]

▶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 [㎳]	Circular interpolation direction
1	1	Incremental	Position	End	Single	1000	0	**0**	1	100	0	CW
2	2	Incremental	Position	End	Single	2000	0	**0**	1	150	0	CW
Step no. change by Operation step no. setting : "10"												
3	10	Incremental	Position	Keep	Single	1000	0	**0**	1	100	0	CW
	11	Incremental	Position	Keep	Single	2000	0	**0**	1	150	0	CW
	12	Incremental	Position	Keep	Single	3000	0	**0**	1	200	0	CW
	13	Incremental	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	Incremental	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

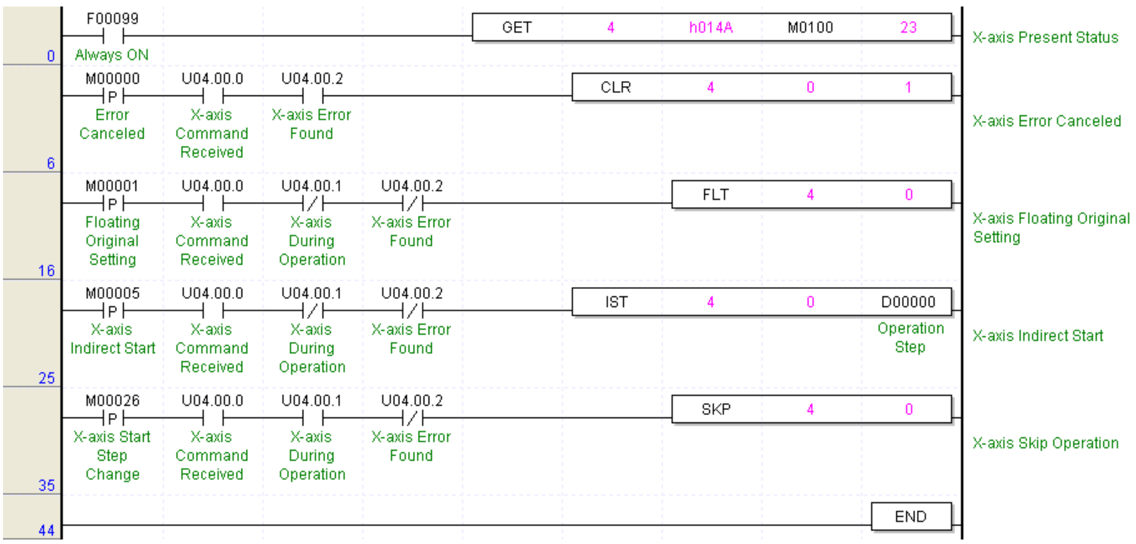
- This is used in case that the operation mode is End, Keep, Continuous and the operation pattern is in Acceleration, Constant speed, Deceleration section.
- If SKIP operation command is executed during operation, it moves from the current operation step no. to next operation step no. and carries out 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	Keep	Single	1000	0	**0**	1	1000	0	CW
	2	Absolute	Position	Keep	Single	2000	0	**0**	1	1500	0	CW
	3	Absolute	Position	Keep	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, Keep, 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 Keep 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 Keep 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

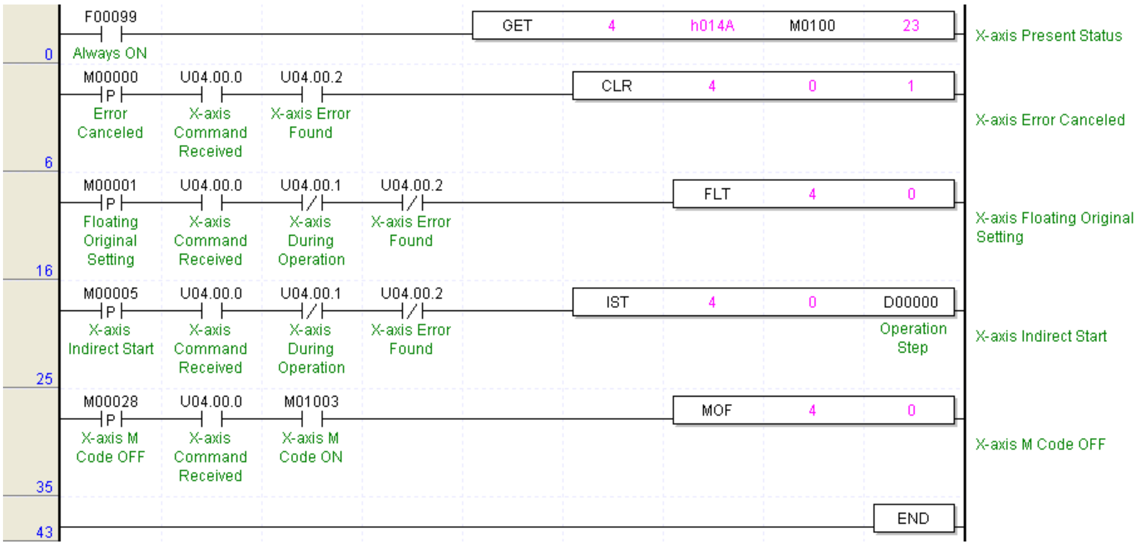
<Operation Data Setting>

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	Keep	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.

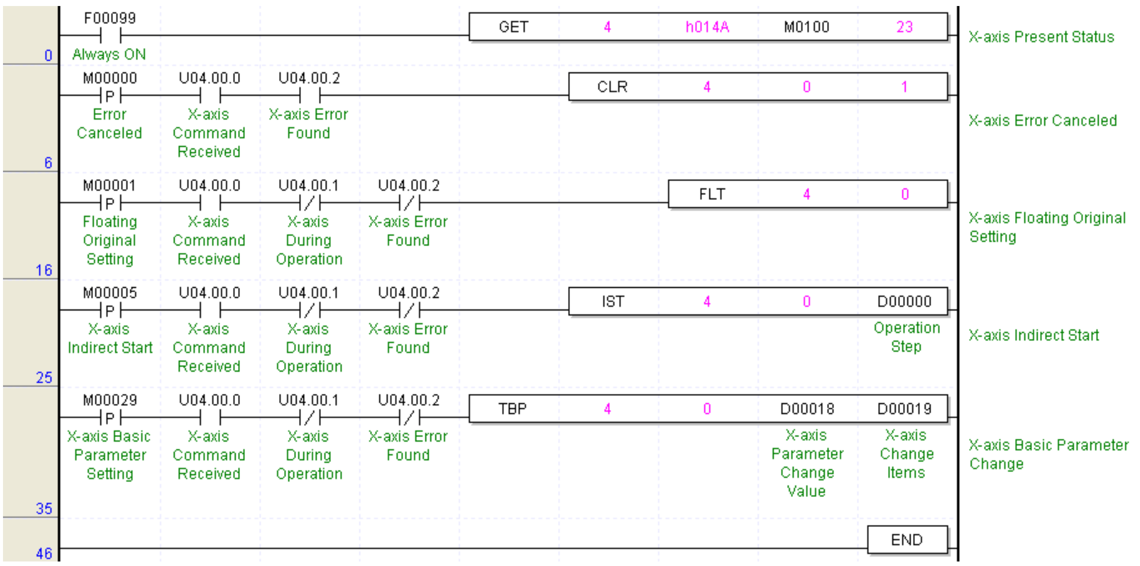
▶The parameter change is available only when the operation stops.

3.18.1 Basic Parameter Teaching

▶The items available to change are as follows.

Basic Parameter	Setting range
Speed Limit	㎜ : 1~2,000,000,000[X10^{-2}㎜/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(㎳)	0 ~ 65,535
Acc./Dec.Time No.2(㎳)	
Acc./Dec.Time No.3(㎳)	
Acc./Dec.Time No.4(㎳)	
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



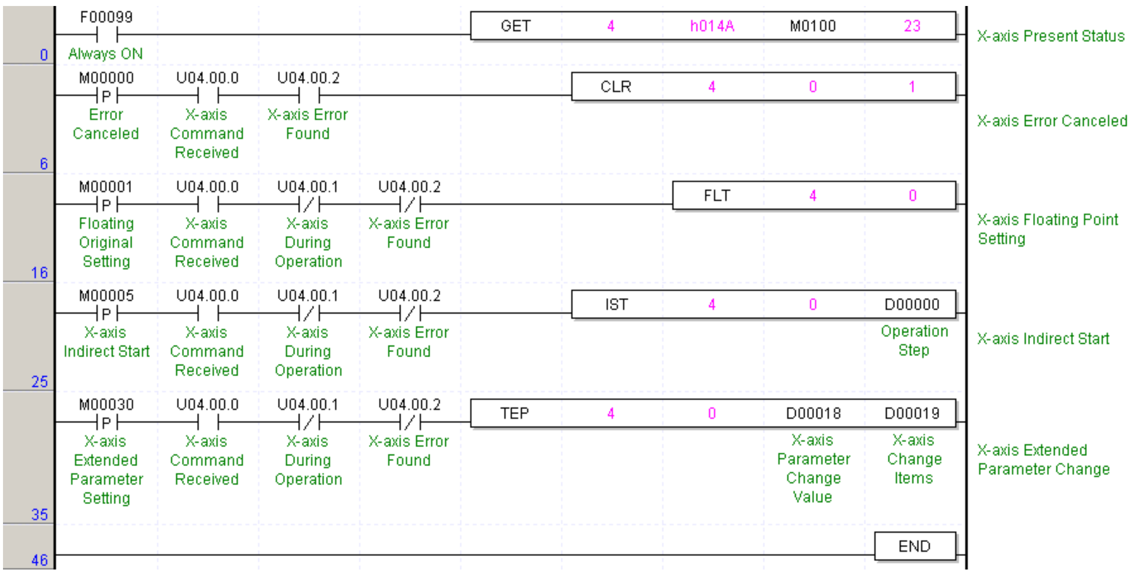
Program 3.22 Basic Parameter Teaching

3.18.2 Extended Parameter Teaching

▶The items available to change are as follows.

Extended parameter	Setting Range
Software high limit	㎜ : -2,147,483,648 ~ 2,147,483,647 [X10^{-4}㎜], inch : -2,147,483,648 ~ 2,147,483,647 [X10^{-}inch], degree : -2,147,483,648 ~ 2,147,483,647 [X10^{-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 (㎳)	
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



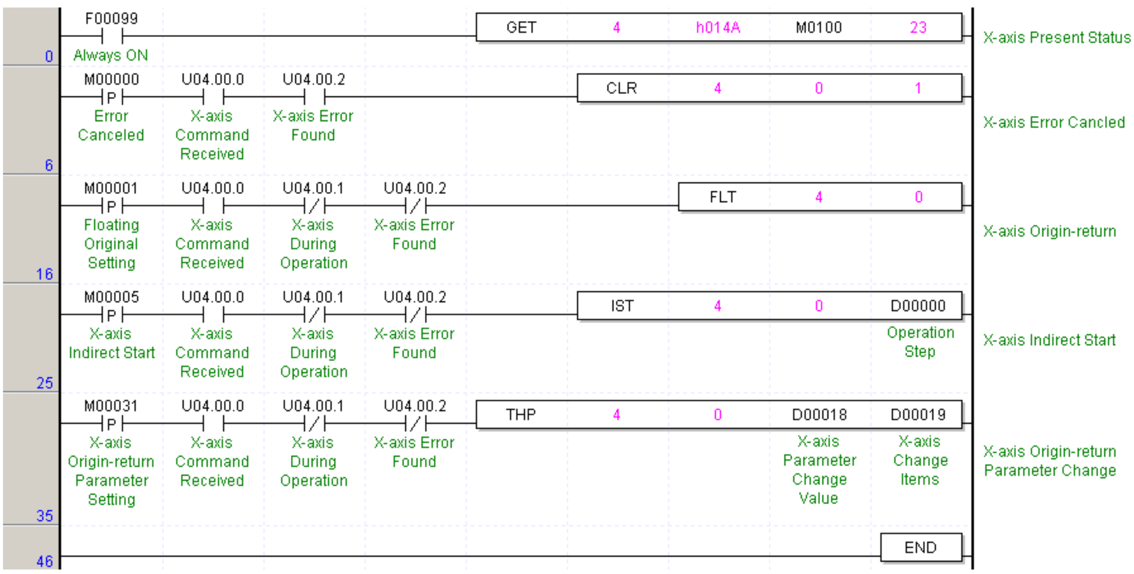
Program 3.23 Extended Parameter Teaching

3.18.3 Origin-return Parameter Teaching

▶The items available to change are as follow.

Origin-return parameter	Setting Range
Origin address	㎜ : -2,147,483,648 ~ 2,147,483,647 [$X10^{-4}$㎜], inch : -2,147,483,648 ~ 2,147,483,647 [$X10^{-}$inch], degree : -2,147,483,648 ~ 2,147,483,647 [$X10^{-5}$degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Origin-return high speed	㎜ : 1 ~ 2,000,000,000[$X10^{-2}$㎜/min], inch : 1 ~ 2,000,000,000[$X10^{-}$inch/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]
Origin-return low speed	
Origin-return acceleration/Deceleration time	0 ~ 65,535
Origin-return dwell time	
Origin compensation amount	㎜ : -2,147,483,648 ~ 2,147,483,647 [$X10^{-4}$㎜], inch : -2,147,483,648 ~ 2,147,483,647 [$X10^{-}$inch], degree : -2,147,483,648 ~ 2,147,483,647 [$X10^{-5}$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



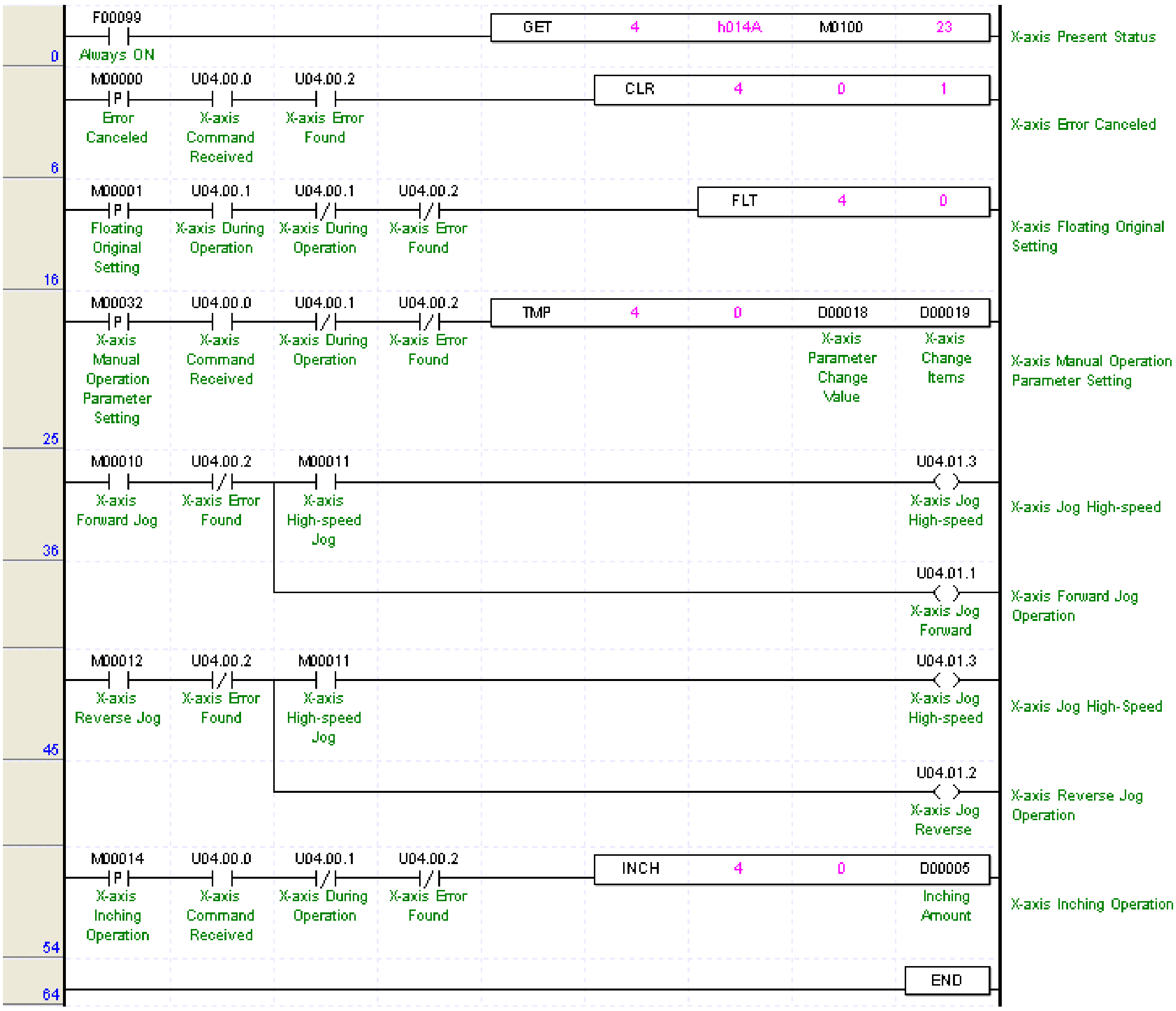
Program 3.24 Origin-return Parameter Teaching

3.18.4 Manual Operation Parameter Teaching

▶The items available to change are as follows.

Manual Operation Parameter	Setting Range
JOG high speed	㎜ : 1 ~ 2,000,000,000[$X10^{-2}$㎜/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]
JOG low speed	
JOG acc./dec. time(㎳)	0 ~ 65,535
Inching speed (pps)	㎜ : 1 ~ 65,535[$X10^{-2}$㎜/min], inch : 1 ~ 65,535[X10inch/min], degree : 1 ~ 65,535[$X10^{-3}$ degree/min], pulse : 1 ~ 65,535[pulse/sec]

▶Program



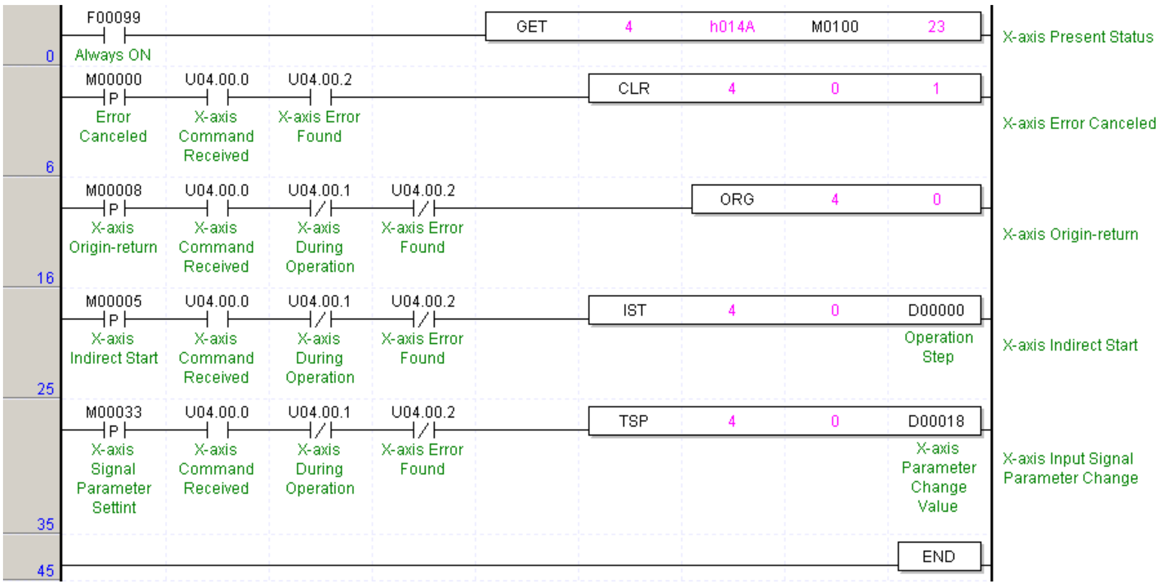
Program 3.25 Manual Operation Parameter Teaching

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



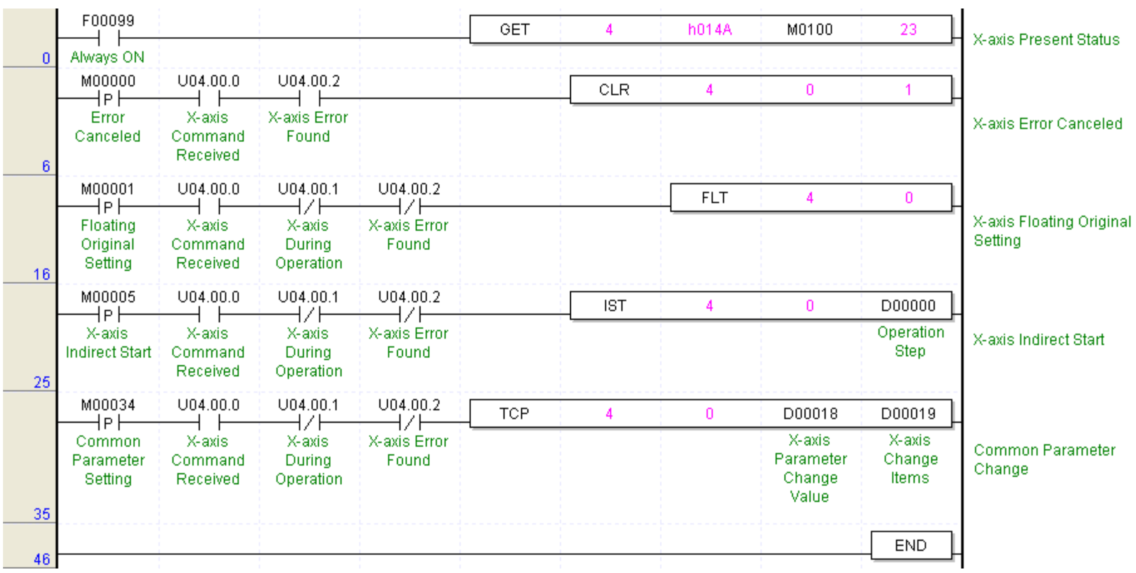
Program 3.26 Input Signal Parameter Teaching

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:Endoder
Zone1 output “ON” position Zone1 output “OFF” position	㎜ : -2,147,483,648 ~ 2,147,483,647 [X10^{-4}㎜], inch : -2,147,483,648 ~ 2,147,483,647 [X10^{-5}inch], degree : -2,147,483,648 ~ 2,147,483,647 [X10^{-5}degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Zone2 setting axis setting	0:X, 1:Y, 2:Z, 3:Encoder
Zone2 output “ON” position Zone2 output “OFF” position	㎜ : -2,147,483,648 ~ 2,147,483,647 [X10^{-4}㎜], inch : -2,147,483,648 ~ 2,147,483,647 [X10^{-5}inch], degree : -2,147,483,648 ~ 2,147,483,647 [X10^{-5}degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Zone3 setting axis setting	0:X, 1:Y, 2:Z, 3:Encoder
Zone3 output “ON” position Zone3 output “OFF” position	㎜ : -2,147,483,648 ~ 2,147,483,647 [X10^{-4}㎜], inch : -2,147,483,648 ~ 2,147,483,647 [X10^{-5}inch], degree : -2,147,483,648 ~ 2,147,483,647 [X10^{-5}degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
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

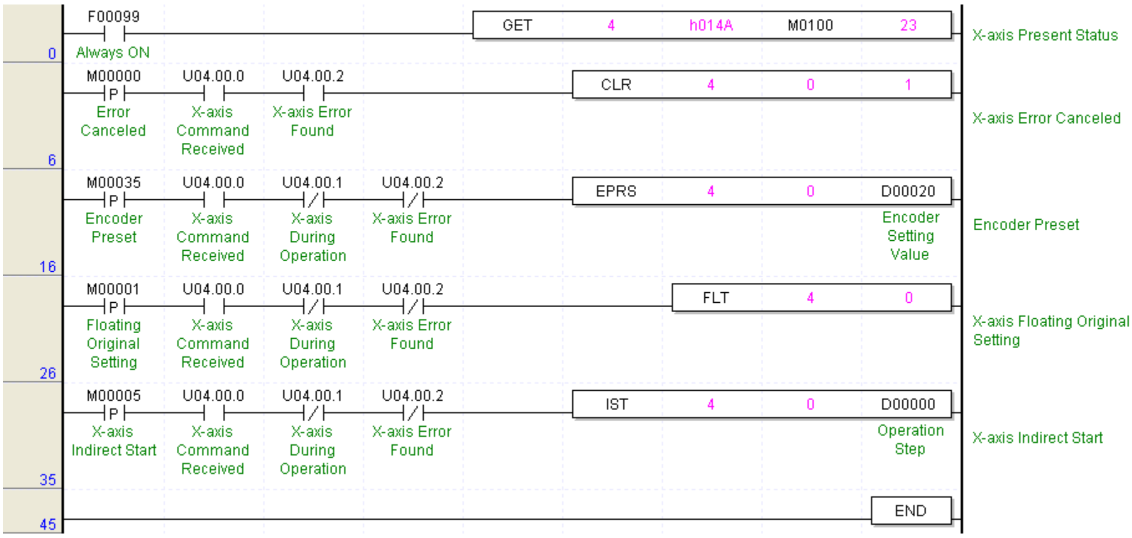
▶ The items available to change are as follows..

Operation Data	Setting Range
Goal position	㎜ : -2,147,483,648 ~ 2,147,483,647 [X10^{-4}㎜], inch : -2,147,483,648 ~ 2,147,483,647 [X10^{-5}inch], degree : -2,147,483,648 ~ 2,147,483,647 [X10^{-5}degree], pulse : -2,147,483,648 ~ 2,147,483,647 [pulse]
Operation speed	㎜ : 1 ~ 2,000,000,000[X10^{-2}㎜/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 (Open Collector)[pulse/sec], 1 ~ 1,000,000 (Line Driver)[pulse/sec]
Dwell time(㎳)	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: Keep, 2: Continuous
Coordinate	0: Absolute, 2: Incremental
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

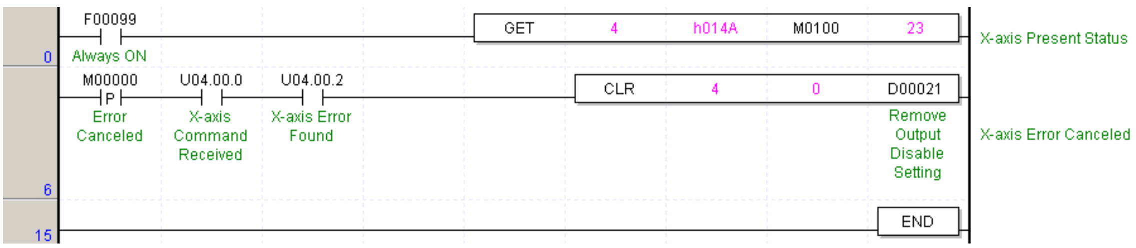


Program 3.29 Encoder Preset

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

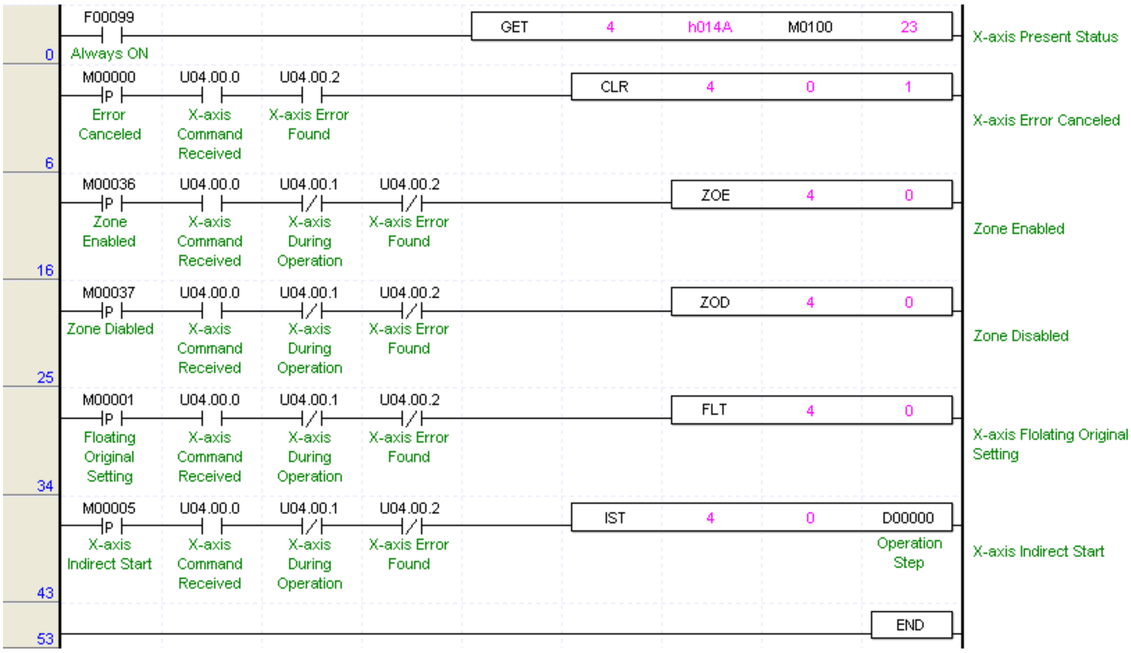
3.22 ZONE Output

▶ 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.

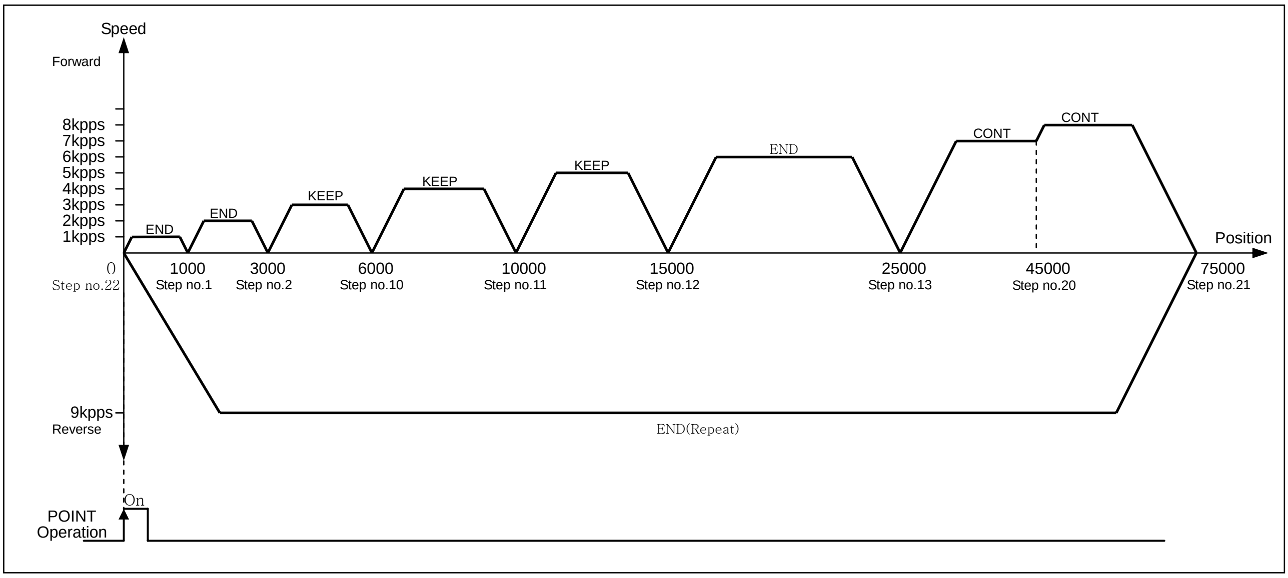
▶ It carries out the point start as much as the assigned point number from step setting (Point 1) regardless of End, Keep, Continuous operation mode. In this case, the step no. to be set should be set as the step no. that starts at the very first in case of Keep or Continuous operation mode.

[Example]

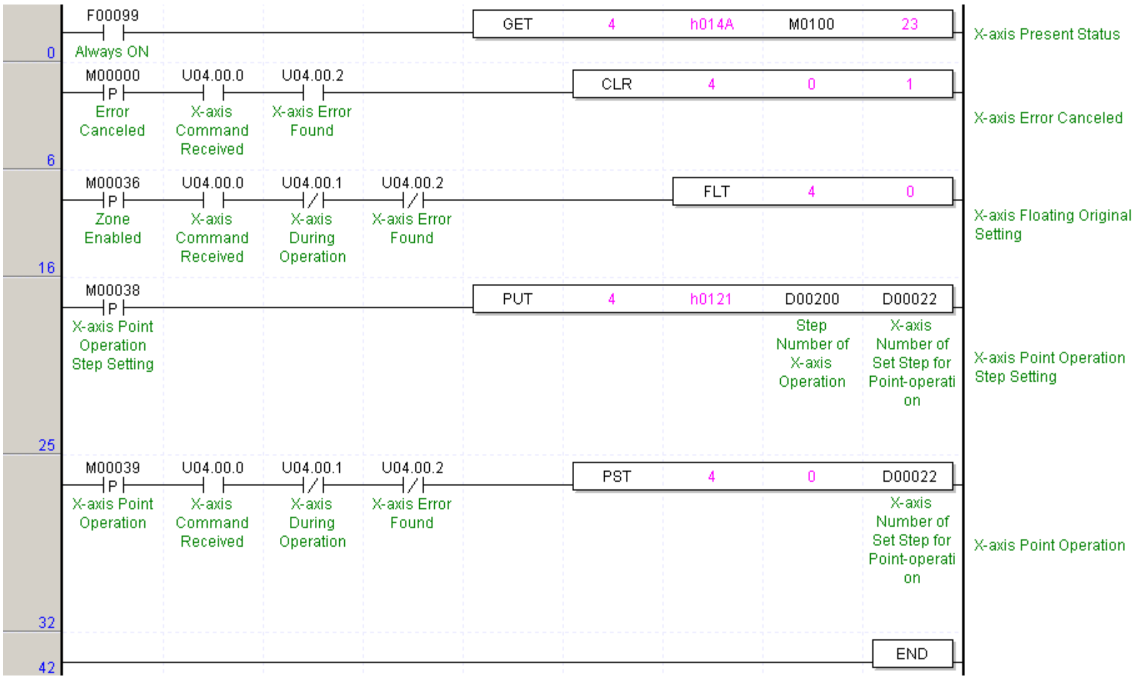
▶APM Software Package Setting

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 [㎳]	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	Keep	Single	6000	0	**0**	1	3000	20	CW
	11	Absolute	Position	Keep	Single	10000	0	**0**	1	4000	20	CW
	12	Absolute	Position	Keep	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



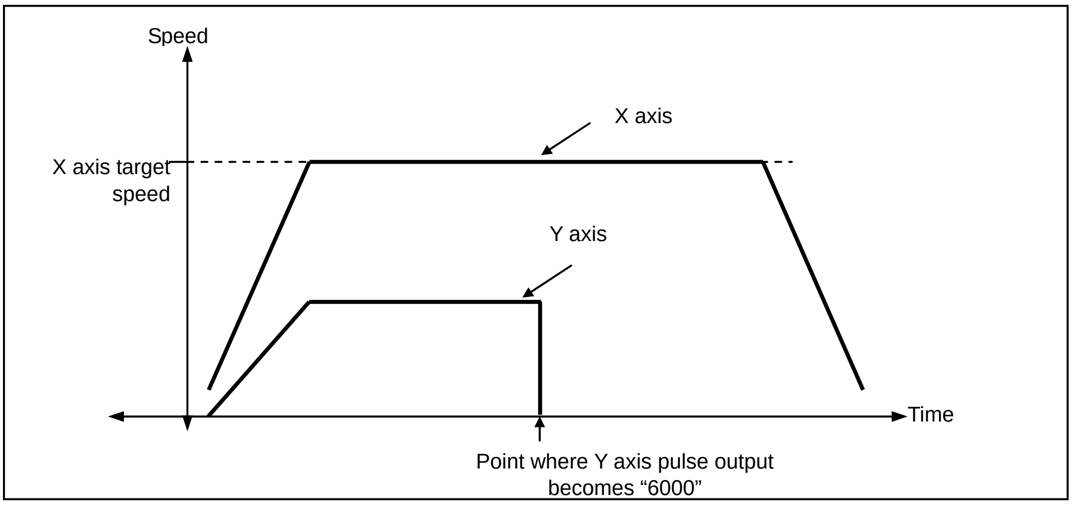
Program 3.32 Point Start

3.24 Speed Synchronization with Position

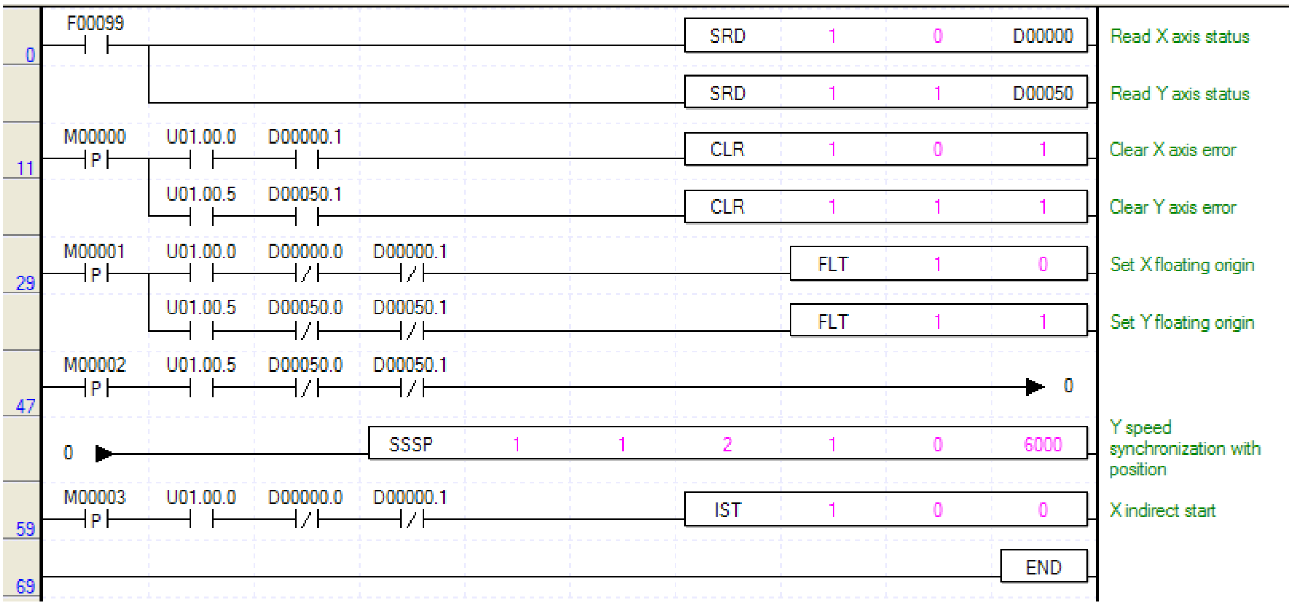
- Speed synchronization with position sets target position at speed synchronization subordinate axis and if speed synchronization main axis produces pulse as many as target position, it ends speed synchronization operation.
- Target position of speed synchronization with position can have +, - sign and that is incremental position value. For example, target position of speed synchronization with position is set as 5000, if subordinate axis outputs 5000 pulse with speed synchronization operation, speed synchronization operation ends automatically.

[**Example**]

If Y axis executes speed synchronization operation with position setting X axis as main axis and main axis rate : subordinate axis = 2 : 1, subordinate axis target position “6000”, it operates as follows.



- Program



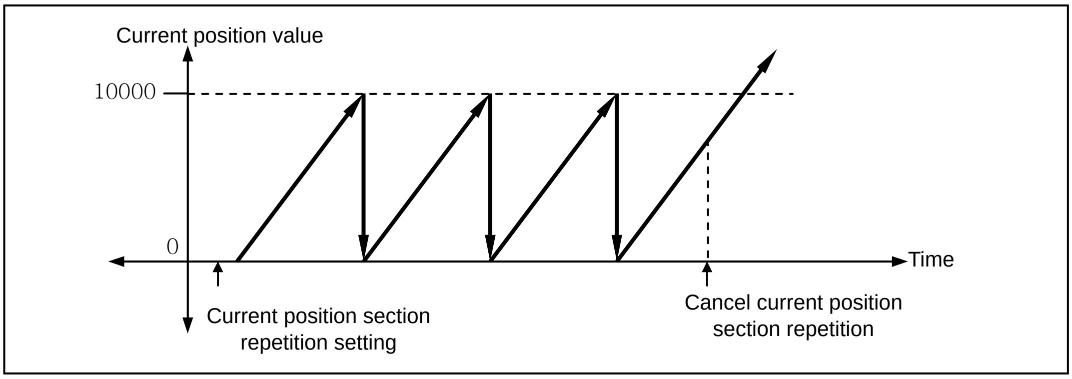
Program 3.33 speed synchronization with position

3.25 Current Position Section Repetition

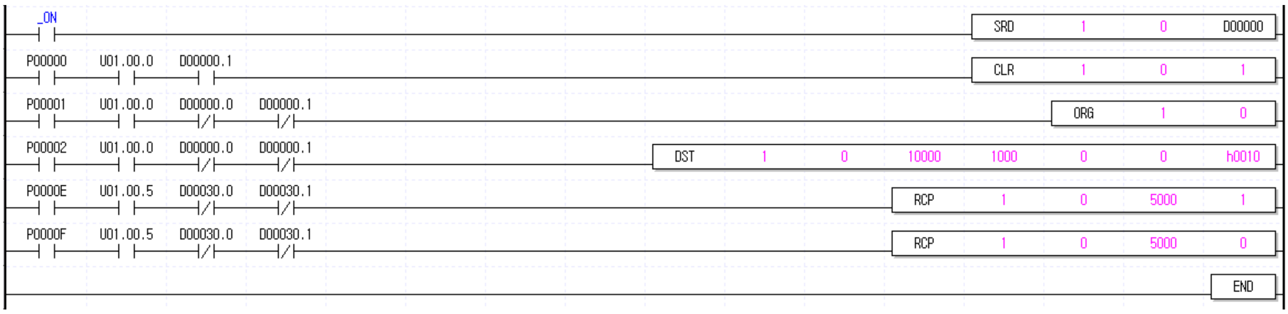
- Current position section repetition indicates current position value within section set as current position section repetition at operation executed direct start.
- Current position section repetition function is effective in operation executed by direct start
- Set or cancel current position section repetition by setting item of current position section repetition

[Example]

If you set section value as “10000” at current position section repetition command, when operating as direct start, the current position is indicates as the following status.



▶ Program

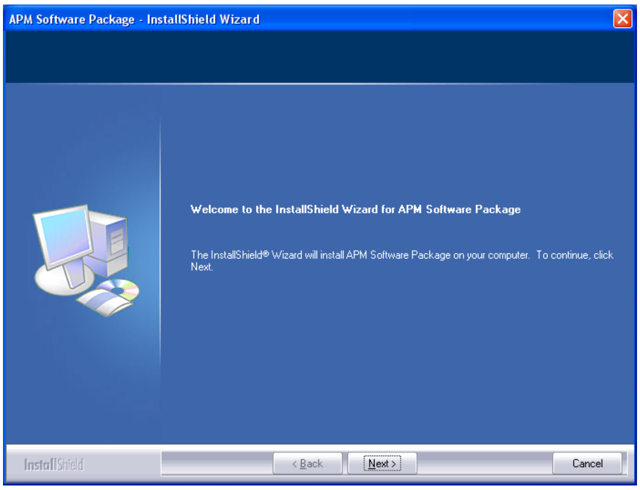


Chapter 4 APM Software Package

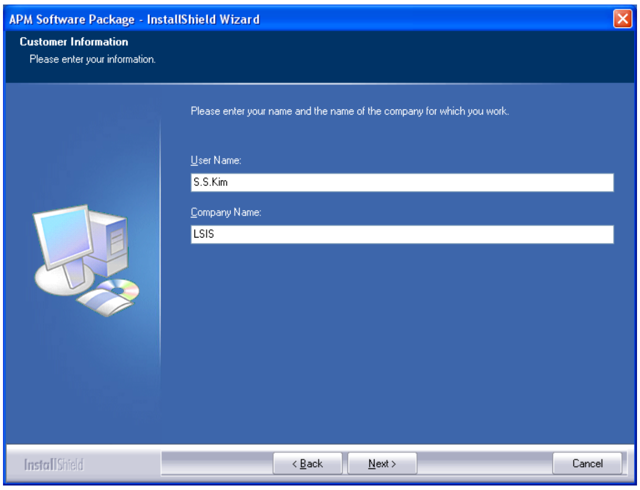
4.1 APM Software Package Installation and Removal

4.1.1 APM Software package Installation Procedure

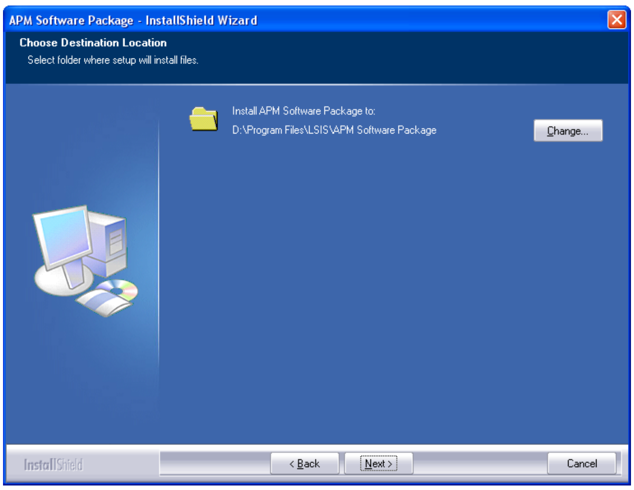
(1) If double-clicking installation file, it shows the following window. Then, pressing [Next] button, the step processing continues to the next step.



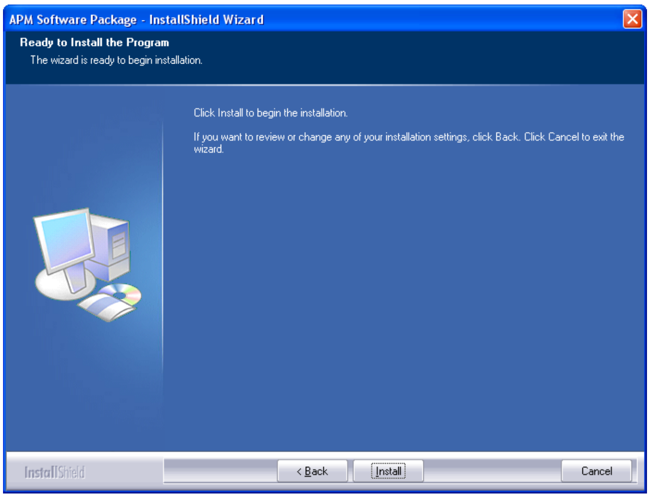
(2) After entering the user name and the company name or school name, if press [Next] button, it continues to the next step.



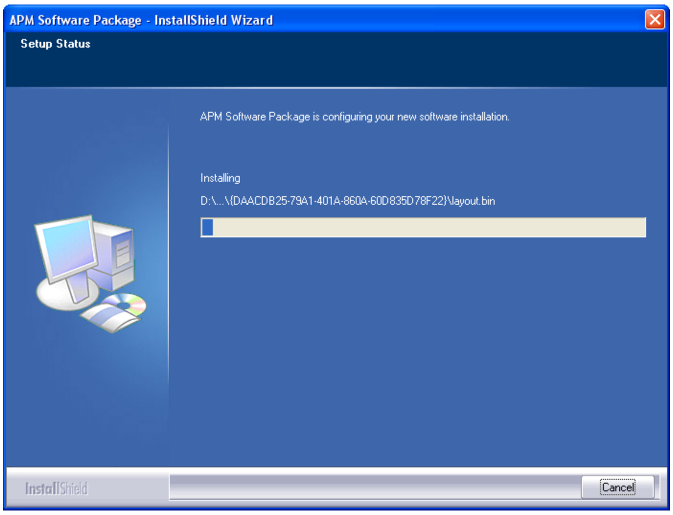
(3) After selecting the folder to install, press Next button.



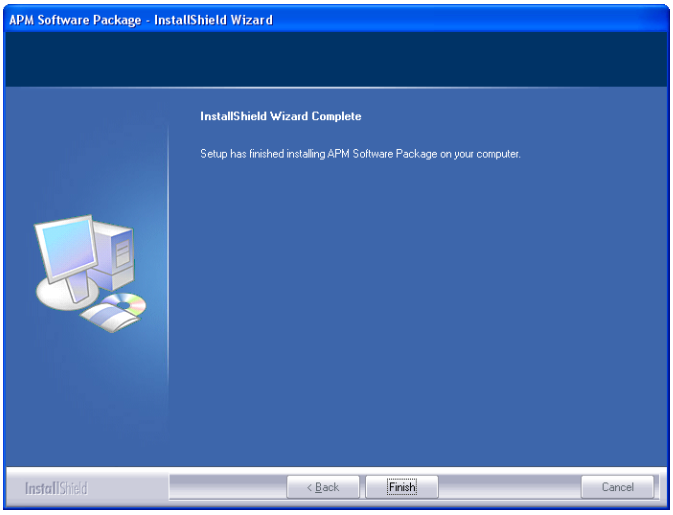
(4) To continue the installation procedure, press Install button. If pressing Back button, it returns to the previous step.



(5) The following window shows the installation progression.



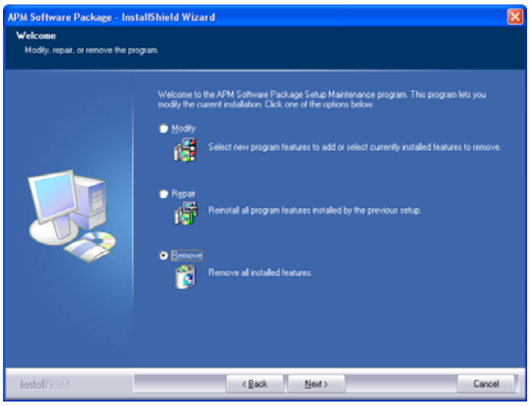
(6) If the following window appears, press End button to complete the installation procedure.



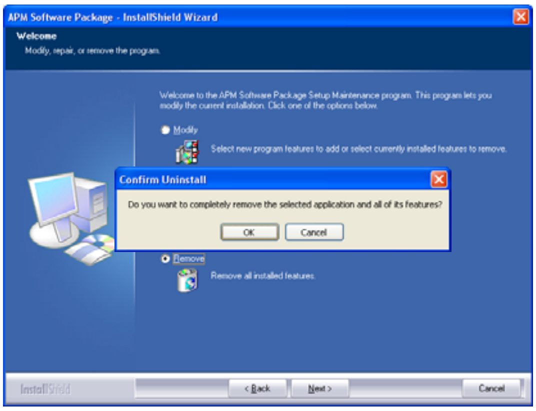
※ When a message stating 'Windows should be rebooted', you should reboot the computer for the normal action of APM Software package.

4.1.2 APM Software Package Removal Procedure

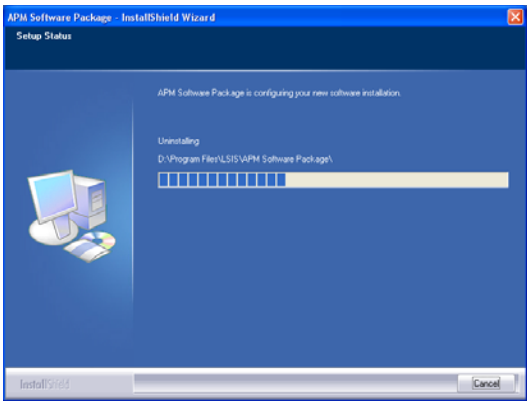
(1) If double-clicking Installation file after the APM Software pakage is installed, the following window appears. Select Remove and press Next and it starts removing the APM software package.



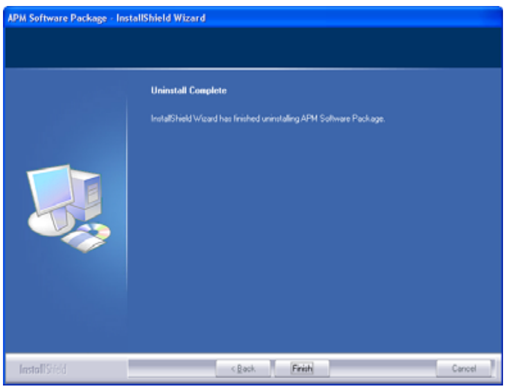
(2) If you press Verify button, APM software package removal begins.



(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

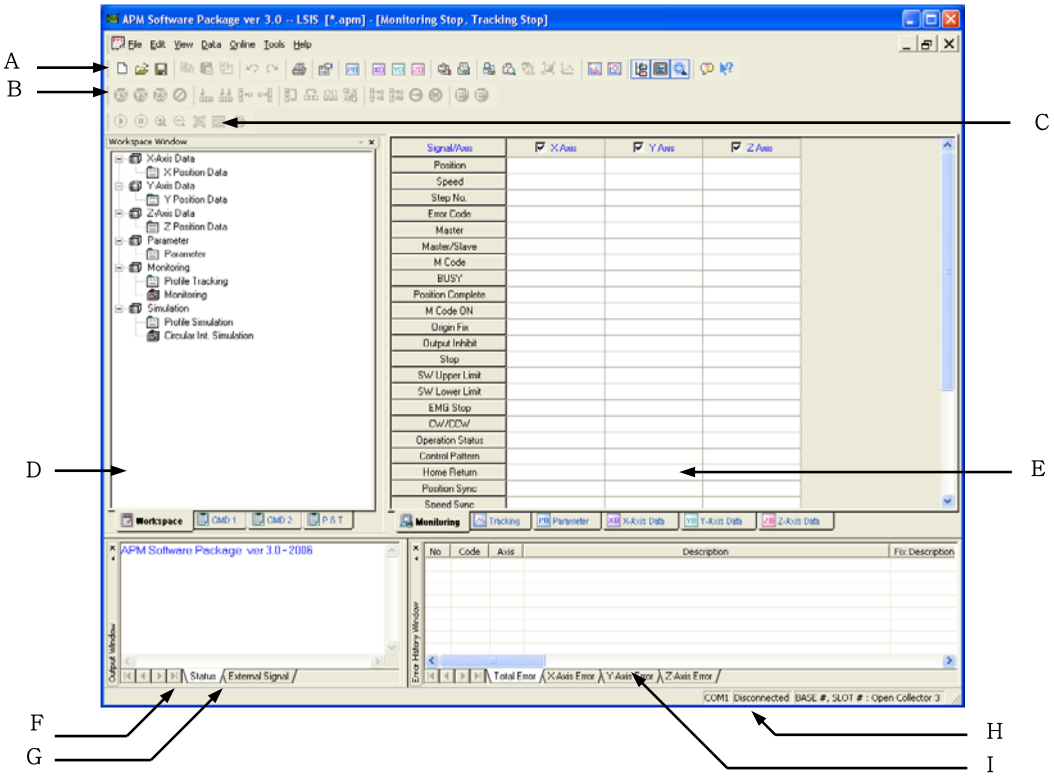


Figure 1. Initial Display of Program Execution

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.

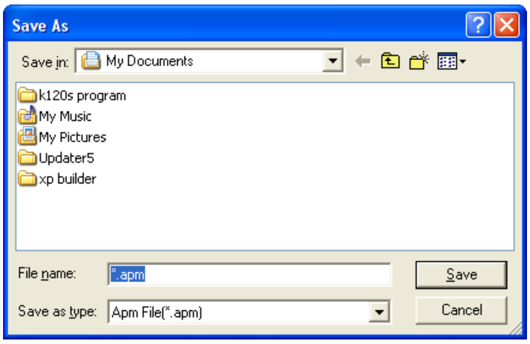


Fig. 2. The screen displayed when saving the working screen

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
	ACC/DEC No.3	1500 ms	1500 ms	1500 ms
	ACC/DEC No.4	2000 ms	2000 ms	2000 ms
Extended Parameter	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

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.

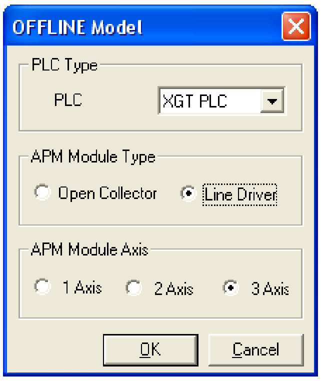


Fig. 4. Offline model setting dialogue box

(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.

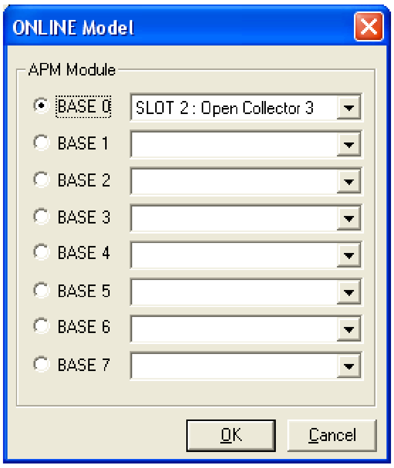


Fig. 5. Online model setting dialogue box

(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.

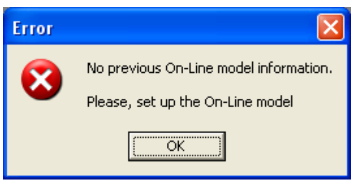


Fig. 6. Error indication for reconnection function

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 fort 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.

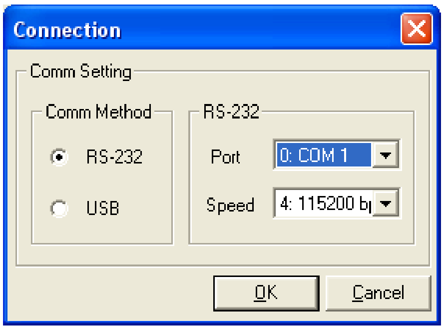


Fig. 7 Communication environment setting dialogue box

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	PR	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
	ACC/DEC No.4	2000 ms	2000 ms	2000 ms
Extended Parameter	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
	Position Complete Cond	0: Dwell	0: Dwell	0: Dwell
	Driver Ready/Inposition	0: Driver Ready	0: Driver Ready	0: Driver Ready
Home Parameter	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

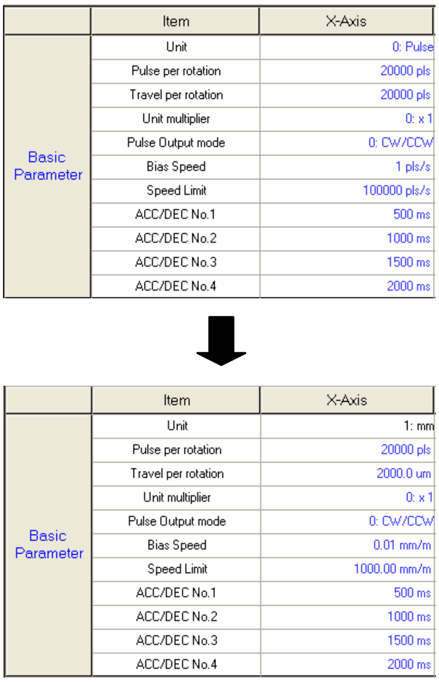
With **[Automatic range and data error check function]** for each item, it is available to modify the error directly through detailed error message when the user entered the data wrong. If such data error occurs, it will be restored as the previous value automatically. Especially, when the user enters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

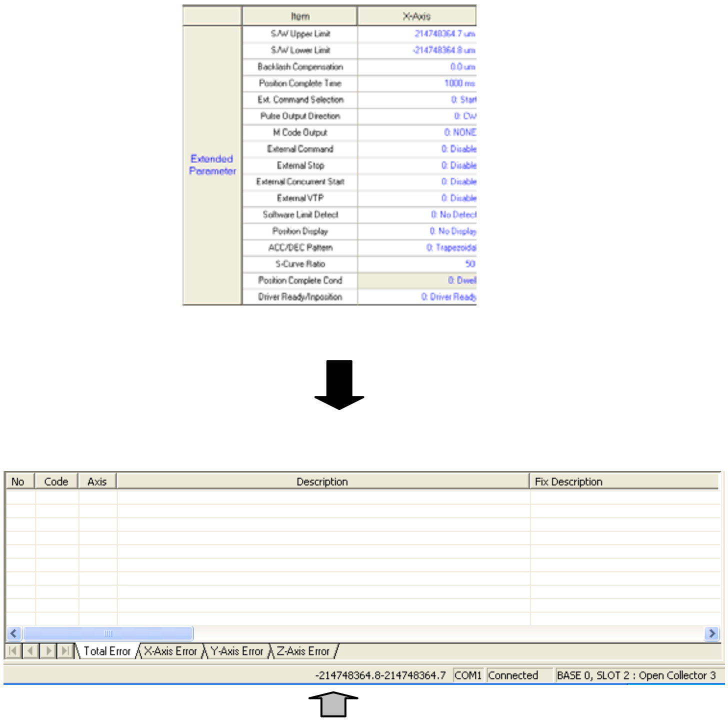
(4) Unit conversion function and Parameter max./min. indication function

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.



Operation parameter screen

Figure 9. Unit conversion function(pulse → mm)



State bar

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

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

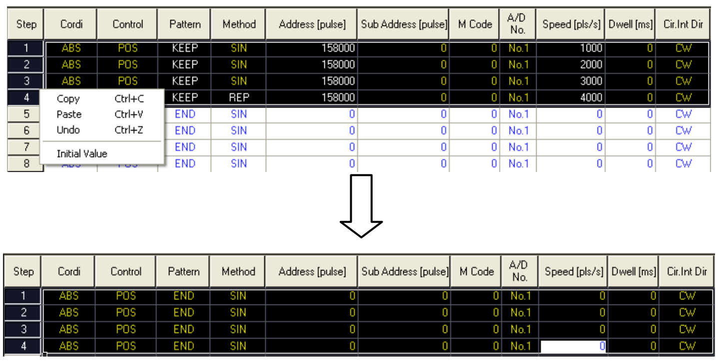
With **[Automatic range and data error check function]** for each item, it is available to modify the error directly through detailed error message when the user entered the data wrong. If such data error occurs, it will be restored as the previous value automatically.

(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.



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.

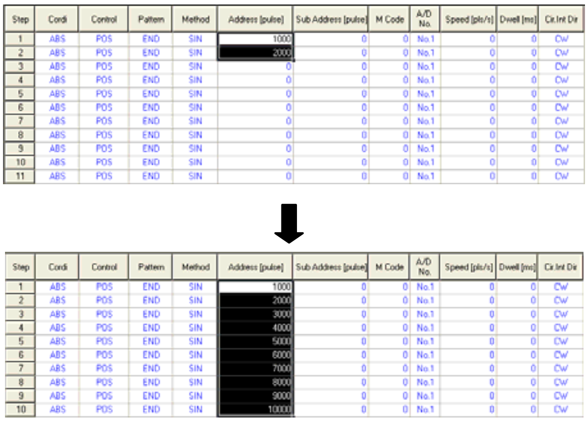
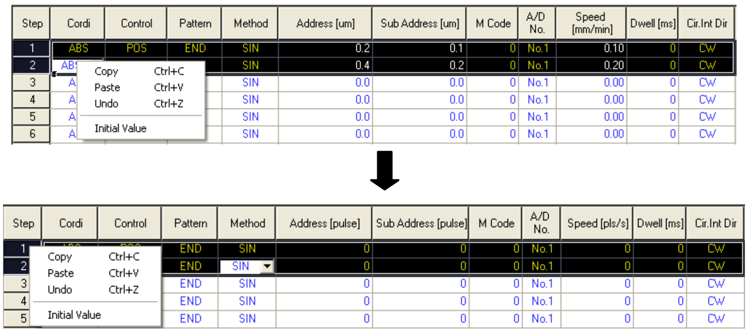


Fig. 13. Auto-Fill function

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.



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.

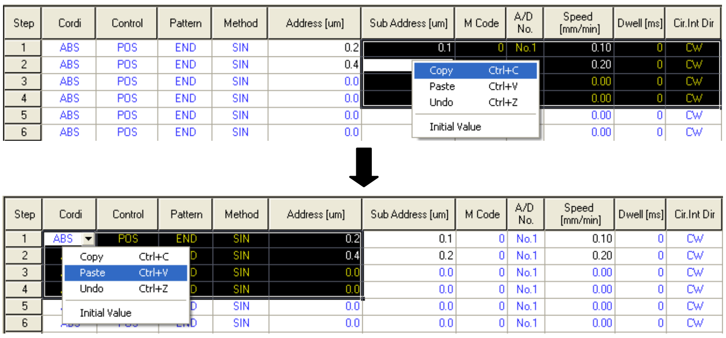


Fig. 15. [Copy/Paste] error in different block

(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]**.

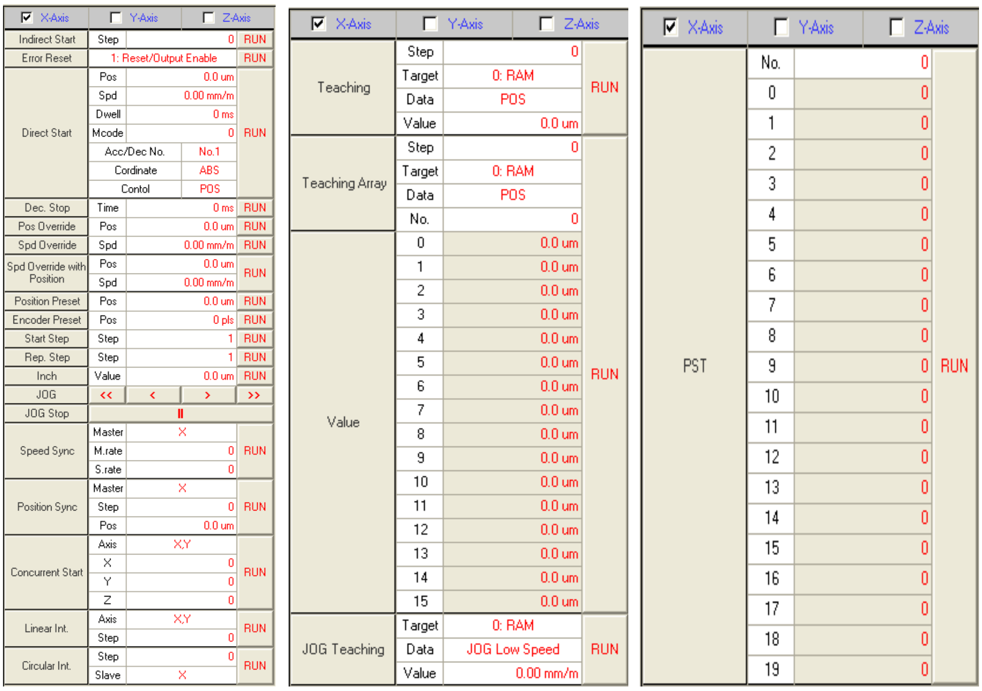
(2) After executing Monitoring or Tracking and setting the command axis, if you click the command item button or click the command item button right after setting the command axis, monitoring is automatically carried out and the corresponding command item is executed.

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



CMD1 CMD2 PST

Fig. 18. Command screen configuration

(2) Unit conversion function

The command item related to **Position** and **Speed** carries out the unit conversion function based on the corresponding axis unit set by operation parameter.

(3) Automatic range and data error check function

The command screen contains **Automatic range and data error check function** for each item.

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

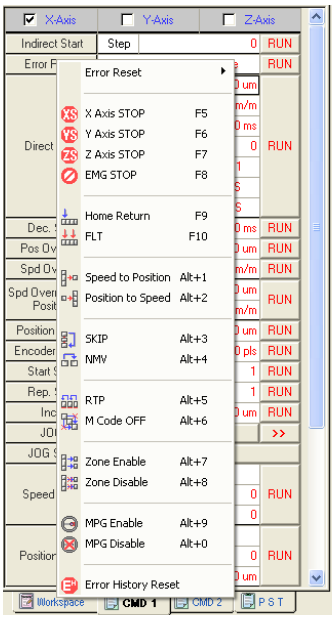
The data to enter in the command item is not saved as a file other than operation data and maintains the input value only when the program is running and it shall be set as an initial value whenever the program begins. The command required to enter the **Axis information** from command items such as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

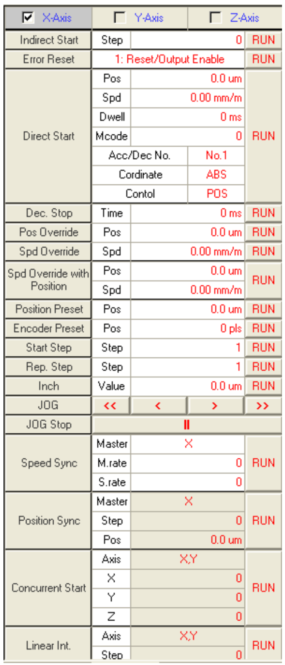


Fig. 20. The command items prohibited when selecting 1 axis APM module

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.

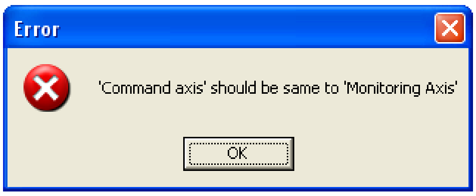


Fig. 22. Command axis setting error message

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.

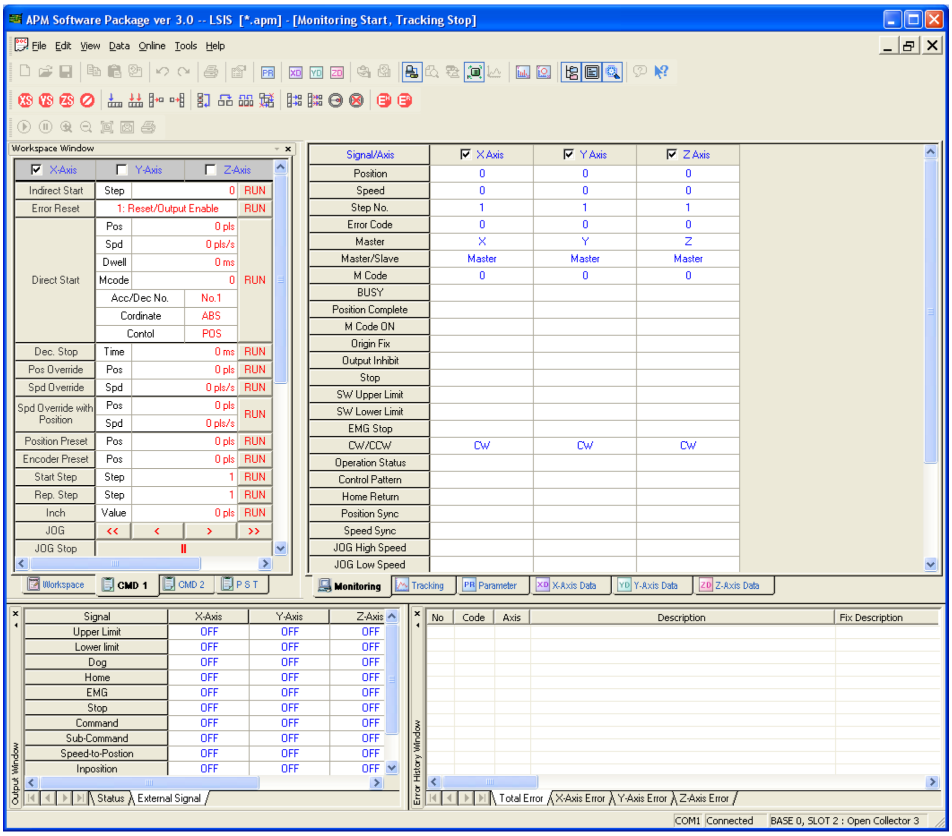


Fig 23. 3 axis APM module monitoring screen

(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.

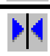
Items	Tool gathering	Hot key
Tracking		SHIFT + T
Start		None
Pause		None
Enlarge		None
Reduce		None
Area enlargement		None
Data indication		None
Save		None
Print		None

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.

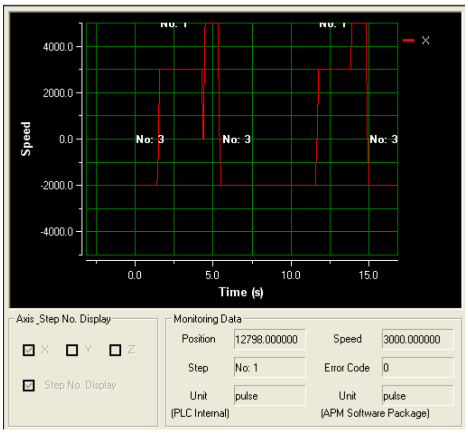


Fig. 25. Tracking screen

- 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

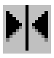
Items	Tool gathering	Function
Start		When Tracking screen pauses or the coordinate of the screen is changed by Enlarge/Reduce function, if you press this button, the coordinate shall be restored as same as set at first and Tracking starts again.
Pause		Used for the **Pause** of Tracking screen.
Enlarge		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.

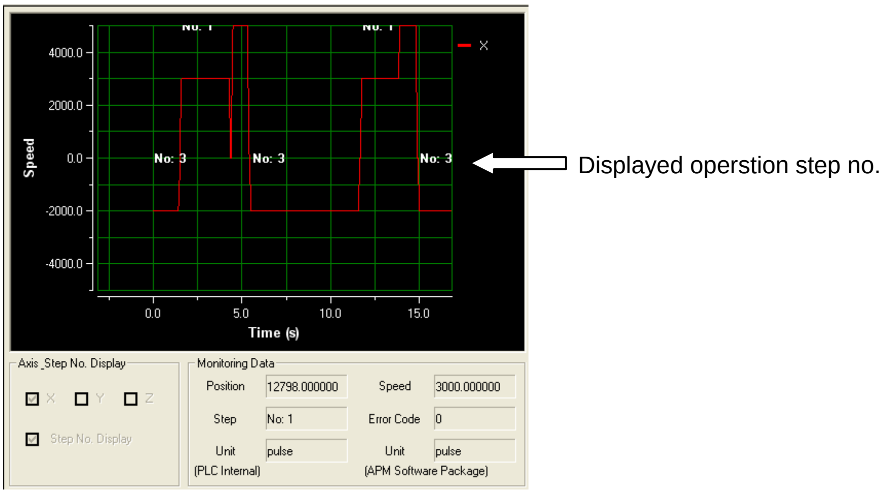


Fig 26. Tracking – Step no. indication function

(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

(1) 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

(2) 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.

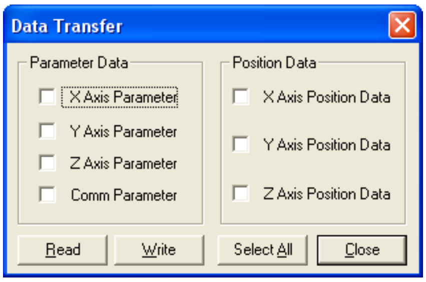
Items	Tool gathering	Hot key
Data Read/Write		SHIFT + R

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.

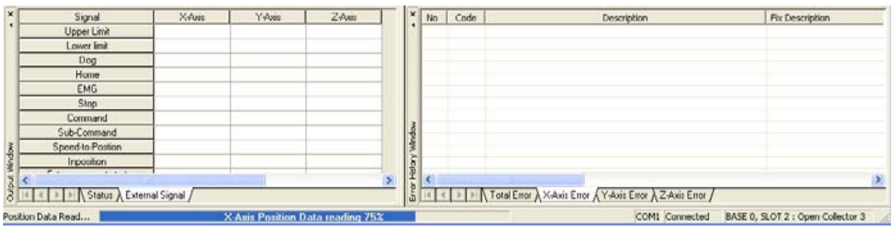


Fig. 28. Data read/write proceeding status indication

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.**

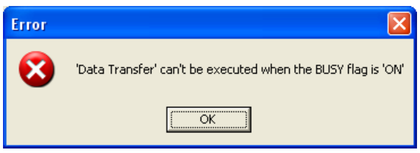


Fig. 29. Error message

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.

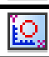
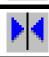
Items	Tool gathering	Hot key
Profile simulation		SHIFT + F
Circular interpolation simulation		SHIFT + I
Restore		None
Enlarge		None
Reduce		None
Area enlargement		None
Data indication		None

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.

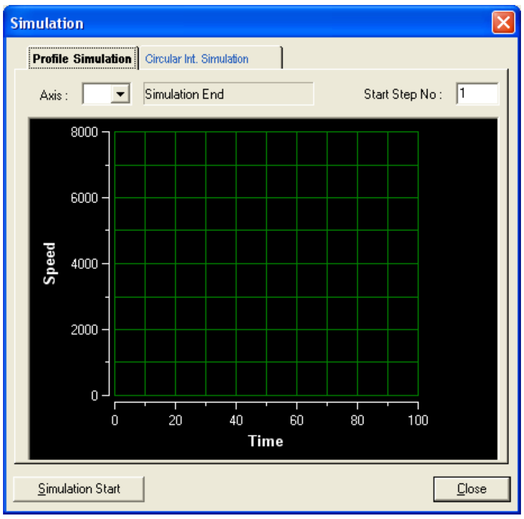


Fig. 30. Profile simulation screen

(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.

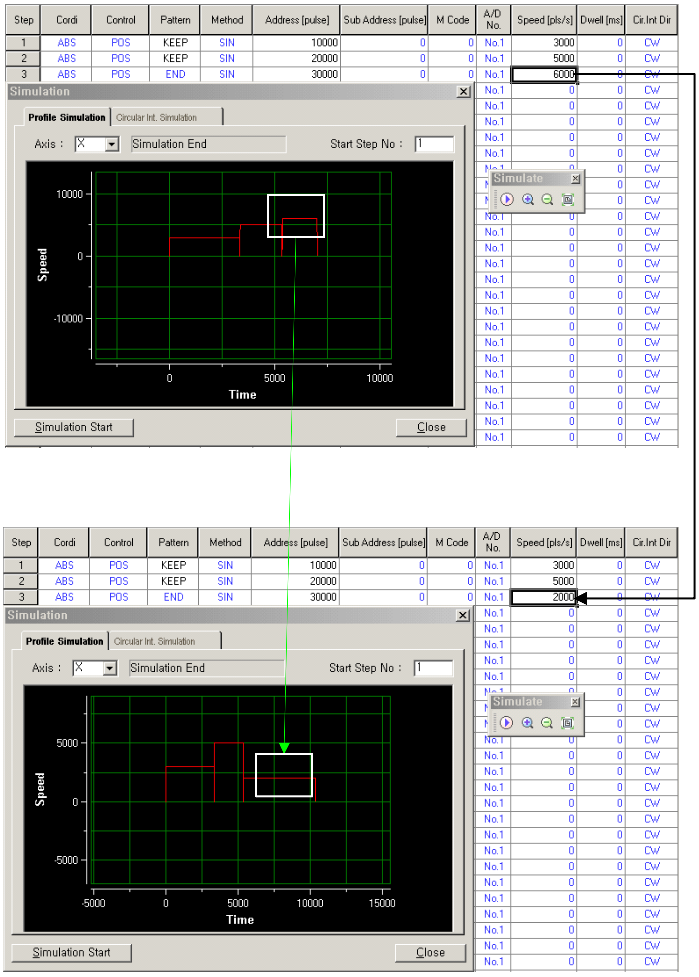


Fig. 31. Profile simulation Run-Time Refresh function

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.

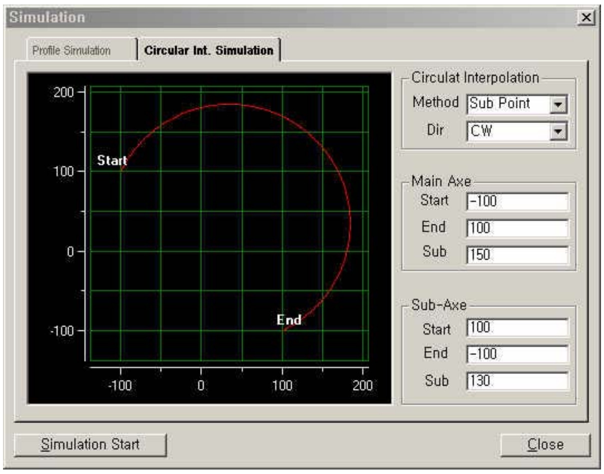


Fig. 32. Circular interpolation simulation by Sub Point method

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.

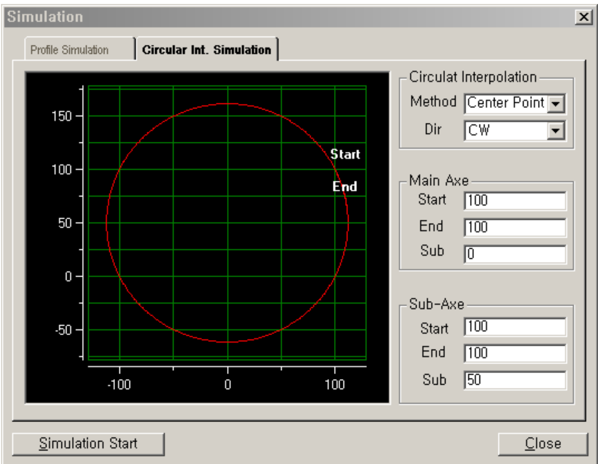


Fig. 33. Circular interpolation simulation by Center point method

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.

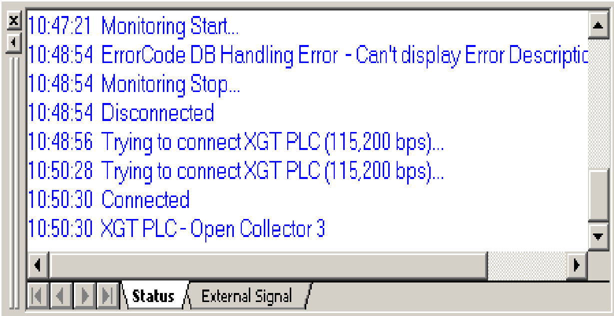


Fig. 34. Status screen

4.12.2 External I/O signal function

1) Function Description

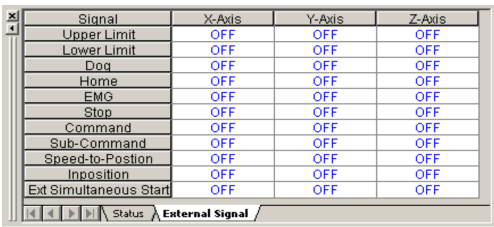
(1) Configuration

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
Dog	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-Postion	OFF	OFF	OFF
Inposition	OFF	OFF	OFF
Ext Simultaneous Start	OFF	OFF	OFF

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.

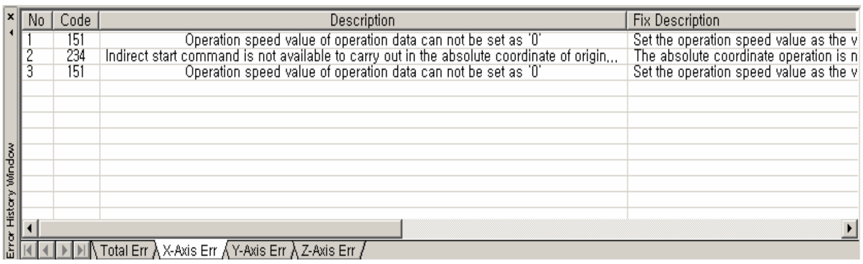


Fig. 36. Error history window

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.

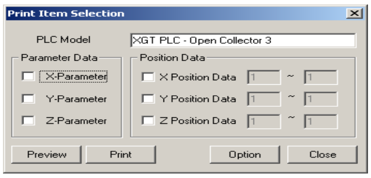


Fig. 37. Print dialogue box

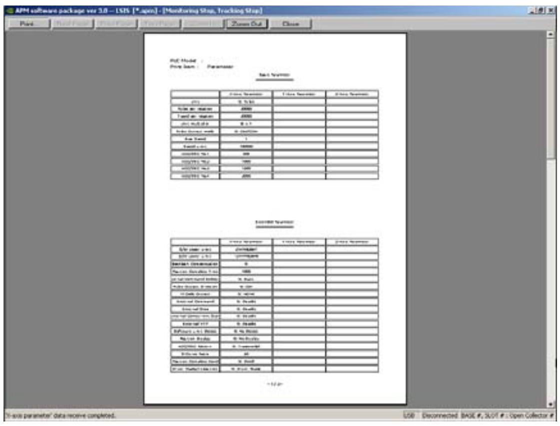


Fig. 38. Preview screen and Printer setting dialogue box

(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.

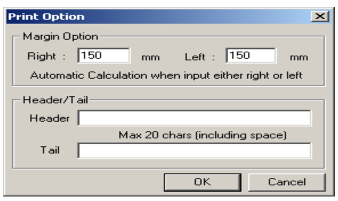


Fig. 39. Print option dialogue box

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.

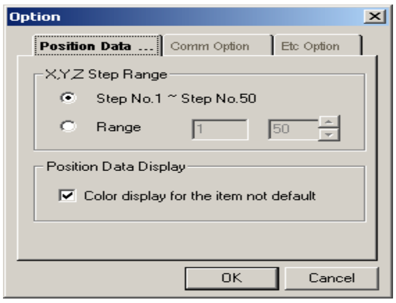


Fig. 40. Environment setting screen – Operation data option

(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.

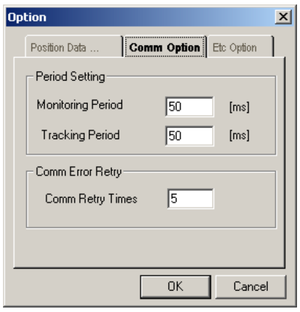


Fig. 41. Environment setting screen – Communication option

[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.

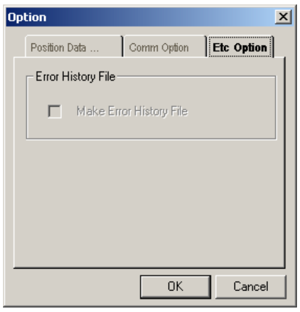


Fig. 42. Environment setting screen – Other option

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 sens 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 5 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]

Article 5.1

	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 um	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

Article 5.2

	Item	X-Axis	Y-Axis	Z-Axis
Extended Parameter	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
	Home Method	0: Driver Ready	0: Driver Ready	0: Driver Ready

Article 5.3

	Item	X-Axis	Y-Axis	Z-Axis
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

Article 5.4

	Item	X-Axis	Y-Axis	Z-Axis
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 Sigaal	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

	Item	Value
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

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 um	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		㎜ : 1 ~ 65,535 [X10^{-1} ㎛] 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		㎜ : 1 ~ 2,000,000,000 [X10^{-2} ㎜/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		㎜ : 1 ~ 2,000,000,000 [X10^{-2} ㎜/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 ㎛ (approx.6.5 ㎜).

▶ 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 ㎛, it is required to adjust the unit allocation so that the travel distance per rotation (Al) does not exceed 6553.5 ㎛.

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

(AL) = (Al) ×(Am) = 6000 ×1

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

(AL) = (Al) ×(Am) = 6000 ×10

= 600 ×100

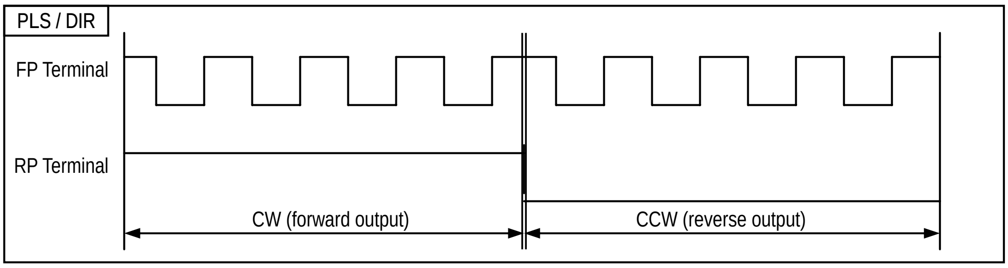
5.1.4 Pulse Output Mode

▶ 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.

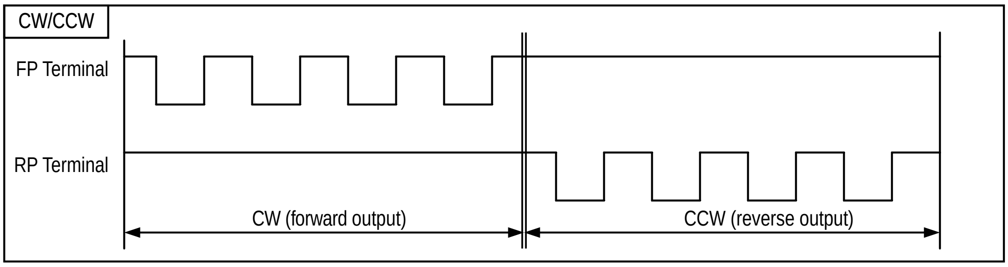
1) PLS/DIR mode

▶ 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.



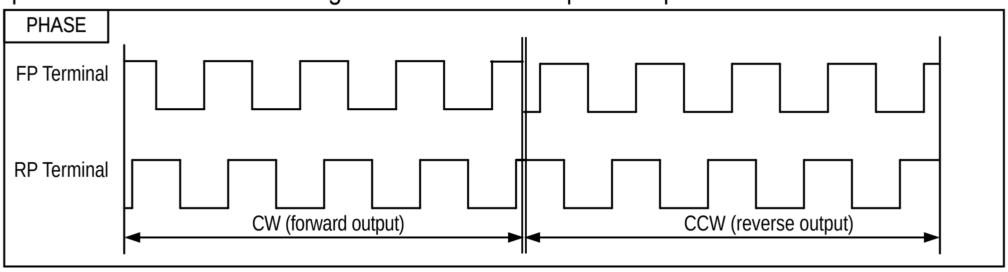
2) CW/CCW mode

▶ 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”.

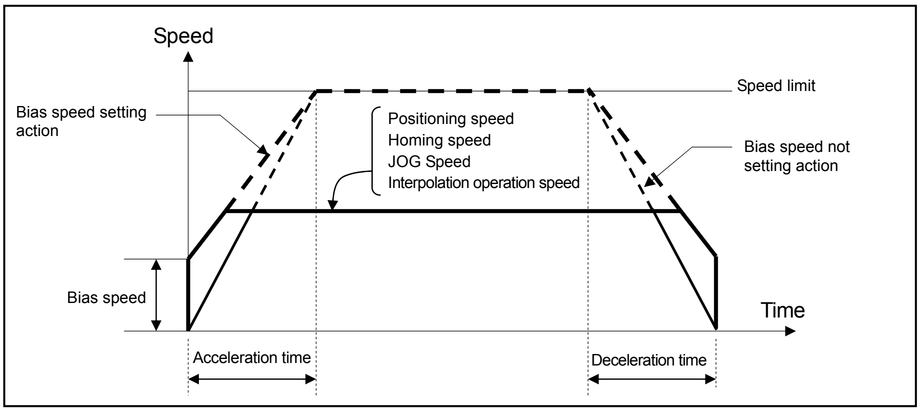
▶ The setting range is 0～200,000[pps] for Open Collector type and 0~1,000,000[pps] for line driver.

▶ 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 ≤ Positioning speed data
2) Bias speed ≤ Homing low speed ≤ Homing high speed
3) Bias speed ≤ 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.

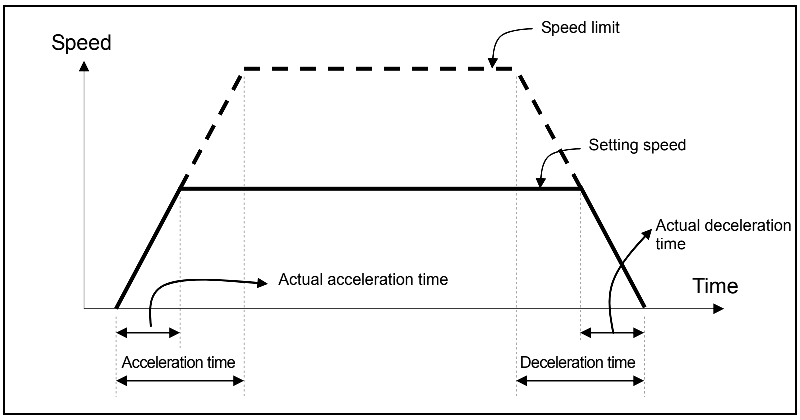
▶The setting range is 0 ～ 65,535 (unit : 1ms) at each axis.

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 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
	Home Method	0: Driver Ready	0: Driver Ready	0: Driver Ready

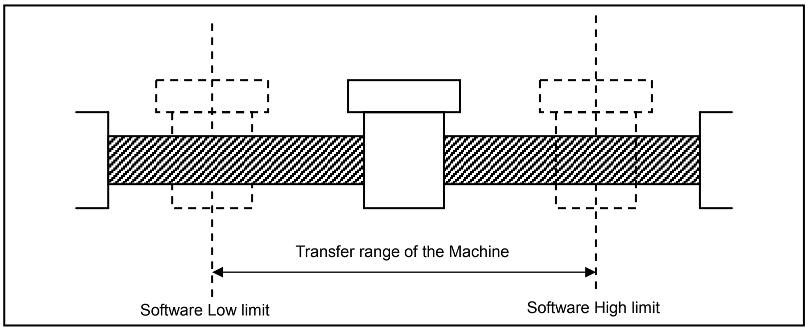
[Configuration of Extended Parameter]

Items	Setting Range	Initial value
Software high limit	㎜ : -2147483648 ~ 2147483647 [$X10^{-4}$ ㎜] inch : -2147483648 ~ 2147483647 [$X10^{-5}$inch] degree : -2147483648 ~ 2147483647 [$X10^{-5}$degree] pulse : -2147483648 ~ 2147483647 [pulse]	2147483647
Software low limit	㎜ : -2147483648 ~ 2147483647 [$X10^{-4}$ ㎜] inch : -2147483648 ~ 2147483647 [$X10^{-5}$inch] degree : -2147483648 ~ 2147483647 [$X10^{-5}$degree] pulse : -2147483648 ~ 2147483647 [pulse]	-2147483648
Backlash compensation amount	㎜ : 0 ~ 65,535 [$X10^{-1}$ ㎛] inch : 0 ~ 65,535 [$X10^{-5}$inch] degree : 0 ~ 65,535 [$X10^{-5}$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.

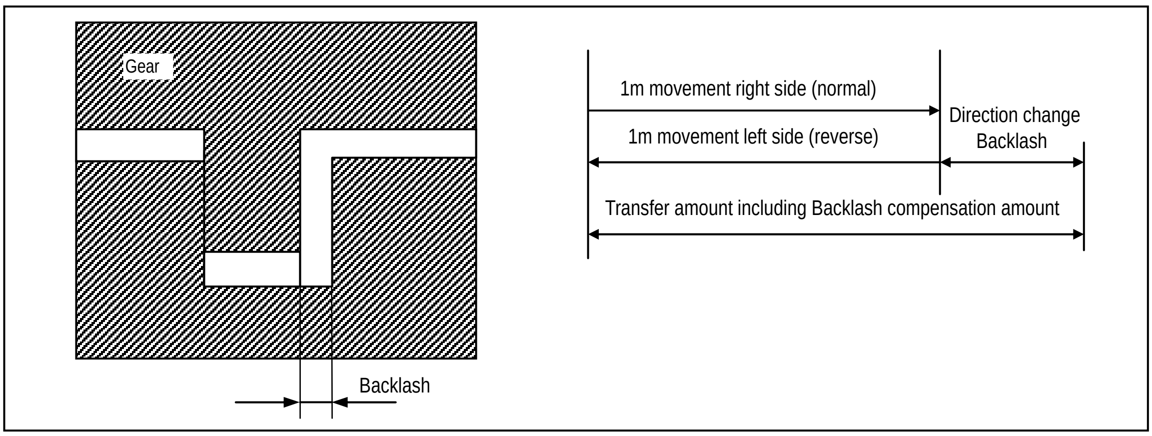
▶This is used for positioning operation, inching operation and jog operation

▶The setting range is 0 ~ 65,535(unit: pulse) at each axis.

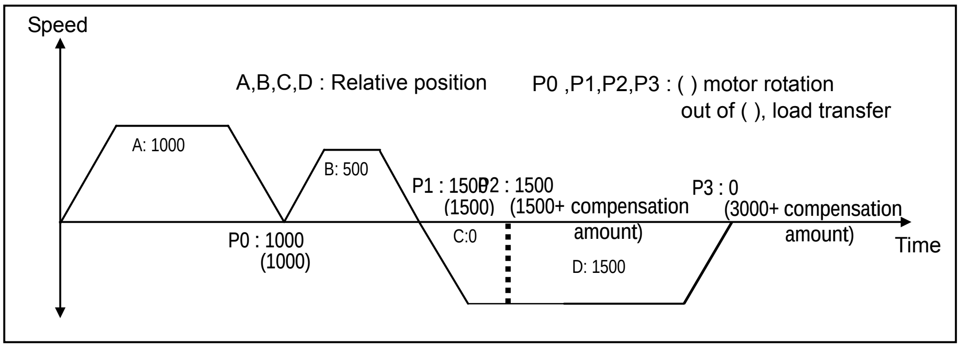
Notes

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

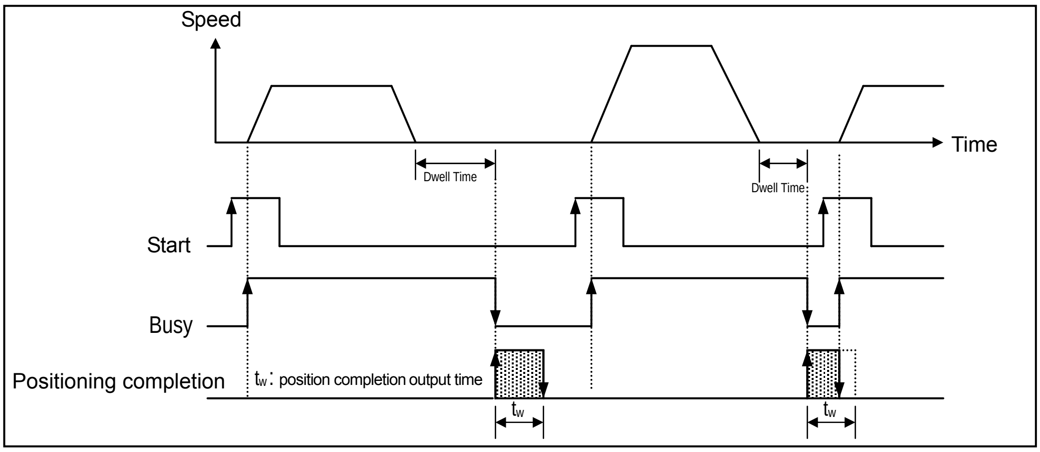
▶Positioning completion time shall be OFF after sustaining “ON” for the setting time after Positioning is completed during single operation, repeat operation, keep operation, continuous operation, linear interpolation operation, circular interpolation operation, speed/position switching control operation (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.

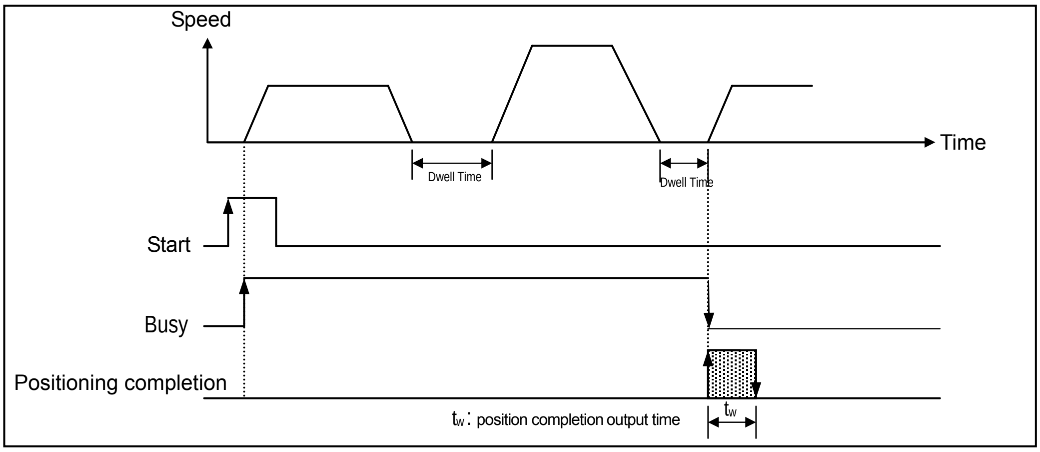
And only in case that keep operation mode and continuous operation mode is ended completely, the positioning end signal shall be outputted.

▶ The setting range is 0 ~ 65,535 (unit: 1 ㎳).

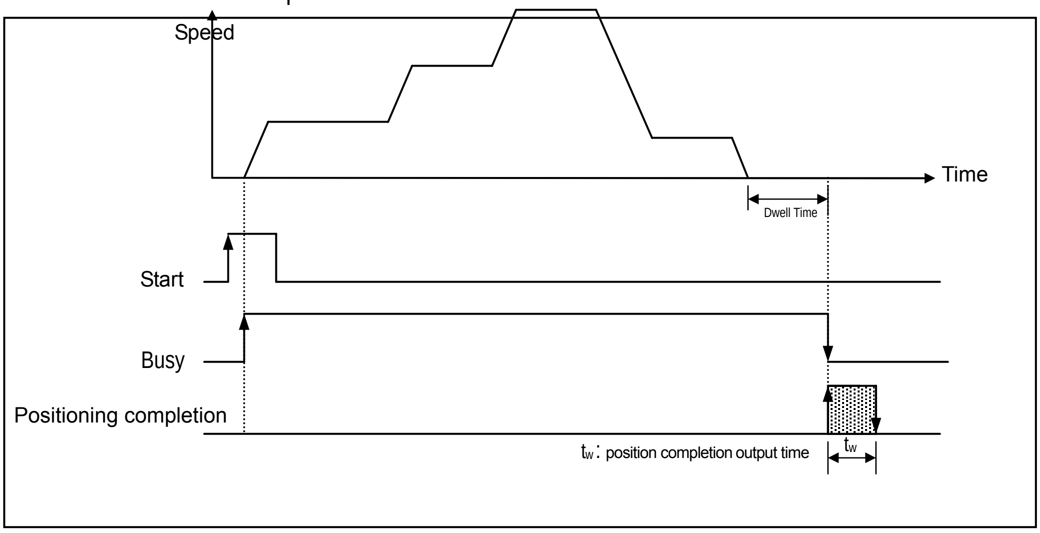
▶ The action of single operation mode is as follows :



▶ The action of Keep operation mode is as follows :



▶ The action of Continuous operation mode is as follows.



5.2.4 Selection of External Command

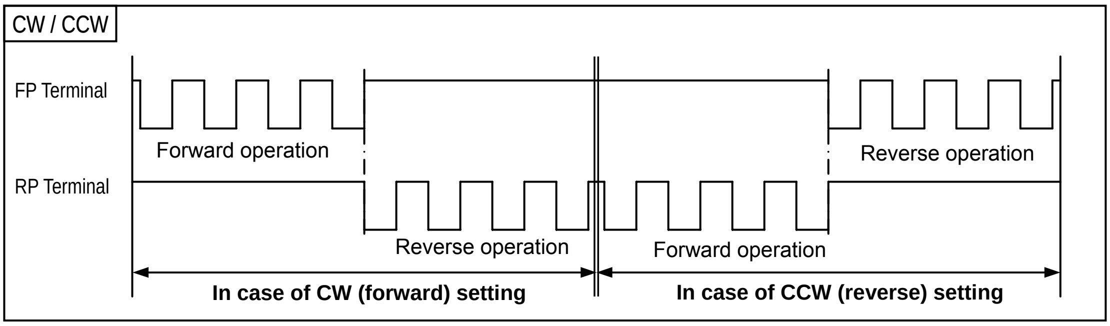
- ▶ It is available to select one among start, jog operation, skip for external command signal input.
- ▶ In case of using the external command signal, the external command should be set as “enabled”.
- ▶ In case of using jog operation as external command selection, the external command signal shall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

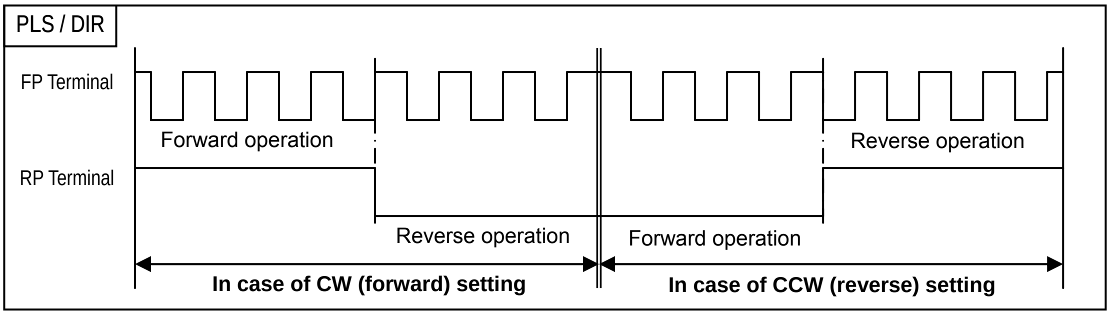
5.2.5 Pulse Output Direction

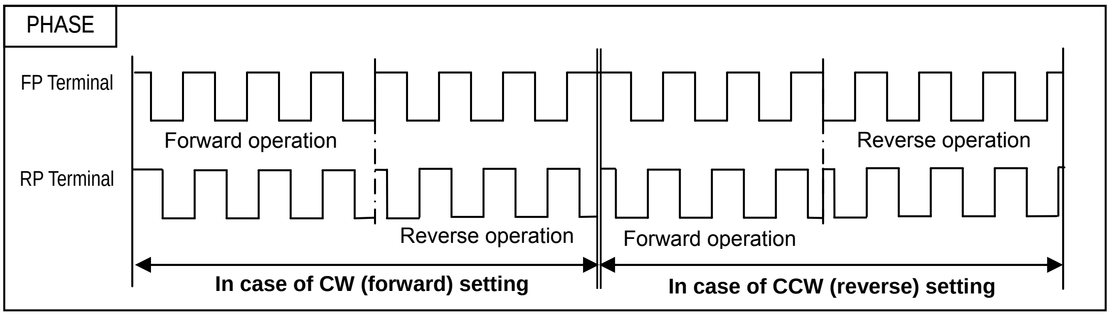
The below shows the pulse output direction in case of Low Active.

▶ 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.

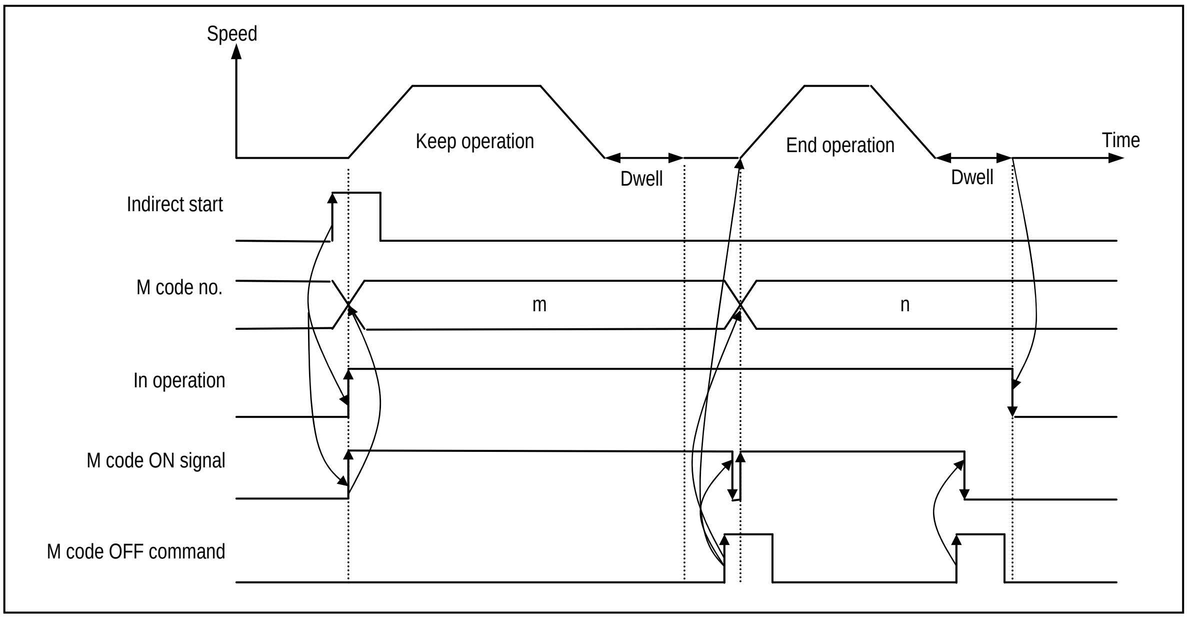
Notes

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.

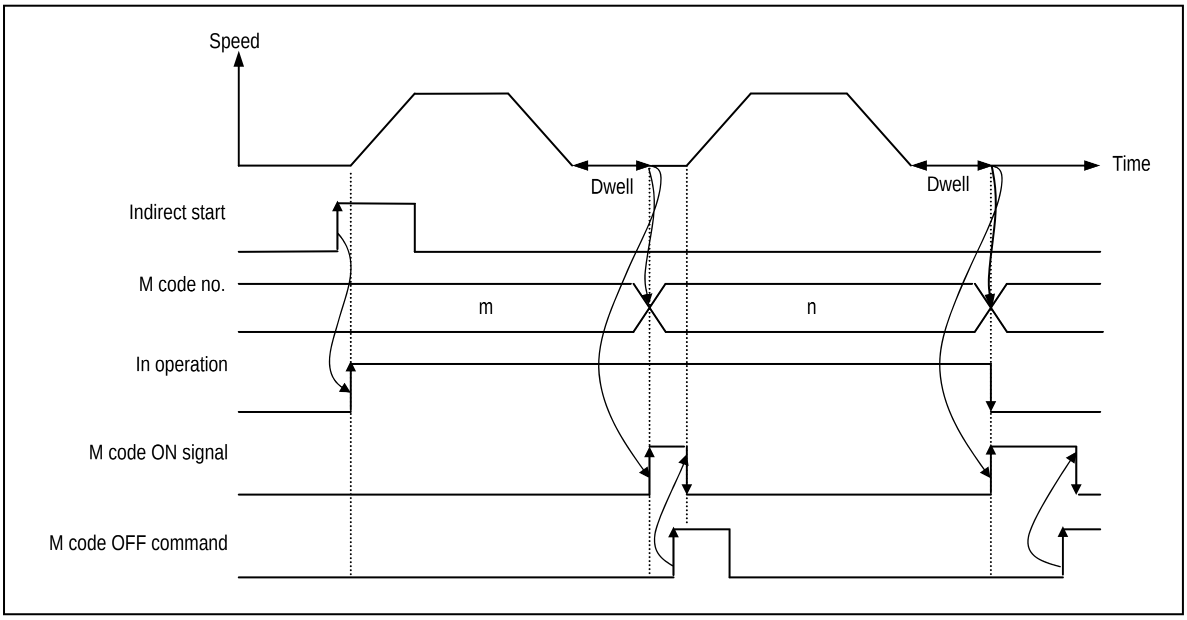
1) With mode

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

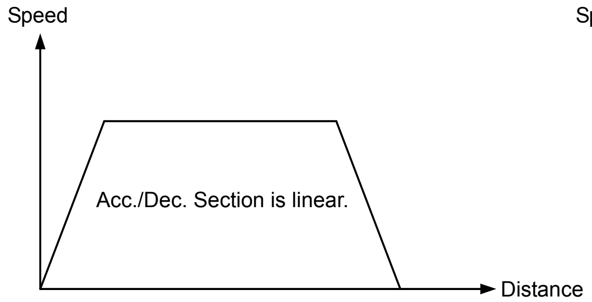
- ▶ This is used to stop the pulse output during equal speed operation by speed control because of detection of Software high/low limit.
- ▶ In this case, the origin determination is completed and the position indication during equal speed operation should be set as "indication" for the detection of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

5.2.12 Position indication during Equal Speed Operation

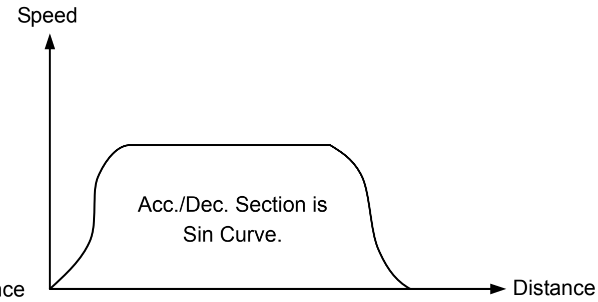
- ▶ If you want to know the current position during equal speed operation by speed control, the position indication during equal speed operation should be set as "indication".
- ▶ But the current position shall be indicated only in the state that the origin determination is completed.

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.



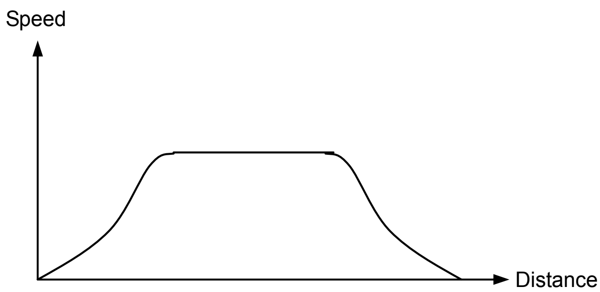
<Trapezoid Acceleration/Deceleration>



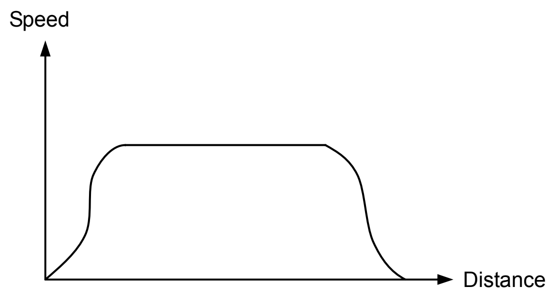
<S-Curve Acceleration/Deceleration>

5.2.14 S-Curve Rate

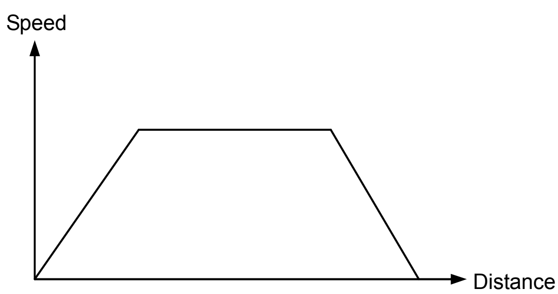
- ▶ In case of selecting S-Curve operation as an acceleration/deceleration pattern, S-Curve rate (1~100%) should be set.
- ▶ According to S-Curve rate, S-Curve operation pattern shall be formed in accordance with sine curve.
- ▶ If S-Curve rate is 100%, it becomes the same as trapezoid operation and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



S-curve rate : 50%



S-curve rate : 1%

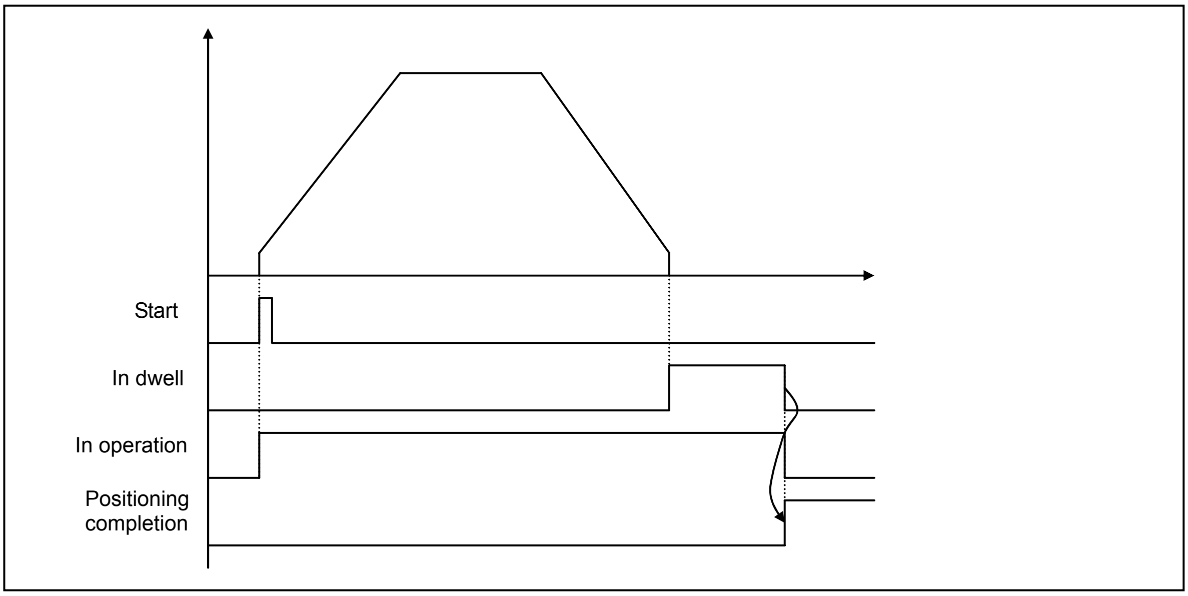


S-curve rate : 100%

5.2.15 Positioning End Condition

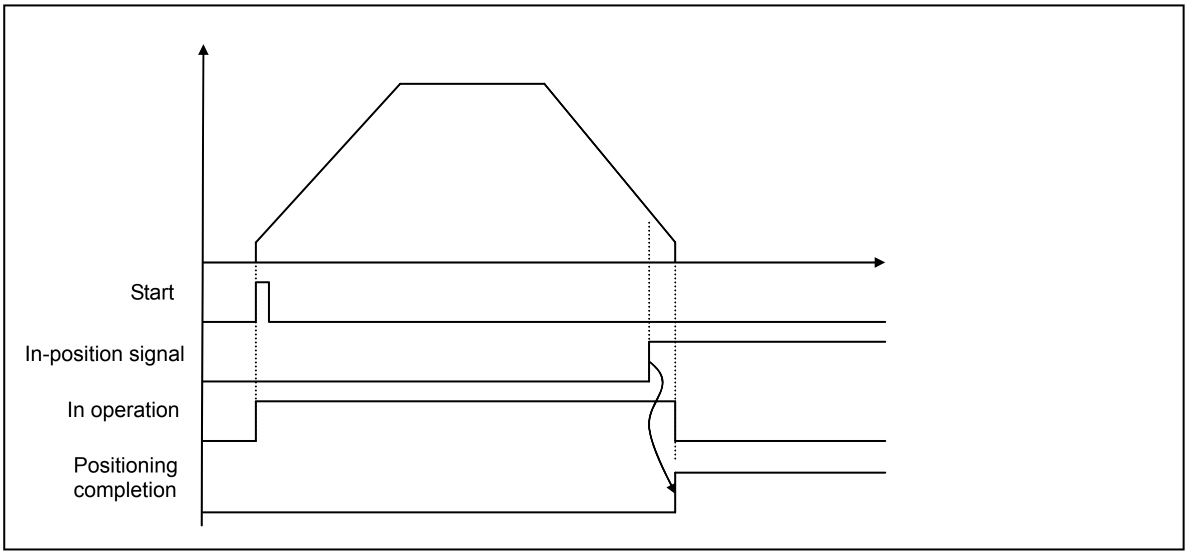
- ▶ Positioning End signal means the signal to notify that the operation set without stop factor after position operation has been completed.
- ▶ There are 4 kinds of methods for positioning end condition.
  1) by dwell time
  2) by in-position signal
  3) by using both dwell time and in-position signal
  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

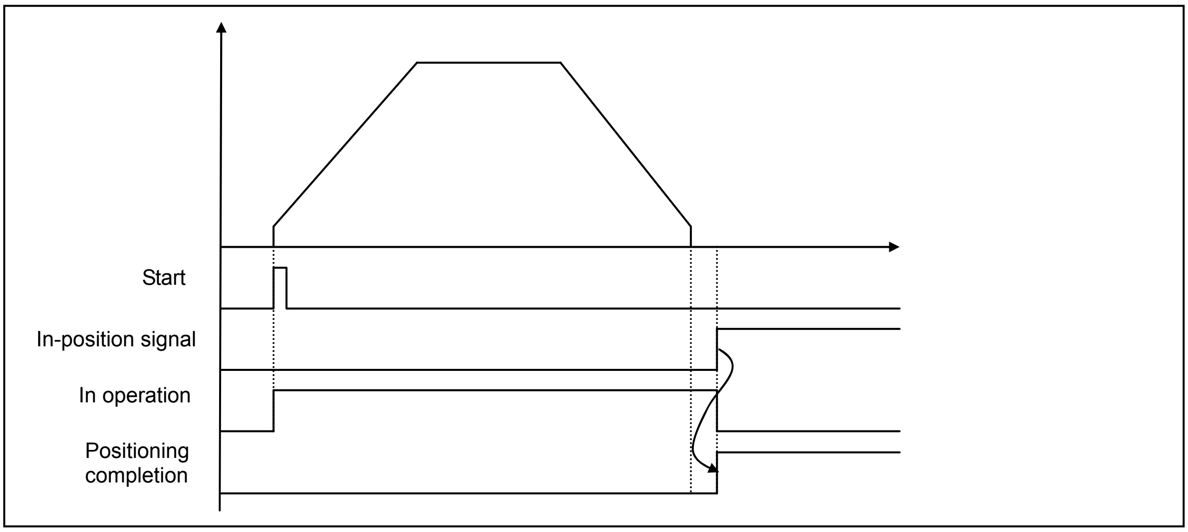


2) Method by in-position signal

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

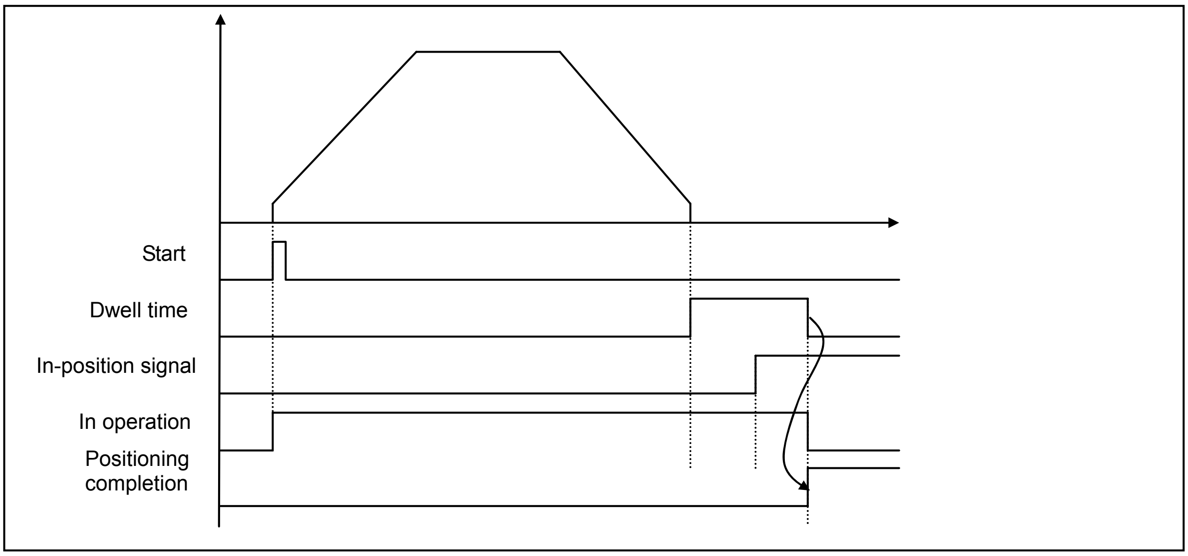


② In case that in-position signal is ON after positioning is completed

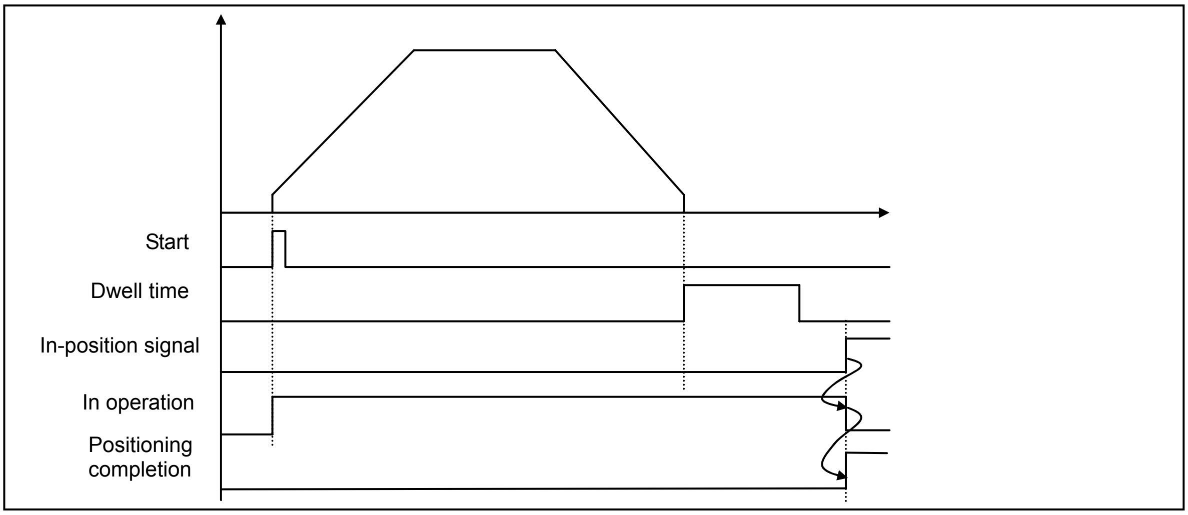


3) Method by using both dwell time and in-position signal

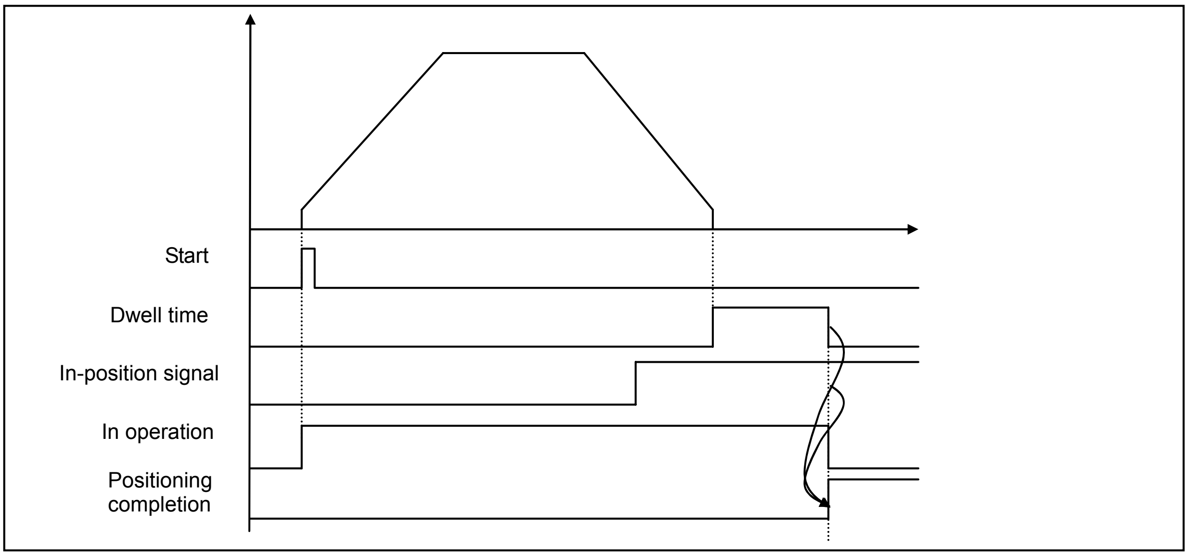
① In case that in-position signal occurs before dwell time is ended



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

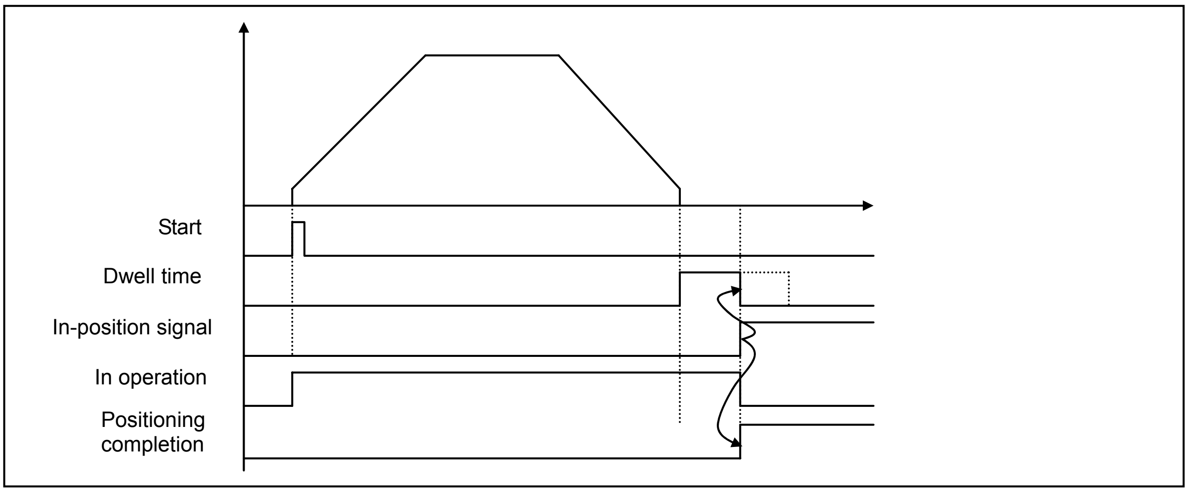


③ In case that in-position signal occurs during pulse output

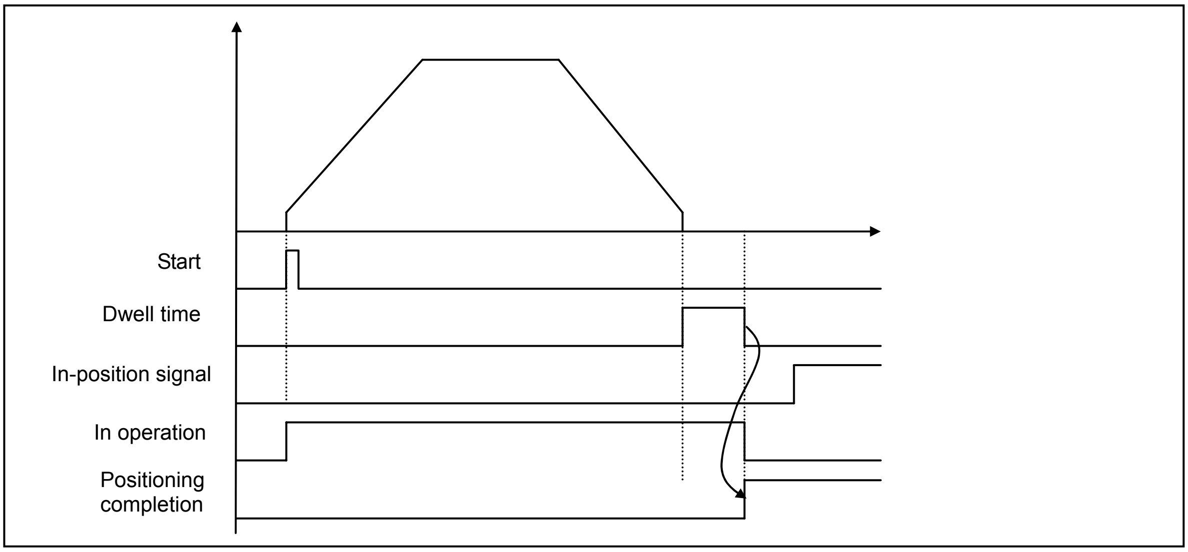


4) Method by using either dwell time or in-position signal

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]

<table>
<tr><th>Items</th><th>Setting Range</th><th>Initial value</th></tr>
<tr><td>Origin address</td><td>㎜ : -2147483648 ~ 2147483647 [X10^{-4} ㎜]
inch : -2147483648 ~ 2147483647 [X10^{-5}inch]
degree : -2147483648 ~ 2147483647 [X10^{-5}degree]
pulse : -2147483648 ~ 2147483647 [pulse]</td><td>0</td></tr>
<tr><td>Homing high speed</td><td>㎜ : 1 ~ 2,000,000,000 [X10^{-2} ㎜/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)</td><td>5,000</td></tr>
<tr><td>Homing-low speed</td><td>㎜ : 1 ~ 2,000,000,000 [X10^{-2} ㎜/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)</td><td>500</td></tr>
<tr><td>Homing Acce./dece.time ※Note 1</td><td>0 ~ 65,535[unit: ms]</td><td>0</td></tr>
<tr><td>Homing dwell time</td><td>0 ~ 50,000[unit: ms]</td><td>0</td></tr>
<tr><td>Origin compensation amount</td><td>㎜ : -2147483648 ~ 2147483647 [X10^{-4} ㎜]
inch : -2147483648 ~ 2147483647 [X10^{-5}inch]
degree : -2147483648 ~ 2147483647 [X10^{-5}degree]
pulse : -2147483648 ~ 2147483647 [pulse]</td><td>0</td></tr>
<tr><td>Homing reset waiting time</td><td>0 ~ 65,535[unit: ms]</td><td>0</td></tr>
<tr><td>Homing mode</td><td><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></td><td>0</td></tr>
<tr><td>Homing direction</td><td>0:forward, 1:reverse</td><td>1</td></tr>
</table>

※ 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	㎜ : 1 ~ 2,000,000,000 [X10^{-2} ㎜/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
Jog low speed	㎜ : 1 ~ 2,000,000,000 [X10^{-2} ㎜/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)	1000
Jog acceleration/ deceleration time※Note 2	0 ~ 65,535[unit: ms]	1000
Inching speed※Note 2	㎜ : 1 ~ 65,535 [X10^{-2} ㎜/min], inch : 1 ~ 65,535 [X10^{-3}inch/min], degree : 1 ~ 65,535 [X10^{-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.

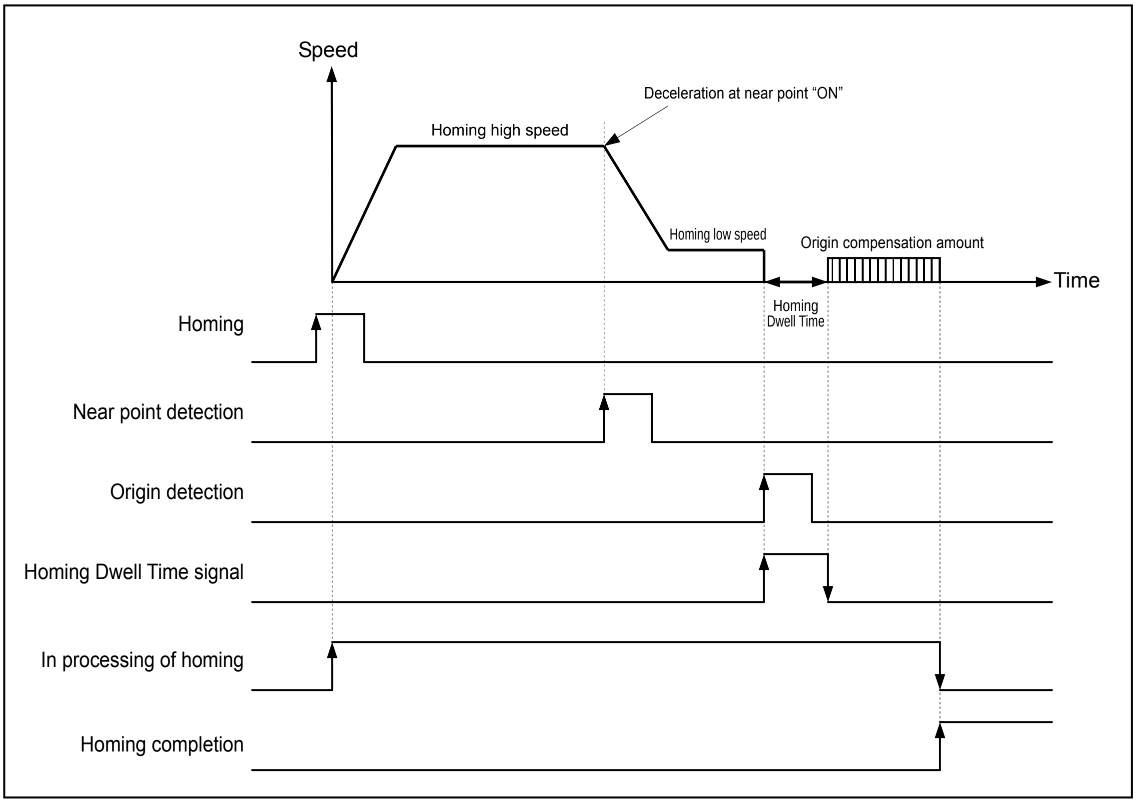
▶ Setting range of homing address : -2,147,483,648 ~ 2,147,483,647(unit: pulse)

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 ≥ homing-high speed ≥ 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 → 1 ~ 200,000[pps]
Line driver → 1 ~ 1,000,000[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 → 1 ~ 200,000[pps]
Line driver → 1 ~ 1,000,000[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 ㎳)

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 ㎳)

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 Sigaal	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	0 : A contact
Origin signal	0 : A contact, 1 : B 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]

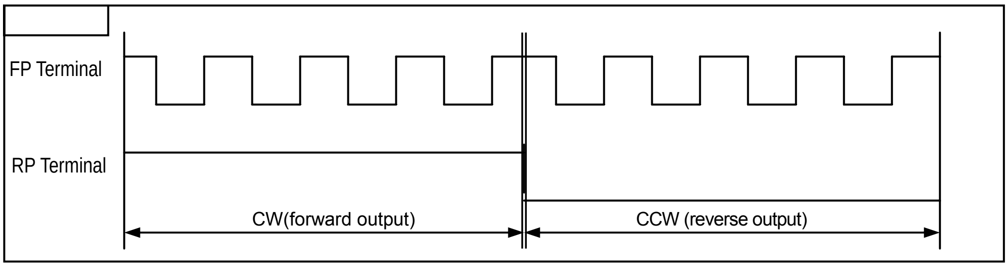
Items	Setting Range	Initial value
Pulse output level	0 : Low Active, 1 : High Active	0
Encoder pulse input mode	0 : CW/CCW, 1phase 1multiplier 1 : CW/CCW, 1phase 2multiplier 2 : Pulse/Dir, 1phase 1multiplier 3 : Pulse/Dir, 1phase 2multiplier 4 : Phase A/B, 2phase 1multiplier 5 : Phase A/B, 2phase 2multiplier 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	㎜ : -2147483648 ~ 2147483647 [X10^{-4} ㎜] inch : -2147483648 ~ 2147483647 [X10^{-5}inch] degree : -2147483648 ~ 2147483647 [X10^{-5}degree] pulse : -2147483648 ~ 2147483647 [pulse/초]	0
Zone1 OFF area		0
Zone2 axis setting	0: X, 1: Y, 2: Z, 3: Encoder	0
Zone2 ON area	㎜ : -2147483648 ~ 2147483647 [X10^{-4} ㎜] inch : -2147483648 ~ 2147483647 [X10^{-5}inch] degree : -2147483648 ~ 2147483647 [X10^{-5}degree] pulse : -2147483648 ~ 2147483647 [pulse]	0
Zone2 OFF area		0
Zone3 axis setting	0: X, 1: Y, 2: Z, 3: Encoder	0
Zone3 ON area	㎜ : -2147483648 ~ 2147483647 [X10^{-4} ㎜] inch : -2147483648 ~ 2147483647 [X10^{-5}inch] degree : -2147483648 ~ 2147483647 [X10^{-5}degree] pulse : -2147483648 ~ 2147483647 [pulse]	0
Zone3 OFF area		0
Zone output mode	0 :individual output, 1: batch output [Zone1]	0
Circular interpolation method	0: middle point, 1: center point	0

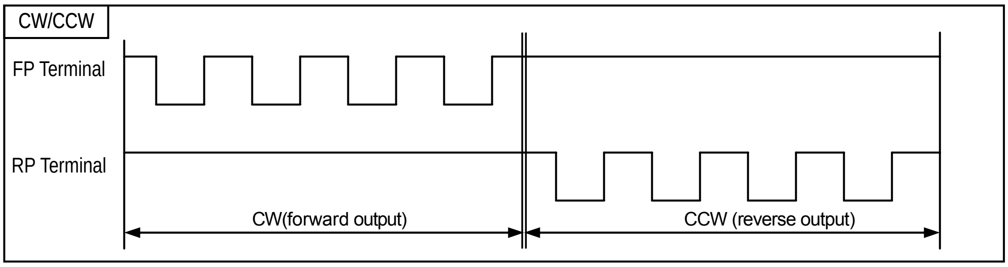
※Note1] XGT positioning module does not have the function of Encoder Value Clear by external Z phase input.

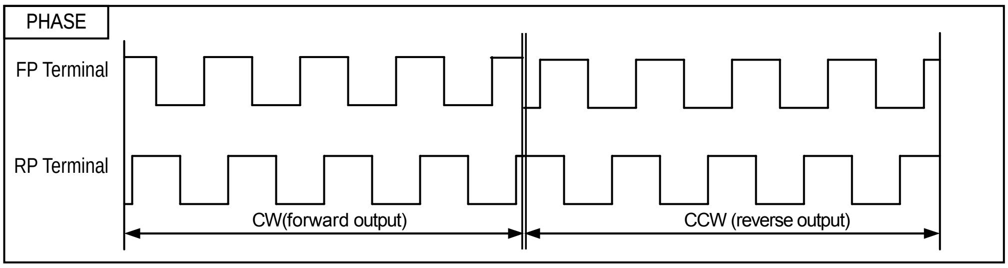
[Setting Range of Common Parameter]

5.5.1 Pulse Output Level

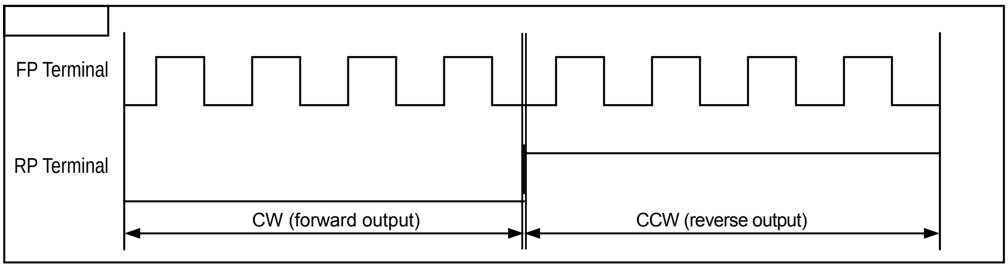
- For the pulse output level setting, select one from Low Active output and High Active output.
- The figure as below shows the case that pulse output level is Low Active according to pulse output mode.

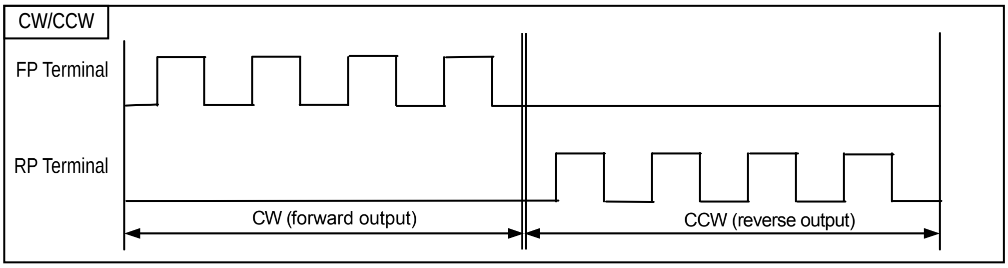


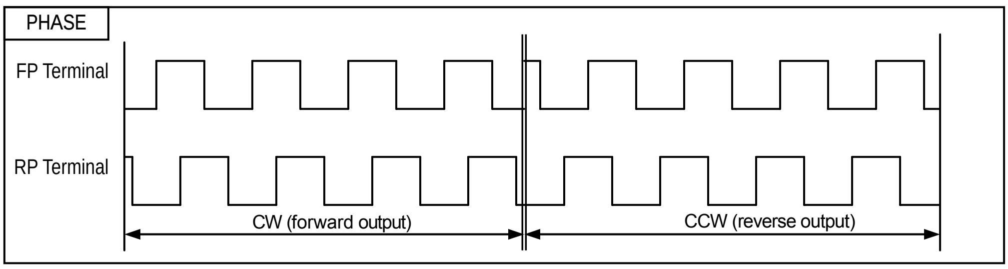




- The figure as below shows the case that pulse output level is High Active according to pulse output mode.







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

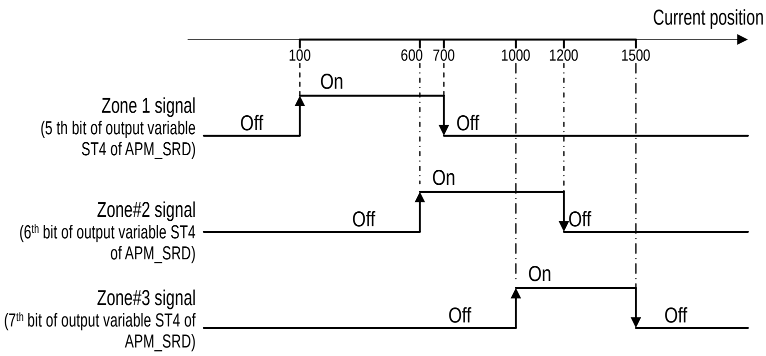
▶ It is available to set within the position address range that the positioning module can move, and there are 3 types.

▶ 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.

ZONE1 ON Area	100pps
ZONE1 OFF Area	700pps
ZONE2 ON Area	600pps
ZONE2 OFF Area	1200pps
ZONE3 ON Area	1000pps
ZONE3 OFF Area	1500pps



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 [um]	Sub Address [um]	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	㎜ : -2147483648 ~ 2147483647 [X10^{-4} ㎜] inch : -2147483648 ~ 2147483647 [X10^{-5}inch] degree : -2147483648 ~ 2147483647 [X10^{-5}degree] pulse : -2147483648 ~ 2147483647 [pulse]	0
Circular interpolation aux. Position	㎜ : -2147483648 ~ 2147483647 [X10^{-4} ㎜] inch : -2147483648 ~ 2147483647 [X10^{-5}inch] pulse : -2147483648 ~ 2147483647 [pulse]	0
Operation speed	㎜ : 1 ~ 2,000,000,000 [X10^{-2} ㎜/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)	0
Dwell time	0 ~ 50,000[unit: ㎳]	0
M Code no.	0 ~ 65,535	0
Operation method	single, repeat	single
Control mode	Position control, Speed control	Position control
Operation pattern	End, Keep, 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]

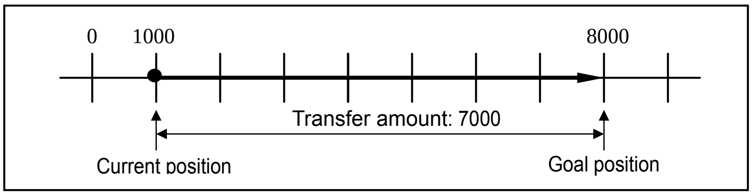
▷ When current position : 1000 , Goal position : 8000, forward direction transfer amount is 7000(8000-1000).

▷ 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

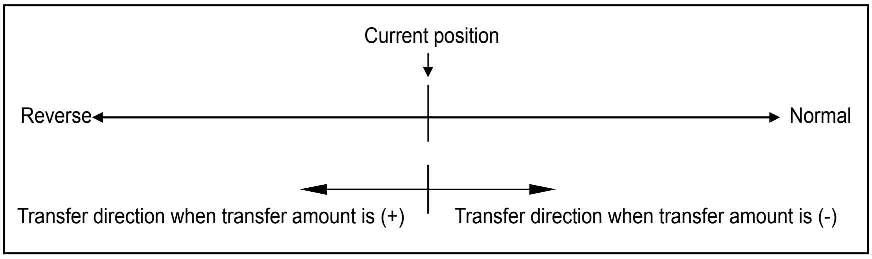
Control by Absolute method (Absolute coordinate) can start only in the state that the origin is determined. If starting in the state that the origin is not determined, Error 234 will occur.

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)



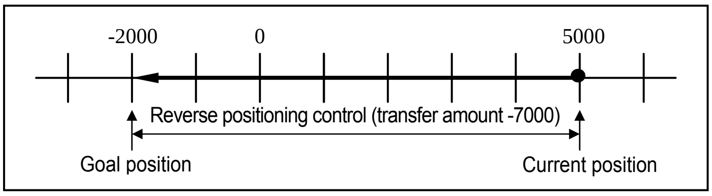
[Example]

- ▷ 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/Keep/Continuous)

- ▶ Select one operation pattern from End, Keep, 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 (㎳).

▶ 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.

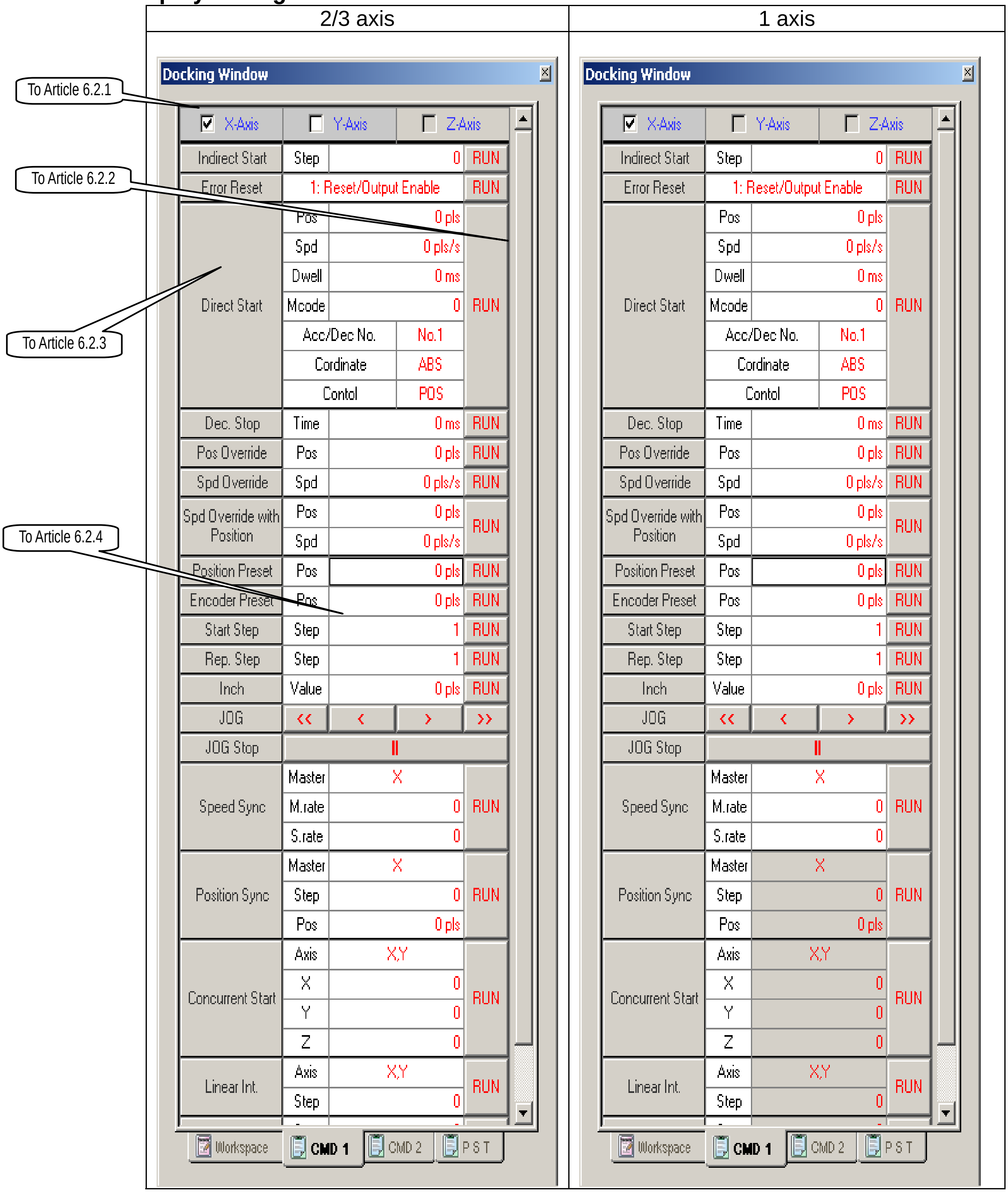
▶ While dwell time is active, the corresponding axis of positioning module maintains “ON” of the “in operation state” and if dwell time proceeds, “in operation state” becomes “OFF” and the positioning end signal becomes “ON”.

Chapter 6 APM Software Package Test Operation

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

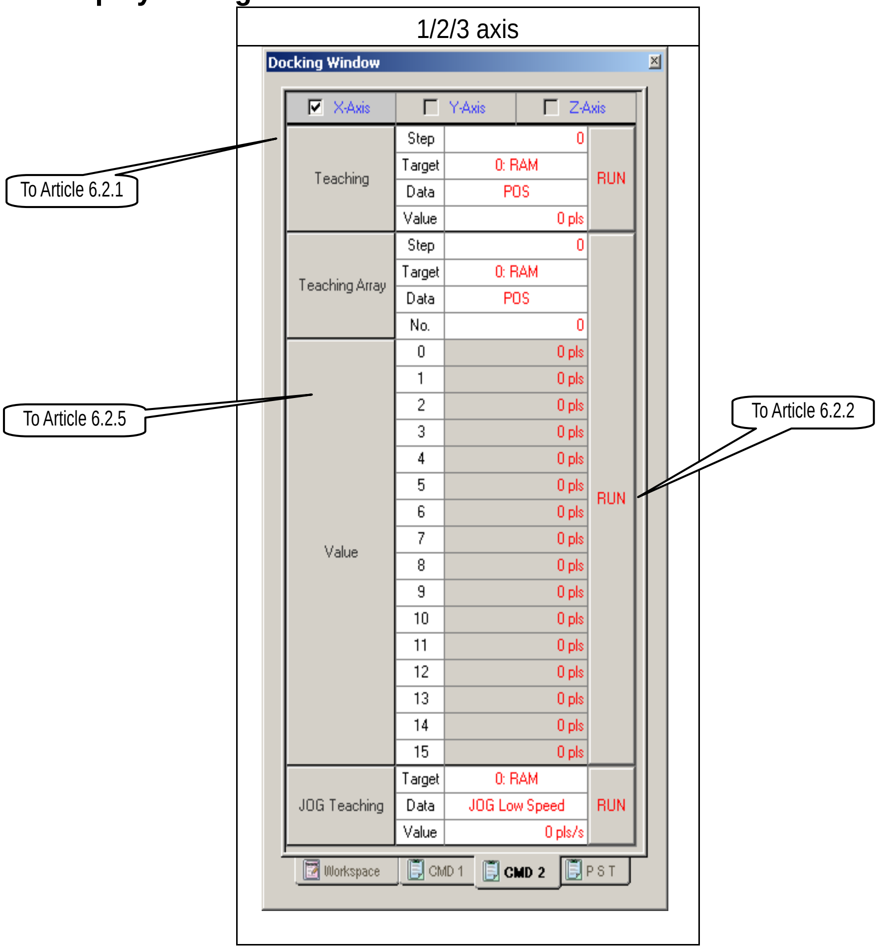
6.1 Test Operation Display Configuration

6.1.1 Display Configuration of Command 1



[Configuration of Command 1]

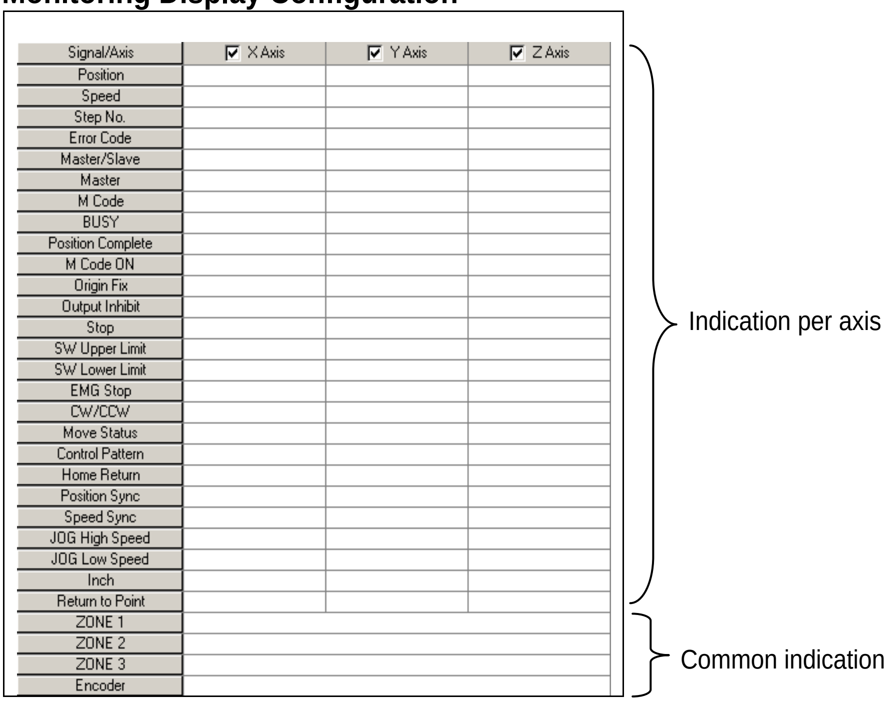
6.1.2 Display Configuration of PST and Command 2



[Configuration of Command 2]

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

6.1.3 Monitoring Display Configuration



▶ 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.

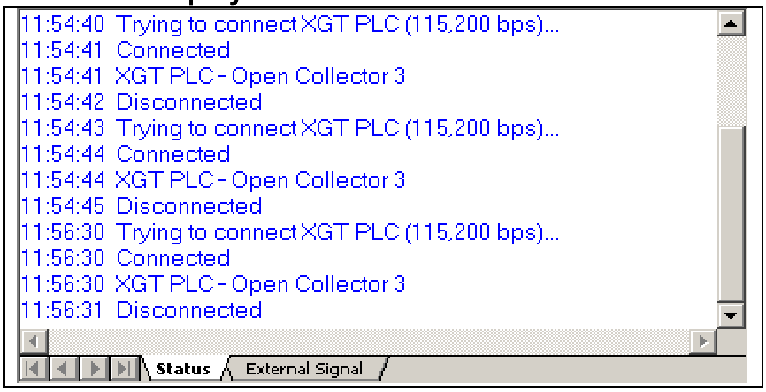
▶ The contents of ”common indication” is the part to be monitored when you click “monitoring button” regardless of the setting of axis.

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-Postion			
Inposition			
Ext Simultaneous Start			

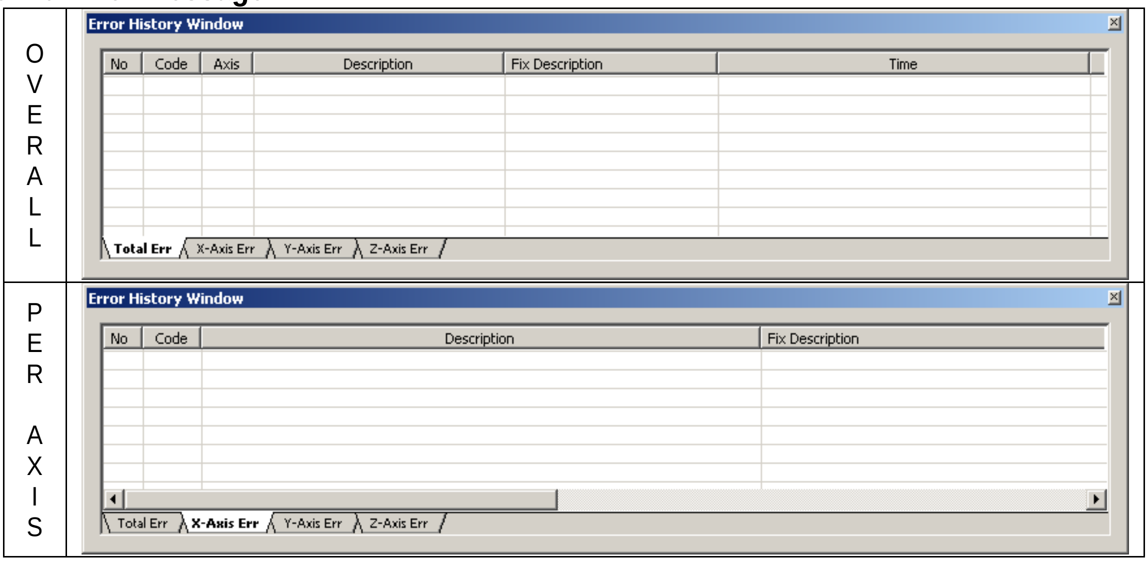
▶ Here indicates the state of External I/O signal by "ON" or "OFF" per axis respectively.

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.

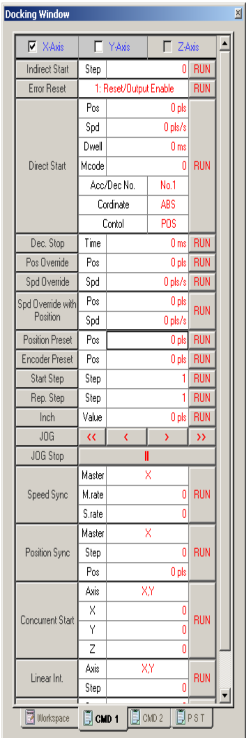
6.2.1 Selection of Command Axis

▶ 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), ㎜ : 1 ~ 2,000,000,000[X10^{-2} ㎜/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), ㎜ : 1 ~ 2,000,000,000[X10^{-2} ㎜/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), ㎜ : 1 ~ 2,000,000,000[X10^{-2} ㎜/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

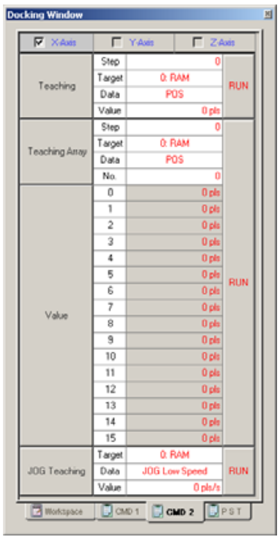
▷ Click the right side execute button of the command contents and the command corresponding to the Icon will be executed.

6.2.4 JOG Operation by APM Software Package

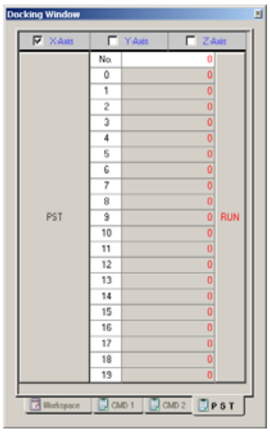
<table>
<tr><th>Software package</th><th>Icon</th><th>Command</th><th>Related command</th></tr>
<tr><td rowspan="5"></td><td><<</td><td>Reverse high speed JOG operation</td><td rowspan="5">JOG</td></tr>
<tr><td><</td><td>Reverse low speed JOG operation</td></tr>
<tr><td>></td><td>Forward low speed JOG operation</td></tr>
<tr><td>>></td><td>Forward high speed JOG operation</td></tr>
<tr><td>II</td><td>JOG operation stop</td></tr>
</table>

▷ 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

<table>
<tr><th>Software Package</th><th>Command</th><th>Setting Range</th><th>Related command</th></tr>
<tr><td rowspan="4"></td><td>Teaching single</td><td>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),
㎜ : 1 ~ 2,000,000,000[X10^{-2} ㎜/min],
inch : 1 ~ 2,000,000,000[X10^{-3}inch/min],
degree: 1 ~ 2,000,000,000[X10^{-3} degree/min]</td><td>TEA</td></tr>
<tr><td>Teaching array</td><td>1. Step : 1 ~ 400
2. Mode : 0(RAM teaching), 1(ROM teaching)
3. Method : 0(position teaching), 1(speed teaching)
4. Number : 1 ~ 16</td><td rowspan="2">TEAA</td></tr>
<tr><td>Teaching array value</td><td>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),
㎜ : 1 ~ 2,000,000,000[X10^{-2} ㎜/min],
inch : 1 ~ 2,000,000,000[X10^{-3}inch/min],
degree: 1 ~ 2,000,000,000[X10^{-3} degree/min]</td></tr>
<tr><td>JOG teaching</td><td>1. Mode : 0(RAM teaching), 1(ROM teaching)
2. Method :JOG low speed/JOG high speed
3. Value : JOG speed value</td><td>TMP</td></tr>
</table>

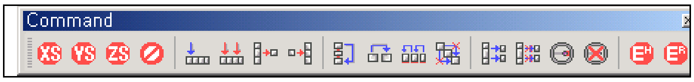
6.2.6 Point Operation by APM Software Package

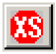
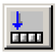
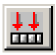
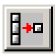
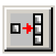
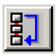
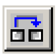
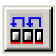
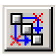
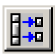
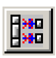
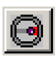
Software Package	Command	Setting range	Related command
	Point start	Number: 1 ~ 20	PST
		Point setting(0 ~ 19): 1 ~ 400 (Operation step no. setting)	

- ▶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

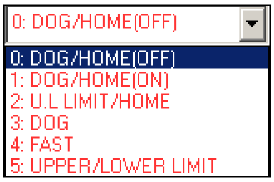
Here describes the examples of APM Software Package Test operation.

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



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

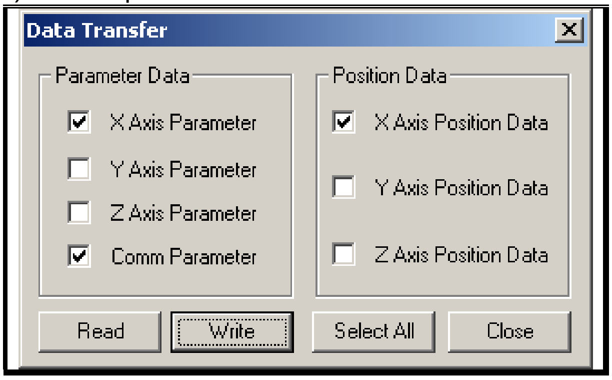
X axis operation data setting

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).

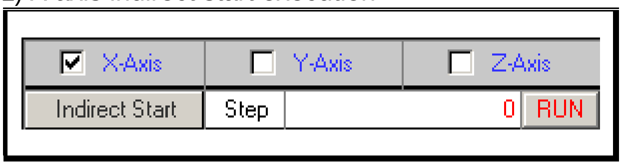
▶ The operation data setting can be used conveniently as it is available to copy/paste the edited contents from MS-OFFICE EXCEL program.

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.

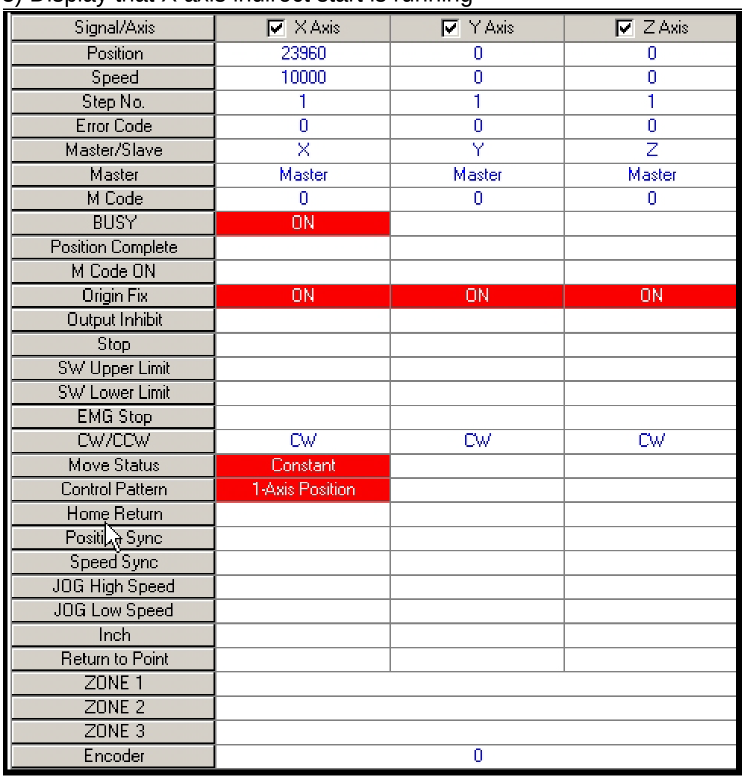
2) X axis indirect start execution



▶ 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	X Axis	Y Axis	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	☑ X Axis	☑ Y Axis	☑ 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

☐ X-Axis	☑ Y-Axis		☐ Z-Axis
Speed Sync	Master	X	RUN
	M.rate	10	
	S.rate	5	

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

Display that speed synchronization is executed

Signal/Axis	☑ X Axis	☑ Y Axis	☑ 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

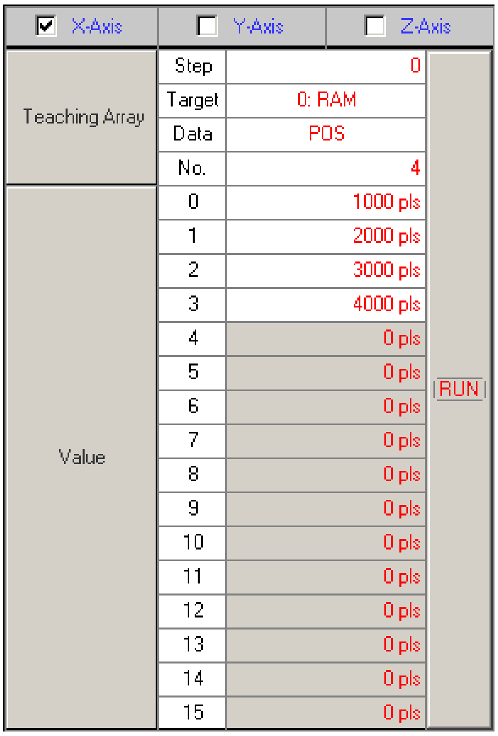
▶The function of Teaching is to set the goal position and operation speed set by operation data again through touch screen in the positioning module and carry out the positioning operation by the changed goal position and operation speed in case of re-operation by the Start command.

▶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



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.

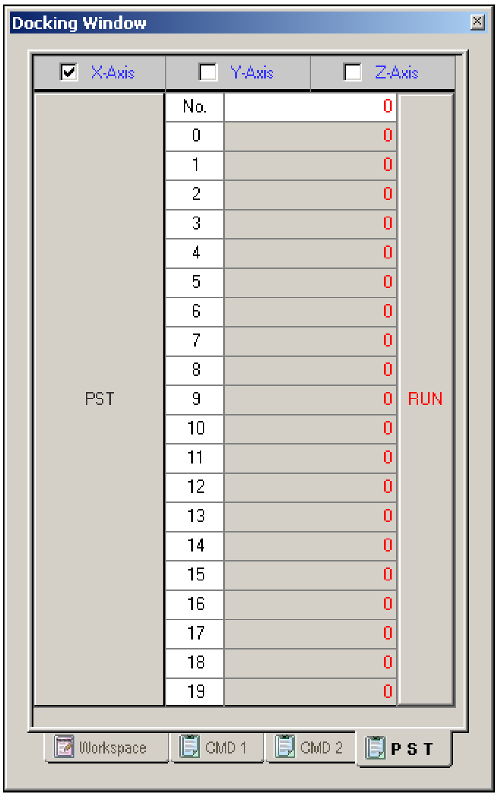
1) First, set the operation data desired to operate as follows.

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



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.

※ 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 ㎜ : -2147483648 ~ 2147483647 [X10^{-4} ㎜/min] inch: -2147483648 ~ 2147483647 [X10^{-5}inch/min] degree : -2147483648 ~ 2147483647 [X10^{-5}degree/min] pulse : -2147483648 ~ 2147483647 [pulse/sec] 2. Speed teaching setting range ㎜ : 1 ~ 2,000,000,000[X10^{-2} ㎜/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)
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)	

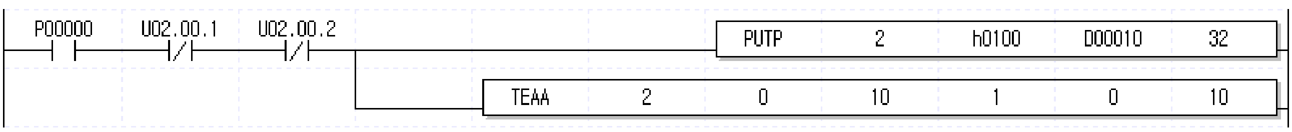
※ The figures in brackets indicates the address of internal memory expressed in decimals

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.



※ 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**.

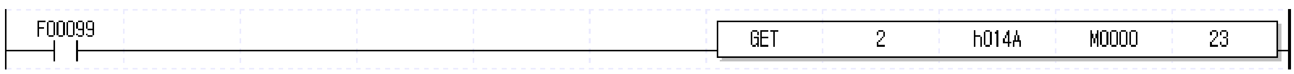
7.1.3 State Information

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).

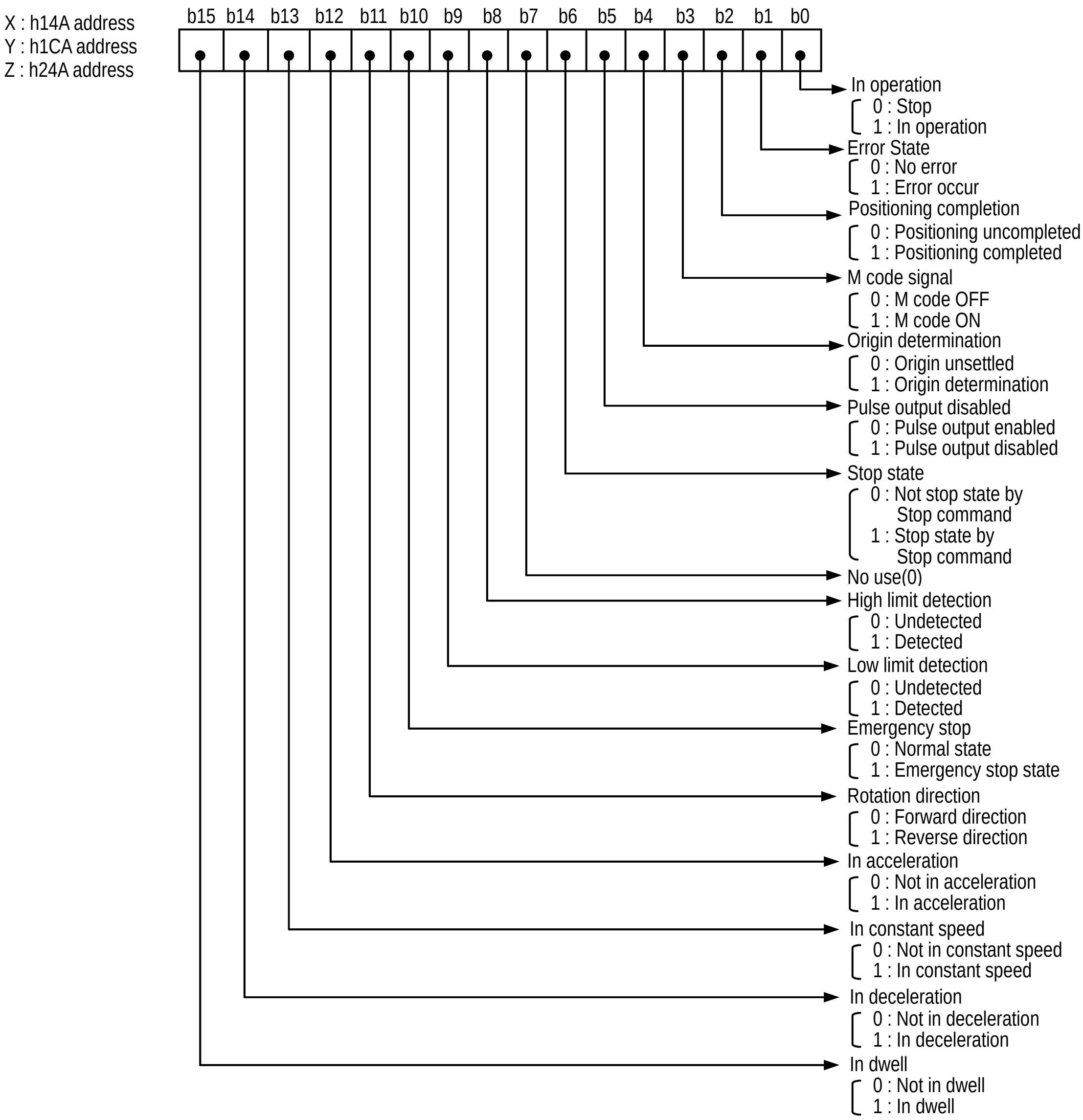


Notes

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

2) Use of State Information

(1) Operation State Bit Information (Lower)



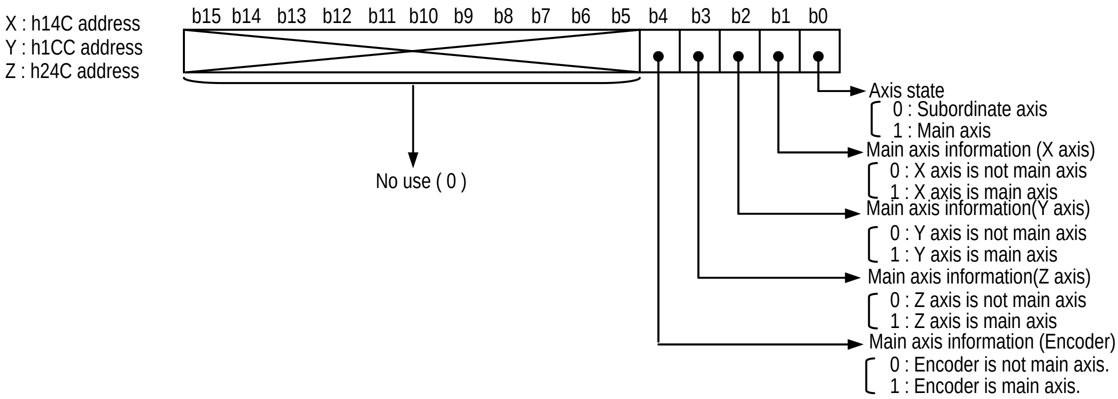
(2) Operation State Bit Information (Upper)

X : h14B address
Y : h1CB address
Z : h24B address

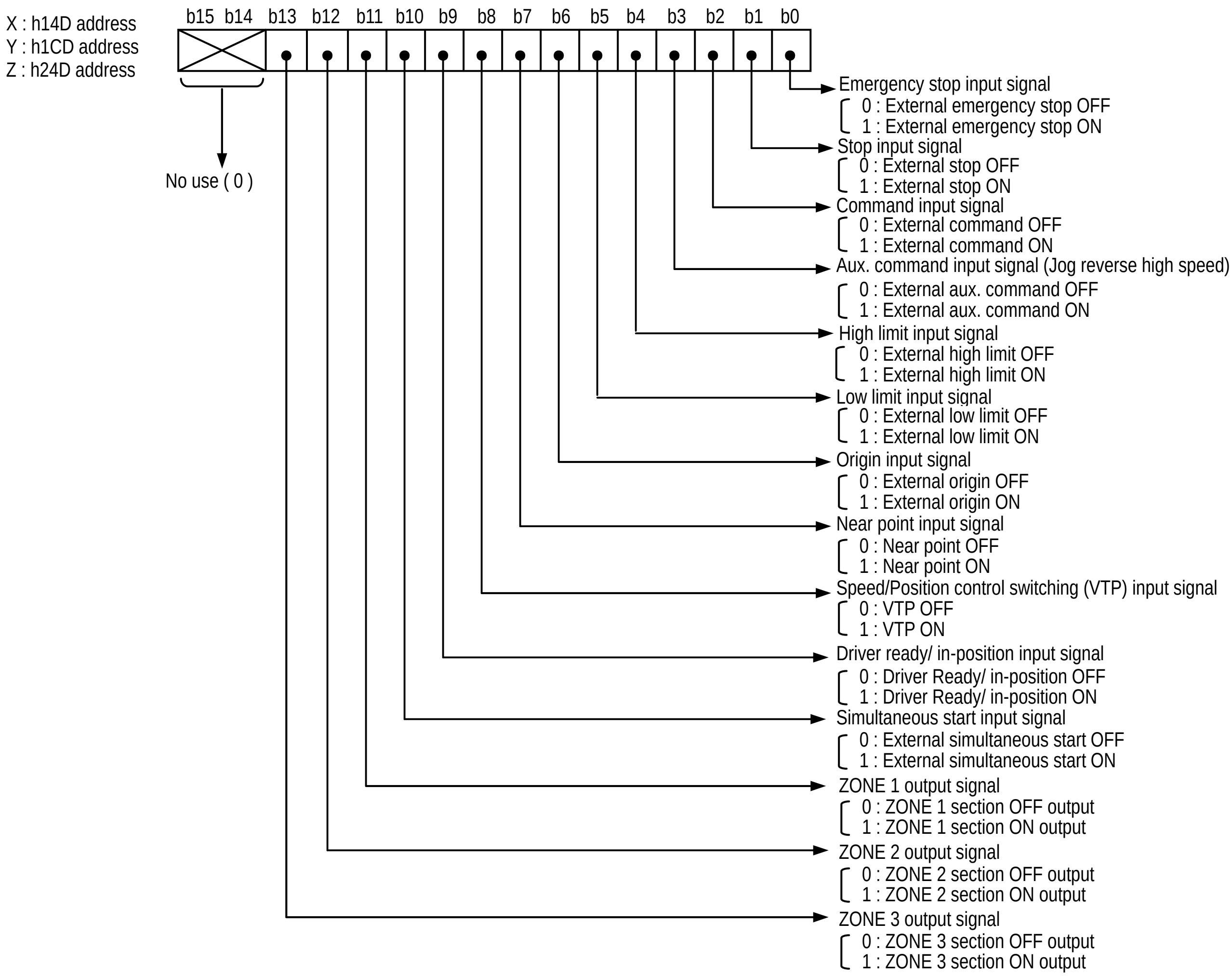
b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0

- b0 → 1axis position control operation
  - 0 : Not in 1axis position control
  - 1 : In 1axis position control
- b1 → 1axis speed control
  - 0 : Not in 1axis speed control
  - 1 : In 1axis speed control
- b2 → 2axixlinear interpolation
  - 0 : Not in 2axis linear interpolation
  - 1 : Not in 2axis linear interpolation
- b3 → 3axis linear interpolation
  - 0 : Not in 3axis linear interpolation
  - 1 : Not in 3axis linear interpolation
- b4 → 2 axis circular interpolation
  - 0 : Not in 2axis circular interpolation
  - 1 : Not in 2axis circular interpolation
- b5 → Homing operation
  - 0 : Not in homing operation
  - 1 : In homing operation
- b6 → Position synchronous start
  - 0 : Not position synchronous start
  - 1 : In position synchronous start
- b7 → Speed synchronous start
  - 0 : Not speed synchronous start
  - 1 : In speed synchronous start
- b8 → Jog low speed operation
  - 0 : Not in Jog low speed operation
  - 1 : In Jog low speed operation
- b9 → Jog high speed operation
  - 0 : Not in Jog high speed operation
  - 1 : In Jog high speed operation
- b10 → Inching operation
  - 0 : Not in inching operation
  - 1 : In inching operation
- b11 → MPG operation
  - 0 : Not in MPG operation
  - 1 : In MPG operation
- b12 → Manual operation position return
  - 0 : Not in manual operation position return
  - 1 : In manual operation position return
- b13 → ZONE 1
  - 0 : ZONE 1 section OFF
  - 1 : ZONE 1 section ON
- b14 → ZONE 2
  - 0 : ZONE 2 section OFF
  - 1 : ZONE 2 section ON
- b15 → ZONE 3
  - 0 : ZONE 3 section OFF
  - 1 : ZONE 3 section ON

(3) Axis Information



(4) External I/O Signal State



7.1.4 Parameter teaching data

1) Content of parameter teaching data

Address			Command information	Setting range
X axis	Y axis	Z axis		
h0121(289)	h01A1(417)	h0221(545)	Parameter teaching data 1	1 ~ 400
h0122(290)	h01A2(418)	h0222(546)	Parameter teaching data 2	
h0123(291)	h01A3(419)	h0223(547)	Parameter teaching data 3	
h0124(292)	h01A4(420)	h0224(548)	Parameter teaching data 4	
h0125(293)	h01A5(421)	h0225(549)	Parameter teaching data 5	
h0126(294)	h01A6(422)	h0226(550)	Parameter teaching data 6	
h0127(295)	h01A7(423)	h0227(551)	Parameter teaching data 7	
h0128(296)	h01A8(424)	h0228(552)	Parameter teaching data 8	
h0129(297)	h01A9(425)	h0229(553)	Parameter teaching data 9	
h012A(298)	h01AA(426)	h022A(554)	Parameter teaching data 10	
h012B(299)	h01AB(427)	h022B(555)	Parameter teaching data 11	
h012C(300)	h01AC(428)	h022C(556)	Parameter teaching data 12	
h012D(301)	h01AD(429)	h022D(557)	Parameter teaching data 13	
h012E(302)	h01AE(430)	h022E(558)	Parameter teaching data 14	
h012F(303)	h01AF(431)	h022F(559)	Parameter teaching data 15	
h0130(304)	h01B0(432)	h0230(560)	Parameter teaching data 16	
h0131(305)	h01B1(433)	h0231(562)	Parameter teaching data 17	
h0132(306)	h01B2(434)	h0232(563)	Parameter teaching data 18	
h0133(307)	h01B3(435)	h0233(564)	Parameter teaching data 19	
h0134(308)	h01B4(436)	h0234(565)	Parameter teaching data 20	
h0135(309)	h01B5(437)	h0235(566)	Parameter teaching data 21	
h0136(310)	h01B6(438)	h0236(567)	Parameter teaching data 22	

2) Setting of parameter teaching data

(1) It is used when you want teaching entire items with one command in case of parameter teaching

(2) It sets X axis at address 121~136, Y axis at address 1A1~1B6, Z axis at address 221~234.

(3) For parameter teaching command, refer to “Ch.8 Command”.

(4) When parameter teaching at program, parameter teaching data should be set previous at step for teaching of parameter entire items to be done normally.

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)
Com-mon	Uxx.00.F	Positioning module ready	Uxx.01.F	No use

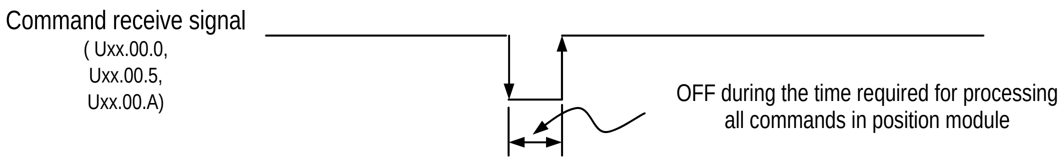
7.2.2 Use of I/O Signal

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

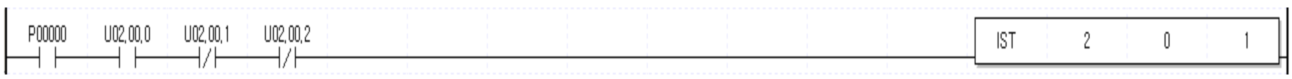
If using Input Signal(in operation, error status, positioning completion, M code On) as the operation condition of program, it should be prohibited to commonly use it with the status bit read in SRD, the status read command and instead, make sure to use the status bit read in any possible SRD. For the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

2) Start (Uxx.01.0, Uxx.01.5, Uxx.01.A)

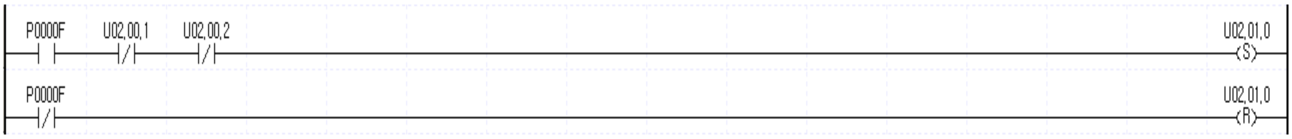
(1) Start signal carries out the positioning operation according to the current operation step no. of positioning module without setting the step no. other than indirect start or direct start by command.

(2) In case of changing the current operation step no. during operation, it is required to use the start step no. change command (SNS).

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

A) Use Push button as Start external input switch.

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.



Device	Description
P000F	X axis Start external input
U02.00.1	X axis signal in operation
U02.00.2	X axis error state
U02.01.0	X axis start

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

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)

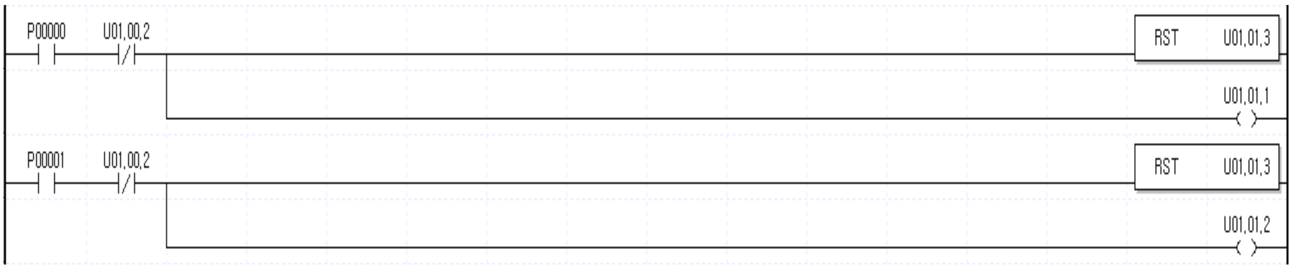
Uxx.01.1	X axis forward direction Jog
Uxx.01.2	X axis reverse direction Jog
Uxx.01.3	X axis Jog high/low speed
Uxx.01.6	Y axis forward direction Jog
Uxx.01.7	Y axis reverse direction Jog
Uxx.01.8	Y axis Jog high/low speed
Uxx.01.B	Z axis forward direction Jog
Uxx.01.C	Z axis reverse direction Jog
Uxx.01.D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

4) MPG Operation (Encoder)

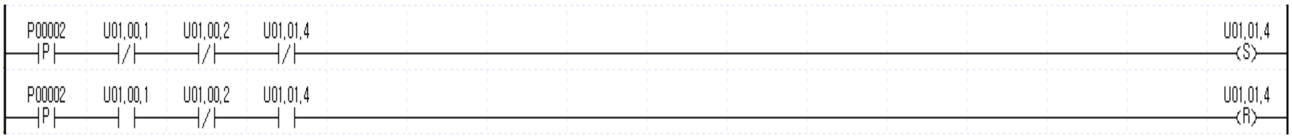
(Uxx.01.4, Uxx.01.9, Uxx.01.E)

(1) MPG Operation (Encoder) signal is Level input. Thus, when it is ON, the change amount of encoder value shall be pulse output for MPG operation axis and if OFF, the pulse output will stop.

(2) The operation per axis by MPG operation (Encoder) is available to carry out MPG operation (Encoder) by X, Y, Z axis at the same time.

(3) MPG operation (Encoder) is available to use the encoder signal of manual pulse generator (MPG) and SERVO drive as external input. For further information of Encoder pulse input mode, please refer to Chapter 5 Positioning Parameter and Operation Data.

(4) Example of MPG operation (Encoder) Program



Device	Description
P0002	X axis MPG operation (Encoder) allowable external input
U01.00.1	X axis operation state
U01.00.2	X axis error state
U01.01.4	X axis MPG operation (Encoder) signal

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

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

(1) This signal occurs during positioning operation or after positioning completion according to M code setting mode (With, After) and M code no. setting of operation data.

(2) For further information, please refer to Chapter 5 Positioning Parameter and Operation Data.

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

(1) As the signal generated after positioning operation is complete, this signal becomes ON for the time set for the positioning completion output time; if start related command is received, it becomes OFF automatically.

(2) For further information on positioning completion output time setting, please refer to “Chapter 5 Positioning Parameter and Operation Data”.

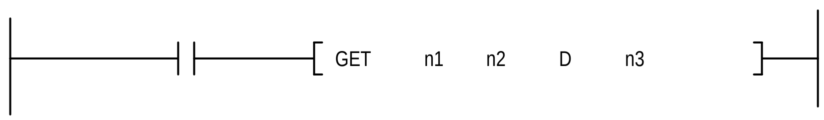
Chapter 8 Command

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.

(Address)	M area of CPU module		internal memory of APM	(Address)
M0000	Operation state bit information (lower)	←	Operation state bit information (lower)	h014A
M0001	Operation state bit information (upper)	←	Operation state bit information (upper)	h014B
M0002	Axis information	←	Axis information	h014C
M0003	External I/O signal state	←	External I/O signal state	h014D
M0004	-		-	h014E

8.1.2 Internal Memory Write (PUT, PUTP Command)

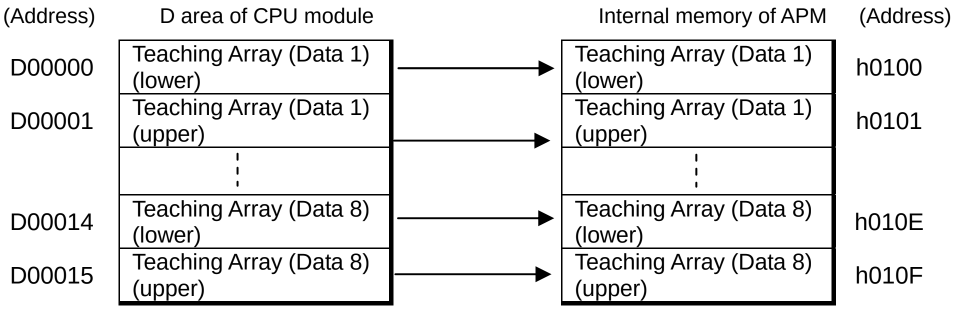
Form	Description	Available area
n1	Base and slot No. installed with special module	Integer or HEX
n2	Leading address of special module internal memory to write data	Integer
S	Leading address of device that the data to Write is saved	M, P, K, L, T, C, D, #D, integer
n3	Word number of data to write	Integer

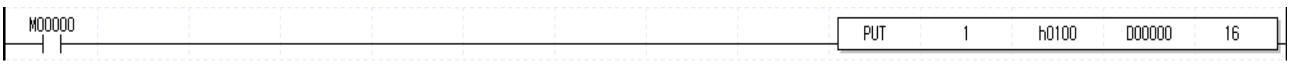
< Difference Between PUT Command and PUTP Command >

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

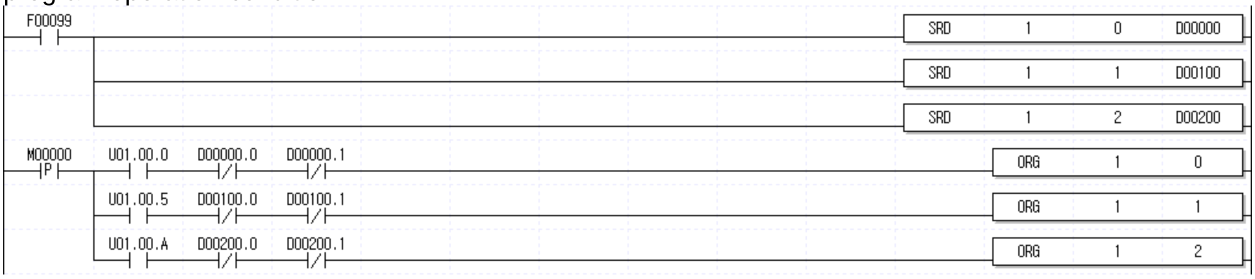
The dedicated command acts at Rising edge. That is, it carries out the first action once when input contact is “ON”. But, SRD carries out High level action.

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



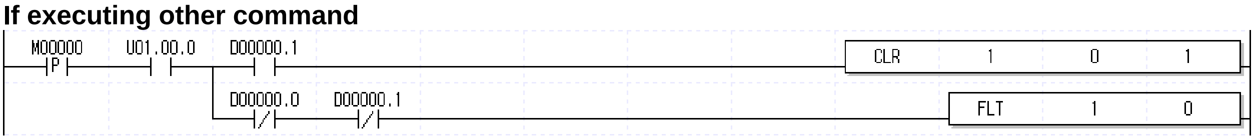
※ U01.00.0: X axis command receive, D00000.0: X axis in operation, D00000.1: X axis error state
U01.00.5: X axis command receive, D00100.0: X axis in operation, D00100.1: X axis error state
U01.00.A: X axis command receive, D00200.0: X axis in operation, D00200.1: X axis error state

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

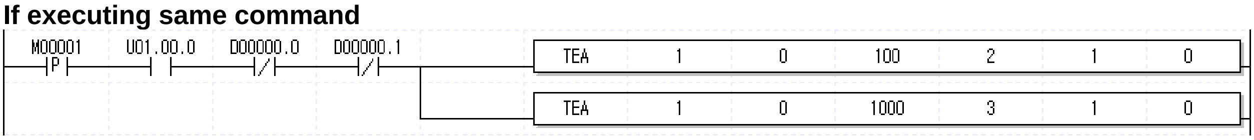
Notes

▶ 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).

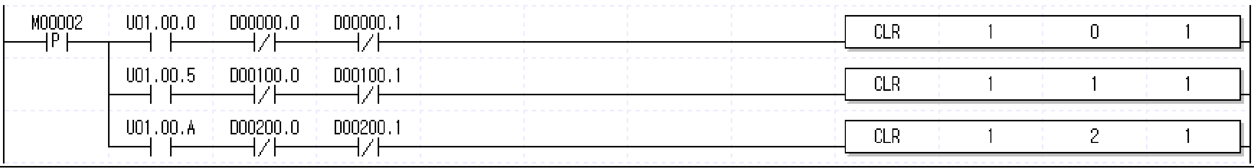
If executing other command



If executing same command



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



8.3.1 Home start (Command : ORG)

1) Program

2) Description

Device	Description
M00000	X axis homing start input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

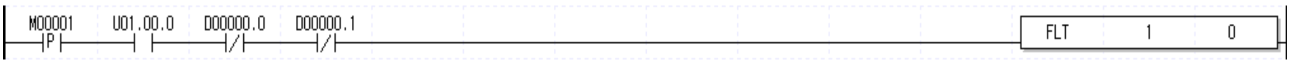
Command	ORG				Homing start
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK, constant, D, Z, R, ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ PMLK means P, M, L and K areas.

▷ If homing start command is executed, it carries out homing operation by the setting homing parameter and if homing is complete by external input signal, the origin determination end signal is “ON”.

8.3.2 Floating origin setting (Command : FLT)

1) Program



2) Description

Device	Description
M00001	X axis floating origin setting input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

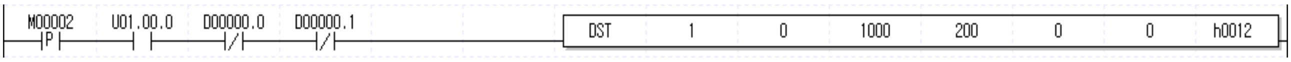
Command	FLT				Floating origin setting
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ PMLK means P, M, L and K areas.

▷ If the floating origin setting command is executed, the current position is changed to the origin address of homing parameter and the origin determination signal(bit) is ON.

8.3.3 Direct start (Command : DST)

1) Program



2) Description

Device	Description
M00002	X axis direct start input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	DST				Direct 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	Goal position	PMLK,constant,D,Z,R,ZR	DINT	Goal position(-2147483648 ~ 2,147483647)
	OP4	Goal speed	PMLK,constant,D,Z,R,ZR	DWORD	Goal speed(LD:1~1000000, OC:1~200000)
	OP5	Dwell time	PMLK,constant,D,Z,R,ZR	WORD	Dwell time(0~65535)
	OP6	M code	PMLK,constant,D,Z,R,ZR	WORD	M code(0~65535)
	OP7	Control word	PMLK,constant,D,Z,R,ZR	WORD	Bit0(0:position,1:speed), Bit4(0:Absolute, 1: Relative), Bit5,6(0:No.1,1:No.2, 2:No.3, 3:No.4 acceleration /deceleration time)

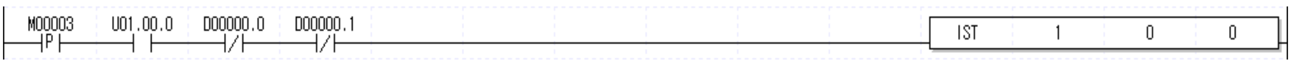
※ PMLK means P, M, L and K areas.

▷ If control word is h0012, it shall be set by position control, relative, acc./dec. time 1.

▷ No.1~3,7~15 Bit of control word is the unused area and does not affect the setting. That is, h0012 and h0010 are set as the same contents.

8.3.4 Indirect start (Command : IST)

1) Program



2) Description

Device	Description
M00003	X axis indirect start input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	DST				Indirect 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	Operation step	PMLK,constant,D,Z,R,ZR	WORD	Step No. to operate (0~400)

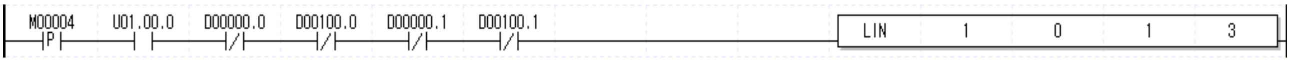
※ PMLK means P, M, L and K areas.

▷ If operation step No. is set as “0” in indirect start, it will be operated as current step No. If other number except 0 is set as the operation step number, it operates only for step no. set.

▷ If operation step No. is set as “0”, the current step No. is changed to the next step number(n+1) of a step(n) executed after positioning operation is complete. But, it is assumed that the operation method of a step executing operation is set as single.

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)

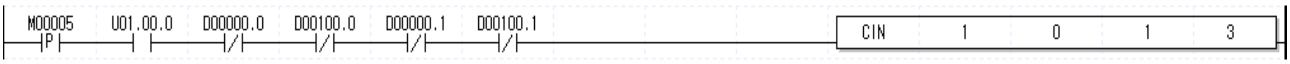
※ PMLK means P, M, L and K areas.

▷ 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: unsetting,1: setting)
	OP4	Operation axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

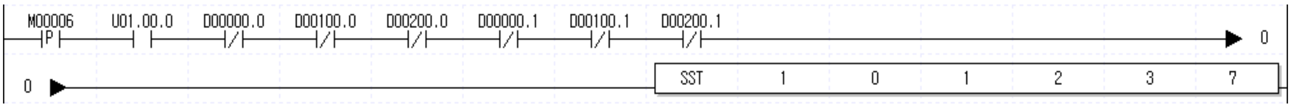
※ PMLK means P, M, L and K areas.

▷ 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.

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)

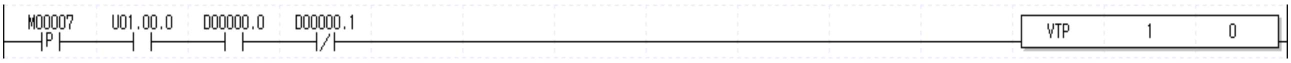
※ PMLK means P, M, L and K areas.

▷ 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

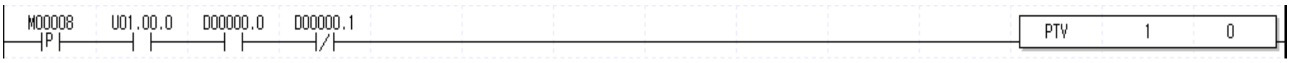
Command	VTP				Speed/position switching control
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ 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



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

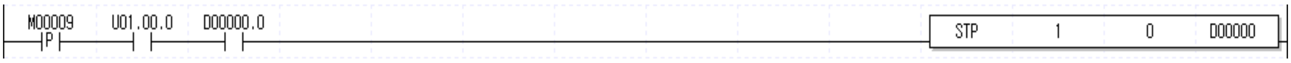
Command	PTV				Position/speed switching control
Operand	OP1	Slot Axis	Constant	WORD	Slot No. installed with APM module
	OP2	Slot Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ 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



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.

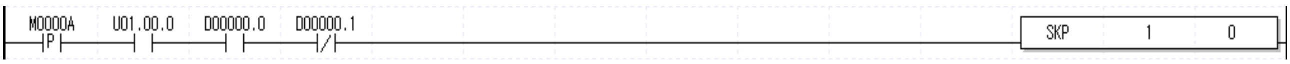
▷ Deceleration stop does not carry out the command in deceleration area and instead, it is executed only in acceleration and equal speed areas.

▷ 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.

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

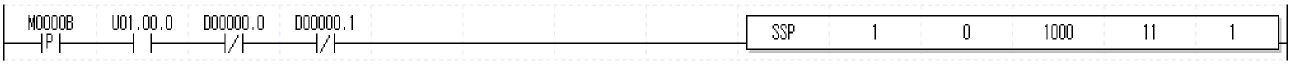
Command	SKP				Skip operation
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ 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

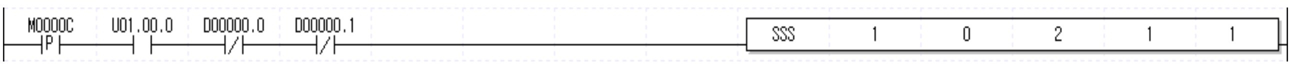
Command	SSP				Synchronous start by position
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Main axis synchronous start position	PMLK,constant,D,Z,R,ZR	DINT	Synchronous start position of main axis to be operated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

8.3.13 Synchronous Start by Speed (Command : SSS)

1) Program



2) Description

Device	Description
M0000C	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 state

Command	SSS				Synchronous start by speed
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 rate	PMLK,constant,D,Z,R,ZR	WORD	Pulse output rate of main axis (1~65535)
	OP4	Subordinate axis rate	PMLK,constant,D,Z,R,ZR	WORD	Pulse output rate of subordinate axis (1~65535)
	OP5	Main axis	PMLK,constant,D,Z,R,ZR	WORD	Main axis(0:X axis,1:Y axis, 2:Z axis, 3:encoder)

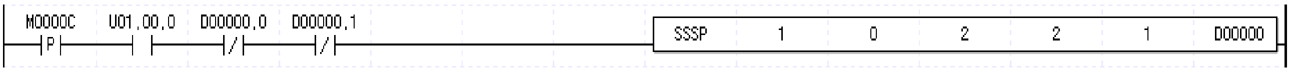
※ PMLK means P, M, L and K areas.

▷ If the command of synchronous start by speed is executed, X axis(subordinate axis) is indicated as ‘in operation’ but does not have pulse output. If operating Y axis set as the main axis, X axis(subordinate axis) is operated at the 1/2 speed of Y axis operation speed.

▷ If the operation speed of Y axis set as the main axis is 1000, X axis is operated at the speed of 500, 1/2 of the Y axis operation speed.

8.3.14 Speed synchronization by position (Command: SSSP)

1) Program



2) Description

Device	Description
M0000C	X axis speed synchronization input by position
U01.00.0	X axis command reception
D00000.0	X axis during operation signal
D00000.1	X axis error status

Command	SSSP				Speed synchronization by position
Operand	OP1	Slot	Constant	WORD	Base no. and slot no. where positioning module is equipped
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Axis to command (0:X axis,1:Y axis,2:Z axis)
	OP3	Main axis rate	PMLK,constant,D,Z,R,ZR	WORD	Pulse output rate of main axis (1~65535)
	OP4	Subordinate axis rate	PMLK,constant,D,Z,R,ZR	WORD	Pulse output rate of subordinate (1~65535)
	OP5	Main axis	PMLK,constant,D,Z,R,ZR	WORD	Main axis (0:X axis,1:Y axis, 2:Z axis, 3:encoder)
	OP6	Target position	PMLK,constant,D,Z,R,ZR	DINT	Target position to stop

※ PMLK means P area, M area, L area, K area.

▷ If you execute speed synchronization command, X axis is expressed Running but real pulse is not outputted. If you operate Y axis set as main axis, X axis, subordinate axis, is operated with half speed of Y axis.

▷ If operation speed of Y axis set as main axis is 1000, X axis operates with half speed of Y operation speed, 500.

▷ It commands speed synchronization by position operating with rate of main axis rate, subordinate rate about OP5 axis designated as OP2 of positioning module. During run, if the number of pulse OP2 outputs becomes setting value set in OP6, it gets out of speed synchronization mode and stops.

8.3.15 Position Override (Command : POR)

1) Program

2) Description

Device	Description
M0000D	X axis position override input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

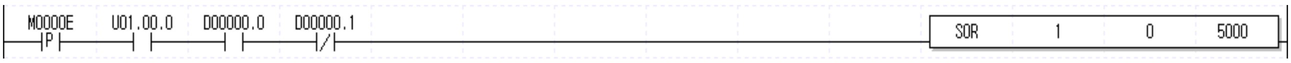
Command	POR				Position override
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Position value	PMLK,constant,D,Z,R,ZR	DINT	Goal position value to change (-2147483648 ~ 2147483647)

※ PMLK means P, M, L and K areas.

▷ If position override is executed before reaching goal position, goal position shall be changed with 20000 for positioning operation. If executing positioning position override after passing a position to execute position override, it stops at the current position.

8.3.16 Speed Override (Command : SOR)

1) Program



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

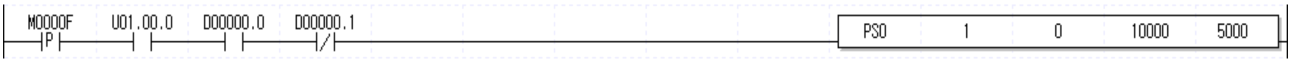
Command	SOR				Speed override
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Speed value	PMLK,constant,D,Z,R,ZR	DWORD	Goal speed value to change (LD:1~1000000,OC:1~200000)

※ 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.

8.3.17 Position Assigned Speed Override (Command : PSO)

1) Program



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

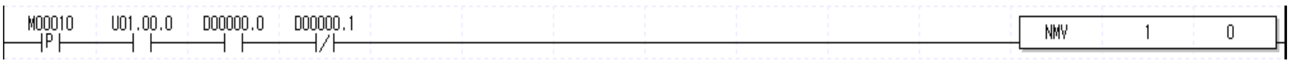
Command	PSO				Position assigned speed override
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Position value	PMLK,constant,D,Z,R,ZR	DINT	Position value to change the speed (-2147483648 ~ 2147483647)
	OP4	Speed value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

8.3.18 Continuous Operation (Command : NMV)

1) Program



2) Description

Device	Description
M00010	X axis continuous operation input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	NMV				Continuous 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)

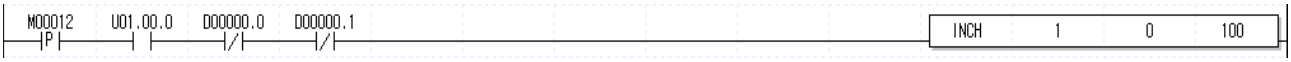
※ PMLK means P, M, L and K areas.

▷ If continuous operation command is executed, the step No. is changed from the step in current operation to the next step No. and continues positioning operation to the speed of the next step and goal position.

▷ Continuous operation command changes the only current operation pattern in operation, not the operation data.

8.3.19 Inching Operation (Command : INCH)

1) Program



2) Description

Device	Description
M00012	X axis inching operation input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

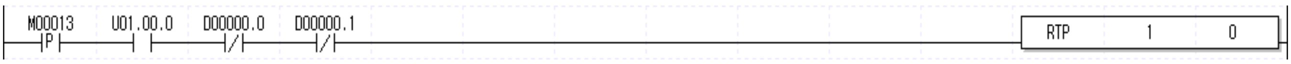
Command	INCH				Inching operation
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Position value	PMLK,constant,D,Z,R,ZR	DINT	Position value to move for inching operation (-2147483648 ~ 2147483647)

※ PMLK means P, M, L and K areas.

▷ It carries out the relative coordinate operation by inching operation speed set in manual operation parameter.

8.3.20 Return to the Previous Manual Operation Position (Command : RTP)

1) Program



2) Description

Device	Description
M00013	X axis return to the previous manual operation position start input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

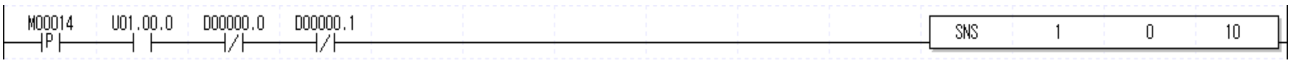
Command	RTP				Return to the previous manual operation position
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ PMLK means P, M, L and K areas.

▷ If the current position is changed by MPG operation, inching operation, Jog operation after completing the positioning, it returns to the previous position of manual operation.

8.3.21 Start Step No. Change (Command : SNS)

1) Program



2) Description

Device	Description
M00014	X axis start step No. change input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

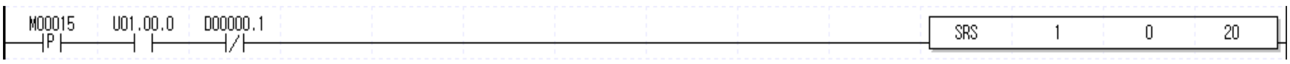
Command	SNS				Start step No. change
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Step No.	PMLK,constant,D,Z,R,ZR	WORD	step No. to change with start step (1~400)

※ PMLK means P, M, L and K areas.

▷ The current operation No. is changed to 10.

8.3.22 Repeat Step No. Change (Command : SRS)

1) Program



2) Description

Device	Description
M00015	X axis start step No. change input
U01.00.0	X axis command receive
D00000.1	X axis error state

Command	SRS				Repeat step No. change
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	Step No.	PMLK,constant,D,Z,R,ZR	WORD	step No. to change with repeat step (0~400)

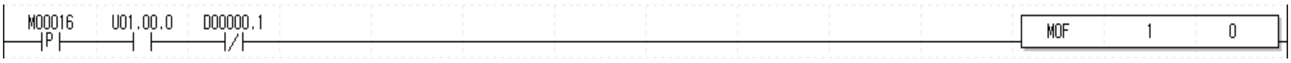
※ PMLK means P, M, L and K areas.

▷ Repeat operation step No. of operation data is changed to 20.

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

8.3.23 M code Release (Command : MOF)

1) Program



2) Description

Device	Description
M00016	X axis M code release input
U01.00.0	X axis command receive
D00000.1	X axis error state

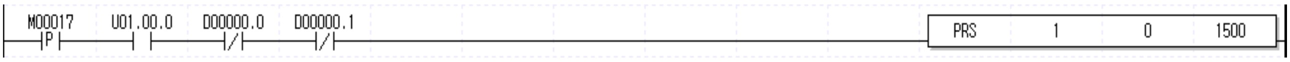
Command	MOF				M code release
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ PMLK means P, M, L and K areas.

▷ When M code occurs, M code signal and M code No. are released at the same time(M code and M code No. are changed to OFF and 0, respectively).

8.3.24 Current Position Preset (Command : PRS)

1) Program



2) Description

Device	Description
M00017	X axis current position preset input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	PRS				Current position preset
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	Current position value to change (-2147483648 ~ 2147483647)

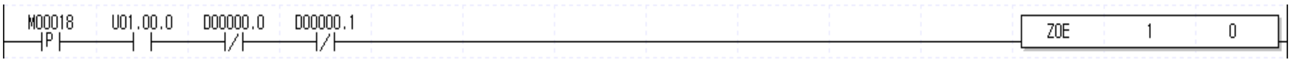
※ PMLK means P, M, L and K areas.

▷ The current position is changed to 1500.

▷ If current position preset command is executed in the origin unsettled state, positioning state signal(bit) is ON and the current position is changed by setting value.

8.3.25 ZONE Output Enabled (Command : ZOE)

1) Program



2) Description

Device	Description
M00018	X axis ZONE output enabled input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

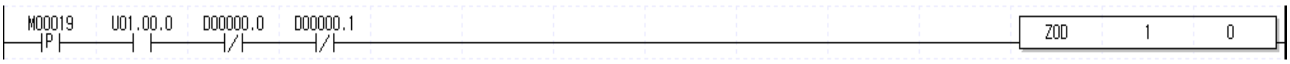
Command	ZOE				ZONE output enabled
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ PMLK means P, M, L and K areas.

▷ It enables the output of ZONE1, ZONE2 and ZONE3 by ZONE areas set in common parameter.

8.3.26 ZONE Output Disabled (Command : ZOD)

1) Program



2) Description

Device	Description
M00019	X axis ZONE output disabled input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

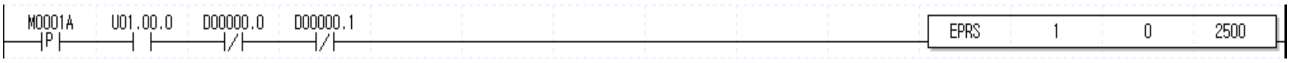
Command	ZOD				ZONE output disabled
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ PMLK means P, M, L and K areas.

▷ It disables the output of ZONE1, ZONE2 and ZONE3 by ZONE areas set in common parameter.

8.3.27 Encoder Preset (Command : EPRS)

1) Program



2) Description

Device	Description
M0001A	X axis encoder preset input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

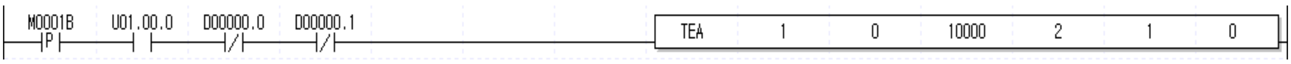
Command	EPRS				Encoder preset
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Position value	PMLK,constant,D,Z,R,ZR	INT	Encoder setting value to change (0~4294967295)

※ PMLK means P, M, L and K areas.

▷ Encoder setting value is changed to 2500.

8.3.28 Single Teaching (Command : TEA)

1) Program



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

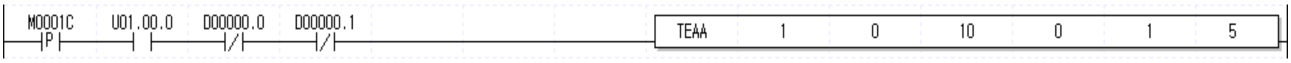
※ PMLK means P, M, L and K areas.

▷ 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).

8.3.29 Teaching Array (Command : TEAA)

1) Program



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.

8.3.30 Teaching Array Data Setting (Command: TWR)

1) Program

2) Description

Device	Description
M0001D	Teaching array data setting input

Command	TWR				Teaching Array 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 teaching array data
	OP3	Device	PMLK,D,Z,R,ZR	WORD	Leading device No. with teaching array data
	OP3	Data No.	PMLK,constant,D,Z,R,ZR	WORD	No. of data to save

※ PMLK means P, M, L and K areas.

▷ 16 double word(DWORD) data from D00100 through D00131 are set in the teaching array data area.

▷ Teaching array is not executed only by executing teaching array data setting command. Please refer to teaching array command(TEAA).

▷ According to the leading No. of device, the data are set in teaching array data area as follows.

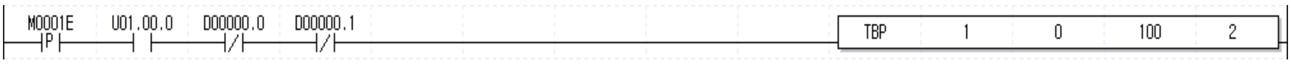
No.	Device NO.	Teaching array data
1	Device + 0	Teaching array data 1
2	Device + 2	Teaching array data 2
3	Device + 4	Teaching array data 3
4	Device + 6	Teaching array data 4
5	Device + 8	Teaching array data 5
6	Device + 10	Teaching array data 6
7	Device + 12	Teaching array data 7
8	Device + 14	Teaching array data 8
9	Device + 16	Teaching array data 9
10	Device + 18	Teaching array data 10
11	Device + 20	Teaching array data 11
12	Device + 22	Teaching array data 12
13	Device + 24	Teaching array data 13
14	Device + 26	Teaching array data 14
15	Device + 28	Teaching array data 15
16	Device + 30	Teaching array data 16

▷ Teaching array data can be set as follows by using PUT.

※ For the details of teaching array data setting using internal memory, please refer to “7.1.2 Teaching Data in Teaching Array”

8.3.31 Basic Parameter Teaching (Command : TBP)

1) Program



2) Description

Device	Description
M0001E	X axis basic parameter teaching input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	TBP				Basic 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 (1~11)

※ PMLK means P, M, L and K areas.

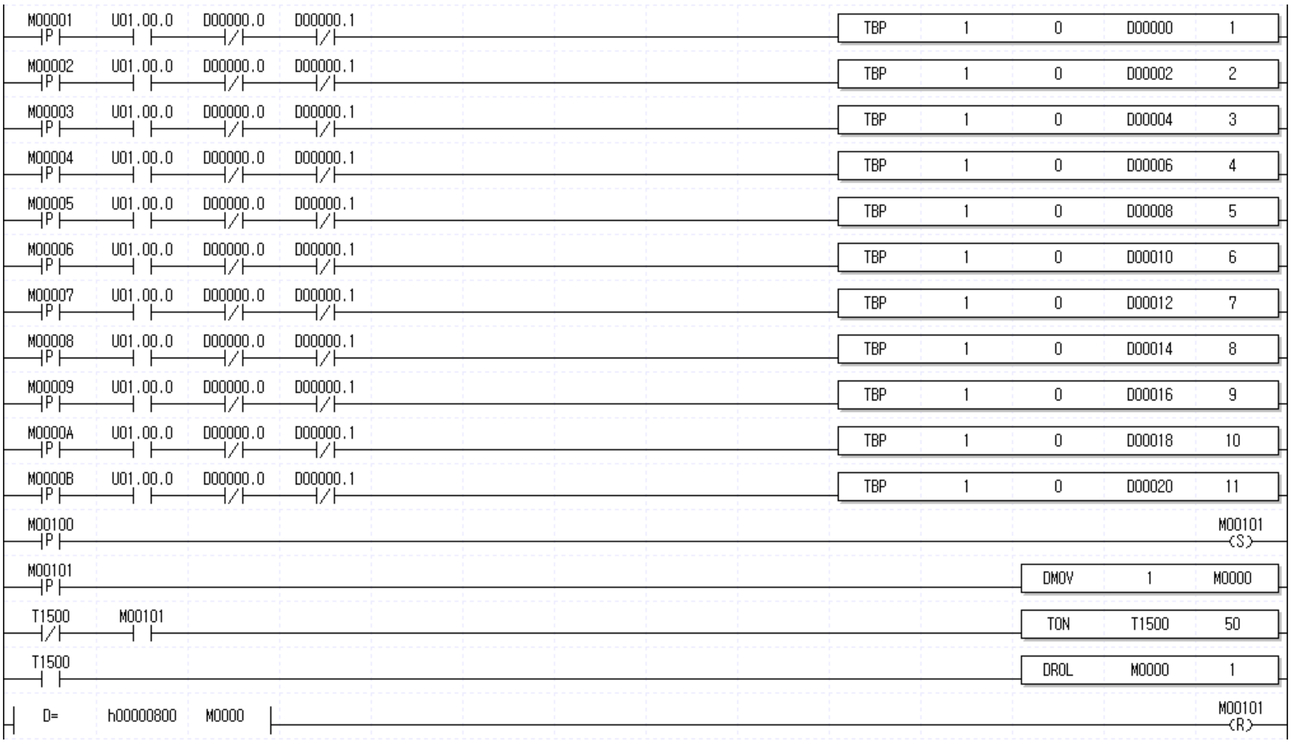
▷ Bias speed of basic parameter is changed to 100.

▷ The parameter value modified by basic parameter Teaching command is valid only while the power is ON. In order to save the parameter value modified by basic parameter Teaching command in the flash memory, it is required to save the parameter value modified by parameter/operation data save command, WRT after basic parameter Teaching.

▷ The value to be set in parameter item are as follows.

Items		Setting value
1	Speed limit value	LD:1~1000000 OC:1~200000
2	Bias speed	
3	Acc./dec. time 1	0~65535
4	Acc./dec. time 2	
5	Acc./dec. time 3	
6	Acc./dec. time 4	
7	Pulse per rotation	1~65535
8	Travel distance per rotation	
9	Pulse output mode	0:CW/CCW 1:PLS/DIR 2:Phase A/B
10	Unit	0:pulse 1:mm 2:inch 3:degree
11	Unit allocation	0:x1 1:x10 2:x100 3:x1000

▷ In case changing every basic parameter, they can be also changed by the following method.

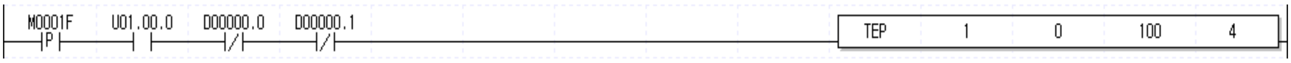


From the scan after M00100 is ON, basic parameter is changed in sequence from basic parameter No.1 through No.11.

※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.

8.3.32 Extended Parameter Teaching (Command : TEP)

1) Program



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.

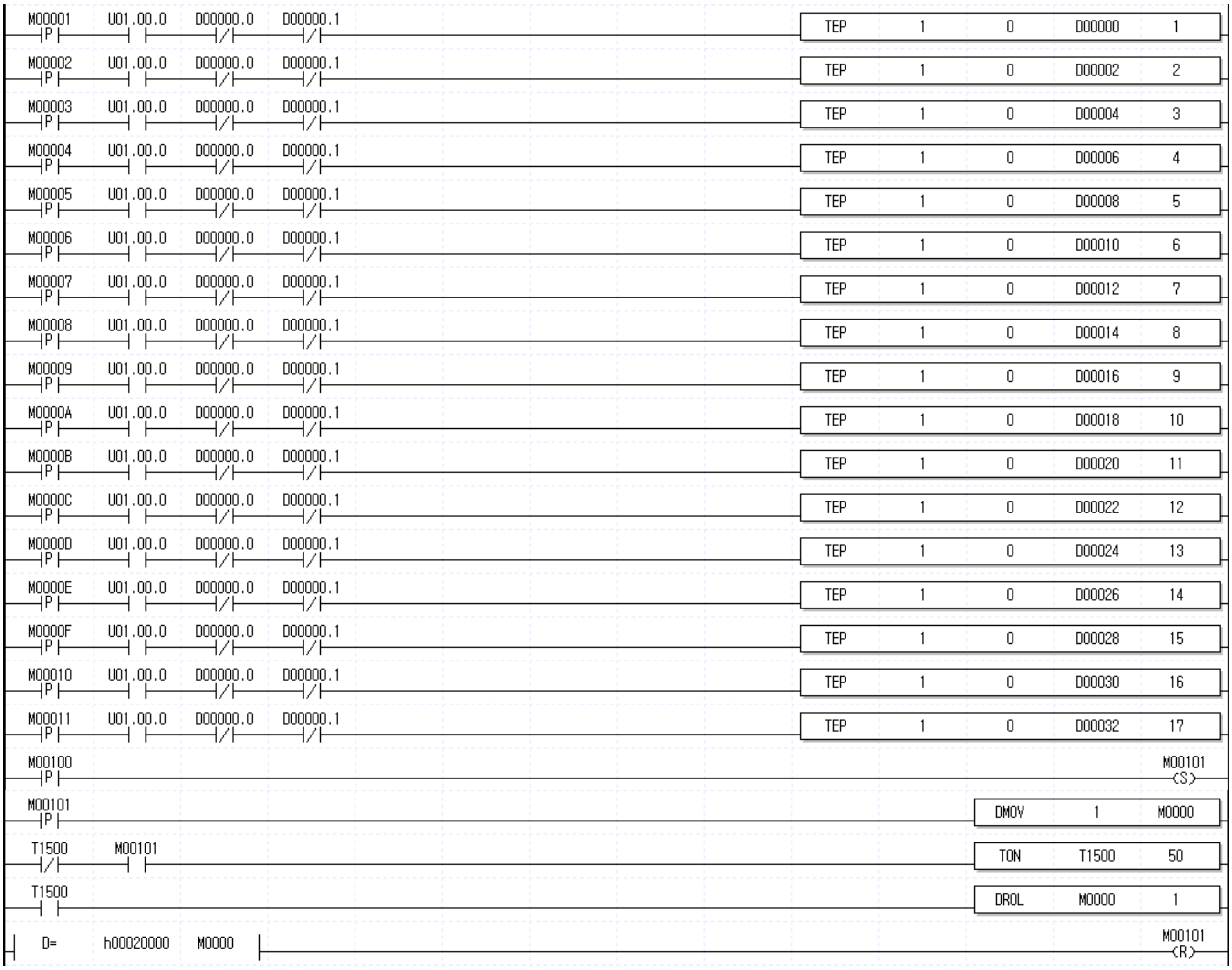
▷ Positioning end output time among Extended parameter is changed to 100ms.

▷ 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.

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.



From the scan after M00100 is ON, extended parameter is changed in sequence from basic parameter No.1 through No.17.

※ 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 Homing Parameter Teaching (Command : THP)

1) Program

2) Description

Device	Description
M00020	X axis homing parameter teaching input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	THP				Homing 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 value to change (1~9)

※ PMLK means P, M, L and K areas.

▷ The origin address among homing parameter of X axis is changed to 10000.

▷ The parameter value modified by homing parameter Teaching command is valid only while the power is ON. In order to save the parameter value modified by homing 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 homing parameter Teaching.

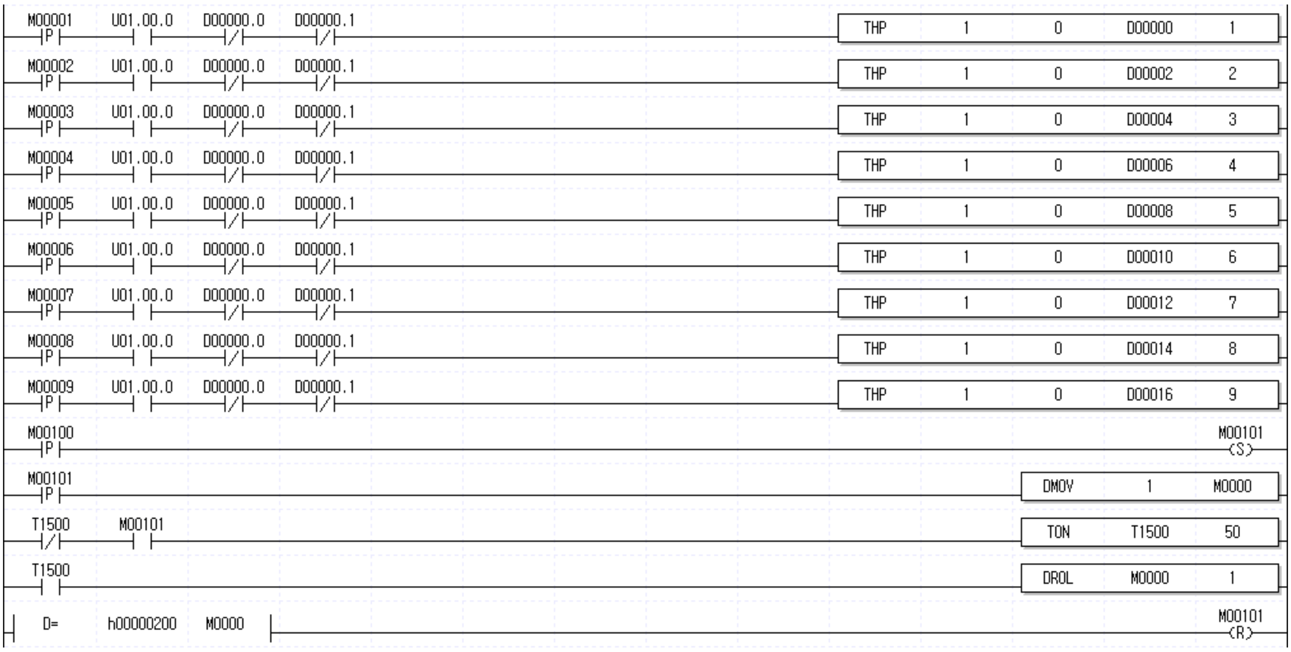
▷ The value to be set in parameter item is as follows.

Items		Setting value
1	Origin address	-2147483648 ~ 2147483647
2	Homing high speed	LD:1~1000000 OC:1~200000
3	Homing low speed	
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

※ DOG means near point signal.

※ Homing high speed executes homing to the point currently positioned on 0.

▷ In case changing every homing parameter, they can be also changed by the following method.

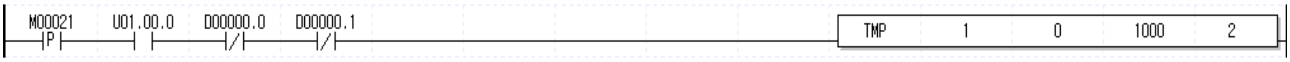


From the scan after M00100 is ON, homing parameter is changed in sequence from basic parameter No.1 through No.9.

※ 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.

8.3.34 Manual Operation Parameter Teaching (Command : TMP)

1) Program



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.

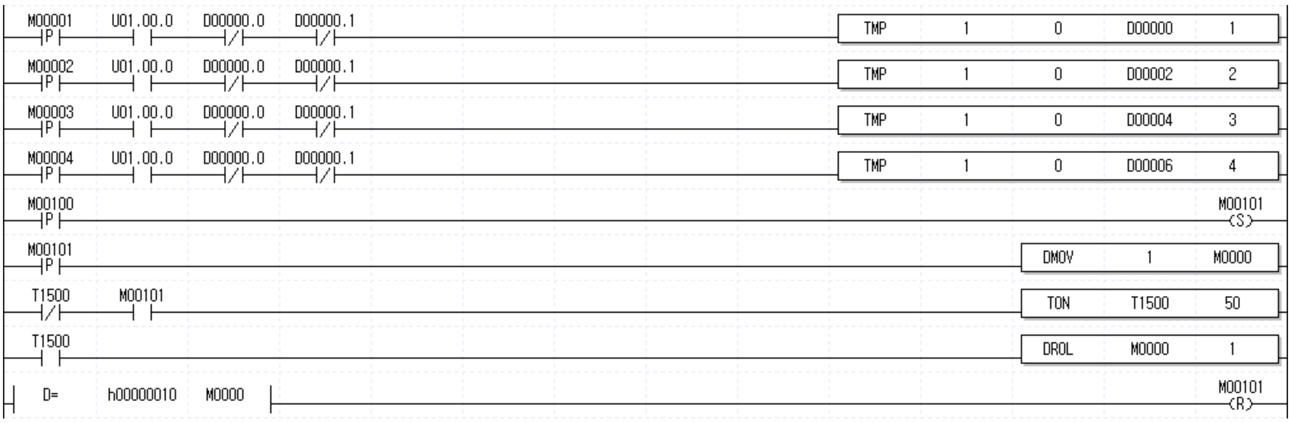
▷ Jog low speed among manual operation parameter of X axis is changed to 1000.

▷ 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.

▷ The value to be set in parameter item is as follows.

Items		Setting value
1	Jog high speed	LD:1~1000000 OC:1~200000
2	Jog low speed	
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

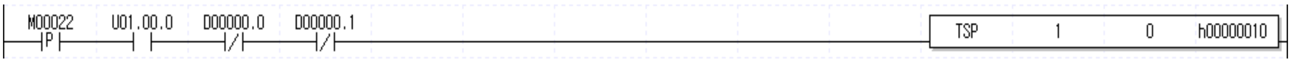


From the scan after M00100 is ON, manual operation parameter is changed in sequence from basic parameter No.1 through No.4.

※ 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.

8.3.35 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.

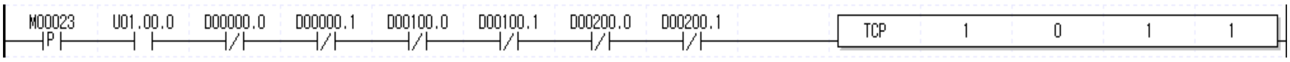
▷ The input signal applied with each bit of the value to be set in parameter item is as follows.

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.

8.3.36 Common Parameter Teaching (Command : TCP)

1) Program



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.

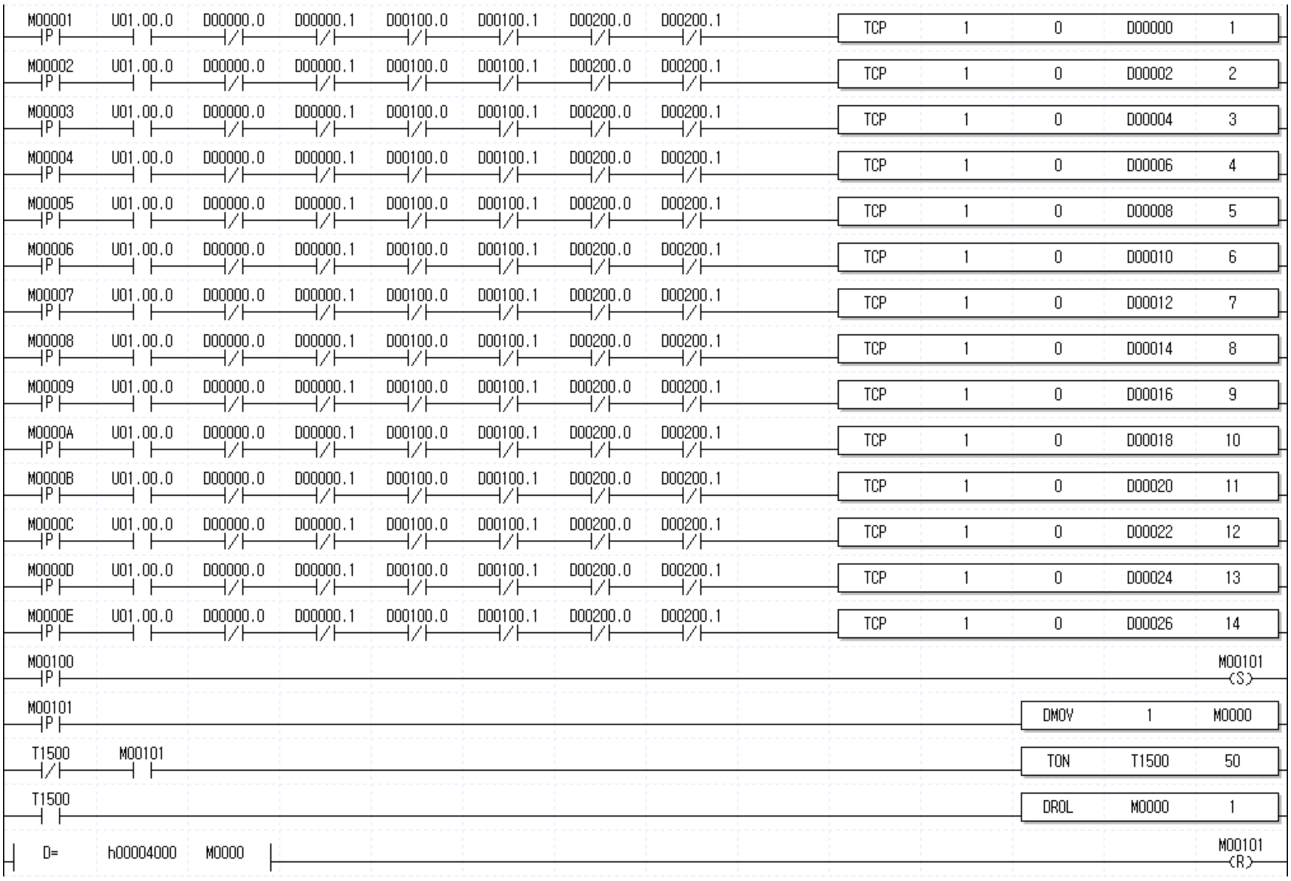
▷ Pulse output level among common parameter is changed to act as High Active.

▷ 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.

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.



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.

8.3.37 Operation Data Teaching (Command: TMD)

1) Program

3) Description

Device	Description
M00024	Operation data teaching input
U01.00.0	X axis command receive
D00000.0	X axis signal in operation
D00000.1	X axis error state

Command	TMD				Operation data 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	Operation data value	PMLK,constant,D,Z,R,ZR	DINT	Operation data value to change
	OP4	Operation data item	PMLK,constant,D,Z,R,ZR	WORD	Operation data item(1~11)
	OP5	Step No.	PMLK,constant,D,Z,R,ZR	WORD	Operation data step No. to change

※ PMLK means P, M, L and K areas.

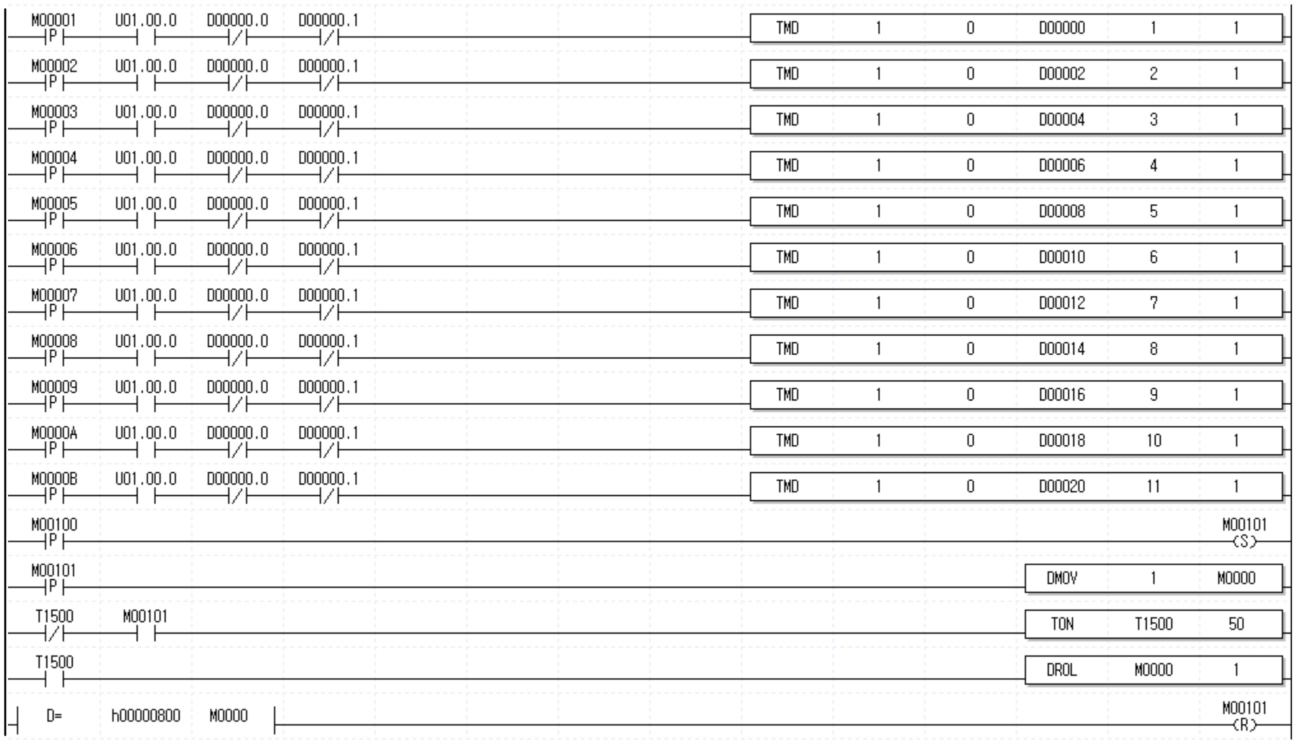
▷ The goal position of step No.1 is changed to 1000 in operation data.

▷ The operation data value modified by operation data teaching command is valid only while the power is ON. In order to save the operation data value modified by operation data teaching command in the ROM, it is required to save the operation data value modified by parameter/operation data save command(WRT) in the ROM after operation data Teaching.

▷ The values to be set in operation data item are as follows

Item		Setting value
1	Goal position	-2147483648 ~ 2147483647
2	Circular interpolation subordinate position	-2147483648 ~ 2147483647
3	Operation speed	0 ~ max. speed(speed limit)
4	Dwell time	0 ~ 50000
5	M code No.	0 ~ 65535
6	Control	0:position 1:speed
7	Operation method	0:single 1:repeat
8	Operation pattern	0:end 1:go on 2:continue
9	Coordinate	0:absolute 1:relative
10	Acc/dec. No.	1 ~ 4
11	Circular interpolation direction	0:CW 1:CCW

▷ In case changing every operation data, they can be also changed by the following method.



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.

8.3.38 Parameter/Operation Data Save (Command : WRT)

1) Program

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.

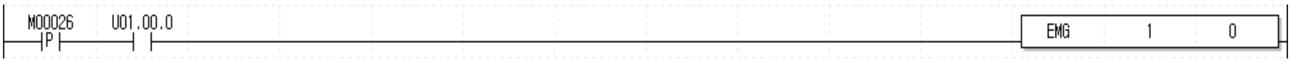
▷ The current parameter and operation data of save selection axis are saved into the flash memory(ROM).

▷ 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).

8.3.39 Emergency Stop (Command : EMG)

1) Program



2) Description

Device	Description
M00026	Internal emergency stop input
U01.00.0	X axis command receive

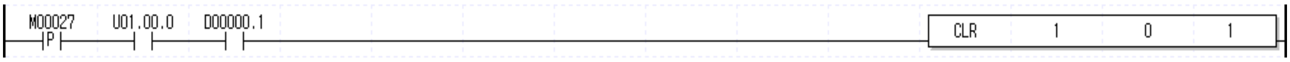
Command	EMG				Emergency stop
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ PMLK means P, M, L and K areas.

▷ All axes stop emergently and become pulse output disabled state.

8.3.40 Error Reset/Output Disabled Release (Command : CLR)

1) Program



2) Description

Device	Description
M00027	X axis error reset input
U01.00.0	X axis command receive
D00000.1	X axis error state

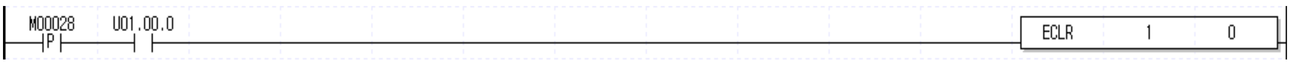
Command	CLR				Error reset, output disabled release
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)
	OP3	Output disabled release	PMLK,constant,D,Z,R,ZR	WORD	0:Output disabled no release 1:Output disabled release

※ PMLK means P, M, L and K areas.

▷ Error occurred is reset and pulse output disabled state shall be released.

8.3.41 Error History Reset (Command : ECLR)

1) Program



2) Description

Device	Description
M00028	Teaching array data save input
U01.00.0	X axis command receive

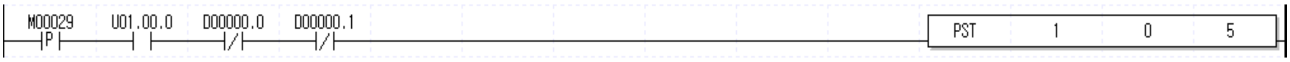
Command	ECLR				Error History Reset
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0:X,1:Y,2:Z)

※ PMLK means P, M, L and K areas.

▷ Error history occurred thus far will be reset(cleared).

8.3.42 POINT Start (Command : PST)

1) Program



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)

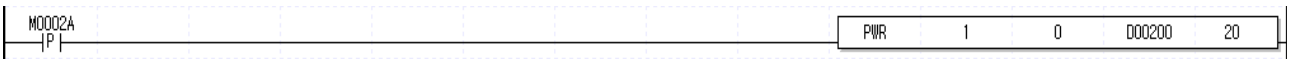
※ PMLK means P, M, L and K areas.

▷ 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.

8.3.43 POINT Start Step Data Setting (Command: PWR)

1) Program



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.

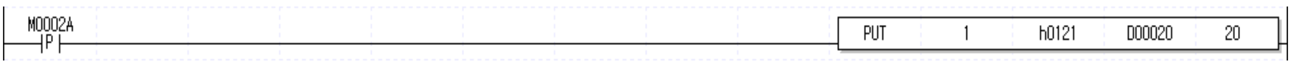
▷ 20 word data from D00200 through D00219 are set in the POINT start step data area.

▷ 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

No.	Device No.	POINT start step data
1	Device + 0	POINT start step data 1
2	Device + 1	POINT start step data 2
3	Device + 2	POINT start step data 3
4	Device + 3	POINT start step data 4
5	Device + 4	POINT start step data 5
6	Device + 5	POINT start step data 6
7	Device + 6	POINT start step data 7
8	Device + 7	POINT start step data 8
9	Device + 8	POINT start step data 9
10	Device + 9	POINT start step data 10
11	Device + 10	POINT start step data 11
12	Device + 11	POINT start step data 12
13	Device + 12	POINT start step data 13
14	Device + 13	POINT start step data 14
15	Device + 14	POINT start step data 15
16	Device + 15	POINT start step data 16
17	Device + 16	POINT start step data 17
18	Device + 17	POINT start step data 18
19	Device + 18	POINT start step data 19
20	Device + 19	POINT start step data 20

▷ The method to set POINT start step data using PUT is as follows.



※ For the details of POINT start step data using internal memory, please refer to “7.1.1 Operation Step Data during POINT start”

8.3.44 Operation State Read (Command: SRD)

1) Program

2) Description

Device	Description
F00099	Always ON Flag

Command	SRD				Current state read
Operand	OP1	Slot	Constant	WORD	Slot No. installed with APM module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Axis to read the current state
	OP3	Device	PMLK,D,Z,R,ZR	WORD	Leading No. of device to read and save the current state value

※ PMLK means P, M, L and K areas.

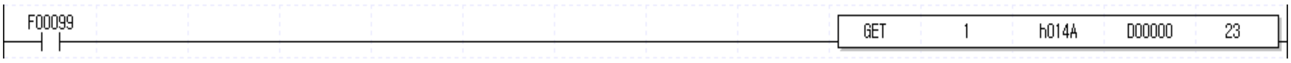
▷ It reads the current state and saves it from D000000 to D00022.

▷ According to the leading No. of Device, the current state is saved 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

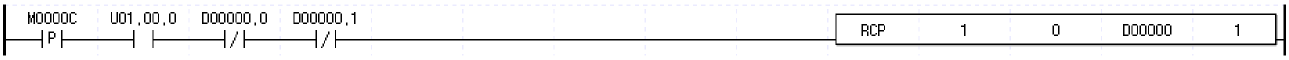
▷ For operation state info, axis info and external input signal state bit info, refer to “7.1.3 State Info”.

▷ The method to read the current state using GET is as follows.



8.3.45 Current position section repetition (Command: RCP)

1) Program



2) Description

Device	Description
M0000C	X axis speed synchronization input
U01.00.0	X axis command reception
D00000.0	X axis during run signal
D00000.1	X axis error status

Command	RCP				Current position section repetition
Operand	OP1	Slot	Constant	WORD	Base and slot number where positioning module is equipped
	OP2	Axis	PMLK, constant,D,Z,R,ZR	WORD	Axis to command (0:X axis,1:Y axis,2:Z axis)
	OP3	Repetition section	PMLK, constant, D,Z,R,ZR	DINT	Section to repeat
	OP4	Repetition or not	PMLK, constant, D,Z,R,ZR	WORD	Section repetition enable/disable

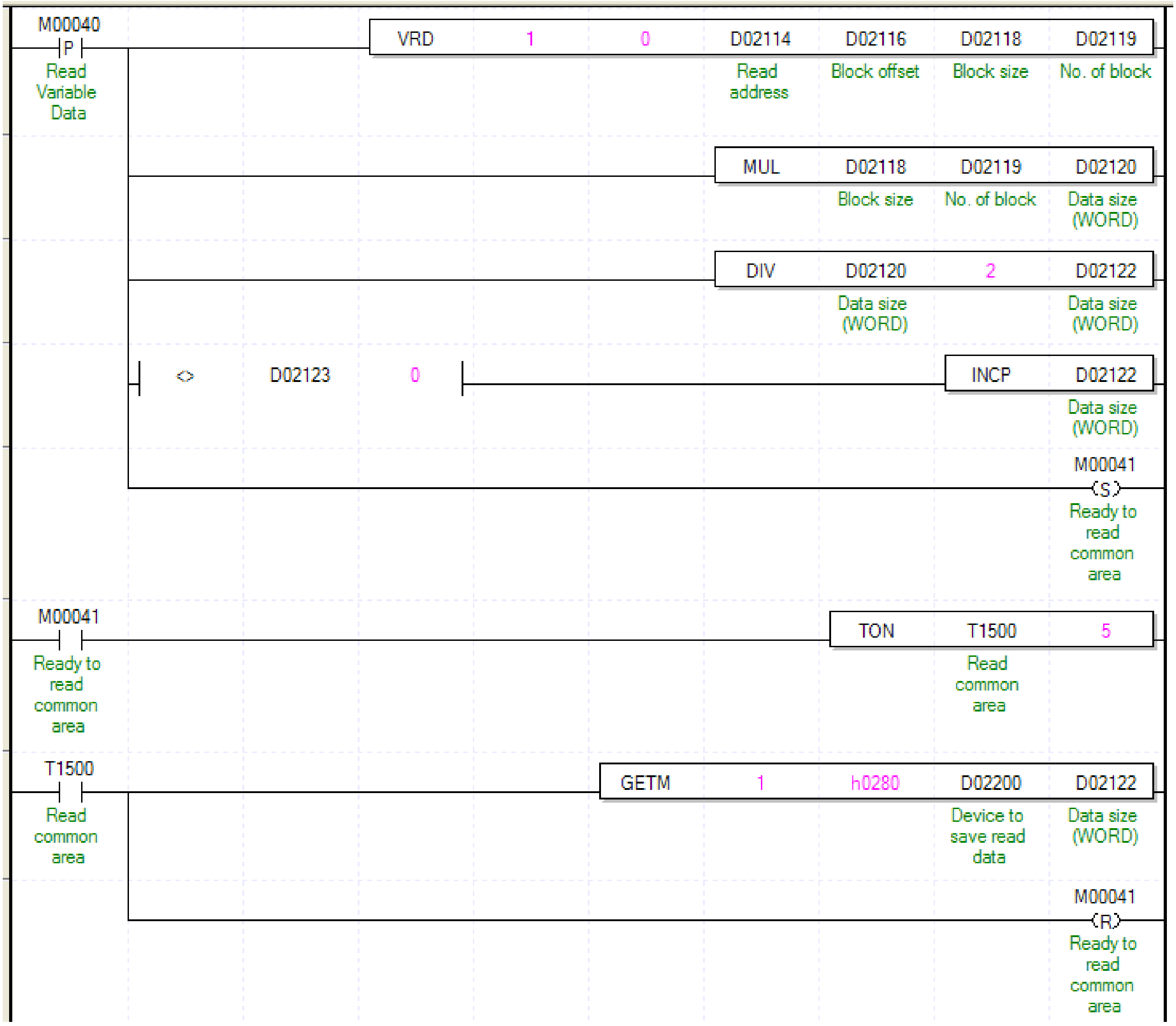
※ PMLK indicates P area, M area, L area, K area.

▷ It’s command to set or prohibit current position section of positioning module.

▷ Current position section repetition can be operated at direct start operation.

8.3.46 Read Variable Data (Command: VRD)

1) Program



2) Description

Device	Description
M00040	Input to read variable data
M00041	Ready flag to read common area (ready flag to save in internal device by GETM after executing command reading variable data)
D02114	Head address to read internal memory data of module
D02116	Block offset
D02118	Block size
D02119	Number of block
D02120	Size of data to read (WORD)
D02122	Size of data to read (DWORD)
D02123	Remaining (after changing WORD to DWORD)
D02200	Head device to save data

Command	VRD				Read variable data
Operand	OP1	Slot	Constant	WORD	Base and slot number where positioning module is equipped
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Axis to command (1 ~ 3: 1 axis ~ 3 axis)
	OP3	Read address	PMLK,constant,D,Z,R,ZR	DWORD	Head address of data in module internal memory to read (0 ~ 12147)
	OP4	Block offset	PMLK,constant,D,Z,R,ZR	DWORD	Offset between blocks (0 ~ 12147)
	OP5	Block size	PMLK,constant,D,Z,R,ZR	WORD	Size of one block (1 ~ 128)
	OP6	No. of block	PMLK,constant,D,Z,R,ZR	WORD	No. of block to read (1 ~ 128)

※ PMLK indicates P area, M area, L area, K area.

▷ This is command that reads data among parameter, operating data, CAM data with WORD unit as many as “Block size” set in OP5 starting “Read address” into CPU. In case “No. of block” set in OP6 is more than 2, it reads blocks with interval of Block offset as many as “No. of block”- 1 in order.

▷ Max data size (Block size X No. of block) can be read with one command is 128 WORD.

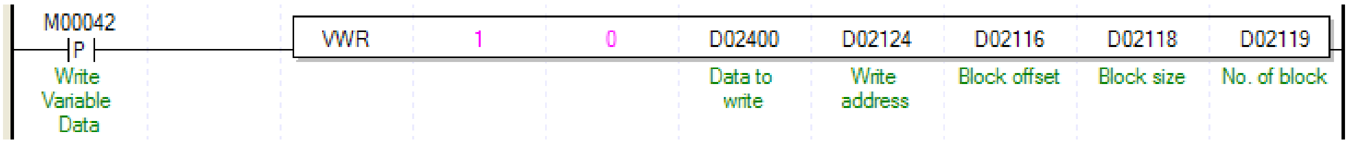
▷ “Read variable data” can be executed in operation.

▷ If you execute “Read variable data”, the data read from positioning module will be saved in common area. In order to save in device for using in program, use GETM command [Read address: h280, data size: read data size (DWORD) as program example after executing “Read variable data” command

▷ In the above program, it reads data as many as D02118 starting “Read address” set in D02114 with WORD unit into CPU. In case “No, of block set in D02119 is more than 2, it reads blocks with interval of “Block Offset” starting “Read address” D02114 as many as “No. of block -1” in order. In the above program, saves the read data in D02200 5ms after executing “Read variable data: command. You have to execute GETM command minimum 4ms after executing “Read variable data” to save the read data in common area.

8.3.47 Write Variable Data (Command: VWR)

1) Program



2) Comment

Device	Description
M00042	Input to write variable data
D2400	Head address where data for writing is saved
D2124	Write address
D2116	Block offset
D2118	Block size
D2119	No. of block

Command	VWR				Write variable data
Operand	OP1	Slot	Constant	WORD	Base and slot number where positioning module is equipped
	OP2	Axis	PMLK,constant,D,Z, R,ZR	WORD	Axis to command (1 ~ 3: 1 axis ~ 3 axis)
	OP3	Data device	PMLK,constant,D,Z, R,ZR	WORD	Head address where data to write is saved.
	OP4	Write address	PMLK,constant,D,Z, R,ZR	DWORD	Head address to write module internal memory data (0 ~ 12147)
	OP5	Block offset	PMLK,constant,D,Z, R,ZR	DWORD	Offset between blocks (0 ~ 12147)
	OP6	Block size	PMLK,constant,D,Z, R,ZR	WORD	Size of one block (1 ~ 128)
	OP7	No. of block	PMLK,constant,D,Z, R,ZR	WORD	No. of block to read (1 ~ 128)

※ PMLK indicates P area, M area, L area, K area.

▷ This is command that writes data starting “Write address” set in OP4 among parameter of positioning module internal memory, operation data, CAM data as many as “Block size” OP6 from PLC program with data set in OP3. In case “No. of block” is more than 2, writes other data to blocks with interval of “Block offset set in OP5 from “Write address” as many as “No. of block”-1 in order.

▷ Max data size (Block seze X No. of block) that can be written with one command is 128 WORD.

▷ “Write variable data” command can’t be executed in operation

▷ In case you execute “Write variable data”, the changed value is kept during power on. So, to save the data, execute “Save Parameter/Operation data (XWRT) command.

▷ In the above program expel, writes data as many as “block size” D02128 starting position set in D02124 among parameter of positioning module internal memory, operation data, CAM data from PLC program to data set in D02400 with WORD unit. In case “No. of Block” set in D02119, write other data to block with interval of “Block offset” D02116 starting “Write address” D02124 as many as “No. of block -1” in order.

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Chapter 9 Function Block

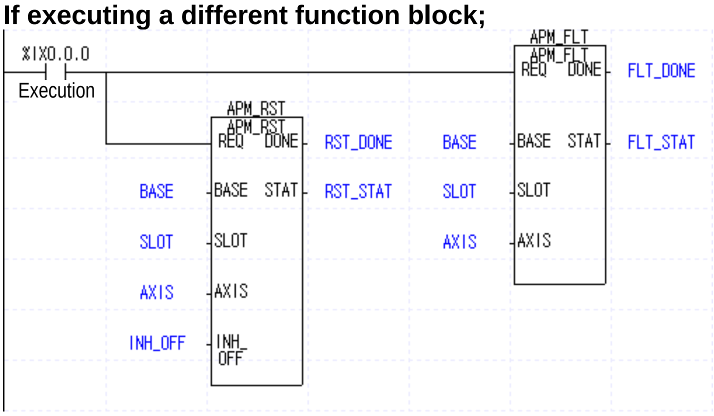
Here describes the positioning function blocks used in XGI CPU Module.

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_SSSP	Speed synchronization with position	Edge	5
15	APM_POR	Position override	Edge	5
16	APM_SOR	Speed override	Edge	5
17	APM_PSO	Positioning speed override	Edge	5
18	APM_NMV	Continuous operation	Edge	5
19	APM_INC	Inching operation	Edge	5
20	APM_RTP	return to the previous position of manual operation	Edge	5
21	APM_SNS	Start step No. change	Edge	5
22	APM_SRS	Repeat step No. change	Edge	5
23	APM_MOF	M code release	Edge	5
24	APM_PRS	Current position preset	Edge	5
25	APM_ZONE	ZONE output enabled/disabled	Edge	5
26	APM_EPRE	Encoder value preset	Edge	5
27	APM_TEA	Single teaching	Edge	5
28	APM_ATEA	Teaching array	Edge	5
29	APM_SBP	Basic parameter teaching	Edge	5
30	APM_SEP	Extended parameter teaching	Edge	5
31	APM_SHP	Homing parameter teaching	Edge	5
32	APM_SMP	Manual operation parameter teaching	Edge	5
33	APM_SIP	Input signal parameter teaching	Edge	5
34	APM_SCP	Common parameter teaching	Edge	5
35	APM_SMD	Operation data teaching	Edge	5
36	APM_EMG	Emergency stop	Edge	5
37	APM_RST	Error reset/output disabled release	Edge	5
38	APM_PST	Point start	Edge	5
39	APM_WRT	Parameter/operation data save	Edge	1000
40	APM_CRD	Operation information read	Level	0.02
41	APM_SRD	Operation state read	Level	0.02
42	APM_ENCRD	Encoder value read	Level	0.02
43	APM_JOG	JOG operation	Level	5
44	APM_MPG	Manual pulse generator operation	Edge	5
45	APM_RCP	Current position section repetition	Edge	5
46	APM_VRD	Read variable data	Edge	5
47	APM_VWR	Write variable data	Edge	5

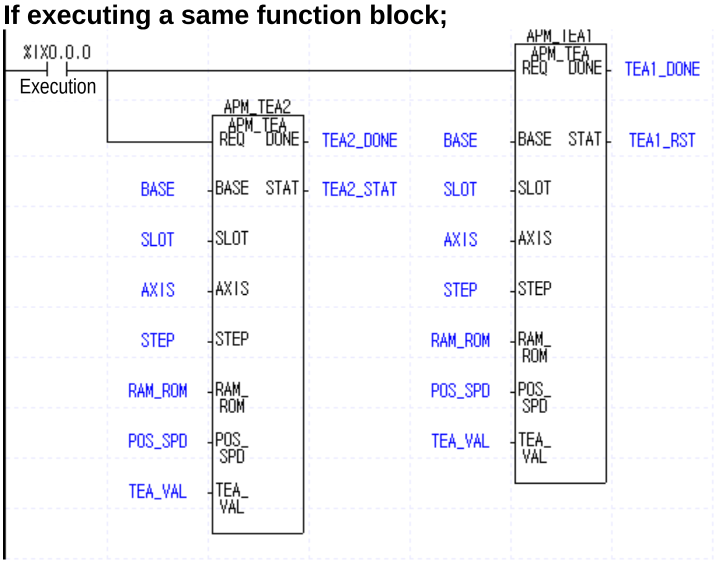
Notes

▷ 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.

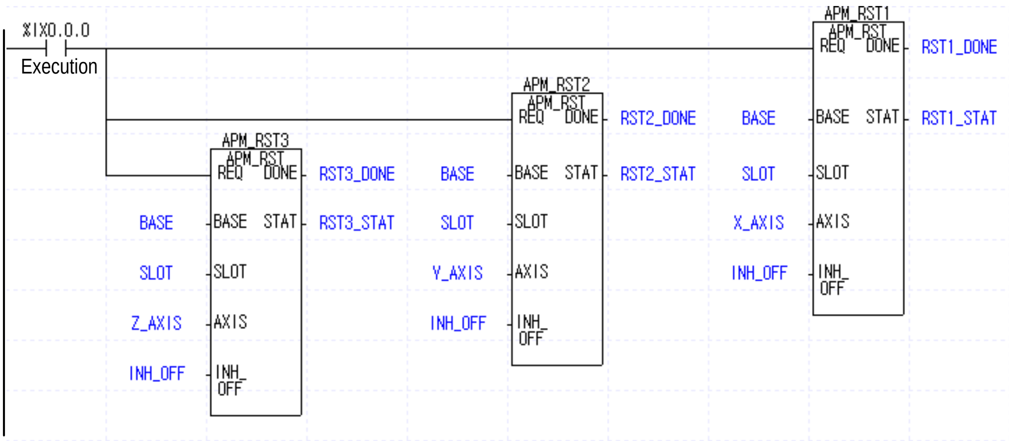
If executing a different function block;



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 ● 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 ● 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 ● 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 ● 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 ● “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 ● If an error occurs during function block execution, it generates the error number.

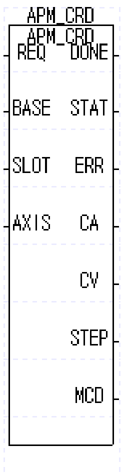
2) The position and speed setting ranges of positioning function block are as follows and the ranges are based on pulse for position or pulse/sec for speed.

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

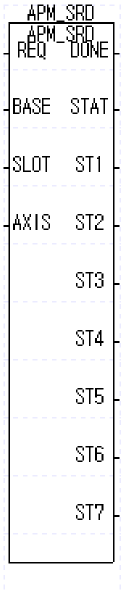
9.2.1 Operation Information Read (APM_CRD)

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
	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

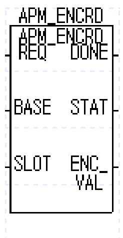
9.2.2 Operation State Read (APM_SRD)

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
	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)

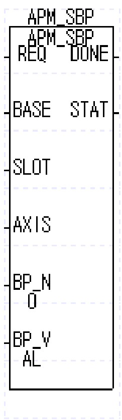
It is used to read encoder value in order to monitor or use them as the conditions in program.

Type	Parameter	Data type	Description
	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
	BP_NO	UDINT	Basic parameter item to execute change
	BP_VAL	USINT	Basic parameter setting value to execute change

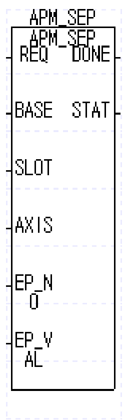
▷ The parameter value modified by basic parameter teaching function block is valid only when the power is on. To save the parameter value modified by basic parameter teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation data 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
	EP_NO	UDINT	Extended parameter item to execute change
	EP_VAL	USINT	Extended parameter setting value to execute change

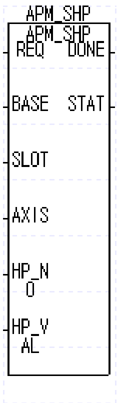
▷ The parameter value modified by extended parameter teaching function block is valid only when the power is on. To save the parameter value modified by extended parameter teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation 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.

<table>
<tr><th>Type</th><th>Parameter</th><th>Data type</th><th>Description</th></tr>
<tr><td rowspan="2">
</td><td>HP_NO</td><td>UDINT</td><td>Homing parameter item to change</td></tr>
<tr><td>HP_VAL</td><td>USINT</td><td>Homing parameter setting value to change</td></tr>
</table>

▷ 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.

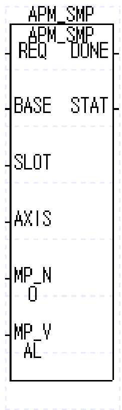
<table>
<tr><th colspan="2">Items</th><th>Setting value</th></tr>
<tr><td>1</td><td>Homing address(position)</td><td>-2,147,483,648 ~ 2,147,483,647</td></tr>
<tr><td>2</td><td>Homing high speed</td><td rowspan="2">Open collector: 1 ~ 200,000
Line driver: 1 ~ 1,000,000</td></tr>
<tr><td>3</td><td>Homing low speed</td></tr>
<tr><td>4</td><td>Homing acc./dec. speed time</td><td>0 ~ 65,535</td></tr>
<tr><td>5</td><td>Homing dwell time</td><td>0 ~ 50,000</td></tr>
<tr><td>6</td><td>Homing compensation amount</td><td>-2,147,483,648 ~ 2,147,483,647</td></tr>
<tr><td>7</td><td>Homing restart time</td><td>0 ~ 65,535</td></tr>
<tr><td>8</td><td>Homing method</td><td>0: DOG/origin(Off), 1: DOG/origin(On)
2: high/low limit/origin, 3: DOG
4. high speed homing, 5. High/low limit</td></tr>
<tr><td>9</td><td>Homing direction</td><td>0: forward, 1: reverse</td></tr>
</table>

※ 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.

<table>
<tr><th>Type</th><th>Parameter</th><th>Data type</th><th>Description</th></tr>
<tr><td rowspan="2">
</td><td>MP_NO</td><td>UDINT</td><td>Manual operation parameter item to change</td></tr>
<tr><td>MP_VAL</td><td>USINT</td><td>Manual operation parameter setting value to change</td></tr>
</table>

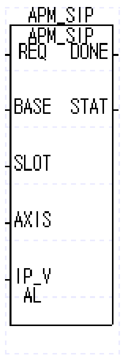
▷ The parameter value modified by manual operation parameter teaching function block is valid only when the power is on. To save the parameter value modified by manual operation parameter teaching function block to the flash memory(ROM), it is necessary to save the parameter value modified by using parameter/operation 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.

<table>
<tr><th colspan="2">Items</th><th>Setting values</th></tr>
<tr><td>1</td><td>JOG high speed</td><td rowspan="2">Open collector: 1 ~ 200,000
Line driver: 1 ~ 1,000,000</td></tr>
<tr><td>2</td><td>JOG low speed</td></tr>
<tr><td>3</td><td>JOG acc./dec. time</td><td>0 ~ 65,535</td></tr>
<tr><td>4</td><td>Inching speed</td><td>0 ~ 65,535</td></tr>
</table>

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
	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.

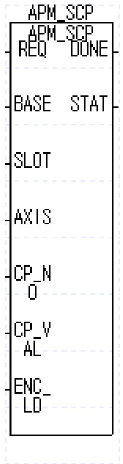
▷ The manual operation parameter items and setting values are as follows.

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.

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
	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.

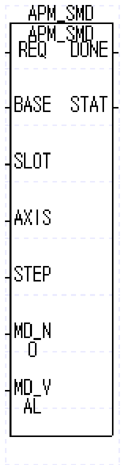
Bit	Items	Setting values
1	Pulse output level	0: Low Active, 1: High Active
2	Circular interpolation method	0: middle point, 1: center point
3	Encoder pulse input mode	0: CW/CCW(1 phase 1 multiplier) 1: CW/CCW(1 phase 2 multiplier) 2: PLS/Dir(1 phase 1 multiplier) 3: PLS/Dir(1 phase 2 multiplier) 4: 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	
10	Zone 1 Off area	-2,147,483,648 ~ 2,147,483,647
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
	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.

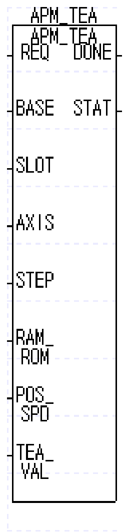
▷ If entering 0 into“STEP”, it changes the current step.

▷ 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: Keep, 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)

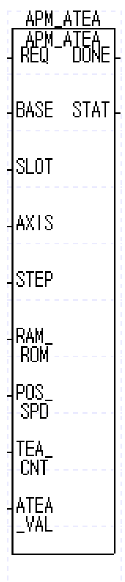
This is used to change the speed or position of operation data, instead of using APM software package.

Type	Parameter	Data type	Description
	STEP	UINT	Operation data step No. to change ● 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 ● Setting range: 0 ~ 1(0: RAM, 1: ROM)
	POS_SPD	BOOL	Select position/speed teaching ● Setting range: 0 ~ 1(0: position, 1: speed)
	TEA_VAL	DINT	Teaching data setting ● Position teaching range: -2,147,483,648 ~ 2,147,483,647 ● Speed teaching range 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.

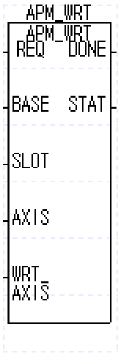
Type	Parameter	Data type	Description
	STEP	UINT	Operation data step No. to change ● Setting range: 0 ~ 400 ● If any other value out of the range is set, it generates "error 11"
	RAM_ROM	BOOL	Select RAM or ROM teaching ● Setting range: 0 ~ 1(0: RAM, 1: ROM)
	POS_SPD	BOOL	Select position or speed teaching ● Setting range: 0 ~ 1(0: position, 1: speed)
	TEA_CNT	USINT	Select the no. of continuous step to execute teaching ● Setting range: 1 ~ 16 ● If any other value out of the range is set, it generates "error 11"
	TEA_VAL	ARRAY [0..15] OF DINT	Teaching data setting ● Position teaching range: -2,147,483,648 ~ 2,147,483,647 ● Speed teaching range 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)

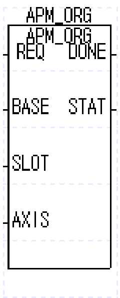
This is used to save the setting value of an item changed by parameter teaching and operation data into ROM (flash memory).

Type	Parameter	Data type	Description
	WRT_AXIS	USINT	Select an axis to save ● 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)

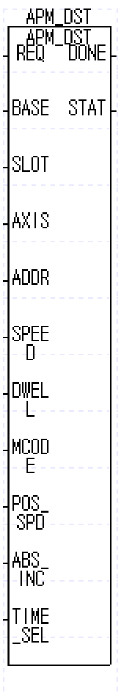
9.6 Start Function block

9.6.1 Homing Start (APM_ORG)

Type	Description
	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).

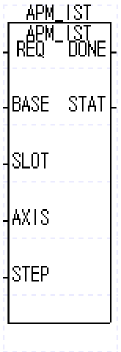
9.6.2 Direct Start (APM_DST)

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
	ADDR	DINT	Goal address(position) ● Setting range: -2,147,483,648 ~ 2,147,483,647
	SPEED	UDINT	Operation speed ● Setting range 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	Dwell time ● Setting range: 0 ~ 50,000 ● If any other value out of the setting range is set, it generates "Error 11".
	MCODE	UINT	M code number ● Setting range: 0 ~ 65,635
	POS_SPD	BOOL	Position/Speed control selection ● Setting range: 0 ~ 1(0: position, 1: speed)
	ABS_INC	BOOL	Absolute/relative coordinate selection ● Setting range: 0 ~ 1(0: absolute, 1: relative)
	TIME_SEL	USINT	Acc./Dec. time number setting ● Setting range: 0 ~ 3 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)

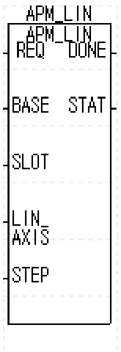
It is used to operate with the operation data saved in ROM(flash memory).

Type	Parameter	Data type	Description
	STEP	UINT	Operation step number ● 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)

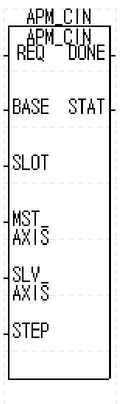
It is used to execute 2/3 axis linear interpolation operation.

<table>
<tr><th>Type</th><th>Parameter</th><th>Data type</th><th>Description</th></tr>
<tr><td rowspan="2"></td><td>LIN_
AXIS</td><td>USINT</td><td>Interpolation operation axis
● Setting range: 1 ~ 7(excluding 1, 2 and 4)
<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>
● If any other value out of the setting range is set, it generates “Error 6”.</td></tr>
<tr><td>STEP</td><td>UINT</td><td>Operation step No.
● Setting range: 0 ~ 400
● If any other value out of the setting range is set, it generates “Error 11”.</td></tr>
</table>

If entering 0 into “STEP”, it operates for the current step.

9.6.5 Circular Interpolation Start (APM_CIN)

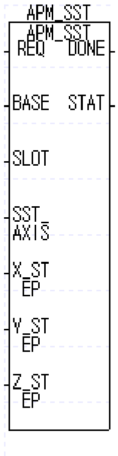
It is used to execute 3 axis circular interpolation operation.

<table>
<tr><th>Type</th><th>Parameter</th><th>Data type</th><th>Description</th></tr>
<tr><td rowspan="3"></td><td>MST
_AXIS</td><td>USINT</td><td>Main axis
● 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”.</td></tr>
<tr><td>SLV
_AXIS</td><td>USINT</td><td>Subordinate axis
● 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”.</td></tr>
<tr><td>STEP</td><td>UINT</td><td>Operation step No.
● Setting range: 0 ~ 400
● If any other value out of the setting range is set, it generates “Error 11”.</td></tr>
</table>

If entering 0 into “STEP”, it operates for the current step.

9.6.6 Simultaneous Start (APM_SST)

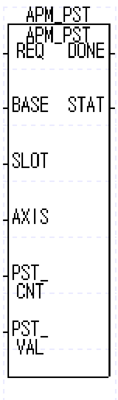
It is used to execute 3 axis circular interpolation operation.

<table>
<tr><th>Type</th><th>Parameter</th><th>Data type</th><th>Description</th></tr>
<tr><td rowspan="4">
</td><td>SST_AXIS</td><td>USINT</td><td>Simultaneous start operation axis
● Setting range: 1 ~ 7(excluding 1, 2 and 4)
<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>
● If any other value out of the setting range is set, it generates “Error 6”.</td></tr>
<tr><td>X_STEP</td><td>UINT</td><td>Operation step No.
● Setting range: 0 ~ 400
● If any other value out of the setting range is set, it generates “Error 11”.</td></tr>
<tr><td>Y_STEP</td><td>UINT</td><td>Operation step No.
● Setting range: 0 ~ 400
● If any other value out of the setting range is set, it generates “Error 11”.</td></tr>
<tr><td>Z_STEP</td><td>UINT</td><td>Operation step No.
● Setting range: 0 ~ 400
● If any other value out of the setting range is set, it generates “Error 11”.</td></tr>
</table>

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.

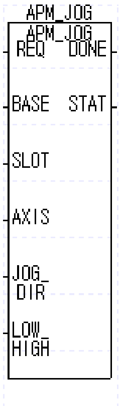
<table>
<tr><th>Type</th><th>Parameter</th><th>Data type</th><th>Description</th></tr>
<tr><td rowspan="2">
</td><td>PST_CNT</td><td>USINT</td><td>No. of operation step for point start
● Setting range: 1 ~ 20
● If any other value out of the setting range is set, it generates “Error 6”.</td></tr>
<tr><td>PST_VAL</td><td>ARRAY [0..19] OF UINT</td><td>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”.</td></tr>
</table>

If entering 0 into “STEP”, it operates for the current step.

9.7 Manual Operation Function Block

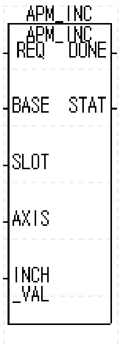
9.7.1 JOG Operation (APM_JOG)

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
	JOG_DIR	BOOL	JOG operation direction ● Setting range: 0 ~ 1(0: forward, 1: reverse)
	LOW_HIGH	BOOL	Select JOG operation low/high speed ● Setting range: 0 ~ 1(0: low speed, 1: high speed)

9.7.2 Inching Operation (APM_INC)

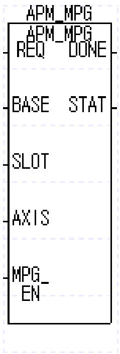
It is the manual operation executed by quantitative operation for a minute movement.

Type	Parameter	Data type	Description
	INCH_VAL	DINT	Inching transfer amount ● Setting range: -2,147,483,648 ~ 2,147,483,647

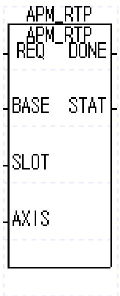
Inching speed can be changed by manual operation parameter.

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
	MPG_EN	BOOL	Select MPG operation disabled/enabled. ● Setting Range: 0 ~ 1(0: disabled, 1: enabled)

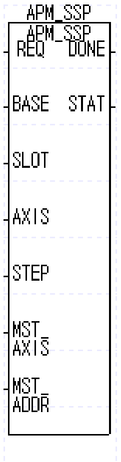
9.7.4 Returning to Previous Manual Operation Position (APM_RTP)

Type	Description
	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

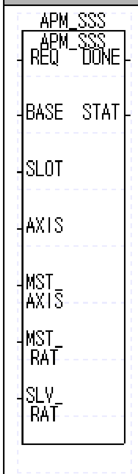
9.8.1 Position Synchronization (APM_SSP)

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
	STEP	UINT	Operation step number ● Setting range: 0 ~ 400 ● If any other value out of the setting range is set, it generates “Error 11”.
	MST_ AXIS	USINT	Main axis ● 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 ● Setting range: -2,147,483,648 ~ 2,147,483,647

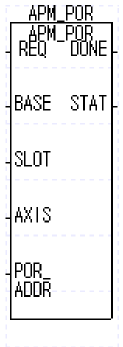
9.8.2 Speed Synchronization (APM_SSS)

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
	MST_AXIS	USINT	Main axis ● 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 ● Setting range: 1 ~ 65,535
	SLV_RAT	UINT	Speed ratio of subordinate axis ● Setting range: 1 ~ 65,535

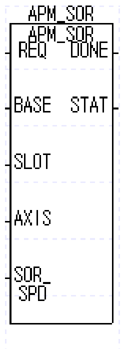
9.8.3 Position Override (APM_POR)

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 ● Setting range: -2,147,483,648 ~ 2,147,483,647

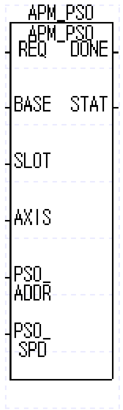
9.8.4 Speed Override (APM_SOR)

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.

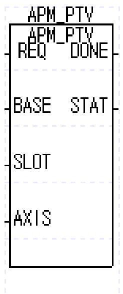
Type	Parameter	Data type	Description
	SOR_SPD	UDINT	Operation speed ● Setting range Open collector: 0 ~ 200,000 Line drover: 0 ~ 1,000,000 ● If any other value out of the setting range is set, it generates "Error 11".

9.8.5 Position Assigned Speed Override (APM_PSO)

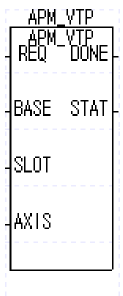
If setting the goal position of an axis in operation for the operation speed/position and executing the function block, the operation speed is changed to the preset operation speed set in the goal position.

Type	Parameter	Data type	Description
	PSO_ADDR	DINT	Goal Position ● Setting Range: -2,147,483,648 ~ 2,147,483,647
	PSO_SPD	UDINT	Operation Speed ● Setting Range 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".

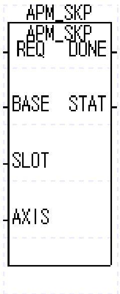
9.8.6 Position/Speed Switching Control (APM_PTV)

Type	Description
	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.

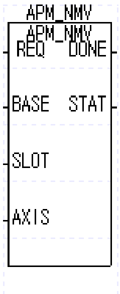
9.8.7 Speed/Position Switching Control (APM_VTP)

Type	Description
	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)

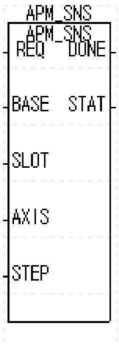
Type	Description
	If executing the function block to an axis in indirect start operation, it stops the operation of the current operation step and keeps the next step operation.

9.8.9 Continuous Operation (APM_NMV)

Type	Description
	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.

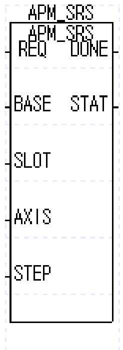
9.8.10 Start Step Number Change (APM_SNS)

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
	STEP	UINT	Operation step No. ● Setting range: 1 ~ 400 ● If any other value out of the setting range is set, it generates "Error 11".

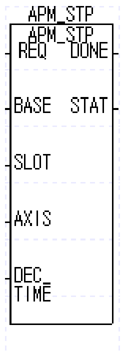
9.8.11 Repeat Step No. Change (APM_SRS)

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
	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)

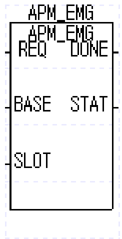
If setting the deceleration time to an axis in operation and executing the function block, it executes the deceleration stop at the deceleration stop in the set deceleration time. If the deceleration time is set to 0, it executes deceleration stop in the acc./dec. time set in the operation of indirect start or direct start.

Type	Variable	Data type	Description
	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.

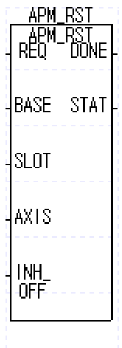
9.9 Error Function blocks

9.9.1 Emergency Stop (APM_EMG)

Type	Description
	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.

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.

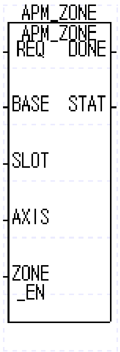
Type	Parameter	Data type	Description
	INH_OFF	BOOL	Output disabled release ● Setting range: 0 ~ 1(0: output disabled not release, 1: output disabled release)

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.

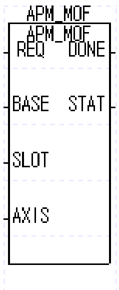
9.10 Other Function Blocks

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.

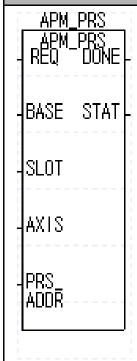
Type	Parameter	Data type	Description
	ZONE_EN	BOOL	Zone output enabled ● Setting range: 0 ~ 1(0: Zone output disabled, 1: Zone output enabled) ● Zone output: ST4, ST4[5](Zone 1), ST4[6](Zone 2), ST4[7](Zone 3), the output parameter of APM_SRD

9.10.2 M Code Release (APM_MOF)

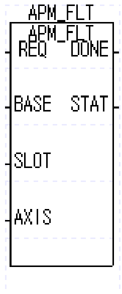
Type	Description
	If executing the function block, M code signal of On(1) is Off(0) and M code number is 0. M code output is On(1) if setting the M code mode of extended parameter as With or After. ● M code output: ST1[3], the output parameter of APM_SRD

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.

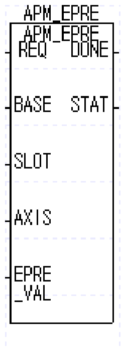
Type	Parameter	Data type	Description
	PRS_ADDR	DINT	Preset value ● Setting range: -2,147,483,648 ~ 2,147,483,647

9.10.4 Floating Origin Setting (APM_FLT)

Type	Description
	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.

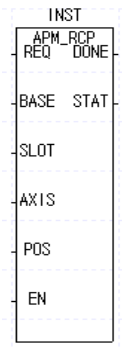
9.10.5 Encoder Value Preset (APM_EPRE)

If setting encoder preset value and executing function block, the encoder value is changed to the set value.

Type	Parameter	Data type	Description
	EPRE_VAL	UDINT	Encoder preset value ● Setting range: 0 ~ 4,294,967,295

9.10.6 Current position section repetition (APM_RCP)

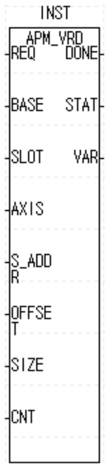
Sets or prohibits the current position section of positioning module. And it operates in direct start.

Type	Parameter	Data type	Description
	POS	DINT	Sets repetition position (address) ● Setting range: -2,147,483,648 ~ 2,147,483,647
	EN	BOOL	Enable current position section repetition ● Setting range: 0 ~ 1 (0: Prohibit current position section repetition 1: Enable current position section repetition)

9.11 Function Blocks that reads/writes variable data

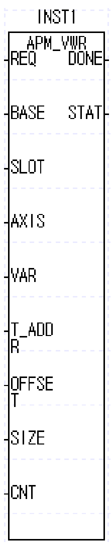
9.11.1 Read variable data (APM_VRD)

This is instruction giving the command that make positioning module read parameter, operation data directly. By specifying the parameter and operation data module internal memory address, you can read data you want.

Type	Parameter	Data type	Description
	S_ADDR	UDINT	Head address of module internal address of data to read ● Setting range: 0 ~ 12147
	OFFSET	UDINT	Offset between data blocks to read ● Setting range: 0 ~ 12147
	SIZE	UINT	Size of data block to read ● Setting range: 1 ~ 128
	CNT	UINT	No. of data block to read ● Setting range: 1 ~ 128

9.11.2 Write variable data (APM_VWR)

This is instruction giving the command that make positioning module write parameter, operation data directly. By specifying the parameter and operation data module internal memory address, you can write data you want.

Type	Parameter	Data type	Description
	VAR	UINT [128]	PLC device where data to write is saved
	T_ADDR	UDINT	Head address of module internal memory where data will be written ● Setting range: 0 ~ 12147
	OFFSET	UDINT	Offset between data blocks to write ● Setting range: 0 ~ 12147
	SIZE	UINT	Data block size to write ● Setting range: 1 ~ 128
	CNT	UINT	No. of data block to write ● Setting range: 1 ~ 128

9.12 Error Code of Function Block

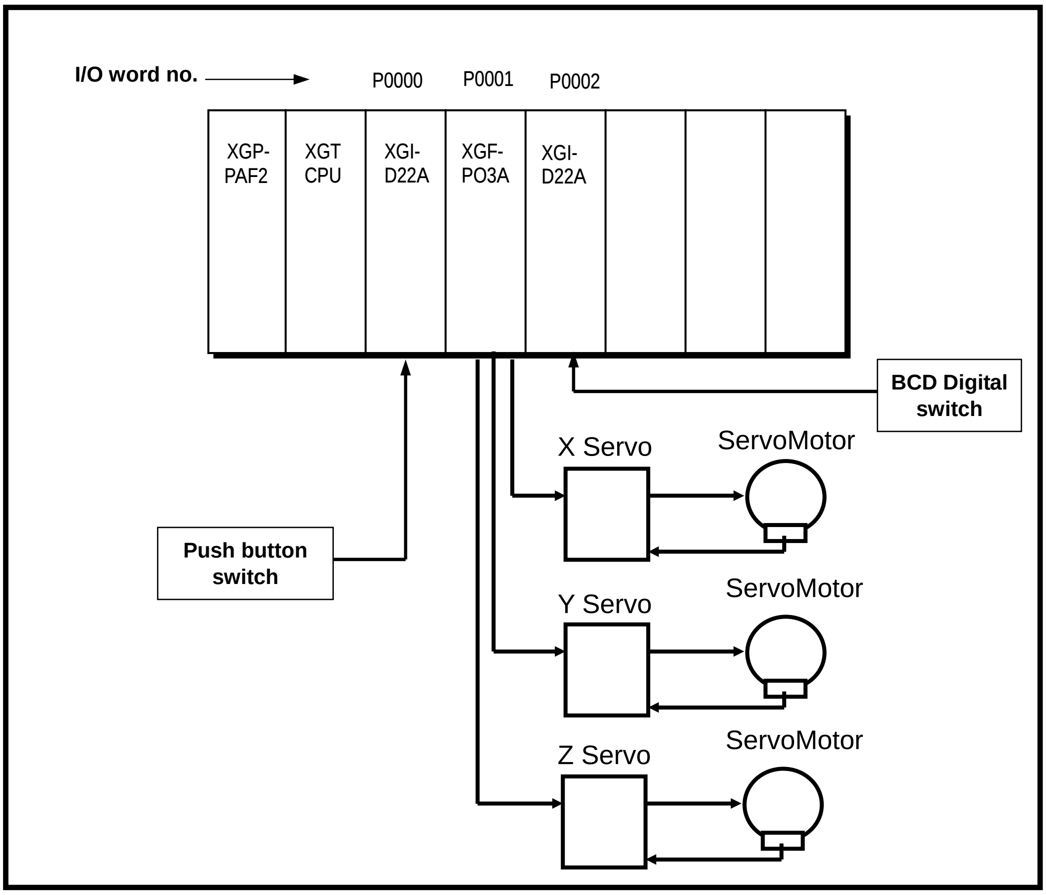
Here describes the error number, type and measure of an output parameter, STAT.

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/XGR) 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/XGR) CPU Module.
- ▶ In case of XGR CPU, positioning module should be installed on extension base so make sure when setting the base number and slot number.
- ▶ 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

10.2 Basic Program

10.2.1 Basic (Floating Origin Setting – Indirect Start)

1) Description

(1) The used device

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

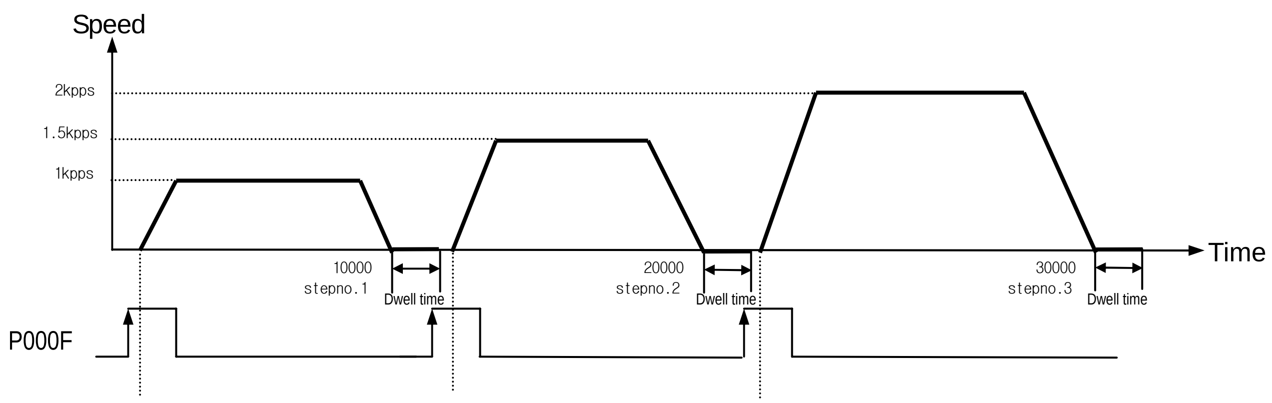
(2) Operation sequence

P00001 (floating origin) switch ON => P0000F (start) switch ON 3 times

(3) Operation data setting

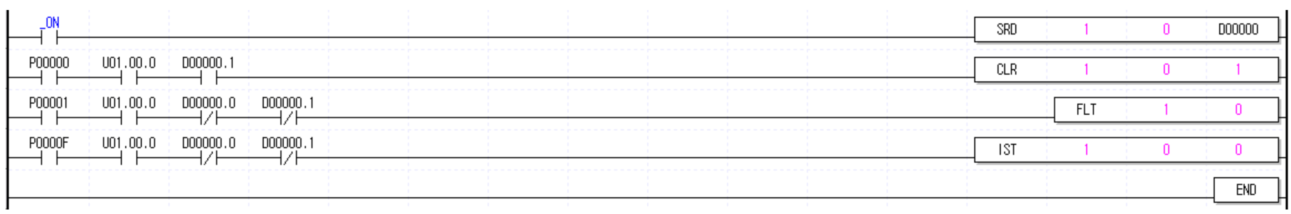
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [㎳]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	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) Operation pattern



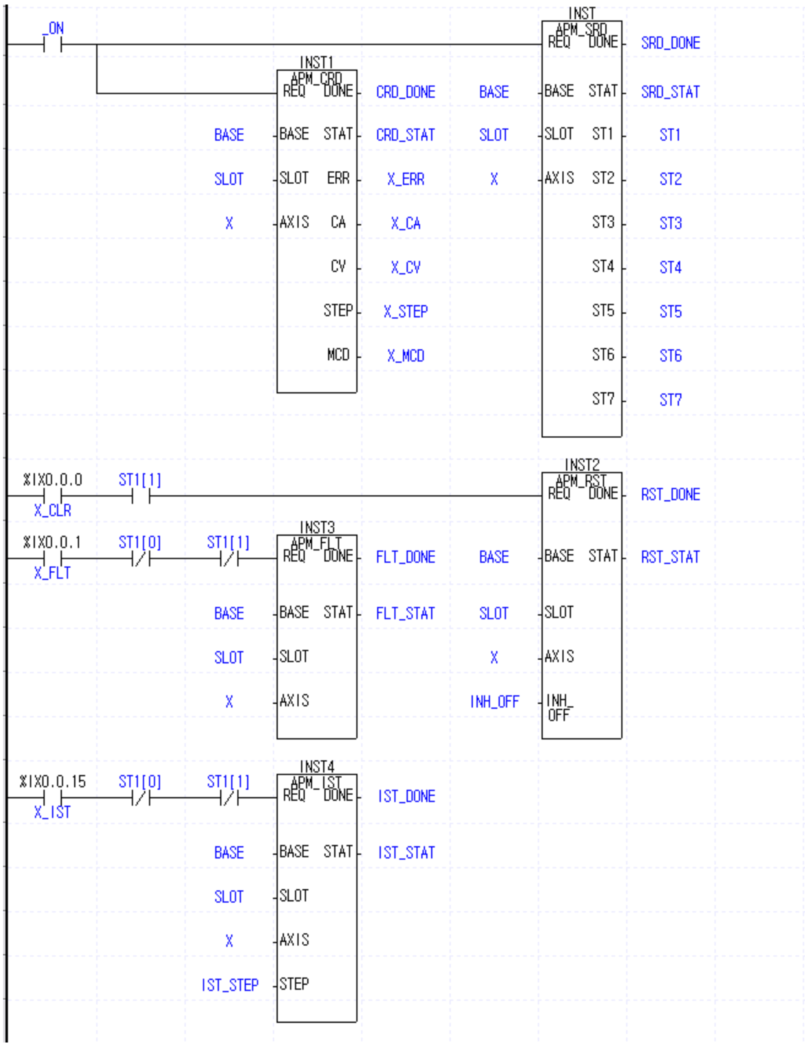
2) Program

(1) XGK



(2) XGI/XGR

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)



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

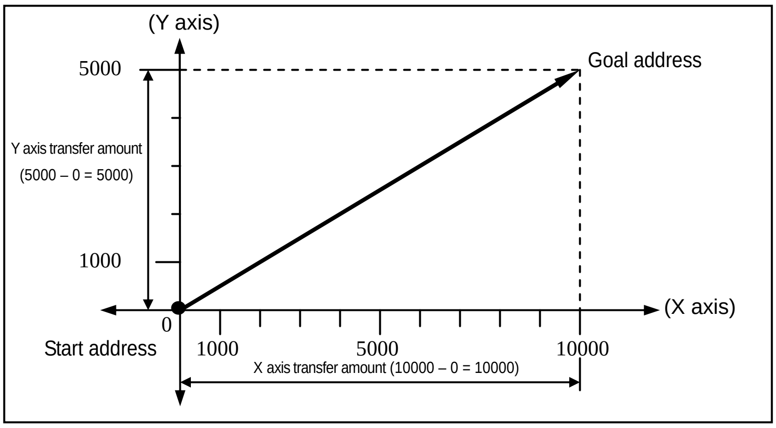
(2) Operation Sequence

P00001 (Floating origin) switch ON ⇒ P0000F (Linear interpolation Start) switch ON

(3) Operation data setting

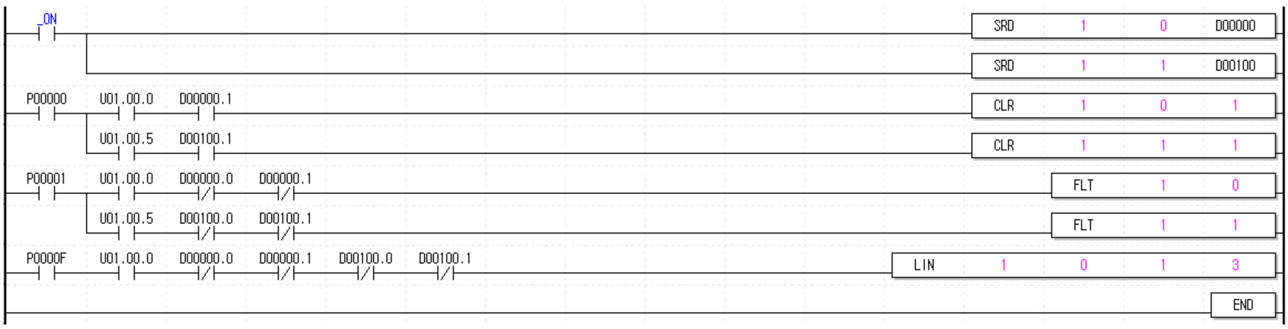
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	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



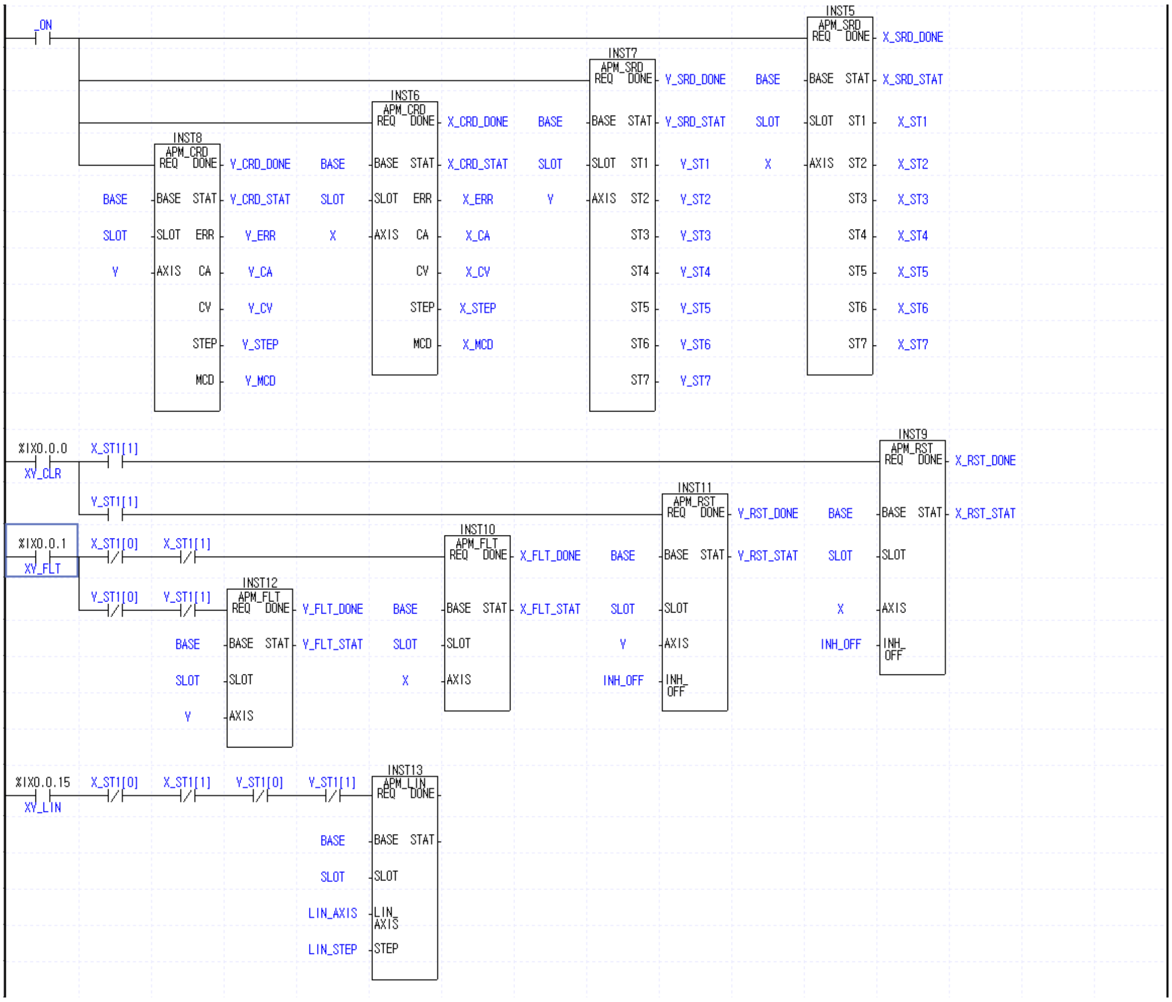
2) Program

(1) XGK



(2) XGI/XGR

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)



10.2.3 Basic (Floating origin setting - Circular 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 circular 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

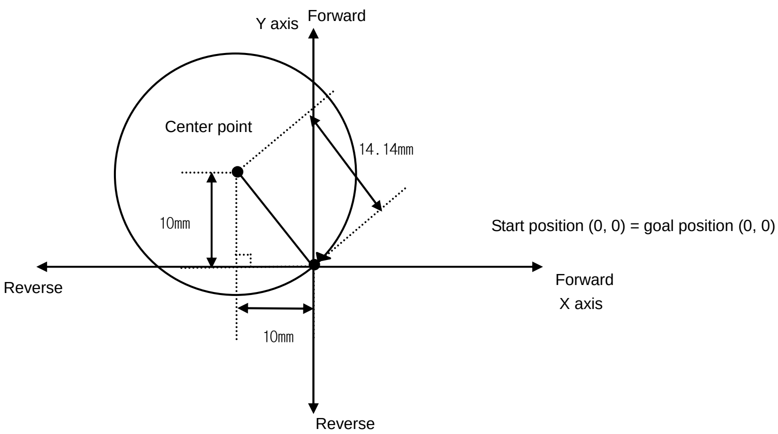
P00001(Floating origin) switch ON ⇒ P0000F(Circular interpolation Start) switch ON

▷ This is the case that is set as circular interpolation operation of center point in Common parameter items. ⇒

(3) Operation data setting

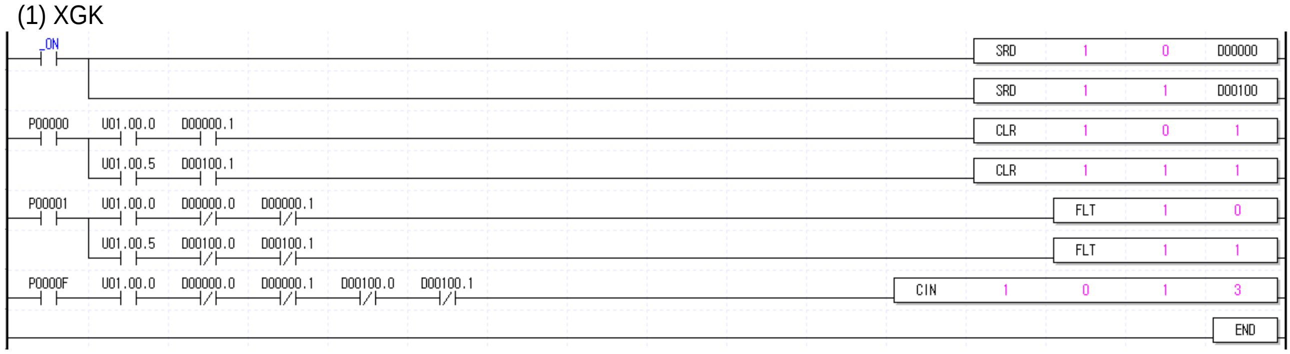
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [mm]	Circular interpolation aux. point[mm]	M code	Acc./ dec. no.	Operation speed [mm/m]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Relative	Position control	End	Single	0.0000	-10.0000	0	1	100.00	100	CW
Y axis setting	1	Relative	Position control	End	Single	0.0000	10.0000	0	1	100.00	100	CW

(4) Operation pattern



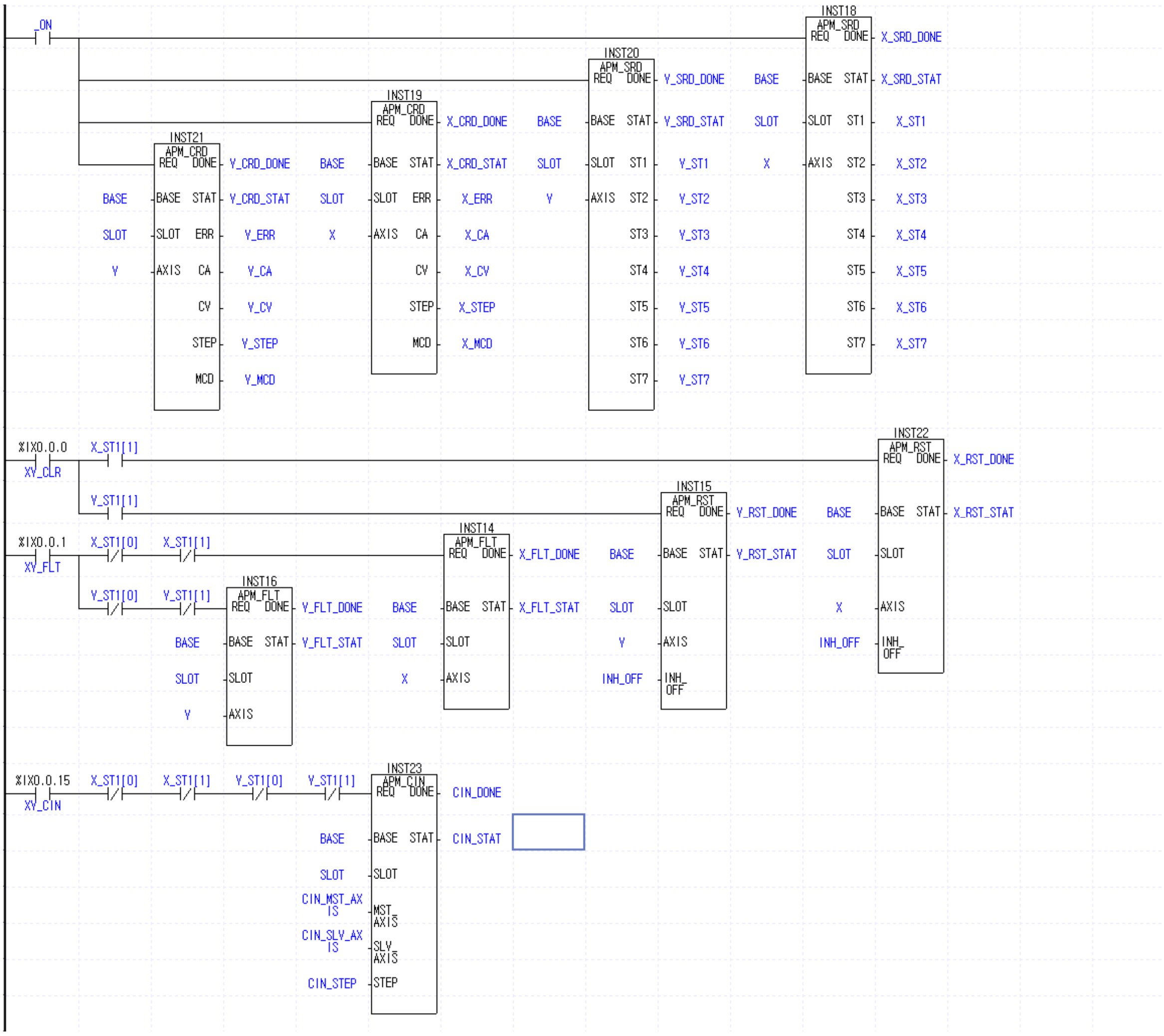
2) Program

(1) XGK



(2) XGI/XGR

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)



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
DOO0O0.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)).

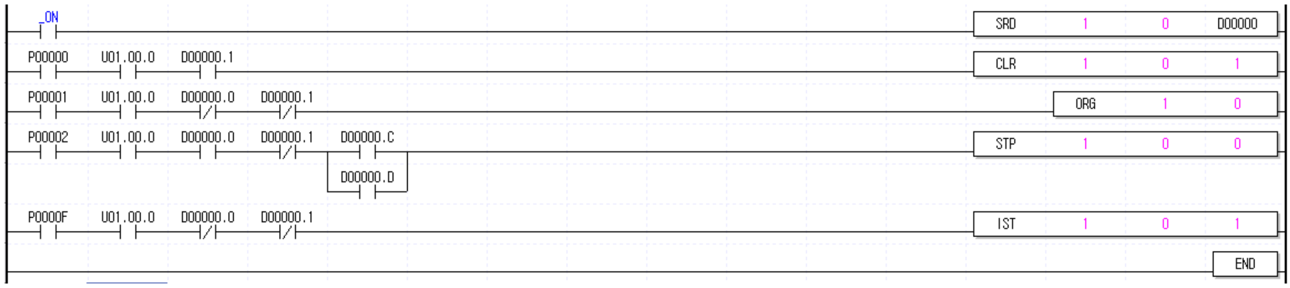
▷ As deceleration time is set as “0” in deceleration stop command, it carries out the deceleration by 1 acc./dec. time.

(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

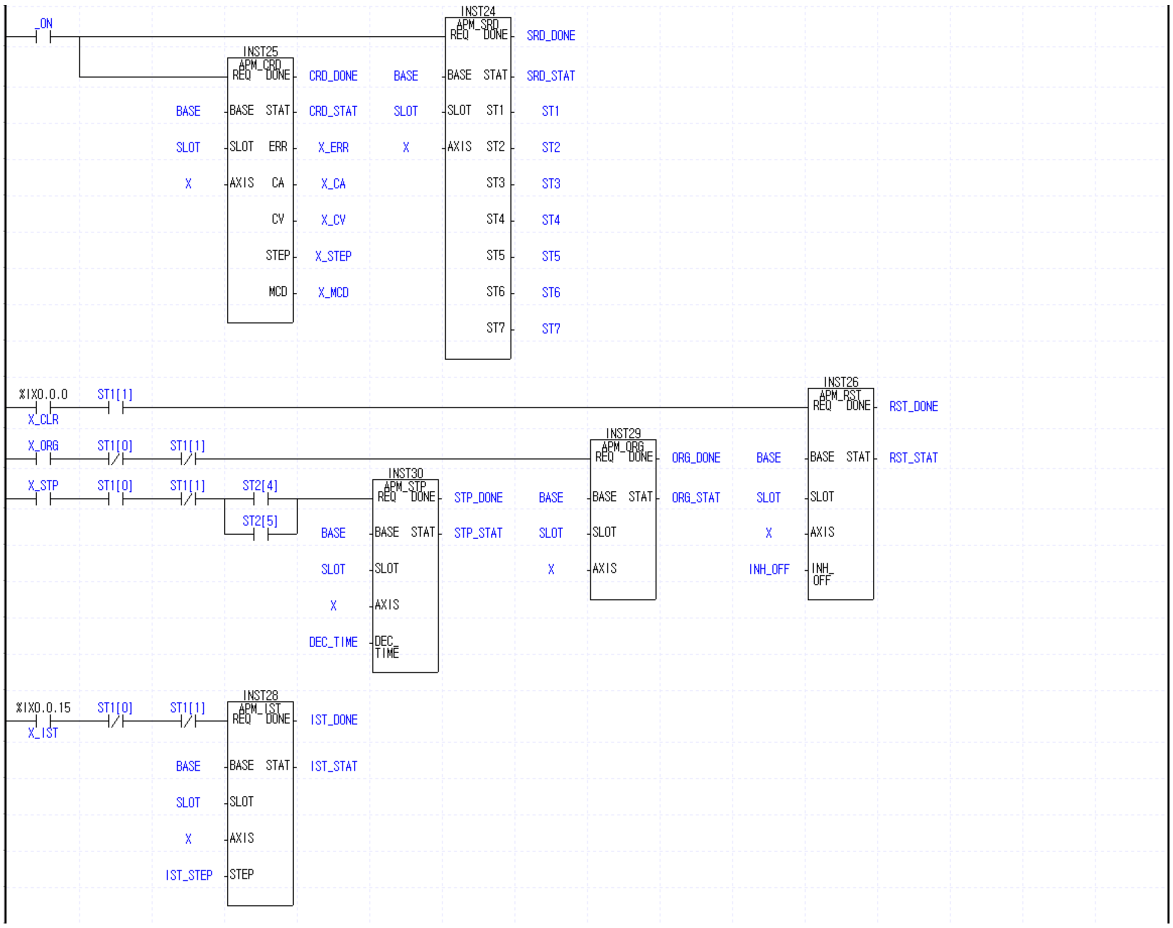
2) Program

(1) XGK



(2) XGI/XGR

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 decleration 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)



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

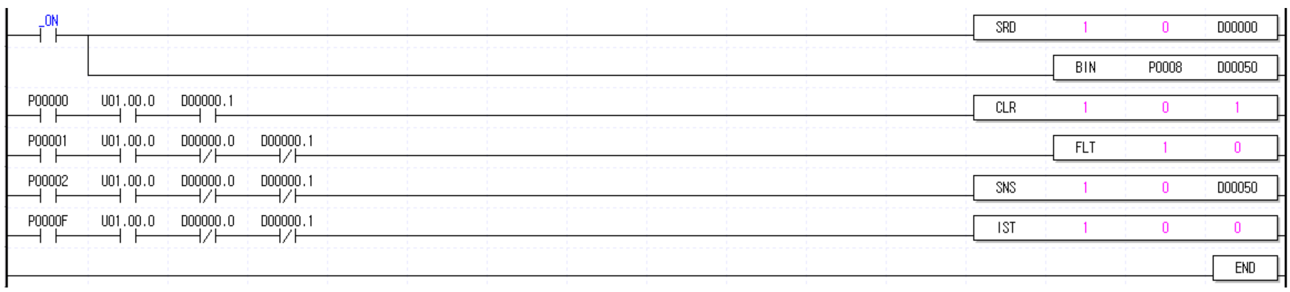
▷ BCD external digital Input should be set as 10 before P00002 switch ON.

(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

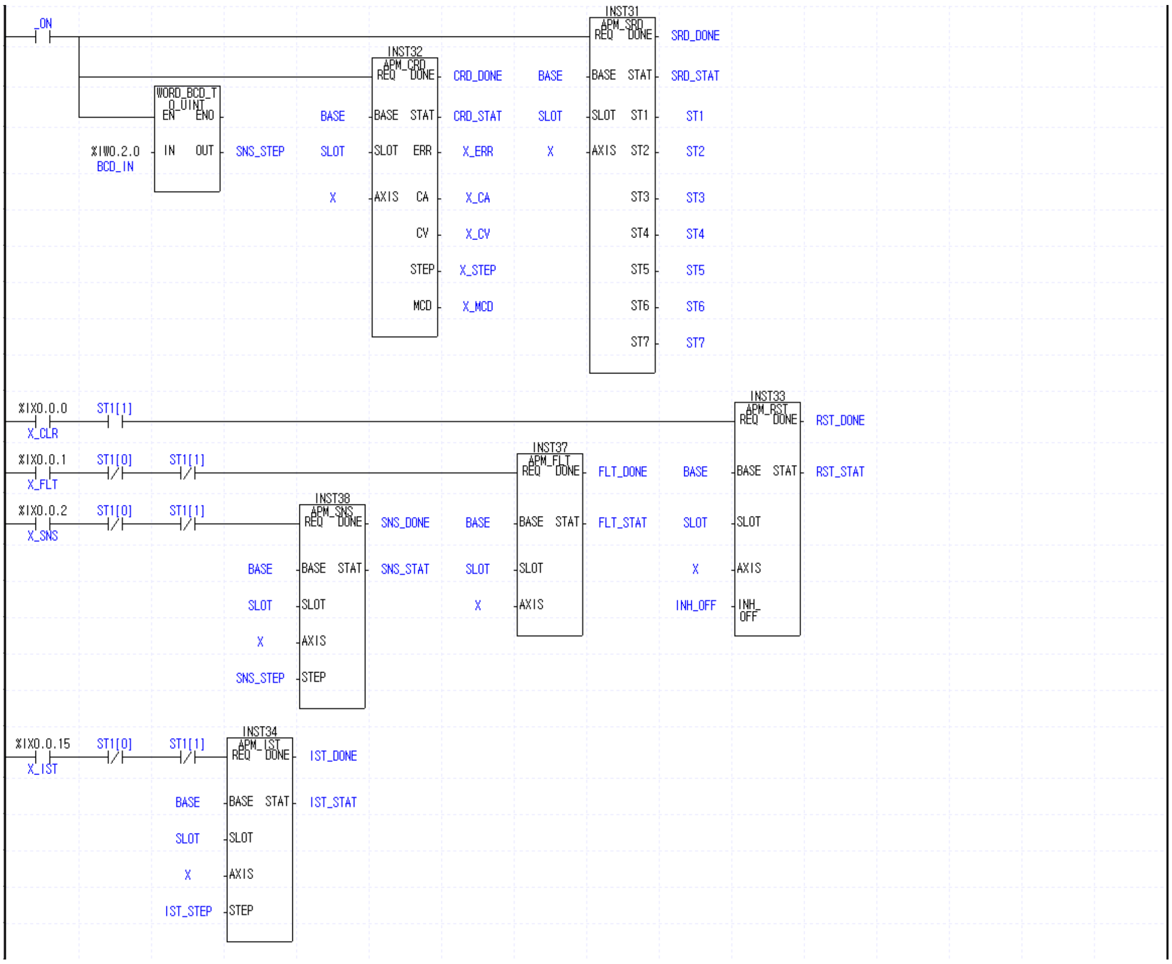
2) Program

(1) XGK



(2) XGI/XGR

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)



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

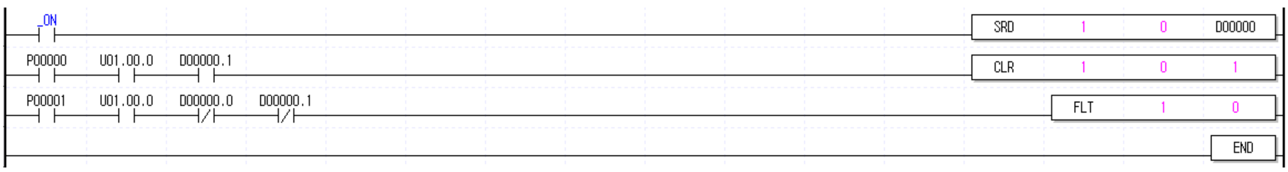
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [㎳]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	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

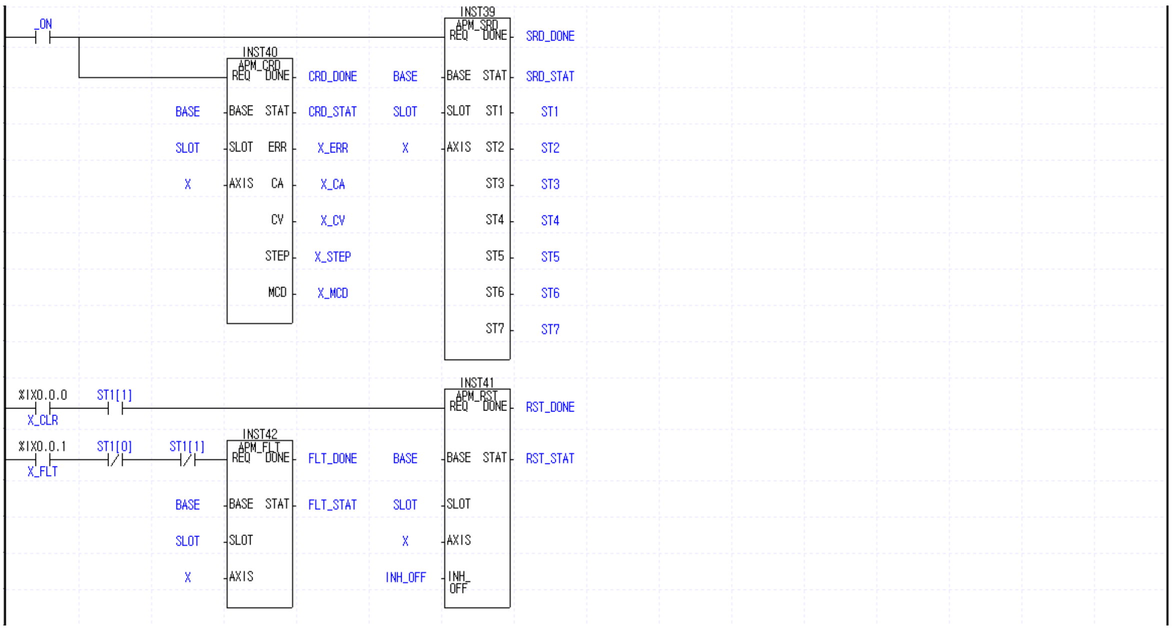
2) Program

(1) XGK



(2) XGI/XGR

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)



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.

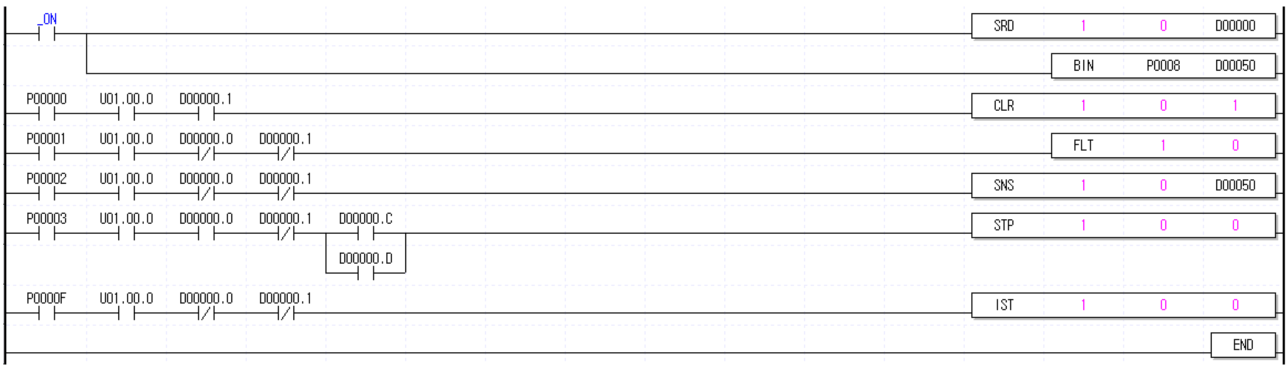
▷ As deceleration time is set as "0" in deceleration stop command, it carries out the deceleration by 1 acc./dec. time.

(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 nterpolation 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

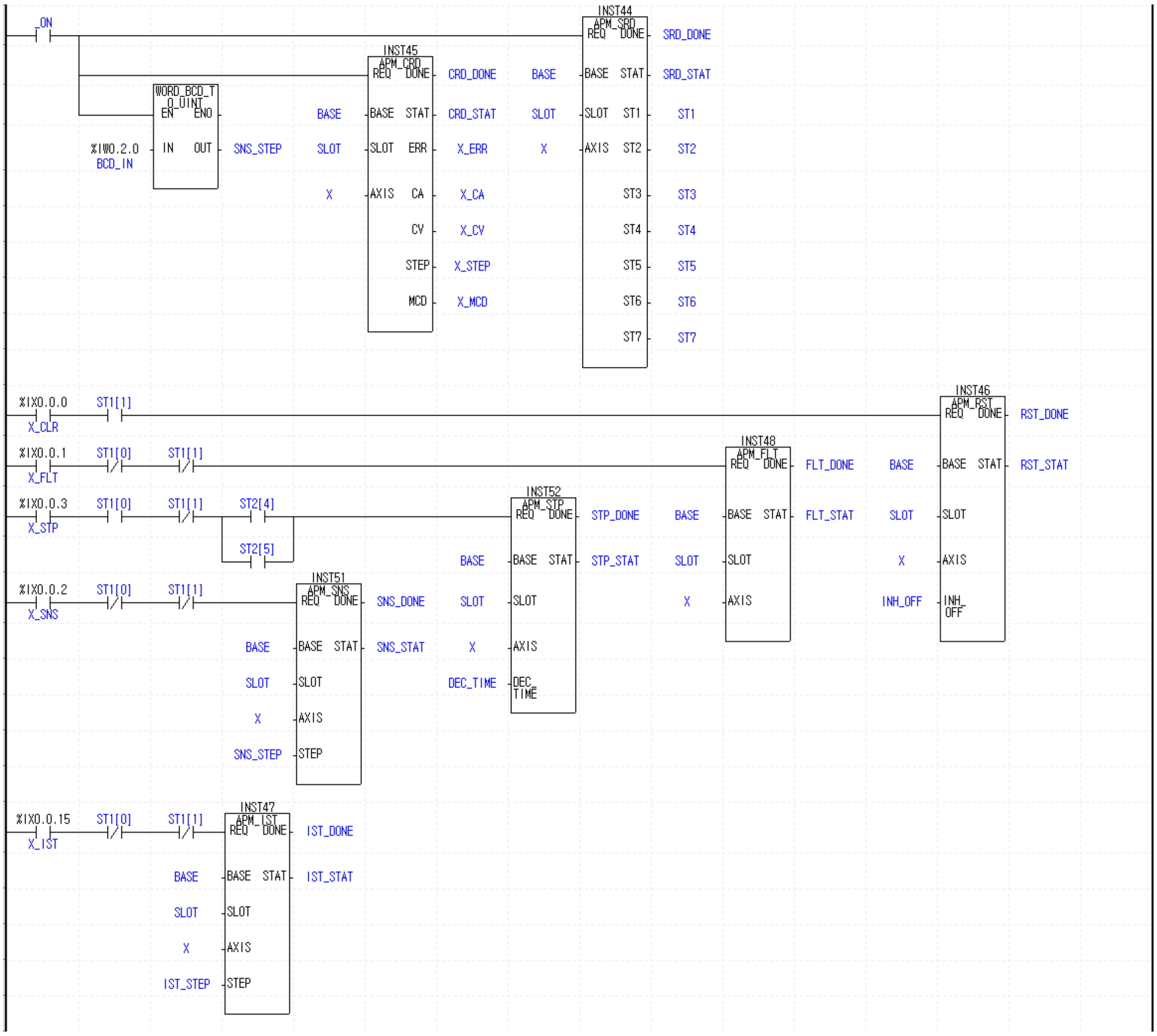
2) Program

(1) XGK



(2) XGI/XGR

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)



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

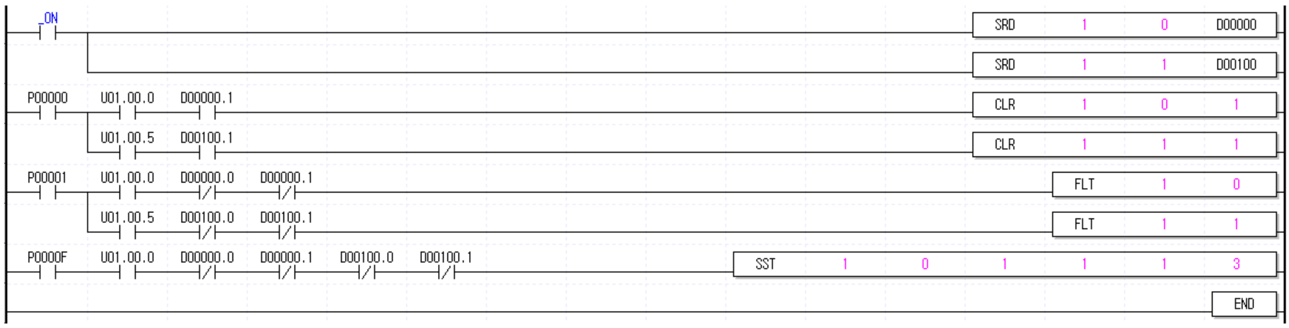
P00001(Floating origin) switch ON ⇒ P0000F(internal synchronous Start) switch ON

(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

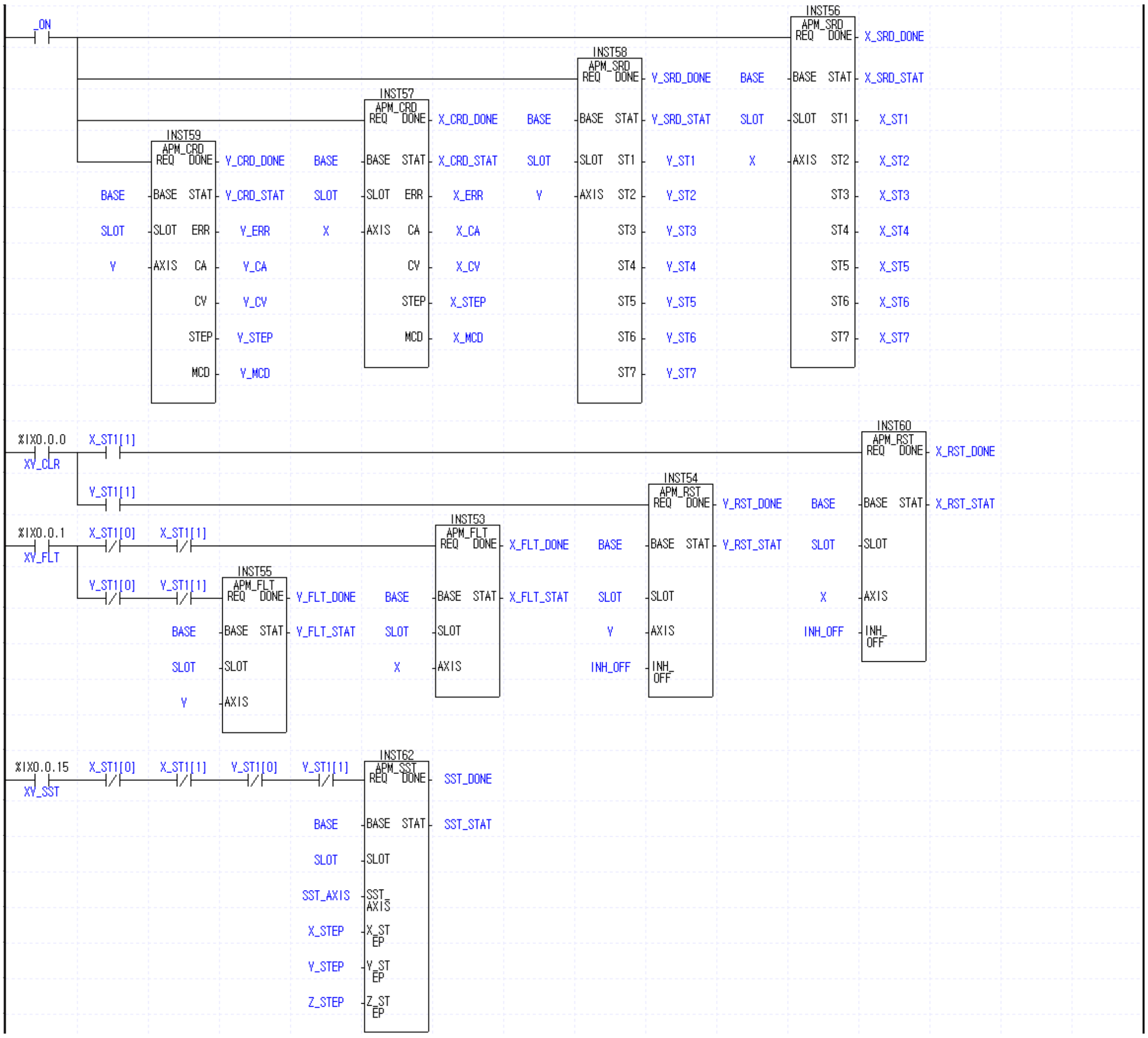
2) Program

(1) XGK



(2) XGI/XGR

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)



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

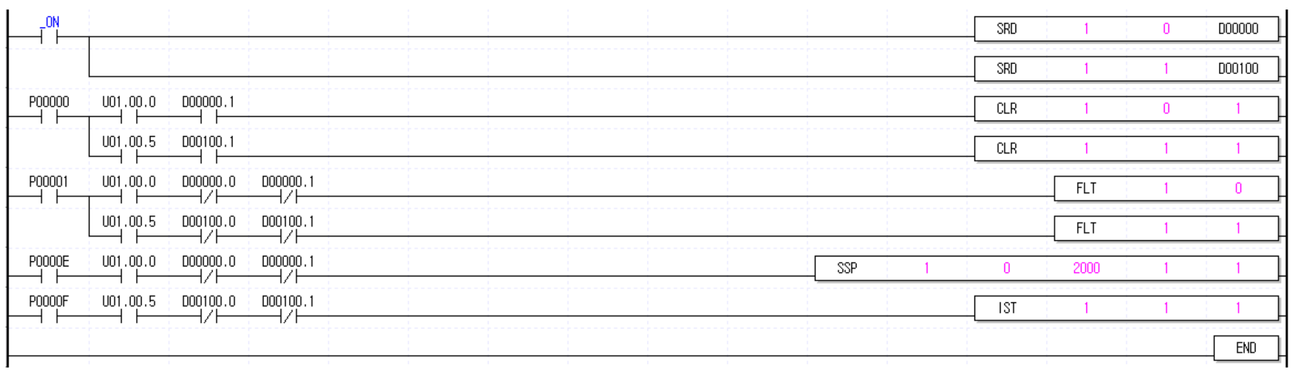
P00001(Floating origin) switch ON ⇒ P0000E(position synchronous start) switch ON ⇒ P0000F(Indirect Start) switch ON

(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

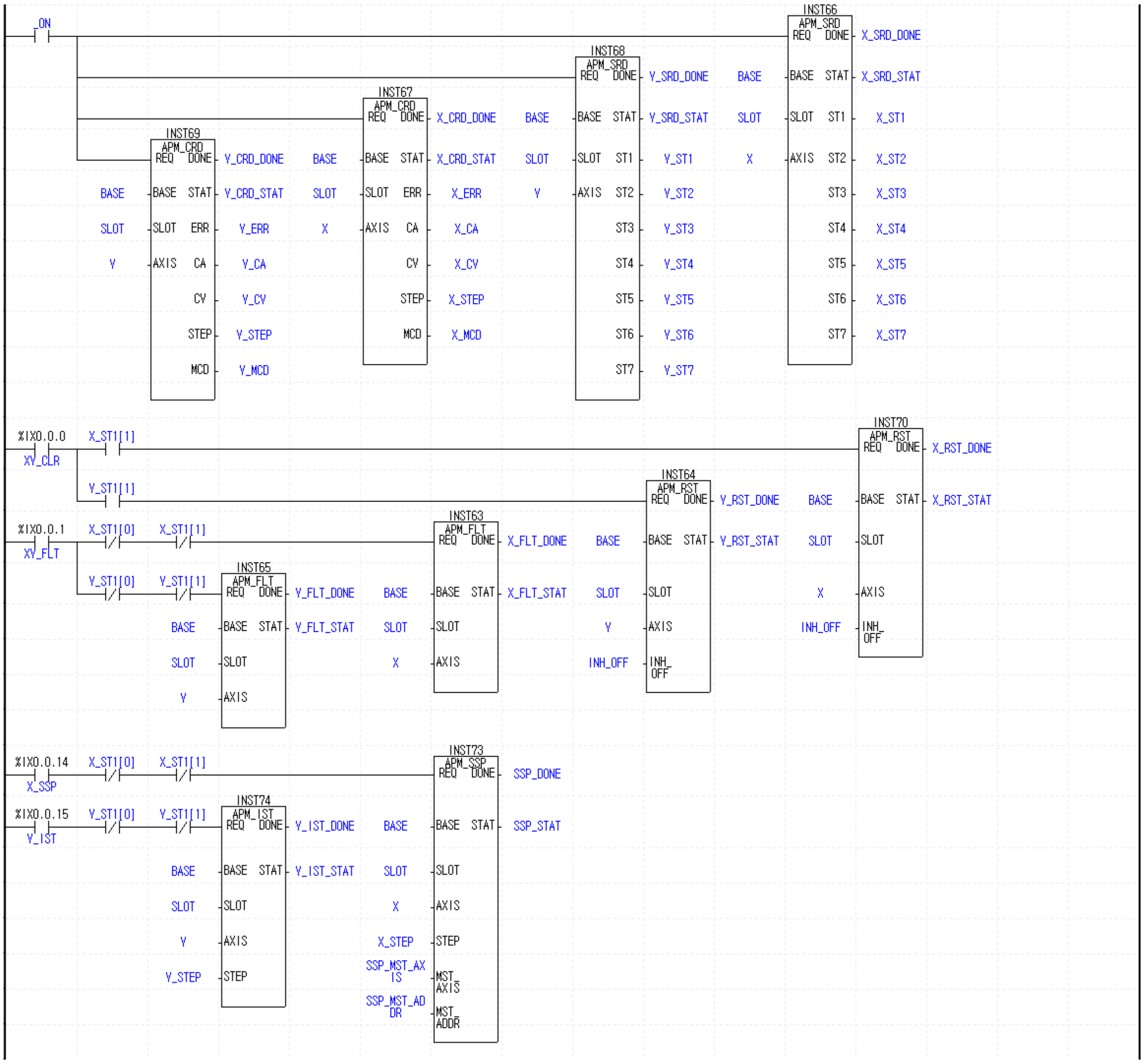
2) Program

(1) XGK



(2) XGI/XGR

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)



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

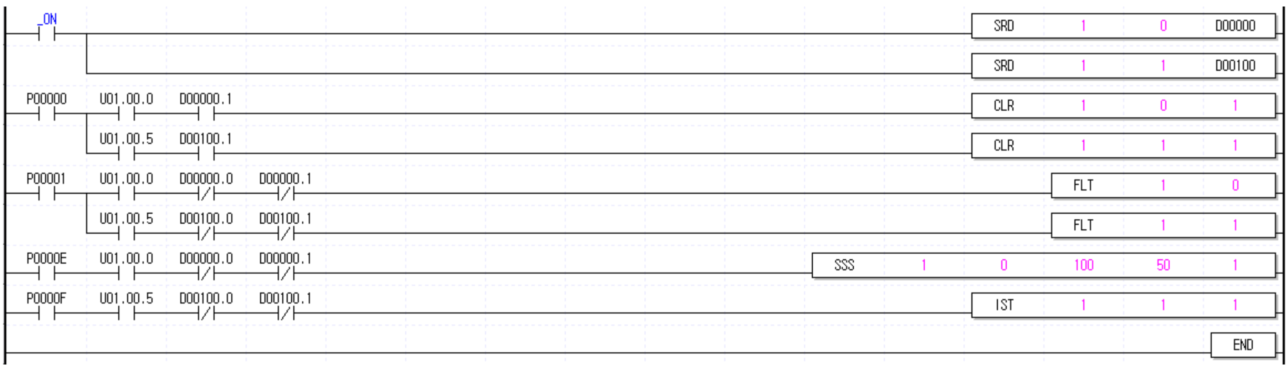
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [㎳]	Circular interpolation direction
Subordinate axis X axis setting	1	Absolute	Speed control	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

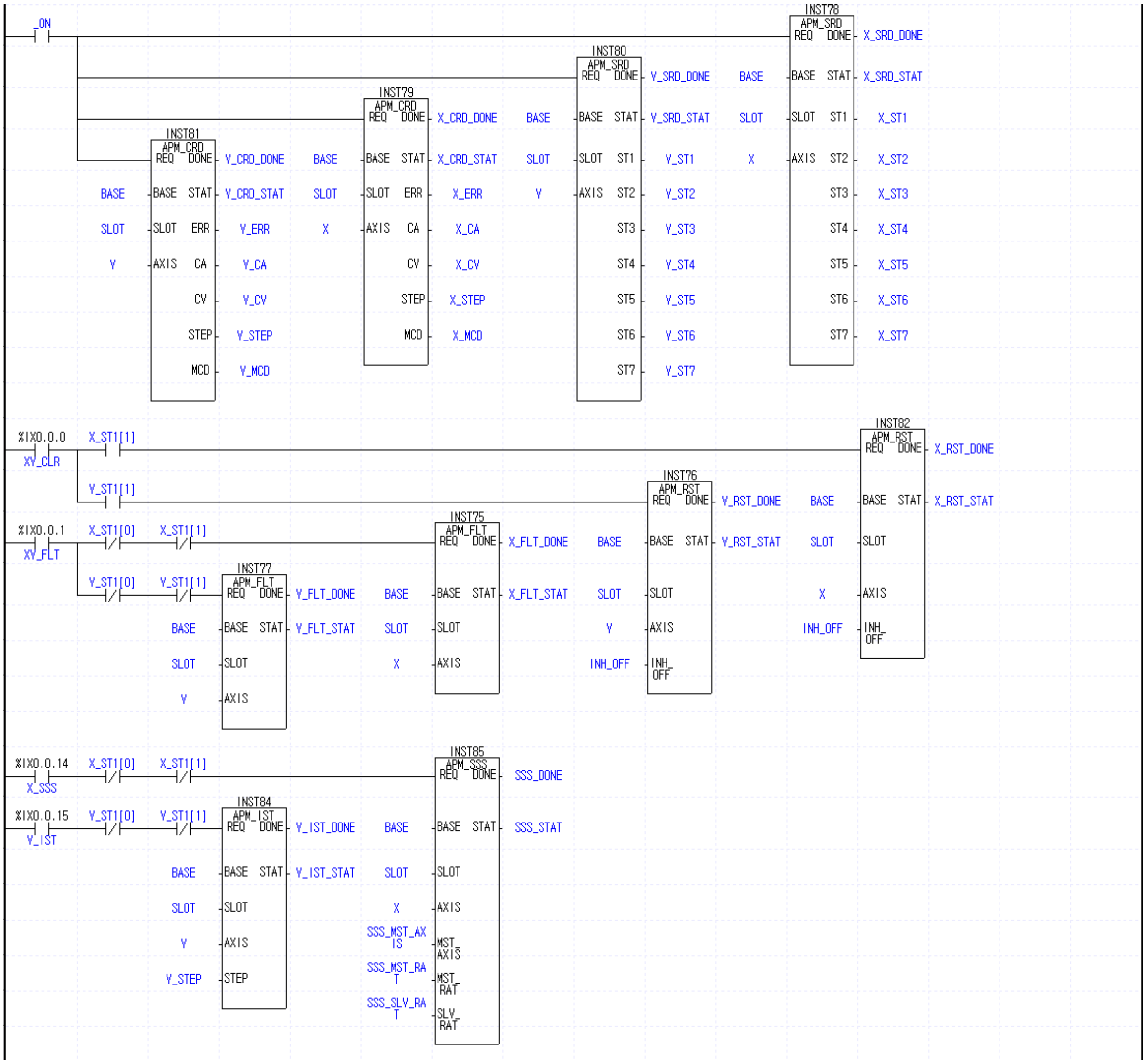
2) Program

(1)XGK



(2) XGI/XGR

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)



10.2.11 Speed synchronization start by position

1) Description

(1) Used device

Device	Description
P00000	X axis error reset, output prohibition cancellation switch
P00001	X axis homing switch
P00002	X axis start switch
P0000F	Y axis speed synchronization by position switch
U01.00.0	X axis command reception switch
U01.00.5	Y axis command reception switch
D00000.0	X axis during run signal
D00000.1	X axis error status signal
D00030.0	Y axis during run signal
D00030.1	Y axis error status signal
D00000 ~ D00022	X axis operation status information
D00030 ~ D00052	Y axis operation statu information

(2) Control sequence

P00001 (homing) switch ON, OFF ⇒ P0000F (Y axis speed synchronization by position) switch ON, OFF ⇒ P00002 (X axis start) switch ON, OFF

(3) Operation data setting

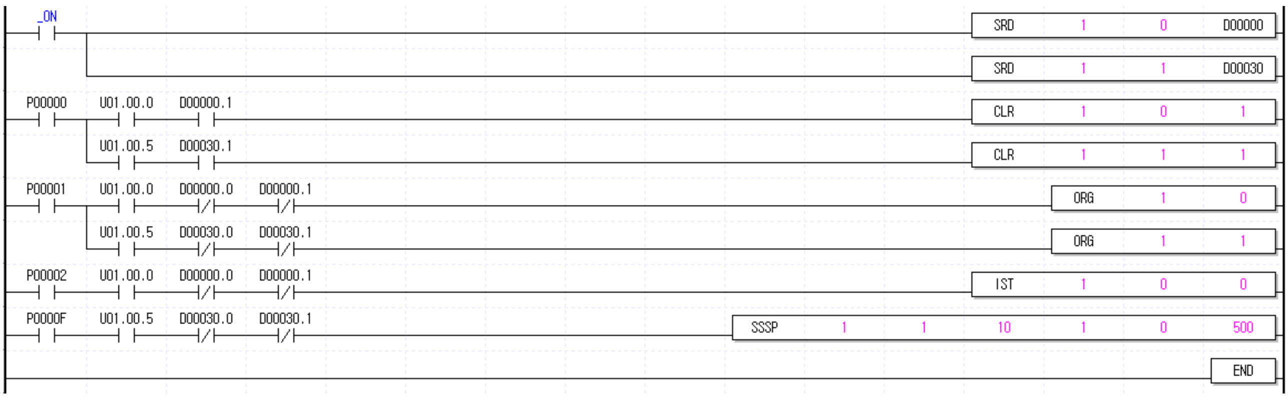
Items of position data	Step no.	Coordnate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absoulute	Position control	END	Single	10000	0	0	1	0	100	CW

(4) Speed synchronous start setting

Command 1	Main axis	0: X axis
	Main axis rate	10
	Subordinate axis rate	1

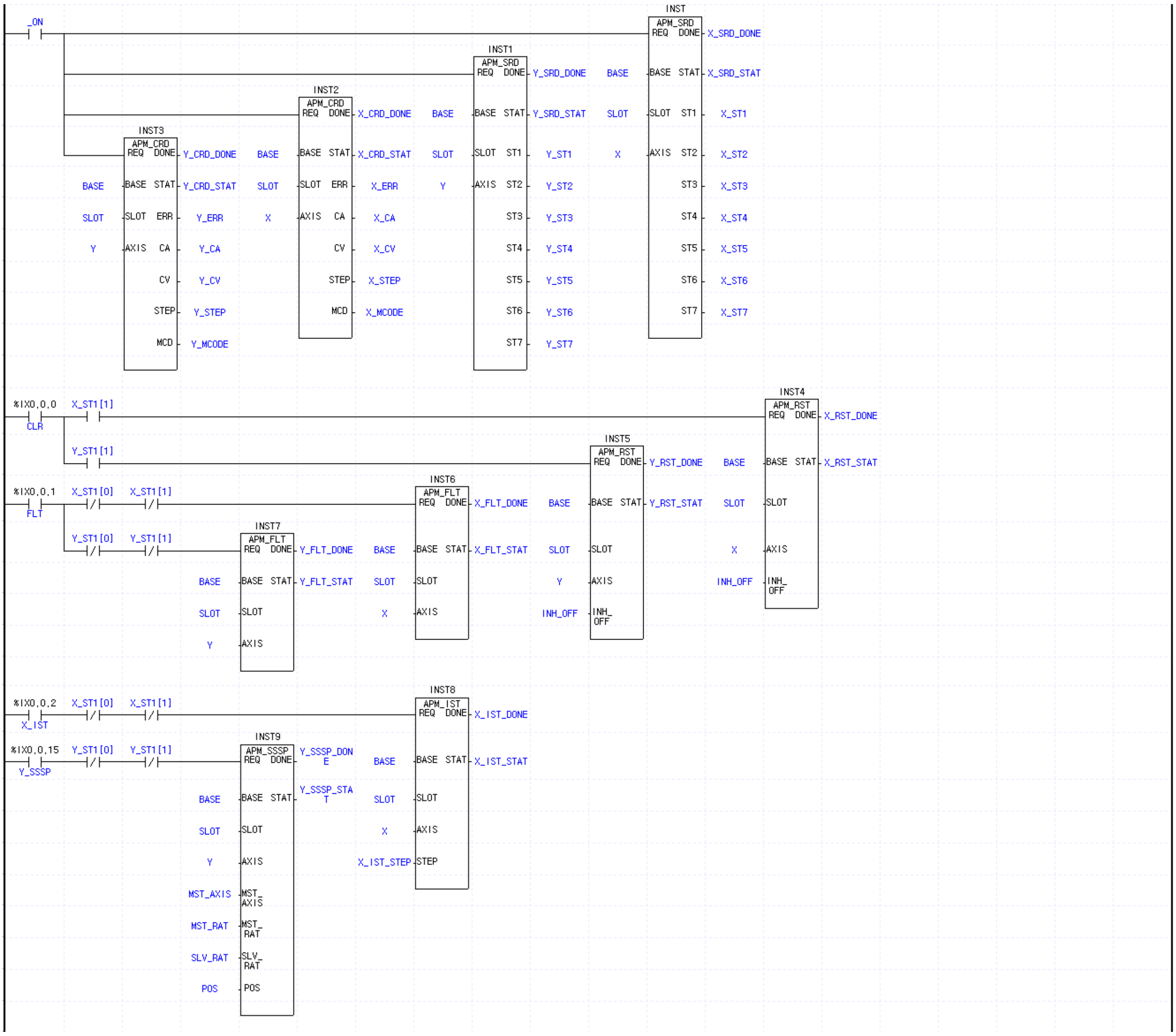
2) Program

(1)XGK



(2) XGI/XGR

Variable	Description	Setting
BASE	Base number where APM is equipped	0
SLOT	Slot number where APM is equipped	1
X	Axis of APM to execute function block	0 (X axis)
Y	Axis of APM to execute function block	1 (Y axis)
X_ST1[0]	X axis during run signal	-
X_ST1[1]	X axis error status signal	-
Y_ST1[0]	Y axis during run signal	-
Y_ST1[1]	Y axis error status signal	-
CLR	X/Y axis error reset execution	No. 0 bit of no.0 slot input module (%IX0.0.0)
FLT	X/Y 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)
Y_SSSP	Y axis speed synchronization by position execution	No.15 bit of no.0 slot input module (%IX0.0.15)
POS	Subordinate stop position	500 in example
MST_AXIS	Speed synchronization by position main axis setting	O in example (X axis)
MST_RAT	Speed synchronization by position main axis rate setting	10 in example
SLV_RAT	Speed synchronization by position subordinate axis rate setting	1 in example



10.2.12 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

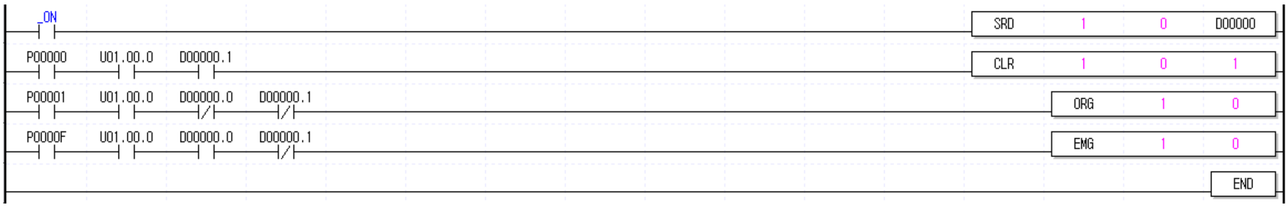
(2) Operation Sequence

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.

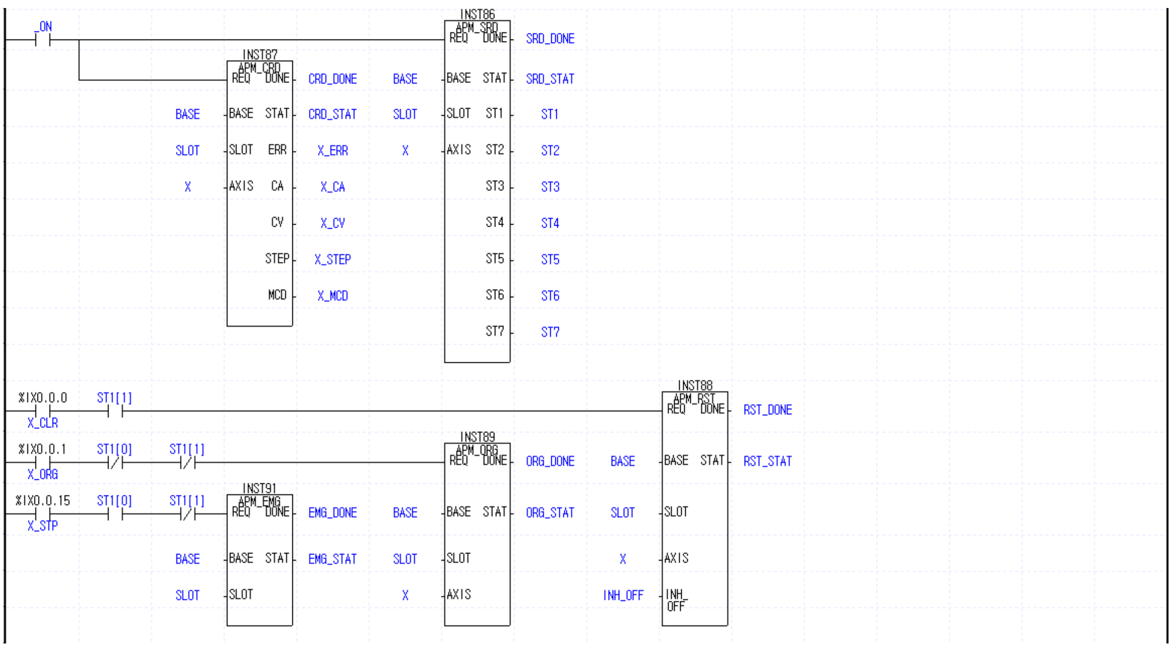
2) Program

(1) XGK



(2) XGI/XGR

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)



10.2.13 Jog Operation

1) Description

(1) The used Device

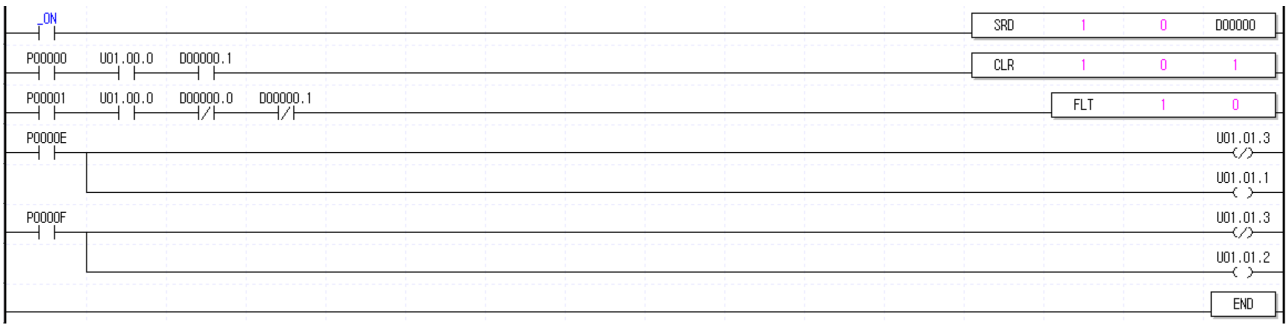
Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis Floating origin setting switch
P0000E	X axis Jog low speed forward rotation
P0000F	X axis Jog low speed reverse rotation
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis 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

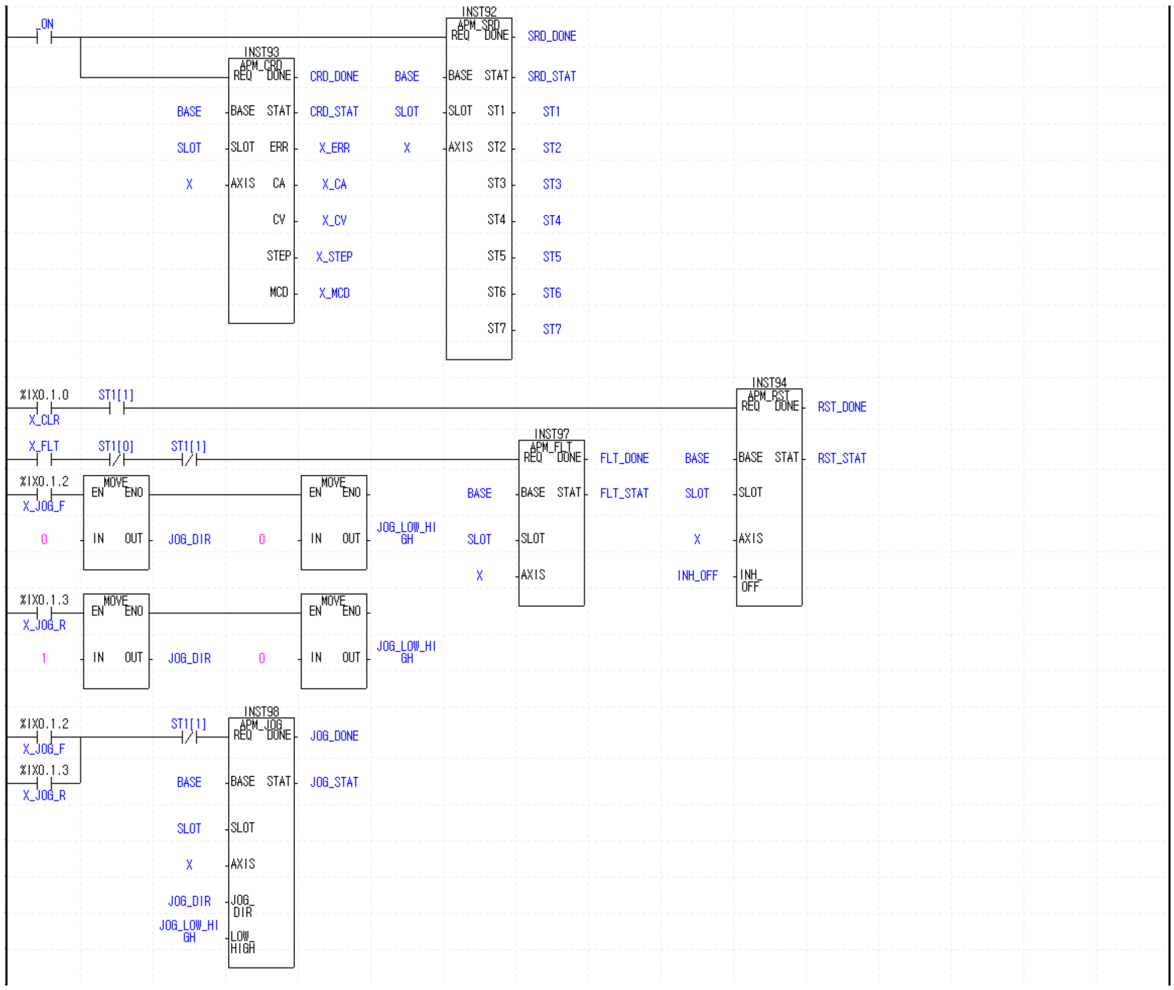
2) Program

(1) XGK



(2) XGI/XGR

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



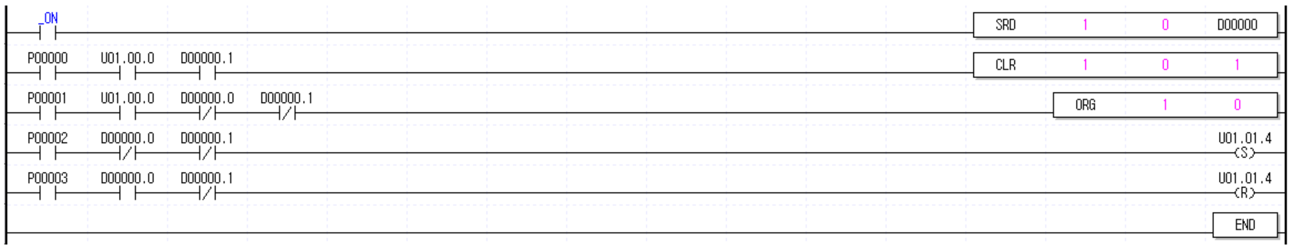
10.2.14 Manual Pulse Generator (MPG) Operation

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

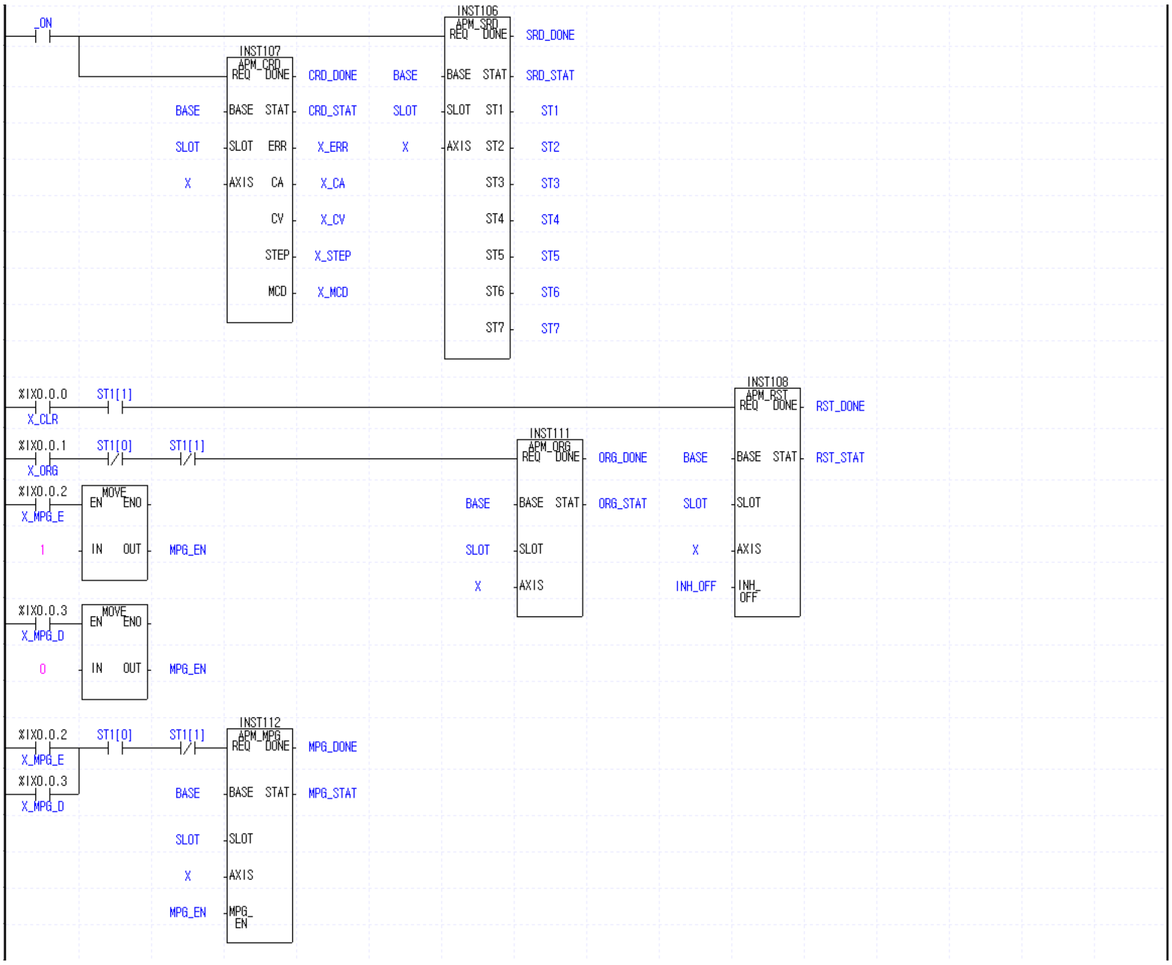
(2) Operation Sequence
P00001(Homing) switch ON,OFF ⇒ P00002(MPG operation enabled) switch ON,OFF ⇒ P00003(MPG operation disabled) switch ON,OFF

2) Program
(1) XGK



(2) XGI/XGR

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)



10.2.15 Inching Operation

1) Description

(1) The used Device

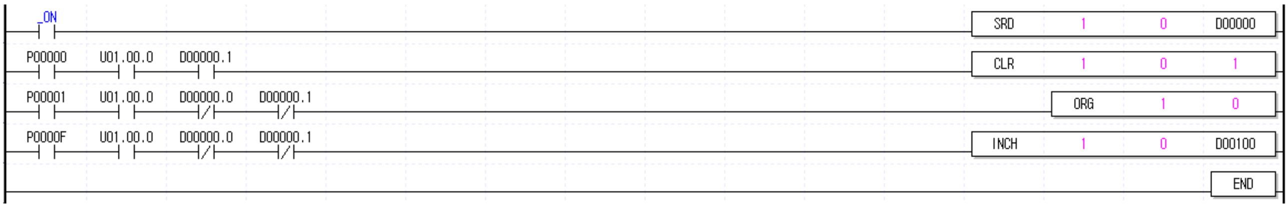
Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P0000F	X axis inching operation switch
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
D00100 ~ D00101	Inching transfer amount
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P0000F(Inching operation) switch ON,OFF

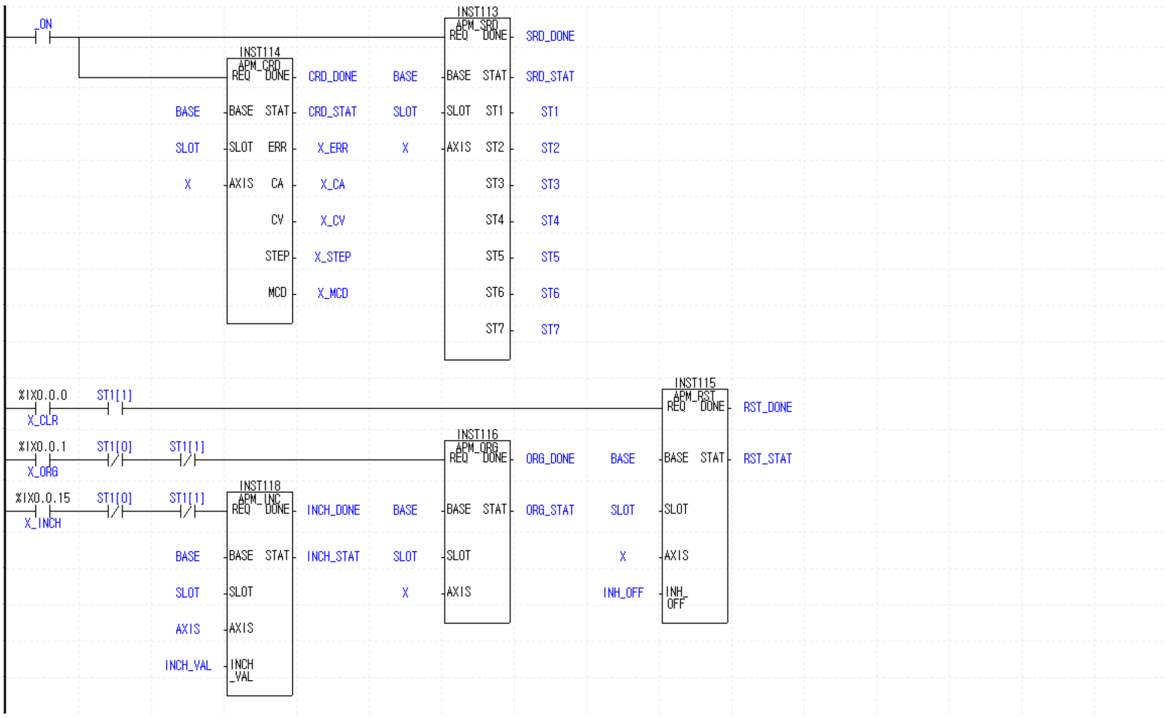
2) Program

(1) XGK



(2) XGI/XGR

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)



10.2.16 Return to the position before ManualOperation

1) Description

(1) The used Device

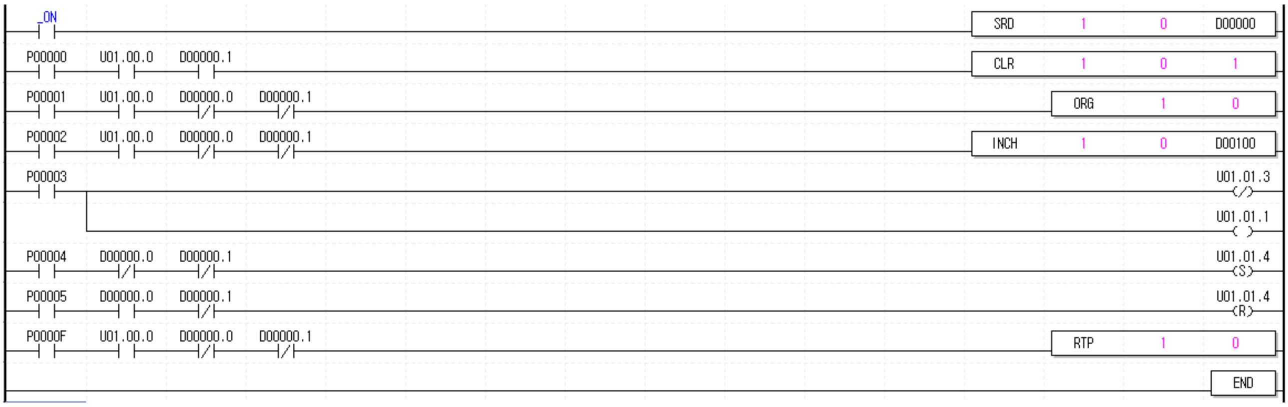
Device	Description
P00000	X axis error reset, output disabled release switch
P00001	X axis homing switch
P00002	X axis inching operation switch
P00003	X axis Jog high speed forward rotation switch
P00004	X axis MPG operation enabled switch
P00005	X axis MPG operation disabled switch
P0000F	X axis return 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

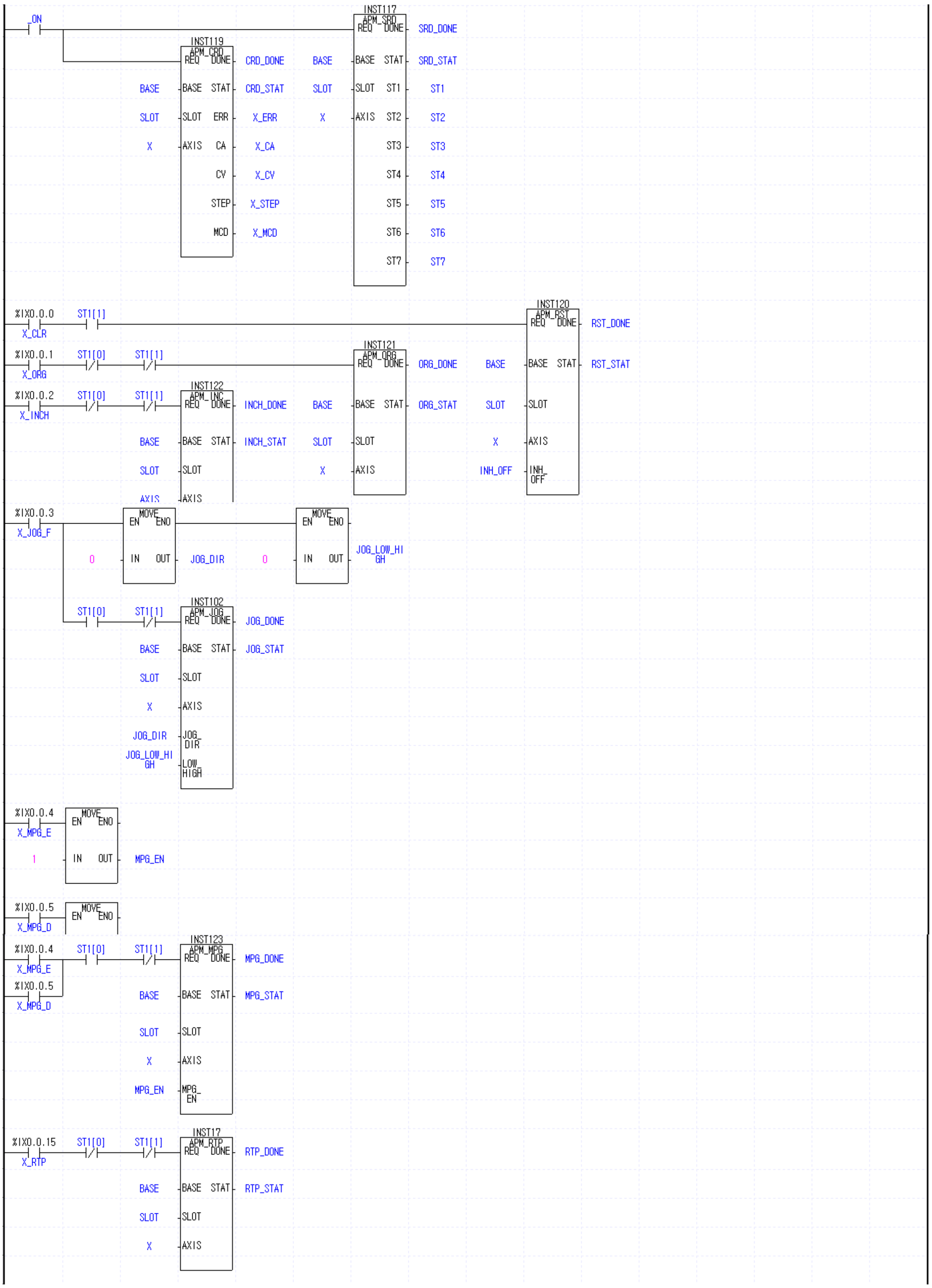
2) Program

(1) XGK



(2) XGI/XGR

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)


_ON
INST117
APM_SRD
REQ DONE
SRD_DONE
INST119
APM_CRD
CRD_DONE
BASE
STAT
SRD_STAT
CRD_STAT
SLOT
ST1
ERR
X_ERR
X
AXIS
ST2
CA
X_CA
ST3
CV
X_CV
ST4
STEP
X_STEP
ST5
MCD
X_MCD
ST6
ST7
%IX0.0.0
X_CLR
ST1[1]
INST120
APM_RST
RST_DONE
%IX0.0.1
X_ORG
ST1[0]
INST121
APM_ORG
ORG_DONE
RST_STAT
%IX0.0.2
X_INCH
INST122
APM_INC
INCH_DONE
ORG_STAT
INCH_STAT
INH_OFF
%IX0.0.3
X_JOG_F
MOVE
EN ENO
IN OUT
JOG_DIR
JOG_LOW_HIGH
INST102
APM_JOG
JOG_DONE
JOG_STAT
%IX0.0.4
X_MPG_E
MPG_EN
%IX0.0.5
X_MPG_D
INST123
APM_MPG
MPG_DONE
MPG_STAT
%IX0.0.15
X_RTP
INST17
APM_RTP
RTP_DONE
RTP_STAT

10.2.17 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

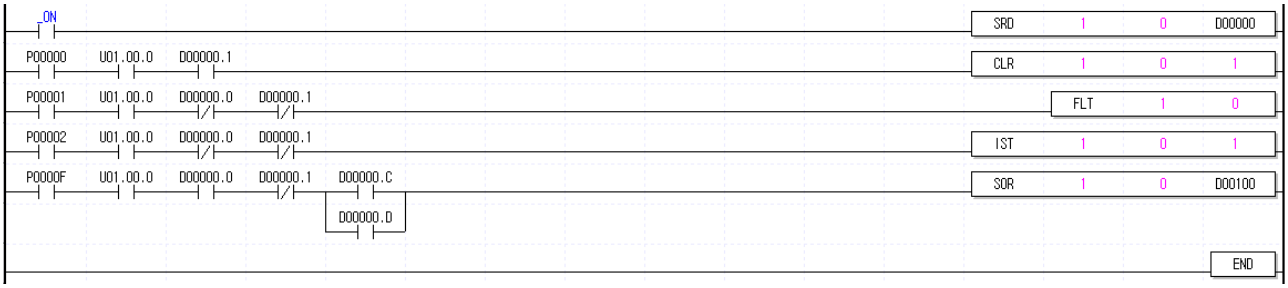
(3) Operation data setting

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

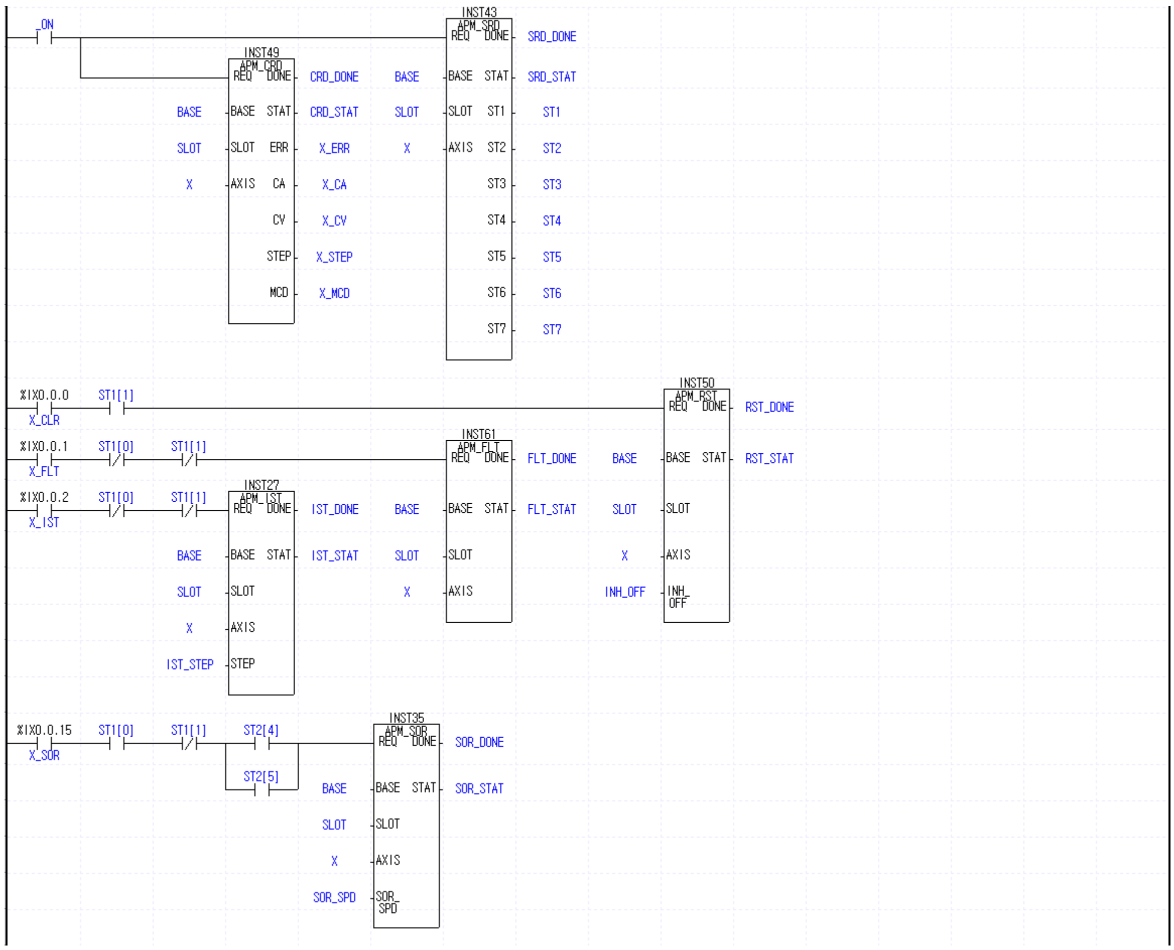
2) Program

(1) XGK



(2) XGI/XGR

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



10.2.18 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

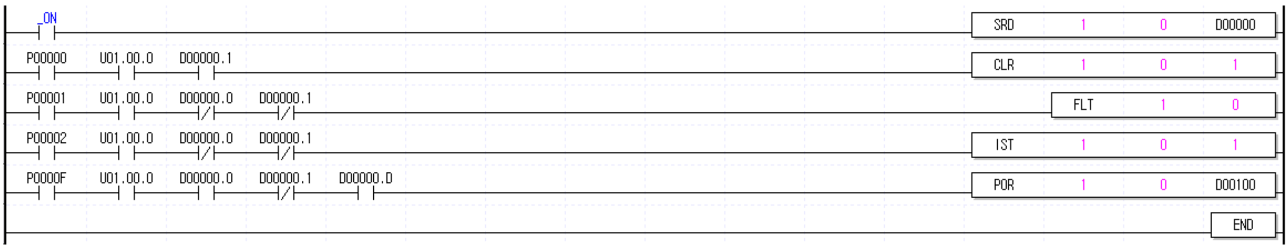
(3) Operation data setting

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 [㎳]	Circular interpolation direction
X axis setting	1	Absolute	Positio ncontr ol	End	Single	100000	0	0	1	5000	100	CW

Change the goal position with 120000 during operation.

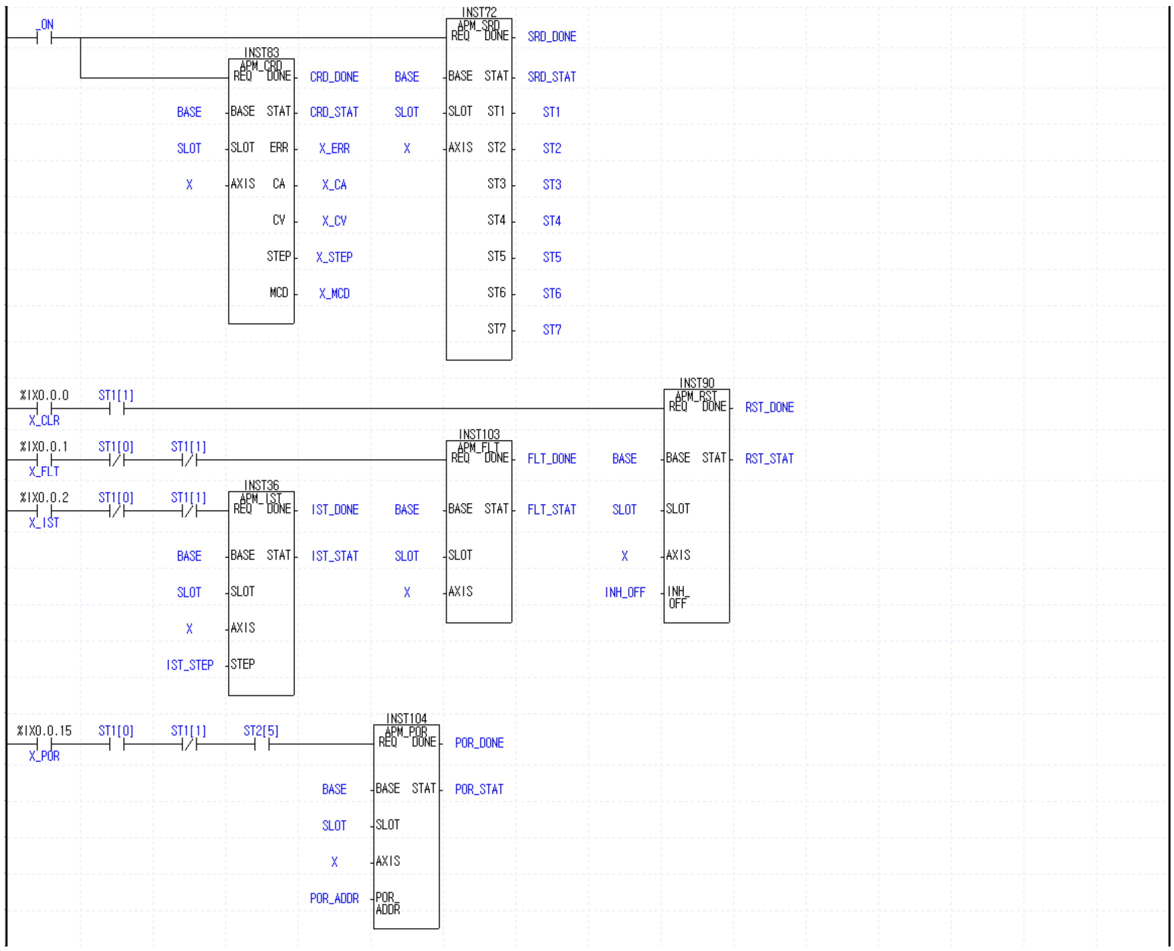
2) Program

(1) XGK



(2) XGI/XGR

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



10.2.19 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

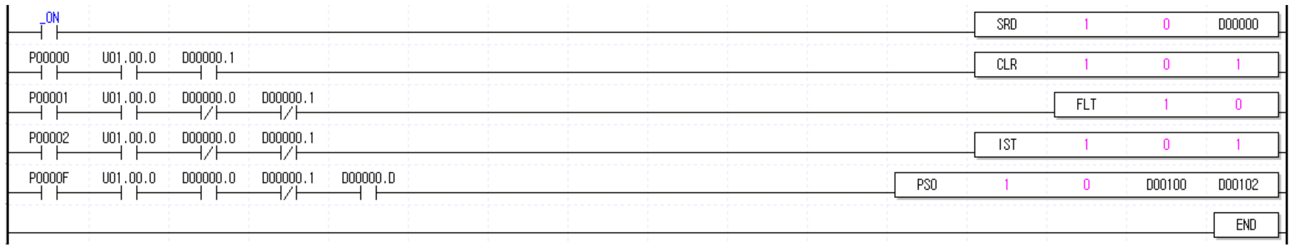
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [㎳]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	100000	0	0	1	5000	100	CW

Change the operation speed with 10000

Change the goal position with 50000 during operation.

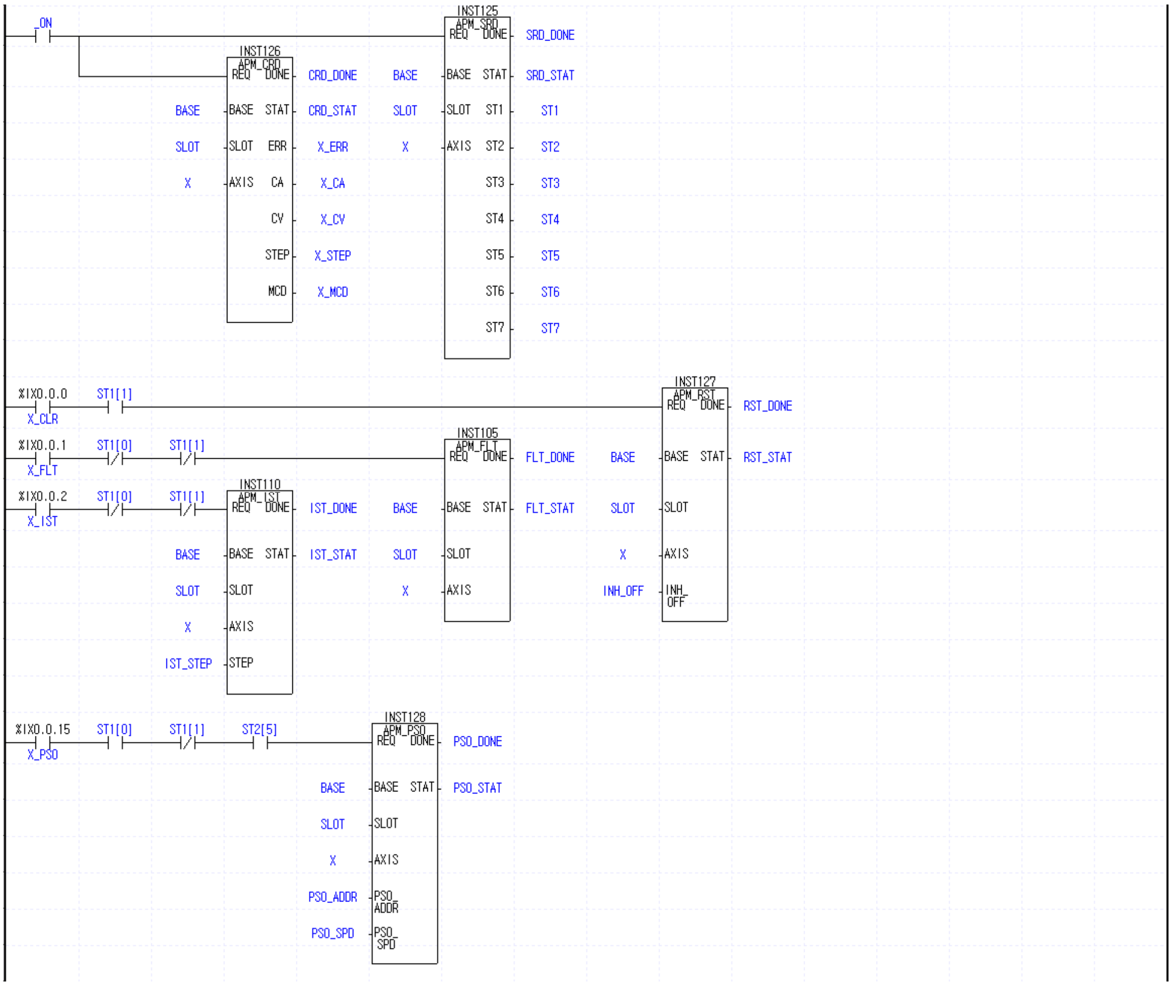
2) Program

(1) XGK



(2) XGI/XGR

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



10.2.20 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
DOO0O0.D	X axis start signal
D00008	X axis signal in constant speed
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

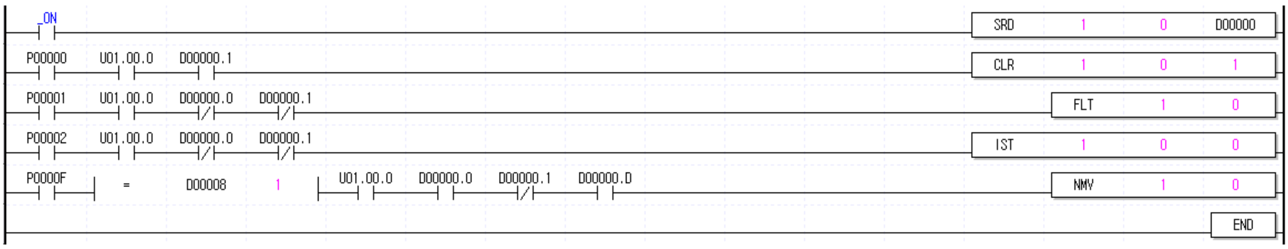
P00001(Floating origin) switch ON,OFF ⇒ P00002(Start) switch ON,OFF ⇒ P0000F(Operation step no.change by Continuous operation) switch ON,OFF

(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 [㎳]	Circular interpolation direction
X axis setting	1	Absolute	Positioncontrol	Continuous	Single	100000	0	0	1	500	100	CW
	2	Absolute	Positioncontrol	Continuous	Single	200000	0	0	1	1500	100	CW
	3	Absolute	Positioncontrol	End	Single	0	0	0	1	2000	100	CW

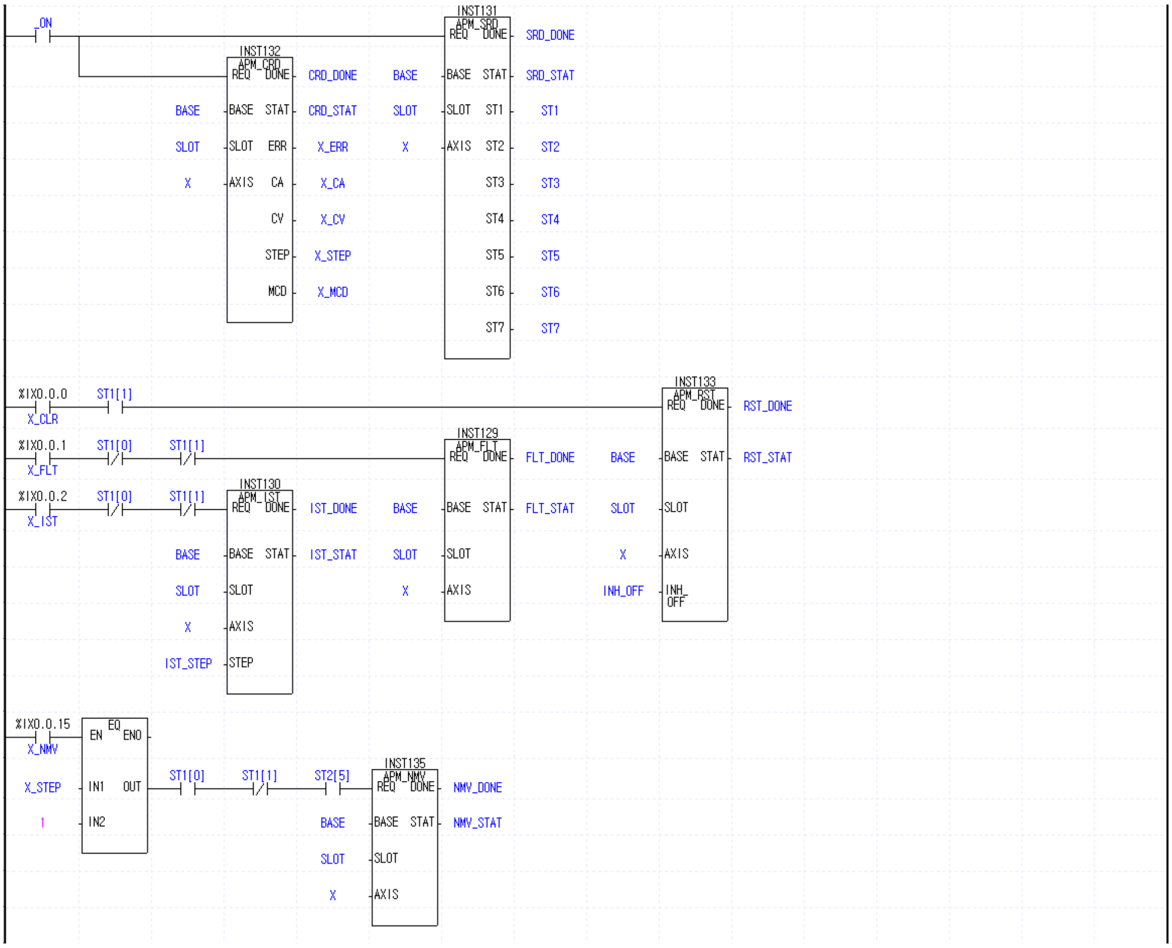
2) Program

(1) XGK



(2) XGI/XGR

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 orign 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.	-



10.2.21 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
DOO0O0.D	X axis start signal
D00008	X axis signal in constant speed
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

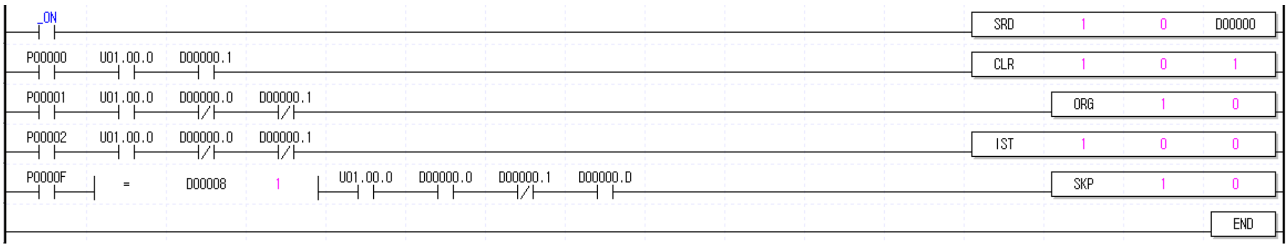
P00001(Homing) switch ON,OFF ⇒ P00002(Start) switch ON,OFF ⇒ P0000F(Skip operation) switch ON,OFF

(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

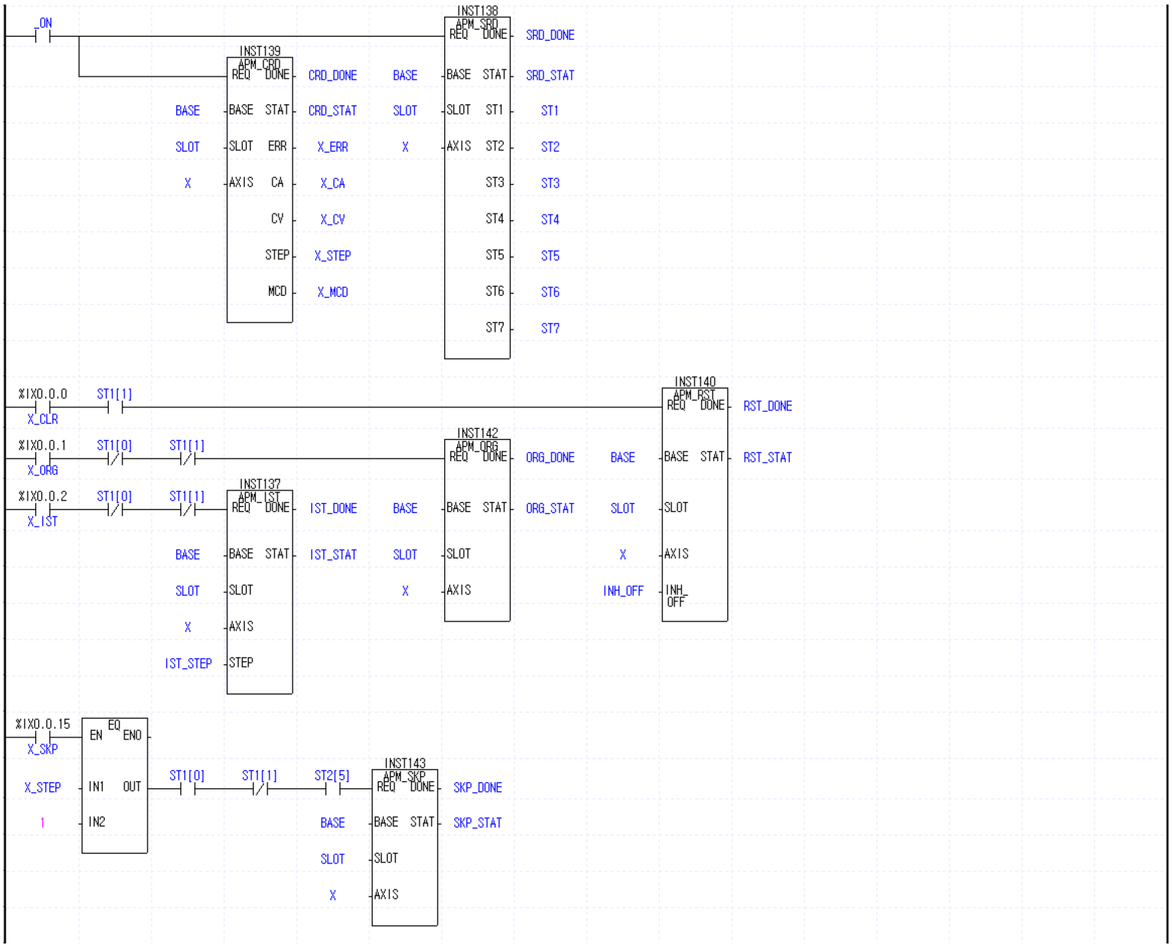
2) Program

(1) XGK



(2) XGI/XGR

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.	-



10.2.22 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

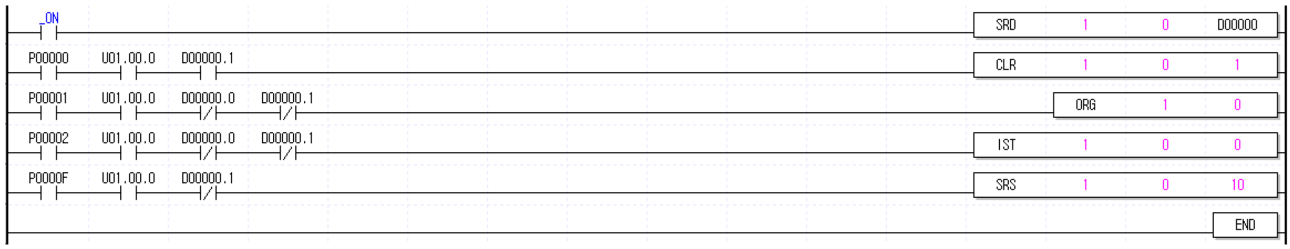
P00001(Homing) switch ON,OFF ⇒ P00002(Start) switch ON,OFF ⇒ P0000F(Operation step no. change during repeat operation) switch ON,OFF ⇒ P00002(Start) switch ON,OFF

(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.	Operationspeed [pls/s]	Dwell time [㎳]	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

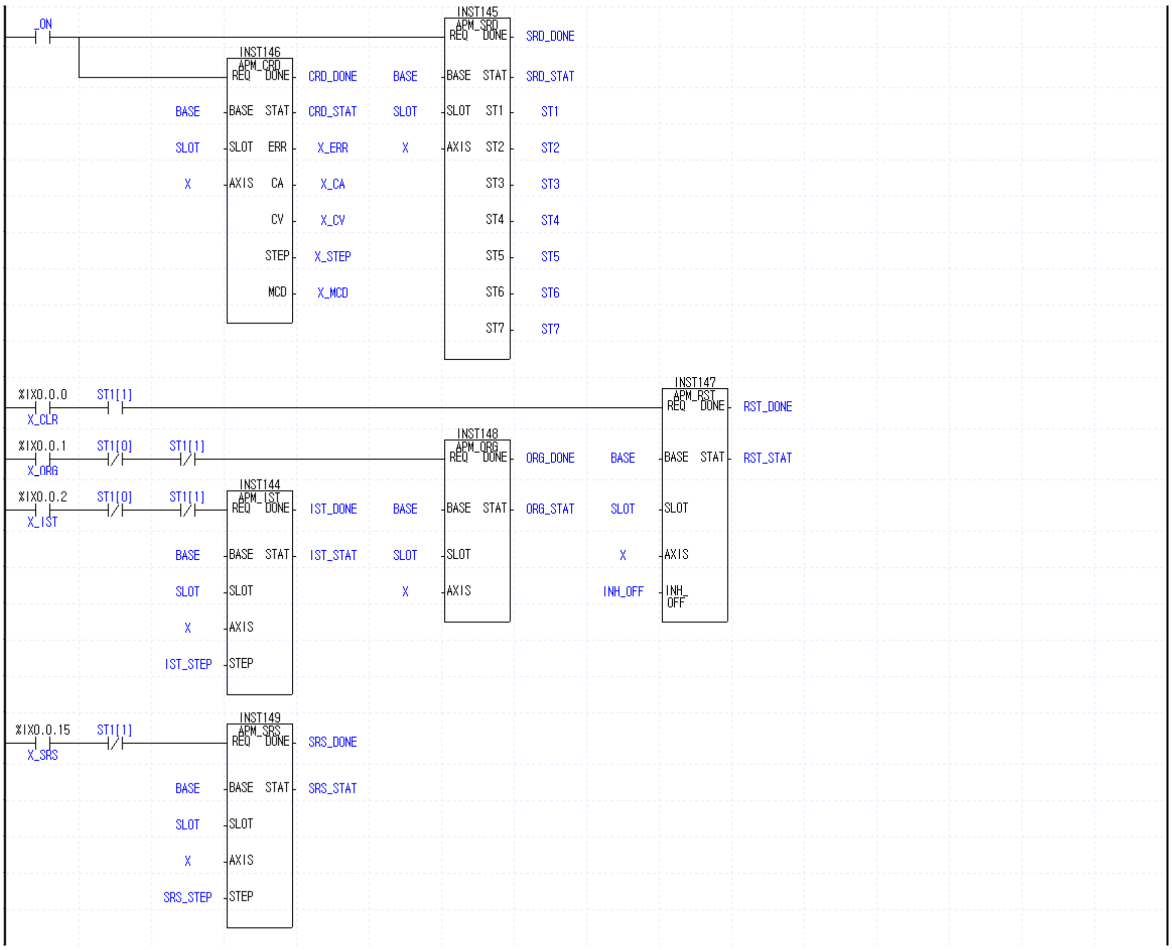
2) Program

(1) XGK



(2) XGI/XGR

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



10.2.23 Current Position Change

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 current position change 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	Current position preset setting value (3000)
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

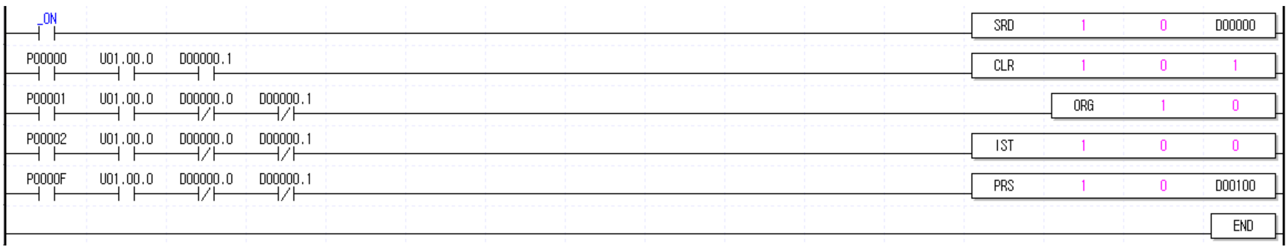
P00001(Homing) switch ON,OFF ⇒ P0000F(current position change) switch ON,OFF ⇒ P00002(Start) switch ON,OFF

(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.	Operationspeed [pls/s]	Dwell time [㎳]	Circular interpolation direction
X axis setting	1	Absolute	Positioncontrol	End	Single	10000	0	0	1	500	100	CW

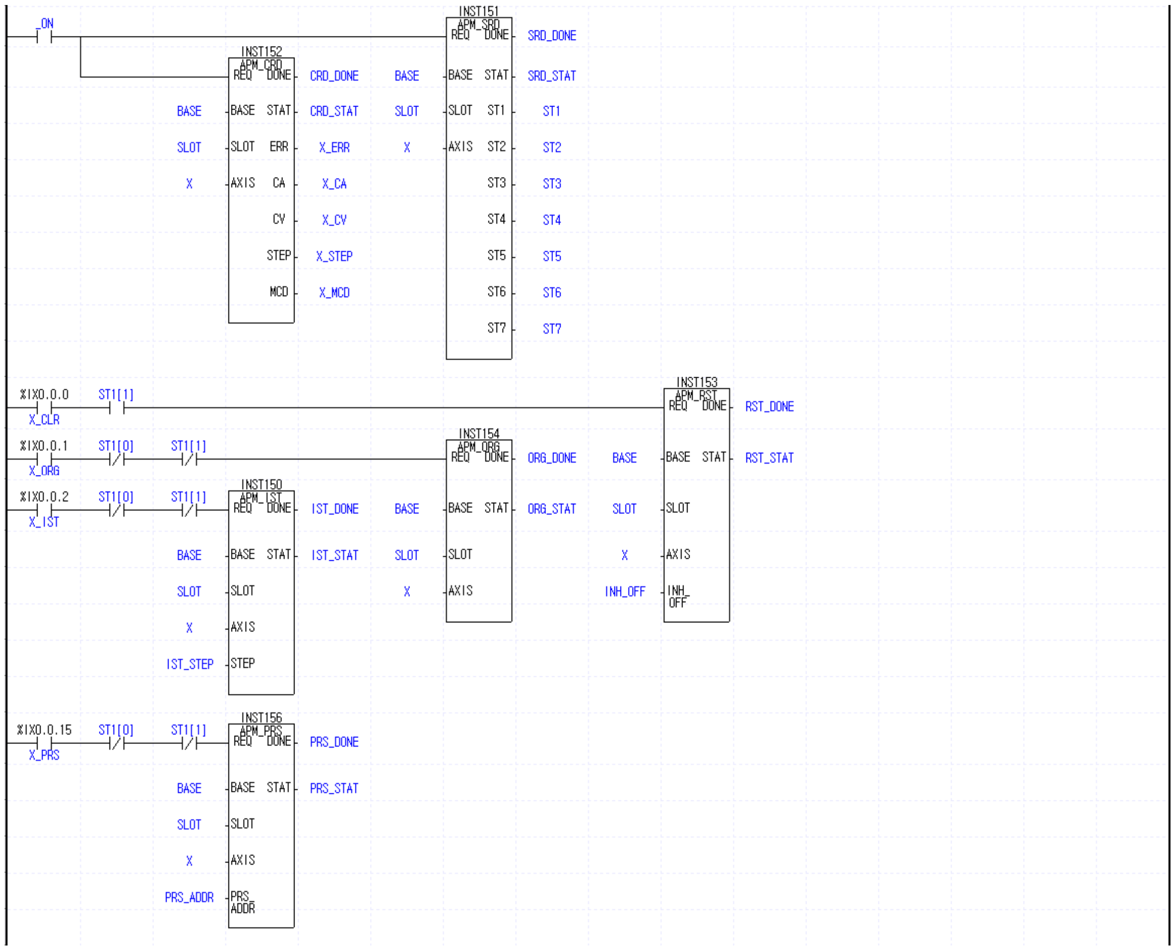
2) Program

(1) XGK



(2) XGI/XGR

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



10.2.24 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

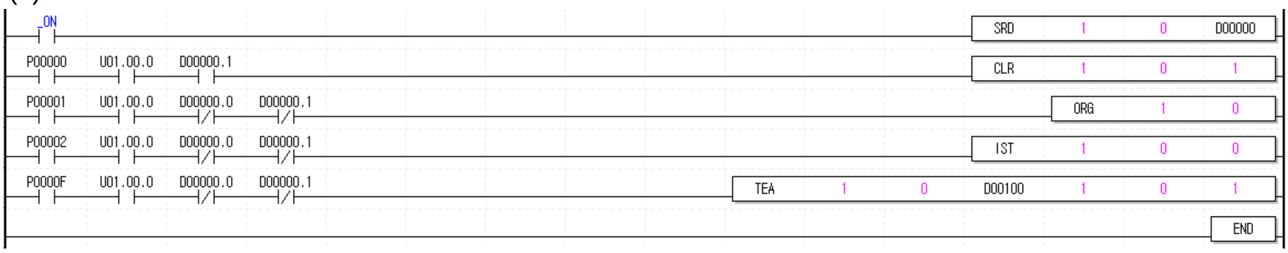
P00001(Homing) switch ON,OFF ⇒ P0000F(speed teaching) switch ON,OFF ⇒ P00002(Start) switch ON,OFF

(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

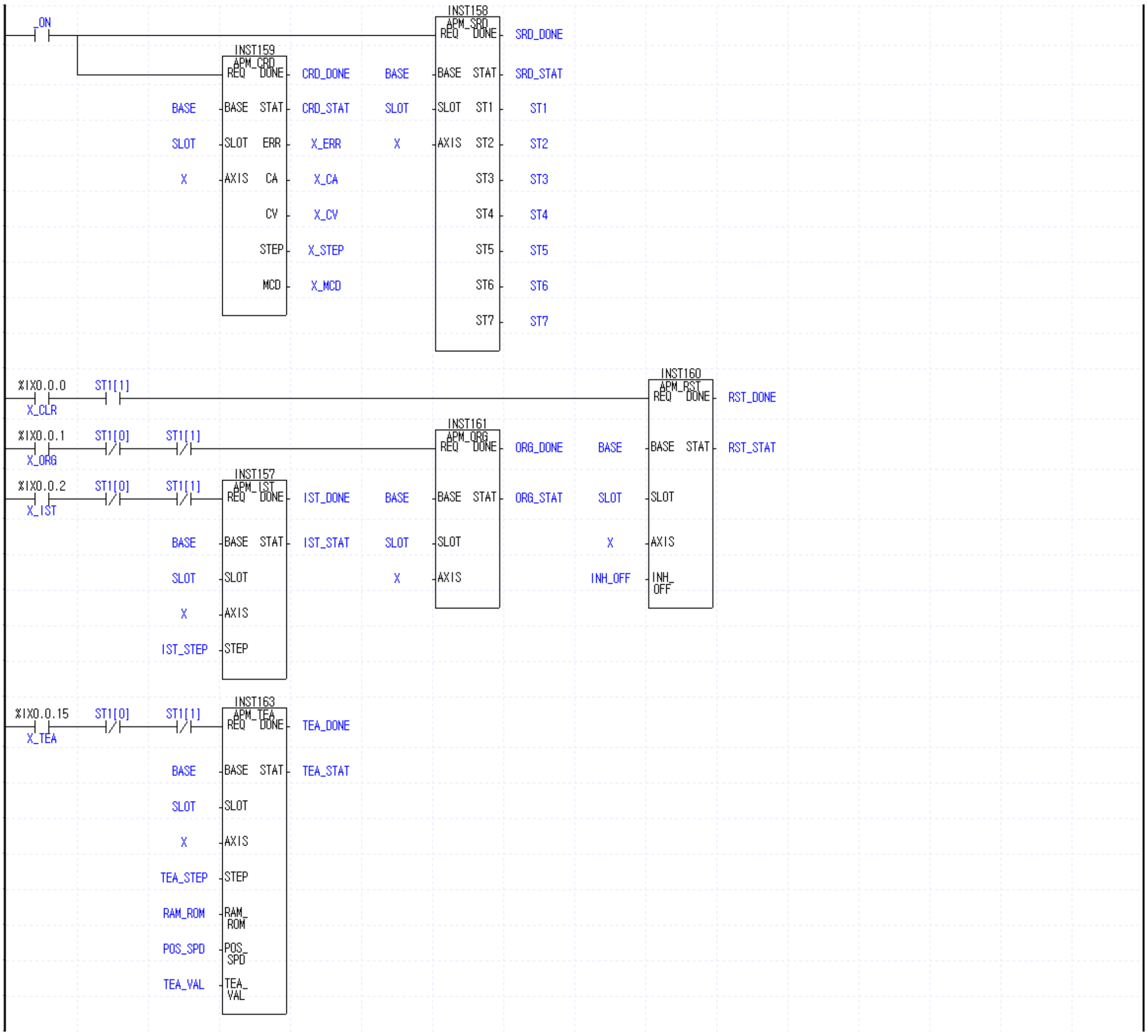
2) Program

(1) XGK



(2) XGI/XGR

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



10.2.25 Position 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 position 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 position teaching data(5000)
M0000 ~ M0003	X axis operatin state information

(2) Operation Sequence

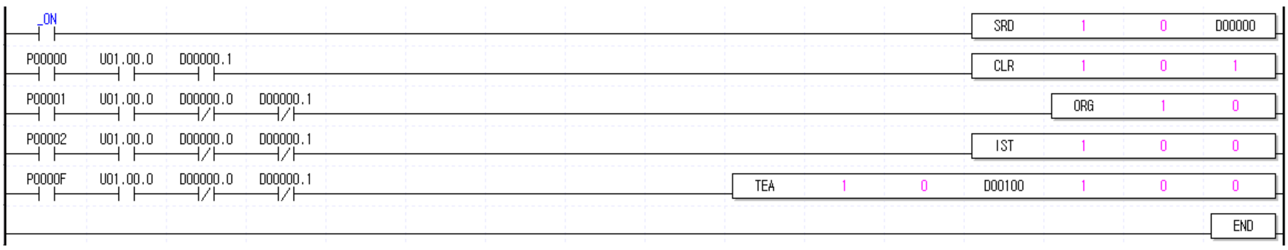
P00001(Homing) switch ON,OFF ⇒ P0000F(Position Teaching) switch ON,OFF ⇒ P00002(Start) switch ON,OFF

(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 [㎳]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	0	0	0	1	500	100	CW

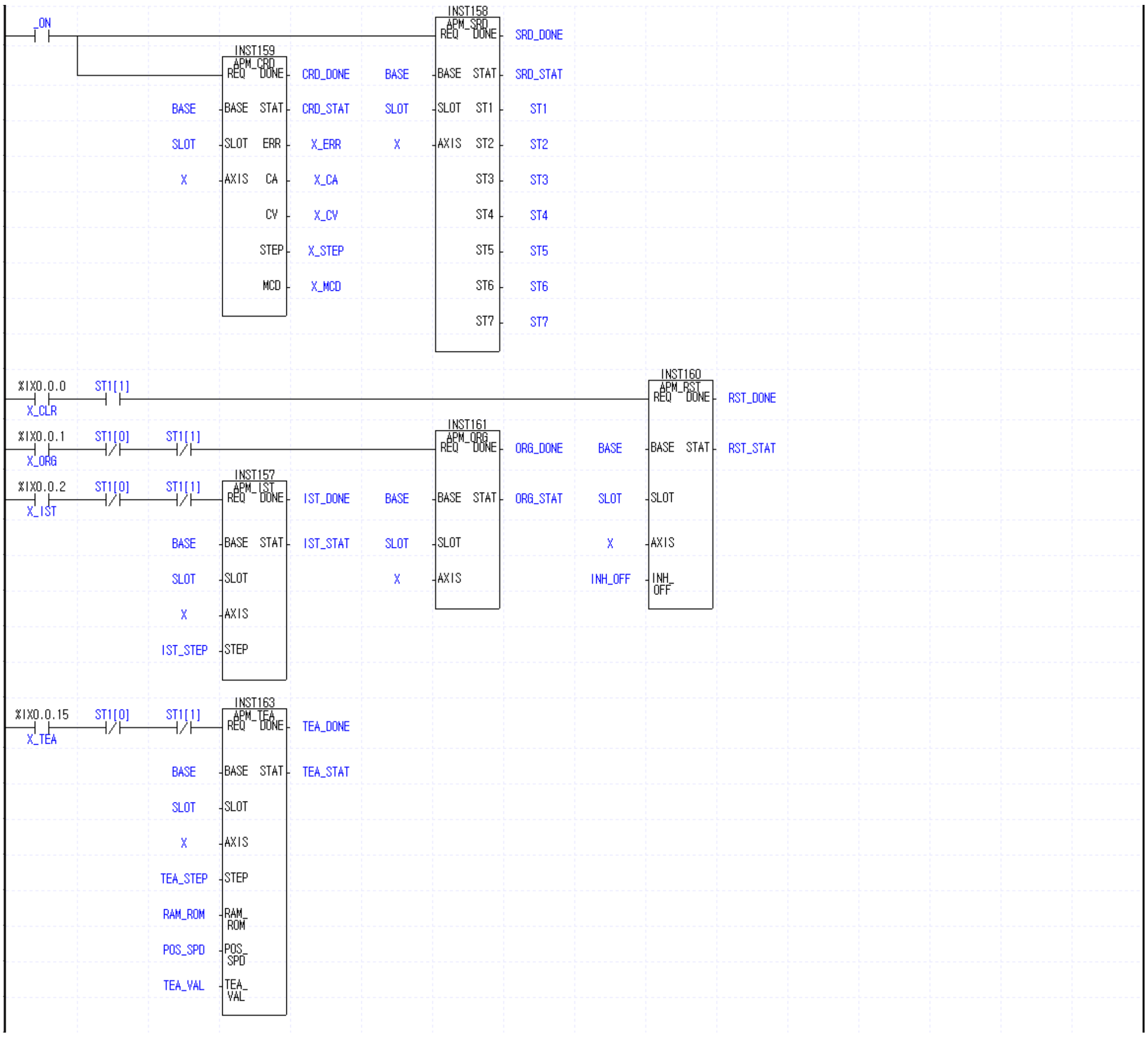
2) Program

(1) XGK



(2) XGI/XGR

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



10.2.26 Parameter Change

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
P0000E	X axis Parameter teaching switch (speed limit value)
P0000F	X axis Parameter teaching switch (acc./dec. time 1)
U01.00.0	X axis command receive signal
D00000.0	X axis signal in operation
D00000.1	X axis error state signal
MOO0OD	X axis signal in constant speed
D00004	X axis current operation step no.
D00100 ~ D00101	X axis speed limit value setting data (200000)
D00102 ~ D00103	X axis acc./dec. time 1 setting data (100)
D00000 ~ D00022	X axis operation state information

(2) Operation Sequence

P00001(Homing) switch ON,OFF ⇒ P0000E(Speed limit value change) switch ON,OFF ⇒ P0000F (Acc./Dec.time 1 change) switch ON,OFF ⇒ P00002(Start) switch ON,OFF

(3) Operation Data Setting

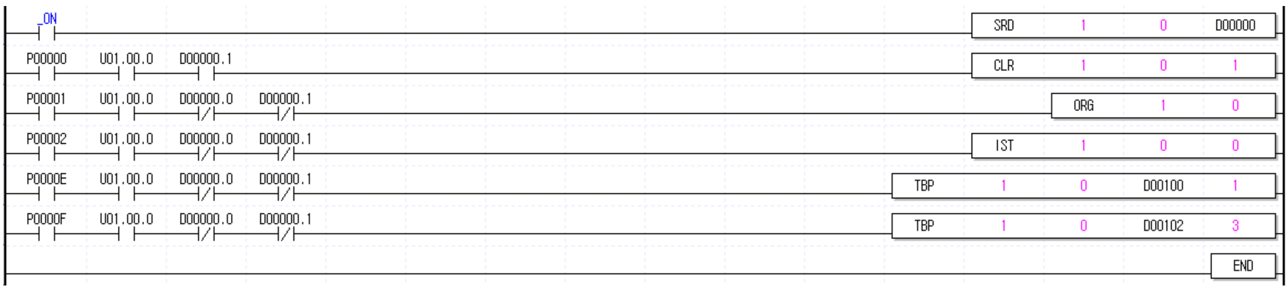
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. Point [pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single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

(4) Basic Parameter Setting

Parameter	Setting value
Speed limit value	200000
Acc./Dec. time 1	100

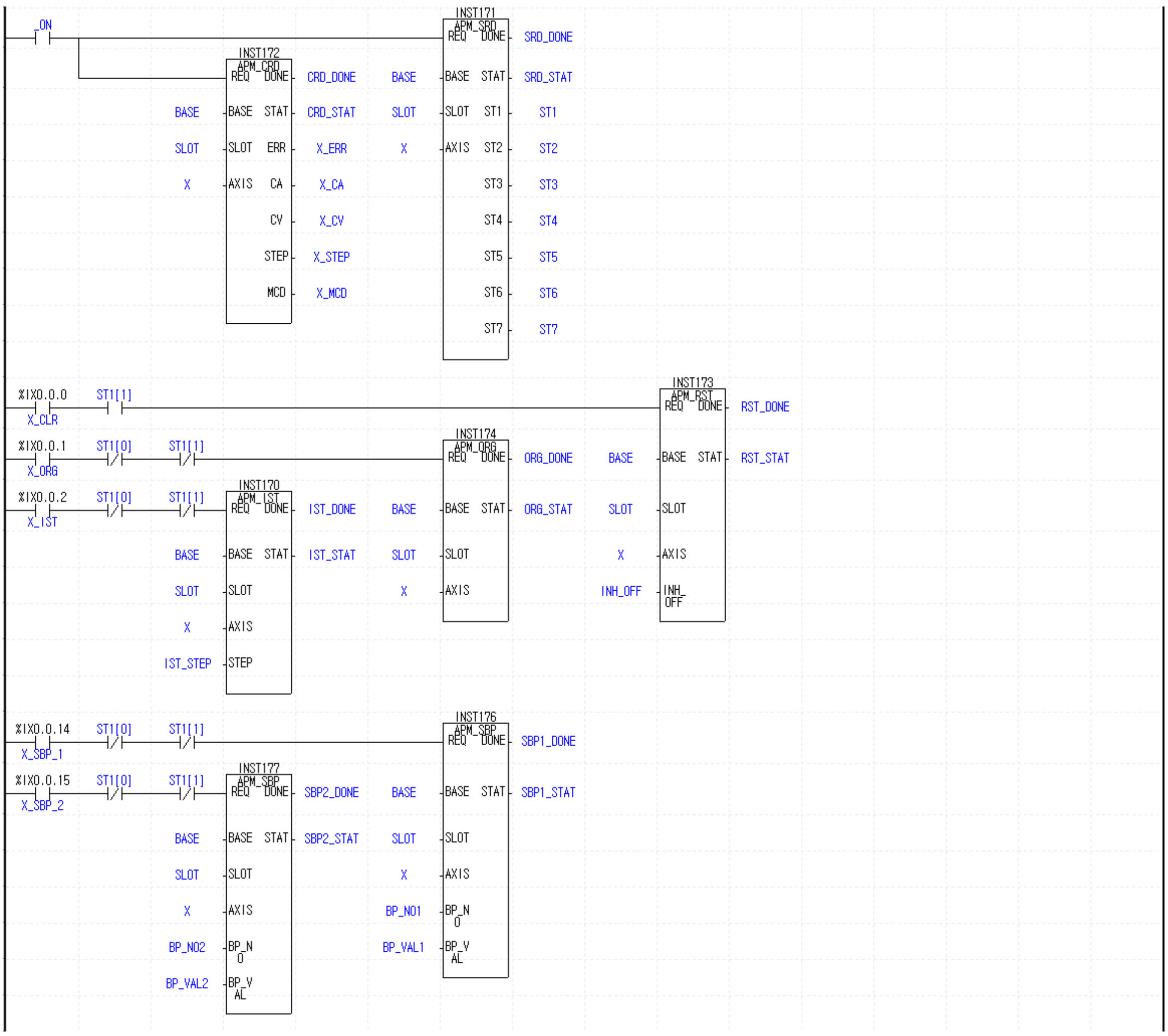
2) Program

(1) XGK



(2) XGI/XGR

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



10.2.27 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
DO0OO0.3	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

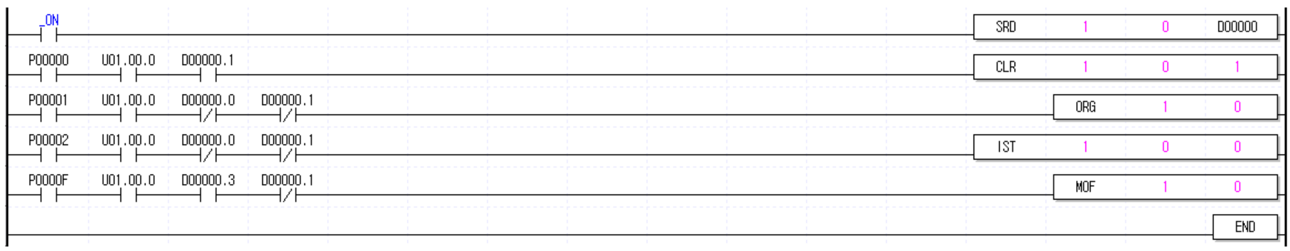
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [㎳]	Circular interpolation direction
X axis setting	1	Absolute	Position control	Go on	Single	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

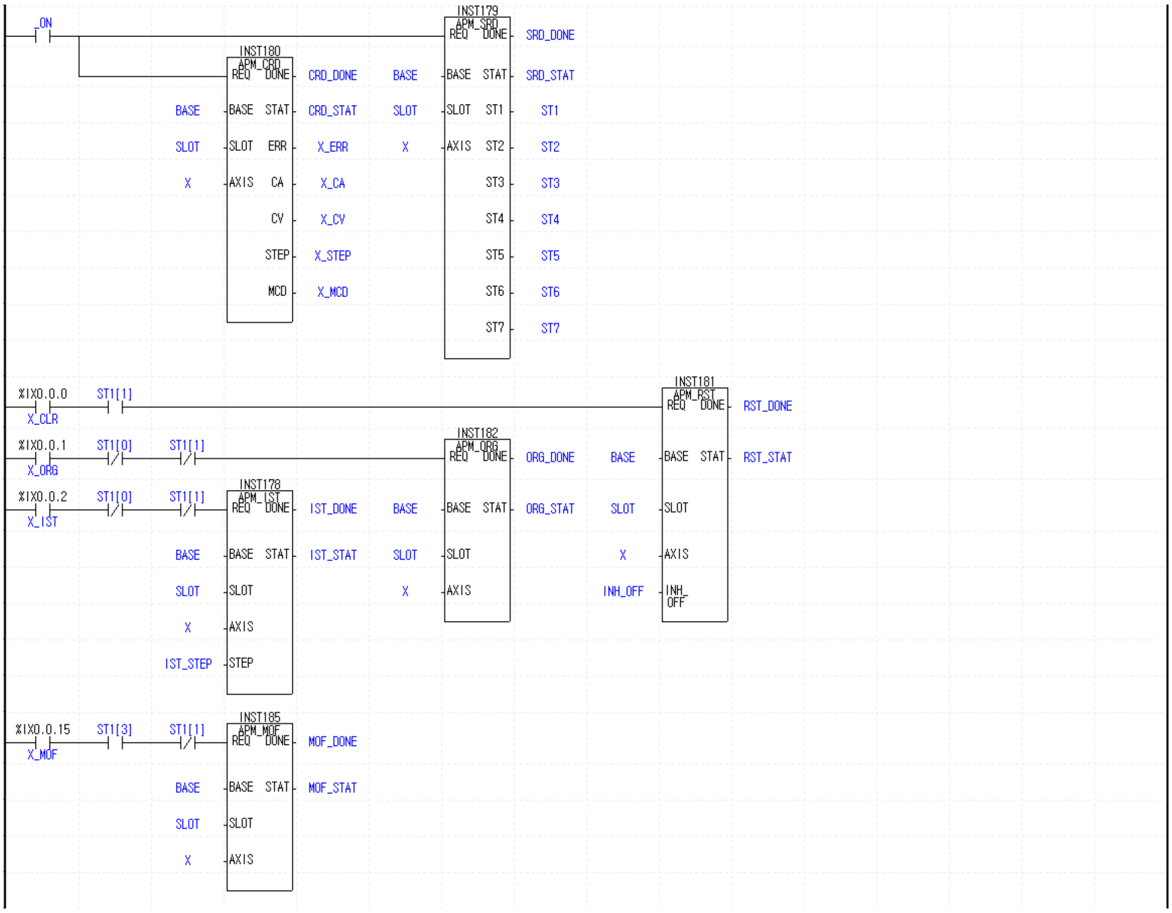
2) Program

(1) XGK



(2) XGI/XGR

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)



10.2.28 ZONE Setting

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
P0000E	X axis ZONE output enabled
P0000F	X axis ZONE output 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 ⇒ P0000E(ZONE output enabled) switch ON,OFF ⇒ P00002(Start) switch ON,OFF ⇒ P0000F(ZONE output disabled) switch ON,OFF ⇒ P00002(Start) switch ON,OFF

(3) Operation Data Setting

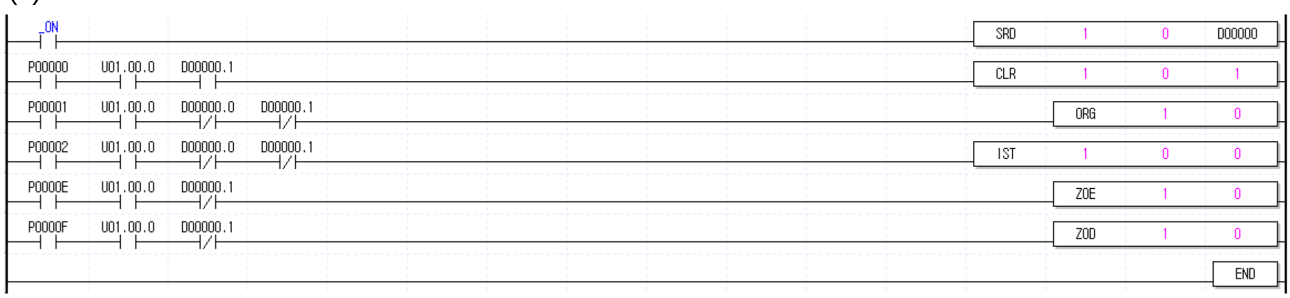
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	10000	0	0	1	500	100	CW

(4) Common Parameter Setting

ZONE output mode	0 : individual output
ZONE1 axis setting	0 : X axis
ZONE2 axis setting	0 : X axis
ZONE3 axis setting	0 : X axis
ZONE1 ON start point	0 pls
ZONE1 ON end point	1000 pls
ZONE2 ON start point	1500 pls
ZONE2 ON end point	2500 pls
ZONE3 ON start point	3000 pls
ZONE3 ON end point	4000 pls

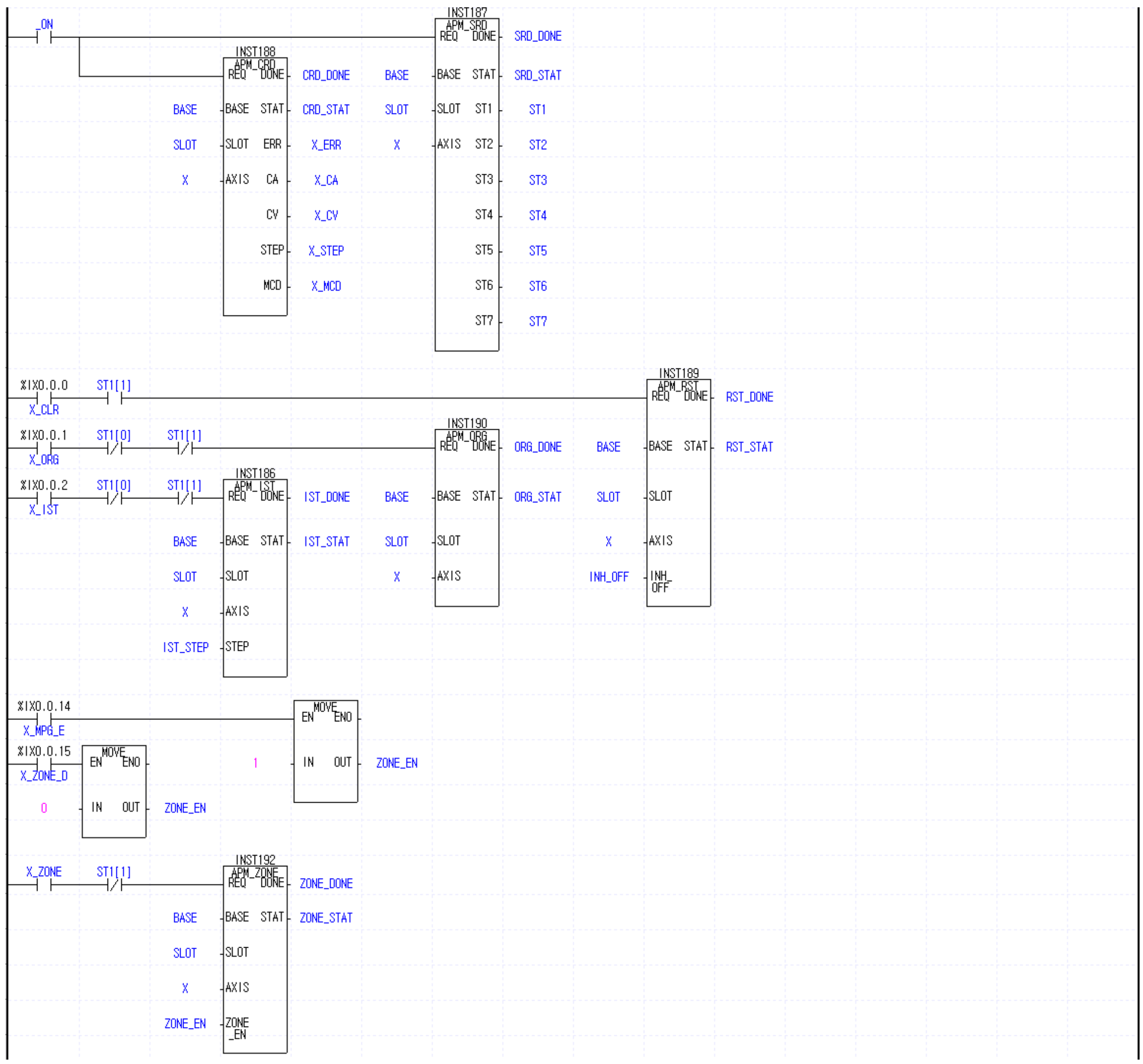
2) Program

(1) XGK



(2) XGI/XXGR

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 축)
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 oiutput disabled setting	No.15 bit of No.0 Slot Input Module(%IX0.0.15)
X_ZONE	ZONE setting execution	-



10.2.29 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

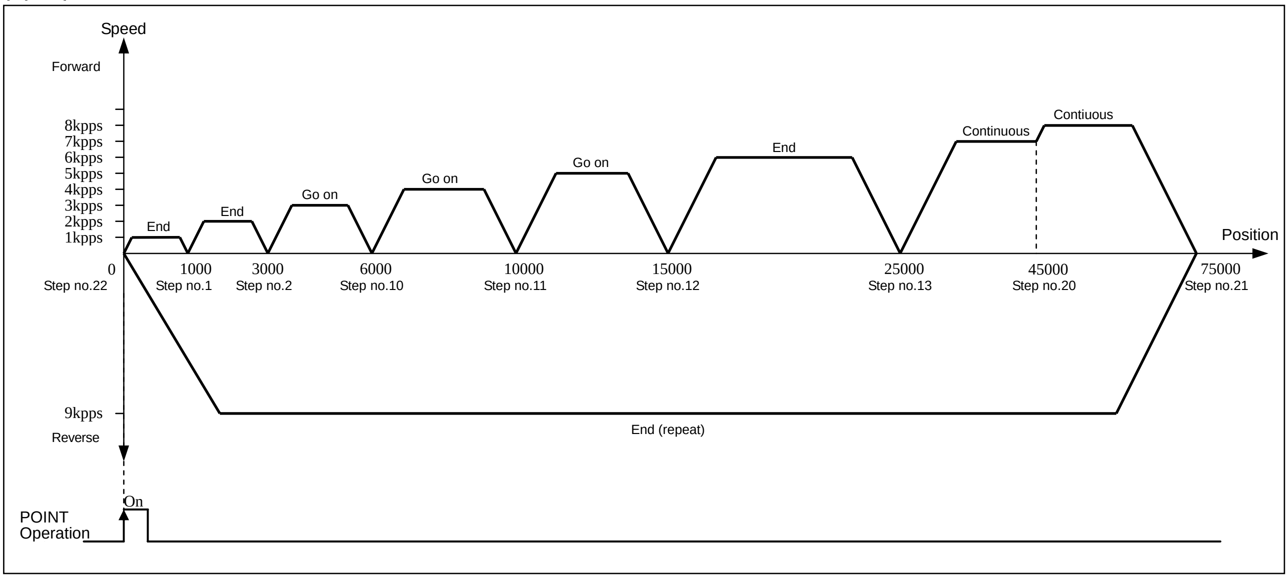
(2) Operation Sequence

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 [㎳]	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	Signle	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

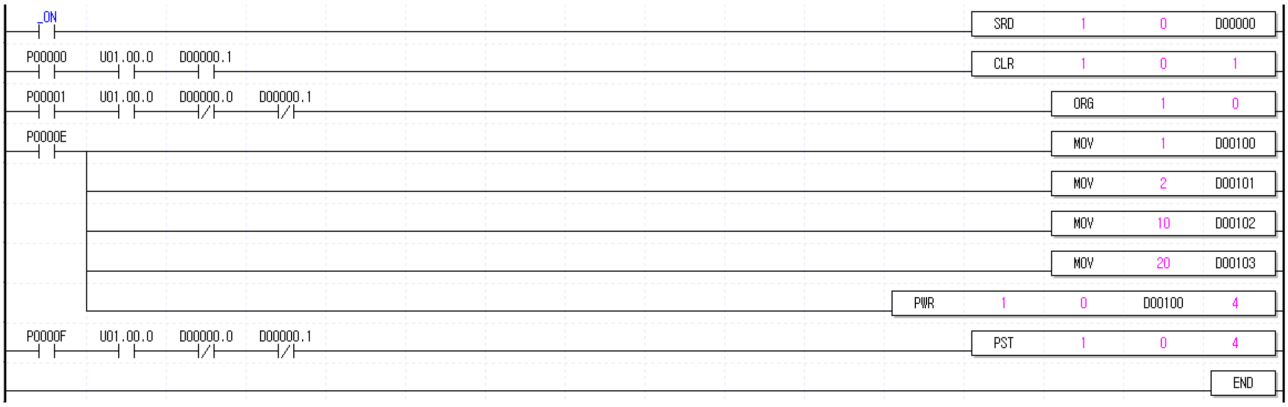


(5) Operation Step Data Setting

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

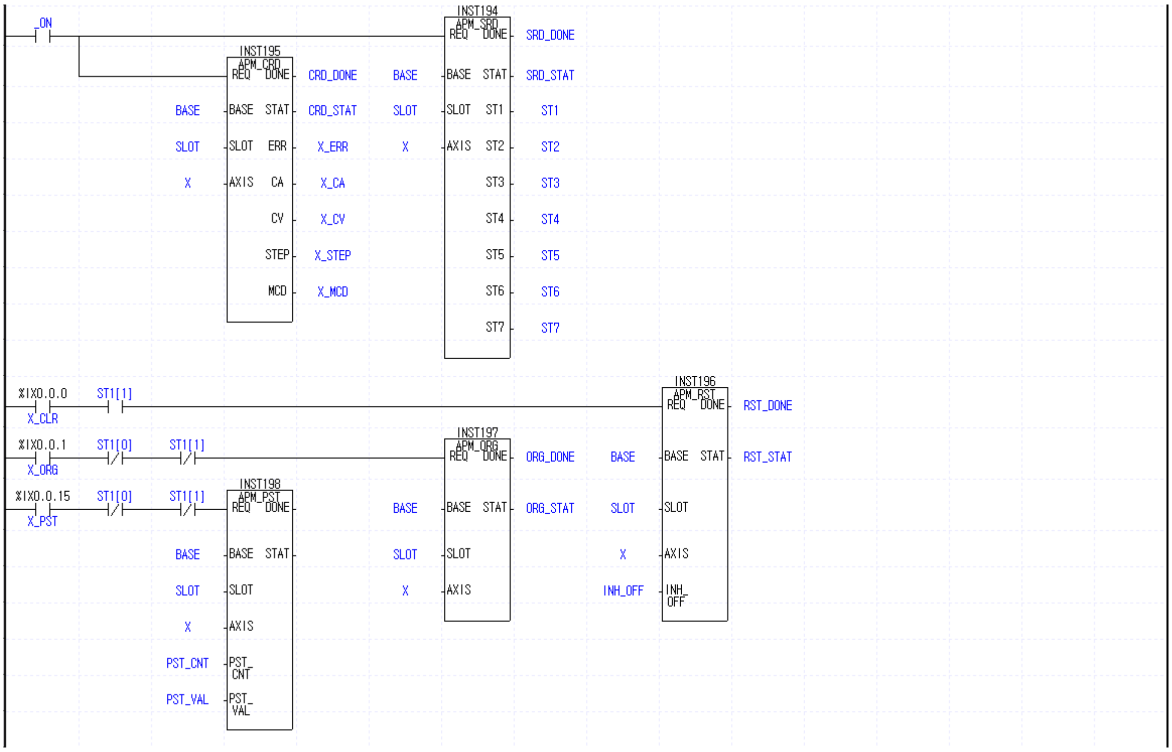
2) Program

(1) XGK



(2) XGI/XGR

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



10.2.30 Current position section repetition

1) Description

(1) Used device

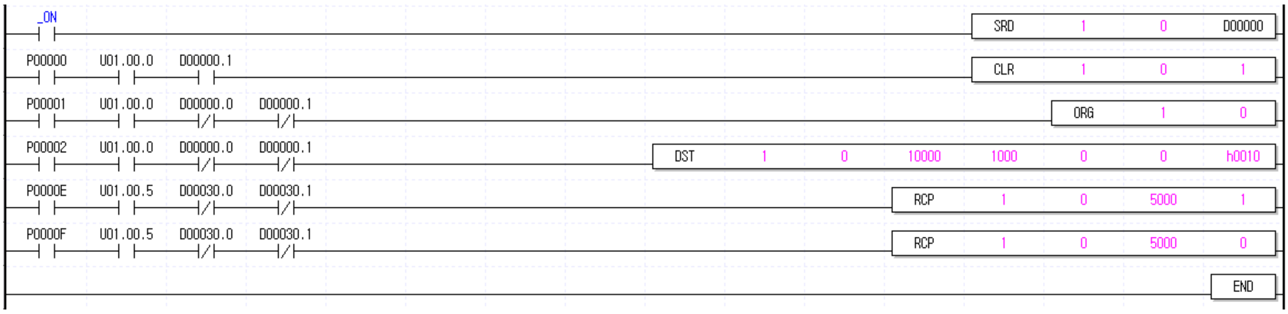
Device	Description
P00000	X axis error reset, output prohibition cancellation switch
P00001	X axis homing switch
P00002	X axis direct start switch
P0000E	X axis current position section repetition switch (setting)
P0000F	X axis current position section repetition switch (Cancelltaion)
U01.00.0	X axis command reception switch
D00000.0	X axis during run signal
D00000.1	X axis error status signal
D00000 ~ D00022	X axis operation status information

(2) Operation sequence

P00001(homing) switch ON, OFF ⇒ P0000E(current position section repetition) switch ON, OFF ⇒ P00002(Direct start) switch ON, OFF

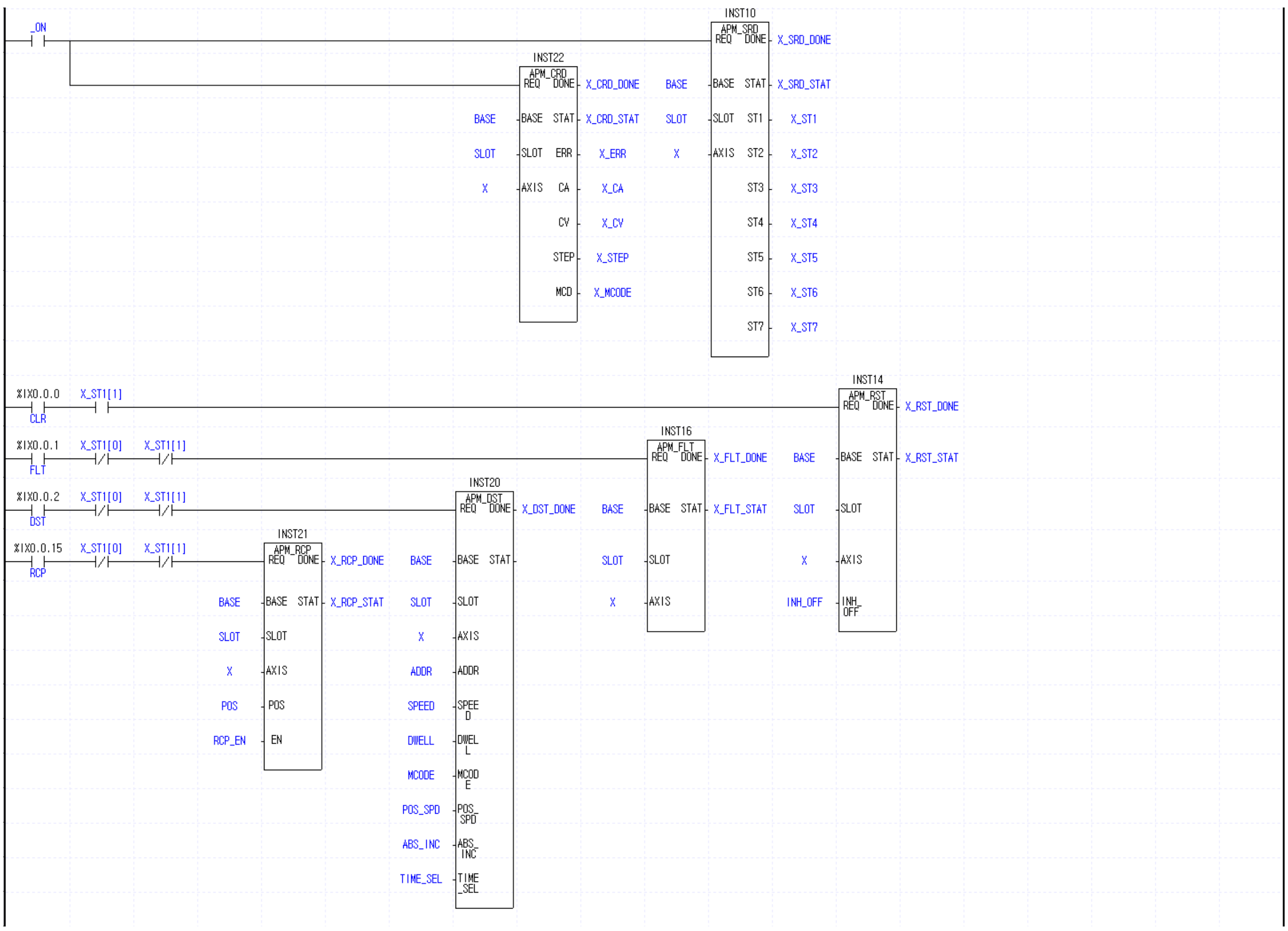
2) Program

(1) XGK



(2) XGI/XGR

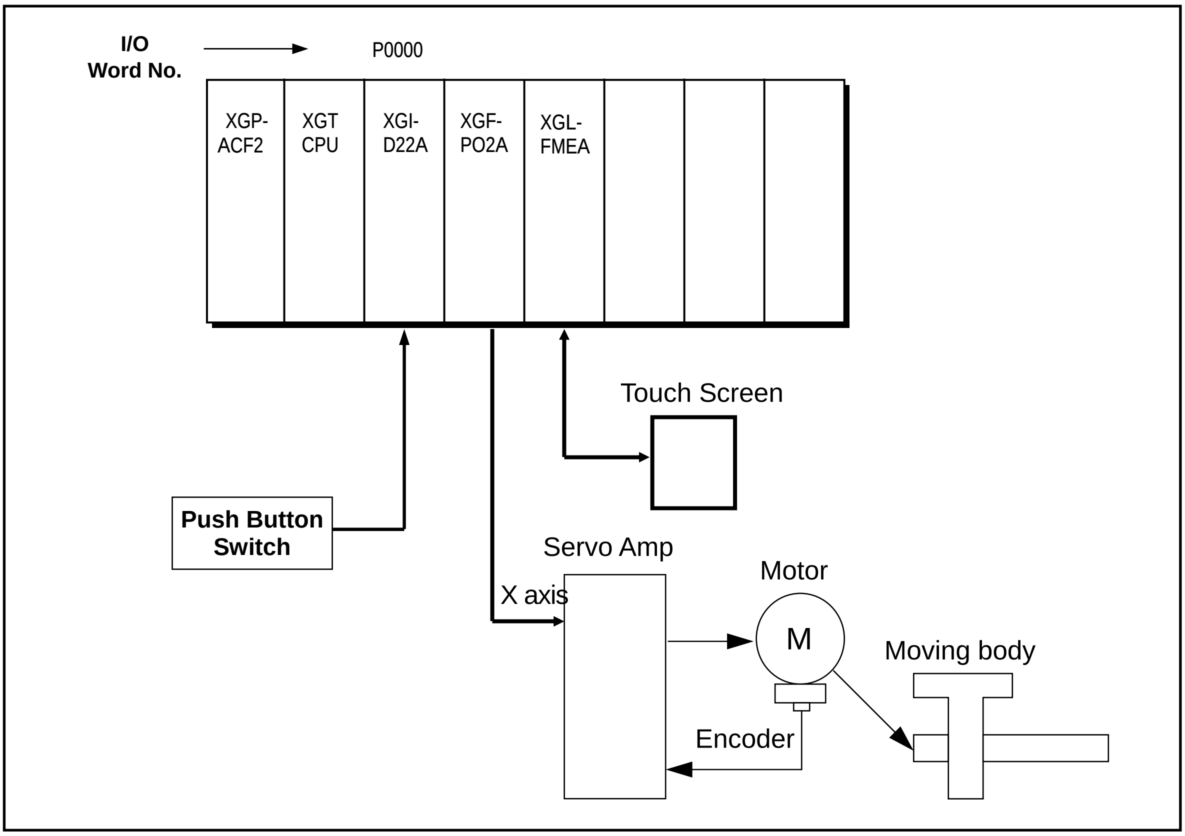
Variable	Description	Setting
BASE	Base number where APM is equipped	0
SLOT	Slot number where APM is equipped	1
X	Axis of APM to execute function block	0 (X axis)
X_ST1[0]	X axis during run signal	-
X_ST1[1]	X axis error status signal	-
CLR	X axis error reset execution	No.0 bit of no.0 slot input module (%IX0.0.0)
FLT	X axis floating origin setting execution	No.1 bit of no.0 slot input module (%IX0.0.1)
DST	X axis direct start execution	No.2 bit of no.0 slot input module (%IX0.0.2)
RCP	X axis current position section repetition execution	No.15 bit of no.0 slot input module (%IX0.0.15)
ADDR	X axis direct start target position	10000 in example
SPEED	X axis direct start target speed	1000 in example
DWELL	X axis direct start dwell time	0 in example
MCODE	X axis direct start M code number	0 in example
POS_SPD	X axis direct start control method	0 in example (position control)
ABC_INC	X axis direct start coordinate	1 in example (incremental coordinate)
TIME_SEL	X axis direct start AEC/DEC number	0 in example
POS	X axis current position section repetition position	5000 in example
RCP_EN	X axis current position section repetition ON/OFf	1(ON), 0(OFF)



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

5) Operation Data Setting

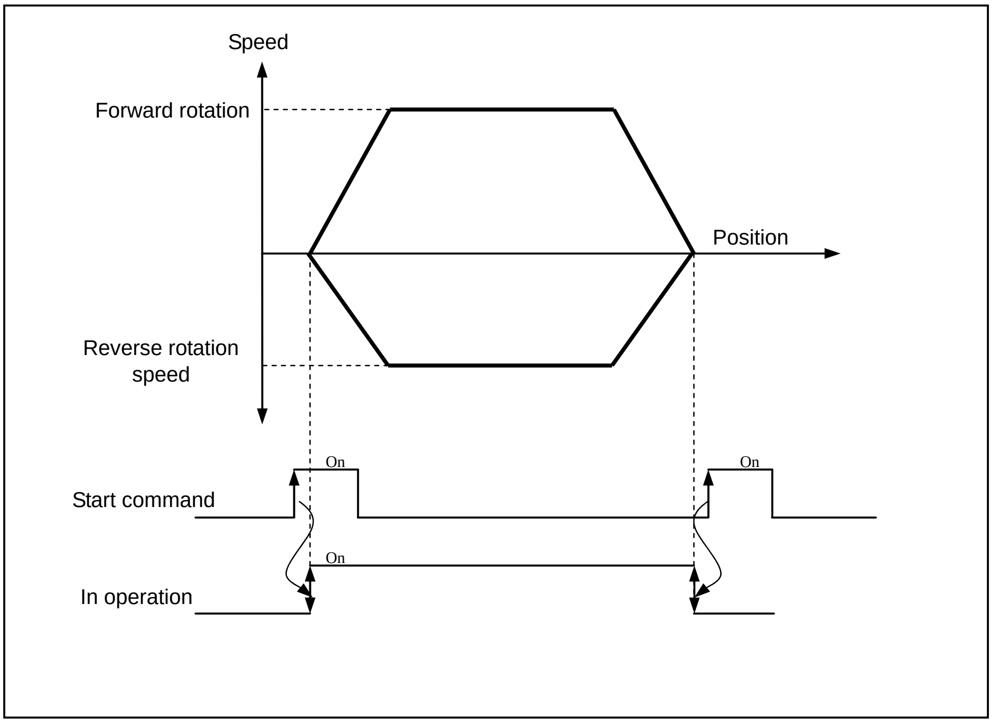
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [㎳]	Circular interpolation direction
X axis setting	1	Absolute	Position control	End	Single	10000	0	**0**	1	500	20	CW
	2	Absolute	Position control	End	Repeat	0	0	**0**	1	500	20	CW

6) Teaching Data Setting

Contents	Teaching setting (P00002)	Teaching setting value(P00003)	Teaching setting value (P00004)
Teaching Step no.	1	1	2
RAM Teaching(0),ROM Teaching(1) setting	0	0	0
position Teaching(0), speed Teaching (1) setting	0	1	1
Device	D0500~D0501	D0540~D0541	D0542~D0543

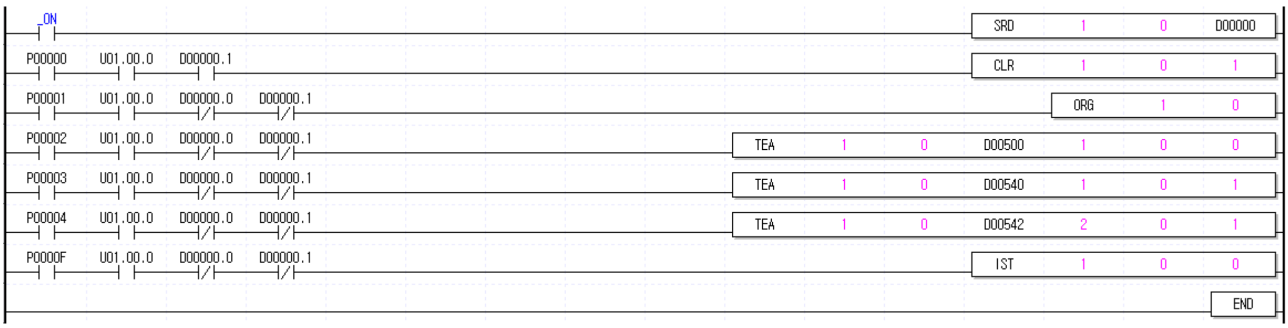
▷ Teaching data shall be saved as the value set in Touch Screen.

7) Operation Pattern



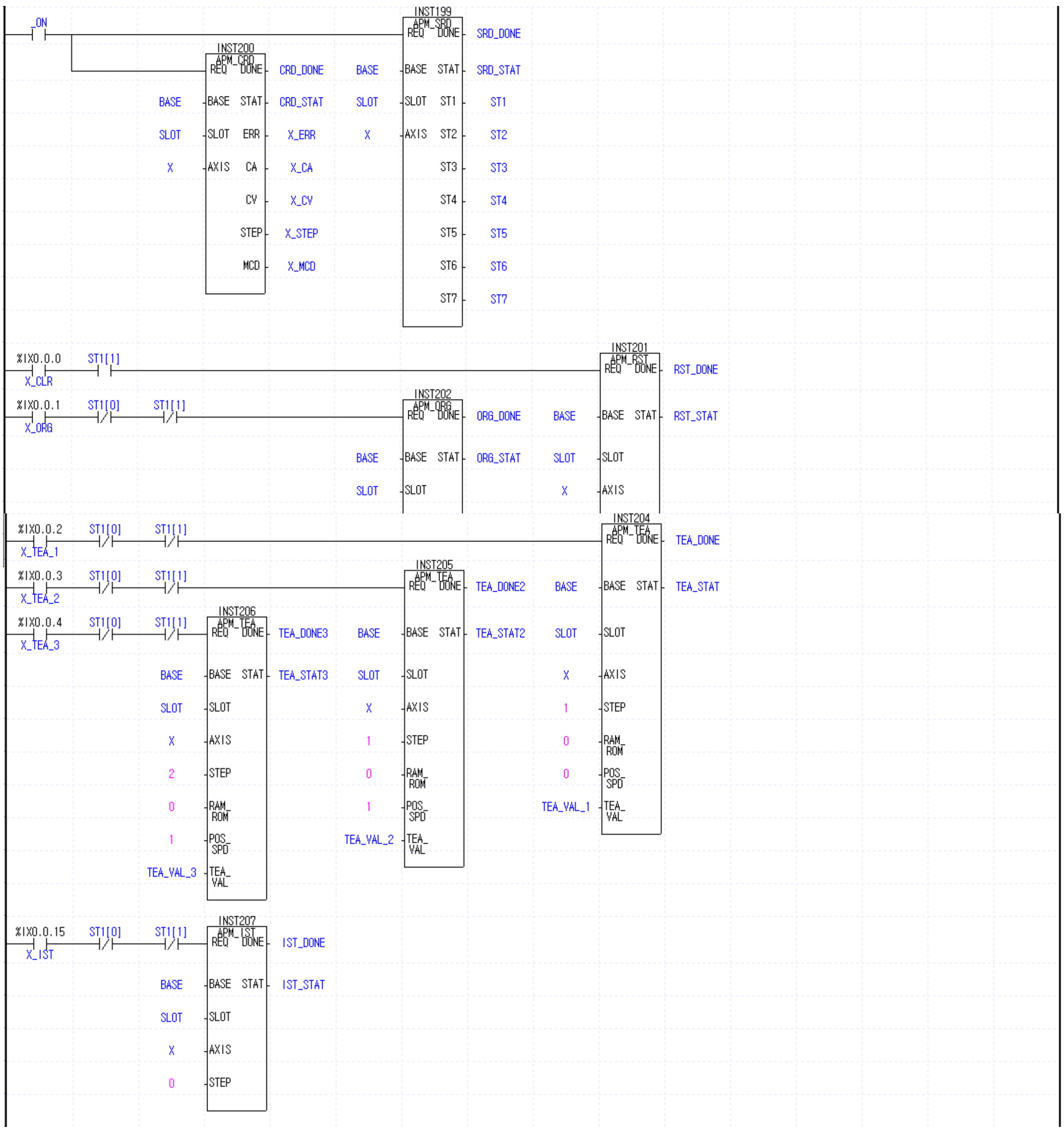
8) Program

(1) XGK



(2) XGI/XGR

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



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

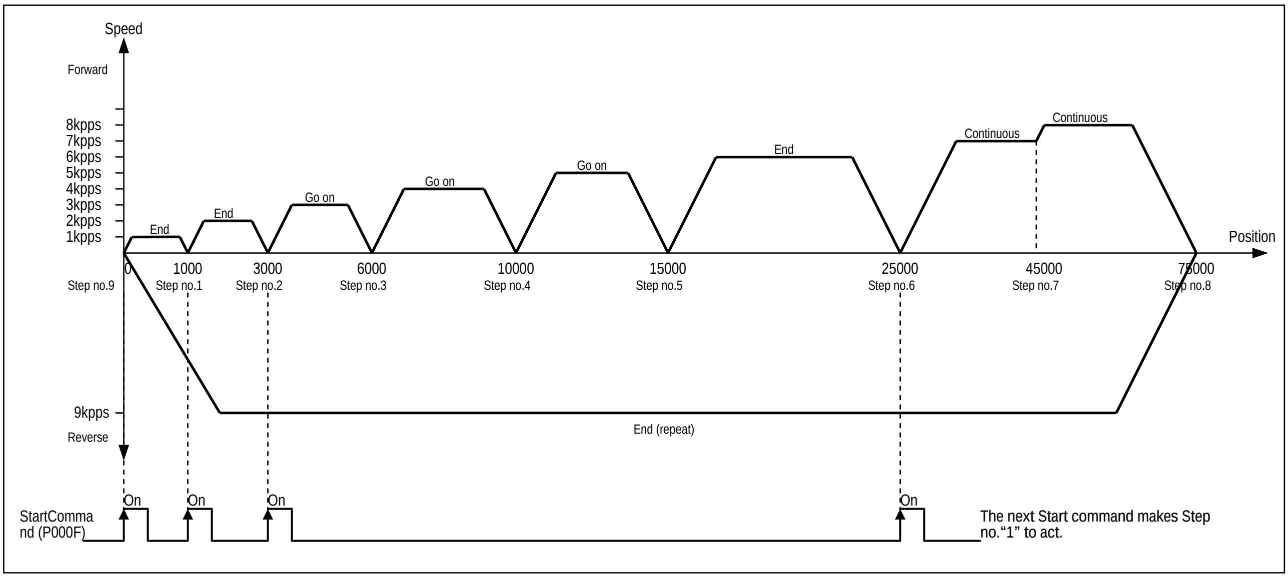
3) Operation Sequence

P00001(Homing) switch ON, OFF ⇒ P0000F(Start) switch ON, OFF 4

4) Operation Data Setting

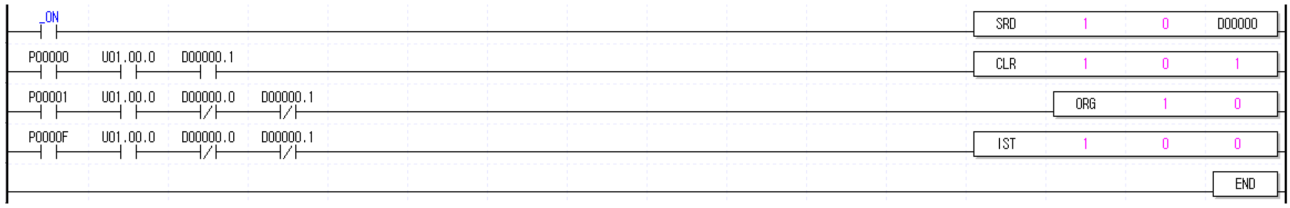
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [㎳]	Circular interpolation direction
Xaxis setting	1	Relative	Position control	End	Single	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



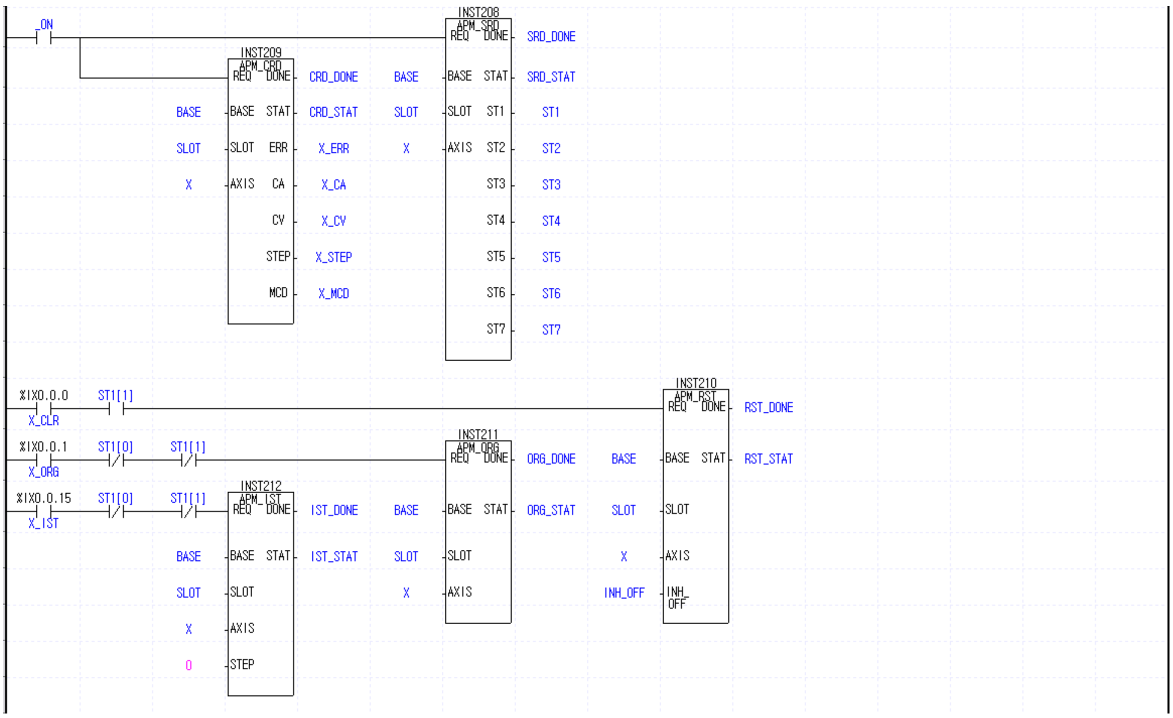
6) Program

(1) XGK



(2) XGI/XGR

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)



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.

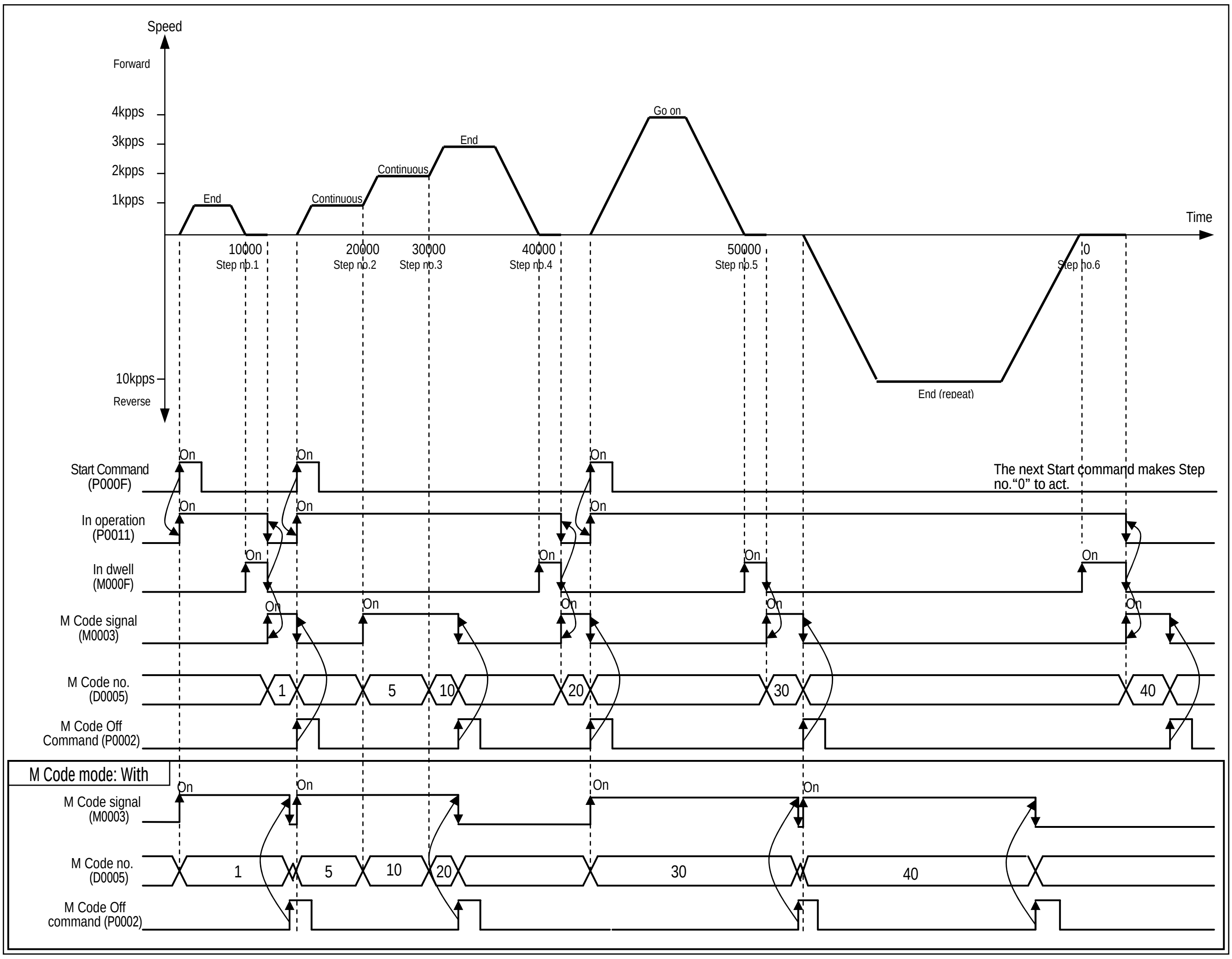
4) Operation Data Setting

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 [㎳]	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

5) Operation Pattern

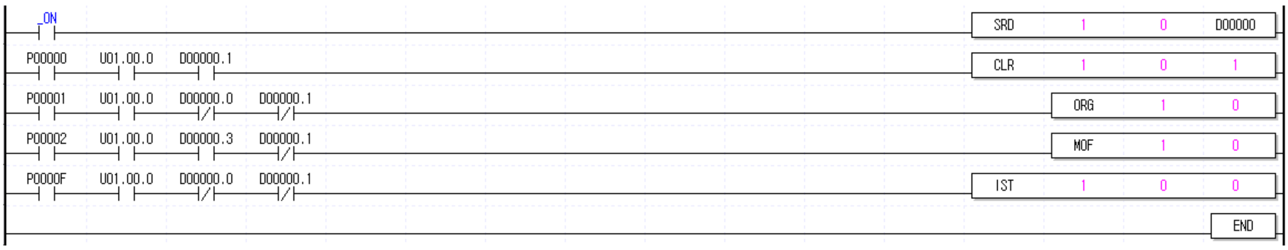


Notes

▶ 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.

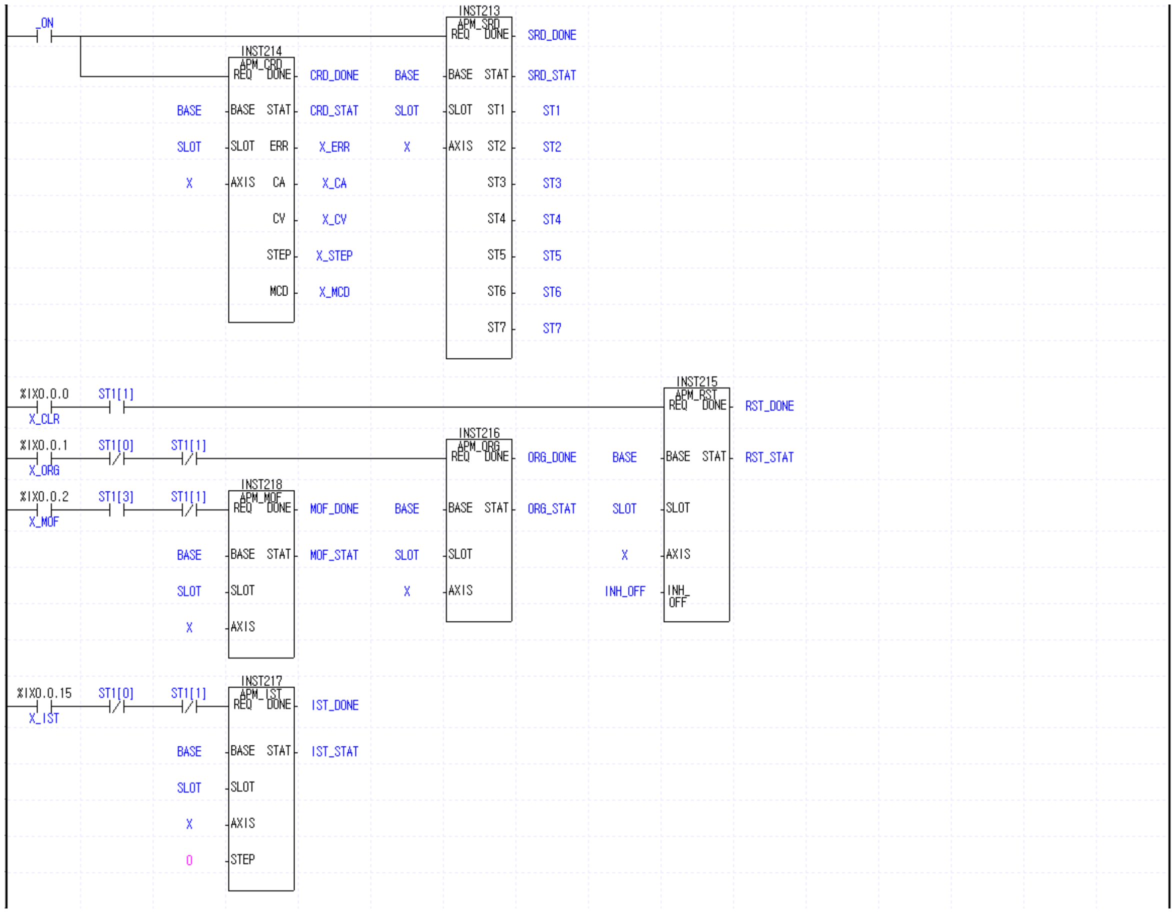
▶ In Go on operation mode, if M Code signal is ON, it is required to make M Code "ON" signal OFF by M Code OFF command in order to operate the next operation step no.

6) Program



(2) XGI/XGR

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)



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

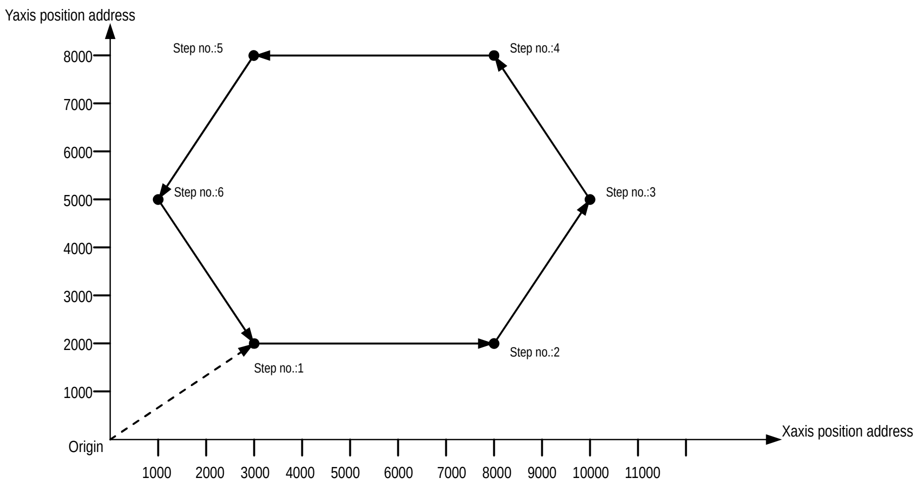
P00001(Homing) switch ON,OFF ⇒ P0000F(Linear interpolation) switch ON,OFF ⇒ P0000F(Linear interpolation) switch ON,OFF

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

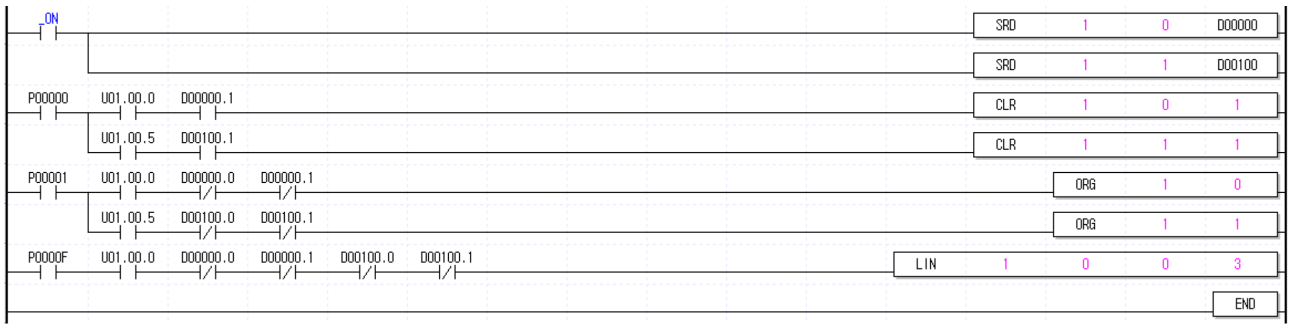
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
Y axis Setting	1	Absolute	Position control	end	Single	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

5) Operation Pattern



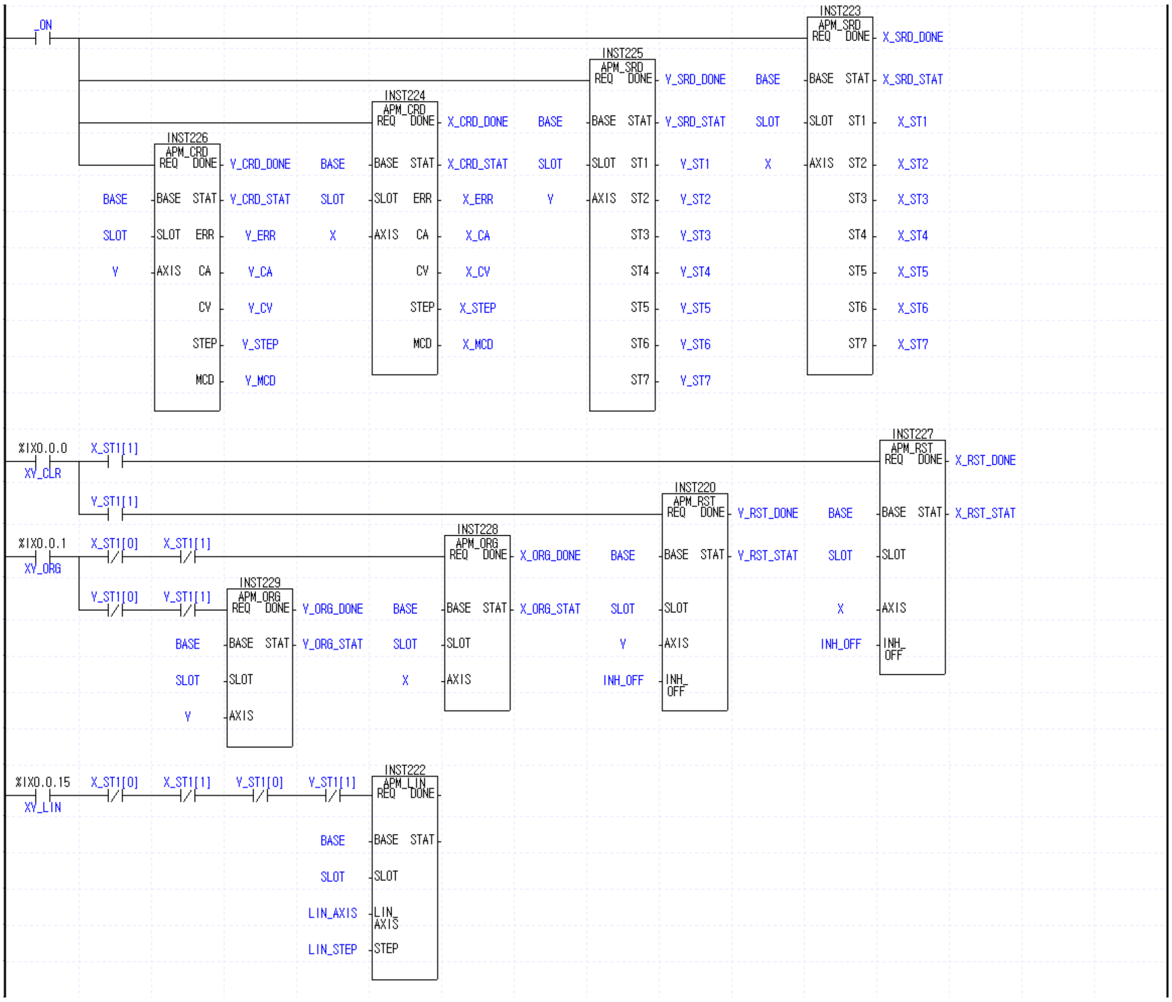
6) Program

(1) XGK



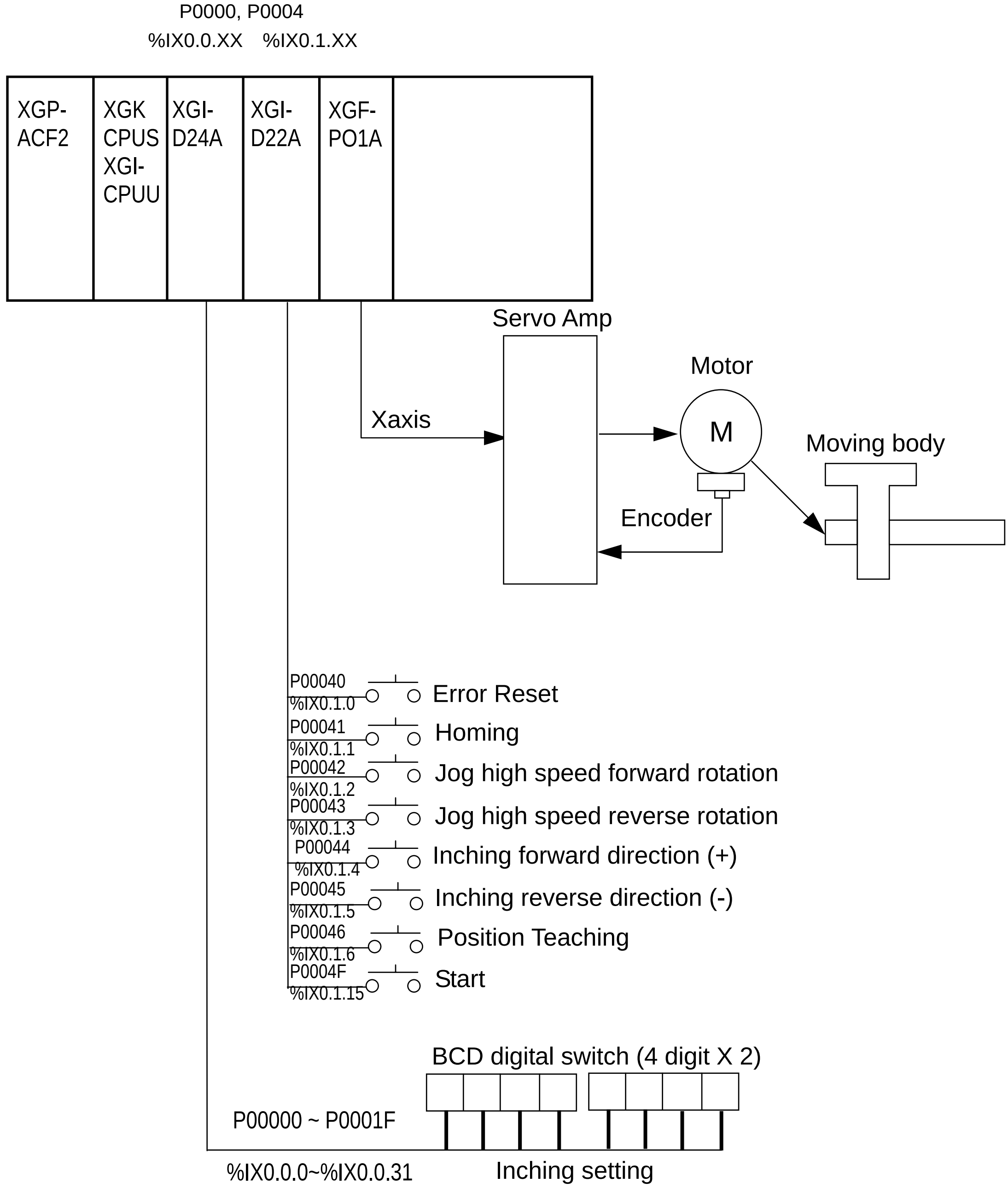
(2) XGI/XGR

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



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

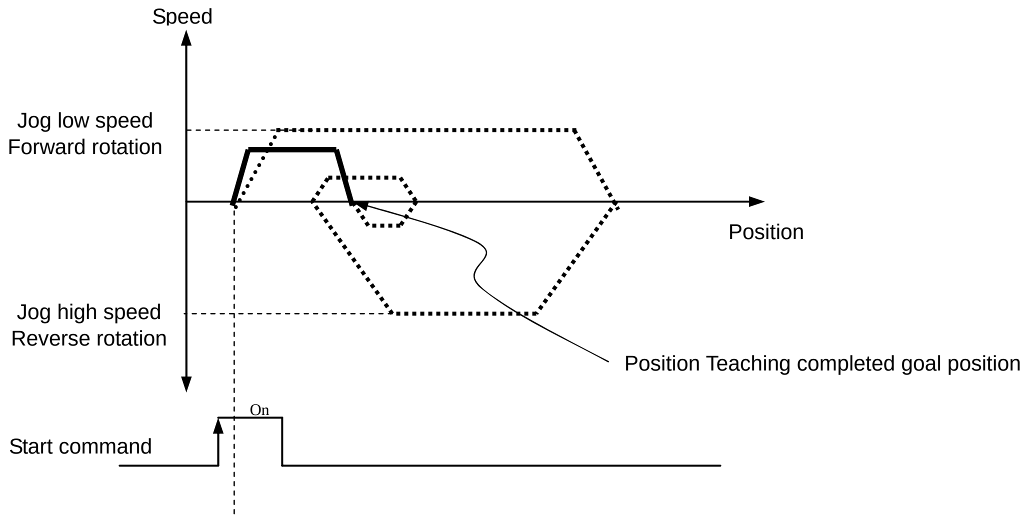
3) Operation Sequence

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 [㎳]	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

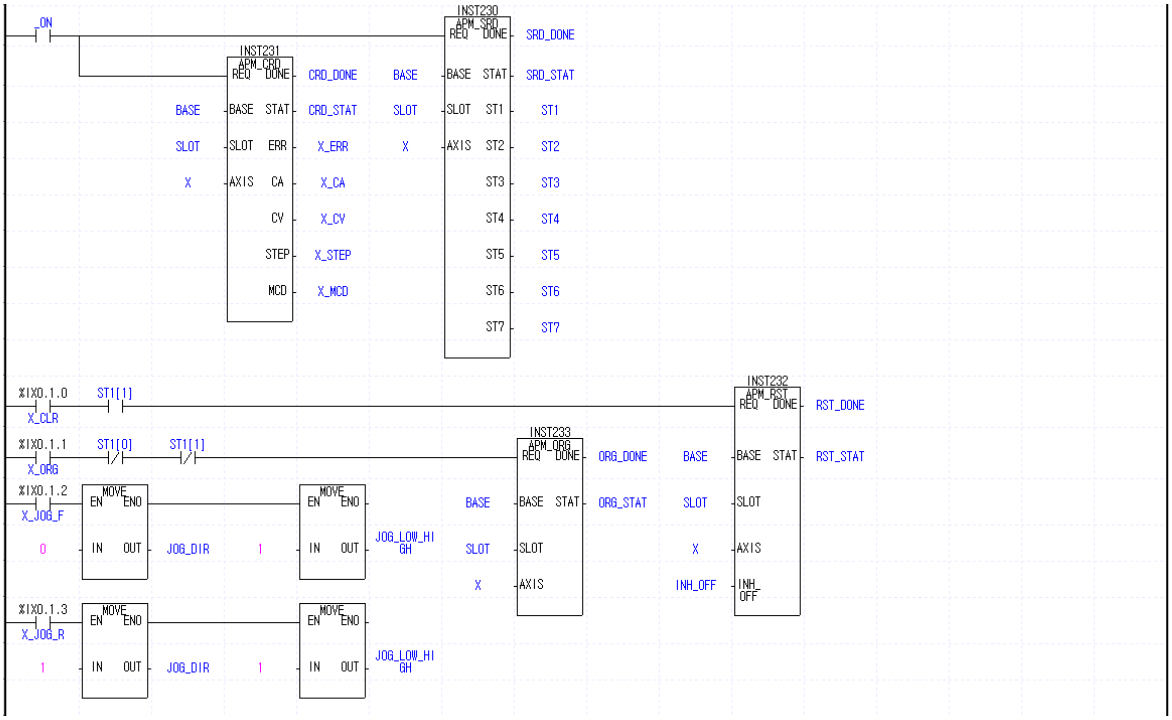


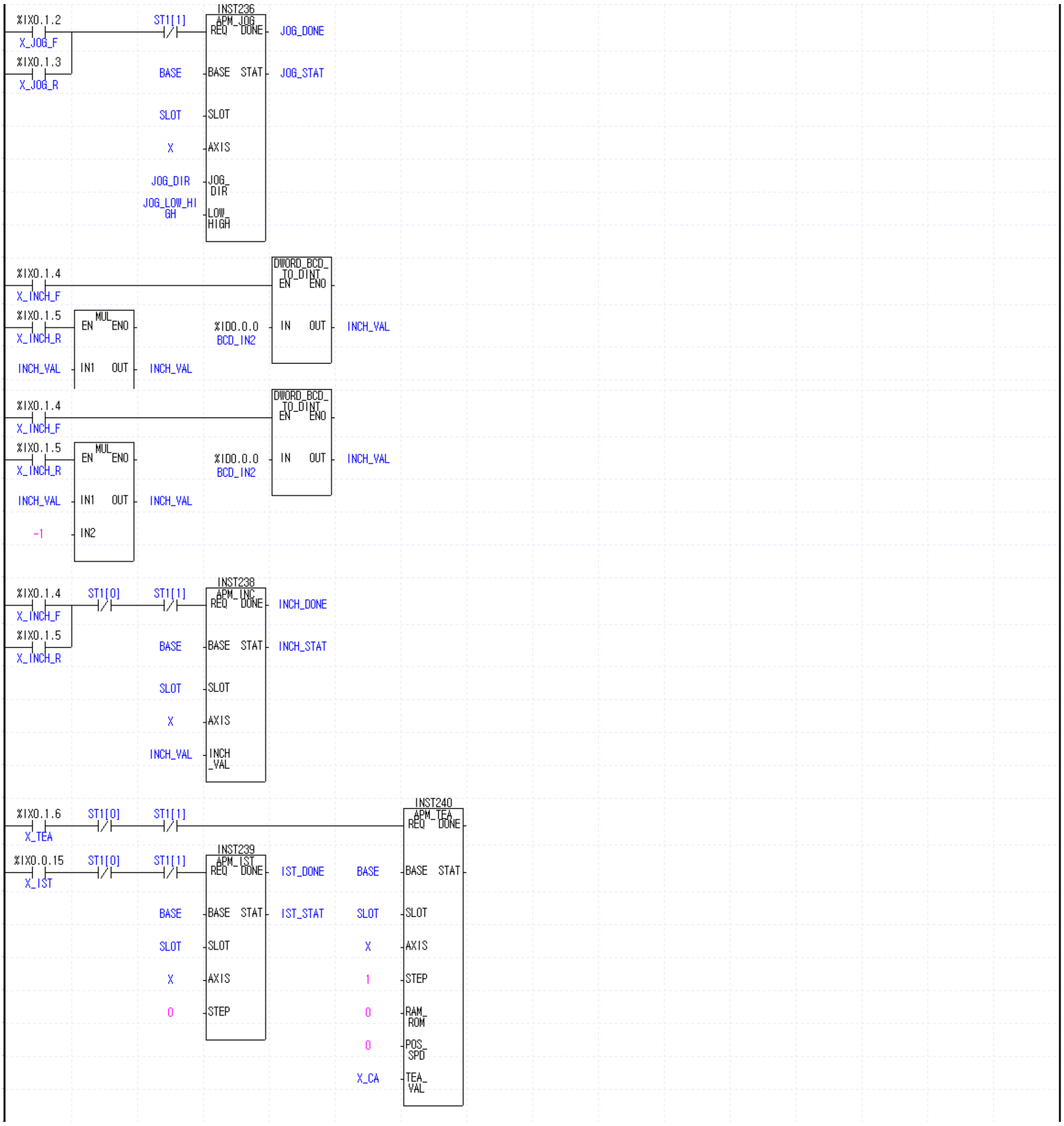
6) Program

(1) XGK

(2) XGI/XGR

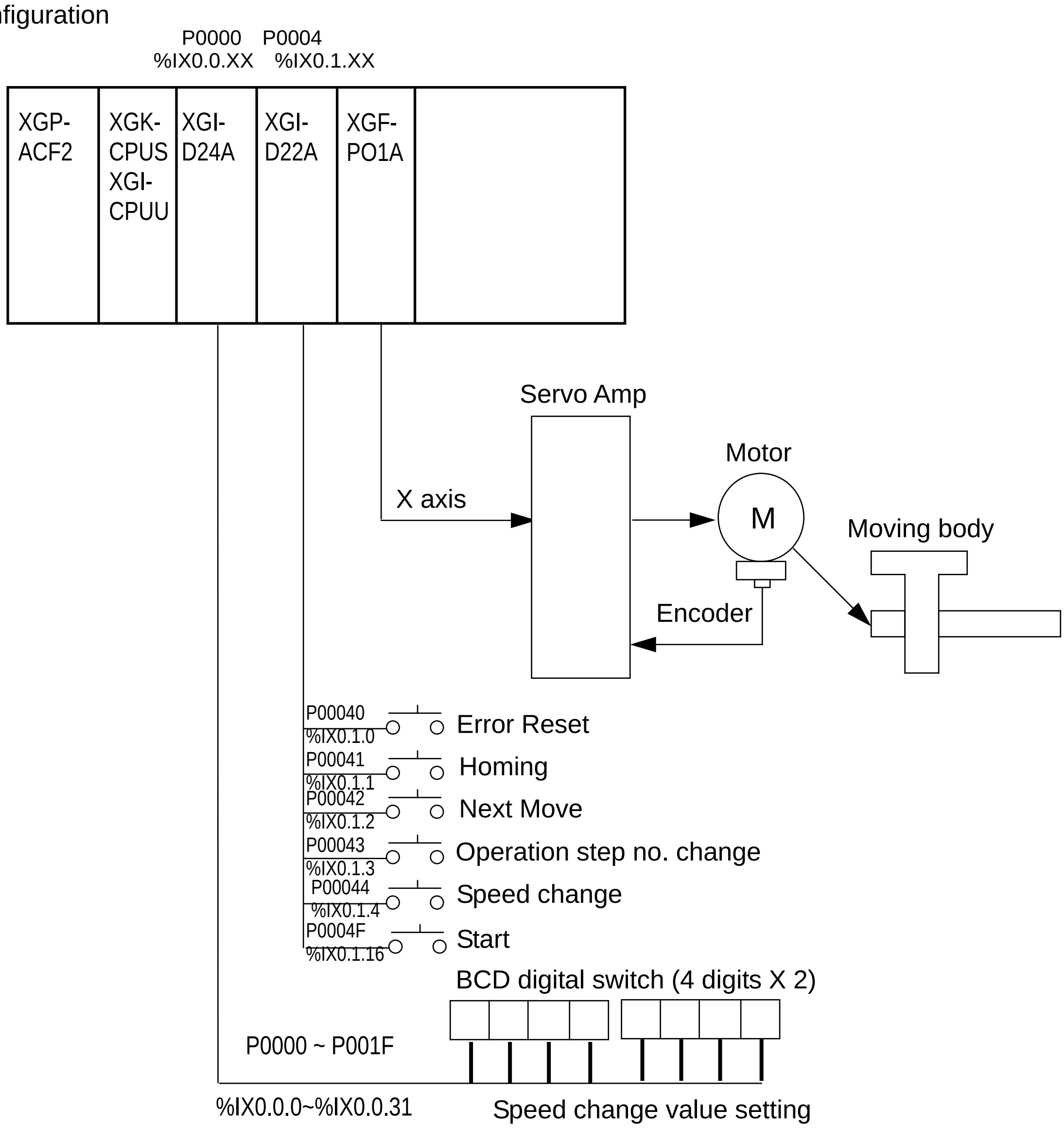
Parameter	Description	Setting
BASE	Base No. for APM Installation	0
SLOT	Slot No. for APM Installation	2
X	APM Axis to execute function block	0 (X 축)
ST1[0]	X axis signal in operation	-
ST1[1]	X axis error state signal	-
X_CLR	X axis reset execution	No.0 bit of No.0 Slot Input Module(%IX0.0.0)
X_ORG	X 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




%IX0.1.2
X_JOG_F
%IX0.1.3
X_JOG_R
ST1[1]
INST236
APM_JOG
REQ DONE
JOG_DONE
BASE
BASE STAT
JOG_STAT
SLOT
X
AXIS
JOG_DIR
JOG_DIR
JOG_LOW_HIGH
LOW HIGH
%IX0.1.4
X_INCH_F
%IX0.1.5
X_INCH_R
MUL
EN ENO
INCH_VAL
IN1 OUT
DWORD_BCD_TO_DINT
%ID0.0.0
BCD_IN2
IN OUT
-1
IN2
INST238
APM_INC
INCH_DONE
INCH_STAT
INCH_VAL
ST1[0]
%IX0.1.6
X_TEA
%IX0.0.15
X_IST
INST239
APM_IST
IST_DONE
IST_STAT
STEP
0
INST240
APM_TEA
1
RAM_ROM
POS_SPD
X_CA
TEA_VAL

10.3.6 Speed Change, Continuous Operation (NMV)

1) System Configuration



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

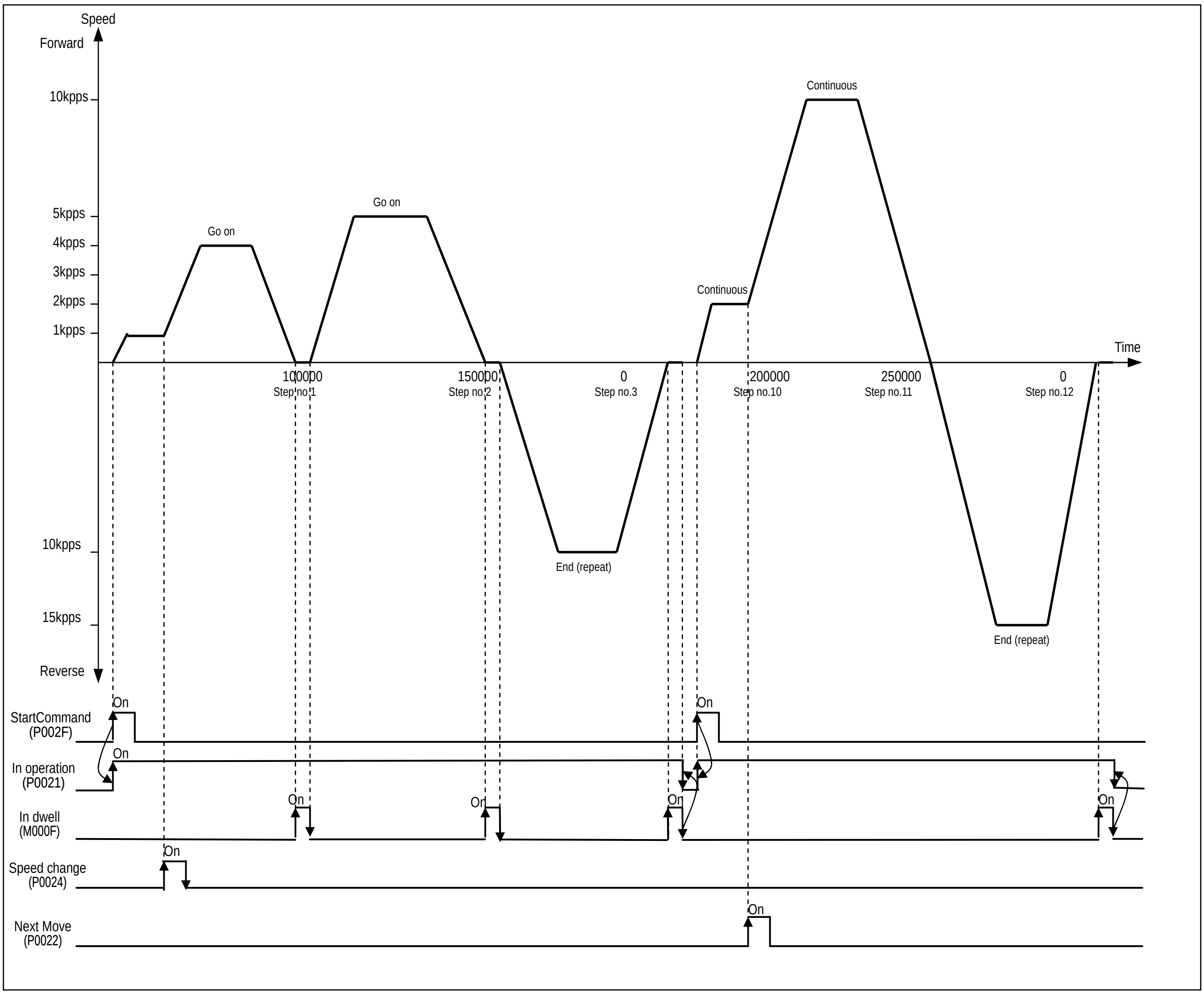
3) Operation Sequence

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

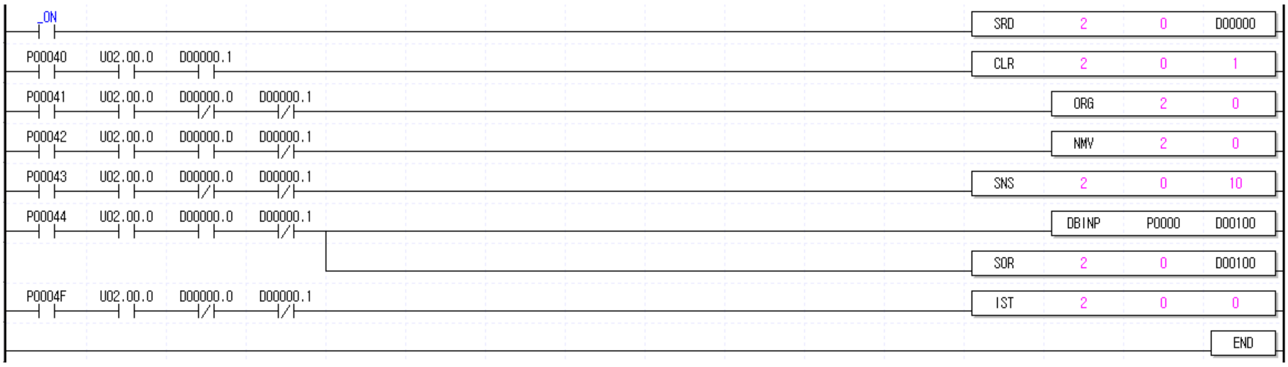
Items of position data	Step no.	Coordinate	Control method	Operation pattern	Operation method	Goal position [pulse]	Circular interpolation aux. point[pulse]	M code	Acc./ dec. no.	Operation speed [pls/s]	Dwell time [ms]	Circular interpolation direction
X axis setting	1	Absolute	Position control	Go on	Single	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



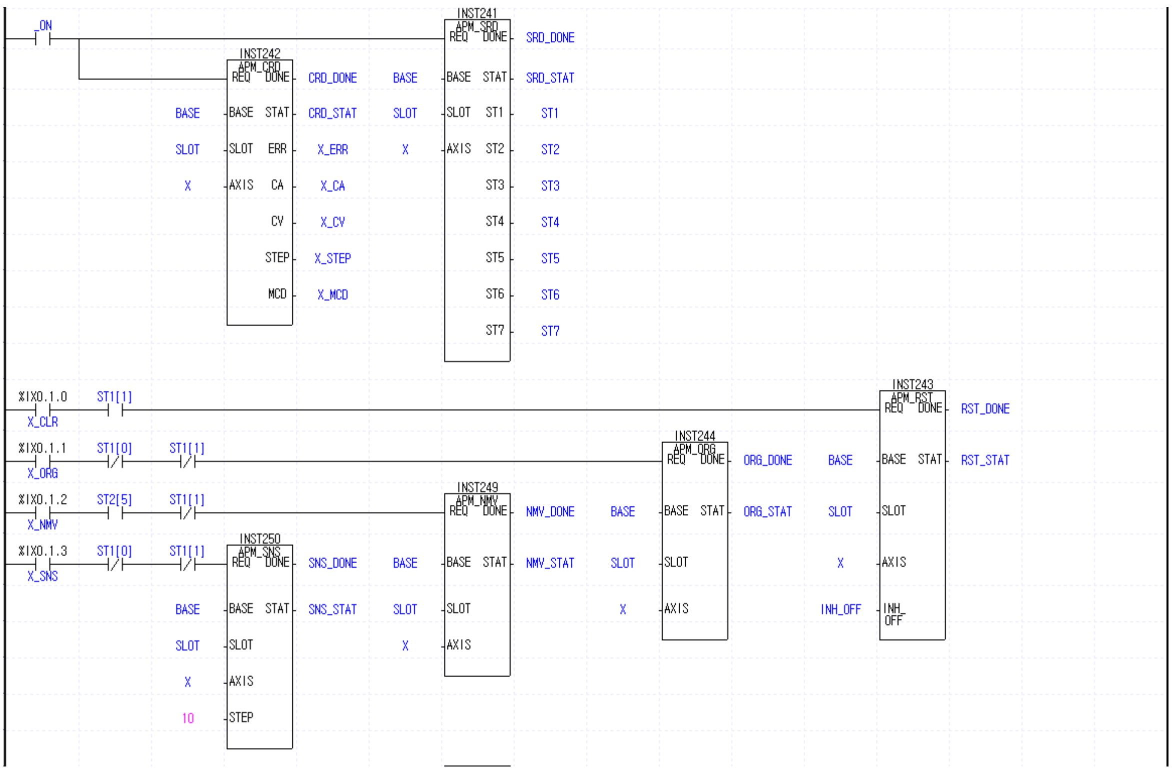
7) Program

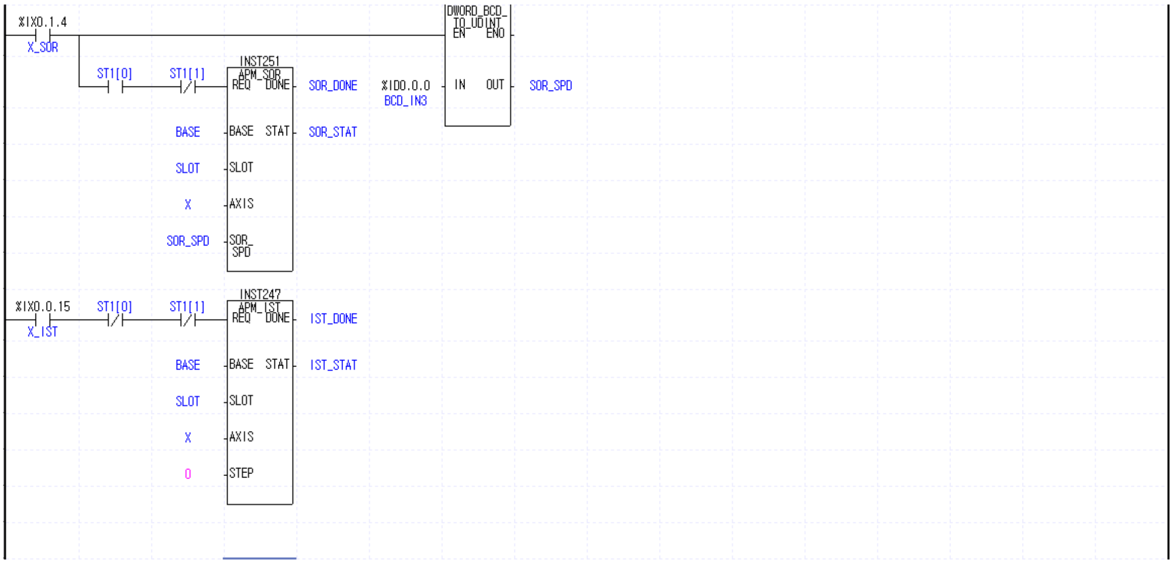
(1) XGK



(2) XGI/XGR

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




%IX0.1.4
X_SOR
ST1[0]
ST1[1]
INST251
APM_SOR
REQ DONE
SOR_DONE
BASE STAT
SOR_STAT
SLOT
AXIS
SOR_SPD
DWORD_BCD_TO_UDINT
EN ENO
%ID0.0.0
BCD_IN3
IN OUT
SOR_SPD
%IX0.0.15
X_IST
INST247
APM_IST
IST_DONE
IST_STAT
BASE
SLOT
X
0
STEP

Chapter 11 Operation Order and Installation

11.1 Operation Order

▶ Here describes the Operation order in case of positioning operation by positioning module.

Start	
↓	
Select pulse output type of positioning module.	Select either Open Collector or Line Driver
↓	
Fix positioning operation method and control unit.	Fix the homing method, coordinate, operation mode, control unit for positioning operation.
↓	
Install APM software package to your computer.	
↓	
Prepare positioning data by software package ▶Positioning parameter (X, Y, Z axis) ▶Operation data (X, Y, Z axis)	Prepared by APM software package
↓	
Install the positioning module to the base	
↓	
Connect between APM, drive machine, motor and external machine	
↓	
Select signal level of input signal parameter according to action state of external signal.	
↓	
Cable connection between computer and RS-232C (or USB) port of CPU module	
↓	
Apply the power to PLC system.	Apply the power when CPU module is “STOP”.
↓	
Test the positioning module system	Check the wiring state by LED indicator of positioning module or APM software package.
↓	
Write the setting data by APM module on computer.	Written by APM software package
↓	
Positioning test operation and various data set/change/monitor by computer ▶Origin address setting ▶Positioning data setting (address) by teaching function, Jog operation, manual pulse generator	Operated by APM software package test operation mode. Check if positioning parameter, position data, speed data setting value is correct and save them by changing if necessary.
↓	
Positioning program write	XG5000
↓	
Positioning operation by CPU module & APM module	
↓	
End	

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(0.3㎟).
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

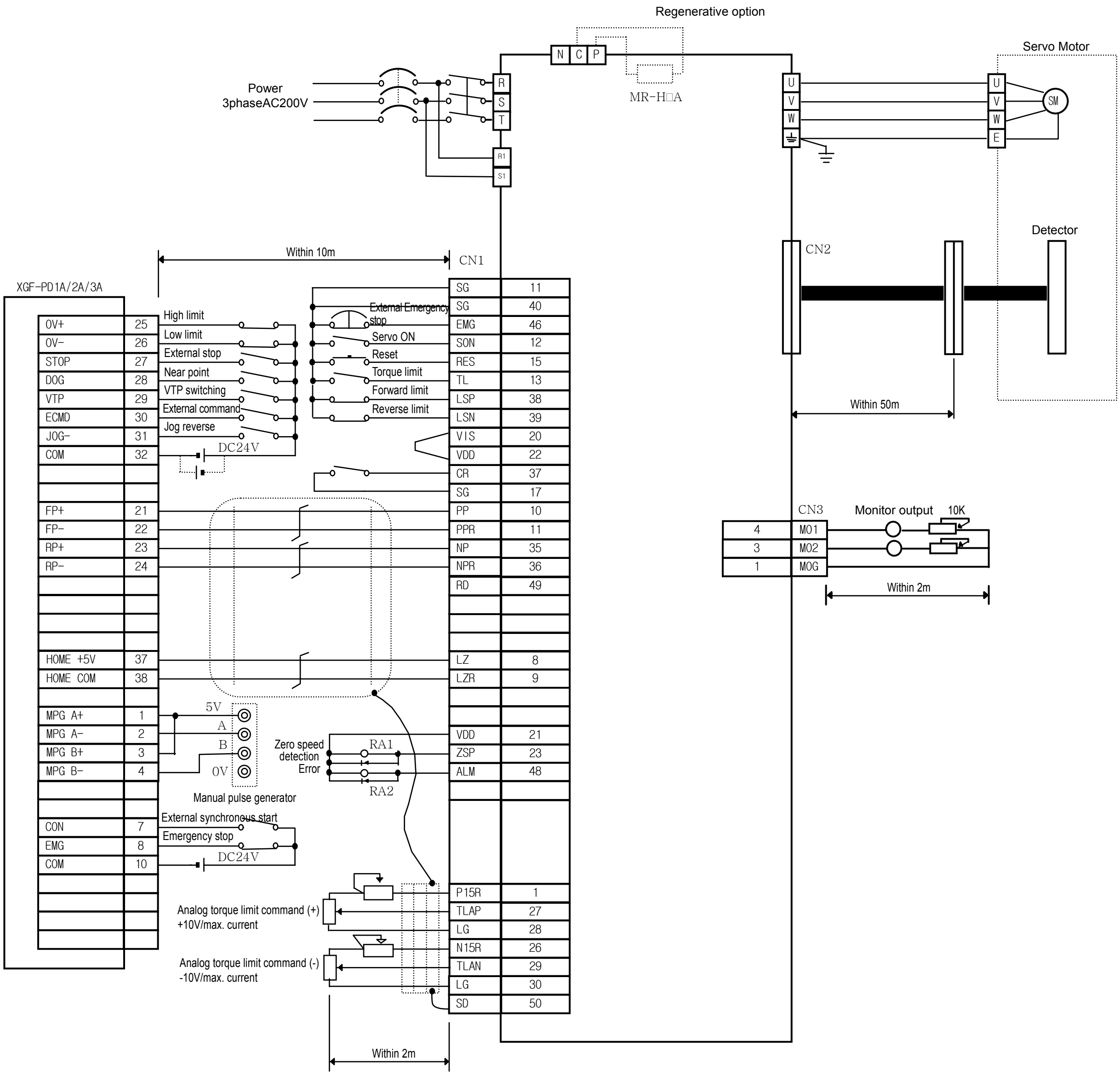
Notes

▶ 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

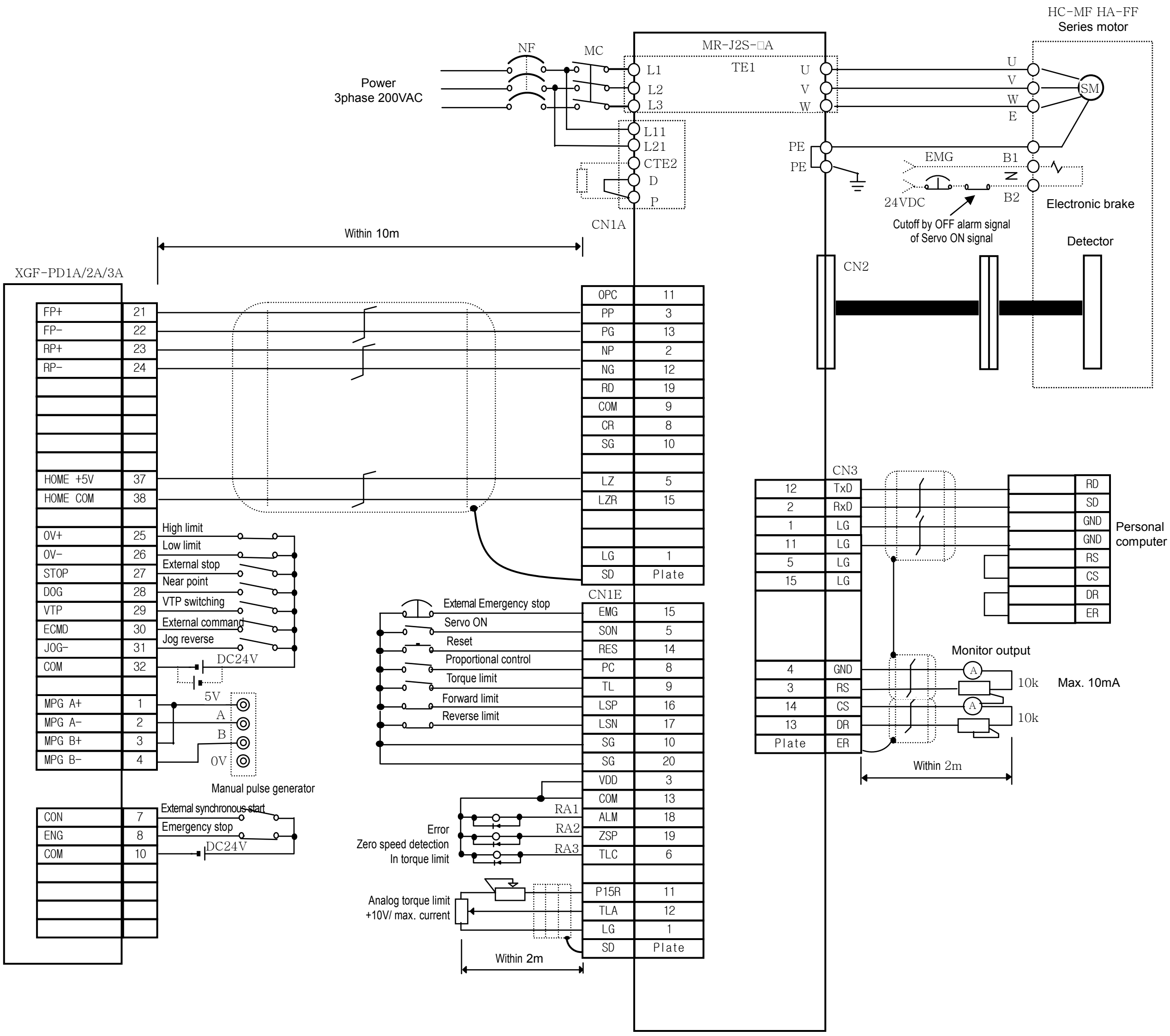
1) MITSUBISHI

(1) MR-H□A Connection (Line Driver)

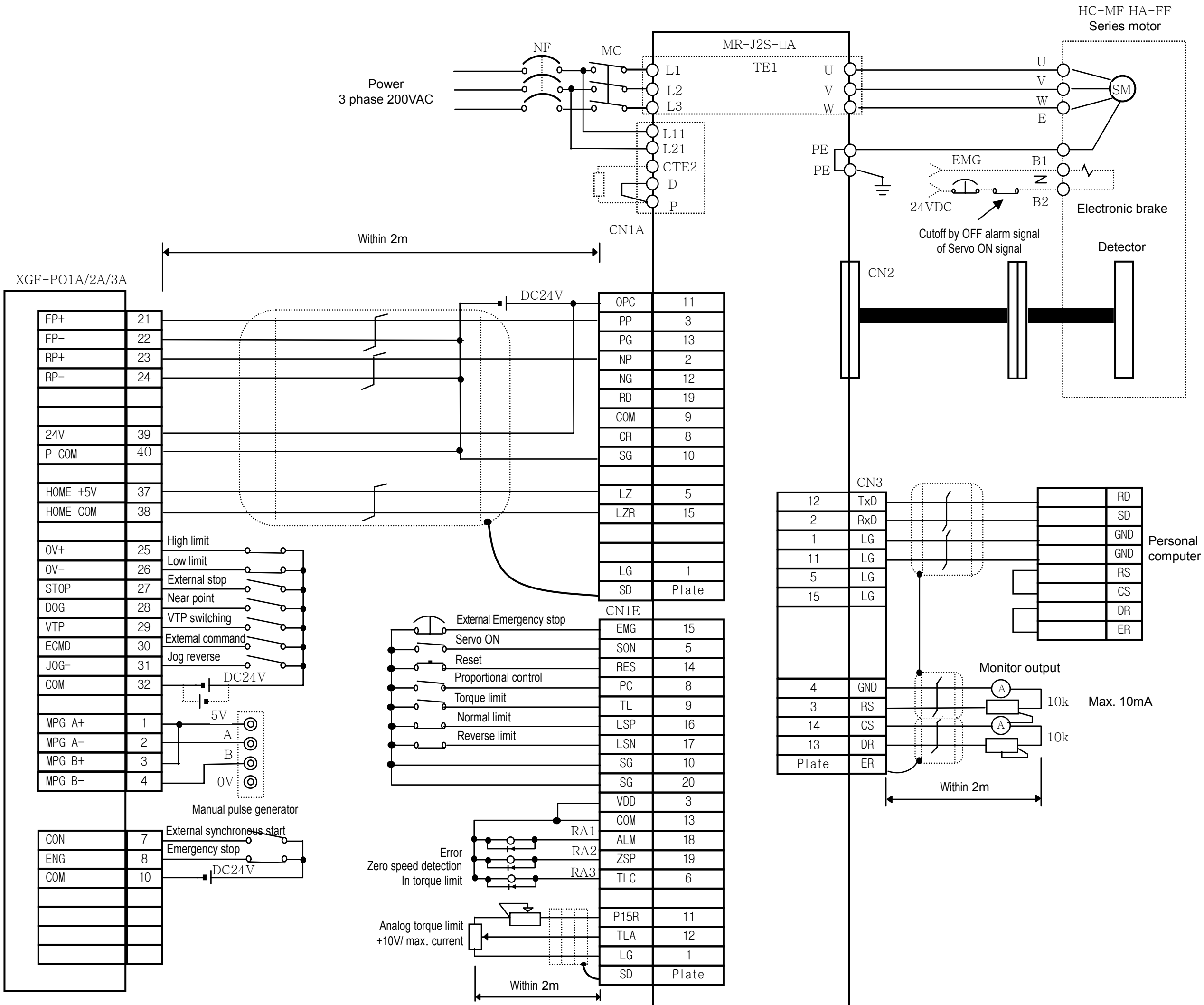


(2) MR-J2/J2S-□A Connection

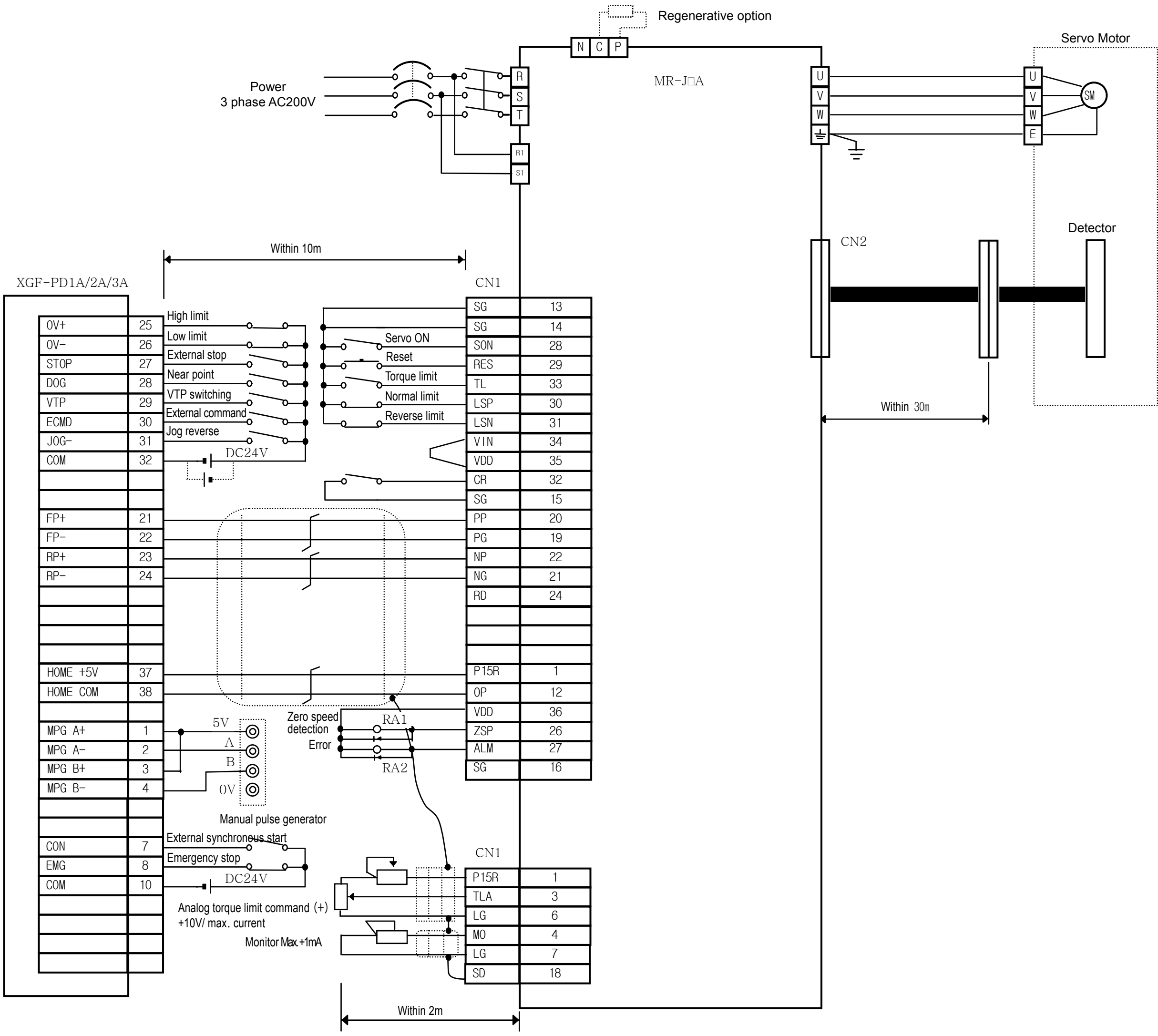
A) Line Driver



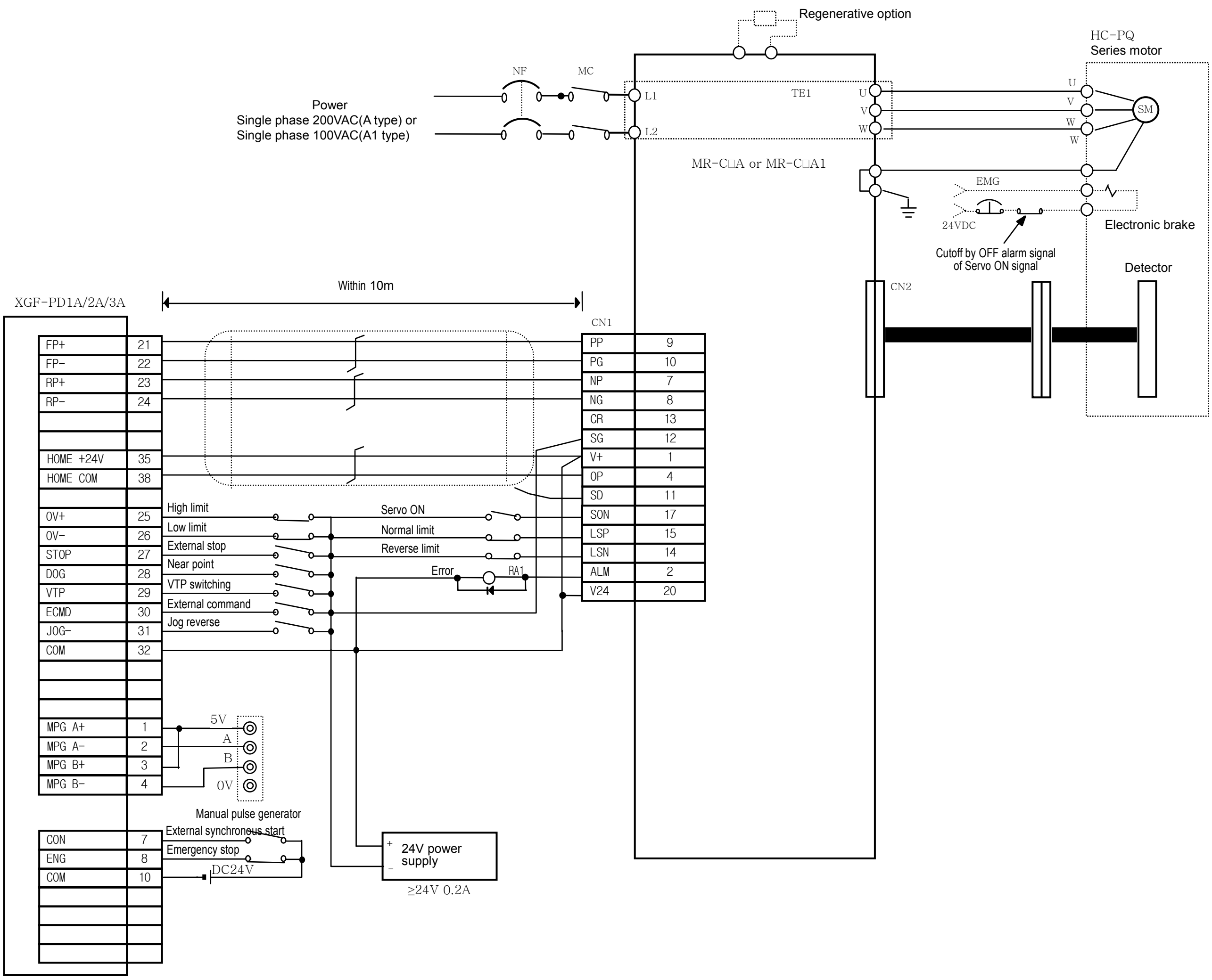
B) Open Collector



(3) MR-J□A Connection (Line Driver)

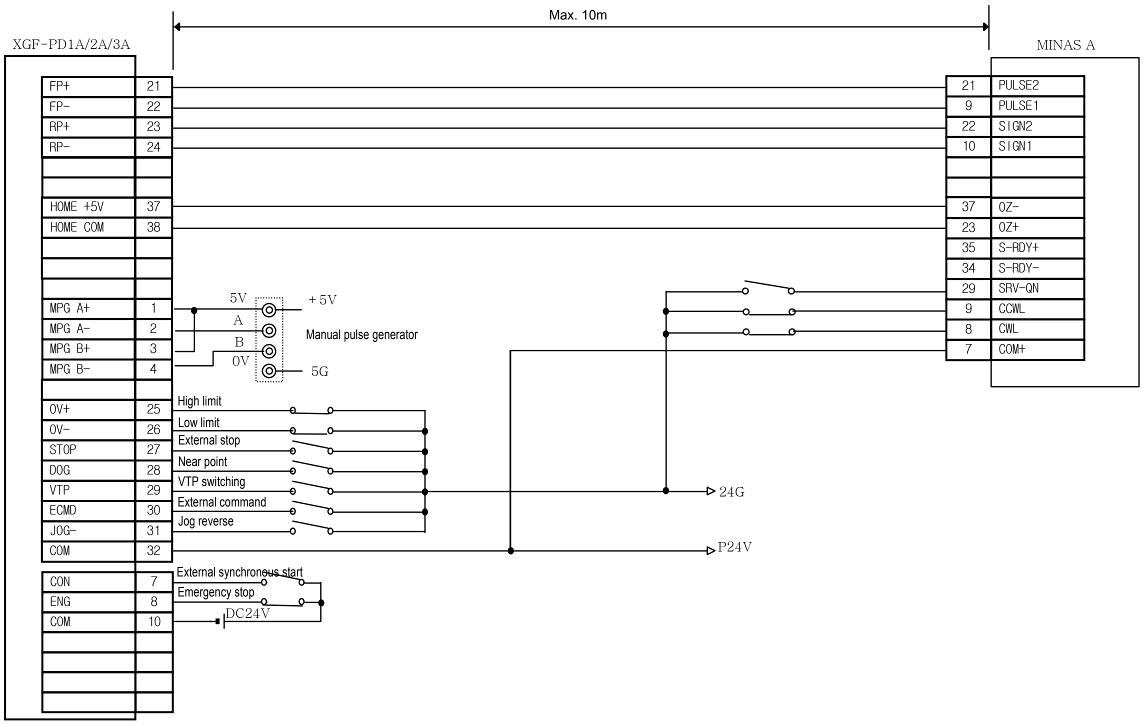


(4) MR-C□A Connection (Line Driver)



2) PANASONIC

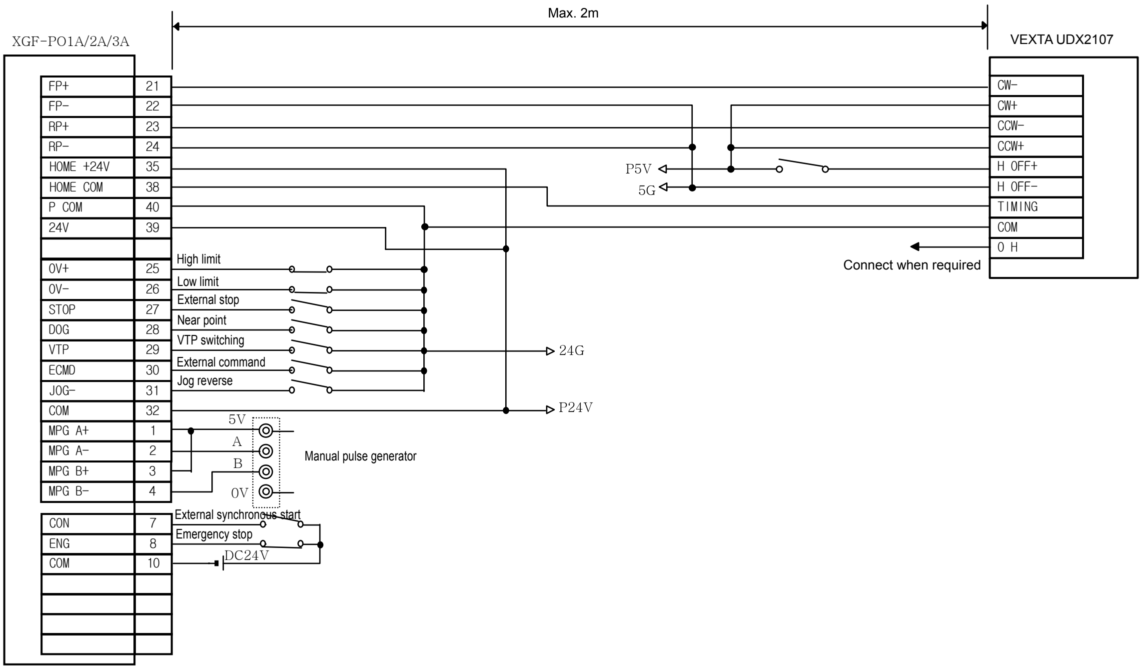
(1) A Series Connection (Line Driver)



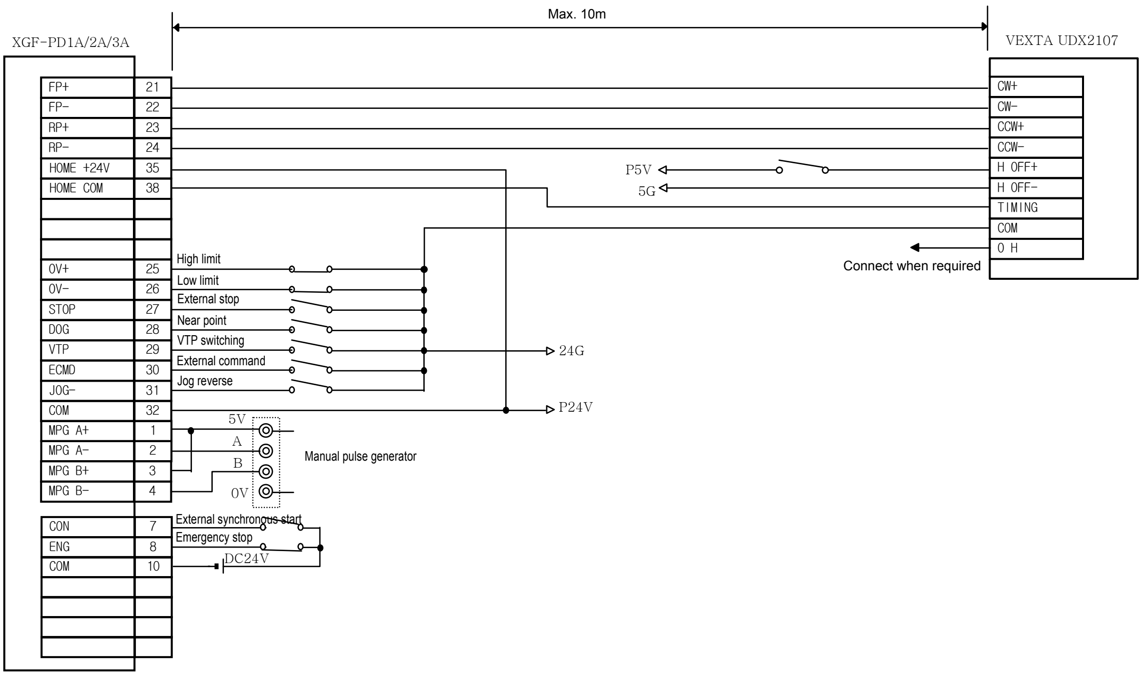
3) VEXTA

(1) UDX2107 Connection

A) Open Collector

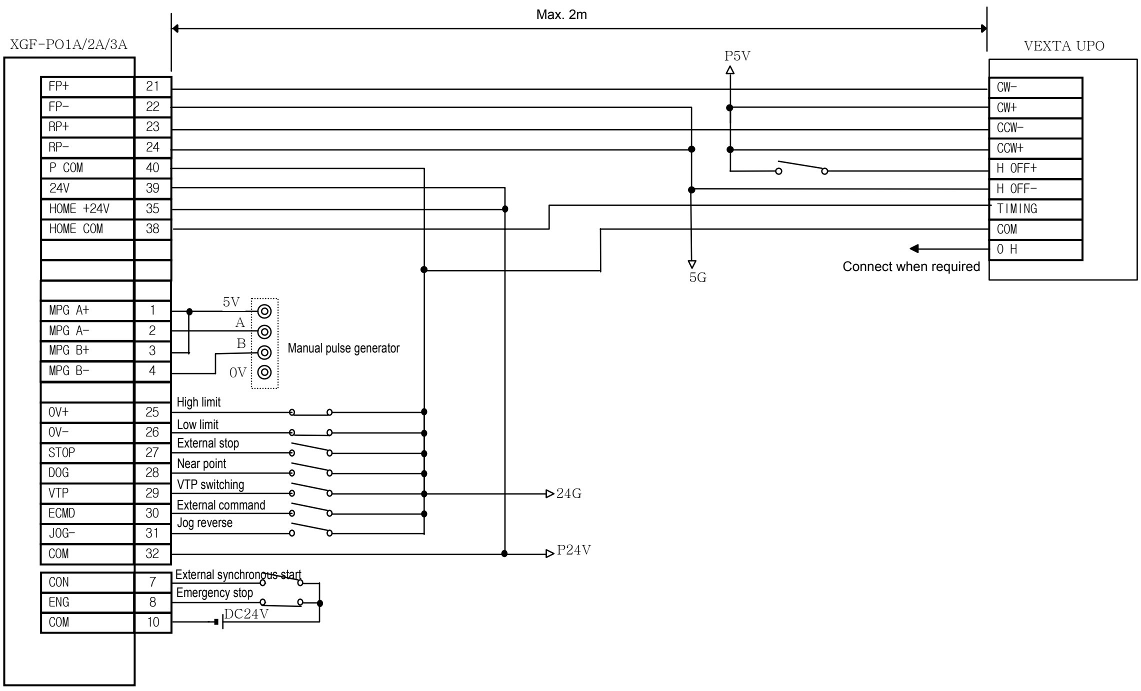


B) Line Driver

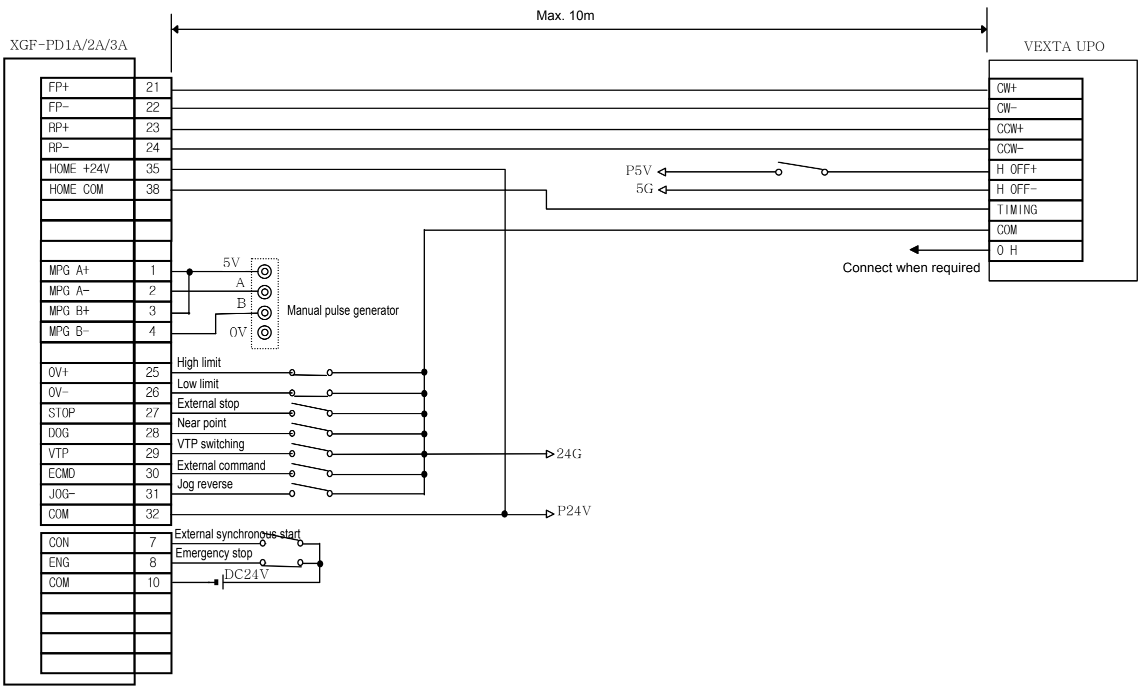


(2) UPD Connection

A) Open Collector

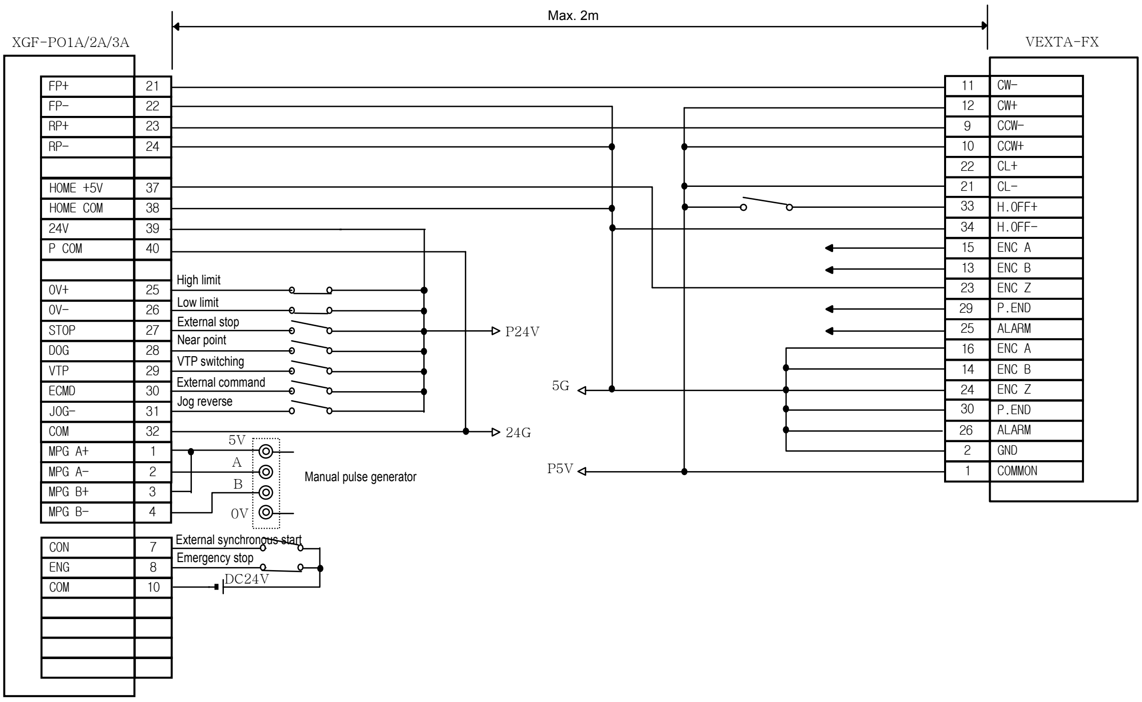


B) Line Driver

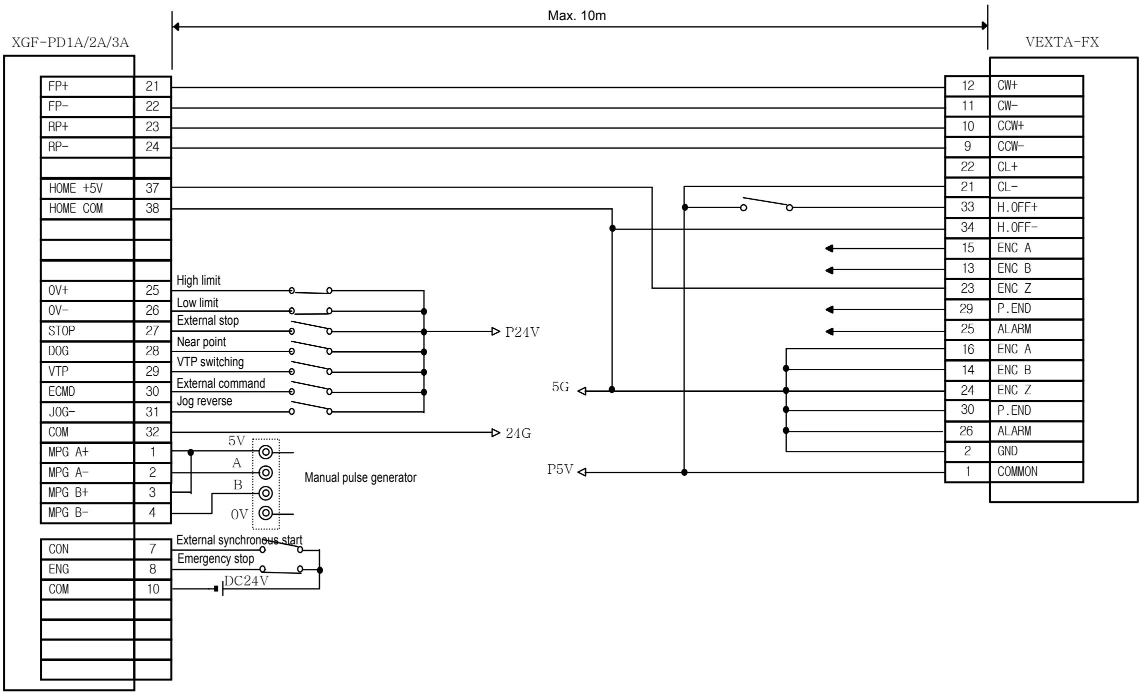


(3) FX Connection

A) Open Collector



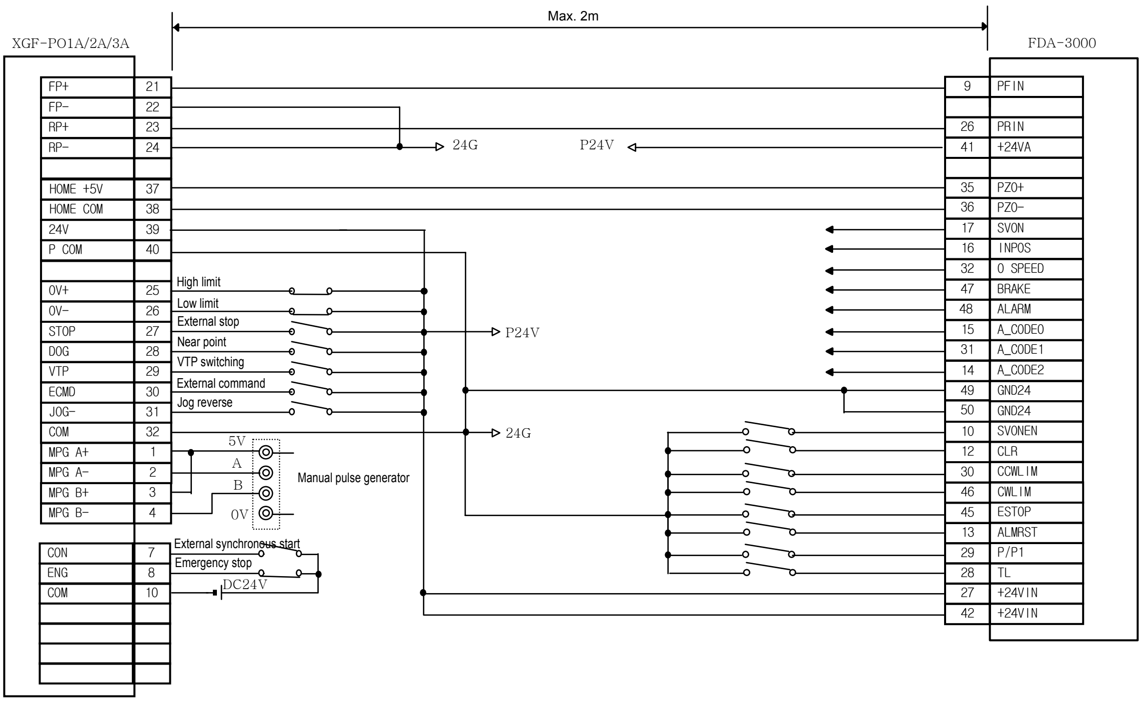
B) Line Driver



4) Heigen Motor

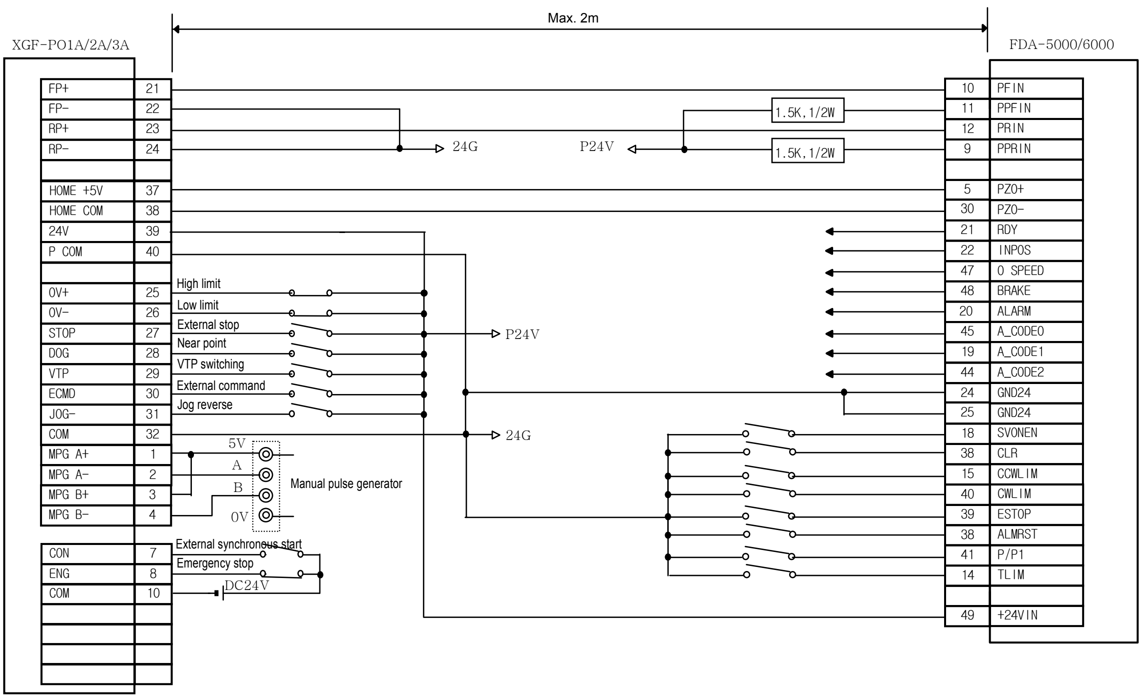
(1) FDA-3000 AC Servo Drive Connection

A) Open Collector

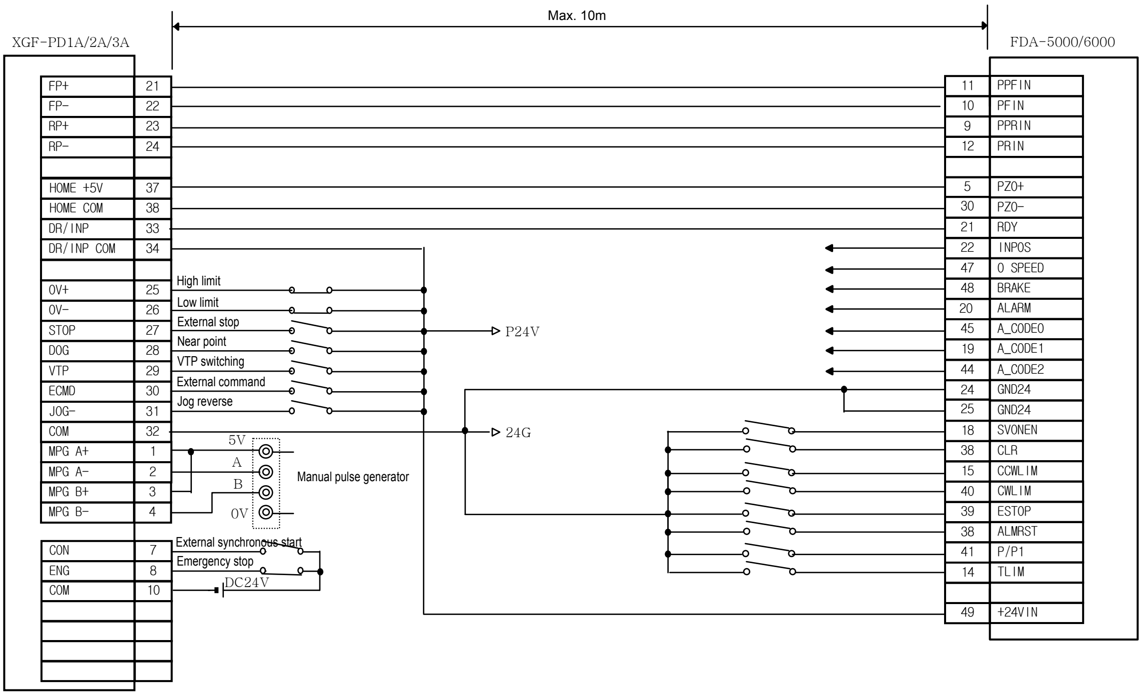


2) FDA-5000/6000 AC Servo Drive Connection

A) Open Collector

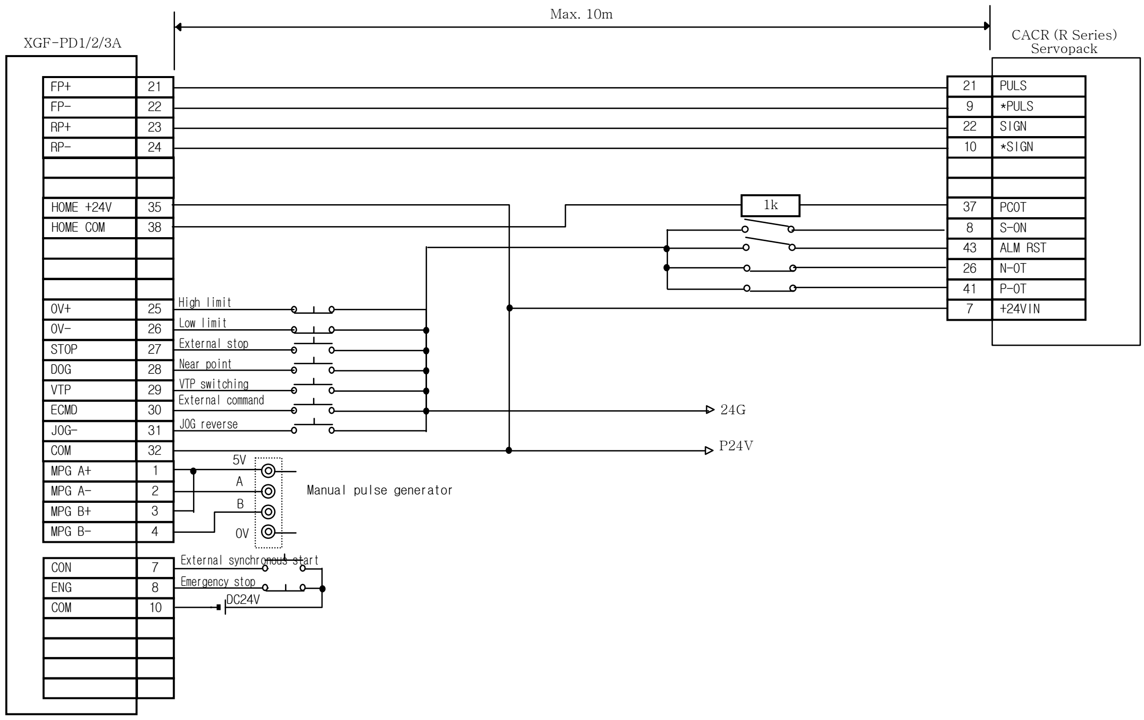


B) Line Driver



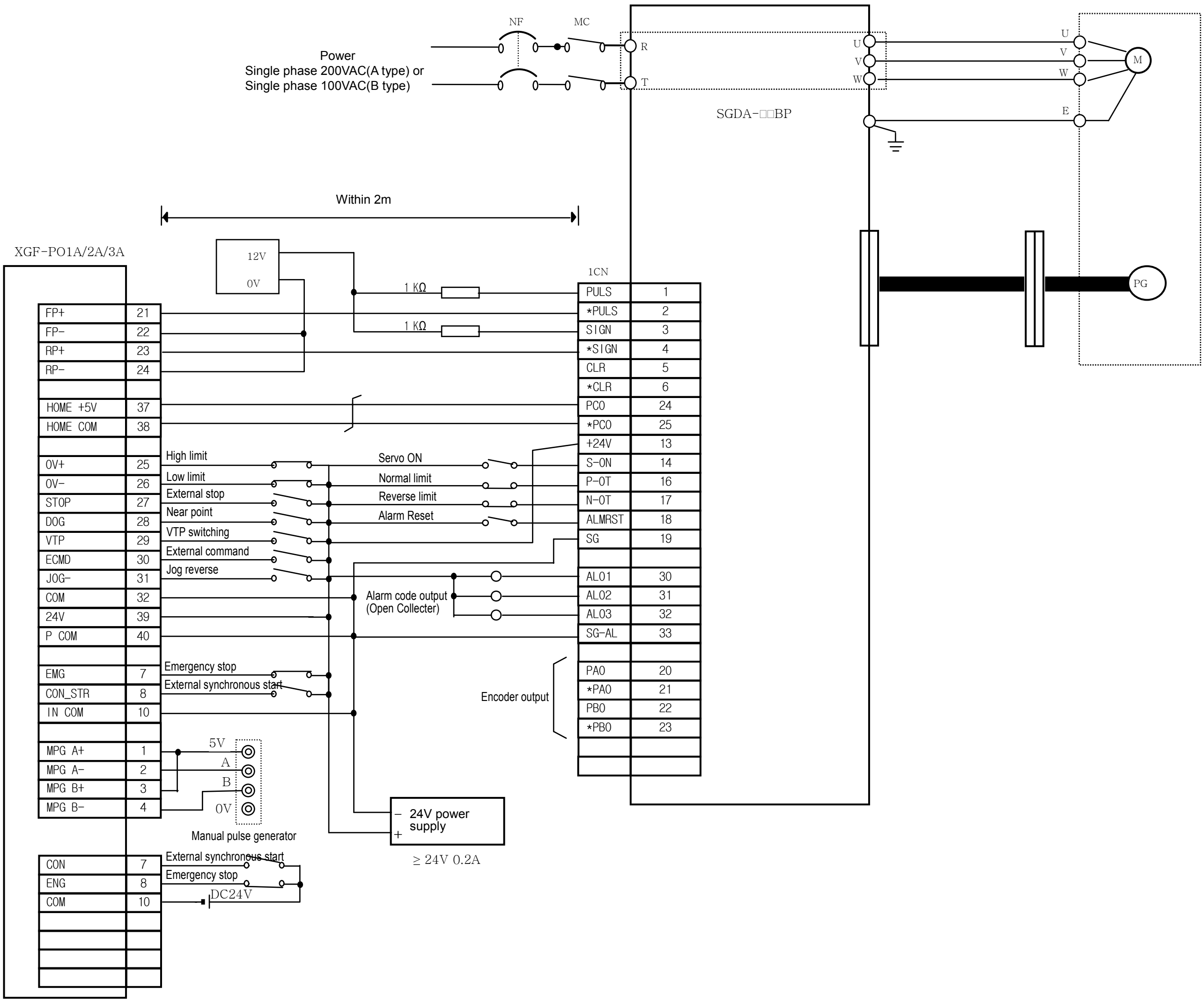
4) YASKAWA

1) CACR(R Series) Connection (Line Driver)

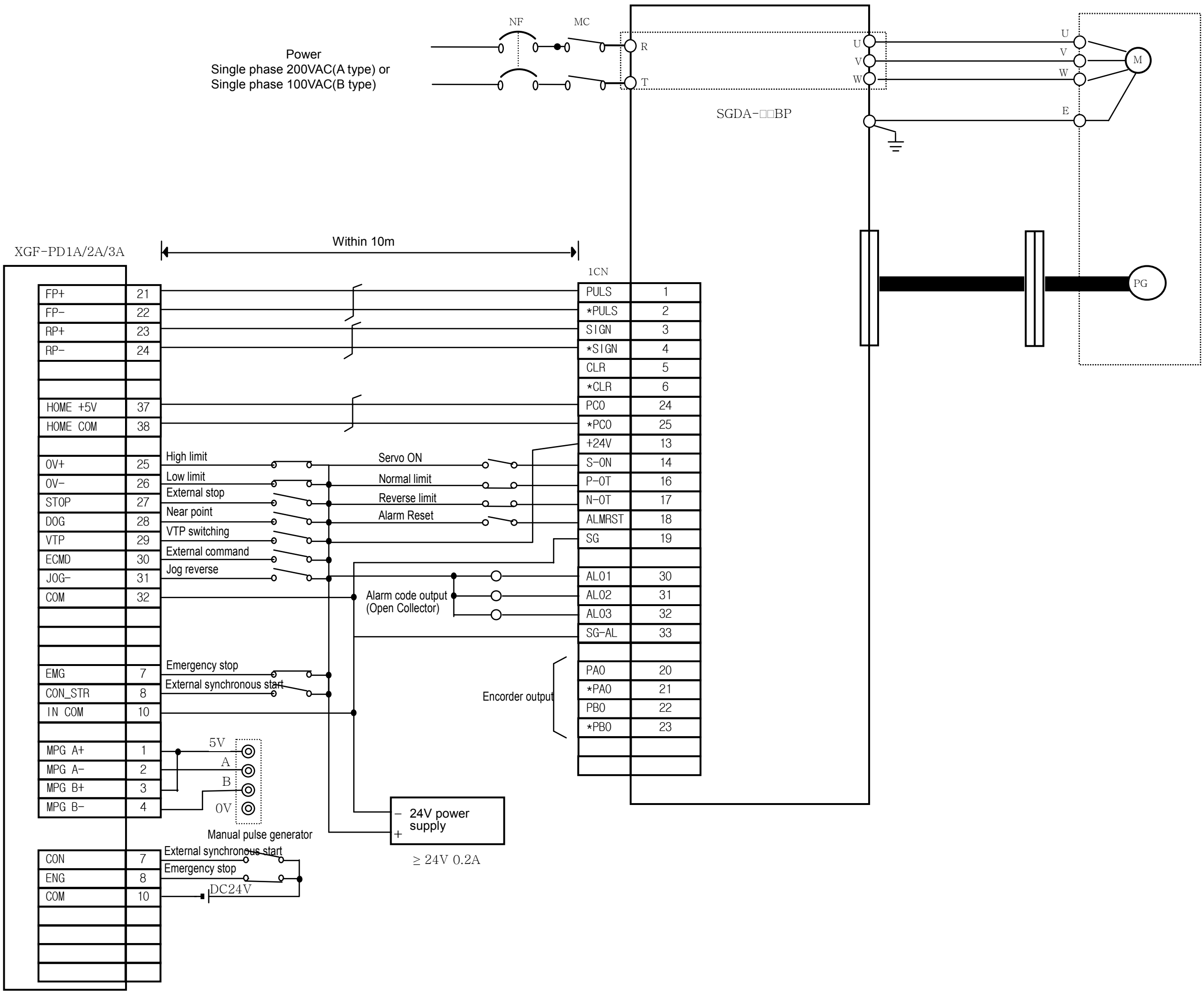


2) SGDA-□□□P Connection

A) Open Collector

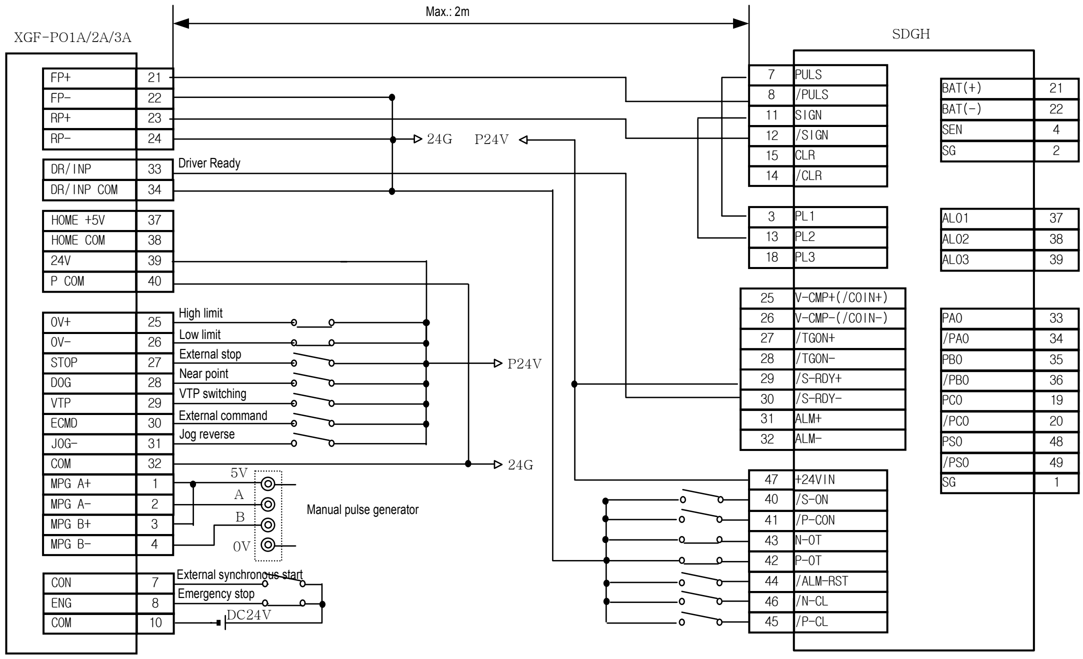


B) Line Driver

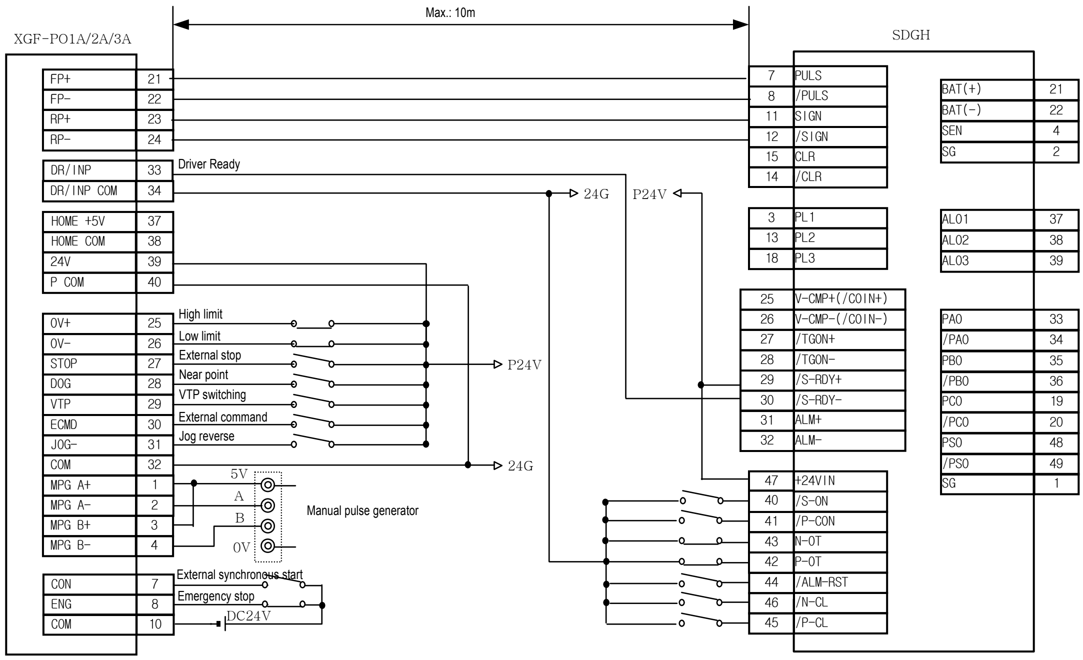


2) ∑-Ⅱ Series SGDH AC Servo Drive Connection

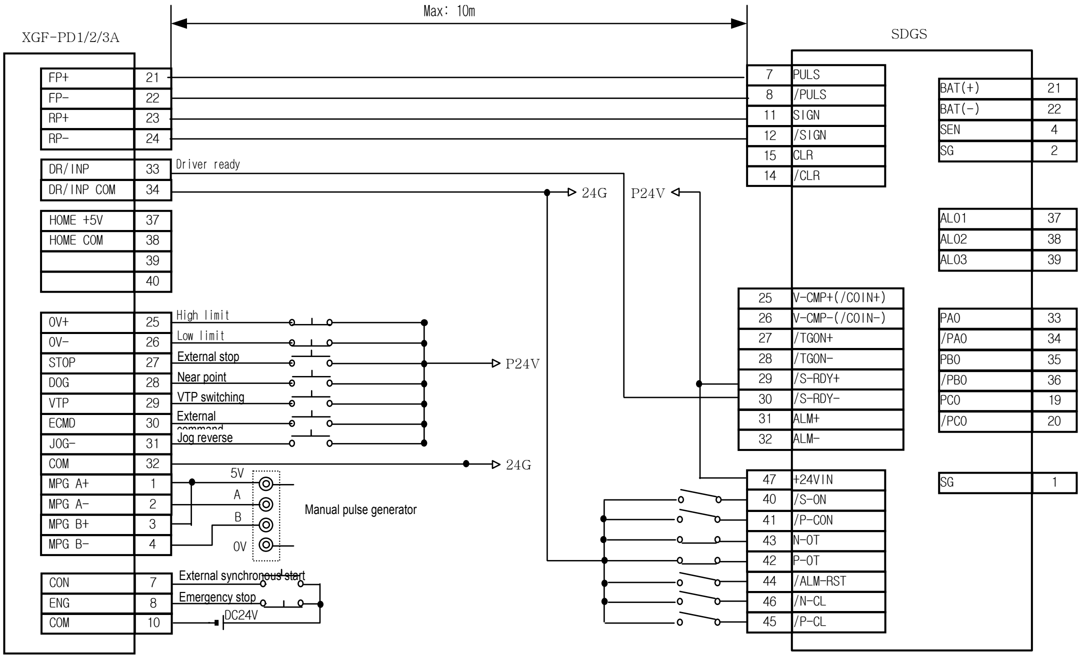
A) Open Collector



B) Line Driver



3) ∑-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 warm 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.

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.

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

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.

GD^2

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 $I=\int r^2 dmGD^2$ is given together with gravity acceleration g by 4gI.

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.

Load inertia ratio

Refer to GDL^2/GDM^2 “GD^2” 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 clap, 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.

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, over shooting 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 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 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 in 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 over shooting 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 warm gear, the stroke limit shall be set according to the length of screw.

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.

Here describes the positioning error types and actions.
This is applied commonly to error information XGF-PO1A/PO2A/PO3A/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.	O		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.	O		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.	O		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	O		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.	O		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.	O		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.	O		Stop	External command selection of Extended Parameteris 0:Start, 1:JOG command, 2:SKIP. Select one among three.
121	Jog high speed value of Manual operation parameter exceeds the range.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		Stop	Set the dwell time of Homing parameter to be less than 50000.
141	Encoder type value of Common parameter exceeds the range.	O		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.	O		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.	O		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.	O		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.	O		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	O		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.	O		Stop	Circular interpolation method of Common parameteris 0:Middle point, 1:Center point. Set one between two.
151	Not available to set operation speed value of Operation data as “0”.	O		Stop	Set operation speed to be greater than “0”.
152	Operation speed of Operation data exceeds max. speed value.	O		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.	O		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.	O		Stop	Set dwell time of operation data to operate to be less than 50000.

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 than20
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.

Error Code	Error Description	Output type Open	Output type Line	Module operation state	Actions
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.

Error Code	Error Description	Output type Open	Output type Line	Module operation state	Actions
273	Not possible to carry circular interpolation start in the state that maxin axis of circular interpolation is output disabled.	O		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.	O		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.	O		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.	O		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.	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.
278	Not possible to carry positioning operation of absolute coordinate in the state that subordinate axis of circular 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.
279	Not possible to carry out the operation as main asix and subordinate axis is set as the same in circular interpolation.	O		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.	O		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.	O		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.	O		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.	O		Sop	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.	O		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.	O		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	O		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.	O		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.	O		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	O		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 Startcommand in the state of in operation.	O		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.	O		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.	O		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.

Error Code	Error Description	Output type Open	Output type Line	Module operation state	Actions
294	Not possible to carry out Synchronous Start command in case that there is no goal position.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		Operation	Check if the axis is in circular interporation 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.	O		Operation	Check if the axis is in linear interporation 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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		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.	O		Stop	Check if the axis is in the state of output disabed 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.	O		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.

Error Code	Error Description	Output type Open	Output type Line	Module operation state	Actions
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 disabed 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 Synchronouos 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 carred 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 genrator.	O		Operation	Check if the axis is in manual pulse generator operation when Position Override command is executed..

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 stte 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.

Error Code	Error Description	Output type Open	Output type Line	Module operation state	Actions
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 400th 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 asa 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 peration.	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.

Error Code	Error Description	Output type		Module operation state	Actions
		Open	Line		
463	Not possible to carry out teaching command in operation	0		Operation	Check if the axis is in operation when Speed Teaching command is executed.
464	Out of speed range of speed teaching command	0		Stop	Check if speed is greater than 1000000.
465	Error on step number to carry out teaching command	0		Stop	Check if step number is equal to or greater than 1 and equal to or less than 400.
466	Teaching item error	0		-	Teaching item should be position or speed.
467	Teaching method error	0		-	Teaching method should be ROM teaching or RAM teaching.
471	Not possible to carry out parameter teaching command in operation	0		Stop	Check if the axis is in operation when Parameter Teaching command is executed.
472	Not possible to carry out operation data teaching command in operation	0		Operation	Check if the axis is in operation when Operation data Teaching command is executed.
473	Not possible to carry out teaching for specified item	0		-	Check if teaching item is normal.
474	Not possible to save in Flash ROM in operation	0		Operation	Check if the axis is in operation when ROM Write command is executed.
475	Out ot range of item	0		-	Don't exceed the setting range of item of parameter teaching.
481	Internal emergency stop error	0		Stop	Remove the emergency stop factor and clear the error using RST command. With RTS command selecting output inhibition cancel option, you can cancel output inhibition.
491	External emergenct stop error	0		Stop	Remove the emergency stop factor and clear the error using RST command. With RTS command selecting output inhibition cancel option, you can cancel output inhibition.
492	Hard upper limit error	0		Stop	Clear the error using RST command after exceeding external upper limit range using JOG command. With RTS command selecting output inhibition cancel option, you can cancel output inhibition.
493	Hard lower limit error	0		Stop	Clear the error using RST command after exceeding external lower limit range using JOG command. With RTS command selecting output inhibition cancel option, you can cancel output inhibition.
494	Servo driver is not ready	0		Stop	Check if Ready signal is inputted properly. You can check through external I/O singl window at Monitoring status of software package.
501	Software upper limit error	0		Stop	Clear the error using RST command after exceeding software upper limit range using JOG command. With RTS command selecting output inhibition cancel option, you can cancel output inhibition.
502	Software lower limit error	0		Stop	Clear the error using RST command after exceeding software lower limit range using JOG command. With RTS command selecting output inhibition cancel option, you can cancel output inhibition.
511	Command code is not reserved number (Dedicated for MASTER-K)	0		Stop	Command code is reserved with number from 1 to 44
512	Aux data step number exceeds range	0		Stop	Step greater than 400 is set in command. Reset the step number to be within 1~400.
711	Data area settin value (Block size and no. of block) of Write/Read variable data command exceeds range	0		Stop	Reset block size and no. of block for [Block size X no. of block] to be within 1~128.
712	Write variable data command can not be executed in operation	0		Operation	Check if the axis is in operation when Write variable data command is executed.
713	Block area of Write variable data is overlapped so can not write.	0		Stop	In case no. of block is larger than 2, set block offset to be larger than blok size. (Or set block size to be smaller than block offset)

Appendix 3.1 Parameter memory address

Item	X-axis		Y-axis		Z-axis		Data to change
	DEC	HEX	DEC	HEX	DEC	HEX	
Basic parameter	0	0	42	2A	84	54	Speed limit (Low)
	1	1	43	2B	85	55	Speed limit (High)
	2	2	44	2C	86	56	Bias speed (Low)
	3	3	45	2D	87	57	Bias speed (High)
	4	4	46	2E	88	58	ACC/DEC time No.1
	5	5	47	2F	89	59	ACC/DEC time No.2
	6	6	48	30	90	5A	ACC/DEC time No.3
	7	7	49	31	91	5B	ACC/DEC time No.4
	8	8	50	32	92	5C	No. of pulse per revolution
	9	9	51	33	93	5D	Distance per revolution
	10	A	52	34	94	5E	CONTROL WORD
	11	B	53	35	95	5F	-
Extended parameter	12	C	54	36	96	60	Soft upper limit (Low)
	34	22	55	37	97	61	Soft upper limit (High)
	14	E	56	38	98	62	Soft lower limit (Low)
	15	F	57	39	99	63	Soft lower limit (High)
	16	10	58	3A	100	64	Backlash compensation
	17	11	59	3B	101	65	Positioning complete signal output time
	18	12	60	3C	102	66	S-Curve rate
	19	13	61	3D	103	67	Select external command signal
	20	14	62	3E	104	68	CONTROL WORD
	21	15	63	3F	105	69	-
Manual operation paramter	22	16	64	40	106	6A	JOG high speed (Low)
	23	17	65	41	107	6B	JOG high speed (High)
	24	18	66	42	108	6C	JOG low speed (Low)
	25	19	67	43	109	6D	JOG low speed (High)
	26	1A	68	44	110	6E	JOG ACC/DEC time
	27	1B	69	45	111	6F	Inching speed

Item	X-axis		Y-axis		Z-axis		Data to change
	DEC	HEX	DEC	HEX	DEC	HEX	
Home parameter	28	1C	70	46	112	70	Home address (Low)
	29	1D	71	47	113	71	Home address (High)
	30	1E	72	48	114	72	Home high speed (Low)
	31	1F	73	49	115	73	Home high speed (High)
	32	20	74	4A	116	74	Home low speed (Low)
	33	21	75	4B	117	75	Home low speed (High)
	34	22	76	4C	118	76	Home acc/dec time
	35	23	77	4D	119	77	Home dwell time
	36	24	78	4E	120	78	Home compensation (Low)
	37	25	79	4F	121	79	Home compensation (High)
	38	26	80	50	122	7A	Home restart waiting time
	39	27	81	51	123	7B	CONTROL WORD
Input signal parameter	40	28	82	52	124	7C	0:upper limit 1:lower limit 2:DOG 3:HOME 4:EMG 5:STP 6:CMD1 7:CMD2 8:VTP 9:DRV/INP 10:SST
	41	29	83	53	125	7D	-
Common parameter	-				126	7E	Pulse output level
					127	7F	CONTROL WORD
					128	80	Encoder Auto Reload value (Low)
					129	81	Encoder Auto Reload value (High)
					130	82	Specify Zone1 axis
					131	83	Zone1 output on position (Low)
					132	84	Zone1 output on position (High)
					133	85	Zone1 output off position (Low)
					134	86	Zone1 output off position (High)
					135	87	Specify Zone2 axis
					136	88	Zone2 output on position (Low)
					137	89	Zone2 output on position (High)
					138	8A	Zone2 output off position (Low)
					139	8B	Zone2 output off position (High)
					140	8C	Specify Zone3 axis
					141	8D	Zone3 output on position (Low)
					142	8E	Zone3 output on position (High)
					143	8F	Zone3 output off position (Low)
					144	90	Zone3 output off position (High)
					145	91	Zone output mode
					146	92	Circular interpolation method
					147	93	-

(1) Basic parameter Control Word

Bit position	Contents
Pulse output mode (bit 0 ~ 1)	0: CW/CCW
	1: PLS/DIR
	2: PHASE
Unit (bit 2 ~ 3)	0: pulse
	1: mm
	2: inch
	3: degree
Unit multiplier (bit 4 ~ 5)	0: x1
	1: x10
	2: x100
	3: x1000

(2) Extended parameter Control Word

Bit position	Contents
Pulse output direction (bit 0)	0: CW, 1: CCW
ACC/DEC pattern (bit 1)	0: Trapezoid, 1: S-curve
M code mode (bit 2 ~ 3)	0: None, 1: With, 2: After
Display position during uniform velocity operation (bit 4)	0: Don’t display, 1: display
Soft upper/lower limit during uniform velocity operation (bit 5)	0: Don’t detect, 1: detect
External speed/postion control switching (bit 6)	0: Disable, 1: Enable
Disable/Enable external command (bit 7)	0: Disable, 1: Enable
Disable/Enable external stop (bit 8)	0: Disable, 1: Enable
Disable/Enable external simultaneous start (bit 9)	0: Disable, 1: Enable
Positioning complete condition (bit 10 ~ 11)	0: Dwell time, 1: inposition, 2: Dwell time AND Inposition, 3: Dwell time OR Inposition
Drive ready/Inpositin (bit 12)	0: Drive ready, 1: Inposition

(3) Home parameter Control Word

Bit position	Contents
Home mode (bit 0 ~ 2)	0: DOG/HOME(OFF)
	1: DOG/HOME(ON)
	2: U.LLimit/Home
	3: DOG
	4: High speed
	5: Upper lower limit
Home direction (bit 3)	0: CW
	1: CCW

(4) Input signal parameter Control Word

Bit position and contents
bit0: upper limit bit1: lower limit bit2: DOG bit3: HOME
bit4: Emergency stop (EMG) bit5: Dec. stop (STP) bit6: Command signal (CMD1) bit7: Aux. command signal (CMD2)
bit8: Speed/Position control switching (VTP) bit9: Drive ready(DRV/INP) bit10: External synchronous start(SST)

(5) Common paramter Control Word

Bit position	Contents
Encoder pulse input mode (bit 0 ~ 2)	0: CW/CCW 1 multiplicaion
	1: PULSE/DIR 1 multiplicaion
	2: PULSE/DIR 2 multiplicaion
	3: PHASE A/B 1 multiplicaion
	4: PHASE A/B 2 multiplicaion
	5: PHASE A/B 3 multiplicaion

Appendix 3.2 X-axis operation data memory address

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
1	148	149	150	151	152	153	154	155	156	157
2	158	159	160	161	162	163	164	165	166	167
3	168	169	170	171	172	173	174	175	176	177
4	178	179	180	181	182	183	184	185	186	187
5	188	189	190	191	192	193	194	195	196	197
6	198	199	200	201	202	203	204	205	206	207
7	208	209	210	211	212	213	214	215	216	217
8	218	219	220	221	222	223	224	225	226	227
9	228	229	230	231	232	233	234	235	236	237
10	238	239	240	241	242	243	244	245	246	247
11	248	249	250	251	252	253	254	255	256	257
12	258	259	260	261	262	263	264	265	266	267
13	268	269	270	271	272	273	274	275	276	277
14	278	279	280	281	282	283	284	285	286	287
15	288	289	290	291	292	293	294	295	296	297
16	298	299	300	301	302	303	304	305	306	307
17	308	309	310	311	312	313	314	315	316	317
18	318	319	320	321	322	323	324	325	326	327
19	328	329	330	331	332	333	334	335	336	337
20	338	339	340	341	342	343	344	345	346	347
21	348	349	350	351	352	353	354	355	356	357
22	358	359	360	361	362	363	364	365	366	367
23	368	369	370	371	372	373	374	375	376	377
24	378	379	380	381	382	383	384	385	386	387
25	388	389	390	391	392	393	394	395	396	397
26	398	399	400	401	402	403	404	405	406	407
27	408	409	410	411	412	413	414	415	416	417
28	418	419	420	421	422	423	424	425	426	427
29	428	429	430	431	432	433	434	435	436	437
30	438	439	440	441	442	443	444	445	446	447
31	448	449	450	451	452	453	454	455	456	457
32	458	459	460	461	462	463	464	465	466	467
33	468	469	470	471	472	473	474	475	476	477
34	478	479	480	481	482	483	484	485	486	487
35	488	489	490	491	492	493	494	495	496	497
36	498	499	500	501	502	503	504	505	506	507
37	508	509	510	511	512	513	514	515	516	517
38	518	519	520	521	522	523	524	525	526	527
39	528	529	530	531	532	533	534	535	536	537
40	538	539	540	541	542	543	544	545	546	547
41	548	549	550	551	552	553	554	555	556	557
42	558	559	560	561	562	563	564	565	566	567
43	568	569	570	571	572	573	574	575	576	577
44	578	579	580	581	582	583	584	585	586	587
45	588	589	590	591	592	593	594	595	596	597
46	598	599	600	601	602	603	604	605	606	607
47	608	609	610	611	612	613	614	615	616	617
48	618	619	620	621	622	623	624	625	626	627
49	628	629	630	631	632	633	634	635	636	637
50	638	639	640	641	642	643	644	645	646	647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
51	648	649	650	651	652	653	654	655	656	657
52	658	659	660	661	662	663	664	665	666	667
53	668	669	670	671	672	673	674	675	676	677
54	678	679	680	681	682	683	684	685	686	687
55	688	689	690	691	692	693	694	695	696	697
56	698	699	700	701	702	703	704	705	706	707
57	708	709	710	711	712	713	714	715	716	717
58	718	719	720	721	722	723	724	725	726	727
59	728	729	730	731	732	733	734	735	736	737
60	738	739	740	741	742	743	744	745	746	747
61	748	749	750	751	752	753	754	755	756	757
62	758	759	760	761	762	763	764	765	766	767
63	768	769	770	771	772	773	774	775	776	777
64	778	779	780	781	782	783	784	785	786	787
65	788	789	790	791	792	793	794	795	796	797
66	798	799	800	801	802	803	804	805	806	807
67	808	809	810	811	812	813	814	815	816	817
68	818	819	820	821	822	823	824	825	826	827
69	828	829	830	831	832	833	834	835	836	837
70	838	839	840	841	842	843	844	845	846	847
71	848	849	850	851	852	853	854	855	856	857
72	858	859	860	861	862	863	864	865	866	867
73	868	869	870	871	872	873	874	875	876	877
74	878	879	880	881	882	883	884	885	886	887
75	888	889	890	891	892	893	894	895	896	897
76	898	899	900	901	902	903	904	905	906	907
77	908	909	910	911	912	913	914	915	916	917
78	918	919	920	921	922	923	924	925	926	927
79	928	929	930	931	932	933	934	935	936	937
80	938	939	940	941	942	943	944	945	946	947
81	948	949	950	951	952	953	954	955	956	957
82	958	959	960	961	962	963	964	965	966	967
83	968	969	970	971	972	973	974	975	976	977
84	978	979	980	981	982	983	984	985	986	987
85	988	989	990	991	992	993	994	995	996	997
86	998	999	1000	1001	1002	1003	1004	1005	1006	1007
87	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017
88	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027
89	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037
90	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047
91	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057
92	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067
93	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077
94	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087
95	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097
96	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107
97	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117
98	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127
99	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137
100	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
101	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157
102	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167
103	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177
104	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187
105	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197
106	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207
107	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217
108	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227
109	1228	1229	1230	1231	1232	1233	1234	1235	1236	1237
110	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247
111	1248	1249	1250	1251	1252	1253	1254	1255	1256	1257
112	1258	1259	1260	1261	1262	1263	1264	1265	1266	1267
113	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277
114	1278	1279	1280	1281	1282	1283	1284	1285	1286	1287
115	1288	1289	1290	1291	1292	1293	1294	1295	1296	1297
116	1298	1299	1300	1301	1302	1303	1304	1305	1306	1307
117	1308	1309	1310	1311	1312	1313	1314	1315	1316	1317
118	1318	1319	1320	1321	1322	1323	1324	1325	1326	1327
119	1328	1329	1330	1331	1332	1333	1334	1335	1336	1337
120	1338	1339	1340	1341	1342	1343	1344	1345	1346	1347
121	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357
122	1358	1359	1360	1361	1362	1363	1364	1365	1366	1367
123	1368	1369	1370	1371	1372	1373	1374	1375	1376	1377
124	1378	1379	1380	1381	1382	1383	1384	1385	1386	1387
125	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397
126	1398	1399	1400	1401	1402	1403	1404	1405	1406	1407
127	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417
128	1418	1419	1420	1421	1422	1423	1424	1425	1426	1427
129	1428	1429	1430	1431	1432	1433	1434	1435	1436	1437
130	1438	1439	1440	1441	1442	1443	1444	1445	1446	1447
131	1448	1449	1450	1451	1452	1453	1454	1455	1456	1457
132	1458	1459	1460	1461	1462	1463	1464	1465	1466	1467
133	1468	1469	1470	1471	1472	1473	1474	1475	1476	1477
134	1478	1479	1480	1481	1482	1483	1484	1485	1486	1487
135	1488	1489	1490	1491	1492	1493	1494	1495	1496	1497
136	1498	1499	1500	1501	1502	1503	1504	1505	1506	1507
137	1508	1509	1510	1511	1512	1513	1514	1515	1516	1517
138	1518	1519	1520	1521	1522	1523	1524	1525	1526	1527
139	1528	1529	1530	1531	1532	1533	1534	1535	1536	1537
140	1538	1539	1540	1541	1542	1543	1544	1545	1546	1547
141	1548	1549	1550	1551	1552	1553	1554	1555	1556	1557
142	1558	1559	1560	1561	1562	1563	1564	1565	1566	1567
143	1568	1569	1570	1571	1572	1573	1574	1575	1576	1577
144	1578	1579	1580	1581	1582	1583	1584	1585	1586	1587
145	1588	1589	1590	1591	1592	1593	1594	1595	1596	1597
146	1598	1599	1600	1601	1602	1603	1604	1605	1606	1607
147	1608	1609	1610	1611	1612	1613	1614	1615	1616	1617
148	1618	1619	1620	1621	1622	1623	1624	1625	1626	1627
149	1628	1629	1630	1631	1632	1633	1634	1635	1636	1637
150	1638	1639	1640	1641	1642	1643	1644	1645	1646	1647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
151	1648	1649	1650	1651	1652	1653	1654	1655	1656	1657
152	1658	1659	1660	1661	1662	1663	1664	1665	1666	1667
153	1668	1669	1670	1671	1672	1673	1674	1675	1676	1677
154	1678	1679	1680	1681	1682	1683	1684	1685	1686	1687
155	1688	1689	1690	1691	1692	1693	1694	1695	1696	1697
156	1698	1699	1700	1701	1702	1703	1704	1705	1706	1707
157	1708	1709	1710	1711	1712	1713	1714	1715	1716	1717
158	1718	1719	1720	1721	1722	1723	1724	1725	1726	1727
159	1728	1729	1730	1731	1732	1733	1734	1735	1736	1737
160	1738	1739	1740	1741	1742	1743	1744	1745	1746	1747
161	1748	1749	1750	1751	1752	1753	1754	1755	1756	1757
162	1758	1759	1760	1761	1762	1763	1764	1765	1766	1767
163	1768	1769	1770	1771	1772	1773	1774	1775	1776	1777
164	1778	1779	1780	1781	1782	1783	1784	1785	1786	1787
165	1788	1789	1790	1791	1792	1793	1794	1795	1796	1797
166	1798	1799	1800	1801	1802	1803	1804	1805	1806	1807
167	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817
168	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827
169	1828	1829	1830	1831	1832	1833	1834	1835	1836	1837
170	1838	1839	1840	1841	1842	1843	1844	1845	1846	1847
171	1848	1849	1850	1851	1852	1853	1854	1855	1856	1857
172	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867
173	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877
174	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887
175	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897
176	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907
177	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917
178	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
179	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
180	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
181	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
182	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
183	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
184	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
185	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
186	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
187	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
188	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
189	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
190	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
191	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057
192	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067
193	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077
194	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087
195	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097
196	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107
197	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117
198	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127
199	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137
200	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
201	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157
202	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167
203	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177
204	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187
205	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197
206	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207
207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217
208	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227
209	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237
210	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247
211	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257
212	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267
213	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277
214	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287
215	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297
216	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307
217	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317
218	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327
219	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337
220	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347
221	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357
222	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367
223	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377
224	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387
225	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397
226	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407
227	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417
228	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427
229	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437
230	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447
231	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457
232	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467
233	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477
234	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487
235	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497
236	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507
237	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517
238	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527
239	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537
240	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547
241	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557
242	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567
243	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577
244	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587
245	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597
246	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607
247	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617
248	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627
249	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637
250	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
251	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657
252	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667
253	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677
254	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687
255	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697
256	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707
257	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717
258	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727
259	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737
260	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747
261	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757
262	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767
263	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777
264	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787
265	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797
266	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807
267	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817
268	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827
269	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837
270	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847
271	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857
272	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867
273	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877
274	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887
275	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897
276	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907
277	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917
278	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927
279	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937
280	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947
281	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957
282	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967
283	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977
284	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987
285	2988	2989	2990	2991	2992	2993	2994	2995	2996	2997
286	2998	2999	3000	3001	3002	3003	3004	3005	3006	3007
287	3008	3009	3010	3011	3012	3013	3014	3015	3016	3017
288	3018	3019	3020	3021	3022	3023	3024	3025	3026	3027
289	3028	3029	3030	3031	3032	3033	3034	3035	3036	3037
290	3038	3039	3040	3041	3042	3043	3044	3045	3046	3047
291	3048	3049	3050	3051	3052	3053	3054	3055	3056	3057
292	3058	3059	3060	3061	3062	3063	3064	3065	3066	3067
293	3068	3069	3070	3071	3072	3073	3074	3075	3076	3077
294	3078	3079	3080	3081	3082	3083	3084	3085	3086	3087
295	3088	3089	3090	3091	3092	3093	3094	3095	3096	3097
296	3098	3099	3100	3101	3102	3103	3104	3105	3106	3107
297	3108	3109	3110	3111	3112	3113	3114	3115	3116	3117
298	3118	3119	3120	3121	3122	3123	3124	3125	3126	3127
299	3128	3129	3130	3131	3132	3133	3134	3135	3136	3137
300	3138	3139	3140	3141	3142	3143	3144	3145	3146	3147

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
301	3148	3149	3150	3151	3152	3153	3154	3155	3156	3157
302	3158	3159	3160	3161	3162	3163	3164	3165	3166	3167
303	3168	3169	3170	3171	3172	3173	3174	3175	3176	3177
304	3178	3179	3180	3181	3182	3183	3184	3185	3186	3187
305	3188	3189	3190	3191	3192	3193	3194	3195	3196	3197
306	3198	3199	3200	3201	3202	3203	3204	3205	3206	3207
307	3208	3209	3210	3211	3212	3213	3214	3215	3216	3217
308	3218	3219	3220	3221	3222	3223	3224	3225	3226	3227
309	3228	3229	3230	3231	3232	3233	3234	3235	3236	3237
310	3238	3239	3240	3241	3242	3243	3244	3245	3246	3247
311	3248	3249	3250	3251	3252	3253	3254	3255	3256	3257
312	3258	3259	3260	3261	3262	3263	3264	3265	3266	3267
313	3268	3269	3270	3271	3272	3273	3274	3275	3276	3277
314	3278	3279	3280	3281	3282	3283	3284	3285	3286	3287
315	3288	3289	3290	3291	3292	3293	3294	3295	3296	3297
316	3298	3299	3300	3301	3302	3303	3304	3305	3306	3307
317	3308	3309	3310	3311	3312	3313	3314	3315	3316	3317
318	3318	3319	3320	3321	3322	3323	3324	3325	3326	3327
319	3328	3329	3330	3331	3332	3333	3334	3335	3336	3337
320	3338	3339	3340	3341	3342	3343	3344	3345	3346	3347
321	3348	3349	3350	3351	3352	3353	3354	3355	3356	3357
322	3358	3359	3360	3361	3362	3363	3364	3365	3366	3367
323	3368	3369	3370	3371	3372	3373	3374	3375	3376	3377
324	3378	3379	3380	3381	3382	3383	3384	3385	3386	3387
325	3388	3389	3390	3391	3392	3393	3394	3395	3396	3397
326	3398	3399	3400	3401	3402	3403	3404	3405	3406	3407
327	3408	3409	3410	3411	3412	3413	3414	3415	3416	3417
328	3418	3419	3420	3421	3422	3423	3424	3425	3426	3427
329	3428	3429	3430	3431	3432	3433	3434	3435	3436	3437
330	3438	3439	3440	3441	3442	3443	3444	3445	3446	3447
331	3448	3449	3450	3451	3452	3453	3454	3455	3456	3457
332	3458	3459	3460	3461	3462	3463	3464	3465	3466	3467
333	3468	3469	3470	3471	3472	3473	3474	3475	3476	3477
334	3478	3479	3480	3481	3482	3483	3484	3485	3486	3487
335	3488	3489	3490	3491	3492	3493	3494	3495	3496	3497
336	3498	3499	3500	3501	3502	3503	3504	3505	3506	3507
337	3508	3509	3510	3511	3512	3513	3514	3515	3516	3517
338	3518	3519	3520	3521	3522	3523	3524	3525	3526	3527
339	3528	3529	3530	3531	3532	3533	3534	3535	3536	3537
340	3538	3539	3540	3541	3542	3543	3544	3545	3546	3547
341	3548	3549	3550	3551	3552	3553	3554	3555	3556	3557
342	3558	3559	3560	3561	3562	3563	3564	3565	3566	3567
343	3568	3569	3570	3571	3572	3573	3574	3575	3576	3577
344	3578	3579	3580	3581	3582	3583	3584	3585	3586	3587
345	3588	3589	3590	3591	3592	3593	3594	3595	3596	3597
346	3598	3599	3600	3601	3602	3603	3604	3605	3606	3607
347	3608	3609	3610	3611	3612	3613	3614	3615	3616	3617
348	3618	3619	3620	3621	3622	3623	3624	3625	3626	3627
349	3628	3629	3630	3631	3632	3633	3634	3635	3636	3637
350	3638	3639	3640	3641	3642	3643	3644	3645	3646	3647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
351	3648	3649	3650	3651	3652	3653	3654	3655	3656	3657
352	3658	3659	3660	3661	3662	3663	3664	3665	3666	3667
353	3668	3669	3670	3671	3672	3673	3674	3675	3676	3677
354	3678	3679	3680	3681	3682	3683	3684	3685	3686	3687
355	3688	3689	3690	3691	3692	3693	3694	3695	3696	3697
356	3698	3699	3700	3701	3702	3703	3704	3705	3706	3707
357	3708	3709	3710	3711	3712	3713	3714	3715	3716	3717
358	3718	3719	3720	3721	3722	3723	3724	3725	3726	3727
359	3728	3729	3730	3731	3732	3733	3734	3735	3736	3737
360	3738	3739	3740	3741	3742	3743	3744	3745	3746	3747
361	3748	3749	3750	3751	3752	3753	3754	3755	3756	3757
362	3758	3759	3760	3761	3762	3763	3764	3765	3766	3767
363	3768	3769	3770	3771	3772	3773	3774	3775	3776	3777
364	3778	3779	3780	3781	3782	3783	3784	3785	3786	3787
365	3788	3789	3790	3791	3792	3793	3794	3795	3796	3797
366	3798	3799	3800	3801	3802	3803	3804	3805	3806	3807
367	3808	3809	3810	3811	3812	3813	3814	3815	3816	3817
368	3818	3819	3820	3821	3822	3823	3824	3825	3826	3827
369	3828	3829	3830	3831	3832	3833	3834	3835	3836	3837
370	3838	3839	3840	3841	3842	3843	3844	3845	3846	3847
371	3848	3849	3850	3851	3852	3853	3854	3855	3856	3857
372	3858	3859	3860	3861	3862	3863	3864	3865	3866	3867
373	3868	3869	3870	3871	3872	3873	3874	3875	3876	3877
374	3878	3879	3880	3881	3882	3883	3884	3885	3886	3887
375	3888	3889	3890	3891	3892	3893	3894	3895	3896	3897
376	3898	3899	3900	3901	3902	3903	3904	3905	3906	3907
377	3908	3909	3910	3911	3912	3913	3914	3915	3916	3917
378	3918	3919	3920	3921	3922	3923	3924	3925	3926	3927
379	3928	3929	3930	3931	3932	3933	3934	3935	3936	3937
380	3938	3939	3940	3941	3942	3943	3944	3945	3946	3947
381	3948	3949	3950	3951	3952	3953	3954	3955	3956	3957
382	3958	3959	3960	3961	3962	3963	3964	3965	3966	3967
383	3968	3969	3970	3971	3972	3973	3974	3975	3976	3977
384	3978	3979	3980	3981	3982	3983	3984	3985	3986	3987
385	3988	3989	3990	3991	3992	3993	3994	3995	3996	3997
386	3998	3999	4000	4001	4002	4003	4004	4005	4006	4007
387	4008	4009	4010	4011	4012	4013	4014	4015	4016	4017
388	4018	4019	4020	4021	4022	4023	4024	4025	4026	4027
389	4028	4029	4030	4031	4032	4033	4034	4035	4036	4037
390	4038	4039	4040	4041	4042	4043	4044	4045	4046	4047
391	4048	4049	4050	4051	4052	4053	4054	4055	4056	4057
392	4058	4059	4060	4061	4062	4063	4064	4065	4066	4067
393	4068	4069	4070	4071	4072	4073	4074	4075	4076	4077
394	4078	4079	4080	4081	4082	4083	4084	4085	4086	4087
395	4088	4089	4090	4091	4092	4093	4094	4095	4096	4097
396	4098	4099	4100	4101	4102	4103	4104	4105	4106	4107
397	4108	4109	4110	4111	4112	4113	4114	4115	4116	4117
398	4118	4119	4120	4121	4122	4123	4124	4125	4126	4127
399	4128	4129	4130	4131	4132	4133	4134	4135	4136	4137
400	4138	4139	4140	4141	4142	4143	4144	4145	4146	4147

Appendix 3.3 Y-axis operation data memory address

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
1	4148	4149	4150	4151	4152	4153	4154	4155	4156	4157
2	4158	4159	4160	4161	4162	4163	4164	4165	4166	4167
3	4168	4169	4170	4171	4172	4173	4174	4175	4176	4177
4	4178	4179	4180	4181	4182	4183	4184	4185	4186	4187
5	4188	4189	4190	4191	4192	4193	4194	4195	4196	4197
6	4198	4199	4200	4201	4202	4203	4204	4205	4206	4207
7	4208	4209	4210	4211	4212	4213	4214	4215	4216	4217
8	4218	4219	4220	4221	4222	4223	4224	4225	4226	4227
9	4228	4229	4230	4231	4232	4233	4234	4235	4236	4237
10	4238	4239	4240	4241	4242	4243	4244	4245	4246	4247
11	4248	4249	4250	4251	4252	4253	4254	4255	4256	4257
12	4258	4259	4260	4261	4262	4263	4264	4265	4266	4267
13	4268	4269	4270	4271	4272	4273	4274	4275	4276	4277
14	4278	4279	4280	4281	4282	4283	4284	4285	4286	4287
15	4288	4289	4290	4291	4292	4293	4294	4295	4296	4297
16	4298	4299	4300	4301	4302	4303	4304	4305	4306	4307
17	4308	4309	4310	4311	4312	4313	4314	4315	4316	4317
18	4318	4319	4320	4321	4322	4323	4324	4325	4326	4327
19	4328	4329	4330	4331	4332	4333	4334	4335	4336	4337
20	4338	4339	4340	4341	4342	4343	4344	4345	4346	4347
21	4348	4349	4350	4351	4352	4353	4354	4355	4356	4357
22	4358	4359	4360	4361	4362	4363	4364	4365	4366	4367
23	4368	4369	4370	4371	4372	4373	4374	4375	4376	4377
24	4378	4379	4380	4381	4382	4383	4384	4385	4386	4387
25	4388	4389	4390	4391	4392	4393	4394	4395	4396	4397
26	4398	4399	4400	4401	4402	4403	4404	4405	4406	4407
27	4408	4409	4410	4411	4412	4413	4414	4415	4416	4417
28	4418	4419	4420	4421	4422	4423	4424	4425	4426	4427
29	4428	4429	4430	4431	4432	4433	4434	4435	4436	4437
30	4438	4439	4440	4441	4442	4443	4444	4445	4446	4447
31	4448	4449	4450	4451	4452	4453	4454	4455	4456	4457
32	4458	4459	4460	4461	4462	4463	4464	4465	4466	4467
33	4468	4469	4470	4471	4472	4473	4474	4475	4476	4477
34	4478	4479	4480	4481	4482	4483	4484	4485	4486	4487
35	4488	4489	4490	4491	4492	4493	4494	4495	4496	4497
36	4498	4499	4500	4501	4502	4503	4504	4505	4506	4507
37	4508	4509	4510	4511	4512	4513	4514	4515	4516	4517
38	4518	4519	4520	4521	4522	4523	4524	4525	4526	4527
39	4528	4529	4530	4531	4532	4533	4534	4535	4536	4537
40	4538	4539	4540	4541	4542	4543	4544	4545	4546	4547
41	4548	4549	4550	4551	4552	4553	4554	4555	4556	4557
42	4558	4559	4560	4561	4562	4563	4564	4565	4566	4567
43	4568	4569	4570	4571	4572	4573	4574	4575	4576	4577
44	4578	4579	4580	4581	4582	4583	4584	4585	4586	4587
45	4588	4589	4590	4591	4592	4593	4594	4595	4596	4597
46	4598	4599	4600	4601	4602	4603	4604	4605	4606	4607
47	4608	4609	4610	4611	4612	4613	4614	4615	4616	4617
48	4618	4619	4620	4621	4622	4623	4624	4625	4626	4627
49	4628	4629	4630	4631	4632	4633	4634	4635	4636	4637
50	4638	4639	4640	4641	4642	4643	4644	4645	4646	4647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
51	4648	4649	4650	4651	4652	4653	4654	4655	4656	4657
52	4658	4659	4660	4661	4662	4663	4664	4665	4666	4667
53	4668	4669	4670	4671	4672	4673	4674	4675	4676	4677
54	4678	4679	4680	4681	4682	4683	4684	4685	4686	4687
55	4688	4689	4690	4691	4692	4693	4694	4695	4696	4697
56	4698	4699	4700	4701	4702	4703	4704	4705	4706	4707
57	4708	4709	4710	4711	4712	4713	4714	4715	4716	4717
58	4718	4719	4720	4721	4722	4723	4724	4725	4726	4727
59	4728	4729	4730	4731	4732	4733	4734	4735	4736	4737
60	4738	4739	4740	4741	4742	4743	4744	4745	4746	4747
61	4748	4749	4750	4751	4752	4753	4754	4755	4756	4757
62	4758	4759	4760	4761	4762	4763	4764	4765	4766	4767
63	4768	4769	4770	4771	4772	4773	4774	4775	4776	4777
64	4778	4779	4780	4781	4782	4783	4784	4785	4786	4787
65	4788	4789	4790	4791	4792	4793	4794	4795	4796	4797
66	4798	4799	4800	4801	4802	4803	4804	4805	4806	4807
67	4808	4809	4810	4811	4812	4813	4814	4815	4816	4817
68	4818	4819	4820	4821	4822	4823	4824	4825	4826	4827
69	4828	4829	4830	4831	4832	4833	4834	4835	4836	4837
70	4838	4839	4840	4841	4842	4843	4844	4845	4846	4847
71	4848	4849	4850	4851	4852	4853	4854	4855	4856	4857
72	4858	4859	4860	4861	4862	4863	4864	4865	4866	4867
73	4868	4869	4870	4871	4872	4873	4874	4875	4876	4877
74	4878	4879	4880	4881	4882	4883	4884	4885	4886	4887
75	4888	4889	4890	4891	4892	4893	4894	4895	4896	4897
76	4898	4899	4900	4901	4902	4903	4904	4905	4906	4907
77	4908	4909	4910	4911	4912	4913	4914	4915	4916	4917
78	4918	4919	4920	4921	4922	4923	4924	4925	4926	4927
79	4928	4929	4930	4931	4932	4933	4934	4935	4936	4937
80	4938	4939	4940	4941	4942	4943	4944	4945	4946	4947
81	4948	4949	4950	4951	4952	4953	4954	4955	4956	4957
82	4958	4959	4960	4961	4962	4963	4964	4965	4966	4967
83	4968	4969	4970	4971	4972	4973	4974	4975	4976	4977
84	4978	4979	4980	4981	4982	4983	4984	4985	4986	4987
85	4988	4989	4990	4991	4992	4993	4994	4995	4996	4997
86	4998	4999	5000	5001	5002	5003	5004	5005	5006	5007
87	5008	5009	5010	5011	5012	5013	5014	5015	5016	5017
88	5018	5019	5020	5021	5022	5023	5024	5025	5026	5027
89	5028	5029	5030	5031	5032	5033	5034	5035	5036	5037
90	5038	5039	5040	5041	5042	5043	5044	5045	5046	5047
91	5048	5049	5050	5051	5052	5053	5054	5055	5056	5057
92	5058	5059	5060	5061	5062	5063	5064	5065	5066	5067
93	5068	5069	5070	5071	5072	5073	5074	5075	5076	5077
94	5078	5079	5080	5081	5082	5083	5084	5085	5086	5087
95	5088	5089	5090	5091	5092	5093	5094	5095	5096	5097
96	5098	5099	5100	5101	5102	5103	5104	5105	5106	5107
97	5108	5109	5110	5111	5112	5113	5114	5115	5116	5117
98	5118	5119	5120	5121	5122	5123	5124	5125	5126	5127
99	5128	5129	5130	5131	5132	5133	5134	5135	5136	5137
100	5138	5139	5140	5141	5142	5143	5144	5145	5146	5147

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
101	5148	5149	5150	5151	5152	5153	5154	5155	5156	5157
102	5158	5159	5160	5161	5162	5163	5164	5165	5166	5167
103	5168	5169	5170	5171	5172	5173	5174	5175	5176	5177
104	5178	5179	5180	5181	5182	5183	5184	5185	5186	5187
105	5188	5189	5190	5191	5192	5193	5194	5195	5196	5197
106	5198	5199	5200	5201	5202	5203	5204	5205	5206	5207
107	5208	5209	5210	5211	5212	5213	5214	5215	5216	5217
108	5218	5219	5220	5221	5222	5223	5224	5225	5226	5227
109	5228	5229	5230	5231	5232	5233	5234	5235	5236	5237
110	5238	5239	5240	5241	5242	5243	5244	5245	5246	5247
111	5248	5249	5250	5251	5252	5253	5254	5255	5256	5257
112	5258	5259	5260	5261	5262	5263	5264	5265	5266	5267
113	5268	5269	5270	5271	5272	5273	5274	5275	5276	5277
114	5278	5279	5280	5281	5282	5283	5284	5285	5286	5287
115	5288	5289	5290	5291	5292	5293	5294	5295	5296	5297
116	5298	5299	5300	5301	5302	5303	5304	5305	5306	5307
117	5308	5309	5310	5311	5312	5313	5314	5315	5316	5317
118	5318	5319	5320	5321	5322	5323	5324	5325	5326	5327
119	5328	5329	5330	5331	5332	5333	5334	5335	5336	5337
120	5338	5339	5340	5341	5342	5343	5344	5345	5346	5347
121	5348	5349	5350	5351	5352	5353	5354	5355	5356	5357
122	5358	5359	5360	5361	5362	5363	5364	5365	5366	5367
123	5368	5369	5370	5371	5372	5373	5374	5375	5376	5377
124	5378	5379	5380	5381	5382	5383	5384	5385	5386	5387
125	5388	5389	5390	5391	5392	5393	5394	5395	5396	5397
126	5398	5399	5400	5401	5402	5403	5404	5405	5406	5407
127	5408	5409	5410	5411	5412	5413	5414	5415	5416	5417
128	5418	5419	5420	5421	5422	5423	5424	5425	5426	5427
129	5428	5429	5430	5431	5432	5433	5434	5435	5436	5437
130	5438	5439	5440	5441	5442	5443	5444	5445	5446	5447
131	5448	5449	5450	5451	5452	5453	5454	5455	5456	5457
132	5458	5459	5460	5461	5462	5463	5464	5465	5466	5467
133	5468	5469	5470	5471	5472	5473	5474	5475	5476	5477
134	5478	5479	5480	5481	5482	5483	5484	5485	5486	5487
135	5488	5489	5490	5491	5492	5493	5494	5495	5496	5497
136	5498	5499	5500	5501	5502	5503	5504	5505	5506	5507
137	5508	5509	5510	5511	5512	5513	5514	5515	5516	5517
138	5518	5519	5520	5521	5522	5523	5524	5525	5526	5527
139	5528	5529	5530	5531	5532	5533	5534	5535	5536	5537
140	5538	5539	5540	5541	5542	5543	5544	5545	5546	5547
141	5548	5549	5550	5551	5552	5553	5554	5555	5556	5557
142	5558	5559	5560	5561	5562	5563	5564	5565	5566	5567
143	5568	5569	5570	5571	5572	5573	5574	5575	5576	5577
144	5578	5579	5580	5581	5582	5583	5584	5585	5586	5587
145	5588	5589	5590	5591	5592	5593	5594	5595	5596	5597
146	5598	5599	5600	5601	5602	5603	5604	5605	5606	5607
147	5608	5609	5610	5611	5612	5613	5614	5615	5616	5617
148	5618	5619	5620	5621	5622	5623	5624	5625	5626	5627
149	5628	5629	5630	5631	5632	5633	5634	5635	5636	5637
150	5638	5639	5640	5641	5642	5643	5644	5645	5646	5647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
151	5648	5649	5650	5651	5652	5653	5654	5655	5656	5657
152	5658	5659	5660	5661	5662	5663	5664	5665	5666	5667
153	5668	5669	5670	5671	5672	5673	5674	5675	5676	5677
154	5678	5679	5680	5681	5682	5683	5684	5685	5686	5687
155	5688	5689	5690	5691	5692	5693	5694	5695	5696	5697
156	5698	5699	5700	5701	5702	5703	5704	5705	5706	5707
157	5708	5709	5710	5711	5712	5713	5714	5715	5716	5717
158	5718	5719	5720	5721	5722	5723	5724	5725	5726	5727
159	5728	5729	5730	5731	5732	5733	5734	5735	5736	5737
160	5738	5739	5740	5741	5742	5743	5744	5745	5746	5747
161	5748	5749	5750	5751	5752	5753	5754	5755	5756	5757
162	5758	5759	5760	5761	5762	5763	5764	5765	5766	5767
163	5768	5769	5770	5771	5772	5773	5774	5775	5776	5777
164	5778	5779	5780	5781	5782	5783	5784	5785	5786	5787
165	5788	5789	5790	5791	5792	5793	5794	5795	5796	5797
166	5798	5799	5800	5801	5802	5803	5804	5805	5806	5807
167	5808	5809	5810	5811	5812	5813	5814	5815	5816	5817
168	5818	5819	5820	5821	5822	5823	5824	5825	5826	5827
169	5828	5829	5830	5831	5832	5833	5834	5835	5836	5837
170	5838	5839	5840	5841	5842	5843	5844	5845	5846	5847
171	5848	5849	5850	5851	5852	5853	5854	5855	5856	5857
172	5858	5859	5860	5861	5862	5863	5864	5865	5866	5867
173	5868	5869	5870	5871	5872	5873	5874	5875	5876	5877
174	5878	5879	5880	5881	5882	5883	5884	5885	5886	5887
175	5888	5889	5890	5891	5892	5893	5894	5895	5896	5897
176	5898	5899	5900	5901	5902	5903	5904	5905	5906	5907
177	5908	5909	5910	5911	5912	5913	5914	5915	5916	5917
178	5918	5919	5920	5921	5922	5923	5924	5925	5926	5927
179	5928	5929	5930	5931	5932	5933	5934	5935	5936	5937
180	5938	5939	5940	5941	5942	5943	5944	5945	5946	5947
181	5948	5949	5950	5951	5952	5953	5954	5955	5956	5957
182	5958	5959	5960	5961	5962	5963	5964	5965	5966	5967
183	5968	5969	5970	5971	5972	5973	5974	5975	5976	5977
184	5978	5979	5980	5981	5982	5983	5984	5985	5986	5987
185	5988	5989	5990	5991	5992	5993	5994	5995	5996	5997
186	5998	5999	6000	6001	6002	6003	6004	6005	6006	6007
187	6008	6009	6010	6011	6012	6013	6014	6015	6016	6017
188	6018	6019	6020	6021	6022	6023	6024	6025	6026	6027
189	6028	6029	6030	6031	6032	6033	6034	6035	6036	6037
190	6038	6039	6040	6041	6042	6043	6044	6045	6046	6047
191	6048	6049	6050	6051	6052	6053	6054	6055	6056	6057
192	6058	6059	6060	6061	6062	6063	6064	6065	6066	6067
193	6068	6069	6070	6071	6072	6073	6074	6075	6076	6077
194	6078	6079	6080	6081	6082	6083	6084	6085	6086	6087
195	6088	6089	6090	6091	6092	6093	6094	6095	6096	6097
196	6098	6099	6100	6101	6102	6103	6104	6105	6106	6107
197	6108	6109	6110	6111	6112	6113	6114	6115	6116	6117
198	6118	6119	6120	6121	6122	6123	6124	6125	6126	6127
199	6128	6129	6130	6131	6132	6133	6134	6135	6136	6137
200	6138	6139	6140	6141	6142	6143	6144	6145	6146	6147

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
201	6148	6149	6150	6151	6152	6153	6154	6155	6156	6157
202	6158	6159	6160	6161	6162	6163	6164	6165	6166	6167
203	6168	6169	6170	6171	6172	6173	6174	6175	6176	6177
204	6178	6179	6180	6181	6182	6183	6184	6185	6186	6187
205	6188	6189	6190	6191	6192	6193	6194	6195	6196	6197
206	6198	6199	6200	6201	6202	6203	6204	6205	6206	6207
207	6208	6209	6210	6211	6212	6213	6214	6215	6216	6217
208	6218	6219	6220	6221	6222	6223	6224	6225	6226	6227
209	6228	6229	6230	6231	6232	6233	6234	6235	6236	6237
210	6238	6239	6240	6241	6242	6243	6244	6245	6246	6247
211	6248	6249	6250	6251	6252	6253	6254	6255	6256	6257
212	6258	6259	6260	6261	6262	6263	6264	6265	6266	6267
213	6268	6269	6270	6271	6272	6273	6274	6275	6276	6277
214	6278	6279	6280	6281	6282	6283	6284	6285	6286	6287
215	6288	6289	6290	6291	6292	6293	6294	6295	6296	6297
216	6298	6299	6300	6301	6302	6303	6304	6305	6306	6307
217	6308	6309	6310	6311	6312	6313	6314	6315	6316	6317
218	6318	6319	6320	6321	6322	6323	6324	6325	6326	6327
219	6328	6329	6330	6331	6332	6333	6334	6335	6336	6337
220	6338	6339	6340	6341	6342	6343	6344	6345	6346	6347
221	6348	6349	6350	6351	6352	6353	6354	6355	6356	6357
222	6358	6359	6360	6361	6362	6363	6364	6365	6366	6367
223	6368	6369	6370	6371	6372	6373	6374	6375	6376	6377
224	6378	6379	6380	6381	6382	6383	6384	6385	6386	6387
225	6388	6389	6390	6391	6392	6393	6394	6395	6396	6397
226	6398	6399	6400	6401	6402	6403	6404	6405	6406	6407
227	6408	6409	6410	6411	6412	6413	6414	6415	6416	6417
228	6418	6419	6420	6421	6422	6423	6424	6425	6426	6427
229	6428	6429	6430	6431	6432	6433	6434	6435	6436	6437
230	6438	6439	6440	6441	6442	6443	6444	6445	6446	6447
231	6448	6449	6450	6451	6452	6453	6454	6455	6456	6457
232	6458	6459	6460	6461	6462	6463	6464	6465	6466	6467
233	6468	6469	6470	6471	6472	6473	6474	6475	6476	6477
234	6478	6479	6480	6481	6482	6483	6484	6485	6486	6487
235	6488	6489	6490	6491	6492	6493	6494	6495	6496	6497
236	6498	6499	6500	6501	6502	6503	6504	6505	6506	6507
237	6508	6509	6510	6511	6512	6513	6514	6515	6516	6517
238	6518	6519	6520	6521	6522	6523	6524	6525	6526	6527
239	6528	6529	6530	6531	6532	6533	6534	6535	6536	6537
240	6538	6539	6540	6541	6542	6543	6544	6545	6546	6547
241	6548	6549	6550	6551	6552	6553	6554	6555	6556	6557
242	6558	6559	6560	6561	6562	6563	6564	6565	6566	6567
243	6568	6569	6570	6571	6572	6573	6574	6575	6576	6577
244	6578	6579	6580	6581	6582	6583	6584	6585	6586	6587
245	6588	6589	6590	6591	6592	6593	6594	6595	6596	6597
246	6598	6599	6600	6601	6602	6603	6604	6605	6606	6607
247	6608	6609	6610	6611	6612	6613	6614	6615	6616	6617
248	6618	6619	6620	6621	6622	6623	6624	6625	6626	6627
249	6628	6629	6630	6631	6632	6633	6634	6635	6636	6637
250	6638	6639	6640	6641	6642	6643	6644	6645	6646	6647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
251	6648	6649	6650	6651	6652	6653	6654	6655	6656	6657
252	6658	6659	6660	6661	6662	6663	6664	6665	6666	6667
253	6668	6669	6670	6671	6672	6673	6674	6675	6676	6677
254	6678	6679	6680	6681	6682	6683	6684	6685	6686	6687
255	6688	6689	6690	6691	6692	6693	6694	6695	6696	6697
256	6698	6699	6700	6701	6702	6703	6704	6705	6706	6707
257	6708	6709	6710	6711	6712	6713	6714	6715	6716	6717
258	6718	6719	6720	6721	6722	6723	6724	6725	6726	6727
259	6728	6729	6730	6731	6732	6733	6734	6735	6736	6737
260	6738	6739	6740	6741	6742	6743	6744	6745	6746	6747
261	6748	6749	6750	6751	6752	6753	6754	6755	6756	6757
262	6758	6759	6760	6761	6762	6763	6764	6765	6766	6767
263	6768	6769	6770	6771	6772	6773	6774	6775	6776	6777
264	6778	6779	6780	6781	6782	6783	6784	6785	6786	6787
265	6788	6789	6790	6791	6792	6793	6794	6795	6796	6797
266	6798	6799	6800	6801	6802	6803	6804	6805	6806	6807
267	6808	6809	6810	6811	6812	6813	6814	6815	6816	6817
268	6818	6819	6820	6821	6822	6823	6824	6825	6826	6827
269	6828	6829	6830	6831	6832	6833	6834	6835	6836	6837
270	6838	6839	6840	6841	6842	6843	6844	6845	6846	6847
271	6848	6849	6850	6851	6852	6853	6854	6855	6856	6857
272	6858	6859	6860	6861	6862	6863	6864	6865	6866	6867
273	6868	6869	6870	6871	6872	6873	6874	6875	6876	6877
274	6878	6879	6880	6881	6882	6883	6884	6885	6886	6887
275	6888	6889	6890	6891	6892	6893	6894	6895	6896	6897
276	6898	6899	6900	6901	6902	6903	6904	6905	6906	6907
277	6908	6909	6910	6911	6912	6913	6914	6915	6916	6917
278	6918	6919	6920	6921	6922	6923	6924	6925	6926	6927
279	6928	6929	6930	6931	6932	6933	6934	6935	6936	6937
280	6938	6939	6940	6941	6942	6943	6944	6945	6946	6947
281	6948	6949	6950	6951	6952	6953	6954	6955	6956	6957
282	6958	6959	6960	6961	6962	6963	6964	6965	6966	6967
283	6968	6969	6970	6971	6972	6973	6974	6975	6976	6977
284	6978	6979	6980	6981	6982	6983	6984	6985	6986	6987
285	6988	6989	6990	6991	6992	6993	6994	6995	6996	6997
286	6998	6999	7000	7001	7002	7003	7004	7005	7006	7007
287	7008	7009	7010	7011	7012	7013	7014	7015	7016	7017
288	7018	7019	7020	7021	7022	7023	7024	7025	7026	7027
289	7028	7029	7030	7031	7032	7033	7034	7035	7036	7037
290	7038	7039	7040	7041	7042	7043	7044	7045	7046	7047
291	7048	7049	7050	7051	7052	7053	7054	7055	7056	7057
292	7058	7059	7060	7061	7062	7063	7064	7065	7066	7067
293	7068	7069	7070	7071	7072	7073	7074	7075	7076	7077
294	7078	7079	7080	7081	7082	7083	7084	7085	7086	7087
295	7088	7089	7090	7091	7092	7093	7094	7095	7096	7097
296	7098	7099	7100	7101	7102	7103	7104	7105	7106	7107
297	7108	7109	7110	7111	7112	7113	7114	7115	7116	7117
298	7118	7119	7120	7121	7122	7123	7124	7125	7126	7127
299	7128	7129	7130	7131	7132	7133	7134	7135	7136	7137
300	7138	7139	7140	7141	7142	7143	7144	7145	7146	7147

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
301	7148	7149	7150	7151	7152	7153	7154	7155	7156	7157
302	7158	7159	7160	7161	7162	7163	7164	7165	7166	7167
303	7168	7169	7170	7171	7172	7173	7174	7175	7176	7177
304	7178	7179	7180	7181	7182	7183	7184	7185	7186	7187
305	7188	7189	7190	7191	7192	7193	7194	7195	7196	7197
306	7198	7199	7200	7201	7202	7203	7204	7205	7206	7207
307	7208	7209	7210	7211	7212	7213	7214	7215	7216	7217
308	7218	7219	7220	7221	7222	7223	7224	7225	7226	7227
309	7228	7229	7230	7231	7232	7233	7234	7235	7236	7237
310	7238	7239	7240	7241	7242	7243	7244	7245	7246	7247
311	7248	7249	7250	7251	7252	7253	7254	7255	7256	7257
312	7258	7259	7260	7261	7262	7263	7264	7265	7266	7267
313	7268	7269	7270	7271	7272	7273	7274	7275	7276	7277
314	7278	7279	7280	7281	7282	7283	7284	7285	7286	7287
315	7288	7289	7290	7291	7292	7293	7294	7295	7296	7297
316	7298	7299	7300	7301	7302	7303	7304	7305	7306	7307
317	7308	7309	7310	7311	7312	7313	7314	7315	7316	7317
318	7318	7319	7320	7321	7322	7323	7324	7325	7326	7327
319	7328	7329	7330	7331	7332	7333	7334	7335	7336	7337
320	7338	7339	7340	7341	7342	7343	7344	7345	7346	7347
321	7348	7349	7350	7351	7352	7353	7354	7355	7356	7357
322	7358	7359	7360	7361	7362	7363	7364	7365	7366	7367
323	7368	7369	7370	7371	7372	7373	7374	7375	7376	7377
324	7378	7379	7380	7381	7382	7383	7384	7385	7386	7387
325	7388	7389	7390	7391	7392	7393	7394	7395	7396	7397
326	7398	7399	7400	7401	7402	7403	7404	7405	7406	7407
327	7408	7409	7410	7411	7412	7413	7414	7415	7416	7417
328	7418	7419	7420	7421	7422	7423	7424	7425	7426	7427
329	7428	7429	7430	7431	7432	7433	7434	7435	7436	7437
330	7438	7439	7440	7441	7442	7443	7444	7445	7446	7447
331	7448	7449	7450	7451	7452	7453	7454	7455	7456	7457
332	7458	7459	7460	7461	7462	7463	7464	7465	7466	7467
333	7468	7469	7470	7471	7472	7473	7474	7475	7476	7477
334	7478	7479	7480	7481	7482	7483	7484	7485	7486	7487
335	7488	7489	7490	7491	7492	7493	7494	7495	7496	7497
336	7498	7499	7500	7501	7502	7503	7504	7505	7506	7507
337	7508	7509	7510	7511	7512	7513	7514	7515	7516	7517
338	7518	7519	7520	7521	7522	7523	7524	7525	7526	7527
339	7528	7529	7530	7531	7532	7533	7534	7535	7536	7537
340	7538	7539	7540	7541	7542	7543	7544	7545	7546	7547
341	7548	7549	7550	7551	7552	7553	7554	7555	7556	7557
342	7558	7559	7560	7561	7562	7563	7564	7565	7566	7567
343	7568	7569	7570	7571	7572	7573	7574	7575	7576	7577
344	7578	7579	7580	7581	7582	7583	7584	7585	7586	7587
345	7588	7589	7590	7591	7592	7593	7594	7595	7596	7597
346	7598	7599	7600	7601	7602	7603	7604	7605	7606	7607
347	7608	7609	7610	7611	7612	7613	7614	7615	7616	7617
348	7618	7619	7620	7621	7622	7623	7624	7625	7626	7627
349	7628	7629	7630	7631	7632	7633	7634	7635	7636	7637
350	7638	7639	7640	7641	7642	7643	7644	7645	7646	7647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
351	7648	7649	7650	7651	7652	7653	7654	7655	7656	7657
352	7658	7659	7660	7661	7662	7663	7664	7665	7666	7667
353	7668	7669	7670	7671	7672	7673	7674	7675	7676	7677
354	7678	7679	7680	7681	7682	7683	7684	7685	7686	7687
355	7688	7689	7690	7691	7692	7693	7694	7695	7696	7697
356	7698	7699	7700	7701	7702	7703	7704	7705	7706	7707
357	7708	7709	7710	7711	7712	7713	7714	7715	7716	7717
358	7718	7719	7720	7721	7722	7723	7724	7725	7726	7727
359	7728	7729	7730	7731	7732	7733	7734	7735	7736	7737
360	7738	7739	7740	7741	7742	7743	7744	7745	7746	7747
361	7748	7749	7750	7751	7752	7753	7754	7755	7756	7757
362	7758	7759	7760	7761	7762	7763	7764	7765	7766	7767
363	7768	7769	7770	7771	7772	7773	7774	7775	7776	7777
364	7778	7779	7780	7781	7782	7783	7784	7785	7786	7787
365	7788	7789	7790	7791	7792	7793	7794	7795	7796	7797
366	7798	7799	7800	7801	7802	7803	7804	7805	7806	7807
367	7808	7809	7810	7811	7812	7813	7814	7815	7816	7817
368	7818	7819	7820	7821	7822	7823	7824	7825	7826	7827
369	7828	7829	7830	7831	7832	7833	7834	7835	7836	7837
370	7838	7839	7840	7841	7842	7843	7844	7845	7846	7847
371	7848	7849	7850	7851	7852	7853	7854	7855	7856	7857
372	7858	7859	7860	7861	7862	7863	7864	7865	7866	7867
373	7868	7869	7870	7871	7872	7873	7874	7875	7876	7877
374	7878	7879	7880	7881	7882	7883	7884	7885	7886	7887
375	7888	7889	7890	7891	7892	7893	7894	7895	7896	7897
376	7898	7899	7900	7901	7902	7903	7904	7905	7906	7907
377	7908	7909	7910	7911	7912	7913	7914	7915	7916	7917
378	7918	7919	7920	7921	7922	7923	7924	7925	7926	7927
379	7928	7929	7930	7931	7932	7933	7934	7935	7936	7937
380	7938	7939	7940	7941	7942	7943	7944	7945	7946	7947
381	7948	7949	7950	7951	7952	7953	7954	7955	7956	7957
382	7958	7959	7960	7961	7962	7963	7964	7965	7966	7967
383	7968	7969	7970	7971	7972	7973	7974	7975	7976	7977
384	7978	7979	7980	7981	7982	7983	7984	7985	7986	7987
385	7988	7989	7990	7991	7992	7993	7994	7995	7996	7997
386	7998	7999	8000	8001	8002	8003	8004	8005	8006	8007
387	8008	8009	8010	8011	8012	8013	8014	8015	8016	8017
388	8018	8019	8020	8021	8022	8023	8024	8025	8026	8027
389	8028	8029	8030	8031	8032	8033	8034	8035	8036	8037
390	8038	8039	8040	8041	8042	8043	8044	8045	8046	8047
391	8048	8049	8050	8051	8052	8053	8054	8055	8056	8057
392	8058	8059	8060	8061	8062	8063	8064	8065	8066	8067
393	8068	8069	8070	8071	8072	8073	8074	8075	8076	8077
394	8078	8079	8080	8081	8082	8083	8084	8085	8086	8087
395	8088	8089	8090	8091	8092	8093	8094	8095	8096	8097
396	8098	8099	8100	8101	8102	8103	8104	8105	8106	8107
397	8108	8109	8110	8111	8112	8113	8114	8115	8116	8117
398	8118	8119	8120	8121	8122	8123	8124	8125	8126	8127
399	8128	8129	8130	8131	8132	8133	8134	8135	8136	8137
400	8138	8139	8140	8141	8142	8143	8144	8145	8146	8147

Appendix 3.4 Z-axis operation data memory address

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
1	8148	8149	8150	8151	8152	8153	8154	8155	8156	8157
2	8158	8159	8160	8161	8162	8163	8164	8165	8166	8167
3	8168	8169	8170	8171	8172	8173	8174	8175	8176	8177
4	8178	8179	8180	8181	8182	8183	8184	8185	8186	8187
5	8188	8189	8190	8191	8192	8193	8194	8195	8196	8197
6	8198	8199	8200	8201	8202	8203	8204	8205	8206	8207
7	8208	8209	8210	8211	8212	8213	8214	8215	8216	8217
8	8218	8219	8220	8221	8222	8223	8224	8225	8226	8227
9	8228	8229	8230	8231	8232	8233	8234	8235	8236	8237
10	8238	8239	8240	8241	8242	8243	8244	8245	8246	8247
11	8248	8249	8250	8251	8252	8253	8254	8255	8256	8257
12	8258	8259	8260	8261	8262	8263	8264	8265	8266	8267
13	8268	8269	8270	8271	8272	8273	8274	8275	8276	8277
14	8278	8279	8280	8281	8282	8283	8284	8285	8286	8287
15	8288	8289	8290	8291	8292	8293	8294	8295	8296	8297
16	8298	8299	8300	8301	8302	8303	8304	8305	8306	8307
17	8308	8309	8310	8311	8312	8313	8314	8315	8316	8317
18	8318	8319	8320	8321	8322	8323	8324	8325	8326	8327
19	8328	8329	8330	8331	8332	8333	8334	8335	8336	8337
20	8338	8339	8340	8341	8342	8343	8344	8345	8346	8347
21	8348	8349	8350	8351	8352	8353	8354	8355	8356	8357
22	8358	8359	8360	8361	8362	8363	8364	8365	8366	8367
23	8368	8369	8370	8371	8372	8373	8374	8375	8376	8377
24	8378	8379	8380	8381	8382	8383	8384	8385	8386	8387
25	8388	8389	8390	8391	8392	8393	8394	8395	8396	8397
26	8398	8399	8400	8401	8402	8403	8404	8405	8406	8407
27	8408	8409	8410	8411	8412	8413	8414	8415	8416	8417
28	8418	8419	8420	8421	8422	8423	8424	8425	8426	8427
29	8428	8429	8430	8431	8432	8433	8434	8435	8436	8437
30	8438	8439	8440	8441	8442	8443	8444	8445	8446	8447
31	8448	8449	8450	8451	8452	8453	8454	8455	8456	8457
32	8458	8459	8460	8461	8462	8463	8464	8465	8466	8467
33	8468	8469	8470	8471	8472	8473	8474	8475	8476	8477
34	8478	8479	8480	8481	8482	8483	8484	8485	8486	8487
35	8488	8489	8490	8491	8492	8493	8494	8495	8496	8497
36	8498	8499	8500	8501	8502	8503	8504	8505	8506	8507
37	8508	8509	8510	8511	8512	8513	8514	8515	8516	8517
38	8518	8519	8520	8521	8522	8523	8524	8525	8526	8527
39	8528	8529	8530	8531	8532	8533	8534	8535	8536	8537
40	8538	8539	8540	8541	8542	8543	8544	8545	8546	8547
41	8548	8549	8550	8551	8552	8553	8554	8555	8556	8557
42	8558	8559	8560	8561	8562	8563	8564	8565	8566	8567
43	8568	8569	8570	8571	8572	8573	8574	8575	8576	8577
44	8578	8579	8580	8581	8582	8583	8584	8585	8586	8587
45	8588	8589	8590	8591	8592	8593	8594	8595	8596	8597
46	8598	8599	8600	8601	8602	8603	8604	8605	8606	8607
47	8608	8609	8610	8611	8612	8613	8614	8615	8616	8617
48	8618	8619	8620	8621	8622	8623	8624	8625	8626	8627
49	8628	8629	8630	8631	8632	8633	8634	8635	8636	8637
50	8638	8639	8640	8641	8642	8643	8644	8645	8646	8647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
51	8648	8649	8650	8651	8652	8653	8654	8655	8656	8657
52	8658	8659	8660	8661	8662	8663	8664	8665	8666	8667
53	8668	8669	8670	8671	8672	8673	8674	8675	8676	8677
54	8678	8679	8680	8681	8682	8683	8684	8685	8686	8687
55	8688	8689	8690	8691	8692	8693	8694	8695	8696	8697
56	8698	8699	8700	8701	8702	8703	8704	8705	8706	8707
57	8708	8709	8710	8711	8712	8713	8714	8715	8716	8717
58	8718	8719	8720	8721	8722	8723	8724	8725	8726	8727
59	8728	8729	8730	8731	8732	8733	8734	8735	8736	8737
60	8738	8739	8740	8741	8742	8743	8744	8745	8746	8747
61	8748	8749	8750	8751	8752	8753	8754	8755	8756	8757
62	8758	8759	8760	8761	8762	8763	8764	8765	8766	8767
63	8768	8769	8770	8771	8772	8773	8774	8775	8776	8777
64	8778	8779	8780	8781	8782	8783	8784	8785	8786	8787
65	8788	8789	8790	8791	8792	8793	8794	8795	8796	8797
66	8798	8799	8800	8801	8802	8803	8804	8805	8806	8807
67	8808	8809	8810	8811	8812	8813	8814	8815	8816	8817
68	8818	8819	8820	8821	8822	8823	8824	8825	8826	8827
69	8828	8829	8830	8831	8832	8833	8834	8835	8836	8837
70	8838	8839	8840	8841	8842	8843	8844	8845	8846	8847
71	8848	8849	8850	8851	8852	8853	8854	8855	8856	8857
72	8858	8859	8860	8861	8862	8863	8864	8865	8866	8867
73	8868	8869	8870	8871	8872	8873	8874	8875	8876	8877
74	8878	8879	8880	8881	8882	8883	8884	8885	8886	8887
75	8888	8889	8890	8891	8892	8893	8894	8895	8896	8897
76	8898	8899	8900	8901	8902	8903	8904	8905	8906	8907
77	8908	8909	8910	8911	8912	8913	8914	8915	8916	8917
78	8918	8919	8920	8921	8922	8923	8924	8925	8926	8927
79	8928	8929	8930	8931	8932	8933	8934	8935	8936	8937
80	8938	8939	8940	8941	8942	8943	8944	8945	8946	8947
81	8948	8949	8950	8951	8952	8953	8954	8955	8956	8957
82	8958	8959	8960	8961	8962	8963	8964	8965	8966	8967
83	8968	8969	8970	8971	8972	8973	8974	8975	8976	8977
84	8978	8979	8980	8981	8982	8983	8984	8985	8986	8987
85	8988	8989	8990	8991	8992	8993	8994	8995	8996	8997
86	8998	8999	9000	9001	9002	9003	9004	9005	9006	9007
87	9008	9009	9010	9011	9012	9013	9014	9015	9016	9017
88	9018	9019	9020	9021	9022	9023	9024	9025	9026	9027
89	9028	9029	9030	9031	9032	9033	9034	9035	9036	9037
90	9038	9039	9040	9041	9042	9043	9044	9045	9046	9047
91	9048	9049	9050	9051	9052	9053	9054	9055	9056	9057
92	9058	9059	9060	9061	9062	9063	9064	9065	9066	9067
93	9068	9069	9070	9071	9072	9073	9074	9075	9076	9077
94	9078	9079	9080	9081	9082	9083	9084	9085	9086	9087
95	9088	9089	9090	9091	9092	9093	9094	9095	9096	9097
96	9098	9099	9100	9101	9102	9103	9104	9105	9106	9107
97	9108	9109	9110	9111	9112	9113	9114	9115	9116	9117
98	9118	9119	9120	9121	9122	9123	9124	9125	9126	9127
99	9128	9129	9130	9131	9132	9133	9134	9135	9136	9137
100	9138	9139	9140	9141	9142	9143	9144	9145	9146	9147

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
101	9148	9149	9150	9151	9152	9153	9154	9155	9156	9157
102	9158	9159	9160	9161	9162	9163	9164	9165	9166	9167
103	9168	9169	9170	9171	9172	9173	9174	9175	9176	9177
104	9178	9179	9180	9181	9182	9183	9184	9185	9186	9187
105	9188	9189	9190	9191	9192	9193	9194	9195	9196	9197
106	9198	9199	9200	9201	9202	9203	9204	9205	9206	9207
107	9208	9209	9210	9211	9212	9213	9214	9215	9216	9217
108	9218	9219	9220	9221	9222	9223	9224	9225	9226	9227
109	9228	9229	9230	9231	9232	9233	9234	9235	9236	9237
110	9238	9239	9240	9241	9242	9243	9244	9245	9246	9247
111	9248	9249	9250	9251	9252	9253	9254	9255	9256	9257
112	9258	9259	9260	9261	9262	9263	9264	9265	9266	9267
113	9268	9269	9270	9271	9272	9273	9274	9275	9276	9277
114	9278	9279	9280	9281	9282	9283	9284	9285	9286	9287
115	9288	9289	9290	9291	9292	9293	9294	9295	9296	9297
116	9298	9299	9300	9301	9302	9303	9304	9305	9306	9307
117	9308	9309	9310	9311	9312	9313	9314	9315	9316	9317
118	9318	9319	9320	9321	9322	9323	9324	9325	9326	9327
119	9328	9329	9330	9331	9332	9333	9334	9335	9336	9337
120	9338	9339	9340	9341	9342	9343	9344	9345	9346	9347
121	9348	9349	9350	9351	9352	9353	9354	9355	9356	9357
122	9358	9359	9360	9361	9362	9363	9364	9365	9366	9367
123	9368	9369	9370	9371	9372	9373	9374	9375	9376	9377
124	9378	9379	9380	9381	9382	9383	9384	9385	9386	9387
125	9388	9389	9390	9391	9392	9393	9394	9395	9396	9397
126	9398	9399	9400	9401	9402	9403	9404	9405	9406	9407
127	9408	9409	9410	9411	9412	9413	9414	9415	9416	9417
128	9418	9419	9420	9421	9422	9423	9424	9425	9426	9427
129	9428	9429	9430	9431	9432	9433	9434	9435	9436	9437
130	9438	9439	9440	9441	9442	9443	9444	9445	9446	9447
131	9448	9449	9450	9451	9452	9453	9454	9455	9456	9457
132	9458	9459	9460	9461	9462	9463	9464	9465	9466	9467
133	9468	9469	9470	9471	9472	9473	9474	9475	9476	9477
134	9478	9479	9480	9481	9482	9483	9484	9485	9486	9487
135	9488	9489	9490	9491	9492	9493	9494	9495	9496	9497
136	9498	9499	9500	9501	9502	9503	9504	9505	9506	9507
137	9508	9509	9510	9511	9512	9513	9514	9515	9516	9517
138	9518	9519	9520	9521	9522	9523	9524	9525	9526	9527
139	9528	9529	9530	9531	9532	9533	9534	9535	9536	9537
140	9538	9539	9540	9541	9542	9543	9544	9545	9546	9547
141	9548	9549	9550	9551	9552	9553	9554	9555	9556	9557
142	9558	9559	9560	9561	9562	9563	9564	9565	9566	9567
143	9568	9569	9570	9571	9572	9573	9574	9575	9576	9577
144	9578	9579	9580	9581	9582	9583	9584	9585	9586	9587
145	9588	9589	9590	9591	9592	9593	9594	9595	9596	9597
146	9598	9599	9600	9601	9602	9603	9604	9605	9606	9607
147	9608	9609	9610	9611	9612	9613	9614	9615	9616	9617
148	9618	9619	9620	9621	9622	9623	9624	9625	9626	9627
149	9628	9629	9630	9631	9632	9633	9634	9635	9636	9637
150	9638	9639	9640	9641	9642	9643	9644	9645	9646	9647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
151	9648	9649	9650	9651	9652	9653	9654	9655	9656	9657
152	9658	9659	9660	9661	9662	9663	9664	9665	9666	9667
153	9668	9669	9670	9671	9672	9673	9674	9675	9676	9677
154	9678	9679	9680	9681	9682	9683	9684	9685	9686	9687
155	9688	9689	9690	9691	9692	9693	9694	9695	9696	9697
156	9698	9699	9700	9701	9702	9703	9704	9705	9706	9707
157	9708	9709	9710	9711	9712	9713	9714	9715	9716	9717
158	9718	9719	9720	9721	9722	9723	9724	9725	9726	9727
159	9728	9729	9730	9731	9732	9733	9734	9735	9736	9737
160	9738	9739	9740	9741	9742	9743	9744	9745	9746	9747
161	9748	9749	9750	9751	9752	9753	9754	9755	9756	9757
162	9758	9759	9760	9761	9762	9763	9764	9765	9766	9767
163	9768	9769	9770	9771	9772	9773	9774	9775	9776	9777
164	9778	9779	9780	9781	9782	9783	9784	9785	9786	9787
165	9788	9789	9790	9791	9792	9793	9794	9795	9796	9797
166	9798	9799	9800	9801	9802	9803	9804	9805	9806	9807
167	9808	9809	9810	9811	9812	9813	9814	9815	9816	9817
168	9818	9819	9820	9821	9822	9823	9824	9825	9826	9827
169	9828	9829	9830	9831	9832	9833	9834	9835	9836	9837
170	9838	9839	9840	9841	9842	9843	9844	9845	9846	9847
171	9848	9849	9850	9851	9852	9853	9854	9855	9856	9857
172	9858	9859	9860	9861	9862	9863	9864	9865	9866	9867
173	9868	9869	9870	9871	9872	9873	9874	9875	9876	9877
174	9878	9879	9880	9881	9882	9883	9884	9885	9886	9887
175	9888	9889	9890	9891	9892	9893	9894	9895	9896	9897
176	9898	9899	9900	9901	9902	9903	9904	9905	9906	9907
177	9908	9909	9910	9911	9912	9913	9914	9915	9916	9917
178	9918	9919	9920	9921	9922	9923	9924	9925	9926	9927
179	9928	9929	9930	9931	9932	9933	9934	9935	9936	9937
180	9938	9939	9940	9941	9942	9943	9944	9945	9946	9947
181	9948	9949	9950	9951	9952	9953	9954	9955	9956	9957
182	9958	9959	9960	9961	9962	9963	9964	9965	9966	9967
183	9968	9969	9970	9971	9972	9973	9974	9975	9976	9977
184	9978	9979	9980	9981	9982	9983	9984	9985	9986	9987
185	9988	9989	9990	9991	9992	9993	9994	9995	9996	9997
186	9998	9999	10000	10001	10002	10003	10004	10005	10006	10007
187	10008	10009	10010	10011	10012	10013	10014	10015	10016	10017
188	10018	10019	10020	10021	10022	10023	10024	10025	10026	10027
189	10028	10029	10030	10031	10032	10033	10034	10035	10036	10037
190	10038	10039	10040	10041	10042	10043	10044	10045	10046	10047
191	10048	10049	10050	10051	10052	10053	10054	10055	10056	10057
192	10058	10059	10060	10061	10062	10063	10064	10065	10066	10067
193	10068	10069	10070	10071	10072	10073	10074	10075	10076	10077
194	10078	10079	10080	10081	10082	10083	10084	10085	10086	10087
195	10088	10089	10090	10091	10092	10093	10094	10095	10096	10097
196	10098	10099	10100	10101	10102	10103	10104	10105	10106	10107
197	10108	10109	10110	10111	10112	10113	10114	10115	10116	10117
198	10118	10119	10120	10121	10122	10123	10124	10125	10126	10127
199	10128	10129	10130	10131	10132	10133	10134	10135	10136	10137
200	10138	10139	10140	10141	10142	10143	10144	10145	10146	10147

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
201	10148	10149	10150	10151	10152	10153	10154	10155	10156	10157
202	10158	10159	10160	10161	10162	10163	10164	10165	10166	10167
203	10168	10169	10170	10171	10172	10173	10174	10175	10176	10177
204	10178	10179	10180	10181	10182	10183	10184	10185	10186	10187
205	10188	10189	10190	10191	10192	10193	10194	10195	10196	10197
206	10198	10199	10200	10201	10202	10203	10204	10205	10206	10207
207	10208	10209	10210	10211	10212	10213	10214	10215	10216	10217
208	10218	10219	10220	10221	10222	10223	10224	10225	10226	10227
209	10228	10229	10230	10231	10232	10233	10234	10235	10236	10237
210	10238	10239	10240	10241	10242	10243	10244	10245	10246	10247
211	10248	10249	10250	10251	10252	10253	10254	10255	10256	10257
212	10258	10259	10260	10261	10262	10263	10264	10265	10266	10267
213	10268	10269	10270	10271	10272	10273	10274	10275	10276	10277
214	10278	10279	10280	10281	10282	10283	10284	10285	10286	10287
215	10288	10289	10290	10291	10292	10293	10294	10295	10296	10297
216	10298	10299	10300	10301	10302	10303	10304	10305	10306	10307
217	10308	10309	10310	10311	10312	10313	10314	10315	10316	10317
218	10318	10319	10320	10321	10322	10323	10324	10325	10326	10327
219	10328	10329	10330	10331	10332	10333	10334	10335	10336	10337
220	10338	10339	10340	10341	10342	10343	10344	10345	10346	10347
221	10348	10349	10350	10351	10352	10353	10354	10355	10356	10357
222	10358	10359	10360	10361	10362	10363	10364	10365	10366	10367
223	10368	10369	10370	10371	10372	10373	10374	10375	10376	10377
224	10378	10379	10380	10381	10382	10383	10384	10385	10386	10387
225	10388	10389	10390	10391	10392	10393	10394	10395	10396	10397
226	10398	10399	10400	10401	10402	10403	10404	10405	10406	10407
227	10408	10409	10410	10411	10412	10413	10414	10415	10416	10417
228	10418	10419	10420	10421	10422	10423	10424	10425	10426	10427
229	10428	10429	10430	10431	10432	10433	10434	10435	10436	10437
230	10438	10439	10440	10441	10442	10443	10444	10445	10446	10447
231	10448	10449	10450	10451	10452	10453	10454	10455	10456	10457
232	10458	10459	10460	10461	10462	10463	10464	10465	10466	10467
233	10468	10469	10470	10471	10472	10473	10474	10475	10476	10477
234	10478	10479	10480	10481	10482	10483	10484	10485	10486	10487
235	10488	10489	10490	10491	10492	10493	10494	10495	10496	10497
236	10498	10499	10500	10501	10502	10503	10504	10505	10506	10507
237	10508	10509	10510	10511	10512	10513	10514	10515	10516	10517
238	10518	10519	10520	10521	10522	10523	10524	10525	10526	10527
239	10528	10529	10530	10531	10532	10533	10534	10535	10536	10537
240	10538	10539	10540	10541	10542	10543	10544	10545	10546	10547
241	10548	10549	10550	10551	10552	10553	10554	10555	10556	10557
242	10558	10559	10560	10561	10562	10563	10564	10565	10566	10567
243	10568	10569	10570	10571	10572	10573	10574	10575	10576	10577
244	10578	10579	10580	10581	10582	10583	10584	10585	10586	10587
245	10588	10589	10590	10591	10592	10593	10594	10595	10596	10597
246	10598	10599	10600	10601	10602	10603	10604	10605	10606	10607
247	10608	10609	10610	10611	10612	10613	10614	10615	10616	10617
248	10618	10619	10620	10621	10622	10623	10624	10625	10626	10627
249	10628	10629	10630	10631	10632	10633	10634	10635	10636	10637
250	10638	10639	10640	10641	10642	10643	10644	10645	10646	10647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
251	10648	10649	10650	10651	10652	10653	10654	10655	10656	10657
252	10658	10659	10660	10661	10662	10663	10664	10665	10666	10667
253	10668	10669	10670	10671	10672	10673	10674	10675	10676	10677
254	10678	10679	10680	10681	10682	10683	10684	10685	10686	10687
255	10688	10689	10690	10691	10692	10693	10694	10695	10696	10697
256	10698	10699	10700	10701	10702	10703	10704	10705	10706	10707
257	10708	10709	10710	10711	10712	10713	10714	10715	10716	10717
258	10718	10719	10720	10721	10722	10723	10724	10725	10726	10727
259	10728	10729	10730	10731	10732	10733	10734	10735	10736	10737
260	10738	10739	10740	10741	10742	10743	10744	10745	10746	10747
261	10748	10749	10750	10751	10752	10753	10754	10755	10756	10757
262	10758	10759	10760	10761	10762	10763	10764	10765	10766	10767
263	10768	10769	10770	10771	10772	10773	10774	10775	10776	10777
264	10778	10779	10780	10781	10782	10783	10784	10785	10786	10787
265	10788	10789	10790	10791	10792	10793	10794	10795	10796	10797
266	10798	10799	10800	10801	10802	10803	10804	10805	10806	10807
267	10808	10809	10810	10811	10812	10813	10814	10815	10816	10817
268	10818	10819	10820	10821	10822	10823	10824	10825	10826	10827
269	10828	10829	10830	10831	10832	10833	10834	10835	10836	10837
270	10838	10839	10840	10841	10842	10843	10844	10845	10846	10847
271	10848	10849	10850	10851	10852	10853	10854	10855	10856	10857
272	10858	10859	10860	10861	10862	10863	10864	10865	10866	10867
273	10868	10869	10870	10871	10872	10873	10874	10875	10876	10877
274	10878	10879	10880	10881	10882	10883	10884	10885	10886	10887
275	10888	10889	10890	10891	10892	10893	10894	10895	10896	10897
276	10898	10899	10900	10901	10902	10903	10904	10905	10906	10907
277	10908	10909	10910	10911	10912	10913	10914	10915	10916	10917
278	10918	10919	10920	10921	10922	10923	10924	10925	10926	10927
279	10928	10929	10930	10931	10932	10933	10934	10935	10936	10937
280	10938	10939	10940	10941	10942	10943	10944	10945	10946	10947
281	10948	10949	10950	10951	10952	10953	10954	10955	10956	10957
282	10958	10959	10960	10961	10962	10963	10964	10965	10966	10967
283	10968	10969	10970	10971	10972	10973	10974	10975	10976	10977
284	10978	10979	10980	10981	10982	10983	10984	10985	10986	10987
285	10988	10989	10990	10991	10992	10993	10994	10995	10996	10997
286	10998	10999	11000	11001	11002	11003	11004	11005	11006	11007
287	11008	11009	11010	11011	11012	11013	11014	11015	11016	11017
288	11018	11019	11020	11021	11022	11023	11024	11025	11026	11027
289	11028	11029	11030	11031	11032	11033	11034	11035	11036	11037
290	11038	11039	11040	11041	11042	11043	11044	11045	11046	11047
291	11048	11049	11050	11051	11052	11053	11054	11055	11056	11057
292	11058	11059	11060	11061	11062	11063	11064	11065	11066	11067
293	11068	11069	11070	11071	11072	11073	11074	11075	11076	11077
294	11078	11079	11080	11081	11082	11083	11084	11085	11086	11087
295	11088	11089	11090	11091	11092	11093	11094	11095	11096	11097
296	11098	11099	11100	11101	11102	11103	11104	11105	11106	11107
297	11108	11109	11110	11111	11112	11113	11114	11115	11116	11117
298	11118	11119	11120	11121	11122	11123	11124	11125	11126	11127
299	11128	11129	11130	11131	11132	11133	11134	11135	11136	11137
300	11138	11139	11140	11141	11142	11143	11144	11145	11146	11147

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
301	11148	11149	11150	11151	11152	11153	11154	11155	11156	11157
302	11158	11159	11160	11161	11162	11163	11164	11165	11166	11167
303	11168	11169	11170	11171	11172	11173	11174	11175	11176	11177
304	11178	11179	11180	11181	11182	11183	11184	11185	11186	11187
305	11188	11189	11190	11191	11192	11193	11194	11195	11196	11197
306	11198	11199	11200	11201	11202	11203	11204	11205	11206	11207
307	11208	11209	11210	11211	11212	11213	11214	11215	11216	11217
308	11218	11219	11220	11221	11222	11223	11224	11225	11226	11227
309	11228	11229	11230	11231	11232	11233	11234	11235	11236	11237
310	11238	11239	11240	11241	11242	11243	11244	11245	11246	11247
311	11248	11249	11250	11251	11252	11253	11254	11255	11256	11257
312	11258	11259	11260	11261	11262	11263	11264	11265	11266	11267
313	11268	11269	11270	11271	11272	11273	11274	11275	11276	11277
314	11278	11279	11280	11281	11282	11283	11284	11285	11286	11287
315	11288	11289	11290	11291	11292	11293	11294	11295	11296	11297
316	11298	11299	11300	11301	11302	11303	11304	11305	11306	11307
317	11308	11309	11310	11311	11312	11313	11314	11315	11316	11317
318	11318	11319	11320	11321	11322	11323	11324	11325	11326	11327
319	11328	11329	11330	11331	11332	11333	11334	11335	11336	11337
320	11338	11339	11340	11341	11342	11343	11344	11345	11346	11347
321	11348	11349	11350	11351	11352	11353	11354	11355	11356	11357
322	11358	11359	11360	11361	11362	11363	11364	11365	11366	11367
323	11368	11369	11370	11371	11372	11373	11374	11375	11376	11377
324	11378	11379	11380	11381	11382	11383	11384	11385	11386	11387
325	11388	11389	11390	11391	11392	11393	11394	11395	11396	11397
326	11398	11399	11400	11401	11402	11403	11404	11405	11406	11407
327	11408	11409	11410	11411	11412	11413	11414	11415	11416	11417
328	11418	11419	11420	11421	11422	11423	11424	11425	11426	11427
329	11428	11429	11430	11431	11432	11433	11434	11435	11436	11437
330	11438	11439	11440	11441	11442	11443	11444	11445	11446	11447
331	11448	11449	11450	11451	11452	11453	11454	11455	11456	11457
332	11458	11459	11460	11461	11462	11463	11464	11465	11466	11467
333	11468	11469	11470	11471	11472	11473	11474	11475	11476	11477
334	11478	11479	11480	11481	11482	11483	11484	11485	11486	11487
335	11488	11489	11490	11491	11492	11493	11494	11495	11496	11497
336	11498	11499	11500	11501	11502	11503	11504	11505	11506	11507
337	11508	11509	11510	11511	11512	11513	11514	11515	11516	11517
338	11518	11519	11520	11521	11522	11523	11524	11525	11526	11527
339	11528	11529	11530	11531	11532	11533	11534	11535	11536	11537
340	11538	11539	11540	11541	11542	11543	11544	11545	11546	11547
341	11548	11549	11550	11551	11552	11553	11554	11555	11556	11557
342	11558	11559	11560	11561	11562	11563	11564	11565	11566	11567
343	11568	11569	11570	11571	11572	11573	11574	11575	11576	11577
344	11578	11579	11580	11581	11582	11583	11584	11585	11586	11587
345	11588	11589	11590	11591	11592	11593	11594	11595	11596	11597
346	11598	11599	11600	11601	11602	11603	11604	11605	11606	11607
347	11608	11609	11610	11611	11612	11613	11614	11615	11616	11617
348	11618	11619	11620	11621	11622	11623	11624	11625	11626	11627
349	11628	11629	11630	11631	11632	11633	11634	11635	11636	11637
350	11638	11639	11640	11641	11642	11643	11644	11645	11646	11647

Step	Target position		Cir. int. aux. point		Speed		Dwell time	M code	Control word	dummy
	Low	High	Low	High	Low	High				
351	11648	11649	11650	11651	11652	11653	11654	11655	11656	11657
352	11658	11659	11660	11661	11662	11663	11664	11665	11666	11667
353	11668	11669	11670	11671	11672	11673	11674	11675	11676	11677
354	11678	11679	11680	11681	11682	11683	11684	11685	11686	11687
355	11688	11689	11690	11691	11692	11693	11694	11695	11696	11697
356	11698	11699	11700	11701	11702	11703	11704	11705	11706	11707
357	11708	11709	11710	11711	11712	11713	11714	11715	11716	11717
358	11718	11719	11720	11721	11722	11723	11724	11725	11726	11727
359	11728	11729	11730	11731	11732	11733	11734	11735	11736	11737
360	11738	11739	11740	11741	11742	11743	11744	11745	11746	11747
361	11748	11749	11750	11751	11752	11753	11754	11755	11756	11757
362	11758	11759	11760	11761	11762	11763	11764	11765	11766	11767
363	11768	11769	11770	11771	11772	11773	11774	11775	11776	11777
364	11778	11779	11780	11781	11782	11783	11784	11785	11786	11787
365	11788	11789	11790	11791	11792	11793	11794	11795	11796	11797
366	11798	11799	11800	11801	11802	11803	11804	11805	11806	11807
367	11808	11809	11810	11811	11812	11813	11814	11815	11816	11817
368	11818	11819	11820	11821	11822	11823	11824	11825	11826	11827
369	11828	11829	11830	11831	11832	11833	11834	11835	11836	11837
370	11838	11839	11840	11841	11842	11843	11844	11845	11846	11847
371	11848	11849	11850	11851	11852	11853	11854	11855	11856	11857
372	11858	11859	11860	11861	11862	11863	11864	11865	11866	11867
373	11868	11869	11870	11871	11872	11873	11874	11875	11876	11877
374	11878	11879	11880	11881	11882	11883	11884	11885	11886	11887
375	11888	11889	11890	11891	11892	11893	11894	11895	11896	11897
376	11898	11899	11900	11901	11902	11903	11904	11905	11906	11907
377	11908	11909	11910	11911	11912	11913	11914	11915	11916	11917
378	11918	11919	11920	11921	11922	11923	11924	11925	11926	11927
379	11928	11929	11930	11931	11932	11933	11934	11935	11936	11937
380	11938	11939	11940	11941	11942	11943	11944	11945	11946	11947
381	11948	11949	11950	11951	11952	11953	11954	11955	11956	11957
382	11958	11959	11960	11961	11962	11963	11964	11965	11966	11967
383	11968	11969	11970	11971	11972	11973	11974	11975	11976	11977
384	11978	11979	11980	11981	11982	11983	11984	11985	11986	11987
385	11988	11989	11990	11991	11992	11993	11994	11995	11996	11997
386	11998	11999	12000	12001	12002	12003	12004	12005	12006	12007
387	12008	12009	12010	12011	12012	12013	12014	12015	12016	12017
388	12018	12019	12020	12021	12022	12023	12024	12025	12026	12027
389	12028	12029	12030	12031	12032	12033	12034	12035	12036	12037
390	12038	12039	12040	12041	12042	12043	12044	12045	12046	12047
391	12048	12049	12050	12051	12052	12053	12054	12055	12056	12057
392	12058	12059	12060	12061	12062	12063	12064	12065	12066	12067
393	12068	12069	12070	12071	12072	12073	12074	12075	12076	12077
394	12078	12079	12080	12081	12082	12083	12084	12085	12086	12087
395	12088	12089	12090	12091	12092	12093	12094	12095	12096	12097
396	12098	12099	12100	12101	12102	12103	12104	12105	12106	12107
397	12108	12109	12110	12111	12112	12113	12114	12115	12116	12117
398	12118	12119	12120	12121	12122	12123	12124	12125	12126	12127
399	12128	12129	12130	12131	12132	12133	12134	12135	12136	12137
400	12138	12139	12140	12141	12142	12143	12144	12145	12146	12147

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

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 pleasurably environmental preservation of the earth.

About Disposal

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.

LS values every single customers.

Quality and service come first at LSIS.

Always at your service, standing for our customers.

http://eng.lsis.biz

LS Industrial Systems

10310000536

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※ LS Industrial Systems constantly endeavors to improve its product so that Information in this manual is subject to change without notice.

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