The right choice for the ultimate yield!

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

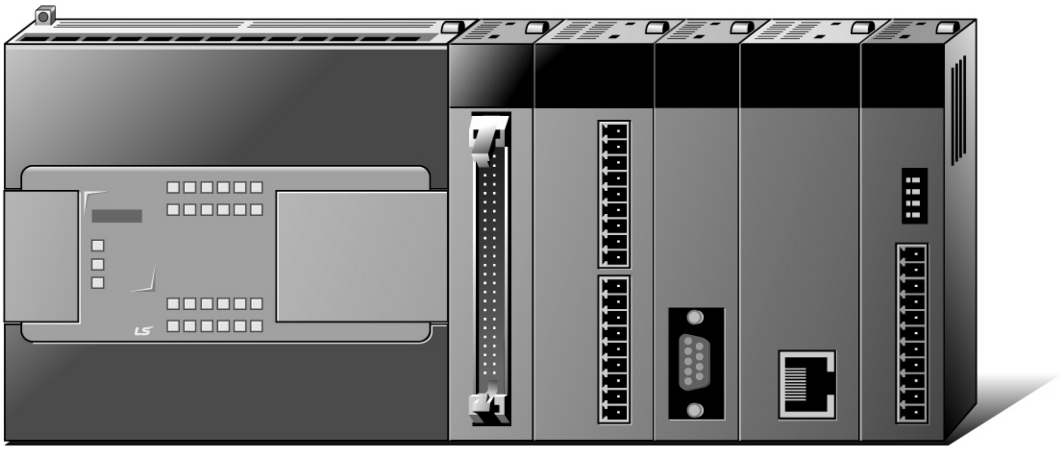
Programmable Logic Control

XGB Positioning Module

XGT Series

User Manual

XBF-PD02A



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 ELECTRIC

Before using the product …

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

► Safety Instructions should always be observed in order to prevent accident or risk with the safe and proper use the product.

► Instructions are divided into "Warning" and "Caution", and the meaning of the terms is as follows.

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

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

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

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

⚠ Be careful! Danger may be expected.

⚠ Be careful! Electric shock may occur.

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

Safety Instructions for design process

⚠ Warning

- **Please install a protection circuit on the exterior of PLC so that the whole system may operate safely regardless of failures from external power or PLC.** Any abnormal output or operation from PLC may cause serious problems to safety in whole system.
  - Install protection units on the exterior of PLC like an interlock circuit that deals with opposite operations such as emergency stop, protection circuit, and forward/reverse rotation or install an interlock circuit that deals with high/low limit under its position controls.
  - If any system error (watch-dog timer error, module installation error, etc.) is detected during CPU operation in PLC, all output signals are designed to be turned off and stopped for safety. However, there are cases when output signals remain active due to device failures in Relay and TR which can't be detected. Thus, you are recommended to install an addition circuit to monitor the output status for those critical outputs which may cause significant problems.
- **Never overload more than rated current of output module nor allow to have a short circuit**. Over current for a long period time may cause a fire.
- **Never let the external power of the output circuit to be on earlier than PLC power**, which may cause accidents from abnormal output or operation.
- **Please install interlock circuits in the sequence program for safe operations in the system when exchange data with PLC or modify operation modes using a computer or other external equipments** Read specific instructions thoroughly when conducting control operations with PLC.

Safety Instructions for design process

⚠ Caution

- **I/O signal or communication line shall be wired at least 100mm away from a high-voltage cable or power line.** Fail to follow this

Safety Instructions on installation process

⚠ Caution

- **Use PLC only in the environment specified in PLC manual or general standard of data sheet.** If not, electric shock, fire, abnormal operation of the product may be caused.
- **Before install or remove the module, be sure PLC power is off.** If not, electric shock or damage on the product may be caused.
- **Be sure that every module is securely attached after adding a module or an extension connector.** If the product is installed loosely or incorrectly, abnormal operation, error or dropping may be caused. In addition, contact failures under poor cable installation will be causing malfunctions as well.
- **Be sure that screws get tighten securely under vibrating environments.** Fail to do so will put the product under direct vibrations which will cause electric shock, fire and abnormal operation.
- **Do not come in contact with conducting parts in each module**, which may cause electric shock, malfunctions or abnormal operation.

Safety Instructions for wiring process

⚠ Warning

- **Prior to wiring works, make sure that every power is turned off.** If not, electric shock or damage on the product may be caused.
- **After wiring process is done, make sure that terminal covers are installed properly before its use.** Fail to install the cover may cause electric shocks.

⚠ Caution

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

Safety Instructions for test-operation and maintenance

Warning

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

Caution

- **Do not make modifications or disassemble each module.** Fire, electric shock or abnormal operation may occur.
- **Prior to installing or disassembling the module, let all the external power off including PLC power.** If not, electric shock or abnormal operation may occur.
- **Keep any wireless equipment such as walkie-talkie or cell phones at least 30cm away from PLC**. If not, abnormal operation may be caused.
- **When making a modification on programs or using run to modify functions under PLC operations, read and comprehend all contents in the manual fully.** Mismanagement will cause damages to products and accidents.
- **Avoid any physical impact to the battery and prevent it from dropping as well.** Damages to battery may cause leakage from its fluid. When battery was dropped or exposed under strong impact, never reuse the battery again. Moreover skilled workers are needed when exchanging batteries.

Safety Instructions for waste disposal

⚠ Caution

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

Revision History

Version	Date	Remark	Page
V 1.0	’10. 1	1. First Edition	-
V1.1	’11. 4	1. Smart Link → I/O Link Revision 2. XEC Type Address Addtion.	2-7 5-8, 9-63
V1.2	’13.10	1. Clear deviation counter Addtion 2. Mitsubishi Servo driver MR-J3 Wiring Method Added 3. Encoder Preset(EPRS) setting Method Added 4. Teaching Array(TWR) Exam Program Added 5. Operation State Reading(SRD) Device Revision 6. Positioning System Current consumption Added	2-6 3-5 6-24 6-28 6-39 Appendix 2
V1.3	’14. 4	1. Added to the deviation counter clear starting point	2-6
V1.4	’15. 7	1. Domain name changed 2. CI changed 3. General specifications changed by reason of changed IEC Specifications. 4. XDL-L7S Series Connection Changed	- - 2-1 2-10, 3-3
V1.5	’16. 3	1. Smart Link Connction Diagram Added and Changed 2. Position Overide Command Changed	2-8~12 6-16
V1.6	’20. 6	1. Changed company name to LS ELECTRIC	-
V1.7	’22.9	1. Changed domain to ls-electric.com	-
V1.8	’24.06	1. Changed Quality warranty period	-
V1.9	’24.10	1. Changed position override contents	9-5-2
V2.0	’25.03	1. Fixed typos in SSS, APM_SSS function	6-3-12 7-7-2

About User's Manual

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

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

Relevant User's Manuals

Title	Description	No. of User's Manual
XG5000 User's Manual (for XGK, XBC,XBM)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGB(MK language) CPU	10310000511
XG5000 User's Manual (for XGI, XGR, XEC)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGB(IEC language) CPU	10310000746
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.	10310000509
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.	10310000739
Ultimate Performance XGB Unit(MK/IEC)	It describes how to use XGB main unit, system configuration,mechanism,program function ,input/output function, Built-in High-speed Counter, Datalog, PID Control, Built-in Communication function, Built-in Position, Built-in Analog input/output..	10310000893, 10310001406
XGB hardware	It describes power, IO, extension specification and system configuration, built-in high speed counter of XGB main unit.	10310000893, 10310000981
XBC Standard / Economic Type Main Unit(MK/IEC)	It describes power, IO, extension specification and system configuration, built-in high speed counter of XGB standard / economic type main unit.	10310001090, 10310001273

◎ Contents ◎

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.

1.1 Characteristics

The characteristics of positioning module are as follows.

(1) The positioning module is available for XGB Series. (It can be used with expansive memory XBM-Dx-xxS type.)

(2) Various positioning control function

It has various functions needed for positioning system such as positioning control, speed control etc.

(a) Up to 150 operation data including positioning address and operation method, operation pattern is available to set for each axis. With this operation data, positioning for each axis is carried out

(b) Various operations are available.

1) Position Control
2) Speed Control
3) Synchronous Control
4) Linear Interpolation
5) Circular Interpolation

(c) Switching Control in operation is available.

1) Position/Speed Control Switching
2) Speed/Position Control Switching.

(d) Various Homing Control Function.

1) 5 methods are available for Homing
   a) The origin detection after DOG Off
   b)The origin detection after deceleration in case of DOG On
   c) The origin detection by DOG
   d) The origin detection by DOG and upper-lower limit
   e) The origin detection by upper-lower limit
2) Available to execute the positioning control (floating origin setting) from random position to the origin of machine

(3) Easy maintenance

Various data such as positioning data, parameter etc. are saved on flash memory in module. Therefore, data will be saved forever (The frequency of writing is limited to 100,000)

(4) The number of positioning module using in one basic unit is not limited

(a) it is available to use within the range satisfied with the capacity of 5V source supply current of basic unit.

(b) The mounting number of available current consumption of each module, please refer to Appendix 2.

(5) Self-diagnosis, monitoring, test by strong positioning software package is available.

(a) Monitoring (Module & External Input/output Signal) Function

(b) Reading and Saving Module Parameter/Operation Data

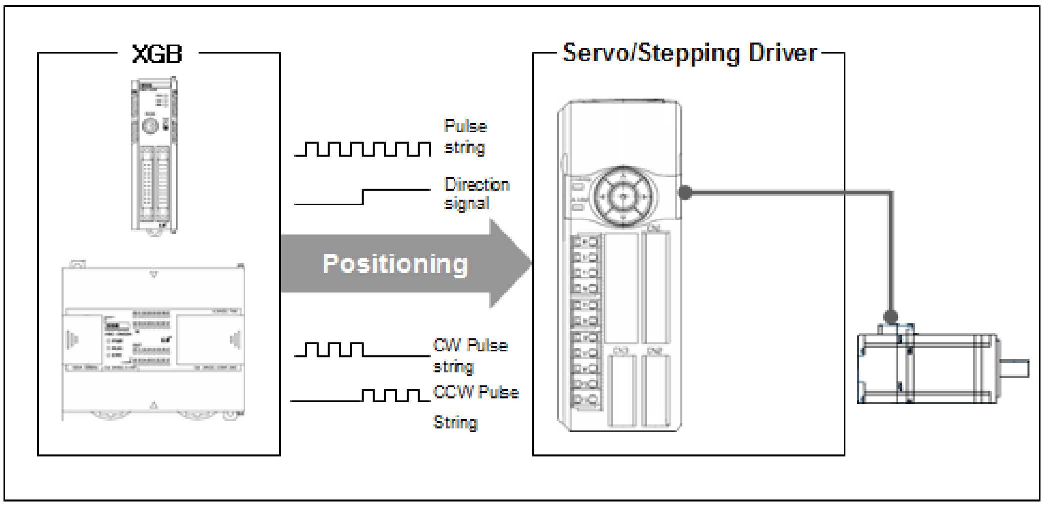
(c) Operation data edition of each axis is available in Excel program

(6) Applicable XGB main unit and XG5000 version for positioning module

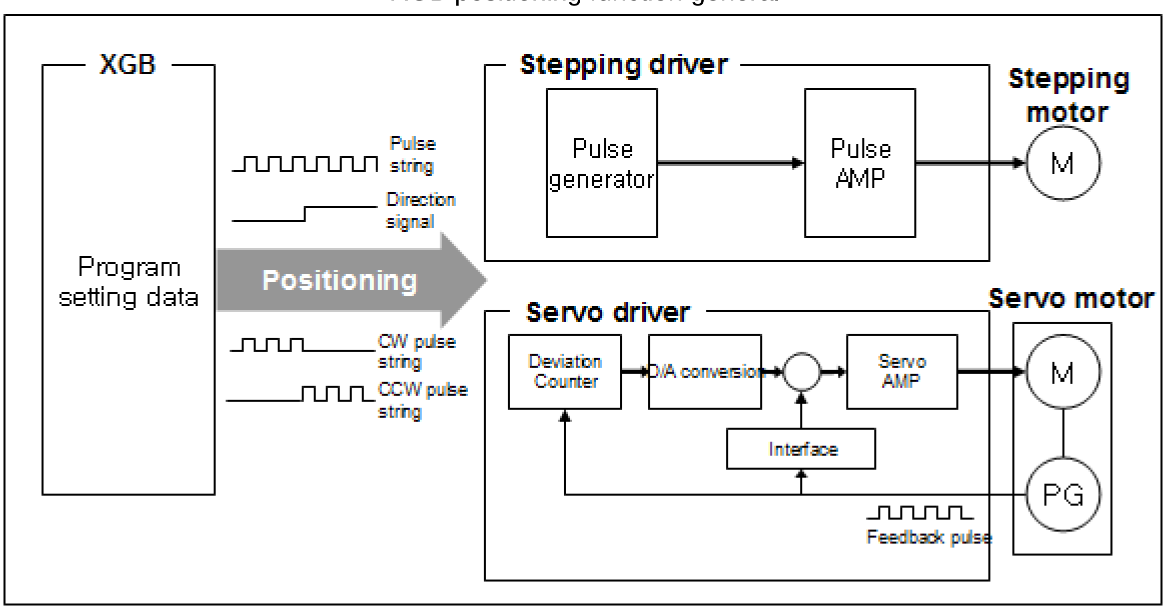
XGB basic unit	Version
XBM – Dx-xxS	Ver 3.00 or upper
XBC-DxxS	Ver 1.20 or upper
XBC-DxxSU	Ver 1.30 or upper
XBC-DxxH	Ver 1.80 or upper
XEC-DxxH	Ver 1.20 or upper
XEC-DxxSU	Ver 1.10 or upper
XG5000	Ver 3.10 or upper

1.2 Purpose of Positioning Control

The purpose of positioning module is to transfer the moving objects (unprocessed items, tools etc.) with 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.



< XGB positioning function general >



< Positioning system inner block diagram >

1.3 Signal Flow of Positioning Module

1.3.1 Operating sequence

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

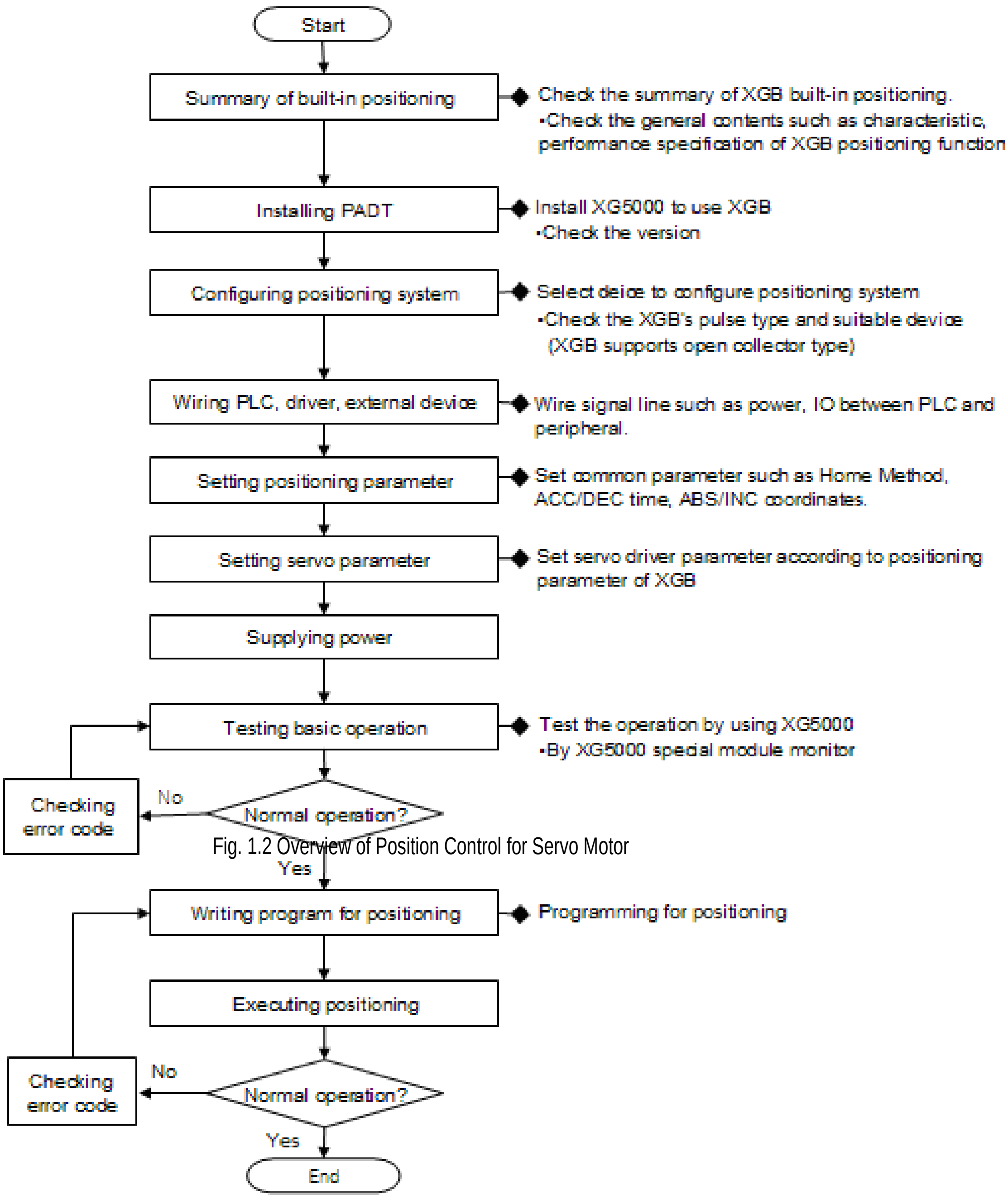
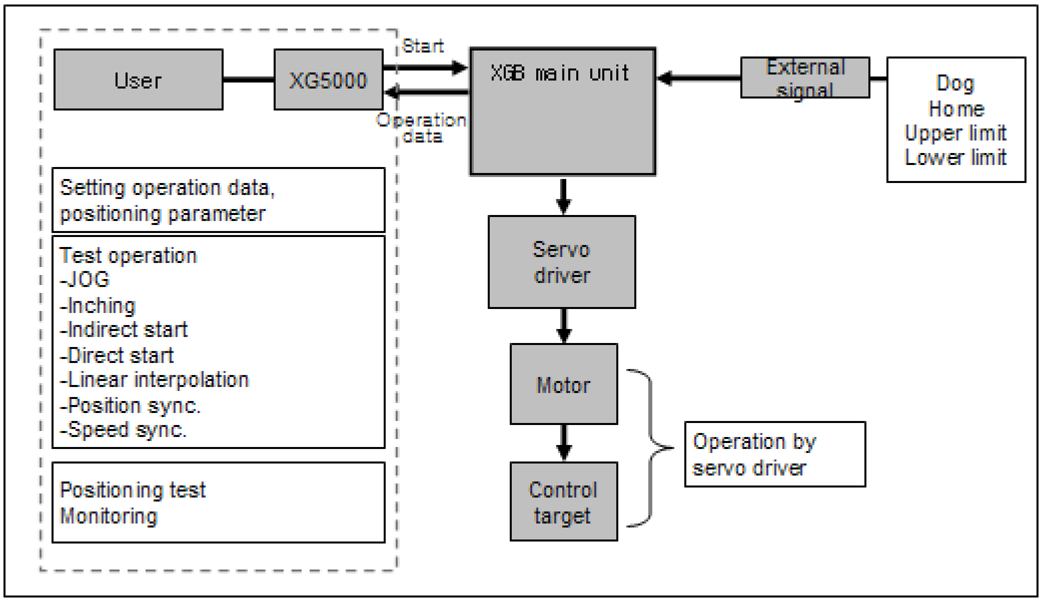


Fig. 1.2 Overview of Position Control for Servo Motor

1.3.2 Flow of position signal

Flow of position signal is as follows.



< XGB Positioning signal flow >

1.4 Function overview of positioning module

Describe Representative functions of positioning module (Linear Interpolation, Circular Interpolation & Stop) briefly. For detail, refer to CH.9

1.4.1 Position Control

Execute positioning control to the designated axis during the movement from starting position (current position) to goal position(the position to move to).

(1) Control by Absolute coordinates

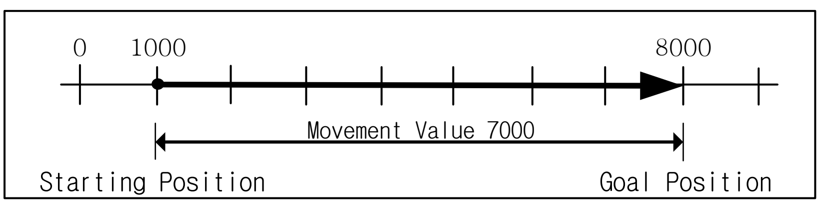
Execute positioning control from starting position to goal position that positioning data designated
Positioning control is executed by the position(origin position) homing designated.
Moving direction is decided by starting position and goal position.

- ■Starting Position < Goal Position : Forward Positioning Operation
- ■Starting Position > Goal Position : Reverse Positioning Operation

[Example]

- ■Starting Position : 1000
- ■Goal Position : 8000

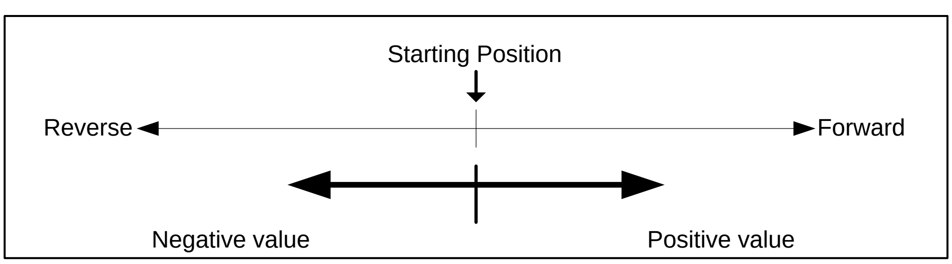
Value of Forward movement is 7000 (7000=8000-1000)



(2) Control by Incremental Coordinates

Execute positioning control from starting position as much as goal movement value.
The difference from absolute coordinates control is that the value goal position designated is movement value, not position value.
Moving direction depends on movement value is positive or negative.

- ■Positive value(+ or 0) : Positioning operation with forward direction
- ■Negative value(-) : Positioning operation with reverse direction

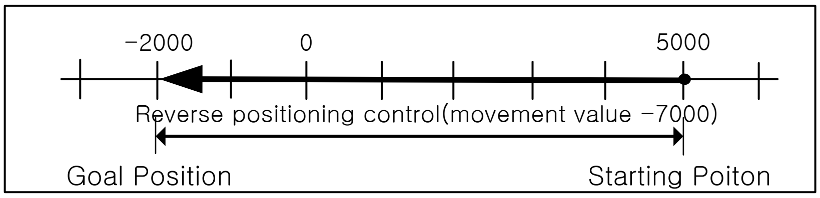


[Example]

■ Starting Position : 5000

■ Goal Position : -7000

In this condition, it moves reversely and positions at -2000.



1.4.2 Interpolation Control

(1) Linear Interpolation Control

Execute Linear interpolation control with designated axis at starting position (Current position).

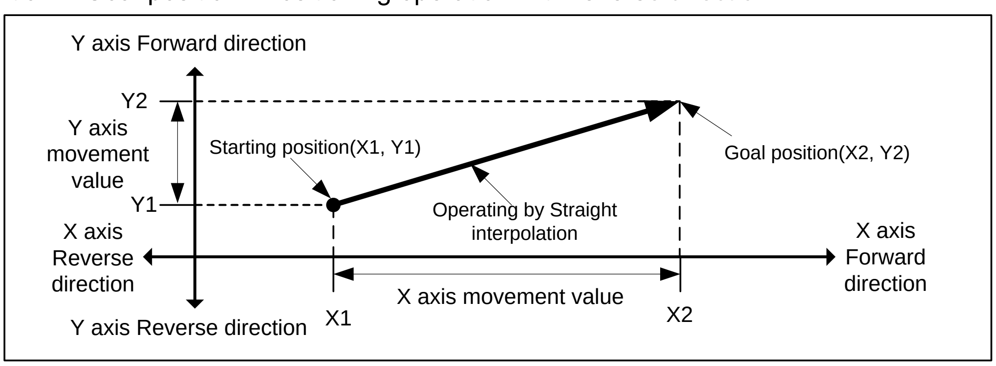
There are two methods for linear interpolation control (control by absolute coordinate and control by incremental coordinate)

(a) Linear interpolation by absolute coordinates

1) Execute Linear interpolation from starting position to goal position designated by positioning data.
2) Positioning control is executed from the position that homing designated.
3) Movement direction is designated by starting position & goal position of each axis.

■ Starting position < Goal position : Positioning operation with forward direction

■ Starting position > Goal position : Positioning operation with reverse direction

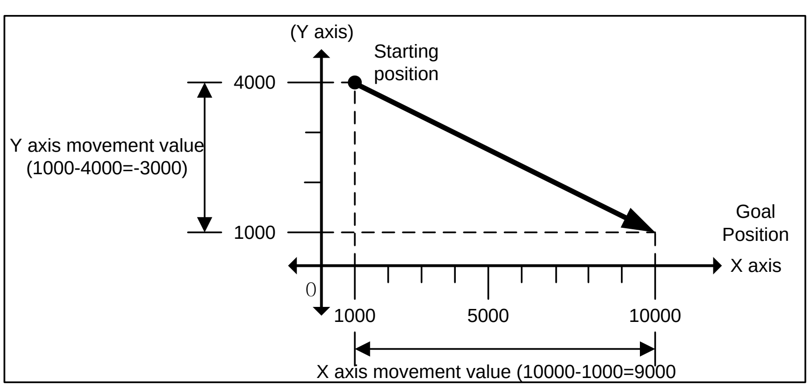


[Example]

■ Starting Position (1000, 4000)

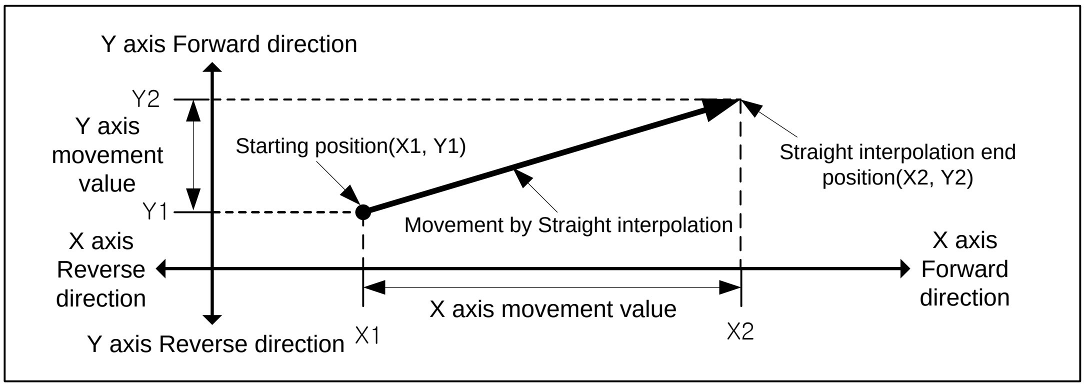
■ Goal Position (10000, 1000)

In this condition, operation is as follows.

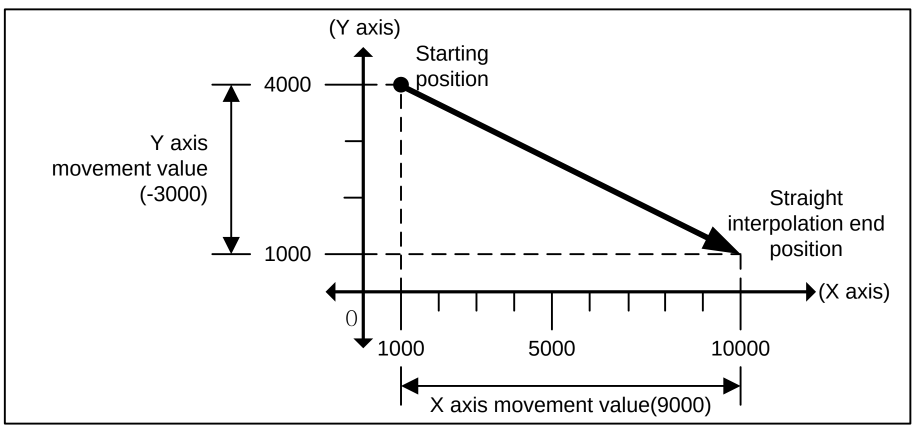


(b) Linear Interpolation by incremental coordinates

1) Execute Linear interpolation for the position that include starting address designated movement direction & movement value of each axis.
2) Moving direction depends on movement value is positive or negative.
 ■Positive value(+ or 0) : Positioning operation with forward direction
 ■Negative value(-) : Positioning operation with reverse direction



[Example]
 ■ Starting position (1000, 4000)
 ■ Goal position (9000, -3000)
 In this condition, operation is as follows.

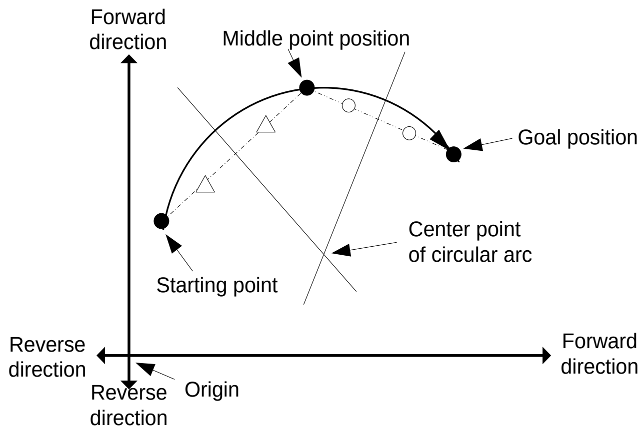


(2) Circular Interpolation Control

Execute interpolation operation along the trace of circle with 2 axis in forward direction that already designated for each axis.
Circular interpolation has 3 kinds of forms which are middle point form passing the position auxiliary point designated, center point form designates the position auxiliary point designated as center point and radius form designates the value auxiliary point designated as radius of circular arc.
In addition, it is available to be executed more than 360° circular interpolation according to the value of 'the number of circular interpolation turn'.

(a) Circular interpolation with middle point designation form.

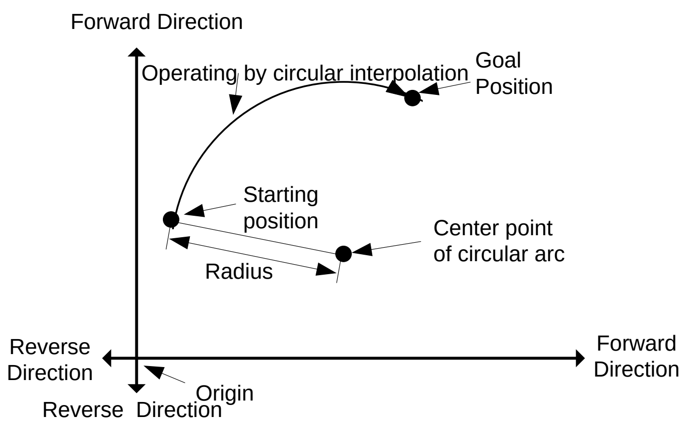
1) Start operating at starting position and execute circular interpolation through the designated middle point.
2) There will be a circular arc which has crossing point as center point that made by perpendicular bisection between starting position and middle point or middle point and goal position.



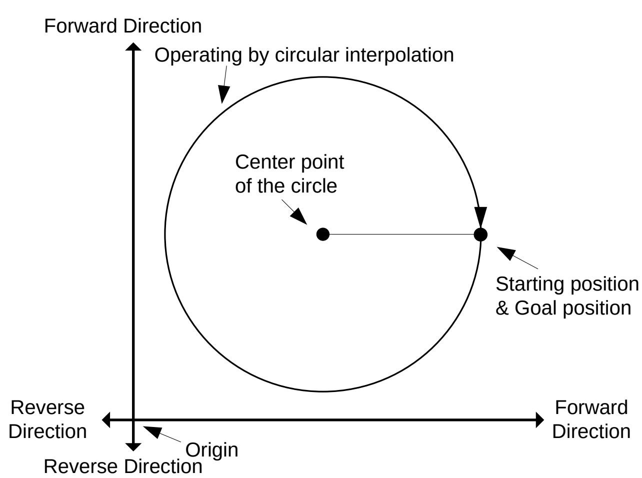
3) Movement direction is automatically designated by goal position and auxiliary point of circular interpolation.

(b) Circular interpolation with center point designation form

1) Start operating from starting position and execute circular interpolation along trace of circle that has distance from starting point to designated center point as radius.



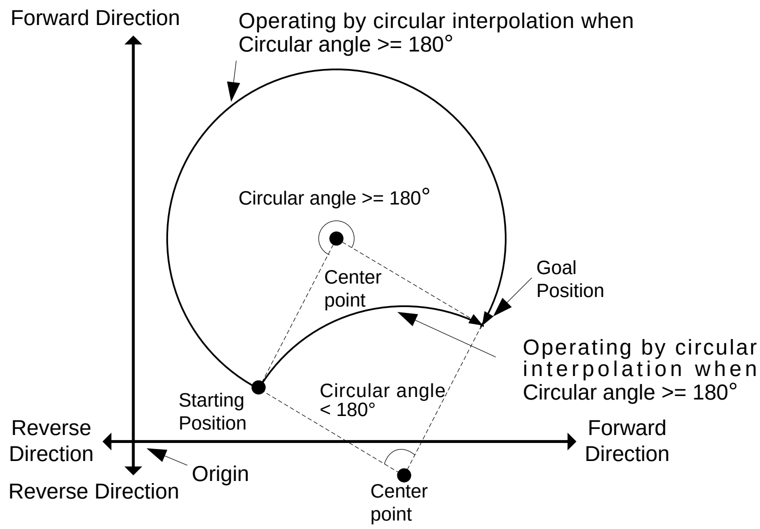
2) If set the goal position same as starting position, it is available to have an operation like a circle that has starting point as its radius.



3) The direction that set on “Circular Interpolation Mode” of operation data (Center point CW, Center point CCW) is designated as movement direction.

(c) Circular interpolation with radius designation form

1) Start operating from starting position and execute circular interpolation along trace of circular arc that has designated radius as it radius. Depending on size setting of circular arc(<180°,>=180°), center point of circular arc will be different.



2) In radius designation form, goal position can not be set the same as starting position.

3) The direction that set on "Circular Interpolation Mode" of operation data (Radius, CW, Circular arc<180°) is designated as movement direction.

1.4.3 Speed Control

(1) It is executed by positioning operation start command (Direct start, Indirect start, Synchronous start), keep operating at the speed already set until Dec. stop command.

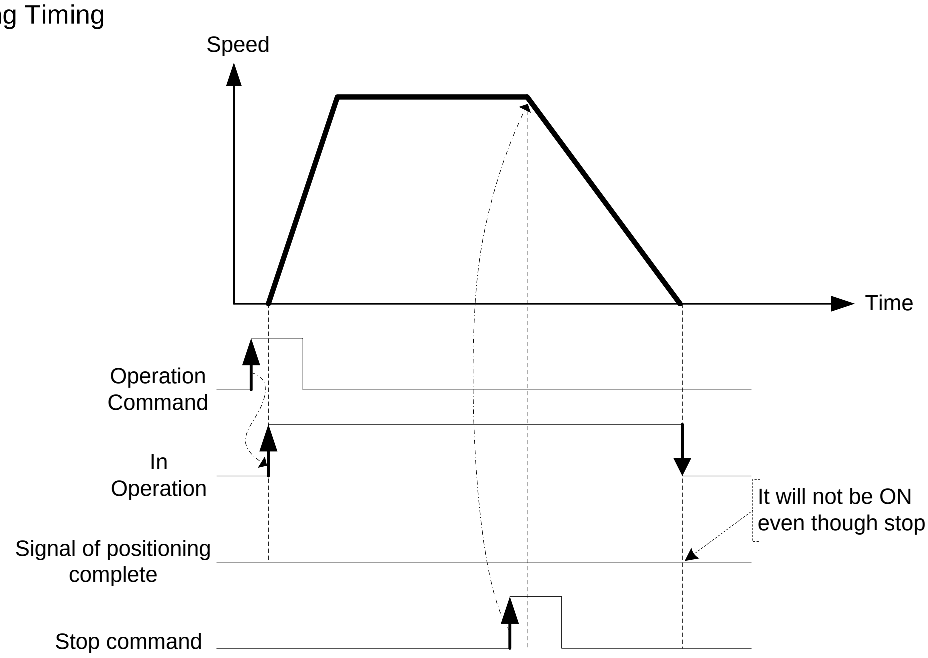
(2) Speed control has forward operation and reverse operation.

(a) Forward operation : Position value >= 0

(b) Reverse operation : Position value < 0

(3) In the case that operated by speed control, M code mode of setting values will be 'on', only if it is 'With'.

(4) Operating Timing



Chapter 2 Specifications

2.1 General Specifications

The following table shows the general specification of XGB series.

<table>
<tr><th>No.</th><th>Items</th><th colspan="4">Specifications</th><th>Related standards</th></tr>
<tr><td>1</td><td>Ambient temperature</td><td colspan="4">0 ~ 55 °C</td><td></td></tr>
<tr><td>2</td><td>Storage temperature</td><td colspan="4">−25 ~ +70 °C</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="3">Occasional vibration</td><td>-</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>$5 \le f < 8.4$Hz</td><td>–</td><td>3.5mm</td><td rowspan="6">10 times each directions (X, Y and Z)</td></tr>
<tr><td>$8.4 \le f \le 150$Hz</td><td>9.8m/s^2(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>$5 \le f < 8.4$Hz</td><td>–</td><td>1.75mm</td></tr>
<tr><td>$8.4 \le f \le 150$Hz</td><td>4.9m/s^2(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>Square wave Impulse noise</td><td colspan="3">AC: ±1,500 V
DC: ± 900V</td><td>LS ELECTRIC standard</td></tr>
<tr><td>Electrostatic discharge</td><td colspan="3">4kV (Contact discharge)</td><td>IEC61131-2
IEC61000-1-2</td></tr>
<tr><td>Radiated electromagnetic field noise</td><td colspan="3">80 ~ 1,000 MHz, 10V/m</td><td>IEC61131-2,
IEC61000-1-3</td></tr>
<tr><td rowspan="2">Fast transient/bust noise</td><td>Segment</td><td>Power supply module</td><td>Digital/analog input/output communication interface</td><td rowspan="2">IEC61131-2
IEC61000-1-4</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>

N0ote

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 XGB Positioning Module.

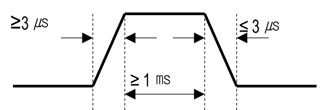
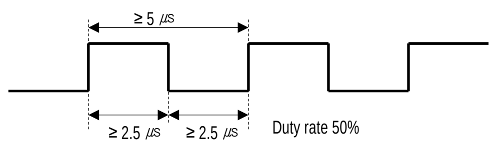
2.2.1 Function Specifications

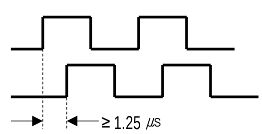
Items \ Model		XBF-PD02A
No. of control axis		2
Interpolation function		2 axes linear interpolation, 2 axes circular interpolation
Control method		Position control, Speed control, Speed/Position control, Position/Speed control,
Control unit		Pulse
Positioning data		150 data area for each axis (operation step number 1 ~ 150) Can be set by parameter, dedicated monitor window, program
Monitoring window	Connection	RS-232C port or USB of basic unit
	Setting data	Basic, home/manual, common, I/O signal parameter, operation data, command information
	Monitor	Operating information, input signal information, error information
Back-up		Saves parameter, operation data at flash memory (battery is not necessary)
POSITIONING	Coordinate	Absolute coordinate/Incremental coordinate
	Position address range	-2,147,483,648 ~ 2,147,483,647(pulse)
	Speed range	1 ~ 2,000,000pps(1pps unit)
	Acceleration/deceleration process	Trapezoid type
	Acceleration/deceleration time	0 ~ 65,535 ㎳, selection available from 4 types of acceleration/deceleration pattern
Manual Operation		JOG operation / MPG operation / Inching operation
Homing method		DOG+HOME(Off), DOG+HOME(On), DOG, upper-lower limit + HOME, upper-lower limit
Speed change function		Speed change (Percent/Absolute value)
External Encoder	Channel	1 channel
	Max. Input	max 200 kpps
	Input form	Lin driver input(RS-422A IEC standard)
	Input type	CW/CCW, PLS/DIR, Phase A/B(4 multiplication)
Max. connection distance		10 m
Error indication		Indicated by LED
Connection connector		40 Pin connector
I/O share point		Fixed type: 64 points
Consumable current		500 ㎃(DC 5V)
Weight		65g

2.3 External I/O Interface 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>DOG</td><td>DC 24V/4.7㎃</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1㎃</td><td>≤DC 4V/1.0㎃</td><td>Approx. 5.1㏀</td><td>≤0.7㎳</td></tr>
<tr><td>External upper-limit</td><td>DC 24V/4.7㎃</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1㎃</td><td>≤DC 4V/1.0㎃</td><td>Approx. 5.1㏀</td><td>≤0.7㎳</td></tr>
<tr><td>External lower-limit</td><td>DC 24V/4.7㎃</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1㎃</td><td>≤DC 4V/1.0㎃</td><td>Approx. 5.1㏀</td><td>≤0.7㎳</td></tr>
<tr><td>Emergency stop</td><td>DC 24V/4.7㎃</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1㎃</td><td>≤DC 4V/1.0㎃</td><td>Approx. 5.1㏀</td><td>≤0.7㎳</td></tr>
<tr><td>In-position</td><td>DC 24V/4.7㎃</td><td>DC 20.4～26.4V</td><td>≥DC 16V/3.1㎃</td><td>≤DC 4V/1.0㎃</td><td>Approx. 5.1㏀</td><td>≤0.7㎳</td></tr>
<tr><td rowspan="2">Home</td><td>DC 5V/8㎃</td><td>DC 4.25～5.5 V</td><td>≥DC 3V/3.5㎃</td><td>≤DC 1V/0.7㎃</td><td>Approx. 670Ω</td><td>≤0.2㎳</td></tr>
<tr><td colspan="6">
</td></tr>
<tr><td rowspan="3">Manual pulse generator /Encoder input</td><td>DC 5V/10㎃</td><td>DC 4.25～5.5 V</td><td>≥DC 3V/3.0㎃</td><td>≤DC 1V/1.0㎃</td><td>Approx. 470Ω</td><td>≤0.5㎳</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


2) Phase difference


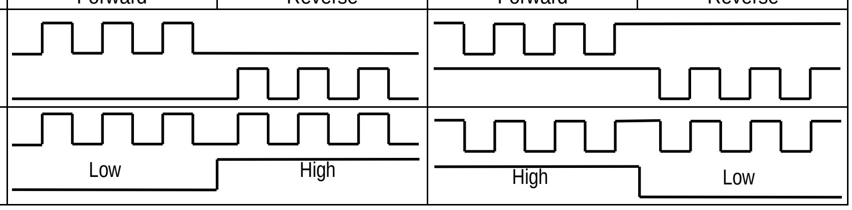
If A phase input pulse precedes B phase input pulse, the position address value increases.

If B phase input pulse precedes A phase input pulse, the position address value decreases.</td></tr>
</table>

2.3.2 Output Specifications

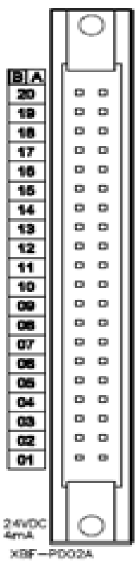
Signal	Rated load voltage	Use load voltage range	Max. load current / Dash current	Max. voltage falling (On)	Leakage current (Off)	Response Time
Deviation clear counter	DC 5～24V	DC 4.75～26.4V	0.1A(1 point) / ≤0.4A 10㎳	≤DC 1V (rating) ≤DC 2.5V (max)	≤0.1㎃	≤0.1ms-
Pulse output	▷ Differential Line Driver based on Am26C31 ▷ CW/ CCW type, PLS/DIR type can be selected from pulse output mode of basic parameter ▷ Pulse output mode (setting it from basic parameter) Pulse output level (setting it from common parameter) is as follows.					

Pulse output mode		Output signal level			
		High Active		Low Active	
		Forward	Reverse	Forward	Reverse
CW/CCW	CW CCW				
PLS/DIR	PULSE DIR				



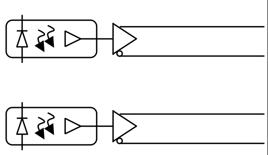
2.3.3 Specifications on Interface with External Equipment

(1) Pin Array of Connector

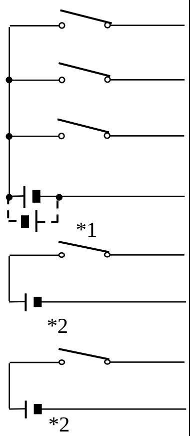
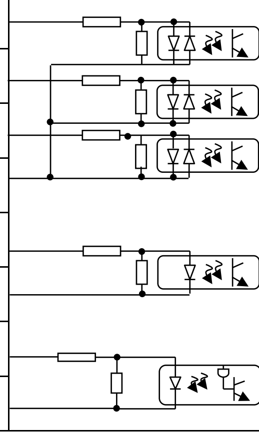
Pin Array	Pin no.		Signal Name		Signal direction positioning-external	**Action condition**
	Y	X				
	B20		MPG A+	Manual pulse generator/Encoder A+	←	
	A20		MPG A-	Manual pulse generator/Encoder A-	←	
	B19		MPG B+	Manual pulse generator/Encoder B+	←	
	A19		MPG B-	Manual pulse generator/Encoder B-	←	
	B18	A18	FP+	Pulse output (Differential Motion +)	→	
	B17	A17	FP-	Pulse output (Differential Motion -)	→	
	B16	A16	RP+	Pulse sign (Differential Motion +)	→	
	B15	A15	RP-	Pulse sign (Differential Motion -)	→	
	B14	A14	OV+	Upper limit	←	
	B13	A13	OV-	Lower limit	←	
	B12	A12	DOG	DOG	←	
	B11	A11	NC	Not used	-	
	B10	A10	NC			
	B9	A9	COM	Common (OV+, OV-, DOG)	-	
	B8	A8	NC	Not used	-	
	B7	A7	INP	In-Position Signal	←	
	B6	A6	INP COM	Common (INP)	-	
	B5	A5	CLR	Deviation counter clear signal	→	
	B4	A4	CLR COM	Common (CLR)	-	
	B3	A3	HOME	Home(+5V)	←	
	B2	A2	COM HOME	Common (Home)	-	
	B1	A1	NC	Not used	-	

(2) Internal circuit of connector

(a) Pulse output

Internal circuit	**Pin No.**		Signal	
	Y	X		
	B18	A18	FP+	Pulse F+(CW/Pulse)
	B17	A17	FP-	Pulse F-(CW/Pulse)
	B16	A16	RP+	Pulse R+(CCW/Sign)
	B15	A15	RP-	Pulse R-(CCW/Sign)

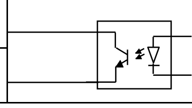
(b) External input signal

Classification	Pin No. Y	Pin No. X	Internal circuit	Signal	
	B14	A14		OV+	Upper limit
	B13	A13		OV-	Lower limit
	B12	A12		DOG	DOG
	B9	A9		COM	Common(OV+,OV-,DOG)
	B7	A7		INP	In-position signal
	B6	A6		COM	In-position Common
	B3	A3		HOME +5V	HOME (+5V)
	B2	A2		HOME COM	HOME(+5V) Common

*1: Available to use it as Sink or Source type input

*2: Available to use it as Sink type input

(c) External Output Signal

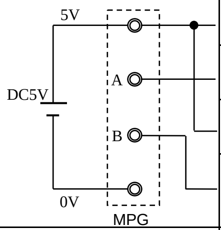
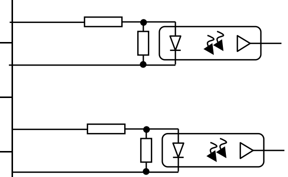
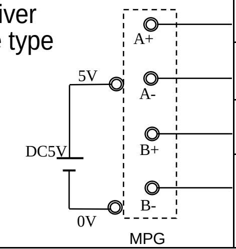
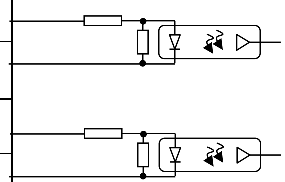
Pin No. Y	Pin No. X	Internal circuit	Signal	
B5	A5		CLR	Deviation counter clear signal
B4	A4		CLR COM	Deviation counter clear signal Common

Remark

1. Deviation counter clear signal is provided on each axis, as the output signal of the servo motor interface, deviation counter of servo motor driver counter cleared. The deviation of the servo motor driver until the count value reaches zero, the motor is driven. Thus, even if the COMMAND pulse output is completed until the motor stops, there may be a short delay. The deviation counter value is cleared to zero, motor can be stopped immediately.

2. Position deviation counter clear signal from the control module is automatically output after completion of homing. Clearing the count of the servo drive for the deviation is used as the output signal.

(d) Manual pulse generator input/encoder input

Classification		Pin No.	Internal circuit	Signal	
Open collector voltage type		B20		MPG A+	Manual pulse generator A+ input
		A20		MPG A-	Manual pulse generator A- input
		B19		MPG B+	Manual pulse generator B+ input
		A19		MPG B-	Manual pulse generator B- input
Line driver voltage type		B20		MPG A+	Encoder A+ input
		A20		MPG A-	Encoder A- input
		B19		MPG B+	Encoder B+ input
		A19		MPG B-	Encoder B- input

(3) I/O wiring by using Smart Link Board

(a) When using positioning function, easy wiring is available by connecting the I/O connector with Smart Link board. The available Smart Link Board and I/O cable are as follows.

Model	Specification	No. of Pin
XBF-PD02A	Positioning Module(Line Drive)	40 Pin Connector × 1

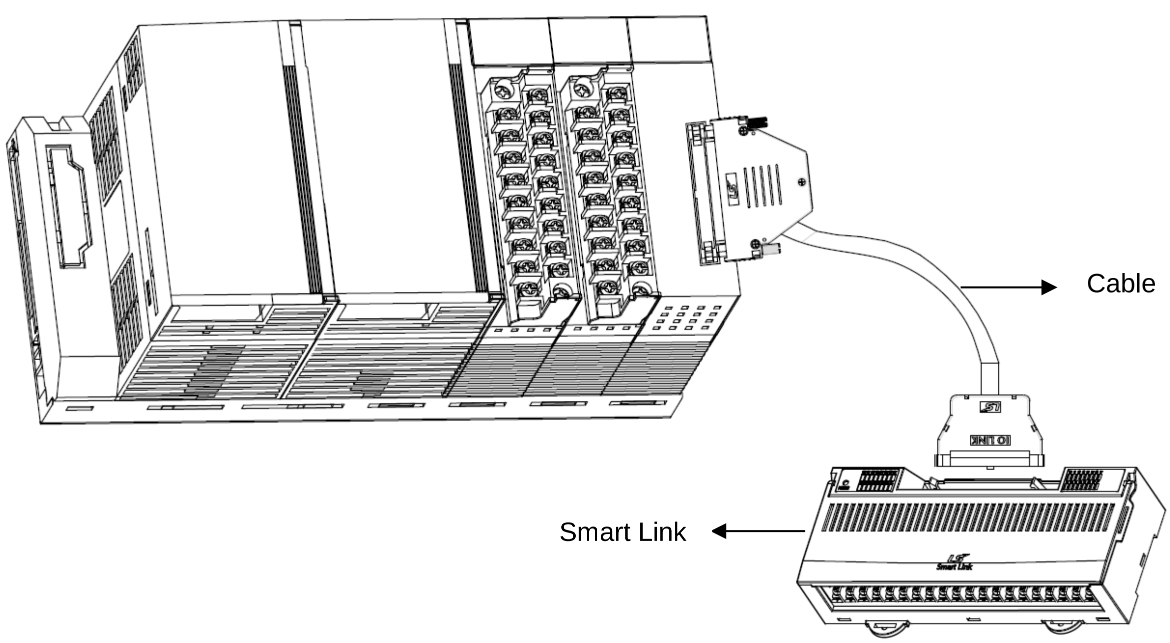
(b) The company prepares smart link products for the convenience of using our Connector type Positioning modules.

For further information, please refer to the data sheet contained in a Smart Link product.

(Refer to (d) Connection Diagram to confirm the differences between TG7-1H40CA and TG7-1H40S)

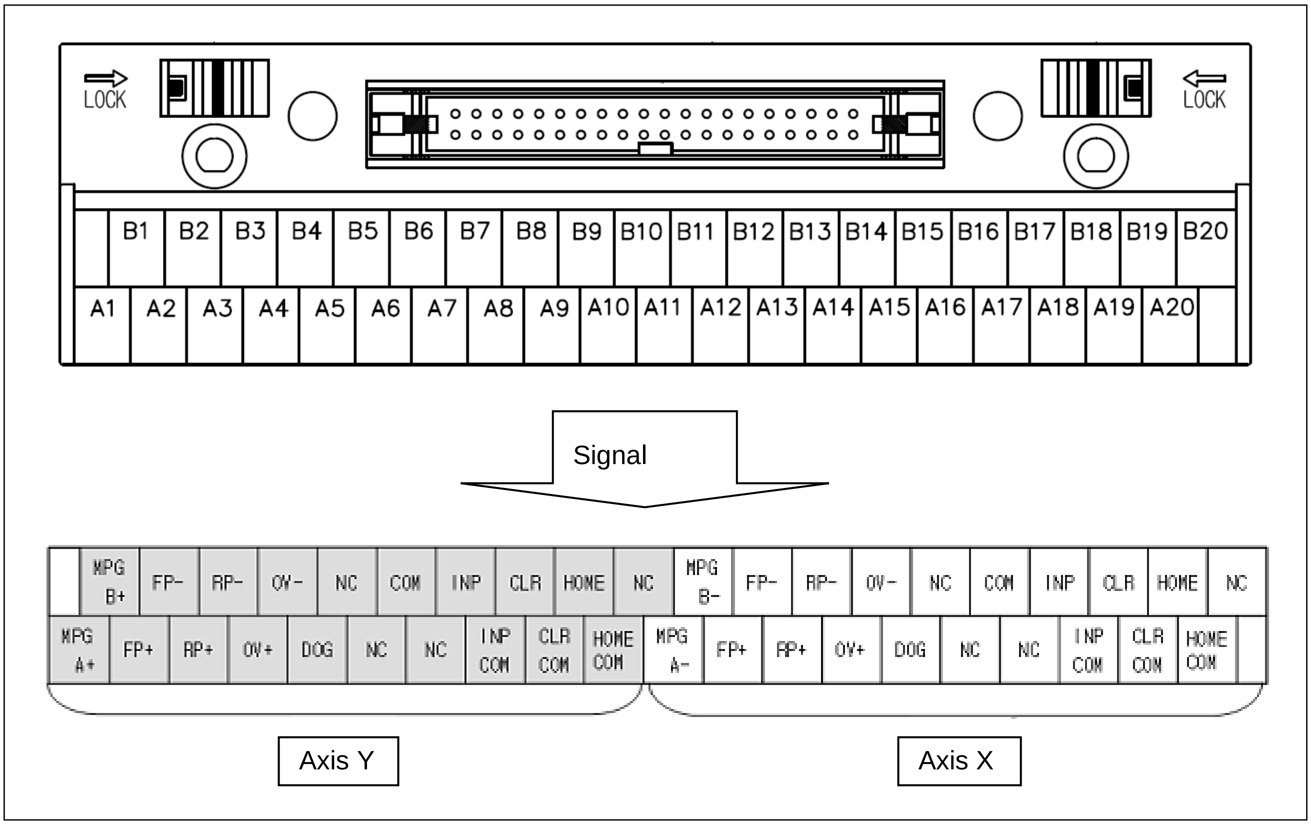
	Model	Cable	Length of Cable
Terminal board	TG7-1H40S	C40HH-05SB-XBI	0.5m
		C40HH-10SB-XBI	1m
		C40HH-15SB-XBI	1.5m
		C40HH-20SB-XBI	2m
		C40HH-30SB-XBI	3m
	TG7-1H40CA (20Pin Common Added)	C40HH-05SB-XBI	0.5m
		C40HH-10SB-XBI	1m
		C40HH-15SB-XBI	1.5m
		C40HH-20SB-XBI	2m
		C40HH-30SB-XBI	3m

C) Smart Link Connection

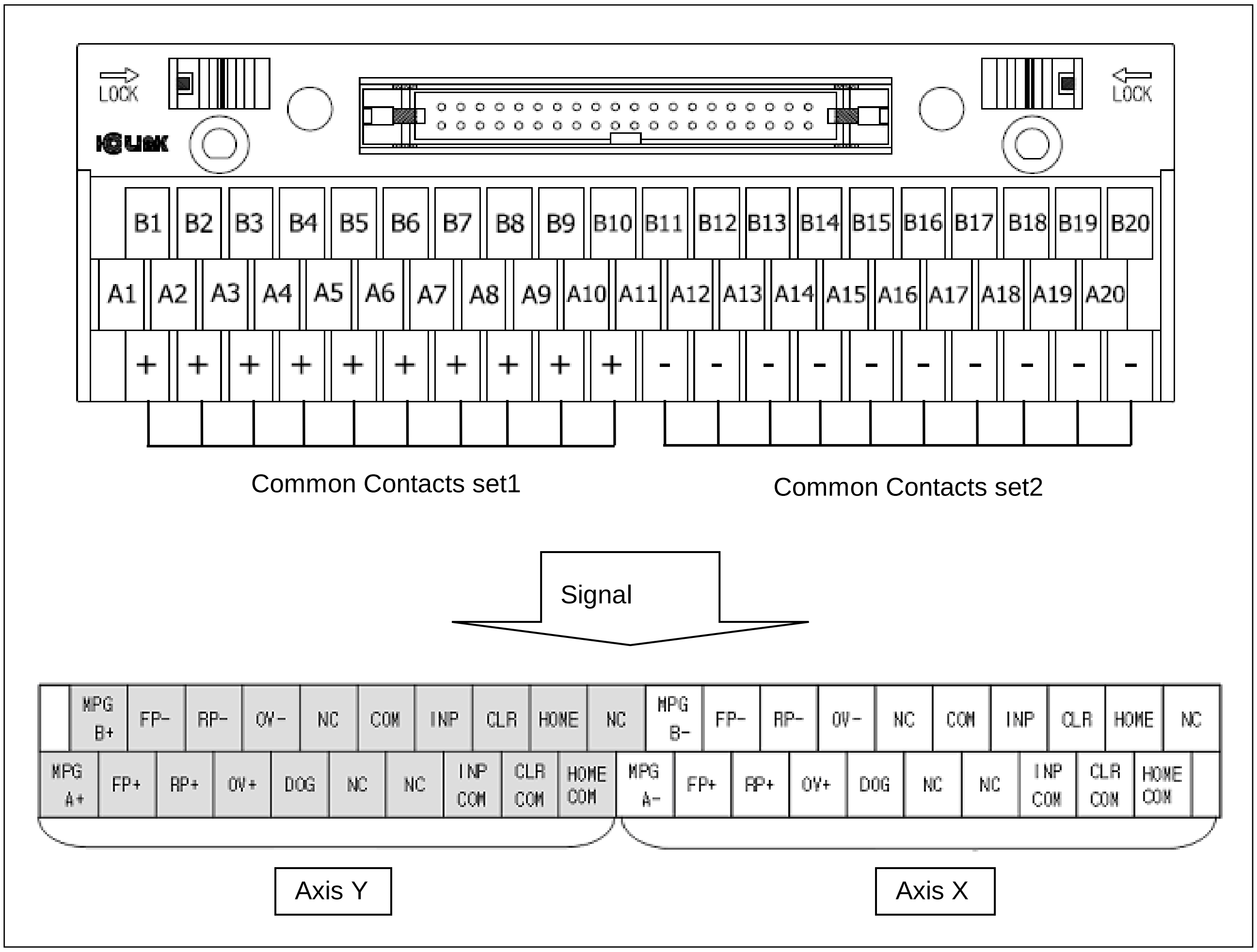


(d) Smart Link Connection Diagram

- TG7-1H40S



- TG7-1H40CA


LOCK
LOCK
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14
B15
B16
B17
B18
B19
B20
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
A17
A18
A19
A20
Common Contacts set1
Common Contacts set2
Signal
MPG B+
FP-
RP-
OV-
NC
COM
INP
CLR
HOME
NC
MPG B-
FP-
RP-
OV-
NC
COM
INP
CLR
HOME
NC
MPG A+
FP+
RP+
OV+
DOG
NC
NC
INP COM
CLR COM
HOME COM
MPG A-
FP+
RP+
OV+
DOG
NC
NC
INP COM
CLR COM
HOME COM
Axis Y
Axis X

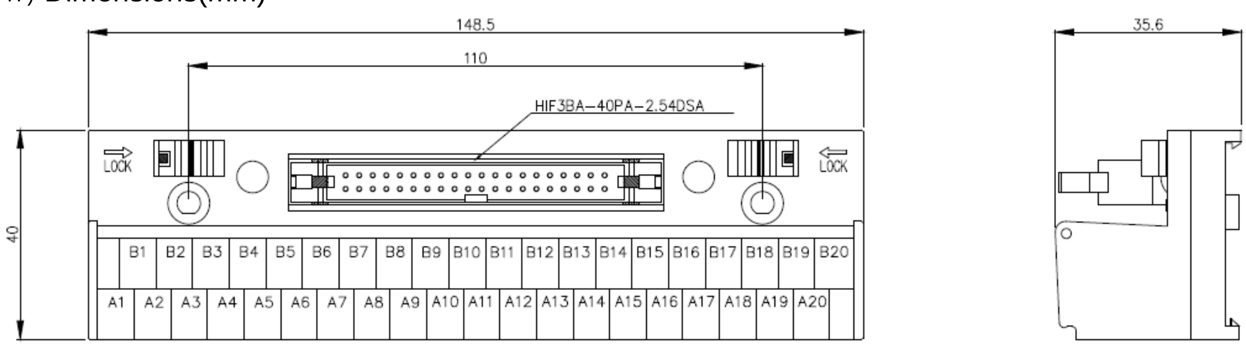
(e) Smart Link Specifications and Dimensions

- TG7-1H40S

ⅰ) Specifications

Rated Voltage	AC, DC 125V
Rated Current	1A
Withstanding Voltage	600V 1min
Insulation resistance	100MΩ (DC 500V)
Applicable Wire	1.25 ㎟ /MAX
T/B Screw	M3 X 10L
Screw Torque	1.2N • m(12Kgf • cm)
Case	Modified PPO(Noryl)(UL 94V-0)

ⅱ) Dimensions(mm)

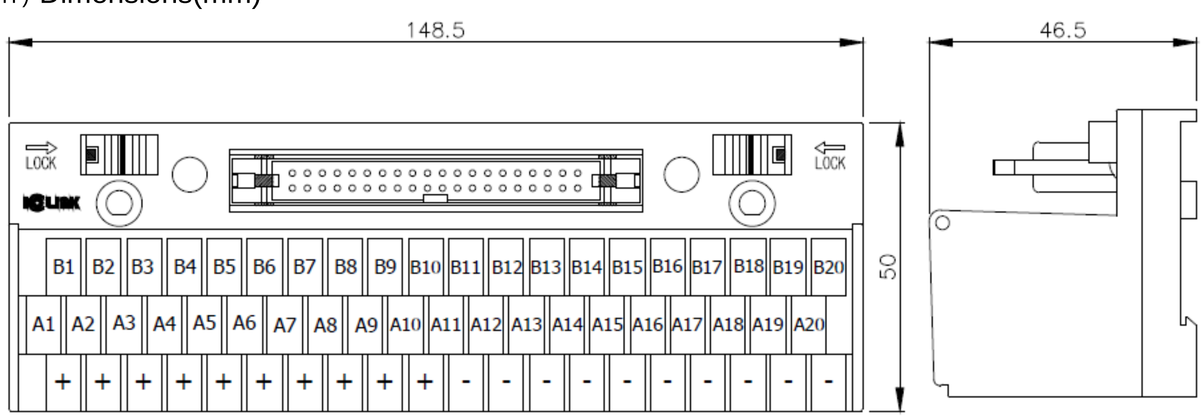


- TG7-1H40CA

ⅰ) Specifications

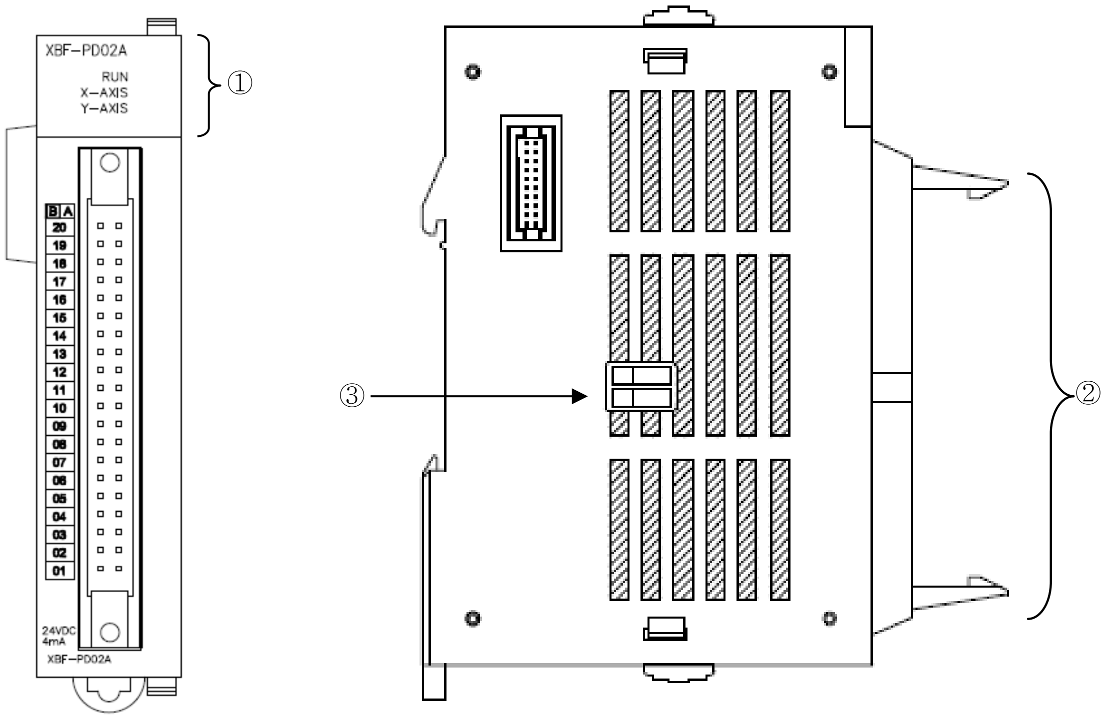
Rated Voltage		125V AC / 24V DC
Rated Current	IO	1A
	Common	10A (Total)
Insulation resistance		100MΩ (DC 500V)
Withstanding Voltage		AC500V 1min
Applicable Wire		AWG22-16 (MAX / 1.5 ㎟)
Contact Screw		M3 X 10L
Screw Torque		1.2N • m(12Kgf • cm)
Ambient Temperature		-10℃ ~ +50℃ (Non-condensing)
Terminal Block & Cover		Modified PPO
Protective Cover		Polycarbonate
PCB		Epoxy 1.6t

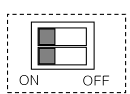
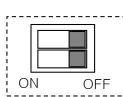
ⅱ) Dimensions(mm)



2.4 The Name of Each Part

2.4.1 The name of each part



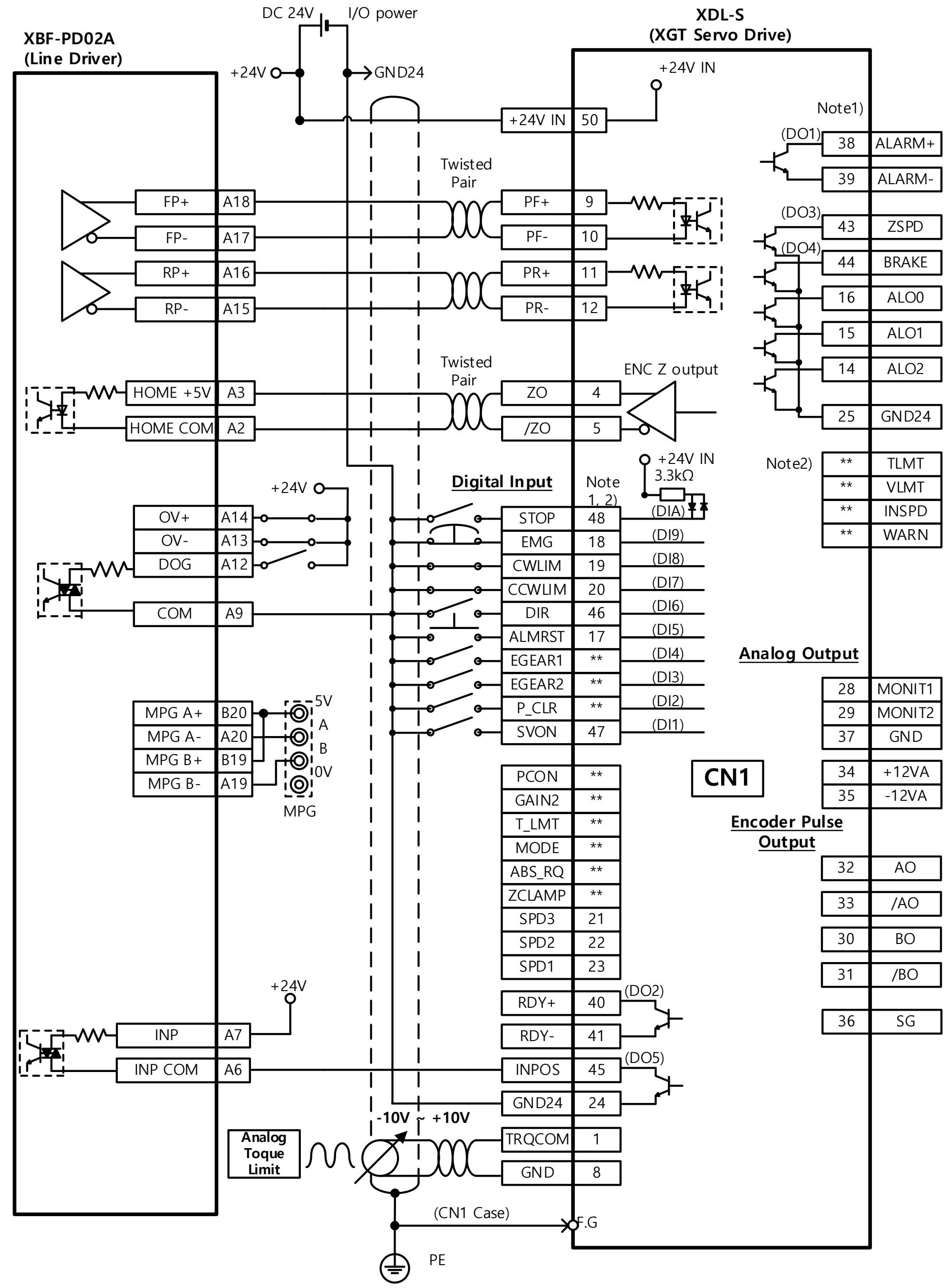
No.	Name	Description
①	Operating indication LED	1. RUN : indicates whether power is supplied or not 2. X-AXIS, Y-AXIS ▶ On : during corresponding axis operation ▶ Off : when the corresponding axis stops ▶ Blink : error of the corresponding axis(LED of axis has error would be blinking)
②	External wiring connector	Drive device, machinery input, Connector to encoder
③	Dip switch for O/S mode	Dip switch for setting O/S download mode/operating mode  : O/S download mode  : operating mode

Remark

1. In case dip switch is set as O/S download mode, positioning module doesn’t operate. Make sure to set dip switch as off except for O/S download.

2.5 Connection to XGT Servo System

The following shows the basic wiring diagram of XGB positioning module and XGT Servo System XDA-S Series.



※ This is an example of a wiring diagram created with a 1-axis connector pin arrangement.

Note

*Note 1
Input signals DI1 to DIA and output signals DO1 to DO5 are default signals allocated by the factory.
*Note 2
These are non-allocated signals. You can change their allocation by setting parameters. For more information, refer to XDL-S sereis servo manual.

Chapter 3 Operation Order and Installation

3.1 Installation

3.1.1 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

(a) Install the control panel available for water-proof, anti-vibration.
(b) The place free from continuous impact or vibration.
(c) The place not exposed to direct rays.
(d) The place with no dew phenomena by rapid temperature change.
(e) The place where surrounding temperature maintains 0-55℃.

(2) Installation Construction

(a) In case of processing the screw hole or wiring, cares should be taken not to put the wiring remnants to PLC inside.
(b) Install on the good place to operate.
(c) Do not install the high voltage machine on the same Panel.
(d) The distance from duct or surrounding module shall be more than 50mm.
(e) Ground to the place where surrounding noise environment is good enough.

3.1.2 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.
(5) When using the system of positioning control, please use it after you've set up the origin.
When Power On or Off, changes of pulse output could occurred by Power On or Off.

3.2 Notices in Wiring

3.2.1 Notices in Wiring

(1) The length of connecting cable between positioning module and drive machine shall be as short as possible. (Max. length : 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) 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.

3.2.2 Connection Example of Servo and Stepping Motor Drive Machine

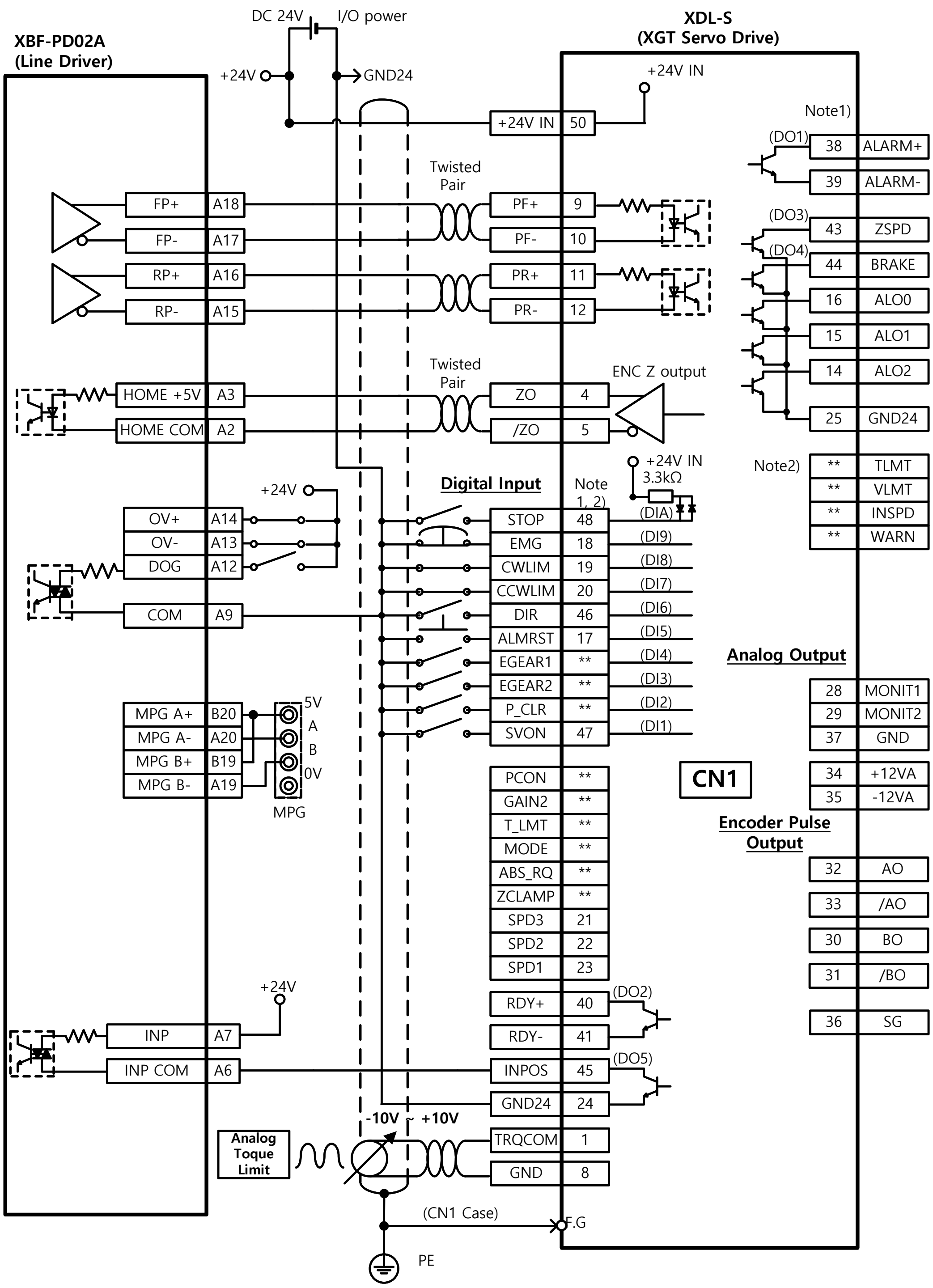
- This is an example of a wiring diagram created with a 1-axis connector pin arrangement.

Notes

▶ Connection example shows the case that the input signal parameter of positioning module is set as follows.
• High limit signal/Low limit signal: B contact point
• DOG/HOME/In-position signal: A contact point
▶ The following example is based on axis X

(1) LS MECAPION

(a) XDL-L7S Series Connection



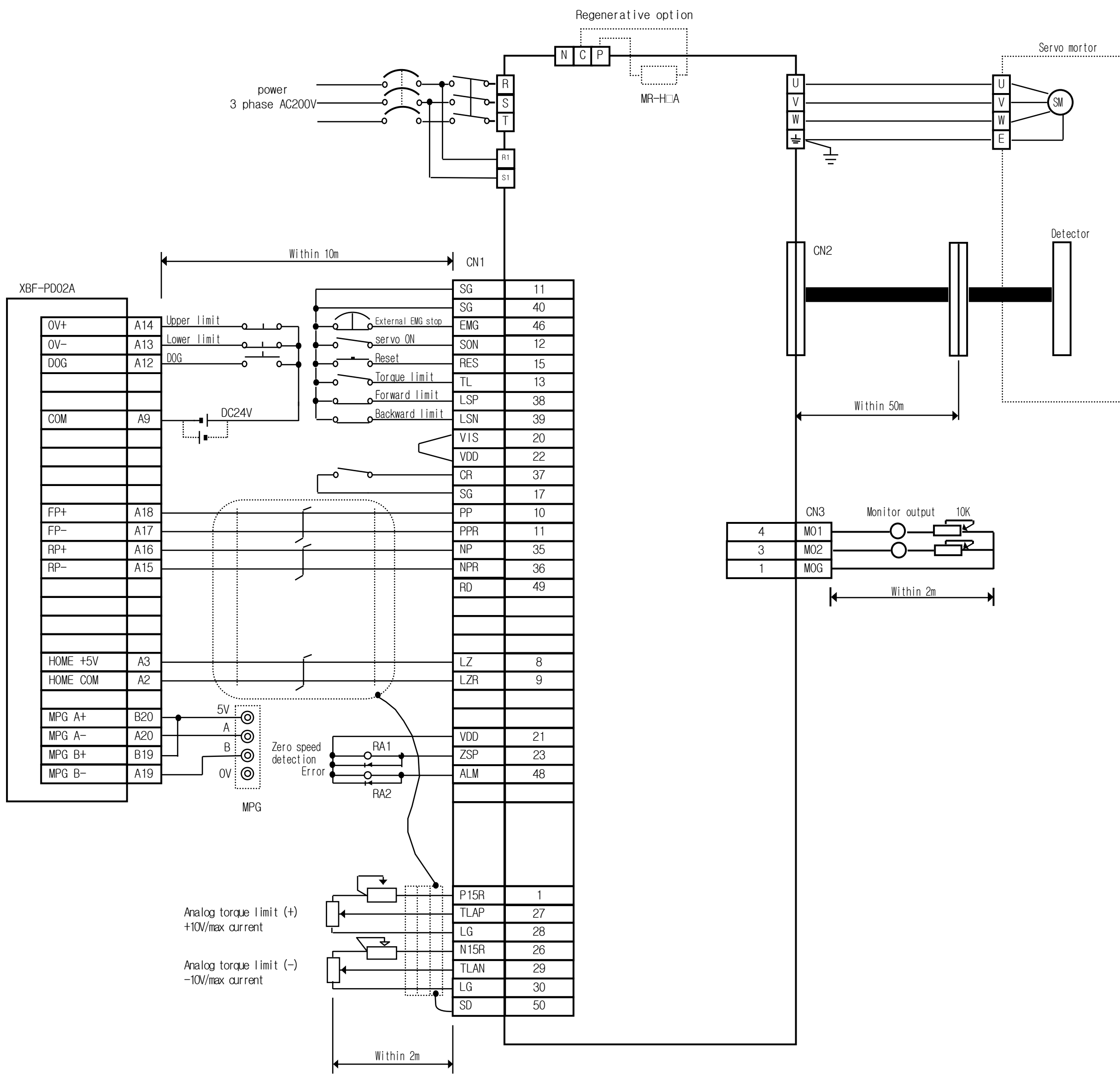
※ **This is an example of a wiring diagram created with a 1-axis connector pin arrangement.**

Note 1) Input signals DI1 to DIA and output signals DO1 to DO5 are default signals allocated by the factory.

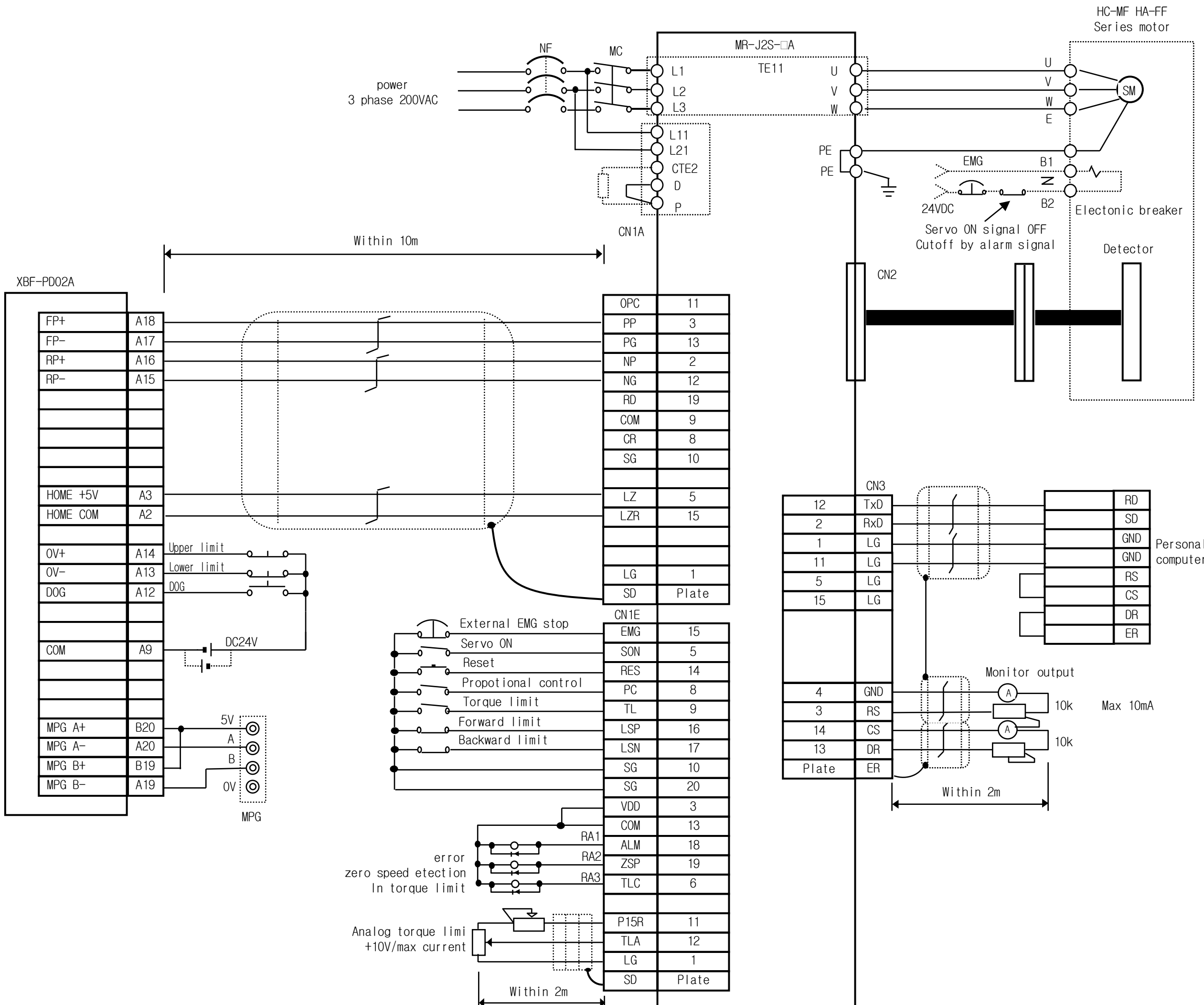
Note 2) ** These are non-allocated signals. You can change their allocation by setting parameters. For more information, refer to L7 sereis servo manual.

(1) MITSUBISHI

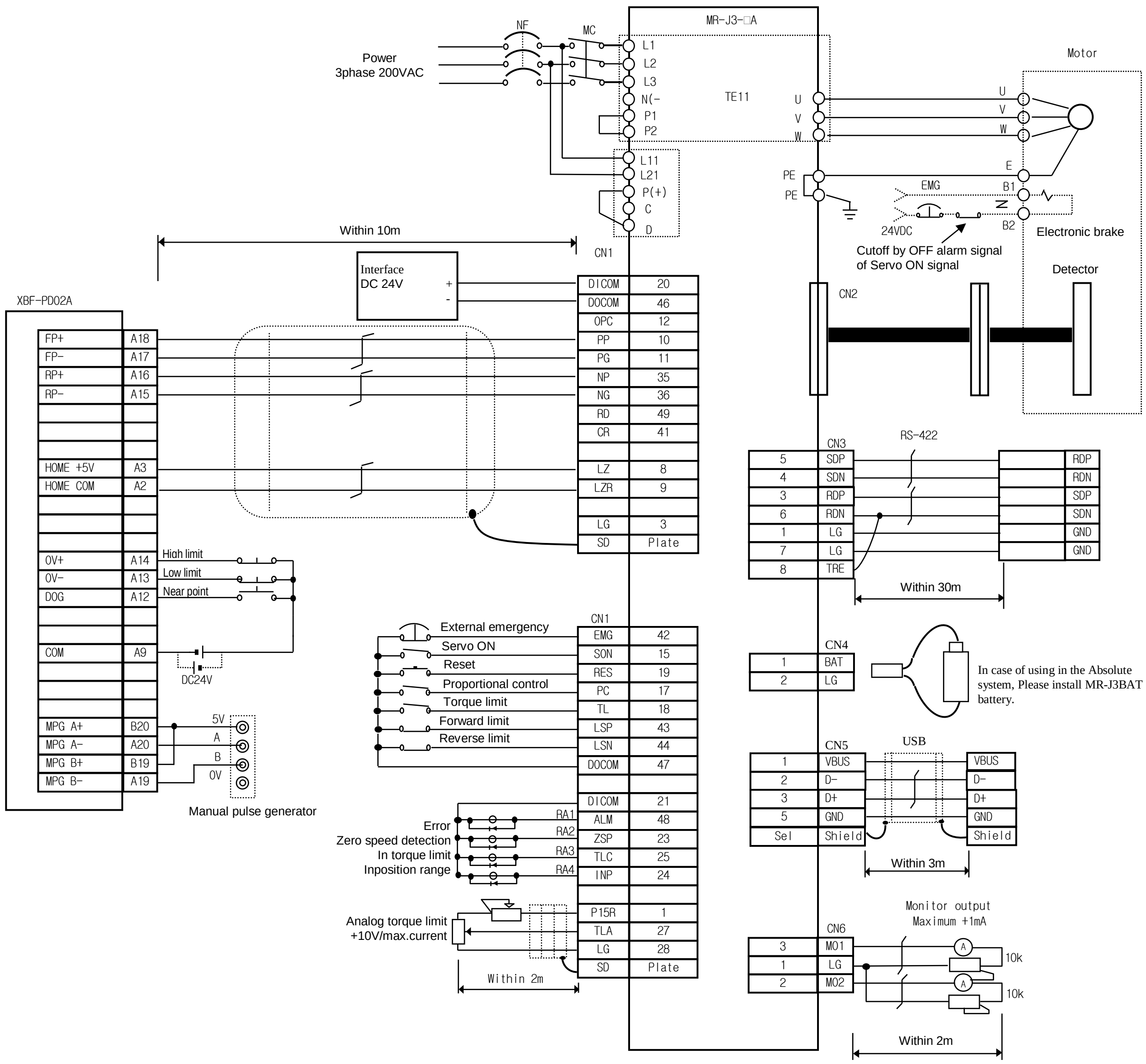
(a) MR-H□A Connection (Line Driver)



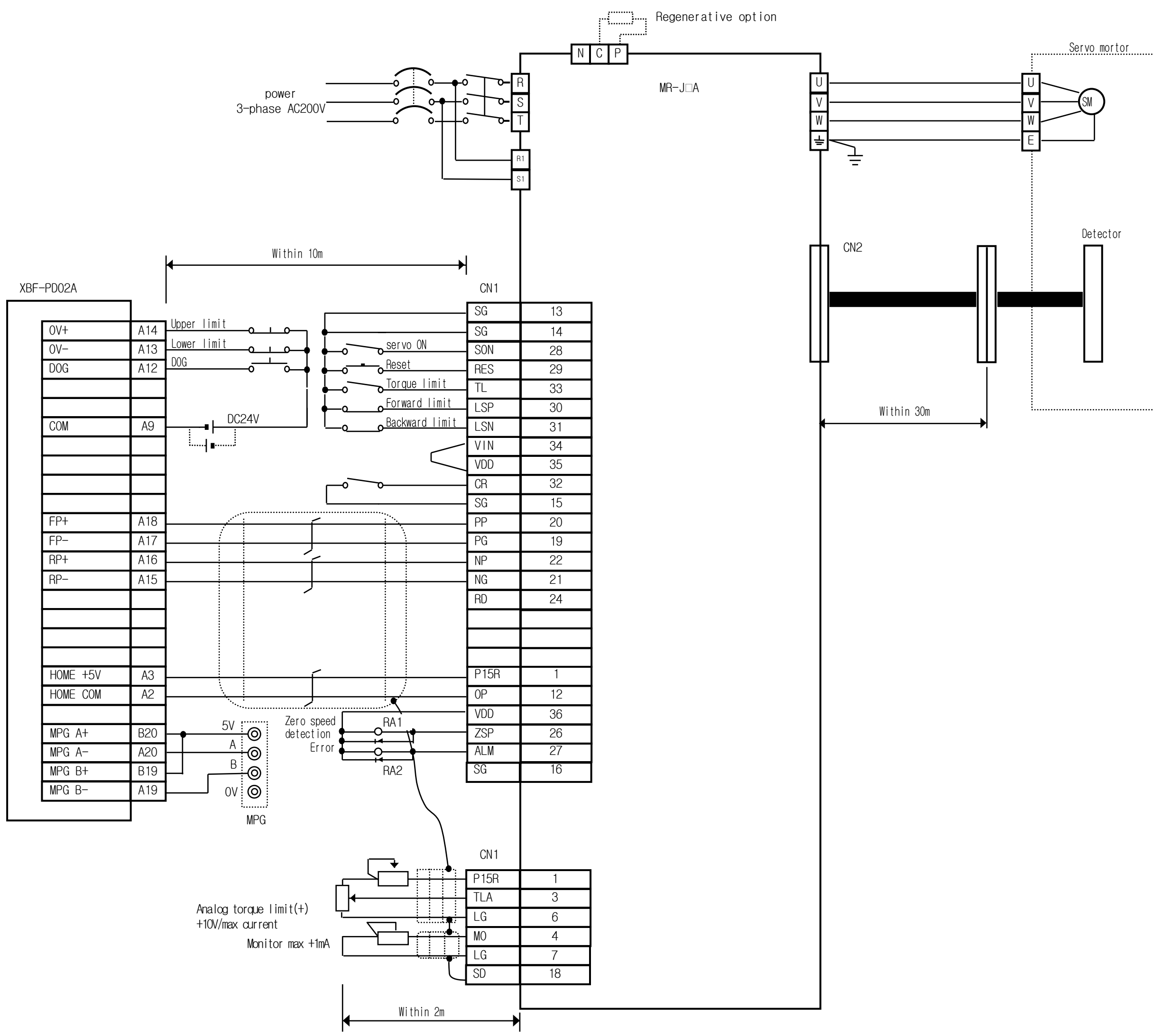
(b) MR-J2/J2S-□A Connection



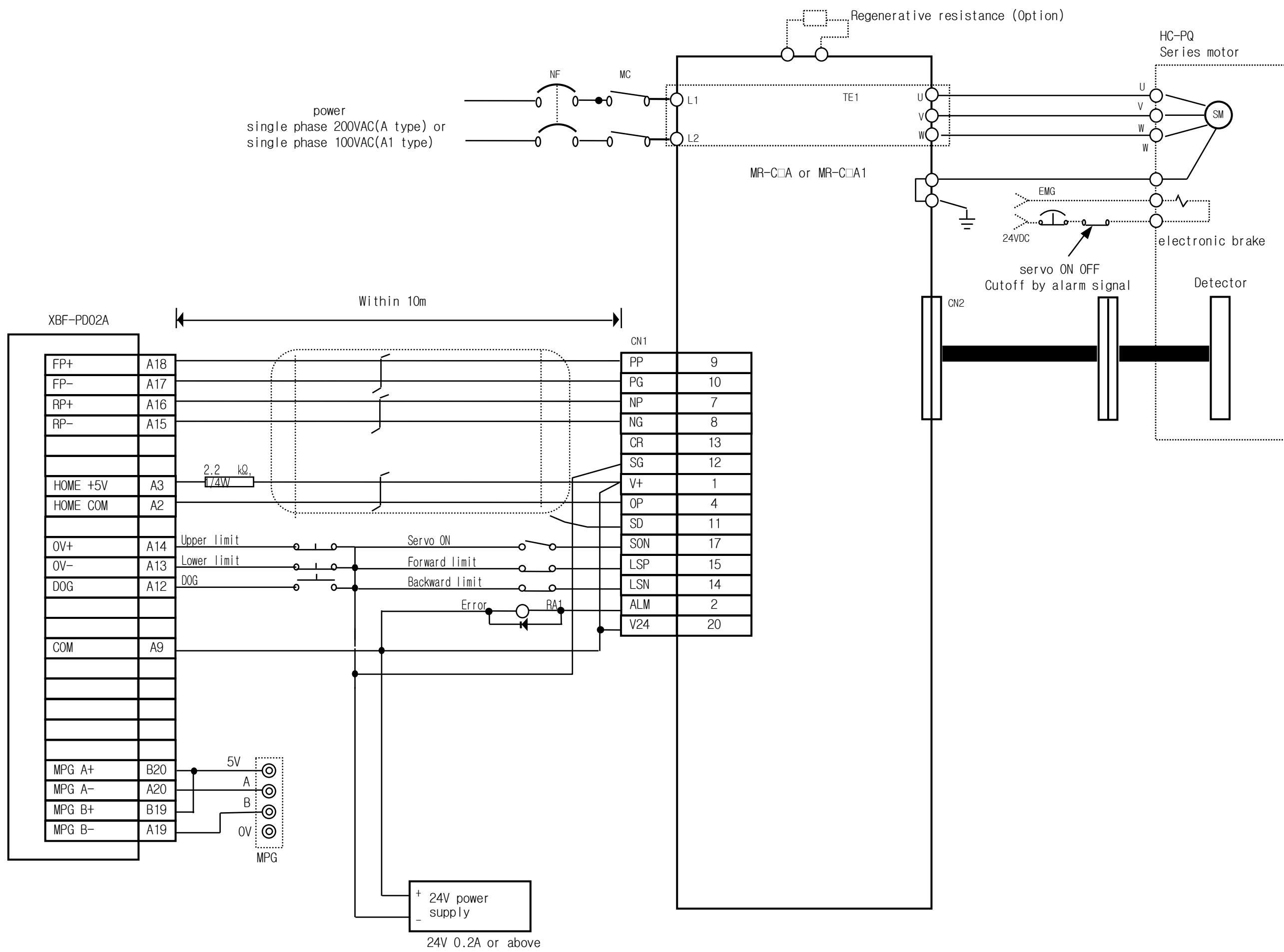
(c) MR-J3-□A Connection



(d) MR-J□A Connection

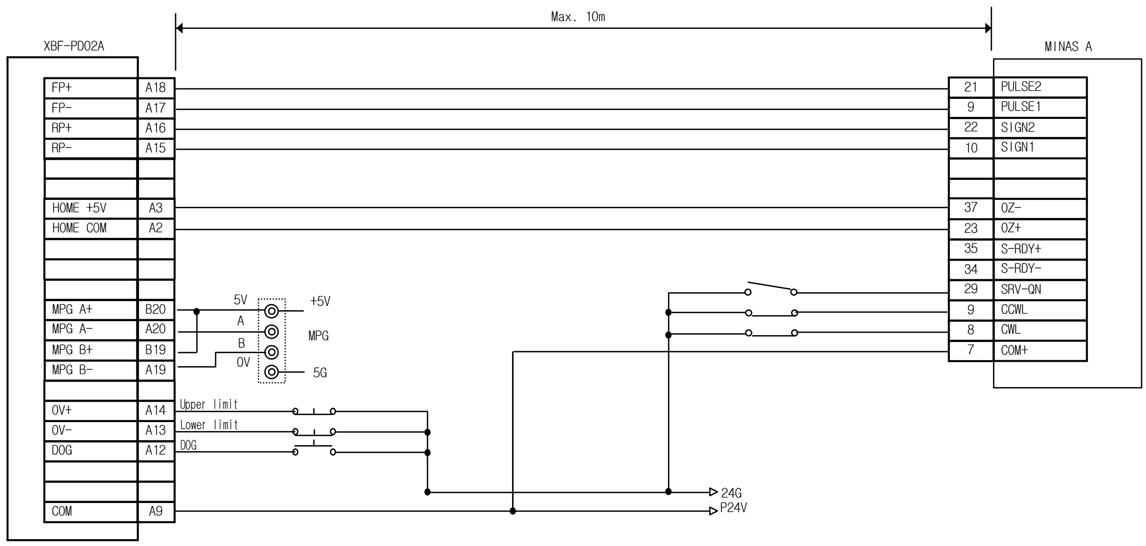


(e) MR-C□A Connection



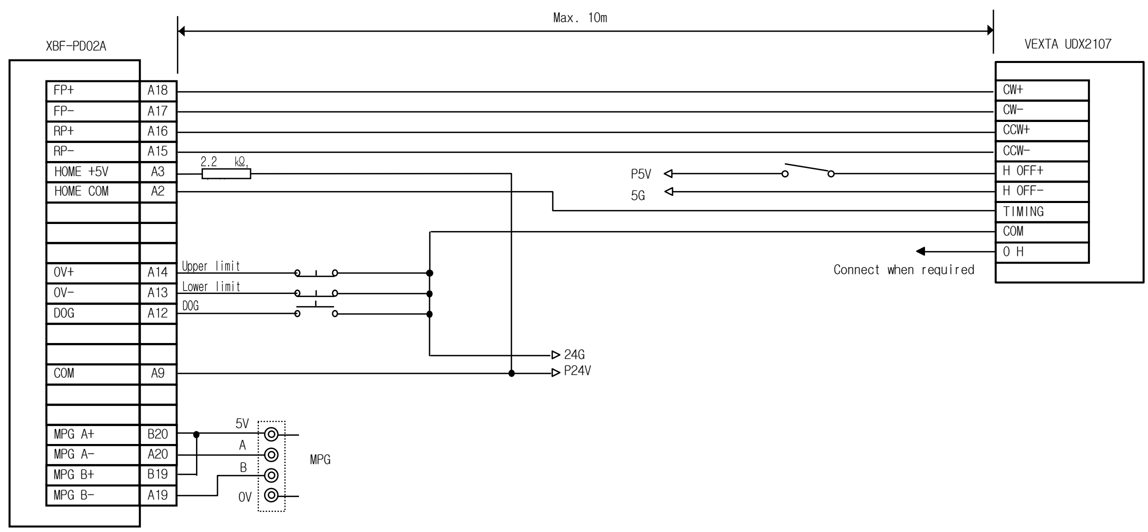
(2) PANASONIC

(a) A Series Connection (Line Driver)

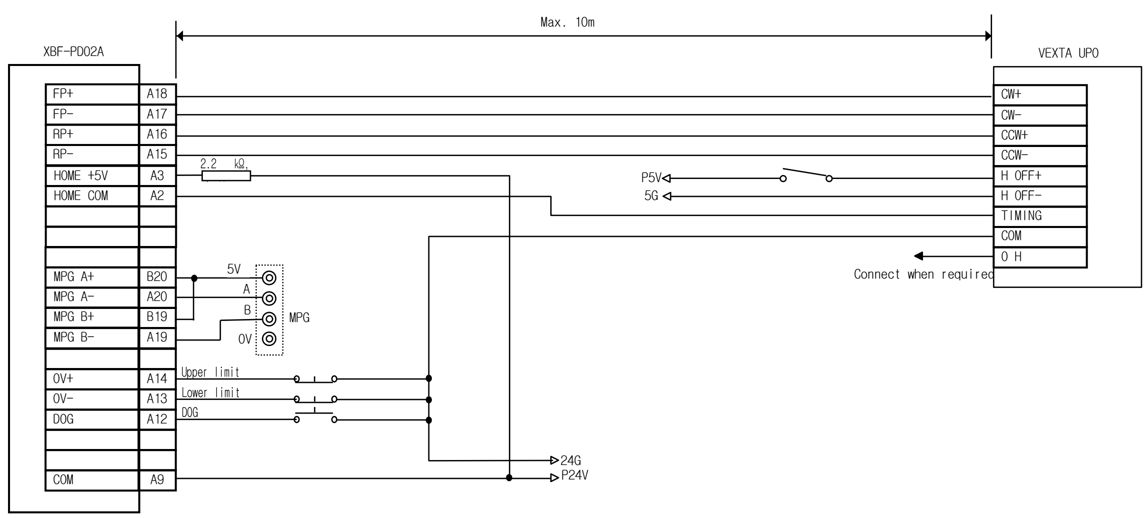


(3) VEXTA

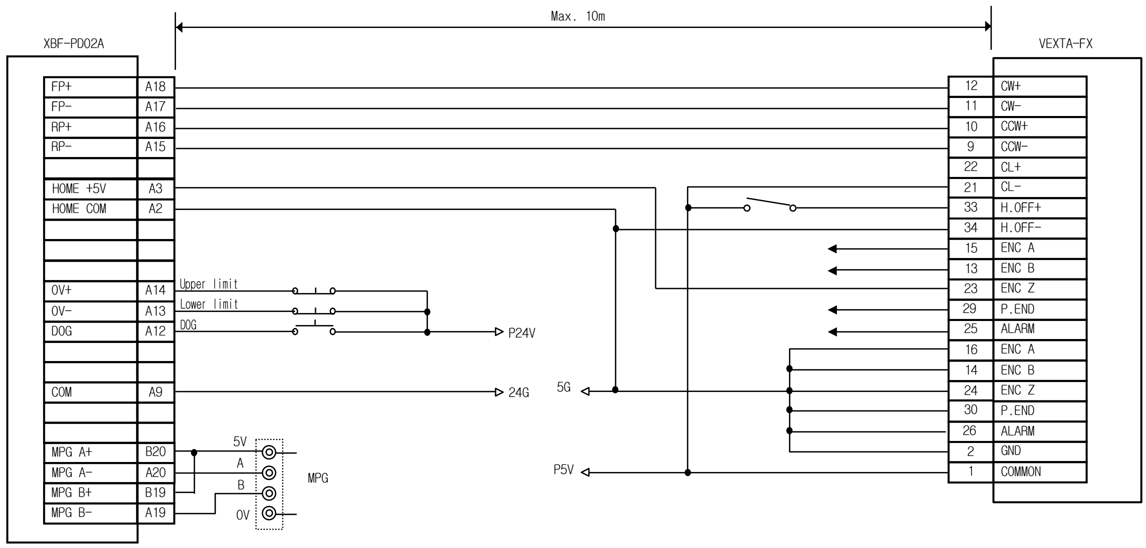
(a) UDX2107 Connection



(b) UPD Connection

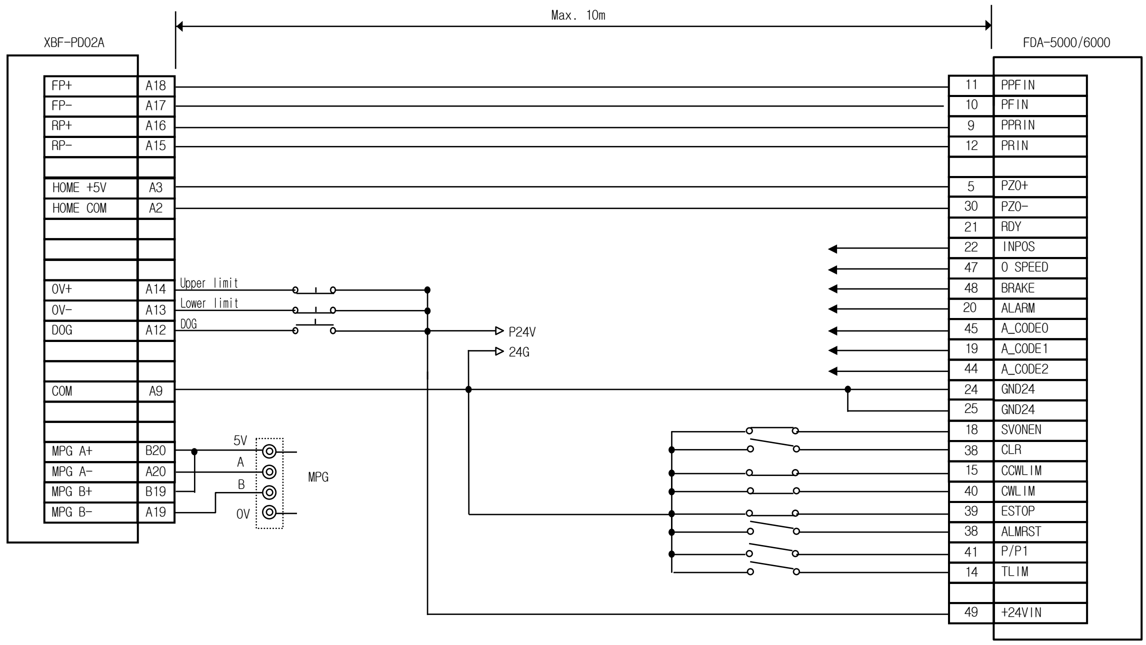


(c) FX Connection



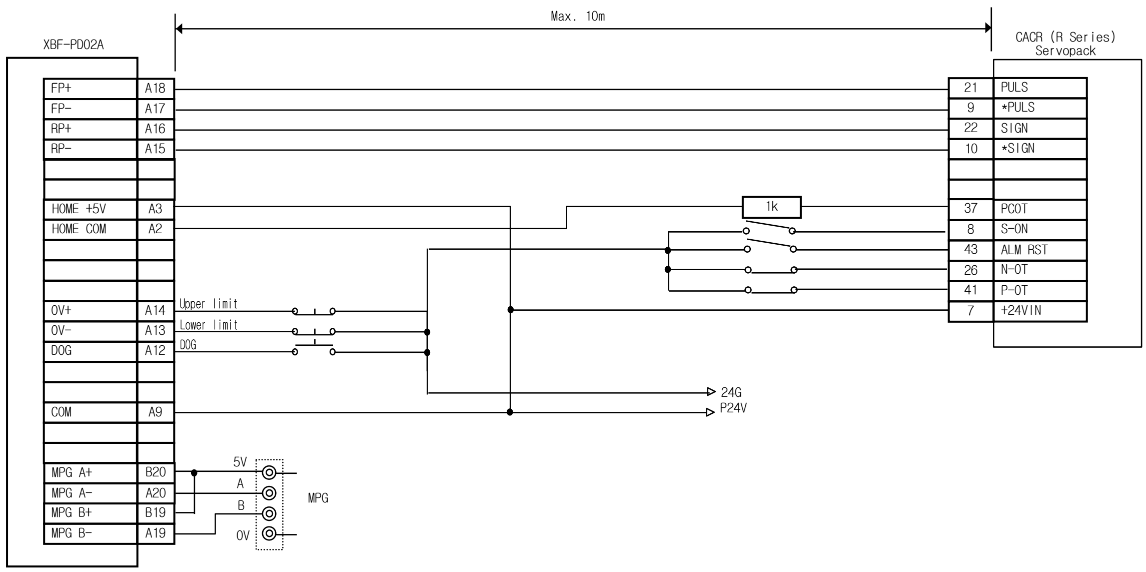
(4) Hagen Motor

(a) FDA-5000/6000/7000 AC Servo Drive Connection

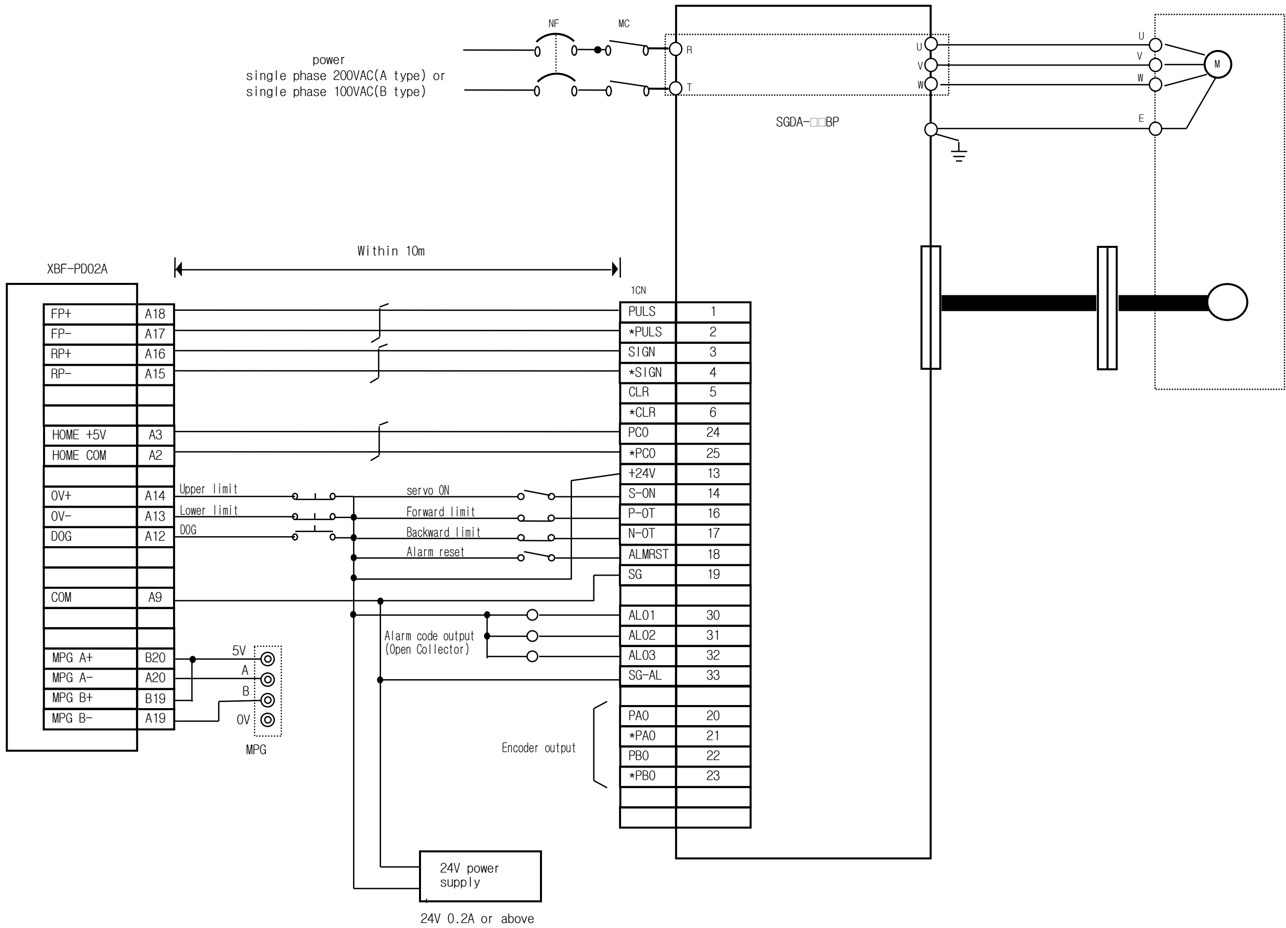


(5) YASKAWA

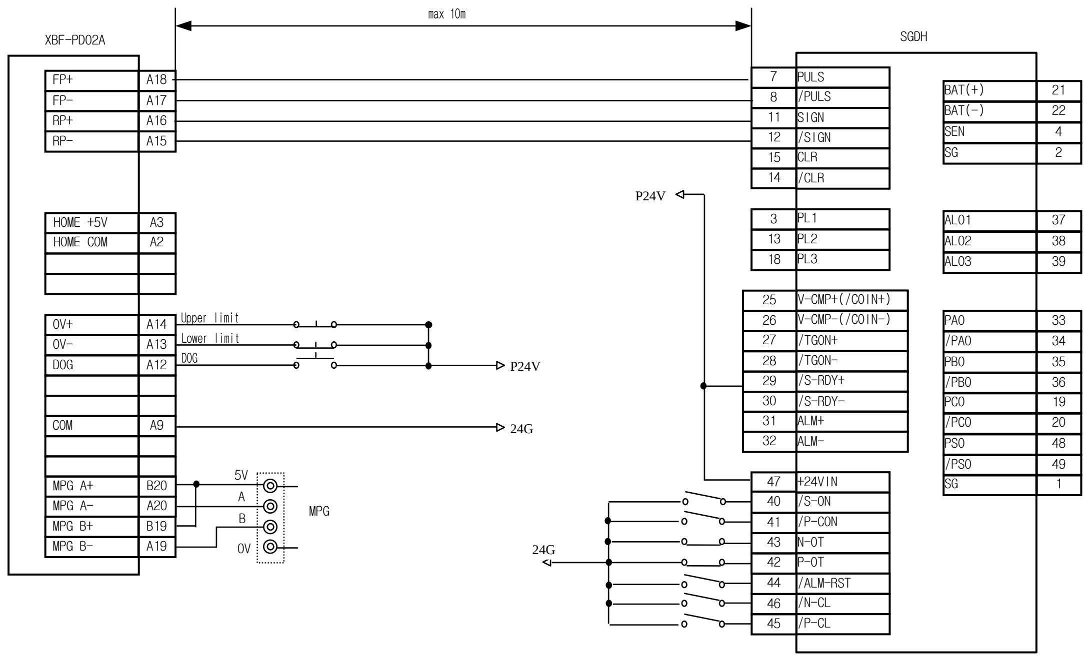
(a) CACR(R Series) Connection



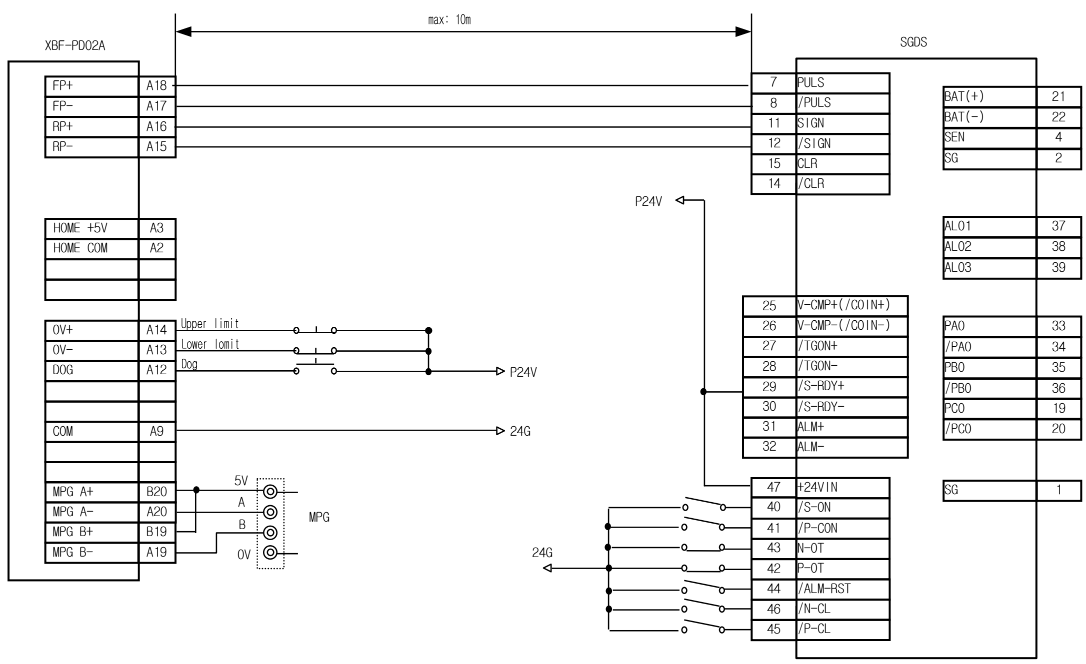
(b) SGDA-□□□P Connection



(c) ∑-Ⅱ Series SGDH AC Servo Drive Connection

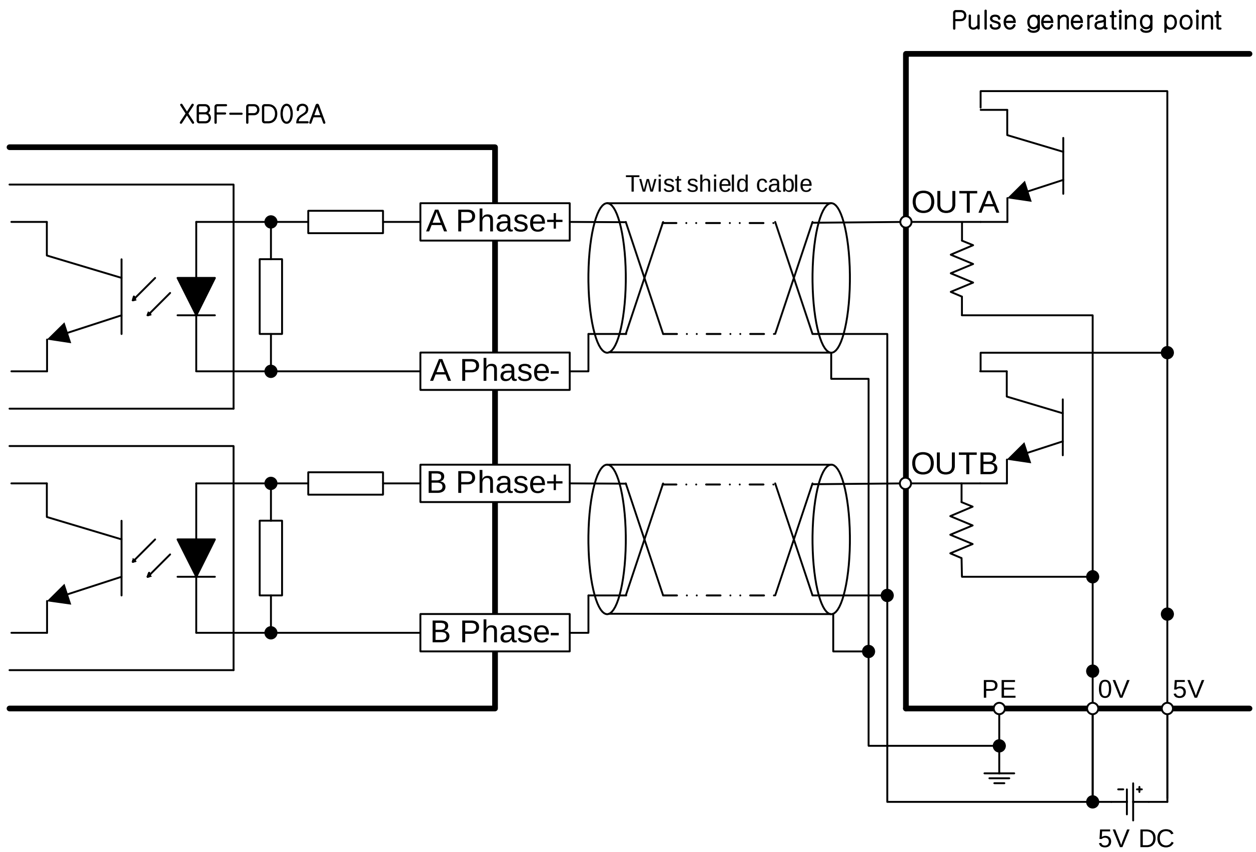


(d) ∑-Ⅲ Series SGDS AC Servo Drive Connection (Line Driver)



3.2.3 Encoder Input (DC 5V Voltage Output) Wiring Example

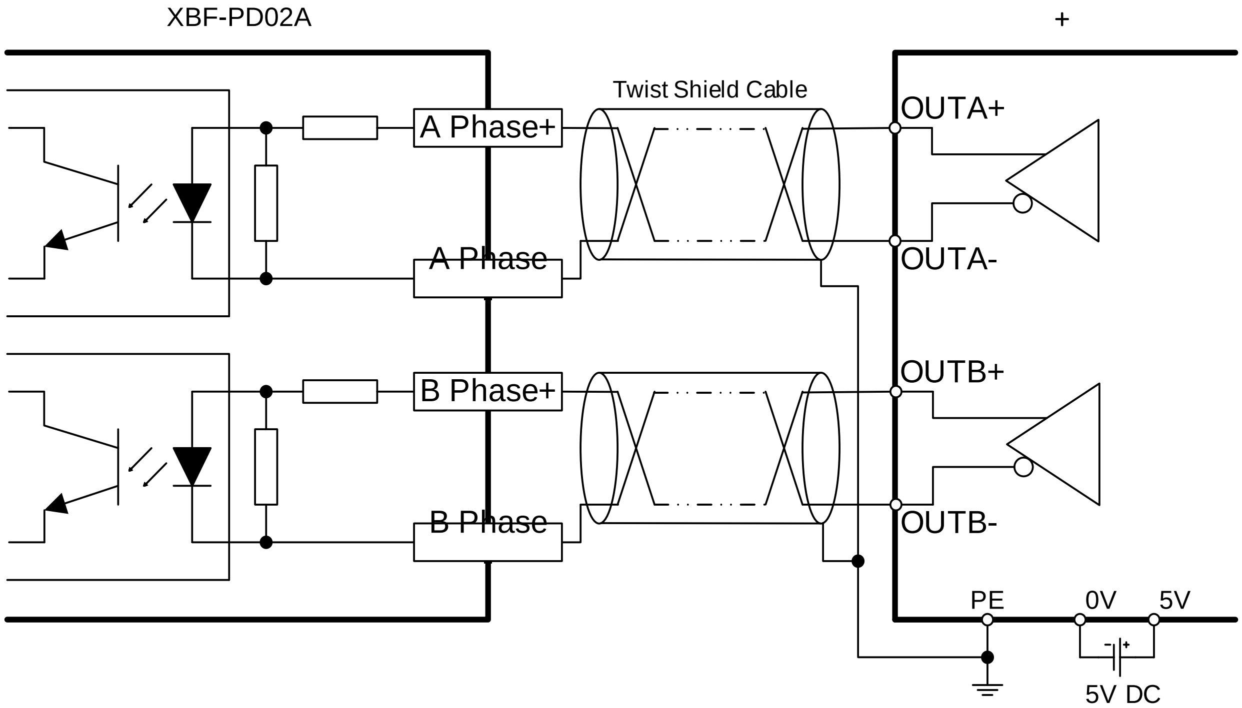
When Pulse Generator is a Voltage Output type, wiring example of positioning module and Encoder entry are as follows. In case of pulse generator uses by voltage output style by totem-pole output, wiring is equal.



Notes

Before Wiring, please consider maximum output distance of pulse generator.

3.2.4 Encoder Input (5V Line Driver Output) Wiring Example



Notes
Before Wiring, please consider maximum output distance of pulse generator.

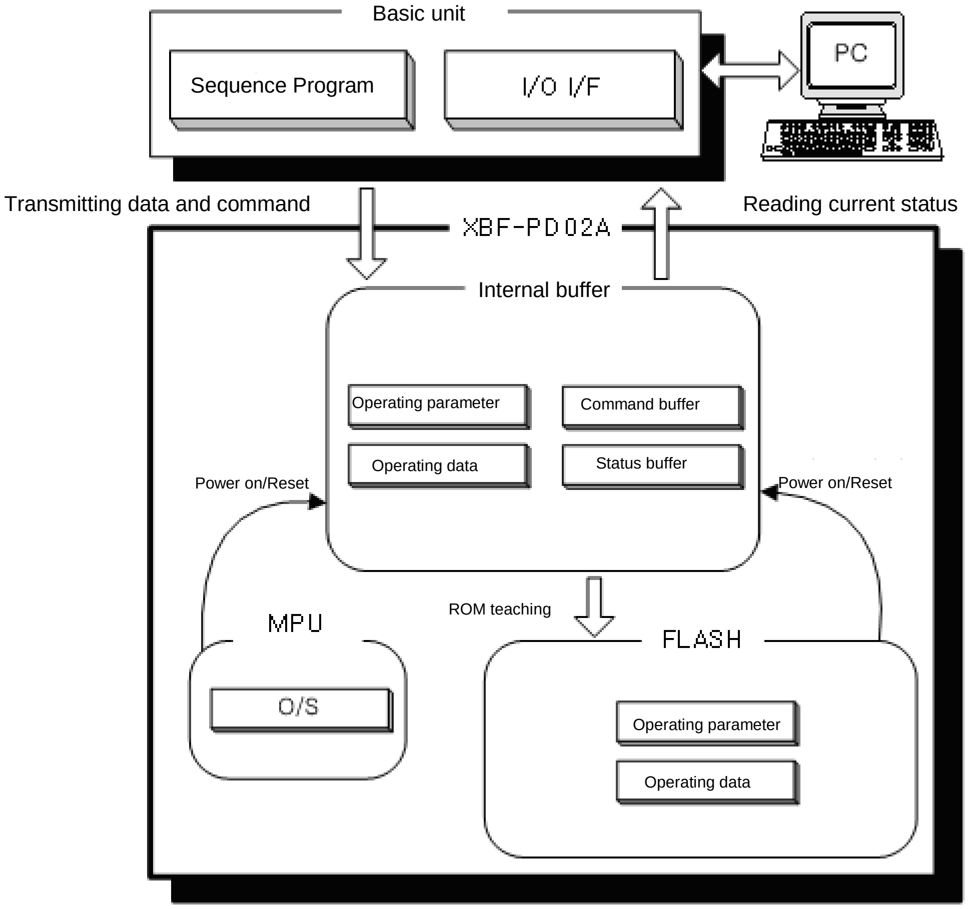
Chapter 4 Positioning Parameter & Operation Data

This chapter describes parameter and operation data

Item of Parameter and operation data should be set at each axis. (But common parameter shall be applied to all axes equally)

4.1 Parameter & Operation data

▶ This picture describe process of the saved parameter and operation data in the module.



4.2 Basic Parameter

▶ Here describes about basic parameter of positioning module.

4.2.1 Basic parameter

Basic parameter item	Setting range
Pulse output level	0: Low Active, 1: High Active
Pulse output mode	0: CW/CCW, 1: PLS/DIR
M code output mode	0: None, 1: With, 2: After
Bias speed	1 ~ 2,000,000[pulse/s]
Speed limit	1 ~ 2,000,000[pulse/s]
Acceleration time 1	0 ~ 65,535 [ms]
Deceleration time 1	
Acceleration time 2	
Deceleration time 2	
Acceleration time 3	
Deceleration time 3	
Acceleration time 4	
Deceleration time 4	
S/W upper limit	-2,147,483,648 ~ 2,147,483,647[pulse]
S/W lower limit	
Backlash compensation	0 ~ 65,535[pulse]
S/W limit detect	0: Not detect, 1: Detect
Positioning complete condition	0: Dwell time, 1: inposition 2: dwell time AND inposition 3: dwell time OR inposition
Use upper-lower limit	0: Not use, 1: use

Notes

Deceleration time will be followed by set deceleration time in order in case of deceleration stop when it is stop. Then, if declaration time was set as 0, Deceleration time will be decreased by set time before begin to operation. In case of sudden stop by internal factors (not by external factors), the deceleration time will be decreased by set time with sudden stop deceleration time.

4.2.2 Basic parameter setting

(1) Pulse output level

You can select one between Low Active and High Active as pulse output level. For Low Active output, select 0. For High Active output, select 1.

(2) Pulse unit

(a) You can set the command unit for positioning control according to control object. The command unit (mm, inch, pulse, degree) can be set for each axis separately.

(b) 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)

(3) Pulse per Rotation

(a) Only in case of using mm, inch, degree as a positioning command unit, you should set pulse per rotation

(b) In case of using SERVO, you should set the value of "the number of output pulse per rotation". If the value does not correspond with parameter value of servo drive, command and motor action can be different.

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

(4) Travel per rotation and unit miltiplier

(a) Only in case of using mm, inch, degree as a positioning command unit, you should set travel per rotation and multiplier

(b) Machine's travel per 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.

(c) Settable Travel per rotation (Al) is listed below

Setting unit	mm	Inch	degree
Travel per rotation	0.1 ~ 20000000.0 um	0.00001 ~ 2000.00000 inch	0.00001 ~ 2000.00000 degree

In case AL exceeds the above range, The travel per rotation (AI) should be set as follows:

Transfer amount (AL) = PB ×1/n

= Travel per rotation (AI) × Unit multiplier (Am)

Note)

In case unit is mm, unit multiplier (Am) is 1,10,100,1000.If the value of "PB ×1/n" exceeds 20000000.0 ㎛, it is required to adjust the unit multiplier so that the travel per rotation (Al) does not exceed 20000000.0 ㎛.

Ex1) In case that (AL) = PB ×1/n = 2500000.0 ㎛(= 2500 ㎜),

(AL) = (Al) × (Am) = 25000000 ×1

Ex2) In case that (AL) = PB ×1/n = 25000000.0 ㎛(= 25000 ㎜),

(AL) = (Al) × (Am) = 25000000 ×10

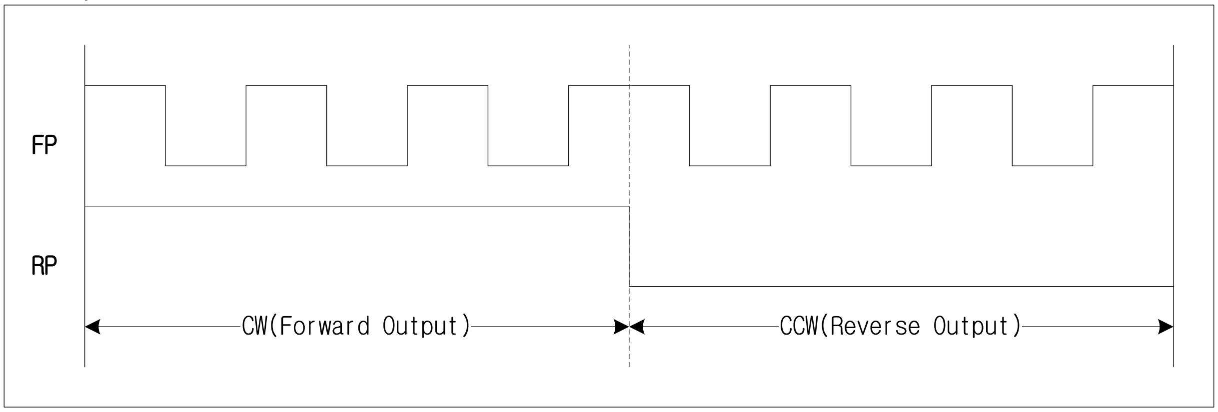
= 2500000 ×100

(5) 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.

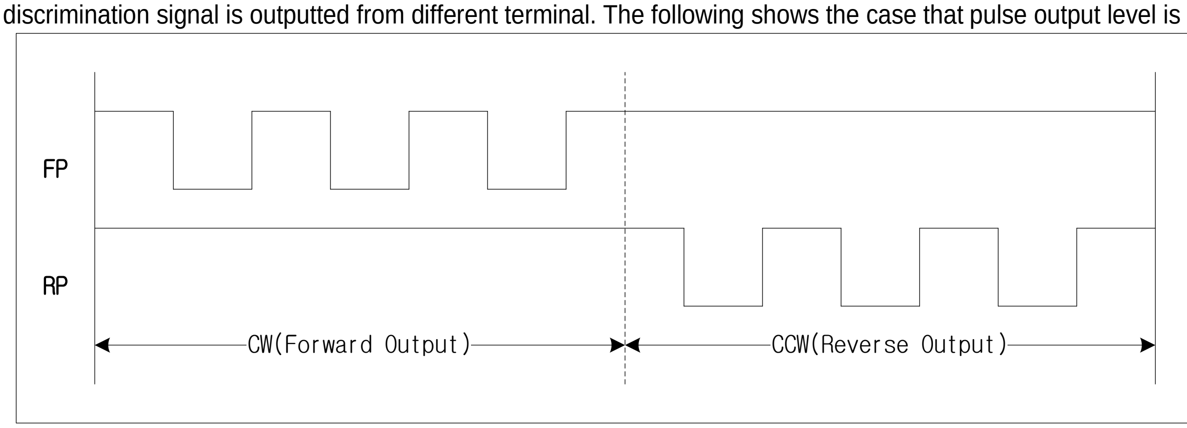
(a) CW/CCW mode

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.



(b) 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.



(6) M code output mode

(a) M code output mode set in the parameter is applied to all operation step of each axis

(b) You can set different Mo code number for each operating step number

(c) M code number setting range: 1~65,535 (If it is set as 0, M code may not operate.)

(d) 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).

(e) M code signal occurring during the operation shall be reset by M code “Off” command.

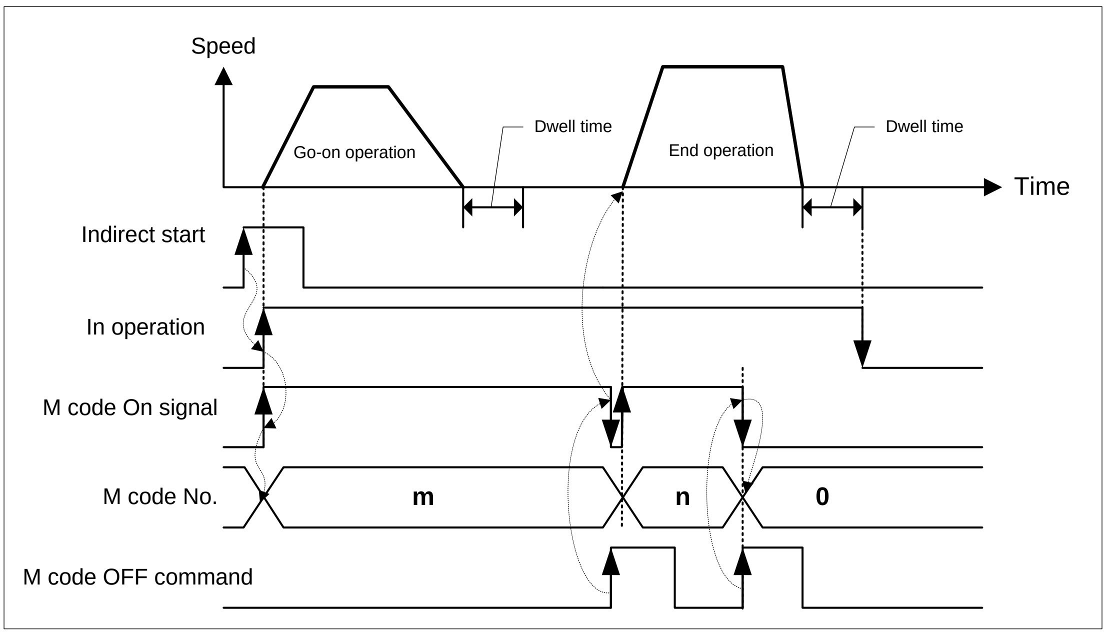
Notes

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

(f) There are two kinds of M code mode according to the output timing of M code signal : With mode and After mode.
(In case of setting NONE, There is no M code signal, even if it was set M code No.)

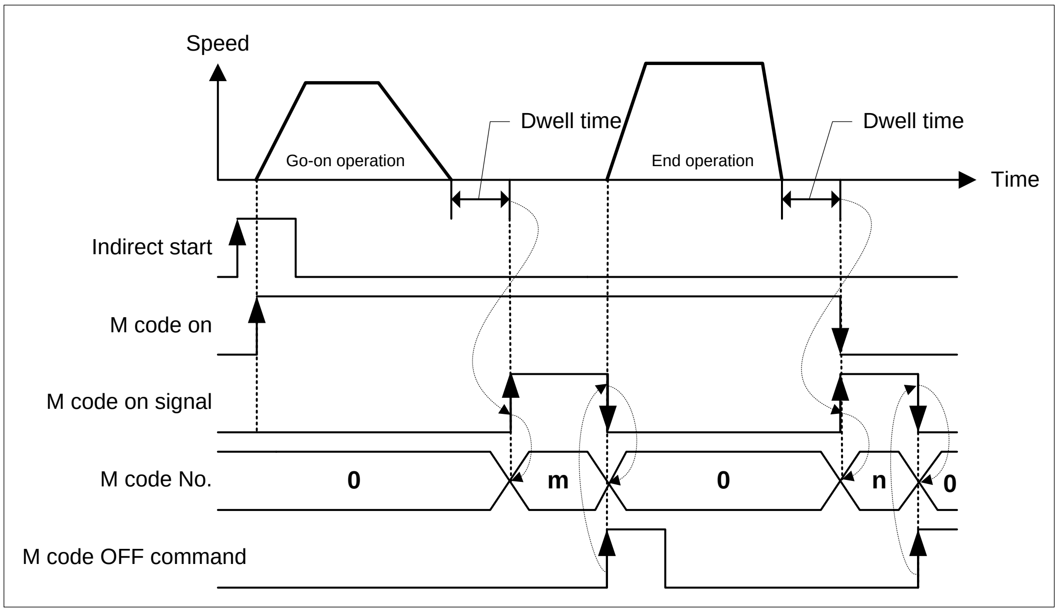
1) With mode

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



(7) 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”.

(a) The setting range is 0 ~ 2,000,000[pps]

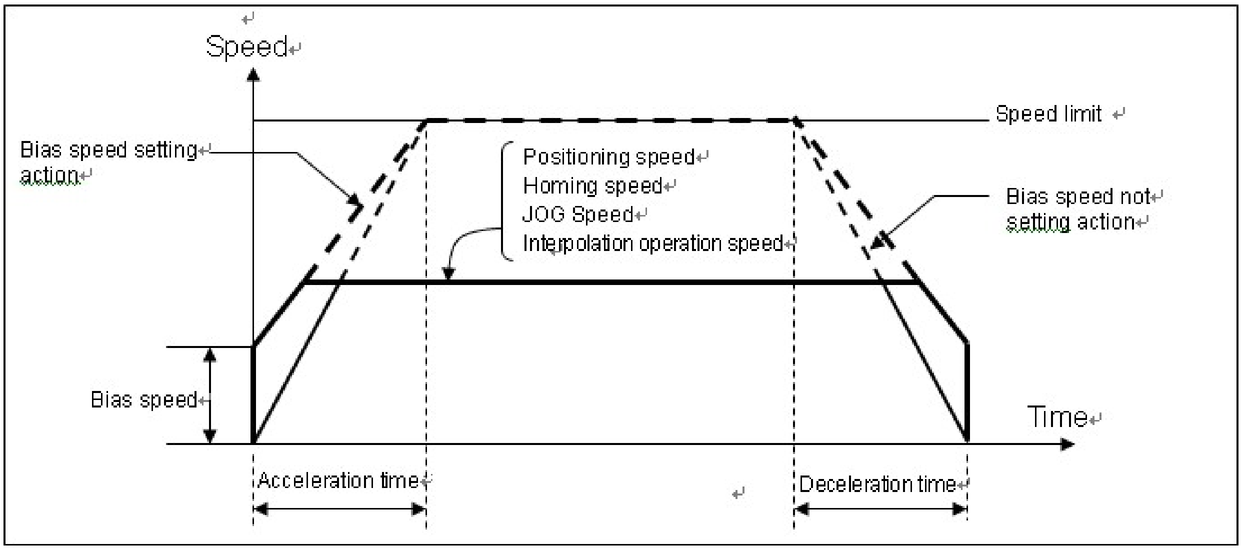
(b) Bias speed shall be used for the main axis of

1) Positioning operation by start command,

2) Homing operation,

3) JOG operation,

4) Main axis of interpolation operation (subordinate axis is not available).



Note

1. 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.
2. The bias speed should be set within the range as follows :
   1) Bias speed ≤ Positioning speed data
   2) Bias speed ≤ Homing-low speed ≤ Homing-high speed
   3) Bias speed ≤ JOG low speed ≤ JOG high speed
3. It causes error in connection with bias speed in the following example.
   1) Bias speed > Positioning speed data : error code 153
   2) Bias speed > Homing-high speed : error code 133
   3) Bias speed > Homing-low speed : error code 134
   4) Bias speed > JOG high speed : error code 121
   5) Bias speed > JOG high speed : error code 122
   6) Bias speed > inching speed : error code 123

(8) Speed Limit, Acceleration Time, Deceleration Time

(a) Speed Limit

Speed limit is maximum speed set by positioning operation.

All of the operating speed should be set by below speed limit when it was in positioning operation.

(b) Acceleration Time

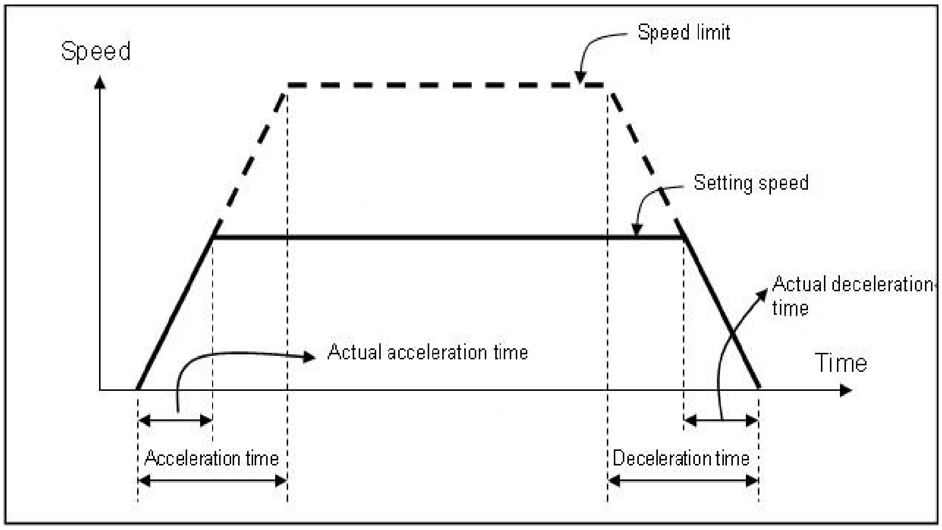
The time required to reach from speed “0”(stop state) to the speed limit which is set by parameter.

(It doesn’t mean that the time require to reach to the operation speed.)

(c) Deceleration Time

The time required to reach from the speed limit set by parameter to the bias speed (stop state).

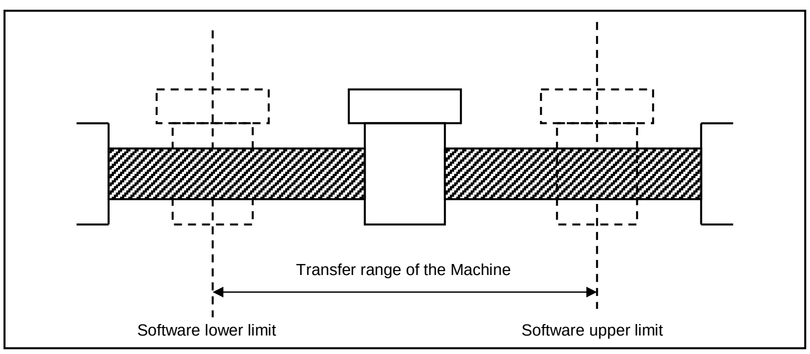
(It doesn’t mean that the time require to reach from the operation speed to the speed “0”.)



(9) Software Upper/Lower Limit

(a) 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 upper limit and software lower limit. That is, this function is used to prevent any derailment of incorrect operation position setting and incorrect operation by user program fault.

(b) External input upper/lower limit can be also set besides the software high/low limits.



(c) The range check of software upper/lower limit shall be done when the operation starts.

(d) If the software upper/lower limit is detected, error (Software upper limit error: 501, Software lower 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.

(e) Setting range is -2,147,483,648～2,147,483,647 [pulse].

But Software upper limit value always should be higher than software lower limit, at least same.

(f) If the software upper/lower limit was set by default value (upper limit: 2,147,483,647, lower limit: -2,147,483,648) or same value, then it wouldn't detect high/low limit.

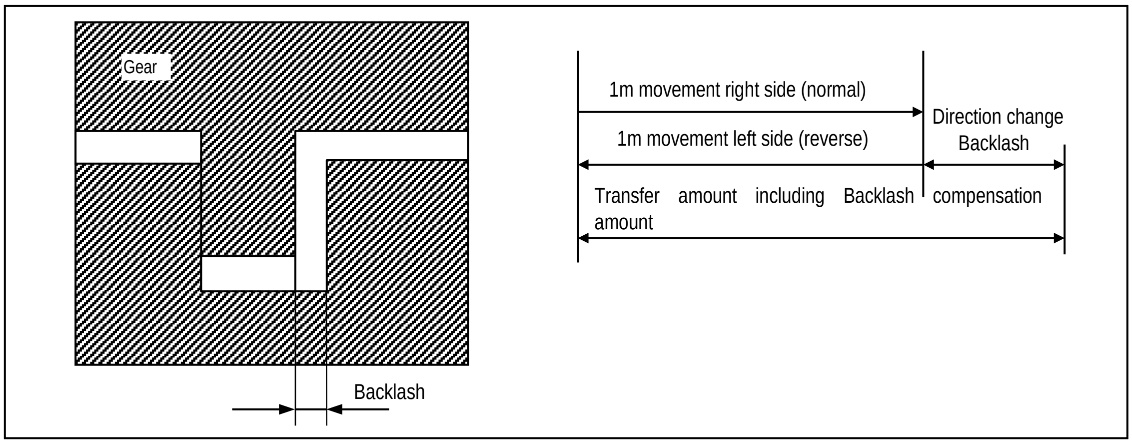
(10) Backlash Compensation Amount

(a) 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.

(b) This is used for positioning operation, inching operation and jog operation

(c) Setting range is 0 ~ 65,535[pulse]

(d) 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.



(11) SW limit detect

This is used to stop pulse output by software upper/lower limit in steady speed operation by speed control. If you set this item as "Detect", detects the software upper/lower limit regardless of origin fix

(12) Positioning End Condition

(a) Positioning End signal means the signal to notify that the operation set without stop factor after position operation has been completed.

(b) 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

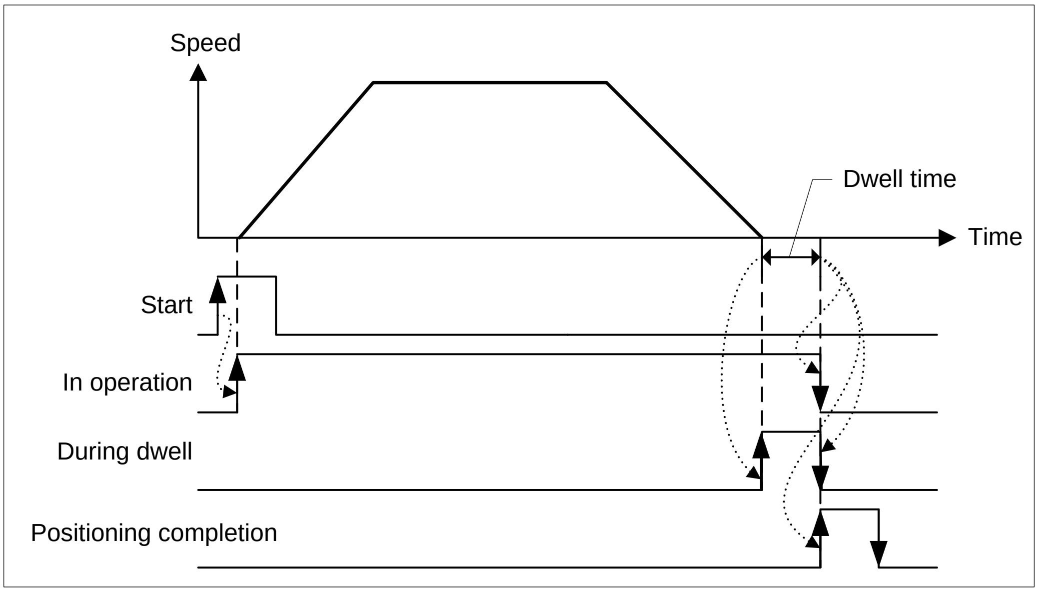
4) by using either dwell time or in-position signal.

(c) 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.

(d) That is a timing for each method.

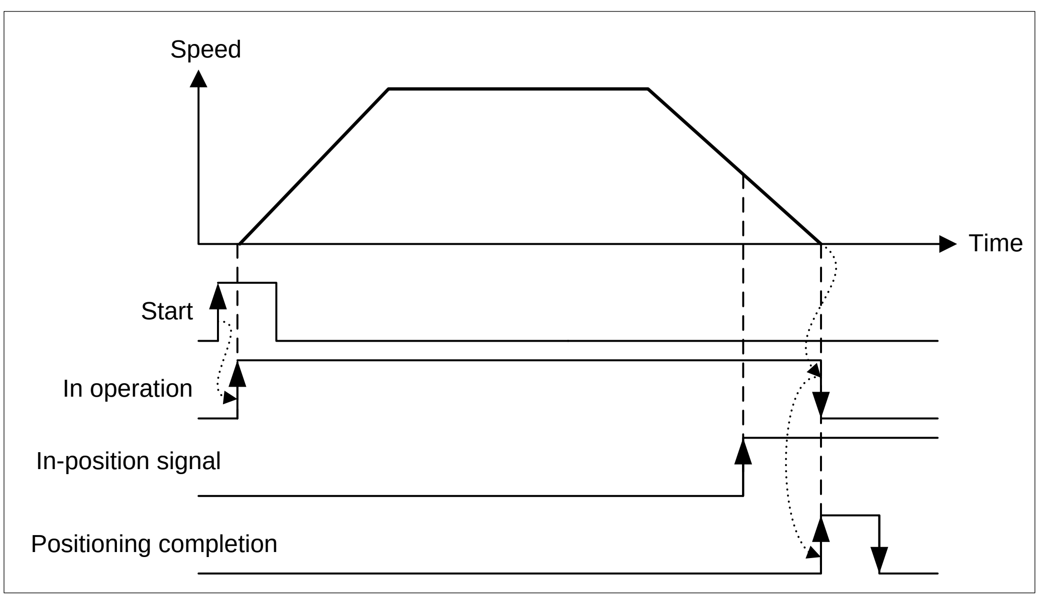
1) Method by dwell time

In case that in-position signal is ON when positioning is completed after dwell time.

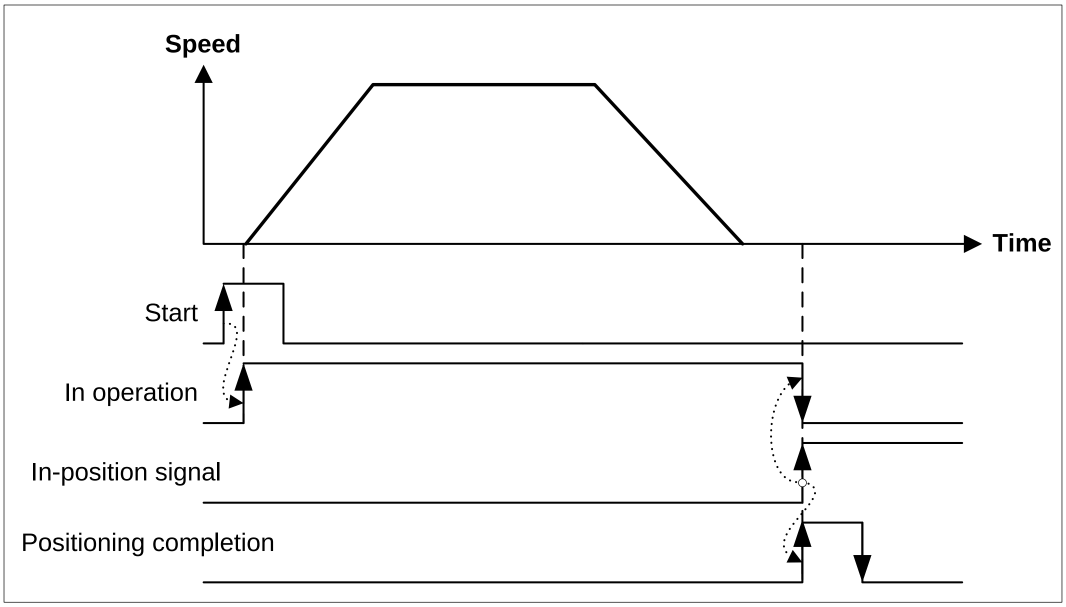


2) Method by in-position signal

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

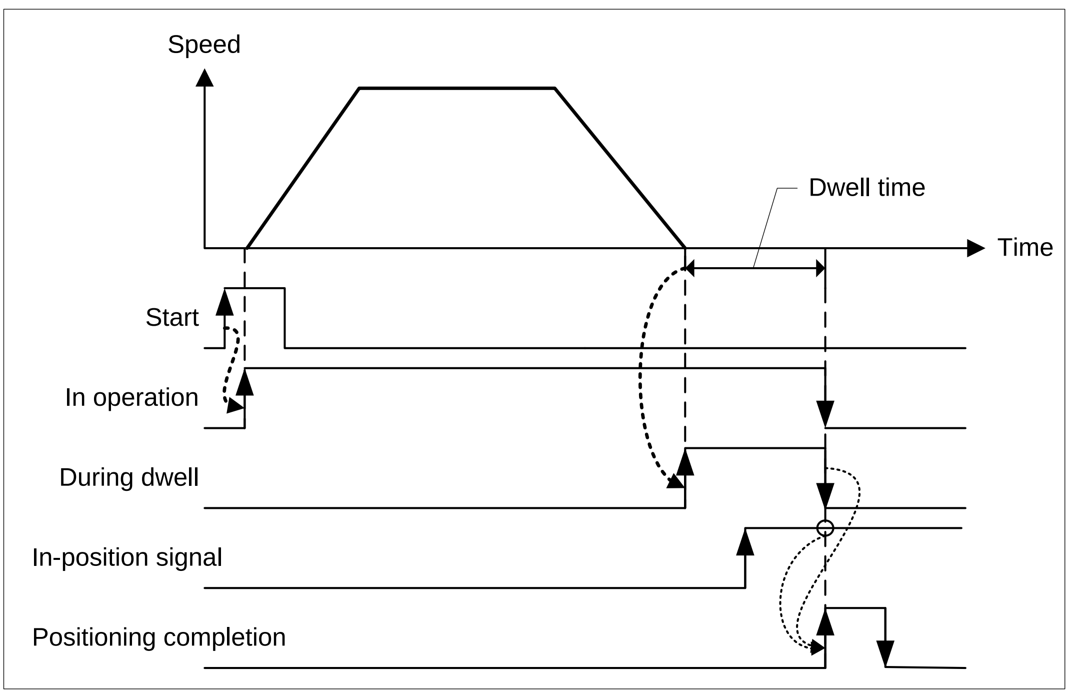


b) In case of In-positioning signal to be On after positioning is ended.

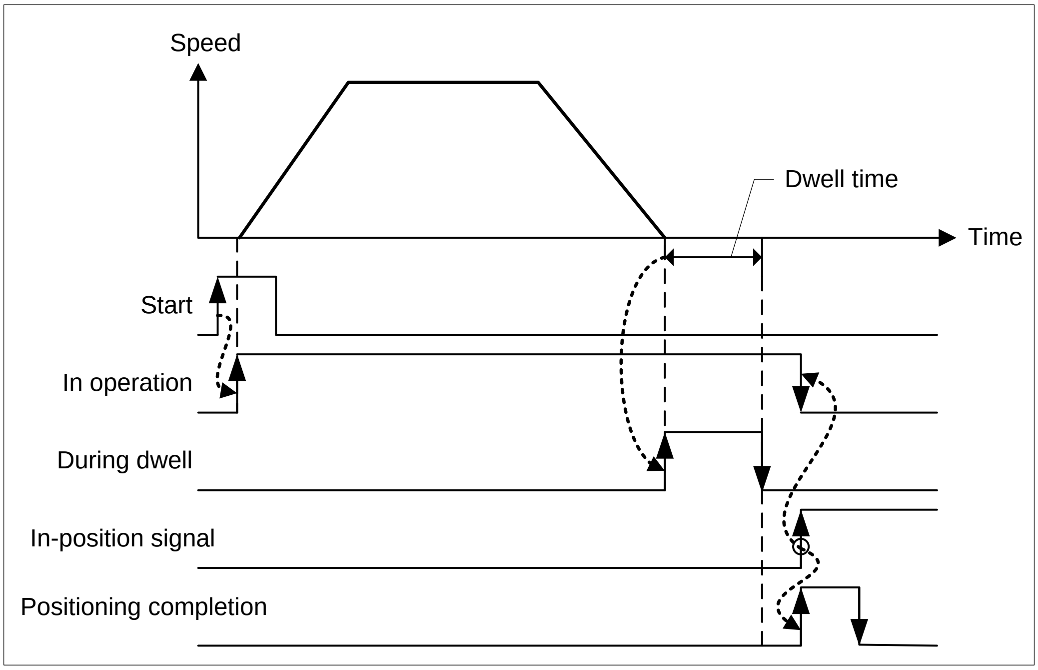


3) Method by using both dwell time and in-position signal

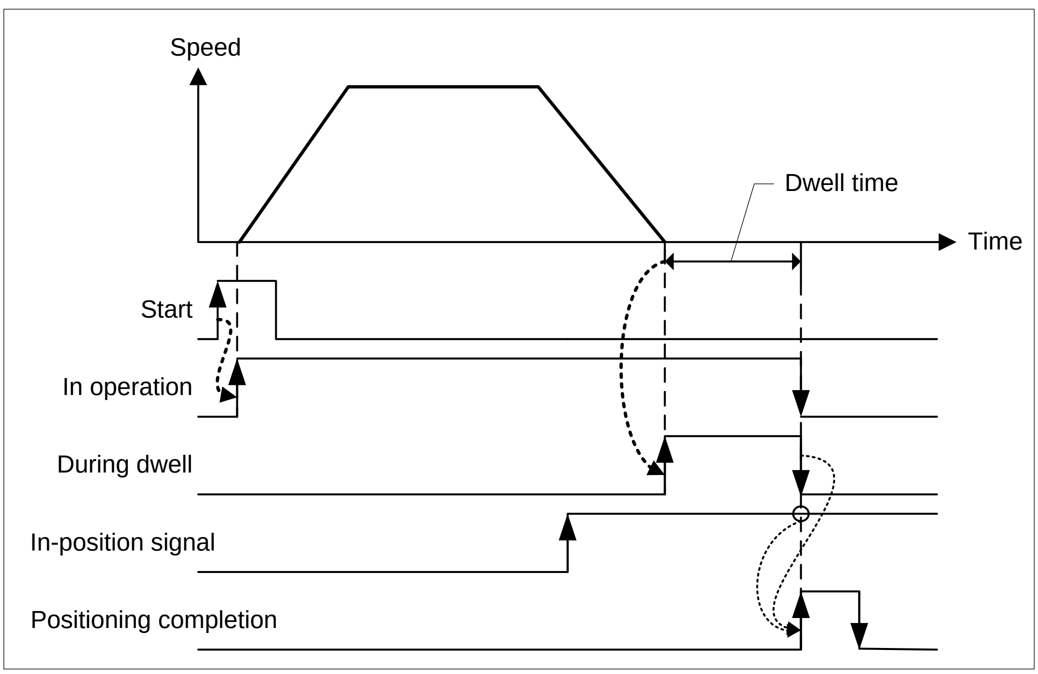
a) In case that in-position signal occurs before dwell time is ended



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

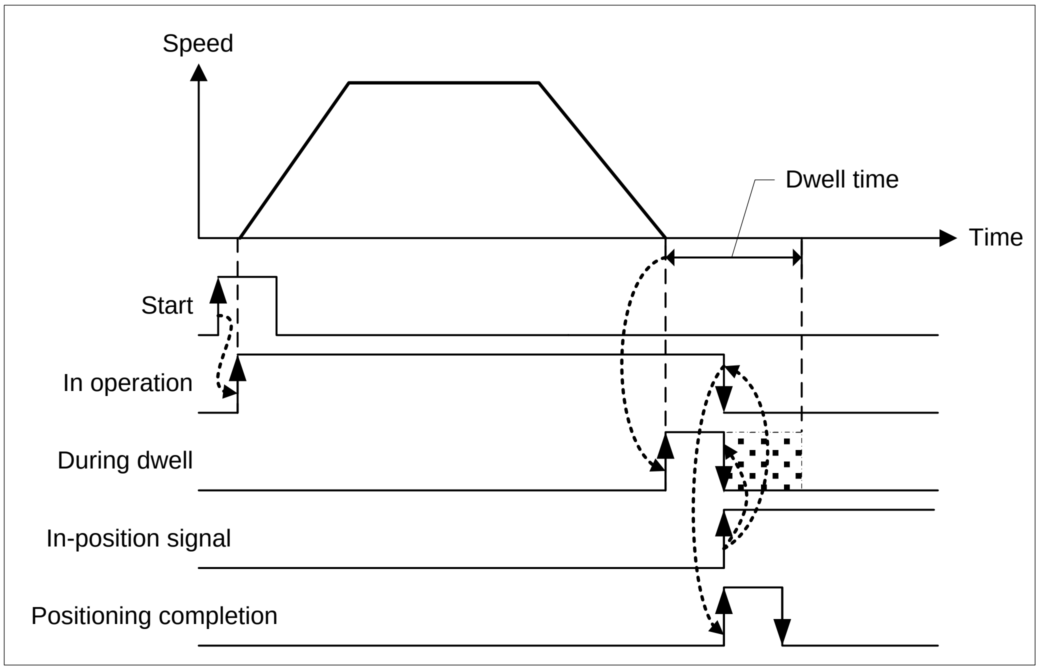


c) In case that in-position signal occurs during pulse output

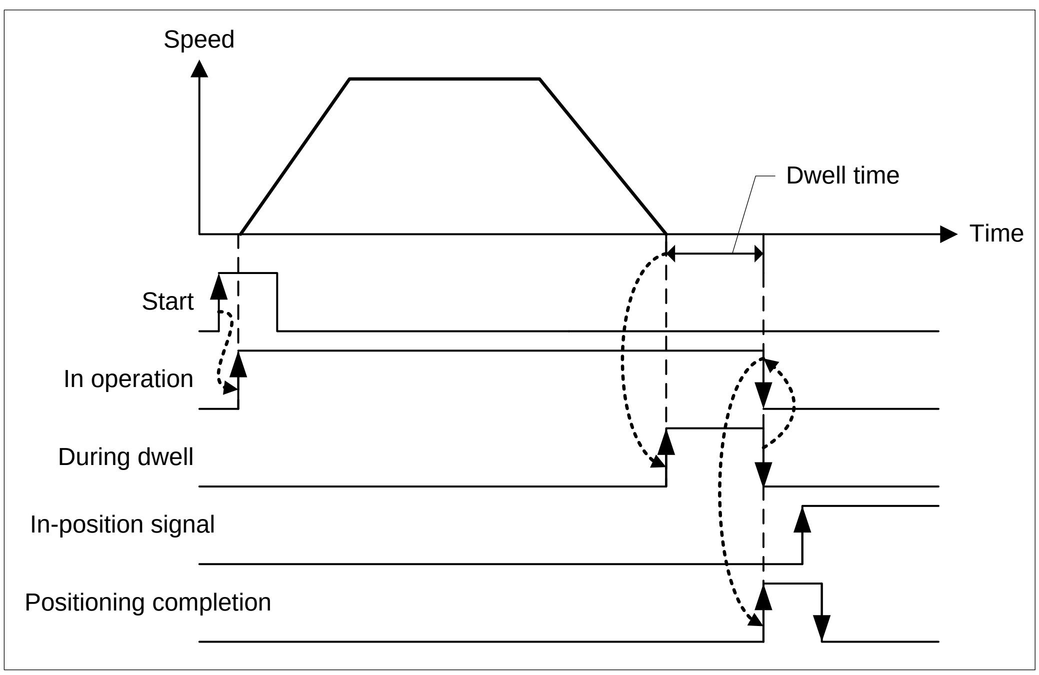


4) Method by using either dwell time or in-position signal

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



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



(13) Use of upper/lower limit

When you use upper/lower limit, set this tiem as “Use”. If you set this item as “Not use”, module doesn’t detect upper/lower limit signal.

4.3 Home/Manual parameter

Describes Home/Manual parameter of XGB positioning module

4.3.1 Contents of Home/Manual parameter

Home parameter items	Setting range
Home method	0:DOG/HOME(Off), 1:DOG/HOME(On), 2: DOG, 3: U.L Limit/Home, 4: U.L Limit
Home direction	0:CW, 1: CCW
Home address	-2,147,483,648 ～ 2,147,483,647 [pulse]
Home high speed	1 ～ 2,000,000 [pulse/s]
Home low speed	
Home compensation	-32,768 ～ 32,767 [pulse]
Home ACC time	0 ~ 65,535[ms]
Home DEC time	
Dwell time	
JOG high speed	-2,147,483,648 ～ 2,147,483,647 [pulse]
JOG low speed	
JOG ACC time (ms)	0 ~ 65,535[ms]
JOG DEC time (ms)	
Inching speed	0 ～ 65,535[pulse/s]

4.3.2 Home/Manual parameter setting

(1) Home method

(a) There are five home return methods as follows.

Home method	Parameter
Detect Home after DOG Off	0:DOG/HOME(Off)
Detect Home after deceleration in case of DOG On	1:DOG/HOME(On)
Detect Home by DOG	2: DOG
Detect Home by Home and upper/lower limit	3: U.L Limit/Home
Detect home by upper/lower limit	4: U.L Limit

(b) For more detail on home method, refer to 9.1 Home return

(2) Home Return direction

(a) There are 2 kinds of homing direction, forward direction and reverse direction.

(b) In case of homing command was set by forward, begin to homing operation to currently increasing direction of position, searching needed signal for homing from external.

(c) In case of homing command was set by reverse, begin to homing operation to currently decreasing direction of position, searching needed signal for homing from external.

(3) Origin Address

(a) When homing is completed by homing command, the value set by homing address shall be used to change the present address value.

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

(4) Homing-High speed

(a) The speed when returning to the origin by homing command : high speed and low speed.

(b) There are two homing action ; ‘detecting the origin signal’& ‘detecting origin signal area’.

‘Detecting the origin signal’; when detect the origin signal, be stop. If it has high speed, can be occurred errors between the origin signal and stop spot of machine. And should be operated under the steady speed.

Then, the speed is homing low speed.

Homing action can complete by higher operation speed in detecting origin position. This is the speed that it is set by homing high speed.

(c) All of the control by positioning module doing work within speed limit. And Homing high speed also can’t exceed speed limit.

And, homing high speed is faster than homing low speed or at least same.

Bias speed ≤ Homing-low speed ≤ Homing-high speed ≤ Speed limit

(5) Homing-Low speed

(a) The speed that acts to the constant speed section from high speed section via deceleration section by homing command.

> **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.

(b) In case of detecting Homing signal, use this function.

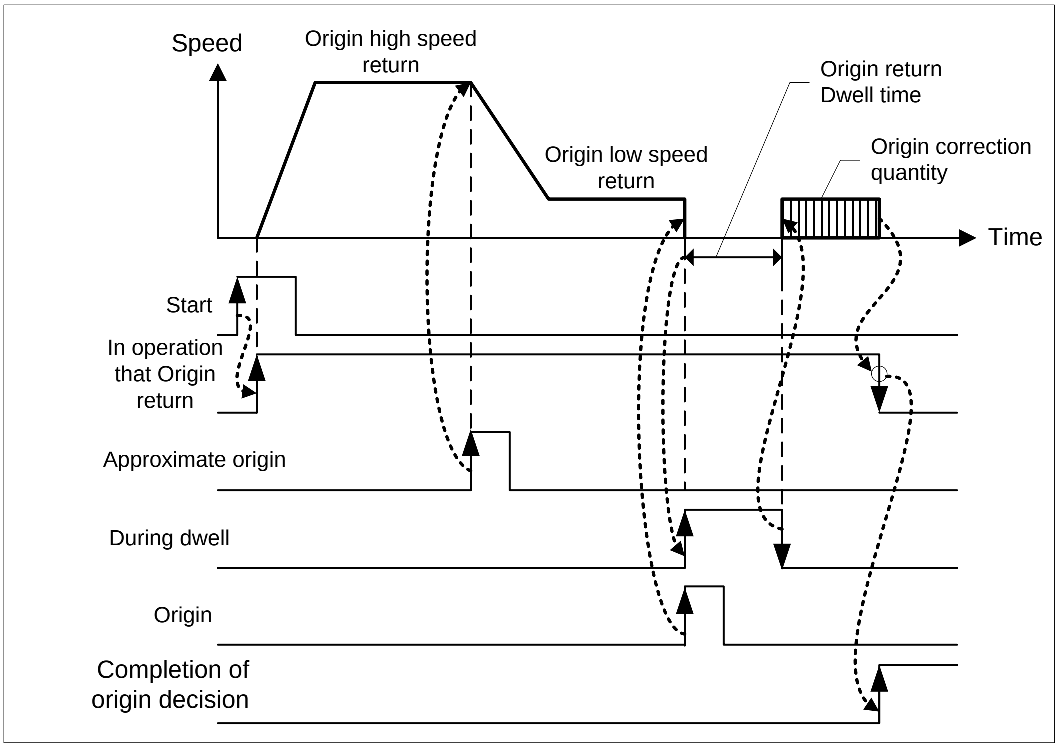
(6) Origin compensation amount

(a) 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.

(b) 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.

(c) Origin compensation amount setting range : -2,147,483,648 ~ 2,147,483,647 (unit: pulse)

(d) This picture is one of the examples about homing method that was applied by homing compensation amount from “Origin detection after approximate origin OFF”.



(7) Homing accelerating speed/ deceleration speed

(a) When it returns by homing command, it will be accelerated or decelerated by set acceleration time and deceleration time.

(b) Setting range is 0 ~ 65,535 [ms].

(c) It will be accelerated or decelerated according to speed limit set at basic parameter

(8) Homing dwell time

(a) This is the time needed to maintain the precise stop accuracy of SERVO motor when using the SERVO motor for positioning.

(b) 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”.

(c) Setting range of Homing dwell time : 0 ~ 65,535(unit: 1 ㎳)

(9) JOG high Speed

(a) 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.

(b) For further information, please refer to 9.3.1 JOG Operation.

(c) 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.

(d) Range of JOG High speed

All speed in positioning control is lower than speed limit. So JOG high speed also can’t be higher than speed limit. And JOG high speed should be higher than JOG low speed or equal.

(Bias speed ≤ Jog low speed ≤ Jog high speed ≤ Speed limit)

(10) JOG Low Speed

(a) JOG low speed operation has operation pattern as acceleration, constant speed, deceleration section.

(b) JOG low speed setting range : Bias speed ~ Jog high speed

(11) JOG Acceleration/Deceleration Time

(a) This means JOG acceleration/deceleration time when Jog high speed and low speed operation.

(b) JOG acceleration/deceleration time setting range : 0 ~ 2,147,483,647 [ms]

In case of set by 0, operate set by acceleration time 1 and deceleration time of parameter.

(12) Inching Speed

(a) The speed necessary for inching operation is set here.

(b) Inching speed setting range : 1 ~ 65,535(unit: 1pps)

4.4 Common Parameter

Here describes common parameter of positioning module

The parameter is applied to all of axes which is connected to positioning module.

4.4.1 Common parameter

Item of common parameter	Setting range
Encoder Max. value	-2,147,483,648 ~ 2,147,283,647
encoder Min. value	
Speed override	0 : % override, 1 : spd. override
Encoder input signal	0 : CW/CCW, 1:PLS/DIR, 2:Phase

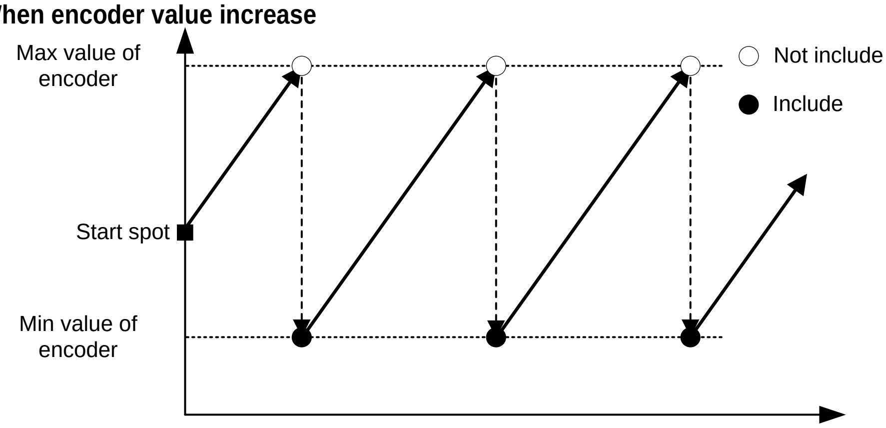
4.4.2 Common Parameter Setting

(1) Max/Min value of encoder

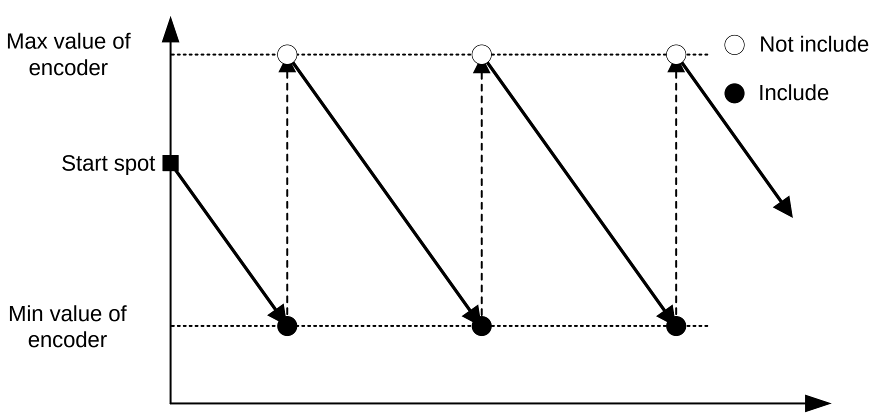
(a) When count Inputted pulse (from a hand pulse generator or encoder signal of Survo drive) and display as encoder value, the count range and range of encoder value need to be set to Max/Min value of encoder,

(b) The act follows the picture of below.

1) When encoder value increase



2) In case of decreasing encoder value



(2) Speed override

(a) When operate changing speed command (Speed override, Positioning speed override, etc), select speed(will be changed) or percentage of goal speed.

(b) in case of setting percentage(%) can set each per 0.01% from 0.01% to 655.35%.

(3) Encoder pulse input mode

(a) If you want to use by signal of a hand pulse generator or Servo drive encoder, can select suitable signal of a hand pulse generator or Survo drive encoder for using.

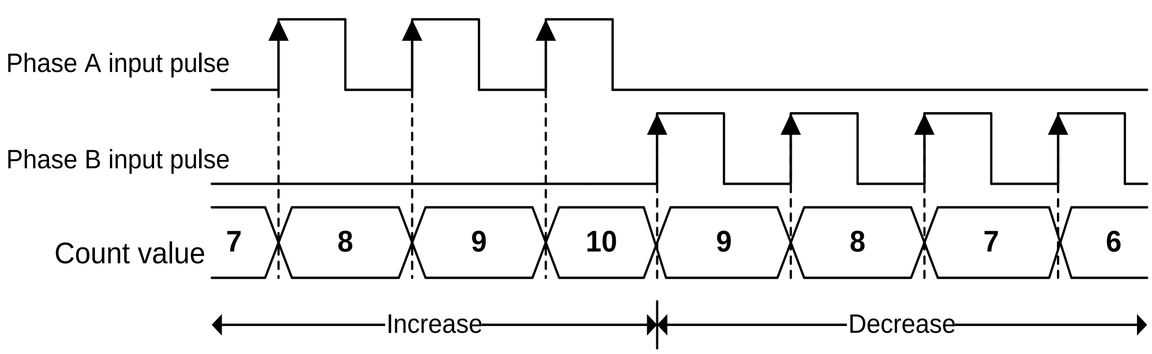
(b) Should select and set one from among CW/CCW, PULSE/DIR 1, PHASE A/B as an encoder input signal.

1) CW/CCW

When the Phase A input pulse was grow, or the phase B input pulse was grow, act to count.

It act to additional work when the Phase B input pulse is 'Low' and the Phase A input pulse is increased. It act to cutback when the Phase A is 'Low' and the Phase B input pulse is grow.

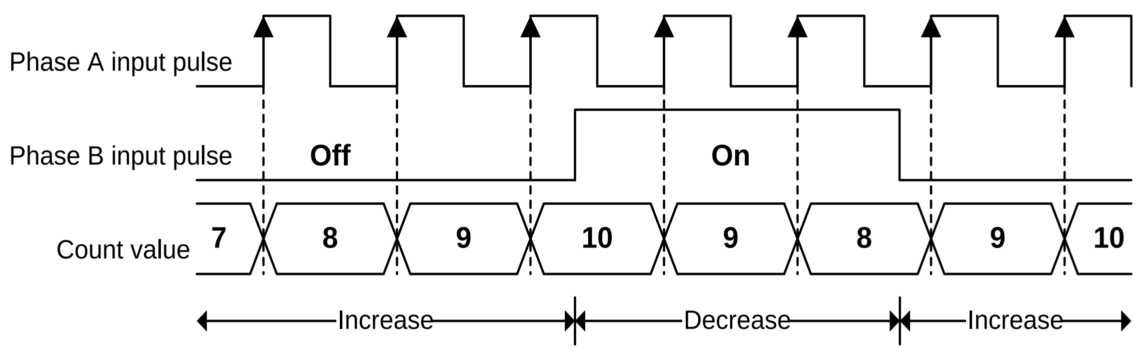
	Phase A input pulse High	Phase A input pulse Low
Phase B input pulse High	-	Decrease count
Phase B input pulse Low	Increase count	-



2) PULSE/DIR 1 multiplier

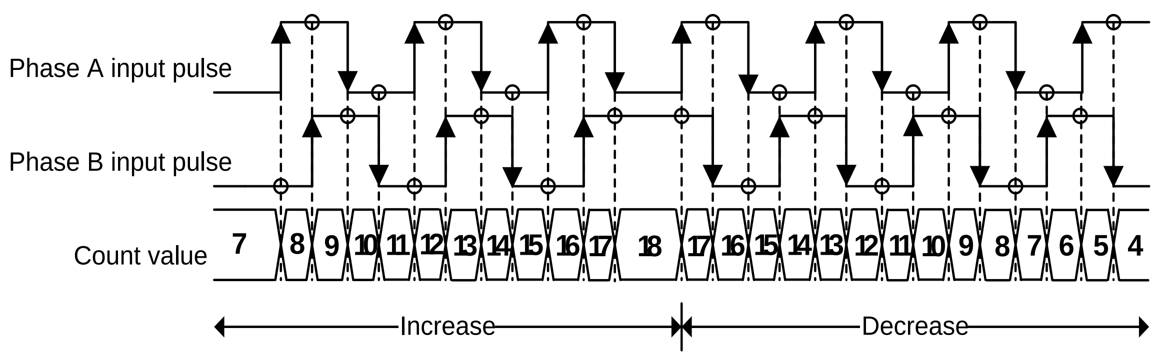
In case of increasing Phase A input pulse, act to count. Addition/cutback was decided by Phase B.

	Increasing Phase A input pulse	Decreasing Phase A input pulse
Phase B input pulse Off	Increase count	-
Phase B input pulse On	Decrease count	-



3) PHASE A/B 4 multiplier

Act to count when Phase A input pulse and Phase B input pulse is increased/decreased. In case that Phase A input faster than Phase B at the phase, act to add. In case that Phase B input faster than Phase A at the phase, act to decrease.



(c) The principal axis set encoder for that acting motor synchro with manual pulse generator (MPG).

Synchro rate can take “Encoder ≤ Motor” or “Encoder ≥ Moter” what you want .

4.5 I/O Signal Parameter

▶ Here describes using input/output signal parameter in positioning module.

▶ Input/output signal parameter use to decide act level of input signal.

4.5.1 I/O Signal Parameter

Input/output signal parameter configuration	Setting range
Upper limit signal	0 : A contact 1 : B contact
Lower limit signal	
DOG signal	
Home signal	
In position signal	

4.5.2 Setting of I/O 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 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’.

4.6 Operation Data

▶ Here describes Operation Data of positioning module.

▶ Can set 150 operation data per each axis, operation of circular interpolation and Linear interpolation act in accordance with information of operation data.

4.6.1 Operation Data

Operation data item	Setting range
Coordinate	0:absolute, 1:incremental
Pattern	0:End, 1: Keep, 2: Continue
Control	0: Position, 1: speed
Method	0:Single, 1:repetition
Repeat step	0 ~ 150
Address	-2,147,483,648 ~ 2,147,483,647 [pulse]
Circular interpolation auxiliary point	-2,147,483,648 ~ 2,147,483,647 [pulse]
Circular interpolation mode	0:MID, 1:CENTER, 2:RADIUS
M code	0 ~ 65,535
ACC. no.	0 ~ 3
DEC. no.	0 ~ 3
Speed	1 ~ 2,000,000 [pulse/s]
Dwell time	0 ~ 65,535[ms]
Cir. Int. turns	0 ~ 65,535
Cir. Int. dir.	0:CW, 1:CCW
Cir. Int. size	0:Arc<180 1:Arc>=180

4.6.2 Operation Data Setting

(1) Step No.

(a) The setting range of positioning data as serial no. is 0 ~ 150

(b) The first Starting step of operation data is no.1 step.

Notes

In case of designating step No. is ‘0’with indirectness maneuver, maneuver at the same time, positioning same period, it means current operation step.

(2) Coordinate

(a) Coordinate of position data includes absolute coordinate and incremental 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) 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.

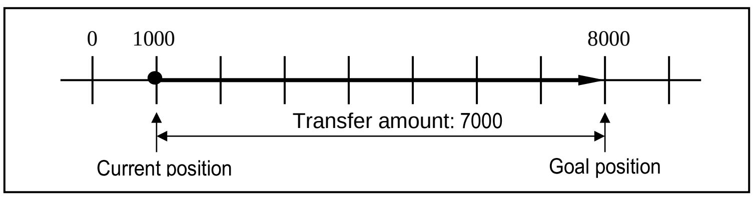
▶ Start position < Goal position : forward direction positioning

▶ 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



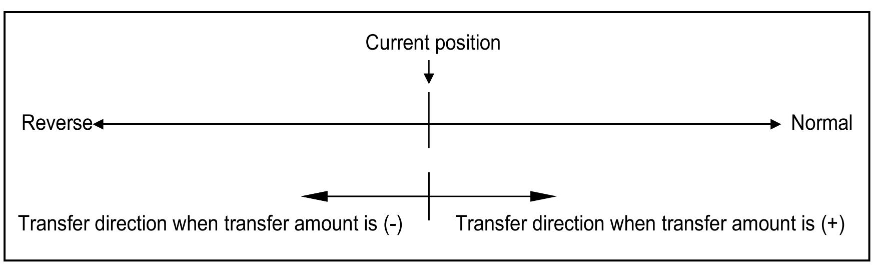
2) Incremental Coordinate (Control by Incremental method)

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)

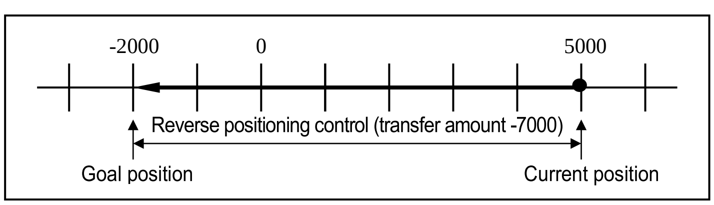
▶ When transfer direction is (-) : reverse direction positioning (position decrease direction)



[Example]

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

▷ Software Package Setting



(3) Control Method (End/KEEP/CONT)

(a) Decides how to connect the current and next step

(b) Select one among END, KEEP, CONT as you desire

(c) For further information, please refer to 9.2.2 operation mode of positioning control of Chapter 9 “Function”.

(4) Method

(a) There are SPD, POS in method. Select one between SPD, POS as you desire.

(b) For further information, please refer to 9.2.2 operation mode of positioning control of Chapter 9 “Function”.

(5) Operation Method (Singular/Repeat)

(a) Operating Method is a option for selecting a operating step after finish operating step from the driving data setting step.

(b) In case of setting singular, It will be select next step after finish operating setted step. If you set by Repeat, It will be select setted Repeat step after finish operating setted step.

(c) Select one positioning operation pattern from Singular, Repeat operation.

(d) For further information, please refer to 9.2.2 operation mode of positioning control of Chapter 9 “Function”.

(6) Repeat step

(a) In case operation method is repeat, set this item.

(b) Rage is 1~150

(7) Goal Position

(a) This is the area to set the transfer amount of position data as “position value”.

(b) The setting range is –2,147,483,648 ~ 2,147,483,647(setting unit: pulse).

(8) Circular interpolating auxiliary position

(a) This is an option for setting auxiliary data when the circular interpolation operates.

(b) According to circular interpolation, mean of circular interpolating auxiliary position is decided.
It means midpoint which is through by circular arc in midpoint method.
It is central point of circular arc in central point method. And It is radius of circular arc in radius method.

(c) In case that circular interpolation method is radius, be valid only value of circular interpolating auxilary position of principal axis.

(d) For further information, please refer to 9.2.6 ~ 9.2.8.

(9) Circular interpolating method

(a) This is an option for method setting from circular interpolating operation.

(b) There are three method for circular interpolation; midpoint, central point, radius.

(c) For further information, please refer to “Circular interpolation control” of 9.2.6 ~ 9.2.8.

(10) M Code

(a) 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.

(b) The setting range is 1 ~ 65,535

(c) M code no. can be identified by read by the operation state code

(d) For further information, please refer to M code output of 4.2.2.

(11) Acceleration/Deceleration No.

(a) 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.

(12) Operation Speed

(a) Operation speed is the goal speed which it is applied when it operate positioning

(b) Operation speed is set within the range that does not exceed Speed limit of basic parameter.

(13) Dwell Time

(a) This is the waiting time before carrying out the next positioning operation after completing one positioning operation.

(b) Setting range is 0 ~ 50,000 (㎳).

(c) 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.

(d) 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".

(14) Circular interpolate turns

(a) When operating circular interpolation more than 360 degree, sets turns of circle

(b) Range is 0 ~ 65,535.

(15) Circular interpolating direction

(a) This is an option for setting direction of drawing circle from circular interpolating operation when the operation starts.

(b) Circular interpolation direction is based on drawing circular interpolation when the principal axis is axis 'X' and the axis of ordinates is axis 'Y'.

(c) This option is ignored from circular interpolation of midpoint because circular interpolating direction is selected by position of midpoint.

(d) For further information, please refer to circular interpolation of 9.2.6 ~ 9.2.8.

(16) Circular arc size

(a) When circular interpolating method is set by radius method, User can select one of 2 circular arcs.

(b) Select one of over the 180-degree circular interpolation or under the 180-degree circular interpolation.

(c) This option is ignored in the circular interpolation of midpoint method and central point method.

(d) For further information, please refer to designating radius circular interpolation of 9.2.6~9.2.8

Chapter 5 Internal Memory and I/O Signal

5.1 Internal Memory

▶Here describes the internal memory used for XGB positioning module

▶ Internal memory is used when executing direct Data read/write between positioning module and PLC main unit by using PUP(PUTP), GET(GETP) command instead of using the dedicated command. For Data read/write using the dedicated command, please refer to 6.2 Dedicated Command.

5.1.1 Teaching Data

(1) Memory Address of Teaching Data

Memory Address		Information
Axis X	Axis Y	
C0	100	Teaching Data1(LOWER)
C1	101	Teaching Data 1(UPPER)
C2	102	Teaching Data 2(LOWER)
C3	103	Teaching Data 2(UPPER)
C4	104	Teaching Data 3(LOWER)
C5	105	Teaching Data 3(UPPER)
C6	106	Teaching Data 4(LOWER)
C7	107	Teaching Data 4(UPPER)
C8	108	Teaching Data 5(LOWER)
C9	109	Teaching Data 5(UPPER)
CA	10A	Teaching Data 6(LOWER)
CB	10B	Teaching Data 6(UPPER)
CC	10C	Teaching Data 7(LOWER)
CD	10D	Teaching Data 7(UPPER)
CE	10E	Teaching Data 8(LOWER)
CF	10F	Teaching Data 8(UPPER)
D0	110	Teaching Data 9(LOWER)
D1	111	Teaching Data 9(UPPER)
D2	112	Teaching Data 10(LOWER)
D3	113	Teaching Data 10(UPPER)
D4	114	Teaching Data 11(LOWER)
D5	115	Teaching Data 11(UPPER)
D6	116	Teaching Data 12(LOWER)
D7	117	Teaching Data 12(UPPER)
D8	118	Teaching Data 13(LOWER)
D9	119	Teaching Data 13(UPPER)
DA	11A	Teaching Data 14(LOWER)
DB	11B	Teaching Data 14(UPPER)
DC	11C	Teaching Data 15(LOWER)
DD	11D	Teaching Data 15(UPPER)
DE	11E	Teaching Data 16(LOWER)
DF	11F	Teaching Data 16(UPPER)

(2) Setting

(a) The command of Teaching data setting is TWR.

(b) References for TEAA and TWR are on ‘Chapter 6.3.24.

(c) In PLC program, in order to carry out the normal action of Teaching command, the Teaching data setting should be done in the step before Teaching command is executed.

5.1.2 State Information

(1) Memory Address of State Information

Memory address (HEX)		Information
Axis X	Axis Y	
140	180	Operation state bit information (Lower)
141	181	Operation state bit information (Upper)
142	182	Axis information
143	183	External I/O signal state
144	184	Current Position (Lower)
145	185	Current Position (Upper)
146	186	Current Speed (Lower)
147	187	Current Speed (Upper)
148	188	Step number
149	189	M code
14A	18A	Error information
14B	18B	Encoder value (Lower)
14C	18C	Encoder value (Upper)

(2) Setting

(a) 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).

(b) The dedicated command of State Information ready only is SRD (refer to 6.3.33 command for reading operation status).

(c) If you use only command SRD, the information of axis status is read at once.

(d) If you want to choose to read among the state information, it is available to read memory address of above table using by GET/GETP

(e) Use of State Information

1) Operation State Bit Information (Lower)

Memory Address		**Information**
Axis X	**Axis Y**	
140	180	Operation State bit Information (Lower)

Bit 0	In Operation	[0: Stop, 1: In Operation]
Bit 1	Error State	[0: No Error, 1: Errors]
Bit 2	Positioning Completed	[0: Positioning not completed, 1: Positioning completed]
Bit 3	M Code Signal	[0: M Code Off, 1: M Code On]
Bit 4	Homing State	[0: Homing not completed 1: Homing completed]
Bit 5	No Use	[0]
Bit 6	Stop State	[0: Stop State not by Stop Command, 1: Stop State by Stop Command]
Bit 7	No Use	[0]
Bit 8	High-end detection	[0: No Detection, 1: Detection]
Bit 9	The lower limit of detection	[0: No Detection, 1: Detection]
Bit 10	Emergency Stop State	[0: Normal, 1: Emergency Stop]
Bit 11	Forward/Reverse	[0: Forward, 1: Reverse]
Bit 12	Acceleration State	[0: No Accelerating, 1: Accelerating]
Bit 13	Constant Speed State	[0: Not Under Constant , 1: Under Constant]
Bit 14	Deceleration State	[0: No Decelerating, 1: Decelerating]
Bit 15	Dwell State	[0: No Dwelling , 1: Dwelling]

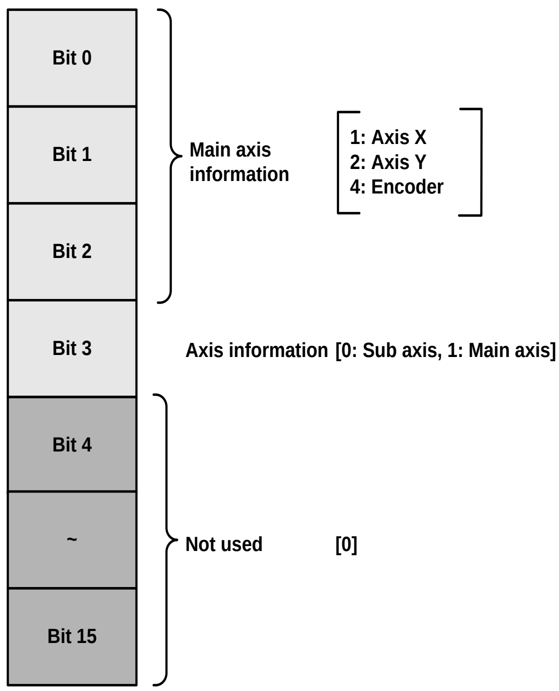
2) Operation State Bit Information (Upper)

Memory address		Information
Axis X	Axis Y	
141	181	Operation State Bit Information (UPPER)

Bit 0	In position control	[0: Not in position control, 1: In position control]
Bit 1	In speed control	[0: Not in speed control, 1: In speed control]
Bit 2	In liner interpolcation	[0: Not in linear interpolation, 1: In linear interpolation]
Bit 3	Not used	[0]
Bit 4	In circular interpolcation	[0: Not in circular interpolation, 1: In circular interpolation]
Bit 5	Homing	[0: Not in homing, 1: Homing]
Bit 6	In position synchrous	[0: Not in position synchronous, 1: In position synchronous]
Bit 7	In speed synchrous	[0: Not in speed synchronous, 1: In speed synchronous]
Bit 8	JOG low speed	[0: Not in JOG low speed, 1: In JOG high speed]
Bit 9	JOG high speed	[0: Not in JOG high speed, 1: In JOG high speed]
Bit 10	In inching operation	[0: Not in inching, 1: In inching]
Bit 11	Not used	[0]
Bit 12	Not used	[0]
Bit 13	Not used	[0]
Bit 14	Not used	[0]
Bit 15	Not used	[0]

3) Axis Information

Memory address		Information
Axis X	Axis Y	
142	182	Axis information



4) External I/O Signal State

Memory address		Information
Axis X	Axis Y	
143	183	Axis information

Bit 0	Not used	[0]
Bit 1		
Bit 2		
Bit 3		
Bit 4	External upper signal	[0: External upper signal OFF, 1: External upper signal ON]
Bit 5	External lower signal	[0: External lower signal OFF, 1: External lower signal ON]
Bit 6	Home	[0: Home signal OFF, 1: Home signal ON]
Bit 7	DOG	[0: DOG signal OFF, 1: DOG signal ON]
Bit 8	Not used	[0]
Bit 9		
Bit 10		
Bit 11		
Bit 12	Inposition signal	[0: Not inposition area, 1: inposition area]
Bit 13	Deviation counter clear	[0: Deviation counter clear output signal OFF, 1: Deviation counter output signal ON]
Bit 14	Not used	[0]
Bit 15		

5.2 I/O Signal

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

5.2.1 Contents of I/O Signal

(1) I/O signal of positioning module uses input: 16 bits and output: 16 bits.

(2) Positioning Module operation ready signal (Uxx.00.F) becomes “ON” only when Modules are in normal state in H/W and it always keeps “ON” regardless of PLC operation mode.

(3) Output Signal

This is the signal which transfers to positioning module from main unit

(4) The following table is based on XBC and XEC.

Axis	Signal Direction: Main unit → Positioning module		
	Output signal		Description
	XBC Type	XEC Type	
Axis X	Uxy.01.0	%UXx.y.16	Axis X forward direction JOG
	Uxy.01.1	%UXx.y.17	Axis X reverse direction JOG
	Uxy.01.2	%UXx.y.18	Axis X JOG low/high speed
	Uxy.01.3	%UXx.y.19	Axis X positioning complete signal clear
Axis Y	Uxy.01.4	%UXx.y.20	Axis Y forward direction JOG
	Uxy.01.5	%UXx.y.21	Axis Y reverse direction JOG
	Uxy.01.6	%UXx.y.22	Axis Y JOG low/high speed
	Uxy.01.7	%UXx.y.23	Axis Y positioning compete signal clear

(5) Input signal

This is the signal which transfers to main unit from positioning module

Axis	Signal direction: Main unit ← Positioning module		
	Input signal		Description
	XBC Type	XEC Type	
-	Uxx.00.0 ~ Uxx.00.E	%UXx.y.0~ %UXx.y.14	Not used
Common	Uxx.00.F	%UXx.y.15	Positioning module ready

5.2.2 Use of I/O Signal

(1) JOG Operation

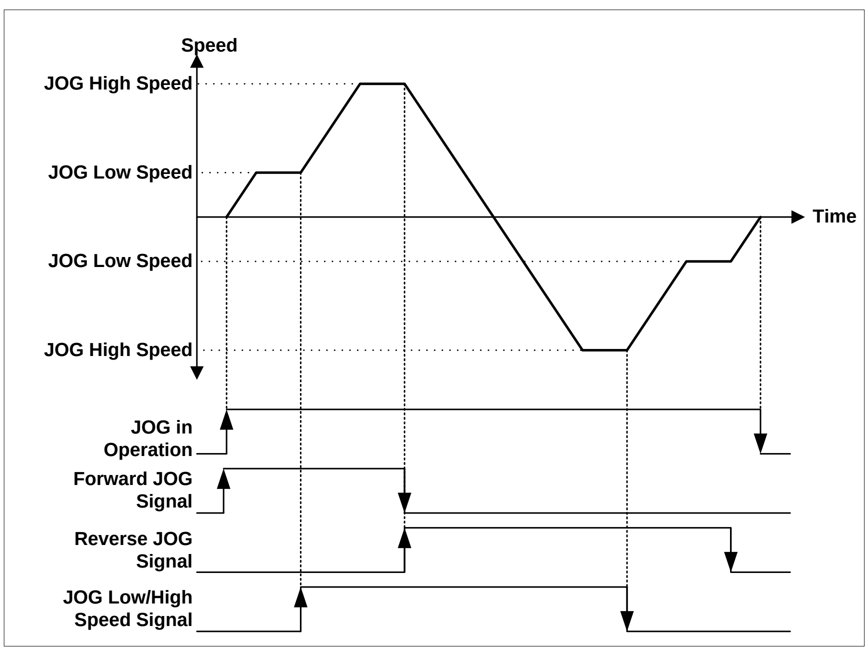
(a) Forward/Reverse Jog Signals show the direction of Jog Operation. The Jog operation shall be divided into Forward/Reverse direction according to the On/Off signals. When Forward Jog Signal is on, it starts Forward Operation and When Jog Signal is Off, it starts Reverse Operation. When both signals off, it stops Jog Signals. When both signals on, it stops

Forward Jog Signal	Reverse Jog Signal	Jog Operation Status
On	Off	Forward Jog Operation
Off	On	Reverse Jog Operation
Off	Off	Stop
On	On	Stop

(b) If Jog direction is changed during Jog operation, it slows down at first and then operates as the direction it changed.

(c) According to value of Jog low/high Signals, it could operate with low/high speed. When jog low/high signals Off, it operates with low speed and when they are ON, it operates with high speed.

(d) If you change value of low/high jog signals during Jog operation, there will be no stop and apply the speed as you changed.



(2) Positioning complete signal clear

(a) It is used to turn off positioning complete signal after complete of single operation, repeated operation, continuous operation, liner interpolation operation, circular interpolation operation, speed/position conversion control operation and inching operation.

(b) In the following two cases, positioning complete signal is off

- If positioning complete signal clear bits (Axis X: Uxx.01.3. Axis Y: Uxx.01.7) is on, it will clear the positioning complete signal.
- It is turned off when positioning dedicated command is executed while positioning complete signal is on.

Chapter 6 Command

Here describes the positioning command.

6.1 Contents of General Command

Command	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

6.1.1 Internal Memory Read (GET, GETP Command)

Form	Description	Available area
n1	Base and slot No. installed with special module	Constant
n2	Leading address of special module internal memory to read a data	Constant
D	Leading address of device to save the data to read	M, P, K, L, U, N, D, R
n3	Word number of data to read	M, P, K, L, Constant

(1) Difference between GET Command and GETP Command

(a) GET Command

Always execute when operating condition is ON. (Level)

That is, when execute condition is ON, it operates continuously.

(b) GETP Command

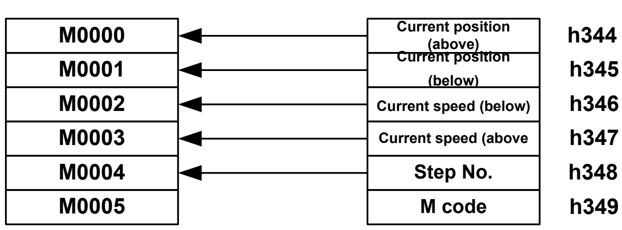
Execute with operation start of execute condition. (Edge)

That is, when execute condition is ON, it operates only one time.

To operate again, execute condition should be off and on again.

Example The case is that read current position, current speed and step number from axis Y state information of positioning module which installed in No.0 base, No.2 slot to PLC CPU M0000.

Set the number of data as 5 to read 5 Word from current position to step number.



6.1.2 Internal Memory Write (PUT, PUTP Command)

Operating condition

[PUT n1 n2 S n3]

Form	Description	Available area
n1	Base and slot No. installed with special module	Constant
n2	Leading address of special module internal memory to write a data	Constant
S	Leading address of device that the data to Write is saved	M, P, K, L, U, N, D, R
n3	Word number of data to write	M, P, K, L, Constant

(1) Difference between GET Command and GETP Command

(a) PUT Command

Always execute when operating condition is ON. (Level)
That is, when execute condition is ON, it operates continuously.

(b) PUTP Command

Execute with operation start of execute condition. (Edge)
That is, when execute condition is ON, it operates only one time.
To operate again, execute condition should be off and on again.

Example The case that is installed in positioning module No.0 base, slot No.1 and writes value of CPU module as axis 3 teaching value by 16 Word data of D00000~D00015.

D00000	Teaching data1(lower)	h280
D00001	Teaching data1(upper)	h281
D00002	Teaching data2(lower)	h282
D00003	Teaching data2(upper)	h283
D00004	Teaching data3(lower)	h284
D00005	Teaching data3(upper)	h285
D00006	Teaching data4(lower)	h286
D00007	Teaching data4(upper)	h287
D00008	Teaching data5(lower)	h288
D00009	Teaching data5(upper)	h289
D00010	Teaching data6(lower)	h28A
D00011	Teaching data6(upper)	h28B
D00012	Teaching data7(lower)	h28C
D00013	Teaching data7(upper)	h28D
D00014	Teaching data8(lower)	h28E
D00015	Teaching data8(upper)	h28F

Operating condition

[PUT 1 h280 D00000 16]

6.2 Dedicated Commands

Command	Description	Condition
ORG	Homing start	Slot, command axis
FLT	Floating origin setting	Slot, command axis
DST	Direct start	Slot, command axis, position, speed, dwell time, M code, control word
IST	Indirect start	Slot, command axis, step number
LIN	Linear interpolation	Slot, command axis, step number, axis setting
CIN	Circular interpolation	Slot, command axis, step number, axis setting
SST	Simultaneous start	Slot, Axis X step number, Axis Y step number, Axis Z step number, axis setting
VTP	Speed/position switching control	Slot, command axis
PTV	Position/speed switching control	Slot, command axis
STP	Deceleration stop	Slot, command axis, deceleration time
SSP	Position synchronous start	Slot, command axis, main axis position, step number, main axis setting
SSS	Speed synchronous start	Slot, command axis, main axis rate, sub axis rate, main axis setting
POR	Position override	Slot, command axis, position
SOR	Speed override	Slot, command axis, speed
PSO	Speed override with position	Slot, command axis, position, speed
INCH	Inching operation	Slot, command axis, inching amount
SNS	Start step no. change	Slot, command axis, step number
SRS	Repeat step no. change	Slot, command axis, step number
MOF	M code release	Slot, command axis
PRS	Current position preset	Slot, command axis, position
EPRS	Encoder preset	Slot, command axis, position
TEA	Single teaching	Slot, command axis, teaching data, step number, RAM/ROM, position/speed
TEAA	Teaching array	Slot, command axis, step number, RAM/ROM, position/speed, number of teaching
TWR	Teaching array data setting	Slot, command axis, teaching data, number of teaching
TBP	Basic parameter teaching	Slot, command axis, basic parameter change value, item to change
THP	Home parameter teaching	Slot, command axis, home parameter change value, item to change
TSP	Input signal parameter teaching	Slot, command axis, I/O signal parameter change value
TCP	Common parameter teaching	Slot, command axis, common parameter change value, item to change
TMD	Operation data teaching	Slot, command axis, operation data, operation data item, step number
WRT	Save parameter/operation data	Slot, command axis, axis information
EMG	Emergency stop	Slot, command axis
CLR	Error reset	Slot, command axis, Enable/disable pulse output
SRD	Read operation status	Slot, command axis, device number to save operation status

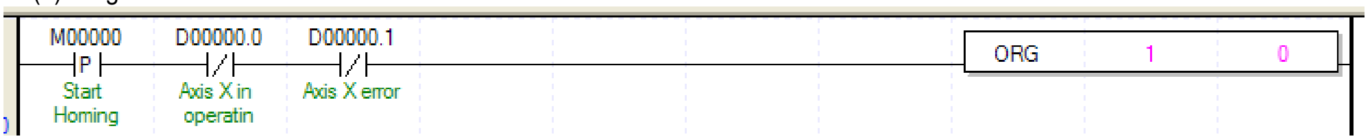
Note

The dedicated command acts at Rising edge. That is, it executed the first action once when input condition is “ON.” To execute the action again, It should be “OFF” and then “ON” again. SRD just execute High level action. When input condition is “On,” it keeps operating and it doesn’t operate when it’s “Off.”

6.3 Use of Dedicated Command

6.3.1 Homing start (Command : ORG)

(1) Program



(2) Description

Device	Description
M00000	Axis X homing start input
D00000.0	Axis X in operation
D00000.1	Axis X error

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

※ PMLK means P, M, L and K areas.

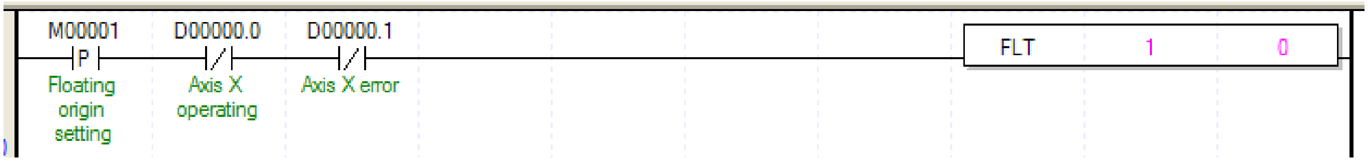
(a) If homing start command is executed, it carries out homing operation by the setting homing parameter and if homing is complete by external input signal, the origin determination end signal is “ON”.

(b) Please refer to "9.1 Homing Start” about detailed explanation of Homing Start.

(c) D device signal (axis X in operating, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.2 Floating origin setting (Command : FLT)

(1) Program



(2) Description

Device	Description
M00001	Axis X floating origin setting
D00000.0	Axis X in operation
D00000.1	Axis X error

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

※ PMLK means P, M, L and K areas.

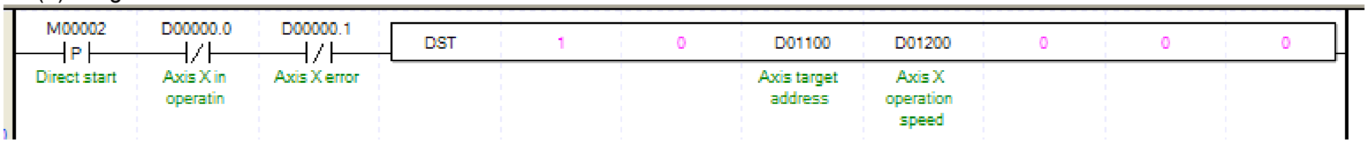
(a) If the floating origin setting command is executed, the current position is changed to the origin address of homing parameter and the origin determination signal (bit) is ON.

(b) Floating origin setting that different from homing origin is set at the current position and can not be set in operation.

(c) D device signal (axis X in operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.3 Direct start (Command : DST)

(1) Program



(2) Description

Device	Description
M00002	Axis X direct start input
D00000.0	Axis X in operation
D00000.1	Axis X error state

Command	DST				Direct start
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis(0: axis X, 1: axis Y)
	OP3	Goal position	PMLK,constant,D,Z,R,ZR	DINT	Goal position (-2,147,483,648 ~ 2,147,483,647)
	OP4	Goal speed	PMLK,constant,D,Z,R,ZR	DWORD	Goal speed
	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	

※ PMLK means P, M, L and K areas.

(a) Details of Control word (OP7) for each Bit are as follows.

15 ~ 12	11 ~ 10	9 ~ 8	7 ~ 5	4	3 ~ 1	0
-	Dec. Time 0: Dec. time1 1: Dec. time2 2: Dec. time3 3: Dec.time4	Acc. Time 0: Acc. Time1 1: Acc. Time2 2: Acc. Time3 3: Acc. Time4	-	0:Absolute 1:Increment al	-	0:Position Control 1:Speed control

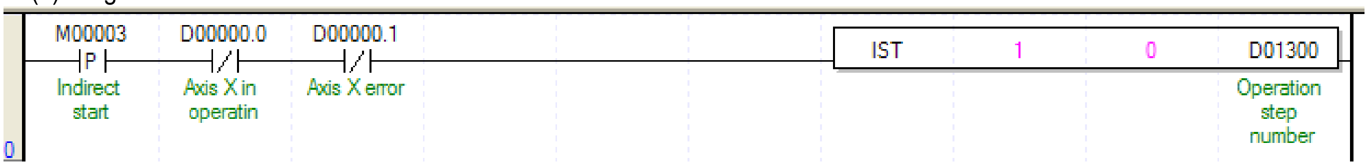
(b) If control word is h0010, it shall be set by position control, Incremental, acc. Time1, dec. time 1.

(c) No.1~3, 5~7, 12~15 Bit of control word is the unused area and does not affect the setting.

(d) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.4 Indirect start (Command : IST)

(1) Program



(2) Description

Device	Description
M00003	Axis X indirect start input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D01300	Axis X step no.

Command	DST				Indirect start
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Operation step number	PMLK,constant,D,Z,R,ZR	WORD	Step No. to operate (0~150)

※ PMLK means P, M, L and K areas.

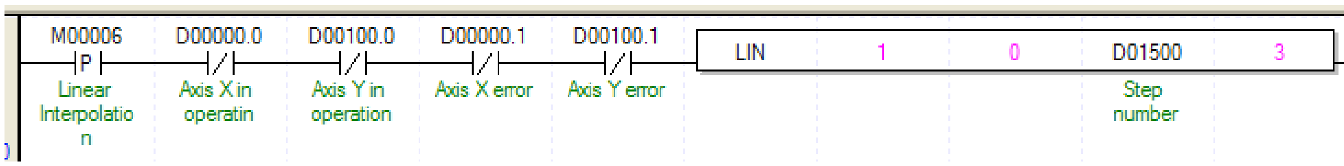
(a) If operation step No. is set as “0” in indirect start, it will be operated as current step No. If other number except 0 is set as the operation step number, it operates only for step no. set.

(b) If operation pattern is set as continuance or go-on, several steps can be operated by an indirect start command.

(c) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.5 Linear Interpolation (Command: LIN)

(1) Program



(2) Description

Device	Description
M00006	Linear interpolation
D00000.0	Axis X in operation
D00000.1	Axis X error status
D00100.0	Axis Y in operation
D00100.1	Axis Y error status
D01500	Operation step

Command	LIN				Direct start
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK, constant, D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Operation step	PMLK, constant, D,Z,R,ZR	WORD	Linear interpolation step number (0~150)
	OP4	Axis setting	PMLK, constant, D,Z,R,ZR	WORD	Operation axis setting (Bit0: axis X, Bit1: axis Y)

※ PMLK means P, M, L and K areas.

(a) Starts linear interpolation with axes set in OP4 (Axis setting)

(b) For axis setting, set the each Bit corresponding to each axis

15 ~ 2 Bit	1Bit	0Bit
Not used	Axis Y	Axis X

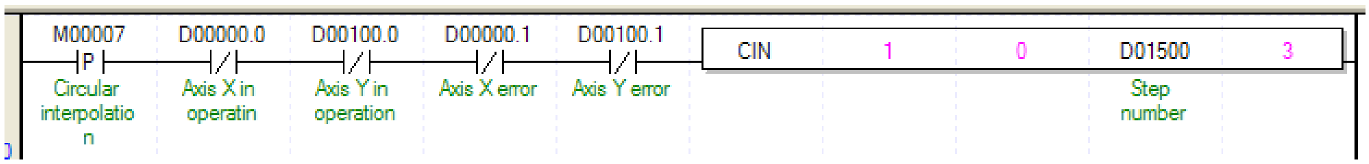
Since XBF-PD02A has 2 axes, set OP4 as 3.

(c) For detail on linear interpolation, refer to “9.2”

(d) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.6 Circular Interpolation (Command: CIN)

(1) Program



(2) Description

Device	Description
M00007	Circular interpolation
D00000.0	Axis X in operation
D00000.1	Axis X error status
D00100.0	Axis Y in operation
D00100.1	Axis Y error status
D01500	Operation step

Command	CIN				Direct start
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK, constant, D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Operation step	PMLK, constant, D,Z,R,ZR	WORD	Circular interpolation step number (0~150)
	OP4	Axis setting	PMLK, constant, D,Z,R,ZR	WORD	Operation axis setting (Bit0: axis X, Bit1: axis Y)

※ PMLK means P, M, L and K areas.

(a) Starts linear interpolation with axes set in OP4 (Axis setting)

(b) For axis setting, set the each Bit corresponding to each axis

15 ~ 2 Bit	1Bit	0Bit
Not used	Axis Y	Axis X

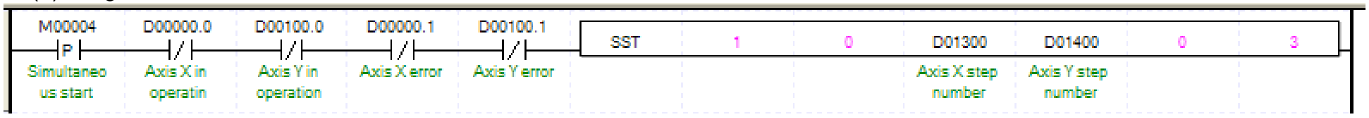
Since XBF-PD02A has 2 axes, set OP4 as 3.

(c) For detail on linear interpolation, refer to “9.2”

(d) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.7 Simultaneous Start (Command : SST)

(1) Program



(2) Description

Device	Description
M00004	Simultaneous start
D00000.0	Axis X in operation
D00000.1	Axis X error status
D00100.0	Axis Y in operation
D00100.1	Axis Y error status
D01300	Axis X simultaneous start step
D01400	Axis Y simultaneous start step

Command	SST				Linear interpolation
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Axis X step	PMLK,constant,D,Z,R,ZR	WORD	Axis X operation step number (0~150)
	OP4	Axis Y step	PMLK,constant,D,Z,R,ZR	WORD	Axis Y operation step number (0~150)
	OP5	Axis Z step	PMLK,constant,D,Z,R,ZR	WORD	Axis X operation step number (0~150)
	OP6	Axis setting	PMLK,constant,D,Z,R,ZR	WORD	Simultaneous start axis setting

※ PMLK means P, M, L and K areas.

(a) Simultaneous command is the command operates simultaneous steps saved in ‘operation axis(OP6)’ at a time.

(b) Axis setting is set by setting the bits to the axis

15 ~ 2 Bit	1 Bit	0 Bit
Not use	Axis Y	Axis X

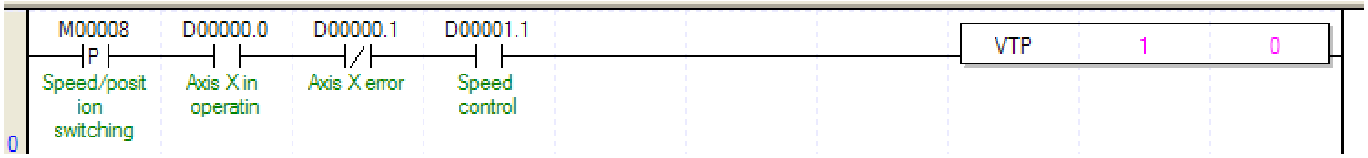
Since XBF-PD02A has 2 axes, set OP4 as 3.

(c) In case of XBF-PD02A, there is no axis Z, value in OP5 is meaningless.

(d) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.8 Speed/Position Switching Control (Command : VTP)

(1) Program



(2) Description

Device	Description
M00008	Axis X speed/position switching control input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D00001.1	Axis X in speed control

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

※ PMLK means P, M, L and K areas.

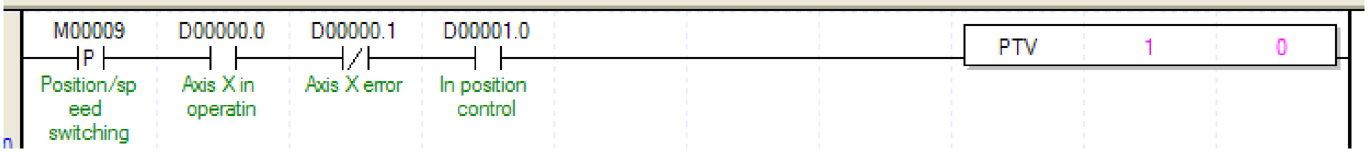
(a) If speed/position switching control is executed in the state of speed control operation, it shall be switched to position control and positioning operation is executed with the position set in the speed control.

(b) For detail description about speed/position switching control, refer to “9.2.9 Speed/Position Switching Control”

(c) D device signal (axis X Signal in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.9 Position/Speed Switching Control (Command : PTV)

(1) Program



(2) Description

Device	Description
M00009	Axis X position/speed switching control input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D00001.0	Axis X in position control

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

※ PMLK means P, M, L and K areas.

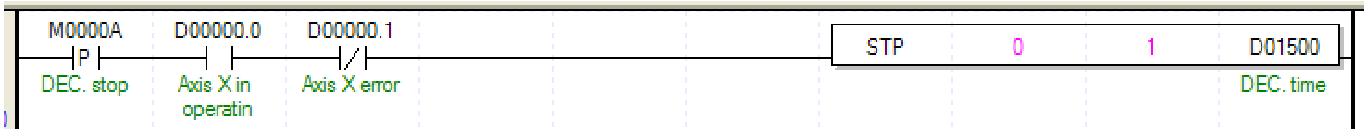
(a) If position/speed switching control is executed during position control operation, it is converted to speed control, operates at the speed set during position control and stops by executing deceleration stop.

(b) For the detail description about position/speed switching control, refer to “9.2.15 Position/Speed Switching Control”.

(c) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.10 Deceleration Stop (Command : STP)

(1) Program



(2) Description

Device	Description
M0000A	Axis X deceleration stop input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D01500	Axis X deceleration stop time set

Command	STP				Deceleration stop
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Deceleration time	PMLK,constant,D,Z,R,ZR	WORD	deceleration time (0 ~ 65,535 ms)

※ PMLK means P, M, L and K areas.

(a) Deceleration stop carry out the command in deceleration, acceleration and equal speed areas.

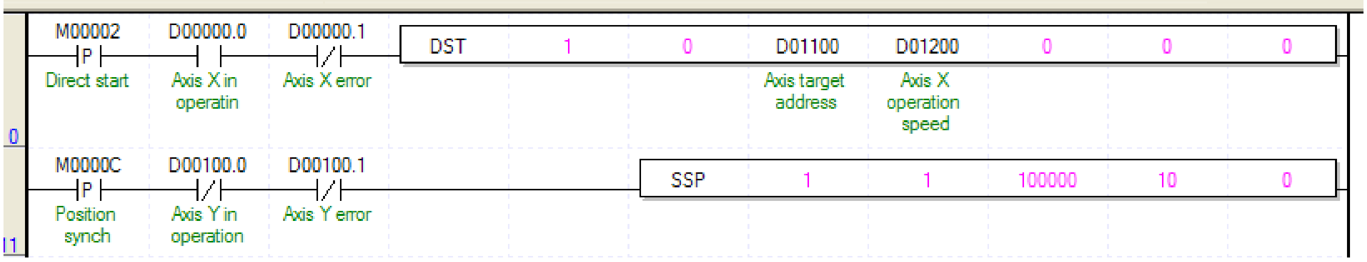
(b) Deceleration time means the time required from deceleration start to stop and it is available to set from 0 ~ 65,535ms. But if setting as “0”, it stops only by deceleration time set at the beginning of operation.

(c) If deceleration stop command is executed in speed sync., position sync., it stops speed sync., position sync. depending on current operation control state.

(d) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.11 Synchronous Start by Position (Command : SSP)

(1) Program



(2) Description

Device	Description
M0000C	Axis X synchronous start by position input
M00002	Axis X direct start input
D00000.0	Axis X in operation
D00000.1	Axis X error signal
D00100.0	Axis Y in operation
D00100.1	Axis Y error state

Command	SSP				Synchronous start by position
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Main axis position	PMLK,constant,D,Z,R,ZR	DINT	Position of sub axis to operate
	OP4	Operation step	PMLK,constant,D,Z,R,ZR	WORD	Sub axis operation step No. (0~ 150)
	OP5	Main axis	PMLK,constant,D,Z,R,ZR	WORD	Main axis (0: axis X, 1: axis Y)

※ PMLK means P, M, L and K areas.

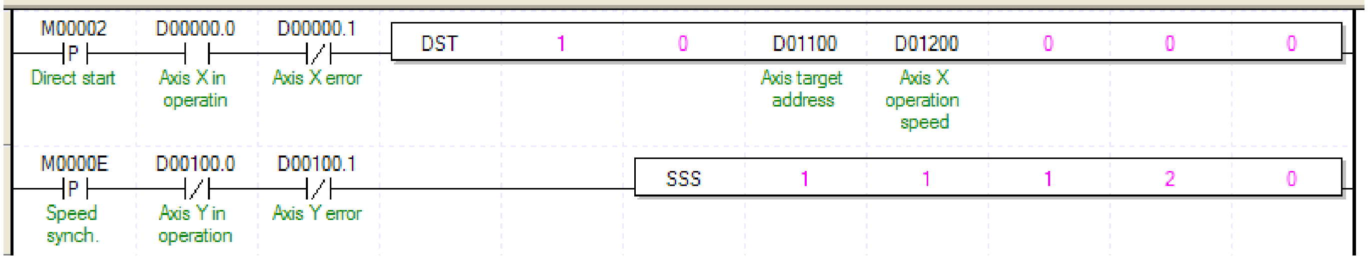
(a) If the command of synchronous start by position is executed, it becomes in operation state but motor does not operate actually. At the point that axis X as main axis setting starts and its current position is 100,000, axisY will start and the motor will operate.

(b) For the detail description about position synchronous start, refer to “9.4.2 position synchronous control”

(c) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.12 Synchronous Start by Speed (Command : SSS)

(1) Program



(2) Description

Device	Description
M0000E	Axis Y speed synchronous start input
M00002	Axis X direct start input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D00100.0	Axis Y in operation
D00100.1	Axis Y error state

Command	SSS				Synchronous start by speed
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: X axis, 1: Y axis)
	OP3	Main axis ratio	PMLK,constant,D,Z,R,ZR	WORD	Speed sync. main axis ratio (1~65,535)
	OP4	Subordinate axis ratio	PMLK,constant,D,Z,R,ZR	WORD	Speed sync. sub axis ratio (1~65,535)
	OP5	Main axis	PMLK,constant,D,Z,R,ZR	WORD	Main axis (0 : X axis, 1 : Y axis, 2 : Encoder)

※ PMLK means P, M, L and K areas.

(a) In the example program above, if the command of synchronous start by speed is executed, axis Y (subordinate axis) is indicated as ‘in operation’ but the motor does not operate. If operating axis X set as the main axis, axis Y (subordinate axis) is operated depending on the designated ratio between main axis(OP3) and sub axis(OP4).

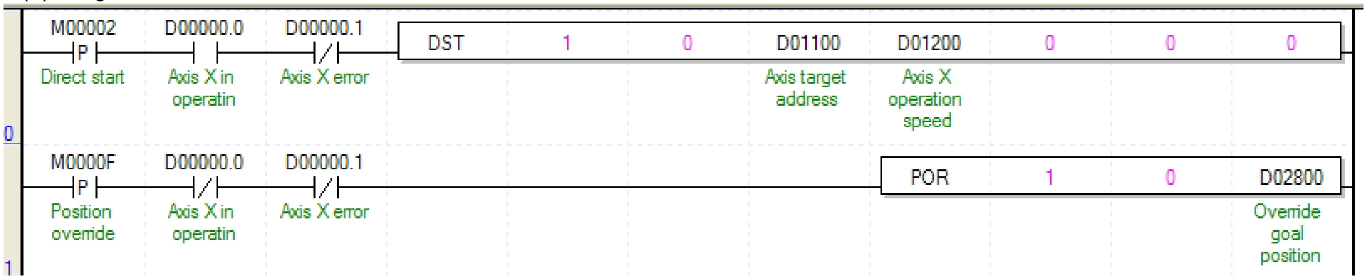
(b) For example, if main axis ratio is 2, sub axis ratio is 1, when main axis moves by 4000, sub axis moves 2000.

(c) For the detail description about speed sync., refer to “9.4.1 Speed Synchronous Start Control”.

(d) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.13 Position Override (Command : POR)

(1) Program



(2) Description

Device	Description
M0000F	Axis X position override input
M00002	Axis X direct start input
D00000.0	Axis XI in operation
D00000.1	Axis X error state
D01100	Goal position value
D02800	Position override value

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

※ PMLK means P, M, L and K areas.

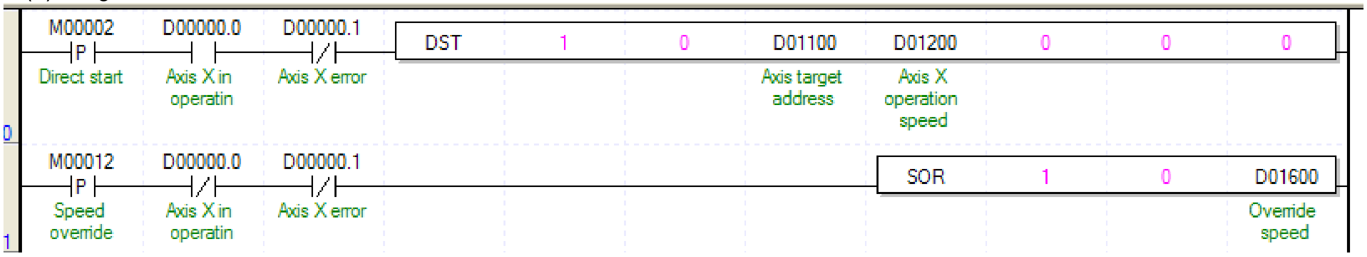
(a) If position override is executed before reaching goal position, goal position shall be changed by the value set in D02800, based on the start-up starting position. If executing positioning position override after passing a position to execute position override, it stops at the current position.

(b) For the detail description about position override, refer to “9.5.2 Position Override”.

(c) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.14 Speed Override (Command : SOR)

(1) Program



(2) Description

Device	Description
M00012	Axis X speed override input
M00002	Axis X direct start input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D01200	Goal speed value
D01600	Speed override value

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

※ PMLK means P, M, L and K areas.

(a) Speed override value (OP3) will be set as “% ” or “Speed value” depending on the value which set on “speed override” in common parameter.

(b) If unit of speed override value is %, the setting area is from 1 to 65,535, it means 0.01% ~ 655.35%.

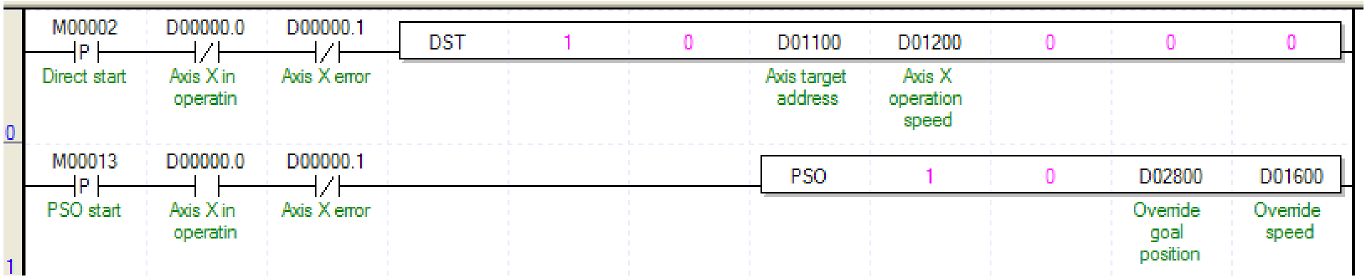
(c) If unit of speed override value is speed value, setting area is from 1 to speed limit value. The speed limit value is set on “Speed limit value” of basic parameter and unit of speed override value depends on unit of axis.

(d) For the detail description about speed override operation, refer to “9.5.3 Speed Override”.

(e) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.15 Position Assigned Speed Override (Command : PSO)

(1) Program



(2) Description

Device	Description
M00013	Axis X position assigned speed override input
M00002	Axis X direct start input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D01200	Goal speed value
D01600	Speed override value
D02800	Position value to execute speed change

Command	XPSO				Position assigned speed override
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Position value	PMLK,constant,D,Z,R,ZR	DINT	Position value to change the speed
	OP4	Speed value	PMLK,constant,D,Z,R,ZR	DWORD	Goal speed value to change

※ PMLK means P, M, L and K areas.

(a) Speed override value (OP3) will be set as “%” or “Speed value” depending on the value which set on “speed override” in common parameter.

(b) If unit of speed override value is %, the setting area is from 1 to 65,535, it means 0.01% ~ 655.35%.

(c) If unit of speed override value is speed value, setting area is from 1 to speed limit value. The speed limit value is set on “Speed limit value” of basic parameter and unit of speed override value depends on unit of axis.

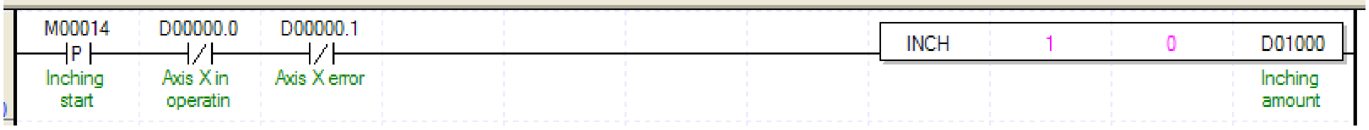
(d) In the example program above, axis X position assigned speed override input(M00013) become “on” to execute position assigned speed override after axis X direct start input (M00002) become “on”. When the position of axis X is located at the position where set at D02800, the speed will be changed to the value set at D01600.

(e) For the detail description about position assigned speed override operation, refer to “9.5.4 Position Assigned Speed Override”.

(f) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.16 Inching Operation (Command : INCH)

(1) Program



(2) Description

Device	Description
M00014	Axis X inching operation input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D01000	Axis X inching value

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

※ PMLK means P, M, L and K areas.

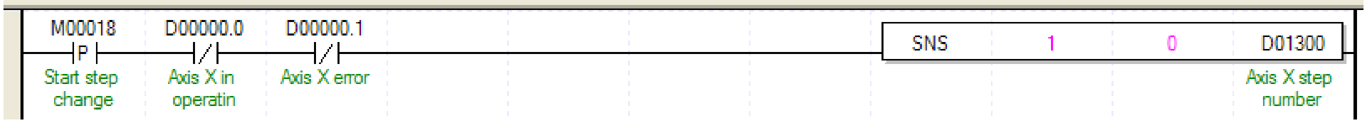
(a) It carries out theincremental coordinate operation by inching operation speed set in manual operation parameter as much as position value (OP3).

(b) For the detail description about inching operation, refer to “9.3.2 Inching Operation”.

(c) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.17 Start Step No. Change (Command : SNS)

(1) Program



(2) Description

Device	Description
M00018	Axis X start step No. change input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D01300	Axis X start step no. to change

Command	SNS				Start step No. change
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Step No.	PMLK,constant,D,Z,R,ZR	WORD	step No. to change with start step (1~150)

※ PMLK means P, M, L and K areas.

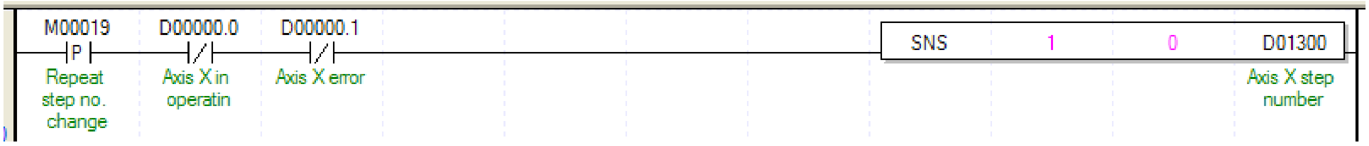
(a) Change the current step into the step value which set on step no.(OP3)

(b) It is not available to be executed in operation.

(c) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.18 Repeat Step No. Change (Command : SRS)

(1) Program



(2) Description

Device	Description
M00019	Axis X start step No. change input
D00000.1	Axis X error state
D01300	Axis X repeat step no. to change

Command	XSRS				Repeat step No. change
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Step No.	PMLK,constant,D,Z,R,ZR	WORD	step No. to change into repeat step (0~150)

※ PMLK means P, M, L and K areas.

(a) Change repeat step into the step value which set on step no.(OP3).

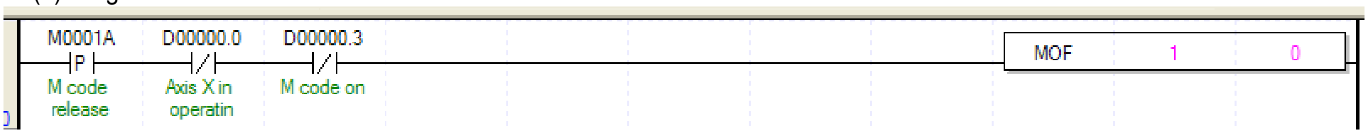
(b) Repeat step No. change is available for command execution even during positioning operation.

(c) The detail description about “9.5.8 Repeat Operation Step no. Change”.

(d) D device signal (axis1 Signal in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.19 M code Release (Command : MOF)

(1) Program



(2) Description

Device	Description
M0001A	Axis X M code release input
D00000.1	Axis X error state
D00000.3	Axis X M code signal

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

※ PMLK means P, M, L and K areas.

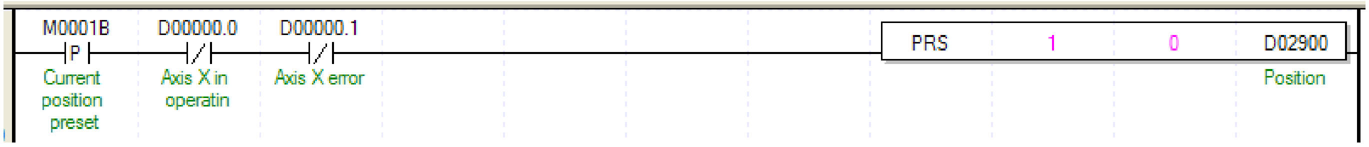
(a) When M code occurs, M code signal and M code No. are released at the same time (M code and M code No. are changed to OFF and 0, respectively).

(b) It is available to be executed in operation.

(c) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.20 Current Position Preset (Command : PRS)

(1) Program



(2) Description

Device	Description
M0001B	Axis X current position preset input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D02900	axis1 preset position value

Command	PRS				Current position preset
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Position value	PMLK,constant,D,Z,R,ZR	DINT	Current position value to change

※ PMLK means P, M, L and K areas.

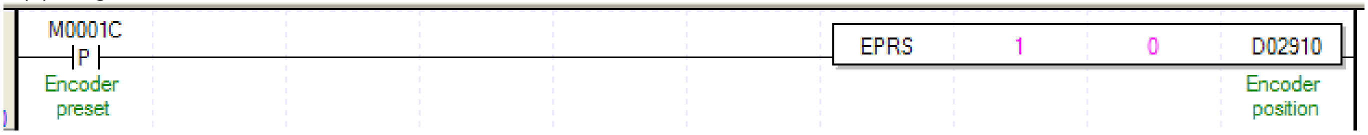
(a) The command that change the current position value to the designated position (OP3).

(b) 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 (OP3).

(c) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.21 Encoder Preset (Command : EPRS)

(1) Program



(2) Description

Device	Description
M0001C	Encoder preset input
D02910	Encoder preset position value

Command	EPRS				Encoder preset
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Setting value	PMLK,constant,D,Z,R,ZR	DWORD	Encoder value to change

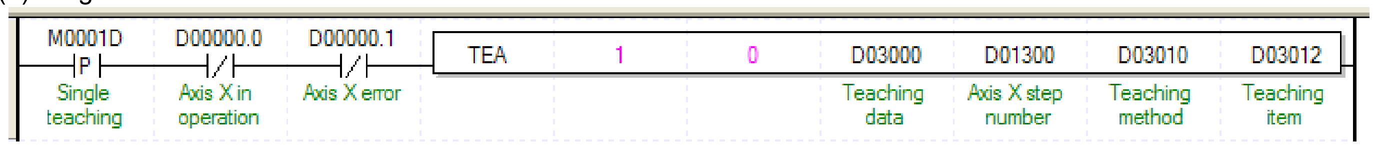
※ PMLK means P, M, L and K areas.

(a) This is the command that changes the current position to the designated position (OP3).

(b) Since there can be only one encoder in positioning module, value of OP2 is meaningless.

6.3.22 Single Teaching (Command: TEA)

(1) Program



(2) Description

Device	Description
M0001D	Axis X single teaching input
D00000.0	Axis X in operation
D00000.1	Axis X error status
D03000	Teaching
D01300	Teaching step
D03010	Select RAM/ROM teaching
D02000	Select position/speed

Command	TEA				Single teaching
Operand	OP1	Slot	상수	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Teaching value	PMLK,constant,D,Z,R,ZR	WORD	Data value for teaching
	OP4	Teaching step	PMLK,constant,D,Z,R,ZR	WORD	Step number for teaching (0~150)
	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.

(a) This command changing goal position or goal speed among operation data of positioning module. At this time, according to teaching method (OP5), if you select RAM teaching, the changed value is effective while module's power is on. If you select ROM teaching, the changed values is kept after power is off.

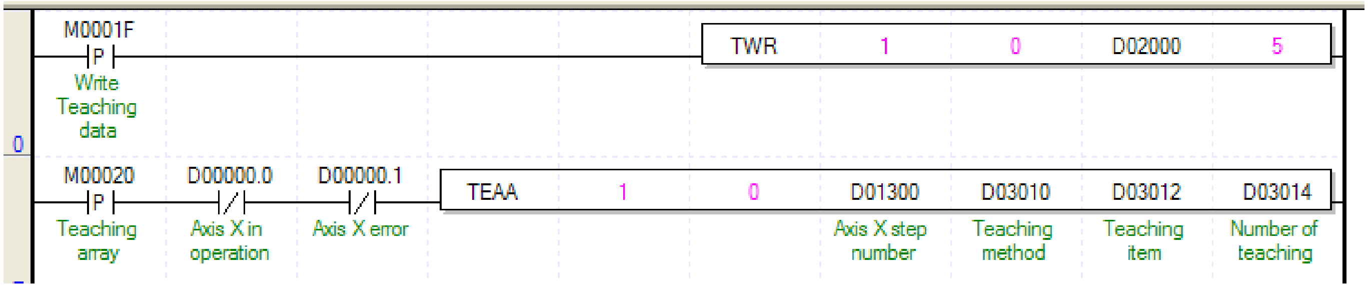
(b) Teaching is available while relevant axis is operating. But when relevant axis is operating, teaching of current step number is not available.

(c) Since operation data of positioning module is saved in flash memory, frequency of ROM teaching is limited to 100,000.

(d) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.23 Teaching Array (Command : TEAA)

(1) Program



(2) Description

Device	Description
M0001F	Axis X teaching data setting input
M00020	Axis X teaching array input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D02000	Axis X teaching array data leading address

Command	TEAA				Teaching Array
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Teaching step	PMLK,constant,D,Z,R,ZR	WORD	leading step No. for teaching (0~150)
	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 teaching 1:Speed teaching
	OP6	Number of Teaching	PMLK,constant,D,Z,R,ZR	WORD	Number of step for Teaching (1~16)

※ PMLK means P, M, L and K areas.

(a) This is the command that change the goal position or goal speed (OP5) among the operation data to the number as many as from the designated step (OP3) to the number of teaching (OP6). In the case of operating RAM teaching according to the teaching method (OP3), the changed value is maintained during APM is connected to power. In the case of operating ROM teaching, it is maintained without power connection of APM.

(b) Teaching is available to be executed in operation of teaching axis but won't be executed when the step operating is in the area of step to do teaching.

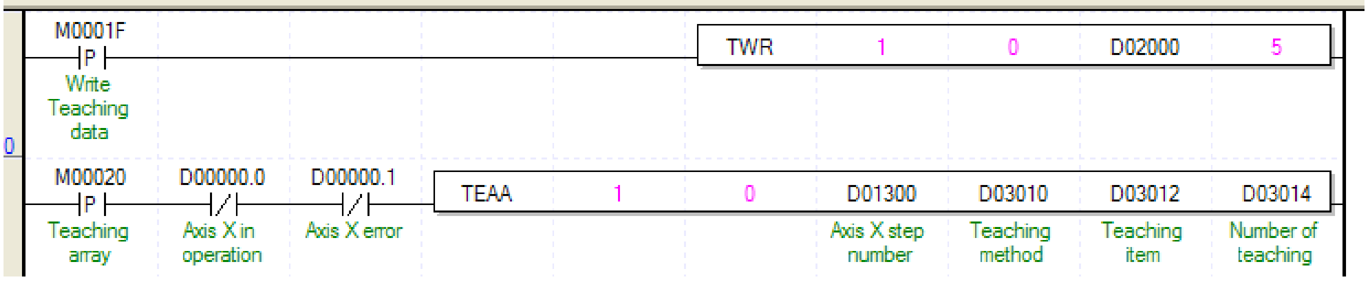
(c) The number of times for ROM teaching is not limited because operation data of positioning module is saved on flash memory.

(d) Before executing teaching array, teaching data should be set in the teaching array setting area. For teaching array data setting, refer to TWR command.

(e) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.24 Teaching Array Data Setting (Command: TWR)

(1) Program



(2) Description

Device	Description
M0001F	Axis X Teaching array data setting input
M00020	Axis X Teaching array input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D02000	Axis X Teaching array data leading address

Command	TWR				Teaching Array Data Setting
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Device	PMLK,D,Z,R,ZR	WORD	Leading device No. with teaching array data
	OP3	Number of data	PMLK,constant,D,Z,R,ZR	WORD	Number of data to save

※ PMLK means P, M, L and K areas.

(a) Teaching data must be set in teaching array data setting area before teaching array is executed.

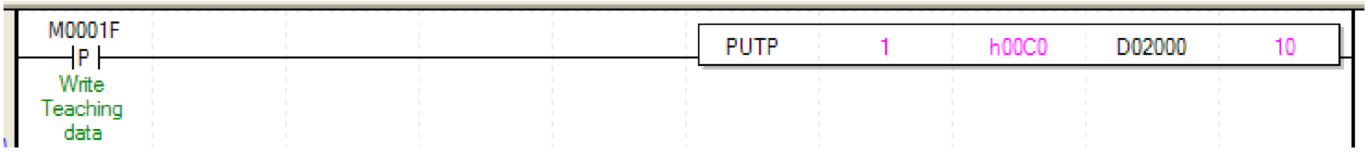
(b) Teaching array is not executed only by executing teaching array data setting command. Please refer to teaching array command (TEAA).

(c) 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

(e) Teaching array data can be set by using PUT command. For this, refer to memory address of “5.1.1 Teaching data” and “6.1.2 Internal Memory Writing”. If use PUT command in the example program above, it displayed like the picture below.

The example program below the X-axis to the internal memory from h00C0 to h00C9 of address D2000 from teaching data 1 (low) to teaching data 5 (high), 10-word data is stored.



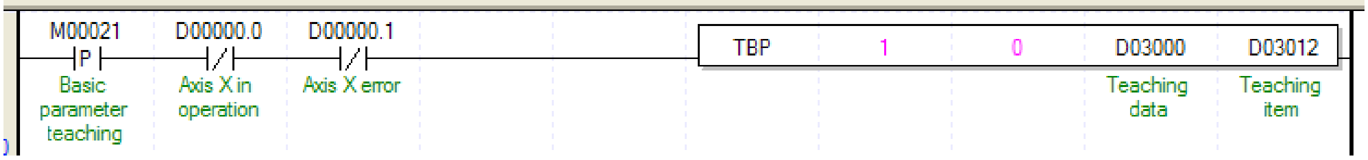
< Teaching Data Memory address >

Memory address (HEX)		Teaching data
X Axis	Y Axis	
C0	100	Teaching Data 1 (Low)
C1	101	Teaching Data 1 (High)
C2	102	Teaching Data 2 (Low)
C3	103	Teaching Data 2 (High)
C4	104	Teaching Data 3 (Low)
C5	105	Teaching Data 3 (High)
C6	106	Teaching Data 4 (Low)
C7	107	Teaching Data 4 (High)
C8	108	Teaching Data 5 (Low)
C9	109	Teaching Data 5 (High)

(f) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

6.3.25 Basic Parameter Teaching (Command : TBP)

(1) Program



(2) Description

Device	Description
M00021	Axis X basic parameter setting input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D03000	Parameter value
D03012	Parameter items

Command	TBP				Basic parameter Teaching
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Parameter value	PMLK,constant,D,Z,R,ZR	DWORD	Parameter value to change
	OP4	Parameter item	PMLK,constant,D,Z,R,ZR	WORD	Parameter item to change (1~19, hFF)

※ PMLK means P, M, L and K areas.

(a) This is the command that changes the value of the item (OP4) which already set among basic parameter items to setting value (OP3). At this time, teaching data is saved in RAM and for permanent presser. For permanent preservation, write to flash memory using WRT command.

(b) Basic parameter setting command is unavailable to be executed when the axis is operating.

(c) Basic parameter items

Setting Value	Items	Setting Range
1	Speed limit value	1 ~ 2,000,000[pulse/S]
2	Bias speed	1 ~ 2,000,000[pulse/S]
3	Acc. Time 1	0 ~ 65,535 [ms]
4	Acc. Time 2	
5	Acc. Time 3	
6	Acc. Time 4	
7	Dec. Time 1	
8	Dec. Time 2	
9	Dec. Time 3	
10	Dec. Time 4	
11	SW upper limit	-2,147,483,648 ~ 2,147,483,647 [pulse]
12	SW lower limit	-2,147,483,648 ~ 2,147,483,647 [pulse]
13	Backlash compensation	0 ~ 65,535 [pulse]
14	Detect upper/lower imit during constant speed operation	0: Not detect, 1: detect
15	Positioning complete condition	0:Dwell time, 1:Inposition, 2:Dwell time AND Inposition, 3:dwell time or inposition
16	Use of upper/lower limit	0: Not use, 1: Use
17	Pulse output level	0: Low Active, 1: High Active
18	Pulse output mode	0: CW/CCW, 1: PLS/DIR
19	M code output mode	0: None, 1: With, 2: After

(e) For the change value (OP3) setting range of each basic parameter item (OP4) which already set, refer to “4.2 Basic Parameter Content”

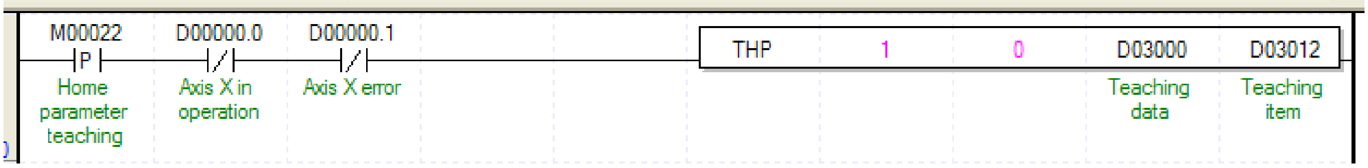
(f) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

(g) If you want to set entire item of basic parameter with one execution of TBP command, set hFF(255) at OP4. At this time, basic parameter should be saved in the following address. The data in the following address doesn’t affect the operation. To apply to operation, use TBP command.

Memory address (HEX)		Contents	Setting range
Axis X	Axis Y		
C0	100	Speed limit value	1 ~ 2,000,000[pulse/s]
C1	101		
C2	102	Bias speed	1 ~ 2,000,000[pulse/s]
C3	103		
C4	104	Acc. Time 1	0 ~ 65,535 [ms]
C5	105	Acc. Time 2	
C6	106	Acc. Time 3	
C7	107	Acc. Time 4	
C8	108	Dec. Time 1	
C9	109	Dec. Time 2	
CA	10A	Dec. Time 3	
CB	10B	Dec. Time 4	
CC	10C	SW upper limit	-2,147,483,648 ～ 2,147,483,647 [pulse]
CD	10D		
CE	10E	SW lower limit	
CF	10F		
D0	110	Backlash compensation	0 ~ 65,535 [pulse]
D1	111	Detect upper/lower limit during constant speed operation	0: Not detect, 1:detect
D2	112	Positioning complete condition	0:Dwell time, 1:Inposition, 2:Dwell time AND Inposition, 3:Dwell time or Inposition
D3	113	Use of upper/lower limit	0: Not use, 1: Use
D4	114	Pulse output level	0: Low Active, 1: High Active
D5	115	Pulse output mode	0: CW/CCW, 1: PLS/DIR
D6	116	M code output mode	0: None, 1: With, 2: After

6.3.26 Homing/Manual Parameter Teaching (Command : THP)

(1) Program



(2) Description

Device	Description
M00022	Axis X homing parameter teaching input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D03000	Parameter value
D03012	Parameter Items

Command	THP				Homing parameter Teaching
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	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 items to change (1~14, hFF)

※ PMLK means P, M, L and K areas.

(a) This is the command that changes the value of the item (OP4) which already set among homing/manual parameter items to setting value (OP3). At this time, teaching data is saved in RAM and for permanent presser. For permanent preservation, write to flash memory using WRT command.

(b) Homing parameter setting command is unavailable to be executed when the axis is operating.

(c) Homing parameter item is as follows.

Setting Value	Items	Setting value
1	Origin address	-2,147,483,648 ~ 2,147,483,647 [pulse]
2	Homing high speed	1 ~ 2,000,000 [pulse/s]
3	Homing low speed	
4	Home compensation	-32,768 ~ 32,767 [pulse]
5	Homing acc. Time	0 ~ 65,535 [ms]
6	Homing dec. time	
7	Homing dwell time	
8	Homing mode	1:DOG/HOME(Off), 1:DOG/HOME(On), 2: DOG 3: U.L.Limit/Home, 4: U.L.Limit
9	Homing direction	0:CW, 1:CCW
10	JOG high speed	1 ~ 2,000,000 [pulse/s]
11	JOG low speed	
12	JOG acc. time	0 ~ 65,535[ms]
13	JOG dec. time	0 ~ 65,535[ms]
14	Inching speed	1 ~ 65,535[pulse/s]

(e) For the change value (OP3) setting range of each homing parameter item (OP4) which already set, refer to “4.3.1 Homing/Manual Parameter Content”

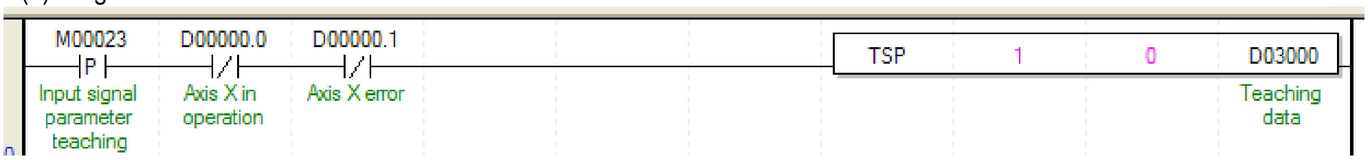
(f) D device signal (axis X in Operation, etc) which used in the example above is an assumption that saving the axis state value in D device area with SRD command.

(g) If you want to set entire item of basic parameter with one execution of THP command, set hFF(255) at OP4. At this time, basic parameter should be saved in the following address.

Memory address (HEX)		Contents	Setting range
Axis X	Axis Y		
C0	100	Origin address	-2,147,483,648 ～ 2,147,483,647 [pulse]
C1	101		
C2	102	Homing high speed	1 ~ 2,000,000[pulse/s]
C3	103		
C4	104	Homing high speed	
C5	105		
C6	106	Home compensation	0 ~ 65,535 [ms]
C7	107	Homing acc. Time	
C8	108	Homing dec. time	
C9	109	Homing dwell time	
CA	10A	Homing mode	0: DOG/HOME(Off), 1:DOG/HOME(On), 2: DOG, 3: U.L.Limit/HOME, 4: U.L.Limit
CB	10B	Homing direction	0:CW, 1:CCW
CC	10C	JOG high speed	1 ~ 2,000,000[pulse/s]
CD	10D		
CE	10E	JOG high speed	
CF	10F		
D0	110	JOG acc. time	0 ~ 65,535[ms]
D1	111	JOG dec. time	0 ~ 65,535[ms]
D2	112	Inching speed	1 ～ 65,535[pulse/s]

6.3.27 I/O Signal Parameter Teaching (Command : TSP)

(1) Program



(2) Description

Device	Description
M00023	Axis X input signal parameter teaching input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D03000	Parameter value

Command	TSP				Input signal parameter Teaching
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Parameter value	PMLK,constant,D,Z,R,ZR	WORD	parameter value to change

※ PMLK means P, M, L and K areas.

(a) This is the command that changes the value of the item (OP4) which already set among Input/output signal parameter items to setting value (OP3). At this time, relevant teaching data is saved in RAM. For permanent preservation, use to flash memory using WRT command.

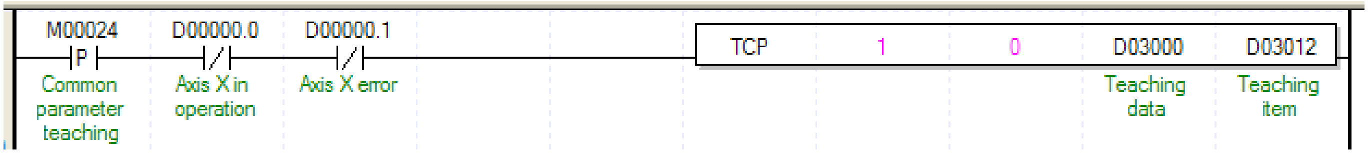
(b) Input/output signal operation parameter setting command is unavailable to be executed when the axis is operating.

(c) The input signal applied with each bit of the value to be set in parameter item is as follows. If each bit is set, it operates as “B contact point”. If they are clear, it operates as “A contact point”

Bit	Signal
0	High limit signal
1	Low limit signal
2	DOG Signal
3	HOME signal
4	Inposition signall
5	Deviation counter clear singal
6~15	Not usedl

6.3.28 Common Parameter Teaching (Command : TCP)

(1) Program



(2) Description

Device	Description
M00024	Common parameter setting input
D02100	Parameter value
D02102	Parameter items

Command	XSCP				Common parameter Setting
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	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, hFF)

※ PMLK means P, M, L and K areas.

(a) This is the command that changes the value of the item (OP4) which already set among common parameter items to setting value (OP3). At this time, relevant teaching data is saved in RAM. For permanent preservation, use to flash memory using WRT command.

(b) Common parameter item is as follows.

Setting value	Item	Setting range
1	Encoder max. value	-2147483648 ~ 2147283647
2	Encoder min. value	
3	Speed override method	0 : % override, 1 : spd. override
4	Encoder input signal	0 : CW/CCW, 1 :PLS/DIR, 2: PHASE

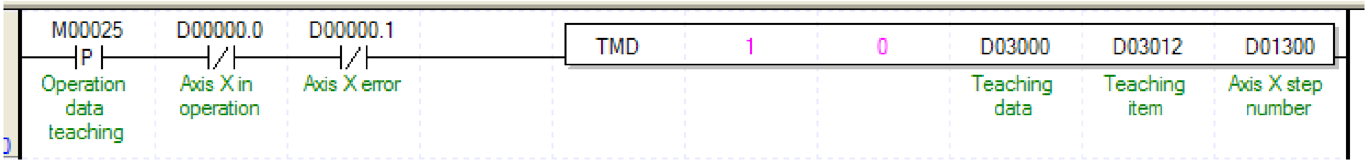
(c) For the change value (OP3) setting range of each common parameter item (OP4) which already set, refer to “4.4.1 Common Parameter Content”

(d) If you want to set entire item of basic parameter with one execution of TCP command, set hFF(255) at OP4. At this time, basic parameter should be saved in the following address.

Memory address (HEX)		Contents	Setting range
Axis X	Axis Y		
C0	100	Encoder max. value	-2,147,483,648 ~ 2,147,483,647 [pulse]
C1	101		
C2	102	Encoder min. value	
C3	103		
C4	104	Speed override method	0 : % override, 1 : spd. override
C5	105	Encoder input signal	0 : CW/CCW, 1 :PLS/DIR, 2: PHASE

6.3.29 Operation Data Teaching (Command: TMD)

(1) Program



(2) Description

Device	Description
M00025	Axis X Operation data setting input
D00000.0	Axis X in operation
D00000.1	Axis X error state
D03000	Operation data value
D03012	Operation data items
D01300	Teaching step

Command	TMD				Operation data setting
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	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 (1~16, hFF)
	OP5	Step No.	PMLK,constant,D,Z,R,ZR	WORD	Operation data step No. to change (0~150)

※ PMLK means P, M, L and K areas.

(a) This is the command that changes the item (OP4) of a step which already set on OP5 among operation data items to setting value (OP3). At this time, relevant teaching data is saved in RAM. For permanent preservation, use to flash memory using WRT command.

(b) Operation data setting command is unavailable to be executed when the axis is operating.

(c) Item of operation data is as follows.

Setting value	Item	Setting range
1	Goal address	-2,147,483,648 ~ 2,147,483,647 [pulse]
2	Cir. Int. aux. point	
3	Speed	1 ~ 2,000,000 [pulse/s]
4	Dwell time	0 ~ 65,535[ms]
5	M code number	0 ~ 65,535
6	Cir. Int. turns	0 ~ 65,535
7	Operation method	0:single, 1:repeat
8	Control method	0:position control, 1:speed control
9	Operation pattern	0:End, 1:Keep, 2:CONT
10	Coordinate	0:Absolute, 1:Incremental
11	Cir. Int. size	0:Arc<180 1:Arc>=180
12	Acc. no.	0 ~ 3
13	Dec. no.	0 ~ 3
14	Cir. Int. mode	0:MID, 1:CENTER, 2:RADIUS

Setting value	Item	Setting range
15	Cir. Int. direction	0:CW, 1:CCW
16	Repeat step number	1~150

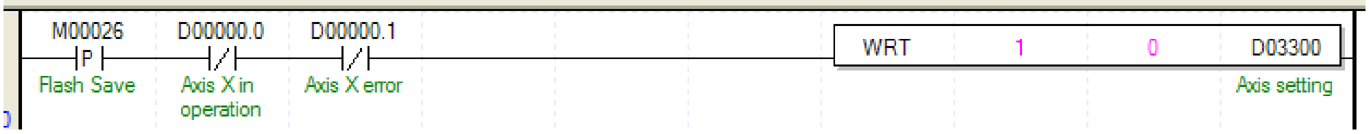
(d) For the change value (OP3) setting range of each position data item (OP4) which already set, refer to "4.6.1 Operation Data Content"

(e) If you want to set entire item of basic parameter with one execution of TMD command, set hFF(255) at OP4. At this time, basic parameter should be saved in the following address.

Memory address (HEX)		Contents	Setting range
Axis X	Axis Y		
C0	100	Goal address	-2,147,483,648 ～ 2,147,483,647 [pulse]
C1	101		
C2	102	Cir. Int. aux. point	
C3	103		
C4	104	Speed	1 ～ 2,000,000 [pulse/s]
C5	105		
C6	106	Dwell time	0 ~ 65,535[ms]
C7	107	M code number	0 ~ 65,535
C8	108	Cir. Int. turns	0 ~ 65,535
C9	109	Operation method	0: single, 1:repeat
CA	10A	Control method	0:position control, 1:speed control
CB	10B	Operation pattern	0:END, 1:KEEP, 2:CONT
CC	10C	Coordinate	0:ABS, 1:INC
CD	10D	Cir. Int. size	0:Arc<180 1:Arc>=180
CE	10E	Acc. no.	0 ~ 3
CF	10F	Dec. no.	0 ~ 3
D0	110	Cir. Int. mode	0:MID, 1:CENTER, 2:RADIUS
D1	111	Cir. Int. direction	0:CW, 1:CCW
D2	112	Repeat step number	1~150

6.3.30 Parameter/Operation Data Save (Command : WRT)

(1) Program



(2) Description

Device	Description
M00026	Axis X parameter/operation data save input
D00000.1	Axis X error state

Command	WRT				Parameter/operation Data save
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Selection axis	PMLK,constant,D,Z,R,ZR	WORD	Axis to save data

※ PMLK means P, M, L and K areas.

(a) This is the command that saves the parameter data & operation data of selected axis on Flash memory.

(b) The current parameter & operation data of selected axis will be saved on Flash memory. It is also maintained when the power is off.

(c) OP2 is reference operand to execute command. Select between 0 and 1.

(d) Parameter/operation data save command is unavailable to be executed when the axis is operating. Execute it when all axis are not in operation.

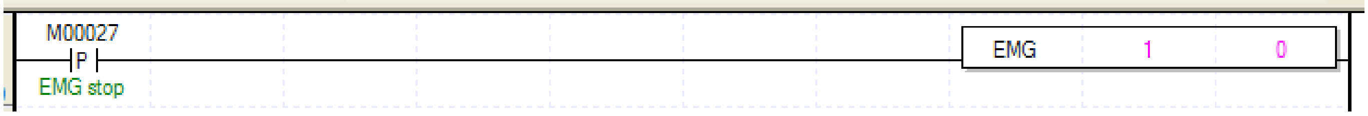
(e) Set the selection axis by setting each bit of axis.

15 ~ 2 Bit	1Bit	0Bit
Not used	Axis Y	Axis X

That is, if set h0003, axis X, axis Y will be set to execute parameter/operation data save.

6.3.31 Emergency Stop (Command : EMG)

(1) Program



(2) Description

Device	Description
M00027	Axis X internal emergency stop input

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

※ PMLK means P, M, L and K areas.

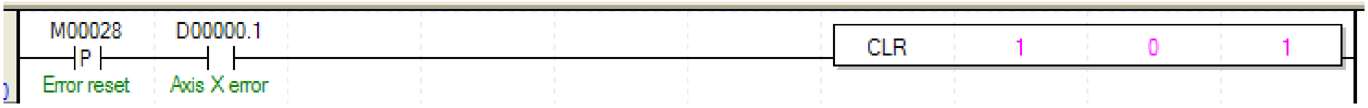
(a) Execute internal emergency stop command to command axis.

(b) In case of EMG stop, it stops promptly without deceleration.

(c) The example program above is the command stop axis X emergently.

6.3.32 Error Reset (Command : CLR)

(1) Program



(2) Description

Device	Description
M00028	Axis X error reset input
D00000.1	Axis X error state

Command	CLR				Error reset
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Cancel output inhabition	PMLK,constant,D,Z,R,ZR	WORD	0: Not cancel output inhibition 1: cancel output inhibetion

※ PMLK means P, M, L and K areas.

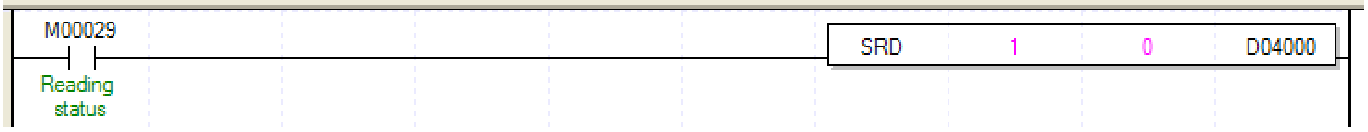
(a) This is the command that reset the error occurred on command axis.

(b) Decides whether to cancel output inhibition or not according to value of OP3

(c) In the above example, resets the error occurred on axis X and cancels output inhibition.

6.3.33 Operation State Reading (Command: SRD)

(1) Program



(2) Description

Device	Description
F00029	Axis operation status reading input
D04000	Leading address to save operation status of axis X

Command	SRD				Operation state reading
Operand	OP1	Slot	Constant	WORD	Slot No. installed with positioning module
	OP2	Axis	PMLK,constant,D,Z,R,ZR	WORD	Command axis (0: axis X, 1: axis Y)
	OP3	Device	PMLK,D,Z,R,ZR	WORD	Leading No. of device to read and save the current state value

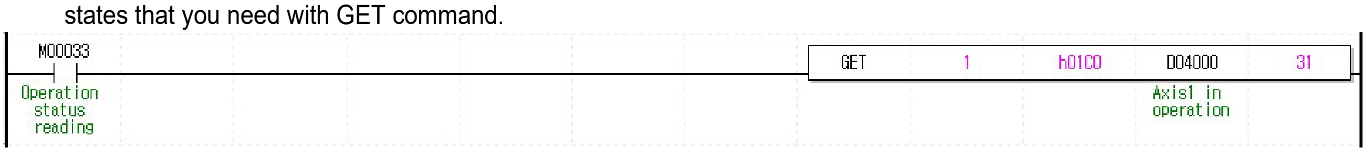
※ PMLK means P, M, L and K areas.

(a) This is the command that checks the operation state of command axis and save it on designated device.

(b) The current state will be saved like items below depending on leading no. of device.

Device No.	Size	State
Device	WORD	Operation State Information (Up)
Device + 1	WORD	Operation State Information (Down)
Device + 2	WORD	Axis Information
Device + 3	WORD	External Input/Output Signal State
Device + 4	DINT	Current Position
Device + 5		
Device + 6	DWORD	Current Speed
Device + 7		
Device + 8	WORD	Step No.
Device + 9	WORD	M Code No.
Device + 10	WORD	Error state
Device + 11	DINT	Encoder Value
Device + 12		

(c) It is able to read the current state of axis with GET command. At this time, refer to memory address of “5.1.2 State Information” and “6.1.1 Internal Memory Reading”. If use GET command in the example above, it is as follows. In addition, it is able to read the states that you need with GET command.



Chapter 7 Function Block

7.1 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 - 1 ~ 4 : axis1 ~ axis4 “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) For the data types which usually used on function block are as follows.

No.	Initial	Data Types	Size(Bit)	Range
1	BOOL	Boolean	1	0, 1
2	SINT	Short Integer	8	-128 ~ 127
3	USINT	Unsigned Short Integer	8	0 ~ 255
4	INT	Integer	16	-32,768 ~ 32,767
5	UINT	Unsigned Integer	16	0 ~ 65,535
6	DINT	Double Integer	32	-2,147,483,648 ~ 2,147,483,647
7	UDINT	Unsigned Double Integer	32	0 ~ 4,294,967,295

7.2 Function Block of Positioning Module

Here describes the positioning function blocks.

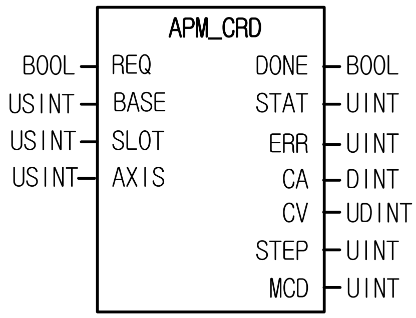
No.	Name	Description	Operation	note
1	APM_CRD	Operation state code information read	Level	7.3.1
2	APM_SRD	Operation state bit information read	Level	7.3.2
3	APM_ENCRD	Encoder value read	Level	7.3.3
4	APM_SBP	Basic parameter teaching	Edge	7.4.1
5	APM_SHP	Homing/manual parameter teaching	Edge	7.4.2
6	APM_SIP	External I/O signal parameter teaching	Edge	7.4.3
7	APM_SCP	Common parameter teaching	Edge	7.4.4
8	APM_SMD	Operation data teaching	Edge	7.4.5
9	APM_TEA	Position/speed teaching (ROM. RAM)	Edge	7.4.6
10	APM_ATEA	Position/speed teaching (ROM. RAM) (Array type)	Edge	7.4.7
11	APM_WRT	Parameter/operation data save	Edge	7.4.8
12	APM_ORG	Homing start	Edge	7.5.1
13	APM_DST	Direct start	Edge	7.5.2
14	APM_IST	Indirect start	Edge	7.5.3
15	APM_LIN	Linear interpolation	Edge	7.5.4
16	APM_CIN	Circular interpolation	Edge	7.5.5
17	APM_SST	Simultaneous start	Edge	7.5.6
18	APM_STP	Deceleration stop	Edge	7.5.7
19	APM_EMG	Emergency stop	Edge	7.5.8
20	APM_INC	Inching operation	Edge	7.6.1
21	APM_SSP	Position synchronization	Edge	7.7.1
22	APM_SSS	Speed synchronization	Edge	7.7.2
23	APM_POR	Position override	Edge	7.8.1
24	APM_SOR	Speed override	Edge	7.8.2
25	APM_PSO	Positioning speed override	Edge	7.8.3
26	APM_PTV	Position/speed switching control	Edge	7.8.4
27	APM_VTP	Speed/position switching control	Edge	7.8.5
28	APM_SNS	Start step No. change	Edge	7.8.6
29	APM_SRS	Repeat step No. change	Edge	7.8.7
30	APM_PRS	Current position preset	Edge	7.8.8
31	APM_EPRE	Encoder value preset	Edge	7.8.9
32	APM_RST	Error reset	Edge	7.9.1
33	APM_FLT	Floating home setting	Edge	7.10.1
34	APM_MOF	M code release	Edge	7.10.2

Note

1. Dedicated commands of positioning module are executed in rising edge. Therefore, it operates when the input condition is “On”. If you want it to operate again, the input condition has to be “Off” first, then be “On”. But, APM_SRD, APM_CRD, APM_ENCRD will be operated by high level. Therefore, it continues to operate during the input condition is “On”. If the input condition become “Off”, it does not operate.

7.3 Function Block related to Module Information Read

7.3.1 Operation Information Read (APM_CRD)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command (0: axis X. 1: axis Y) **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation ERR : Display error CA : Display the current position CV : Display the current speed STEP : Step no. of the current operation data MCD : Display the current M code value

(1) Read the axis state of current operation designated in the axis of designated positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) The operation information is saved in parameter set on output of function block.

(3) Set an axis to command and the value 0 and 1 are available to be set. If you set wrongly, “Error6” arises.

(4) You can monitor current position, current speed, operation data step no. and M code value of axis or use them as a condition in user’s program.

7.3.2 Operation State Bit Information Read (APM_SRD)

Form of Function Block	Description
APM_SRD BOOL – REQ DONE – BOOL USINT – BASE STAT – UINT USINT – SLOT ST1 – BOOL[8] USINT – AXIS ST2 – BOOL[8] ST3 – BOOL[8] ST4 – BOOL[8] ST5 – BOOL[8] ST6 – BOOL[8] ST7 – BOOL[8]	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command (0: axis X. 1: axis Y) **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation ST1 : State 1 ST2 : State 2 ST3 : State 3 ST4 : State 4 ST5 : State 5 ST6 : State 6 ST7 : State 7

(1) Give “Bit Information of Current operation reading” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

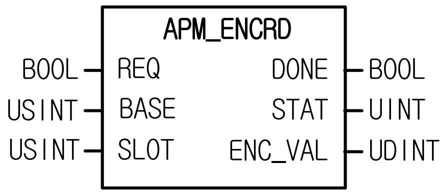
(2) The bit information about the state of current operation is saved in parameter set on ST1 ~ ST7.

(3) The contents of output parameters, ST1 ~ ST7 are important information necessarily applied in the program.

Des.	Bit	Description	Bit	Description
ST1	[0]	Operating(0:STOP, 1:BUSY)	[4]	Origin fix state(0:Uncompletion, 1:Completion)
	[1]	Error state	[5]	-
	[2]	Positioning completion	[6]	Stop
	[3]	M code On signal(0:Off, 1:On)	[7]	-
ST2	[0]	High limit detection	[4]	In acceleration
	[1]	Low limit detection	[5]	In stable speed
	[2]	Emergent Stop	[6]	In deceleration
	[3]	Direction(0:Forward, 1:Reverse)	[7]	In dwell
ST3	[0]	Axis1 in positioning control	[4]	In circular interpolation operation
	[1]	Axis1 in speed control	[5]	In homing operation
	[2]	In linear interpolation	[6]	In position synchronous start operation
	[3]	-	[7]	In speed synchronous start operation
ST4	[0]	In JOG low operation	[4]	-
	[1]	In JOG high operation	[5]	-
	[2]	In inching operation	[6]	-
	[3]	-	[7]	-
ST5	[0]	Main axis information 1: axis X, 2: axis Y, 4: Encoder	[4]	-
	[1]		[5]	-
	[2]		[6]	-

Des.	Bit	Description	Bit	Description
	[3]	Axis state (0: main axis, 1: sub axis)	[7]	-
ST6	[0]	-	[4]	High limit signal
	[1]	-	[5]	Low limit signal
	[2]	-	[6]	Origin signal
	[3]	-	[7]	DOG signal
ST7	[0]	-	[4]	In-position signal
	[1]	-	[5]	Declination counter clear output signal
	[2]	-	[6]	-
	[3]	-	[7]	-

7.3.3 Encoder Value Read (APM_ENCRD)

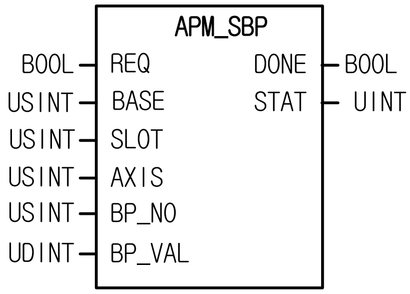
<table>
<tr><th>Form of Function Block</th><th>Description</th></tr>
<tr><td>
</td><td>Input
REQ : Request for execution of function block
BASE : Set the base no. with module
SLOT : Set the slot no. with module
Output
DONE : Maintain 1 after first operating
STAT : Output the error no. in operation
ENC_VAL : Current value of encoder</td></tr>
</table>

(1) Give “Encoder Reading” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) The current encoder value is displayed on ENC_VAL

7.4 Parameter/Operation Data Teaching Function Block

7.4.1 Basic Parameter Teaching (APM_SBP)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command BP_VAL : Basic parameter to change BP_NO : Item no. of basic parameter to change **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

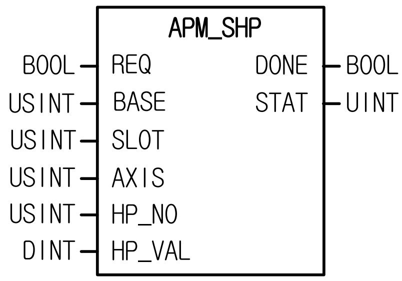
(1) Give “Basic Parameter Teaching” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) Parameter value modified by basic parameter teaching command is valid within power connection. If you want to keep the parameter without power connection, save the value in flash memory APM_WRT (Parameter/Operation Data Saving command) after basic parameter teaching.

(3) The value that need to be set in basic parameter is as follows.

Value	Items	Setting Range
1	Speed Limit	1 ~ 2,000,000[pulse/s]
2	Bias speed	1 ~ 2,000,000[pulse/s]
3	Acc. Time 1	0 ~ 65,535 [ms]
4	Acc. Time 2	
5	Acc. Time 3	
6	Acc. Time 4	
7	Dec. Time 1	
8	Dec. Time 2	
9	Dec. Time 3	
10	Dec. Time 4	
11	SW upper limit	-2,147,483,648 ~ 2,147,483,647 [pulse]
12	SW lower limit	-2,147,483,648 ~ 2,147,483,647 [pulse]
13	Backlash compensation	0 ~ 65,535 [pulse]
14	S/W limit detect	0: not detect, 1: detect
15	Position complete condition	0: dwell time, 1: inposition,2: dwell time and inposition, 3:dwell time or inposition
16	Upper/lower limit	0: not use, 1: use
17	Pulse output level	0: Low Active, 1: High Active
18	Pulse ouput mode	0: CW/CCW, 1: PLS/DIR
19	M code output mode	0: None, 1: With, 2: After

7.4.2 Homing/Manual Parameter Teaching (APM_SHP)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command HP_NO : Item no. of homing/manual parameter to modify HP_VAL : Homing/manual parameter value to modify **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

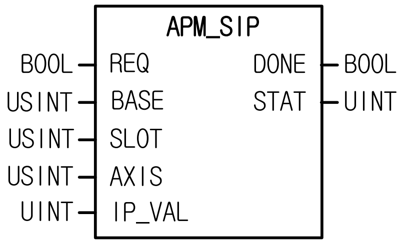
(1) Give “Homing Parameter Setting” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) Parameter value modified by homing parameter teaching command is valid within power connection. If you want to keep the parameter without power connection, save the value in flash memory APM_WRT (Parameter/Operation Data Saving command) after basic parameter teaching

(3) The homing/manual parameter items and setting values are as follows.

Setting value	Items	Setting Range
1	Homing position	-2,147,483,648 ~ 2,147,483,647 [pulse]
2	High speed for homing	1 ～ 2,000,000 [pulse/s]
3	Low speed for homing	
4	Home compensation	-32,768 ～ 32,767 [pulse]
5	Homing Acc. Time	0 ~ 65,535 [ms]
6	Homing Dec. Time	
7	Homing Dwell Time	
8	Homing mode	0:DOG/HOME(Off), 1:DOG/HOME(On), 2:DOG 3:U.L.Limit/Home, 4:U.L.Limit
9	Homing direction	0:Forward, 1:Reverse
10	JOG high speed	1 ～ 2,000,000 [pulse/s]
11	JOG low speed	
12	JOG acceleration time (ms)	0 ~ 65,535[ms]
13	JOG deceleration time (ms)	0 ~ 65,535[ms]
14	Inching speed	1 ～ 65,535[pulse/s]

7.4.3 I/O Signal Parameter Teaching (APM_SIP)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command IP_VAL : External signal parameter value to modify Set the corresponding signal for each Bit **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

(1) Give “Input Signal Parameter Setting” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) Parameter value modified by input signal parameter teaching command is valid within power connection. If you want to keep the parameter without power connection, save the value in flash memory APM_WRT (Parameter/Operation Data Saving command) after basic parameter teaching

(3) Set an axis to command from 0 ~1. If you set wrongly, “Error6” arises.

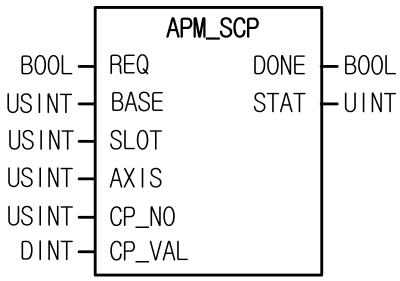
(4) The setting value of each setting area of external signal has the meaning as below.

0 : A contact, 1 : B contact

(5) The I/O signal parameter items and setting values are as follows.

Bit	Signal
0	Upper limit signal
1	Lower limit signal
2	DOG signal
3	HOME signal
4	In-position signal
5	Deviation counter clear output signal
6~15	Not used

7.4.4 Common Parameter Teaching (APM_SCP)

<table>
<tr><th>Form of Function Block</th><th>Description</th></tr>
<tr><td>
</td><td>Input
REQ : Request for execution of function block
BASE : Set the base no. with module
SLOT : Set the slot no. with module
AXIS : Axis to command
CP_NO : Item no. of common parameter to modify
CP_VAL : Common parameter value to modify
Output
DONE : Maintain 1 after first operation
STAT : Output the error no in operation</td></tr>
</table>

(1) Give “Common Parameter Setting” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

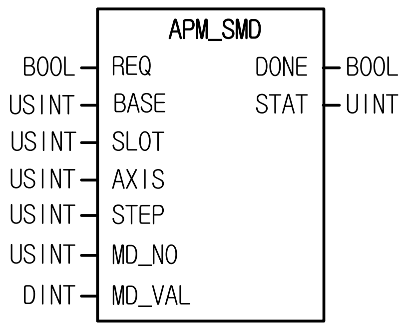
(2) Parameter value modified by common parameter teaching command is valid within power connection. If you want to keep the parameter without power connection, save the value in flash memory APM_WRT (Parameter/Operation Data Saving command) after basic parameter teaching

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(4) The common parameter items and setting values are as follows.

Setting value	Item	Setting range
1	Encoder max. value	-2,147,483,648 ~ 2,147,283,647
2	Encoder min. value	
3	Speed override method	0 : % override, 1 : speed override
4	Encoder input signal	0 : CW/CCW, 1 :PLS/DIR, 2: PHASE

7.4.5 Operation Data Teaching (APM_SMD)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command STEP : Step no. to modify MD_NO : Item no. of operation data to modify MD_VAL : Operation data value to modify **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

(1) Give "Operation Data Teaching" command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

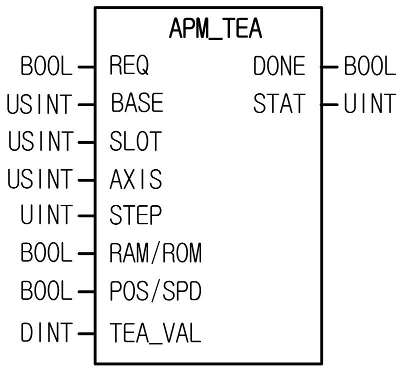
(2) Parameter value modified by operation data teaching command is valid within power connection. If you want to keep the parameter without power connection, save the value in flash memory APM_WRT (Parameter/Operation Data Saving command) after basic parameter teaching

(3) In case "STEP" is 0, it changes current step.

(4) The operation data items and setting values are as follows.

Setting value	Item	Setting range
1	Goal address	-2,147,483,648 ～ 2,147,483,647 [pulse]
2	Cir. Int. aux. point	
3	Speed	1 ～ 2,000,000 [pulse/s]
4	Dwell time	0 ~ 65,535[ms]
5	M code number	0 ~ 65,535
6	Cir. Int. turns	0 ~ 65,535
7	Operation method	0:single, 1:repeat
8	Control method	0:position control, 1:speed control
9	Operation pattern	0:End, 1:Keep, 2:CONT
10	Coordinate	0:Absolute, 1:Incremental
11	Cir. Int. size	0:Arc<180 1:Arc>=180
12	Acc. no.	0 ~ 3
13	Dec. no.	0 ~ 3
14	Cir. Int. mode	0:MID, 1:CENTER, 2:RADIUS
15	Cir. Int. direction	0:CW, 1:CCW
16	Repeat step number	1~150

7.4.6 Single Teaching (APM_TEA)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command STEP : Set the step no. to do teaching (0~150) RAM/ROM : Selection of RAM/ROM teaching 0 : RAM teaching, 1 : ROM teaching POS/SPD : Selection of position/speed teaching 0 : Position, 1 : Speed TEA_VAL : Set the teaching value **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

(1) Give “Teaching Array” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

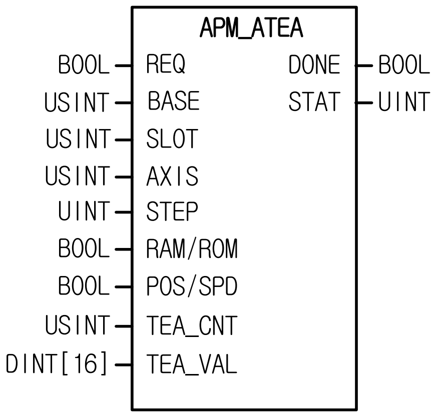
(2) Speed teaching is for user to use random speed value in a operation data of specified step and position teaching is for user to use random position value in a operation data of specified operation step.

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(4) You may set step no.(0~150) of operation data on STEP. If you set wrongly, “Error11” arises.

(5) Parameter value modified by teaching command and setting RAM/ROM as “0” is valid within power connection. If you want to keep the parameter without power connection, execute teaching command with setting “1” on RAM/ROM or save the modified parameter value on Flash memory with APM_WRT (Parameter/Operation Data Saving command) after teaching.

7.4.7 Teaching Array (APM_ATEA)

<table>
<tr><th>Form of Function Block</th><th>Description</th></tr>
<tr><td>
</td><td>Input
REQ : Request for execution of function block
BASE : Set the base no. with module
SLOT : Set the slot no. with module
AXIS : Axis to command (0: axis X. 1: axis Y)
STEP : Set the step no. to do teaching (0~150)
RAM/ROM : Selection of RAM/ROM teaching
0 : RAM teaching, 1 : ROM teaching
POS/SPD : Selection of position/speed teaching
0 : Position, 1 : Speed
TEA_CNT : Set the no. of data to do teaching
1 ~ 16
TEA_VAL : Set the teaching value
Output
DONE : Maintain 1 after first operation
STAT : Output the error no in operation</td></tr>
</table>

(1) Give “Teaching Array” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) Speed teaching is for user to use random speed value in a operation data of specified step and position teaching is for user to use random position value in a operation data of specified operation step.

(3) This command is for modifying maximum 16 goal positions/speed value at once with teaching array function block.

(4) In SLOT, this command is used in extension module. If you set 0 “Error3” arises

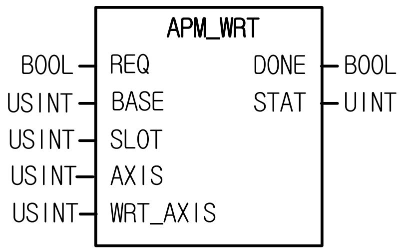
(5) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(6) You may set step no.(0~150) of operation data on STEP. If you set wrongly, “Error11” arises.

(7) You may set the no. of data to do teaching on TEA_CNT and do teaching max. 16. If you set wrongly, “Error11” arises.

(8) Parameter value modified by teaching command and setting RAM/ROM as “0” is valid within power connection. If you want to keep the parameter without power connection, execute teaching command with setting “1” on RAM/ROM or save the modified parameter value on flash memory with APM_WRT (Parameter/Operation Data Saving command) after teaching. When PLC is writing in flash memory, you can’t execute the instruction.(refer to Appendix 1 ,ErrorCode176)

7.4.8 Saving Parameter/Operation Data (APM_WRT)

Form of Function Block	Description
 	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command WRT_AXIS : Saving axis setting (by setting bit) Bit0: axis X, Bit1: axis Y **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

(1) Give "Basic Parameter Setting" command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) Set an axis to command from 0 ~ 1. If you set wrongly, "Error6" arises.

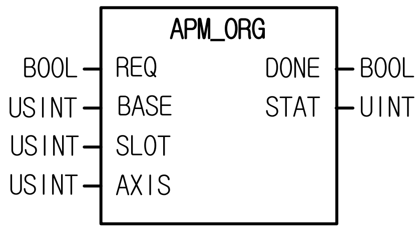
(3) If function block is executed normally, the current operation parameter and data which saved on WRT_AXIS are saved on Flash memory and maintain the data without the power connection.

(4) For setting of WRT_AXIS, set bit relevant to each axis

15 ~ 2 Bit	1Bit	0Bit
Not Use	Axis Y	Axis X

7.5 Start/Stop Function Block

7.5.1 Homing Start (APM_ORG)

<table>
<tr><th>Form of Function Block</th><th>Description</th></tr>
<tr><td>


</td><td>
Input
REQ : Request for execution of function block
BASE : Set the base no. with module
SLOT : Set the slot no. with module
AXIS : Axis to command
Output
DONE : Maintain 1 after first operation
STAT : Output the error no in operation
</td></tr>
</table>

(1) This is the command that give homing command to positioning module.

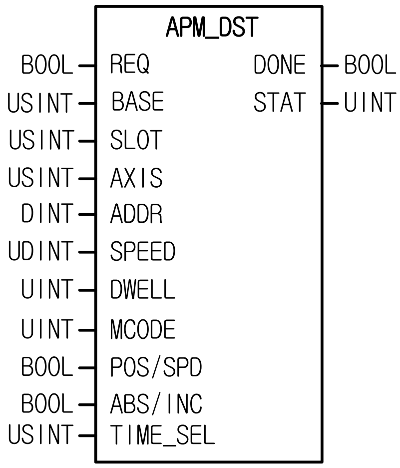
(2) This is the command to find the origin of machine by Direction, Correction, Speed, Address and Dwell set on parameter of each axis for homing according to the homing access.

(3) Give “Homing” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(4) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(5) If homing command is executed normally, it starts homing according to “homing method” of “homing parameter”.

7.5.2 Direct Start (APM_DST)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command ADDR : Goal position address setting -2147483648 ~ +2147483647 SPEED : Goal speed setting DWELL : Dwell time setting 0 ~ 65535[ms] M code : M code value setting POS/SPD: control method setting 0: position control, 1: speed control ABS/INC: Coordinates setting 0: Absolute, 1: Incremental TIME_SEL: Acc./Dec, time number setting **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

(1) Give "Direct Start" command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) This is for operating by setting goal position address, operation speed, dwell time, M code, control method, coordinates setting and no. of Acc./Dec time, not by operation data.

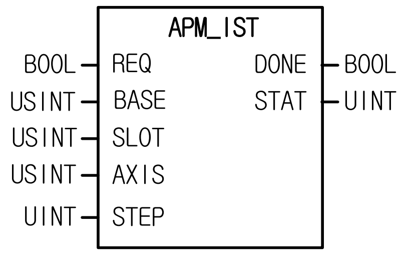
(3) Set an axis to command from 0 ~ 1. If you set wrongly, "Error6" arises.

(4) If the value set on SPEED, TIME_SEL is out of setting range, "Error11" will occur on STAT.

(5) For TIME_SEL, set the bit relevant to each setting as follows.

7 ~ 4 Bit	3 ~ 2 Bit	1~0Bit
Not use	0 : Dec. time 1 1 : Dec. time 2 2 : Dec. time 3 3 : Dec. time 4	0 : Acc. time 1 1 : Acc. time 2 2 : Acc time 3 3 : Acc time. 4

7.5.3 Indirect Start (APM_IST)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command STEP : Set the step no. to do teaching 0 ~ 150 **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

(1) Give “Indirect Start” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

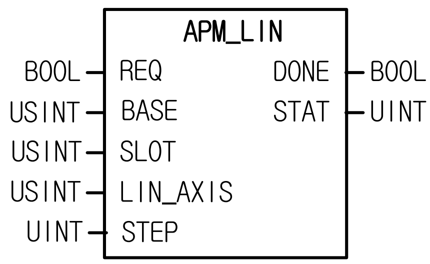
(2) This is for operating by setting operation step no. of axis which set as an operation data.

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(4) If the value set on STEP is out of the setting range (0~150), “Error11” arises on STAT.

(5) If set STEP to 0, it operates the current step.

7.5.4 Linear Interpolation (APM_LIN)

Form of Function Block	Description
 	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module LIN_AXIS: linear interpolation axis (fixed as 3 in XGB positioning module) STEP : Step no. to operate **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

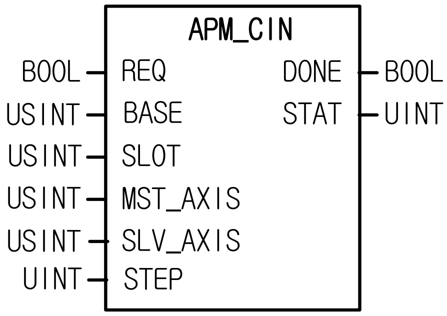
(1) Give “Linear Interpolation” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) Linear interpolation is executed with step set in STEP of designated step

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(4) In case STEP is 0, linear interpolation is executed with current step.

7.5.5 Circular interpolation (APM_CIN)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command STEP : Step no. to operate RATIO : Ellipse ratio(%) DEG : Operating angle **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

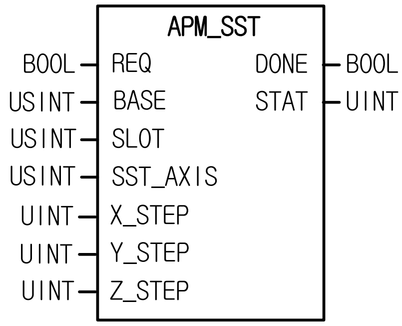
(1) Give “circular Interpolation” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) This is the command that execute circular interpolation with main axis set in MST_AXIS and sub axis set in SLV_AXIS according to operation data set in STEP

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(4) In case STEP is 0, command is executed with current step.

7.5.6 Simultaneous Start (APM_SST)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module SST_AXIS : Simultaneous axis setting X_STEP: axis X step number Y_STEP: axis Y step number Z_STEP: not used **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

(1) Give “Simultaneous Start” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

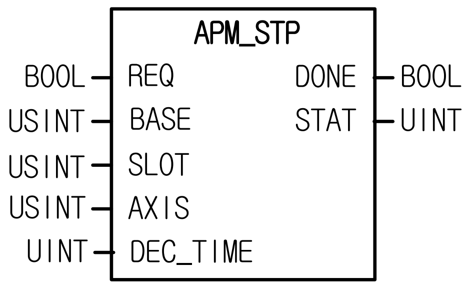
(2) This is for starting 2axis at once.

(3) If you set a value out of setting range, “Error6” arises. Set with each bit as follows.

7bit	6bit	5bit	4bit	3bit	2bit	1bit	0bit
-	-	-	-	-	-	Axis Y	Axis X

(4) Set the step no. of each axis to execute simultaneous start on X_STEP ~ Y_STEP.

7.5.7 Deceleration Stop (APM_STP)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command DEC_TIME : Decelerating stop time 0: Acc./Dec. time applied when start operating 1 ~ 65,535: 1 ~ 65,535ms **Output** DONE : Maintain 1 after first operation STAT : Output the error no in operation

(1) Give “Decelerating Stop” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) If receive the stop command by operation data, it will stop operating and continue to operate by start command.

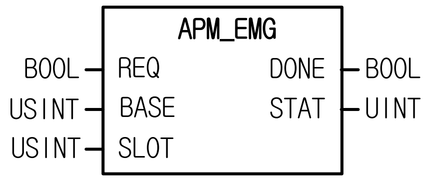
(3) If “Decelerating Stop” is executed in speed/position and synchronization, speed/position and synchronization will stop depending on the state of the current operation control.

(4) “Decelerating Stop” may be executed in not only acc./dec. area but also steady speed area.

(5) Deceleration time means the time between the point of start decelerating and the point of stop and may be set to 0 ~ 65,535ms. But, if it is set to “0”, it will stop by the time set at the starting of operation.

(6) Decelerating time means the time between the speed limit of basic parameter and stop.

7.5.8. Emergency Stop (APM_EMG)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

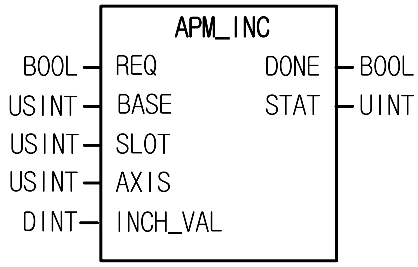
(1) Give "Emergency Stop" command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) This command is for immediate stop. The axis to execute this command will stop.

(3) If EMG stop is executed, state of axis becomes error, output inhibition, origin-not fixed state. When you start operation again, reset error, cancel output inhibition and fix origin again.

7.6 Manual Operation Function Block

7.6.1 Inching Operation (APM_INC)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command INCH_VAL: Amount of movement by Inching Operation -2,147,483,648 ~ 2,147,483,647 **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “Inching Operation” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

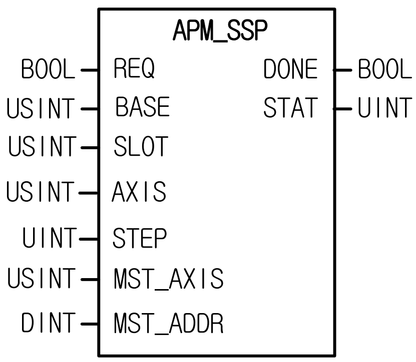
(2) This command is a kind of manual operation for process a minute movement as an operation of fixed amount.

(3) Speed of inching operation is set on manual operation parameter.

(4) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

7.7 Synchronization Start Function Blocks

7.7.1 Position Synchronization (APM_SSP)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command STEP : Step no. to operate 0 ~ 150 MST_AXIS : Set the main axis 0: axis X, 1: axis Y MST_ADDR : Set the position of main axis -2,147,483,648 ~ 2,147,483,647 **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

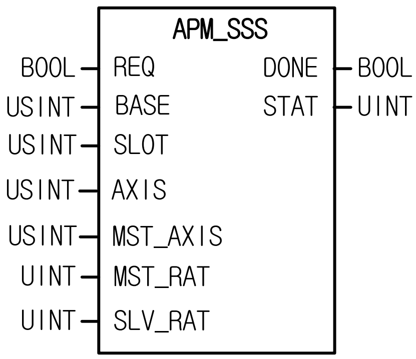
(1) Give “Synchronization Start” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) Operate operation step set by command axis after main axis comes to the position of synchronization.

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(4) You may set the main axis on MST_AXIS with 0 or 1. If you set wrongly, “Error6” arises.

7.7.2 Speed Synchronization (APM_SSS)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command 0: X axis 1: Y axis MST_AXIS : Set main axis 0: X axis 1: Y axis 2: encoder MST_RAT : Set speed rate of main axis 1 ~ 65,535 SLV_RAT : Set speed rate of sub axis 1 ~ 65,535 **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “Speed Synchronization” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) This command is for operating at the operation speed ratio between main axis and subordinate axis.

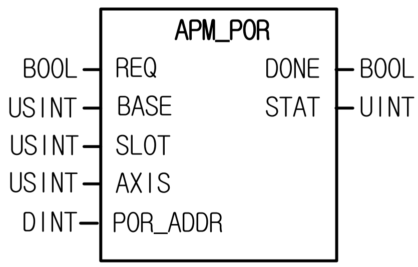
(3) There is no rule about size of the speed ratio between main/sub axis. If the speed ratio of main axis is bigger than sub’s, the main axis will move faster than sub axis. If the speed ratio of sub axis is bigger than main’s, the sub axis moves faster than main.

(4) You may set an Axis to Command with following values. If you set wrongly, “Error6” arises.
0: axis X, 1: axis Y

(5) You may set the main axis on MST_AXIS with following values. If you set wrongly, “Error6” arises.
0: axis X, 1: axis Y, 2: encoder

7.8 Modification Function Block

7.8.1 Position Override (APM_POR)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command POR_ADDR : Set a new goal position -2,147,483,648 ~ 2,147,483,647 **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “Position Override” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

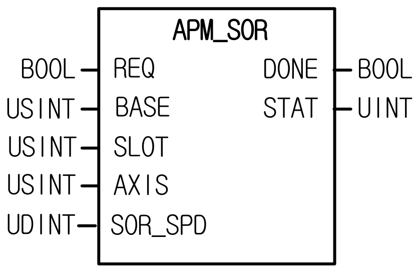
(2) This command is for changing the goal position in operation.

(3) If execute position override after pass the position to execute position override, it will stop at the current position

(4) Set the goal position to modify on POR_ADDR.’

(5) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

7.8.2 Speed Override (APM_SOR)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command SOR_SPD : Set a new operaion speed value **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give "Speed Override" command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) This command is for changing the operating speed in operation.

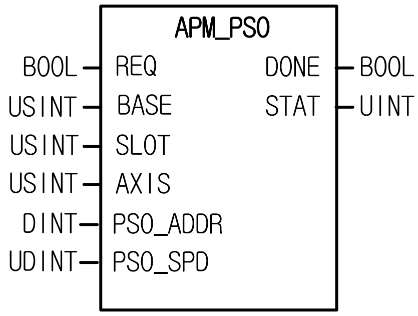
(3) It may be set to "%" or "Speed value (unit/time)" according to "Speed Override" value of common parameter.

(4) If unit of Speed override is %, setting range is from 1 to 65,535. It means 0.01% ~ 655.35%.

(5) If unit of speed override is speed value, the setting range is from 1 to speed limit. The speed limit is the value set on "Speed Limit" item of basic parameter and the unit of speed override is the same as unit of axis.

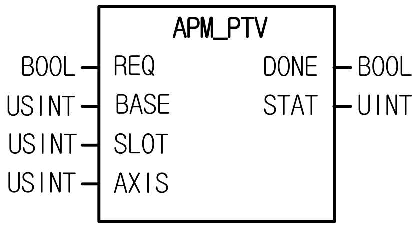
(6) Set an axis to command from 0 ~ 1. If you set wrongly, "Error6" arises.

7.8.3 Position Assigned Speed Override (APM_PSO)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command PSO_ADDR : The position to change speed -2,147,483,648 ~ 2,147,483,647 PSO_SPD : Set new speed value **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “Position Assigned Speed Override” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).
(2) This command is for changing operating speed in operation after command axis arrives at definite position.
(3) The speed value set on PSO_SPD will be “% Designation” or “Speed value Designation” depending on the value set on “Speed Override” of common parameter.
(4) If unit of speed value is %, the setting range is from 1 ~ 65,535 and it means 0.01% ~ 655.35%.
(5) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

7.8.4 Position/Speed Switching Control (APM_PTV)

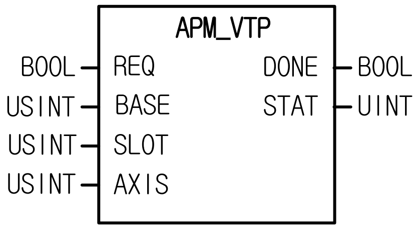
Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “Position/Speed Switching Control” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) When the designated axis is in positioning control operation, if it receives position/speed control switching command, positioning control operation will be changed into speed control operation. And continue to operate until stop command.

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

7.8.5 Speed/Position Switching Control (APM_VTP)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

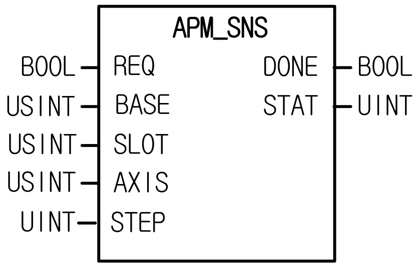
(1) Give "Speed/Position Switching Control" command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) When the designated axis receives speed/position control switching command in speed control operation, speed control will be changed to position control and keep operating by the position value at the beginning.

(3) If this command is executed, origin would be decided at the same time and it finishes the positioning after arrive at the goal position.

(4) Set an axis to command from 0 ~ 1. If you set wrongly, "Error6" arises.

7.8.6 Start Step Number Change (APM_SNS)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command STEP : Set the operation step no. to operate 1 ~ 150 **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

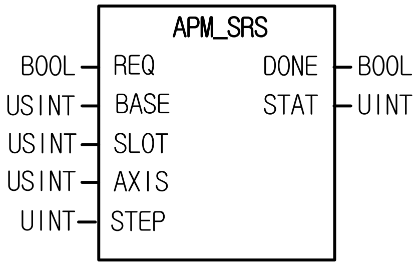
(1) Give “Start Step no. Change” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) This command is for changing the operation step of command axis.

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(4) Set the step no. on STEP. The setting range is 1 ~ 150, if you set the setting value wrongly, “Error11” arises.

7.8.7 Repeat Step No. Change (APM_SRS)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command (0: axis X. 1: axis Y) STEP : Set the repeat step no. to change 0~ 150 **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “Repeat Step no. Change” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

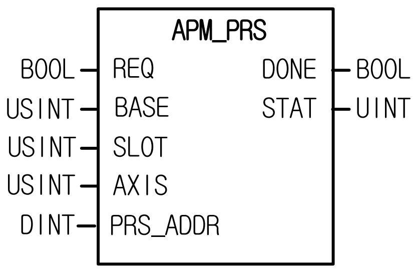
(2) This command is for designating the starting step no. of repeat operation and operating from the designated operation step.

(3) In SLOT, this command is used in extension module. If you set 0 “Error3” arises

(4) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(5) Set the step no. to operate repeatedly on STEP. The setting range is 0~ 150, if you set the setting value wrongly, “Error11” arises.

7.8.8 Current Position Change (APM_PRS)

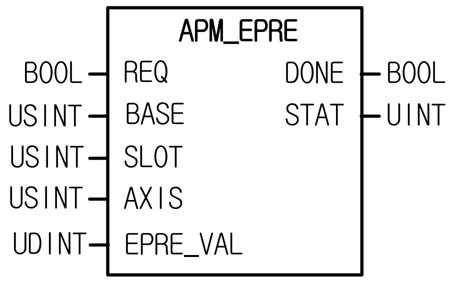
Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command PRS_ADDR : Set the current position value to change. -2,147,483,648 ~ 2,147,483,647 **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “Basic Parameter Setting” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) This command is for changing the current position to random position. If it is executed in the state of non-origin, the origin signal would be On and the current position would be set as setting value (PRS_ADDR).

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

7.8.9 Encoder Value Preset (APM_EPRE)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command EPRE_VAL : Set the value of encoder preset 0~2,147,483,647 **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

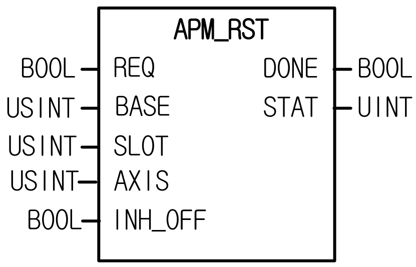
(1) Give “Encoder Preset” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) This command is for changing the current value of encoder to the value set on EPRE_VAL

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

7.9 Error Function blocks

7.9.1 Error Reset (APM_RST)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command INHL_OFF: Cancel output inhibition 0~1 (0: not cancel output inhibition, 1: cancel output inhibition) **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “Error Reset” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

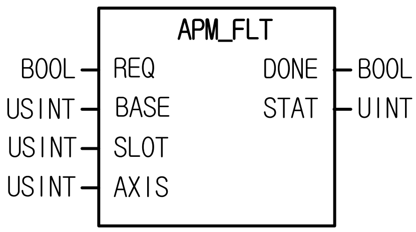
(2) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

(3) This is for resetting the errors when error such as parameter setting range excess occurs during operation.

(4) For error causing output inhibition, set INHL_OFF as 1 and execute function block to cancel output inhibition.

7.10 Other Function Blocks

7.10.1 Floating Origin Setting (APM_FLT)

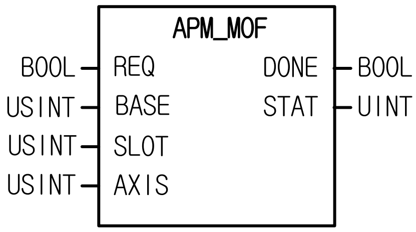
Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “Floating Origin” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) This command is for setting the current position as the origin by compulsion. The address value saved on homing address will be the current position.

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

7.10.2 M code Release (APM_MOF)

Form of Function Block	Description
	**Input** REQ : Request for execution of function block BASE : Set the base no. with module SLOT : Set the slot no. with module AXIS : Axis to command **Output** DONE : Maintain 1 after first operating STAT : Output the error no. in operation

(1) Give “M code Release” command to the axis designated as the axis of positioning module with BASE (Base no. of Positioning module) and SLOT (Slot no. of Positioning module).

(2) In the case that M code of parameter of each axis is set as “With” of “After”, you may turn the M code off with this command. That is, M code signal will be OFF, M code no. will be 0.

(3) Set an axis to command from 0 ~ 1. If you set wrongly, “Error6” arises.

Chapter 8 Program

Here describes the basic program that operate positioning module case by using its commands.

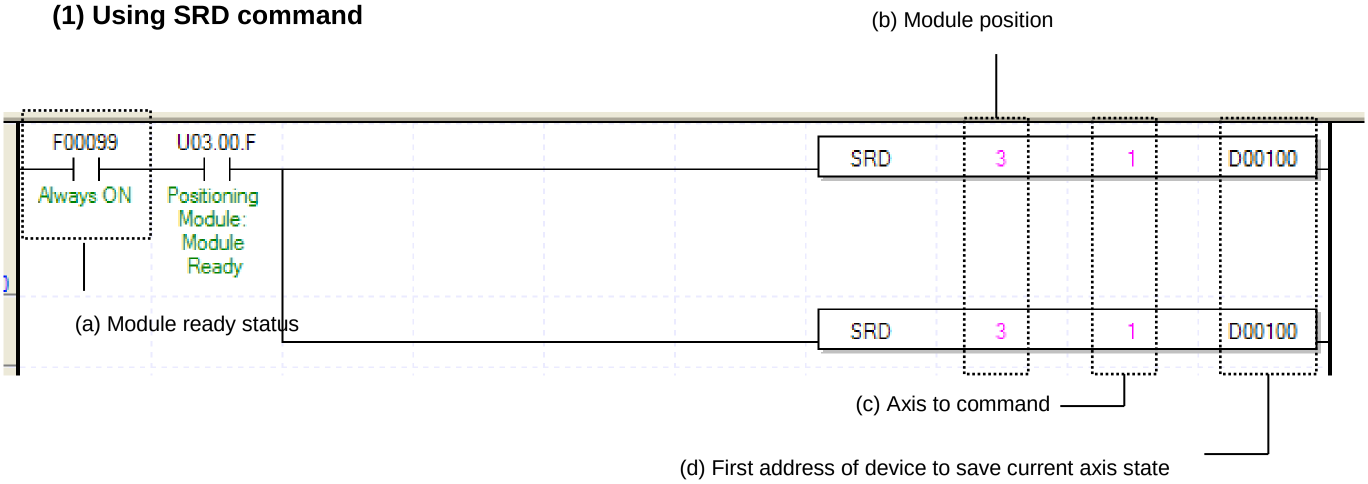
8.1 Example of XBC Programming

8.1.1 General description

Here we supposed the positioning module installed at the slot no.3. In the real usage, you need to change its value according to your actual set up.

8.1.2 Current State Read

(1) Using SRD command



(a) Module's ready

After Turn On, if there is no error occurred in Positioning Module, it is "ON," meaning that modules are ready to operate.

(b) Address of Positioning Module

Before operation, you need to configure its position by numbers. In this example, Positioning Module installed at the slot no.3.

(c) Axis of operation

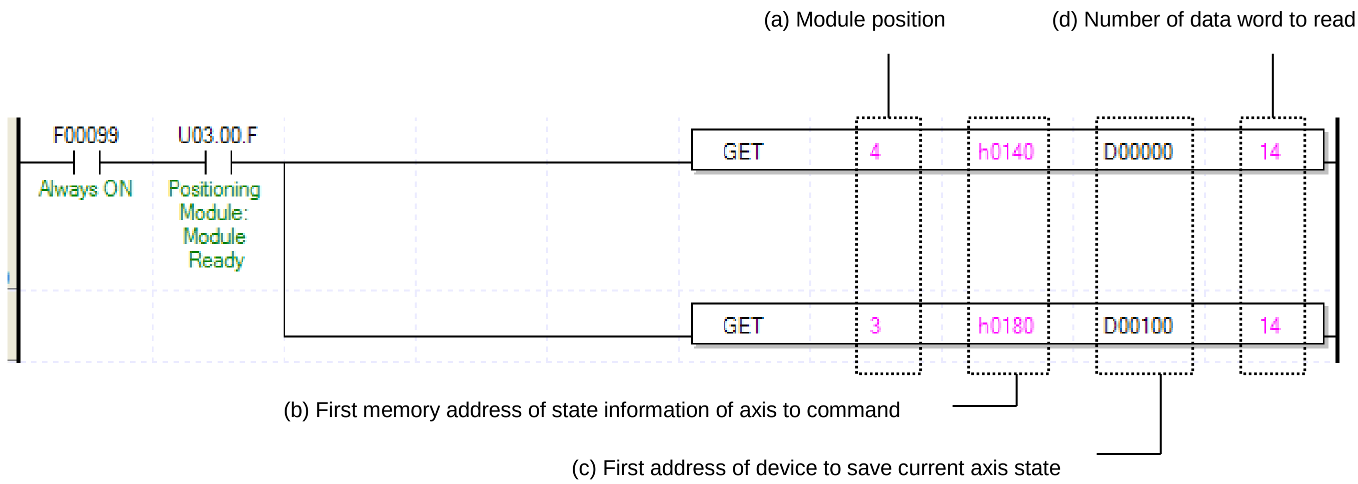
Positioning module operate as 2 axes. In this example, number 0 through 1 means axis X through axis Y.

(d) Address of first device where those conditions of current axis are saved

This D00000 tells the address of first device which already register from the configuration of sequence program. For example, in this program above, the condition of axis X will be saved from D00000 to D00012. How to setup a device function would be explained at the "Chapter 6.3.33 Reading Driving Condition."

(e) Also you can use the bit information from saved data in the device for as a condition of another operation. For example, in this program above, according to use axis X driving signal, you need to setup a data as D00000.0, and to check error condition of axis Y, you need to configure as D0100.1.

(2) Using command Get



(a) The address of Positioning Module.

(b) The first memory address of operating Axis.

You can setup the memory address of state information case by axis. For example, in this program above, “h0140” refers that state information of axis X. How to setup a memory address by axis would be explained at “Chapter 5.1.2 state Information.”

(c) The first address of device which can save the current state of axis

(d) Number of reading data by WORD

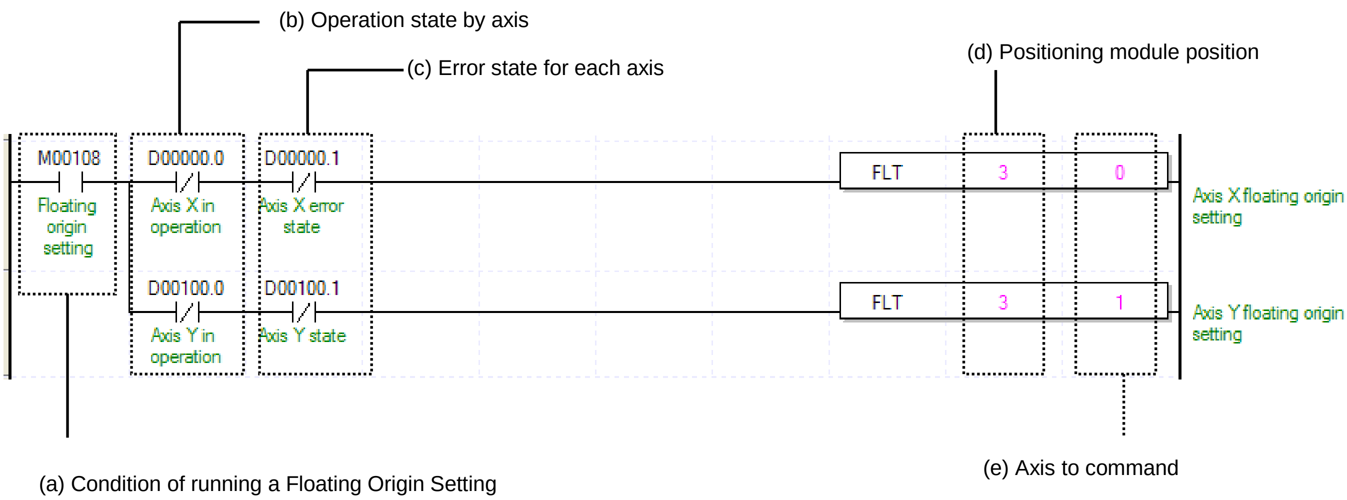
Using command GET to read condition information, can save number of data by WORD, hence you only chosen data will be saved.

(e) Also you can use the bit information from saved data in the device for as a condition of another operation. For example, in this program above, according to use axis X driving signal, you need to setup a data as D00000.0, and to check error condition of axis Y, you need to configure as D0100.1.

8.1.3 Operation Test

(1) Floating Origin Setting

Decide origin of current motor's position without set a machinery origin.



(a) Condition of running a Floating Origin Setting

It executes Floating Origin Setting (FLT) command.

(b) Operating state by axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Operating" for each axis.

In case relevant axis is in operation, it will be on. Since FLT command can't be executed during operation sets to be executed when axis is not in operation. In case FLT is executed during operation, "error 212" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error.

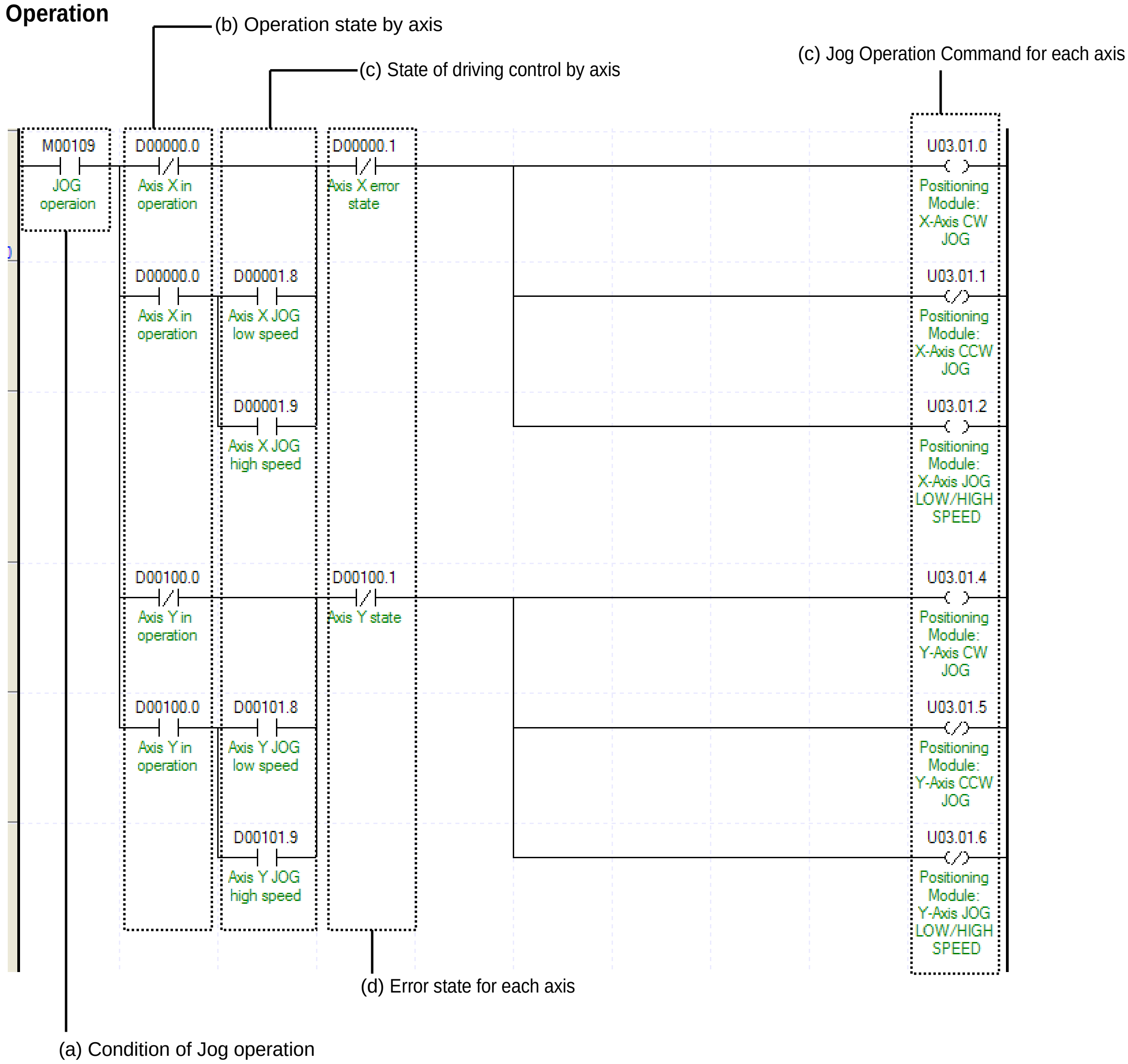
(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3 of 0 bases.

(e) Axis of command execution

You can set an axis for Floating Origin Setting. XBF-PD02a series supports for 2 axes. In the "execution of axis" from the configuration of Floating Origin Setting, you can set a value 0 or 1.

(2) Jog Operation



(a) Condition of Jog Operation

Condition of Jog Operation Command

(b) Operating state by axis

Jog Operation can only be working when the state of axis set as Jog Operation. In this example above, specific axis set as Jog Operation otherwise it is not operating.

(c) State of driving control by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Jog Operating” for each axis. It turns on when it is operating. Jog Operation configuration can be changed while it is operating.

(d) Error state for each axis

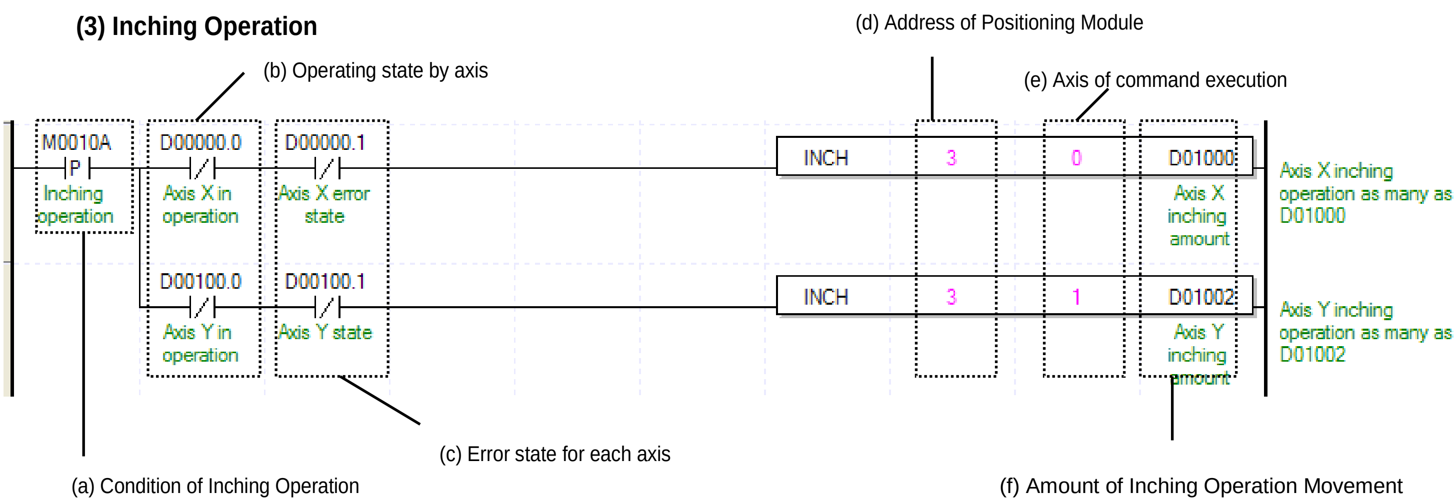
According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(e) Jog Operation Command for each axis

Jog Operation works by setting or clearing directly its considered bit from U device not by a command. In this example above, look at the axis 1, once Jog Operation conditions are satisfied, clockwise jog bit becomes "On,' count clockwise jog bit becomes "Off'," and jog speed bit becomes "On." Everything together Jog Operation works clock wisely with high speed. Reference for detail information about Bit of U device is from "Chapter 5.2.1."

The value of U device renewed from Scan End of sequence program.

(3) Inching Operation



(a) Condition of Inching Operation

Condition of Inching Operation Command (INCH)

(b) Operating state by axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Inching Operating" for each axis. It turns on when it is operating. Inching Operation can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Inching Operation while it is running, the "error 401" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3 of 0 bases.

(e) Axis of command execution

You can set an axis for Inching Operation. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Inching Operation, you can set a value 0 or 1.

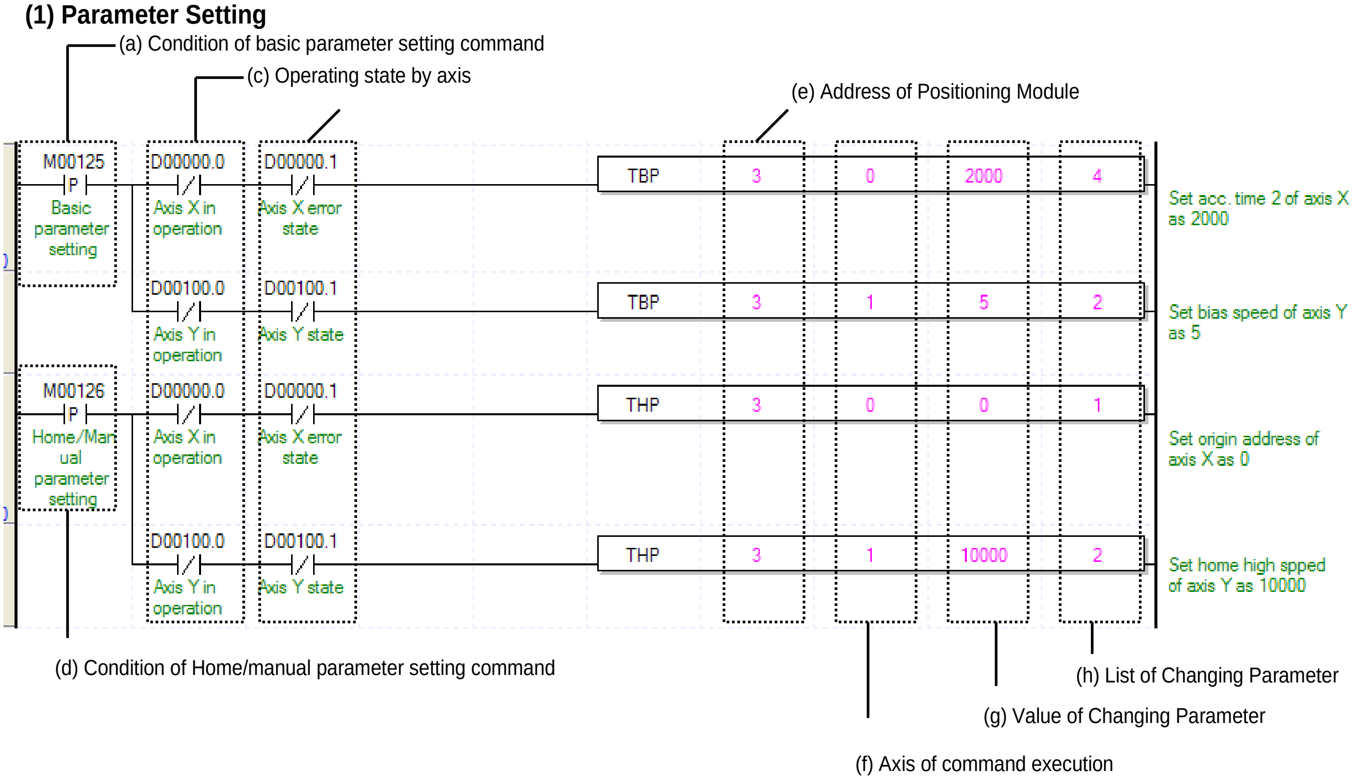
(f) Amount of Inching Operation Movement

Measure the amount of moving range by Inching Operation.

(h) Reference for Inching Operation is from "Chapter 9.3.2."

8.1.4 Parameter and Operation Data Setting

(1) Parameter Setting



(a) Condition of basic parameter setting command

Condition of basic parameter setting command (TBP)

(b) Condition of home/manual parameter setting command

Condition of home/manual parameter setting command (THP)

(c) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Except common parameter setting, parameter setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Parameter Setting while it is running, the “error 471” would be appeared.

(d) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(e) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(f) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(g) Value of Changing Parameter

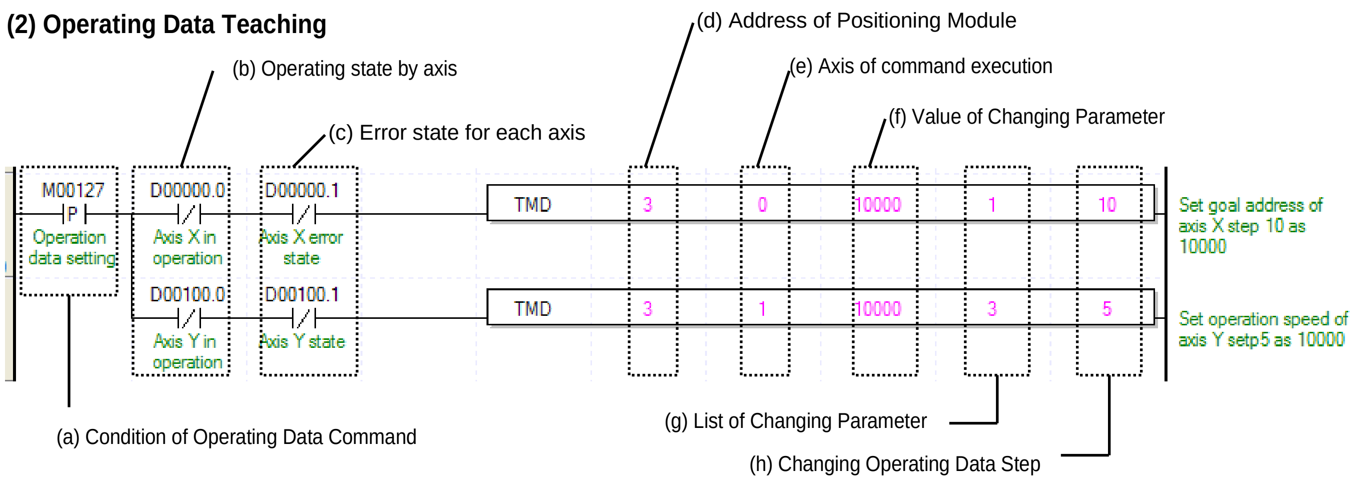
You can set a value of changing parameter. For more information about Parameter Value Changing look for “Chapter 6.

Command."

(h) List of Changing Parameter

You need to set a list for parameter (g) changing from set command. Once operating is working, this value will change to parameter (g). For more information of list of changing parameter look for "Chapter 6. Command."

(2) Operating Data Teaching



(a) Condition of Operating Data Command

Condition of Operating Data Command (TMD)

(b) Operating state by axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Operating Data Setting while it is running, the "error 472" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(f) Value of Changing Parameter

You can set a value of changing parameter.

(g) List of Changing Parameter

You need to set a list for parameter (f) changing from set command. Once operating is working, this value will change to parameter (f). Each value of Operating Data is listed below. For example if you put 1000 for value of Changing Operating Data and 4 for Operating data then the value of Dwell is going to be set as 1000ms.

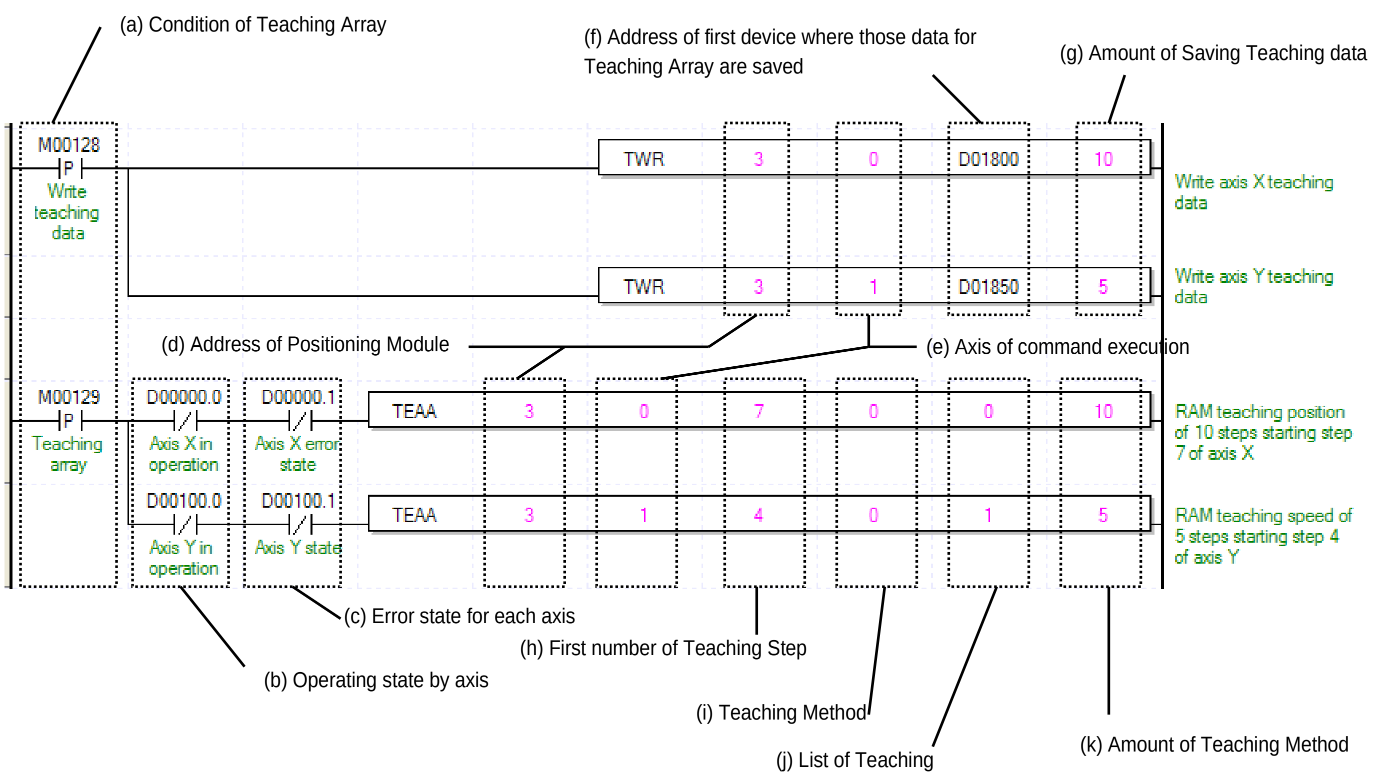
Setting Value	Items
1	Goal Position
2	Circular interpolation auxiliary position

Setting Value	Items
3	Operating speed
4	Dwell Time
5	M code No.
6	Circular interpolation turns
7	Operation method
8	Control method
9	Operting pattern
10	Coordinates
11	Size of Circular arc
12	Acc. No.
13	Dec. No.
14	Circular interpolation method
15	Circular interpolation direction
16	Repeat step number

(h) Changing Operating Data Step

You can configure the changing operating data step number by using the operating data step command. XBF-PD02A supports 150 steps for each axis. This value supports from number 0 to 150. The numbers are considered as a step meaning number 1~150 are same as 1~150 steps. When you set this value as 0 means that you will stay put with current value.

(3) Operation Data Teaching Array



(a) Condition of Teaching Array

Condition Write Teaching Array Data (TWR), Teaching Array Command (TEAA)

(b) Operating state by axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Teaching Array can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Teaching Array while it is running, the "error 461" would be appeared when it is Position Teaching or the "error 463" would be appeared when it is Speed Teaching.

(c) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3 of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XGF series supports for 4 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value for axis 1 through 4 axes.

(f) Address of first device where those data for Teaching Array are saved

To execute a Teaching Array, you need to set a specific value first. TWR commands are using for set up those Teaching Array data. It has to be done before actual Teaching Array operation. Teaching Data will be set up depends on number of first device as below table.

No.	Device No.	Teaching array data
1	Device + 0	Teaching array data1
2	Device + 2	Teaching array data2
3	Device + 4	Teaching array data3
4	Device + 6	Teaching array data4
5	Device + 8	Teaching array data5
6	Device + 10	Teaching array data6
7	Device + 12	Teaching array data7
8	Device + 14	Teaching array data8
9	Device + 16	Teaching array data9
10	Device + 18	Teaching array data10
11	Device + 20	Teaching array data11
12	Device + 22	Teaching array data12
13	Device + 24	Teaching array data13
14	Device + 26	Teaching array data14
15	Device + 28	Teaching array data15
16	Device + 30	Teaching array data16

(g) Amount of Saving Teaching data

Decide how many data will be saved by using TWR command. Maximum 16 data can be saved. In this example above, 10 Teaching data saved in the axis 1. Therefore those Teaching data from D01800~D01818 saved in the module.

(h) First number of Teaching Step

You can setup the first number of Teaching Step among the Operating Data step. In this example above, Teaching Array of axis X will be operate on 10 steps from 7th step, hence it will be operate between 7th step and 16th step.

(i) Teaching Method

This function sets whether you save value of changed Teaching data to Rom or Ram. If you choose Rom the data will be saved regardless of power and if you save in the ram the data will be vanished when powers off. This parameter sets as 1 means Rom saved, and sets as 0 means Ram saved. The frequency of ROM teaching is limited to 100,000.

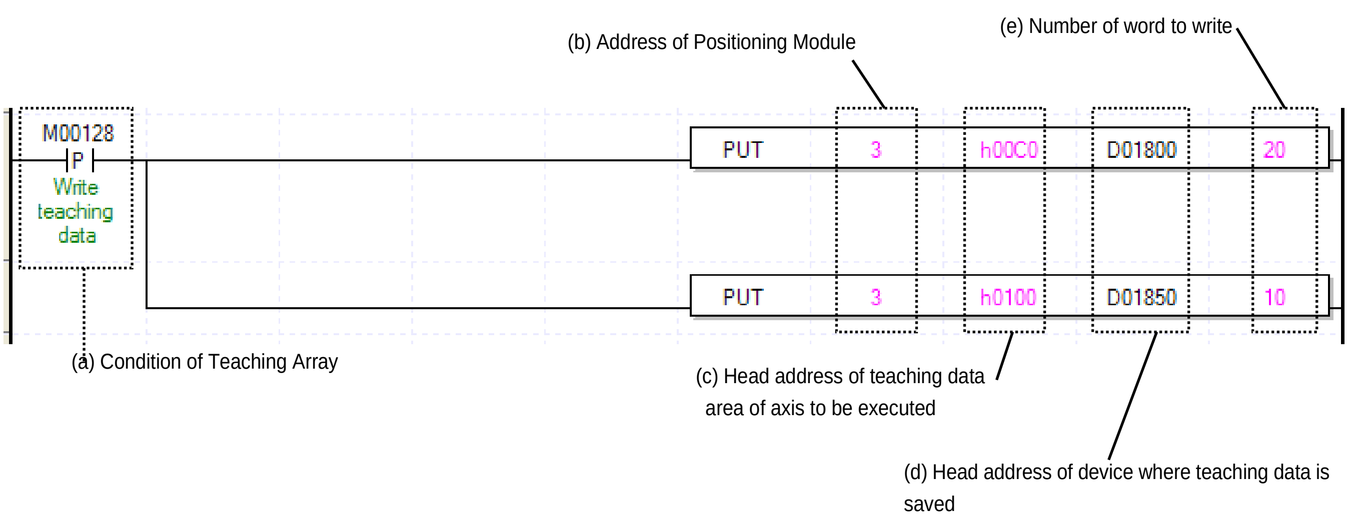
(j) List of Teaching

You can set a data with Teaching Method among the Operating Data. Both "Goal Position" and "Operating Speed" can be changed by Teaching Array. When its value set "0" means set a Goal Position and "1" means set an Operating Speed.

(k) Amount of Teaching Method

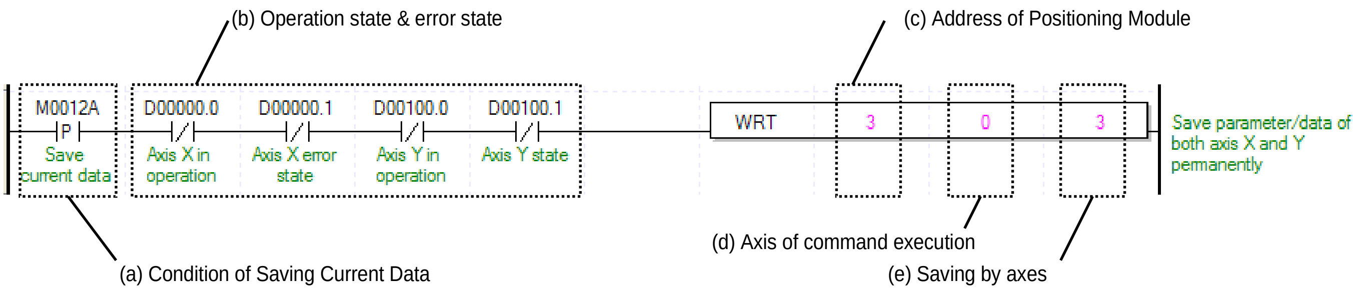
Decide how many steps will be operated using by Teaching Method. Maximum 16 Teaching Array data can be used. For more information about Teaching Array Operation, look for reference from "Chapter 9.7.1"

(l) Write Teaching Data (TWR) of above example also be operated, using command PUT.



For more information about each saving Teaching Data, look for reference from "Chapter 5.1.1." When you are using a command "PUT," you need to setup a type of data as a "WORD" not a "DINT" considered its size.

(4) Saving Current Data



(a) Condition of Saving Current Data

Condition of Saving Current Data Command (WRT). When current saving data operated, those values of module parameter and operating data would be saved in Flash memory. Therefore configuration of Ram Teaching would be constantly saved whether power is on or not.

(b) Operation state & error state

According to exercise from “Chapter 8.1.2 Current State Reading”, it is a signal of “operation state and error state” for each axis. Since Saving Current Data command can’t be executed, condition is set to be executed when both axes are not in operation. If you execute Saving Current Data command during operation, error 172 occurs.

(c) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3 of 0 bases.

(d) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

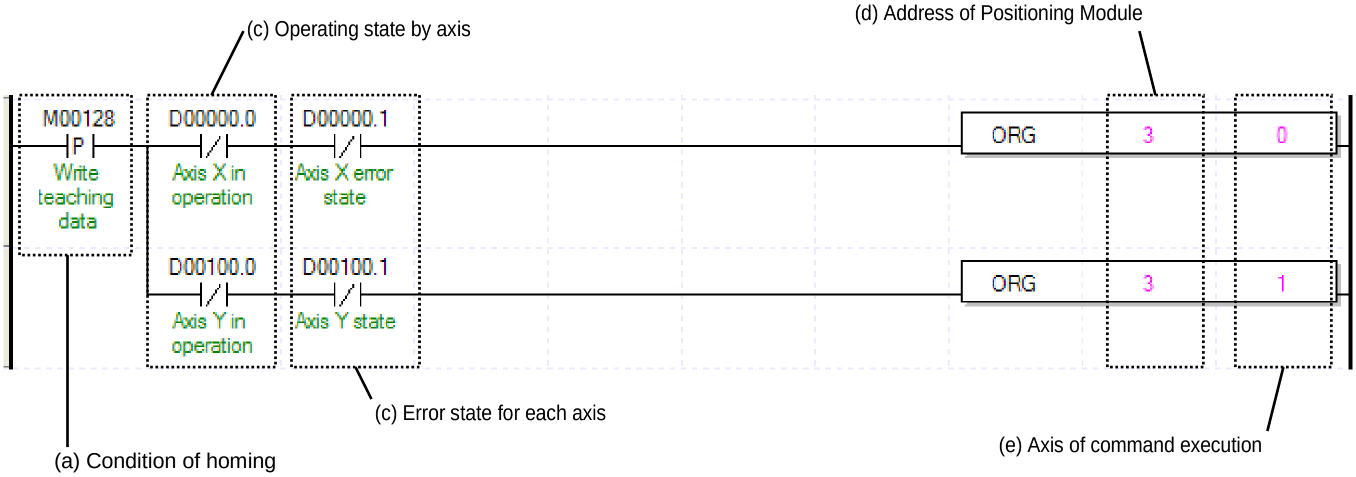
(e) Saving by axes

Configure current data operation setting. Choosing axes are configured follow by below table. Therefore even if those axis are not operated as it programmed, saving axis can be saved in Array. The data of operated axis saved in flash memory, which make constantly stable whether its power is on or not.

15 ~ 2 Bit	1Bit	0Bit
N/A	axis Y	axis X

8.1.5 Positioning Operation

(1) Homing



(a) Condition of Homing

Condition of Homing Command (ORG)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Homing command can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Homing while it is running, the “error 201” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

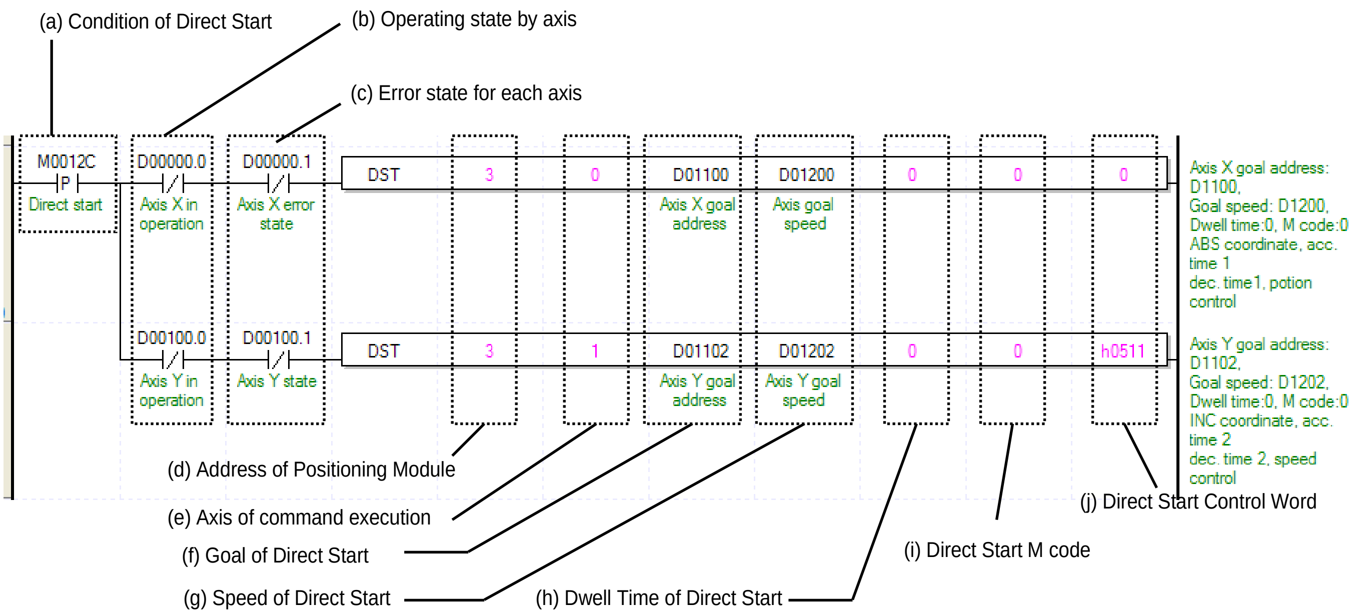
In this example, Positioning Module installed at the slot no.3 of 0 bases.

(e) Axis of command execution

You can set an axis for Inching Operation. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Manual Operation, you can set a value 0 or 1.

(f) For more information, reference for Homing is in the “Chapter 9.1.”

(2) Direct Start



(a) Condition of Direct Start

Condition of Direct Start Command (DST)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Direct Start command can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Direct Start while it is running, the “error 221” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(e) Axis of command execution

Set the axis to execute direct start

(f) Goal of Direct Start

Decide changing position of Direct Start command. In this example above, the initialized value is “device,” but you can also change it with “real numbers,” which data type is “DINT.”

(g) Speed of Direct Start

Decide goal speed of Direct Start. In this example above, the initialized value is “device,” but you can also change it with “real numbers,” which data type is “UDINT.”

(h) Dwell Time of Direct Start

Dwell Time consider as a total amount of time from beginning of Direct Start operation that reach to the goal position and make output of Positioning Done Signal. That means after done its operation, direct Start will make a Positioning done signal. Its unit is “ms,” and type is “UINT”

(i) Direct Start M code

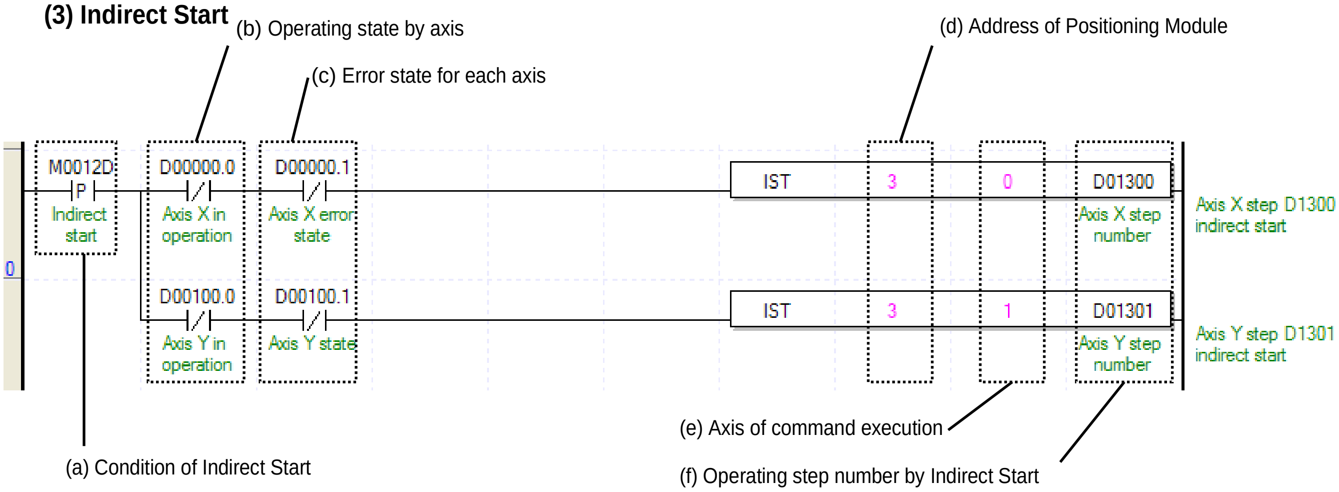
You can set a value of M code which are displaying of Operating Parameter by Direct Start. The way of M code outputs are “Parameter Expansion, M code Mode,” within the “None, With, After.” It will make an M code besides you choose “None” for its parameter. For more information, reference for M code is in the “Chapter 4.2.2”

(j) Direct Start Control Word

These are list of setting values in a form of Word by Bit for Direct Start. The details of Bits are in the table below.

15 ~ 12	11 ~ 10	9 ~ 8	7 ~ 5	4	3 ~ 2	1 ~ 0
-	Dec. Time	Acc. Time	-	0:Absolute 1:Ralative	-	0:Position control 1:Speed control

(3) Indirect Start



(a) Condition of Indirect Start

Condition of Indirect Start Command (IST)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Indirect Start while it is running, the “error 231” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(e) Axis of command execution

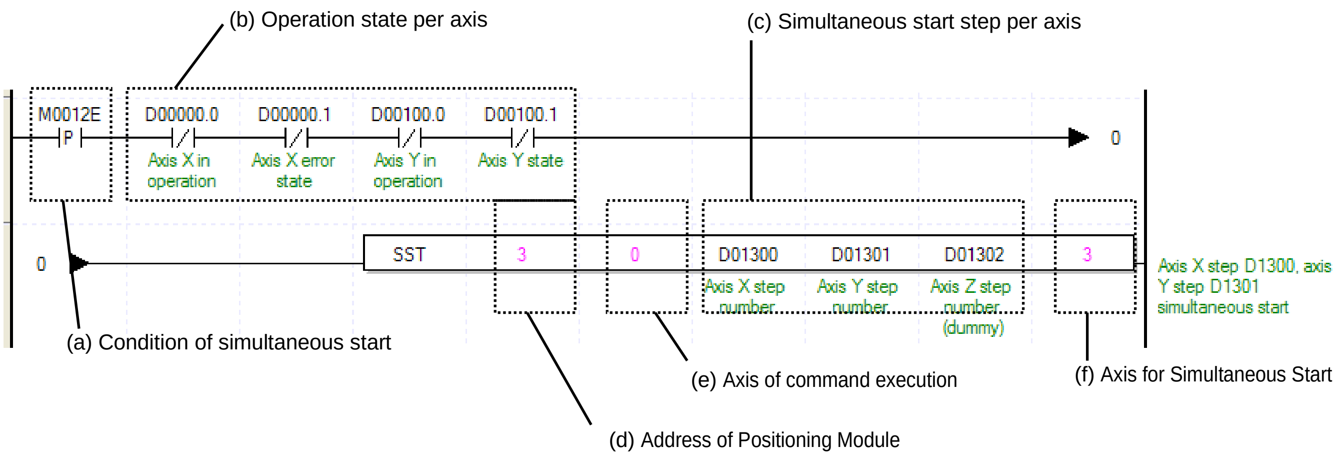
You can set an axis for Parameter Setting. XGF series supports for 4 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value for axis 1 through 4 axes.

(f) Operating step number by Indirect Start

Set the operating step number by indirect start for main command axis.

(g) Indirect start operates by appointing step of position data for each axis. For more information, reference for Setting of Operating Data is in the "Chapter4.6."

(4) Simultaneous Start



(a) Condition of Simultaneous Start

Condition of Simultaneous Start Command

(b) Operating state by axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Axis Simultaneous Start while it is running, the "error 291" would be appeared.

(c) Simultaneous start step per axis

These are step numbers to execute simultaneous start per axis. Since XBF-PD02A supports two axes, step number of axis Z is meaningless.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(e) Axis of command execution

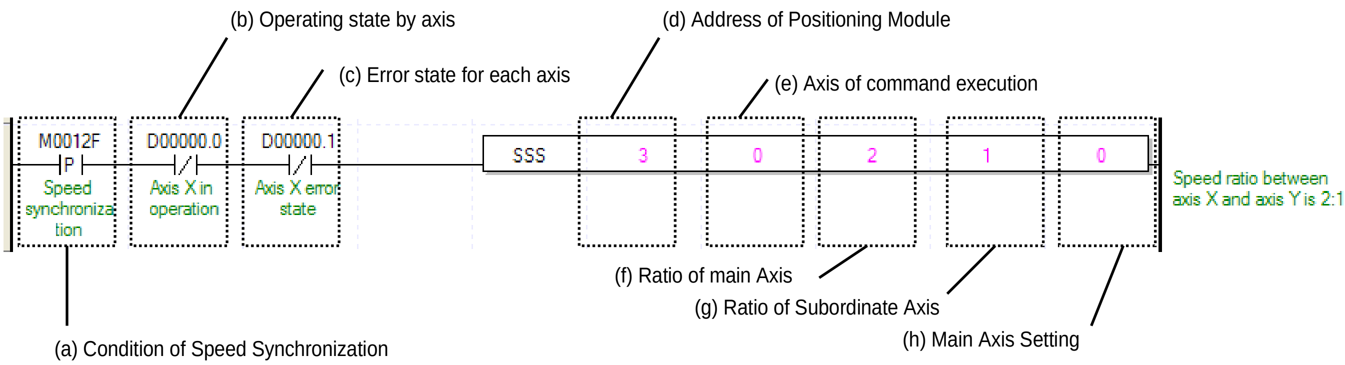
You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(g) Axis for Simultaneous Start

Set axis for Simultaneous Start. The axis for Simultaneous Start uses a "bit" from WORD Data setting as a "1" for each axis. Axis for each bits are as below.

15 ~ 2 Bit	1Bit	0Bit
Not use	Axis Y	Axis X

(5) Speed Synchronization



(a) Condition of Speed Synchronization

Condition of Speed Synchronization Command (SSS)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Speed Synchronization while it is running, the “error 351” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3 of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(f) Ratio of Main Axis

Set value for Ratio of Main Axis to execute a Speed Synchronization.

(g) Ratio of Subordinate Axis

Set value for Ratio of Subordinate Axis to execute a Speed Synchronization. In this example above, the ratio of main and subordinate axis is 2:1. Meaning that operational speed ratio of those axes is 2 to 1. So, if main axis is operating in speed of 10000, subordinate axis will be operating in speed of 5000.

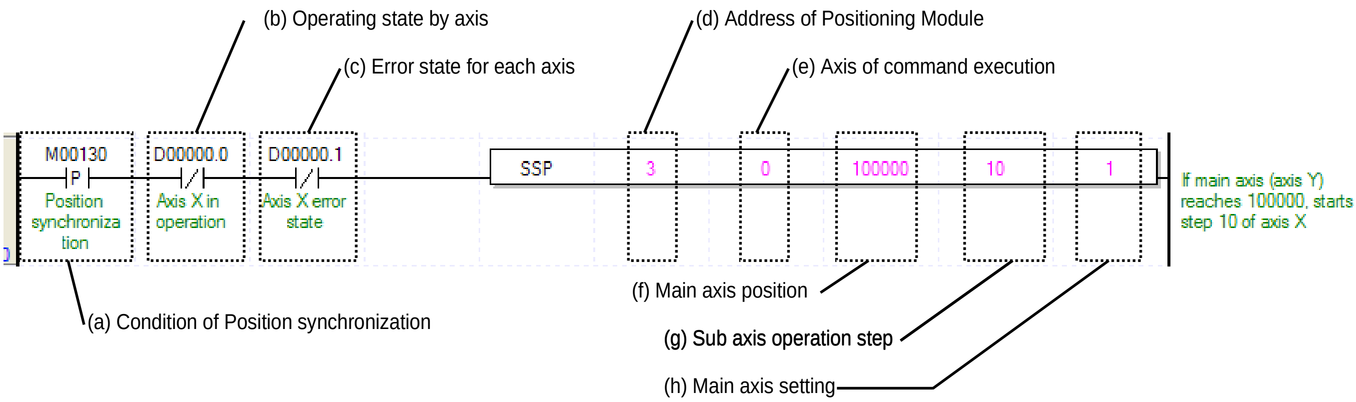
(h) Main Axis Setting

Setting of main axis to operate Speed Synchronization. This setting is for main axis of Speed Synchronization. This setting cannot be set as same value as command axis, and possible setting values are as below.

Setting value	Main Axis
0	Axis X
1	Axis Y
2	Encoder

(i) For more information, reference for Speed Synchronization is in the “Chapter 9.4.1.”

(6) Position Synchronization



(a) Condition of Position Synchronization

Condition of Position Synchronization Command (SSP)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured if it is not running. If you execute Position Synchronization while it is running, the “error 341” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3 of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(g) Main axis position

You can set the position of main axis to execute position synchronization. Sub axis start when main axis reaches this position.

(h) Step number of sub axis

You can set the operating step number of sub axis which is executed by position synchronization.

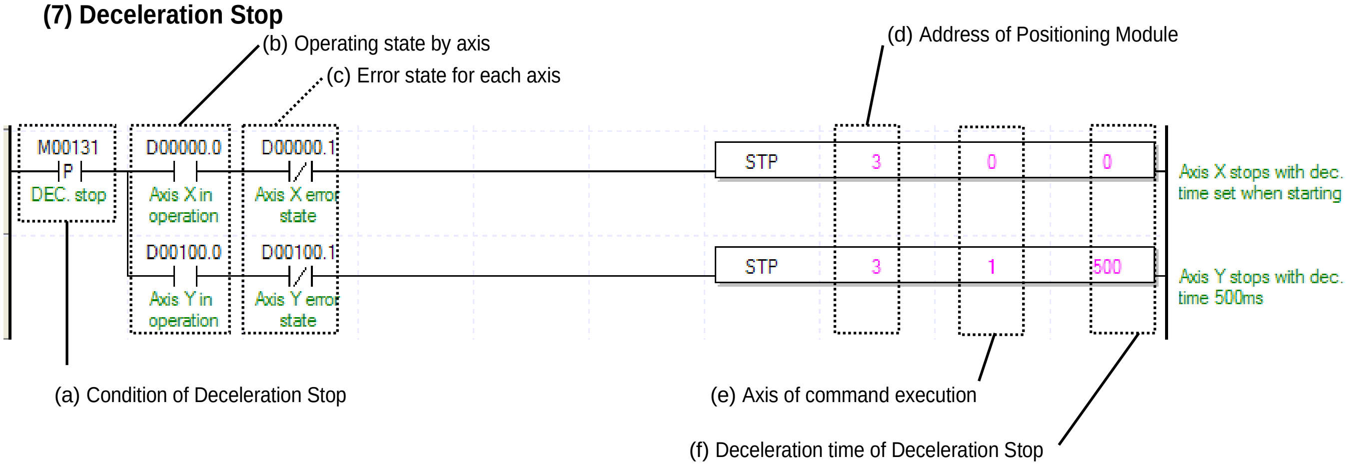
(i) Main Axis Setting

Setting of main axis to operate Position Synchronization. This setting is for main axis of Position Synchronization. This setting cannot be set as same value as command axis, and possible setting values are as below.

Setting value	Main Axis
0	Axis X
1	Axis Y

(j) For more detail on position synchronization, refer to “9.4.2 position synchronization”

(7) Deceleration Stop



(a) Condition of Deceleration Stop

Condition of Deceleration Stop Command (STP)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can be configured while it is running hence configuration will only be configured when it is running.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(e) Axis of command execution

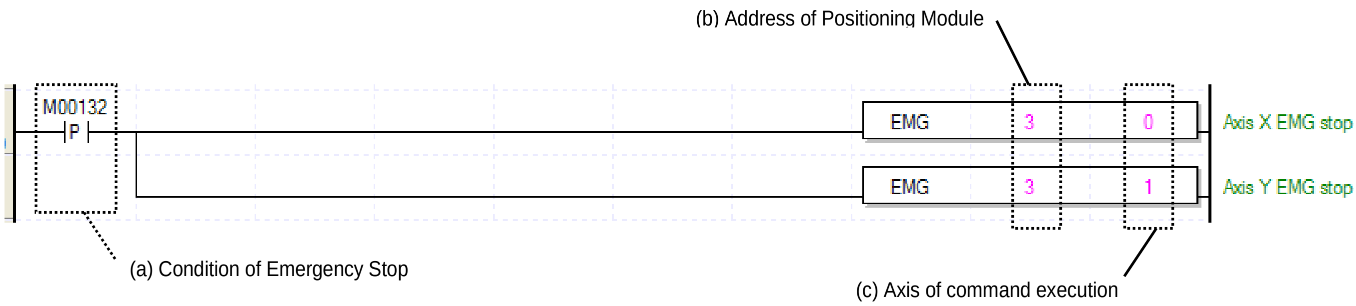
You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(f) Deceleration time of Deceleration Stop

Setting a deceleration time of Deceleration Stop operation. Unit of Deceleration Stop is [ms]. Since this time refers deceleration time from the speed limit, there might be little difference between Deceleration Stop set time and actual stop time. The range of deceleration time is “0~65,535.” 1~65,535 means Deceleration Time set as 1ms ~ 65,535ms. If it set as “0,” it will be operated with set deceleration value. (For example, in case of indirect start, it will stop with deceleration time set in operation data.). During speed synchronization operation, DEC. stop is used to stop speed synchronization operation.

(g) For more information, reference of Deceleration Stop is in the “Chapter 9.2.12.”

(8) Emergency Stop



(a) Condition of Emergency Stop

Condition of Emergency Stop Command (EMG)

(b) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(c) Axis of command execution

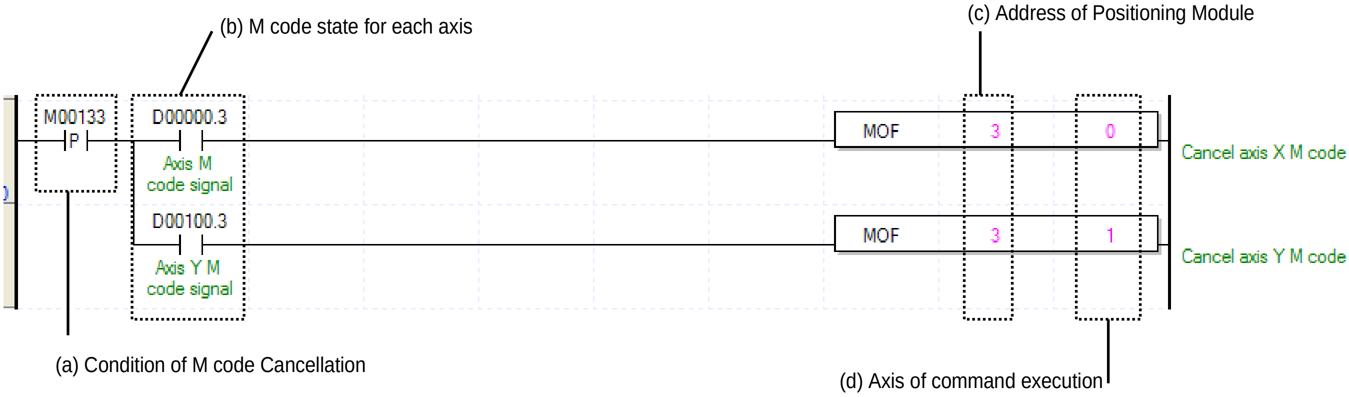
You can set an axis for Parameter Setting. XBF-PD02A supports for2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(d) Emergency Stop is operating by each axis.

Once Emergency Stop command executes the error “481” would be occurred and it stops immediately.

(e) For more information, refer to (3) Emergency Stop is in the “Chapter 9.2.12.”

(9) M code Cancellation



(a) Condition of M code Cancellation

Condition of M code Cancellation (MOF). Once M code Cancellation command executed, number of M code would be change to "0," and signal of M code to "Off."

(b) M code state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "M Code" for each axis. It turns on when it is operating. M code Cancellation command can only be valid once M code are generated. The condition for execution is operation possible when it is "On."

(c) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

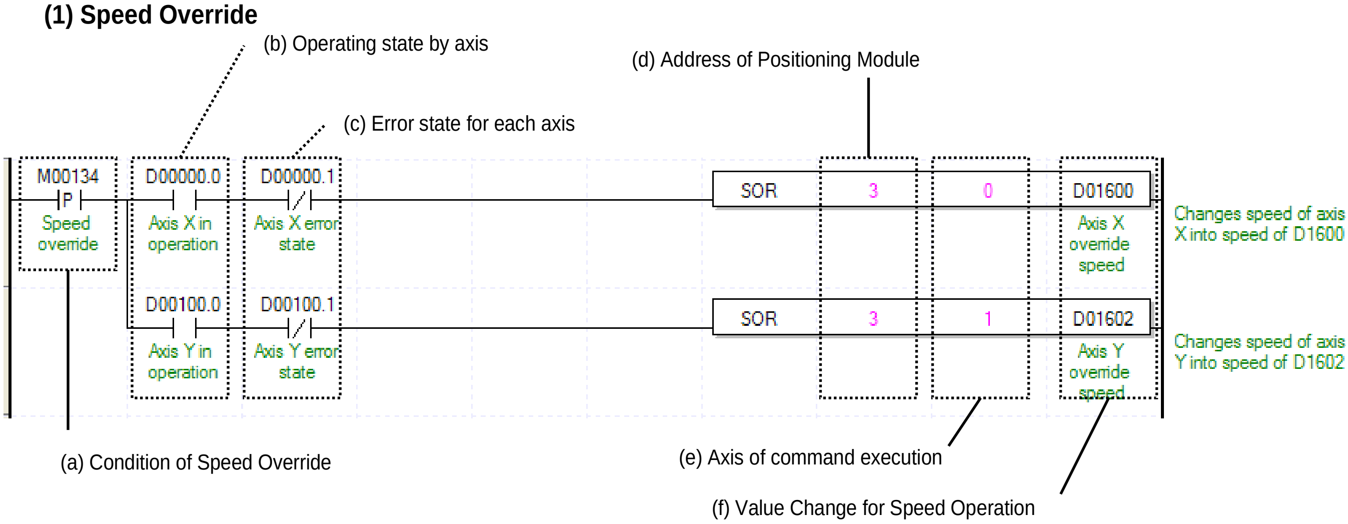
(d) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(e) For more information, reference of M code Cancellation is in the "Chapter 9.6.2."

8.1.6 Operation Setting Change while Operating

(1) Speed Override



(a) Condition of Speed Override

Condition of Speed Override Command (SOR)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Speed Override while it is running, the “error 371” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(e) Axis of command execution

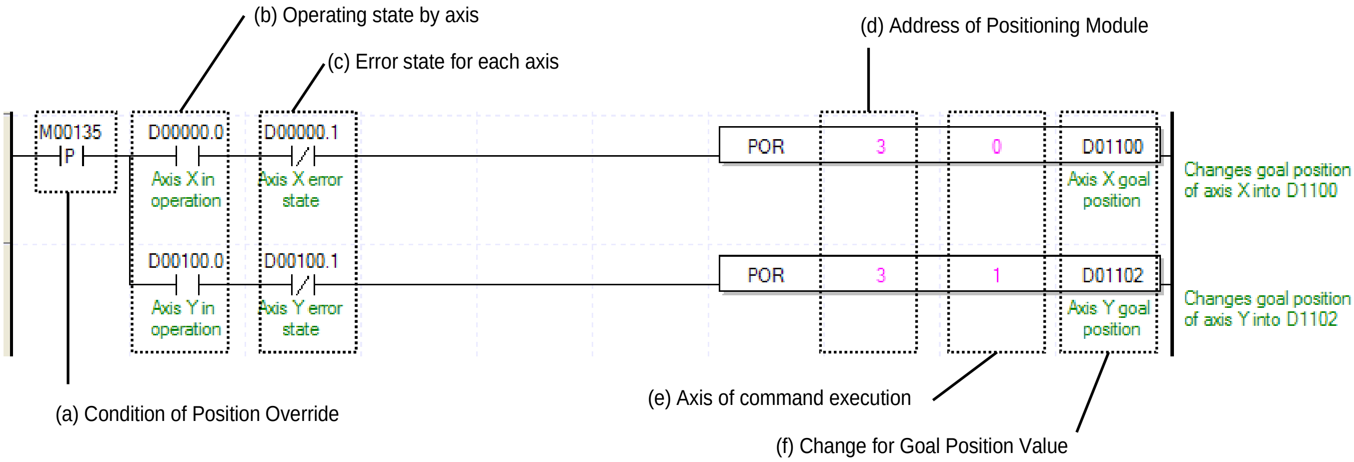
You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(f) Value Change for Speed Operation

Setting Value Change for Speed Operation. According to Speed Override from common parameters, it is a signal of “%” or “Speed Value” depends on setting of category. Also, when Speed Override set as Speed Value, it means Pulse/Second depends on Speed Command Unit from basic parameters. If a changing Operation Speed Value is “%,” then the unit would be [$X10^{-2}$%].

(g) For more information, reference of Speed Override is in the “Chapter 9.5.3.”

(2) Position Override



(a) Condition of Position Override

Condition of Position Override Command (POR)

(b) Operating state by axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Position Override while it is running, the "error 361" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(e) Axis of command execution

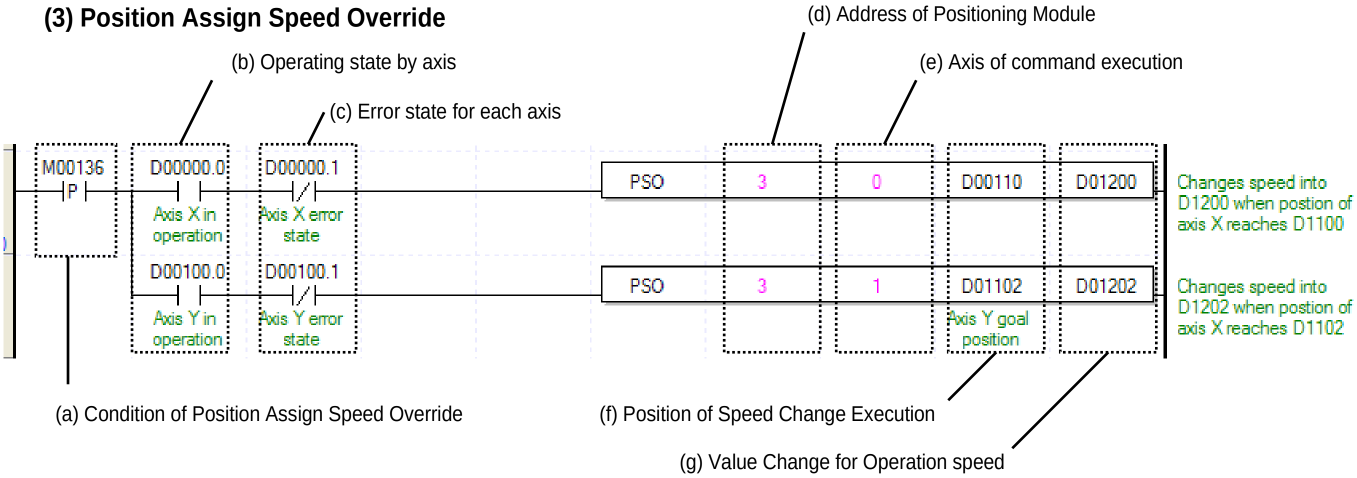
You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(f) Change for Goal Position Value

Setting Value Change for Goal Position Value. The unit of this value depends on "Unit" category. Once Position Override commands are executed, the goal position of executed axis will be changed to set goal position.

(g) For more information, reference of Position Override is in the "Chapter 9.5.2."

(3) Position Assign Speed Override



(a) Condition of Position Assign Speed Override

Condition of Position Assign Speed Override Command (PSO)

(b) Operating state by axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Position Assign Speed Override while it is running, the "error 381" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3 of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(f) Position of Speed Change Execution

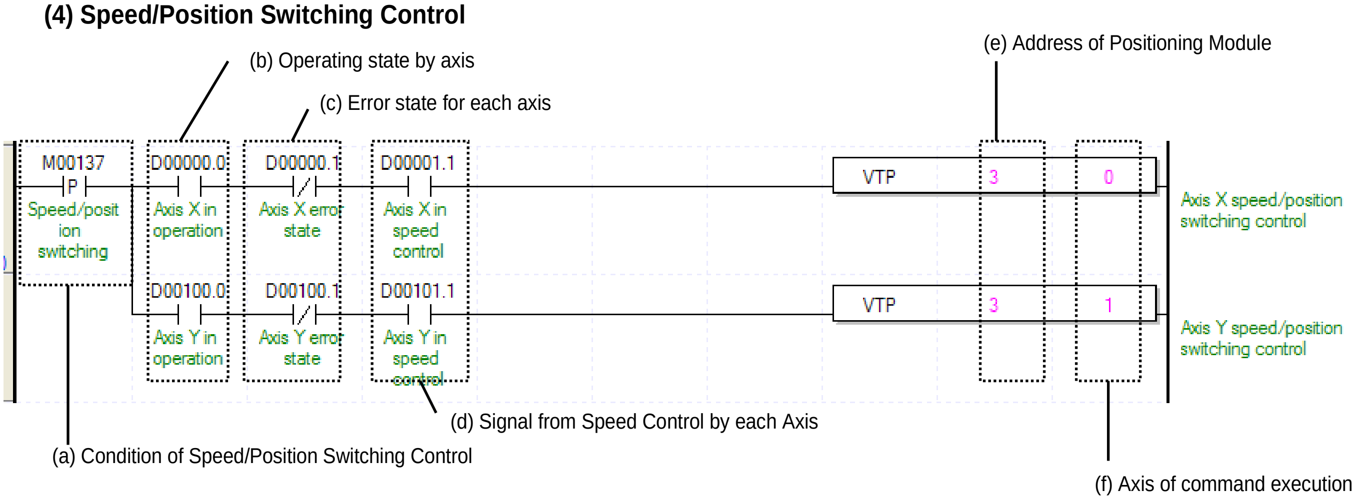
Setting position of Speed Change. Once the actual position located at set position with speed override command running, the speed change commands are executed.

(g) Value Change for Operation speed

Setting Value Change for Operation speed. According to Speed Override from common parameters, it is a signal of "%" or "Speed Value" depends on setting of category. Also, when Speed Override set as Speed Value, it means Pulse/Second depends on Speed Command Unit from basic parameters. If a changing Operation Speed Value is "%," then the unit would be [X10^{-2}%].

(h) For more information, reference of Position Assign Speed Override is in the "Chapter 9.5.4."

(4) Speed/Position Switching Control



(a) Condition of Speed/Position Switching Control

Condition of Speed/Position Switching Control Command (VTP)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Speed/Position Switching Control while it is running, the “error 301” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Signal from Speed Control by each Axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Speed Control state” for each axis. It turns on when it is operating. Speed/Position Switching Control Setting can only be configured while it is running. If you execute Speed/Position Switching Control while it is not running, the “error 302” would be appeared.

(e) Address of Positioning Module

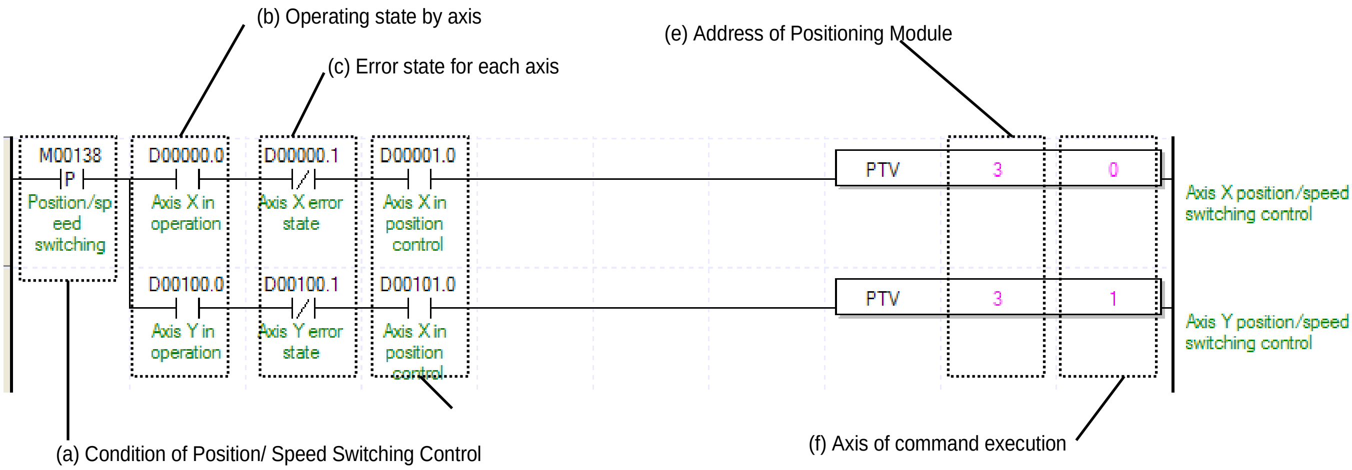
In this example, Positioning Module installed at the slot no.3.

(f) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(g) For more information, reference of Speed/Position Switching Control is in the “Chapter 9.2.9.”

(5) Position/ Speed Switching Control



(a) Condition of Position/ Speed Switching Control

Condition of Position/ Speed Switching Control Command (PTV)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Position/ Speed Switching Control while it is running, the “error 311” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Signal from Position Control by each Axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Position Control state” for each axis. It turns on when it is operating. Position/ Speed Switching Control Setting can only be configured while it is running. If you execute Position/Speed Switching Control while it is not running, the “error 317” would be appeared.

(e) Address of Positioning Module

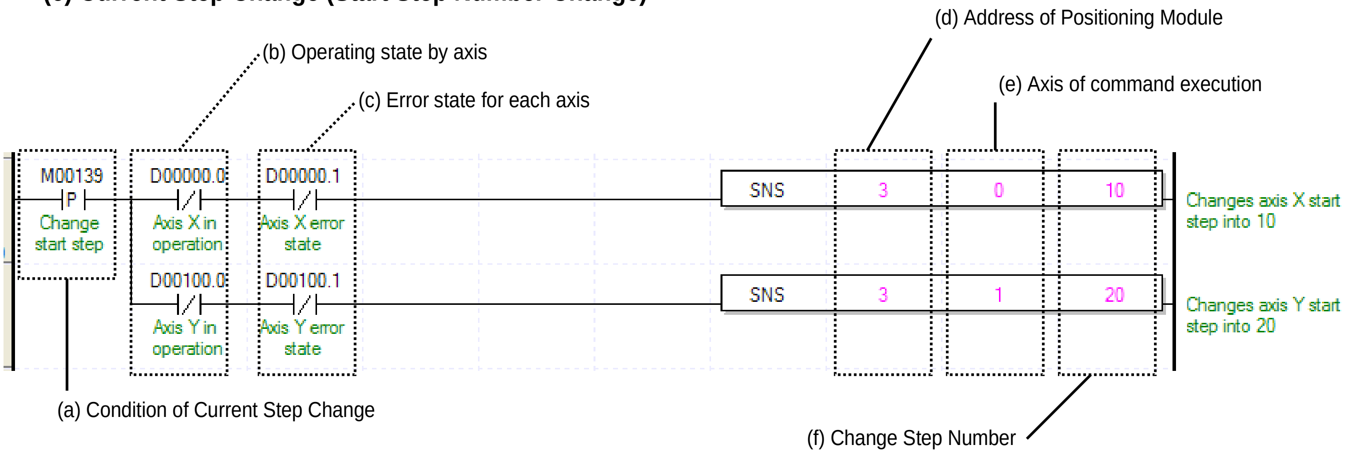
In this example, Positioning Module installed at the slot no.3.

(f) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(g) For more information, reference of Position/ Speed Switching Control is in the “Chapter 9.2.10.”

(6) Current Step Change (Start Step Number Change)



(a) Condition of Current Step Change

Condition of Current Step Change Command (SNS). Once Current Step Change is executed, current operation step will move set step.

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Current Step Change while it is running, the “error 441” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3 of 0 bases.

(e) Axis of command execution

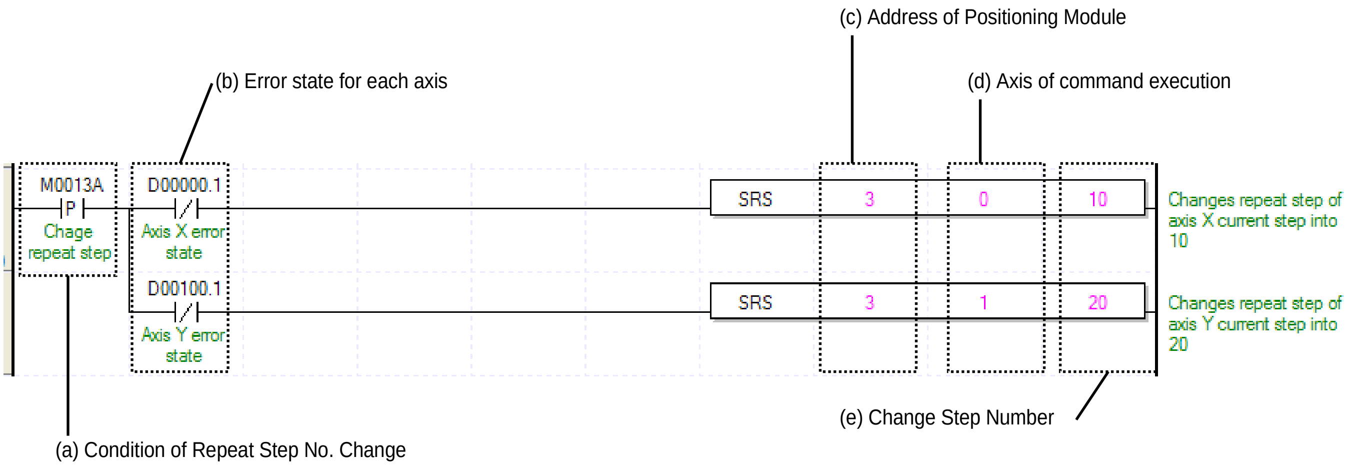
You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value for axis 0 or 1.

(f) Change Step Number

Set change step number by Current Step Change. XBF-PD02A support 150 step operation data for each Axis. Therefore, the range of step number setting of Current Step Change is 1~150.

(g) For more information, reference of Current Step Change is in the “Chapter 9.5.7.”

(7) Repeat Step No. Change



(a) Condition of Repeat Step No. Change

Condition of Repeat Step No. Change Command (SRS). Once Repeat Step No. Change is executed, repeat operation step will move set step. When current step is complete, the next start step will be the step set in repeat step.

(b) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(c) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(d) Axis of command execution

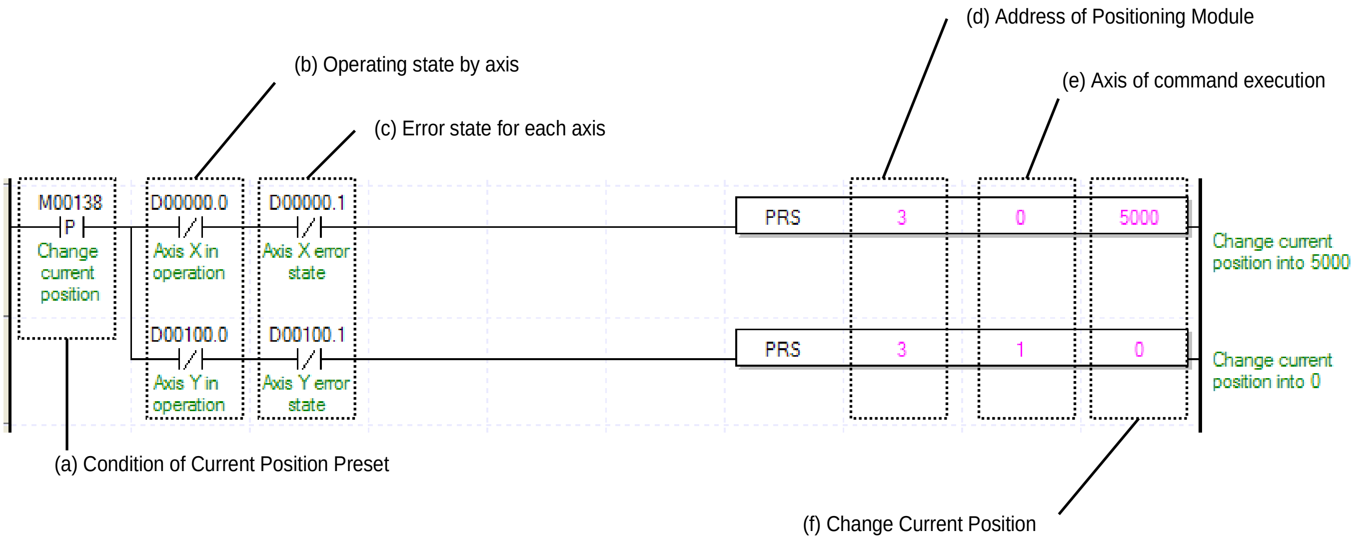
You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(e) Change Step Number

Set change step number by Current Step Change. XBF-PD02A series support 150 step operation data for each Axis. Therefore, the range of step number setting of Current Step Change is 1~150.

(f) For more information, reference of Repeat Step No. Change is in the "Chapter 9.5.8."

(8) **Current Position Preset**



(a) Condition of Current Position Preset

Condition of Current Position Preset Command (SNS). Once Current Position Preset is executed, current operation step will move to set step. If the origin has not set yet, the origin would be set to origin decided.

(b) Operating state by axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Current Position Preset while it is running, the "error 451" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(e) Axis of command execution

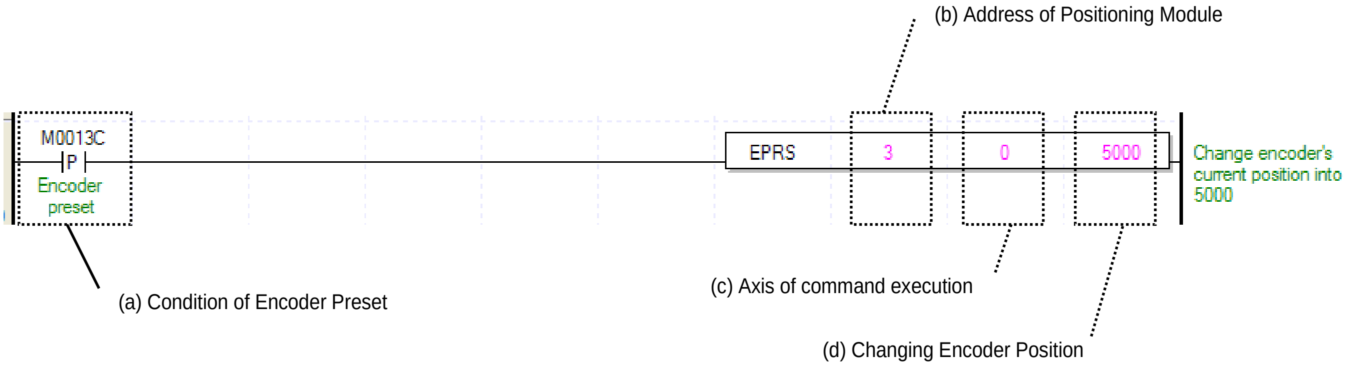
You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(f) Change Current Position

Set change current position by Current Position Preset. Unit is pulse.

(g) For more information, reference of Current Position Preset is in the "Chapter 9.5.5."

(9) Encoder Preset



(a) Condition of Encoder Preset

Condition of Encoder Preset Command (EPRS). Once Encoder Preset is executed, current operation step will move to set step.

(b) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(c) Axis of command execution

You can set an axis for Encoder preset. You can input 0 (axis X) or 1 (axis Y). But in case of XBF-PD02A, it supports only one encoder. So any value doesn't affect the EPRS instruction.

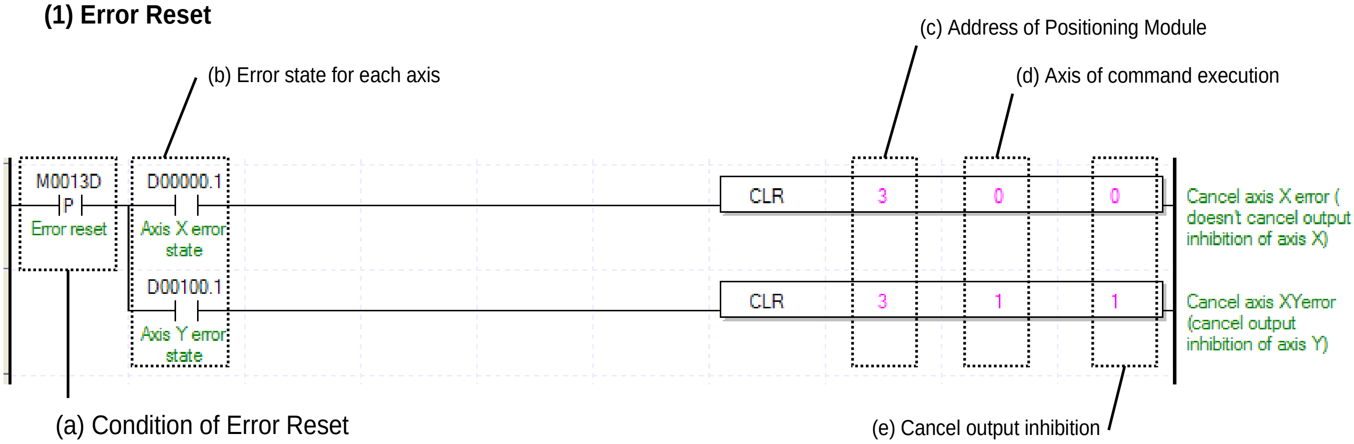
(d) Changing Encoder Position

Set for Changing Encoder Position

(e) For more information, reference of Encoder Preset is in the "Chapter 9.5.6."

8.1.7 Error

(1) Error Reset



(a) Condition of Error Reset

Condition of Error Reset Command (CLR). Once Error Reset is executed, it erases errors of module form each axis.

(b) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(c) Address of Positioning Module

In this example, Positioning Module installed at the slot no.3.

(d) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(e) Cancel output inhibition

In case of output inhibition, you can select whether to cancel output inhibition or not. If it is 0, doesn't cancel output inhibition. If it is 1, cancels output inhibition.

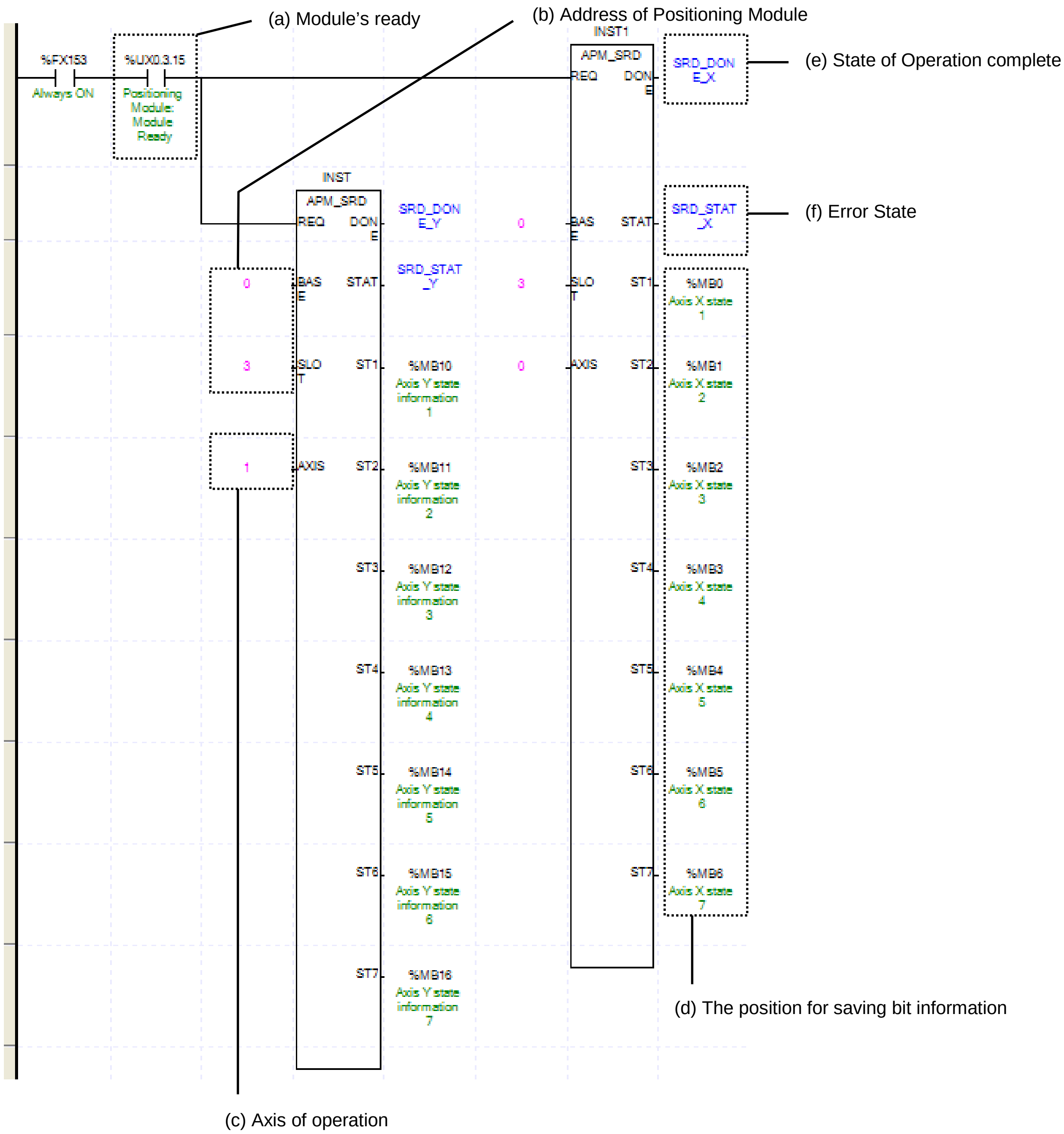
8.2 Example of IEC type Programming

8.2.1 General description

Here we supposed the positioning Module is installed at the 3 slot. In the real usage, you need to change its value according to your actual set up. And we supposed the axis X and axis Y is used.

8.2.2 Current State Read

(1) Bit Information about Operation state Reading (APM_SRD)



(a) Module's ready

After Turn On, if there is no error occurred in Positioning Module, it is "ON," meaning that modules are ready to operate.

(b) Address of Positioning Module

Before operation, you need to configure its position by numbers. In this example, Positioning Module is installed at the 3 slot.

(c) Axis of operation

If you command each axis, need to set Axis of command execution. XBF-PD02A can control max. 2 axes and Axis of command execution 0~1 means axis X ~ axis Y.

(d) The position for saving bit information

Set the device to save bit state value of axis from the positioning module with APM_SRD. This device is available to be used in sequence program as a condition. For example, the current bit state in the example program above is saved in %MB0 ~ % MB6. For the detail description about the device saved, refer to "7.3.2 Current Operation State Bit Information Reading". Bit information which saved in a device is available to be used to execute another command. For example, if you need to use In-operation-signal of axis1, just set as %MB0.0. If you need to use Error-state of axis2, just set %MB10.1.

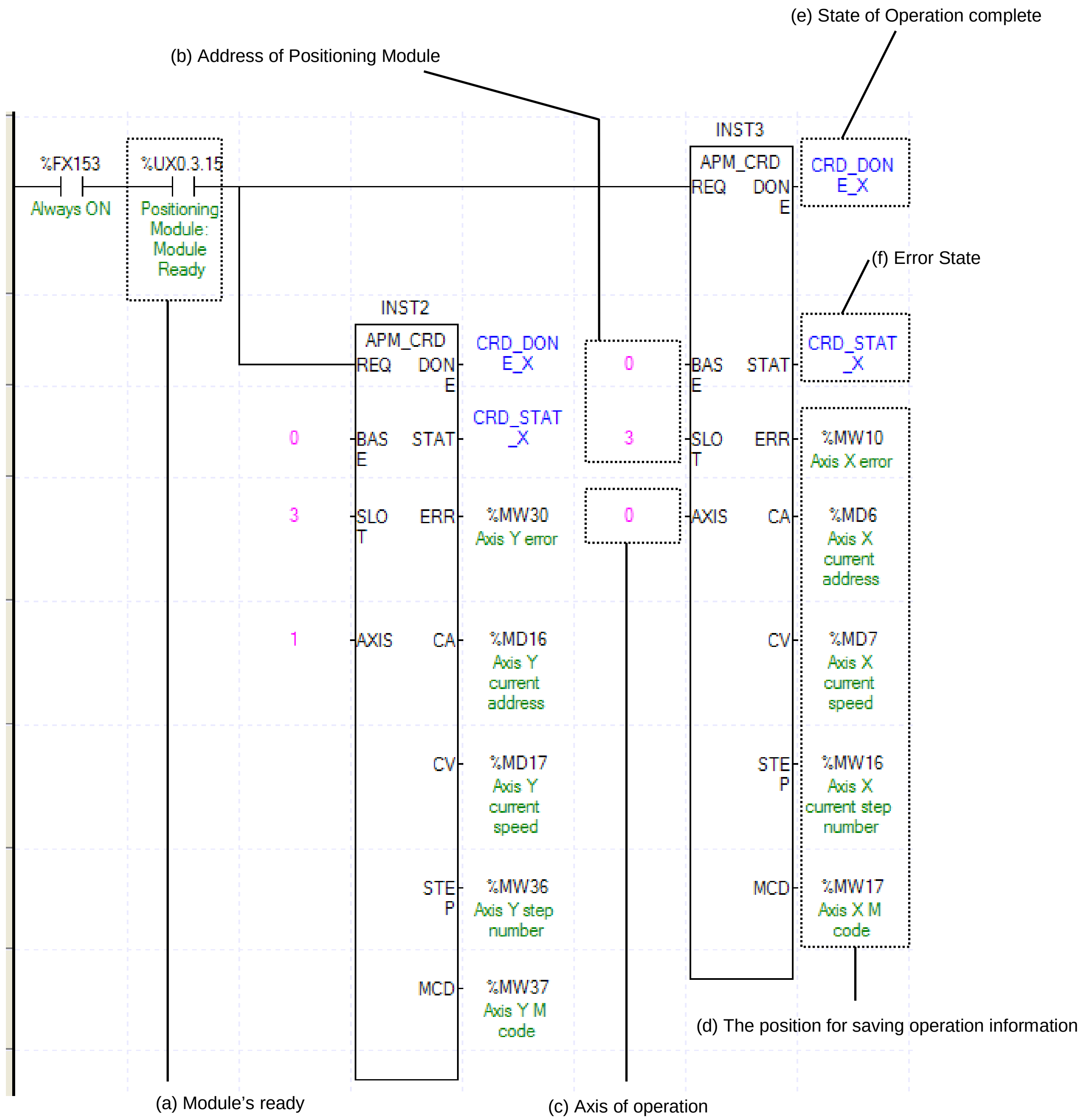
(e) State of Operation complete

If function block is completed without error, "1" will be outputted and maintain "1" until the next operation. If error occurred, "0" will be outputted.

(f) Error State

This is the area that output error no. if there are errors in operation of function block.

(2) Current Operation Information Reading



(a) Module's ready

After Turn On, if there is no error occurred in Positioning Module, it is "ON," meaning that modules are ready to operate.

(b) Address of Positioning Module

Before operation, you need to configure its position by numbers. In this example, Positioning Module is installed at the 3 slot.

(c) Axis of operation

If you command each axis, need to set Axis of command execution. XBF-PD02A can control max. 2 axes, Axis of command execution 0~1 means axis X~ axis Y.

(d) The position for saving operation information

Set the device to save operation state value of axis from the APM module with APM_CRD. This device is available to be used in sequence program as a monitoring value. For example, the current position value of axis1 in the example program above is saved in %MD6. For the detail description about the device saved, refer to “7.3.1 Operation Information Reading (APM_CRD)”.

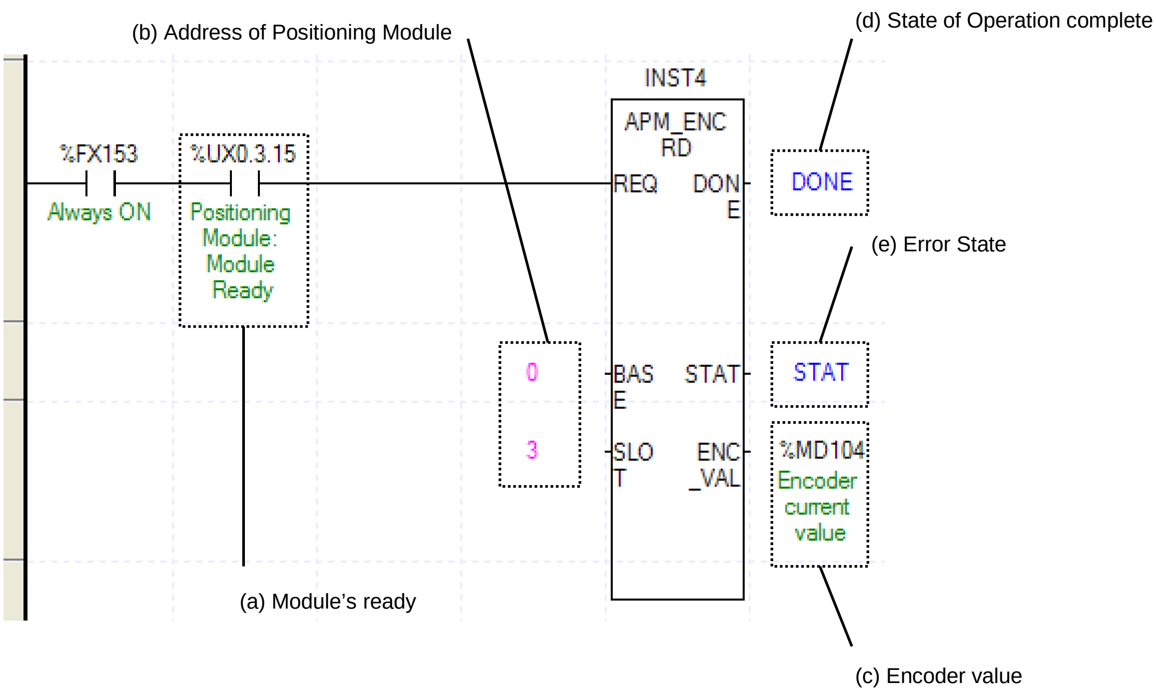
(e) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(f) Error State

This is the area that output error no. if there are errors in operation of function block.

(3) Encoder value Reading



(a) Module's ready

After Turn On, if there is no error occurred in Positioning Module, it is "ON," meaning that modules are ready to operate.

(b) Address of Positioning Module

Before operation, you need to configure its position by numbers. In this example, Positioning Module is installed at the 3 slot.

(c) Encoder value

The current value of encoder is displayed.

(d) State of Operation complete

If function block is completed without error, "1" will be outputted and maintain "1" until the next operation. If error occurred, "0" will be outputted.

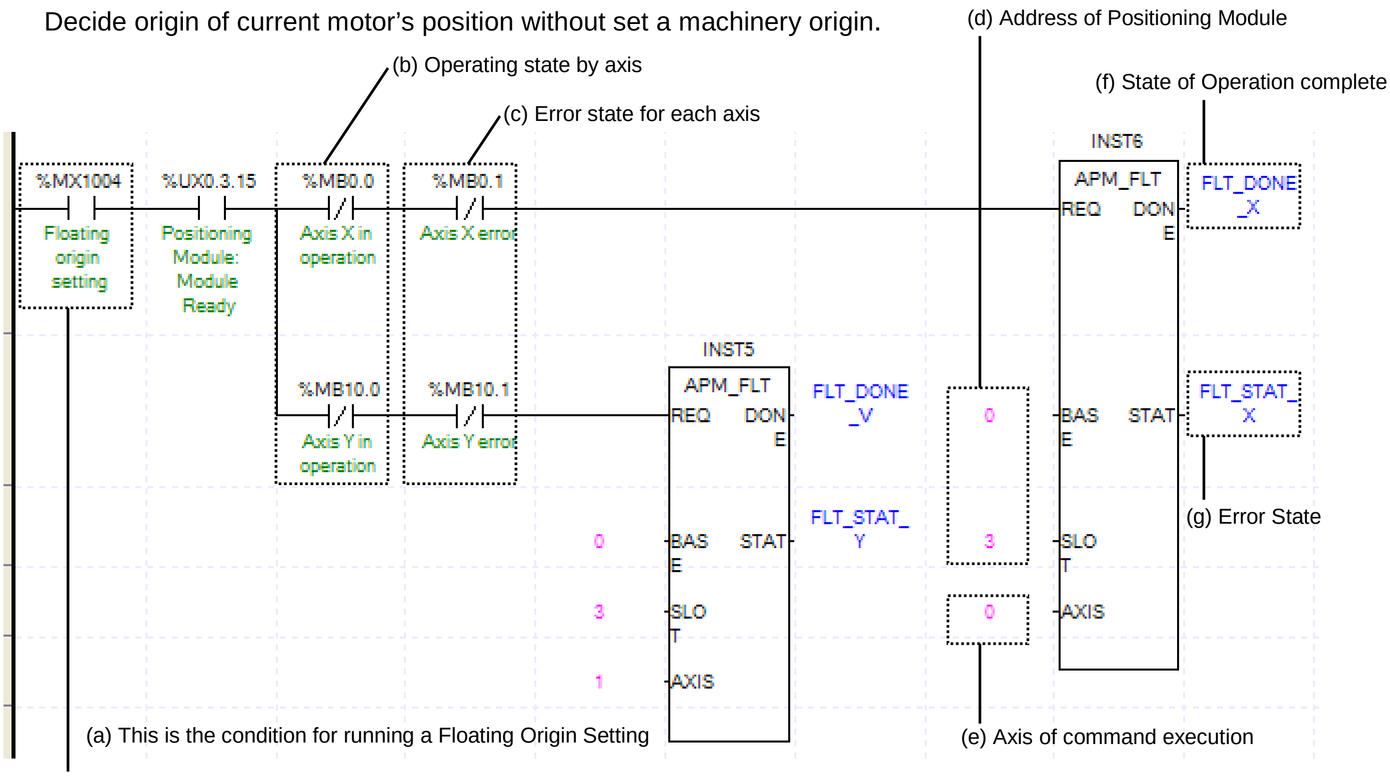
(e) Error State

This is the area that output error no. if there are errors in operation of function block.

8.2.3 Operation Test

(1) Floating Origin Setting

Decide origin of current motor's position without set a machinery origin.



(a) This is the condition for running a Floating Origin Setting

(b) Operating state by axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Operating" for each axis.

This command can be executed when axis is not in operation. If you execute this command during operation, error code 211 occurs.

(c) Error state for each axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot.

(e) Axis of command execution

You can set an axis for Floating Origin Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Floating Origin Setting, you can set a value 0 or 1.

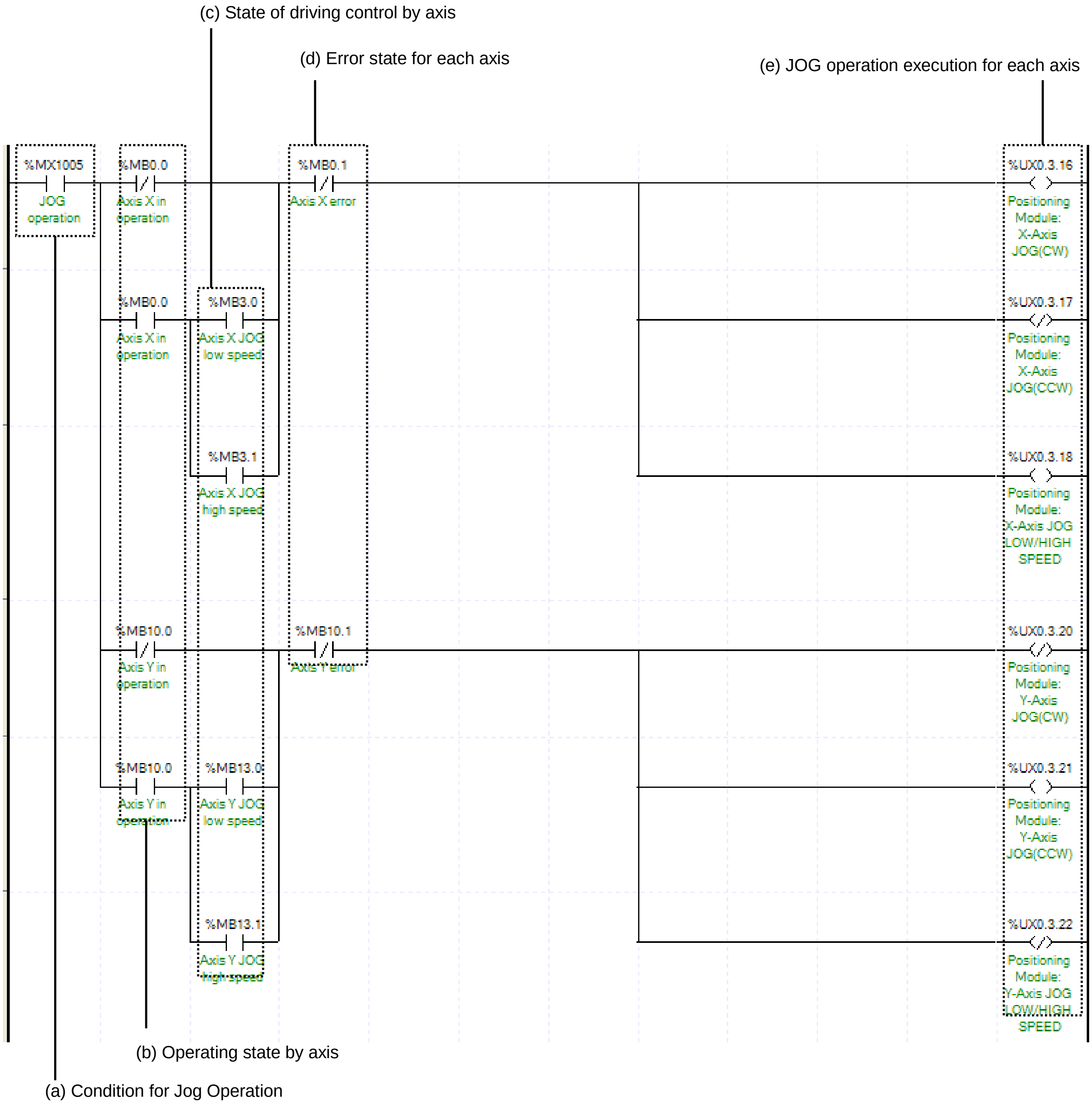
(f) State of Operation complete

If function block is completed without error, "1" will be outputted and maintain "1" until the next operation. If error occurred, "0" will be outputted.

(g) Error State

This is the area that output error no. if there are errors in operation of function block.

(2) Jog Operation



(a) This is the condition for Jog Operation

This is the condition for Jog Operation Command

(b) Operating state by axis

Jog Operation can only be working when the state of axis set as Jog Operation. In this example above, specific axis set as Jog Operation otherwise it is not operating.

(c) State of driving control by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Jog Operating” for each axis. It turns on when it is operating. Jog Operation configuration can be changed while it is operating.

(d) Error state for each axis

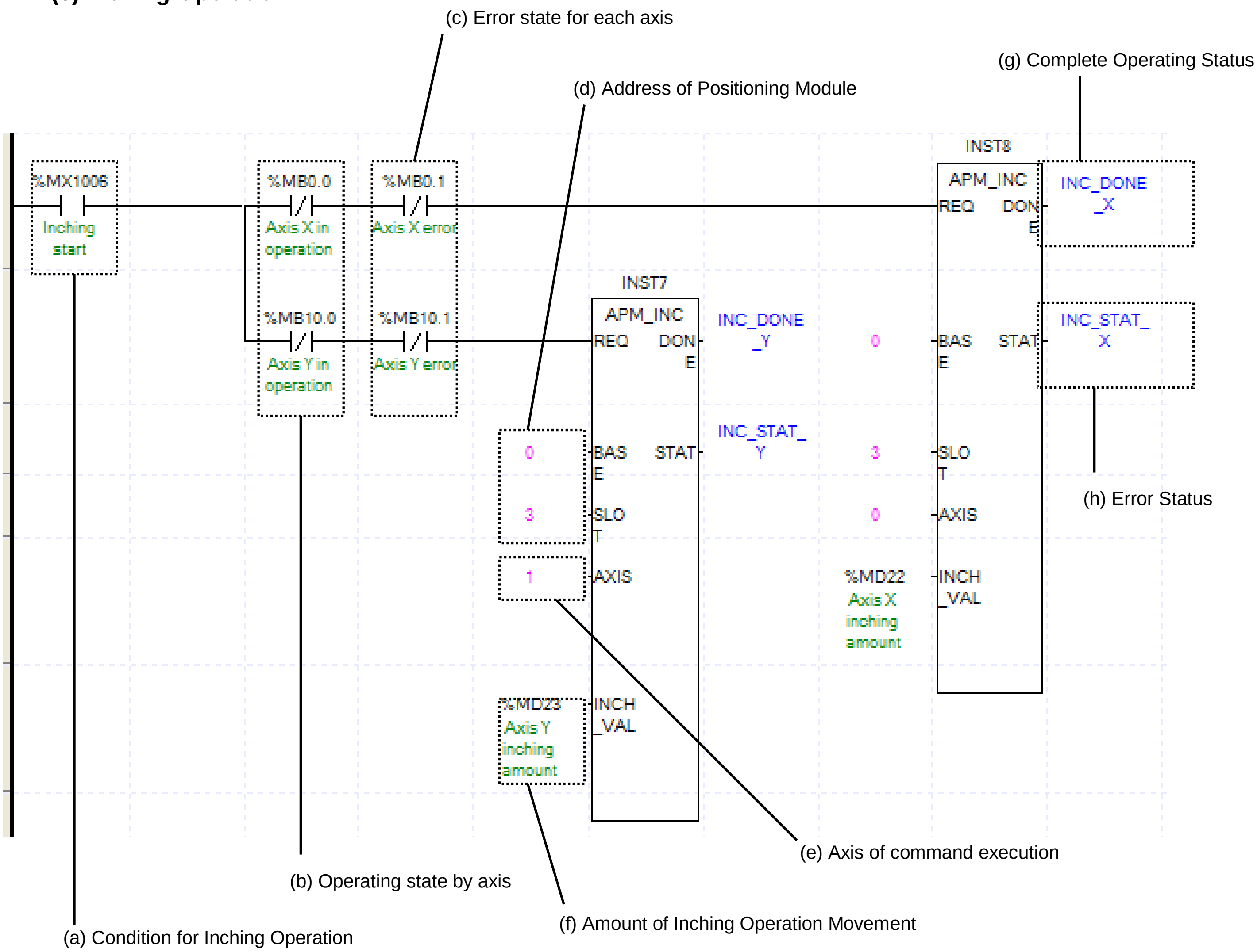
According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(e) JOG operation execution for each axis

JOG operation command is not executed by using instruction but by set or clear relevant bit of U device. In the above example, if condition for JOG condition is on, X axis JOG (CW) will be on, X axis JOG (CCW) will be off and X axis JOG LOW/HIGH SPEED will be on. So JOG CW HIGH SPEED operation will be exetuted.

For U device, refer to “5.2.1”. U device is refreshed at scan end.

(3) Inching Operation



(a) This is the condition for Inching Operation

This is the condition for Inching Operation Command (APM_INC)

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. This command can be executed when axis is not in operation. If you execute this command during operation, error code 401 occurs.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot.

(e) Axis of command execution

You can set an axis for Inching Operation. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Inching Operation, you can set a value for axis X through axis Y.

(f) Amount of Inching Operation Movement

Measure the amount of moving range by Inching Operation.

(g) Complete Operating Status

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

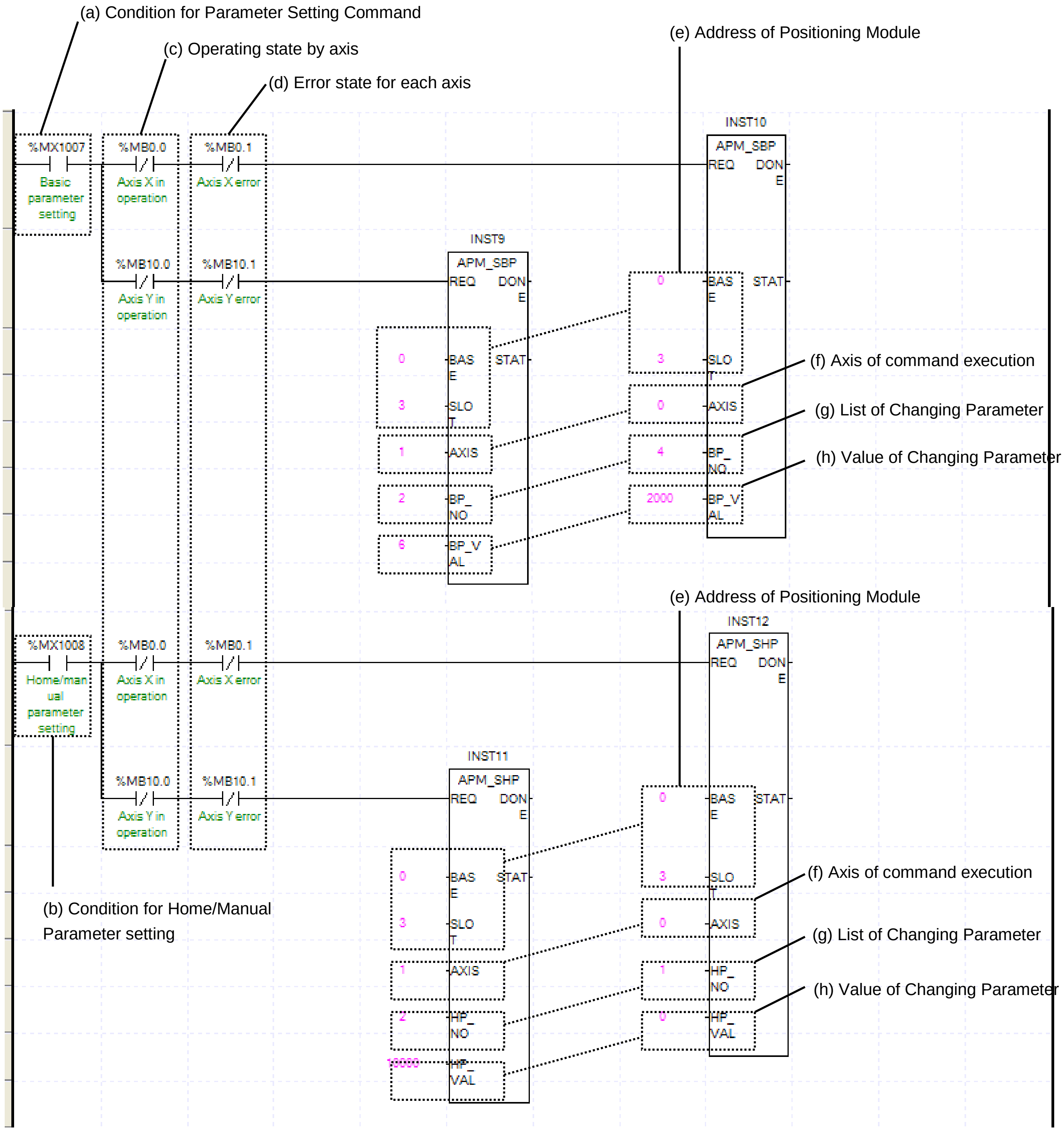
(h) Error Status

This is the area that output error no. if there are errors in operation of function block.

(i) Reference for Inching Operation is from “Chapter 7.6.1.”

8.2.4 Parameter and Operation Data Setting

(1) Parameter Setting



(a) This is the condition for Parameter Setting Command

This is the condition for Basic Parameter Setting Command (APM_SBP)

(b) This is the condition for Home/Manual Parameter Setting Command

This is the condition for Home/Manual Parameter Setting Command (APM_SHP)

(c) Operating state by axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Except common parameter setting, parameter setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Parameter Setting while it is running, the "error 471" would be appeared.

(d) Error state for each axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(e) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(f) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(g) Value of Changing Parameter

You can set a value of changing parameter. For more information about Parameter Value Changing look for "Chapter 7. Function Block." In case of setting I/O parameter, the value would be parameter value itself.

(h) List of Changing Parameter

You need to set a list for parameter (f) changing from set command. Once operating is working, this value will change to parameter (f). For more information of list of changing parameter look for "Chapter 7. Function Block." In case of setting I/O parameter, the value would be parameter value itself. Therefore changing of list would not be necessary.

(i) Execution content of each function block is as follows.

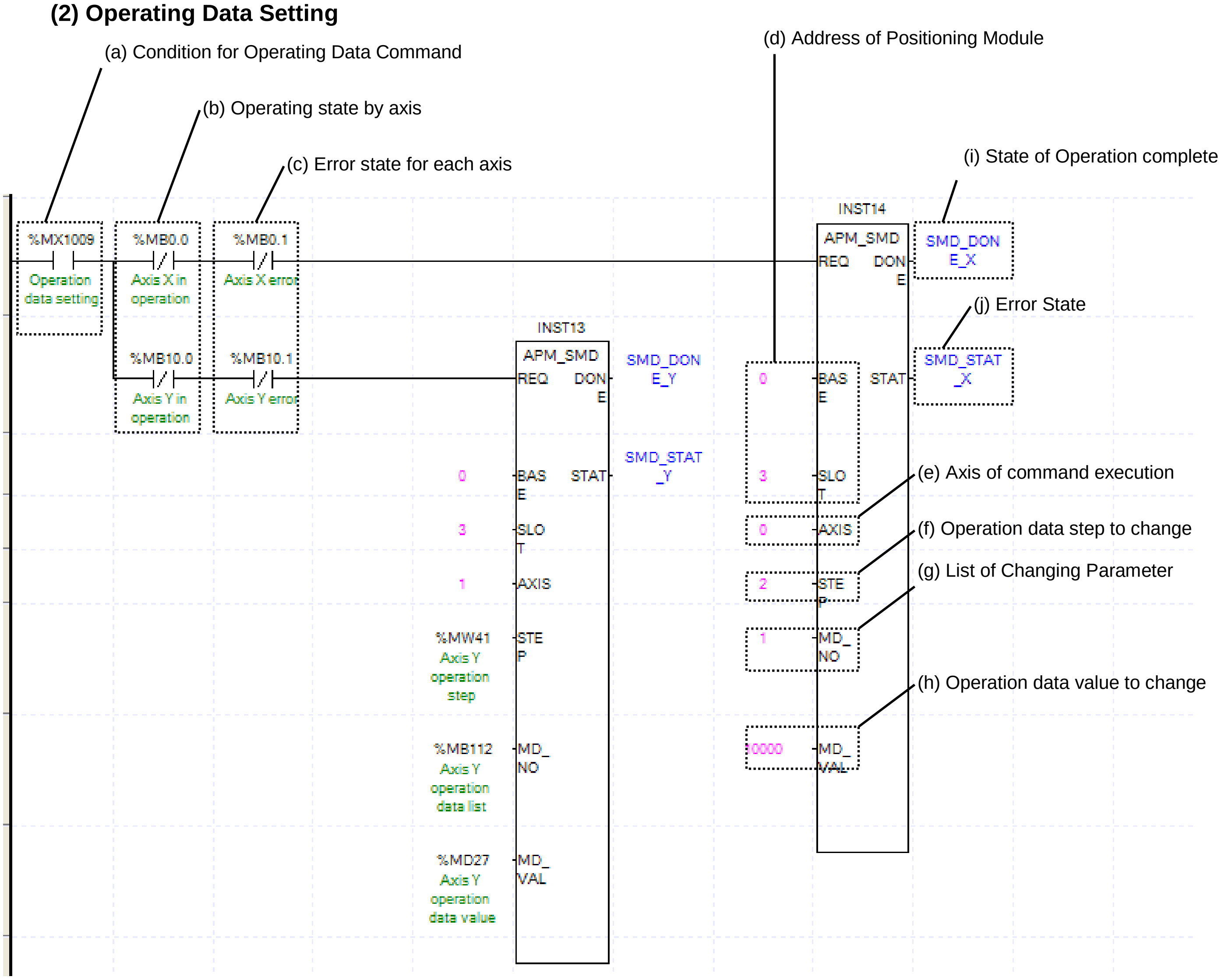
APM_SBP: changes acc. time 2 of axis X basic parameter into 200ms

APM_SBP: changes bias speed of axis X basic parameter into 5

APM_SHP: changes home address of axis X home/manual parameter into 0.

APM_SHP: changes JOG high speed of axis Y home/manual parameter into 10000.

(2) Operating Data Setting



(a) This is the condition for Operating Data Command

This is the condition for Operating Data Command (SMD)

(b) Operating state by axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Operating Data Setting while it is running, the "error 472" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(f) Operation data step to change

Set the operation data step no. to change with operation data setting command. XBF-PD02A can set 150 step operation data per each axis and the data would be 0 to 150. If the data is set as “0”, it means “Current step” of operation data of corresponding axis.

(g) List of Changing Parameter

You need to set a list for parameter (h) changing from set command. Once operating is working, this value will change to parameter (h). Each value of Operating Data is listed below. For example if you put 1000 for value of Changing Operating Data and 4 for Operating data then the value of Dwell is going to be set as 1000ms.

Setting value	Operation Data
1	Goal position
2	Circular interpolation support position
3	Operation speed
4	Dwell time
5	M code No.
6	Circular interpolation turns
7	Operation method
8	Control method
9	Operation pattern
10	Coordinate
11	Arc size
12	Acceleration No.
13	Deceleration No.
14	Circle interpolation method
15	Circle interpolation direction
16	Repeat step number

(h) Operation data value to change

Set the value of operation data to change.

(j) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(j) Error State

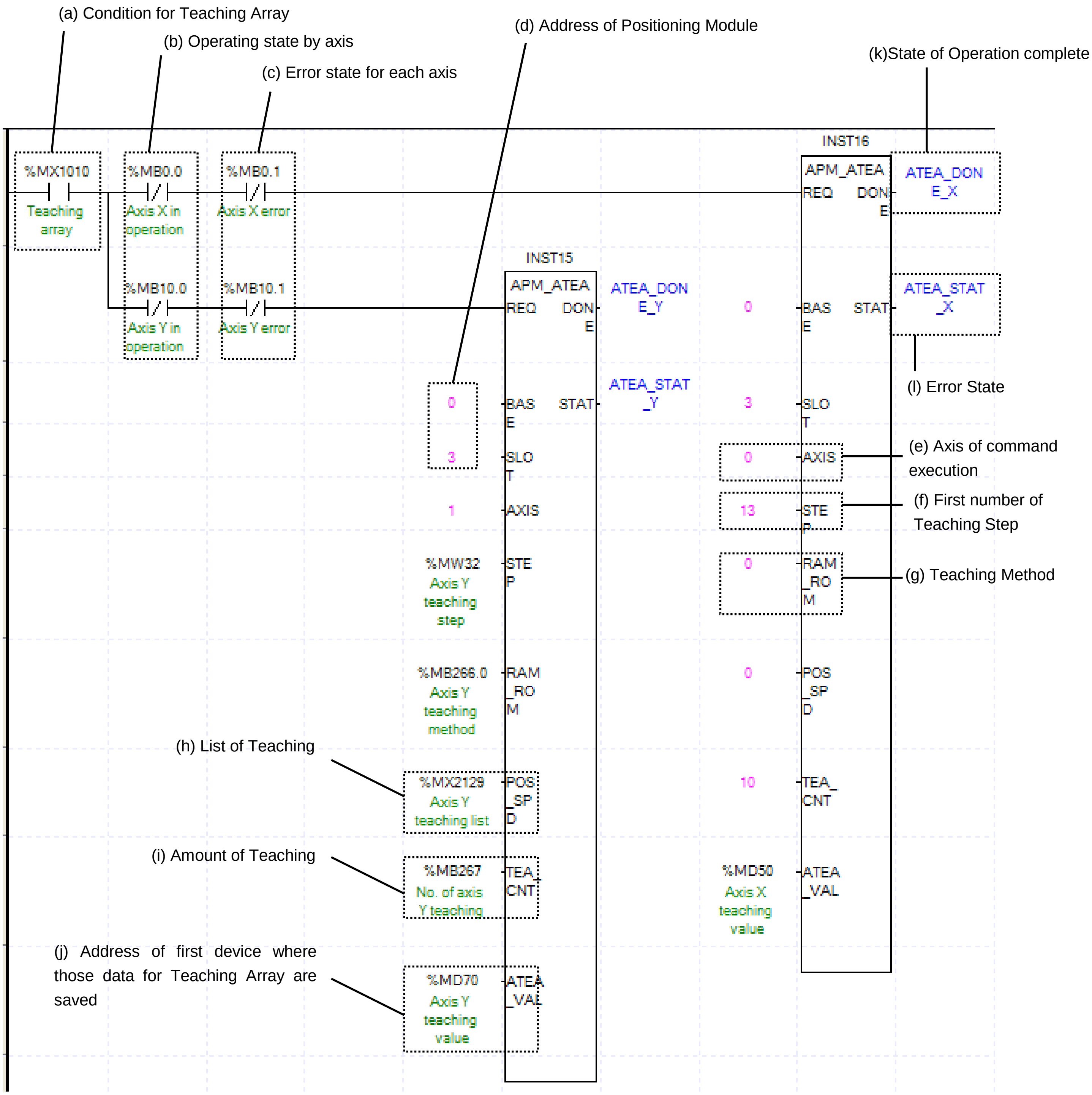
This is the area that output error no. if there are errors in operation of function block.

(k) Execution content of each function block is as follows.

Operation data setting for axis X: sets the goal position on step no.2 of axis X operation data as 10000.

Operation data setting for axis Y: sets %MB112 (Operation data item of axis Y) of axis Y operation data %MW41 (Operation step of axis Y) step as %MD27 (Operation data value of axis Y).

(3) Operation Data Teaching Array



(a) This is the condition for Teaching Array

Condition Teaching Array Command (APM_ATEA)

(b) Operating state by axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Teaching Array cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Teaching Array while it is running, the “error 461” would be appeared when it is Position Teaching or the “error 463” would be appeared when it is Speed Teaching.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(f) First number of Teaching Step

You can setup the first number of Teaching Step among the Operating Data step. In this example above, Teaching Array of axis X will be operate from 22th step, which is 10th step away from 13th step, hence it will be operate between 13th step and 22th step.

(g) Teaching Method

This function sets whether you save value of changed Teaching data to Rom or Ram. If you choose Rom the data will be saved regardless of power and if you save in the ram the data will be vanished when powers off. This parameter sets as 1 means Rom saved, and sets as 0 means Ram saved. Frequency of ROM teaching is limited to 100,000.

(h) List of Teaching

You can set a data with Teaching Method among the Operating Data. Both “Goal Position” and “Operating Speed” can be changed by Teaching Array. When its value set “0” means set a Goal Position and “1” means set an Operating Speed.

(i) Amount of Teaching

Decide how many steps will be operated using by Teaching Method. Maximum 16 Teaching Array data can be used. For more information about Teaching Array Operation, look for reference from “Chapter 7.4.7”

(j) Address of first device where those data for Teaching Array are saved

To execute a Teaching Array, you need to set a specific value first. Teaching Data will be set up depends on number of first device as below table.

Value	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 + 17	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

(k)State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(l) Error State

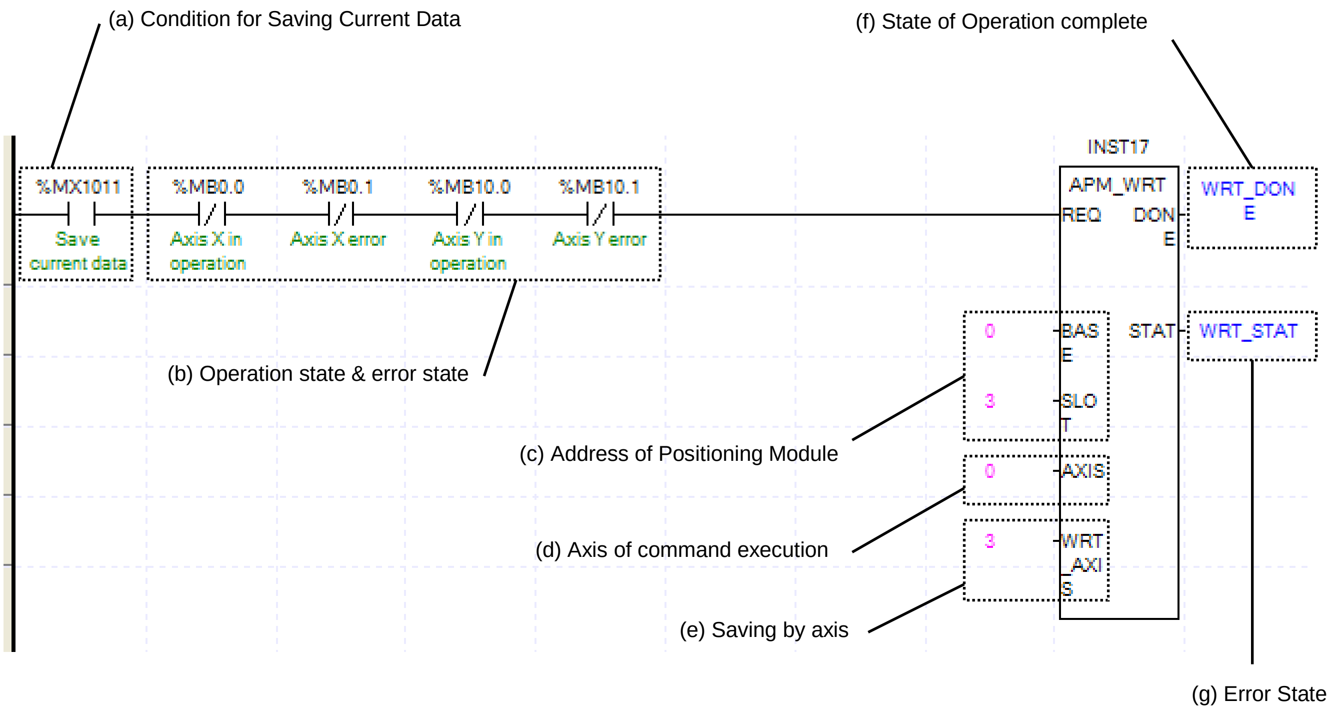
This is the area that output error no. if there are errors in operation of function block.

(m) Execution content of each function block is as follows.

Axis X Teaching Array : Execute RAM Teaching the position value of 10 steps from no.13 to no.22 of axis X as the value saved in %MD50 ~ %MD59.

Axis Y Teaching Array : Execute Teaching array based on the value in variable.

(4) Saving Current Data



(a) This is the condition for Saving Current Data

This is the condition for Saving Current Data Command (APM_WRT). When current saving data operated, those values of module parameter and operating data would be saved in flash memory. Therefore configuration of Ram or Ram Teaching would be constantly saved whether power is on or not.

(b) Operation state & error state

According to exercise from "Chapter 8.1.2 Current State Reading", it is a signal of "operation state and error state" for each axis. Since Saving Current Data command can't be executed, condition is set to be executed when both axes are not in operation. If you execute Saving Current Data command during operation, error 172 occurs.

(c) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot.

(d) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 or 1.

(e) Saving by axis

Configure current data operation setting. Choosing axis are configured follow by below table. Therefore even if those axis are not operated as it programmed, saving axis can be saved in Array. The data of operated axis saved in flash memory, which make constantly stable whether its power is on or not.

15 ~ 2 Bit	1Bit	0Bit
N/A	axis Y	axis X

(f) State of Operation complete

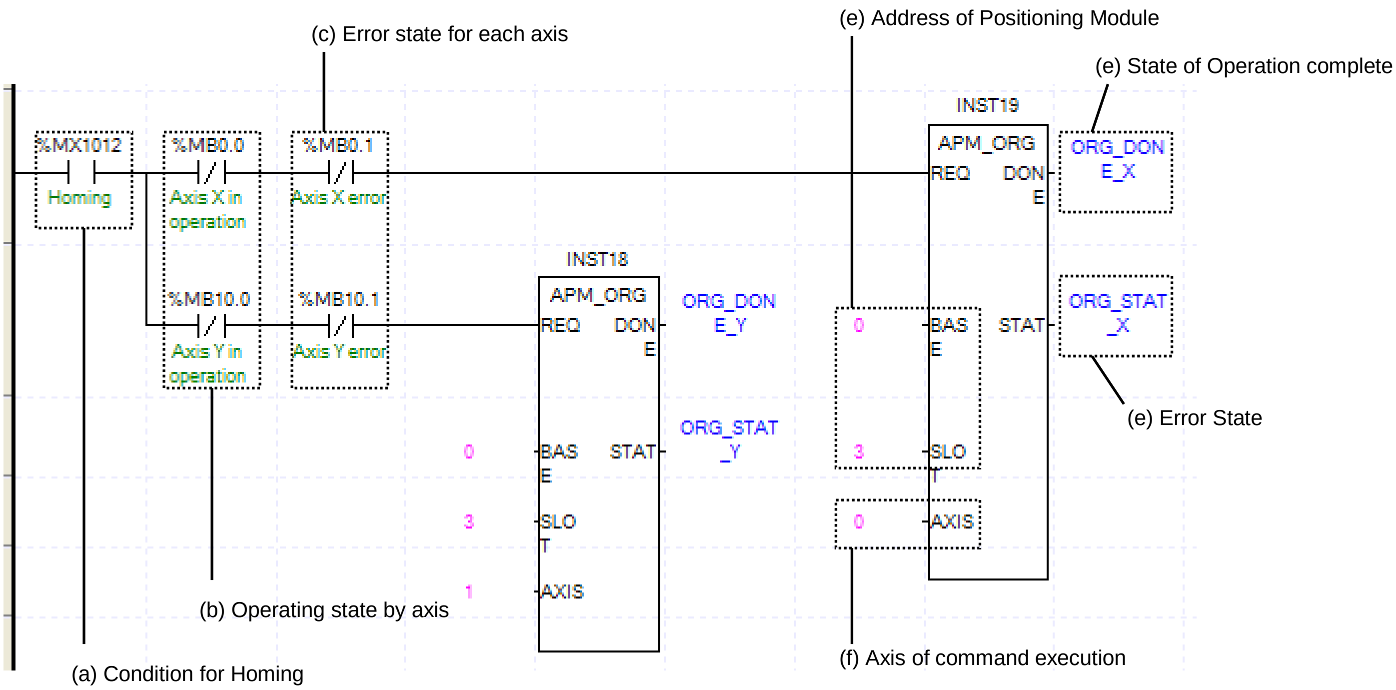
If function block is completed without error, "1" will be outputted and maintain "1" until the next operation. If error occurred, "0" will be outputted.

(g) Error State

This is the area that output error no. if there are errors in operation of function block.

8.2.5 Positioning Operation

(1) Homing



(a) This is the condition for Homing

This is the condition for Homing Command (APM_ORG)

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Homing command cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Homing while it is running, the “error 201” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot.

(e) Axis of command execution

You can set an axis for Inching Operation. XBF-PD02A supports for 2 axes. In the “execution of axis”, you can set a value 0 (Axis X) or 1 (Axis Y).

(g) State of Operation complete

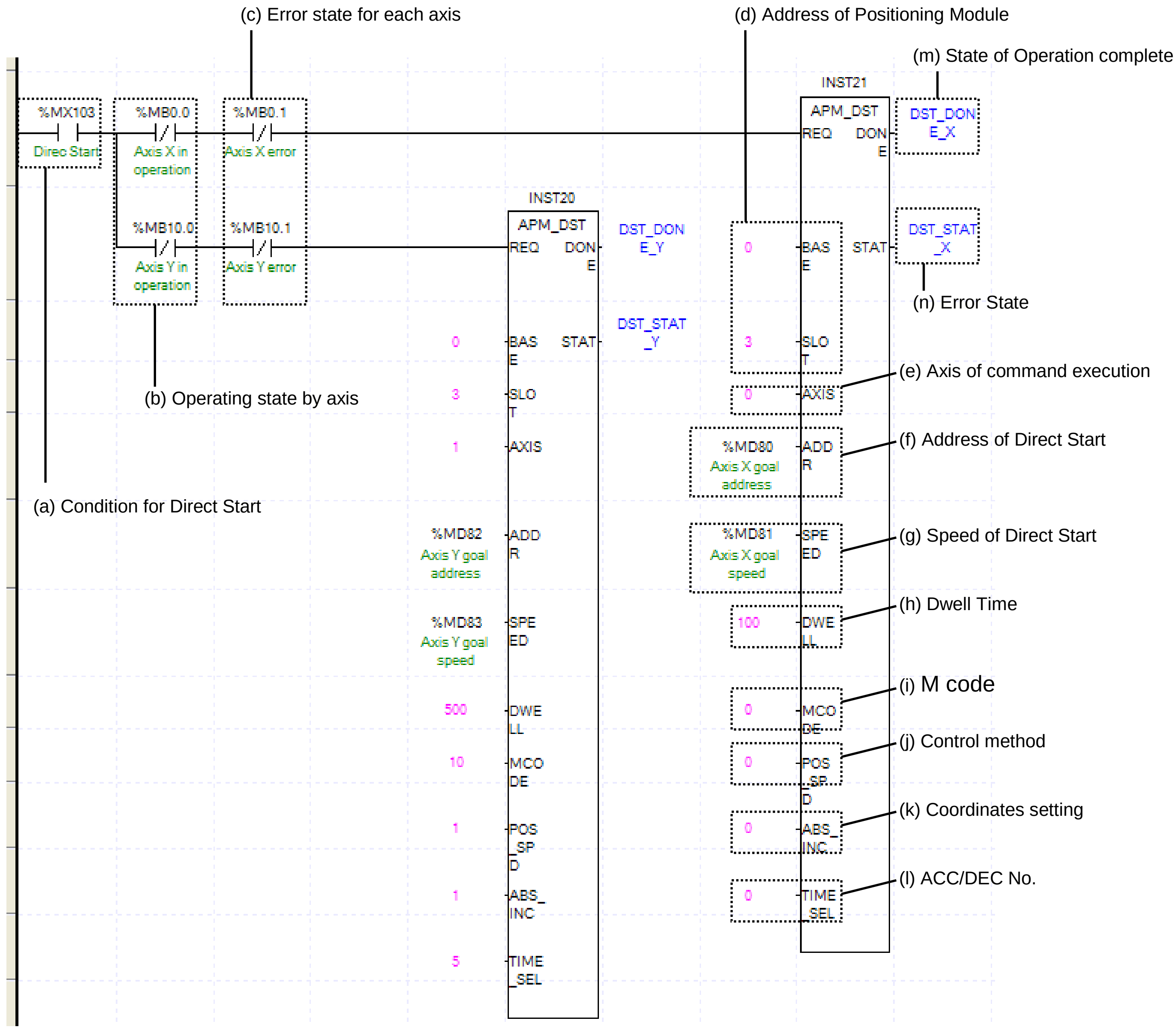
If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(h) Error State

This is the area that output error no. if there are errors in operation of function block.

(i) For more information, reference for Homing is in the “Chapter 9.1.”

(2) Direct Start



(a) This is the condition for Direct Start

This is the condition for Direct Start Command (APM_DST)

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Direct Start command cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Direct Start while it is running, the “error 221” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Inching Operation. XGF series supports for 4 axes. In the “execution of axis” from the configuration of Manual Operation, you can set a value 0 (axis X) or 1 (axis Y).

(f) Address

Decide changing position of Direct Start command. In this example above, the initialized value is “device,” but you can also change it with “real numbers,” which data type is “DINT.”

(g) Speed

Decide goal speed of Direct Start. In this example above, the initialized value is “device,” but you can also change it with “real numbers,” which data type is “UDINT.”

(h) Dwell Time

Dwell Time consider as a total amount of time from beginning of Direct Start operation that reach to the goal position and make output of Positioning Done Signal. That means after done its operation, direct Start will make a Positioning done signal. Its unit is “ms,” and type is “UINT”

(i) M code

You can set a value of M code which are displaying of Operating Parameter by Direct Start. The way of M code outputs are “Parameter Expansion, M code Mode,” within the “None, With, After.” It will make an M code besides you choose “None” for its parameter. For more information, reference for M code is in the “Chapter 4.2.2”

(j) Control method

Set direct start. Follows are executed depending on setting value.

0 : Position control

1 : Speed control

(K) Coordinates setting

Set the operating coordinates of direct start. Followings are executed depending on setting value.

0 : Absolute coordinates

1 : Relative coordinates

(l) ACC/DEC No.

Set the ACC/DEC No. used in positioning control. It operates by corresponding ACC/DEC Time of basic parameter depending on setting value. Data type is USINT.

7 ~ 4	3 ~ 2	1 ~ 0
-	0 : DEC no.1 1 : DEC no.2 2 : DEC no.3 3 : DEC no.4	0 : ACC no.1 1 : ACC no.2 2 : ACC no.3 3 : ACC no.4

(m) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(n) Error State

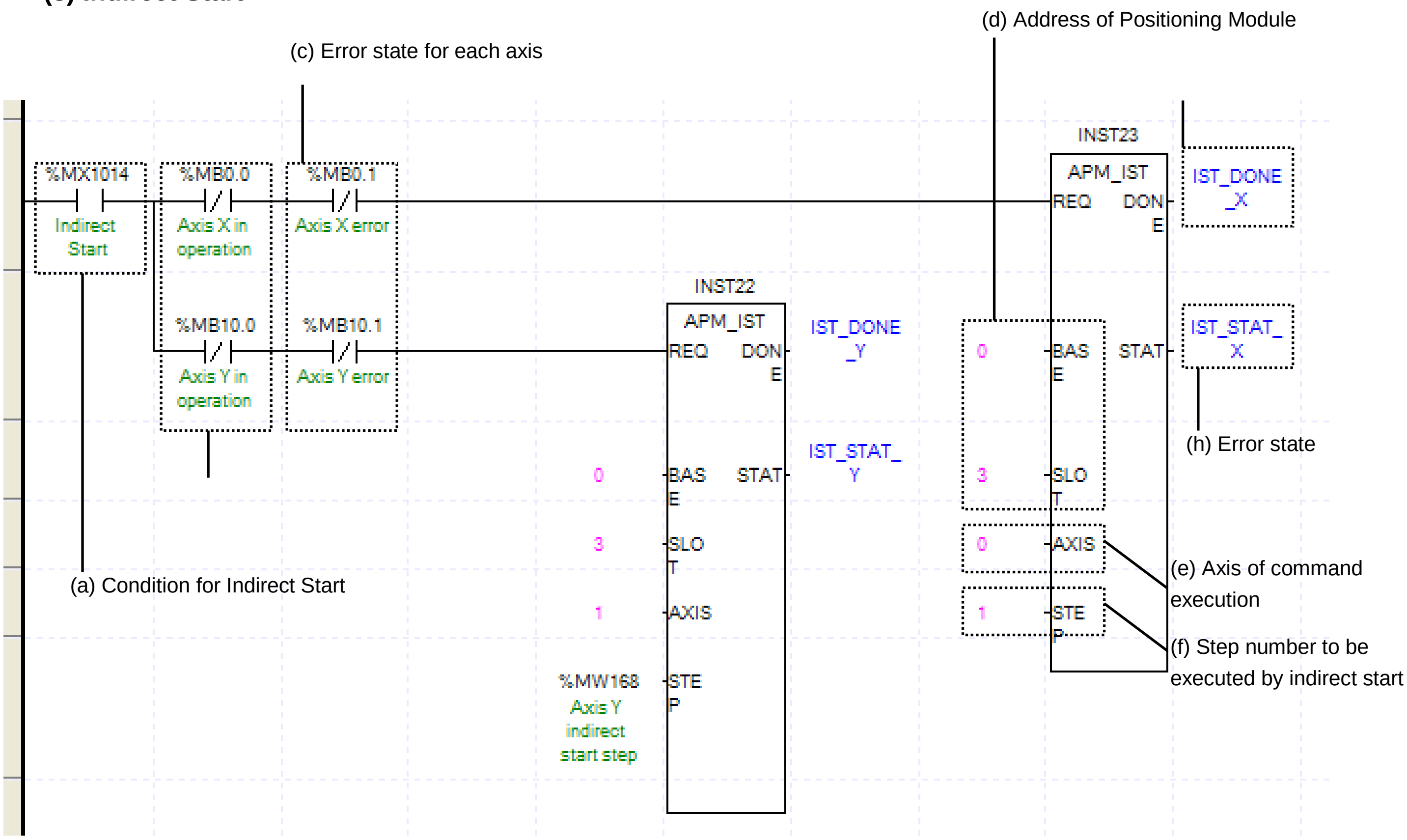
This is the area that output error no. if there are errors in operation of function block.

(o) The function block used in the example is as follows.

Axis X Direct Start : Execute position control with Axis X Goal Position %MD80(axis X goal position), Goal Speed %MD81(axis Goal Speed), Dwell time 100ms, M code 0, Absolute coordinates, Acc. Time1, Dec Time 1

Axis Y Direct Start : Execute position control with Axis X Goal Position %MD82(axis X Goal position), Goal Speed %MD83(axis X Goal Speed), Dwell time 500ms, M code 0, Relative coordinates, Acc. Time 2, Dec Time 2

(3) Indirect Start



(a) This is the condition for Indirect Start

This is the condition for Indirect Start Command (APM_IST)

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Indirect Start while it is running, the “error 231” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(f) Operating step number by Indirect Start

Set the operating step number by indirect start for main Axis of command execution.

(g) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(h) Error State

This is the area that output error no. if there are errors in operation of function block.

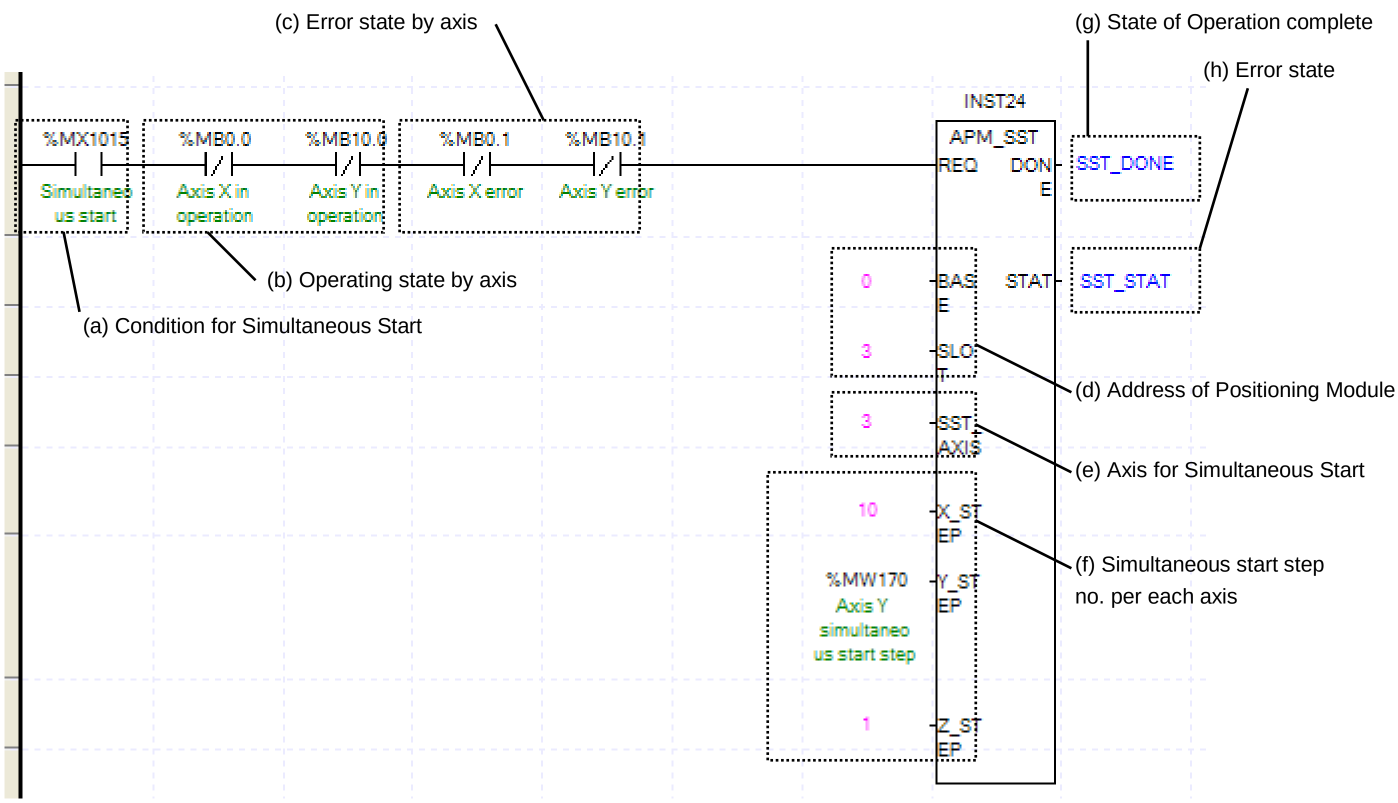
(i) Indirect start operates by appointing step of position data for each axis. Therefore it could run those commands of Positioning control, Speed control, Linear circular interpolation depends on setting of positioning data. For more information, reference for Setting of Operating Data is in the “Chapter4.6.”

(j) The operation of function block is as follows.

Axis1 Indirect Start : Execute step no.1 of axis X by indirect start

Axis2 Indirect Start : Execute %MW168(Indirect start step) of axis Y by indirect start

(4) Synchronous Start



(a) This is the condition for Simultaneous Start

This is the condition for Simultaneous Start Command

(b) Operating state by axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Axis X Simultaneous Start while it is running, the "error 291" would be appeared.

(c) Error state by axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis for Simultaneous Start

Set axis for Simultaneous Start. The axis for Simultaneous Start uses a "bit" from WORD Data setting as a "1" for each axis. Axis for each bits are as below. Since XBF-PD02A supports up to two axes, set this WORD as 3.

15~2 Bit	1Bit	0Bit
N/A	Axis X	Axis Y

(f) Simultaneous start step no. per each axis

Set the step no. of each axis for Simultaneous start. XBF-PD02A can control 2 axes, it doesn’t use Z_STEP input.

(g) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(h) Error State

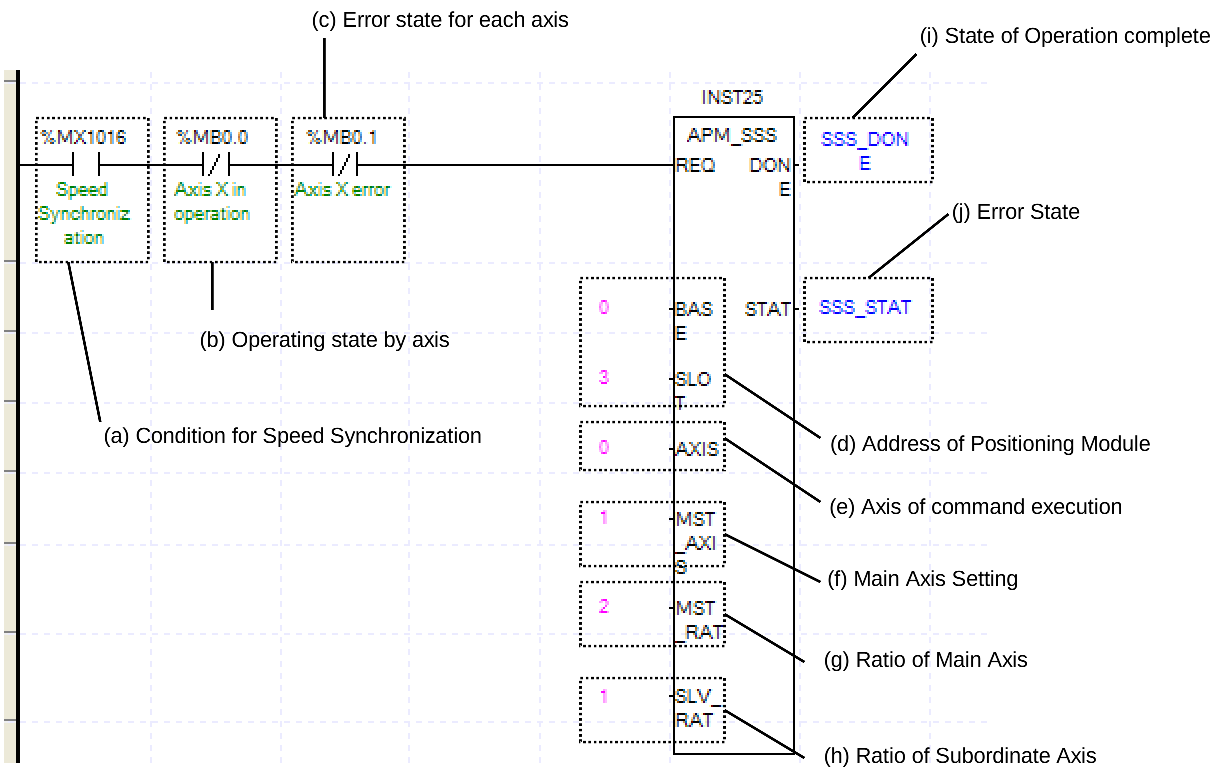
This is the area that output error no. if there are errors in operation of function block.

(j) The function block used in the example is as follows.

Simultaneous start: Execute no.10 operation step of axis X and step of %MW170 (axis Y Simultaneous start step) simultaneously.

.

(5) Speed Synchronization



(a) This is the condition for Speed Synchronization

This is the condition for Speed Synchronization Command (APM_SSS)

(b) Operating state by axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Speed Synchronization while it is running, the "error 351" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(f) Main Axis Setting

Set a main axis to operate Speed Synchronization. This setting is for main axis of Speed Synchronization. This setting cannot be set as same value as Axis of command execution, and possible setting values are as below.

Setting value	Main axis
0	X - axis
1	Y – axis
2	Encoder

(g) Ratio of Main Axis

Set value for Ratio of Main Axis to execute a Speed Synchronization.

(h) Ratio of Subordinate Axis

Set value for Ratio of Subordinate Axis to execute a Speed Synchronization. In this example above, the ratio of main and subordinate axis is 2:1. Meaning that operational speed ratio of those axis is 2 to 1. So, if main axis is operating in speed of 10000, subordinate axis will be operating in speed of 5000.

(i) State of Operation complete

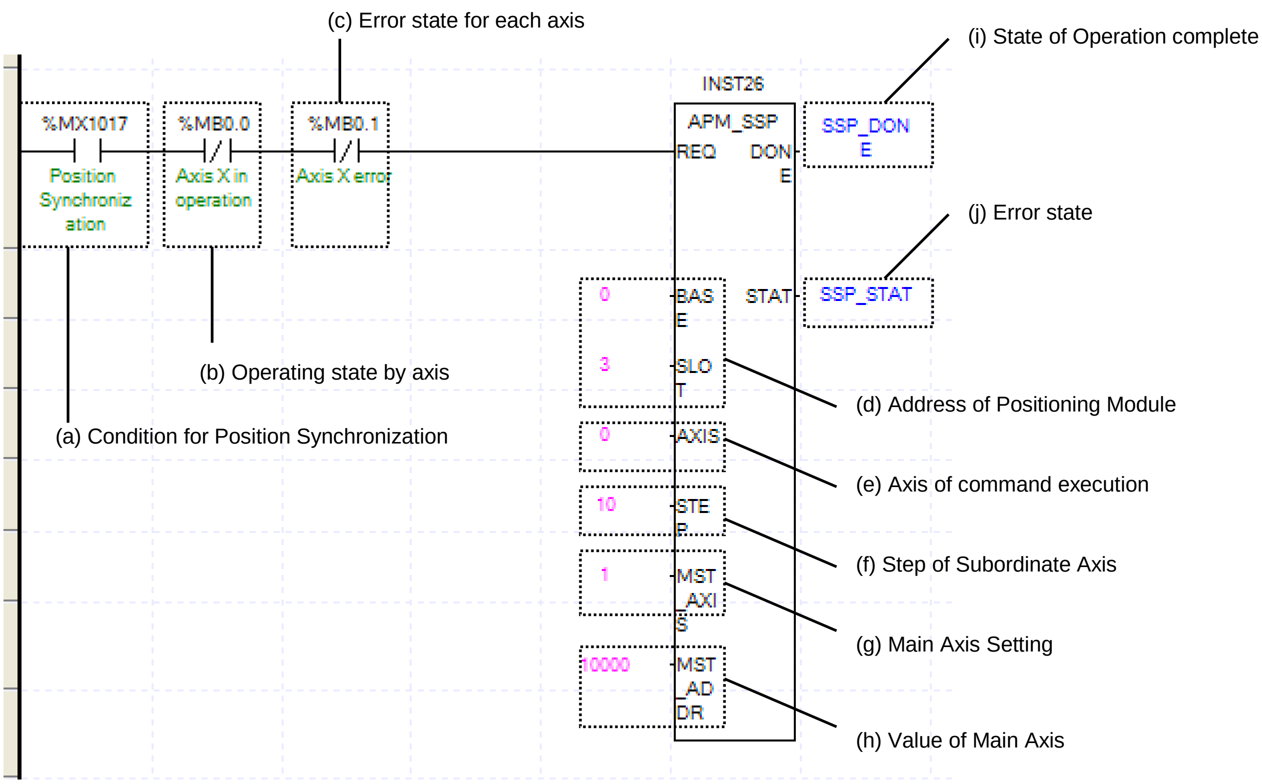
If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(j) Error State

This is the area that output error no. if there are errors in operation of function block.

(k) For more information, reference for Speed Synchronization is in the “Chapter 9.4.1.”

(6) Position Synchronization



(a) This is the condition for Position Synchronization

This is the condition for Position Synchronization (APM_SSP)

(b) Operating state by axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Position Synchronization while it is running, the “error 341” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.1.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1(axis Y).

(f) Step of Subordinate Axis

Set step number for Subordinate Axis to execute a Position Synchronization.

(g) Value of Main Axis

Set value for Main Axis to execute Position Synchronization. Therefore main axis will be executed the command when the subordinate axis reaches this set value.

(h) Main Axis Setting

Set a main axis to operate Speed Synchronization. This setting is for main axis of Position Synchronization.

This setting cannot be set as same value as Axis of command execution, and possible setting values are as below.

Set value	Main Axis
0	Axis X
1	Axis Y

(j) State of Operation complete

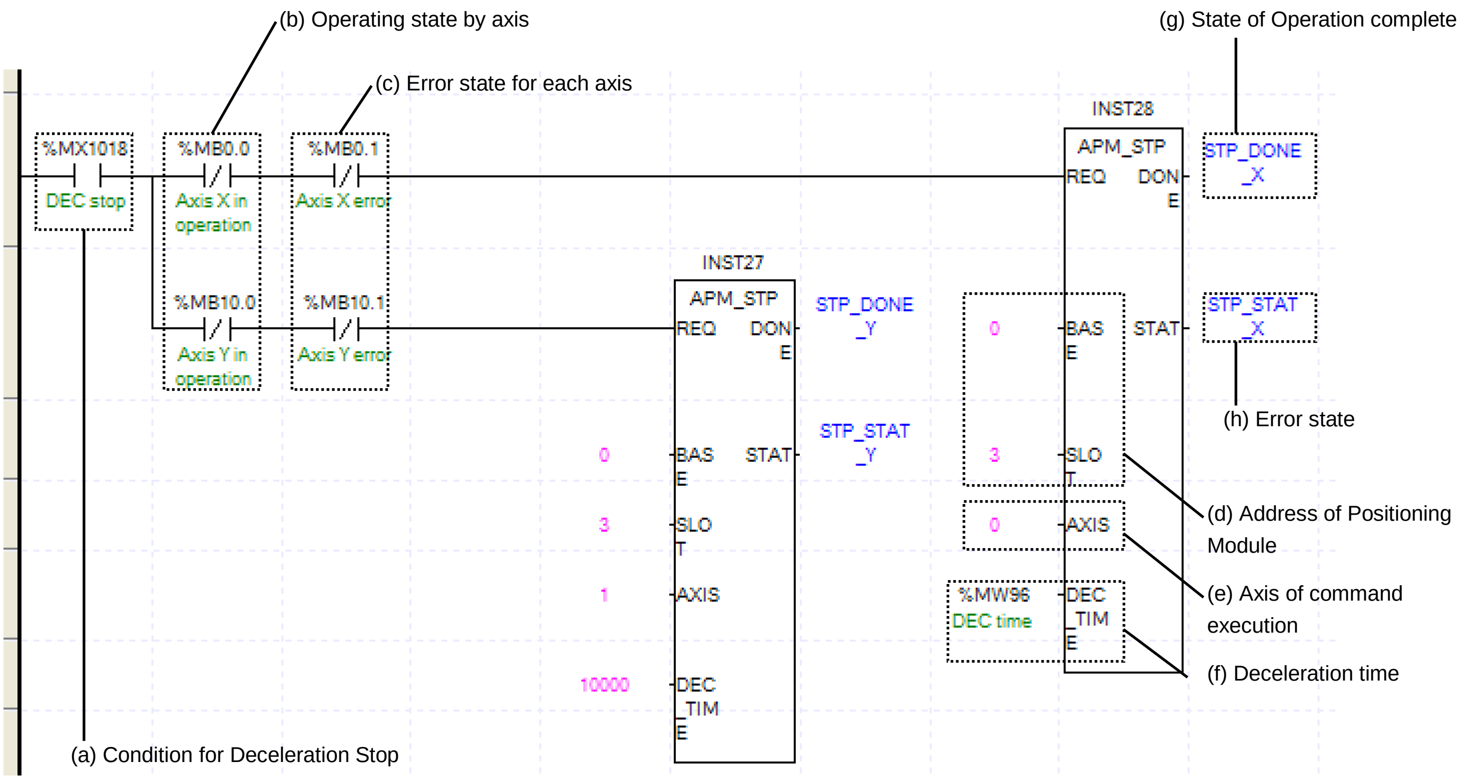
If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(k) Error State

This is the area that output error no. if there are errors in operation of function block.

(l) For more information, reference for Synchronous Start by Position is in the “Chapter 9.4.2.”

(7) Deceleration Stop



(a) This is the condition for Deceleration Stop

This is the condition for Deceleration Stop Command (APM_STP)

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(f) Deceleration time of Deceleration Stop

Set a deceleration time of Deceleration Stop operation. Unit of Deceleration Stop is [ms]. Since this time refers deceleration time from the speed limit, there might be little difference between Deceleration Stop set time and actual stop time. The range of deceleration time is “0~65,535.” 1~65,535 means Deceleration Time set as 1ms ~ 65,535ms. If it set as “0,” it will be operated with set deceleration value. Also it use to stop Speed Synchronization Operation while Speed Synchronization Operation.

(g) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(h) Error State

This is the area that output error no. if there are errors in operation of function block.

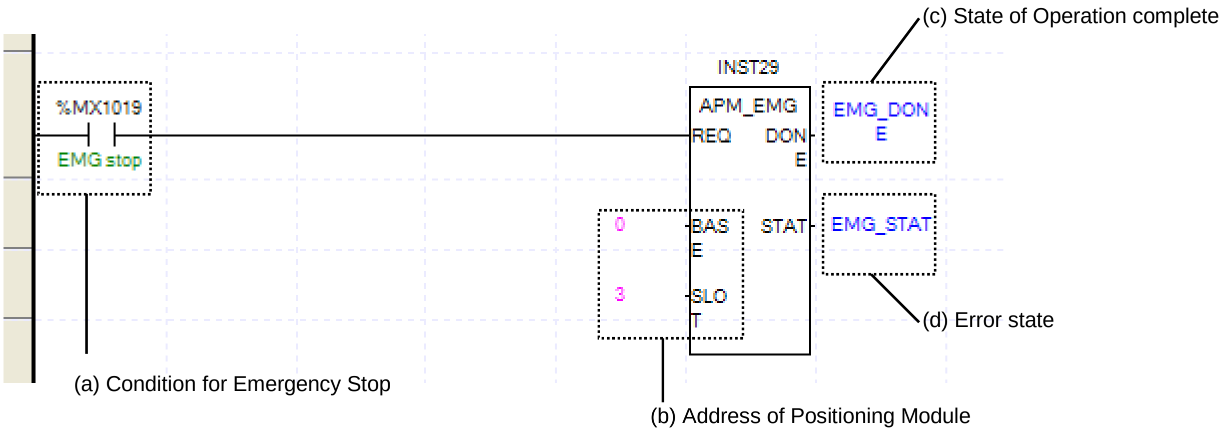
(i) For more information, reference of Deceleration Stop is in the “Chapter 9.2.12.”

(j) Operation of each function block is as follows.

Axis1 Dec. Time : When axis X is in operation, decelerate to %MW96(axis X Dec. stop Time), then stop.

Axis2 Dec. Time : When axis Y is in operation, decelerate to 1000ms, then stop.

(8) Emergency Stop



(a) This is the condition for Emergency Stop

This is the condition for Emergency Stop Command (APM_EMG)

(b) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(c) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(d) Error State

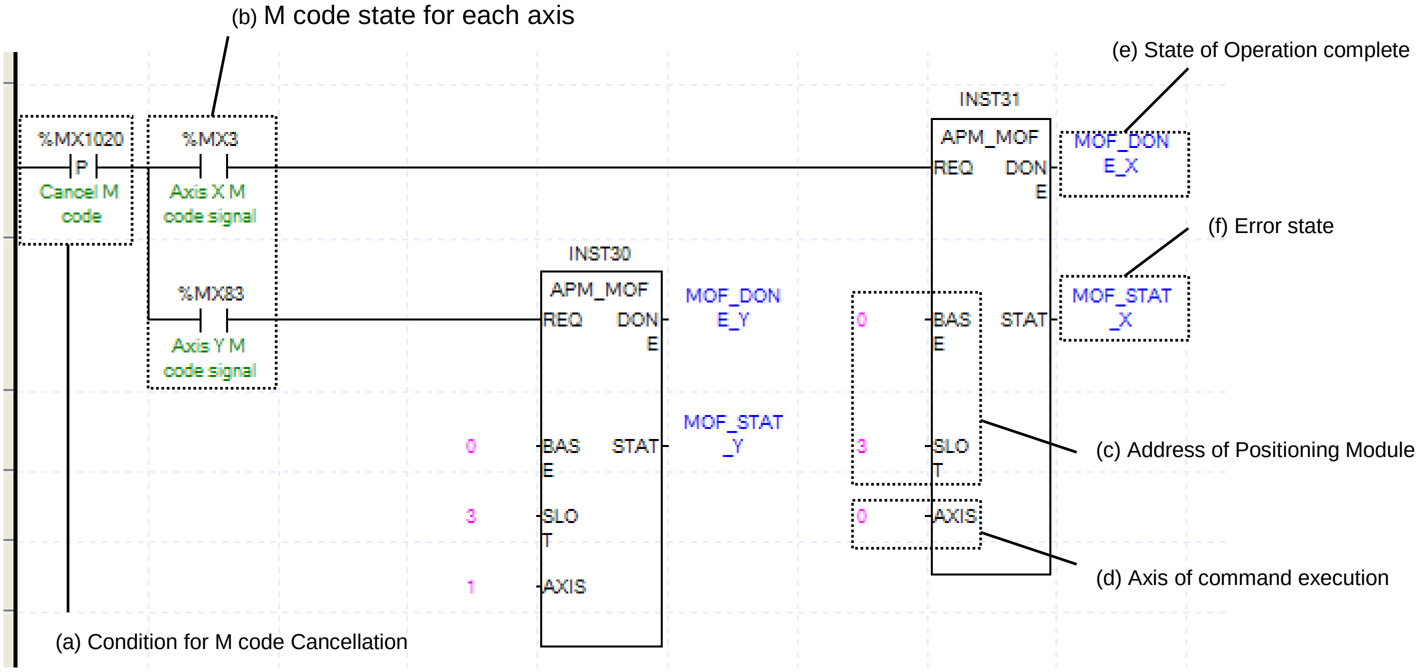
This is the area that output error no. if there are errors in operation of function block.

(e) Emergency Stop is operating by each axis.

EMG stop command is applied to both axis X and axis Y. Once it is executed, both axes occurs error code 481 and stop without deceleration

(f) For more information, reference of Emergency Stop is in (3) EMG stop of “Chapter 9.2.1.”

(9) M code Cancellation



(a) This is the condition for M code Cancellation

This is the condition for M code Cancellation (APM_MOF). Once M code Cancellation command executed, number of M code would be change to “0,” and signal of M code to “Off.”

(b) M code state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “M Code” for each axis. It turns on when it is operating. M code Cancellation command can only be valid once M code are generated. The condition for execution is operation possible when it is “On.”

(c) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(d) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(e) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

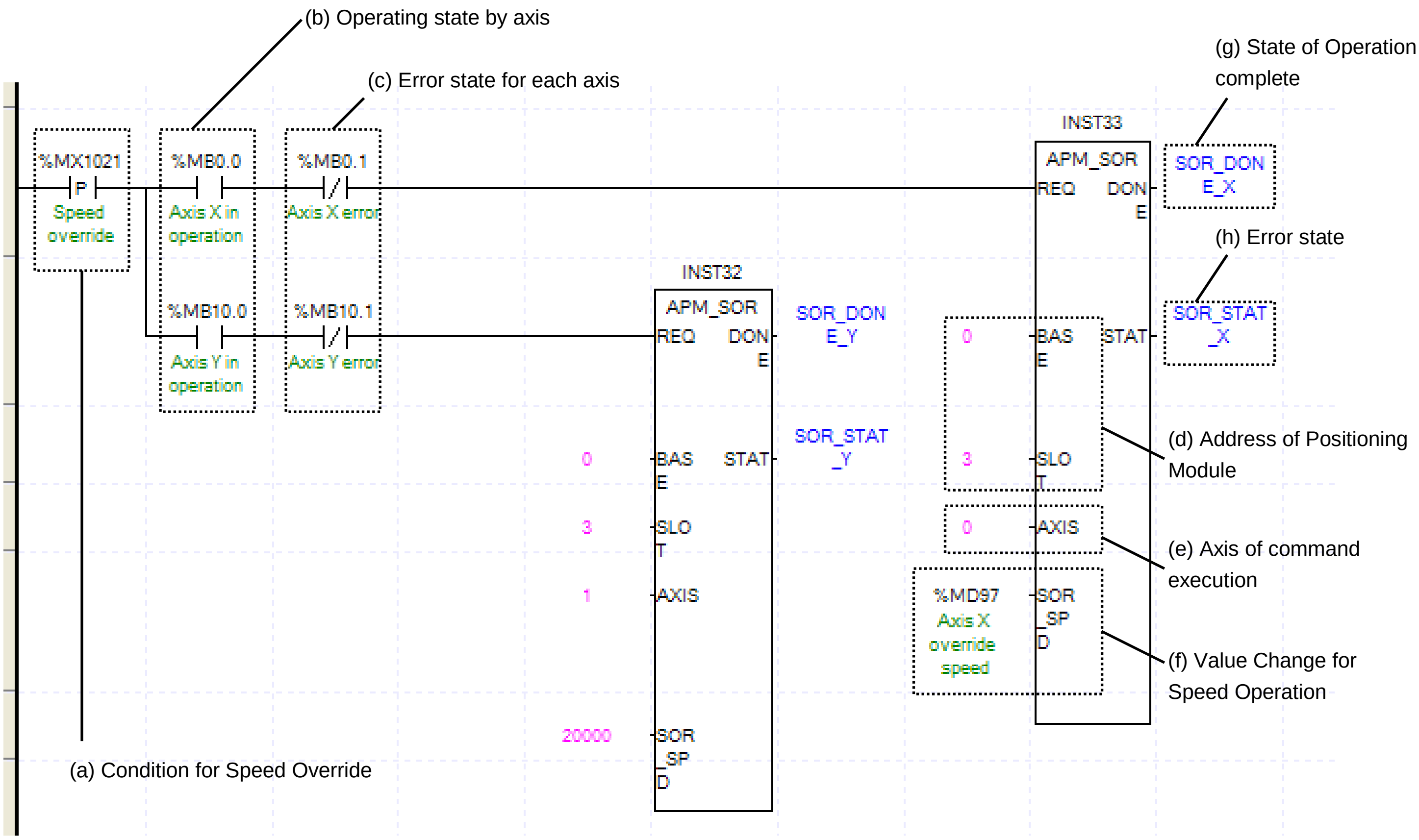
(f) Error State

This is the area that output error no. if there are errors in operation of function block.

(g) For more information, reference of M code Cancellation is in the “Chapter 9.6.2.”

8.2.6 Operation Setting Change while Operating

(1) Speed Override



(a) This is the condition for Speed Override

This is the condition for Speed Override Command (APM_SOR)

(b) Operating state by axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Speed Override while it is running, the "error 371" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(f) Value Change for Speed Operation

Set speed value. According to Speed Override from common parameters, it is a signal of "%" or "Speed Value" depends on setting of category. Also, when Speed Override set as Speed Value, it means Pulse/Second. If a changing Operation Speed Value is "%," then the unit would be [X10^{-2}%].

(g) State of Operation complete

If function block is completed without error, "1" will be outputted and maintain "1" until the next operation. If error occurred, "0" will be outputted.

(h) Error State

This is the area that output error no. if there are errors in operation of function block.

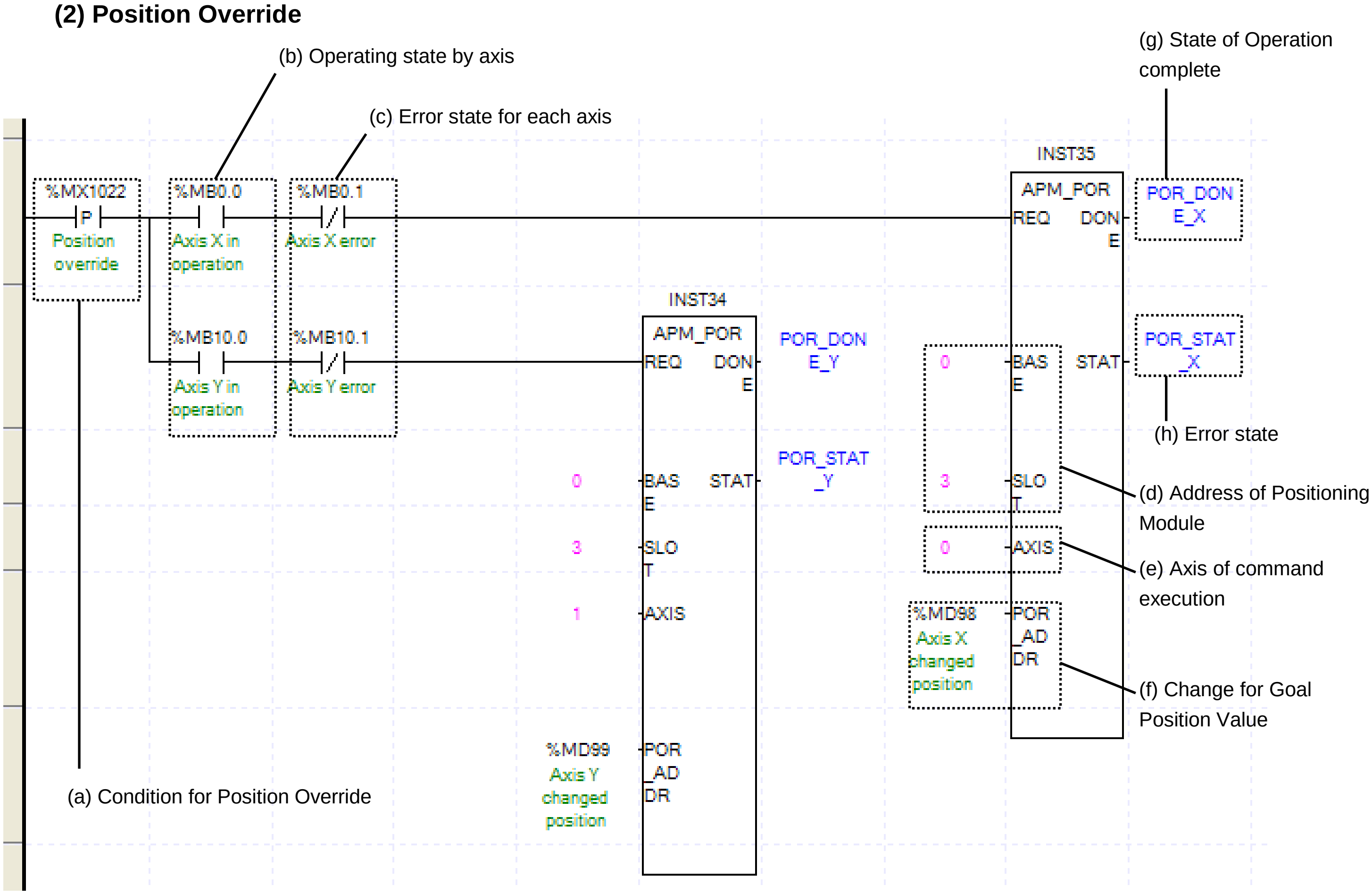
(i) The function block in the example above is as follows.

Axis X Speed Override : The operating speed of axis X will be changed to speed value saved in %MD97 and then continue to operate.

Axis Y Speed Override : The operating speed of axis Y will be changed to 20000 and then continue to operate.

(j) For more information, reference of Speed Override is in the "Chapter 9.5.3."

(2) Position Override



(a) This is the condition for Position Override

This is the condition for Position Override Command (APM_POR)

(b) Operating state by axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Operating" for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Position Override while it is running, the "error 361" would be appeared.

(c) Error state for each axis

According to exercise from "Chapter 8.2.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(f) Change for Goal Position Value

Setting Value Change for Goal Position Value. Once Position Override commands are executed, the goal position of executed axis will be changed to set goal position.

(g) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(h) Error State

This is the area that output error no. if there are errors in operation of function block.

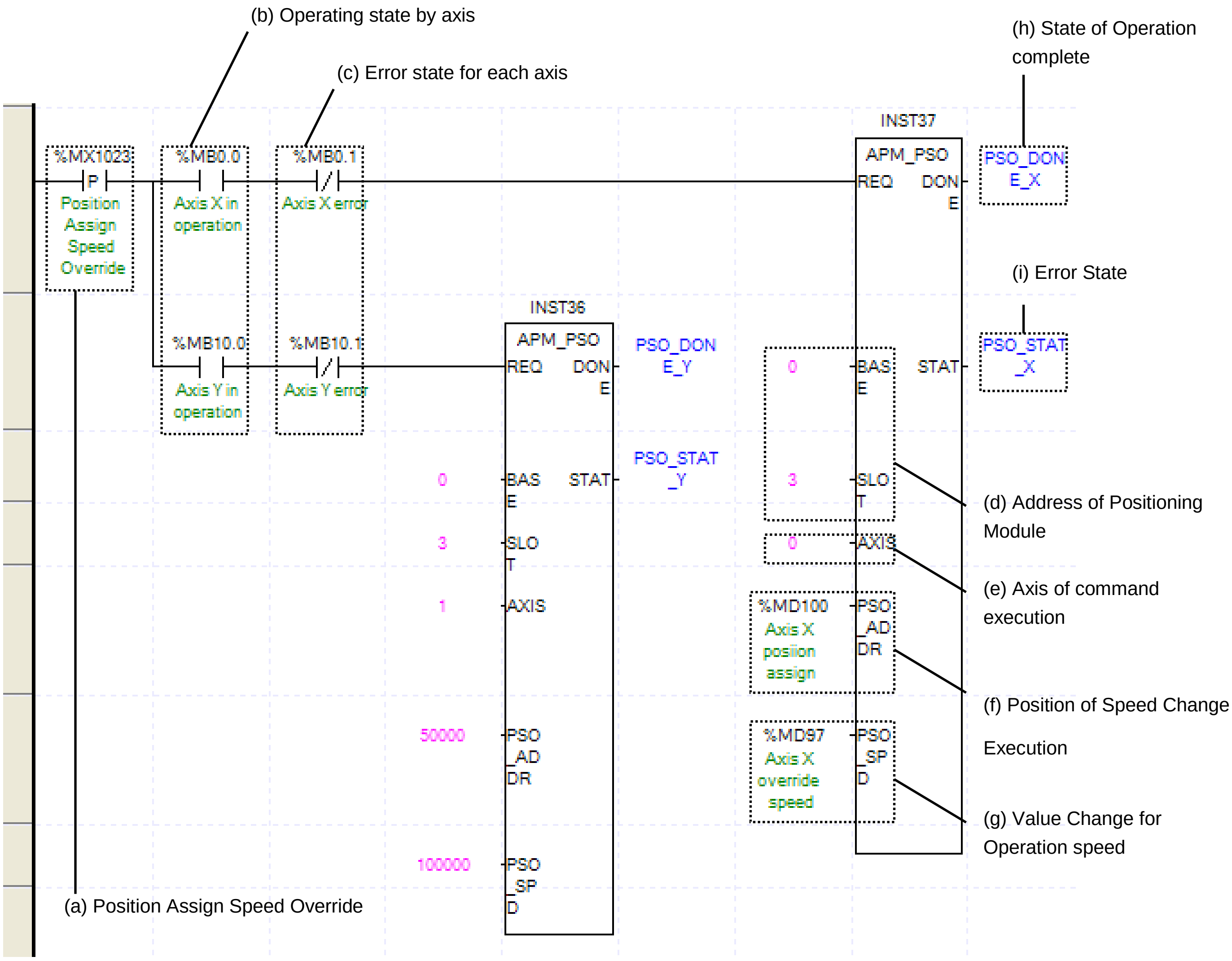
(i) The function block in the example above is as follows.

Axis X Position Override : Goal position of axis X is changed to the value saved in %MD98.

Axis Y Position Override : Goal position of axis Y is changed to the value saved in %MD99.

(j) For more information, reference of Position Override is in the “Chapter 9.5.2.”

(3) Position Assign Speed Override



(a) This is the condition for Position Assign Speed Override

This is the condition for Position Assign Speed Override Command (APM_PSO)

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Position Assign Speed Override while it is running, the “error 381” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(f) Position of Speed Change Execution

Set the position of Speed Change. Once the actual position located at set position with speed override command running, the speed change commands are executed.

(g) Value Change for Operation speed

Set the Value Change for Operation speed. According to Speed Override from common parameters, it is a signal of “%” or “Speed Value” depends on setting of category. Also, when Speed Override set as Speed Value, it means Pulse/Second. If a changing Operation Speed Value is “%,” then the unit would be [$X10^{-2}$%].

(h) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(i) Error State

This is the area that output error no. if there are errors in operation of function block.

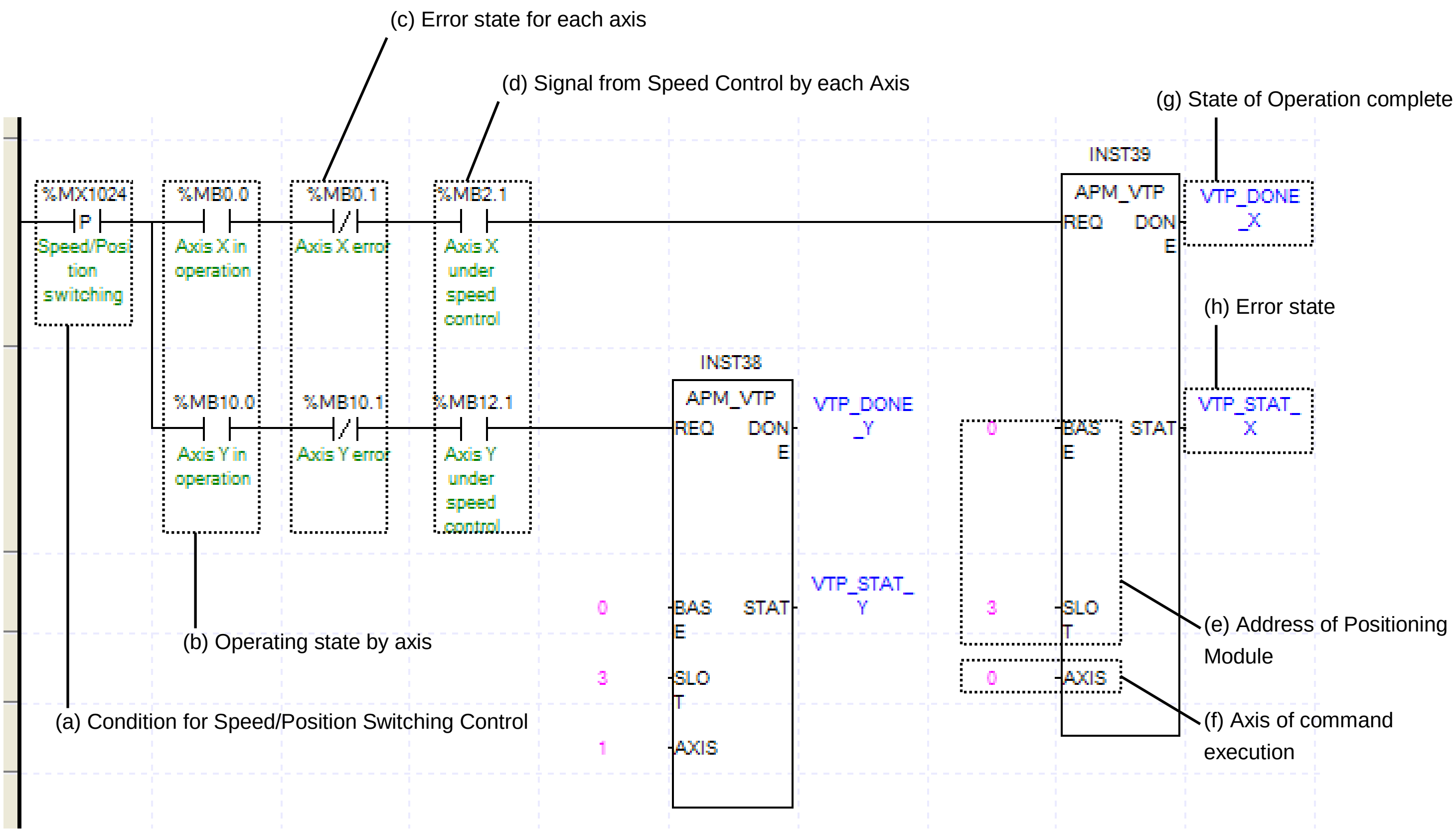
(j) The function block in the example above is as follows.

Axis X Positioning Speed Override : When the current position of axis X become the same position as the position saved in %MD100, the speed value will be changed to the speed saved in %MD97.

Axis Y Positioning Speed Override : When the current position of axis X become 50000, the speed will be changed to 100000.

(k) For more information, reference of Position Assign Speed Override is in the “Chapter 9.5.4.”

(4) Speed/Position Switching Control



(a) This is the condition for Speed/Position Switching Control

This is the condition for Speed/Position Switching Control Command (APM_VTP)

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Speed/Position Switching Control while it is running, the “error 301” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Signal from Speed Control by each Axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Speed Control state” for each axis. It turns on when it is operating. Speed/Position Switching Control Setting can only be configured while it is running. If you execute Speed/Position Switching Control while it is not running, the “error 302” would be appeared.

(e) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(f) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(g) State of Operation complete

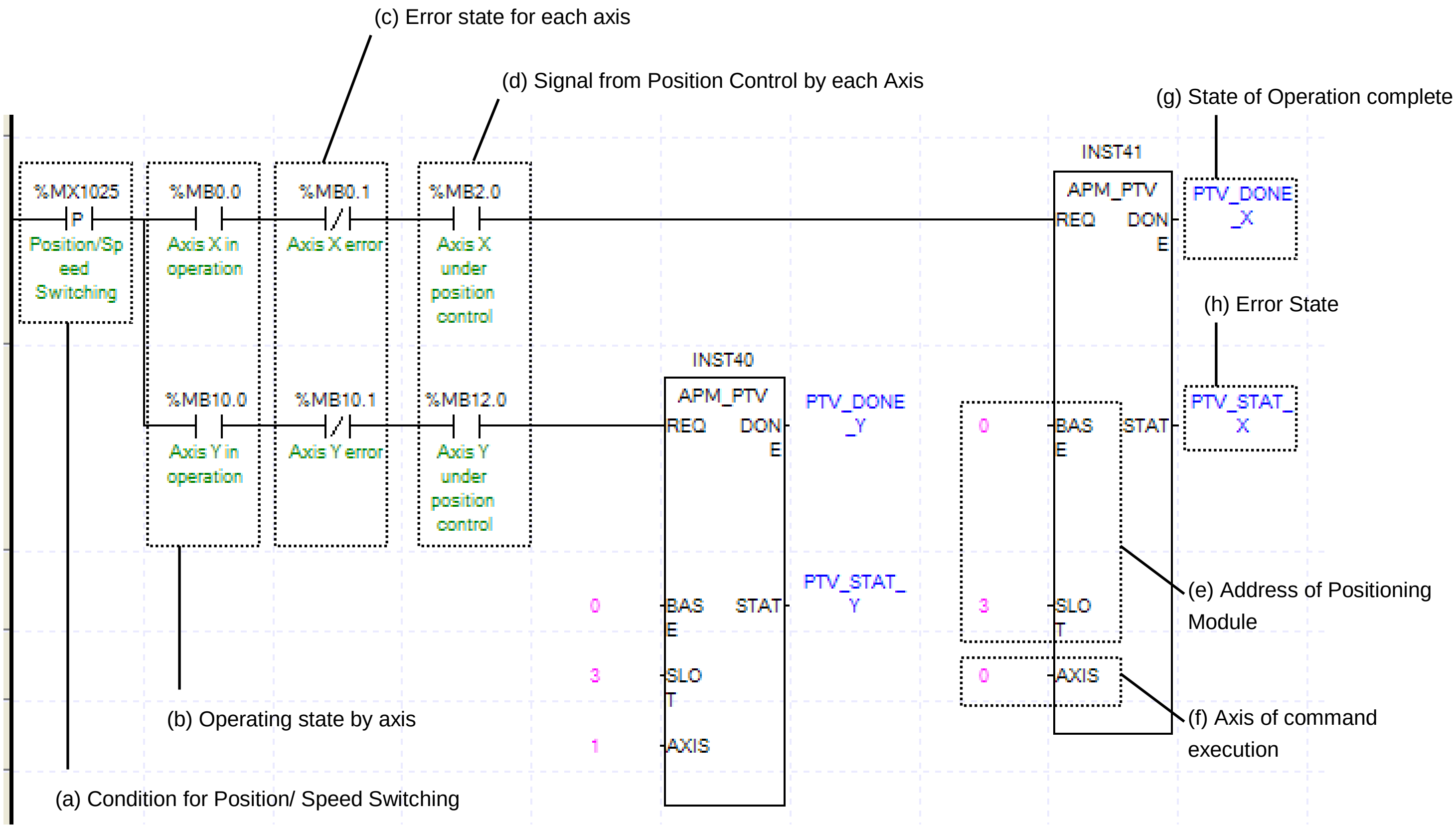
If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(h) Error State

This is the area that output error no. if there are errors in operation of function block.

(i) For more information, reference of Speed/Position Switching Control is in the “Chapter 9.2.9.”

(5) Position/ Speed Switching Control



(a) This is the condition for Position/ Speed Switching Control

This is the condition for Position/ Speed Switching Control Command (APM_PTV)

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting can not be configured while it is running hence configuration will only be configured when it is not running. If you execute Position/ Speed Switching Control while it is running, the “error 311” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Signal from Position Control by each Axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Position Control state” for each axis. It turns on when it is operating. Position/ Speed Switching Control Setting can only be configured while it is running. If you execute Position/Speed Switching Control while it is not running, the “error 317” would be appeared.

(e) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(f) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(g) State of Operation complete

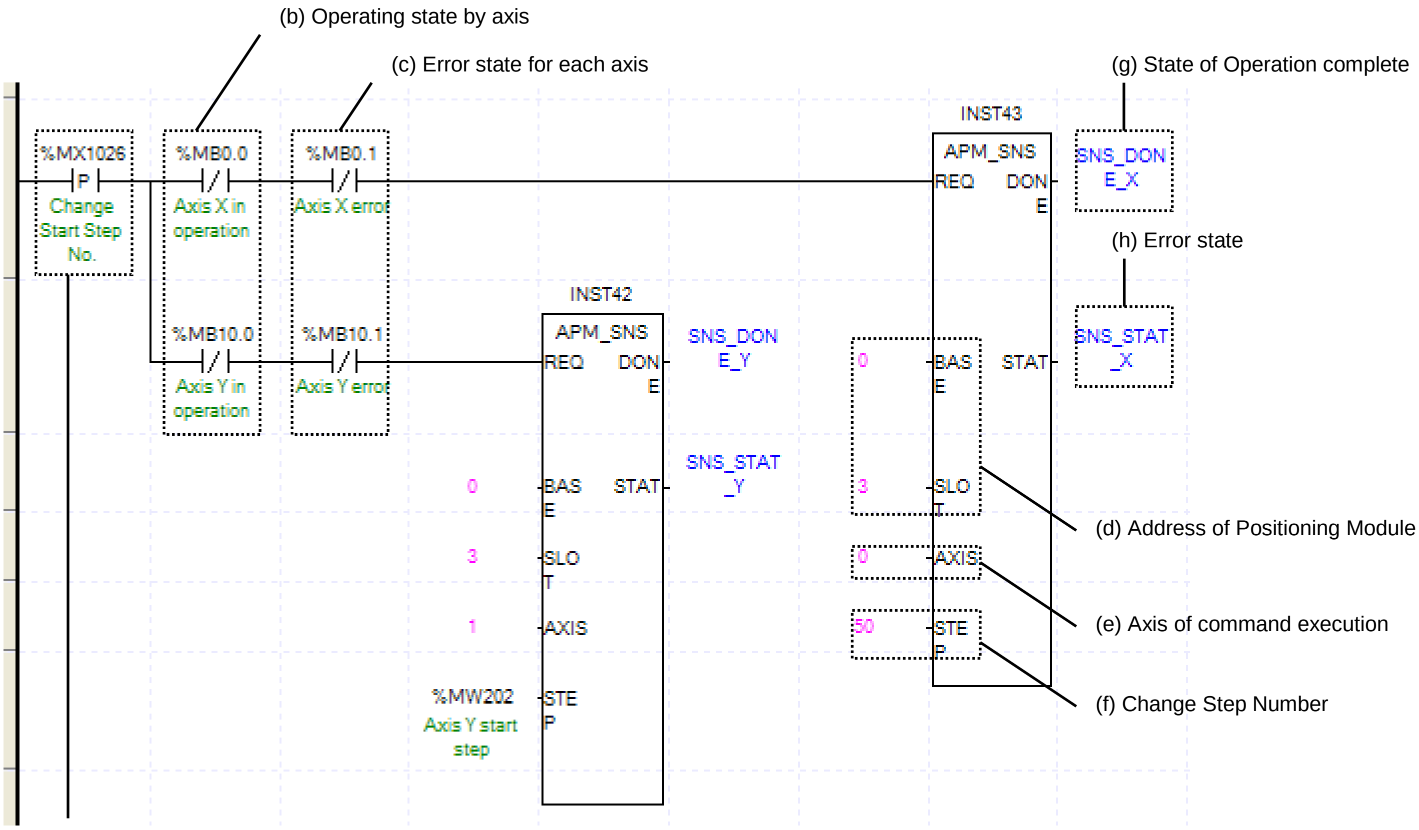
If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(h) Error State

This is the area that output error no. if there are errors in operation of function block.

(i) For more information, reference of Position/ Speed Switching Control is in the “Chapter 9.2.10”.

(6) Current Step Change (Start Step Number Change)



(a) This is the condition for Current Step Change

This is the condition for Current Step Change Command (APM_SNS). Once Current Step Change is executed, current operation step will move set step.

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Current Step Change while it is running, the “error 441” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(f) Change Step Number

Set change step number by Current Step Change. XBF-PD02A supports 150 step operation data for each Axis. Therefore, the range of step number setting of Current Step Change is 1~150. In the above example, current step of axis X changes into step no. 50 and that of axis Y changes into step no. designated at %MW202 (Axis Y start step)

(g) State of Operation complete

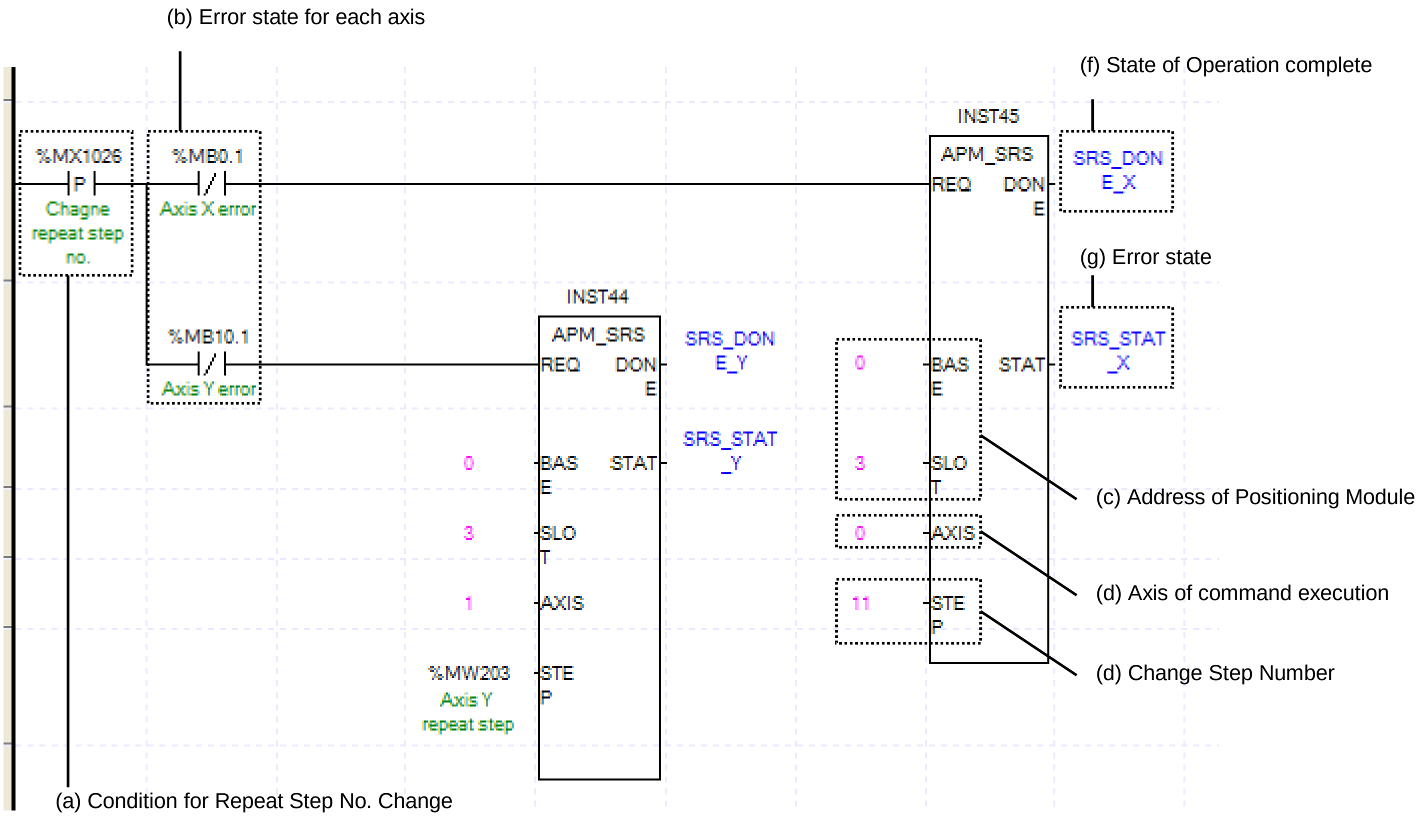
If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(h) Error State

This is the area that output error no. if there are errors in operation of function block.

(i) For more information, reference of Current Step Change is in the “Chapter 9.5.7.”

(7) Repeat Step No. Change



(a) This is the condition for Repeat Step No. Change

This is the condition for Repeat Step No. Change Command (APM_SRS). Once Repeat Step No. Change is executed, current operation step will move set step. It will execute a operation when set of Operation Method is "Repeat."

(b) Error state for each axis

According to exercise from "Chapter 8.1.2 Current State Reading," it is a signal of "Error state" for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(c) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(d) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the "execution of axis" from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(e) Change Step Number

Set change step number by Current Step Change. XBF-PD02A supports 150 step operation data for each Axis. Therefore, the range of step number setting of Current Step Change is 1~150. In the example, Axis X and axis Y are changed to step no.11 and step no. saved in %MW203 (axis Y repeat step).

(f) State of Operation complete

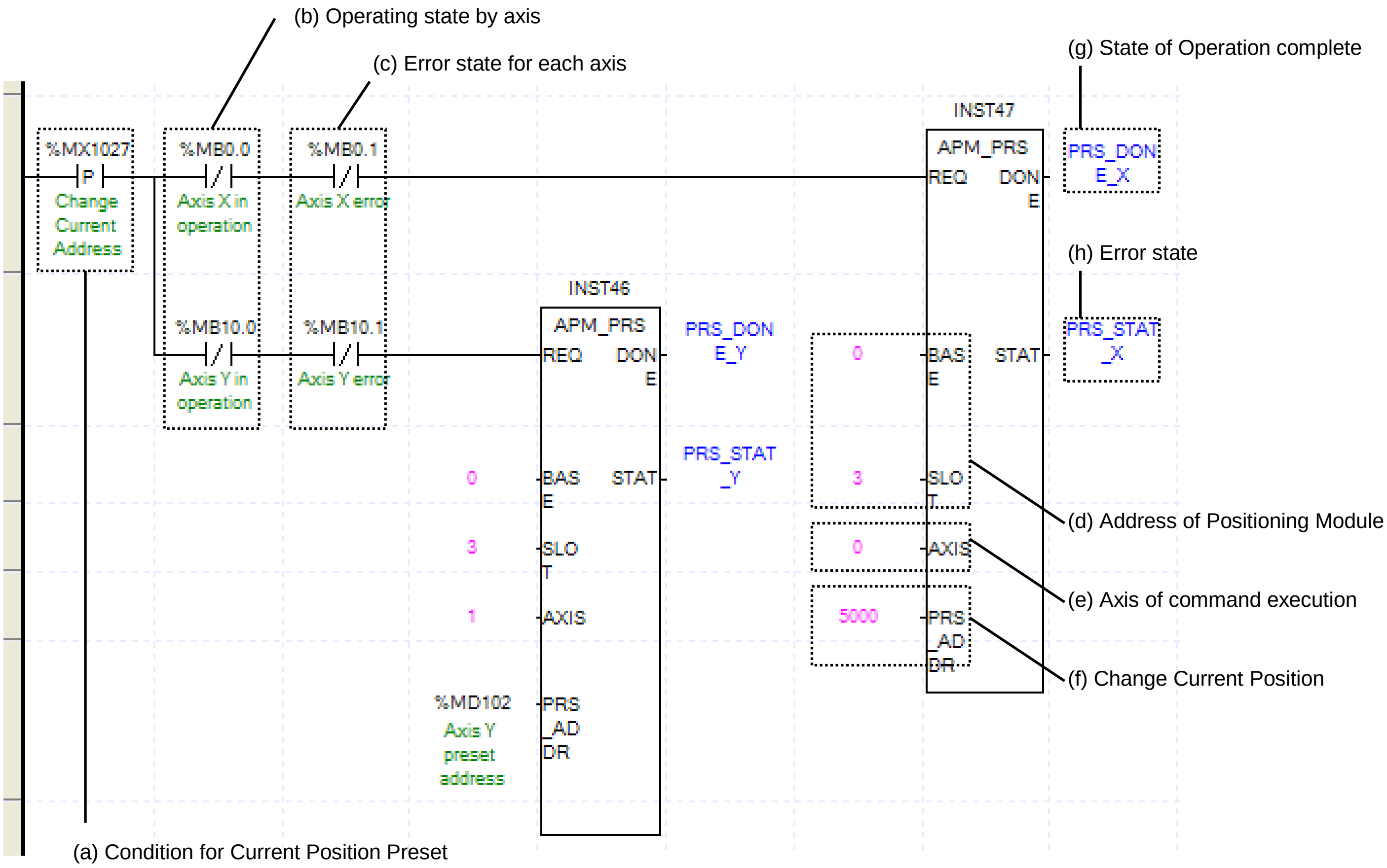
If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(g) Error State

This is the area that output error no. if there are errors in operation of function block.

(h) For more information, reference of Repeat Step No. Change is in the “Chapter 9.5.8.”

(8) Current Position Preset



(a) This is the condition for Current Position Preset

This is the condition for Current Position Preset Command (APM_SNS). Once Current Position Preset is executed, current operation step will move to set step. If the origin has not set yet, the origin would be set to origin decided.

(b) Operating state by axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Operating” for each axis. It turns on when it is operating. Operating Data Setting cannot be configured while it is running hence configuration will only be configured when it is not running. If you execute Current Position Preset while it is running, the “error 451” would be appeared.

(c) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(d) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(e) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1(axis Y).

(f) Change Current Position

Set change current position by Current Position Preset. Unit follows the value from “Unit” of basic parameter. In the example, Axis X and axis Y are changed to 5000 and the position saved in %MD102 respectively.

(g) State of Operation complete

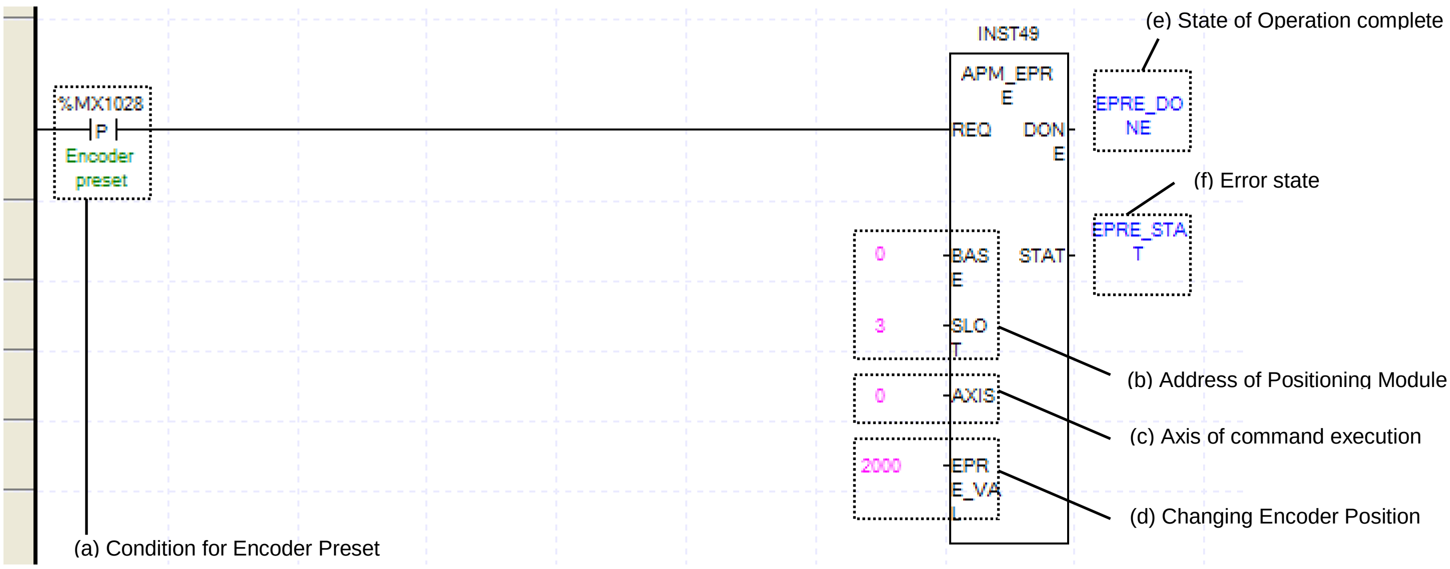
If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(h) Error State

This is the area that output error no. if there are errors in operation of function block.

(i) For more information, reference of Current Position Preset is in the “Chapter 9.5.7.”

(9) Encoder Preset



(a) This is the condition for Encoder Preset

This is the condition for Encoder Preset Command (APM_EPRE). Once Encoder Preset is executed, current operation step will move to set step.

(b) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(c) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 (axis X) or 1 (axis Y).

(d) Changing Encoder Position

Set for Changing Encoder Position. In the example, the encoder position is changed to 2000.

(e) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

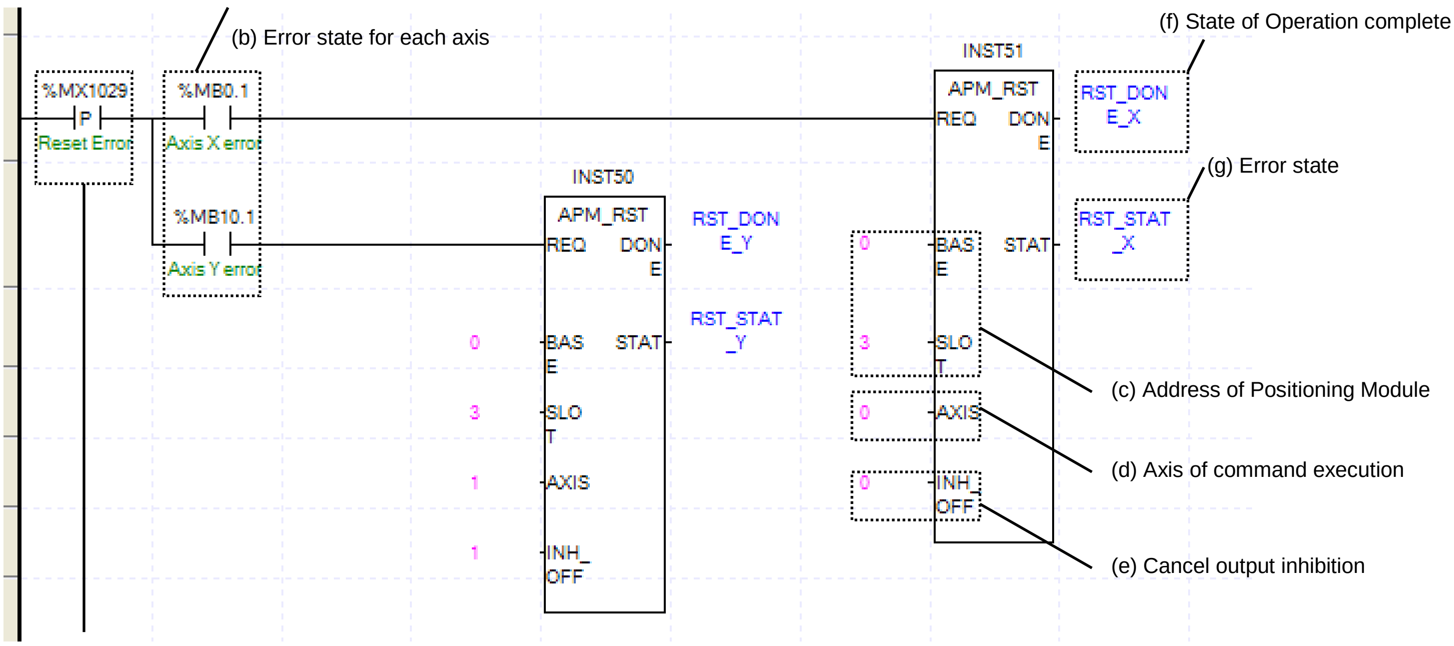
(f) Error State

This is the area that output error no. if there are errors in operation of function block.

(g) For more information, reference of Encoder Preset is in the “Chapter 9.5.6.”

8.2.7 Error

(1) Error Reset



(a) Condition for Error Reset

(a) This is the condition for Error Reset

This is the condition for Error Reset Command (APM_RST). Once Error Reset is executed, it erases errors of module form each axis.

(b) Error state for each axis

According to exercise from “Chapter 8.2.2 Current State Reading,” it is a signal of “Error state” for each axis. It turns on when an error occurred. Operation will only work when there is no error. If you want to operate a system regardless of errors, you can just inactivate the function.

(c) Address of Positioning Module

In this example, Positioning Module is installed at the 3 slot of 0 bases.

(d) Axis of command execution

You can set an axis for Parameter Setting. XBF-PD02A supports for 2 axes. In the “execution of axis” from the configuration of Parameter Setting, you can set a value 0 or 1.

(e) Cancel output inhibition

You can select whether you cancel output inhibition or not. If 0, doesn’t cancel output inhibition. If 1, cancels output inhibition.

(f) State of Operation complete

If function block is completed without error, “1” will be outputted and maintain “1” until the next operation. If error occurred, “0” will be outputted.

(g) Error State

This is the area that output error no. if there are errors in operation of function block.

Chapter 9 Functions

9.1 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.

9.1.1 Homing method

(1) By DOG

(a) Origin detection after DOG “Off” (0: DOG/HOME (Off))

(b) Origin detection after deceleration when DOG “On” (1: DOG/HOME (On))

(c) Origin detection by DOG (2: DOG)

(2) By not using DOG

(a) Origin detection by origin and high/low limit (3: Upper/Lower limit/HOME)

(b) Origin detection by high/low limit (4: Upper/Lower limit)

※The items that effect to the homing from Software Package parameter are as follows.

9.1.2 Parameters for Homing

(1) Position of Origin
(2) Homing High Speed
(3) Homing Low Speed
(4) Homing acceleration time
(5) Homing deceleration time
(6) Homing dwell time
(7) Origin compensation amount
(8) Homing mode
(9) Homing Direction

- For further information about homing parameters and setting value, please refer to Chapter 4.

9.1.3 Origin Detection after DOG Off (0: DOG/HOME (Off))

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

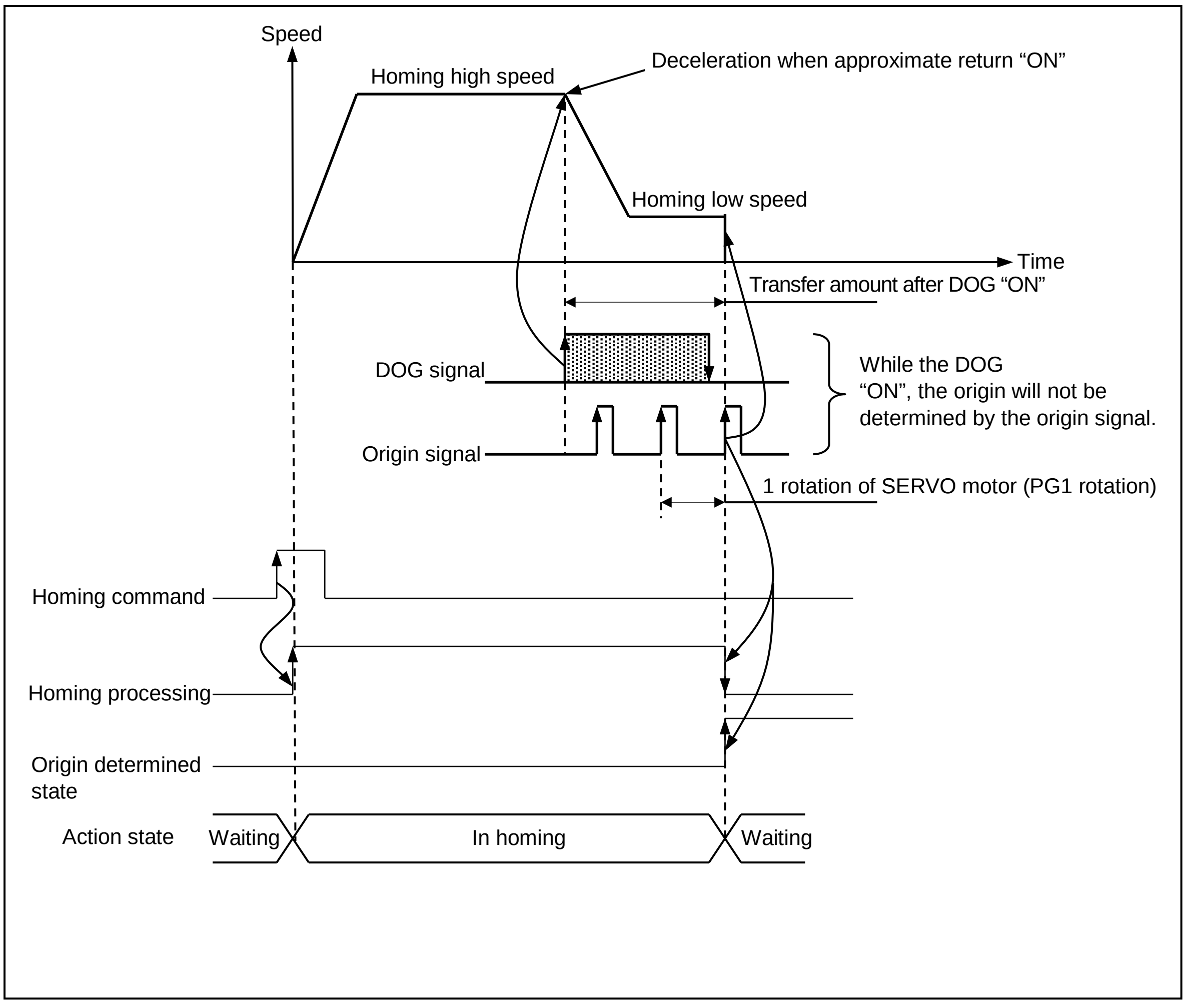
(1) Operation

(a) It accelerates to the setting homing direction and acts by homing high speed.

(b) In this case, if DOG signal is entered, it decelerates and acts by homing low speed.

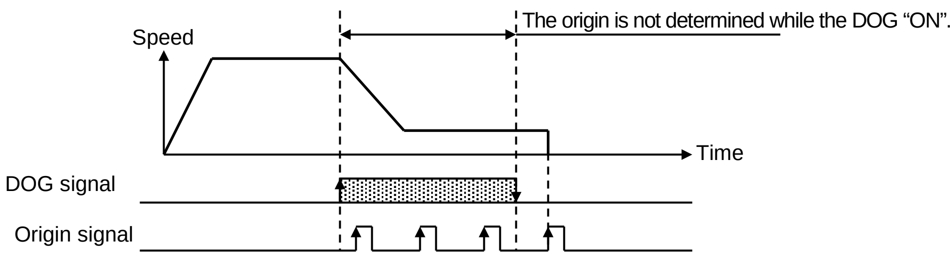
(c) If origin signal is entered after the DOG signal has changed from “On” to “Off”, the origin shall be determined and it stops.

■ Operating Pattern

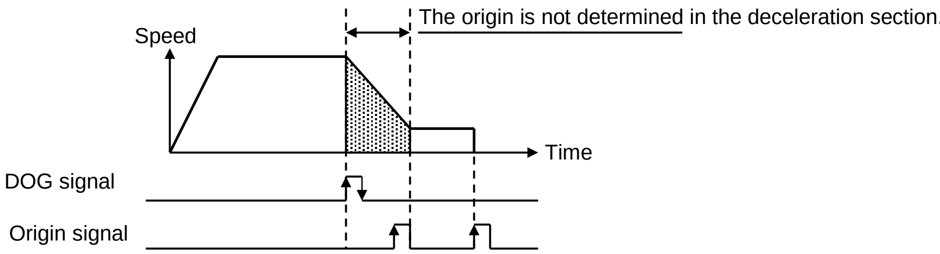


NOTE

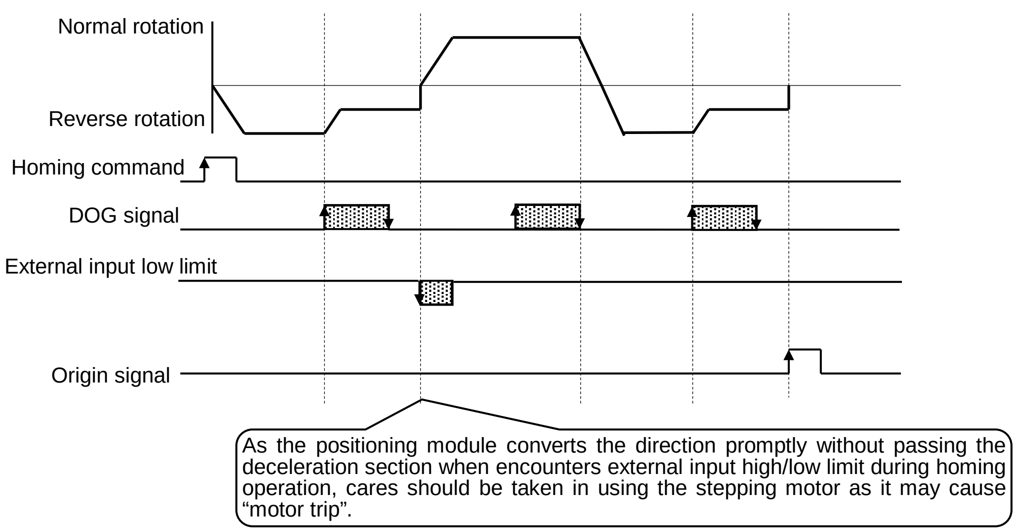
1. While DOG signal maintains “On”, the origin will not be determined by origin signal.
That is, when DOG signal changes from “Off” to “On”(acceleration section -> homing high speed) , from “On” to “Off” (deceleration section -> homing low speed) and then when the origin changes from “Off” to “On”, the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



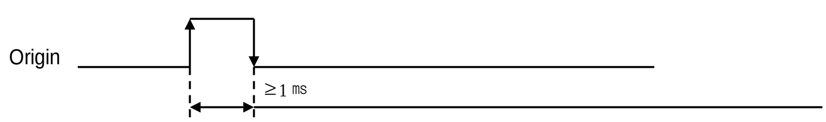
2. While the homing speed acts to the deceleration section by homing high speed after the DOG signal is changed from “Off” to “On”, from “On” to “Off”, the origin will not be determined even if encounters the origin input.



3. If the DOG 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.



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



9.1.4 Origin Detection after Deceleration when DOG On (1: DOG/HOME (On))

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

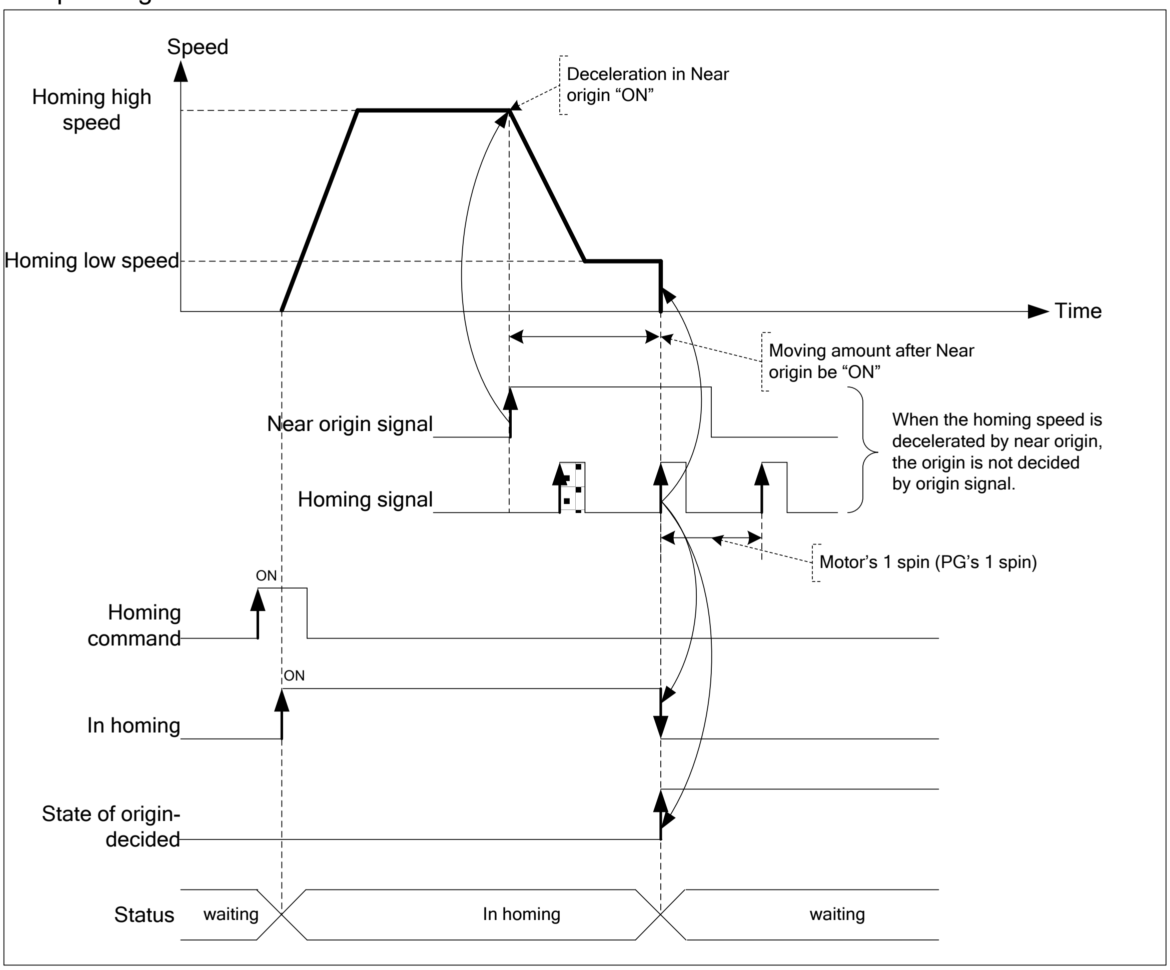
(1) Operation

(a) It accelerates to the setting homing direction and acts by homing high speed.

(b) In this case, if DOG signal is entered, it decelerates and acts by homing low speed.

(c) If encounters the origin signal as external input signal when the DOG is “On” while the homing low speed is active, the origin shall be determined and it stops.

■ Operating Pattern



Note

1. Once the DOG 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 DOG 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 DOG signal has changed from “Off” to “On”, the action will be the same as the method of Article 9.1.3

3. If “On” time of origin signal is short, the positioning module can not recognize it.

9.1.5 Origin Detection by DOG (2: DOG)

This is used when determines the origin only by using the DOG.

(1) Operation

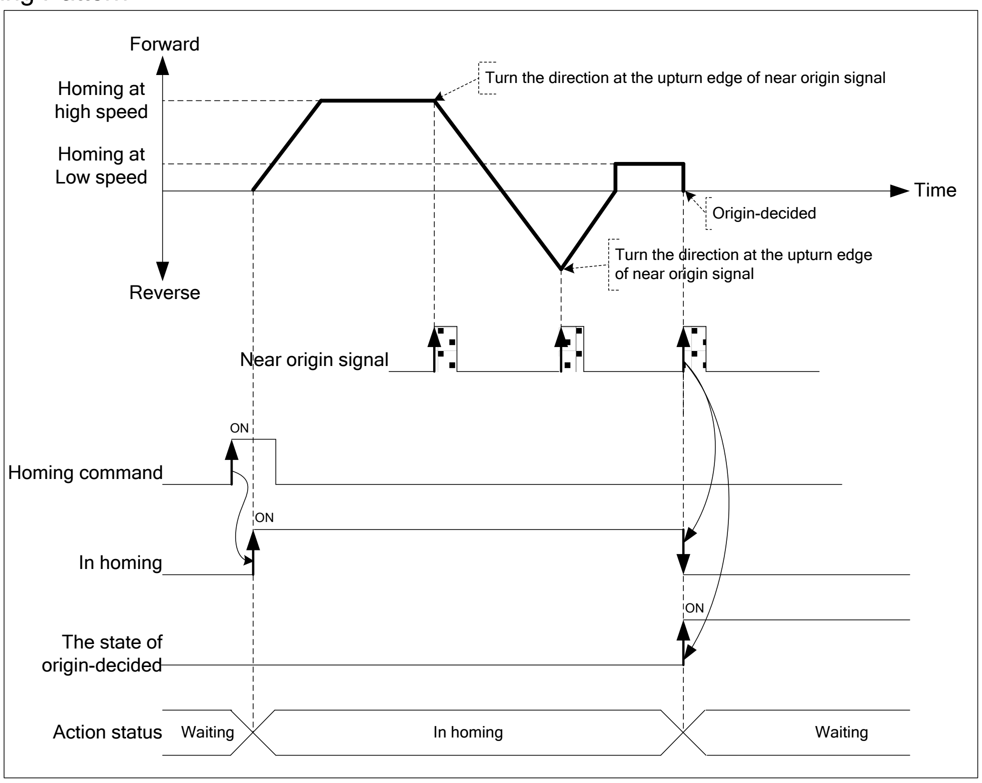
(a) It accelerates to the setting homing direction and acts by homing high speed.

(b) In this case, if DOG signal is entered, it decelerates and transferred to opposite direction acts by homing high speed.

(c) When it operates in opposite direction, if DOG is entered, it decelerates and transferred to opposite direction and acts by homing low speed.

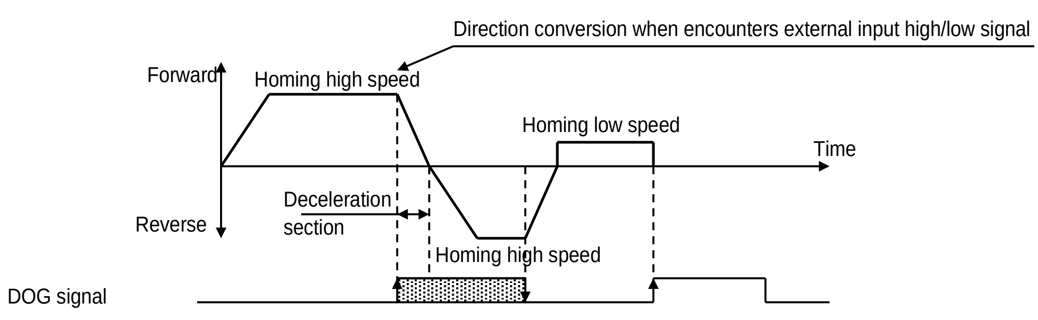
(d) In this case, if encounters DOG origin signal, the origin would be determined and it stops.

■ Operating Pattern



Note

If “ON” time of DOG is longer than deceleration time, the action is as follows.



9.1.6 Origin Detection by Origin and Upper/Lower Limit (3: Upper/Lower Limit/Home)

This is the homing method using external input upper/lower signal and origin signal and is used in case of not using the DOG signal.

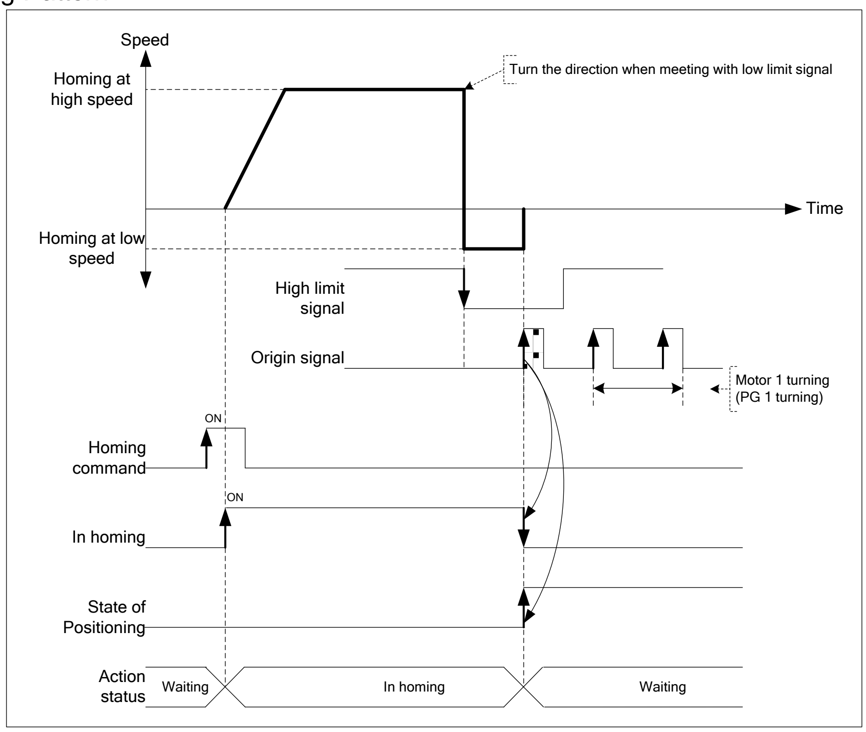
(1) Operation

(a) It accelerates to the setting homing direction and acts by homing high speed.

(b) In this case, if High/Low signal is entered, it transferred to opposite direction and acts by homing low speed.

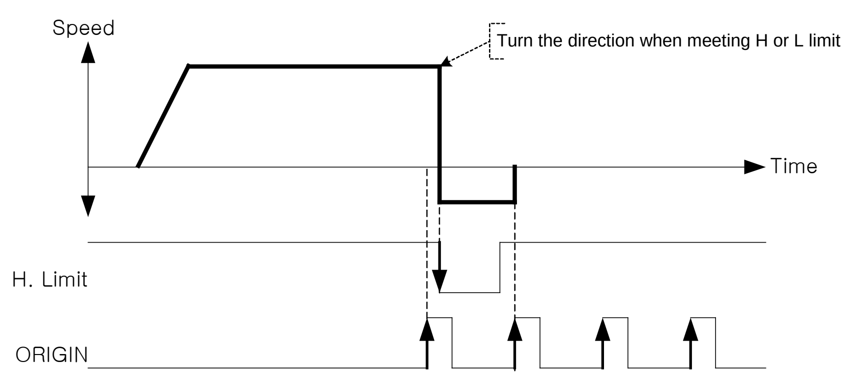
(c) If encounters the origin signals while the homing low speed is active, the origin would be determined and it stops.

■ Operating Pattern



Note

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.



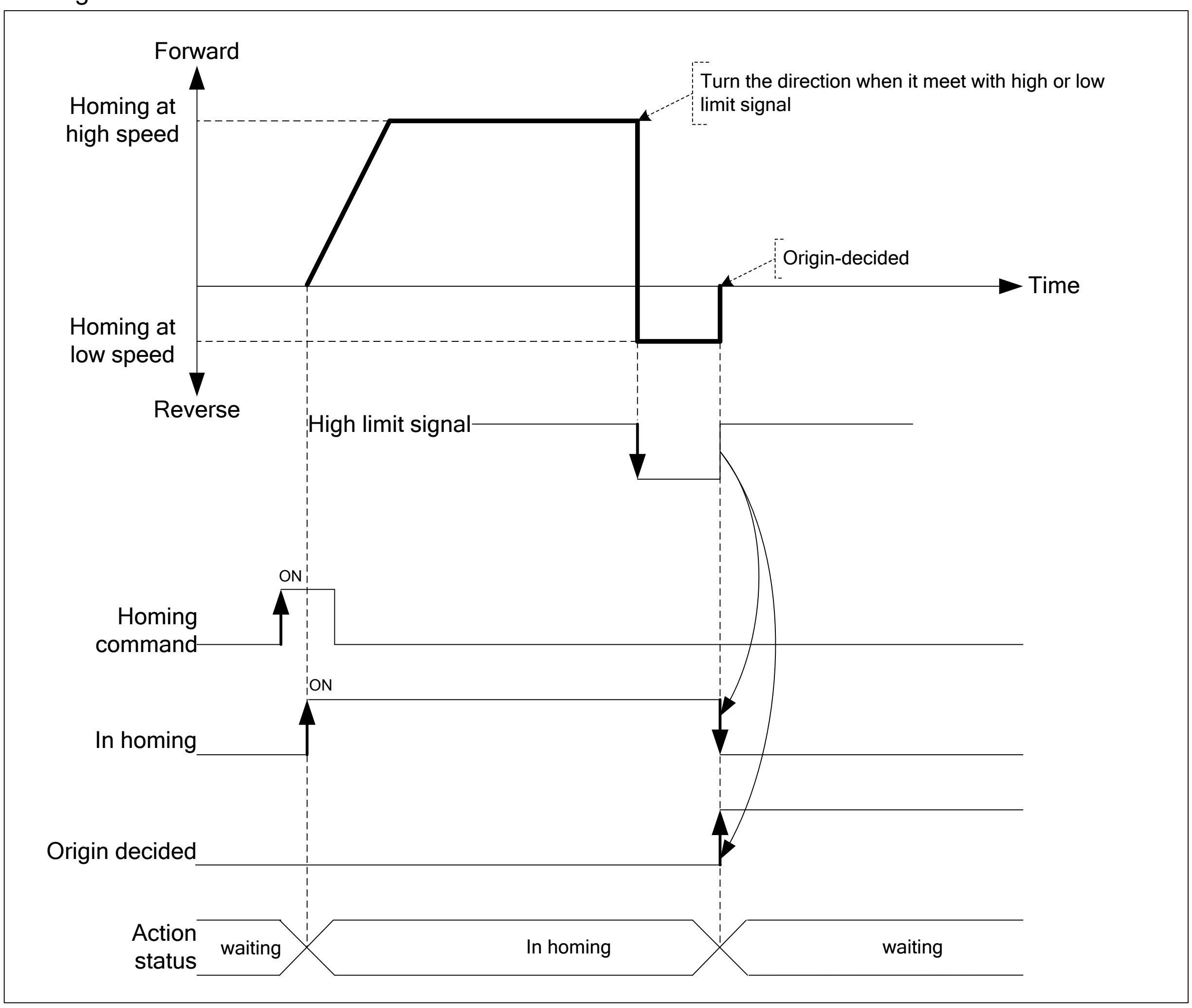
9.1.7 Origin Detection by Upper/Lower Limit (4: Upper/Lower Limit)

This is the homing method using the external input upper/lower limit signal and is used when not using the origin or DOG signal.

(1) Operation

(a) It accelerates to the setting homing direction and acts by homing high speed.
(b) In this case, if High/Low limit signal is entered, it transferred to opposite direction and acts by homing low speed.
(c) If encounters the origin signals while the homing low speed is active, the origin would be determined and it stops.

■ Operating Pattern



9.2 Positioning Control

Positioning control execute using data which set on the 「Operation Data」. Positioning Control includes Shortening Position control, Shortening Speed Control, Shortening Feed Control, Interpolation control, Speed/Position Switching control, Position/Speed Switching control and Position/Torque Switching control.

Positioning Control		Control Method	Operation
Positioning Control	Position Control	Absolute, Position Control Incremental, Position Control	Specified axis executes positioning control from the beginning (current stop position) to the goal position.
	Linear Interpolation	Absolute, Linear Interpolation Incremental, Linear Interpolation	Executing linear interpolation control by using starting address (current stop position) from the axis (2 axes or more) to the target position.
	Circular Interpolation	Absolute, Circular Interpolation Incremental, Circular Interpolation	Execute positioning control until goal position by the trajectory of arc and control sub-axis as using axis-2 according to data of main axis.
Speed Control		Absolute, Speed Control Incremental, Speed Control	Execute Speed control as setting speed until deceleration stop command is entered.
Speed/Position Switching Control		Absolute, Speed Control Incremental, Speed Control	Speed controlling and then speed / position switching command or speed / position control switching input signal is entered, speed control switch to position control and execute positioning control as much as target position.
Position/Speed Switching Control		Absolute, Position Control Incremental, Position Control	Position controlling and then position / speed switching command is executed, position control switch to speed control and execute speed control as setting speed until deceleration stop command is entered.

9.2.1 Operation Data for Positioning Control

Describe the Operation data and Setting to execute positioning control.

Operation Data	Setting
Control Method	Set the Type of control and Standard coordinates of Positioning control.
Operation pattern	Select one among END, KEEP, CONT
Control method	Select one among position control and speed control
Operation Method	Set the control method of continuous operation data.
Repeat step	In case of Repeat operation, sets the step to repeat.
Goal Position	Set the absolute target position or distance of positioning control.
Operation Speed	Set the value of operation speed during operation control.
Cir. Int. aux. point	Set the value of auxiliary point (MID, CENTER, RADIUS) in case of circular interpolation
Cir. Int. mode	Set how to create circular arc (MID, CENTER, RADIUS).
M Code	Set the M Code when using the code number for sub operation of positioning control.
Acceleration Number	Set the operation number of operation control during acceleration time. Acceleration Number is selected from basic parameters which are Acceleration Number1, 2, 3, and 4.
Deceleration Number	Set the operation number of operation control during deceleration time. Deceleration Number is selected from basic parameters which are Deceleration Number1, 2, 3, and 4.
Dwell Time	After complete the positioning control, set the time until servo drive complete positioning control.
Cir. Int. Turns	Set the number of arcs to draw during circular interpolation.
Cir. Int. direction	Set the direction in case of circular interpolation
Cir. Int. Size	Set the size of circular arc in case of circular interpolation middle point method

Note

It is available to set the operation data each of 1~150 steps for each axis.

9.2.2 Operation mode of Positioning Control

Operation mode describes various configurations 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 Method	Operation Pattern		Operation
Positioning Control	Single	End	○	Terminated after the completion of the current step position control
		Keep	○	Continue to the next step after the completion of the current step position control
		Continuous	○	The current step and the next step in a continuous drive speed
	Repeat	End	○	Repeat the step after the completion of the current step position control to change the step number
		Keep	○	Repeat the step after the completion of the current step position control continues to drive
		Continuous	○	Repeat the step and the successive steps in the current driving speed
Speed Control	Single	End	○	Speed control drive of the driving data to the current step
		Keep	○	Speed control drive of the driving data to the current step After completing the following steps VTP control orders continue to drive location
		Continuous	X	Errors
	Repeat	End	○	Speed control drive of the driving data to the current step
		Keep	○	Speed control drive of the driving data to the current step Repeat the step after the completion of location control, VTP orders continue to drive
		Continuous	X	Errors
Linear Interpolation	Single	End	○	Terminated after the completion of the current step-linear interpolation
		Keep	○	The next step after the completion of the staff continue to drive a straight line interpolation
		Continuous	X	Errors
	Repeat	End	○	Repeat the step after the completion of the current staff, continue to drive a straight line interpolation
		Keep	○	Repeat the current step and the successive steps to speed linear interpolation driving
		Continuous	X	Errors
Circular Interpolation	Single	End	○	After completing the current step termination arc interpolation
		Keep	○	The next step after the completion of the staff continue to drive the arc interpolation
		Continuous	X	Errors
	Single	End	○	Repeat the step after the completion of the current staff, continue to drive the arc interpolation
		Keep	○	Repeat the step and the successive steps in the current arc interpolation drive speed
		Continuous	X	Errors

Note

1, Operation mode shall be set from PLC Program or Operation data.

2. Operation data can be set up to 150 from operation step no. 1 ~ 150 at each axis.

3. 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.

(1) End Operation (Single)

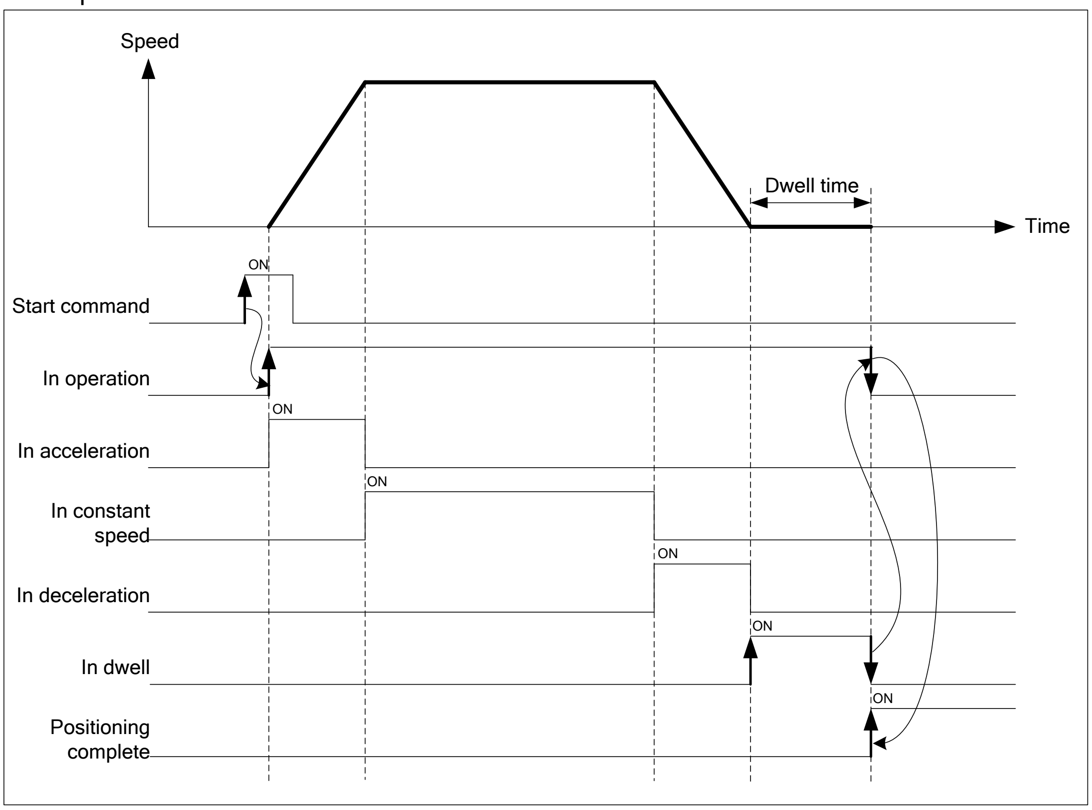
(a) With one time start command, the positioning to the goal position is executed and the positioning shall be completed at the same time as the dwell time proceeds.

(b) The positioning completion of this operation mode can be used as operation mode of last positioning data of Go-on operation mode and Continuous operation mode.

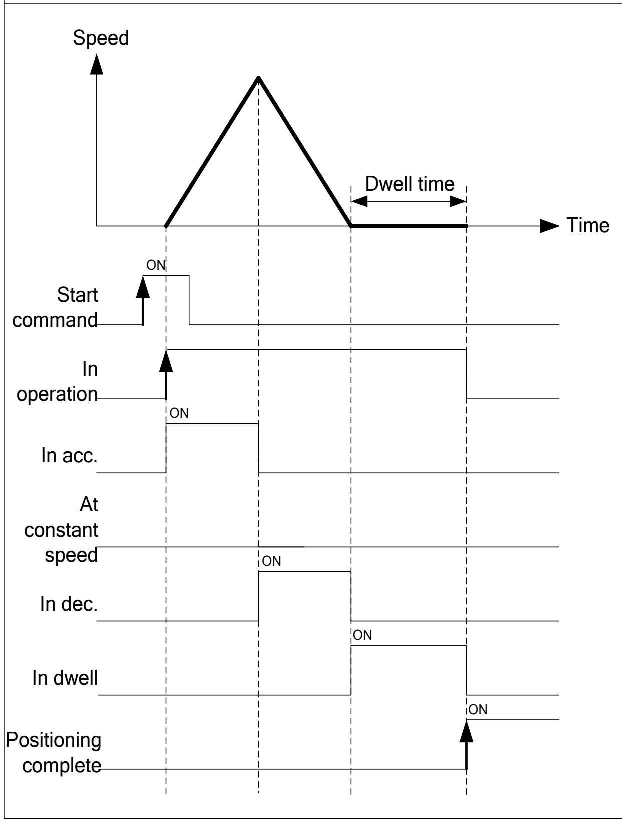
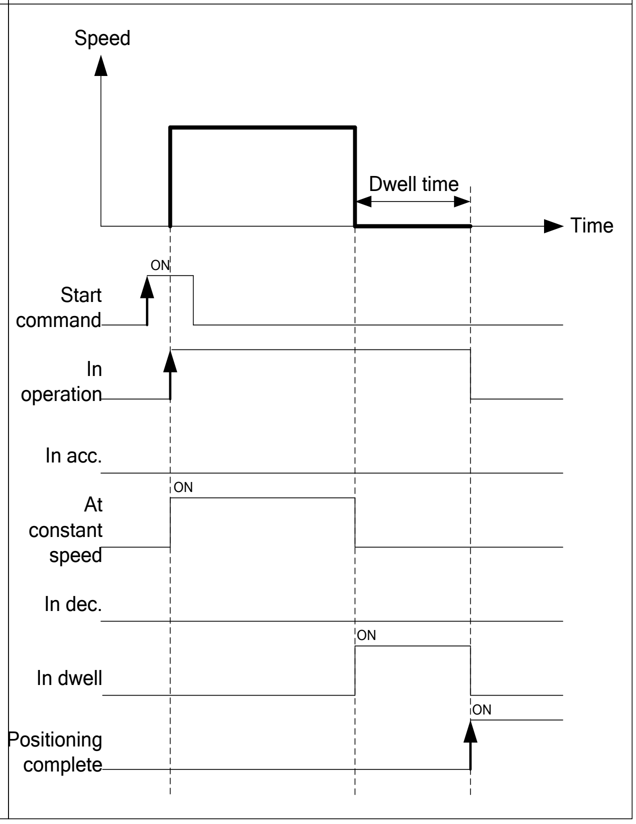
(c) Operation direction shall be determined by the value of address.

(d) 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.

1) Normal Operation Patterns



2) Abnormal Operation Patterns

Increase the operation speed by comparing with moving amount	Acc. time = 0, Dec. time = 0
	

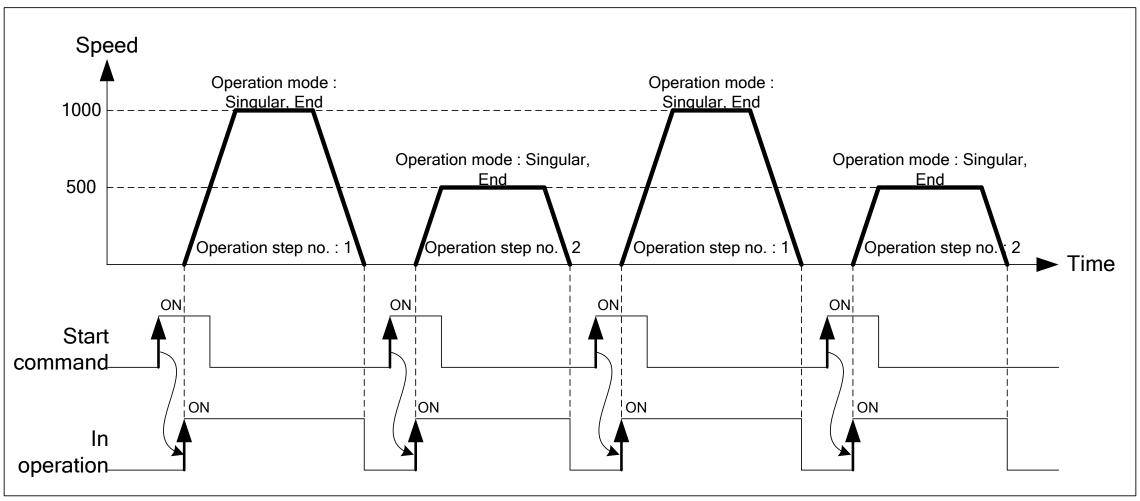
[Example] - When operating only by Start Command [when setting the step no. as "0" by indirect start

- Starting command execute total four times.

■ Setting of XG5000

Step NO.	Coord.	Control	Method	Pattern	Goal Position [pls]	Operation Speed [pls/s]	Accel NO.	Decel NO.	M Code	Dwell Time
1	ABS	POS	SIN	END	10000	1000	No.1	No.1	0	0
2	ABS	POS	SIN	END	15000	500	No.1	No.1	0	0
3	ABS	POS	SIN	END	25000	1000	No.1	No.1	0	0
4	ABS	POS	SIN	END	30000	500	No.1	No.1	0	0

■ Operation Pattern



Operating step that execute according to starting command order will be [1] → [2] → [3] → [4].

(2) End Operation (Repeat)

(a) 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.

(b) 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.

(c) 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.

(d) In case that operation step is set as the value except "0" (1~150) 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.

(e) Operation direction shall be determined by position address.

(f) Repeat operation step no. change command is available to execute during operation.

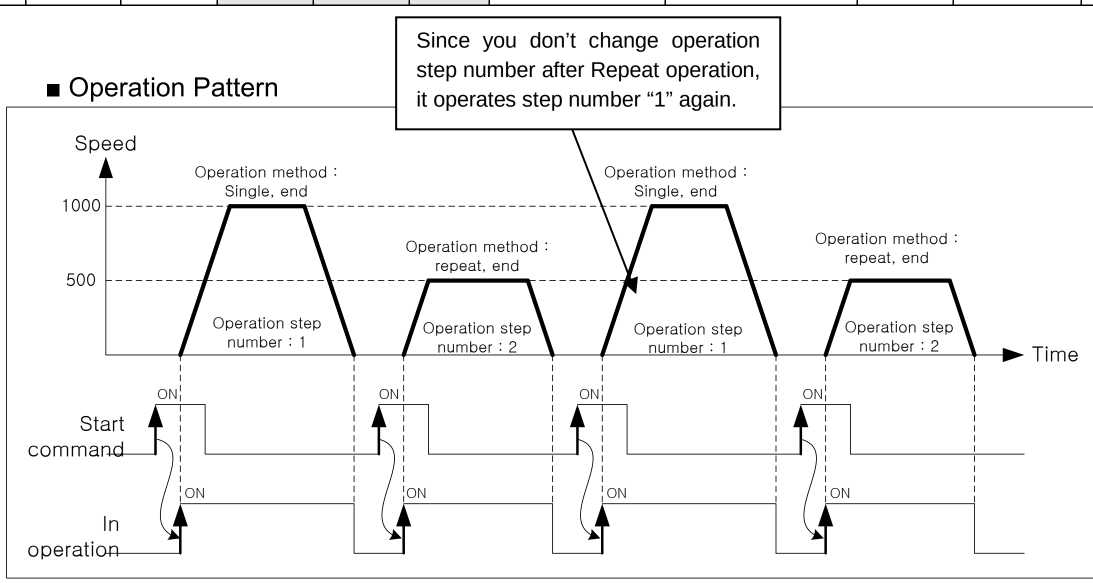
[Example 1] - When operating only by Start Command [when setting the step no. as "0" by indirect start

- Starting command execute total four times.

■ Setting of XG5000

Step NO.	Coord.	Control	Method	Pattern	Rep. step	Goal Position [pls]	Operation Speed [pls/s]	Accel NO.	Decel NO.	M Code	Dwell Time
1	ABS	POS	SIN	END	0	10000	1000	No. 1	No. 1	0	0
2	ABS	POS	REP	END	1	15000	500	No. 1	No. 1	0	0
3	ABS	POS	SIN	END	0	25000	1000	No. 1	No. 1	0	0
4	ABS	POS	REP	END	1	30000	500	No. 1	No. 1	0	0

■ Operation Pattern



Operating step that execute according to starting command will be [1] → [2] → [1] → [2].

Operating step 3, 4 will not execute.

(3) Keep Operation

(a) 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.

(b) Go-on operation mode is available to execute several operation steps in order.

(c) Set the operation pattern by 'End' when executing the last step of Go-on operation.

(d) When operation pattern is Go-on (or continuous), continue operation until operation pattern come out as 'End'. Therefore, if there is no 'End' operation pattern, execute the operation data 400 times. When 400 times operation pattern is not the end, error occurs and operation will be stop. When 400 times operation steps is 'Go-on' and 'Continuous', execute operation data of Repeat Step Number.

(e) Operation direction shall be determined by setting value of goal position.

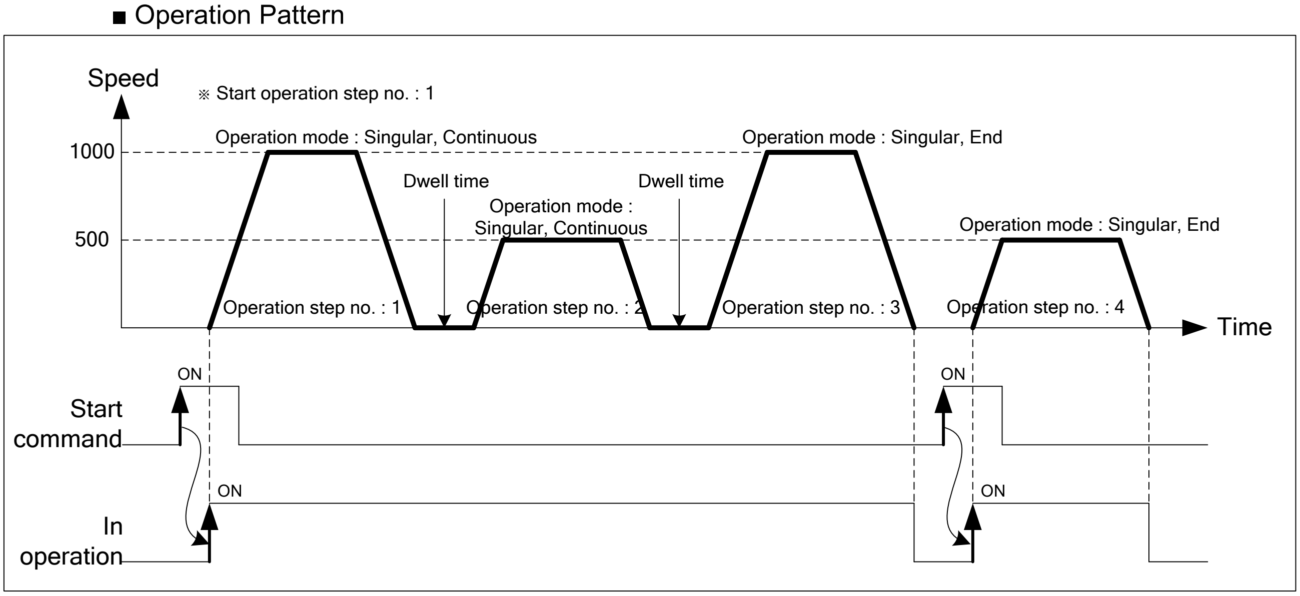
[Example] - When operating only by Start Command [when setting the step no. as “0” by indirect start

- Starting command execute total two times.

■ Setting of XG5000

Step NO.	Coord.	Control	Method	Pattern	Goal Position [pls]	Operation Speed [pls/s]	Accel NO.	Decel NO.	M Code	Dwell Time
1	ABS	POS	SIN	Keep	10000	1000	N0.1	N0.1	0	0
2	ABS	POS	SIN	Keep	15000	500	N0.1	N0.1	0	0
3	ABS	POS	SIN	END	25000	1000	N0.1	N0.1	0	0
4	ABS	POS	SIN	END	30000	500	N0.1	N0.1	0	0

■ Operation Pattern



Operating step that execute according to starting command order will be [1→ 2 → 3] → [4].

(4) Continuous Operation

(a) 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.

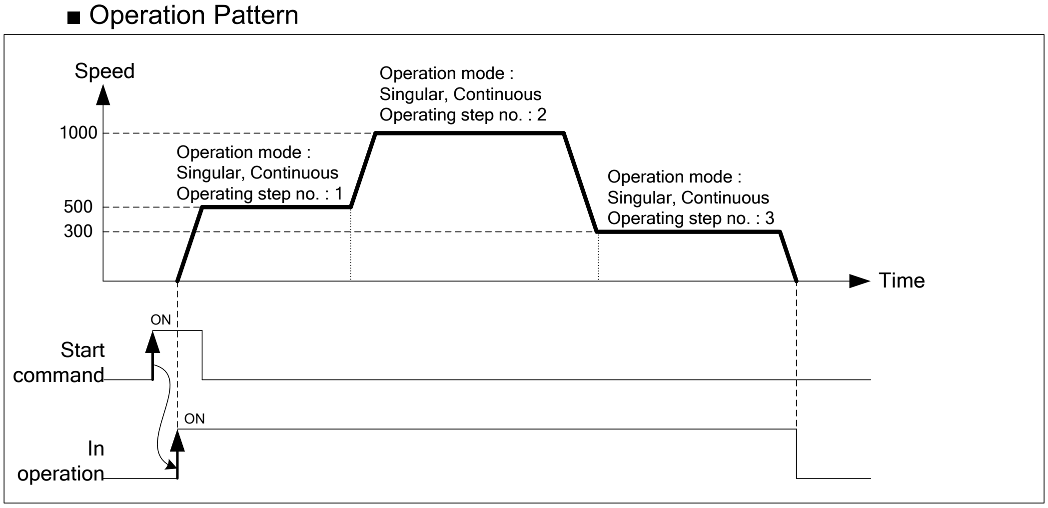
(b) Steps of dwell time set as 'Continuous' operation mode is ignored, steps of dwell time set as 'End' operation pattern is valid.
(c) When you execute 'Continuous' operation mode, always set as 'End' for the very last operation step.
(d) In case direction changes during 'Continuous Operation', error code 511 occurs and positioning stops. In case of changing direction, use END, KEEP Operation.

[Example] - When operating only by Start Command [when setting the step no. as "0"
by indirect start
- Starting command execute once.

■ Setting of XG5000

Step NO.	Coord.	Control	Method	Pattern	Goal Position [pls]	Operation Speed [pls/s]	Accel NO.	Decel NO.	M Code	Dwell Time
1	ABS	POS	SIN	CONT	10000	500	Once	Once	0	0
2	ABS	POS	SIN	CONT	15000	1000	Once	Once	0	0
3	ABS	POS	SIN	END	25000	300	Once	Once	0	0

■ Operation Pattern



Operating step that execute according to starting command order will be [1 → 2 → 3].

9.2.3 Positioning Control

After executed by the start positioning operation command (「Direct start」, 「Indirect start」, 「Simultaneous start」), positioning control from specified axis (the current stop position) to goal position (the position to move).

(1) Control by Absolute method (Absolute coordinate)

(a) Positioning control from start position to goal position (the position assigned by positioning data). Positioning control is carried out based on the position assigned (origin position) by homing.

(b) Transfer direction shall be determined by start position and goal position.

▶Start position < Goal position: forward direction positioning

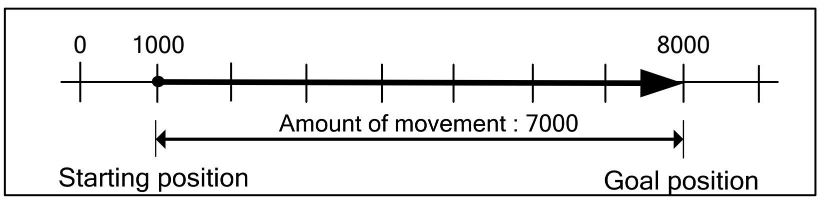
▶Start position > Goal position: reverse direction positioning

[Example] Set the Incremental Coordinates as follow, Operate shortening positioning control.

▷Start position: 1000,

▷Goal position: 8000

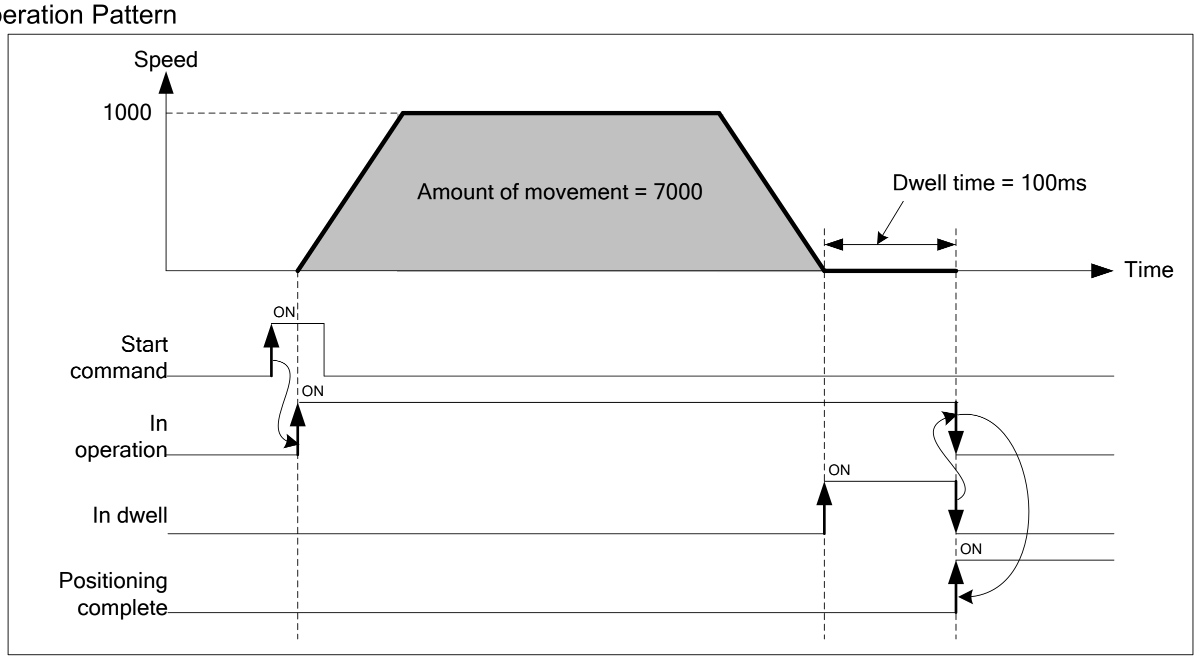
The transfer amount to forward direction shall be 7000 (7000=8000-1000).



■ Setting of XG5000

Step NO.	Coord.	Control	Method	Pattern	Goal Position [pls]	Operation Speed [pls/s]	Accel NO.	Decel NO.	M Code	Dwell Time
1	ABS	POS	SIN	END	8000	1000	No.1	No.1	0	100

■ Operation Pattern



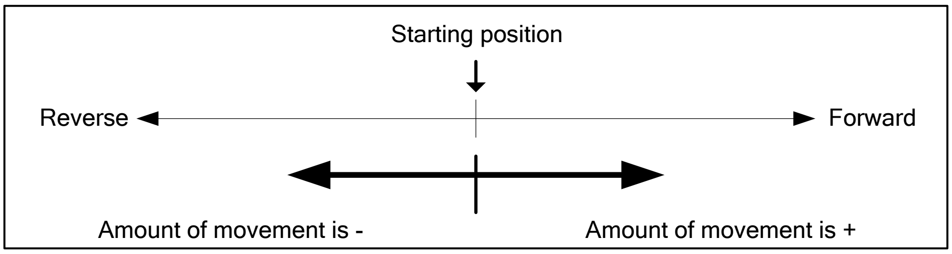
(2) Control by Incremental method (Incremental coordinate)

(a) Positioning control as much as the goal transfer amount from start position. Unlike the absolute coordinates of goal position, it is not a value of specified on goal position; it is a moving amount of current position.

(b) Transfer direction shall be determined by the sign of transfer amount.

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

▷Transfer direction (-) : reverse direction (current position decrease) positioning

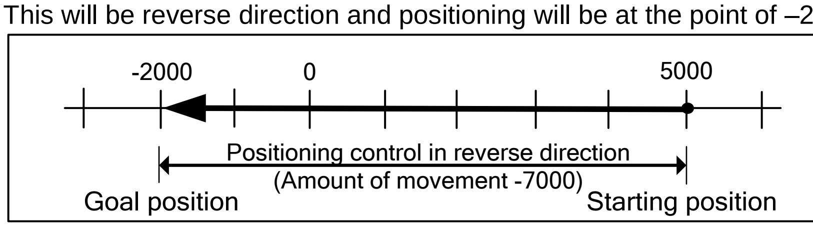


[Example] Set the Incremental Coordinates as follow, Operate shortening positioning control.

▷ Start address : 5000,

▷Goal address : -7000

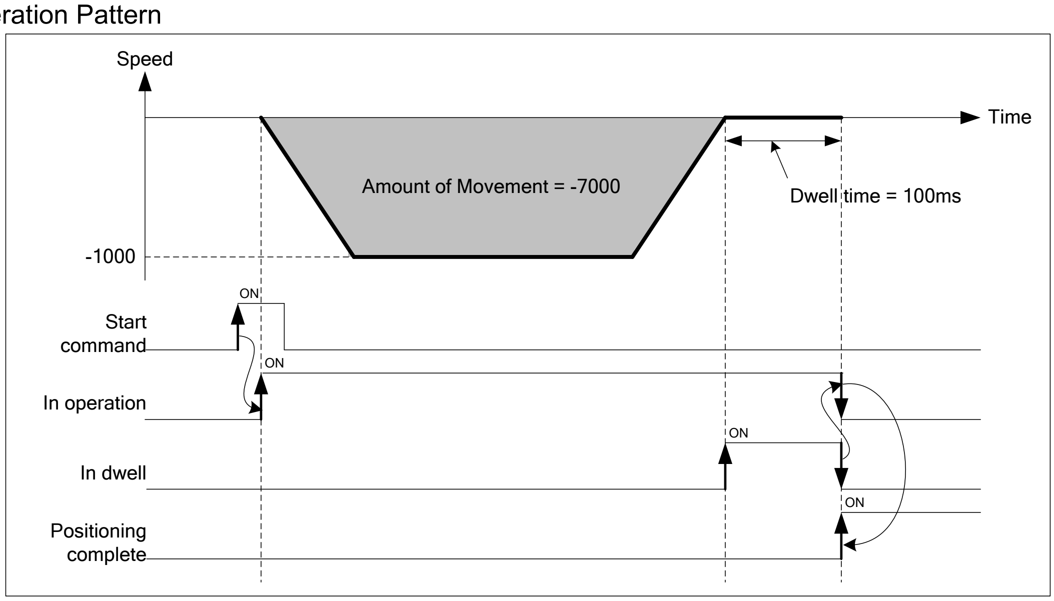
This will be reverse direction and positioning will be at the point of –2000.



■ Setting of XG5000

Step NO.	Coord.	Control	Method	Pattern	Goal Position [pls]	Operation Speed [pls/s]	Accel NO.	Decel NO.	M Code	Dwell Time
1	INC	POS	SIN	END	-7000	1000	N0.1	N0.1	0	100

■ Operation Pattern



9.2.4 Speed Control

After executed by the start positioning operation command (「Direct start」, 「Indirect start」, Simultaneous start」), this controls the speed by the setting speed until deceleration stop command is entered.

(1) Features of Control

(a) Speed control contains 2 types of start : Forward direction start and Reverse direction start.

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

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

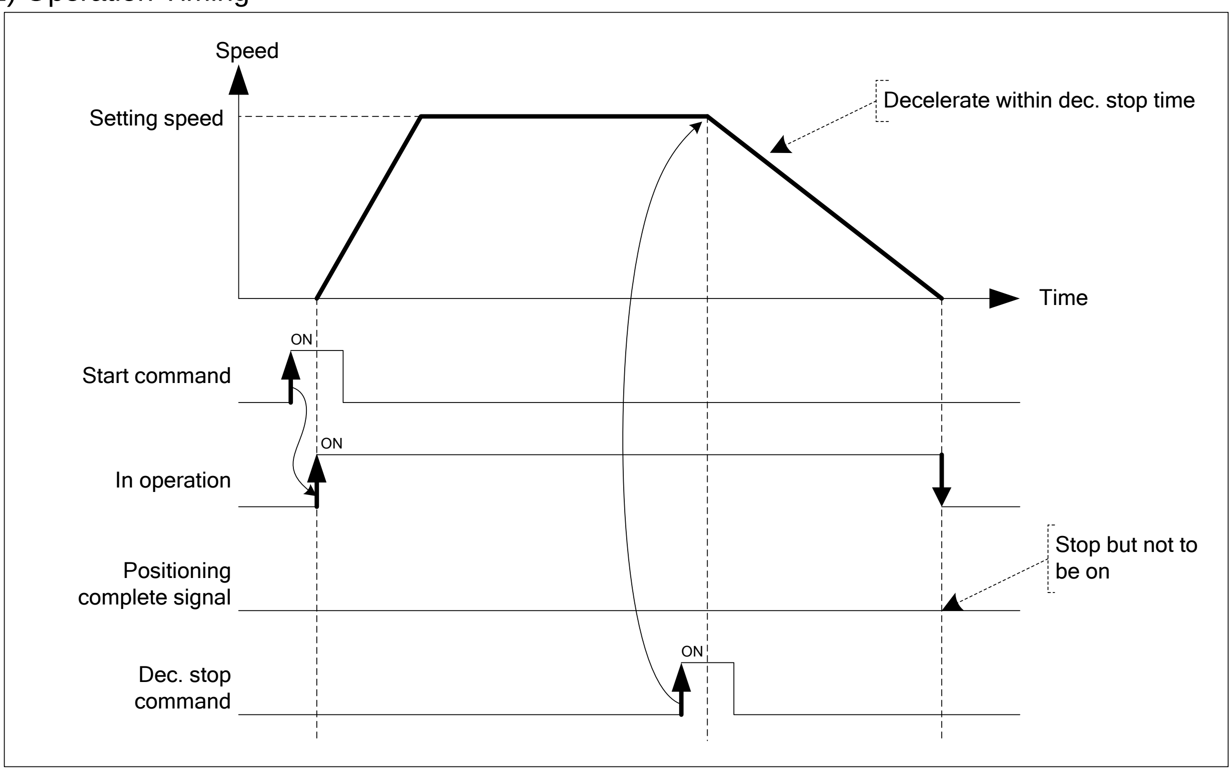
(b) In case of using speed control, the following items of operation data do not affect.

▷ Coordinates, Operation method, Dwell time

▷ “Absolute, shortening speed control”, “Incremental, shortening speed control” execute same operation.

(c) Accelerating operation of speed control operate with acceleration number and time on setting data, decelerating operation operate with deceleration number and time of a command 「deceleration stop」.

(2) Operation Timing



(3) Restrictions

(a) Set the operation pattern of speed control as 'End' or 'Go-On'. When it is set on "Continuous", error occurs (error code: 236) and can not execute speed control.

(b) Using as speed control, only when「M code mode」 of extended parameter is "with", M code signal is "On".

(Using "After mode", M code signal is not "On".)

(c) Speed control of software upper/lower limit checking change according to the setting of the speed control of software upper/lower limit check.

Item	Setting Value	Contents
During Speed Control Soft Upper/Lower limit	0 : Not Detected	During Speed Control, do not operate to check the range of upper/lower limit of software
	1 : Detected	During Speed Control, operate to check the range of upper/lower limit of software

(4) Setting of XG5000

Step NO.	Coord.	Control	Method	Pattern	Goal Position [pls]	Operation Speed [pls/s]	Accel NO.	Decel NO.	M Code	Dwell Time
1	ABS	SPD	SIN	END	100	1000	N0.1	No.1	0	0

9.2.5 Linear Interpolation Control

Executes interpolation control from starting position to the goal position with interpolation axis set as the main axis and sub axis

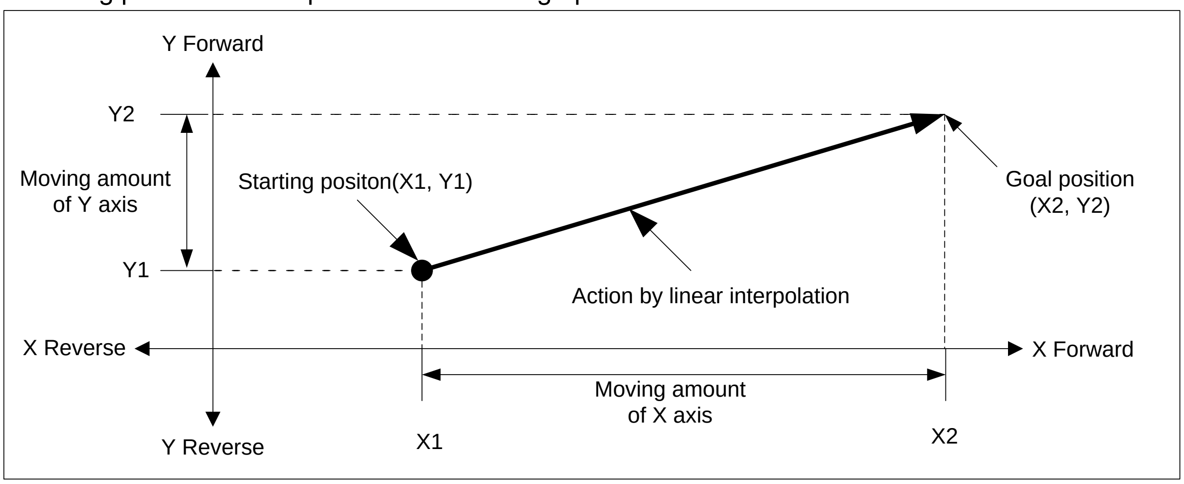
(1) Linear interpolation control with absolute coordinates

(a) Execute linear interpolation from starting position to the goal position designated on positioning data. Positioning control is on basis of the designated position from homing.

(b) The direction of movement depends on the starting position and the goal position for each axis.

■ Starting position < Goal position : Positioning operation in forward

■ Starting position > Goal position : Positioning operation in reverse



Note

Because more than 2 axes are in action, so need user to pay attention

1. Available pattern is END, KEEP and available method is SIN, REP. In case of using CONT, it operates as KEEP.
2. The available auxiliary commands are as follows.
   ▪ DEC. stop, EMG. stop
3. The commands unavailable in linear interpolation are as follows.
   ▪ Position/Speed switching control, Position override, Speed override, Position specified speed override
4. Main and sub axis are determined depending on movement amount.
   (1) main axis: movement amount is larger between axis X and axis Y
   (2) sub axis: movement amount is smaller between axis X and axis Y
5. The parameter items which work depending on the value of each axis are as follows.
   ▪ Backlash compensation, Software high/low limit

(c) Setting example of operating data

Setting items	Main-axis setting	Sub-axis setting	Description
Control method	ABS	ABS	Sets the coordinate method
Pattern	END	-*1	Sets the pattern of main axis
Control	POS	-	Sets the control method of main axis
Method	SIN	SIN	Sets the operation method of linear interpolation
Goal position [pls]	10000	5000	Set the goal position to position on main-axis and sub-axis
Operating speed [pls/s]	1000	-	Use speed-designated method of main axis for linear interpolation
Acc. no.	No.1	-	Set acc. no. for acceleration (no.1 ~ no.4)
Dec. no.	No.2	-	Set dec. no. for deceleration. (no.1 ~ no.4)
M code	0	-	When need to execute auxiliary work synchronizing with linear interpolation
Dwell time	500	-	Set dwell time(ms) to outputting the signal positioning completion

- *1 : It does not need to be set. Whatever value is set as, it does not affect linear interpolation.

[Example] axis X and axis Y are main and sub axis each. Execute linear interpolation by the setting as follows.

■ Starting position (1000, 4000), Goal position (10000, 1000)

In this condition, the operation is as follows.

■ Setting example of XG5000

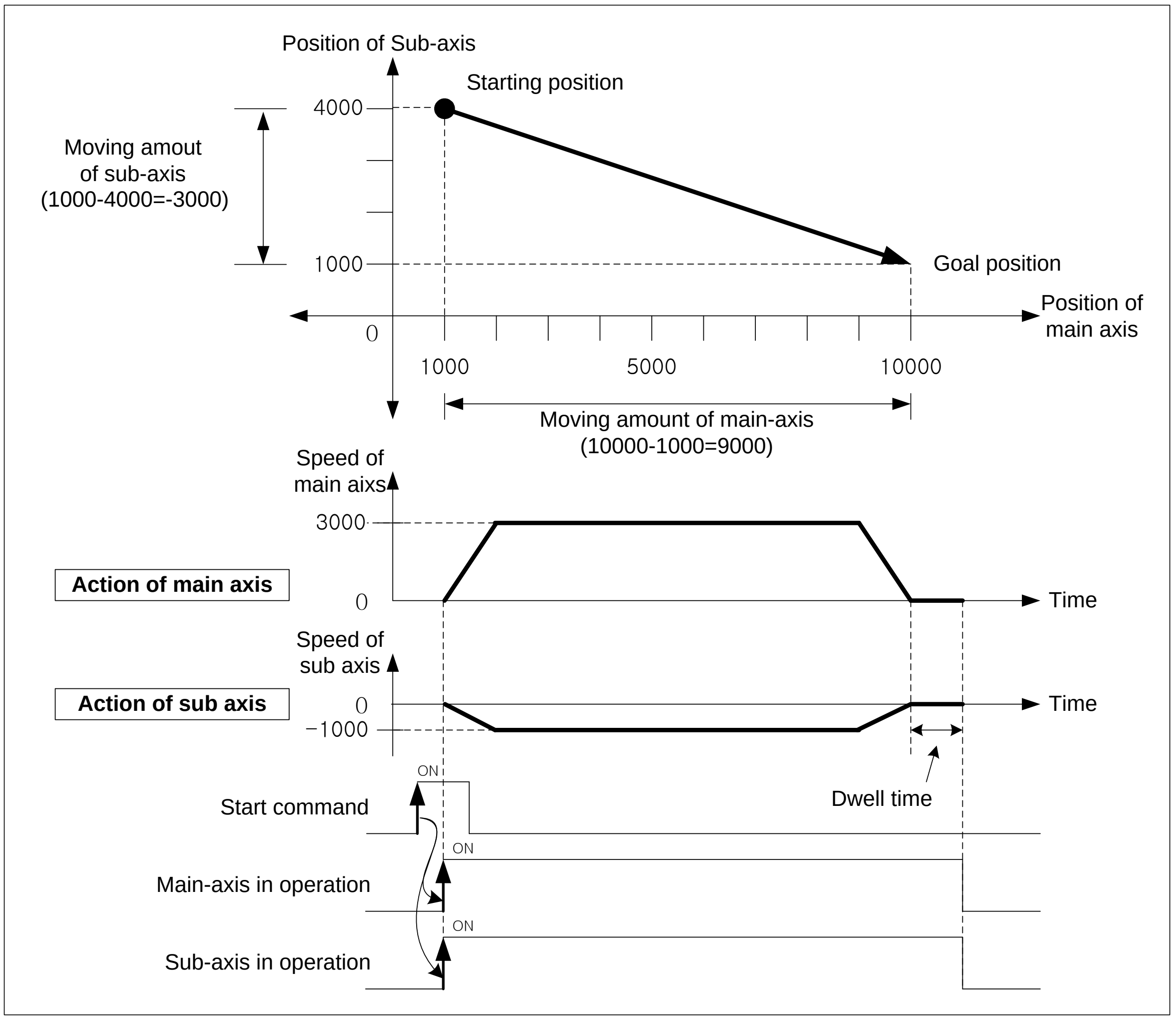
▪ Operating data of main-axis (axis X)

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. no.	Dec. no.	M code	Dwell time
1	ABS	POS	SIN	END	10000	3000	No.1	No.1	0	100

▪ Operating data of sub-axis (axis Y)

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. no.	Dec. no.	M code	Dwell time
1	ABS	POS	SIN	END	1000	3000	No.1	No.1	0	100

■ Operating pattern



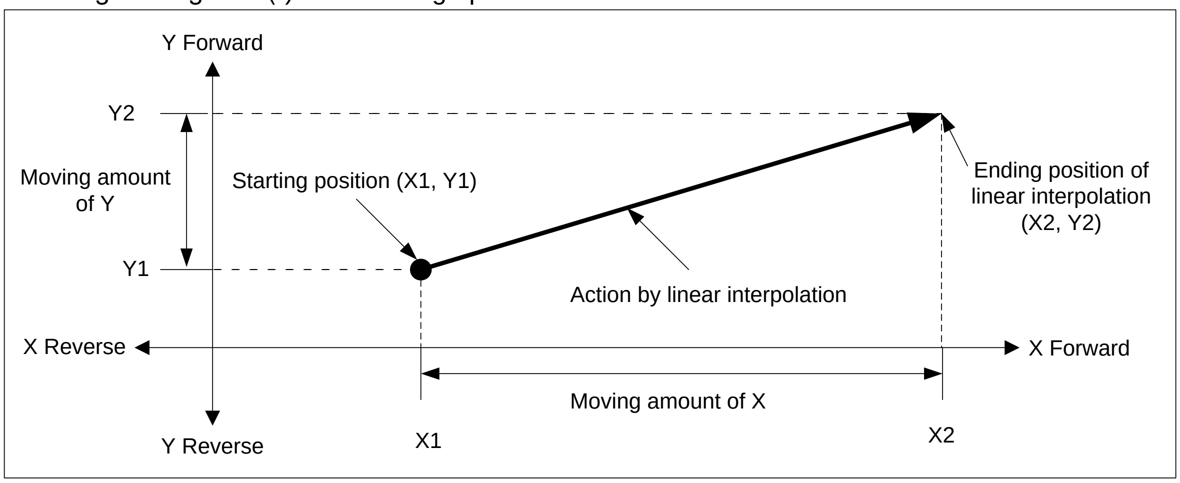
(2) Linear interpolation control with Incremental coordinates

(a) Execute 2 axes linear interpolation from starting position to the goal position. Positioning control is on basis of the current stop position.

(b) Moving direction depends on the sign of the goal position (Moving amount)

■ The sign is positive (+ or nothing) : Positioning operation in forward

■ The sign is negative (-) : Positioning operation in reverse



[Example] axis X and axis Y are main and sub axis each. Execute linear interpolation by the setting as follows.

■ Starting position (1000, 4000), Goal position (9000, -3000)

In this condition, the operation is as follows.

■ Setting example of XG5000

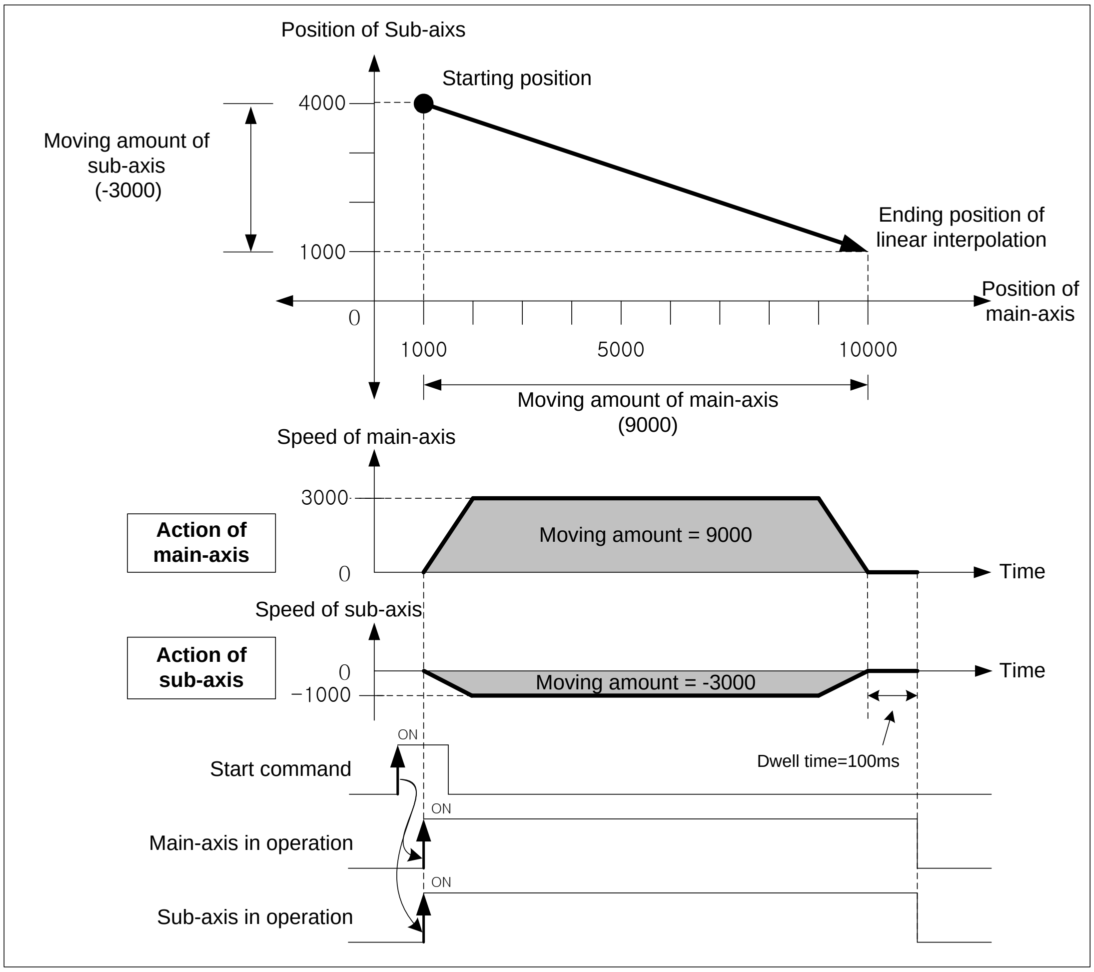
▪ Operating data of main-axis (axis X)

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. no.	Dec. no.	M code	Dwell time
1	INC	POS	SIN	END	9000	3000	No.1	No.1	0	100

▪ Operating data of sub-axis (axis Y)

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. no.	Dec. no.	M code	Dwell time
1	INC	POS	SIN	END	-3000	0	No.1	No.1	0	0

■ Operating pattern



$$\text{Interpolating speed}\,(F) = \sqrt{V_x^{\,2} + V_y^{\,2}}$$

9.2.6 Designate Midpoint of Circular Interpolation

Operates interpolation following the path of circular which is through midpoint that is set by 2 axes

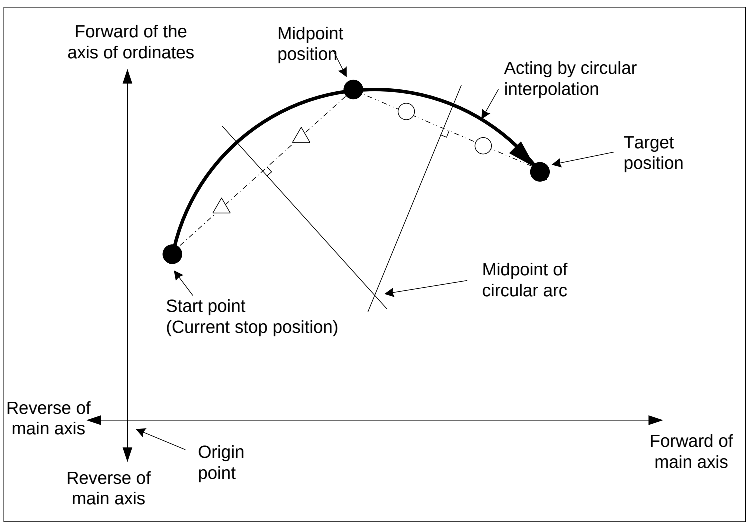
And, available to execute circular interpolation of over 360 degrees by the set circular interpolation turns

(1) Control of circular interpolation by absolute coordinate, designate midpoint

(a) Operate circular interpolation from starting point and pass the midpoint that is set operation data to target point.

(b) To be made path of circular interpolation with start position, midpoint and a crossing which is perpendicular divide equally position of midpoint and target position.

(c) Movement direction is decided automatically depends on set target position and auxiliary point of circular interpolation.



(d) Restriction

▪ User can't draw circle which is starting point same with last point on the circular interpolation of midpoint designation method. If you want to draw circle, please use method of midpoint.

▪ User cannot progress circular interpolation of midpoint designation method with following cases.

▪ Midpoint that is designated as auxiliary point same with start position or target position. (Error code : 284)

▪ In case of start position same with target position (Error code : 285)

▪ In case of calculated radius of circular arc exceed 2,147,483,647pls (Error code : 286)

▪ In case of auxiliary position and target position in a straight line from start position, (Error code : 287)

Note

Because more than 2 axes are in action, so need user to pay attention

1. Available pattern is END, KEEP and available method is SIN, REP. In case of using CONT, it operates as KEEP.
2. The available auxiliary commands are as follows.
   ▪ DEC. stop, EMG. stop
3. The commands unavailable in linear interpolation are as follows.
   ▪ Position/Speed switching control, Position override, Speed override, Position specified speed override
4. Main and sub axis are determined depending on movement amount.
   (1) main axis: movement amount is larger between axis X and axis Y
   (2) sub axis: movement amount is smaller between axis X and axis Y
5. The parameter items which work depending on the value of each axis are as follows.
   ▪ Backlash compensation, Software high/low limit

(e) Example of setting operation data

Setting item	Main axis setting	Sub axis setting	Contents
Coord.	ABS	-*1	Set the coordinate method of main axis
Pattern	END	-	Set the operation pattern of main axis
Control	POS	-	Set control method of main axis
Method	SIN	-	Set operation method for circular interpolation.
Target position [pls]	10000	0	Set the target position for positioning on the main axis and sub axis.
Operation speed [pls/s]	1000	-	Circular interpolation use method of designating composition speed
Acceleration speed	No.1	-	Set the acceleration time No. for acceleration. (No.1 ~ 4)
Deceleration speed	No.2	-	Set the deceleration time No. for deceleration. (No.1 ~ 4)
M code	0	-	Set it for progressing auxiliary operation depends on circular interpolation operation.
Dwell time	500	-	set the dwell time taken until plc outputs the signal which informs users of finishing the position decision
Circular interpolation Auxiliary point	5000	5000	Set midpoint for passing circular arc on the method of the designating midpoint.
Circular interpolation mode	MID	-	In case of using the method of designating midpoint, set 「midpoint」 on the main axis.
Circular interpolation Turns	0	-	When user want to draw circle which is over 360 degrees, set the number of rotations of circular arc.

- *1 : Do not need setting. Whatever you set, there is no effect to circular interpolation.

Note

The circular interpolation control of the method of designating midpoint operate by standards of set item on the operation data of main axis (command axis).
When circular interpolation operation of the method of designating midpoint, there is no effect except for「Target position」, 「Auxiliary point of circular interpolation」 on the axis of setting. What ever you take for the value, there is no effect to operate, there is no error.

[Example] Operate circular interpolation of designating midpoint and absolute coordinate (main axis; axis X, sub axis; axis Y)

■ In case of Start position (0, 0), Target position (10000, 6000), Auxiliary point (2000, 6000), operation is as follows;

■ Example of setting in the XG5000

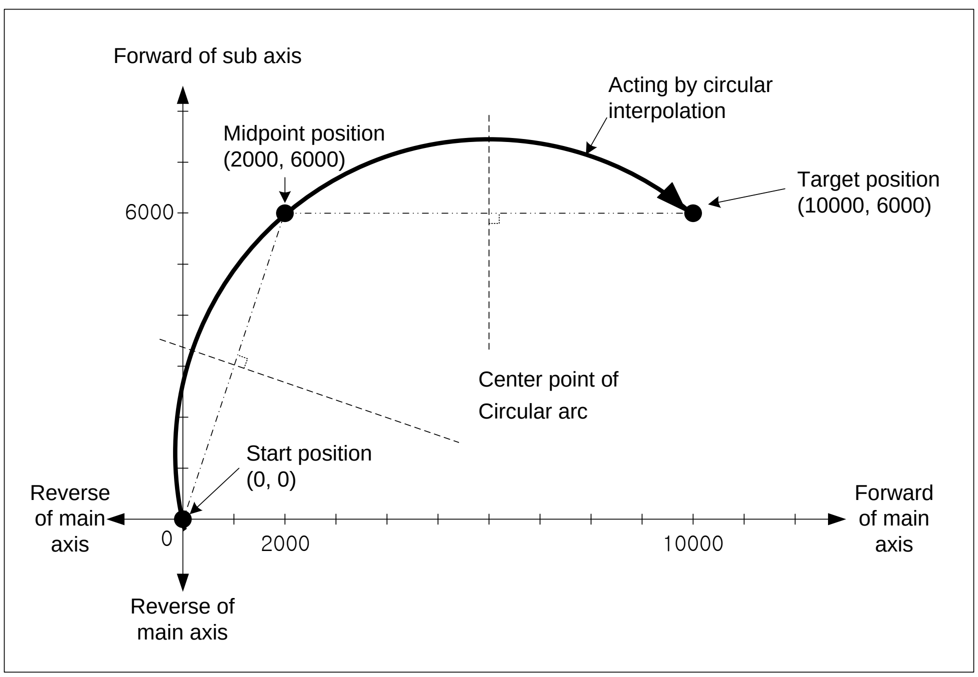
▪ Main axis (axis X) operation data

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation Speed [pls/s]	Acc. Speed	Dec. Speed	M code	Dwell time	Circular interpolation Auxiliary point	Circular interpolation mode	The number of rotations of Circular interpolation
1	ABS	POS	SIN	END	10000	3000	No. 1	No. 1	0	100	2000	Midpoint	0

▪ Sub axis (axis Y) operation data

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation Speed [pls/s]	Acc. Speed	Dec. Speed	M code	Dwell time	Circular interpolation Auxiliary point	Circular interpolation mode	The number of rotations of Circular interpolation
1	ABS	POS	SIN	END	6000	0	No. 1	No. 1	0	100	6000	Midpoint	0

■ Operation pattern



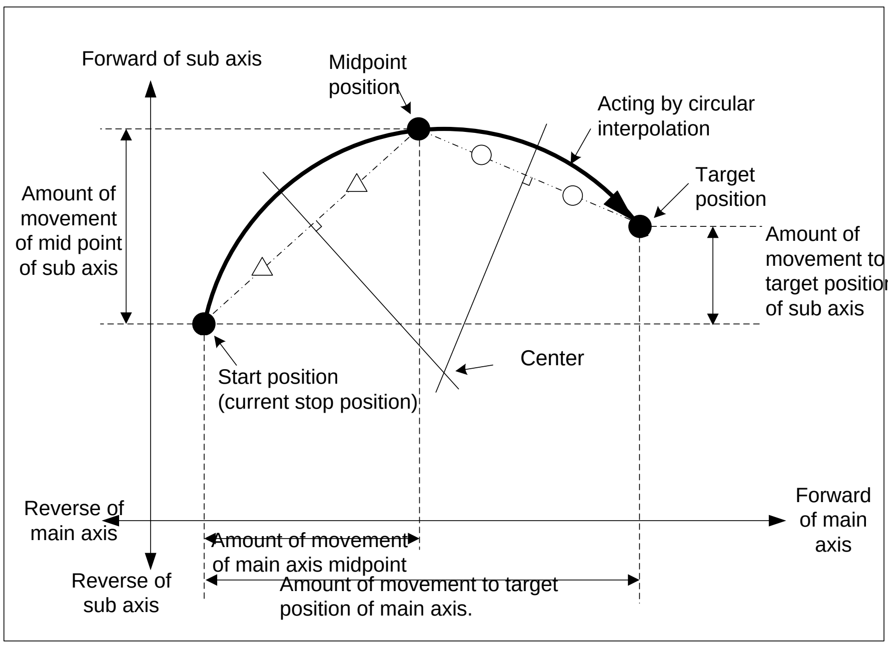
(2) Circular interpolation by Incremental coordinates, the method of designating midpoint

(a) Operate circular interpolation from start position and go through midpoint to target position as amount of set movement.

(b) Midpoint position is the incremented position as set value on 「the circular interpolation auxiliary point」 from current stop position.

(c) The intersection of perpendicular bisectors of starting position and midpoint, the current stop position and the goal position will be the center-point of the arc.

(d) Movement direction is decided by set target position and circular interpolation auxiliary point.



(e) Restriction

■ Can not draw circle which starting point is the same with last point on the circular interpolation of the method of designating midpoint. When want to draw circle, should use midpoint method.

■ In this following case, it will be error and can not working circular interpolation of method of designating midpoint.

▪ In case of midpoint which is designated as auxiliary point is same with start position and target position. (Error code : 284)

▪ In case of start position same with target position. (Error code : 285)

▪ Radius of calculated circle exceed 2147483647pls (Error code : 286)

▪ Start position is in alignment with auxiliary position and target position. (Error code : 287)

(f) Example of operation data setting

Setting item	Main axis setting	Sub axis setting	Contents
Coord.	INC	-*1	Set coordinate method of main axis
Pattern	END	-	Set pattern of main axis
Control	POS	-	Set control method of main axis
Method	SIN	-	Set operation method for circular interpolation
Target position [pls]	10000	0	Set target position as a amount of increment of stop position for positioning on the main axis, sub axis.
Operation speed [pls/s]	1000	-	Circular interpolation use method of designating composition speed. Set composition speed on the main axis.
Acceleration speed	No.1	-	Set acceleration time No. for acceleration. (No.1 ~ No.4)
Deceleration speed	No. 2	-	Set deceleration time No. for deceleration. (No.1 ~ No.4)
M code	0	-	Set it when user wants to progress other auxiliary action with circular interpolation operation.
Dwell time	500	-	set the dwell time taken until plc outputs the signal which informs users of finishing the position decision
Circular interpolation auxiliary point	5000	5000	Set the middle point that the arc with mid-point designating method would pass by as an increment from the current stop position
Circular interpolation mode	Mid	-	Set “midpoint”, when use method of designating midpoint.
The number of rotations of circular interpolation	0	-	Set the number of rotations for drawing circle that it is over 360 degrees.

- *1 : Do not need setting. Whatever user set, there is no effect to circular interpolation.

Note

Circular interpolation of method of designating midpoint is depends on item that it is set on operation data of main axis (command axis).

There is no effect to circular interpolation operation except for 「Target position」 and 「Circular interpolation auxiliary point」, when operate circular interpolation of method of designating midpoint. Whatever user set, there is no effect and no error.

[Example] Operate circular interpolation of method of designating Incremental coordinate midpoint with axis X (main axis), with axis Y (sub axis)

■ Start position : (1000, 1000)

Target position (amount of movement) setting : (8000, 4000)

Auxiliary point (amount of movement) setting : (5000, 5000)

In this case operation is as follows:

■ Example of setting XG5000

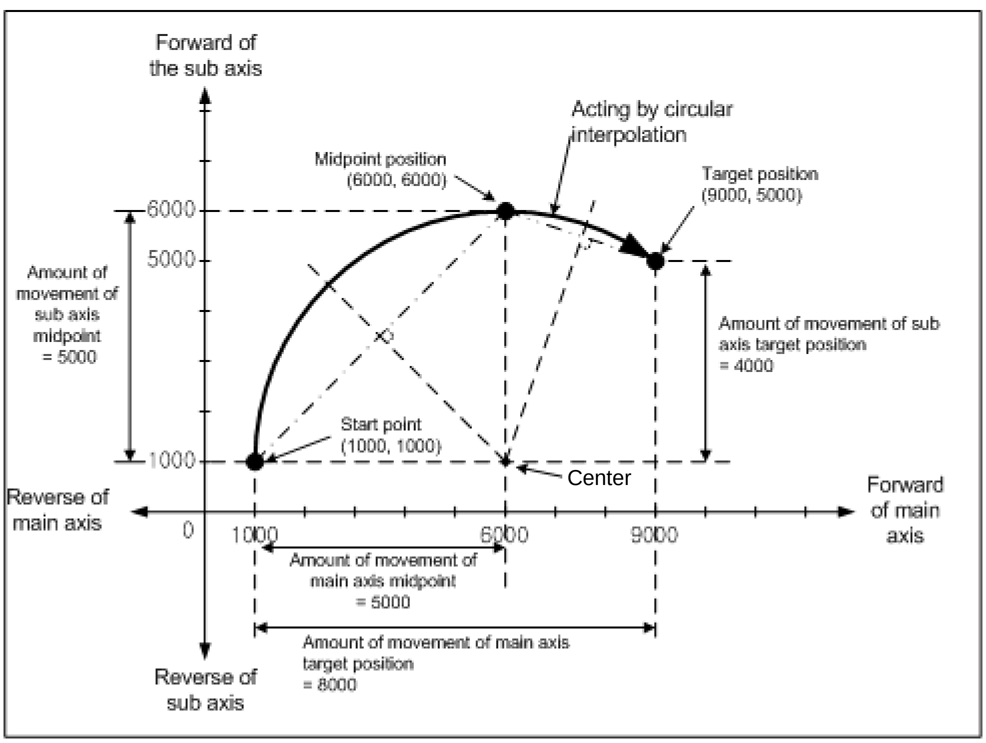
▪ Main axis (axis X) Operation data

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation Speed [pls/s]	Acc. Speed	Dec. Speed	M code	Dwell time	Circular interpolation Auxiliary point	Circular interpolation mode	The number of rotations of Circular interpolation
1	INC	POS	SIN	END	8000	1000	No. 1	No. 1	0	100	5000	Midpoint	0

▪ Sub axis (axis Y) Operation data

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation Speed [pls/s]	Acc. Speed	Dec. Speed	M code	Dwell time	Circular interpolation Auxiliary point	Circular interpolation mode	The number of rotations of Circular interpolation
1	INC	POS	SIN	END	4000	0	No. 1	No. 1	0	100	5000	Midpoint	0

■ Operation pattern



9.2.7 Circular interpolation control of designating center point

Operate interpolation up to trace of the circle after operate by starting command of positioning operation. And then, Center point is center of circle and it is move to rotation direction of circular interpolation.

「The number of rotations of circular interpolation」 can operate circular interpolation which is over 360 degrees with setting value.

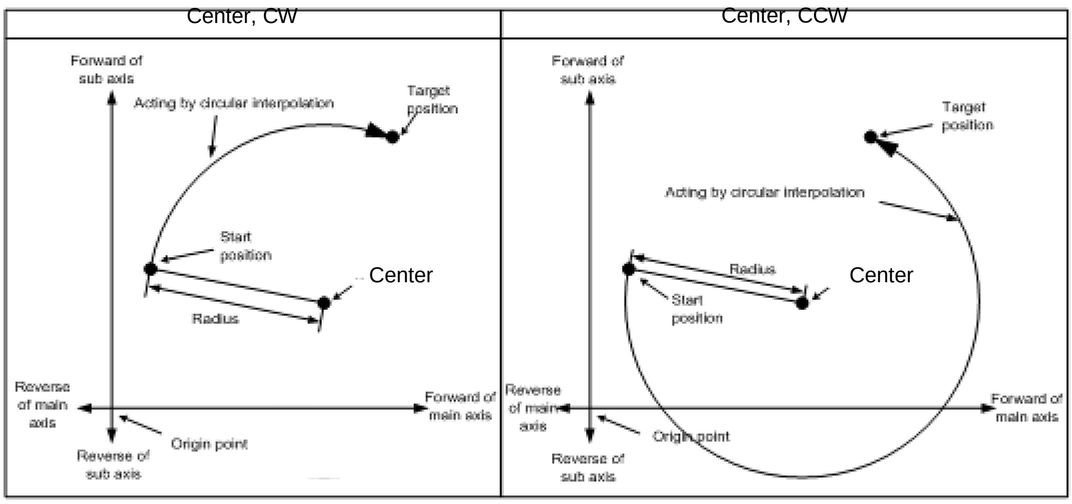
There is no limit for composition of axis 2 that it needs to use circular interpolation control.

(1) Circular interpolation by method of absolute coordinate, designating center point

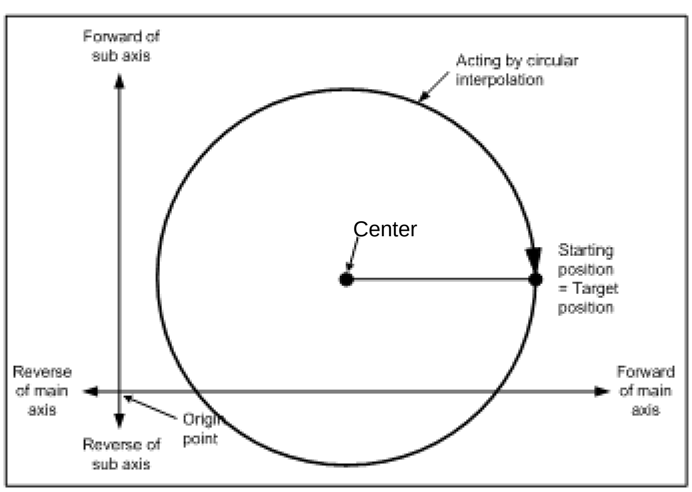
(a) Operate from start position and circular interpolate to target position with the trace of circle. And the circle has radius which distance is to set midpoint position. 「Circular interpolation auxiliary point」 is midpoint of this circle.

(b) Moving direction depends on set direction on “circular interpolation mode” of operation data.

- 「Center, CW」 - Circular interpolation go clockwise from current position.
- 「Center, CCW」 - Circular interpolation go counterclockwise from current position.



(c) If target position is same with start position, can progress circular interpolation. And the circle radius is distance from midpoint to starting position (=target position)



(d) Restriction

■ In this following case, to be error and can not progress circular interpolation control of method of designating midpoint.

▪ In case of midpoint which is set as auxiliary point is same with starting/target position, (Error code : 284)

▪ In case of calculated radius of circle exceed 2,147,483,647pls, (Error code : 286)

Note

If executing circular interpolation start, 2 axes will operate at the same time. Need user to pay attention.

1. Available pattern is END, KEEP and available method is SIN, REP. In case of using CONT, it operates as KEEP.
2. The available auxiliary commands are as follows.
   ▪ DEC. stop, EMG. stop
3. The commands unavailable in linear interpolation are as follows.
   ▪ Position/Speed switching control, Position override, Speed override, Position specified speed override
4. Main and sub axis are determined depending on movement amount.
   (1) main axis: movement amount is larger between axis X and axis Y
   (2) sub axis: movement amount is smaller between axis X and axis Y
5. The parameter items which work depending on the value of each axis are as follows.
   ▪ Backlash compensation, Software high/low limit

(e) Example of operation data setting

Setting item	Main axis setting	Sub axis setting	Contents
Coord.	ABS	-*1	Set coordinate method of main axis
Pattern	END	-	Set pattern of main axis
Control	POS	-	Set control method of main axis
Method	SIN	-	Set operation method for circular interpolation.
Target position [pls]	10000	0	Set target position as a amount of increment of stop position for positioning on the main axis, sub axis.
Operation speed [pls/s]	1000	-	Circular interpolation use method of designating composition speed. Set composition speed on the main axis.
Acceleration speed	No.1	-	Set acceleration time No. for acceleration. (No.1 ~ No.4)
Deceleration speed	No.2	-	Set deceleration time No. for deceleration. (No.1 ~ No.4)
M code	0	-	Set it when user wants to progress other auxiliary action with circular interpolation operation.
Dwell time	500	-	set the dwell time taken until plc outputs the signal which informs users of finishing the position decision
Circular interpolation auxiliary point	5000	5000	Set the center-point on the method of designating center-point.
Circular interpolation mode	Center	-	.Set the center-point on the method of designating center-point.
Circular interpolation direction	CW	-	Set the moving direction of circular arc
The number of rotations of circular interpolation	0	-	Set the number of rotations for drawing circle that it is over 360 degrees.

- *1 : Do not need setting. Whatever user set, there is no effect to circular interpolation.

Note

Circular interpolation of method of designating midpoint is depends on item that it is set on operation data of main axis (command axis).
There is no effect to circular interpolation operation except for 「Target position」 and「Circular interpolation auxiliary point」, when operate circular interpolation of method of designating midpoint. Whatever user set, there is no effect and no error.

[Example] Operate circular interpolation of designating midpoint and absolute coordinate (main axis; axis 1, sub axis; axis 2)

■ In case of Start position (0, 0), Target position (0, 0), Auxiliary point (1000, 1000), direction of rotation :CW operation is as follows;

■ Example of setting in the XG5000

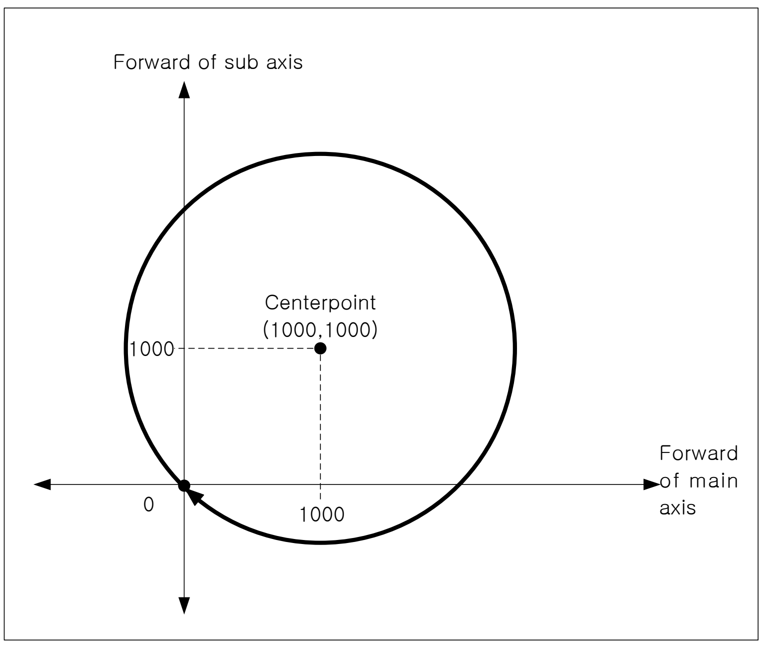
▪ Main axis (axis X) operation data

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation Speed [pls/s]	Acc. Speed	Dec. Speed	M code	Dwell time	Circular interpolation Auxiliary point	Circular interpolation mode	Cir. Int. dir.	The number of rotations of Circular interpolation
1	ABS	POS	SIN	END	0	1000	No. 1	No. 1	0	100	1000	Center	CW	0

▪ Sub axis (axis Y) operation data

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation Speed [pls/s]	Acc. Speed	Dec. Speed	M code	Dwell time	Circular interpolation Auxiliary point	Circular interpolation mode	Cir. Int. dir.	The number of rotations of Circular interpolation
1	ABS	POS	SIN	END	0	0	No. 1	No. 1	0	100	1000	Center	CW	0

■ Operation pattern



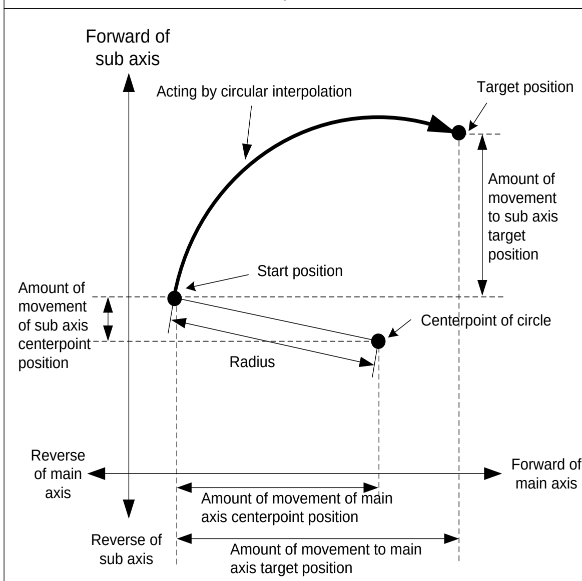
(2) Circular interpolation control by the method of Incremental coordinate, designating center-point

(a) Start operating at starting position and then execute circular interpolation by moving amount already set, along the trace of the arc which has a distance between starting position and designated mid-point as radius. 「Circular interpolation auxiliary point」 means the moving amount between the current position and mid-point.

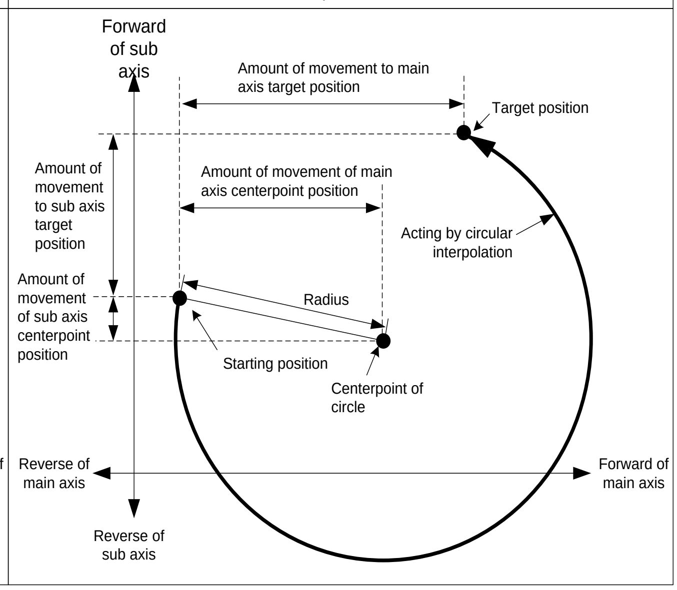
(b) Moving direction is decided to set direction on “circular interpolation mode” of operation data.

- 「Center-point, CW」 - Circular interpolation go clockwise from current position..
- 「Center-point, CCW」 - Circular interpolation go counterclockwise from current position.

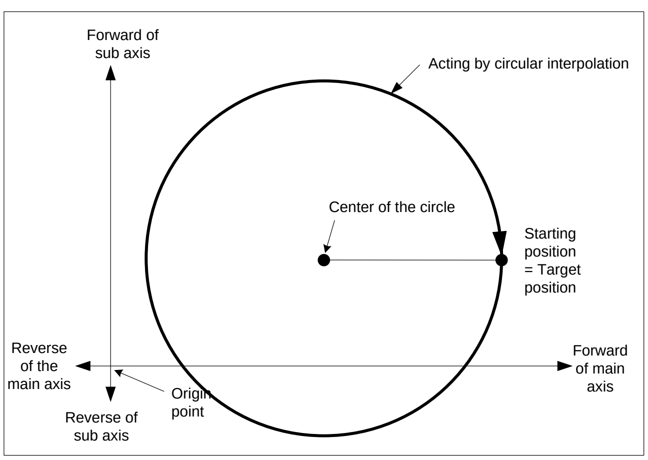
Centerpoint, CW



Centerpoint, CCW



(c) If set target position of main axis and sub axis as “0”, than starting position will be same with target position and can progress circular interpolation that it is drawing circle. The radius of the circle is distance from starting position to center-point.



(d) Restriction

■ User cannot progress circular interpolation of midpoint designation method with following cases.

▪ Midpoint that is designated as auxiliary point same with start position or target position. (Error code: 284)

▪ In case of calculated radius of circular arc exceed 2,147,483,647pls (Error code: 286)

(e) Example of operation data setting

Setting item	Main axis setting	Sub axis setting	Contents
Coord.	INC	-*1	Set coordinate method o main axis
Pattern	END	-	Set pattern of main axis
Control	POS	-	Set control method of main axis
Method	SIN	-	Set operation method for circular interpolation.
Target position [pls]	10000	0	Set target position as the amount of increment of stop position for positioning on the main axis, sub axis.
Operation speed [pls/s]	1000	-	Circular interpolation use method of designating composition speed. Set composition speed on the main axis.
Acceleration speed	No.1	-	Set acceleration time No. for acceleration. (No.1 ~ No.4)
Deceleration speed	No.2	-	Set deceleration time No. for deceleration. (No.1 ~ No.4)
M code	0	-	Set it when users want to progress other auxiliary action with circular interpolation operation.
Dwell time	500	-	set the dwell time taken until plc outputs the signal which informs users of finishing the position decision
Circular interpolation auxiliary point	5000	-5000	Set the center-point position by amount of increment of current stop position on the method of designating center-point.
Circular interpolation mode	Center	-	In case of using the method of designating center-point, set the center-point
Cir. Int. Dir	CW	-	Set moving direction of circular arc
The number of rotations of circular interpolation	0	-	Set the number of rotations for drawing circle that it is over 360 degrees.

- [*1] : Do not need setting. Whatever user set, there is no effect to circular interpolation.

Note

Circular interpolation of method of designating midpoint is depends on item that it is set on operation data of main axis command axis).
There is no effect to circular interpolation operation except for 「Target position」 and「Circular interpolation auxiliary point」, when operate circular interpolation of method of designating midpoint. Whatever user set, there is no effect and no error.

[Example] Operate circular interpolation of the method of designating Incremental coordinate center point with axis X (main axis), with axis Y (sub axis)

■ Start position: (0, 0)

Target position (amount of movement) setting: (2000, 0)

Auxiliary point (amount of movement) setting: (1000, 0)

Direction of rotations: CW

In this case operation is as follows:

■ Example of setting XG5000

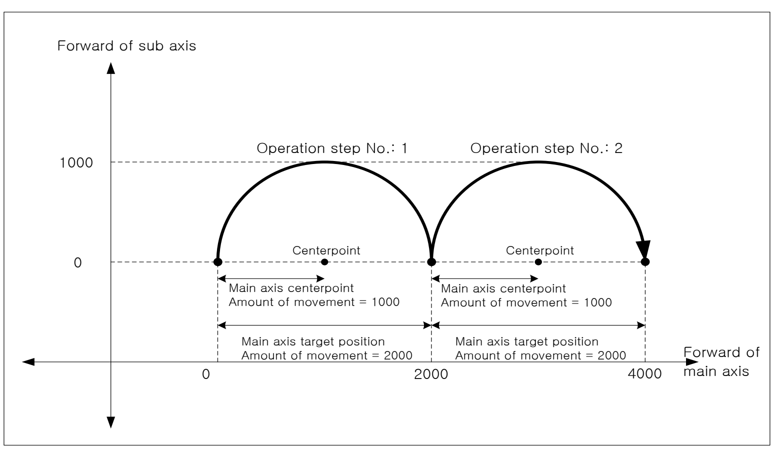
▪ Main axis (axis X) Operation data

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation Speed [pls/s]	Acc. Speed	Dec. Speed	M code	Dwell time	Circular interpolation Auxiliary point	Circular Interpolation mode	Circular int. Dir.	The number of rotations of Circular interpolation
1	ABS	POS	SIN	KEEP	2000	1000	No. 1	No. 1	0	100	1000	Center-point	CW	0
2	ABS	POS	SIN	END	2000	1000	No. 1	No. 1	0	100	1000	Center-point	CW	0

▪ Sub axis (axis Y) Operation data

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation Speed [pls/s]	Acc. Speed	Dec. Speed	M code	Dwell time	Circular interpolation Auxiliary point	Circular Interpolation mode	Circular int. Dir.	The number of rotations of Circular interpolation
1	ABS	POS	SIN	KEEP	0	0	No. 1	No. 1	0	100	1000	Center-point	CW	0
2	ABS	POS	SIN	END	0	0	No. 1	No. 1	0	100	1000	Center-point	CW	0

■ Operation pattern

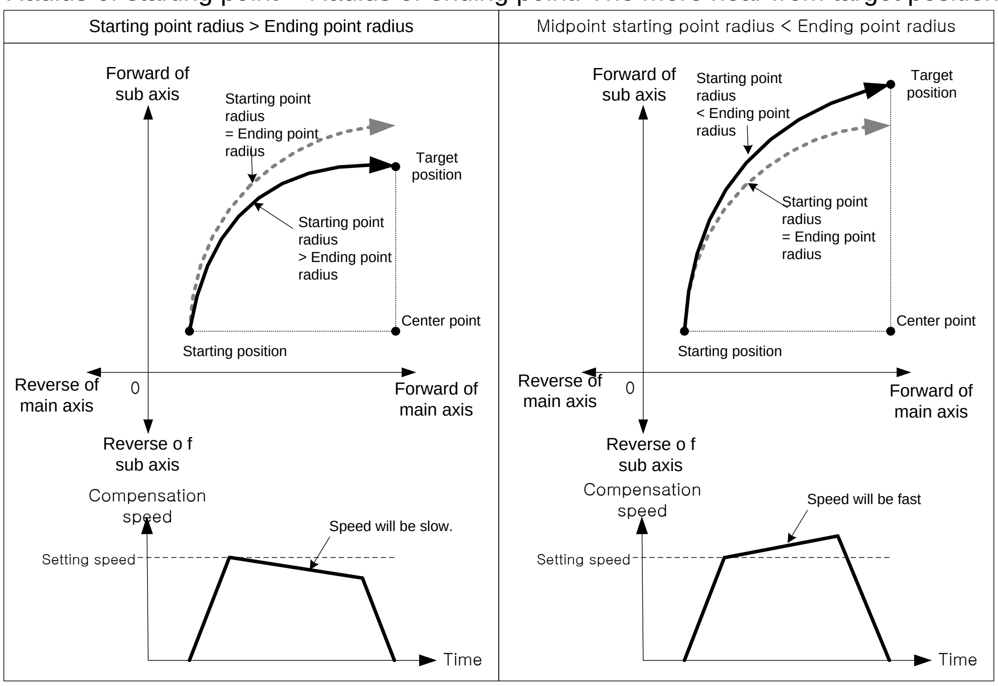


(3) Circular interpolation control which radius of starting point is different with radius of ending point.

(a) According to set value of target position, distance A which it is distance from start point to center point is different with distance B which it is distance from target position to center point (End point, Radius) on circular interpolation control of the method of designating center point. Sometimes do not operate normally. When starting point radius have difference with end point radius, calculate each speed on the set operation speed, and operate circular interpolation control with compensating radius.

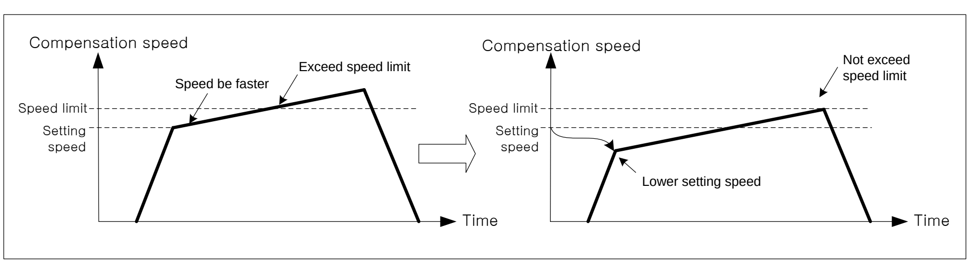
(b) In case of starting point radius has some difference with ending point radius, compensating speed is as follows:

- Radius of starting point > Radius of ending point: The more near from target position, the slower.
- Radius of starting point < Radius of ending point: The more near from target position, the faster.



Note

In case of "Starting point radius < Ending point radius", the more operate circular interpolation, the faster. Sometimes exceed 「Speed limit」 of parameter. When operate circular interpolation, in case of starting point radius shorter than ending point radius, lower speed for never exceeding「Speed limit」.
Can operate no exceed 「Speed limit」, even if it is near to target position.



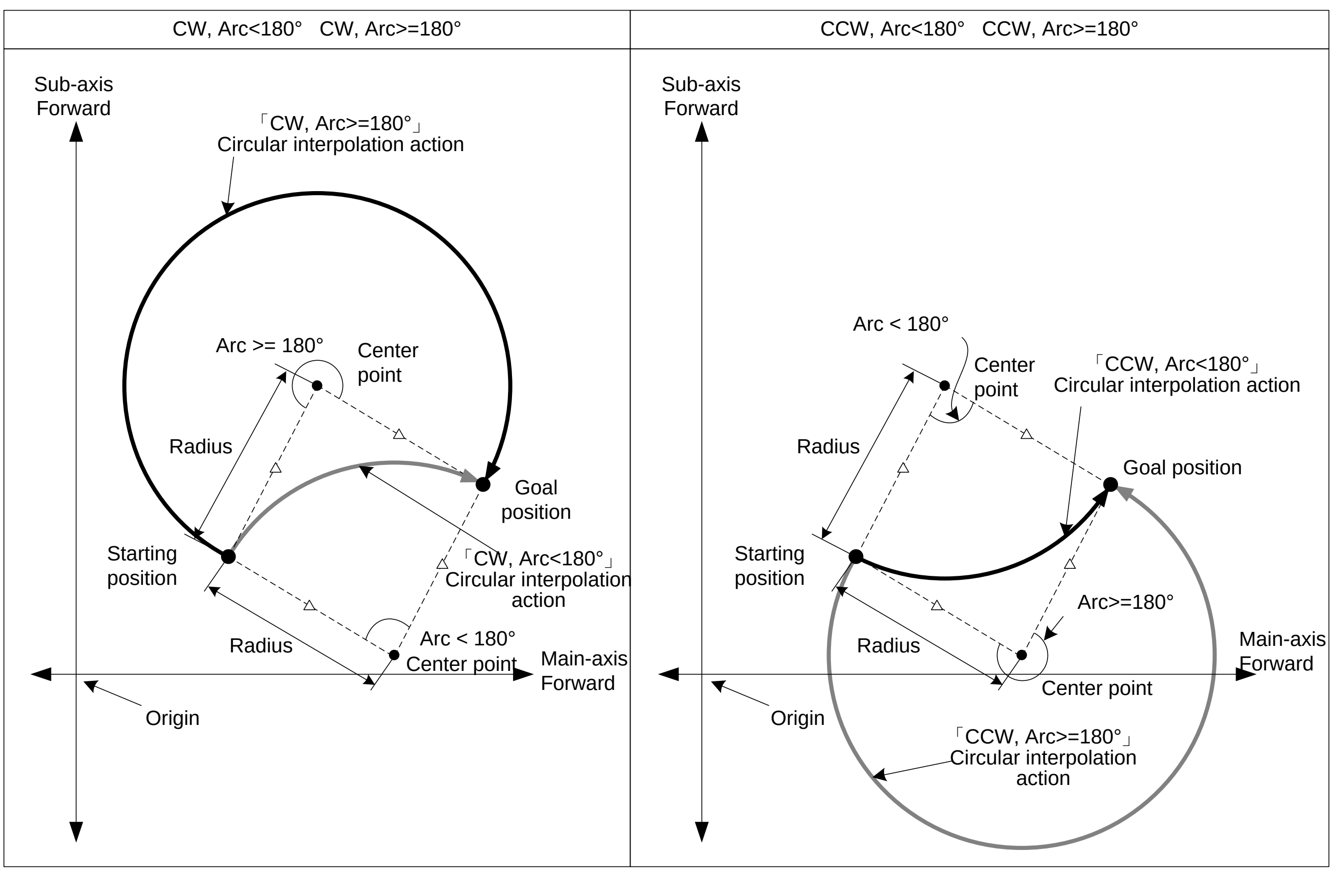
9.2.8 Circular interpolation control with designated radius

After being executed by circular interpolation command, then it operates along the trace of the circle made by circular interpolation with 2 axes. According to「The turn no. of circular interpolation」, circular interpolation which is bigger than 360° is available to be executed.

(1) Circular interpolation by method of absolute and designating radius

(a) Start operating at starting position and execute circular interpolation along the trace of the circle which has radius set on circular interpolation auxiliary point of main-axis operating data. Center point of Circular arc depends on the turning direction (CW, CCW) of「Circular interpolation mode」 and size setting of circular arc (Circular arc<180°, Circular arc>=180°).

Circular interpolation mode	Description
Radius, CW, Arc<180°	Execute circular interpolation in clockwise and the arc is smaller than 180°
Radius, CW, Arc>=180°	Execute circular interpolation in clockwise and the arc is bigger than 10°
Radius, CCW, Arc<180°	Execute circular interpolation in counterclockwise and the arc is smaller than 180° or same.
Radius, CCW, Arc>=180°	Execute circular interpolation in counterclockwise and the arc is bigger than 180° or same.



(b) Restrictions

■ Circular interpolation with designating radius method may not draw an exact circle that the starting position and ending position are same. If user wants to draw an exact circle, use circular interpolation with center point method.

■ In the cases below, error would arise and circular interpolation may not be executed.

▪ Starting position and goal position are same (error code:285)

▪ Radius value of circular interpolation of main-axis operating data is smaller than half of the length from starting position to goal position

- Radius < (R x 0.8) : Error (error code:270)
- (R x 0.8) <= Radius < R

: Execute circular interpolation after reset the radius to R. In other words, execute circular interpolation by setting the center of the line from starting position to goal position as center point.

Note

If executing circular interpolation start, 2 axes will operate at the same time. Need user to pay attention.

1. Available pattern is END, KEEP and available method is SIN, REP. In case of using CONT, it operates as KEEP.
2. The available auxiliary commands are as follows.
   ▪ DEC. stop, EMG. stop
3. The commands unavailable in linear interpolation are as follows.
   ▪ Position/Speed switching control, Position override, Speed override, Position specified speed override
4. Main and sub axis are determined depending on movement amount.
   (1) main axis: movement amount is larger between axis X and axis Y
   (2) sub axis: movement amount is smaller between axis X and axis Y
5. The parameter items which work depending on the value of each axis are as follows.
   ▪ Backlash compensation, Software high/low limit

(c) Setting example of Operating data

Items	Main-axis setting	Sub-axis setting	Description
Coord.	ABS	-*1	Set the coordinate method of main axis
Pattern	END	-	Set the operation pattern of main axis
Control	POS	-	Set the control method of main axis
Method	SIN	-	Set the operation method for circular interpolation
Goal position[pls]	10000	0	Set the goal position to execute on Main, Sub, Helical axis
Operating speed[pls/s]	1000	-	Use connecting speed designation method for circular interpolation. Set connecting speed on main-axis
Acc. no.	No.1	-	Set no. of acc. time to use in acceleration (no1~4)
Dec. no.	No.2	-	Set no. of dec. time to use in deceleration (no1~4)
M code	0	-	Set it when executing another auxiliary operation synchronizing with circular interpolation
Dwell time	500	-	Set dwell time for outputting positioning complete
Auxiliary point	5000	-	Set the radius on main-axis
Circular interpolation Mode	Radius	-	If use radius designation method, set「Radius」on main-axis and
Circular interpolation direction	CW		Set moving direction of arc and
Arc size	Arc<180°	-	Set size of arc
The No. of Turns	-	-	Set the no. of turns of arc for making a circle bigger than 360°

- [*1] : It means that no need to be set. Whatever value it is, it dose not affect circular interpolation.

Note

1. Circular interpolation control of Radius designation method is executed on the basis of the items set on operating data. When it is executed, only「Goal position」can affect circular interpolation. In other words, whatever value is set as, it does not affect the action and no errors arise.
2. When setting the circular interpolating auxiliary point (radius) of main-axis, it must be bigger than the half of the length between starting position and goal position. If it is smaller than the half(R) and the value is higher than 80% of R, circular interpolation which has middle point between starting position and goal position as center-point is executed. If it is smaller than the half(R) and the value is lower than 80% of R, error (error code:270) arises and circular interpolation is not executed.

[Example] Axis X is main-axis and Axis Y is sub-axis. Execute circular interpolation with absolute coordinates and designated radius.

- Starting position (1000, 1000), Goal position (9000, 1000), Auxiliary point (5000, 0)

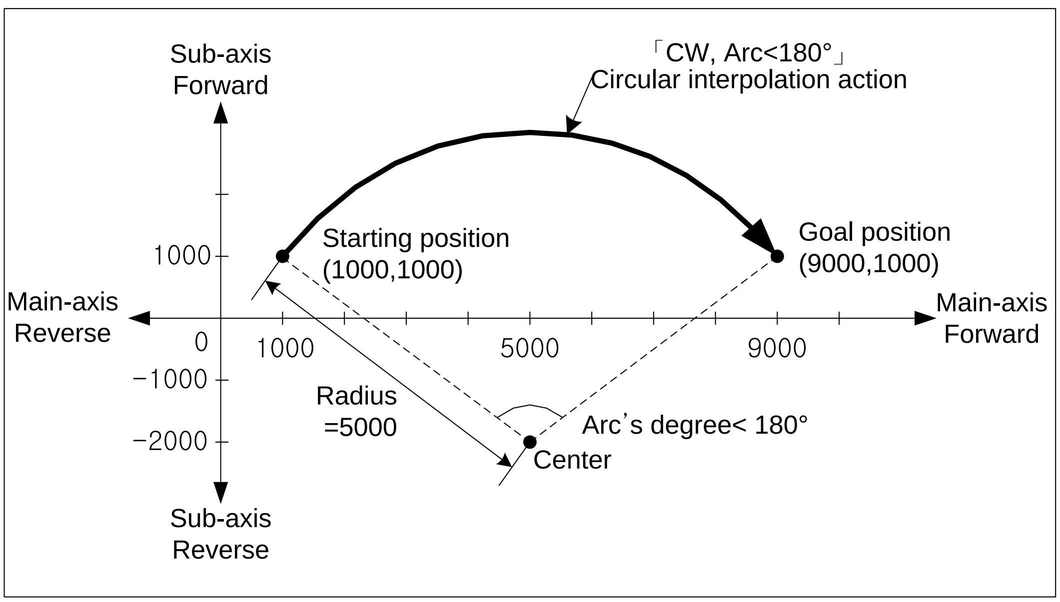
  Moving direction of arc : CW, Size of arc : Arc >= 180°
  The action is as follows in the condition above
- Setting example in XG5000
  - Main-axis (Axis X) Operating data

Step No.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. No,	Dec. No,	Dwell Time	Auxiliary Point	Circular interpolation mode	Cir. Int. Dir.	Arc size	The no. of turns
1	ABS	POS	SIN	KEEP	9000	1000	No.1	No.1	100	5000	Radius,	CW	0	Arc<180

  - Sub-axis (Axis Y) Operating data

Step No.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. No,	Dec. No,	Dwell Time	Auxiliary Point	Circular interpolation mode	Cir. Int. Dir.	Arc size	The no. of turns
1	ABS	POS	SIN	KEEP	9000	1000	No.1	No.1	100	5000	Radius,	CW	0	Arc<180

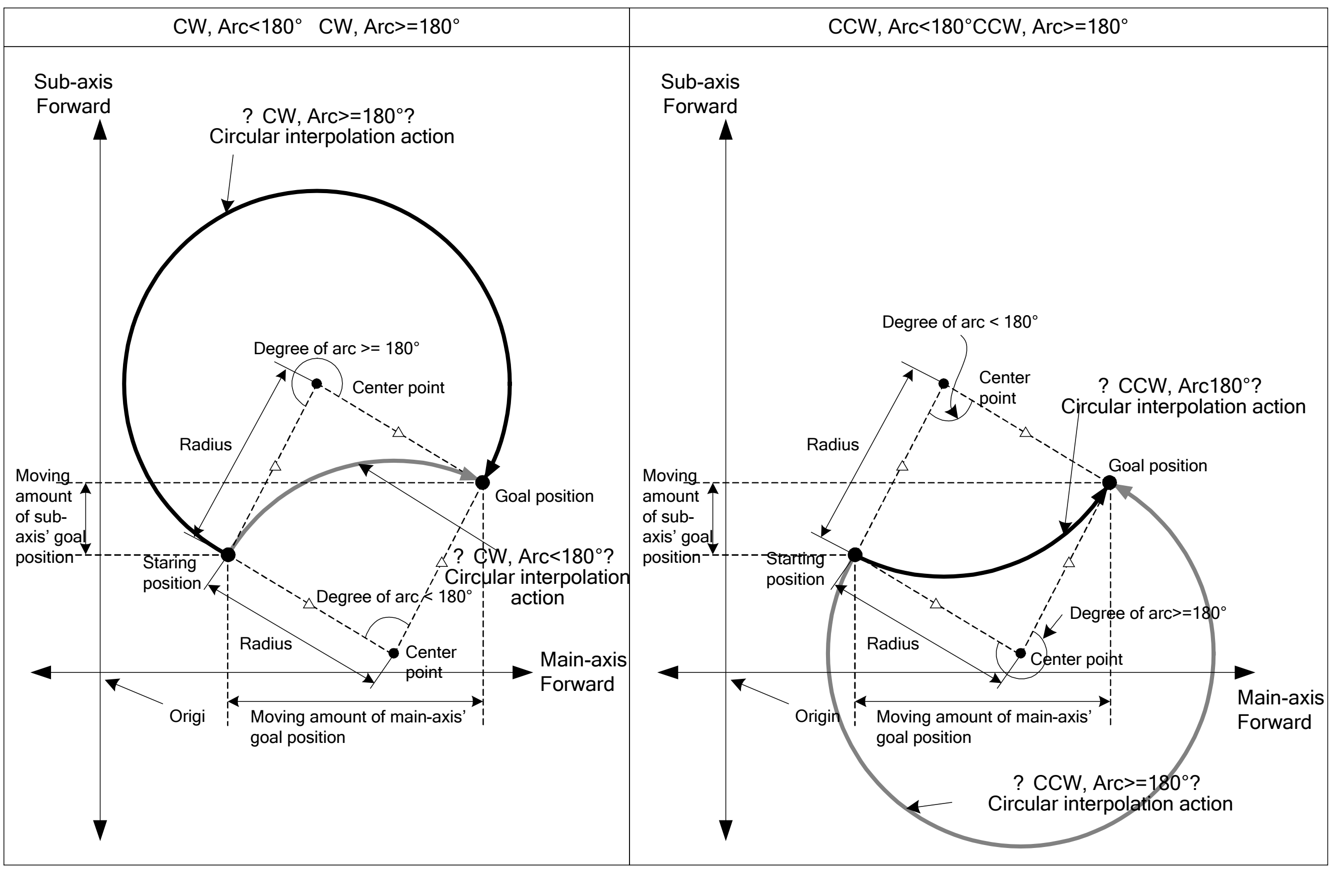
- Operation pattern



(2) Circular interpolation by method of Incremental and designating radius

(a) Start operating from starting position and then execute circular interpolation by increment set on goal position along the trace of the circle which has the value set on circular interpolation auxiliary point of main-axis operation data as a radius. Circular arc depends on the moving direction of「Circular interpolation mode」(CW, CCW) and setting of arc size(Arc<180°, Arc>=180°)

Circular interpolation mode	Description
Radius, CW, Arc<180°	Execute circular interpolation with center-point of arc which smaller than 180°in direction of CW
Radius, CW, Arc >=180°	Execute circular interpolation with center-point of arc which bigger than 180°in direction of CW
Radius, CCW, Arc<180°	Execute circular interpolation with center-point of arc which smaller than 180°in direction of CCW
Radius, CCW, Arc>=180°	Execute circular interpolation with center-point of arc which bigger than 180°in direction of CWW



(b) Restrictions

■ Circular interpolation with designating radius method may not draw an exact circle that the starting position and ending position are same. If user wants to draw an exact circle, use circular interpolation with center point method.

■ In the cases below, error would arise and circular interpolation may not be executed.

■ Starting position and goal position are same (error code: 285)

■ Radius value of circular interpolation of main-axis operating data is smaller than half of the length from starting position to goal position

- Radius < (R x 0.8) : Error (error code: 270)
- (R x 0.8) <= Radius < R

: Execute circular interpolation after reset the radius to R. In other words, execute circular interpolation by setting the center of the line from starting position to goal position as center point.

(c) Setting example of Operating data

Items	Main-axis setting	Sub-axis setting	Description
Coord.	INC	- [*1]	Set the coordinate method of main axis
Pattern	END	-	Set the operation pattern of main axis
Control	POS	-	Set the control method of main axis
Method	SIN	-	Set the method to execute circular interpolation
Goal position[pls]	10000	0	Set the goal position to execute on Main, Sub, Helical axis
Operating speed[pls/s]	1000	-	Use connecting speed designation method for circular interpolation. Set connecting speed on main-axis
Acc. no.	No.1	-	Set no. of acc. time to use in acceleration (no1~4)
Dec. no.	No.2	-	Set no. of dec. time to use in deceleration (no1~4)
M code	0	-	Set it when executing another auxiliary operation synchronizing with circular interpolation
Dwell time	500	-	Set dwell time for outputting positioning complete
Auxiliary point	5000	-	Set the radius on main-axis
Circular interpolation Mode	Radius	-	If use middle-point-designation method, set「Middle-point」on main-axis
Cir. Int. Dir	CW	-	Set moving direction
Arc size	Arc<180°	-	Set arc size
The No. of Turns	0	-	Set the no. of turns of arc for making a circle bigger than 360°

- [*1] : It means that no need to be set. Whatever value it is, it dose not affect circular interpolation.

Note

1. Circular interpolation control of Radius designation method is executed on the basis of the items set on operating data. When it is executed, only「Goal position」can affect circular interpolation. In other words, whatever value is set as, it does not affect the action and no errors arise.
2. When setting the circular interpolating auxiliary point (radius) of main-axis, it must be bigger than the half of the length between starting position and goal position. If it is smaller than the half(R) and the value is higher than 80% of R, circular interpolation which has middle point between starting position and goal position as center-point is executed. If it is smaller than the half(R) and the value is lower than 80% of R, error (error code:270) arises and circular interpolation is not executed.

[Example] Axis X is main-axis and Axis Y is sub-axis. Execute circular interpolation with Incremental coordinates and designated radius.

■ Starting position (1000, 1000), Goal position (8000, 0), Auxiliary point (5000, 0)

Moving direction of arc : CCW, Size of arc : Arc >= 180°

The action is as follows in the condition above

■ Setting example in XG5000

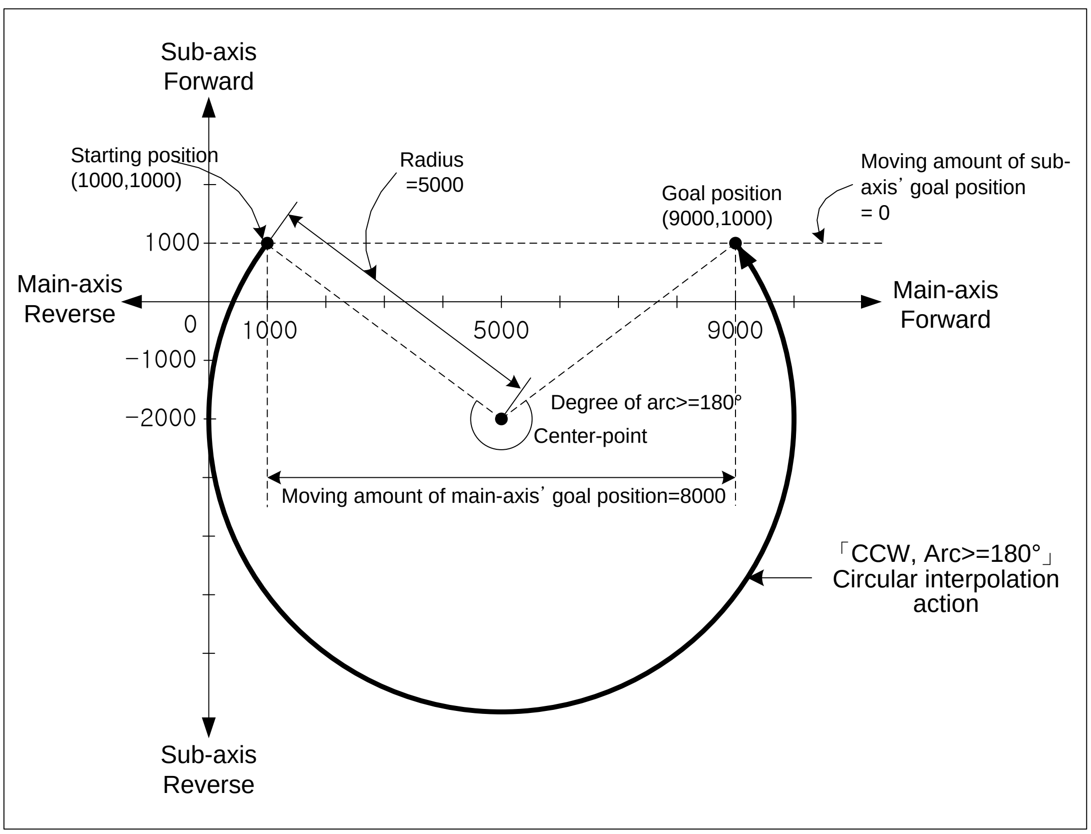
▪ Main-axis (Axis X) Operating data

Step No.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. No,	Dec. No,	Dwell Time	Auxiliary Point	Circular interpolation mode	Cir. Int. dir	Arc size	The no. of turns
1	ABS	POS	SIN	END	8000	1000	No.1	No.1	100	5000	Radius	CW	Arc>=180	0

▪ Sub-axis (Axis Y) Operating data

Step No.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. No,	Dec. No,	Dwell Time	Auxiliary Point	Circular interpolation mode	Cir. Int. dir	Arc size	The no. of turns
1	ABS	POS	SIN	END	8000	1000	No.1	No.1	100	5000	Radius	CW	Arc>=180	0

■ Operation pattern



9.2.9 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.

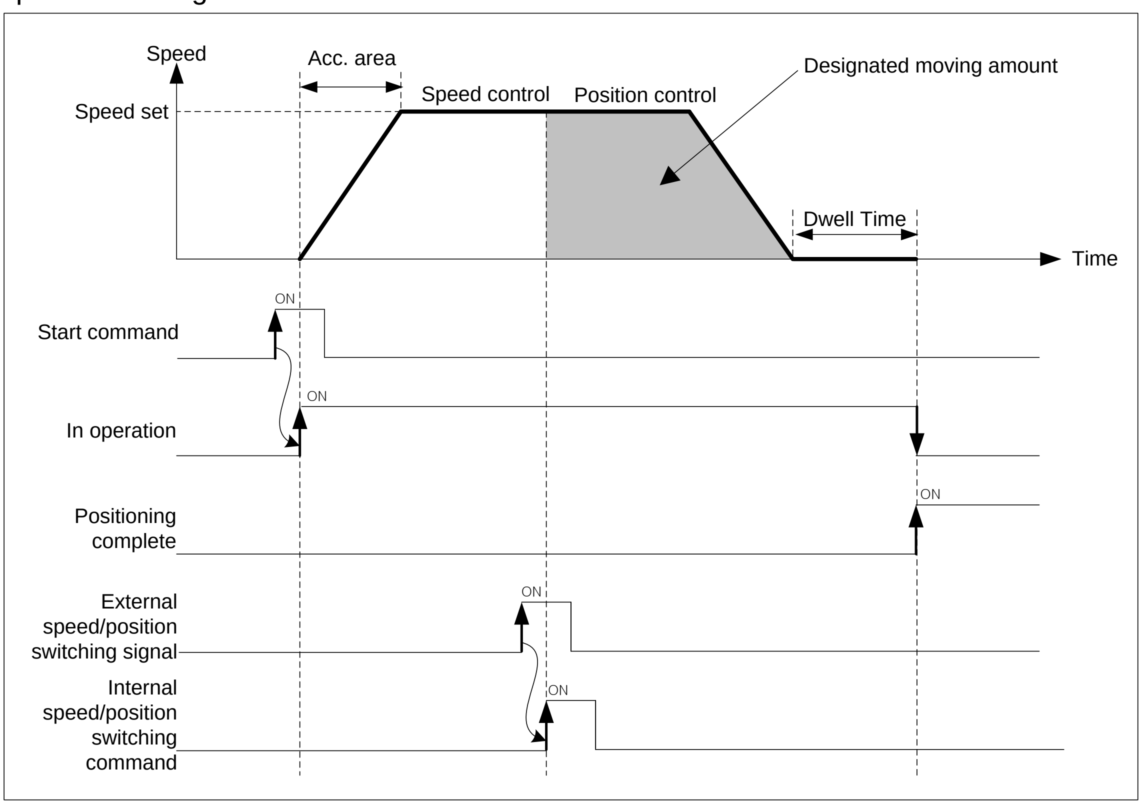
(1) Characteristics of Control

(a) Set control method of operating data as “Shortcut speed control” and executing positioning with「Speed/Position Switching」 in speed control operation.

(b) Direction of movement depends on the sign of value.

- ■ Forward : The position value is Positive(+)
- ■ Reverse : The position value is Negative(-)

(2) Operation timing



(3) Restrictions

(a) Operation pattern of speed control has to be set as “End” or “Go on”. If “Continuous” is set as, error (error code:236) arises and speed control may not be executed.

(b) If the value of goal position is 0, speed/position switching command may not be executed. In this case, it continues to operate with speed control and error code 304 occurs.

(4) Setting example of operation data

Items	Setting value	Description
Coord.	ABS	Set the coordinate method of main axis
Pattern	END	Set the pattern of main axis
Control	SPD	Set the control of main axis as SPD when starting
Method	SIN	Set the operation method
Goal position [pls]	10000	After inputting speed/position switching control, set moving amount to position.
Operating speed [pls/s]	1000	Set the operating speed of speed/position switching control
Acc. no.	No1	Set acc. no. used in acceleration (no.1~4)
Dec. no.	No.2	Set dec. no. used in deceleration (no.1~4)
M code	0	Set it when user needs to execute another auxiliary work synchronizing with speed/position switching control
Dwell time	500	Set dwell time(ms) between switching command's inputting and positioning completion's outputting

9.2.10 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.

(1) Characteristics of Control

(a) Set control method of operating data as “Shortcut position control” and user may change position control to speed control with「Speed/Position Switching」

(b) Direction of movement depends on the sign of value and coordinates

■ 「Absolute, position control」

▪ Starting position < Goal position : Positioning in forward direction

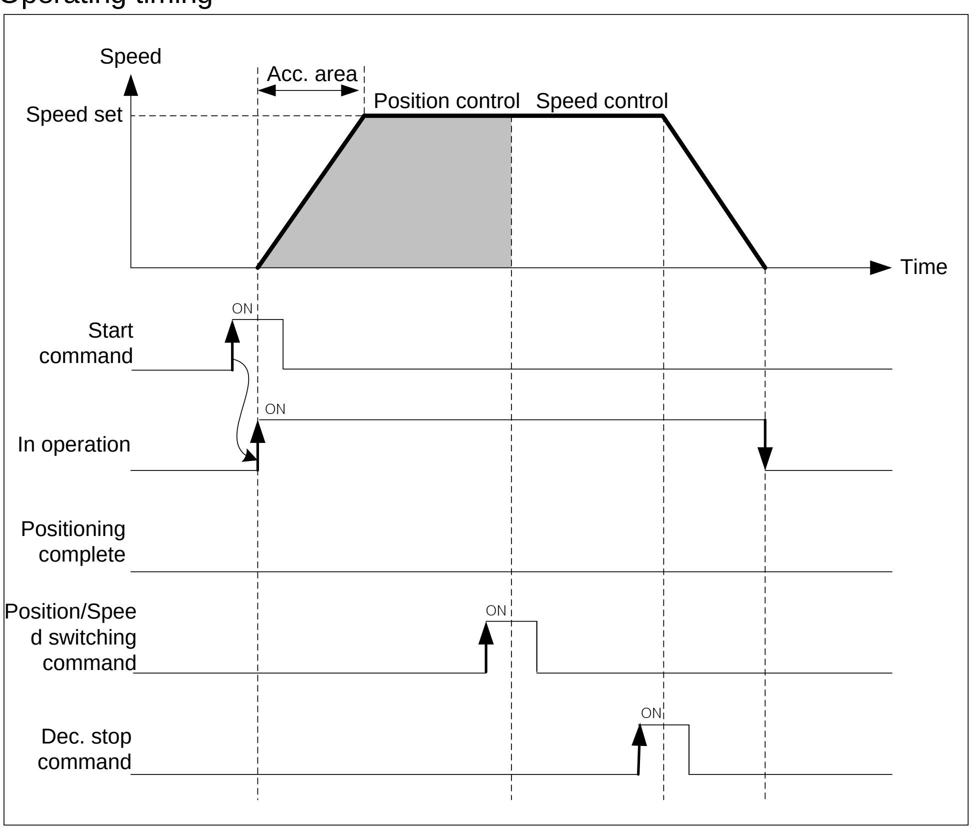
▪ Starting position > Goal position : Positioning in reverse direction

■ 「Incremental, position control」

▪ The value of goal position has positive sign (+) : Positioning in forward direction

▪ The value of goal position has negative sign (-) : Positioning in reverse direction

(2) Operating timing



(3) Restrictions

(a) Position/speed switching command is not inputted before positioning to the goal position, it stops by deceleration and finishes the positioning.

(b) After position/speed switching, software high/low limit check depends on “Soft high/low limit in speed control” of extended parameter.

Items	Setting value	Description
Soft high/low in speed control	0 : Not detect	Not to execute checking for software high/low limit in speed control
	1 : Detect	Execute checking for software high/low limit in speed control

(4) Setting example of operation data

Items	Setting value	Description
Coord.	ABS	Set the coordinate method of main axis
Pattern	END	Set the operation pattern of main axis
Control	POS	Set the control method as POS when starting
Method	SIN	Set the operation method
Goal position [pls]	10000	Set the value of goal position for position control
Operating speed [pls/s]	1000	Set the operating speed of position/speed switching control
Acc. no.	No.1	Set acc. no. used in acceleration (no.1~4)
Dec. no.	No.2	Set dec. no. used in deceleration (no.1~4)
M code	0	Set it when user needs to execute another auxiliary work synchronizing with speed/position switching control
Dwell time	500	When it is executed with position control and without position/speed switching command, set dwell time between positioning and complete signal’s outputting.

9.2.11 Start of Positioning

In case of stop in action of dynamic positioning, can positioning by restart. Three Starting types are general start, Simultaneous start, point operation. Operating signal is have to “OFF”, when it start.

(1) Direct start

(a) Do not use operating data, directly input positioning data by auxiliary data and perform positioning control.

(b) Setting auxiliary data of direct start.

Setting item	Contents
Target position	Set target position of control.
Operating speed	Set operating speed of control.
Dwell time	Set dwell time (ms) that it is from positioning to outputting signal of positioning. (0~65535)
M code	Set for performing auxiliary action which is depending on set control.(0~65535)
Acc. time No.	Set acceleration time number for acceleration. (No.1 ~ No.4)
Dec. time No.	Set reduction time number for reduction. (No.1 ~ No.4)
Coordinate	Set coordinate about target position of set control.(absolute, Incremental)
Control method	Select one between position control and speed control (0:Positioning, 1:Speed control)

(2) Indirect Start

(a) Start control of positioning by designating step number of operation data which was saved in positioning module.

(b) Setting auxiliary data of indirect start

Setting item	Contents
Operation step	Set step number of operation data what you need operating.(0 or 1 ~ 400)

Note

Set ‘0’ operation step of Indirect start and carry out command of indirect start. And then start operation data which was saved in step number.

(3) Simultaneous start

(a) According to axis information and setting step, executes Simultaneous start

(b) Restriction

In these cases can not operate all of the axes which were set simultaneous start by error.

▪ When occurred error in over an axis among setting axes of simultaneous start. (Output error code in its axis.)

▪ When command axis of simultaneous start was wrong. (Error code : 296)

- Only set command axis (Set over 2 axes is necessary.)

[Example] Set Simultaneous start of axis X, axis Y as follows;

■ Current position of axis 1: 0, Operation step: 1
Current position of axis 2: 0, Operation step: 3

■ Example of setting XG5000

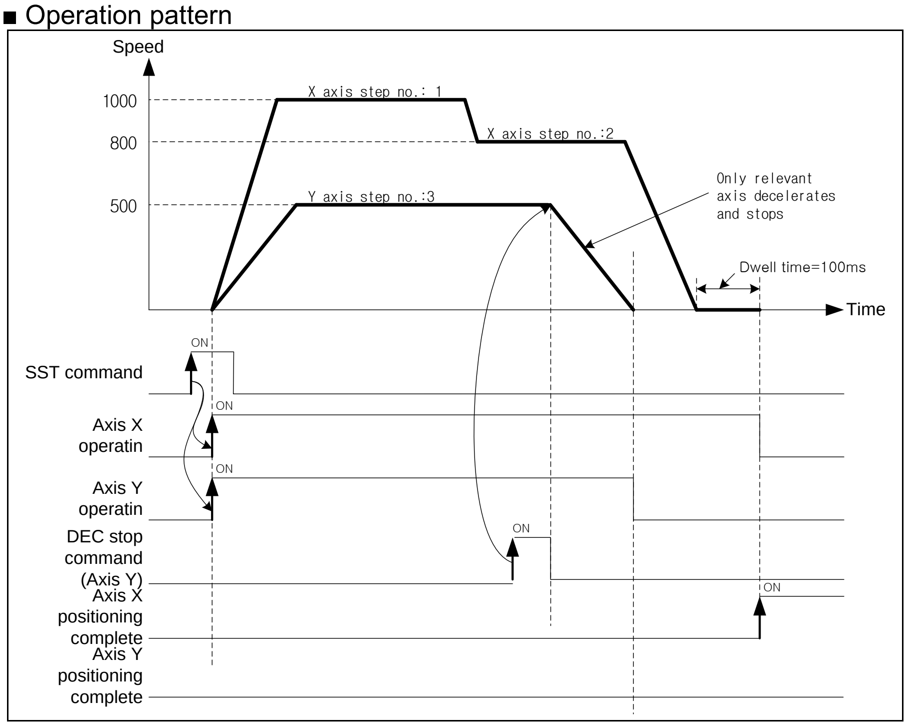
▪ Operation data of axis X

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation speed [pls/s]	Acceleration No.	Deceleration No.	M code	Dwell time
1	ABS	POS	SIN	CONT	1000	1000	1	1	0	0
2	ABS	POS	SIN	END	1800	800	1	1	0	0

▪ Operation data of axis Y

Step No.	Coord.	Control	Method	Pattern	Target position [pls]	Operation speed [pls/s]	Acceleration No.	Deceleration No.	M code	Dwell time
3	ABS	POS	SIN	END	900	500	2	2	0	0

■ Operation pattern



9.2.12 Positioning stop

Here describes factor which are stop axis during operation.

(1) Stop command and Stop factor

Command & Stop factor of stop positioning operating is as follows;

(a) It will stop, when stop command is “On” or there are some stop factors at each axis. But, interpolation control (linear interpolation, Circular interpolation, helical interpolation, elliptic interpolation)

In case of there is stop command or stop factor on main axis, operation axes of interpolation control will stop.

Status Stop factor		Positioning *1	Homing*2	Jog Operation	Speed synchronous	Status of Axis after stop	M code On Status of signal
Parameter setting *3	Exceed soft high-limit	Prompt stop	No Detection	Prompt stop *4		Error (Error501)	No change
	Exceed soft low-limit	Prompt stop	No Detection	Prompt stop		Error (Error502)	No change
Sequence program	Deceleration stop command	Deceleration stop	Deceleration stop	Error 322 (Go-on operation)	Deceleration stop*5	Stop On	No change
	Emergency stop command	Sudden stop				Error (Error481)	“Off”
External signal	External high-limit “On”	Sudden stop		When operate to forward, sudden stop	Sudden stop	Error (Error492)	No change
	External low-limit “On”	Sudden stop		When operate to reverse, sudden stop	Sudden stop	Error (Error493)	No change
XG5000 monitor window	Deceleration stop command	Deceleration stop	Deceleration stop	Error322 (Go-on operation)	Deceleration stop	Stop “On”	No change
	Emergency stop command	Sudden stop				Stop “On”	“Off”

Note

*1 : Positioning means position control, speed control, interpolation control, speed/position switching control, position/speed switching control.
*2 : When complete homing, DOG and origin signal do not effect to positioning control.
*3 : Only work while software high/low limit on the speed control of expansion parameter at the speed control operation mode is set “1:detection”
*4 : Output speed become “0”, when it has factor of stop.
*5 : Speed goes to "0", according to DEC stop time, auxiliary data of DEC stop command

(2) Deceleration Stop

(a) If meet emergency stop while operate indirect start, direct start, simultaneous start, start operation, homing operation, inching operation, it will sudden stop.

(b) Deceleration stop command not different at these sections: acceleration section, constant section, deceleration section.

(c) If it is decelerated and stopped by deceleration stop command, will not be completed positioning operation as set target position. And….

- No signal for completely positioning
- M code signal cannot be “On” during “After” mode of “M code” mode.

(d) If it receives order for indirect start command (step No. = current step No.) while it is stop,

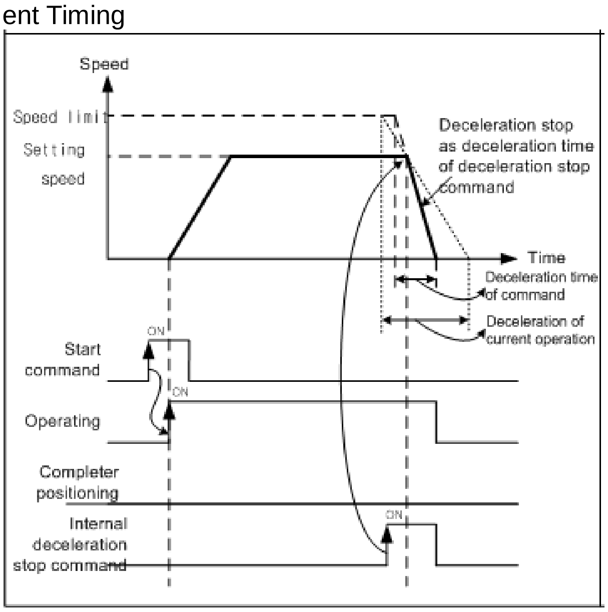
- Positioning of absolute coordinate method: Operate amount of the position reminder which it isn’t outputted on the current operation step.
- Positioning of Incremental coordinate method: Operate as set movement at the target position.

(e) It decelerate and stop by XG5000 and「deceleration stop」command of sequence program as set support data.

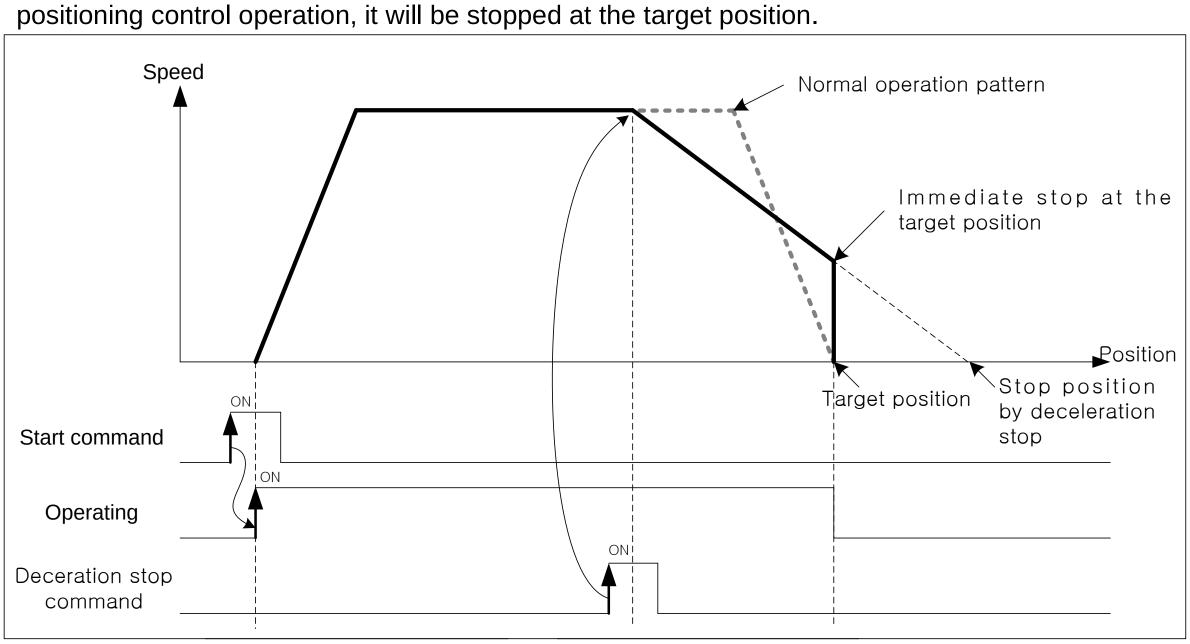
(f) Restriction

- When command internal deceleration stop. The value of deceleration time can bigger than set value of deceleration time by auxiliary data.
- If deceleration stop command is inputted while operate Jog, error (error code: 322) will be made. Use “Stop Jog” command for Jog operation stop.

(g) Movement Timing



■ If the deceleration distance is longer than distance to target position when input deceleration stop command during positioning control operation, it will be stopped at the target position.



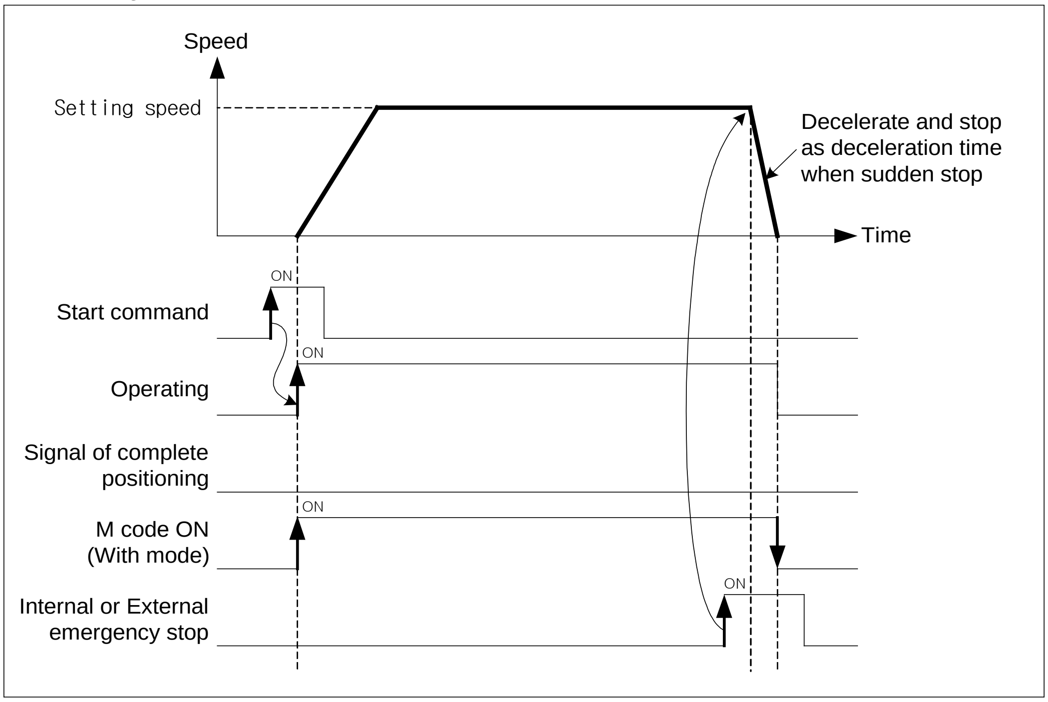
(3) Emergency Stop

(a) If EMG stop command occurs during indirect operation, direct operation, simultaneous start operation, synchronization operation, Home return operation, Jog operation and inching operation, it will stop immediately without deceleration.

(b) In case of emergency stop, error 481 will occur.

(c) M code signal will be “Off” after Emergency stop.

(d) Motion timing

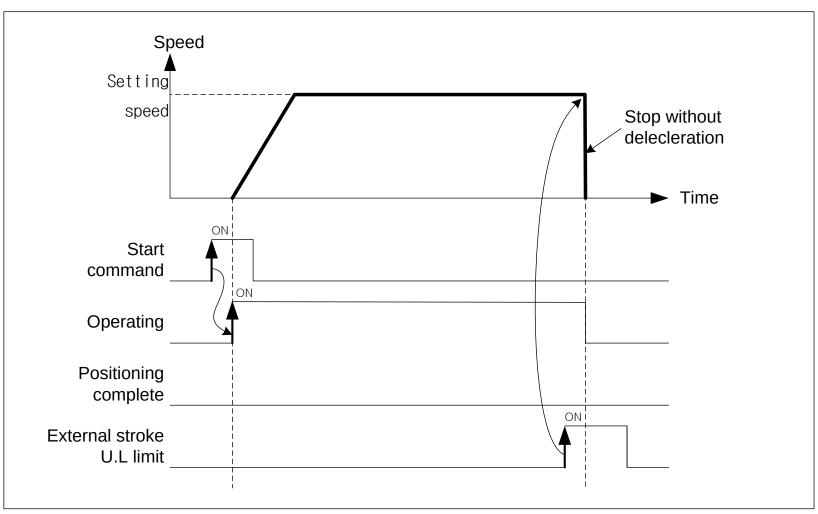


(4) Stop hardware by high/low limit

(a) When positioning control, if the signal of hardware high/low limit is inputted, then stop positioning control and it will be stopped immediately and error will be occurred.

(b) In case of external input stroke high limit error, error 492 will occur and in case of external input stroke low limit error, error 493 will occur.

(c) Motion timing



(5) Stop by software upper/lower limit

(a) When positioning control, if value of current command position out of set value of expansion parameter in「software upper limit」and「software lower limit」, it will promptly be stopped without outputting value of command position.

(b) If value of command position to be out of software upper limit range, will occur error 501, and if it to be out of software lower limit range, will occur error 502.

■ Setting related parameter (expansion parameter)

Item	Setting value	Contents
Software upper limit	-2147483648 ~ 2147483647	Set position of software upper limit.
Software lower limit	-2147483648 ~ 2147483647	Set position of software lower limit.

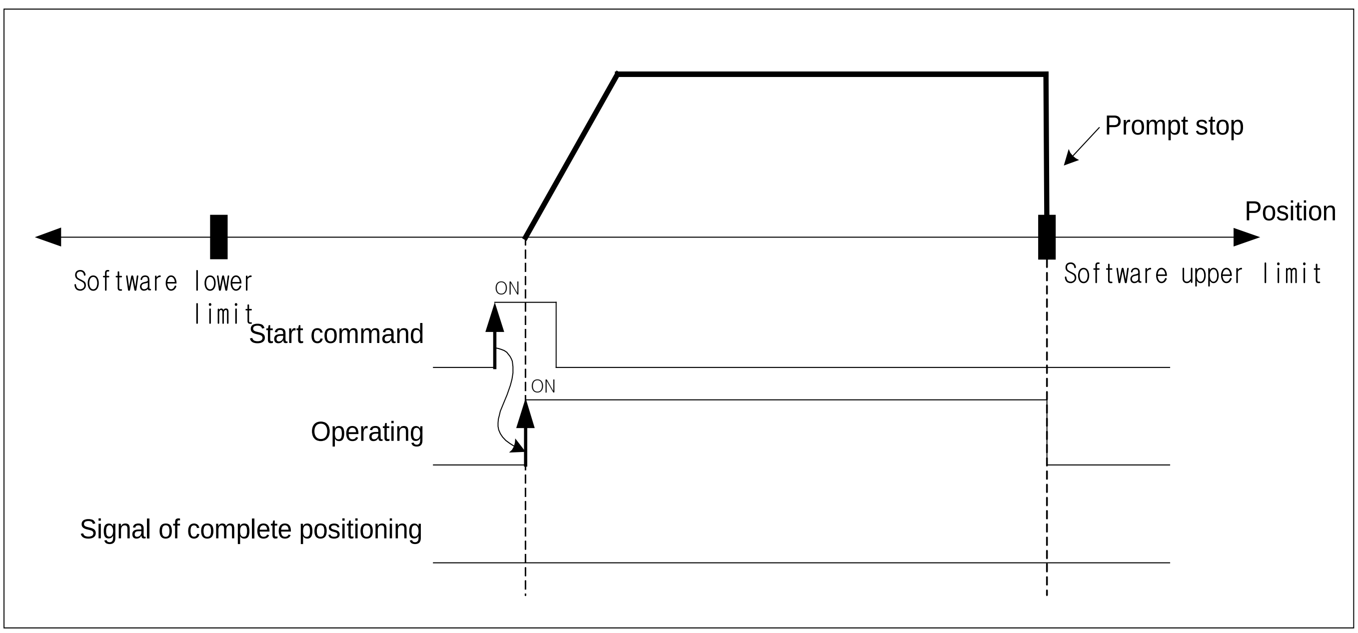
(c) Condition

Software upper/lower limit not to be checked in the following case:

• In case of setting Software high/low limits as maximum (2147483647), minimum (-2147483648)

• In case of “Software upper limit = Software lower limit”

(d) Motion timing



(6) The priority of stop process

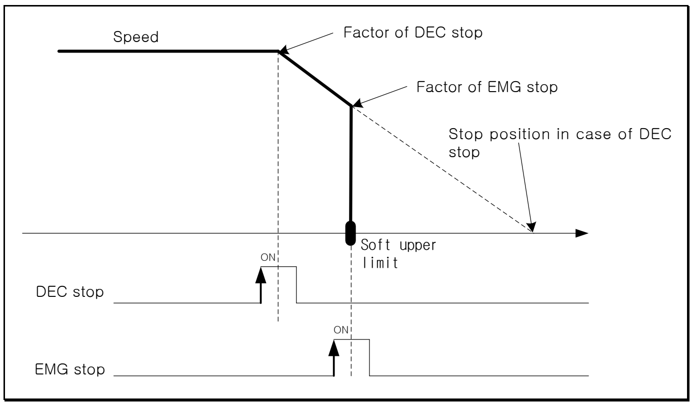
The priority of stop process of positioning module is as follows:

Deceleration stop < Sudden stop

When encounter factor of sudden stop in deceleration stop of positioning, it will be suddenly stopped.

Note

Process is as follows, when factor of sudden stop is occurred during deceleration stop.

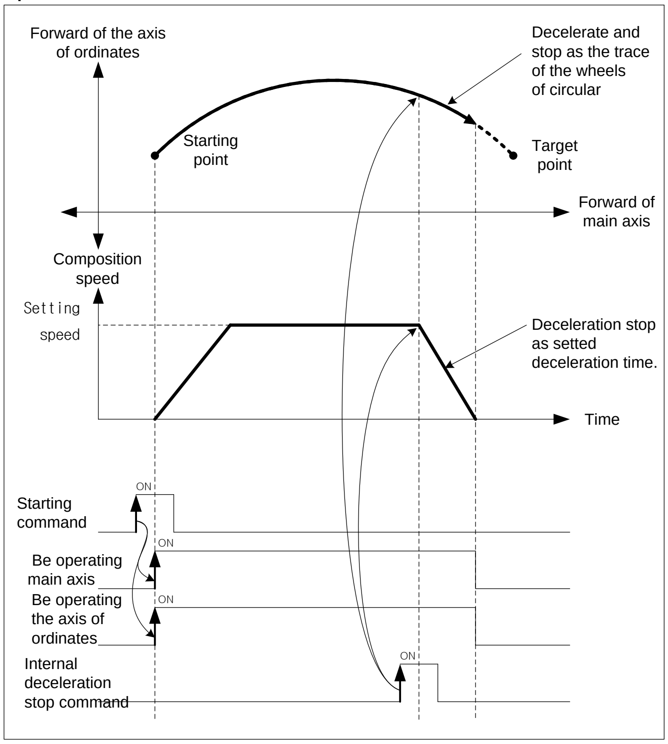


(7) Stop command under interpolation operation

(a) If encounters stop command during interpolation operation (linear interpolation, circular interpolation, helical interpolation, elliptic interpolation), it carries out the deceleration stop. It depends on the trace of wheels of origin.

(b) When it restarts after deceleration stop, indirect start command carries out operation to target position of positioning. And then, operation depends on absolute coordinate and Incremental coordinate.

(c) Operation pattern



(8) Restart after Positioning stop

(a) Deceleration stop

When indirect start after deceleration stop, operate positioning as set operation step.

In case of using with mode, Signal “On” of M code has to “Off” for restart.

Signal On of M code have to be changed “Off” by「Cancellation M code (MOF)」command.

(b) Restart after emergency stop

In case of emergency stop, signal On of M code will automatically be “Off”, therefore can operate positioning as set operation step, when it operate indirect start.

9.3 Manual Operation Control

Manual control is a function that execute random positioning according to user’s demand without operation data

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

9.3.1 Jog Operation

(1) Characteristic of Control

(a) Jog Operation is

- Execute positioning control at jog high/low speed depending on the signal of high/low speed during forward/reverse jog start signal is being ON.
- Positioning is started by Jog command from the state that the origin is determined. The value of positioning stars changing, user can monitor it.
- This is a way of manual operation that can be executed before determination of origin.

(b) Acceleration/Deceleration process and Jog speed

The acceleration/deceleration processing is controlled based on the setting time of Jog acceleration/ deceleration time from XG5000 manual operation parameter setting.

Set the Jog speed on Jog high/low speed of XG5000 manual operation parameter setting.

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

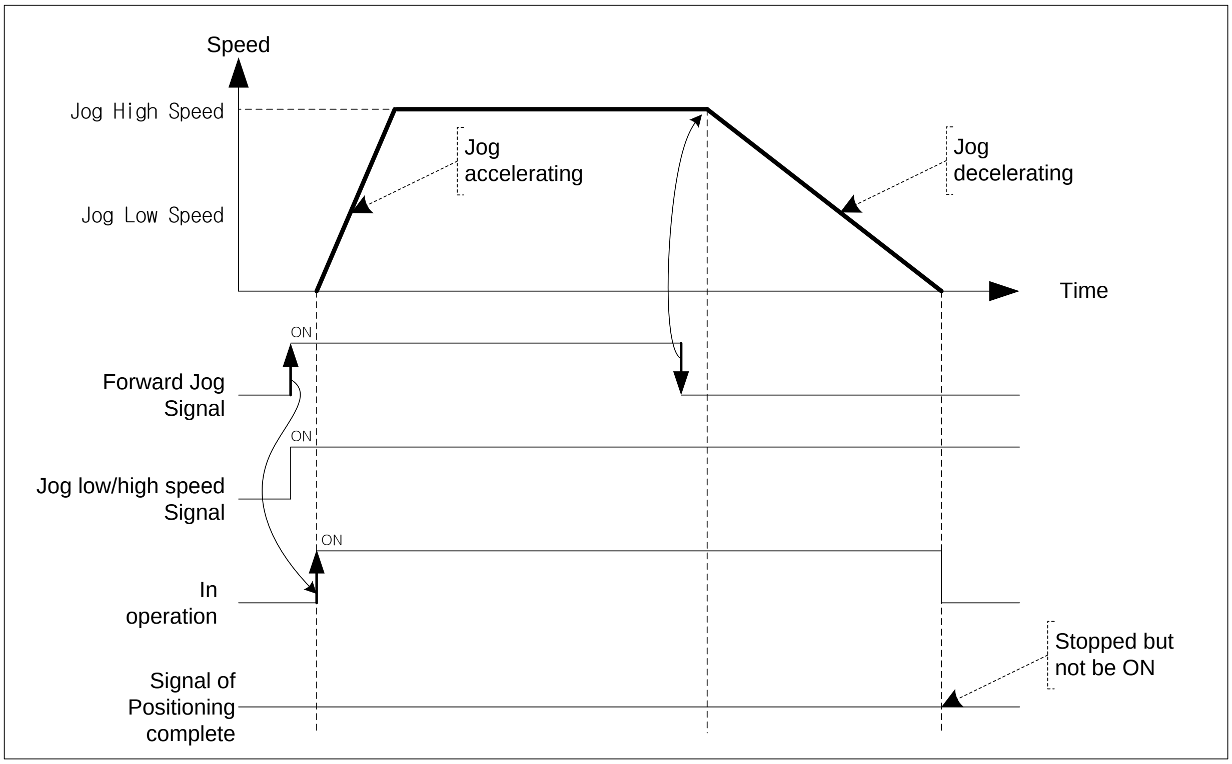
■ Parameter setting (Manual Parameter)

Item	Setting value	Description
Jog High Speed	1 ~ Speed limit	Set Jog speed. Jog high speed must be set below limit
Jog Low Speed	1 ~ Jog High Speed	Set Jog speed. Jog low speed must be set below Jog high speed
Jog Acc. Time	0 ~ 65,535	Set the acc. Time used in acceleration of Jog operation
Jog Dec. Time	0 ~ 65,535	Set the dec. time used in deceleration of Jog operation

Note

If “Jog Acc. Time” is 0, it operates at a goal speed immediately
If “Jog Dec. Time” is 0, it stops immediately without deceleration.

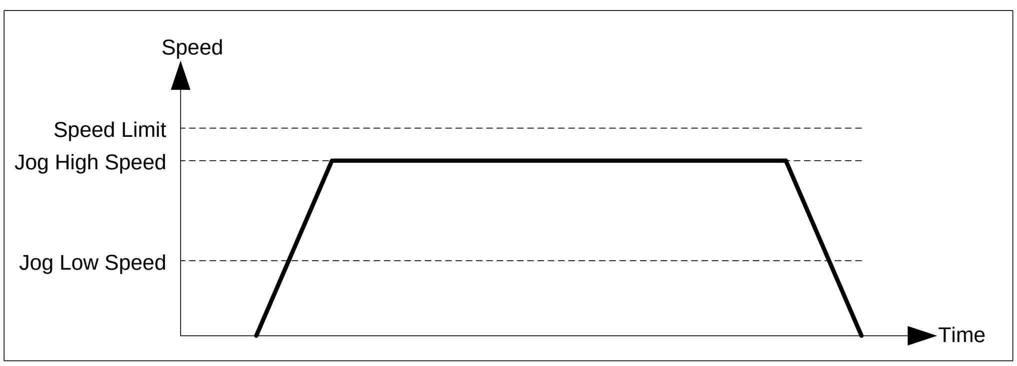
(2) Operation Timing



Note

Notices for setting Jog speed are as follows.

Jog Low Speed ≤ Jog High Speed ≤ Speed Limit



(3) Restrictions

You can not execute Jog operation in the case as follows.

(a) Value of Jog High Speed exceeds the speed limit of basic parameter (Error code : 121)

(b) Value of Jog Low Speed exceeds the value of Jog high speed. (Error code : 122)

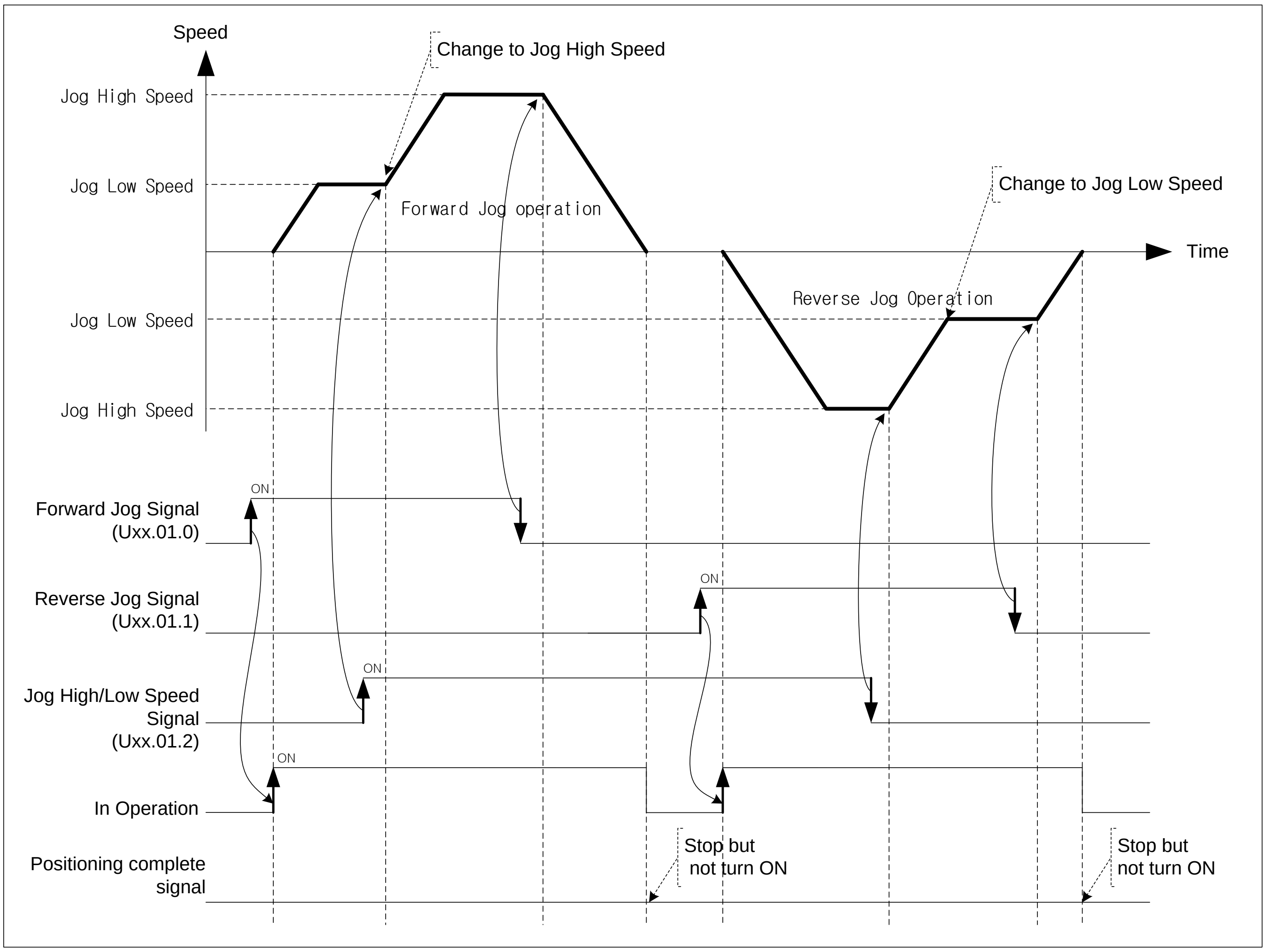
(4) Jog Operation Start

Jog operation start consists of Start by XG5000 and Start by Sequence program. The start by sequence program is that execute Jog operation with output contact of CPU.

Axis	Direction of Signal : CPU -> Positioning module		
	Output Signal		Description
	XBC Type	XEC Type	
X - axis	UXX.01.0	%UXx.y.16	Axis X Forward Jog
	UXX.01.1	%UXx.y.17	Axis X Reverse Jog
	UXX.01.2	%UXx.y.18	Axis X Jog Low/High Speed
	UXX.01.3	%UXx.y.19	Clear positioning complete signal
Y - axis	UXX.01.4	%UXx.y.20	Axis Y Forward Jog
	UXX.01.5	%UXx.y.21	Axis Y Reverse Jog
	UXX.01.6	%UXx.y.22	Axis Y Jog Low/High Speed
	UXX.01.7	%UXx.y.23	-Clear positioning complete signal

[Example] Execute Jog start in the order as follows.

■ Forward Jog Low speed Operation -> Forward Jog High speed Operation -> Stop
Reverse Jog High speed Operation -> Reverse Jog Low speed Operation -> Stop



Note

Dec. stop command will not be executed in Jog Operation.
Jog operation will stop if turn the Jog signal of the current operating direction Off.

9.3.2 Inching Operation

This is a kind of manual operation and executing positioning at the speed already set on manual operation parameter as much as the amount of movement already set on the data of inching operation command.

(1) Characteristics of Control

(a) While the operation by ON/OFF of Jog signal 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.

(b) 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.

(c) The setting range is –2147483648 ~2147483647 Pulse.

(d) The direction of moving depends on the amount of inching.

■ The amount is POSITIVE(+) : Positioning operation in forward direction

■ The amount is NEGATIVE(-) : Positioning operation in reverse direction

(e) Acc./Dec process and Inching speed

Use Jog acc./dec. Time of manual operation as acc./dec. time of Inching operation.

Set Jog acc./dec. time on “Jog acc./dec. time” of manual operation parameter setting of XG5000.

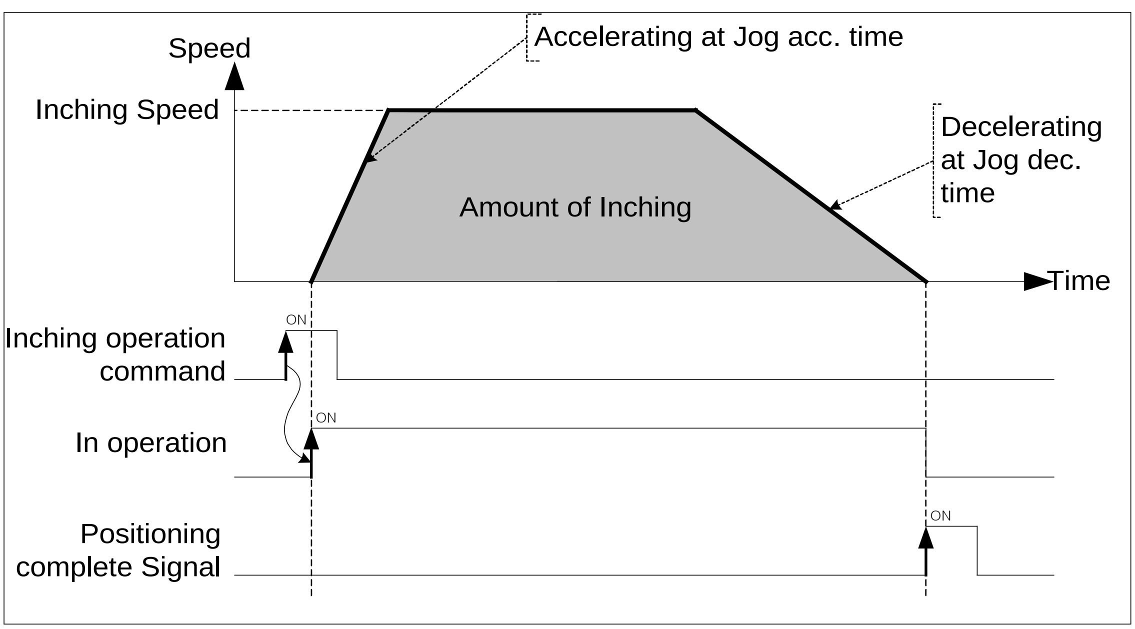
Set Inching speed on “Inching speed” of manual operation parameter setting.

If inching speed is set out of the setting range, error will occur and the operation does not work.

■ Related parameter setting (Manual operation parameter)

Items	Setting value	Description
Jog acc. Time	0 ~ 65,535	Set the accelerating time for acceleration of Inching operation
Jog dec. Time	0 ~ 65,535	Set the decelerating time for deceleration of Inching operation
Inching Speed	1 ~ 65,535	Set the speed of Inching operation

(2) Operation Timing



9.4 Synchronous Control

This is the command that control the operation synchronizing with the main axis or operating of encoder.

9.4.1 Speed Synchronous Control

This is the command that synchronize with sub axis in speed and control operation depending on speed synchronous rate already set when main axis starts.

(1) Characteristic of Control

(a) Start and Stop is repeated depending on operating of main axis after execution of speed synchronous command. The operating direction of sub axis and the main's are same.

(b) If execute speed sync. command, it will be the state of operating and remain in the state of speed sync. operation before release of speed sync. command.

(c) Auxiliary data of speed sync. command

The auxiliary data used in speed sync. command is as follows.

Item	Setting value	Description
Main Axis	0 (X-axis), 1(Y-axis), 2(encoder)	Set the main axis of speed sync.
Ratio of Main axis	1~65,535	Set the ratio of main axis at speed sync. ratio.
Ratio of Sub axis	1~65,535	Set the ratio of sub axis at speed sync. ratio..

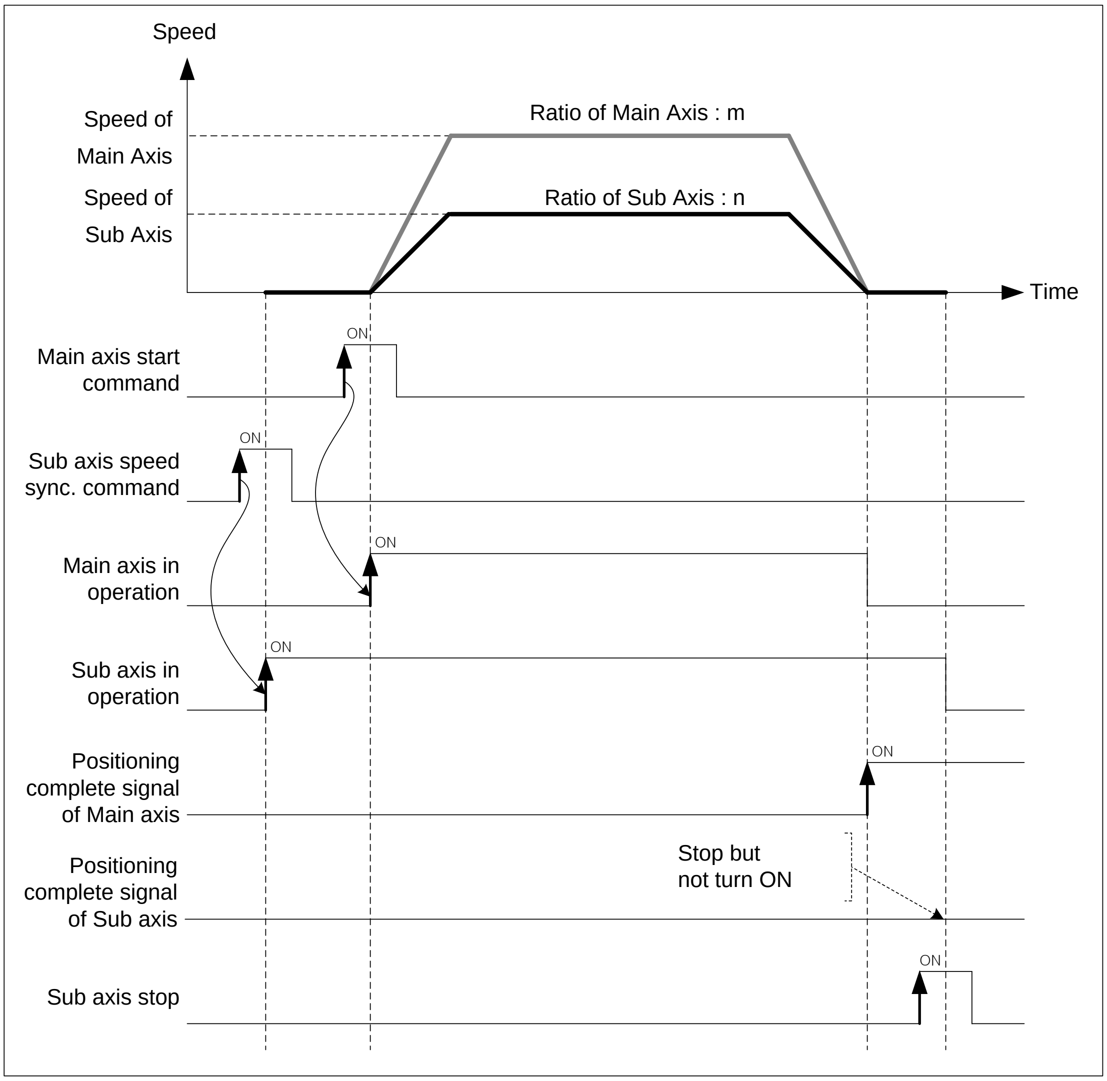
Ratio of Speed sync. is calculated as follows.

$$Ratio = \frac{SubAxis}{MainAxis}$$

Operating speed of sub axis is calculated as follows.

$$\begin{aligned} Operaing\ \ speed\ \ of\ \ SubAxis &= Operating\ \ Speed\ \ of\ \ MainAxis \times Ratio\ \ of\ \ speed\ \ sync. \\ &= Operating\ \ Speed\ \ of\ \ MianAxis \times \frac{Ratio\ \ of\ \ SubAxis}{Ratio\ \ of\ \ MainAxis} \end{aligned}$$

(2) Operation Timing



(3) Restrictions

You can not execute Jog operation in the case as follows.

(a) If speed sync. is executed in being On of M code signal, error (code:353) arises. Make M code “off” with M code release command (MOF) before use.

(b) In the case that the axis set as main axis is not the axis can be set or the case that the setting of main axis is the same as the setting of command axis, error (code”355) arises. Set the main axis among the axis available to be set.

(c) If the speed of main axis exceeds the speed limit, error (code:357) arises. In the case, the speed of main axis has to be down below the speed limit. In the case that the speed of main axis exceeds the speed limit, error arises and it decelerate in “Dec. time of emergent stop”.

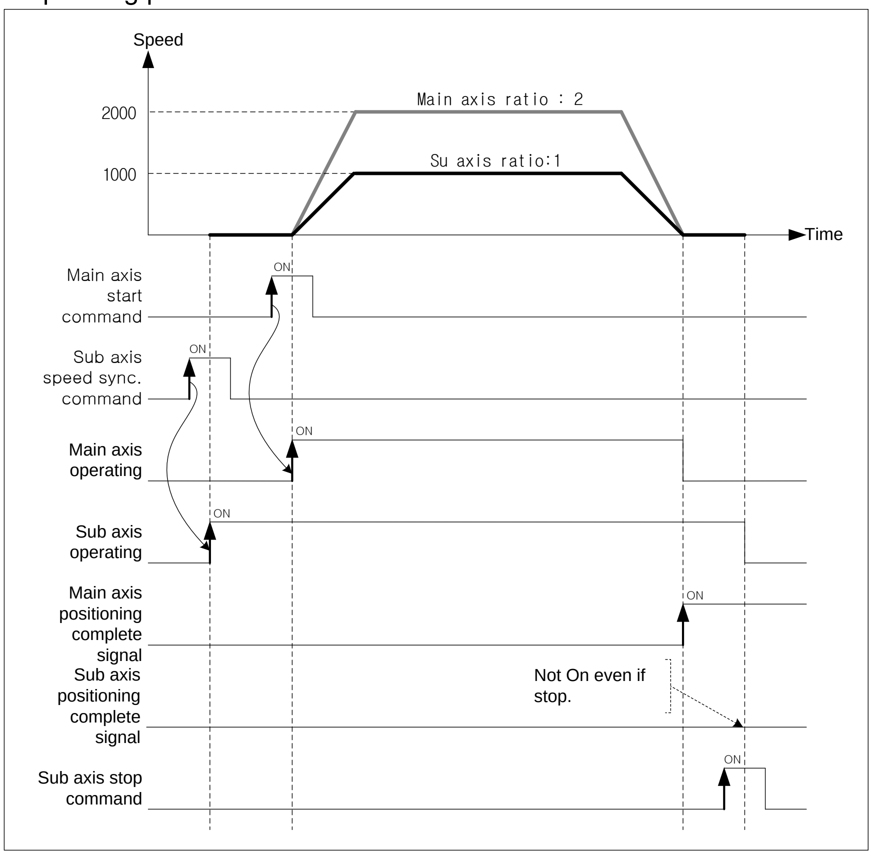
[Example] axis X is main axis, axis Y is sub axis. Operate at “ratio of main axis : ratio of sub axis = 2 : 1”

■ Example of setting in XG5000

▪Operation data of main axis (axis X)

Step no.	Coord.	Control	Method	Pattern	Goal Position [pls]	Operating speed [pls/s]	Acc. no.	Dec. no.	M code	Dwell Time
1	INC	POS	SIN	END	10000	2000	No. 1	No. 1	0	0

■ Operating pattern



(4) Speed synchronous control with encoder

(a) Set encoder as the main axis of speed sync. and execute positioning control by ratio of speed sync. that consists of pulse speed from encoder, ratio of main axis and ratio of sub axis.

(b) This command is used in the case that executing thorough positioning manually.

(c) After executed speed sync. command, when the pulse string is inputted, speed sync. control starts.

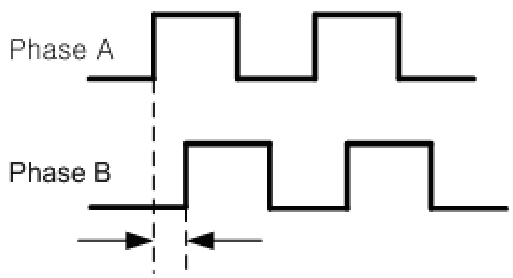
(d) Operate In case of origin fix

(e) The pulse inputted by encoder increase of decrease the position value of encoder.

(f) The direction of moving depends on encoder pulse input mode and ratio of speed sync,

■ Encoder direction in PHASE A/B 4 multiplication

- Positioning in forward direction : Input pulse of A phase is ahead of B’s
- Positioning in reverse direction : Input pulse of B phase is ahead of A’s



Above 1.25 μs

The value of position increase when the input pulse of phase A is ahead of B's

The value of position decrease when the input pulse of phase B is ahead of A's

(g) Related parameter (Common Parameter)

Set parameter related to encoder on common parameter.

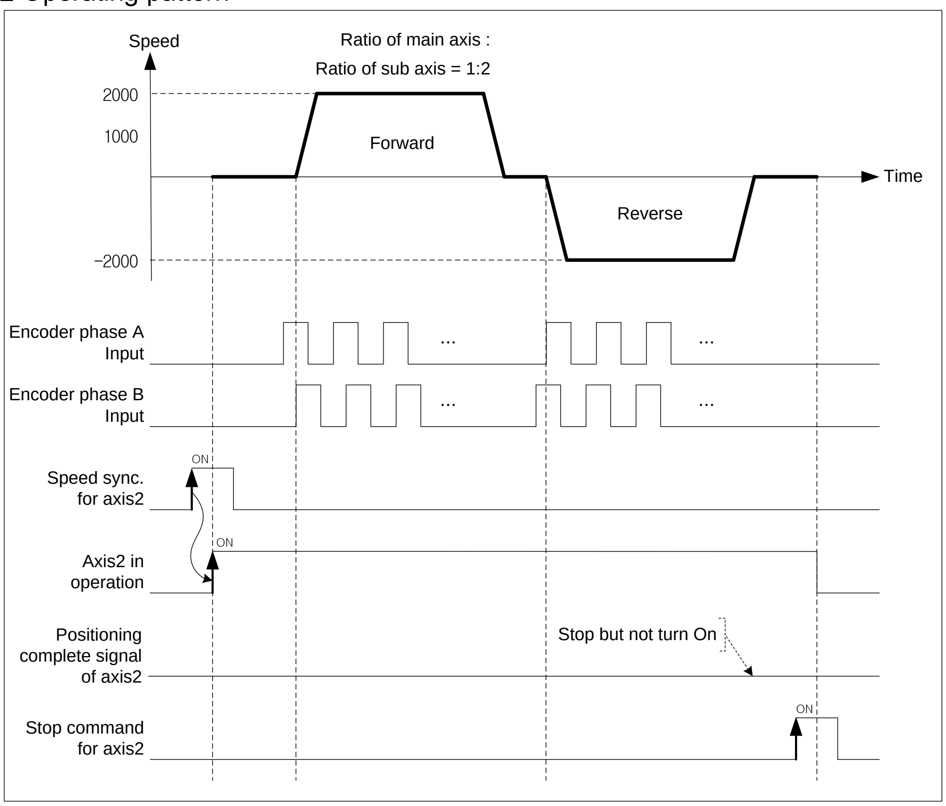
Item	Setting Value	Description
Encoder Pulse Input	0 : CW/CCW 1 multiplying 1 : PULSE/DIR 1 multiplying 2 : PHASE A/B 4 multiplying	Set the encoder to use in input of encoder
Maximum of encoder	-2147483647 ~ 2147483647	Set the count range with max./min. of encoder
Minimum of encoder	-2147483647 ~ Max. of Encoder	

[Example] Execute speed sync. control with encoder (main axis), axis2(sub axis) at "the ratio of main axis : the ratio of sub axis = 1 : 2".

(Hypothesize that the input speed of encoder is 1Kpps)

When the direction of encoder is forward, the operating direction of sub axis is reverse. When the direction of encoder is reverse, the operating direction of sub axis is forward.

■ Operating pattern



9.4.2 Position synchronous control

Start positioning with step no. and operation data when the current position of main axis is same as the position set in position sync.

(1) Characteristics of control

(a) Synchronous Start by Position (SSP) command is carried out only in case that the main axis is in the origin determination state.

(b) SSP command starts by the synchronization of the subordinate axis according to the current position of the main axis.

(c) SSP carries out the SSP command at the subordinate axis.

(d) 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.

(e) 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.

(f) The auxiliary data of position sync. command

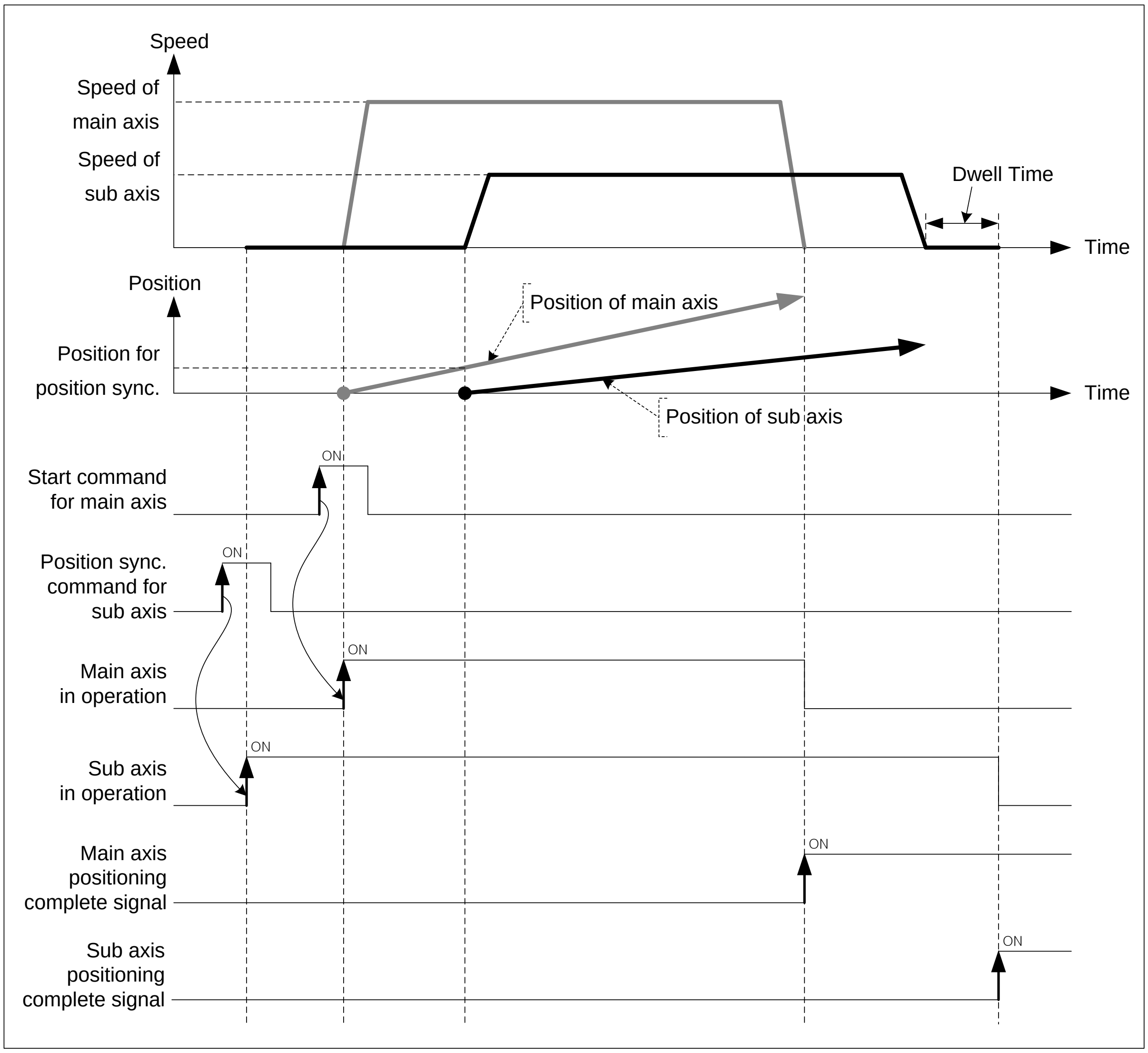
The auxiliary data used in position sync. is as follows.

Items	Setting Value	Description
Position of position sync.	-2147483648 ~ 2147483647	Set the position of main axis in position sync. control
Operation step	1~150	Set the step no. to be executed when the main axis arrives at the position for position sync.
Main axis	0 (axis X) ~ 1(axis Y)	Set the main axis of position sync.

Note

Even though the current position of main axis and the setting value set on position sync. are not exactly same, if the current position of main axis is at between the position of main axis of previous scan and the current position of main axis, the sub axis will be executed with the positioning data of step no. set on operation step.

(2) Operation timing



(3) Restrictions

Position sync. control can be executed in the case below.

(a) If position sync. command is executed in M code signal is On, error (code:343) arises. Use it after making M code "Off" with M code release command (MOF).

(b) If the current main axis is not the axis can be set on the current module or main axis and command axis are the same axis, error (code:355) arises. Set the main axis among one of the axis can be set on module.

[Example] Axis X is main axis, axis X is sub axis. The position of main axis for position sync. is 1300, execute position sync. with operation data no.10 of axis Y.

■ The current position of axis X : 0

The current position of axis Y : 0

■ Example in XG5000

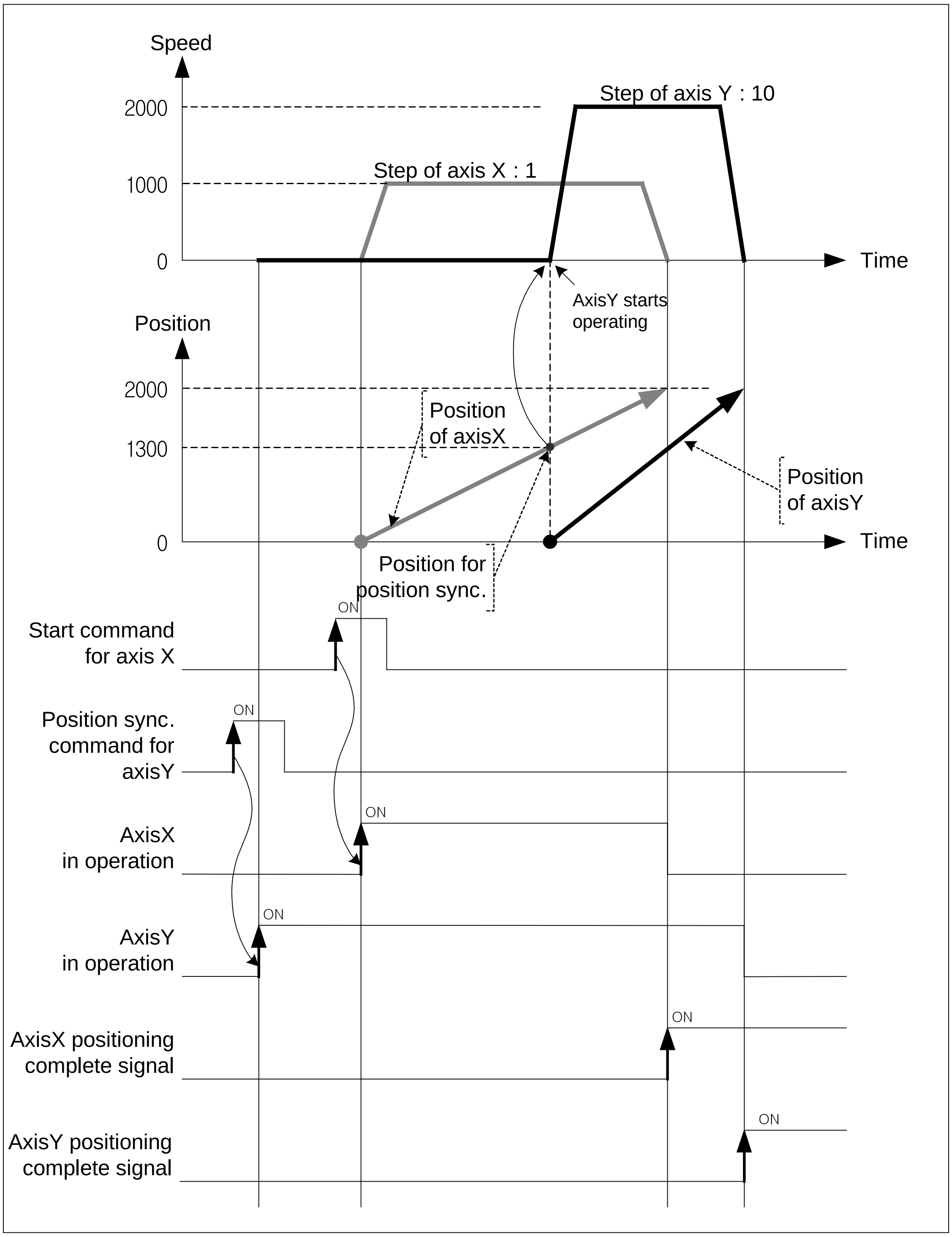
▪ Main axis (axis X) Operation data

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. no.	Dec. no.	M code	Dwell time
1	INC	POS	SIN	END	2000	1000	No. 1	No. 1	0	0

▪ Sub axis (axis Y) Operation data

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operating speed [pls/s]	Acc. no.	Dec. no.	M code	Dwell time
10	INC	POS	SIN	END	2000	2000	No. 2	No. 2	0	0

■ Operating pattern



9.5 Modification Function of Control

9.5.1 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.

(1) Characteristic of Control

(a) Modify the current position into “Homing end position” of homing parameter and become Origin-decided status.

(b) After floating origin setting command is executed, the current position is changed to “The position of homing completion” of homing parameter.

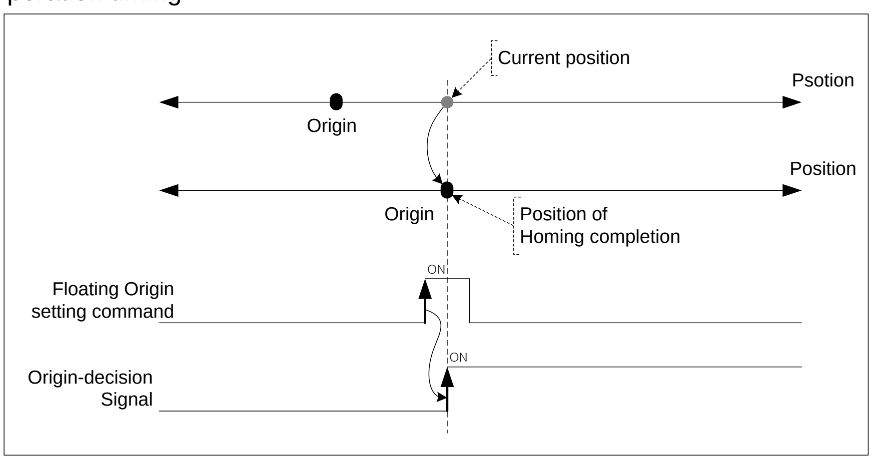
(c) Related parameter (Homing Parameter)

Items	Setting value	Description
Position of homing completion	-2147483648 ~ 2147483647	Set the position after homing completion or floating origin setting

Note

Floating origin setting just executes forced origin-decision from the current position to origin completion position. So user need to take notice as follows.
1. When error arose, clear the cause of error and reset,
2. set floating origin again,
3. Change the operation step no. to operate with start step no. change command and then execute.

(2) Operation timing



9.5.2 Position Override

This is used to change the goal position during positioning operation by positioning data.

(1) Characteristics of Control

(a) Position override command is used in the operation pattern (Acceleration, Constant speed, Deceleration section) and the available operation mode is End operation, Go-on operation, Continuous operation.

(b) Position setting range is –2,147,483,648 ~ 2,147,483,647 Pulse.

(c) Since the position override command is applied based on incremental coordinates, the processing method varies depending on when the command is executed. That is, when the position override command is executed, if the current position passes the override position based on the starting point of the step being driven, a deceleration stop is performed. If the current position has not passed the override position, the target position is changed by applying the override position in incremental coordinates based on the start point of the current step.

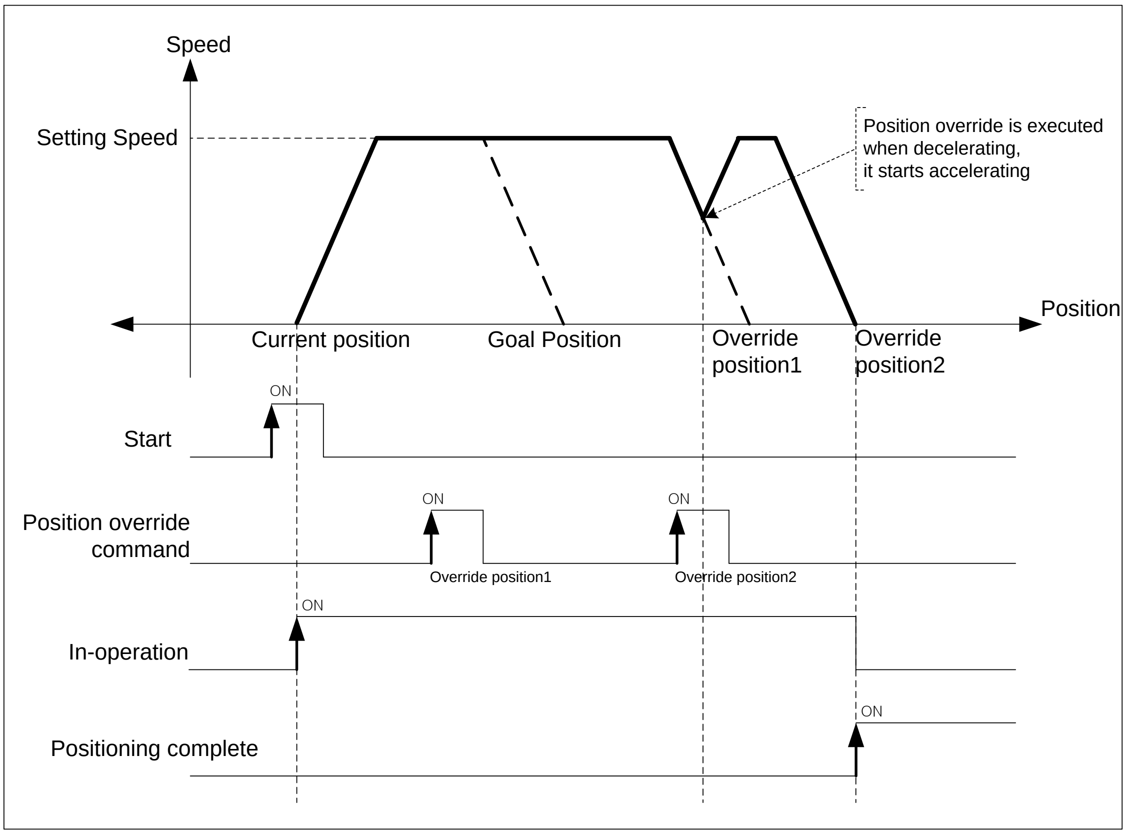
(ex) Let's explain the location override operation using the example of the case where the current location is 20,000 and the driving data is set as in the table below.(The position override amount is assumed to be 15,000.)

Step no.	Coord.	Pattern	Control	Method	Repeat step	Goal position [pls]	M Code	Acc/ Dec no.	Operation speed [pls/s]	Dwell time(ms)
3	ABS	END	POS	SIN	0	40,000	0	0	500	100

1) When driving step 3 is activated, it moves forward to absolute coordinates 40,000.
2) If the location override is executed when the current location is 30,000 while driving, the target location will be changed to 35,000, which is 20,000 + 15,000, since it has not passed 15,000 from the driving start point of 20,000.
3) If the position override is executed when the current position is 38,000, it will decelerate to a stop because it has passed 15,000 from the driving start point of 20,000.

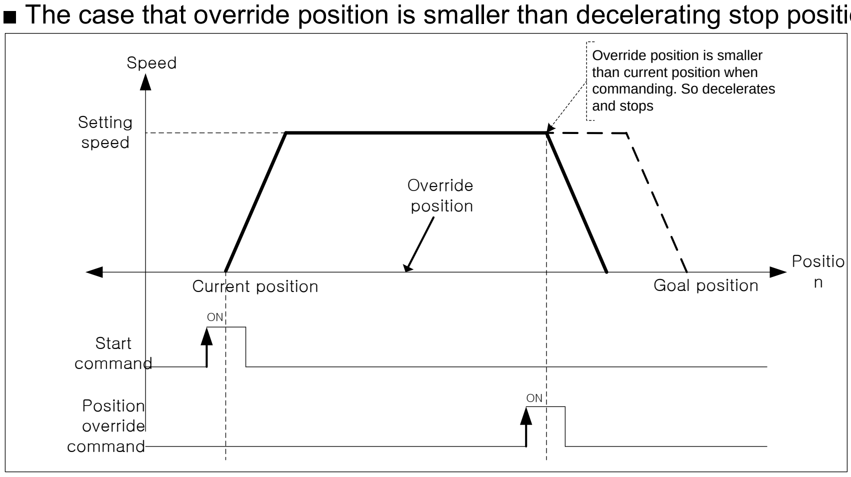
(d) This command may be executed several times in operation.

(2) Operation timing



If position override is executed in operation, the goal position is changed to override position1 and keep operating. If position override for override position2 is executed at dec. area, positioning is finished by acc. speed already set at override position2.

■ The case that override position is smaller than decelerating stop position.



(3) Restrictions

In the cases below, position override is not executed and previous operation is being kept.

(a) Execute position override in dwell. (error code:362)

(b) Current operation is not positioning control(shortcut positioning, Inching operation). (error code:363)

(c) Execute position override on the axis operating linear interpolation. (error code:364)

(d) Execute position override on the axis operating circular interpolation. (error code:365)

(e) Execute position override on the sub axis of sync. operation. (error code:366)

[Example] Execute position override on axis X operating by absolute, position control.

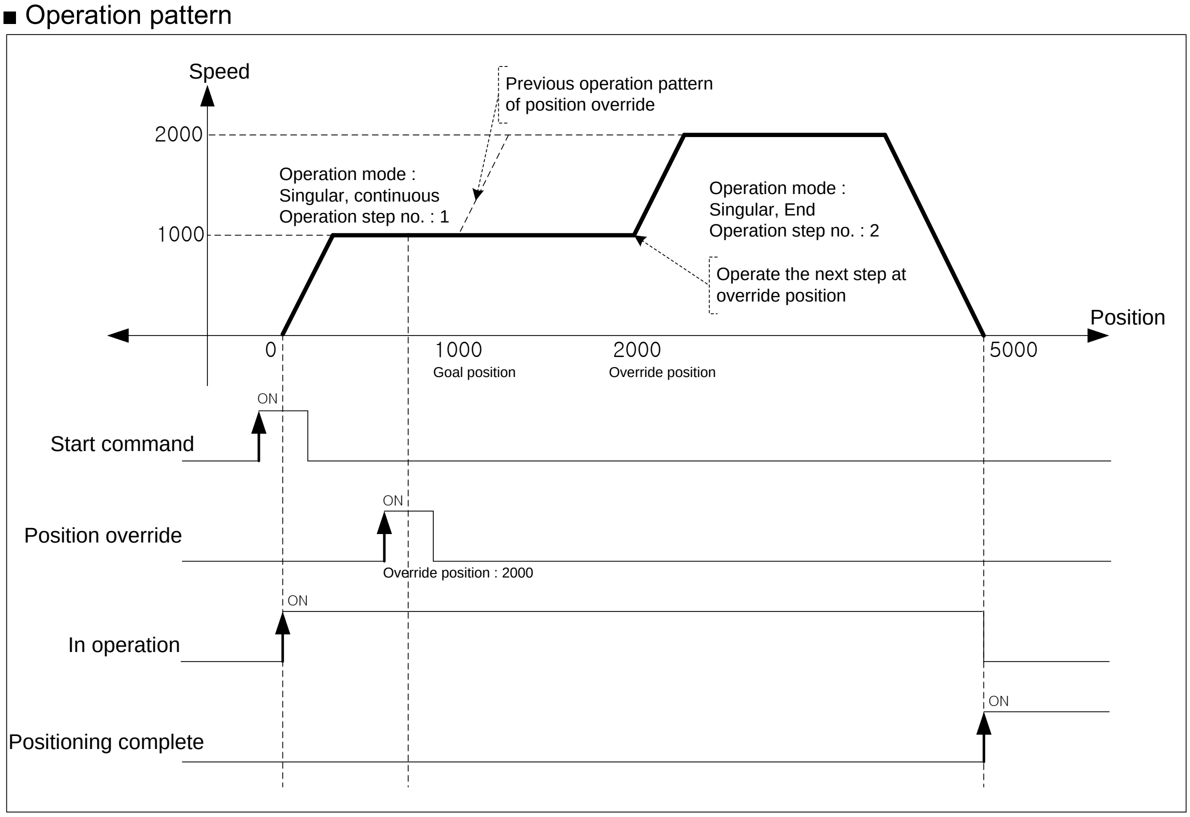
■ Current position of axis X : 0

■ Setting example in XG5000

▪ Operation data of axis X

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operation speed [pls/s]	Acc.no.	Dec.no.	M code	Dwell time
1	ABS	POS	SIN	CONT	1000	1000	No.1	No.1	0	0
2	ABS	POS	SIN	END	5000	2000	No.1	No.1	0	0

■ Operation pattern



Note

If operation pattern is “continuous” and override position is bigger than goal position, keep operating at current speed then continue to operate the next step. If override position is smaller than goal position, execute decelerating stop and position in reverse direction, then continue to operate the next step.

9.5.3 Speed Override

When user wants to change the operation speed of positioning control, user may change the speed with speed override command.

(1) Characteristics of Control

(a) Speed override command is available in acc./steady speed area and available operation modes are “end”, “go on” and “continuous”.

(b) It may be executed several times in operation.

(c) User may set speed override value as “%setting” or “speed setting” on [Speed override] of common parameter.

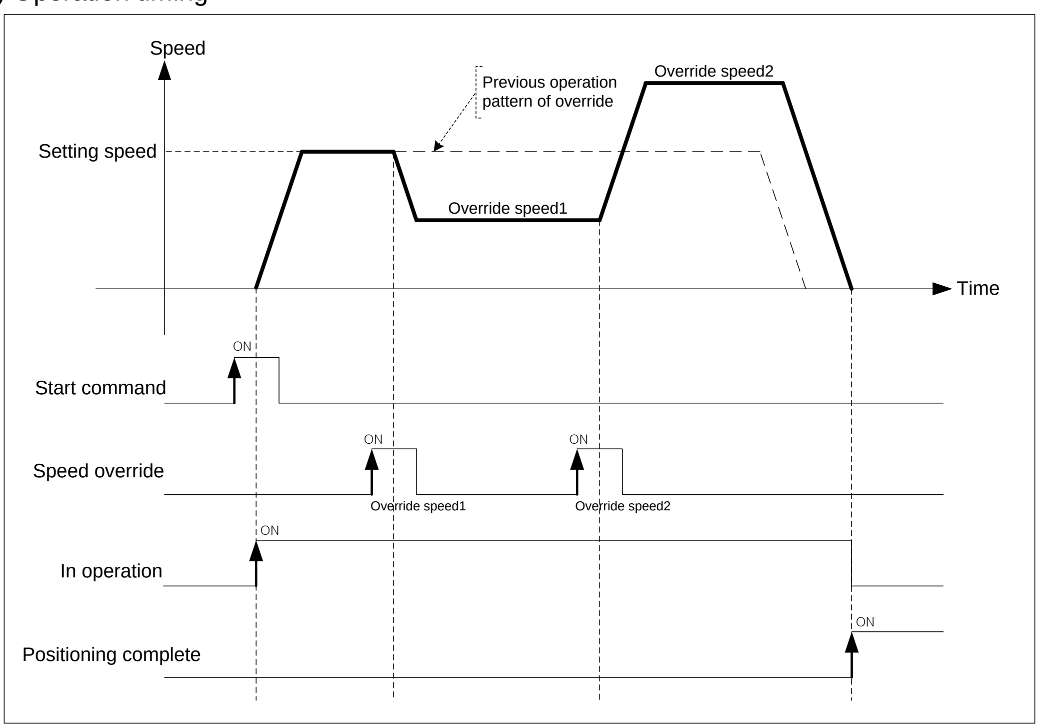
(d) Related parameter setting (common parameter)

Items	Setting value	Description
Speed override	0 : %setting	Set the speed override setting value by %
	1 : speed setting	Set the speed override setting value with exact number

(e) Auxiliary data of speed override command setting

Items	Setting value	Description
Speed	0.01 ~ 65,535 (1=0.01%)	Set the speed override setting value with percentage (If it is 100%, set 10000)
	1 ~ Speed limit	Set the speed override setting value directly

(2) Operation timing



(3) Restrictions

In the cases below, speed override is not executed and previous operation is being kept.

(a) Value of speed override exceeds speed limit of basic parameter. (error code:372)

Speed value of Speed override must be below speed limit.

Override speed of linear interpolation for each axis need to be below speed limit.

(b) Execute speed override on the sub axis of linear interpolation. (error code:373)

In linear interpolation, speed override must be executed on main axis.

(c) Execute speed override on the sub axis of circular interpolation. (error code:374)

In circular interpolation, speed override must be executed on main axis.'

(d) Execute speed override on sub axis of sync. operation. (error code:375)

(e) Execute speed override in dec. area. (error code:377)

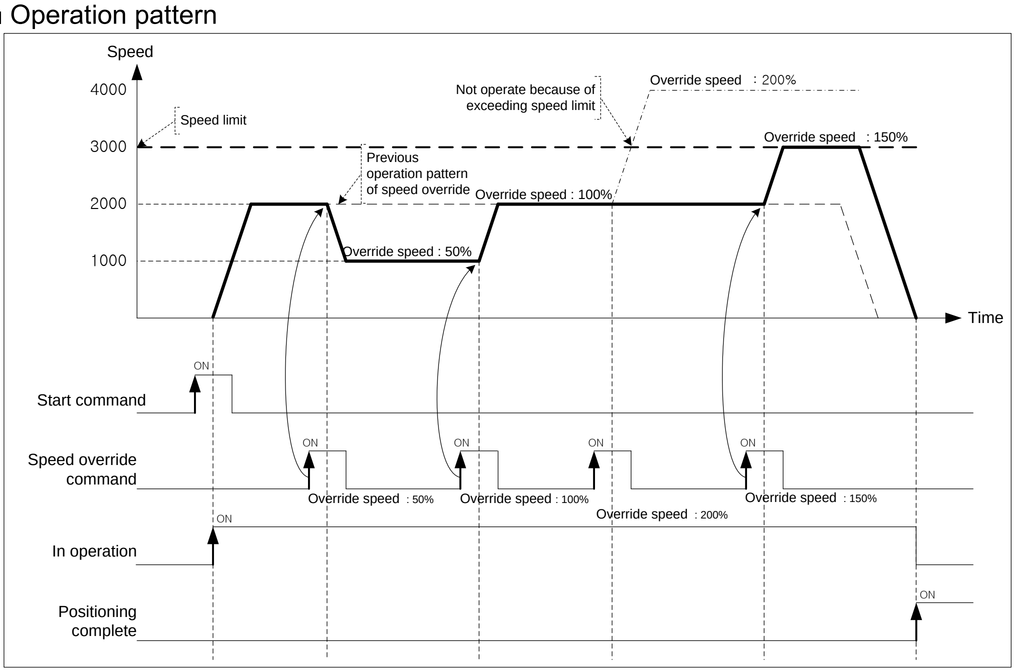
[Example] Execute speed override(50%→100%→200%→150%) on axis X operating by absolute, position control.

■ Current position of axis X : 0
"Speed override" of common parameter : Set %
"Speed limit" of basic parameter : 3000 [pls/s]

■ Setting example of XG5000
▪ Operation data of axis X

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operation speed [pls/s]	Acc.no.	Dec.no.	M code	Dwell time
1	ABS	POS	SIN	END	1000	2000	No.1	No.1	0	0

■ Operation pattern



9.5.4 Positioning Speed Override

This is the command to operate by the changed operation speed if it reaches the setting position during positioning operation.

(1) Characteristics of Control

(a) This command is used only in Acceleration and Constant speed section from operation pattern and the available operation mode is End, Go-on, Continuous operation.

(b) As this command is not carried out in Deceleration section, cares should be taken in using.

(c) The position setting range is –2147483648 ~ 2147483647 Pulse.

(d) User may set speed override value as “%setting” or “speed setting” on [Speed override] of common parameter.

(e) User may select that consider the designated position value on “coordinates of positioning speed override” of extended parameter as an absolute position or a Incremental position.

(f) Related parameter setting

■ Common parameter

Items	Setting value	Description
Speed override	0 : Set %	Set the value of speed override by %
	1 : Set speed	Set the value of speed override with exact number

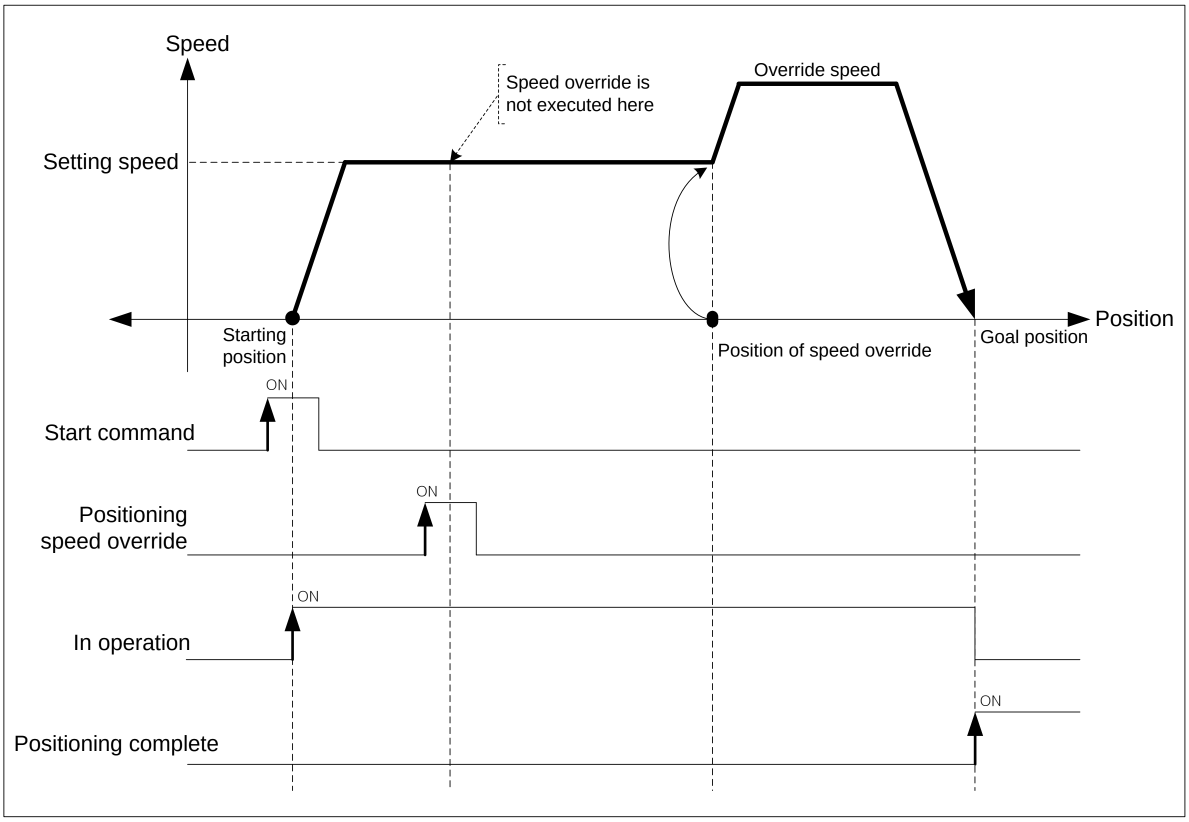
(g) Auxiliary data setting of positioning speed override command

Items	Setting value	Description
Postion	-2147483648 ~ 2147483647	Set the position to start speed override
Speed	0.01 ~ 655.35 (1=0.01%)	If speed override is “%”, set the speed by % (100% is 10000)
	1 ~ Speed limit	If speed override is “Exact number”, set the speed with exect number

Note

While the current position is not exactly same as the value set on speed override, if the position of speed override is at between previous scan and current scan, speed override is executed at the speed set.

(2) Operation timing



(3) Restrictions

In the cases below, positioning speed override is not executed and previous operation is being kept.

(a) Current operation is not positioning (shortcut position control, Inching operation) control. (error code:382)

(b) The value of speed override exceeds speed limit of basic parameter. (error code:383)

The speed value of speed override must be below speed limit.

(c) Execute positioning speed override on the sub axis of linear interpolation. (error code:384)

In linear interpolation, positioning speed override must be executed on main axis.

(d) Execute speed override on the sub axis of circular interpolation. (error code:385)

In circular interpolation, positioning speed override must be executed on main axis.’

(e) Execute speed override on sub axis of sync. operation. (error code:386)

(f) If execute positioning speed override in dec. area., error code 377 arise and speed overrid is not executed.

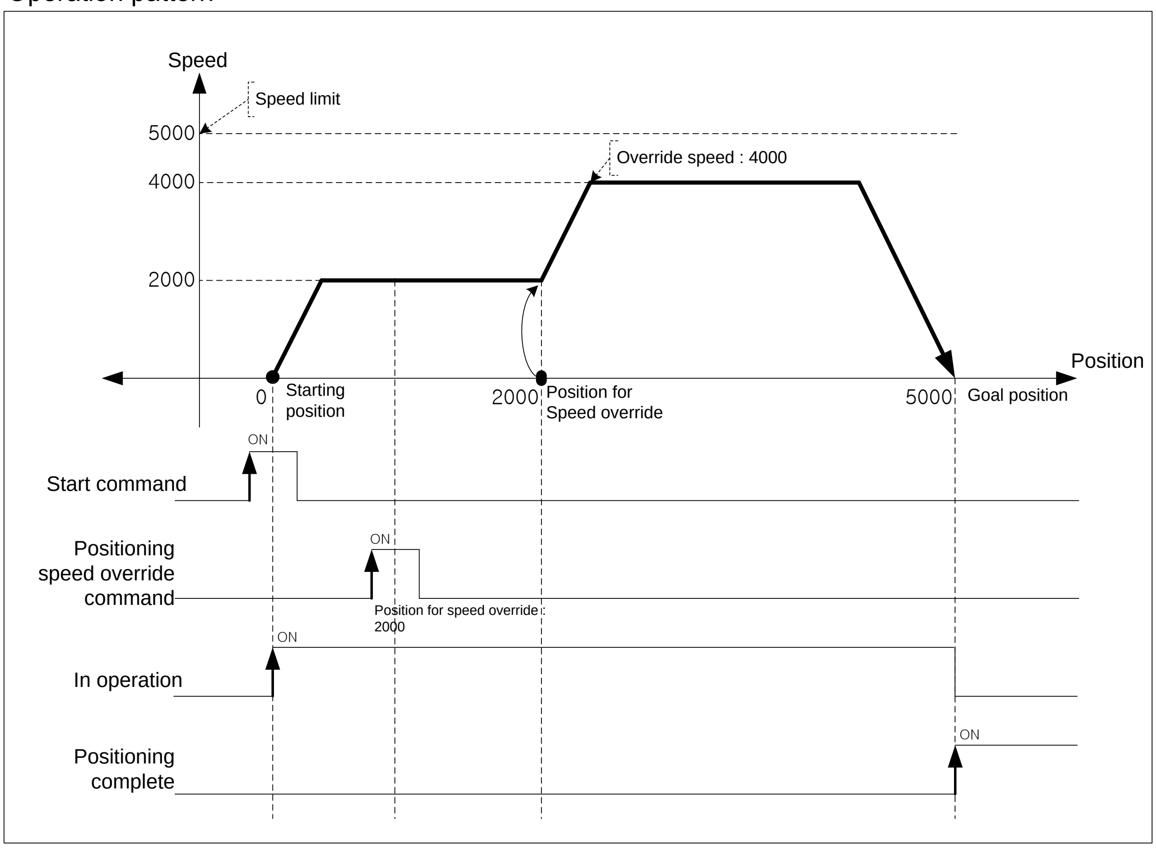
[Example] Execute positioning speed override at 4000 [pls/s] at 2000(position of speed override) on axis X operating by absolute, position control.

■ Current position of axis X : 0
「Speed override」 of common parameter : Speed setting
「Speed limit」 of basic parameter : 5000 [pls/s]

■ Setting example in XG5000
▪ Operation data of axis X

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operation speed [pls/s]	Acc.no.	Dec.no.	M code	Dwell time
1	ABS	POS	SIN	END	5000	2000	No.1	No.1	0	0

■ Operation pattern



9.5.5 Current Position Preset

This command is for changing the current position value to the value at user's pleases.

(1) Characteristics of Control

(a) If user uses this command, the origin-undecided status becomes origin-decided status.

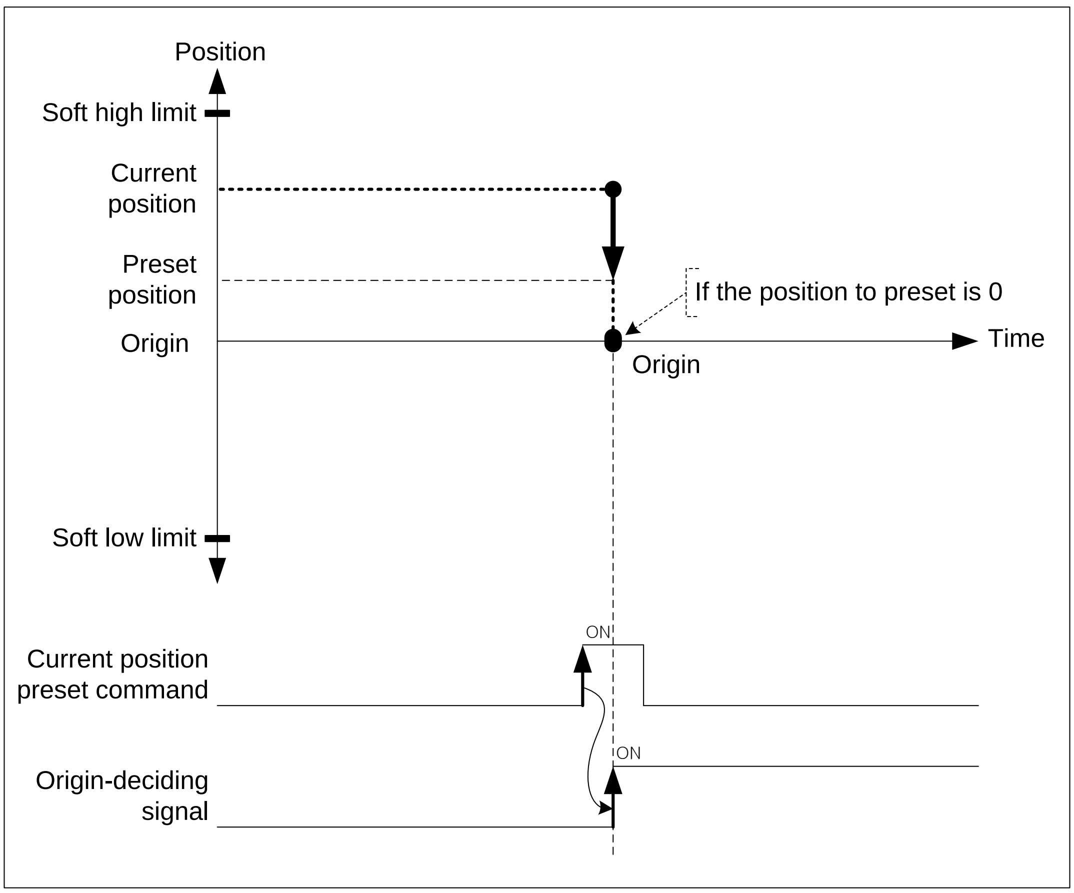
(b) When the current position is changed by position changing command, the mechanical origin position is changed. If user wants to use the mechanical origin again, has to execute homing command.

(c) The current position preset command may not be executed in operation.

(d) Auxiliary data setting of current position preset command.

Items	Setting value	Description
Position	-2147483648 ~ 2147483647	Set the position to change

(2) Operation timing



(3) Restrictions

In the cases below, current position preset is not executed and error arises.

(a) Setting value of current position preset exceeds soft high/low limit of extended parameter. (error code:452)

9.5.6 Encoder Preset

This command is for changing the value of current encoder position to the value at user's pleases.

(1) Characteristics of Control

(a) User may change the current position value.

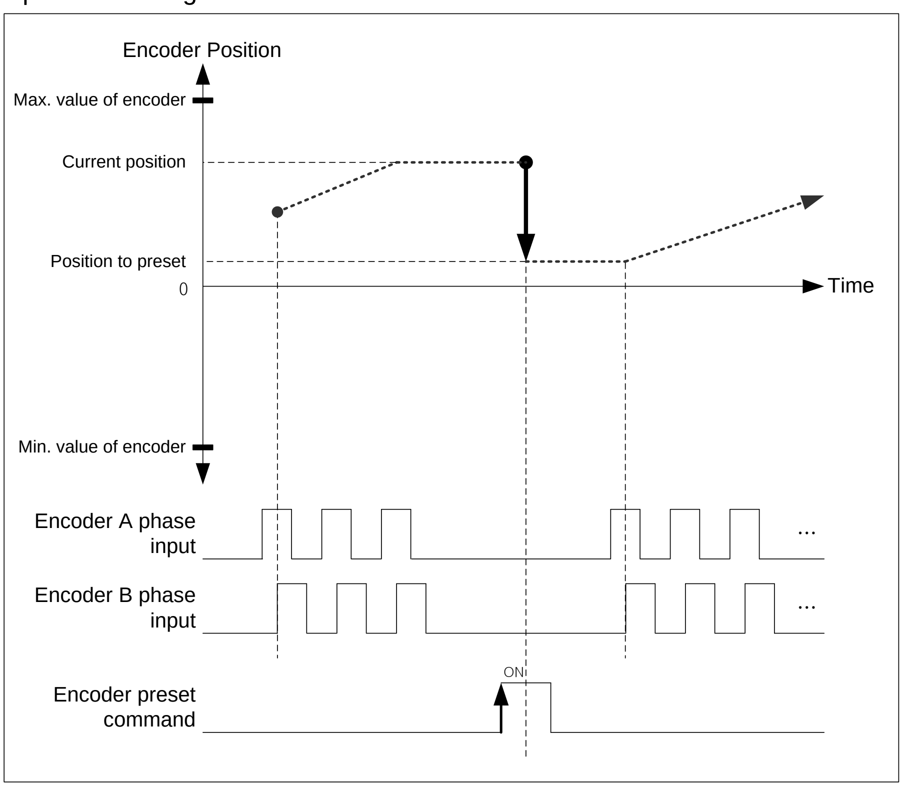
(b) If there is an encoder being main axis, the speed of sub axis is possible to be changed dramatically, so encoder preset command may not be executed.

(c) Encoder preset command should be executed in the status that external encoder pulse input is not entered.

(d) Auxiliary data setting of encoder preset command

Items	Setting value	Description
Position	-2147483648 ~ 2147483647	Set the encoder position to change on selected encoder

(2) Operation timing



(3) Restrictions

In the cases below, encoder preset command may not be executed and error arises.

(a) There is an encoder as a main axis (error code: 532)

(b) Position value of encoder preset exceeds the max./min. value of encoder of common parameter. (error code:534)

9.5.7 Start Step no. Change

This command is for changing the current step no. when executing indirect start command.

(1) Characteristics of Control

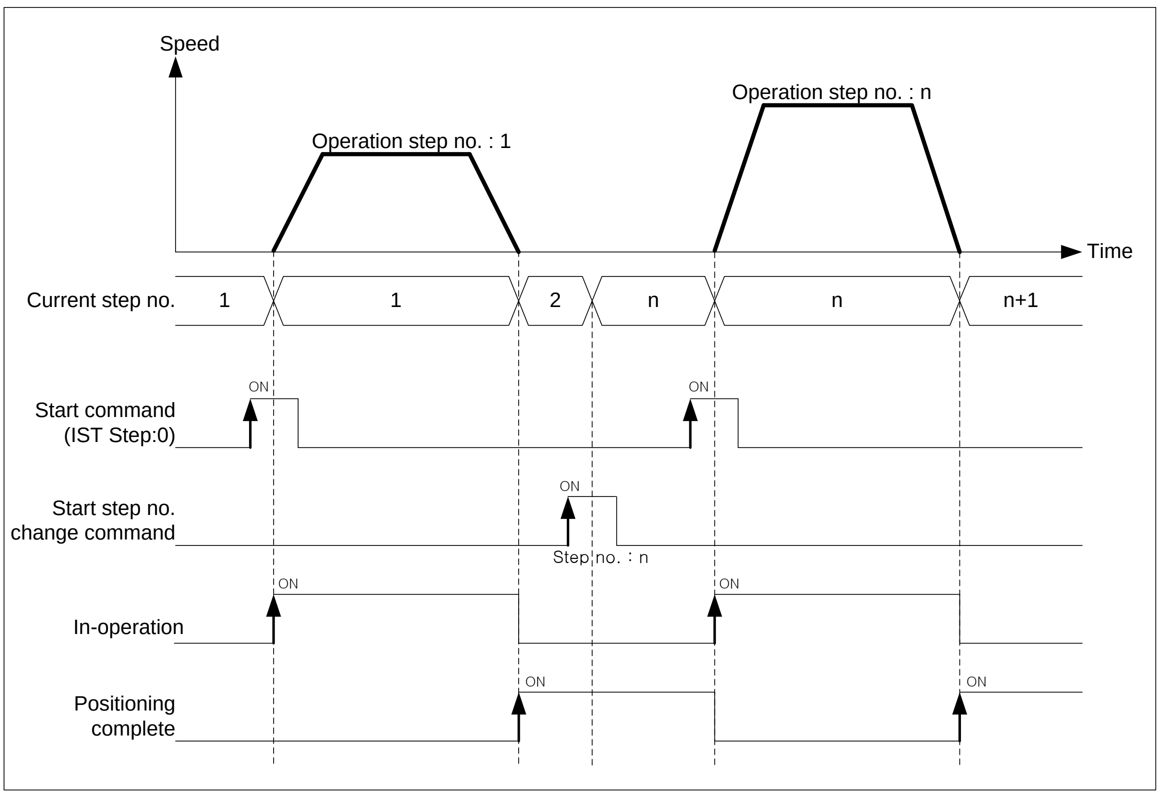
(a) When starting with setting step no. as 0 in indirect start command, current operation step no. is executed. The current step no. may be changed by start step no. change command.

(b) This command may be only executed in stop motion or error arises.

(c) Auxiliary data setting of start step no. change command.

Items	Setting value	Description
Step	1 ~ 150	Set the step no. to change

(2) Operation timing



(3) Restrictions

In the case below, start step no. change command is not executed.

(a) Step no. to change is out of 0 ~ 400. (error code:442)

If step no. is 0, keep the current step no.

9.5.8 Repeat Operation Step no. Change

This command is for changing the repeat operation step no will be executed next.

(1) Characteristics of Control

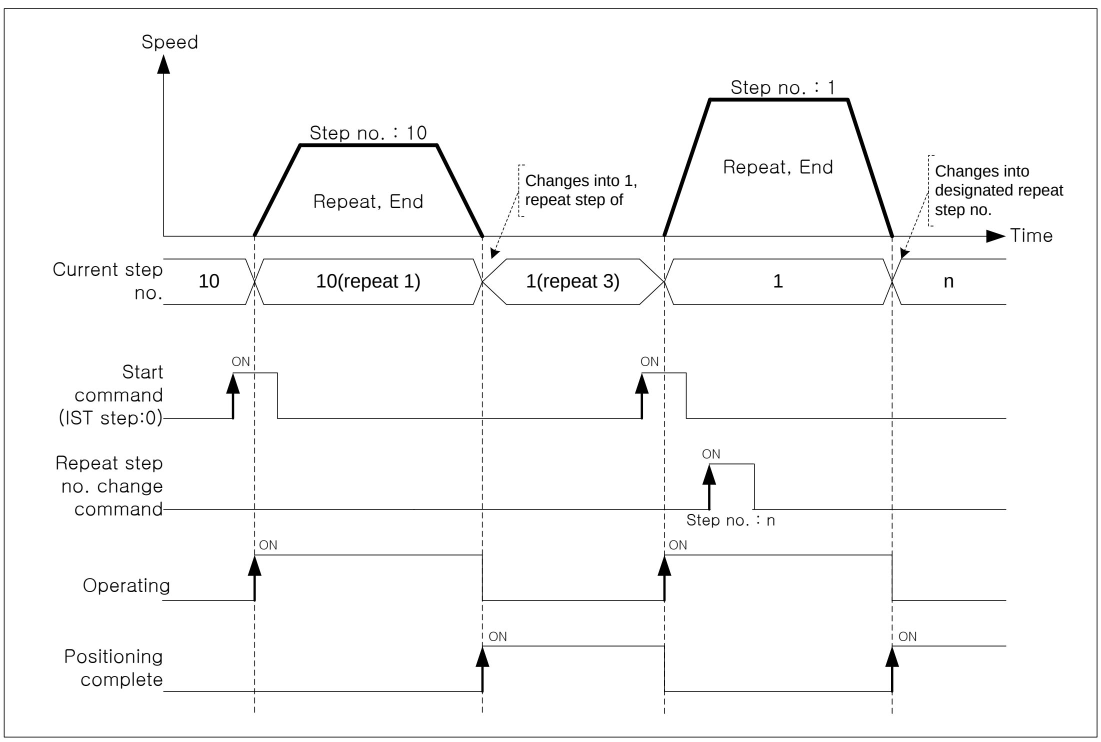
(a) In case of repeat operation mode setting (End, Go-on, Continuous operation), the current operation step no. will be changed automatically to operate the step no.1 when repeat operation mode setting step completes the positioning operation but if start step no. change command is executed in repeat operation, the step no. will be changed with the assigned step no. not the step no.1 .

(b) The repeat operation step no. change command can be executed during positioning operation.

(c) Auxiliary data setting of repeat operation step no. change command

Items	Setting value	Description
Step	1 ~ 150	Set the repeat operation step no. to change

(2) Operation timing



(3) Restrictions

In the case below, repeat operation step no. change command is not executed.

(a) Step no. to change is out of 0 ~ 150. (error code:442)

If the step no. is 0, keep the previous step no.

[Example] Execute repeat operation step no. change command on axis1 operating by absolute, shortcut position control.

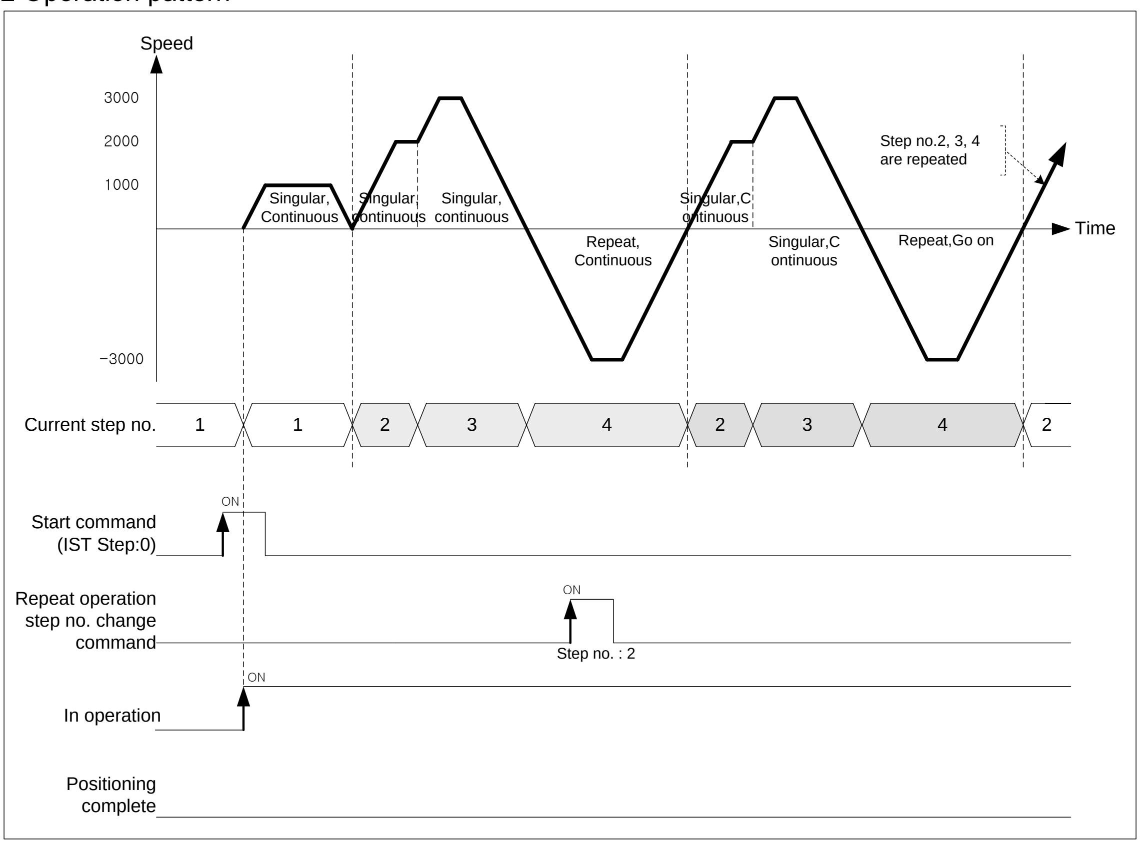
■ Current position of axis X: 0

■ Setting example in XG5000

▪ Operation data of axis X

Step no.	Coord.	Control	Method	Pattern	Repeat step	Goal position [pls]	Operation speed [pls/s]	Acc. no.	Dec. no.	M code	Dwell time
1	ABS	POS	SIN	KEEP	-	1000	1000	No.1	No.1	0	0
2	ABS	POS	SIN	CONT	-	2000	2000	No.1	No.1	0	0
3	ABS	POS	SIN	CONT	-	4000	3000	No.1	No.1	0	0
4	ABS	POS	REP	KEEP	10	2000	3000	No.1	No.1	0	0
5	ABS	POS	SIN	END	-	5000	2000	No.1	No.1	0	0

■ Operation pattern



9.6 Auxiliary Function of Control

9.6.1 High/Low limit

Positioning module includes Hardware high/low limit and Software high/low limit.

(1) Hardware High/Low Limit

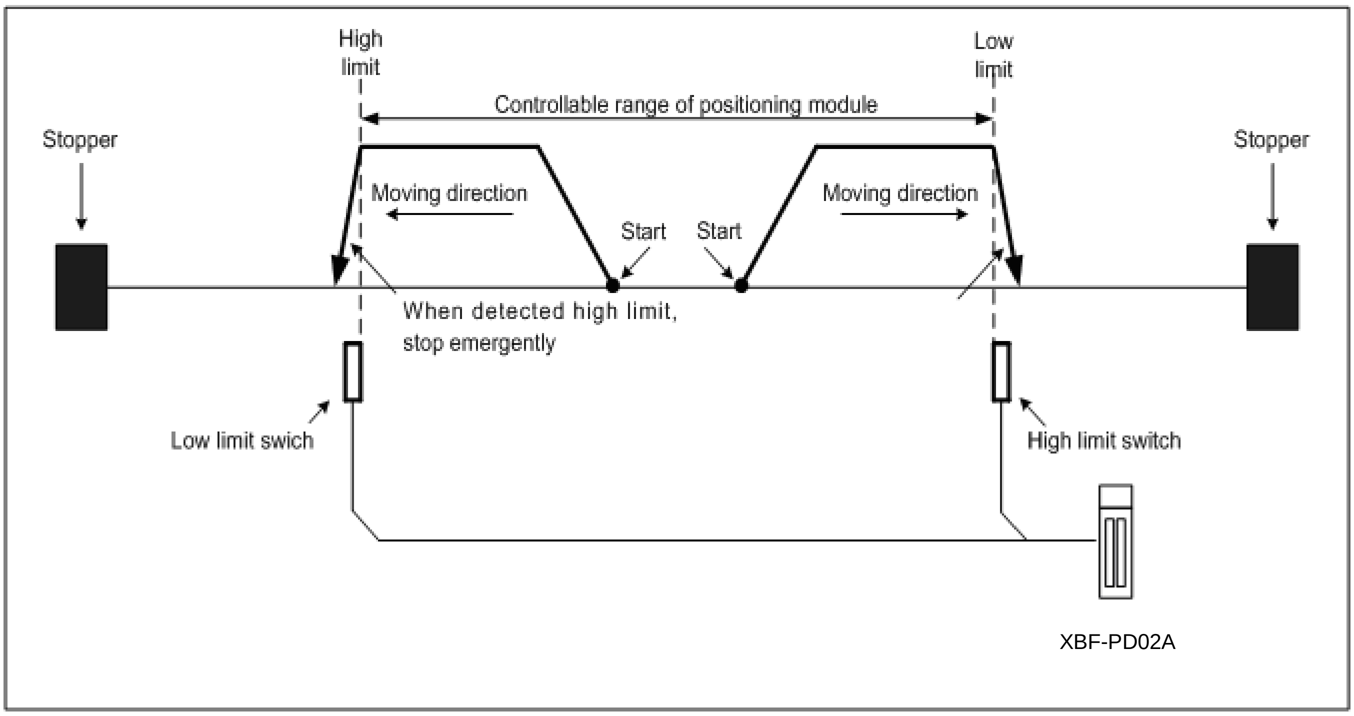
(a) This is used to stop the positioning module promptly before reaching Stroke limit/Stroke End of the Driver by installing the stroke limit of positioning module inside Stroke limit/Stroke end of the Driver. In this case, if it is out of the high limit, Error 492 will occur and if it is out of the low limit, Error 493 will occur.

(b) Input of high/low limit switch is connected to input/out terminal block.

(c) When positioning module is not in the controllable area, positioning operation is not executed.

(d) If it is stopped by hardware high/low limit detection, move it into the controllable area with Jog operation in reverse direction of detected signal.

(e) Hardware high/low limit is shown as follows.



(f) Emergent stop when hardware high/low limit is detected

When hardware high/low limit is detected, stop the current positioning control immediately.

(2) Software High/Low Limit

(a) This command is for setting the movable range of machine as software high/low limit. If it is out of the range in operation, stop emergently within dec. time for emergency. In other words, this command is for preventing errors, malfunctions and being out of range.

(b) If it is out of the range of software high/low limit, set external input high/low limit for use.

(c) Checking range of software high/low limit is executed at the beginning.

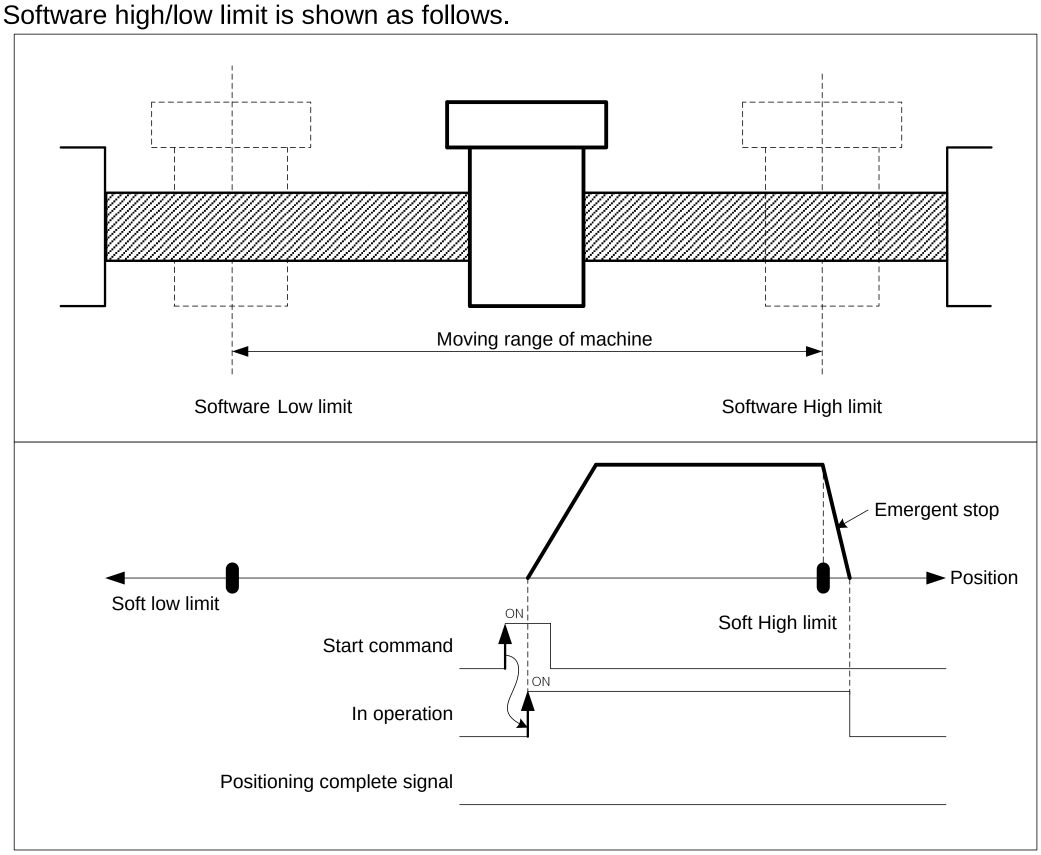
(d) If software high/low limit is detected, error arises. (High limit error:501, Low limit error:502)

(e) User may set the position value of high/low limit on extended parameter.

■ Related parameter setting (Extended parameter)

Items	Setting value	Description
Soft High Limit	-2147483648 ~ 2147483647	Set the position of soft high limit
Soft Low Limit	-2147483648 ~ 2147483647	Set the position of soft low limit

(f) Software high/low limit is shown as follows.



(g) In the case below, software high/low limit are not detected.

▪ The value of soft high limit 2147483647, the value of soft low limit is -2147483648

▪ The value of soft high and low limit are same. (High limit = Low limit)

9.6.2 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.

(1) Characteristics of Control

(a) M code should be set in the M code item of operation data.(Setting range : 0 ~ 65535)

(b) If M code is set as “0”, M code signal will not occur.

(c) If M code occurs, M code no.(1 ~ 65535) and M code signal (On) will occur simultaneously.

(d) In case of Go-on operation mode, if M code no. and M code signal occur, it becomes standby for the next step; if executing M code release command, it carries out Go-on operation to the next step without start command.

(e) In continuous operation mode, even if M code no. and M code On signal occur, not to wait but execute continuous operation to the next step.

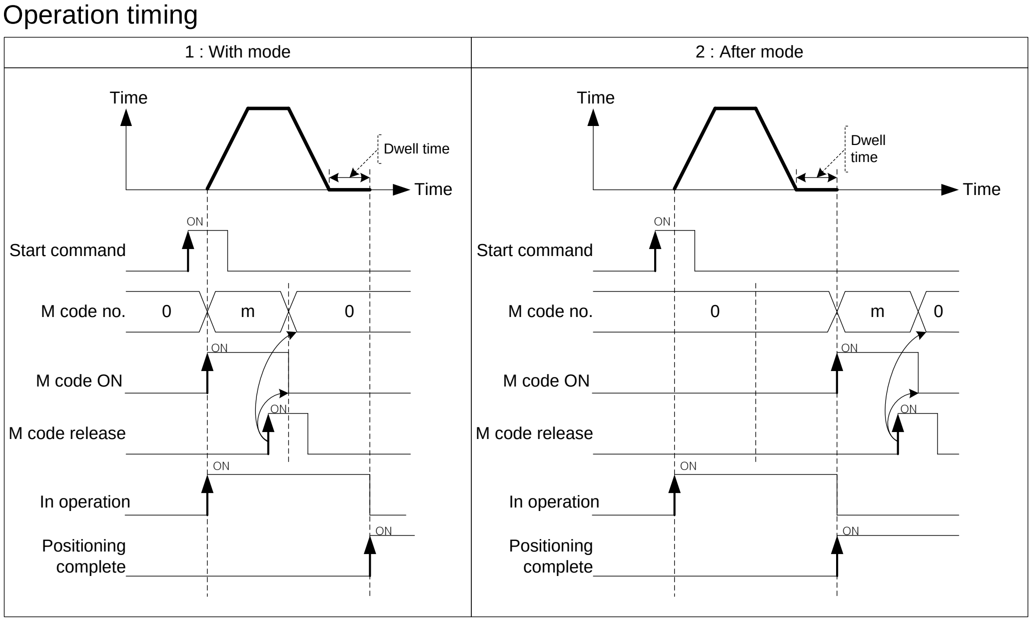
(f) User may turn M code signal off and set M code no. to 0 with M code release command. M code release command can be used even during operation.

(g) M code mode is set from M code output item of extended parameter. (0 : NONE, 1 : WITH, 2 : AFTER)

■ Related parameter setting (Extended parameter)

Items	Setting value	Description
M code mode	0 : None	Not to output M code signal and M code no.
	1 : With	Start and turn M code signal on at the same time, then output M code no. set in operation data.
	2 : After	After finishing positioning by start command, turn M code signal on and then output M code no. set in operation data.

(2) Operation timing



[Example] Set M code no. in operation data as follows and execute absolute, positioning control.

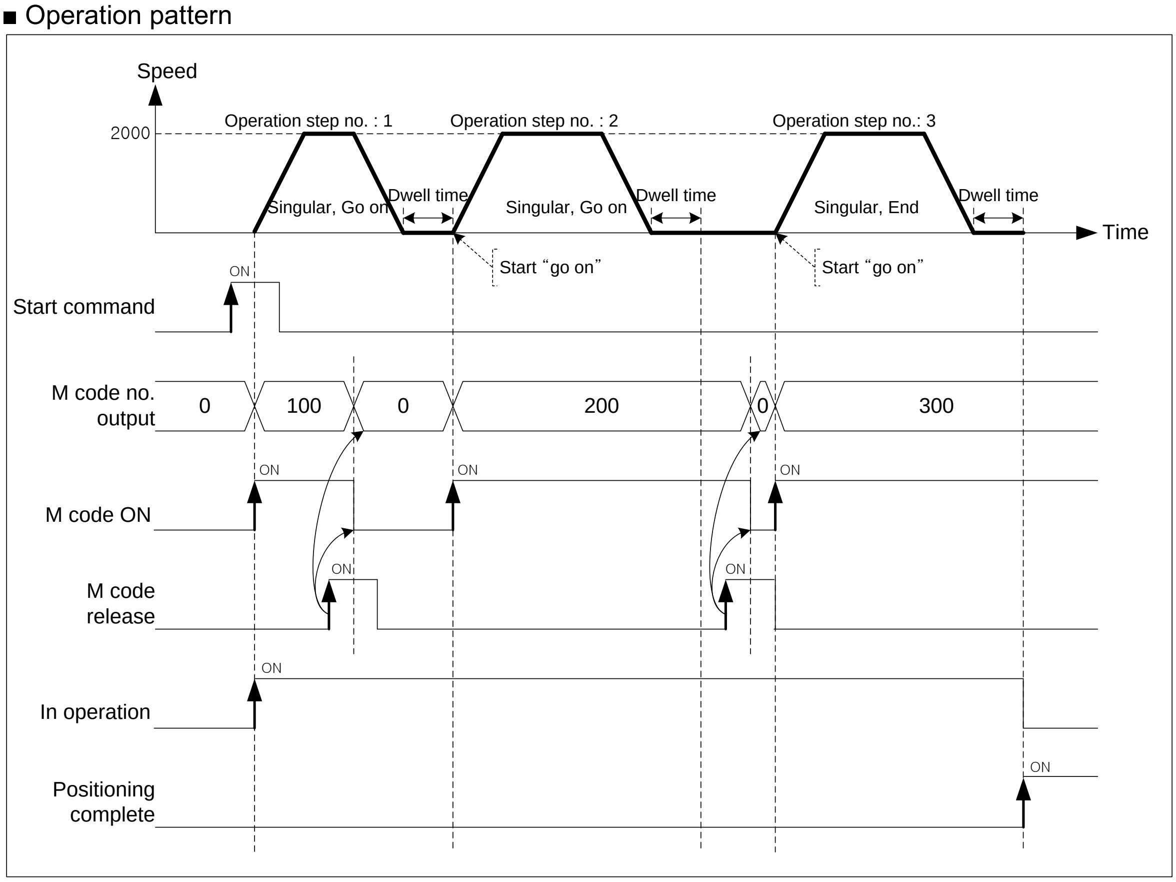
■ Current position of axis X : 0
M code mode of basic parameter : With

■ Setting example in XG5000

▪ Operation data of axis X

Step no.	Coord.	Control	Method	Pattern	Goal position [pls]	Operation speed [pls/s]	Acc. no.	Dec. no.	M code	Dwell time
1	ABS	POS	SIN	KEEP	1000	2000	No.1	No.1	100	0
2	ABS	POS	SIN	KEEP	3000	2000	No.1	No.1	200	0
3	ABS	POS	SIN	END	5000	2000	No.1	No.1	300	0

■ Operation pattern



9.7 Data Modification Function

This function is for changing operation data and operation parameter of APM module.

9.7.1 Teaching Array

User may change the operating speed and the goal position of the step user designated with teaching command but without XG5000.

(1) Characteristics of Control

(a) This command is for changing operating speed or the goal position on several steps.

(b) User may change maximum 16 data.

(c) RAM teaching and ROM teaching are available depending on the saving position.

■ RAM teaching

When executing teaching to operation data of APM module and operating APM module in power connection, user may change speed value or position value but the speed value and position value are not saved in non-power connection.

■ ROM teaching

When executing teaching to operation data of APM module and operating APM module in power connection, user may change speed value or position value and operation data is saved permanently even in non-power connection.

(d) The value of goal position being changed is position teaching, the value of operating speed being changed is speed teaching.

(e) The axis in operation may be the subject of position teaching or speed teaching.

(f) If user changes the value of goal position or operating speed frequently, this command is very useful for it.

(g) Auxiliary data setting of teaching array command

■ Single teaching

Items	Setting value	Description
Step	0 ~ 150	Set the step no. for teaching
Position	0 : RAM teaching 1 : ROM teaching	Set the method of teaching
Data	0 : Position 1 : Speed	Set the data items for teaching

■ Teaching array

Items	Setting value	Description
Step	0 ~ 150	Set the step no. for teaching
Position	0 : RAM teaching 1 : ROM teaching	Set the method of teaching
Data	0 : Position 1 : Speed	Set the data items for teaching
Number	1 ~ 16	Set the number of step

> **Note**
> The teaching data must be set in the data setting area for teaching array before teaching array command is executed. Refer to the teaching array command TWR.

(2) Restrictions

Teaching array command may not be executed in the case as follows.

(a) Execute teaching to the axis in operation.

- If it is position teaching, (Error code: 461)
- If it is speed teaching, (Error code: 463)

(b) The number of teaching array is out of the range (1~16). (Error code: 462)

(c) Teaching step no. is out of the range (1~150). (Error code: 465)

Total number (Teaching step no. + The number of Teaching) must be below 150.

9.7.2 Parameter Change from Program

User may modify the operation parameter set on XG5000 with teaching command for each parameter.

(1) Characteristics of Control

(a) There are 6 kinds of parameter teaching command. (Basic, Extended, Manual operation, Homing, External signal, common parameter teaching)

(b) Parameter teaching is not available in operation.

(c) Parameter is saved in RAM. If you want to save the parameter permanently, use WRT instruction.

(2) Basic Parameter Teaching

(a) Change the setting value of designated item from basic parameter of APM module into teaching data.

(b) Auxiliary data setting of basic parameter teaching command

Setting value	Items	Setting range
1	Speed limit	1 ~ 2,000,000 [pulse/s]
2	Bias speed	1 ~ 2,000,000 [pulse/s]
3	Acc.time 1	0 ~ 65,535 [ms]
4	Acc.time 2	
5	Acc.time 3	
6	Acc.time 4	
7	Dec.time 1	
8	Dec.time 2	
9	Dec.time 3	
10	Dec.time 4	
11	SW upper limit	-2,147,483,648 ~ 2,147,483,647 [pulse]
12	SW lower limit	-2,147,483,648 ~ 2,147,483,647 [pulse]
13	Backlash compensation amount	0 ~ 65,535 [pulse]
14	SW limit detect	0: not detect, 1: detect
15	Pos. Comp. Condition	0: Dwell, 1: Inposition 2: Dwell and Inposition 3: Dwell or Inposition
16	Upper/Lower limit	0: not use, 1: use
17	Pulse output level	0: Low Active, 1: High Active
18	Pulse output mode	0: CW/CCW, 1: PLS/DIR
19	M code output mode	0: None, 1: With, 2: After

For the details about basic parameter items and setting value, refer to “Chapter 4 parameter and operation data”.

(3) Homing/Manual Parameter Teaching

(a) Change the setting value of designated item from homing/manual parameter into teaching data.

(b) Auxiliary data setting of homing parameter teaching command

Setting value	Item	Setting range
1	Home address	-2,147,483,648 ~ 2,147,483,647 [pulse]
2	Home high speed	1 ~ 2,000,000 [pulse/s]
3	Home low speed	
4	Home compensation	-32,768 ~ 32,767 [pulse]
5	Homing ACC time	0 ~ 65,535 [ms]
6	Homing Dec time	
7	Dwell time	
8	Home method	0:DOG/HOME(Off), 1:DOG/HOME(On), 2:DOG, 3: U.L.Limit/HOME, 4:U.L.Limit
9	Home direction	0:CW, 1:CCW
10	JOG high speed	1 ~ 2,000,000 [pulse/s]
11	JOG low speed	
12	JOG ACC Time (ms)	0 ~ 65,535[ms]
13	JOG DEC Time (ms)	0 ~ 65,535[ms]
14	Inching speed	1 ~ 65,535[pulse/s]

For the details about basic parameter items and setting value, refer to “Chapter 4 parameter and operation data”.

(4) I/O Signal Parameter Teaching

(a) Change the setting value of designated item from I/O signal parameter of into teaching data.

(b) Auxiliary data setting of I/O signal parameter teaching command

Bit	Signal
0	Upper limit signal
1	Lower limit signal
2	DOG signal
3	HOME signal
4	INPOSITION signal
5	Deviation counter clear output signal
6 ~ 15	Not used

For the details about basic parameter items and setting value, refer to “Chapter 4 parameter and operation data”.

(5) Common Parameter Teaching

(a) Change the setting value of designated item from common parameter into teaching data.

(b) Auxiliary data setting of common parameter teaching command

Setting value	Item	Setting range
1	Encoder max. value	-2147483648 ~ 2147283647
2	Encoder min. value	
3	Speed override	0 : % override, 1 : SPD. override
4	Encoder input	0 : CW/CCW, 1 :PLS/DIR, 2: PHASE

For the details about basic parameter items and setting value, refer to “Chapter 4 parameter and operation data”.

9.7.3 Data Change from Program

User may modify the positioning operation data set on XG5000 with operation data teaching command.

(1) Characteristics of Control

(a) Change setting value of designated step and item from positioning module's operation data into teaching data.

(b) Parameter teaching is not available in operation.

(c) The changed parameter is saved in RAM. If you want to save parameter permanently, use WRT instruction.

(d) Auxiliary data setting of operation data teaching command

Setting value	Item	Setting range
1	Goal address	-2,147,483,648 ~ 2,147,483,647 [pulse]
2	Cir. int. aux. point	
3	Speed	1 ~ 2,000,000 [pulse/s]
4	Dwell time	0 ~ 65,535[ms]
5	M code number	0 ~ 65,535
6	Cir. int. turns	0 ~ 65,535
7	Method	0: SIN, 1: REP
8	Control	0: POS, 1: SPD
9	Pattern	0: END, 1: KEEP, 2: CONT
10	Coord.	0: ABS, 1: INC
11	Cir. int. size	0: Arc<180 1: Arc>=180
12	ACC. no.	0 ~ 3
13	DEC. no.	0 ~ 3
14	Cir. int. mode	0:MID, 1: CENTER, 2: RADIUS
15	Cir. int. direction	0:CW, 1:CCW
16	Repeat step no.	1~150

For the details about basic parameter items and setting value, refer to "Chapter 4 parameter and operation data".

Chapter 10 Positioning Monitoring Package

10.1 Positioning Monitoring Package

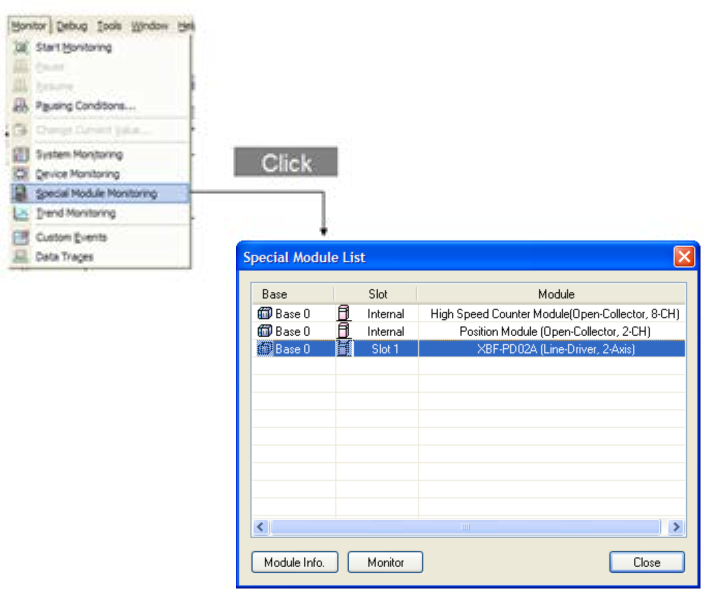
You can monitor the status of XGB PLC positioning module and carry out test operation without the program by changing the parameters and operation data if you use the XGB monitoring package.

10.1.1 Introduction of Positioning Monitoring Package

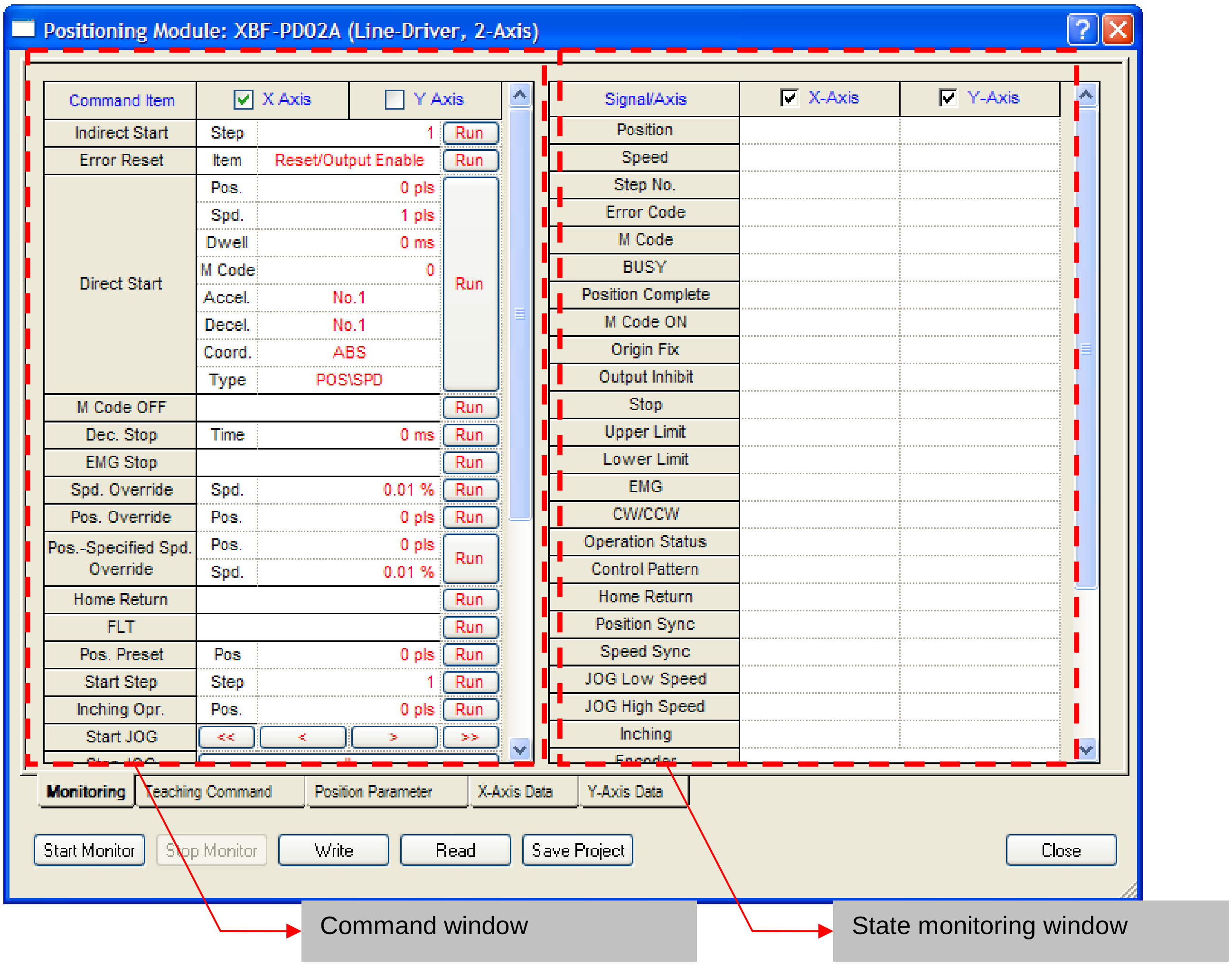
• You can easily and conveniently monitor the current positioning operation or change the parameter or operation data by using the following positioning monitoring package with XGB PLC connected to XG5000.
• If you use the positioning monitoring package, you can easily carry out test operation without the program, adjust the parameter and operation data, and permanently save it in PLC after the adjustment.
• XGB positioning monitoring package for XGB positioning module is available with over XG5000 V3.1 and it is carried out in the following sequence.

(1) Opening the Monitoring Package

• Select 'Monitoring' → 'Special Module Monitoring' with XGB PLC connected to XG5000, the special module monitoring display is invoked as follows.
(If XGB is not connected to XG5000, 'Special Module Monitoring' is inactivated in the 'Monitoring' menu. Thus make sure that XGB is connected to XG5000 before using positioning monitoring.)



• When you want to carry out the positioning monitoring package, double click on the positioning module or select the positioning module, and then click on the 'Monitoring' button at the bottom. And the positioning monitoring package is started as follows.



• The menu and function of the positioning monitoring package are as follows.

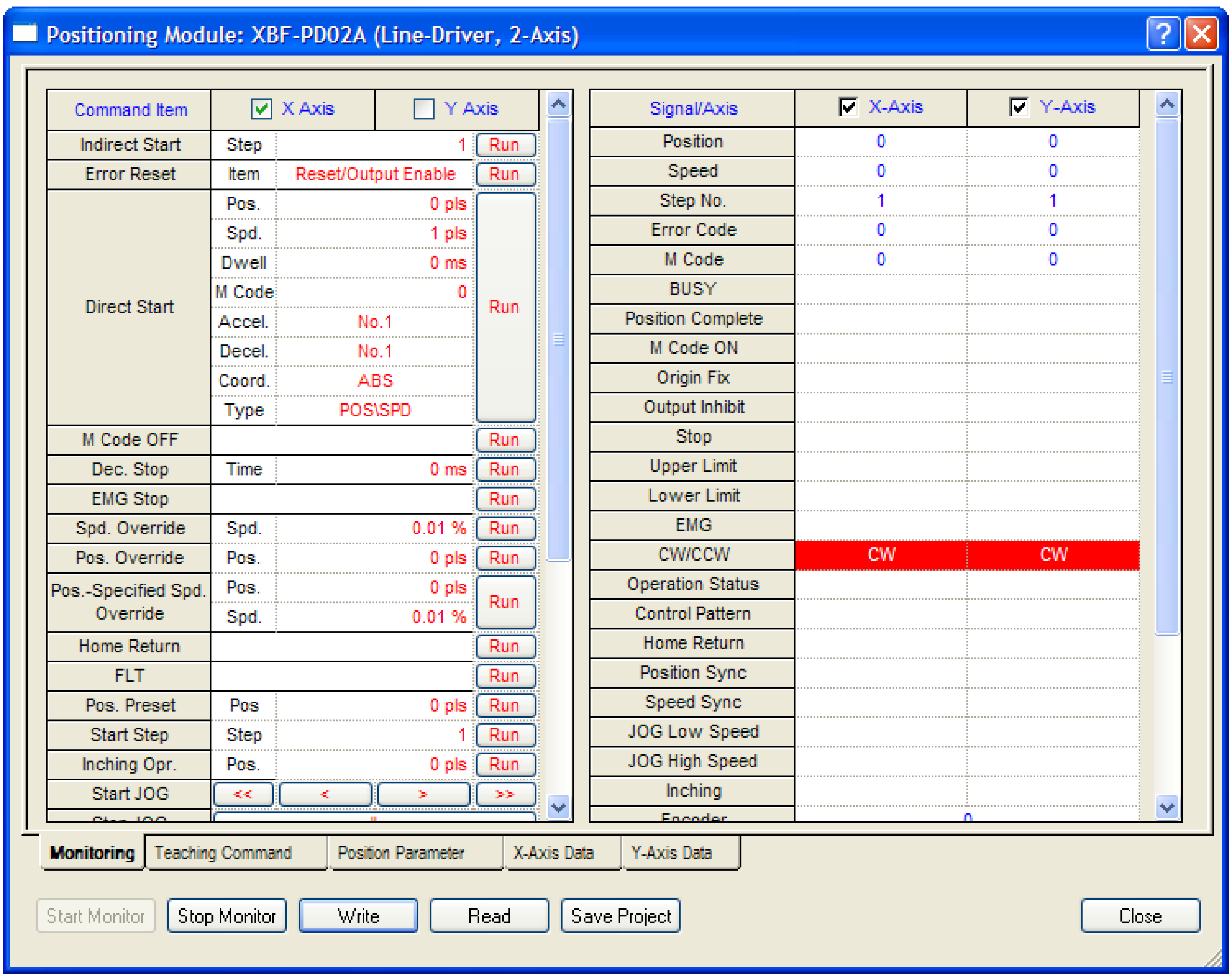
Items	Functions	Remark
Monitoring	Monitors the positioning of the axis or gives commands.	
Teaching Command	Executes teaching for each axis	
Position Parameter	Checks and modifies the positioning parameter of each axis.	
X-axis data	Checks and modifies the operation data of axis X.	
Y-axis data	Checks and modifies the operation data of axis Y.	
Start Monitor	Carries out positioning monitoring.	
Stop Monitor	Stops positioning monitoring.	
Write	Permanently saves the changed parameter and operation data in PLC.	WRT function
Read	Reads parameter and operation data saved in module	
Save Project	Saves the changed parameter and operation data in XG5000 project.	

10.2 Menu and Functions of Positioning Monitoring

The following is the function and use of the menus of the XGB monitoring package.

10.2.1 Monitoring and Command

- The positioning monitoring package consists of the command window for positioning test operation, teaching command window and positioning monitoring window as shown above.
- If you click on the 'Start Monitor' button at the left bottom of the package, the monitoring and command function is activated to make various commands and current status monitoring functions available.
- If you start the command on the left, the corresponding functions are activated without the program and the status is displayed on the monitoring window on the right.



(1) Positioning Command

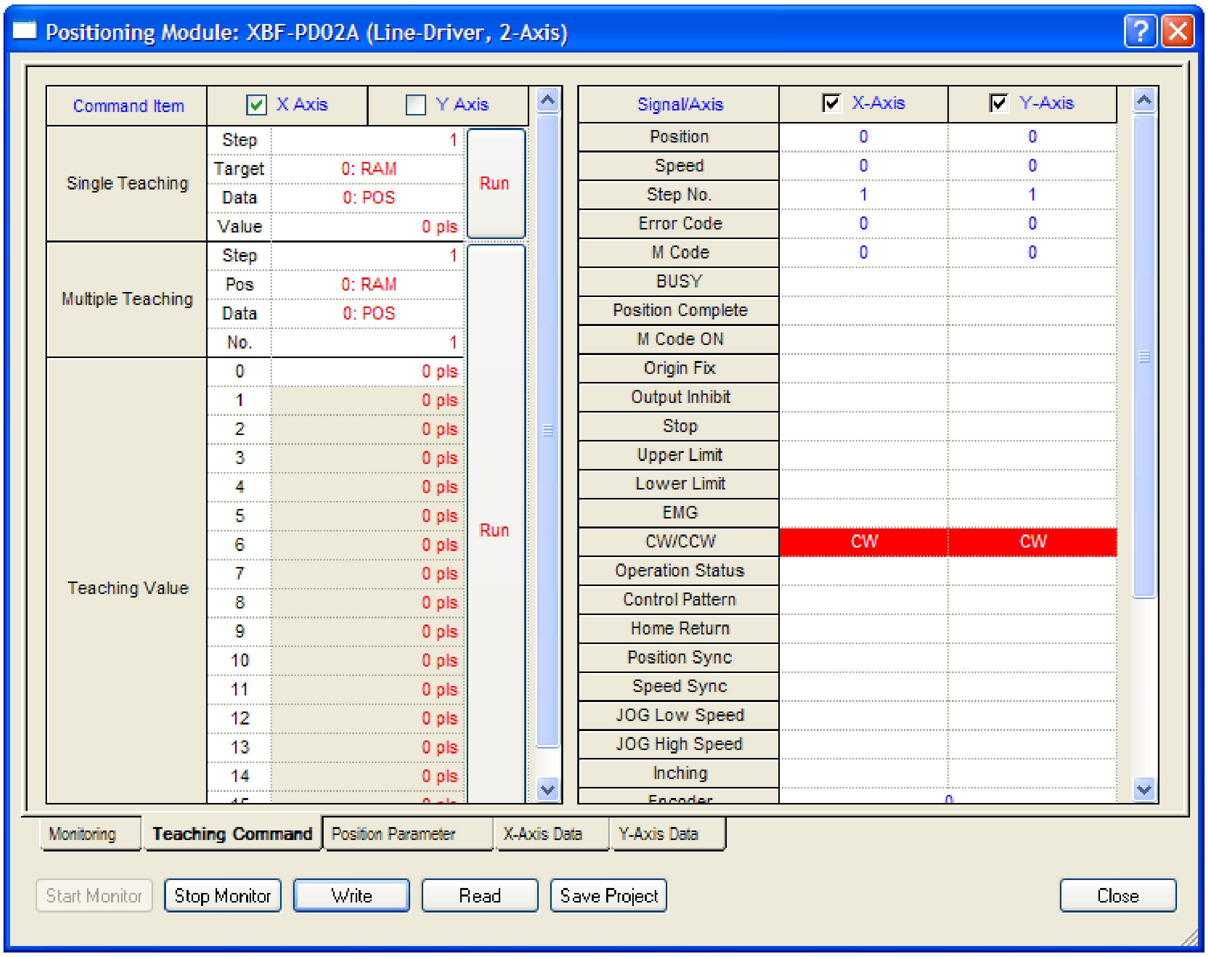
- The commands available in the positioning monitoring package are as follows.
- To execute an command, enter the setting of the command, and click on the ‘Run’ button (「<<」,「<」,「||」,「>」,「>>」 during jog operation).

<table>
<tr><th>Item</th><th colspan="5">Description</th><th>Command</th></tr>
<tr><td>Indirect start</td><td colspan="5">Direct start with the operation step set in the monitoring window</td><td>IST, APM_IST</td></tr>
<tr><td>Error reset</td><td colspan="5">Resets the error code and output inhibition in case of an error</td><td>CLR, APM_RST</td></tr>
<tr><td>Direct start</td><td colspan="5">Directly starts with the position, speed, dwell, M code, acc./dec. number, coordinates and control method set in the monitoring window</td><td>DST, APM_DST</td></tr>
<tr><td>M code OFF</td><td colspan="5">Cancels the M code On signal and M code number</td><td>MOF, APM_MOF</td></tr>
<tr><td>Dec. stop</td><td colspan="5">Carries out deceleration stop in the set deceleration time</td><td>STP, APM_STP</td></tr>
<tr><td>EMG stop</td><td colspan="5">Stops the operation of the axis and inhibits pulse output</td><td>EMG, APM_EMG</td></tr>
<tr><td>Spd override</td><td colspan="5">Overrides the speed at the set speed value</td><td>SOR, APM_SOR</td></tr>
<tr><td>Pos override</td><td colspan="5">Overrides the position at the set position value</td><td>POR, APM_POR</td></tr>
<tr><td>Spd override with position</td><td colspan="5">Changes the operation speed at the speed value set in the set position</td><td>PSO, APM_PSO.</td></tr>
<tr><td>Home return</td><td colspan="5">Conducts home return as the home return method set in the positioning parameter</td><td>ORG, APM_ORG</td></tr>
<tr><td>FLT</td><td colspan="5">Sets the current position as the fixed home</td><td>FLT, APM_FLT</td></tr>
<tr><td>Position preset</td><td colspan="5">Presets the current position with the set value</td><td>PRS, APM_PRS</td></tr>
<tr><td>Start step No.</td><td colspan="5">Changes the start step with the set step</td><td>SNS, APM_SNS</td></tr>
<tr><td>Inching</td><td colspan="5">Conducts inching operation to the set position (inching amount) at the inching speed set in the positioning parameter</td><td>INCH, APM_INC</td></tr>
<tr><td rowspan="3">Jog</td><td colspan="5">Conducts jog operation at the jog speed set in the parameter</td><td rowspan="3">-</td></tr>
<tr><td><<</td><td><</td><td>II</td><td>></td><td>>></td></tr>
<tr><td>Reverse high speed</td><td>Reverse low speed</td><td>Jog stop</td><td>Normal low speed</td><td>Normal high speed</td></tr>
<tr><td>Spd position conversion</td><td colspan="5">Changes from speed control to position control</td><td>VTP, APM_VTP</td></tr>
<tr><td>Position spd conversion</td><td colspan="5">Changes from position control to speed control</td><td>PTV, APM_PTV</td></tr>
<tr><td>Spd synchronous operation</td><td colspan="5">Speed synchronous operation at the set main axis, speed ration and delay time</td><td>SSS, APM_SSS</td></tr>
<tr><td>Position synchronous</td><td colspan="5">Speed synchronous operation at the set main axis, step and position</td><td>SSP, APM_SSP</td></tr>
</table>

Item	Description	Command
operation		
Simultaneous start	Simultaneous start with the operation step set for each axis	SST, APM_SST
Linear interpolation operation	Linear interpolation operation for axes X and Y with the set operation step	LIN, APM_LIN
Circular interpolation operation	Circular interpolation operation for axes X and Y with the set operation step	CIN, APM_CIN

(2) Teaching command

• You can execute goal speed/position teaching for each step at positioning monitoring package



Command item	Aux. data	Description
Single teaching	Step	Inputs operation step for single teaching (1~150)
	Target	Inputs position to save teaching data (0:RAM, 1:ROM)
	Data	Inputs type of teaching data .(0:position, 1:speed)
	Value	Input value for teaching
Multiple teaching	Step	Inputs head operation step for multiple teaching (1~150)
	Target	Inputs position to save teaching data (0:RAM, 1:ROM)
	Data	Inputs type of teaching data .(0:position, 1:speed)
	No.	Inputs the number of step for multiple teaching (1~16)
	Value	Input value for teaching

(3) Positioning Monitoring Window

- The monitoring window on the right of the monitoring package displays the current status according to the positioning command.
- The information displayed in the positioning monitoring window is as follows.

Item	Displays
Current position	Current position of each axis
Current speed	Current speed of each axis
Step No.	Currently operating step of each axis
Error code	Error code in case of an error of the axis
M code	M code of the currently operating step
Busy	Whether the axis is operating
Positioning complete	Whether the positioning has been completed for the axis
M code On	M code On/Off of the currently operating step
Origin fix	Whether the origin has been fixed
Output inhibit	Whether output is inhibited
Upper limit detection	Whether the upper limit is detected
Lower limit detection	Whether the lower limit is detected
EMG stop	Emergency stop
Normal/reverse rotation	Normal and reverse rotation
Operation status	The operation status of each axis (acc., dec., constant speed, and dwell)
Control pattern	Operation control pattern of each axis (position, speed, interpolation)
Home return	Whether home return is being conducted
Position Sync	Whether position synchronization is being conducted
Speed Sync	Whether position synchronous operation is being conducted
Jog high speed	Whether jog high speed operation is being conducted
Jog low speed	Whether jog low speed operation is being conducted
Inching	Whether inching operation is being conducted
Encoder	Current encoder count
Upper limit signal	External upper limit signal status of the axes
Lower limit signal	External lower limit signal status of the axes

Item	Displays
DOG	DOG signal status of the axes
HOME	Origin signal status of the axes
INPOSITION	INPOSITION signal status of the axes

10.3 Parameter/Operation Data Setting Using Monitoring Package

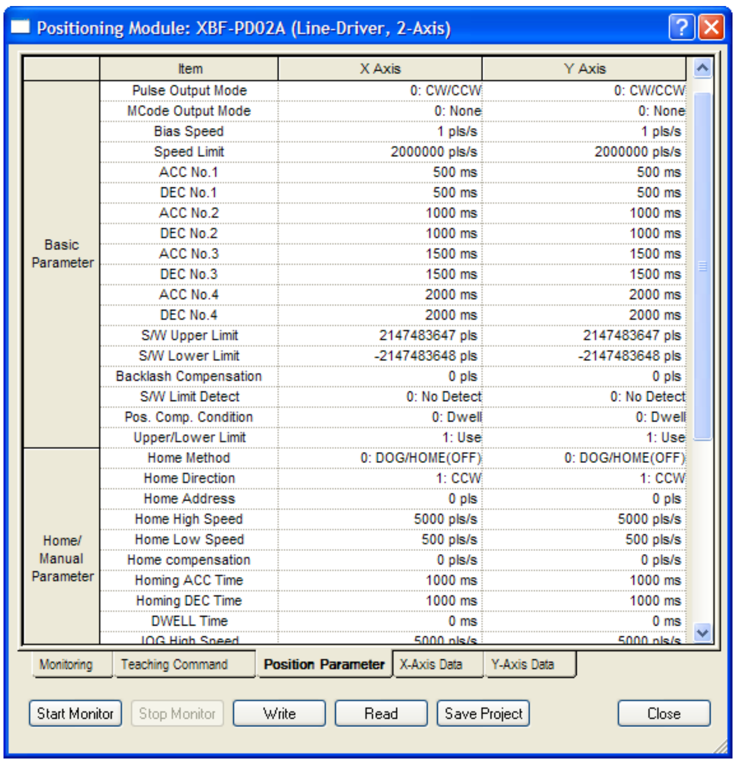
You can change the positioning parameter and operation data of XGB PLC and do test operation by using the XGB monitoring package.

10.3.1 Changing the Position Parameter

(1) How to Change the Parameter

• You can change the position parameter by using the position monitoring package. Note that you can't change the parameter during output because PLC can't save parameter in flash memory.

• If you select 'Position Parameter' tab in the positioning monitoring package, the window appears where you can change the positioning basic parameter and the origin/manual parameter and the parameter saved in XG5000 is displayed as well.



• To change the parameter, first of all, change the parameter value to change, and select 'Write PLC'. Then the changed parameter is transferred to PLC, the position parameter saved in PLC is changed.

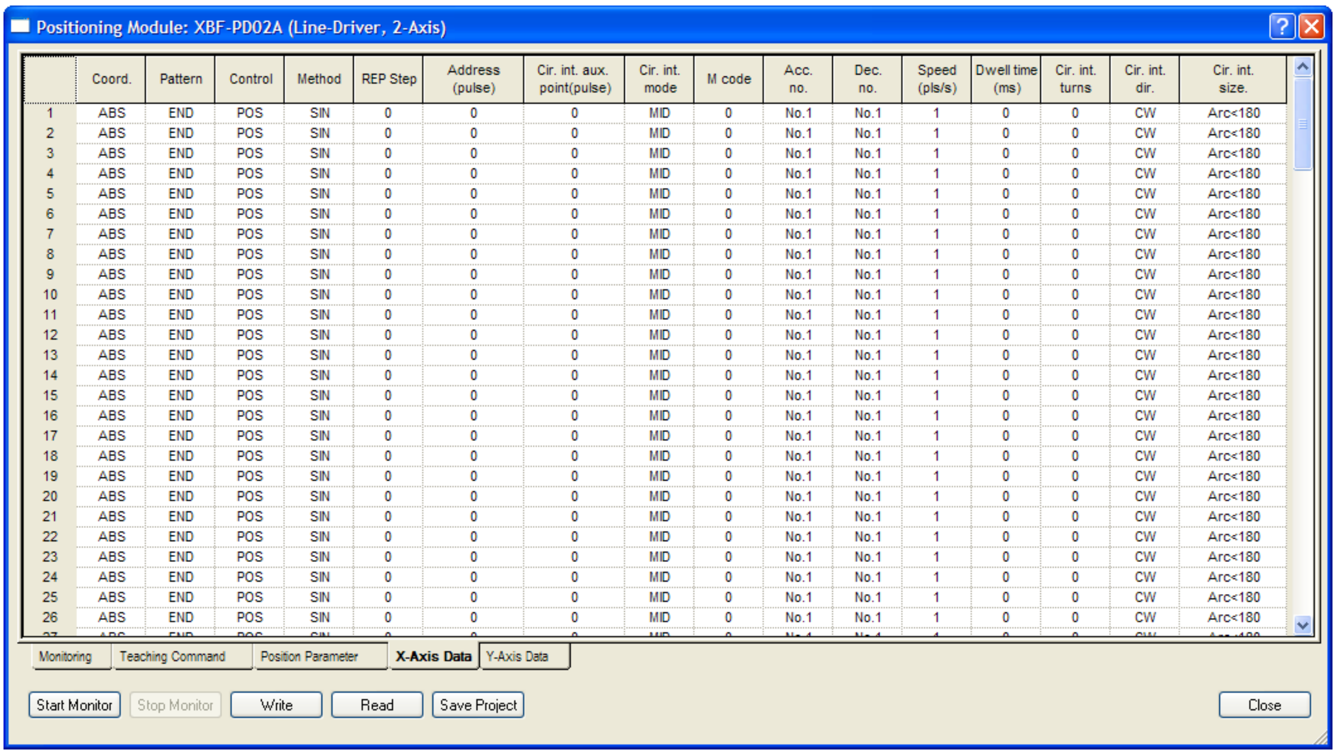
Remark

• If you execute 'Write PLC,' the position parameter set in the positioning monitoring package and the operation data of each axis are all transferred to XGB.
• The parameter and operation data displayed when the positioning monitoring package is executed are not the data read from XGB but the parameter and operation data currently saved in XG5000. Therefore if you change the parameter or operation data in the positioning monitoring package, change the data after reading the data from XGB.
• Be sure to press the 'Save Project' button to save them in the XG5000 project. Otherwise the settings of XG5000 I/O parameter might be different from XGB.

10.3.2 Change of Position Operation Data

(1) How to Change the Position Operation Data

- You can change the operation data of each axis by using the positioning monitoring package. Note that you can't change the operation data during operation because PLC can't save the operation data in flash memory.
- If you select the 'axis X data' or 'axis Y data' tabs in the positioning monitoring package, the window is invoked where you can set the operation data of each axis as follows along with the operation data saved in XG5000.



	Coord.	Pattern	Control	Method	REP Step	Address (pulse)	Cir. int. aux. point(pulse)	Cir. int. mode	M code	Acc. no.	Dec. no.	Speed (pls/s)	Dwell time (ms)	Cir. int. turns	Cir. int. dir.	Cir. int. size.
1	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
2	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
3	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
4	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
5	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
6	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
7	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
8	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
9	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
10	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
11	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
12	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
13	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
14	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
15	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
16	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
17	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
18	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
19	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
20	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
21	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
22	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
23	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
24	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
25	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180
26	ABS	END	POS	SIN	0	0	0	MID	0	No.1	No.1	1	0	0	CW	Arc<180

- To change the operation data, first of all, change the operation data value to change, and select 'Write PLC'. Then the changed operation data is transferred to PLC, the operation data saved in PLC is changed.

Remark

- If you execute 'Write PLC,' the position parameter set in the positioning monitoring package and the operation data of each axis are all transferred to XGB.
- The parameter and operation data displayed when the positioning monitoring package is executed are not the data read from XGB but the parameter and operation data currently saved in XG5000. Therefore if you change the parameter or operation data in the positioning monitoring package, change the data after reading the data from XGB.
- Be sure to press the 'Save Project' button to save them in the XG5000 project. Otherwise the settings of XG5000 I/O parameter might be different from XGB.

Appendix 1 Positioning Error Information & Solutions

Here describes the positioning error types and its solutions.

(1) Error Information of Basic Parameter

Error Code	Error Description	Solutions
101	Invalid speed limit setting f basic parameter	Speed limit of basic parameter should be bias speed ~ 2,000,000.
102	Bias speed value of Basic Parameter exceeds the range.	Bias speed of Basic Parameter should be 1 ~ bias speed.
103	Pulse output mode value of Basic Parameter exceeds the range.	Pulse output mode of Basic Parameter is 0: CW/CCW 1: Pulse/Dir. Select one among two.
104	Speed limit of basic parameter by degree is bigger than 180 out of range, so circular interpolation can not be executed.	Operate with lower speed limit of Circular Interpolation
111	Extended Parameter software upper/lower limit range error	S/W upper limit of Extended Parameter should be greater than or equal to S/W lower limit of Extended Parameter.
112	M Code Mode value of Extended Parameter exceeds the range.	M Code output of Extended Parameter is 0: None, 1: With, 2: After. Select one among three.

(2) Error Information of Home/Manual Operation Parameter

Error Code	Error Description	Solutions
121	Jog high speed value of Manual operation parameter exceeds the range.	Set Jog high speed of Manual operation parameter to be greater than or equal to Jog low 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.	Set Jog low speed of Manual operation parameter to be more than bias speed and less than Jog high speed of Manual operation parameter.
123	Inching speed value of Manual operation parameter exceeds the range.	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.	Homing method of Homing parameter is 0: DOG/HOME(Off), 1: DOG/HOME(On), 2: DOG, 3: U.L.limit/HOME, 4: U.L.limit. Select one among five.
132	Homing address of Homing parameter exceeds the range.	Set Homing address of Homing parameter to be greater than S/W lower limit of Extended parameter and less than S/W upper limit of Extended Parameter.
133	Homing high speed value of Homing parameter exceeds the range.	Set Homing high speed of Homing parameter to be greater than or equal to Homing low 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.	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.

(3) Error Information of Common Parameter

Error Code	Error Description	Solutions
141	Encoder type value of Common parameter exceeds the range.	Set Encoder input signal of Common parameter to be between 0 and 2.
148	Encoder max/min value of common parameter Exceeds the range.	Set Encoder max value smaller than min value, also set encoder max/min value contains current position.

(4) Error Information of Operating Data

Error Code	Error Description	Solutions
151	Not available to set operation speed value of Operation data as “0”.	Set operation speed to be greater than “0”.
152	Operation speed of Operation data exceeds max. speed value.	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.	Set operation speed to be greater than or equal to bias speed set in Basic Parameter.
155	Exceeds End/Keep/Continuous operation setting range of Operation data.	Set one from operation pattern (0:End, 1:Go on, 2: Continuous) of operation data to operate
159	Goal position of operation data exceeds the range.	Goal position should be -2147483648 ~ 2147483647.

(5) Error Information of Data Writing

Error Code	Error Description	Solutions
172	Can’t execute writing parameter because writing parameter is executed while operating	Once current operation is done, eliminate error with error-reset command, and then execute writing command again. Do not execute start operation while parameter sending.
175	Start command cannot be executed while writing sending-parameters or operating-data from XG5000.	Execute again once writing of parameter or operating data are done.
176	Can’t execute instruction writing data in flash memory because PLC is writing in flash memory by WRT instruction or Write Parameter of XG5000.	Execute again after finishing writing in flash memory

(6) Error Information of Positioning command and Step control

Error Code	Error Description	Solutions
201	Not possible to carry out Homing command in the state of in 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 inhibition.	Check if axis is in the state of output inhibition when Homing command is executed.
211	Not possible to carry out Floating origin setting command in the state of in operation.	Check if command axis is in operation when Floating origin setting command is executed.
221	Not possible to carry out Direct Start command in the state of in 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 inhibition.	Check if axis is in the state of output inhibition when Direct Start command is executed.

Error Code	Error Description	Solutions
223	Not possible to carry out Direct Start command in the state of M Code ON.	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.	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.
231	Not possible to carry out Indirect Start command in the state of in 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 inhibition.	Check if axis is in the state of output inhibition when Indirect Start command is executed.
233	Not possible to carry out Indirect Start command in the state of M Code ON.	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.	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.
236	Not possible to carry out Continuous operation of Indirect Start at speed control.	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.
241	Not possible to carry out Linear interpolation Start in the state that main axis of linear interpolation is in 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 of linear interpolation is in operation.	Check if subordinate axis 1 is in operation when Linear interpolation command is executed.
244	Not possible to carry out Linear Interpolation Start command when main axis is in the state of output inhibition.	Check if main axis is in the state of output inhibition when Linear Interpolation Start command is executed.
245	Not possible to carry out Linear Interpolation Start command when sub axis is in the state of output inhibition.	Check if sub axis is in the state of output inhibition when Linear Interpolation Start command is executed.
247	Not possible to carry out Linear interpolation Start in the state that M Code signal of main axis of Linear interpolation is ON.	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.	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.
250	Not possible to carry out positioning operation of absolute coordinate in the state that main axis of Linear interpolation is origin unsettled.	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 of Linear interpolation is origin unsettled.	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	Check if the subordinate axis is not assigned, or only

Error Code	Error Description	Solutions
	set wrong in Linear interpolation.	one axis is assigned, or no axis is assigned when Linear interpolation command is executed.
257	Moving amount of main and sub axes are set as 0	Check if moving amount of main and sub axes are set as 0
258	Main axis of linear interpolation is set as speed control	Check if main axis of linear interpolation is set as speed control
259	Sub axis of linear interpolation is set as speed control	Check if sub axis of linear interpolation is set as speed control
270	Error of radius setting from radius circular interpolation.	Set radius setting from circular interpolation main axis operating data for 80% bigger than its half distance of beginning point to end point.
271	Not possible to carry circular interpolation start in the state that main axis of circular interpolation is in 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	Check if subordinate axis is in operation when circular interpolation command is executed.
273	Not possible to carry out Circular Interpolation Start command when main axis is in the state of output inhibition.	Check if main axis is in the state of output inhibition when Circular Interpolation Start command is executed.
274	Not possible to carry out Circular Interpolation Start command when sub axis is in the state of output inhibition.	Check if sub axis is in the state of output inhibition when Circular Interpolation Start command is executed.
275	Not possible to carry circular interpolation start in the state that M Code signal of main axis of circular interpolation is ON.	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.	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.	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	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	Incorrect setting of main and sub axis from circular Interpolation.	Check setting of main and sub axis of circular interpolation.
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.	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.	Check if circular interpolation method of Common parameter is set as middle point (or radius) and if the position of start point is not the same as end point.
286	Radius setting error in circular interpolation.	The radius of the circle to carry out circular interpolation operation is 1 ~ 2147483647. Check if radius is in the range.
287	Not possible to carry out the operation as linear profile comes out of circular interpolation.	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.
290	Since angular velocity is greater than 90°, correct circle cannot be drawn.	Set operation speed lower than 90° for circular Interpolation angular velocity.

Error Code	Error Description	Solutions
291	Not possible to carry out Simultaneous Start command in the state of in operation.	Check if the Error occurred axis is included in Simultaneous Start command and if there is no axis in operation when the command is executed.
292	Not possible to carry out Simultaneous Start command in the state of output inhibition.	Check if axis is in the state of output inhibition when Simultaneous Start command is executed.
293	Not possible to carry out Simultaneous Start command in the state of M Code ON.	Check if the Error occurred axis is included in Simultaneous Start command and if M Code signal is ON when the command is executed. Available to make M Code OFF by MOF command
294	Not possible to carry out Synchronous Start command in case that there is no goal position.	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 incremental coordinate.
296	In case that Simultaneous Start command axis setting is wrong.	Check if only one axis of Simultaneous Start command is assigned. The axis assignment address means 0 bit: X axis, 1 bit: Y axis 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.	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.	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.	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 goal position is 0.	Check if the goal position is 0 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.	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.	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.	Check if the axis is in circular interpolation operation when position/speed control switching command is executed.
314	Not possible to carry out Position/Speed control switching command in the state of Linear interpolation operation.	Check if the axis is in linear interpolation operation when position/speed control switching command is executed.
316	Not possible to carry out Position/Speed switching command in the state of decreasing section.	Execute Position/Speed switching command before the decreasing of axis, while in increasing section or regular section.
317	Not possible to carry out Position/Speed switching command when it is not either at the positioning control or inching operation	Execute Position/Speed switching command while the commanding axis is positioning control or inching operation
322	Not possible to carry out deceleration stop command in the state of Jog operation.	Not possible to carry out deceleration stop command in the state of Jog operation.
341	Not possible to carry out Synchronous Start by Position command in the state of in operation.	Check if the axis is in operation when Synchronous Start by Position command is executed.
342	Not possible to carry out Position Sync. command in the state of output inhibition.	Check if axis is in the state of output inhibition when Position Sync. command is executed.
343	Not possible to carry out Position Sync. command in the state of M Code ON.	Check if the M Code signal of the axis is ON when Position Sync. command is executed. Available to make M Code OFF by MOF command.

Error Code	Error Description	Solutions
344	Not possible to carry out Position Sync. command at the absolute coordinate in the state of origin unsettled.	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.
346	Not possible to carry out Position Sync. command in the state that the origin of main axis is not settled.	Check if main axis is in the origin unsettled state when Position Sync. command is executed.
347	There is error in setting main axis/subordinate axis of Position Sync. command.	Check if main axis of Position Sync. command is set as the same as command axis. Main axis is set by writing 0(X axis), 1(Y axis) to the setting address.
349	Can't execute Position Sync. Command when main axis of command is already operating as sub axis of Position Sync. command	Check if main axis of command is already operating as sub axis of Position Sync. command
350	Not possible to carry out Speed Sync. command in the state of in operation of main axis.	Execute Speed Sync. command while main axis Is not operating when it is state of stop.
351	Not possible to carry out Speed Sync. command in the state of in operation.	Check if the axis is in operation when Speed Sync. command is executed.
352	Not possible to carry out Speed Sync. command in the state of output inhibition.	Check if axis is in the state of output inhibition when Speed Sync. command is executed.
353	Not possible to carry out Speed Sync. command in the state of M Code ON.	Check if the M Code signal of the axis is ON when Speed Sync. command is executed. Available to make M Code OFF by MOF command.
355	There is error in setting main axis/subordinate axis of Speed Sync. command.	Check if main axis of Speed Sync. command is set as the same as command axis. Main axis is set by writing 0(X axis),1(Y axis) to the setting address.
356	There is error in main axis ratio/second axis ratio value	Check if main axis ratio or sub axis ratio is set as 0.
357	The speed of Speed Sync. Command cannot exceed its speed limit.	Set low for main axis ratio/second axis ratio values so that the value would not exceed its limitation.
361	Not possible to carry out Position Override command not in the state of in operation (Busy).	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.	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.	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.	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.	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.	Check if the axis is in operation by subordinate axis of Synchronous Start operation when Position Override command is executed.
371	Not possible to carry out Speed Override command not in the state of in operation (Busy).	Check if the axis is 'stop' state when Speed Override is executed.
372	Exceeds the range of speed override value.	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.	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 sub axis of circular	Check if the axis is in operation by subordinate axis of circular interpolation operation when Speed Override

Error Code	Error Description	Solutions
	interpolation operation.	command is executed.
375	Not possible to carry out Speed Override command for the subordinate axis of Synchronous operation.	Check if the axis is in operation by subordinate axis of Synchronous Start operation when Speed Override command is executed.
377	Not possible to carry out Speed Override command in the deceleration section.	Check if the axis is in the state of deceleration stop when Speed Override command is executed.
381	Not possible to carry out position speed override command not in the state of in operation.	Check if the axis is ‘stop’ state when position speed override command is executed.
382	Not possible to carry out position speed override command not in positioning operation.	Check if the axis is in speed control operation when position speed override command is executed.
383	Exceeds the speed override value range of position speed override command.	Speed value of 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 position speed override command for the subordinate axis of Linear interpolation 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 position speed override command for the axis of circular interpolation operation.	Check if the axis is in circular interpolation operation when Speed Override command is executed.
386	Not possible to carry out position speed override command for the subordinate axis of Synchronous operation.	Check if the axis is in operation by subordinate axis of Synchronous Start operation when Speed Override command is executed.
401	Not possible to carry out Inching command in the state of in operation.	Check if the axis is in operation when Inching command is executed.
411	Not possible to carry out Jog Start command in the state of in operation.	Check if the axis is in operation when Jog Start command is executed.
441	Not possible to carry out Start step no. Change command in the state of in operation.	Check if the axis is in operation when Start step no. change command is executed.
442	Exceeds the step assignment range of Start step no. Change/Repeat Operation Start step no. assignment command.	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 150.
451	Not possible to carry out Current Position Preset command in the state of in 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.	Check if the position value of current position preset command is within the range of soft upper/lower limit set in Extended Parameter.
461	Not possible to carry out Position Teaching command in the state of in 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.	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.
463	Not possible to carry out Speed Teaching command in the state of in operation.	Check if the axis is in operation when Speed teaching command is executed.
464	Not possible to carry out ROM teaching in the state of in operation	Check if the axis is in operation when ROM teaching command is executed
465	Error from step number appointing which are about to execute teaching operation.	Make sure step for teaching operation is smaller than 150 or same as 150.
466	Teaching list error for multi teaching command.	Execute teaching command after set teaching data list as 0: position or 1: speed
467	Teaching method error for multi teaching command.	Execute teaching command after set teaching method as 0: RAM or 1: ROM
471	Parameter teaching command cannot be Executed while its operating.	Check if the axis was operating when parameter teaching commands are executing
472	Operating data teaching command cannot be	Check if the axis was operating when operating Data

Error Code	Error Description	Solutions
	Executed while its operating.	teaching commands are executing
473	Set data cannot be teaching.	Execute teaching command after setting right value for parameter teaching data or operating data teaching list.
475	Error of value for teaching data is out of range.	Execute teaching command after setting value of parameter teaching or operating data teaching data among its set range.
481	Internal emergency stop	Eliminate reason of emergency stop and execute CLR command to delete the error.
492	Hard upper limit error	Be out of limited external upper signal range by using counter direct jog command. Then execute CLR command to delete the error.
493	Hard lower limit error	Be out of limited external lower signal range by using direct jog command. Then execute CLR command to delete the error.
501	Soft upper limit error	Be out of limited soft upper range by using counter direct jog command. Then execute CLR command to delete the error.
502	Soft lower limit error	Be out of limited soft upper range by using direct jog command. Then execute CLR command to delete the error.
511	Inappropriate command	Check the commands are appropriate. Look up the references for COMMANDS.
512	Step number of support data is out of range.	Commands set for bigger than 150. Set it Between 1 and 150.
513	Not possible to change direction in the state of continuous operation	If you want change the direction, use Keep operation.
531	Error for Encoding number exceed from Encoder preset command.	Execute Encoder preset command after set “0” For encoder number.
532	Preset command cannot be done because of the axis which using encoder as a main axis	Execute Encoder preset when the encoder using axis is not operating
534	The position of Encoder preset exceeds from Max or Min value of encoder.	Execute Encoder preset command after set the value of encoder position preset as bigger than Min value and smaller than Max value.

Appendix 2 Positioning System Current consumption

(1) Module Current consumption (DC 5V)

(Unit : ㎃)

Item	Model	Current consumption
XGB Modular type Main Unit(XBMS)	XBM-DR16S	400
	XBM-DN16S	250
	XBM-DN32S	280
XGB Compact “S” type Main Unit(XBCS)	XBC-DN20S	240
	XBC-DN30S	255
	XBC-DN20SU	252
	XBC-DN30SU	270
	XBC-DN40SU	288
	XBC-DN60SU	340
	XBC-DP20SU	305
	XBC-DP30SU	352
	XBC-DP40SU	355
	XBC-DP60SU	394
	XBC-DR20SU	478
	XBC-DR30SU	626
	XBC-DR40SU	684
	XBC-DR60SU	942
XGB Compact “H” type Main Unit(XBCH)	XBC-DR32H	660
	XBC-DR64H	1,040
	XBC-DN32H	260
	XBC-DN64H	330
XGB IEC “H” type Main Unit(XECH)	XEC-DR32H	660
	XEC-DR64H	1,040
	XEC-DN32H	260
	XEC-DN64H	330
	XEC-DP32H	300
	XEC-DP64H	380
XGB IEC “S” type Main Unit (XECS)	XEC-DR20SU	478
	XEC-DR30SU	626
	XEC-DR40SU	684
	XEC-DR60SU	942
	XEC-DN20SU	252
	XEC-DN30SU	270
	XEC-DN40SU	288
	XEC-DN60SU	340
	XEC-DP20SU	305
	XEC-DP30SU	352
	XEC-DP40SU	355
	XEC-DP60SU	394

Item	Model	Current consumption
I/O Module	XBE-DC32A	50
	XBE-DC16A/B	40
	XBE-DC08A	20
	XBE-RY16A	440
	XBE-RY08A/B	240
	XBE-TN32A	80
	XBE-TN16A	50
	XBE-TN08A	40
	XBE-DR16A	250
Special Module	XBF-AD04A	120
	XBF-AD08A	105
	XBF-AD04C	105
	XBF-AH04A	120
	XBF-DV04A	110
	XBF-DV04C	70
	XBF-DC04A	110
	XBF-DC04B	110
	XBF-DC04C	70
	XBF-RD04A	100
	XBF-TC04S	100
	XBF-PD02A	500
	XBF-HO02A	270
	XBF-HD02A	330
Communication Module	XBL-C21A	110
	XBL-C41A	110
	XBL-EMTA	190
	XBL-EIMT/F/H	280/670/480
	XBL-EIPT	400
	XBL-CMEA	150
	XBL-CSEA	150
Option Module	XBO-DC04A	50
	XBO-TN04A	80
	XBO-AD02A	50
	XBO-DA02A	150
	XBO-AH02A	150
	XBO-RD01A	30
	XBO-TC02A	50
	XBO-RTCA	30
	XBO-M2MB	70

(2) Calculation Example of Consumption Current/Voltage

Calculate the consumption current and configure the XGB PLC system not to exceed the output current capacity of basic unit

(1) XGB PLC configuration example 1

- Consumption of current/voltage is calculated as follows.

Type	Model	Unit No.	Internal 5V consumption current (Unit : ㎃)	Remark
Main unit	XBC-DN20SU	1	252	In case all contact points are On. (Maximum consumption current)
Expansion module	XBE-DC32A	1	50	
	XBE-TN32A	1	80	
	XBF-PD02A	2	500	All channel is used. (Maximum consumption current)
Consumption current	1,382㎃			-
Consumption voltage	6.91W			1.112A x 5V = 6.91W

In case system is configured as above, since 5V consumption current is total 1,382mA and 5V output of XGB standard type main unit is maximum 1.5A, normal system configuration is available.

(2) XGB PLC configuration example 2

Type	Model	Unit No.	Internal 5V consumption current (Unit : ㎃)	Remark
Main unit	XBC-DN30SU	1	270	In case all contact points are On. (Maximum consumption current)
Expansion module Consumption current	XBE-DR16A	2	250	
	XBE-RY16A	2	440	
	XBF-PD02A	2	500	All channel is used. (Maximum consumption current)
	XBL-C21A	1	110	
Consumption voltage	2,260㎃			-
Main unit	11.3W			2A x 5V = 11.3W

If system is configured as above, total 5V current consumption is exceeded 2,260 mA and it exceeds the 5V output of XGB standard type main unit. Normal system configuration is not available. Although we assume the above example that all contact points are on, please use high-end type main unit which 5V output capacity is higher than standard type main unit.

Warranty

1. Warranty Period
The product you purchased is guaranteed for 36 months from the date of manufacture.

2. Scope of Warranty
(1) The initial diagnosis of faults is basically conducted by your company. However, upon your request, our company or our service network can undertake this task for a fee. If the cause of the fault lies with our company, this service will be provided free of charge.
(2) This warranty only applies if the product is used under normal conditions according to the specifications and precautions described in the handling instructions, user manuals, catalogs, and caution labels.
(3) Even within the free warranty period, the following cases will be subject to paid repairs:
 1) Replacement of consumable and life-limited parts (e.g., relays, fuses, electrolytic capacitors, fans, LCDs, batteries, etc.)
 2) Failures or damages caused by improper storage, handling, negligence, or accidents by the customer
 3) Failures resulting from the customer's hardware or software design
 4) Failures due to modifications without our consent
 (Repairs will be refused, even for a fee, if recognized as modified or repaired outside our company)
 5) Failures that could have been avoided if the customer's equipment, in which our product is incorporated, had safety devices required by legal regulations or common industry standards
 6) Failures that could have been prevented if maintenance and replacement of consumable parts were performed normally according to the handling instructions or user manuals.
 7) Failures and damages to the product caused by using connected equipment or inappropriate consumables
 8) Failures caused by external factors such as fire, abnormal voltage, force majeure, and natural disasters such as earthquakes, lightning, salt damage, wind, and flood damage.
 9) Failures due to reasons that could not be predicted with the scientific and technical standards at the time of our shipment
 10) Other failures, damages, or defects recognized as the responsibility of your company

Environmental Policy

LS ELECTRIC Co., Ltd supports and observes the environmental policy as below.

Environmental Management

LS ELECTRIC considers the environmental preservation as the preferential management subject and every staff of LS ELECTRIC use the reasonable endeavors for the pleasurably environmental preservation of the earth.

About Disposal

LS ELECTRIC PLC unit is designed to protect the environment. For the disposal, separate aluminum, iron and synthetic resin (cover) from the product as they are reusable.

www.ls-electric.com

LS ELECTRIC Co., Ltd.

■ **Headquarter**
LS-ro 127(Hogye-dong) Dongan-gu, Anyang-si, Gyeonggi-Do, 14119, Korea
■ **Seoul Office**
LS Yongsan Tower, 92, Hangang-daero, Yongsan-gu, Seoul, 04386, Korea
Tel: 82-2-2034-4033, 4888, 4703 Fax: 82-2-2034-4588
E-mail: automation@ls-electric.com

■ **Overseas Subsidiaries**
- LS ELECTRIC Japan Co., Ltd. (Tokyo, Japan)
  Tel: 81-3-6268-8241 E-Mail: japan@ls-electric.com
- LS ELECTRIC (Dalian) Co., Ltd. (Dalian, China)
  Tel: 86-411-8730-6495 E-Mail: china.dalian@lselectric.com.cn
- LS ELECTRIC (Wuxi) Co., Ltd. (Wuxi, China)
  Tel: 86-510-6851-6666 E-Mail: china.wuxi@lselectric.com.cn
- LS ELECTRIC Middle East FZE (Dubai, U.A.E.)
  Tel: 971-4-886-5360 E-Mail: middleeast@ls-electric.com
- LS ELECTRIC Europe B.V. (Hoofddorp, Netherlands)
  Tel: 31-20-654-1424 E-Mail: europartner@ls-electric.com
- LS ELECTRIC America Inc. (Chicago, USA)
  Tel: 1-800-891-2941 E-Mail: sales.us@lselectricamerica.com
- LS ELECTRIC Turkey Co., Ltd.
  Tel: 90-212-806-1225 E-Mail: turkey@ls-electric.com

■ **Overseas Branches**
- LS ELECTRIC Tokyo Office (Japan)
  Tel: 81-3-6268-8241 E-Mail: tokyo@ls-electric.com
- LS ELECTRIC Beijing Office (China)
  Tel: 86-10-5095-1631 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Shanghai Office (China)
  Tel: 86-21-5237-9977 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Guangzhou Office (China)
  Tel: 86-20-3818-2883 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Chengdu Office (China)
  Tel: 86-28-8670-3201 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Qingdao Office (China)
  Tel: 86-532-8501-2065 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Nanjing Office (China)
  Tel: 86-25-8467-0005 E-Mail: china.auto@lselectric.com.cn
- LS ELECTRIC Bangkok Office (Thailand)
  Tel: 66-90-950-9683 E-Mail: thailand@ls-electric.com
- LS ELECTRIC Jakarta Office (Indonesia)
  Tel: 62-21-2933-7614 E-Mail: indonesia@ls-electric.com
- LS ELECTRIC Moscow Office (Russia)
  Tel: 7-499-682-6130 E-Mail: info@lselectric-ru.com
- LS ELECTRIC America Western Office (Irvine, USA)
  Tel: 1-949-333-3140 E-Mail: america@ls-electric.com

2025.03