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Programmable Logic Controller

XGB Built-in Positioning

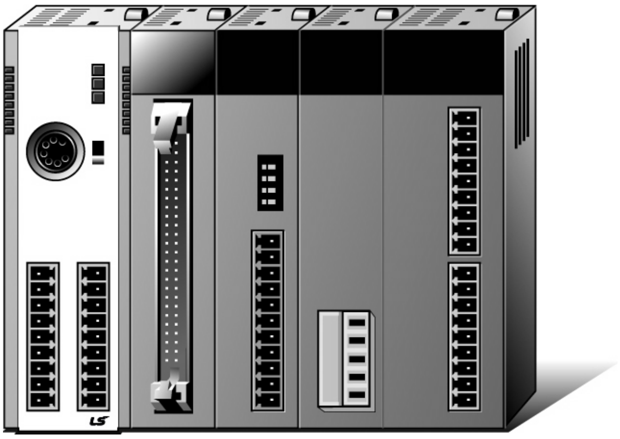
XGT Series

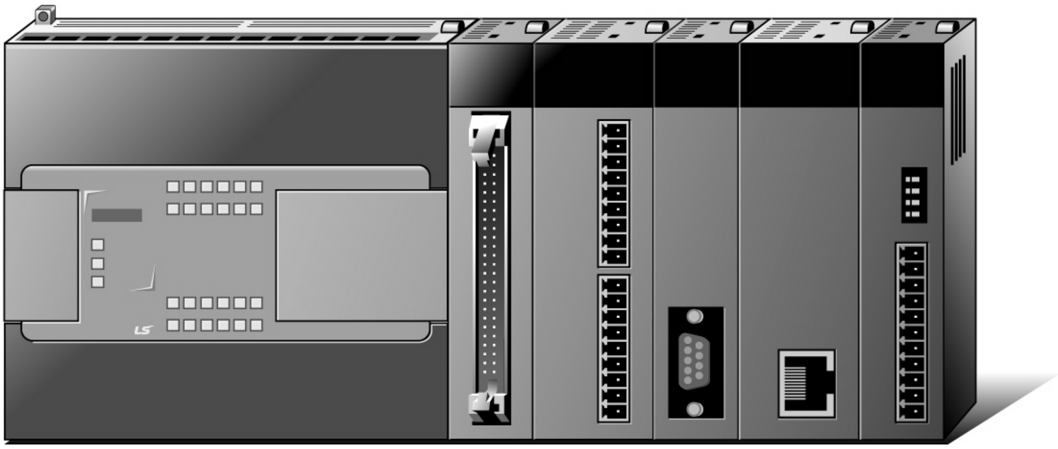
User's Manual

XGB Modular type

XBC High-end/Standard type

XEC High-end/ Standard type





Safety Instructions

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

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Safety Instruction

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 by using the product properly and safely.

► Precautious measures can be categorized as "Warning" and "Caution", and each of the meanings 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 damages in products 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.

After reading this user's manual, it should be stored in a place that is visible to product users.

Safety Instruction

Safety Instructions when designing

⚠Warning

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

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

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

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

Safety Instruction

Safety Instructions when designing

⚠ Caution

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

Safety Instructions when designing

⚠ Caution

- **Use PLC only in the environment specified in PLC manual or general standard of data sheet.** If not, electric shock, fire, abnormal operation of the product or flames may be caused.

- **Before installing the module, be sure PLC power is off.** If not, electric shock or damage on the product may be caused.

- **Be sure that each module of PLC is correctly secured.** If the product is installed loosely or incorrectly, abnormal operation, error or dropping may be caused, also unusual contact with cable is may cause abnormal operation due to poor contact.

- **If lots of vibration is expected in the installation environment, don’t let PLC directly vibrated.** Electric shock, fire or abnormal operation may be caused.

- **Don’t let any metallic foreign materials inside the product**, which may cause electric shock, fire or abnormal operation..

Safety Instruction

Safety Instructions when wiring

⚠ Warning

- **Prior to wiring, be sure that power of PLC and external power is turned off.** If not, electric shock or damage on the product may be caused.

- **Before PLC system is powered on, be sure that all the covers of the terminal are securely closed.** If not, electric shock may be caused

⚠ Caution

- **Let the wiring installed correctly after checking the voltage rated of each product and the arrangement of terminals.** If not, fire, electric shock or abnormal operation may be caused.

- **Secure the screws of terminals tightly with specified torque when wiring.** If the screws of terminals get loose, short circuit, fire or abnormal operation may be caused. And if the screws of terminals too tighten, it may cause dropping of product, short circuit, or abnormal operation may be caused due to damage of screw or module.

- **Surely use the ground wire of Class 3 for FG terminals, which is exclusively used for PLC**. If the terminals not grounded correctly, abnormal operation may be caused.

- **Don’t let any foreign materials such as wiring waste inside the module while wiring,** which may cause fire, damage on the product or abnormal operation.

- Connector of extension connection is using designated tools pressing or properly soldering.

Safety Instruction

Safety Instructions for test-operation or repair

⚠ Warning

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

⚠ Caution

- **Don't remove PCB from the module case nor remodel the module.** Fire, electric shock or abnormal operation may occur.
- **Prior to installing or disassembling the module, let all the external power off including PLC power.** If not, electric shock or abnormal operation may occur.
- **Keep any wireless installations or cell phone at least 30cm away from PLC**. If not, abnormal operation may be caused.
- Before use edit function during operate, make sure to carefully read and understand the User's Manual. If not, it may be caused damage to the product or accident due to disoperation.
- Do not drop and give an impact to battery. It may be caused leak of liquid of inside battery due to damage the battery. Do not use any battery that had been fell on the floor or had been shocked. Also let skilled worker take in charge of the operation of changing battery.

Safety Instruction

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	2008.1	1. Positioning first edition according to XGB user manual separation	
		2. Added contents	
		(1) IO wiring method through smart link board	1-8
		(2) Positioning function list	3-1
		(3) How to check the positioning	3-26
		(4) Positioning monitoring package	6-1
		(5) Positioning trouble shooting method	8-1
		3. Modified contents	
		(1) IO signal allocation	1-6
		(2) Positioning parameter setting method	4-1
		(3) Positioning instruction contents	5-1
		(4) Modifying safety precaution for safety	-
V1.1	2008.3	1. Added type and function according to developing XGB compact type basic unit (XBC-DxxxH)	-
V1.2	2009.8	1. Added type and function according to developing XGB compact type basic unit (XEC-DxxxH)	-
		(1) Description on positioning flag added	
		(2) Description on positioning instruction added	
		(3) Positioning program example added	
V1.4	2011.6	1. type and function according to developing XGB compact type basic unit (XBC-DxxxS(U)) added	-
V1.5	2013.7	1. Motor Wiring Examples Added(XGT-Servo:XDL-S)	APP3-6, 7
		2. Modules(XB(E)C-DPxxSU) added	1-9,10 2-2,3
V1.6	2013.12	1. PWM instruction added	5-47,95
		2. HOME, DOG Device Modified	3-2,3-3
		3. Domain Of Homepage Changed	Front/Back cover
V1.7	2015.07	1. Input/Output contact point list Added	Ch2, Ch8
		2. XEC Function block list Added	APP2

-

※ The number of User's manual is indicated right part of the back cover.

About User's Manual

Thank you for purchasing PLC of LSIS.,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.lsis.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/XGB)	It describes how to use XG5000 software about online functions such as programming, printing, monitoring and debugging when using XGB series products.	10310000512
XG5000 user's manual (for XGI/XGR/XEC)	It describes how to use XG5000 software about online functions such as programming, printing, monitoring and debugging when using XGB (IEC language) series products	10310000834
XGK/XGKB Instructions & Programming	It is the user's manual for programming to explain how to use instructions that are used PLC system with XGB CPU.	10310000510
XGI/XGR/XEC Instructions & Programming	It is the user's manual for programming to explain how to use instructions that are used in XGB (IEC language) CPU	10310000833
XGB hardware	It describes power, IO, extension specification and system configuration, built-in high speed counter of XGB main unit.	10310000693
XGB hardware (IEC)	It describes power, IO, extension specification and system configuration, built-in high speed counter of XGB (IEC) main unit.	10310000983
XGB Analog user's manual	It describes how to use the analog input, analog output, temperature input module, system configuration and built-in PID control for XGB basic unit.	10310000920
XGB Cnet I/F	It is the user's manual about XGB Cnet I/F that describes built-in communication function and external Cnet I/F module of XGB basic unit	10310000816
XGB FEnet I/F	It describes how to use XGB FEnet I/F module.	10310000873

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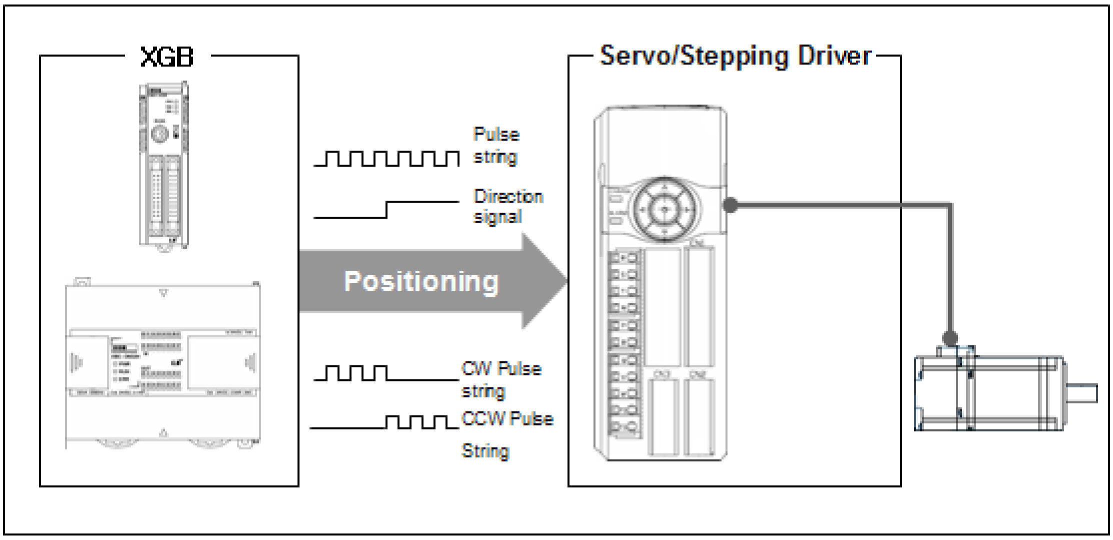
Chapter 1 General

XGB series transistor output type contains 2 positioning axes. This manual describes the specifications and usage of positioning.

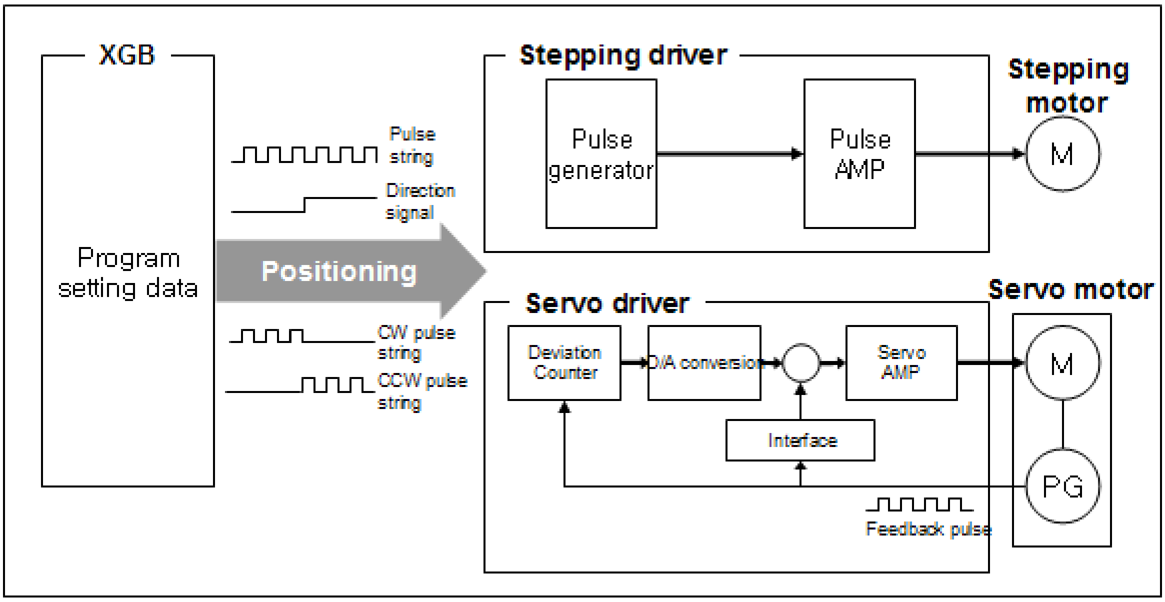
1.1 General

1.1.1 Purpose of position function

The purpose of position function is to exactly move an object from the current position to a designated position and this function executes highly precise position control by sending a position pulse string signal to types of servo drive or stepping motor control drive. For applications, it may be widely used; for instance, machine tools, semiconductor assembling machine, grinder, small machine center, lifter and etc.



< XGB positioning function general >



< Positioning system inner block diagram >

1.1.2 Features

Positioning function features the followings.

(1) Max. two axis, 100kpps positioning
- XGB PLC can execute positioning of up to 2 axes with up to 100kpps.

(2) Diversity of positioning function
- XGB PLC contains various functions necessary for position system such as position control at any temporary position or constant speed operation.

(a) Operation data containing position address, operation method and operation pattern may be set up to 80 steps per axis (based on "H" type). It executes position function by using this operation data.

(b) Linear control is available by using each operation data
- The control can also perform single position control by one operation data and continuous position control by several operation data

(c) linear interpolation control is available.

(d) According to operation data and control types designated by parameters, position control, speed control, position/speed switching control and position/speed switching control are available

(e) It also provides various home return functions.

1) Home return can be chosen among the following three.
- Origin detection after DOG Off
- When DOG On, Origin detection after deceleration
- Origin detection by DOG

2) temporary position can be set as machine's origin by using floating origin setting function.

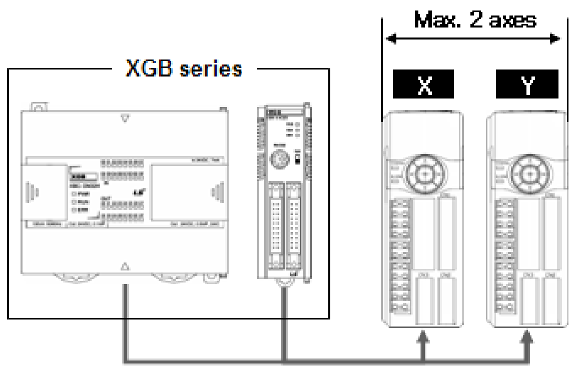
(3) Easy maintenance
- It saves data such as position data and parameter into flash memory of main unit permanently.
- The modified data during positioning can be preserved in the flash memory by application instruction (WRT/APM_WRT instruction).

(4) XG5000 can perform self-diagnosis, monitor and test.

(a) Diagnosing of I/O signal line.

(b) It can test all functions of built-in positioning or check the current operation status without program through special module monitoring

(c) It is easy to take action because the user can check error by error occurrence flag (Ch0: K4201, ,%KX6721 Ch1: K4301, %KX6881) and error code (Ch0: K427, %KW427 Ch1: K437, %KW437) easily.

XGB positioning system	Reference
	•For parameter setting, refer to Ch3.2 and for operation data setting, refer to Ch3.3. •For instruction of positioning, refer to Ch5. •For I/O signal, refer to Ch1.4.

1.2 Performance specifications

1.2.1 Performance specifications of XGB built-in positioning

The performance specifications of positioning function are as follows.
Here standard type indicates XBM-DN□□S/ XBC-DN□□S(U) and high end type indicate XBC(XEC)-DN□□H.
Each type is indicated as ‘S’ type and ‘H’ type.

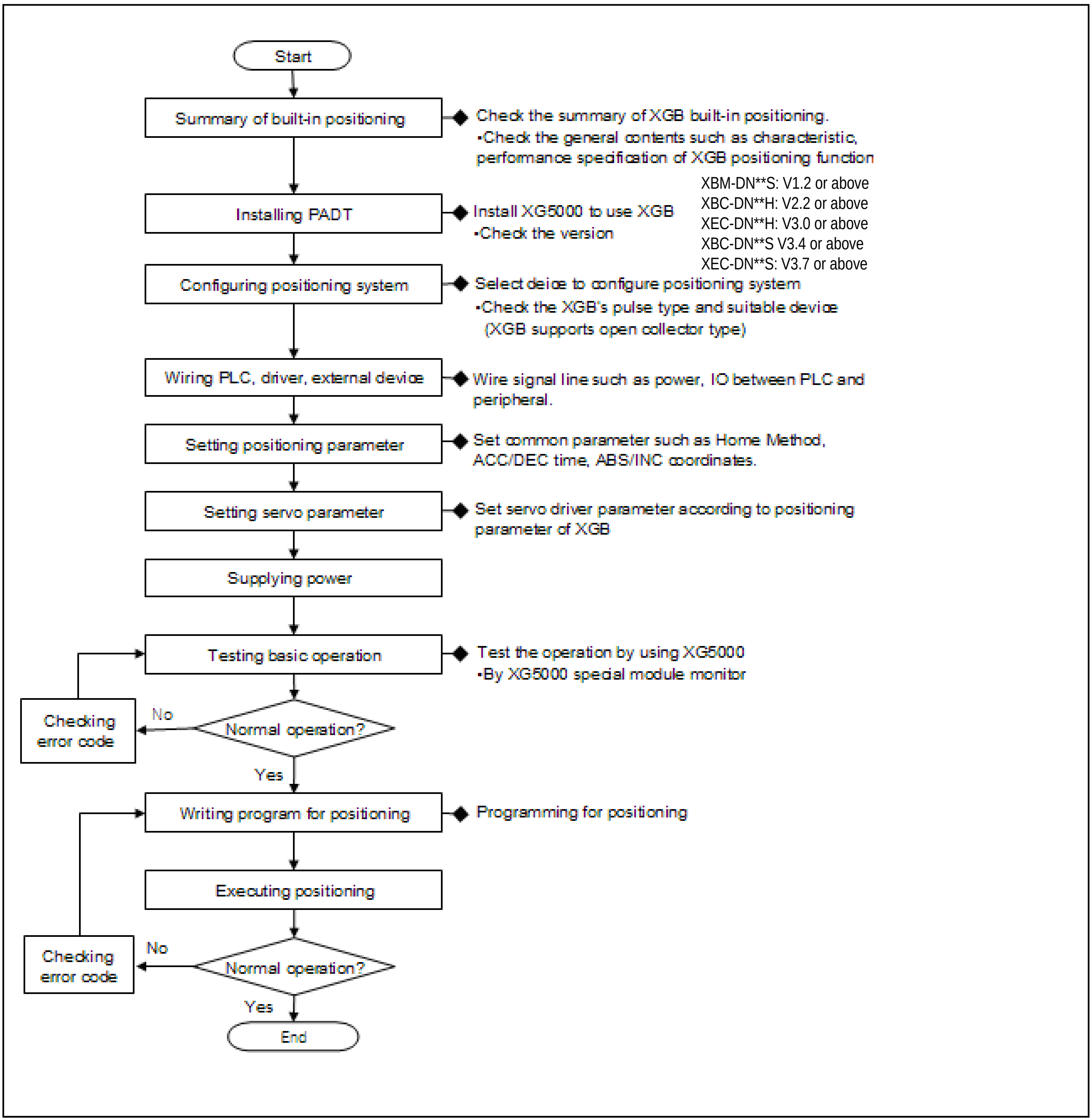
<table>
<tr><th colspan="2" rowspan="2">Type / Item</th><th colspan="3">XGB Basic Unit (Transistor output)</th></tr>
<tr><th colspan="2">Standard type (“S” type)</th><th>High-end type (“H” type)</th></tr>
<tr><td colspan="2">No. of control axis</td><td colspan="3">2 axes</td></tr>
<tr><td colspan="2">Interpolation</td><td colspan="3">2 axes linear interpolation</td></tr>
<tr><td colspan="2">Pulse output method</td><td colspan="3">Open collector (DC 24V)</td></tr>
<tr><td colspan="2">Pulse output type</td><td colspan="2">Pulse + Direction</td><td>Pulse + Direction
CW/CCW output</td></tr>
<tr><td colspan="2">Control type</td><td colspan="3">Position control, speed control, speed/position switching, position/speed switching</td></tr>
<tr><td colspan="2">Control unit</td><td colspan="3">Pulse</td></tr>
<tr><td colspan="2" rowspan="4">Position data</td><td colspan="2">30 data areas per axis
(operation step no. 1 ~ 30)
* XBC-DN□□S(U) supports 80 data areas per axis</td><td>80 data areas per axis
(operation step no. 1 ~ 80)</td></tr>
<tr><td rowspan="3">Setting method</td><td colspan="2">Setting through Embedded parameter of XG5000 → permanent auto-preservation</td></tr>
<tr><td colspan="2">Setting through dedicated monitoring package → permanent preservation by PADT instruction</td></tr>
<tr><td colspan="2">Setting through K area dedicated for positioning
→ permanent preservation by application instruction (WRT/APM_WRT instruction)</td></tr>
<tr><td colspan="2">Positioning monitor</td><td colspan="3">Special module monitoring of XG5000 / monitoring by K area</td></tr>
<tr><td colspan="2">Back-up</td><td colspan="3">Parameter, operation data → Flash memory
K area →RAM (super capacitor back up for S type/ battery back up for H type)
(Saving them in the flash memory is available by application instruction(WRT/APM_WRT))</td></tr>
<tr><td rowspan="5">Position</td><td>Position method</td><td colspan="3">Absolute method / Incremental method</td></tr>
<tr><td>Position address range</td><td colspan="3">-2,147,483,648 ~ 2,147,483,647(Pulse)</td></tr>
<tr><td>Speed range</td><td colspan="3">1 ~ 100,000pps(1pps unit)</td></tr>
<tr><td>Acc/dec processing</td><td colspan="3">Trapezoid-shaped</td></tr>
<tr><td>Acc/dec time</td><td colspan="3">1 ~ 10,000 ㎳ (selectable from 4 types of acc/dec patterns)</td></tr>
<tr><td colspan="2">Max. output pulse</td><td colspan="3">100 kpps</td></tr>
<tr><td colspan="2">Max. connection distance</td><td colspan="3">2 m</td></tr>
</table>

< Performance specifications >

1.3 Operation Sequence of Positioning

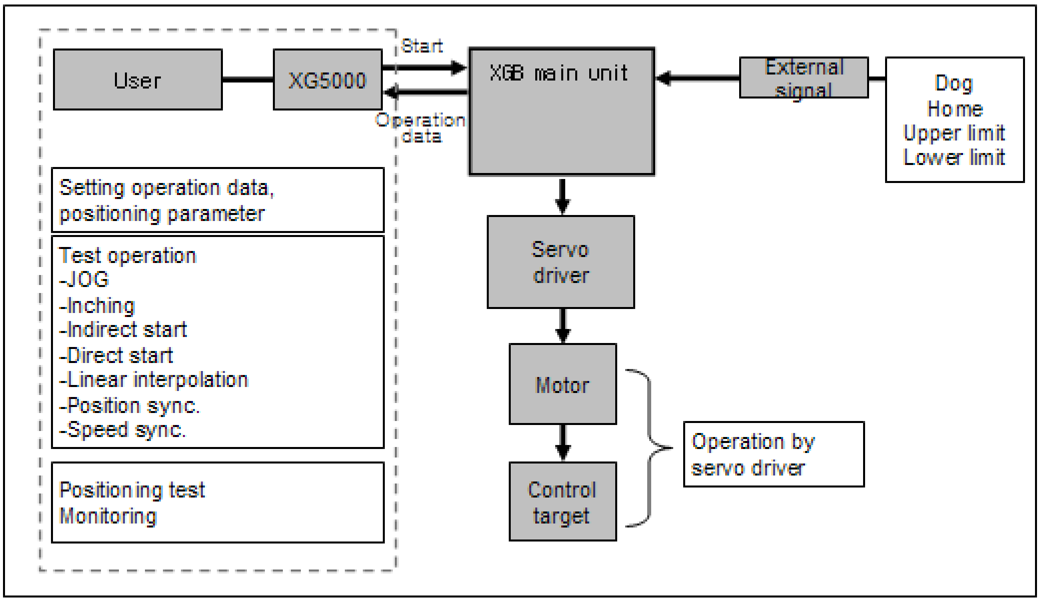
1.3.1 Operation Sequence of Positioning

Operation sequence is as follows.



1.3.2 Flow of position signal

Flow of position signal is as follows.



< XGB Positioning signal flow >

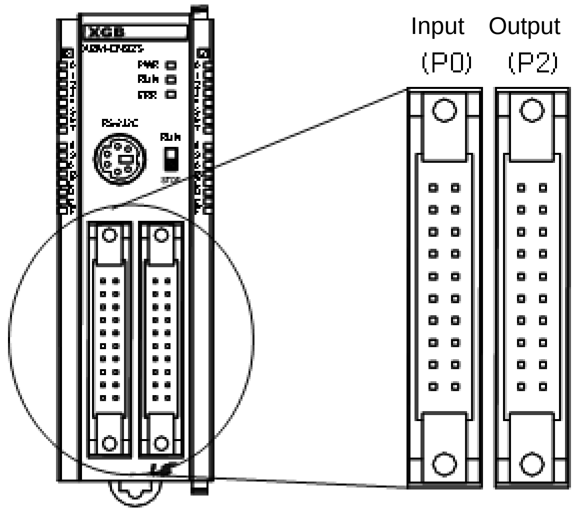
1.4 I/O Signal Allocation

1.4.1 Allocation of modular type input signal

In case of modular type, external I/O signal for built-in function is allocated as follows.

(1) Pin array of I/O connector

Pin array of I/O connector of XGB modular type transistor type basic unit is as follows.



P000	P008
P001	P009
P002	P00A
P003	P00B
P004	P00C
P005	P00D
P006	P00E
P007	P00F
COM	COM
COM	COM

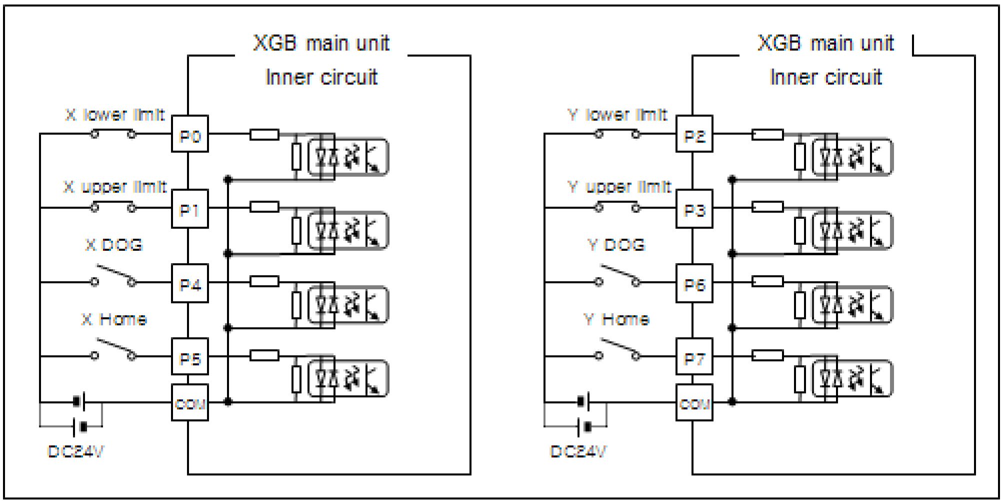
P020	P028
P021	P029
P022	P02A
P023	P02B
P024	P02C
P025	P02D
P026	P02E
P027	P02F
12/24V	COM
12/24V	COM

(2) Allocation of external input signal

Signal name	Input contact point no.		Detail	-
External lower limit signal (LimitL)	X axis	P0000	detected at the falling edge of input contact point.	Normally closed contact point (B contact point)
	Y axis	P0002	detected at the falling edge of input contact point.	
External upper limit signal (LimitH)	X axis	P0001	detected at the falling edge of input contact point.	
	Y axis	P0003	detected at the falling edge of input contact point.	
DOG signal	X axis	P0004	When homing, detected at the rising edge	Normally open contact point (A contact point)
	Y axis	P0006	When homing, detected at the rising edge	
ORIGIN signal	X axis	P0005	When homing, detected at the rising edge	
	Y axis	P0007	When homing, detected at the rising edge	
Input common	X/Y axis	COM	Input common	

(3) Example of wiring the external input signal

Example of wiring the external input signal is as follows.



< Example of wiring the external input signal >

1.4.2 Allocation of modular type output signal

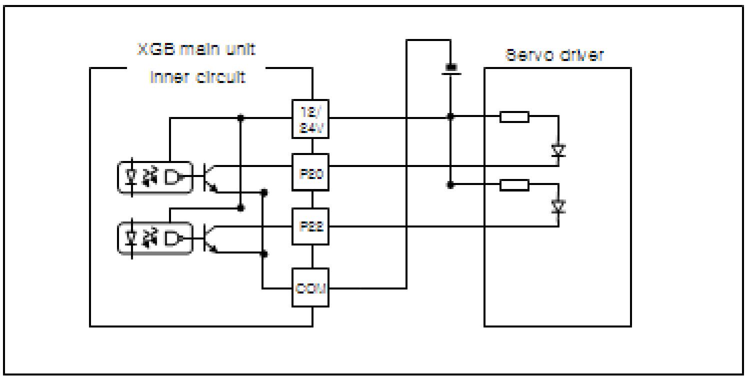
(1) Allocation of output signal

When using the positioning function, the output signal is allocated as shown below.

Signal name	Input contact point no.		Detail	-
Pulse output	X axis	P0020	Positioning X axis pulse string output contact point (Open collector output)	Low Active and High Active is selectable in parameter setting.
	Y axis	P0021	Positioning Y axis pulse string output contact point (Open collector output)	
Direction output	X axis	P0022	Positioning X axis direction output contact point (Open collector output)	
	Y axis	P0023	Positioning Y axis direction output contact point (Open collector output)	
External 24V	X/Y axis	DC12 /24V	For external power (12/24V) supply	
Output common	X/Y axis	COM	Output common	

(2) Example of wiring external input signal

Example of wiring external output signal is as follows.

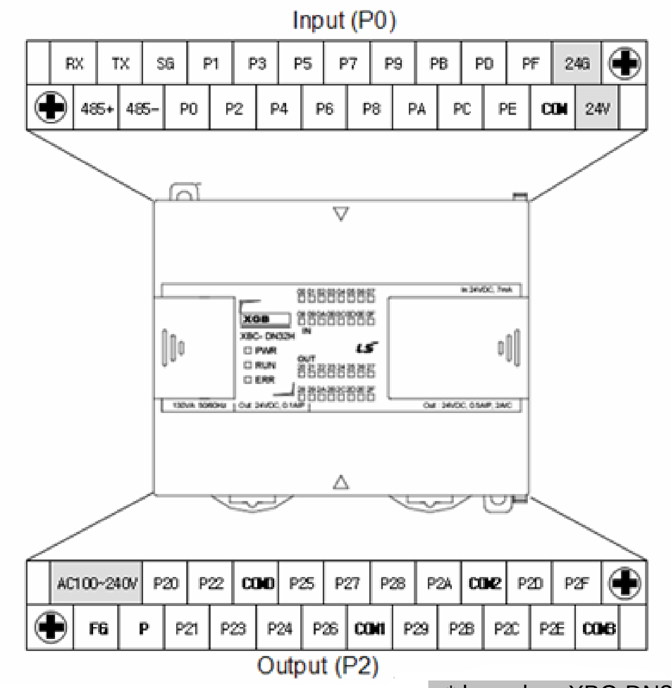


1.4.3 Allocation of compact type (S/H type) input signal

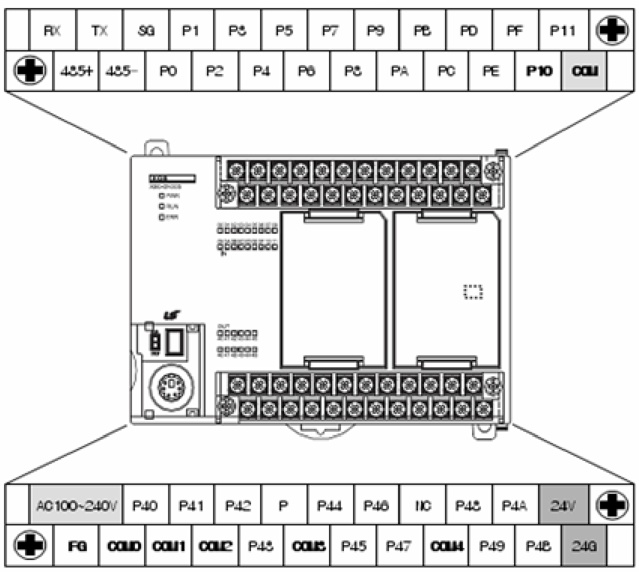
In case of compact standard/high-end type, external input signal for built-in positioning is allocated as follows

(1) I/O terminal block array

Array of XGB transistor output type basic unit is as figure below.



* based on XBC-DN32H



* based on XBC-DN30SU

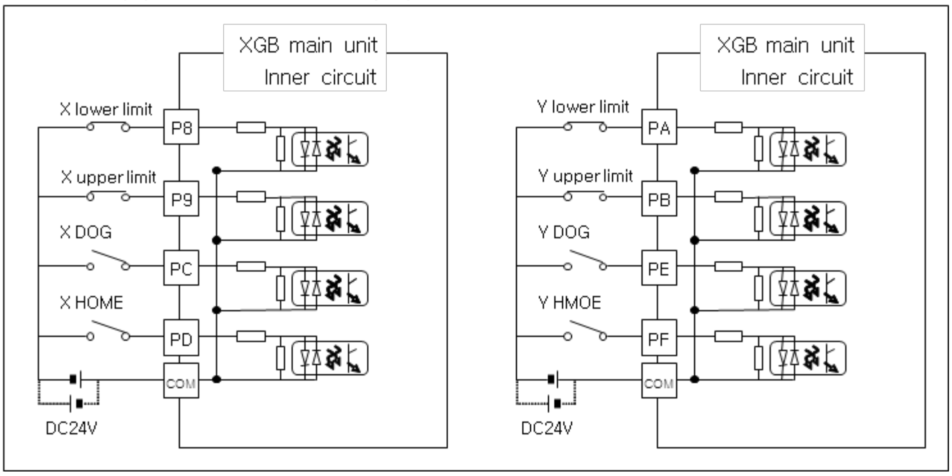
(2) Allocation of external input signal

Signal name	Input contact point no.			Operation content	Reference
	Axis	XBC-DN(P) □□S(U)/H	XEC-DN(P) □□H		
External lower limit (LimitL)	X axis	P0008	%IX0.0.8	Detected at the falling edge of input contact point	Normally closed contact point (B contact point)
	Y axis	P000A	%IX0.0.10	Detected at the falling edge of input contact point.	
External upper limit (LimitH)	X axis	P0009	%IX0.0.9	Detected at the falling edge of input contact point	
	Y axis	P000B	%IX0.0.11	Detected at the falling edge of input contact point	
DOG signal	X axis	P000C	%IX0.0.12	When homing, detected at rising edge	Normally opened contact point (A contact point)
	Y axis	P000E	%IX0.0.14	When homing, detected at rising edge	
ORIGIN signal	X axis	P000D	%IX0.0.13	When homing, detected at rising edge	
	Y axis	P000F	%IX0.0.15	When homing, detected at rising edge	
Input common	X/Y axis	COM		Input common terminal	

(3) Wiring example of external input signal

In case of using positioning function of XGB compact main unit, wiring example of input signal is as follows.

(XBC-DN□□S(U)/H is used for example)



< XGB high-end positioning input signal wiring example >

1.4.4 Allocation of compact type (S/H type) output signal

(1) Allocation of output signal

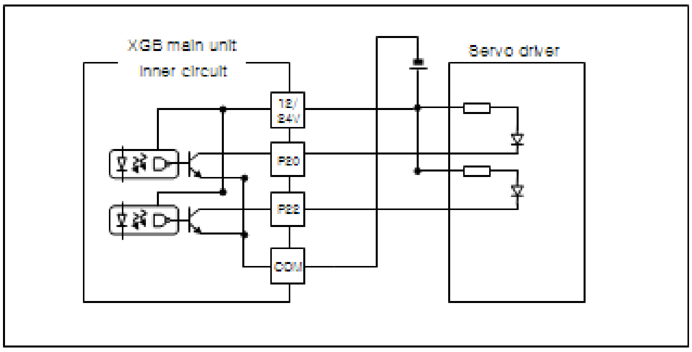
In case of using built-in positioning of XGB compact standard/high-end type main unit, output signal is allocated as follows.

Signal name	Input contact point no.				Operation content		Reference
	Axis	XBC-DN□□H	XBC-DN(P)□□S(U)	XEC-DN(P)□□S(U)/H	Pulse + Direction mode	CW/CCW mode	
Pulse output (CW output)	X axis	P00020	P00040	%QX0.0.0	Positioning X axis pulse string (Open collector output)	X axis CW pulse string output (Open collector output)	Low Active and High Active is selectable in parameter setting
	Y axis	P00021	P00041	%QX0.0.1	Positioning Y axis pulse string (Open collector output)	Y axis CW pulse string output (Open collector output)	
Direction output (CCW output)	X axis	P00022	P00042	%QX0.0.2	X axis direction output contact point (Open collector output)	X axis CCW pulse string output (Open collector output)	
	Y axis	P00023	P00043	%QX0.0.3	Y axis direction output constant point (Open collector output)	Y axis CCW pulse string output (Open collector output)	
External 24V	X/Y axis	P			Terminal for external power (12/24V) to implement the transistor		
Input common	X/Y axis	COM0 ~ 7			Output common terminal		

* Standard type (XBC-DN(P)□□S(U)) supports only "pulse + direction mode".

(2) Wiring example of external input signal

In case of using positioning function of XGB high-end basic unit, wiring example is as follows.



1.5 I/O wiring by using Smart Link Board

1.5.1 Smart link board

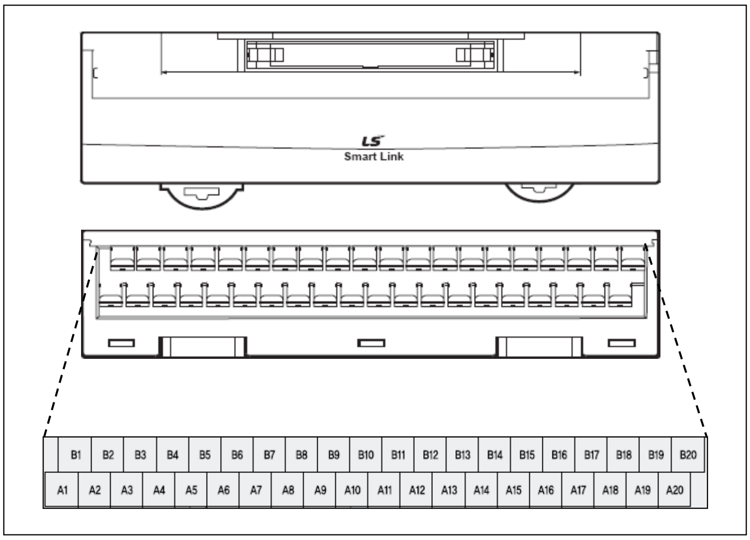
When using positioning function, easy wiring is available by connecting the I/O connector with smart link board.
The available smart link and I/O cable are as follows.

XGB		Smart link		Connection cable		
Classification	Model	Model	The no. of pin	Model	Length	Content
Main unit	XBM-DN32S	SLP-T40P	40	SLT-CT101-XBM	1m	For main unit connection (20Pin + 20Pin)
	XBM-DN16S					
Extension module	XBE-DC32A	SLP-T40P	40	SLT-CT101-XBE	1m	For extension module connection (40Pin)
	XBE-TN32A	SLP-T40P	40	SLT-CT101-XBE	1m	
		SLP-RY4A	40	SLP-CT101-XBE	1m	For extension module connection (40Pin) Exclusive for relay built-in SLP type

It describes wring of XGB, SLP-T40P and SLT-CT101-XBM.
For wring of other smart link boards or XGB extension module, refer to XGB user manual for hardware.

(1) SLT-T40P terminal array

Terminal array of SLP-T40P is as follows.



Item	Specification
Rated voltage	AC/DC 125[V]
Rated current	Max. 1[A]
Withstanding voltage	600V 1min
Insulation resistor	100 ㏁ (DC500V)
Cable specification	1.25[㎟] or below
Terminal/screw	M3 X 8L
Torque	6.2 ㎏ f.㎝ or above
Terminal material	PBT, UL94V-0
Weight	186g

(2) Wiring of SLT-T40P and XGB main unit

Wiring of XGB main unit through SLP-T40P and SLT-CT101-XBM is as follows

At this time, relationship of XGB I/O signal and Smart link board terminal number is as follows.
The following figure describes signal allocation when SLT-CT101-XBM is used as connection cable.
When the user makes the cable, make sure that wring is done as figure below.

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

Signal name

P001	P003	P005	P007	COM0	P009	P00B	P00D	P00F	COM1	P021	P023	P025	P027	12/24V	P029	P02B	P02D	P02F	COM
P000	P002	P004	P006	COM0	P008	P00A	P00C	P00E	COM1	P020	P022	P024	P026	12/24V	P028	P02A	P02C	P02E	COM

Input (P000–COM1) Output (P020–COM)

Chapter 2 General Specification

2.1 General Specification

General specification is as follows.

<table>
<tr><th>No.</th><th>Item</th><th colspan="4">Specifications</th><th>Related standards</th></tr>
<tr><td>1</td><td>Operating 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>Operating humidity</td><td colspan="4">5 ~ 95%RH, no condensation</td><td></td></tr>
<tr><td>4</td><td>Storage humidity</td><td colspan="4">5 ~ 95%RH, no condensation</td><td></td></tr>
<tr><td rowspan="8">5</td><td rowspan="8">Vibration immunity</td><td colspan="3">If intermittent vibration exists</td><td>-</td><td></td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Times</td><td rowspan="7">IEC61131-2</td></tr>
<tr><td>10 ≤ f < 57Hz</td><td>–</td><td>3.5mm</td><td rowspan="6">10 times to X, Y and Z directions, each</td></tr>
<tr><td>57 ≤ f ≤ 150Hz</td><td>9.8m/s^2</td><td>–</td></tr>
<tr><td colspan="3">If continuous vibration exists</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td></tr>
<tr><td>10 ≤ f < 57Hz</td><td>–</td><td>1.75mm</td></tr>
<tr><td>57 ≤ f ≤ 150Hz</td><td>4.9m/s^2</td><td>–</td></tr>
<tr><td>6</td><td>Shocks</td><td colspan="4">• Max. impact acceleration : 147 m/s^2
• Time allowed : 11ms
• Pulse waveform : half sine wave (3 times to X, Y and Z directions, each)</td><td>IEC61131-2</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Noise immunity</td><td>Rectangular impulse noise</td><td colspan="3">AC: ±1,500 V
DC: ± 900 V</td><td>Test specifications of LSIS</td></tr>
<tr><td>Electrostatic discharge</td><td colspan="3">Voltage : 4kV (contact discharge)</td><td>IEC61131-2
IEC61000-4-2</td></tr>
<tr><td>Radiating electronic field noise</td><td colspan="3">80 ~ 1,000 MHz, 10V/m</td><td>IEC61131-2,
IEC61000-4-3</td></tr>
<tr><td rowspan="2">Fast transient / Burst noise</td><td>Type</td><td>Power module</td><td>Digital/Analogue Input/Output, Communication interface</td><td rowspan="2">IEC61131-2
IEC61000-4-4</td></tr>
<tr><td>Voltage</td><td>2kV</td><td>1kV</td></tr>
<tr><td>8</td><td>Environment</td><td colspan="4">Free of corrosive gas and dust</td><td></td></tr>
<tr><td>9</td><td>Altitude</td><td colspan="4">Lower than 2,000m</td><td></td></tr>
<tr><td>10</td><td>Pollution degree</td><td colspan="4">2 and lower</td><td></td></tr>
<tr><td>11</td><td>Cooling method</td><td colspan="4">Natural air cooling type</td><td></td></tr>
</table>

Note

1) **IEC(International Electro technical Commission)**
: International private group facilitating international cooperation of electric/electronic standardization, issuing international standards and operating the compliance evaluation systems.

2) **Pollution degree**
: As an index representing the pollution degree of an environment to determine the insulation of a device, pollution degree 2 generally means the status generating non-conductive contamination. However, it also contains the status generating temporarily conduction due to condensation.

2.2 Power Specification

Power specification of XGB series main unit is as follows.

2.2.1 Modular type(XBM-DN□□S) power specification

Item		Specification
Input	Rated input voltage	DC24V
	Input voltage range	DC20.4~28.8V(-15%, +20%)
	Inrush current	70A Peak or below
	Input current	Max. 1A (Typ. 550 ㎃)
	Efficiency	60% or above
	Allowed temporary cutoff	1 ㎳ or below
Output	Output voltage	DC5V (±2%)
	Output current	Max 1.5 A
Voltage status display		When power is normal, PWR LED On
Cable specification		0.75 ~ 2 ㎟

2.2.2 Compact standard type (XB(E)C-DR/DN/DP□□S(U)) power specification

Item			Specification		
			XB(E)C-DR(N)(P)20S(U) /DR(N)(P)30S(U)	XB(E)C-DR/DN/DP40SU	XB(E)C-DR/DN/DP60SU
Input	Rated input voltage		AC 100 ~ 240 V		
	Input voltage range		AC85~264V(-15%, +10%)		
	Inrush current		50A Peak or below		
	Input current		0.5A or below (220V), 1A or below (110V)		
	Efficiency		65% or above		
	Allowed temporary cutoff		10 ㎳ or below		
Output	Output voltage	DC5V	1.5A	2A	2.5A
		DC24V	0.3A	0.3A	0.5A
	Output voltage ripple	DC5V	DC 4.9 ~ 5.1V (±2%)	DC 4.9 ~ 5.15V (-2%, +3%)	
		DC24V	DC21.6~26.4 V(±10%)		
Voltage status display			When power is normal, PWR LED On		
Cable specification			0.75 ~ 2 mm^2		

* For protection of power supply, use power supplier which has maximum 4A fuse.

2.2.3 Compact high-end type (XB(E)C-DR/DN/DP□□H) power specification

Item			Specification			
			XBC- /DR32H /DN32H	XEC- DR32H /DN32H /DP32H	XBC- DR64H /DN64H	XEC- DR64H /DN64H /DP64H
Input	Rated input voltage		AC 100 ~ 240 V			
	Input voltage range		AC85~264V(-15%, +10%)			
	Inrush current		50A Peak or less			
	Input current		0.5A or less (220V), 1A or less (110V)			
	Efficiency		65% or above			
	Allowed temporary cutoff		10 ㎳ or less (Checking is necessary)			
Output	Rated output	DC5V	2A		3A	
		DC24V	0.4A		0.6A	
	Output voltage ripple	DC5V	DC 4.9 ~ 5.15V (-2%, +3%)			
		DC24V	DC21.6~26.4 V(±10%)			
Voltage status display			In case output voltage is normal, LED On			
Cable specification			0.75 ~ 2 mm^2 (Checking is necessary)			

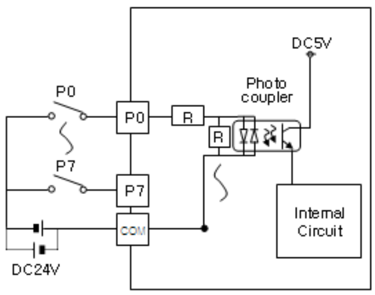
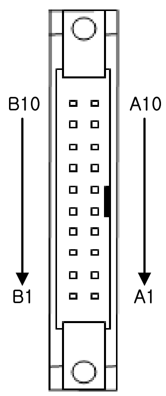
* For protection of power supply, use power supplier which has maximum 4A fuse.

2.3 I/O Specification

It describes I/O specification when P0000~P000F is used for built-in positioning. For using P0000~P000F as general I/O, refer to XGB user manual for hardware

2.3.1 Input Specification

(1) Modular type input contact point specification

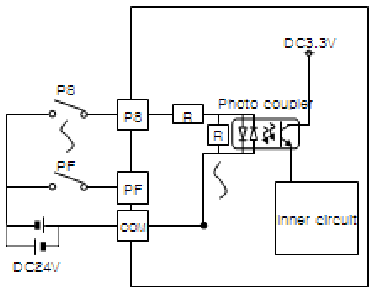
Contact point no.						
Contact point no.	X axis	P0000	P0001	P0004	P0005	Ref.
	Y axis	P0002	P0003	P0006	P0007	
Signal name		External lower limit	External upper limit	DOG	HOME	
Rated input voltage		DC24V (DC20.4~28.8V (-15/20%, ripple rate 5% or less))				
Rated input current		about 7 ㎃/24V		About 4 ㎃/24V		
Insulation method		Photo coupler insulation				
Input impedance		About 3.3 ㏀		About 5.6 ㏀		
On voltage/current		DC 19V or above/5.7 ㎃ or above		DC 19V or above /3.4 ㎃ or above		
Off voltage/current		DC 6V or less/1.8 ㎃ or less		DC 6V or less/1.1 ㎃ or less		
Response time		0.5 ㎳ or less (When used for positioning)				
Min. input width		100 ㎲ or above				
Circuit configuration and connector array				(see pin table below)		

Pin	Contact point	Pin	Contact point
B10	P00	A10	P08
B09	P01	A09	P09
B08	P02	A08	P0A
B07	P03	A07	P0B
B06	P04	A06	P0C
B05	P05	A05	P0D
B04	P06	A04	P0E
B03	P07	A03	P0F
B02	COM	A02	COM
B01		A01	

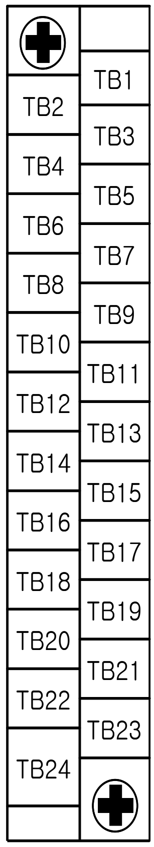
(2) Compact standard type input contact point specification

Contact point no.	X axis	P0008 %IX0.0.8	P0009 %IX0.0.9	P000C %IX0.0.12	P000D %IX0.0.13	Ref.
	Y axis	P000A %IX0.0.10	P000B %IX0.0.11	P000E %IX0.0.14	P000F %IX0.0.15	
Signal name		External lower limit	External upper limit	DOG	HOME	
Rated input voltage		DC24V (DC20.4~28.8V (-15/20%, ripple rate 5% or less))				
Rated input current		About 4 ㎃/24V				
Insulation method		Photo coupler insulation				
Input impedance		About 5.6 ㏀				
On voltage/current		DC 19V or above /3.4 ㎃ or above				
Off voltage/current		DC 6V or less/1.1 ㎃ or less				
Response time		0.5 ㎳ or less (when used for input for positioning)				
Min. input width		200 ㎲ or above				

Circuit configuration and terminal array



No.	Contact	No.	Contact
		TB1	RX
TB2	485+	TB3	TX
TB4	485-	TB5	SG
TB6	P00 IX0.0.0	TB7	P01 IX0.0.1
TB8	P02 IX0.0.2	TB9	P03 IX0.0.3
TB10	P04 IX0.0.4	TB11	P05 IX0.0.5
TB12	P06 IX0.0.6	TB13	P07 IX0.0.7
TB14	P08 IX0.0.8	TB15	P09 IX0.0.9
TB16	P0A IX0.0.10	TB17	P0B IX0.0.11
TB18	P0C IX0.0.12	TB19	P0D IX0.0.13
TB20	P0E IX0.0.14	TB21	P0F IX0.0.15
TB22	P10 IX0.0.16	TB23	P11 IX0.0.17
TB24	COM		

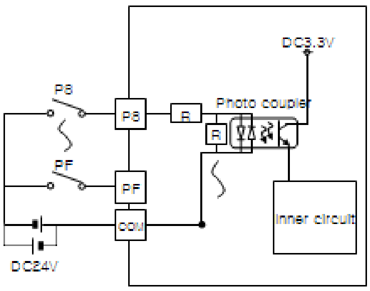


For XBC-DN20S(U), there is no actual input point P0000C ~ P0000F. If you want to use them, turn on by user program.

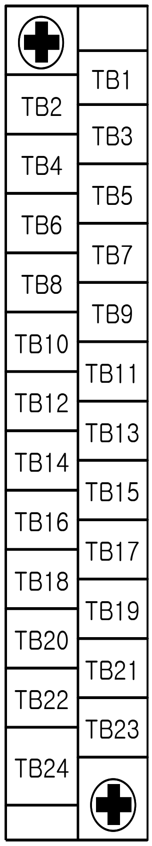
(3) Compact high end type input contact point specification

Contact point no.					Ref.
X axis	P0008 %IX0.0.8	P0009 %IX0.0.9	P000C %IX0.0.12	P000D %IX0.0.13	
Y axis	P000A %IX0.0.10	P000B %IX0.0.11	P000E %IX0.0.14	P000F %IX0.0.15	
Signal name	External lower limit	External upper limit	DOG	HOME	
Rated input voltage	DC24V (DC20.4~28.8V (-15/20%, ripple rate 5% or less))				
Rated input current	About 4 ㎃/24V				
Insulation method	Photo coupler insulation				
Input impedance	About 5.6 ㏀				
On voltage/current	DC 19V or above /3.4 ㎃ or above				
Off voltage/current	DC 6V or less/1.1 ㎃ or less				
Response time	0.5 ㎳ or less (when used for input for positioning)				
Min. input width	200 ㎲ or above				

Circuit configuration and terminal array

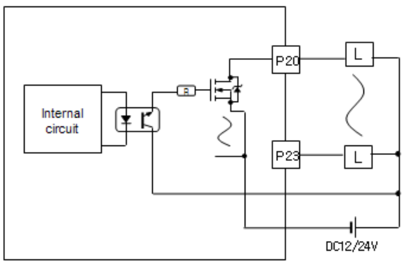
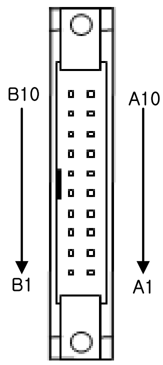


No.	Contact	No.	Contact
		TB1	RX
TB2	485+	TB3	TX
TB4	485-	TB5	SG
TB6	P00 IX0.0.0	TB7	P01 IX0.0.1
TB8	P02 IX0.0.2	TB9	P03 IX0.0.3
TB10	P04 IX0.0.4	TB11	P05 IX0.0.5
TB12	P06 IX0.0.6	TB13	P07 IX0.0.7
TB14	P08 IX0.0.8	TB15	P09 IX0.0.9
TB16	P0A IX0.0.10	TB17	P0B IX0.0.11
TB18	P0C IX0.0.12	TB19	P0D IX0.0.13
TB20	P0E IX0.0.14	TB21	P0F IX0.0.15
TB22	**COM**	TB23	24G
TB24	24V		



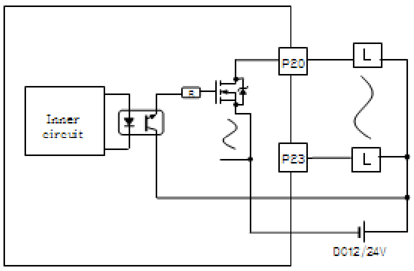
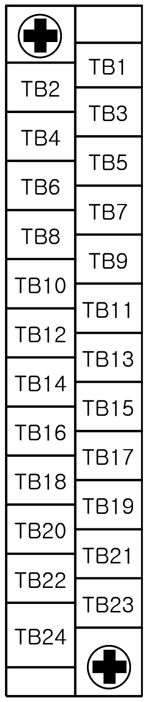
2.3.2 Output specification

(1) Modular type output contact point specification

Contact no.				Ref.
Contact no.	X axis	P0020	P0022	Ref.
	Y axis	P0021	P0023	
Signal name		Pulse string output	Direction output	
Rated load voltage		DC5~24V (DC4.75~26.4V)		
Max. load current		0.1A/1 point or below		
Insulation method		Photo-coupler insulation		
Inrush current		1A/10 ㎳ or below		
Voltage drop when On		DC 0.3V or below		
Leakage current when Off		0.1 ㎃ or below		
Response time		0.1 ㎳ or below (Rated load, resistor load)		
Circuit configuration and connector array (standard type)			(pin table below)	

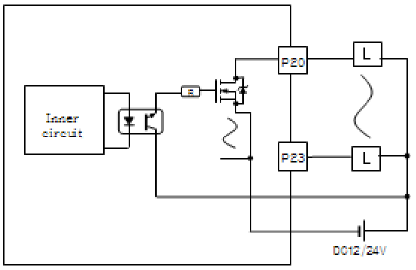
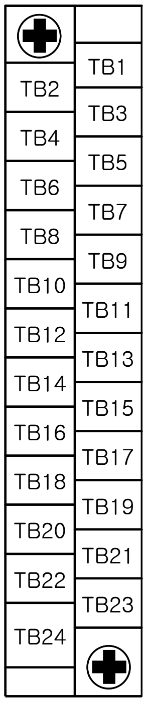
No.	Contact	No.	Contact
B10	P20	A10	P28
B09	P21	A09	P29
B08	P22	A08	P2A
B07	P23	A07	P2B
B06	P24	A06	P2C
B05	P25	A05	P2D
B04	P26	A04	P2E
B03	P27	A03	P2F
B02	12/24V	A02	COM
B01	12/24V	A01	COM

(2) Compact standard type output contact point specification

Contact no.				Ref.
Contact no.	X axis	P00040 %QX0.0.0	P00042 %QX0.0.2	Ref.
	Y axis	P00041 %QX0.0.1	P00043 %QX0.0.3	
Signal name		Pulse string output	Direction output	
Rated load voltage		DC5~24V (DC4.75~26.4V)		
Maximum load current		0.1A/1or less		
Insulation method		Photo coupler insulation		
Inrush current		1A/10 ㎳ or less		
Voltage drop when On		DC 0.3V or less		
Leakage current when Off		0.1 ㎃ or less		
Response time		0.1 ㎳ or less (rated load, resistive load)		
Circuit configuration and terminal array				

No.	Contact	No.	Contact
		TB1	AC100 ~240V
TB2	PE	TB3	
TB4	COM0	TB5	P40 QX0.0.0
TB6	COM 1	TB7	P41 QX0.0.1
TB8	COM 2	TB9	P42 QX0.0.2
TB10	P43 QX0.0.3	TB11	P
TB12	COM 3	TB13	P44 QX0.0.4
TB14	P45 QX0.0.5	TB15	P46 QX0.0.6
TB16	P47 QX0.0.7	TB17	NC
TB18	COM 4	TB19	P48 QX0.0.8
TB20	P49 QX0.0.9	TB21	P4A QX0.0.10
TB22	P4B QX0.0.11	TB23	24V
TB24	24G		

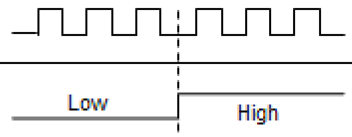
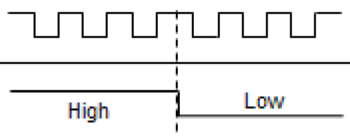
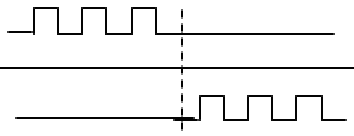
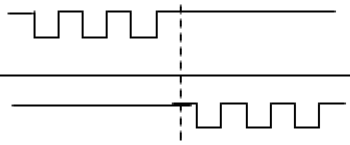
(3) Compact high-end type output contact point specification

Contact no.				Ref.
	X axis	P00020 %QX0.0.0	P00022 %QX0.0.2	
	Y axis	P00021 %QX0.0.1	P00023 %QX0.0.3	
Signal name		Pulse string output / CW output	Direction output / CCW output	
Rated load voltage		DC5~24V (DC4.75~26.4V)		
Maximum load current		0.1A/1or less		
Insulation method		Photo coupler insulation		
Inrush current		1A/10 ㎳ or less		
Voltage drop when On		DC 0.3V or less		
Leakage current when Off		0.1 ㎃ or less		
Response time		0.1 ㎳ or les (rated load, resistive load)		
Circuit configuration and terminal array			(see terminal table below)	

No.	Contact	No.	Contact
		TB1	AC100 ~240V
TB2	PE	TB3	AC100 ~240V
TB4	P	TB5	P20 QX0.0.0
TB6	P21 QX0.0.1	TB7	P22 QX0.0.2
TB8	P23 QX0.0.3	TB9	COM0
TB10	P24 QX0.0.4	TB11	P25 QX0.0.5
TB12	P26 QX0.0.6	TB13	P27 QX0.0.7
TB14	COM1	TB15	P28 QX0.0.8
TB16	P29 QX0.0.9	TB17	P2A QX0.0.10
TB18	P2B QX0.0.11	TB19	COM2
TB20	P2C QX0.0.12	TB21	P2D QX0.0.13
TB22	P2E QX0.0.14	TB23	P2F QX0.0.15
TB24	COM3		

2.3.3 Output pulse level

Output pulse of XGB built-in positioning consists of Pulse + Direction or CW/CCW like figure below.
At this time, output level of Low Active and High Active can be specified by positioning parameter and K area flag dedicated for positioning (X axis: K4871, %KX7793, Y axis: K5271, %KX8433).

Pulse output type	Output signal	Output signal level				Reference
		High Active mode		Low Active mode		
		Forward	Reverse	Forward	Reverse	
Pulse + direction mode	Pulse					Supported at S, H type
	Direction					
CW/CCW mode	CW					Supported at H type
	CCW					

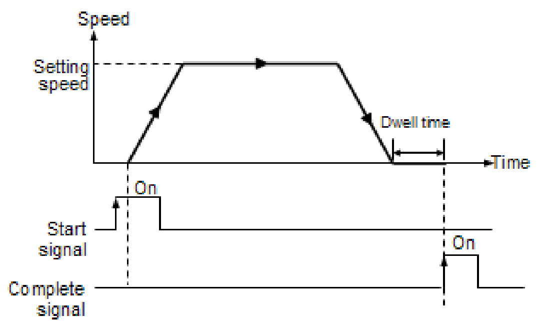
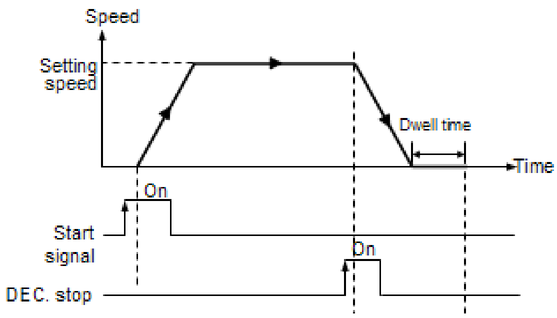
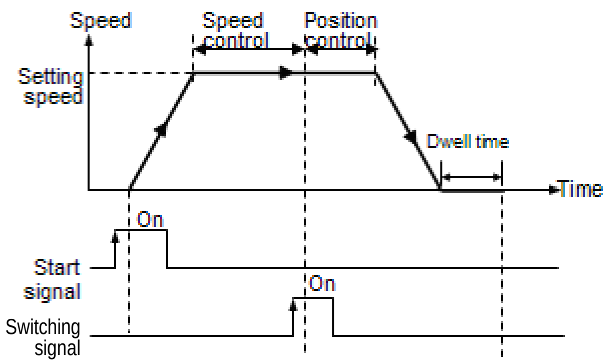
Chapter 3 Before Positioning

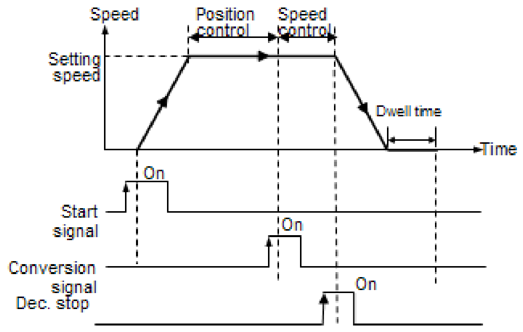
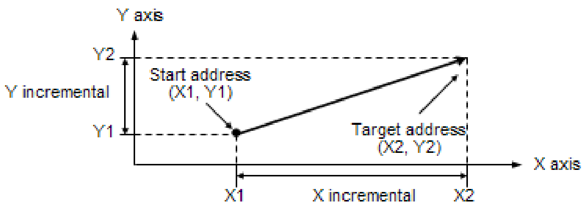
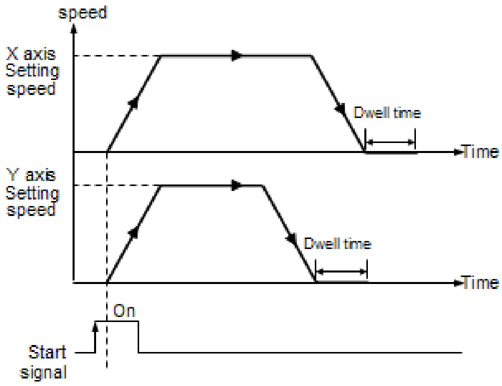
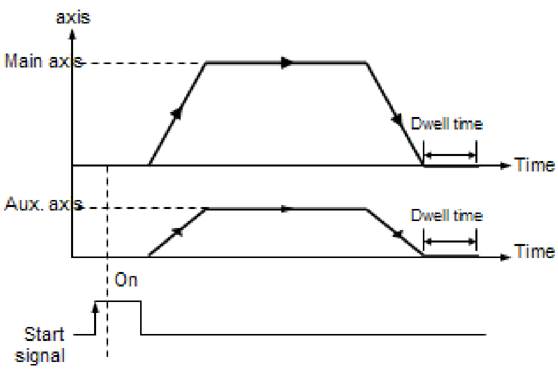
It describes the function of position control, operation parameter setting, operation data setting, K area for positioning, servo driver setting and programming.

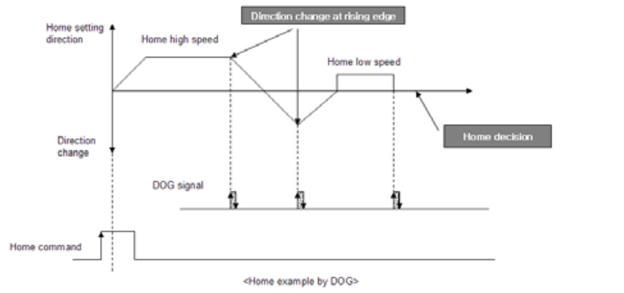
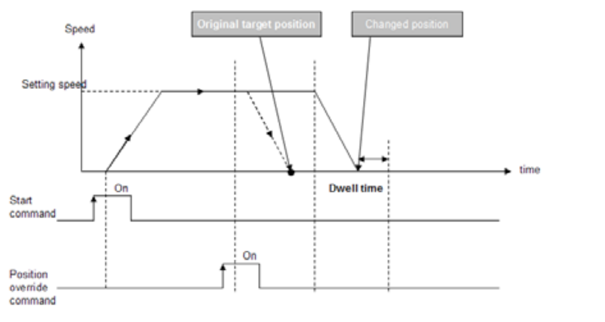
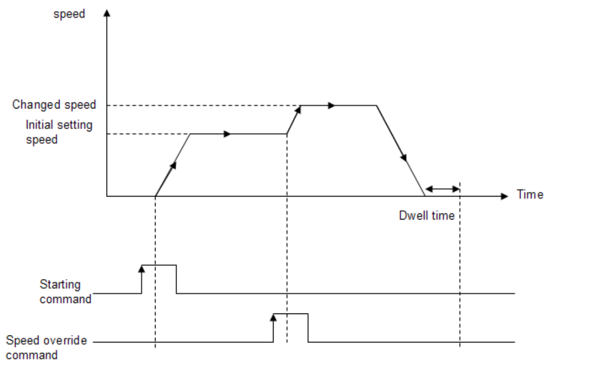
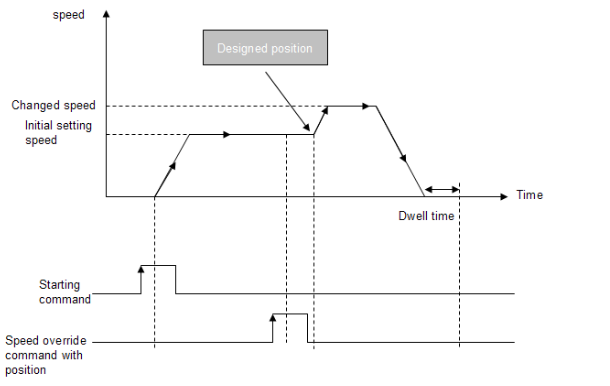
3.1 Positioning Function

3.1.1 Positioning function list

Positioning function of XGB built-in positioning is as follows.
For more detail, refer to ch.5.2.

Positioning function	Operation description		Instruction	Ref.
Position control	Operation pattern		DST IST APM_DST APM_IST	Ch.5.2.3 Ch.5.2.4 Ch.5.3.4 Ch.5.3.5
	Operation	If the rising edge of start command is detected, it moves with designated speed to designated position and after dwell time, complete signal is on during one scan.		
Speed control	Operation pattern		DST IST APM_DST APM_IST	Ch.5.2.3 Ch.5.2.4 Ch.5.3.4 Ch.5.3.5
	Operation	If the rising edge of start command is detected, it moves with designated speed and stops after deceleration by stop command. At this time, complete signal will not be not on.		
speed/position switching control	Operation pattern		VTP APM_VTP	Ch.5.2.7 Ch.5.3.8
	Operation	Speed control is executed by start command and it is switched to position control by switching signal and it moves to designated position.		

Positioning function		Operation description	Instruction	Ref.
Position/speed switching control	Operation pattern		PTV APM_PTV	Ch.5.2.8 Ch.5.3.9
	Operation	Position control is executed by start command and it is switched to speed control by switching signal and stops after deceleration by stop command .		
Linear interpolation control	Operation pattern		LIN APM_LIN	Ch.5.2.5 Ch.5.3.6
	Operation	2 axes linear interpolation control is executed by start command from current position to target position.		
Simultaneous start	Operation pattern		SST APM_SST	Ch.5.2.6 Ch.5.3.7
	Operation	X axis and Y axis starts simultaneously by start command. At this time, each operation data such as operation speed, target position is applied to each axis.		
Sync start	Operation pattern		SSP SSS APM_SSP APM_SSSB	Ch.5.2.10 Ch.5.2.11 Ch.5.3.11 Ch.5.3.12
	Operation	If sync start is executed by command, subsidiary axis is synchronized with main axis' position or speed. At this time, setting of subsidiary axis is ignored and operates according to the operating status of main axis		

Positioning function	Operation description		Instruction	Ref.
Home return	Operation pattern		ORG APM_ORG	Ch.5.2.1 Ch.5.3.2
	Operation	It goes to home direction and detects the mechanical origin At this time, home method can be specified by operation parameter.		
Position override	Operation pattern		POR APM_POR	Ch.5.2.12 Ch.5.3.13
	Operation	It changes the target position by position override command.		
Speed override	Operation pattern		SOR APM_SOR	Ch.5.2.13 CH.5.3.14
	Operation	It changes the speed by speed override command.		
Speed override with position	Operation pattern		PSO APM_PSO	Ch.5.2.14 Ch.5.3.15
	Operation	It changes the speed at the designated position by speed override with position command.		

3.1.2 Position control

Position control is to move the designated axis from start address (present position) up to target address (movement). There are two position control methods, absolute and incremental.

(1) Control by absolute coordinates (Absolute coordinates)

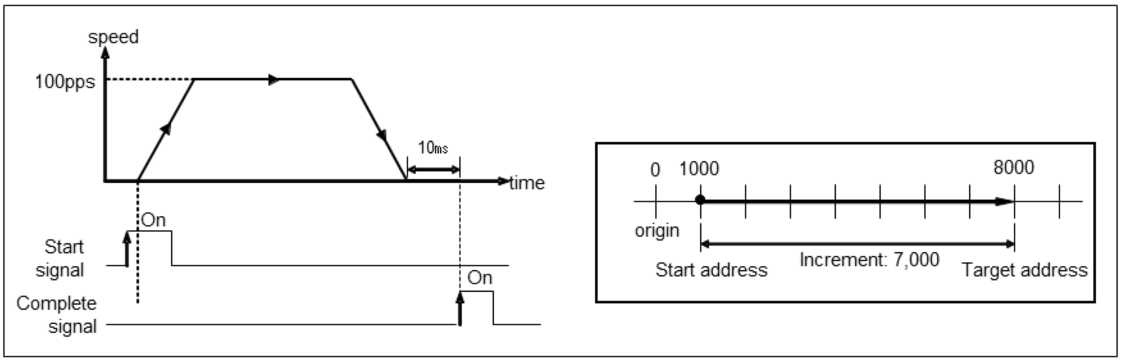
Object moves from start address to target address. Position control is performed, based on the address designated in Home Return (home address).
Direction is determined by start address and target address.
- Start address < target address: forward positioning
- Start address > target address: reverse positioning

(a) example
- It assumes that operation data is specified as shown table 3-1. (For how to set operation parameter, refer to the Ch.3.3)

Step no.	Coord.	Pattern	Control	Method	Rep step	Address [Pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [㎳]
1	**ABS**	END	**POS**	SIN	0	8,000	0	1	100	10

<Table 3-1 operation data example of absolute coordinates type>

- In table 3-1, since coordinates is ‘ABS’, control method is ‘POS’, step no. 1 is position control by absolute coordinates.
- It assumes that the current poison is 1000. Since address in step no.1 is 8000, object moves to 8000 as shown figure and increment is 8000-1000=7000. Object moves forward because target address is larger than start address.



<Figure 3-1 operation example of absolute coordinates type>

Remark

- Every position/speed control is available as long as the origin is determined preliminarily.
- If it is executed while origin is not determined, error code 234 occurs and it doesn’t move.
  - In case error occurs, refer to App.1.2 and remove the cause of error.
- Complete signal is on during one scan.

(2) Control by incremental coordinates

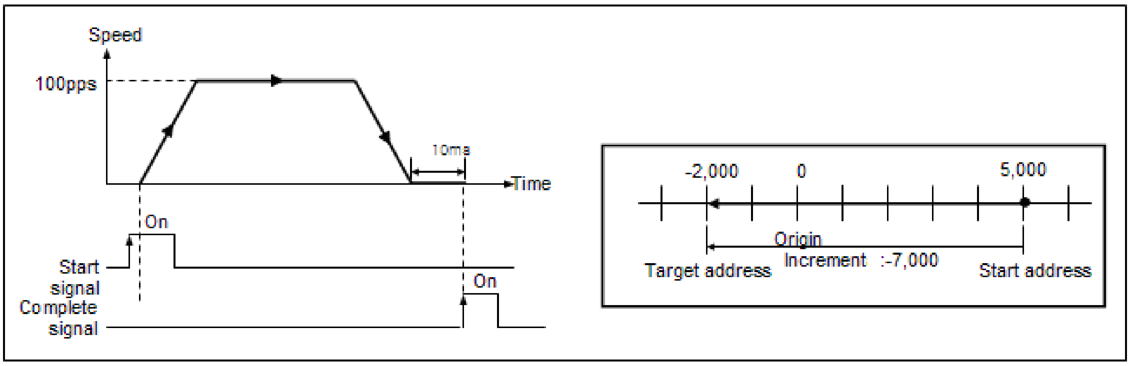
Object moves from current position as far as the address set in operation data. At this time, target address is based on start address. Direction is determined by sign (+,-).
• In case Address is positive number: forward positioning（Direction increasing address)
• In case Address is negative number: reverse positioning (Direction decreasing address)

(a) Example
- It assumes that operation data is specified as shown table 3-2. (For how to set operation parameter, refer to the Ch.3.3)

Step no.	Coord.	Pattern	Control	Method	Rep step	Address [Pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]
1	**INC**	END	**POS**	SIN	0	-7,000	0	1	100	10

<Table 3-2 operation data example of incremental coordinates type>

- In table 3-1, since coordinates is ‘INC’, control method is ‘POS’, step no. 1 is position control by incremental coordinates.
- It assumes that current position is 5000. Since object moves as long as -7000, target stop at -2000 (absolute coordinates) as shown figure 3-2. At this time, increment is -7000 pulse and direction is reverse.



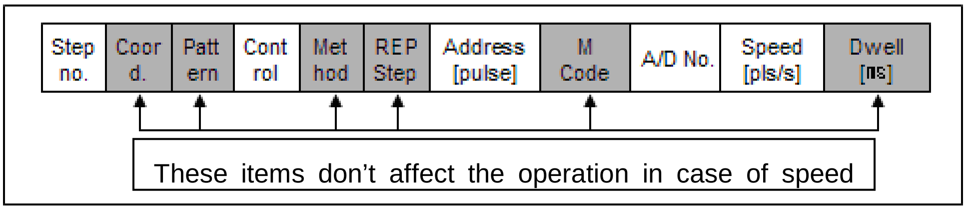
< Figure 3-2 operation example of incremental coordinates type>

3.1.3 Speed control

- Speed control means that object moves with steady speed (steady pulse string) until stop command.

- In case of speed control, direction is determined by sign of Address set in operation data.
  Forward : Address is positive number
  Reverse : Address is negative number
  In the speed control, direction is determined by sign of target address regardless of current position and target position.
  For example, current position is 100 and target position is 90, though target position is less than current position, since sign is positive, it moves forward.

- In case of speed control, some items as figure below doesn't affect the operation.



- If Control is specified as SPD, coordinates, pattern, method, M code, dwell time doesn't affect the operation.
- So in case of speed control, when object stops by STP command, it stops without dwell time and M code doesn't operate.

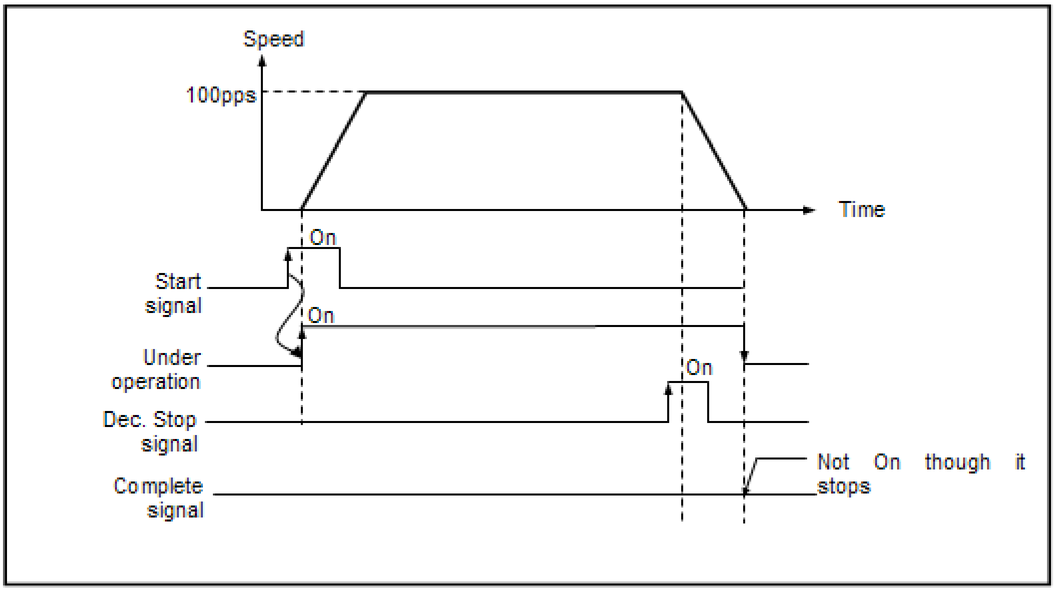
(1) Example

- It assumes that operation data is specified as shown table 3-3

Step no.	Coord.	Pattern	Control	Method	Rep step	Address [Pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]
1	INC	END	**SPD**	SIN	0	10	10	1	100	10

<Table 3-3 operation data example of speed control>

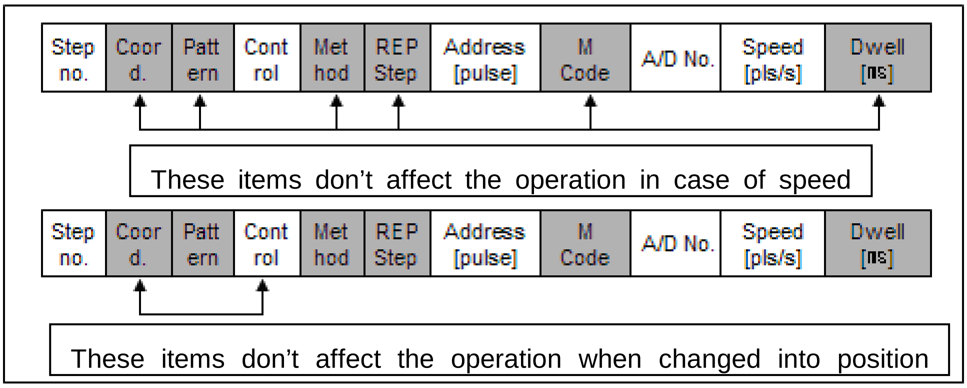
- In table 3-3, since Control is 'SPD', step no. 1 is operation data of speed control.
- Since Address is positive number and Speed is 100, target moves forward with 100 pls/s speed regardless of current position until stop command (DEC. stop or EMG stop).
- If object moves, flag (X axis: K4200, %KX6720, Y axis: K4300, %KX6880) is on. And if DEC. stop command is executed, it stops after deceleration without dwell time and flag turns off immediately.
- At this time, deceleration time conforms to that in operation data, not operand of instruction.



< Figure 3-3 Operation of speed control >

3.1.4 Speed/position switching control

- It change speed control to position control by switching command (VTP instruction).
- In case of speed/position switching control, items affecting the operation are different according to control method.



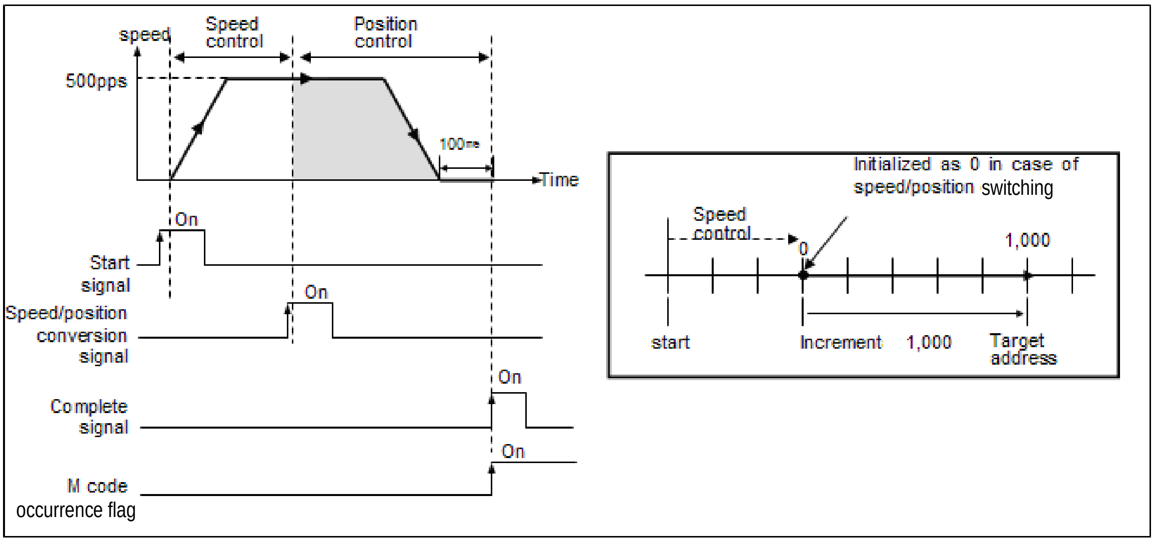
- First, object moves by speed control. If speed/position switching control is executed, target will move by position control.
- At this time, position control is executed by absolute coordinates with initializing the current position as 0. So coordinates item doesn't affect the operation.
- Since control method also changes by speed/position switching, control method in the operation data doesn't affect the operation.
- In case of speed/position switching, object keeps its previous direction.

(1) Example

- It assumes that operation data is specified as shown table 3-4.

Step no.	Coord.	Pattern	Control	Method	Rep step	Address [Pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]
1	INC	END	SPD	SIN	0	1000	11	1	500	100

<Table 3-4 operation data example of speed/position switching control>



< Figure 3-4 Operation of speed/position switching control >

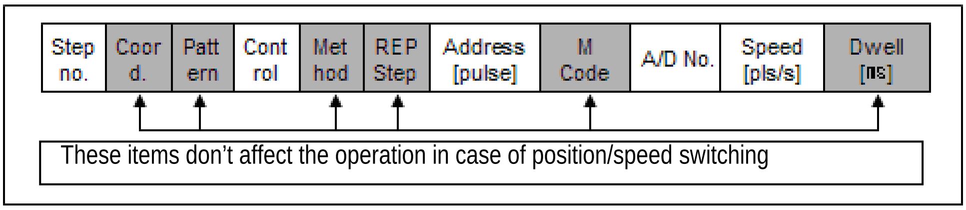
• If step no. 1 in table 3-4 starts, object moves forward by speed control because Control is SPD and Address is positive number.
• If speed/position switching command (VTP instruction) is executed during speed control, current position will be initialized as 0 and object moves by position control until 1000.
• If object reaches target position, complete flag and M code occurrence flag will be on after dwell time. At this time, M code number 11 is displayed as set in operation data.
• Positioning complete flag will be on during one scan and M code occurrence flag keeps on status, until it is turned off by off command.

Remark

• M code occurrence flag is turned off by MOF instruction.
• Using MOF instruction, M code occurrence flag and M code number will be clear simultaneously.
• Speed/position switching command is executed only when each axis is operating.
If it is executed during stop, it may cause error.
• If position/speed switching command is executed during operation by speed control, the command is ignored. But at this time, error is not occurred.

3.1.5 Position/speed switching control

• It change position control to speed control by switching command (VTP instruction).
• In case of position/speed switching control, items affecting the operation are different according to control method. In case position control, all items affect the operation but in case of speed, some items affect the operation as shown below.



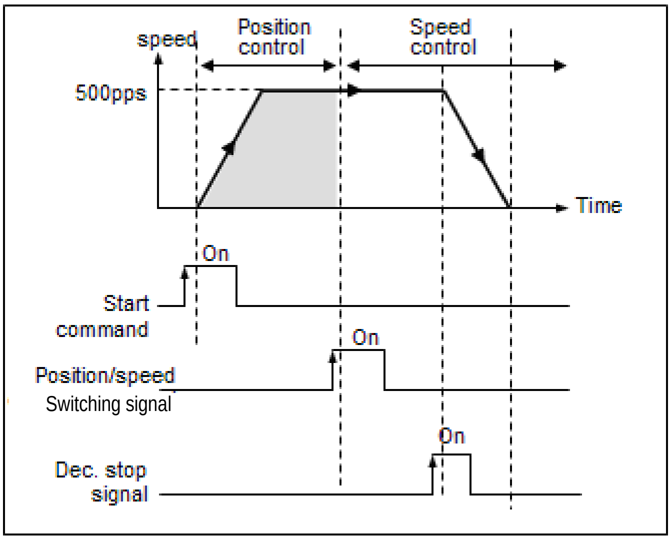
- First, object moves by position control. If position/speed switching control is executed, object will move by speed control. At this time, the current position is not initialized. Only control method changes into speed control and it continues operation
- When control method changes, some items in operation data doesn't affect the operation.

(1) Example
• It assumes that operation data is specified as shown table 3-5.

Step no.	Coord.	Pattern	Control	Method	Rep step	Address [Pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]
1	INC	END	POS	SIN	0	10000	12	1	500	100

< Table 3-5 operation data example of position/speed switching control >

• If step no. 1 in table 3-5 starts, object moves by position control according to operation data in table 3-5 because Control is POS.
• If position/speed switching command (VTP instruction) is executed during position control, object moves by speed control until stop command.
• If object stops by stop command, it will stop without dwell time and positioning complete flag will not be on.



<Figure 3-5 Operation of position/speed switching control>

Remark

- Position/speed switching command is executed only when each axis is operating.
  If it is executed during stop, it may cause error.
- If speed/position switching command is executed during operation by position control, the command is ignored and causes error. But at this time, positioning doesn't stop.

3.1.6 Linear interpolation control

- Object moves by linear interpolation control from start address to target address using two axes, X, Y. There are two method in linear interpolation control, absolute coordinates and incremental coordinates.

(1) Control by absolute coordinates

When linear interpolation control is executed, object moves based on the origin designated by Home return.
Direction is determined by start address and target address for each axis.

- start address < target address: Forward
- start address > target address: Reverse

(a) How to set operation data

In the linear interpolation control, since two axes operates simultaneously, it needs attention
The following is notice when setting the operation data.

1) Determining main axis
- For linear interpolation, first you have to determine the main axis. In the XGB built-in positioning, main axis is determined automatically. The one which has a large moving amount becomes main axis.

2) Determining control method
- In the linear interpolation operation, control methods of both axes should be specified as "position". If not, error will occur and it will not be executed.

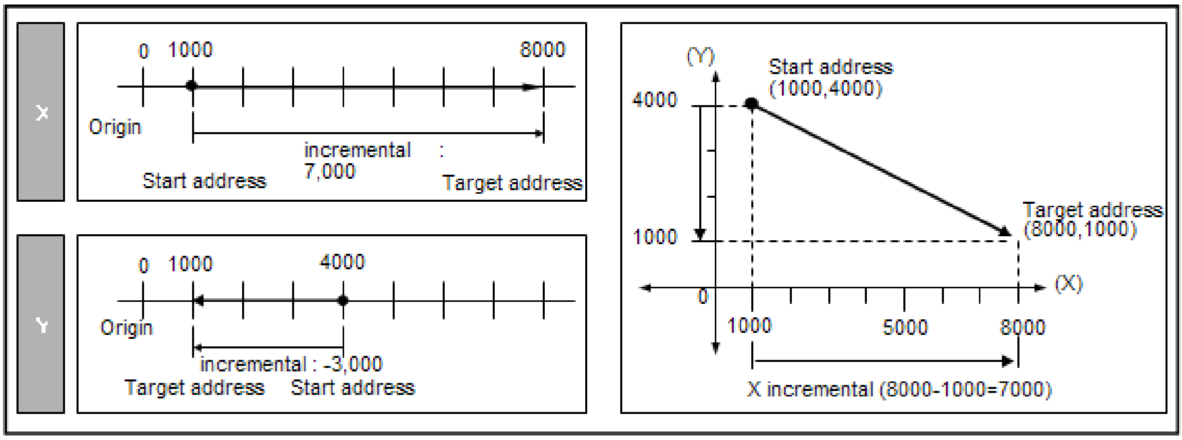
3) Setting of operation pattern
- In case of main axis, operation pattern should be specified as ‘END’ or ‘KEEP’. In case it is specified as ‘CONT’, it operates as ‘KEEP’.
- In case of subsidiary, pattern doesn’t affect the operation, it operates according to main axis pattern.

(b) Example

• It assumes that operation data is specified as shown table 3-6 and current position are X=1000 , Y=4000.

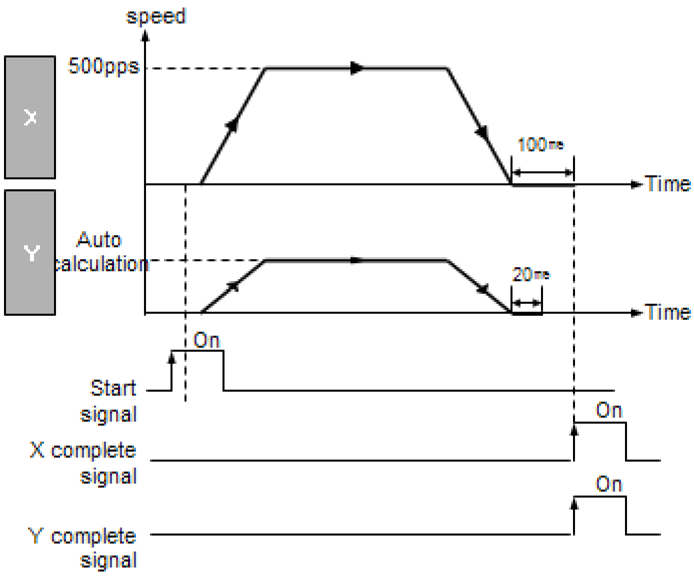
Step no.	Coord.	Pattern	Control	Method	Rep step	Address [Pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [㎳]	Step no.
X	1	ABS	END	POS	SIN	0	8000	0	0	500	100
Y	1	ABS	KEEP	POS	REP	3	1000	0	0	2000	20

<Table 3-6 operation data example of linear interpolation control by absolute coordinates>



< Figure 3-6 linear interpolation operation by absolute coordinates >

• If linear interpolation starts, main axis is determined automatically based on moving amount of X and Y axis. In table 3-6, since moving amount of X axis is larger than Y axis X, X axis becomes main axis.
• So operation pattern, speed, A/D number, dwell time of Y axis is ignored and it is specified automatically according to operation data of X axis.
• Figure 3-7 indicates operation of linear interpolation control.



< Figure 3-7 operation of linear interpolation control >

(2) Control by incremental coordinates

It executes the linear interpolation control based on current position by incremental coordinates. At this time, Address of operation data means how long object moves from current position. Direction is determined sign of Address.

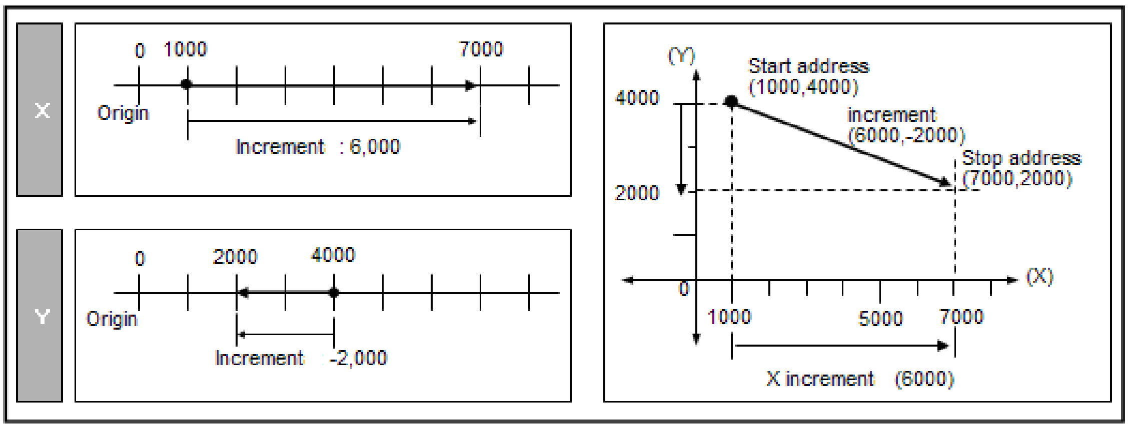
- In case Address is positive number: forward
- In case Address is negative number: backward

(a) Example

- It assumes that operation data is specified as shown table 3-7 and current position are X=1000 , Y=4000.

Step no.	Coord.	Pattern	Control	Method	Rep step	Address [Pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [ms]	Step no.
X	1	INC	END	POS	SIN	0	6000	0	0	500	100
Y	1	INC	KEEP	POS	REP	3	-2000	0	0	2000	20

< Table 3-7 operation data example of linear interpolation control by absolute coordinates >



< Figure 3-8 linear interpolation operation by absolute coordinates >

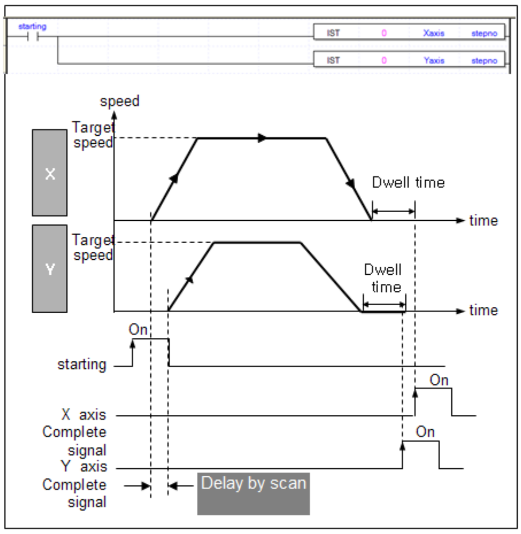
• If linear interpolation is executed, main axis is determined according to moving amount of X and Y axis. In table 3-7, since moving amount of X axis is larger than Y, X axis becomes main axis.
• So subsidiary Y axis operation pattern, operation speed, ACC/DEC time, dwell time do not affect the operation and recalculated according to operation data of main axis. For example, if you execute the linear interpolation control with operation data such as table 3-7, subsidiary Y axis starts as END, SINGLE operation and operates with automatically calculated ACC/DEC speed and operation speed, as for Dwell time after stop, 100ms, dwell time of main axis X is applied. not 20ms, setting value.

Remark

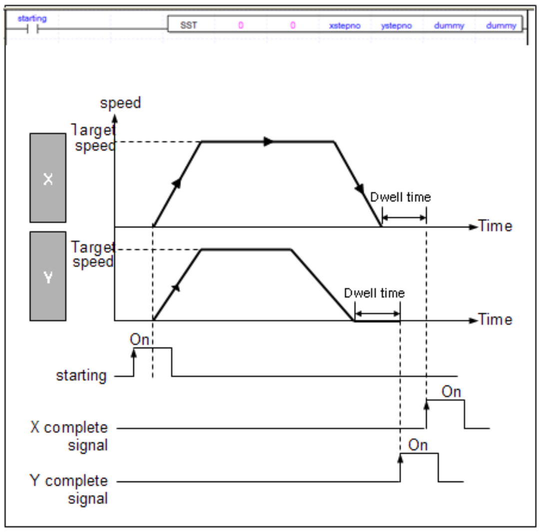
• A special attention should be paid that linear interpolation start operates on 2 axes simultaneously.
• Pattern of main axis can specified as 'END', 'KEEP'. If it is specified as 'CONT', object moves as it is 'KEEP'.
• Available commands during linear interpolation are DEC. STOP, EMG. STOP.
• During linear interpolation operation, position/speed switching control, speed override, position override, speed override with position, If those are executed during liner interpolation operation, it may cause error.
• Operation method, operation pattern, speed limit, dwell time is specified as that of main axis.
• Speed, acceleration/deceleration time, bias speed of subsidiary axis is calculated again automatically.
• Backlash compensation amount, SW upper/lower limit is specified as it is for each axis.

3.1.7 Simultaneous start control

• It starts each step for each axis simultaneously by simultaneous start control (SST instruction).
• If SST instruction is used, it can remove delay of start caused by scan time delay.



In case of starting each axis in the scan program



In case of using SST command

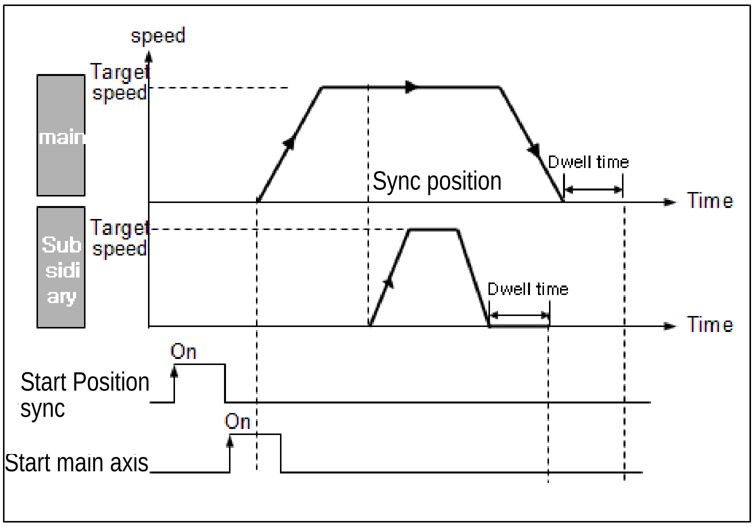
• SST instruction can be executed when two axes stop. If SST instruction is executed again after stop, in case of incremental coordinates, the current position is initialized as 0.

3.1.8 Sync control

•In sync control, position or speed of subsidiary axis is synchronized with that of main axis. There are two types in sync control, speed sync control and position sync control.

(1) Position sync control

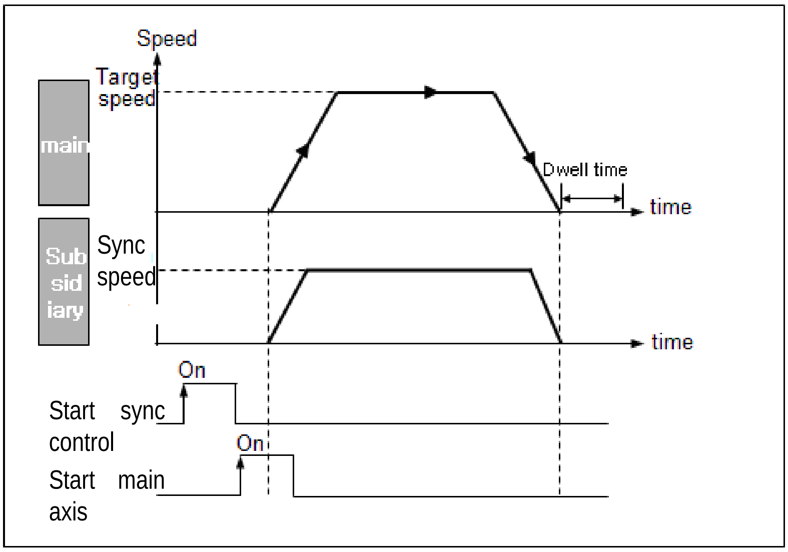
• Position sync control means starting the operation step of subsidiary at the time when position of main axis is same with position set in SSP instruction (Sync control)



• Position sync control can be executed when origin of both axes is determined. When executing the SSP instruction, if origin of main axis is not determined, error code 346 occurs and for subsidiary axis, error code 344.
• When using SST instruction, specify the main axis to be different with subsidiary axis. If not, error code 347 will occur.
• If synch control is executed, though pulse is not yielded until main axis goes to designated axis, flag indicating whether subsidiary axis moves or not, turns on (X axis: K4200, %KX6720, Y axis: K4300, %KX6880).
• After executing position sync control, if the user wants to cancel the execution of position sync control, execute the STP instruction (stop command).

(2) Speed sync control

• If main axis starts as figure below, subsidiary axis moves with speed of sync speed rate set in the SSS instruction (speed sync command).



- It can be executed when origin of subsidiary axis is not determined.
- Since subsidiary axis moves according to speed of main axis, whether main axis moves by speed control or position control doesn't matter. At this time, direction of subsidiary axis is same as that of main axis.
- When sync control is executed and main axis stops, though pulse is not outputted, flag indicating whether subsidiary axis moves or not, turns on (X axis: K4200, %KX6720, Y axis: K4300, %KX6880).
- In case of speed synch control, sync speed rate is 0.00% ~ 100.00%. If it is out of range, error code 356 occurs.
- After executing speed sync control, if the user wants to cancel the execution of speed sync control, execute the STP instruction (stop command).
- When executing speed sync control, if M code is on, error code 353 will occur.
- The user can set X axis, Y axis, channel 0~3 of High speed counter as main axis in the speed sync control. For more detail, refer to Ch.5.2.12.

3.1.9 Home return

- Home return is used to fine mechanical origin when starting machine. Home return is executed according to home parameter for each axis. In home parameter, items affecting homing are as follows. (For setting of each parameter, refer to Ch.3.2)

Type	Items	Description	-
Home parameter	Home Method	Setting home method	
	Home Direction	Start direction when homing	
	Home Address	Origin address when detecting origin	
	Home High/Low speed	High/Low speed when homing	
	Homing ACC/DEC Time	ACC/DEC time when homing	
	DWELL time	Time required to remove offset pulse of remaining bias counter immediately after positioning ends	

- When origin is determined by homing, though the user inputs homing signal and DOG signal, those are ignored.

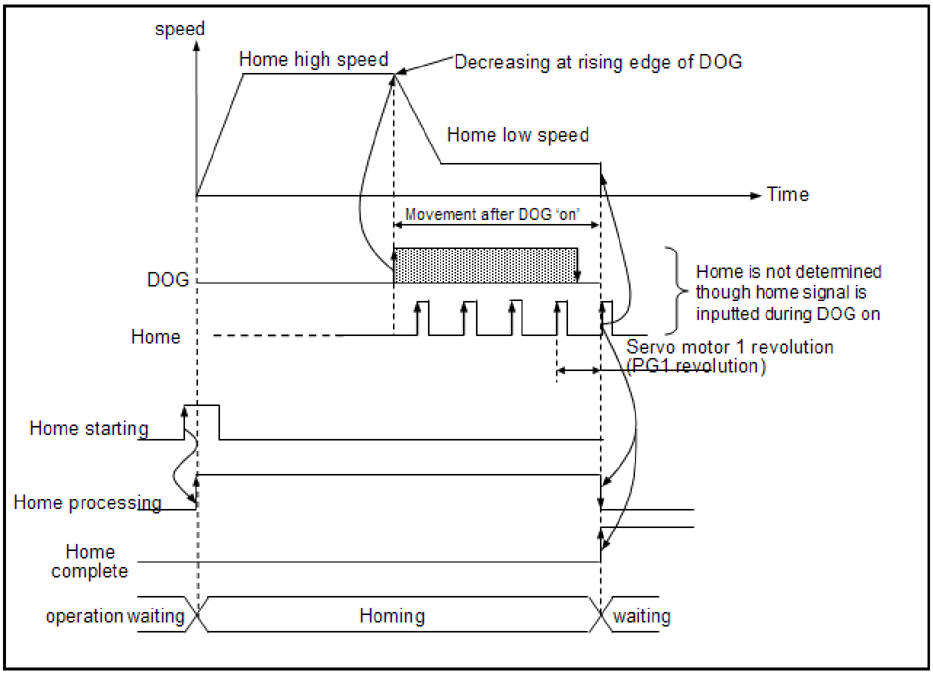
(1) Type of Home method

Generally, home method can be divided into one using DOG and another not using DOG. In the XGB built-in positioning, there are three methods using DOG.

Home method	Necessary input signal	Reference
Origin detection after DOG off (0: DOG/HOME(OFF))	DOG, Origin	Content of () is displayed in the Home Parameter of XG5000.
Origin detection after DEC. when DOG on (1: DOG/HOME(On))	DOG, Origin	
Origin detection by DOG (2: DOG)	DOG	

(2) Origin detection after DOG Off

The operations by Home Return instruction using DOG and origin signal are as follows.



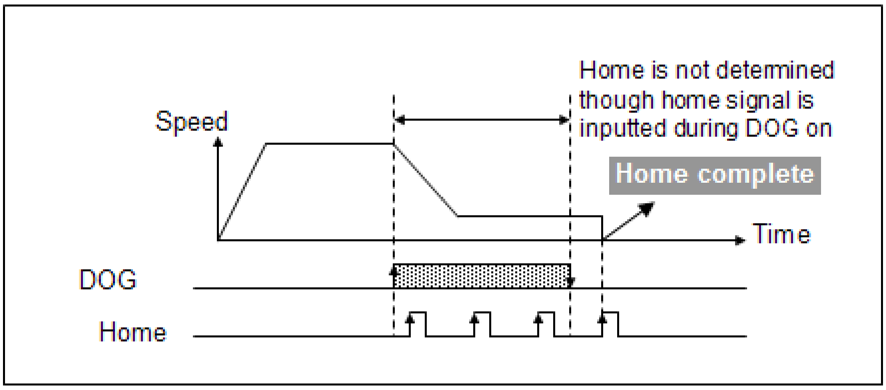
(a) If home return command (ORG instruction) is executed, it accelerates toward a preset home return direction and with Home high speed.

(b) During operating with Home Return High speed, if rising edge of DOG signal occurs, it operates with Home Return Low speed and monitors if there is falling edge of DOG signal. At this time, though Origin signal is inputted while DOG signal is On, Origin is not determined.

(c) If first origin signal is entered after DOG signal changes from “On” to “Off”, it stops.

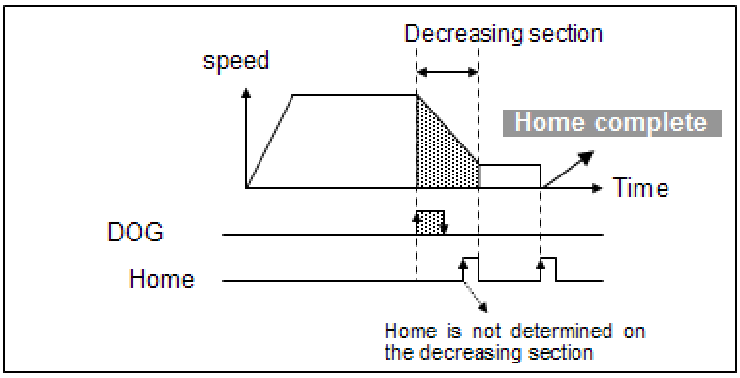
Remark

- While DOG signal is “On”, origin is not determined by origin signal. That is, origin may be determined as soon as origin signal is inputted after DOG signal changes from “On” to “Off”.

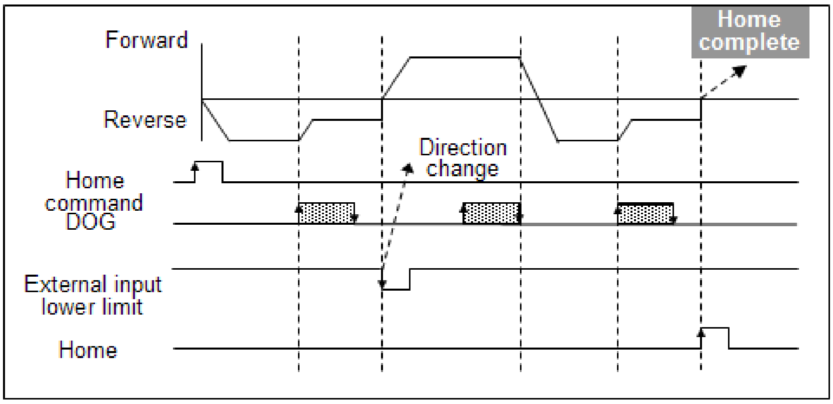


Remark

- In speed-decreasing section, origin is not determined. Though DOG changed from “On” to “Off” and Origin signal is inputted in speed-decreasing section, origin is not determined. Origin is determined at first Origin signal after speed-decreasing section
.



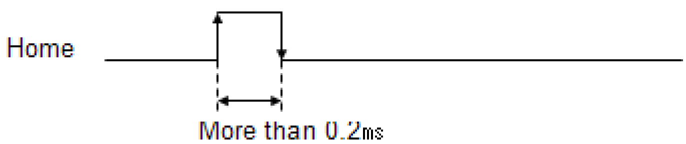
- It operates as follows if it meets an external lower limit while waiting for origin entry after DOG signal changes Off->On->Off. (The following figure is example when home direction is backward)



(1) If object starts home return backward by homing command and meets rising edge of DOG, it changes homing with slow speed and if it meets falling edge again , it waits to determine the origin at the first origin signal.
(2) At this status, if external low limit input signal (B contact point) is entered, target changes the direction and homing forward with high speed.
(3) At the moment when target meets rising edge of DOG again and falling edge, target changes the direction to backward and repeats step (1), if origin signal is entered, origin is determined.

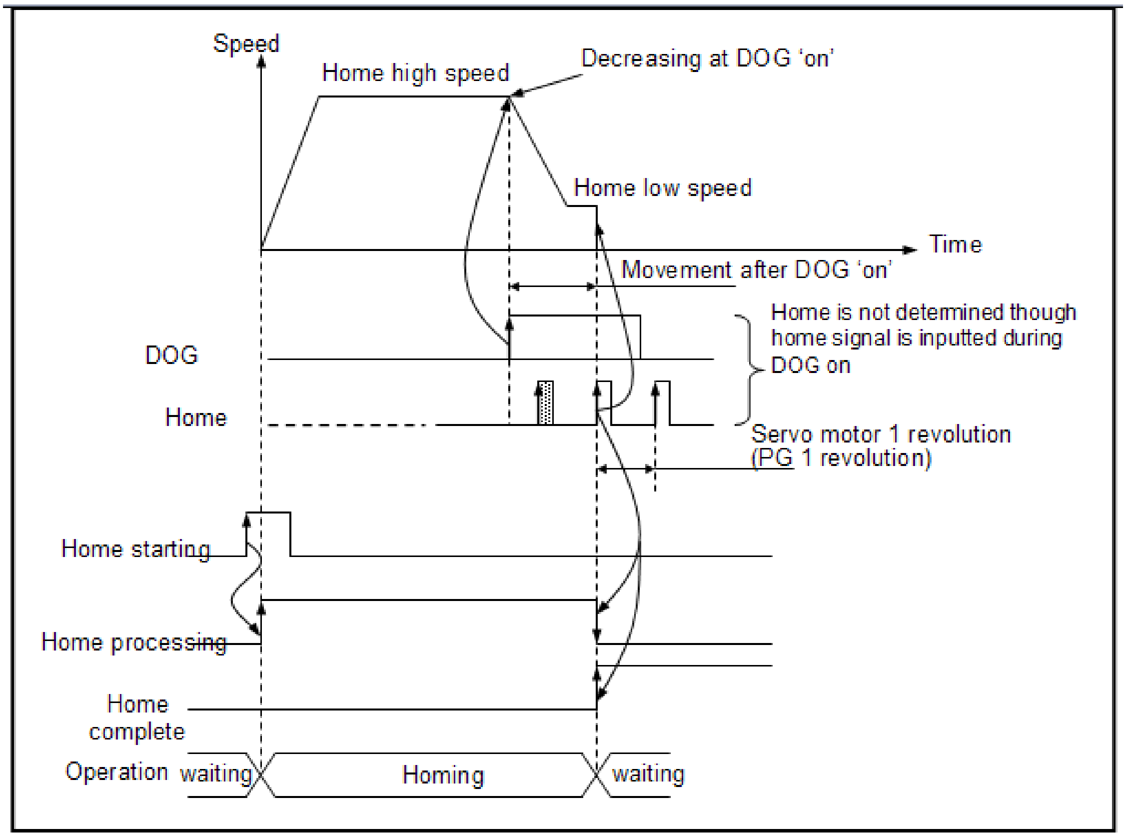
※ During homing, if external input upper or lower limit is entered, object changes direction promptly without deceleration section. When stepping motor is used, this may cause out of operation. So be careful.

- If ‘On’ time of origin input signal is very short, XGB may not recognize the input signal. So ‘On’ time of origin should be larger than 0.2ms.



(3) Origin detection after deceleration with DOG set “On”

Operations by home return instruction using DOG and origin signal are as follows.



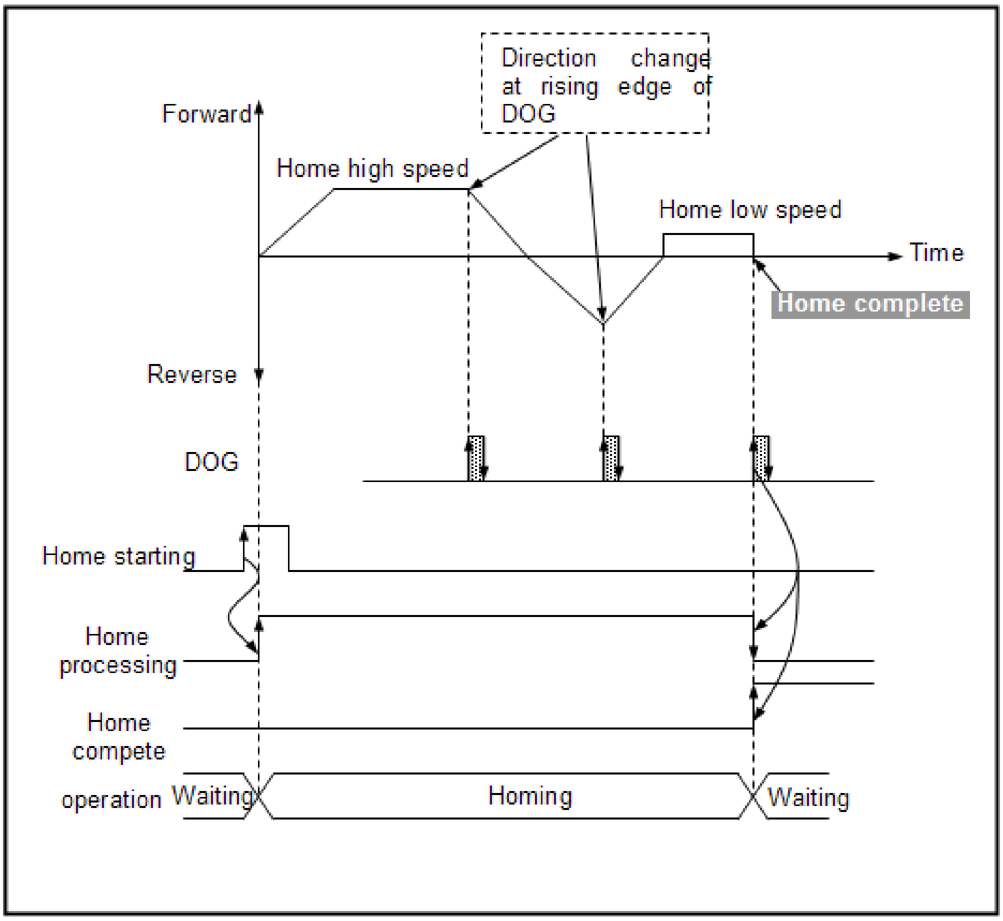
(a) If homing command(ORG instruction) is executed, it accelerates toward a set home direction and operates at home high speed.
(b) At the moment, if an external entry, DOG signal is entered, it decelerates and operates at home return low speed.
(c) Origin is determined and it stops if it meets an external entry, origin signal with DOG set “On” while it operates at home return low speed.

Remark

•Origin is determined if origin signal is entered with DOG set “On” as long as home return speed is operating at low speed from high speed via decelerating section with DOG signal set “On”. That is, when home return speed is decelerating, origin is not determined by origin signal.
• If it meets external upper/lower limit signal prior to origin after DOG signal is changed from “Off” to “On”, it works backward direction.

(4) Origin detection by DOG

It is used when determining origin by using the only DOG.



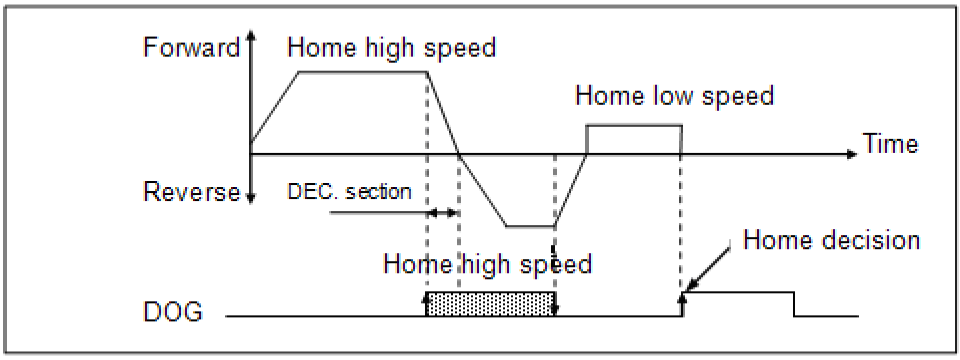
(a) If homing command (ORG instruction) is executed, it accelerates to home direction set in Home Parameter and it homes with high speed.
(The above figure is example when homing direction is forward)

(b) While target is homing with high speed, if rising edge of DOG occurs, target speed decreases and change its direction.

(c) When it accelerates after changing direction, if rising edge of DOG occurs, it homes with low speed.

(d) In the homing status with low speed, rising edge occurs of DOG third time, it stops and determines the origin.

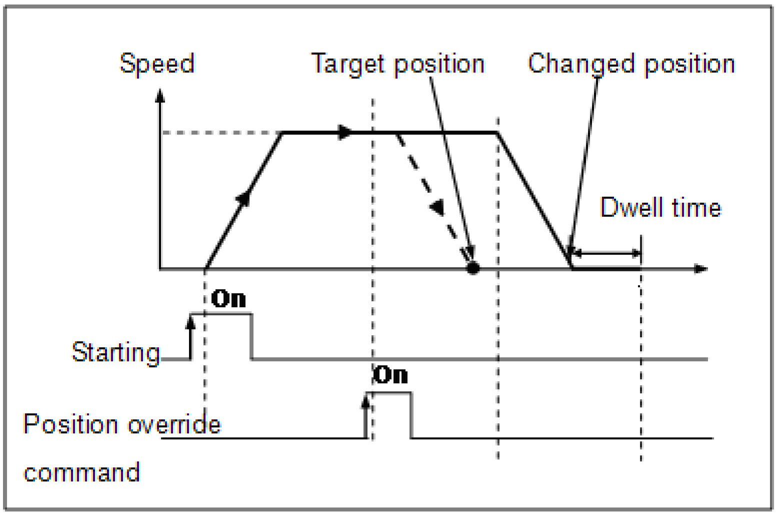
(e) When ‘On’ time of DOG signal is larger decreasing time, it changes the direction at the falling edge of DOG and moves with low speed and stops at the rising edge of DOG and determines the origin.



3.1.10 Position and speed override

- Override means changing target address or speed without stop during positioning.
  The XGB positioning provides three type of override, position override, speed override, speed override with position.

(1) Position override
If changing a target position during positioning operation with positioning data, it may be changed by using position override command (POR instruction).



• When using position override, be careful the followings.

(a) That is, if passing a position to change during operation, it decelerates, stops and keeps positioning operation by the subsequent operation pattern; if not passing a position, it starts positioning operation as taking a Incremental position as much as override set in the start point of the step of position override instruction.

(Ex.) It assumes that current location is 20,000 and operation data is specified as table below.
(It assumes that position override amount is 15,000)

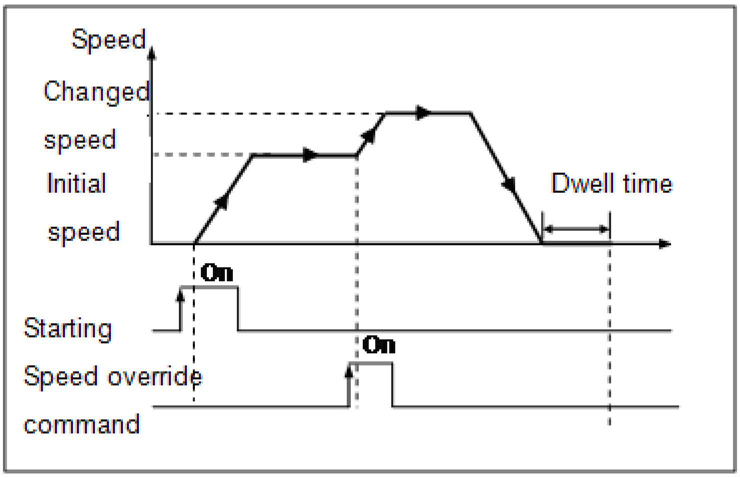
Step no.	Coord.	Pattern	Control	Method	Rep step	Address [Pulse]	M Code	A/D No.	Speed [pls/s]	Dwell [㎳]
3	ABS	END	POS	SIN	0	40,000	0	0	500	100

1) If operation step 3 starts, target moves to 40,000 by absolute coordinates forward.
2) If override is executed at the time current position is 30,000 during operation, since it doesn't pass 15,000 based on operation start point 20,000 target position changes 35000 (20,000+15,000).
3) If override is executed at the time current position is 38,000 during operation, since it passes 15,000 based on operation start point 20,000, target speed decreases and stops.

(b) Position override command is available in the ACC., KEEP, DEC. section among operation pattern. If position override command is executed during dwell, error code 362 occurs.
(c) In case operation pattern is set as CONT, override is executed based on start position of operation step used at this time.
(d) Position override ranges –2,147,483,648 ~ 2,147,483,647 Pulse.

(2) Speed override

While positioning by operation data, it is used to change operation speed by speed override command (SOR instruction).



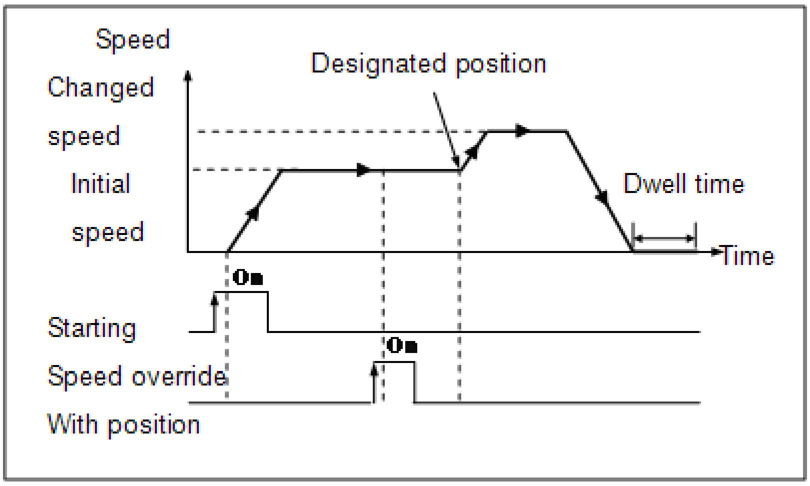
• Speed override command is available during acceleration, constant speed operation section and executing speed override instruction in deceleration section during operation or dwell section may cause Error 377 but the operation continues.
• Speed override setting ranges 1~100,000pps (setting unit: 1pps).

Remark

• Note that if a sudden difference between the current speed used for operation and a new speed newly changed by speed override is excessive, it may cause a Step-over.
• During speed override, if target speed is smaller than bias speed. it will be operate by bias speed.

(3) Speed override with position

Positioning speed override instruction changes its speed and keeps operating once it reaches the set position during positioning operation by using speed override with position (PSO instruction).



• Positioning speed override instruction is available only in acceleration and regular speed sections among operation patterns while the available operation modes are end operation, continuous operation and sequential operation.

3.1.11 Positioning stop signal

(1) Stop instruction and stop factors

- Stop instructions and factors are summarized as follows and divided into individual stop and simultaneous stop.
  Individual axis stop instructions or the stop factors affect the only axis (axes) of which stop instruction is “On” or stop factor exists. However, interpolation control operation axis stops if an axis is with stop instruction or stop factor during linear/circular interpolation.

Stop factor	Operation status	Positioning *1	Home *2	Jog operation	Axis operation status after stop instruction *3	M code ”On” Signal status
Stop by parameter setting *4	Excess of soft upper limit	Immediate stop	Not detected	Immediate stop	Error status (Error 501)	No change
	Excess of soft lower limit	Immediate stop	Not detected	Immediate stop	Error status (Error 502)	No change
Stop by sequence program *5	Dec. stop instruction	Dec. stop	Dec. stop	Error 322 (keep running)	Decelerating	No change
	Emergency stop instruction	Immediate stop			Error status (Error 481) No output	Off
Stop by external signal	External upper limit “On”	Immediate stop		Forward immediate stop	Error status (Error 492)*6	No change
	External lower limit “On”	Immediate stop		Backward immediate stop	Error status (Error 493)*6	No change
Stop by monitoring package	Dec. stop instruction	Immediate stop	Immediate stop	Error 322 (keep running)	Stopping	No change

Remark

*1: Positioning refers to position control, speed control, position/speed switching control and speed/position switching position by positioning data.
*2: If Home Return is complete, DOG and Home Signal, which are external input signals, do not affect positioning control.
*3: If axial operation is ‘no output’ after being stopped, run a instruction to cancel ‘No Output’. Then, No output is cancelled and error number is reset.
*4: Soft upper/lower limits by parameters are unavailable in speed control operation mode.
*5: Sequence program refers to XGB program method.
*6: Error 495 may occur depending on a rotation direction.

(2) Stop Process and Priority

(a) Stop Process

- Since positioning operation is not complete if it stops due to deceleration stop instruction, After Mode among M code modes is not "On" because it does not generate positioning completion signal.
- After then, if indirect start instruction (step number = current step number) is generated, Absolute method operation operates as much as the remaining distance of the current operation step yet output while Incremental method operation operates as much as the target distance.

(b) Process of emergency stop and external input upper/lower limits

- If emergency stop instruction or external input upper/lower limits are input during positioning control, it stops positioning control and turns 'No output', generating an error.

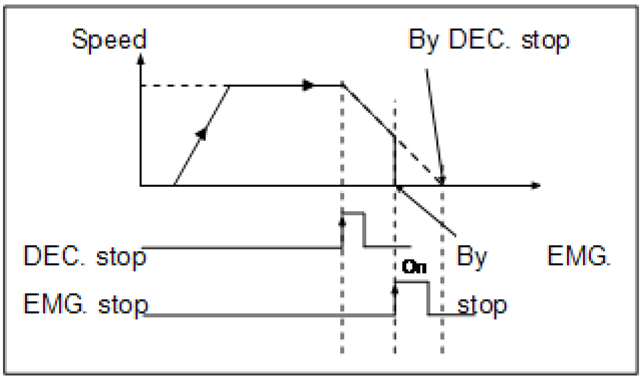
(c) Stop process priority

The priority of positioning module stop process is as follows.

Decelerating stop < Immediate stop

Remark

- In case of any immediate stop factor during decelerating stop, it processes as follow.



- Immediate stop factors: ①internal emergency stop, ②external input upper/lower limit, ③ Soft upper/lower limits

(d) Interpolation stop

- It decelerates and stops if it meets a stop instruction during interpolation operation.
- If indirect start instruction is executed in the current step when re-starting after decelerating stop, it resumes operating the positioning operation data to the target position. At the moment, it operates differently depending on absolute coordinate and Incremental coordinate.

(e) Emergency stop

- It immediately stops if meeting emergency stop while performing start-related instructions (indirect start, direct start, simultaneous start, synchronic start, linear interpolation start, Home Return start, jog start and inching start).
- Internal emergency stop generates Error 481.
- Since it is subject to no output and un-defined origin once emergency stop is executed, it may run

positioning operation after executing origin determination (Home Return, floating origin and the current position preset) in case it is operated with absolute coordinate or in determined origin.

3.1.12 Manual operation

In general, manual operations refer to jog operation, inching operation which don't use operation data.

(1) Jog operation

- Jog operation means positioning by jog operation stat contact point or positioning monitoring package.

Classification		Jog forward start	Jog backward start	Jog high speed/low speed
X axis	XBM/XBC	K4291	K4292	K4293
	XEC	%KX6865	%KX6866	%KX6867
Y axis	XBM/XBC	K4391	K4392	K4393
	XEC	%KX7025	%KX7026	%KX7027

- It is operated by jog speed set in positioning parameter.
- It can be executed when origin is not determined.
- Acceleration/deceleration process is controlled by the duration set in jog acceleration/deceleration time among parameter settings of this software package.
- If jog speed is set out of allowable range, it generates an error and operation is not available

Range	High speed jog operation	1 ~ 100,000	(Unit: 1pps)
	Low speed jog operation	1 ~ jog high speed	

Remark

- Make sure to follow the cautions

Bias speed ≤ Jog high speed ≤ Speed limit

(2) Inching operation

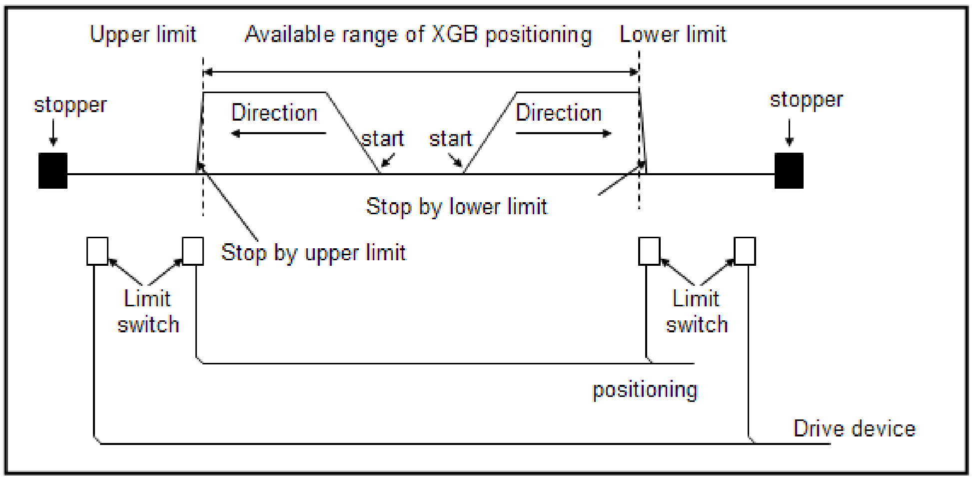
- As one of manual operations, it outputs as much as pulse set at the speed for origin/manual parameter inching speed.
- While operation by jog instruction may not exactly move to the start/end points, inching instruction may easily reach to a target point as much as desirable distance. Therefore, it is probable to move close to an operation position by jog instruction and then move to an exact target position by inching operation instruction.
- The available range is between –2,147,483,648 ~ 2,147,483,647 Pulse.

3.1.13 Stroke Upper/Lower Limits

Positioning is subject to external input stroke limit (external input upper limit, external input lower limit) and software stroke limit (software upper limit, software lower limit).

(1) External input stroke upper/lower limits

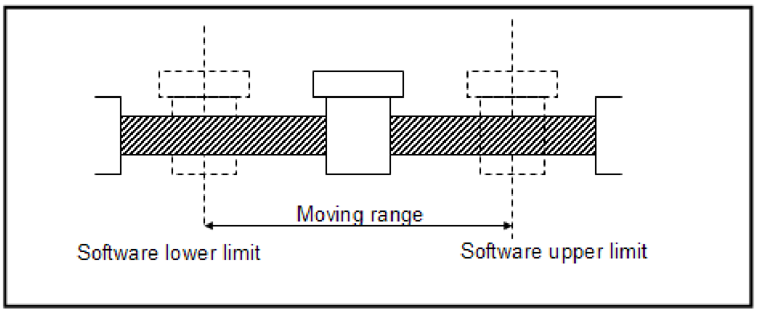
- External input stroke limit is an external input connector of positioning; external input upper limit/external input lower limit.
- It is used to immediately stop a positioning module before reaching to stroke limit/stroke end by setting up stroke limits of positioning module inside stroke limit/stroke end of drives. At the moment, if exceeding upper limit, it generates Error 492 while if exceeding lower limit, it generates Error 493.



- Note that positioning operation is not available if it stops out of positioning range.
  If it stops due to external input stroke limit detection, move it into the controllable range of positioning by manual operation (jog operation, inching operation, manual pulse generator operation).
- External input stroke upper/lower limit error is detected by edge during positioning, so manual operation is available although it exceeds stroke range.

(2) Stroke upper/lower limits

- Stroke upper/lower limit function does not execute positioning operation if it is operated out of ranges of stroke upper/lower limits, which are set in positioning parameters.
- When it starts operation or is in operation, stroke upper/lower limits are checked.



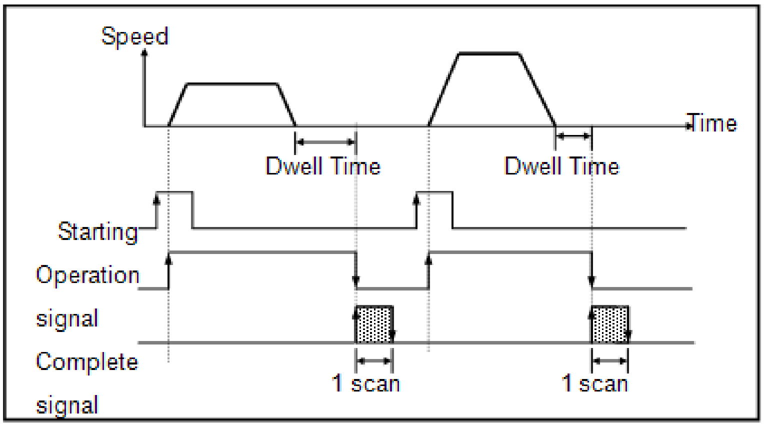
Remark

- Software stroke upper/lower limits are not detected unless origin is determined.

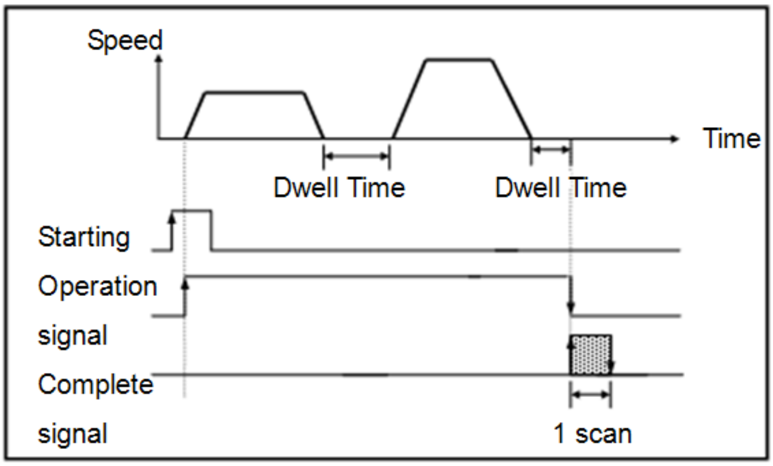
3.1.14 Output of positioning completion signal

- Regarding positioning completion output time, the completion signal(X axis: 4202, %KX6722, Y axis: K4302, %KX6882) is on and it turns off after ‘on’ is maintained as much as 1 scan time after positioning is completed during single operation, repeat operation, continuous operation, sequential operation, linear interpolation operation, speed/position switching operation (with position indicated during constant speed operation) and inching operation.
- In case operation pattern is KEEP or CONT, positioning completion signal is yielded when operation pattern stops completely.

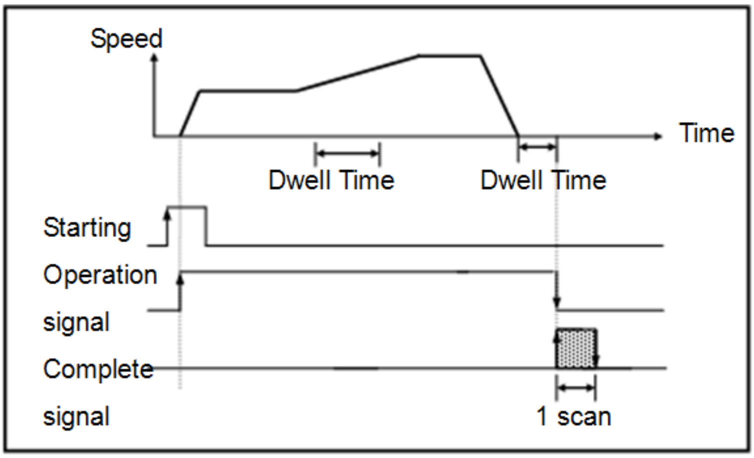
- The operations in single operation mode are as follows.



- The operations in continuous mode are as follows.



- The operations in sequential operation mode are as follows.



3.2 Positioning Parameter

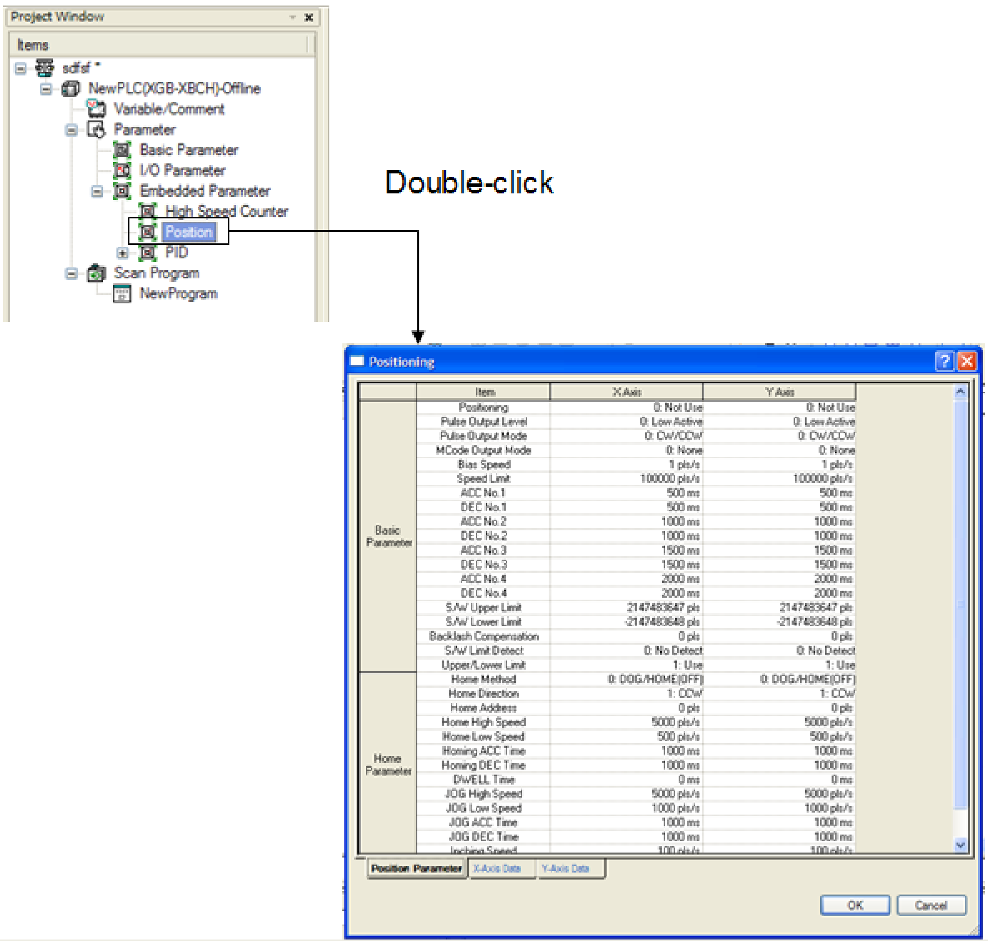
It describes positioning parameter and operation data setting.

3.2.1 Positioning parameter setting sequence

- Positioning parameter can be set more than V1.2 (high end type can be set more than XG5000 V2.2) and it has the following sequence. (This manual is described by using XG5000 V2.2.)

(1) Opening parameter setting window

- Select [Parameter] -> [Embedded Parameter] -> [Positioning] and double-click to open positioning parameter setting window.
  (If project is not displayed, press [View] -> [Project Window] to open project window [shortcut key: ALT + 1])



< Positioning parameter setting window >

(2) Setting parameter

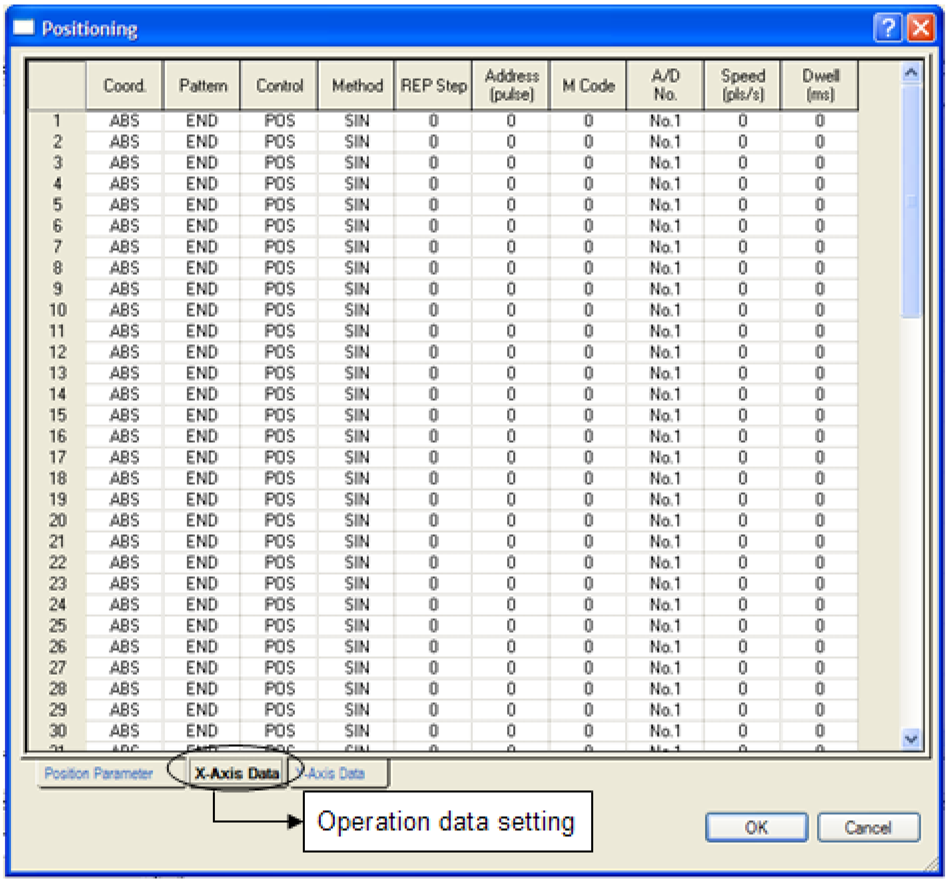
- Positioning parameter setting window is classified into basic parameter and Home parameter.
- Each item can be set independently.
- For detail setting of basic parameter, refer to 3.2.3.
- For detail setting of Home parameter, refer to 3.2.4.

Type	Item	Description
Basic parameters	Positioning	Set whether to use positioning function.
	Pulse output level	Set pulse output mode (Low/High Active).
	Bias speed	Set the initial start speed for early operation.
	Speed limit	Set the max speed settable in positioning operation.
	ACC/DEC No.1	Time setting of ACC/DEC section No.1
	ACC/DEC No.2	Time setting of ACC/DEC section No.2
	ACC/DEC No.3	Time setting of ACC/DEC section No.3
	ACC/DEC No.4	Time setting of ACC/DEC section No.4
	S/W upper limit	Set upper limit within a machine's operation range
	S/W lower limit	Set lower limit within a machine's operation range
	Backlash compensation amount	Set compensation amount of tolerance in which a machine is not operated due to wear when rotation direction is changed.
	S/W upper/lower limits during constant speed operation	Set whether to detect or not S/W upper/lower limits during constant speed operation
	Use upper/lower limits	Use or not
Origin/Manual parameters	Home Return method	Set home return method
	Home Return direction	Set home return direction
	Origin address	Set origin address
	Origin compensation amount	Set origin compensation amount
	Home Return high speed	Set high speed for home return
	Home Return low speed	Set low speed for home return
	Home Return accelerating time	Set accelerating time for home return
	Home Return decelerating time	Set decelerating time for home return
	Dwell time	Set a time required to remove remaining bias counter immediately after positioning ends
	Jog high speed	Set high speed for jog operation
	Jog low speed	Set low speed for jog operation
	Jog accelerating time	Set accelerating time for jog operation
	Jog decelerating time	Set decelerating time for jog operation
	Inching speed	Set speed for inching operation

< Positioning parameter setting item >

(3) Operation data setting

- If the user select 'X Axis Data' or 'Y Axis Data' tap on the positioning parameter setting window, the user can set operation data of 30 steps as show below.
- Standard type can set up to 30 steps, high-end type can set up to 80 steps.



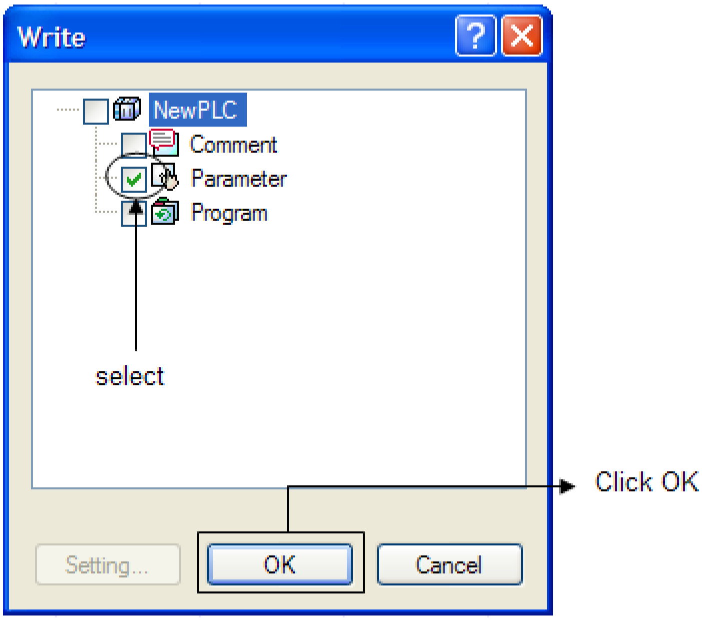
< Position operation data setting window >

- Items of operation data is as table below.
- For detail of operation data, refer to 3.3.

Item	Description	Initial value
Coord.	Setting Cood. of each step (ABS/INC)	ABS
Pattern	Setting operation pattern of each step (END/KEEP/CONT)	END
Control	Setting control method of each step (POS/SPD)	POS
Method	Setting operation method of each step (SIN/REP)	SIN
REP step	In case of repeated operation, setting the next step no.	0
Address	Setting target address of each step	0[Pulse]
M Code	In case of using M code, number indicated when M code occurred (In case of setting as 0, M code function is not used)	0
A/D No.	Setting A/D no. of each step	No.1
Speed	Operation speed of each step	0[pps]
Dwell	After ending step, time necessary to remove remaining pulse of offset counter	0[㎳]

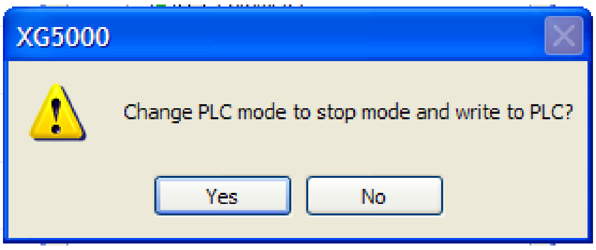
(4) Writing to PLC

•After setting of positioning parameter and operation data per each axis, download them to PLC
•Selecting [Online] -> [Write], 'Write' dialog box is displayed.
In order to download parameter, select 'Parameter' and click 'OK'.



Remark

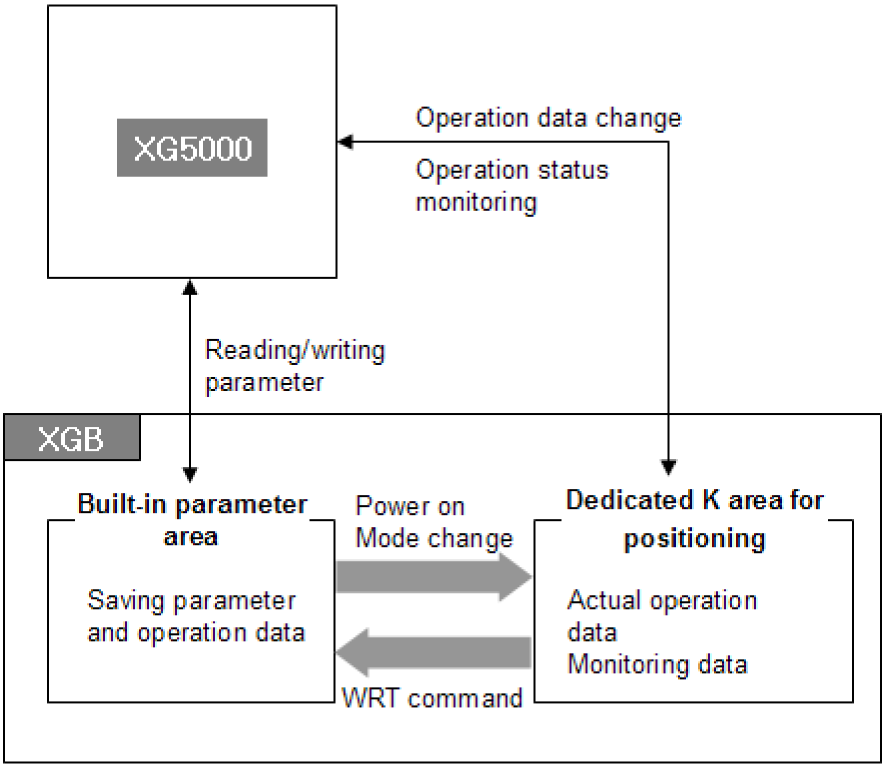
• If XG5000 is not connected with PLC, 'Write' menu is not activated. In case of this, select [Online] -> [Connect] to connect with PLC.
• When PLC is RUN mode, comment is available to download so only comment is displayed in the 'Write' dialog box. At this time, change PLC's mode to STOP and retry it.



• If downloading parameter, basic parameter, I/O parameter, built-in parameter is transmitted.
• The downloaded positioning parameter is applied when turning on the power or changing operation mode. For more detail, refer to 3.2.2.

3.2.2 Relationship between positioning parameter and dedicated K area

XGB built-in positioning function executes the positioning control by using parameter and K area dedicated for positioning. Here describes relationship between positioning parameter and K area.
Internal memory configuration related with XGB built-in positioning is as follows.



< Relationship between positioning parameter and K area >

•XGB has a built-in parameter area to save operation data and parameter written in the XG5000 and a dedicated K area for use of real positioning operation.
•If writing the embedded positioning parameter and operation data, the downloaded data is saved in the built-in parameter area permanently. And in case of reading, it reads built-in parameter area.
•XGB executes the initialization by copying the parameter and operation data saved in the built-in parameter area to K area dedicated for positioning.
  (1) In case of restarting after power cut
  (2) In case of changing PLC operation mode
  (3) In case of restarting PLC by reset command
•XGB built-in positioning is executed by using data of K area and Flags that indicate the current operation status and monitoring data are displayed in the K area. So the user can change operation data easily by changing the K area data
•In order to preserve the current K area data, K area data should be applied to built-in parameter area by using application command (WRT command)
•For detail list of K area, refer to A2.2.

Remark

•After changing K area and not using WRT instruction, if restarting after power cut or changing PLC operation mode, K area is initialized.
•For more detail of WRT instruction, refer to 5.2.21.

3.2.3 Setting basic positioning parameters

It describes the range of setting basic parameters and special K area for positioning.

Item	Range	Initial value	K area for positioning		Data size
			X-axis	Y-axis	
			XBM/XBC	XBM/XBC	
			XEC	XEC	
Positioning	0: No use, 1 : use	0	K4870 %KX7792	K5270 %KX8432	Bit
Pulse output level	0 : Low Active, 1 : High Active	0	K4871 %KX7793	K5271 %KX8433	Bit
Pulse output mode	0 : CW/CCW 1 : PLS/DIR	0	K4873 %KX7795	K5273 %KX8435	Bit
M code output mode	0 : NONE, 1 : WITH 2 : AFTER	0	K4681-2 %KX7489-90	K5081-2 %KX8129-30	Bit
Bias speed	1 ~	1	K450 %KD225	K490 %KD245	Double word
Speed limit	1 ~	100,000	K452 %KD226	K492 %KD246	Double word
ACC time 1	0 ~ 10,000[unit: ms]	500	K454 %KW454	K494 %KW494	word
DEC time 1	0 ~ 10,000[unit: ms]	500	K455 %KW455	K495 %KW495	word
ACC time 2	0 ~ 10,000[unit: ms]	1,000	K456 %KW456	K496 %KW496	word
DEC time 2	0 ~ 10,000[unit: ms]	1,000	K457 %KW457	K497 %KW497	word
ACC time 3	0 ~ 10,000[unit: ms]	1,500	K458 %KW458	K498 %KW498	word
DEC time 3	0 ~ 10,000[unit: ms]	1,500	K459 %KW459	K499 %KW499	word
ACC time 4	0 ~ 10,000[unit: ms]	2,000	K460 %KW460	K500 %KW500	word
DEC time 4	0 ~ 10,000[unit: ms]	2,000	K461 %KW461	K501 %KW501	word
S/W upper limit	-2,147,483,648 ~ 2,147,483,647 [pulse]	2,147,483,647	K462 %KD231	K502 %KD251	Double word
S/W lower limit	-2,147,483,648 ~ 2,147,483,647 [pulse]	-2,147,483,648	K464 %KD232	K504 %KD252	Double word
Backlash Compensation	0 ~ 65,53	0	K466 %KW466	K506 %KW506	word
S/W Limit Detect	0 : No detect1 : detect	0	K4684 %KX7492	K5084 %KX8132	Bit
Upper/lower limits	0: no use, 1: use	1	K4872 %KX7794	K5272 %KX8434	Bit

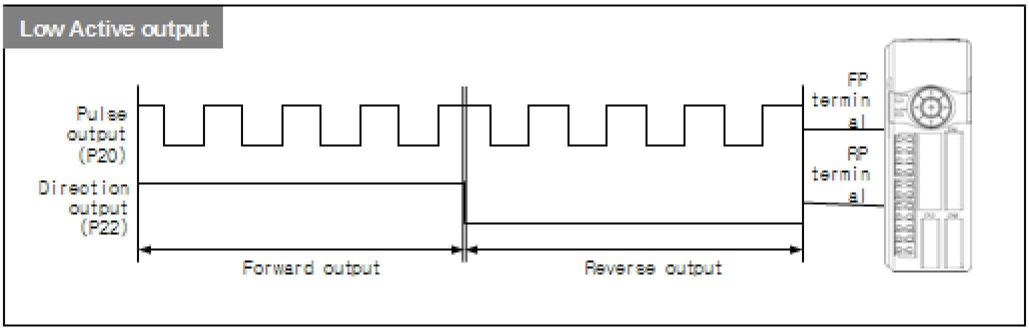
(1) Positioning
- •Determine whether to use positioning.
- • If not using positioning function, set it '0: no use' while for use, it should be set to '1: use'.
- • If setting it as '1:use', though it doesn't execute the instruction related with positioning, it is controlled by positioning.

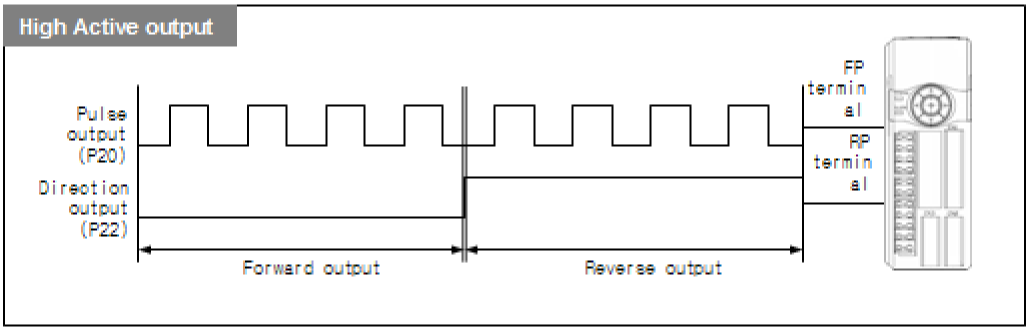
  So in this case, though the user turns on this contact point by other application instruction, only output image data of XG5000 monitoring window is on and real output contact point doesn't turn on.

Remark

• Make sure to set it '1: use' to use positioning.
If using the instruction related with positioning when it is set as '0: no use", error code 105 occurs.

(2) Pulse output level
- •For pulse output level, select either of 'Low Active output' or 'High Active output'.
- •For Low Active output, set as 0, for High Active output, set as 1.
- •The following figure shows output pulse type in case of Low Active and High Active output based on X axis. (in case of Y axis, pulse string output: P21, direction output: P23)



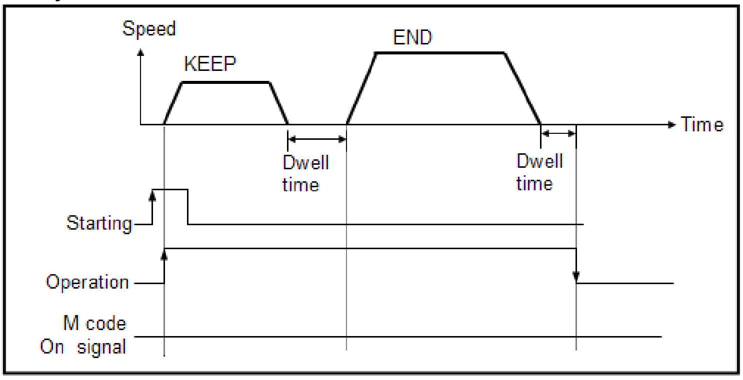


(3) Pulse output mode (For only high end type)
- •XGB built-in positioning can select output mode as one between PLS/DIR mode and CW/CCW mode.
- •If you use CW/CCW mode, select 0. If you use PLS/DIR mode, select 1.
- •About output pulse shape according to each pulse output mode, refer to ch.2.2.3.

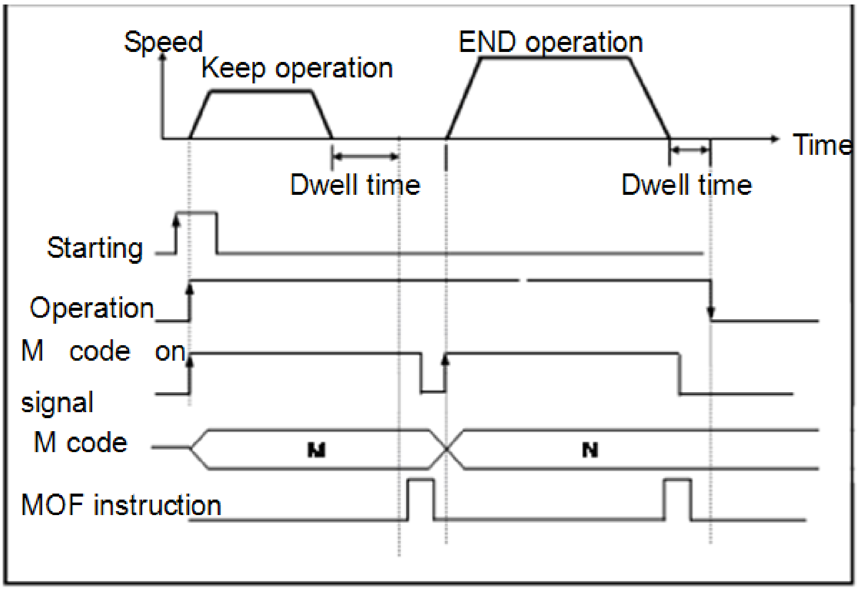
(4) M code output mode (For only high end type)
- •In case of using M code function, you can set output timing of M code.

•M code output mode set in the parameter is applied to all operation step of each axis.
•The user can select one M code output mode among three modes, NONE, WITH, AFTER.
According to each setting value, timing of M code output signal is as follows.

(a) NONE mode
•In case M code output mode is selected as NONE, though M code is set in operation data, M code doesn't occur like the following figure.
•If the user use this function, it can prohibit the M code function set per operation step, simultaneously.

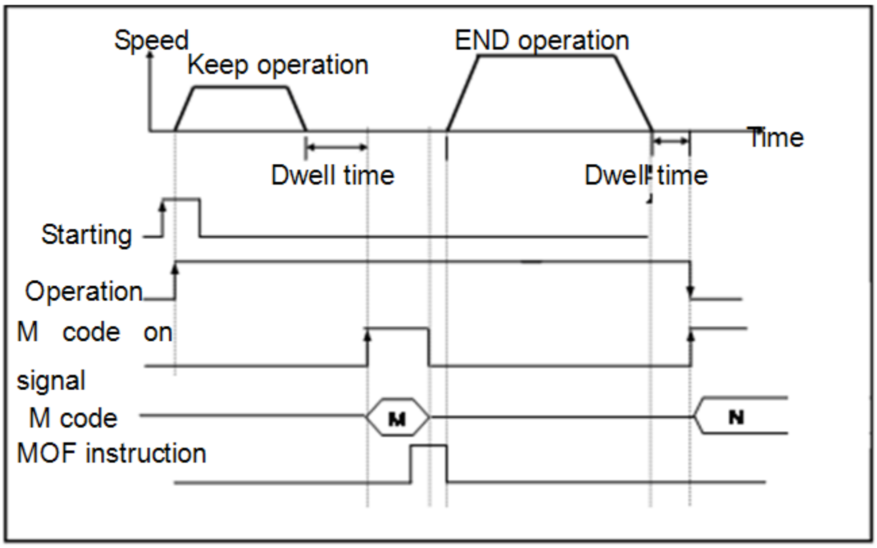


(b) WITH mode
• In case M code output mode is set as WITH, like the following figure, it outpus M code on signal and M code number when each step runs.



< M code output timing in case of WITH mode >

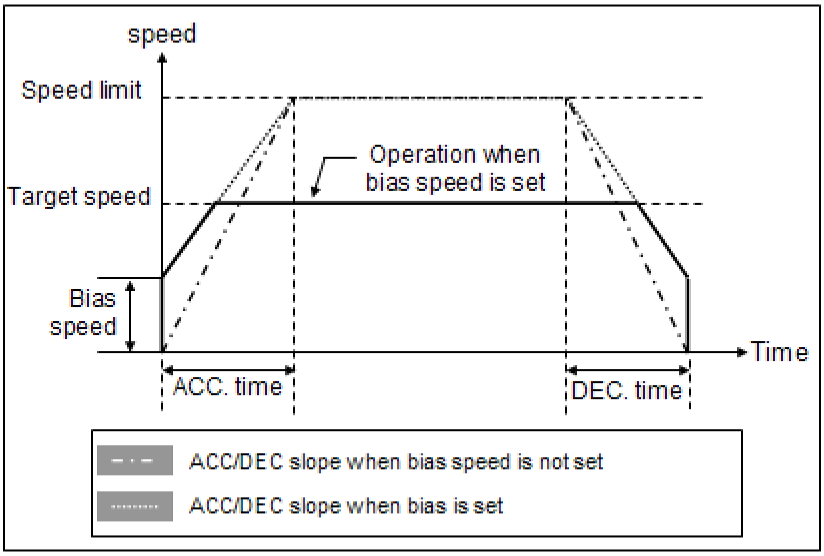
(c) AFTER mode
• In case M code output mode is set as AFTER, like the following figure, if each operation of step is completed, it outputs M code On signal and M code number.



< M code output timing in case of AFTER mode >

(5) Bias speed

- Considering that torque of stepping motor is unstable when its speed is almost equal to 0, the initial speed is set during early operation in order to facilitate motor's rotation and is used to save positioning time. The speed set in the case is called 'bias speed'.
- In case of XGB built-in positioning, setting range of bias speed is 0 ~ 100,000 (unit:pps).
- Bias speed may be used for
  (1) Positioning operation by start instruction (IST,DST,SSTetc.)
  (2) Home operation, JOG operation
  (3) Main axis of interpolation operation(not available for sub axis)



< Operation when setting bias speed >

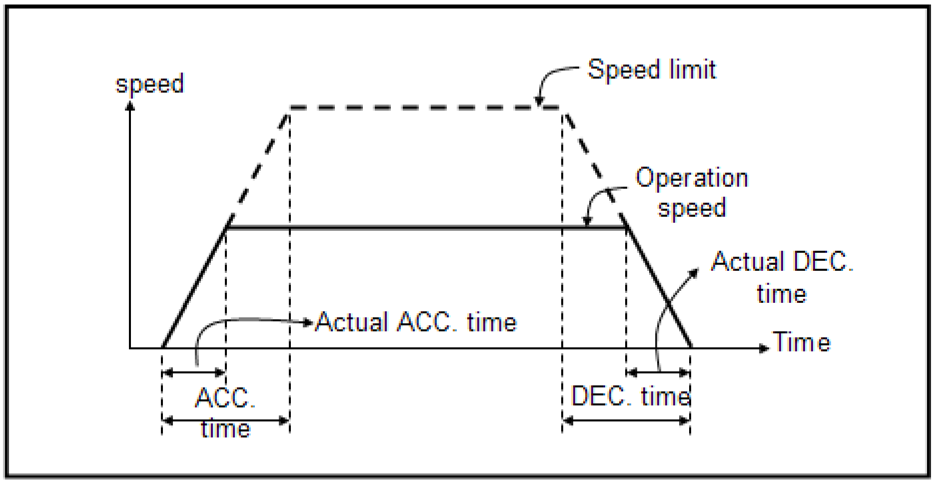
- The figure above shows operation when setting bias speed.
  The entire operation time may be advantageously reduced if bias speed is highly set, but excessive value may cause impact sound at the start/end time and unreasonable operation on a machine.

- Bias speed should be set within the following range.
  (a) Bias speed ≤ Positioning speed
  (b) Bias speed ≤ Home Return low speed ≤ Home Return high speed

(c) Bias speed ≤ JOG high speed
→ (If home return speed is set lower than bias speed, it generates Error 133; if operation speed is set lower than bias speed during positioning, it generates Error 153; if JOG high speed is set lower than bias speed, it generates Error 121.)

(6) Speed limit
- It refers to the allowable max speed of positioning operation.
- In Pulse unit, the range is between 1 ~ 1,000,000(unit: pps).
- During position operation, operation speed, home return speed and jog operation speed are affected by speed limit, and if they are set higher than speed limit, it detects error.
  (1) If home return speed is higher than speed limit : Error 133
  (2) If positioning speed is higher than speed limit : Error 152
  (3) If jog operation speed is higher than speed limit : Error 121

(7) ACC/DEC time
- It is applied to sequential operation instruction, speed override, positioning speed override during positioning operation as well as start/end time of positioning operation. At this time, ACC and DEC time is defined as shown below.
  (a) ACC time: a duration required to reach from “0(stop)” speed to the speed limit set in parameter. Using bias would be a time consumed to reach from bias speed set to the speed limit set in parameter.
  (b) DEC time: a duration required to reach from the speed limit set in parameter up to “0”(stop) speed. Using bias would be a time consumed to reach from bias speed set to the speed limit set in parameter.

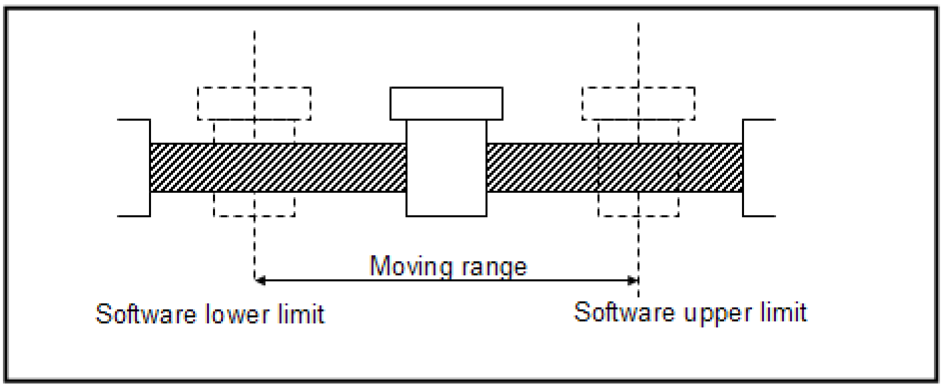


ACC. time : Time to take from stop status to speed limit

Actual ACC. time: Time to take from stop status to operation speed

- The range is between 0 ~ 10,000 (unit: 1 ㎳) per axis.
- ACC/DEC time is set with 4 types and it can be set differently according to each operation data.

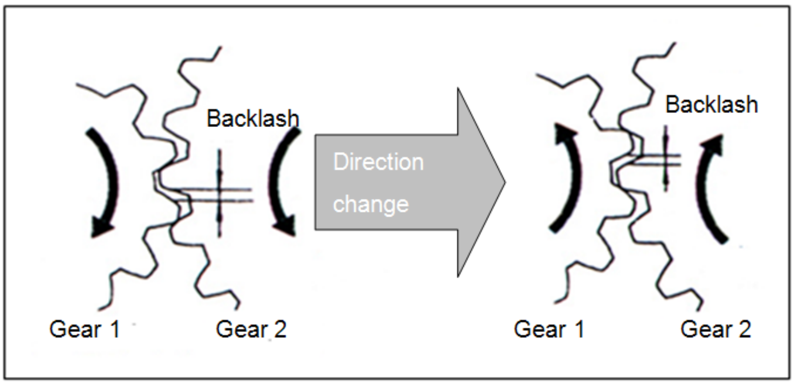
(8) S/W Upper/Lower Limit
- A range of a machine’s move is called ‘stroke limit’, and it sets the upper/lower limits of stroke into software upper limit and software lower limit and does not execute positioning if it operates out of ranges set in the above.
  Therefore, it is used to prevent against out-of-range of upper/lower limits resulting from incorrect positioning address or malfunction by program error and it needs installing emergency stop limit switch close to a machine’s stroke limit.
- Except S/W upper limit and lower limit, install limit switch for emergency stop near stroke limit of machine.



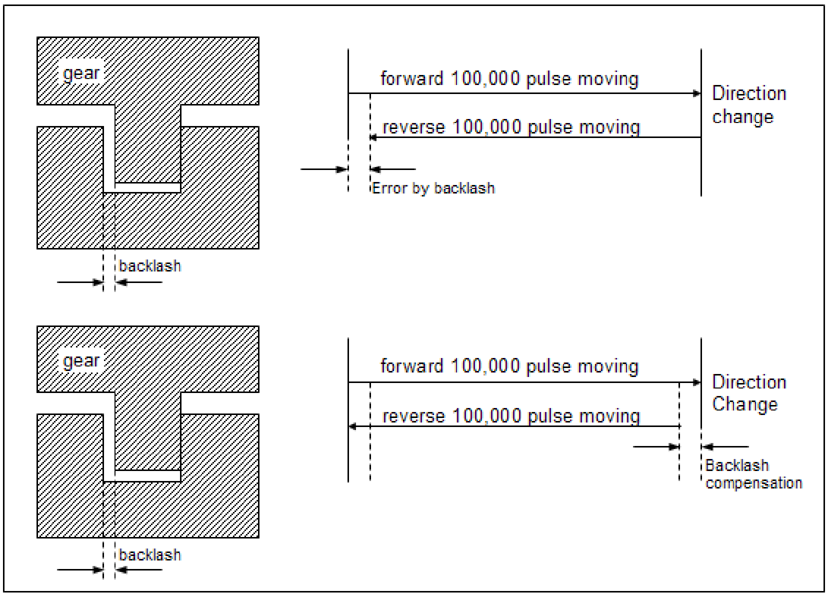
- Range of S/W upper limit and lower limit is checked when starting positioning and operating.
- If an error is detected by setting software upper/lower limits(software upper limit error: 501, software lower limit error: 502), pulse output of positioning module is prohibited.
  Therefore, to resume operation after an error is detected, it is prerequisite to cancel 'No output'.
  (No output status is displayed at K4205(%KX6725), for X axis and K4305(%KX6885) for Y axis.

- It can be set according to each axis and range is as follows.
  - S/W upper limit address value range: -2,147,483,648 ~ 2,147,483,647 (unit: Pulse)
  - S/W lower limit address value range: -2,147,483,648 ~ 2,147,483,647 (unit: Pulse)

(9) Backlash Compensation Amount
- A tolerance that a machine does not operate due to wear when its rotation direction is changed if it is moving with motor axis combined with gear and screw is called 'backlash'.
- Therefore, when changing a rotation direction, it should output by adding backlash compensation amount to positioning amount.
- The range is between 0 ～ 65,535(unit: Pulse) per axis.
- It is available for positioning operation, inching operation and jog operation

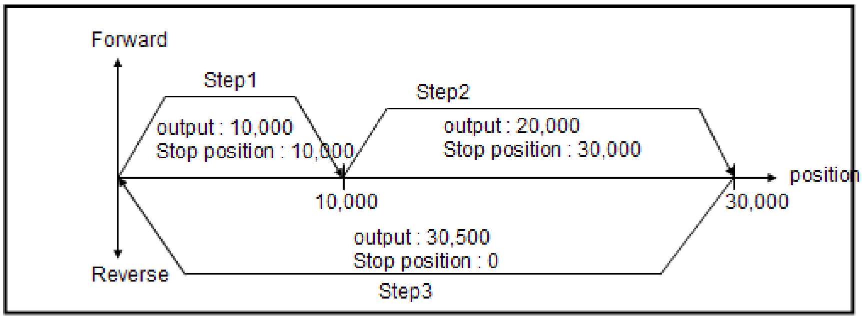


- Backlash compensation outputs backlash compensation amount first and then, address of positioning operation, inching operation and jog operation move to the target positions. (At this time, output as many as backlash amount is not added to the current position address.)



- The above figure describes difference of backlash setting or no backlash setting.
  In case of not setting backlash compensation amount, it moves as many as 100,000 pulse forward and changes the direction and moves backward as many as 100,000 pulse. It may cause error by backlash. For example, it assumes that backlash is 500 pulse, in case of not setting backlash, final stop location is 500. To compensate this, setting backlash compensation as 500, when changing the direction, 100,500 pulse is yielded adding 500 pulse set as backlash compensation amount. So target stops at the precise stop position.
- The following table indicates real pulse output and stop position in case of setting backlash. (Absolute coordinates is used.)

Operation step	Backlash setting amount	Target address	Direction conversion	Real output pulse	Stop positio
1	500	10,000	X	10,000	10,000
2		30,000	X	20,000	30,000
3		0	○	-30,500	0



Remark

- Once backlash compensation amount is set or changed, home return should be executed otherwise there can be error at the current position by backlash compensation amount.

(10) S/W upper/lower limits during constant speed operation

- It is used to stop pulse output by S/W upper/lower limit detection during constant speed operation by speed control.

- In the case, S/W upper/lower limit detection is available as long as origin is set and the position mark during constant speed operation is "Mark"

(11) Use of Upper/Lower Limits

- To use upper/lower limits during operation, it should be set as "Use".
- Upper/Lower limit input contact point is fixed as the table below and it can be used as normally closed contact point (B contact point).
- If 'No use' is set, it does not detect upper/lower limits and is available with general input contact.

Signal name	Input contact point number			Operation content	Reference
		Standard	High end		
External low limit signal (LimitL)	X axis	P0000	P0008	Detects the X axis external lower limit at the rising edge of input contact point	Acts as normally closed contact point (B contact point)
	Y axis	P0002	P000A	Detects the Y axis external lower limit at the rising edge of input contact point.	
External upper limit signal (LimitH)	X axis	P0001	P0009	Detects the X axis external upper limit at the rising edge of input contact point.	
	Y axis	P0003	P0008	Detects the Y axis external upper limit at the rising edge of input contact point.	

3.2.4 Origin/Manual Parameter Setting for Positioning

Here describes setting range, method of origin/manual parameter for positioning, and special K area for positioning corresponding to each item. They are summarized as the table below.

Item	Setting range	Initial value	Dedicated K area		Data size
			X axis XBM/XBC XEC	Y axis XBM/XBC XEC	
Home Return method	0 : origin detection after DOG off 1 : origin detection after deceleration when DOG is On 2 : origin detection by DOG	0	K4780-81 %KX7648-49	K5180-81 %KX8288-89	2 Bit
Home Return direction	0 : forward, 1 : backward	1	K4782 %KX7650	K5182 %KX8290	Bit
Origin address	-2,147,483,648 ~2,1	0	K469 %KD234	K509 %KD254	Double word
Home Return high speed	1 s] 100,000[pulse/	5,000	K471 %KD235	K511 %KD255	Double word
Home Return low speed	1 s] 100,000[pulse/	500	K473 %KD236	K513 %KD256	Double word
Home Return ACC time	0 ~ 10,000[unit: ms]	1,000	K475 %KW475	K515 %KW515	Word
Home Return DEC time	0 ~ 10,000[unit: ms]	1,000	K476 %KW476	K516 %KW516	Word
Dwell time	0 ~ 50,000[unit: ms]	0	K477 %KW477	K517 %KW517	Word
Jog high speed	1 s] 100,000[pulse/	5,000	K479 %KD239	K519 %KD259	Double word
Jog low speed	1 s] 100,000[pulse/	1,000	K481 %KD240	K521 %KD260	Double word
Jog ACC time	0 ~ 10,000[unit: ms]	1,000	K483 %KW483	K523 %KW523	Word
Jog DEC time	0 ~ 10,000[unit :ms]	1,000	K484 %KW484	K524 %KW524	Word
Inching speed	1 s] 65,535[pulse/	100	K485 %KW485	K525 %KW525	Word

(1) Home Return method
- There are three home return methods as follows.
  a) DOG/Origin(Off) :
     -If origin signal is inputted, it detects the origin signal after DOG changes On -> Off.
  b) DOG/Origin(On) : When DOG is on, it detects the origin after deceleration
     -If DOG signal is on and origin signal is inputted after deceleration, it detects the origin.
  c) DOG :
     -It detects the origin by using DOG signal.
- For more detail of home return method, refer to 3.1.9.

(2) Home Return direction
- Home Return direction is divided into CW(forward) and CCW(backward) depending on pulse output direction.

Setting value	Home Return direction	Pulse output operation of XGB positioning module
0	Forward	Executing forward home return.
1	Backward	Executing backward home return.

(3) Origin address
- It is used to change the current address to a value set in home return address when home return is completed by home return instruction.
- setting range: -2,147,483,648 ~ 2,147,483,647 (unit: Pulse)

(4) Home Return high speed
- As a speed when it returns home by home return instruction, it is divided into high speed and low speed.
- It refers to a speed operating in regular speed section via accelerating section by home return instruction.
- The range of home return high speed is between 1 ~ 100,000(unit: pps)

(5) Home Return low speed
- It refers to a speed operating in regular speed section via decelerating section from home return high speed by home return instruction.
- The range of home return low speed is between 1 ~ 100,000(unit: pps)

Remark

- When setting home return speed, it should be “speed limit ≥ home return high speed ≥ home return low speed”.
- It is recommended to set home return low speed as low as possible when setting home return speed. Origin signal detection may be inaccurate if low speed is set too fast.

(6) Home Return ACC/DEC time
- When it returns home by home return instruction, it returns home at the speed of home return high speed and home return low speed by ACC/DEC time.
- The range of home return ACC/DEC time is between 0 ~ 10,000(unit: 1 ㎳).

(7) Dwell time
- It sets Dwell time applied to Home Return
- Dwell time is necessary to maintain precise stop of servo motor when positioning by using a servo motor.
- The actual duration necessary to remove remaining pulse of bias counter after positioning ends is called ‘dwell time’.
- The range of home return dwell time is between 0 ~ 50,000 (unit: 1 ㎳)

(8) JOG high speed

• Jog speed is about jog operation, one of manual operations and is divided into jog low speed operation and jog high speed operation.
• Jog high speed operation is operated by patterns with accelerating, regular speed and decelerating sections. Therefore, job is controlled by ACC/DEC instruction in accelerating section and decelerating section.
• The range of jog high speed is between 1 ～ 100,000(unit: 1pps)

(9) JOG low speed

• Jog low speed operation is operated with patterns of accelerating, regular speed and decelerating sections.
• The range of jog low speed is between 1 ～ 100,000 (unit: 1pps)

Remark

• When setting JOG high speed, it should be “Speed limit ≥ JOG high speed ≥ Bias speed”.
• When setting JOG low speed, it should be smaller than JOG high speed.

(10) JOG ACC/DEC time

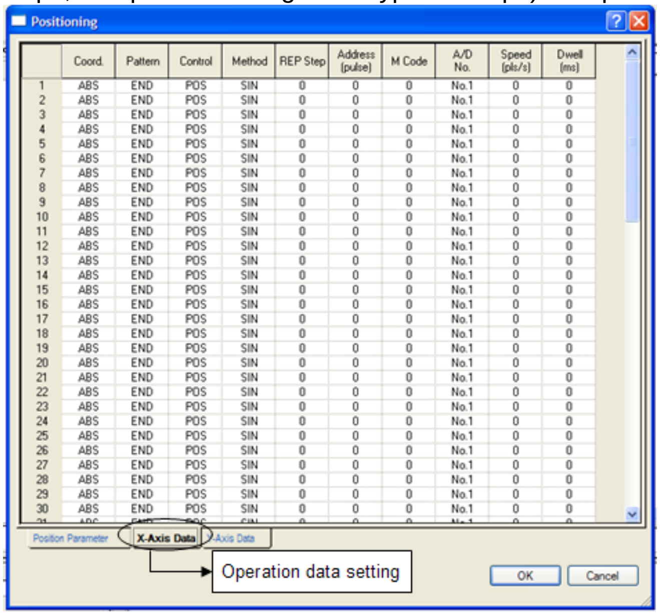
• It refers to JOG ACC/DEC time during jog high/low speed operation.
• The range of JOG ACC/DEC time is between 0 ～ 10,000 (unit: 1 ㎳)

(11) Inching speed

• The inching operation speed is set.
• The range of inching speed is between 1 ～ 65,535 (unit: 1pps)
• For detail of inching operation, refer to 3.1.12.

3.3 Positioning Operation Data

It describes operation data for XGB positioning. If the user select ‘X axis data’ or ‘Y axis data’ tap in the positioning parameter setting window, the following figure is displayed. Each axis can have 30~80 (standard type: 30 steps, compact stand/high-end type: 80steps) steps of operation data.



Each of item can have a following data.

Step	Item	Range	Initial values	Device area		Remarks
				X-axis	Y-axis	
1	Coord.	0 : ABS, 1 : Incremental	ABS	K5384 %KX8612	K8384 %KX13412	Bit
	Pattern	0 : end, 1 : continuous, 2 : sequential	End	K5382~3 %KX8610-11	K8382~3 %KX13410-11	Bit
	Control	0 : position control, 1 : speed control	Position	K5381 %KX8609	K8381 %KX13409	Bit
	Method	0: single, 1 : repeat	Single	K5380 %KX8608	K8380 %KX13408	Bit
	REP	0~30(High end 0~80)	0	K539 %KW539	K839 %KW839	Word
	Address(pulse)	-2,147,483,648 ~ 2,147,483,647 [pulse]	0	K530 %KD265	K830 %KD415	Double word
	M Code	0 ~ 65,535	0	K537 %KW539	K837 %KW837	Word
	A/D No.	0 : No.1, 1 : No.1, 2 : No.3 3 : No.4	0	K5386-87 %KX8614-15	K8386-87 %KX13414-15	Bit
	Speed	1 ~ 100,000[pulse/sec]	0	K534 %KD267	K834 %KD417	Double word
	Dwell time	0 ~ 50,000[unit: ㎳]	0	K536 %KW536	K836 %KW836	Word
2	Same item with No.1 step			K540~549 %KW540~549	K840~849 %KW840~849	
3~30	Same item with No.1 step			K550~829 %KW550~829	K850~1129 %KW850~1129	
31	Same item with No.1 step			K2340~2349 %KW2340~2349	K2840~2849 %KW2840~2849	Only for high end type
32~80	Same item with No.1 step			K2350~2839 %KW2350~2839	K2850~3339 %KW2850~3339	

(1) Step number

- The range of positioning data serial number is between 1 ~ 30.
  (compact standard/high-end type is 1~80)
- When executing indirect start, simultaneous start, linear interpolation operation, position synchronization and etc., if you designates the step number of data to operate, it operates according to positioning dedicated K area where operation data is saved.
- If step number is set as 0, operation step indicated at the current step number (X axis: K426(%KW426), Y axis: K436(%KW436)) of positioning monitor flag is operated.

Remark

- The user can use variable of dedicated K area per each step easily by using Register U Device. For detail of monitor registration of positioning, refer to XG5000 user manual.

(2) Coordinates

- Here sets the coordinates method of relevant operation step data.
- Coordinates methods selectable are absolute coordinate and Incremental coordinate.
- For more detail, refer to 3.1.2.

(3) Operation pattern (END/KEEP/CONT) and operation method (SIN/REP)

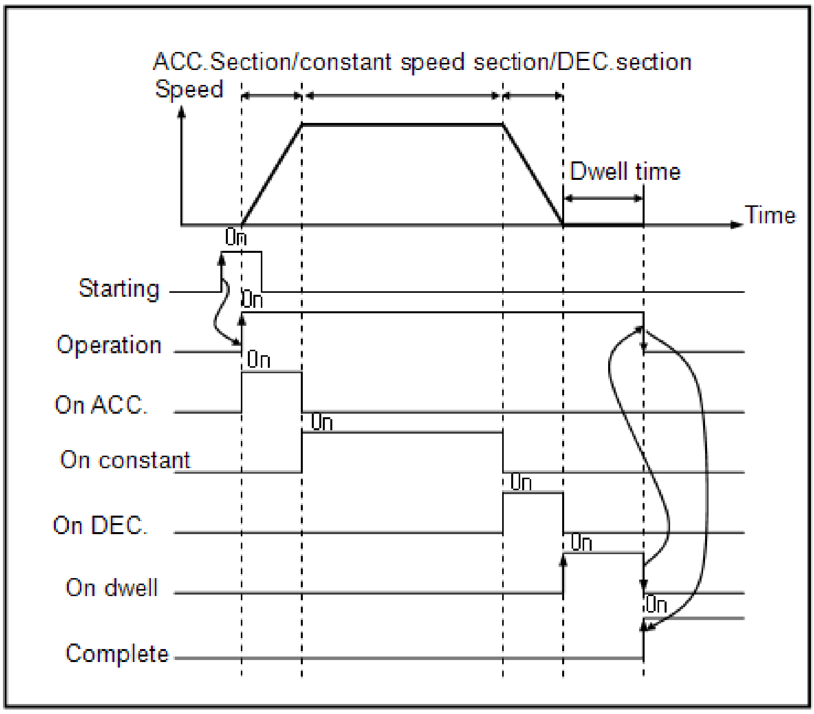
- The user can select one pattern among three operation patterns per step. It can configure how to use the positioning operation data.
- Operation pattern can be set as follows according to Control and Method on the operation data.

Control	Method	Pattern	Reference
POS	SIN	END	
		KEEP	
		CONT	Linear interpolation is not available
	REP	END	
		KEEP	
		CONT	Linear interpolation is not available
SPD	SIN	END	Linear interpolation is not available
		KEEP	Linear interpolation is not available
		CONT	Not available
	REP	END	Linear interpolation is not available
		KEEP	Linear interpolation is not available
		CONT	Not available

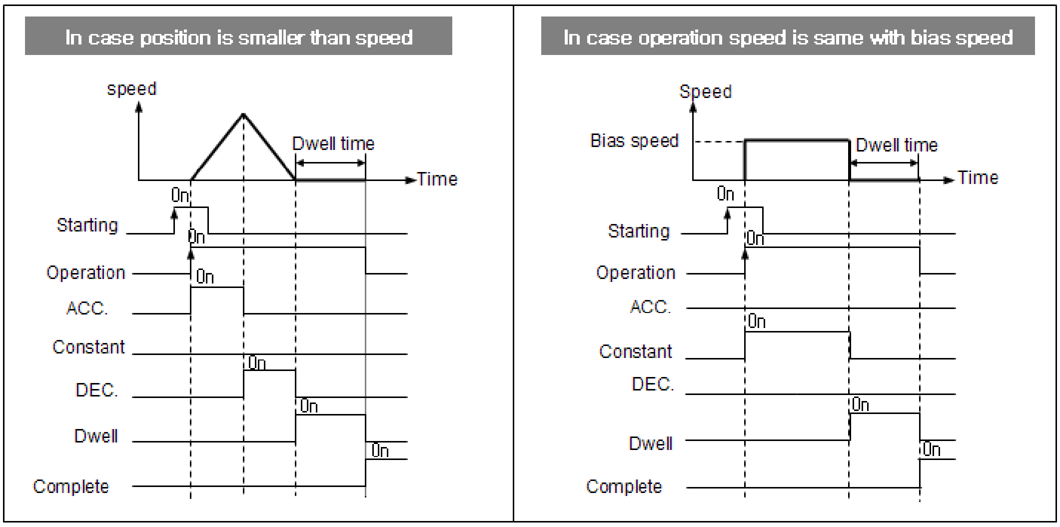
- In case Method is set as SIN, the next operation step become ‘current operation step + 1’. And in case Method is set as REP, the next operation step become the step set in REP Step.

(a) END (SIN)

- It refers to execute the positioning to target address by using the data of operation step and complete the positioning after dwell time.



- Generally with END operation, position operation is executed according to pre-arranged speed and position like above picture as ladder shape with accelerated, constant, and decelerated intervals. However depending on position and speed settings, special shapes besides a ladder can be witnessed as below.

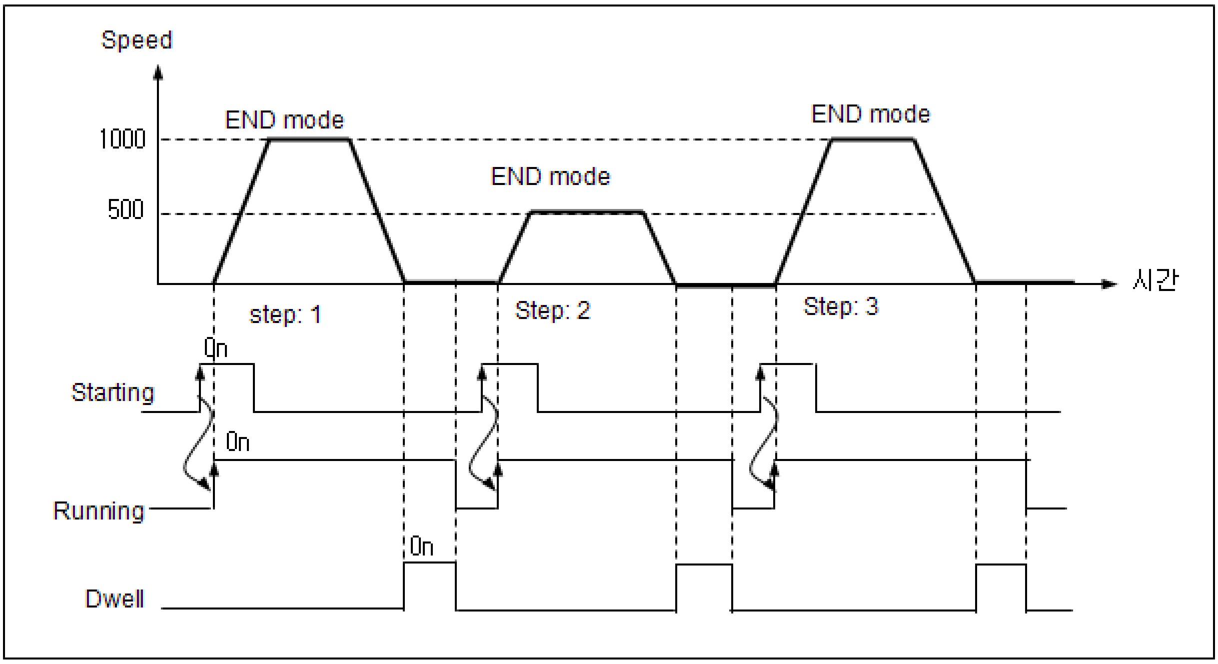


1) In case target address is far less than speed, it can't pass the acceleration - regular speed – deceleration section. In this case, the positioning is complete without regular speed section.
2) In case operation speed is same with bias speed, target moves with regular speed (bias speed) and it stops without deceleration section.

• It assumes that operation data is as follows to describe END/SIN operation.

Step no.	Coord .	Pattern	Contr ol	Metho d	REP Step	Address [Pulse]	M code	A/D No.	Speed [pls/s]	Dwell [ms]
1	ABS	**END**	POS	**SIN**	0	10,000	0	1	1,000	100
2	ABS	**END**	POS	**SIN**	0	20,000	0	1	500	100
3	ABS	**END**	POS	**SIN**	0	30,000	0	1	1,000	100

• In the above table, operation pattern is set as END, target moves once by once start command and since Method is set as SIN, the next step becomes 'current operation step + 1'.
• To operate the next step, one more start command is necessary.

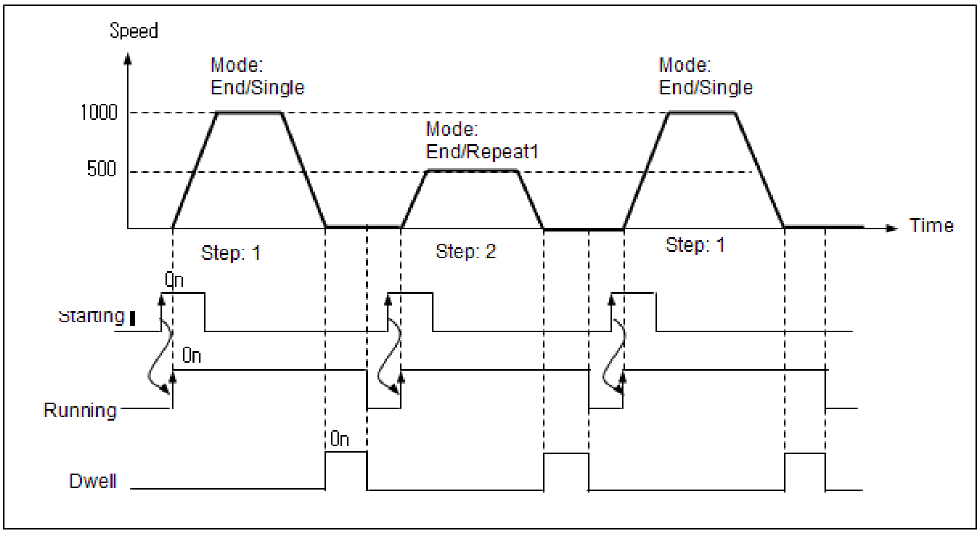


(b) END operation (Repetition)

• In case END operation (repetition), operation of currently started operation is same with END operation (single).
But, The next step becomes the step set in the REP Step, which is different with END operation (single).
• It assumes that operation data is set as follows to describe END/Repetition.

Step No.	Coord .	Pattern	Contr ol	Metho d	REP Step	Address [Pulse]	M code	A/D No.	Speed [pls/s]	Dwell [ms]
1	ABS	**END**	POS	**SIN**	0	10,000	0	1	1,000	100
2	ABS	**END**	POS	**REP**	1	20,000	0	1	500	100
3	ABS	**END**	POS	**SIN**	0	30,000	0	1	1,000	100

1) By first start command, target moves to 10,000 pulse with 1,000pps speed and stops. At this time, since Method is SIN, the next operation step becomes the no.2 step, current operation step +1.
2) By second start command, target moves to 20,000 with 500pps and stops. At this time, Method is REP, the next operation step becomes no.1 step set in REP Step, not no.3 step.
3) If third start command is inputted, target moves to 10,000 ABS coordinates with 1,000 pps.
4) Like this, no.1 step and no.2 step are repeated whenever start command is executed so no.3 step is not operated.



Remark

- If the operation mode is set as single, set the operating step number in the IST at 0, then the step specified in the current step number (axis X: K426(%KW426), axis Y: K436 (%KW436)) in area K for positioning.
- If the operation mode is set as Repeat and the Repeat step is set at 0, the step stops operating and the next step changes into 0.
  In this case, the operating step gets out of the range of 1~30 (1~80 for the compact standard/high-end type) and error code 512 comes out, so be careful of the repeating step setting when you set at the repeating operation.

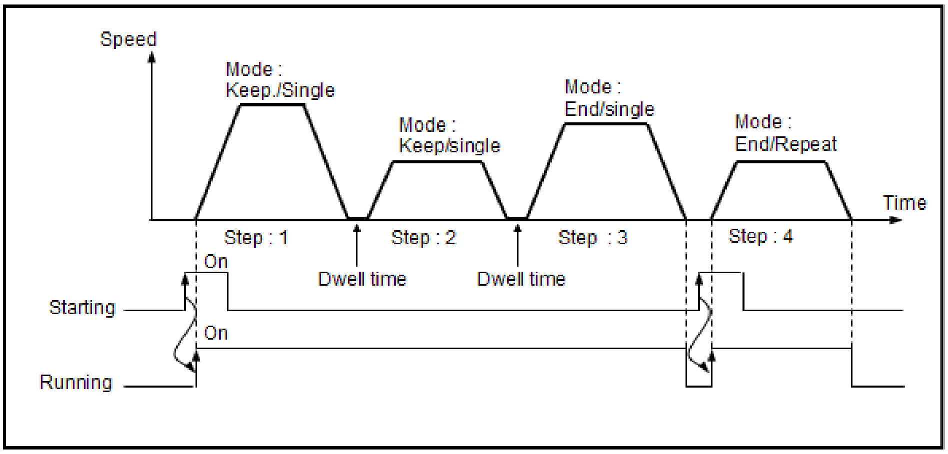
(c) Continued Operation

- Continued operation refers to the operation which carried out positioning to the target position by using the data of the corresponding operating step by the operation instruction and continues the next operating steps without any additional operation instructions with the positioning not completed after the dwell time.
- The next operating steps differ according to the current operating mode of the steps.
  A) The operation mode of the current step is single: current operating step + 1
  B) The operation mode of the current step is repetition: the step designated as Repeat in the current operation step
- If you use the continued operation pattern, you can conduct the pattern operation that sequentially carried out multiple operating steps with only one operation instruction.
- The continued operation can be explained with the operation data in the following table.

Step No.	Coordinates	Operation pattern	Control	Operation mode	Repeating step	Target position [Pulse]	M code	Acc./Dec. No.	Speed [pls/s]	Dwell time [ms]
1	Absolute	Keep	Position	Single	0	10,000	0	0	1,000	100
2	Absolute	Keep	Position	Single	0	20,000	0	0	500	100
3	Absolute	End	Position	Single	0	30,000	0	1	1,000	0
4	Absolute	End	Position	Repeat	1	40,000	0	1	500	0

1) Steps 1 and 2 are continued in the operation pattern and single in the operation mode, so they operate at 1,000pps to the pulse of absolute coordinates 10,000 and then operates step 2, the next step, without waiting for the next operation instruction when the dwell time passes. If the dwell time passes after step 2, step 3 is operated.
2) Step 3, of which the operation pattern is end, operates up to absolute coordinates 30,000, and then stops right away because the dwell time is 0, and the positioning completion bit turns on for a scan.

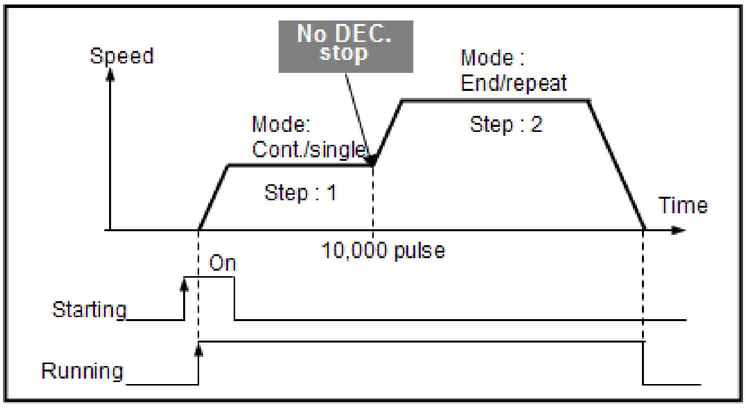
3) Since the operation mode of step 3 is single, the next step is No. 4.
4) Step 4 has been set as end/repeat 1, it operates up to absolute coordinates 40,000 when step 4 operates by the second operation instruction, and stops without dwell time, and the next step points at step 1 which has been designated as the Repeat step.
5) The operation pattern can be illustrated as follows.



(d) Incessant Operation
• Incessant operation refers to the operation that continues the steps set as continued operation by the operation instruction.
• The continued operation can be explained with the operation data in the following table.

Step No.	Coordinates	Operation pattern	Control	Operation mode	Repeating step	Target position [Pulse]	M code	Acc./Dec. No.	Speed [pls/s]	Dwell time [㎳]
1	INC	Continuous	Position	Single	0	10,000	0	1	500	100
2	INC	End	Position	Repeat	1	20,000	0	1	1,000	0

1) Since the operation pattern of step 1 has been set as continued, it operates up to the incremental coordinates 10,000 pulse at 500pps by the first operation instruction, and changes the operation speed to 1,000pps without deceleration or stop and continues to operate step 2.
2) Because the operation pattern of step 2 is end, it moves to incremental coordinates 20,000 and the positioning ends after the dwell time.



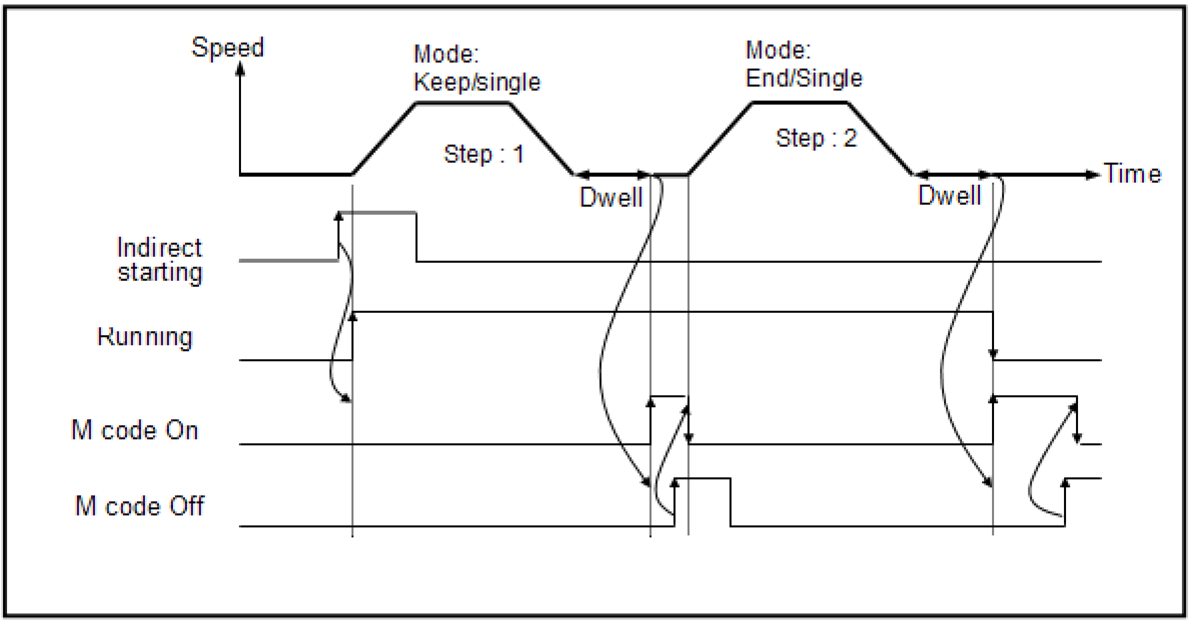
Remark

• If the direction changes during the continued operation, error code 511 comes out and the operation stops. If the direction has to change, change “Continuous” into “End” or “Keep”.

(4) Repeat Step
- Sets the step to repeat when the operation mode is set as Repeat.
- The setting range is 1~30 (1~80 for the compact standard/high-end type).

(5) Target Position
- Sets the movement of the operation of the step.
- The setting range is -2,147,483,648 ~ 2,147,483,647 (unit: Pulse).
- The target position set in operation data setting can be freely changed in the program by changing the value of area K for positioning.
- For the address of area K for positioning of each step number, see 2.2.

(6) M Code
- M code is for checking the current operation step or carrying out the auxiliary work such as tool change, clamp, and drill rotation.
- In general, the output of M code divides into the ‘With’ mode, when M code is output with the step operating, and the ‘After’ mode when M code is output after the step operation is completed.
  For XGB built-in positioning, the standard type has only the After mode, and the advanced type has all modes.
- For example, if M code output mode is set as the After mode, the positioning of the step is completed and at the same time, the M code On signal (axis X: K4203(%KX6723), axis Y: K4303 (%KX6883)) is set and the M code number set in the M code item of the step operation data is output in the M code output device (axis X: K428(%KW428), axis Y: K438(%KW438)).
- M code can be set differently for the operation steps of the positioning operation data. The setting range is 1 ~ 65,535. If you don’t want to use M code function for the step, just set it at 0. If you don’t want to use M code function for any step, set the M code output mode parameter as NONE.
- If there is the M code signal, you can reset it by using the M code Off instruction (MOF).
- If there is the M code signal, the operation differs depending on the current operation pattern.
  (a) End: Stops with M code coming out. For operation of the next operation step, the M code should be reset and the operation instruction should be executed.
  (b) Continued: Enters the Stand-by status for operation of the next step with M code coming out. For operation of the next operation step, if the M code is reset, the next operation step is operated without additional operation instructions.
  (c) Incessant: Does not stop and operates the next operation step although M code comes out. In this case, M code Off instruction can be carried out even during operation.
- For example, the output timing of M code signals in case of After Mode can be illustrated as follows.



Remark

- With M code signal On, if you execute the next operation step number, error code 233 will come out and the operation will not happen.
  Therefore, for positioning of the next operation step number with M code signal “On,” you must reset M code signal as M code Off instruction (MOF).

(7) Acceleration/Deceleration Numbers
- Sets the Acc./Dec. numbers to be used in the step during the acceleration/deceleration time set in the basic positioning parameter.
- The setting range is 1~4.
- For details about the acceleration/deceleration time, see 3.2.3.

(8) Operation Speed
- Set the target speed at which to operate in the step.
- The setting range is 1 ~ 100,000 pulse (unit:1pps).
- The operation speed should be set higher than or equal to the bias speed set in the basic positioning parameter, and lower than or equal to the speed limit.

(9) Dwell Time
- The dwell time to be applied to the operation step.
- The dwell time refers to the time needed to maintain the precise stop of the servo motor in controlling the positioning by using the servo motor, and also the standby time given before the next positioning operation when one positioning operation is finished.
- Especially when the servo motor is used, it might not reach the target position or stay excessive even though the output of the positioning function has been stopped, so the dwell time is the data that set the standby time until the stable rest.
- The operation status of the axis of the XGB positioning function during the dwell time maintains “Operation,” and if the dwell time passes, the operation status signaling bit (axis X: K4200(%KX6720), axis Y: K4300(%KX6880)) turns Off and the positioning completion signal turns On.

3.4 Positioning Status Monitoring and Area K for Input and Output

The XGB built-in positioning function controls positioning by using area K for positioning and the parameters. This Chapter describes area K for positioning.

For the relations between the XGB built-in positioning parameters and area K, see 3.2.2.

XGB built-in positioning area K divides into the bit flag, word, and double word flag. The flag in turn divides into the status monitoring flag area (for read only) and the flag for instruction and command (for read and write).

3.4.1 Status Monitoring and Flag for Positioning

This chapter describes the XGB built-in status monitoring flag for positioning (for read only).
The status monitoring flag divides into bit, word, and double word.

(1) Bit Area Flag

(a) XBM/XBC bit area flag

Variables	Device Area						Status
	Axis X			Axis Y			
	Word	Bit	Address	Word	Bit	Address	
In operation	K420	0	K4200	K430	0	K4300	0: stop, 1: operation
Error		1	K4201		1	K4301	0: no error, 1: error
Positioning completed		2	K4202		2	K4302	0: not completed, 1: completed
M code signal		3	K4203		3	K4303	0:M code Off, 1:M code On
Origin settled		4	K4204		4	K4304	0: origin not decided, 1: origin decided
No pulse output		5	K4205		5	K4305	0: output available, 1: no output
Stopped		6	K4206		6	K4306	0: not stopped 1: stopped
Upper limit detected		8	K4208		8	K4308	0: undetected, 1: detected
Lower limit detected		9	K4209		9	K4309	0: undetected, 1: detected
Emergency stop		A	K420A		A	K430A	0: normal, 1: abnormally stopped
Normal/backward rotation		B	K420B		B	K430B	0: normal direction, 1: backward direction
Operation (acceleration)		C	K420C		C	K430C	0: not accelerated, 1: accelerated
Operation (constant speed)		D	K420D		D	K430D	0: not constant speed, 1: constant speed
Operation (deceleration)		E	K420E		E	K430E	0: not decelerated, 1: decelerated
Operation (dwell)		F	K420F		F	K430F	0: not during dwell, 1: during dwell
Operation (positioning)	K421	0	K4210	K431	0	K4310	0: position not controlled 1: position controlled
Operation (speed control)		1	K4211		1	K4311	0: speed not controlled 1: speed controlled
Operation control (straight interpolation)		2	K4212		2	K4312	0: interpolation not controlled 1: interpolation controlled
Return to origin		5	K4215		5	K4315	0: not returning to origin 1: returning to origin
Position synchronization		6	K4216		6	K4316	0: position not synchronized 1: position synchronized

Speed synchronization		7	K4217		7	K4317	0: speed not synchronized 1: speed synchronized
Jog low speed		8	K4218		8	K4318	0: jog not at low speed 1: jog at low speed
Jog high speed		9	K4219		9	K4319	0: jog not at high speed 1: jog at high speed
Inching operation		A	K421A		A	K431A	0:not during inching operation 1: during inching operation

(a) XEC bit area flag

Variables	Device area		Status
	Axis X	Axis Y	
	Address	Address	
In operation	%KX6720	%KX6880	0: stop, 1: operation
Error	%KX6721	%KX6881	0: no error, 1: error
Positioning completed	%KX6722	%KX6882	0: not completed, 1: completed
M code signal	%KX6723	%KX6883	0:M code Off, 1:M code On
Origin settled	%KX6724	%KX6884	0: origin not decided, 1: origin decided
No pulse output	%KX6725	%KX6885	0: output available, 1: no output
Stopped	%KX6726	%KX6886	0: not stopped 1: stopped
Upper limit detected	%KX6728	%KX6888	0: undetected, 1: detected
Lower limit detected	%KX6729	%KX6889	0: undetected, 1: detected
Emergency stop	%KX6730	%KX6890	0: normal, 1: abnormally stopped
Normal/backward rotation	%KX6731	%KX6891	0: normal direction, 1: backward direction
Operation (acceleration)	%KX6732	%KX6892	0: not accelerated, 1: accelerated
Operation (constant speed)	%KX6733	%KX6893	0: not constant speed, 1: constant speed
Operation (deceleration)	%KX6734	%KX6894	0: not decelerated, 1: decelerated
Operation (dwell)	%KX6735	%KX6895	0: not during dwell, 1: during dwell
Operation (positioning)	%KX6736	%KX6896	0: position not controlled 1: position controlled
Operation (speed control)	%KX6737	%KX6897	0: speed not controlled 1: speed controlled
Operation control (straight interpolation)	%KX6738	%KX6898	0: interpolation not controlled 1: interpolation controlled
Return to origin	%KX6741	%KX6901	0: not returning to origin 1: returning to origin
Position synchronization	%KX6742	%KX6902	0: position not synchronized 1: position synchronized
Speed synchronization	%KX6743	%KX6903	0: speed not synchronized 1: speed synchronized
Jog low speed	%KX6744	%KX6904	0: jog not at low speed 1: jog at low speed
Jog high speed	%KX6745	%KX6905	0: jog not at high speed 1: jog at high speed
Inching operation	%KX6746	%KX6906	0:not during inching operation 1: during inching operation

(2) Status Monitoring Data Area

(a) XBM/XBC status monitoring area

Variables	Device Area				Status
	Axis X		Axis X		
	Address	Properties	Address	Properties	
Current position	K422	Double word	K432	Double word	Shows current position
Current speed	K424	Double word	K434	Double word	Shows current speed
Step No.	K426	Double word	K436	Word	Shows current operation step
Error code	K427	Word	K437	Word	Shows error code in case of an error
M code No.	K428	Word	K438	Word	Shows M code number when M code is on

(b) XBM/XBC status monitoring area

Variables	Device Area				Status
	Axis X		Axis Y		
	Address	Properties	Address	Properties	
Current position	%KD211	Double word	%KD216	Double word	Shows current position
Current speed	%KD212	Double word	%KD217	Double word	Shows current speed
Step No.	%KW426	Double word	%KW436	Word	Shows current operation step
Error code	%KW427	Word	%KW437	Word	Shows error code in case of an error
M code No.	%KW428	Word	%KW438	Word	Shows M code number when M code is on

3.4.2 Flag for Positioning Instruction and Command

The flag for positioning instruction and command divides as follows. You can easily conduct positioning operation without positioning instruction using the flag. If you change the flag for instruction of area K, the scan ends and applies in the next scan.

(1) Bit Area Flag

(a) XBM/XBC bit area flag

Variables	Device Area						Status
	Axis X			Axis Y			
	Word	Bit	Address	Word	Bit	Address	
Start signal	K429	0	K4290	K439	0	K4390	Indirect start at rising edge
Normal direction jog		1	K4291		1	K4391	0: stop jog, 1: normal direction jog operation
Backward direction jog		2	K4292		2	K4392	0: stop jog,, 1: normal direction jog operation
Jog high/low speed		3	K4293		3	K4393	0: jog low speed, 1: jog high speed
M code output mode	K468	1	K4681	K508	1	K5081	0: NONE, 1: WITH, 2: AFTER
		2	K4682		2	K5082	

Upper/lower limit detection of S/W allowed during constant speed operation		4	K4684		4	K5084	0: detection not allowed, 1: detection allowed
Return-to-origin method	K478	0,1	K4780~1	K518	1	K5180~1	0: approximate origin/origin(OFF) 1: approximate origin/origin (On) 2: approximate origin
Return-to-origin direction		2	K4782		2	K5182	0: normal direction, 1: backward direction
Use for positioning	K487	0	K4870	K527	0	K5270	0: use, 1: no use
Pulse output level		1	K4871		1	K5271	0: low Active,1: high Active
Use of upper/lower limit		2	K4872		2	K5272	0: no use, 1: use
Pulse output mode		3	K4873		3	K5273	0: CW/CCW, 1: PLS/DIR

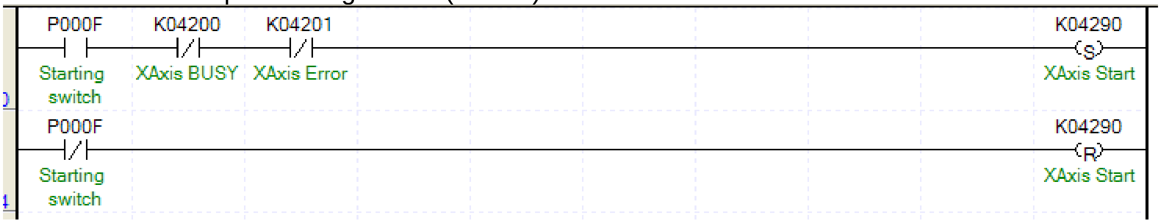
(b) XEC bit area flag

Variables	Device area		Status
	Axis X	Axis Y	
	Address	Addreess	
Start signal	%KX6864	%KX7024	Indirect start at rising edge
Normal direction jog	%KX6865	%KX7025	0: stop jog, 1: normal direction jog operation
Backward direction jog	%KX6866	%KX7026	0: stop jog,, 1: normal direction jog operation
Jog high/low speed	%KX6867	%KX7027	0: jog low speed, 1: jog high speed
M code output mode	%KX7489	%KX8129	0: NONE, 1: WITH, 2: AFTER
	%KX7490	%KX8130	
Upper/lower limit detection of S/W allowed during constant speed operation	%KX7492	%KX8132	0: detection not allowed, 1: detection allowed
Return-to-origin method	%KX7648-49	%KX8288-89	0: approximate origin/origin(OFF) 1: approximate origin/origin (On) 2: approximate origin
Return-to-origin direction	%KX7650	%KX8290	0: normal direction, 1: backward direction
Use for positioning	%KX7792	%KX8432	0: use, 1: no use
Pulse output level	%KX7793	%KX8433	0: low Active,1: high Active
Use of upper/lower limit	%KX7794	%KX8434	0: no use, 1: use
Pulse output mode	%KX7795	%KX8435	0: CW/CCW, 1: PLS/DIR

(c) Starting Signals

1) The starting signals conducts positioning operation according to the current operation step number (axis X: K426(%KW426), axis Y: K436(%KW436)) without setting the step number unlike indirect or direct starting.
2) Since the current operation step area is for read only, if you want to change the operation step number, you need to use the starting step number change instruction (SNS, APM_SNS).
3) The following program is an example of the program that indirectly starts with the operation data displayed in the current step number (K426) on axis X by setting the starting signal whenever

the external input starting switch (P000F) turns On.

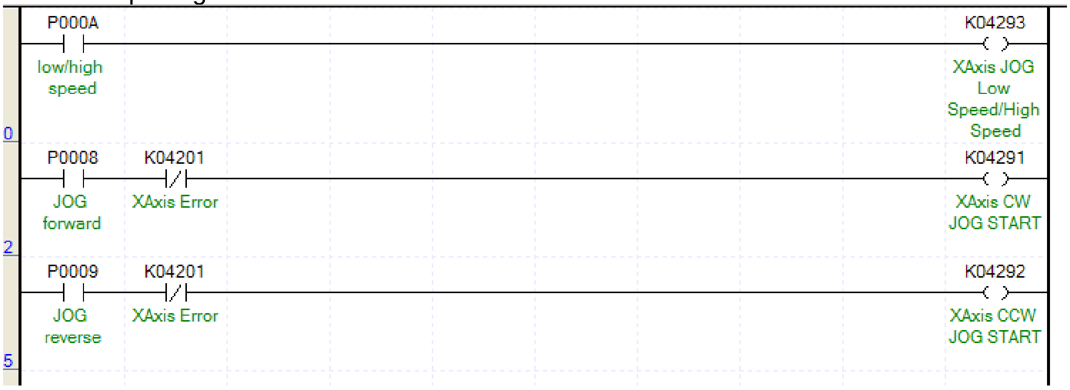


Device	Description	Device	Description
P000F(%IX0.0.15)	Axis X starting external switch	K4201(%KX6721)	Axis X error
K4200(%KX6720)	Axis X signal during operation	K4290(%KX6864)	Axis X starting instruction flag

- The program above is an example of the program that indirectly starts with the operation data of the current step number (K426 word) on axis X by setting the starting signal whenever the external input starting switch (P000F) turns On.
- When the starting switch turns On, the starting commanding flag (K4290) is set and axis X starts, and when the starting switch turns Off, the starting contact point is reset.
- Note that the set coil is used for axis X starting commanding flag (K4290) instead of ordinary coil output.
  For example, if a toggle switch is used for the starting switch, and if the starting commanding flag (K4290) is not set but ordinary coil output is used, there might be the problem that it is automatically restarted by the bit Off during operation when positioning is completed. To avoid this, use a push button switch for the external input switch, and use a set coil and reset coil according to the On/Off of the input switch for the starting commanding flag.

(b) Jog Operation

1) The following program is an example of the program that carries out the jog operation of axis X by turning on/off the flag for commanding the normal/backward direction jog according to the external input signal.



Device	Description	Device	Description
P0008(%IX0.0.8)	External input of normal direction jog	K4201(%KX6721)	Flag displaying axis X error
P0009(%IX0.0.9)	External input of backward direction jog	K4291(%KX6865)	Flag commanding normal direction jog of axis X
P000A(%IX0.0.10)	External input of jog low speed/high speed	K4292(%KX6866)	Flag commanding backward direction jog of axis X
K4200(%KX6720)	Signal of axis X during operation	K4293(%KX6867)	Flag commanding jog low/high speed of axis X

• The program above is an example of the program that carries out the jog operation in the corresponding direction while the external input normal direction jog switch (P0008) or backward direction jog switch (P0009) in On.
• Then the operation speed is jog high speed if the jog low/high speed external input (P000A) is On, and high low if Off, and can be changed during jog operation, too.
• As the start and stop of jog operation is done by the level of the input signals, if the input signal (P0008, P0009) is On, it operates, and if Off, it carries out jog stop.
• If both jog normal direction operation and backward direction operation are On, there is no error code in XGB built-in positioning, but it stops if it is currently in operation.

Remark

• If you do jog operation by adding the signal (K4200(%KX6720), K4300(%KX6880)) during operation as the normally closed contact point (contact point B) for the jog operation input condition, it alternates starting and stopping according to the On/Off of the signal during operation.

(2) Data Area for Positioning Setting

(a) In case of XBM/XBC

Variables	Device Area				Status
	Axis X		Axis Y		
	Address	Properties	Address	Properties	
Bias speed	K0450	Double word	K0490	Double word	Sets bias speed.
Speed limit	K0452	Double word	K0492	Double word	Sets maximum speed limit.
Acceleration time 1	K0454	Word	K0494	Word	Sets acceleration time 1.
Deceleration time 1	K0455	Word	K0495	Word	Sets deceleration time 1.
Acceleration time 2	K0456	Word	K0496	Word	Sets acceleration time 2.
Deceleration time 2	K0457	Word	K0497	Word	Sets deceleration time 2.
Acceleration time 3	K0458	Word	K0498	Word	Sets acceleration time 3.
Deceleration time 3	K0459	Word	K0499	Word	Sets deceleration time 3.
Acceleration time 4	K0460	Word	K0500	Word	Sets acceleration time 4.
Deceleration time 4	K0461	Word	K0501	Word	Sets deceleration time 1
Upper limit of software	K0462	Double word	K0502	Double word	Sets upper limit value of software.
Lower limit of software	K0464	Double word	K0504	Double word	Sets lower limit value of software.
Backlash correction	K0466	Word	K0506	Word	Sets backlash correction value.
Origin address	K0469	Double word	K0509	Double word	Sets origin address for origin return.
High speed of origin return	K0471	Double word	K0511	Double word	Sets high speed for origin return.
Low speed of origin return	K0473	Double word	K0513	Double word	Sets low speed for origin return.
Acceleration time for origin return	K0475	Word	K0515	Word	Sets acceleration time for origin return
Deceleration time for origin return	K0476	Word	K0516	Word	Sets deceleration time for origin return
Dwell time for origin return	K0477	Word	K0517	Word	Sets dwell time for origin return
Jog high speed	K0479	Double word	K0519	Double word	Sets high speed for jog operation.
Jog low speed	K0481	Double word	K0521	Double word	Sets low speed for jog operation
Jog acceleration time	K0483	Word	K0523	Word	Sets acceleration time for jog operation
Jog deceleration time	K0484	Word	K0524	Word	Sets deceleration time for jog operation
Inching speed	K0485	Word	K0525	Word	Sets operation speed for inching operation.

(b) In case of XEC

Variables	Device area				Status
	Axis X		Axis Y		
	Address	Properties	Address	Properties	
Bias speed	%KD225	Double word	%KD245	Double word	Sets bias speed.
Speed limit	%KD226	Double word	%KD246	Double word	Sets maximum speed limit.
Acceleration time 1	%KW454	Word	%KW494	Word	Sets acceleration time 1.
Deceleration time 1	%KW455	Word	%KW495	Word	Sets deceleration time 1.
Acceleration time 2	%KW456	Word	%KW496	Word	Sets acceleration time 2.
Deceleration time 2	%KW457	Word	%KW497	Word	Sets deceleration time 2.
Acceleration time 3	%KW458	Word	%KW498	Word	Sets acceleration time 3.
Deceleration time 3	%KW459	Word	%KW499	Word	Sets deceleration time 3.
Acceleration time 4	%KW460	Word	%KW500	Word	Sets acceleration time 4.
Deceleration time 4	%KW461	Word	%KW501	Word	Sets deceleration time 1
Upper limit of software	%KD231	Double word	%KD251	Double word	Sets upper limit value of software.
Lower limit of software	%KD232	Double word	%KD252	Double word	Sets lower limit value of software.
Backlash correction	%KW466	Word	%KW506	Word	Sets backlash correction value.
Origin address	%KD234	Double word	%KD254	Double word	Sets origin address for origin return.
High speed of origin return	%KD235	Double word	%KD255	Double word	Sets high speed for origin return.
Low speed of origin return	%KD236	Double word	%KD256	Double word	Sets low speed for origin return.
Acceleration time for origin return	%KW475	Word	%KW515	Word	Sets acceleration time for origin return
Deceleration time for origin return	%KW476	Word	%KW516	Word	Sets deceleration time for origin return
Dwell time for origin return	%KW477	Word	%KW517	Word	Sets dwell time for origin return
Jog high speed	%KD239	Double word	%KD259	Double word	Sets high speed for jog operation.
Jog low speed	%KD240	Double word	%KD260	Double word	Sets low speed for jog operation
Jog acceleration time	%KW483	Word	%KW523	Word	Sets acceleration time for jog operation
Jog deceleration time	%KW484	Word	%KW524	Word	Sets deceleration time for jog operation
Inching speed	%KW485	Word	%KW525	Word	Sets operation speed for inching operation.

(3) Status Monitoring and Commanding Flag by Operation Step
(a) In case of XBM/XBC (Step 01)

Variables	Device area			Status
	Axis X Address	Axis Y Address	properties	
Step 01 target position	K0530	K0830	Double word	
Step 01 operation speed	K0534	K0834	Double word	
Step 01 dwell time	K0536	K0836	Word	
Step 01 M code number	K0537	K0837	Word	
Step 01 operation method	K05380	K08380	Bit	
Step 01 control method	K05381	K08381	Bit	
Step 01 operation pattern (Low)	K05382	K08382	Bit	
Step 01 operation pattern (High)	K05383	K08383	Bit	
Step 01 coordinates	K05384	K08384	Bit	
Step 01 acc./dec. number (Low)	K05386	K08386	Bit	
Step 01 acc./dec. number (High)	K05387	K08387	Bit	
Step 01 coordinates	K0539	K0839	Word	

(b) In case of XBM/XBC (Step 01)

Variables	Device area			Status
	Axis X Address	Axis Y Address	properties	
Step 01 target position	%KD265	%KD415	Double word	
Step 01 operation speed	%KD267	%KD417	Double word	
Step 01 dwell time	%KW536	%KW836	Word	
Step 01 M code number	%KW537	%KW837	Word	
Step 01 operation method	%KX8608	%KX13408	Bit	
Step 01 control method	%KX8609	%KX13409	Bit	
Step 01 operation pattern (Low)	%KX8610	%KX13410	Bit	
Step 01 operation pattern (High)	%KX8611	%KX13411	Bit	
Step 01 coordinates	%KX8612	%KX13412	Bit	
Step 01 acc./dec. number (Low)	%KX8614	%KX13414	Bit	
Step 01 acc./dec. number (High)	%KX8615	%KX13415	Bit	
Step 01 coordinates	%KW539	%KW839	Word	

• The table above shows the area K for positioning of the operation step #1. You can change the operation data without setting the parameters by changing the value of the corresponding area K.
• If you want to permanently preserve the operation data of the changed area K, apply the data of current area K to the built-in parameter area by using the applied instruction (WRT instruction, APM_WRT instruction).

Remark

• Note that area K for positioning is initialized if you cut the power and re-supply power or if you change the operation mode without executing the WRT instruction after changing the value of area K.
• The variable of area K for each step can be used more conveniently by using the variable registration function of XG5000. For the positioning monitor registration, see the manual of XG5000.

Chapter 4 Positioning Check

This Chapter describes how to test the operation test to check whether the positioning function is well performed before the XGB positioning function is used.

4.1 The Sequence of Positioning Check

This is for checking whether the XGB positioning operation is normally performed by carrying out normal and reverse direction jog operation. The sequence is as follows.

(1) Power Off

- Distribution is needed to check the XGB positioning operation.
  Before distribution, turn off XGB.
- Be sure to check whether the PWR LED of XGB is off before moving on to the next step.

(2) Input Signal Distribution

- Distribute the input signals needed to check the operation as follows.
- Do not connect the output signal line to the motor driver. If there is a problem with the PLC hardware, connecting to the motor driver might lead to malfunction or damage to the equipment.

Input Signal	Contact Point Type	Contact Point No.			Remark
			XBC	XEC	
Jog normal direction switch	Contact point normally open (A)	Axis X	P0010	%IX0.0.16	Contact point randomly selected
		Axis Y	P0011	%IX0.0.17	Contact point randomly selected
Jog reverse direction switch		Axis X	P0012	%IX0.0.18	Contact point randomly selected
		Axis Y	P0013	%IX0.0.19	Contact point randomly selected

(3) Making the Program for Operation Check

- Make the program for checking the operation by using XG5000. For the details and making of the program, see '4.2 Making of the Program for Operation Check.'

(4) Power Supply and Program Writing

- If you have finished making the program, supply power to XGB PLC, and use XGB as the parameter and the program.

(5) Input Contact Point Operation Check

- Before switching the operation mode of the PLC to RUN, check the normal operation of the input contact point as follows.

Input Signal	Contact No.			Operation Check
		XBC	XEC	
Jog normal direction	Axis X	P0010	%IX0.0.16	• Check whether the LED of the contact point turns on while the switch is ON and the value of the contact point changes into 1 in the device monitor of XG5000.
	Axis Y	P0011	%IX0.0.17	
Jog reverse direction	Axis X	P0012	%IX0.0.18	
	Axis Y	P0013	%IX0.0.19	

- If the device doesn't work as described in the table above, there might be a problem with the LED or the input hardware, so contact the customer center.

(6) Operation Check through Jog Operation

• Check the operation of XGB positioning doing jog operation in the following sequence.
• This manual describes the axis X operation check when the pulse output mode is PLS/DIR mode and the pulse output level is set as Low Active. Check the operation of axis Y. in the same manner.

(a) Check of Normal Direction Rotation of Jog

• Turn on the normal direction switch(P0010) of axis X, with the reverse direction switch of the jog set at Off.
• Check whether the XGB positioning function normally generates jog normal direction output.
1) Check of the output LED
- P0020 (%QX0.0.0) : flashes quickly
- P0022 (%QX0.0.2) : stays ON
2) Check of area K
- Check whether the current position address is increasing by checking the current position address area (axis X: K422 double word) with XG5000.

(b) Check of Normal Direction Stop of Jog

• Turn Off the jog normal direction switch (P0010, %IX0.0.16) during jog normal direction operation, and check whether the output LED (P0020, %QX0.0.0, P0022, %QX0.0.2) is Off, the current position address area (axis X: K422, %KD211 double word) with XG5000, and whether the current position address has stopped increasing.

(c) Check of Reverse Direction Rotation of Jog

• Turn on the axis X jog reverse direction switch (P0012, %IX0.0.18)), with the normal direction switch of the jog Off.
• Check whether the XGB positioning function is generating jog reverse direction output normally.
1) Output LED Check
- P0020(%QX0.0.0) : flashes quickly
- P0022(%QX0.0.2) : stays OFF
2) Check of area K
- Check whether the current position address is decreasing by checking the current position address area (axis X: K422, %KD211 double word) with XG5000

(d) Check of Reverse Direction Stop of Jog

• Turn Off the jog reverse direction switch (P0012, %IX0.0.18) during jog reverse direction operation, and check whether the output LED (P0020, %QX0.0.0, P0022, %QX0.0.2) is Off, the current position address area (axis X: K422, %KD211 double word) with XG5000, and whether the current position address has stopped decreasing

(e) For compact standard type, there is not actual output P00040/P00044 and they are indicated by LED.

(7) Finish of Positioning Check

• When you have finished checking whether the jog normal and reverse operation is normally operating through the process above, end the check, make the positioning operation program to be actually used and conduct the positioning operation.

4.2 Making of Operation Check Program

The program for operation check used in this manual should be made as follows.

The positioning parameters should be set as follows.
For setting the positioning parameters, see 3.2.

(1) Positioning Basic Parameters

Items	Range	Set Values	Data Size
Positioning	0 : not used, 1 : used	0	Bit
Pulse output level	0 : Low Active, 1 : High Active	0	Bit
Pulse output mode	0 : CW/CC, 1 : PLS/DIR	1	Bit
M code output mode	0 : NONE, 1 : WITH, 2 : AFTER	0	2 Bit
Bias speed	1 ～ 100,000[pulse/sec.]	1	Double word
Speed limit	1 ～ 100,000[pulse/sec.]	100,000	Double word
Acceleration time 1	0 ~ 10,000[unit: ms]	500	Word
Deceleration time 1	0 ~ 10,000[unit: ms]	500	Word
Acceleration time 2	0 ~ 10,000[unit: ms]	1,000	Word
Deceleration time 2	0 ~ 10,000[unit: ms]	1,000	Word
Acceleration time 3	0 ~ 10,000[unit: ms]	1,500	Word
Deceleration time 3	0 ~ 10,000[unit: ms]	1,500	Word
Acceleration time 4	0 ~ 10,000[unit: ms]	2,000	Word
Deceleration time 4	0 ~ 10,000[unit: ms]	2,000	Word
S/W upper limit	-2,147,483,648 ～ 2,147,483,647 [pulse]	2,147,483,647	Double word
S/W lower limit	-2,147,483,648 ～ 2,147,483,647 [pulse]	-2,147,483,648	Double word
Backlash correction	0 ～ 65,535[pulse]	0	Word
SW upper and lower limit during constant speed operation	0 : not detected, 1 : detected	0	Bit
Use of upper and lower limit	0 : not used, 1 : used	1	Bit

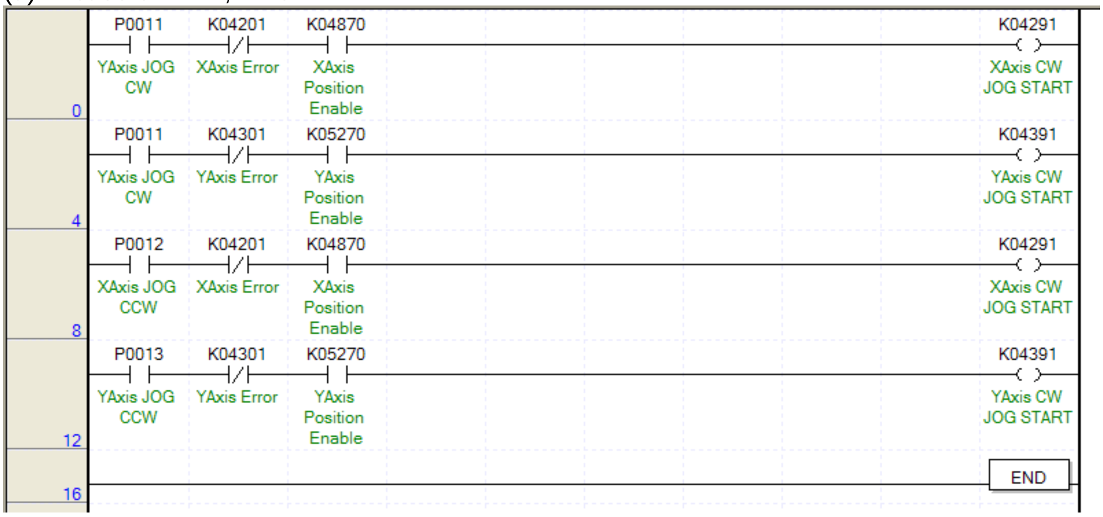
(2) Home return/Manual Operation Parameter

Items	Range	Initial Values	Data Size
Home return method	0 ~2	0	Bit
Home return direction	0 : normal direction, 1 : reverse direction	1	Bit
Origin address	-2,147,483,648～2,147,483,647[pulse]	0	Double word
Home return high speed	1 ～ 100,000[pulse/sec.]	5,000	Double word
Home return low speed	1 ～ 100,000[pulse/sec.]	500	Double word
Home return acceleration time	0 ~ 10,000[unit: ms]	1,000	Word
Home return deceleration time	0 ~ 10,000[unit: ms]	1,000	Word
Dwell time	0 ~ 50,000[unit: ms]	0	Word
JOG high speed	1 ～ 100,000[pulse/sec.]	5,000	Double word
JOG low speed	1 ～ 100,000[pulse/sec.]	1,000	Double word
JOG acceleration time	0 ~ 10,000[unit: ms]	1,000	Word
JOG deceleration time	0 ~ 10,000[unit: ms]	1,000	Word
Inching speed	1 ～ 65,535[pulse/sec.]	100	Word

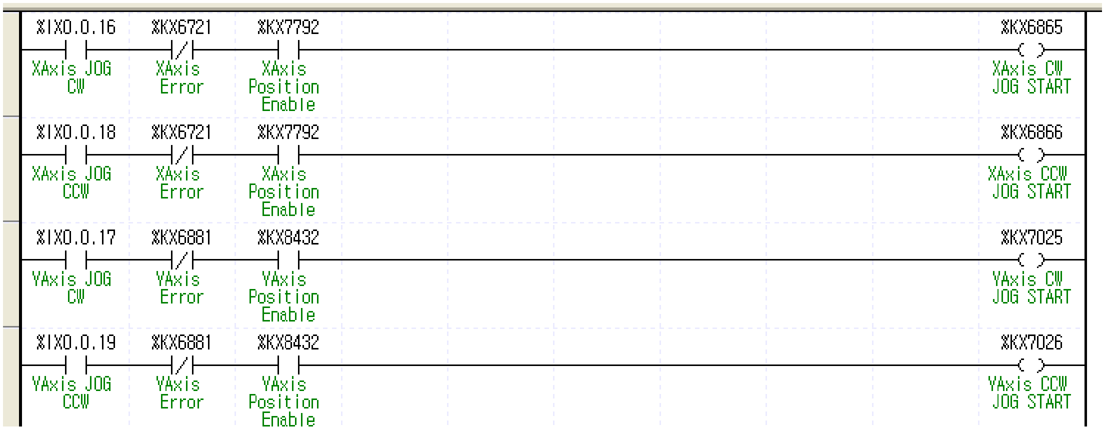
(3) Example of the Program

The following is an example of the program for positioning check.

(a) In case of XBM, XBC



(b) In case of XEC



Chapter 5 Positioning Instructions

This chapter describes the definitions, functions, use of the positioning instructions used in XGB positioning functions and the program examples.

5.1 Positioning Instruction List

The positioning instructions used for XGB positioning are as follows.

(1) In case of XBC/XBM

Instructions	Description	Conditions	Remark
ORG	Start return to the origin	Slot, instruction axis	5.2.1
FLT	Set floating origin	Slot, instruction axis	5.2.2
DST	Direct starting	Slot, instruction axis, position, speed, dwell time, M code, control word	5.2.3
IST	Indirect starting	Slot, instruction axis, step number	5.2.4
LIN	Linear interpolation starting	Slot, instruction axis, step number, axis information	5.2.5
SST	Simultaneous starting	Slot, instruction axis, axis X step, axis Y step, axis Z step, axis information	5.2.6
VTP	Speed/position switching	Slot, instruction axis	5.2.7
PTV	Position/speed switching	Slot, instruction axis	5.2.8
STP	Stop	Slot, instruction axis, deceleration time	5.2.9
SSP	Position synchronization	Slot, instruction axis, step number, main axis position, main axis setting	5.2.10
SSS	Speed synchronization	Slot, instruction axis, synchronization rate, delay time	5.2.11
POR	Position override	Slot, instruction axis, position	5.2.12
SOR	Speed override	Slot, instruction axis, speed	5.2.13
PSO	Positioning speed override	Slot, instruction axis, position, speed	5.2.14
INCH	Inching starting	Slot, instruction axis, inching amount	5.2.15
SNS	Change starting step number	Slot, instruction axis, step number	5.2.16
MOF	Cancel M code	Slot, instruction axis	5.2.17
PRS	Preset current position	Slot, instruction axis, position	5.2.18
EMG	Emergency stop	Slot, instruction axis	5.2.19
CLR	Reset error, cancel output inhibition	Slot, instruction axis, inhibit/allow pulse output	5.2.20
WRT	Save parameter/operation data	Slot, instruction axis, select the storage area	5.2.21
PWM	Pulse width modulation	Slot, instruction axis, output cycle, off duty rate	5.2.22

• XGB positioning instructions are activated at the rising edge. That is, when the execution contact point is On, it carried out the instruction only once. (PWM insturction is activated at the “On” level)

(2) In case of XEC

Function Block	Description	Conditions	Remark
APM_ORG	Start return to the origin	Req, Base, Slot, Axis	5.3.2
APM_FLT	Set floating origin	Req, Base, Slot, Axis	5.3.3
APM_DST	Direct starting	Req, Base, Slot, Axis, Position, speed, dwell time, M code, position/speed, absolute/incremental, ACC/DEC time	5.3.4
APM_IST	Indirect starting	Req, Base, Slot, Axis, step number	5.3.5
APM_LIN	Linear interpolation starting	Req, Base, Slot, Axis, step number	5.3.6
APM_SST	Simultaneous starting	Req, Base, Slot, Axis, X axis step, Y axis step, Z axis step	5.3.7
APM_VTP	Speed/position switching	Req, Base, Slot, Axis	5.3.8
APM_PTV	Position/speed switching	Req, Base, Slot, Axis	5.3.9
APM_STP	Stop	Req, Base, Slot, Axis, ACC/DEC time	5.3.10
APM_SSP	Position synchronization	Req, Base, Slot, Axis, Step number, main axis, Main axis position	5.3.11
APM_SSSB	Speed synchronization	Req, Base, Slot, Axis, main axis, rate of sub-axis, delay time	5.3.12
APM_POR	Position override	Req, Base, Slot, Axis, position	5.3.13
APM_SOR	Speed override	Req, Base, Slot, Axis, speed	5.3.14
APM_PSO	Positioning speed override	Req, Base, Slot, Axis, position, speed	5.3.15
APM_INC	Inching starting	Req, Base, Slot, Axis, inching amount	5.3.16
APM_SNS	Change starting step number	Req, Base, Slot, Axis, step number	5.3.17
APM_MOF	Cancel M code	Req, Base, Slot, Axis	5.3.18
APM_PRS	Preset current position	Req, Base, Slot, Axis, position	5.3.19
APM_EMG	Emergency stop	Req, Base, Slot	5.3.20
APM_RST	Reset error, cancel output inhibition	Req, Base, Slot, Axis, Enable/Disable pulse output	5.3.21
APM_WRT	Save parameter/operation data	Req, Base, Slot, Axis, Select area to save	5.3.22
APM_PWM	Pulse width modulation	Reg, Slot, Axis, output cycle, off duty rate	5.3.23

5.2 Details of Positioning Instructions (In case of XBC/XBM)

5.2.1 Origin Return Instructions

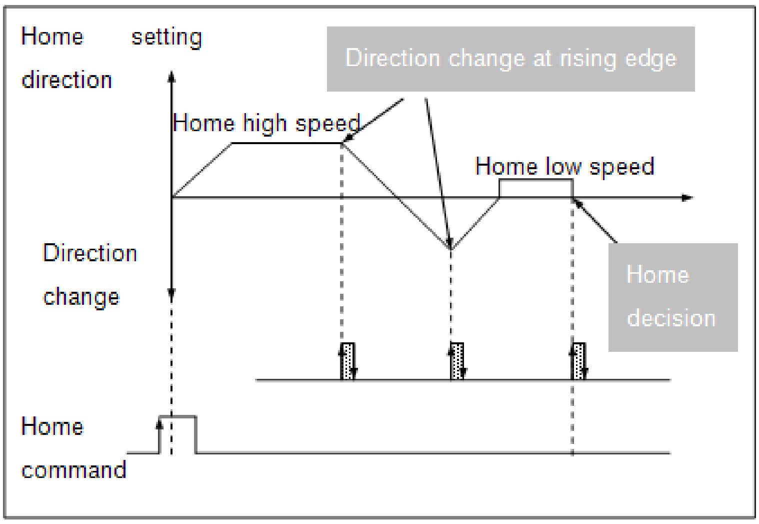
• Origin return is sued to check the origin of the machine when power is supplied to the machine in general. If the origin return instruction is given, it is executed depending on the setting of the origin return parameter. (for setting of the origin return parameter, refer to 3.2.4.)

Type	Items	Description	Remark
origin return parameter	origin return method	Set origin return method	
	origin return direction	Starting direction during origin return operation	
	Origin address	origin address in detecting origin	
	origin return speed	high/low speed during origin return operation	
	origin return dec./acc. time	dec./acc. time during origin return operation	
	origin return deceleration time	Set deceleration time during origin return operation	
	DWELL time	Time it takes to remove remaining pulse of the deviation counter right after origin return is finished	

• In general, the origin return divides into two ways, one of which is using the DOG and the other is not using it. In XGB positioning function, the following three ways can be used that use the DOG. (for details of the origin return method, refer to 3.1.9.)

Origin return method	Necessary input signals	Remark
Detect origin after DOG turns Off (0: DOG/origin (OFF))	DOG signal, origin signal	( ) is what is displayed in the positioning origin/manual parameter.
When DOG is On, detect the origin after deceleration . (1: DOG/origin (On))	DOG signal, origin signal	
Detect the origin by DOG (2: DOG)	DOG signal	

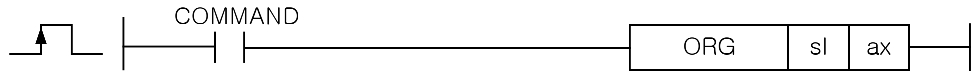
• The following diagram is an example of origin detection by DOG among the three ways of origin return.



(1) Origin return Instruction (ORG)

Instruction		Available areas														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
ORG	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				

ORG



A

[Area seting]

Operand	Description	Setting range	Data size
sl	Slot number where positioning modules are mounted	XGB is fixed at 0.	WORD
ax	The axis to give instructions	0(axis X) or 1(axis Y)	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function
- This instruction is for carrying out the origin return of the XGB built-in positioning function.
- It gives the origin return instruction to the axis designated as the ax of positioning built in XGB at the rising edge of the input condition.
- When origin return is completed, the origin setting bit (axis X:K4204,axis Y:K4304) turns On and the current address is preset at the address value set in the origin return parameter.

(s) Error
- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.
- This is an error of instruction execution, so the error flag (axis X:K4201,axis Y: K4301) of area K for positioning does not turn On.

(2) Related Device Alarm
- The parameters and area K devices related to ORG instructions are as follows.

Parameter		**Area K**			**Data size**
Item	**Setting range**	**axis X**	**axis Y**	**Properties**	
origin return method	0 : DOG/Home(Off) 1 : DOG/Home(On) 2 : DOG	K4780 K4781	K5180 K5181	Read/write	2 bit
origin return direction	0 : CW, 1 : CCW	K4782	K5182	Read/write	Double word
Origin address	-2,147,483,648～2,147,483,647[pulse]	K469	K509	Read/write	Double word
origin return high speed	1 ～ 100,000[pps]	K471	K511	Read/write	Double word

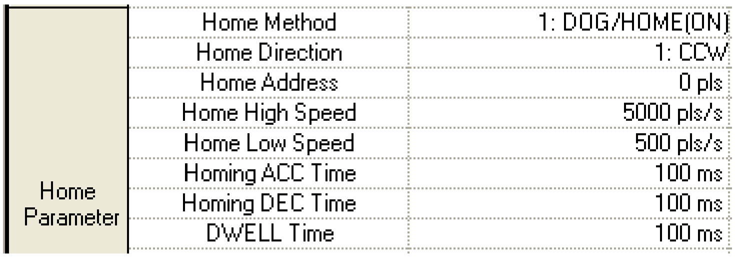
Parameter		Area K			Data size
Item	Setting range	Data size	axis Y	Properties	
origin return low speed	1 ~ 100,000[pps]	K473	K513	Read/write	Double word
origin return acceleration time	0 ~ 10,000[ms]	K475	K515	Read/write	Word
origin return deceleration time	0 ~ 10,000[ms]	K476	K516	Read/write	Word
Dwell time	0 ~ 50,000[ms]	K477	K517	Read/write	Word

(3) Examples of Instructions

- The origin return instructions are described as follows with the examples of the parameters and programs.
- The examples of the ORG instructions are described on the basis of axis X.

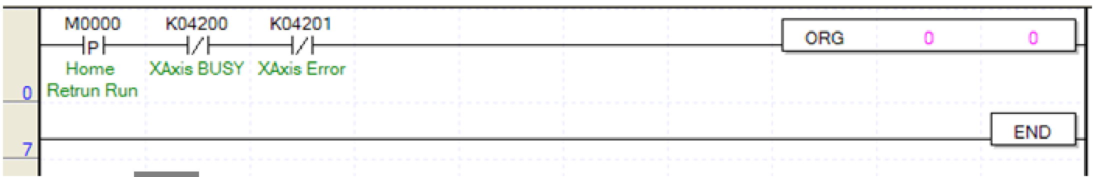
(a) Parameter Setting

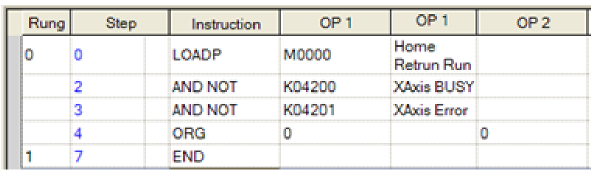
Parameter	
Item	Value
origin return method	1: DOG /origin(On)
origin return direction	1: reverse direction
Origin address	0
origin return high speed	50,000[pps]
origin return low speed	500[pps]
origin return acceleration time	100[ms]
origin return deceleration time	100[ms]
Dwell time	100[ms]



Home Parameter		
	Home Method	1: DOG/HOME(ON)
	Home Direction	1: CCW
	Home Address	0 pls
	Home High Speed	5000 pls/s
	Home Low Speed	500 pls/s
	Homing ACC Time	100 ms
	Homing DEC Time	100 ms
	DWELL Time	100 ms

(b) Examples of the Program





Rung	Step	Instruction	OP 1	OP 1	OP 2
0	0	LOADP	M0000	Home Retrun Run	
	2	AND NOT	K04200	XAxis BUSY	
	3	AND NOT	K04201	XAxis Error	
	4	ORG	0		0
1	7	END			

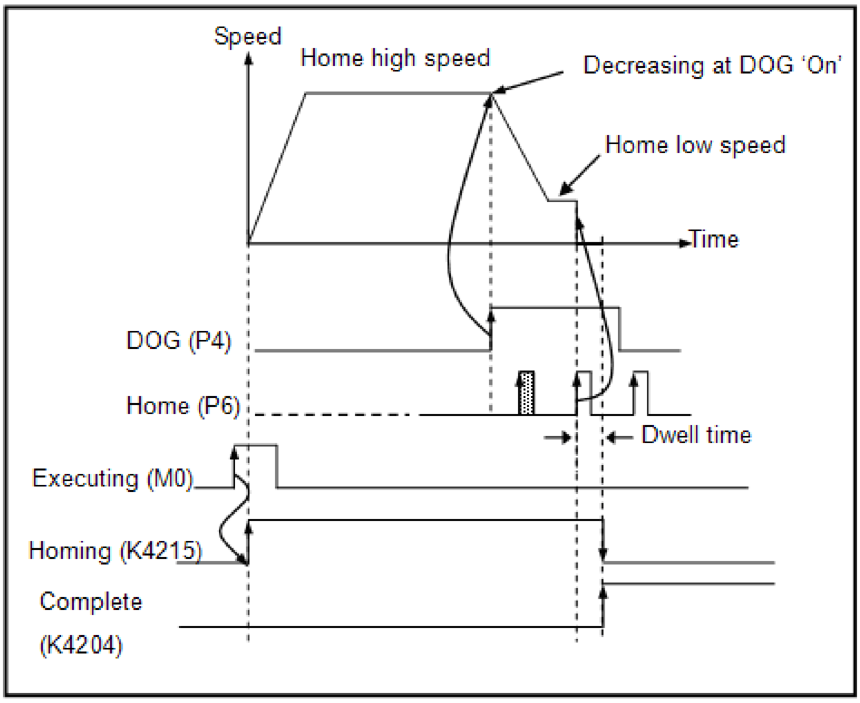
(c) Devices Used

Device	Description
M0000	Starting signal of axis X origin return
K4200	Signal during axis X operation
K4201	axis X error

(d) Program Operation

• The ORG instruction is executed when there is the rising edge of M0000 which was used as the starting signal of the axis X origin return.
(It doesn't work if axis X is operating or in error)

1) If the origin return instruction (ORG instruction) is executed, it is decelerated in the reverse direction as set in the origin return parameter and operates at origin return high speed (50,000pps).
2) If there is the rising edge of the DOG signal during origin return high speed operation, it is decelerated and operates at origin return low speed (500pps). The deceleration time is 100ms, set in the parameter.
3) If the origin signal is input, which is the external input signal, after switch to the origin return low speed, the output immediately stops, and the origin determining status flag (K4204 bit) turns On after the dwell time (100ms).
(There may be a delay as long as 'dwell time + 1 scan time' until the origin determining status flag (K4204 bit) turns On after the output stops.)
4) Then the current address is preset at 0, which is the origin address set in the parameter.



• The DOG signal and origin signal are respectively fixed as the following contact points.

	Standard		Compact standard/high-end type	
	DOG	origin	DOG	origin
axis X	P0004	P0005	P000C	P000D
axis Y	P0006	P0007	P000E	P000F

• If the contact points of the DOG and the origin input are used together as the external preset input of the high speed counter, or together as the starting signal of the external contact point task, the origin detection might be inaccurate.
• The current position address does not change during origin return.

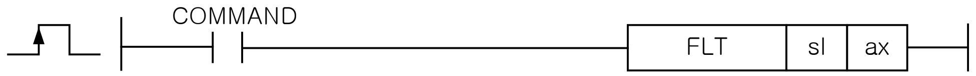
5.2.2 Floating Origin Setting Instruction

• Floating origin setting refers to setting the current position as the origin by force with the instruction without carrying out the actually mechanical origin return.

(1) Floating origin Setting Instruction (FLT)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
FLT	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				

FLT



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot number where positioning module is mounted	XGB is fixed at 0	WORD
ax	Axis to give instruction	0(axis X) or 1(axis Y)	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• This instruction is for setting the floating origin to the XGB built-in positioning.
• The instruction of setting the floating origin is given to the axis designated as ax of XGB positioning at the rising edge of the input condition.
• If the instruction is carried out, the current position address becomes 0, and the origin determining bit (axis X: K4204,axis Y:K4304) turns On.

(b) Error

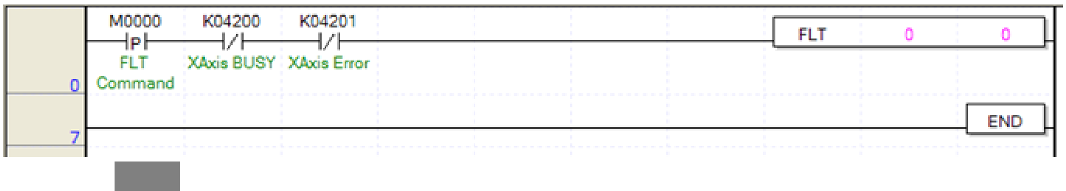
• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed

• Floating origin setting presets the current position at 0 and only fixs the origin, so you need to note the following when you use the instruction of setting the floating origin.
  → Check whether there is an error before carrying out the floating origin setting instruction. If there is an error, remove the cause of the error, reset the error (CLR instruction) and terminate the output inhibition.
  → Now set the floating origin, change the step number to operate into the starting step change instruction (SNS), and then get it started.

(2) Example of Use of the Instruction

• The floating origin setting instruction is described with the example of the following program.
• The example of use of the FLT instruction is described on the basis of axis X.

(a) Example of the Program



Rung	Step	Instruction	OP 1	OP 1	OP 2
0	0	LOADP	M0000	FLT Command	
	2	AND NOT	K04200	XAxis BUSY	
	3	AND NOT	K04201	XAxis Error	
	4	ORG	0		0
1	7	END			

(b) Device Used

Device	Description
M0000	axis X floating origin instruction signal
K4200	Signal during axis X operation
K4201	axis X error

(c) Operation of the Program

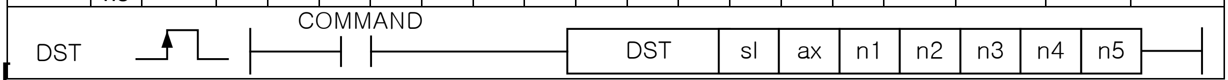
• The FLT instruction is executed when there is the rising edge of M0000, which was used as axis X floating origin instruction signal.
  (Not if axis X is operating or in error)
• If the FLT instruction is executed, the origin is fixed right away at the current position differently from the origin return, the origin determining signal (axis X:K4204) turns On, and the current address is preset at 0.

5.2.3 Direct Starting Instruction

• Direct starting refers to designating the operation data of the target position and speed from the positioning instruction (DST instruction) for operation without using the setting of the step set in the positioning operation data.

(1) Direct Starting Instruction (DST)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
DST	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n2	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n3	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n4	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n5	○	-	○	-	-	-	○	-	-	○	-	-	○	-				



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Target position	-2,147,483,648~2,147,483,647[Pulse]	DINT
n2	Target speed	1~100,000[pps]	DWORD
n3	dwell time	0~50,000[㎳]	WORD
n4	M code number	M code (0~65,535)	WORD
n5	Control word	See '(a) function'	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• This instruction is for directly ordering the start to XGB built-in positioning.
• This instruction carries out direct starting of the axis designated as ax of XGB positioning at the rising edge of input condition.
• If the instruction is executed, positioning operation is started by using the target position set in n1, the target speed set in n2, the dwell time set in n3, and the M code number set in n4 instead of the operation data set in the step number (axis X:K426, axis Y:K436 word) of area K.
• The absolute/Incremental coordinates, position/speed control and acceleration/deceleration pattern number are fixed by the setting of each bit of the control word set as n5.

Bit number	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Setting item	Not used									Acc./dec. time		coordinates setting	Not used			control method
Setting range	-									0: 1, 1:2 2:3, 3:4		0: absolute 1: ncremental	-			0: position 1: speed

- The instruction only sets the item of the operation data, and the basic parameter items related to the operation such as the bias speed and speed limit are fixed in the positioning basic parameters.
- If you use the DST instruction, the operation pattern is fixed as End operation, and the operation method is fixed as the single operation. But if continued operation or repeated operation is needed, use indirect starting (IST instruction).

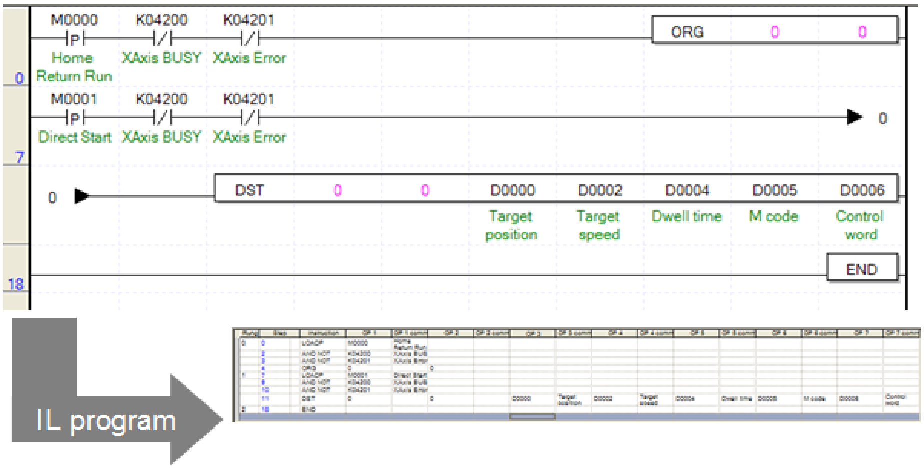
(b) Error

- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.
- This case if an error of execution of the instruction, so the error of positioning area K flag (axis X:K4201, axis Y: K4301) does not turn On.

(2) Example of Use of the Instruction

- Direct starting instruction is described with the example of the following program.
- The example of use of the DST instruction is described on the basis of axis X.

(a) Example of the Program



(b) Device Used

Device	Description	Data size	Example of setting
M0000	axis X origin return instruction signal	BIT	-
M0001	axis X direct starting instruction signal	BIT	-
K4200	signal during axis X operation	BIT	-
K4201	axis X error	BIT	-
D0000	Target position	DINT	100,000
D0002	Target speed	DWORD	30,000
D0004	Dwell time	WORD	100
D0005	M code number	WORD	123
D0006	Control word	WORD	H'20※

※ H`20 : Bit5~6 : 1 (No.2 acceleration/deceleration pattern), Bit 4 : 0 (absolute coordinates), Bit0 : 0(position control)

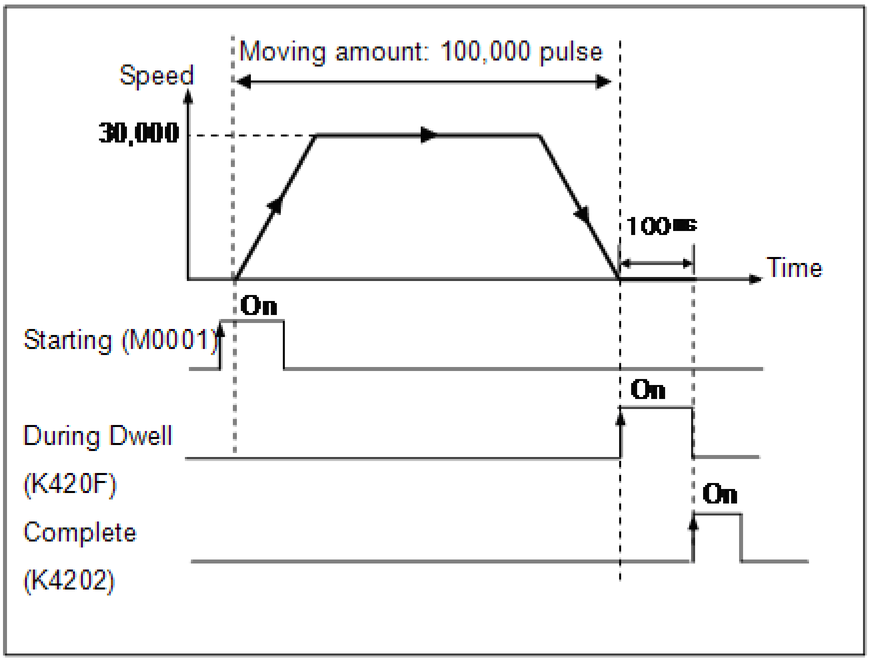
(c) Operation of the Program

• If there is the rising edge of M0001 used as the direct starting instruction signal of axis X, the DST instruction is executed.
(Not if axis X is operating or in error.)

• If the origin is not fixed when the DST is started, error code 224 will appear and operation will not occur. In such a case, turn on M0000, execute the ORG instruction and thereby carry out the origin return, and start the DST instruction.

1) If the DST instruction is executed, the positioning operation gets started as set in the operand as follows.
   - Since sl and ax are 0, built-in positioning axis X is started.
   - The target position will be 100,000 pulse set as double word in D0002.
   - The target speed will be 30,000 pps set as double word in D0002.
   - After positioning is finished, the dwell time becomes 100ms set in D0004, and No.123 designated in D0005 will be output as the M code.
   - Since the control word of D0006 is H`20, the acceleration/deceleration pattern will follow the acceleration time 2 and deceleration time 2 of the basic parameter, and the positioning operation will be done as the absolute coordinates. If the DST instruction is started, the position control will be executed in the absolute coordinates, it will operate up to the 100,000 pulse at 30,000 pps, then stop, and after the dwell time of 100 ms passes, the positioning is finished, and M code outputs 123.

2) If positioning is finished by direct starting, positioning finish signal (axis X:K4202) turns on for a scan.

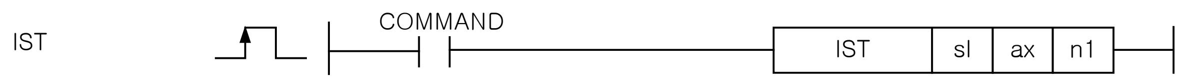


5.2.4 Indirect Starting Instruction

- Indirect starting refers to execution of the positioning operation by using the operation step data set in the positioning operation data.

(1) Indirect Starting Instruction (IST)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
IST	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Step number to start	0~30(standard), 0~80(advanced)	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

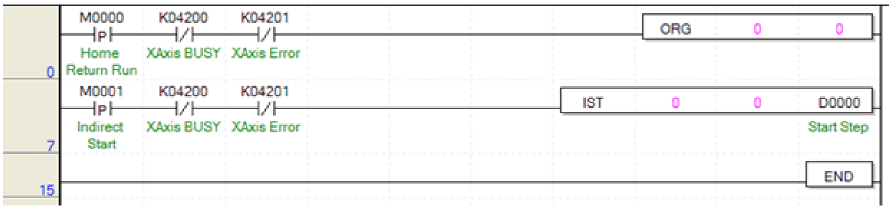
- This instruction is giving indirect starting instruction to XGB built-in positioning.
- The indirect starting is executed to the axis designated as ax of XGB positioning at the rising edge of the input condition.
- If the instruction is executed, the positioning operation is carried out by the operation data set in the step number of area K designated in n1. If n1 is set at 0, the operation step is executed which is displayed in the step number of current positioning area K (axis X:K426, axis Y:K436 word).
- Various operation patterns such as end, continued, and incessant operation, and single and repeated operation can be made and executed by using the indirect operation instruction.

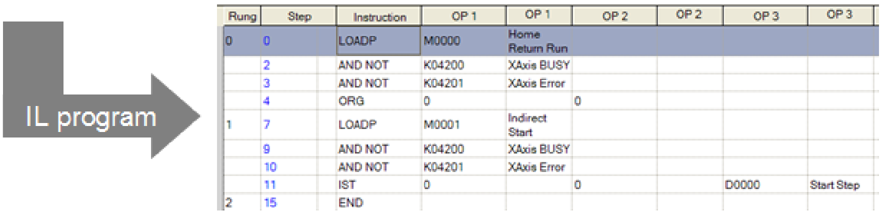
(b) Error

- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.
- In this case, execution of instruction is error. so K area error ocurrence Flag(X axis:K4201, Y axis:K4301) doesn't turn On
- If the set value of the starting step number gets out of the settable range, instruction Error Flag(F110) is not set, the error flag of positioning area K (axis X:K4201, axis Y: K4301) turns On, and the operation does not occur.

(2) Example of Use of the Instruction
- The indirect starting instruction is described with the example of the following program.
- The example of use of the IST instruction is described on the basis of axis X.

(a) Example of the Program





Rung	Step	Instruction	OP 1	OP 1	OP 2	OP 2	OP 3	OP 3
0	0	LOADP	M0000	Home Return Run				
	2	AND NOT	K04200	XAxis BUSY				
	3	AND NOT	K04201	XAxis Error				
	4	ORG	0		0			
1	7	LOADP	M0001	Indirect Start				
	9	AND NOT	K04200	XAxis BUSY				
	10	AND NOT	K04201	XAxis Error				
	11	IST	0		0		D0000	Start Step
2	15	END						

(b) Device Used

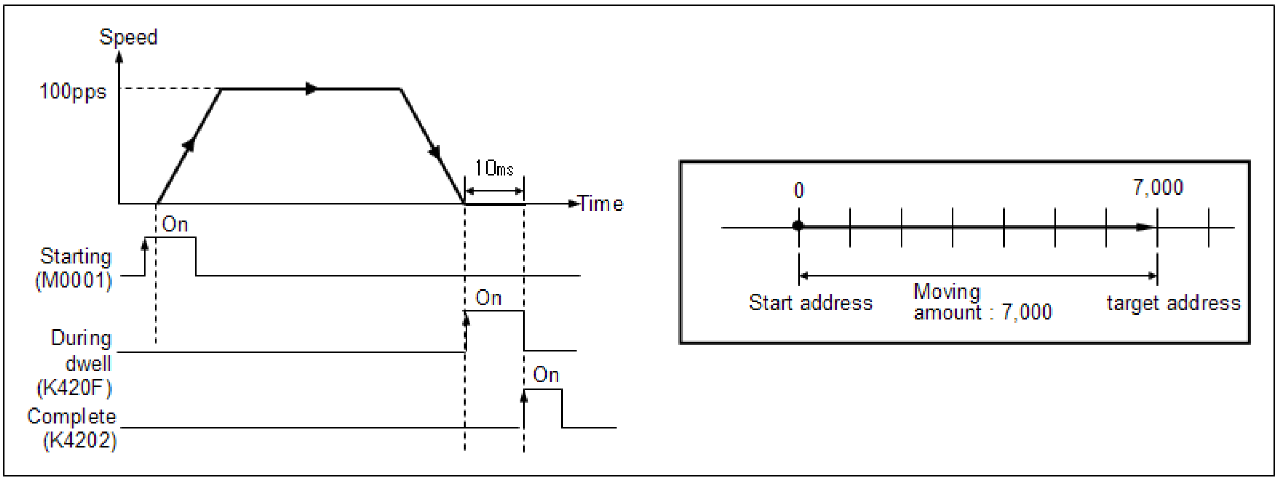
Device	Description	Data size	Example of setting
M0000	axis X origin return instruction signal	BIT	-
M0001	axis X indirect starting instruction signal	BIT	-
K4200	signal during axis X operation	BIT	-
K4201	axis X error	BIT	-
D0000	Starting step number	WORD	3

Step No.	coordinates	Operation pattern	Control method	Operation mode	Repeated Step	Target position [Pulse]	M code	Acc./dec. No.	Operation speed[pls/s]	Dwell time [ms]
3	Incremental	end	position	single	0	7,000	0	1	100	10

(c) Operation of the Program
- If there is the rising edge of M0001 used as the axis X indirect starting instruction signal, the IST instruction is executed.
  (Not if axis X is operating or in error.)
- If the origin is not fixed when the DST is started, error code 224 will appear and operation will not occur. In such a case, turn on M0000, execute the ORG instruction and thereby carry out the origin return, and start the DST instruction.

1) If the direct starting instruction (IST instruction) is executed, positioning operation starts as set in the operand as follows.
   - Since sl and ax are 0, built-in positioning axis X of the basic unit is started.
   - Because the starting step number is set as 3, positioning operation is carried out by the data of No. 3 step of the positioning operation data. That is, if the IST instruction is started, positioning control is conducted in the Incremental coordinates as set in operation data No. 3 step, moves up to 7,000 pulse at 100pps, stops, and when the dwell time of 10ms passes, positioning is finished.

2) Since M code is set at 0, it does not appear and as the operation pattern is End, the step number (axis X:K426) of area K is changed into 4, which is step + 1.



- In addition to executing indirect operation by using the IST instruction, indirect starting can also be started by using the starting signal instruction contact point (axis X:K4290, axis Y:K4390) of area K.
  - → If starting is done by using the starting signal instruction contact point, the operation step is fixed at the current operation step number (axis X:K426, axis Y:K436).
  - → Therefore if you want to change the operation step when starting by using the starting signal instruction contact point, change the operation step by using the Starting step number changing instruction and turn on the starting instruction contact point.
- For details, refer to 3.4.2.

5.2.5 Straight Interpolation Starting Instruction

- Straight interpolation starting refers to the operation so that the path of axes X and Y is straight from the starting address (current stop location) to the target address (target address).
- Straight interpolation control divides into control by absolute coordinates and Incremental coordinates. For details, refer to 3.1.2.
- When the instruction of straight interpolation starting is given, the axis where there is more movement is designated as the main axis. If the movements are equal, axis X is the main axis.
- The speed of the auxiliary axis does not follow the setting of the operation data, but conducts operation by calculating the operation speed, acceleration time, deceleration time, and bias speed automatically by the following operations.

$$\text{auxiliary axis speed} = \frac{\text{main axis speed} \times \text{auxiliary axis distance}}{\text{main axis distance}}$$

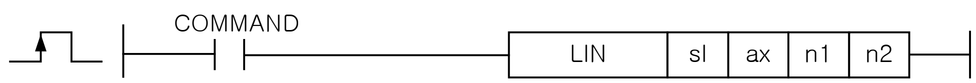
•main axis: the axis where there is more movement of positioning
•auxiliary axis: the axis where there is less movement of positioning

- The operation pattern that can use straight interpolation operation is limited to End and Continued operation. If the main axis is set as Continued and the interpolation operation is started, no error is issued in XGB built-in positioning but the operation pattern of the main axis is changed into Continued. If the auxiliary axis is set as Continued, it does not affect the straight interpolation.

(1) Straight Interpolation Starting Instruction (LIN)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
LIN	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n2	○	-	○	-	-	-	○	-	-	○	-	-	○	-				

LIN



A

[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot number of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Step number to carry out straight interpolation	0~30(standard), 0~80(advanced)	WORD
n2	Set the axis to carry out straight interpolation	XGB is set at 3	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• This instruction is giving the straight interpolation starting instruction to XGB built-in positioning.
• The two axes of XGB positioning conduct straight interpolation starting at the rising edge of input condition.
• If the instruction is executed, the two axes of XGB positioning carried out the straight interpolation operation according to the axis setting designated in n2. The step number to be operated is the step number set in n1.
• In setting of the axis of n2, the axis to carry out the straight interpolation operation as follows.

Bit number	15 ~ 3	2	1	0
Setting	Not used	Axis Z (XGB is not used)	axis Y	axis X

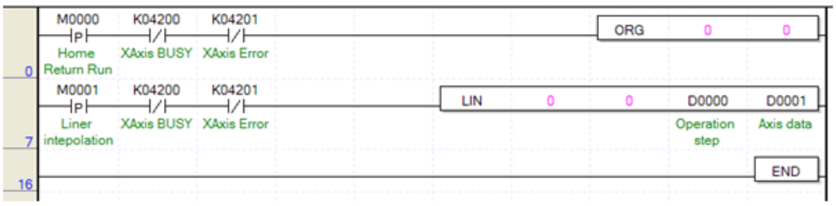
- Each bit refers to the axis to start the straight interpolation. In the case of XGB built-in positioning, n2 should be fixed as 3 since only axis X and axis Y are available. Otherwise, error code 253 is issued and it does not operate.

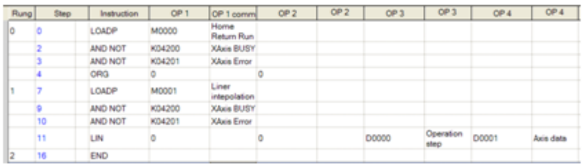
(b) Error

• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.
• Since this case if an error of execution of the instruction, the error in positioning area K error flag(axis X:K4201, axis Y: K4301) does not turn On..
• If the set value of the starting step number gets out of the settable range, instruction Error Flag(F110) is not set, the error flag of positioning area K (axis X:K4201, axis Y: K4301) turns On, and the operation does not occur.

(2) Example of Use of the Instruction

(a) Example of the Program





Rung	Step	Instruction	OP 1	OP 1 comm	OP 2	OP 2	OP 3	OP 3	OP 4	OP 4
0	0	LOADP	M0000	Home Return Run						
	2	AND NOT	K04200	XAxis BUSY						
	3	AND NOT	K04201	XAxis Error						
	4	ORG	0		0					
1	7	LOADP	M0001	Liner intepolation						
	9	AND NOT	K04200	XAxis BUSY						
	10	AND NOT	K04201	XAxis Error						
	11	LIN	0		0		D0000	Operation step	D0001	Axis data
2	16	END								

(b) Device Used

Device	Description	Data size	Example of setting
M0000	axis X origin return instruction signal	BIT	-
M0001	Interpolation starting instruction signal	BIT	-
K4200	signal during axis X operation	BIT	-
K4201	axis X error	BIT	-
D0000	Operation step number	WORD	10
D0001	Axis information	WORD	3

Axis	Step No.	coordinates	Operation pattern	Control method	Operation mode	Repeated Step	Target position [Pulse]	M code	Acc./dec. No.	Operation speed[pls/s]	Dwell time [㎳]
X	10	Rel.	End	position	Single	0	7,000	0	1	100	10
Y	10	Rel.	End	position	Single	0	2,000	0	2	300	10

(c) Operation of the Program

• The LIN instruction is executed if the rising edge of M0001 is generated which was used as the instruction signal of the straight interpolation starting.
(If it is in operation of axis X or in error, it does not operate. If axis Y is in operation, error code 242 is issued and it does not operate)

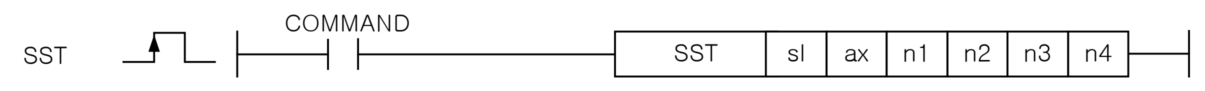
1) If the straight interpolation instruction (LIN instruction) is executed, the straight interpolation operation is started as set in operand.
2) Since sl is 0, built-in positioning of the basic unit operates straight interpolation.
   - Because the starting step number is set as 3, positioning operation is carried out by the data of No. 3 step of the positioning operation data. That is, if the IST instruction is started, positioning control is conducted in the Incremental coordinates as set in operation data No. 3 step, moves up to 7,000 pulse at 100pps, stops, and when the dwell time of 10ms passes, positioning is finished.
3) As the ax is set at 0, the straight interpolation instruction for axis X is started. (For actual zero, the main and auxiliary axes of axis X and axis Y are calculated according to the size of the target position for starting, to the ax operand does not affect the operation)
4) Since the step number of n1 operation is set at 10, the main and auxiliary axes are automatically selected by No. 10 operation data of axis X and axis Y. (In this example, because the target position of axis X is larger, axis X is the main axis and axis Y is the auxiliary axis.)
5) The acceleration and deceleration time and speed of axis Y, which is the auxiliary axis, does not follow the set value but automatically calculated for operation.
6) That is, axis X and axis Y are designated as the main and auxiliary axes respectively by starting of the LIN instruction, it moves by (7000,2000) to the relative position and the operation ends.

5.2.6 Simultaneous Starting Instruction

• The simultaneous starting instruction (SST instruction) is for simultaneously starting the steps of the axes set in the instruction. For details, refer to 3.1.7.

(1) simultaneous starting instruction (SST)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
SST	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n2	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n3	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n4	○	-	○	-	-	-	○	-	-	○	-	-	○	-				



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	axis X Step No.	0~30(standard), 0~80(advanced)	WORD
n2	axis Y Step No.	0~30(standard), 0~80(advanced)	WORD
n3	axis Z Step No.	Not used	WORD
n4	Axis setting	XGB is set at 3	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• This function is for giving the simultaneous starting instruction to XGB built-in positioning simultaneous starting.

• The two axes of XGB positioning are simultaneously started at the rising edge of the input condition. (For the difference between using the simultaneous starting instruction and starting the two axes consecutively in the PLC ladder program, refer to 3.1.7.)

• When the instruction is executed, axis X and axis Y simultaneously start by using the operation data of the step number set in n1 and n2 respectively. XGB built-in positioning does not have axis Z, so the set value of n3 does not affect the operation.

• Axis setting of n4 sets the axis to carry out simultaneous starting by bit as follows.

Bit No.	15 ~ 3	2	1	0
Setting	Not used	Axis Z (XGB not used)	axis Y	axis X

- Each bit refers to the axis to start straight interpolation. In the case of XGB built-in positioning, only axis X and axis Y are available, so n4 should be fixed at 3. Otherwise, error code 296 is issued and operation does not occur.

(b) Error

• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

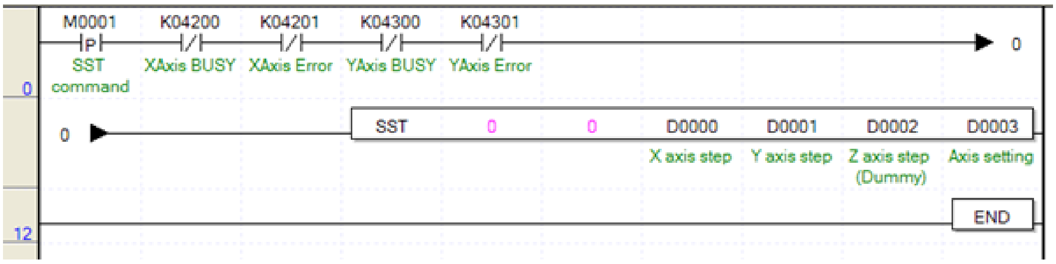
• Since this case if an error of execution of the instruction, the error in positioning area K error flag(axis X:K4201, axis Y: K4301) does not turn On..

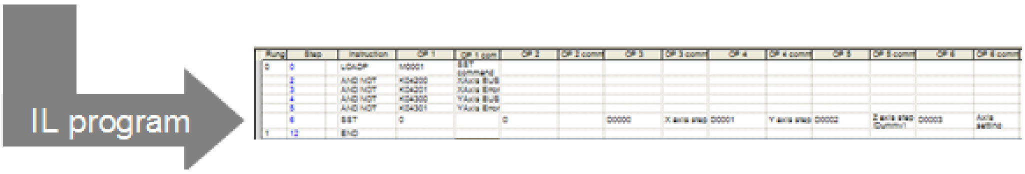
• If the set value of the starting step number gets out of the settable range, instruction Error Flag(F110) is not set, the error flag of positioning area K (axis X:K4201, axis Y: K4301) turns On, and the operation does not occur.

(2) Example of Use of the Instruction

• The instruction is described with the example of the following program simultaneous starting instruction.

(a) Example of the Program





(b) Device Used

Device	Description	Data size	Example of setting
M0001	simultaneous starting instruction signal	BIT	-
K4200	signal during axis X operation	BIT	-
K4201	axis X error	BIT	-
K4300	signal during axis Y operation	BIT	-
K4301	axis Y Error	BIT	-
D0000	axis X operation Step No.	WORD	1
D0001	axis Y operation Step No.	WORD	2
D0002	axis Z operation Step No.	WORD	-
D0003	Axis setting	WORD	3

Axis	Step No.	coordinates	Operation pattern	Control method	Operation mode	Repeated Step	Target position [Pulse]	M code	Acc./dec. No.	Operation speed[pls/s]	Dwell time [ms]
X	1	Rel.	End	position	Single	0	7,000	0	1	100	10
Y	2	Rel.	End	Position	Single	0	2,000	0	2	300	10

(c) Operation of the Program

• SST instruction is executed it the rising edge of M0001, which was used as the instruction signal of the simultaneous starting is generated.

1) If the simultaneous starting instruction (SST) is executed, the two axes are simultaneously started as set in the operand as follows.
2) Since sl is 0, built-in positioning of the basic unit operates simultaneous starting.
3) If the set value of ax does not exceed the setting range, it does not affect the operation.
4) Since the step numbers of axis X and axis Y are set 1 and 2 respectively, the two axes are simultaneously started by using the operation data of the operation step.
5) Since there is no axis Z in XGB built-in positioning, even if a random value is input as the step number of axis Z operation, the operation is not affected.

5.2.7 Speed Position Switching Instruction

• This is positioning according to the target position by switching the axis operated by speed control to position control through speed/position switching instruction (VTP instruction). For details, refer to 3.1.4.

(1) Speed/Position Switching Instruction (VTP)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
VTP	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				

VTP — COMMAND — [VTP | sl | ax]

[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• This instruction is giving the speed/position control switching instruction to XGB built-in positioning.
• The axis designated as ax at the rising edge in the input condition is switched from the speed operation to position operation.
• The current position which was output during the previous speed control operation is initialized to 0 and operated to the target position by absolute coordinates method.

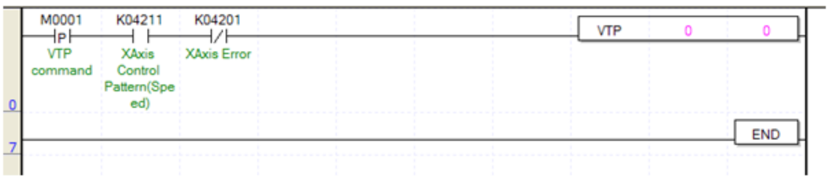
(b) Error

• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction

• The program speed/position control switching instruction is described with the following example.

(a) Example of the Program



0	0	LOADP	M0001	VTP command	
	2	AND	K04211	XAxis Control Pattern(Speed)	
	3	AND NOT	K04201	XAxis Error	
	4	VTP	0		0
1	7	END			

(b) Device Used

Device	Description	Data size	Example of setting
M0001	speed/position switching instruction signal	BIT	-
K4211	Signal during axis X speed control	BIT	-
K4201	axis X error	BIT	-

(c) Operation of the Program

- VTP instruction is executed when there is the rising edge of M0001, which was used as the speed/position switching instruction signal.
- It the speed control is going on currently, it is switched into position control, the current position is preset to 0, and position control is carried out up to the target position. Now the target position divides into the following cases according to the direct and indirect starting.
  1) In case of indirect starting, the target position of the operating step becomes the target position after the speed position switching.
  2) In case of direct starting, the target position set as the operand in the DST instruction becomes the target position after the speed position switching
- When using the speed/position switching instruction, make sure that the instruction is not executed during the position operation by using the display flag (axis X:K4211, axis Y:K4311) during speed control as the program example above.

5.2.8 Position Speed Switching Instruction

- This is operation by switching the axis operating by the current position control into speed control by the position/speed switching instruction (PVT instruction). For details, refer to 3.1.5.

(1) Position/Speed Switching Instruction (PTV)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
PTV	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
PTV	COMMAND	PTV	sl	ax															

[
[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD

[Flag Set]

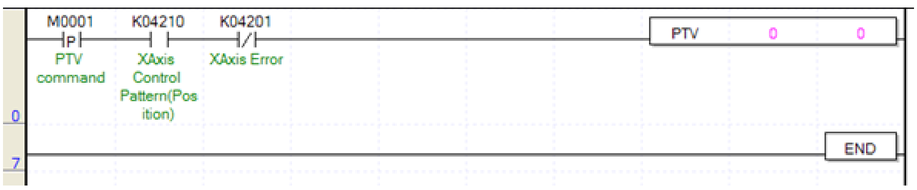
Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

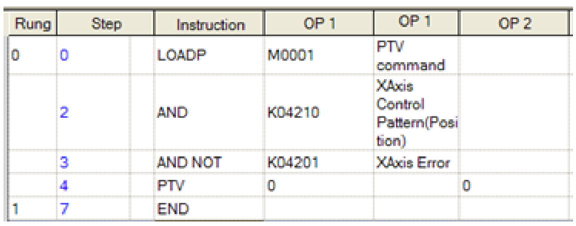
(a) Function
- This instruction is giving the position/speed control switching instruction to XGB built-in positioning.
- The axis designated as ax at the rising edge in the input condition is switched from the position operation to speed operation.
- The current position which was output during the previous speed control operation is not initialized to 0 and only the control method is switched to speed control with the operation continued.

(b) Error
- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction
- The position/speed control switching instruction is described with the example of the following program.

(a) Example of the Program





Rung	Step	Instruction	OP 1	OP 1	OP 2
0	0	LOADP	M0001	PTV command	
	2	AND	K04210	XAxis Control Pattern(Position)	
	3	AND NOT	K04201	XAxis Error	
	4	PTV	0		0
1	7	END			

(b) Device Used

Device	Description	Data size	Example of setting
M0001	position/speed switching instruction signal	BIT	-
K4210	signal during axis X position control	BIT	-
K4201	axis X error	BIT	-

(c) Operation of the Program

- PVT instruction is executed when there is the rising edge of M0001, which was used as the position/speed switching instruction signal.
- It the position control is going on currently, it is switched into speed control, and the current position is not preset but only the control method is switched to speed control.
- When using the position/speed switching instruction, make sure that the instruction is not executed during the speed operation by using the display flag (axis X:K4210, axis Y:K4310) during position control as the program example above.
- To stop the operation after switching to speed control, use the stop instruction (STP).

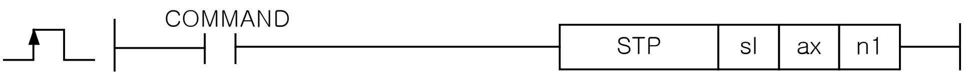
5.2.9 Deceleration Stop Instruction

- The currently operating axis is decelerated and stopped at the speed designated by the deceleration stop instruction (STP instruction). For details, refer to 3.1.11.

(1) Deceleration Stop Instruction (STP)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
STP	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				

STP



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	deceleration time	0~65535	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function
- This instruction is giving the deceleration stop instruction to XGB built-in positioning.
- The axis designated as ax at the rising edge of the input condition conducts deceleration stop for the deceleration time set in the corresponding operation step.

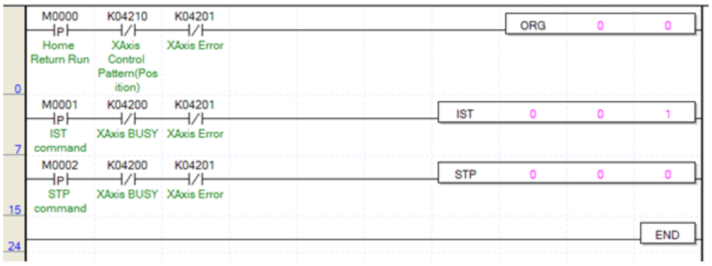
(b) Error
- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

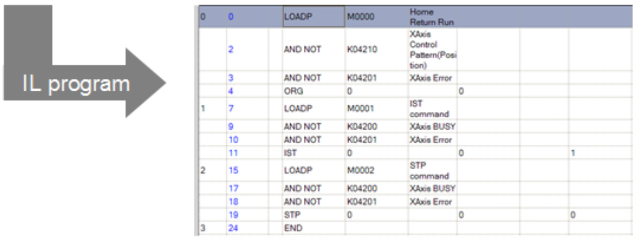
- If the deceleration time is set at 0, it stops right away without deceleration in XGB positioning. In this case, note that there might be shock noise or damage to the motor.
- If the deceleration time of n1 is set at 0, it stops right away without deceleration. Otherwise, it stops according to the operation data of the operation data and the acceleration/deceleration number set in the DST instruction respectively in case of indirect starting and direct starting.

(2) Example of Use of the Instruction

• The deceleration stop instruction is described with the example of the following program.

(a) Example of the Program





0	0		LOADP	M0000	Home Return Run			
	2		AND NOT	K04210	XAxis Control Pattern(Position)			
	3		AND NOT	K04201	XAxis Error			
	4		ORG	0		0		
1	7		LOADP	M0001	IST command			
	9		AND NOT	K04200	XAxis BUSY			
	10		AND NOT	K04201	XAxis Error			
	11		IST	0		0		1
2	15		LOADP	M0002	STP command			
	17		AND NOT	K04200	XAxis BUSY			
	18		AND NOT	K04201	XAxis Error			
	19		STP	0		0		0
3	24		END					

(b) Device Used

Device	Description	Data size	Example of setting
M0000	origin return instruction signal	BIT	-
M0001	Indirect starting instruction signal	BIT	-
M0002	Deceleration stop instruction signal	BIT	-
K4200	signal during axis X position control	BIT	-
K4201	axis X error	BIT	-

(c) Operation of the Program

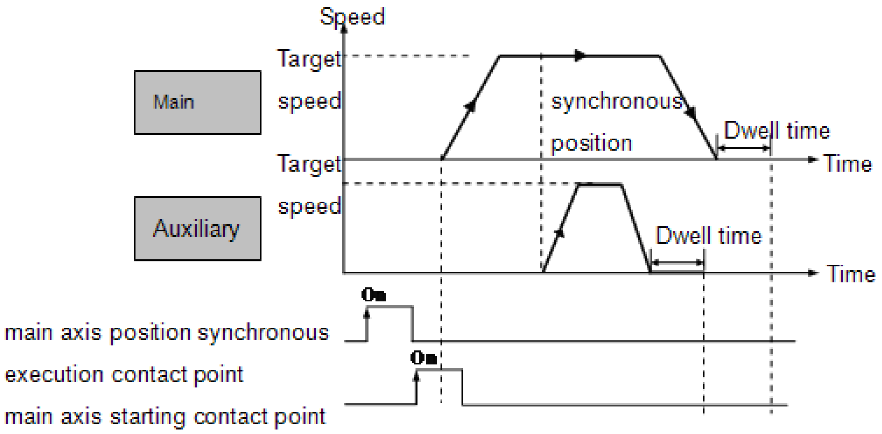
• IST instruction is executed when there is the rising edge of M0001, which was used as the indirect starting instruction signal.
  - In the program above, the indirect starting of No. 1 step of axis X is executed.

• If there is the rising edge of M0002, which is the deceleration stop instruction signal during operation, the deceleration stop instruction is executed according to the setting of STP instruction.
  - Since sl (first Operand) and ax(second Operand) are set at 0, the deceleration stop is executed for axis X of basic unit built-in positioning.
  - Since the deceleration time is set at 0, if the STP instruction is executed, it stops right away without deceleration.

• Note the following in executing the STP instruction.
  - If it has been stopped by the deceleration stop instruction, because the positioning operation has not been finished to the set target position, no positioning completion signal (axis X:K4202, axis Y:K4302) is generated, and if M code is set, the M code signal does not turn On either.
  - In this case, the operation step number maintains the current step.
  - If the indirect starting instruction is executed again afterwards, the operation methods differs according to the coordinates type.
    1) Absolute coordinates: The remaining position output which has not been output from the current operation step is output.
    2) Incremental coordinates: Operation is conducted as much as the new target position.
  - For example, if the target value of the corresponding step is 20,000 and it has been stopped at 15,000 by the deceleration stop instruction, and if the indirect starting is executed again, in case of absolute coordinates, operation is done as much as 5,000 and stops at 20,000, and in case of Incremental coordinates, it newly moves 20,000 and stops at 35,000.

5.2.10 Main axis position synchronous Instruction

• As follows, this is the instruction for synchronous starting according to the current position of the main axis with the axis set in the SSP being the auxiliary axis. For details, refer to 3.1.8.



(1) Main axis position synchronous Starting Instruction (SSP)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
SSP	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n2	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n3	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
SSP	COMMAND	SSP	sl	ax	n1	n2	n3												

[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Position value of the main axis position synchronous main axis	-2,147,483,648 ~ 2,147,483,647	DINT
n2	Operation step number of auxiliary axis	0~30(standard), 0~80(advanced)	WORD
n3	Setting of the main axis of position synchronous	0 (axis X) or 1 (axis Y)	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• This instruction is executing main axis position synchronous starting for the XGB built-in positioning.

• The main axis position synchronous instruction is executed with the axis set in the axis designated as ax at the rising edge of the input condition auxiliary axis, n3 being the main axis.

- If the instruction is executed, the auxiliary axis stands by without generating actual pulse (the operation status flag of the auxiliary axis (axis X:K4200, axis Y:K4300) turns On), and n2 step of the auxiliary axis is started when n3 axis, which is the main axis, is positioned as set in n1.
- The position synchronous starting instruction can be executed only when the origins of both the main axis and auxiliary axis are fixed. If the origin of the main axis is not decided when the main axis position synchronous instruction (SSP) is started, error code 346 is issued, and if the origin of the auxiliary axis is not decided when the main axis position synchronous instruction (SSP) is started, error code 344 is issued.
- When you use the main axis position synchronous instruction, set the main axis and auxiliary axis at different axes. If they are set at the same axis, error code 347 is issued.
- If you want to cancel the main axis position synchronous instruction after you executed it, execute the stop instruction of the auxiliary axis (STP).

(b) Error

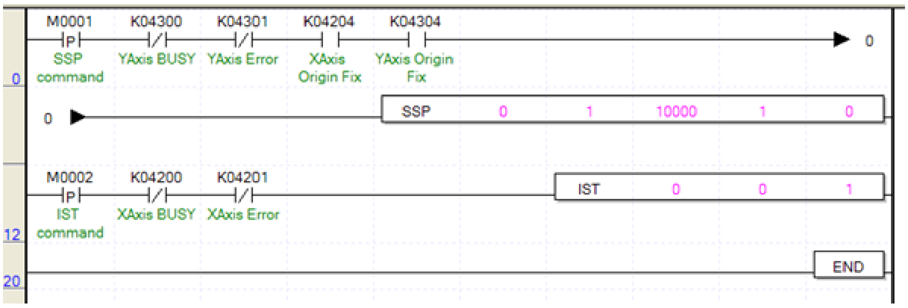
- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

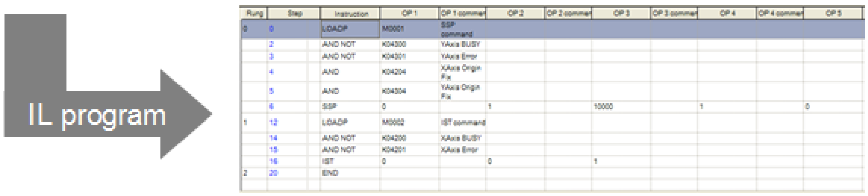
(2) Example of Use of the Instruction

- The main axis position synchronous starting instruction is described with the example of the following program.

(a) Example of the Program

- The following program example is starting No.1 step operation data of the auxiliary axis when axis Y is the auxiliary axis and axis X is the main axis, and the position of the main axis is 10,000.





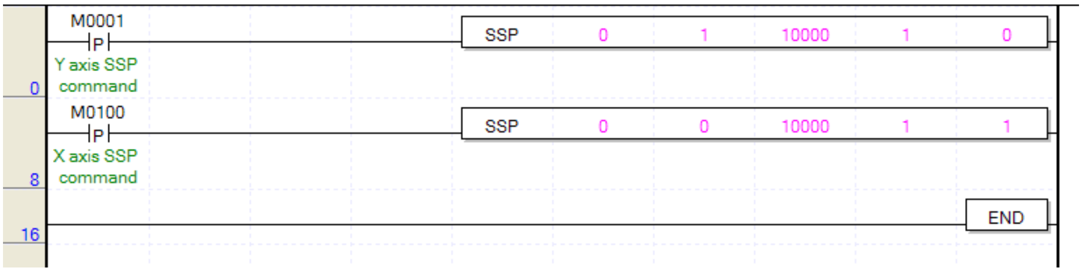
(b) Device Used

Device	Description	Data size	Example of setting
M0001	main axis position synchronous instruction signal	BIT	-
M0002	main axis instruction signal	BIT	-
K4300	Signal during auxiliary axis (axis Y) position control	BIT	-
K4301	auxiliary axis(axis Y) Error	BIT	-
K4204	axis X origin fixed	BIT	-
K4304	axis Y origin fixed	BIT	-
K4200	Signal during the main axis(axis X) position control	BIT	-
K4201	main axis(axis X) Error	BIT	-

(c) Operation of the Program

- The SSP instruction is executed if there is the rising edge of M0001, which was used as the main axis position synchronous instruction signal.
  Since the second operand is 1 (axis Y), axis Y is the auxiliary axis, and as the fifth operand is 0(axis X), so the main axis is axis X.
- No.1 step of axis X is indirectly started if there is the rising edge of M0002, which is the indirect starting instruction signal of the main axis.
- When the current position of the main axis during operation becomes 10,000[Pulse], set in the third operand of the SSP instruction, axis Y, which is the auxiliary axis, starts No. 1 step, which is the operation step set in the fourth operand of the SSP instruction.

- When you use the main axis position synchronous instruction, if the axis set as the main axis has already been started as the main axis position synchronous auxiliary axis, error code 349 is issued and it is not executed. If the following example, axis Y becomes the auxiliary axis and axis X becomes the main axis at the rising edge of M0001 and the main axis position synchronous instruction is executed. If there is the rising edge of M0100, the position synchronous instruction is issued with axis X being the auxiliary axis and axis Y being the main axis. In this case, since axis Y used as the main axis, is already being started as the auxiliary axis of the main axis position synchronous instruction, axis X generates error code 349 and is not started.

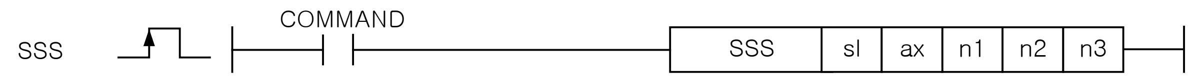


5.2.11 Speed Synchronous Instruction

- The speed synchronous instruction (SSS instruction) is for speed synchronization at the set synchronous speed rate and operation when the main axis is started with the axis set in the instruction being the auxiliary axis. For details, refer to 3.1.8.

(1) Speed Synchronous Starting Instruction (SSS)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
SSS	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n2	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n3	○	-	○	-	-	-	○	-	-	○	-	-	○	-				



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	speed synchronous ratio	1 ~ 10,000(0.01% ~ 100.00%)	WORD
n2	Delay time	1 ~ 10[㎳]	WORD
n3	Speed delay main axis setting	See 0 ~ 9 '(1) Function'	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

- This instruction is for executing the speed synchronous starting for synchronous starting.
- The axis set in the axis designated as ax at the rising edge of the input condition auxiliary axis, n3 becomes the main axis and the speed main axis position synchronous starting instruction is executed.
- If the instruction is executed, the auxiliary axis stands by without generating actual pulse (the operation status flag of the auxiliary axis (axis X:K4200, axis Y:K4300) turns On), and nn3 axis, which is the main axis, it is started according to the speed synchronous ratio set in n1.
- The synchronous ratio settable in n1 is 0.01% ~ 100.00% (set value 1 ~ 10,000). If the set speed ratio gets out of this range, error code 356 is issued.
- The delay time of n2 refers to the delay time it takes for speed of the auxiliary axis to reach the current main axis speed. In XGB built-in positioning, when controlling the speed synchronization, the speed of the current main axis is detected every 500 ㎲, and thereby the speed of the auxiliary axis is adjusted. If the speed of the auxiliary axis is synchronized to the current main axis speed without a delay time and immediately changed, there might be damage or shock noise to the motor due to the sudden change of the auxiliary axis speed.

  For example, assuming the speed ratio is 100.00% and the delay time is 5[ms], if the speed of the main axis is 10,000[pps], the XGB built-in positioning adjusts the speed of the auxiliary axis according to the speed of the main axis every 500[㎲] by adjusting the current speed for the speed of the auxiliary axis to reach 10,000[pps].

  The longer the delay time, the longer the delay time between the main axis and auxiliary axis, but the output pulse is stably output. If there is likely to be step out of the motor, lengthen the delay time.

- The delay time settable for n2 is 1 ~ 10[㎳]. If it gets out of the settable range, error code 357 is issued.
- The main axis of n3 is settable between 0 and 9. If it gets out of the settable range, error code 355 is issued

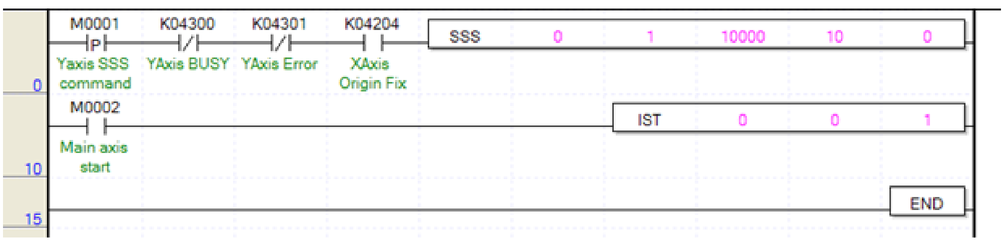
Set value	Main axis setting	Remark
0	axis X	
1	axis Y	
2	High speed counter Ch0	
3	High speed countCh1	
4	High speed countCh2	
5	High speed countCh3	
6	High speed counter Ch4	Only the advanced type is settable.
7	High speed counter Ch5	
8	High speed counter Ch6	
9	High speed counter Ch7	

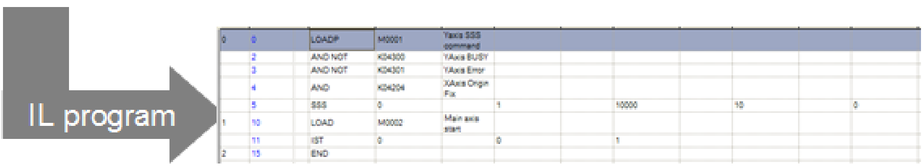
- If you want to cancel the speed synchronous instruction after you execute it, execute the stop instruction (STP) for the auxiliary axis.
- The speed synchronous control is executable even when the origin is not fixed.
- The speed synchronous control is synchronized to the speed of the main axis for operation of the auxiliary axis, so even if the control method of the auxiliary axis is set as position control, starting and stop are alternated by the operation of the main axis, with the rotation of the auxiliary axis being in the same direction as the main axis.
- If the M code of the auxiliary axis is On when you execute the speed synchronous instruction, error code 353 is issued.

(b) Error
- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction
- The speed synchronous starting instruction is described with the example of the following program.

(a) Example of the Program
- The following program example is about speed synchronous starting with the synchronization ratio 100.00[%] and the delay time being 10[㎳] when the main axis is started if axis Y is the auxiliary axis and axis X is the main axis.





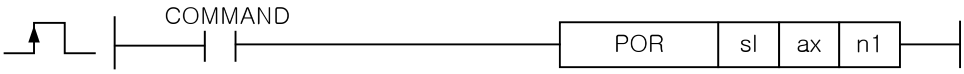
(b) Operation of the Program

- SSS instruction is executed if there is the rising edge of M0001, which was used as the speed synchronous instruction signal. Since the second operand is 1(axis Y), axis Y becomes the auxiliary axis, and because the fifth operand is 0(axis X), the main axis is axis X.
- If there is the rising edge of M0002, which is the indirect starting instruction signal of the main axis, No. 1 step of axis X is indirectly started.
- When the main axis is started, axis Y is started at the synchronous ratio speed of 100.00[%] set in the third operand of SSS instruction, and is synchronized to the main axis with the delay time of 10[ms] set in the fourth operand for operation.

5.2.12 Position Override Instruction

• The position override instruction (POR) is for changing the target position of the axis being operated for the current positioning into the target position set in the instruction. For details, refer to 3.1.10.

(1) position override instruction (POR)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
POR	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
POR																			

[Area Setting]

Operand	Description	Settable range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Target position to change	-2,147,483,648 ~ 2,147,483,647	DINT

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• This instruction is giving the position override instruction to the XGB built-in positioning.
• This is changing the target position to the position set in n1 during the operation of the axis designated as ax at the rising edge of the input condition.
• The position override instruction is available in the acceleration and deceleration sections and if the position override is executed during dwell, error code 362 is issued.

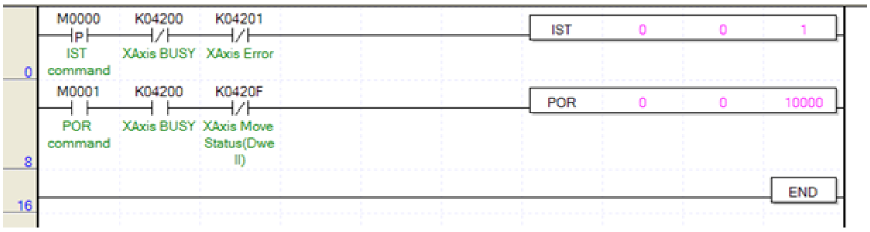
(b) Error

• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction

• The position override instruction is described with the example of the following program.

(a) Example of the Program



0	0	LOADP	M0000	IST command			
	2	AND NOT	K04200	XAxis BUSY			
	3	AND NOT	K04201	XAxis Error			
	4	IST	0		0		1
1	8	LOAD	M0001	POR command			
	9	AND	K04200	XAxis BUSY			
	10	AND NOT	K0420F	XAxis Move Status(Dwell)			
	11	POR	0		0		10000
2	16	END					

(b) Operation of the Program

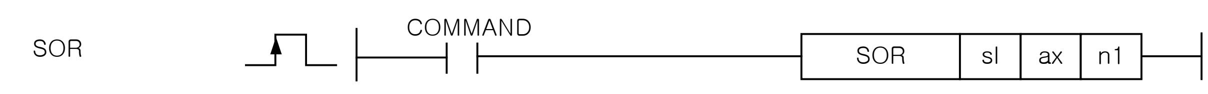
- The positioning axis X is indirectly started with operation step 1 when there is the rising edge of M0000 used as the indirect starting instruction signal.
- If there is the rising edge of M0001 used as the instruction signal of the position override instruction before the current position during operation reaches 100,000 [Pulse], operation continues by changing the target position of the currently operating step into 100,000. (Note that the value of the target position of No. 1 step set in the positioning parameter is not changed)
- If the position override instruction is executed when the current position has passed 100,000[Pulse], it is decelerated and stops.
- If the position override instruction is executed during dwell operation, error code 362 is issued. To prevent this, make the program by connecting the axis X dwell flag to the starting contact point with the normally closed contact point (contact point B).

5.2.13 Speed Override Instruction

- The speed override instruction (SOR) is for changing the operation speed of the axis during current positioning operation into the speed set in the instruction. For details, refer to 3.1.10.

(1) Speed Override Instruction (SOR)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
SOR	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Operation speed to change	0 ~ 100,000[pps]	DWORD

[Flag Set]

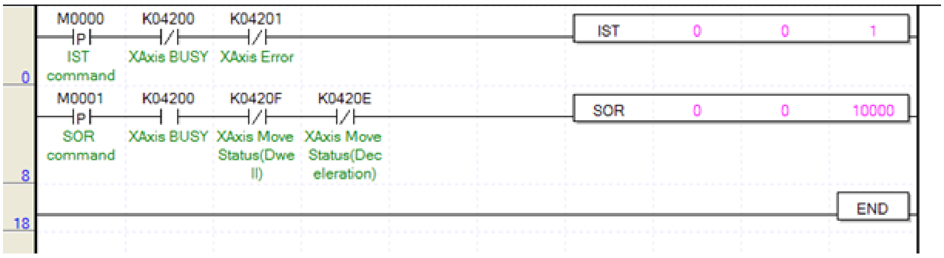
Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function
- This instruction is giving the speed override instruction to XGB built-in positioning.
- This is for changing the operation speed into the speed set in n1 during the operation of the axis designated as ax at the rising edge of the input condition.
- The speed override instructions available in the acceleration and constant speed sections and if the speed override is executed during deceleration or dwell, error code 377 is issued and the currently operating operation step continues.

(b) Error
- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction
- The speed override instruction is described with the example of the following program.

(a) Example of the Program



0	0	LOADP	M0000	IST command			
	2	AND NOT	K04200	XAxis BUSY			
	3	AND NOT	K04201	XAxis Error			
	4	IST	0		0		1
1	8	LOADP	M0001	SOR command			
	10	AND	K04200	XAxis BUSY			
	11	AND NOT	K0420F	XAxis Move Status(Dwell)			
	12	AND NOT	K0420E	XAxis Move Status(Deceleration)			
	13	SOR	0		0		10000
2	18	END					

(b) Operation of the Program

- The positioning axis X is indirectly started with operation step 1 if there is the rising edge of M0000 used as the indirect starting instruction signal.
- If there is the rising edge of M0001 used as the instruction signal of the speed override instruction during operation, operation continues by changing the speed of the currently operating step into 10,000[pps]. (Note that the value of the operation speed of No. 1 step set in the positioning parameter is not changed)
- If the speed override instruction is executed during deceleration or dwell, error code 377 is issued. To prevent this, make the program by connecting the axis X dwell flag to the starting contact point with the normally closed contact point (contact point B).

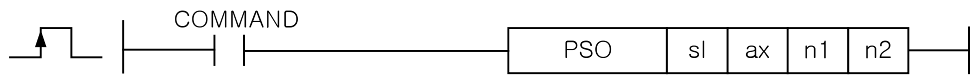
5.2.14 Positioning Speed Override Instruction

• The positioning speed override instruction (PSO) is changing the operation speed of the axis during current positioning operation at the specific position set in the instruction. For details, refer to 3.1.10.

(1) Positioning speed override instruction (PSO)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
PSO	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n2	○	-	○	-	-	-	○	-	-	○	-	-	○	-				

PSO



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Position to change the speed	-2,147,483,648 ~ 2,147,483,647	DINT
n2	Operation speed to change	0 ~ 100,000[pps]	DWORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

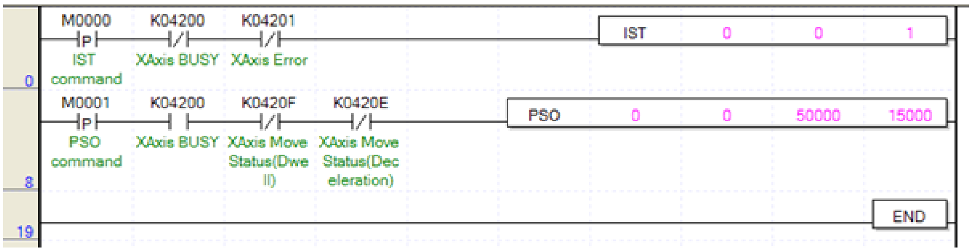
• This instruction is giving the positioning speed override instruction to XGB built-in positioning.
• The positioning speed override is executed at the axis designated as ax at the rising edge of the input condition, and if the current position reaches the position set in n1 during operation, the current operation speed is overridden to the speed set in n2.
• The positioning speed override instruction is available in the deceleration and acceleration sections and if the positioning speed override is executed during deceleration or dwell, no error code is issued, but the instruction is not executed either.

(b) Error

• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction

(a) Example of the Program



0	0	LOADP	M0000	IST command			
	2	AND NOT	K04200	XAxis BUSY			
	3	AND NOT	K04201	XAxis Error			
	4	IST	0		0	1	
1	8	LOADP	M0001	PSO command			
	10	AND	K04200	XAxis BUSY			
	11	AND NOT	K0420F	XAxis Move Status(Dwell)			
	12	AND NOT	K0420E	XAxis Move Status(Deceleration)			
	13	PSO	0		0	50000	15000
2	19	END					

(b) Operation of the Program

- If there is the rising edge of M0000 used as the indirect starting instruction signal, positioning axis X is indirectly started with operation step 1.
- If there is the rising edge of M0001 used as the instruction signal of the positioning speed override instruction during operation, operation continues by changing the operation speed to 15,000[pps] when the position of the currently operating step reaches 50,000.

5.2.15 Inching Starting Instruction

- The inching starting instruction (INCH) is moving to the position set in the instruction at the inching speed set in the origin/manual parameter. For details, refer to 3.1.12.

(1) inching starting instruction (INCH)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
INCH	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
INCH	COMMAND — [INCH | sl | ax | n1]																		

[Area Setting]

Operand	Description	Setting range 줄	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Position to move by inching	-2,147,483,648 ~ 2,147,483,647	DINT

[Flag Set]

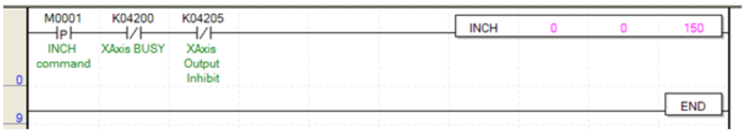
Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function
- This instruction is giving the inching operation instruction to XGB built-in positioning.
- It moves to the position set in n1 at the inching speed set in the positioning parameter with respect to the axis designated as ax at the rising edge of the input condition.

(b) Error
- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction

(a) Example of the Program



Rung	Step	Instruction	OP 1	OP 1 comm	OP 2	OP 2	OP 3
0	0	LOADP	M0001	INCH command			
	2	AND NOT	K04200	XAxis BUSY			
	3	AND NOT	K04205	XAxis Output Inhibit			
	4	INCH	0		0		150
1	9	END					

(b) Operation of the Program
- I there is the rising edge of M0001 used as the inching starting instruction signal, positioning axis X moves to position 150 at the inching speed set in the positioning origin/manual parameter.
- If the axis is in operation or inhibited from output during inching starting, it generates error code 401 and 402 respectively and no operation takes place.

5.2.16 Starting Step Number Change Instruction

• The starting step number change instruction is for changing the number of the step to be operated currently by force.

(1) Starting Step Number Change Instruction (SNS)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
SNS	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
SNS		COMMAND										SNS	sl	ax	n1				

[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Step number to change	1~30(standard), 1~80(advanced)	WORD

[Flag Set]

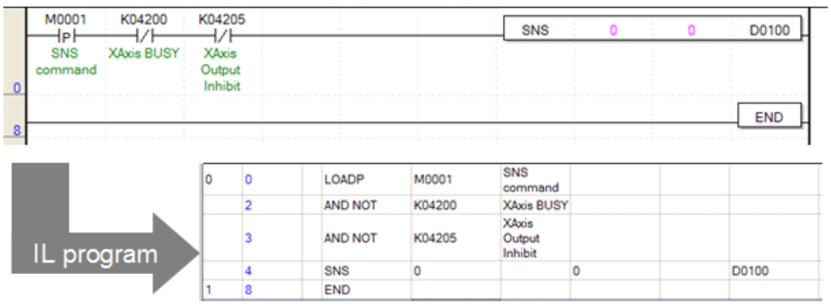
Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function
• This instruction is giving the starting step instruction to XGB built-in positioning.
• The current step number of the axis designated as ax at the rising edge of the input condition changes into the step set in n1.

• If the corresponding axis is operating when the starting step change instruction is executed, error code 441 is issue and the instruction is not executed. If the set value of n1 gets out of the settable range, error code 442 is issued and the instruction is not executed either.

(b) Error
• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction
(a) Example of the Program



(b) Operation of the Program
• If there is the rising edge of M0001 used as the starting step change instruction signal, the current operation step number of positioning axis X changes into the step number set in D0100.

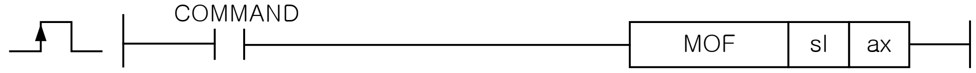
5.2.17 M Code Cancel Instruction

• M code cancel instruction (MOF) is for cancelling the M code generated during operation. For details, refer to 3.3.

(1) M code cancel instruction (MOF)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
MOF	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				

MOF



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to cancel M code	0 (axis X) or 1 (axis Y)	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• This instruction is giving the instruction of cancelling the M code to XGB built-in positioning.

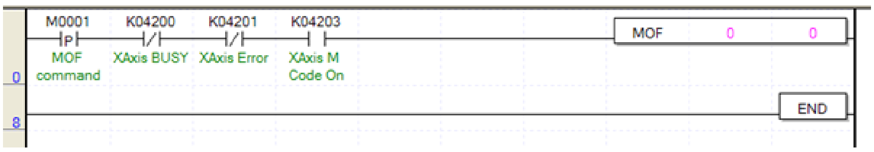
• The M code On signal (axis X: K4203, axis Y: K4303 bit) of the axis designated as ax at the rising edge of the input condition and M code number (axis X : K428, axis Y:K438 word) are simultaneously cancelled.

(b) Error

• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction

(a) Example of the Program



0	0	LOADP	M0001	MOF command	
	2	AND NOT	K04200	XAxis BUSY	
	3	AND NOT	K04201	XAxis Error	
	4	AND	K04203	XAxis M Code On	
	5	MOF	0		0
1	8	END			

(b) Operation of the Program

• If there is the rising edge of M0001 used as the M code cancel instruction signal and if there is an M code in positioning axis X, the M code On signal and M code number are cancelled.

5.2.18 Current Position Preset Instruction

• The current position preset instruction (PRS instruction) is for changing the current position by force.

(1) Current Position Preset Instruction (PRS)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
PRS	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
PRS		COMMAND PRS sl ax n1																	

[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Current position value to change	-2,147,483,648 ~ 2,147,483,647	DINT

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

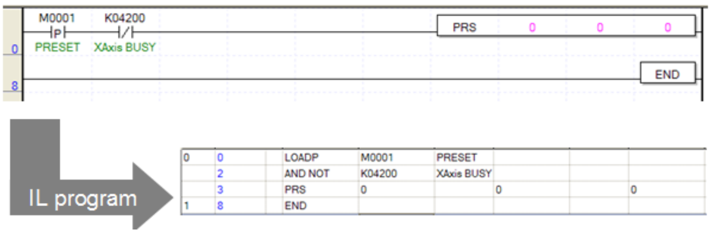
• This instruction is giving the instruction of changing the current position to XGB built-in positioning.
• The current position of the axis designated as ax at the rising edge of the input condition is changed to the position set in n1 of the instruction by force.
• If the origin is not fixed, the origin fixed status (axis X:K4202, axis Y:K4304) turns On and the origin is fixed.
• If the current position preset instruction is executed, and if the axis is currently operating, error code 451 is issued and the instruction is not executed.

(b) Error

• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction

(a) Example of the Program



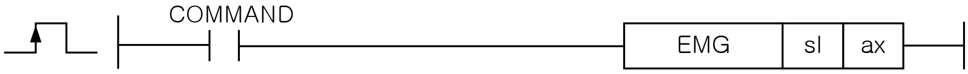
(b) Operation of the Program

• If there is the rising edge of M0001 used as the current position preset, the current position of the positioning axis X changes into 0, which has been set in the instruction, and the origin determining bit turns On.

5.2.19 Emergency Stop Instruction

- The emergency stop instruction is immediately stopping the current positioning operation and the output. For details, refer to 3.1.11.

(1) Emergency Stop Instruction (EMG)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
EMG	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
EMG		 COMMAND																	

[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

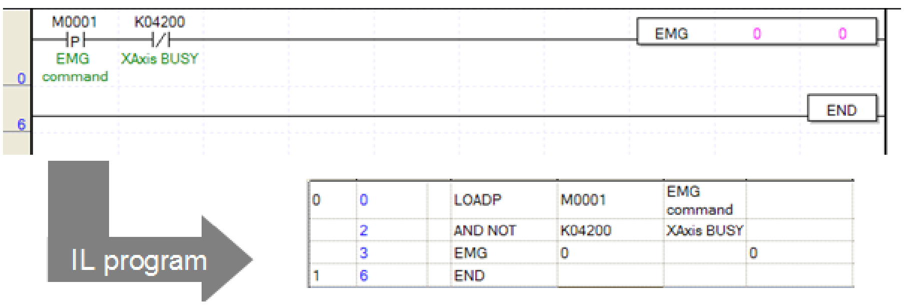
- This is for giving the emergency stop instruction to XGB built-in positioning.
- With respect to the positioning of the axis designated as ax at the rising edge of the input condition, the output immediately stops, the output stop status flag (axis X : K4205, axis Y:K4305) turns On, and error code 481 is issued.
- If the emergency stop instruction is executed, output is inhibited and the origin gets undecided, so in order to resume operation, set the origin return or floating origin or preset the current position to decide the origin.

(b) Error

- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction

(a) Example of the Program



(b) Operation of the Program

- If there is the rising edge of M0001 used as the emergency stop instruction signal, the positioning axis X immediately stops the current operation, issues error code 481 and inhibits output.

5.2.20 Error Reset, Output Inhibition, Inhibition Termination

• The error reset instruction is resetting the current error and terminating the output inhibition.

(1) Error Reset Instruction (CLR)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
CLR	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
CLR		COMMAND												CLR		sl	ax	n1	

[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Whether output inhibition is terminated	0 ~ 65,535	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• This instruction is giving the error reset instruction to XGB built-in positioning.

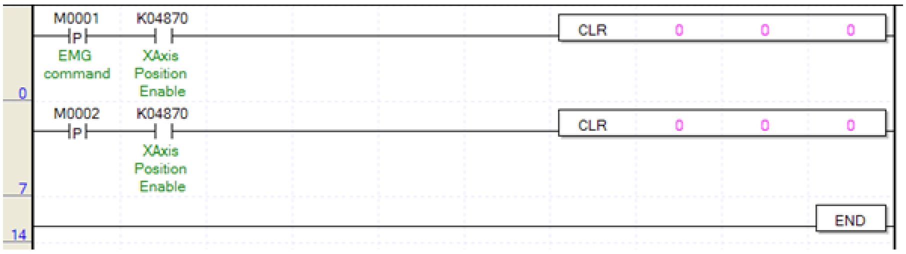
• At the rising edge of the input condition, the error code generated in the axis designated as ax is cancelled, and if the value set in n1 is 0, only the error code is cancelled, with the output inhibition maintained. If the value set in n1 is other than 0, the output inhibition is also cancelled.

(b) Error

• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction

(a) Example of the Program



Rung	Step	Instruction	OP 1	OP 1	OP 2	OP 2	OP 3
0	0	LOADP	M0001	EMG command			
	2	AND	K04870	XAxis Position Enable			
	3	CLR	0		0		0
1	7	LOADP	M0002				
	9	AND	K04870	XAxis Position Enable			
	10	CLR	0		0		0
2	14	END					

(b) Operation of the Program

- If the error and output inhibition are simultaneously generated due to the emergency stop, when there is the rising edge of M0001 used as the error cancel instruction signal, only the error code of axis X is cancelled but the output inhibition is not cancelled.
- If there is the rising edge of M0002 used as the error termination/output inhibition termination instruction signal, the error code of axis X and output inhibition are cancelled together.

5.2.21 Parameter/Operation Data Save

• The parameter save instruction (WRT) is permanently preserving the operation data of positioning area K changed during operation in the XGB built-in flash memory. For the relations between positioning area K and the positioning parameter, refer to 3.2.2.

(1) Parameter Save (WRT)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
WRT	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
WRT	COMMAND	WRT	sl	ax	n1														

[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Not used in XGB	0 ~ 1(Dummy Operand)	WORD
n1	Set the parameter to save	0 ~ 2	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

• The instruction is for permanently preserving the operation data of positioning area K in the XGB built-in flash memory.

• The operation data of positioning area K are permanently preserved in the XGB built-in flash memory according to the setting of n1 at the rising edge as follows.

Set value	0	1	2
Area k to be permanently preserved	Positioning data	High speed counter data	PID control function data

• If n1 has been set at 0, the current operation data of area K of axis X and axis Y for positioning are permanently preserved as the positioning parameter. If set at 1, the data of area K of all the channels of the high speed counter are permanently preserved as the positioning parameter. If set at 2, the data set in area K of 16 loop of the built-in PID are permanently preserved as the PID parameter.

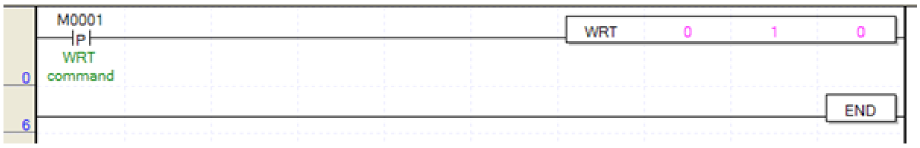
• Although the value set as ax is the operand that does not affect the execution of WRT instruction, if it gets out of the setting range, instruction execution error flag (F110) turns On and the instruction is not executed.

(b) Error

• If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

(2) Example of Use of the Instruction

(a) Example of the Program



IL program

0	0	LOADP	M0001	WRT command			
	2	WRT	0		1		0
1	6	END					

(b) Operation of the Program

• If there is the rising edge of M0001 used as the parameter save instruction signal, the operation data of area K of positioning axis X and axis Y are permanently preserved as the positioning parameter of XGB built-in flash memory.

• If WRT instruction is executed, the previously saved positioning parameter is deleted and the parameter is changed to the operation data of the current area K.

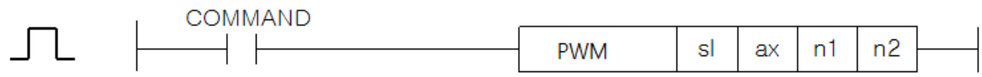
• Be careful that if WRT instruction is executed, the scan time of the scan where the instruction has been executed because the previous positioning parameter of the flash memory is deleted and the operation data of area K is written.

5.2.22 Pulse Width Modulation

• Pulse Width Modulation is to operate On/Off output in designated Off duty rate and Output cycle.

(1) Pulse width Modulation (PWM)

Instruction		Areas available														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	constant	U	N	D	R		Error (F110)	Zero (F111)	Carry (F112)
WRT	sl	-	-	-	-	-	-	-	-	-	○	-	-	-	-	4~7	○	-	-
	ax	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n1	○	-	○	-	-	-	○	-	-	○	-	-	○	-				
	n2	○		○				○			○			○					
PWM																			



[Area Setting]

Operand	Description	Setting range	Data size
sl	Slot No. of positioning module	XGB is fixed at 0	WORD
ax	Axis to give instruction	0 (axis X) or 1 (axis Y)	WORD
n1	Output Cycle	1~20,000(ms)	WORD
n2	Off duty rate	0~100(%)	WORD

[Flag Set]

Flag	Description	Device number
Error	If the value of ax gets out of the range	F110

(a) Function

- This instruction is for PWM output.
- While the input condition is On state, XGB postioning outputs pulse train in designated cycle time in n1 and designated Off duty rate in n2 at designated axis in ax
- During PWM output, current address don't change. Constant speed bit(X axis: K0420D, Y axis: K0430S) and Operation bit(X axis: K04200 Y axis: K4300) set On.

(b) Error

- If the value designated as ax (instruction axis) is other than 0 and 1, the error flag (F110) is set and the instruction is not executed.

- If PWM instruction is executed, other instruction do not operate. And upper/lower limit does not work

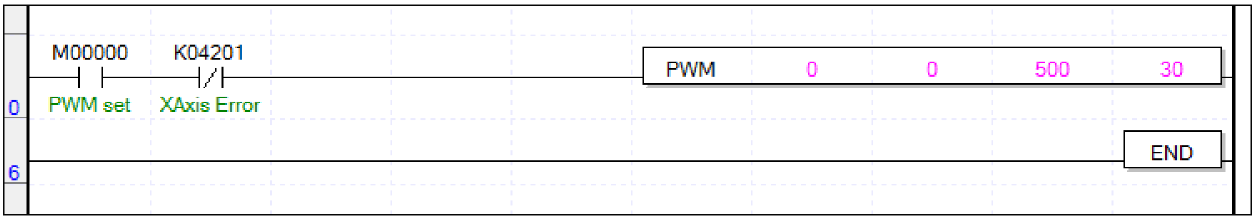
- If PWM instruction is executed, STP, EMG instruction doesn't operate. To stop output, Off the Start-up contact

- If output cycle is changed, when operating APM_PWM, it cannot be applied.

- PWM applicable version
  -XBM-DNxxS: H/W from V2.0, O/S V3.10
  -XBC-DN/DPxxH: O/S from V2.03
  -XBC-DN/DPxxSU: O/S from V1.10

(2) Example of Use of the Instruction

(a) Example of the Program



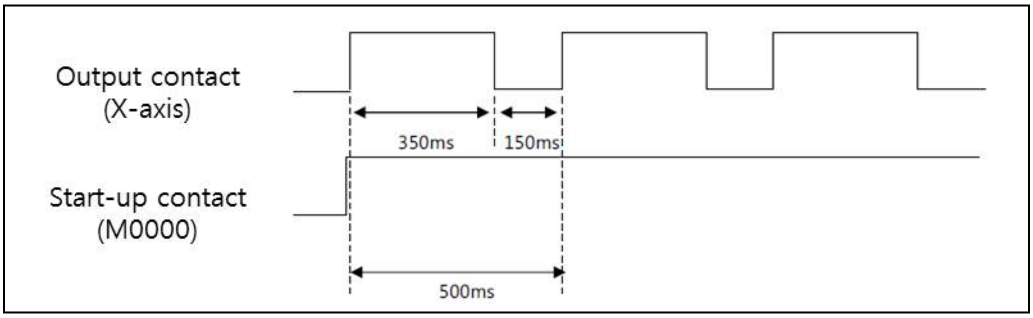
(b) Used Device

Device	설 명
M00000	PWM output reference signal
K04201	X-axis error state

(c) Operation of the Program

• While M00000 is On which is used as output reference signal, PWM is operated.
(At this time, the X-axis is in operation or errorstatus, the instruction will not be executed.)

• If PWM executed, designated output cycle(500ms for this picture) and designated Off duty rate(30% for this picture)



5.3 Positioning Function Blocks (In case of XEC)

5.3.1 General for Function Block

In the XEC PLC, the input/output variables and their functions which are applied commonly for all the function blocks used for internal positioning are as follows..

Classification	Variable Name	Data Type	Description
Input Variables	REQ	BOOL	•Request for function block execution - If the condition in connection with this area is satisfied during the software running and 0→1 (edge or level), the function block is executed.
	BASE	USINT	•Base Number - This area is for setting up the number of the base where the positioning module is mounted. (In the internal positioning of XGB, fix this to 0.)
	SLOT	USINT	•Slot Number - This area is for setting up the number of the slot where the positioning module is mounted. (In the internal positioning of XGB, fix this to 0.)
	AXIS	USINT	•Number of the axis in use - X-axis: 0, Y-axis: 1
Output Variables	DONE	BOOL	•Indicates completion of the function block execution - If the function block is executed without error, "1" is outputted and maintained until the next execution. If erroneous, "0" is outputted.
	STAT	UINT	•Error State Indication - This area indicates the number of the error occurred in the start-up of the function block. (The errors occurred during operation are indicated in the K area which outputs error codes.)

Other I/O variables excluding the common variables presented in the above table are described below.

(1) Common Error Codes for Function Block

The types and description of the common error codes which may occur in the starting up of the function blocks related with internal positioning are as follows.

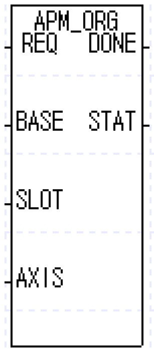
Error Code	Error Type	Countermeasures
0	Function block normally executed	-
1	Base No. exceeded setting range	Set the base No. to "0" for internal positioning.
3	Slot No. exceeded setting range	Set the slot No. to "0" for internal positioning.
6	Axis range No. exceeded setting range	Adjust the axis No. within the allowable range of the function block (0: X-axis, 1: Y-axis)
10	A new function block was executed while the previous instruction has not been completed	Modify the program so that a new function block can be executed after completion of the previous instruction.
11	Set-up auxiliary input value exceeded allowable range	Adjust the value within the allowable range.

For other error code, see "Appendix 1. Error Code List."

5.3.2 Function Block for Return to Origin

•Return to Origin instruction is usually used to confirm the Origin of machine when applying power. This instruction is executed in accordance with the set-up parameters shown below (see 3.2.4 for setting-up of the return-to-Origin parameters).

(1) Return to Origin Function Block (APM_ORG)

Form	Description
	•This instruction is for the execution of the Origin return of the XEC-DN**H internal positioning function. •At the ascending edge of the input condition, the return to Origin instruction is given to the axis defined to be the axis of the internal positioning decision. •After completing Origin return, the Origin determination bit (X-axis: %KX6724,Y-axis: %KX6884) turns on and the present address is preset to the address setup with the Origin return parameter.

(2) Related Device List

•The parameters related with the APM_ORG instruction and the exclusive K area devices are presented in the table below.

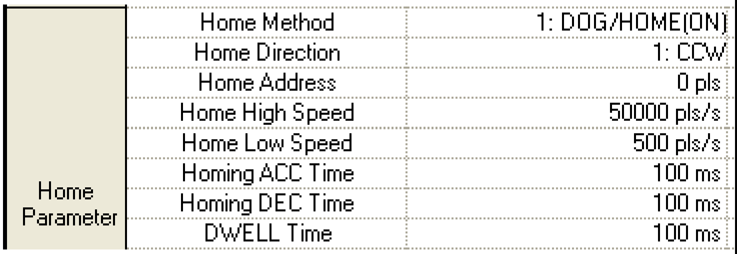
Parameter		Exclusive K Area			Data Type
Title	Setting Range	X-axis	Y-axis	Attribute	
Origin returning method	0: DOG/ Origin (Off) 1: DOG/ Origin (On) 2: DOG	%KX7648	%KX8288	Read/Write	Bool
		%KX7649	%KX8289		Bool
Origin returning direction	0: normal, 1: reverse	%KX7650	%KX8290	Read/Write	Bool
Origin address	-2,147,483,648～2,147,483,647[pulse]	%KD234	%KD254	Read/Write	DINT
Origin return high speed	1 ～ 100,000[pps]	%KD235	%KD255	Read/Write	UDINT
Origin return low speed	1 ～ 100,000[pps]	%KD236	%KD256	Read/Write	UDINT
Origin return accelerating time	0 ~ 10,000[ms]	%KW475	%KW515	Read/Write	UINT
Origin return decelerating time	0 ~ 10,000[ms]	%KW476	%KW516	Read/Write	UINT
Dwell time	0 ~ 50,000[ms]	%KW477	%KW517	Read/Write	UINT

(4) Exemplary Instruction

- •An example of return to Origin instruction execution is explained with the exemplary parameters and sample program as presented below.
- •The example of the APM_ORG instruction is with reference to the X-axis.

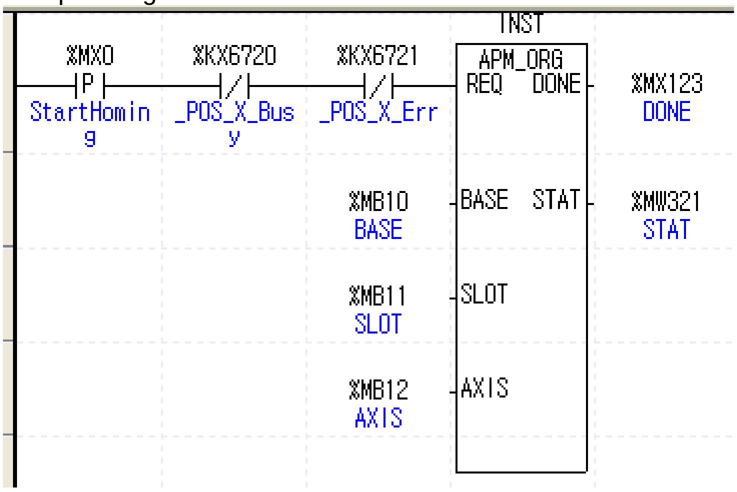
(a) Parameter Setting

Parameter	
Title	**Value**
Origin returning method	1:DOG/HOME (On)
Origin returning direction	1: reverse
Origin address	0
Origin return at high speed	50,000 [pps]
Origin return at low speed	500 [pps]
Origin return accelerating time	100[ms]
Origin return decelerating time	100[ms]
Dwell time	100[ms]



Home Parameter		
	Home Method	1: DOG/HOME(ON)
	Home Direction	1: CCW
	Home Address	0 pls
	Home High Speed	50000 pls/s
	Home Low Speed	500 pls/s
	Homing ACC Time	100 ms
	Homing DEC Time	100 ms
	DWELL Time	100 ms

(b) Sample Program



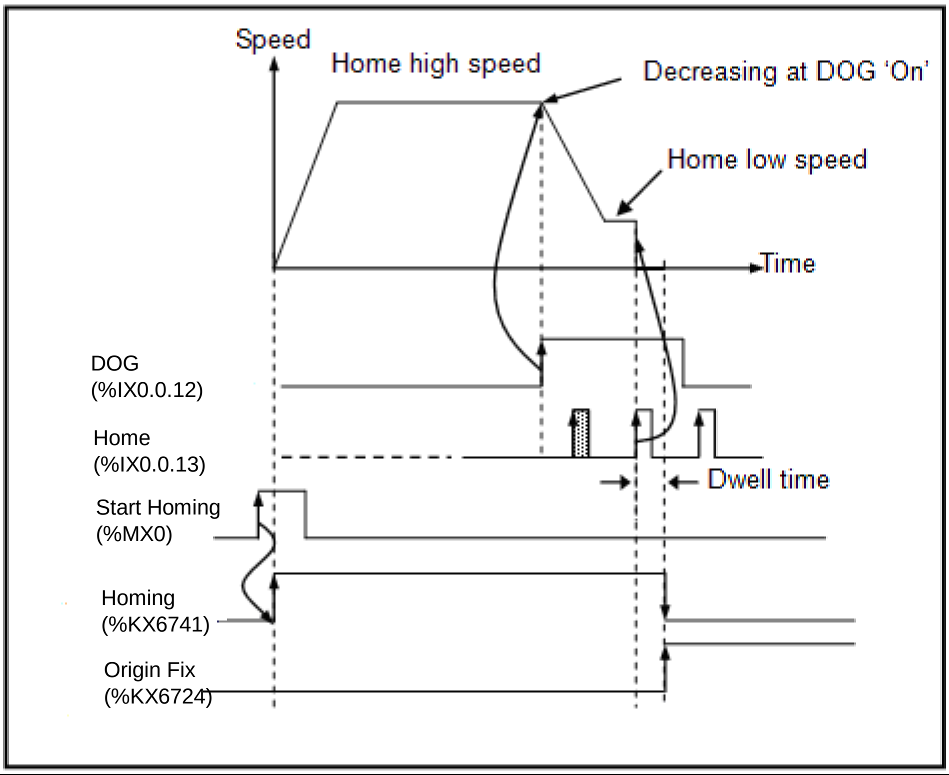
(c) Devices Used

Device	Description
StartHoming	Signal for X-axis Origin return start-up
%KX6720	Signal for X-axis in operation
%KX6721	X-axis in error status

(d) Program Operation

At the ascending edge of the 'starting-up Origin return' used for the Origin return start-up signal for X-axis, the APM_ORG instruction is executed. At this time, the X-axis is in operation or error status, the instruction will not be executed.

1) When the Origin return instruction (APM_ORG) is executed, the operation will be 'Origin return at high speed (50,000 pps)' accelerated reversely as set up in the Origin return parameter.
2) If an ascending edge of DOG signal occurs during the operation of Origin return at high speed, it will be decelerated and operated at the Origin return at low speed (500 pps) set up in the parameter. The decelerating time will be 100 ㎳ set up in the parameter.
3) If the Origin signal which is an external signal enters after being changed to Origin return at low speed, the output is immediately stopped, and the Origin determination status flag (%KX6724) is turned on after the dwell time (100ms) set up in the parameter. From the interruption of the output to the turning On of the Origin determination status flag (%KX6724), there may be (dwell time + 1 scan time) of delay.
4) Here, the present address will be preset to '0' which is the address of the Origin set up in the parameter.



•The DOG signal and Origin signal are fixed to the contact points shown below.

	XEC-DNxxH	
	DOG	Origin point
X-axis	%IX0.0.12	%IX0.0.13
Y-axis	%IX0.0.14	%IX0.0.15

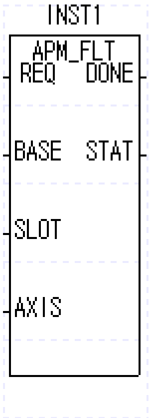
•Take care that, if both the DOG and Origin input contact are used as the external preset inputs of the high speed counter or as the start up signals for the external contact, the Origin detection may become incorrect.

•During returning to Origin, the present position address is not changed.

5.3.3 Function Block for Floating Origin Setting

•In floating Origin setting, the present position is set up as the Origin by instruction, without executing mechanical operation of Origin return.

(1) Floating Origin setting instruction (APM_FLT)

Form	Description
	•This is the instruction for floating Origin setting in the XGB internal positioning. •At the ascending edge of the input condition, floating Origin instruction is given to the axis selected as the axis for the XGB positioning. •When this instruction is executed, the present position address becomes 0 and the Origin determination bit (X-axis: %KX6724,Y-axis: %KX6884) becomes On.

•For floating Origin setting, the present position is preset to 0 and only Origin is determined. Therefore, following cautions should be taken for this instruction.

→ Before executing this instruction, check it an error has been occurred. If occurred, correct the cause of the error and reset the error with APM_RST instruction to lift the output interruption.

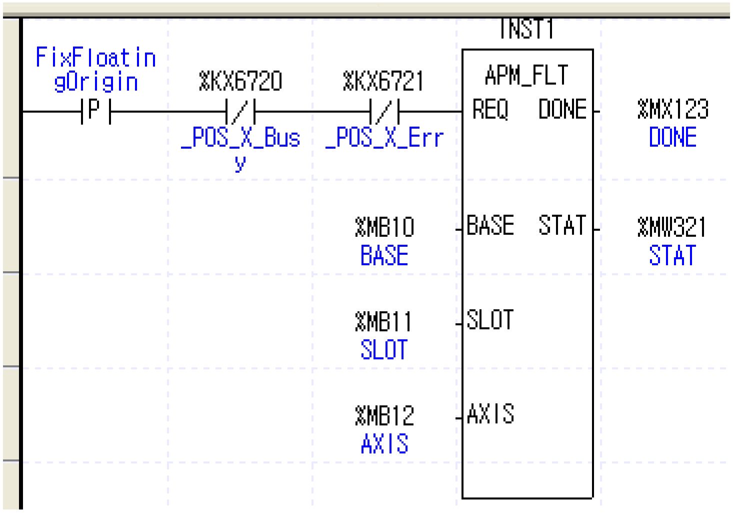
→ Then, set up the floating Origin and change the step No. for operation to the start-up step change instruction (APM_SNS) and start-up.

(2) Example of Instruction

•The floating Origin setting instruction is explained with a sample program shown below.

•This exemplary APM_FLT instruction is with reference to the X-axis.

(a) Sample Program



(b) Used Devices

Device	Description
Floating Origin Instruction	X-axis floating reference instruction signal
%KX6720	X-axis in-operation signal
%KX6721	X-axis error state

(c) Program Operation

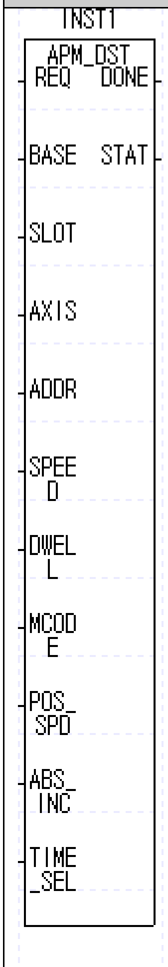
•When the rising edge of the 'floating reference instruction' which was used as the X-axis floating reference instruction signal is generated, the APM_FLT instruction is executed. (However, the instruction is not executed if the X-axis is in operation or error.)

•When the APM_FLT instruction is executed, the Origins is determined at the present position different from return to reference, and the Origin determination signal (X-axis: %KX6724) turns on and the present address is preset to 0.

5.3.4 Direct Start-up Function Block

•In direct start-up, the operation data such as target position or velocity is specified in the exclusive positioning instruction (APM_DST instruction), not using the setting for operation steps set up in the positioning operation data.

(1) Direct Start-up Instruction (APM_DST)

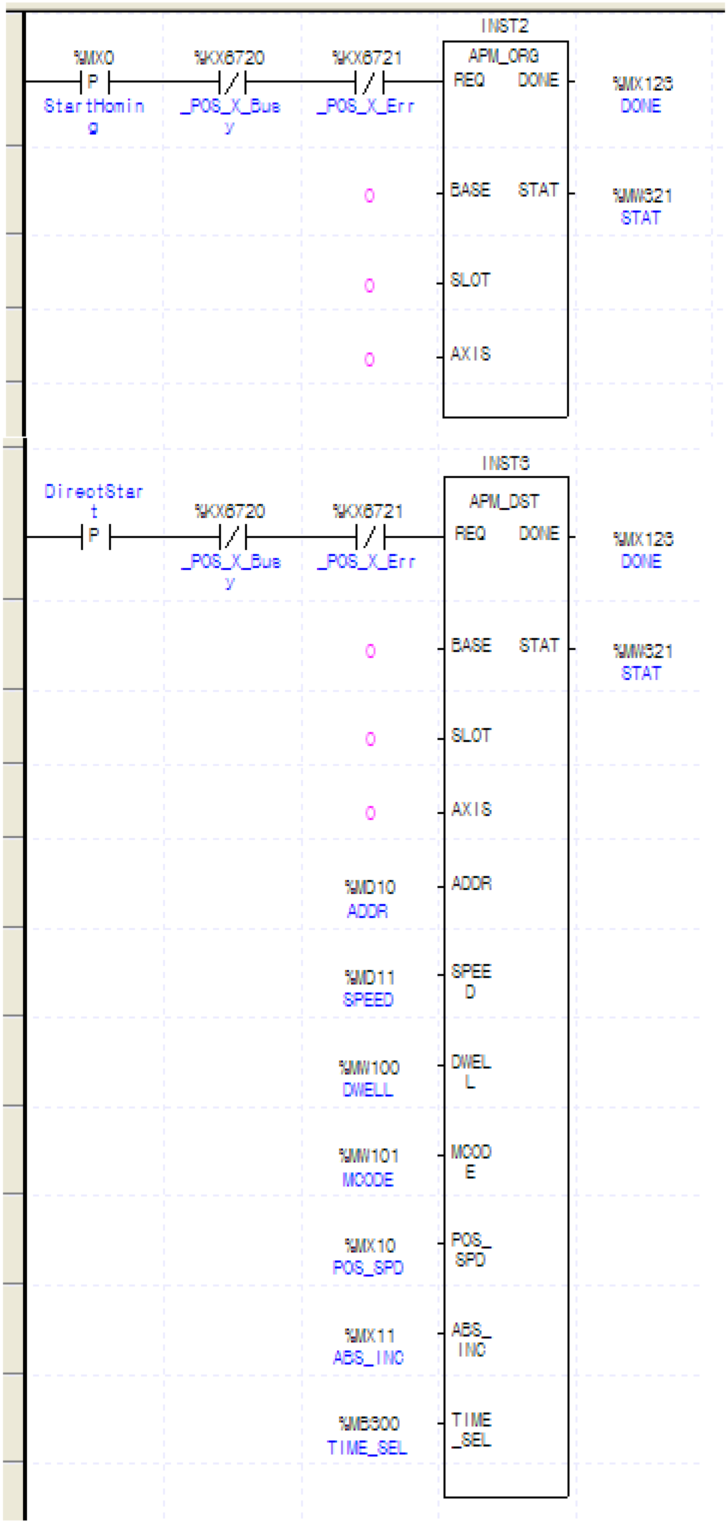
Form	Variable	Data Type	Description
	ADDR	DINT	Target address (position) ● Setting range: -2,147,483,648 ~ 2,147,483,647
	SPEED	UDINT	Operation velocity ● Setting range: 0 ~ 100,000
	DWELL	DINT	Dwell time ● Setting range: 0 ~ 50,000
	MCODE	UINT	M Code No. ● Setting range: 0 ~ 65,635
	POS_SPD	BOOL	Position/velocity control selection ● Setting range: 0 ~ 1(0: position, 1: velocity)
	ABS_INC	BOOL	Absolute/Incremental coordinates selection ● Setting range: 0 ~ 1(0: absolute, 1: Incremental)
	TIME_SEL	USINT	Acceleration/deceleration time numbering ● Setting range: 0 ~ 3 0: Accl./Dec. time 1, 1: Accl./Dec. time 2, 2: Accl./Dec. time 3, 3: Accl./Dec. time 4

(2) Sample Instruction

•Direct start-up instruction is explained with the sample program below.

•This exemplary APM_DST instruction is with reference to the X-axis.

(a) Sample Program



(b) Used Devices

Device	Description	Data Size	Exemplary Setting
Reference Decision	X-axis reference return instruction signal	BOOL	-
Direct Start	X-axis direct start-up instruction signal	BOOL	-
%KX6720	X-axis in-operation signal	BOOL	-
%KX6721	X-axis error state	BOOL	-
ADDR	Target position	DINT	100,000
SPEED	Target velocity	UDINT	30,000
DWELL	Dwell time	DINT	100
MCODE	M code No.	UINT	123
POS_SPD	Position/velocity control selection	BOOL	0
ABS_INC	Absolute/Incremental coordinates selection	BOOL	0
TIME_SEL	Acce/dec. time numbering	BOOL	0

(d) Program Operation

•APM_DST instruction is executed when the rising edge of the direct start-up used as the X-axis direct start-up instruction signal is generated. However, if X-axis is in operation or error state, the instruction is not executed.

•If reference has not been defined at the start of DST, error code 224 is outputted to STAT_1 and the instruction is not executed.
In such case, turn on the 'reference determination' signal ON and perform reference return with APM_ORG instruction before starting-up the APM_DST instruction.

1) When the direct start-up instruction (APM_DST instruction) is executed, positioning operation is started as set up in the operand as shown below.
   - Because the BASE, SLOT and AXIS are 0, the built-in positioning X-axis of the base unit is started.
   - The target position is the 100,000 pulse set up in ADDR as DINT.
   - The target velocity is 30,000 pps set up in SPEED as UDINT.
   - After the positioning, the dwell time is 100ms set up in the DWEELL, and as for M code, the 123 stored in the MCODE is stored in the %KW428.
   - Because POS_SPD and ABS_INC are 0, positioning control operation is based on absolute coordinates. Since TIME_SEL is 0, the acceleration/deceleration pattern follows 1 which is the acceleration time in the basic parameters.

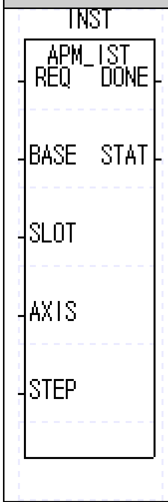
   In particular, when the APM_DST instruction is started, positioning is controlled in absolute coordinates, operated at 30,000 pps up to 100,000 pulse position and stopped, and positioning is completed after 100ms of dwell time and the M code outputs 123.

2) When the position has been determined by direct start-up, the position determination completion signal (X-axis: %KX6722) turns on for one scan.

5.3.5 Indirect Start-up Function Block

•In the indirect start-up, position determination operation is performed with the operation step data set up in the position determination operation data.

(1) Indirect Start-up Instruction (APM_IST)

Form	Variable	Data Type	Description
	STEP	UINT	Operation step No. ● Setting range: 0 ~ 80

(a) Function

•This instruction provides an indirect start-up reference to the XGB built-in positioning.

•At the rising edge of input condition, indirect start-up is executed in the axis defined to be the axis of XGB positioning.

•When the instruction is executed, positioning is performed using the operation data in the K area according to the step No. designated to the STEP. If the STEP is 0, the operation step indicated at the step No. (X-axis: %KW426, Y-axis: %KW436 word) in the exclusive K area is executed.

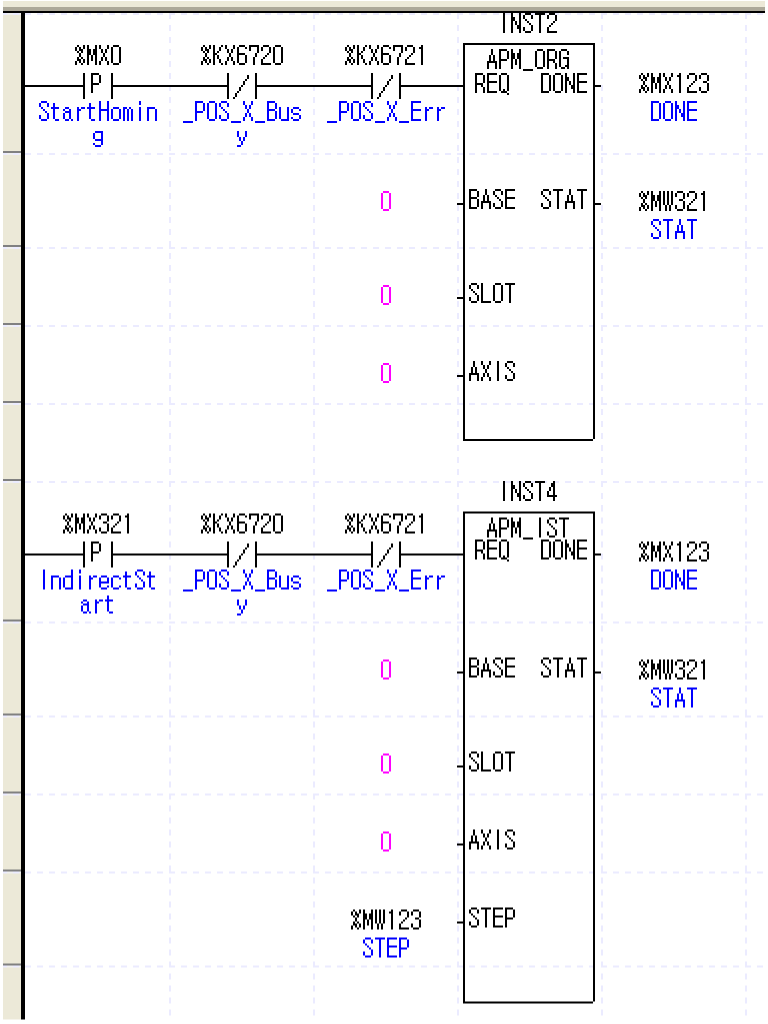
•With indirect operation instruction, diversified composition and execution of operation patterns can be implemented, such as termination, continue, continuous, single, or repeated operation, etc.

(2) Sample Instruction

•Indirect start-up instruction is explained with the sample program shown below.

•The sample IST instruction is described with reference to X-axis.

(a) Sample Program



(b) Used Devices

Device	Description	Data Size	Setting Examples
Reference Determination	X-axis reference return instruction signal	BOOL	-
Indirect Start	X-axis indirect start-up instruction signal	BOOL	-
%KX6720	X-axis in-operation signal	BOOL	-
%KX6721	X-axis error state	BOOL	-
STEP	Start-up step No.	UINT	3

Step No.	Coordinate	Op. Pattern	Control Type	Op. Type	Rep. Step	Target Pos. [Pulse]	M Code	Accl/dec. No.	Op. Speed [pls/s]	Dwell Time [ms]
3	Rel.	Term.	Pos.	Sing.	0	7,000	0	1	100	10

(c) Program Operation

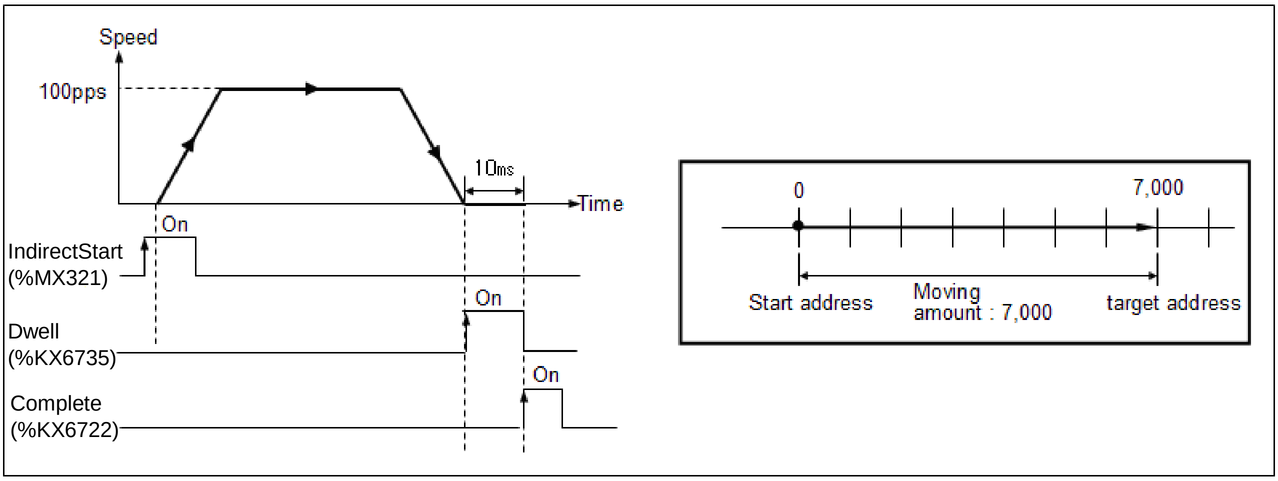
•When the rising edge of the ‘Indirect Start-up’ uses as the X-axis indirect start reference signal is generated, the APM_IST instruction is executed. However, if X-axis is in operation or error state, the instruction is not executed.

•If the Origin has not been defined at the start-up of the APM_IST, error code 224 is outputted to the STAT_1 and the operation is not executed.
In such case, turn the ‘Reference Decision’ on to execute APM_ORG instruction to return to reference before starting the APM_IST instruction.

1) When direct start-up instruction (APM_IST instruction) is executed, positioning operation is started as set up in the instruction line operand as set forth below.
- Since the BASE, SLOT and AXIS are 0, the built-in positioning X-axis of the base unit is started up.
- Because the start-up step No. was appointed by 3, positioning operation is carried out with the data in the No. 3 step of the positioning operation data.

In particular, when the APM_IST instruction is stated, positioning is carried out as set up in the operation data No. 3 step in Incremental coordinates, move to 7,000 pulse position at 100 pps velocity and stop, and after 10ms of dwell time, the positioning is completed.

2) Here, as the M code was set to 0, it is not generated, and as the operation pattern is terminated, the step No. X-axis: %KW426 of the exclusive K area is changed to 4 which is the (present operation step + 1).



•In addition to using indirect start instruction, indirect start can be done using the start signal reference contact (X-axis: %KX6864, Y-axis: %KX7024) in the K area.

→ In the start-up using the start signal reference contact, the operation step is fixed to the present operation step number which is X-axis: %KW426, Y-axis: %KW436.

→ Therefore, to change operation step in starting –up using start signal reference contact, change the operation step with starting step number change instruction (APM_SNS) and then turn the start reference contact ON.

•For the details of the starting method using starting signal reference, see 3.4.2.

5.3.6 Linear Interpolation Start-up Function Block

•In linear interpolation start-up, both X and Y axes are used in the manner that the movement paths of the 2 axes, from the start address (present stationary position) to the target address (position), is linear.

•This method can be classified into absolute coordinates control and Incremental coordinates control. For details, see 3.1.2.

•At the linear interpolation start-up instruction, the axis having greater movement for positioning becomes the main axis automatically. If the 2 axes move the same distance, X-axis is set up as the main axis.

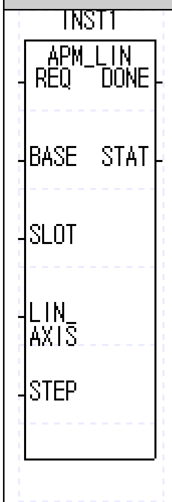
•Here, the velocity of the subsidiary axis does not follow the setting of the operation data. The operation velocity, accelerating and decelerating times, and bias velocity are calculated automatically with the formula below to perform the operation.

$$\text{auxiliary axis speed} = \frac{\text{main axis speed} \times \text{auxiliary axis distance}}{\text{main axis distance}}$$

•main axis: the axis where there is more movement of positioning
•auxiliary axis: the axis where there is less movement of positioning

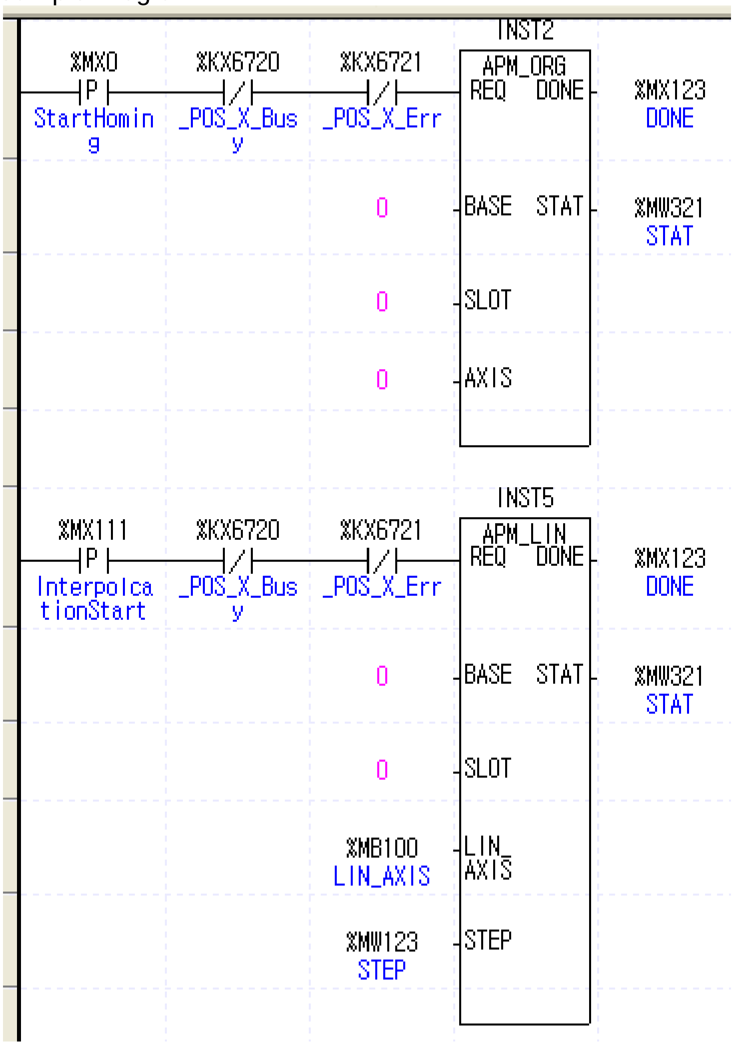
•The operation patterns available for linear interpolation are termination and continuous operation only. If the interpolation operation is started when the main axis is set up to be continuous, the XGB internal positioning does not trigger error and performs the operation of the main axis by changing it to be continuous. If the sub-axis is set to be continuous, it does not affect linear interpolation.

(1) Linear Interpolation Start-up Instruction (APM_LIN)

<table>
<tr><th>Form</th><th>Variable</th><th>Data Type</th><th>Description</th></tr>
<tr><td rowspan="2">
</td><td>LIN_AXIS</td><td>USINT</td><td>● Interpolation operation axis
<table>
<tr><td colspan="2">Axis information</td><td rowspan="2">Setting value</td><td rowspan="2">Operation axis</td></tr>
<tr><td>Y-axis(BIT1)</td><td>X-axis(BIT0)</td></tr>
<tr><td>ON(1)</td><td>ON(1)</td><td>3</td><td>X,Y</td></tr>
</table></td></tr>
<tr><td>STEP</td><td>UINT</td><td>Operation step No.
● setting range: 0 ~ 80</td></tr>
</table>

(2) Sample Instruction

(a) Sample Program



(b) Used Device

Device	Description	Data Size	Example
Reference Decision	X-axis reference return instruction signal	BOOL	-
Interpolation Start	Interpolation start reference signal	BOOL	-
%KX6720	X-axis in-operation signal	BOOL	-
%KX6721	X-axis error state	BOOL	-
LIN_AXIS	Axis information	USINT	3
STEP	Operation step No.	UINT	10

Axis	Step No.	Coordinate	Op. Pattern	Control Type	Op. Type	Rep. Step	Target Pos. [Pulse]	M Code	Accl/dec. No.	Op. Speed [pls/s]	Dwell Time [ms]
X	10	Rel.	Term.	Pos.	Sing.	0	7,000	0	1	100	10
Y	10	Rel.	Term.	Pos.	Sing.	0	2,000	0	2	300	10

(d) Program Operation

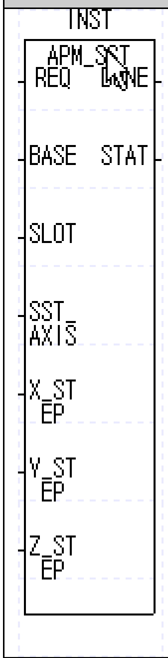
•At the rising edge of the 'Interpolation Start-up' used as the linear interpolation start-up reference signal, the APM_LIN instruction is executed. If X-axis is in operation or error condition, it is not executed. If Y-axis is in operation, error code 242 is outputted to STAT_1 and operation is not performed.

1) When linear interpolation instruction (APM_LIN) is executed, linear interpolation operation is carried out as set up in the instruction operand as set forth below.
2) Since the BASE and SLOT are 0, the internal positioning of the base unit performs linear interpolation operation.
3) Since the STEP operation step No. was set to 10, main and sub-axes are automatically selected with the No. 10 operation data of the X-axis and Y-axis. In this example, since the target position of the X-axis is larger, X-axis becomes the main the Y-axis becomes the sub-axis.
4) Here, the velocity and the accelerating and decelerating times of the sub-axis Y do not follow the set up values but automatically calculated for operation.
5) in particular, with the APM_LIN instruction, the X-axis and Y-axis become main and sub-axes, respectively, and travels by (7000, 2000) in elative position basis before operation stopped.

5.3.7 Simultaneous Start-up Function Block

•Simultaneous start-up instruction (APM_SST) starts the steps of the 2 axes designated in the instruction simultaneously. For details, see 3.1.7.

(1) Simultaneous Start-up Instruction(APM_SST)

<table>
<tr><th>Form</th><th>Variable</th><th>Data Type</th><th>Description</th></tr>
<tr><td rowspan="4">
</td><td>SST_AXIS</td><td>USINT</td><td>● Simultaneous start-up operation axis
<table>
<tr><th colspan="2">Axis information</th><th rowspan="2">Setting Value</th><th rowspan="2">Operation axis</th></tr>
<tr><th>Y-axis(BIT1)</th><th>X-axis(BIT0)</th></tr>
<tr><td>ON(1)</td><td>ON(1)</td><td>3</td><td>X,Y</td></tr>
</table></td></tr>
<tr><td>X_STEP</td><td>UINT</td><td>Operation step No.
● Setting range: 0 ~ 80</td></tr>
<tr><td>Y_STEP</td><td>UINT</td><td>Operation Step No.
● Setting range: 0 ~ 80</td></tr>
<tr><td>Z_STEP</td><td>UINT</td><td>Dummy variable</td></tr>
</table>

(a) Function

•This instruction gives simultaneous start-up reference to the XGB internal positioning.

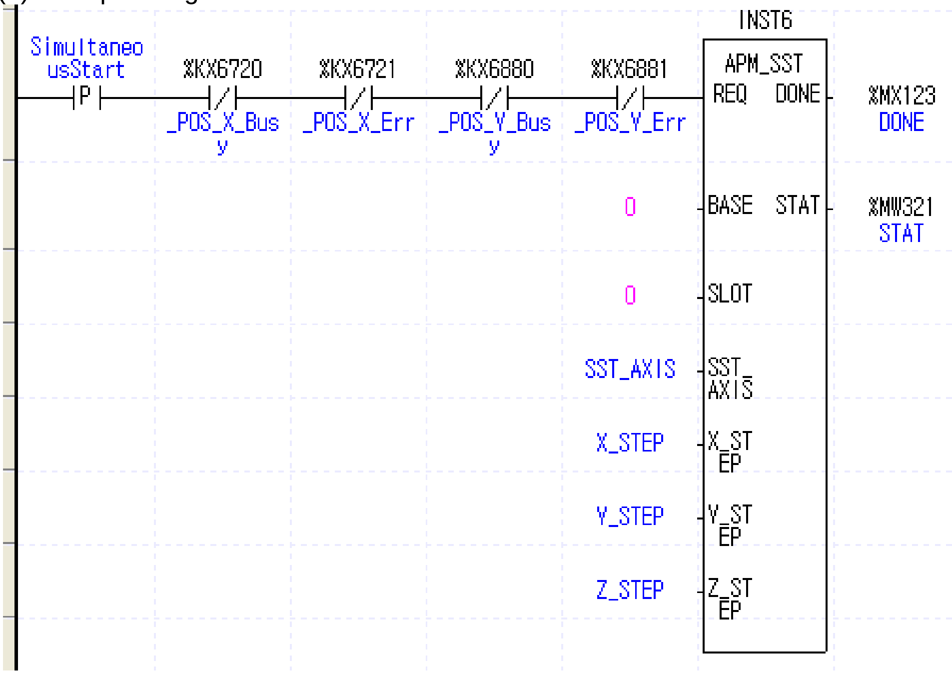
•At the rising edge of the input condition, the 2 axes of the XGB positioning are started up simultaneously. See 3.1.7 for the difference between using simultaneous start up instruction and continuous start up of 2 axes continuously with PLC ladder programming.

•When this instruction is executed, of the XGB's positioning axes, X and Y axes are simultaneously started up using the operation data set up at X_STEP and Y_STEP for X-axis and Y-axis, respectively. Here, since the XGB internal positioning has no Z-axis, the set value of Z_STEP does not have influence on the operation.

(2) Exemplary Instruction

•The sample program below is provided to explain the operation of the simultaneous start-up instruction.

(d) Sample Program



(e) Used Devices

Device	Description	Data Size	Exemplary Setting
Simultaneous Start	Simultaneous start reference signal	BOOL	-
%KX6720	X-axis in-operation signal	BOOL	-
%KX6721	X-axis error state	BOOL	-
%KX6880	Y-axis in-operation signal	BOOL	-
%KX6881	Y-axis error state	BOOL	-
SST_AXIS	Axis setting	USINT	3
X_STEP	X-axis operation step No.	UINT	1
Y_STEP	Y-axis operation step No.	UINT	2
Z_STEP	Z-axis operation step No.	UINT	-

Axis	Step No.	Coordinate	Op. Pattern	Control Type	Op. Type	Rep. Step	Target Pos. [Pulse]	M Code	Accl/dec. No.	Op. Speed [pls/s]	Dwell Time [㎳]
X	1	Coor.	Term.	Pos.	Sing.	0	7,000	0	1	100	10
Y	2	Coor.	Term.	Pos.	Sing.	0	2,000	0	2	300	10

(f) Program Operation

•At the occurrence of the rising edge of the simultaneous start-up used for the simultaneous start-up reference signal, the APM_SST instruction is executed.

1) When the simultaneous start-up instruction (APM_SST) is executed, the 2 axes start up simultaneously as set up in the instruction operands set forth below.

2) Since the BASE and SLOT are 0, the internal positioning of the base unit performs simultaneous start-up.

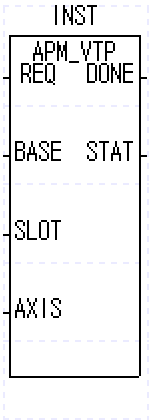
3) Since the operation step numbers of the X and Y axes are set to 1 and 2 respectively, the 2 axes start up simultaneously using the operation data set up in the operation steps.

4) Since the XGB internal positioning has no Z-axis, the Z-axis operation step No. has no influence on the operation.

5.3.8 Velocity to Position Transfer Function Block

•Velocity/Position transfer instruction (APM_VTP) changes the axis presently in velocity control to position control and determines position to the target position. For details, see 3.1.4.

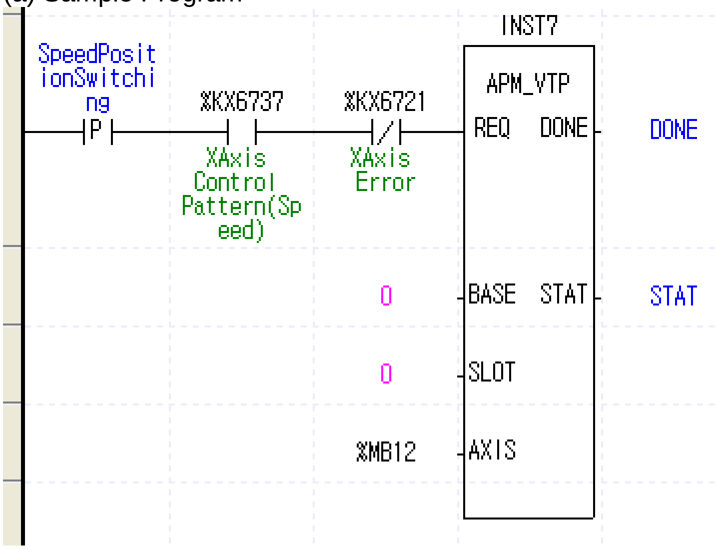
(1) Velocity/Position Transfer (APM_VTP)

Form	Description
	•This instruction provides XGB internal positioning with velocity/position transfer reference. •At the rising edge of the input condition, the axis designated as the AXIS is transferred from velocity operation to position operation. •At this time, the present position outputted from the previous velocity control operation is initialized to 0 and the system operates in absolute coordinates system to the target position.

(2) Sample Instruction

•The sample program below shows the operation of the velocity/position control transfer instruction.

(a) Sample Program



(b) Used Devices

Device	Description	Data Size	Exemplary Setting
Velocity/Position Transfer	Velocity/Position Transfer reference signal	BOOL	-
%KX6737	X-axis in-velocity-control signal	BOOL	-
%KX6721	X-axis error state	BOOL	-

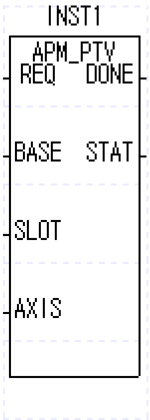
(c) Program Operation

- At the occurrence of the rising edge of the velocity to position transfer used as the velocity to position transfer reference signal, the VTP instruction is executed.
- if presently under velocity control, the mode is changed to position control and the present position is preset to 0 and position control is carried out until the target position. At this time, the target position is classified as follows according to being in the indirect or direct start-up.
  1) If presently in indirect start up, the target position of the step in operation becomes the target position after transfer from velocity to position control.
  2) If presently in direct start up, the target position value set up as the operand with the APM_DST instruction becomes the target position after transfer from velocity to position control.
- When using this velocity/position transfer instruction, as shown in the sample program above, use the indicator flag (X-axis: %KX6737, Y-axis: %KX6897) during velocity control to prevent instruction from being executed during position operation.

5.3.9 Position Velocity Transfer Function Block

•This APM_PTV instruction changes the axis presently in position control to velocity control. For details, see 3.1.5.

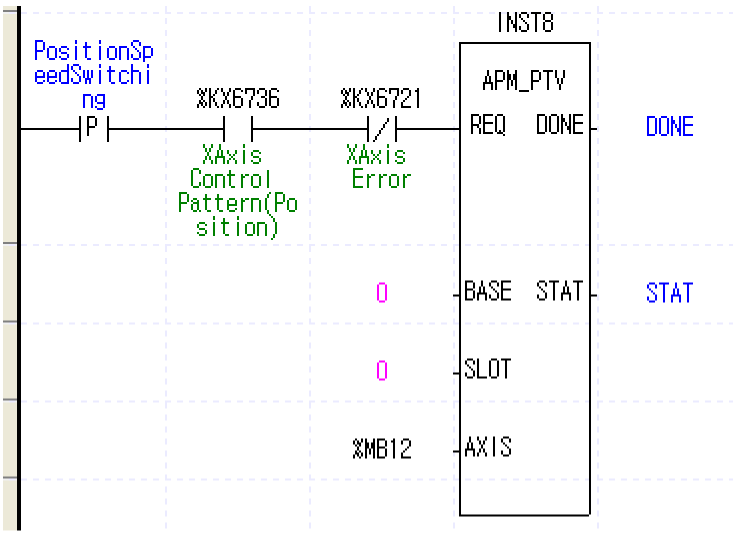
(1) Position/Velocity Transfer Instruction (APM_PTV)

Form	Description
	•This instruction provides position/velocity transfer reference to the XGB internal positioning. •At the rising edge of the input condition, the axis designated as the AXIS is transferred from position operation to velocity operation. •At this time, the present position obtained from the previous velocity control operation is not initialized to 0, and only the control mode is changed from position to velocity to continue to operate.

(2) Sample Instruction

•The sample program below shows the operation of the position/velocity control transfer instruction.

(a) Sample Program



(b) Used Devices

Device	Description	Data Size	Exemplary Setting
Position/Velocity Transfer	Position/Velocity transfer reference signal	BIT	-
%KX6736	X-axis in-position control signal	BIT	-
%KX6721	X-axis error state	BIT	-

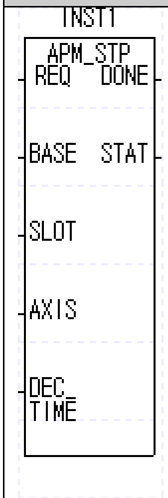
(c) Program Operation

- At the occurrence of the rising edge of the position/velocity transfer signal used as the position/velocity transfer reference signal, the PTV instruction is executed.
- Present position control mode is changed to velocity control mode. The present position is not preset and only control mode is changed.
- After changed to velocity control, to stop operation, used the stop instruction (APM_STP).
- When using this position/velocity transfer instruction, as shown in the sample program above, use the position control indicator flag (X-axis: %KX6736, Y-axis: %KX6896) to prevent instruction from being executed during velocity operation.

5.3.10 Deceleration Stop Function Block

•This APM_STP instruction decelerates a running axis at the rate specified in the instruction to stop it. For the details of the stop function in positioning operation including deceleration stop, see 3.1.11.

(1) Decelerate to Stop Instruction (APM_STP)

Form	Variable	Data Type	Description
	DEC_TIME	UINT	Deceleration time ● Setting range: 0 ~ 65,535

[

(a) Function

•This instruction executes deceleration stop to XGB internal positioning.

•At the rising edge of the input condition, the axis designated to be the AXIS decelerates and stops at the deceleration time set up in the respective operation step.

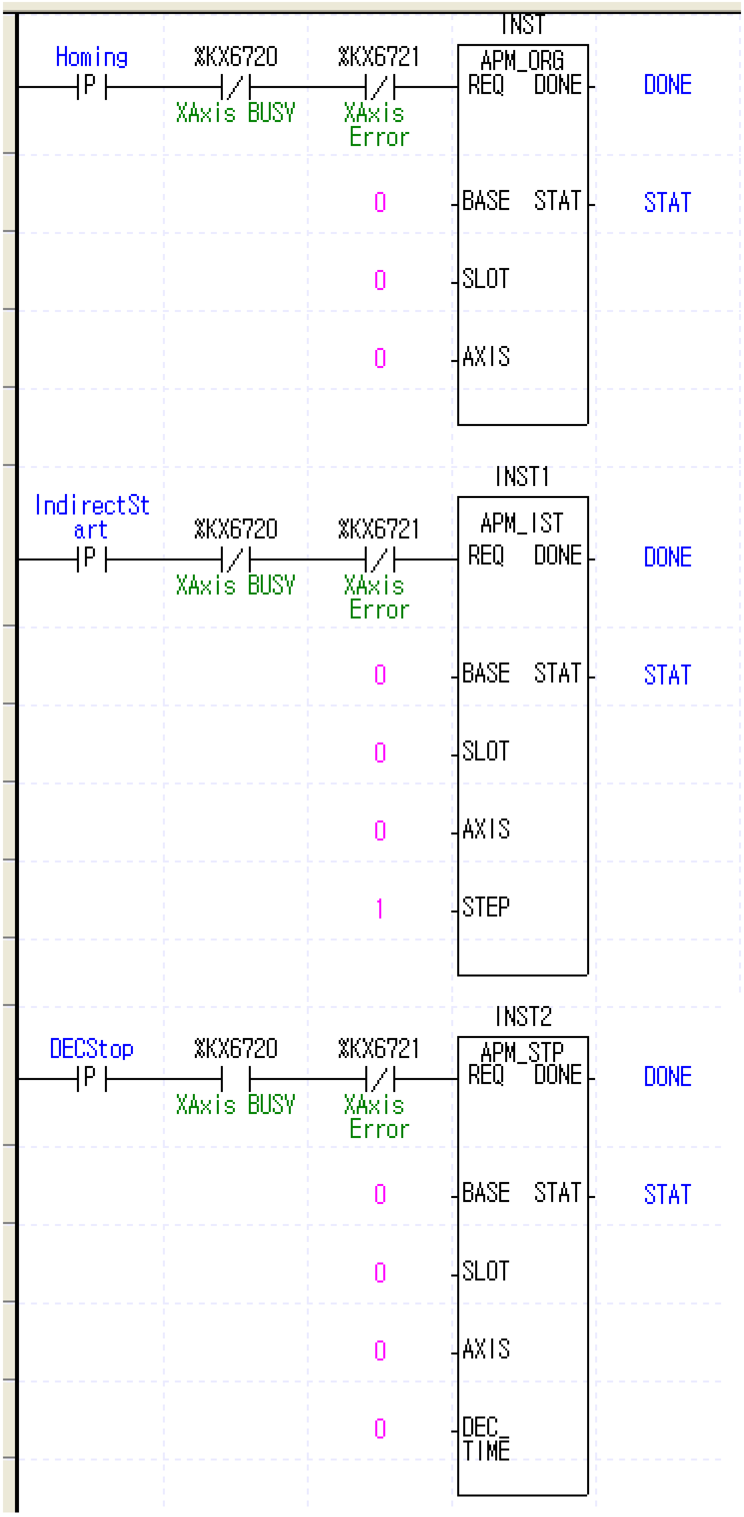
•It the deceleration time setting is 0, the XGB positioning stops immediately without waiting the time for deceleration. In this case, the motor may make impact sound by shock, which requires caution.

•If the DEC_TIME setting is 0, the positioning stops immediately without deceleration process. For other setting values, it stops according to the acceleration/deceleration number set up in the operation data of the respective operation step or in the APM_DST instruction, in case of indirect start-up or direct start-up, respectively.

(2) Sample Instruction

•The sample program below show the exemplary operation of the deceleration stop.

(a) Sample Program



(b) Used Devices

Device	Description	Data Size	Exemplary Setting
Return to Reference	Return to Home instruction signal	BIT	-
Indirect starting	Indirect start-up reference signal	BIT	-
Deceleration stop	Deceleration stop reference signal	BIT	-
%KX6720	X-axis in position control signal	BIT	-
%KX6721	X-axis error state	BIT	-

(d) Program Operation

•At the rising edge of the ‘Indirect Start-up’ signal used as the indirect start-up reference signal, the Installation instruction is executed.

- In the above program, indirect start-up for the No. 1 step of the X-axis is executed.

•At the rising edge of the ‘Deceleration Stop’ signal used as the deceleration stop during operation reference signal, the deceleration stop instruction is executed in accordance with the setting of the STP instruction.

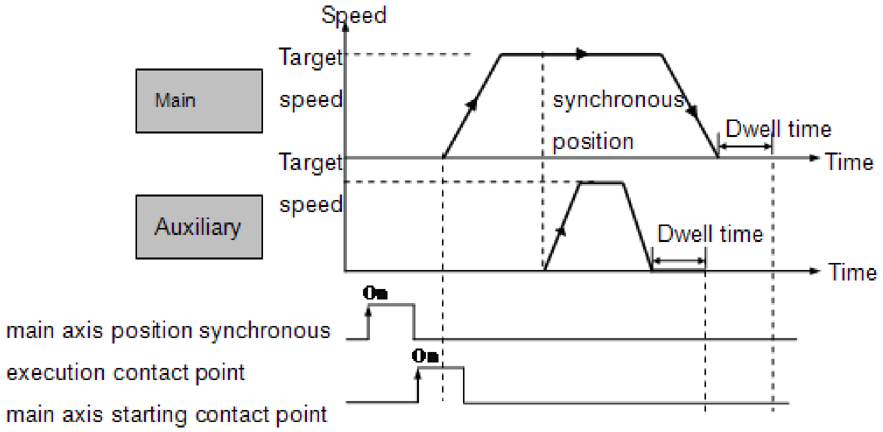
- Since the BASE, SLOT and AXIS are set to 0, deceleration stop is executed to the X-axis of the internal positioning of the base unit.
- At this time, since the deceleration time setting is 0, the STP instruction will result in immediate stop without deceleration time.

• For APM_STP instruction execution, take care of followings;

- When stopping by deceleration stop instruction, positioning operation is not completed until the set up target position. Therefore, position determination completed signal (X-axis: %KX6722, Y-axis: %KX6882) is not created, and if M code was set up, the M code signal is not turned on, neither.
- In this case, the present operation step No. is maintained.
- If indirect start-up instruction is executed again later, operation method varies by coordinate system.
  1) In absolute coordinate system: output the residual position output not outputted in the present operation step.
  2) In Incremental coordinate system: operates for the new target position value.
- For example, if the target value of the respective step is 20,000 and was stopped at position of 15,000 by deceleration stop instruction, and if the indirect start-up instruction is executed again; in absolute coordinate system, the system travels for the rest value of 5,000 and stops at position 20,000, and; in Incremental coordinate system, the system travels 20,000 again and stops at 35,000.

5.3.11 Position Synchronization Function Block

•As shown below, this is a synchronous start-up instruction with the axis set up by the position synchronization instruction (APM_SSP) as the sub-axis according to the present position of the main axis. For details, see 3.1.8.



(1) Position Synchronization Start-up Instruction (APM_SSP)

Form	Variable	Data Type	Description
INST4 APM_SSP REQ DONE BASE STAT SLOT AXIS STEP MST_AXIS MST_ADDR	STEP	UINT	Operation step No. ● Setting range: 0 ~ 80
	MST_ AXIS	USINT	Main axis ● Setting range: 0 ~ 1(0: X-axis, 1: Y-axis)
	MST_ ADDR	DINT	Target position of main axis ● Setting range: -2,147,483,648 ~ 2,147,483,647

(a) Function

•This instruction executes position synchronization start-up to the XGB internal positioning.

•At the rising edge of the input condition, synchronized start-up instruction is executed, where, the axis designated as AXIS is the sub-axis and that designated in the MST_AXIS is the main axis.

•When the instruction is executed, the sub-axis does not out real pulses (at this time, the in-operation-state flag (X-axis: %KX6720, Y-axis: %KX6880) of the sub-axis is ON), and the STEP of the sub-axis starts up when the main axis MST_AXIS is at the position set up in the MST_ADDR.

•The position synchronization instruction can be executed only when the Origins for both of the main axis and sub-axis have been determined. if the Origin of the main axis or sub-axis has not been determined at the start of the APM_SSP instruction, error code 346 or 344, respectively, will be outputted to STAT.

•When using this instruction, set up the main axis and sub-axis with different axis. Otherwise, error code 347 will be outputted to STAT.

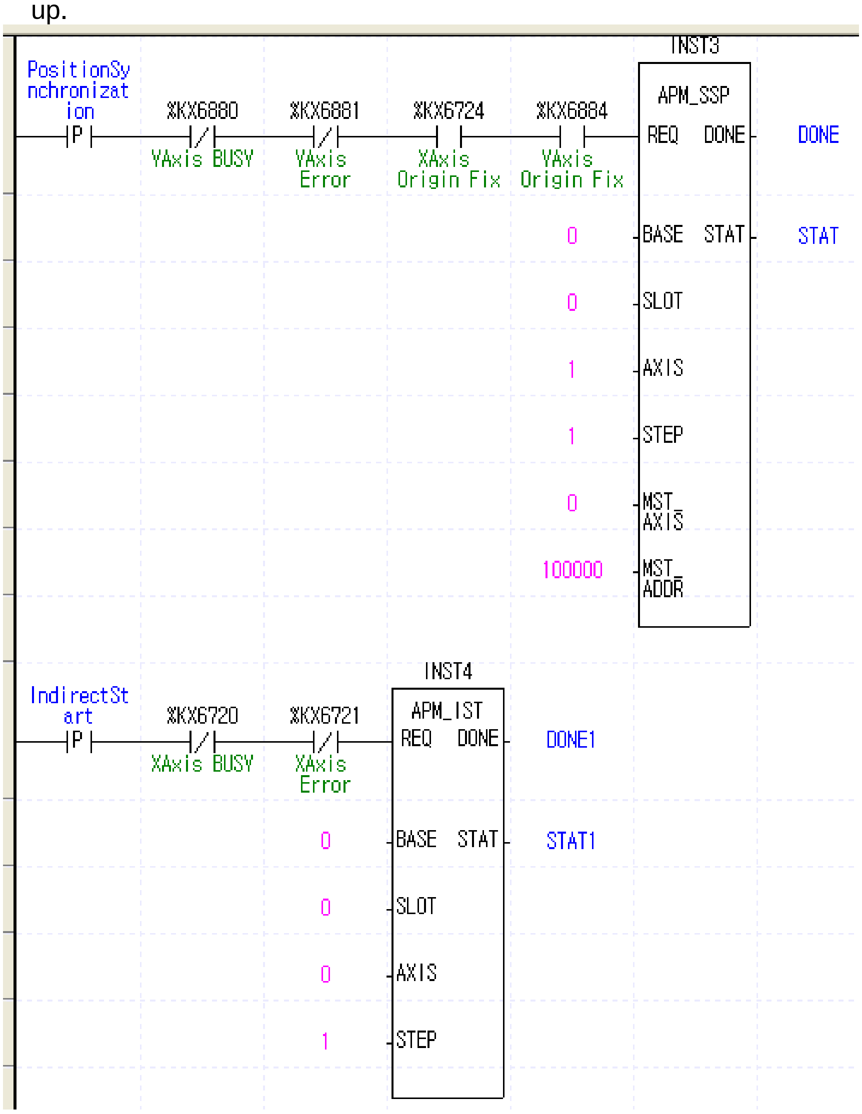
•To cancel the execution of position synchronization instruction after it is given, execute the stop instruction (APM_STP) to the sub-axis.

(2) Sample Instruction

•the sample program below shows the operation of the position synchronization start-up instruction.

(a) Sample Program

•In the sample program below, where the Y-axis is the sub-axis and X-axis is the main axis, when the main axis position is at 100,000, the operation data in the No. step of the sub-axis is started up.



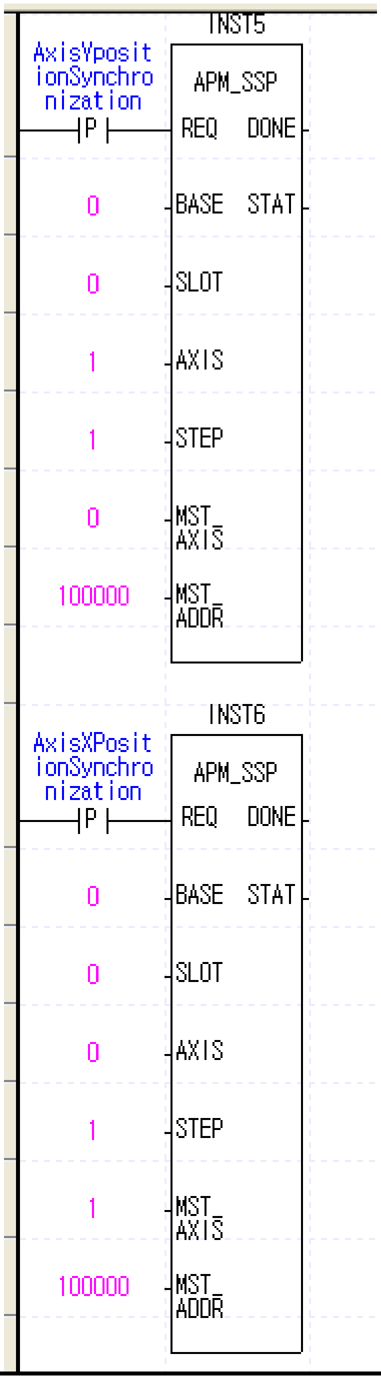
(b) Used Devices

Device	Description	Data Size	Exemplary Setting
Position Sync.	Position synchronization reference signal	BIT	-
Indirect start	Main axis indirect start reference signal	BIT	-
%KX6880	Sub-axis (Y-axis) position being controlled signal	BIT	-
%KX6881	Sub-axis (Y-axis) in error state	BIT	-
%KX6724	X-axis reference determined state	BIT	-
%KX6884	Y-axis reference determined state	BIT	-
%KX6720	Main axis (X-axis) position being controlled signal	BIT	-
%KX6721	Main axis (X-axis) in error state	BIT	-

(c) Program Operation

- At the rising edge of the 'position synchronization' signal used as the position synchronization reference signal, APM_SSP instruction is executed.
  At this time, since the AXIS is 1 (Y-axis), Y-axis is the sub-axis and as the MST_AXIS is 0 (X-axis), X-axis is the main axis.
- At the rising edge of the 'indirect start-up' signal which is the indirect start-up reference signal of the main axis, No. 1 step of the X-axis starts indirectly.
- During operation, when the present position of the main axis reaches 100,000 [Pulse] set up in the MAST_ADDR of the APM_SSP instruction, the Y-axis which is the sub-axis starts up the operation step (No. 1) set up in the STEP of the APM_SSP instruction.

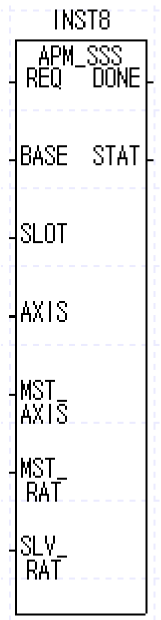
•If the axis set up as the main axis has been started up as the sub-axis of position synchronization, error code 349 is outputted to STAT and the position synchronization instruction is not executed.
In the example shown below, at the rising edge of the 'Y-axis position synchronization,' position synchronization instruction is executed with the Y-axis as the sub-axis and the X-axis as the main axis. In this state, if a rising edge of the 'X-axis position synchronization' signal occur, the position synchronization instruction reference is generated with the X-axis as the sub-axis and the Y-axis as the main axis. In this case, because the Y-axis which is used as the main axis has already been started up as the sub-axis of the position synchronization instruction, the X-axis outputs error code 349 to the STAT1 and is not started.



5.3.12 Speed Synchronization Function Block

•This instruction (APM_SSSB) is for the operation at synchronized speed at the preset rate with the axis set up in the instruction as the sub-axis when the main axis is started up. For details of speed synchronization function, see 3.1.8.

(1) Speed Synchronization Start-up Instruction (APM_SSSB)

<table>
<tr><th>Form</th><th>Variable</th><th>Data Type</th><th>Description</th></tr>
<tr><td rowspan="3"></td><td>MST_ AXIS</td><td>USINT</td><td>● Main axis setting range
<table>
<tr><th>Setting Value</th><th>Main Axis Setting</th><th>Setting Value</th><th>Main Axis Setting</th></tr>
<tr><td>0</td><td>X-axis</td><td>5</td><td>High Speed Counter Ch3</td></tr>
<tr><td>1</td><td>Y-axis</td><td>6</td><td>High Speed Counter Ch4</td></tr>
<tr><td>2</td><td>High Speed Counter Ch0</td><td>7</td><td>High Speed Counter Ch5</td></tr>
<tr><td>3</td><td>High Speed Counter Ch1</td><td>8</td><td>High Speed Counter Ch6</td></tr>
<tr><td>4</td><td>High Speed Counter Ch2</td><td>9</td><td>High Speed Counter Ch7</td></tr>
</table></td></tr>
<tr><td>SLV_RAT</td><td>UINT</td><td>Speed ratio of sub-axis
● Setting range: 1 ~ 10,000(0.01 ~ 100.00%)</td></tr>
<tr><td>DELAY</td><td>USINT</td><td>Sub-axis delay time
● Setting range: 1 ~ 10(1 ~ 10ms)</td></tr>
</table>

(a) Function

•This is the instruction for executing speed synchronized start-up to the XGB internal positioning.

•At the rising edge of the input condition, speed position synchronized start-up instruction is executed with the AXIS as the sub-axis and the axis designated in the MST_AXIS as the main axis.

•When the instruction is executed, the sub-axis does not output real pulse (at this time, the in-operation-state flag (X-axis: %KX6720, Y-axis: %KX6880) of the sub-axis is ON), and when the main axis MST_AXI starts, the sub-axis starts at the speed synchronization ratio set up in the AXIS.

•The synchronization ratio which can be set up in the SLV_RAT is 0.01% ~ 100.00% (setting value 1 ~ 10,000). If the setting exceeds this range, error code 356 is created.

•The DELAY time is the time required for the speed of the sub-axis to reach the present speed of the main axis. In the XGB internal positioning function, for speed synchronization control, the present speed of the main axis is detected at every 500 ㎲ to control the speed of the sub-axis. Here, if the speed of the sub-axis is synchronized to that of the main axis without delay time, the motor and drive may receive excessive impact.

For example, when the speed synchronization ratio is 100.00% and delay time is 5[ms], and if the present speed of the main axis is 10,000[pps], XGB internal positioning adjusts the speed of the sub-axis so that it's speed is the same as that of the main axis after 5[㎳] at every 500[㎲].

When the delay time is longer, the synchronization time delay between the main and sub-axes is longer but the output pulse is more stable. If there is the possibility that the motor may lose synchronism, set the delay time longer.

•The range of the delay time that can be set up in DELAY n2 is 1 ~ 10[㎳]. If this range is exceeded, error code 357 is generated.

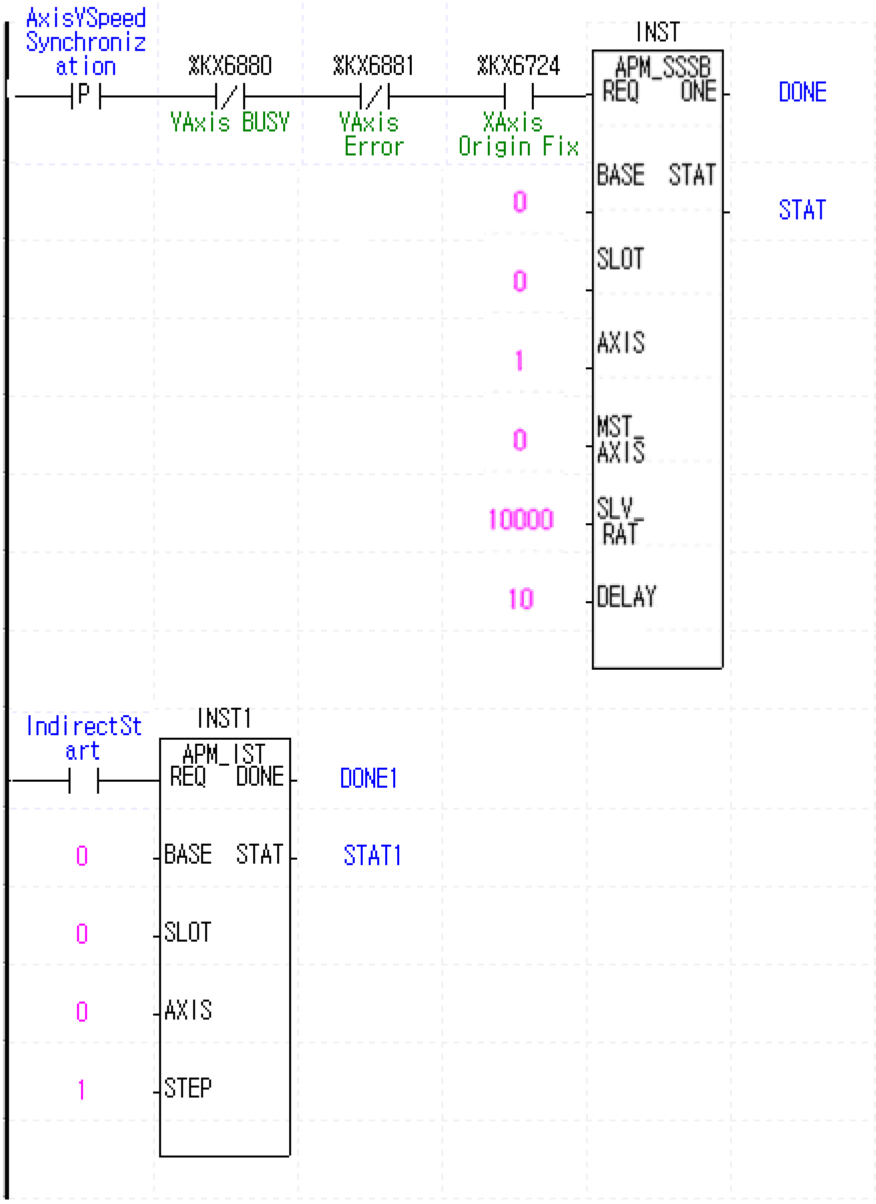
- •The range of the main axis setting of MST_AXIS is 0 ~ 9 as shown below. If this range is exceeded, error code 355 is generated.
- •To cancel the execution of speed synchronization instruction, run the stop instruction (APM_STP) for the sub-axis.
- •Speed synchronization control can be executed even when the Origin of the sub-axis has not be determined.
- •In speed synchronization, the sub-axis is synchronized to the main axis. Therefore, even if the control mode of the sub-axis is set up position control, it repeats start and stop according to the operation of the main axis, and the direction of rotation of the sub-axis is the same as that of the main axis.
- •If the M code of the sub-axis is ON at the execution of the speed synchronization instruction, error code 353 is outputted to STAT.

(2) Sample Instruction

•The program below is to show exemplary operation of speed synchronization start instruction.

(a) Sample Program

•In the sample program below with the Y-axis as the sub-axis and the X-axis as the main axis, the speed synchronization start-up is executed at the synchronization ratio of 100.00[%] and delay time of 10[ms] when the main axis is started-up.



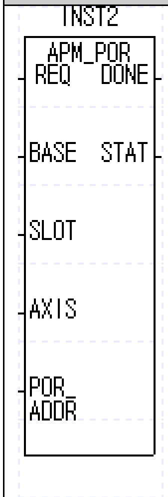
(b) Program Operation

- At the rising edge of the 'Y-axis speed synchronization' signal used as the speed synchronization reference signal, the APM_SSSB instruction is executed. Here, since the AXIS is 1 (Y-axis), Y-axis is the sub-axis and as the MST_AXIS is 0 (X-axis), X-axis is the main axis.
- At the rising edge of the 'indirect start-up' signal which is the indirect start-up reference signal, the No. 1 step of the X-axis starts indirectly.
- When the main axis starts up, Y-axis is started-up at the synchronization ratio of 100.00[%] set up in the third operand of the APM_SSSB instruction and synchronized to the main axis by 10[ms] of delay time.

5.3.13 Position Override Function Block

•The position override instruction (APM_POR) changes the target position of the axis which is presently in positioning operation to the target position set up in the instruction. For details, see 3.1.10.

(1) Position Override Instruction (APM_POR)

Form	Variable	Data Type	Description
	POR_ ADDR	DINT	Position ● Setting range: -2,147,483,648 ~ 2,147,483,647

(a) Function

•This instruction provides position override reference to the XGB internal positioning.

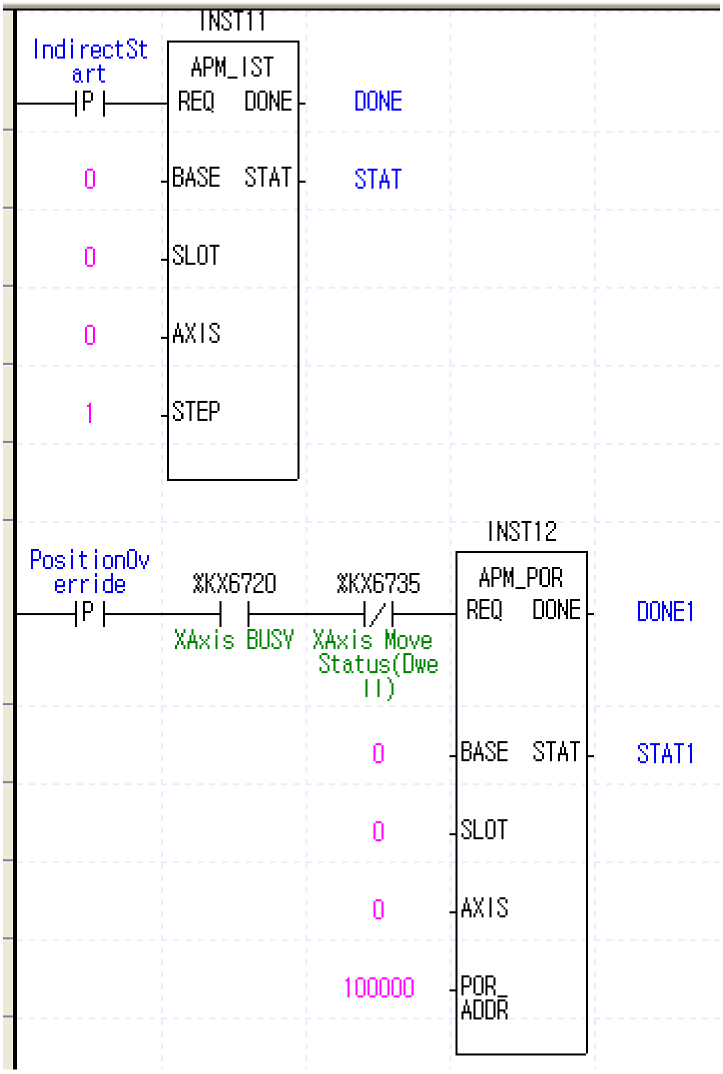
•At the rising edge of the input condition, the axis designated as AXIS changes its target position to the position set up in the POR_ADDR during operation.

•Position override instruction is available for the acceleration, constant speed, and deceleration sections of operation patterns. If position override instruction is executed during dwelling, error code 362 is outputted to STAT.

(2) Sample Instruction

•The sample program below show exemplary operation of position override.

(c) Sample Program



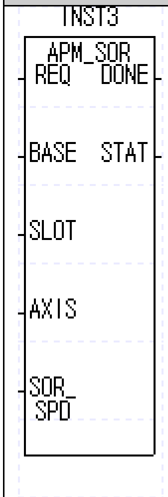
(d) Program Operation

- At the rising edge of the 'indirect start-up' signal which is the reference signal for indirect start-up, positioning X-axis is started up indirectly by operation step No. 1.
- If the rising edge of the 'position override reference' signal used as the reference signal for the position override instruction occurs before the present position reaches 100,000[Pulse] during operation, the operation continues by changing the target position of the step presently in operation to 100,000. Take care that the target position value of the No.1 step set up with the positioning parameter itself is not changed.
- If position override instruction is executed after the present position has passed 100,000[Pulse], deceleration stop occurs.
- If position override instruction is executed while the operation state is in dwelling, error code 362 is outputted to STAT. To prevent this, the start-up contact should be connected with the X-axis dwell status flag as normally closed (B contact) in the program.

5.3.14 Speed Override Function Block

•Speed override instruction (APM_SOR) changes the operating speed of the axis presently in positioning operation to the speed set up in the instruction line. For the details of speed override function, see 3.1.10.

(1) Speed Override Instruction (APM_SOR)

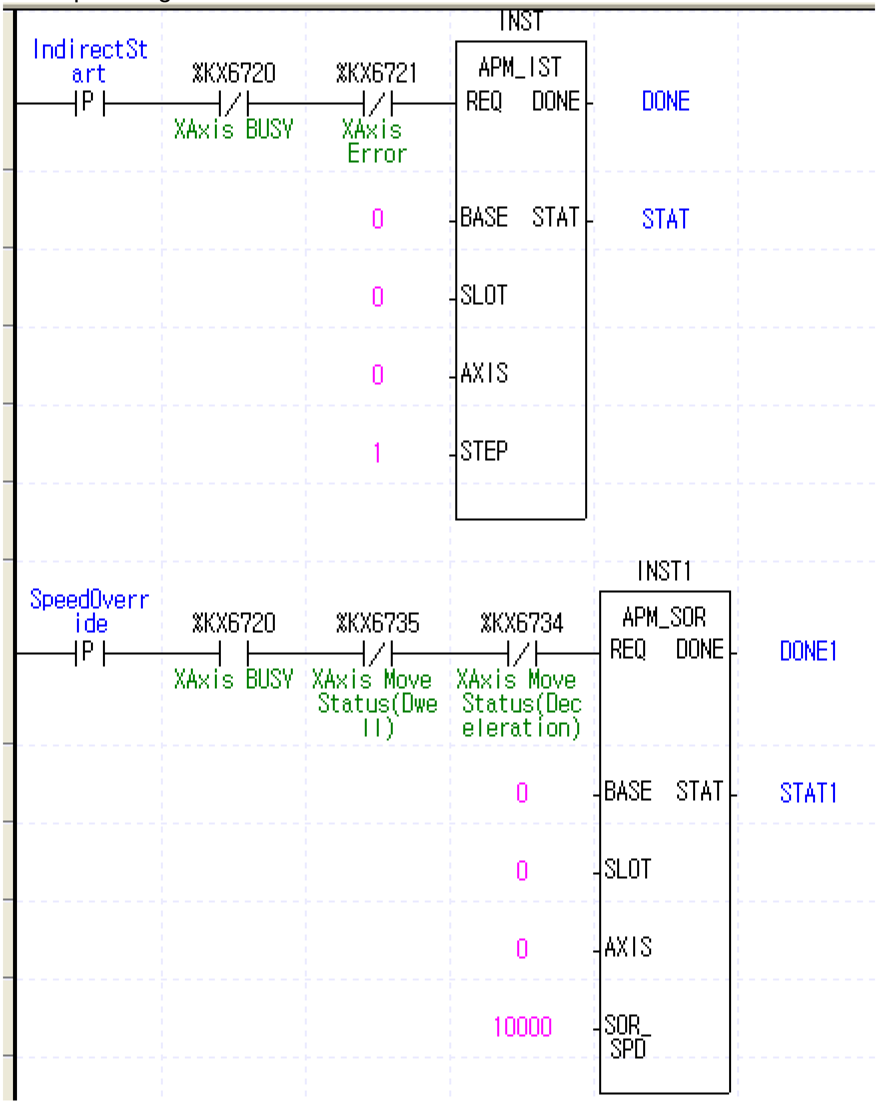
Form	Variable	Data Type	Description
	SOR_ SPD	UDINT	Operating Speed ● Setting range: 1~100,000

(a) Function
- •This instruction provides speed override reference to the XGB internal positioning.
- •At the rising edge of the input condition, the axis designated to be AXIS changes its operating speed to the speed set up in SOR_SPD.
- •Speed override instruction is available for the acceleration, constant speed, and deceleration sections of operation patterns. If speed override instruction is executed during deceleration or dwelling, error code 377 is outputted to STAT, and the present operating step does not stop and continues running.

(2) Sample Instruction

•The sample program below shows exemplary operation of speed override instruction.

(c) Sample Program



(d) Program Operation

•At the rising edge of the indirect start-up signal used as the reference for indirect start up signal, positioning X-axis is started up indirectly by the operating step No. 1.

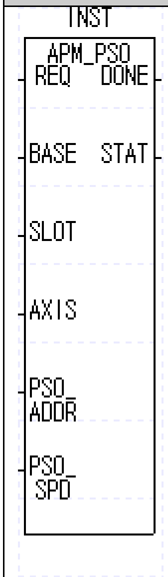
•If the rising edge of the 'speed override reference' signal used as the reference signal for the speed override instruction occurs during operation, the operation continues by changing the operating speed of the present operation step to 10,000[pps]. Take care that the speed value of the No.1 step set up with the positioning parameter itself is not changed.

•If speed override instruction is executed while the operation state is in deceleration or dwelling, error code 377 is outputted to STAT. To prevent this, the start-up contact should be connected with the X-axis dwell status flag as normally closed (B contact) in the program.

5.3.15 Positioning Speed Override Function Block

•This instruction (APM_PSO) changes the operating speed of the axis which is presently in positioning operation, at the position specified in the instruction line. For the details of this function, see 3.1.10.

(1) Positioning Speed Override Instruction (APM_PSO)

Form	Variable	Data Type	Description
	PSO_ADDR	DINT	Target position ● Setting range: -2,147,483,648 ~ 2,147,483,647
	PSO_SPD	UDINT	Operating Speed ● Setting range: 1~100,000

(a) Function

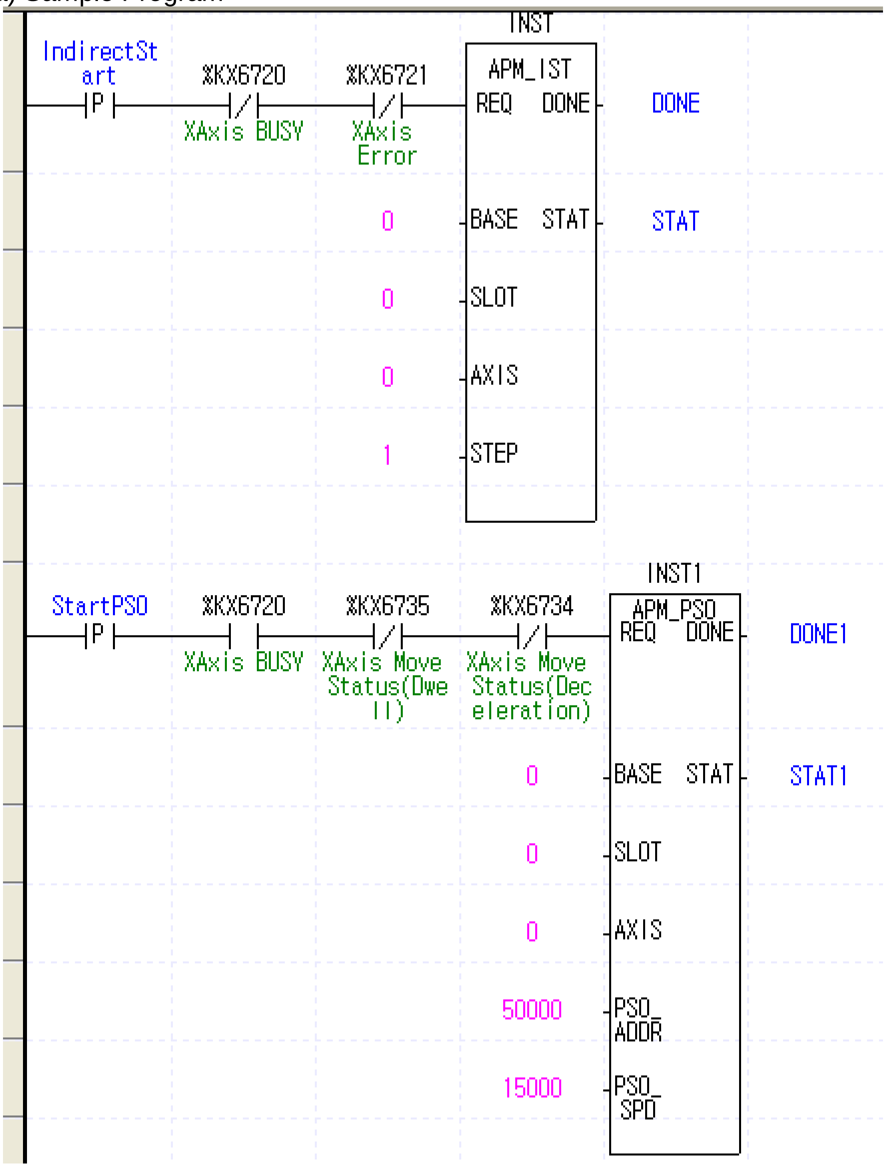
•This instruction provides positioning speed override reference to the XGB internal positioning.

•At the rising edge of the input condition, the axis designate as the AXIS executes positioning speed override. When the present position reaches the points set up in the PSO_ADDR during operation, present speed is overridden by the speed set up by the PSO_SPD.

•This instruction is available in the acceleration and constant speed sections of the operation patterns. If this override is executed during deceleration or dwelling, no error code is generated but the instruction is not executed.

(3) Sample Instruction

(a) Sample Program



(b) Program Operation

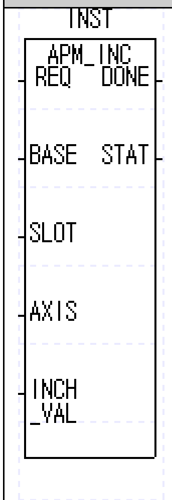
•At the rising edge of the ‘Indirect Start-up’ signal used as the indirect start-up reference signal, the positioning X-axis is started indirectly by operation step No.1.

•If the rising edge of the ‘PSO start reference signal, which is used as the reference signal for the positioning speed override instruction, occurs during operation, operation continues by changing the speed to 15,000[pps] at the moment when the position of the present operation step reaches 50,000.

5.3.16 Inching Start Function Block

•This instruction (APM_INC) is for the movement at the inching speed set up by the positioning Origin/manual parameter in the instruction. For details about inching operation, see 3.1.12.

(1) Inching Start Instruction (APM_INC)

Form	Variable	Data Type	Description
	INCH_VAL	DINT	Inching Distance ● Setting range: -2,147,483,648 ~ 2,147,483,647

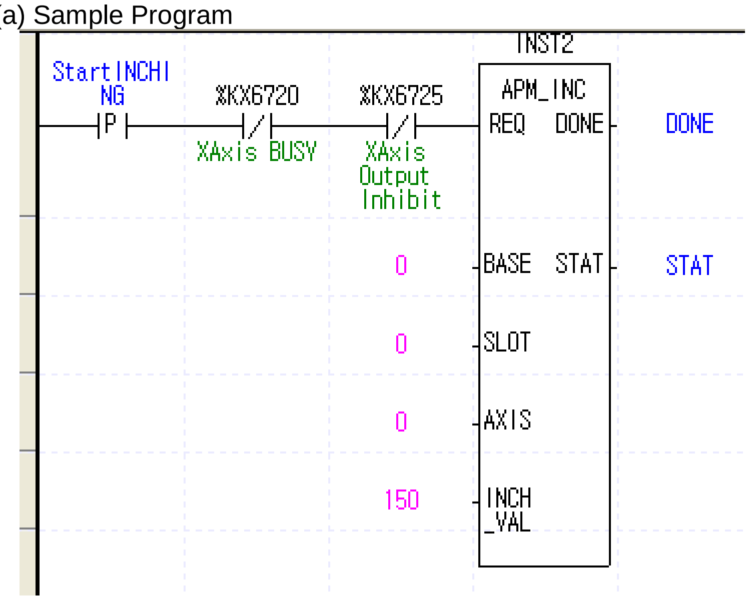
(a) Function

•This instruction provides inching operation reference to the XGB internal positioning.

•At the rising edge of the input condition, the axis designated as AXIS moves by the distance and speed set up by the INCH_VAL and positioning parameter, respectively.

(2) Sample Instruction

(a) Sample Program



(b) Program Operation

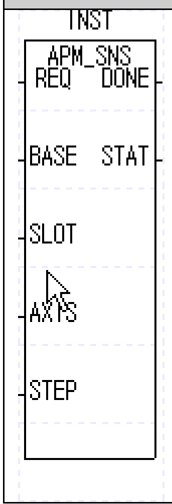
•At the rising edge of the inching start signal used as the reference signal for inching start, the positioning X-axis moves by 150 at the inching speed in Incremental coordinate set up in the positioning Origin/manual parameter.

•At inching start, if the axis is in operation or being prohibited from output, error codes 401 and 402, respectively, are outputted to STAT and does not operate.

5.3.17 Start Step Number Change Function Block

•This instruction (APM_SNS) changes the number of the step to be operated.

(1) Start Step No. Change Instruction (APM_SNS)

Form	Variable	Data Type	Description
	STEP	UINT	Operation Step No. ● Setting range: 1 ~ 80

(a) Function

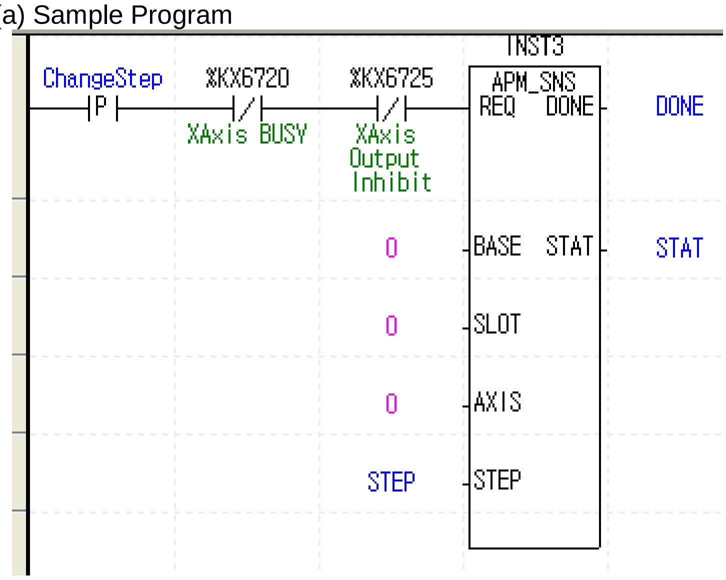
•This instruction provides start step change reference to the XGB internal positioning.

•At the rising edge of the input condition, the present step number of the axis designated to be AXIS is changed to the step set up in the STEP.

•If the axis has been in operation when this instruction is given, error code 441 is generated and the instruction is not executed. If the setting value in the STEP exceeds allowable range, error code 442 is generated and the instruction is not executed.

(2) Sample Instruction

(a) Sample Program



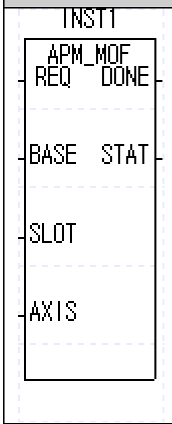
(b) Program Operation

•At the rising edge of the 'operation step change' signal used as the reference signal, the present operation step No. of the positioning X-axis is changed to the step No. set up in the STEP.

5.3.18 M Code Release Function Block

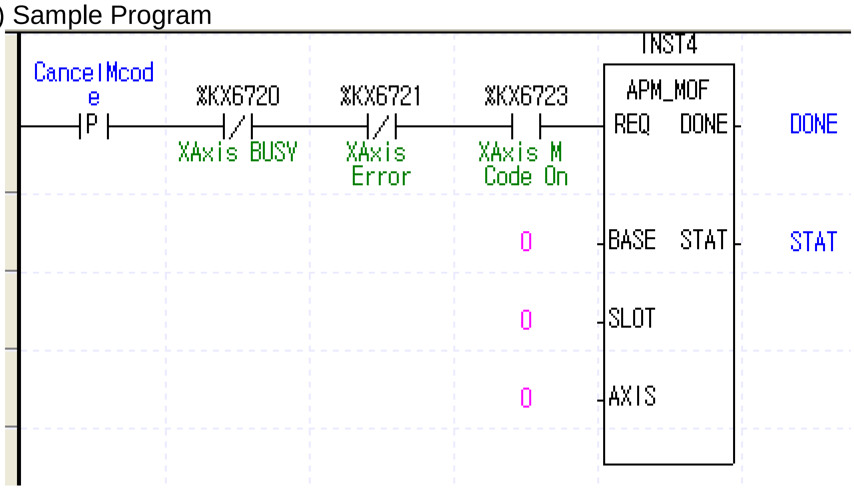
•This instruction (APM_MOF) cancels the M code generated during operation.
For details of the M code, see 3.3.

(1) M Code Release Instruction (APM_MOF)

Form	Description
	•This instruction provides M code release reference to the XGB internal positioning. •At the rising edge of the input condition, the M code On signal (X-axis: %KX6723, Y-axis: %KX6883) and the M code number (X-axis: %KW428, Y-axis: %KW438) of the axis designated as AXIS are cancelled.

(2) Sample Instruction

(a) Sample Program

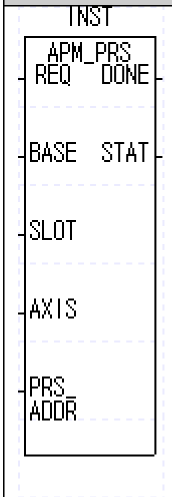


(b) Program Operation
•At the rising edge of the 'M code release' signal used as the reference signal, and if M code is generated to the positioning X-axis, the ON signal and the number of the M code are cancelled.

5.3.19 Present Position Preset Function Block

•This instruction (APM_PRS) changes present position.

(1) Present Position Preset Instruction (APM_PRS)

Form	Variable	Data Type	Description
	PRS_ADDR	DINT	Preset Value ● Setting range: -2,147,483,648 ~ 2,147,483,647

(a) Function

•This instruction provides position change reference to the XGB internal positioning.

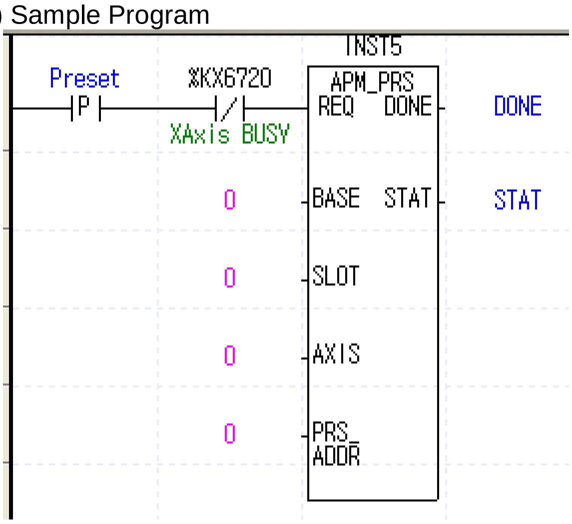
•At the rising edge of the input condition, the present position of the axis designated to be AXIS is changed to the position set up at the PRS_ADDR in the instruction line.

•At this time, if the Origin has not been defined, the Origin determination status (X-axis: %KX6724, Y-axis: %KX6884) becomes ON.

•It the axis has been in operation when this instruction is given, error code 451 is outputted to STAT and the instruction is not executed.

(2) Sample Instruction

(a) Sample Program



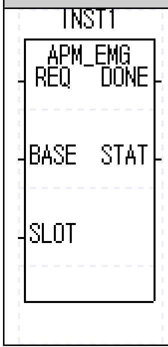
(b) Program Operation

• At the rising edge of the ‘preset’ signal, the position of the positioning X-axis is changed to 0 set up in the instruction and the reference determination state bit is ON.

5.3.20 Emergency Stop Function Block

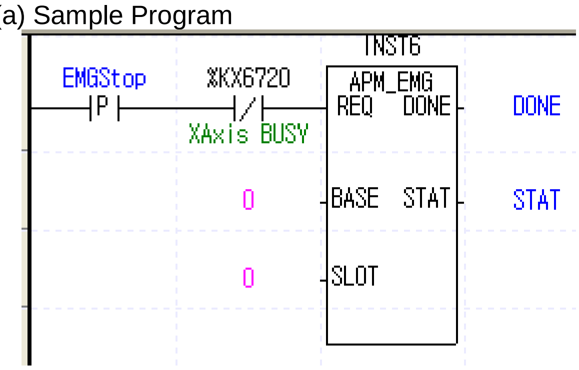
•Emergency stop instruction immediately stops present operation and cuts off output.
For details of this function, see 3.1.11.

(1) Emergency Stop Instruction (APM_EMG)

Form	Description
	•Provides emergency stop reference to the XGB internal positioning. •At the rising edge of the input condition, both internal positioning X-axis and Y-axis are stopped without deceleration process, status flag (X-axis: %KX6725, Y-axis: %KX6885) is On, and error code 481 is outputted to STAT. •When this instruction has been executed, output is cut off and Origin is undetermined. To resume operation, Origin must be determined by reference return, floating reference setting, or present position preset function.

(2) Sample Instruction

(a) Sample Program



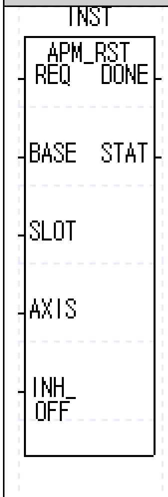
(b) Program Operation

•At the rising edge of the 'emergency stop' signal used as the reference signal, both X-axis and Y-axis of the XEC internal positioning stop operation immediately. Error code 481 is generated and output is cut off.

5.3.21 Error Reset, Output Cut-off Release Function Block

•This instruction reset present error and releases output cut-off.

(1) Error Reset Instruction (APM_RST)

Form	Variable	Data Type	Description
	INH_OFF	BOOL	Output cut-off release ● Setting range: 0 ~ 1 (0: output cut-off not released, 1: output cut-off released)

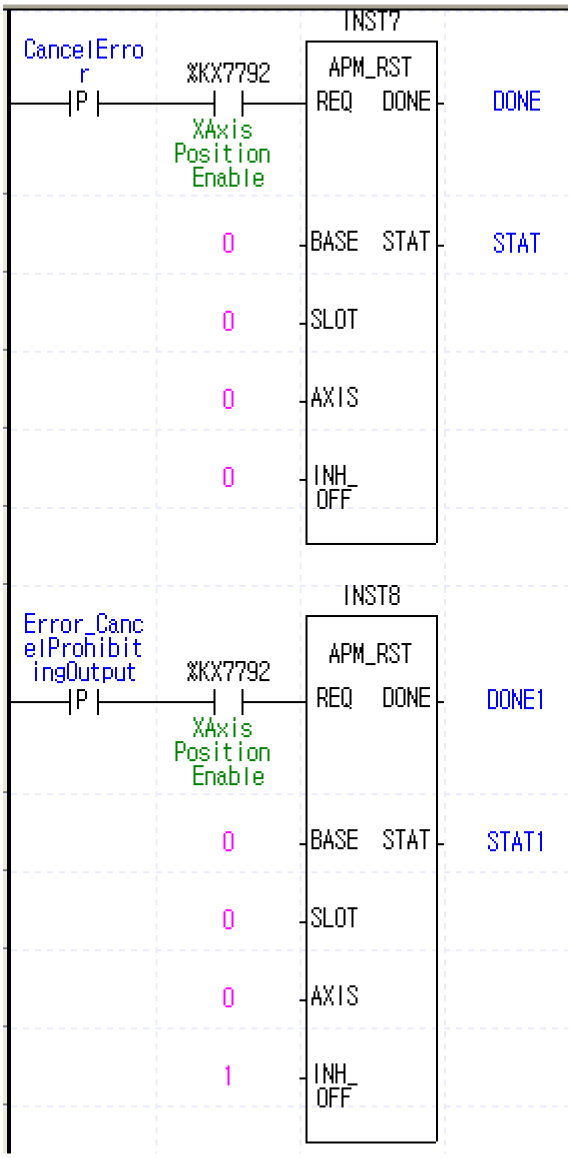
(a) Function

•This instruction provides error reset reference to the XGB internal positioning.

•At the rising edge of the input condition, the error code applied to the axis designated as the AXIS is released. At this time, if the setting value of the INH_OFF is 0, only the error code is released but the output cut-off is maintained, and it the value is 1. output cut-off is released too.

(2) Sample Instruction

(a) Sample Program



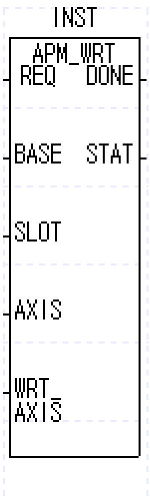
(b) Program Operation

- When error and output cut-off have been applied by emergency stop, at the rising edge of the 'error reset' signal which is used as the reference signal for error reset, the error code of the positioning X-axis only is released and the output cut-off is not released.
- At the rising edge of the 'Error_Output Cut-off Release' signal used as the reference signal, both the error code and output cut-off of the positioning X-axis are released.

5.3.22 Parameter/Operation Data Write Function Block

•Parameter Write instruction (APM_WRT) writes the operation data, which is changed during operation, of the positioning exclusive K area permanently in the built-in flash memory of the XGB. For the relation between the positioning exclusive K area and the positioning parameter, see 3.2.2.

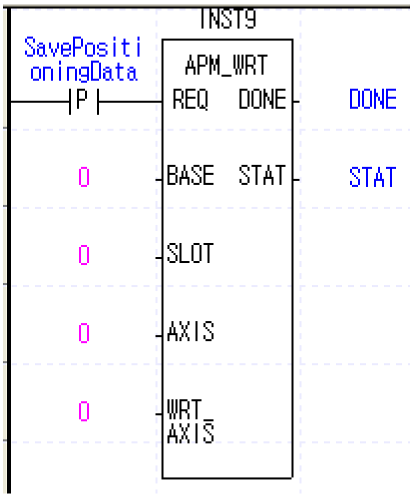
(1) Parameter Write Instruction (APM_WRT)

<table>
<tr><th>Form</th><th>Variable</th><th>Data Type</th><th>Description</th></tr>
<tr><td>
</td><td>WRT_AXIS</td><td>USINT</td><td>•This instruction provides reference to the XGB internal positioning for permanent preservation of the operation data of the exclusive K area.
•At the rising edge of the input condition, as shown below, saves the operation data of the exclusive K area respective of the n1 setting in the flash memory device of the XGB, permanently.
<table>
<tr><th>Setting Value</th><th>0</th><th>1</th><th>2</th></tr>
<tr><td>K area to be preserved</td><td>Positioning Data</td><td>High Speed Counter Data</td><td>PID Control Data</td></tr>
</table>
•If WRT_AXIS is set to 0, the present operation data in the exclusive K area of the positioning functions X-axis and Y-axis are permanently stored as the positioning parameters.
If it is set to 1, the setting data in the exclusive K area of all the high speed counter channels are stored permanently as the high speed counter parameters.
If it is set to 2, the setting data in the exclusive K area in the internal PID's 16 loop are stored permanently as the PID parameters.

•At this time, although the value set up with AXIS is the operand which does not have influence on the execution of the APM_WRT instruction, however, be careful that, if it exceeds the setting range (0 ~ 1), 11 is outputted to STAT and the instruction is not executed.</td></tr>
</table>

(2) Sample Instruction

(a) Sample Program



(b) Program Operation

•At the rising edge of the ‘store positioning data’ signal used as the parameter saving reference signal, the operation data in the exclusive K area of the positioning functions X-axis and Y-axis are permanently stored as the parameters in the XGB’s flash memory.

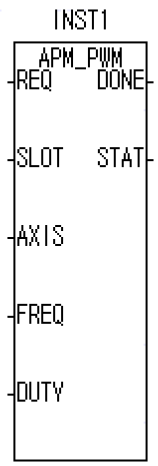
•Take care that, when the APM_WRT instruction is executed, the positioning parameters previously stored are replaced with the operation data of the exclusive K area.

•Take care that when APM_WRT instruction is executed, the existing positioning parameters in the flash memory are replaced with the operation data in the exclusive K area, therefore, the scan time of the scan in which the instruction has been executed becomes longer.

5.3.23 Pulse Width Modulation

• Pulse Width Modulation is to operate On/Off output in designated Off duty rate and Output cycle.

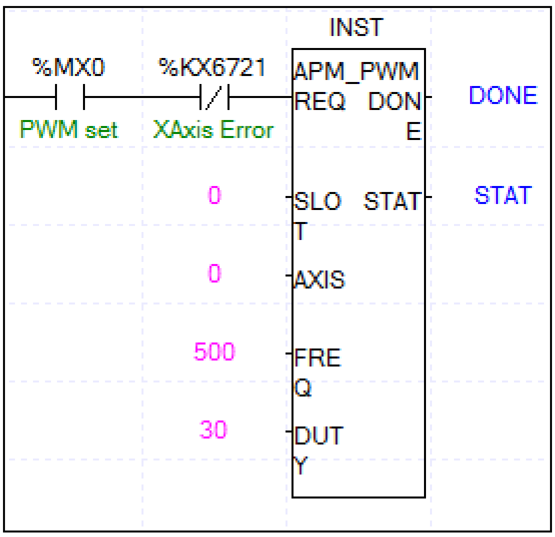
(1) Pulse Width Modulation (APM_PWM)

Form	Variable	Data Type	Description
	FREQ	WORD	Output cycle ● Setting rage: 1~20,000(ms)
	DUTY	WORD	Off duty rate ● Setting range: 1 ~100(%)

(a) Fuction
- This instruction is for PWM output.
- While the input condition is On state, XGB postioning outputs pulse train in designated cycle time in FREQ and designated Off duty rate in DUTY at designated axis in AXIS
- During PWM output, current address don't change. Constant speed bit(X-axis: %K%6733, Y-axis: %KX6893) and Operation bit(X- axis: %KX6720, Y- axis:%KX6880) set On.

(2) Example of Use of the Instruction

(a) Sample Program

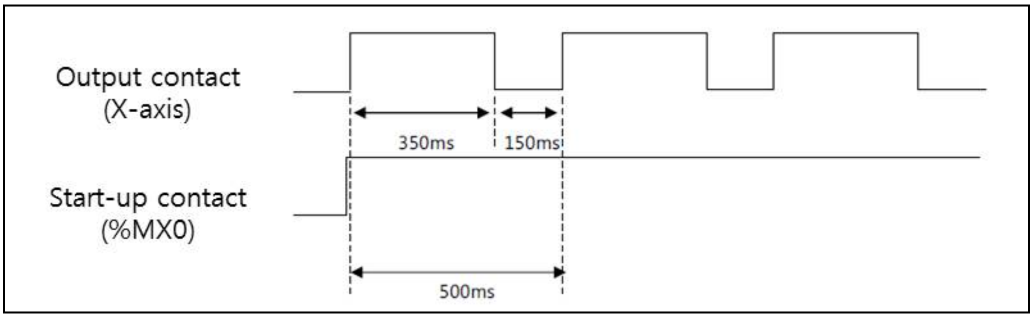


(b) Used Device

Device	설 명
MX0	PWM output reference signal
%KX6721	X-axis error state

(c) Operation of the Program

• While MX0 is On which is used as output reference signal, PWM is operated.
(At this time, the X-axis is in operation or errorstatus, the instruction will not be executed.)
• If PWM executed, designated output cycle(500ms for this picture) and designated Off duty rate(30% for this picture)



• If APM_PWM instruction is executed, other instruction do not operate. And upper/lower limit does not work

• If APM_PWM instruction is executed, STP, EMG instruction doesn’t operate. To stop output, Off the Start-up contact

• If output cycle is changed, when operating APM_PWM, it cannot be applied.

• PWM applicable version
-XEC-DN/DPxxH: O/S from V1.50
-XEC-DN/DPxxSU: O/S from V1.00

Chapter 6 Positioning Monitoring Package

6.1 Introduction to Positioning Monitoring Package

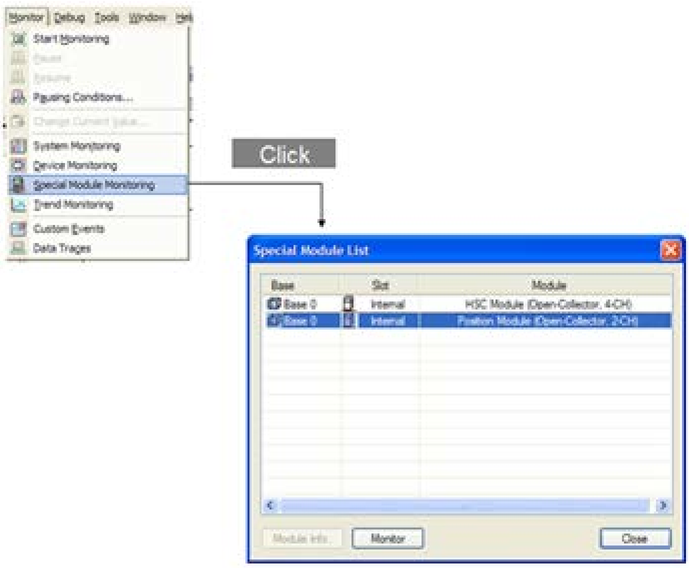
You can monitor the status of XGB PLC built-in positioning and carry out test operation without the program by changing the parameters and operation data if you use the XGB monitoring package.

6.1.1 Introduction of Positioning Monitoring Package

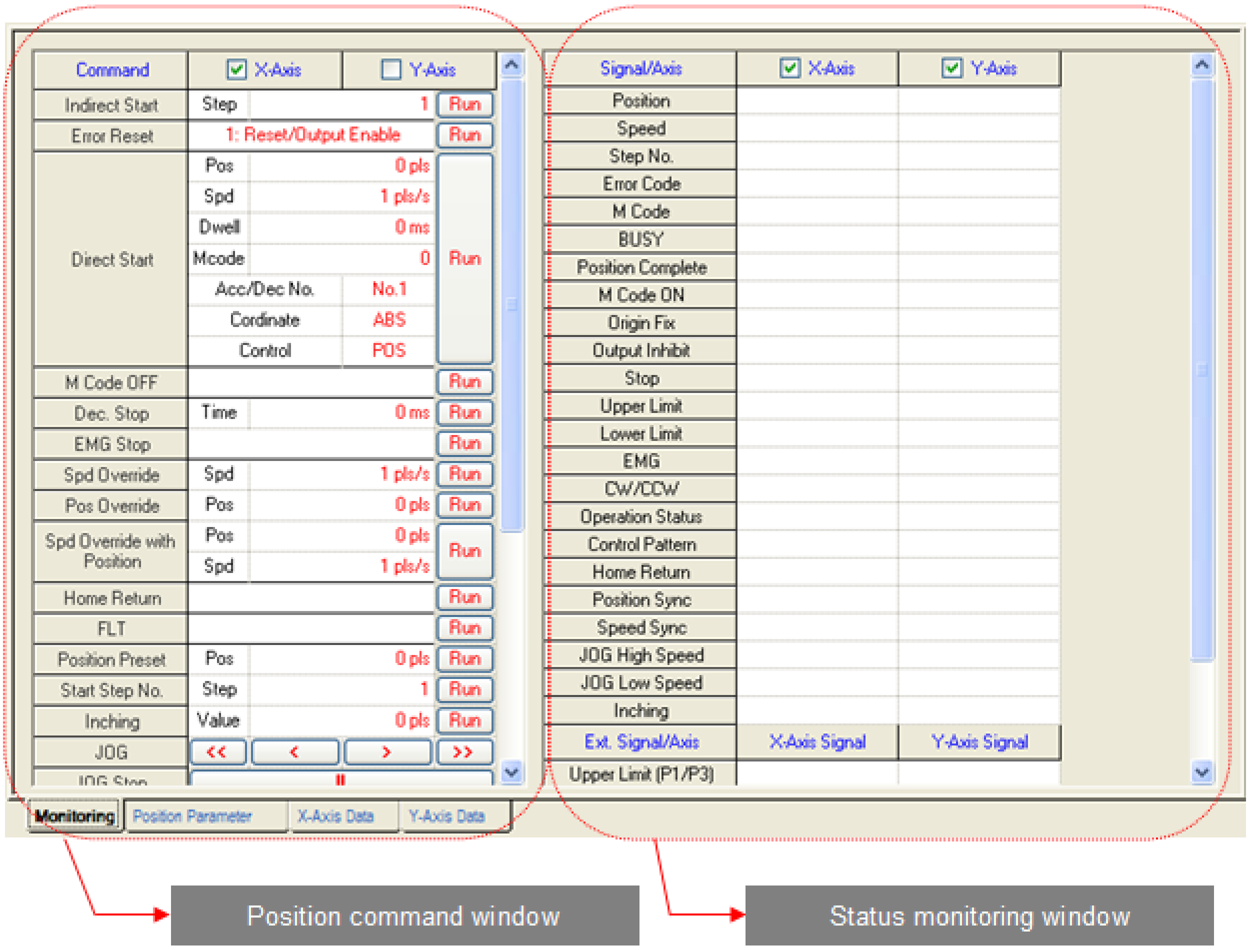
- You can easily and conveniently monitor the current positioning operation or change the parameter or operation data by using the following positioning monitoring package with XGB PLC connected to XG5000.
- If you use the positioning monitoring package, you can easily carry out test operation without the program, adjust the parameter and operation data, and permanently save it in PLC after the adjustment.
- This chapter describes how to run the XGB positioning monitoring package.
- XGB positioning monitoring package is available with over XG5000 V1.2 (over V2.2 for XBCH, over V3.0 for XECH, over V3.4 for XBCS, over V3.7 for XECS), and it is carried out in the following sequence. (This manual has been made by using XG5000 V2.2)

(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.	
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	Carried out positioning monitoring.	
Stop Monitor	Stops positioning monitoring.	
Write PLC	Permanently saves the changed parameter and operation data in PLC.	WRT function
Save Project	Saves the changed parameter and operation data in XG5000 project.	

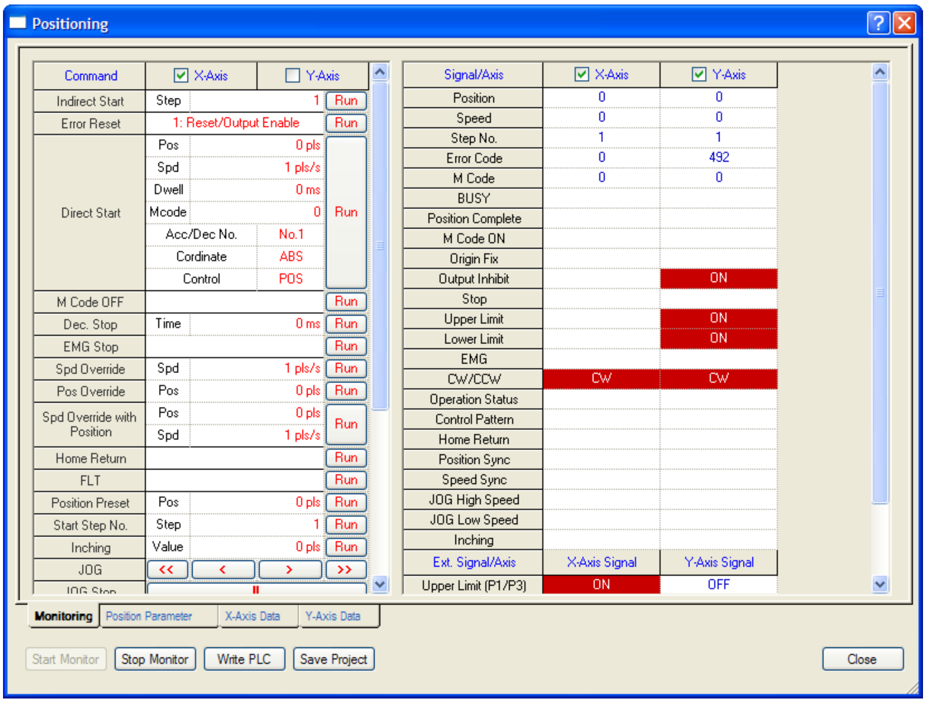
• For details of each menu, refer to 6.2.

6.2 Menus and Functions of Positioning Monitoring

The following is the function and use of the menus of the XGB monitoring package.

6.2.1 Monitoring and Command

- The positioning monitoring package consists of the command window for positioning test operation 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).

Item	Description	Command	Remark
Indirect start	Direct start with the operation step set in the monitoring window	IST APM_IST	5.2.4 5.3.5
Error reset	Resets the error code and output inhibition in case of an error	CLR APM_RST	5.2.20 5.3.21
Direct start	Directly starts with the position, speed, dwell, M code, acc./dec. number, coordinates and control method set in the monitoring window	DST APM_DST	5.2.3 5.3.4
M code OFF	Cancels the M code On signal and M code number	MOF APM_MOF	5.2.17 5.3.18
Dec. stop	Carries out deceleration stop in the set deceleration time	STP APM_STP	5.2.9 5.3.10
EMG stop	Stops the operation of the axis and inhibits pulse output	EMG APM_EMG	5.2.19 5.3.20

Item	Description	Command	Remark
Spd override	Overrides the speed at the set speed value	SOR APM_SOR	5.2.13 5.3.14
Pos override	Overrides the position at the set position value	POR APM_POR	5.2.12 5.3.13
Spd override with position	Changes the operation speed at the speed value set in the set position	PSO APM_PSO.	5.2.14 5.3.15
Home return	Conducts home return as the home return method set in the positioning parameter	ORG APM_ORG	5.2.1 5.3.2
FLT	Sets the current position as the fixed home	FLT APM_FLT	5.2.2 5.3.3
Position preset	Presets the current position with the set value	PRS APM_PRS	5.2.18 5.3.19
Start step No.	Changes the start step with the set step	SNS APM_SNS	5.2.16 5.3.17
Inching	Conducts inching operation to the set position (inching amount) at the inching speed set in the positioning parameter	INCH APM_INC	5.2.15 5.3.16
Jog	Conducts jog operation at the jog speed set in the parameter [<<] Reverse high speed [<] Reverse low speed [II] Jog stop [>] Normal low speed [>>] Normal high speed	-	
Spd position conversion	Changes from speed control to position control	VTP APM_VTP	5.2.7 5.3.8
Position spd conversion	Changes from position control to speed control	PTV APM_PTV	5.2.8 5.3.9
Spd synchronous operation	Speed synchronous operation at the set main axis, speed ration and delay time	SSS APM_SSS	5.2.11 5.3.12
Position synchronous operation	Speed synchronous operation at the set main axis, step and position	SSP APM_SSP	5.2.10 5.3.11
Simultaneous start	Simultaneous start with the operation step set for each axis	SST APM_SST	5.2.6 5.3.7
Straight interpolation operation	Straight interpolation operation for axes X and Y with the set operation step	LIN APM_LIN	5.2.5 5.3.6

Remark

- Note that the positioning command through the XGB positioning monitoring package is executed regardless of the operation mode of PLC.
- If the PLC operation mode is Run mode, the positioning command is executed in the positioning monitoring package, and if a different command is executed in the instruction of the program, XGB PLC executes them both.
  Therefore, in such a case, it might operate differently from the intent of the user or an error might occur.
  Note that if you use the positioning monitoring package, positioning by the instruction in the program is not executed.

(2) 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.

(a) In case of XBM/XBC

Item	Displays	Related flag		Remark
		Axis X	Axis Y	
Current position	Current position of each axis	K422	K432	DINT
Current speed	Current speed of each axis	K424	K434	DINT
Step No.	Currently operating step of each axis	K426	K436	WORD
Error code	Error code in case of an error of the axis	K427	K437	WORD
M code	M code of the currently operating step	K428	K438	WORD
Busy	Whether the axis is operating	K4200	K4300	BIT
Positioning complete	Whether the positioning has been completed for the axis	K4202	K4302	BIT
M code On	M code On/Off of the currently operating step	K4203	K4303	BIT
Origin fix	Whether the origin has been fixed	K4204	K4304	BIT
Output inhibit	Whether output is inhibited	K4205	K4305	BIT
Upper limit detection	Whether the upper limit is detected	K4208	K4308	BIT
Lower limit detection	Whether the lower limit is detected	K4209	K4309	BIT
EMG stop	Emergency stop	K420A	K430A	BIT
Normal/reverse rotation	Normal and reverse rotation	K420B	K430B	BIT
Operation status	The operation status of each axis (acc., dec., constant speed, and dwell)	K420C~ K420F	K430C~ K430F	BIT
Control pattern	Operation control pattern of each axis (position, speed, interpolation)	K4210~ K4212	K4310~ K4312	BIT

Item	Displays	Related flag		Remark
		Axis X	Axis Y	
Home return	Whether home return is being conducted	K4215	K4315	BIT
Position Sync	Whether position synchronization is being conducted	K4216	K4316	BIT
Speed Sync	Whether position synchronous operation is being conducted	K4217	K4317	BIT
Jog high speed	Whether jog high speed operation is being conducted	K4219	K4319	BIT
Jog low speed	Whether jog low speed operation is being conducted	K4218	K4318	BIT
Inching	Whether inching operation is being conducted	K421A	K431A	BIT

(b) In case of XEC

Item	Displays	Related flag		Remark
		Axis X	Axis Y	
Current position	Current position of each axis	%KD211	%KD216	DINT
Current speed	Current speed of each axis	%KD212	%KD217	DINT
Step No.	Currently operating step of each axis	%KW426	%KW436	WORD
Error code	Error code in case of an error of the axis	%KW427	%KW437	WORD
M code	M code of the currently operating step	%KW428	%KW438	WORD
Busy	Whether the axis is operating	%KX6720	%KX6880	BIT
Positioning complete	Whether the positioning has been completed for the axis	%KX6722	%KX6882	BIT
M code On	M code On/Off of the currently operating step	%KX6723	%KX6883	BIT
Origin fix	Whether the origin has been fixed	%KX6724	%KX6884	BIT
Output inhibit	Whether output is inhibited	%KX6725	%KX6885	BIT
Upper limit detection	Whether the upper limit is detected	%KX6728	%KX6888	BIT
Lower limit detection	Whether the lower limit is detected	%KX6729	%KX6889	BIT
EMG stop	Emergency stop	%KX6730	%KX6890	BIT
Normal/reverse rotation	Normal and reverse rotation	%KX6731	%KX6891	BIT
Operation status	The operation status of each axis (acc., dec., constant speed, and dwell)	%KX6732 ~ %KX6735	%KX6892 ~ %KX6895	BIT
Control pattern	Operation control pattern of each axis (position, speed, interpolation)	%KX6736 ~ %KX6738	%KX6896 ~ %KX6898	BIT

Item	Displays	Related flag		Remark
		Axis X	Axis Y	
Home return	Whether home return is being conducted	%KX6741	%KX6901	BIT
Position Sync	Whether position synchronization is being conducted	%KX6742	%KX6902	BIT
Speed Sync	Whether position synchronous operation is being conducted	%KX6743	%KX6903	BIT
Jog high speed	Whether jog high speed operation is being conducted	%KX6744	%KX6904	BIT
Jog low speed	Whether jog low speed operation is being conducted	%KX6745	%KX6905	BIT
Inching	Whether inching operation is being conducted	%KX6746	%KX6906	BIT

(3) Positioning External Input Signal Monitoring

• The external signal monitoring at the bottom of the monitoring window displays the status of the external input contact point, which is the fixed input contact point for the axes as follows.

Item	Displays	Type	Contact No.		Remark
			Axis X	Axis Y	
Upper limit signal	External upper limit signal status of the axes	XBM	P00001	P00003	
		XBC	P00009	P0000B	
		XEC	%IX0.0.9	%IX0.0.11	
Lower limit signal	External lower limit signal status of the axes	XBM	P00000	P00002	
		XBC	P00008	P0000A	
		XEC	%IX0.0.8	%IX0.0.10	
Approximate origin signal	Approximate origin signal status of the axes	XBM	P00004	P00006	
		XBC	P0000C	P0000E	
		XEC	%IX0.0.12	%IX0.0.14	
Origin signal	Origin signal status of the axes	XBM	P00005	P00007	
		XBC	P0000D	P0000F	
		XEC	%IX0.0.13	%IX0.0.15	

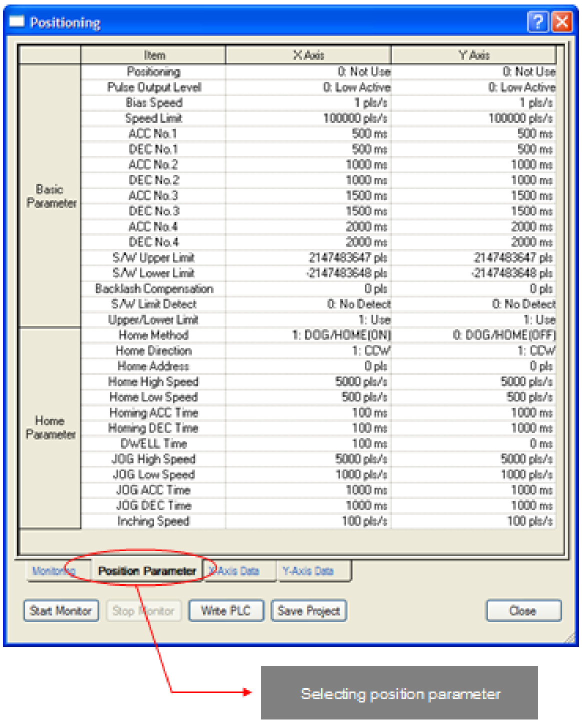
6.3 Parameter/Operation Data Setting Using Monitoring Package

You can change the positioning parameter and operation data of XGB PLC and do test operation by using the XGB monitoring package.

6.3.1 Changing the Position Parameter

(1) How to Change the Parameter

- You can change the position parameter by using the position monitoring package. Note that the change of the parameter is applied when the next operation is started after the currently operating step ends.
- 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, and the parameter and operation data that have been changed are applied when the next operation step is started.

Remark

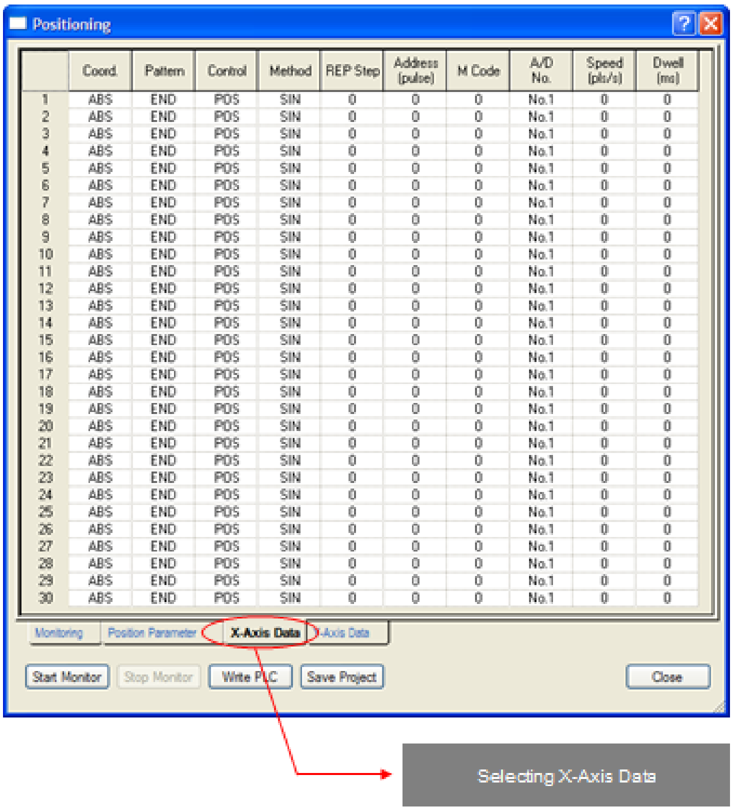
- If you execute 'Write PLC,' the position parameter set in the positioning monitoring package and the operation data of each axis are all transferred to XGB.
- The parameter and operation data displayed when the positioning monitoring package is executed are not the data read from XGB but the parameter and operation data currently saved in XG5000. Therefore if you change the parameter or operation data in the positioning monitoring package and save them in the XGB PLC, be sure to press the 'Save Project' button to save them in the XG5000 project. Otherwise the settings of XG5000 might be different from XGB.

6.3.2 Change of Position Operation Data

(1) How to Change the Position Operation Data

• You can change the operation data of each axis during operation by using the positioning monitoring package. Note that the change of the operation data is applied when the next operation is started after the currently operating step ends.

• 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.



• 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, and the parameter and operation data that have been changed are applied when the next operation step is started

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 and save them in the XGB PLC, be sure to press the ‘Save Project’ button to save them in the XG5000 project. Otherwise the settings of XG5000 might be different from XGB.
• For details, refer to 3.2. and 3.3.

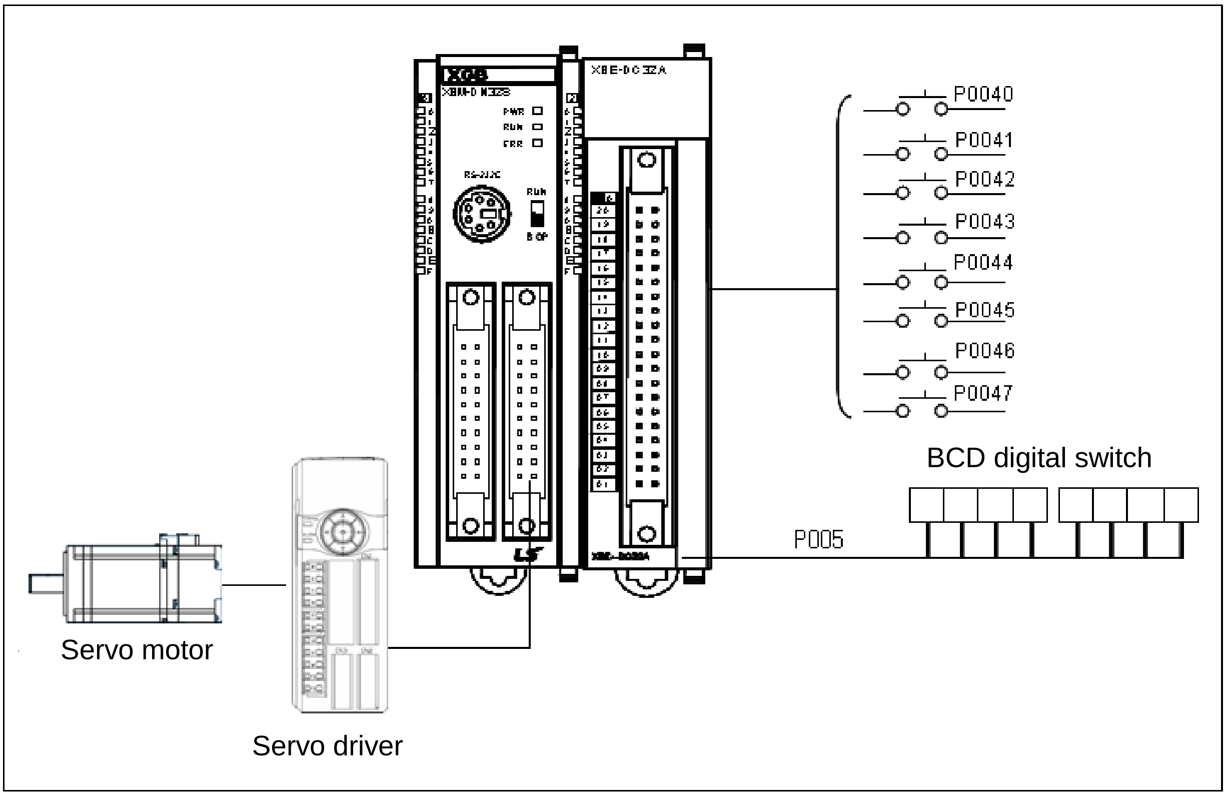
Chapter 7 Program Examples of Positioning

This chapter describes the program examples of the instructions of XGB positioning function.

7.1 System Composition and Setting of Input and Output

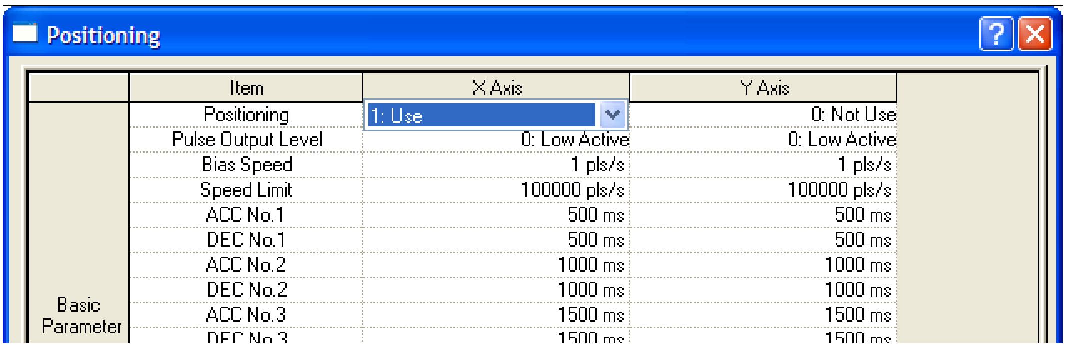
- This section describes the setting of the positioning system and the input and output signals for the program example of XGB positioning. If there is no separate description, all the example programs addressed in Chapter 7 were made according to the settings of the input and output signals described in this chapter.

(1) XBM-DNxxS system configuration



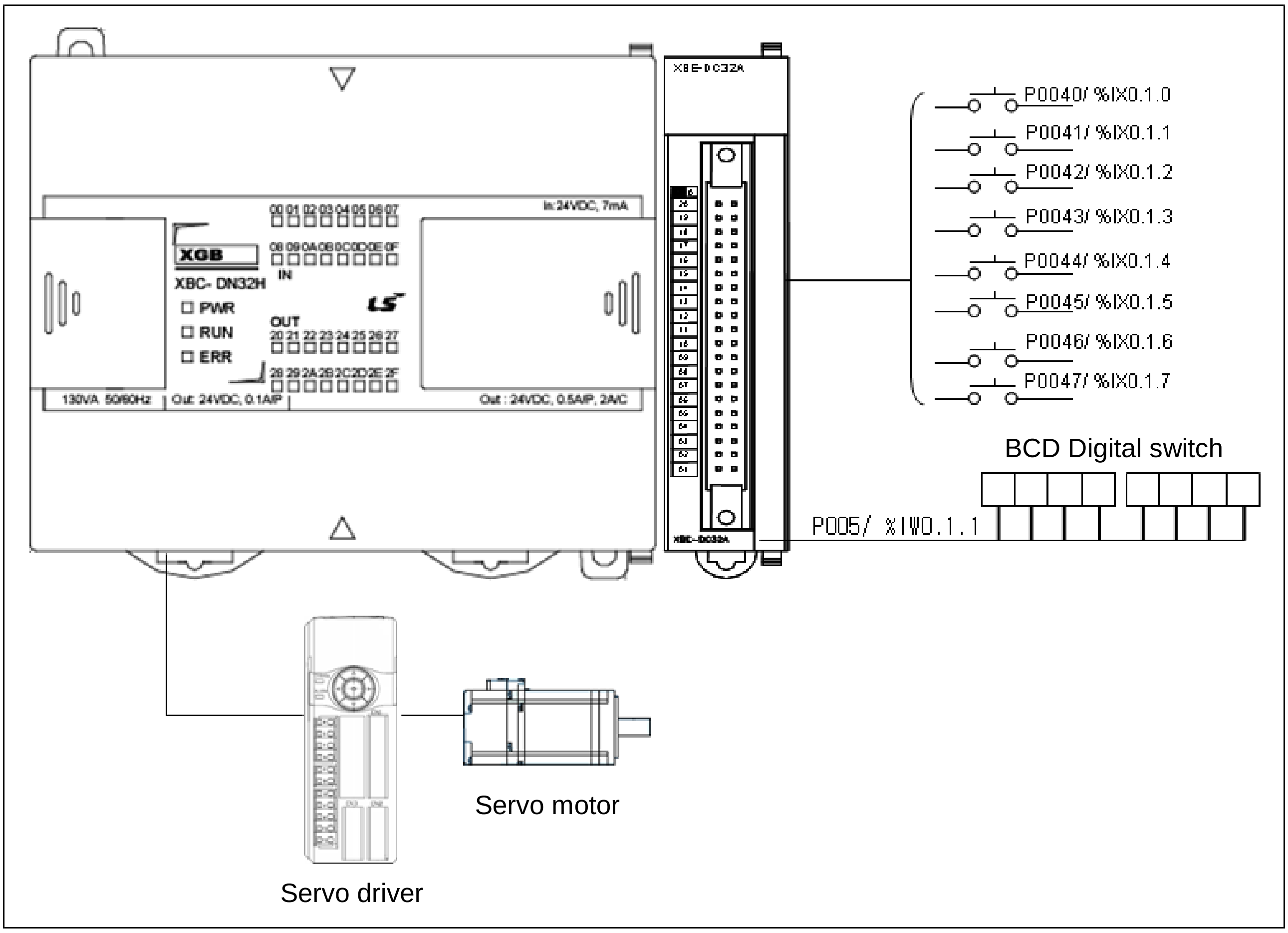
Remark

- Be sure to set the basic parameter positioning as '1:Use' when you use the positioning function.



	Item	X Axis	Y Axis
Basic Parameter	Positioning	1: Use	0: Not Use
	Pulse Output Level	0: Low Active	0: Low Active
	Bias Speed	1 pls/s	1 pls/s
	Speed Limit	100000 pls/s	100000 pls/s
	ACC No.1	500 ms	500 ms
	DEC No.1	500 ms	500 ms
	ACC No.2	1000 ms	1000 ms
	DEC No.2	1000 ms	1000 ms
	ACC No.3	1500 ms	1500 ms
	DEC No.3	1500 ms	1500 ms

(2) XBC(XEC)-DNxxH system configuration

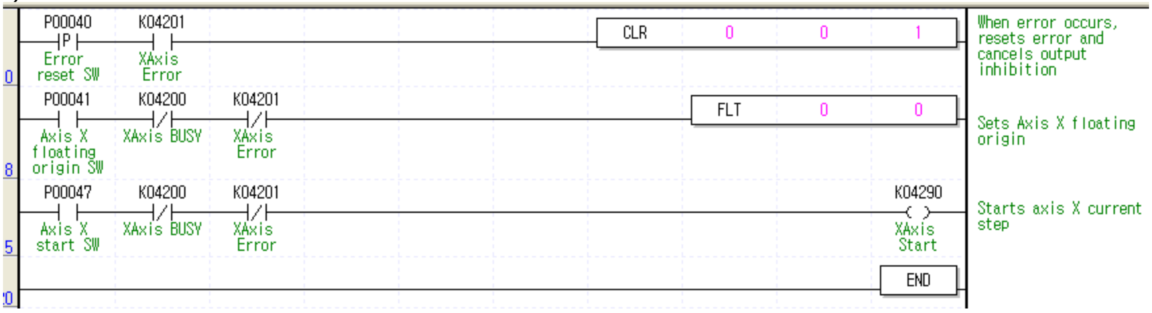


7.2 Program Examples

7.2.1 Floating Origin Setting/Single Operation

• The example program of the single operation after the floating origin setting by using the XGB positioning function is as follows.

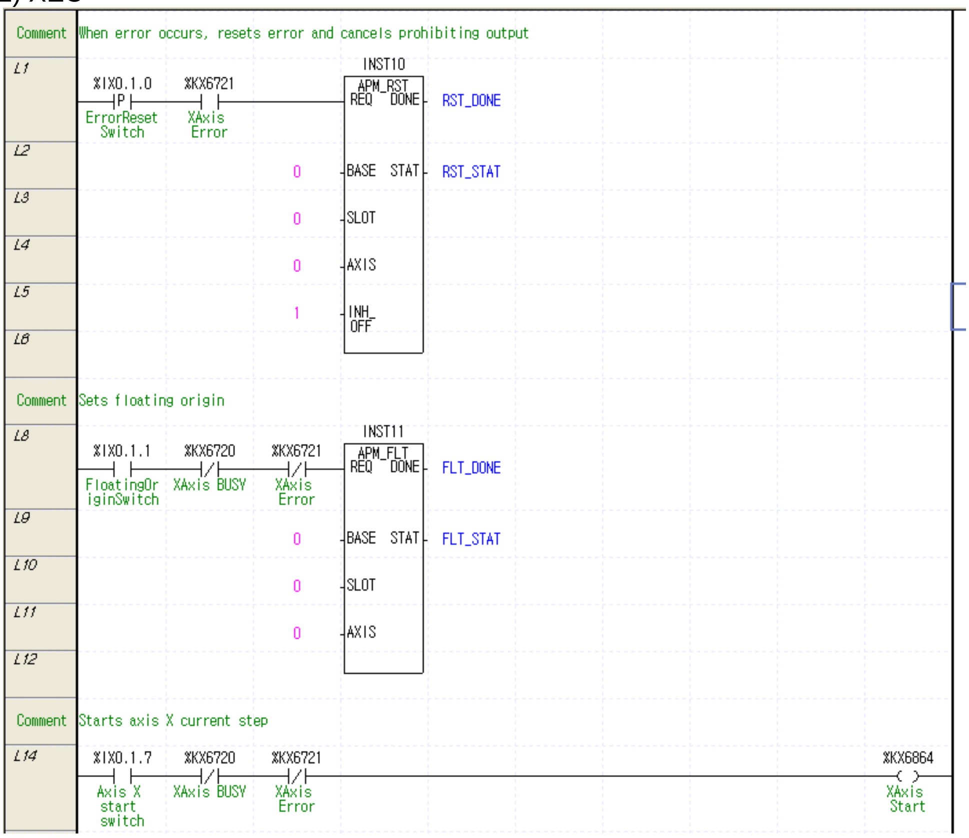
(1) XBM/XBC



(a) Devices Used

Device	Description
P0040	Axis X error reset, output inhibition cancel switch
P0041	Axis X axis X floating origin switch
P0047	Start switch of axis X
K4200	Signal during axis X operation
K4201	Error signal of axis X
K4290	Axis X start

(2) XEC



(a) Devices Used

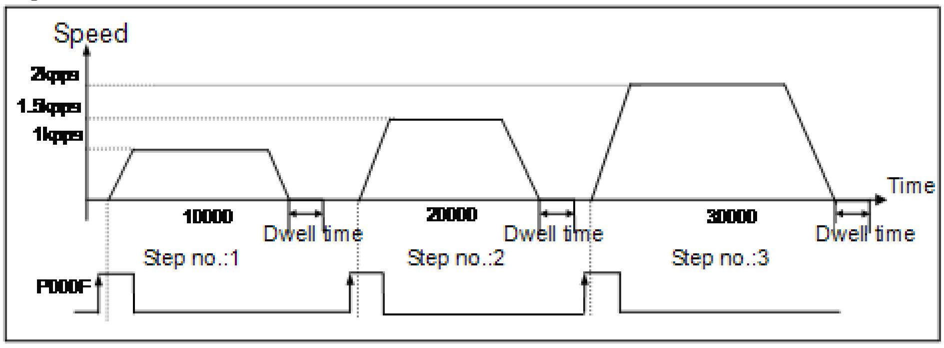
Device	Description
%IX0.1.0	Axis X error reset, output inhibition cancel switch
%IX0.1.1	Axis X axis X floating origin switch
%IX0.1.7	Start switch of axis X
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X
%KX6864	Axis X start

(3) Operation Data Setting

Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [㎳]
1	Absolute	Position control	End	Single	0	10,000	0	1	1000	100
2	Absolute	Position control	End	Single	0	20,000	0	1	1500	100
3	Absolute	Position control	End	Single	0	30,000	0	1	2000	100

(4) Operation Sequence

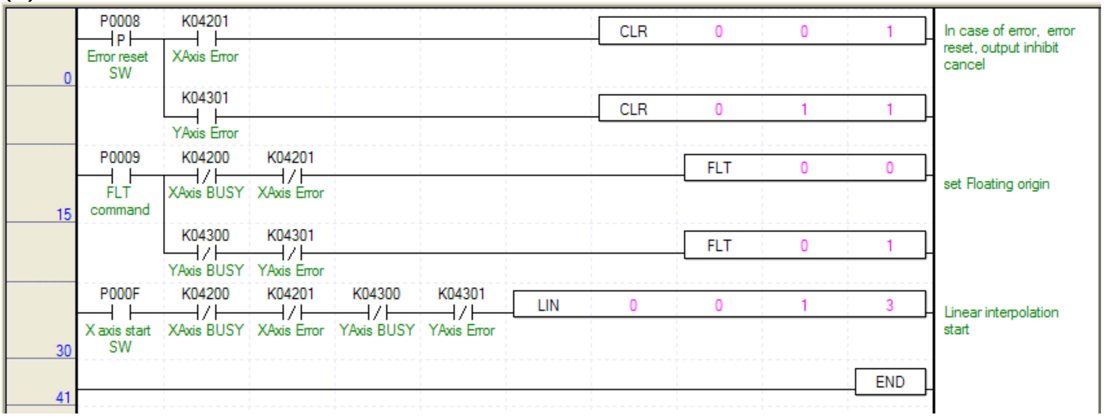
- P0041/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position
- 3 times of P0047/%IX0.1.7 (start) switch On : 3 times of single operation (steps 1~3). If it is operating now, the start instruction is not executed.



7.2.2 Straight Interpolation Operation

• The example program of the straight interpolation operation after the floating origin is set is as follows.

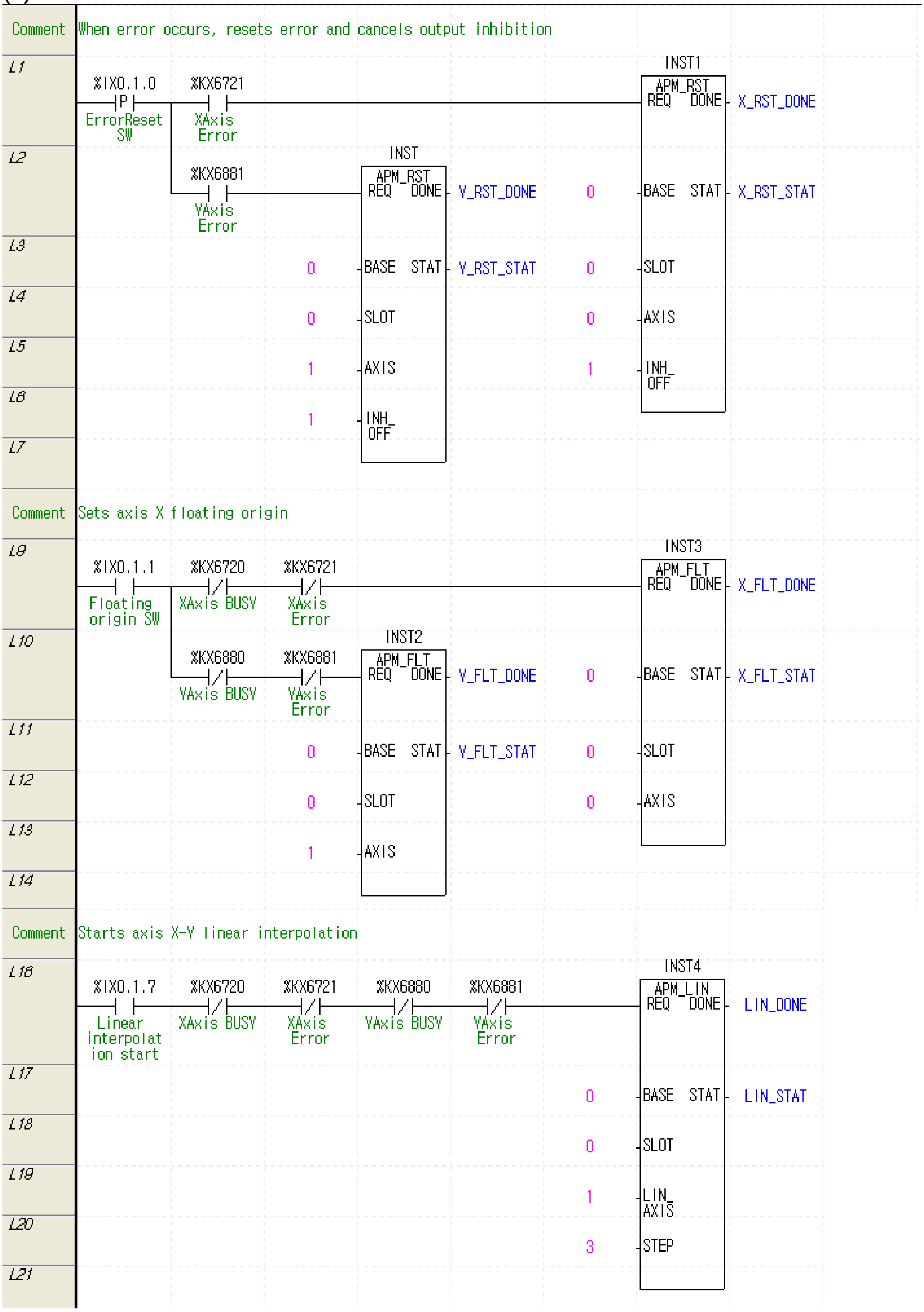
(1) XBM/XBC



(a) Devices Used

Device	Description
P0008	Axis X error reset, output inhibition cancel switch
P0009	floating origin switch
P000F	Straight interpolation start switch
K4200	Signal during operation of axis X
K4201	Signal of axis X error
K4300	Signal during operation of axis Y
K4301	Signal of axis Y error

(2) XEC



Comment When error occurs, resets error and cancels output inhibition
%IX0.1.0
ErrorReset SW
%KX6721
XAxis Error
%KX6881
YAxis Error
INST1
APM_RST
REQ DONE
X_RST_DONE
BASE STAT
X_RST_STAT
SLOT
AXIS
INH_OFF
INST
APM_RST
V_RST_DONE
V_RST_STAT
Comment Sets axis X floating origin
%IX0.1.1
Floating origin SW
%KX6720
XAxis BUSY
%KX6880
YAxis BUSY
INST3
APM_FLT
X_FLT_DONE
X_FLT_STAT
INST2
V_FLT_DONE
V_FLT_STAT
Comment Starts axis X-Y linear interpolation
%IX0.1.7
Linear interpolation start
INST4
APM_LIN
LIN_DONE
LIN_STAT
LIN_AXIS
STEP

(a) Devices Used

Device	Description
%IX0.1.0	Axis X error reset, output inhibition cancel switch
%IX0.1.1	floating origin switch
%IX0.1.7	Straight interpolation start switch
%KX6720	Signal during operation of axis X
%KX6721	Signal of axis X error
%KX6880	Signal during operation of axis Y
%KX6881	Signal of axis Y error

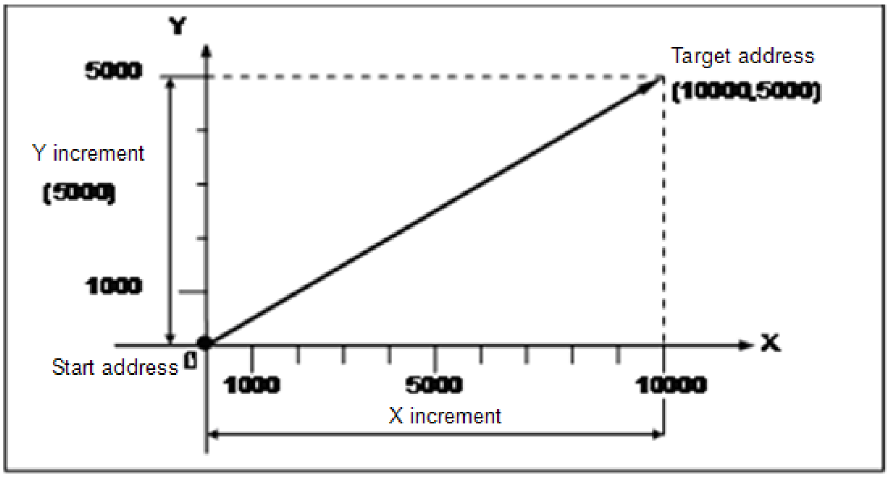
(3) Operation Data Setting

Axis	Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [ms]
X	1	Absolute	Position control	End	Single	0	10,000	0	1	1000	100
Y	1	Absolute	Position control	End	Single	0	5,000	0	1	1000	100

(4) Operation Sequence

• P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.

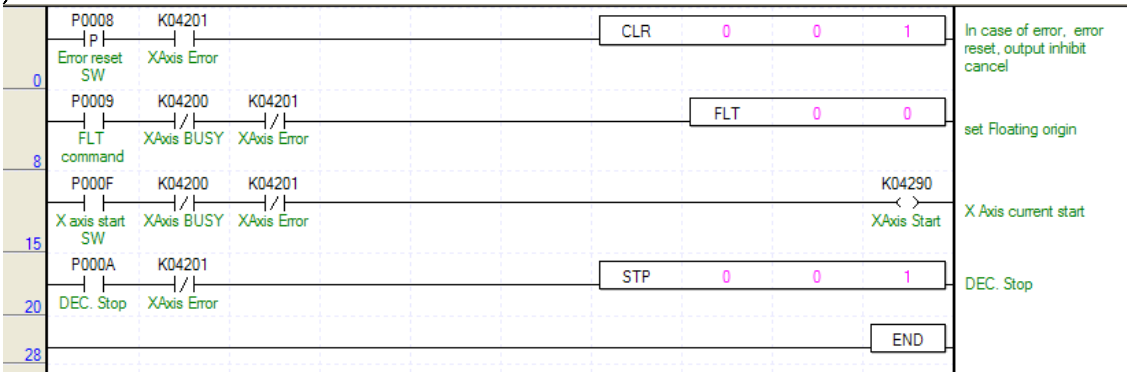
• P000E/%IX0.1.7 (straight interpolation start) switch On : the straight interpolation start of axes X-Y is started.



7.2.3 Deceleration Stop

• The example program of deceleration stop during operation is as follows.

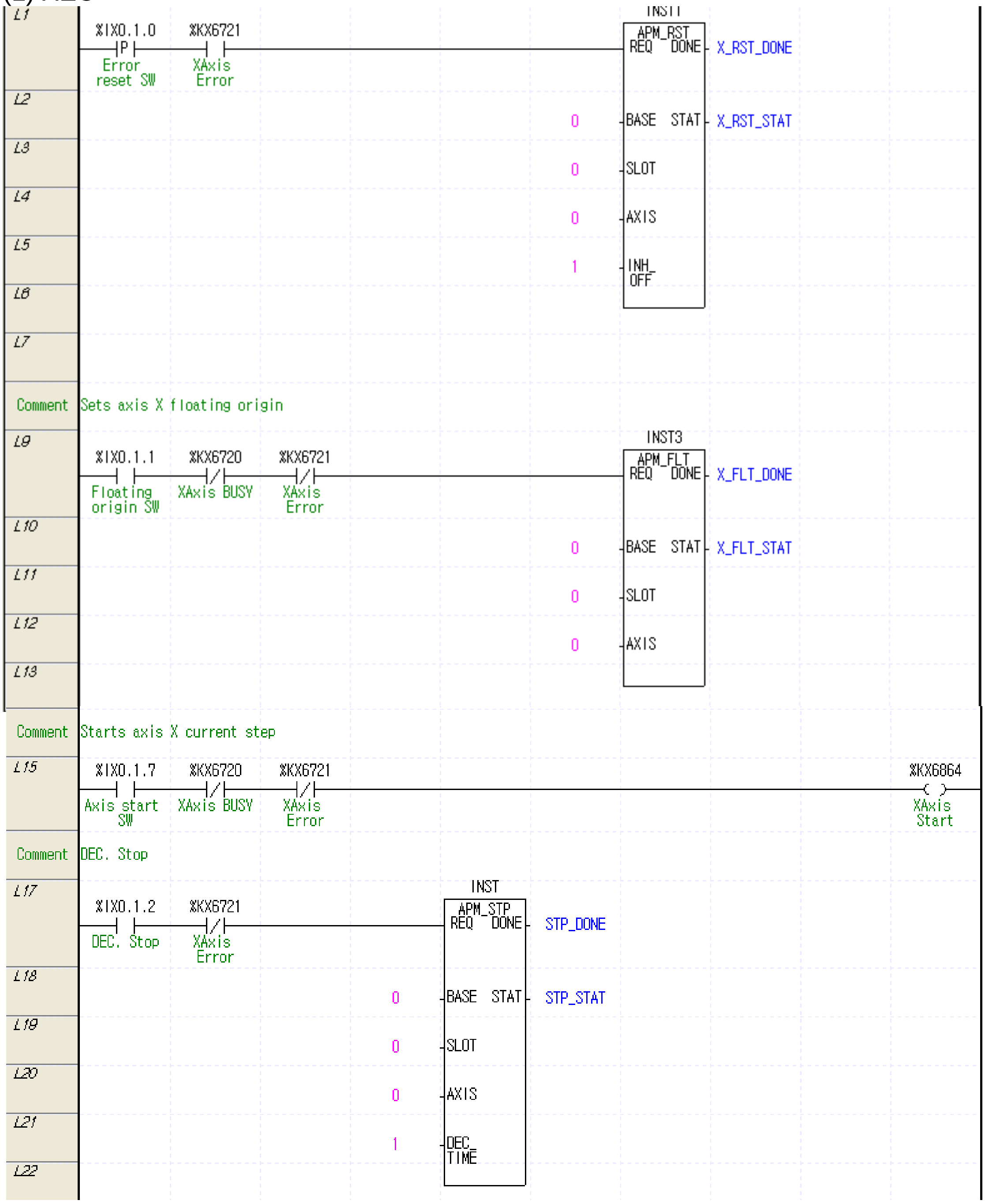
(1) XBM/XBC



(a) Devices Used

Device	Description
P0008	Axis X error reset, output inhibition cancel switch
P0009	axis X floating origin switch
P000A	axis X deceleration stop switch
P000F	axis X start switch
K4200	Signal during axis X operation
K4201	Error signal of axis X

(1) XEC



(a) Devices Used

Device	Description
%IX0.1.0	Axis X error reset, output inhibition cancel switch
%IX0.1.1	axis X floating origin switch
%IX0.1.2	axis X deceleration stop switch
%IX0.1.7	axis X start switch
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X

(3) Operation Data Setting

Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [ms]
1	Absolute	Position control	End	Single	0	10,000	0	1	1000	100

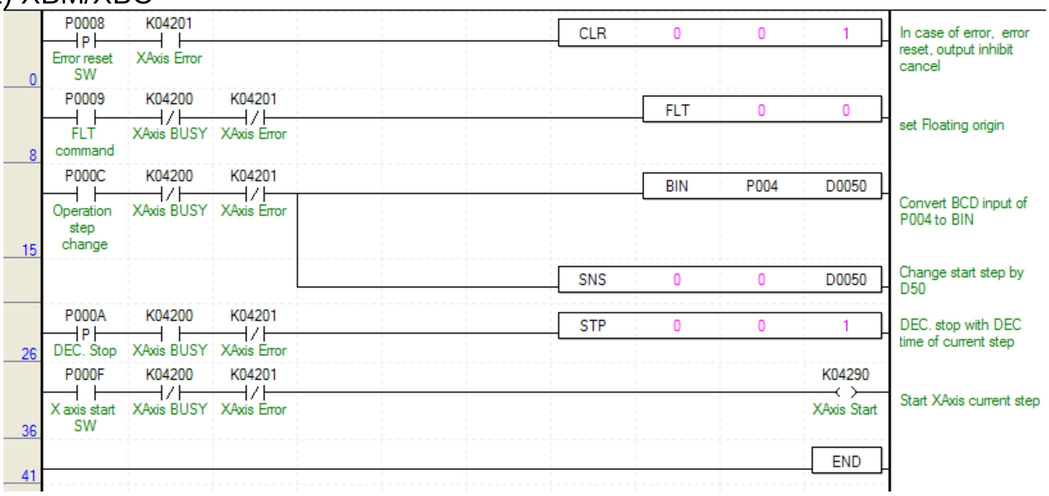
(4) Operation Sequence

- •P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.
- •P000F/%IX0.1.7 (start) switch On : indirect start of axis X is started.
- •P000A/%IX0.1.2 (deceleration stop) switch On : Since the deceleration time is not 0 when the deceleration stop instruction is given, it does deceleration stop for the deceleration time (100ms) of the currently operating step.

7.2.4 Setting of Operation Step/Single Operation

• The example program of conducting the single operation by setting the operation step is as follows.

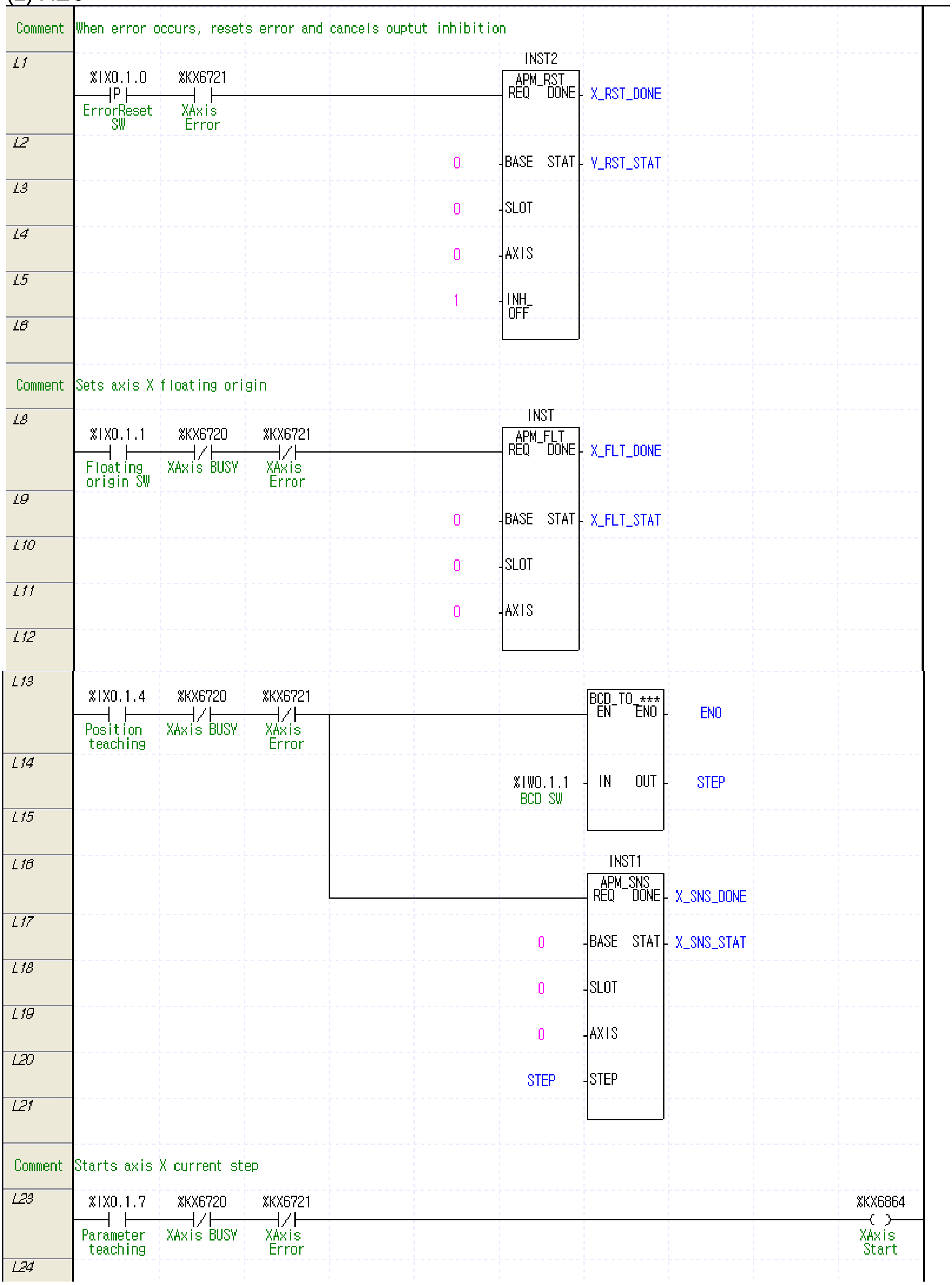
(1) XBM/XBC



(a) Devices Used

Device	Description
P0008	Error reset, output inhibition cancel switch
P0009	Floating origin switch
P000C	Operation step change switch
P000F	axis X start switch
K4200	Signal during axis X operation
K4201	Error signal of axis X

(2) XEC


Comment When error occurs, resets error and cancels ouptut inhibition
L1
%IX0.1.0
ErrorReset SW
%KX6721
XAxis Error
INST2
APM_RST
REQ DONE
X_RST_DONE
L2
0
BASE STAT
Y_RST_STAT
L3
0
SLOT
L4
0
AXIS
L5
1
INH_OFF
L6
Comment Sets axis X floating origin
L8
%IX0.1.1
Floating origin SW
%KX6720
XAxis BUSY
%KX6721
XAxis Error
INST
APM_FLT
REQ DONE
X_FLT_DONE
L9
0
BASE STAT
X_FLT_STAT
L10
0
SLOT
L11
0
AXIS
L12
L13
%IX0.1.4
Position teaching
%KX6720
XAxis BUSY
%KX6721
XAxis Error
BCD_TO_***
EN ENO
ENO
L14
%IW0.1.1
BCD SW
IN OUT
STEP
L15
L16
INST1
APM_SNS
REQ DONE
X_SNS_DONE
L17
0
BASE STAT
X_SNS_STAT
L18
0
SLOT
L19
0
AXIS
L20
STEP
STEP
L21
Comment Starts axis X current step
L23
%IX0.1.7
Parameter teaching
%KX6720
XAxis BUSY
%KX6721
XAxis Error
%KX6864
XAxis Start
L24

(a) Devices Used

Device	Description
%IX0.1.0	Error reset, output inhibition cancel switch
%IX0.1.1	Floating origin switch
%IX0.1.4	Operation step change switch
%IX0.1.7	axis X start switch
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X

(3) Operation Data Setting

Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [ms]
1	Absolute	Position control	End	Single	0	10,000	0	1	1,000	100
2	Absolute	Position control	End	Single	0	20,000	0	1	1,500	100
3	Absolute	Position control	End	Single	0	30,000	0	1	2,000	100
10	Absolute	Position control	End	Single	0	50,000	0	1	1,000	100
11	Absolute	Position control	End	Single	0	60,000	0	1	1,500	100
12	Absolute	Position control	End	Single	0	70,000	0	1	2,000	100

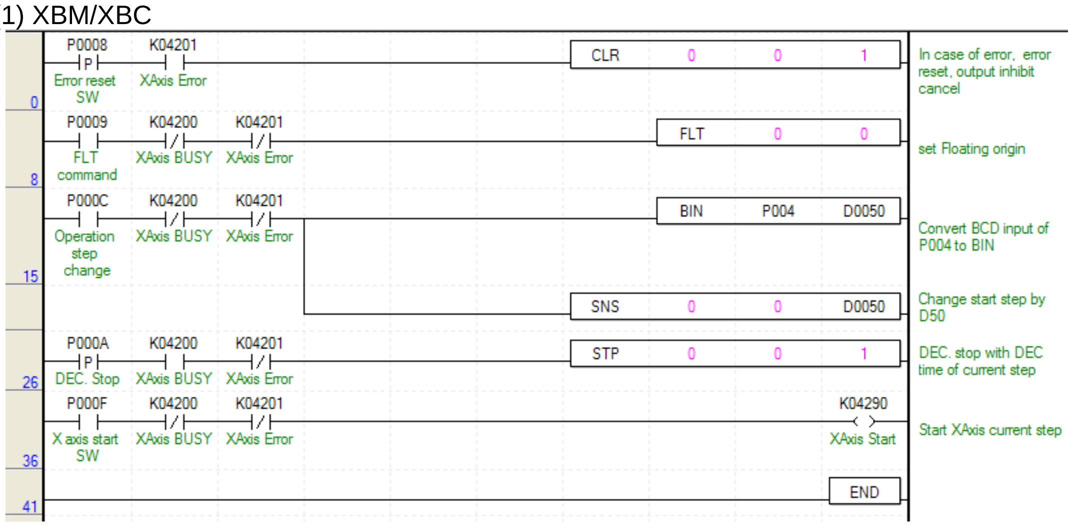
(4) Operation Sequence

- P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.
- BCD/SNS_STEP switch input: enters the operation step to change in P004(enters 10 in this example).
- P000C/%IX0.1.4(operation step change) switch On : the currently operating step changes into 10.
- P000F/%IX0.1.7(axis X start) On : indirect start is conducted with the changed step (10).

7.2.5 Setting of Operation Step/Speed Control

- The program example of conducting speed control by setting the operation step is as follows.

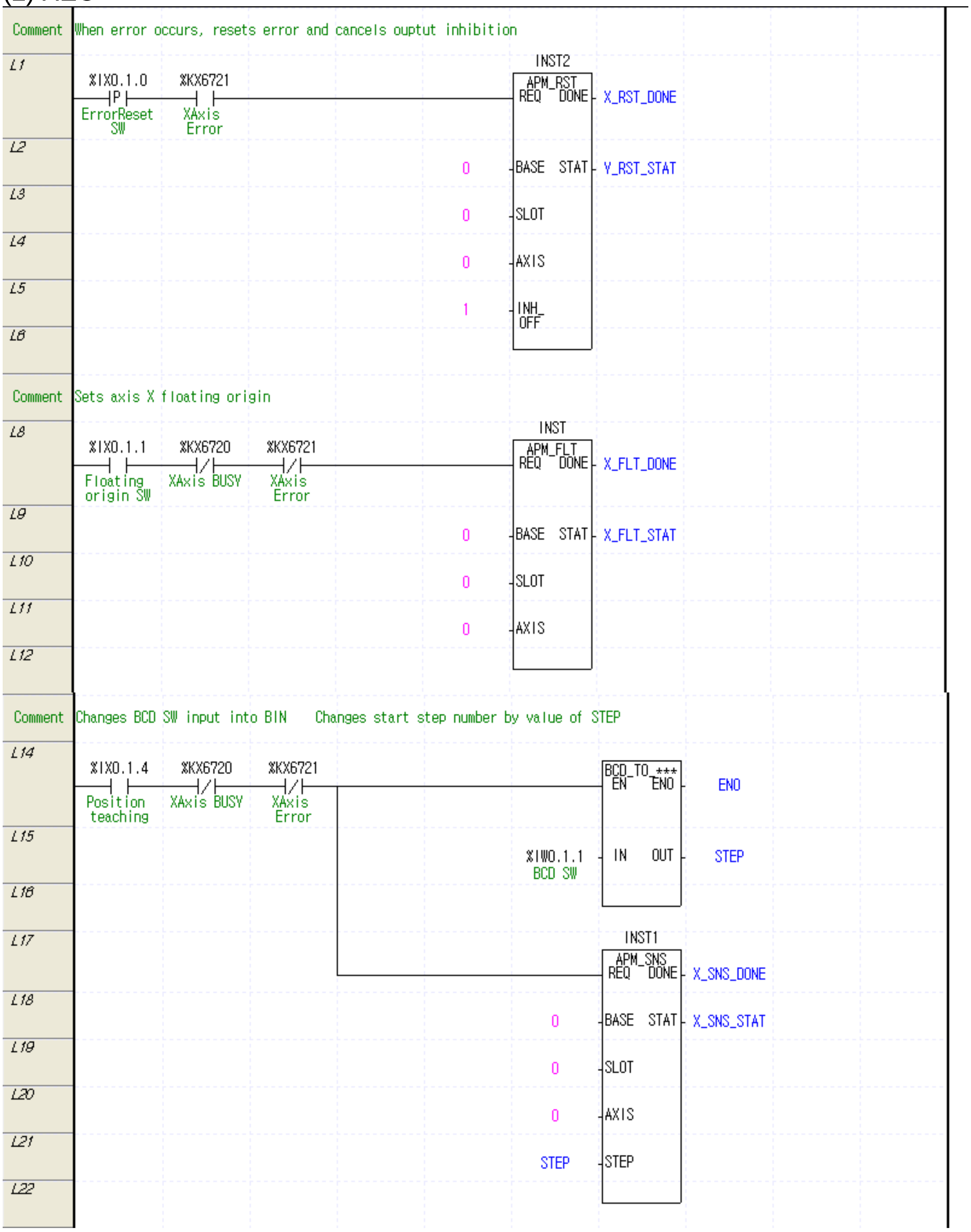
(1) XBM/XBC

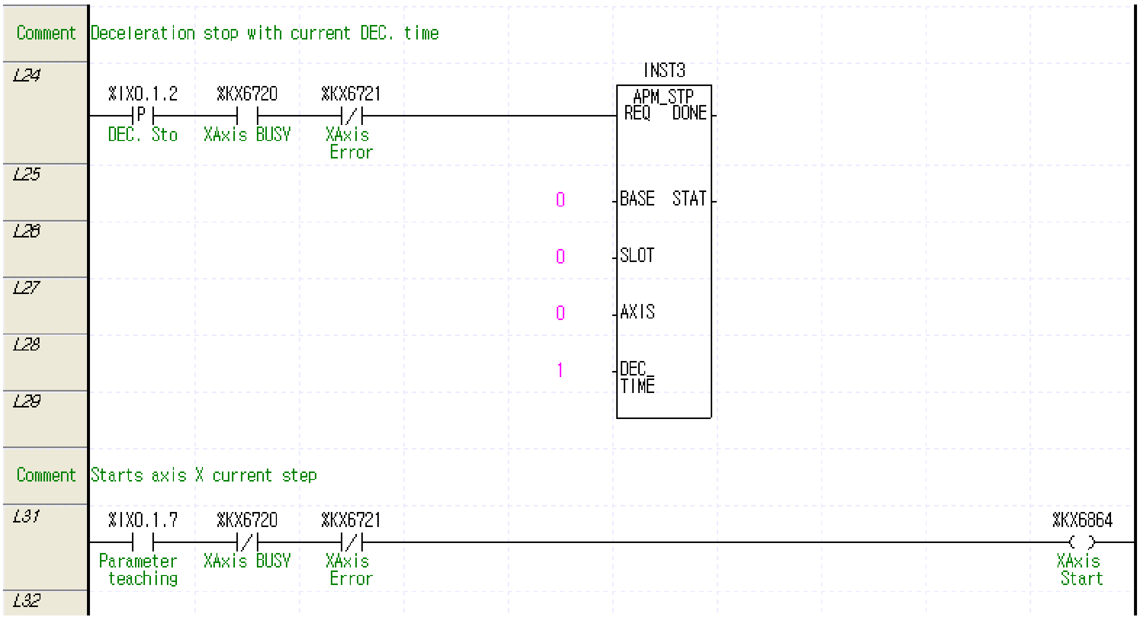


(a) Devices Used

Device	Description
P0008	Error reset, output inhibition cancel switch
P0009	floating origin switch
P000C	Operation step changing switch
P000F	axis X start switch
P000A	Deceleration stop switch of axis X
K4200	Signal during axis X operation
K4201	Error signal of axis X

(2) XEC





(a) Devices Used

Device	Description
%IX0.1.0	Error reset, output inhibition cancel switch
%IX0.1.1	floating origin switch
%IX0.1.4	Operation step changing switch
%IX0.1.7	axis X start switch
%IX0.1.2	Deceleration stop switch of axis X
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X

(3) Operation Data Setting

Step No.	coordi nates	Control pattern	Operatio n pattern	Operatio n type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [ms]
1	Abs olute	Position control	End	Single	0	10,000	0	1	1,000	100
2	Abs olute	Position control	End	Single	0	20,000	0	1	1,500	100
3	Abs olute	Position control	End	Single	0	30,000	0	1	2,000	100
10	Abs olute	Speed control	End	Single	0	50,000	0	1	1,000	100
11	Abs olute	Position control	End	Single	0	60,000	0	1	1,500	100
12	Abs olute	Position control	End	Single	0	70,000	0	1	2,000	100

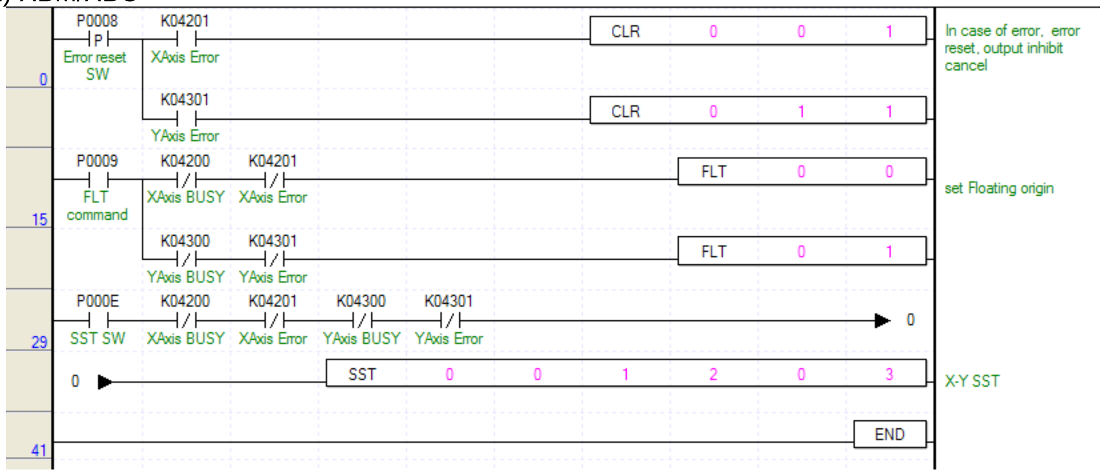
(4) Operation Sequence

- •P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.
- •BCD/SNS_STEP switch input: enters the operation stop to change in P004 (enters 10 in this example).
- •P000C/%IX0.1.4 (operation step change) switch On : the current operating step changes into 10.
- •P000F/%IX0.1.7(axis X start) On : indirect start is conducted with the changed step (10).
- •P000A/%IX0.1.2 (deceleration stop) switch On : axis X, which is being operated with speed control, is decelerated and stopped by the deceleration time of the current step.

7.2.6 Simultaneous Start

• The program example of simultaneous start of axes X, Y is as follows.

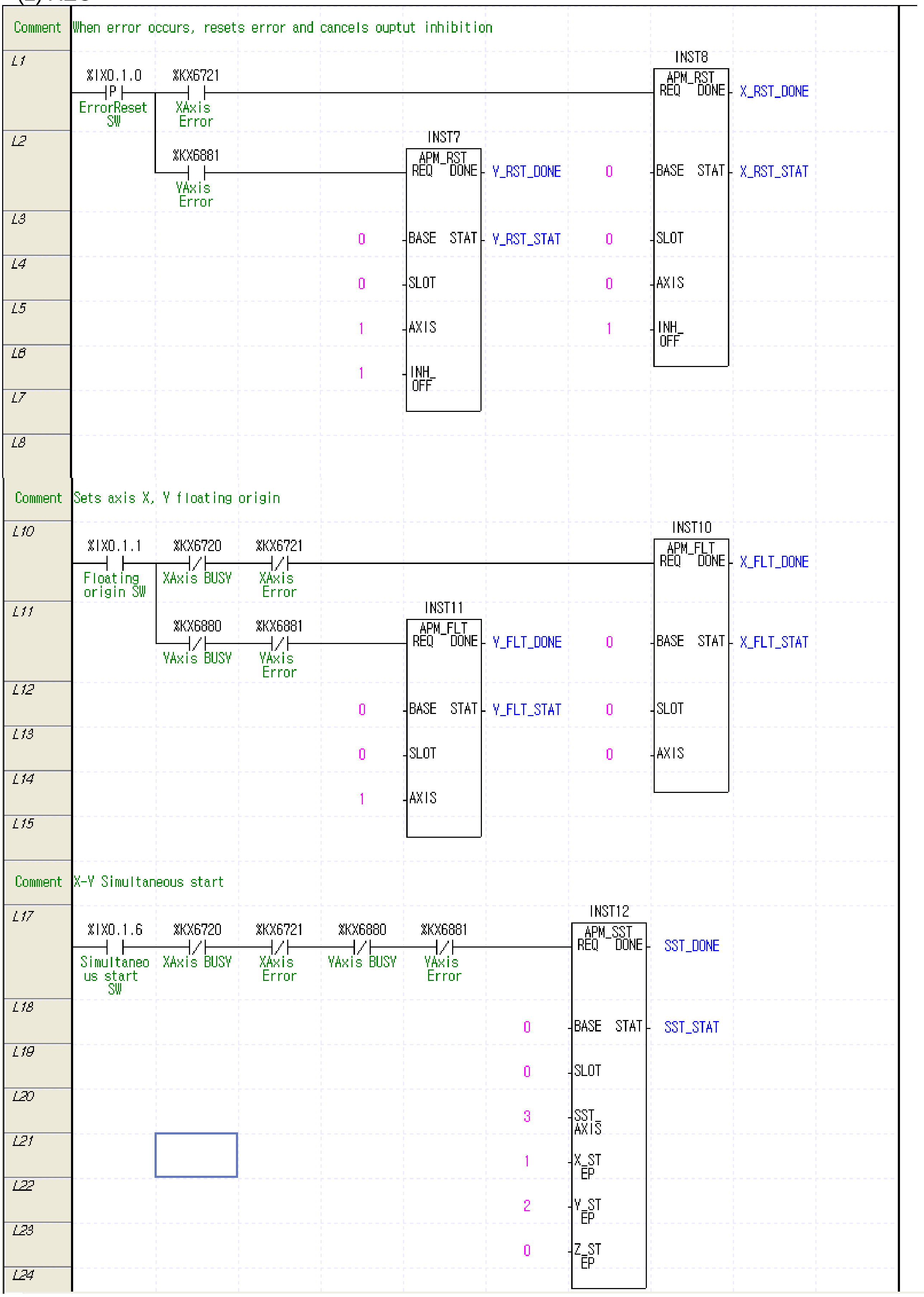
(1) XBM/XBC



(a) Devices Used

Device	Description
P0008	axes X and Y error reset, output inhibition cancel switch
P0009	axes X and Y floating origin switch
P000E	simultaneous start switch of axes X and Y
K4200	Signal during axis X operation
K4201	Error signal of axis X
K4300	Signal during axis Y operation
K4301	Axis Y error signal

(2) XEC


Comment When error occurs, resets error and cancels ouptut inhibition
L1
L2
L3
L4
L5
L6
L7
L8
%IX0.1.0
ErrorReset SW
%KX6721
XAxis Error
%KX6881
YAxis Error
INST8
APM_RST
REQ DONE
X_RST_DONE
BASE STAT
X_RST_STAT
SLOT
AXIS
INH_OFF
INST7
APM_RST
REQ DONE
Y_RST_DONE
BASE STAT
Y_RST_STAT
SLOT
AXIS
INH_OFF
0
0
1
1
0
0
0
1
Comment Sets axis X, Y floating origin
L10
L11
L12
L13
L14
L15
%IX0.1.1
Floating origin SW
%KX6720
XAxis BUSY
%KX6721
XAxis Error
%KX6880
YAxis BUSY
%KX6881
YAxis Error
INST10
APM_FLT
REQ DONE
X_FLT_DONE
BASE STAT
X_FLT_STAT
SLOT
AXIS
INST11
APM_FLT
REQ DONE
Y_FLT_DONE
BASE STAT
Y_FLT_STAT
SLOT
AXIS
0
0
1
0
0
Comment X-Y Simultaneous start
L17
L18
L19
L20
L21
L22
L23
L24
%IX0.1.6
Simultaneous start SW
%KX6720
XAxis BUSY
%KX6721
XAxis Error
%KX6880
YAxis BUSY
%KX6881
YAxis Error
INST12
APM_SST
REQ DONE
SST_DONE
BASE STAT
SST_STAT
SLOT
SST_AXIS
X_STEP
Y_STEP
Z_STEP
0
0
3
1
2
0

(a) Devices Used

Device	Description
%IX0.1.0	axes X and Y error reset, output inhibition cancel switch
%IX0.1.1	axes X and Y floating origin switch
%IX0.1.6	simultaneous start switch of axes X and Y
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X
%KX6880	Signal during axis Y operation
%KX6881	Axis Y error signal

(3) Operation Data Setting

Axis	Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [ms]
X	1	Absolute	Position control	End	Single	0	10,000	0	1	1000	100
Y	2	Absolute	Position control	End	Single	0	20,000	0	1	2000	100

(4) Operation Sequence

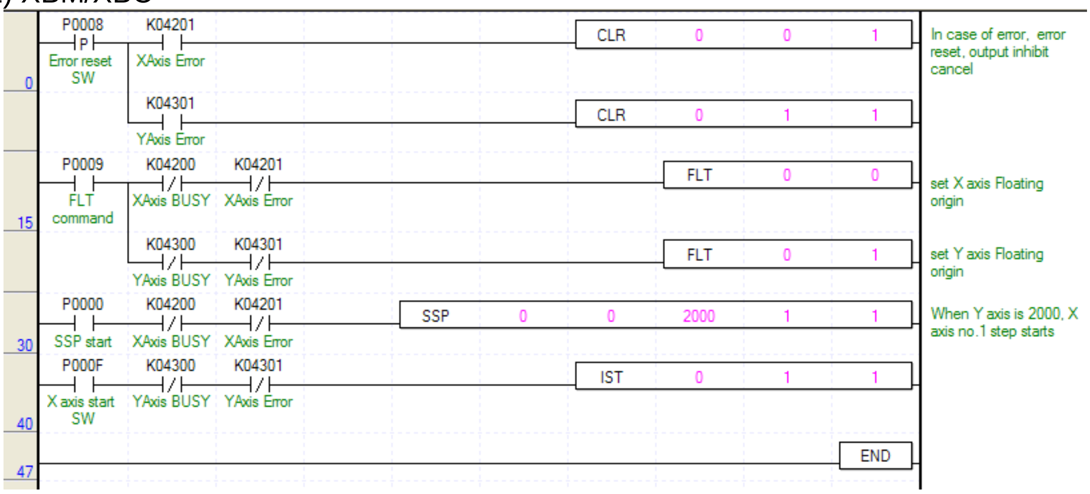
•P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.

•P000F/%IX0.1.6 (simultaneous start) switch On : axis X simultaneously starts step 1, and axis Y does step 2.

7.2.7 Position Synchronous Start

• The program example of position synchronous start is as follows.

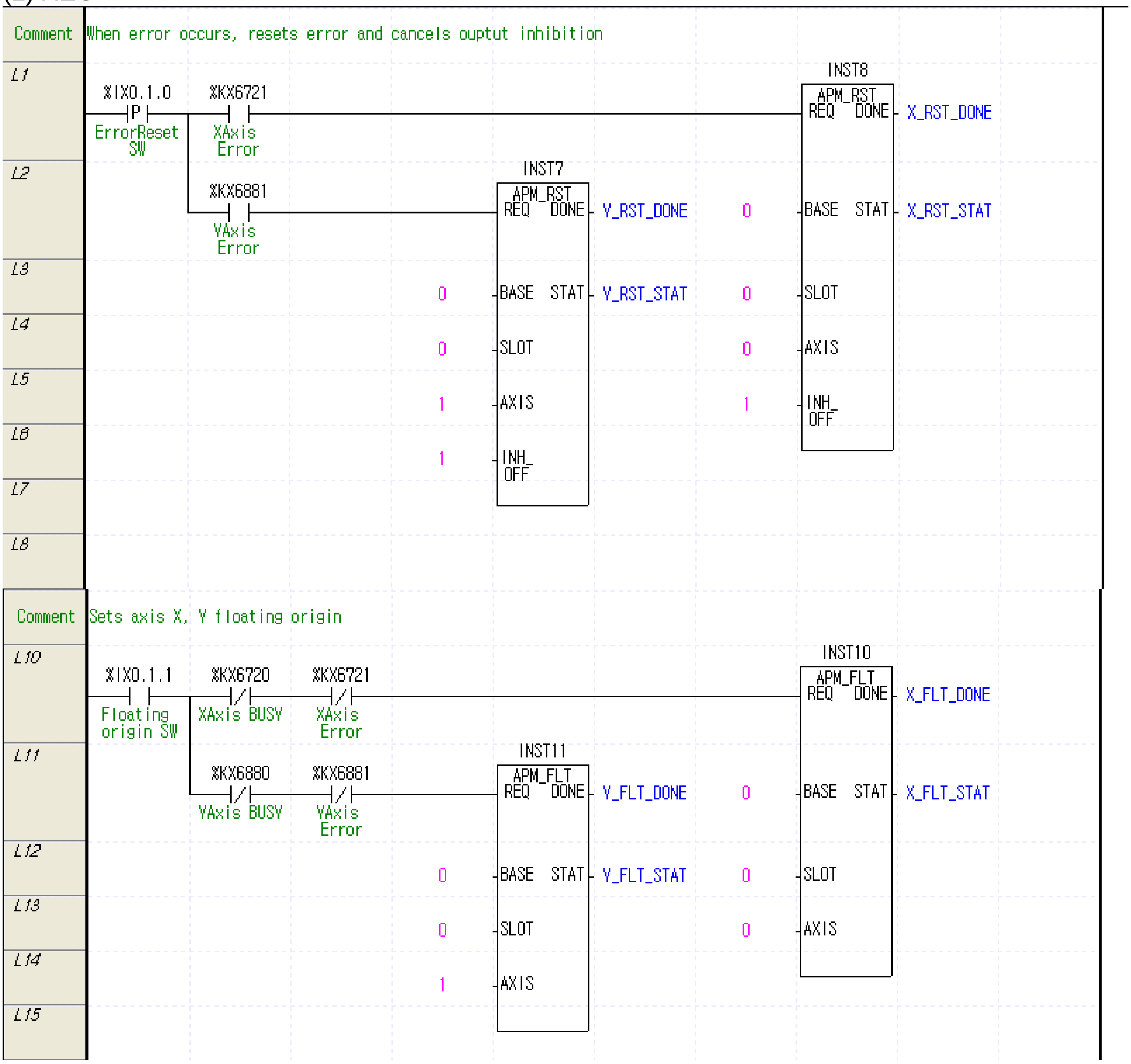
(1) XBM/XBC

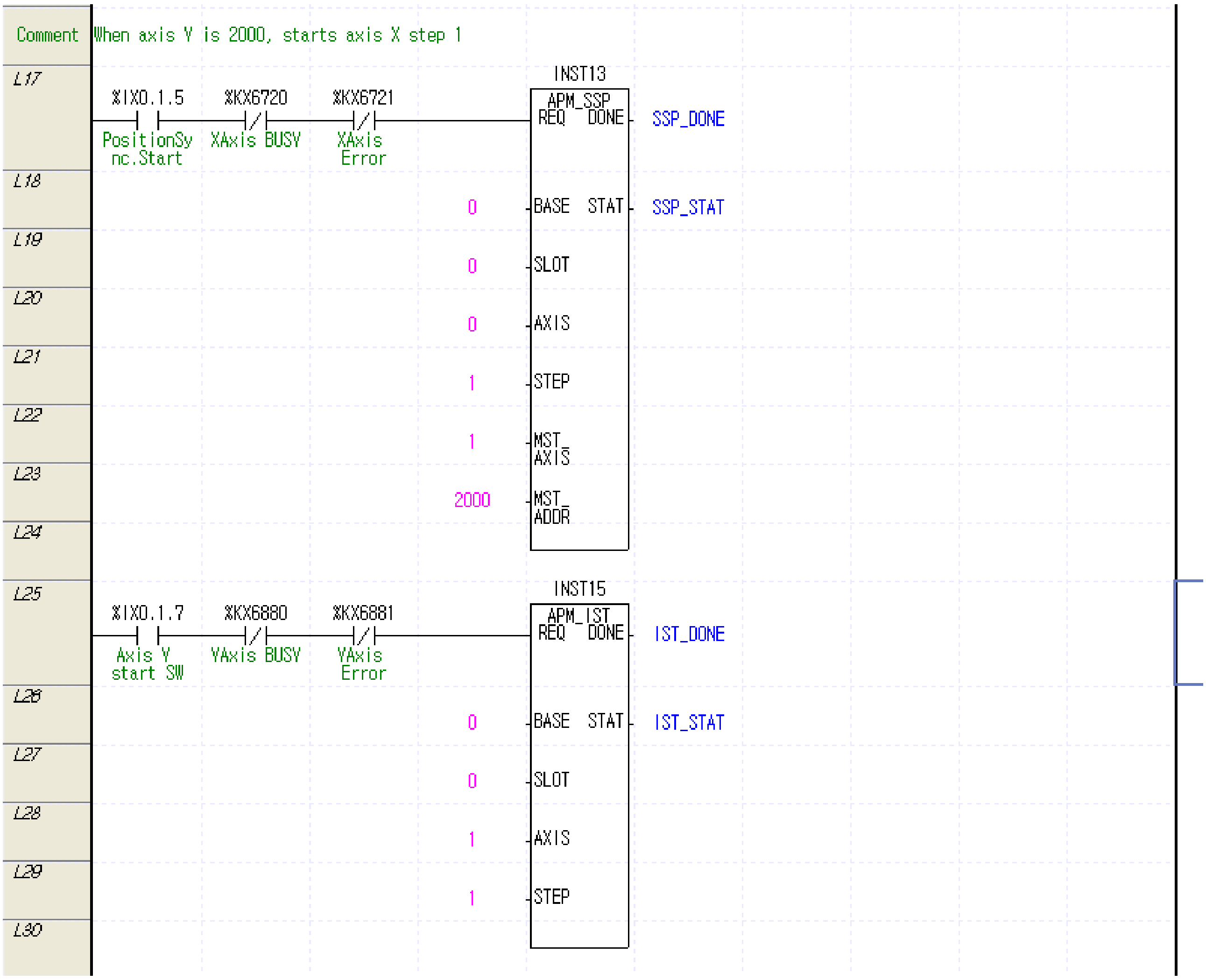


(a) Devices Used

Device	Description
P0008	axes X and Y error reset, output inhibition cancel switch
P0009	axes X and Y floating origin switch
P000D	Axis X position synchronous switch
P000F	Indirect start switch f axis Y
K4200	Signal during axis X operation
K4201	Error signal of axis X
K4300	Signal during axis Y operation
K4301	Axis Y error signal

(2) XEC





(a) Devices Used

Device	Description
%IX0.1.0	axes X and Y error reset, output inhibition cancel switch
%IX0.1.1	axes X and Y floating origin switch
%IX0.1.5	Axis X position synchronous switch
%IX0.1.7	Indirect start switch f axis Y
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X
%KX6880	Signal during axis Y operation
%KX6881	Axis Y error signal

(3) Operation Data Setting

Axis	Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [ms]
X	1	Absolute	Position control	End	Single	0	10,000	0	1	1000	100
Y	1	Absolute	Position control	End	Single	0	20,000	0	1	2000	100

(4) Operation Sequence

•P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.

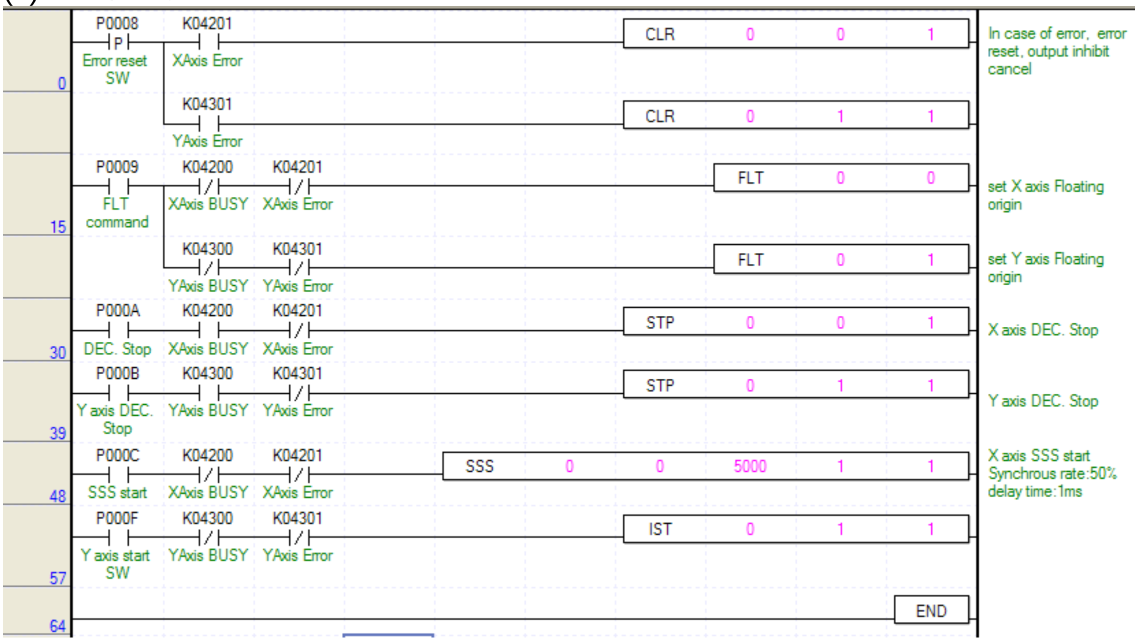
•P000D/%IX0.1.5 (synchronous start) switch On : axis X tarts position synchronous start with axis Y being the main axis.

•P000F/%IX0.1.7 (Axis Y start) switch On : axis Y starts the step operation. If the position of axis Y reaches 2,000, axis X is synchronized to this, starting step 1.

7.2.8 Speed Synchronous Start

• The program example of speed synchronous start is as follows.

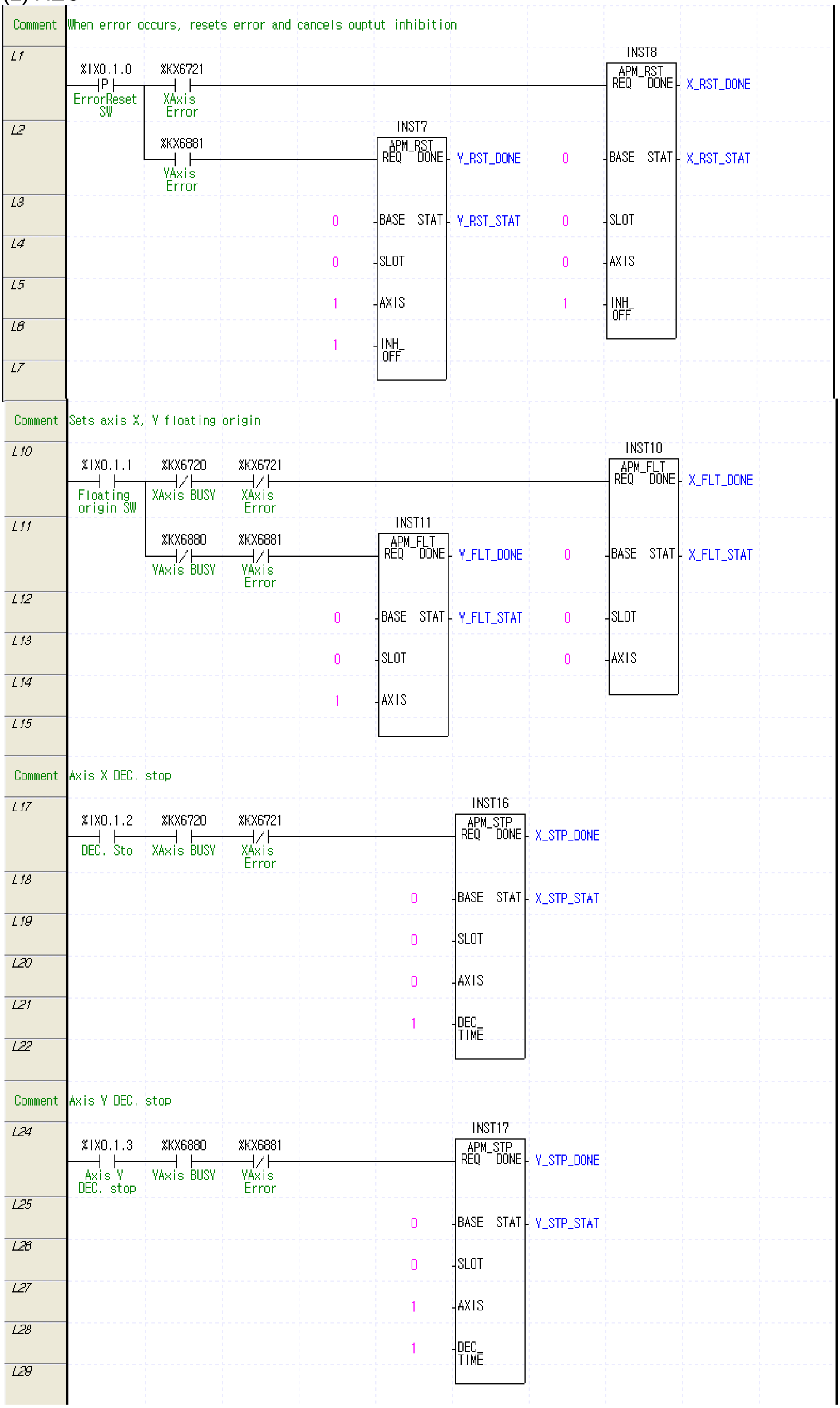
(1) XBM/XBC

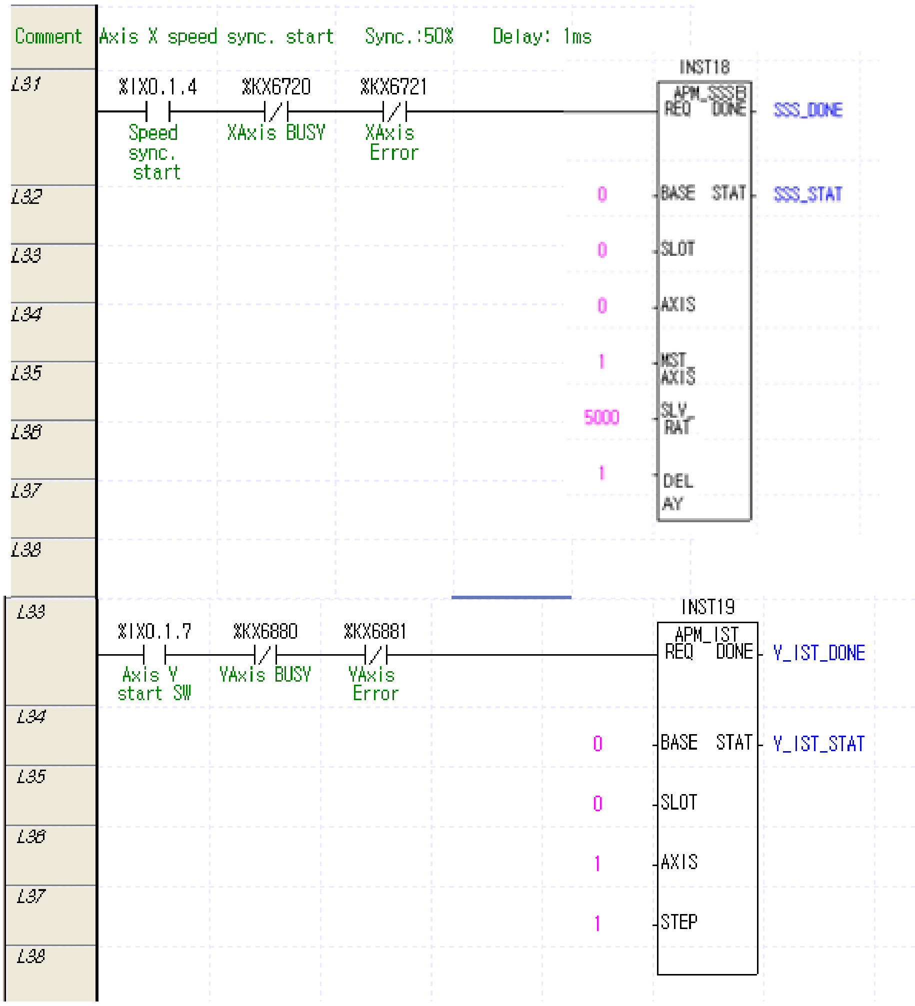


(a) Devices Used

Device	Description
P0008	axes X and Y error reset, output inhibition cancel switch
P0009	Floating origin switch of axes X and Y
P000A	axis X deceleration stop switch
P000B	deceleration stop switch of axis X
P000C	axis X speed synchronous start switch
P000F	indirect start switch of axis Y
K4200	Signal during axis X operation
K4201	Error signal of axis X
K4300	Signal during axis Y operation
K4301	Axis Y error signal

(2) XEC


Comment
When error occurs, resets error and cancels ouptut inhibition
L1
%IX0.1.0
%KX6721
ErrorReset SW
XAxis Error
INST8
APM_RST
REQ DONE
X_RST_DONE
L2
%KX6881
YAxis Error
INST7
APM_RST
REQ DONE
Y_RST_DONE
0
BASE STAT
X_RST_STAT
L3
0
BASE STAT
Y_RST_STAT
0
SLOT
L4
0
SLOT
0
AXIS
L5
1
AXIS
1
INH_OFF
L6
1
INH_OFF
L7
Comment
Sets axis X, Y floating origin
L10
%IX0.1.1
%KX6720
%KX6721
Floating origin SW
XAxis BUSY
XAxis Error
INST10
APM_FLT
REQ DONE
X_FLT_DONE
L11
%KX6880
%KX6881
YAxis BUSY
YAxis Error
INST11
APM_FLT
REQ DONE
Y_FLT_DONE
0
BASE STAT
X_FLT_STAT
L12
0
BASE STAT
Y_FLT_STAT
0
SLOT
L13
0
SLOT
0
AXIS
L14
1
AXIS
L15
Comment
Axis X DEC. stop
L17
%IX0.1.2
%KX6720
%KX6721
DEC. Sto
XAxis BUSY
XAxis Error
INST16
APM_STP
REQ DONE
X_STP_DONE
L18
0
BASE STAT
X_STP_STAT
L19
0
SLOT
L20
0
AXIS
L21
1
DEC_TIME
L22
Comment
Axis Y DEC. stop
L24
%IX0.1.3
%KX6880
%KX6881
Axis Y DEC. stop
YAxis BUSY
YAxis Error
INST17
APM_STP
REQ DONE
Y_STP_DONE
L25
0
BASE STAT
Y_STP_STAT
L26
0
SLOT
L27
1
AXIS
L28
1
DEC_TIME
L29



(a) Devices Used

Device	Description
%IX0.1.0	axes X and Y error reset, output inhibition cancel switch
%IX0.1.1	Floating origin switch of axes X and Y
%IX0.1.2	axis X deceleration stop switch
%IX0.1.3	deceleration stop switch of axis X
%IX0.1.4	axis X speed synchronous start switch
%IX0.1.7	indirect start switch of axis Y
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X
%KX6880	Signal during axis Y operation
%KX6881	Axis Y error signal

(3) Operation Data Setting

Axis	Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [㎳]
X(auxiliary axis)	1	Absolute	Position control	End	Single	0	10,000	0	1	1000	100
Y(main axis)	1	Absolute	Speed control	End	Single	0	15000	0	1	1000	100

(4) Operation Sequence

•P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.

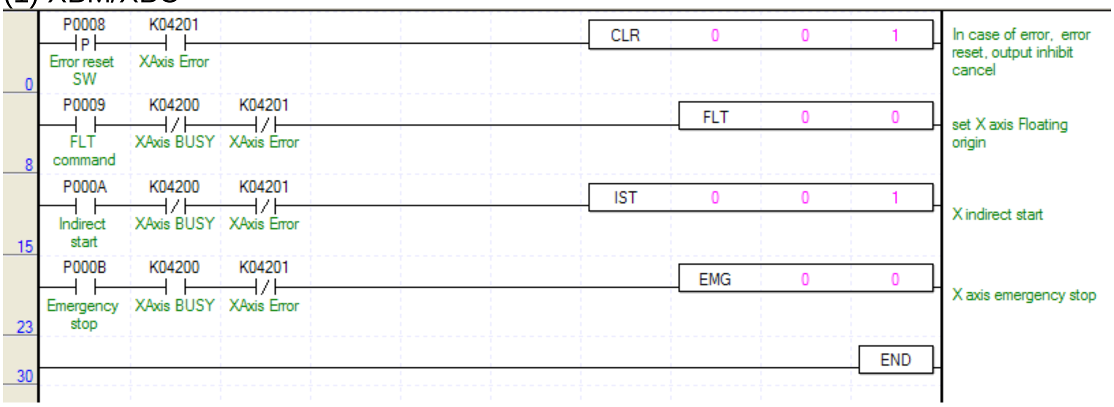
•P000C/%IX0.1.4 (synchronous start) switch On : axis X starts speed synchronous start with axis Y being the main axis.

•P000F/%IX0.1.7 (Axis Y start) switch On : axis Y starts step 1 operation. Axis X is synchronized to the speed of 50,00%of axis Y and started.

7.2.9 Emergency Stop

• The program example of emergency stop during operation is as follows.

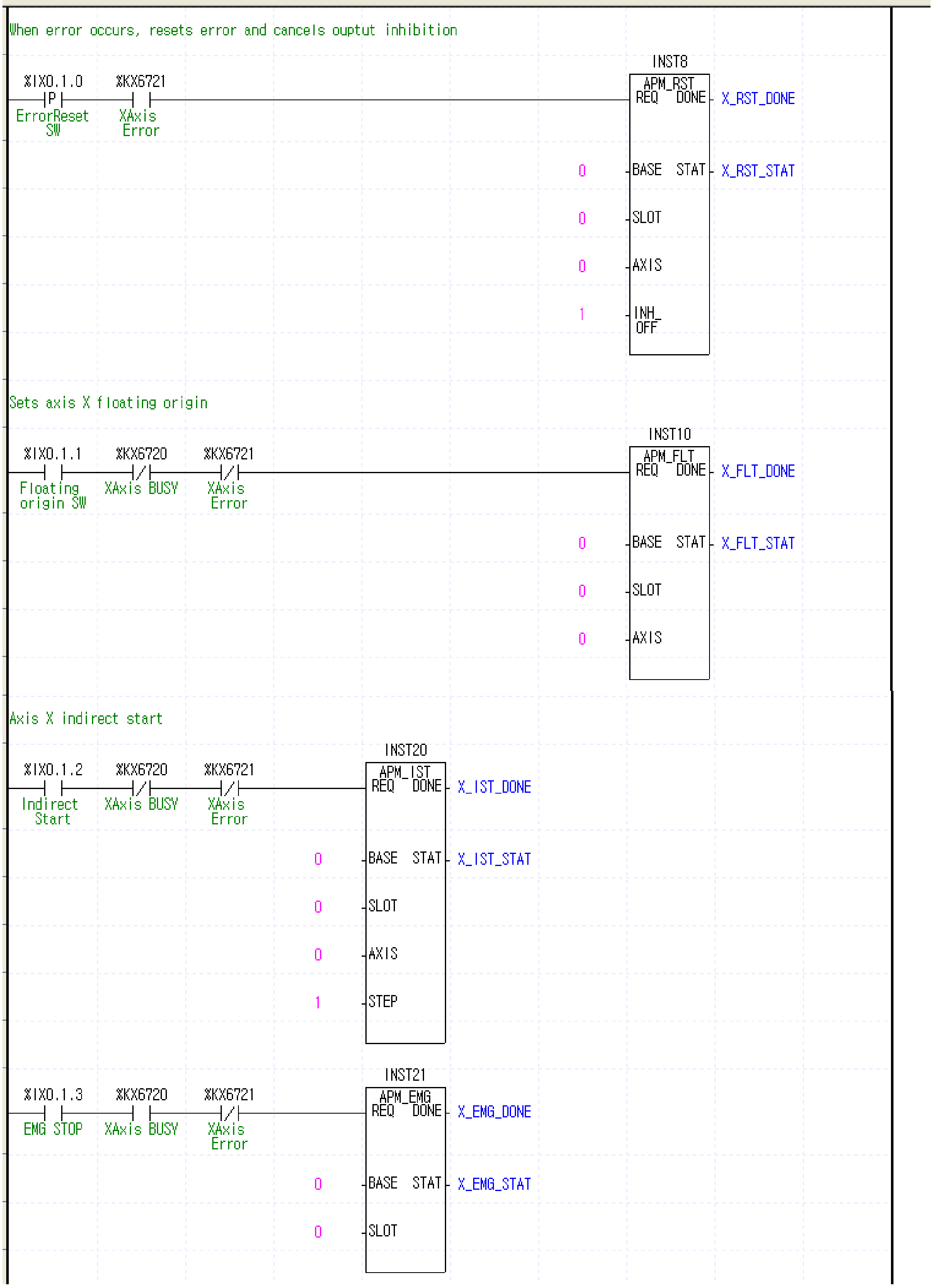
(1) XBM/XBC



(a) Devices Used

Device	Description
P0008	Error reset, output inhibition cancel switch in case of emergency stop
P0009	axis X home return switch
P000B	emergency stop switch during home return
K4200	Signal during axis X operation

(2) XEC



(a) Devices Used

Device	Description
%IX0.1.0	Error reset, output inhibition cancel switch in case of emergency stop
%IX0.1.1	axis X home return switch
%IX0.1.7	emergency stop switch during home return
%KX6720	Signal during axis X operation

(3) Operation Data Setting

Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [㎳]
1	Absolute	Speed control	End	Single	0	10000	0	1	1000	100

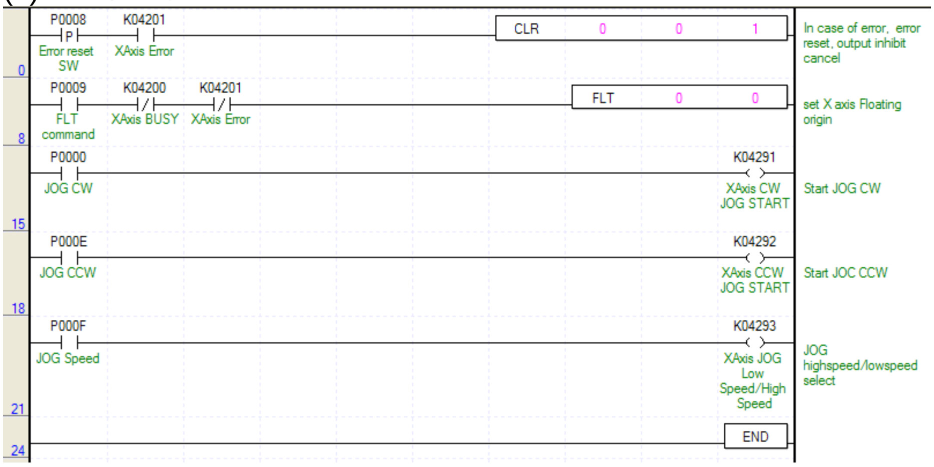
(4) Operation Sequence

- •P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.
- •P000A/%IX0.1.2 (indirect start) switch On : axis X indirectly starts step 1 and starts speed control.
- •P000B/%IX0.1.7 (emergency stop) switch On : axis X does emergency stop without deceleration and the output is inhibited.

7.2.10 Jog Operation

• The program example of jog operation is as follows.

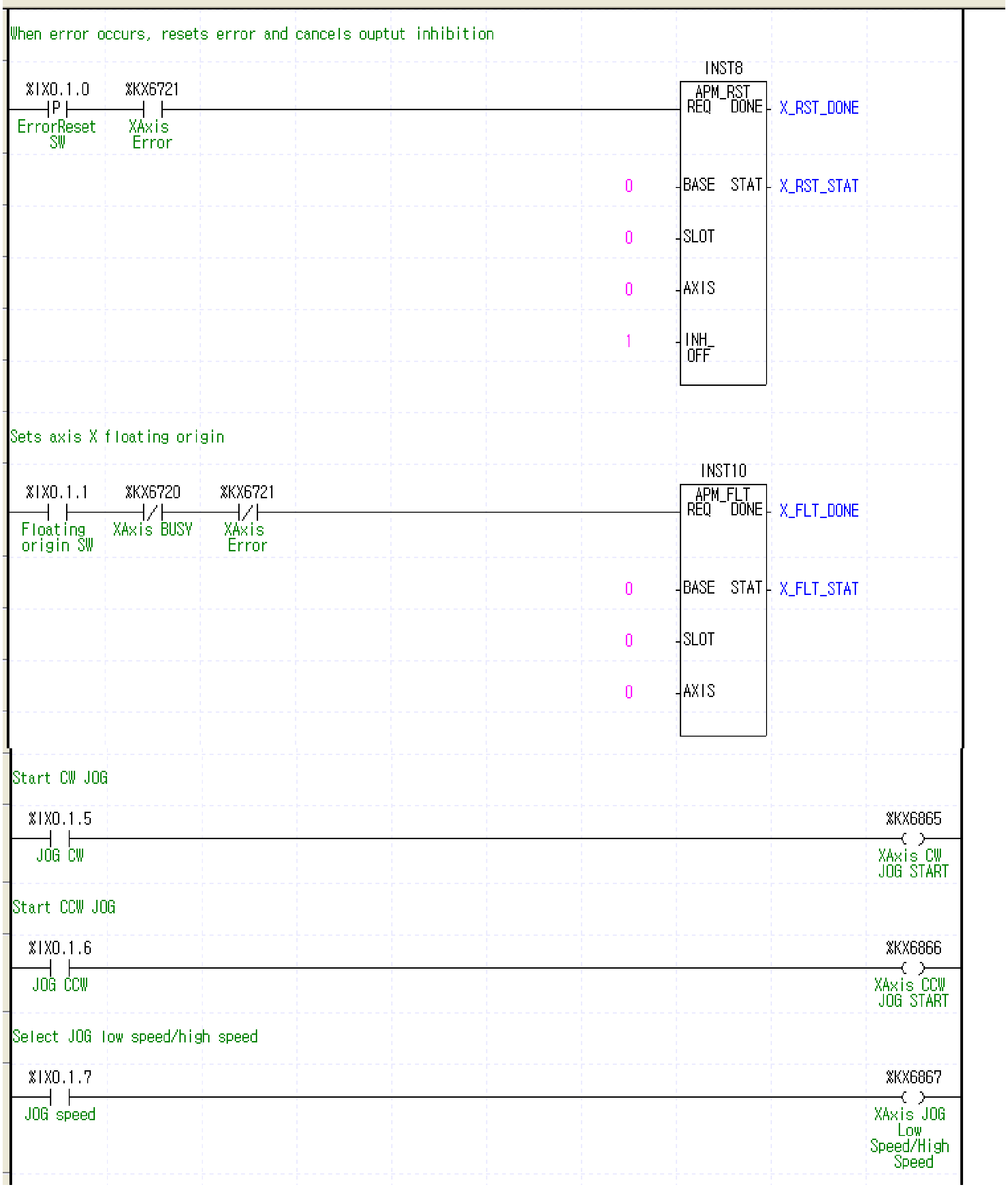
(1) XBM/XBC



(a) Devices Used

Device	Description
P0008	Axis X error reset, output inhibition cancel switch
P0009	axis X floating origin switch
P000D	axis X jog normal direction start switch
P000E	axis X jog reverse direction start switch
P000F	Switch for low/high speed selection of axis X jog
K4200	Signal during axis X operation
K4201	Error signal of axis X

(2) XEC



(a) Devices Used

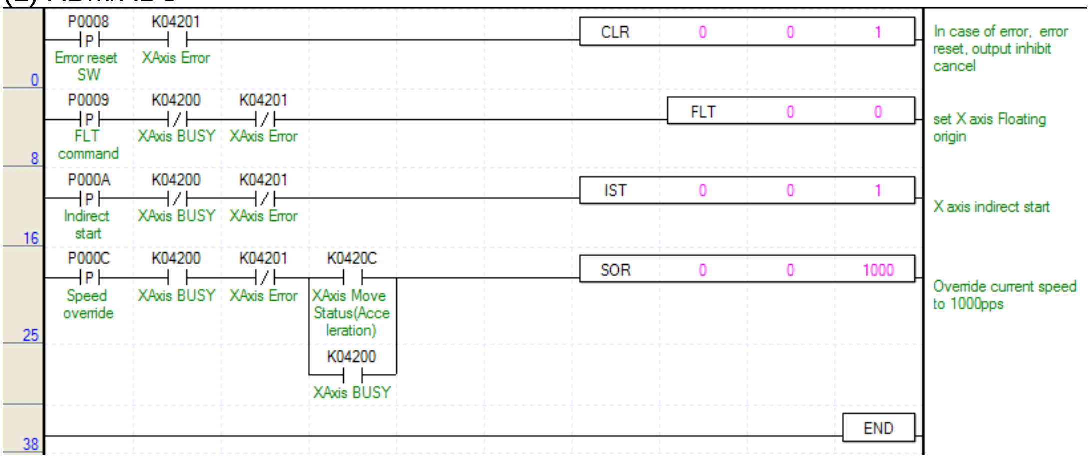
Device	Description
%IX0.1.0	Axis X error reset, output inhibition cancel switch
%IX0.1.1	axis X floating origin switch
%IX0.1.5	axis X jog normal direction start switch
%IX0.1.6	axis X jog reverse direction start switch
%IX0.1.7	Switch for low/high speed selection of axis X jog
%KX6880	Signal during axis X operation
%KX6881	Error signal of axis X

(3) Operation Sequence
•P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.
•P000D/%IX0.1.5 (jog normal direction) switch On : axis X starts normal direction jog operation.
•P000F/%IX0.1.7 (jog speed) switch On : axis X is converted to jog high speed.
•P000D/%IX0.1.5 (jog normal direction) switch Off : axis X does jog stop.
•P000E/%IX0.1.6 (jog reverse direction) switch On : axis X starts reverse direction jog operation.
•P000E/%IX0.1.6 (jog reverse direction) switch Off : axis X does jog stop.

7.2.11 Speed Override

• The program example of speed override during operation is as follows.

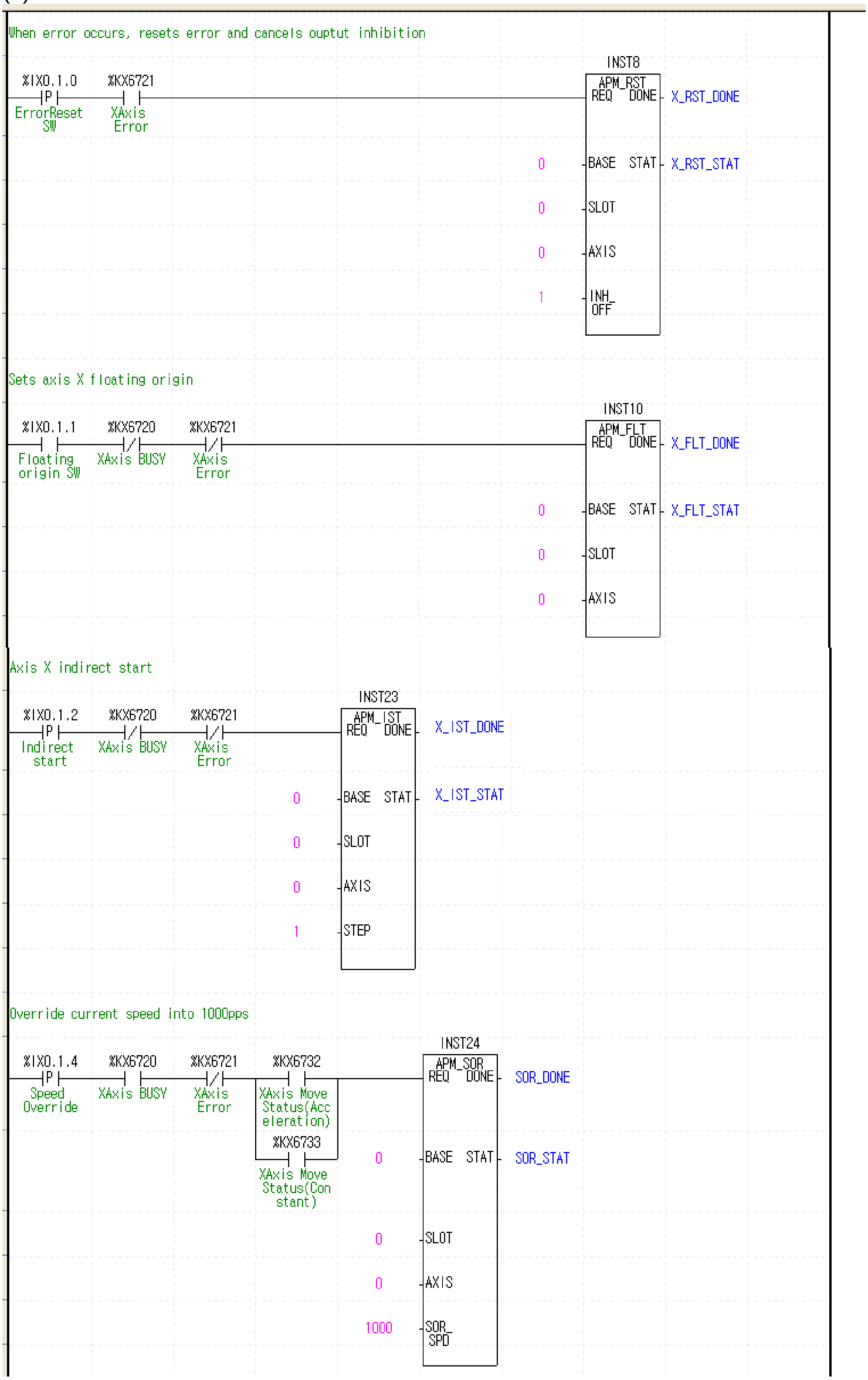
(1) XBM/XBC



(a) Devices Used

Device	Description
P0008	Axis X error reset, output inhibition cancel switch
P0009	axis X floating origin switch
P000A	axis X indirect start switch
P000C	axis X speed override switch
K4200	Signal during axis X operation
K4201	Error signal of axis X
K420C	axis X acceleration signal
K420D	axis X constant speed signal

(2) XEC


When error occurs, resets error and cancels ouptut inhibition
INST8
APM_RST
REQ DONE
X_RST_DONE
%IX0.1.0
P
ErrorReset SW
%KX6721
XAxis Error
0
BASE STAT
X_RST_STAT
0
SLOT
0
AXIS
1
INH_OFF
Sets axis X floating origin
INST10
APM_FLT
REQ DONE
X_FLT_DONE
%IX0.1.1
Floating origin SW
%KX6720
XAxis BUSY
%KX6721
XAxis Error
0
BASE STAT
X_FLT_STAT
0
SLOT
0
AXIS
Axis X indirect start
INST23
APM_IST
REQ DONE
X_IST_DONE
%IX0.1.2
P
Indirect start
%KX6720
XAxis BUSY
%KX6721
XAxis Error
0
BASE STAT
X_IST_STAT
0
SLOT
0
AXIS
1
STEP
Override current speed into 1000pps
INST24
APM_SOR
REQ DONE
SOR_DONE
%IX0.1.4
P
Speed Override
%KX6720
XAxis BUSY
%KX6721
XAxis Error
%KX6732
XAxis Move Status(Acceleration)
%KX6733
XAxis Move Status(Constant)
0
BASE STAT
SOR_STAT
0
SLOT
0
AXIS
1000
SOR_SPD

(a) Devices Used

Device	Description
%IX0.1.0	Axis X error reset, output inhibition cancel switch
%IX0.1.1	axis X floating origin switch
%IX0.1.2	axis X indirect start switch
%IX0.1.4	axis X speed override switch
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X
%KX6732	axis X acceleration signal
%KX6733	axis X constant speed signal

(3) Operation Data Setting

Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [㎳]
1	Absolute	Position control	End	Single	0	100000	0	1	5000	100

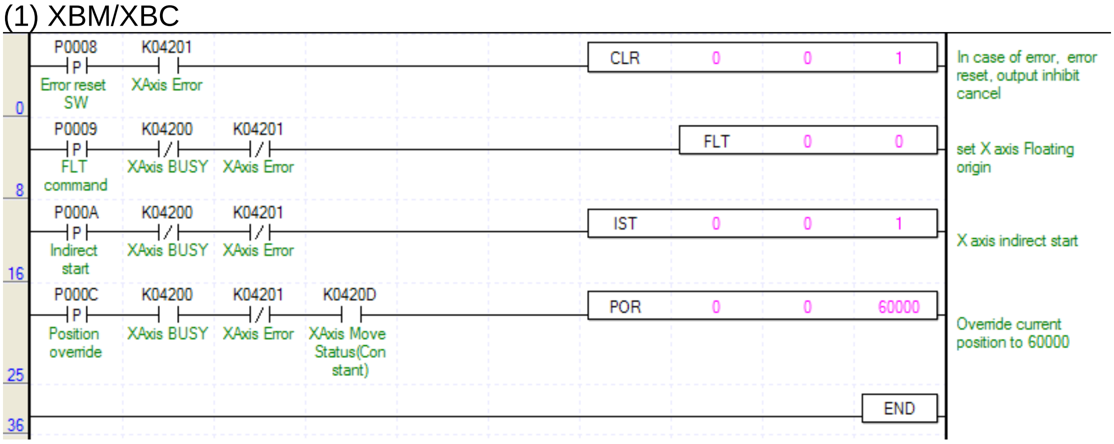
(4) Operation Sequence

- P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.
- P000A/%IX0.1.2 (indirect start) switch On : axis X indirectly starts step 1.
- P000C/%IX0.1.4 (speed override) switch On : overrides the current speed to 1000pps during acceleration or constant speed operation of axis X.

7.2.12 Position Override

• The program example of position override during operation is as follows.

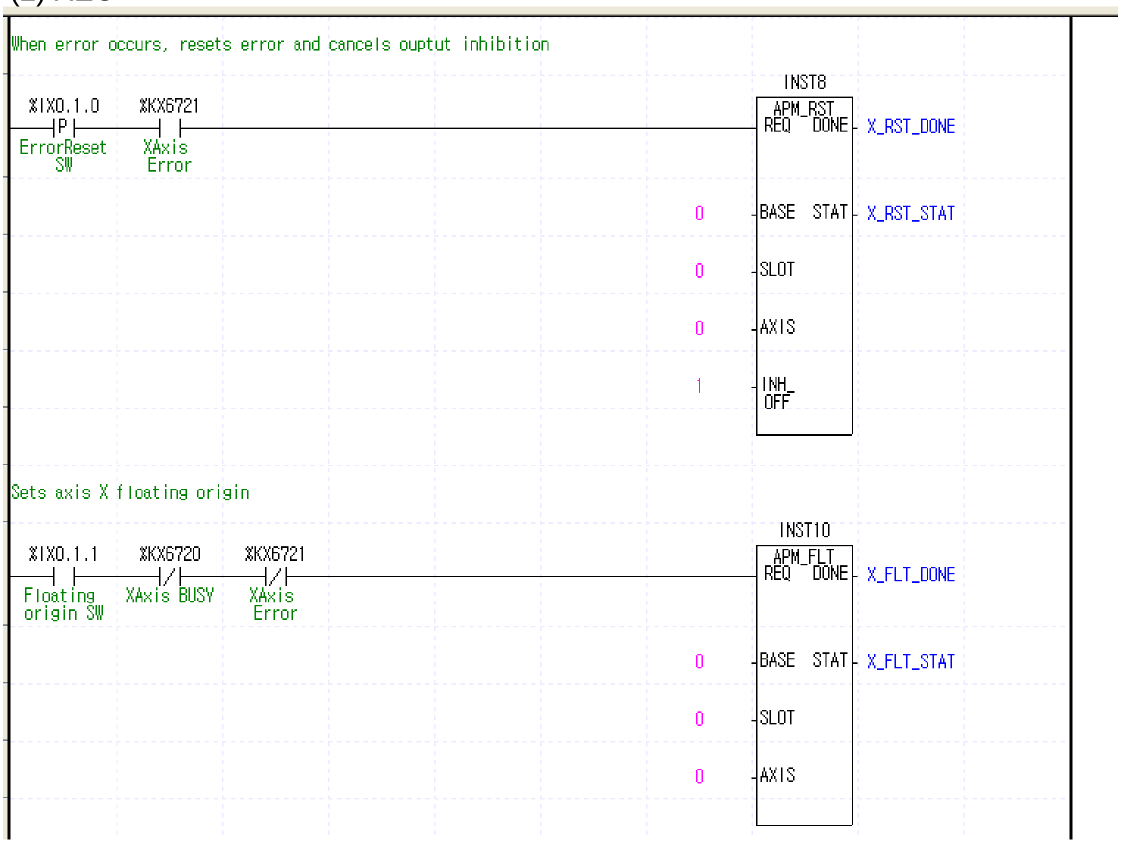
(1) XBM/XBC

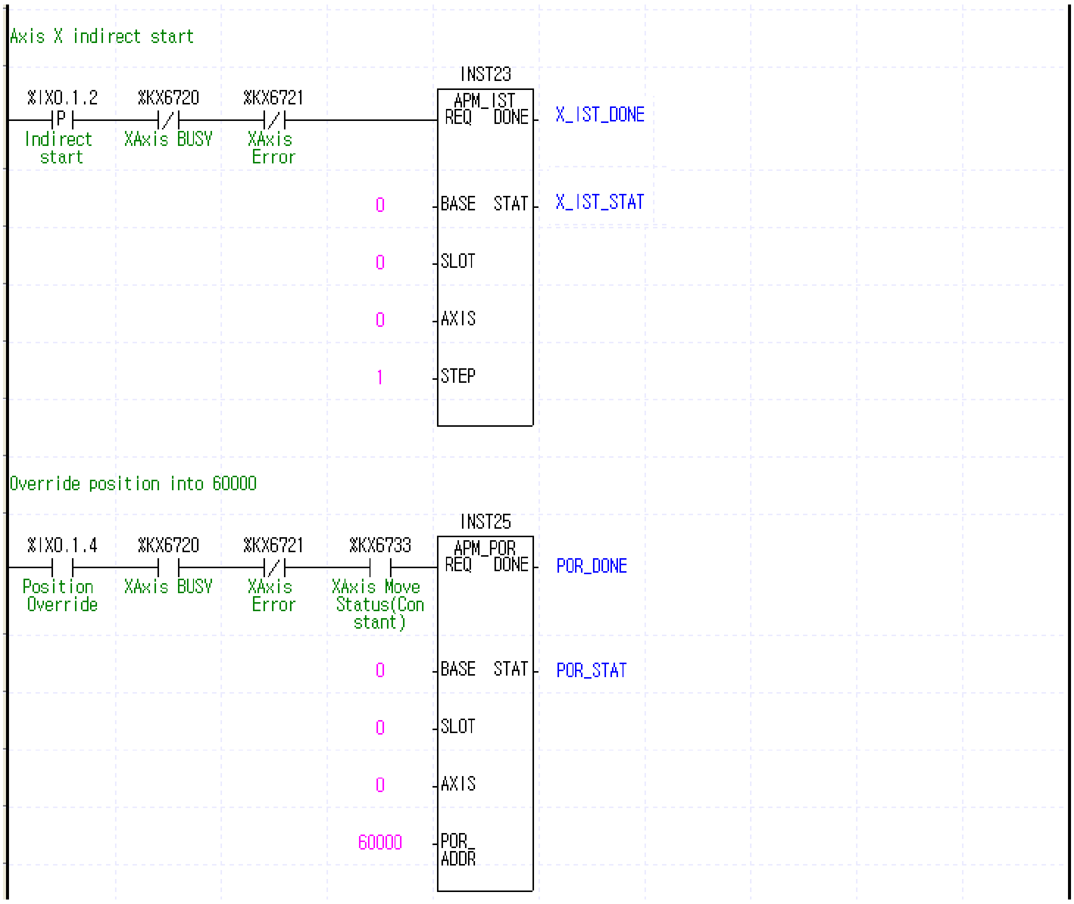


(a) Devices Used

Device	Description
P0008	Axis X error reset, output inhibition cancel switch
P0009	axis X floating origin switch
P000A	axis X indirect start switch
P000C	axis X position override switch
K4200	Signal during axis X operation
K4201	Error signal of axis X
K420D	axis X constant speed signal

(2) XEC





(a) Devices Used

Device	Description
%IX0.1.0	Axis X error reset, output inhibition cancel switch
%IX0.1.1	axis X floating origin switch
%IX0.1.2	axis X indirect start switch
%IX0.1.4	axis X position override switch
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X
%KX6733	axis X constant speed signal

(3) Operation Data Setting

Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [㎳]
1	Absolute	Position control	End	Single	0	100000	0	1	5000	100

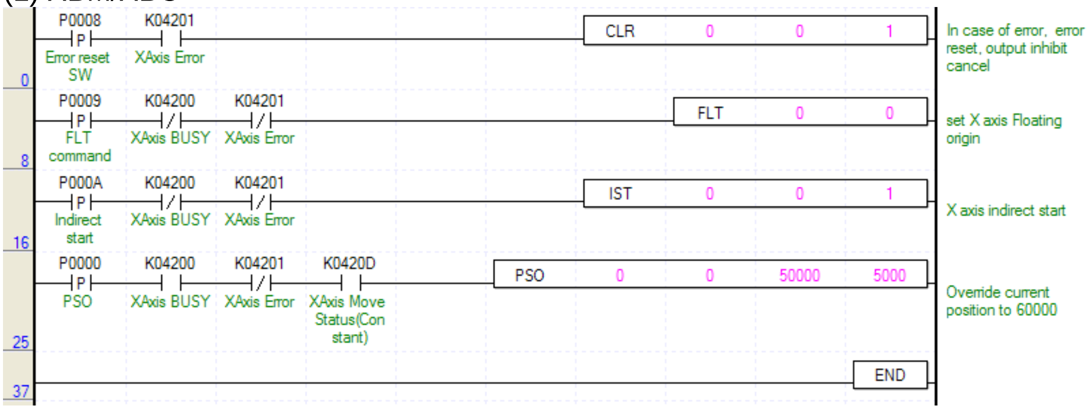
(4) Operation Sequence

- •P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.
- •P000A/%IX0.1.2 (indirect start) switch On : axis X indirectly starts step 1.
- •P000C/%IX0.1.4 (position override) switch On : overrides the current position to 60,000 when the current position is below 60,000.

7.2.13 Speed Override with Position

• The program example of positioning speed override during operation is as follows

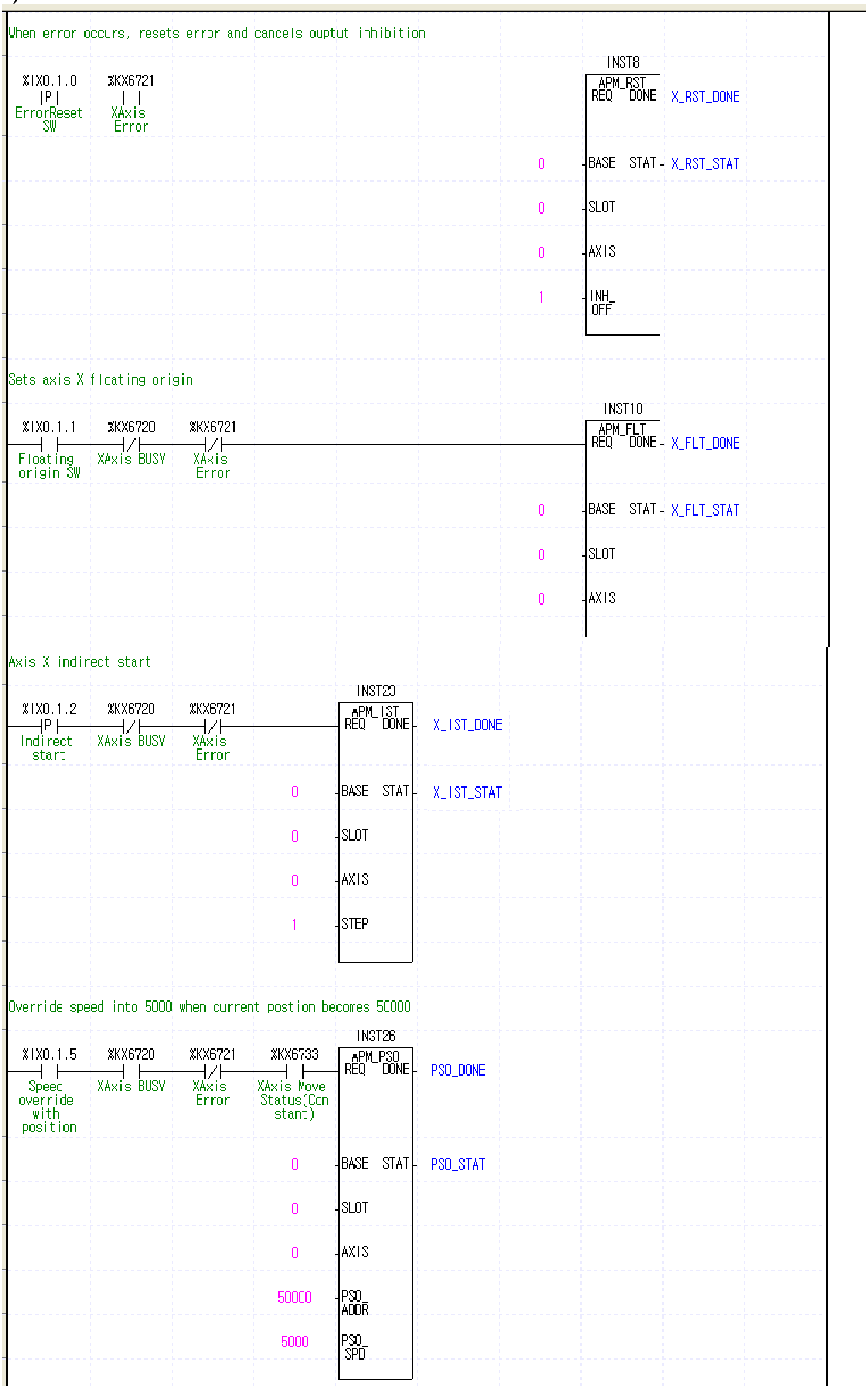
(1) XBM/XBC



(a) Devices Used

Device	Description
P0008	Axis X error reset, output inhibition cancel switch
P0009	axis X floating origin switch
P000A	axis X indirect start switch
P000D	axis X positioning speed override switch
K4200	Signal during axis X operation
K4201	Error signal of axis X
K420D	axis X constant speed signal

(2) XEC


When error occurs, resets error and cancels ouptut inhibition
INST8
%IX0.1.0
ErrorReset SW
%KX6721
XAxis Error
APM_RST
REQ
DONE
X_RST_DONE
0
BASE
STAT
X_RST_STAT
0
SLOT
0
AXIS
1
INH_OFF
Sets axis X floating origin
INST10
%IX0.1.1
Floating origin SW
%KX6720
XAxis BUSY
%KX6721
XAxis Error
APM_FLT
REQ
DONE
X_FLT_DONE
0
BASE
STAT
X_FLT_STAT
0
SLOT
0
AXIS
Axis X indirect start
INST23
%IX0.1.2
Indirect start
%KX6720
XAxis BUSY
%KX6721
XAxis Error
APM_IST
REQ
DONE
X_IST_DONE
0
BASE
STAT
X_IST_STAT
0
SLOT
0
AXIS
1
STEP
Override speed into 5000 when current postion becomes 50000
INST26
%IX0.1.5
Speed override with position
%KX6720
XAxis BUSY
%KX6721
XAxis Error
%KX6733
XAxis Move Status(Constant)
APM_PSO
REQ
DONE
PSO_DONE
0
BASE
STAT
PSO_STAT
0
SLOT
0
AXIS
50000
PSO_ADDR
5000
PSO_SPD

(a) Devices Used

Device	Description
%IX0.1.0	Axis X error reset, output inhibition cancel switch
%IX0.1.1	axis X floating origin switch
%IX0.1.2	axis X indirect start switch
%IX0.1.5	axis X positioning speed override switch
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X
%KX6733	axis X constant speed signal

(3) Operation Data Setting

Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [ms]
1	Absolute	Position control	End	Single	0	100000	0	1	10000	100

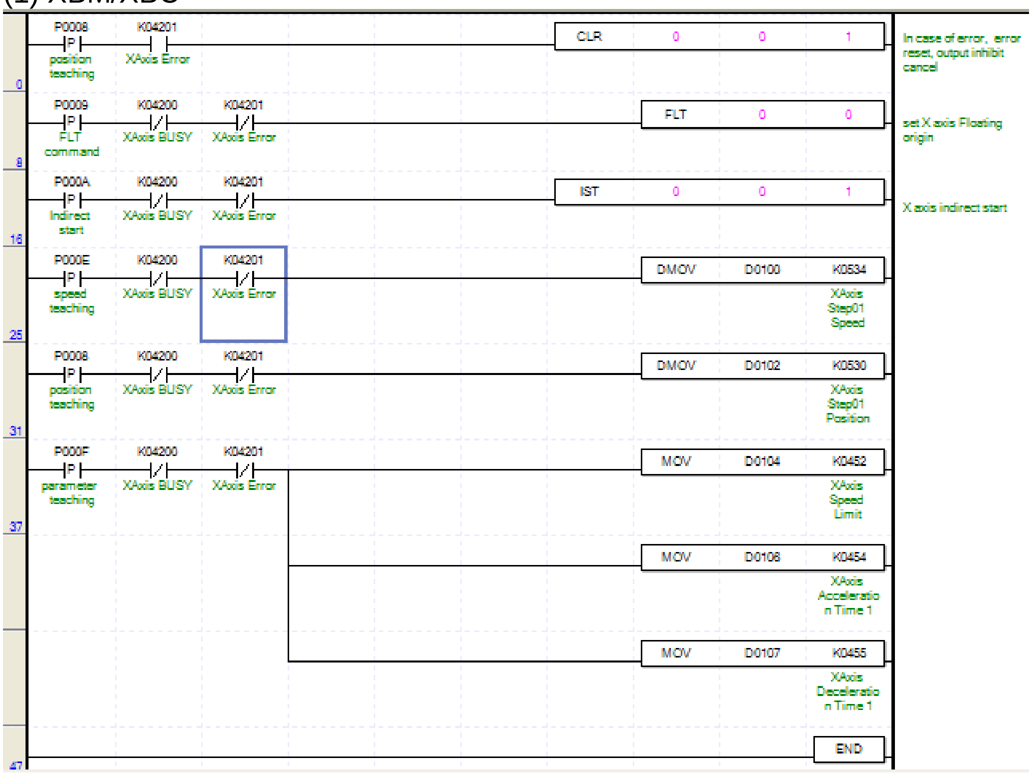
(4) Operation Sequence

•P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.
•P000A/%IX0.1.2 (indirect start) switch On : axis X indirectly starts step 1.
•P000D/%IX0.1.5 (positioning speed override) switch On : overrides the current speed to 5000 when the current position reaches 50,000.

7.2.14 Speed, Position, and Parameter Teaching

• The program example of teaching of speed, position, and operation parameter is as follows

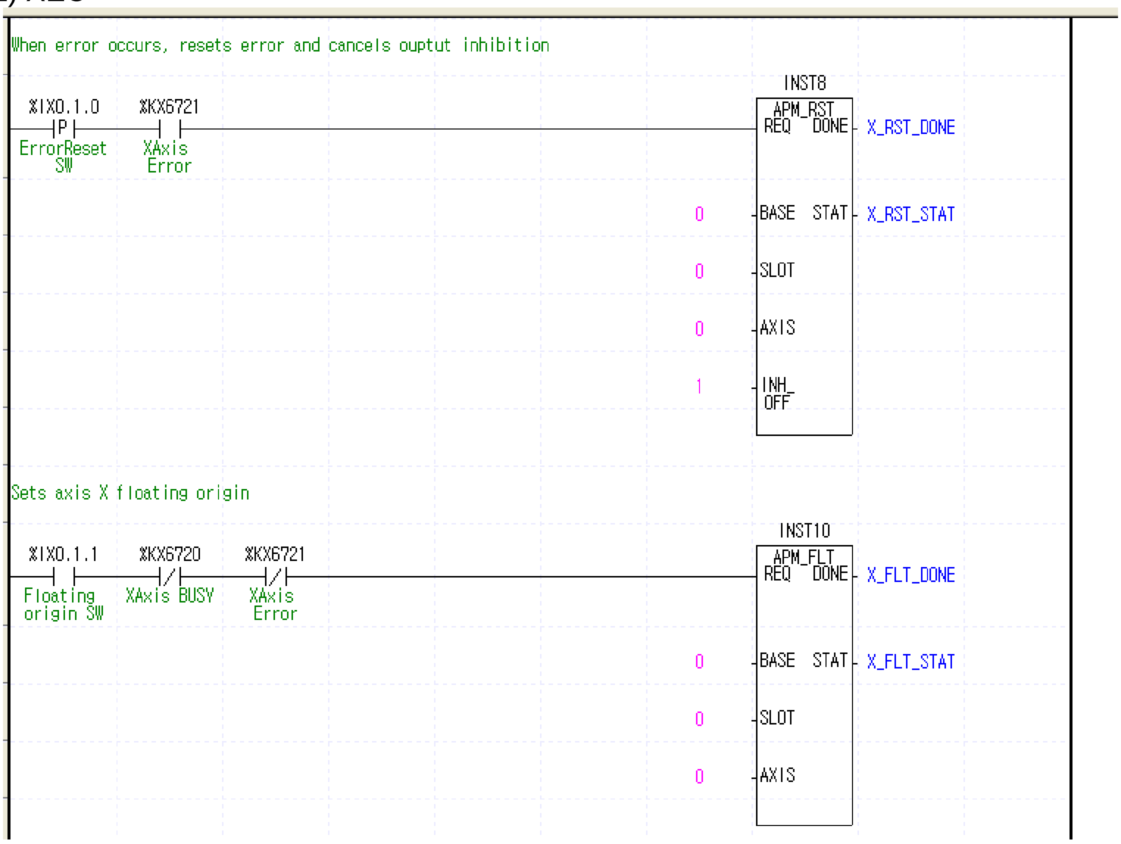
(1) XBM/XBC

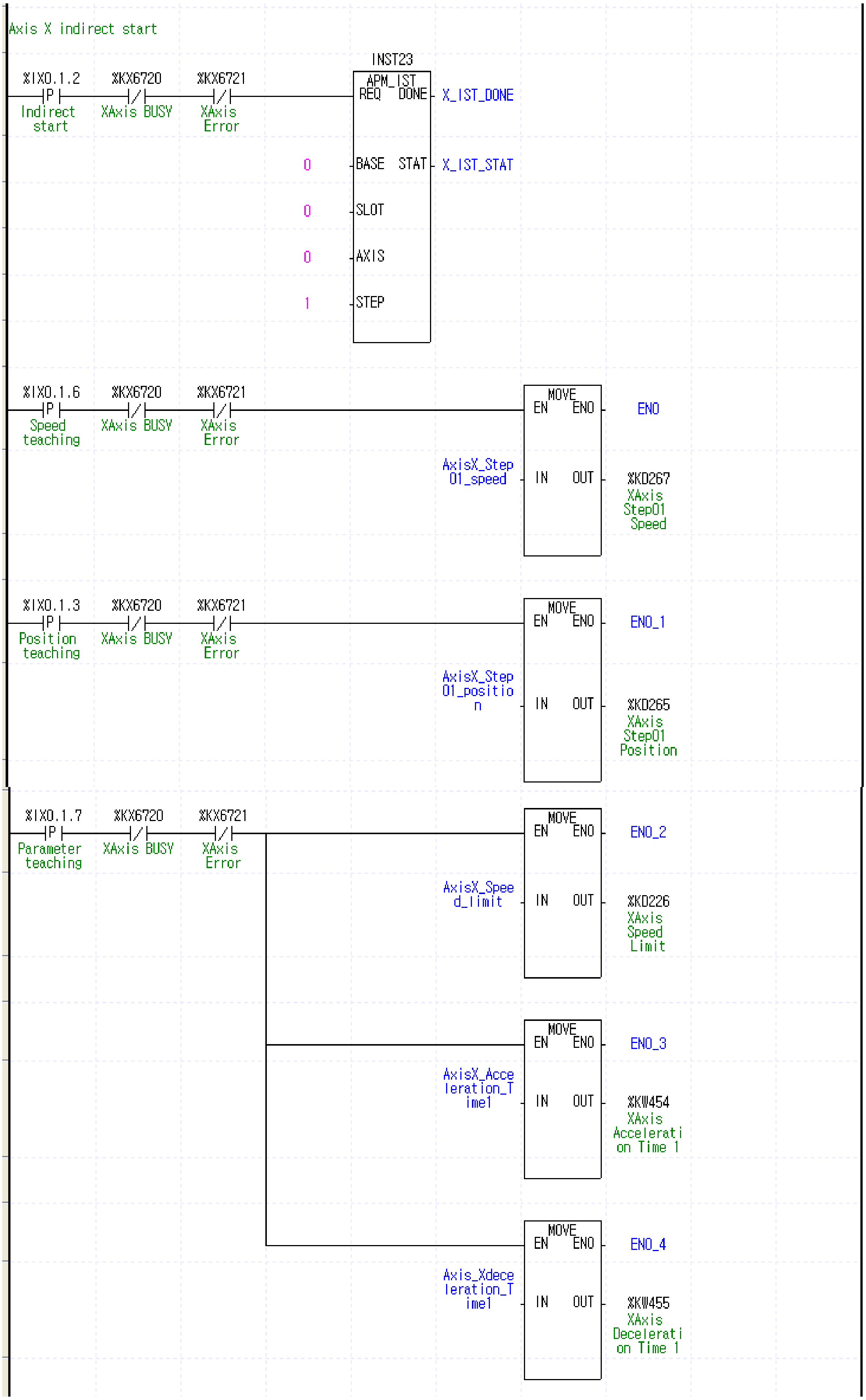


(a) Devices Used

Device	Description
P0008	Axis X error reset, output inhibition cancel switch
P0009	axis X home return switch
P000A	axis X start switch
P000E	axis X speed teaching switch
P000B	axis X position teaching switch
P000F	axis X parameter teaching switch
K4200	Signal during axis X operation
K4201	Error signal of axis X
K534 ~ K535	axis X step 1 operation speed
D0100 ~ D0101	axis X speed change data (3000)
K530 ~ K531	axis X step 1 target position
D0100 ~ D0101	axis X speed change data (5000)
K452 ~ K453	axis X speed limit
K454	axis X deceleration time
K455	axis X acceleration time
D0100 ~ D0101	axis X speed limit setting data (10000)
D0102	axis X deceleration time 1 setting data (50)
D0103	axis X deceleration time 1 setting data (50)

(2) XEC




Axis X indirect start
INST23
%IX0.1.2
P
Indirect start
%KX6720
XAxis BUSY
%KX6721
XAxis Error
APM_IST
REQ DONE
X_IST_DONE
0
BASE STAT
X_IST_STAT
0
SLOT
0
AXIS
1
STEP
%IX0.1.6
Speed teaching
%KX6720
XAxis BUSY
%KX6721
XAxis Error
MOVE
EN ENO
ENO
AxisX_Step01_speed
IN OUT
%KD267
XAxis Step01 Speed
%IX0.1.3
Position teaching
%KX6720
XAxis BUSY
%KX6721
XAxis Error
MOVE
EN ENO
ENO_1
AxisX_Step01_position
IN OUT
%KD265
XAxis Step01 Position
%IX0.1.7
Parameter teaching
%KX6720
XAxis BUSY
%KX6721
XAxis Error
MOVE
EN ENO
ENO_2
AxisX_Speed_limit
IN OUT
%KD226
XAxis Speed Limit
MOVE
EN ENO
ENO_3
AxisX_Acceleration_Time1
IN OUT
%KW454
XAxis Acceleration Time 1
MOVE
EN ENO
ENO_4
Axis_Xdeceleration_Time1
IN OUT
%KW455
XAxis Deceleration Time 1

(a) Devices Used

Device	Description
%IX0.1.0	Axis X error reset, output inhibition cancel switch
%IX0.1.1	axis X home return switch
%IX0.1.2	axis X start switch
%IX0.1.6	axis X speed teaching switch
%IX0.1.3	axis X position teaching switch
%IX0.1.7	axis X parameter teaching switch
%KX6720	Signal during axis X operation
%KX6721	Error signal of axis X
%KD267	axis X step 1 operation speed
AxisX_Step01_Speed	axis X speed change data (3000)
%KD265	axis X step 1 target position
AxisX_Step01_Position	axis X speed change data (5000)
%KD266	axis X speed limit
%KW454	axis X acceleration time
%KW455	axis X deceleration time
AxisX_Speed_limit	axis X speed limit setting data (10000)
AxisX_acceleration_time1	axis X acceleration time 1 setting data (50)
AxisX_deceleration_time1	axis X deceleration time 1 setting data (50)

(3) Operation Data Setting

Step No.	coordinates	Control pattern	Operation pattern	Operation type	Repeat step	Target position [pulse]	M code	Acc./Dec. No.	Operation speed [pls/s]	Dwell time [ms]
1	Relative	Position control	End	Repeat	1	10,000	0	1	1000	100

(4) Positioning Basic Parameter Setting

Parameter	Set value
Speed limit	100,000
Acceleration time 1	100
Deceleration time 1	100

(5) Operation Sequence

- •P0009/%IX0.1.1 (floating origin) switch On : set as the floating origin at the current position.
- •P000A/%IX0.1.2 (indirect start) switch On : axis X indirectly starts step 1.
  - speed : 1,000[pps]
  - target position : 10,000[Pulse]
  - acceleration/deceleration time : 100[㎳]
- •P000E/%IX0.1.6 (speed teaching) switch On after positioning is completed: speed of step 1 changes to 3,000[pps].
- •P000A/%IX0.1.2 (indirect start) switch On : axis X indirectly starts step 1 again.
  - speed : changes to 3,000[pps] and operates.
  - target position : 10,000[Pulse]
  - acceleration/deceleration time : 100[㎳]
- • P000B/%IX0.1.3 (position teaching) switch On after positioning is completed: the target position of step 1 changes to 5,000.
- •P000A/%IX0.1.2 (indirect start) switch On : axis X indirectly starts step 1 again.
  - speed : 3,000[pps]
  - target position : changes to 5,000[Pulse] and operates.
  - acceleration/deceleration time : 100[㎳]
- • P000F/%IX0.1.7 (parameter teaching) switch On after positioning is completed: positioning basic parameter is changed.
- •P000A/%IX0.1.2 (indirect start) switch On : axis X indirectly starts step 1 again.
  - speed : 3,000[pps]
  - target position : 5,000[Pulse]
  - acceleration/deceleration time : changes to 50[㎳] and operates.

Remark

• Permanent Storage of Teaching Data

- If you have changed the operation data and parameter by using the DMOV instruction, you need to use the WRT instruction to save the changed value in the flash memory. Otherwise, it is initialized to the value saved in the previous flash memory when the power is off or the mode is changed.

Chapter 8 Troubleshooting Procedure

This chapter describes the errors that occur during the use of XGB PLC and the built-in positioning function, the method of finding the cause of the error, and the actions to take.

8.1 Basic Procedure of Troubleshooting

Although t is important to use a highly reliable device for normal operation of the system, it is important as well how to deal with a trouble quickly.

In case of a trouble, if you want to restart the system, it is critical to find the cause of the trouble and take an action as soon as possible. The basic troubleshooting points you need to keep in mind are as follows.

(1) Check with Naked Eye

Check the following with your naked eye.

- Operation of the machine (in motion, not in motion)
- Power supply – whether the rated voltage is normally supplied to XGB PLC
- Condition of the input and output devices
- Distribution (input and output lines, communication cables, expansion)
- Check the Indicators (PWR LED, RUN LED, STOP LED, input and output LED), and access the peripheral devices to check the PLC operation and program contents.

(2) Trouble Check

When you manipulate the device as follows, observe how the trouble develops.

- Turn the operation mode switch to STOP and turn On / Off.

(3) Supposition of the Cause of Trouble

Suppose which of the following the cause of the trouble is.

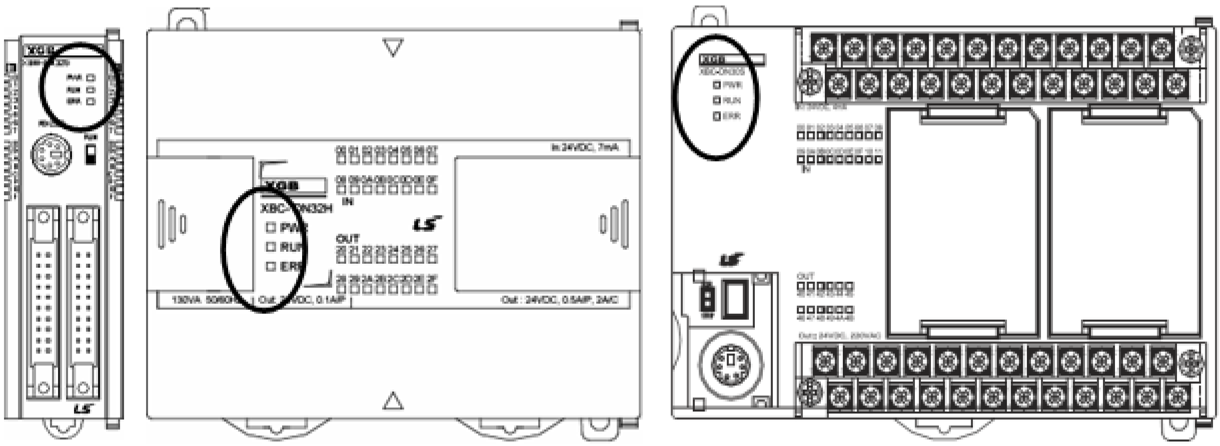
- Whether the cause is in the PLC or an external device
- If the trouble is in the PLC, decide whether it is the trouble of the basic unit or other expansion modules.
- In the former is the case, decide whether there is a problem with the PLC parameter/program or hardware.

8.2 Check by Using the LED

If there is trouble in using the XGB built-in positioning function, you can roughly presume the cause of the trouble by checking the LED of XGB PLC. This chapter describes the LED related to the trouble of the positioning function. With respect to the trouble that occurs during use of other functions of the basic unit, refer to 'Hardware section of the XGB Manual.'

8.2.1 LED Check

If there is trouble during use of the positioning function, check the status of PWR LED, RUN LED and ERR LED of XGB PLC, and check the LED of the input and output contact point related to positioning.



(1) PWR LED Check

Check the PWR LED status and take the following actions.

LED	PLC trouble	Actions to take
On	• Rated voltage is normally supplied to XGB.	• The power supply is normal, so check whether there is another cause.
Flashing	• One of the following might be the cause. - Rated voltage/current set for the XGB is not being supplied. - Problem with the PLC hardware - Problem with external lines	• Check the voltage and current of the power supply. • Remove the input and output lines, re-supply power and check again. - If there still is the same problem, contact the A/S office or customer center.
Off	• Power is not being supplied. • Supplied voltage is lower than the rated voltage. • The cable is severed. • There is a problem with the PLC hardware.	• Check whether rated voltage is being normally supplied to the PLC. - If normally supplied, contact an A/S office or customer center.

(2) RUN LED Check

LED	PLC trouble	Actions to take
On	• The program is being normally operated.	• Check whether there is another cause.
Off	• The running of the program has stopped.	• The program has stopped. - Check the ERR LED to find whether it is because of an error or the operation mode is STOP.

(3) ERR LED Check

LED	PLC trouble		Actions to take
On	• A problem with the PLC hardware		• There is a problem with the PLC hardware, so contact an A/S office or customer center.
Flashing	Quick flashing (0.1 sec)	• Serious trouble that makes operation impossible	• Access XGB with XG5000, execute 'Online' → 'PLC error/warning', check the error and warning, and remove the cause.`
	Slow flashing (0.5 sec)	• A minor problem with operation continuing	
On	• The program is being normally run.		• The program is being normally run, so check whether there is another problem.

(4) Positioning Output LED Check

If no problem is found as a result of the check of the LED, check the LED of the output contact point related to the positioning function, and take the following actions.

(a) When the pulse output mode is the PLS/DIR mode

Signal	Contact point	LED status	Error and actions to take
Pulse output	P20,P21 (XBM, XBCH) P40,P41 (XBCS) Q00,Q01 (XECH,XECS)	Fast flashing	• Pulse is being normally output by the positioning function. • Check whether there is a problem with the lines of the XGB and motor driver.
		Off	• Pulse is not being normally output. - Positioning operation has finished (normal). → Start the next operation instruction. - There is an error that makes positioning operation impossible. → Check the positioning error code and remove the cause. • For the method of check the error code, refer to Appendix 1.1.

Signal	Contact point	LED status	Output level	Error and actions to take
Direction output	P22,P23 (XBM, XBCH) P42,P43 (XBCS) Q02,Q03 (XECH,XECS)	On	Low Active	• Direction signals are being output in the normal direction (normal).
			HIGH Active	• Direction signals are being output in the reverse direction (normal). • Pulse is not being normally output - Positioning operation has finished (normal) → Start the next operation instruction. - There is an error that makes positioning operation impossible → Check the positioning error code and remove the cause.
		Off	Low Active	• Direction signals are being output in the reverse direction (normal) • Pulse is not being normally output - Positioning operation has finished (normal) → Start the next operation instruction. - There is an error that makes positioning operation impossible → Check the positioning error code and remove the cause.
			HIGH Active	• Direction signals are being output in the normal direction (normal).

(b) When the pulse output mode is the CW/CCW mode

Signal	CW contact point	CCW contact point	Error and actions to take
CW output	Flashing	Off	• CW pulse is being normally output (normal).
		Flashing	• The pulse is being abnormally output. → Contact an A/S office or customer center.
	Off	Off	• Pulse is not being output (normal). - Positioning operation has finished (normal). → Start the next operation instruction. - There is an error that makes positioning operation impossible. → Check the positioning error code and remove the cause
		Flashing	• CCW pulse is being normally output (normal).

Remark

• If PWR, RUN, and ERR LED are all off, there is a problem with the internal operation system of XGB. In such a case, XGB PLC cannot normally operate, so inquire of the customer center.

8.3 Check by Error Code

If there is found to be an error as a result of the check of the LED related to positioning, access XGB with XG5000, check the positioning error code, and remove the cause.

This chapter only describes how to check the positioning error codes. With respect to the details of error codes and actions to take, refer to Appendix 1.1.

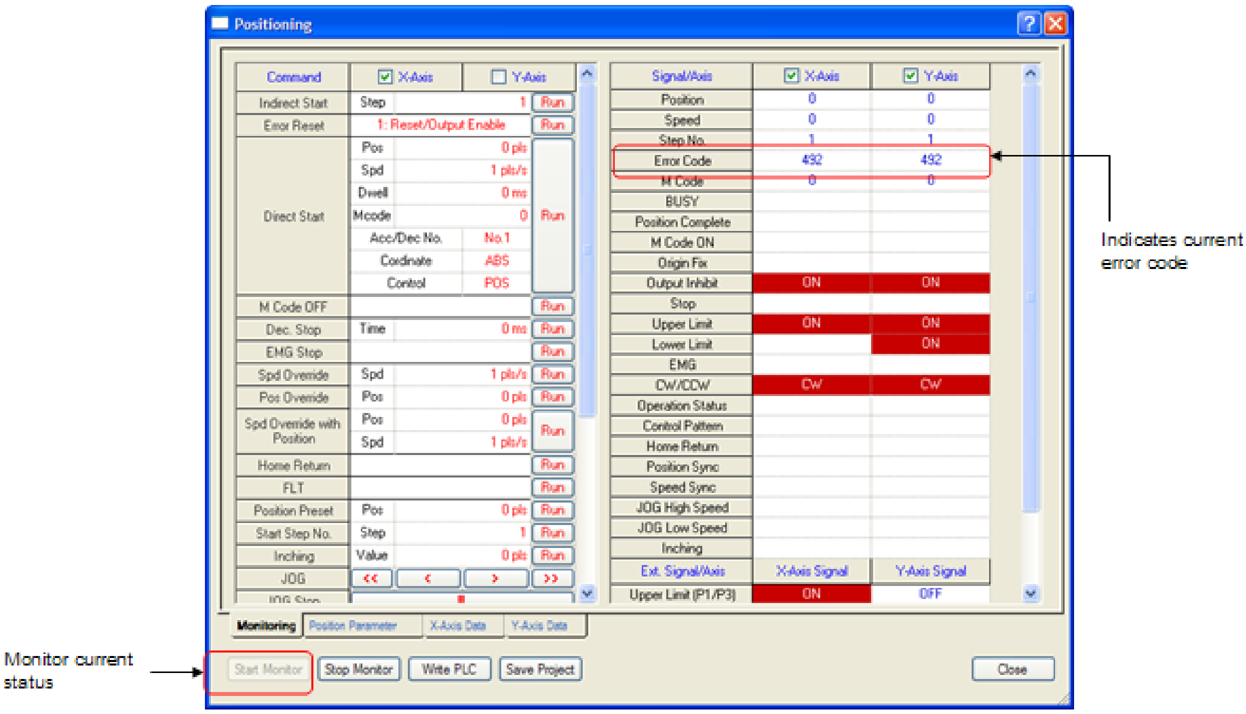
8.3.1 How to Check Error Codes

The built-in positioning error code can be checked by using the XGB positioning monitoring package or the positioning error code device of area K in the following procedure.

(1) Positioning Monitoring Package

(a) Access PLC with XG5000.

(b) Select 'Monitor' → 'Special Module Monitor' → 'Positioning Module,' the following monitoring package is executed. Select 'Start Monitor' at the left bottom, you can check the error code.



(2) Positioning Area K

(a) You can check the error code by using the device monitor function of XG5000.

(b) To check the error code of the XGB positioning function, monitor the following device. About how to use the device monitor function, refer to the manual of XG5000.

	Area K address	Data size
Axis X	K427(%KW427)	Word
Axis Y	K437(%KW437)	Word

8.4 Check of Motor Failures

If the motor does not work despite there being no problem after the check according to the procedure described above, check the following.

8.4.1 If the Motor Doesn't Work

(1) Lines between the XGB and Motor Driver

- Check whether the lines between XGB and servo motor driver are connected rightly.
- For the specifications of the input and output of XGB, refer to Chapter 2.
- For examples of wiring between XGB and the motor driver, refer to Appendix 3.
- If you use a motor driver that is not addressed in this manual, refer to the manual of that motor driver.

(2) Setting of the Motor Driver

- If there is no problem with the wiring, check whether the input pulse of the motor driver is the same as that of the XGB.
- XGB only supports the open collector type. Check whether the motor driver you are using can accommodate the type, and check the setting of the motor driver.

(3) Check of the Motor Driver

- If no problem is found as a result of the procedure above, check whether pulse is actually supplied to the motor driver by using the oscilloscope. If the motor driver isn't working despite the pulse actually being supplied, refer to the manual of the motor driver and check whether there is an error of the driver.

Appendix 1 List of Error Codes

1.1 List of PLC Error Codes

The general error codes that might occur during XGB operation are as follows.
To check the error codes, access XGB with XG5000 and execute 'online' → 'PLC error/warning' menu.

Code	Cause	Action to take	Type	LED status	Detected during
23	There is a problem with the program to run	Re-download and run the project	Minor	0.5 second Flicker	RUN
24	Over I/O parameter	Check the preservation by reading I/O parameter or basic parameter according to the error code type. If there is a problem, correct it to Write with PLC and check the operation. If the problem still goes on, replace the basic unit.	Minor	0.5 second Flicker	Reset RUN mode conversion
25	Over basic parameter		Minor	0.5 second Flicker	Reset RUN mode conversion
30	The module set in I/O parameter does not match the actually mounted module.	Correct the I/O parameter for it to match the actually mounted module and write with PLC.	Minor	0.5 second Flicker	RUN mode conversion
31	Module is removed or another module is mounted during operation	Turn OFF -> ON.	Serious	0.1 second Flicker	Every scan
33	Data of input and output modules during operation are not normally collected	Replace the module and restart it after checking the input and output where the error took place by using XG5000.	Serious	0.1 second Flicker	Scan end
34	Data of special/comm.. module during operation are not normally collected		Serious	0.1 second Flicker	Scan end
38	Number of additionally mounted modules exceeded	No more than 7 layer can be added, remove the excessively added modules and restart.	Serious	0.1 second Flicker	Every scan
39	PLC CPU operation overload or failure due to noise or hardware	1) If repeated when resupply power, call A/S. 2) Carry out noise action.	Serious	0.1 second Flicker	Any time
40	Program scan time during operation exceeds the set scan delay monitoring time	Check the scan delay monitoring time of the basic parameter, and modify it or the program and restart.	Minor	0.5 second Flicker	Program running
41	Operation error during sequence program	Check the step where the operation error took place, remove the cause and restart.	Minor	0.5 second Flicker	Program running
44	Timer index use error	Modify the timer index program, write the program and restart.	Minor	0.5 second Flicker	Scan end
50	Serious failure is detected in external device due to sequence program	Refer to the serious failure detecting error flag of external device, repair it and restart.	Serious	0.1 second Flicker	Scan end
60	E_STOP function performed	Remove the cause of error that started the E-STOP function in the program and re-supply power.	Serious	0.1 second Flicker	Program running
500	Data memory backup error	Re-supply power. (converted to STOP mode in remote mode)	Warning	1 second Flicker	Power On

1.2 List of Positioning Error Codes

Error code that can be occurred in the XGB positioning is as follows.
The user can check error code through XGB dedicated positioning monitoring package or K area (X axis: K427, Y axis: K437). Error code occurs according to dedicated K area applied at starting.
For checking the relationship between positioning parameter and dedicated K area, refer to ch.3.2.

Error code	Description	Operation	Countermeasures
101	Exceeding the max speed range of basic parameter	Stop	Change the max speed value
102	Exceeding the bias speed of basic parameter 1) bias speed ≥ Speed limit 2) bias speed = 0	Stop	Re-adjust it lower then the max speed of basic parameter.
103	ACC time setting error 1) ACC time > 10,000 2) Jog ACC time > 10,000	Stop	Re-adjust ACC time of basic parameter lower than 10,000
104	DEC time setting error 1) DEC time > 10,000 2) Jog DEC time > 10,000	Stop	Re-adjust DEC time of basic parameter lower than 10,000
105	Setting non use dedicated positioning at parameter	Stop	Setting dedicate positioning.
111	Expansion parameter soft upper/lower limit error • S/W upper > S/W lower	Stop	Re-adjust S/W upper limit equal to or larger than the lower limit.
121	Manual operation parameter jog high speed range exceeding error 1) Jog high speed < bias speed 2) Jog high speed > > max speed 3) Jog high speed = 0 4) Jog high speed < Jog low speed	Stop	Re-adjust to be max speed≥jog high speed≥bias speed
122	Manual operation parameter jog low speed range exceeding error 1) Jog low speed < bias speed 2) Jog low speed > max speed 3) Jog low speed = 0 4) Jog low speed > Jog high speed	Stop	Re-adjust to be jog high speed≥jog low speed≥ 1.
123	Manual operation parameter inching speed range exceeding error 1) inching speed < bias speed 2) inching speed > > max speed	Stop	Re-adjust to be max speed ≥ inching speed ≥ bias speed
131	Home return parameter home return mode value range exceeding error	Stop	Re-adjust to be 0 < home return parameter ≤ 3. (1:Dog/origin(On) 2:upper/lower limit/origin 3:DOG)
132	Home return parameter home return address range exceeding error	Stop	Re-adjust to be S/W upper limit ≥ home return address≥ S/W lower limit
133	Home return parameter home return high speed range exceeding error 1) home return high speed < bias speed 2) home return high speed > max speed	Stop	Re-adjust to be max speed ≥home return high speed ≥ bias speed
134	Home return parameter home return low speed range exceeding error 1) home return low speed < bias speed 2) home return low speed > home return high speed	Stop	Re-adjust to be home return high speed ≥home return low speed≥ bias speed
135	Home return dwell time out error of home return parameter • Home return dwell time > 50,000	Stop	Re-adjust dwell time lower than 50000.

Error code	Description	Operation	Countermeasures
136	Home return ACC time setting error • Home return ACC time > 10,000	Stop	Re-adjust home return ACC time lower than 10,000
137	Home return DEC time setting error • Home return DEC time > 10,000	Stop	R-adjust home return Dec time lower than 10,000.
151	Operation speed ‘0’ setting error of operation data	Stop	Set operation speed over ‘0’.
152	Operation speed of operation data exceeding the max speed	Stop	Re-adjust to be max speed ≥ operation speed.
153	Operation speed of operation data set lower than bias speed.	Stop	Re-adjust to be operation speed ≥ bias speed.
154	Exceeding dwell time setting range of operation data	Stop	Set dwell time lower than 50000.
155	Exceeding end/continuous/sequential setting range of operation data	Stop	Re-set operation pattern of operation data as one of 0:end, 1:continuous or 2:sequential
201	Home return command is unavailable during operation	Stop	Check whether command axis was not operating at the time of home return command.
202	Home return command is unavailable in case of ‘no output’ status.	Stop	Check whether command axis was not in ‘no output’ status at the time of home return command.
211	Floating origin setting command is unavailable during operation.	Stop	Check whether command axis was not operating at the time of floating origin setting command.
221	Direct start command is unavailable during operation.	Stop	Check whether command axis was not operating at the time of direct start command
222	Direct start command is unavailable in case of ‘no output ’ status.	Stop	Check whether command axis was not in ‘no output’ status at the time of direct start command.
223	Direct start command is unavailable in case of M code On	Stop	Check whether M code of command axis was not On at the time of direct start command.
224	Direct start command is unavailable without origin set in absolute coordinate.	Stop	Absolute coordinate operation is not available without origin set. Check whether operation data to operate and the current origin set.
231	Indirect start command is unavailable during operation	Operation	Check whether command axis was not operating at the time of indirect start command.
232	Indirect start command is unavailable in case of ‘no output’ status.	Stop	Check whether command axis was not in ‘no output’ status at the time of indirect command.
233	Indirect start command is unavailable in case of M code On.	Stop	Check whether M code signal of command axis was not On at the time of indirect start command.
234	Indirect start command is unavailable without origin set in absolute coordinate.	Stop	Absolute coordinate operation is not available without origin set. Check whether operation data to operate and the current origin set.
236	Continuous operation of indirect start is unavailable in speed control.	Stop	Re-set single or continuous operation if operation data control method is speed
241	Linear interpolation start is unavailable when main axis of linear interpolation s operating.	Operation	Check whether main axis was not operating at the time of linear interpolation command.
242	Linear interpolation start is unavailable when sub axis of linear interpolation is operating.	Operation	Check whether sub axis was not operating at the time of linear interpolation command.

Error code	Description	Operation	Countermeasures
244	Linear interpolation start is unavailable when main axis of linear interpolation is in 'Output disabled' status.	Stop	Check whether main axis was not in 'Output disabled' status at the time of linear interpolation command.
245	Linear interpolation start is unavailable when sub axis of linear interpolation is in 'Output disabled' status.	Stop	Check whether a sub axis was not in 'Output disabled' status at the time of linear interpolation command.
247	Linear interpolation start is unavailable when the M code signal of linear interpolation's main axis is On.	Stop	Check whether M code signal of main axis was not On at the time of linear interpolation command.
248	Linear interpolation start is unavailable when M code signal of linear interpolation's sub axis is On.	Stop	Check whether M code signal of sub axis was not On at the time of linear interpolation.
250	Absolute coordinate positioning operation is unavailable when the origin of linear interpolation sub axis is not set.	Stop	Absolute coordinate operation is not available without origin set. Check whether operation data to operate and the current origin set.
251	Absolute positioning operation is unavailable when the origin of linear interpolation's sub axis is not set.	Stop	Absolute coordinate operation is not available without origin set. Check whether operation data to operate and the current origin set.
253	Main axis and sub axis of linear interpolation are set incorrectly.	Stop	Re-set the axis date as 3 of linear interpolation command.
257	Linear interpolation is not available when the target position of main axis does not have a target position.	Stop	Check whether the target position of operation data of a step for linear interpolation was not the present status in case of absolute coordinate or set to '0' in case of Incremental coordinate.
258	Linear interpolation is unavailable when main axis is controlling speed.	Stop	Check whether the control method of main axis operation data step for linear interpolation operation was not set by speed control.
259	Linear interpolation is unavailable when sub axis is controlling speed.	Stop	Check whether the control method of sub axis operation data step for linear interpolation was not set by speed control.
291	Concurrent start command is unavailable during operation.	Operation	Check whether an axis with error was not contained in concurrent start command and whether there wasn't any operating axis at the time of the command
292	Concurrent start command is unavailable in 'no output' status.	Stop	Check whether an axis with error was not contained in concurrent start command and whether it was not in 'no output' status at the time of the command.
293	Concurrent start command is not available with M code On	Stop	Check whether an axis with error was not contained in concurrent start command and whether M code signal was not On at the time of the command.
294	Concurrent start command is unavailable without origin set	Stop	Concurrent start command with origin set
296	When concurrent start command axis is incorrectly set.	Stop	Re-set the axis date as 3 of concurrent start command
301	Speed/position switching command is unavailable while not operating.	Stop	Check whether an axis did not stop at the time of speed/position switching command.
302	Speed/position switching command is unavailable while not controlling speed.	Stop	Check whether an axis was not in speed control status at the time of speed/position switching command.
304	Speed/position switching command is unavailable without target position.	Stop	Check whether operation had a move(amount) at the time of speed/position switching command.

Error code	Description	Operation	Countermeasures
311	Position/speed switching command is unavailable while not operating.	Stop	Check whether an axis did not stop at the time of position/speed switching command.
312	Position/speed switching command is unavailable On a sub axis of synchronic operation.	Stop	Check whether an axis was operating as a synchronic operation sub axis at the time of position/speed switching command.
314	Position/speed switching command is unavailable during linear operation.	Operation	Check whether an axis was not in linear interpolation operation at the time of position/speed switching command.
321	DEC stop command is unavailable while not operating.	Stop	Check whether it was not operating at the time of DEC stop command.
322	DEC stop command is not available during jog operation.	Operation	Check whether it was not jog-operating at the time of DEC stop command.
341	Position synchronic command is not available during operation	Operation	Check whether an axis was not in operating at the time of position synchronic command
342	Position synchronic command is unavailable in 'no output' status.	Stop	Check whether an axis was not in 'no output' status at the time of position synchronic command.
343	Position synchronic command is unavailable with M code On.	Stop	Check whether M code signal of an axis was not On at the time of position synchronic command.
344	Position synchronic command is unavailable without origin set.	Stop	Absolute coordinate operation is not available without origin set. Check whether operation data to operate and the current origin set.
346	Position synchronic command is unavailable without origin of main axis set.	Stop	Check whether main axis was without origin set at the time of position synchronic command.
347	There is an error of setting main/sub axis of position synchronic command.	Stop	Check whether main axis of position synchronic command was not set equally with command axis.
351	Speed synchronic command is unavailable during operation.	Operation	Check whether an axis was not operating at the time of speed synchronic command.
352	Speed synchronic command is unavailable in 'no output' status.	Stop	Check whether an axis was not in 'no output' status at the time of speed synchronic command.
353	Speed synchronic command is unavailable with M code On	Stop	Check whether M code signal of an axis was not On at the time of speed synchronic command.
355	There is an error of main/sub axis setting of speed synchronic command. 1) main/ sub axis were set equally 2) set of main axis >5	Stop	Check whether the main axis of speed synchronic command was not set equally with command axis.
356	There is an error of synchronization ratio setting of speed synchronic command	Stop	Check whether the synchronization ratio of speed synchronic command was not set between 0~10,000.
357	Delay time setting error	Stop	Check whether delay time was set between 1 ~ 10ms.
361	Position override command is unavailable in any other status but 'busy'	Stop	Check whether an axis did not stop at the time of position override command.
362	Position override command is unavailable during dwelling	Stop	Check whether an axis was not dwelling at the time of position override command.
363	Position override command is unavailable in any other status but positioning operation.	Operation	Check whether an axis was not operating by position control at the time of position override command.
364	Position override command is unavailable for an axis of linear interpolation operation.	Operation	Check whether an axis was not in linear-interpolation operation at the time of position override command.

Error code	Description	Operation	Countermeasures
366	Position override command is unavailable for a synchronic operation sub axis.	Operation	Check whether an axis was not operating as a sub axis of synchronic operation at the time of position override command.
371	Speed override command is unavailable in any other status but 'busy'.	Stop	Check whether an axis did not stop at the time of speed override command.
372	Out-of speed override range error	Stop	Re-set the speed of speed override command equal to or lower than the max speed set in the basic parameter.
373	Speed override command is unavailable to an sub axis of linear interpolation operation.	Operation	Check whether an axis was not operating as a sub axis of linear interpolation at the time of speed override command.
375	Speed override command is unavailable to an sub axis of synchronic operation	Operation	Check whether an axis was not operating as a sub axis of synchronic operation at the time of speed override command.
377	Speed override command is unavailable in a DEC section	Operation	Check whether an axis was not decelerating for stoppage at the time of speed override command.
381	Positioning speed override command is unavailable in any other status but 'operation'.	Stop	Check whether an axis did not stop at the time of positioning speed override command.
382	Positioning speed override command is unavailable in any other operation but 'positioning operation'	Stop	Check whether an axis was not in speed control operation at the time of positioning speed override.
383	Out of speed override range error of positioning sped override command	Stop	Check whether the speed of positioning speed override command was not equal to or lower than the max speed set in parameter.
384	Positioning speed override command is unavailable to an sub axis of linear interpolation operation.	Operation	Check whether an axis was not operating as a sub axis of linear interpolation at the time of positioning speed override command.
386	Positioning speed override command is unavailable to an sub axis of synchronic operation.	Operation	Check whether an axis was not operating as a sub axis of synchronic operation at the time of positioning speed override command.
401	Inching command is unavailable during operation.	Operation	Check whether an axis was not operating at the time of inching command.
402	Inching command is unavailable in 'no output' status.	Stop	Check whether an axis was not in 'no output' status at the time of inching command.
411	Jog start command is unavailable during operation.	Operation	Check whether an axis was not operating at the time of jog start command.
412	Jog start command is unavailable in 'no output' status.	Stop	Check whether an axis was not in 'no output' status at the time of jog start command.
441	Start step number change/repeat operation start step number designation command is unavailable during operation.	Operation	Check whether an axis was not operating at the time of start step number change command.
442	Start step number change/repeat operation start step number command is unavailable during operation. 1) Step = 0 2) Step > 30(80 for high end)	Stop	Check whether the step number of start step number change command or repeat operation start step number designation command is equal to or higher than 1 and lower and 30(80 for high end) or within the range.
451	Present position preset command is unavailable during operation.	Operation	Check whether an axis was not operating at the time of present position present command.
452	Sub position data may not be set exceeding soft upper/lower limits at the time of present position preset command.	Stop	Check whether the position of present position present command was within the soft upper/lower limits.

Error code	Description	Operation	Countermeasures
481	emergency stop error	Stop	Remove emergency stop causes and clear the error by executing CLR command.
491	External emergency stop error	Stop	Remove emergency stop causes and clear the error with CLR command.
492	Hard upper limit error	Stop	Escape from external upper signal range by using jog command and clear the error with CLR command.
493	Hard lower limit error	Stop	Escape from external upper signal range by using jog command and clear the error with CLR command.
501	Soft upper limit error	Stop	Escape from soft upper limit range by using jog command and clear the error with CLR command.\
502	Soft lower limit error	Stop	Escape from soft lower limit range by using jog command and clear the error with CLR command.
511	Direction turning error during sequential operation	Stop	Check whether the direction are turned during sequential operation.
512	Step number error during indirect start.	Stop	A step over 30 was set in a command. Re-set step number between 1 ~ 30.
513	Address error during indirect start.	Stop	Check whether it repetitively operates a step of which address is '0' during indirection start.
601	PWM command is unavailable during operation.	Operation	Check whether an axis was not operating at the time of present position present command.
602	PWM command is unavailable in 'no output' status	Stop	Check whether an axis was not in 'no output' status at the time of inching command.
603	PWM Output Cycle setting error	Stop	Check whether PWM Output Cycle was set between 1 ~ 20,000.
604	PWM Off duty rate setting error	Operation / Stop	Check whether PWM Off duty rate was set between 1 ~ 100.
605	Speed override command is unavailable during PWM operation	Operation	Check whether an axis was not in PWM operation at the time of speed override command.
606	Position/speed switching command is unavailable during PWM operation	Operation	Check whether an axis was not in PWM operation at the time of position/speed switching command.

Appendix 2 Positioning Instruction and K area List

Appendix 2.1 Positioning instruction list

Instruction used in the XGB positioning is as follows.
For detail, refer to ch.5.2 ~ ch5.3
(1) In case of XBC/XBM.

Instructions	Description	Conditions	Remark
ORG	Home starting	Slot, command axis	5.2.1
FLT	Float origin setting	Slot, command axis	5.2.2
DST	Direct starting	Slot, command axis, position, speed, dwell time, M code, control word	5.2.3
IST	Indirect starting	Slot, command axis, step no.	5.2.4
LIN	Linear interpolation starting	Slot, command axis, step no., axis information	5.2.5
SST	Simultaneous starting	Slot, command axis, X step, Y step, Z step, axis information	5.2.6
VTP	Speed/position change	Slot, command axis	5.2.7
PTV	position/speed change	Slot, command axis	5.2.8
STP	Stop	Slot, command axis, DEC. time	5.2.9
SSP	Position synchronization	Slot, command axis, step no., main axis position, main axis setting	5.2.10
SSS	Speed synchronization	Slot, command axis, synchronization rate, delay time	5.2.11
POR	Position override	Slot, command axis, position	5.2.12
SOR	Speed override	Slot, command axis, speed	5.2.13
PSO	Speed override with position	Slot, command axis, position, speed	5.2.14
INCH	Inching starting	Slot, command axis, inching amount	5.2.15
SNS	starting step no. change	Slot, command axis, step no.	5.2.16
MOF	M code cancel	Slot, command axis	5.2.17
PRS	Current position preset	Slot, command axis, position	5.2.18
EMG	EMG stop	Slot, command axis	5.2.19
CLR	Error reset, output inhabit cancel	Slot, command axis, pulse output inhabit/allowed	5.2.20
WRT	Parameter/operation data saving	Slot, command axis, storage area selection	5.2.21
PWM	Pulse width modulation	Slot, instruction axis, output cycle, off duty rate	5.2.22

Remark

• XGB positioning instructions are activated at the rising edge. That is, when the execution contact point is On, it carried out the instruction only once. (PWM insturction is activated at the "On" level).

(2) In case of XEC

Function Block	Description	Conditions	Remark
APM_ORG	Start return to the origin	Req, Base, Slot, Axis	5.3.2
APM_FLT	Set floating origin	Req, Base, Slot, Axis	5.3.3
APM_DST	Direct starting	Req, Base, Slot, Axis, Position, speed, dwell time, M code, position/speed, absolute/incremental, ACC/DEC time	5.3.4
APM_IST	Indirect starting	Req, Base, Slot, Axis, step number	5.3.5
APM_LIN	Linear interpolation starting	Req, Base, Slot, Axis, step number	5.3.6
APM_SST	Simultaneous starting	Req, Base, Slot, Axis, X axis step, Y axis step, Z axis step	5.3.7
APM_VTP	Speed/position switching	Req, Base, Slot, Axis	5.3.8
APM_PTV	Position/speed switching	Req, Base, Slot, Axis	5.3.9
APM_STP	Stop	Req, Base, Slot, Axis, ACC/DEC time	5.3.10
APM_SSP	Position synchronization	Req, Base, Slot, Axis, Step number, main axis, Main axis position	5.3.11
APM_SSSB	Speed synchronization	Req, Base, Slot, Axis, main axis, rate of sub-axis, delay time	5.3.12
APM_POR	Position override	Req, Base, Slot, Axis, position	5.3.13
APM_SOR	Speed override	Req, Base, Slot, Axis, speed	5.3.14
APM_PSO	Positioning speed override	Req, Base, Slot, Axis, position, speed	5.3.15
APM_INC	Inching starting	Req, Base, Slot, Axis, inching amount	5.3.16
APM_SNS	Change starting step number	Req, Base, Slot, Axis, step number	5.3.17
APM_MOF	Cancel M code	Req, Base, Slot, Axis	5.3.18
APM_PRS	Preset current position	Req, Base, Slot, Axis, position	5.3.19
APM_EMG	Emergency stop	Req, Base, Slot	5.3.20
APM_RST	Reset error, cancel output inhibition	Req, Base, Slot, Axis, Enable/Disable pulse output	5.3.21
APM_WRT	Save parameter/operation data	Req, Base, Slot, Axis, Select area to save	5.3.22
APM_PWM	Pulse width modulation	Reg, Slot, Axis, output cycle, off duty rate	5.3.23

Appendix 2.2 Positioning Dedicated K area List

Appendix 2.2.1 K area of positioning basic parameter

Item	Setting range	Initial value	Type	K area for positioning		Data size
				X axis	Y axis	
Positioning	0 : Not use, 1 : use	0	XBM/XBC	K4870	K5270	bit
			XEC	%KX7792	%KX8432	
Pulse output level	0 : Low Active, 1 : High Active	0	XBM/XBC	K4871	K5271	bit
			XEC	%KX7793	%KX8433	
Pulse output mode	0 : CW/CCW, 1 : PLS/DIR	0	XBM/XBC	K4873	K5273	Bit
			XEC	%KX7795	%KX8435	
M Code Output Mode	0 : NONE, 1 : WITH 2 : AFTER	0	XBM/XBC	K4681 K4682	K5081 K5082	2bit
			XEC	%KX7489 %KX7490	%KX8129 %KX8130	
Bias speed	1 ～ 100,000[pulse/s]	1	XBM/XBC	K450	K490	Double word
			XEC	%KD225	%KD245	
Speed limit	1 ～ 100,000[pulse/s]	100,000	XBM/XBC	K452	K492	Double word
			XEC	%KD226	%KD246	
ACC No.1	0 ~ 10,000[unit: ms]	500	XBM/XBC	K454	K494	Word
			XEC	%KW454	%KW494	
DEC No.1	0 ~ 10,000[unit: ms]	500	XBM/XBC	K455	K495	Word
			XEC	%KW455	%KW495	
ACC No.2	0 ~ 10,000[unit: ms]	1,000	XBM/XBC	K456	K496	Word
			XEC	%KW456	%KW496	
DEC No.2	0 ~ 10,000[unit: ms]	1,000	XBM/XBC	K457	K497	Word
			XEC	%KW457	%KW497	
ACC No.3	0 ~ 10,000[unit: ms]	1,500	XBM/XBC	K458	K498	Word
			XEC	%KW458	%KW498	
DEC No.3	0 ~ 10,000[unit: ms]	1,500	XBM/XBC	K459	K499	Word
			XEC	%KW459	%KW499	
ACC No.4	0 ~ 10,000[unit: ms]	2,000	XBM/XBC	K460	K500	Word
			XEC	%KW460	%KW500	
DEC No.5	0 ~ 10,000[unit: ms]	2,000	XBM/XBC	K461	K501	Word
			XEC	%KW461	%KW501	
S/W Upper Limit	-2,147,483,648 ～ 2,147,483,647 [pulse]	2,147,483,647	XBM/XBC	K462	K502	Double word
			XEC	%KD231	%KD251	
S/W Lower Limit	-2,147,483,648 ～ 2,147,483,647 [pulse]	- 2,147,483,648	XBM/XBC	K464	K504	Double word
			XEC	%KD232	%KD252	
Backlash Compensation	0 ～ 65,535[pulse]	0	XBM/XBC	K466	K506	Word
			XEC	%KW466	%KW506	
S/W Limit Detect	0 : No Detect, 1 : Detect	0	XBM/XBC	K4684	K5084	Bit
			XEC	%KX7492	%KX8132	
Upper/Lower limit	0 : No Detect, 1 : Detect	1	XBM/XBC	K4872	K5272	Bit
			XEC	%KX7794	%KX8434	

Appendix 2.2.2 K area of positioning home parameter

Item	Setting range	Initial value	Type	Dedicated K area		Data size
				X axis	Y axis	
Home Method	0 ~2	0	XBM/XBC	K4780 K4781	K5180 K5181	Bit
			XEC	%KX7648 %KX7649	%KX8288 %KX8289	
Home Direction	0 : CW, 1 : CCW	1	XBM/XBC	K4782	K5182	Bit
			XEC	%KX7650	%KX8290	
Home Address	-2,147,483,648～2,147,483,647[pulse]	0	XBM/XBC	K469	K509	Double word
			XEC	%KD234	%KD254	
Home High Speed	1 ～ 100,000[pulse/s]	5,000	XBM/XBC	K471	K511	Double word
			XEC	%KD235	%KD255	
Home Low Speed	1 ～ 100,000[pulse/s]	500	XBM/XBC	K473	K513	Double word
			XEC	%KD236	%KD256	
Homing ACC Time	0 ~ 10,000[unit: ms]	1,000	XBM/XBC	K475	K515	Word
			XEC	%KW475	%KW515	
Homing DEC Time	0 ~ 10,000[unit: ms]	1,000	XBM/XBC	K476	K516	Word
			XEC	%KW476	%KW516	
DWELL Time	0 ~ 50,000[unit: ms]	0	XBM/XBC	K477	K517	Word
			XEC	%KW477	%KW517	
JOG High Speed	1 ～ 100,000[pulse/s]	5,000	XBM/XBC	K479	K519	Double word
			XEC	%KD239	%KD259	
JOG Low Speed	1 ～ 100,000[pulse/s]	1,000	XBM/XBC	K481	K521	Double word
			XEC	%KD240	%KD260	
JOG ACC Time	0 ~ 10,000[unit: ms]	1,000	XBM/XBC	K483	K523	Word
			XEC	%KW483	%KW523	
JOG DEC Time	0 ~ 10,000[unit: ms]	1,000	XBM/XBC	K484	K524	Word
			XEC	%KW484	%KW524	
Inching Speed	1 ～ 65,535[pulse/s]	100	XBM/XBC	K485	K525	Word
			XEC	%KW485	%KW525	

Appendix 2.2.3 Positioning operation data K area

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
1	Coord.	0 : ABS, 1 : INC	ABS	K5484 %KX8772	K8484 %KX13572	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K5482~83 %KX8770~71	K8482~83 %KX13570~71	Bit
	Control	0 : POS, 1 : SPD	POS	K5481 %KX8769	K8481 %KX13569	Bit
	Method	0 : SIN, 1 : REP	SIN	K5480 %KX8768	K8480 %KX13568	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K549 %KW549	K849 %KW849	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K540 %KD270	K840 %KD420	Double word
	M Code	0 ~ 65,535	0	K547 %KW547	K847 %KW847	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K5486~87 %KX8774~75	K8486~87 %KX13574~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K544 %KD272	K844 %KD422	Double word
	Dwell	0 ~ 50,000[unit:ms]	0	K546 %KW546	K846 %KW846	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
2	Coord.	0 : ABS, 1 : INC	ABS	K5484 %KX8772	K8484 %KX13572	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K5482~83 %KX8770~71	K8482~83 %KX13570~71	Bit
	Control	0 : POS, 1 : SPD	POS	K5481 %KX8769	K8481 %KX13569	Bit
	Method	0 : SIN, 1 : REP	SIN	K5480 %KX8768	K8480 %KX13568	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K549 %KW549	K849 %KW849	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K540 %KD270	K840 %KD420	Double word
	M Code	0 ~ 65,535	0	K547 %KW547	K847 %KW847	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K5486~87 %KX8774~75	K8486~87 %KX13574~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K544 %KD272	K844 %KD422	Double word
	Dwell	0 ~ 50,000[unit:ms]	0	K546 %KW546	K846 %KW846	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
3	Coord.	0 : ABS, 1 : INC	ABS	K5584 / %KX8932	K8584 / %KX13732	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K5582~83 / %KX8930~31	K8582~83 / %KX13730~31	Bit
	Control	0 : POS, 1 : SPD	POS	K5581 / %KX8929	K8581 / %KX13729	Bit
	Method	0 : SIN, 1 : REP	SIN	K5580 / %KX8928	K8580 / %KX13728	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K559 / %KW559	K859 / %KW859	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K550 / %KD275	K850 / %KD425	Double word
	M Code	0 ~ 65,535	0	K557 / %KW557	K857 / %KW857	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K5586~87 / %KX8934~35	K8586~87 / %KX13734~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K554 / %KD277	K854 / %KD427	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K556 / %KW556	K856 / %KW856	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
4	Coord.	0 : ABS, 1 : INC	ABS	K5684 / %KX9092	K8684 / %KX13892	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K5682~83 / %KX9090~91	K8682~83 / %KX13890~91	Bit
	Control	0 : POS, 1 : SPD	POS	K5681 / %KX9089	K8681 / %KX13889	Bit
	Method	0 : SIN, 1 : REP	SIN	K5680 / %KX9088	K8680 / %KX13888	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K569 / %KW569	K869 / %KW869	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K560 / %KD280	K860 / %KD430	Double word
	M Code	0 ~ 65,535	0	K567 / %KW567	K867 / %KW867	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K5686~87 / %KX9094~95	K8686~87 / %KX13894~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K564 / %KD282	K864 / %KD432	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K566 / %KW566	K866 / %KW866	Word

Step	Item	Setting range	Initial value	Dedicated K area X axis	Dedicated K area Y axis	Data size
5	Coord.	0 : ABS, 1 : INC	ABS	K5784 %KX9252	K8784 %KX14052	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K5782~83 %KX9250~51	K8782~83 %KX14050~51	Bit
	Control	0 : POS, 1 : SPD	POS	K5781 %KX9249	K8781 %KX14049	Bit
	Method	0 : SIN, 1 : REP	SIN	K5780 %KX9248	K8780 %KX14048	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K579 %KW579	K879 %KW879	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K570 %KD285	K870 %KD435	Double word
	M Code	0 ~ 65,535	0	K577 %KW577	K877 %KW877	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K5786~87 %KX9254~55	K8786~87 %KX14054~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K574 %KD287	K874 %KD437	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K576 %KW576	K876 %KW876	Word

Step	Item	Setting range	Initial value	Dedicated K area X axis	Dedicated K area Y axis	Data size
6	Coord.	0 : ABS, 1 : INC	ABS	K5884 %KX9412	K8884 %KX14212	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K5882~83 %KX9410~11	K8882~83 %KX14210~11	Bit
	Control	0 : POS, 1 : SPD	POS	K5881 %KX9409	K8881 %KX14209	Bit
	Method	0 : SIN, 1 : REP	SIN	K5880 %KX9408	K8880 %KX14208	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K589 %KW589	K889 %KW889	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K580 %KD290	K880 %KD440	Double word
	M Code	0 ~ 65,535	0	K587 %KW587	K887 %KW887	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K5886~87 %KX9414~15	K8886~87 %KX14214~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K584 %KD292	K884 %KD442	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K586 %KW586	K886 %KW886	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
7	Coord.	0 : ABS, 1 : INC	ABS	K5984 %KX9572	K8984 %KX14372	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K5982~83 %KX9570~71	K8982~83 %KX14370~71	Bit
	Control	0 : POS, 1 : SPD	POS	K5981 %KX9569	K8981 %KX14369	Bit
	Method	0 : SIN, 1 : REP	SIN	K5980 %KX9568	K8980 %KX14368	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K599 %KW599	K899 %KW899	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K590 %KD295	K890 %KD445	Double word
	M Code	0 ~ 65,535	0	K597 %KW597	K897 %KW897	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K5986~87 %KX9574~75	K8986~87 %KX14374~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K594 %KD297	K894 %KD447	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K596 %KW596	K896 %KW896	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
8	Coord.	0 : ABS, 1 : INC	ABS	K6084 %KX9732	K9084 %KX14532	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6082~83 %KX9730~31	K9082~83 %KX14530~31	Bit
	Control	0 : POS, 1 : SPD	POS	K6081 %KX9729	K9081 %KX14529	Bit
	Method	0 : SIN, 1 : REP	SIN	K6080 %KX9728	K9080 %KX14528	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K609 %KW609	K909 %KW909	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K600 %KD300	K900 %KD450	Double word
	M Code	0 ~ 65,535	0	K607 %KW607	K907 %KW907	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6086~87 %KX9734~35	K9086~87 %KX14534~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K604 %KD302	K904 %KD452	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K606 %KW606	K906 %KW906	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
9	Coord.	0 : ABS, 1 : INC	ABS	K6184 %KX9892	K9184 %KX14692	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6182~83 %KX9890~91	K9182~83 %KX14690~91	Bit
	Control	0 : POS, 1 : SPD	POS	K6181 %KX9889	K9181 %KX14689	Bit
	Method	0 : SIN, 1 : REP	SIN	K6180 %KX9888	K9180 %KX14688	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K619 %KW619	K919 %KW919	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K610 %KD305	K910 %KD455	Double word
	M Code	0 ~ 65,535	0	K617 %KW617	K917 %KW917	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6186~87 %KX9894~95	K9186~87 %KX14694~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K614 %KD307	K914 %KD457	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K616 %KW616	K916 %KW916	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
10	Coord.	0 : ABS, 1 : INC	ABS	K6284 %KX10052	K9284 %KX14852	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6282~83 %KX10050~51	K9282~83 %KX14850~51	Bit
	Control	0 : POS, 1 : SPD	POS	K6281 %KX10049	K9281 %KX14849	Bit
	Method	0 : SIN, 1 : REP	SIN	K6280 %KX10048	K9280 %KX14848	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K629 %KW629	K929 %KW929	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K620 %KD310	K920 %KD460	Double word
	M Code	0 ~ 65,535	0	K627 %KW627	K927 %KW927	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6286~87 %KX10054~55	K9286~87 %KX14854~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K624 %KD312	K924 %KD462	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K626 %KW626	K926 %KW926	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
11	Coord.	0 : ABS, 1 : INC	ABS	K6384 %KX10212	K9384 %KX15012	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6382~83 %KX10210~11	K9382~83 %KX15010~11	Bit
	Control	0 : POS, 1 : SPD	POS	K6381 %KX10209	K9381 %KX15009	Bit
	Method	0 : SIN, 1 : REP	SIN	K6380 %KX10208	K9380 %KX15008	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K639 %KW639	K939 %KW939	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K630 %KD315	K930 %KD465	Double word
	M Code	0 ~ 65,535	0	K637 %KW637	K937 %KW937	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6386~87 %KX10214~15	K9386~87 %KX15014~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K634 %KD317	K934 %KD467	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K636 %KW636	K936 %KW936	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
12	Coord.	0 : ABS, 1 : INC	ABS	K6484 %KX10372	K9484 %KX15172	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6482~83 %KX10370~71	K9482~83 %KX15170~71	Bit
	Control	0 : POS, 1 : SPD	POS	K6481 %KX10369	K9481 %KX15169	Bit
	Method	0 : SIN, 1 : REP	SIN	K6480 %KX10368	K9480 %KX15168	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K649 %KW649	K949 %KW949	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K640 %KD320	K940 %KD470	Double word
	M Code	0 ~ 65,535	0	K647 %KW647	K947 %KW947	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6486~87 %KX10374~75	K9486~87 %KX15174~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K644 %KD322	K944 %KD472	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K646 %KW646	K946 %KW946	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
13	Coord.	0 : ABS, 1 : INC	ABS	K6584	K9584	Bit
				%KX10532	%KX15332	
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6582~83	K9582~83	Bit
				%KX10530~31	%KX15330~31	
	Control	0 : POS, 1 : SPD	POS	K6581	K9581	Bit
				%KX10529	%KX15329	
	Method	0 : SIN, 1 : REP	SIN	K6580	K9580	Bit
				%KX10528	%KX15328	
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K659	K959	Word
				%KW659	%KW959	
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K650	K950	Double word
				%KD325	%KD475	
	M Code	0 ~ 65,535	0	K657	K957	Word
				%KW657	%KW957	
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6586~87	K9586~87	Bit
				%KX10534~35	%KX15334~35	
	Speed	1 ～ 100,000[pulse/s]	0	K654	K954	Double word
				%KD327	%KD477	
	Dwell	0 ~ 50,000[unit:㎳]	0	K656	K956	Word
				%KW656	%KW956	

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
14	Coord.	0 : ABS, 1 : INC	ABS	K6684	K9684	Bit
				%KX10692	%KX15492	
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6682~83	K9682~83	Bit
				%KX10690~91	%KX15490~91	
	Control	0 : POS, 1 : SPD	POS	K6681	K9681	Bit
				%KX10689	%KX15489	
	Method	0 : SIN, 1 : REP	SIN	K6680	K9680	Bit
				%KX10688	%KX15488	
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K669	K969	Word
				%KW669	%KW969	
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K660	K960	Double word
				%KD330	%KD480	
	M Code	0 ~ 65,535	0	K667	K967	Word
				%KW667	%KW967	
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6686~87	K9686~87	Bit
				%KX10694~95	%KX15494~95	
	Speed	1 ～ 100,000[pulse/s]	0	K664	K964	Double word
				%KD332	%KD482	
	Dwell	0 ~ 50,000[unit:㎳]	0	K666	K966	Word
				%KW666	%KW966	

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
15	Coord.	0 : ABS, 1 : INC	ABS	K6784 %KX10852	K9784 %KX15652	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6782~83 %KX10850~51	K9782~83 %KX15650~51	Bit
	Control	0 : POS, 1 : SPD	POS	K6781 %KX10849	K9781 %KX15649	Bit
	Method	0 : SIN, 1 : REP	SIN	K6780 %KX10848	K9780 %KX15648	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K679 %KW679	K979 %KW979	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K670 %KD335	K970 %KD485	Double word
	M Code	0 ~ 65,535	0	K677 %KW677	K977 %KW977	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6786~87 %KX10854~55	K9786~87 %KX15654~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K674 %KD337	K974 %KD487	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K676 %KW676	K976 %KW976	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
16	Coord.	0 : ABS, 1 : INC	ABS	K6884 %KX11012	K9884 %KX15812	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6882~83 %KX11010~11	K9882~83 %KX15810~11	Bit
	Control	0 : POS, 1 : SPD	POS	K6881 %KX11009	K9881 %KX15809	Bit
	Method	0 : SIN, 1 : REP	SIN	K6880 %KX11008	K9880 %KX15808	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K689 %KW689	K989 %KW989	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K680 %KD340	K980 %KD490	Double word
	M Code	0 ~ 65,535	0	K687 %KW687	K987 %KW987	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6886~87 %KX11014~15	K9886~87 %KX15814~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K684 %KD342	K984 %KD492	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K686 %KW686	K986 %KW986	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
17	Coord.	0 : ABS, 1 : INC	ABS	K6984 %KX11172	K9984 %KX15972	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K6982~83 %KX11170~71	K9982~83 %KX15970~71	Bit
	Control	0 : POS, 1 : SPD	POS	K6981 %KX11169	K9981 %KX15969	Bit
	Method	0 : SIN, 1 : REP	SIN	K6980 %KX11168	K9980 %KX15968	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K699 %KW699	K999 %KW999	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K690 %KD345	K990 %KD495	Double word
	M Code	0 ~ 65,535	0	K697 %KW697	K997 %KW997	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K6986~87 %KX11174~75	K9986~87 %KX15974~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K694 %KD347	K994 %KD497	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K696 %KW696	K996 %KW996	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
18	Coord.	0 : ABS, 1 : INC	ABS	K7084 %KX11332	K10084 %KX16132	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7082~83 %KX11330~31	K10082~83 %KX16130~31	Bit
	Control	0 : POS, 1 : SPD	POS	K7081 %KX11329	K10081 %KX16129	Bit
	Method	0 : SIN, 1 : REP	SIN	K7080 %KX11328	K10080 %KX16128	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K709 %KW709	K1009 %KW1009	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K700 %KD350	K1000 %KD500	Double word
	M Code	0 ~ 65,535	0	K707 %KW707	K1007 %KW1007	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7086~87 %KX11334~35	K10086~87 %KX16134~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K704 %KD352	K1004 %KD502	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K706 %KW706	K1006 %KW1006	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
19	Coord.	0 : ABS, 1 : INC	ABS	K7184 %KX11492	K10184 %KX16292	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7182~83 %KX11490~91	K10182~83 %KX16290~91	Bit
	Control	0 : POS, 1 : SPD	POS	K7181 %KX11489	K10181 %KX16289	Bit
	Method	0 : SIN, 1 : REP	SIN	K7180 %KX11488	K10180 %KX16288	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K719 %KW719	K1019 %KW1019	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K710 %KD355	K1010 %KD505	Double word
	M Code	0 ~ 65,535	0	K717 %KW717	K1017 %KW1017	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7186~87 %KX11494~95	K10186~87 %KX16294~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K714 %KD357	K1014 %KD507	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K716 %KW716	K1016 %KW1016	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
20	Coord.	0 : ABS, 1 : INC	ABS	K7284 %KX11652	K10284 %KX16452	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7282~83 %KX11650~51	K10282~83 %KX16450~51	Bit
	Control	0 : POS, 1 : SPD	POS	K7281 %KX11649	K10281 %KX16449	Bit
	Method	0 : SIN, 1 : REP	SIN	K7280 %KX11648	K10280 %KX16448	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K729 %KW729	K1029 %KW1029	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K720 %KD360	K1020 %KD510	Double word
	M Code	0 ~ 65,535	0	K727 %KW727	K1027 %KW1027	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7286~87 %KX11654~55	K10286~87 %KX16454~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K724 %KD362	K1024 %KD512	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K726 %KW726	K1026 %KW1026	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
21	Coord.	0 : ABS, 1 : INC	ABS	K7384 %KX11812	K10384 %KX16612	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7382~83 %KX11810~11	K10382~83 %KX16610~11	Bit
	Control	0 : POS, 1 : SPD	POS	K7381 %KX11809	K10381 %KX16609	Bit
	Method	0 : SIN, 1 : REP	SIN	K7380 %KX11808	K10380 %KX16608	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K739 %KW739	K1039 %KW1039	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K730 %KD365	K1030 %KD515	Double word
	M Code	0 ~ 65,535	0	K737 %KW737	K1037 %KW1037	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7386~87 %KX11814~15	K10386~87 %KX16614~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K734 %KD367	K1034 %KD517	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K736 %KW736	K1036 %KW1036	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
22	Coord.	0 : ABS, 1 : INC	ABS	K7484 %KX11972	K10484 %KX16772	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7482~83 %KX11970~71	K10482~83 %KX16770~71	Bit
	Control	0 : POS, 1 : SPD	POS	K7481 %KX11969	K10481 %KX16769	Bit
	Method	0 : SIN, 1 : REP	SIN	K7480 %KX11968	K10480 %KX16768	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K749 %KW749	K1049 %KW1049	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K740 %KD370	K1040 %KD520	Double word
	M Code	0 ~ 65,535	0	K747 %KW747	K1047 %KW1047	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7486~87 %KX11974~75	K10486~87 %KX16774~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K744 %KD372	K1044 %KD522	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K746 %KW746	K1046 %KW1046	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
23	Coord.	0 : ABS, 1 : INC	ABS	K7584	K10584	Bit
				%KX12132	%KX16932	
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7582~83	K10582~83	Bit
				%KX12130~31	%KX16930~31	
	Control	0 : POS, 1 : SPD	POS	K7581	K10581	Bit
				%KX12129	%KX16929	
	Method	0 : SIN, 1 : REP	SIN	K7580	K10580	Bit
				%KX12128	%KX16928	
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K759	K1059	Word
				%KW759	%KW1059	
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K750	K1050	Double word
				%KD375	%KD525	
	M Code	0 ~ 65,535	0	K757	K1057	Word
				%KW757	%KW1057	
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7586~87	K10586~87	Bit
				%KX12134~35	%KX16934~35	
	Speed	1 ～ 100,000[pulse/s]	0	K754	K1054	Double word
				%KD377	%KD527	
	Dwell	0 ~ 50,000[unit:㎳]	0	K756	K1056	Word
				%KW756	%KW1056	

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
24	Coord.	0 : ABS, 1 : INC	ABS	K7684	K10684	Bit
				%KX12292	%KX17092	
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7682~83	K10682~83	Bit
				%KX12290~91	%KX17090~91	
	Control	0 : POS, 1 : SPD	POS	K7681	K10681	Bit
				%KX12289	%KX17089	
	Method	0 : SIN, 1 : REP	SIN	K7680	K10680	Bit
				%KX12288	%KX17088	
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K769	K1069	Word
				%KW769	%KW1069	
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K760	K1060	Double word
				%KD380	%KD530	
	M Code	0 ~ 65,535	0	K767	K1067	Word
				%KW767	%KW1067	
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7686~87	K10686~87	Bit
				%KX12294~95	%KX17094~95	
	Speed	1 ～ 100,000[pulse/s]	0	K764	K1064	Double word
				%KD382	%KD532	
	Dwell	0 ~ 50,000[unit:㎳]	0	K766	K1066	Word
				%KW766	%KW1066	

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
25	Coord.	0 : ABS, 1 : INC	ABS	K7784 %KX12452	K10784 %KX17252	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7782~83 %KX12450~51	K10782~83 %KX17250~51	Bit
	Control	0 : POS, 1 : SPD	POS	K7781 %KX12449	K10781 %KX17249	Bit
	Method	0 : SIN, 1 : REP	SIN	K7780 %KX12448	K10780 %KX17248	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K779 %KW779	K1079 %KW1079	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K770 %KD385	K1070 %KD535	Double word
	M Code	0 ~ 65,535	0	K777 %KW777	K1077 %KW1077	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7786~87 %KX12454~55	K10786~87 %KX17254~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K774 %KD387	K1074 %KD537	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K776 %KW776	K1076 %KW1076	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
26	Coord.	0 : ABS, 1 : INC	ABS	K7884 %KX12612	K10884 %KX17412	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7882~83 %KX12610~11	K10882~83 %KX17410~11	Bit
	Control	0 : POS, 1 : SPD	POS	K7881 %KX12609	K10881 %KX17409	Bit
	Method	0 : SIN, 1 : REP	SIN	K7880 %KX12608	K10880 %KX17408	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K789 %KW789	K1089 %KW1089	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K780 %KD390	K1080 %KD540	Double word
	M Code	0 ~ 65,535	0	K787 %KW787	K1087 %KW1087	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7886~87 %KX12614~15	K10886~87 %KX17414~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K784 %KD392	K1084 %KD542	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K786 %KW786	K1086 %KW1086	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
27	Coord.	0 : ABS, 1 : INC	ABS	K7984 %KX12772	K10984 %KX17572	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K7982~83 %KX12770~71	K10982~83 %KX17570~71	Bit
	Control	0 : POS, 1 : SPD	POS	K7981 %KX12769	K10981 %KX17569	Bit
	Method	0 : SIN, 1 : REP	SIN	K7980 %KX12768	K10980 %KX17568	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K799 %KW799	K1099 %KW1099	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K790 %KD395	K1090 %KD545	Double word
	M Code	0 ~ 65,535	0	K797 %KW797	K1097 %KW1097	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K7986~87 %KX12774~75	K10986~87 %KX17574~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K794 %KD397	K1094 %KD547	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K796 %KW796	K1096 %KW1096	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
28	Coord.	0 : ABS, 1 : INC	ABS	K8084 %KX12932	K11084 %KX17732	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K8082~83 %KX12930~31	K11082~83 %KX17730~31	Bit
	Control	0 : POS, 1 : SPD	POS	K8081 %KX12929	K11081 %KX17729	Bit
	Method	0 : SIN, 1 : REP	SIN	K8080 %KX12928	K11080 %KX17728	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K809 %KW809	K1109 %KW1109	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K800 %KD400	K1100 %KD550	Double word
	M Code	0 ~ 65,535	0	K807 %KW807	K1107 %KW1107	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K8086~87 %KX12934~35	K11086~87 %KX17734~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K804 %KD402	K1104 %KD552	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K806 %KW806	K1106 %KW1106	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
29	Coord.	0 : ABS, 1 : INC	ABS	K8184 %KX13092	K11184 %KX17892	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K8182~83 %KX13090~91	K11182~83 %KX17890~91	Bit
	Control	0 : POS, 1 : SPD	POS	K8181 %KX13089	K11181 %KX17889	Bit
	Method	0 : SIN, 1 : REP	SIN	K8180 %KX13088	K11180 %KX17888	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K819 %KW819	K1119 %KW1119	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K810 %KD405	K1110 %KD555	Double word
	M Code	0 ~ 65,535	0	K817 %KW817	K1117 %KW1117	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K8186~87 %KX13094~95	K11186~87 %KX17894~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K814 %KD407	K1114 %KD557	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K816 %KW816	K1116 %KW1116	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
30	Coord.	0 : ABS, 1 : INC	ABS	K8284 %KX13252	K11284 %KX18052	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K8282~83 %KX13250~51	K11282~83 %KX18050~51	Bit
	Control	0 : POS, 1 : SPD	POS	K8281 %KX13249	K11281 %KX18049	Bit
	Method	0 : SIN, 1 : REP	SIN	K8280 %KX13248	K11280 %KX18048	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K829 %KW829	K1129 %KW1129	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K820 %KD410	K1120 %KD560	Double word
	M Code	0 ~ 65,535	0	K827 %KW827	K1127 %KW1127	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K8286~87 %KX13254~55	K11286~87 %KX18054~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K824 %KD412	K1124 %KD562	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K826 %KW826	K1126 %KW1126	Word

• Operation step 31~80 is available for only high end type (H type).

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
31	Coord.	0 : ABS, 1 : INC	ABS	K23484 %KX37572	K28484 %KX45572	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K23482~83 %KX37570~71	K28482~83 %KX45570~71	Bit
	Control	0 : POS, 1 : SPD	POS	K23481 %KX37569	K28481 %KX45569	Bit
	Method	0 : SIN, 1 : REP	SIN	K23480 %KX37568	K28480 %KX45568	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2349 %KW2349	K2849 %KW2849	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2340 %KD1170	K2840 %KD1420	Double word
	M Code	0 ~ 65,535	0	K2347 %KW2347	K2847 %KW2847	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K23486~87 %KX37574~75	K28486~87 %KX45574~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2344 %KD1172	K2844 %KD1422	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2346 %KW2346	K2846 %KW2846	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
32	Coord.	0 : ABS, 1 : INC	ABS	K23584 %KX37732	K28584 %KX45732	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K23582~83 %KX37730~31	K28582~83 %KX45730~31	Bit
	Control	0 : POS, 1 : SPD	POS	K23581 %KX37729	K28581 %KX45729	Bit
	Method	0 : SIN, 1 : REP	SIN	K23580 %KX37728	K28580 %KX45728	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2359 %KW2359	K2859 %KW2859	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2350 %KD1175	K2850 %KD1425	Double word
	M Code	0 ~ 65,535	0	K2357 %KW2357	K2857 %KW2857	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K23586~87 %KX37734~35	K28586~87 %KX45734~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2354 %KD1177	K2854 %KD1427	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2356 %KW2356	K2856 %KW2856	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
33	Coord.	0 : ABS, 1 : INC	ABS	K23684 %KX37892	K28684 %KX45892	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K23682~83 %KX37890~91	K28682~83 %KX45890~91	Bit
	Control	0 : POS, 1 : SPD	POS	K23681 %KX37889	K28681 %KX45889	Bit
	Method	0 : SIN, 1 : REP	SIN	K23680 %KX37888	K28680 %KX45888	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2369 %KW2369	K2869 %KW2869	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2360 %KD1180	K2860 %KD1430	Double word
	M Code	0 ~ 65,535	0	K2367 %KW2367	K2867 %KW2867	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K23686~87 %KX37894~95	K28686~87 %KX45894~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2364 %KD1182	K2864 %KD1432	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2366 %KW2366	K2866 %KW2866	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
34	Coord.	0 : ABS, 1 : INC	ABS	K23784 %KX38052	K28784 %KX46052	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K23782~83 %KX38050~51	K28782~83 %KX46050~51	Bit
	Control	0 : POS, 1 : SPD	POS	K23781 %KX38049	K28781 %KX46049	Bit
	Method	0 : SIN, 1 : REP	SIN	K23780 %KX38048	K28780 %KX46048	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2379 %KW2379	K2879 %KW2879	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2370 %KD1185	K2870 %KD1435	Double word
	M Code	0 ~ 65,535	0	K2377 %KW2377	K2877 %KW2877	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K23786~87 %KX38054~55	K28786~87 %KX46054~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2374 %KD1187	K2874 %KD1437	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2376 %KW2376	K2876 %KW2876	Word

Step	Item	Setting range	Initial value	Dedicated K area X axis	Dedicated K area Y axis	Data size
35	Coord.	0 : ABS, 1 : INC	ABS	K23884 %KX38212	K28884 %KX46212	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K23882~83 %KX38210~11	K28882~83 %KX46210~11	Bit
	Control	0 : POS, 1 : SPD	POS	K23881 %KX38209	K28881 %KX46209	Bit
	Method	0 : SIN, 1 : REP	SIN	K23880 %KX38208	K28880 %KX46208	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2389 %KW2389	K2889 %KW2889	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2380 %KD1190	K2880 %KD1440	Double word
	M Code	0 ~ 65,535	0	K2387 %KW2387	K2887 %KW2887	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K23886~87 %KX38214~15	K28886~87 %KX46214~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2384 %KD1192	K2884 %KD1442	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2386 %KW2386	K2886 %KW2886	Word

Step	Item	Setting range	Initial value	Dedicated K area X axis	Dedicated K area Y axis	Data size
36	Coord.	0 : ABS, 1 : INC	ABS	K23984 %KX38372	K28984 %KX46372	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K23982~83 %KX38370~71	K28982~83 %KX46370~71	Bit
	Control	0 : POS, 1 : SPD	POS	K23981 %KX38369	K28981 %KX46369	Bit
	Method	0 : SIN, 1 : REP	SIN	K23980 %KX38368	K28980 %KX46368	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2399 %KW2399	K2899 %KW2899	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2390 %KD1195	K2890 %KD1445	Double word
	M Code	0 ~ 65,535	0	K2397 %KW2397	K2897 %KW2897	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K23986~87 %KX38374~75	K28986~87 %KX46374~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2394 %KD1197	K2894 %KD1447	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2396 %KW2396	K2896 %KW2896	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
37	Coord.	0 : ABS, 1 : INC	ABS	K24084 %KX38532	K29084 %KX46532	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24082~83 %KX38530~31	K29082~83 %KX46530~31	Bit
	Control	0 : POS, 1 : SPD	POS	K24081 %KX38529	K29081 %KX46529	Bit
	Method	0 : SIN, 1 : REP	SIN	K24080 %KX38528	K29080 %KX46528	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2409 %KW2409	K2909 %KW2909	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2400 %KD1200	K2900 %KD1450	Double word
	M Code	0 ~ 65,535	0	K2407 %KW2407	K2907 %KW2907	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24086~87 %KX38534~35	K29086~87 %KX46534~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2404 %KD1202	K2904 %KD1452	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2406 %KW2406	K2906 %KW2906	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
38	Coord.	0 : ABS, 1 : INC	ABS	K24184 %KX38692	K29184 %KX46692	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24182~83 %KX38690~91	K29182~83 %KX46690~91	Bit
	Control	0 : POS, 1 : SPD	POS	K24181 %KX38689	K29181 %KX46689	Bit
	Method	0 : SIN, 1 : REP	SIN	K24180 %KX38688	K29180 %KX46688	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2419 %KW2419	K2919 %KW2919	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2410 %KD1205	K2910 %KD1455	Double word
	M Code	0 ~ 65,535	0	K2417 %KW2417	K2917 %KW2917	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24186~87 %KX38694~95	K29186~87 %KX46694~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2414 %KD1207	K2914 %KD1457	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2416 %KW2416	K2916 %KW2916	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
39	Coord.	0 : ABS, 1 : INC	ABS	K24284 %KX38852	K29284 %KX46852	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24282~83 %KX38850~51	K29282~83 %KX46850~51	Bit
	Control	0 : POS, 1 : SPD	POS	K24281 %KX38849	K29281 %KX46849	Bit
	Method	0 : SIN, 1 : REP	SIN	K24280 %KX38848	K29280 %KX46848	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2429 %KW2429	K2929 %KW2929	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2420 %KD1210	K2920 %KD1460	Double word
	M Code	0 ~ 65,535	0	K2427 %KW2427	K2927 %KW2927	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24286~87 %KX38854~55	K29286~87 %KX46854~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2424 %KD1212	K2924 %KD1462	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2426 %KW2426	K2926 %KW2926	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
40	Coord.	0 : ABS, 1 : INC	ABS	K24384 %KX39012	K29384 %KX47012	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24382~83 %KX39010~11	K29382~83 %KX47010~11	Bit
	Control	0 : POS, 1 : SPD	POS	K24381 %KX39009	K29381 %KX47009	Bit
	Method	0 : SIN, 1 : REP	SIN	K24380 %KX39008	K29380 %KX47008	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2439 %KW2439	K2939 %KW2939	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2430 %KD1215	K2930 %KD1465	Double word
	M Code	0 ~ 65,535	0	K2437 %KW2437	K2937 %KW2937	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24386~87 %KX39014~15	K29386~87 %KX47014~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2434 %KD1217	K2934 %KD1467	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2436 %KW2436	K2936 %KW2936	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
41	Coord.	0 : ABS, 1 : INC	ABS	K24484 %KX39172	K29484 %KX47172	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24482~83 %KX39170~71	K29482~83 %KX47170~71	Bit
	Control	0 : POS, 1 : SPD	POS	K24481 %KX39169	K29481 %KX47169	Bit
	Method	0 : SIN, 1 : REP	SIN	K24480 %KX39168	K29480 %KX47168	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2449 %KW2449	K2949 %KW2949	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2440 %KD1220	K2940 %KD1470	Double word
	M Code	0 ~ 65,535	0	K2447 %KW2447	K2947 %KW2947	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24486~87 %KX39174~75	K29486~87 %KX47174~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2444 %KD1222	K2944 %KD1472	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2446 %KW2446	K2946 %KW2946	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
42	Coord.	0 : ABS, 1 : INC	ABS	K24584 %KX39332	K29584 %KX47332	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24582~83 %KX39330~31	K29582~83 %KX47330~31	Bit
	Control	0 : POS, 1 : SPD	POS	K24581 %KX39329	K29581 %KX47329	Bit
	Method	0 : SIN, 1 : REP	SIN	K24580 %KX39328	K29580 %KX47328	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2459 %KW2459	K2959 %KW2959	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2450 %KD1225	K2950 %KD1475	Double word
	M Code	0 ~ 65,535	0	K2457 %KW2457	K2957 %KW2957	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24586~87 %KX39334~35	K29586~87 %KX47334~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2454 %KD1227	K2954 %KD1477	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2456 %KW2456	K2956 %KW2956	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
43	Coord.	0 : ABS, 1 : INC	ABS	K24684 %KX39492	K29684 %KX47492	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24682~83 %KX39490~91	K29682~83 %KX47490~91	Bit
	Control	0 : POS, 1 : SPD	POS	K24681 %KX39489	K29681 %KX47489	Bit
	Method	0 : SIN, 1 : REP	SIN	K24680 %KX39488	K29680 %KX47488	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2469 %KW2469	K2969 %KW2969	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2460 %KD1230	K2960 %KD1480	Double word
	M Code	0 ~ 65,535	0	K2467 %KW2467	K2967 %KW2967	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24686~87 %KX39494~95	K29686~87 %KX47494~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2464 %KD1232	K2964 %KD1482	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2466 %KW2466	K2966 %KW2966	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
44	Coord.	0 : ABS, 1 : INC	ABS	K24784 %KX39652	K29784 %KX47652	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24782~83 %KX39650~51	K29782~83 %KX47650~51	Bit
	Control	0 : POS, 1 : SPD	POS	K24781 %KX39649	K29781 %KX47649	Bit
	Method	0 : SIN, 1 : REP	SIN	K24780 %KX39648	K29780 %KX47648	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2479 %KW2479	K2979 %KW2979	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2470 %KD1235	K2970 %KD1485	Double word
	M Code	0 ~ 65,535	0	K2477 %KW2477	K2977 %KW2977	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24786~87 %KX39654~55	K29786~87 %KX47654~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2474 %KD1237	K2974 %KD1487	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2476 %KW2476	K2976 %KW2976	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
45	Coord.	0 : ABS, 1 : INC	ABS	K24884	K29884	Bit
				%KX39812	%KX47812	
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24882~83	K29882~83	Bit
				%KX39810~11	%KX47810~11	
	Control	0 : POS, 1 : SPD	POS	K24881	K29881	Bit
				%KX39809	%KX47809	
	Method	0 : SIN, 1 : REP	SIN	K24880	K29880	Bit
				%KX39808	%KX47808	
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2489	K2989	Word
				%KW2489	%KW2989	
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2480	K2980	Double word
				%KD1240	%KD1490	
	M Code	0 ~ 65,535	0	K2487	K2987	Word
				%KW2487	%KW2987	
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24886~87	K29886~87	Bit
				%KX39814~15	%KX47814~15	
	Speed	1 ～ 100,000[pulse/s]	0	K2484	K2984	Double word
				%KD1242	%KD1492	
	Dwell	0 ~ 50,000[unit:㎳]	0	K2486	K2986	Word
				%KW2486	%KW2986	

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
46	Coord.	0 : ABS, 1 : INC	ABS	K24984	K29984	Bit
				%KX39972	%KX47972	
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K24982~83	K29982~83	Bit
				%KX39970~71	%KX47970~71	
	Control	0 : POS, 1 : SPD	POS	K24981	K29981	Bit
				%KX39969	%KX47969	
	Method	0 : SIN, 1 : REP	SIN	K24980	K29980	Bit
				%KX39968	%KX47968	
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2499	K2999	Word
				%KW2499	%KW2999	
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2490	K2990	Double word
				%KD1245	%KD1495	
	M Code	0 ~ 65,535	0	K2497	K2997	Word
				%KW2497	%KW2997	
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K24986~87	K29986~87	Bit
				%KX39974~75	%KX47974~75	
	Speed	1 ～ 100,000[pulse/s]	0	K2494	K2994	Double word
				%KD1247	%KD1497	
	Dwell	0 ~ 50,000[unit:㎳]	0	K2496	K2996	Word
				%KW2496	%KW2996	

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
47	Coord.	0 : ABS, 1 : INC	ABS	K25084 %KX40132	K30084 %KX48132	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25082~83 %KX40130~31	K30082~83 %KX48130~31	Bit
	Control	0 : POS, 1 : SPD	POS	K25081 %KX40129	K30081 %KX48129	Bit
	Method	0 : SIN, 1 : REP	SIN	K25080 %KX40128	K30080 %KX48128	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2509 %KW2509	K3009 %KW3009	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2500 %KD1250	K3000 %KD1500	Double word
	M Code	0 ~ 65,535	0	K2507 %KW2507	K3007 %KW3007	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25086~87 %KX40134~35	K30086~87 %KX48134~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2504 %KD1252	K3004 %KD1502	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2506 %KW2506	K3006 %KW3006	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
48	Coord.	0 : ABS, 1 : INC	ABS	K25184 %KX40292	K30184 %KX48292	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25182~83 %KX40290~91	K30182~83 %KX48290~91	Bit
	Control	0 : POS, 1 : SPD	POS	K25181 %KX40289	K30181 %KX48289	Bit
	Method	0 : SIN, 1 : REP	SIN	K25180 %KX40288	K30180 %KX48288	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2519 %KW2519	K3019 %KW3019	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2510 %KD1255	K3010 %KD1505	Double word
	M Code	0 ~ 65,535	0	K2517 %KW2517	K3017 %KW3017	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25186~87 %KX40294~95	K30186~87 %KX48294~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2514 %KD1257	K3014 %KD1507	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2516 %KW2516	K3016 %KW3016	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
49	Coord.	0 : ABS, 1 : INC	ABS	K25284 %KX40452	K30284 %KX48452	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25282~83 %KX40450~51	K30282~83 %KX48450~51	Bit
	Control	0 : POS, 1 : SPD	POS	K25281 %KX40449	K30281 %KX48449	Bit
	Method	0 : SIN, 1 : REP	SIN	K25280 %KX40448	K30280 %KX48448	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2529 %KW2529	K3029 %KW3029	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2520 %KD1260	K3020 %KD1510	Double word
	M Code	0 ~ 65,535	0	K2527 %KW2527	K3027 %KW3027	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25286~87 %KX40454~55	K30286~87 %KX48454~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2524 %KD1262	K3024 %KD1512	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2526 %KW2526	K3026 %KW3026	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
50	Coord.	0 : ABS, 1 : INC	ABS	K25384 %KX40612	K30384 %KX48612	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25382~83 %KX40610~11	K30382~83 %KX48610~11	Bit
	Control	0 : POS, 1 : SPD	POS	K25381 %KX40609	K30381 %KX48609	Bit
	Method	0 : SIN, 1 : REP	SIN	K25380 %KX40608	K30380 %KX48608	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2539 %KW2539	K3039 %KW3039	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2530 %KD1265	K3030 %KD1515	Double word
	M Code	0 ~ 65,535	0	K2537 %KW2537	K3037 %KW3037	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25386~87 %KX40614~15	K30386~87 %KX48614~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2534 %KD1267	K3034 %KD1517	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2536 %KW2536	K3036 %KW3036	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
51	Coord.	0 : ABS, 1 : INC	ABS	K25484 %KX40772	K30484 %KX48772	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25482~83 %KX40770~71	K30482~83 %KX48770~71	Bit
	Control	0 : POS, 1 : SPD	POS	K25481 %KX40769	K30481 %KX48769	Bit
	Method	0 : SIN, 1 : REP	SIN	K25480 %KX40768	K30480 %KX48768	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2549 %KW2549	K3049 %KW3049	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2540 %KD1270	K3040 %KD1520	Double word
	M Code	0 ~ 65,535	0	K2547 %KW2547	K3047 %KW3047	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25486~87 %KX40774~75	K30486~87 %KX48774~75	Bit
	Speed	1 ~ 100,000[pulse/s]	0	K2544 %KD1272	K3044 %KD1522	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2546 %KW2546	K3046 %KW3046	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
52	Coord.	0 : ABS, 1 : INC	ABS	K25584 %KX40932	K30584 %KX48932	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25582~83 %KX40930~31	K30582~83 %KX48930~31	Bit
	Control	0 : POS, 1 : SPD	POS	K25581 %KX40929	K30581 %KX48929	Bit
	Method	0 : SIN, 1 : REP	SIN	K25580 %KX40928	K30580 %KX48928	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2559 %KW2559	K3059 %KW3059	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2550 %KD1275	K3050 %KD1525	Double word
	M Code	0 ~ 65,535	0	K2557 %KW2557	K3057 %KW3057	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25586~87 %KX40934~35	K30586~87 %KX48934~35	Bit
	Speed	1 ~ 100,000[pulse/s]	0	K2554 %KD1277	K3054 %KD1527	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2556 %KW2556	K3056 %KW3056	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
53	Coord.	0 : ABS, 1 : INC	ABS	K25684 %KX41092	K30684 %KX49092	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25682~83 %KX41090~91	K30682~83 %KX49090~91	Bit
	Control	0 : POS, 1 : SPD	POS	K25681 %KX41089	K30681 %KX49089	Bit
	Method	0 : SIN, 1 : REP	SIN	K25680 %KX41088	K30680 %KX49088	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2569 %KW2569	K3069 %KW3069	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2560 %KD1280	K3060 %KD1530	Double word
	M Code	0 ~ 65,535	0	K2567 %KW2567	K3067 %KW3067	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25686~87 %KX41094~95	K30686~87 %KX49094~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2564 %KD1282	K3064 %KD1532	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2566 %KW2566	K3066 %KW3066	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
54	Coord.	0 : ABS, 1 : INC	ABS	K25784 %KX41252	K30784 %KX49252	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25782~83 %KX41250~51	K30782~83 %KX49250~51	Bit
	Control	0 : POS, 1 : SPD	POS	K25781 %KX41249	K30781 %KX49249	Bit
	Method	0 : SIN, 1 : REP	SIN	K25780 %KX41248	K30780 %KX49248	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2579 %KW2579	K3079 %KW3079	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2570 %KD1285	K3070 %KD1535	Double word
	M Code	0 ~ 65,535	0	K2577 %KW2577	K3077 %KW3077	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25786~87 %KX41254~55	K30786~87 %KX49254~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2574 %KD1287	K3074 %KD1537	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2576 %KW2576	K3076 %KW3076	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
55	Coord.	0 : ABS, 1 : INC	ABS	K25884	K30884	Bit
				%KX41412	%KX49412	
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25882~83	K30882~83	Bit
				%KX41410~11	%KX49410~11	
	Control	0 : POS, 1 : SPD	POS	K25881	K30881	Bit
				%KX41409	%KX49409	
	Method	0 : SIN, 1 : REP	SIN	K25880	K30880	Bit
				%KX41408	%KX49408	
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2589	K3089	Word
				%KW2589	%KW3089	
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2580	K3080	Double word
				%KD1290	%KD1540	
	M Code	0 ~ 65,535	0	K2587	K3087	Word
				%KW2587	%KW3087	
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25886~87	K30886~87	Bit
				%KX41414~15	%KX49414~15	
	Speed	1 ～ 100,000[pulse/s]	0	K2584	K3084	Double word
				%KD1292	%KD1542	
	Dwell	0 ~ 50,000[unit:㎳]	0	K2586	K3086	Word
				%KW2586	%KW3086	

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
56	Coord.	0 : ABS, 1 : INC	ABS	K25984	K30984	Bit
				%KX41572	%KX49572	
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K25982~83	K30982~83	Bit
				%KX41570~71	%KX49570~71	
	Control	0 : POS, 1 : SPD	POS	K25981	K30981	Bit
				%KX41569	%KX49569	
	Method	0 : SIN, 1 : REP	SIN	K25980	K30980	Bit
				%KX41568	%KX49568	
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2599	K3099	Word
				%KW2599	%KW3099	
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2590	K3090	Double word
				%KD1295	%KD1545	
	M Code	0 ~ 65,535	0	K2597	K3097	Word
				%KW2597	%KW3097	
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K25986~87	K30986~87	Bit
				%KX41574~75	%KX49574~75	
	Speed	1 ～ 100,000[pulse/s]	0	K2594	K3094	Double word
				%KD1297	%KD1547	
	Dwell	0 ~ 50,000[unit:㎳]	0	K2596	K3096	Word
				%KW2596	%KW3096	

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
57	Coord.	0 : ABS, 1 : INC	ABS	K26084 %KX41732	K31084 %KX49732	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26082~83 %KX41730~31	K31082~83 %KX49730~31	Bit
	Control	0 : POS, 1 : SPD	POS	K26081 %KX41729	K31081 %KX49729	Bit
	Method	0 : SIN, 1 : REP	SIN	K26080 %KX41728	K31080 %KX49728	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2609 %KW2609	K3109 %KW3109	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2600 %KD1300	K3100 %KD1550	Double word
	M Code	0 ~ 65,535	0	K2607 %KW2607	K3107 %KW3107	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26086~87 %KX41734~35	K31086~87 %KX49734~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2604 %KD1302	K3104 %KD1552	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2606 %KW2606	K3106 %KW3106	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
58	Coord.	0 : ABS, 1 : INC	ABS	K26184 %KX41892	K31184 %KX49892	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26182~83 %KX41890~91	K31182~83 %KX49890~91	Bit
	Control	0 : POS, 1 : SPD	POS	K26181 %KX41889	K31181 %KX49889	Bit
	Method	0 : SIN, 1 : REP	SIN	K26180 %KX41888	K31180 %KX49888	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2619 %KW2619	K3119 %KW3119	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2610 %KD1305	K3110 %KD1555	Double word
	M Code	0 ~ 65,535	0	K2617 %KW2617	K3117 %KW3117	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26186~87 %KX41894~95	K31186~87 %KX49894~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2614 %KD1307	K3114 %KD1557	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2616 %KW2616	K3116 %KW3116	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
59	Coord.	0 : ABS, 1 : INC	ABS	K26284 %KX42052	K31284 %KX50052	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26282~83 %KX42050~51	K31282~83 %KX50050~51	Bit
	Control	0 : POS, 1 : SPD	POS	K26281 %KX42049	K31281 %KX50049	Bit
	Method	0 : SIN, 1 : REP	SIN	K26280 %KX42048	K31280 %KX50048	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2629 %KW2629	K3129 %KW3129	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2620 %KD1310	K3120 %KD1560	Double word
	M Code	0 ~ 65,535	0	K2627 %KW2627	K3127 %KW3127	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26286~87 %KX42054~55	K31286~87 %KX50054~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2624 %KD1312	K3124 %KD1562	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2626 %KW2626	K3126 %KW3126	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
60	Coord.	0 : ABS, 1 : INC	ABS	K26384 %KX42212	K31384 %KX50212	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26382~83 %KX42210~11	K31382~83 %KX50210~11	Bit
	Control	0 : POS, 1 : SPD	POS	K26381 %KX42209	K31381 %KX50209	Bit
	Method	0 : SIN, 1 : REP	SIN	K26380 %KX42208	K31380 %KX50208	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2639 %KW2639	K3139 %KW3139	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2630 %KD1315	K3130 %KD1565	Double word
	M Code	0 ~ 65,535	0	K2637 %KW2637	K3137 %KW3137	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26386~87 %KX42214~15	K31386~87 %KX50214~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2634 %KD1317	K3134 %KD1567	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2636 %KW2636	K3136 %KW3136	Word

Step	Item	Setting range	Initial value	Dedicated K area X axis	Dedicated K area Y axis	Data size
61	Coord.	0 : ABS, 1 : INC	ABS	K26484 %KX42372	K31484 %KX50372	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26482~83 %KX42370~71	K31482~83 %KX50370~71	Bit
	Control	0 : POS, 1 : SPD	POS	K26481 %KX42369	K31481 %KX50369	Bit
	Method	0 : SIN, 1 : REP	SIN	K26480 %KX42368	K31480 %KX50368	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2649 %KW2649	K3149 %KW3149	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2640 %KD1320	K3140 %KD1570	Double word
	M Code	0 ~ 65,535	0	K2647 %KW2647	K3147 %KW3147	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26486~87 %KX42374~75	K31486~87 %KX50374~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2644 %KD1322	K3144 %KD1572	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2646 %KW2646	K3146 %KW3146	Word

Step	Item	Setting range	Initial value	Dedicated K area X axis	Dedicated K area Y axis	Data size
62	Coord.	0 : ABS, 1 : INC	ABS	K26584 %KX42532	K31584 %KX50532	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26582~83 %KX42530~31	K31582~83 %KX50530~31	Bit
	Control	0 : POS, 1 : SPD	POS	K26581 %KX42529	K31581 %KX50529	Bit
	Method	0 : SIN, 1 : REP	SIN	K26580 %KX42528	K31580 %KX50528	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2659 %KW2659	K3159 %KW3159	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2650 %KD1325	K3150 %KD1575	Double word
	M Code	0 ~ 65,535	0	K2657 %KW2657	K3157 %KW3157	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26586~87 %KX42534~35	K31586~87 %KX50534~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2654 %KD1327	K3154 %KD1577	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2656 %KW2656	K3156 %KW3156	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
63	Coord.	0 : ABS, 1 : INC	ABS	K26684 %KX42692	K31684 %KX50692	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26682~83 %KX42690~91	K31682~83 %KX50690~91	Bit
	Control	0 : POS, 1 : SPD	POS	K26681 %KX42689	K31681 %KX50689	Bit
	Method	0 : SIN, 1 : REP	SIN	K26680 %KX42688	K31680 %KX50688	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2669 %KW2669	K3169 %KW3169	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2660 %KD1330	K3160 %KD1580	Double word
	M Code	0 ~ 65,535	0	K2667 %KW2667	K3167 %KW3167	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26686~87 %KX42694~95	K31686~87 %KX50694~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2664 %KD1332	K3164 %KD1582	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2666 %KW2666	K3166 %KW3166	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
64	Coord.	0 : ABS, 1 : INC	ABS	K26784 %KX42852	K31784 %KX50852	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26782~83 %KX42850~51	K31782~83 %KX50850~51	Bit
	Control	0 : POS, 1 : SPD	POS	K26781 %KX42849	K31781 %KX50849	Bit
	Method	0 : SIN, 1 : REP	SIN	K26780 %KX42848	K31780 %KX50848	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2679 %KW2679	K3179 %KW3179	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2670 %KD1335	K3170 %KD1585	Double word
	M Code	0 ~ 65,535	0	K2677 %KW2677	K3177 %KW3177	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26786~87 %KX42854~55	K31786~87 %KX50854~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2674 %KD1337	K3174 %KD1587	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2676 %KW2676	K3176 %KW3176	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
65	Coord.	0 : ABS, 1 : INC	ABS	K26884 %KX43012	K31884 %KX51012	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26882~83 %KX43010~11	K31882~83 %KX51010~11	Bit
	Control	0 : POS, 1 : SPD	POS	K26881 %KX43009	K31881 %KX51009	Bit
	Method	0 : SIN, 1 : REP	SIN	K26880 %KX43008	K31880 %KX51008	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2689 %KW2689	K3189 %KW3189	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2680 %KD1340	K3180 %KD1590	Double word
	M Code	0 ~ 65,535	0	K2687 %KW2687	K3187 %KW3187	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26886~87 %KX43014~15	K31886~87 %KX51014~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2684 %KD1342	K3184 %KD1592	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2686 %KW2686	K3186 %KW3186	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
66	Coord.	0 : ABS, 1 : INC	ABS	K26984 %KX43172	K31984 %KX51172	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K26982~83 %KX43170~71	K31982~83 %KX51170~71	Bit
	Control	0 : POS, 1 : SPD	POS	K26981 %KX43169	K31981 %KX51169	Bit
	Method	0 : SIN, 1 : REP	SIN	K26980 %KX43168	K31980 %KX51168	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2699 %KW2699	K3199 %KW3199	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2690 %KD1345	K3190 %KD1595	Double word
	M Code	0 ~ 65,535	0	K2697 %KW2697	K3197 %KW3197	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K26986~87 %KX43174~75	K31986~87 %KX51174~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2694 %KD1347	K3194 %KD1597	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2696 %KW2696	K3196 %KW3196	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
67	Coord.	0 : ABS, 1 : INC	ABS	K27084 %KX43332	K32084 %KX51332	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27082~83 %KX43330~31	K32082~83 %KX51330~31	Bit
	Control	0 : POS, 1 : SPD	POS	K27081 %KX43329	K32081 %KX51329	Bit
	Method	0 : SIN, 1 : REP	SIN	K27080 %KX43328	K32080 %KX51328	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2709 %KW2709	K3209 %KW3209	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2700 %KD1350	K3200 %KD1600	Double word
	M Code	0 ~ 65,535	0	K2707 %KW2707	K3207 %KW3207	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27086~87 %KX43334~35	K32086~87 %KX51334~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2704 %KD1352	K3204 %KD1602	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2706 %KW2706	K3206 %KW3206	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
68	Coord.	0 : ABS, 1 : INC	ABS	K27184 %KX43492	K32184 %KX51492	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27182~83 %KX43490~91	K32182~83 %KX51490~91	Bit
	Control	0 : POS, 1 : SPD	POS	K27181 %KX43489	K32181 %KX51489	Bit
	Method	0 : SIN, 1 : REP	SIN	K27180 %KX43488	K32180 %KX51488	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2719 %KW2719	K3219 %KW3219	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2710 %KD1355	K3210 %KD1605	Double word
	M Code	0 ~ 65,535	0	K2717 %KW2717	K3217 %KW3217	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27186~87 %KX43494~95	K32186~87 %KX51494~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2714 %KD1357	K3214 %KD1607	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2716 %KW2716	K3216 %KW3216	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
69	Coord.	0 : ABS, 1 : INC	ABS	K27284 %KX43652	K32284 %KX51652	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27282~83 %KX43650~51	K32282~83 %KX51650~51	Bit
	Control	0 : POS, 1 : SPD	POS	K27281 %KX43649	K32281 %KX51649	Bit
	Method	0 : SIN, 1 : REP	SIN	K27280 %KX43648	K32280 %KX51648	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2729 %KW2729	K3229 %KW3229	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2720 %KD1360	K3220 %KD1610	Double word
	M Code	0 ~ 65,535	0	K2727 %KW2727	K3227 %KW3227	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27286~87 %KX43654~55	K32286~87 %KX51654~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2724 %KD1362	K3224 %KD1612	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2726 %KW2726	K3226 %KW3226	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
70	Coord.	0 : ABS, 1 : INC	ABS	K27384 %KX43812	K32384 %KX51812	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27382~83 %KX43810~11	K32382~83 %KX51810~11	Bit
	Control	0 : POS, 1 : SPD	POS	K27381 %KX43809	K32381 %KX51809	Bit
	Method	0 : SIN, 1 : REP	SIN	K27380 %KX43808	K32380 %KX51808	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2739 %KW2739	K3239 %KW3239	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2730 %KD1365	K3230 %KD1615	Double word
	M Code	0 ~ 65,535	0	K2737 %KW2737	K3237 %KW3237	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27386~87 %KX43814~15	K32386~87 %KX51814~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2734 %KD1367	K3234 %KD1617	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2736 %KW2736	K3236 %KW3236	Word

Step	Item	Setting range	Initial value	Dedicated K area X axis	Dedicated K area Y axis	Data size
71	Coord.	0 : ABS, 1 : INC	ABS	K27484 %KX43972	K32484 %KX51972	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27482~83 %KX43970~71	K32482~83 %KX51970~71	Bit
	Control	0 : POS, 1 : SPD	POS	K27481 %KX43969	K32481 %KX51969	Bit
	Method	0 : SIN, 1 : REP	SIN	K27480 %KX43968	K32480 %KX51968	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2749 %KW2749	K3249 %KW3249	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2740 %KD1370	K3240 %KD1620	Double word
	M Code	0 ~ 65,535	0	K2747 %KW2747	K3247 %KW3247	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27486~87 %KX43974~75	K32486~87 %KX51974~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2744 %KD1372	K3244 %KD1622	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2746 %KW2746	K3246 %KW3246	Word

Step	Item	Setting range	Initial value	Dedicated K area X axis	Dedicated K area Y axis	Data size
72	Coord.	0 : ABS, 1 : INC	ABS	K27584 %KX44132	K32584 %KX52132	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27582~83 %KX44130~31	K32582~83 %KX52130~31	Bit
	Control	0 : POS, 1 : SPD	POS	K27581 %KX44129	K32581 %KX52129	Bit
	Method	0 : SIN, 1 : REP	SIN	K27580 %KX44128	K32580 %KX52128	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2759 %KW2759	K3259 %KW3259	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2750 %KD1375	K3250 %KD1625	Double word
	M Code	0 ~ 65,535	0	K2757 %KW2757	K3257 %KW3257	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27586~87 %KX44134~35	K32586~87 %KX52134~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2754 %KD1377	K3254 %KD1627	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2756 %KW2756	K3256 %KW3256	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
73	Coord.	0 : ABS, 1 : INC	ABS	K27684 %KX44292	K32684 %KX52292	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27682~83 %KX44290~91	K32682~83 %KX52290~91	Bit
	Control	0 : POS, 1 : SPD	POS	K27681 %KX44289	K32681 %KX52289	Bit
	Method	0 : SIN, 1 : REP	SIN	K27680 %KX44288	K32680 %KX52288	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2769 %KW2769	K3269 %KW3269	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2760 %KD1380	K3260 %KD1630	Double word
	M Code	0 ~ 65,535	0	K2767 %KW2767	K3267 %KW3267	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27686~87 %KX44294~95	K32686~87 %KX52294~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2764 %KD1382	K3264 %KD1632	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2766 %KW2766	K3266 %KW3266	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
74	Coord.	0 : ABS, 1 : INC	ABS	K27784 %KX44452	K32784 %KX52452	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27782~83 %KX44450~51	K32782~83 %KX52450~51	Bit
	Control	0 : POS, 1 : SPD	POS	K27781 %KX44449	K32781 %KX52449	Bit
	Method	0 : SIN, 1 : REP	SIN	K27780 %KX44448	K32780 %KX52448	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2779 %KW2779	K3279 %KW3279	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2770 %KD1385	K3270 %KD1635	Double word
	M Code	0 ~ 65,535	0	K2777 %KW2777	K3277 %KW3277	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27786~87 %KX44454~55	K32786~87 %KX52454~55	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2774 %KD1387	K3274 %KD1637	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2776 %KW2776	K3276 %KW3276	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
75	Coord.	0 : ABS, 1 : INC	ABS	K27884 %KX44612	K32884 %KX52612	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27882~83 %KX44610~11	K32882~83 %KX52610~11	Bit
	Control	0 : POS, 1 : SPD	POS	K27881 %KX44609	K32881 %KX52609	Bit
	Method	0 : SIN, 1 : REP	SIN	K27880 %KX44608	K32880 %KX52608	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2789 %KW2789	K3289 %KW3289	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2780 %KD1390	K3280 %KD1640	Double word
	M Code	0 ~ 65,535	0	K2787 %KW2787	K3287 %KW3287	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27886~87 %KX44614~15	K32886~87 %KX52614~15	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2784 %KD1392	K3284 %KD1642	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2786 %KW2786	K3286 %KW3286	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
76	Coord.	0 : ABS, 1 : INC	ABS	K27984 %KX44772	K32984 %KX52772	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K27982~83 %KX44770~71	K32982~83 %KX52770~71	Bit
	Control	0 : POS, 1 : SPD	POS	K27981 %KX44769	K32981 %KX52769	Bit
	Method	0 : SIN, 1 : REP	SIN	K27980 %KX44768	K32980 %KX52768	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2799 %KW2799	K3299 %KW3299	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2790 %KD1395	K3290 %KD1645	Double word
	M Code	0 ~ 65,535	0	K2797 %KW2797	K3297 %KW3297	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K27986~87 %KX44774~75	K32986~87 %KX52774~75	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2794 %KD1397	K3294 %KD1647	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2796 %KW2796	K3296 %KW3296	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
77	Coord.	0 : ABS, 1 : INC	ABS	K28084 %KX44932	K33084 %KX52932	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K28082~83 %KX44930~31	K33082~83 %KX52930~31	Bit
	Control	0 : POS, 1 : SPD	POS	K28081 %KX44929	K33081 %KX52929	Bit
	Method	0 : SIN, 1 : REP	SIN	K28080 %KX44928	K33080 %KX52928	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2809 %KW2809	K3309 %KW3309	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2800 %KD1400	K3300 %KD1650	Double word
	M Code	0 ~ 65,535	0	K2807 %KW2807	K3307 %KW3307	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K28086~87 %KX44934~35	K33086~87 %KX52934~35	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2804 %KD1402	K3304 %KD1652	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2806 %KW2806	K3306 %KW3306	Word

Step	Item	Setting range	Initial value	Dedicated K area		Data size
				X axis	Y axis	
78	Coord.	0 : ABS, 1 : INC	ABS	K28184 %KX45092	K33184 %KX53092	Bit
	Pattern	0 : END, 1 : KEEP, 2 : CONT	END	K28182~83 %KX45090~91	K33182~83 %KX53090~91	Bit
	Control	0 : POS, 1 : SPD	POS	K28181 %KX45089	K33181 %KX53089	Bit
	Method	0 : SIN, 1 : REP	SIN	K28180 %KX45088	K33180 %KX53088	Bit
	REP Step	0 ~ 30 (0 ~ 80 for high - end)	0	K2819 %KW2819	K3319 %KW3319	Word
	Address [pulse]	-2,147,483,648～2,147,483,647 [pulse]	0	K2810 %KD1405	K3310 %KD1655	Double word
	M Code	0 ~ 65,535	0	K2817 %KW2817	K3317 %KW3317	Word
	A/D No.	0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4	0	K28186~87 %KX45094~95	K33186~87 %KX53094~95	Bit
	Speed	1 ～ 100,000[pulse/s]	0	K2814 %KD1407	K3314 %KD1657	Double word
	Dwell	0 ~ 50,000[unit:㎳]	0	K2816 %KW2816	K3316 %KW3316	Word

<table>
<tr><th rowspan="2">Step</th><th rowspan="2">Item</th><th rowspan="2">Setting range</th><th rowspan="2">Initial value</th><th colspan="2">Dedicated K area</th><th rowspan="2">Data size</th></tr>
<tr><th>X axis</th><th>Y axis</th></tr>
<tr><td rowspan="20">79</td><td rowspan="2">Coord.</td><td rowspan="2">0 : ABS, 1 : INC</td><td rowspan="2">ABS</td><td>K28284</td><td>K33284</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45252</td><td>%KX53252</td></tr>
<tr><td rowspan="2">Pattern</td><td rowspan="2">0 : END, 1 : KEEP, 2 : CONT</td><td rowspan="2">END</td><td>K28282~83</td><td>K33282~83</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45250~51</td><td>%KX53250~51</td></tr>
<tr><td rowspan="2">Control</td><td rowspan="2">0 : POS, 1 : SPD</td><td rowspan="2">POS</td><td>K28281</td><td>K33281</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45249</td><td>%KX53249</td></tr>
<tr><td rowspan="2">Method</td><td rowspan="2">0 : SIN, 1 : REP</td><td rowspan="2">SIN</td><td>K28280</td><td>K33280</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45248</td><td>%KX53248</td></tr>
<tr><td rowspan="2">REP Step</td><td rowspan="2">0 ~ 30 (0 ~ 80 for high - end)</td><td rowspan="2">0</td><td>K2829</td><td>K3329</td><td rowspan="2">Word</td></tr>
<tr><td>%KW2829</td><td>%KW3329</td></tr>
<tr><td rowspan="2">Address [pulse]</td><td rowspan="2">-2,147,483,648～2,147,483,647 [pulse]</td><td rowspan="2">0</td><td>K2820</td><td>K3320</td><td rowspan="2">Double word</td></tr>
<tr><td>%KD1410</td><td>%KD1660</td></tr>
<tr><td rowspan="2">M Code</td><td rowspan="2">0 ~ 65,535</td><td rowspan="2">0</td><td>K2827</td><td>K3327</td><td rowspan="2">Word</td></tr>
<tr><td>%KW2827</td><td>%KW3327</td></tr>
<tr><td rowspan="2">A/D No.</td><td rowspan="2">0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4</td><td rowspan="2">0</td><td>K28286~87</td><td>K33286~87</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45254~55</td><td>%KX53254~55</td></tr>
<tr><td rowspan="2">Speed</td><td rowspan="2">1 ～ 100,000[pulse/s]</td><td rowspan="2">0</td><td>K2824</td><td>K3324</td><td rowspan="2">Double word</td></tr>
<tr><td>%KD1412</td><td>%KD1662</td></tr>
<tr><td rowspan="2">Dwell</td><td rowspan="2">0 ~ 50,000[unit:㎳]</td><td rowspan="2">0</td><td>K2826</td><td>K3326</td><td rowspan="2">Word</td></tr>
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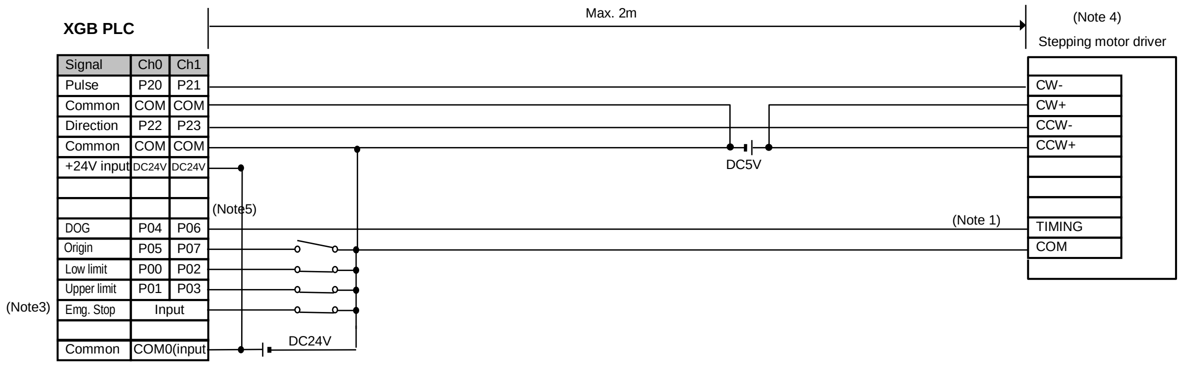
<tr><th>X axis</th><th>Y axis</th></tr>
<tr><td rowspan="20">80</td><td rowspan="2">Coord.</td><td rowspan="2">0 : ABS, 1 : INC</td><td rowspan="2">ABS</td><td>K28384</td><td>K33384</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45412</td><td>%KX53412</td></tr>
<tr><td rowspan="2">Pattern</td><td rowspan="2">0 : END, 1 : KEEP, 2 : CONT</td><td rowspan="2">END</td><td>K28382~83</td><td>K33382~83</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45410~11</td><td>%KX53410~11</td></tr>
<tr><td rowspan="2">Control</td><td rowspan="2">0 : POS, 1 : SPD</td><td rowspan="2">POS</td><td>K28381</td><td>K33381</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45409</td><td>%KX53409</td></tr>
<tr><td rowspan="2">Method</td><td rowspan="2">0 : SIN, 1 : REP</td><td rowspan="2">SIN</td><td>K28380</td><td>K33380</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45408</td><td>%KX53408</td></tr>
<tr><td rowspan="2">REP Step</td><td rowspan="2">0 ~ 30 (0 ~ 80 for high - end)</td><td rowspan="2">0</td><td>K2839</td><td>K3339</td><td rowspan="2">Word</td></tr>
<tr><td>%KW2839</td><td>%KW3339</td></tr>
<tr><td rowspan="2">Address [pulse]</td><td rowspan="2">-2,147,483,648～2,147,483,647 [pulse]</td><td rowspan="2">0</td><td>K2830</td><td>K3330</td><td rowspan="2">Double word</td></tr>
<tr><td>%KD1415</td><td>%KD1665</td></tr>
<tr><td rowspan="2">M Code</td><td rowspan="2">0 ~ 65,535</td><td rowspan="2">0</td><td>K2837</td><td>K3337</td><td rowspan="2">Word</td></tr>
<tr><td>%KW2837</td><td>%KW3337</td></tr>
<tr><td rowspan="2">A/D No.</td><td rowspan="2">0 : No.1, 1 : No.2, 2 : No.3, 3 : No.4</td><td rowspan="2">0</td><td>K28386~87</td><td>K33386~87</td><td rowspan="2">Bit</td></tr>
<tr><td>%KX45414~15</td><td>%KX53414~15</td></tr>
<tr><td rowspan="2">Speed</td><td rowspan="2">1 ～ 100,000[pulse/s]</td><td rowspan="2">0</td><td>K2834</td><td>K3334</td><td rowspan="2">Double word</td></tr>
<tr><td>%KD1417</td><td>%KD1667</td></tr>
<tr><td rowspan="2">Dwell</td><td rowspan="2">0 ~ 50,000[unit:㎳]</td><td rowspan="2">0</td><td>K2836</td><td>K3336</td><td rowspan="2">Word</td></tr>
<tr><td>%KW2836</td><td>%KW3336</td></tr>
</table>

Appendix 3 Motor Wiring Example

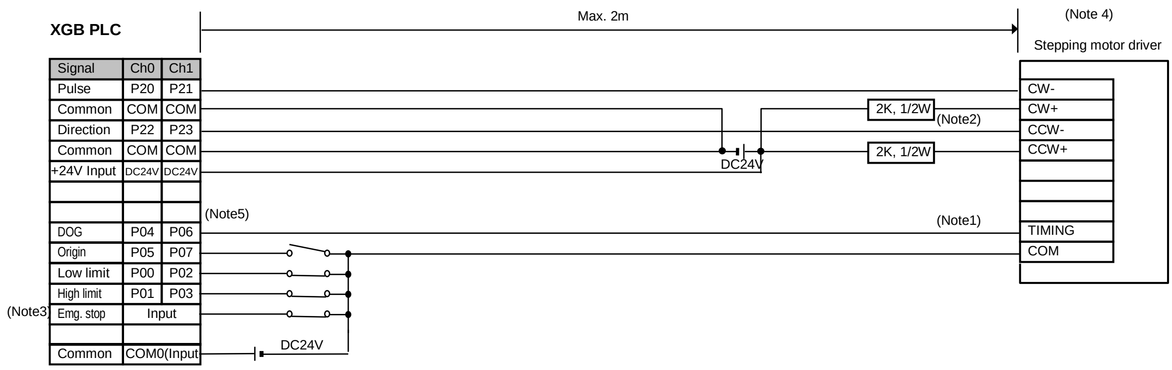
Appendix 3.1 Stepping Motor Wiring Example

Here describes wiring example between XGB and stepping motor.
In case of using stepping motor not described here, refer to relevant driver's user manual.

(1) Connection to a stepping motor driver (DC5V Power)



(2) Connection to a stepping motor driver (DC24V Power)



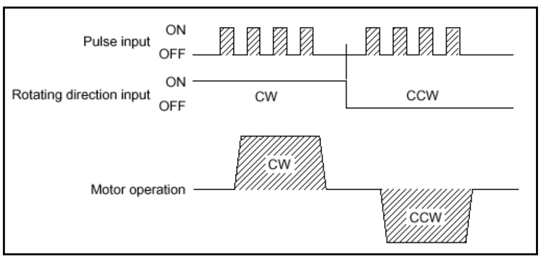
(Note1) In case of VEXTA PKD, timing output is on every time a motor rotates 7.2 degrees. For precise home return, timing output and origin sensor should be structured by AND circuit. Depending on a system's features, it is recommended to use **home return only by DOG signal or origin sensor by origin signal** (XGB origin input rating is DC 24V).

(Note2) Connect resistors suitable for the driver in series if DC24V is used.

(Note3) Although origin, DOC, upper/lower limit signals are with fixed contact, it may be used for general input if they are not used. Emergency stop is available by the command (EMG).

(Note4) In case of XGB standard type, since only pulse + direction mode is available, change input mode of stepping motor driver to 1 phase input mode.

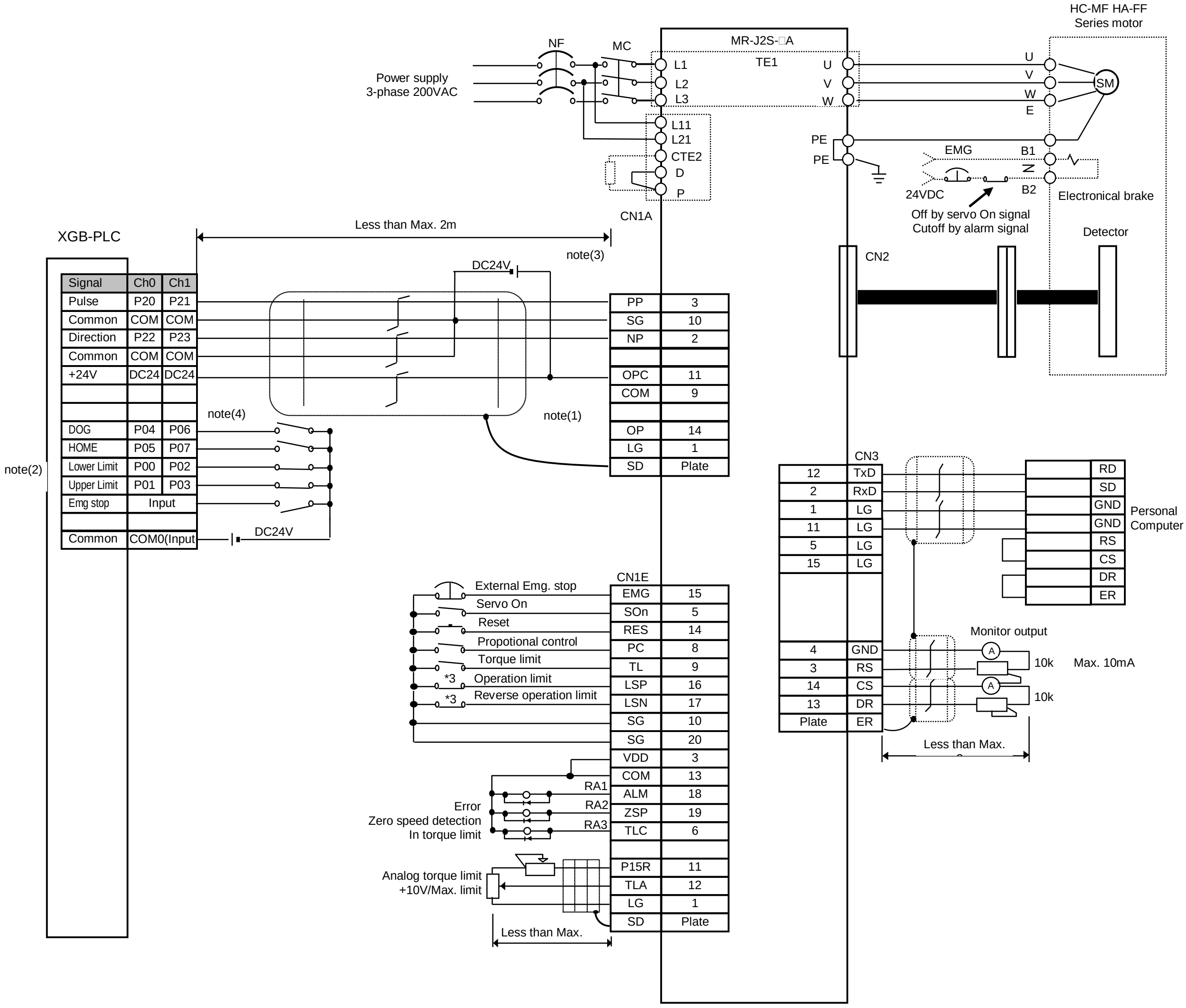
(Note 5) The above figure is example of XGB standard type. For high-end type, Origin, DOG, upper/lower limit input contact point is different with standard type.



Appendix 3.2 Servo Motor Wiring Example

Here describes wiring example between XGB and servo motor.
In case of using servo motor not described here, refer to relevant driver's user manual.

(1) Connection to a servo motor driver (MR-J2/J2S-□A)

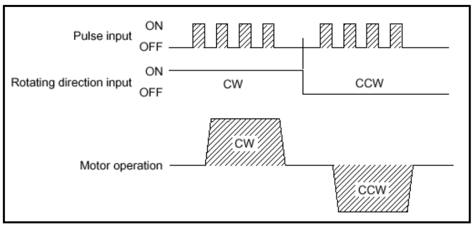


(Note1) The rating of XGB origin input is DC24V. Make sure to connect the open collector output of a driver.

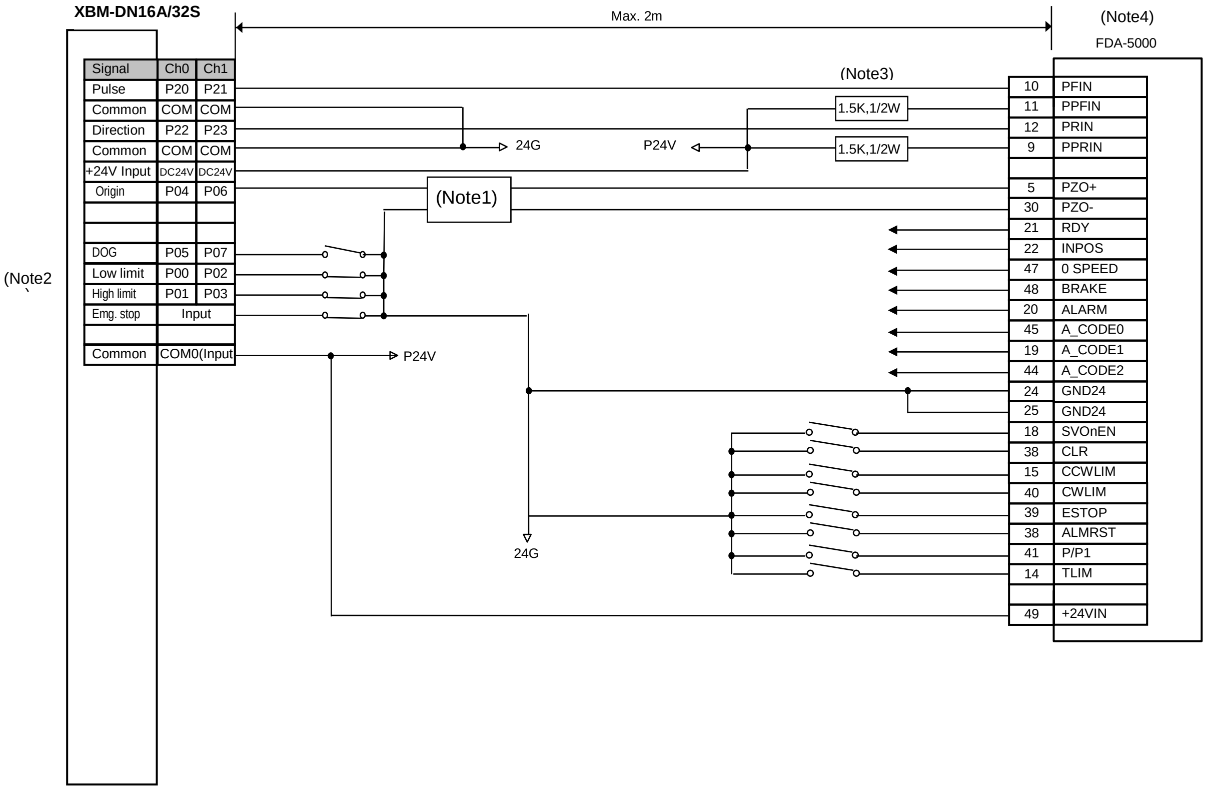
(Note2) Although origin, DOC, upper/lower limit signals are with fixed contact, it may be used for general input if they are not used. Emergency stop is available by the command (EMG).

(Note3) In case of XGB standard type, since only pulse + direction mode is available, change input mode of servo motor driver to 1 phase input mode.

(Note4) The above figure is example of XGB standard type. For high-end type, Origin, DOG, upper/lower limit input contact point is different with standard type.



(2) Connection to a servo motor driver (FDA-5000 AC Servo Driver)

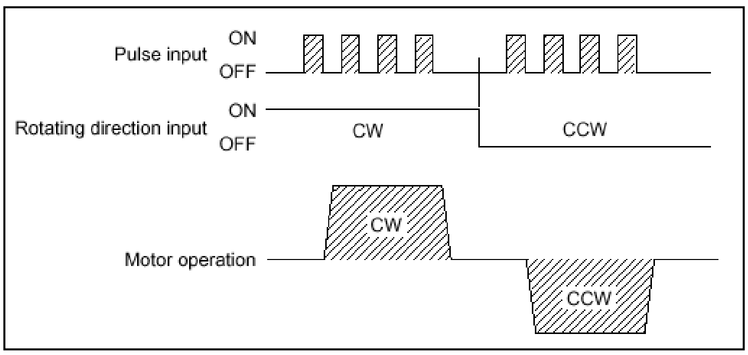


(Note1) The rating of XGB is 24VDC. If it is line driver output, contact is not connected. In the case, use a convert from line driver output to open collector output or use home return only by DOG signal/origin sensor of origin signal.

(Note2) Although origin, DOC, upper/lower limit signals are with fixed contact, it may be used for general input if they are not used. Emergency stop is available by the command (EMG).

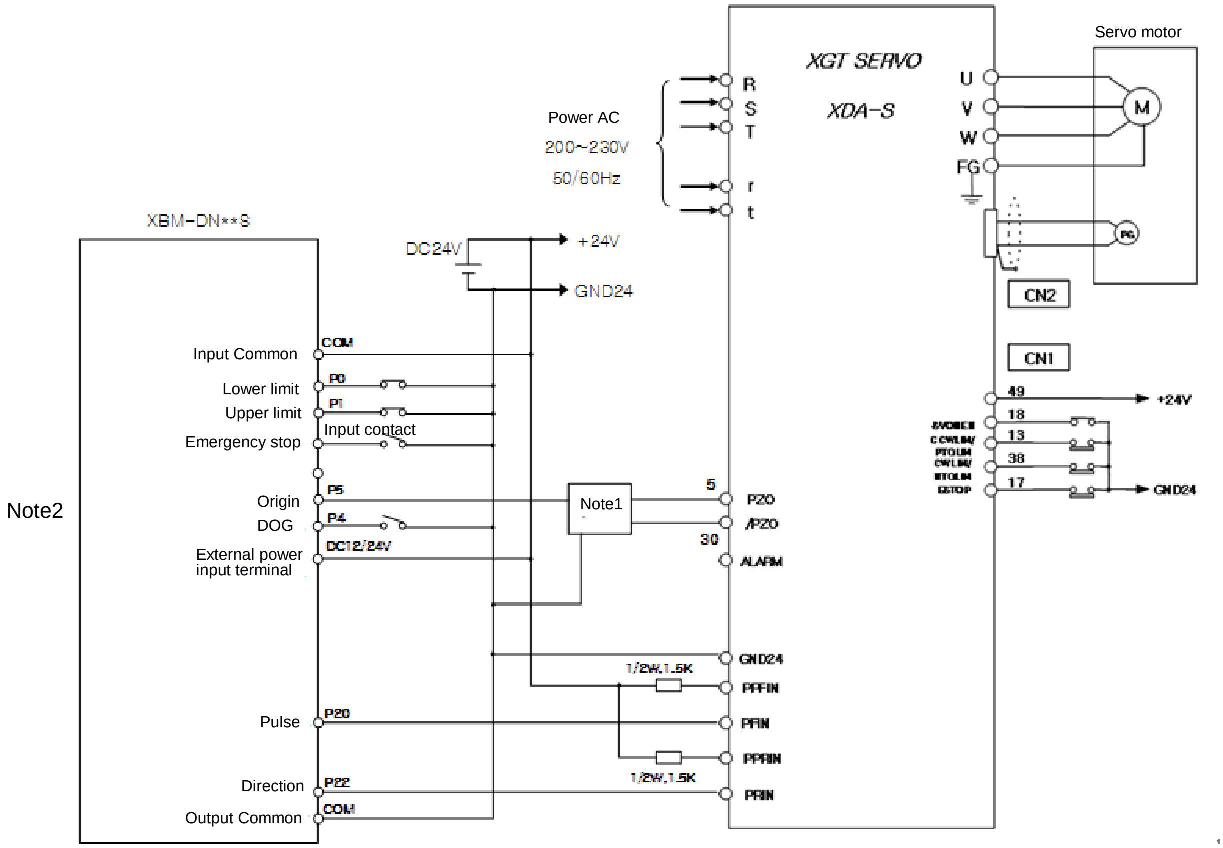
(Note3) If using DC24V, make sure to connect resistor suitable for a driver (1.5K,1/2W) in series.

(Note4) Since the positioning pulse of XGB forward/reverse-rotates by the rotation direction as in the below figure, make sure to change the input mode of a servo motor driver into 1 phase input mode prior to use.



(3) Connection to a servo motor driver (XGT Servo XDA-S)

(a) In case of XBM-DN**S



(Note1) The rating of Origin input for XGB stand type is 24VDC. If it is line driver output, contact can't be connected. In the case, use a convert from line driver output to open collector output or use home return only by DOG signal/origin sensor of origin signal.

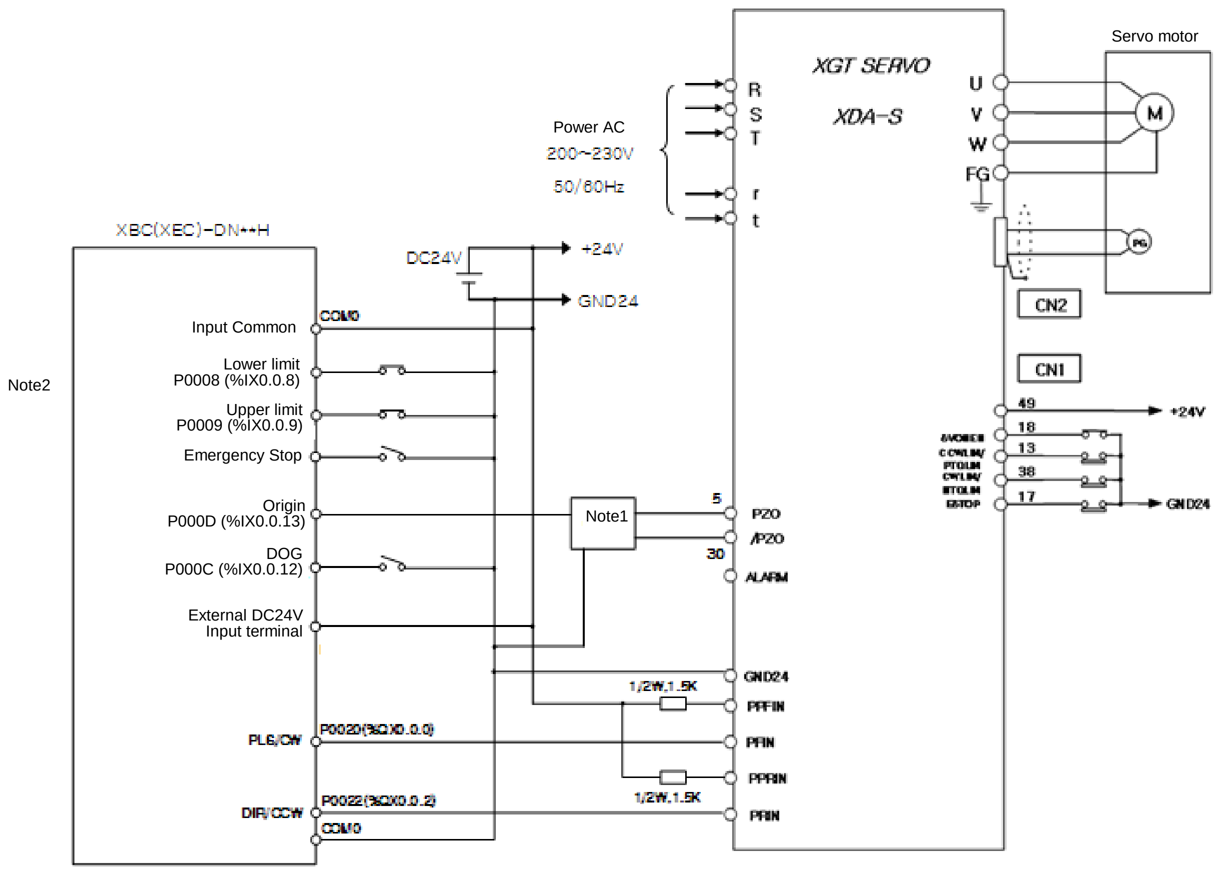
(Note2) Although origin, DOC, upper/lower limit signals are with fixed contact, it may be used for general input if they are not used. Emergency stop is available by the command (EMG).

(Note3) The above wiring is applied when P07-01=27(positioning mode)

(Note4) Since only pulse + direction mode is available for XGB standard type, make sure to change the input mode of a servo motor driver into pulse + direction mode prior to use

(Note5) In the above wiring, Axis X of XGB standard built-in positioning is used.

(b) In case of XBC/XEC-DN**H



(Note1) The rating of Origin input for XGB stand type is 24VDC. If it is line driver output, contact can't be connected. In the case, use a convert from line driver output to open collector output or use home return only by DOG signal/origin sensor of origin signal.

(Note2) Although origin, DOC, upper/lower limit signals are with fixed contact, it may be used for general input if they are not used. Emergency stop is available by the command (EMG).

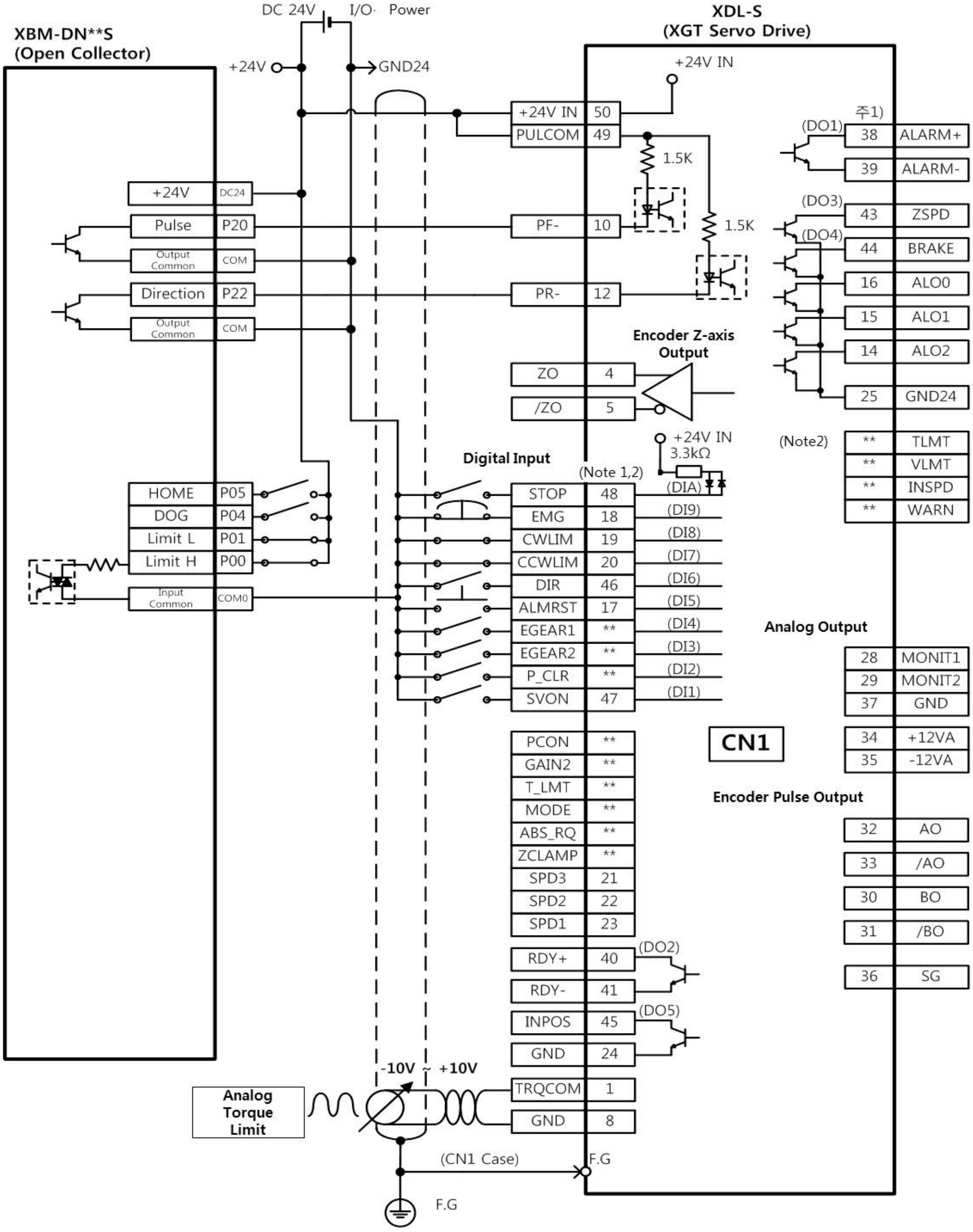
(Note3) The above wiring is applied when P07-01=27(positioning mode)

(Note4) Since pulse + direction mode and CW/CCW mode are available for XGB high-end type, make sure to change the input mode of a servo motor driver according to output mode of positioning module

(Note5) In the above wiring, Axis X of XGB high-end type built-in positioning is used.

(4) Connection to a servo motor driver (XGT Servo XDL-S)

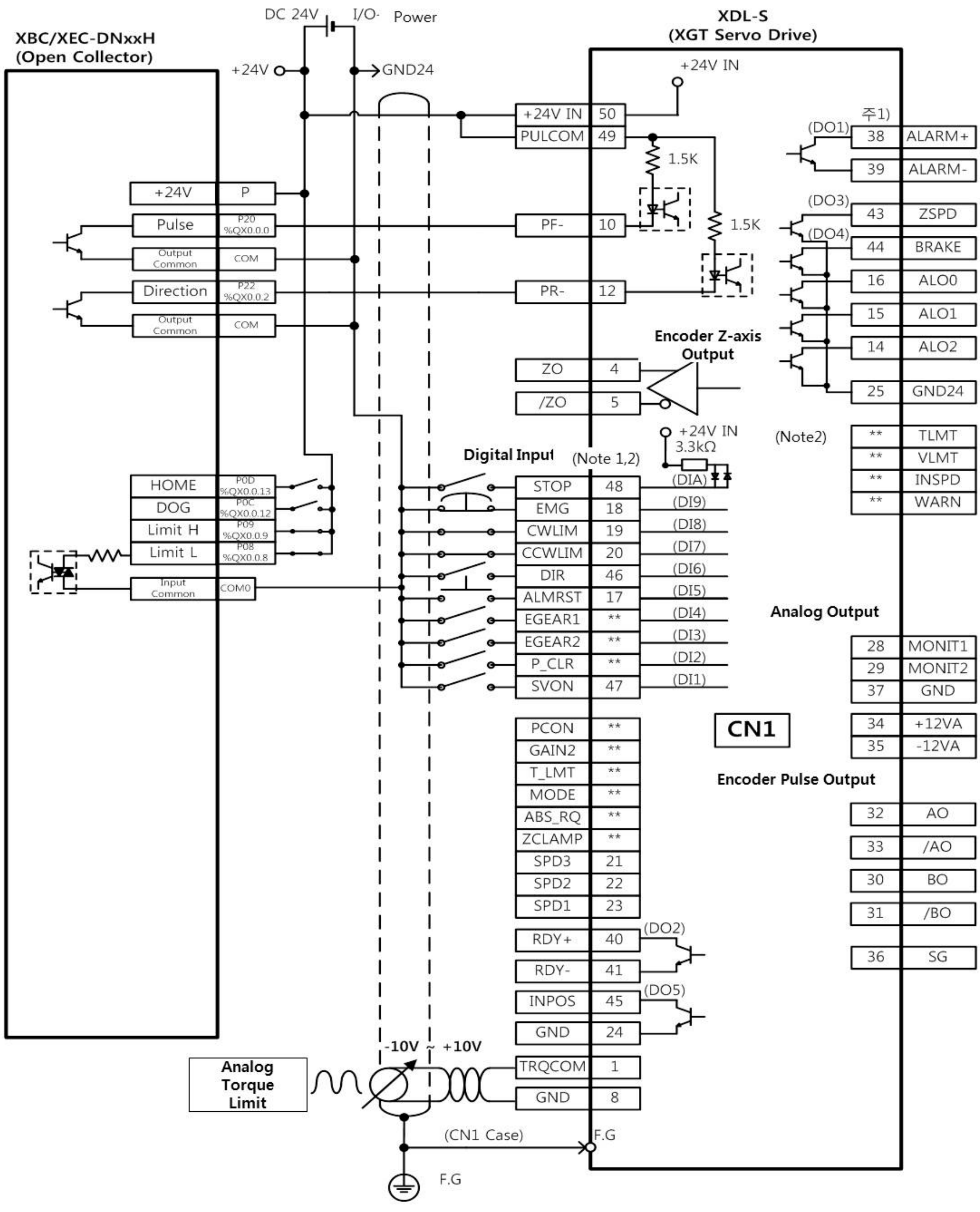
(a) In case of XBM-DN**S



※ This picture is based on 1-axis. For more information about 2-axis wiring, refer to pin information.

(Note1) Input Signal DI1~DIA, Output Signal DO1~DO5 is assigned initial signal from factory shipment
(Note2) ** Not assigned Signal. Allocation can be changed by setting servo parameter

(b) In case of XBC/XEC-DN**H



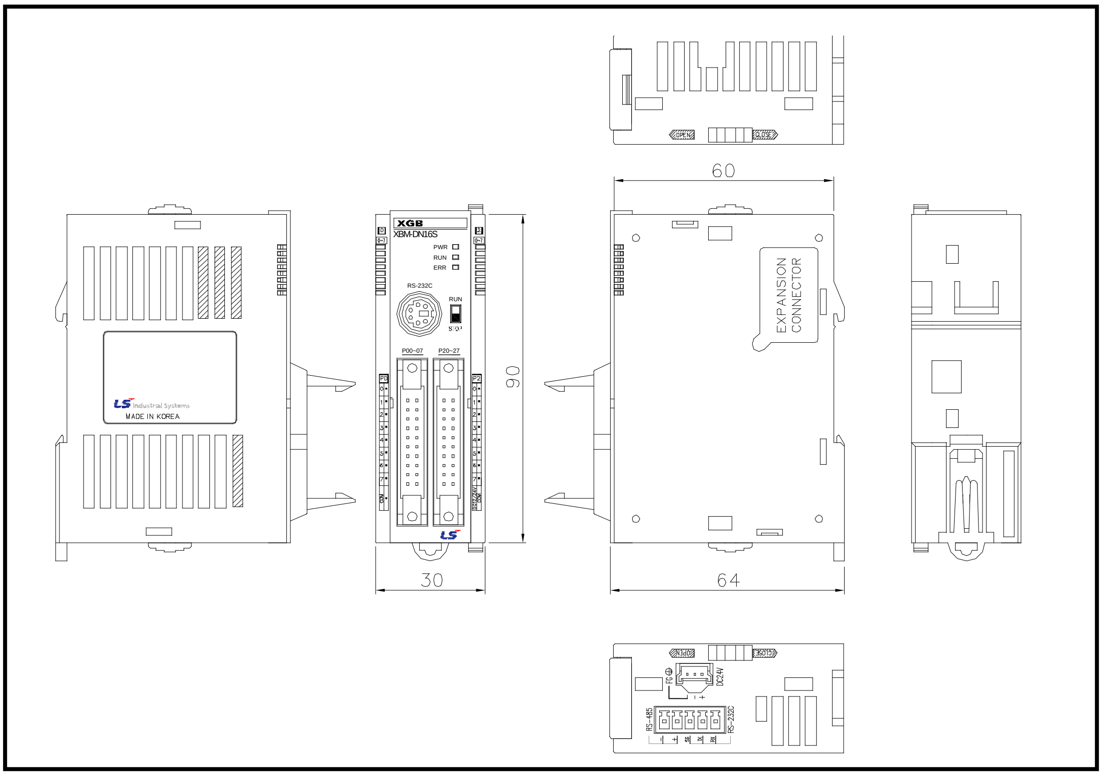
※This picture is based on 1-axis. For more information about 2-axis wiring, refer to pin information.

(Note1) Input Signal DI1~DIA, Output Signal DO1~DO5 is assigned initial signal from factory shipment
(Note2) ** Not assigned Signal. Allocation can be changed by setting servo parameter

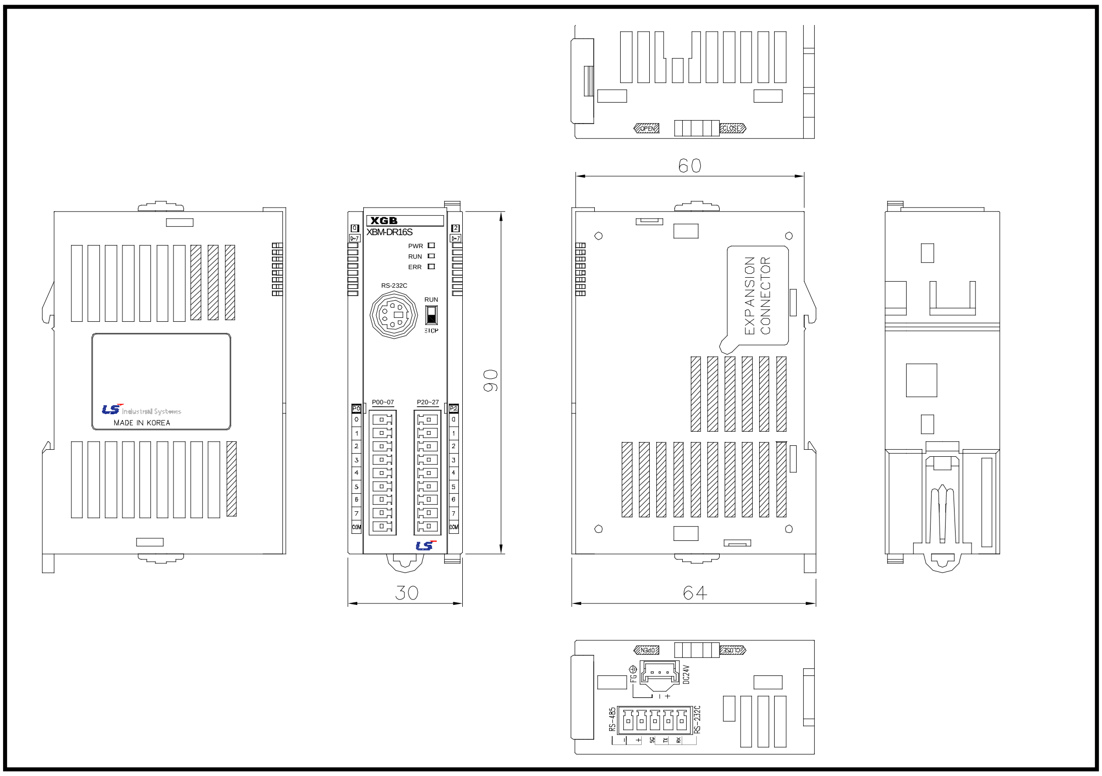
Appendix 4 Dimension (Unit : mm)

(1) Modular type main unit

-. XBM-DN16S/32S

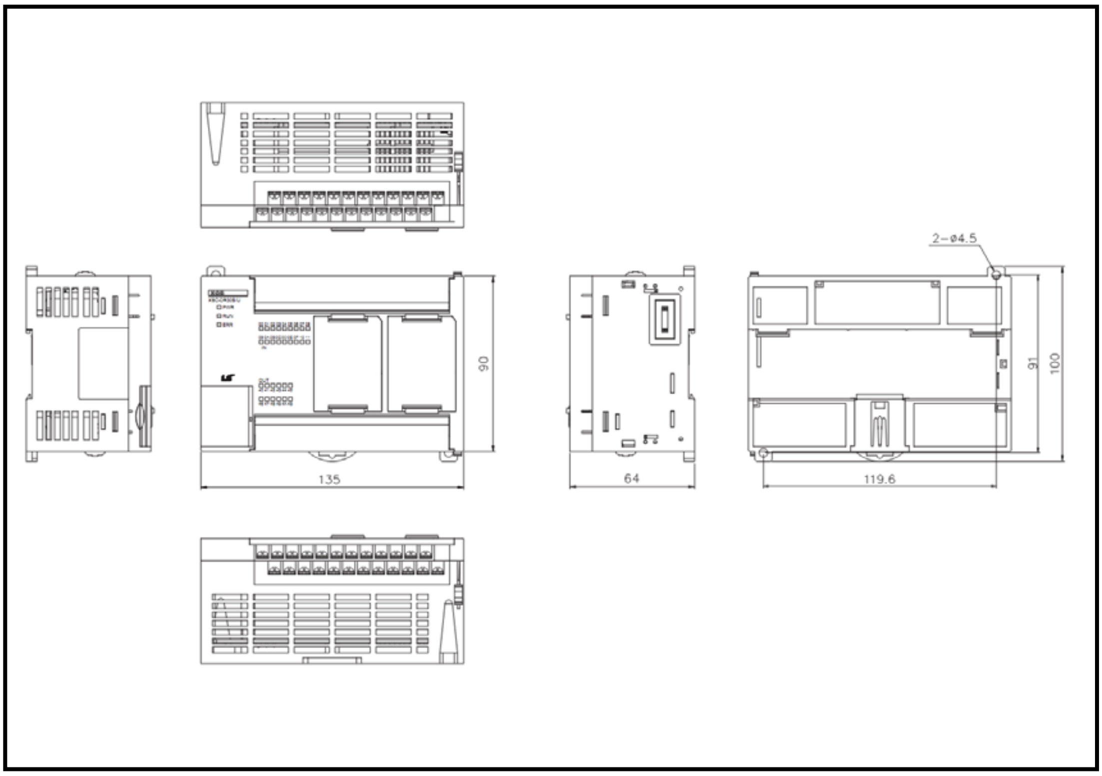


-. XBM-DR16S

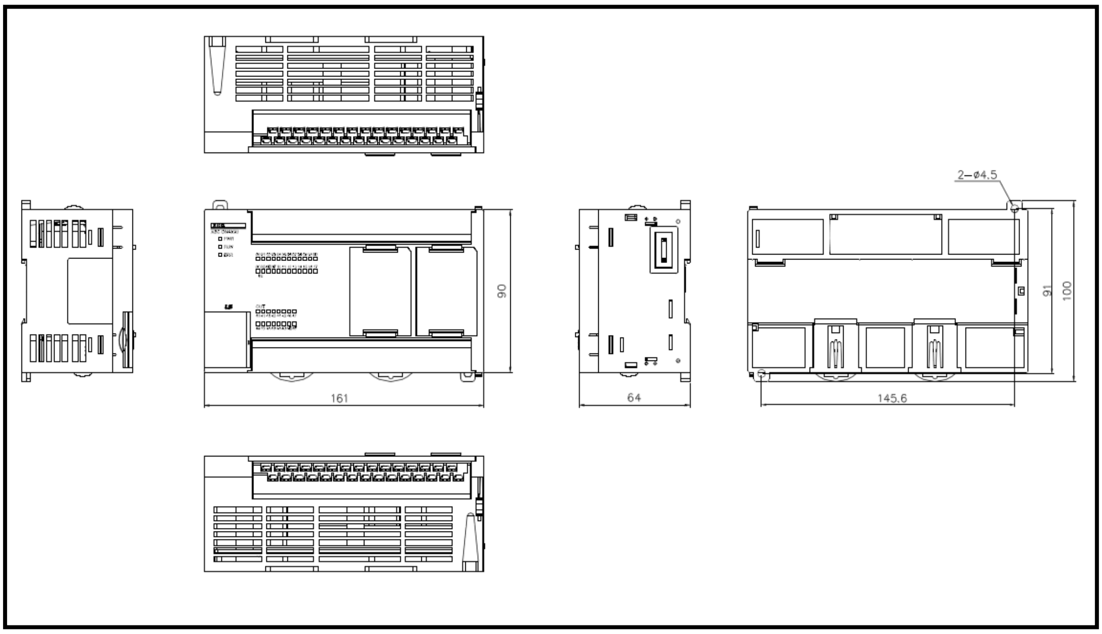


(2) Compact Standard main unit ("S(U)"type)

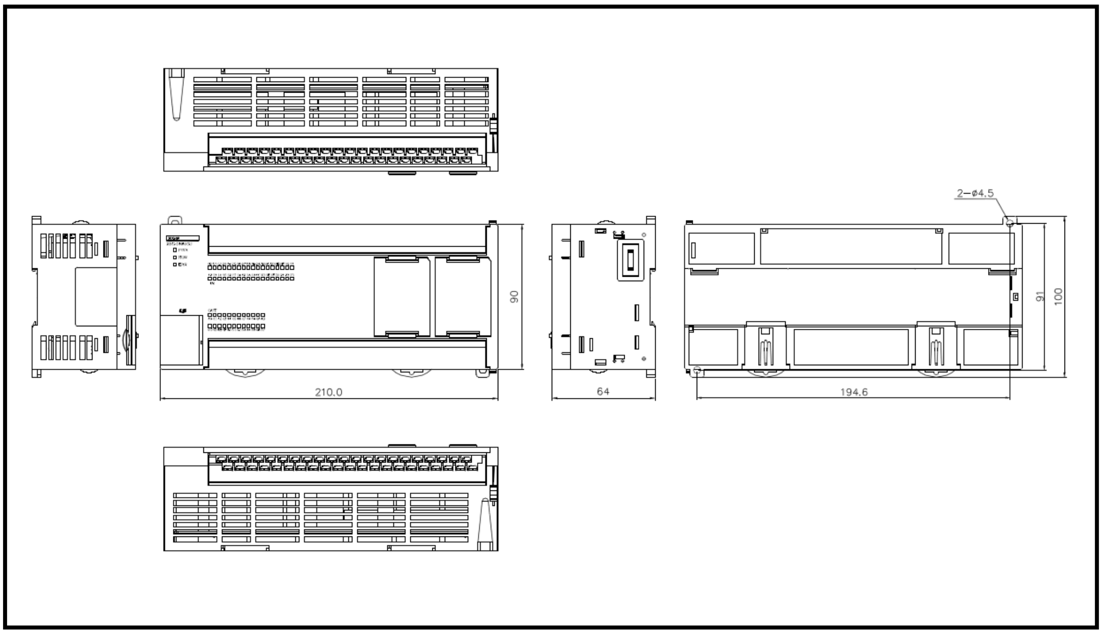
- XB(E)C-DR20/30S(U), XB(E)C-DN20/30SU, XB(E)C-DP20/30SU



-. XB(E)C-DR40SU, XB(E)C-DN40SU, XB(E)C-DP40SU

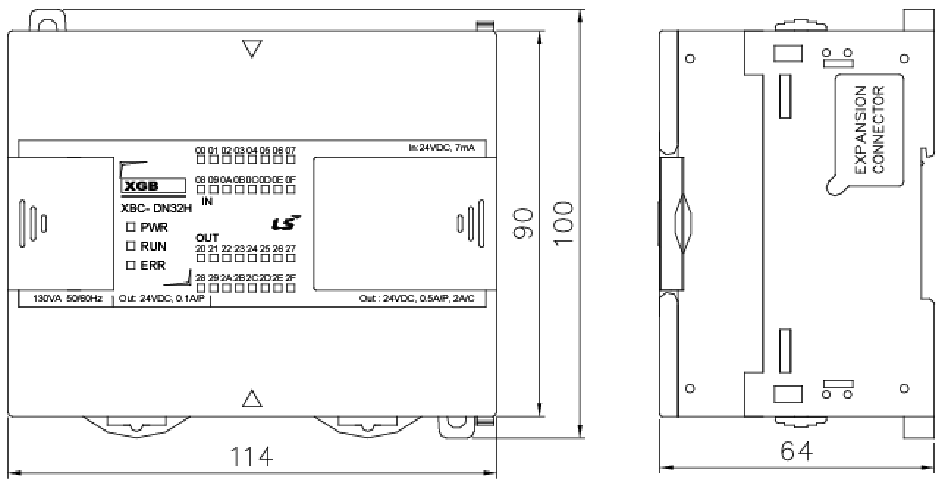


-. XB(E)C-DR60SU, XB(E)C-DN60SU, XB(E)C-DP60SU

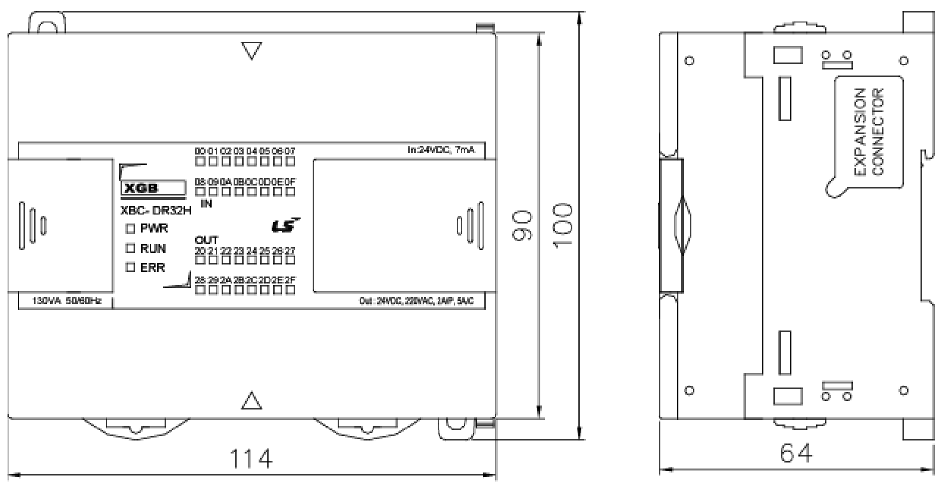


(3) Compact High-end type main unit

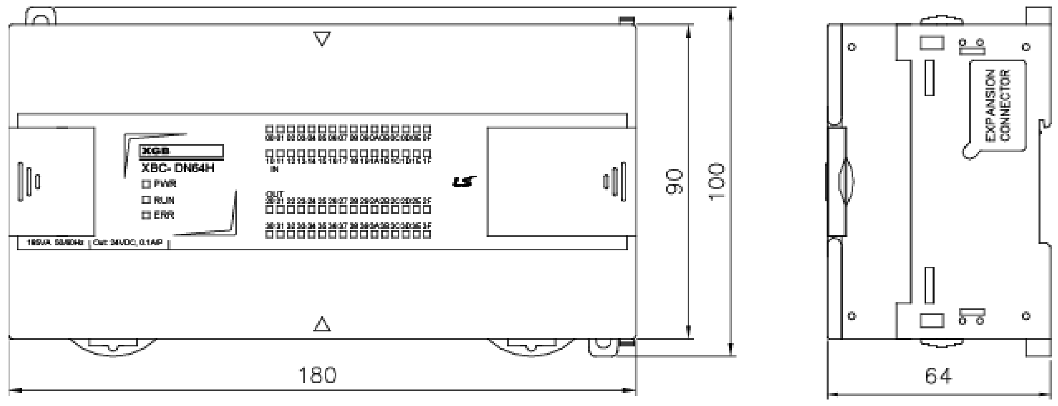
-. XBC-DN32H/XEC-DN32H/XEC-DP32H



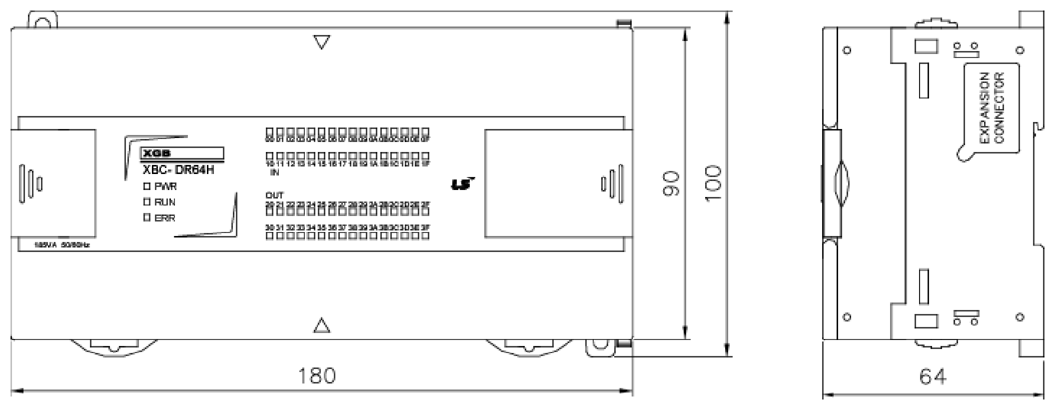
-. XBC-DR32H/XEC-DR32H



-. XBC-DN64H/XEC-DN64H/XEC-DP64H

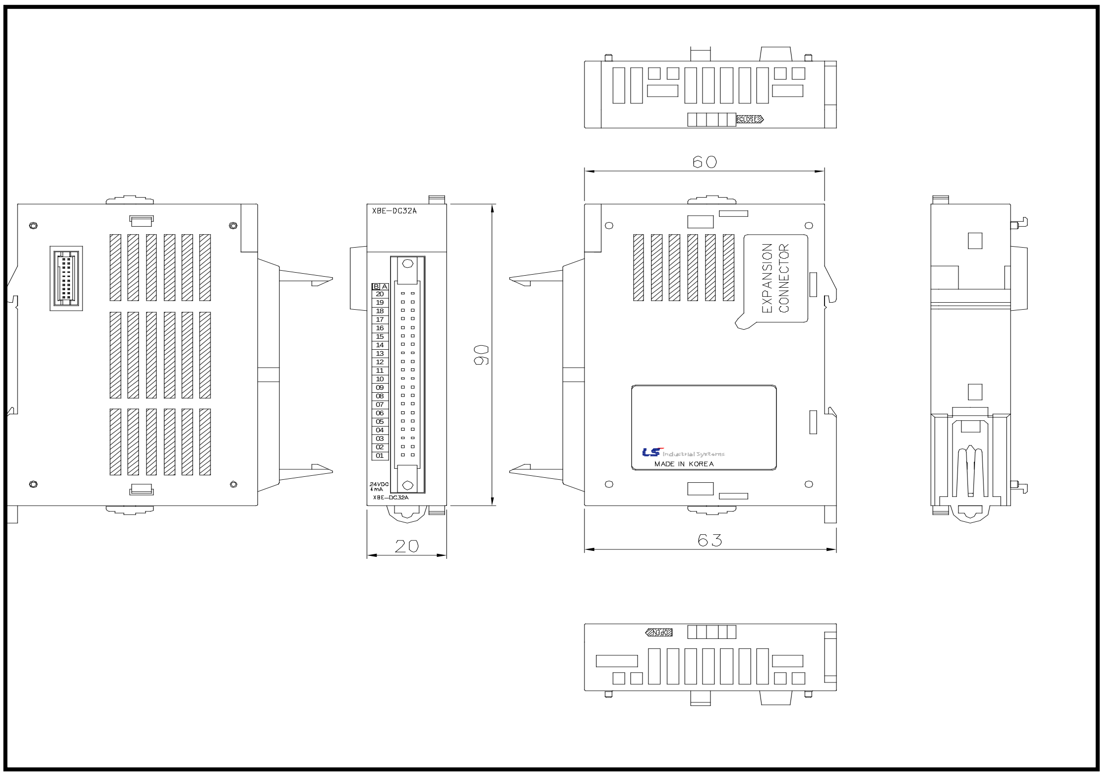


-. XBC-DR64H/XEC-DR64H

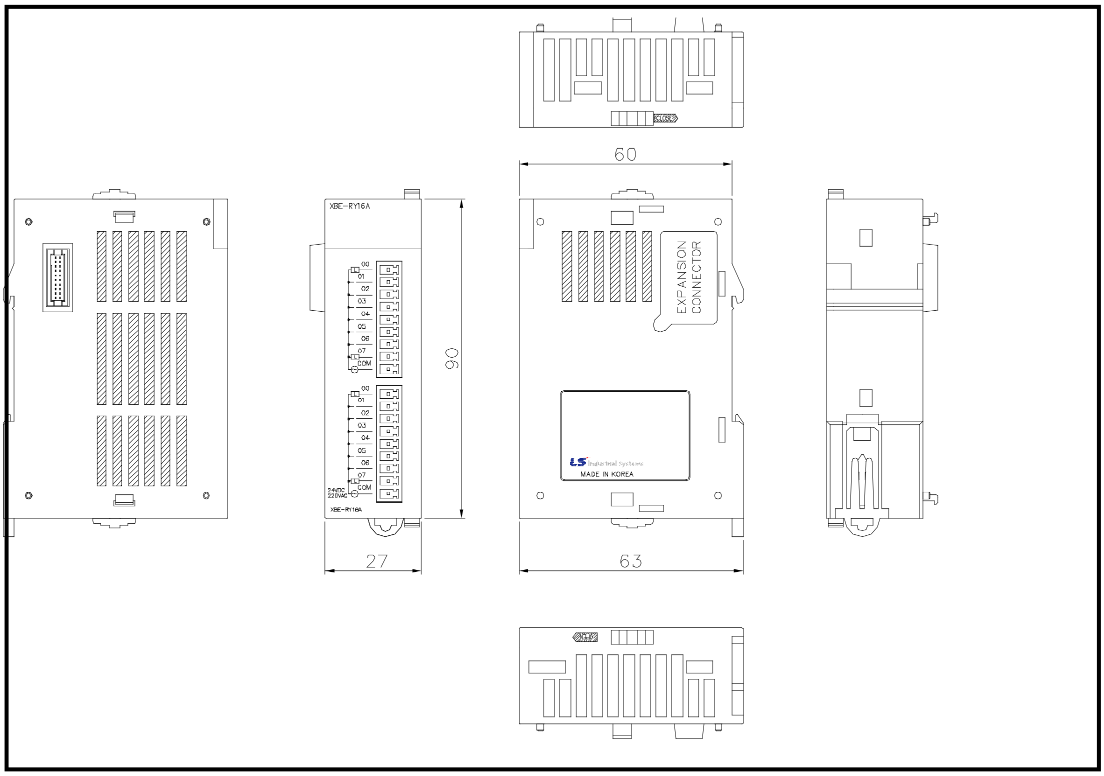


(4) Extended I/O module

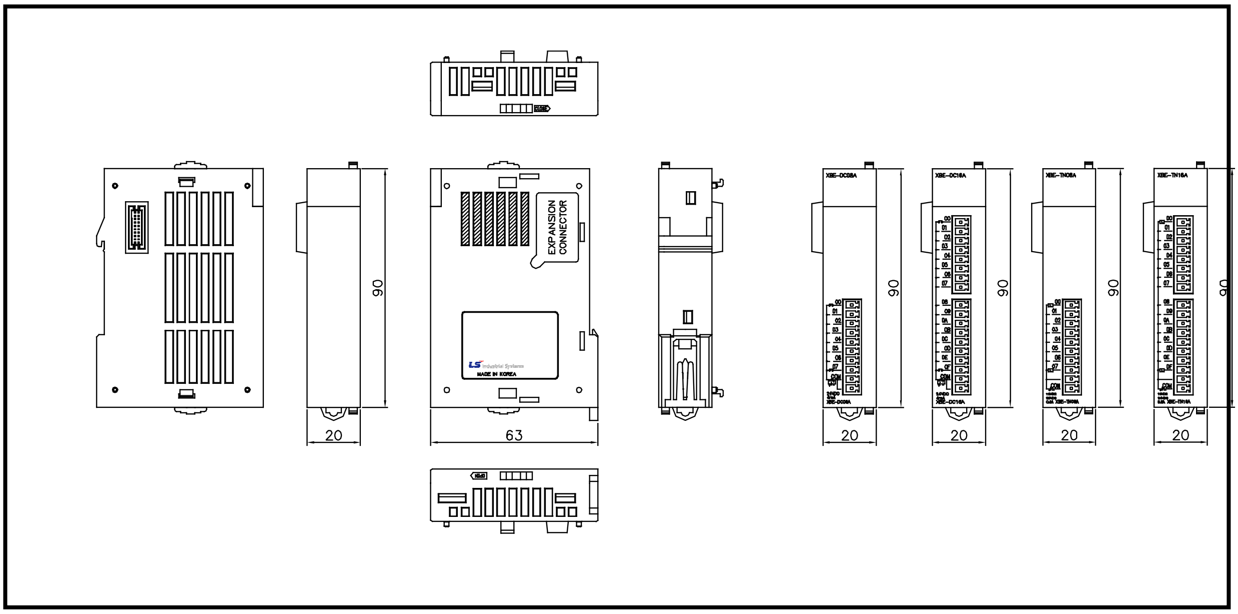
-. XBE-DC32A, XBE-TR32A



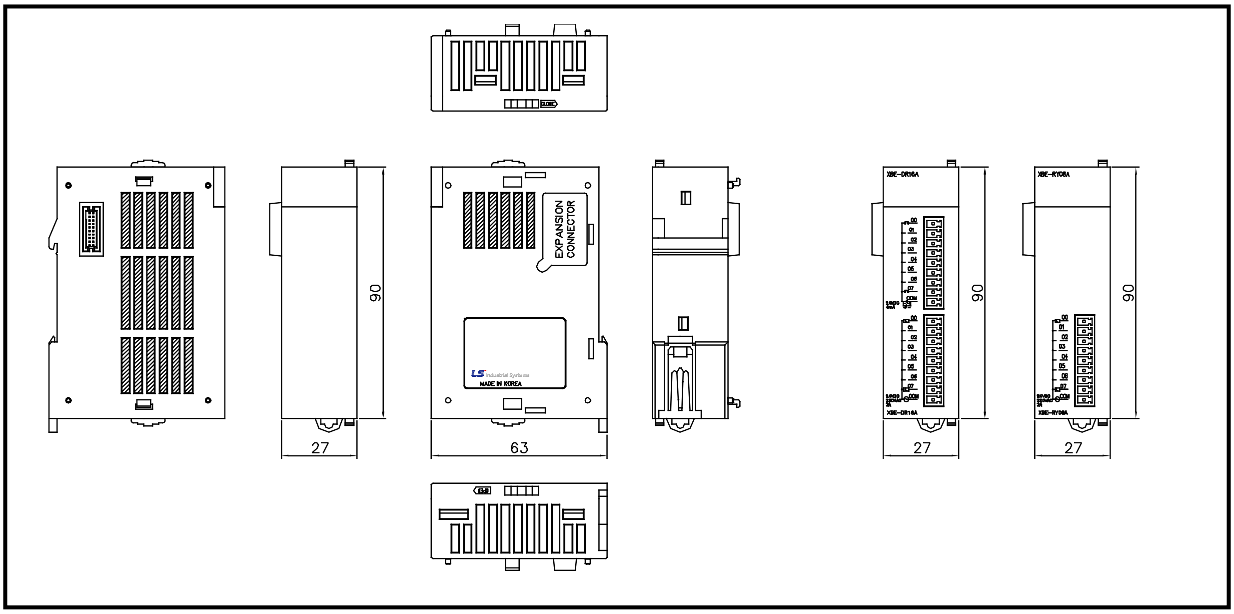
-. XBE-RY16A



-. XBE-DC08A, XBE-DC16A, XBE-TN08A, XBE-TN16A

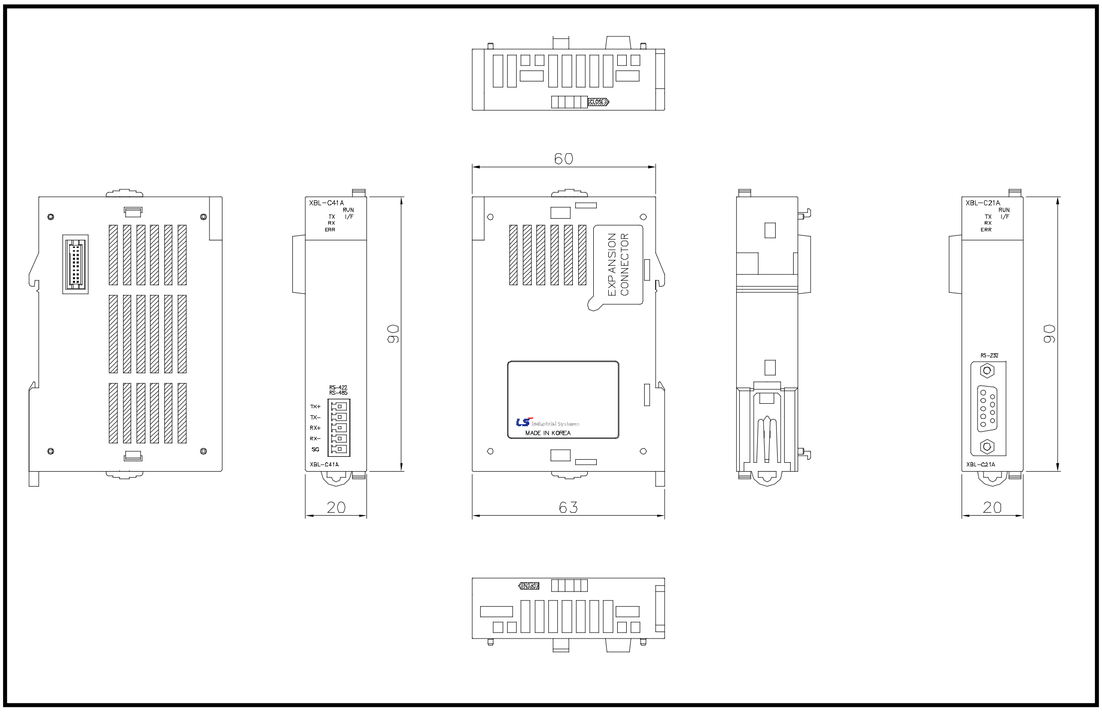


-. XBE-DR16A, XBE-RY08A

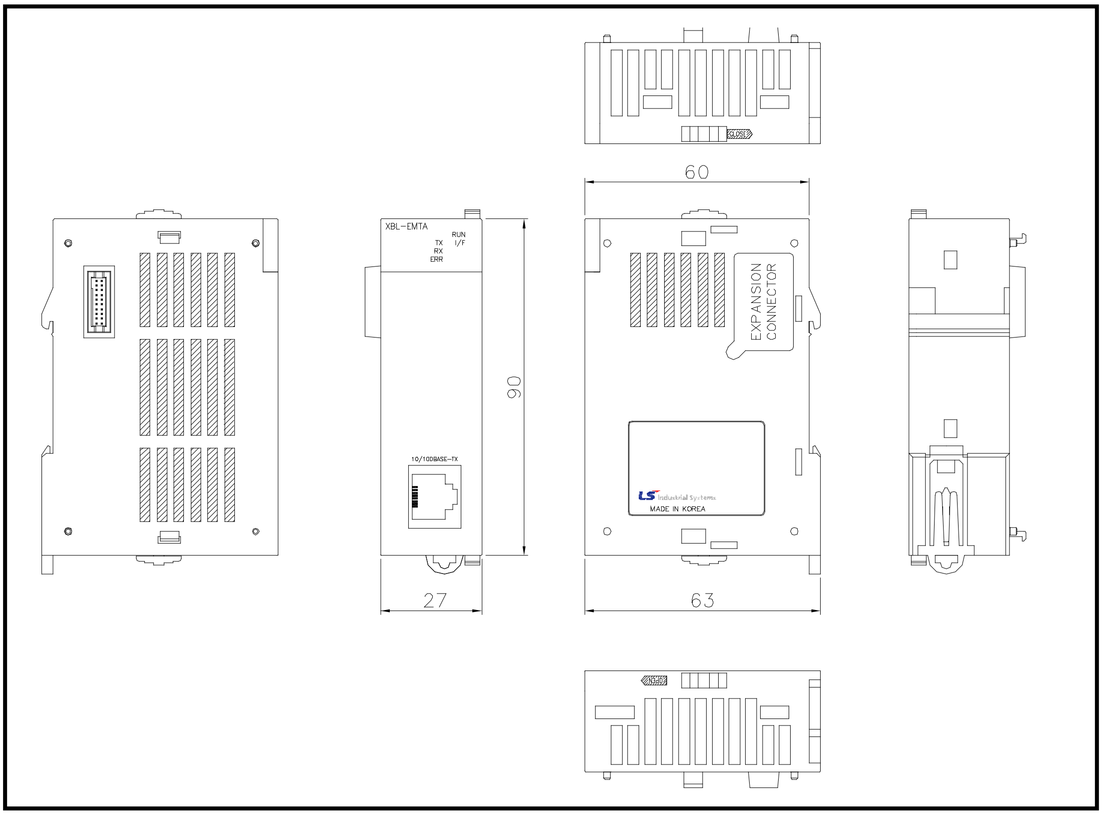


(5) Communication module

-. XBL-C41/21A

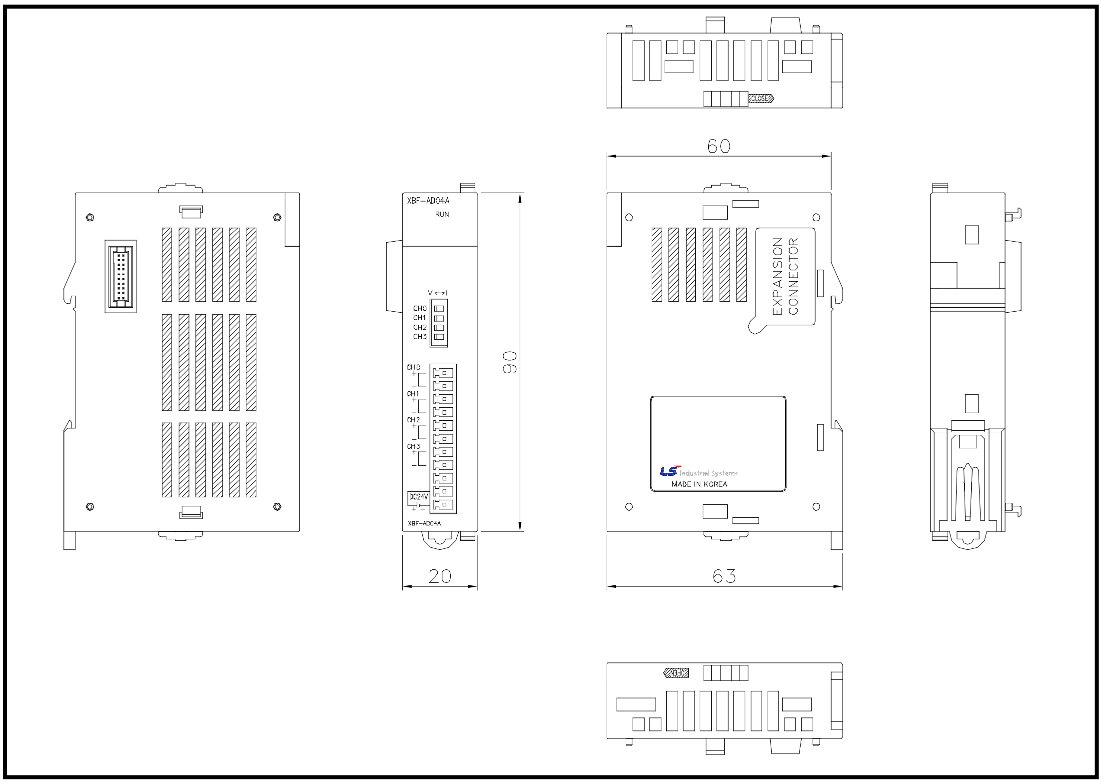


-. XBL-EMTA

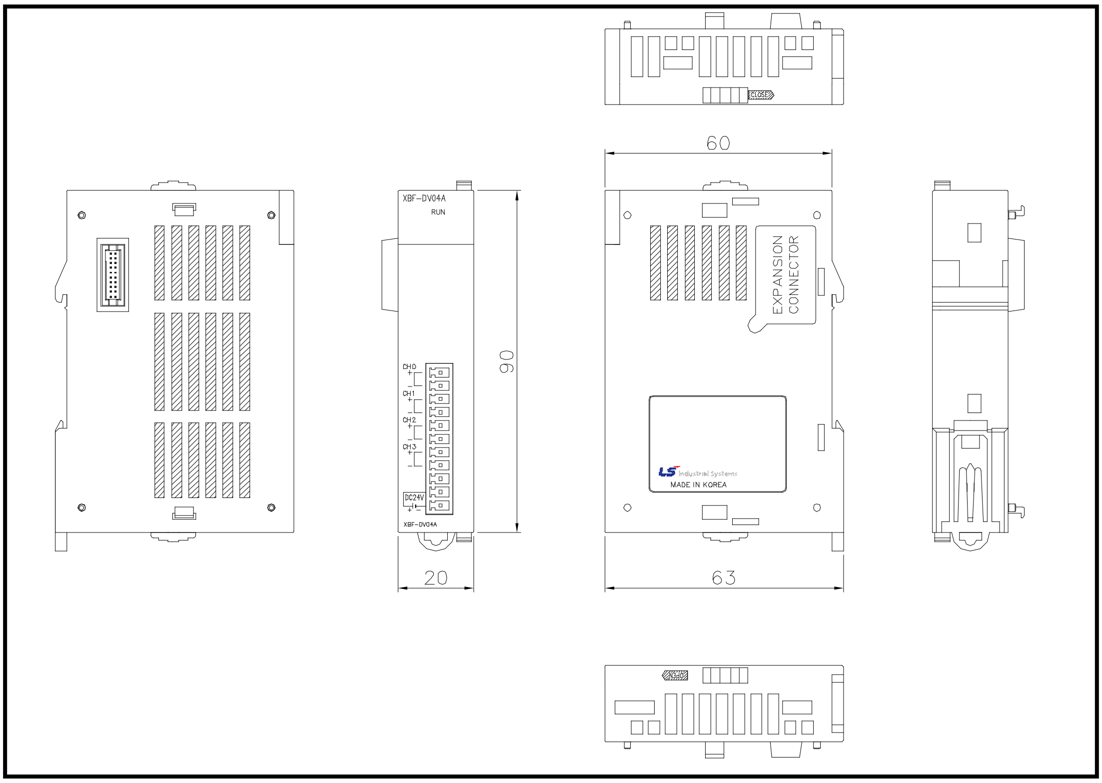


(5) Special module

-. XBF-AD04A



-. XBF-DV04A



Warranty

1. Warranty Period
   The product you purchased will be guaranteed for 18 months from the date of manufacturing.

2. Scope of Warranty
   Any trouble or defect occurring for the above-mentioned period will be partially replaced or repaired. However, please note the following cases will be excluded from the scope of warranty.

   (1) Any trouble attributable to unreasonable condition, environment or handling otherwise specified in the manual,
   (2) Any trouble attributable to others' products,
   (3) If the product is modified or repaired in any other place not designated by the company,
   (4) Due to unintended purposes
   (5) Owing to the reasons unexpected at the level of the contemporary science and technology when delivered.
   (6) Not attributable to the company; for instance, natural disasters or fire

3. Since the above warranty is limited to PLC unit only, make sure to use the product considering the safety for system configuration or applications.

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Environmental Management	About Disposal
LSIS considers the environmental preservation as the preferential management subject and every staff of LSIS use the reasonable endeavors for the pleasurably environmental preservation of the earth.	LSIS' PLC unit is designed to protect the environment. For the disposal, separate aluminum, iron and synthetic resin (cover) from the product as they are reusable.

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2015. 06